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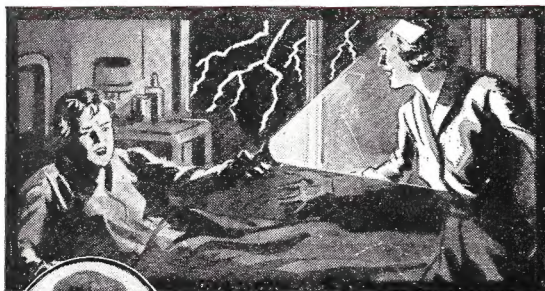
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"Minutes later there was a lightning flash and the lights went out. As I wondered what they would do in the dark operating room, a nurse groped her way to my room. 'Let me have your flashlight, quick! Where is it?...They had started to operate when the lights went out...they've got



to continue....and a lamp is likely to cause an ether explosion!...Quick!"

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(Signed)

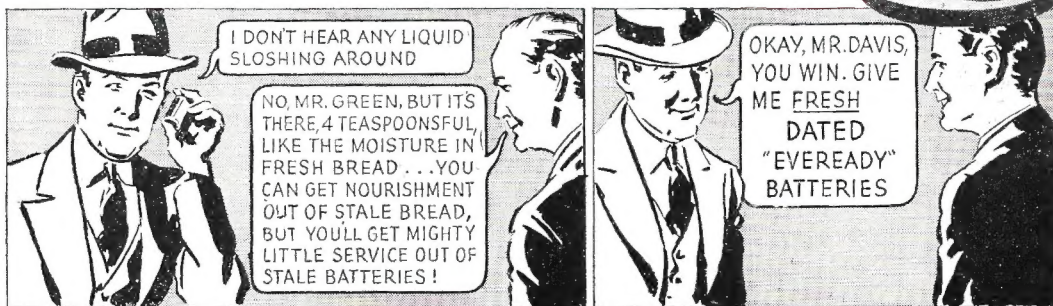
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DECEMBER
1937

Volume XIX
Number 2

Circulation over 250,000

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many general features of an in-
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Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Spare time Radio set servicing pays as much as \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their letters in my 64-page book. Mail the coupon.

There's a Real Future in Radio for Well-Trained Men

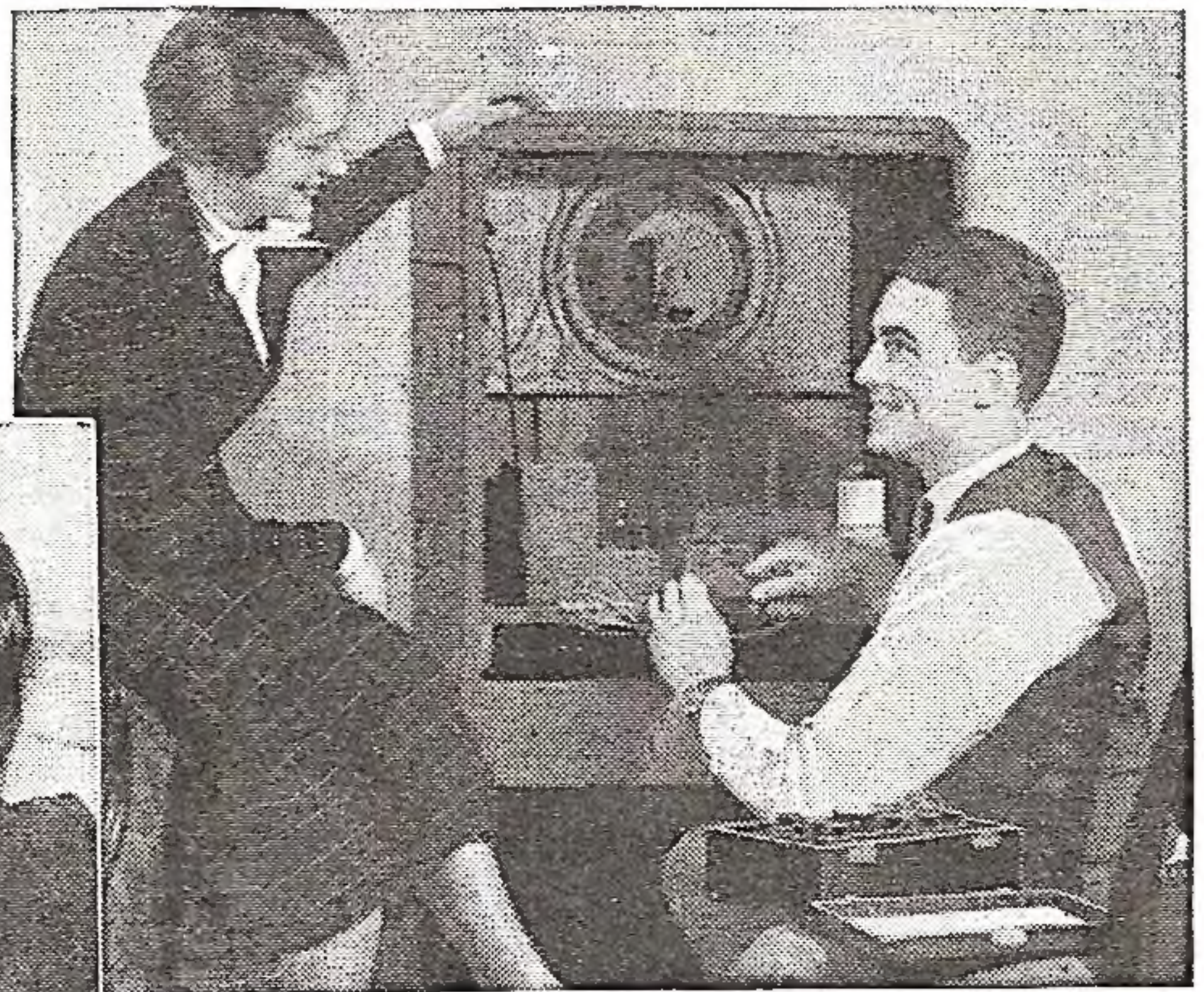
Radio already gives good jobs to more than 300,000 people. And in 1936, Radio enjoyed one of its most prosperous years. More than \$500,000,000 worth of sets, tubes and parts were sold—an increase of more than 60% over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred \$30, \$50, \$75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time service man. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs, how to cash in quickly! Throughout your training I send you plans that made good spare time money—\$200 to \$500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

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My Course is not all book training. I send you special Radio Equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

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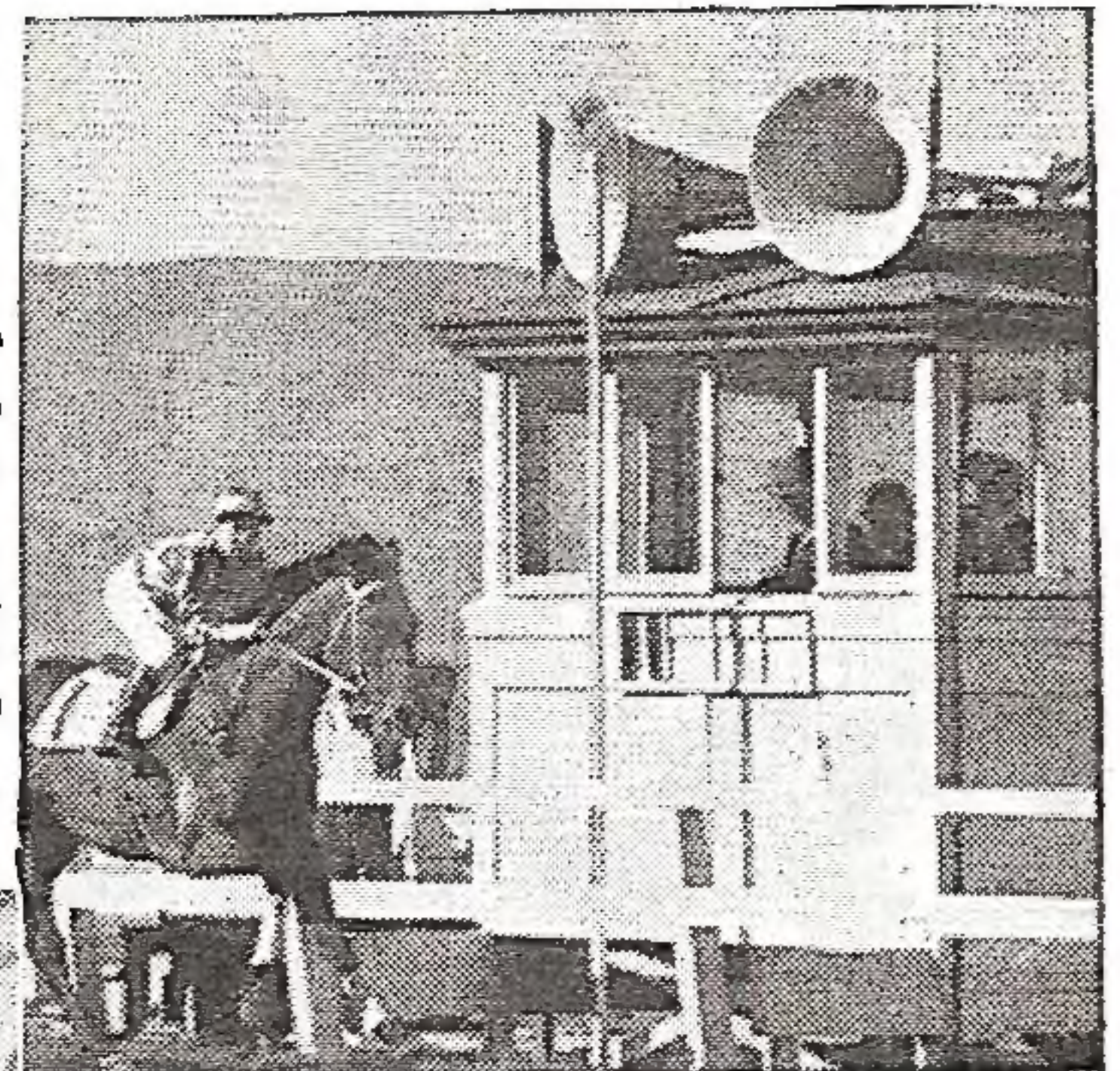
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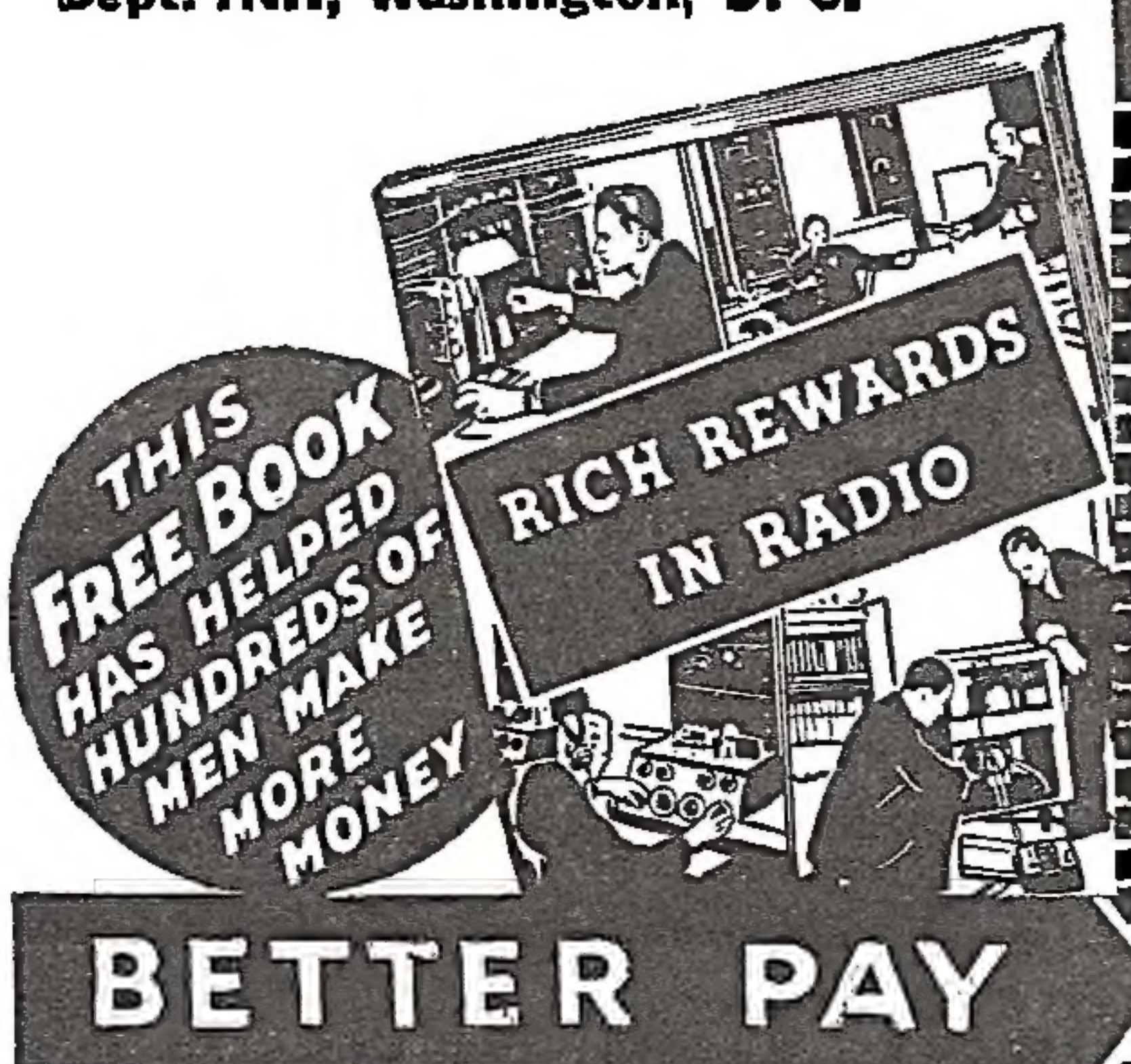
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Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAMEAGE

ADDRESS

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A frank man to PATENTS-INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than \$15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and

millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the gold of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.



Can You Answer These Questions?

Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the *first* man to think of *my invention*? Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! **YOU CAN HAVE THEM**, without cost, trouble, or delay.

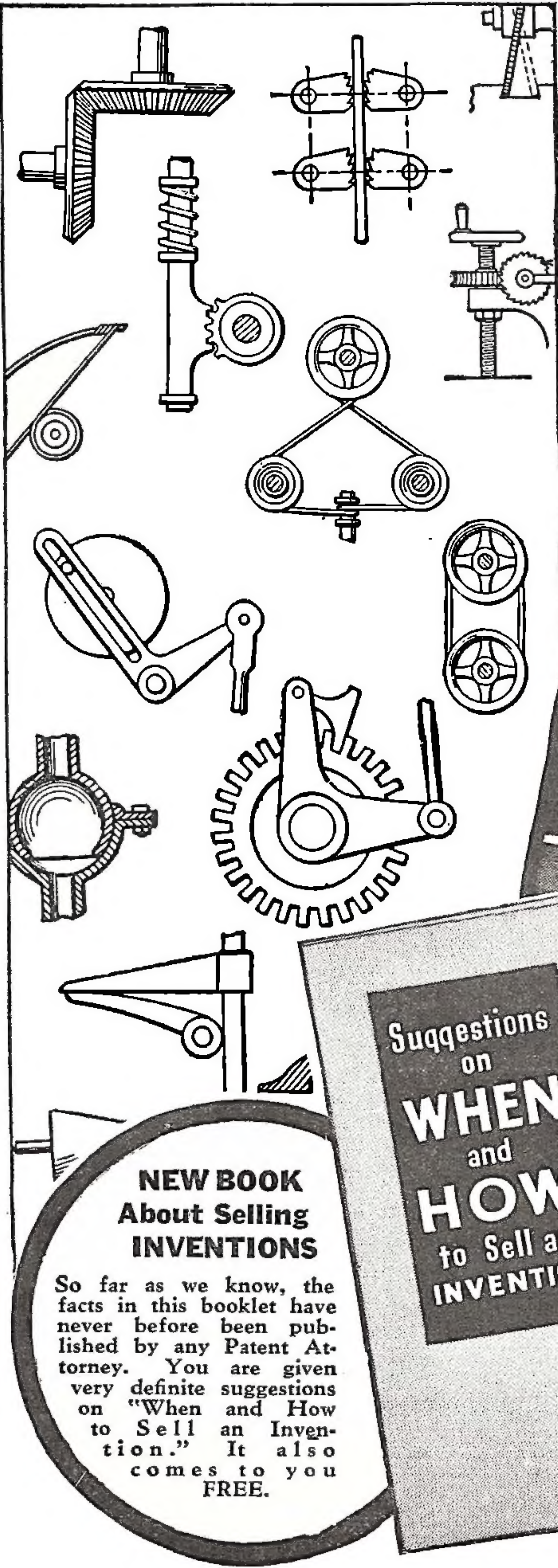
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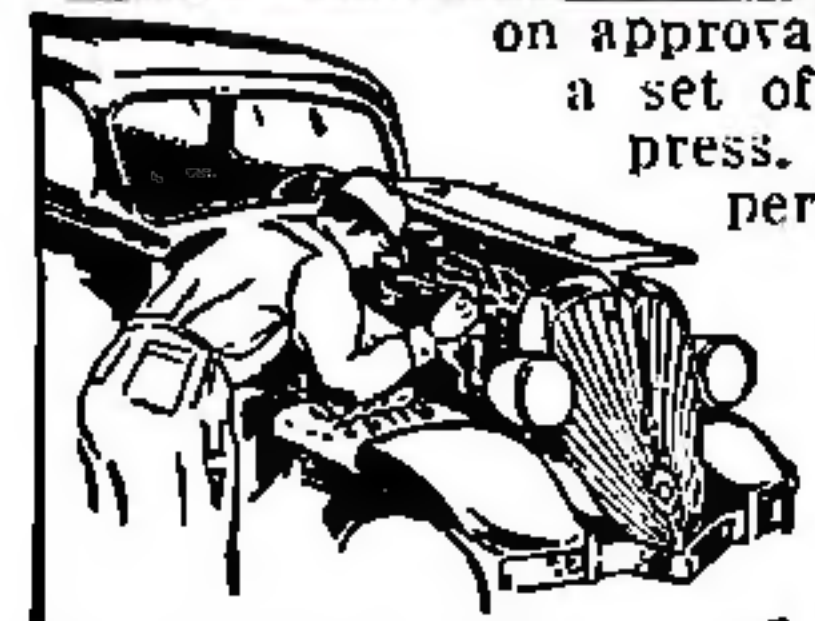
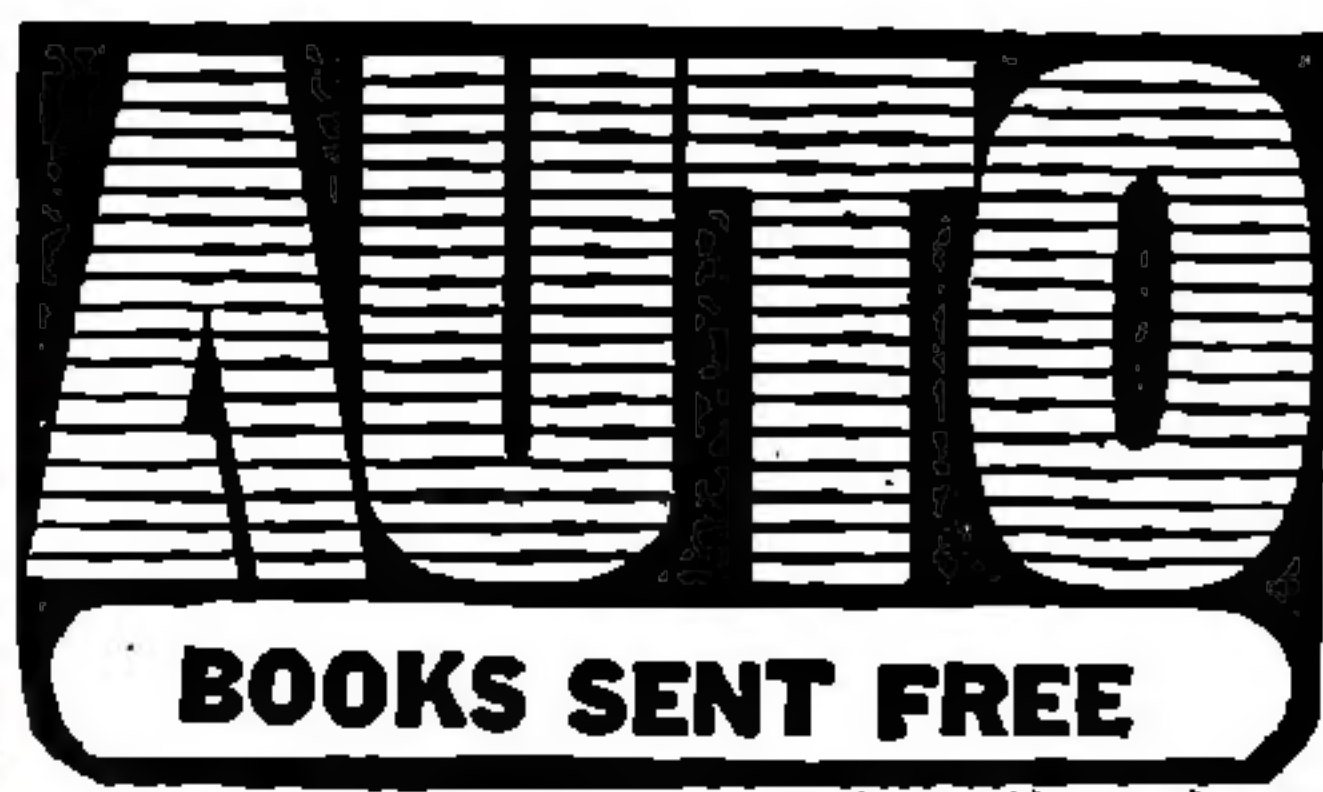
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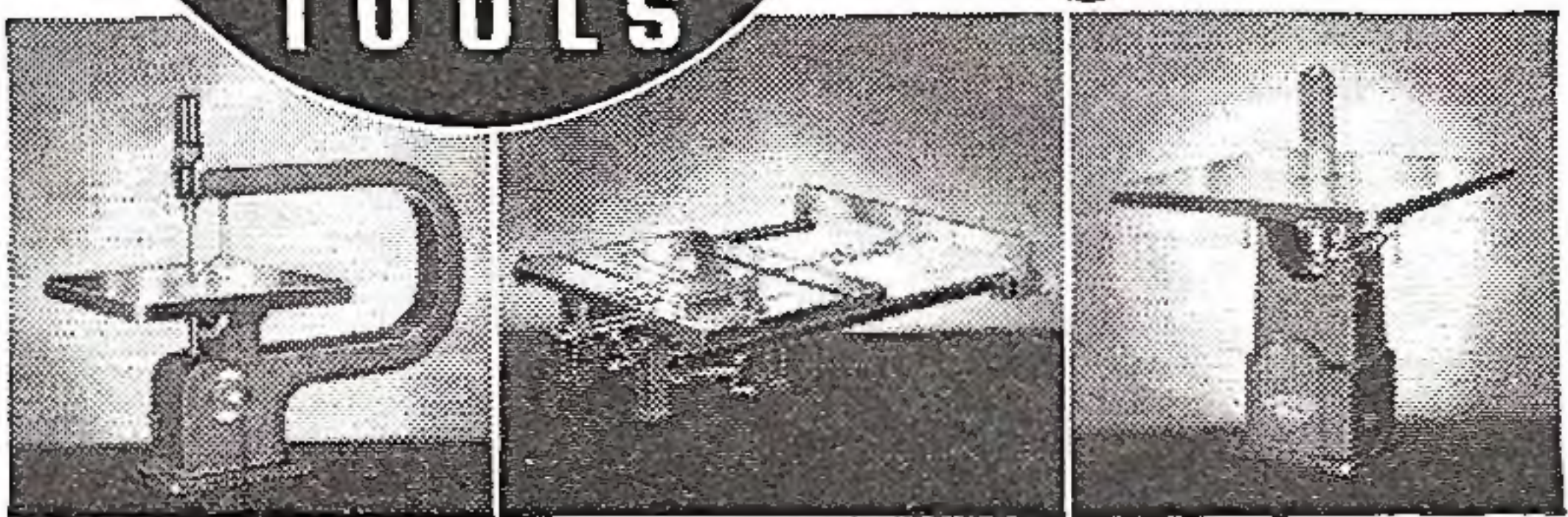
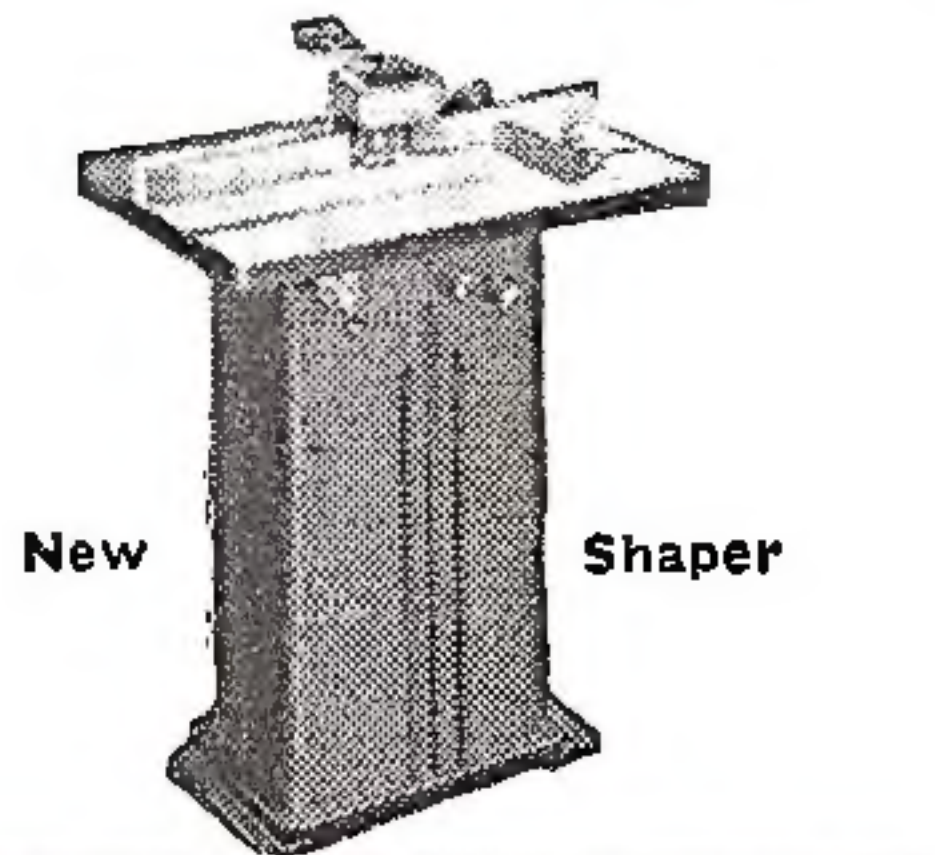
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Young Man!*

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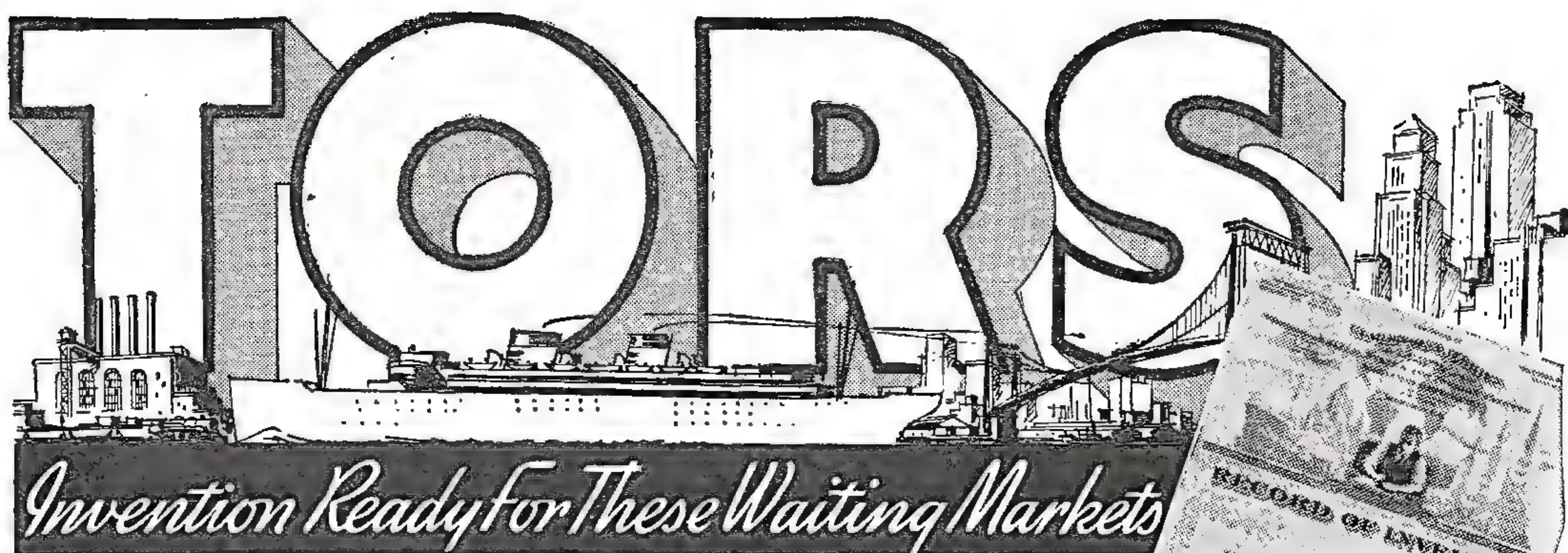
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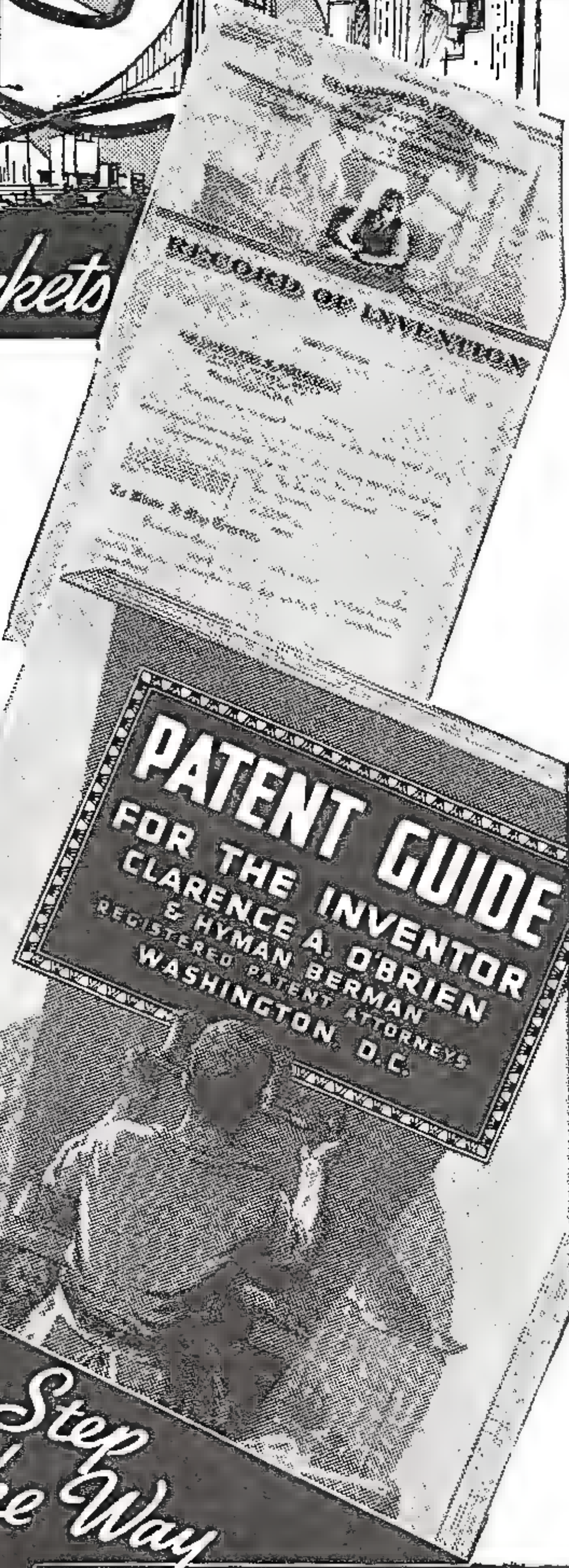
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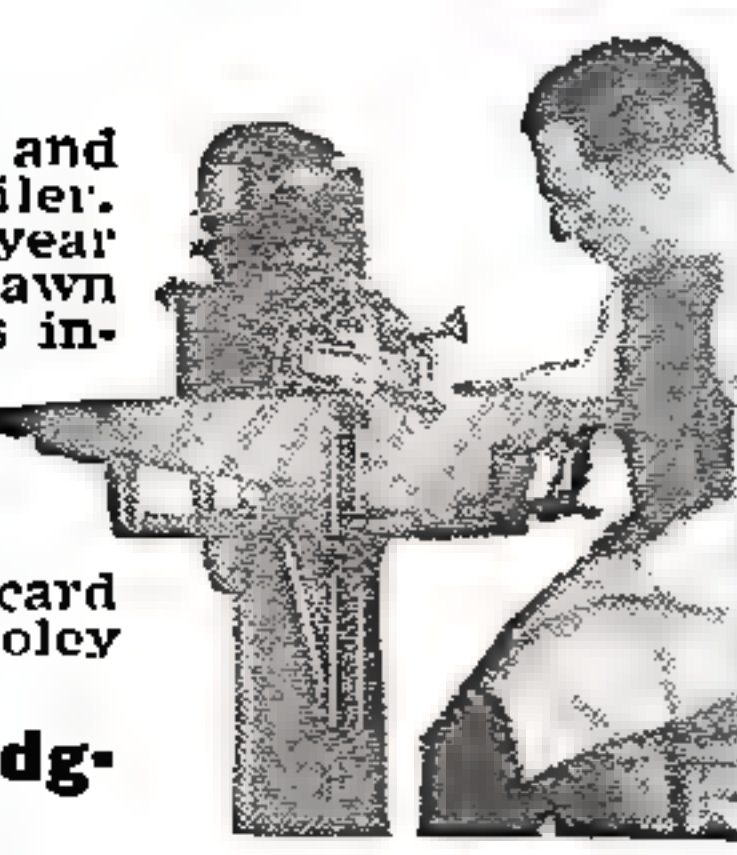
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7617 W. State St.
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Dear Sirs:

Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gas-line.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 60 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,

Bob McKenzie



**Sets New
Coast-to-Chicago
Record**

**New Supercharge
Principle
SAVES GAS**

**MORE POWER - MORE SPEED
FASTER PICK-UP - NEW LIFE**

ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago—2,322 miles in 39 hours and 42 minutes—driving 75 and 80 to maintain a speed average of 59.7 miles per hour!

Here is speed—a gruelling grind—where quick acceleration, greater top speed — and less stops for gasoline mean those precious moments saved that make new speed records possible. The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is positively automatic—simple to install—inexpensive—and pays for itself many times over in gas savings.

Automatic - - Nothing Like It!

Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

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Wauwatosa, Wis.

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Gauge Measures Paint Coat



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Device Tests Exhaust Gases

AN EXHAUST gas analyzer device that makes valuable data on the operation of various types of internal combustion engines available has been developed by a New York manufacturer. The machine is readily portable and can be operated by a 6-volt direct current motor powered by an automobile storage battery or by a motor connected to a standard lighting circuit.

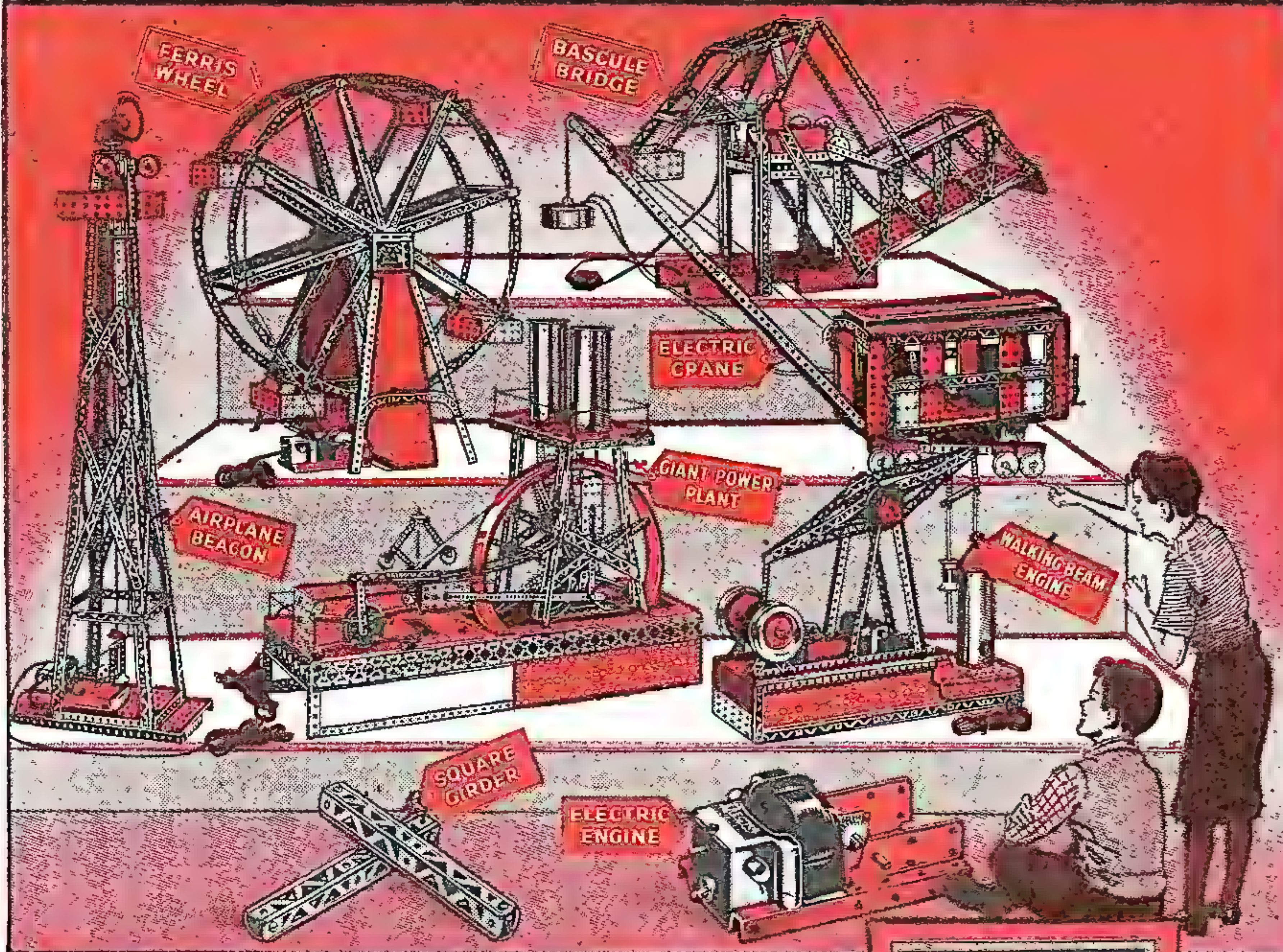
The device determines the air-fuel ratio by a mechanical principle based on the fact that the specific weight of exhaust gases varies with changes in the air-fuel ratio. To obtain substantial force as a means of measuring the specific weight of the exhaust gas being tested, a rotating motion is imparted to the gas by a motor-driven fan revolving in a chamber.

The fan blows the gas against the blades of an impulse wheel, thus producing a torque on the shaft of the wheel in proportion to the air-fuel ratio which registers on a calibrated scale.

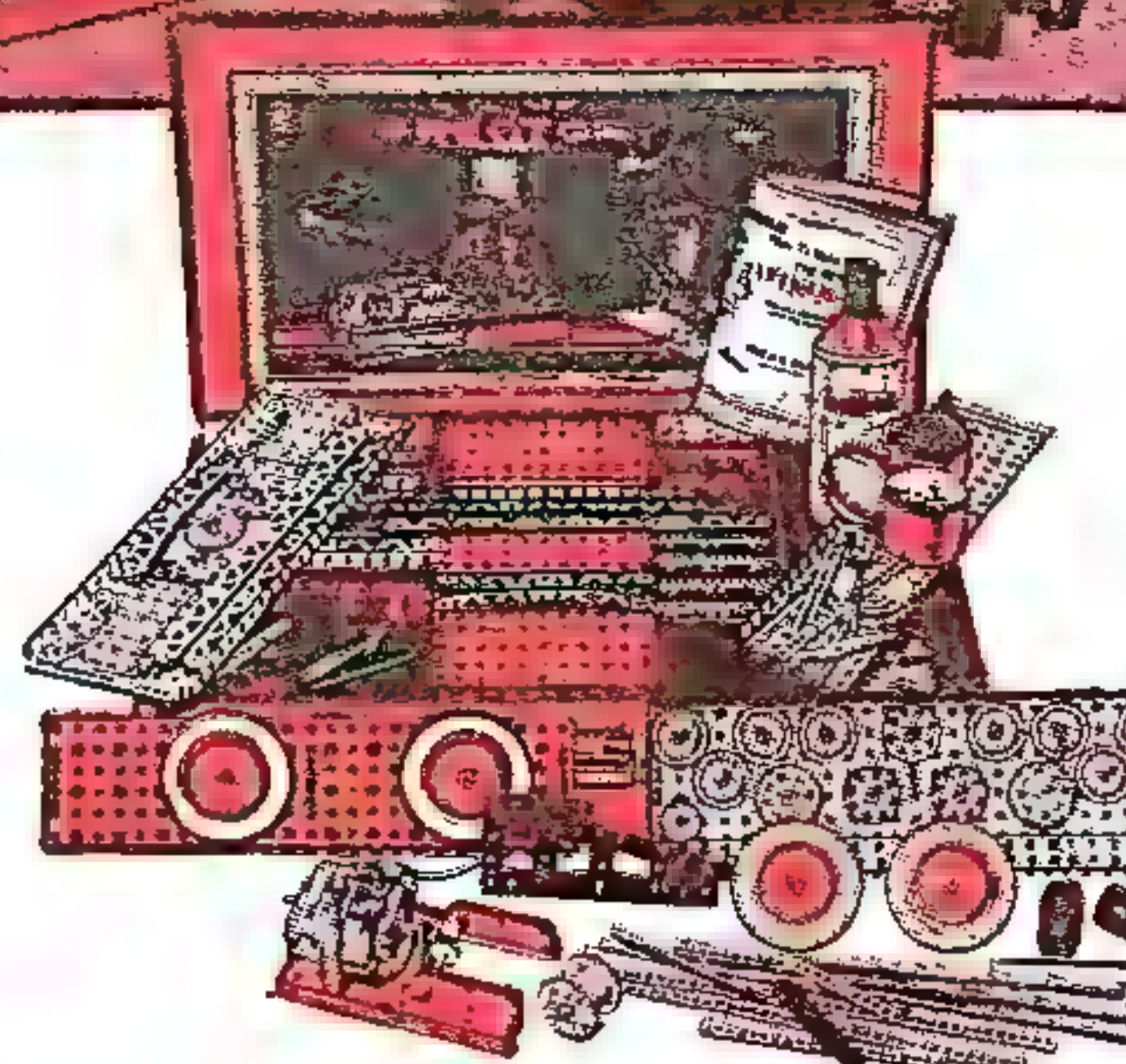
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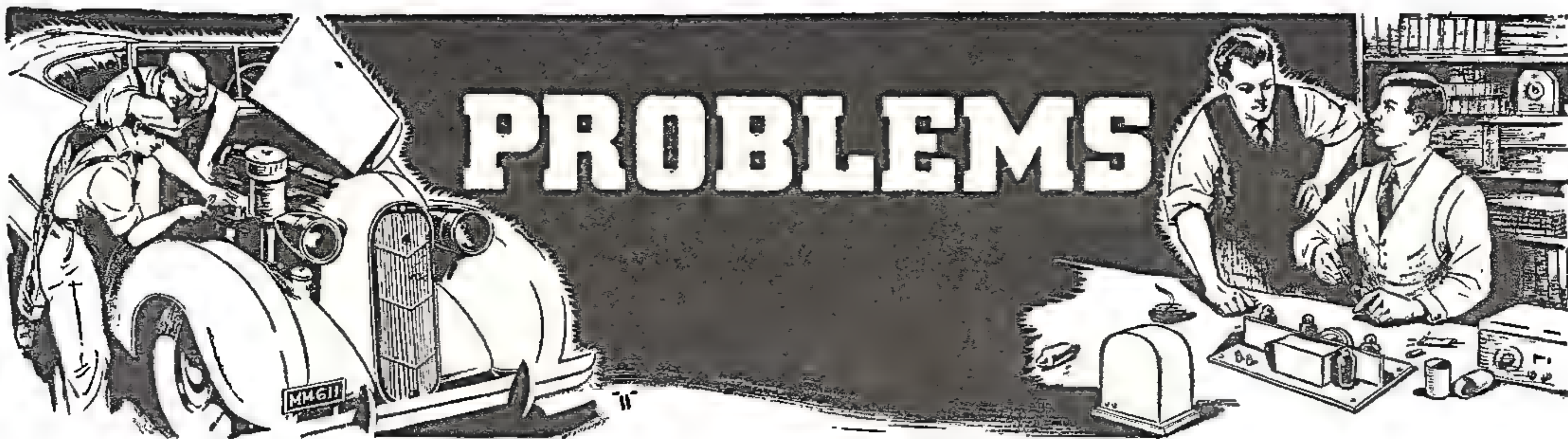
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RESTORING FADED WRITING

While cleaning out our attic I ran across some very old letters in which the writing (ink) is faded so that it is almost illegible. Is there any way of restoring the writing?
—John White, N. Y. C.

Writing on old manuscripts or letters can be restored by rubbing over it a solution of ammonium sulphide, hydrogen sulphide, or "liver of sulphur." This treatment will not restore writing in aniline ink, working only with ink that forms a black sulphide. Try it on your letters.

A SATISFACTORY AMBER CEMENT

Can you supply me with information as to how to make a cement that will be satisfactory for use on broken amber?
—Fred Weckworth, Leonia, N. J.

Moisten the pieces to be joined with caustic potash and press them together when warm. The union will be so perfect that no trace of the juncture is visible. Don't forget to warm the amber first.

REMEDY FOR HORSE BLISTERS

Several of our horses have developed blisters due, apparently, to harness friction. Can you provide me with a simple and cheap remedy?
—James Connors, Rosendale, N. Y.

We would advise you to seek the services of a veterinarian unless you are sure that the blisters are of the common type. For treatment of common blisters use tincture cantharides, 1 ounce; camphorated oil, $\frac{1}{2}$ ounce. Apply three times daily.

COMMON WEATHER FORECASTER

As a boy I used to prepare a small piece of cloth with some chemical solution so that by changing color it would indicate a change of weather. Can you supply me with a formula as I have forgotten the ingredients used?
—Jack Smith, Yonkers, N. Y.

Make up a solution of 1 quart of cobalt chloride; 75 parts of nickel oxide; 20 parts of gelatin; 200 parts of water. A strip of cloth, soaked in this solution, will appear green in clear weather and will lose its color when damp weather approaches.

REMOVING RUST SPOTS FROM LINEN

Please give me some advice as to how rust stains can be removed from linen fabrics.—Martha Burke, Lynbrook, L. I.

Dissolve potassium binoxalate, 200 parts, in distilled water, 8,800 parts; add glycerine, 1,000 parts, and filter. Moisten the rust spots with this solution, letting the linen lie for 3 hours. Rub the rust spots frequently during the 3 hours and then wash well with water.

WIND TUNNEL FOR MODEL PLANES

Several months ago you ran an article on flying titled "Is There A Speed Limit?" in which frequent reference was made to wind tunnel tests of airplanes and airplane models. Do you know where I can obtain plans and instructions for building a small wind tunnel in which ordinary airplane models could be tested?
—Paul Rappaport, Philadelphia, Pa.

An article and plans for constructing a small wind tunnel for model airplanes appeared in the 1932 edition of the MM FLYING MANUAL. You can obtain a copy by sending 50c to our Greenwich, Conn., office.

TO BLACKEN ALUMINUM SHEETING

I am interested in learning some method of blackening aluminum sheeting. Can you supply me with such information?
—Thomas Cox, Boston, Mass.

The surface of the sheet should be polished with very fine emery powder or emery cloth. After polishing, pour a thin layer of olive oil over the surface and heat slowly over an alcohol flame. Large sheets can be heated in an oven. Under the action of the heat the plate will first turn brown, then black, according to the degree of heat.

FROSTING MIRRORS FOR DISPLAY USE

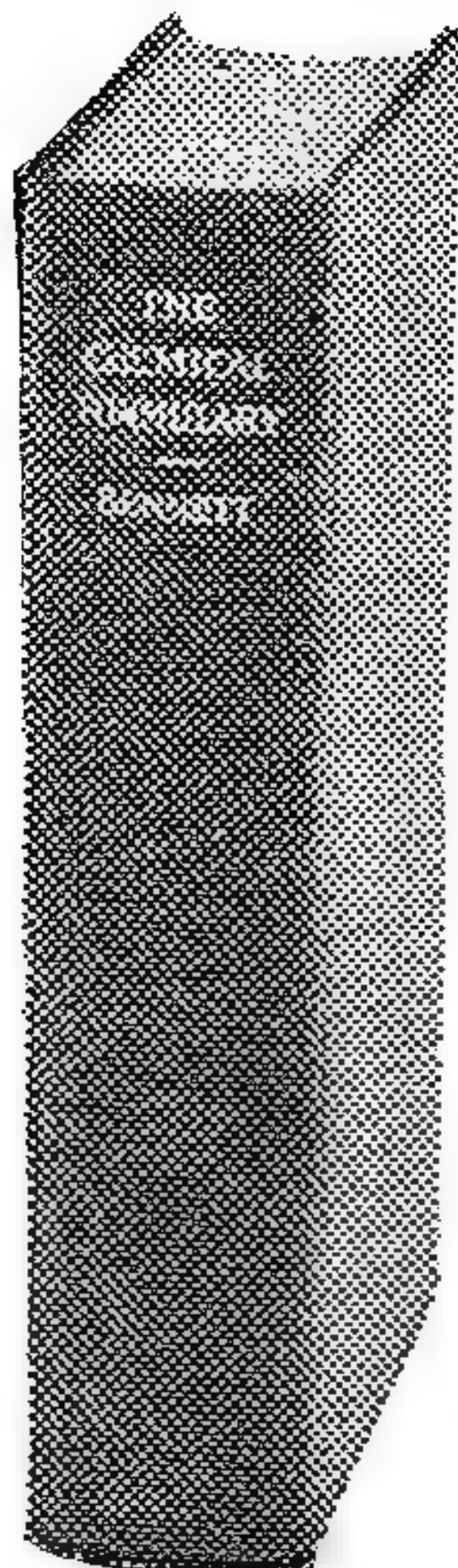
Kindly inform me as to the proper method of frosting a mirror so that desired designs, etc., can be sketched upon it.—Joseph Di Castro, Detroit, Mich.

Make a mixture of 4 ounces of sour ale and 1 ounce of magnesium sulphate and apply to the mirror with a small, clean sponge. Allow to dry, after which the artist can make his sketches, using any desired colors.

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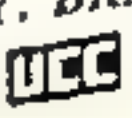
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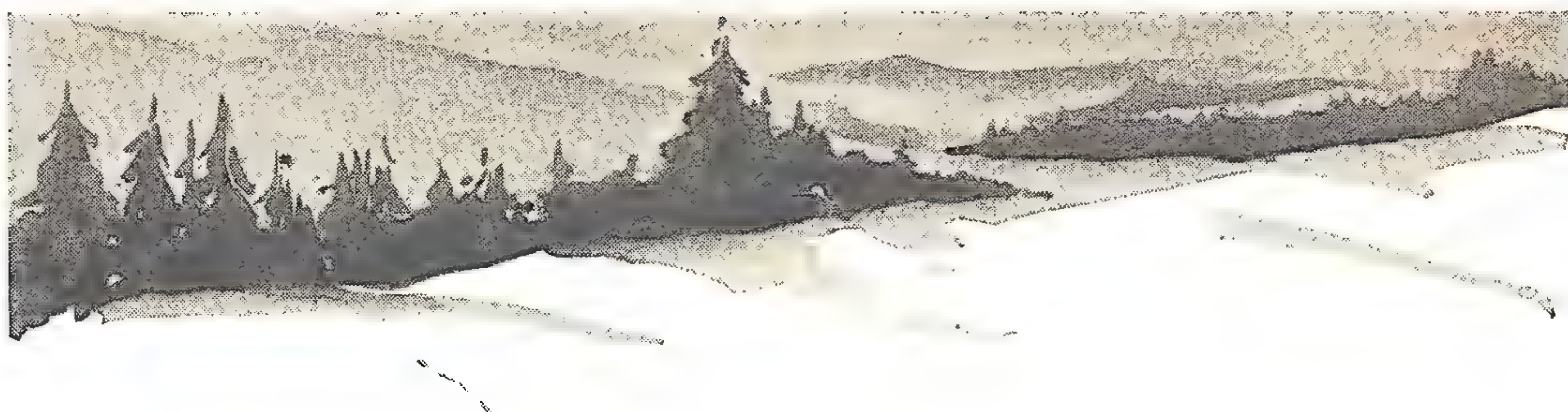
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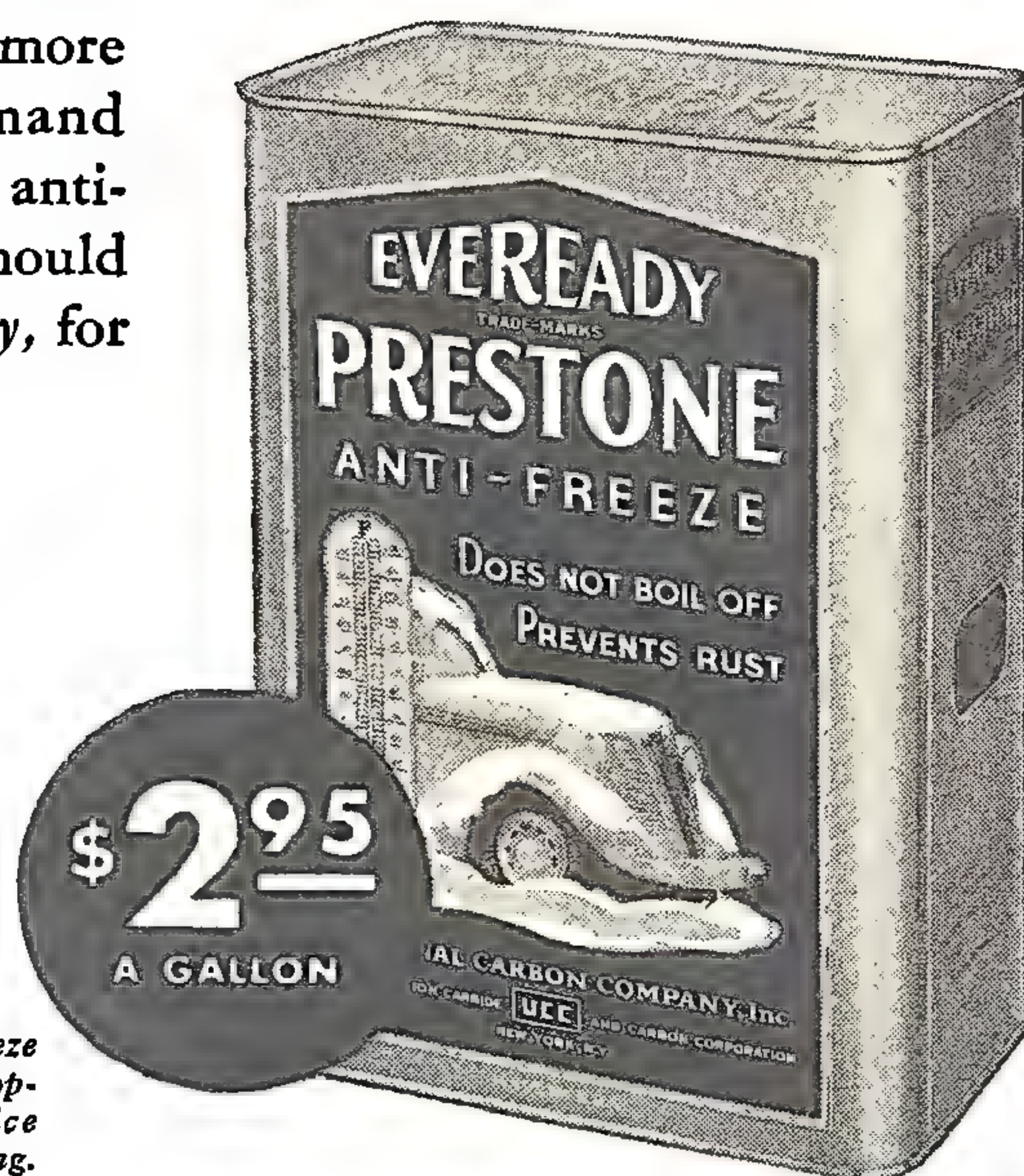
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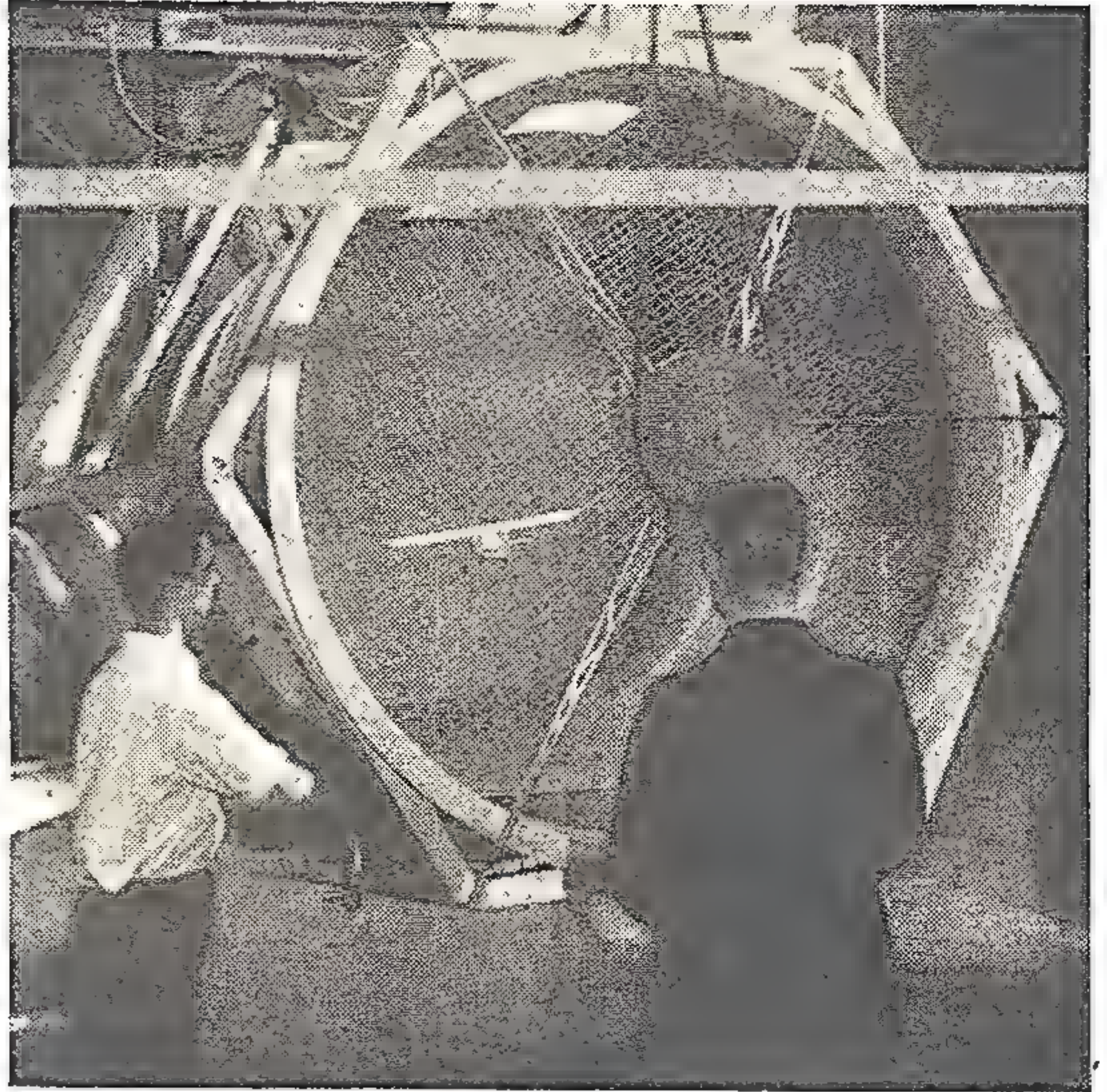
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Model "Flies" In Wind Tunnel



THE National Advisory Committee for Aeronautics has added a "free flight" wind tunnel to its world famous laboratories at Langley Field, Va. Through the use of exact scale models, the new tunnel enables studies of airplane stability and control to be made on a more advanced scale than was possible in the past.

To use the "free flight" wind tunnel, a model plane is set at its gliding angle and air is blown at the model until it "takes off." Ailerons and rudder are controlled by magnetic devices set within the wings of the tiny aircraft.

Mid-Wing Lockheed Tested

A MID-WING version of the famous Lockheed Electra airplane has been developed and tested by the Lockheed Aircraft Corporation of Burbank, Calif. It is said to be larger, faster, and to have a greatly increased payload capacity. The usual two rudders and vertical fins of the Lockheed design are featured in the new plane.

Known as the Model 14, the new plane provides luxurious accommodations for eleven passengers, two pilots, and a stewardess. Two engines of 1,000 horsepower each are housed in nacelles fitted into the leading edges of the wing. Although performance figures have not been disclosed as yet, engineers claim that the Model 14 will be the fastest transport plane in the world. The cabin of the plane is air-conditioned and completely sound-proofed with a non-inflammable material.

3,700 Phone Calls at Once

So large is the switchboard of the telephone system in the newly opened Department of Interior at Washington, D. C., that 3,700 calls can potentially be handled at once.

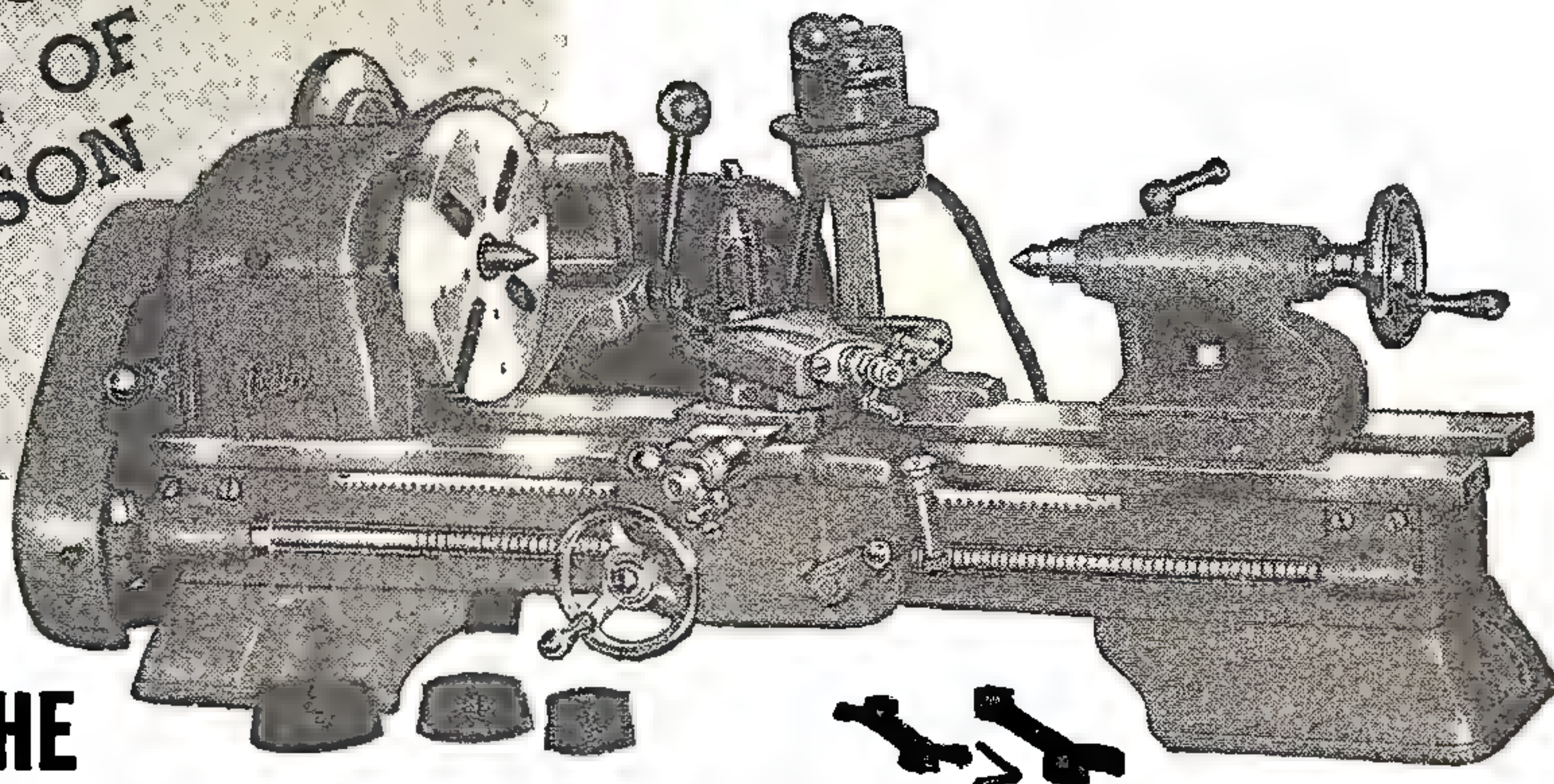
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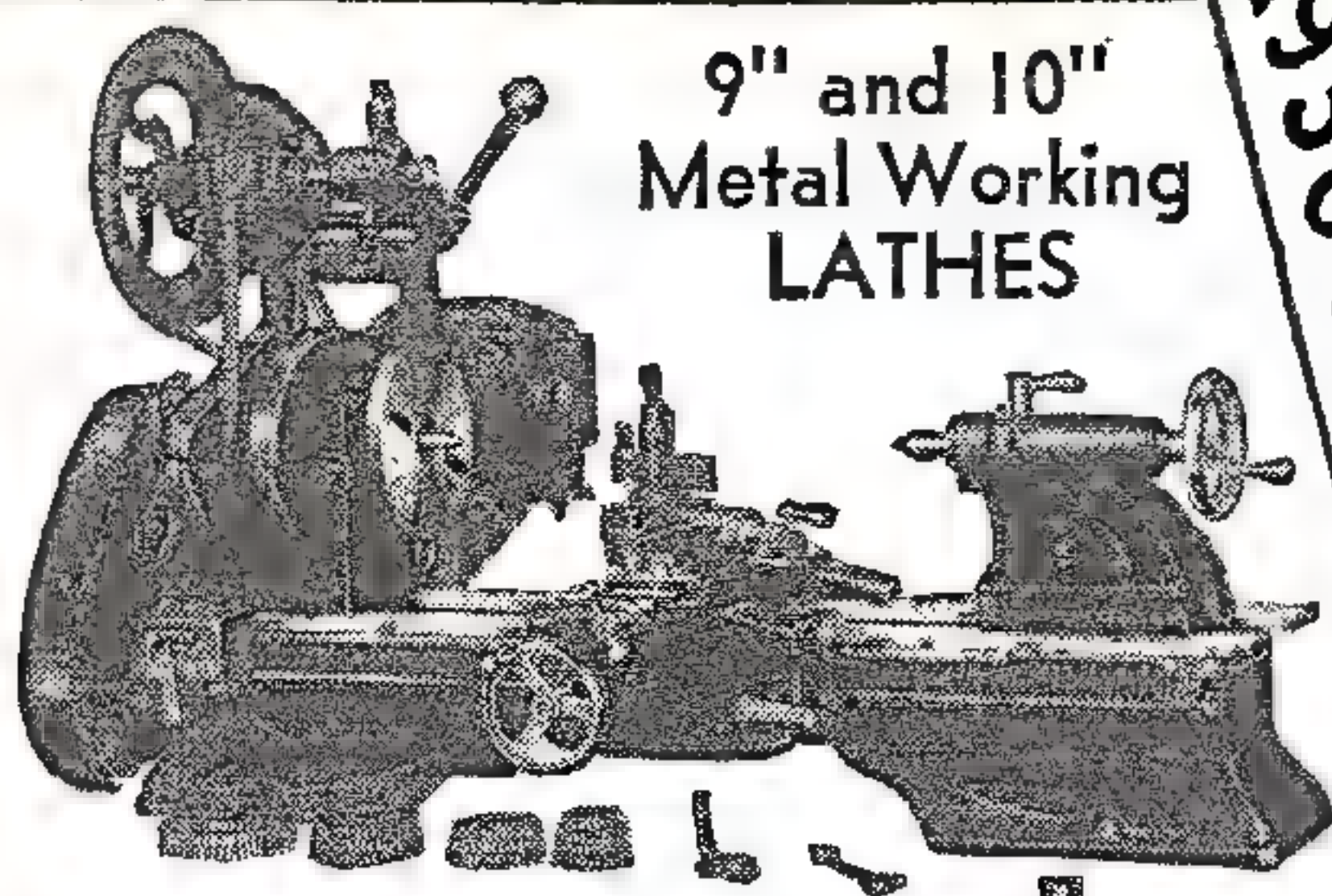
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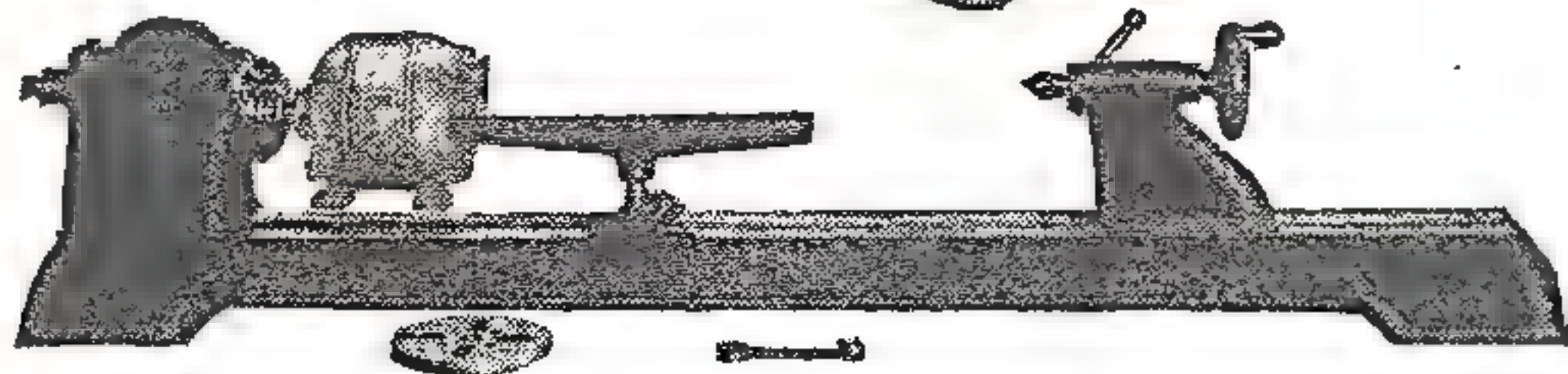


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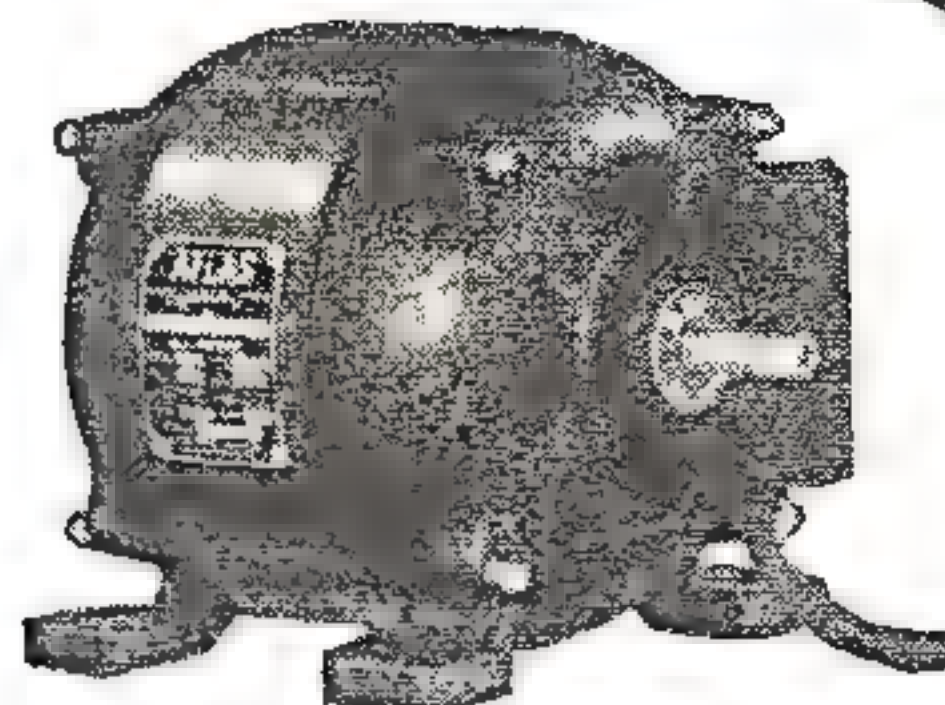
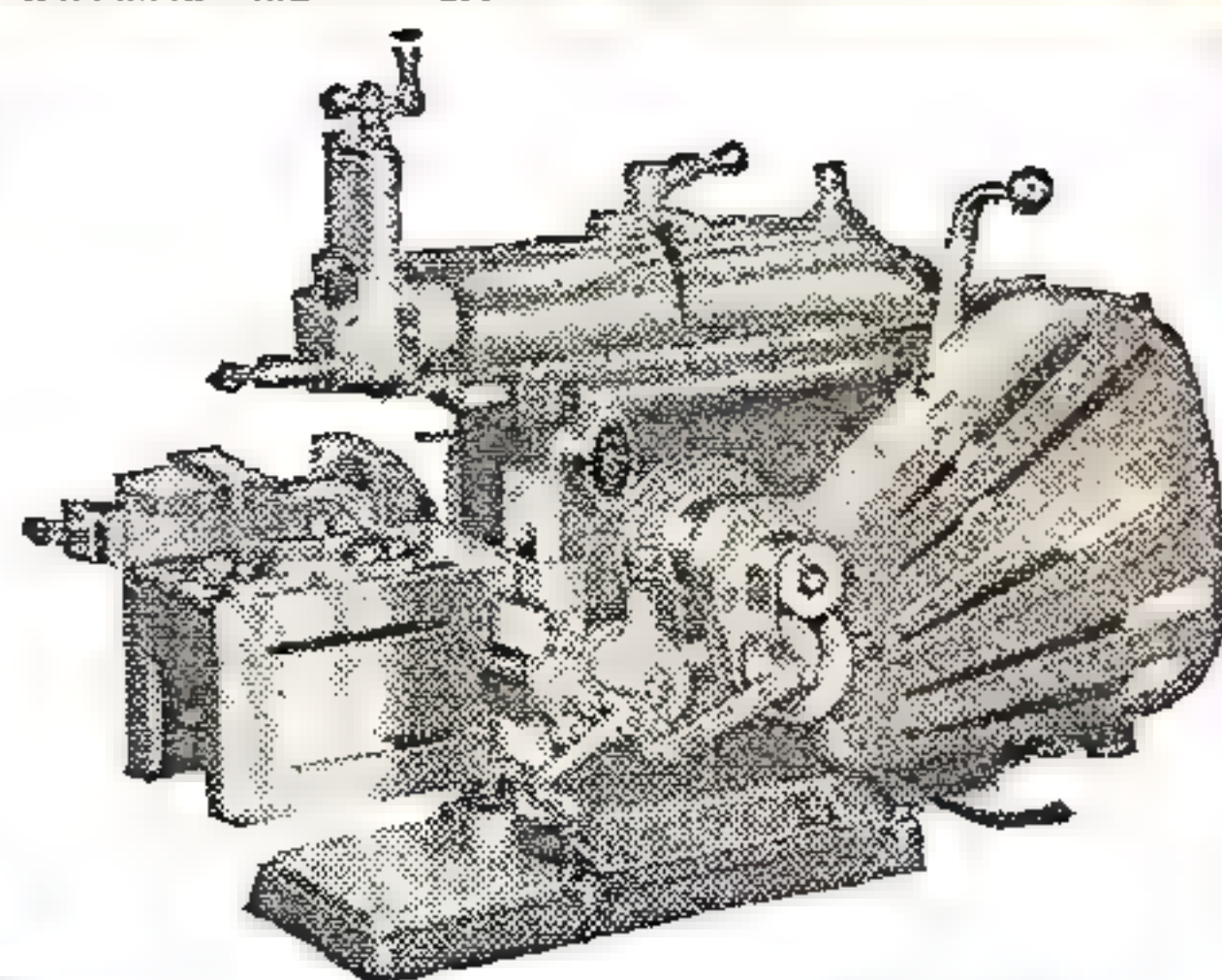
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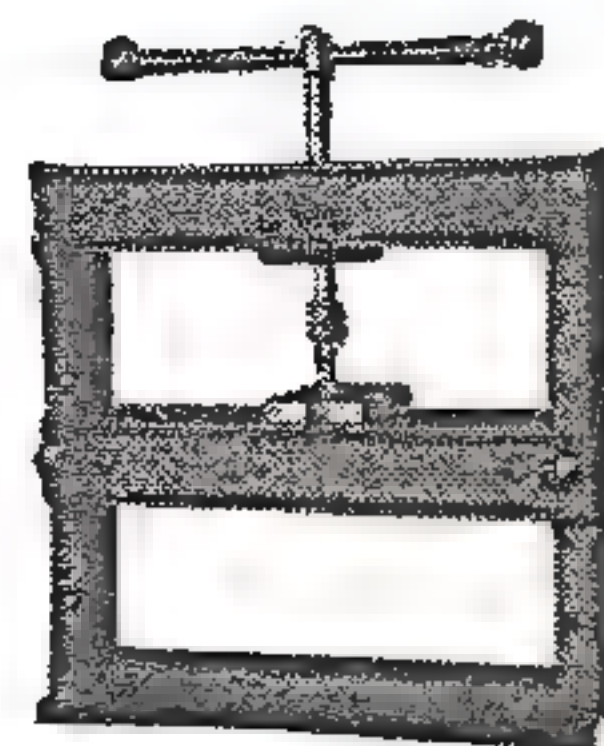
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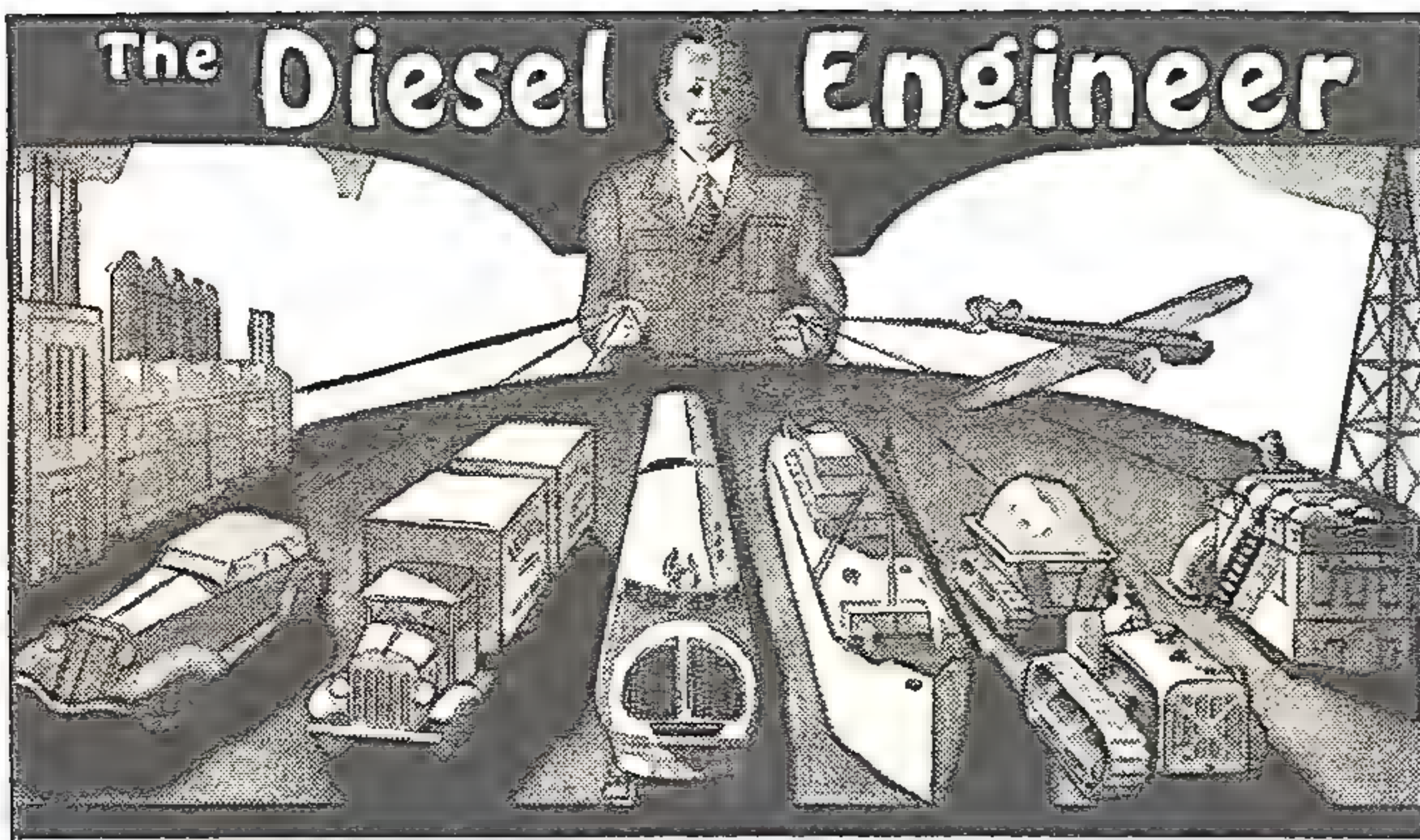
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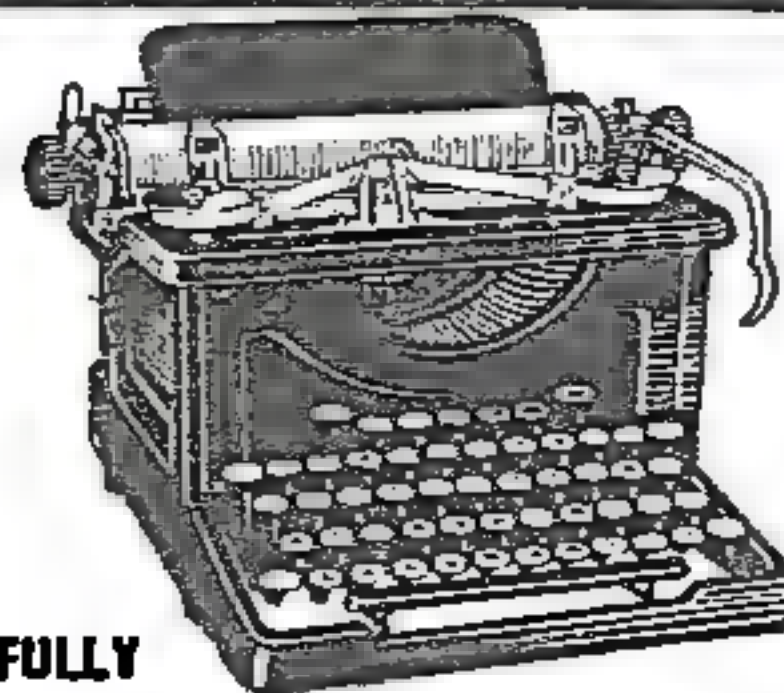
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This contest open only to amateurs, 16 years old or more. Professional commercial artists and Federal students are not eligible.

1. Make drawing of girl 6½ inches high, on paper 7 inches square. Draw only the girl, no lettering.
2. Use only pencil or pen.
3. We return no drawings.
4. Print your name, address, age, occupation on back of drawing.
5. All drawings must be received by November 26th, 1937. Prizes will be awarded for drawings best in proportion and neatness by Federal Schools Faculty.

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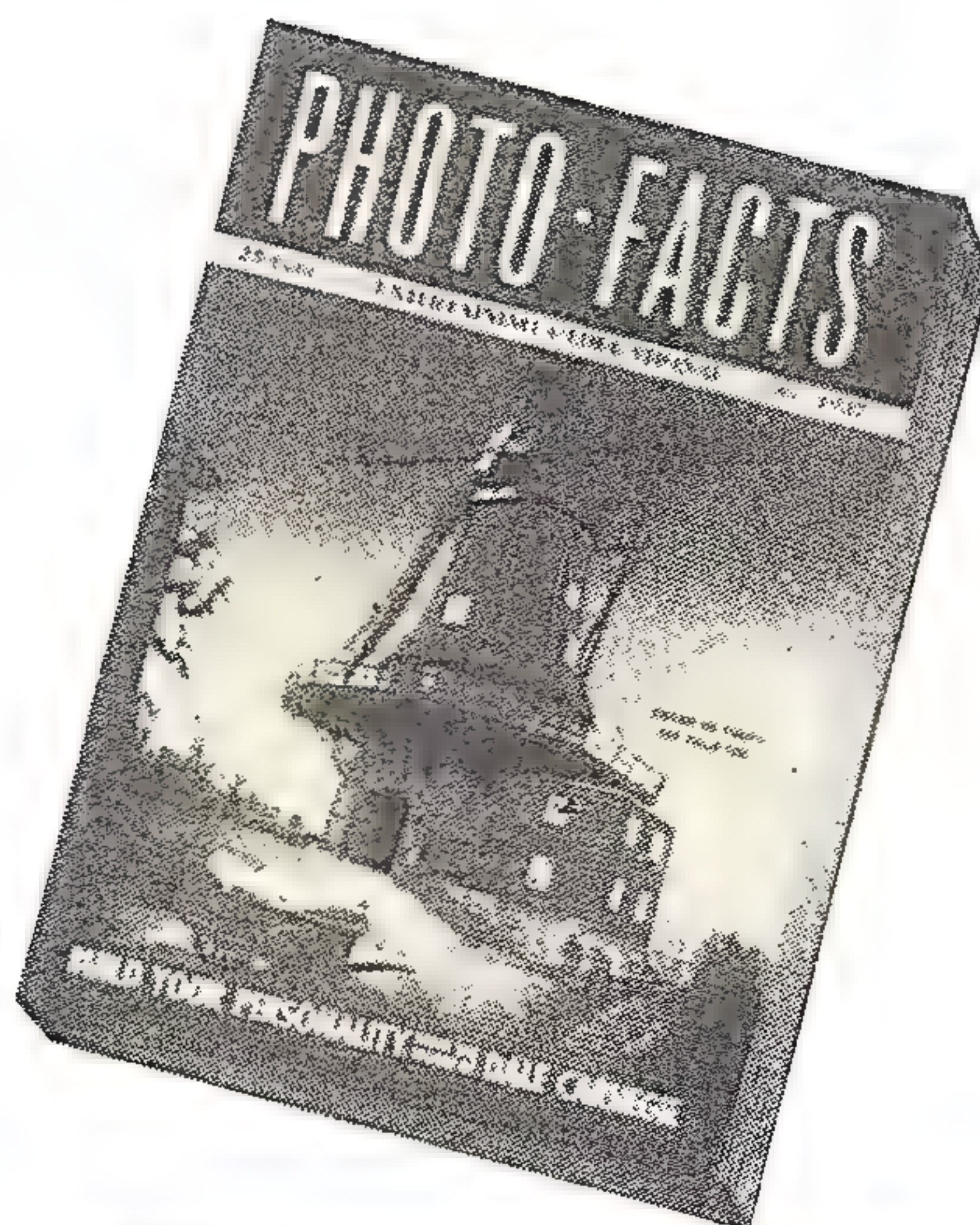
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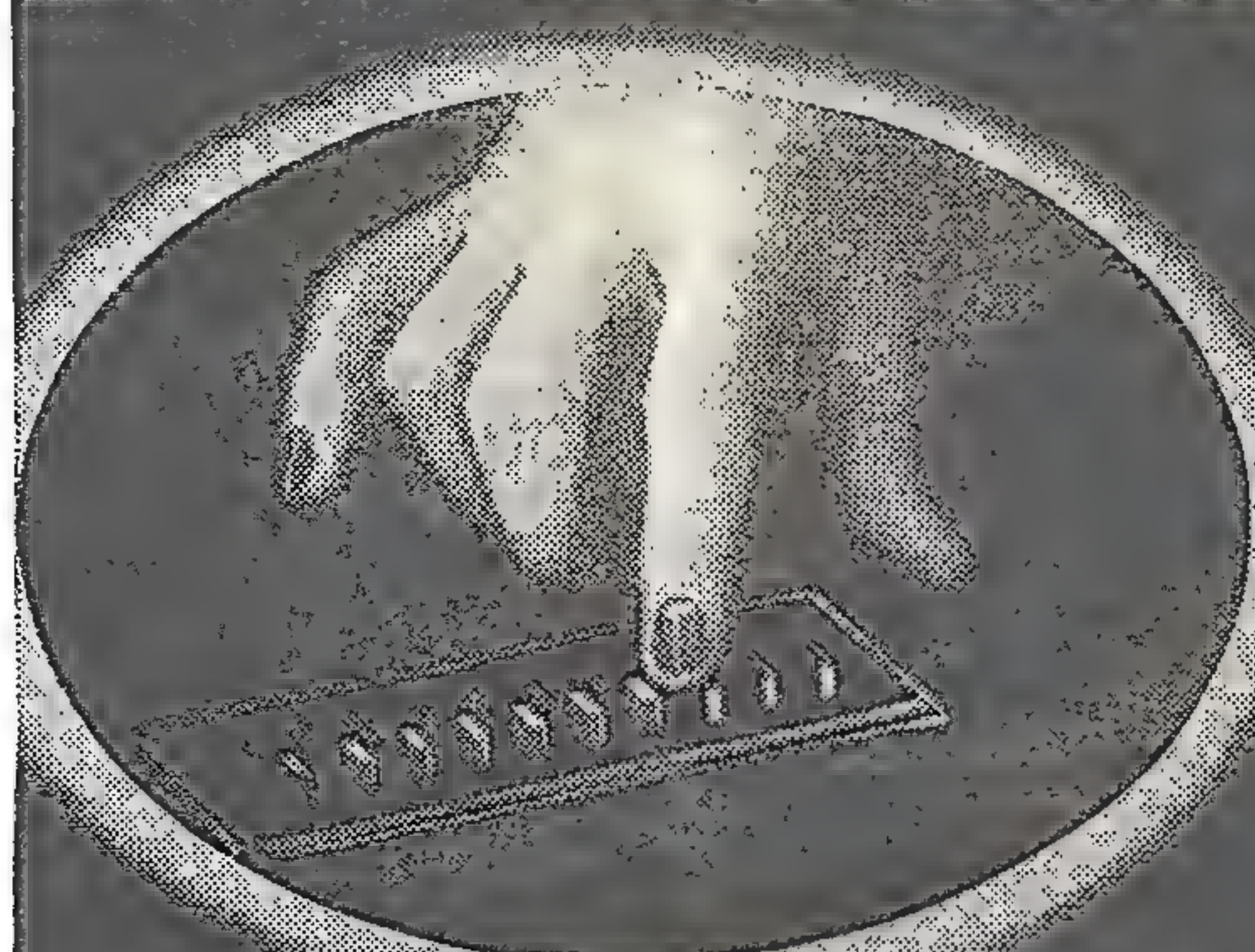
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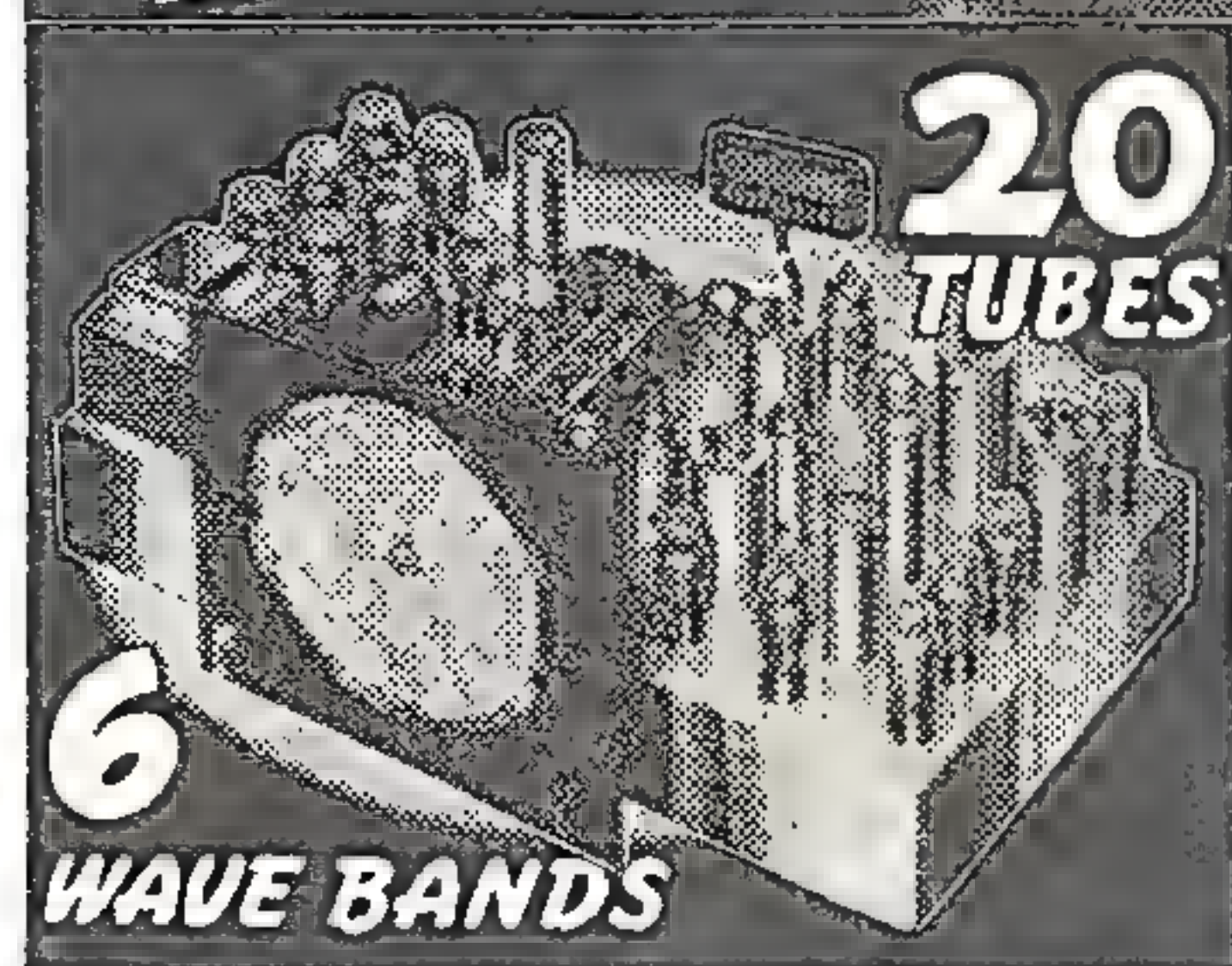


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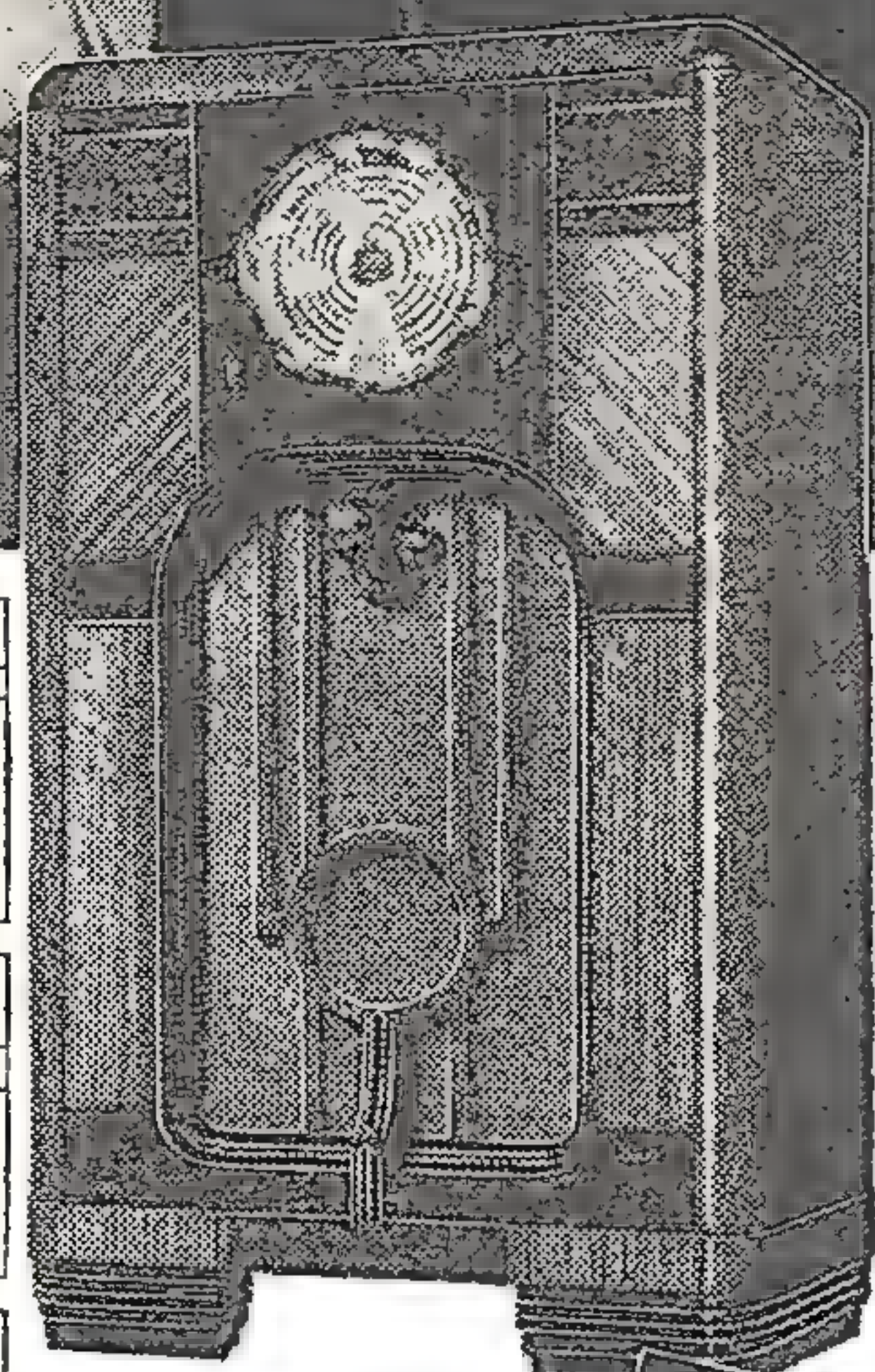
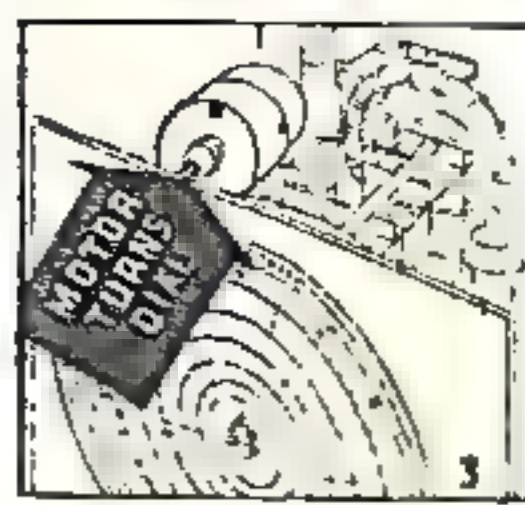
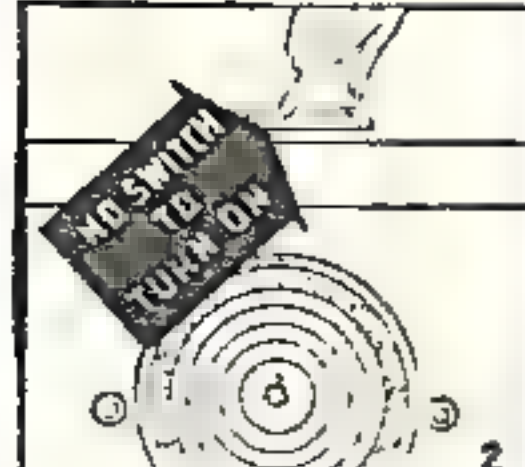
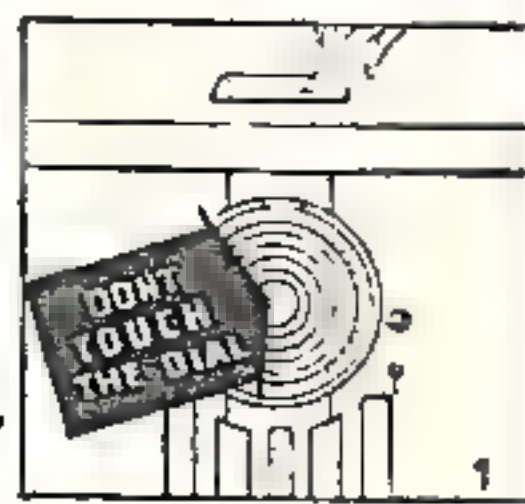
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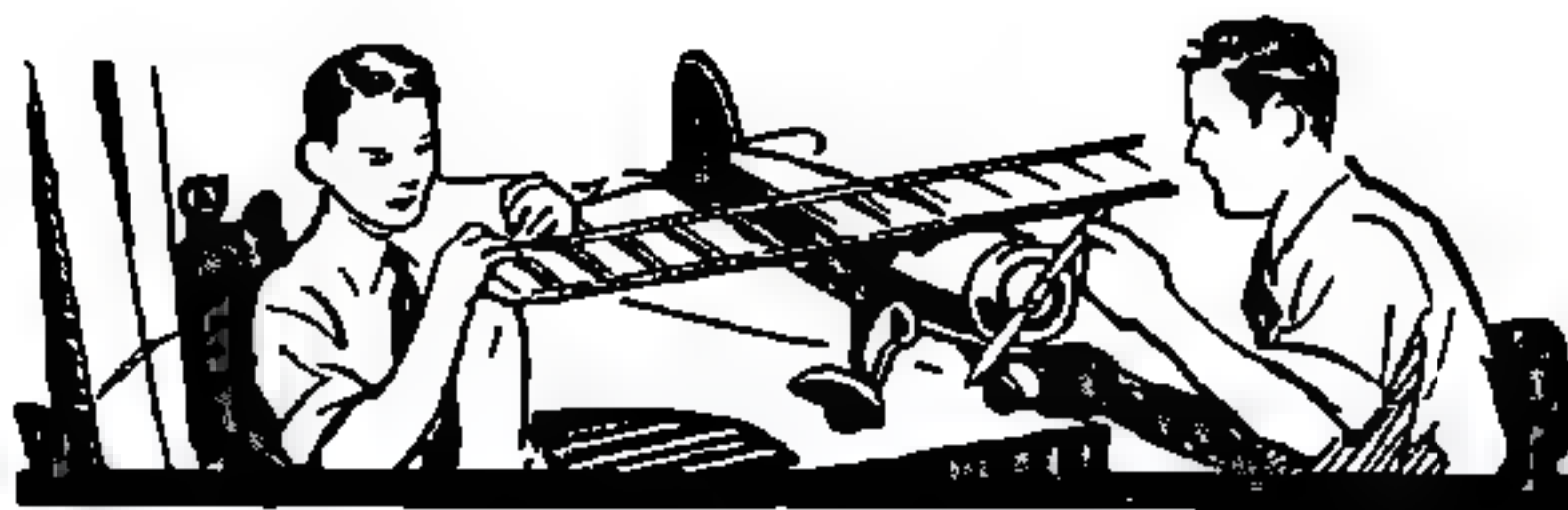
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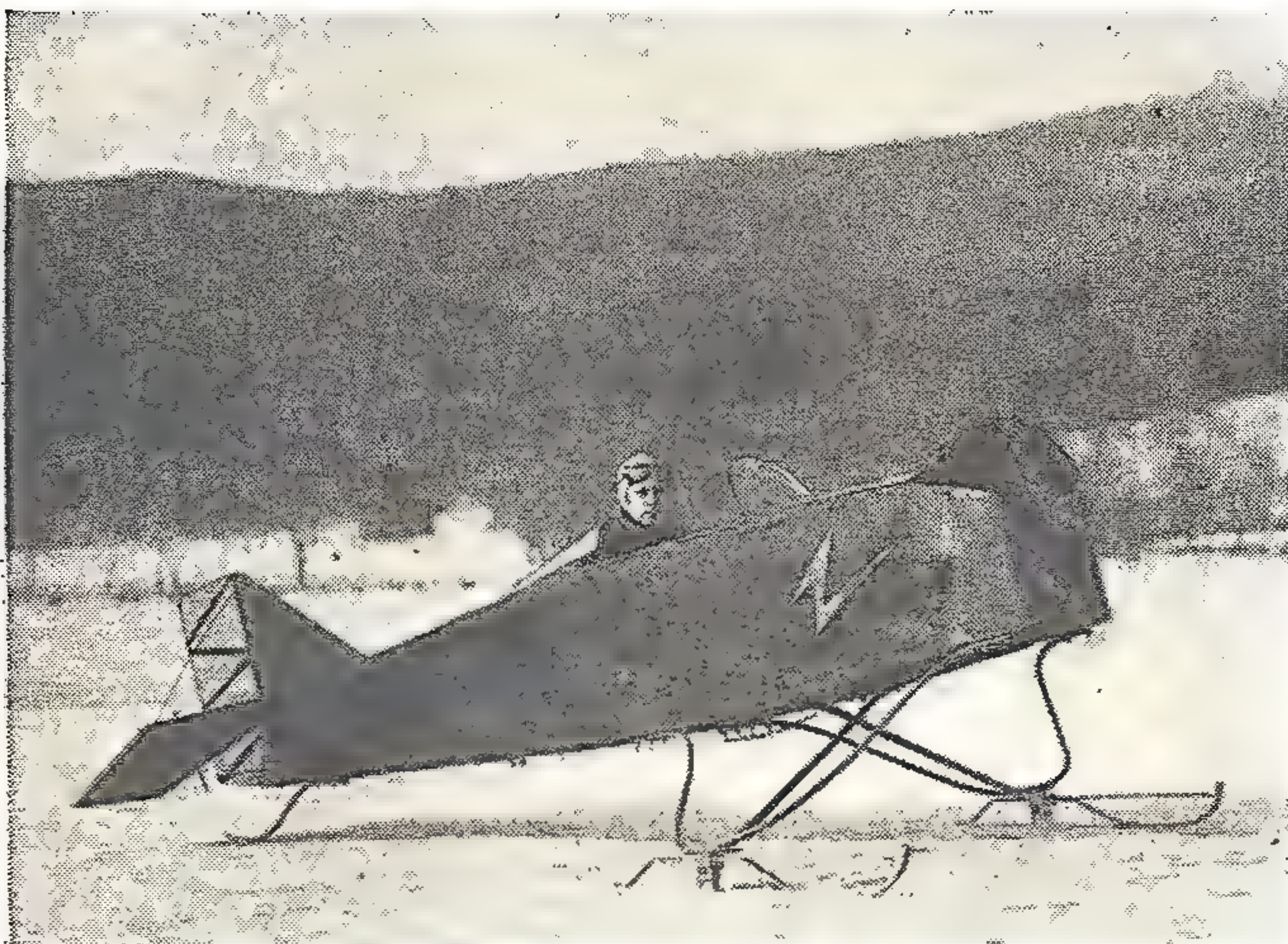
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Chips from the



Few thrills can equal those provided by a powered iceplane like this one built by Milton W. Graves, of Adams, Mass. The rudder and elevator controls operate like those of an airplane.

WITH long winter evenings at hand, the time is ripe for dusting off the workshop bench and tools and starting work on projects that will bring hours of enjoyment and recreation next Spring. Suitable plans and articles to meet the fancy of every type of home-craftsman can be found in each issue of MM or in the books—"How To Build It," "How To Build 20 Boats," or "How To Build Trailers," copies of which are available at 50c each from your local news dealer or direct from MM at Greenwich, Conn.

Milton W. Graves, of Adams, Mass., was awarded the first prize of \$5 in this month's Workbench contest, for his photo and letter describing a powered iceplane. His letter reads:

Dear Editor:

I am enclosing a photograph of my iceplane, which is powered by a used motorcycle engine. How do you like it?

The propeller is driven directly from the motor, which is mounted to a wooden frame fuselage covered with dope-treated airplane cloth. The elevators are controlled with a joy stick while the rudder is manipulated by placing my feet on a rudder bar.

The plane levels off and rides on the two front runners, which are six feet apart, when a speed of about 20 miles an hour is attained. I received many ideas for my plane from past issues of MM.

Milton W. Graves.

We can well imagine that Graves' iceplane provides thrills that are akin to real flying. If YOU want to have some real fun, fellows, follow

Graves' example and build a powered iceplane.

A \$3 award was sent to Winston B. Mackley in far away New Zealand for his photo and details of a record-breaking model plane. The letter states:

Dear Editor:

Enclosed is a photo of my microfilm covered hydroplane. It rises off the water and recently set a New Zealand record for models of its type by remaining aloft for 4 minutes, 46 4/5 seconds.

I shall be glad to correspond with American model builders. My address is 8 Ascot Drive, Remuera, S. E. 2, Auckland, New Zealand.

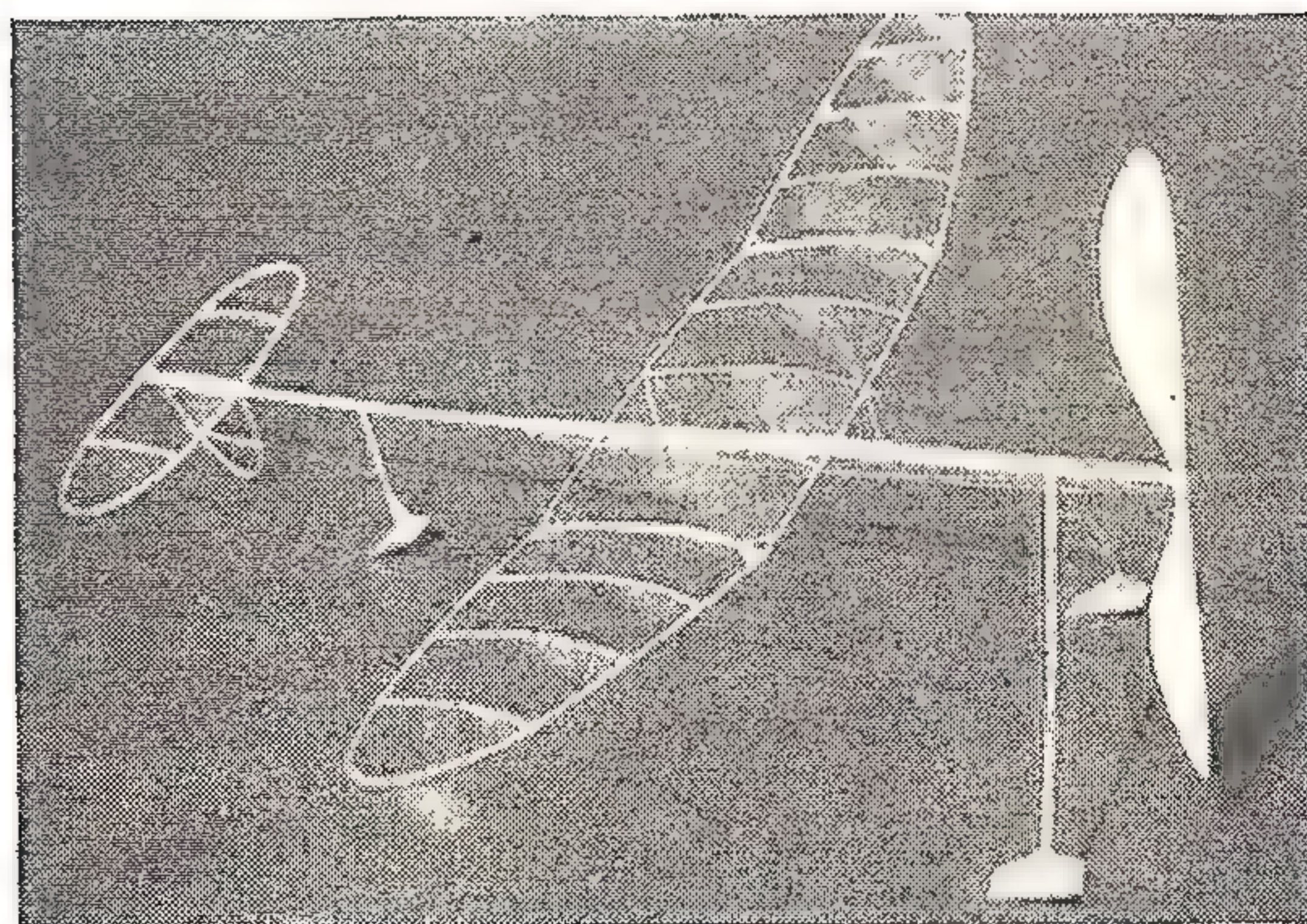
Winston B. Mackley.

Microfilm, being eight times lighter than tissue paper, is being used on more models every day. We would like to know if MM modelers would like to see an article on how to make and use microfilm. Send in your suggestions for articles at any time, as they are always welcome.

Few projects surpass midget racers in popularity with MM readers. A photo and letter from Abner A. Beyer, of East Greenville, Pa., describing his racer, was awarded a \$3 prize. He says:

Dear Editor:

Enclosed you will find a snapshot of the midget racer I built. It is 5 1/2 feet long, has a 45-inch wheel-base, and a 30-inch tread. Power is supplied by a 3/4-horsepower engine.



Fitted with tiny pontoons to permit takeoffs from water, this microfilm-covered model set a New Zealand flight record of 4 minutes, 46 4/5 seconds, reports builder Winston B. Mackley.

Modern Mechanix

Editor's Workbench



The tiny car has three speeds forward and one reverse. Its construction features a steel frame supported on four springs, the front ones being 18 inches long and the rear, 22 inches. (The driver is four years old.)

Abner A. Beyer.

We think most readers will agree with us when we say that Beyer's midget racer is an unusually fine one.

An award of \$3 was sent to Nicholas Stark, of New York, N. Y., for an interesting project photo and letter. Stark writes:

Dear Editor:

I am enclosing a photo of my powered scooter, designed and constructed by myself. It is 40 inches long and driven by a $\frac{3}{4}$ -horsepower washing machine motor.

The scooter is started by a good push and a speed of 25 m.p.h. is obtained. Low gas consumption makes the operating cost very reasonable.

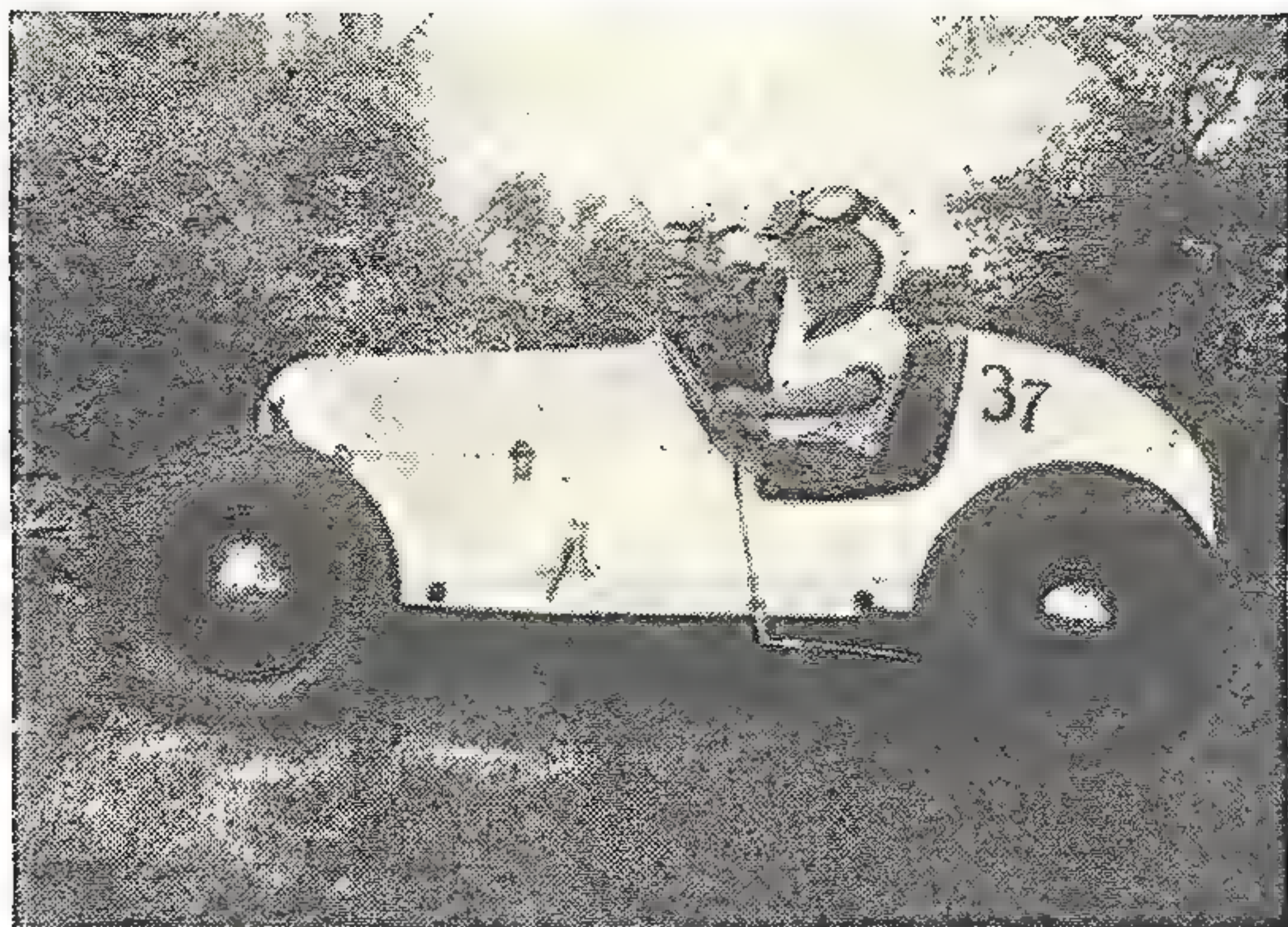
Nicholas Stark.

We'll bet that reader Stark is much envied by the neighborhood boys when he rolls up with his powered scooter. It certainly is a useful and pleasure-giving project.



Nicholas Stark with his home-built power scooter.

Model locomotive fans will be interested in a letter and photo from Bartlett Sissons, of Alberta, Canada, who was awarded a \$3 prize. The letter reads:



Midget racer fans will be quick to acknowledge that this speedster, built by Abner A. Beyer, is one of the finest ever shown in MM pages. The "driver" is four years old.



This model locomotive, built by Bartlett Sissons, is a perfect replica of its Canadian National Railways prototype.

Dear Editor:

I enclose a photo of a Canadian National locomotive model that I recently constructed. This model is run by a motor situated in the firebox and geared to the driving wheels. Your article on Midget Mike helped me very much in constructing this and other locomotive models.

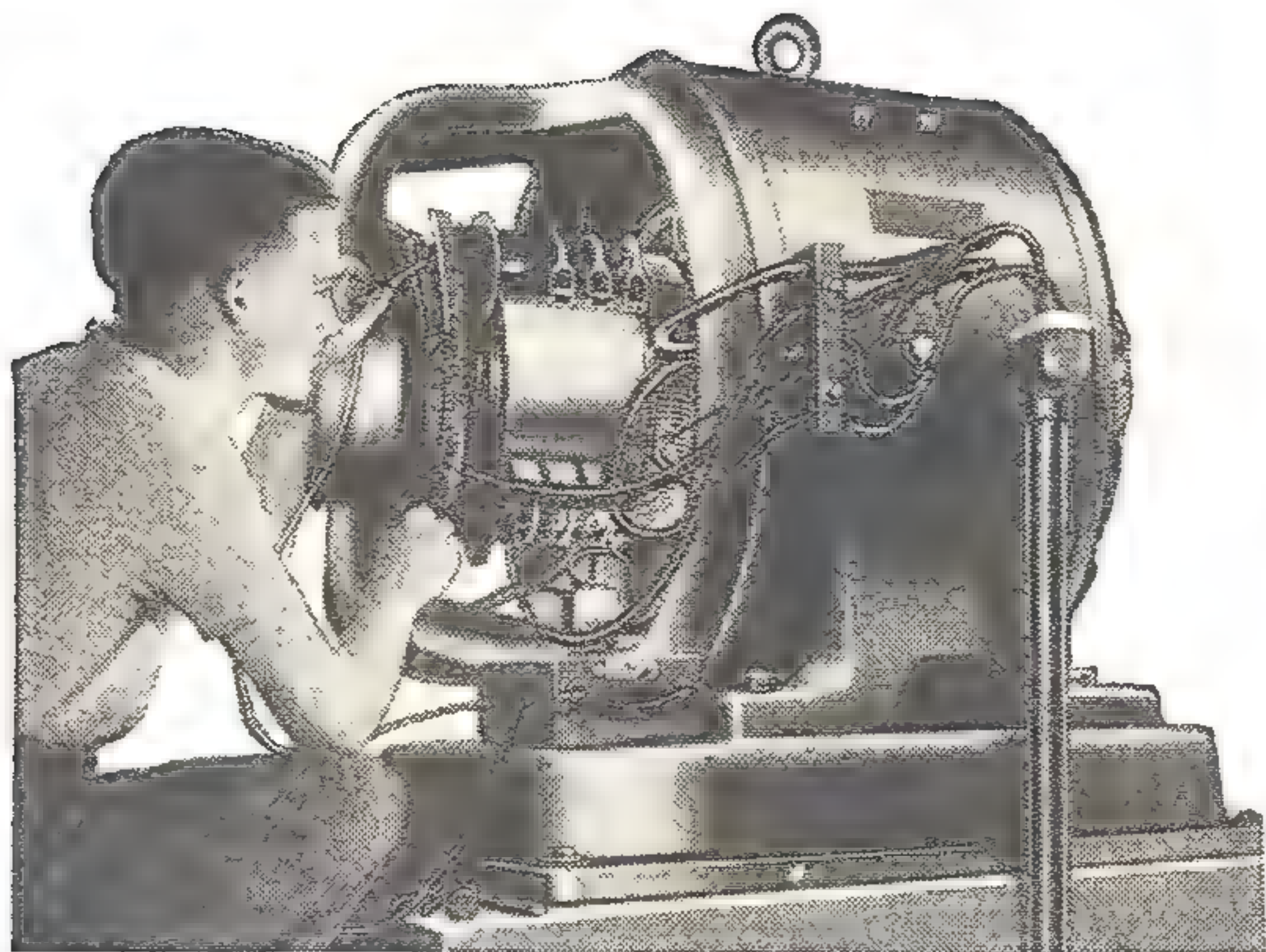
Bartlett Sissons.

Sissons' model locomotive is a good looking job. Model railroaders who want to build a fascinating little locomotive should secure a copy of the latest "How To Build It" book and read the article on building Midget Mike.

Unless builders of model airplanes powered by miniature gasoline engines unite in their efforts to combat threatening legislation, they may find themselves in the same predicament as the home-built aircraft fans—banned from flying their creations. Several states have already banned gas-powered models, one state passing a ridiculous law requiring the builder to hold a real airplane pilot's license before he can launch his model!

We strongly urge every airplane model builder to protest laws that would ban the flying of gas-powered models and request that you file your letter of protest with the editors of MM who will co-operate with aviation editors and organizations preparing to wage "war" on the proponents of legislation that would be detrimental to the hobby of flying gas-powered models.

Although this year's boating season is well over, we know that many MM boat fans will find a
[Continued on page 31]



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Editor's Workbench Chips

[Continued from page 29]



Using plans that appear in the MM "How To Build 20 Boats" book, Ray Watt constructed this trim auxiliary sloop at a cost of only \$40, including sails. Isn't she a beauty?

photo and letter from Ray Watt, of St. Ignatius, Montana, to be of interest. Watt was awarded a \$3 award and his letter reads:

Dear Editor:

Enclosed is a photo of "Bail-Out," an auxiliary sloop built from plans of NOMAD in the MM boat book. It is a very seaworthy craft and exceeded my expectations in every way.

I built this boat in my spare time at a cost of \$40, including sails. It is built of select yellow pine and is entirely home-made, even to the mast and boom. The only deviations from the original plans lie in the use of oak chines and a double bottom.

Ray Watt.

Watt's trim looking craft certainly should provide inspiration for you fellows who plan to build a boat this winter. Get a copy of "How To Build 20 Boats" and take your choice of the best lot of boat plans you ever cast your eyes on.

Every reader of MM is invited to send in photos and letters describing completed workshop projects. Although we prefer to use photos showing projects constructed from MM plans, we assure our readers that equal consideration will be given to other photos.

Photos, upon being received at the MM office, are judged by the editors and the best photo received each month is awarded a prize of \$5. All other photos used in the Workbench are awarded prizes of \$3 each. The fact that a photo does not receive a prize one month does not mean that it will not be considered when the following month's judging is conducted. In fact, the photos are judged collectively each month, the best of those on hand being considered each time.

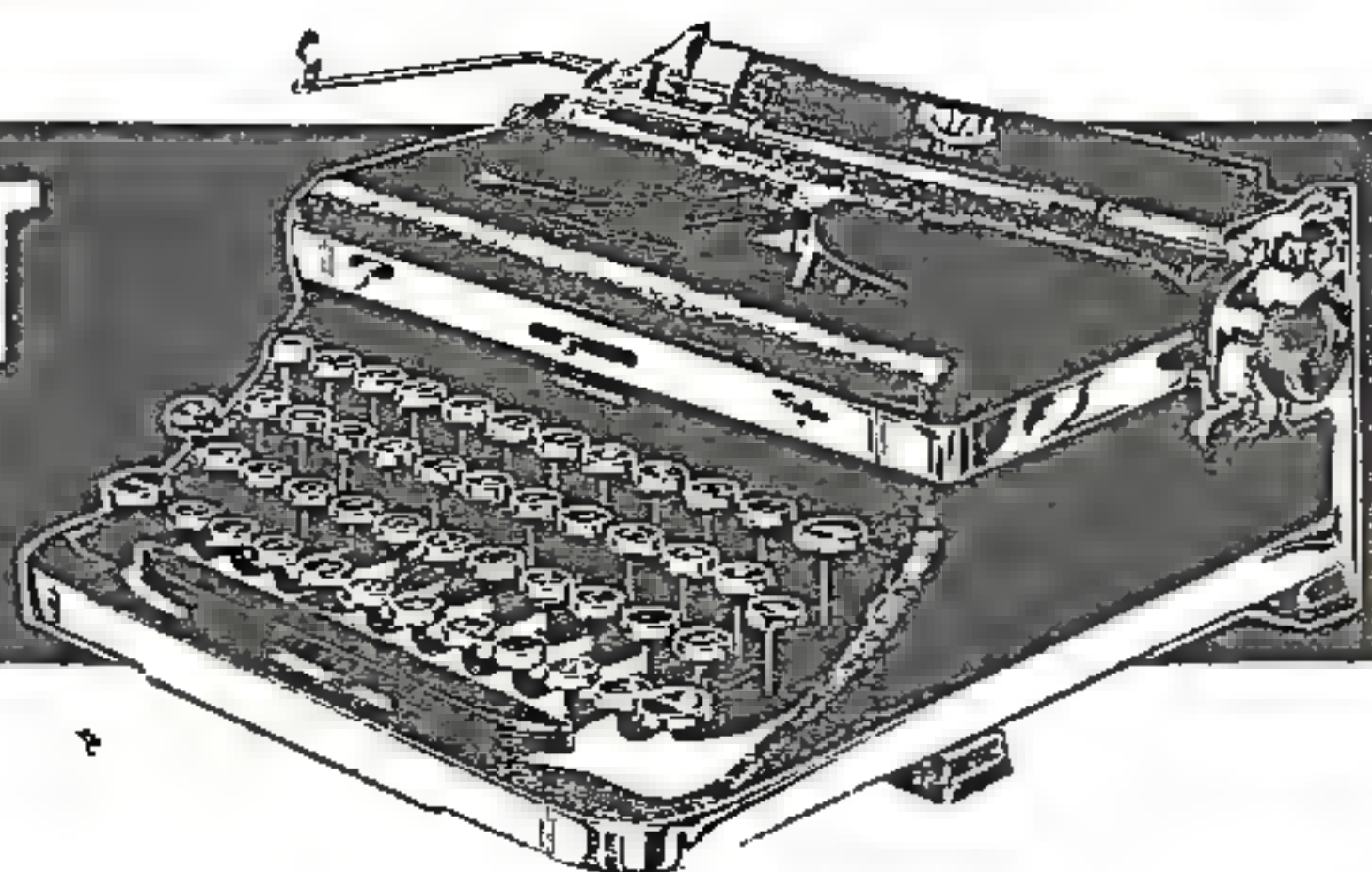
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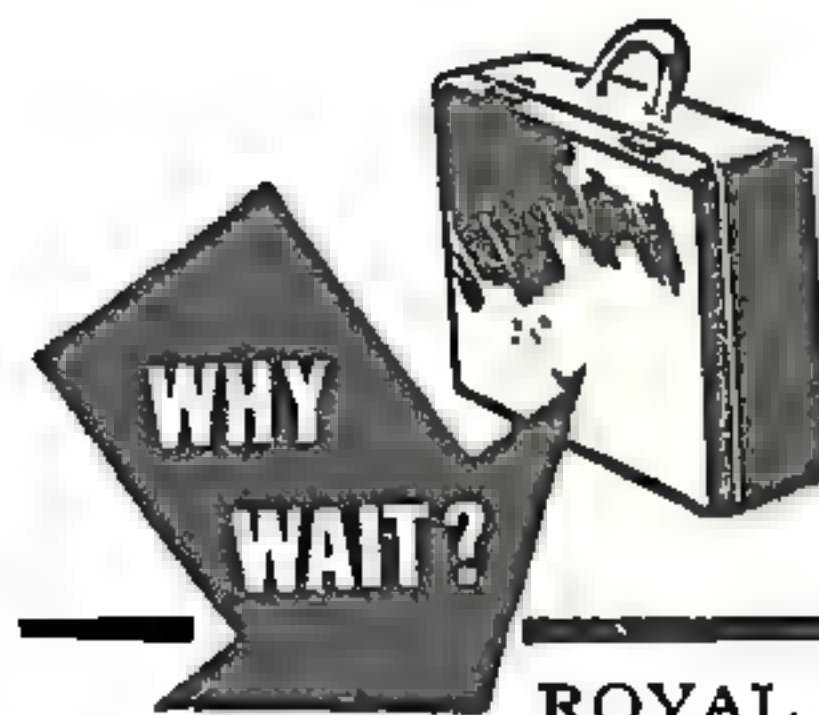
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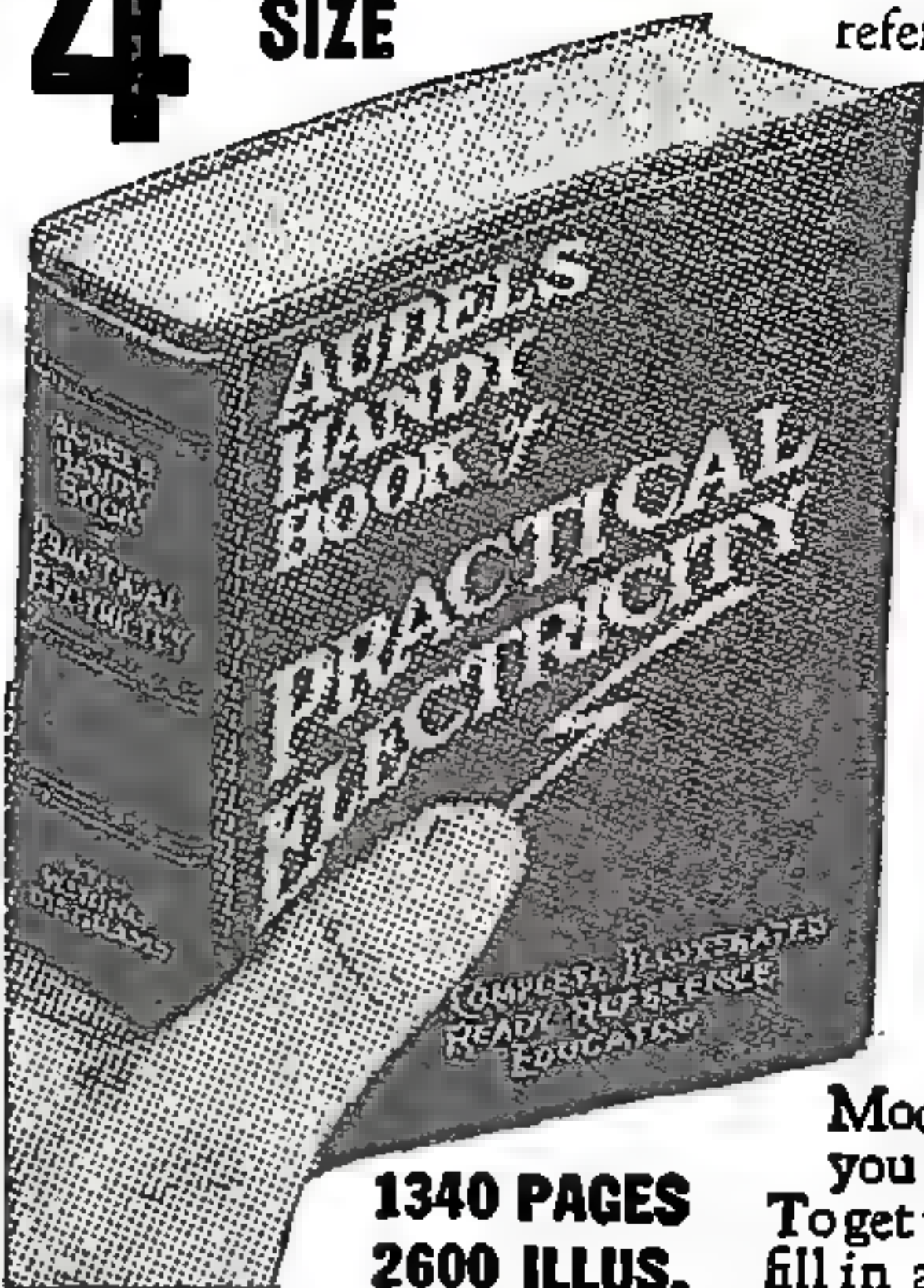
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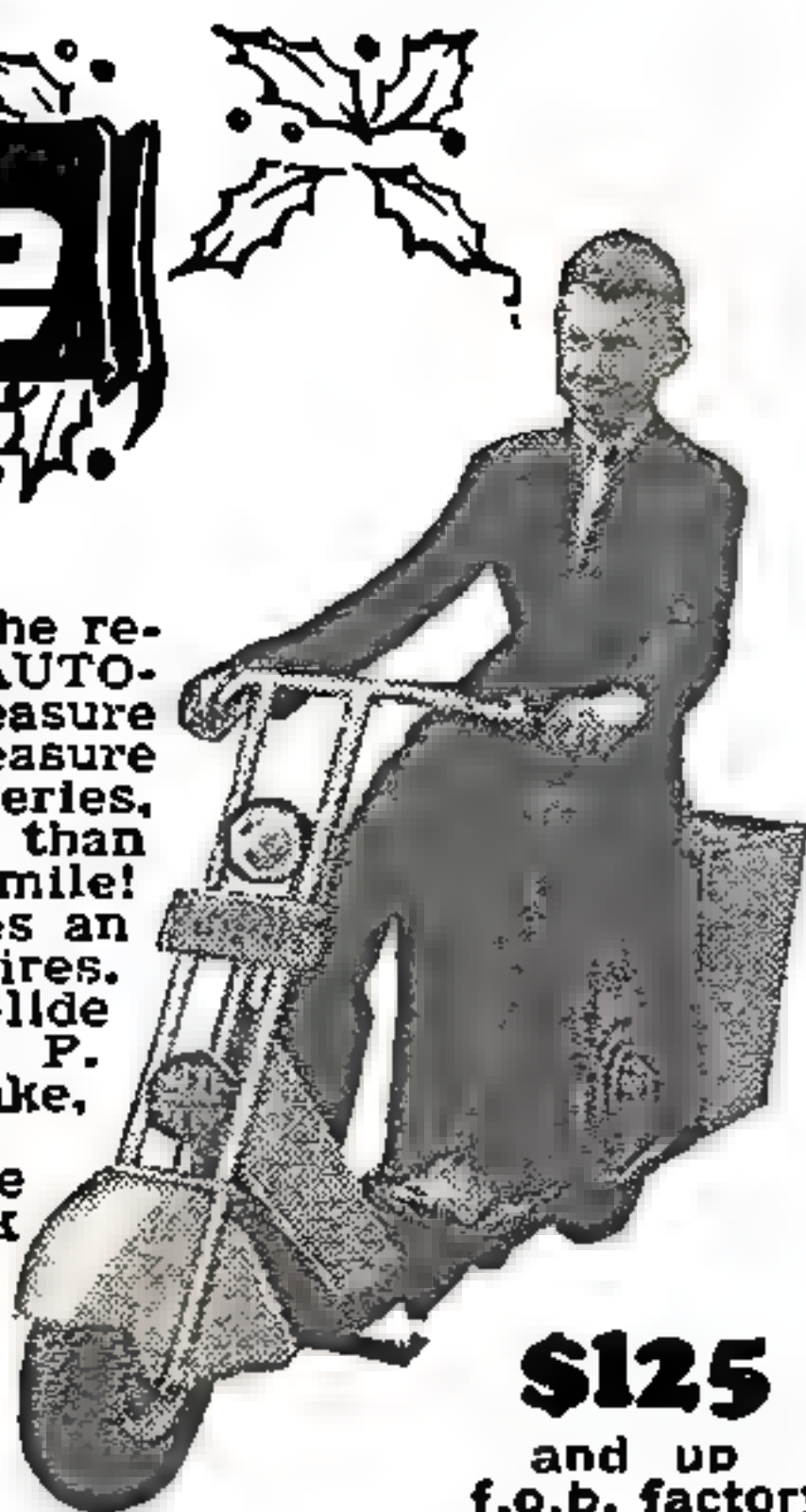
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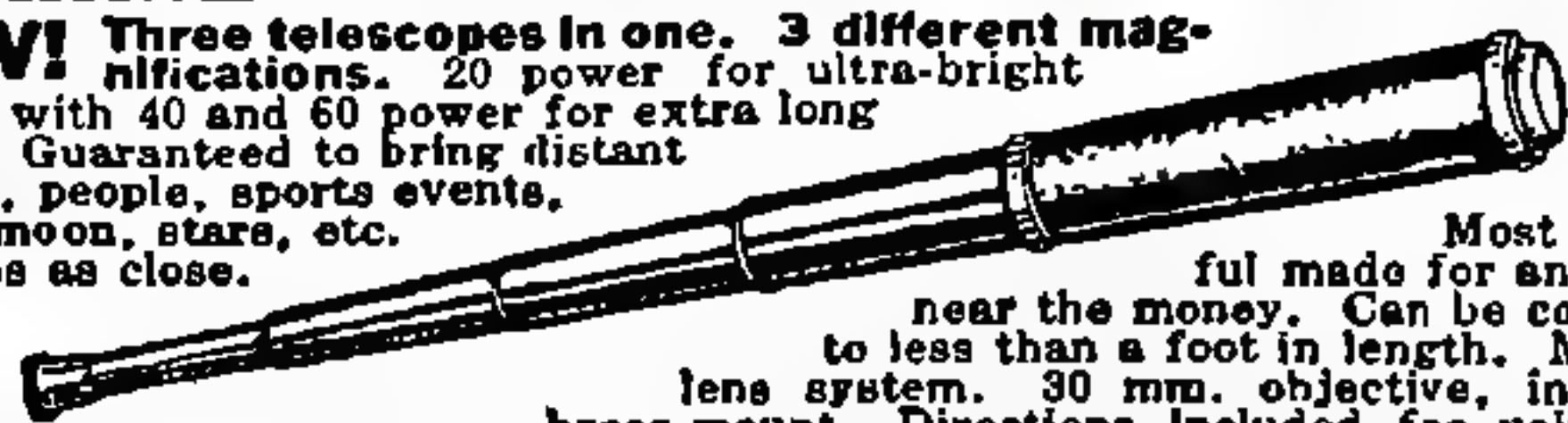
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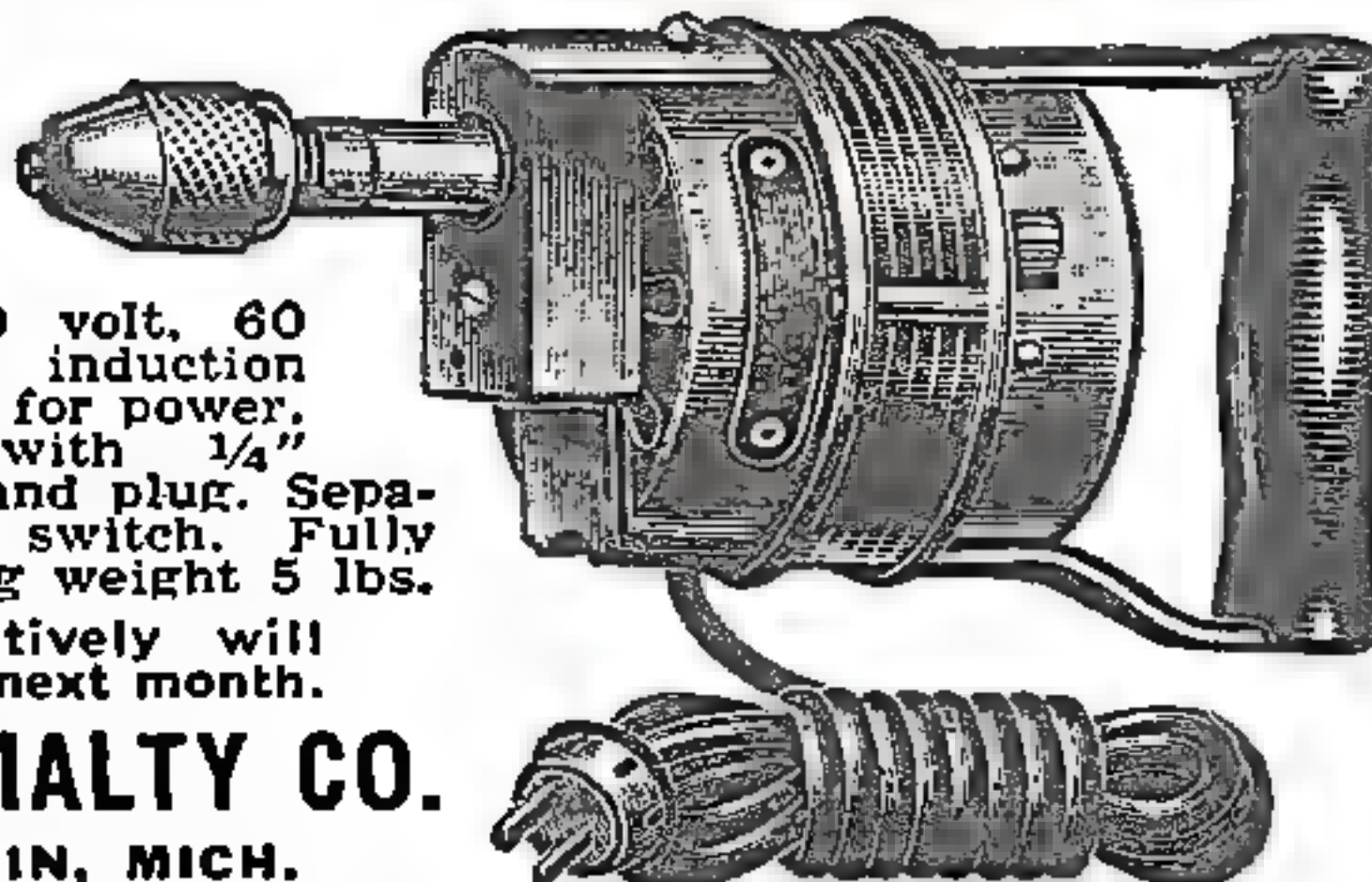
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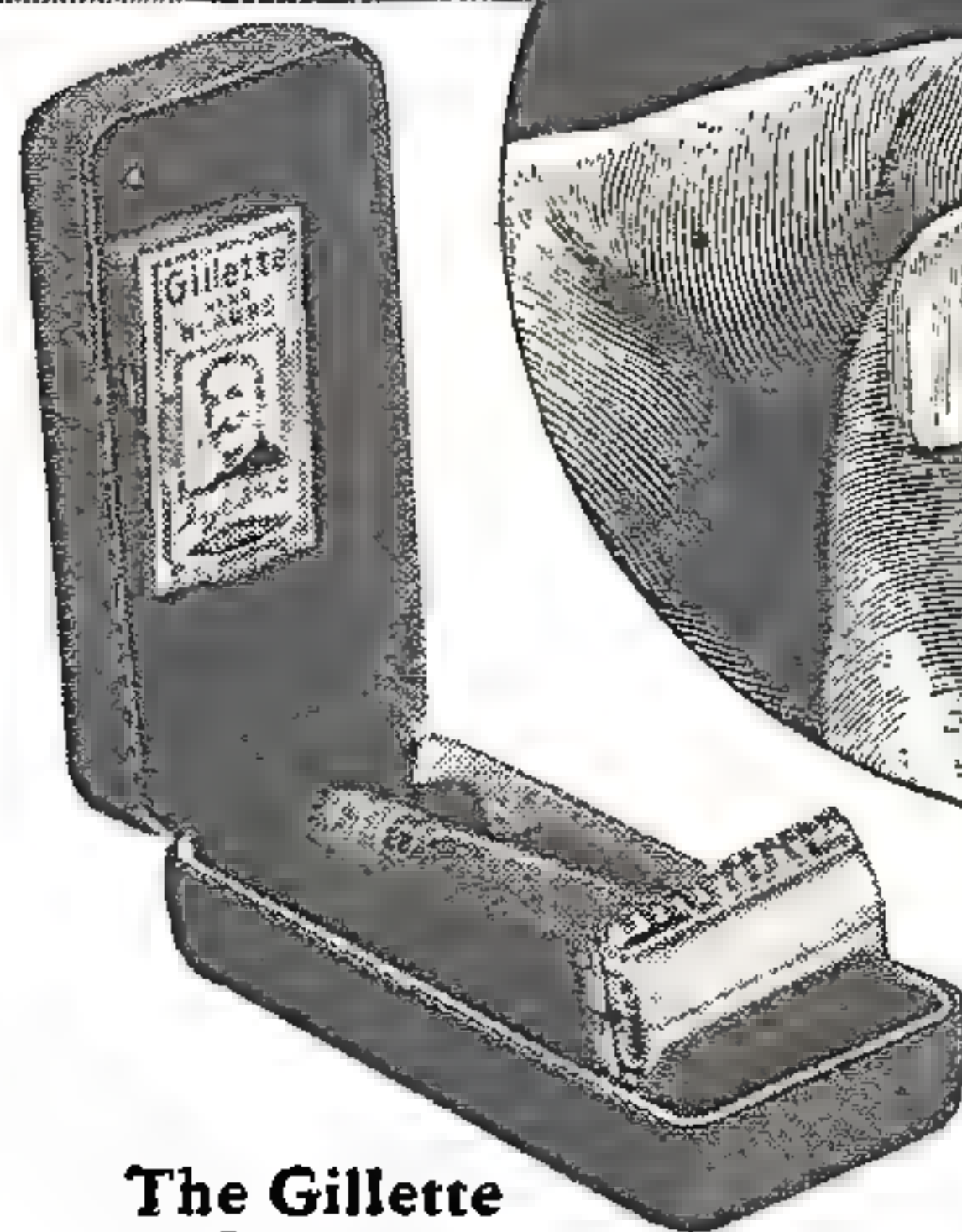
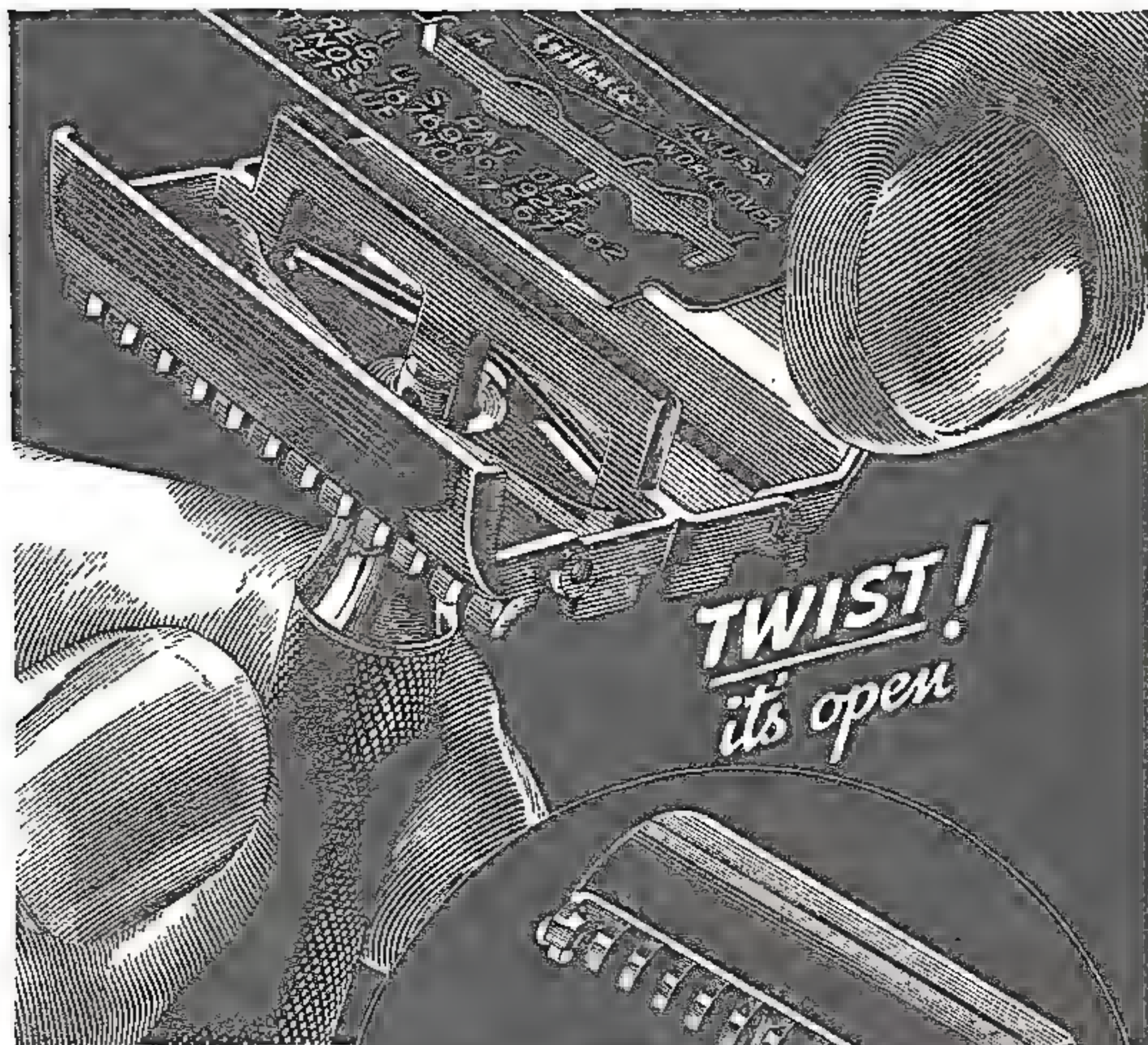
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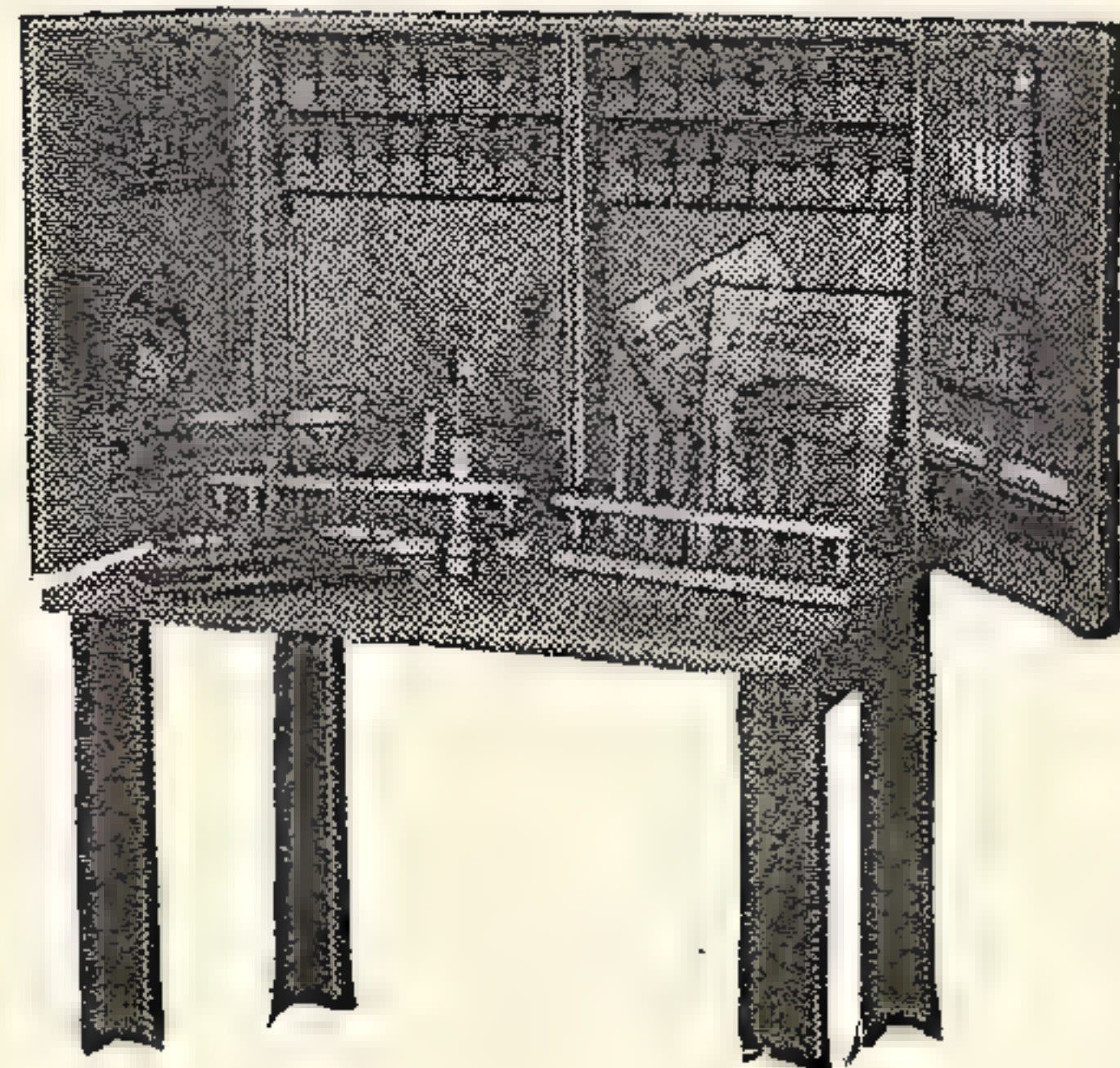
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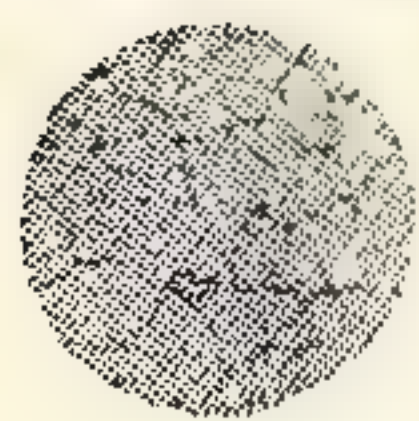
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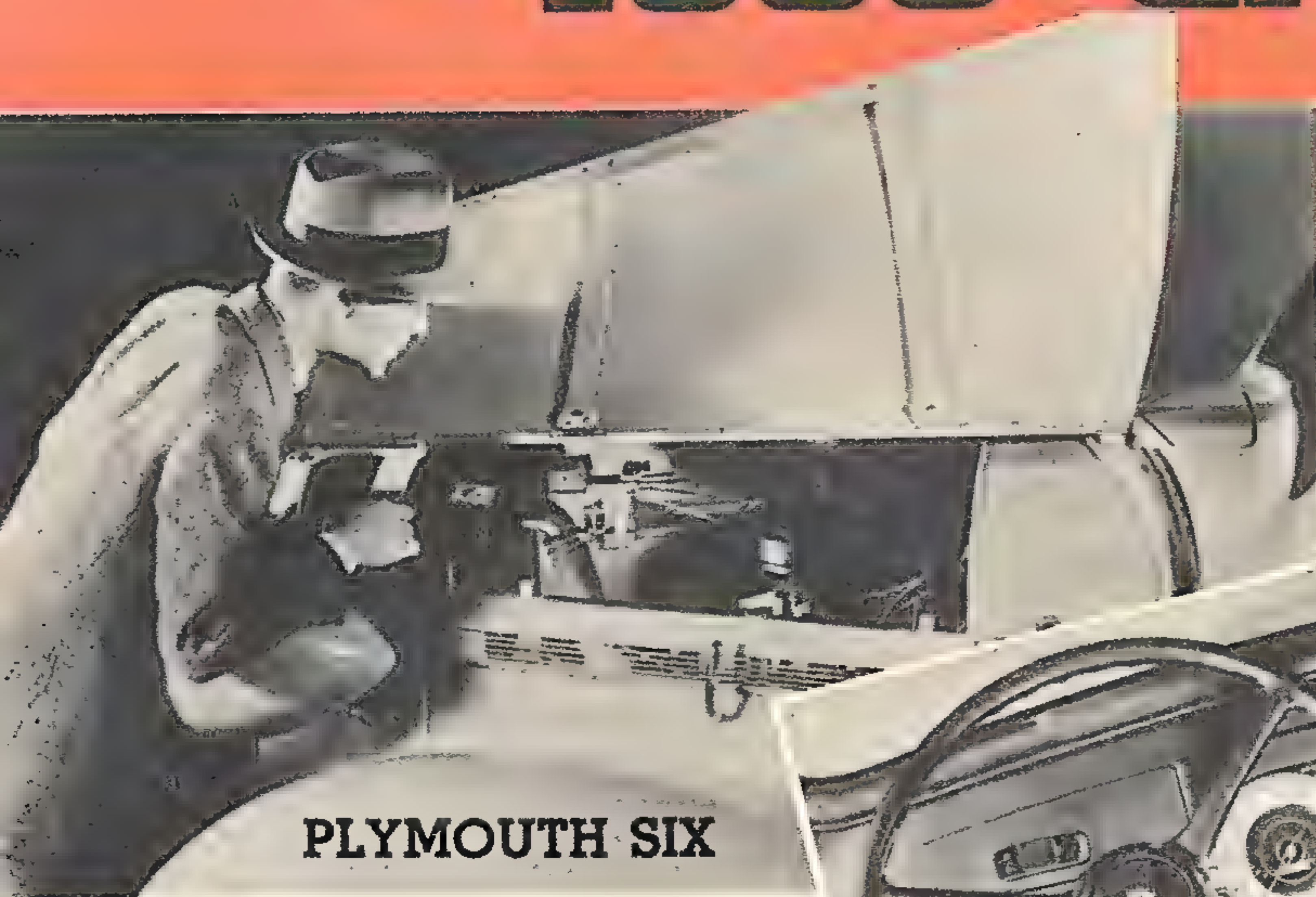
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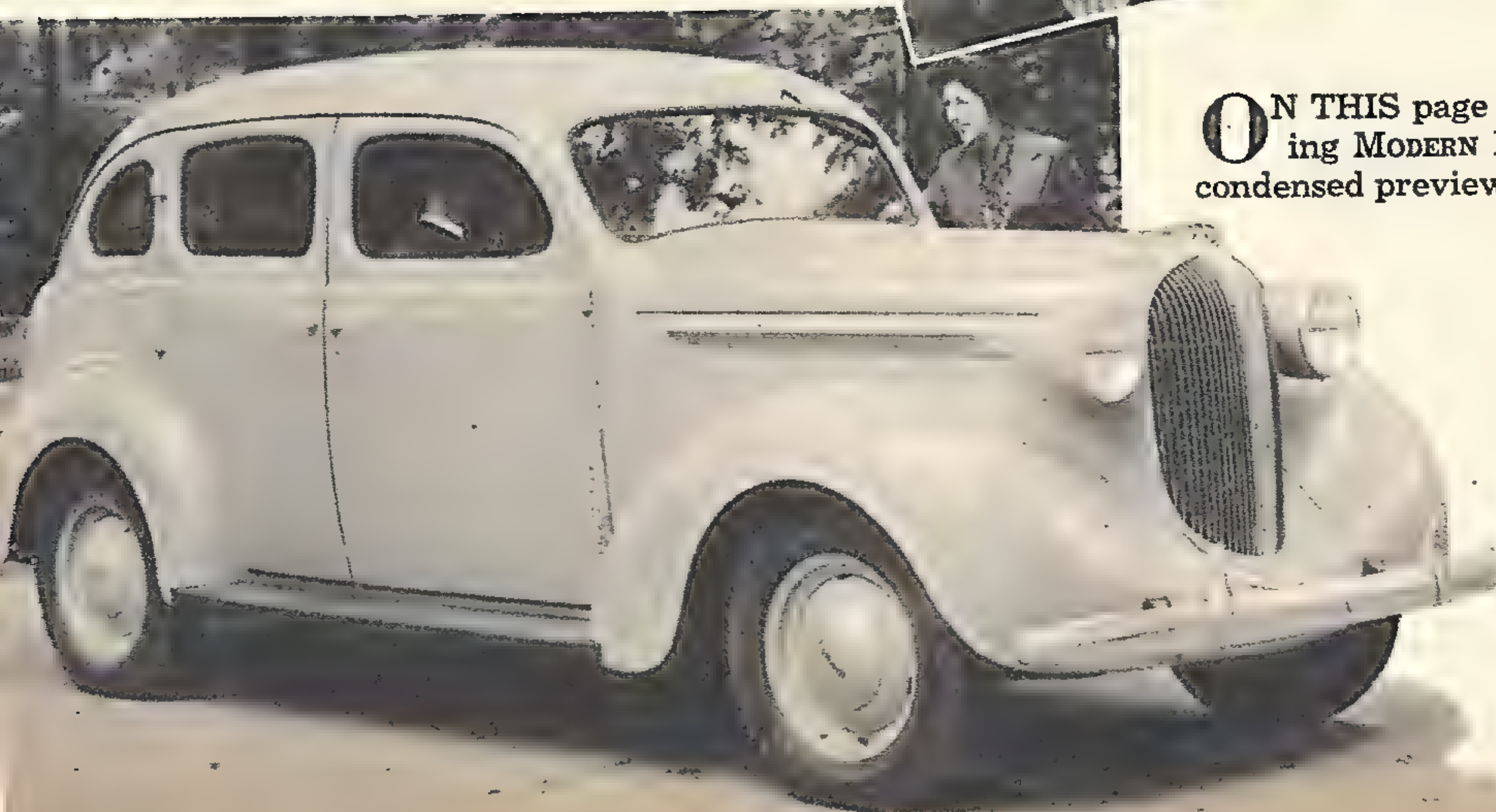
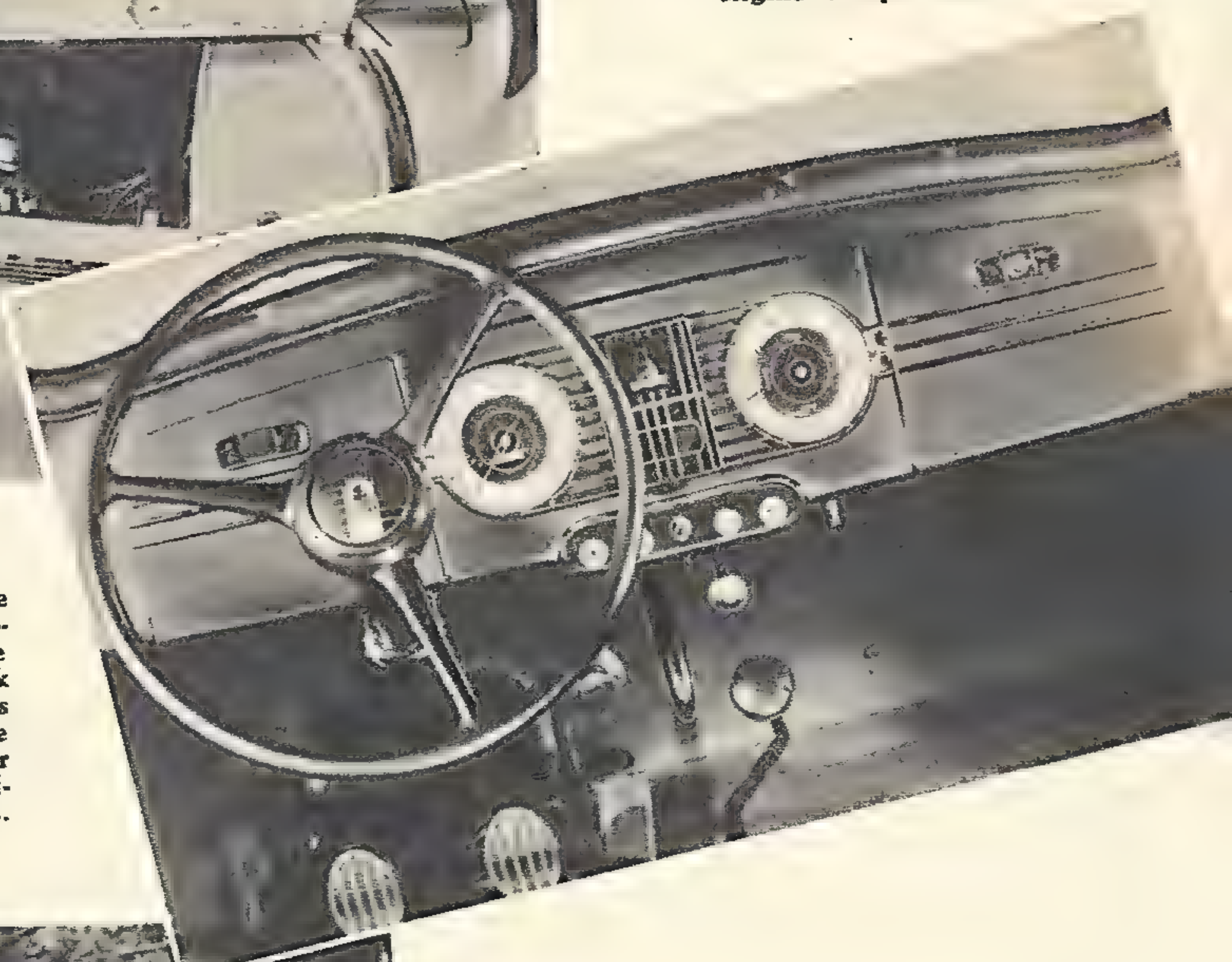
Advance Showing —1938 CARS



PLYMOUTH SIX

Left: Plymouth for 1938 offers its tenth anniversary "Jubilee" model, featuring faster steering, easier handling and continuing reliability. The hood front has been stiffened considerably, and access to the engine is had through a half-section cover as pictured. Note length of engine compartment.

Right: The safety style instrument panel of the 1938 Plymouth, with controls recessed for protection of passengers. All the instruments are grouped in the center of the board, for quick and easy observation by the driver. This photo also shows the new pistol-grip handbrake lever under the cowl. Below: the four-door sedan has broad, sweeping fenders, large windshield and unobstructed vision in all directions.



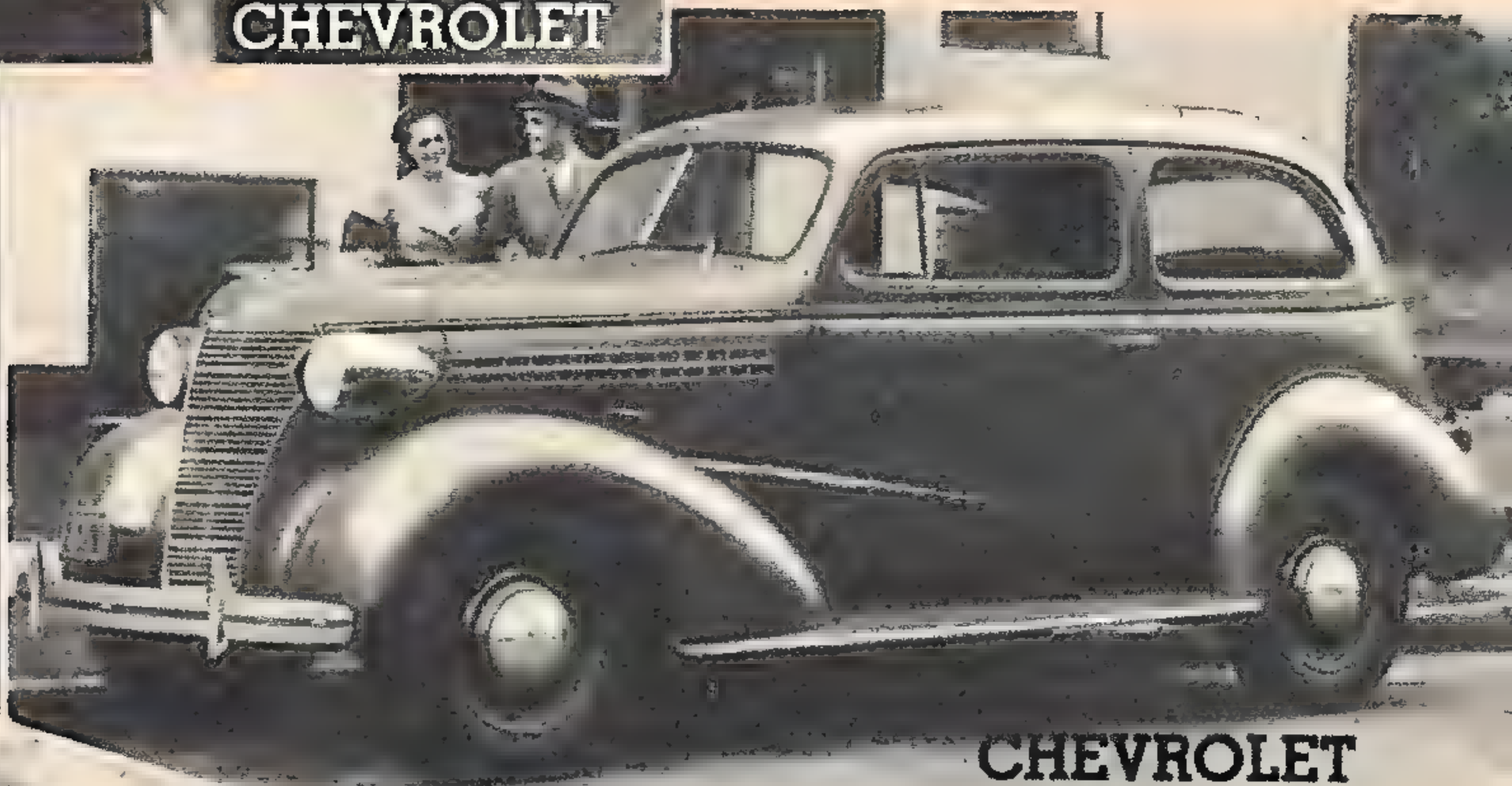
ON THIS page and the four following MODERN MECHANIX presents a condensed preview of next year's automobiles. The mechanical improvements incorporated in these cars are reflected in greater safety and comfort and increased convenience and [Continued on page 120]



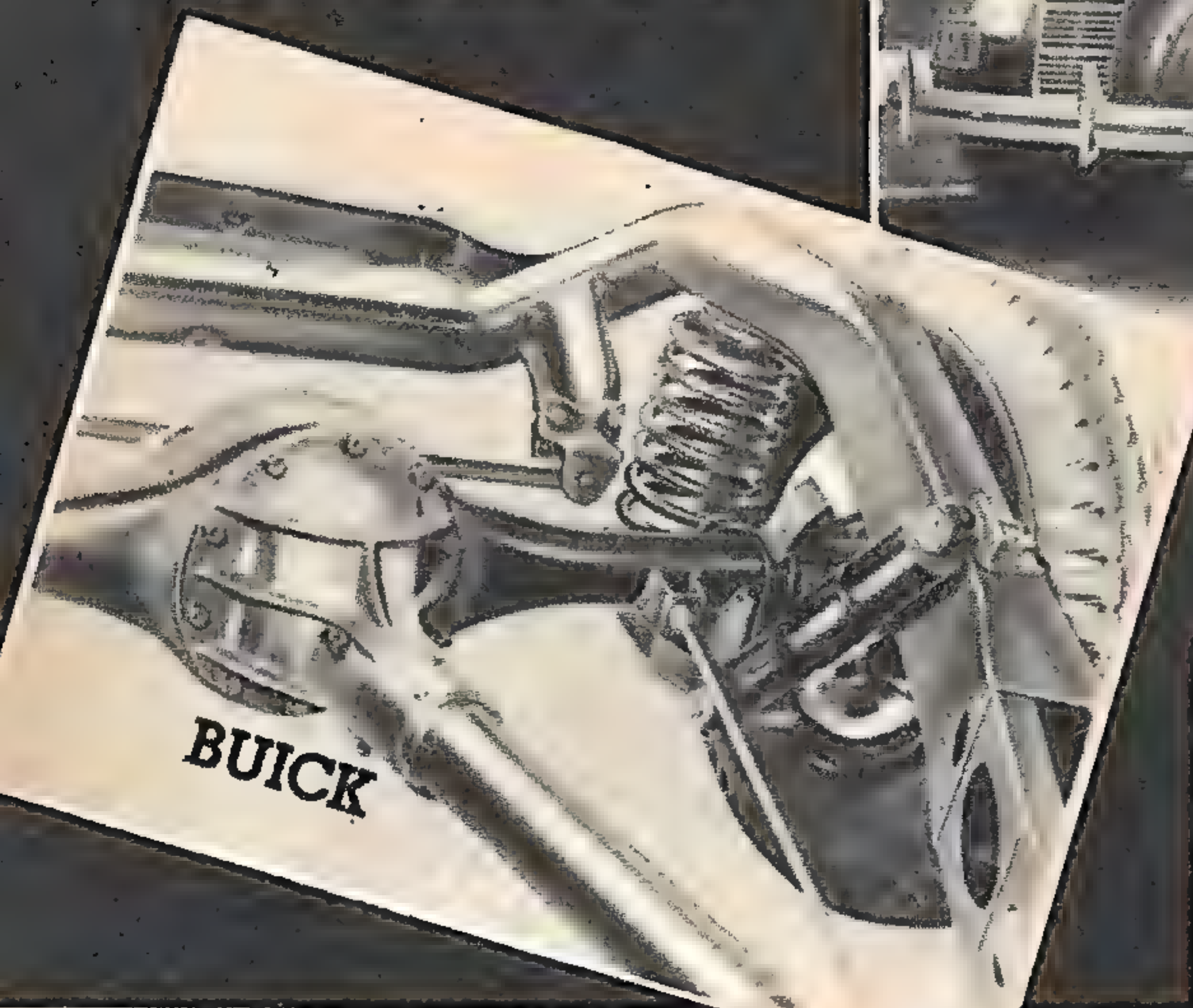
Driving effort is greatly reduced, and control over the car is increased, by the new "Tiptoe-Matic" clutch introduced in the 1938 Chevrolets. The makers claim that 25% less effort is required to operate this clutch than in the 1937 model. The mechanism needs no lubrication throughout the life of the car. A new type of hand brake is also a feature. This has a hinged top, and is easy and positive in operation. Chevrolet remains a six-cylinder car, the valve-in-head engine being brought up-to-date with many small improvements. In the Master series fully-enclosed knee-action is also retained. Unusually roomy interiors give the new Chevrolets increased comfort and utility. Photo at left shows the unusually capacious trunk, which also contains the spare tire.

CHEVROLET

Coil spring rear suspension is an exclusive Buick feature for 1938. Combined with airplane type shock absorbers, this provides greatly improved riding and steering qualities. Photo below shows spring and shock absorber hook-up on right rear wheel of Buick chassis. Size and thickness of spring may be judged by comparison with tire.

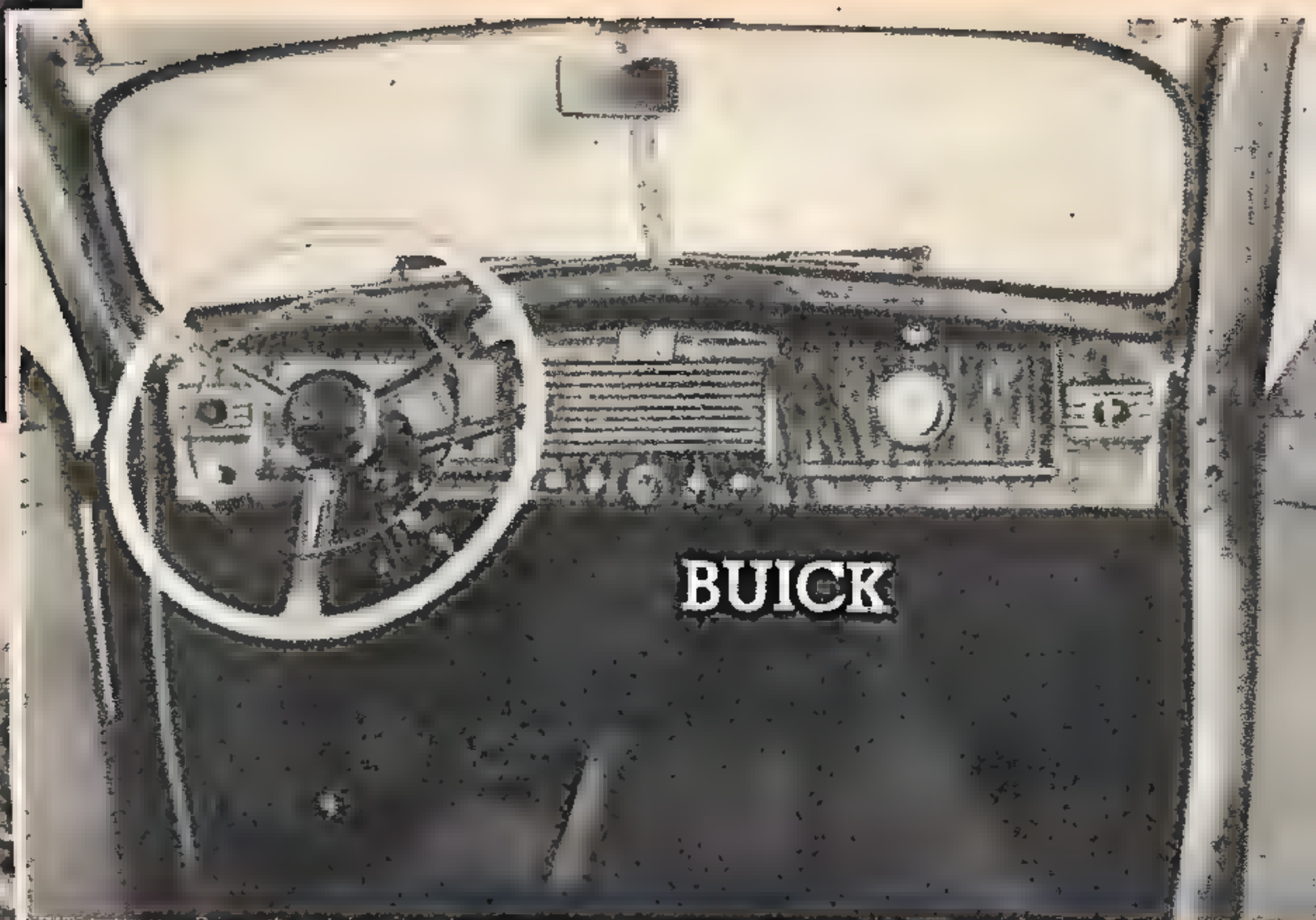


CHEVROLET



BUICK

This is the master deluxe coach of the Chevrolet 1938 line. The new styling is especially evident in radiator and hood. No-draft ventilation, all-steel bodies and safety glass continue as standard features.



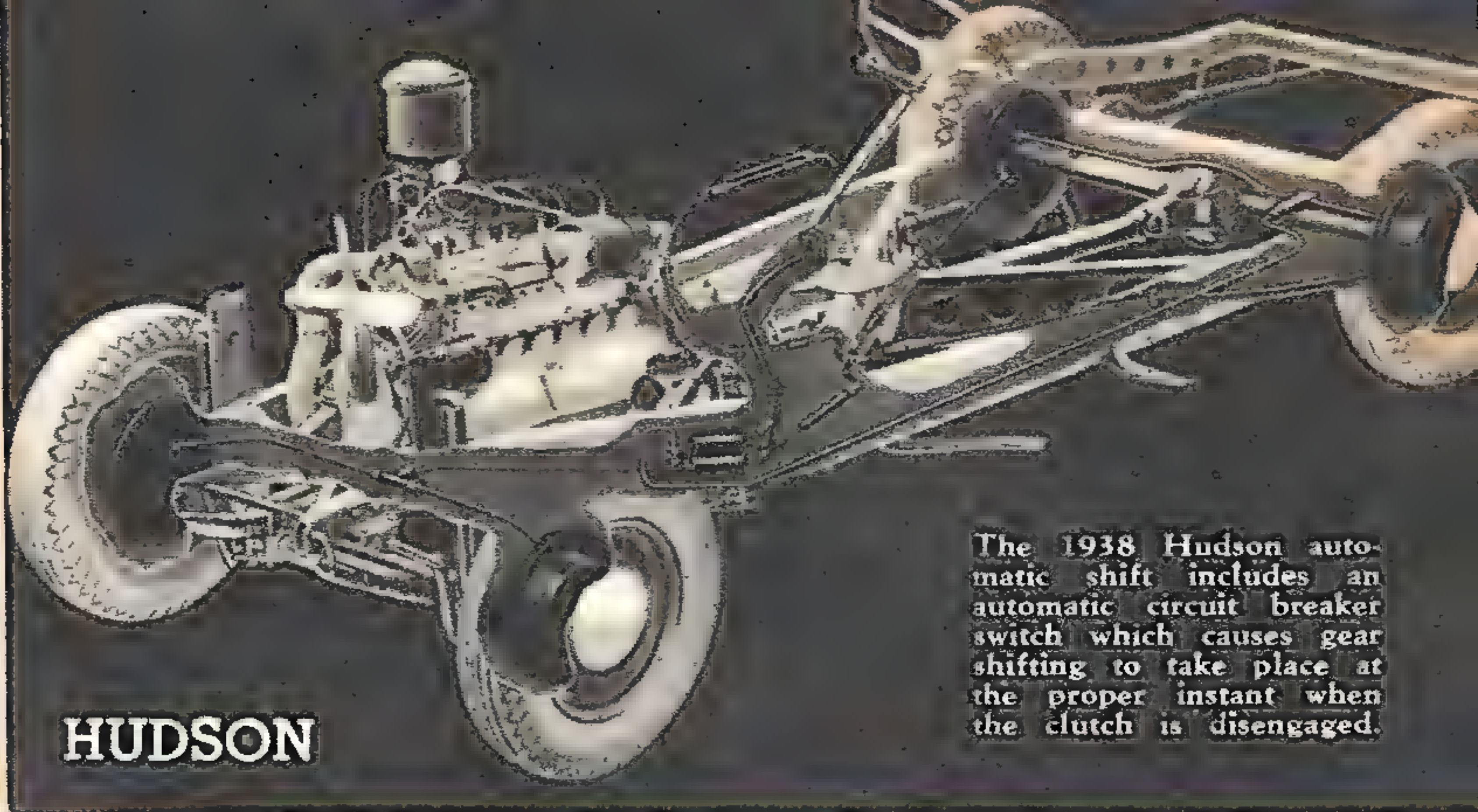
BUICK

Above: Buick's self-shifting transmission has the control arm on the steering post under the wheel at the right. Photo shows the completely cleared driver's compartment. Hand brake is under cowl at extreme left. Left photo: The Buick hood lifts from the molding line, providing for quick and convenient "light" service. Hood side panels are stationary, lending strength to the entire front end sheet metal assembly. Radiator grilles are die-cast.



BUICK

A cut-away view of Hudson's powerful duo-automatic hydraulic braking system with the "double safety" feature of an emergency mechanical brake linkage operating from the same foot pedal. This feature enables the driver to retain control over the car even after the hydraulic system has been disconnected, by continuing to press on the pedal until the emergency rotary-equalized mechanical brakes take hold. The complete Hudson line consists of an eight-cylinder car made on both 129 and 122-inch wheelbases, a six on 122-inch wheelbase, and the Hudson Terraplane on a 117-inch wheelbase.



HUDSON

The 1938 Hudson automatic shift includes an automatic circuit breaker switch which causes gear shifting to take place at the proper instant when the clutch is disengaged.



PONTIAC

Above—The interior of the 1938 Pontiac. The safety-shift remote control gear lever is shown directly below the deluxe type steering wheel. Instrument panel with accessory electric clock can be seen. Right—The Silver Streak radiator and hood grille of the new Pontiac. No other style motif has been so characteristic of Pontiac since its introduction four years ago. Note the parking lights integral with the headlamps.

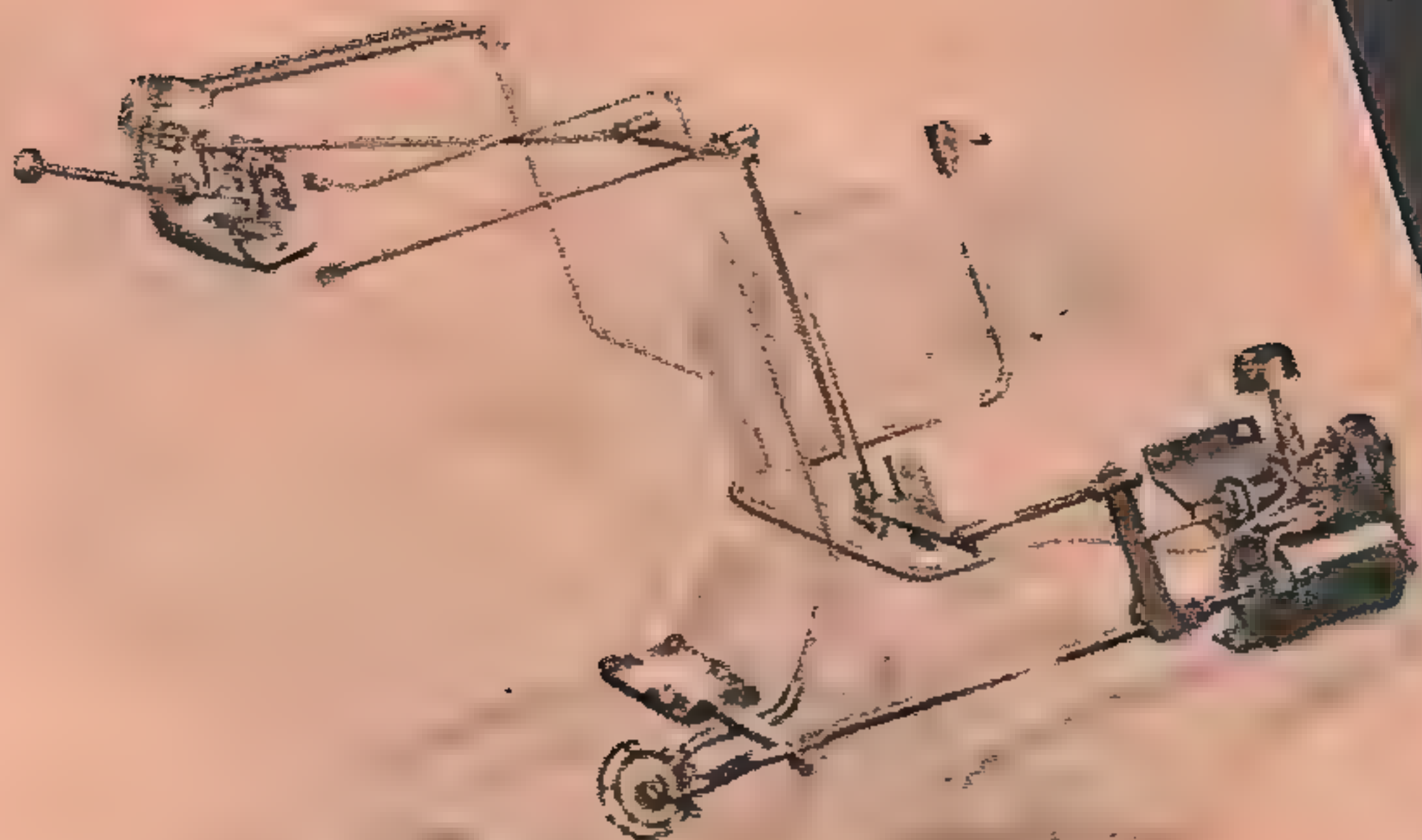


PONTIAC

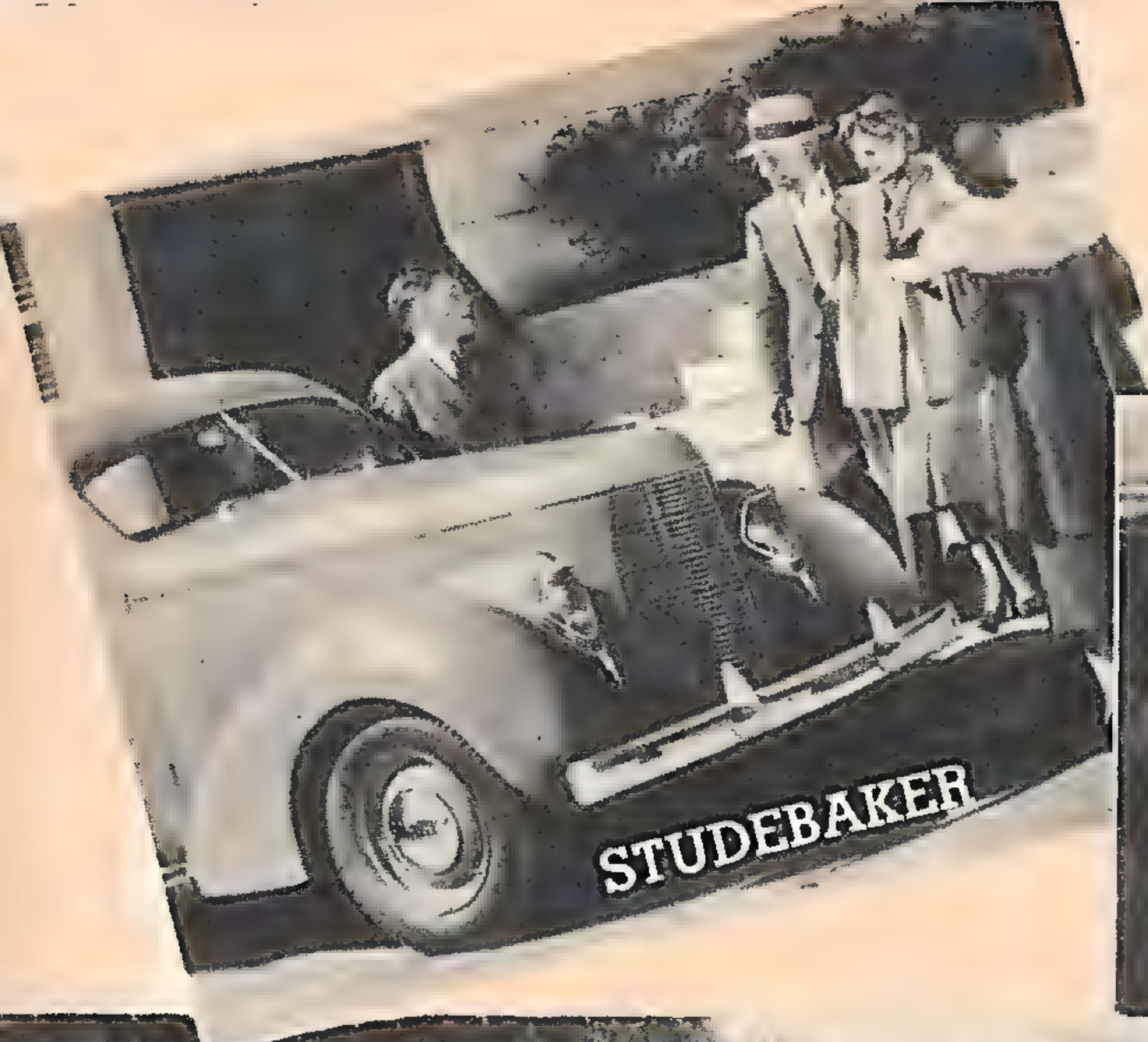


NASH

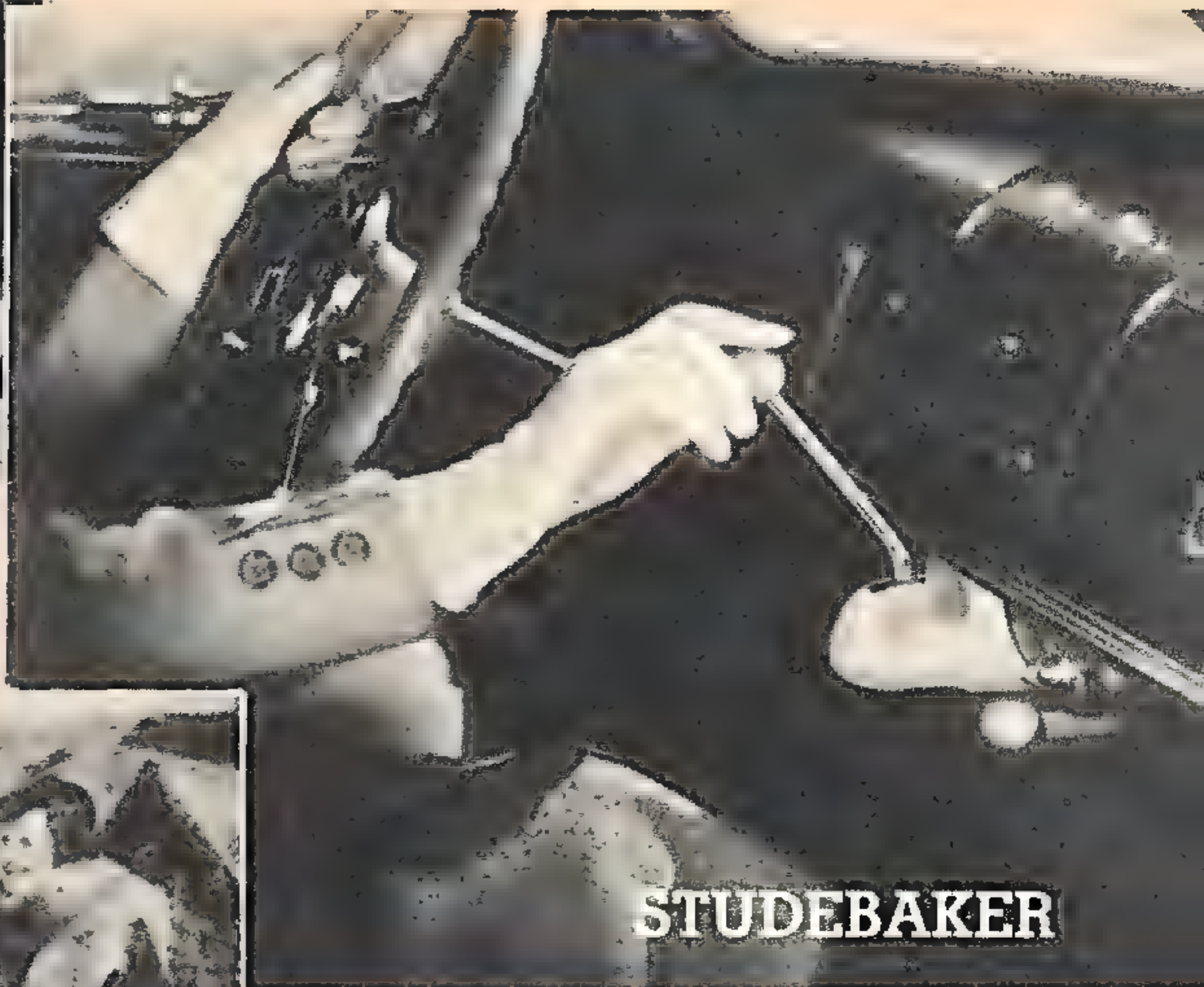
Left—Its steering control lever located conveniently near the rim of the steering wheel, affording finger tip control, Nash's new vacuum gear-shifting system is shown here in diagrammatic detail. Above—The instrument panel of the new Nash. The air conditioning unit is shown just below the gear shift lever. This device supplies an abundance of warmed, conditioned air for winter driving.



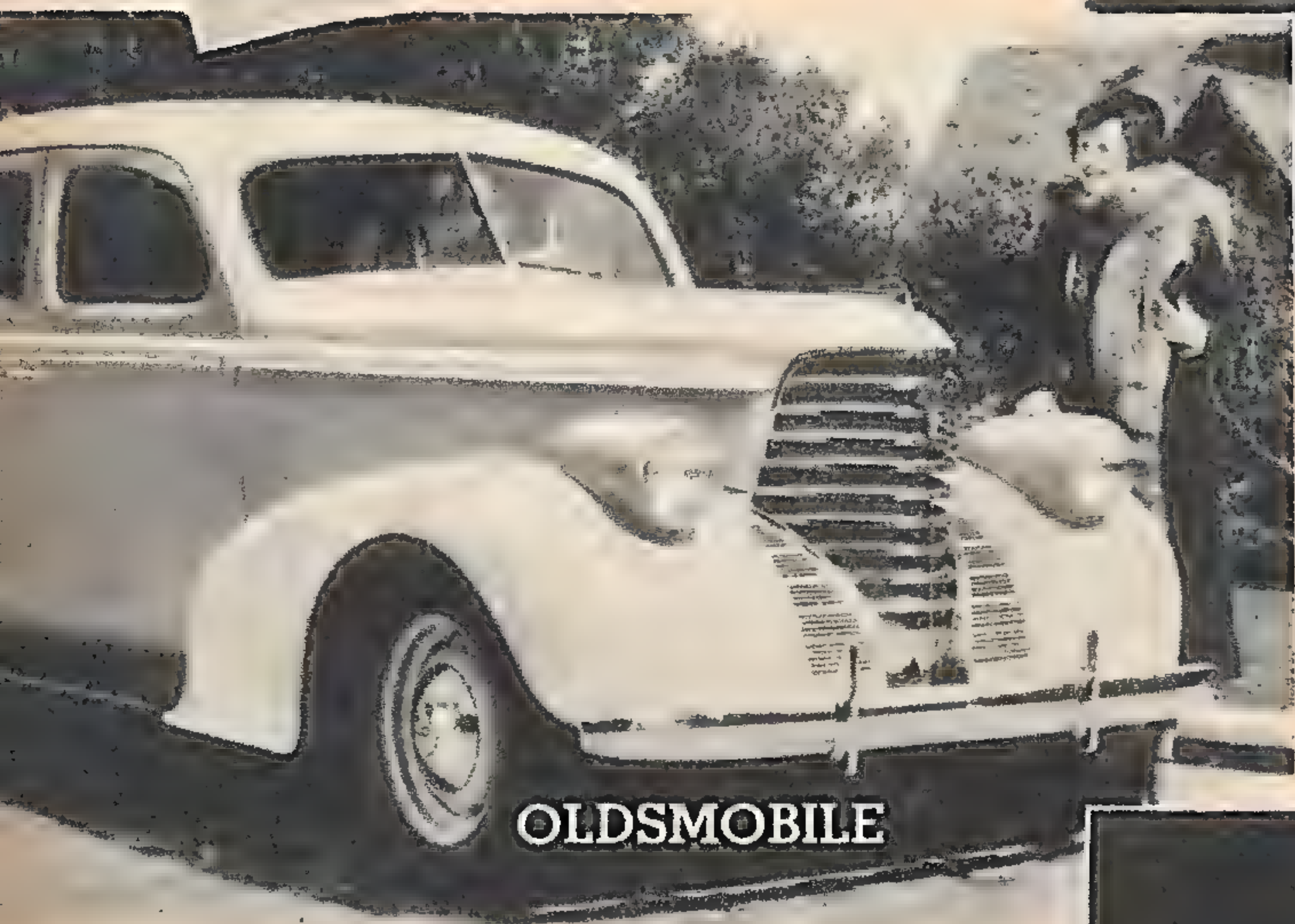
NASH



Looking at the 1938 Studebaker (left) from the front, one sees streamlined headlamps faired into the broad steel fenders of the various models. The frames, chassis and bodies are entirely new. The bodies are approximately six inches wider than last year's models, providing 55½ inches front seat and 47½ inches rear seat room. Frames are lighter and feature increased overall torsional rigidity.



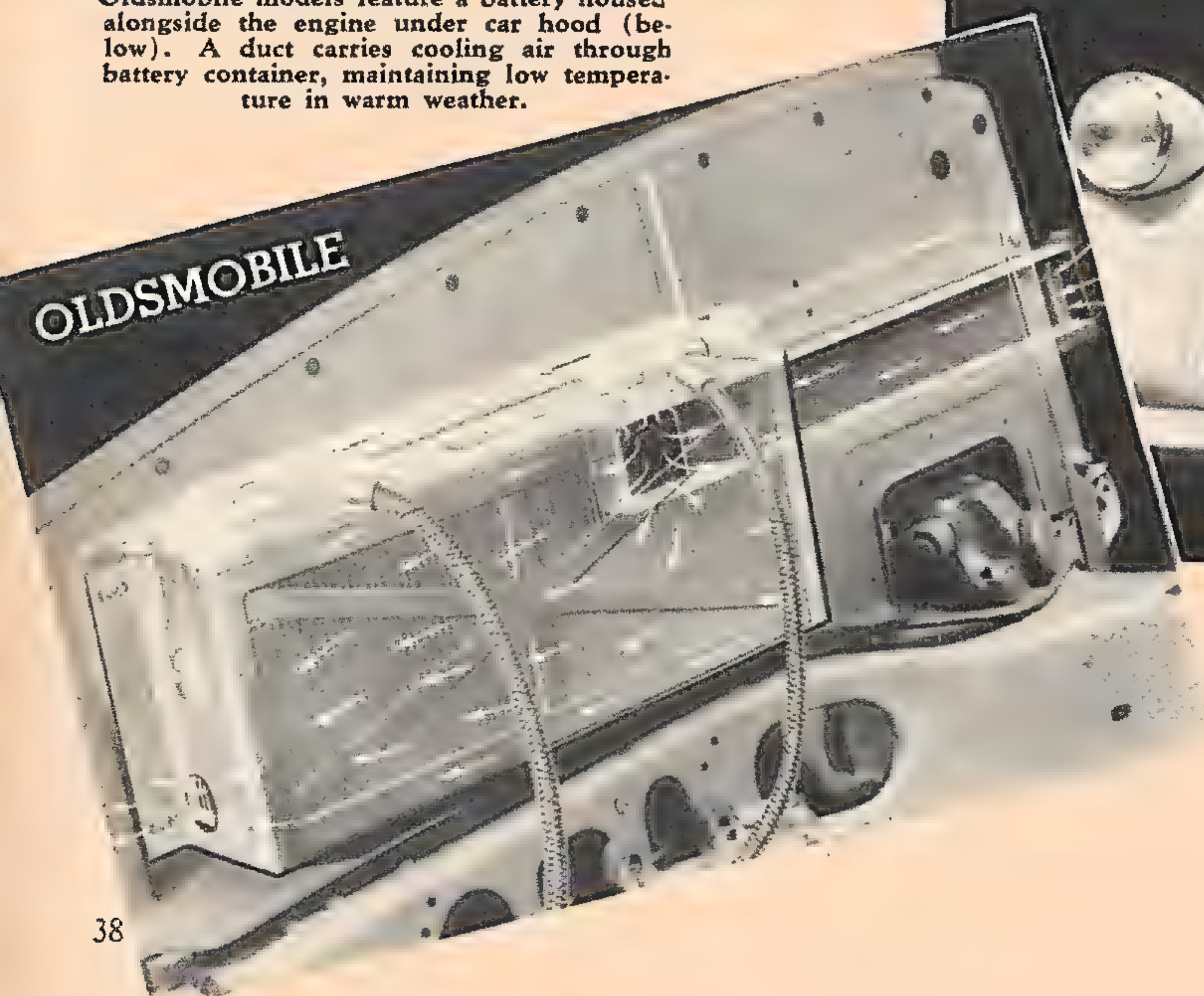
The vacuum gear shift featured by 1938 Studebaker models utilizes the engine manifold vacuum to actuate the transmission gear changes. A small shift lever (above), five inches long, extends from dashboard, leaving the floor free for passengers' feet.



Body lines of the 1938 Oldsmobiles are lower and cleaner, as shown at left. Bullet-type headlamps are demountable for economy's sake in case of fender damage. All models are available with safety transmission, requiring use of clutch only when starting and stopping.

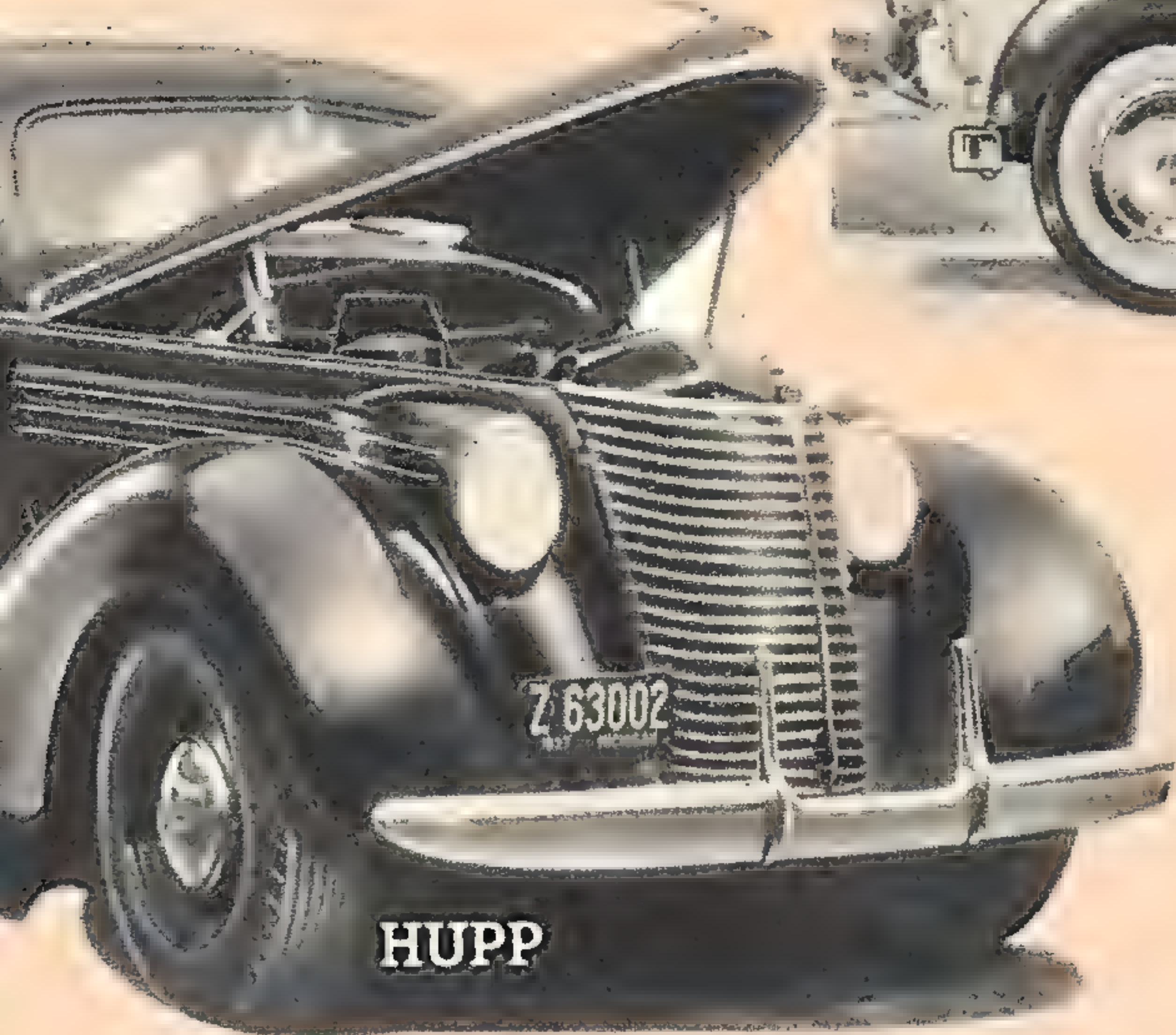
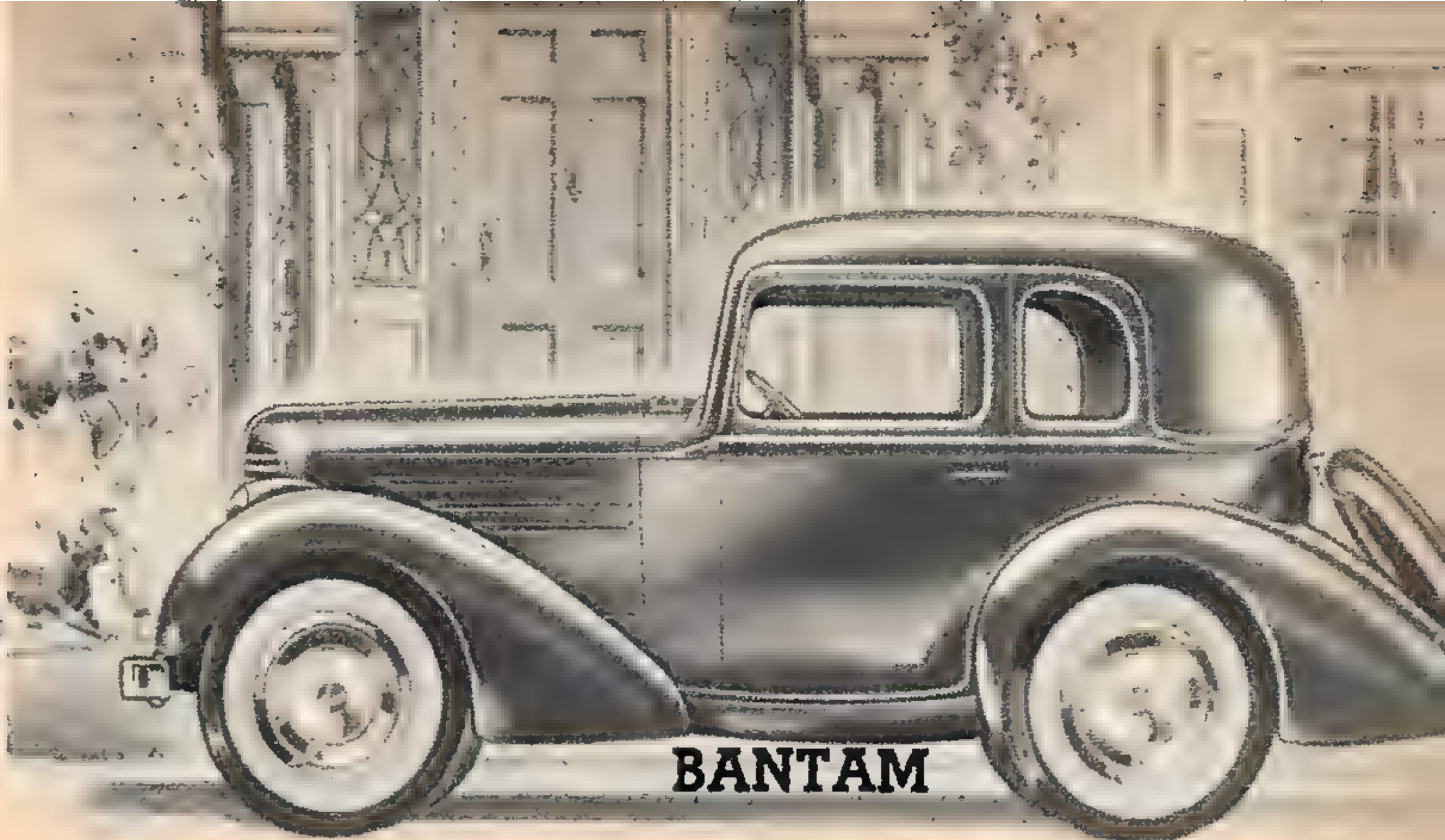


De Soto's distinctive new "face" (above) features a radiator grille made of horizontal die-cast chromium bars. A new frame, wider and deeper than before; bigger, more powerful hydraulic brakes and a new rubber-insulated steering set-up that isolates road shock from the wheel are the highlight features of the many mechanical improvements in the 1938 models.



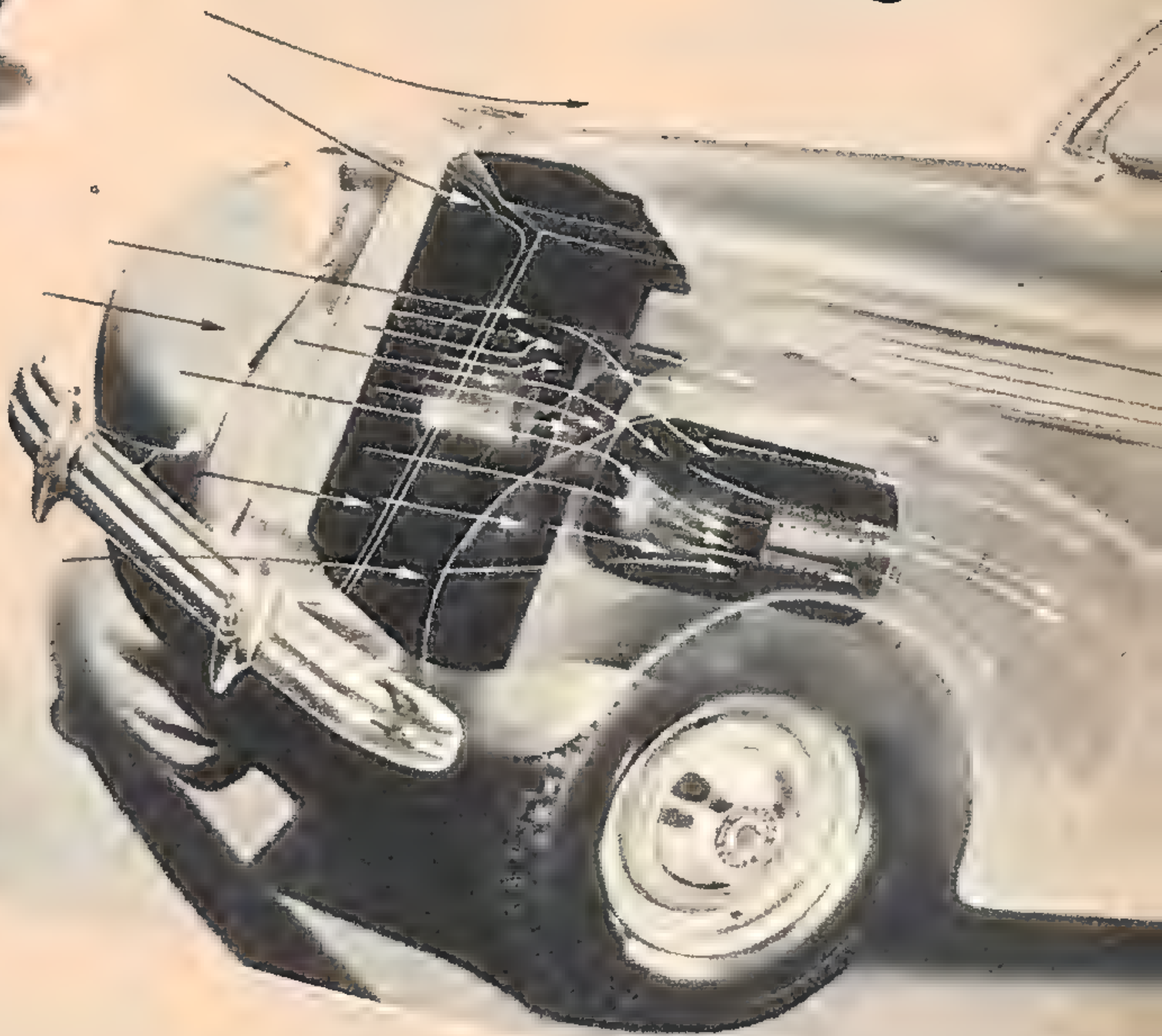
Oldsmobile models feature a battery housed alongside the engine under car hood (below). A duct carries cooling air through battery container, maintaining low temperature in warm weather.

Successor to the Austin is the new American Bantam, selling at prices from \$75 to \$125 below any other car in the low-price field. Shown at right is the 1938 Bantam "60" coupe, powered by a 4-cylinder, 20 h. p. motor suspended on live rubber. Performance claims include speeds of 60 m. p. h., 60 miles to the gallon of gas and an operating cost of 3/4-cent per mile. In addition to the coupe, the manufacturers announce a complete series of "60" models.



Below—All four models of the 1938 Packard incorporate scores of new details. One novel feature is the expulsion of engine heat through louvers located under the front fender skirts. The outstanding feature of the new "Junior" series is a revolutionary type of rear spring suspension.

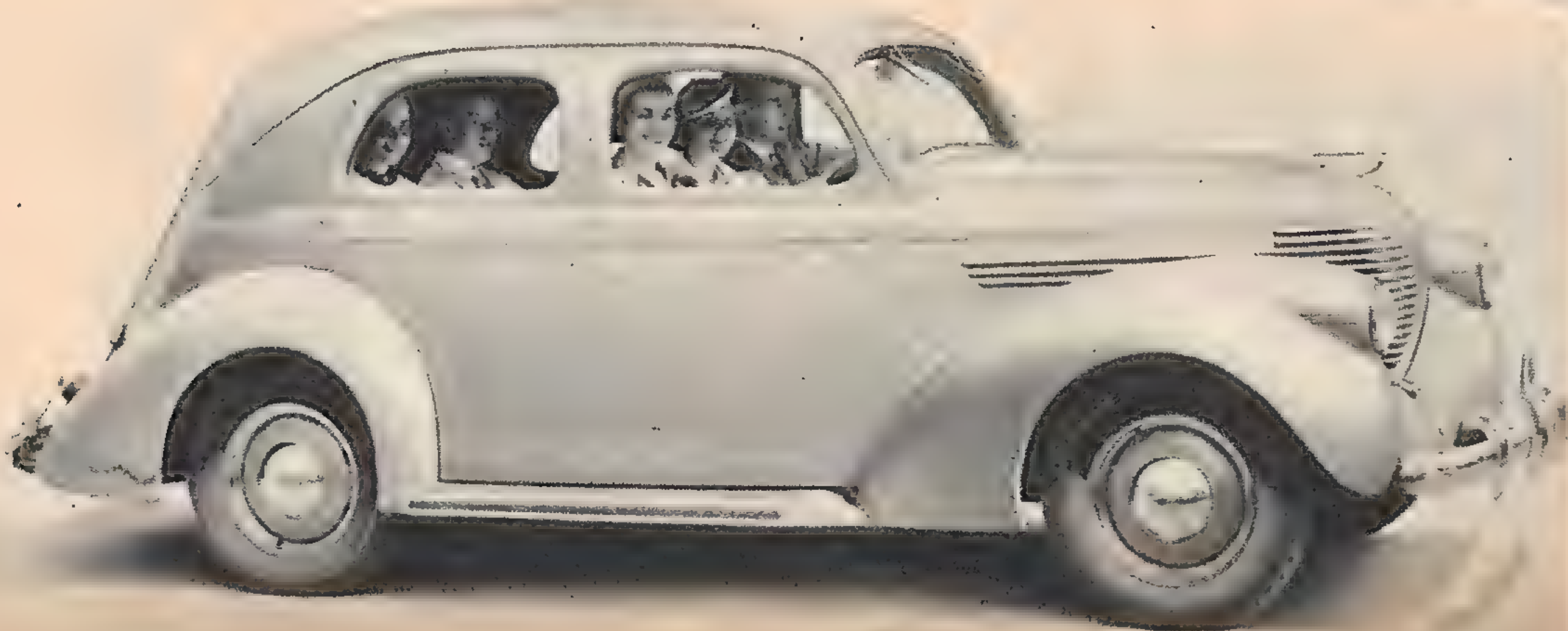
PACKARD



The new Hupmobile series includes two models, a six and eight, powered by an L-head engine. Both models provide greater body width and length. A distinctive radiator grille design gives both models a dynamic head-on appearance. Radiator decoration serves as handle to permit access to motor. Headlights are built into the hood.

Below—The new Willys Sedan for 1938 features a patented all-steel body and top, 178-inch overall length, safety type duo-servo brakes, improved steering and safety glass. The power plant is a Willys-built 4-cylinder engine providing economical operation up to 35 miles to the gallon of gas. Two models, a 5-passenger sedan and 3-passenger coupe, are available in a wide range of colors.

WILLYS





This 36-foot racing car is being built for Captain George Eyston, of England, who hopes to attain a 400-m.p.h. speed with it. When completed, the racer will have eight wheels.

Old Railway Thrills Tourists

TOURISTS visiting Cincinnati, Ohio, are thrilled by a ride on the local Mt. Adams Plane Railway, which was erected in 1877 to carry street cars up a 980-foot incline. Only the demand of sight-seers has saved the novel railway from being abandoned in the march of progress, over two million persons using the railway annually.

The lifts of the old railway are drawn by four cables and operate in balance, one ascending while the other descends. Street cars using the lifts are kept on an even keel while traveling the 28.9% grade.



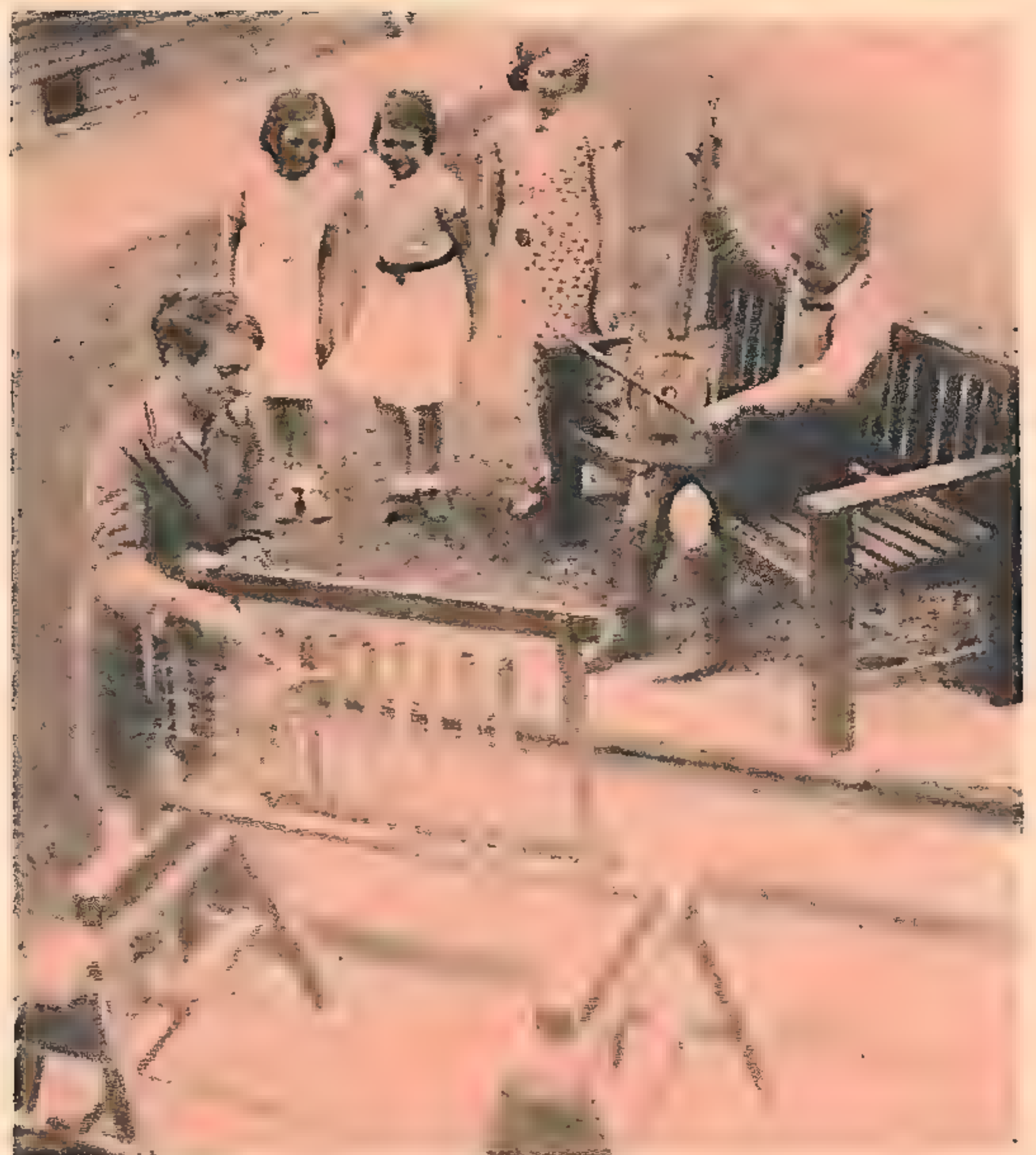
Street cars carrying tourists are the principal users of this old plane railway in Cincinnati, Ohio. The cable lifts carry the cars up a 980-foot incline featuring a grade of 28.9%.

Mammoth Racing Auto Equipped With 8 Wheels

A THIRTY-SIX-FOOT streamlined racing car being constructed at Tifton, England, is equipped with eight wheels, four of which are needed to steer the car effectively at high speeds. The giant racer will be used by Capt. George Eyston in an attempt to better the present speed record of 301 m.p.h., which is held by Sir Malcolm Campbell, noted English sportsman.

Powered by two engines of 3,000 horsepower each, the new racer is expected to attain a speed of 400 m.p.h., according to Captain Eyston, who will make the record-breaking attempt at Salt Lake City, Utah. The racer features hand-made tires designed to withstand the tremendous heat resulting from speeding over the hard-packed sand of the famous Utah racecourse.

Boys Turn Bike Into Chimes



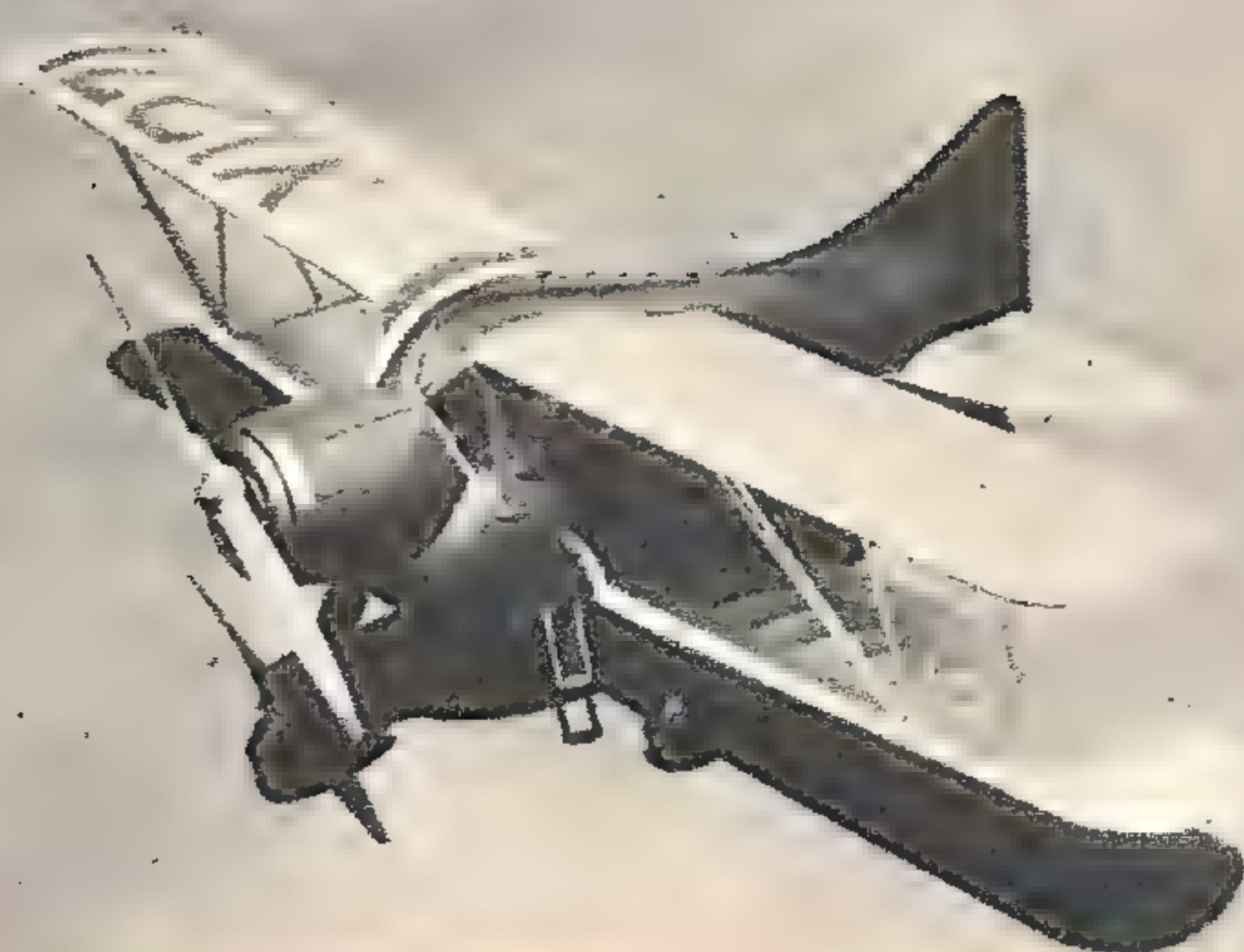
For the entertainment of several local girls, these English schoolboys are playing a tune on the novel chimes and stringed instrument they cleverly constructed from old bicycle tubing.

BOYS at Weoley Castle School in Birmingham, England, have developed a novel use for old bicycles. Sawing the old bicycle tubing to various lengths and stringing the cut sections on wires hung on a home-built mounting, the boys have created musical chimes featuring a full complement of notes, enabling tunes to be played.

Three-Wheeled Biplane Has Simplified Controls

A TWO-SEATER biplane, featuring simplified automobile-type controls that are said to enable student pilots to learn flying in half the time ordinarily required, has been developed by Joseph Gwinn, Jr., of Buffalo, N. Y. The plane is equipped with a tricycle landing gear designed to insure smoother and easier landings for the amateur pilot.

The "aircar," as the Gwinn airplane is called, has a wingspan of 24 feet and an overall length of 16 feet. Powered by a Pobjoy Niagara II engine of 90-horsepower, the plane has a top speed of 120 m.p.h. The gasoline fuel supply is governed by a foot accelerator.



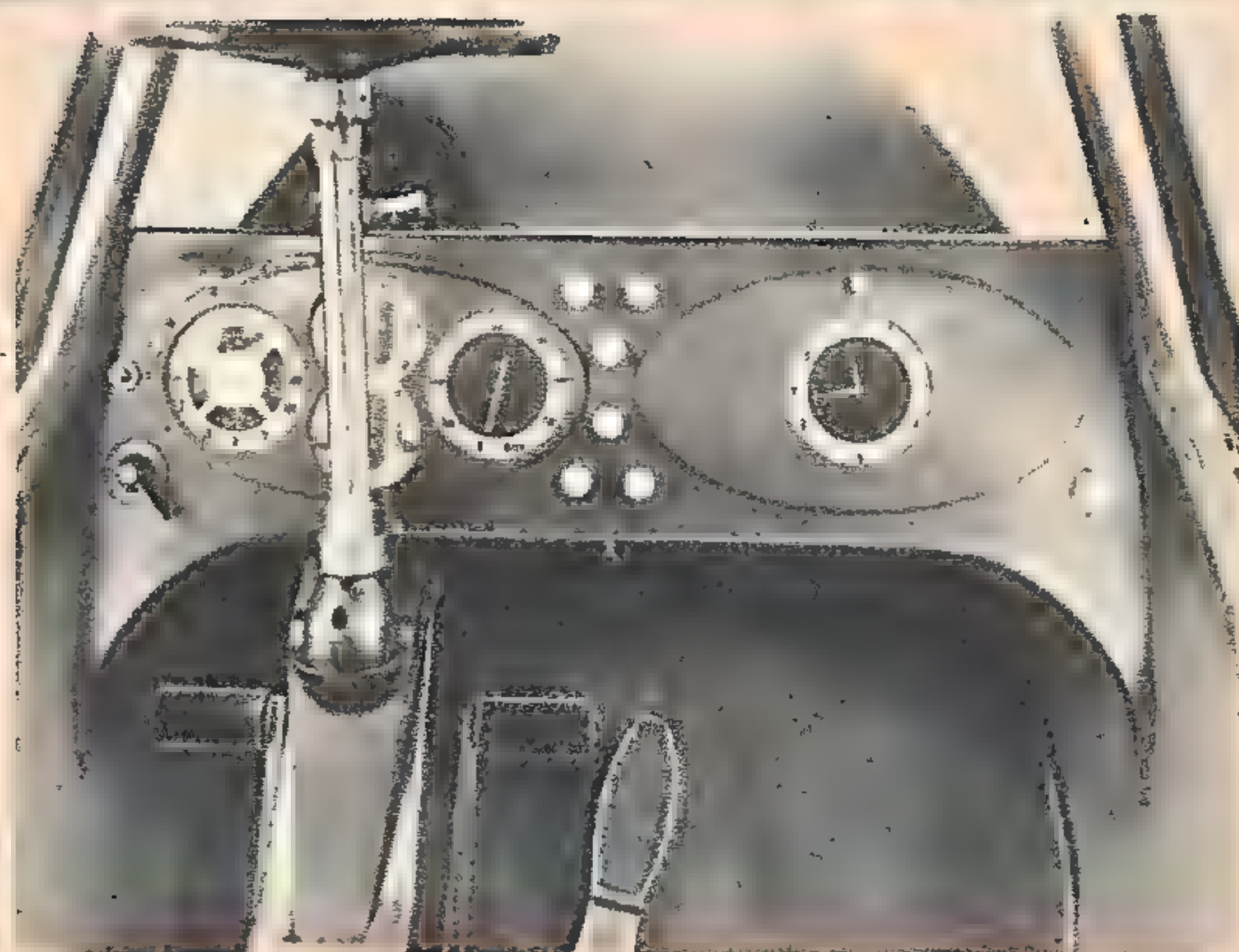
"Decelometer" Tests Brakes



When placed on the floor of an auto, a new "decelometer" device (circle) invented by R. J. Alden, flashes a green light if brakes stop car within safe limits, and a red light otherwise.

A "DECELOMETER," an instrument for testing the efficiency of an automobile's brakes, has been invented by R. J. Alden, of New York. The device, which is placed on the floor of the car being tested, operates on the scientific principle of the release of kinetic energy built up by acceleration. A mercury switch mechanism causes the decelometer to flash a green light if the car can stop within safe limits, while a red light flashes if the brakes are inefficient.

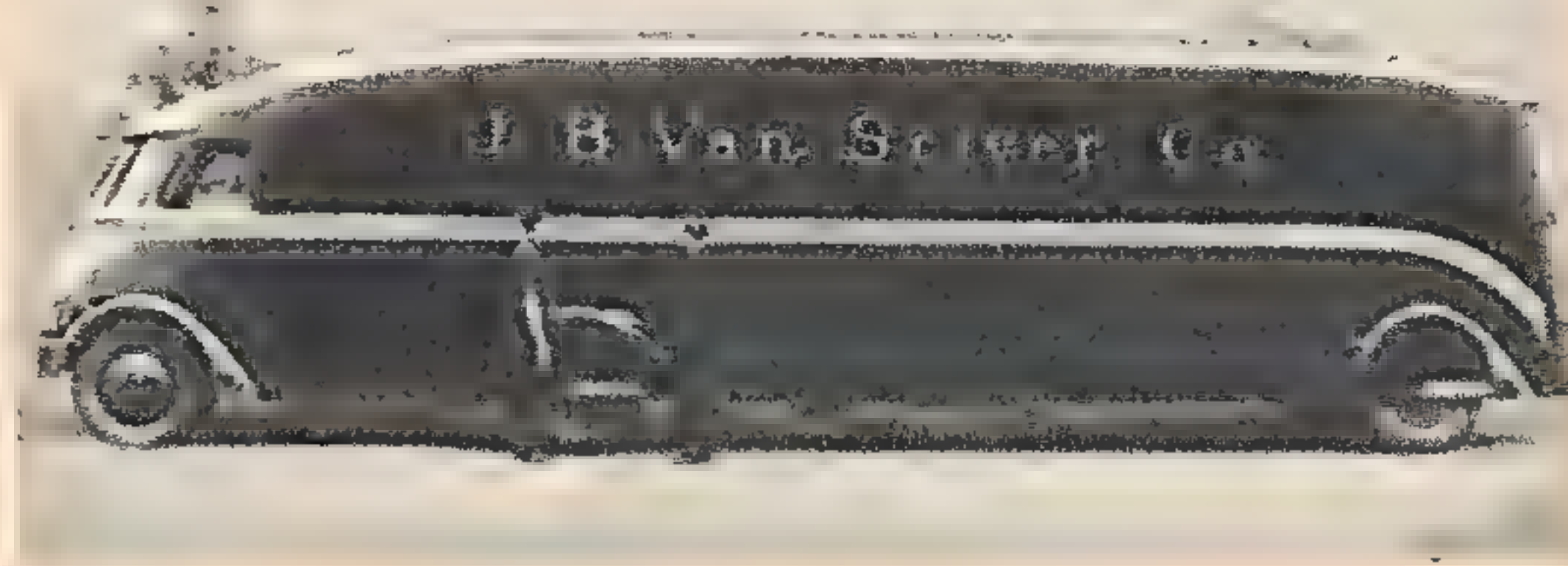
December, 1937



The Gwinn "aircar," a two-seater biplane (top), is equipped with a tricycle landing gear to insure safe landings. Lower photo shows the simplified control wheel that governs turning, ascent and descent. Note the auto-type foot accelerator.

Van Carries 12-Room Load

CAPABLE of carrying enough furniture to outfit a twelve-room house, a streamlined tractor-trailer van operated by a Camden, N. J., firm is 38 feet, 10 inches long and weighs 16,270 pounds. The exterior is made of steel, the interior being completely padded to protect the furniture. The van features a fire-blue finish, trimmed with gold leaf bands on the sides of the body.



Claimed to be the first streamlined tractor-trailer ever built in America, this furniture van is 38 feet, 10 inches long.



FILMING A

A swinging boom (above) enables the cameraman to secure an action "shot" of soldiers marching from a trench. Left—Even movie "wars are hell" agree actors John King and "Slim" Summerville, warming their hands between scenes of the photoplay "The Road Back."

BURSTING bombs failed to stop scores of German soldiers charging across the scarred battlefield under cover of night. The ground was rent by machine-gun bullets. Soldiers dropped hopelessly in barbed wire entanglements.

It was the World War all over again for many American Legion men and ex-German soldiers acting as extras during the filming of *The Road Back*. Every exploding shell and spattering of machine gun fire brought back memories of war's deadliness. But this was a movie war—nobody was being killed! Hollywood's explosive experts, through years of experience, have developed tricks that make acting in a movie war safer than crossing a busy highway.

The script called for a night scene in the

trenches in November, 1918, shortly before the Armistice was signed. It was bitter cold in France then. Universal Studio's special effects department had little difficulty obtaining this impression, as the spring nights, when the battle sequences were shot, were extremely cold for California. The air was frosty and smudge pots blazed in orange groves nearby. But there was no snow such as blew over the Western Front in November, 1918. To accomplish this desired effect studio workmen simply sprayed white paint over the ground.

Several acres on the studio's back lot was marked off for the battlefield. Official U. S. Signal Corps photos were scanned in order to get authentic detail into the battlefield set. A huge sky drop was built in the background, across the width of the battlefield. The sky drop consisted of a wooden scaffolding, some forty feet high, from which a great canvas curtain was hung. Painters were busy for several days spraying on "clouds." This gave



Few persons could tell whether this is a real or staged war scene, so realistic does it appear to the camera.

MOVIE WAR

by Earl Theisen

No expense or detail is spared to make battle scenes realistic.

the effect that the war ground's horizon was several miles away.

Twelve pieces of digging equipment—tractors, scrapers, and steam shovels, were required to dig trenches, grade the battlefield and to give it that shot-to-pieces appearance. Each day, after the night war episodes were shot, workmen would dig up the ground and sprinkle it with water to make the mire deep for the coming night. Realism of the first order.

Real war is costly. So is a movie war! Thousands of rounds of blank ammunition for the 8 mm Mauser rifles were fired. One thousand pounds of black powder, five hundred pounds of dynamite, and 2,000 detonating caps went up in smoke for the combat scenes. Four hundred parachute-flares and seven hundred night flares were consumed during night film warfare.

Workers prepare a shell-blasted farmhouse (center right) which will collapse in a later scene, while explosive experts (right) prepare a smoke bomb to provide thrilling action for the same scene.





It requires a combination of practical science and infinite patience to record a movie war. In the photo above, a sound man is shown at his control board. The horn is part of a loud-speaker system used by directors to address the movie army before it goes into "battle." Right — Spraying on a "sky" backdrop.



Over a hundred gallons of liquid smoke, the preparation, ingredients and manufacturing processes of which are a carefully guarded military secret, were employed in the battle scenes. Navy planes use this liquid smoke to hide ships during maneuvers.

Two "inventions" were worked out in the battle sequences. Ground oyster shells were found to give a better photographic reproduction of dust, in shell-explosions, than dust itself. And by balancing the charcoal content in black-powder bombs, greater photographic value was given to explosions.

Months of research must go into a war film before the cameras begin to roll. Hundreds of historic photos must be studied by the technical department. The wardrobe department must correctly tailor the exact type of uniform worn by a certain regiment at a certain time. The studio arsenal must be sure to supply the correct rifle model. More care must be taken for carefully depicting recent wars than those of a century ago, as many veterans are film fans.

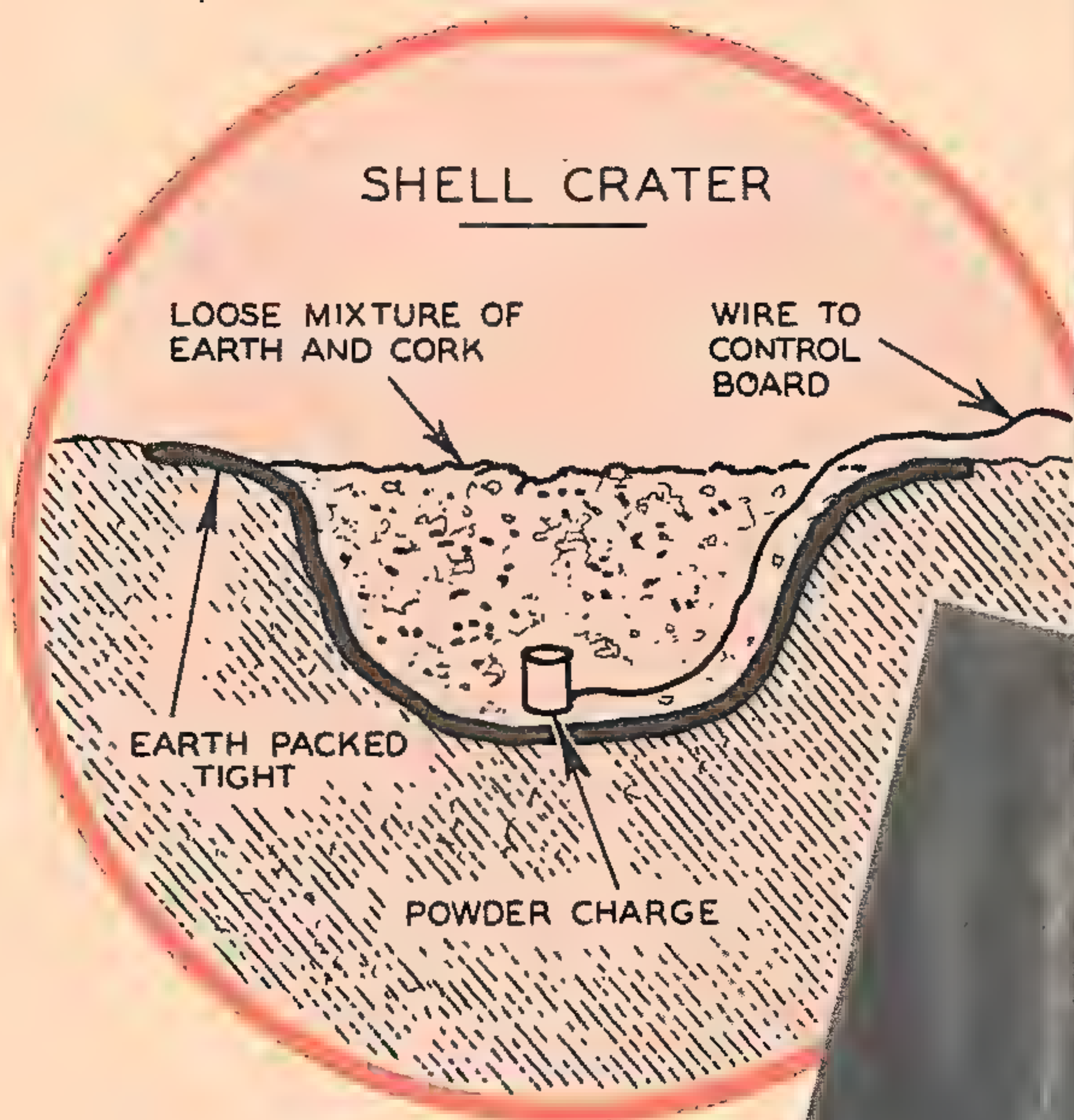
Ralph Morgan, head of Universal's special effects department, who has worked on many war films, including *The Big Parade*, tells how one of the war illusions is achieved:

"To get the effect of a shell striking the

ground and exploding we first dig the shell hole. The shell crater is dug in hard earth. The earth on the sides of the hole is tightly packed. Next the explosives man plants his powder charge in the center of the crater in such a way that it will blow straight upward. Then into the shell hole is sifted a mixture of earth and cork until it is even with the rest of the terrain.

"A wire connects this prepared hole with the head explosive expert's control board. These shell holes are often marked by an odd clod of dirt, an old gun carriage wheel or a fake stump. Sometimes the danger spot is dabbed with a bit of paint that will not show in the film. The players, who have previously been coached by the director and his assistants, will avoid passing directly over these shell explosives. A shower of soft earth and ground cork will be the only discomfort actors who pass near these shell hole explosions will suffer."

When you see a performer being blown skyward by an explosion you can be certain it's a dummy. The dummy is usually made from rubber. Often an actual life cast of the actor the dummy is supposed to represent is made from rubber. This type dummy is more realistic than those formerly



The method used to prepare ground to get the effect of a shell striking and exploding, leaving a gaping shell crater, is sketched above. The crater is dug in hard earth, the sides of the hole being tightly packed. Next, a measured powder charge is planted in the crater and covered with a loose mixture of earth and cork. A wire connects the powder charge to the explosive expert's control board located directly behind the scenes.

used, which were stuffed with sawdust.

The effects of bullets striking are obtained by two different methods. The usual system is to fire away with the rifle or machine-gun at the top of an entrenchment or building while the camera is safely located at one side filming the hits. Special care must be taken that bullets do not ricochet. This stunt is used when actors are not in the scene.

To get the effect of bullets striking near players in trenches, tiny powder charges are embedded in the dust. These explosives have about the same power as toy torpedoes youngsters throw on the Fourth of July. In fact some explosives men have used torpedoes for this effect. A thin wire is attached to each charge and to a control board. As a man presses the control board buttons the small explosives go off, giving the effect of

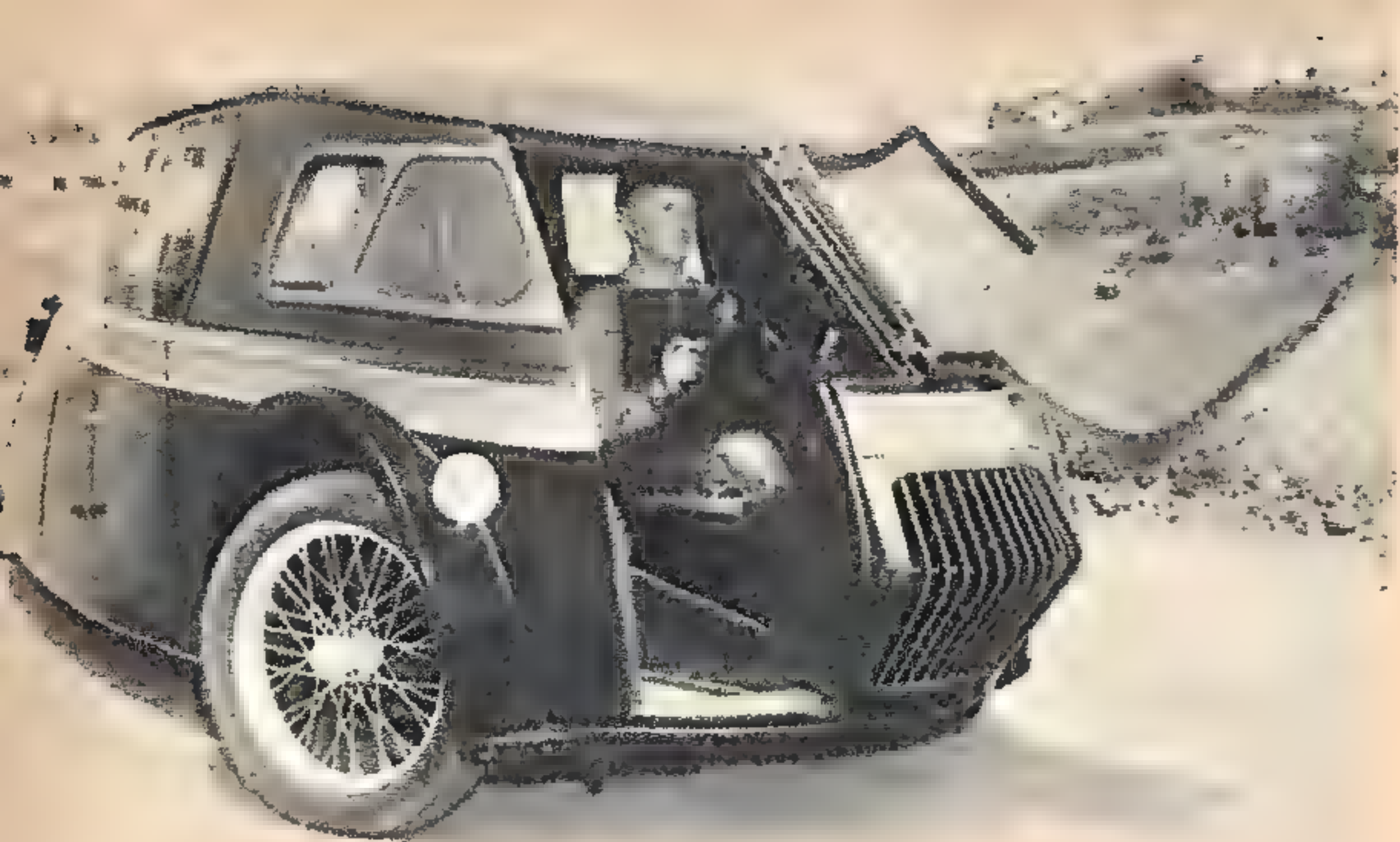
a bullet biting the dust. The action of machine-gun bullets striking can be had by firing a series of these minute explosives in a row, all within a few seconds.

A new trick was used in *The Road Back* to get the realization of a French bullet crashing a mirror in front of "Slim" Summerville,

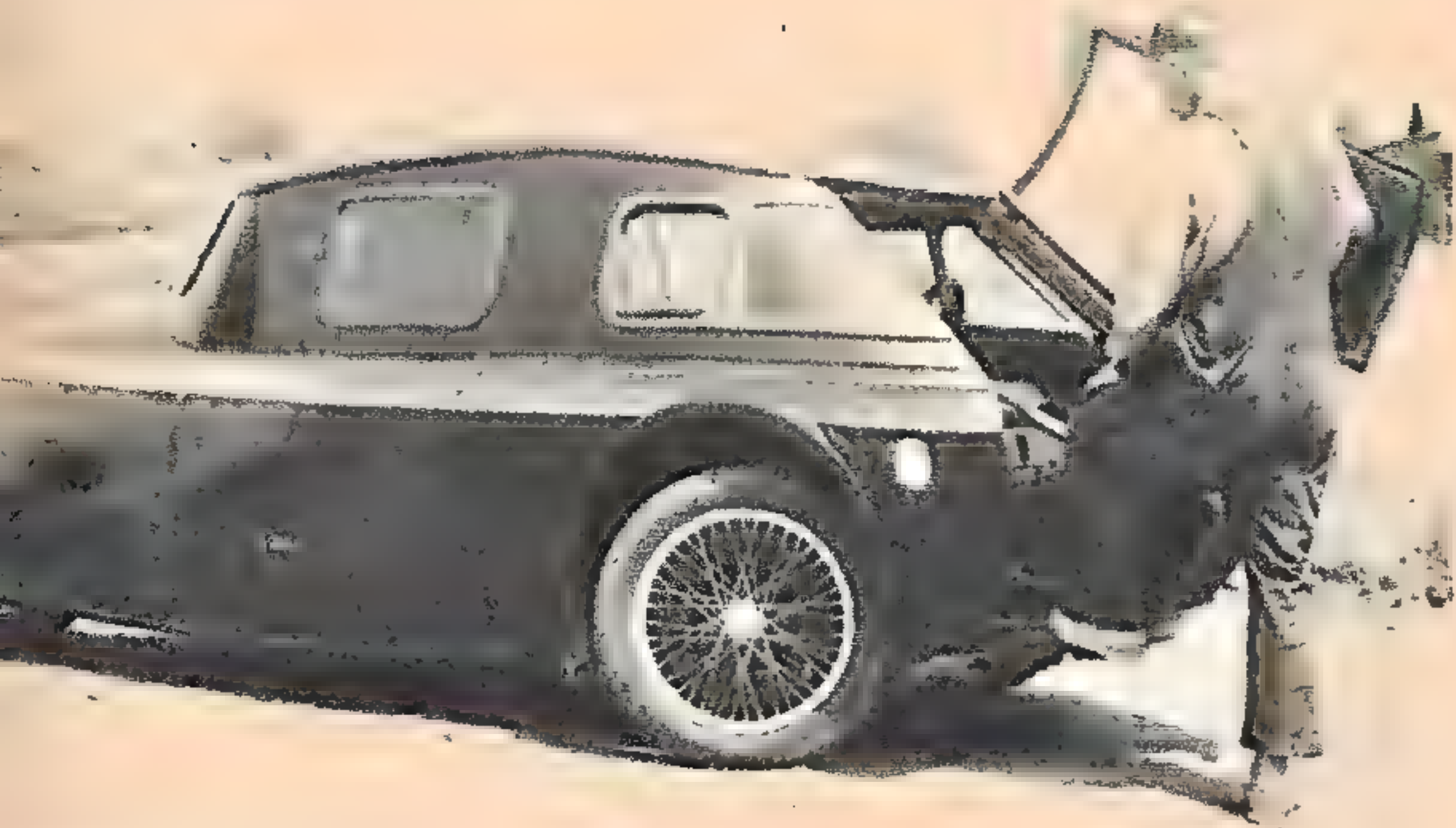
[Continued on page 122]



In filming "The Road Back," the script called for snow flurries such as blew over the Western Front on Armistice Day, 1918, so studio workers sprayed white paint over the ground and trenches to create the proper background effect.



The driver of the novel auto has an unrestricted view ahead and to all sides.



Conveniently entered through a door at its front end, as shown above, this "teardrop" three-wheeled auto seats four.

Campbell Sets Boat Record

IN A TEST that thrilled the crowds lining the shore of Lake Maggiore at Locarno, Switzerland, Sir Malcolm Campbell, famous English racer, established a new world's speedboat record of 129.4164 m.p.h. The previous record of 124.86 m.p.h. was held by Gar Wood, noted American speedboat designer and pilot.

Sir Malcolm established the new record with his specially designed "Bluebird" speedboat. In creating the record, the "Bluebird" covered the outward run of the measured mile course in 27.6 seconds, covering the mile at a 134.43 m.p.h. speed. Sir Malcolm now holds both land and sea speed records.



Skimming over the water at an average speed of 129.4164 m.p.h. in this specially designed "Bluebird" speedboat, Sir Malcolm Campbell, famous English sportsman, set new record.

Three-Wheeled Car Goes 50 Miles on Gallon of Gas

POWERED by a four-cylinder motorcycle engine, a streamlined three-wheeled automobile constructed by R. H. Griffin, of San Diego, Calif., has a top speed of 60 m.p.h. The novel auto carries four persons and is said to average 50 miles per gallon of gasoline while traveling at a speed of 40 m.p.h.

The "tear-drop" shaped auto cost \$450 to build and weighs 975 pounds. It is 14 feet, 4 inches long and of standard tread, with a frame of steam-bent oak and axles made of iron-bark wood imported from Australia. One of the outstanding features of the vehicle is the use of rubber straps in place of metal springs, involving a weight saving of more than 38 pounds.

The body design of the car, which provides an entrance door at the front end, affords full vision for the driver. A wind tunnel, running from front to rear, cools the engine and air conditions the body interior.

Builds Novel Model Exhibit



Controlled by a single small motor, this model exhibit operates for five minute periods during which the landscape shows the rising and setting of the sun, trains speed along, boats pass each other on a lake, roosters crow, airplanes fly, etc.

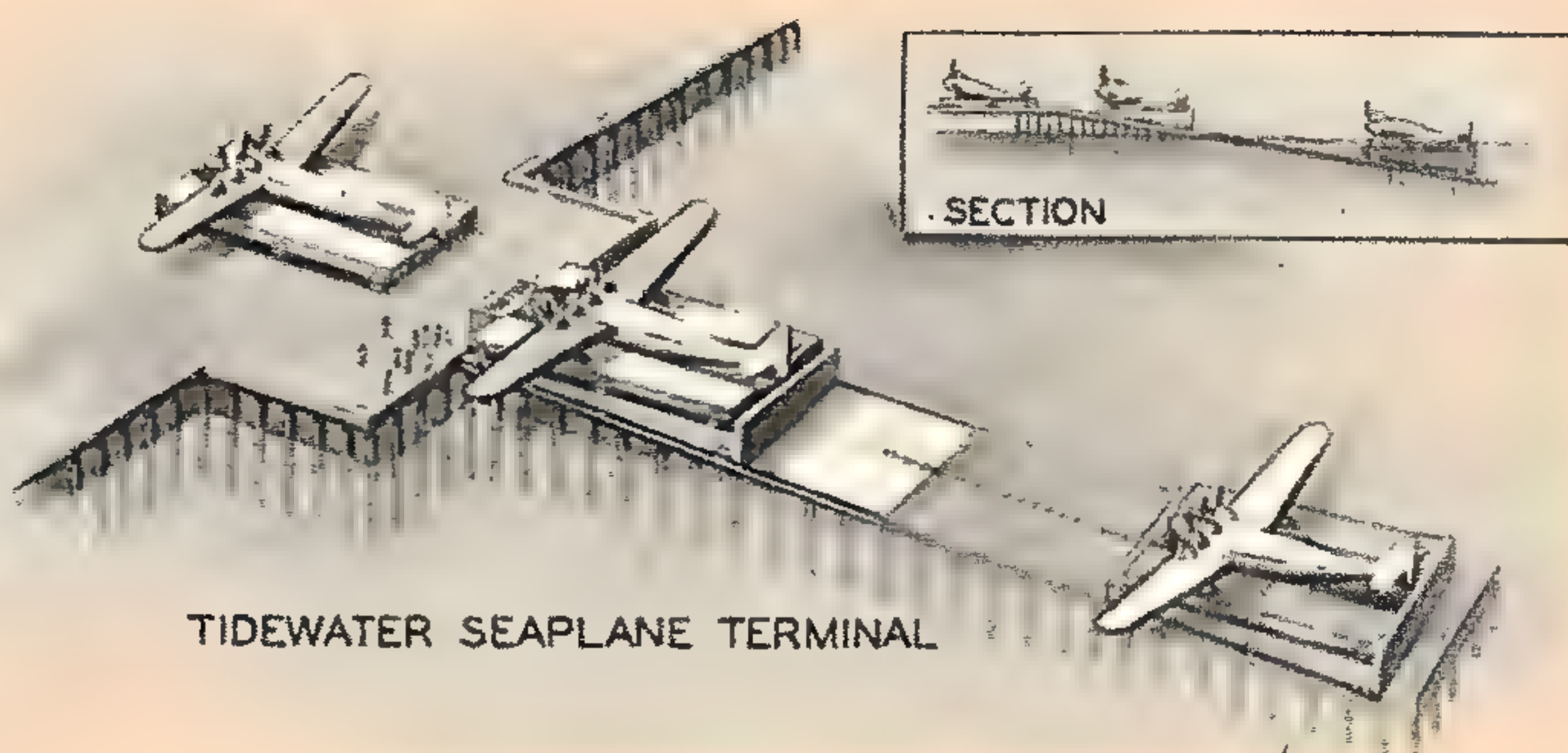
A MODEL exhibit featuring an electric landscape that shows the setting of the sun, the rising of the moon, and the rising sun of a new day, has been constructed by a Portage, Wis., model builder. The landscape, which contains over one hundred small lights, required a year and a half to build.

The exhibit operates entirely by itself for five minutes during which a breeze blows across a lake; roosters crow; a church bell rings; a train winds its way through a village, etc. All electrical connections, sound effects, etc., are operated by a small motor.

Seaplane Base Design Features "Even-Keel" Cradle

A DESIGN for a tidewater seaplane terminal involving constructional details that would enable all types of amphibians and seaplanes to be handled on an even keel during all stages of raising and lowering from the water has been conceived by John J. Curry, of New York. The design is such that very little valuable waterfront property is needed for installation.

Seaplanes using the proposed terminal would approach the device, taxiing to a position over a submerged cradle. A motor mechanism would then cause the "even-keel" cradle to travel up an inclined ramp, carrying the aircraft out of the water and up to a platform on which passengers could alight.



TIDEWATER SEAPLANE TERMINAL

Seaplanes using this tidewater terminal conceived by John J. Curry of New York City, would be carried from the water on a special cradle designed to hold the plane level.

College Teaches Yachting

EXTRA-CURRICULAR courses in all phases of yachting are offered to students at Massachusetts Institute of Technology in Cambridge, Mass. Needless to state, the courses have become one of the most popular of student activities.

The college boasts a fleet of 38 sailing dinghies, the largest collegiate yacht fleet in the world. The dinghies were especially designed by Professor George Owen, of the M. I. T. department of Naval and Marine Architecture. The efficiency of the dinghies and their crews is attested by the fact that the Institute holds the Intercollegiate Dinghy Championship. The dinghies are each 12½ feet long and 5 feet wide, with overhanging bow and stern. A feature of the design is provision for two masts, enabling the craft to be rigged as sloops or catboats.

Builds Tiny Bikes As Hobby



Building the world's smallest bicycles is the unique hobby of A. G. Tabb, an Englishman, who is shown with his daughter while riding a tandem bike that is only 17 inches high.

BUILDING the world's smallest bicycles is the honor claimed by A. G. Tabb, of Kidderminster, England. He has constructed several of the miniature cycles, the latest being 17 inches long and nine inches high. Many of the novel bicycles are two-seaters.



The dock of the sailing pavillion maintained by Massachusetts Institute of Technology is always crowded with students eagerly awaiting their turn to sail one of the college's dinghies.

WHY

The cockpits of modern iceboats are designed not only for speed but for comfort as well. The two-place iceboat shown below possesses both of these vital features.

The speed of an iceboat depends to a large extent upon its construction. Hollow oval-shaped or streamlined masts and tear-drop runner planks should be incorporated in the design of a speed craft.

SAILING four times faster than the wind is a remarkable phenomenon alien to every other wind-driven vehicle but iceboats. Early craft, that only doubled the velocity of the wind, established the time-honored question, "Why do icecraft outpace the wind?"

Improvements based on scientific development increased the speed ratio to 3 to 1. Today, ultra-modern ice-fliers achieve the

4 to 1 ratio with greater frequency than the question is answered.

Unless wind and ice conditions are favorable, relatively high speeds on ice are not obtainable. On smooth ice, a 10-mile breeze will propel a light-weather craft 40-miles an hour. Let's see what causes this phenomenon.

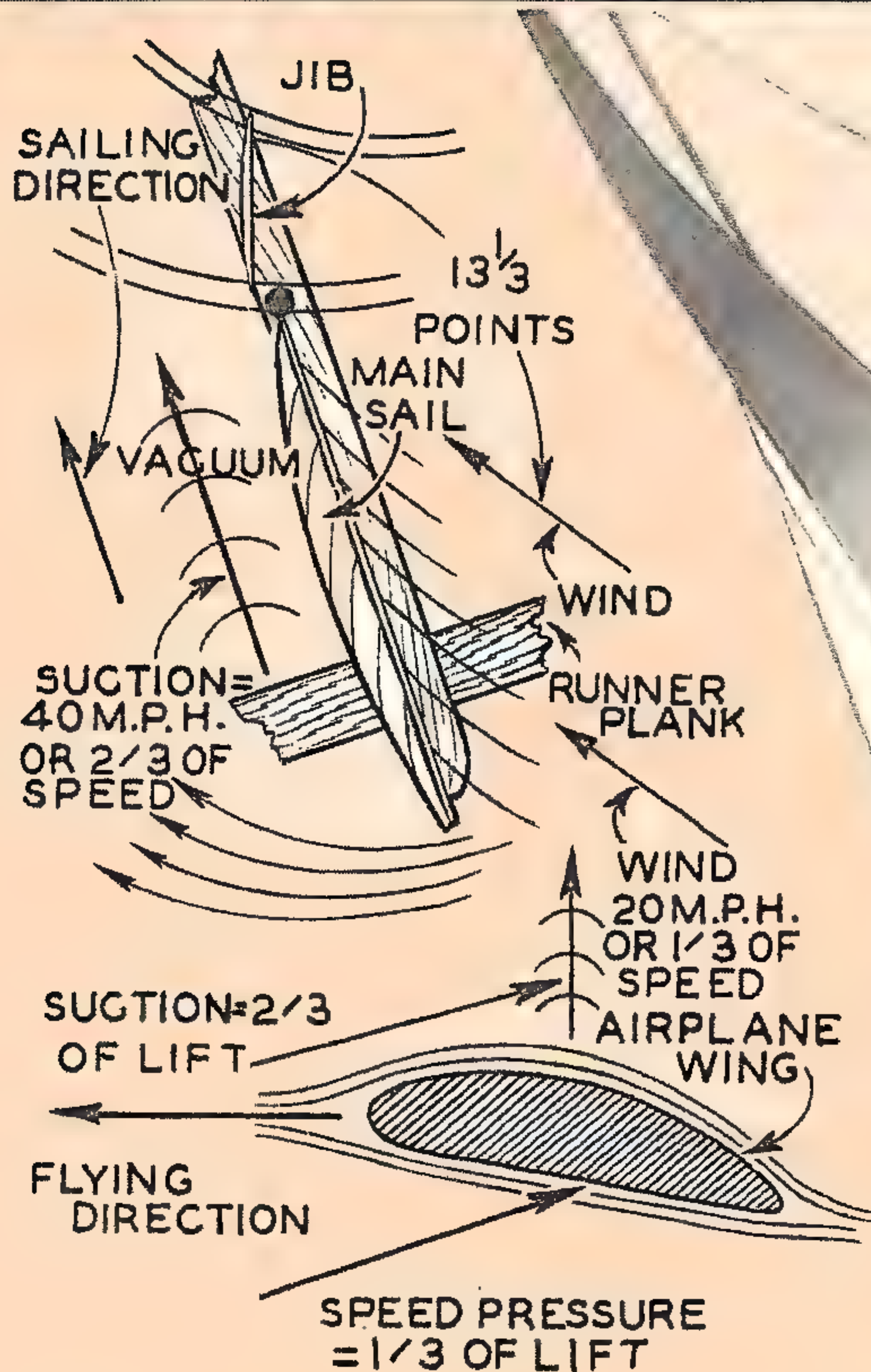
To avoid complicated problems in physics and mathematics, a simple factor in aeronautics will illustrate the forces that contribute to iceboat speed. The wing of an airplane appropriately compares to sails. The curved top surface of an airplane wing has the sole purpose of creating suction, or lifting power, to hold the ship aloft. The greater the curvature, the greater the lifting power, while flying. It may be surprising to know that two-thirds of the total lift of the wings comes from top-surface suction and only one-third from the pressure brought to bear against the tilted bottom surface by flying speed.

Similar factors are manifest in iceboat sailing. As the wind strikes the sail, it bellies. The curvature resulting on the lee side corresponds to that of the airplane wing's upper side. An efficient non-porous sail protects a vacuum behind it, while the wind is blowing.

The presence of the vacuum can be determined by holding a match close behind the

Modern Mechanix

Iceboats Quadruple The Wind's Speed!



The iceboat sail compares with the lifting surface of an airplane wing, as shown in the above detail. Like the airplane top wing surface, two-thirds of the lift or pull on the sail is developed on the bellied side.

sail, even while the craft is standing still, with sail filled. For lack of air, the match will go out. Hold another match farther from the sail, protected by the wind, and the flame will be drawn outward by the suction.

While under way, the vacuum causes a terrific suction behind the sail with a pull greater than the wind's actual driving power. That pull provides two-thirds of the speed of average craft and three-fourths of that of racers.

All this is predicated on the fastest point of sailing, which is 150 degrees or 13 1/3 points off the wind. Beam winds would seem to cause or create lateral suction or "sidepull." But resistance of the runners prevents leeway and directs the pull forward. Because



the vacuum is greatest in quartering winds, sailing down-wind limits momentum to the wind's speed. Speed consistency is impossible in puffy winds; rough ice and heavy snow are also speed deterrents.

Another explanation is that an iceboat is like a wedge between the resistance of the runners and the lateral pressure of the wind. Between these opposing forces, the craft escapes the pressure by seeking the line of least resistance, which is forward. Because ice resistance is negligible, the craft, like a bar of soap wedged in one's wet hand, shoots ahead with incredible speed.

Again, an iceboat creates its own wind as it moves along. Its momentum sends a rush of air back to the sails to enhance driving power. Puffy winds, especially, furnish an example of this. As the craft gets under way,

[Continued on page 120]

WIRE FENCE BALKS BRIDGE JUMPERS



Ninety persons committed suicide by jumping from the Arroyo Seco Bridge (top) in Pasadena, Calif., before authorities erected a 7-foot wire fence around railing. Lower photo shows close-up of the fence and a wire rail-end guard.

Lifeguards Use Surfboards

LIFEGUARDS at Los Angeles, Calif., have been equipped with new surfboards and new inhalator machines to facilitate their task of patrolling five miles of beach. The surfboards are constructed like airplane wings, being of hollow construction, and are said to be much faster than the old type lifeboats.



Because they are faster than lifeboats, lifeguards at Los Angeles beaches now use surfboards to reach swimmers in distress. Open boxes contain latest type of inhalator machines.

COSTING \$20,000, a 22-ton woven wire fence has been erected on posts along the railing of the Arroyo Seco Bridge in Pasadena, Calif., in an attempt to balk the suicide attempts of despondent persons. The fence stands seven feet high and is topped with bobbed wire.

The bridge is a beautiful, gracefully-curved steel and concrete arch located in a particularly scenic location of Pasadena and from its highest span it is a sheer drop of 150 feet to the arroyo below. Since the bridge was built, ninety persons have ended their lives by jumping from it.

Citizens of Pasadena became annoyed when the bridge became known as "Suicide Bridge" and local authorities, seeking to remove the stigma, raised funds for the construction of the fence. Policemen stationed on the bridge will now be able to catch any persons contemplating a suicide jump before they have time to clamber over the seven-foot fence.

Tots Study "Stop-Go" Lights



Policemen in Boston, Mass., employ miniature traffic signal towers to teach city's school children meaning of the various colored lights. Current is provided by means of a long cable.

THE Police Department of Boston, Mass., is teaching the city's school children to observe traffic lights when crossing streets through use of a miniature, portable signal unit. Standing about four feet high, the signal unit features the customary red, yellow, and green lights.

During school hours, groups of children are taken to a street intersection near their school, the tiny traffic tower is set up, and a policeman explains the meaning of the different colored lights. Current for the portable signal unit is derived by means of a long cable attachment.

Amateur Photo Fan Snaps Picture Of Rare Lightning

WHILE taking pictures during a storm, an amateur photographer at Lake Maggiore, Switzerland, was fortunate enough to secure a photo of a spiral of glaring light which revolved rapidly on its way to the ground. Lightning of this type is very rare and the amateur's photo is said to be the first of its kind ever taken.

The Swiss Meteorology Bureau explained the phenomenon as resulting from some highly inflammable compound in the air during the storm which, ignited and surrounded by electrical discharges, made its way to the earth in the weird spiral form.

Small Motor Powers Mower



Unusually quiet in operation, this rubber-tired electric lawn mower need only be guided over a lawn, since it is motivated by a compact one-quarter horsepower geared motor.

REQUIRING only that the user guide it, a new electric lawn mower supplies its own motivation by means of a two-wheel drive powered by a gear and head motor of one-quarter horsepower. The mower travels at a two-and-one-half-mile per hour speed and is said to be capable of climbing an embankment of 35 degrees. An automatic control switch on the handgrip governs the 110-volt current that runs the motor.

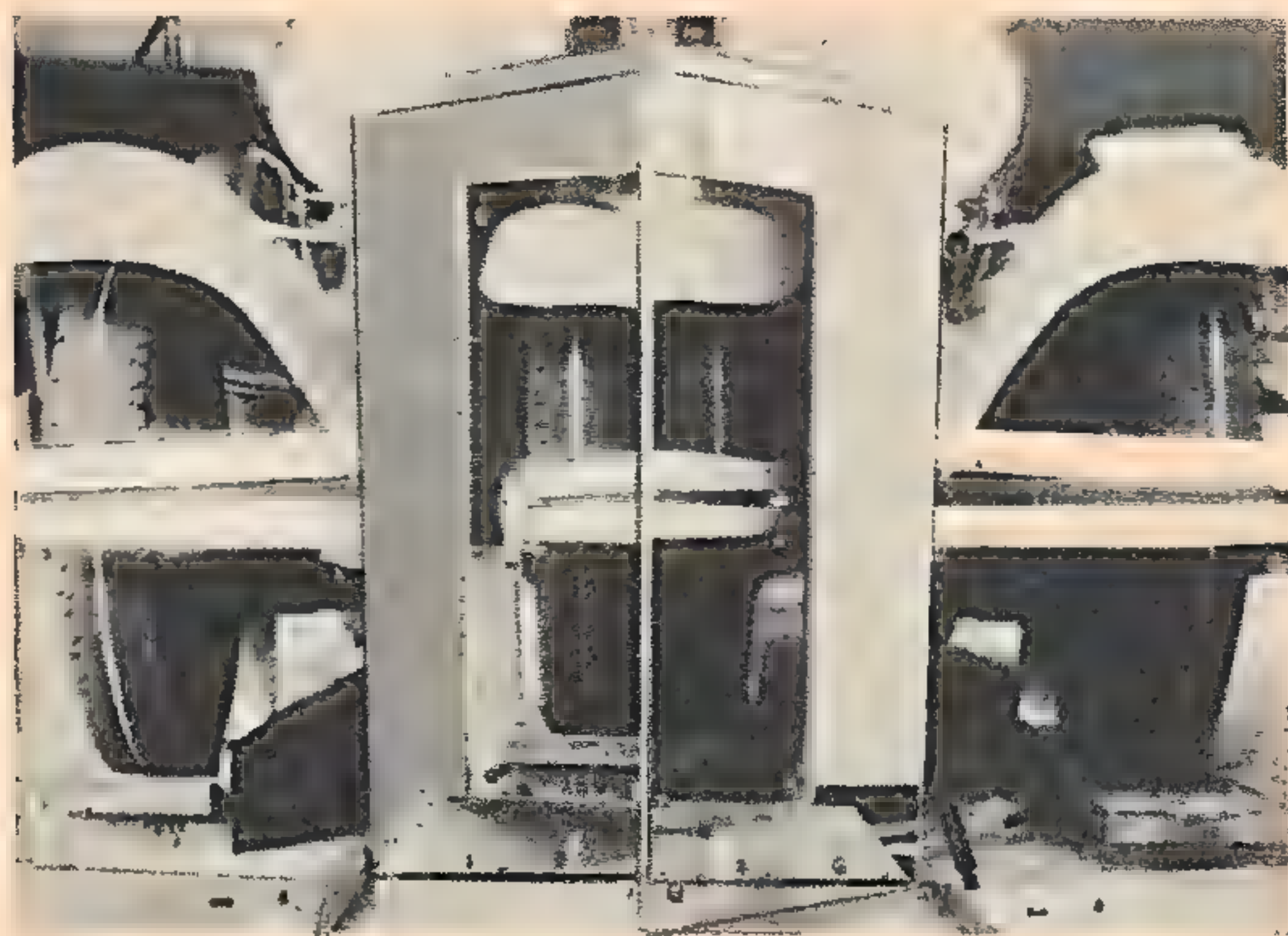
December, 1937



This unusual photograph, taken by an amateur photographer during a thunder storm at Lake Maggiore, Switzerland, shows the glaring light of spiral lightning, a very rare phenomenon.

"Alignoscope" Aids Motorists

PLACED before the radiator of an auto, an "alignoscope" mirror device, invented by A. J. Mathieu, of Miami, Florida, indicates whether or not the front wheels are in proper alignment. The mirrors are set at an angle that reflects the wheels so they appear to be side by side. A line drawn through the tread center of each tire thus enables the auto owner to determine proper alignment. The mirrors can be set at different angles in a few seconds by a simple adjustment.

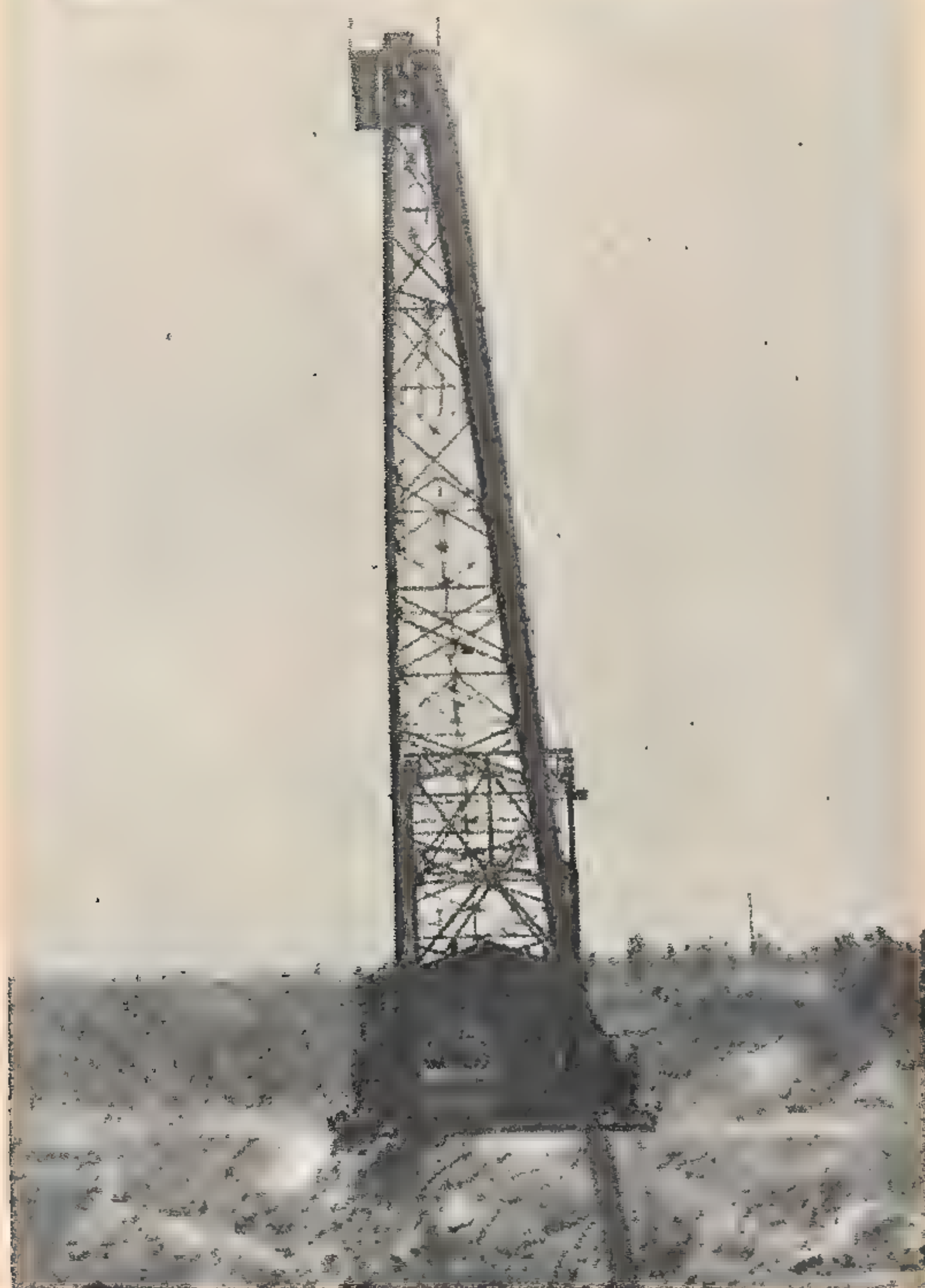


Reflecting the front wheels of an auto so they appear to be close together, a new "alignoscope" enables mechanics to check alignment. Note wheel reflection in device's mirrors.

HERDING The



Made possible only through the use of gigantic draglines, the All-American Canal (above) cuts through the desert for 80 miles and will be one of California's major watercourses when completed in 1939. The canal bed is over 200 feet wide and will carry water from Colorado River to Imperial Valley. Note how figure of man in photo is dwarfed by canal's width.



Elevated skyward, the boom of this huge dragline looks like an oil derrick. In operation, the boom enables the dragline bucket to go into action at any point within the boom's radius.

WHEREVER dirt has to be moved in huge quantities, there you'll find the dragline man at the throttle of his snorting, puffing machine. He well earns his ten to fifteen dollars a day, for few workmen put out as much actual mechanical labor as he. Lately, engineers have given him a new tool—a gigantic dragline so huge it makes the kind you see digging foundations for a skyscraper look like toys. So far only eight of these monsters have been built, and it is safe to say there aren't more than a couple of dozen men in the whole world who have sat at the throttle of one of them.

In the Iowa coal fields, one of the great-granddaddies of all steam shovels is uncovering a four-foot vein of coal, forty-eight feet below the surface. It reaches down like a monstrous ostrich, gulps off a fifty-ton bite, lifts it high as a seven-story building, and dumps it out of the way. Each bucketful would fill a good sized room. Two more are gouging the All-American Canal through sand hills of the Arizona desert. Several are repairing the ravaged Mississippi levees, and the biggest one in the world is in a Brazilian

Mechanical Dinosaurs

by
Maxwell R. Grant

With a single scoop, man-made monster equal the work of hundreds of strong men.

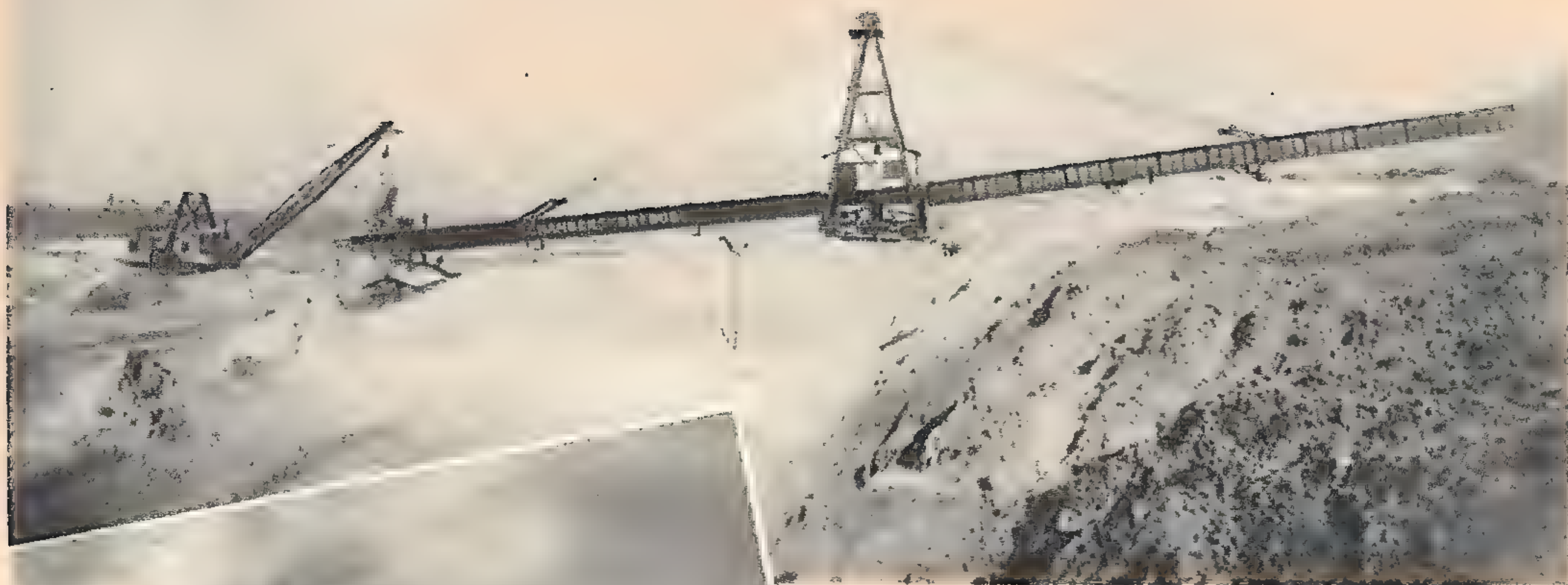


cement quarry. Its boom is slightly more than half a block long!

Even if you have the half-million dollars to buy one of these big draglines, the chances are you won't want to buy it outright. There aren't many jobs big enough to keep this voracious machine busy long. Even the government usually rents one, for interest alone on the investment amounts to more than eighty dollars daily. Then, it costs a lot to get it on the job. When one of the big machines was shipped out to the All-American Canal job in California, it took eighteen freight cars to hold its dismantled parts.

One of the weirdest sights imaginable is to see one of these huge diggers actually walk.

Picking up an auto is child's play for the bucket of a dragline used to make the All-American Canal (circle). Top—The bucket "on the move." Right—Control cabin of huge dragline.



This queer looking machine picks up dragline bucket loads at its left end (above) and deposits dirt at its right end, more than one hundred and seventy-five feet away.



This dragline scoops up enough dirt in one "bite" to fill a waiting truck to overflowing. Note men at work in pit.

The giant machine, with mighty rumbles and groans, arches the eccentric cams on its two sides, raises itself on its huge flat-footed shoes, and hunches forward, seven feet at a step. Then the eighteen-ton shoes lift and move forward ready for another step. The machine would make no speed records—its average gait is about a fifth of a mile per hour; yet it can wheel sharply, turn at right angles, or sidestep like some huge, awkward duck. Steering is just like backing a trailer. Point the boom the opposite way from the direction you want to go. Marshes, sand hills, mud flats, don't make any difference to this fantastic creature. Despite its million pounds of weight, it can walk over any ground that will

support a man. Its tread is light because its giant shoes, seven feet wide and forty-four feet long, spread this weight over an area half as large as an ordinary bungalow. When one was delivered for work on the Florida ship canal, it was assembled at the station; it then "tramped" eight miles overland to the job, saving an immense amount of trucking expense and labor.

The cab, which from the front looks much like a ferryboat, is a nest of giant motors—a big five-cylinder Diesel, the main power plant; a couple of big 100-horsepower electrics, which swivel the dragline on its base; and a battery of smaller motors that pump oil, keep water circulating, clean the air for the intake, and generate power for the lights—for on a big job they don't stop at night. Powerful floodlights bathe the excavation with their brilliance. Weather doesn't matter, either. The operator is snug behind his glass windows and it's warm by the big purring Diesels. Not even a desert sand-storm halts operations on the All-American Canal job; the machines are equipped with special air cleaners that take out grit that would score cylinder walls.

One man doesn't operate one of these giants alone—he has an oiler and several "pit men" to help. Certain parts of the machine have to be oiled every two hours, others every four, so the oiler has a continuous round of duty. On big parts like the cams which operate the walking shoes, he can smear heavy grease with a paddle. Other bearings take a good grade of lubricating oil.

When the boom dips into a deep hole, the operator is so far above his work that distorted perspective makes distances deceptive. Pit men below wigwag where to drop the bucket, using a private sign language of their own development.

Now and then the oiler must go up the narrow cat-walk along the boom and lubricate the sheaf of pulleys at the end. It takes nerve to creep along the latticed frame in a stiff wind while the big machine monotonously weaves back and forth. As you look down, things on the ground seem small, for you are as high as a ten-story building. Objects blur before your eyes as you swing along on the boom at forty miles an hour.

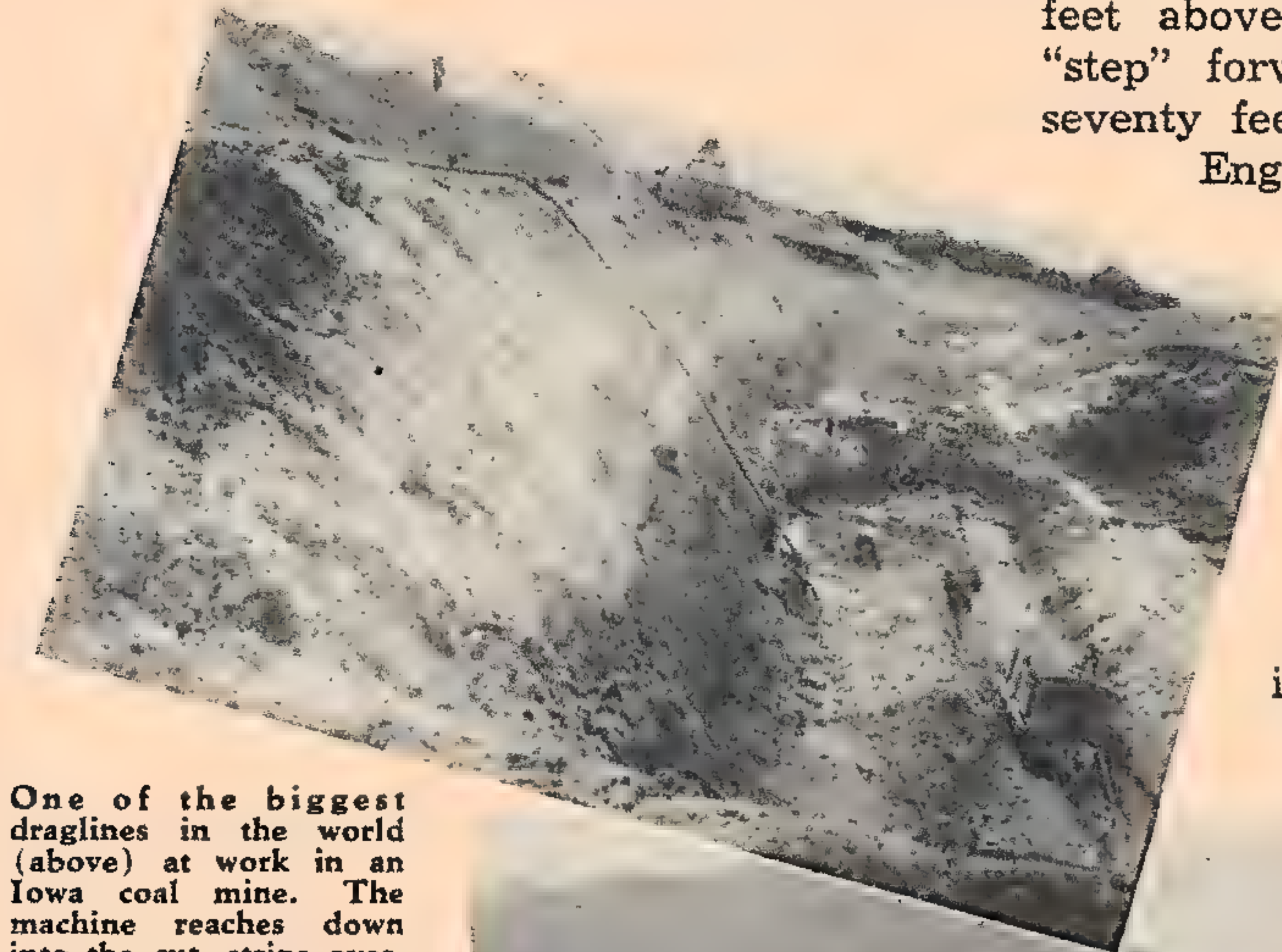
Up the center of the latticed boom, the cable races along, first in one direction, then the other. It is almost as thick as your wrist, a one and three-eighths inch bundle of twisted strands of steel, for it must stand a terrific pull when the

operator gouges the twelve-yard bucket into hard, rocky formations. When he lets go, down it plunges, 154 feet a minute. The "pit man" waves his hand; the boom whips like a trout pole as the power comes on and the bucket scoops into the earth. Cables taut, it begins to move again as the cab smoothly turns on its seventy-six conical roller bearings, as big as dinner plates in diameter. As it nears the end of its arc the bucket begins to descend, while huge asbestos-block brakes check the cab's pivot. With the precision of a well-oiled clock, the bucket halts directly above the waiting truck and tilts. A single bite fills the big truck to overflowing and off it starts, while the operator gently flicks his levers and starts the great dinosaur moving again—all within a few minutes time.

This big machine can pick up a load of dirt, pivot 180 degrees, and set it down nearly a block away. It can reach down 104 feet into an excavation, bring its bite of dirt to its own level or higher, or deposit it fifty-nine feet above where it stands. Or, it can "step" forward or back and add another seventy feet to its reach.

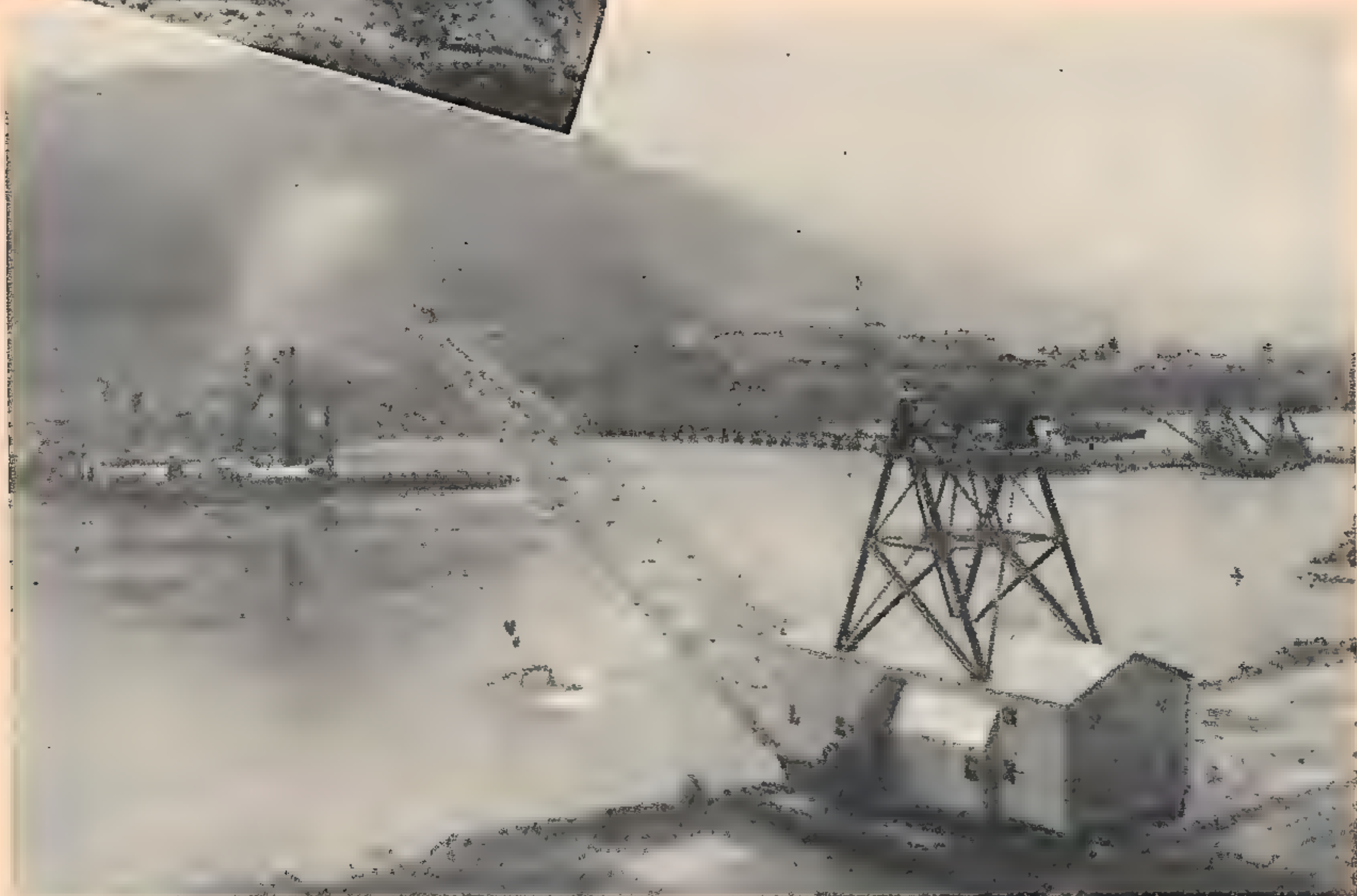
Engineers on the Florida Ship Canal faced the problem of moving huge quantities of dirt over a distance too far for one machine, yet too short for trucks to haul it efficiently. They designed a machine that looks like a gigantic bird with outstretched wings. It is a huge walking dragline with a 175-foot arm extending from each side. Along each

[Continued on page 120]



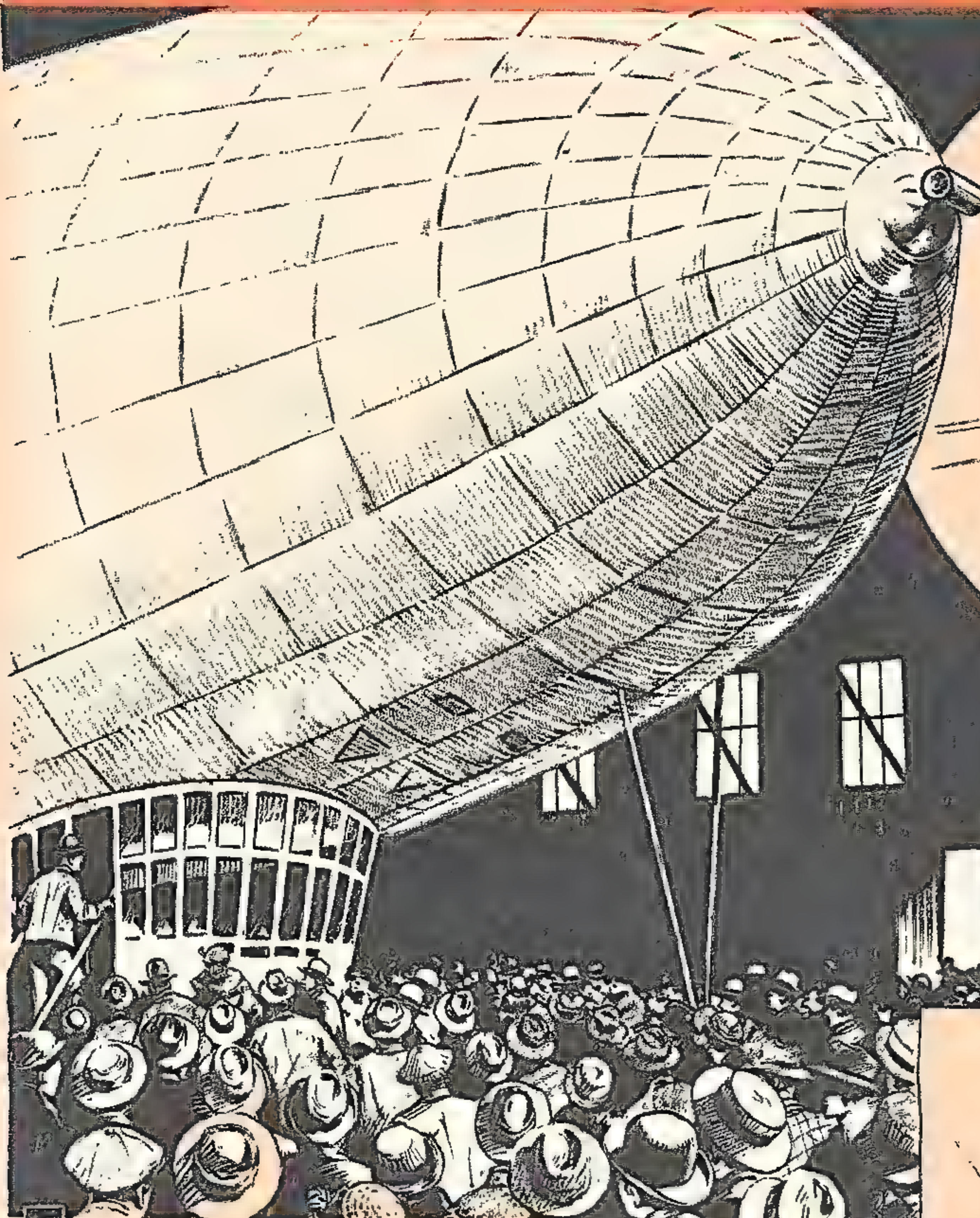
One of the biggest draglines in the world (above) at work in an Iowa coal mine. The machine reaches down into the cut, strips overburden away, gouges out a load, and swings it back out of the way. One bucket load represents work of hundreds of men.

Regardless of the job, there is a dragline fitted for the work. Because of its big flat feet, this medium-sized dragline (right) can safely "walk" back and forth over the mud without fear of sticking as it scoops away at its job on the banks of the Columbia River, helping to construct Bonneville Dam in the state of Oregon.



GROUNDING ZEPP'S INCOME INCREASES

Nic Sprank Offers \$5.00 For Best Oddity



ZEPP DOWN, INCOME UP!—THE GRAF ZEPPELIN HAS MADE MORE MONEY SINCE IT HAS BEEN DECOMMISSIONED THAN IT DID WHEN IT WAS IN SERVICE. THOUSANDS OF PERSONS ARE GOING ABOARD TO INSPECT THE CRAFT AT THE RATE OF TWENTY-THREE CENTS EACH.

DOROTHY THOMSON, NEW YORK, N.Y.



WASHING DIRTY CLOTHES! SOAP AND WATER CLEANS AND WHITENS CLOTHES FOR THE FIRST SEVEN MINUTES OF WASHING. AFTER THAT THE MATERIAL GRADUALLY BECOMES MORE DIRTY AND GRAY.

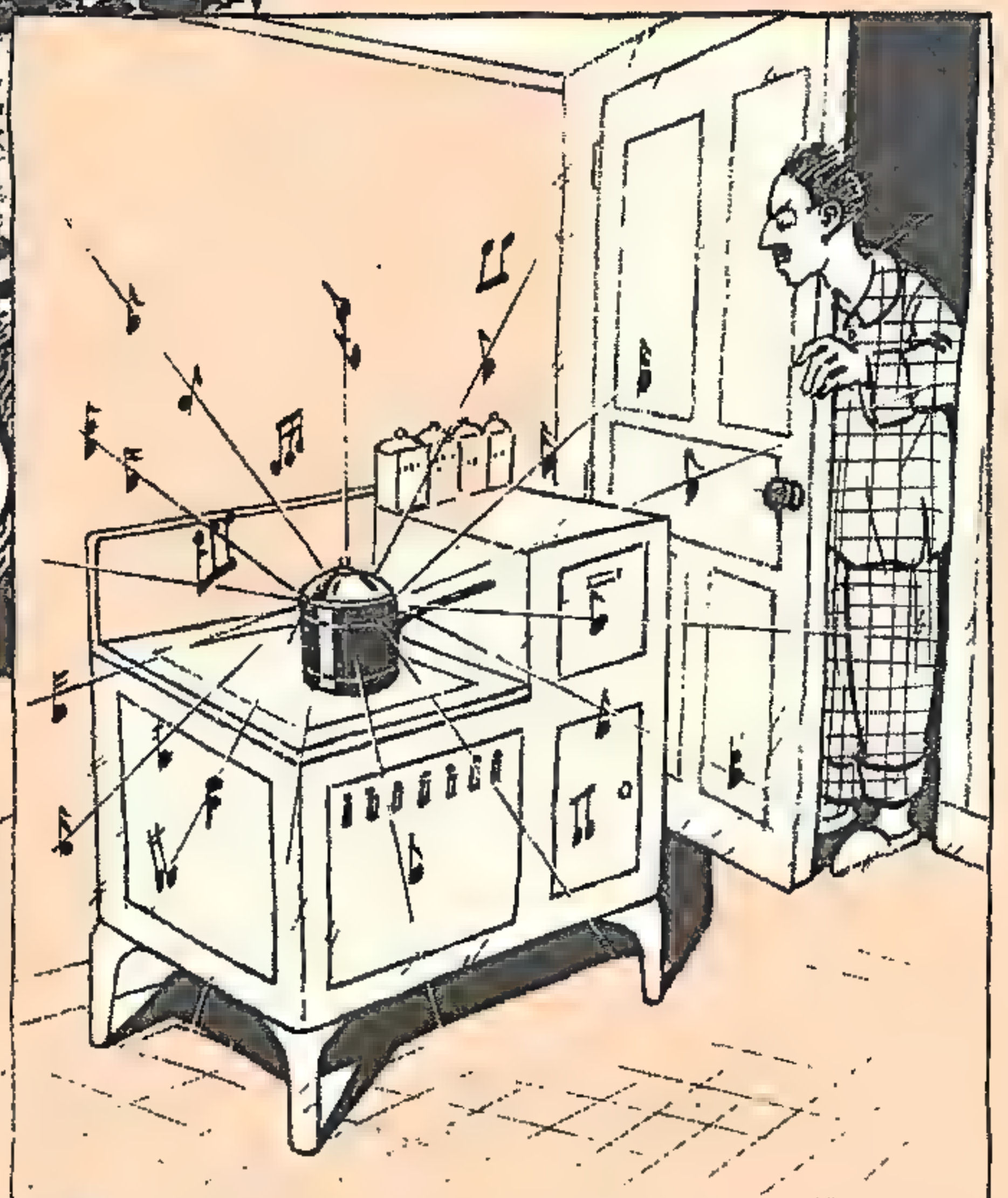
JENNINGS BERG, MINNEAPOLIS, MINN.

Nic Sprank



TABLE LEGS SPROUT FOLIAGE!—SPROUTS WITH LEAVES THREE INCHES LONG BURST FROM TABLE LEGS SHORTLY AFTER THE TABLE WAS PURCHASED. NOW THE TABLE IS BEING COAXED WITH WATER TO BRING FORTH MORE FOLIAGE.

A.L. MARAN, ELIZABETH, N.J.



STOVE GIVES MUSIC!—AN ELECTRIC RANGE LOCATED NEAR A BROADCASTING STATION SUDDENLY EMITTED STRAINS OF SCHUBERT'S "AVE MARIA."—RADIO PROGRAMS ALSO HAVE BEEN HEARD IN HOT AIR SHAFTS CONNECTED WITH ELECTRIC FURNACES.

Five dollars will be paid for the oddity used by Nic Sprank as his leading illustration. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Modern Mechanix Publishing Company, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

Plumbing Fittings Make Novel Football Display

A NOVEL display conceived by an employe of a leading plumbing fixtures manufacturer features a football team of robot-like figures made from such equipment as elbows, nipples, tees, couplings, etc. Placed in a traditional gridiron setting, the display attracted much attention in the cities where it was exhibited.

Erected by two former football players, every figure in the display assumes a technically perfect position. To distinguish the two teams, one set of players was finished with white paint, while the other appears untouched.



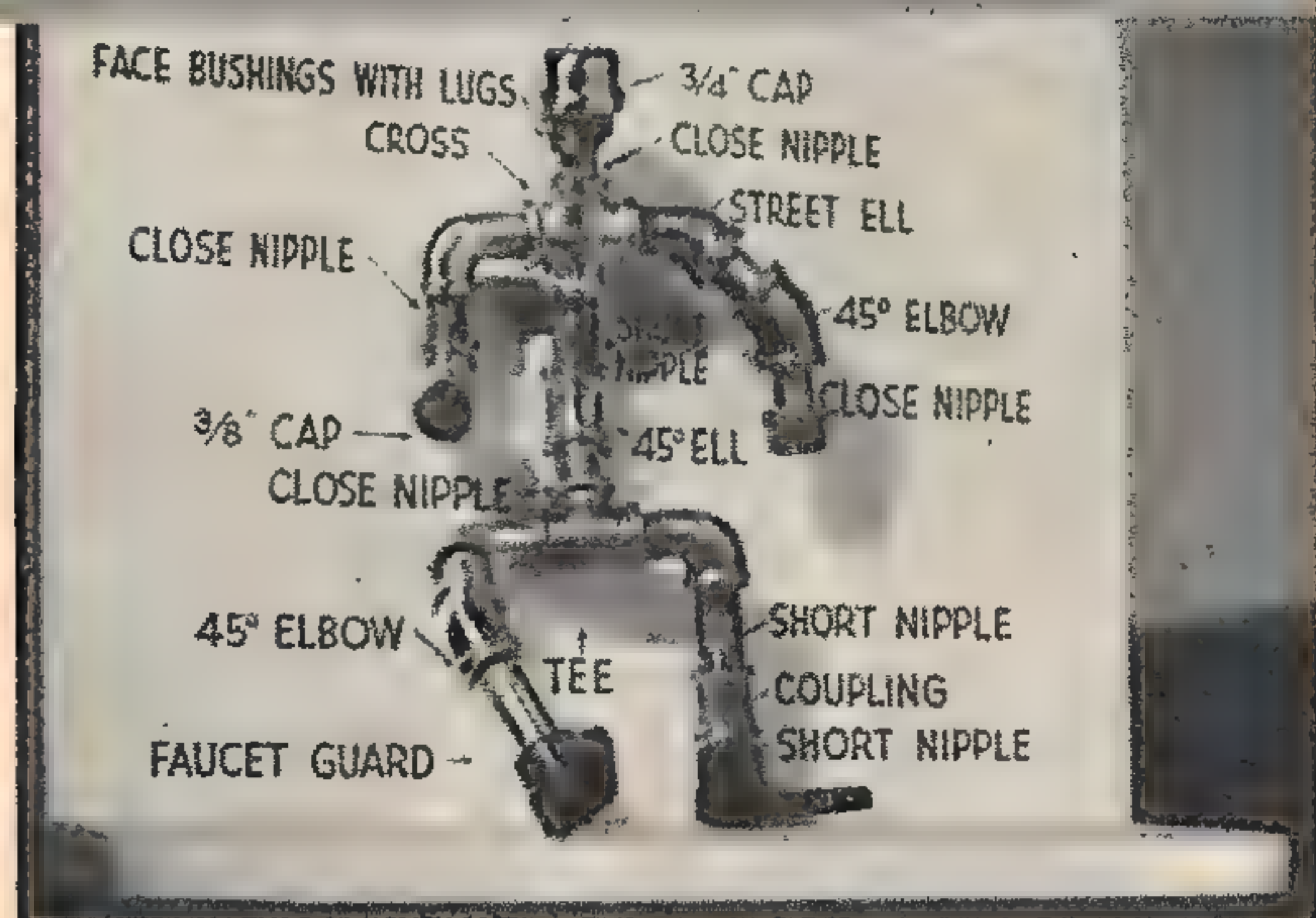
Build Largest Welded Ship



Under construction at Chester, Pa., this oil tanker will be the world's largest welded vessel when completed. Speeding at 13 knots, the ship will carry 156,000 barrels of oil.

THE world's largest welded ship, an 18,500-ton tanker, is being constructed for an oil firm at Chester, Pa., shipyards. The new vessel will be 521 feet long and will have a cargo capacity of 156,000 barrels. Turbo-electric engines developing 5,000 horsepower will give the tanker a speed of over 13 knots, enabling it to make trips between Texas gulf ports and Philadelphia in six days.

December, 1937



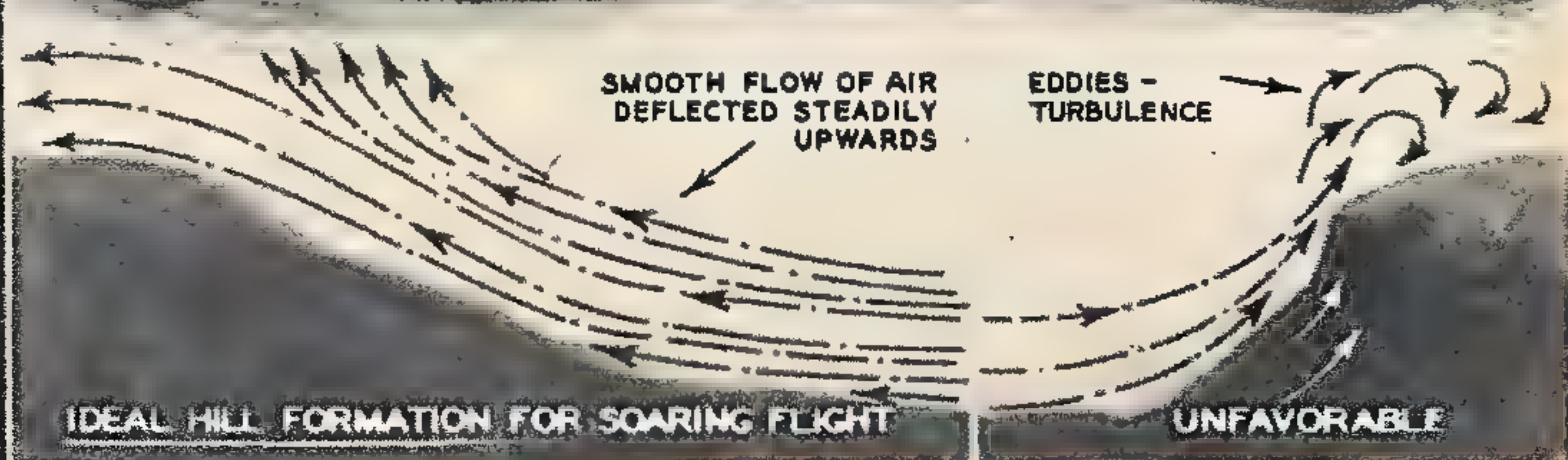
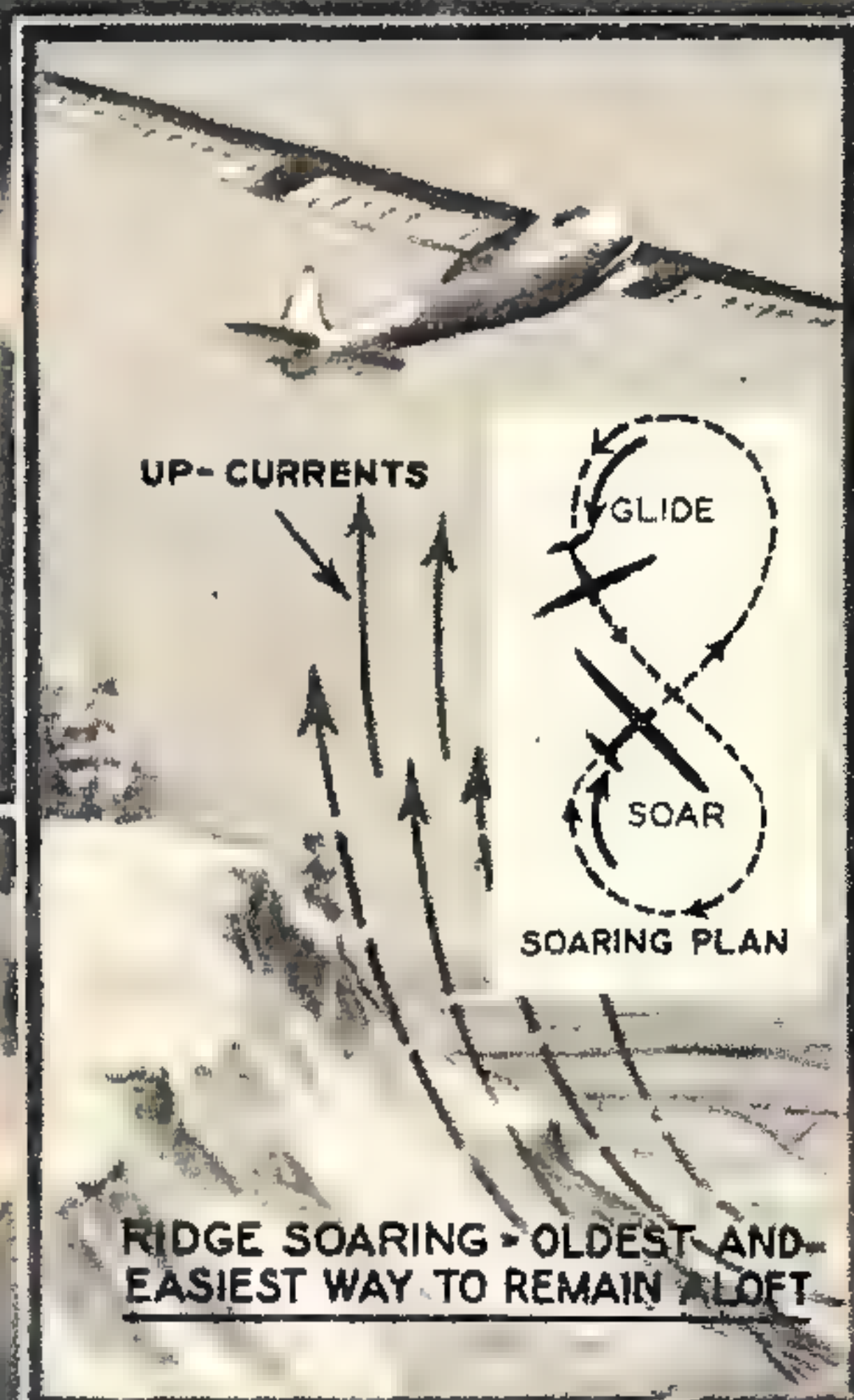
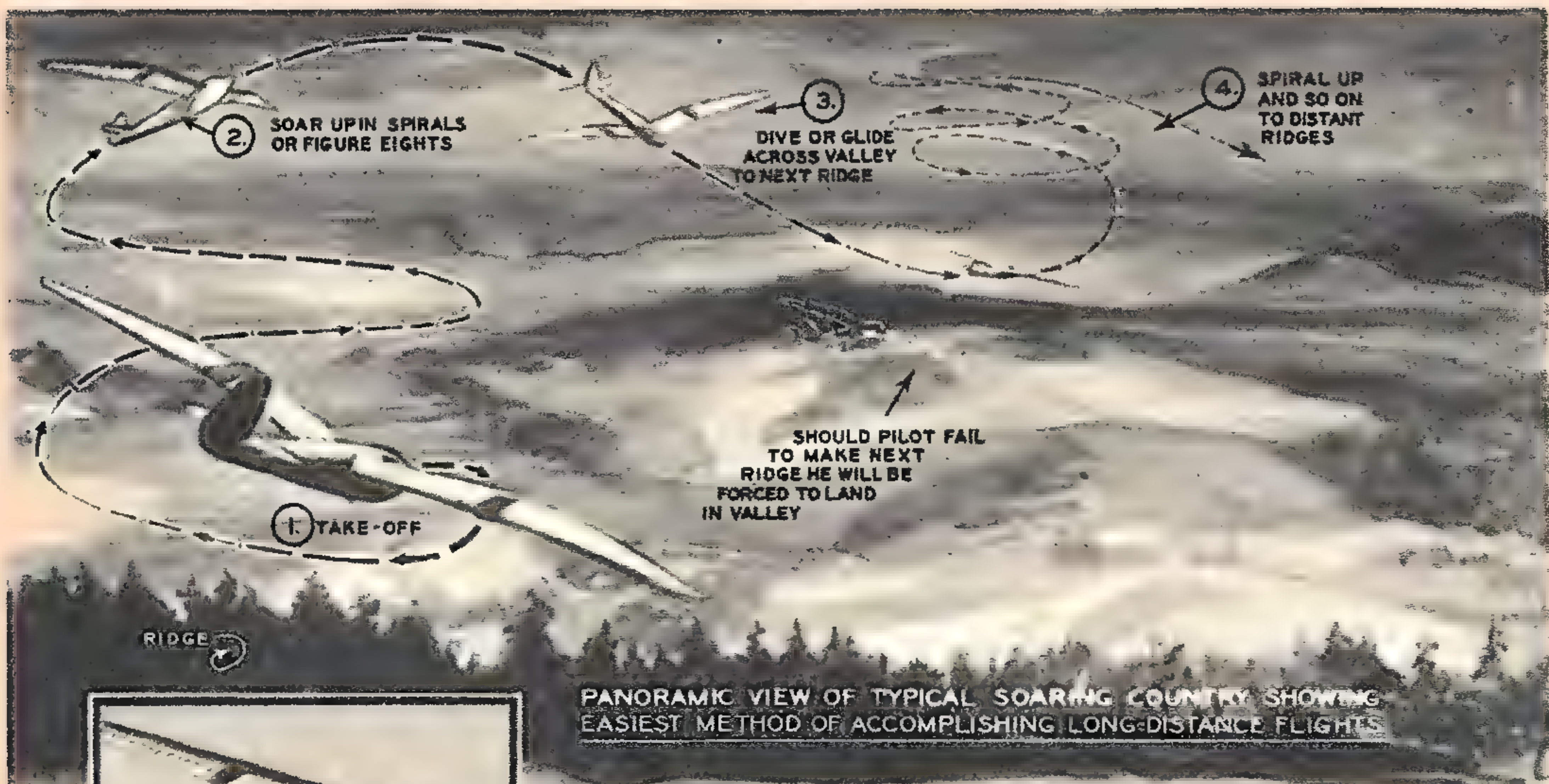
Depicting a technically perfect gridiron scene, the novel display shown in top photo features robot-like "players" made from plumbing fittings. Lower—Parts used to make figures.

Nurse Corps Uses Airplanes

PREPARED to take off at a moment's notice in case of disaster, a corps of aerial nurses organized in Los Angeles, Calif., is fully equipped to handle emergency cases anywhere in the U. S. The organization, known as the Aerial Nurses Corps of America, is equipped with the latest medical equipment and two monoplane "ambulances."

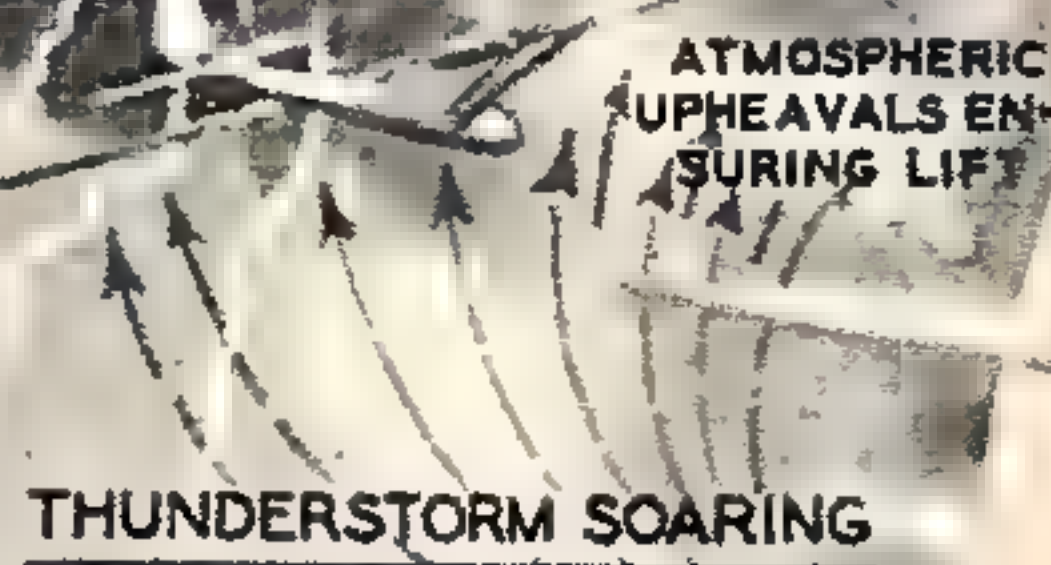


Members of the Aerial Nurses Corps of America demonstrate how a patient is transferred from an auto to aerial ambulance.



SOARING —

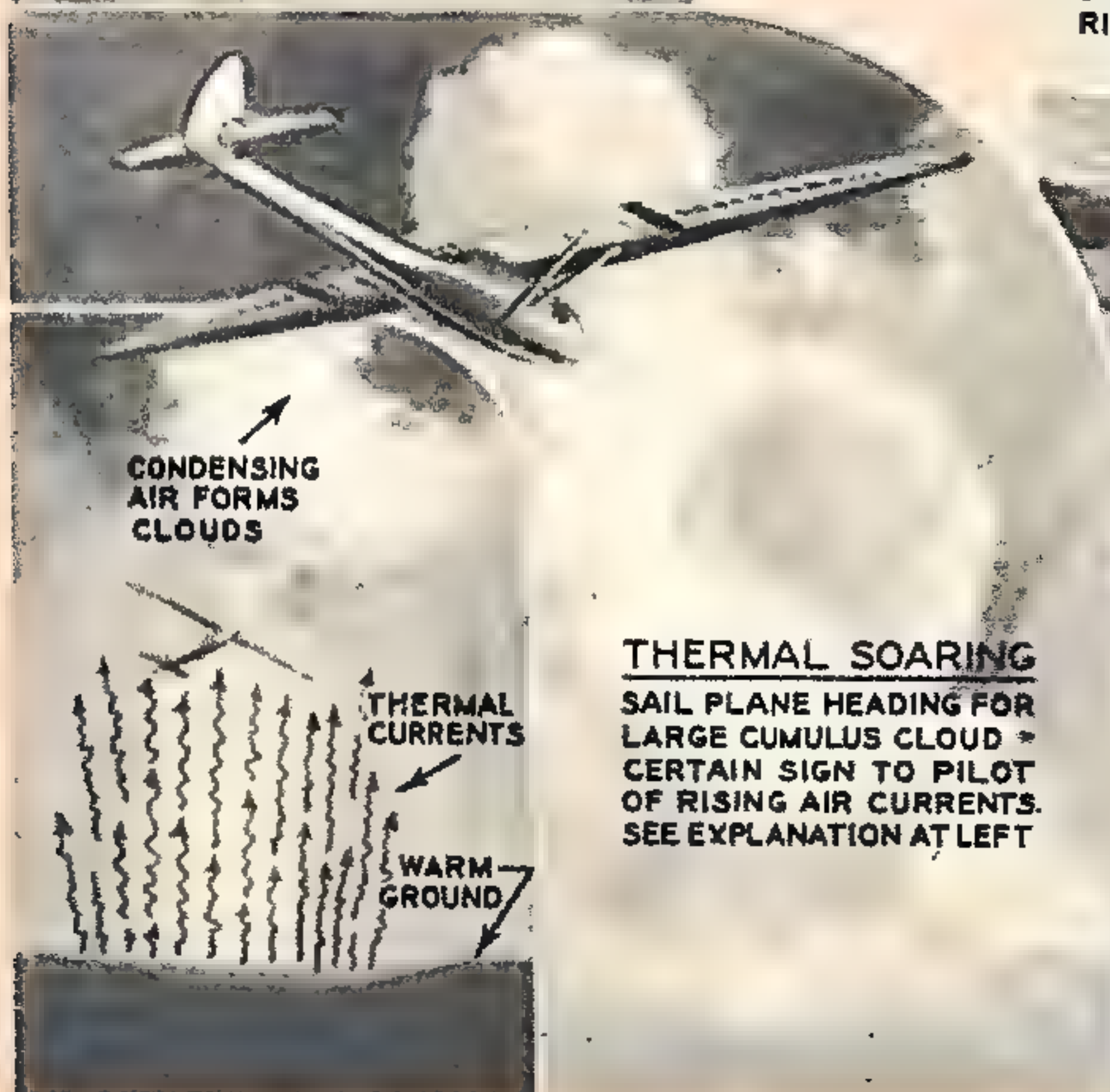
MAN'S nearest approach to true bird-like flight lies in the operation of soaring gliders or "sailplanes." Light in weight, with airfoils designed to provide maximum lift with the least forward motion, the sailplane, with a skillful pilot at the controls, takes advantage of rising thermal (hot air) currents or air deflected from ridges of hills below. Artist's sketch shows various methods by which famous soaring pilots have made flights of 300 miles and attained altitudes of 10,000 feet.



INDICATIONS OF RISING AIR CURRENTS THROUGH WHICH ALTITUDE IS GAINED ON CLOUDLESS, DRY DAYS

SMOKE RISING

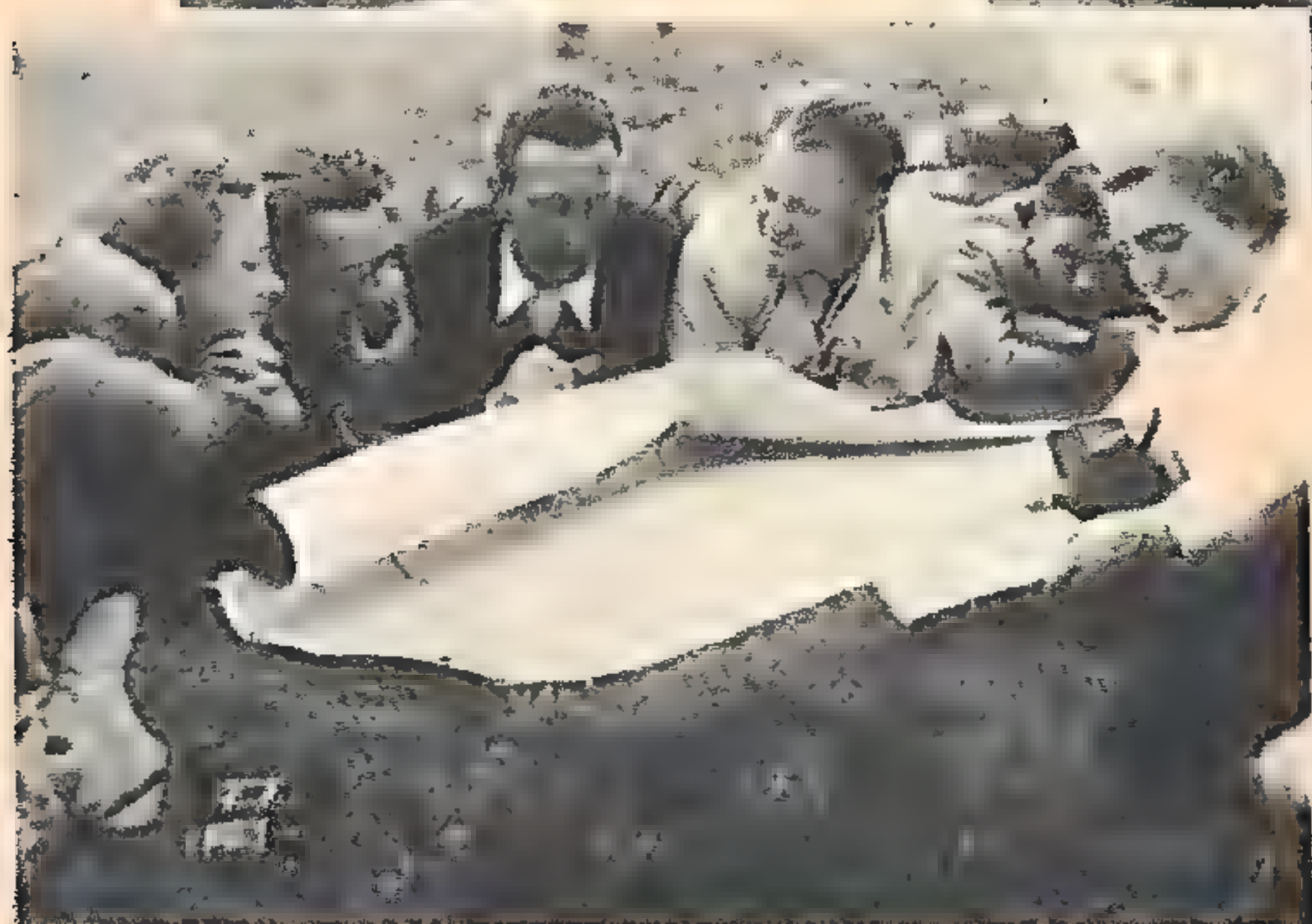
SCRAPS OF PAPER BLOWING UP FROM GROUND



CLOUD-HOPPING - UTILIZING CLOUDS FOR DISTANT FLIGHTS



—King of Sports



Few thrills can compare with that of riding the wind in a sailplane. In Germany, where soaring has developed its greatest following, over 12,000 sailplanes are flown by the nation's 50,000 glider pilots. Top—A sailplane sets out for a flight over a valley. Above—Carrying sailplanes to the top of a hill for some ridge soaring. Left—Studying a map to determine most likely soaring terrain. Upper left—Time out for refreshments while waiting for better air currents to develop.

Are HOME—

Letters from readers indicate a rebirth of interest in amateur aviation field.

Flying a home-built plane (right) is a privilege enjoyed by residents of only a few states. Right lower—An "Air Camper", built from MM Flying Manual (1932) plans.



Circle—Many men now prominent in the aviation industry can be thankful that more liberal air laws were in force during their early days, enabling them to secure low-cost aviation knowledge through construction of their own planes. Above—Many an amateur built his plane in his back yard.

CAN the amateur airplane builder successfully construct a light airplane which he can depend on to perform reliably in the air? Having constructed it, can he use the knowledge thus acquired as a stepping stone to a worthwhile job in aviation? The answer is, "YES—if it weren't for government restrictions that keep the amateur plane builder grounded except in a few liberal-minded states that encourage amateurs."

Home-built aircraft, if constructed to reliable plans, can be as safe as any aircraft of equal size and power that carry an NC license. The experience of Oregon, and several other states that permit home-built aircraft to be flown, bears out this statement.

Modern Mechanix

Built Planes Safe?



Above—Amateurs CAN build aircraft that rival commercially-built planes in craftsmanship, design, and beauty of finish, and—they are safe, too, as records prove. Below—An amateur's partially constructed plane. Note excellent work.



From 1929 to 1933, inspired by the belief that thousands of young men throughout the country were intensely eager to own and fly their own airplanes, MODERN MECHANIX published annual Flying Manuals containing reliable plans from which amateurs could, and did, construct dependable light airplanes at a moderate cost. The sales figures of the manuals proved that our belief was correct, and MODERN MECHANIX only stopped publishing an annual Flying Manual (although back issues of the 1931-32-33 editions are available at 50 cents each) when federal restrictions on the flying of home-built planes were adopted by a majority of the 48 states.

Recently, we received quite a few letters from readers interested in building airplanes—letters asking us to provide the latest information regarding government laws on the subject; asking us to campaign for more liberal laws relating to the building and flying of home-built planes; and letters urging us to propose some plan that would help the light plane enthusiasts and still be approved



The welded tubing motor mount of the home-built plane in the upper photo can be favorably compared with any found on commercially built "fivverplanes". Lower photo—A home-built airplane powered with a converted Ford auto engine.

by the government aviation authorities.

The re-birth of interest in home-built airplanes, as indicated by the number of letters received, caused MODERN MECHANIX to investigate the possibility of changes in the laws now in force. Sad to relate, there seems very little chance of any changes occurring in the near future, if ever.

A bulletin issued by the Bureau of Air Commerce states that its engineers feel that the requirements for light airplanes can be

[Continued on page 147]

Fleet Of 398 Planes Tests London's Air Defenses



These Avro Anson bombing planes were part of a fleet of 398 aircraft that participated in a mock attack to test London's air defenses. Tests indicated bombers "destroyed" the city.

Beading "Dresses Up" Auto

MOTORISTS are able to accentuate the graceful lines of their autos through use of a combination of molding and beading developed by a St. Louis, Mo., firm. Use of the combination material is said to make the body appear longer and low-swung without obscuring the make of the auto.

The combination consists of a streamlined radiator grille and a series of raised molding strips which are carried back along the panels of the doors and sides of the auto, ending in a narrow, graceful sweep at the rear. Strips are obtainable in colors.



A combination of a streamlined radiator grille and a series of raised molded strips carried back along doors and sides give this car a smart appearance. Strips have colored finish.

CONTRIVED to test the air defenses of London, a monster sham battle involving the flying of 398 airplanes of various types was staged recently by the Royal Air Force. A force of 176 bombing planes tested the anti-aircraft defenses of the city, while 222 fighting planes went up to "shoot" them down.

The air exercises also afforded an opportunity to test the Civilian Observer Corps, whose members served to spot the attacking bombers before they reached London, communicating their positions to the defense flying squadrons. Searchlight crews also participated in the sham battle. The results of the mock air attack indicated that the city had been "destroyed."

Clock Indicates World Time



Designed primarily for short-wave enthusiasts and airport use, this universal electric clock simultaneously indicates the correct time at 16 large cities scattered over the globe.

A NEW electric clock invented by F. O. Kaeppler, of Los Angeles, Calif., simultaneously indicates the time at sixteen or more cities scattered over the globe. A hair-line crossing a series of scales enables the user to read the time at any location shown.

Although the device is designed primarily for short-wave radio enthusiasts, it is expected to prove useful at airports, railway stations, and brokerage offices.

Modern Mechanix

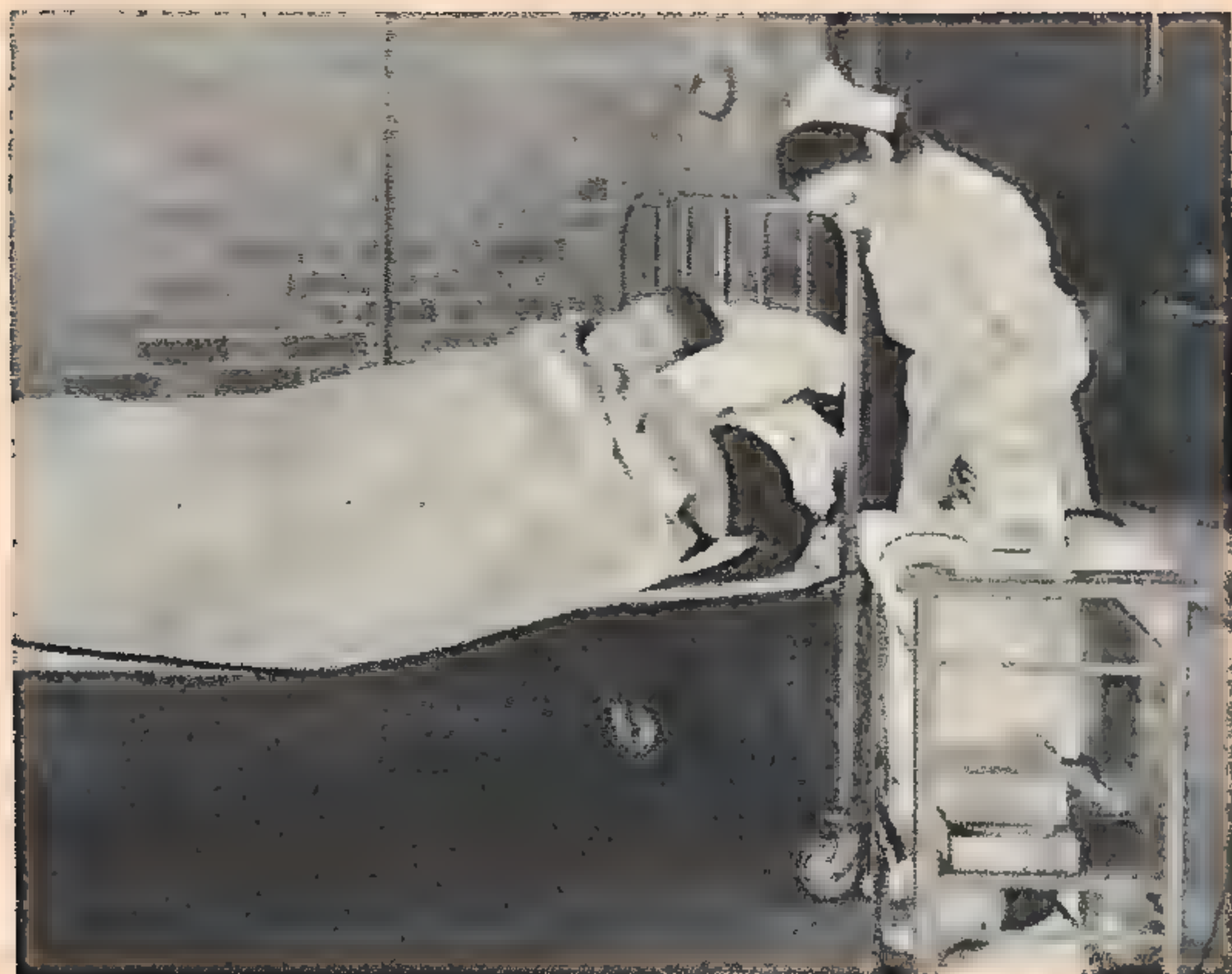
Surgeon Devises Special Forceps To Treat Dogs

PRACTICALLY all foreign bodies lodged in the stomachs of dogs can be removed quickly, painlessly and safely in from three to five minutes through use of an instrument developed by Dr. Raymond J. Garbutt, chief surgeon of the American Society for Prevention of Cruelty to Animals in New York. Spark plugs, iron washers, ball bearings, lead sinkers and stones are some of the unusual objects removed from the ailing canines' stomachs.

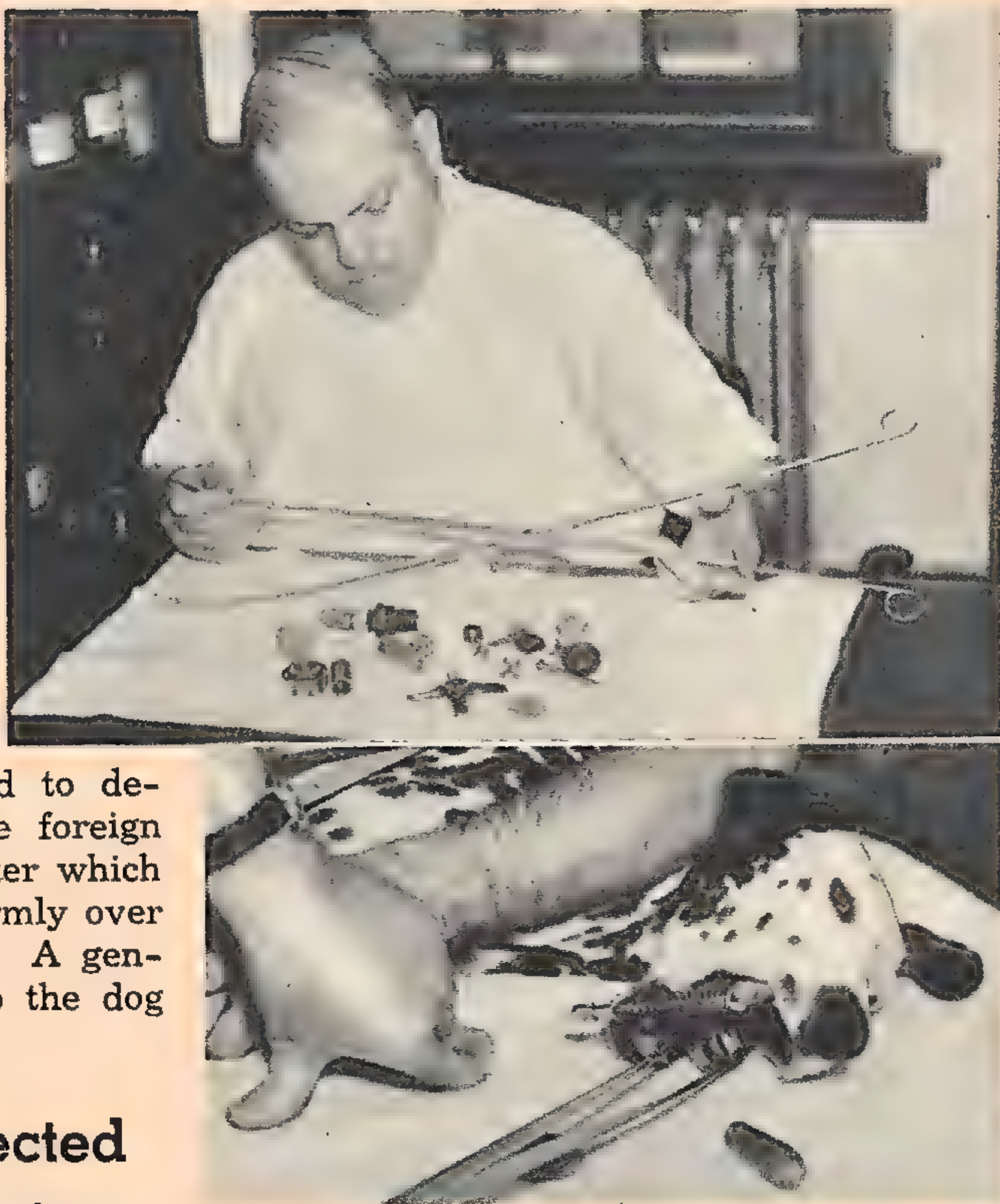
To remove the foreign bodies, Dr. Garbutt uses a special forceps which, after sterilizing, is gently passed down the animal's oesophagus. A fluoroscope is then used to determine the exact position of the foreign body in relation to the forceps, after which the jaws of the latter are closed firmly over the objects and gently withdrawn. A general anaesthetic is administered to the dog patient during the "operation."

Electric Blanket Perfected

ALTHOUGH it weighs no more than an average blanket, a newly perfected electric comforter features two thicknesses of light-weight material between which many feet of specially insulated and water-proof flexible wire have been sewn. The wires are connected to a current control box which can be placed at the head of a bed and operated by the sleeper or, in the case of an ill patient, an attending nurse.



This nurse is adjusting the compact thermostat and transformer device that safely regulates the amount of current supplied to the wiring of a newly perfected electric blanket.



Top—Dr. Raymond J. Garbutt examines the special forceps he developed for removing foreign objects from dogs' stomachs. Lower photo shows how forceps are used to painlessly remove unusual objects that canines sometimes swallow.

"Indestructible" Plane Built

FEATURING construction that makes it practically indestructible by machine gun fire from other aircraft, a "convoy fighter" airplane has been developed by the Seversky Aircraft Corp., of Farmingdale, L. I. The all-metal construction is such that the stresses of flight are spread over the entire wing and no single beam carries a critical load. The wings can be literally riddled with bullets and the plane can still maintain flight.

The new plane is powered by an 1100-horsepower, twin-row radial engine and is said to be capable of traveling 300 m.p.h. Armament consists of five machine guns and wing racks for carrying 300 pounds of demolition bombs.

The plane is believed to be the most versatile ever constructed for military use. It can be used as a light bomber, an observation plane, a pursuit plane, an attack plane, or as an advanced trainer.

Bungalows



Rows of adobe bricks drying in the sun.

The main requirements are a supply of ordinary dirt that does not contain too high a percentage of sand, enough water to thoroughly dampen the adobe mixture, and plenty of sunlight. Add to these a truly Spanish disregard of time, infinite patience and a *strong pair of legs*, and you are as well equipped as others who have successfully built their own houses out of native soil.

It is well known to students of California history that most of the missions built by the Spanish padres who first explored that state were made of adobe. The prime reason for this was the scarcity of timber in some sections. Yet, after more than a century of



Above—Scraping loose soil from dried adobe slabs. Right—Heavy timber poles are used to make the door frames.

FANTASTIC as the statement may seem at first glance, it is quite possible for anyone without previous experience in building to construct a modern, durable and artistic dwelling out of mud, or—to use the old Spanish-Californian name—adobe. This has been proved by a number of residents of the San Ramon Valley in central California.



of Mud

by
Robert
McLean



Modern adobe dwellings are easy to build.

The roof rafters, of native timber, are supported at the ridge by a log extending through each gable end wall, as shown in above photo. Right—Setting in the window frames. Below—When completed, the outside of the novel house is whitewashed to create a real Spanish appearance.



use, many of the old California missions are still standing and habitable. In Mexico and other longer settled countries, adobe buildings over two hundred years old are still occupied.

During the past few years a revival of interest in adobe construction has taken place in California. Although he does not claim the distinction, Harry H. Hindman, a resident of San Ramon Valley, is credited by

his neighbors with being the "pioneer" of this renaissance of an ancient craft. Hindman's adobe house has served as a model for a number of others in that part of California.

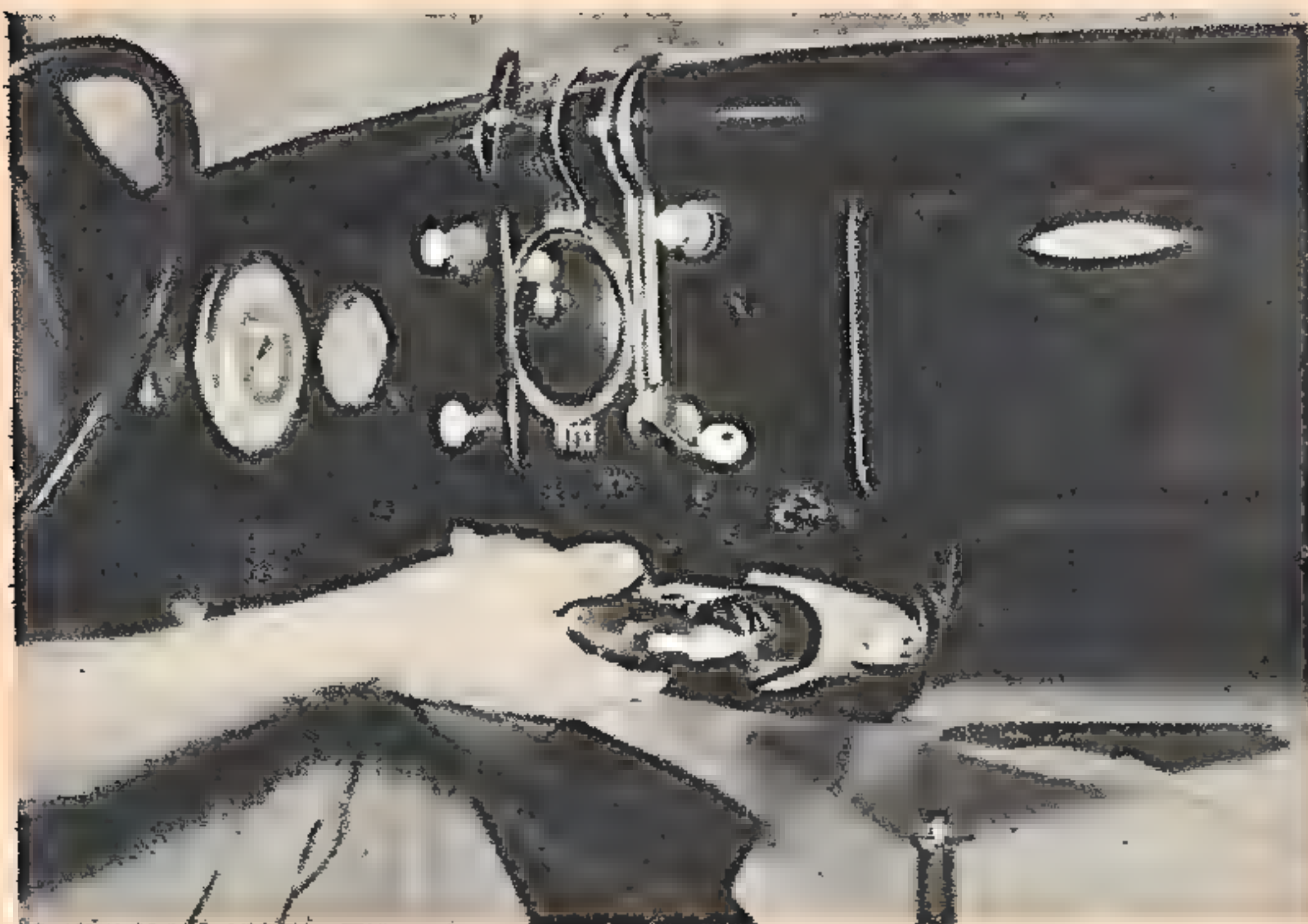
Departing radically from the classic Spanish design which consisted of a square, box-like structure surrounding a court or patio, Hindman and his neighbors have built
[Continued on page 148]



This automobile wheel, invented by Chris Sauer, of Chico, Calif., is said to eliminate blowout accidents by locking deflated tire to it, making the two one unit. Although torn to shreds, test tire remained locked to wheel at 65 m.p.h.

Auto Gun Holder Invented

ADAPTED for use with any revolver from .22 to .45 caliber, a newly invented holster compartment is easily and quickly attached to the bottom of an automobile instrument panel. The compartment features a special door fitted with a lock that not only protects the gun from theft, but which automatically thrusts the gun into the user's hand when the lock is tripped. The holster is constructed of heavy gauge iron.



Located conveniently at the base of an automobile instrument panel, a new revolver holster compartment flips open and thrusts gun in user's hand when a special lock is tripped.

Flanges On Wheel Prevent Tire Blowout Accidents

AN AUTOMOBILE wheel designed to prevent accidents that result from tire blowouts has been invented by a Chico, Calif., tire dealer. Tests in which a tire was blasted by a shotgun while the car was speeding at 65 m.p.h. are said to have proved the merit of the invention.

The wheel features two metal flanges which serve as a tire bead lock when the tire is inflated. The flanges are one-quarter inch in height and extend for approximately the entire circumference of the wheel. In event of a blowout, the flanges serve to keep the tire locked to the wheel, eliminating the vibration that normally occurs when a blown tire becomes disengaged from a wheel.

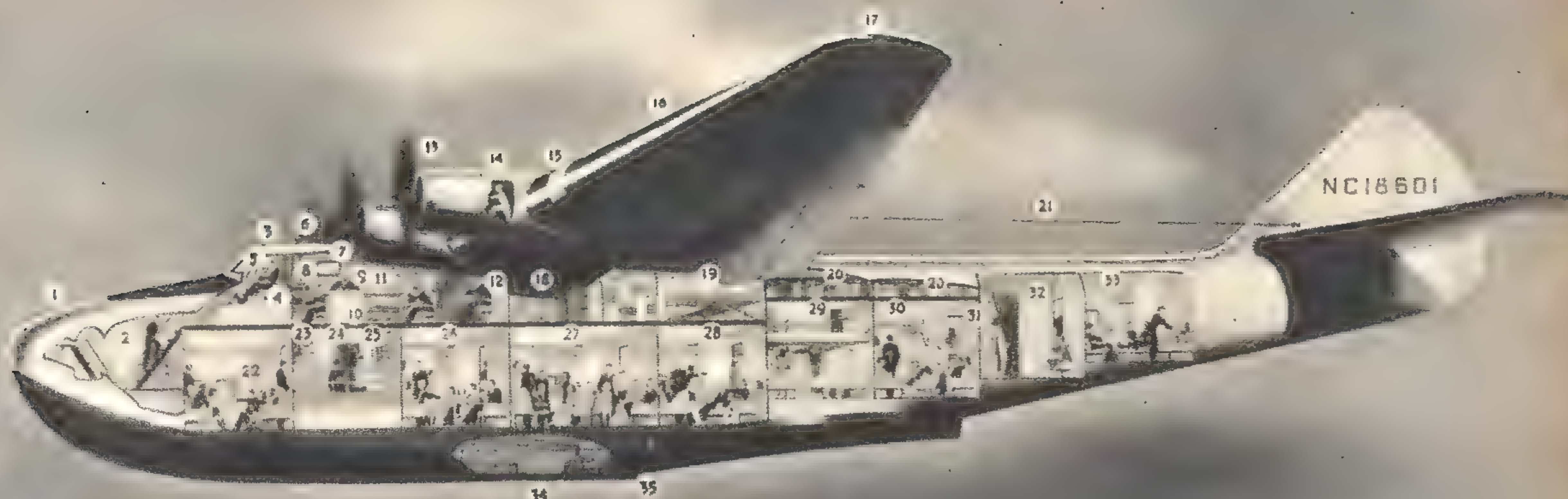
Public Teletypes In Service



Featuring dials similar to those used on telephones, teletype machines have been placed in operation for public use in Germany. Wooden cabinets can be locked when desired.

TELETYPE apparatus for public use is the latest means of communication in Germany. Dial devices, like those used on telephones, enable individuals to establish their own connections through eleven central offices now in operation throughout the country. The teletype machines are housed in compact lockable cabinets of sturdy wooden construction.

GIANT FLYING BOATS NEAR COMPLETION



A fleet of six giant flying boats like the one sketched here is being built for Pan American Airways by the Boeing Aircraft Company. With a wingspan of 152 feet and an overall length of 109 feet, the four-engined planes will each carry 50 passengers.

DESIGNED to carry 50 passengers on 24-hour schedules between America and Europe, a fleet of six giant flying boats has been under construction at the Boeing Aircraft Company plant in Seattle, Wash., for more than a year. Huge three-deck liners, the planes will each be powered by four 1,500-horsepower Wright Cyclone engines.

Despite their weight of 42½ tons when fully loaded, the giant flying boats will feature a top speed of about 200 m.p.h. Cruising range, with 50 passengers, will be 3,200 miles. The hull length of the new planes is 109 feet, while the wingspan is 152 feet, making the new craft about twice the size of the Sikorsky Clipper planes that recently made survey flights across the Atlantic for Pan American Airways, the air line for which the Boeing flying boats are being built.

The cut-away drawing identifications are:

(1) anchor hatch, (2) seamens' compartment, (3) the bridge, where flying controls are located, (4) First Pilot, (5) Second Pilot, (6) radio direction finder loop, (7) navigation room, (8) radio officer's post, (9) chart room-navigator's post, (10) map case, marine library, flares, etc., (11) engineering officer and engine controls, (12) Captain's office, (13) engines, 1,500 horsepower each, (14) mechanics' wing section, (15) landing lights, (16) wing, 152 feet, (17) navigation lights, (18) main cargo hold, (19) crew's sleeping quarters, (20) luggage holds, (21) radio antenna, (22) passenger compartment, (23) spiral stairway to bridge, (24) men's retiring room, (25) galley, (26, 27, 28)

lounges, (29, 30) passenger compartments, (31) women's dressing room, (32, 33) passenger compartments, (34) pumps for transferring fuel from wings, (35) auxiliary hold.

Sprayer Travels Over Lawn

A LOCOMOTIVE lawn sprayer invented by William H. Soper, of Denver, Colo., pulls itself along by winding in a light wire cable which may be staked out for one hundred feet from the machine. While slowly traveling, the machine throws any type of spray through an arc of 180 degrees.

The lawn sprinkler travels over grass or along a sidewalk and, once set, requires no attention until the entire cable is wound in, upon which it automatically shuts itself off, thus preventing waste of water. The machine is driven by the water pressure in its hose, cylinder and valves.



Driven by the water pressure within its valves and tubing, this lawn sprayer pulls itself along by winding in a light wire cable which is attached to a stake placed 100 feet away.

Winners in "Midget Mike" Model Locomotive Contest

Pictured above is James W. Kendrick of Battston Spa, New York, first prize winner in the "Midget Mike" locomotive contest. His prize model, No. 4517 of the "Little River R. R." is shown at right. Mr. Kendrick's craftsmanship won for him a complete kit for building an OO gauge, Hudson type, N. Y. Central locomotive.

Dr. Charles A. Layton, Detroit, Mich., was recipient of the second prize award for his "Michigan Central"—"Midget Mike" model.

ONCE more the accuracy of Modern Mechanix construction plans has been attested by readers who entered the recent "Midget Mike" model locomotive contest. At the conclusion of the three-installment article describing the building of the authentic lilliputian locomotive, the editors announced a group of valuable prizes to be awarded for the best models submitted by readers. The winning models appear on this page.

First prize was given to James W. Kendrick, of Battston Spa, N. Y. His reward was a complete kit of machined parts for building an authentic Hudson type, New York Central locomotive.

Dr. Charles A. Layton, Detroit, Mich., received a complete kit of parts for building an air conditioned Pullman coach, as second prize winner.

Third prize, a complete kit for building any one of 17 different types of freight cars, was awarded to Bernard

[Continued on page 136]

Third and fourth prize models, pictured above, were built by Bernard W. Cruger of Schenectady, N. Y., and William G. Gerrish, Brooklyn, N. Y.

Irvin W. Streng, a Chicago, Illinois, model locomotive enthusiast, received Modern Mechanix' fifth prize for this "Illinois Southern" version.

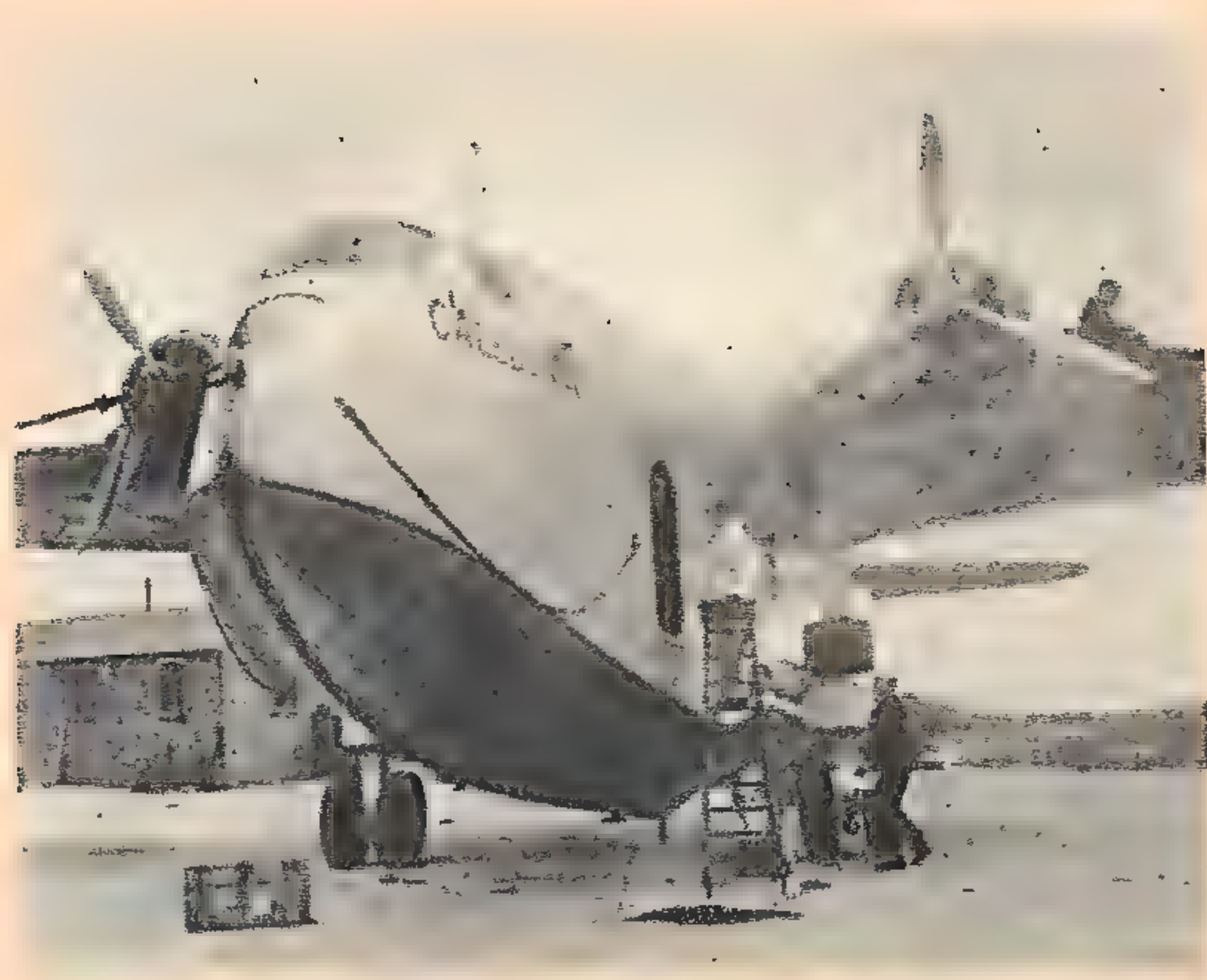
Modern Mechanix

Headline Hunter Preserves Old Newspaper Copies

COLLECTING newspaper headlines of important events is the hobby of Montgomery Mulford of Buffalo, N. Y. Each headline selected is photographed and placed in an album for safekeeping. The upper photograph shows a copy of the *Buffalo Express* telling of the sinking of the *Lusitania*. Below is a photograph of the issue explaining the false armistice of November 8, 1918. Although keen disappointment was felt when the armistice report was found to be false, the nation had but a few days to wait before the actual armistice was signed.

Like postage stamps, old copies of newspapers many times become rare and achieve considerable value. Some copies of newspapers telling of world events are worth a fortune.

Special Engine Powers Radio



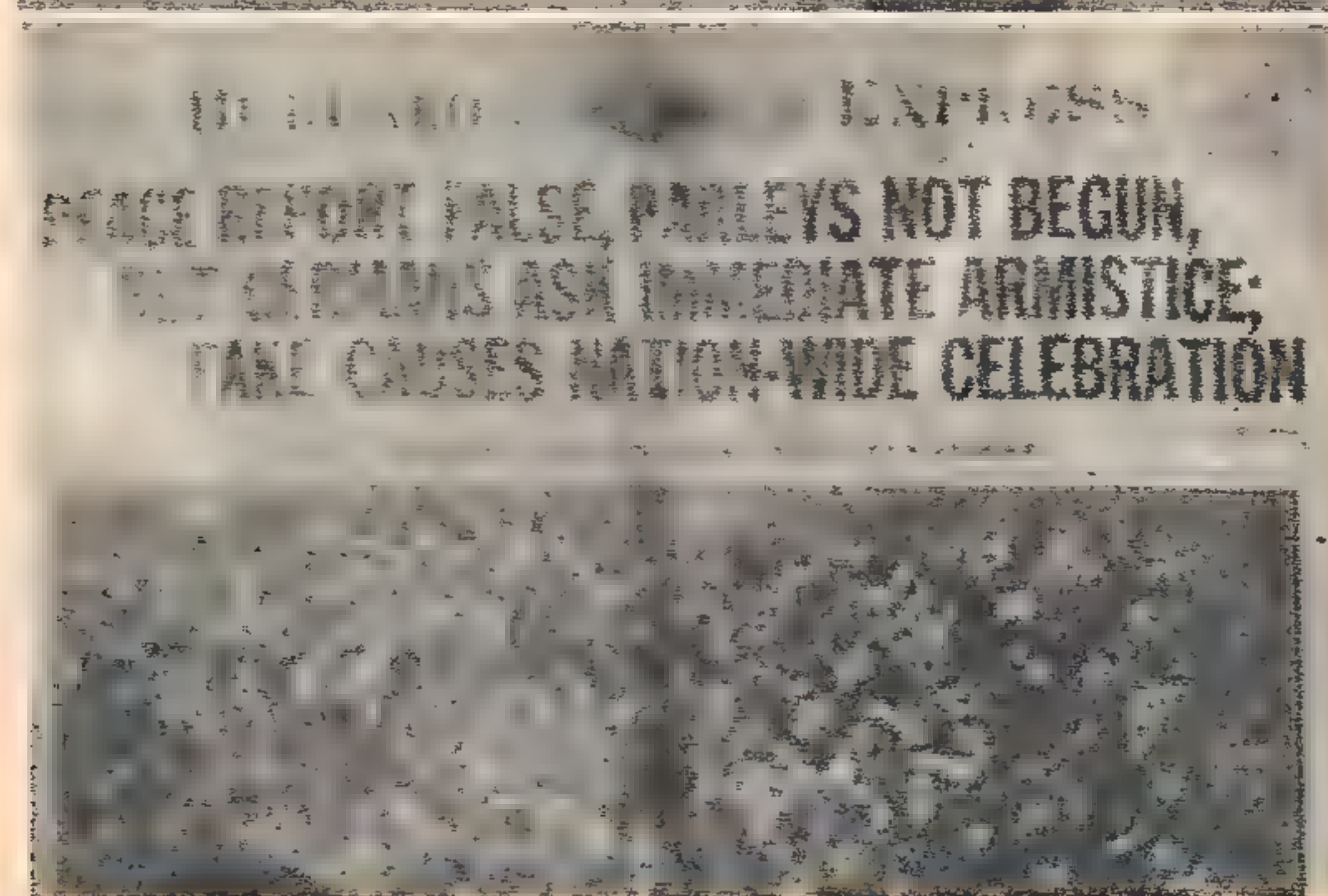
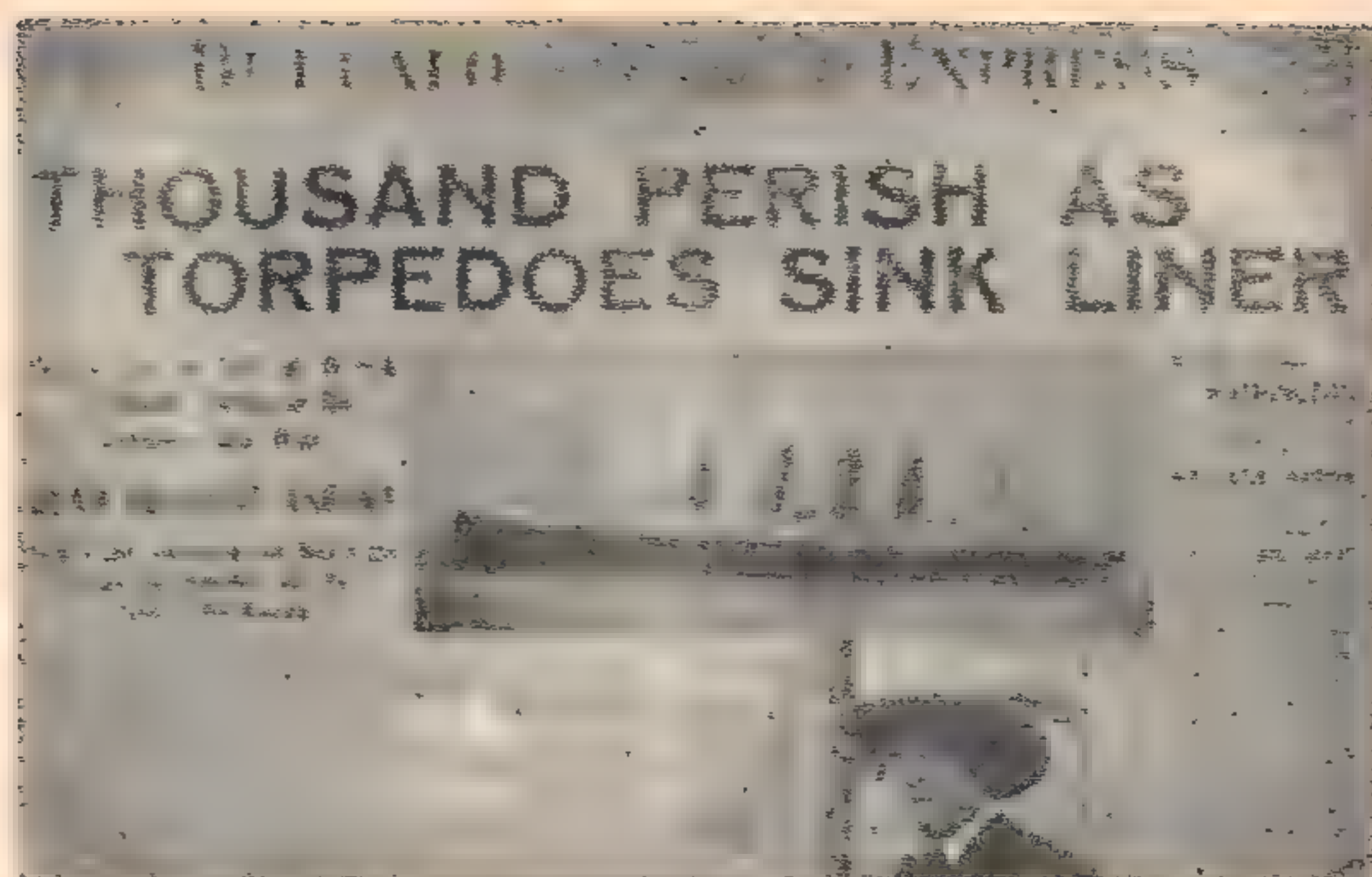
The trans-Atlantic plane "Caledonia" during an overhaul preparatory to one of its trips. The smoke is from a gasoline engine used to supply power to the special radio transmitter.

THE Imperial Airways liner "Caledonia" of trans-Atlantic fame carries a special gasoline-driven generator for supplying power to its powerful transmitting equipment.

Two-way radio aboard planes has done much to eliminate danger to the crew and passengers as well as the plane. In trans-ocean crossings, communication with both sides gives the pilot complete knowledge of weather conditions along his route.

After air travel across the Atlantic becomes established, passengers probably will be able to converse with friends on shore, as steamer passengers do at present.

December, 1937



When the *Lusitania* sank newspapers carried screaming headlines. One of these, as well as one explaining the false armistice, is in the collection owned by Montgomery Mulford.

Car Serves Home, Business

A COMBINATION truck and passenger car gives two-car use with one-car purchase. During the week the car can be used as a truck. For week-end use by the family, the two rear seats are replaced and the truck has been turned into a passenger car.



By removing two seats, ample space is obtained for carrying merchandise, equipment or tools. With seats replaced, the car is suitable for taking the family for a week end or short trip.

NEW STAMPS FROM WAR-TORN SPAIN

By Montgomery Mulford

THE postage stamps which have come from Spain during the first years of its civil war have been mainly those issued in the territories conquered and controlled by General Franco. If Franco's cause does not finally triumph, philatelists the world over are going to find that these stamps will become a mighty fine investment. If Franco wins, the issues will be known as provisionals and first issues; but those used on covers—postally cancelled envelopes—will be avidly sought after because they will be comparatively elusive.

Franco started out with stamps for each province. Most of the stamps were overprinted issues, inscribed for use in definite localities. Thus "Sevilla" or Mallorca (Majorca) would have postage stamps which could be used only within their areas. These Insurgent issues appeared in

In addition to the provincial stamps issued by the Spanish Insurgent government there are also the charity issues. These stamps, like the one pictured at upper right, must be affixed to all mail, in addition to usual postage.

such localities as Babajoz, Cadiz, Cordova, Granada, Huelva, Leon, Seville, Orense, San Sebastian, Palencia, Majorca, and Zaragoza.

Only by the early part of 1937 did the Franco, or Insurgent government, first issue a regular series to cover all the territories under rebel control.

These were inscribed "Espana" and may be at once distinguished from Loyalist (Madrid) republican issues because the latter are inscribed "Espanola."

Besides the provincial postage stamps of Franco's Spain, there were, in each province, also charity tax stamps which were compulsory on mail-matter. If a letter bore merely the postage adhesive, it was not forwarded; it was also essential to have the charity or semi-postal stamp affixed.

Seville, Cadiz, Orense and Majorca in the Balearic Isles were the first to have insurgent postage, which appeared in August, 1936. These stamps were Spanish republican issues overprinted "Viva Espana."

Early in 1937 however, the first regular postage issue for the Franco forces appeared. There were eleven values in the series, lithographed at Zaragoza. The one center was imperforate, but the rest of the stamps were perforated 11½. Each of the stamps of this issue pictures a famous building in a city under Insurgent control, and has the inscription, "Junta de Defensa Nacional"—national defense junta, or committee.

This issue became exhausted by the end of April, and a second regular Insurgent series was brought out. But these

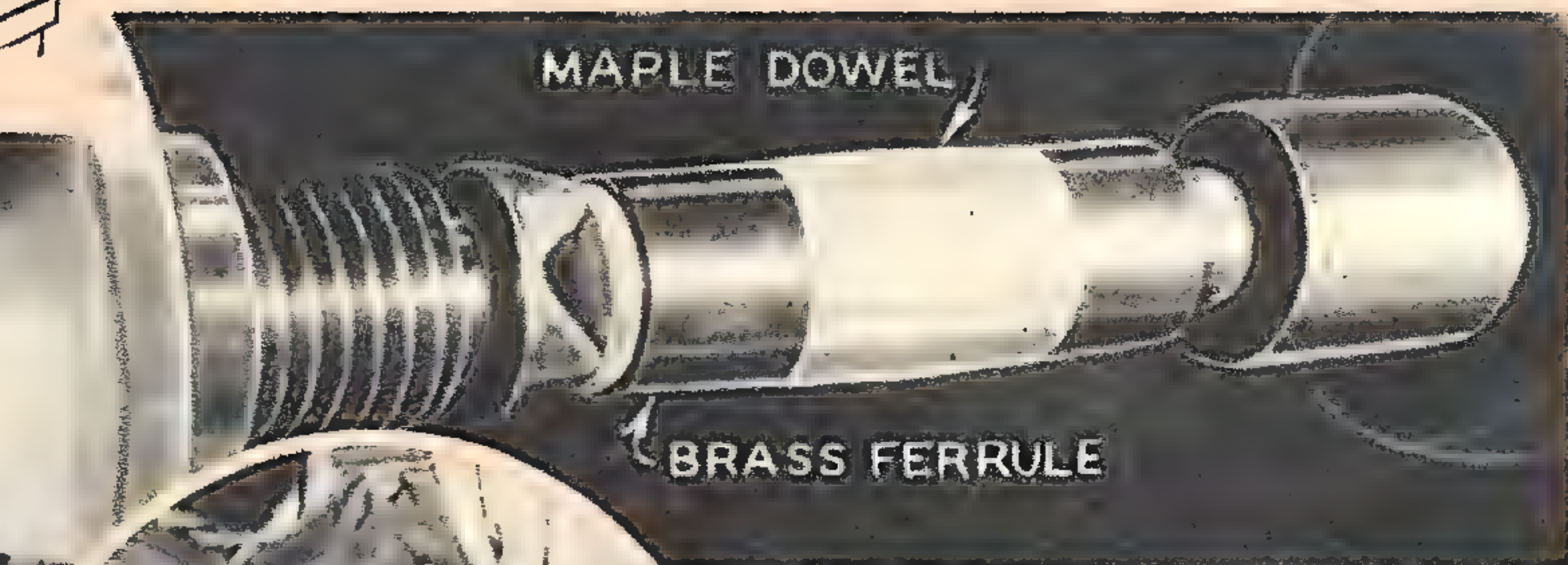
[Continued on page 126]

These stamps are but a few of the many issued for each province now controlled by the Spanish Insurgent government. They may be identified by the word, "Espana" surprinted on them.





CRAFTS and HOBBIES



A CAST METAL-LATHE TURNED DINNER GONG

THIS dinner gong can be made in the shop, including the casting of the bell if you have a small blast furnace. Its metal is aluminum bronze which has a tone quite comparable to the musical tones of the famous Swiss bells. And because aluminum bronze is merely alloy of copper and aluminum, an old skillet and scrap copper wire can be melted down to provide the metal.

Turn first, a pattern of wood to the same shape and very little oversize of the finished bell. Its maximum diameter should be $5\frac{1}{2}$ inches, its depth, $1\frac{7}{8}$ inches and the walls about $\frac{3}{16}$ -inch average. This increases somewhat at the very rim. Bore a $\frac{1}{2}$ -inch hole squarely through the center. This pattern, when a $\frac{1}{2}$ -inch iron rod is inserted in the hole, becomes the counterpart of the bell and is placed in the flasks and the moulding sand packed in the usual way about it. Before separating the flasks the rod is removed carefully and this becomes the well for the metal.

[Continued on page 136]

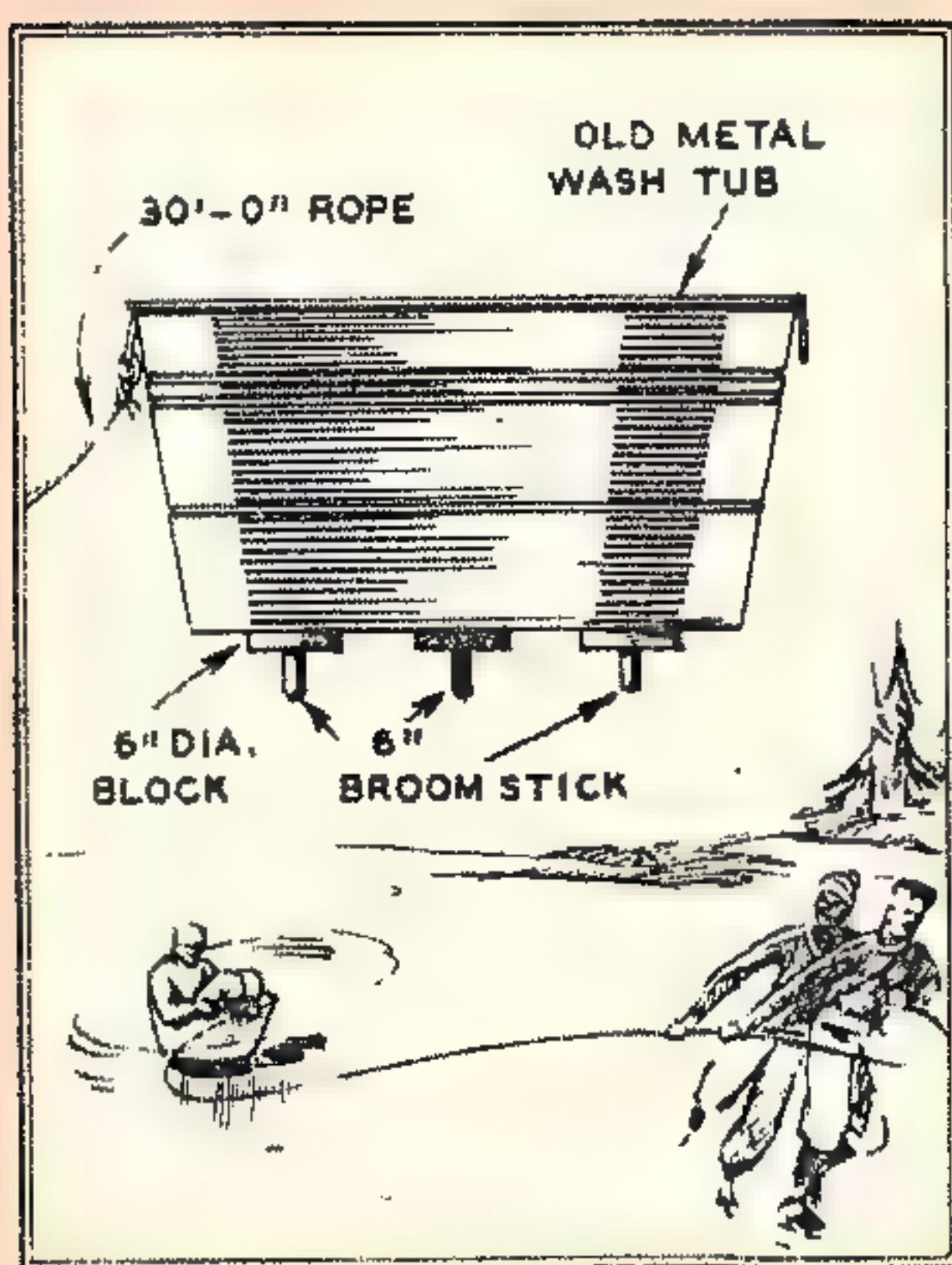
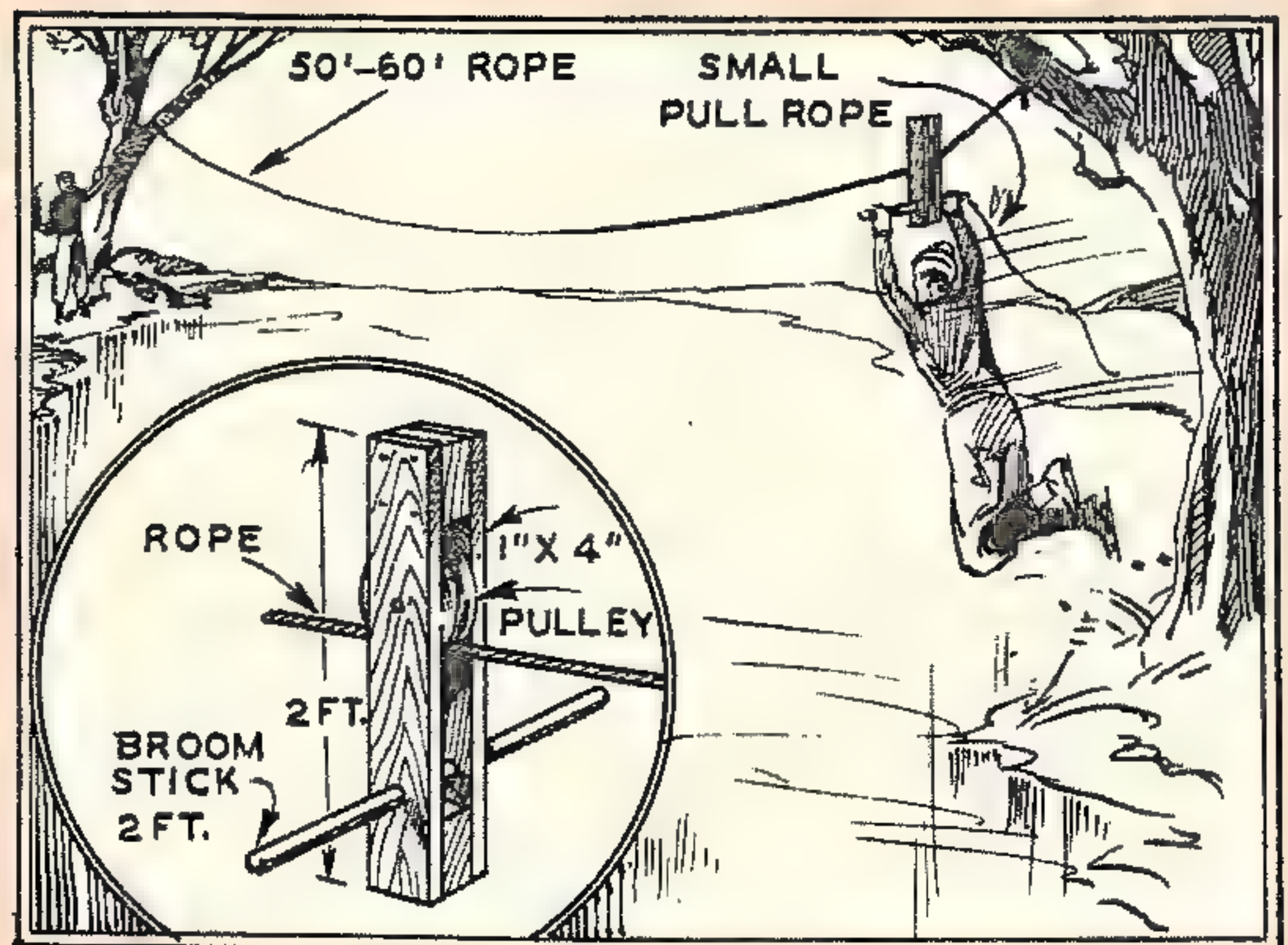
The above pictures show the various stages in the construction of the gong. The bell, itself, is cast from aluminum-copper alloy and turned to shape on a metal-working lathe. Gong mould and base are turned on a wood lathe. The bell hammer is fitted with polished brass ferrules to enhance appearance.



WINTER SPORTS PROJECTS

An Air-Line Skating Glide

THIS air-line glide provides thrills in taking off and coasting on ice skates. Install the rig between trees on the banks of a stream, the rope trolley being from 50 to 60 feet long, with the ends tied to the branches about 10 feet above the ice. The trolley car consists of two 1-by-4-inch boards, 2 feet long, with 2-by-4-inch blocks nailed between them at top and bottom as shown. A broom-stick or willow pole serves for the handle bar.

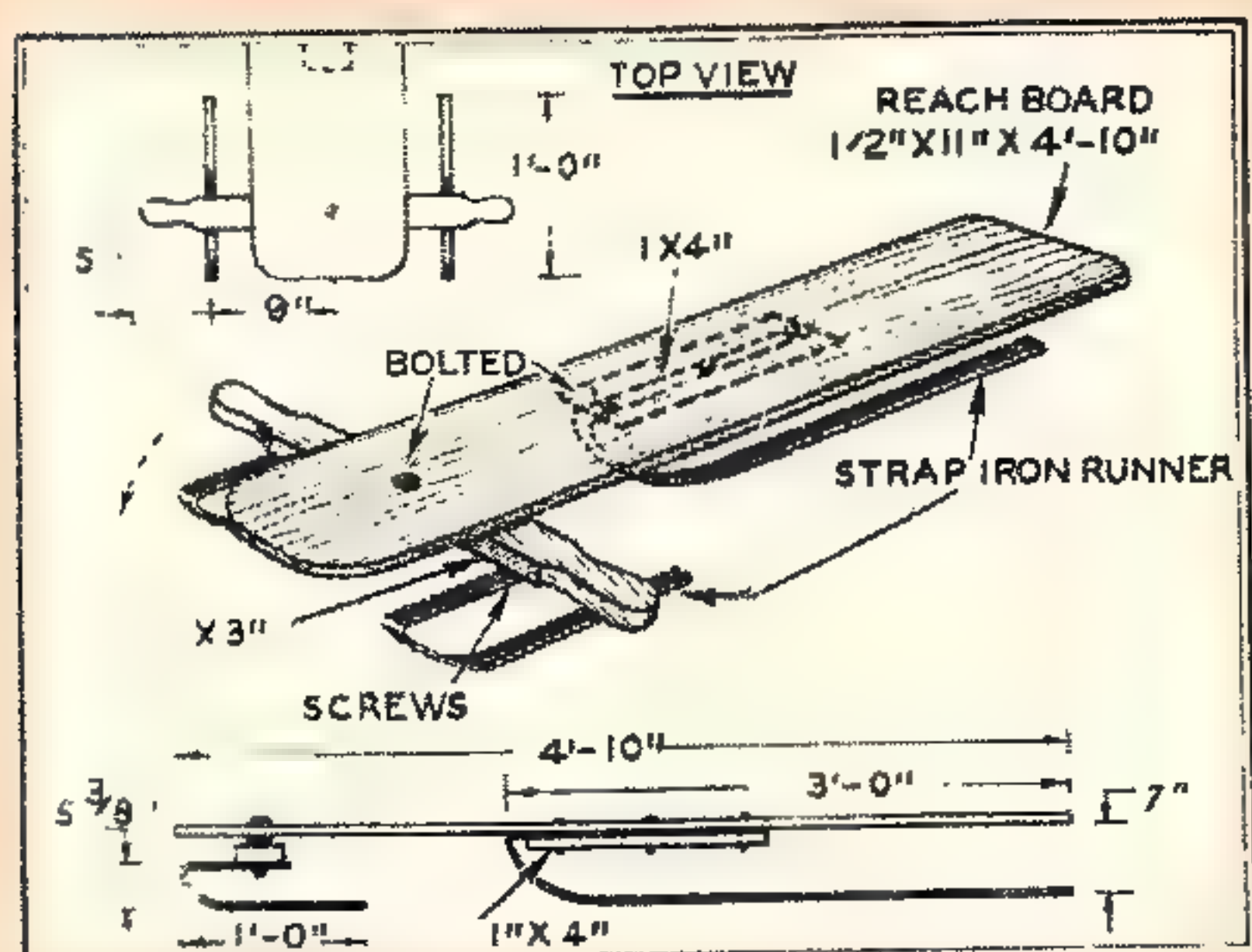
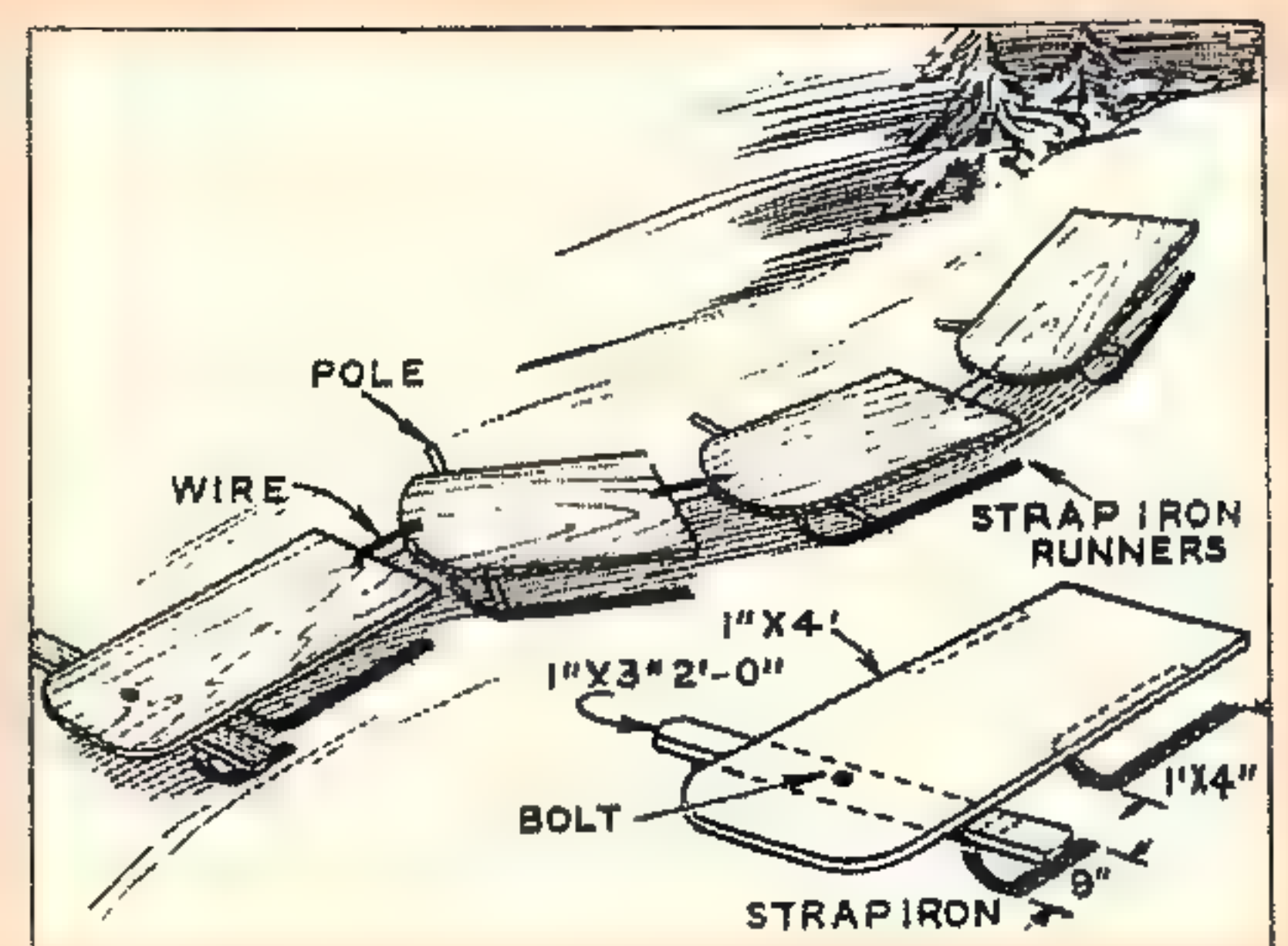


Ice Tub Whirligig Provides Thrills—Spills

ADD exciting fun to your next skating party by taking along this whirligig tub, and giving everyone in the crowd a trial spin in it. Find an old metal wash tub, too old for further service, and equip it with three sliding pegs. These consist of wood blocks 6 inches in diameter, with holes bored at the center of each, and a length of broom-stick glued and nailed in place. Fasten the blocks to the bottom of the tub with nails or screws, set equidistant apart. Use a 30-foot heavy trot line or rope, attached to one of the handles. The three sliding pegs should be rounded smoothly, and the tub used only on smooth ice. Short pegs make it almost impossible to upset the tub.

Multiple Sleds Form Snake Coaster

THIS inexpensive coaster will take a twisting coasting trail easily, twisting and turning, with the springy strap-iron runners adding more thrills. Saw up a 1-by-12-inch pine board into 3-foot lengths for the "cars," with the leading bob having a reach board 4 feet long. The front sled has a steering device, consisting of a 1-by-3-inch bar, 2 feet long, bolted at the middle. Runners are of 1 by 9 and 1 by 14-inch strap-iron.

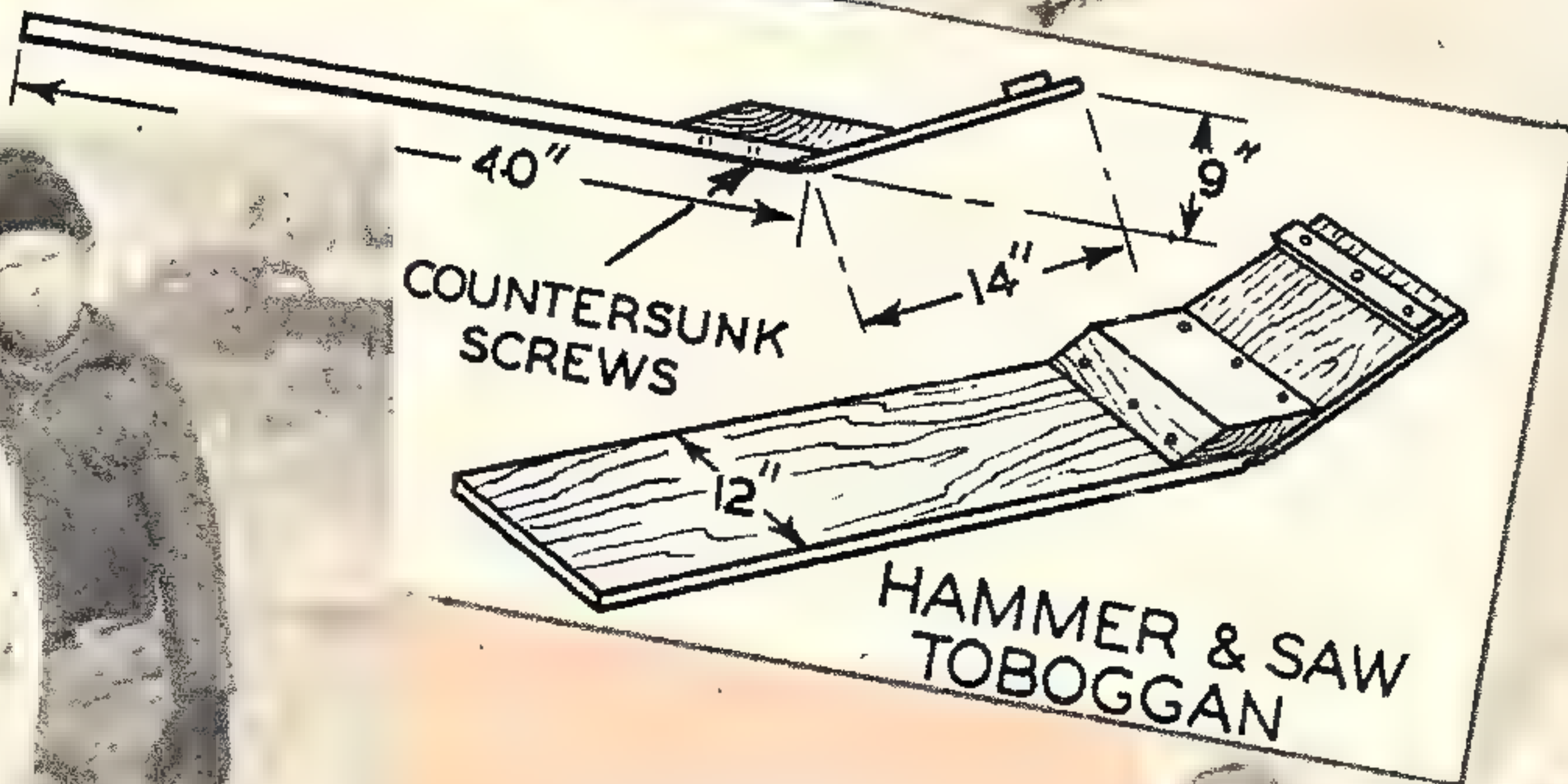


Mono-Runner Sled Is Easily Built

STRAP-IRON $\frac{3}{4}$ -inch wide forms the main runner of this fast sled, and the two short steering bobs as shown in the drawing. Use a strong board $\frac{1}{2}$ -inch thick, 11 inches wide and 4 feet, 10 inches long for the reach board, rounding the corners at the front. The front bob stick is hardwood, 2 feet, 4 inches long, with the ends whittled into handles. Bend the strap-iron mono-runner into shape and drill and fasten it to the bottom of the reach board with stove bolts.

Simplified Toboggans Provide Winter Thrills

by
Hi Sibley



The toboggan pictured at left can be assembled in less than one hour. It is constructed of scrap wood with only two tools—a hammer and saw. The bottom surface is wax finished.

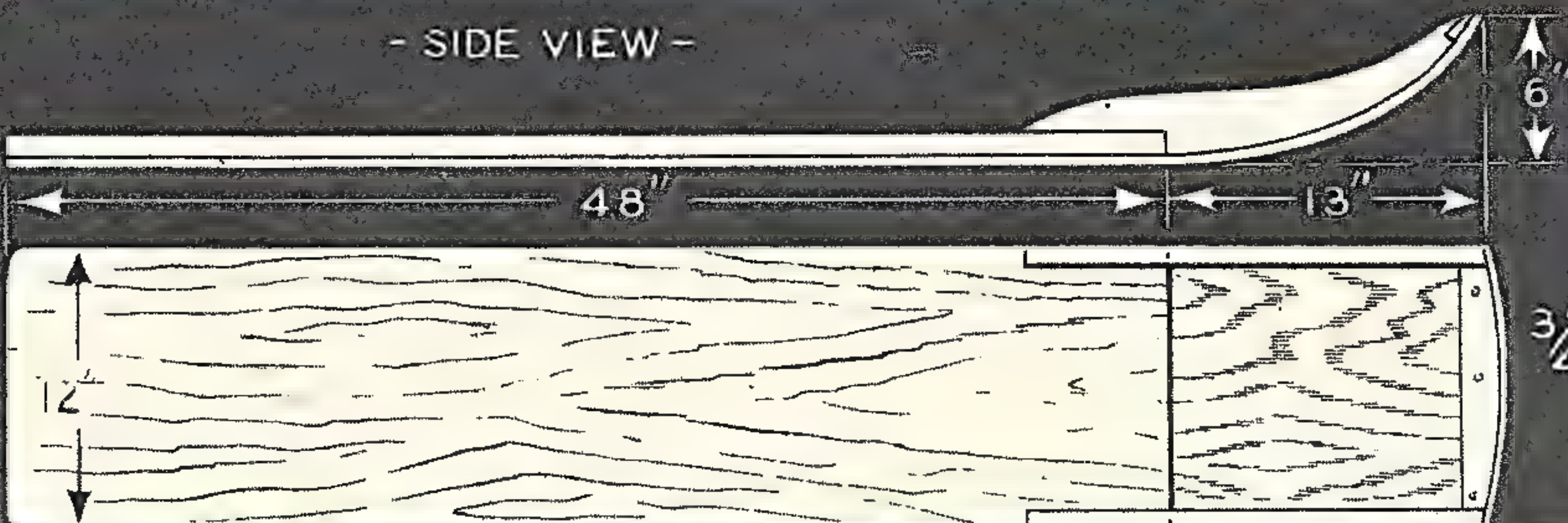
THESE easy-to-build toboggans are not only efficient, but can be built at practically no cost. The simpler design can be assembled from scrap pieces of wood, while the plywood model should not involve a material expense of more than \$1.

The "Hammer and Saw" toboggan consists of a 12 by 40-inch runner board and 12 by 14-inch nose attached to the main member with a 2 by 6-inch cleat as shown in the details. Plywood is used to form the nose and runner of the "Built-Up" model. The veneering is screwed to a $\frac{3}{4}$ -inch pine board, 48 inches long and 12 inches wide. The nose is then clamped to the side brackets to complete construction. The bottoms of both models are sanded smooth and waxed.

Somewhat more elaborate, this snow craft is also easy to build. Its cost should not exceed \$1. The runner is formed of plywood, reinforced with pine. Top of toboggan is varnished while bottom is sandpapered and waxed.



- SIDE VIEW -

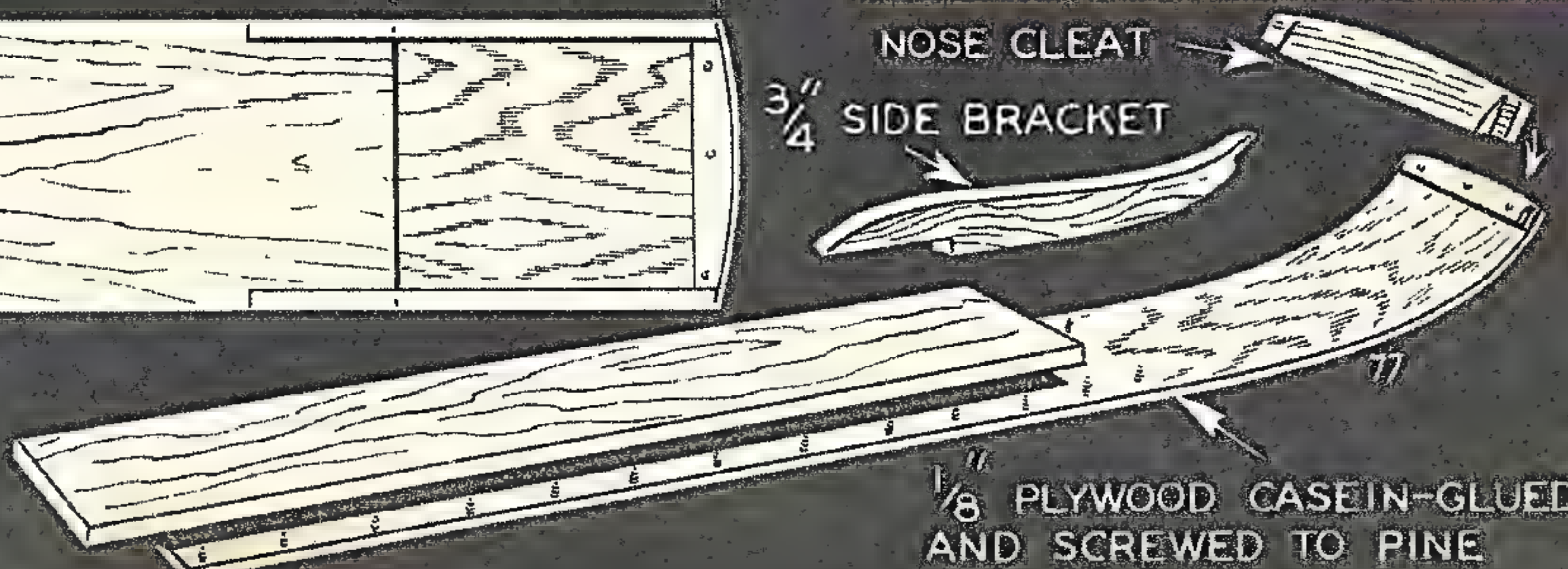


- TOP VIEW -

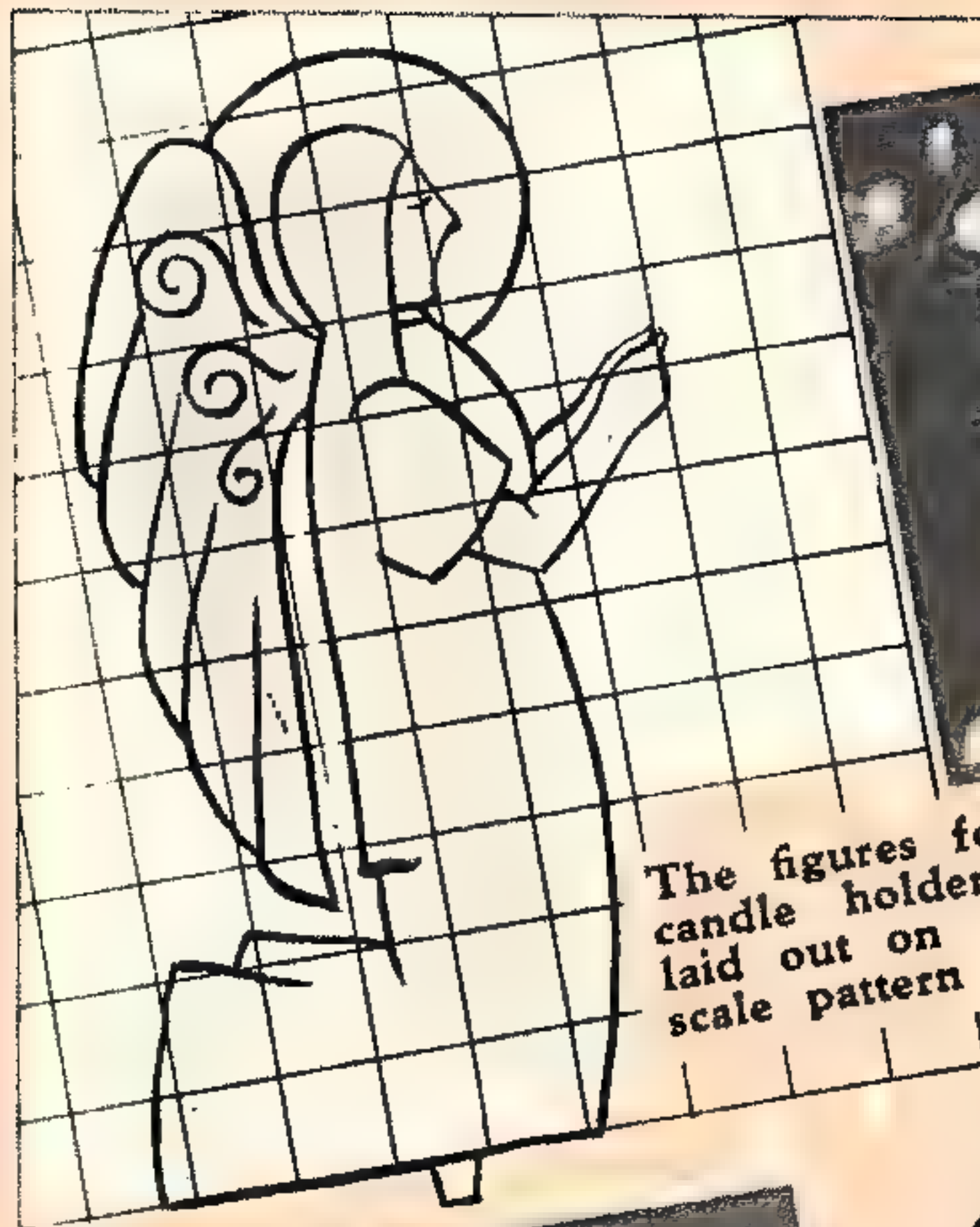
$\frac{3}{4}$ PINE BOARD

- BUILT UP TOBOGGAN -

NOSE CLEAT
 $\frac{3}{4}$ SIDE BRACKET



$\frac{1}{8}$ PLYWOOD CASEIN-GLUED AND SCREWED TO PINE



The figures for this candle holder were laid out on $\frac{1}{2}$ -inch scale pattern shown.



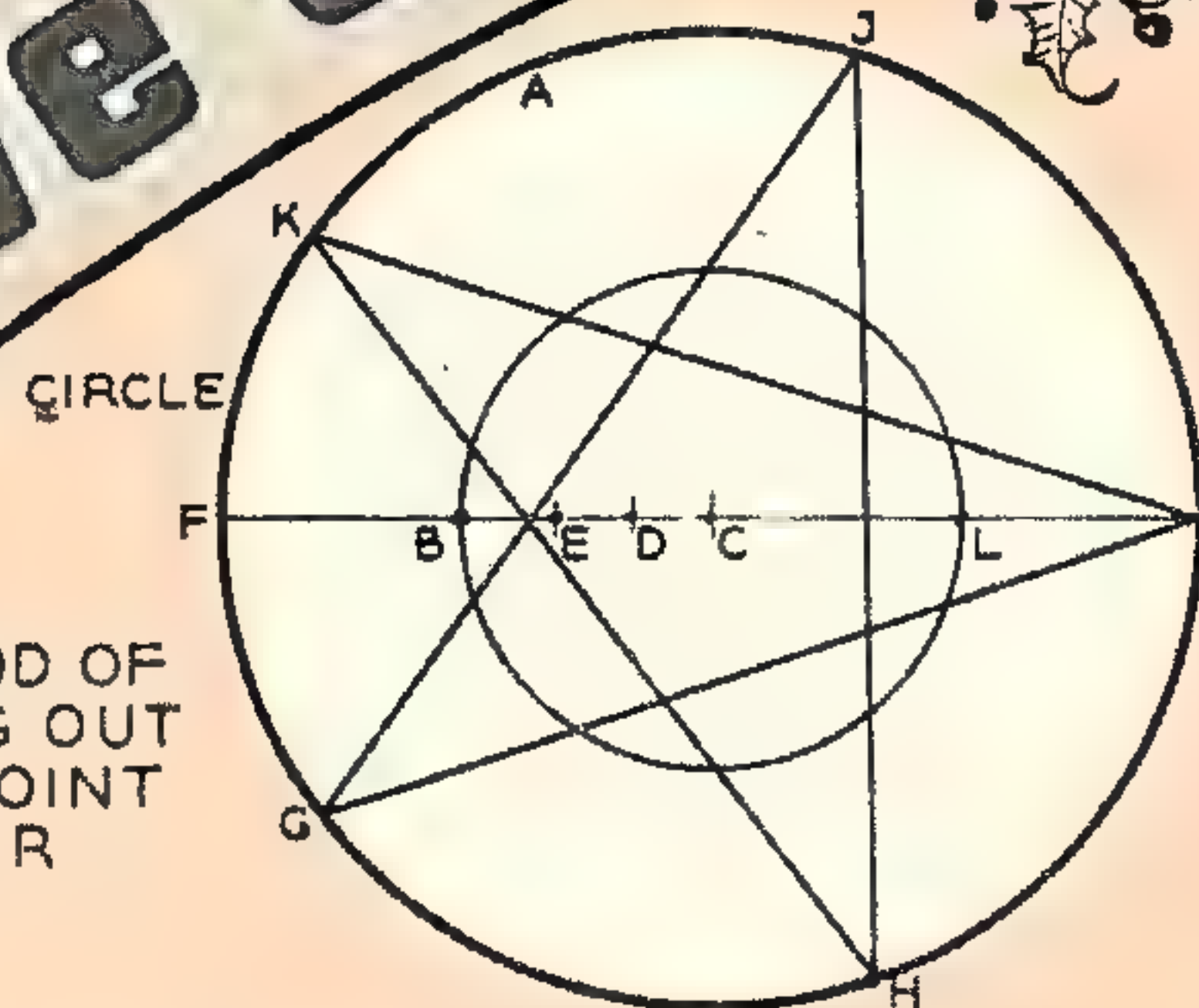
Stars form these candle holders.



These Old English Carolers are cut from thin plywood, laid out to the $\frac{1}{2}$ -inch pattern shown.

Decorative Candle

METHOD OF
LAYING OUT
A 5-POINT
STAR



by Ray J. Marran

IF YOU desire to make something unusual and out of the ordinary to brighten the home at Christmas festivities, something that will add cheer and decorative novelty to the Christmas dinner table, try your hand and power tools in producing a few of the novelty candle holders illustrated on these pages.

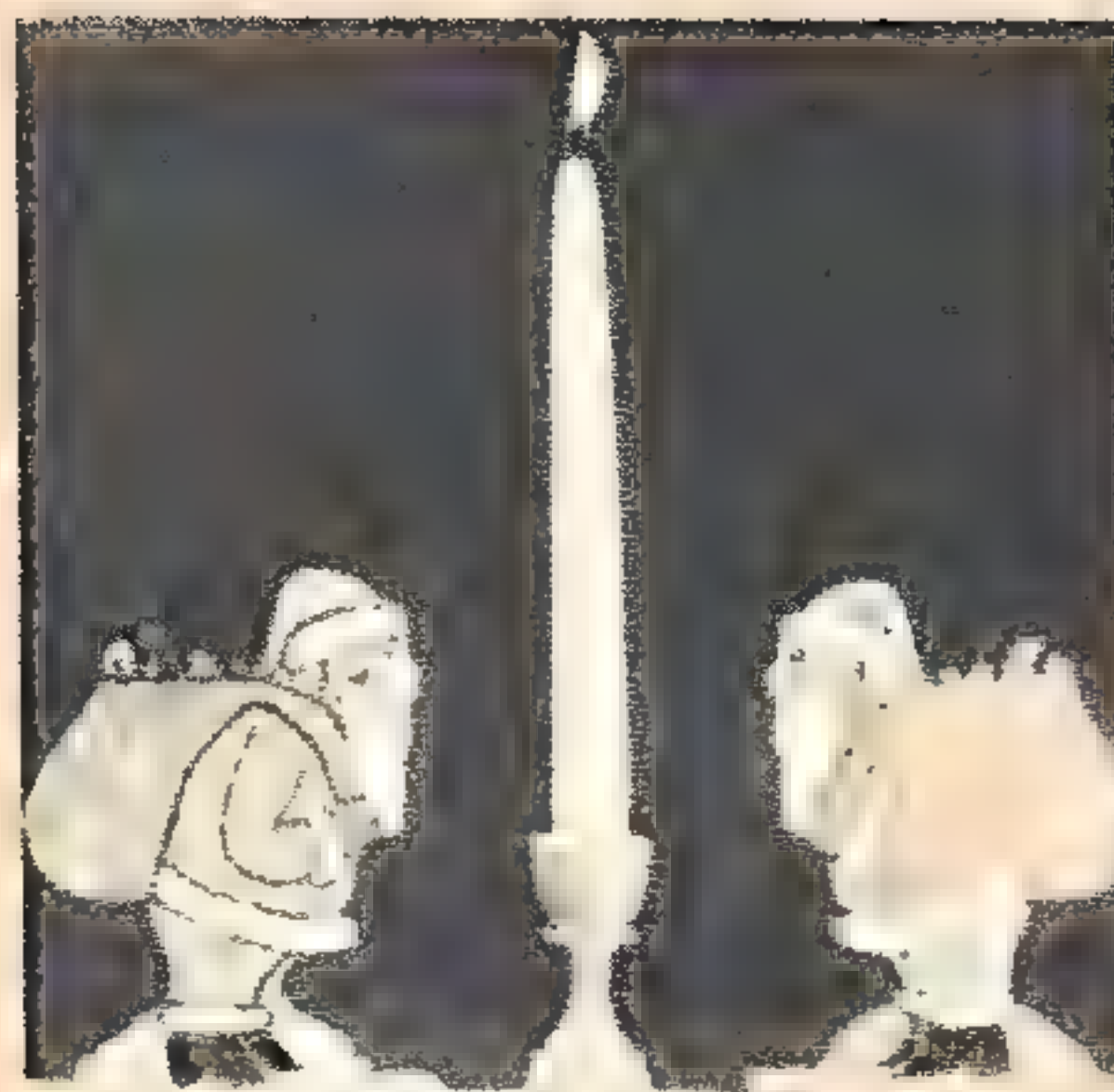
All of these holders were specially designed for the Christmas candle. They are easily and quickly constructed by cutting the parts on a small jig saw and a lathe. When carefully painted with several coats of quick drying enamel in the regulation Christmas colors of red, green, white and silver, these candle holders make exceptionally attractive and appropriate center-piece decorative units for the Christmas table, or for the mantel shelf.

Cut the parts from white pine and three-ply paneling, following a design unit similar to those in the illustrations.

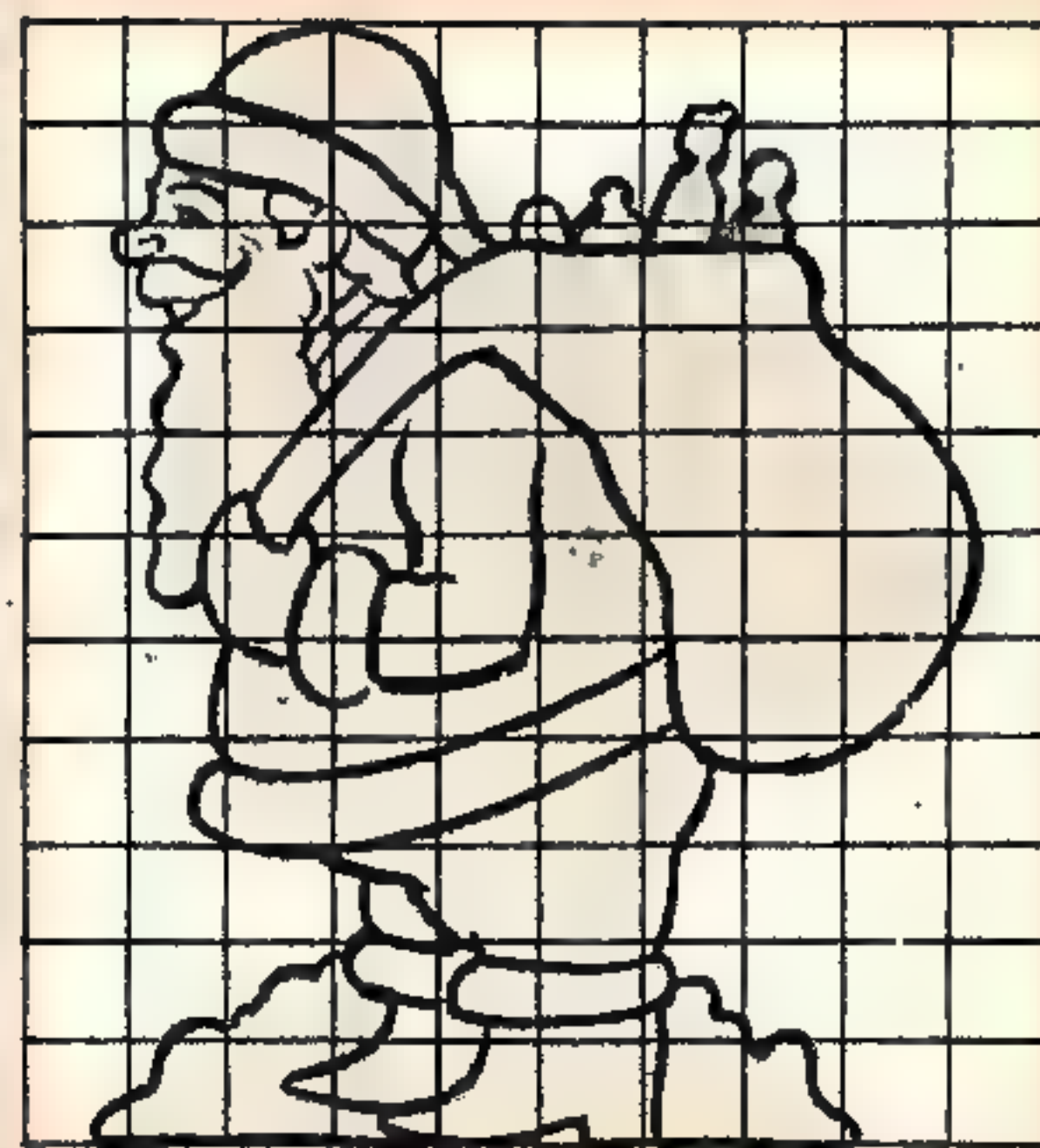
To lay out a perfect 5-pointed star, scribe a circle

The jolly Santa Claus characters shown below are cut from thin plywood and attached to a $\frac{3}{4}$ -inch pine base.

"A" the desired size. Divide the diameter into $\frac{1}{4}$ -points F, B, C, L and I. Scribe the



A black and white illustration of a family of five gathered around a dining table for a holiday meal. A woman stands at the head of the table, lighting a candle in a small house-shaped holder. The table is set with plates, glasses, and a large roasted bird. The word 'Holiday' is written in a large, stylized font at the top left.



The Santa Claus candle holders pictured on the opposite page are made from either this pattern or the one illustrated below. Before mounting, paint figures.

The stars required for the decorative unit are then cut on a jig saw. Stars cut from 3-ply paneling may be cut four to six at one

Note that a $\frac{3}{4}$ -inch center hole for the candle butt is bored in the plywood before the design is cut.

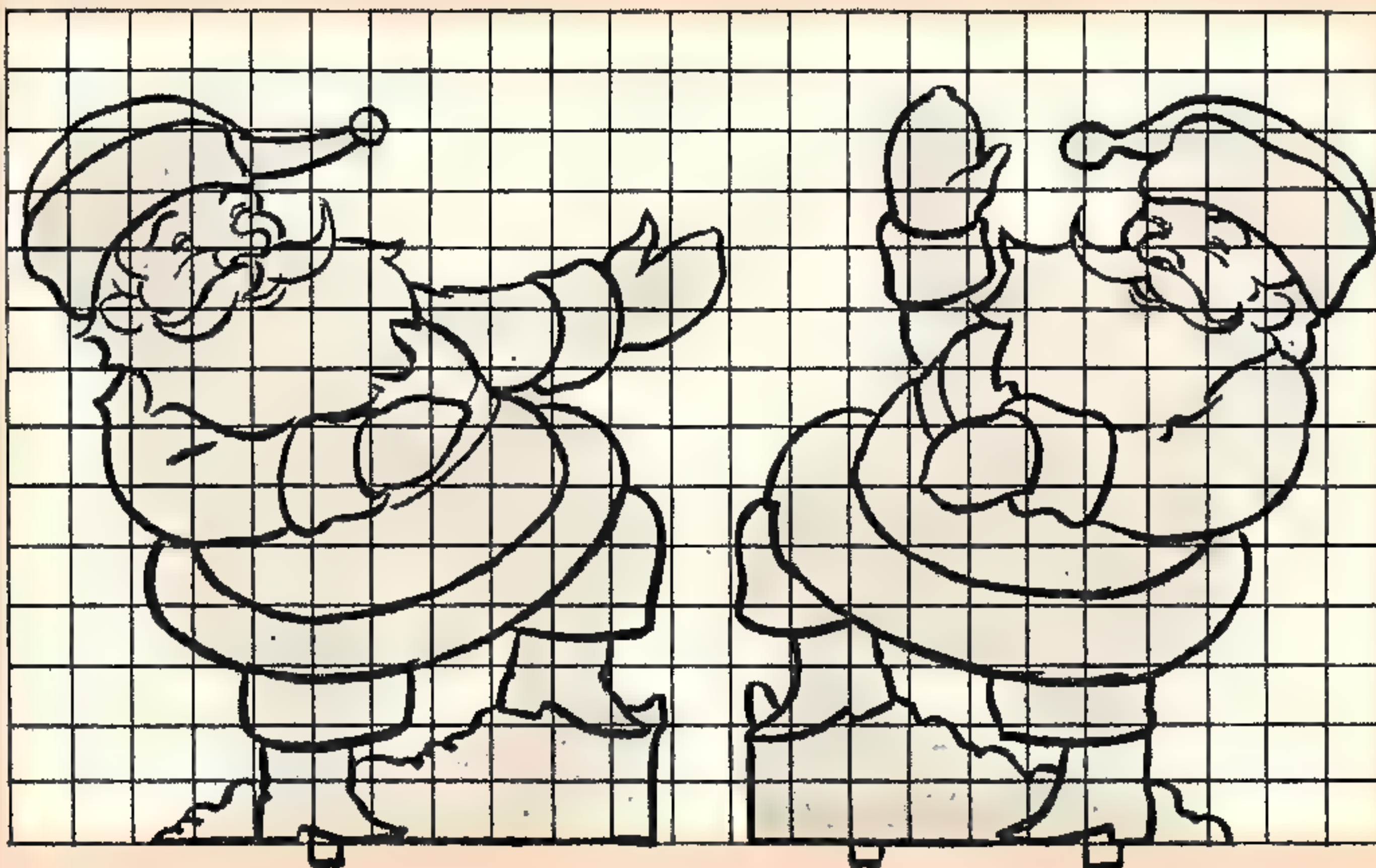
A combination of stars, mounted on a base-board, or elevated slightly with round up-rights, makes attractive decorative units for three or more Christmas candles. The base is enameled glossy red, the stars glossy white

and the trees a combination of bright reds, greens, yellows and silver.

[Continued on page 126]



Left—Before cutting the star candle holder to shape, drill a hole in the center of the plywood block large enough to accommodate the tall white or red Yuletide taper.



The craftsman can vary the antics of the Santa Claus characters by making several different kinds. In each instance they are made to 1/2-inch squared patterns, laid out on tissue paper or sketched directly on the wood. The characters are then cut to shape, sanded, painted and attached to the base.

COMBINING the beauty of natural walnut with shining brass fittings, this useful and attractive nut bowl and mallet allows the craftsman to display his skill twofold.

While both a wood and a metal turning lathe were used in making the original set, the potential constructor will not be handicapped if he does not possess the latter piece of shop equipment. Lacking a metal lathe, the mallet rings can be cut to the required $\frac{1}{2}$ -inch height from brass tubing and shrunk to fit over the ends of the walnut mallet head. Otherwise, the mallet may be turned in its entirety from solid brass. A form of opening flower motif is imparted to the bowl although its size prevents this idea

from being obvious. However, the lines are distinctive and very appropriate.

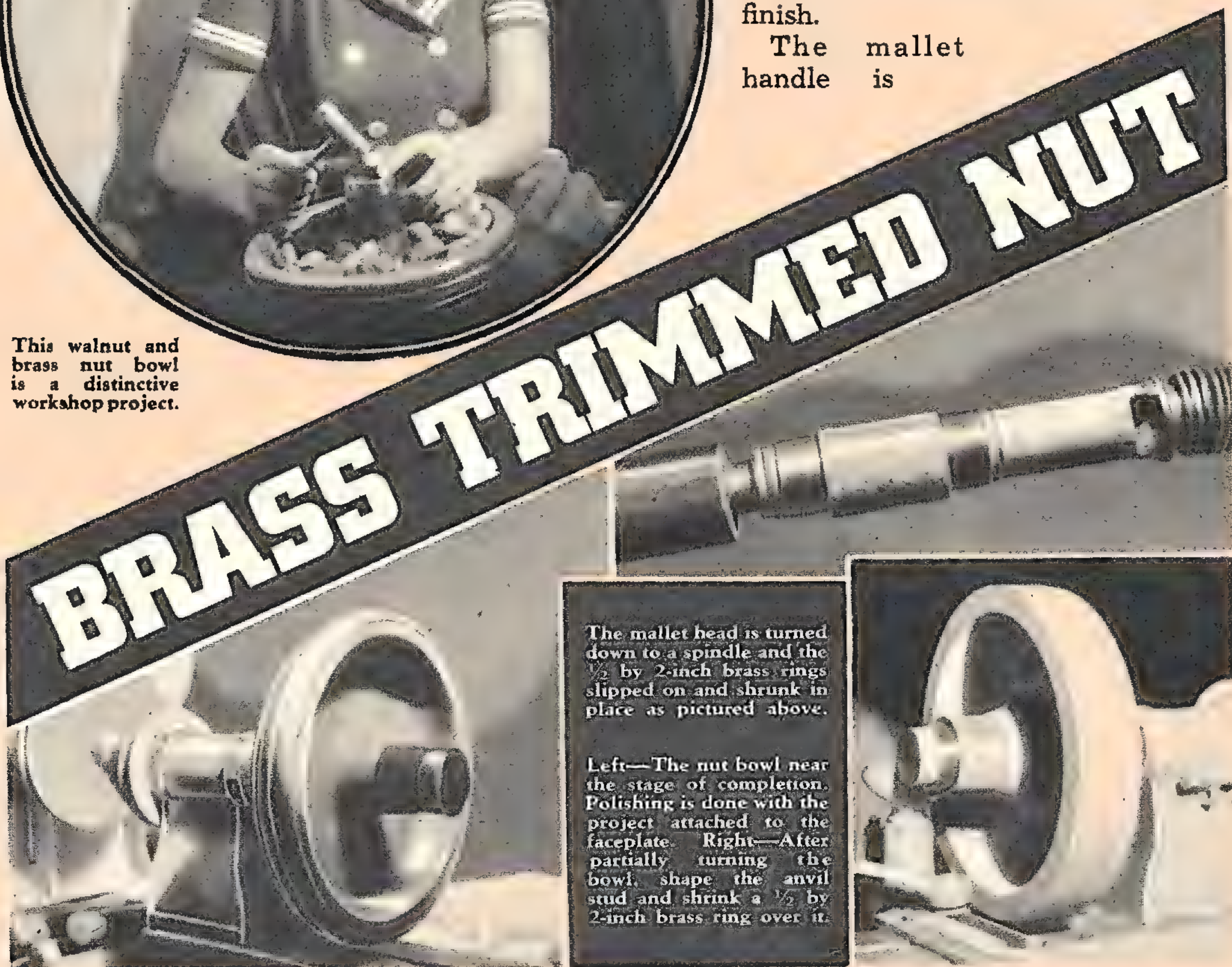
Turn the bowl from a block 2 inches thick and slightly more than 10 inches in diameter. Before the center spindle is turned down to exact diameter, bore a $\frac{1}{2}$ -inch hole, 1-inch deep in its center, make a similar hole in a block of walnut or other appropriate wood with the grain running vertically. Glue the flat and also the dowel joints, bring the tail stock center tight against the piece and let the glue set.

Get and smooth a ring of brass about $\frac{1}{16}$ -inch thick, $\frac{1}{2}$ -inch wide and 2 inches in diameter. First turn down the top of the upright so the ring barely starts on. This turning should have a slight taper. Tap it snug, start the lathe and, holding a block of wood against the brass, make it quite hot by rubbing. This expands the brass so that it can be driven tightly against the shoulder before cooling. The whole bowl is then gone over lightly, turned to shape, sanded, rubbed and finished. Lacquer, shellac or varnish, which is later rubbed with No. 000 steel and finally polished with wax, provides a good finish.

The mallet handle is

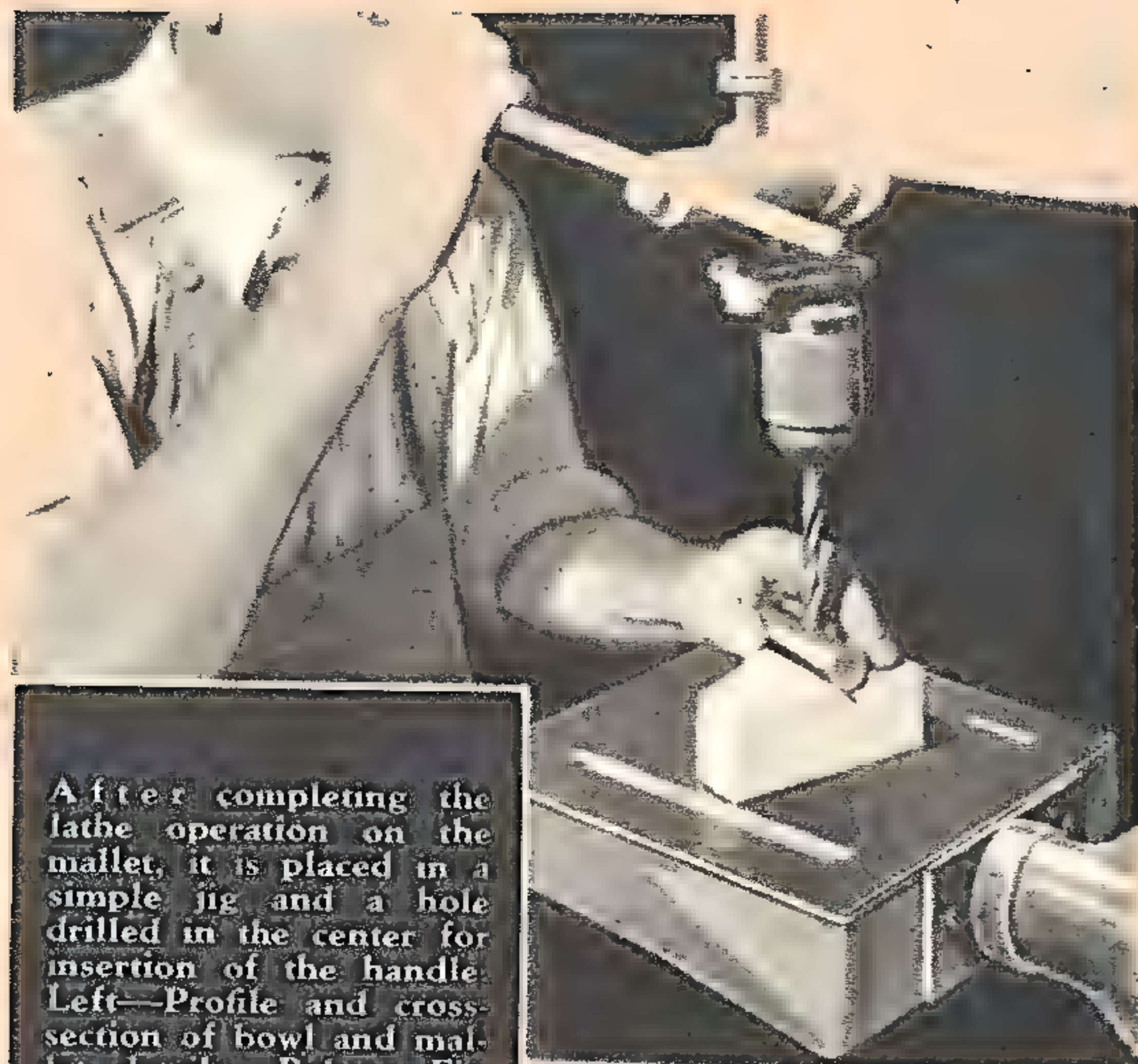


This walnut and brass nut bowl is a distinctive workshop project.



The mallet head is turned down to a spindle and the $\frac{1}{2}$ by 2-inch brass rings slipped on and shrunk in place as pictured above.

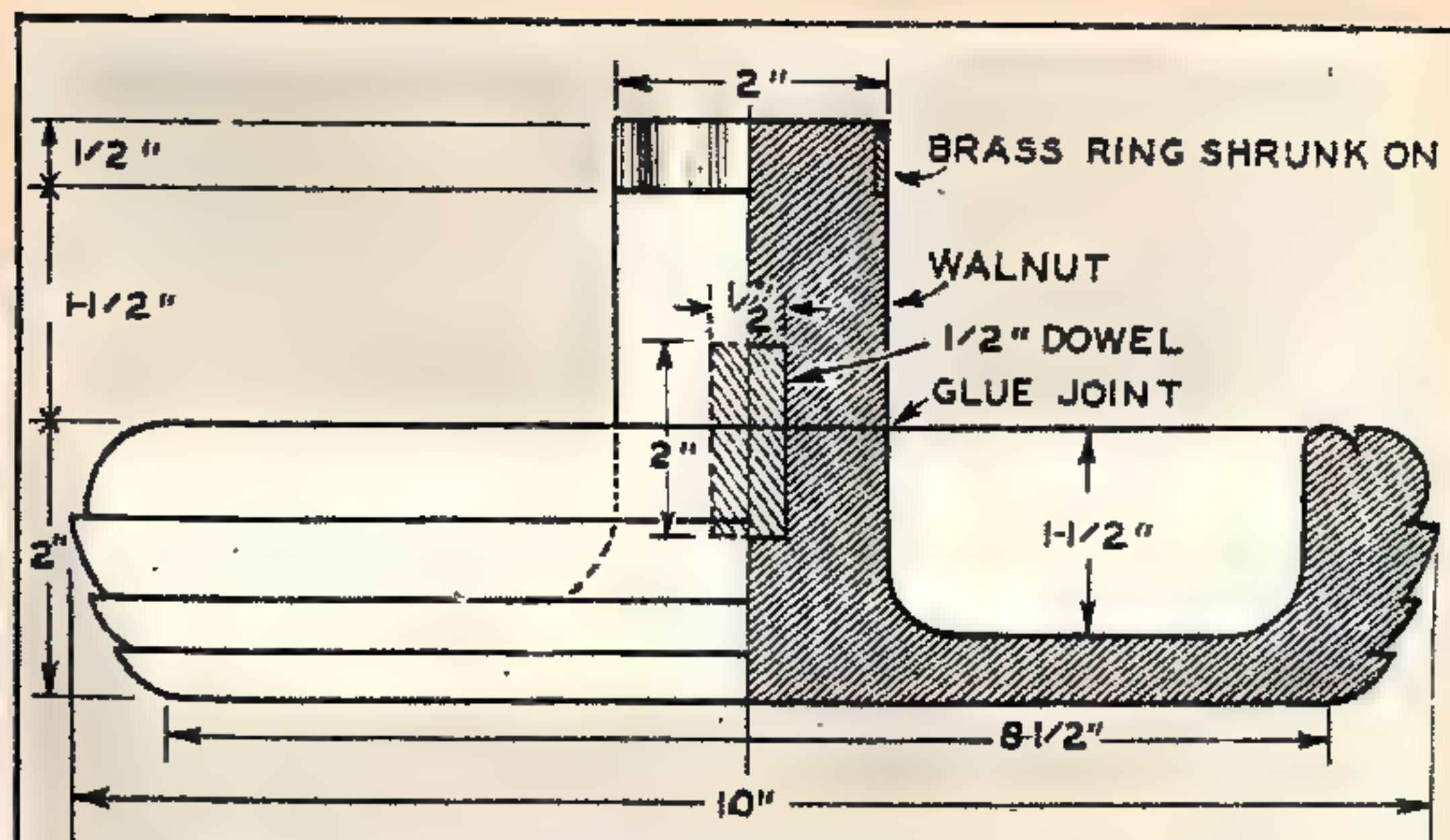
Left—The nut bowl near the stage of completion. Polishing is done with the project attached to the faceplate. Right—After partially turning the bowl, shape the anvil stud and shrink a $\frac{1}{2}$ by 2-inch brass ring over it.



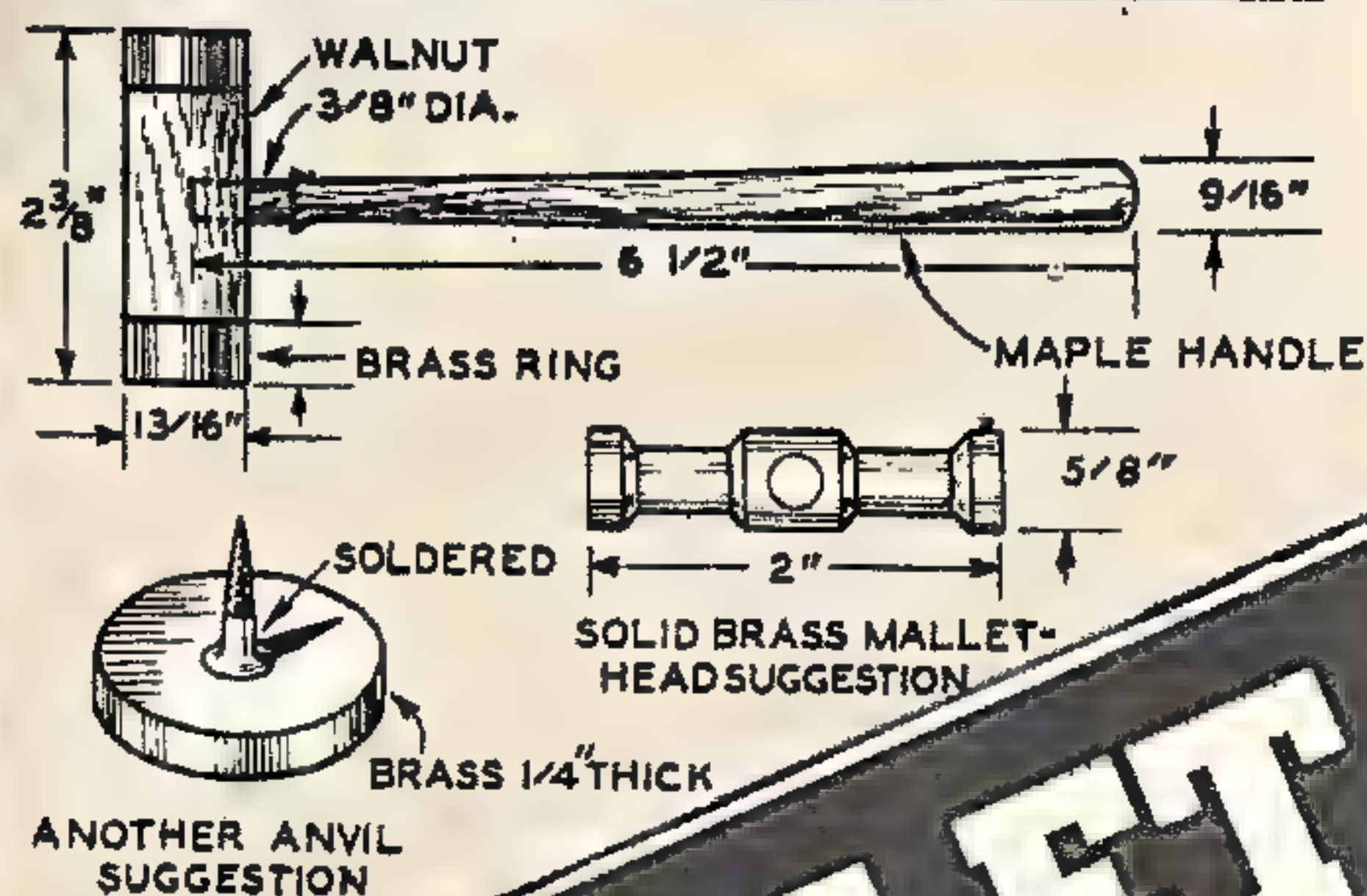
After completing the lathe operation on the mallet, it is placed in a simple jig and a hole drilled in the center for insertion of the handle. Left—Profile and cross-section of bowl and mallet details. Below—Fitting the maple handle to the brass trimmed mallet.



BOWL AND MALLET



BRASS TRIMMED NUT BOWL AND MALLET



ANOTHER ANVIL SUGGESTION

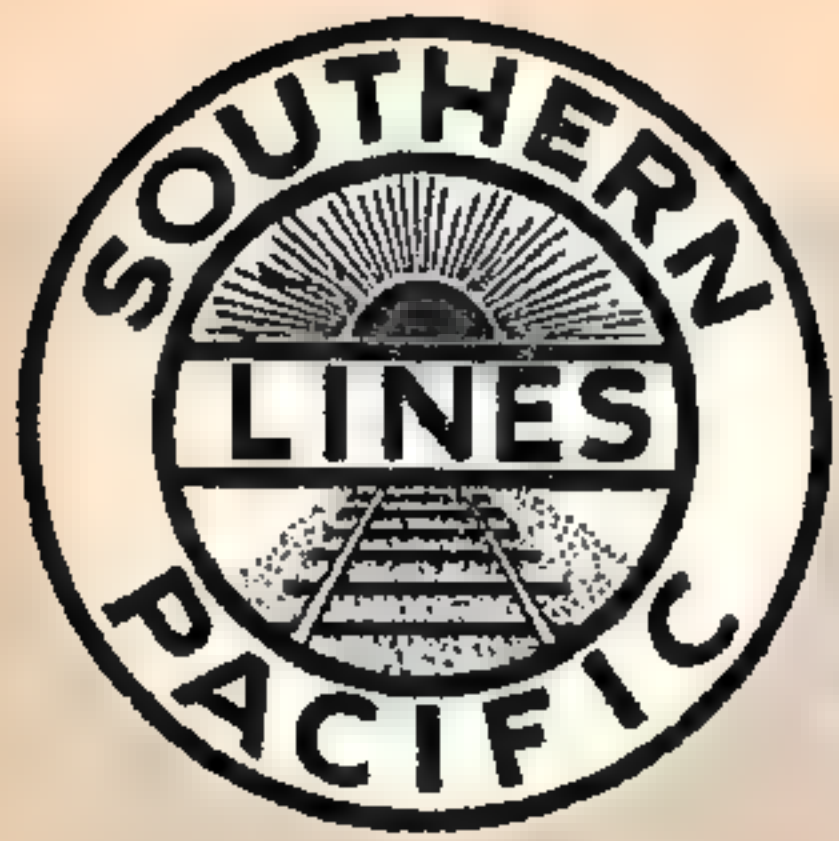
turned to shape from a maple dowel. The head is turned down to a spindle and the brass ferrules of brass to $\frac{1}{16}$ -inch in width, diameter and wall thickness shown. In the same manner as was described above, the brass rings are heated and driven to a tight fit.

For the walnut, filler should of course be used to fill the grain before applying the finish. The whole unit can be made entirely of walnut, or the bowl can be turned from figured gum or birch, while the mallet and top half of the center spindle, or "anvil," can be of walnut to provide a pleasing contrast.

Completed this bowl will take two pounds of nuts without appearing over full. It is an ideal wintertime project and, of course, has commercial angles which the enterprising home shop owner can work out to his advantage.

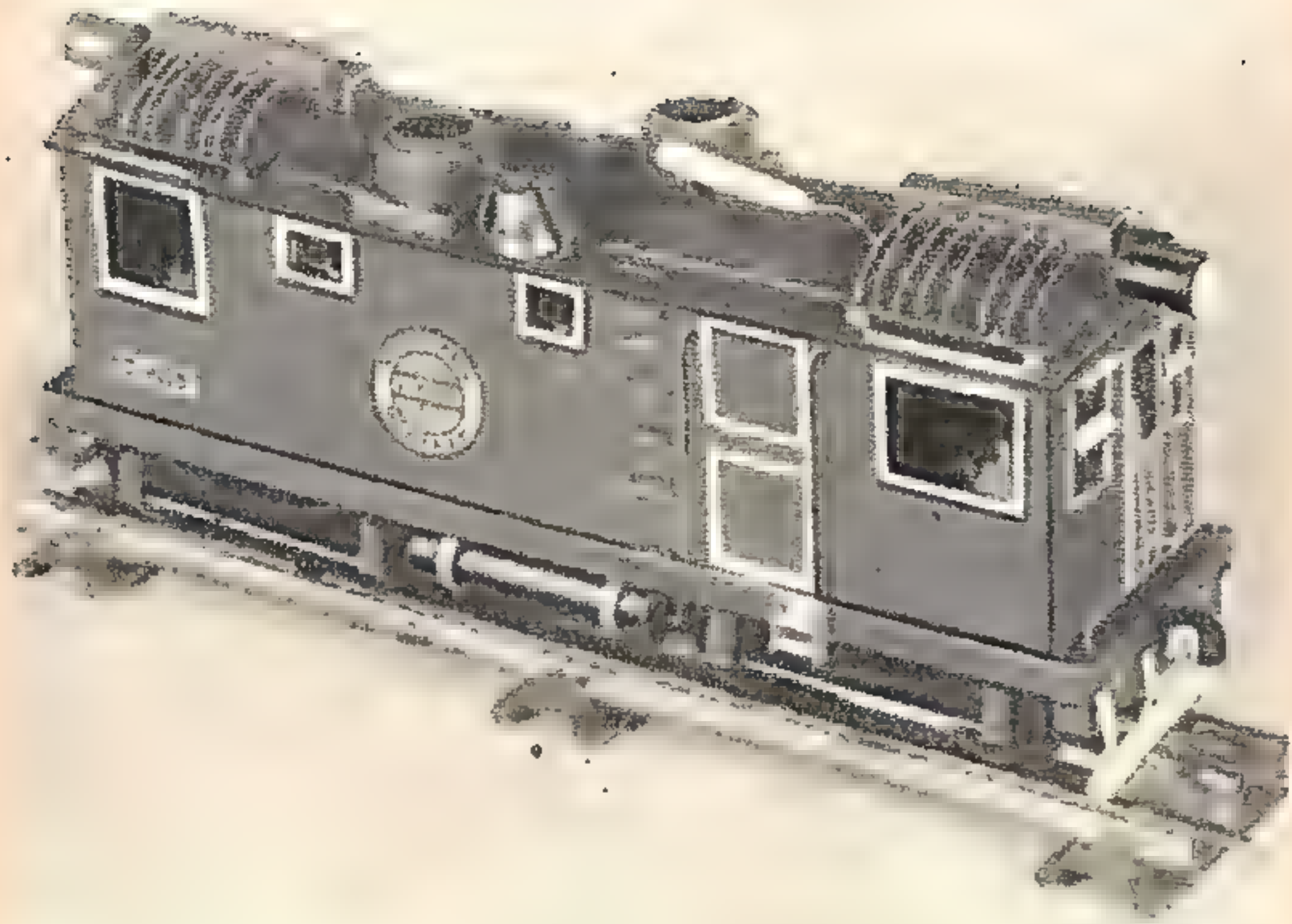
If a solid brass mallet head is used, it can be of the same dimensions as the brass trimmed wood head shown, or shanks can be turned between head center and the end faces. Another way to provide a neat brass trim is to dispense with the glued-up center block by soldering a large, flat head wood screw to the under side of a brass disc about $\frac{1}{4}$ -inch thick and turn the screw into a hole drilled in the original center portion. This will make the anvil just $\frac{1}{4}$ -inch higher than the bowl rim, but the heavy metal will not blemish with use as much as will the end grained hardwood block. When this arrangement is used the center hole must be slightly countersunk to accommodate the screwhead so as to permit the brass disc to fit tightly against the wood. The protruding edges of the solid brass are then turned down flush with the wood center and finished in the usual way.

by Dale R. Van Horn



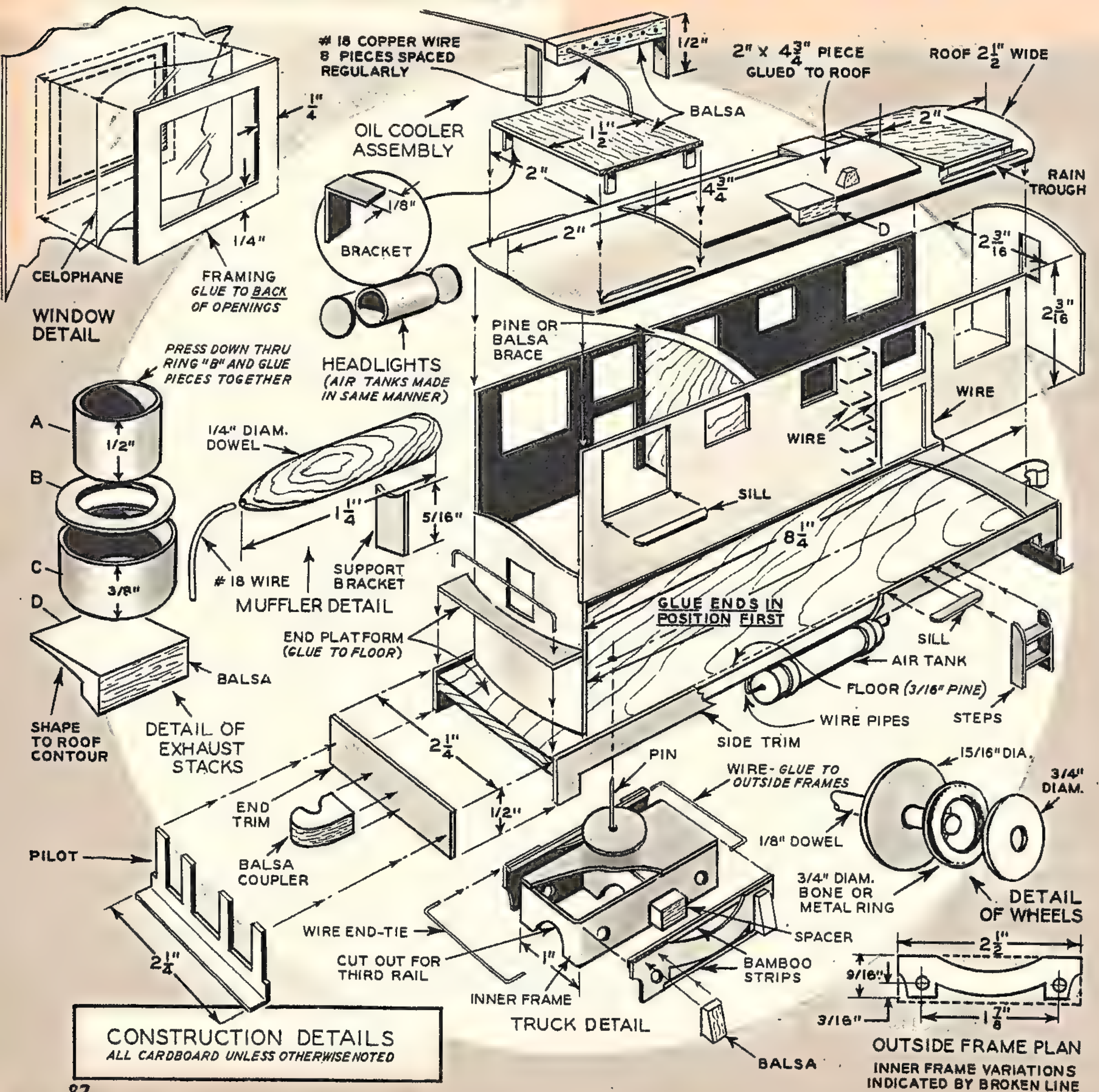
An "O" Gauge Oil-

OF CARDBOARD



THE model locomotive presented here is of all cardboard and wood construction, even down to the trucks, its total cost being in the neighborhood of twenty cents.

The materials, with the exception of glue and cardboard, were bought in the five and ten. However, the trucks may be purchased complete with a motor and the rest of the construction built up of cardboard from "O" gauge plans given here. Metal may be used in place of the cardboard and wood.



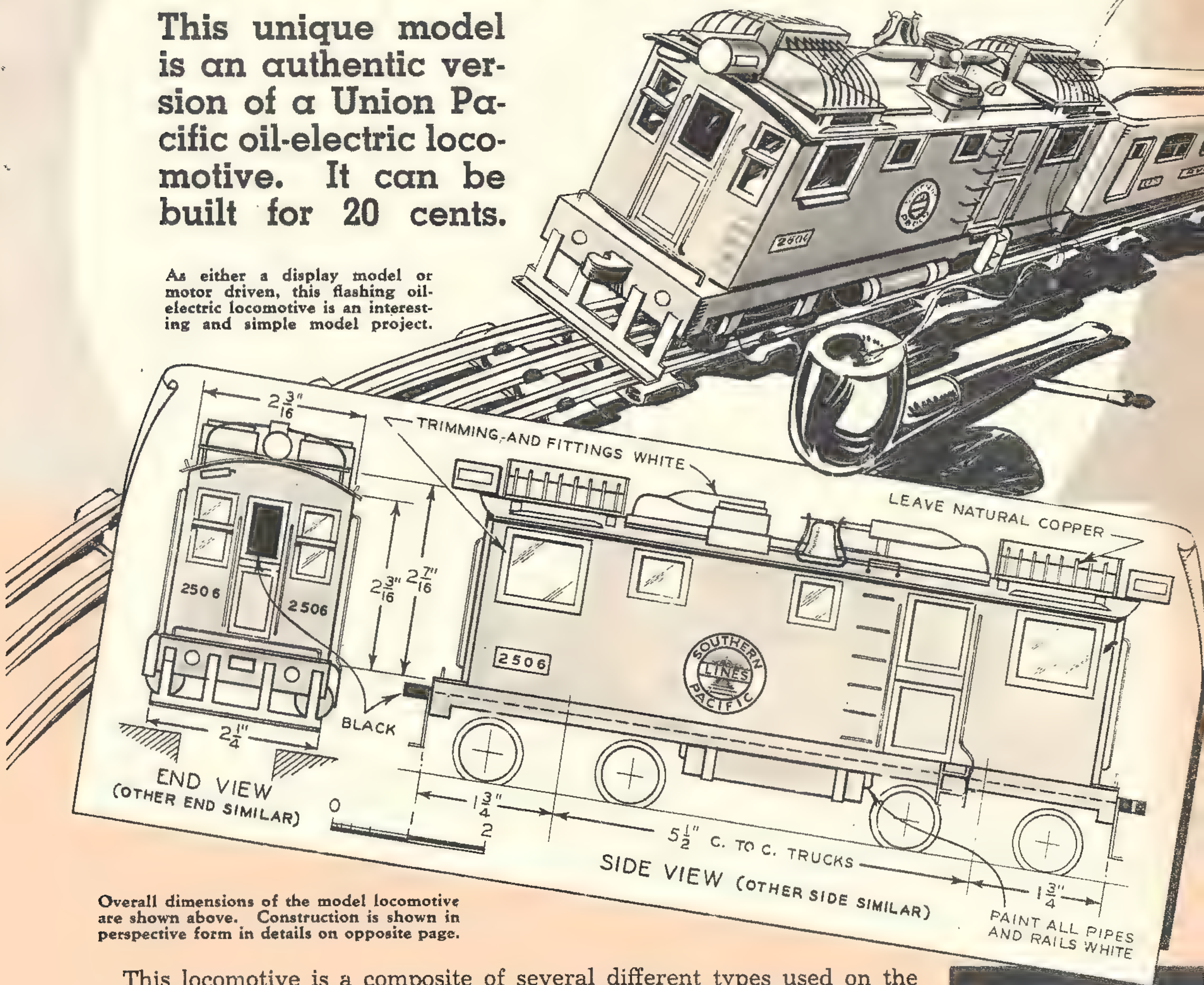
Electric Locomotive

CONSTRUCTION

by Herbert Lozier

This unique model is an authentic version of a Union Pacific oil-electric locomotive. It can be built for 20 cents.

As either a display model or motor driven, this flashing oil-electric locomotive is an interesting and simple model project.



Overall dimensions of the model locomotive are shown above. Construction is shown in perspective form in details on opposite page.

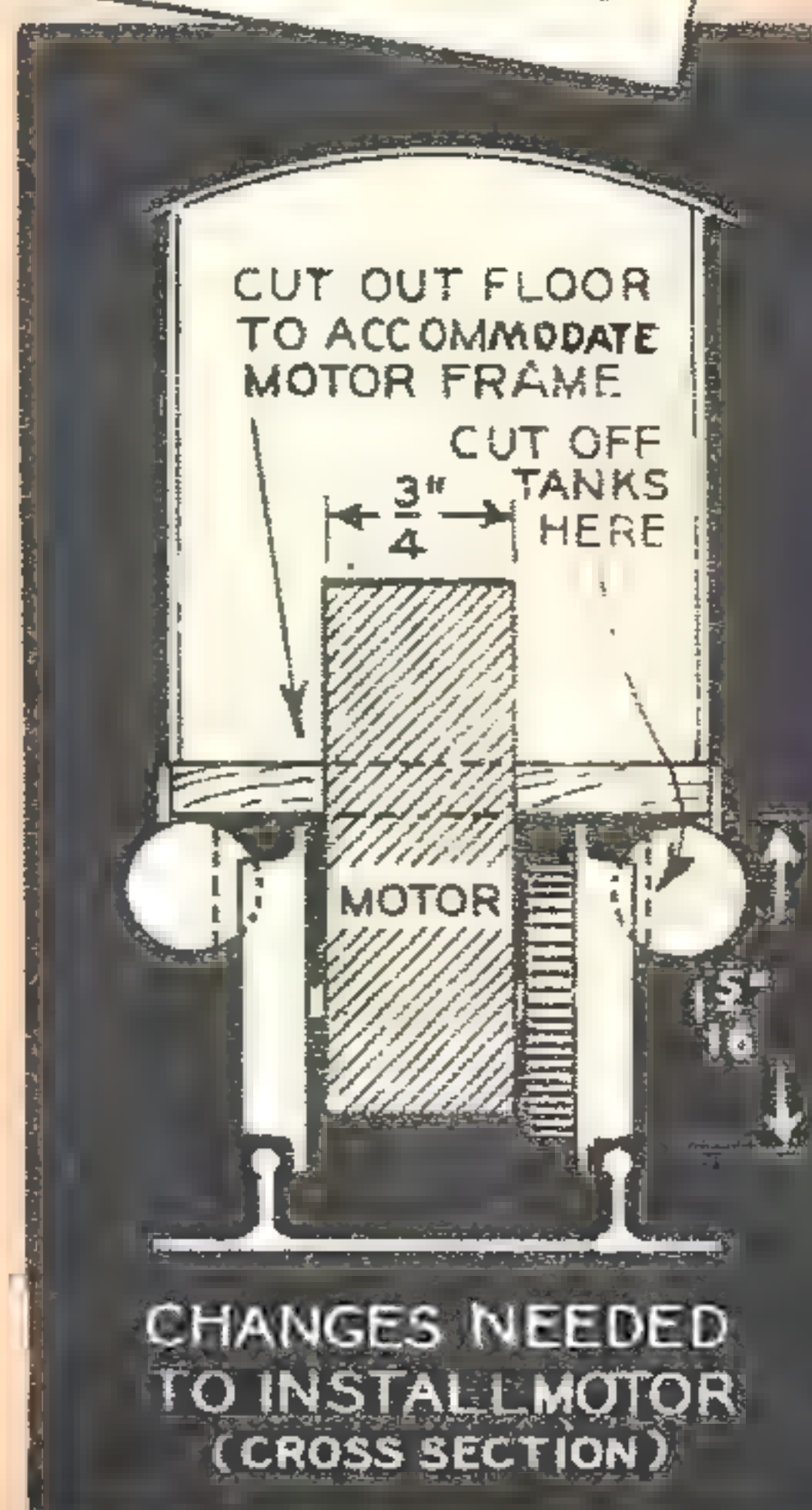
This locomotive is a composite of several different types used on the roads. Either the mufflers or exhaust stacks may be left off at will, depending upon the builder's creative desires.

Begin the model by making the trucks, building them up on a section of "0" gauge track so as to avoid any chance of mistakes when spacing the wheels.

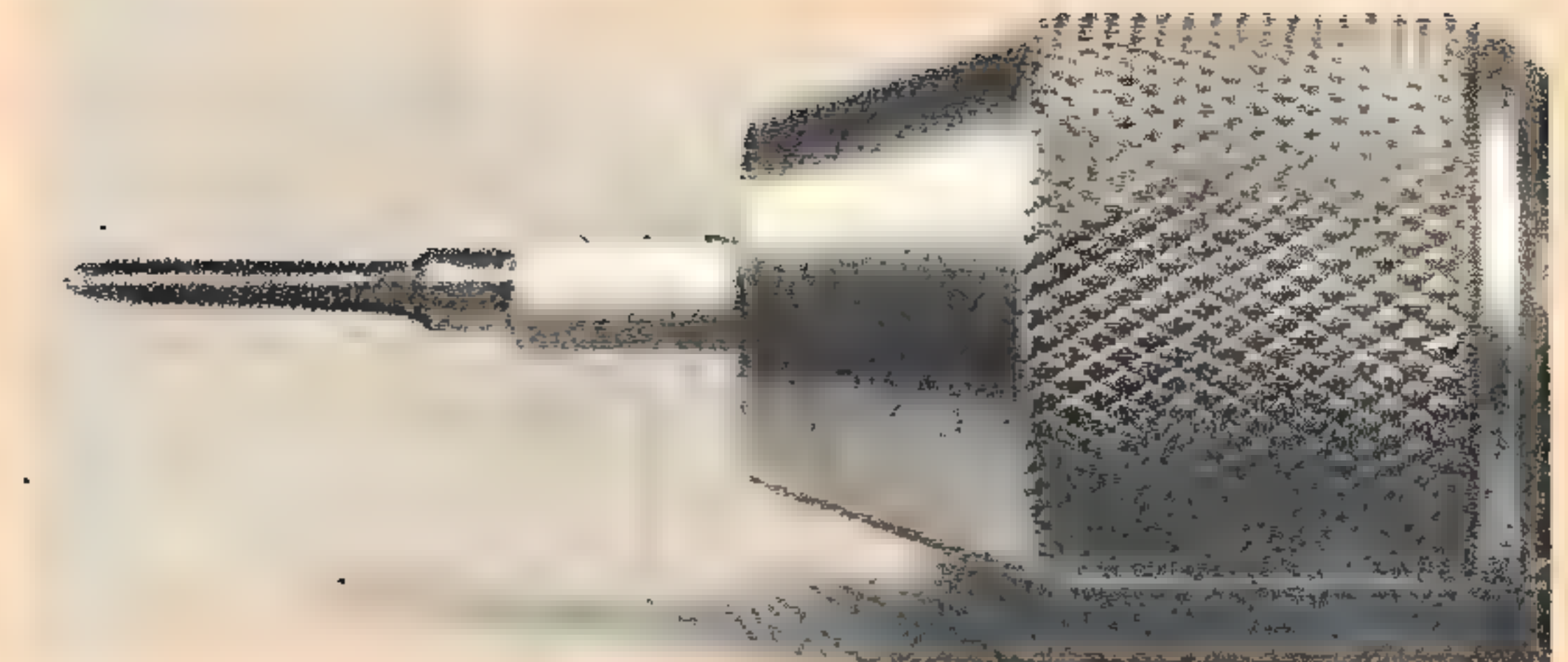
The pattern for both inside and outside frames of the trucks will be found on the accompanying plan. Make the inside first by folding the patterns over into box shape and gluing them securely at the seam. After they have dried, add the top and pivot disk.

[Continued on page 140]

The model can be fitted with a regular "O" gauge motor by cutting off the back of each tank and allowing an opening in the floor for insertion of the motor, as shown at right.



Kinks and Gadgets FOR The Home Workshop



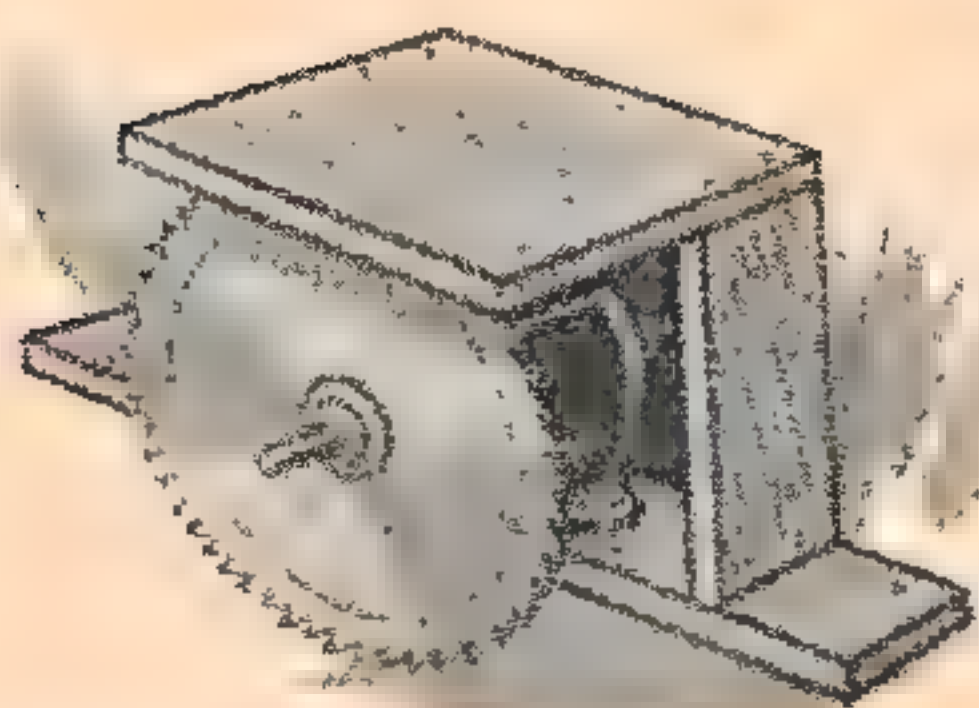
Left—A $\frac{3}{4}$ by $2\frac{1}{2}$ by 8 inch block of maple forms a handy scroll saw blade holder. Holes are drilled in the end of the block, a notch provided in the center and the holder attached to the saw arm with a strip of metal. Above—A strip of paper wrapped around taps prevents breakage from undue pressure.



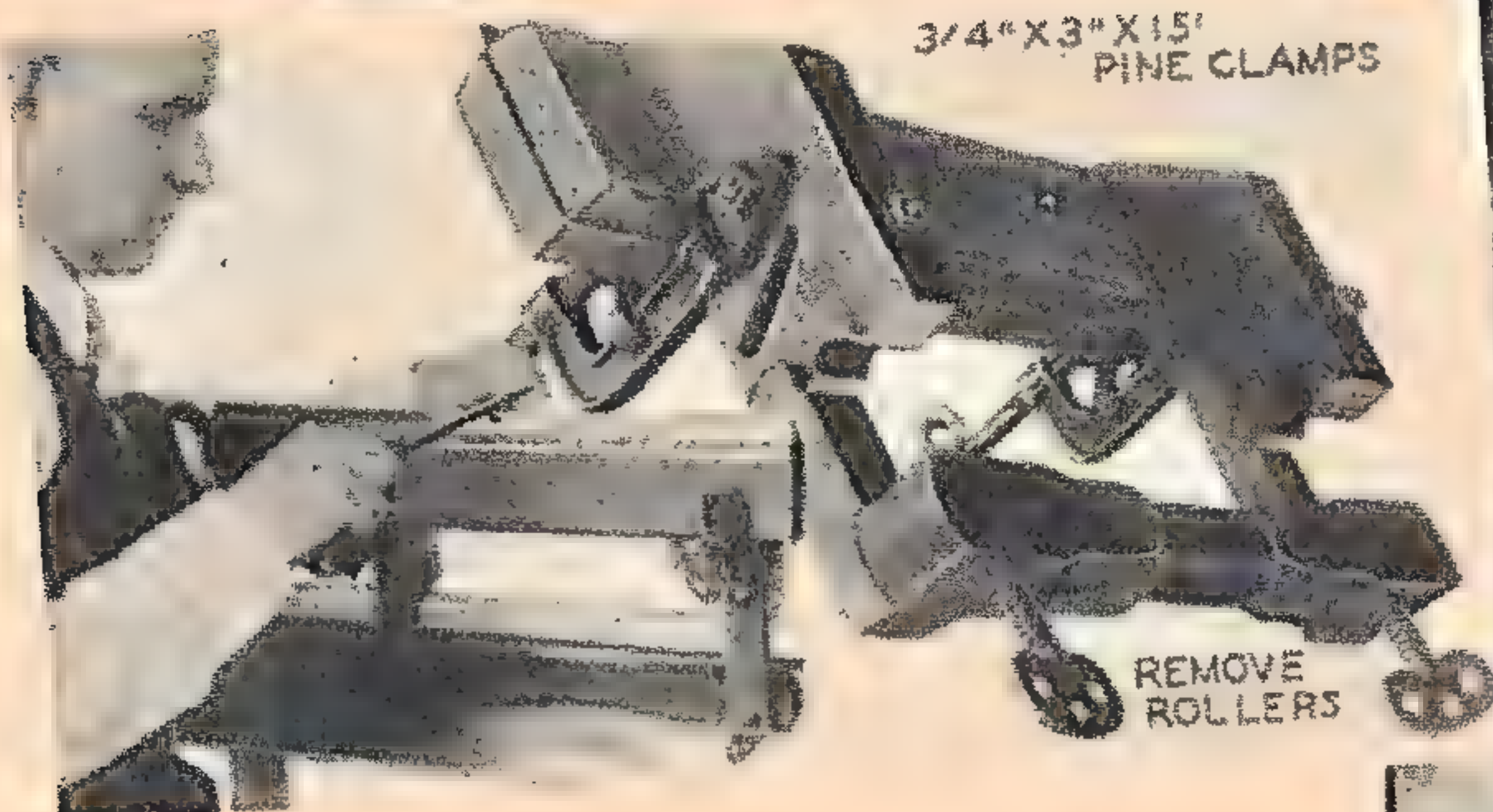
Assembled from scrap pieces of pine, the auger bit rack pictured at right makes a useful workshop accessory. The two vertical and two horizontal pieces are nailed together and four spring-type clothes pins attached to the cross members with staples. Bits can be inserted in the rack by pushing the shank against the pin jaws.



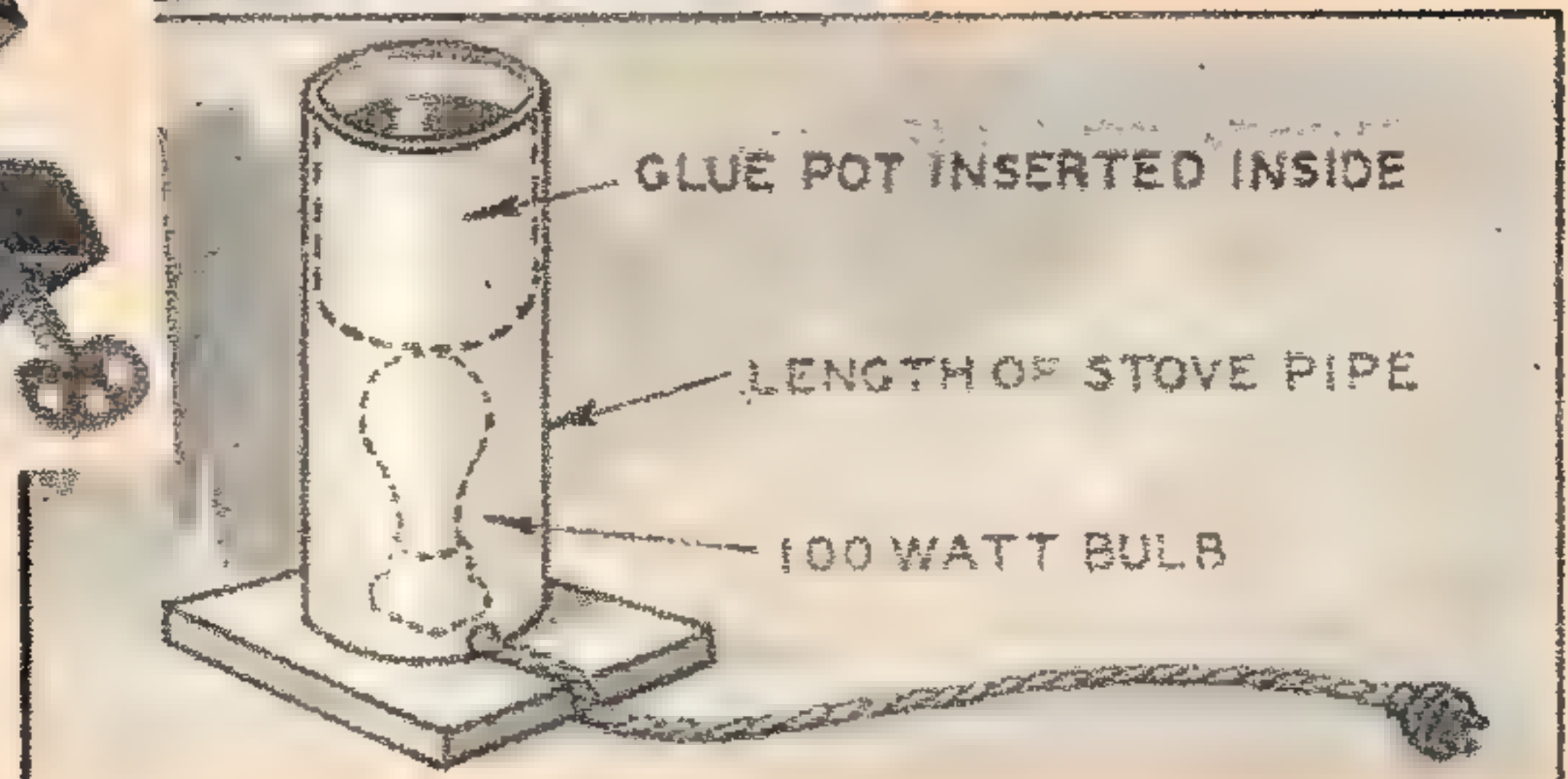
A length of stove pipe, a 100-watt bulb and a porcelain socket form this serviceable shop glue pot. Mount the socket on a wooden base, placing the stove pipe and glue container over it as described in phantom detail below.



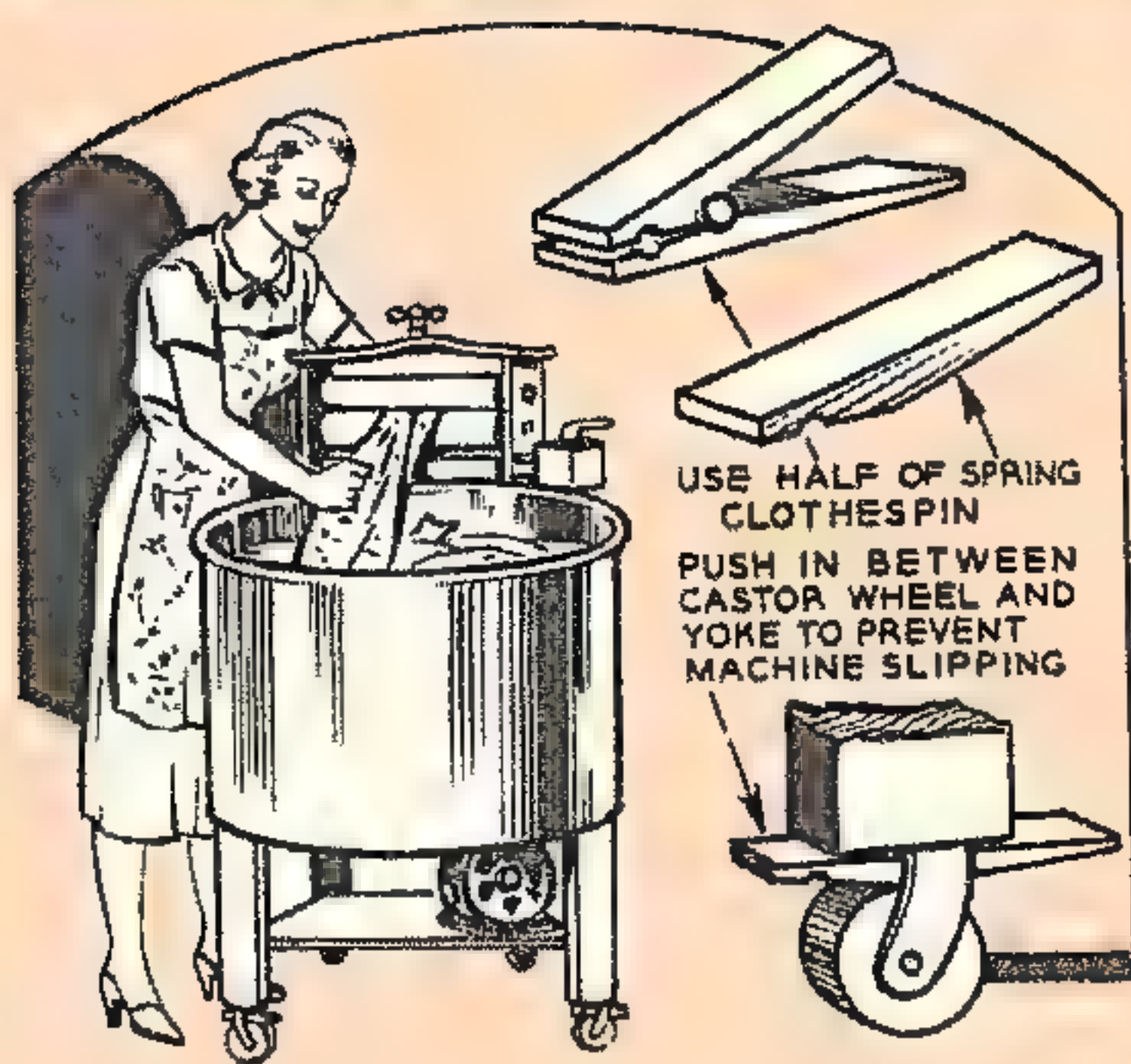
A $\frac{1}{2}$ h.p. electric motor, fitted with an arbor and circular saw and mounted in a box, as shown at left, permits sawing of lengthy lumber, uniformly straight.



An old wash wringer, from which the rollers have been removed, will find practical application as a saw filing vise. Fit the original wringer clamps with $\frac{3}{4}$ by 3 by 15 inch pine boards, cut away roller supports on one side and mount to work bench.



KINKS THAT SIMPLIFY HOME TASKS



Wedges Prevent Creeping Of Casters

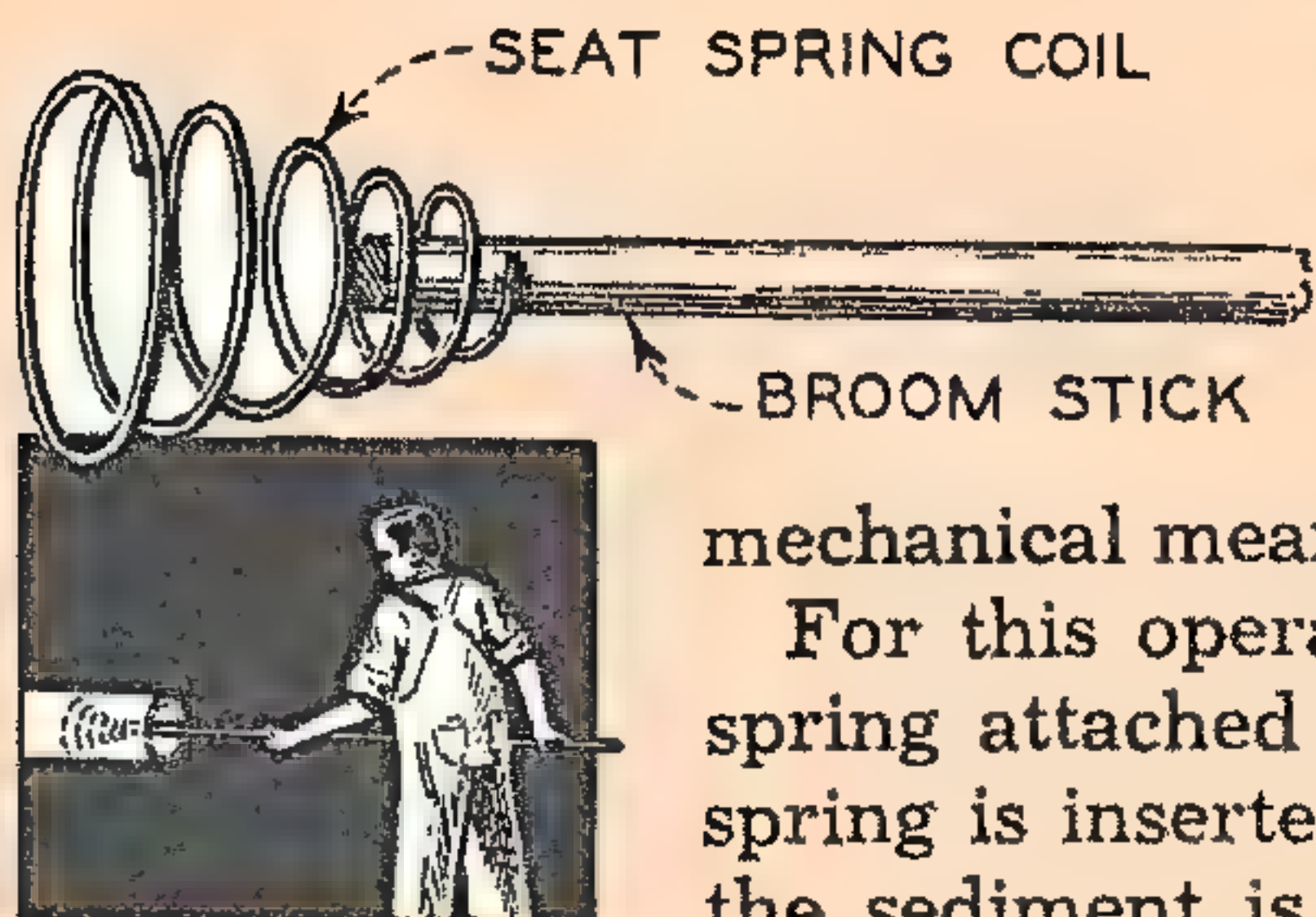
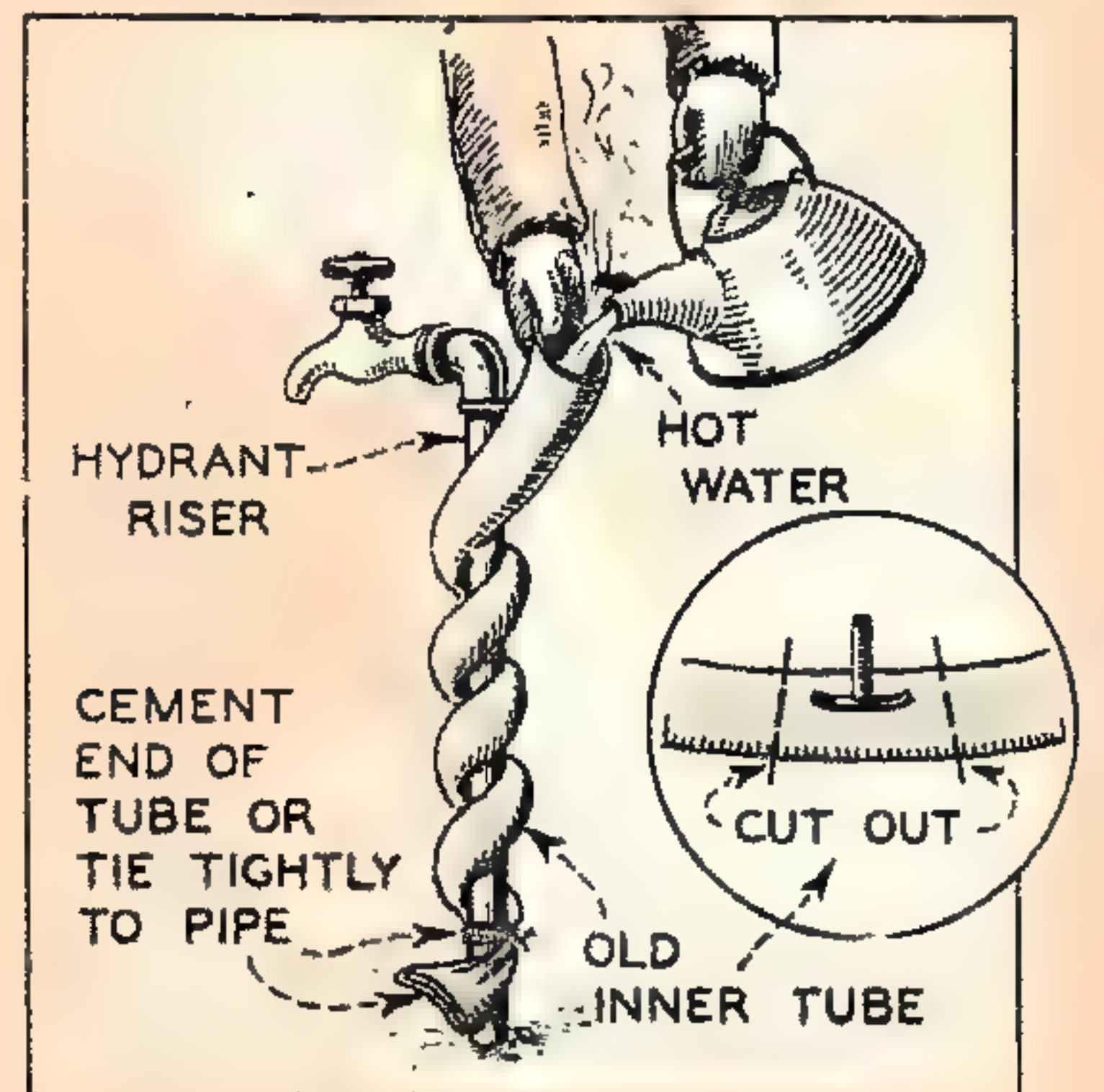
EVERY housewife knows how annoying it is to have the casters supporting an electric washing machine creep so that the washer must be pushed back to its proper location every few minutes. With the aid of a few spring-clip clothes pins, this nuisance can be permanently eliminated.

Remove the spring from the wooden jaws and insert the resulting wedge-shaped pieces between the caster wheel and yoke. The wedges will lock the casters so that the machine will remain in a fixed position.—A. H. Waychoff.

Inner Tube Aids Thawing Of Pipes

WHERE it is necessary to frequently thaw out an exposed hydrant riser, the use of an old automobile inner tube will not only do the job quickly, but at the same time, end the accumulation of ice that usually forms after the hot water, poured around the pipe, has cooled.

Cut the inner tube at the valve stem and seal up one end with tire patching cement. After the cement has been allowed to set, wrap the tube around the pipe and fill it with boiling water. In a few minutes the heat of the water in the tube will melt the ice in the hydrant, and the water will once more flow through it.



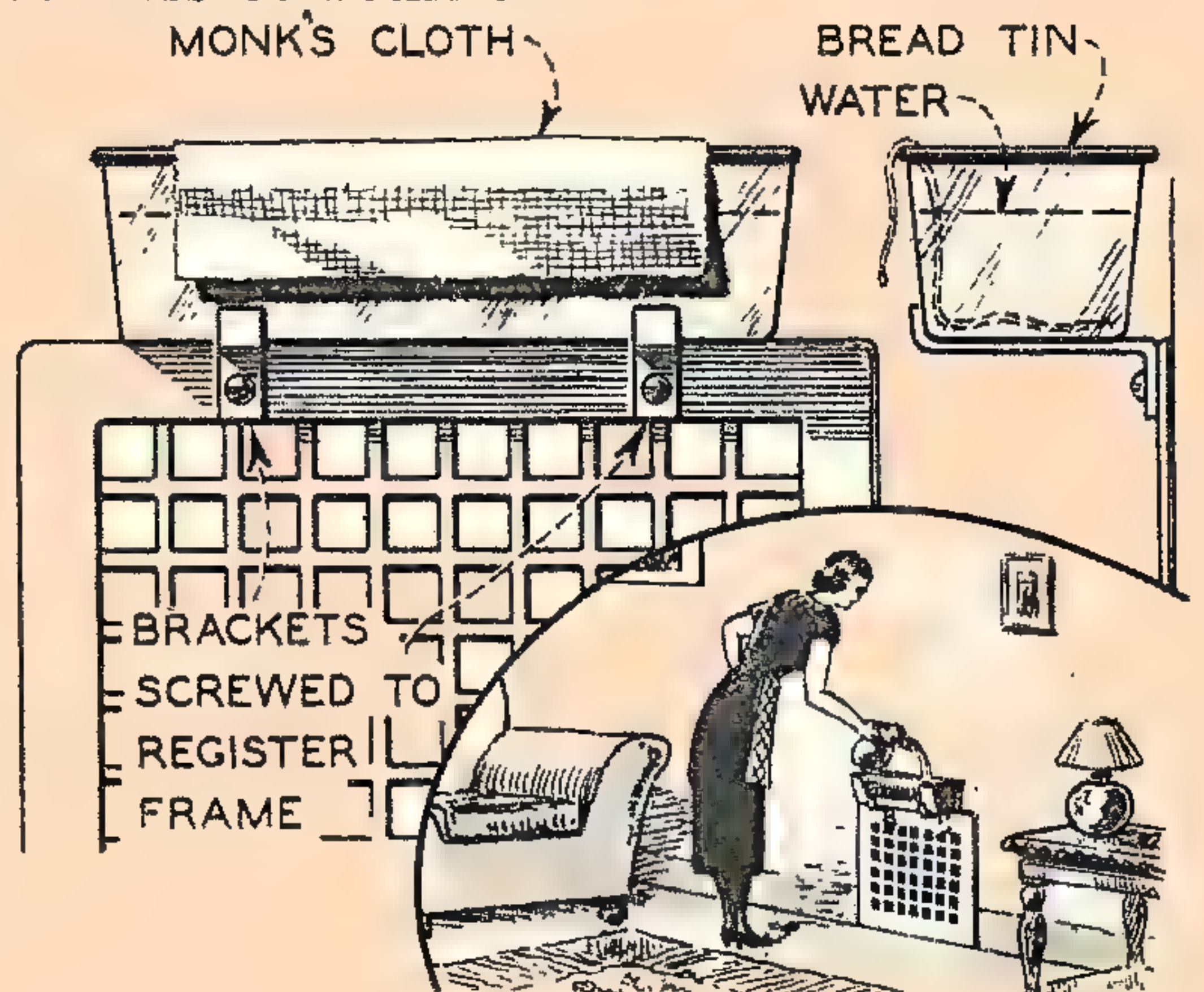
Spring Opens Clogged Drain Pipes

WHERE commercial drain cleaners fail to produce any noticeable effect on the passage of water through a clogged drain, it is advisable to remove the trap or plug and remove the accumulated sludge by mechanical means.

For this operation, nothing serves the purpose better than an old seat spring attached to a length of broom stick with small wire staples. The spring is inserted into the pipe with a twisting motion. When withdrawn, the sediment is ejected without mess or bother.

A Simple Home Humidifier

OCCUPANTS of homes heated with hot-air systems may be protected against dryness of the skin and throat by simple humidifiers installed over each hot air register. The air conditioner, illustrated at right, consists of a tin bread pan mounted over the register with strap iron brackets. A piece of monk's cloth is hung over the pan and the latter partially filled with water. The cloth is thus saturated with water so that it is drawn upward by capillary action, causing it to mix with surrounding air.—Hi Sibley.





The perforated portion of the shaker cap is removed with a sharp knife or chisel (above) and the rough ends turned down with pliers, as shown in photo below.



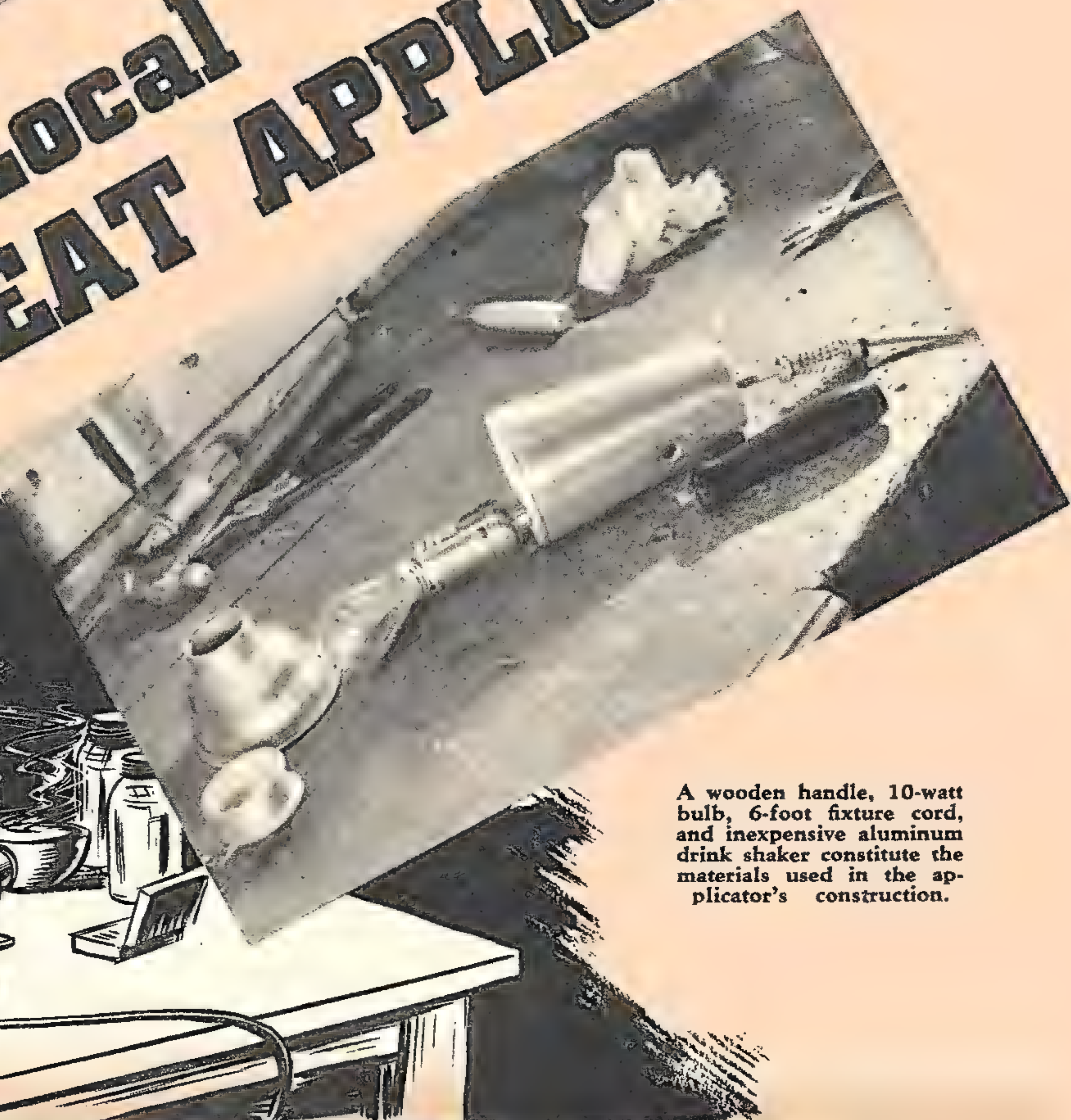
A Local HEAT APPLICATOR



THERE are many instances where it would be convenient to apply a moderate degree of heat to a small area. Keeping small quantities of paraffin warm in the microscope laboratory, rapid drying of small objects or areas, instances where a hot water bottle might be used but where ordinary bottles are too large and clumsy—these are but a few examples.

For such work, the simple and inexpensive lamp illustrated will be found useful. The lamp, the general idea for which was originated by G. F. Prideaux, a Cleveland, Ohio, lighting engineer, consists of a 10-watt bulb enclosed in a metal housing that concentrates the heat and light rays at one small spot, about the size of a silver dollar.

For assembling the heat applicator the following materials, most of which can be obtained at a local hardware or dime store, will be required: 1 brass socket for standard medium screw base bulb, preferably keyless; a $\frac{1}{2}$ to 1-inch piece of brass tube, threaded to fit socket hole; 1 nut



A wooden handle, 10-watt bulb, 6-foot fixture cord, and inexpensive aluminum drink shaker constitute the materials used in the applicator's construction.



For Home And Shop Use

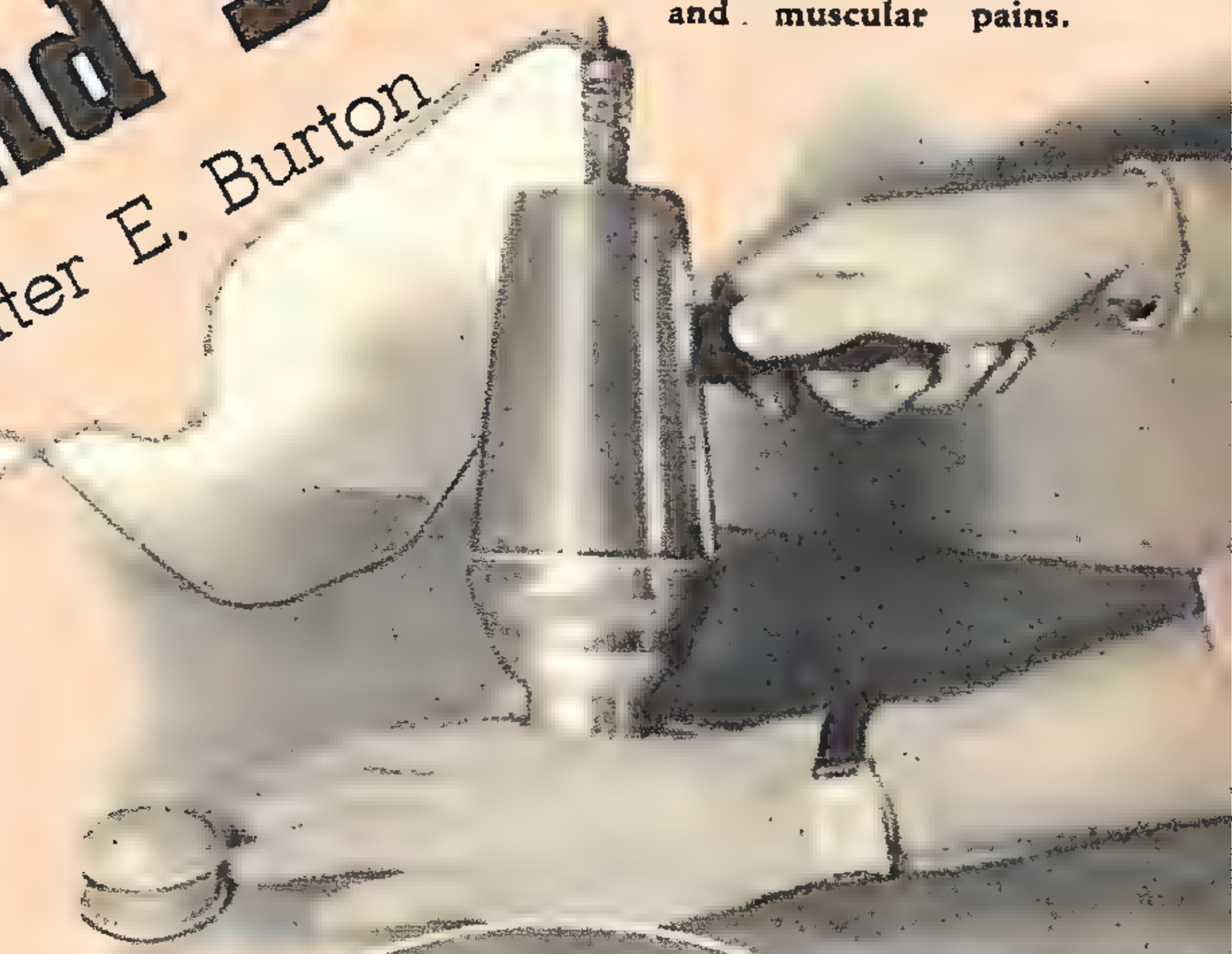
by Walter E. Burton

One of the applicator's many uses: an aid in relieving rheumatic and muscular pains.

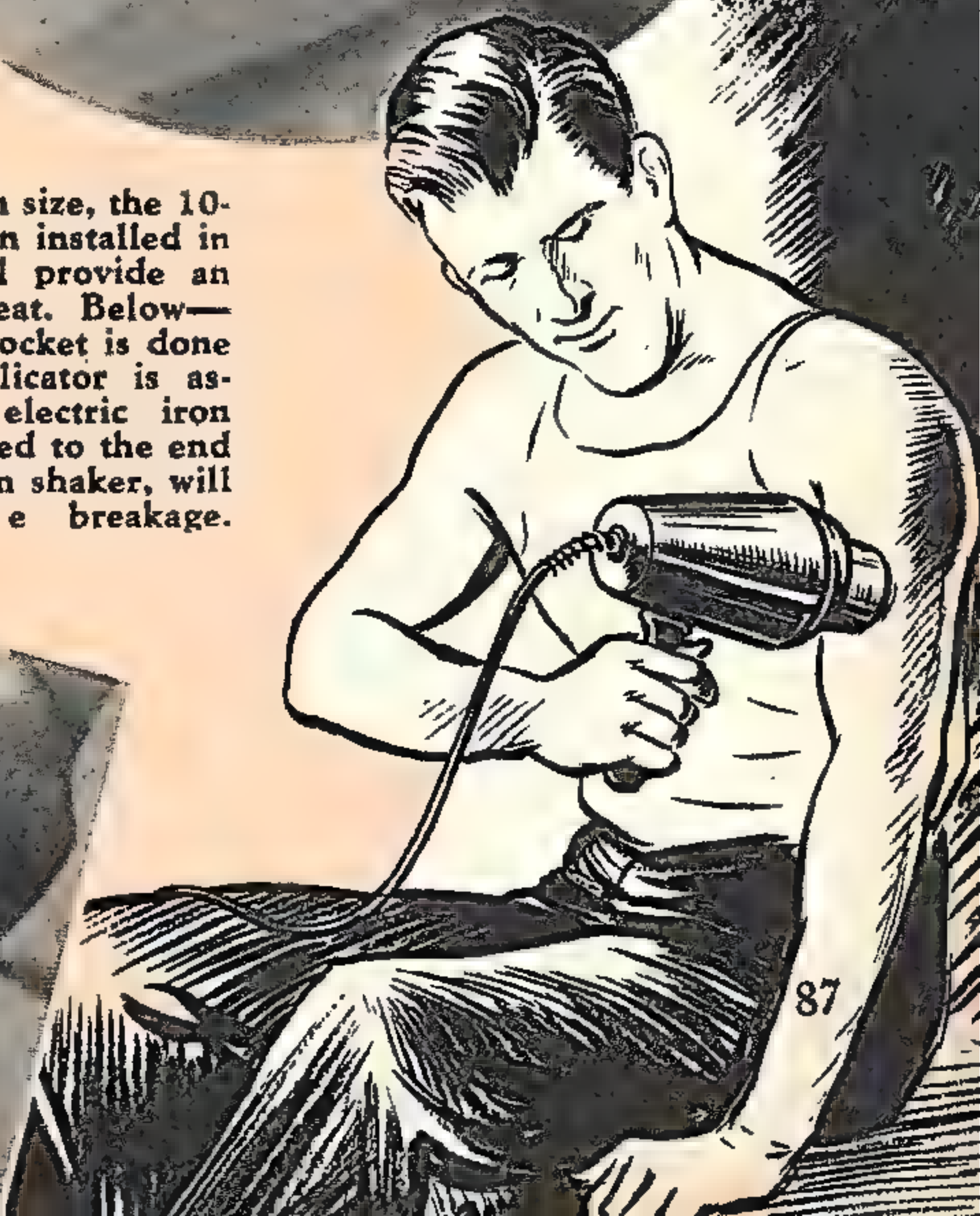
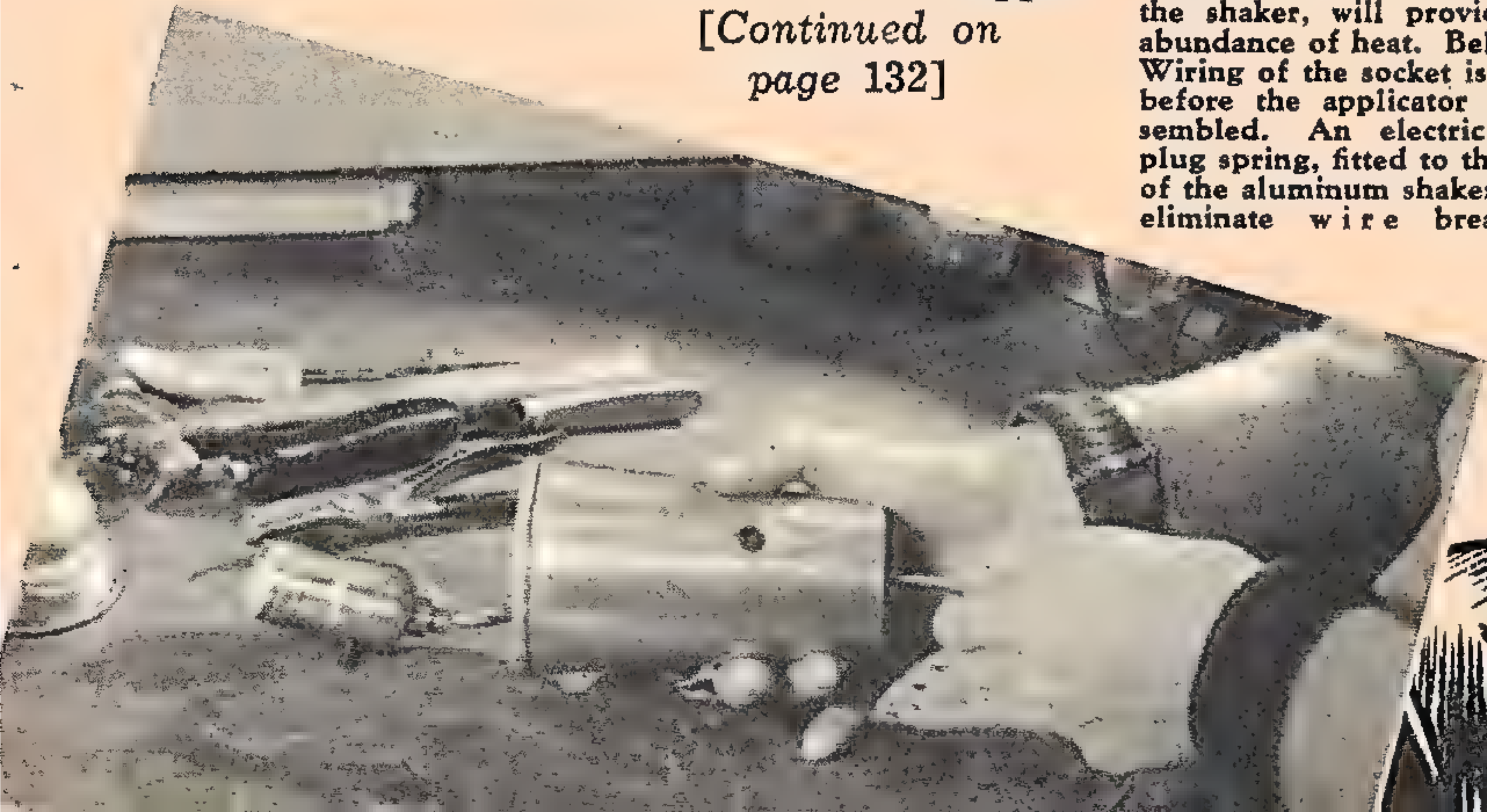
to fit threaded tube; 1 aluminum drink mixer of the type illustrated; 1 10-watt, clear-glass lamp bulb; 6 feet of lamp or asbestos-covered heater cord; 1 separable plug for connecting to lamp socket or wall outlet; 1 wooden handle, which can be a 5-inch length of broom stick. If desired, a spring-type cord protector, like the ones found on electric iron plugs, can be added, for further protection of the wire.

In the bottom of the drink mixer, punch a hole and enlarge it so that it will receive the threaded nipple. Connect one end of the wire to the socket, screw the threaded nipple into the socket, and run the wire and nipple through the hole in the mixer bottom, from the inside. Clamp the socket in position by screwing the nut over the nipple, centered with respect to the sides of the container and attach the connection plug to the other end of the wire. It is a good idea to provide some means of preventing the edges

of the threaded nipple
[Continued on
page 132]



Though small in size, the 10-watt bulb, shown installed in the shaker, will provide an abundance of heat. Below—Wiring of the socket is done before the applicator is assembled. An electric iron plug spring, fitted to the end of the aluminum shaker, will eliminate wire breakage.



These suggestions
will help overcome
car starting difficul-
ties in cold weather.

SIMPLIFYING

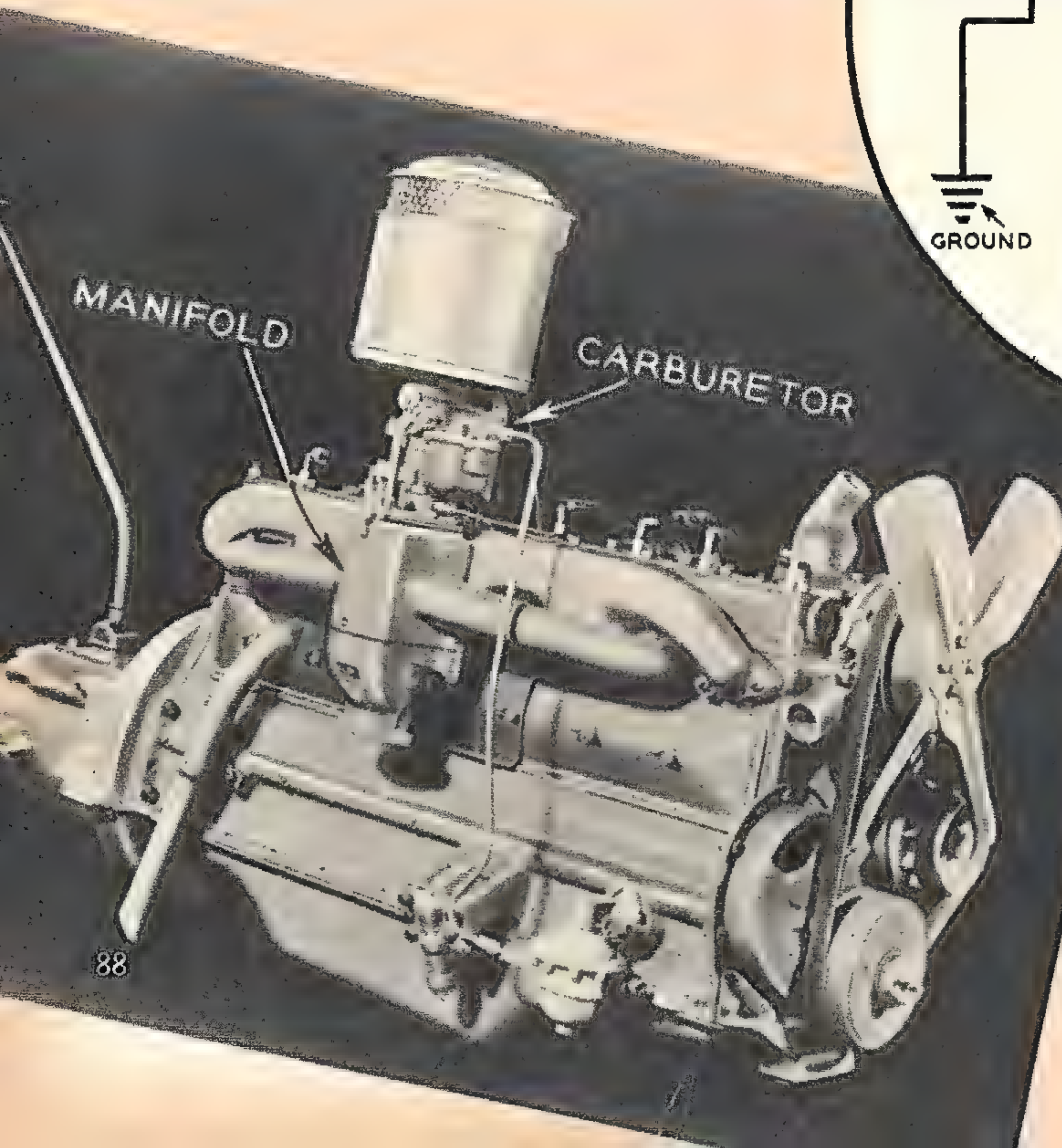
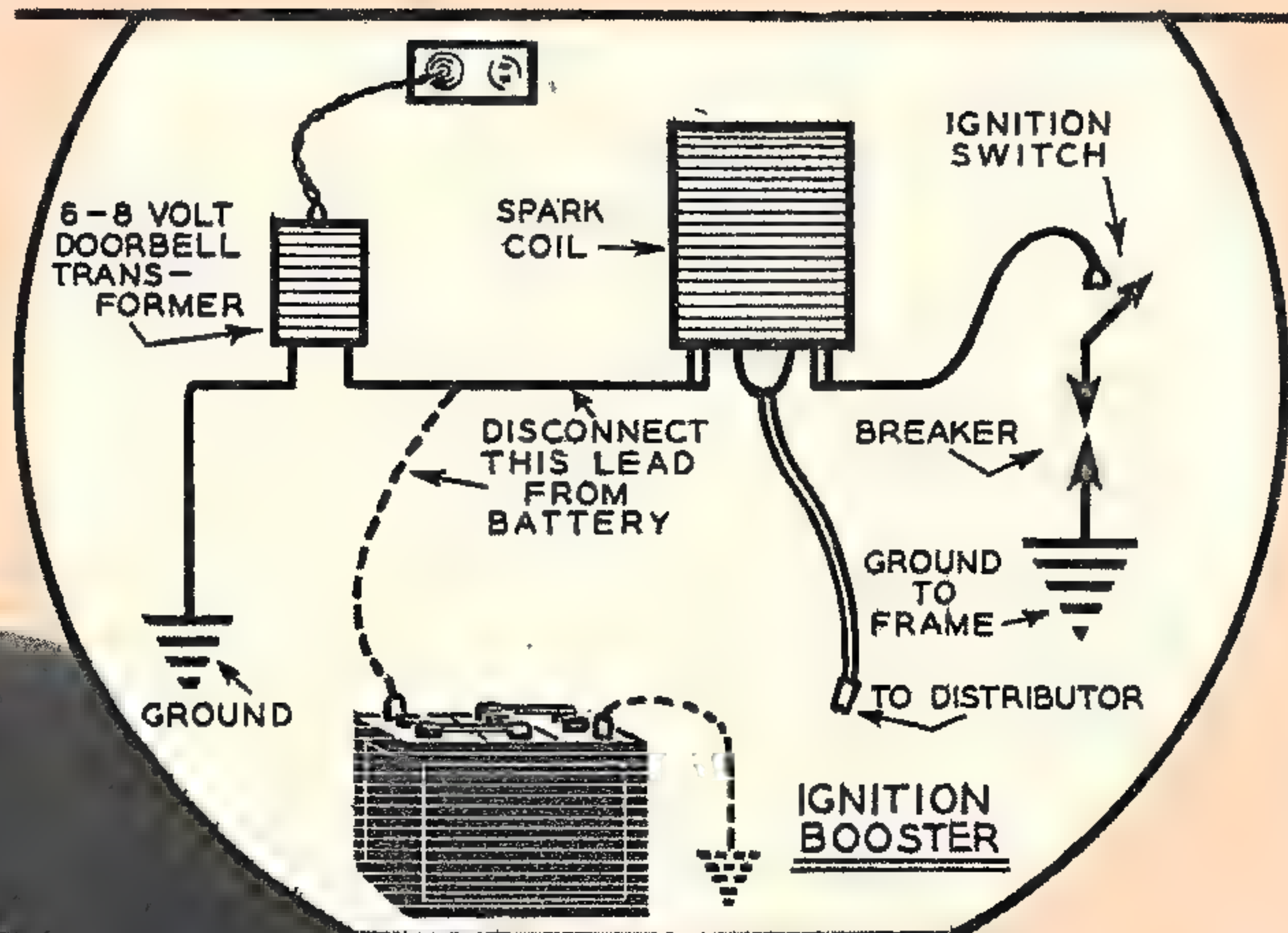
by
Thomas A. Blanchard

EVERY motorist knows, only too well from past experience, the numerous troubles that develop in the car's motor during the winter months. Run-down batteries, broken high-tension cables and short circuits in the distributor are only a few of the many annoyances to be contended with. To say that these temper-shattering troubles can be avoided is by no means an exaggeration. With a better understanding of the factors involved in the motor's proper operation,

winter starting can be made just as pleasant as it is during the summer.

In order to introduce and compress a charge of fuel it is necessary that the motor turn over at a fair rate of speed. Unless the summer oil has been replaced with a light winter lubricant, this is impossible. In moderately cold climates the crankcase should be drained and refilled with a good grade of oil having a viscosity rating of S.A.E. 20 or 20-W. In localities where the temperature hovers at sub-zero, an even lighter oil, such as S.A.E. 10 or 10-W, should be used. Any competent gasoline station attendant will advise the correct oil for use in your car or

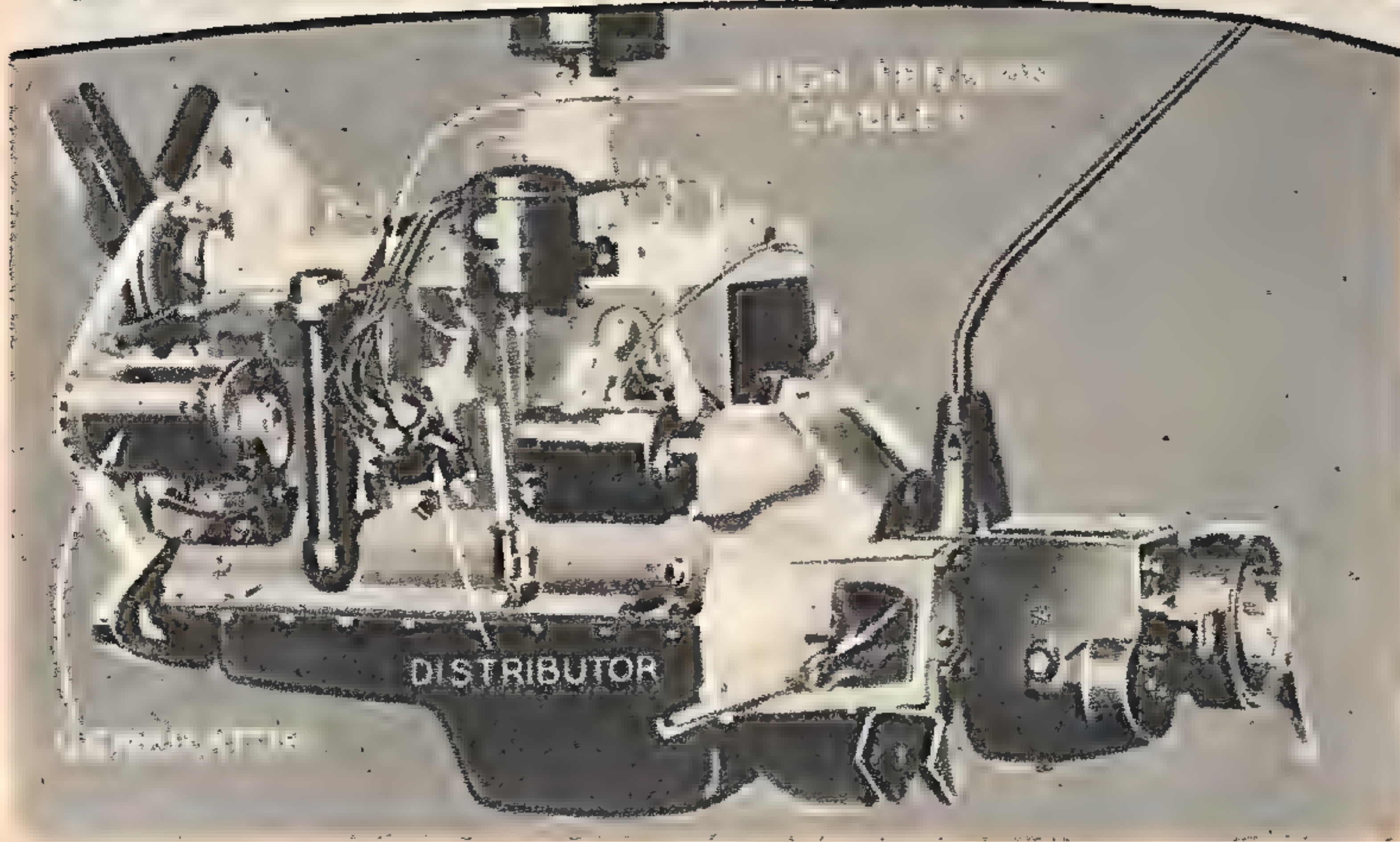
When the car battery is too weak to permit starting, even by cranking, the problem may be solved by inserting a doorbell transformer in the ignition circuit as illustrated at right. Once motor has warmed up, original battery connections may be restored. Lower right—If a small quantity of cylinder oil placed outdoors overnight will pour from the bottle the next morning, its viscosity is satisfactory for winter use. Below—Starting troubles are often traced to carburetor and manifold



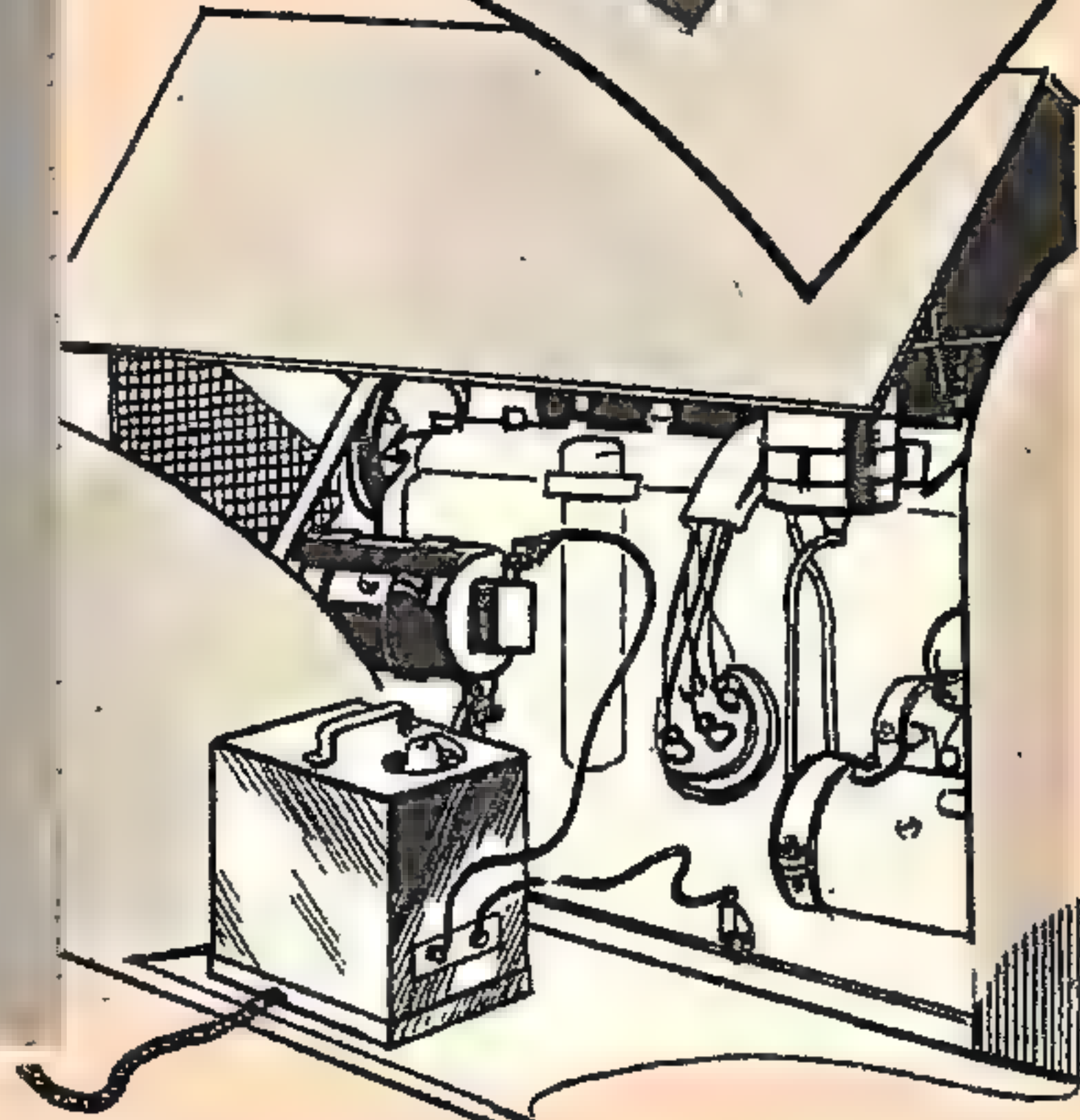
EXPOSE OIL OVERNIGHT
IN COLD WEATHER



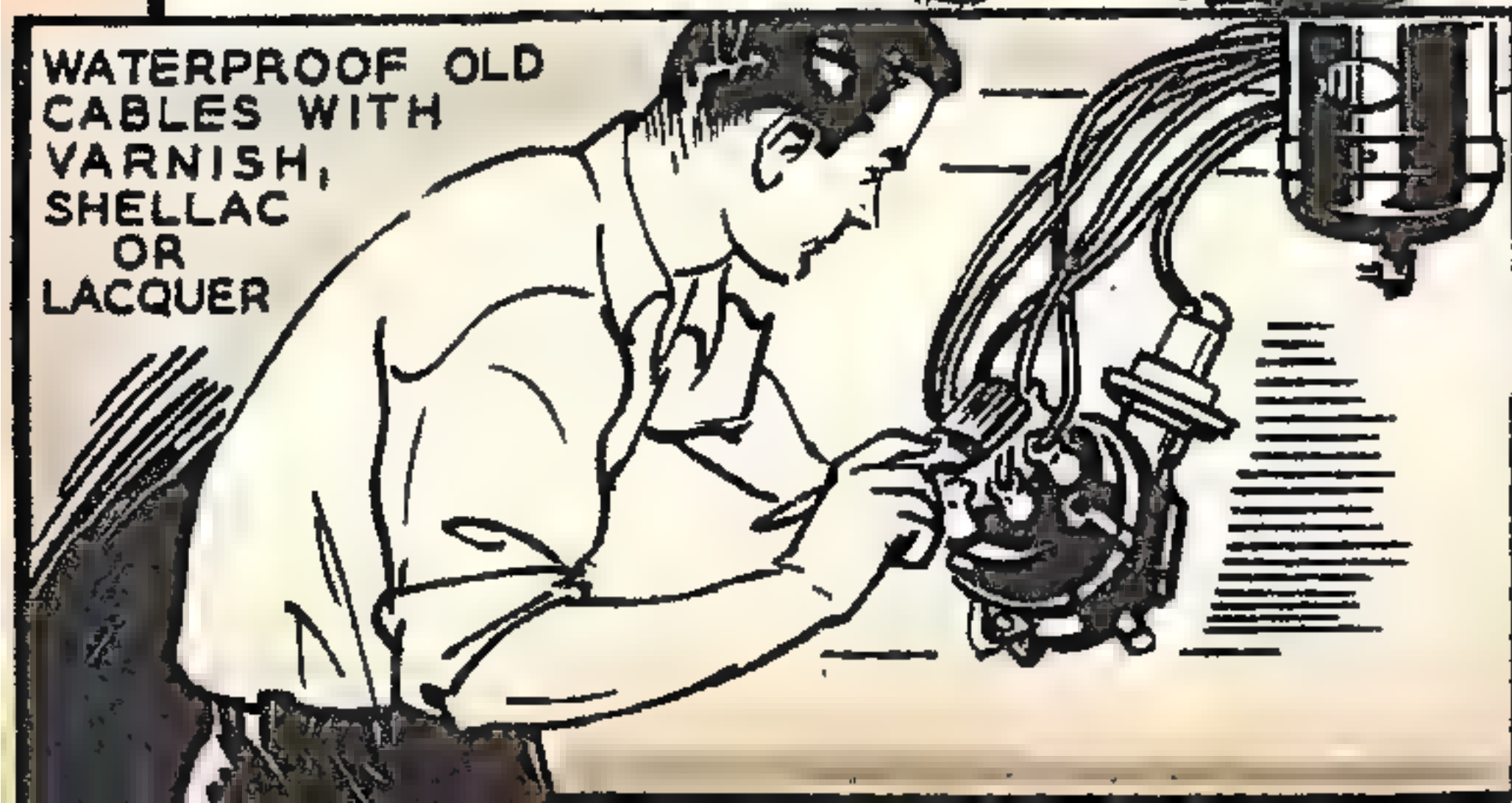
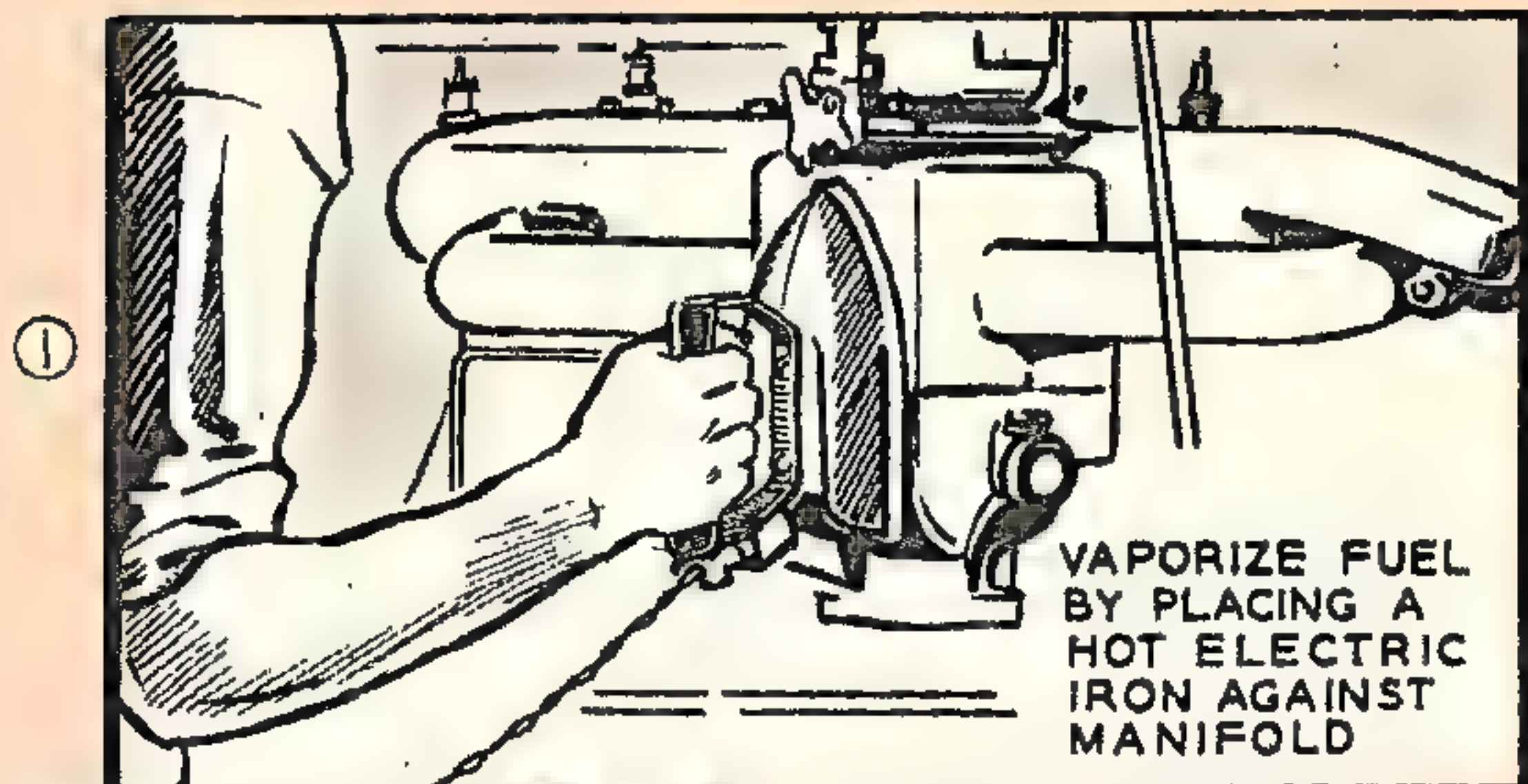
WINTER STARTING



This photo of a modern automobile motor shows where to look for trouble in the ignition system. Trouble often occurs in the cables, distributor or generator. Sometime all three may be at fault. Right—A simple way to charge a weak battery.



CONNECT A STORAGE BATTERY CHARGER TO TERMINAL OF GENERATOR CUT-OUT, WITH OTHER TERMINAL TO FRAME OF CAR TO MAINTAIN STRONG CAR BATTERY



you can determine this yourself by a simple viscosity test.

Place a tablespoonful of oil in a small bottle and allow it to remain outdoors overnight during a cold spell. If the oil, after being exposed to the elements, becomes too hard to pour, you may be sure that it is not suitable for use in the crank-case.

In order that the gasoline is converted into vapor for firing the cylinders, a certain amount of heat is required. Even the best grades of gasoline cannot be expected to function properly unless the chemical changes they require are given proper consideration. The quickest way to accomplish vaporization of the fuel is to heat the manifold of the engine externally. This may be done by resting an electric iron against the manifold or playing the flame of a blow torch on it for a few minutes. With this simple treatment the motor will start almost instantly if the engine is first turned over a few revolutions with the choke momentarily pulled out before the ignition switch is turned on.

[Continued on page 142]

Many winter starting annoyances can be remedied if the suggestions outlined in the illustrations at left are carried out. 1—An electric iron held against the manifold will aid in vaporizing the gasoline. 2—Clean both inside and outside of bakelite distributor with a clean cloth and alcohol, then (3) file rotary points and contacts. 4—To prevent power leakage, waterproof high-tension cables with several coats of shellac, varnish or clear lacquer.

AUTO REPAIRING TIME SAVERS



Dressing Applied With Fly Sprayer

BY APPLYING top dressing to the roof of the car with a common household fly sprayer, a neater job can be accomplished, and in much less time than required when application is made with a brush. Clean out the fly sprayer and fill it with the top dressing compound, thinning it with the solvent recommended by the manufacturer.

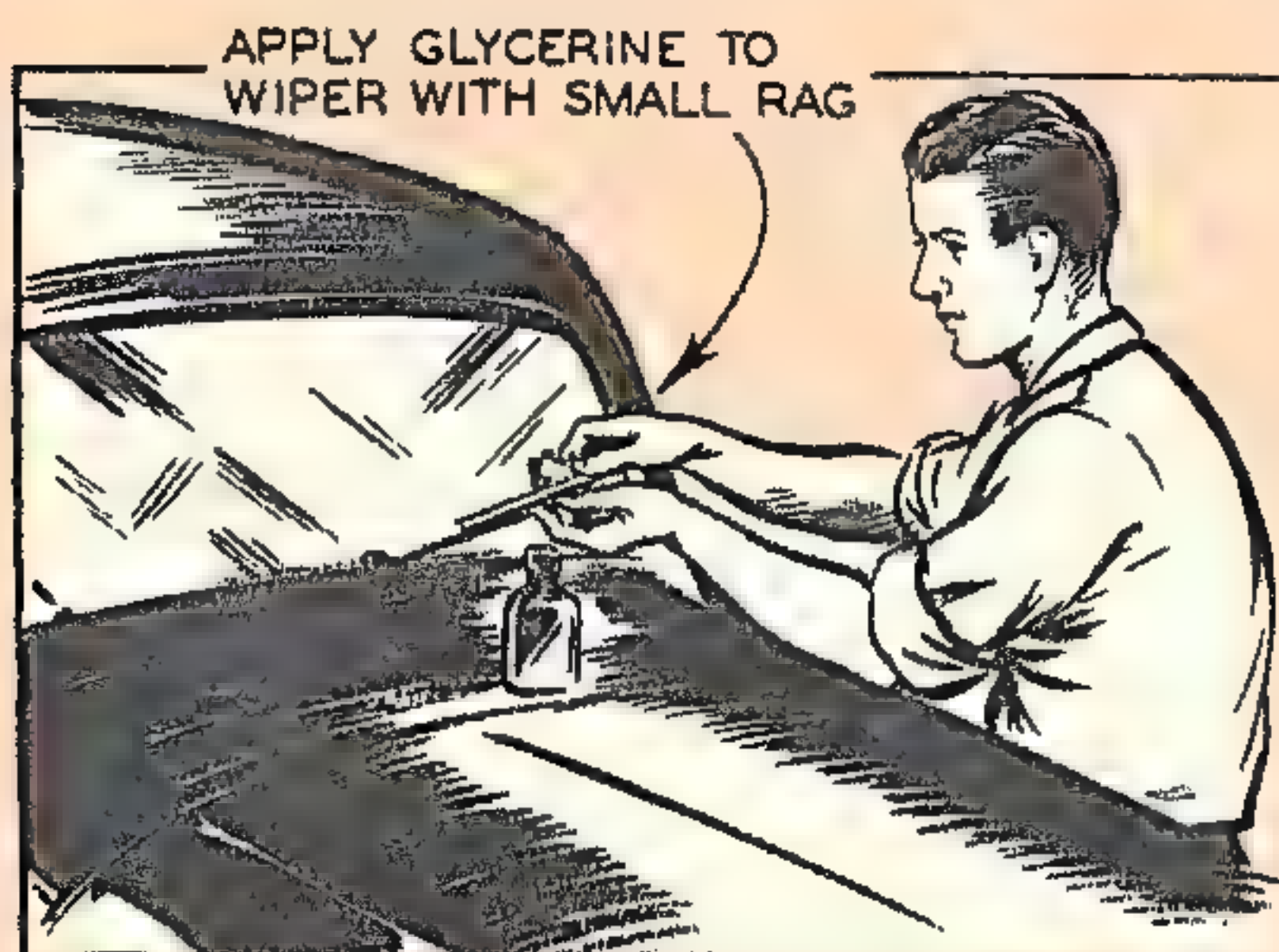
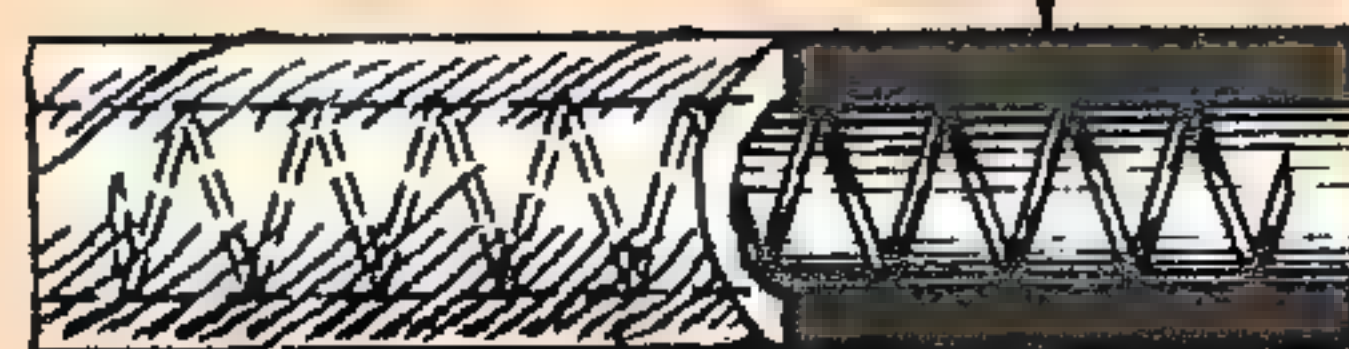
The fine mist ejected by the sprayer will spread evenly and at the same time penetrate the thin cracks and crevices which have formed in the roof covering.

Coil Spring Reinforces Radiator Hose

CONSIDERABLE trouble is often experienced with the radiator hose on heavy trucks and tractors collapsing, resulting in the stoppage of normal water circulation. Since the replacement of the hose in many instances serves only as a temporary solution to the trouble, a more permanent repair is desired.

To permanently end this annoyance, obtain or make a spring with a diameter a fraction larger than the inside diameter of the inside of the hose and $\frac{3}{4}$ inch shorter than the overall length. Force the spring into the hose and replace between radiator and motor block as before. Elimination of hose collapse will result.—A. M. Chester.

SPRING $\frac{3}{4}$ " SHORTER
THAN HOSE



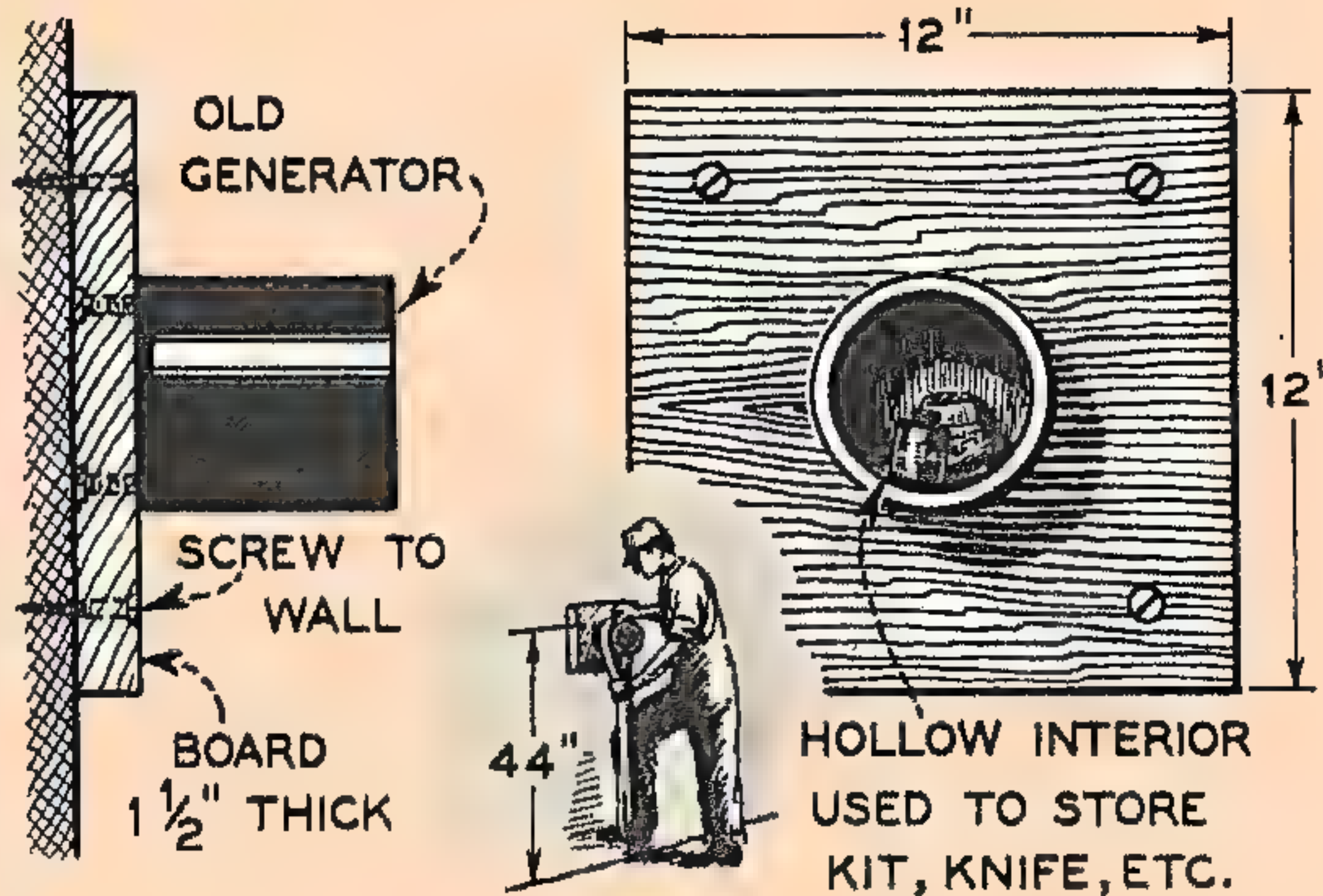
Glycerine Helps Windshield Wiper

DURING the winter months the windshield wiper of the car requires special attention so that it will be in good working condition at all times.

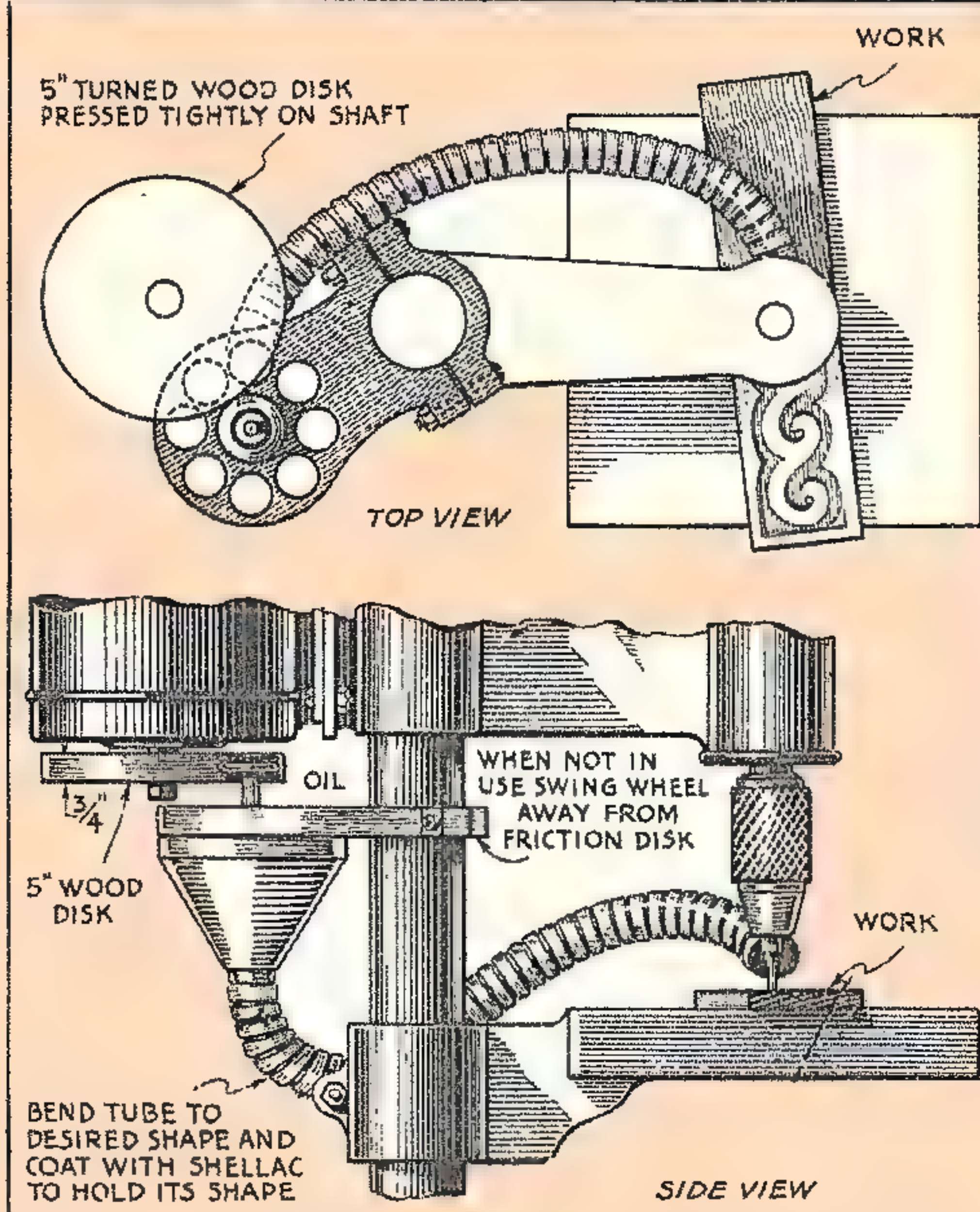
To restore the laminations to their original condition, remove them from the wiper arm and apply several drops of glycerine to the surface, allowing them to soak in between the laminations before wiping off any excess with a clean cloth. —A. H. Waychoff.

Efficient Tube Repair Rack

THE housing of an otherwise worthless auto generator can be converted into a handy tube repair rack. Discard all of the generator except the heavy casing and mount this to a block of wood measuring 12 by 12 by $1\frac{1}{2}$ inches. The completed rack is then screwed fast to the side of the garage, where it is ready for instant use. In making repairs to inner tubes the tube is hung over the rack, drawn tight with the foot and repair patch applied.—E. E. Swanson.



Blower Keeps Drill Press Clean



The blower attaches to the drill press upright by means of a clamped bracket, cut to the required dimensions from $\frac{3}{4}$ -inch plywood. A 5-inch friction-drive wheel operates the funnel-shaped blower.

by Dick Cole

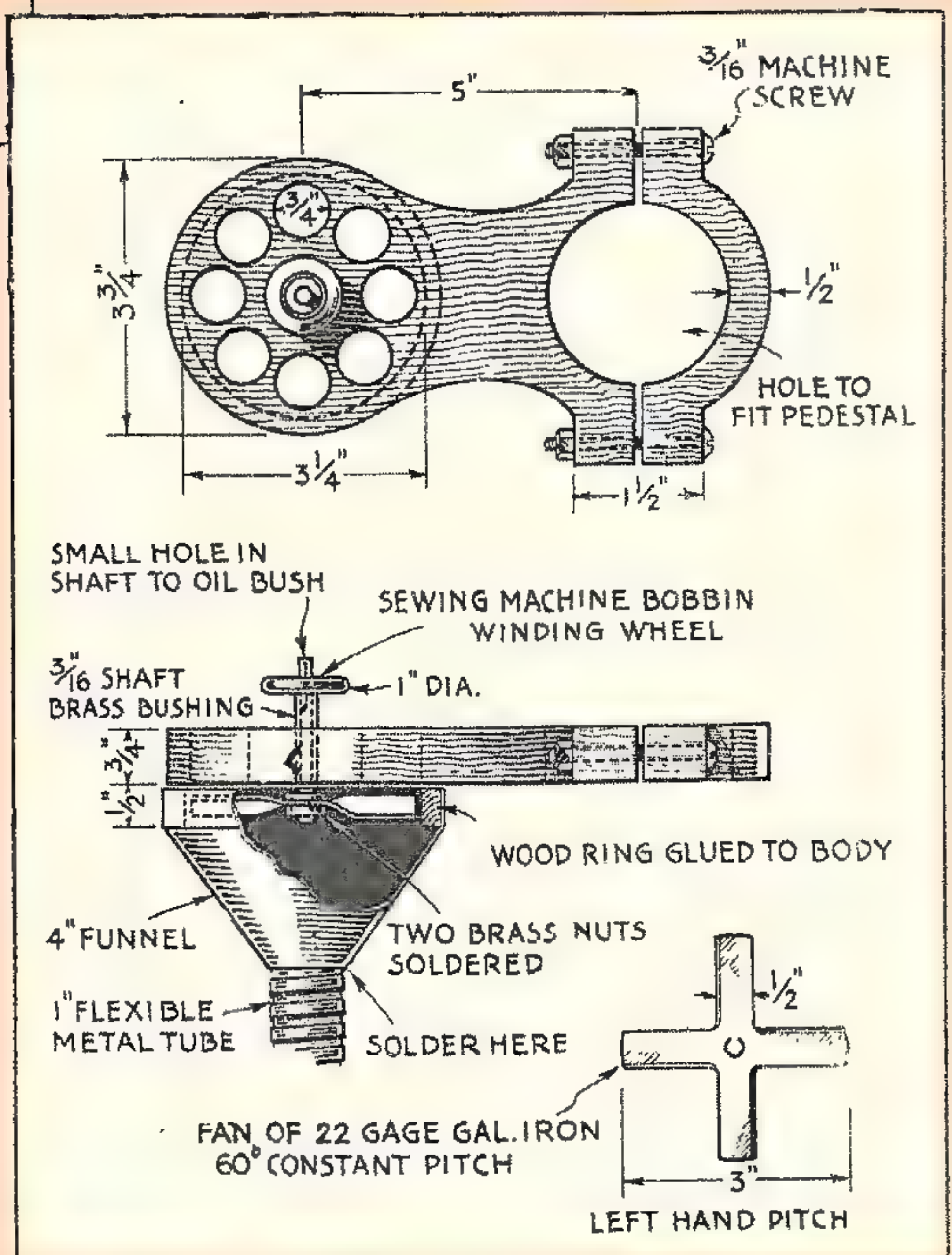
A DRILL-PRESS is a very versatile tool in a home workshop and besides performing its primary function of drilling holes, it can, with special attachments, be used for mortising, routing, carving and as a shaper. It is desirable in many of these operations that the chips be cleared away, particularly when a pattern must be followed, as in carving.

Here is a very efficient blower which can be made for a few cents. Nearly all of the current model motors, for home workshop use, have double shafts—that is, the shaft protrudes at both ends of the motor. In the case of a drill-press with a vertical motor, it is a simple job to fit a wood friction disk to the lower shaft-end, and have it turn a smaller friction wheel, such as the bobbin-winding wheel from an old sewing machine. This, in turn, is on the shaft with a fan contained in the funnel-like housing. A short length of flexible, metal tubing carries the blast of air to the job on the drill-table. All of which is very simple.

The detail drawings show the general lay-



Costing practically nothing to build, this handy drill press blower whisks away chips, dust and shavings from the work table as rapidly as they are produced.



The blower housing is formed from a 4-inch funnel, fitted with a length of flexible metal tubing. Make the fan from galvanized iron to dimensions indicated. Holes drilled in the bracket provide for air intake.

out, which, with minor variations, will meet the requirements of nearly any drill-press of the vertical motor type. Even in the case where the motor is a separate unit, the basic
[Continued on page 132]



Experiments in



Ordinary household gelatin, vinegar, water and a few common and inexpensive chemicals provide all materials for performing these novel experiments.

by E. Mason Marcus

PROBABLY the most discouraging factor to all embryo home chemists is the lack of costly equipment that is outlined as necessary in most experiments. The experiments described in this article are unique in that the only necessary equipment consists of a few test tubes, jars, a pan, and a teaspoon.

Perhaps you are wondering what a colloidal chemistry is all about. Colloidal chemistry is concerned with suspensions, emulsions, and all other phenomena of finely divided particles.

Colloids are quite common in our everyday life. Milk is a colloid. Steam, fog, ink, butter, and gelatin are all colloids. The red of a beautiful sunset is due to the finely divided colloidal particles of dust suspended in the air and refracting the light. Some of

these colloidal particles are so small that they cannot be seen in a regular microscope which shows particles in transmitted light but must be viewed in an ultramicroscope which uses a dark-field and the particles are seen by reflected light.

There are two types of colloidal systems. One of these is a watery system and is called a "sol." The type that we are going to experiment with are called "gels" for they are in the form of a jelly-like substance such as the gelatin desserts which we eat.

There is a beautiful phenomena in the chemistry of gels which we call rhythmic banding. These can be made in gels of gelatin or of silicic acid. Beautiful bands of bright red and colorless can be made to appear in an ordinary test-tube. All of these



Rhythmic banding effects, as picture at left, are produced by mixing $\frac{1}{2}$ teaspoonful of water glass with 2 teaspoonsful of water. To this is added a few crystals of potassium iodide dissolved in 2 teaspoonsful of vinegar. When poured into a test tube a jelly-like mass is formed. Adding a solution made from a few mercuric acid crystals, will produce beautiful red bands. Below—Cross-section view of Liesegang's rings formed from a solution containing unflavored gelatin, silver nitrate, or lunar caustic, and water.



Colloidal Chemistry

for the Home Chemist



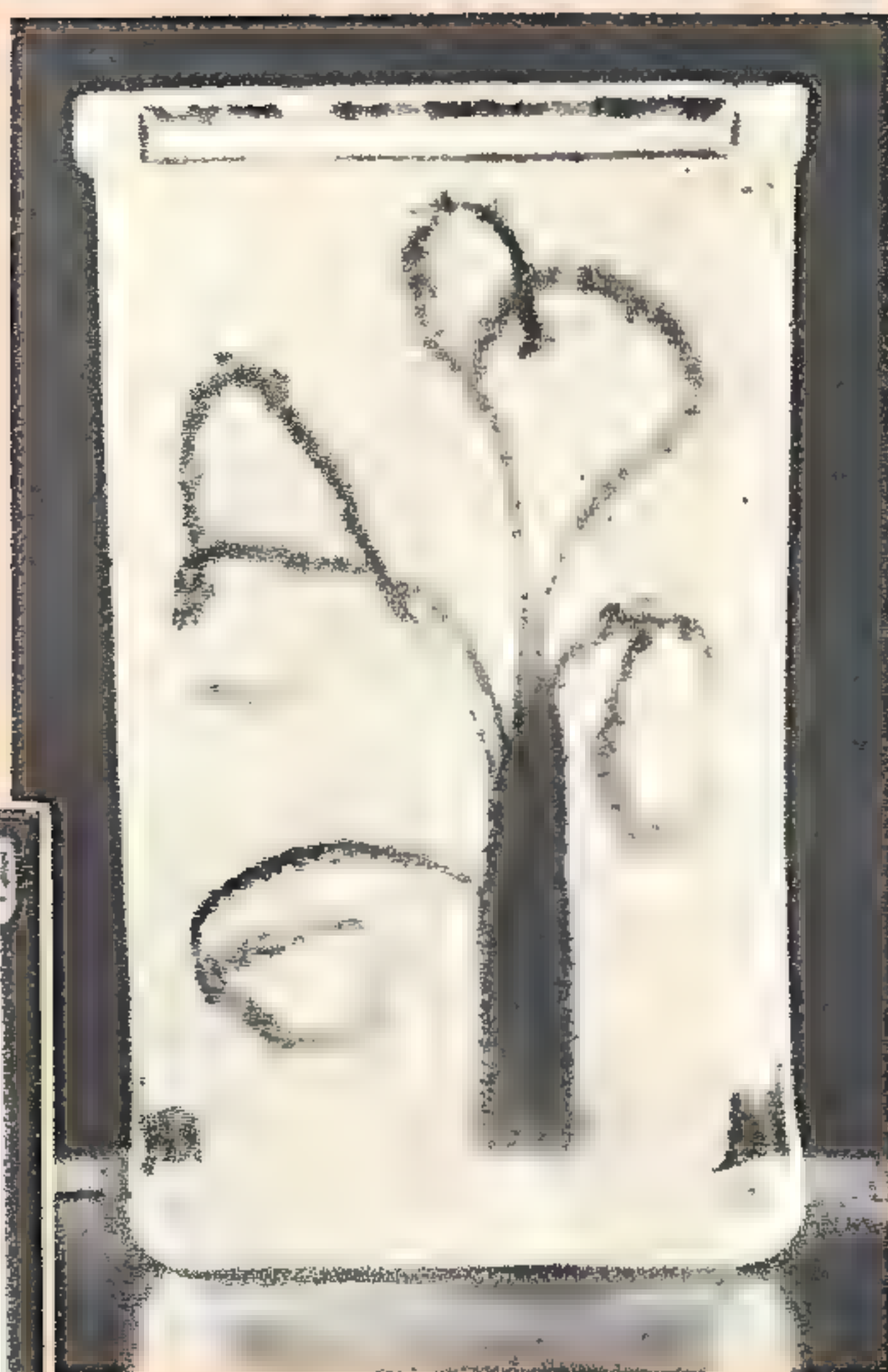
Anyone can perform these unique experiments in colloidal chemistry. The only equipment required is a few test tubes, a teaspoon, pan and several small bottles.

experiments have a gel for a base. For the first experiment in which we get the red bands, we will use silicic acid for a base. Do not let the name scare you, for silicic acid gel is nothing more than a mixture of common water glass and an acid such as white vinegar. It can be made by taking $\frac{1}{2}$ -teaspoon of water glass which can be purchased at any hardware or drug store, and mixing it with two teaspoons of water. This forms solution "A." Solution "B" consists of two teaspoons of white vinegar or 5% acetic acid which is found in all vinegar and which gives it its sour taste.

When solution "B" is poured into solution "A" a colorless solid mass is formed, known as pure silicic acid gel. It will be noticed that it is quite rubbery and will produce a metallic ring when the test-tube is tapped.

To make the red bands in the test-tube, a few crystals of potassium iodide are added to the acid solution "B," and then "B" is added to "A." When this has set, which should require no more than a few seconds, a

[Continued on page 130]

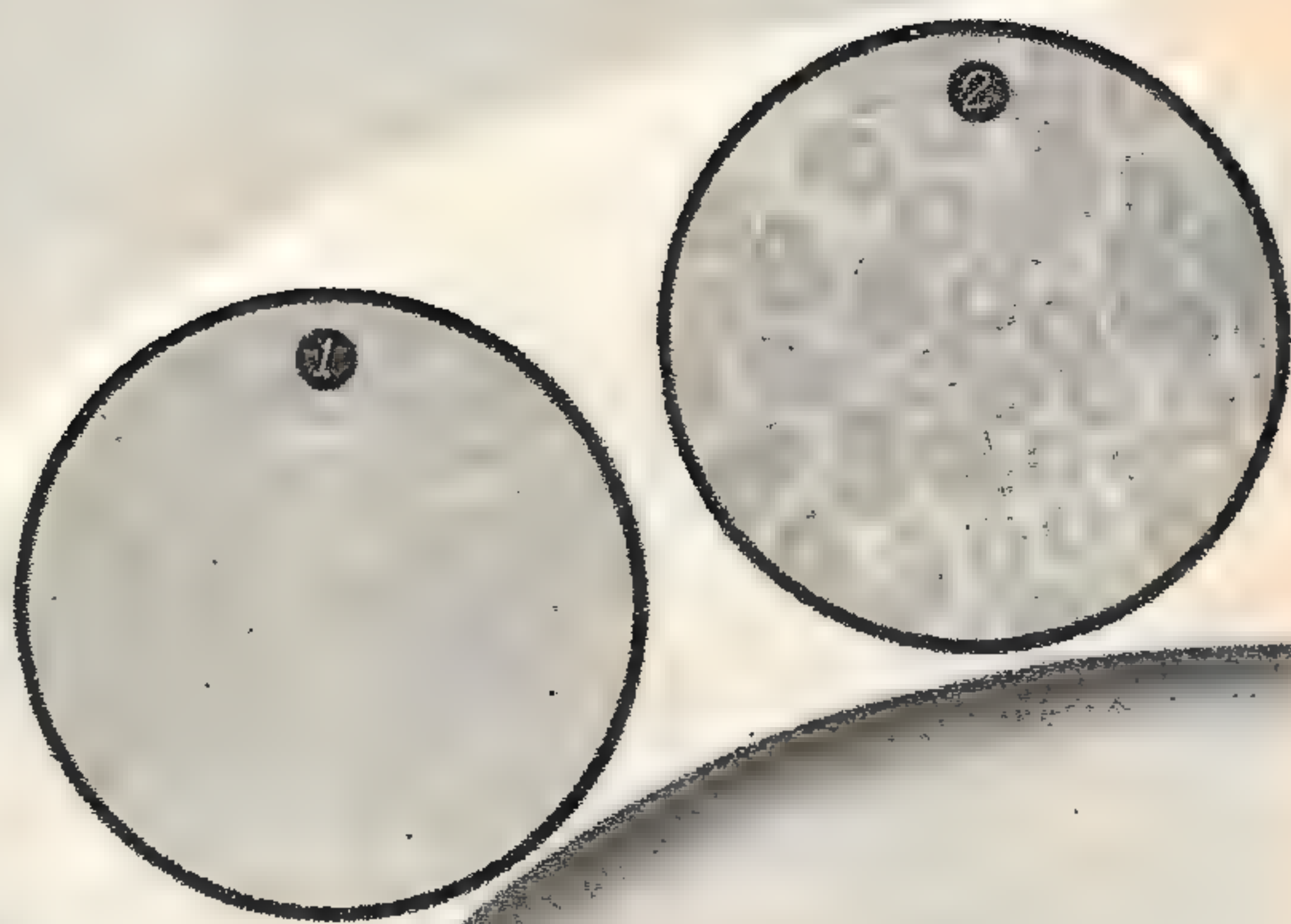


This unusual "lead tree" experiment provides one of the most unusual displays in colloidal chemistry. In a small vial place $\frac{1}{2}$ teaspoonful of water glass mixed with 2 teaspoonful of water. Next dissolve a few lead acetate crystals in 3 teaspoonful of white vinegar and add to the water and water glass solution. Insert a small strip of zinc in the vial and allow it to remain submerged for several days. Resulting effects are shown in these pictures. Top picture shows the "lead tree" after 2 hours while at left tree is shown after 24 hours.

Hitching a Microscope



Many set-ups may be used in taking photomicrographs. Here a plate camera is supported over the microscope on a tripod, while blocks of wood elevate the microscope to correct height. Desk lamp light source appears at the extreme left.



The results obtained when a slide of human blood is photomicrographed are shown in the above series of pictures. The first print made (1) showed lack of contrast. In the next, (2) orthochromatic film was used with a moderately short exposure. Results still were not satisfactory, so a longer exposure was given the ensuing print (3) with noticeable improvement. The amateur expected better results and purchased a set of light filters. The first print was jarred during exposure (4) so another attempt was made. In realigning the lens, the condenser was moved slightly, resulting in an off-focus image (5), but the experimenter finally triumphed with excellent photomicrograph of blood (6).

THE mere inspection of bugs and other specimens under a microscope, or the making of permanent slides, is a fascinating pastime. But *photography* through a microscope is something else and a job worthy of the most enthusiastic devotee and one of the most engaging of all hobbies.

It must be admitted at the outset that photomicrography is probably the most difficult of all forms of the photographic art, assuming that perfection is the goal. But *reasonably* good pictures can be secured by the beginner within a week. Thereafter, as in any type of photography, improvement is a matter of skill gained by patience, care and practice.

Of decided importance is the fact that contrary to expectation, one does not need a lot of expensive equipment for this work. Any type of camera can be hitched to a microscope, and the accessories either purchased

a few at a time or made at home, according to preference. Naturally, the better the equipment, the better the results. But it does not follow that one should put off trying his hand at a few pictures just because his instruments happen to be of the cheaper or cruder sort. Take some shots anyway and learn the rudiments of the game; it's loads of fun and good experience. Better pictures will then come more easily when a better outfit is obtained.

Complete photomicrographic apparatus is commercially available at prices covering a considerable range. Some of the professional outfits run into elaborate and expensive designs that would appall the novice as much by their complexity as by their cost. Nevertheless all of them, from simplest to most intricate, operate on a single, elementary principle that we can easily and quickly demonstrate.

Roll up a cone of cardboard and tie or glue the overlapping edges, so that the smaller

To Your Camera

by Julian D. Corrington, Ph.D.

Photographing
microscopic
wonders is a
new and inter-
esting hobby.

Photomicrographic slides
from: Wards Natural
Science Est., Inc.

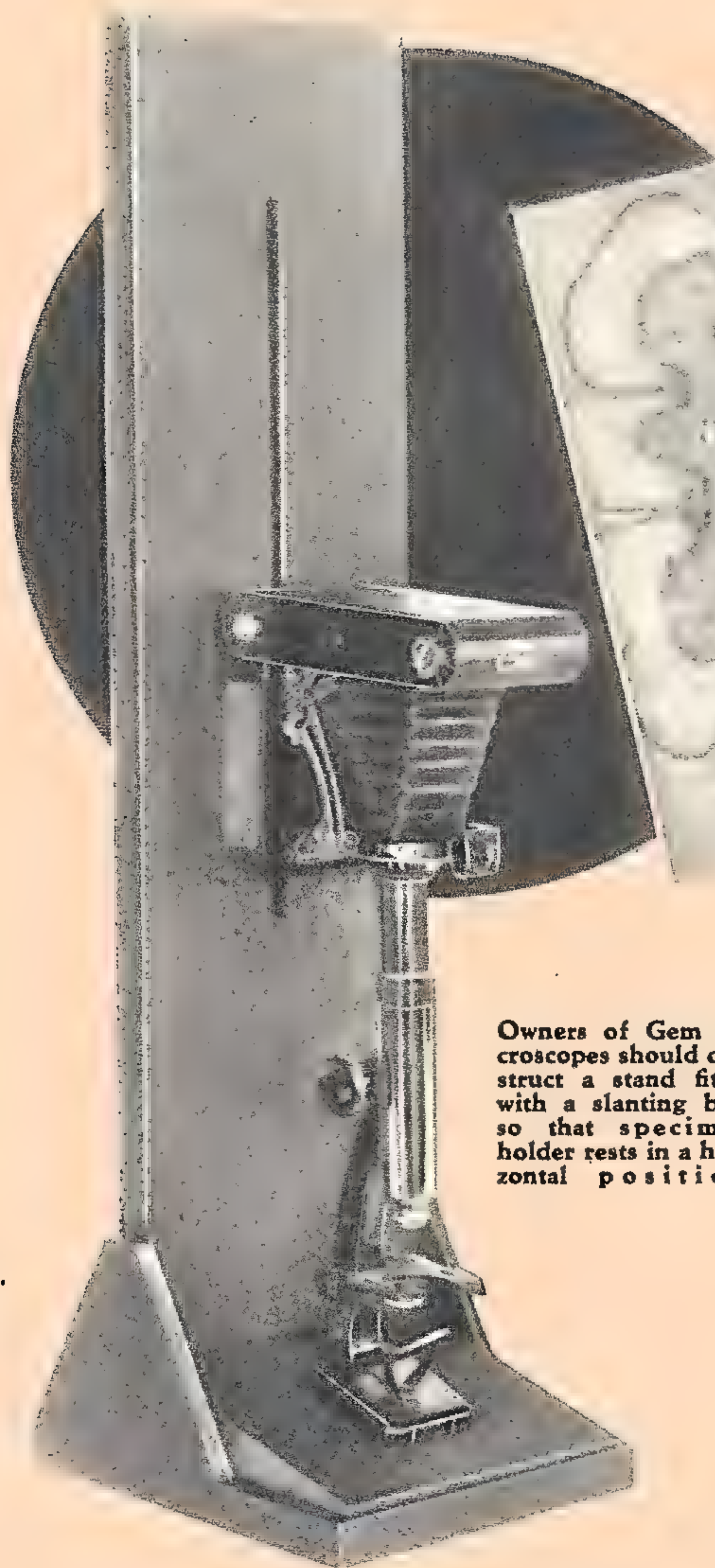
opening of the apex will fit snugly over the eyepiece of the microscope, the cone being inverted, base upward. This base should be some 10 inches above the eyepiece and from 4 to 6 inches in diameter. Paste a sheet of white tissue paper across the open base. With a slide in position on the microscope stage, and performing the demonstration at night in a darkened room, shoot as much light as possible through the microscope, secure a focus, and there is the picture of the object upon the tissue paper. This is actually a case of projection, just like that of the motion picture or lantern slide projector.

Now it is obvious that if we were to replace the tissue paper with sensitized film or plate, we should be able to make a photograph of the object in this same manner. And that is just what is done by photomicrographic

cameras, which are no more than black boxes; the word "camera" means a chamber and a box is a miniature chamber. When hooked up to a microscope, all of the accessories of modern cameras may be dispensed with, since the microscope already has lenses for focusing, and exposures may be made by snapping the light source on and off, thus eliminating the necessity of a shutter.

One of the best methods of building your own camera is to center the construction

This 9x12 cm plate camera, attached to a home-made stand, makes excellent photomicrographs. A sheet of photo mount paper between camera lens and microscope eyepiece serves as a light-tight adapter. Black "scotch" tape will also provide effective results.

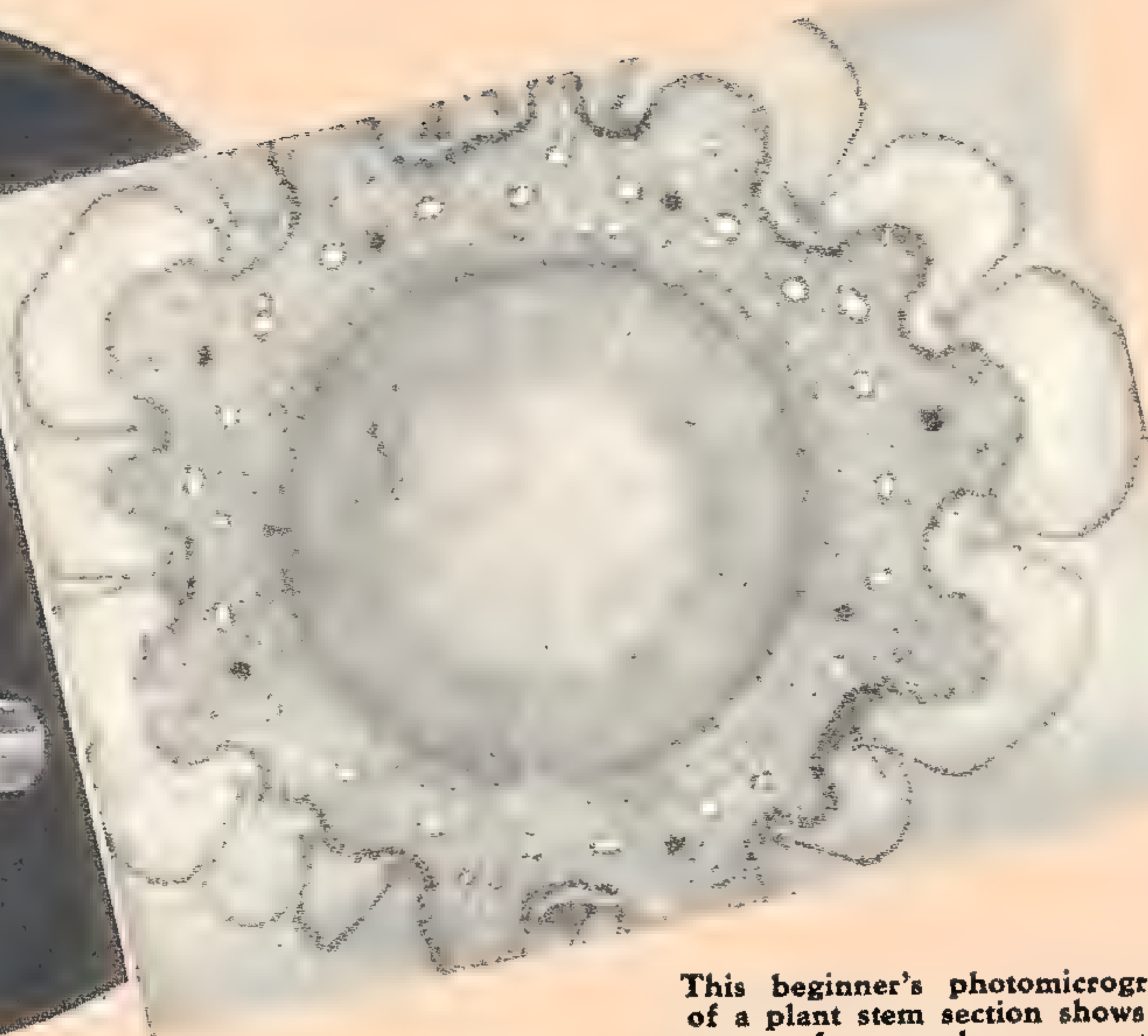


Owners of Gem microscopes should construct a stand fitted with a slanting base so that specimen holder rests in a horizontal position.

around a plate holder. Buy a 4x5 plate holder, new or used, and at the same time secure a 4x5 ground glass. Build a box out of plywood, pressed-wood, or similar material, glued or bradded to a wooden frame. At one end is the plate holder; at the other, a trifle less than 10 inches away, cut a round hole in the center, 3 inches in diameter.

Two points should receive careful attention: The plate holder must be accurately level when the camera is fastened to the stand, so that all parts of the image will be simultaneously in sharp focus; and the camera must be light-tight.

The stand is that part of the apparatus which puts the camera in correct relationship to the microscope, and some of the accompanying illustrations indicate the simplicity



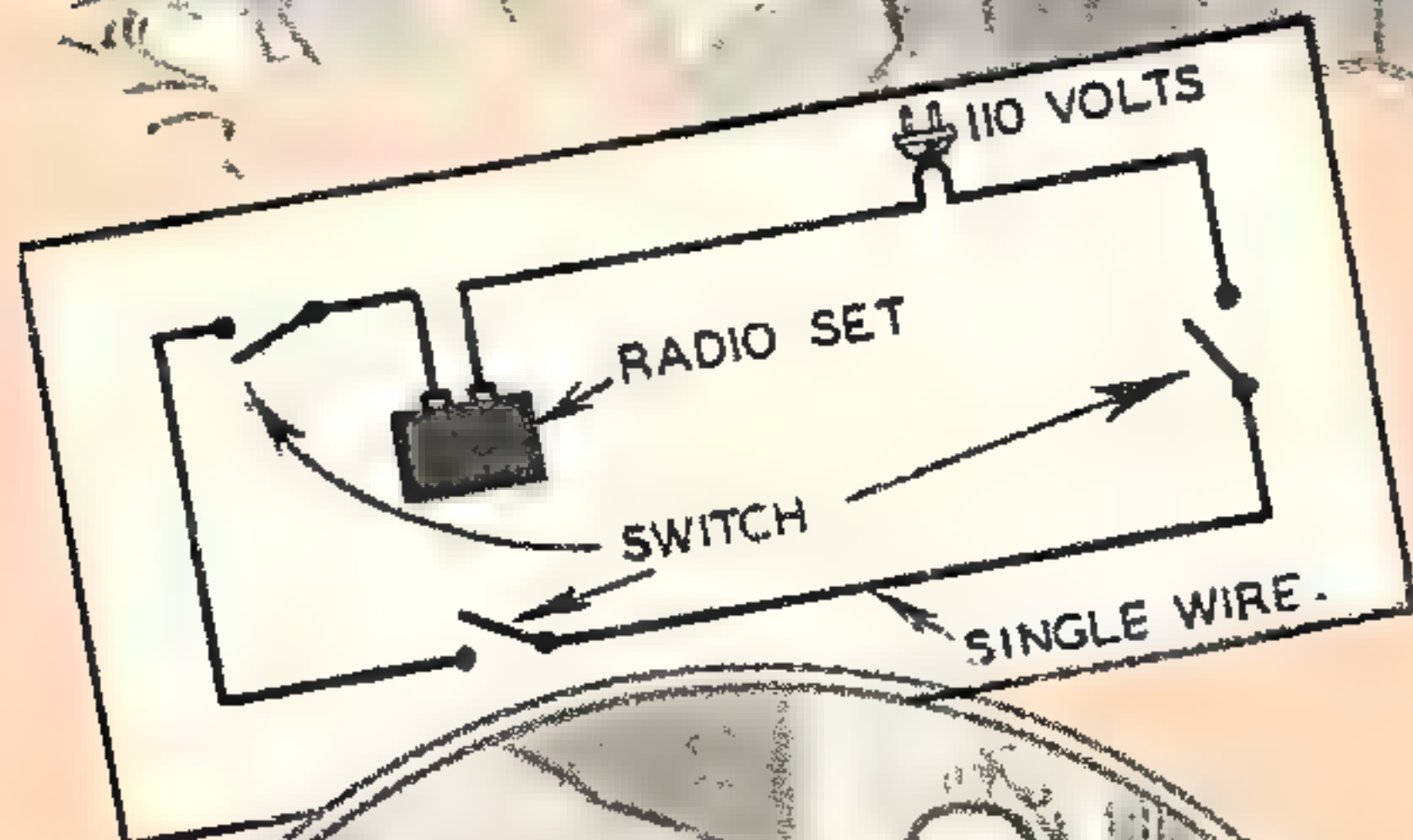
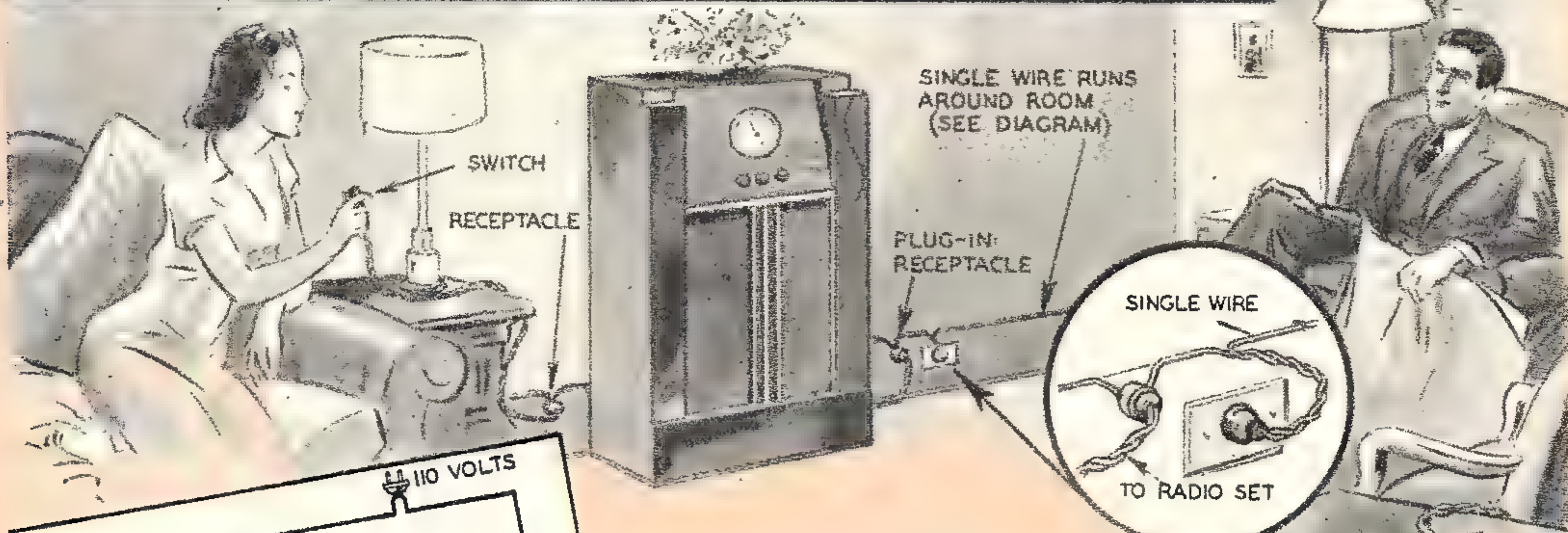
This beginner's photomicrograph of a plant stem section shows improper focus and poor contrast. A filter and longer exposure would have improved it considerably.

with which a home-made stand may be constructed. The base should be broad and flat and heavy to provide a firm support; the upright should be a true perpendicular and of sufficient massiveness and rigidity of connection to the base as to avoid all possible vibration. If the camera is a home-made box, as suggested above, it may be fastened permanently to the upright so that the plate holder is accurately level and at such a distance as to be in approximate focus, as determined by trial for any given microscope. The exact focus is then secured by means of the coarse and fine adjustments as well as the drawtube, according to the type of instrument used.

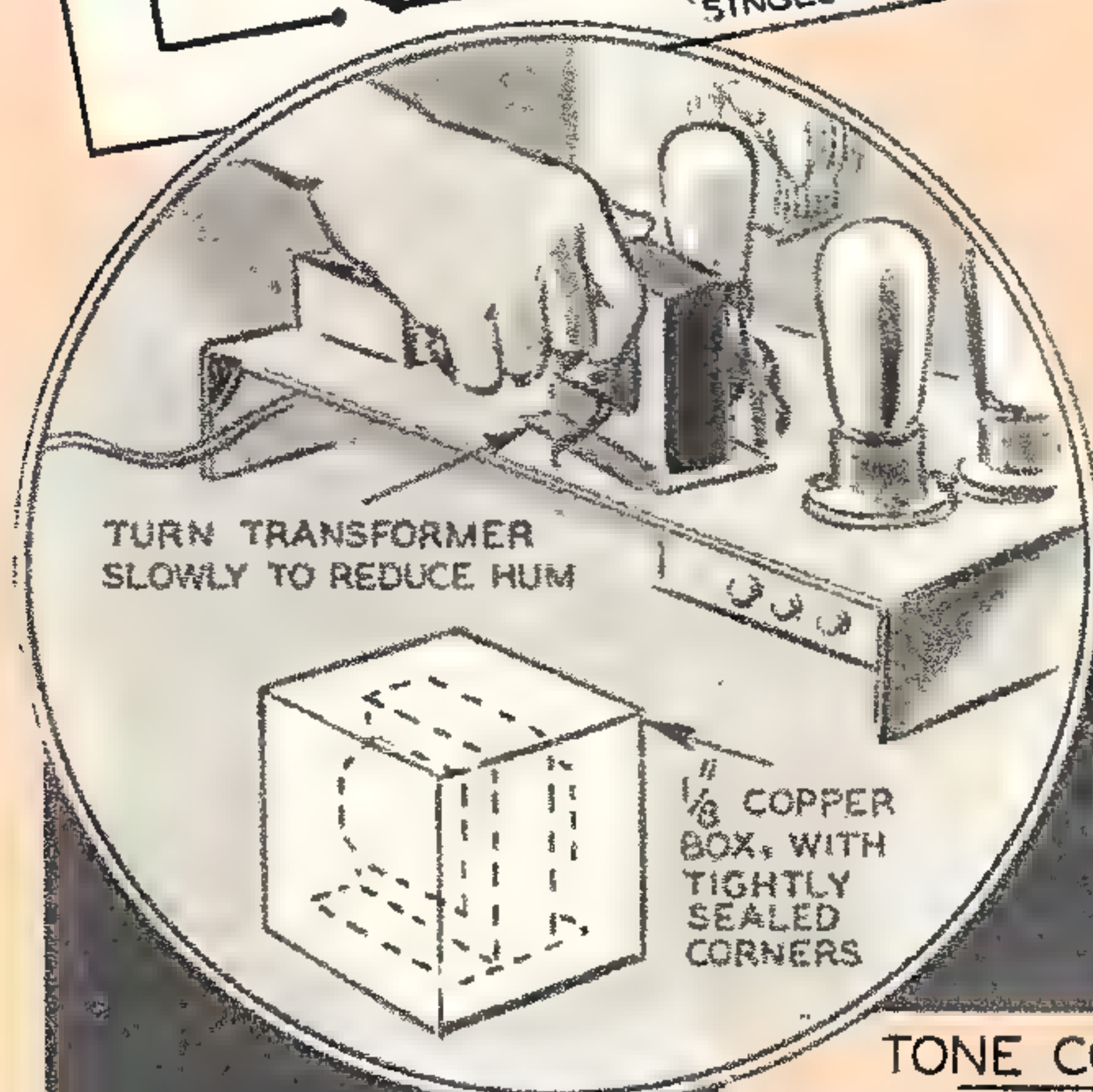
A useful and time-saving suggestion is to find, once and for all, the correct position for the microscope on the base. Cut a sheet of plywood or very heavy cardboard to fit the base of the photomicrographic stand. Place this sheet on the base, then add the microscope and secure an accurate alignment by focusing the image of some slide mount on the camera ground glass, exactly as in taking a picture. This should be the permanent position of the scope for all future exposures. Now trace around the microscope base with a pencil, jigsaw out the design, tack or glue the stencil thus made to the stand base, and thereafter merely insert the microscope in this receiving well. Pivoted wooden cleats

[Continued on page 142]

RADIO SPARKS



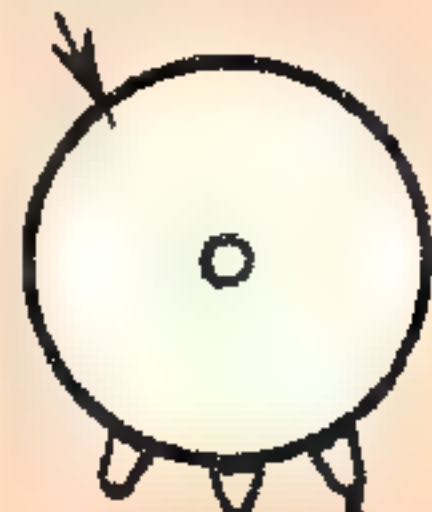
The necessity for getting up to shut off the radio during an advertising "blurb" can be eliminated by connecting the set in series with several button-type pendant switches. The switches can be located around the room in the manner shown above. The single wire connecting up the various switches may be tacked to the top of the baseboards with staples so that its presence will not be noticed.



On early types of a.c. sets hum is produced by improper placement or shielding of the A.F. transformer between first and second stages. To overcome this, enclose transformer in copper shield can or turn it until the hum pickup is minimized.

TONE CONTROL

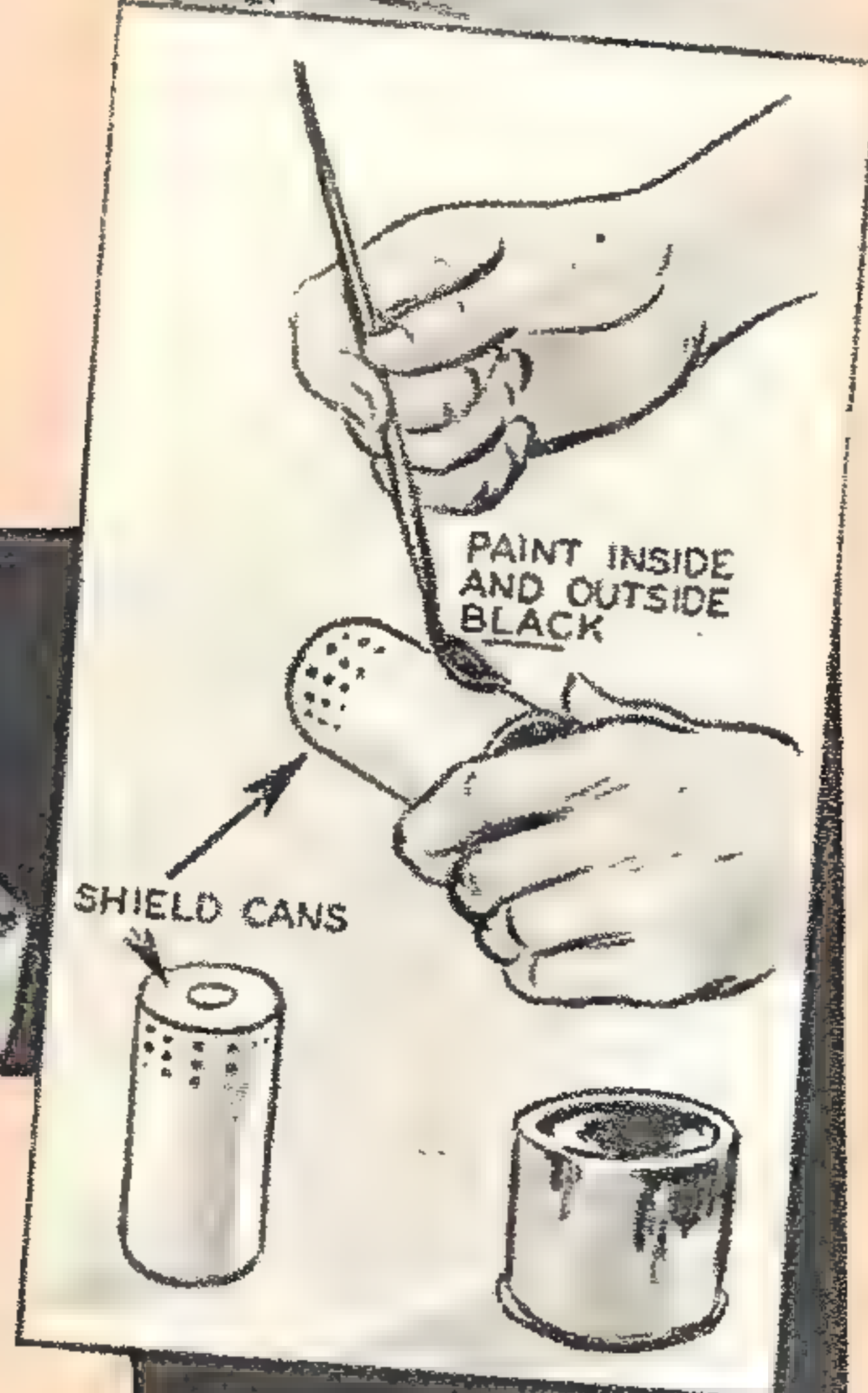
200,000 OHM POTENTIOMETER



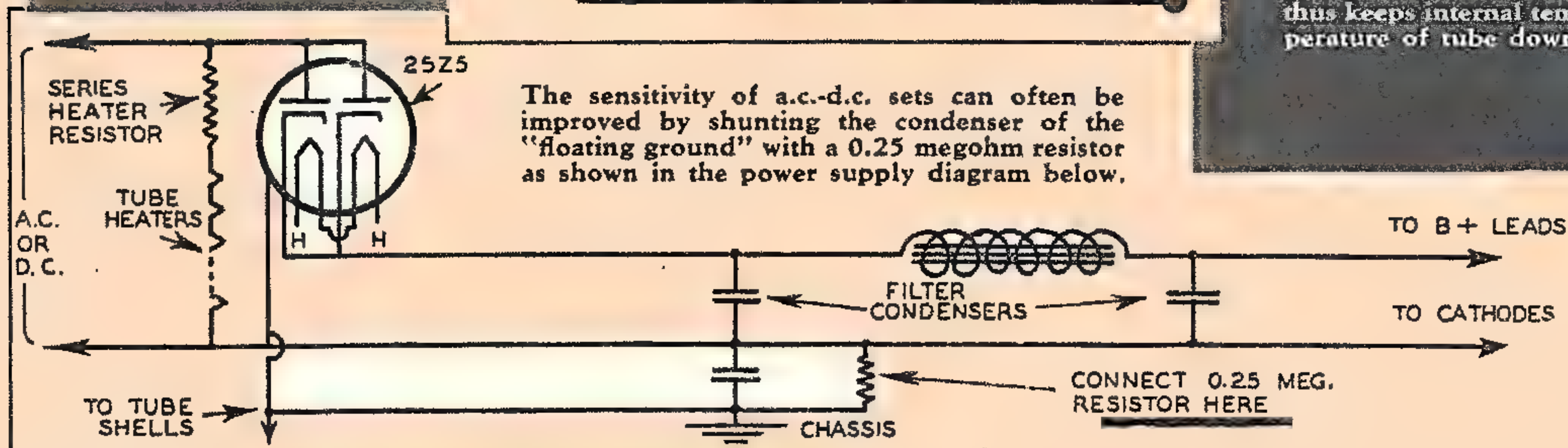
This simple tone control can be installed on any set. Mount parts in a bakelite box, connect red lead to plate of output tube and black to chassis. If set uses two output tubes, connect leads to plate prong of each.

0.1 MFD. 400 V.

RED
BLACK



By painting both inside and outside of rectifier shield can with black paint, life of tube can be lengthened. The paint absorbs heat and thus keeps internal temperature of tube down.



The sensitivity of a.c.-d.c. sets can often be improved by shunting the condenser of the "floating ground" with a 0.25 megohm resistor as shown in the power supply diagram below.

The Cause and Cure

Faulty power lines are sometimes responsible for the interference heard on sets. Power companies stand ready to track down troublesome lines.

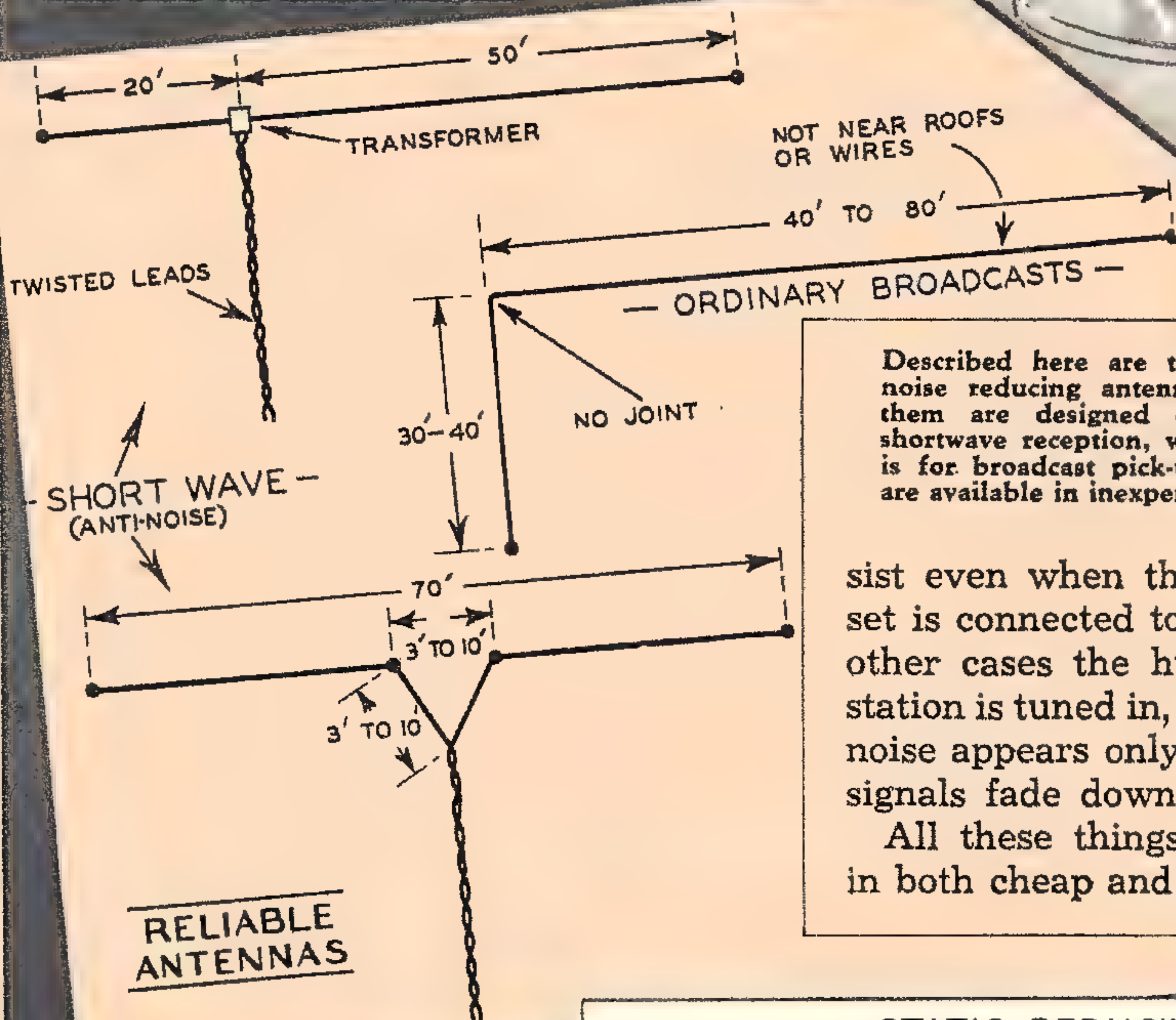


by Robert S. Kruse, E. E.

IT IS no good to plug a crack in a rowboat while water is pouring in through a 6-inch hole at the other end. In just the same way one cannot get quiet radio reception with the best anti-noise device while noise is pouring in through some other gateway—and there are 5 ways for the noise to get in. Let us examine the 5 gates, to see how they may be closed.

Very many radio receivers, even when in good repair, are noise-factories on their own account. These noises take the form of hums or "Shhhhhh" noises, which may per-

Broken light sockets, worn heating pads, toasters and irons all tend to create noise that hinders reception.

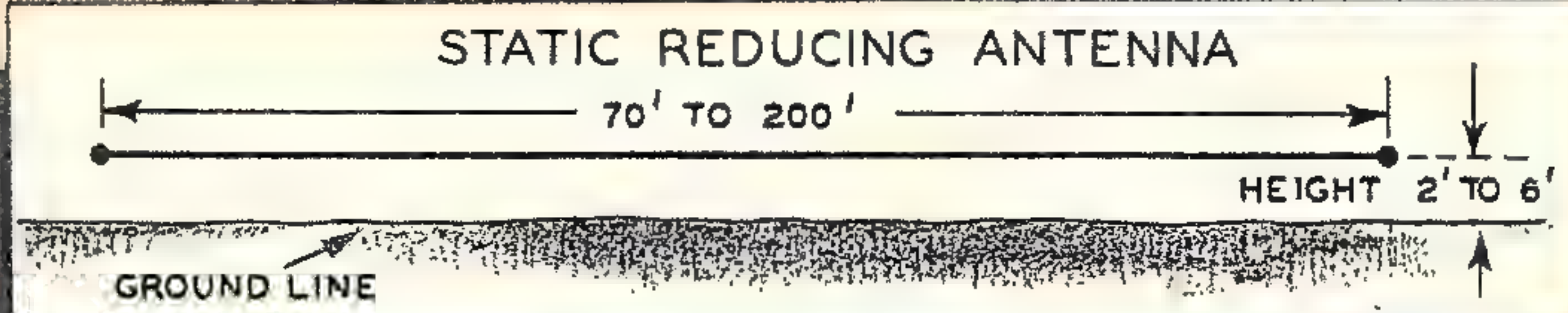


Described here are three types of noise reducing antennas. Two of them are designed especially for shortwave reception, while the third is for broadcast pick-up only. All are available in inexpensive kit form.

sist even when the antenna terminal of the set is connected to the chassis of the set. In other cases the hum is heard only when a station is tuned in, and still others the "shush" noise appears only on weak stations or when signals fade down.

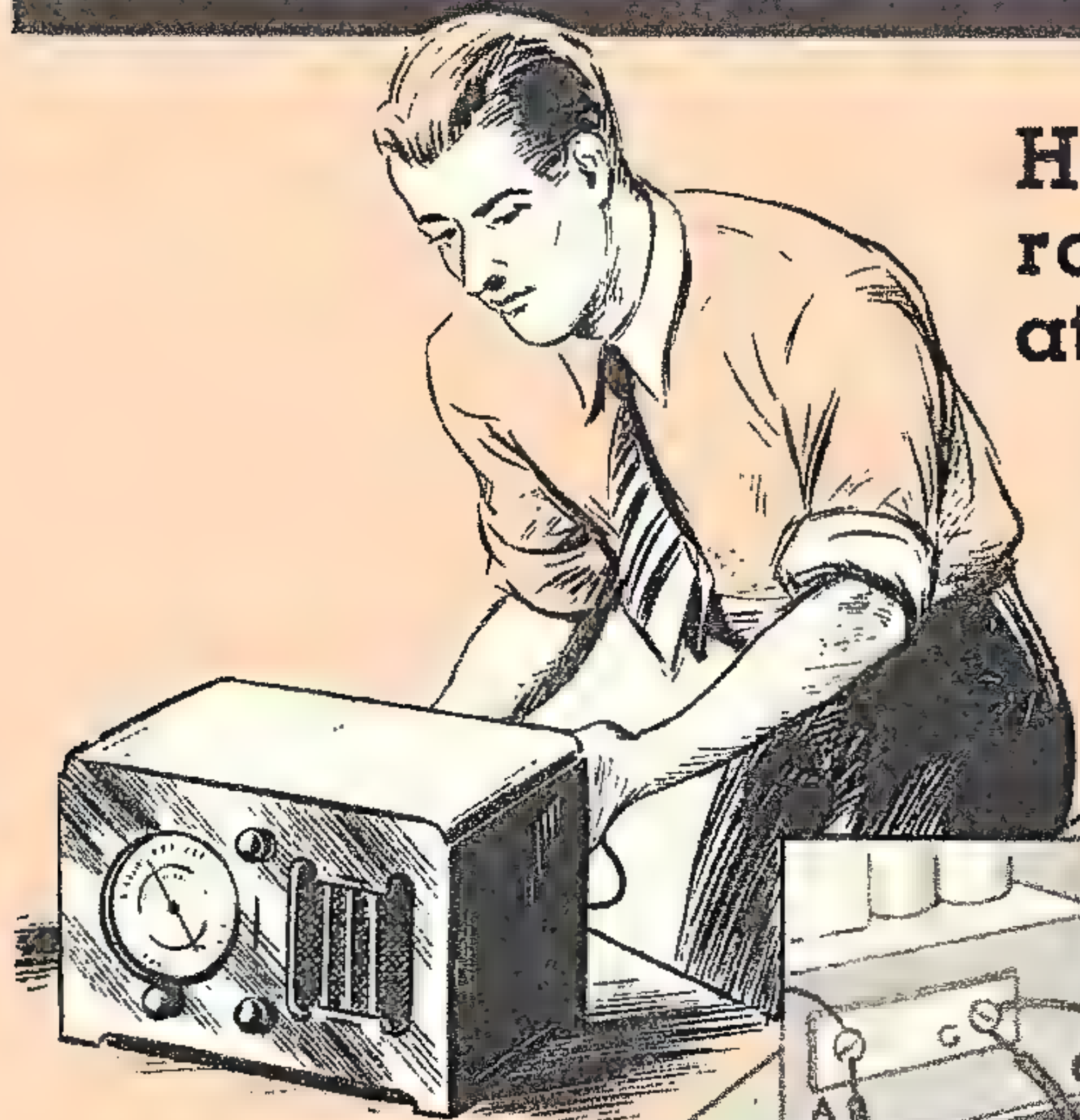
All these things are design-defects found in both cheap and costly receivers. A really

Right—In localities where static is excessive, an antenna located only a few feet above the ground will often reduce annoying radio disturbances.

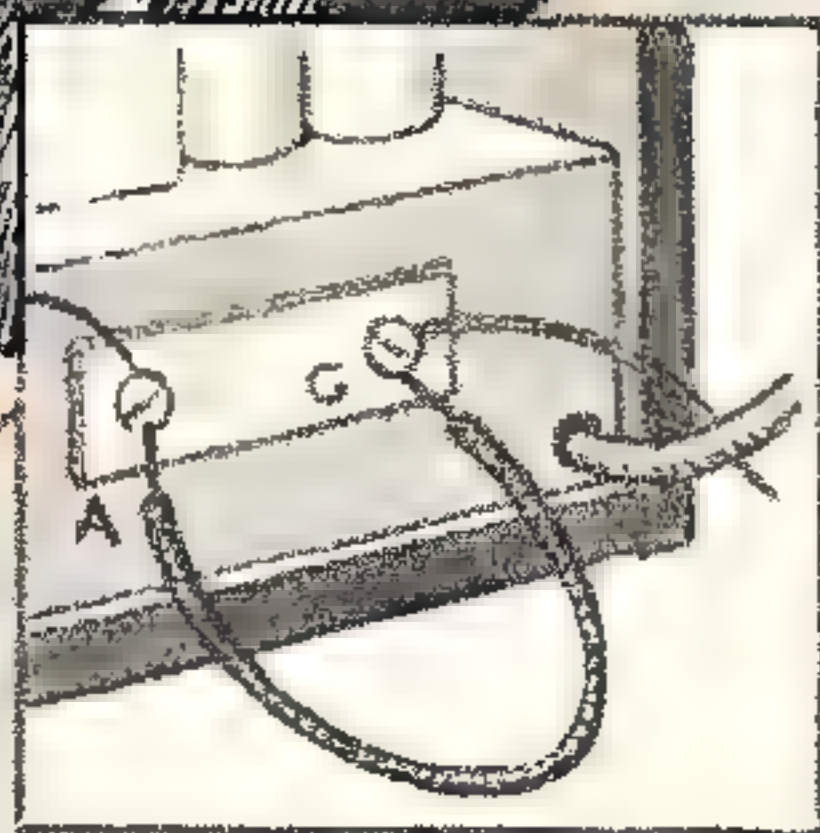


of RADIO NOISES

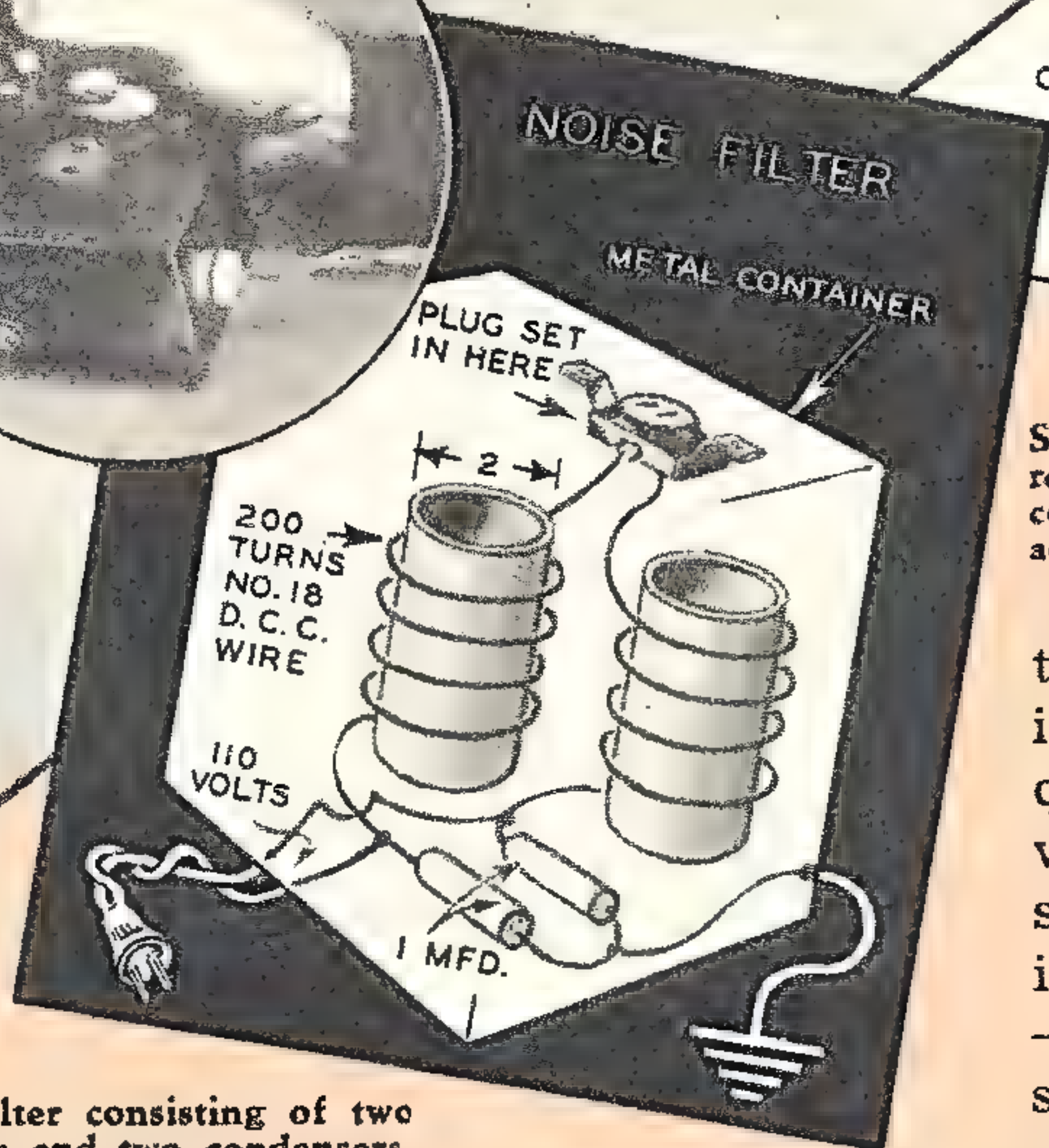
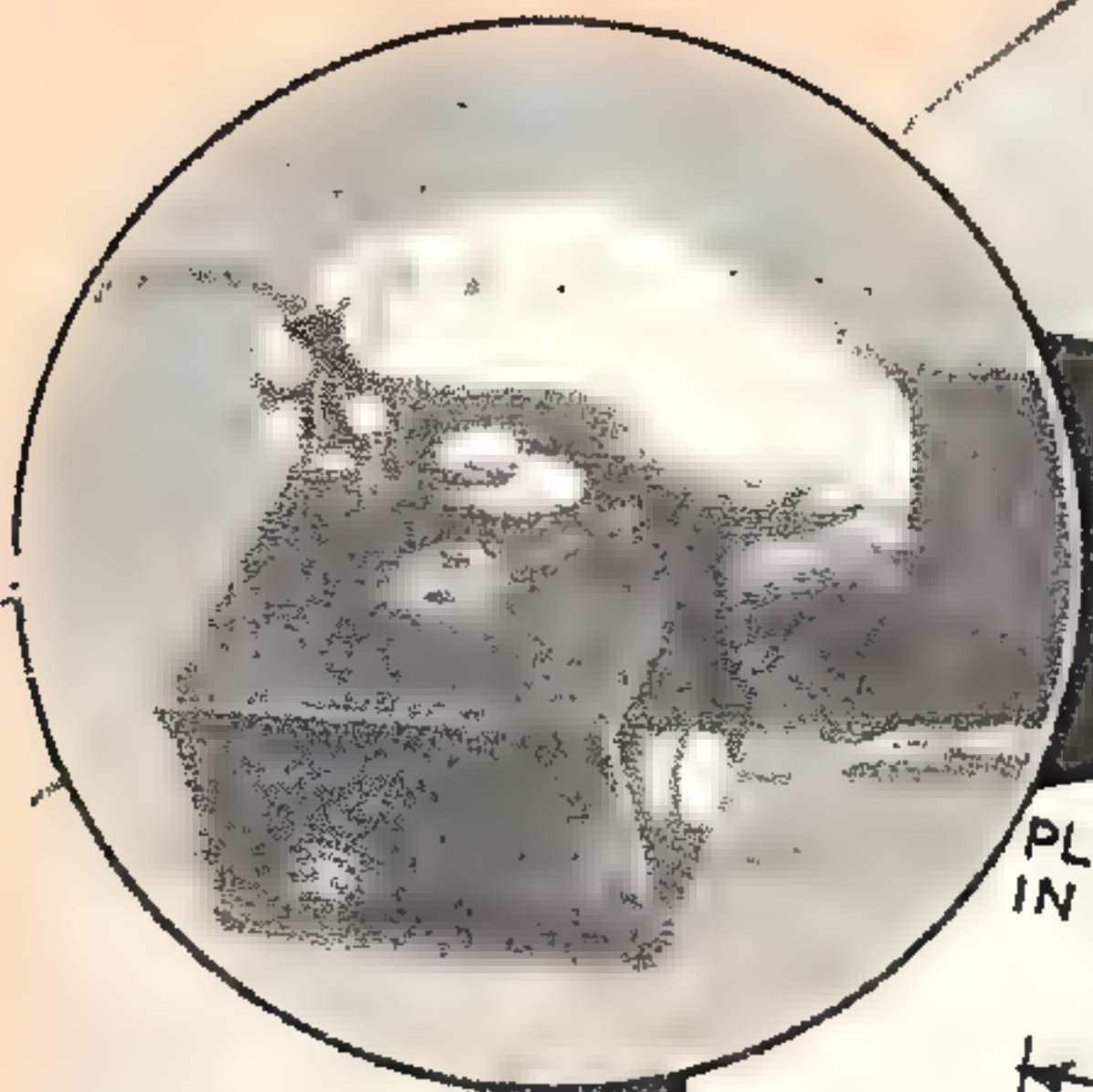
How to check
radio noise
at its source.



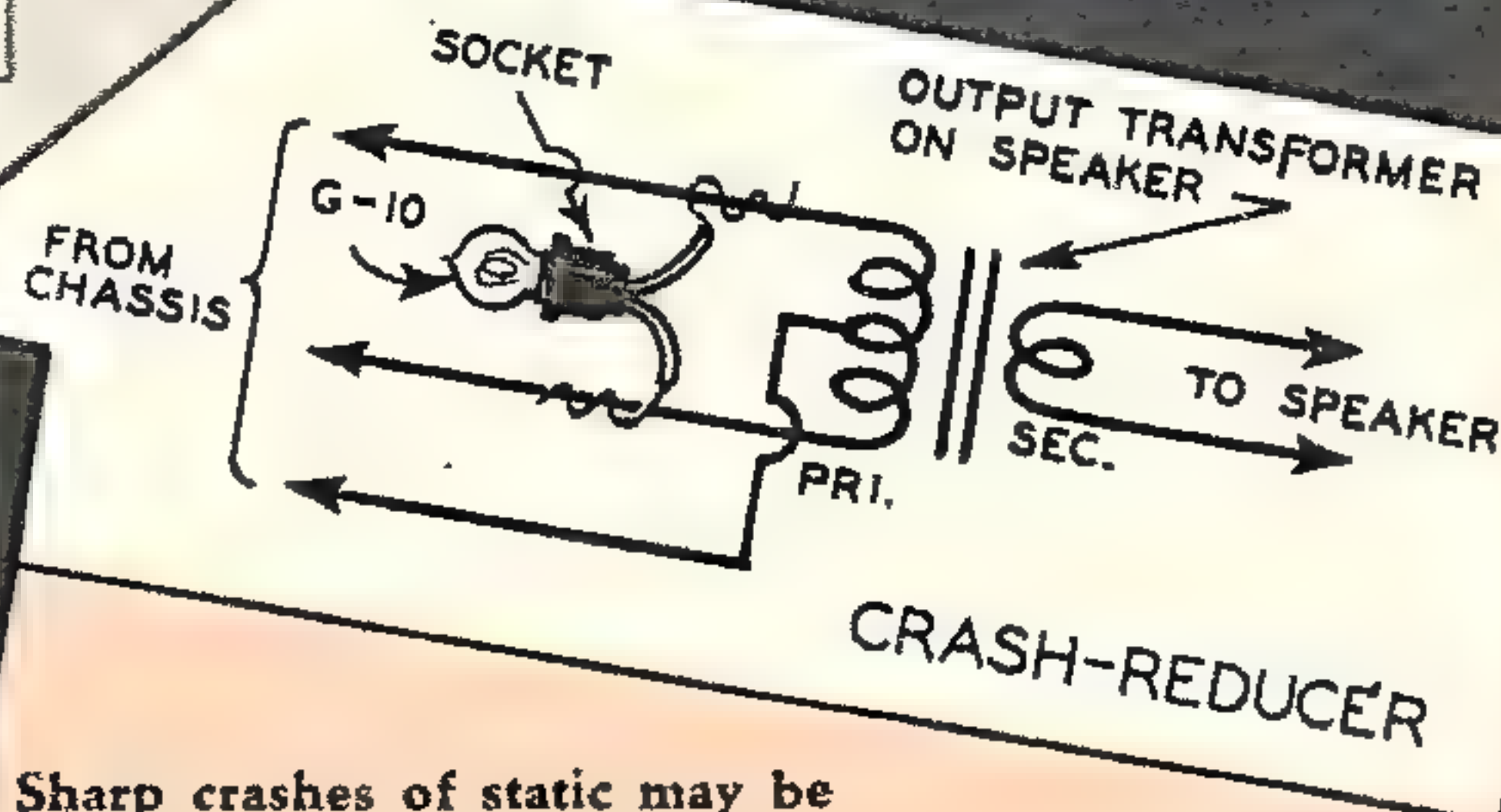
If noise persists
when antenna is
grounded to
chassis, it is en-
tering set through
the power line.



Natural static, as caused
by thunderstorms, cannot
be entirely eliminated.
Special antennas will aid
in partially reducing it.



A noise filter consisting of two
choke coils and two condensers,
connected as shown, will often
reduce power line interference.



Sharp crashes of static may be
reduced in some instances by
connecting a G-10 neon bulb
across the speaker transformer.

good serviceman will understand what causes them and you may learn whether to trade in the set for a better one or have him make changes in its circuit to get rid of the noise. Sometimes the receiver can be made decently quiet if given a 100-foot antenna but if that seems to overload it, compromise with a 75-foot antenna.

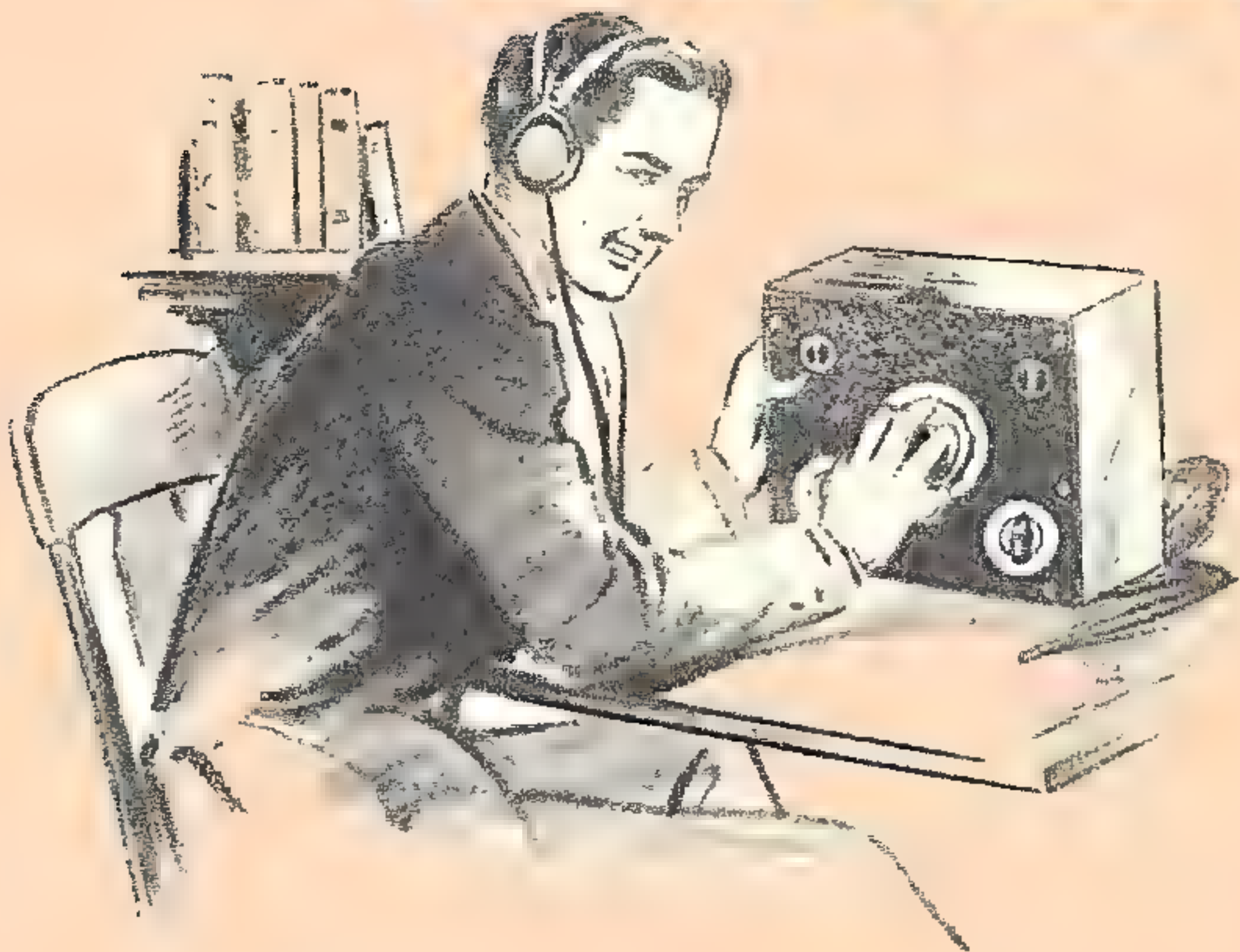
On Jack Benny's program, and in the funny papers, any fool noise is called "static," but

there is no mistaking the real article when it has once been recognized. Static is infrequent in winter and frequent in warm weather, especially after sundown. It never squeals or buzzes as the funny-men say, but is always and every time explosive in nature—a crash or pop for a single "splash" of static on a grating or frying sound but never a steady noise. It cannot be stopped at the source, for nature is responsible, but we can cover moderately strong static by using a larger antenna, as already mentioned, provided we make the antenna merely longer—not higher. Broadcast reception can be made fairly acceptable with an antenna 5 feet high and 100 feet long when the ordinary antenna nearly ruins the speaker.

Most people now know that pitched noises may be reduced by turning the tone control to "bass" or "low pitch" and accepting the

[Continued on page 134]

BUILD THIS TWO-TUBE "AMATEUR SPECIAL"



by Clifford Peters

THE "Two-Tube Amateur Special" will fill the wants of the future radio amateur, or the person who desires to listen only to the short waves with all their interesting broadcasts. For the person who now is learning the code, this receiver will supply all the code practice desired.

Simple to construct, the entire outfit can be assembled and wired, ready to operate, during a weekend. A metal cabinet serves the double purpose of furnishing adequate shielding and giving the finished product an attractive appearance. The outfit was constructed with the power supply as a separate unit to remove the possibility of a. c. hum pickup so predominant in many home-built regenerative receivers, using a power pack.

Before starting the actual construction, the builder would do well to study carefully the wiring diagram and the placement of parts. Slight variation of parts placement will not materially affect the operation of the receiver.

The builder will notice that the two tuning condensers are connected in parallel. The .0001 mf. variable condenser is used for band-setting purposes, and the .000035 mf. condenser, mounted near the center of the panel, for spreading the section of the band selected by the band-setting condenser.

Although this receiver is not recommended for loudspeaker operation, it will furnish sufficient volume on some stations to be heard throughout the room. It will, in any case, give signals loud enough to be read with headphones.

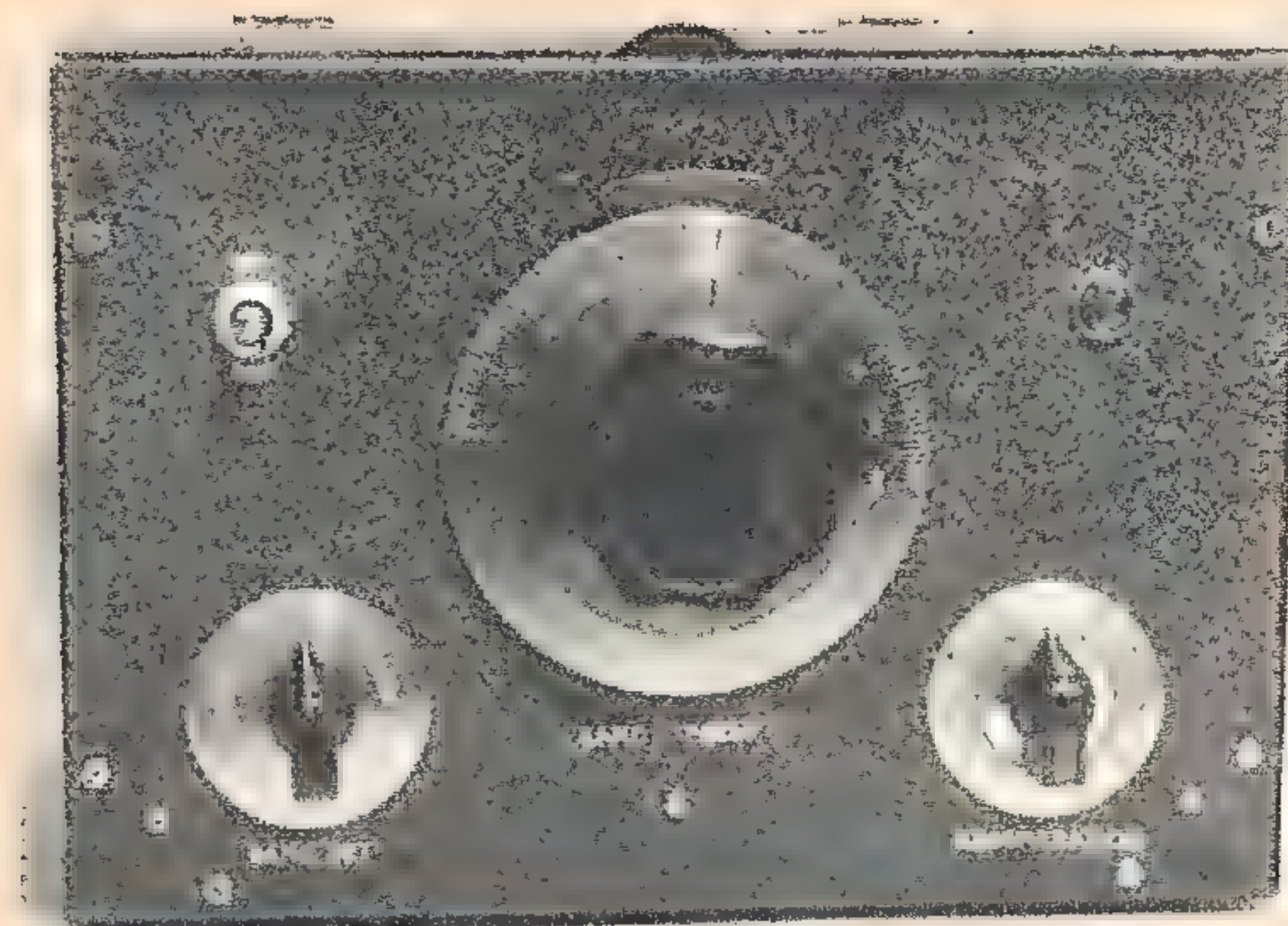
Actual construction should start with the panel layout. A cabinet measuring seven by ten inches long and eight inches deep will be found to be most suitable. This cabinet should have a removable panel so that layout and drilling can be done with it removed from the rest of the cabinet.

The location for the band-spread condenser was obtained by drawing diagonal lines from the corners of the panel, and measuring up one-quarter of an inch from the intersection of these lines.

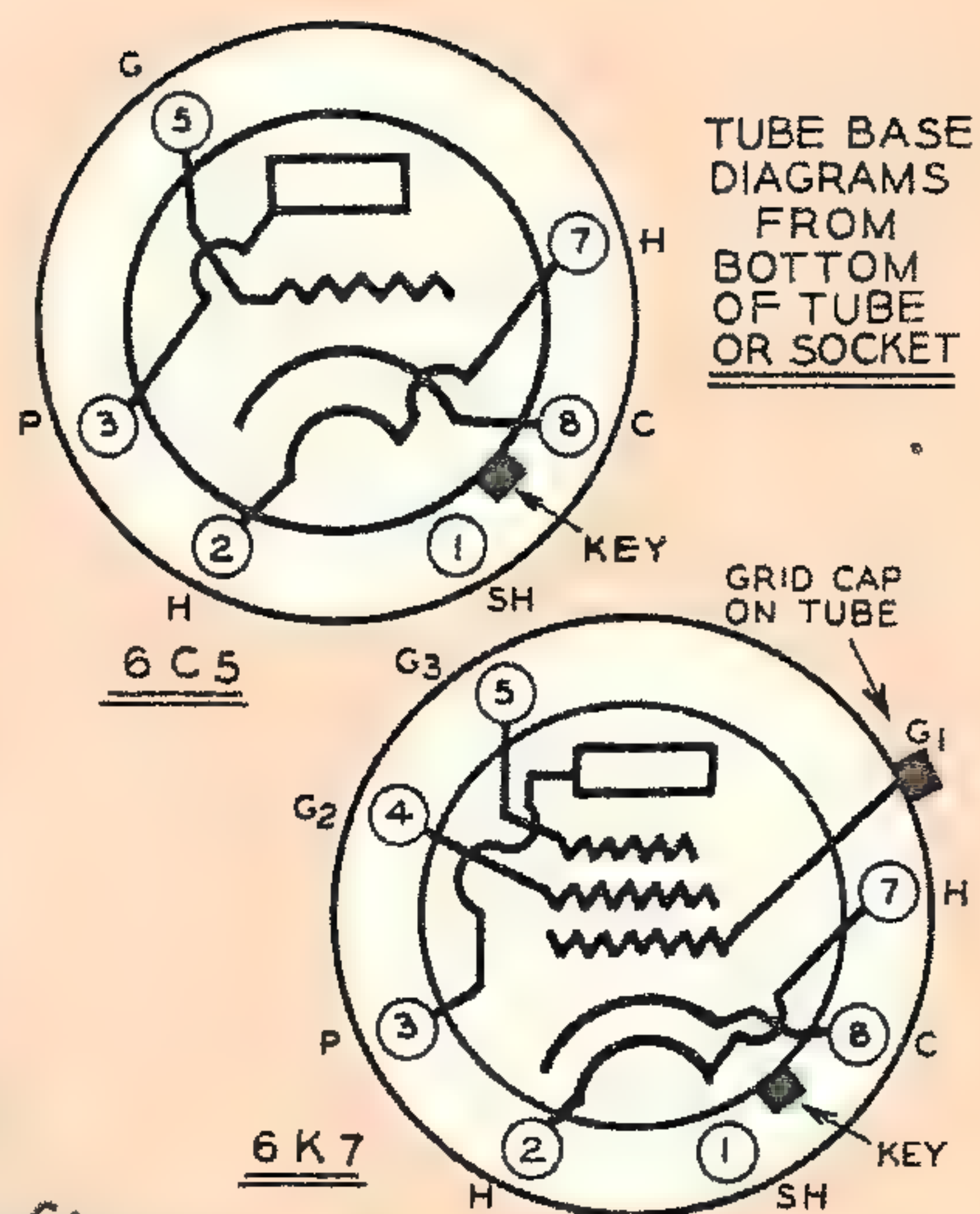
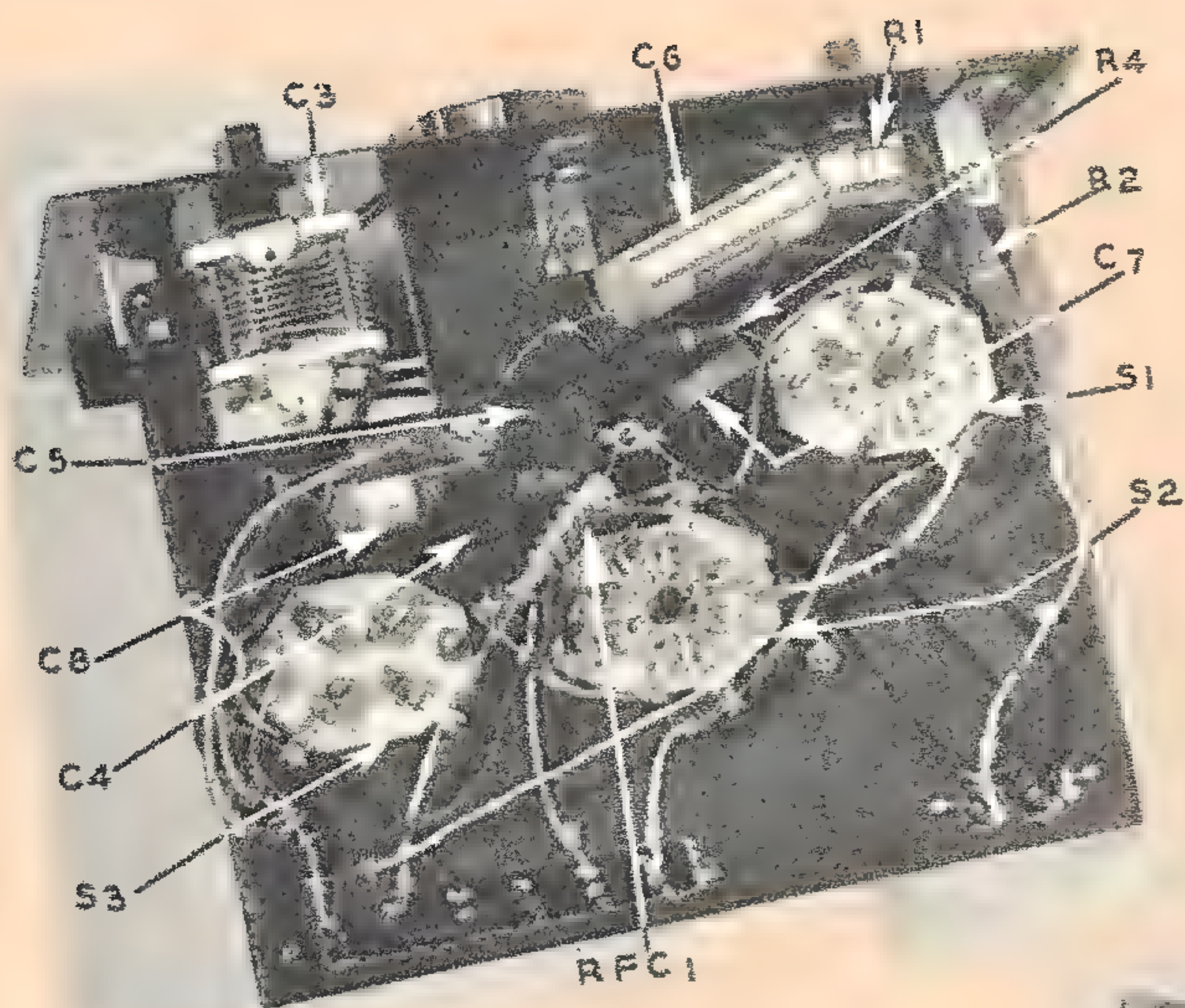
The centers of the holes for the band-set condenser and the potentiometer are obtained by measuring up two inches from the bottom of the panel and two inches in from each side. The pilot light and the "B" switch are located one and one-half inches from each side and two inches from the top of the panel.

A plyboard subpanel measuring eight by seven inches deep is attached to the panel by three one-inch angle brackets. The subpanel is mounted approximately one and a half inches from the bottom. Because the potentiometer and the band-setting condenser are mounted only two inches from the bottom of the panel, it is necessary to cut sections out of the baseboard to accommodate these instruments.

It will be noted that the power supply is larger than most of those used for receivers. It can therefore be used with an amplifier for this receiver, or as a source of power for a crystal oscillator.

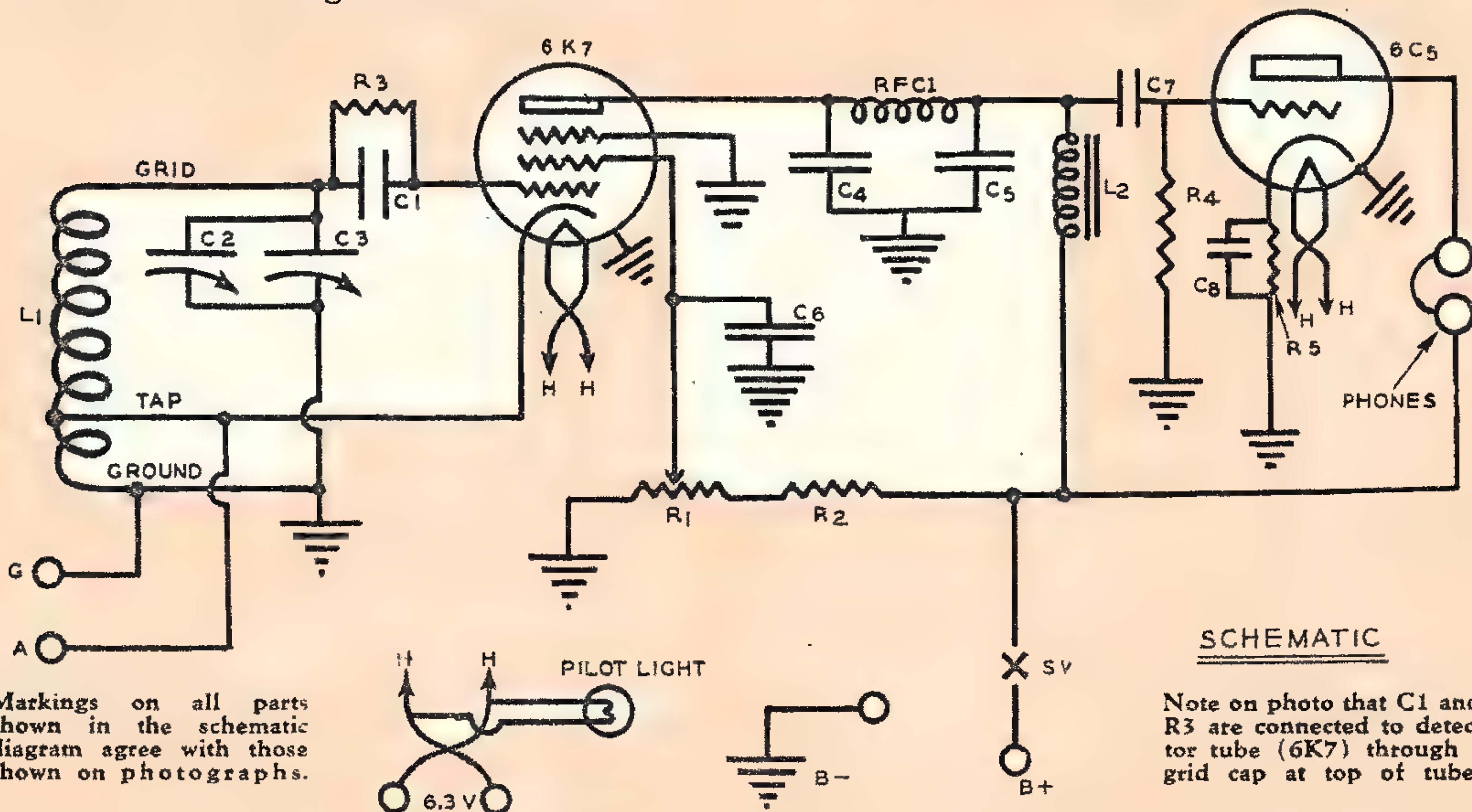
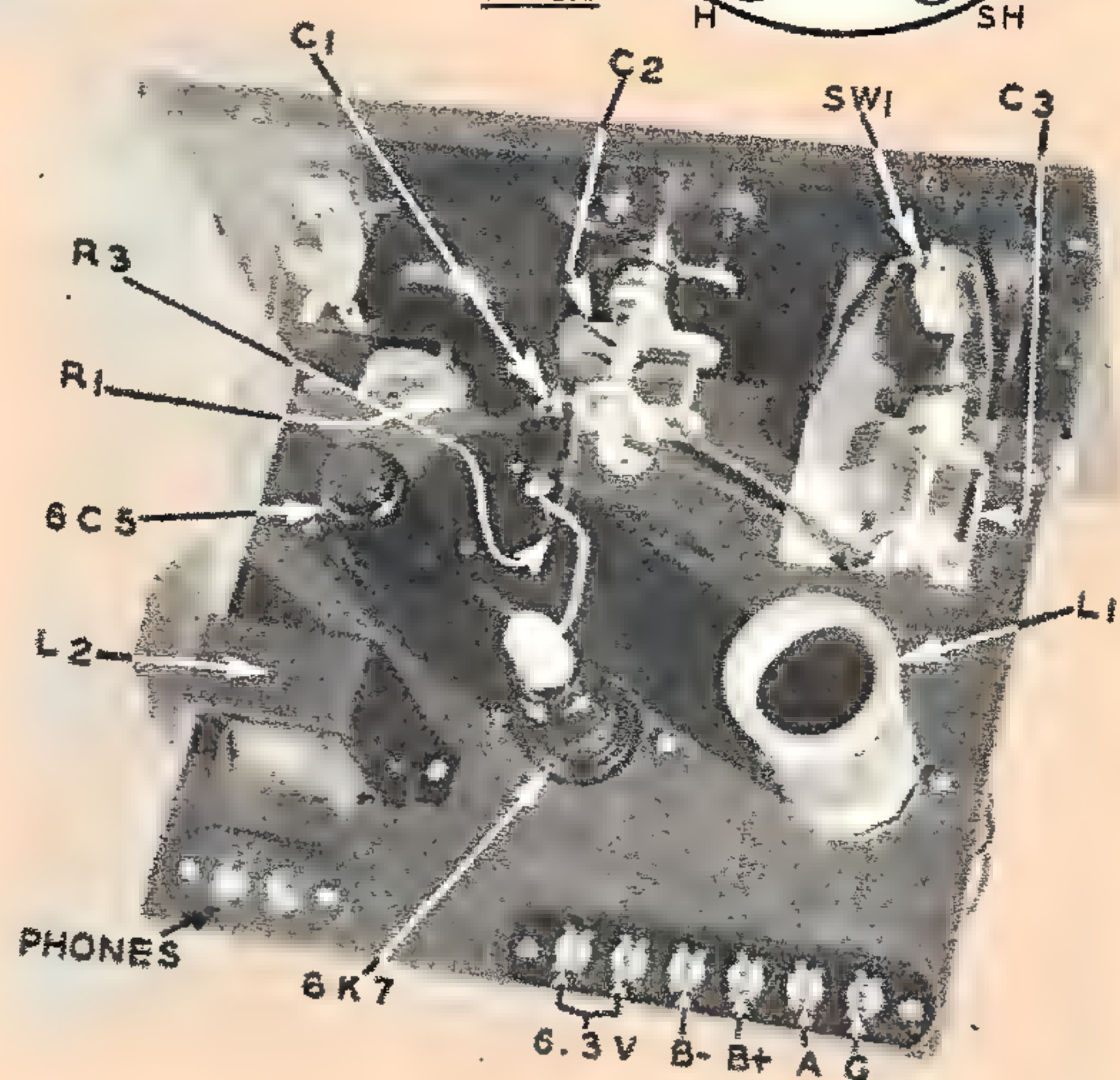


The completed receiver as viewed from the front. "B" switch shows at the upper left corner of the panel. The pilot light is at the right. The panel measures seven by ten inches long.

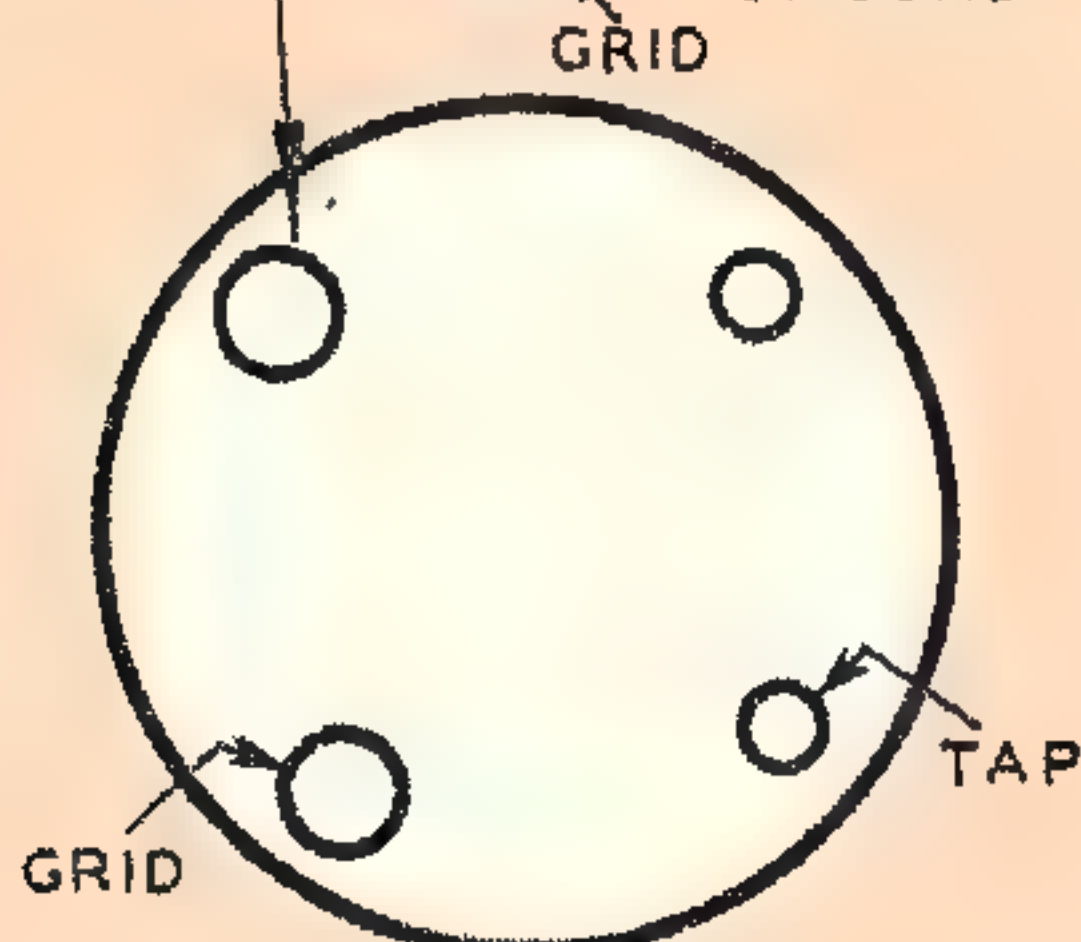
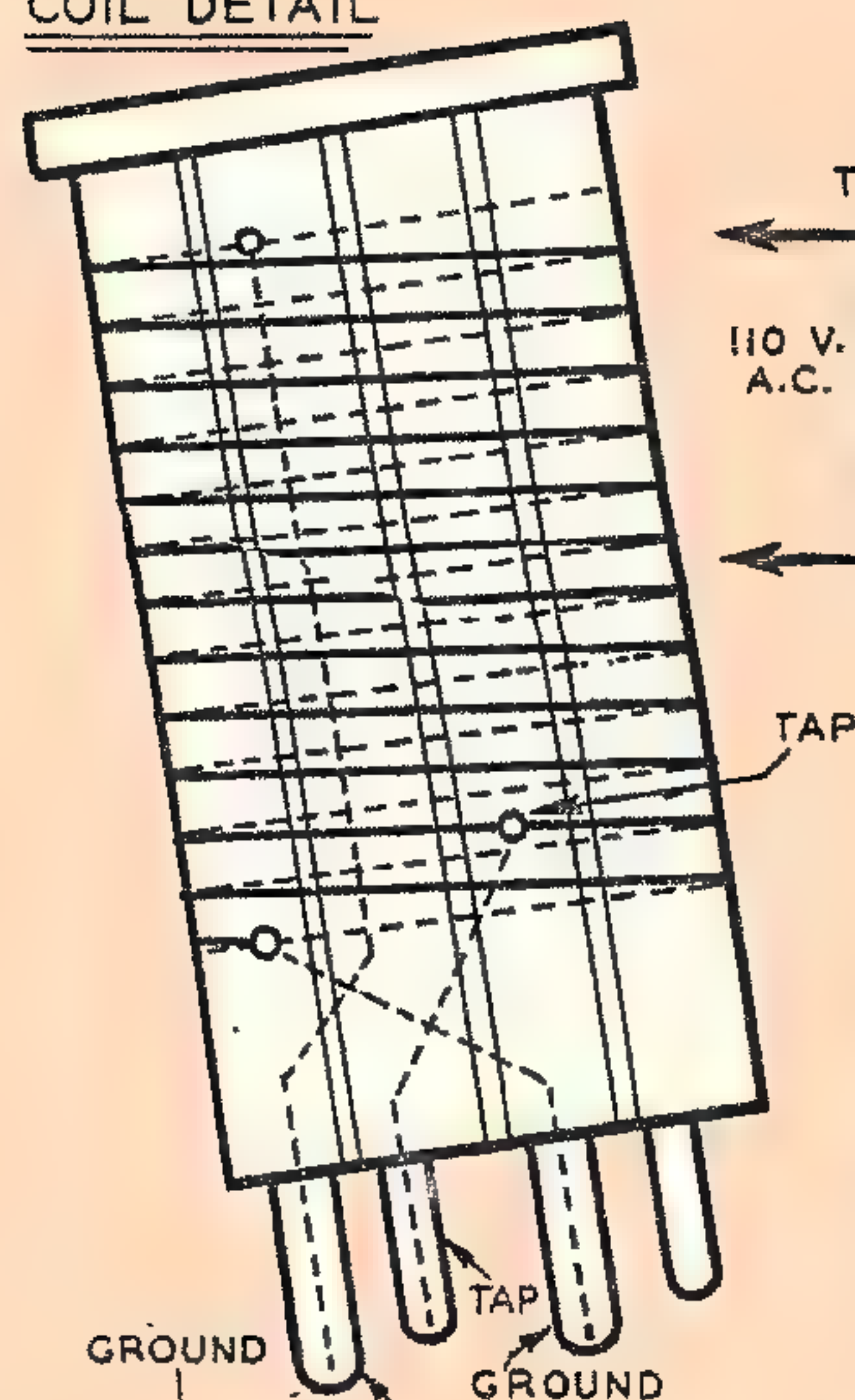


A switch is placed in the "B" plus lead so that the receiver may be shut off temporarily without turning off the filaments. When the receiver is used with a transmitter, this "B" switch will be found especially useful. If the entire receiver, including the filaments, is turned off, approximately twenty seconds are required before the tubes are again at operating temperature. The "B" switch eliminates this time lag. The pilot light indicates that the receiver is turned on even though the "B" switch is turned off.

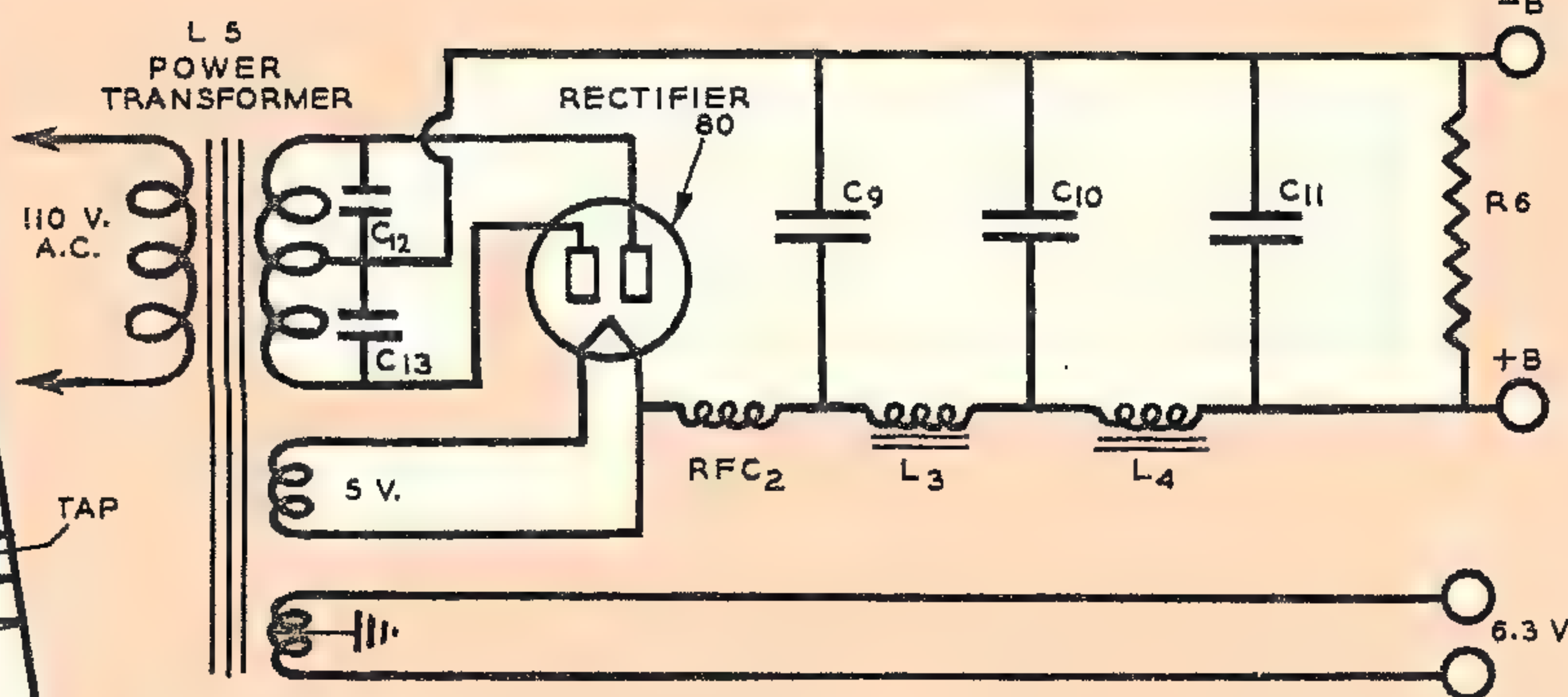
Different values of grid leaks should be



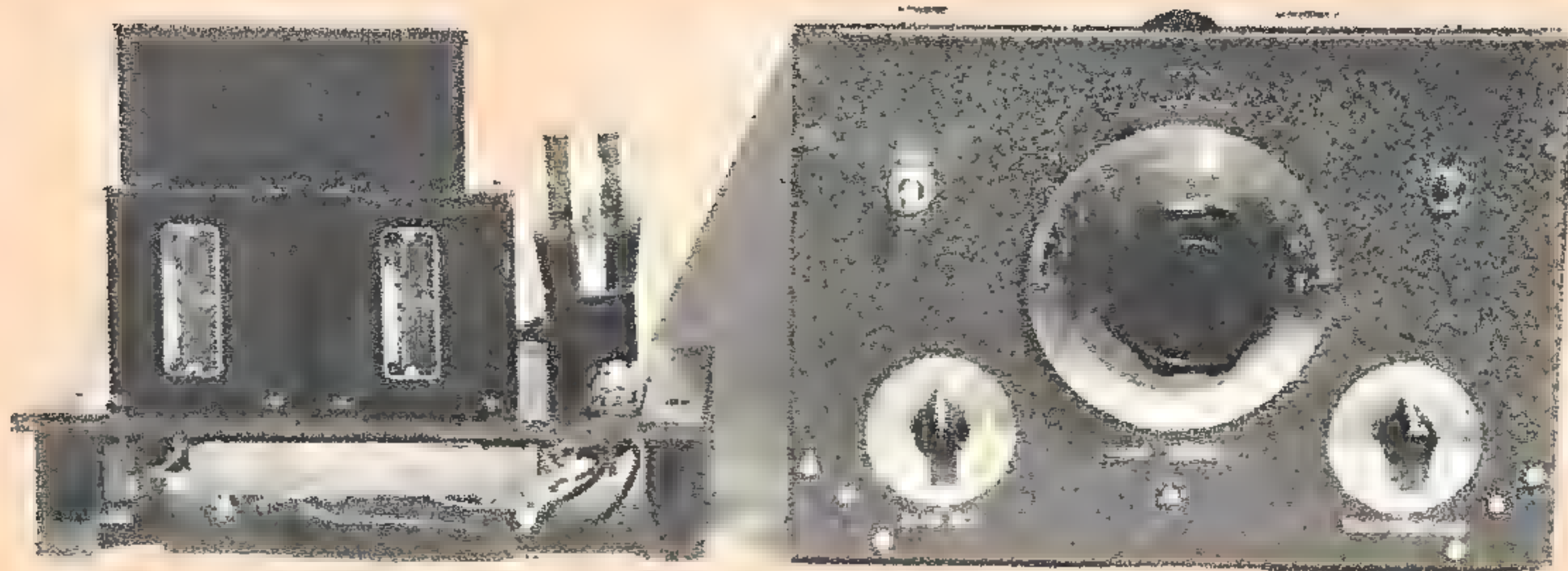
COIL DETAIL



BOTTOM VIEW
OF COIL FORM



Above is shown the schematic diagram of the power supply. Condensers C9, C12, C13, and RFC2 may be omitted if the receiver is not troubled with tunable hum. Below is shown the completed receiver with its power supply. During operation be sure that the power unit is kept several feet from the receiver. The 40,000-ohm bleeder resistor is shown under the base. The connections for the tuning coil are shown at the left. No provisions are made for turning the power supply on or off; this is left to the builder. Probably the simplest method is by pulling out a. c. plug or by a switch in the line itself.



tried if the set does not go into oscillation smoothly. Probably two or three megohms will be found to be the correct size.

If your set is not troubled with tunable hums, it will not require condensers C9, C12, C13, and choke coil RFC2. If your transformer does not have a center tap on the 6.3-volt winding used for the 6K7 and the 6C5, connect a 75-ohm center tap resistor across the filament at the detector tube socket. Connect the center contact to the ground. The two outside contacts are connected to the filament, one on each lead.

Be sure that the rear of the panel is scraped clean where condensers C2 and C3 are fastened. As most metal panels are painted black at the rear, a poor contact may result if the panel at that point is not clean.

Holes are drilled through the rear of the cabinet to make room for the wires to the binding posts at the rear of the set. Be sure that the wire used for connecting the set to the power supply is well insulated.

The coils should be wound on four-prong forms measuring one and one-half inches in diameter. The winding should be spread out over a space measuring an inch and a

quarter to an inch and three-quarters. No. 22 or 24 D.C.C. wire is used for the windings. The tap for the cathode is counted off from the ground end of the coil. Although the following specifications were found to bring in the various amateur bands at the correct points on the band-setting condenser, the builder may find that a few more or less turns will be required.

Frequency	Total turns	Cathode tap turns
1715- 2000 kc.	58	4
3500- 4000 kc.	29	1½
7000- 7300 kc.	14	1
14400-14000 kc.	9	¾

Be sure to solder all connections. The greatest help in doing a neat soldering job is a well-tinned iron. When the set is completed and ready for testing, examine the wiring once more to be sure that all connections are made to the correct points and well soldered. The connections marked "Sh" in the socket diagrams are connected to ground.

After the set is turned on, a click should be heard when the potentiometer is turned past the point of oscillation. With the potentiometer turned just past the point of oscil-

[Continued on page 144]

MODERN PHOTOGRAPHY

Section of MODERN MECHANIX—Pages 103-114



No, they're not quadruplets, but one and the same man! This picture, taken by Calaway Moore of Swainsboro, Ga., earned this month's \$15 award. The shot was made by exposing only one-quarter of the film at a time. The lens aperture was stopped down to f. 11.



This unusual wide-angle picture was taken with a Graflex by Ivan R. Tomkins of Savannah, Ga. Close examination will reveal that the image is a reflection from the hub cap of an automobile wheel. For this photograph, Mr. Tomkins received second award of \$10.



Sunset scenes like this one always make interesting additions to the photo album. Fifth award of \$5 was given to C. Edward Zeller of Westmount, Que., for his interesting photo.

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay \$15 for the best picture received from readers, \$10 for the second choice, and \$5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor, MODERN MECHANIX, 1501 Broadway, New York, N. Y.



Fireworks displays are always excellent subjects for unusual pictures. This photo, taken with a f. 4.5 lens and 1/25 second exposure, earned for Bruce Pendlebury of Moose Jaw, Sask., Canada, third award of \$5.

Though the picture at right is a photo oddity, it brings out an important point that should not be overlooked by the amateur photographer. Don't get too close to the subject if your camera has a short focus lens, otherwise a distorted shot will result. For this picture, Emil Pearson of Redgranite, Wis., received the \$5 fourth award.





Designing Photographic

by Paul Hadley

THE popularity of photographic greeting cards increases each year among amateur photographers, who have developed many interesting and unique ways of making them. Yet, there is one branch of this hobby, though especially well adapted to the making of greeting cards, that has somehow been overlooked. This is table top photography, by means of which little scenes can be built up on a table in the quiet of the home, and photographed by artificial light.

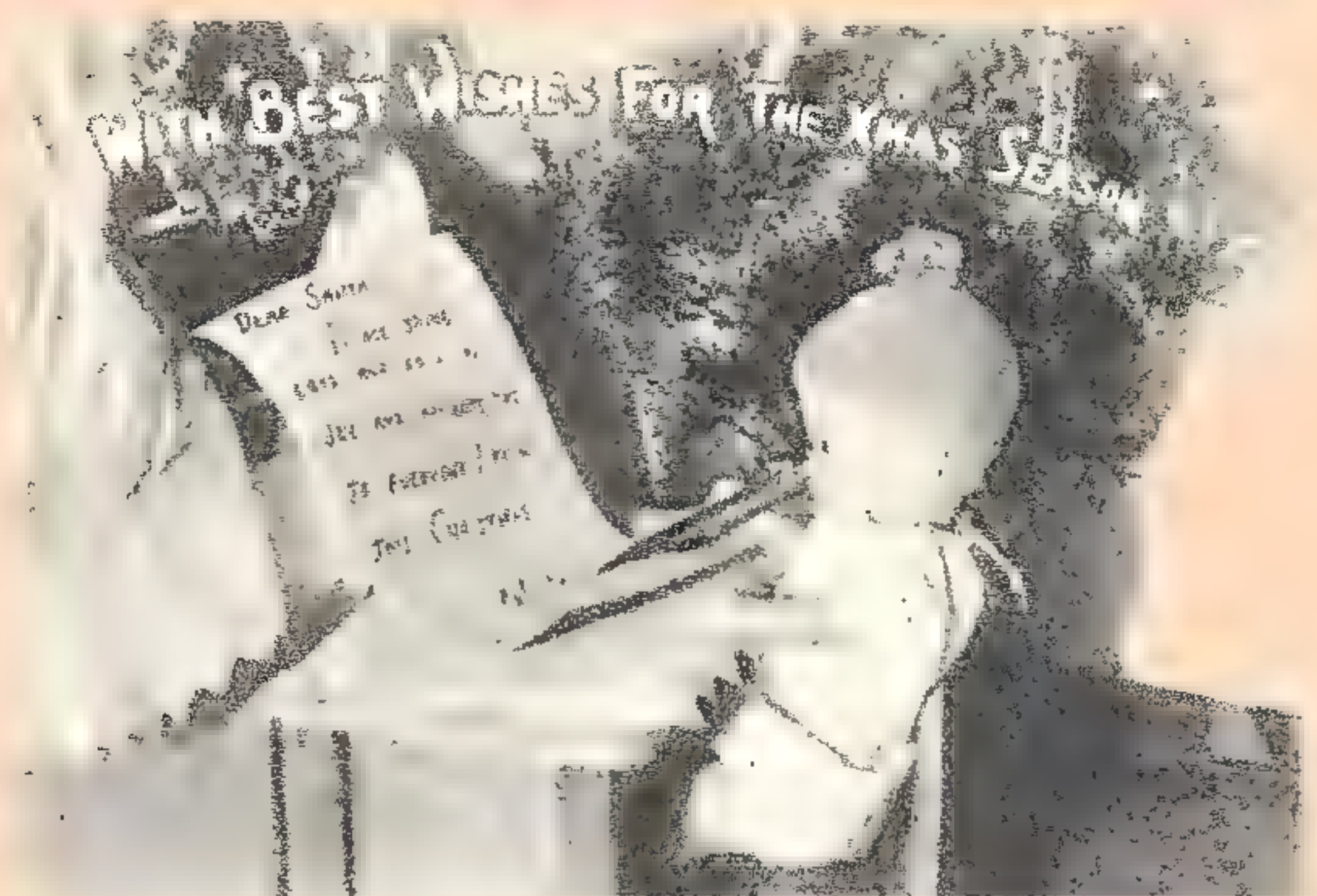
Many are the effects that can be produced with a few simple "props," such as a toy doll or two, miniature Santa Claus and reindeer, or other miscellany found in any toy store. No particular equipment is needed; any available camera that can be focused on objects within a foot or two of the lens is well adapted to the work. As the objects are necessarily stationary, time exposures of any length may be given so that even the most simple lighting can be made to produce good results. All of the accompanying illustrations were made with a simple focusing camera, using one or two photoflood bulbs for illumination.

Ordinary lighting bulbs would have served just as well however, by increasing the time of exposure.

One of the accompanying illustrations shows a small doll seated at a table, much as any child would sit, just finishing a letter to Santa Claus, in which she requests him to bring lots of pleasant things to the recipients of the card. This little scene was simply made. The doll was an ordinary ten-cent china doll from the toy store, about 5 inches high, seated at a table made from a small wooden box. For a background, a sheet of white cardboard was placed immediately back of the table, with a window and cur-

tains, made from black paper and two scraps of white cloth set up in front. An evergreen twig, decorated with a bit of tinsel, add a bit of Christmas atmosphere. The note was printed on white paper with black ink, and propped into place against the curtain. One photoflood bulb, at the same height as the set-up, and located beside the camera, furnished the light. The exposure was made in 6 seconds at f. 22 stop.

The same tinsel decorated cedar limb was used in making the other three pictures in which the symbol of Christmas appears. In two of these the little trees, decorated with



Though distinctively different, these novel greeting cards are easy to make. Properties consist of odd pieces of cloth, cardboard, two ten-cent dolls and a few miniature "prize package" toys. Draw greetings on resulting negatives with black show card paint.

★ Your Own ★ Holiday Cards

A small camera and simple props provide all equipment needed to make these clever greeting cards.



gifts, in a homelike setting, was made with the same window and wall background, but with the use of an additional doll character. The toys used to decorate the tree were a tint chair from a set of kiddie's doll furniture, supplemented with a striped whistle and a few marbles to look like balls. Lighting for this scene is the same as that used in the first except, that the lamp was moved a bit farther to the left, so that more sharply defined shadows are cast.

In the North Pole scene, we find old Santa, himself, about to leave on his yearly round, while the Aurora shines brilliantly around the North Pole. This scene took but a little over an hour in the making and photographing, and proved to be one of the favorites with the children to whom it was sent. In



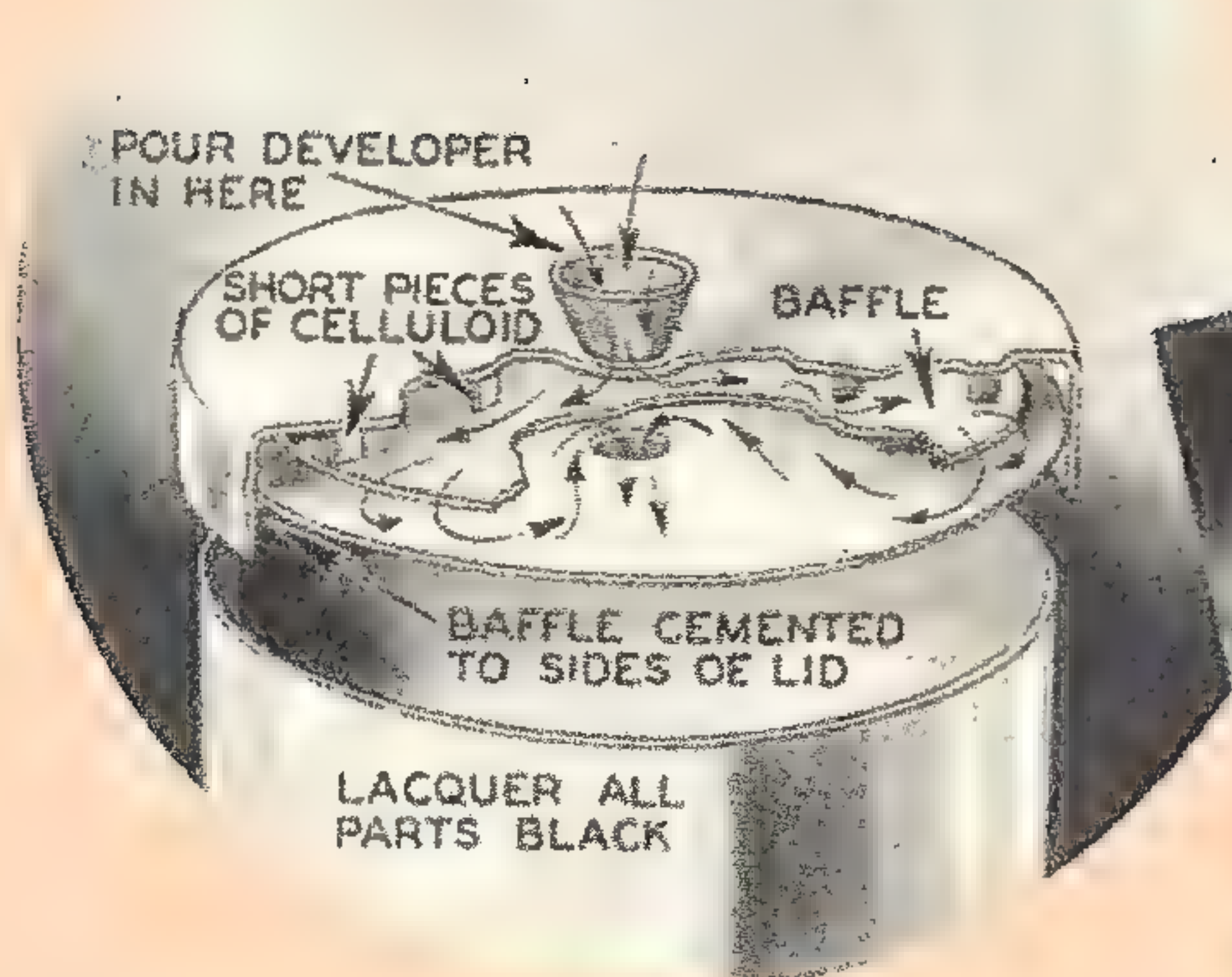
Simplest of all to make, this card is nevertheless very effective. A lighted candle, pen, inkwell and evergreen twig provide a cheery setting for the friendly Yuletide greeting.

making this, the table was first covered with a layer of newspapers, and the "aurora" background, of dark colored cardboard with the designs painted on it with white ink, set in place. A half inch layer of flour was then sifted over the paper covered table top and a small pile made where the "North Pole" was to stand. The pole, by the way, was nothing more than a large peppermint stick as sold in all stores at Christmas time. Santa, his
[Continued on page 128]



Bits of tinsel, an evergreen twig, a doll chair and a pair of china character dolls are incorporated into this original greeting card. The window frame in the background is formed of black cardboard and thin strips of wood. Star and snow effect are painted in.

CELLULOID DEVELOPING



In order that the developer mix thoroughly when poured into the tanks and all light shielded from solution, the lids of the developing tanks are fitted with baffles made as shown in the above phantom detail. The baffle is cemented to the lid on short celluloid tabs. The funnel, on top is cemented with acetone.

Pictured at right is a completed roll film tank, loaded and ready for the developing solution. Although shown transparent, the tank when in actual use should be given one or more of black lacquer.



This box-shaped developing tank is designed expressly for taking cut film. Insertion of the film spacers is accomplished through the use of acetone cement. A fingernail polish applicator and stamp tongs are used in mounting the strips. In order to maintain uniform spacing of strips, a ruled cardboard template is laid underneath celluloid.

To insure tank rigidity, the bottoms are fitted with plywood and rendered waterproof with a sheet of celluloid, secured to plywood with acetone cement.



MOST professional photographers develop their negatives by the time and temperature method in a tank, to assure results that are uniform from day to day. A high average of good negatives is one of the secrets of the successful photographer. When the amateur wishes to follow this method, however, quite often he is confronted with one or more problems. First, a suitable tank may be too expensive. Again, one of the right size, particularly for roll film, may not be available. Finally, if you wish to make your own tank and are lucky enough to have a sheet of non-corrosive metal, such as monel or stainless steel, it is difficult to put together. Solder cannot be used, as it would contaminate the developer.

Heavy sheet celluloid, which you can purchase at any auto supply store, is the ideal answer to the problem. It is not expensive, does not affect the developer and can be welded together easily. Hold two pieces together lightly and touch the edges with a drop

TANKS ARE EASY TO MAKE

by Kenneth Murray



Though inexpensive to make, the celluloid developing tanks will be found superior to many commercial types. The photo above shows a cut film tank in use.

Below—When winding roll film on the developing tank spool, squeeze the edges of the film, as it is wound up, so that it bulges sufficiently to permit its insertion in the film tracks.



Spiral strips of celluloid are cemented to the inside of the spool so that the surfaces do not contact each other during the developing process. Note holes in upper disc for developer to pass through. Make these with a small machine drill.



A rubber bulb circulator inserted in the cut film tank insure the developing solution of proper agitation at all times. Roll film is agitated by gently shaking the covered tank.



of acetone. Like a flash the latter penetrates and makes a secure, waterproof bond.

The illustrations show how to make tanks for developing either cut film, film packs or roll film. The roll film tank is supplied with a celluloid spool on which the film is rolled for development.

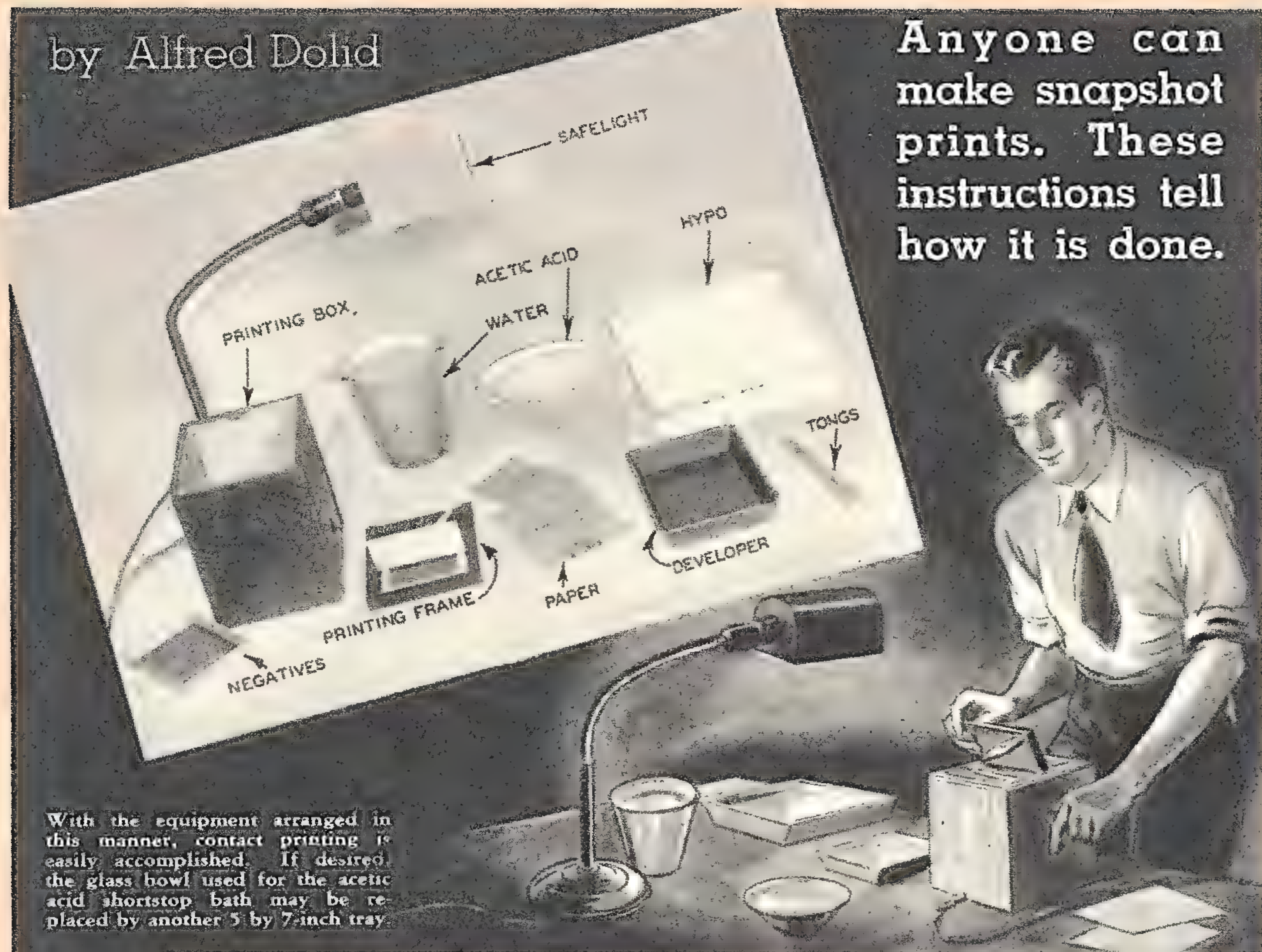
First cut a piece of thin plywood to the desired size and shape for the bottom of the tank, then bend a sheet of celluloid around it to make the sides. Cover the plywood with a piece of celluloid of identical size and flow acetone along the edges so that the two will be bonded to the walls. This forms the real bottom of the tank and protects the plywood from moisture. If the tank is large it is advisable to reinforce the corners and edges with additional strips of celluloid, welded in place with acetone.

In the case of the cut-film tank, bend narrow strips of celluloid and weld them in orderly fashion on either side, with acetone, to form troughs or grooves into which the

[Continued on page 136]

by Alfred Dolid

Anyone can make snapshot prints. These instructions tell how it is done.



With the equipment arranged in this manner, contact printing is easily accomplished. If desired, the glass bowl used for the acetic acid shortstop bath may be replaced by another 5 by 7-inch tray.

How To PRINT

FULL instructions for developing roll film at home were given on pages 104 and 105 of the November issue of *MODERN MECHANIX*. The next operation is "printing," which is the process of producing actual black and white pictures on paper from the developed negatives.

There are two kinds of photographic "printing"—contact and projection. In contact printing, the negative is placed directly against the surface of a sheet of sensitized paper while light is flashed through the negative so that it hits the paper directly. The size of the resulting print is thus exactly the same size as the original negative taken by the camera.

In projection printing the negative is placed behind a lens in a sort of lantern, and the image is thrown onto sensitized paper a short distance away. By proper adjustment of the optical system, the print can be made many times larger than the

original negative. This form printing is commonly known as "enlarging."

The person just beginning in photography should learn contact printing first, as it is very simple and requires only one very inexpensive and easily-made instrument — a printing box. This is a plain box, constructed of three-ply veneer or pressed wood, with an electric bulb in the bottom. The top is left open to accommodate a "printing frame," a device for holding the negative and the sensitive paper firmly and evenly together. You can make such a box in less than an hour if you follow the accompanying plans.

The dimensions shown are for a 4 by 5-inch printing frame; that is, a frame that takes negatives up to 4 by 5 inches. This is large enough for all standard roll or film pack negatives in the popular amateur sizes. An opening in the center of the glass, to take your particular negative, is easily masked

off with black "scotch" tape, which costs only a few cents a roll.

In making the box, be sure that the printing frame fits loosely over the top, so that it can be put in place and removed quickly.

Besides the printing box, the following items, all obtainable at very reasonable prices from any photo supply house will be needed: an "OA" yellow filter for the darkroom safelight; several fresh tubes of "MQ" developer; the same hypo saved from the negative developing process; a one-pound bottle of acetic acid; two trays, one 5 by 7 and the other 8 by 10 inches; a few glass bowls or shallow jars; a wooden clip or pair of tongs for handling wet prints and a supply of contact paper.

As a starter, get one envelope each of Azo E-4 and E-2 paper. This is semi-matte paper, the first of "contrast" grade for flat negatives and the other "normal" grade for normal negatives. This material is surprisingly cheap and therefore permits a lot of experimenting.

Half fill the 8 by 10 tray with hypo. Mix the MQ developer as per its label for contact prints and put it into the 5 by 7 tray.

Measure out $\frac{3}{4}$ -oz. of acetic acid, mix with cold water to make a pint of liquid, and pour into the flat bowl or, better still, into another 5 by 7 tray. Last, fill the tall jar with plain water.

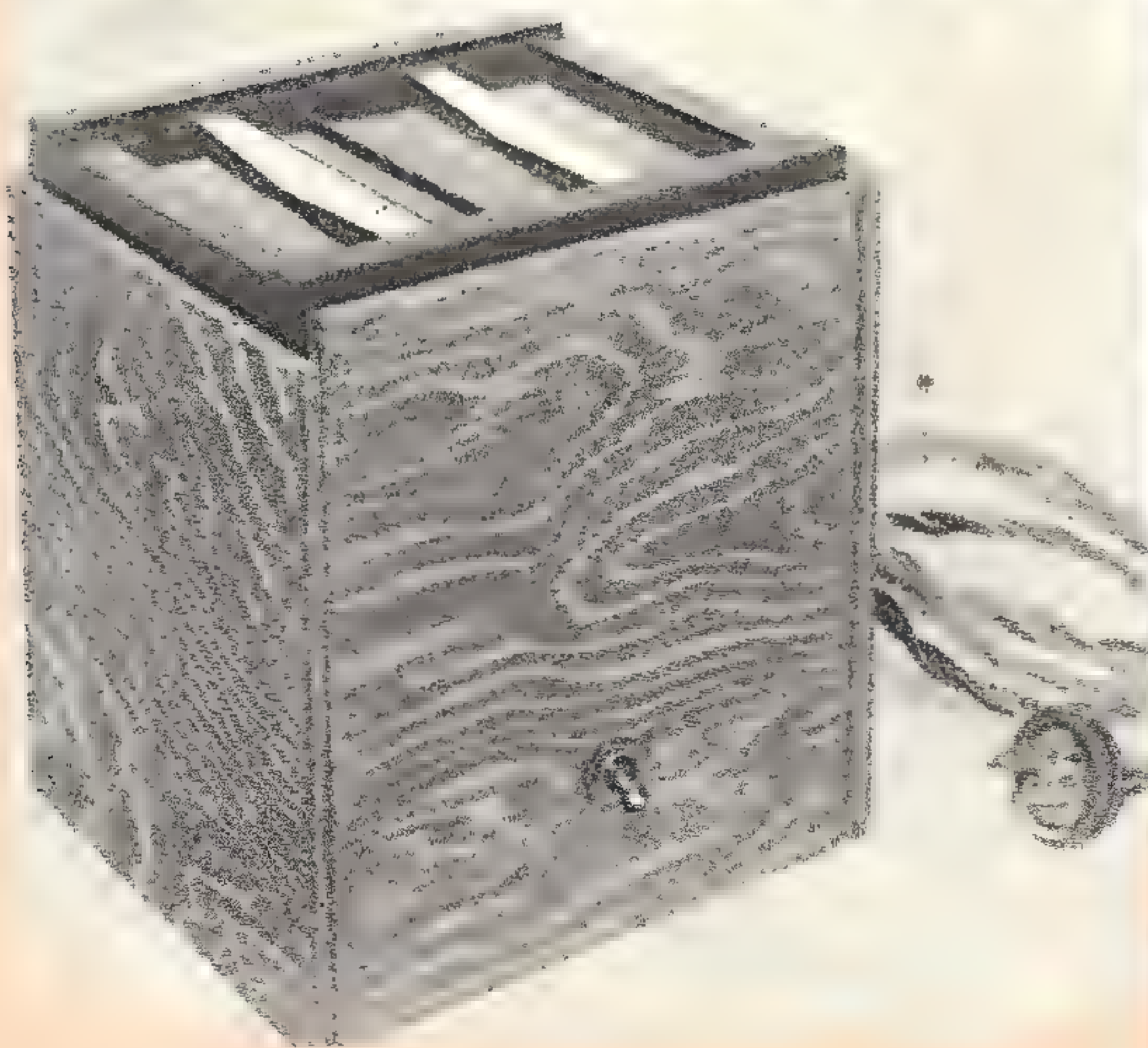
The arrangement of apparatus as shown in the large picture is a convenient one. To commence, darken the room and turn on the safelight. Don't be alarmed by the brightness of the yellow light. Photographic paper is much less sensitive to light than negatives, and can be handled in perfect safety under the "OA" filter.

The ability to judge the "contrast" of negatives will come only with experience. Normally-exposed negatives, which have been developed in MQ developer, usually take "normal" grade paper; therefore start with that.

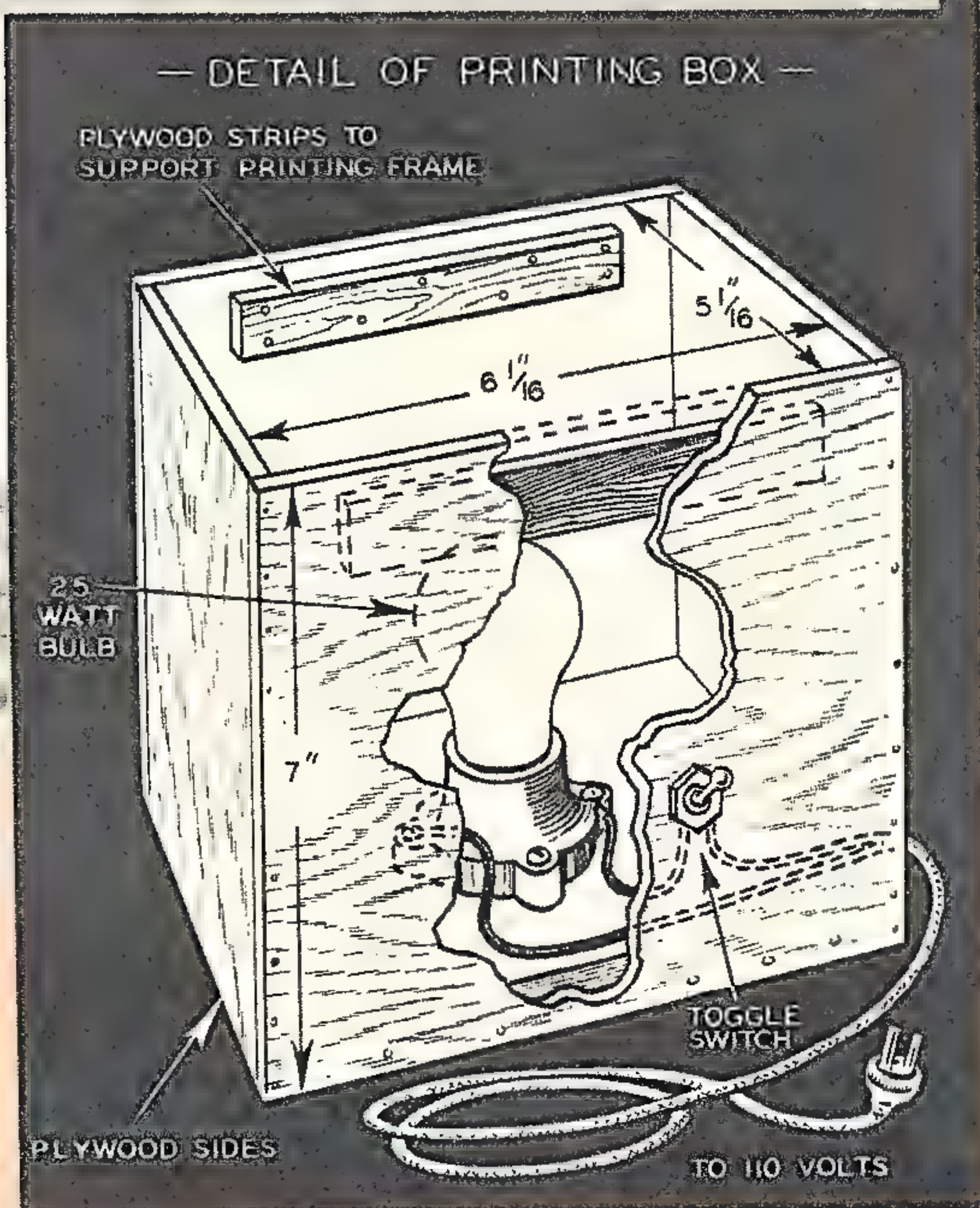
Open the printing box and clean glass pane carefully with a soft handkerchief. Place the negative on it, with the dull (emulsion) side up. A sheet of Azo paper is then laid evenly over the negative, with its chemically-treated side against the latter. By examining the paper under the safelight, the

[Continued on page 142]

Your Own Pictures



The printing box is of simple plywood construction, made to the dimensions given in the detail at right. A cleat socket, fitted with a 25-watt bulb, is mounted in the bottom and wired to a radio toggle switch and a length of fixture cord. Printing frame fits on top.



New Aids and Ideas For



Three narrow strips of wood, each fitted with sharpened nail prods, provide a handy means for extending the legs of a tripod. The strips are attached to the regular tripod with small "C" clamps as is illustrated at left.

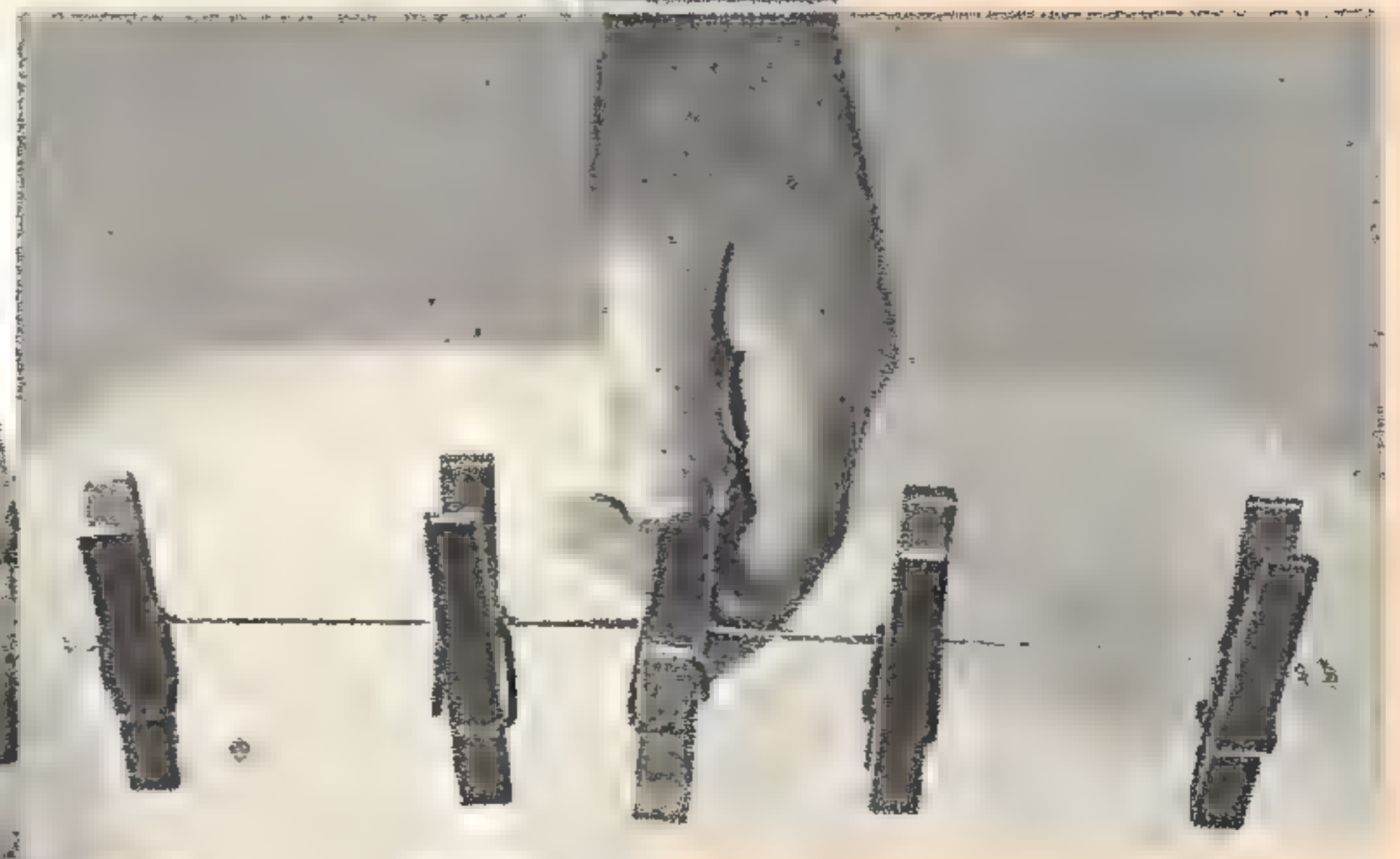
L-shape cardboard boarders, like the one shown at right, are excellent for determining the correct amount of trimming a print requires, in order that it shows up most effectively. Once determined, it is an easy matter to mark the print with a China marking pencil and trim it down to correct size.



Below—An ink that will chemically react with a photographic print so as to produce a lasting white signature is easy to make. First dissolve 20 grains of copper sulphate in 2 oz. of water, then add 10 grains of sodium chloride (common salt). When this dissolves, add sufficient ammonia to turn it a clear blue color. Finally add 10 grains of sodium hyposulphite (ordinary "hypo"). Apply ink to photo with a gold pen.

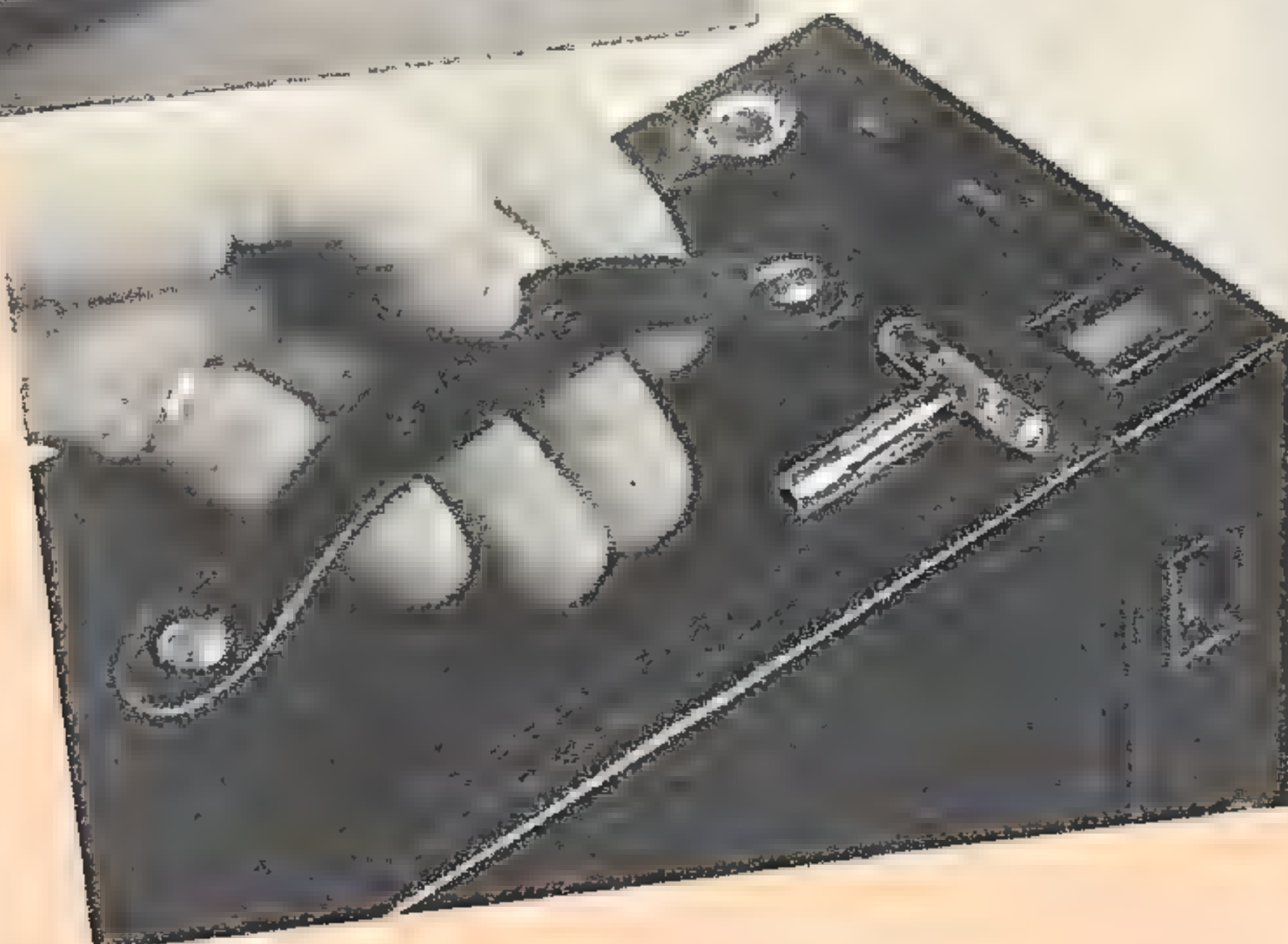


Left—A 2 1/2 v. flash-light bulb and battery, connected in series with a photo-flash lamp, will instantly tell its condition. If 2 1/2 v. bulb glows, photoflash lamp is in working condition.



Above — Where the darkroom facilities are too cramped to permit drying of film by suspending it from a long cord, this clip holder will prove extremely useful. Several spring clothes pins are threaded on a length of iron wire in the manner shown. The end clips may be attached to a chair with the center clips serving to suspend the strip of wet film.

Right—Amateur photographers who take their pictures with a box camera can be sure of level "shots" by equipping the camera with two small spirit levels. The levels are nothing more than automobile fuses partly filled with alcohol or red ink, sealed and attached to the camera with cellulose cement. If old fuses are not available, short lengths of glass tubing, plugged with small corks, may be substituted.

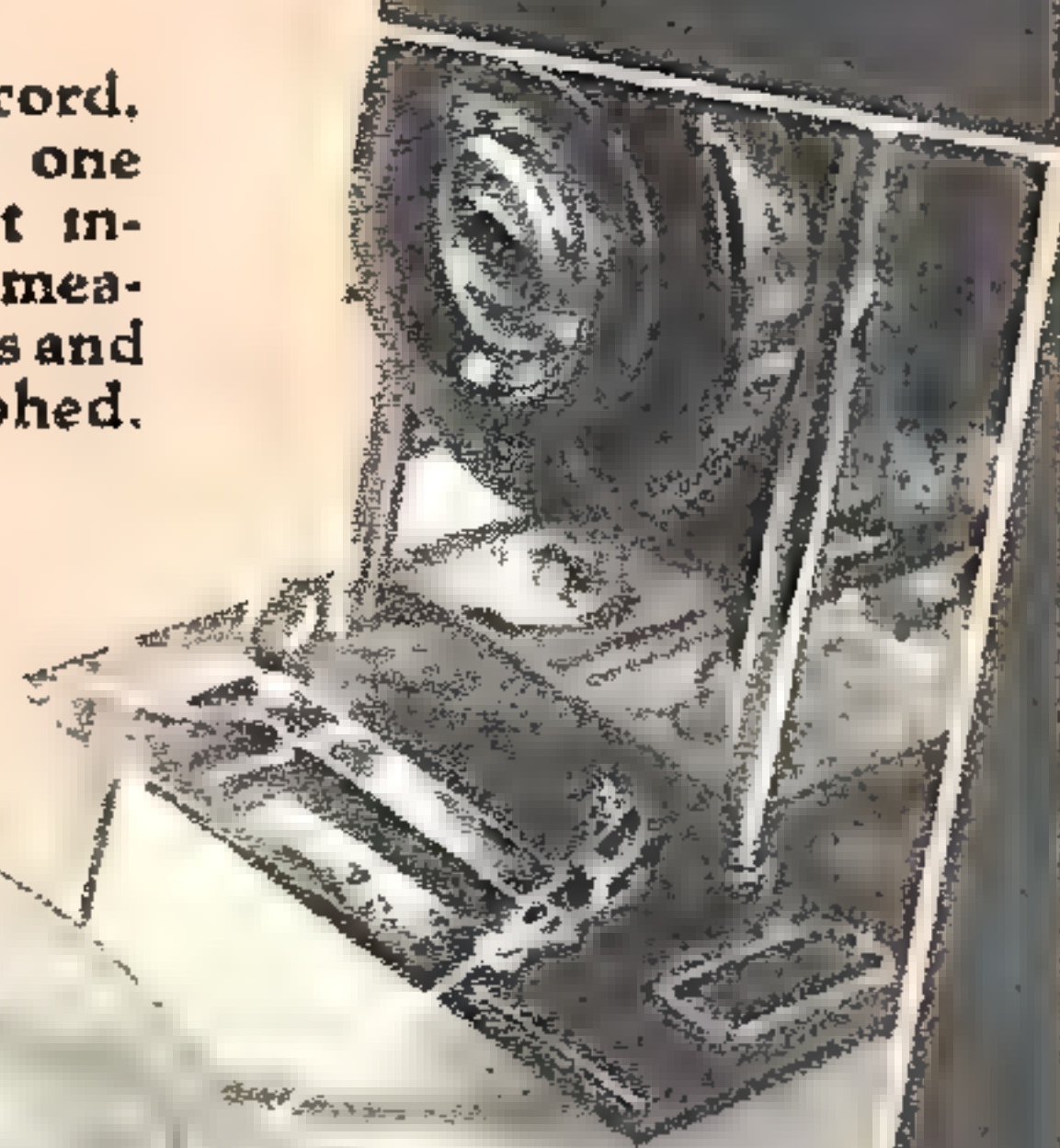


The Amateur Photographer



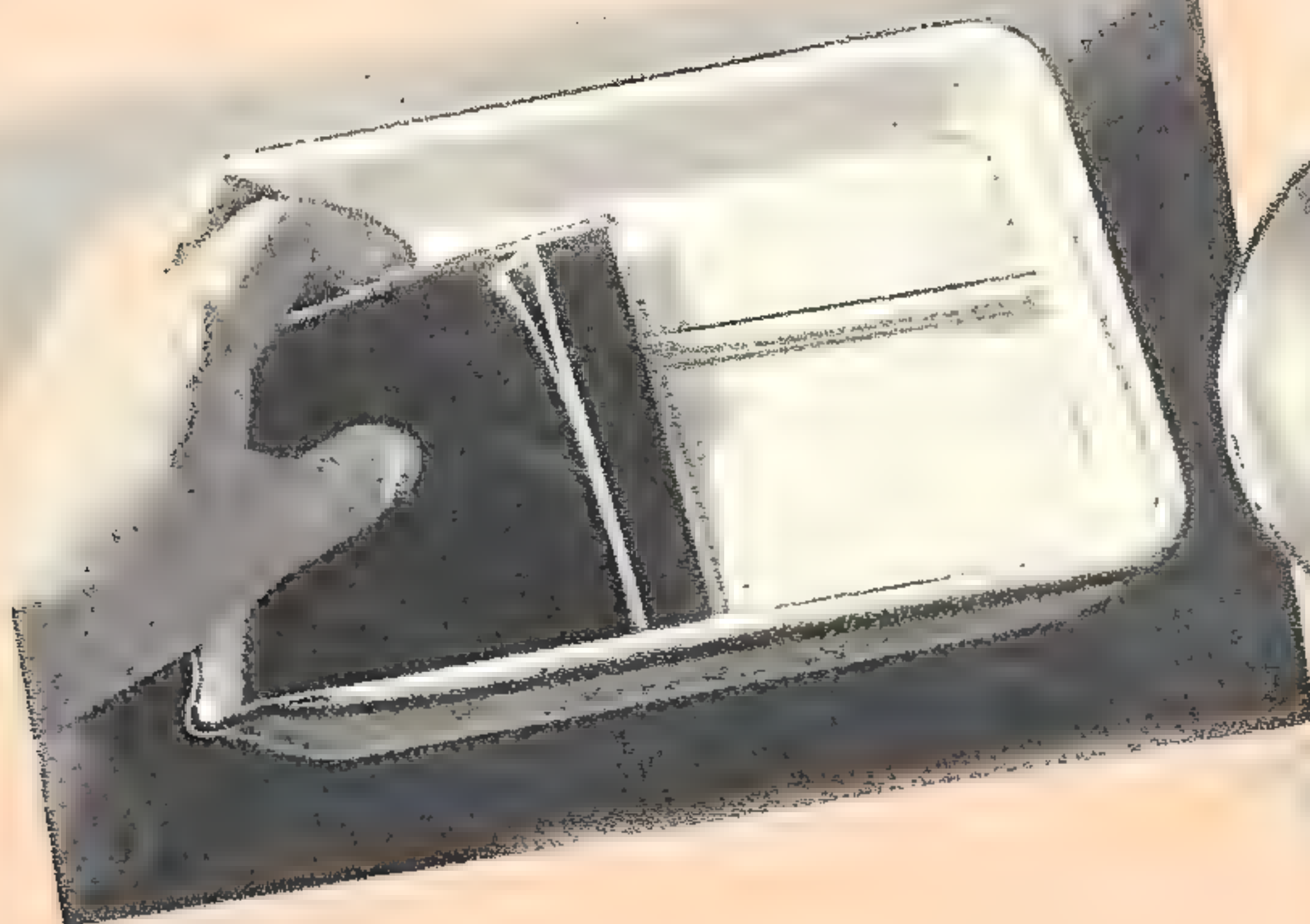
By removing the socket and shade from a flexible desk lamp it can be fitted with a reading glass so as to leave both hands free when "spotting" print blemishes.

A length of linen fish cord, fitted with a wire hook on one end and knotted at 1-foot intervals, is excellent for measuring distance between lens and subject to be photographed.

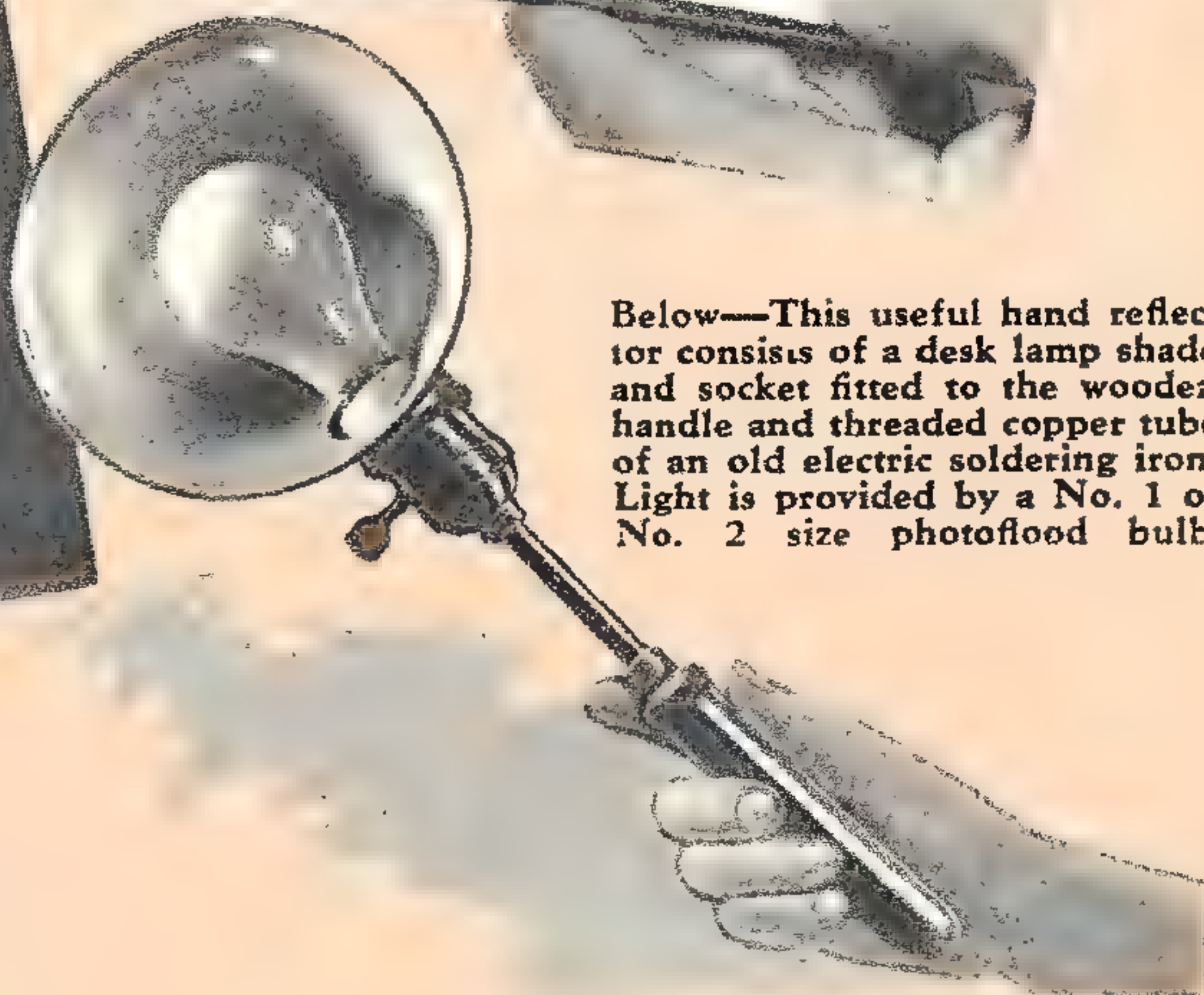


Where the celluloid backing of a negative is stained or scratched, the emulsion can be saved by application of acetic acid to backing. Attach negative, emulsion side down, to a glass plate with rubber cement. After backing comes off, remove emulsion from plate and wipe off all rubber cement.

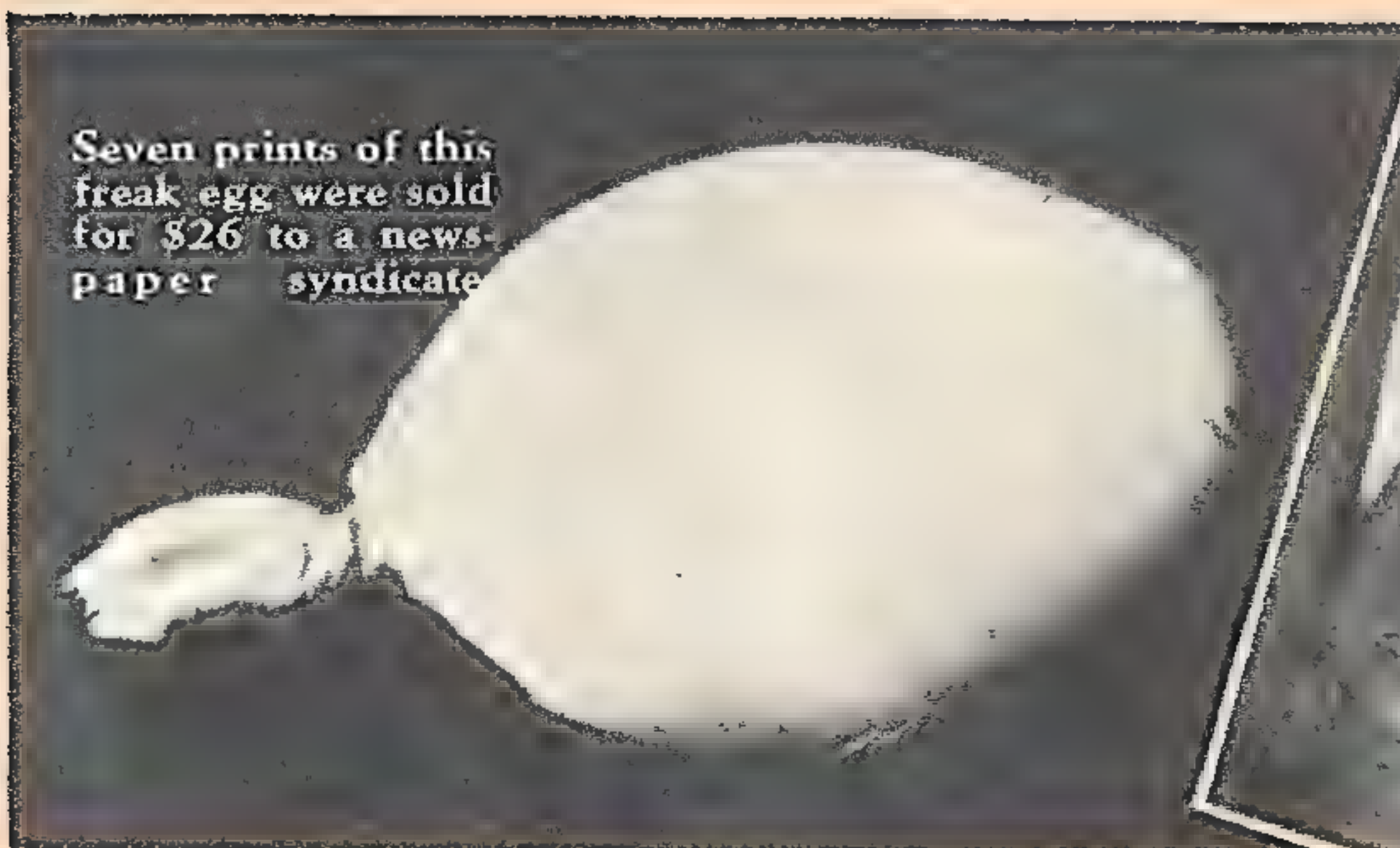
An ordinary portrait lens can be used for wide-angle work. Focus images on a ground glass screen and fit camera with a new distance calibration as shown at lower right



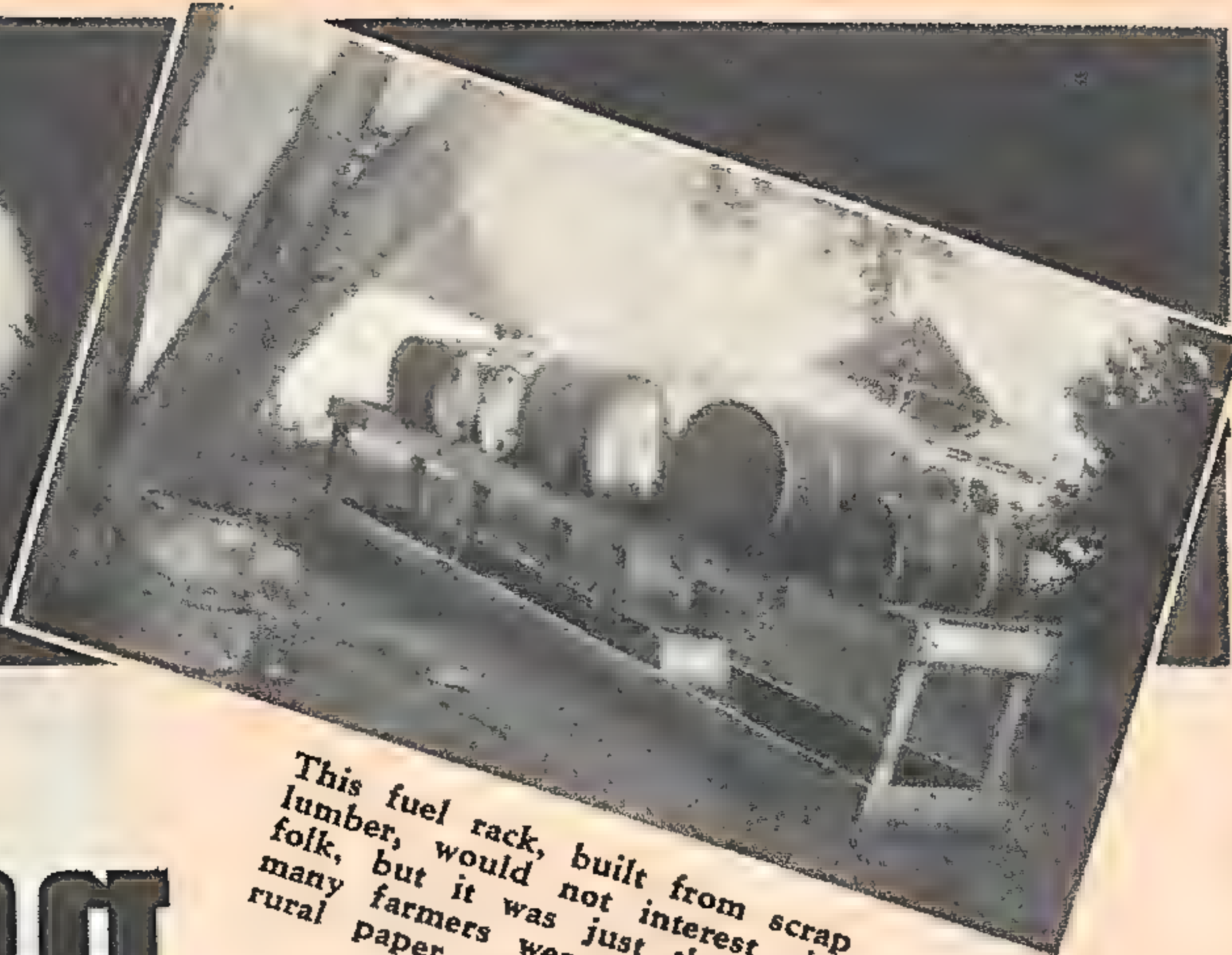
Very often the presence of small scratches on the surface of a cut-film negative can be attributed to the action of the finger nails from attempting to lift it from the developer. To overcome the difficulty, place a glass rod in tray as shown. The rod will elevate the negatives and permit easy removal.



Below—This useful hand reflector consists of a desk lamp shade and socket fitted to the wooden handle and threaded copper tube of an old electric soldering iron. Light is provided by a No. 1 or No. 2 size photoflood bulb.



Seven prints of this freak egg were sold for \$26 to a newspaper syndicate



This fuel rack, built from scrap lumber, would not interest city folk, but it was just the thing many farmers were seeking. A rural paper purchased the idea.

Making Your Camera



This homemade corn stalk cutter would not appeal to the average newspaper reader, but a photo and short article on its construction resulted in a \$10 check from a mechanical magazine. Left—A fast lens is needed to catch action pictures of home-built devices such as this trapeze ring-bar.

THIS camera business gets into your blood. No matter how good the last roll of film may turn out, you say to yourself, "This shot is undertimed. That one is over. I got too much scenery in this one. Boy, next time will be different!"

Not long ago, three men got together for an evening. All were interested in photography. Two were amateurs, the third a commercial photographer who had a great outlay in equipment. No matter what the shot, he could get it. One of the two alleged

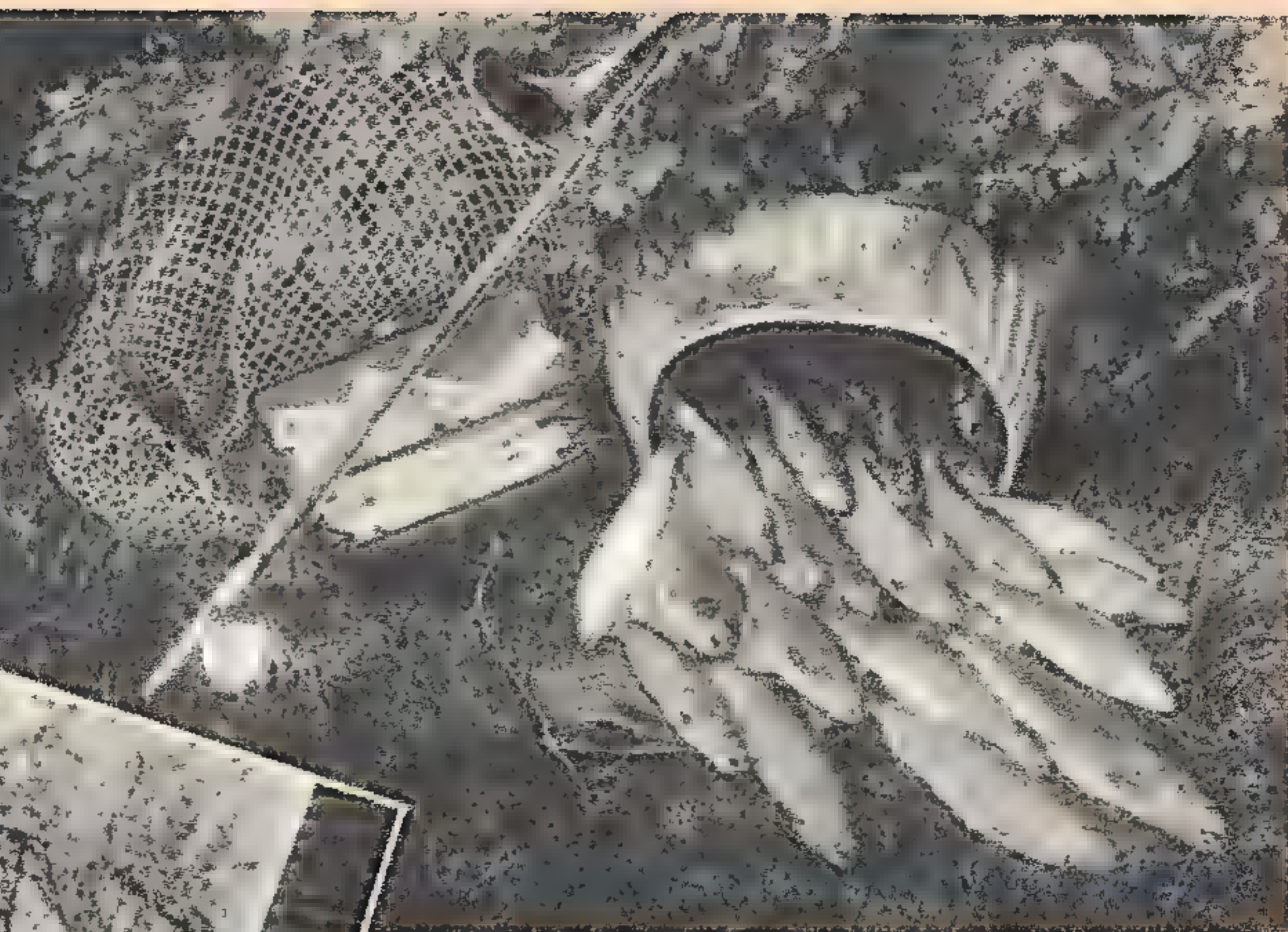
amateurs was not actually that in the strict sense, because for years he had been selling prints to magazines and newspapers. Yet the commercial man regarded him as such because he used a small folding camera which cost perhaps \$30 when new. The third man owned a camera, too, though all he had was expense, and was about fed up because, while his pictures were usually good, he failed to find any market for them.

Now here's the odd part of that meeting. It came out, after much talking, that the first amateur who was selling an occasional picture to magazines was getting more for his prints than was the commercial chap using an 8x10 camera. The reason was simple. A great many magazines, including the one you

Newspapers and magazines are constantly seeking new and novel pictures. Here is how you can supply their wants and also be paid well.



A picture of this feed pit accompanied by an outline of its construction sold to a farm paper because it proved to be practical.



In spite of the excellence of this picture, it would be hard to sell alone. Accompanied with a story on fishing, it would have the interest needed to sell it.

Pay Dividends



This picture, showing the engine which supplied power to a midget auto, proved to be the keystone of an entire set of construction pictures. It sold the story! Left — Two photos of this model train layout and a detailed caption earned \$7 for an ambitious photographer.



are reading, pay \$3 or more for pictures with a story to tell. Often an idea, photographically shown and with a short, but accurate description, having two or three pictures included, will bring a \$10 check, or even more. But, lest they be overlooked in the rush for stamps and envelopes, there are a few *buts* and *ands* which are mighty important. Pictures of the kind that sell must convey a specific idea and must also be in sharp focus,

and on glossy paper. The larger the print the better of course, but in known instances, an old Brownie, taking a 3¼x5½ print that cost \$4 second-hand, earned over \$2,000 in less than two years for its owner. The prints averaged \$3.48 each, proving that the size or quality of the camera isn't so important as knowing what kinds of pictures will sell and to whom to send them.

[Continued on page 138]

CALCULATOR CARD

A new convenience for photographers is this photo-flash calculator card, which is small enough to be carried conveniently in the vest-pocket. In use, the inner sliding board is set for distance between subject and bulb and the correct diaphragm openings for the various shutter speeds read on edge of card.

ALBUM TITLES -



Block letters, such as sold in 10-cent stores, are useful in creating unusual titles for home movies. They serve a still more novel use in separating the photographic title pages can in this way be created for vacation pictures, family groups, sports events and workshop scenes like the title pictured above.

New Ideas For the Camera Fan

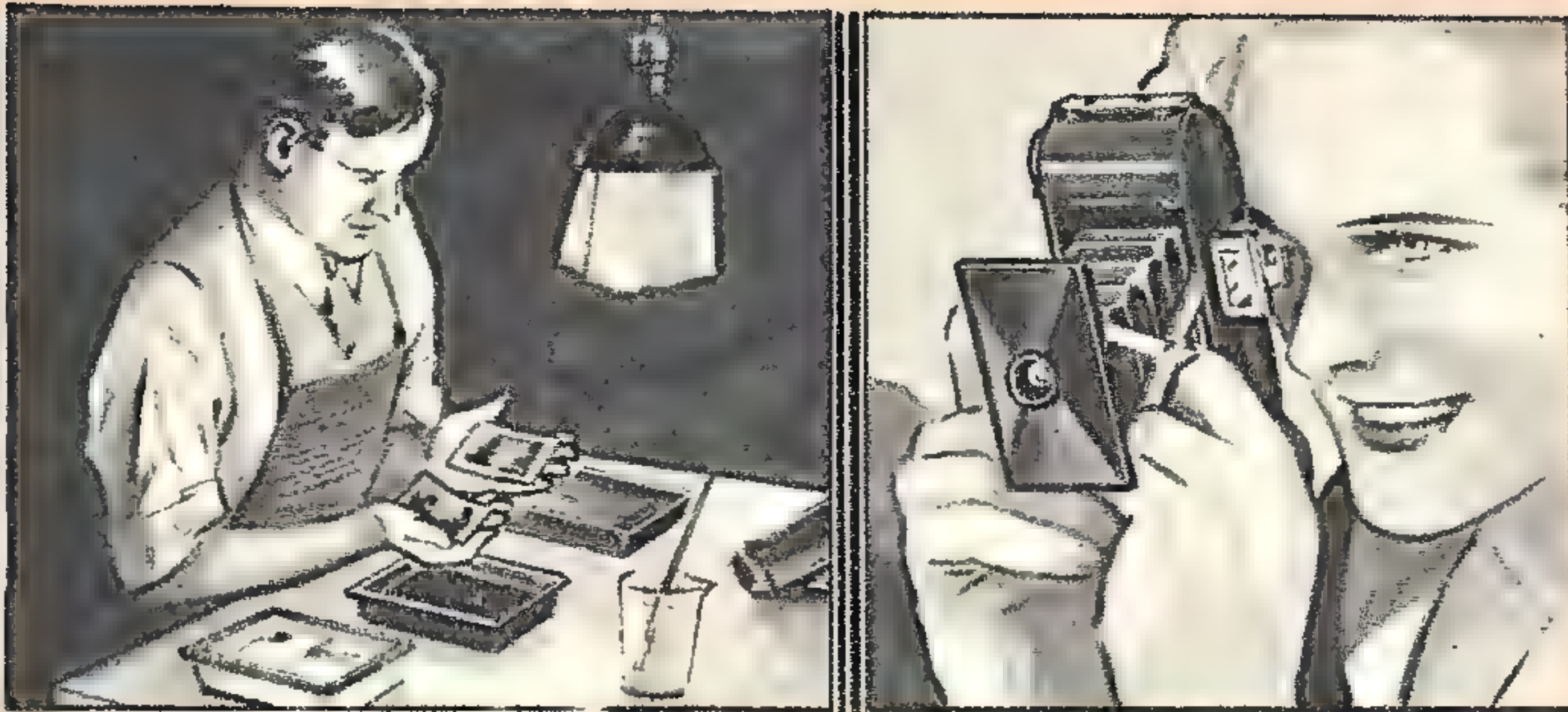
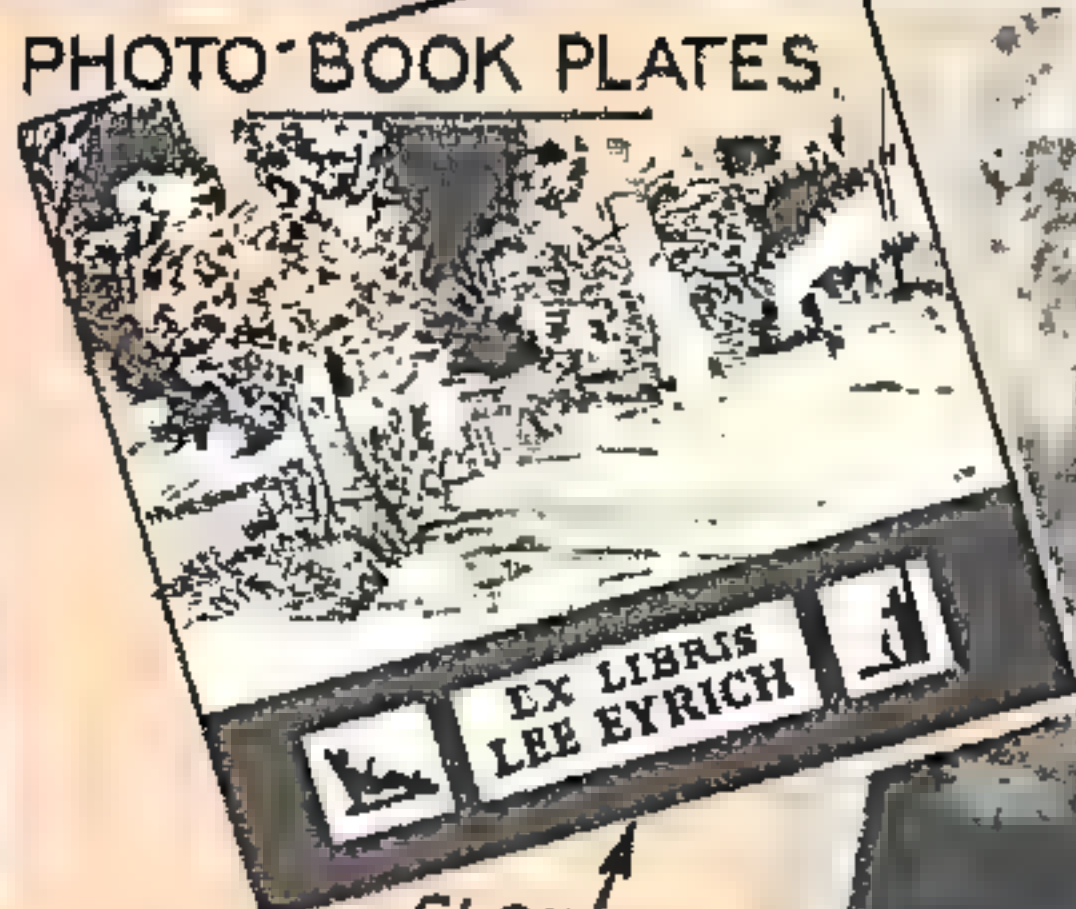
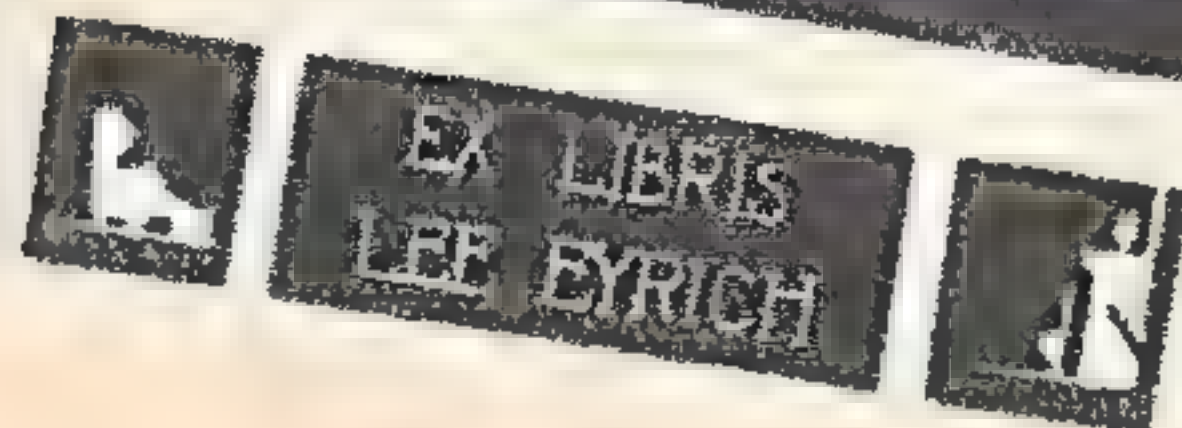
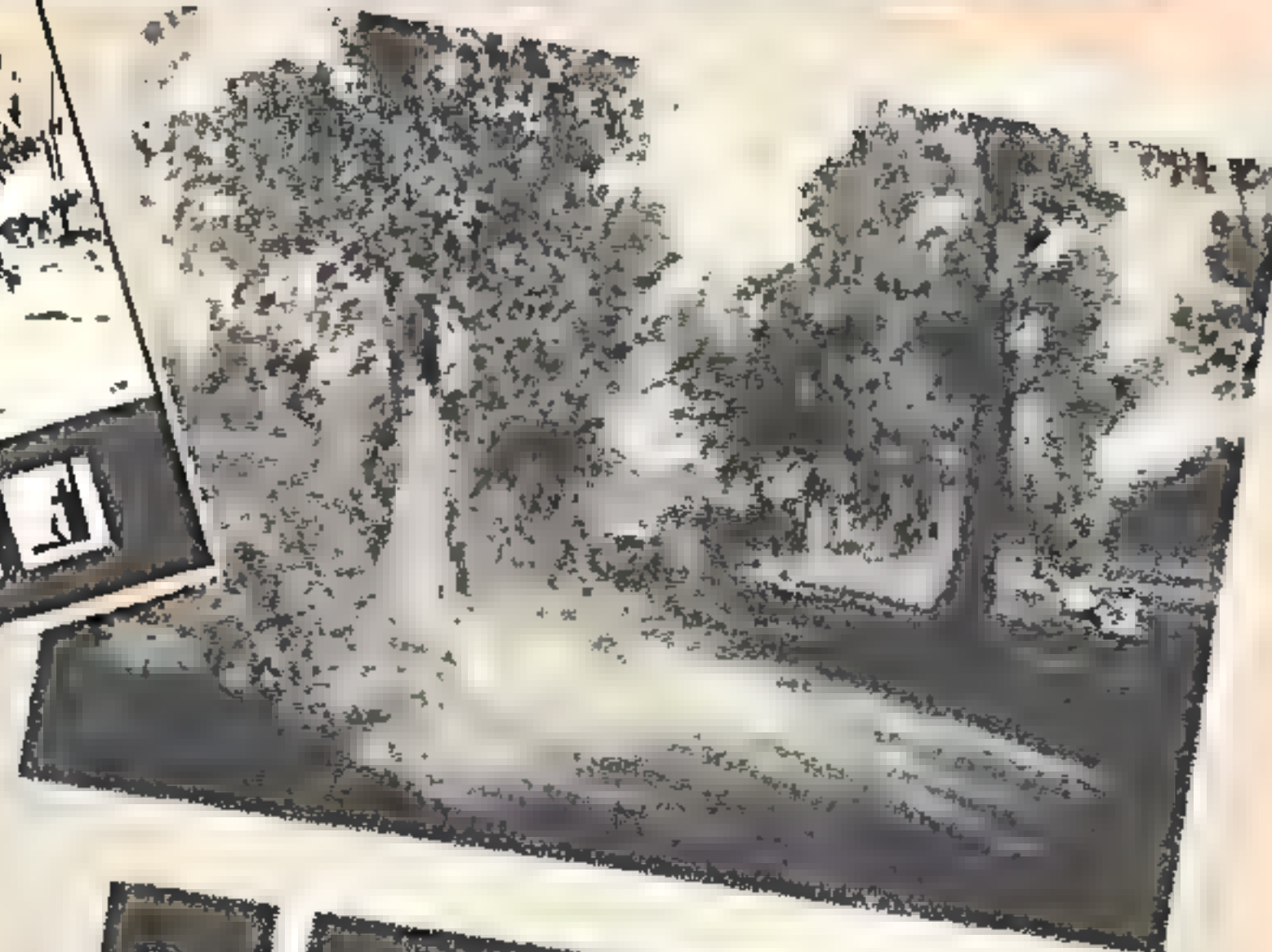


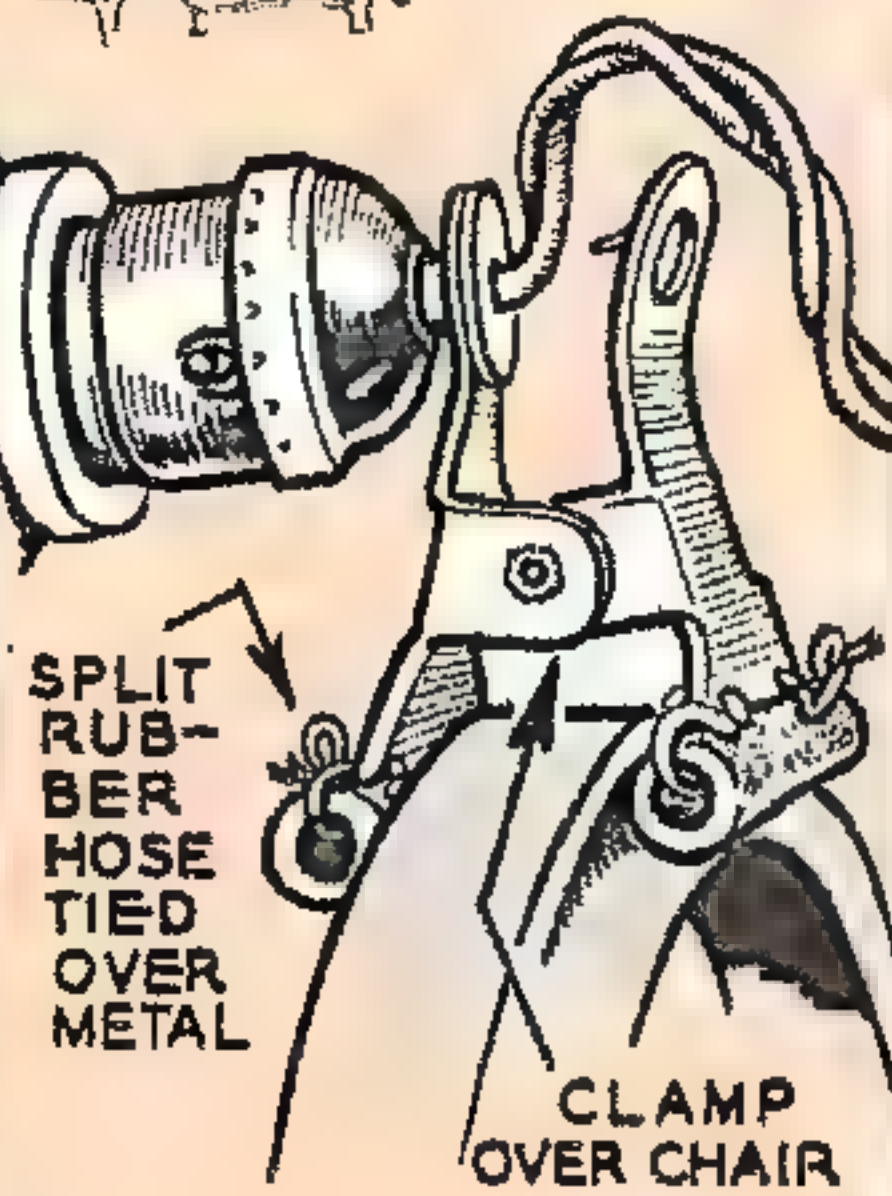
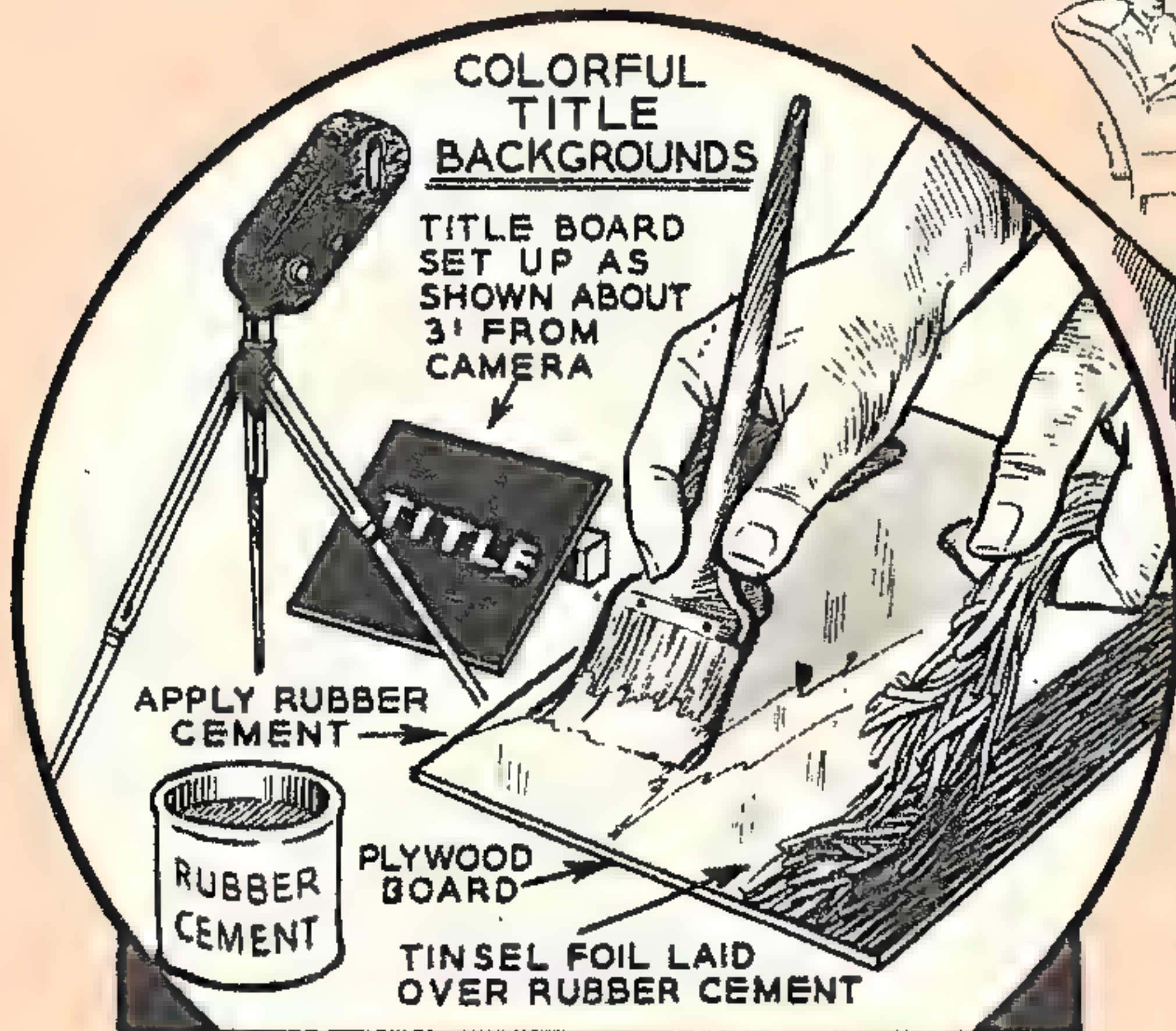
PHOTO BOOK PLATES



CLOTH BLACKENED AND LETTERED AS SHOWN - GLUE IT TO PRINT SIDE OF NEGATIVE



Negatives of favorite snapshots will make excellent bookplates for home library volumes. The inscription is lettered on tracing cloth with ink, as shown in the upper detail sketch. Attach cloth to film with rubber cement and print in usual way.



PAPER CLAMP LIGHT SUPPORT



Amateur movie fans will appreciate this sparkling film titling board, especially if they use Kodachrome films. It consists of a plywood board, 13 by 17 inches, to which are attached, with rubber cement, strands of multi-colored Christmas tree tinsel. When the cement has dried, the lettering is applied over the tinsel and the board rested at an angle to reflect the rays of a nearby, floodlight.

A photoflood lamp that can be conveniently attached to a chair, table or any other object can be made by securing a light socket to a large size paper clip with a $\frac{3}{8}$ -inch nipple and nut. Cut two pieces of $\frac{1}{4}$ -inch rubber hose slightly longer than the clip's jaws, slit them down the center and tie or cement over the sharp metal edges. The socket is fitted with a collapsible shade to complete lamp.

More Fun-Packed Hours

when you
Ride a 1938 HARLEY-DAVIDSON

That's right! The snappy new 1938 Models are always "rarin' to go." And with one of these Harley-Davidsons you sure can pack every spare hour with pleasure—afternoons, evenings, holidays and vacations. So decide now that you're going to OWN a Harley-Davidson. . . The new 1938 Models have the power, zip and stamina to "go places" with real class. New streamlined style and advanced mechanical features make them "tops" in performance and ride value—with new "lows" in mileage cost.

See your nearest Harley-Davidson dealer NOW for a FREE RIDE—ask about his Easy Pay Plans — and send in the coupon!



Harley-Davidson wins all four 1937 National Hillclimb Championships at Muskegon, Michigan. Above: Hap Seamans, 45 and 80 Class "B" National Champion — Harley-Davidson mounted.

HARLEY-DAVIDSON

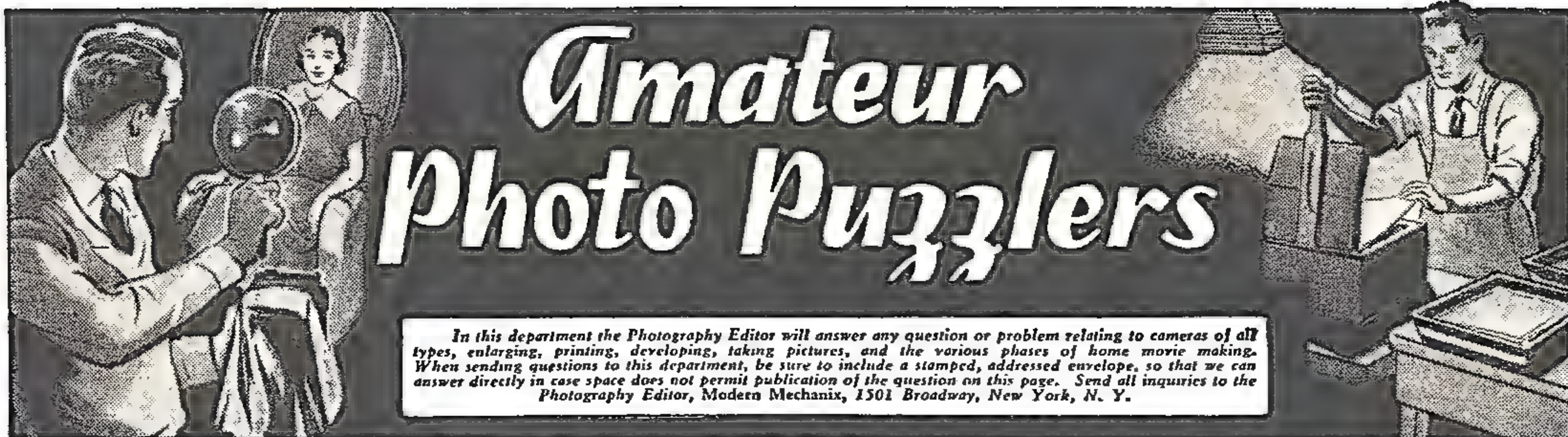
HARLEY-DAVIDSON MOTOR CO.,
 Dept. MM, Milwaukee, Wis.

Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name

Address

My age is ☐ 16-19 years, ☐ 20-30 years,
☐ 31 years and up, ☐ 16 years.
 Check your age group



SELF-TONING PAPER

In various photography manuals I have seen references to self-toning paper. Can you tell me what it is and how it is used?—Verrel Blythstone, Tampa, Fla.

Self-toning paper is a special type of printing-out paper in which the emulsion contains a certain amount of gold necessary for toning. The image is printed-out, usually by daylight, although strong sources of artificial light such as an electric arc or mercury vapor lamp may be used. The prints are washed for a few minutes in water, then fixed in an ordinary fixing bath. Tones ranging from sepia to purple are produced according to the amount of washing. Self-toning papers are not very popular in America because they require strong daylight exposure and a negative of good quality with rather more contrast than required for ordinary printing papers.

PART OF FIXING BATH TURNS MILKY—PART DOESN'T

A part of the fixing bath which I made up recently turned milky, while that which was left standing in a tray, after fixing about a dozen prints, didn't. To what might be attributed the cause of this?—George Exeter, Patterson, N. J.

The precipitate, or milky coloring, appearing in the fixing bath consists of sulphur. It is due to too much acid, the use of insufficient or impure sulphur, or an excessive bath temperature. The temperature should not exceed 70° F.

The reason for the used bath remaining clear was due to the neutralizing effect of the developer, carried over to the fixing bath by the prints.

PLATINUM PRINTS AND HOW THEY ARE MADE

Not long ago I was shown some prints by a friend who said they were on platinum paper. Can you tell me what they are and how they are made?—Vera Tanfford, Upper Darby, Pa.

The Platinotype Process now in general use was invented by an Englishman, Willis, about 1875. The paper, which is available commercially from a British film manufacturer, is coated with a light-sensitive salt of iron and potassium chloroplatinite. When exposed to light, the iron salt is reduced, forming a faintly visible image. The paper is then placed in a solution of potassium oxalate, which reduces the platinum salt in contact with the image to metallic platinum, thus producing a highly stable image of pure platinum. The iron salts are then removed by placing the prints in a weak solution of hydrochloric acid, after which the print is washed briefly and dried. Despite its absolute permanence, this process is very seldom used, due to the high cost of materials and its limited application only to negatives of the highest quality contrast.

HOW TO DETERMINE FILTER FACTOR

I have a yellow filter marked 2X. Does this number indicate that an exposure twice the length of the usual exposure be required with Verichrome film?—Robert Hendricks, Seattle, Wash.

The increase in exposure required when using a lens filter depends not only on the filter itself, but on the film with which it is used, and the light source. While the factor should be approximately two, with the film mentioned, it may be more or less.

You can determine the factor, with sufficient accuracy for practical purposes, by making a series of exposures on a gray object, with and without the filter attached to the camera lens. An excellent test can be made by copying a black and white photograph, first with the filter and then without it. With several exposures, you can determine the ratio required to produce negatives of the same general density.

ECONOMICAL MEASURES WITH DEVELOPERS NOT ADVISED

If I were to dilute a standard developing solution with an equal part of water, will pictures develop in twice the usual time required? Is this economy measure advised when one has plenty of spare time at his disposal?—Henry Green, Toronto, Ontario.

The time of development with ordinary developers, excepting glycin, is not directly proportional to the dilution. While it might be possible to obtain satisfactory results by increasing the developing period, the time required would be greater than twice the time necessary for developing under normal conditions. As developers are inexpensive the "try and hope" method is not advised.

CAUSE FOR LINES ON NEGATIVES

During the summer months I developed several rolls of film and found that a fine network of lines appeared on some of them. To what might be attributed the cause of the lines appearing?—Allison McDonald, Vancouver, B. C., Canada.

The effect to which you refer is known as "reticulation" and is the result of sudden swelling or contraction of the gelatine film. To prevent this from happening again, keep the temperatures of the processing solutions and the water bath as nearly uniform as possible. Use a moderately rapid developer, fresh acid fixing and hardening bath. Avoid excessive washing if the water supply is warm, and dry the negatives as rapidly as possible in a current of air.

HOW TO USE ONLY PART OF A CONVERTIBLE LENS

I have a convertible Kodak F. 4.5 lens. When using the front element alone, should I put it in the back or leave it in front of the lens housing?—Edward Johnson, San Antonio, Tex.

The proper position for a single element of a convertible lens, when used alone, is behind the diaphragm. This position is correct for light rays reaching the concave of the lens first.

MODERN MECHANIX AWARDS \$40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of Modern Mechanix will distribute \$40 in cash awards to the five persons who, in their opinion, submit the best pictures suitable for publication in the Modern Photography section. Full particulars regarding these awards will be found in this issue on page 103.

America's fastest growing hobby

SNAPSHOTS at NIGHT



Just do this

1. Load your camera with Kodak "SS" Film
2. Use two or three Photoflood lamps in Kodak Handy Reflectors



FREE BOOKLET...

Suggests a variety of picture opportunities... shows you how to arrange your lights... how to place your subject... tells you everything you need to know about two ways to make night pictures—snapshots with Photoflood lamps, fast exposures with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your camera can be set for "time.")

Get a copy at your dealer's... Eastman Kodak Company, Rochester, N. Y.

THERE'S FUN for the whole family in snapshots at night. Baby in his bath... the older children with their pets... grown-ups at the piano... everybody enjoys the "shooting." And you, most of all—for you're snapping those intimate family pictures you've always wanted, never hoped to get.

You don't need an expensive camera for snapshots indoors at

night—not any more. Any camera that can be loaded with Kodak "SS" Film will do the trick—even the simplest Brownie.

With "SS" Film, you use two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, in the inexpensive Kodak Handy Reflectors. If your camera has an $f.6.3$ or faster lens, then No. 1 Photoflood lamps are powerful enough.



Underground Airport Radio Beacon Aids Blind Landings

A new radio landing beam that emerges from an underground pit and holds great promise for making blind landings of airplanes practical and safe in foggy weather has been revealed by two National Bureau of Standards scientists, H. Diamond and F. W. Dunmore.

The transmitting antenna is placed in a special subterranean compartment under the center of the landing field instead of being erected dangerously in the air at the edge of the field. The Bureau of Standards' scientists had their preliminary work done and ready to report two years ago but the interest of another government bureau delayed the scientific announcement.

About six years ago the same group of government scientists developed a radio beacon system for aircraft landing fields which was so effective that after demonstrations in this country it was adopted and put into extensive use in Europe, Japan and Russia. It has not been installed as regular equipment on American landing fields, however.

The new pit antenna improves this radio landing beacon. In the landing system, the airplane glides down a path that is marked by equal strength radio signals indicated on a convenient dial on the plane's instrument panel. The way that radio waves travel from the transmitting antenna makes this system possible. One kind of wave goes directly from the antenna to the plane, while another goes from the transmitting antenna to the ground and then is reflected to the plane. The interference of these two waves plus decreasing distance combine to enable the pilot to steer his craft along a radio path to a happy landing even if he can not see the landing field.

When the transmitting antenna is in the air at the field's edge the path of the landing glide is a little too flat. Now the pit antenna gives a steeper and more satisfactory approach path. A further advantage of the underground system is that it can be built on a turntable and swung around to conform to wind direction, thus allowing landings to be made from any direction with the aid of only one antenna. Previously several antennae at the edges of the field were necessary.

New Use For Old 'Squeegees'

SQUEEGEE plates, which have become too dull for further use, can be converted into serviceable developing trays for processing large prints. Bend up the sides and ends of the plates so that the tray attains a depth of about 1½ inches. Do not cut the corners of the metal, but rather fold them over to form a flat-type waterproof joint.

Franklin Institute Aids Amateur Star Gazers

IT IS highly possible that Philadelphia may some day boast of an amateur astronomer discovering a new comet, star or nova, according to James Stokley, Associate Director of The Franklin Institute in charge of Astronomy.

For the past few months Mr. Stokley has been welcoming many amateur astronomers to the Institute, where, under the supervision of expert amateur and professional students of the stars, they have been grinding telescope mirrors and building instruments with enthusiasm.

"The Institute," said Mr. Stokley, "has set aside a complete workshop for these amateurs where they may spend all the time they wish. Dozens of telescopes are now in the course of construction. Periodic visits to the Fels Planetarium and the fine public Observatory of the Institute serve to bring the average layman closer to the majesty of the heavens.

"Amateurs in astronomy," continues Mr. Stokley, "are contributing invaluable material toward the furtherance of this science and are also rendering much important aid and information to the professional. There is definite work to which thousands of amateurs contribute their observations. This is principally in keeping an almost continual watch over the variable stars which are always changing in brightness.

"The professional astronomer must necessarily confine his attention to certain particular phases of the science, but the amateur is better able to watch over broader areas, and thus, when anything unusual, like a new star or a comet occurs, he may notice it before the professional. Thus, Peltier has contributed five new comets and a new star in little more than ten years, and a few years ago a Japanese melon patch worker in California found another comet. This requires a very thorough knowledge of the constellations and the stars and other objects in them, so that anything strange may be recognized at once."

Air pressure on the body of an average sized person amounts to about 14 tons.

The moon gives off no light of its own, but it reflects light from the sun which travels to the earth in a little over a minute.

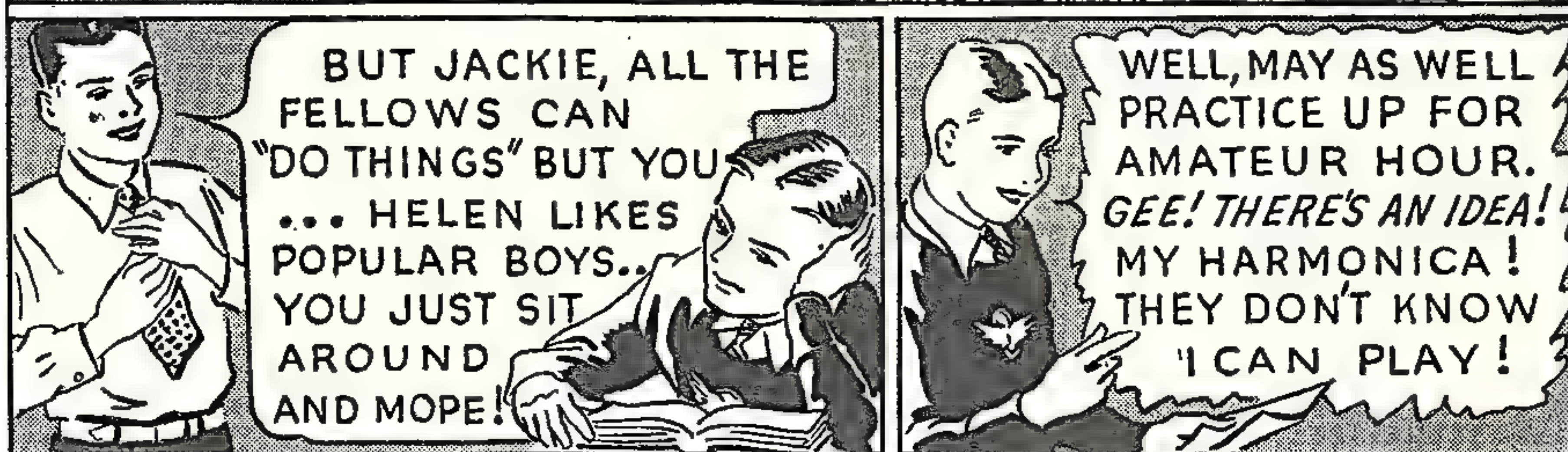
THE HERO OF AMATEUR HOUR

Jack was the "HIT" of Helen's Party ... and he wasn't even there!



YES—THE WHOLE CROWD'S COMING TO MY PARTY... 'CEPT JACK EVANS ... HE'S NOT MUCH FUN

HELEN DIDN'T EVEN SAY HELLO! GUESS I DON'T GET ASKED TO HER PARTY.



BUT JACKIE, ALL THE FELLOWS CAN "DO THINGS" BUT YOU ... HELEN LIKES POPULAR BOYS.. YOU JUST SIT AROUND AND MOPE!

WELL, MAY AS WELL PRACTICE UP FOR AMATEUR HOUR. GEE! THERE'S AN IDEA! MY HARMONICA! THEY DON'T KNOW I CAN PLAY!



AT HELEN'S PARTY

JACK EVANS...WITH OVER 5000 VOTES—WINS **FIRST PRIZE** FOR HIS BEAUTIFUL HARMONICA PLAYING!...ONE MORE TUNE JACK ... BEFORE WE SIGN OFF?

JACK EVANS! AND I DIDN'T EVEN INVITE HIM TO THE PARTY.



NEXT DAY

WHY JACK EVANS! — YOU WERE WONDERFUL! WE ALL HEARD YOU LAST NIGHT... CONGRATULATIONS! ...I'M HAVING ANOTHER PARTY NEXT WEEK AND I WANT YOU TO COME...WILL YOU HELP ME ROUND UP THE BUNCH?...AND BE SURE TO BRING YOUR HARMONICA!

Boys and Girls who are good Harmonica players are always popular—always in demand at parties and "get-togethers". Don't miss good times. Learn to play the Harmonica. It's so easy with the new Hohner Instruction Book. Just mail the coupon for your Free copy.

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Iceboats Quadruple Speed!

[Continued from page 49]

the first puff of a 10-mile breeze propels the boat at that speed. The second 10-mile puff doubles the speed after the craft receives full benefit of the first blast. The third 10-mile puff increases the speed to 30 m. p. h. A craft of racing type can advantageously utilize another puff to hit 40 m. p. h.

Air resistance, or windage, is the first of two factors that allay the assumption that craft could indefinitely multiply the wind's velocity. For that reason the speed ratio is limited to a 4 to 1 ratio.

The second factor is weather ability, that makes performances in 40 and 50-mile winds for seemingly potential 150 and 200-mile gaits impossible. Of course, in moderately high winds, the speed of ice craft increases correspondingly; 20 and 30-mile wind velocities cater to 60 to 90-mile marks. Craft that are eligible to the 4-1 ratio in light winds can't safely be eligible in near gales.

Although wind limitations govern the frequency of 90 m. p. h. speeds, heavy weather racing machines capable of doing four times the wind have hit the 124 m.p.h. mark in rare instances. Such is the *Debutante III*, reputed to have traveled the fastest mile on ice at Kull Lake, Mich., in 1922. In a burst of speed, she hit 124 m. p. h.

The 4 to 1 ratio is applicable to only the latest types, which embody sail efficiency and scientific improvements. Lightness is the keynote of their construction, with the mast, booms, runnerplank and backbone of hollow construction, like the bones of a bird.

In selecting an iceboat, to build or buy, choose one with streamlined (oval) mast and tear-drop runnerplank, if speed is desired. With streamlined features, the craft possesses minimized resistance and higher speed possibilities.

See that rigging is of thin, powerful airplane cable to reduce windage; heavy shrouds and hull stays, slow the boat down noticeably. Check the alignment of the runners. Unless they are true fore and aft, with front and rear ends equidistant, a drag will result.

Sails should be efficiently cut, with proper draft, to furnish the utmost driving power. To prevent leakage and loss of vacuum, use only closely woven Wamsutta cloth. By experimenting with the tilt of the mast, the amount of rake needed to make the craft sail fastest can be easily determined. It should be remembered that the rake should always be aft.

Germany had 172,000 workers employed in chemical industries in 1933; in 1936 the number had grown to 220,000.

Cotton fabric is almost as important as rubber in making most automobile tires.

Advance Showing—1938 Cars

[Continued from page 35]

and ease of handling. Silence and freedom from vibration are achieved in higher degree than ever before, and less-frequent attention to lubrication is required.

The most important changes are those tending to make gear-shifting easier. In many cars the gear lever has been removed from the floor and replaced by semi-automatic systems which make use of finger-levers situated either on the dashboard or just under the steering wheel. With the hand-brake lever replaced by under-dash handles, the floor of the driver's compartment is left without obstructions, and the front seat now accommodates three persons in comfort.

Transmissions have undergone many changes aside from the shifting device, and several of them include automatic overdrives which are designed to reduce engine speed and increase fuel economy at high rates of travel.

Aside from bolder treatment of radiator fronts, no radical changes are noticeable in outward appearances. Corners are nicely rounded, but little departure has been attempted from conventional shapes. "Tear drop" and similar freak designs, which did not receive popular support in past seasons, are entirely absent.

The Mechanical Dinosaur

[Continued from page 55]

arm travels an electric dump car. Another big dragline fills the dump car, which then speeds off and dumps the dirt by remote control. The enormous "bird" can tramp along the bank, spreading dirt wherever needed.

Out in the Arizona desert, government diggers ran into patches of gravel stuck together so hard with natural cement that it called for blasting. But an engineer designed a huge steel hook twenty-seven feet long, with an eight-foot crook that reaches out under a patch of gravel and exerts a powerful up-leverage. This ten-ton "fish-hook" quickly broke up the cemented gravel so a bucket could handle it, saving blasting.

In black and white photographs, blue shows up lighter than it appears in true colors; yellow photographs darker than it appears, and red very dark.

Colleges in this country are carrying education to over a quarter of a million people by their correspondence and extension courses.

Rhodium, sister metal of platinum, is being used to plate highway signs, so that the letters will shine at night when headlights flash on them.



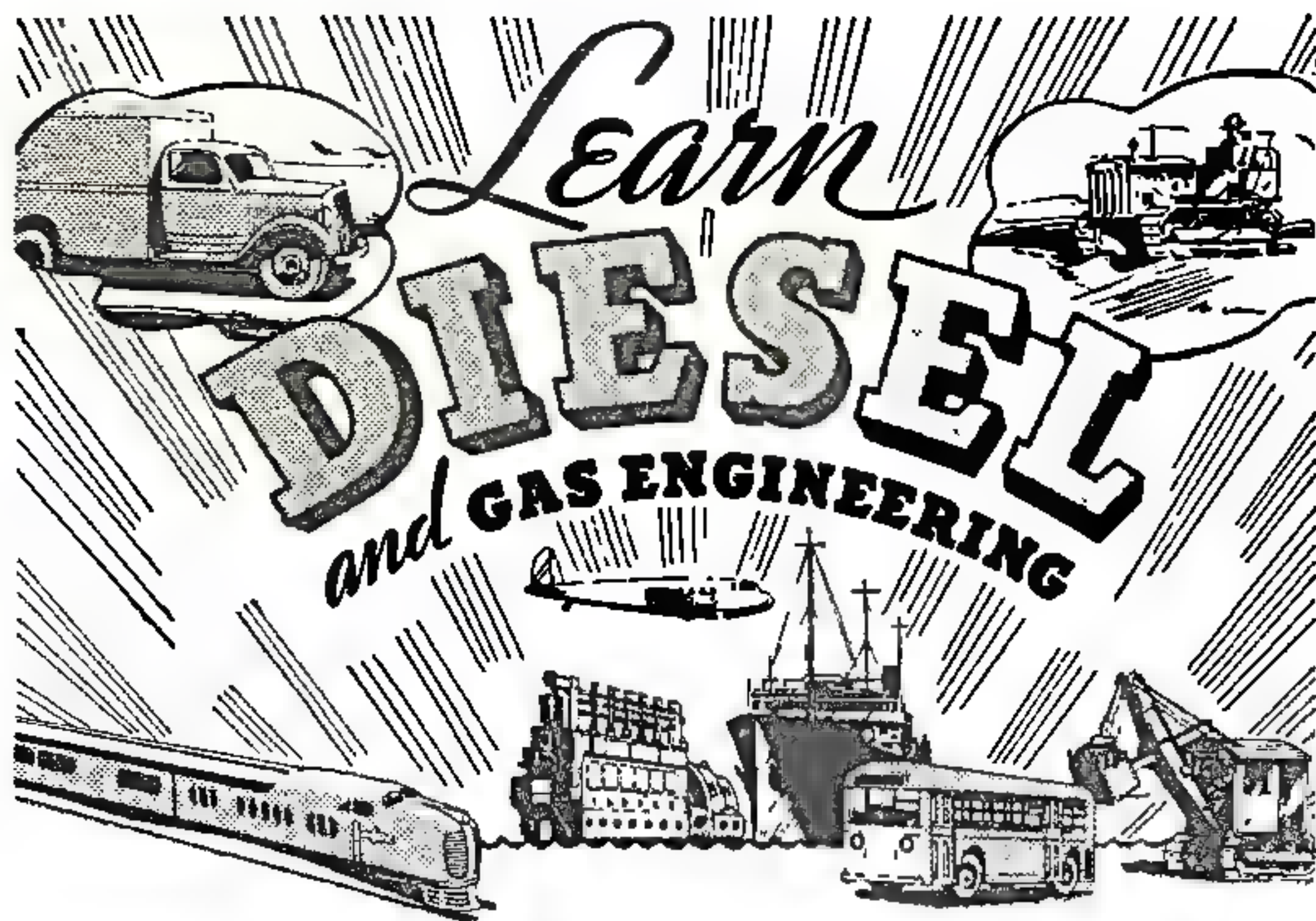
Put a
ring
around
this

*it's better
smoking
tobacco*

...and here's
why

- aged-in-wood
Burley tobacco
 - extra good taste
 - for pipe or
cigarette
- 2 full ounces
in every tin*

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To qualify for a good Diesel job you must receive training in an institution that can offer you *practical* instruction. At National Schools you actually work on the latest equipment, including practically every approved make of Diesel engine. You get the kind of instruction that serves your every day needs in the Diesel field after you have graduated. It's the type of training you can "cash in" on. You are trained under the direct, personal supervision of licensed Diesel Engineers.

Diesel Electric Power Generation

A new feature essential to the complete training of Diesel experts. Completely covers power generation. This extra course is now presented to all Diesel students without extra tuition.

EASY-TO-LEARN MASTER TRAINING

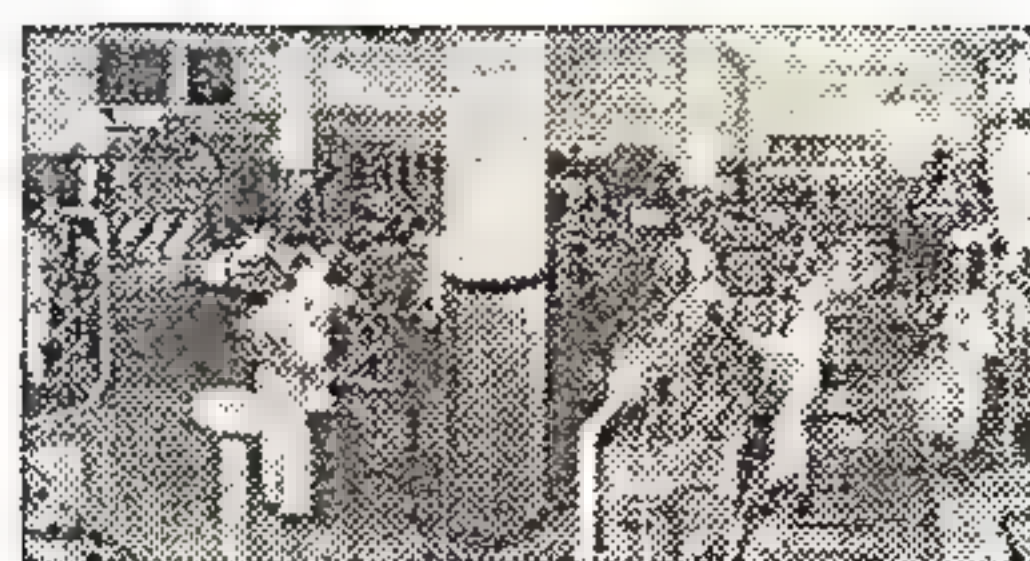
National Schools' training is complete in every respect. It includes all phases of Diesel engines, fuel injection, gasoline, butane, propane and natural gas engines, also Auto-Diesel electrics, machine shop practice, batteries and other essentials that must be learned in order to give you well rounded-out training.

LEARN IN LOS ANGELES

The most delightful place to learn—Los Angeles—the playground of America. Fascinating surroundings. Your coach railroad fare will be allowed to Los Angeles from any point in the U. S.

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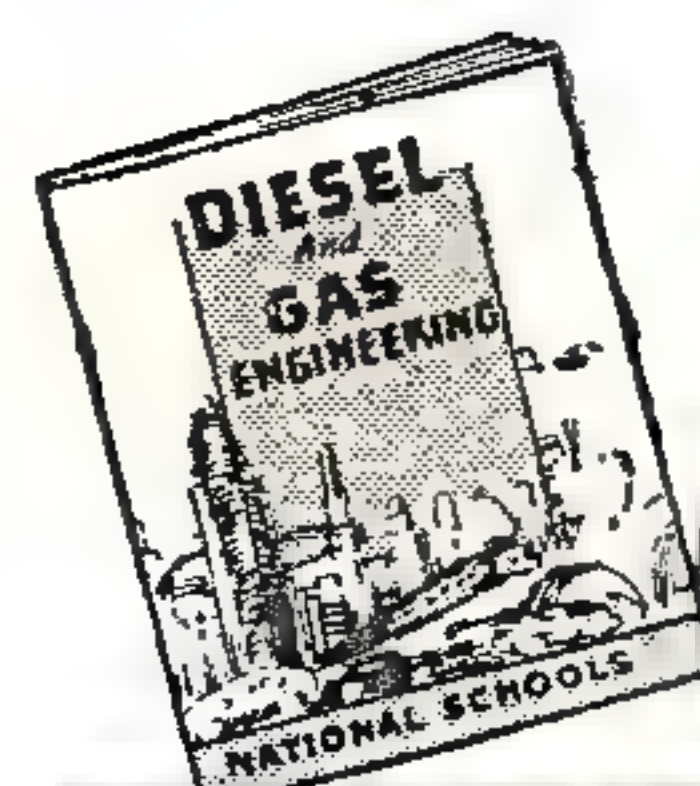
Partial Room, Diesel Engine Dept.



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Diesel Generating Unit, Diesel Converted Ford Auto



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Filming A Movie War

[Continued from page 45]

the comedian, as he shaves. A prop man, who was a clever marksman with a sling shot, shattered the mirror on the first shot.

To create the illusion of shrapnel bursting in the air, a paper bag is filled with black cardboard chips and flashlight powder and then catapulted into the air. A time fuse sets off the powder, explodes the sack and scatters the harmless cardboard scraps about so that it looks as if deadly steel shrapnel was pelting the actor-fighters.

Explosions for day and night warfare vary. For daylight hostilities bombs are usually made from black powder and bone charcoal so as to send great bunches of black smoke and dust mushrooming skyward. At night white smoke and dust serves the purpose better. Large spotlights are hidden in shell holes and trenches to enable them to cast a glow on explosions' smoke.

When a building or tree is to be blown up before the camera it is usually weakened first or constructed in such way as to crack-up from a small charge of powder. Bricks and masonry are often made from papier-mache if players are to be in the danger zone when the building blows up.

Every explosive expert has his own tricks for making movie wars. There are about a dozen employed at this odd occupation in Hollywood. Each has a different system for laying out a war. Some use one control board to manage their explosives, while others have several assistants posted at different spots over the battlefield to handle various explosions. They are always to one side, out of the camera's range. Cameras with telephoto lens are often used to film dangerous mine explosions from a distance.

James Whale, the director of *The Road Back*, was in touch with the actor-soldiers on the movie battlefield at all times by means of an elaborate loud speaker system. Megaphones, that directors once shouted through in the old days, have been replaced by the more audible electrically operated loud speaker systems.

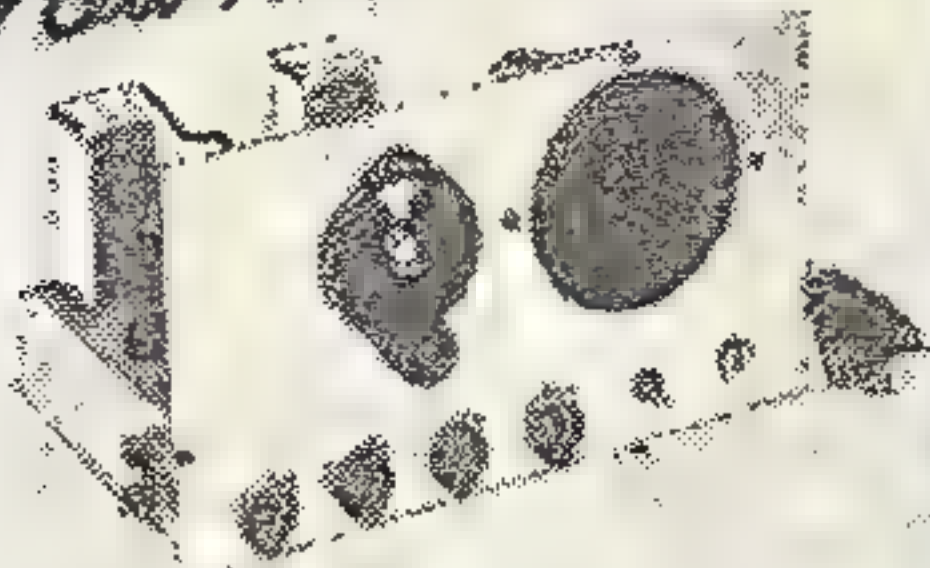
Many of the more thrilling over the top attacks were taken without sound being recorded. The little sound mike would have had a busy time keeping up with the player-soldiers. And the sounds would not be as real as those created by the sound men and later "dubbed-in" the film.

It might be well to mention the number of persons besides the actual actors and extras who helped to make the cinema war. One hundred and twenty-four property men, wardrobe men, wardrobe checkers, gunsmiths and assistant "powder monkeys" were required to keep track of the equipment used. A special prop and wardrobe room was constructed near the set, from which the cleaned uniforms, rifles, and the day's supply of ammunition were issued to the fighters. Eighty-seven electricians were needed to operate several hundred big lamps required to illuminate the battlefield for night shooting.

The Radio Leader for 1938

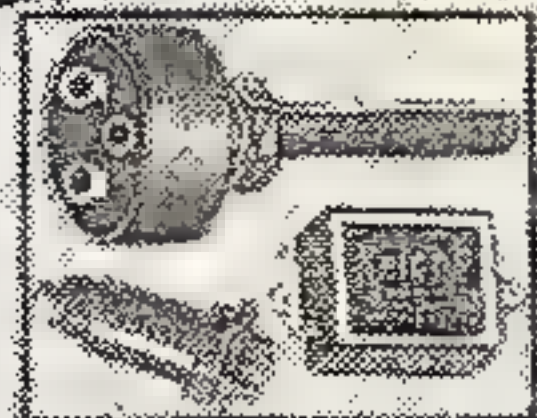
AMAZING KNIGHT 11 TUBE ALL-WAVE SUPERHET

New Kits



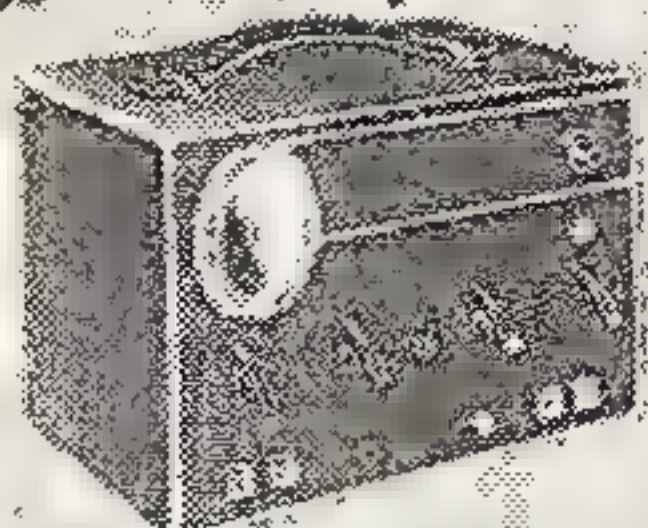
32 Build-Your-Own Kits—from a 1 Tube Set to a 14 Tube All-Wave Superhet! See these kits in the Radio Builders' section of the new ALLIED Catalog. Write for Free Parts Lists for building any set described in this magazine.

12,000 Parts



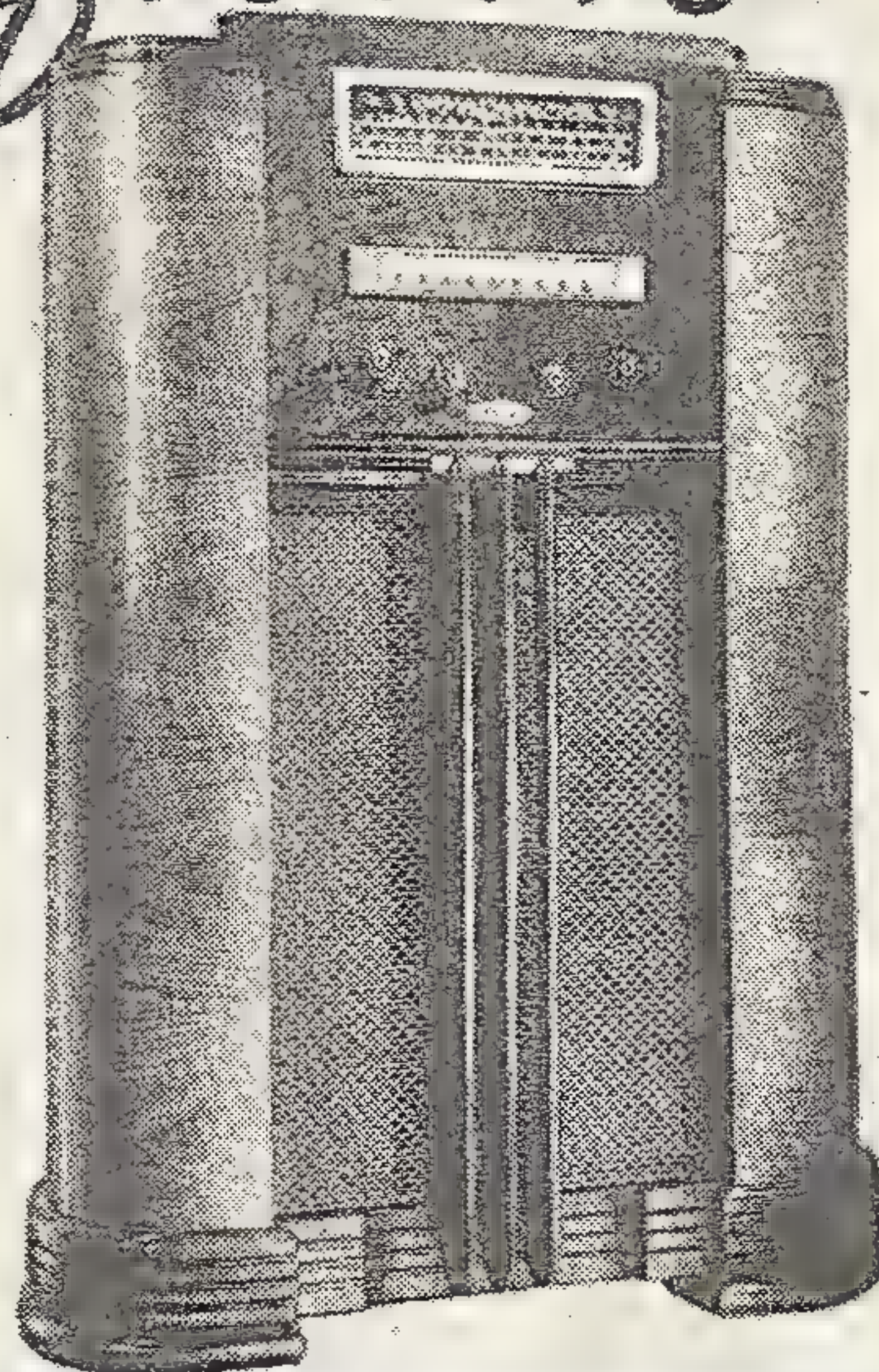
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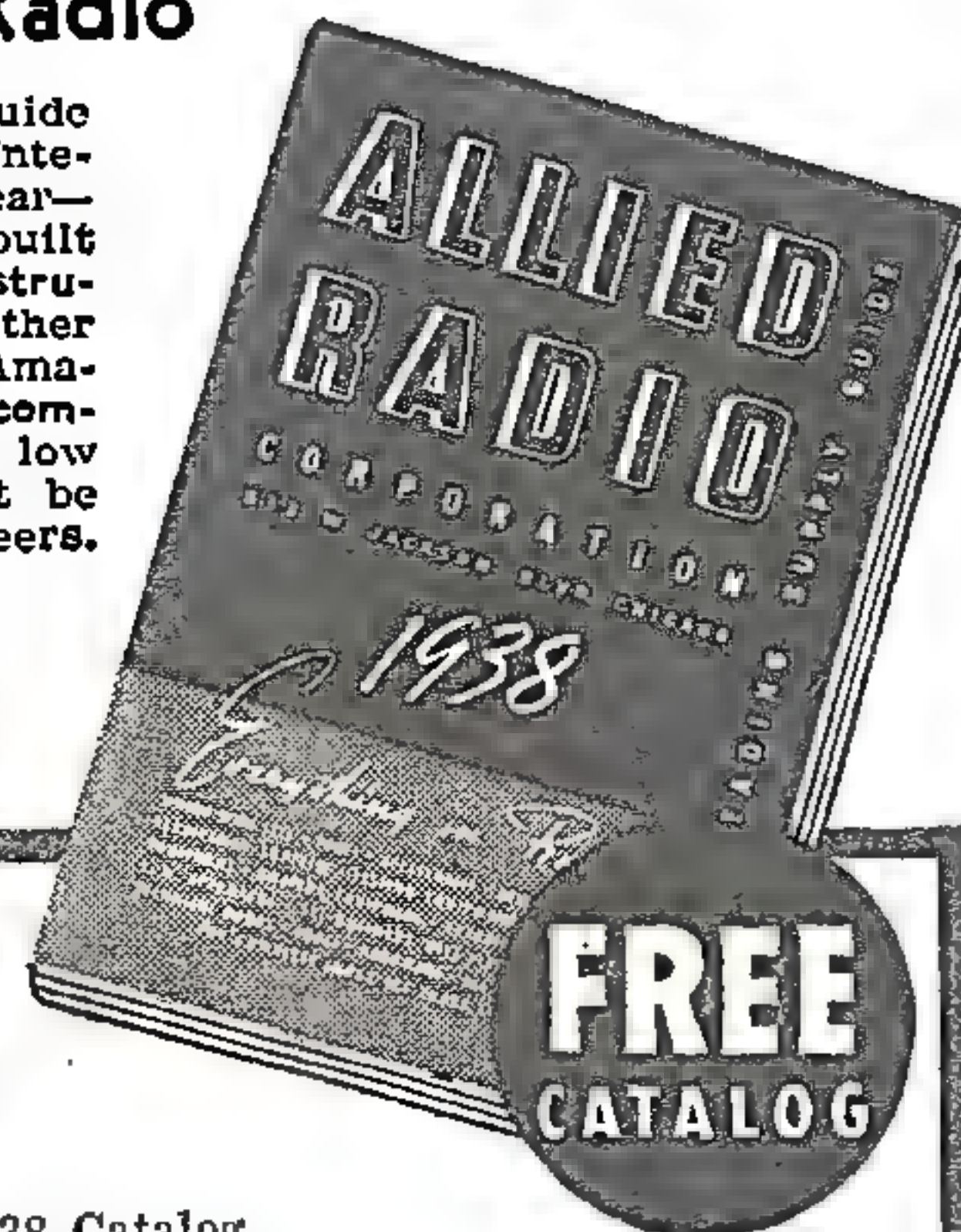
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In the Knight 11-Tube illustrated, you'll find Electric Push-Button Tuning—press a button and there's your station instantly. Select-O-Matic 9" Horizontal Dial with all ranges in full view. Giant 12" Electro-Dynamic Speaker. Powerful new Superhet circuit tunes everything on the air, three full bands; full 7 Watts Output—Double-tuned I.F.'s—R. F. Preselector—3-gang condenser—A.V.C.—Tone Control—all these features and more are yours at the lowest price in radio! See this sensational value now in ALLIED's new Catalog, and 60 other super-value KNIGHTS for every purpose—5 to 16 tubes—for AC, AC-DC, 6 Volt, 32 Volt, Battery, and Auto operation. Just send coupon.

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Build "Polaris"—New Iceboat

[Continued from page 75]

The runnerplank is a solid timber 13 feet long, 12 inches wide and 2 inches thick, preferably of Sitka spruce. Two ½-inch holes are drilled through the runnerplank for the bolts, welded to the iron band, which locks the backbone to the plank.

Disregard old-fashioned wooden hobbler and make them of four pieces of 16-inch long angle-iron that have 3-inch sides. Weld them in pairs 1¾ inches apart to iron plates measuring ¼ by 7¾ by 12 inches. The plates are bolted to the ends of the runnerplank.

Make the runner chocks of 1⅝ by 3½-inch white oak. If you're going to race this craft, alignment of runner is extremely important for speed. Therefore, to prevent warping, laminate the chocks by cutting the depth of the wood into seven ½-inch strips, and glue up to size. If you like beauty, alternate the white oak with strips of mahogany for an attractive varnished finish.

Make the runner blades by beveling both sides of the stem of the angle iron 45 degrees for soft ice or 60 degrees for hard ice. This can be done in a machine shop for a nominal charge. Through the cross-pieces on both sides of the blades, drill ¼-inch holes every 3 inches for fastening to chocks with 1½-inch F. H. screws.

The rudder post is welded to a channel, as shown, for the steering runner. An 8-inch grooved wheel is secured to the lower end of post with a set screw. To the top of the tiller post is welded a channel which takes the butt-end of the steering quadrant. Construction of the quadrant necessitates steaming to get the bend. The quadrant is hinged to the channel, as shown, so that it may be lifted clear for entering and leaving the cockpit.

Cross the steering cable to turn the boat the same way as tiller. Before securing hull fittings, sandpaper all surfaces smooth and put on three coats of spar varnish. The insides of the cockpits may be painted, but all other wooden parts should be varnished. Paint the hobbler and other fittings bronze.

The band that secures the backbone to the plank is ⅛ by 1½ by 28½-inch iron strap with the ends welded to ½ by 5½-inch bolts whose heads are cut off. Line the band with a leather strap to avoid marring the backbone.

A boom traveler is fastened to the deck 4 inches ahead of the tiller post. The main sheet should lead back to a cleat fastened to the cross-piece of the quadrant.

To brace the hull, two sides stays of ⅜-inch cable are fastened to the plank and hull with straps, 1 by 4 inches. Details for the mast-step are given. There is a socket in the mast, which is of 3 by 5 inches by 20-foot spruce, to fit the step. Screw a Marconi metal track to fit slides attached to the sail hoist. The boom is 2 by 4 inches by 9½ feet.

The mast is stayed up with ⅜-inch cable stays
[Continued on page 153]

BILL, YOU SURE HAVE A SWELL BUILD! DID YOU TRAIN FOR A LONG TIME WITH WEIGHTS AND PULLEYS?

ABSOLUTELY NOT! THE ATLAS WAY - WITH NO APPARATUS - MAKES MUSCLES GROW LIKE MAGIC!

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BY

Charles Atlas

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This is the actual photograph of Wm. Goldstein in which *Physical Culture Magazine* reproduced in a full page in a recent issue.

CHARLES ATLAS.

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Stamps From War Torn Spain

[Continued from page 70]

are really of less interest than the provinces stamps which came before them, some of which, postally used, are going to become rarities indeed.

Coats of arms feature most of the charity stamps; figures, portraits, arms, and scenes figure as the designs of the postage stamps.

The various province issues were necessary when Franco was conquering, since national organization was not then established. Each section had to have postage of course; and so each section was permitted its own. When Franco had what we might term as a "breathing spell," and set to work to effect a nationalization and a unity of his various conquests, he substituted regular issues for the provincials or provisionals. When these, latter, were in use, postage rates often differed in various localities. When the former, the regular issues, were adopted and introduced, a uniform postage rate was re-established.

Collectors who enjoy the serious pursuit of stamps, and find it fun to seek elusive items, should attempt to obtain these provincial stamps, particular on cover. It will not be found a simple task, but the "chase" will add zest to your collecting.

Decorative Candle Holders

[Continued from page 79]

Santa Claus cut-outs are very appropriate for the base decorative ornaments of a Christmas candle holder. These jolly looking little fellows are cut from 3-ply paneling, then painted on both sides with the Christmas colors, red and white. Mount the figures on a long wood base, on which is centered a short, lathe-turned upright for the candle stick. The figures are cut out by following the 1/2-inch squared pattern.

Angels, carol singers and many other characters representative of the Christmas season may be used as decorative units on the Christmas candle base. Cut these figures from 3-ply paneling, paint with bright, glossy enamels and mount to the bases as shown. Lathe-turn the candle stick uprights and attach all figures to the base with tiny tenons.

Candle holders of this type will not only be appreciated by the housewife to aid her in arranging an attractive Christmas dinner table, but they offer excellent possibilities for marketing through gift stores, and will return a handsome profit to the maker.

Building boards made from sugar cane afford protection against termites in the tropics, according to recent tests.

The giant sequoia trees of the Pacific coast have been called the biggest plants known to man.

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PAGES**



**250
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Whether or not you have ever attempted to build a boat you will find unusual interest in the many boat designs described in this latest Modern Mechanics Manual, which contains

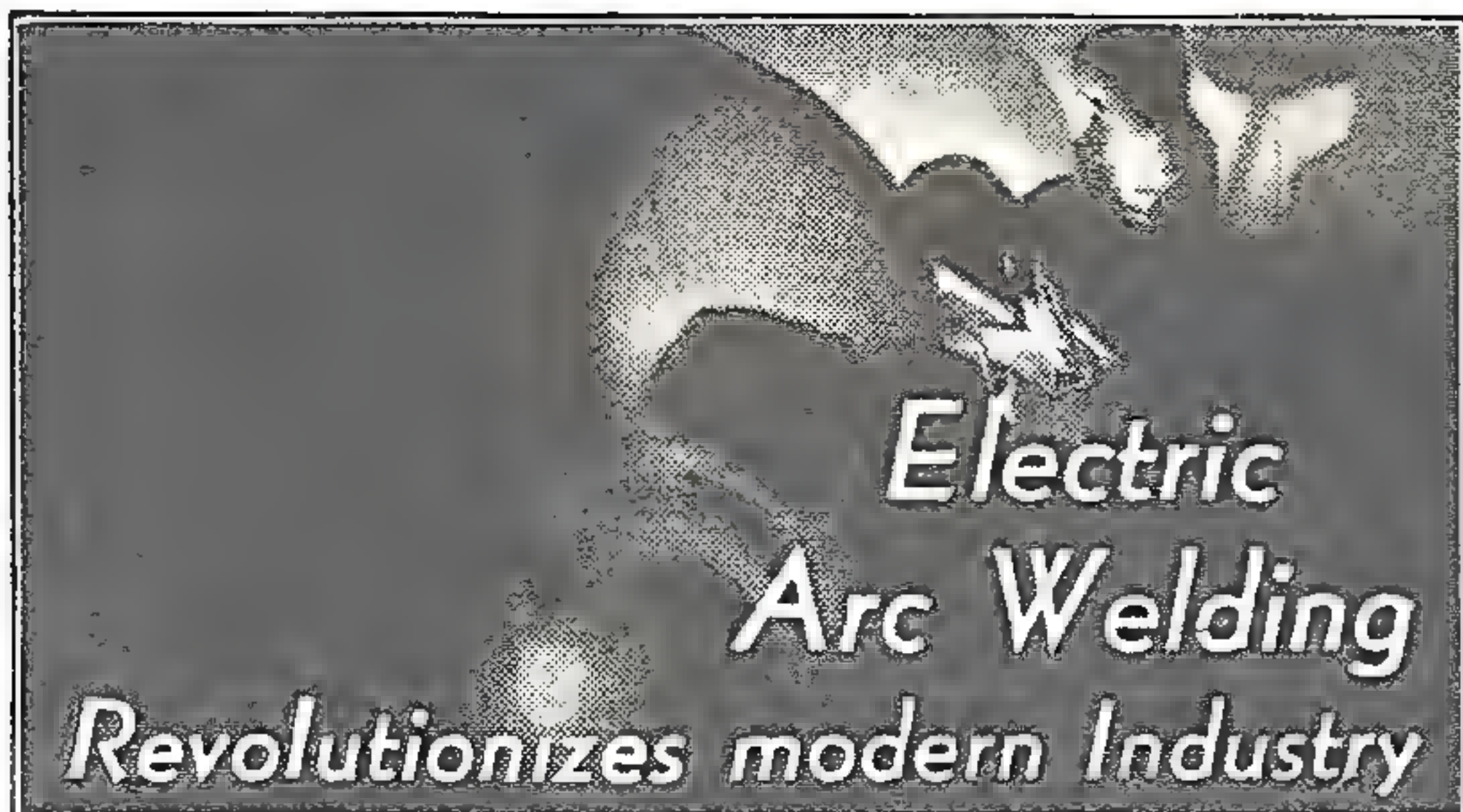
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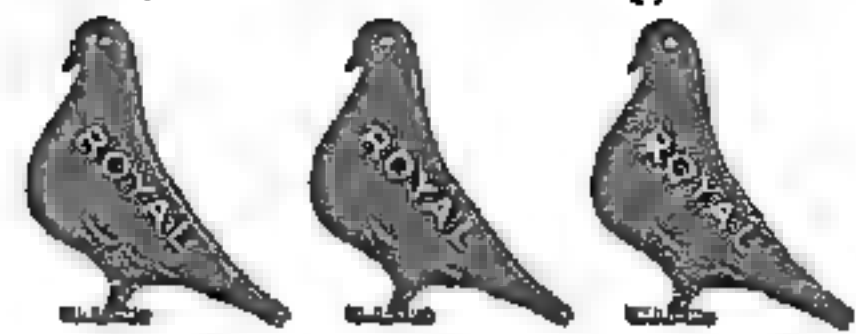
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Designing Your Xmas Cards

[Continued from page 105]

sled, and also his reindeer, were purchased at a toy store for a dime, while a lump of rock salt furnished the iceberg in the lower left hand corner. This exposure was also made with a small stop, placing the light at a low angle to show the texture of the "snow."

Another card which is less juvenile in appeal than the ones aforementioned, also employs a doll as the principal character in the scene. A pin cushion doll, from the vanity dresser, is seen looking out through a window, made by cutting a hole in a sheet of cardboard, onto a winter's night scene, the snow being merely flour, with a toy cardboard church in the distance. In this case, all of the light that reached the doll came through the opening in the cardboard. The central explanatory illustration shows the camera setup, with camera and light in actual position as used.

Any greetings desired may, of course, be written onto these cards by either of two methods. In the cards shown in the accompanying photos, where the lettering appears in white, the greetings were printed on the back of the negatives with a pen and show card ink. While any other ink would have served as well, the show card ink can be washed off, enabling the same negative to be used again for other purposes. If preferred, the greeting may be written on the finished card with ink.

The simplest of all greetings that can be made by tabletop photography, yet which is remarkably effective, is one in which the greeting is simply written out on white paper and laid on the table top with a candle, pen and ink well with a spray of pine twigs forming the background. This setup is too simple to require much description, except to say the pine boughs were tacked to the wall, and the scene built up on the table underneath. Light from one mazda lamp furnished the illumination with the candle being lighted throughout the exposure.

In making up these novel cards, the craftsman will, doubtless, be able to think up many other ideas as good or better than those suggested, and when completed, will have a set of Christmas greeting cards which his family will be proud to send out to friends.

To replenish the sugar and salt lost by the body when a laborer works in hot surroundings, a pharmaceutical company is making tablets containing seven parts of salt and three parts of dextrose.

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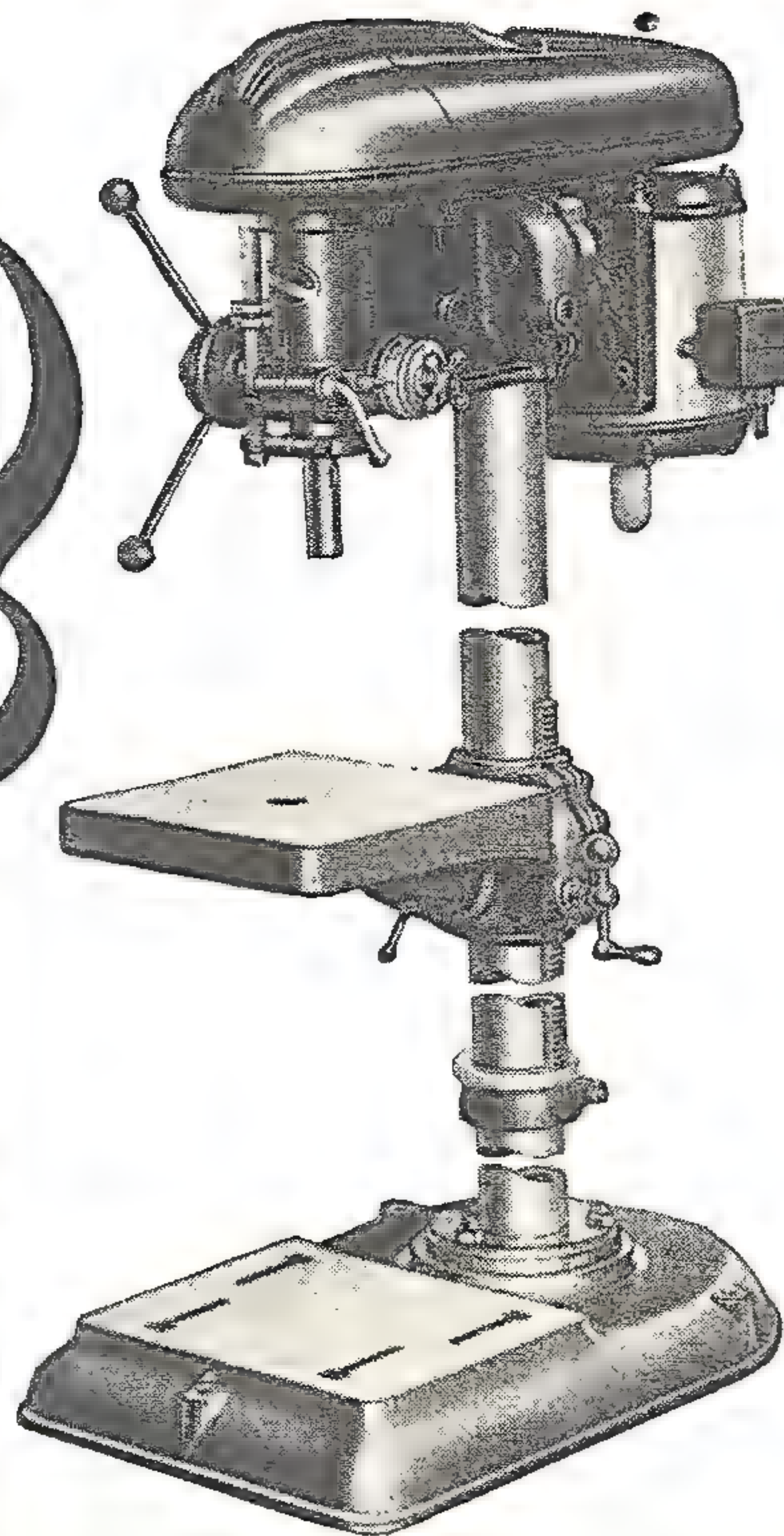
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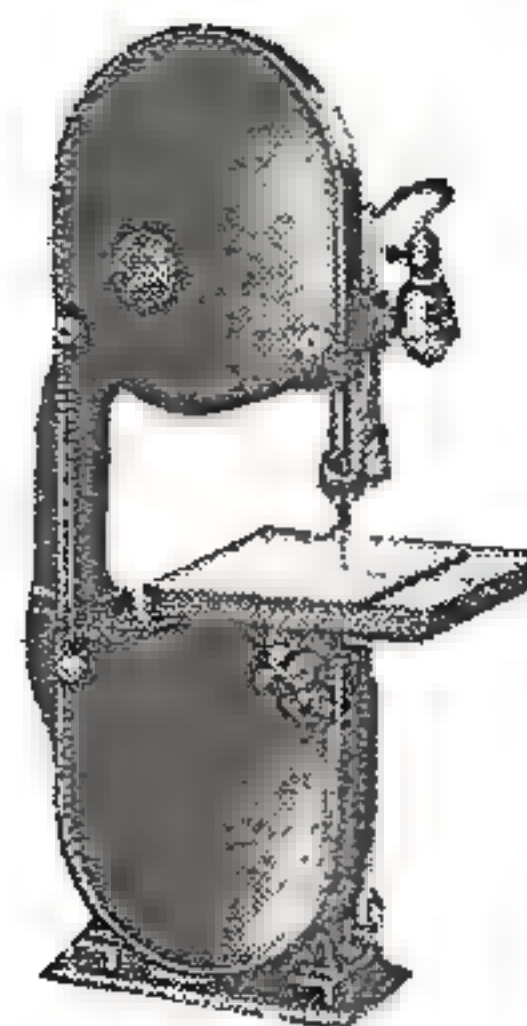
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QUALITY TOOLS



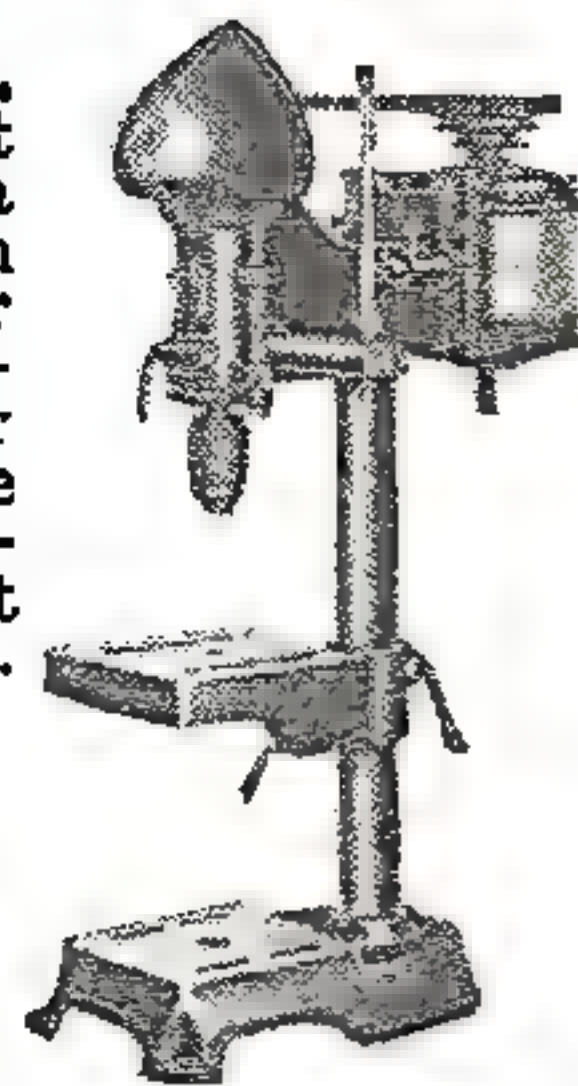
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Experiments In Chemistry

[Continued from page 93]

solution of a few crystals of mercuric nitrate is poured on top of the gel. In a few hours beautiful red bands are formed, and on standing, as many as thirty alternating bands of red and white are formed. The accompanying picture of these rings, made in a U-Tube, was for effective reasons only.

A most unusual experiment comes under the name of a "Lead Tree". This is a flowery spray of many frills and ferns, all made of lead and growing in a gel.

The base for this tree is a silicic acid gel. Solution "A" is made up as before. Solution "B" is made up in the following manner: A few crystals of lead acetate or sugar of lead are added to three teaspoons of white vinegar or 5% acetic acid. A thin strip of zinc sheet or foil is placed in a narrow jar. Solution "A" and solution "B" are poured over the strip at the same time. The mixture should completely cover the zinc and should be clear. If solution "B" itself is not clear but milky, more acid or vinegar must be added to it till it is clear and colorless. This gel should set in a few minutes, but may take longer if more acid is used. In an hour or two, growth will be noticed and the next day the jar will be filled with a profuse growth of a "Lead Tree".

Probably the most astonishing and intriguing experiment of them all is a type of rhyth-banding called Liesegang's rings. A block of ordinary gelatin dessert is cut open and found to contain beautiful bands of white and red.

The base for this experiment is not a silicic acid gel but ordinary unflavored gelatin. One heaping teaspoon of gelatin is dissolved in $\frac{3}{4}$ -cup of water which has been heated to boiling in an ordinary saucepan and a few crystals of potassium dichromate added. This mixture is poured into a jar with no lip so that the solid gelatin mold can be removed in one piece. When set, the time varying with different grades of gelatin, it is removed from the mold and placed in a solution of $\frac{1}{4}$ -teaspoon silver nitrate, or lunar caustic, dissolved in a cup of water. The gelatin and solution are then put in an ice box or refrigerator for two days. It is then removed from the solution and carefully washed with water. For the most striking effect, the gelatin should be cut vertically through the center. If this procedure is followed, intricate ring designs can be produced.

While these have been but a few of the many thousand interesting experiments that are included in the important branch of chemistry, which deals with colloids and colloidal solutions, they, nevertheless, show a few of the thrills provided by simple everyday scientific study.

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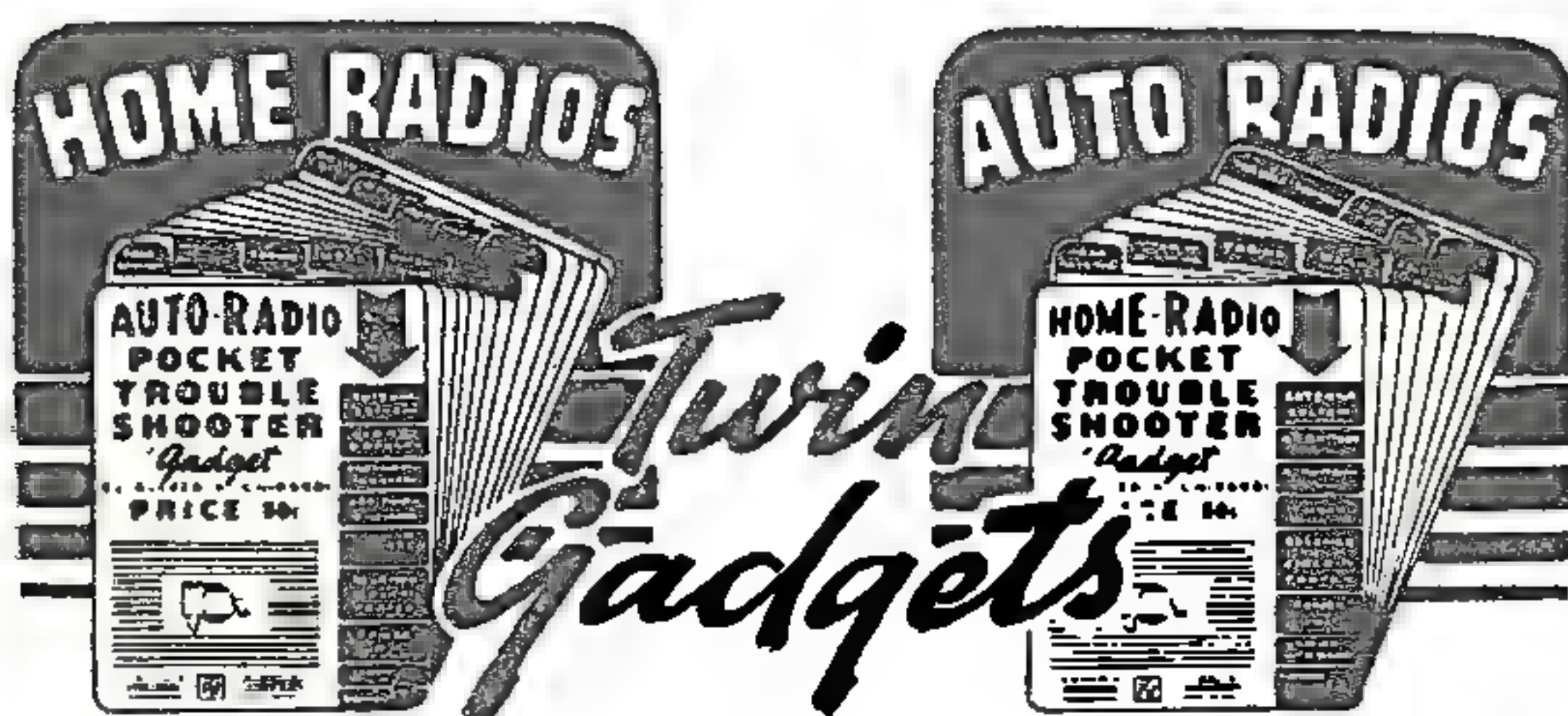
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A Local Heat Applicator

[Continued from page 87]

from damaging the wire insulation. Smoothing the edges may be sufficient, but a guard like that shown is better.

The drink mixer has a removable cap with a number of small holes in the center, and over this a cylindrical lid about 1¾ inches in diameter. With a chisel, sharp knife or pointed metal shears, cut out the perforated section, and bend the edges inward to provide a smooth opening. Keep the lid, for it is useful as a cover to keep out dust when the lamp is not in use.

Bore a hole in the end of the 5-inch length of broom handle, and drive into it a length of threaded rod, leaving about ¼-inch projecting. This rod can be a length of ¼x20 machine bolt, either brass or iron. Punch a hole in the side of the mixer can, and place a washer on each side of the hole. Insert the handle lug, and fasten it in place with a nut. The handle should be about midway between the bottom and top of the shaker, when the cap is off.

Screw the 10-watt lamp bulb into the socket, and the applicator is ready for use. Heat is applied by holding the open end of the cap near or against the object to be heated. At first, you may be disappointed with the amount of heat given off by the small bulb; but in a minute or two you will realize that it is adequate—just about all you can bear when the lamp is held against your skin, but not enough to cause a burn. Operating cost is negligible. A suggested improvement for the lamp shown would be the addition of a convenient switch. A small canopy switch mounted in the side of the can, or a feed-through switch in the cord will serve excellently.

Although heat application is generally recognized as a treatment for various bodily ailments, therapeutic use of a lamp like the one described should be undertaken only upon the advice of a physician. Another precaution is to keep away from bathroom fixtures and other grounded objects when any part of the lamp is in contact with the body. This precaution also holds true for any other electrical device.

Blower Keeps Press Clean

[Continued from page 91]

principle can be applied by using a little ingenuity.

The shaping of the main body, the fitting of the funnel and tubing is quite obvious in the details. A point which should be stressed is that the fan shaft must be fitted with a long, well-fitting bushing, and provision must be made to oil this through a hole in the shaft. It should be oiled at least every fifteen minutes when in continuous use. When one is working on a job not necessitating the blower, the friction wheels are swung out of contact.

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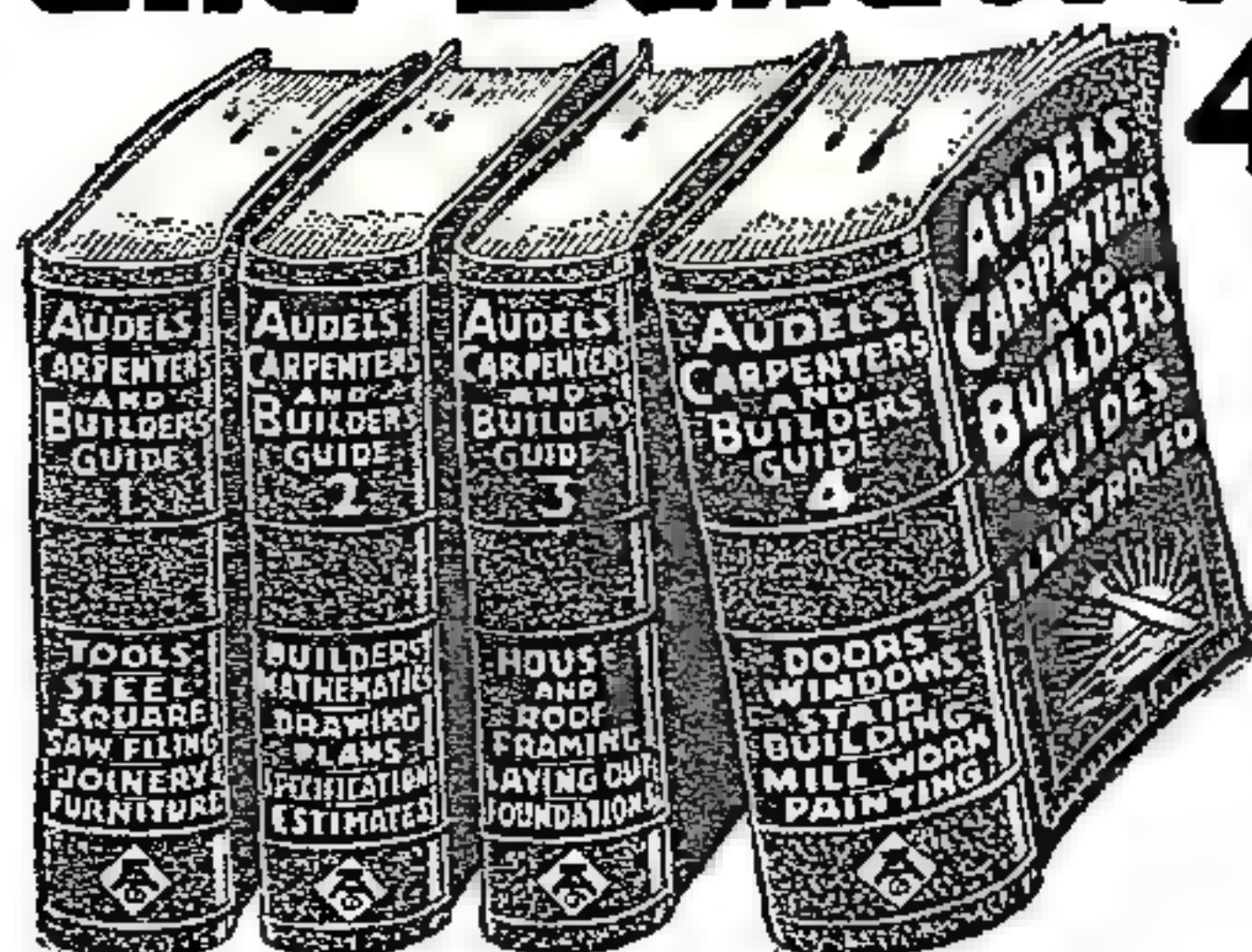
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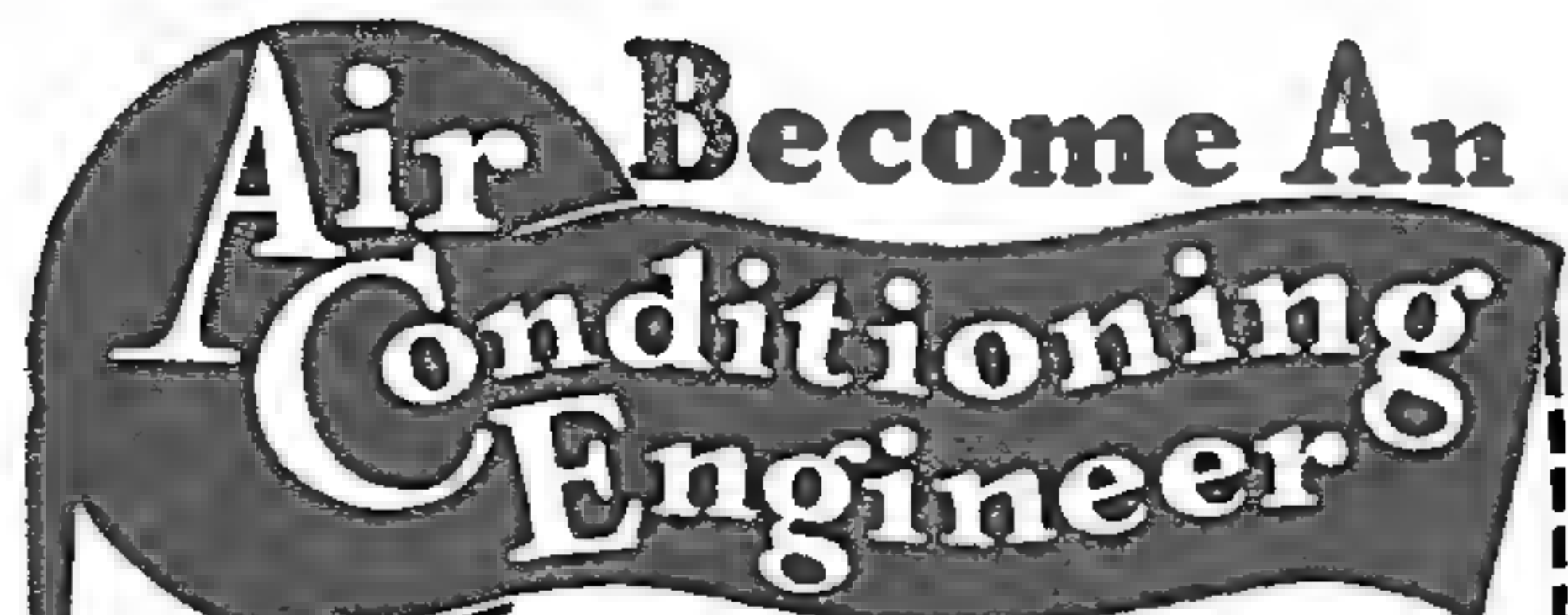
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Cause, Cure Of Radio Noises

[Continued from page 99]

resultant damage to the music or speech. Since most radio receivers do not, as yet, have noise-reducing circuits built in them, no great additional relief is possible except by swearing. This always helps. If you really *must* hear some speech through the explosive local-thunderstorm type of static it sometimes helps if a small "G-10" neon bulb is connected across the speaker transformer in the manner shown on page 99—but don't expect too much from this.

Man-made electrical noises may originate in or near your own home, whereupon they follow the flexible cord which feeds power to the receiver, and thus enter the receiver very directly without even having to reach the antenna. If connecting the antenna wire of the receiver to its chassis drops the noise considerably but does not stop it, the noise is certain to be entering the set through the power line. Of course every receiver should have a built-in noise filter to keep out interference, but try to buy one which includes such a device. It is, therefore, necessary to add a noise-filter, remembering that those walnut-size gadgets peddled on street corners are fakes. A noise filter of any value is a box-like affair costing around \$2 to \$4, which is why it was omitted from the receiver. It should be bought on a *written* understanding that it may be returned for full price if it does not fit your case, as a filter which works in some places may fail in others. If desired, you can build your own from the accompanying plans.

Before buying anything at all it is best to walk around the house looking for loose lamps, or those nearly ready to burn out, wiggling lamp cords and otherwise hunting for possible noises right at home. The next-door home may also be investigated if you are a diplomat.

Practically every noise-situation may be helped by using a really good ground. If no ground is used at all, of course, reception will be noisy, because then the electric light lines are acting as a ground, and that is where noise comes from in the first place. If you use a ground, but no antenna, the same story holds, except that the light lines are working as antenna. Do not ground onto waterpipes.

Not until the end do we get to the antenna. Electrical noises, even when barred from the ground connection, and from the flexible power-supply cord of the receiver, can still jump off into space and come in "by radio" through the antenna. If the noises are very bad it is a safe bet they begin within a mile or two from the home, or else enter the set by following an overhead power line. No ordinary citizen can trace this sort of thing down, therefore note for several days, the hours at which the noise is heard, then write the electric power company and have neighbors do the same. Most public utilities firms want to run this sort of thing down because a noise may be developing into a costly breakdown and it is helpful to receive many reports from citizens, preferably every few days until the trouble is found. Seldom indeed does one need to secure aid from newspapers, radio dealers and broadcasting stations in getting action. Power companies do not love to be hated.

Certain localities of cities are noisy despite the best present effort of the power and traction companies. It is then necessary to bar the use of the regular type of antenna. While all sorts of "anti noise antennas" are on the market the best has a simple twisted-pair downlead and a 1-wire top approximately 70 feet long. There is no need for hanging a lot of crockery and hardware in the air. The instructions with the antenna are not just chatter, but are vital to the result and should be followed.

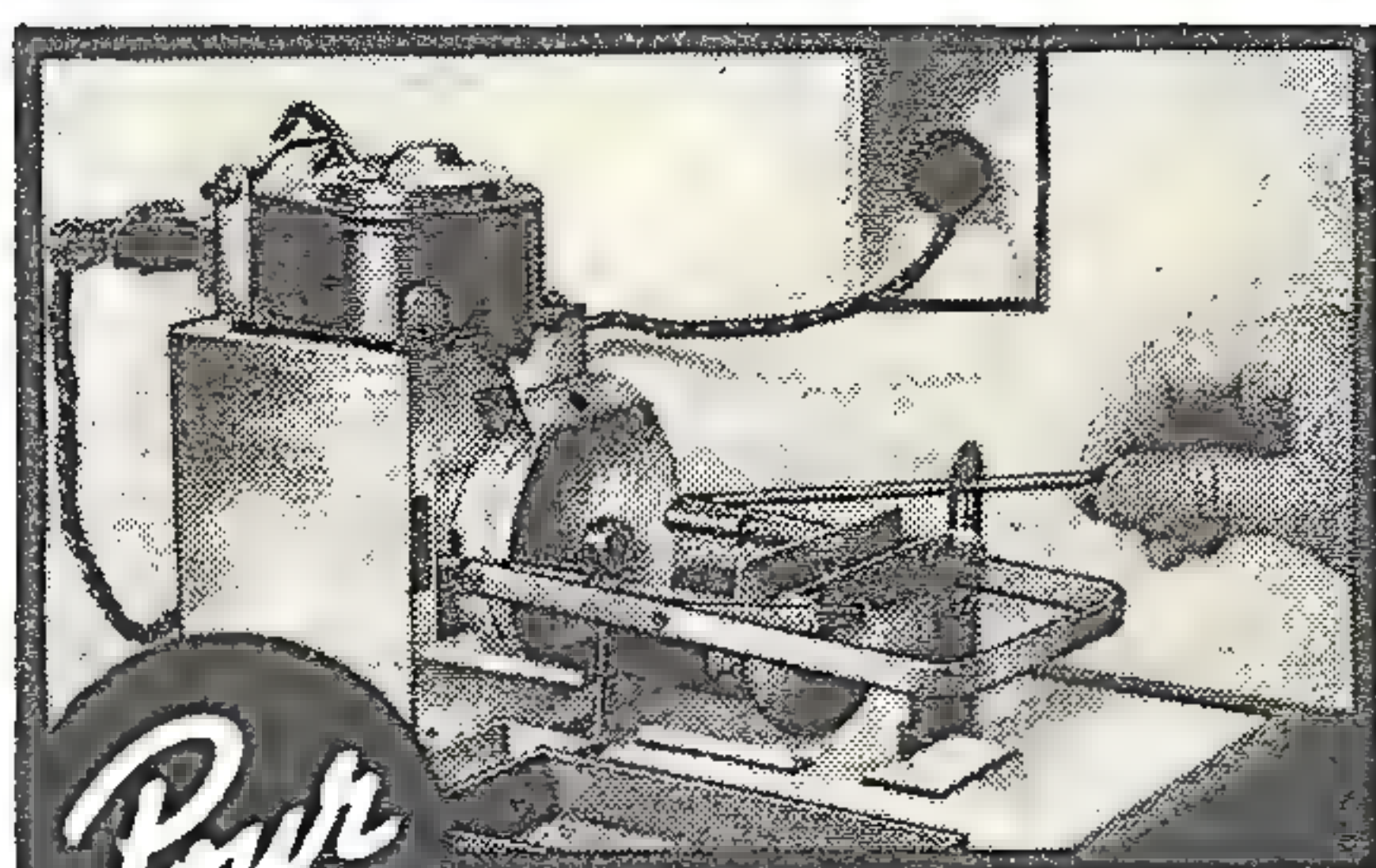
However the instructions always forget to mention the proper antenna height for shortwave reception. If the antenna is too high you may hear no Europeans. Numerous tests have proved that sometimes dropping an antenna helps European signals, besides cutting down noise. In a suburban district a good average seems to be about 30 feet but NOT OVER THE HOUSE. For plain reception of American broadcast stations the trick antennas are seldom as good and never better than the old-style single wire, providing the wire is long enough and, except for static, as high as you can make it while staying "in the clear". Up to 40 feet and out 60 feet will pick up signals to choke off a lot of noise—if the other 4 noise-gates have been closed first.

In its winter sleep the lump-nosed bat curls its ears in spiral coils like a ram's horn.

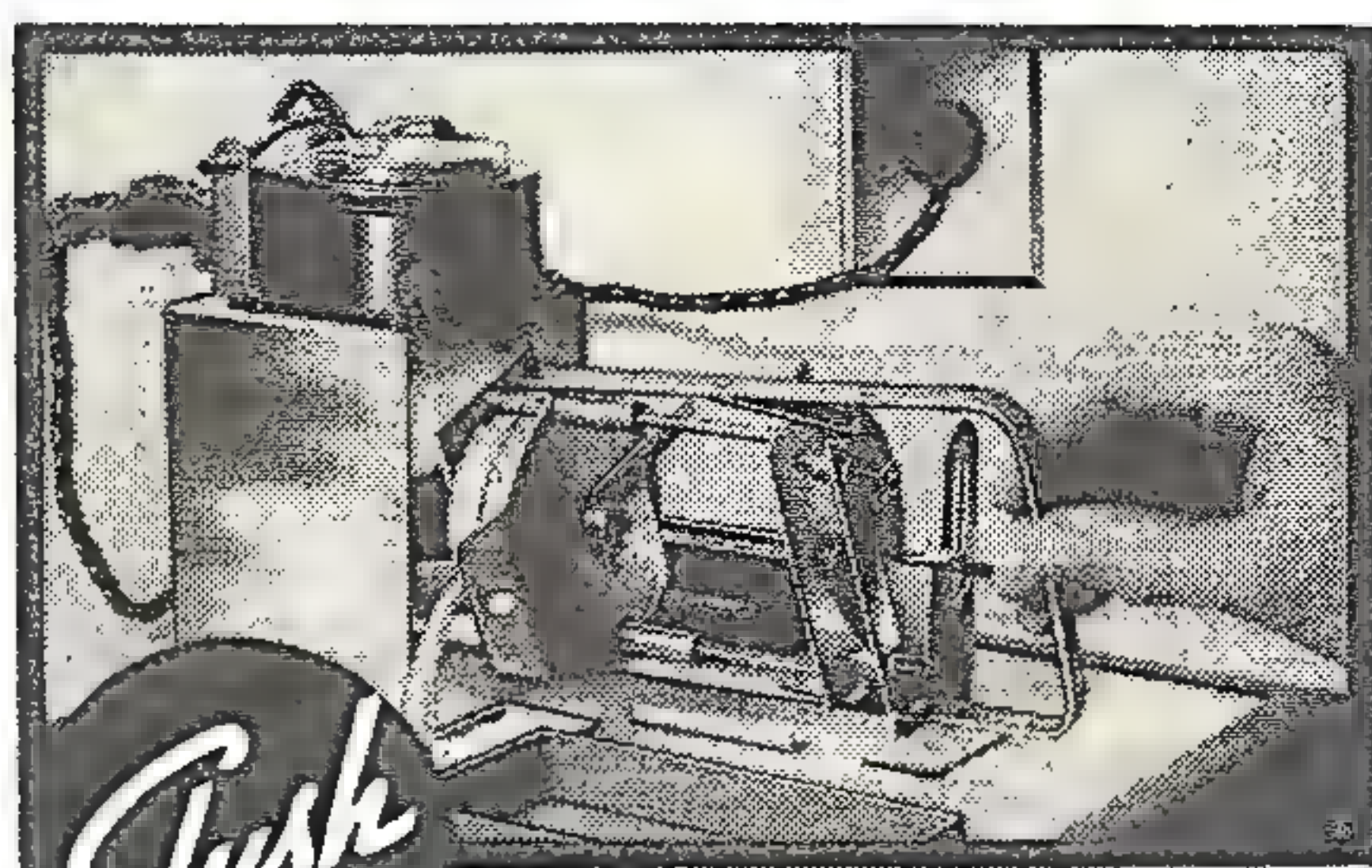
Workers in a famous glass factory in Germany have an orchestra, and play instruments made of glass.

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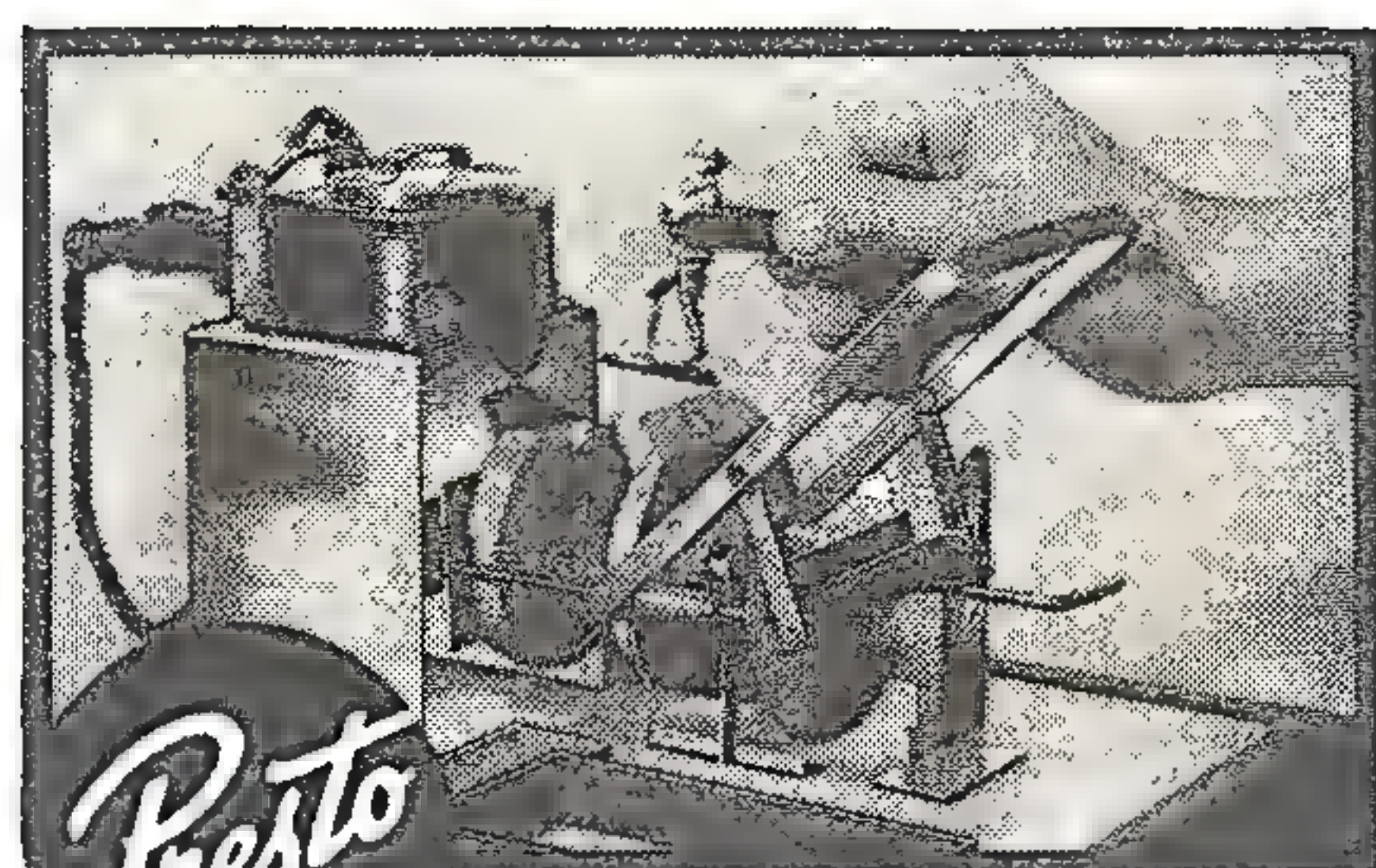
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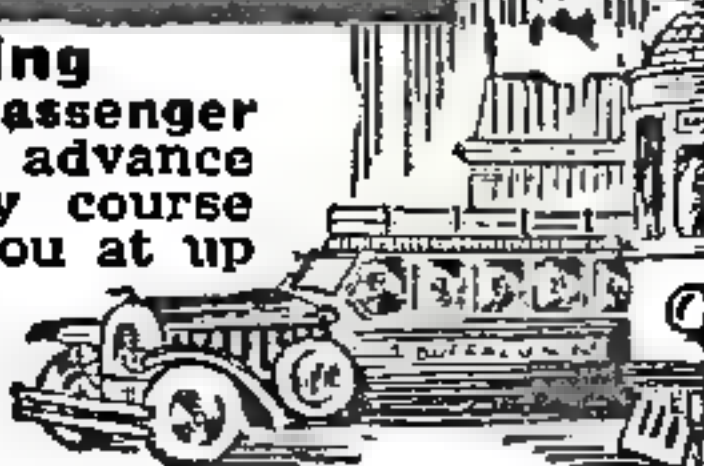
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Celluloid Tanks Easily Made

[Continued from page 107]

cut films can be dropped. These should be spaced at least 1/4-inch apart. At one side attach a small rubber tube and bulb to keep the solution agitated. Squeezing the bulb occasionally during development will circulate the developer about in the tank, giving more snap to the negatives. Rinse out the bulb each time the tank is used.

The roll film tank is made in the same manner. In making the film spool, use discs of celluloid reinforced with narrower strips. Cement 1/8-inch strips, spiral fashion, to each disc; these serve as tracks to keep the film turns separated. Holes must be punched in each disc to allow the developer to circulate freely. The axis of the spool is a piece of celluloid formed into a tube around a pencil.

Developing tanks are ordinarily used and loaded in the darkroom, and the transparency of the celluloid is a considerable aid in judging the density of the negative without removal. In case you wish to load the tank in the darkroom and complete development in white light, however, it can be provided with a lid and all parts made absolutely light tight by merely coating them with black lacquer. This may be applied with a small air brush of the type used for touching up automobile fenders. The drawing shows how to construct the lid with a light trap so that developer can be poured in after the tank has been loaded and carried out of the darkroom. Both styles of tanks can be used for fixing the negatives after development, without removing them. The developer should be well rinsed out before pouring in the fixing solution.

Lathe Turned Dinner Gong

[Continued from page 71]

Melt down the copper first for its flowing temperature of 1980°F. is considerably more than aluminum which is 1300°F. Then add the aluminum. An excellent formula for aluminum bronze is, copper 88% and aluminum 12%. Stir the molten metal with a wood stick and skim off the slag before pouring. Weight down the mould to prevent the upper flask from rising because there is considerably hydraulic action in the process.

If the metal in the well is full round and solidly affixed to the bell itself, you may simply leave a 1-inch projection; otherwise machine smooth and drill the dome of the bell for a 1/2-inch brass or bronze pin which is riveted underneath. Only the outside, and rim of the bell, need be machined and polished; this requiring the reversing of the casting in the chuck. To prevent the chuck jaws from blemishing the rim, after turning, lay a short strip of thick copper under each jaw before tightening.

[Continued on page 145]

Midget Mike Contest Winner

[Continued from page 68]

W. Cruger, of Schenectady, New York.

Fourth and fifth prizes, consisting of kits for building a freight car, less trucks, were awarded to Wm. G. Gerrish, Brooklyn, N. Y., and Irvin W. Streng, Chicago, Ill., respectively.

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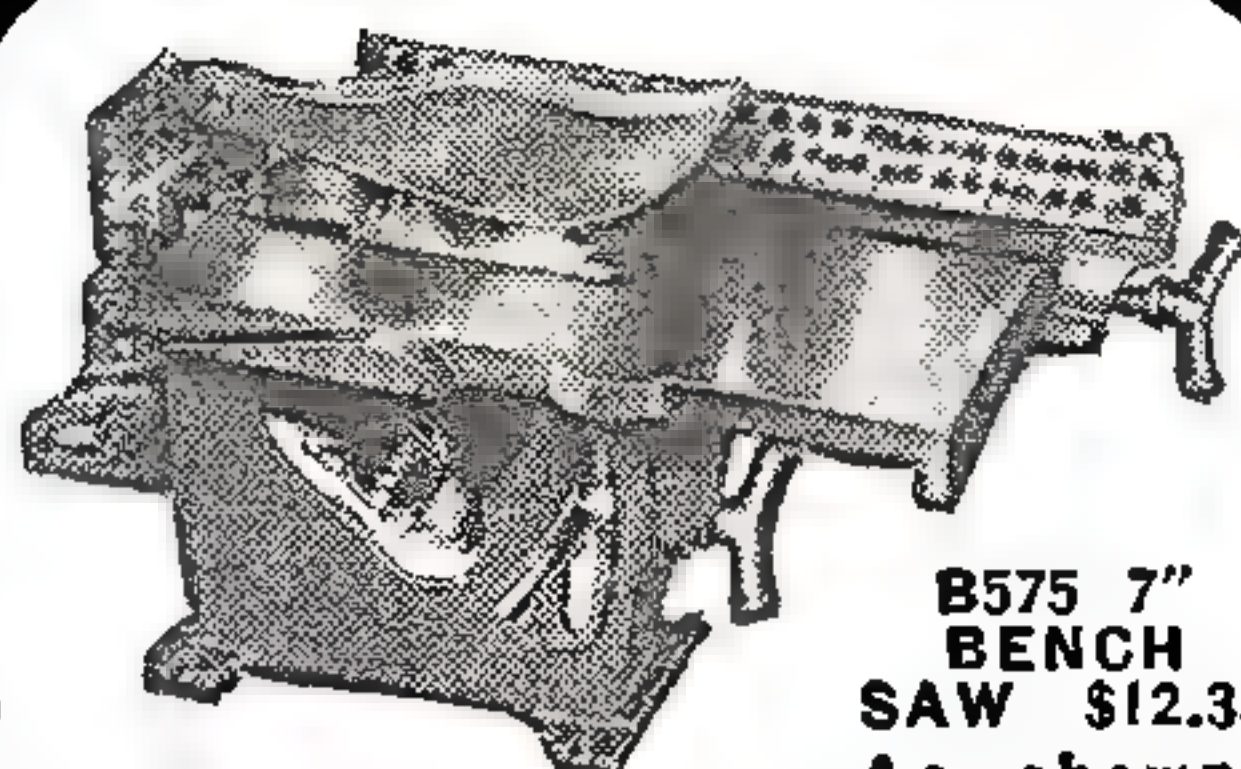


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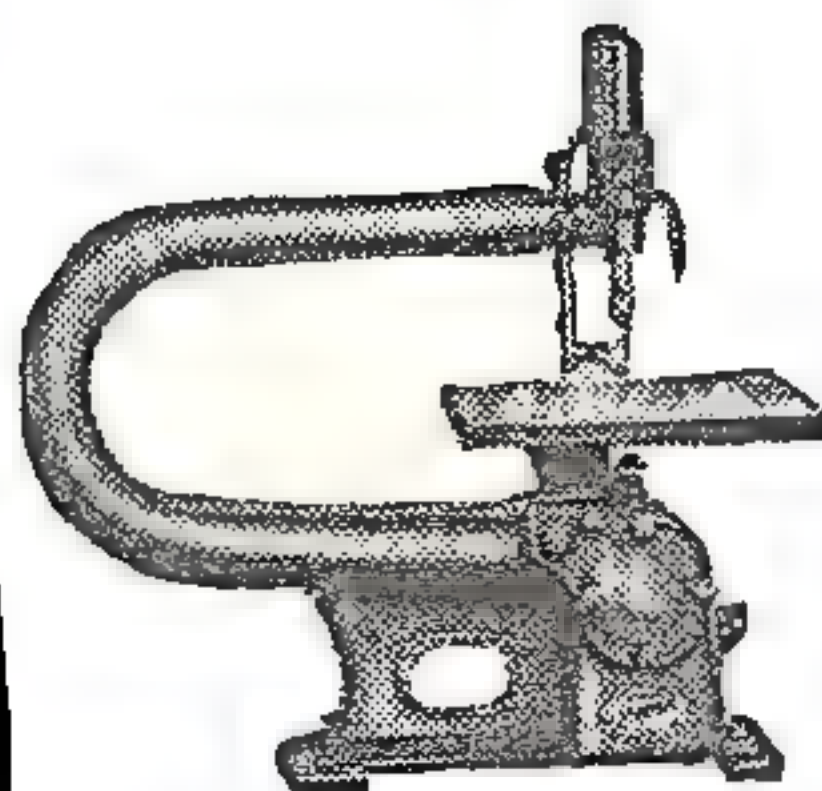
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B575 7"
BENCH
SAW \$12.35

As shown, including guard and splitter, steel rip fence and mitre gauge.

A Driver bench saw will relieve any home craftsman of much of his hardest work. The 7" blade on this tool cuts stock to 2 1/4" thick. 14"x10" ground cast iron table tilts to 45°, permitting angle cuts. Saw arbor raises and lowers. Heavy steel ripping fence. Safety guard with splitter which facilitates sawing of green or damp lumber.

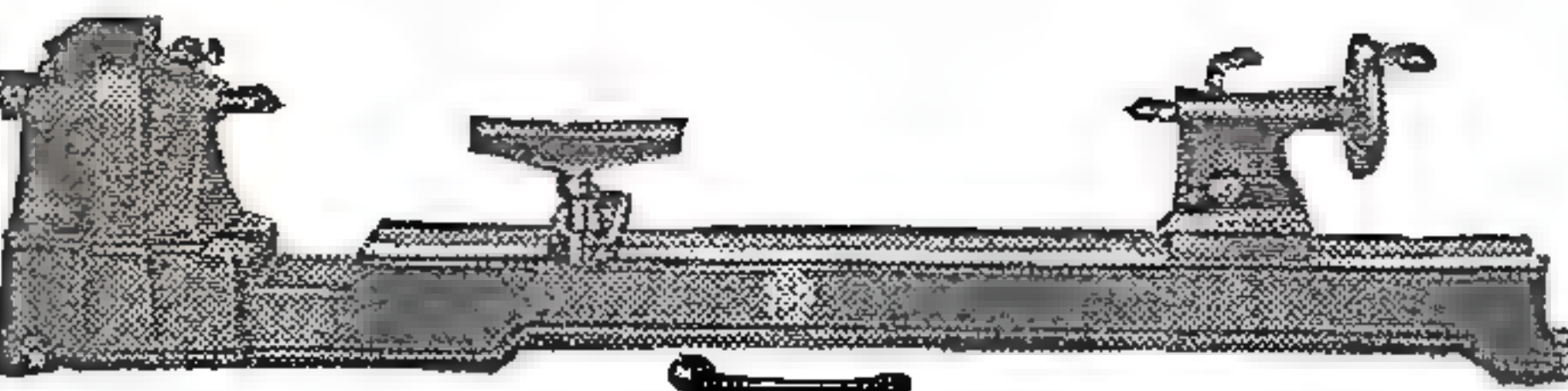


J505 14"
JIG SAW
\$13.45

As shown, including pulley on machine. Motor pulley and belt extra.

Complete in itself for a great variety of creative work, this jig saw is built to give hour after hour of vibrationless, trouble-free performance. It has cast iron tubular frame with throat capacity of 14". Table 9"x9" tilts to 45° and has accurate quadrant indicator. Enclosed drive mechanism lubricated by splash oil system. Plunger-type blower clears cutting line of sawdust.

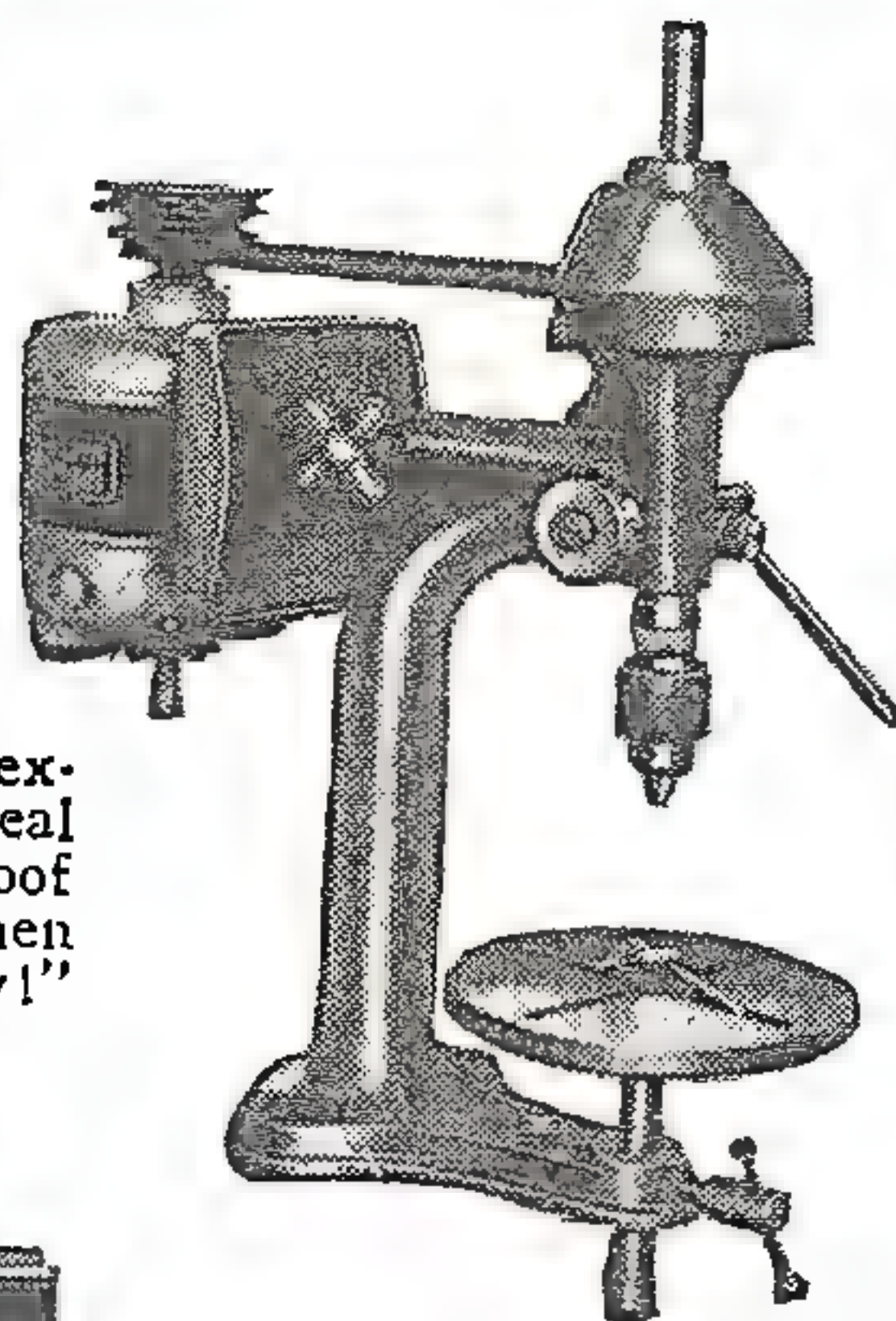
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L540. GAP BED LATHE \$18.50
As shown, including 34" V-belt and box wrench.

This low priced tool will handle the bulk of wood and plastic turning and metal turning jobs in the home workshop and do them well. It has sturdy cast iron gap bed 44" long and 3 1/2" high. Morse Taper centers, bronze bearings, ball thrust bearing in head. Capacity: work 30 1/2" long, discs 10" in diameter.

A 72-page manual is included with each of these machines. Send for the big, free 1938 catalog describing three full lines of Driver Engineered Bench Saws, Band Saws, Drill Presses, Jig Saws, Jointers, Lathes, Flexible Shafts and Motor Grinders. Walker-Turner Co., Inc., 5127 South Ave., Plainfield, N. J.



D570 DRILL PRESS \$19.25
As shown, less motor. Includes Jacobs Key Chuck, belt and motor pulley.

Here's a superior drill press unique in its price class. It has a Jacobs (1/8" to 1/2") Key Chuck. Bronze bearings and ball thrust bearing. Rigid cast iron frame and adjustable 8" table. Spindle travels 2 3/8". Four speeds.

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Camera Pays You Dividends

[Continued from page 113]

Many a farm yard has an idea or two going to seed, waiting only for the right chap to come along and photograph them. Ideas found in farm yards and farm homes, which are novel or have a new twist and which come up to specifications, are apt to sell to a mechanical magazine or farm paper. Now these specifications, whether they are to apply to the above fields or for some other type of magazine should, first of all, appeal to the average reader of that magazine. One editor has become quite frank on this topic and says that to interest him, an idea should appeal to 25% of his readers. That, in a way, seems high, but nevertheless your first rule should be to photograph an object, method or idea which will appeal to the average reader of a magazine or paper in a given field.

Rule two pertains particularly to the how-to-make type and it is this: Is the article to be photographed easy to make? Rule three is: Will it cost much? The three rules just mentioned cover the field, and if applied before taking the picture, unnecessary expense will thus be avoided.

Conversely, there are types of pictures which never sell. This list includes pretty scenery, youngsters at play, staid pictures of residences, buildings, flower gardens, etc. But, let a few good scenery shots illustrate a story on a good fishing trip, with persons close up in at least some of them, and these same pictures, now that they have a purpose, will help put your story over with magazine editors. For example, if you were to photograph a child in a clever homemade contraption, his presence in the picture will help to sell a print of that contraption. A photo of a home will sell if there is some unusual slant to it. The flower garden shot may bring a check if, around that garden there is an unusual kind of wall, or if the picture, for some other reason, shows something specific.

Farm yards yield many salable ideas, and because of the compactness, low cost of operation and adaptability of the small hand camera, you'll be wise and dollars ahead if you get in the habit of carrying it loaded every time you take a Sunday drive through the country. The writer's files have more than 3,000 films alone of farm ideas which have sold to many magazines. And to illustrate just how many possibilities a typical farm yard has, let's walk through one.

Stopping the car in the drive you notice an unusual mail box beside the highway. On the lawn is a clever two-way sprinkler that the mechanically minded farm boy has contrived from odds and ends. Back of the house you discover the cellar door equipped with a counterbalance to make opening and closing easier. A simple guard is on one tree to prevent cats from climbing the trunk to get at a bird's nest. Beside the back door is a good but improvised foot scraper, no idea for a garden magazine, but quite in keeping with what a farm paper editor is looking for as a "filler."

[Continued on page 150]



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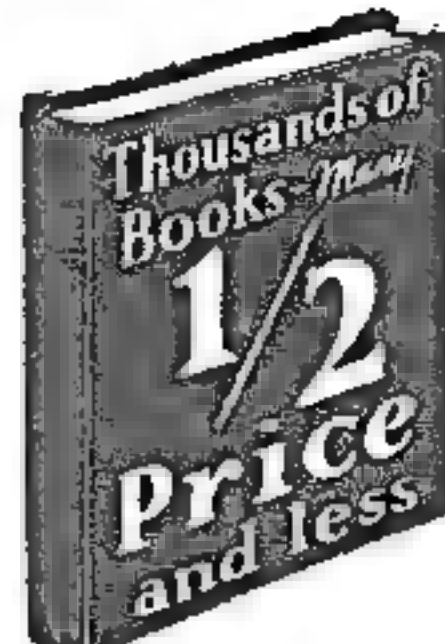
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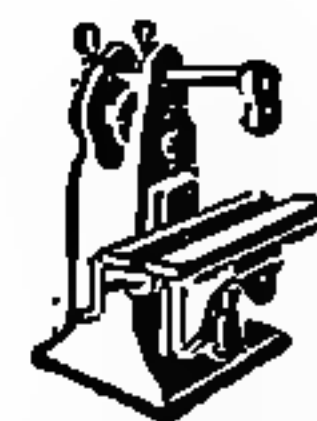
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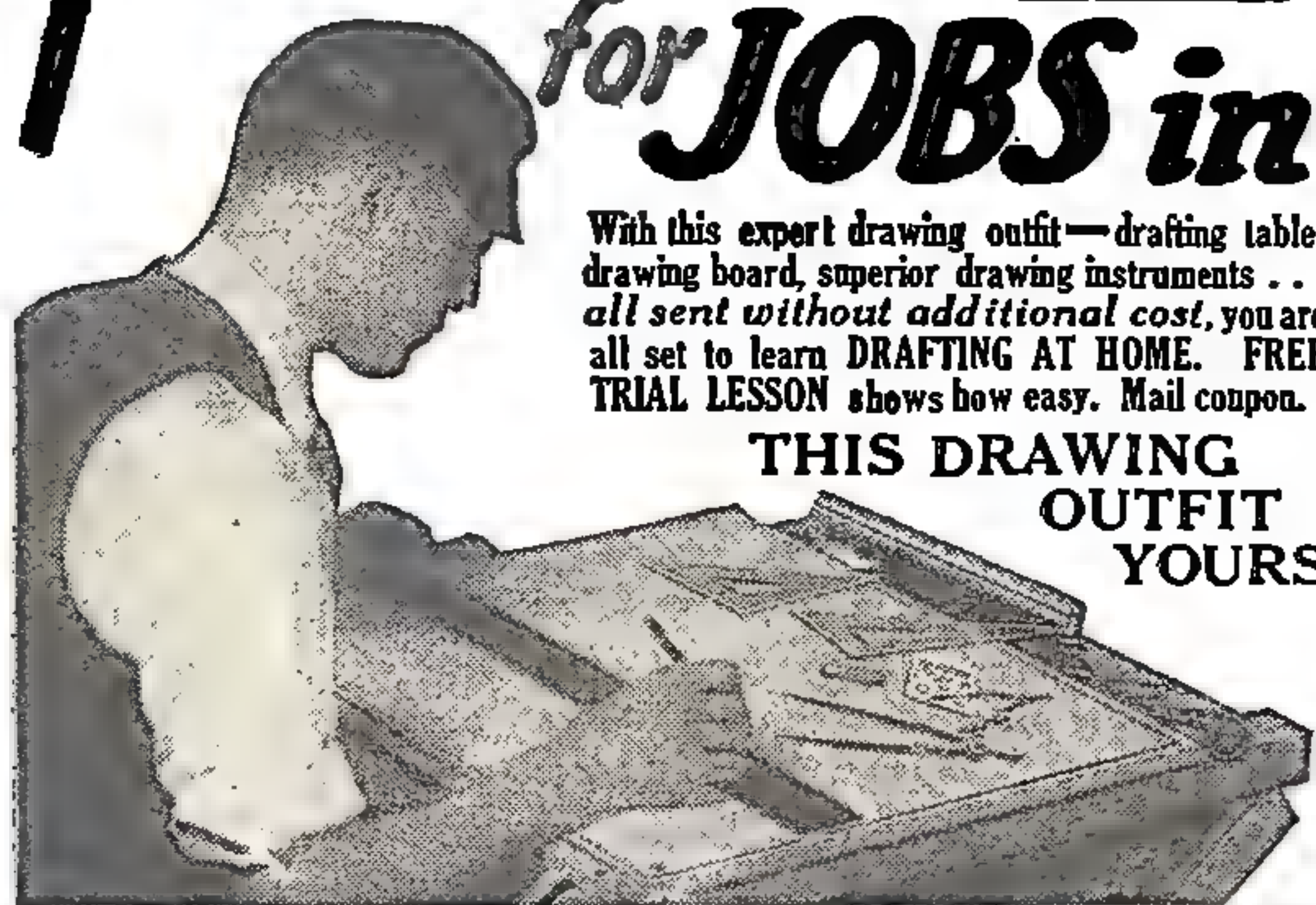
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An "O" Gauge Locomotive

[Continued from page 83]

Through this, run a small nail or pin for fastening the truck to the floor.

With the two inner frames completed, start on the wheels. These are built up in three parts consisting of two cardboard disks and a hollow ring. The rings may be either metal or bone. You can purchase a card of twelve (at the sewing or art counter in any ten-cent store) that will serve the purpose very well. Make sure though, that they are exactly $\frac{3}{4}$ inch in diameter.

Cut out all of the large disks first to form the wheel flanges and lay them on a flat board. Next glue a ring to each flange and allow them to dry while cutting out the smaller $\frac{3}{4}$ -inch disks. These are glued over the rings to complete the wheels.

While the wheels are drying, cut four lengths of lolly-pop dowel for the axles. Trim them evenly, then sandpaper until smooth. Make holes in the wheels just large enough to receive the axles, and push them through. If they fit correctly remove two wheels, one off of each axle, and push them through the holes in the inside frame. Then add the other wheels and glue them securely to the axles. Run the assembly over the track to see that it rolls smoothly. If so, complete the other truck in the same manner.

After finishing the inside assembly, begin the four outside frames. Mount them by gluing them to a small balsa block, glued in turn to the inside frame between the wheels.

When they have dried re-enforce them with lengths of bamboo, $\frac{1}{8}$ -inch square, and number 18 copper wire. Consult the plans to make certain that their construction is correct.

The chassis, on floor, is made from a piece of pine wood, $\frac{3}{8}$ -inch thick $2\frac{1}{4}$ inches wide and 9 inches long or cigar wood if there is any handy. Sandpaper it smooth and drill a small hole about $1\frac{3}{4}$ -inch from each end to take the nail or pin already placed in the trucks.

Fasten the trucks to the chassis by bending the pin over so that the point sticks into the top of the floor. Be sure that it is not fastened too tightly or the trucks will not swing.

Next, make a border of cardboard to go around the outside of the chassis. This border gives the floor the correct thickness. On it the ladders and pilots or cow catchers are mounted. This may be done at this stage if desired. Both pilots and ladders are built up of cardboard strips glued together, as clearly shown in the plans.

With the chassis completed, begin work on the body or cab. Make it of stiff cardboard in four sections; front, back, and two sides. Both front and back as well as the sides are exactly alike. Their construction is very simple. Cut out the windows and doors with a razor blade, using a ruler as a guide.

The trimmings inside the windows are made of $\frac{1}{4}$ -inch strips of cardboard glued around the frames so that half their width shows. Cellophane is used to represent glass.

Cement the front and rear ends of the cab to the floor, making sure that they are both exactly the same distance from the ends of the chassis, or about $\frac{1}{8}$ -inch from the edge. The extra platforms go directly in front of the cab ends and are cemented directly to the floor.

The body sides are then glued to the floor and ends, and held upright with a few straight pins until the glue sets thoroughly. A cross piece or brace is placed in the inside of the cab of exactly the same width as the inside of the cab. Make this of wood and glue it securely in place.

The roof is made of the same grade cardboard as the rest of the cab, and measures about $2\frac{1}{2}$ -inches wide and $8\frac{3}{4}$ -inches long. Spread glue all along the top sides of the cab walls and allow the glue to become tacky before attaching the roof. Hold it down with straight pins in the same manner as the sides until it is dry.

At this stage all main parts of the locomotive will have been completed. There remains only the details, and these are very easy to make except for the bell, which should be purchased from a model supply house.

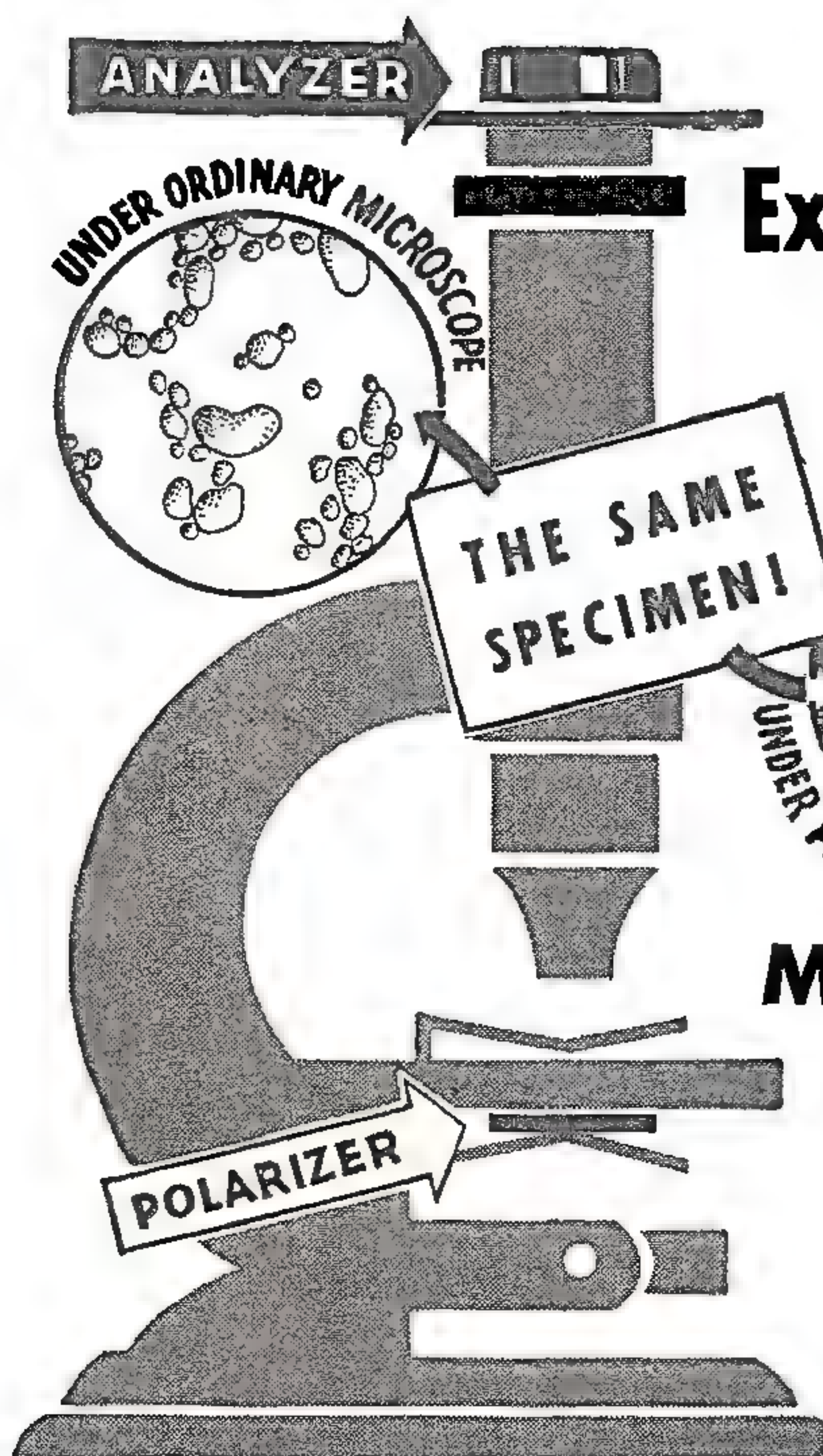
The two searchlights are made by simply cutting off a length of dowel and wrapping writing paper around it so that when paint is applied, the paper will have a smooth metal-like finish.

The platforms for the oil coolers may be made of flat balsa $\frac{1}{8}$ -inch thick, or heavy cardboard. When mounting these glue the center portion only, to the roof. The ends must be left standing up so that the legs, made of small squares of cardboard, can be glued at each corner.

Make the oil coolers of number 18-wire, running the wires through a piece of balsa $\frac{1}{4}$ -inch square. They are held above the platform by two cardboard legs glued to both ends of the $\frac{1}{4}$ -inch square piece of balsa, measuring $\frac{1}{2}$ -inch high and $\frac{1}{4}$ -inch wide.

Drill twelve holes in the wood, glue the legs in place and mount the assembly on the platforms before you put the copper coolers in place. When you bend the coolers to shape

[Continued on page 151]



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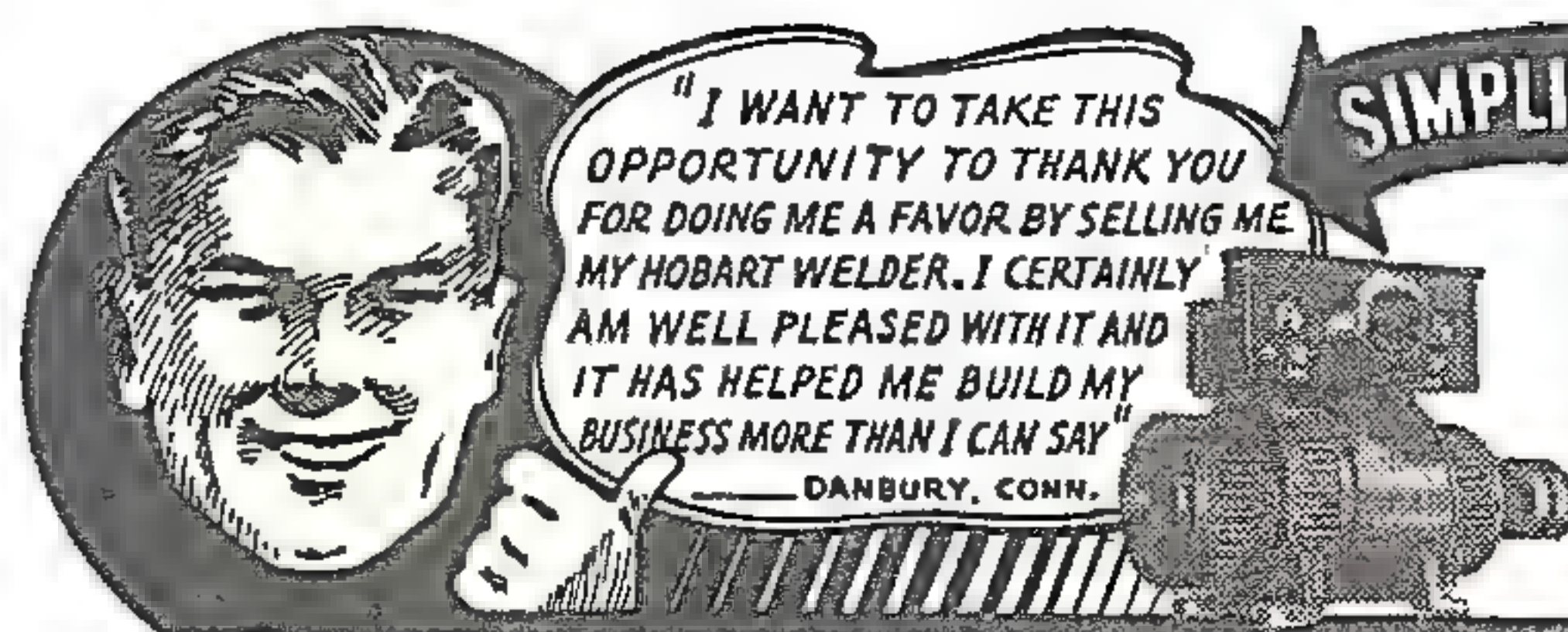
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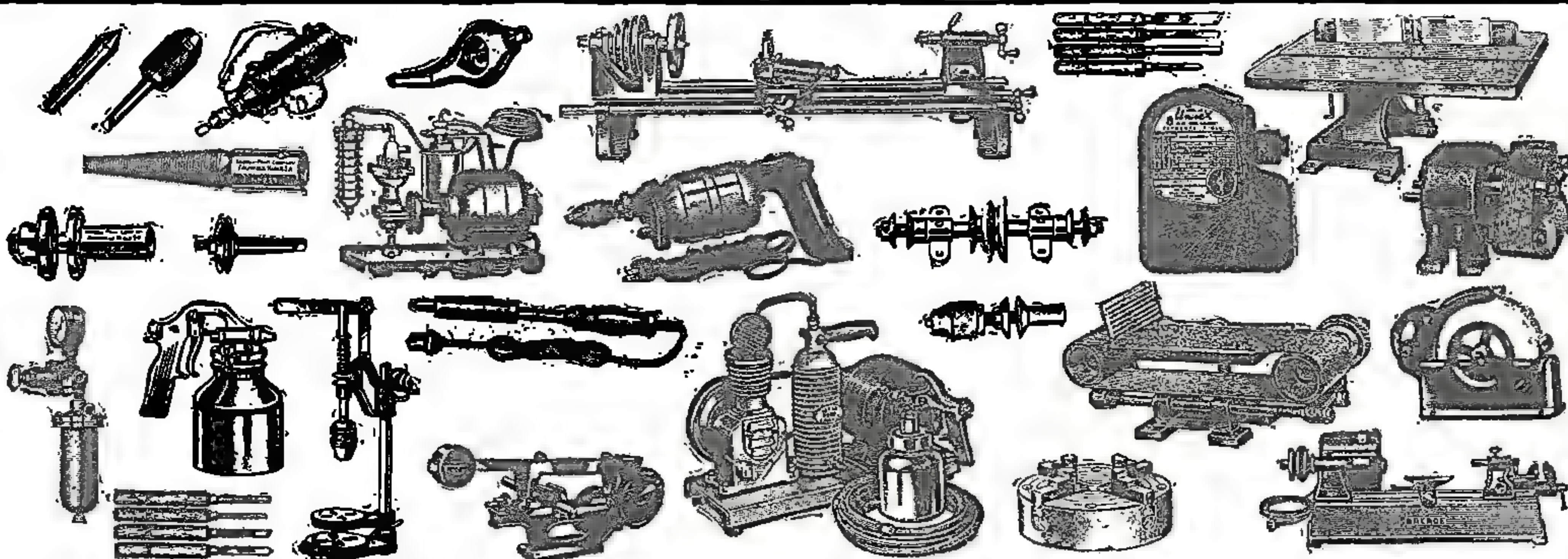
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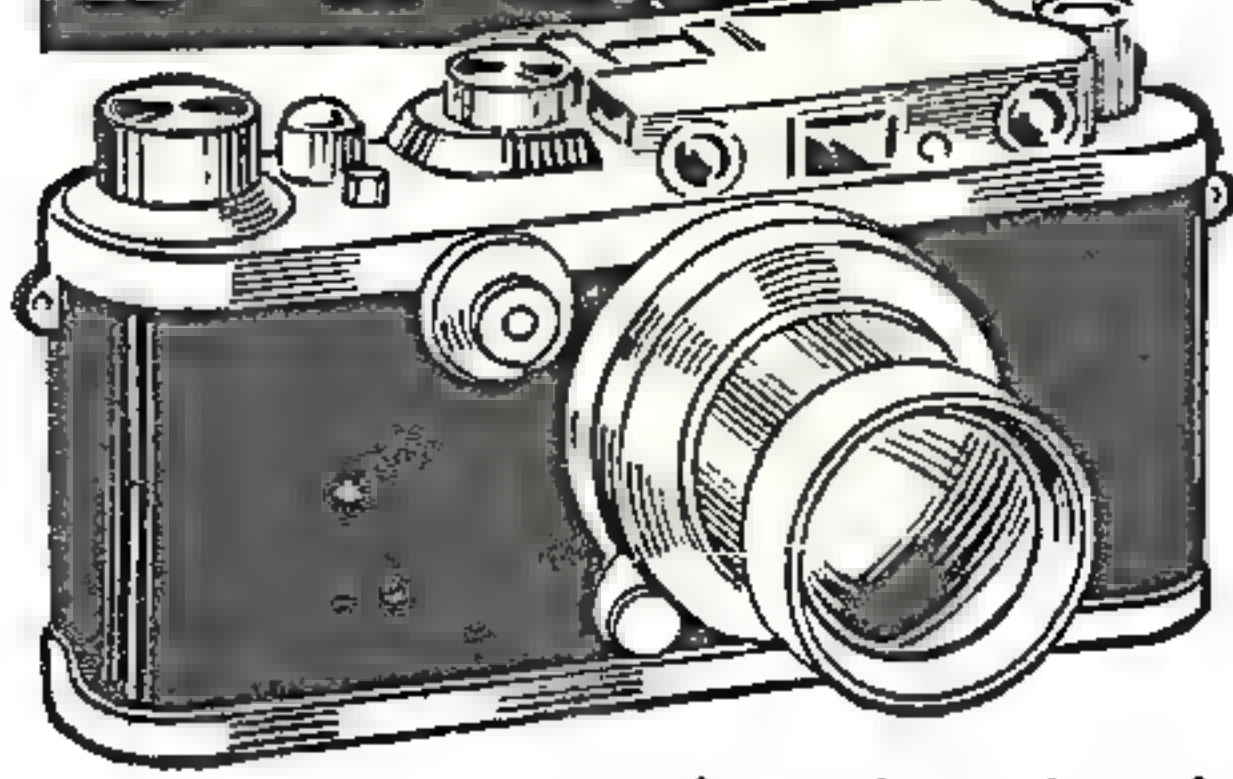
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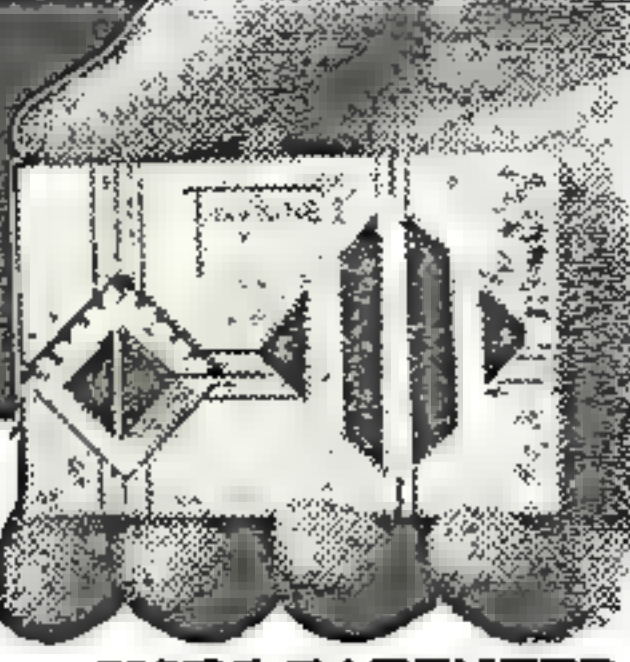


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Simplifying Winter Starting

[Continued from page 89]

As the ignition system and carburetor are virtually the heart of the automobile's mechanism, both must be in perfect condition in order that the engine operate satisfactorily. If the foregoing suggestions fail to have any effect on the car's starting, you may be sure that the trouble is in the ignition circuit. Moisture has a tendency to seep into the distributor housing and short circuit the high tension current. Unless a heavy spark is obtained when the spark plug cable is held three-eighths of an inch from the plug terminal, the ignition system is not performing normally.

In this event, the spark coil, distributor or spark plug cables are at fault and each should be individually checked so as to determine the exact seat of the trouble. First of all, remove the distributor cap and wipe off both the inside and outside of the bakelite case with a dry cloth, following this with a second wiping with a cloth slightly moistened with alcohol. The alcohol will absorb all minute particles of moisture that may remain.

While the cap is off, continue the overhauling by filing the points and rotary contacts. Where the points are worn to any extent it is advisable to replace them. Worn points exert excess charges on the distributor condenser and may cause it to burn out or short circuit. Expense and trouble can be saved by prompt replacement of these contacts.

Replace the distributor cap, at this point, and repeat the spark test on the plugs. If they show any evidence of receiving weak sparks while the motor is running, replace the old cable with a new one. In cases where the original cables still provide satisfactory service they may be given additional life by waterproofing with a coat of clear varnish, shellac or lacquer.

[Continued on page 169]

Add Microscope To Camera

[Continued from page 96]

swung over the toes will then prevent all movement. Among necessary adjuncts is a light-tight adapter to make connection between microscope and camera. For the plain box type of camera, fashion a 4-inch ring of heavy wire and to this sew a sleeve of thick black velvet, nap inward. Drop the ring into the box and pull the velvet through the 3-inch hole in the camera bottom. The other end of the sleeve is then caught around the microscope eyepiece with a heavy rubber band; or even better by a short band of elastic tape fastened with a clothing snap or a hook and eye after one turn around the eyepiece. For other cameras, both ends of the sleeve should be equipped with elastics.

Stands for commercial cameras are similar to the one already described except that a vertical slot is cut along the center of the upright and the camera is fastened to a sliding block which runs along this slot, and tightened at any desired elevation by a wing nut. While the whole assembly may be arranged in a horizontal position, such a setup cannot be used with living cultures or anything of a fluid nature. It will therefore be found most convenient to do practically all work in the vertical plane, rigging the camera up over the microscope.

[Continued on page 143]

How To Print Your Pictures

[Continued from page 109]

plain paper back and the sensitized surface can easily be distinguished. Close the frame, put it on the box and turn the light on, for approximately three seconds. This is only a guess; you may spoil two or three sheets for each negative until "timing sense" is acquired.

Remove the paper and dunk it in the developer, holding its edge by means of the wooden tongs. In a few seconds the image will begin to appear. Contact paper should require about 45 or 50 seconds for complete development. If it blackens in less time, it has been "overexposed"—the light was kept on too long; if it seems sluggish and doesn't darken enough, it has been "underexposed."

[Continued on page 145]

Add Microscope To Camera

[Continued from page 142]

Choice of subjects for the initial attempts is very important, since many a beginner has been sadly discouraged by his failure to secure good pictures through chance selection of a subject that would challenge the resourcefulness of an expert. Try something simple, flat and of one color, as a fly's wing or a stained section of a plant leaf or stem. Pond life mounted in gelatin to prevent movement is also excellent. Avoid bulky objects with curved surfaces and too great a depth of focus; avoid high power and fine detail; avoid opaque or semiopaque materials that are not perfectly clear by transmitted light. Reserve all such subjects for a later time, when experience has brought knowledge of lighting, lenses, condensers, filters and other advanced considerations.

If a strong light source can be obtained from above, throwing a beam of light down upon the slide, it is not difficult to try a low-power shot of some simple object by reflected light. Cut out a 1/2-inch square of a newspaper photograph or make a fingerprint on white paper; pass through xylene for a few minutes and then into thin balsam. When dry, such a slide will make an interesting subject for this type of photomicrograph.

At this point the first exposure may be attempted. Clean all glass parts thoroughly, including both surfaces of the slide mount, the mirror, objective and eyepiece of the microscope and the camera lens, if present. Place the slide on the stage and secure a sharp focus, centering the object and getting just the picture which is to be photographed. Then, transfer the microscope to the stand and connect the light-tight adapter so as to exclude all light at this juncture and observe the image on the ground glass. The work may be performed either by day or night. It is not necessary to have a dark room, save for focusing on the ground glass, where a cloth hood may be found useful. Most professionals employ a hand lens in examining the image on the ground glass in order to have the focus as sharp as possible.

If a regulation camera is utilized, set the stop at infinity, open the iris diaphragm to its fullest extent and set the shutter at time exposure, shutter open. Affix the camera to the stand so that the lens almost touches the microscope eyepiece, put on the light-tight adapter, and open the camera back, focusing on the ground glass. If no such glass is present, as in roll film cameras, one can be easily made or purchased and set into the ledge of the camera back. It must lie in the exact plane of the sensitized film. It is quite essential that the optical axis of this setup, or all parts traversed by light rays, be in accurate alignment. This includes light source, mirror condenser (if present), object, objective, eyepiece, camera lens (if present) and film or plate surface. Be sure that all movable parts are rigidly tightened to prevent vibration.

When all is in readiness, remove the ground glass and load the camera. The exposure is best made by snapping the light on and off, the plate being exposed throughout. This brings us to a consideration—the most important topic of all—the illumination. Strong sunlight would do, but since it cannot be depended on, or used at night, it has become universal practice to employ a strong artificial light, as that from a small arc or a Mazda lamp, the favorite type being a 6-volt 108-watt Mazda with a filament of tungsten ribbon, though this requires a transformer if hooked up to the house lighting circuit. Regular household bulbs of high wattage may be used just as well by increasing the length of exposure. The lamp should be close to the microscope mirror and for that reason many prefer to attach the light socket permanently to the base of the photomicrographic stand.

The length of exposure has to be determined by trial and error because there are so many variable factors. Type of objective, eyepiece and camera lens (if used), density and color of object, intensity and kind of light, degree of magnification, kind of photographic film or plate used, presence or absence and type of color filter are all considerations affecting the time needed to secure a satisfactory negative. Try making five or six shots, the first with a 3/4-minute exposure and the rest each 1/4-minute longer in succession. Keep full and accurate card records of each picture relative to subject, lens combination, kind of light and color filter (if any), type of plate or film and length of exposure. Keep a check on the sequence of these first pictures, then select the best one and use that as a standard in estimating correct length of exposure for other subjects.

It is sometimes hard to punch enough light through a microscope. Dense or dark objects, and higher magnifications, require more time. By formulating certain rules of procedure, applying to a particular setup, the resulting pictures will show a steady improvement in quality. The next step involves experiment with light filters. The ideal

[Continued on page 164]

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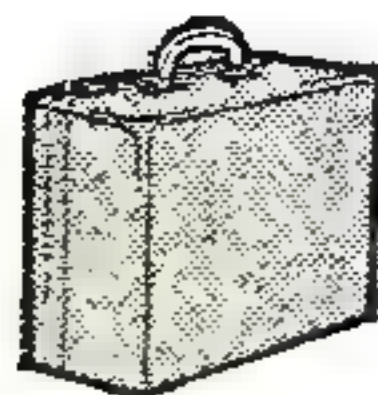
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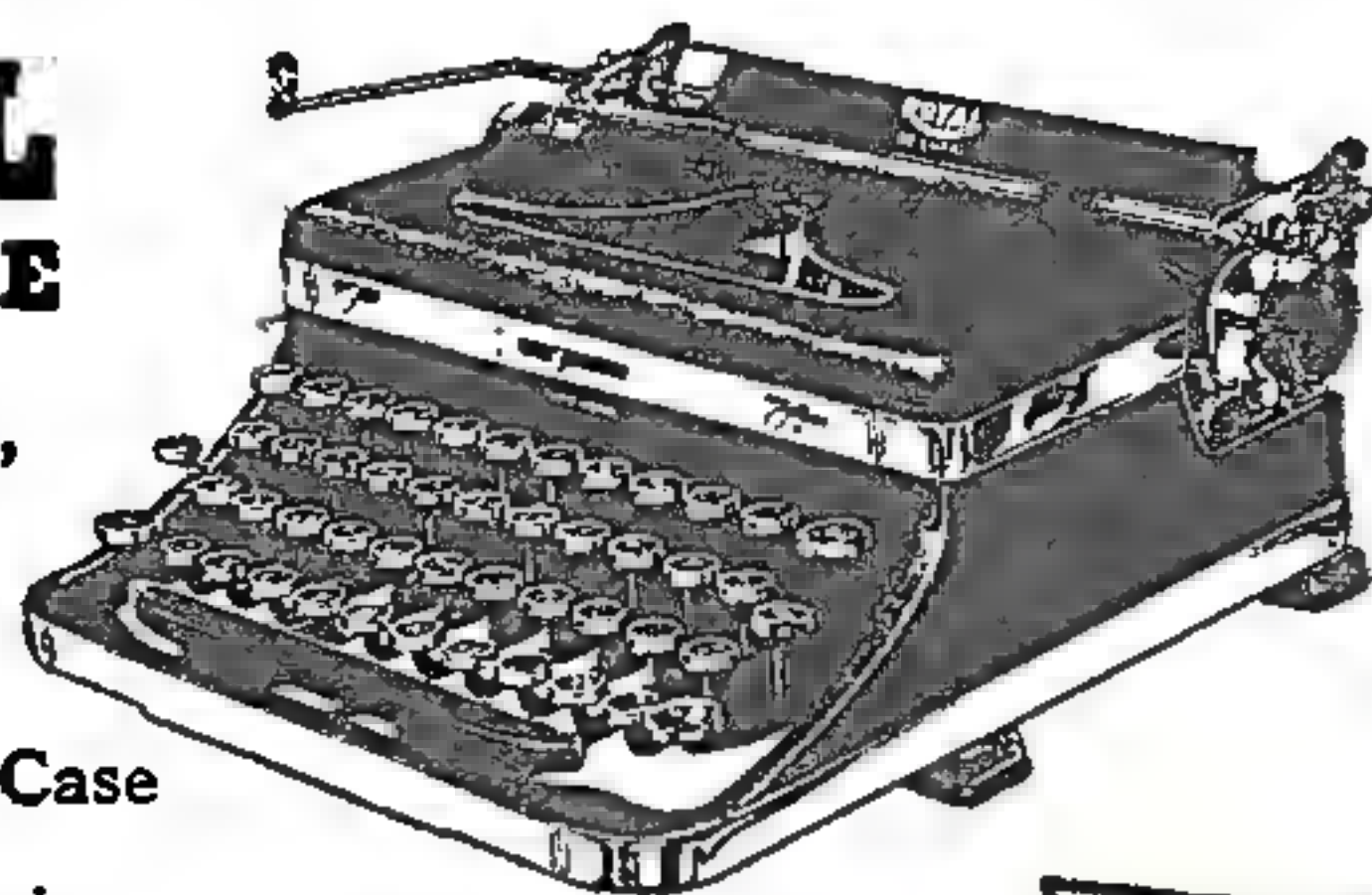
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[Continued from page 102]

lation, turn the band-setting condenser until a whistle is heard. If the signal is from a phone station, back down the potentiometer to a point where the oscillation ceases. The voice signal then should be heard. For c.w. (code) reception, keep the potentiometer turned to a point just past oscillation. The receiver's sensitivity increases until its peak is reached just at the point of oscillation. The sensitivity decreases rapidly as the potentiometer is moved either side of this spot.

The coils should be adjusted so that each of the amateur bands comes in with the band setting condenser set at about half capacity. The band-spread condenser then is used to tune over the band.

The builder will find that the greatest number of distant stations will come in on the higher frequency bands. The twenty-meter band (14400-14000 kc.) will give the most consistent DX reception. This band is most active during the daylight hours and just before dark and sometimes just after dark in the early evening.

Amateur phone stations will be heard on the 160-, 75- and 20-meter bands. The 160-meter band will be found to bring in only the stations within a few hundred miles. The 75-meter phone band will be found a much better DX band, with stations one or two thousand miles coming in frequently. However, for greater distance the listener will find that the 20-meter band is most satisfactory. Here he will find stations coming in from all parts of the globe.

For the builder who is not interested in amateur activity, this receiver will supply plenty of broadcast station DX. During the first hour that this set was in operation, many European and South American broadcast stations were heard. Several of them were loud enough to be heard throughout the room. Many of the international broadcasts are heard on the 19-, 31- and 49-meter bands. The 49-meter band is the usual one for evening reception, the other two being best for day light listening. However, the listener will learn early in his listening career that the rules do not always work. The band on which nothing is heard six nights a week, suddenly may become a splendid night-time band.

The would-be "ham" will find that such of the best code practice will be found not always on the amateur bands, but on commercial code frequencies. These commercial stations many times transmit at very slow speed and thus are suitable for code students.

A single wire about 50 to 100 feet long will be suitable for the antenna. For a ground, use a water pipe, preferably the cold one. Only as last resort connect the ground wire to the gas pipe. This is an unsatisfactory ground in most cases, because of the sealing compound used when

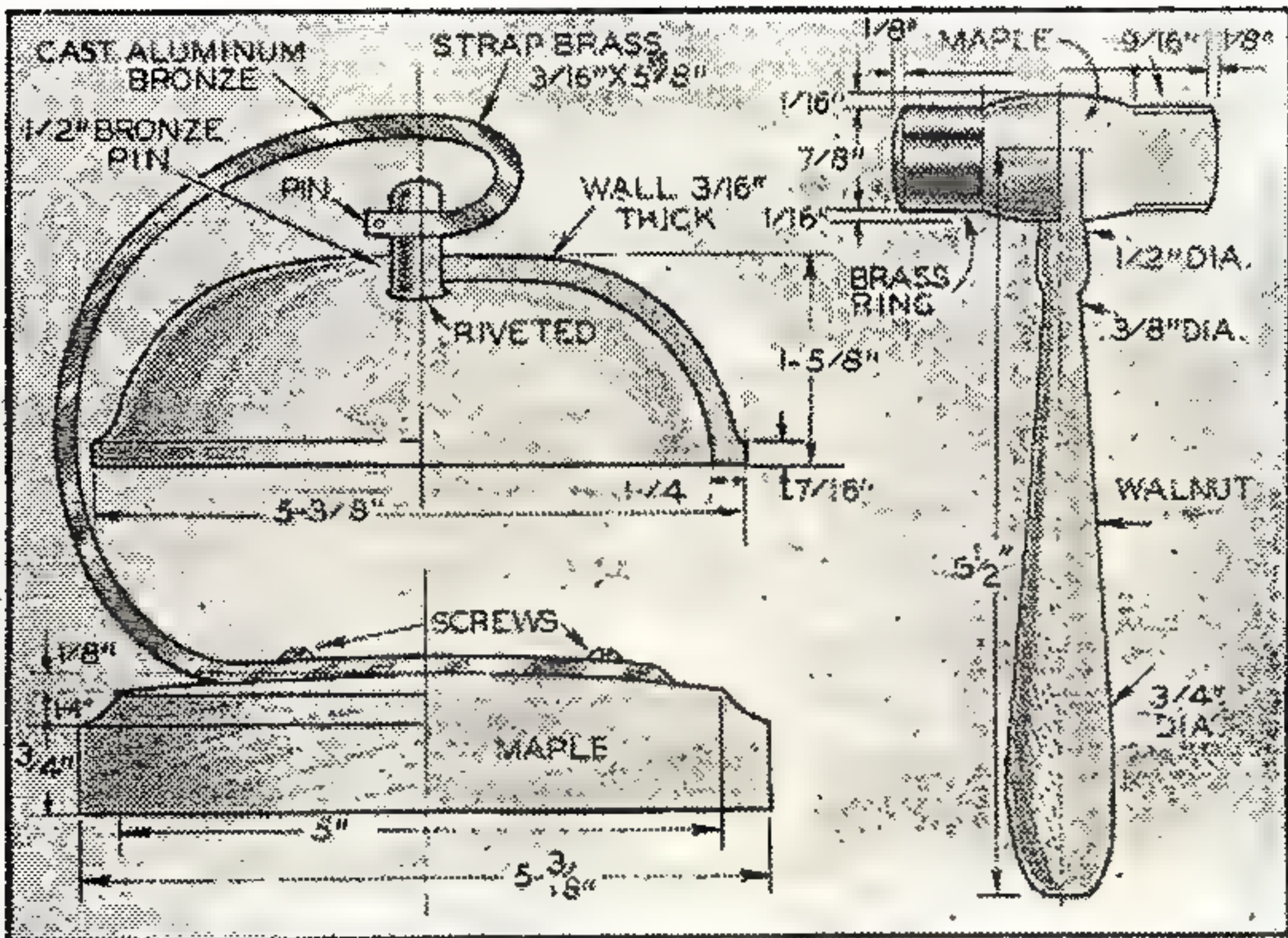
[Continued on page 153]

Lathe Turned Dinner Gong

[Continued from page 136]

The pin in the bell dome is later slotted on opposite sides, near the top, to take the two forks of the slotted end of the strap brass support. If the bell has a clear tone, but you wish to increase its volume, machine more of the metal away from the top portions, reducing the upper thickness to about 1/8 inch.

The base is of maple, turned in the wood lathe to the dimensions indicated in the accompanying drawings and its top is slightly convexed. Strap brass 3/16 by 5/8 inch, and of suitable length, is heated red and annealed in water to make



In the above details, all dimensions for the Dinner Gong and Hammer are indicated. Make the casting mould on a wood-turning lathe, to dimensions slightly larger than finished bell.

more ductile. If this isn't done, the brass is apt to break squarely off with slight bending. This is particularly true if the bending or shaping is attempted while red hot.

The upper end of the strap is slotted with hack saw and file and drilled for a small pin, the latter locking the bell in position, yet allowing it to rock slightly. Two screws hold the lower end of the strap to the maple base, the strap being bent slightly to conform to the top curve of the base.

As a metal faced hammer would dent the bell each time it was struck, turn a maple head and fit brass ferrules cut from brass pipe, over the ends allowing the wood to protrude slightly as shown. Ferrules and wood will blend in a common line. The hammer handle, also a simple lathe operation, is of walnut for contrast and is glued into the head.—Dale R. Van Horn.

(Editor's Note: Though no mention was made of the actual casting of the gong, this information will be found in the December, 1936, issue of Modern Mechanix under the title, "Metal Casting in Aluminum and Bronze". Back issues, containing this article, may be obtained from Modern Mechanix Pub. Co., Fawcett Bldg., Greenwich, Conn., at 20c.)

How To Print Your Pictures

[Continued from page 142]

When the print looks about right, pull it out, let it drain off a bit, and swish it through the acetic acid for about 10 seconds. This is known as a "short stop" bath, serving to stop the chemical action of the developer. Now let it drain again, and submerge it in the hypo, where it must remain for at least 15 minutes. Wash the tongs thoroughly in the water jar so as to remove all traces of acetic acid and hypo, and then continue with the next print.

Do not get a single drop of liquid on your hands at any time during the printing process. Use the tongs carefully, avoid splashing, and the resulting prints will be clean and spotless. A wet, sloppy darkroom is a sign of a careless worker.

[Continued on page 169]

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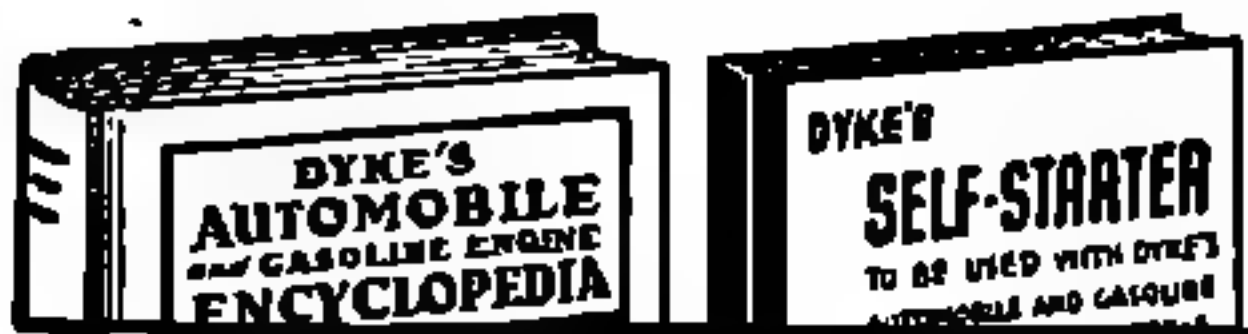
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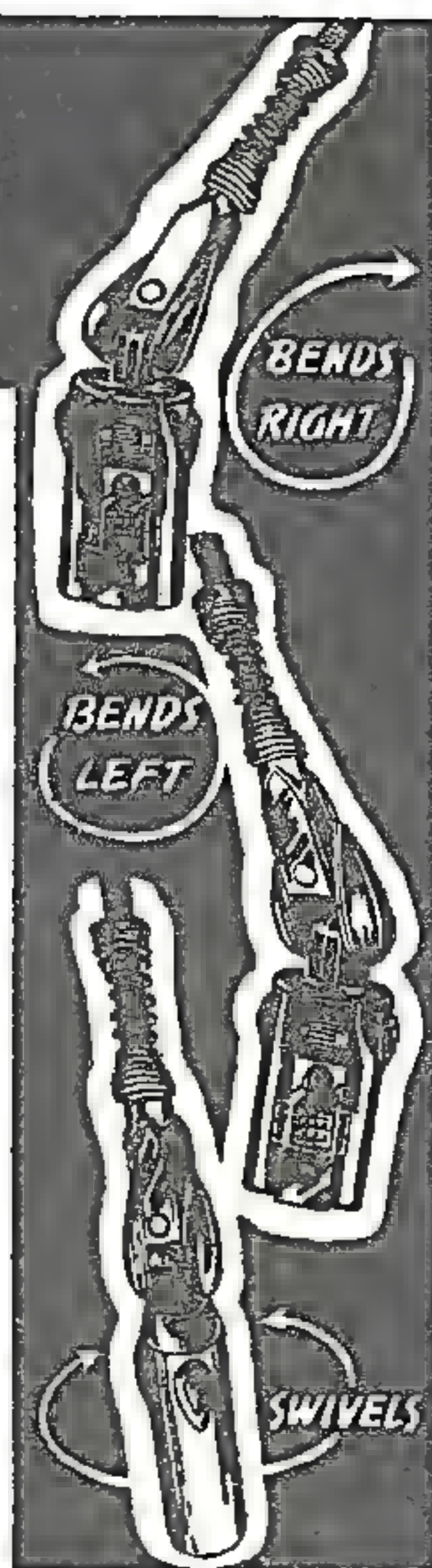
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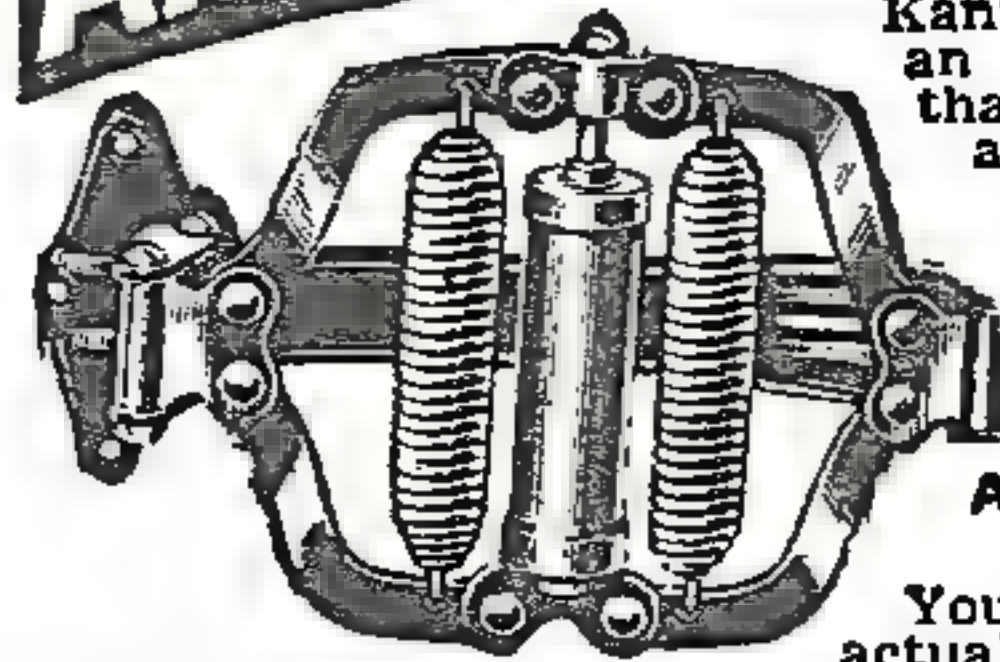
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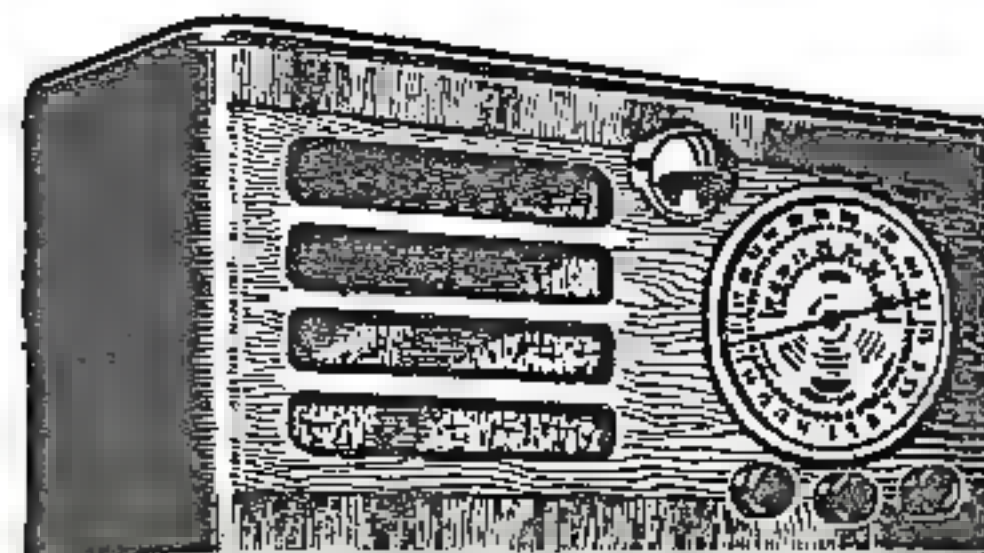
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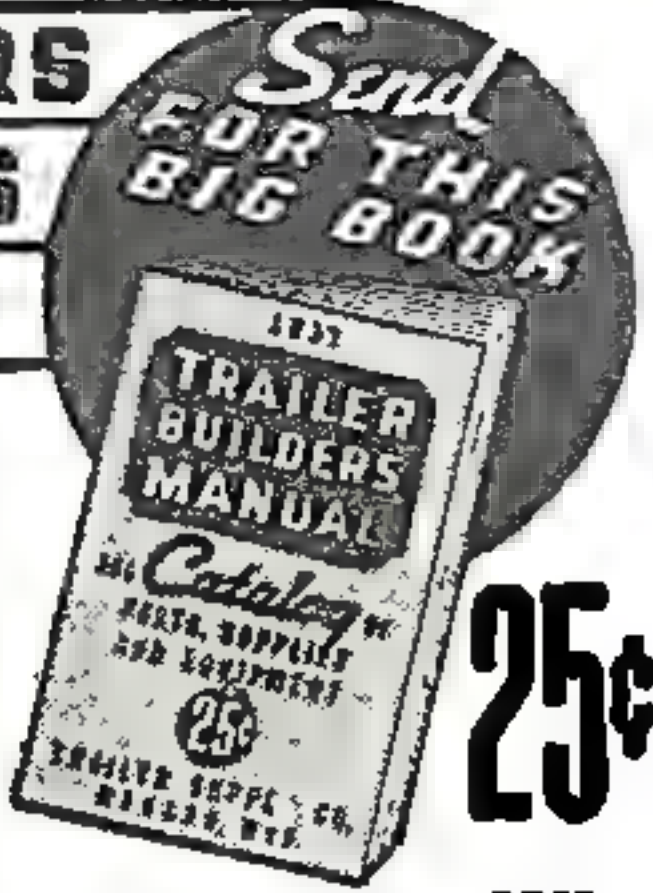


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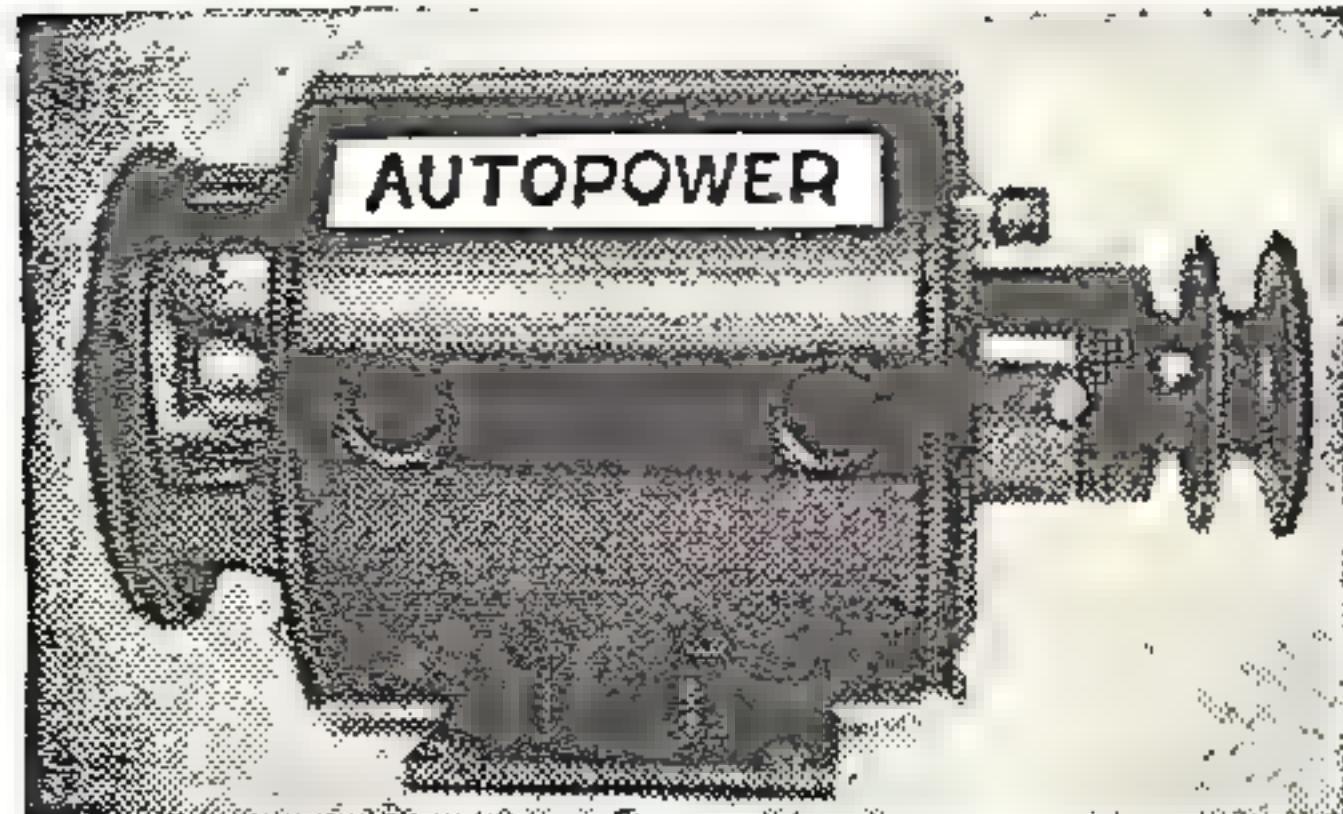
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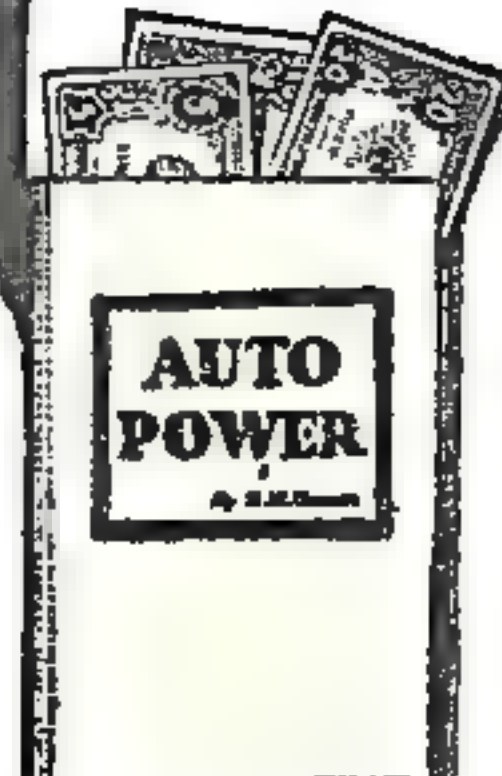
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Are Home Built Planes Safe?

[Continued from page 61]

considerably simplified, but that it does not appear possible, however, to eliminate stress analysis, or equivalent static tests, if the Bureau is to continue to license the airplane as air-worthy. Naturally, the expense involved in conducting engineering tests is a stumbling block for most amateur light plane builders. After all, the primary reason for home-built aircraft is their low production cost.

The Bureau of Air Commerce is said to be considering plans whereby this situation can be improved, notably the dividing of the engineering cost of a new design among a relatively large number of prospective builders. However, according to latest reports, nothing has been definitely accomplished in this respect.

In the meantime, it is hard to reconcile the hundreds of would-be builders in law-encumbered states when they know that home-built planes are being flown in more liberal states. MM seeks to consolidate the opinions of its readers on this subject and, through its pages, provide a medium for the exchange of ideas and suggestions that may provide a basis for more liberal air legislation. Here are a few letters received recently. (Send in YOUR opinion).

The first letter concerning home-built aircraft was received from George C. Moritz, of New Haven, Conn., who says:

Dear Editor:

In my opinion the problem of getting a really low-priced plane on the market would have been solved long ago if light plane builders were given a free hand. I feel sure I am not alone in saying that what private aviation needs is more encouragement and less restrictions for the light plane fan.

I would like to see all light plane builders get a "break." Why not have MM sponsor a Light Plane Club of America?

George C. Moritz.

Reader Moritz's suggestion for a light plane club is undoubtedly prompted by the belief that a united group would have a better chance to secure more liberal air legislation. Perhaps, if enough interest is shown, MM WILL sponsor such a club. Would YOU be interested in joining?

* * *

Another light plane fan who favors more freedom in the matter of air legislation is E. L. Zastrow, of Portage, Wis., whose letter reads:

Dear Editor:

I most certainly believe that the amateur plane builder should have absolute freedom to do as he pleases, taking for granted, of course, that he does not

[Continued on page 152]



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Bungalows Of Mud

[Continued from page 65]

thoroughly modern, artistic and durable houses, using the soil on their own land. Cool in summer, warm in winter, these dwellings retain the charm and graceful aspect of a bygone, courtly age.

With the help of three local Mexican laborers, Hindman built his own house. Two concessions were made to modern progress, neither of them being absolutely essential. Plans for the building were drawn by a professional architect and the adobe was laid on a concrete foundation. A photographic record of progress was made by Hindman, and his own photographs are used to illustrate this article. The method of construction, however, remains the same as it was when castanets clacked and guitars strummed in California one hundred years ago.

The first step in building an adobe house is to determine the size and ground plan of your house. Then lay the concrete foundation, if you want one. The advantage of a concrete foundation lies in the fact that it will absorb far less moisture from the surrounding soil than adobe bricks laid directly on the ground. Next, lay out the boundaries of your basement. Every adobe house has a basement, the dirt excavated being used in building the house!

If it is planned to make the room walls of adobe, a narrow, deep basement is indicated, since ground room must be left for their support. If wood or fiber board is to be used for the individual rooms, the basement may comprise almost the full dimensions of the building itself.

After loosening the top soil of your proposed basement, soak it thoroughly with plenty of water, until it attains the consistency of mud pies made by children. Next, get in there and tramp it with your bare feet! Foolish as it may seem, this is the only practical method of working up the mud into the proper texture. Concrete mixers, tampers, etc., have been tried without success. In this respect, at least, adobe is still making a gallant stand against the encroachments of modern ingenuity.

Then, alternate layers of straw and fine gravel, tramping in each layer thoroughly. Shovel out the mixture into wheelbarrows or any other containers. The above process must be repeated with each layer of earth until enough adobe has been obtained.

Haul the mixture to any previously selected level spot, spread it out evenly to a depth of four inches, and you are now ready to mold the bricks. One or more molds 12 by 18 by 4 inches in size, and made of wood strips are used. The mixture must be kept constantly wet while the bricks are being molded.

Starting at one end of your mud patch, force the mold down into the mixture. When it reaches bottom, separate the resulting brick from the mass and repeat the operation until the whole batch of mud has been made into slabs, 12 by 18 by 4.

Leave a slight space between each brick and its fellows to allow air circulation. Time needed for the bricks to bake depends upon the dryness of the climate and intensity of the sunlight.

After the adobe slabs have dried sufficiently to handle, scrape off loose soil and stack them in piles or "ricks."

Adobe walls are laid up in much the same manner as a brick wall, except that adobe mortar is used. This is a slightly thinner mud mixture, to which a small amount of sand has been added. Laid flat, their twelve-inch dimension parallel to the wall line, the bricks thus form a wall eighteen inches thick. In the old Spanish type of construction, two bricks were laid end-to-end, achieving a three foot thickness. This has not been found necessary in modern adobe houses.

In setting frames for doors and windows, provision should be made for some vertical shrinkage, due to the contraction of the mortar in drying.

Interior walls—those of individual rooms—serve as buttresses for the exterior. In the case of a one-room house or one in which the rooms are constructed of wood or fiber board, the same result may be obtained by setting timbers slightly more than head-high, extending the full length and width of the building.

In most adobe houses there is no real ceiling, the roof construction taking its place. Satisfactory rafters can be made from the poles of any fairly straight native timber, five to seven inches in diameter. These are supported at the ridge by a log of slightly larger diameter, extending through each gable end wall. Each rafter is bolted to a log cross-tie, which in turn is bolted on top of the exterior wall.

The roof itself is largely a matter of individual taste—tile, shakes, or a plank foundation with the convenient adobe mixture spread on top. Any of these are in keeping with the Spanish tradition. For flooring, the same size poles used in the rafters make the best support. These are fitted tightly into holes carved on the *inside* of the exterior walls. When finished, the building may be white-washed and the interior decorated to suit the owner's fancy.

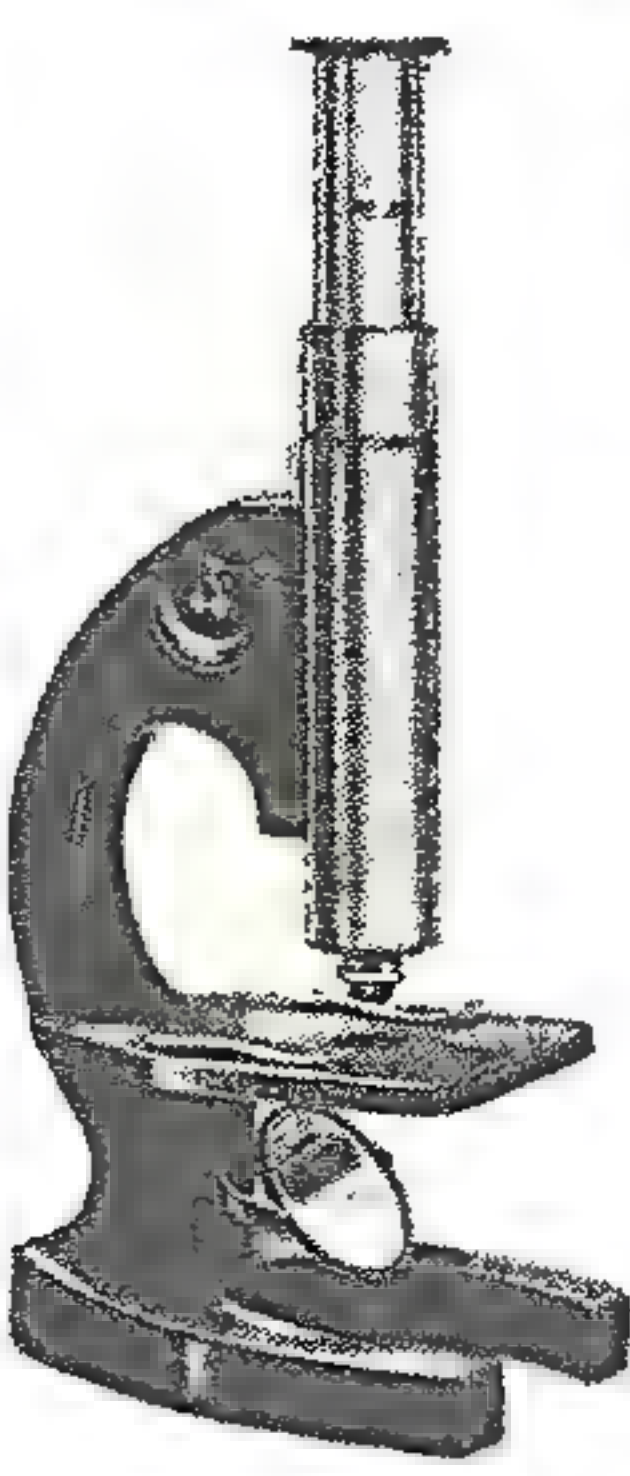
If you want a hurry-up job, don't start an adobe house. There's one word which might very well serve as the slogan of adobe builders. That word is "manana"—Spanish for "to-morrow!"

The disease called tularemia, which is notably due to handling infected rabbits, may be also transmitted to man by about 20 other kinds of wild life.

A patent has been granted for an equal-cut pie pan, which solves the old problem of who gets the biggest piece of pie.

For Christmas A STRANGE NEW ADVENTURE IN SCIENCE

WAITING for the nature enthusiast who has yet to know the thrill of microscopy is a hidden world of beauty, mystery, intrigue. Start microscopy this Christmas, and start it with a precision microscope — a Bausch & Lomb microscope.



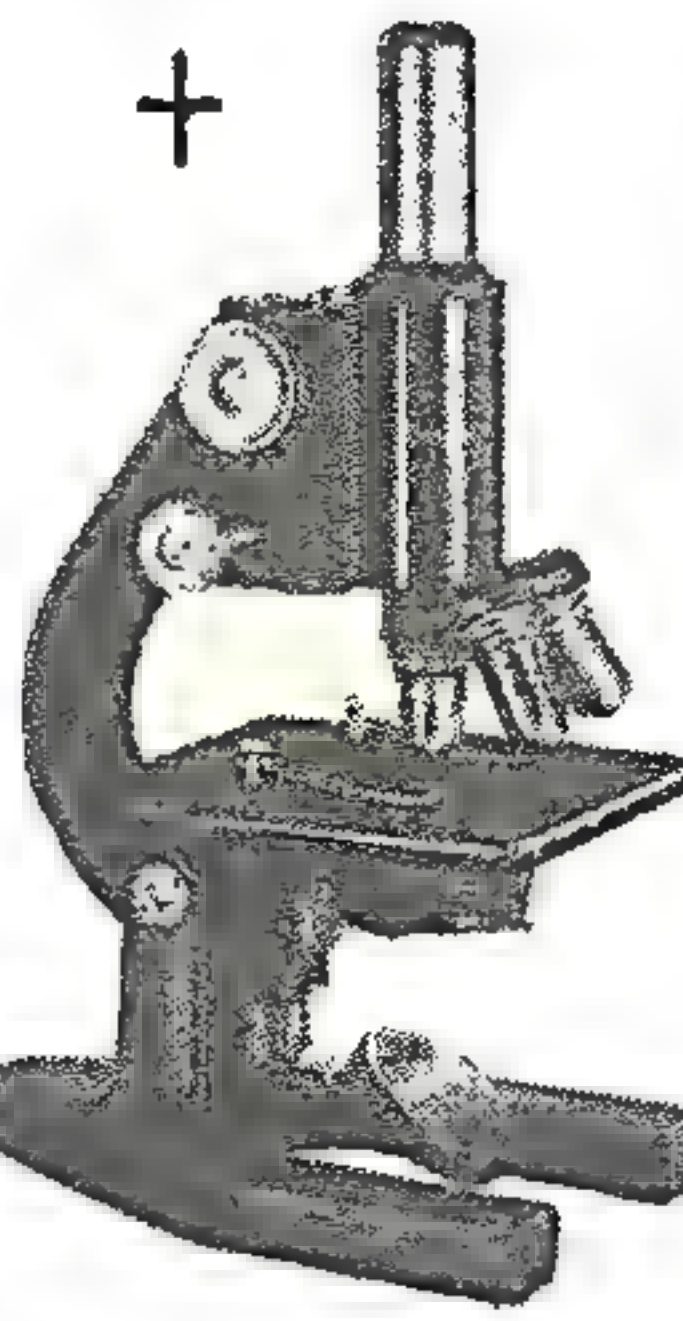
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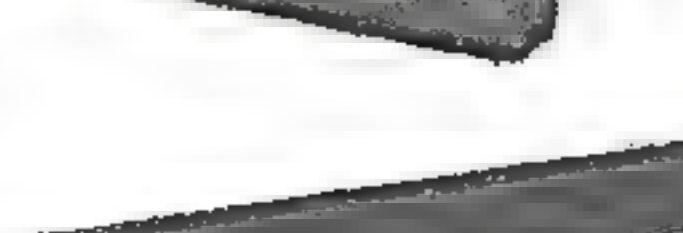
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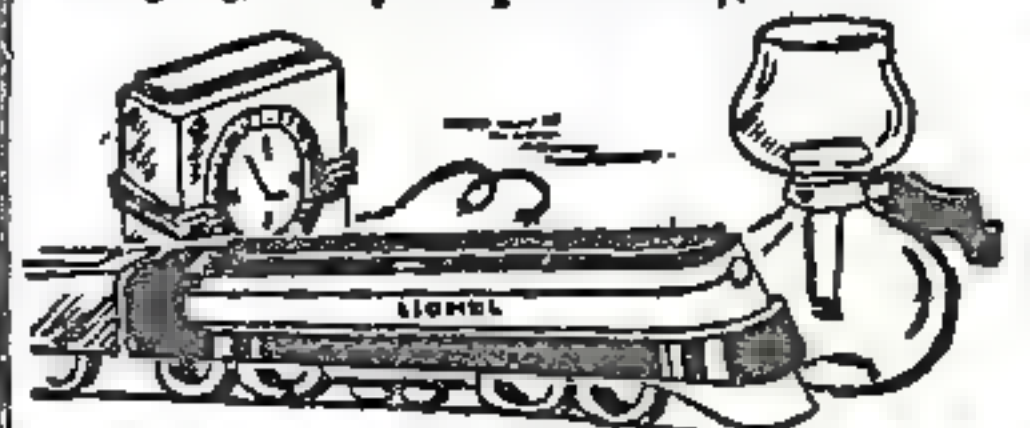
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Camera Pays You Dividends

[Continued from page 138]

At the hog lot there is a chute made from scrap boards which makes it easy to get slop into the trough without climbing the fence. There is also a dandy self-feeder in the yard for young pigs. It is a barrel without any ends, mounted and fastened with wire to an old mower wheel. The barn has an unusual type of sliding door and behind there is a small farm shop equipped with a forge made from parts of an old cream separator. These are but a few of the many possible ideas that stand an excellent chance of being accepted by some magazine editor.

The urban or suburban dweller need not be handicapped for ideas, either, for they will be found all around him. Look! Down the street a daddy made his young hopeful an ordinary teeter-totter. Then he added hand grips which made the device safer for the youngster, but made it also salable for a fellow who happened along later with a Kodak. The thing that sold a picture of that idea was the addition of the hand grips. The teeter-totter wouldn't have sold because without the grips there would have been no novelty.

A neighbor whose back yard sloped slightly to the rear drive rigged up a very nice spot. He built two small pools, one slightly above the other and some distance apart, and connected them with tiny depressions, lined with cobble stones. Then he fixed the garden hose so it would run water into the first pool. The overflow from this ran down the miniature gulch and filled the second pool. The overflow from this one ran into the drive. Result, a novel touch to an otherwise commonplace garden. Second result, two pictures that sold.

There are hundreds of ideas to be photographed in grocery stores, garages and other places of business. Their logical destination, if they are of primary interest only to other businessmen, is a trade paper in that particular field.

One "amateur" photographer with a small hand camera having a moderately fast lens augments his income about 20% by selling shots to newspapers. Most of these go into Sunday editions, although now and then he clicks with a "spot" news shot. Nine out of ten pictures which newspapers use are either obtained from syndicates or staff photographers. Perhaps the percentage is even higher. Nevertheless, the free lance photographer has a good chance to trade the right kind of clear pictures for checks by sending them to the right newspaper editors. The writer has received as high as \$10 for a single print from a New York paper.

Syndication is another field which offers many possibilities. A photographer who expects to remain on good terms with editors never sells a picture to more than one editor unless the other editors are each in different fields or there is an understanding to that effect.

To syndicate a picture you do one of two things. You sell your print *with the negative* to some

syndicate whose business is the resale of pictures, or you syndicate it yourself. The former method will bring you \$3 or \$5—occasionally more—or a percentage of the gross profit. The latter method puts all the resulting money in your own pocket. But there will be many rejections, much postage to buy, many envelope flaps to seal, and usually bills to send out. It is not often profitable to syndicate anything but outstanding photos or either high spot news value or decided novelty.

Cameras earn their keep and show a profit in many ways but the plans just described are perhaps as interesting as any. For one thing, you never know for sure just how much a print will bring; for another, you won't know, until the dust settles, whether you will make a sale. But it's heaps of fun trying, and often surprisingly profitable.

An "O" Gauge Locomotive

[Continued from page 140]

make sure that they are all the same length and height. Between the two platforms there is another roof or platform that is glued directly to the top. It is simply made from a piece of cardboard measuring 2 by 4 3/4 inches.

To this roof attach the mufflers and exhaust stacks. The exhaust stacks are made from a 3/4-inch cardboard tube cut off 1/2-inch deep. These in turn are mounted on small platforms made of balsa.

The mufflers are 1/4-inch dowel, sandpapered smooth and tapered at one end. Use number 18 wire for the lead-in on the roof. The supporting leg is a strip of cardboard 1/4-inch wide and 1 5/8-inch long, glued in place after the wire has been inserted into the roof. The correct positions for both exhausts and mufflers will be found in the plan.

The smaller details, such as the rain troughs above the windows and the straps around the two air tanks, may be made from cardboard strips glued in place or bits of bamboo bent over the end of a hot soldering iron.

The two air tanks are merely lengths of dowel cut off to the proper size and glued just inside the cardboard border running around the chassis. The pipes that go from the tanks to the floor are made of copper wire, inserted in holes and glued firmly.

The seven ladder rungs on either side of the cab and the handles that border each door are wire bent to shape and placed in holes made by a pin. Make sure that the wire is bent evenly and glued securely.

Make the couplers out of a bit of balsa wood. Cut then to shape, and paint them black. Glue them in position and you are ready to complete the model.

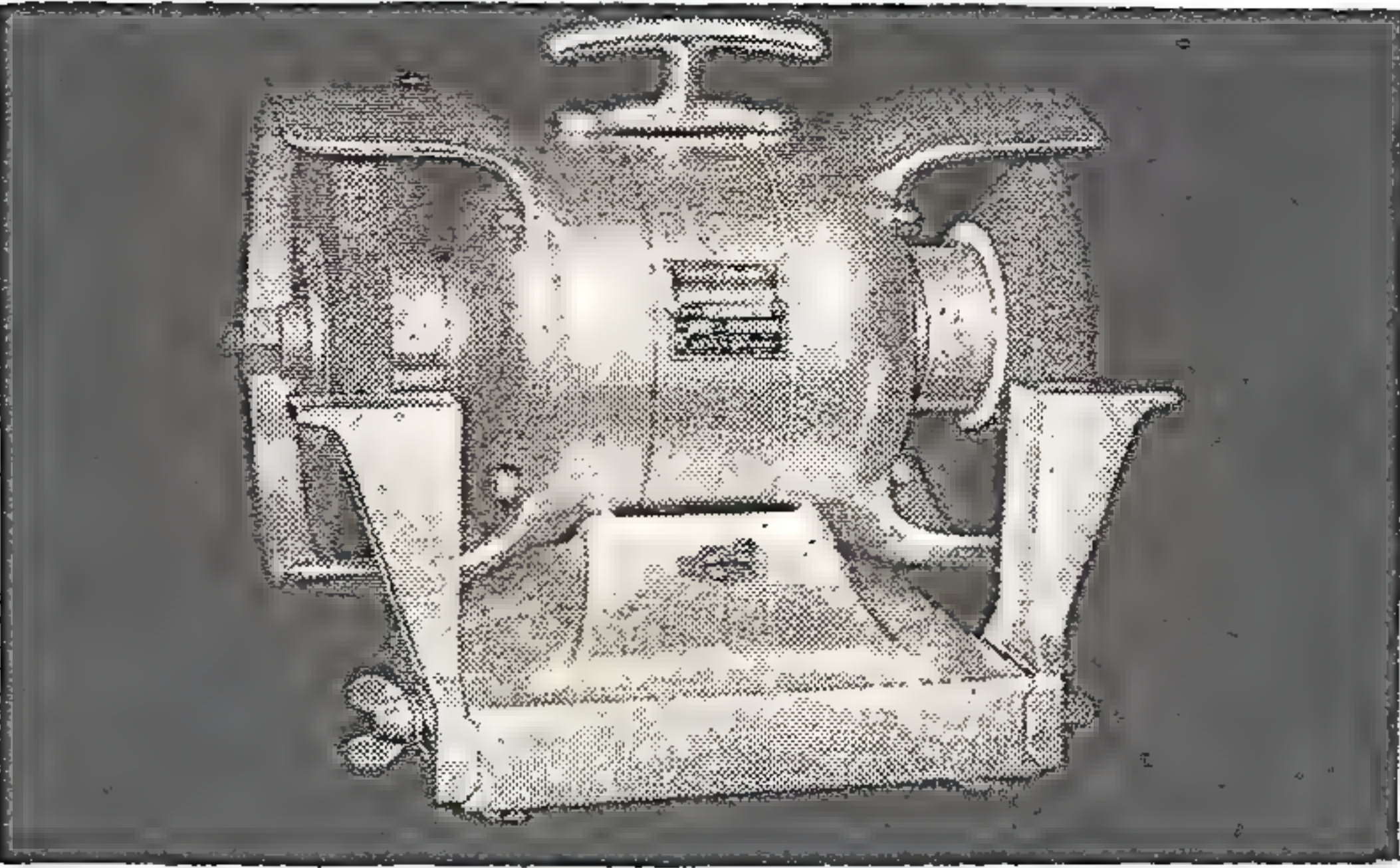
Last of all, paint the locomotive with a good grade of enamel. On the original model a reddish brown, corresponding to the actual color of the Southern Pacific gas-oil locomotives, was used. Of course, colors such as red, green or black may be substituted if the herald or insignia of some other railroad is to be affixed to the locomotive. If desired, the builder may cut the scale size heralds from the plans and attach them to the model and thus simplify an otherwise difficult lettering operation.

Glacial milk is the opaque-looking water in glacier-fed streams, and is due to the rock dust that the glacier grinds as it moves over its rocky foundations.

Next to insects, there are more species of mollusks than any other kinds of animal life—about 80,000 mollusk species.

A Japanese store is selling a package house, weighing only a ton and a half, which can be assembled in three hours: price \$170.

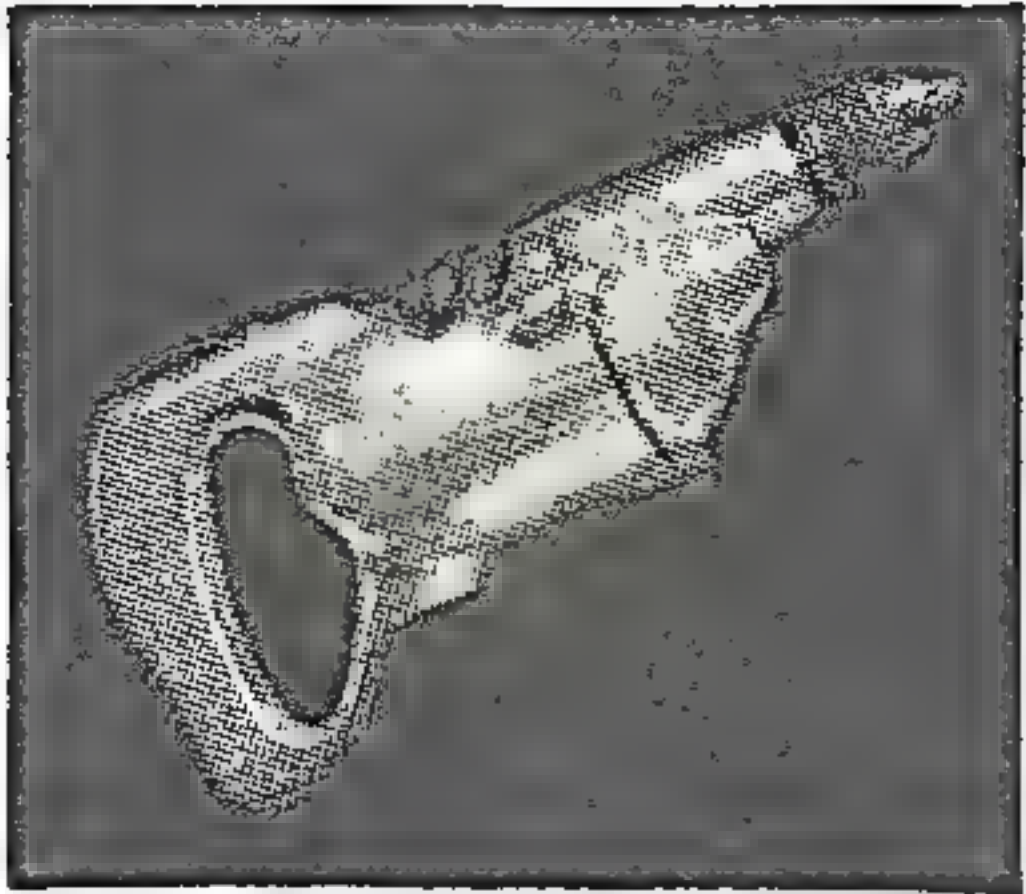
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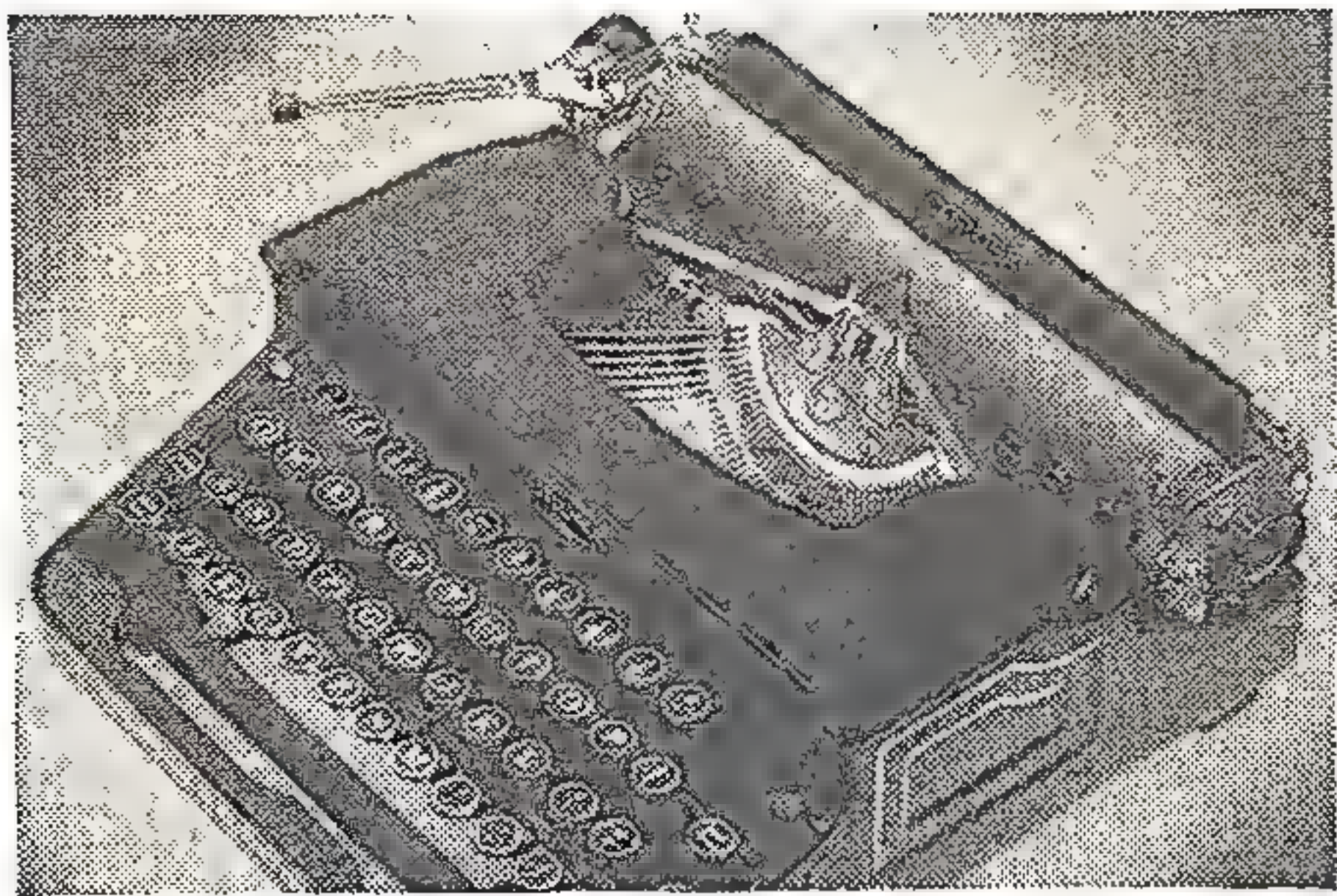
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Are Home Built Planes Safe?

[Continued from page 147]

create a hazard for others. Those who would go to the trouble of constructing a light plane, incurring the expense involved, would be certain to realize that a good job must be turned out.

I have learned to fly and have owned two manufactured planes—a very expensive way of granting a desire to learn aviation. What is more natural than to turn to home-built airplane construction as a means of learning more about my favorite subject, and at the same time, secure a plane at least expense?

I fail to see where the home-built airplanes' record of accidents is out of proportion to the record of other accidents, so why all the "holler" about it? Away with the manacles on amateur aviation!

E. L. Zastrow.

* * *

There is some real "meat" in the letter MM received from D. B. Thomson, of New York City. He writes:

Dear Editor:

If the government was more interested in being fair to amateurs than in playing up to light plane manufacturers, private aviation would increase. Let's band together and see if we can't get some more favorable legislation.

The amateur realizes that airplanes must be inspected thoroughly before they can be certified as airworthy. He is willing to submit his home-built plane to such an inspection, but—stress analysis and other engineering tests cost too much money, serving to discourage the amateurs.

Why can't the government work up about a half dozen plans of small aircraft that they will know are correctly designed, and sell them to amateurs at a reasonable price? After the amateur builds the plane, according to the government plans, let him submit the plane to a thorough inspection so that all important items such as welding of joints, size of tubing, bracing, etc., can be certified as satisfactory.

Government aircraft inspectors could easily determine if suitable materials were used; if welding was done satisfactorily, etc. They do this type of work every day when they inspect commercial airplanes that have been repaired after crack-ups, etc.

The above plan, in my estimation, would satisfy both the amateur and the government's requirements. How about it, MM?

D. B. Thomson.

It would appear that reader Thomson has submitted the best solution to the problem, to date. Plans drawn up by government aviation experts and sold to amateurs should solve the matter of proper design. Field inspections by government inspectors should solve the airworthiness problem. What do other MM light plane fans think of this idea? We will be glad to receive photos of home-built airplanes from interested readers of this article.

Two-Tube "Amateur Special"

[Continued from page 144]

the gas pipes are installed. Usually this material is of high resistance, thereby causing an ineffective ground.

A complete list of the parts used in the receiver and the power supply, and the manufacturers' addresses, may be obtained by sending a three-cent stamp to MODERN MECHANIX Publishing Co., 1501 Broadway, New York, N. Y.

VALUES OF PARTS SHOWN IN SCHEMATIC DIAGRAM

- C1—.0001 mf. receiving type mica condenser
- C2—.000035 mf. variable condenser
- C3—.0001-mf. variable condenser
- C4, C5—.0001 mf. receiving type mica condensers
- C6—2 mf. electrolytic condenser (200 volt)
- C7—.01 mf. receiving type mica condenser
- C8—5 mf. electrolytic condenser (35 volt)
- C9, C12, C13—.003 mf. receiving type mica condensers
- C10, C11—8 mf. electrolytic condensers (450 volt operating)
- R1—50,000 ohm potentiometer
- R2—50,000 ohm resistor (2 watt)
- R3—1 to 5 megohm resistor (2 watt)
- R4—.5 megohm resistor (1 watt)
- R5—2000 ohm resistor (1 watt)
- R6—40,000 ohm bleeder (50 watt)
- L1—See table for values
- L2—500 henry plate choke
- L3—20 henry filter choke
- L4—20 henry filter choke
- RFC1, RFC2—2.5 mh. r. f. choke (receiving type)
- Secondaries giving:
- L5 (transformer)—420-0-420 volts, 125 milliamperes
5 volts, 3 amperes
6.3 volts, 3 amperes, (center tapped)
- S1—8-prong socket
- S2—8-prong socket
- S3—4-prong socket
- S5—4-prong socket
- Coil forms (four-prong) 1½ inches in diameter; four required

MISCELLANEOUS PARTS REQUIRED

- Metal cabinet 7x10x8 inches
- 6K7, 6C5 tubes (one each)
- 80 rectifier tube (one)
- Power supply base board 7x9 inches
- Subpanel for receiver, 8x7 inches (wood)
- Spool of 22 or 24 D. C. C. wire for coil winding
- Push-back wire for wiring receiver and power supply
- Terminal strips:—one six-terminal
one four-terminal
one two-terminal
- One four-inch dial for band spread condenser
- Two two-inch dials for potentiometer and band setting condenser
- One toggle switch (S. P. S. T.)
- One pilot light mounting with 6.3-volt bulb
- One small can of liquid coil dope
- One pair of pliers
- One-inch angle brackets (three required)
- Miscellaneous bolt, nuts, screws and wire for antenna and ground connections.
- Antenna insulators, wire, lead-in strip, etc.

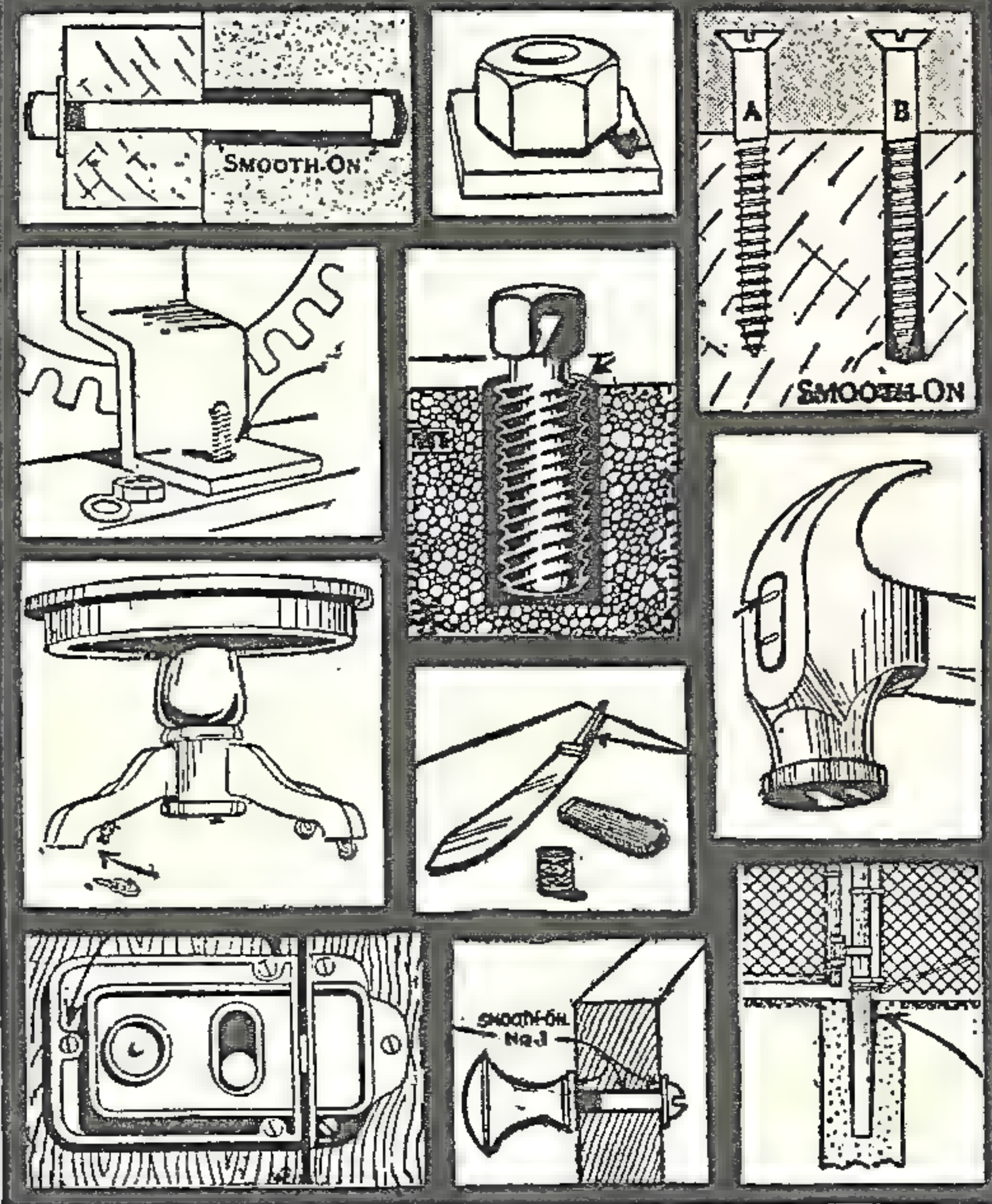
Build "Polaris"—New Iceboat

[Continued from page 124]

tightened with turn-buckles. Ready-made cushions and backrests may be purchased reasonably for the cockpit.

Sharpen the runners as necessary with a file laid flat on the beveled cutting edge, then smooth with an oil stone. Be sure the runners are parallel before tightening hobbler bolts. Align the runners fore and aft to prevent drag. Runners should pivot in the hobbler on ½-inch king-bolts, the nuts being locked with cotter pins.

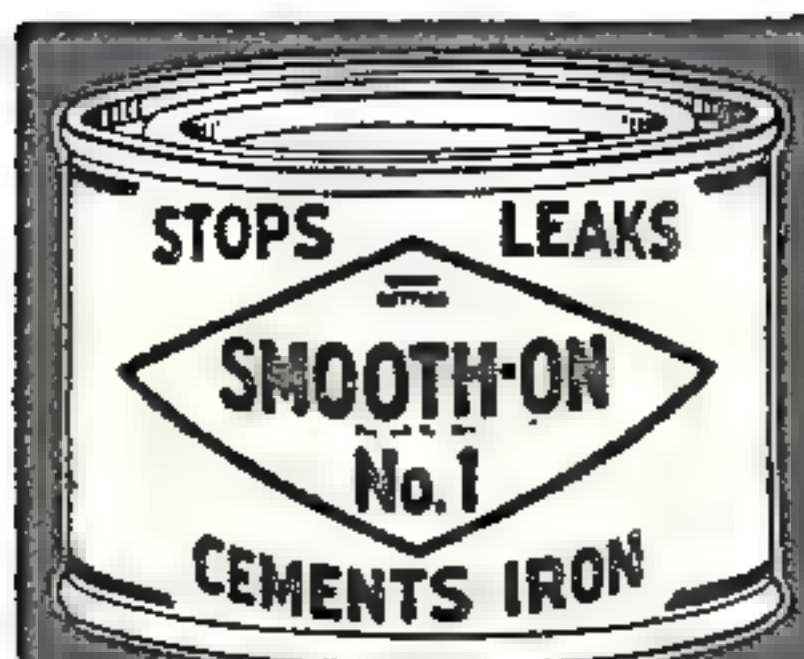
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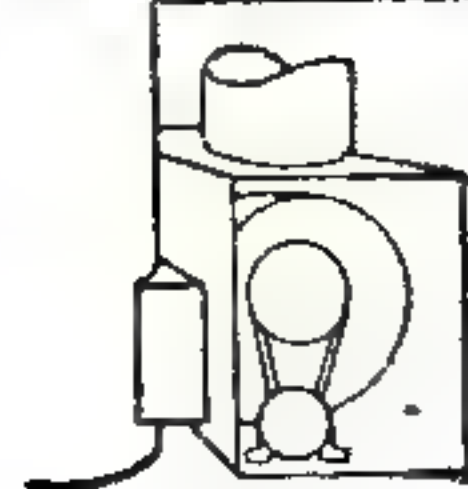
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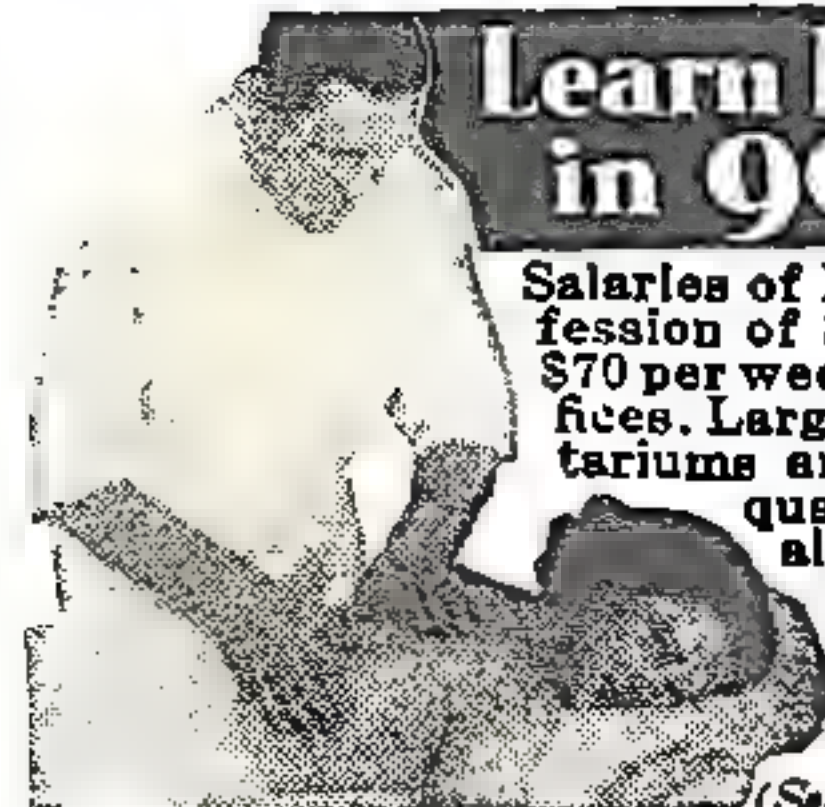
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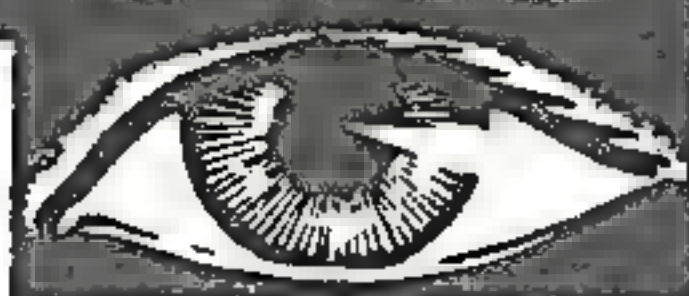
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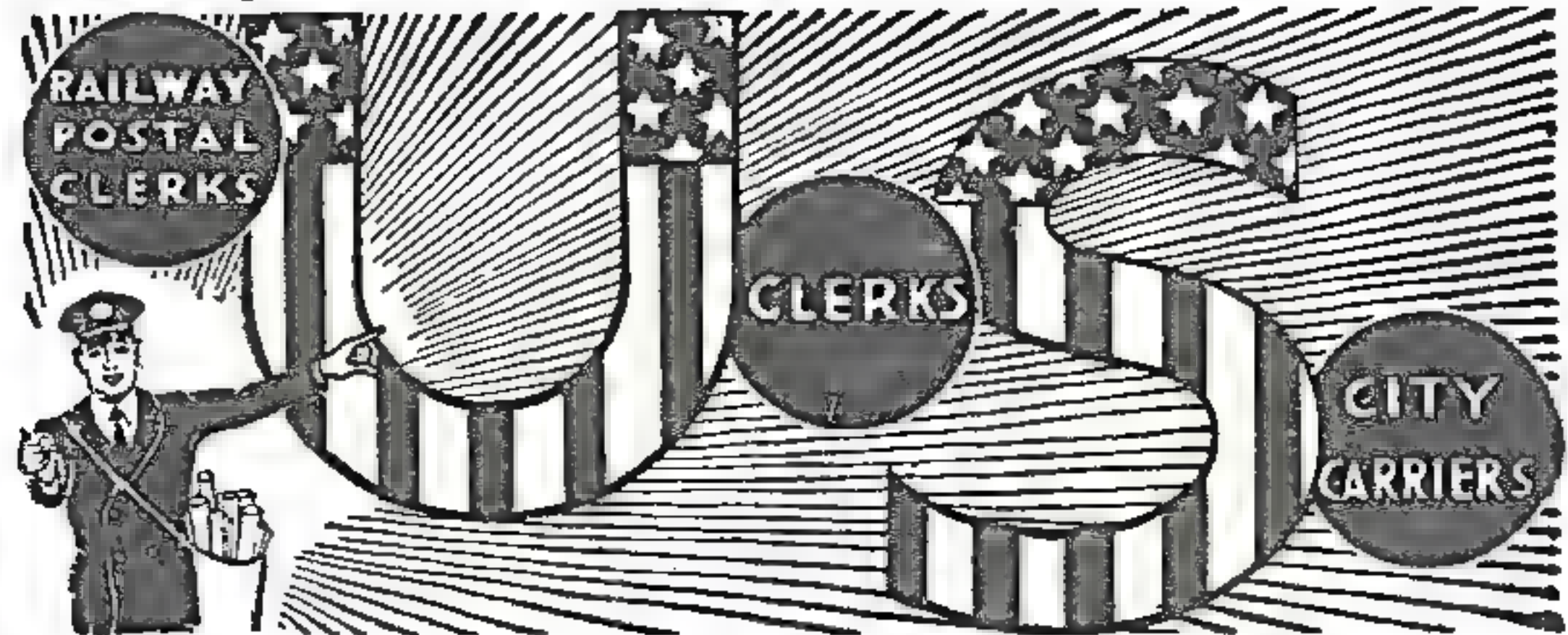
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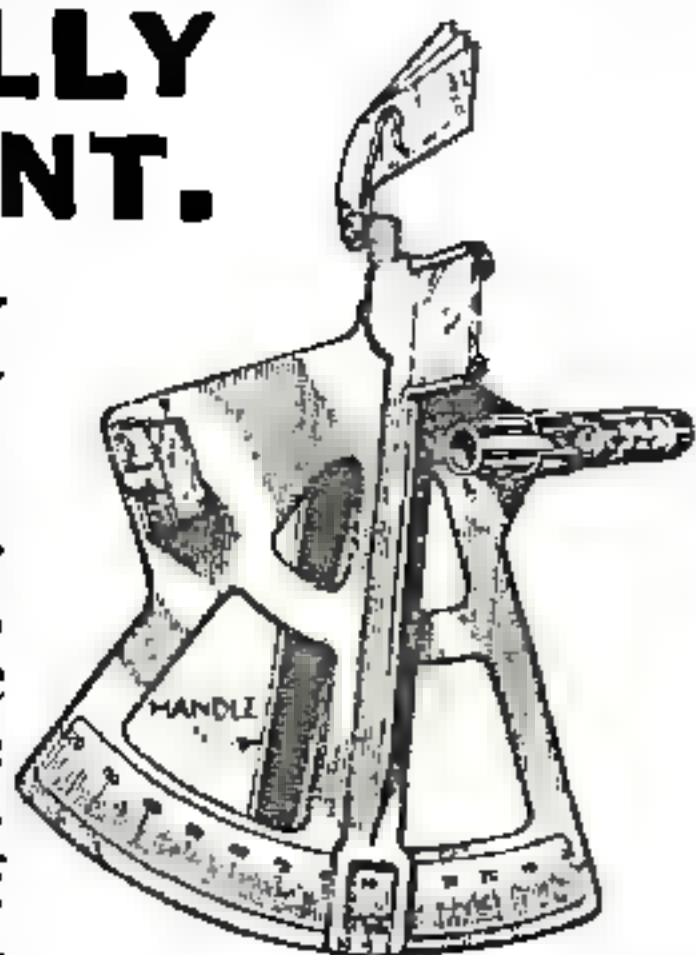
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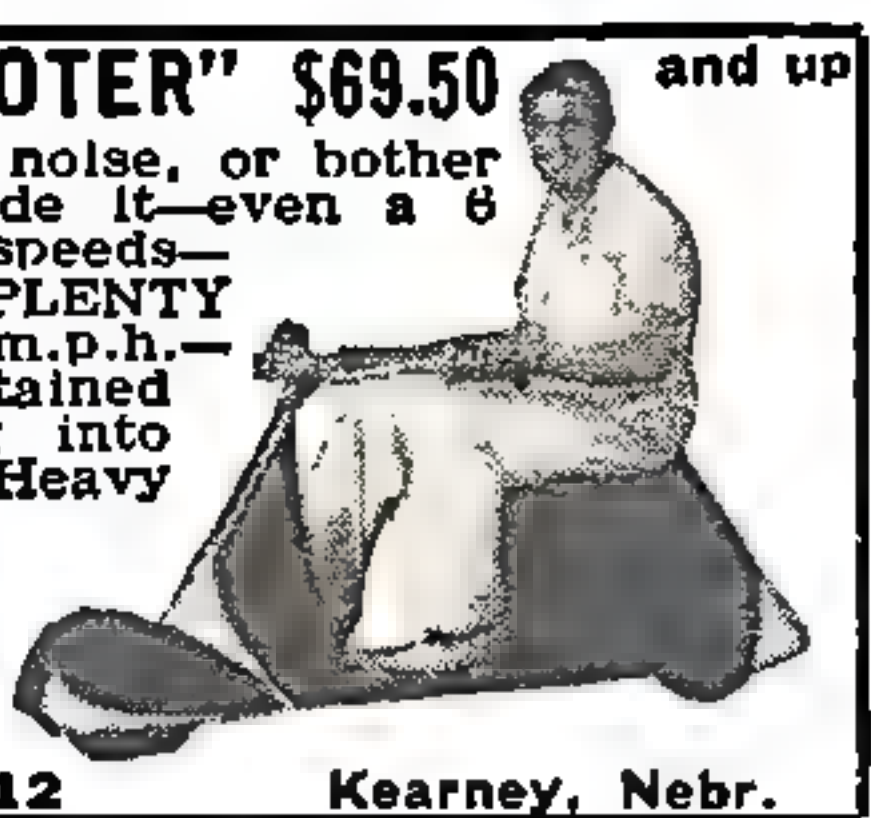
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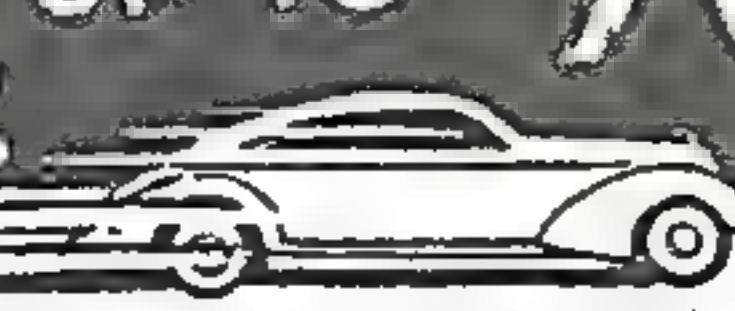


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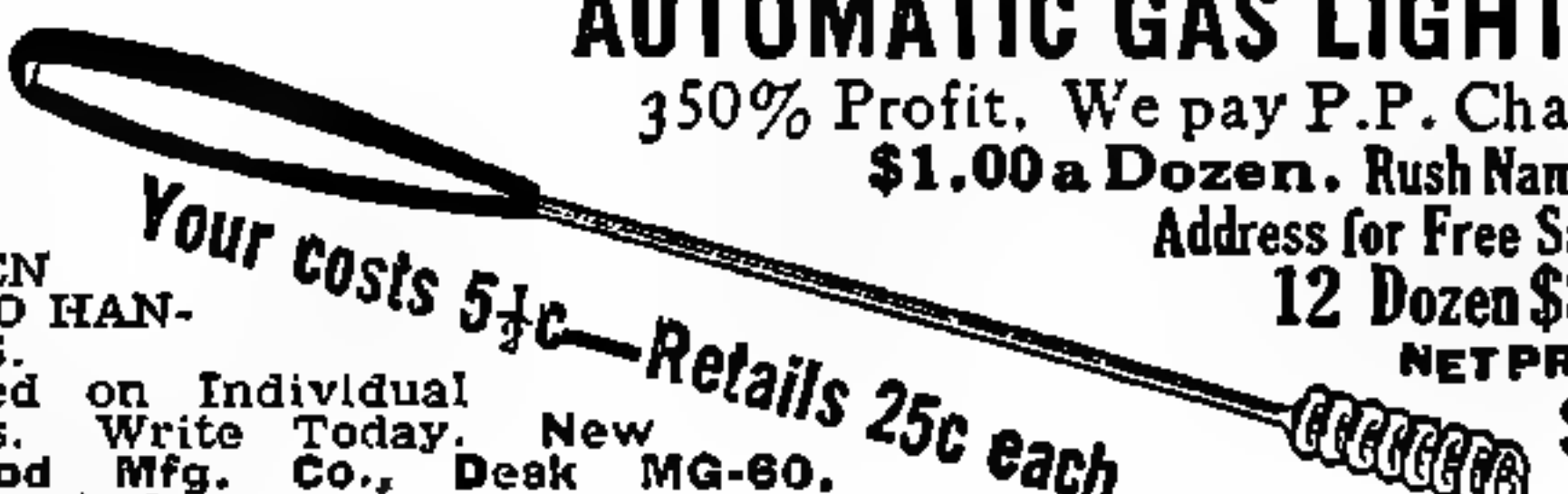
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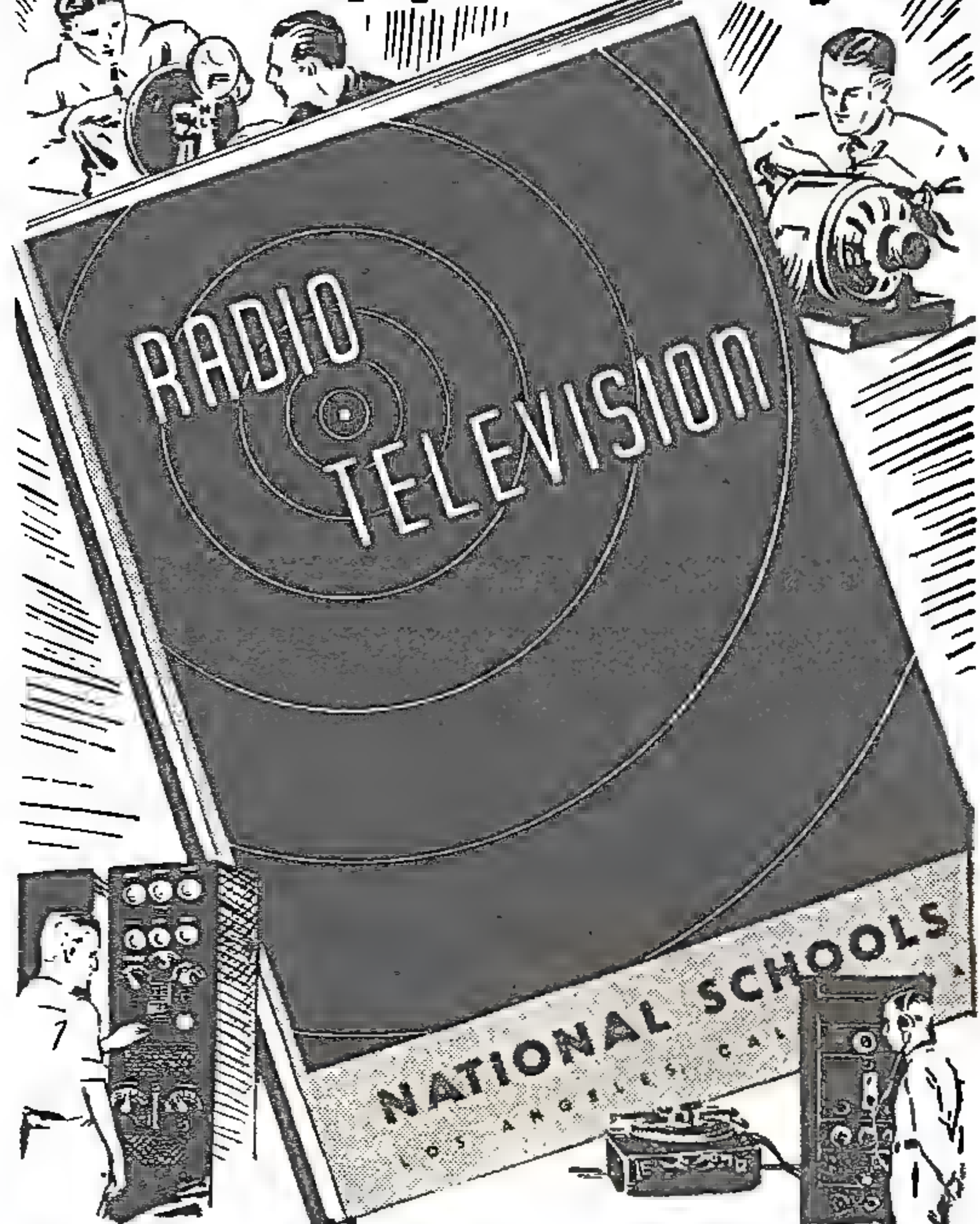
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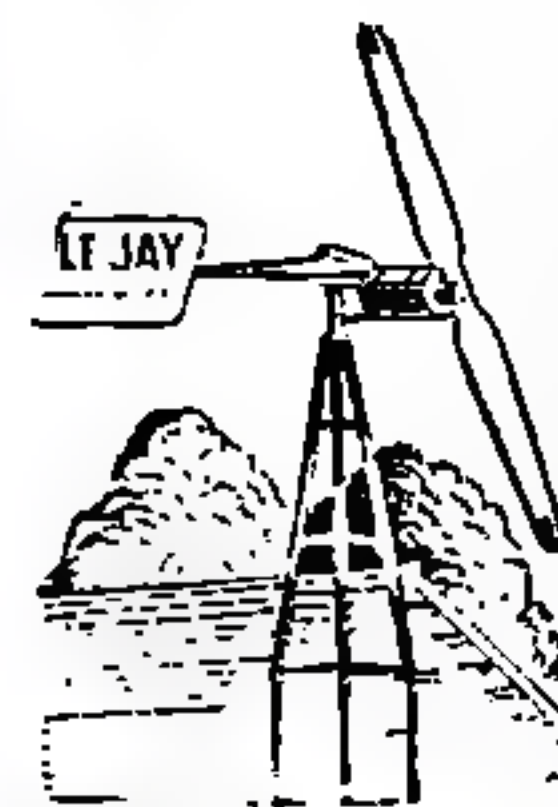
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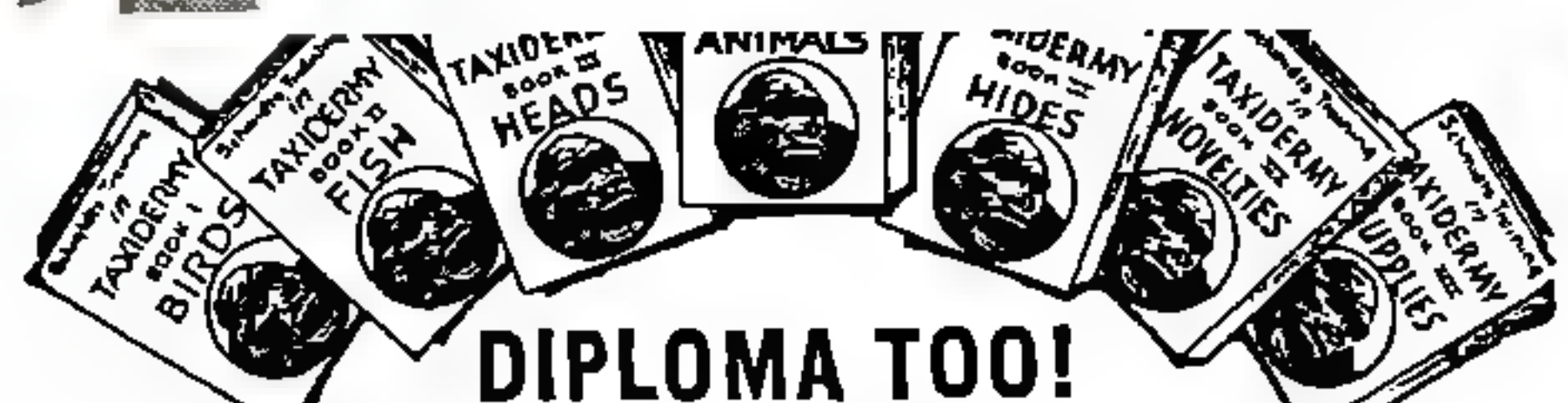
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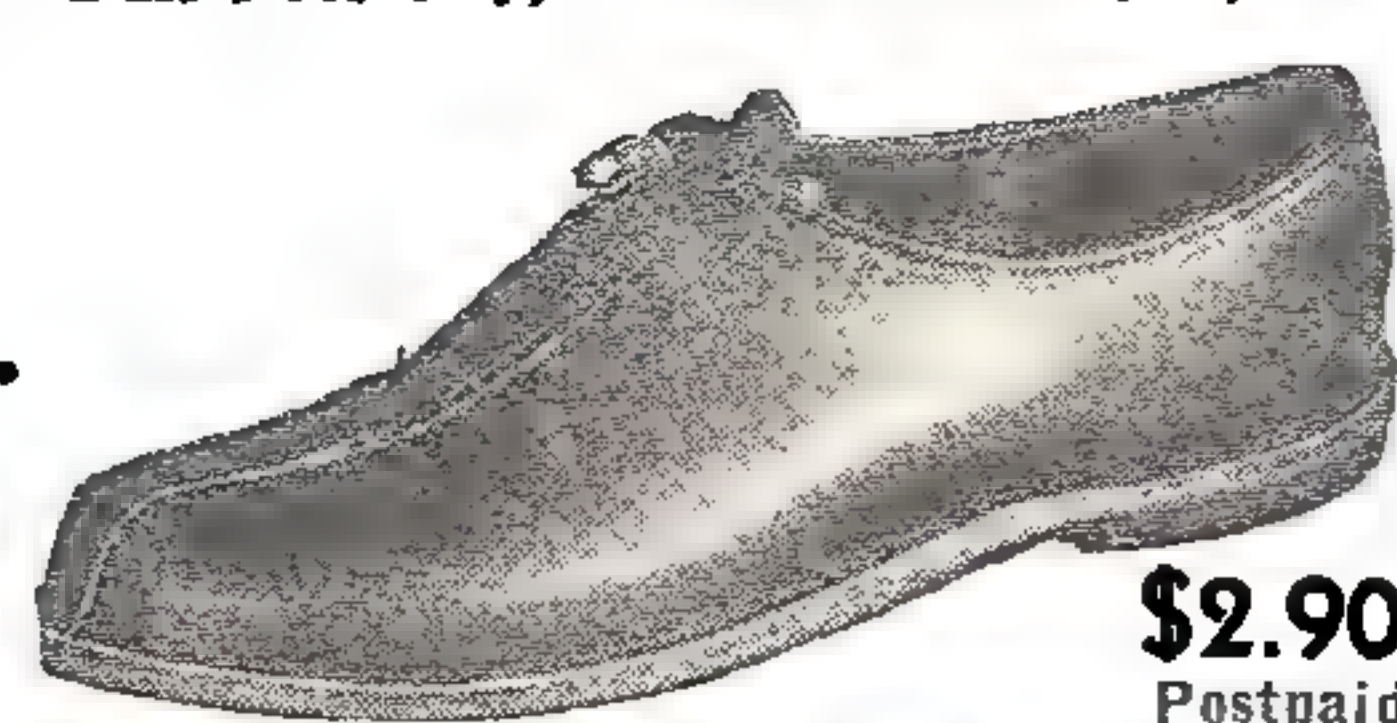
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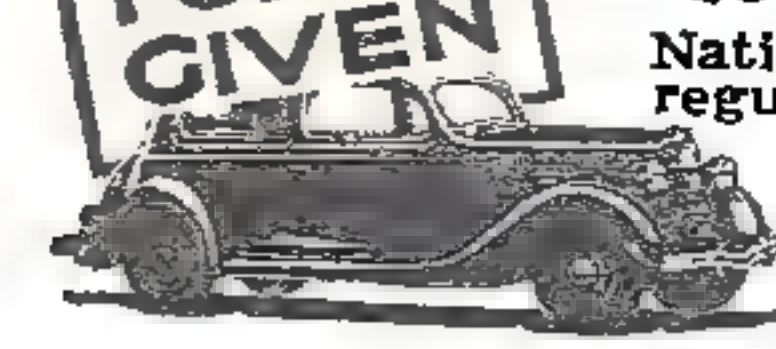
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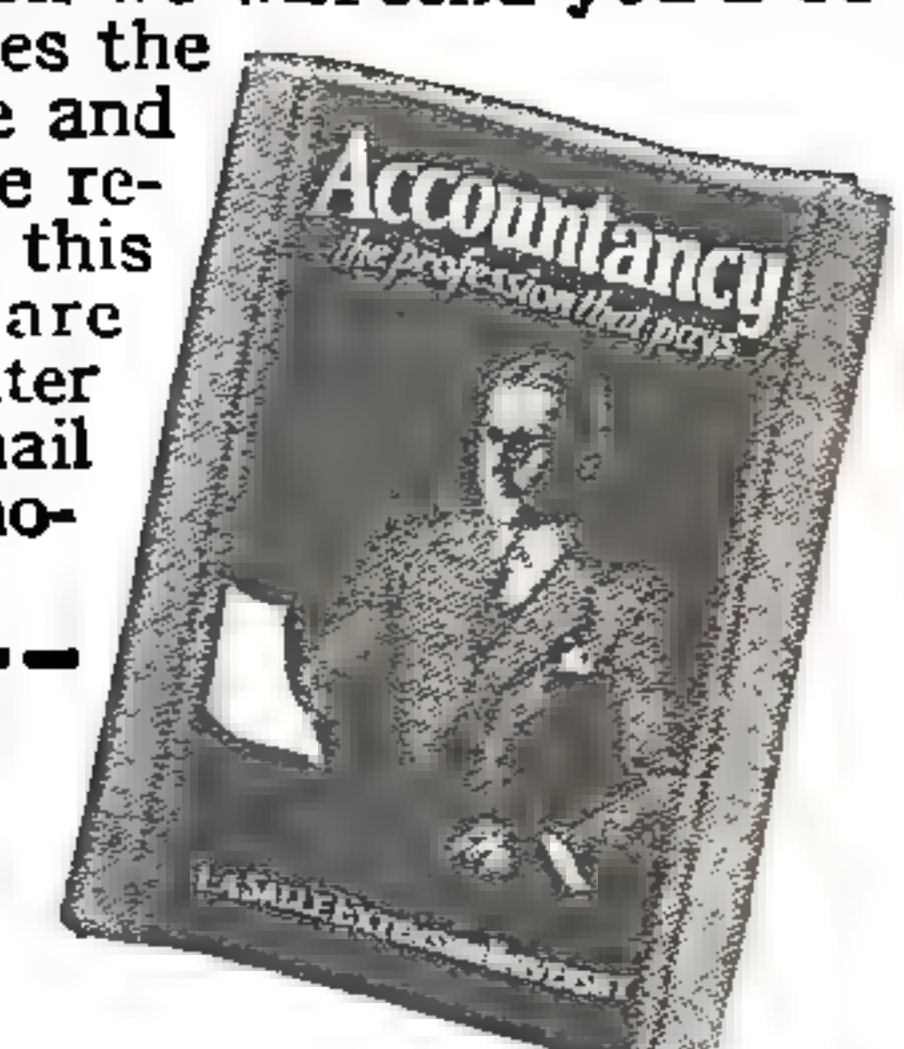
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Add Microscope To Camera

[Continued from page 143]

light for photomicrography is monochromatic, consisting of a single color. Therefore filters are commonly employed to absorb certain of the colors in white light and to transmit others. Wherever contrast in the visual image of an object depends mainly on color contrasts, then a filter is essential in order to approximate these contrasts in the photographic print.

For example, suppose we are dealing with a section of animal tissue in which the predominating stain is red. A duct or an artery may stand out, as one views the section through a microscope, because stained a darker red than the surrounding structures; the eye discriminates various shades of reds and contrast is afforded. But red photographs black by white light and all of the many hues of red will affect the film more or less equally. A picture so made will be very disappointing—a dark succession of grays and blacks in which contrast is lacking. In selecting a color filter, choose the complementary color to that predominating in the subject. In this case where the stain is red the complement is, of course, green. Make the picture with a green filter and the result will be a vast improvement; a lighter picture with good contrast.

Color filters may be purchased either singly or in sets, but they are very easy to make. Cut some glass plates or buy lantern slide blanks and between two of these, thoroughly cleaned and dried, place a sheet of colored cellophane, then bind the whole around the edges with gummed tape. Arrange a holder or stand so that the filter comes between the light source and the microscope mirror and success is assured. By experimenting on the same subject with filters of different colors the variation in results and the improvement in pictures will be surprising.

There are still other experiments to do. See whether or not the lens of the camera can be unscrewed. If so, try taking pictures without the camera lens or with the camera lens in place, but with the eyepiece of the microscope removed. Both of these methods are recommended in order to get lower magnification or larger field, as is necessary when an entire view of a relatively large object is required.

Inexpensive low power eyepieces are obtainable; they are known as projection oculars because they are employed in microprojection machines. These are best of all for most photomicrographic work. Then again there are the low power objectives. In fact, for very low magnifications, no microscope at all is used, a lens known as a micro-tessar being screwed directly into the camera shutter.

As to types of plates or film, any will do, though panchromatic gives best results. By all means do your own developing and printing; it's not only far cheaper and more satisfactory, but is grand fun. The kitchen, bath room or cellar may be converted into a darkroom by covering the windows with heavy cardboard.

Prepared developers and fixing salts are obtainable from any photographic supply shop. Use slow, panchromatic emulsions and develop in complete darkness. See the article, "Develop Your Own Pictures", which appeared in the "Modern Photography" section of MODERN MECHANIX for November 1937.

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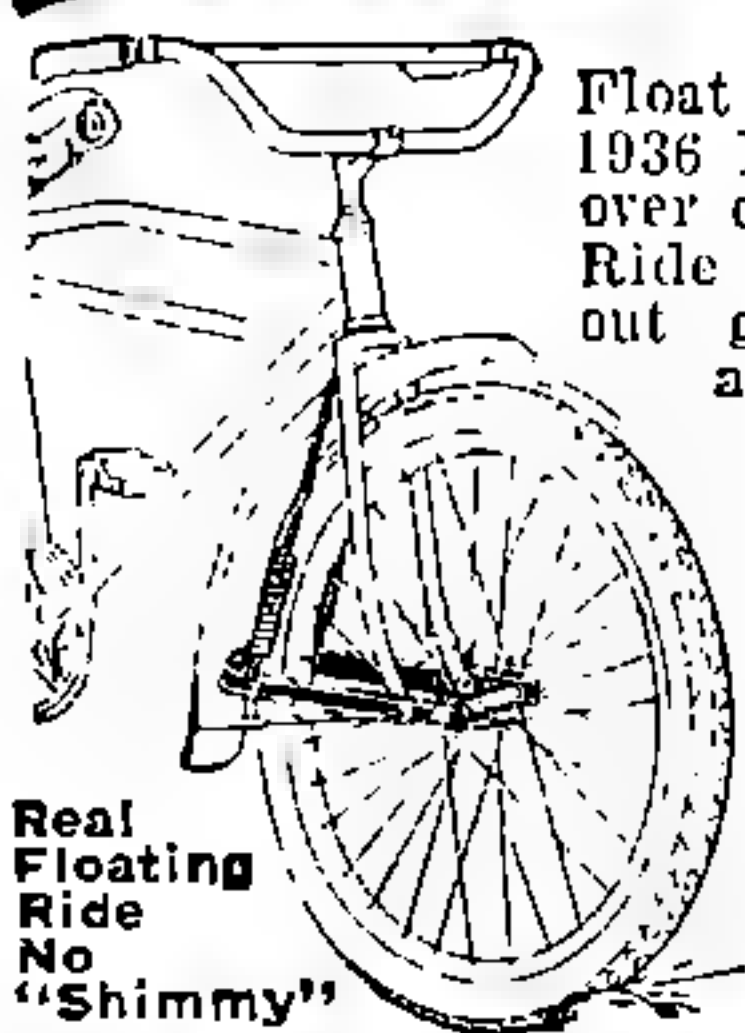
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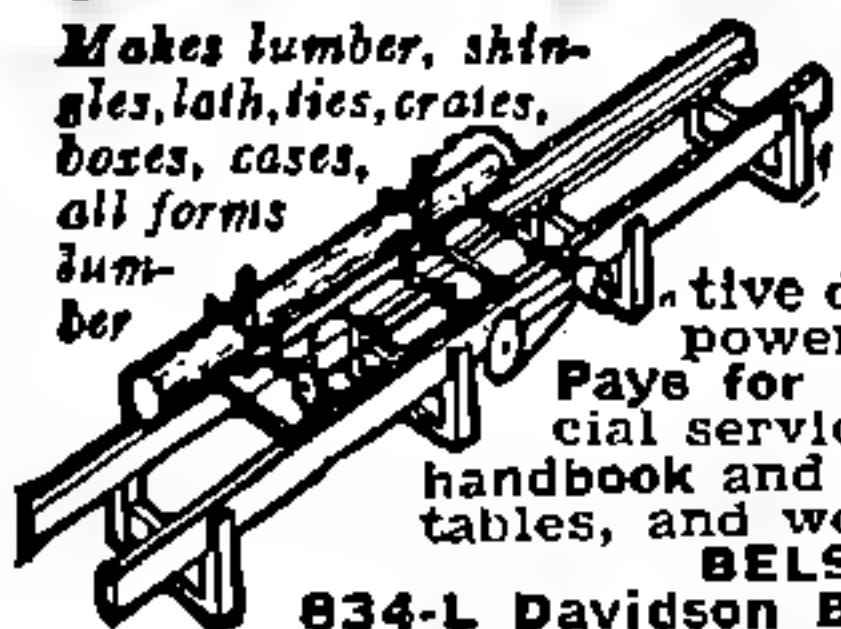
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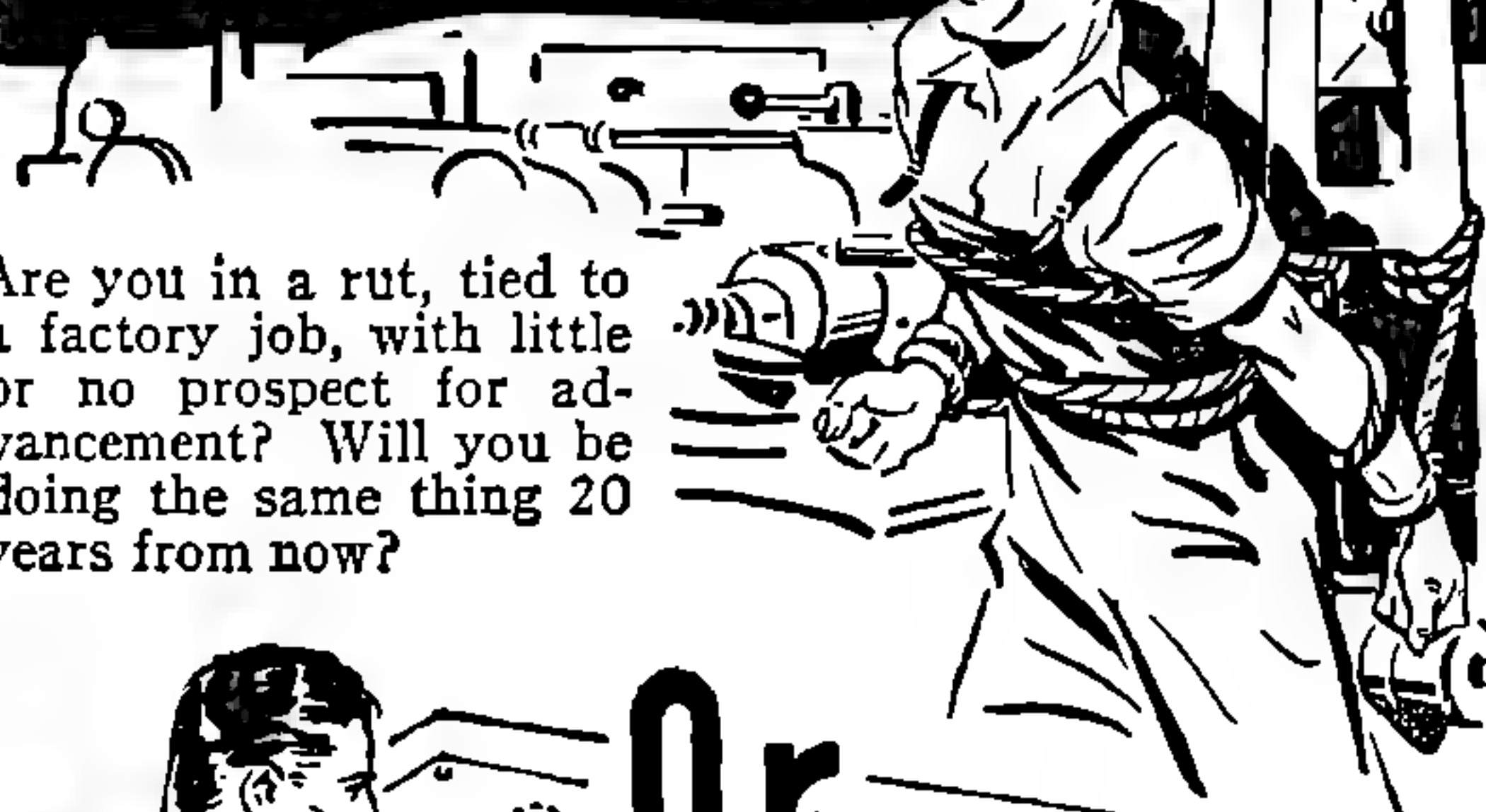
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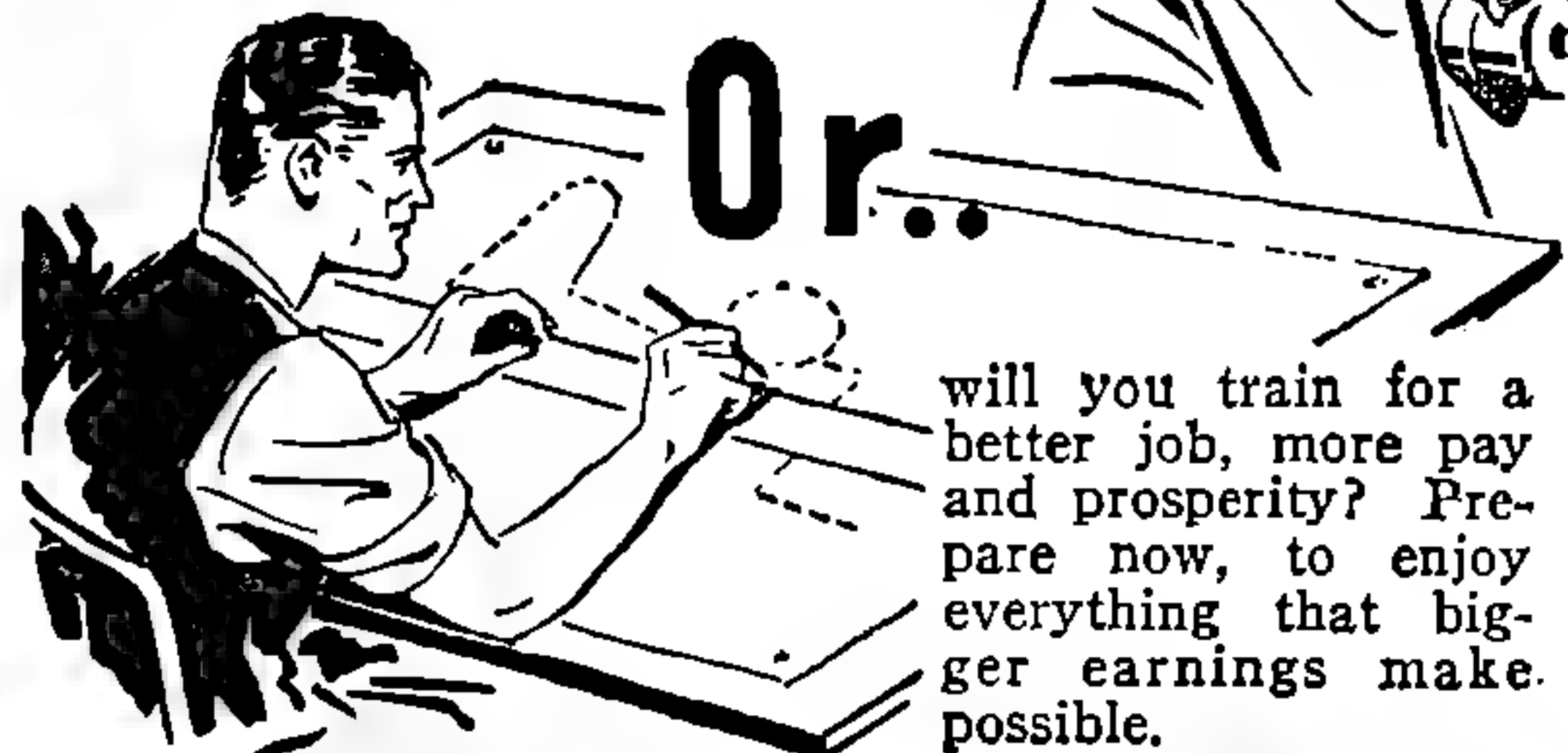
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OF MODERN MECHANIX, published monthly at Louisville, Kentucky, for October 1st, 1937.
State of Connecticut } ss.
County of Fairfield }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Conway Bolstad, who having been duly sworn according to law, deposes and says that he is the Business Manager of the MODERN MECHANIX and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Modern Mechanix Publishing Company, Greenwich, Connecticut; Editor, Robert Hertzberg, Jackson Heights, Long Island, N. Y.; Managing Editor, Ralph Daigh, New York, N. Y.; Business Manager, Conway Bolstad, Old Greenwich, Connecticut.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Modern Mechanix Publishing Company, Greenwich, Conn.; Fawcett Publications, Inc., Greenwich, Conn.; W. H. Fawcett, Greenwich, Conn.; Roger Fawcett, New York, N. Y.; W. H. Fawcett, Jr., Greenwich, Conn.; Marion F. Bagg, Tulsa, Okla.; Gordon Fawcett, Hollywood, Calif.; Roscoe Kent Fawcett, Greenwich, Conn.; Frances M. Fawcett, Greenwich, Conn.; Margaret Connor, Seattle, Wash.; Eva Adams, Seattle, Wash.; Clarence Fawcett, Portland, Ore.; Gloria Fawcett Trust, LaJolla, Calif.; Virginia Lee Fawcett Trust, LaJolla, Calif.; John Fawcett Trust, New York, N. Y.; Nellie O'Brien Trust, Waseca, Minn.

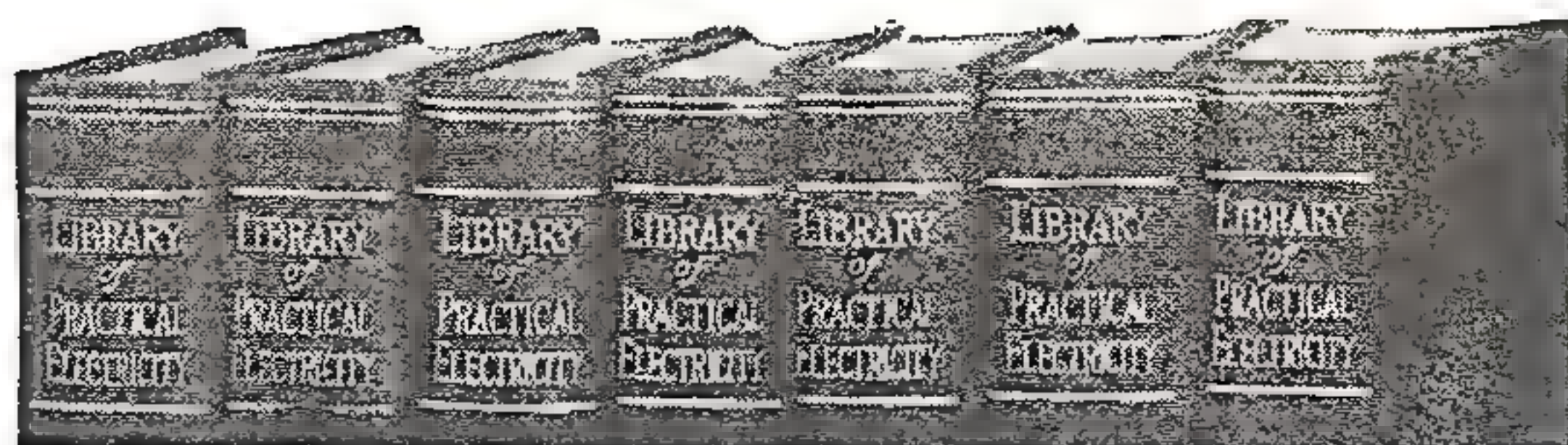
3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stocks, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is (This information is required from daily publications only.)

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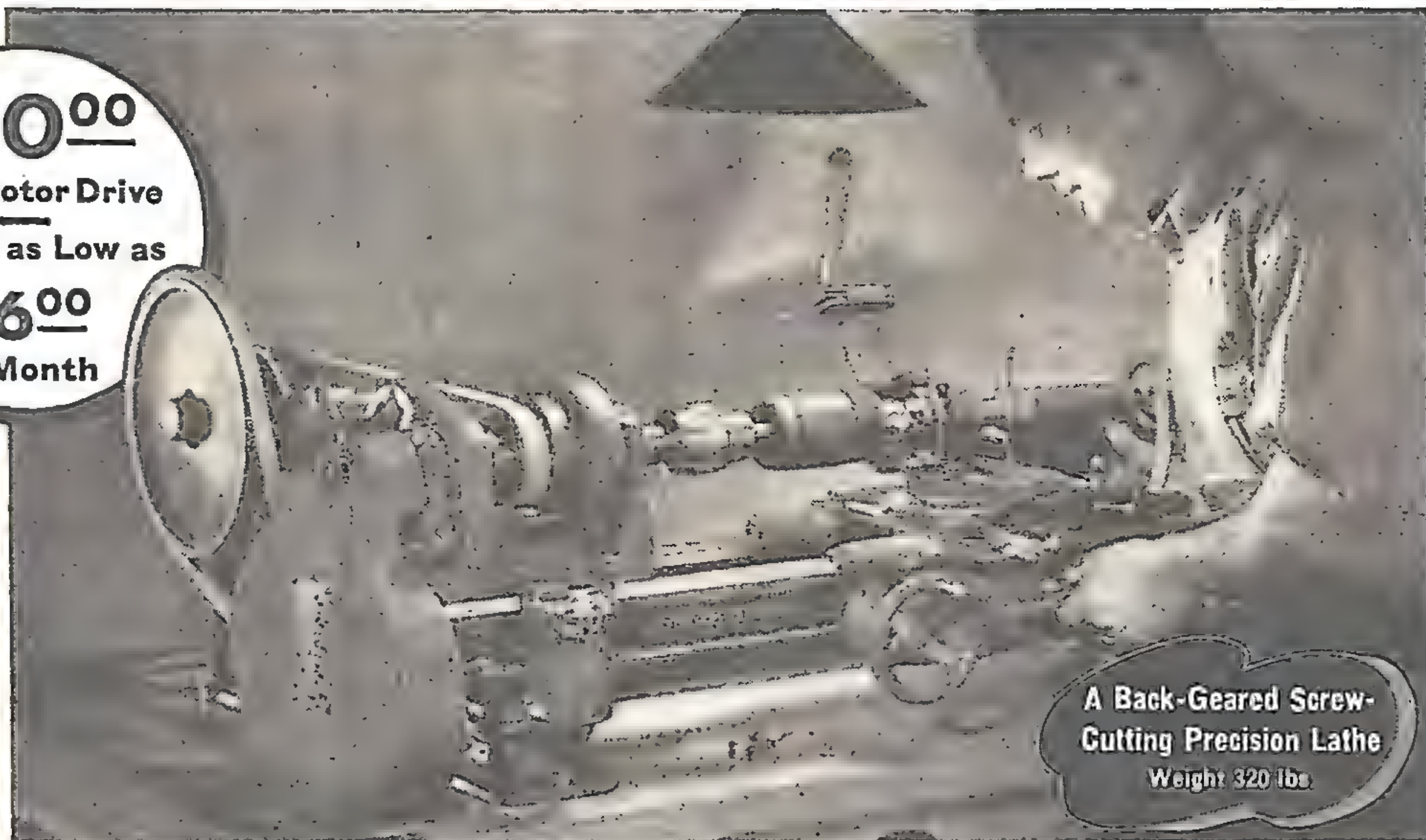
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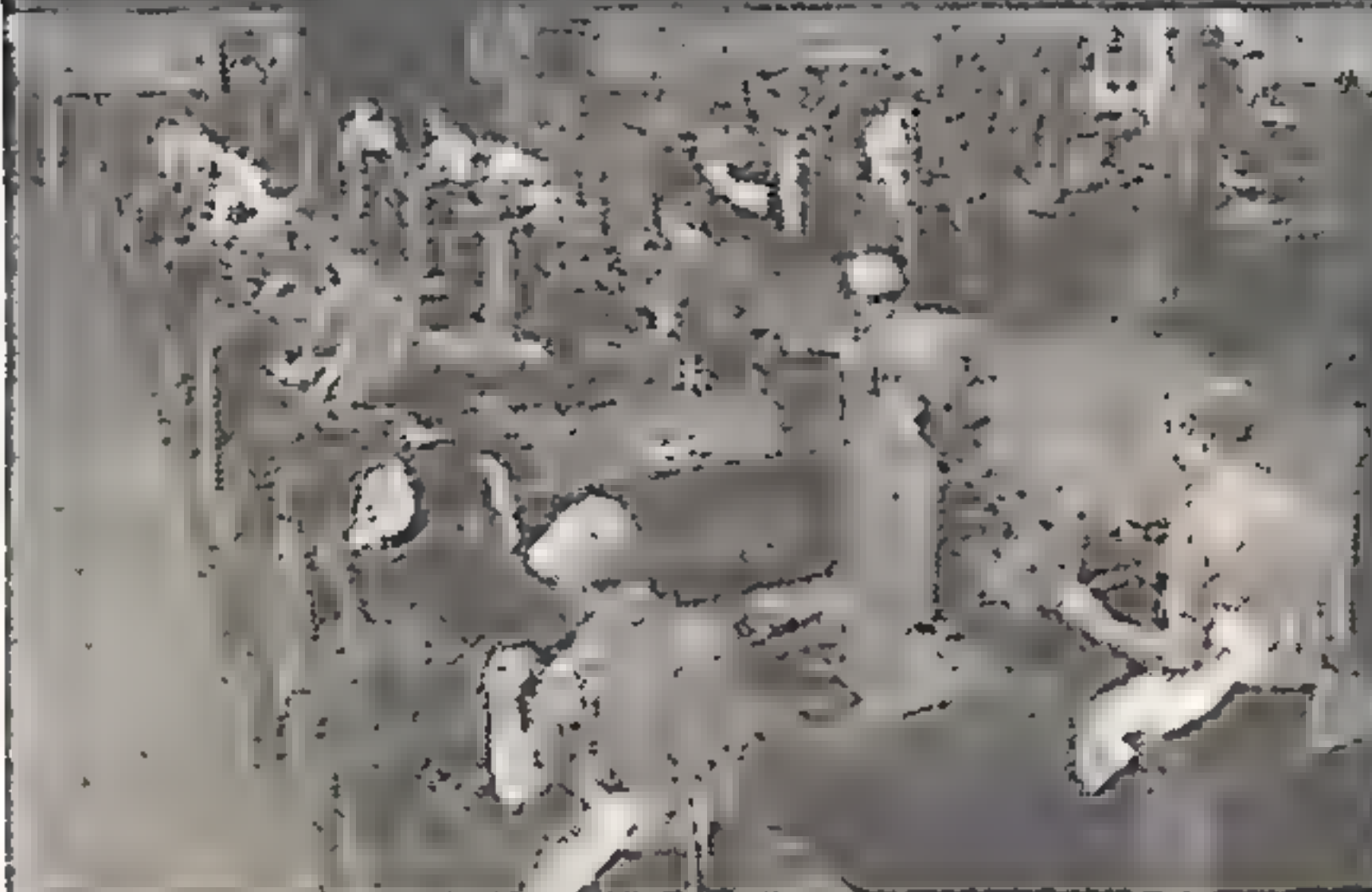
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SOUTH BEND *Precision* LATHES

Simplifying Winter Starting

[Continued from page 142]

Excessive churning of the starter will rapidly depreciate the battery's charge, often to the point where scarcely enough current remains to operate the ignition coil. In cases of this kind, the car can be started by an emergency measure. Disconnect the "hot" lead to the storage battery and connect it by means of an ordinary piece of lamp cord to one side of a bell-ringing transformer secondary. Connect the other terminal of the transformer's secondary to the car's frame. Crank the car by hand and it will fire quickly. Let it run until the engine is thoroughly warmed up, and then reconnect the battery. Another spin of the hand crank will restart the car and it can then be driven off.

As frozen batteries are often caused by the cells being undercharged, the battery should be kept fully charged throughout the winter. Many attics will yield a storage battery charger that was put to rest with the advent of the family's first electric radio. This same charger can be used to maintain a full charge in the car battery by connecting it, with the correct polarity, to the frame of the car and to the insulated terminal on the generator cut-out, each night after putting the car away.

A final precaution concerns the transmission grease. In every instance summer grease should be replaced with a light lubricant intended for winter use. Many motorists fail to realize that car stalling is often due to the "drag" or resistance of heavy oil on the driveshaft. This is harmful to the car and should be avoided by all means.

How To Print Your Pictures

[Continued from page 145]

After the prints have "fixed" in the hypo for the prescribed 15 minutes, wash them in running water. The wash basin arrangement pictured on page 105 of the November issue will serve nicely. Keep the prints well separated and let them wash for about thirty minutes. To dry, place between the leaves of a "blotter book," weight the book with a flat iron or one or two bricks, and put it away until morning.

If glossy prints are preferred buy glossy paper instead of the semi-matte, and develop exactly as outlined. To dry them, however, a "ferrotype" plate will be needed. These are made of brass, with one side heavily chromium plated and polished, and have no iron in them at all. To use the plate, wash the polished surface with ordinary soap, rinse off with hot water, and apply the wet prints face down. Roll them flat with a print roller and set them aside to dry. In a few hours they will pop off by themselves. The 10 by 14-inch size will be found most convenient for amateur use.

The hypo can be saved for future use. The acetic acid solution is good for several dozen prints, and can also be saved, but it is a good idea to mix a fresh bath for every batch of prints. The developer cannot be saved for more than a few hours. These various chemicals are so cheap that it is foolish economy to try to stretch their life.

Here are a few concise precautions to observe:

In handling negatives, hold them by the edges and keep them clean and dry. Take out one sheet of paper at a time, and keep the rest in the black envelopes. Filter developer, short-stop bath and hypo before use. Wash all trays and other vessels in plenty of running water before and after use.

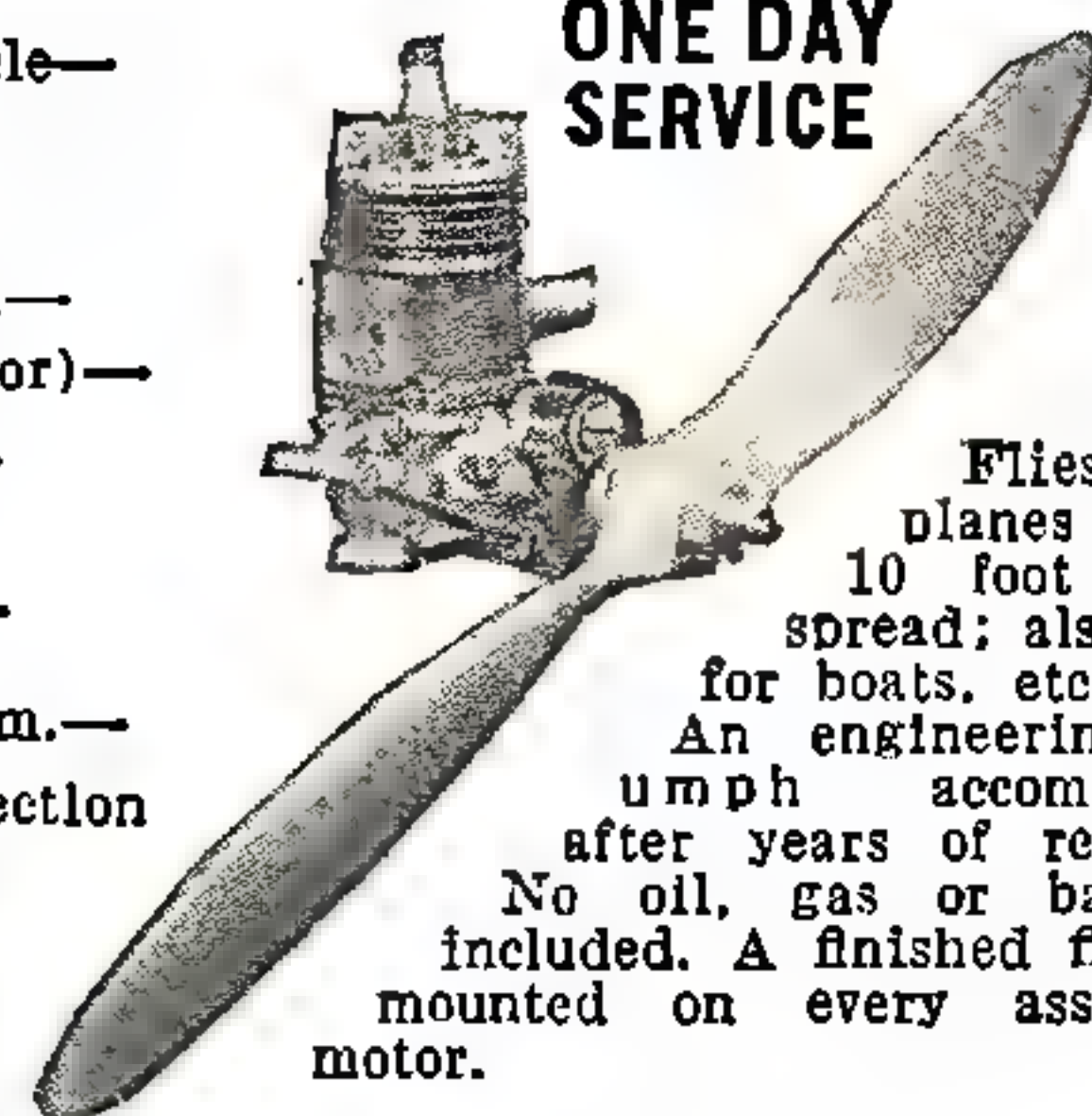
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Many model builders are not aware of the fact that the G. H. Q. gas engine once sold for \$35 each and the demand was so great that there was a waiting list of customers. Mass production methods and enthusiastic customer reception have enabled us to lower our price, postpaid, to \$8.50 for a finished parts set and \$12.50 for the completely assembled motor.

4 Port 2 Stroke Cycle—
¾" Stroke—
1½" Bore—
300-12,000 R.P.M.—
Weight, 12 oz. (Motor)—
Turns 14" Prop.—
8" Pitch—
Bearing Surface.
¾" x 1¼"—
Crankshaft, ½" Diam.—
Rotation, Either Direction

**ONE DAY
SERVICE**



Flies model planes up to 10 foot wing-spread; also used for boats, etc. An engineering triumph accomplished after years of research. No oil, gas or batteries included. A finished flywheel mounted on every assembled motor.

FINISHED PARTS KIT \$8.50

**FINISHED ASSEMBLED
MOTOR—with flywheel \$12.50**

**POST
PAID**

G. H. Q. MODEL AIRPLANE CO.

854A East 149 St.

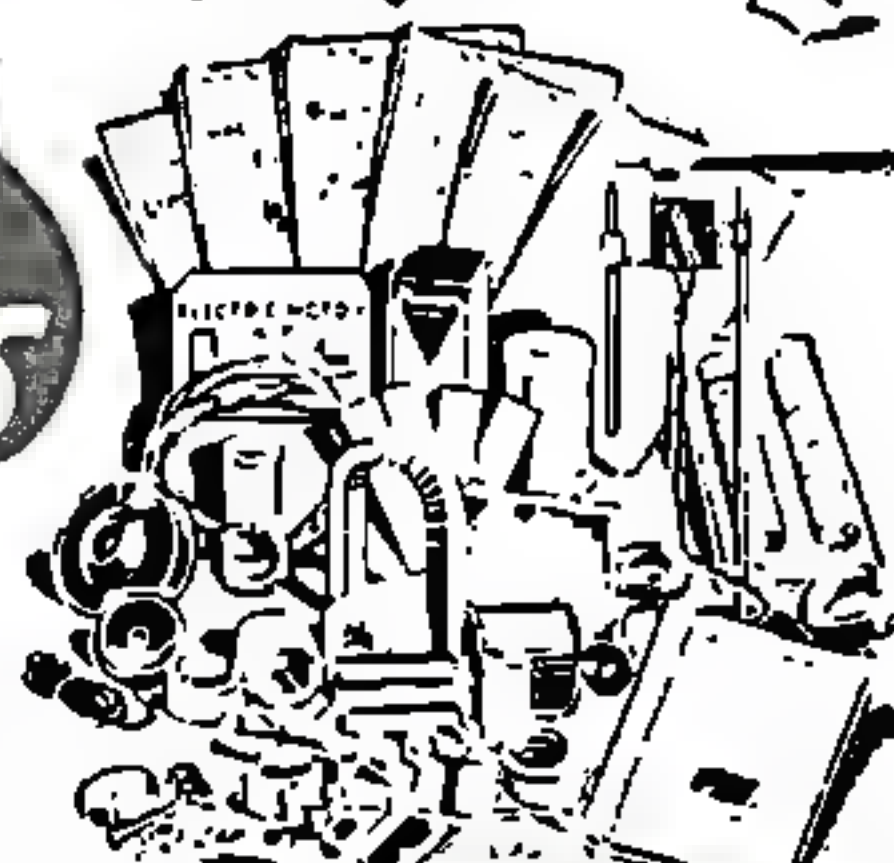
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25-PIECE KIT! Genuine Commercial Apparatus—Not Toys!

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New Ideas for Home & Shop



A focusing magnifier which is placed on the easel of a photographic enlarger. It projects an enlarged image to the eye of the operator, enabling him to adjust machine for exact focus.

A heavy vehicle-type fire extinguisher with special "shock absorber" construction to withstand excessive vibration. It is fitted with specially built sturdy steel brackets in two styles for truck and bus use.

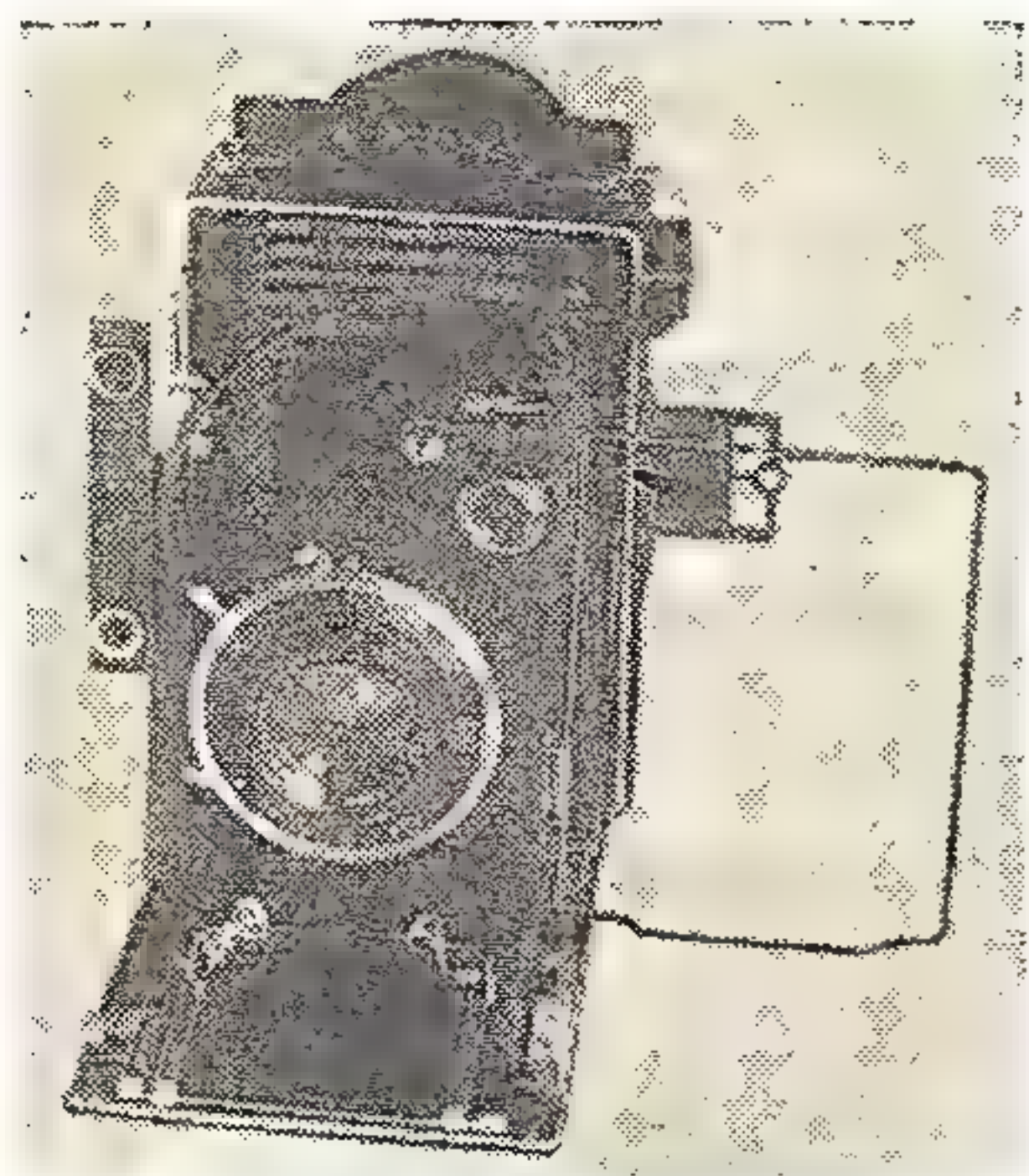
A silent, automatic humidifier for home use. It has no moving parts and empties ten to twenty-four gallons of water into the air per day.

A machine which automatically grades potatoes according to size.

A lightweight and compact microphone claimed to be 100 per cent directional. Case is of moulded bakelite.

An improved, lightweight bridge or industrial floor unit. Its unique construction eliminates need for intermediate beams on spans from five to twenty feet.

A bright ray fog light which is water proof and dust proof, and clamps securely to the bumper of a car by means of a heavy-duty malleable cast iron bracket.



A synchronized range finder for use with practically all folding cameras in the popular 9 x 12 cm. size.

A device which automatically opens garage doors when the car's headlights are turned on. Can be applied to doors now in use. May also be operated by a switch mounted on a post located at the side of the driveway, so that it may be reached by the driver without leaving the car.

A canopy type lighting unit which provides completely diffused, high intensity illumination.

A road striping outfit which consists of a striping machine and gun, hand valve, necessary hose and connections for all operating conditions.

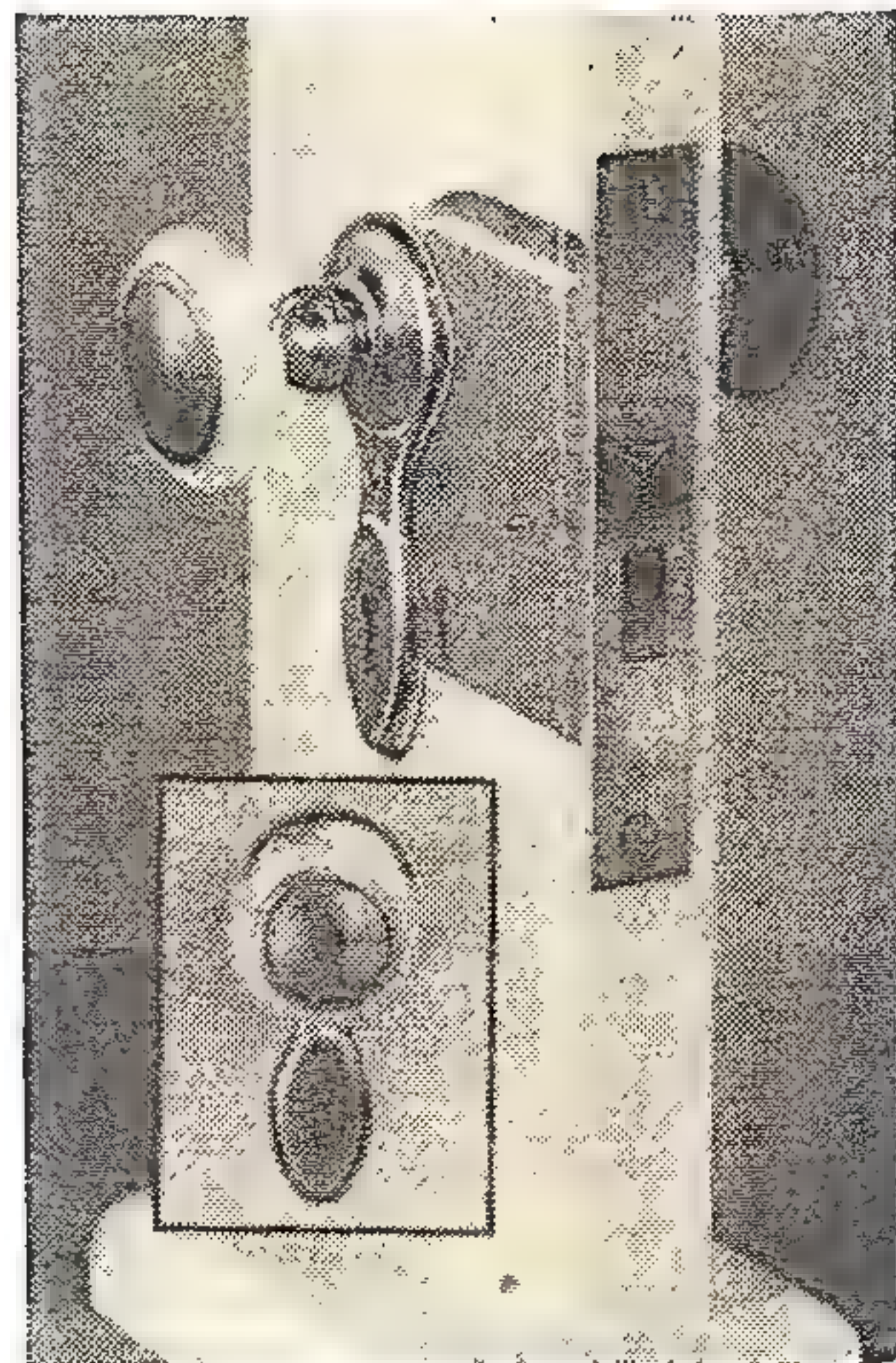
A workman's hat molded in a single piece crown, flared at the base to form a brim. It is non-rigid, and being non-brittle, does not crack under the impact of blows. Various size brims are available.

A dial caliper is designed for the direct reading of a measurement by means of a dial and hand instead of the conventional vernier.

A power sweeper designed for all types of sweeping jobs on large areas ordinarily cared for by a crew of men sweeping with hand brushes or brooms. The machine can be equipped with a sprinkling attachment when raising dust would be harmful.

An erasing machine designed to save time, money and materials. Built for use on either 110 volts A.C. or D.C., the rotary eraser is said to leave no smudges or holes in the paper or cloth.

A print protector, designed to hold a working drawing, order card, chart or any paper handled in a plant, has a transparent front. It may be hung from or screwed to a machine or wall. The holder can be filed in a standard file or desk drawer. Large drawing can be folded so that the working portions face outward when in folder.



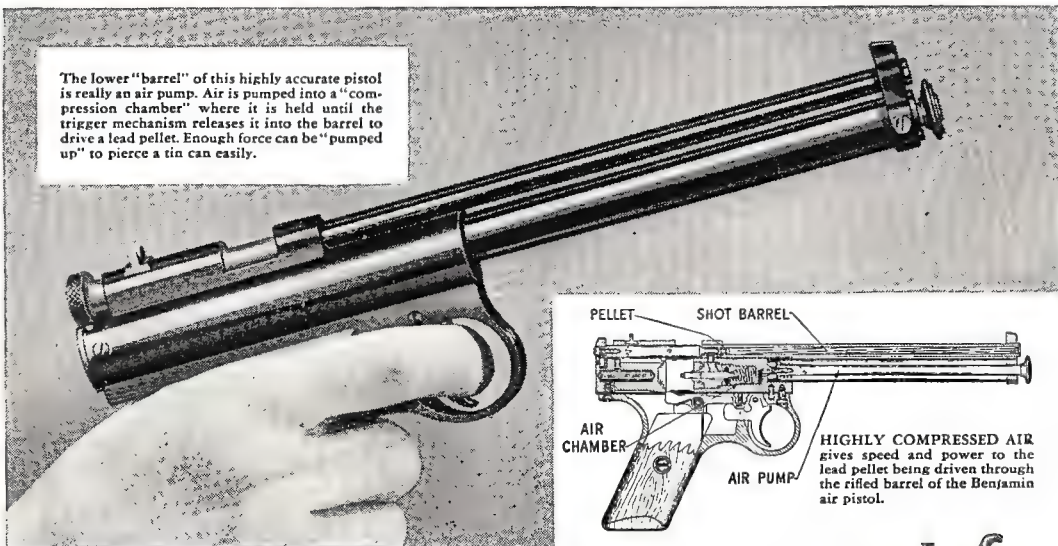
A combination rose and key plate for use with sectional door trim



Eraser for ink and typewriter, using rubberglass and fiberglass refills.

COMPRESSED AIR FIRES BULLET IN NEW TARGET PISTOL

The lower "barrel" of this highly accurate pistol is really an air pump. Air is pumped into a "compression chamber" where it is held until the trigger mechanism releases it into the barrel to drive a lead pellet. Enough force can be "pumped up" to pierce a tin can easily.



Practice arm demonstrates HIGH COMPRESSION principle of modern auto engine

THE greater the air pressure back of the air-gun's pellet, the further and harder it will shoot. The higher the compression in the cylinders of your motor car, the more power you get.

It's as simple as that. And that's why automobile manufacturers are using high compression engines in even the lowest priced cars. These cars squeeze more power, more mileage, more get-away from every drop of gasoline.



Look for this emblem on the base or globe of every Ethyl pump. It means best-grade gasoline.

GIVES YOU A BETTER RUN FOR YOUR MONEY

ETHYL GETS FULL POWER FROM HIGH COMPRESSION

HIGHLY COMPRESSED GAS mixture in the cylinders of your automobile engine gives extra power, more mileage, and that added responsiveness so important in emergencies. Only Ethyl permits you to get the full benefit of this compression—lets your car dealer advance the spark for maximum performance.



To get these advantages go to your car dealer and have him set the spark for maximum performance *and then use a fuel made for high compression!* Stop at the "Ethyl" pump. There you get more anti-knock fluid (containing lead tetraethyl) than you get in the best regular-grade gasoline. By preventing harmful knock you make sure of 100% performance from your high compression engine.

And remember—at these Ethyl pumps you get all-round quality that is double-tested—by the oil company and by the Ethyl laboratories.

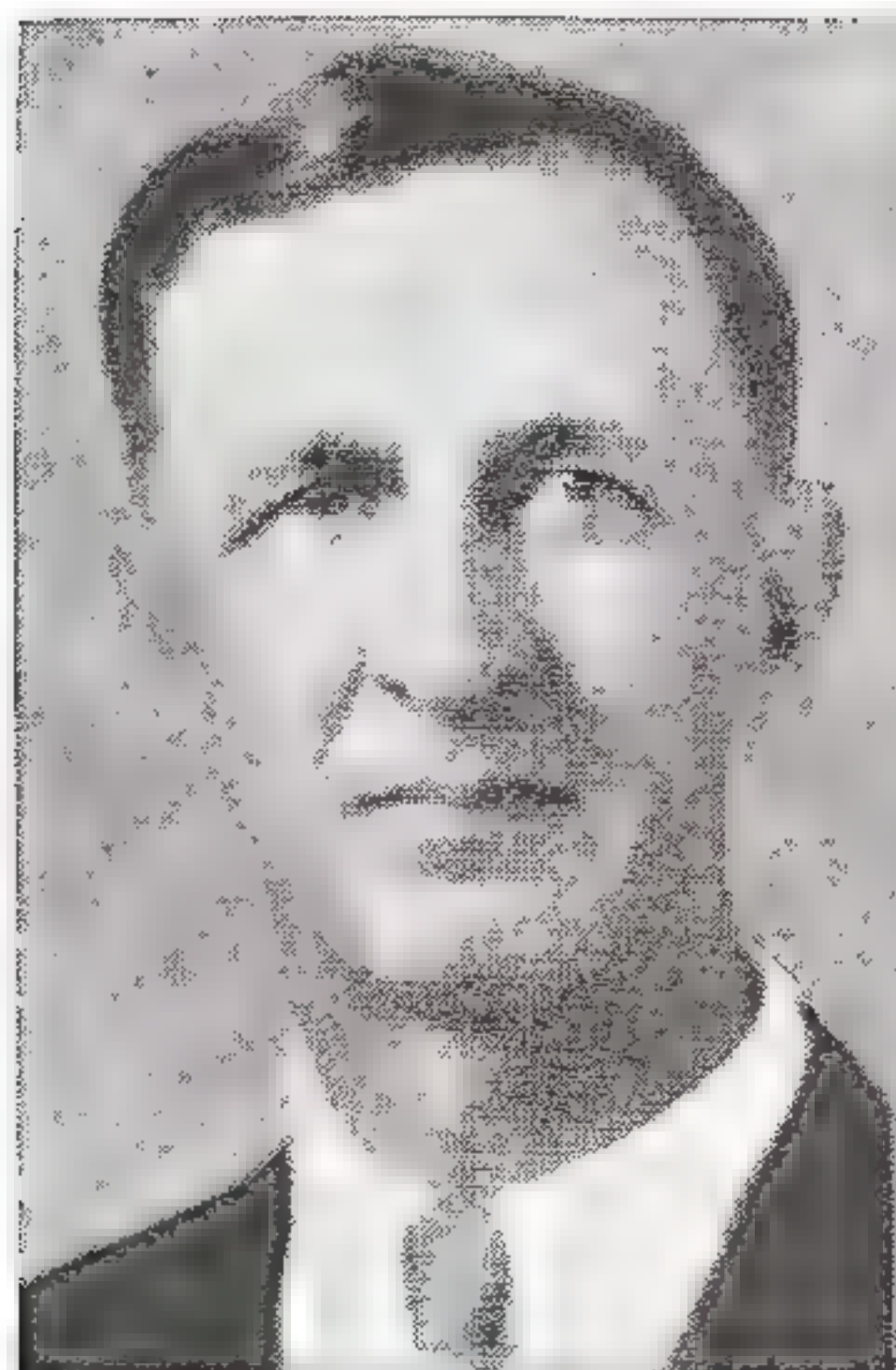
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has directed the
home study
training of more
men for the
Radio Industry
than any other
man in America.

HERE'S PROOF THAT MY TRAINING PAYS

Chief Operator Broadcasting Station

"When I completed 23 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WJPC, where I am now Chief Operator."—**HOLLIS F. HAYES**, 85 Madison St., Lapeer, Mich.

\$10 a Week in Spare Time

"My work has consisted of Radio set servicing, with some Public Address Systems work—all in my spare time. My earnings in Radio amount to about \$10 a week."—**WILLIAM MEYER**, 705 Ridge Road, Hobart, Ind.

Head Radio Man With Store

"I am head Radio man of the Sterchi Stores, Inc., Atlanta, Ga., making a salary plus commissions. I am rated one of Atlanta's best technicians, and I owe my success to your Course alone."—**W. C. CARAWAY, JR.**, 323 Howard Ave., College Park, Ga.

\$200 to \$300 a Month in Own Business

"For the last 18 months I have been in business for myself, making between \$200 and \$300 a month. I have N.R.I. to thank for my start in this field."—**ARLIE J. FROEHNER**, 224 W. Texas Ave., Goose Creek, Texas.

Serviceman for Two Stores

"Along with my own work, I am handling service work for two Radio stores, doing a salary from one shop and I receive a piece rate at the other."—**WILLIAM MOSTELLER**, 739 E. 3rd St., Williamsport, Pa.

Do you want to make more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Spare time Radio set servicing pays as much as \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their letters in my 64-page book. Mail the coupon.

There's a Real Future in Radio for Well-Trained Men

Radio already gives good jobs to more than 300,000 people. And in 1936, Radio enjoyed one of its most prosperous years. More than \$500,000,000 worth of sets, tubes and parts were sold—an increase of more than 60% over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred \$30, \$50, \$75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time service man. The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs, how to cash in quickly! Throughout your training I send you plans that made good spare time money—\$200 to \$500 a year—for hundreds of fellows. My training is famous as "the Course that pays for itself."

THE TESTED WAY TO

EXPERT



I Give You Practical Experience

My Course is not all book training. I send you special Radio Equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical.

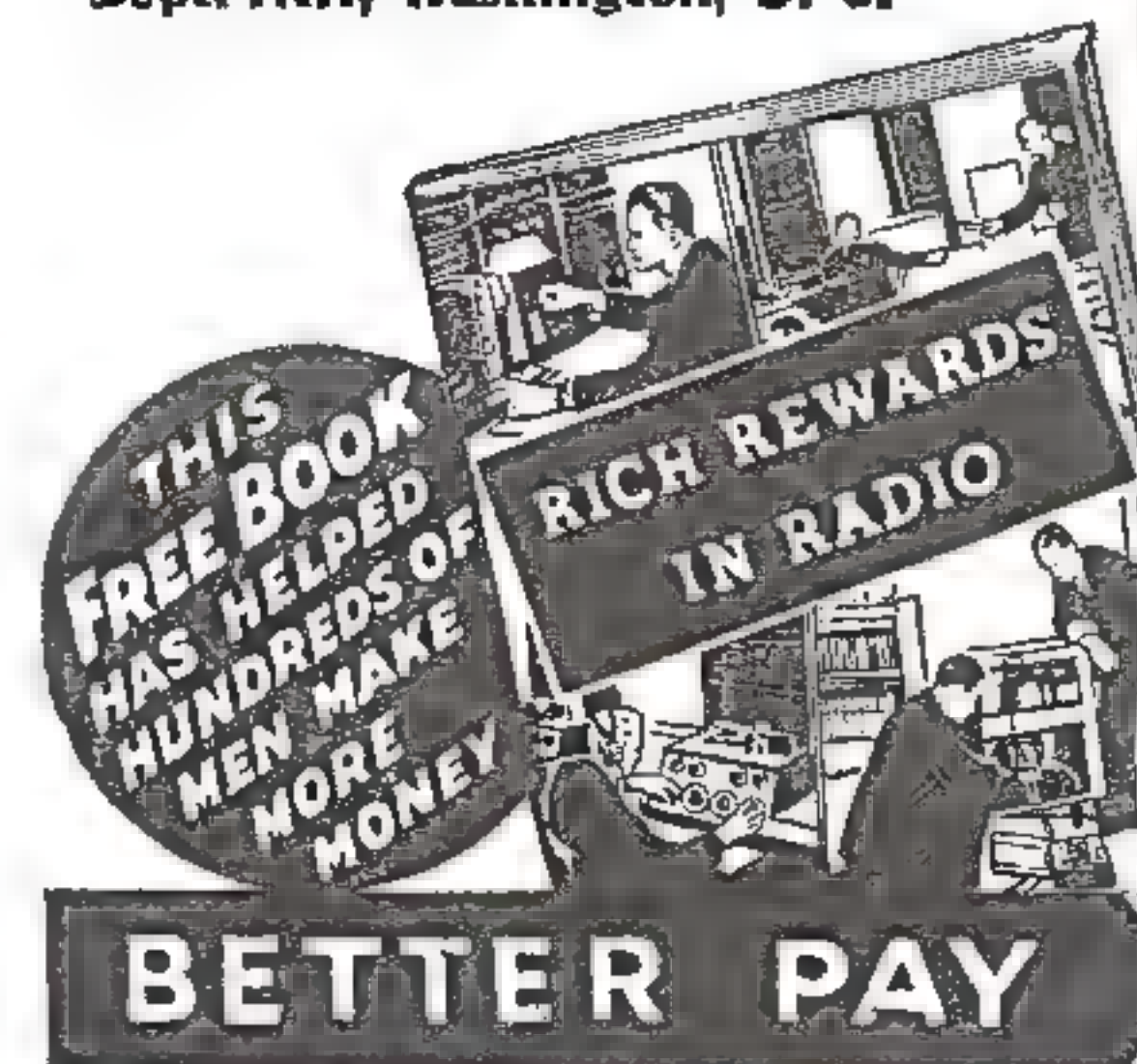
You Get a Money-Back Agreement

I am sure I can train you successfully. I agree in writing to refund every penny you pay if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send you a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste on a postcard—NOW!

**J. E. SMITH, President,
National Radio Institute,
Dept. 7NH, Washington, D. C.**



SET SERVICING. Spare time set servicing pays many \$5, \$10, \$15 a week extra while learning. Full time servicing pays as much as \$30, \$50, \$75 a week.

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Employ managers, engineers, operators, installation and maintenance men for fascinating jobs and pay up to \$5,000 a year.



LOUD SPEAKER SYSTEMS. Building, installing, servicing and operating public address systems is another growing field for men well trained in Radio.

AUTOMOBILE RADIO. Another new Radio field—selling, installing, servicing. One million or more auto owners will install radio sets within the next year.

Mail this to get 64 page Book FREE

**J. E. SMITH, President, Dept. 7NH
National Radio Institute, Washington, D. C.**

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAMEAGE

ADDRESS

CITYSTATE

A frank man to man talk about PATENTS-INVENTIONS - SELLING INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than \$15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and

millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

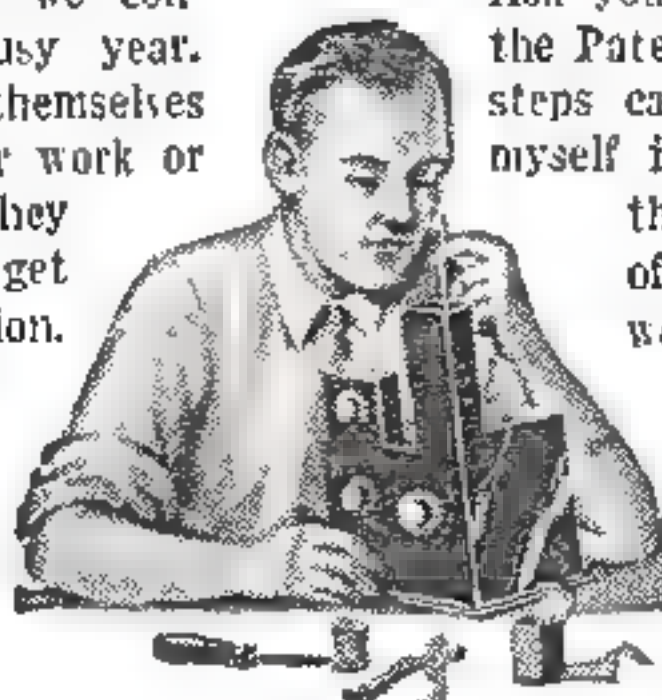
Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the gold of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.



Can You Answer These Questions?

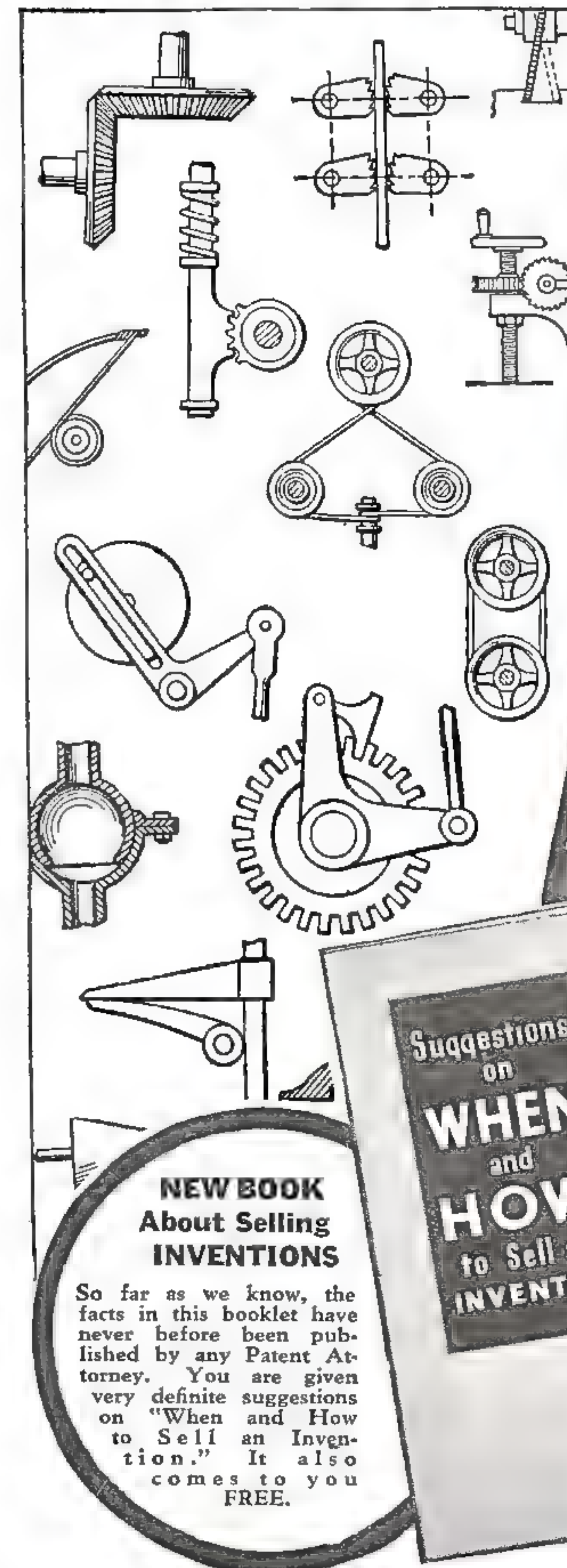
Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the first man to think of my invention? Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! **YOU CAN HAVE THEM**, without cost, trouble, or delay.

Our Business Is To Help You. Write Us Today

For more than thirty-six years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of trained, experienced specialists—Registered Patent Attorneys, Draftsmen, and Searchers to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Questions promptly answered. Write us frankly with absolute assurance that what you say will be treated with strictest secrecy. **BUT FIRST**, send for the **FREE BOOKS** shown on the opposite page. They are filled with facts, pictures and suggestions. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense, **EVEN LATER DISAPPOINTMENT**. Simply fill in the coupon. No charge, no obligation. Write us today.

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Before you spend money in making a model, or spend weeks in its design, we advise you first to have a preliminary search made through U. S. Patents in the U. S. Patent Office to see if there are inventions like yours already on record; and, if so, let us give you our opinion as to the patentability of what you have.

We employ experienced searchers to perform this service for you. From the reports of our searchers we can quickly form our opinion as to whether your invention is confronted with obstacles in the form of already granted patents. First get our FREE BOOK and read the chapter on "How Can I Know Whether My Idea Is Patentable?"

How We Serve The Inventor

We have secured patents for inventors located in every state in the Union. Our organization is a large and efficient one. Our practice is confined entirely to Patents, Trade-Marks, and Copyrights. We have had years of experience in Patent Matters. When you place your invention in our hands, we are in position to proceed at once to secure protection for you. Our fees are reasonable, and, if you desire, we can arrange convenient terms of payment.

CLARENCE A. O'BRIEN & HYMAN BERMAN

3177 ADAMS BUILDING, WASHINGTON, D. C.
Registered Patent Attorneys before U. S. Patent Office

What Help is the Patent Attorney?

Your invention may provide your life's greatest opportunity. If it is to bring income to you it should be legally yours. Upon your patent attorney's skill rests how completely your patent covers all the protectable points in your invention. The inventor may actually lose money on his invention by overlooking a single claimable point that a skilled patent attorney would not miss.

What The Inventor Must Know

In order to proceed successfully, the inventor must follow certain definite steps that precedent has established as the quickest way to reach his goal. Our FREE BOOK, "Patent Guide for the Inventor," gives a concrete, logical, and thorough resume for the inventor to follow. It takes him, through 48 pages, from the crude first model to the finished commercial product. It shows the inventor how to avoid mistakes, how to shorten the road in getting his invention ready for market; it also points out how to save money and avoid the errors of inexperience in applying for patent. Getting our FREE BOOK should be the first step in definitely declaring yourself an inventor. After you get this illustrated, clearly worded guide of carefully compiled patent knowledge you will know how to proceed without expensive mistakes and discouraging setbacks from "wrong-track" methods.

TORS

Invention Ready For These Waiting Markets

Keen competition in every form of industry has put manufacturers feverishly at work trying to speed up output, reduce overhead, save on materials, outsell trade opponents. The inventor is the key-man in making advancement possible to any business. Upon the inventor rests the success of many enterprises.

This does not mean that you must have something gigantic to win commercial success. A new way to open a door or button up a shirt may be the very thing hundreds of manufacturers are looking for. If you have something novel—if it is practical to manufacture—no matter whether it be an improved rattle for a child or a whistle for a mechanical automobile, there is likely a waiting market.

FREE RECORD OF INVENTION FORM

This FREE Record of Invention Form enables you to make in convenient form a sketch of your invention and have it witnessed in a manner of value to you should the occasion for evidence arise. MAIL THE COUPON TODAY and obtain our FREE BOOK and Record of Invention Form.

WILL SHOW YOU Every Step of the Way

FINISHED COMMERCIAL PRODUCT

The Importance Of Immediate Action

In making application for patent it is important to be first. Even if your application is delayed by a few days you may be placed at a disadvantage. The short time that elapsed between Elisha Gray's application for his telephone patent and the application of Alexander Graham Bell probably cost Gray the rights to the telephone.

TEAR OFF
AND
MAIL
NOW!

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& HYMAN BERMAN**
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GENERAL OFFICES NEW YORK, N. Y. BRANCHES CHICAGO • SAN FRANCISCO
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THEY TOLD ME IT WAS JUST AS GOOD... BUT IT MUST HAVE BOILED AWAY DURING THE WARM SPELL LAST WEEK.

GET RIGHT IN FOLKS, WE'LL HAVE YOU HOME IN NO TIME.

I DON'T KNOW WHAT WE WOULD HAVE DONE IF YOU HADN'T COME ALONG... WE'RE NEARLY FROZEN

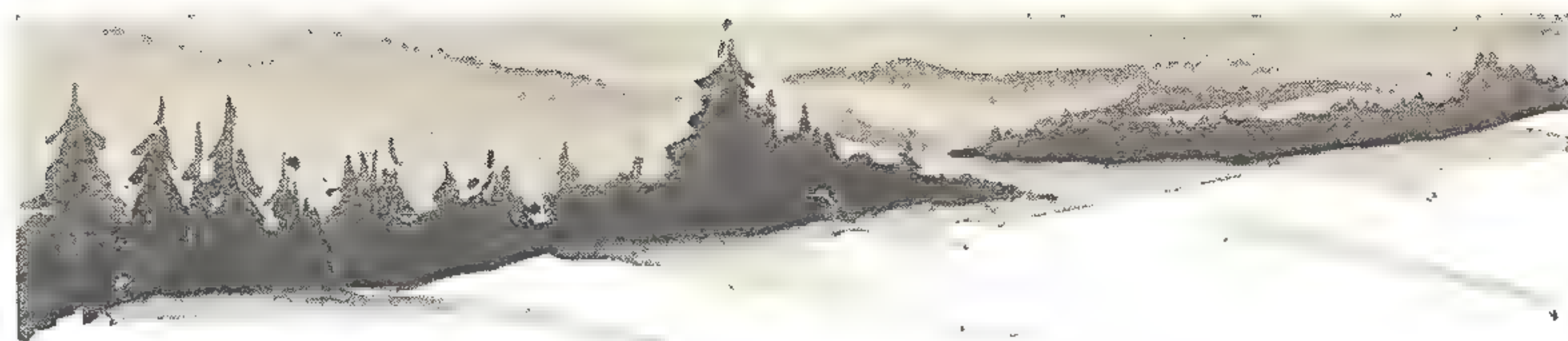
I'M COLD I WANNA GO HOME

"NEXT TIME, NEIGHBOR, GET THE GUARANTEED ANTI-FREEZE... READ THAT... THERE'S NOTHING ELSE LIKE IT!"

EVEREADY

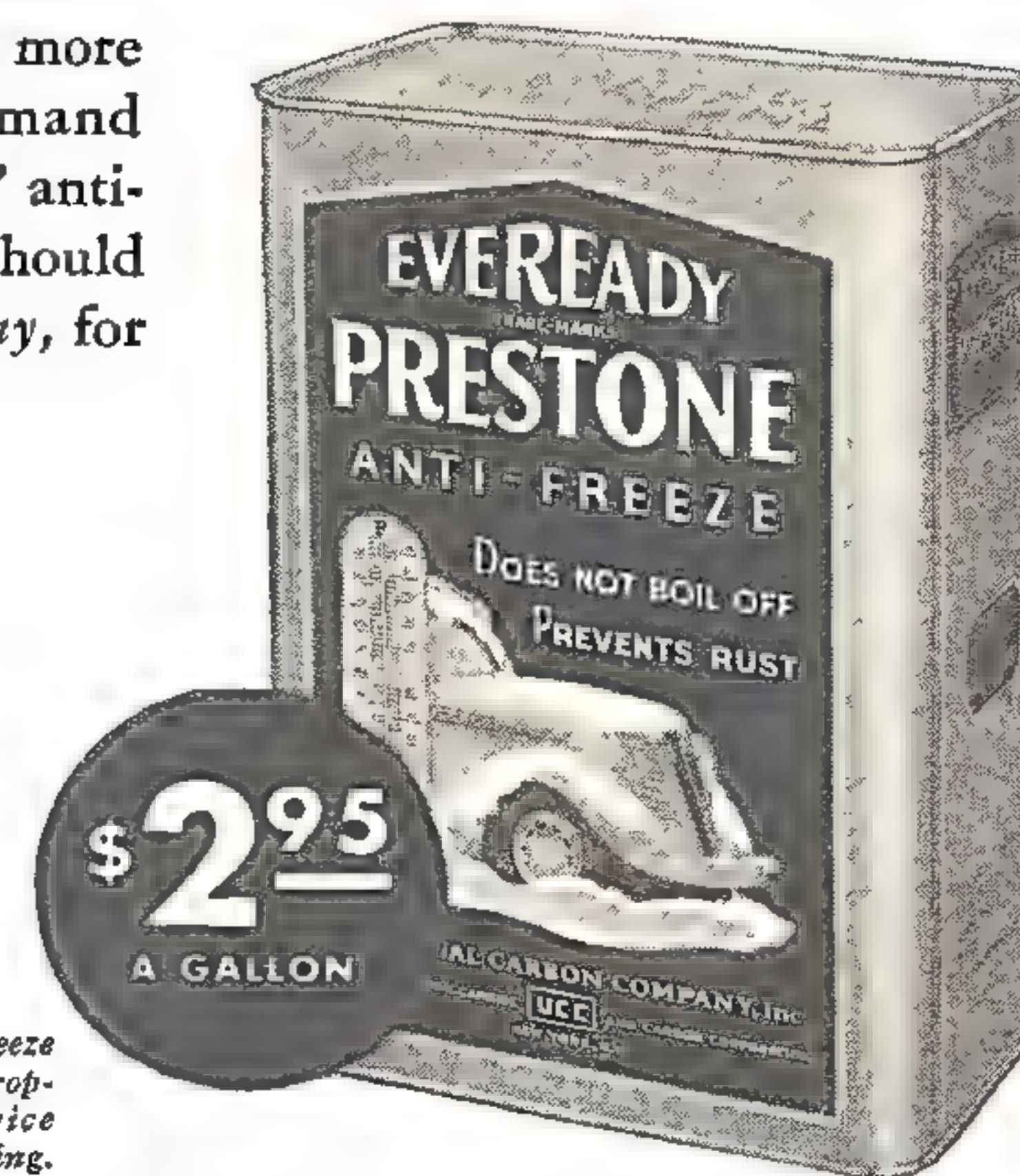
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ANTI-FREEZE IS



AMONG all the brands available to U. S. motorists, there's no other anti-freeze like "Eveready" "Prestone." This anti-freeze is guaranteed, insures you against FREEZE-UP, BOIL-AWAY and RUST-CLOGGING, the three winter purse-snatchers that cost American motorists millions of dollars every year. • But when you gamble on anti-freeze you risk more than money...you take chances with your family's health and safety, hazard all-winter comfort, wreck your peace-of-mind.

• Every year millions more decide on safety, demand "Eveready" "Prestone" anti-freeze. So perhaps you should get yours early...Today, for example.



Buy "Prestone" anti-freeze from dealers who are properly equipped to service your car for winter driving.

PRESTONE

MARKS

GUARANTEED IN *Writing*



Chips from the



Few thrills can equal those provided by a powered iceplane like this one built by Milton W. Graves, of Adams, Mass. The rudder and elevator controls operate like those of an airplane.

WITH long winter evenings at hand, the time is ripe for dusting off the workshop bench and tools and starting work on projects that will bring hours of enjoyment and recreation next Spring. Suitable plans and articles to meet the fancy of every type of home-craftsman can be found in each issue of MM or in the books—"How To Build It," "How To Build 20 Boats," or "How To Build Trailers," copies of which are available at 50c each from your local news dealer or direct from MM at Greenwich, Conn.

Milton W. Graves, of Adams, Mass., was awarded the first prize of \$5 in this month's Workbench contest, for his photo and letter describing a powered iceplane. His letter reads:

Dear Editor:

I am enclosing a photograph of my iceplane, which is powered by a used motorcycle engine. How do you like it?

The propeller is driven directly from the motor, which is mounted to a wooden frame fuselage covered with dope-treated airplane cloth. The elevators are controlled with a joy stick while the rudder is manipulated by placing my feet on a rudder bar.

The plane levels off and rides on the two front runners, which are six feet apart, when a speed of about 20 miles an hour is attained. I received many ideas for my plane from past issues of MM.

Milton W. Graves.

We can well imagine that Graves' iceplane provides thrills that are akin to real flying. If YOU want to have some real fun, fellows, follow

Graves' example and build a powered iceplane.

A \$3 award was sent to Winston B. Mackley in far away New Zealand for his photo and details of a record-breaking model plane. The letter states:

Dear Editor:

Enclosed is a photo of my microfilm covered hydroplane. It rises off the water and recently set a New Zealand record for models of its type by remaining aloft for 4 minutes, 46 4/5 seconds.

I shall be glad to correspond with American model builders. My address is 8 Ascot Drive, Remuera, S. E. 2, Auckland, New Zealand.

Winston B. Mackley.

Microfilm, being eight times lighter than tissue paper, is being used on more models every day. We would like to know if MM modelers would like to see an article on how to make and use microfilm. Send in your suggestions for articles at any time, as they are always welcome.

Few projects surpass midget racers in popularity with MM readers. A photo and letter from Abner A. Beyer, of East Greenville, Pa., describing his racer, was awarded a \$3 prize. He says:

Dear Editor:

Enclosed you will find a snapshot of the midget racer I built. It is 5 1/2 feet long, has a 45-inch wheel-base, and a 30-inch tread. Power is supplied by a 3/4-horsepower engine.



Fitted with tiny pontoons to permit takeoffs from water, this microfilm-covered model set a New Zealand flight record of 4 minutes, 46 4/5 seconds, reports builder Winston B. Mackley.

Modern Mechanix

Editor's Workbench



The tiny car has three speeds forward and one reverse. Its construction features a steel frame supported on four springs, the front ones being 18 inches long and the rear, 22 inches. (The driver is four years old.)

Abner A. Beyer.

We think most readers will agree with us when we say that Beyer's midget racer is an unusually fine one.

An award of \$3 was sent to Nicholas Stark, of New York, N. Y., for an interesting project photo and letter. Stark writes:

Dear Editor:

I am enclosing a photo of my powered scooter, designed and constructed by myself. It is 40 inches long and driven by a 3/4-horsepower washing machine motor.

The scooter is started by a good push and a speed of 25 m.p.h. is obtained. Low gas consumption makes the operating cost very reasonable.

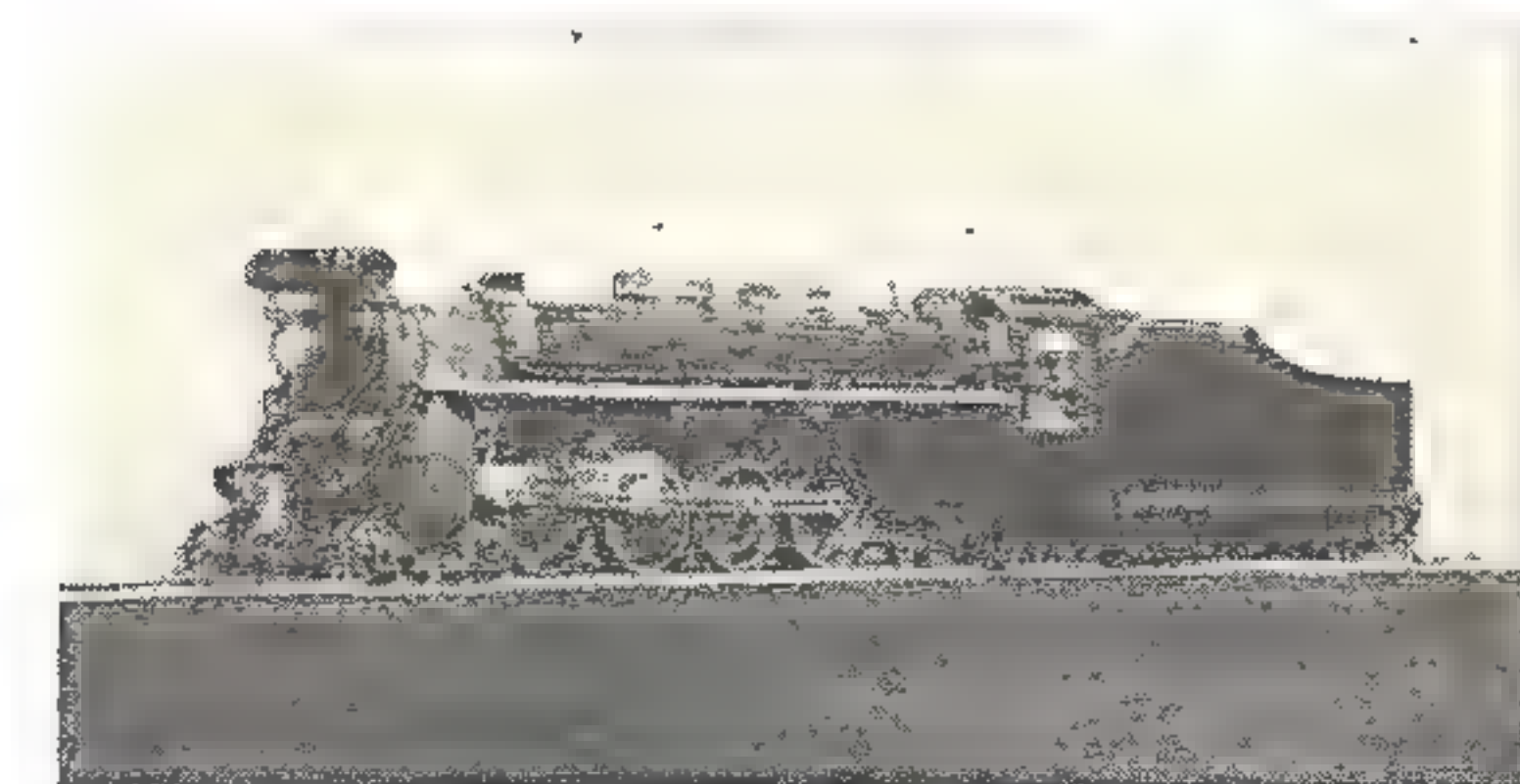
Nicholas Stark.

We'll bet that reader Stark is much envied by the neighborhood boys when he rolls up with his powered scooter. It certainly is a useful and pleasure-giving project.



Nicholas Stark with his home-built power scooter.

Model locomotive fans will be interested in a letter and photo from Bartlett Sissons, of Alberta, Canada, who was awarded a \$3 prize. The letter reads:



This model locomotive, built by Bartlett Sissons, is a perfect replica of its Canadian National Railways prototype.

Dear Editor:

I enclose a photo of a Canadian National locomotive model that I recently constructed. This model is run by a motor situated in the firebox and geared to the driving wheels. Your article on Midget Mike helped me very much in constructing this and other locomotive models.

Bartlett Sissons.

Sissons' model locomotive is a good looking job. Model railroaders who want to build a fascinating little locomotive should secure a copy of the latest "How To Build It" book and read the article on building Midget Mike.

Unless builders of model airplanes powered by miniature gasoline engines unite in their efforts to combat threatening legislation, they may find themselves in the same predicament as the home-built aircraft fans—banned from flying their creations. Several states have already banned gas-powered models, one state passing a ridiculous law requiring the builder to hold a real airplane pilot's license before he can launch his model!

We strongly urge every airplane model builder to protest laws that would ban the flying of gas-powered models and request that you file your letter of protest with the editors of MM who will co-operate with aviation editors and organizations preparing to wage "war" on the proponents of legislation that would be detrimental to the hobby of flying gas-powered models.

Although this year's boating season is well over, we know that many MM boat fans will find a [Continued on page 31]



Midget racer fans will be quick to acknowledge that this speedster, built by Abner A. Beyer, is one of the finest ever shown in MM pages. The "driver" is four years old.

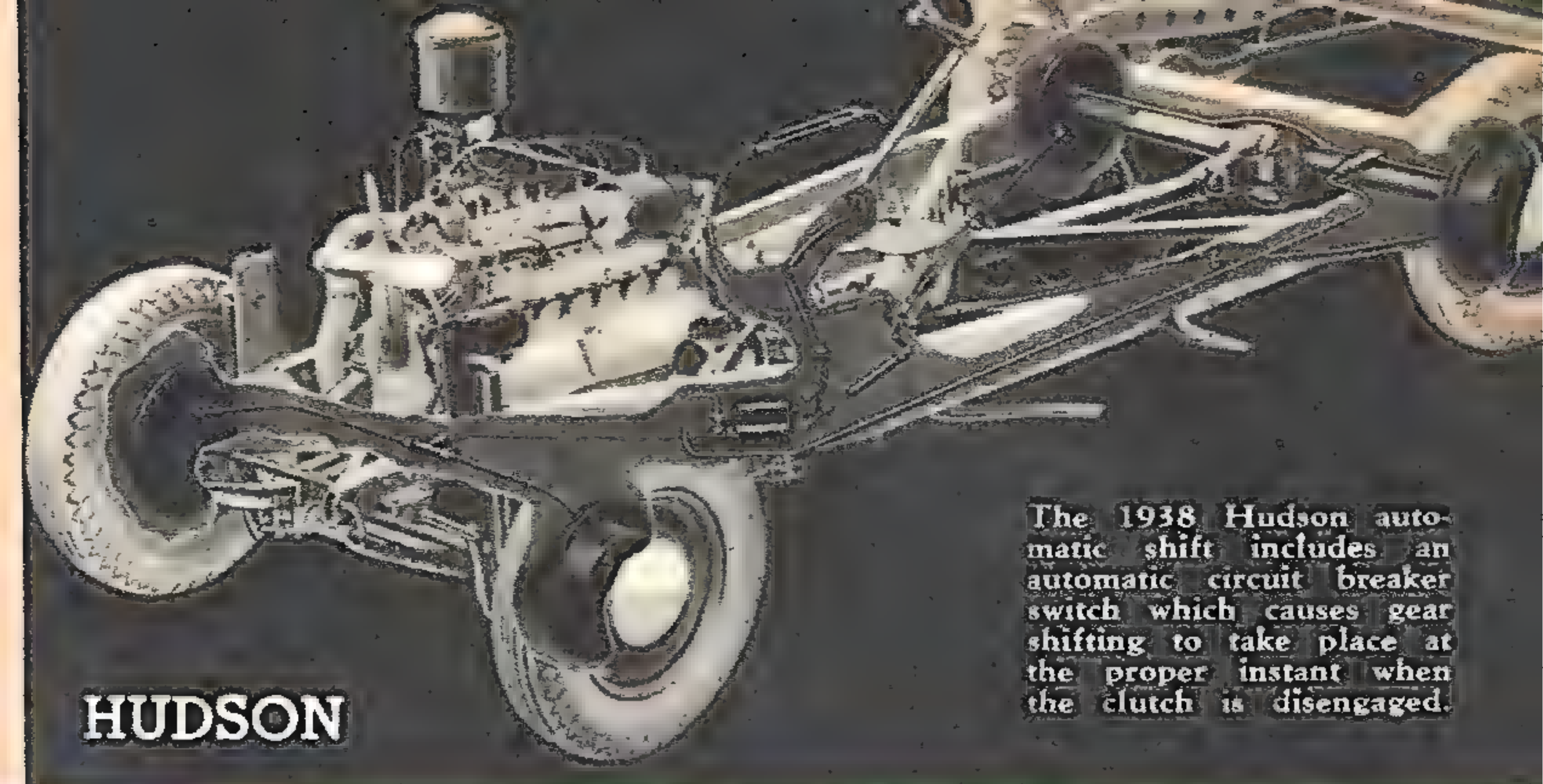
December, 1937



CHEVROLET

Driving effort is greatly reduced, and control over the car is increased, by the new "Tiptoe-Matic" clutch introduced in the 1938 Chevrolets. The makers claim that 25% less effort is required to operate this clutch than in the 1937 model. The mechanism needs no lubrication throughout the life of the car. A new type of hand brake is also a feature. This has a hinged top, and is easy and positive in operation. Chevrolet remains a six-cylinder car, the valve-in-head engine being brought up-to-date with many small improvements. In the Master series fully-enclosed knee-action is also retained. Unusually roomy interiors give the new Chevrolets increased comfort and utility. Photo at left shows the unusually capacious trunk, which also contains the spare tire.

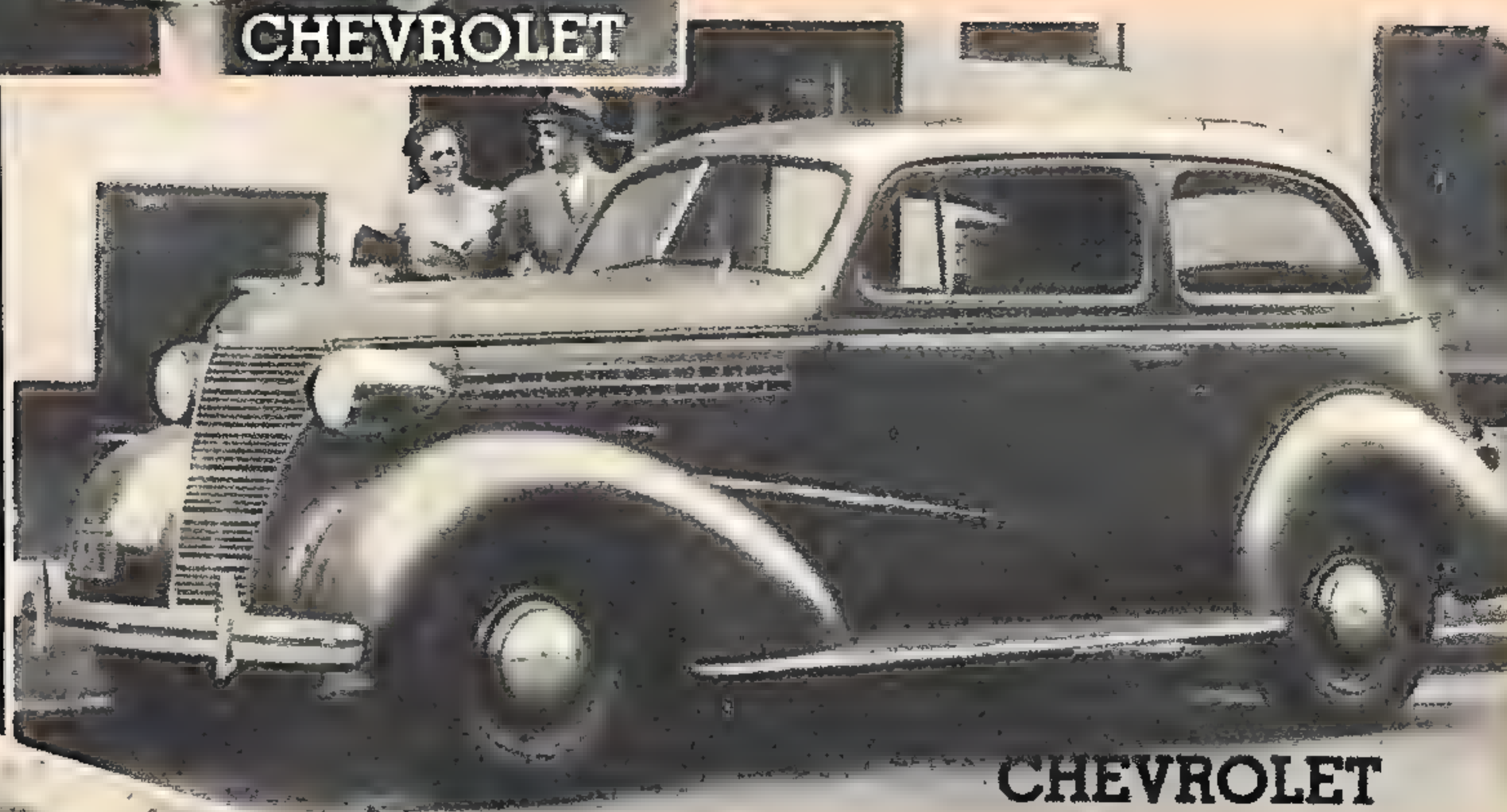
A cut-away view of Hudson's powerful duo-automatic hydraulic braking system with the "double safety" feature of an emergency mechanical brake linkage operating from the same foot pedal. This feature enables the driver to retain control over the car even after the hydraulic system has been disconnected, by continuing to press on the pedal until the emergency rotary-equalized mechanical brakes take hold. The complete Hudson line consists of an eight-cylinder car made on both 129 and 122-inch wheelbases, a six on 122-inch wheelbase, and the Hudson Terraplane on a 117-inch wheelbase.



HUDSON

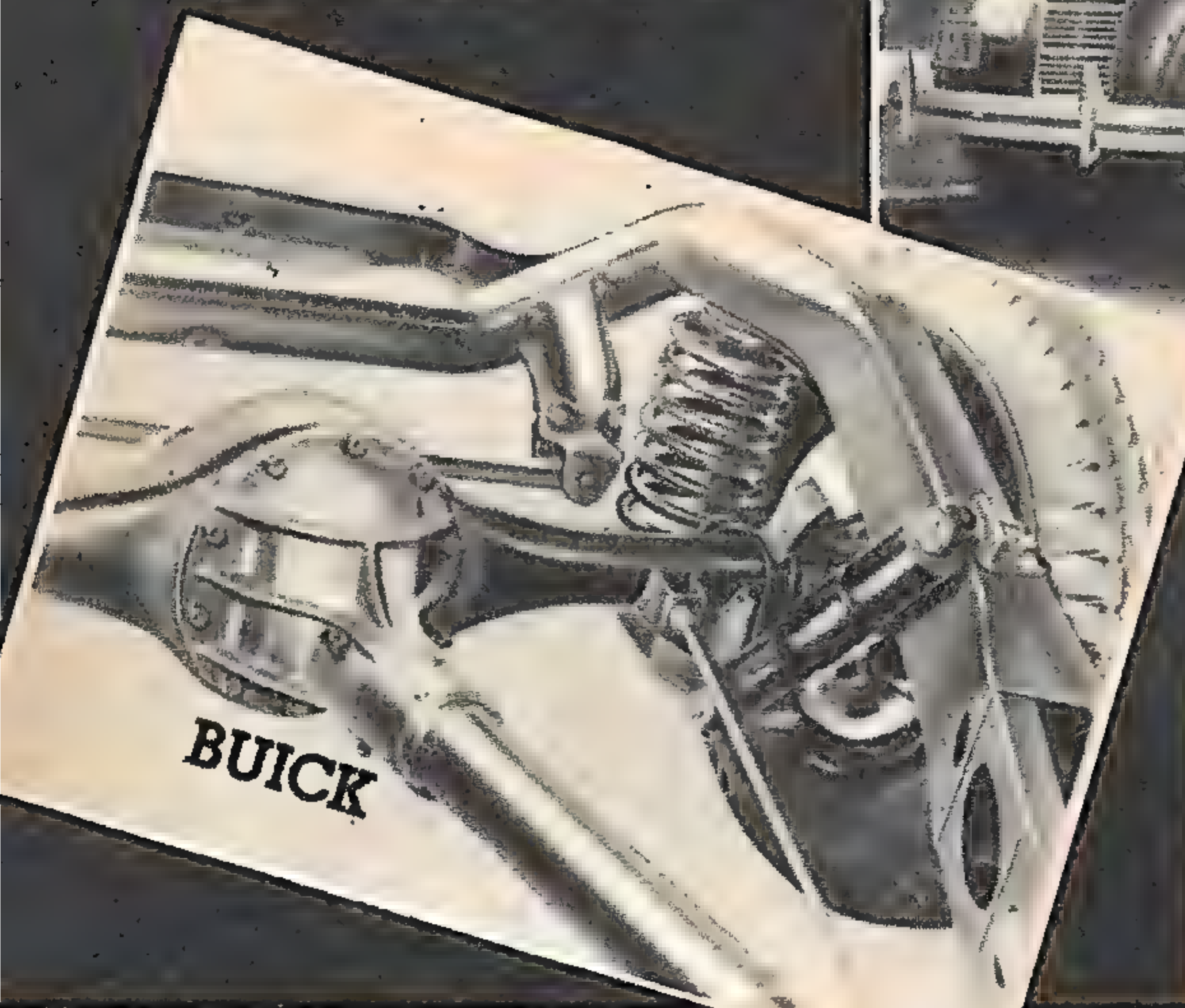
The 1938 Hudson automatic shift includes an automatic circuit breaker switch which causes gear shifting to take place at the proper instant when the clutch is disengaged.

Coil spring rear suspension is an exclusive Buick feature for 1938. Combined with airplane type shock absorbers, this provides greatly improved riding and steering qualities. Photo below shows spring and shock absorber hook-up on right rear wheel of Buick chassis. Size and thickness of spring may be judged by comparison with tire.

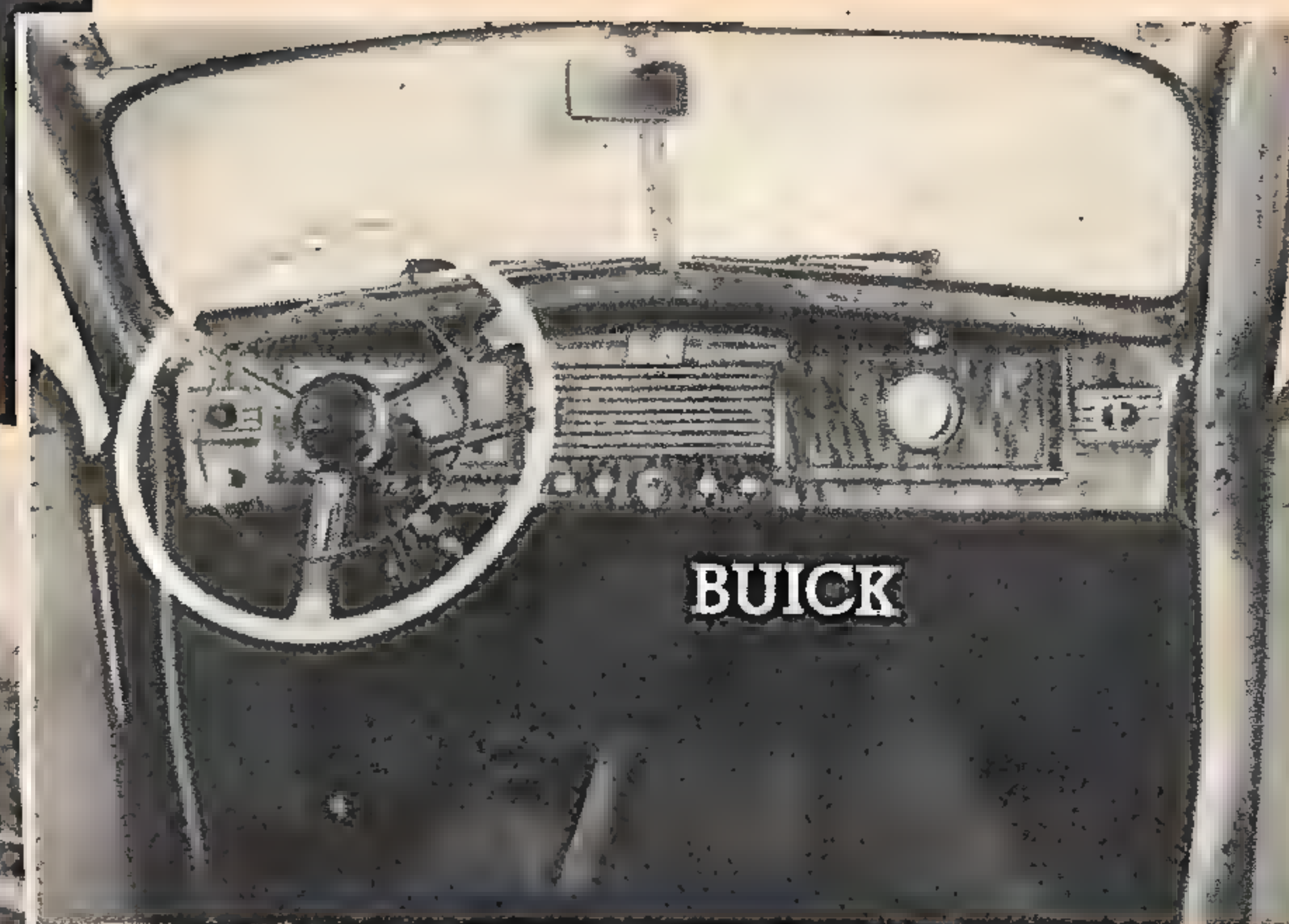


CHEVROLET

This is the master deluxe coach of the Chevrolet 1938 line. The new styling is especially evident in radiator and hood. No-draft ventilation, all-steel bodies and safety glass continue as standard features.



BUICK



BUICK

Above: Buick's self-shifting transmission has the control arm on the steering post under the wheel at the right. Photo shows the completely cleared driver's compartment. Hand brake is under cowl at extreme left. Left photo: The Buick hood lifts from the molding line, providing for quick and convenient "light" service. Hood side panels are stationary, lending strength to the entire front end sheet metal assembly. Radiator grilles are die-cast.

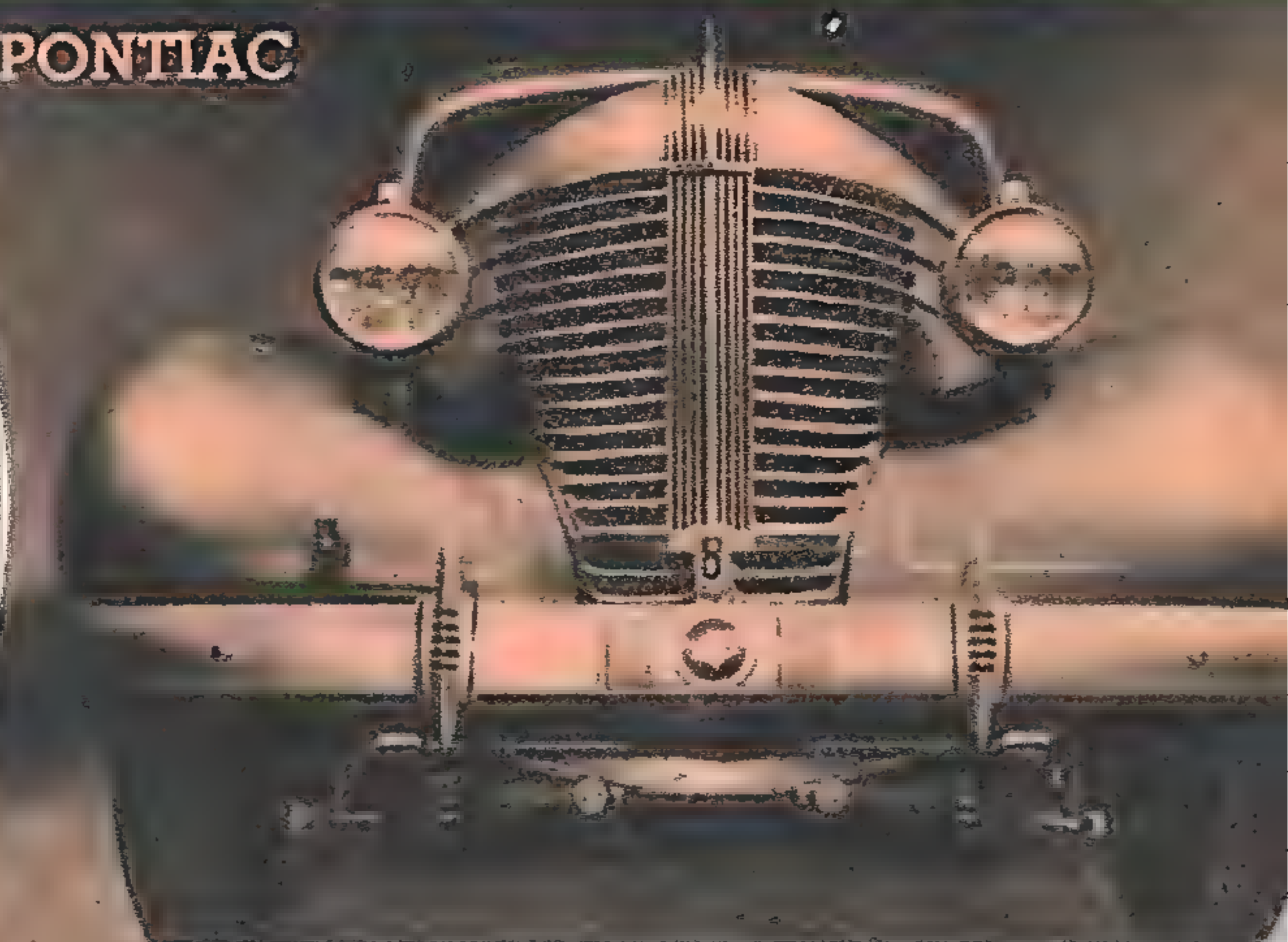


BUICK



PONTIAC

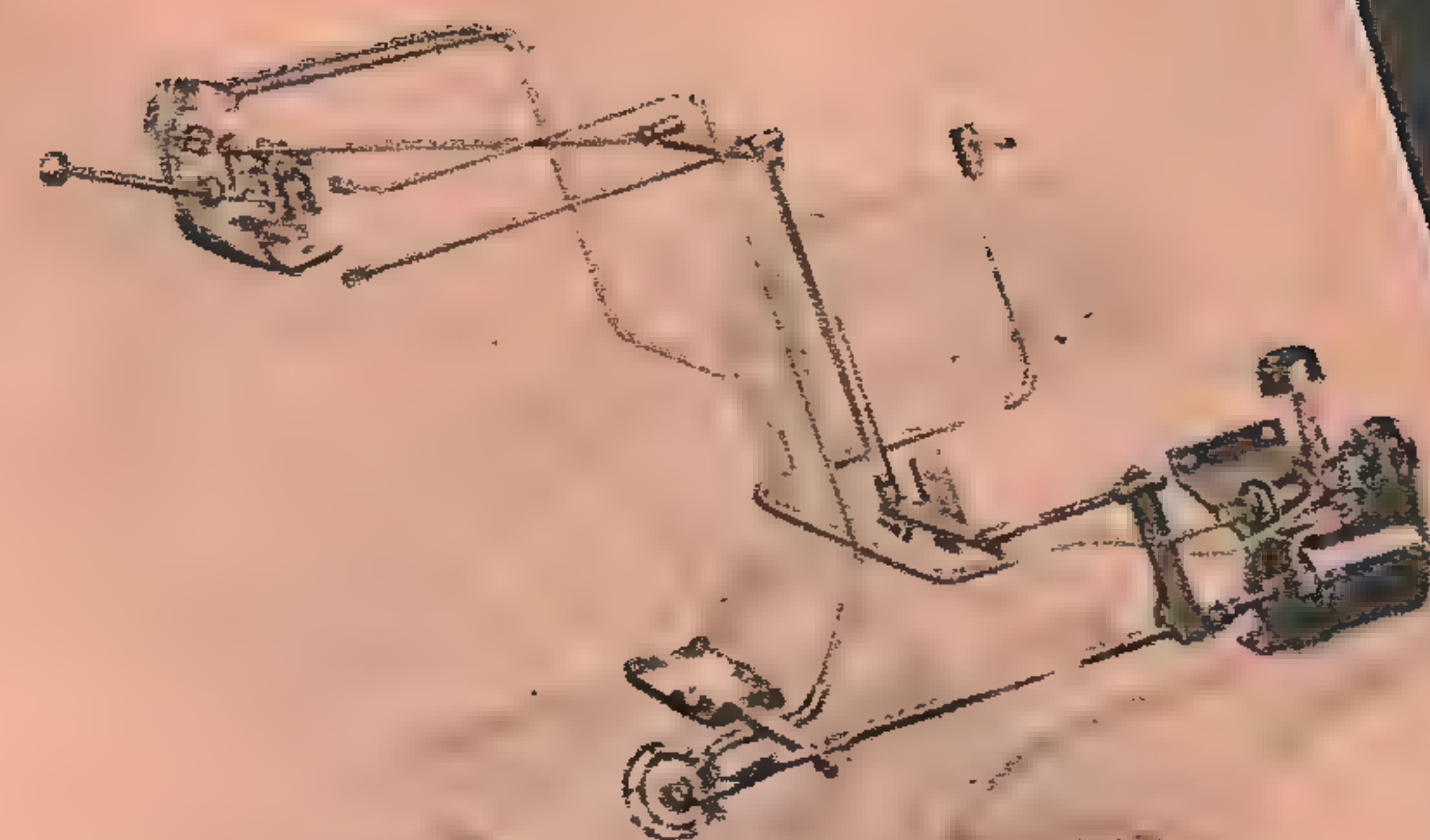
PONTIAC



Above—The interior of the 1938 Pontiac. The safety-shift remote control gear lever is shown directly below the deluxe type steering wheel. Instrument panel with accessory electric clock can be seen. Right—The Silver Streak radiator and hood grille of the new Pontiac. No other style motif has been so characteristic of Pontiac since its introduction four years ago. Note the parking lights integral with the headlamps.



NASH

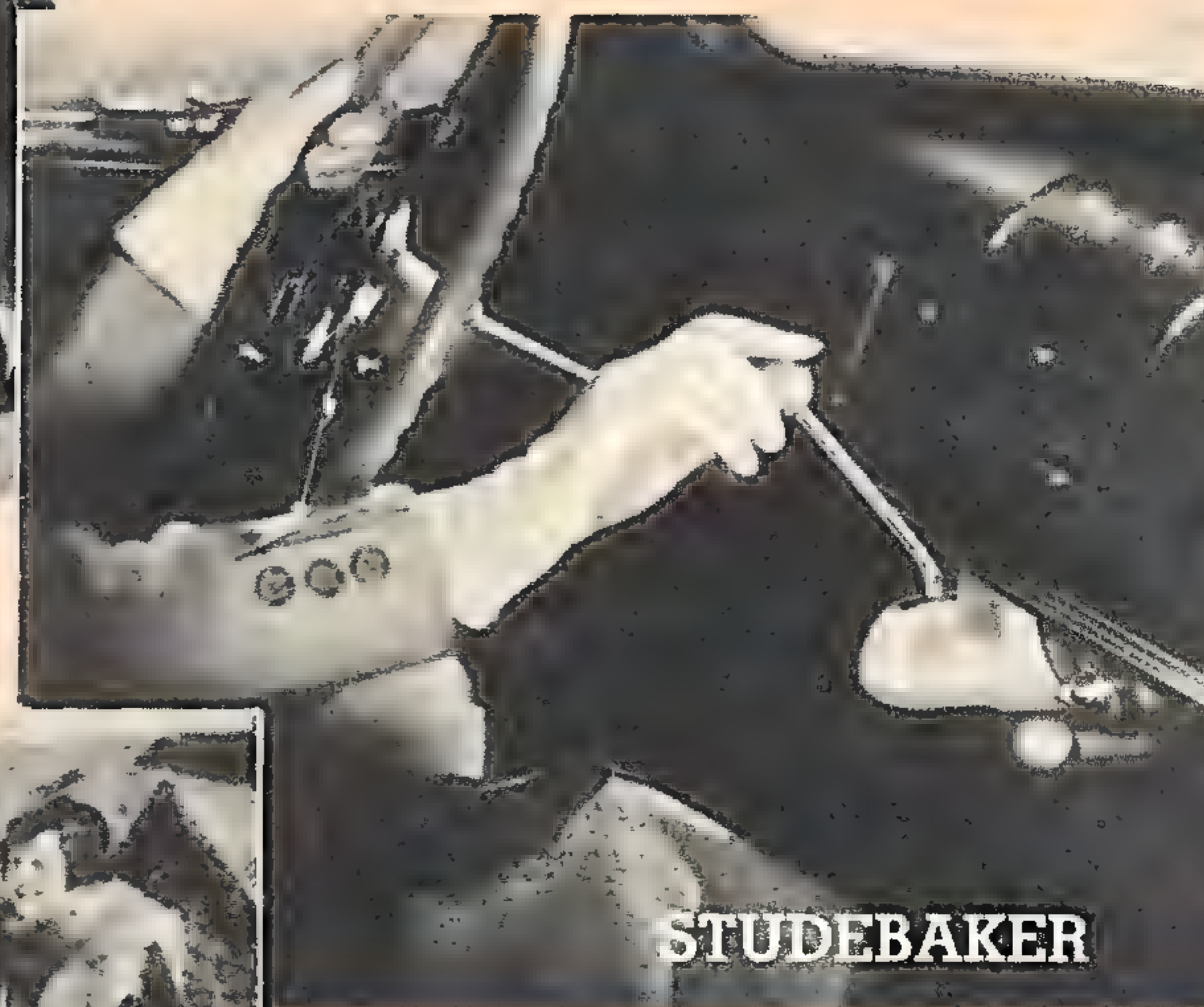


NASH

Left—Its steering control lever located conveniently near the rim of the steering wheel, affording finger tip control, Nash's new vacuum gear-shifting system is shown here in diagrammatic detail. Above—The instrument panel of the new Nash. The air conditioning unit is shown just below the gear shift lever. This device supplies an abundance of warmed, conditioned air for winter driving.

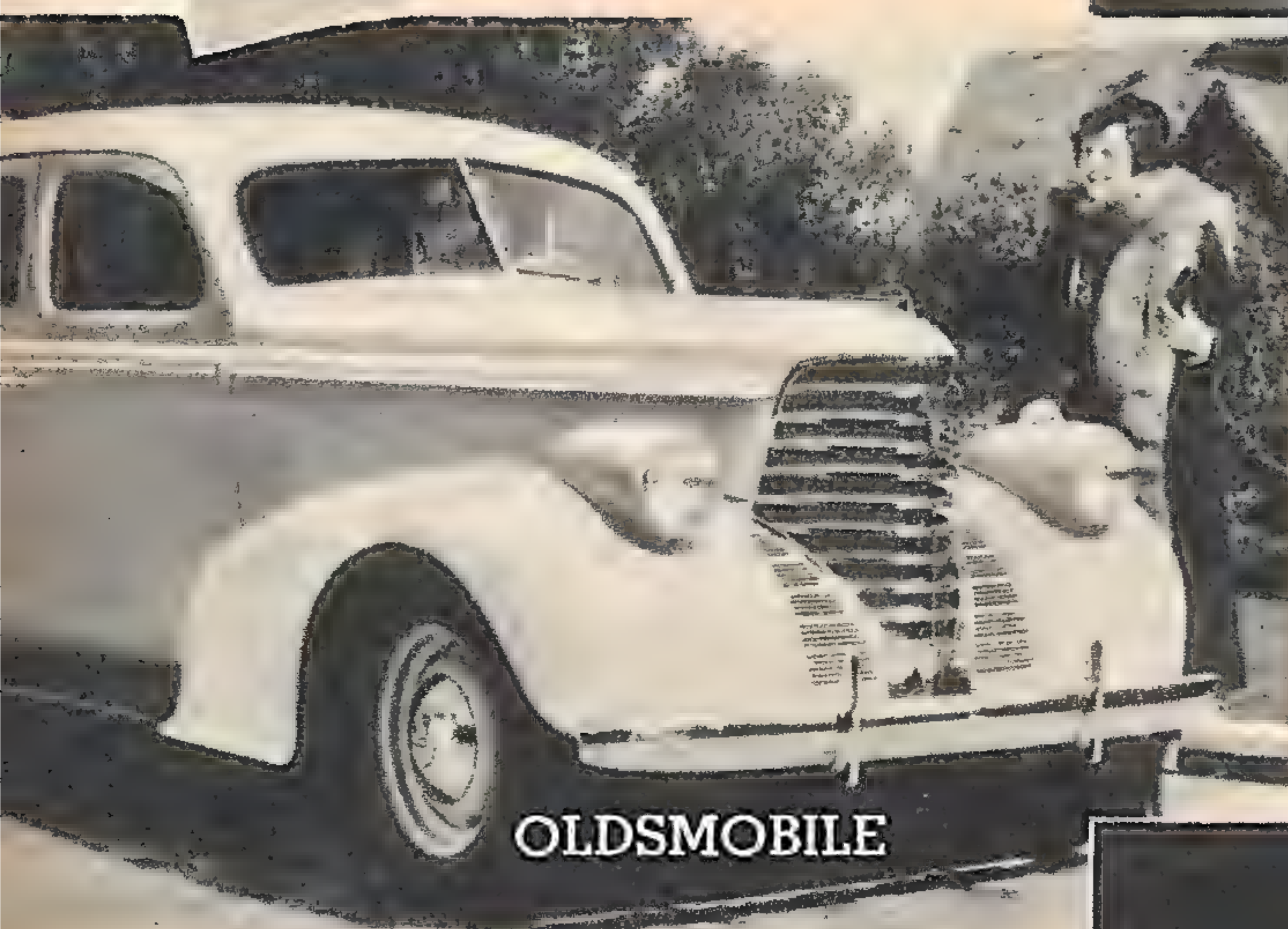


Looking at the 1938 Studebaker (left) from the front, one sees streamlined headlamps faired into the broad steel fenders of the various models. The frames, chassis and bodies are entirely new. The bodies are approximately six inches wider than last year's models, providing 55½ inches front seat and 47½ inches rear seat room. Frames are lighter and feature increased overall torsional rigidity.

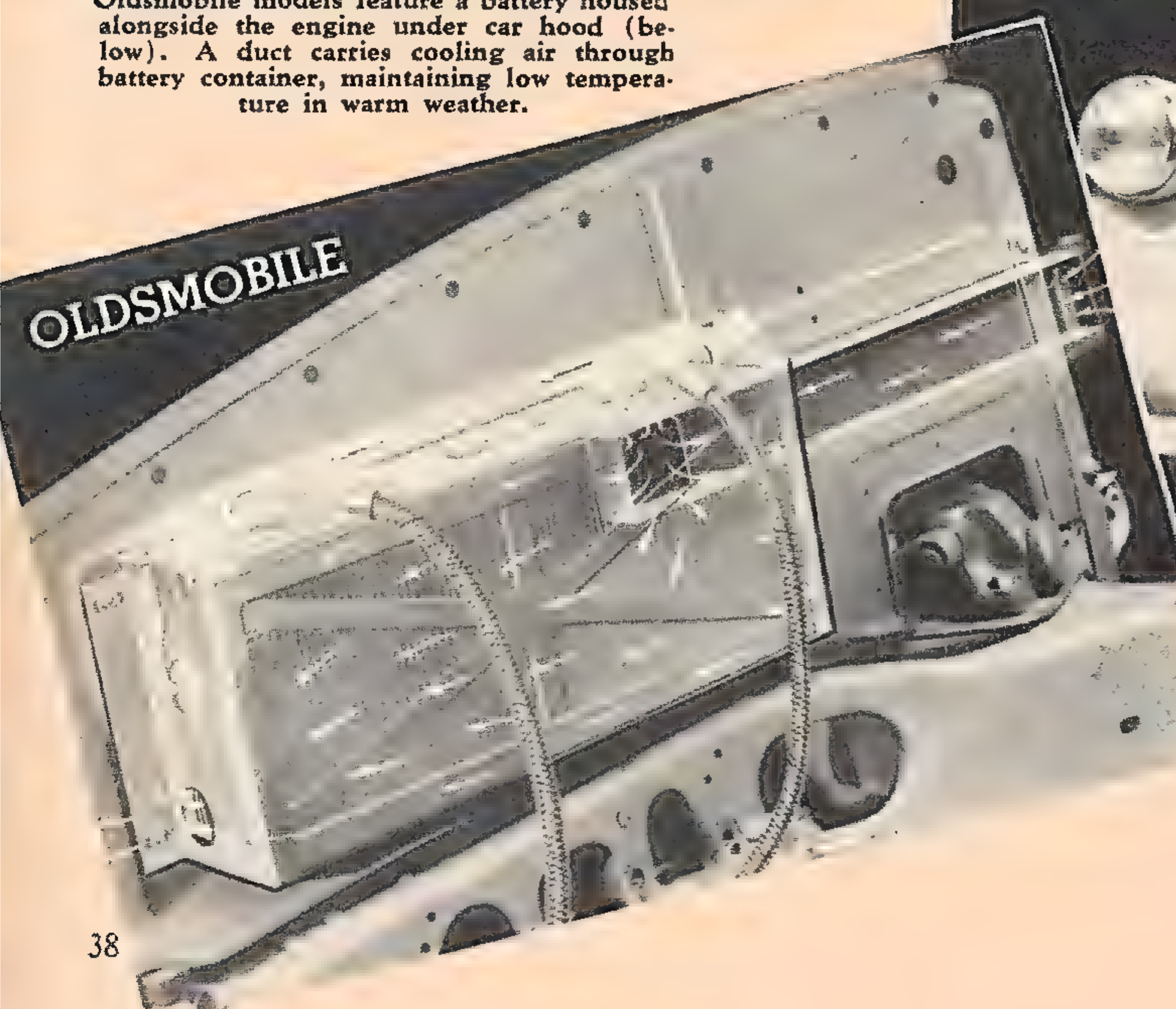


The vacuum gear shift featured by 1938 Studebaker models utilizes the engine manifold vacuum to actuate the transmission gear changes. A small shift lever (above), five inches long, extends from dashboard, leaving the floor free for passengers' feet.

Body lines of the 1938 Oldsmobiles are lower and cleaner, as shown at left. Bullet-type headlamps are demountable for economy's sake in case of fender damage. All models are available with safety transmission, requiring use of clutch only when starting and stopping.

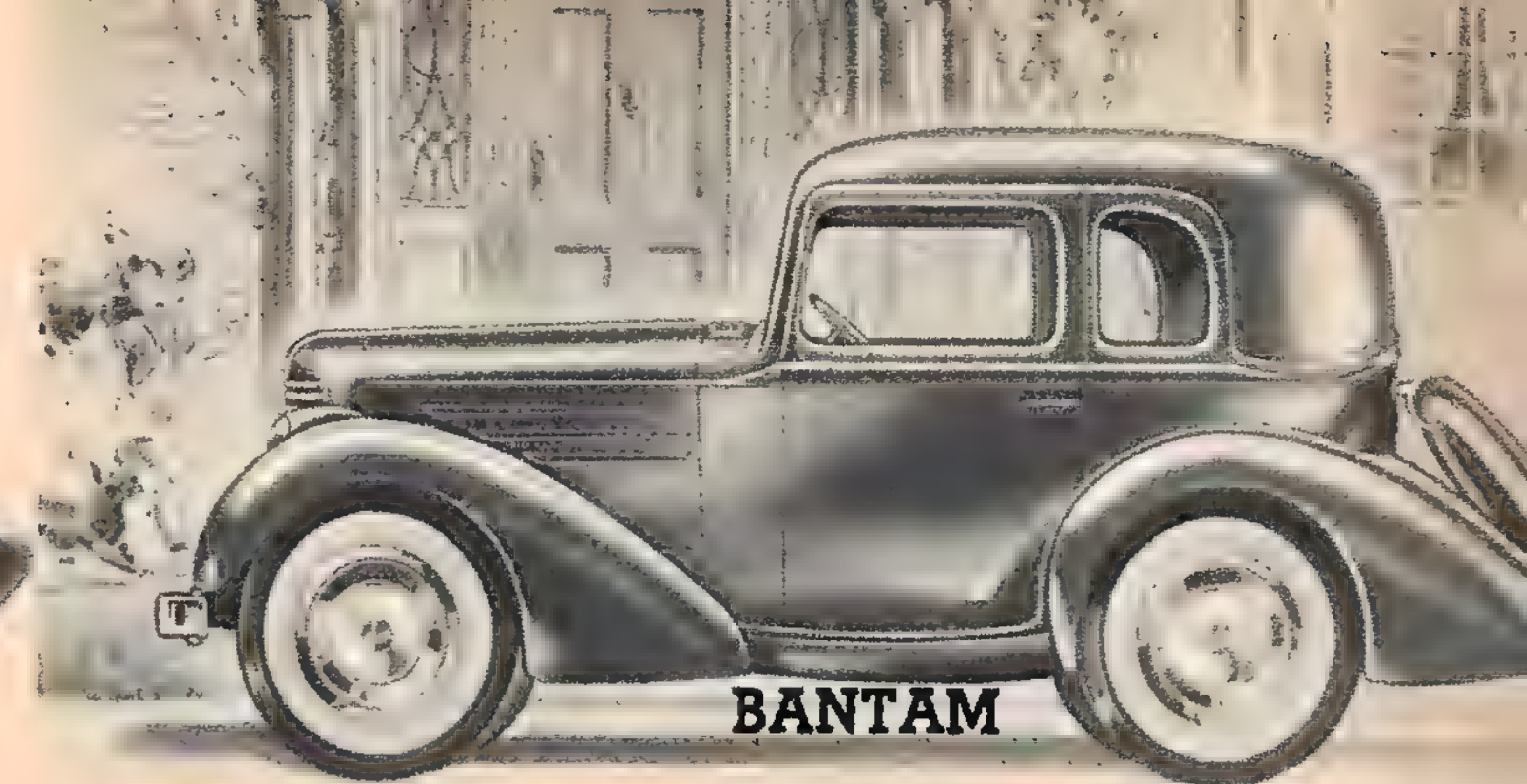


Oldsmobile models feature a battery housed alongside the engine under car hood (below). A duct carries cooling air through battery container, maintaining low temperature in warm weather.

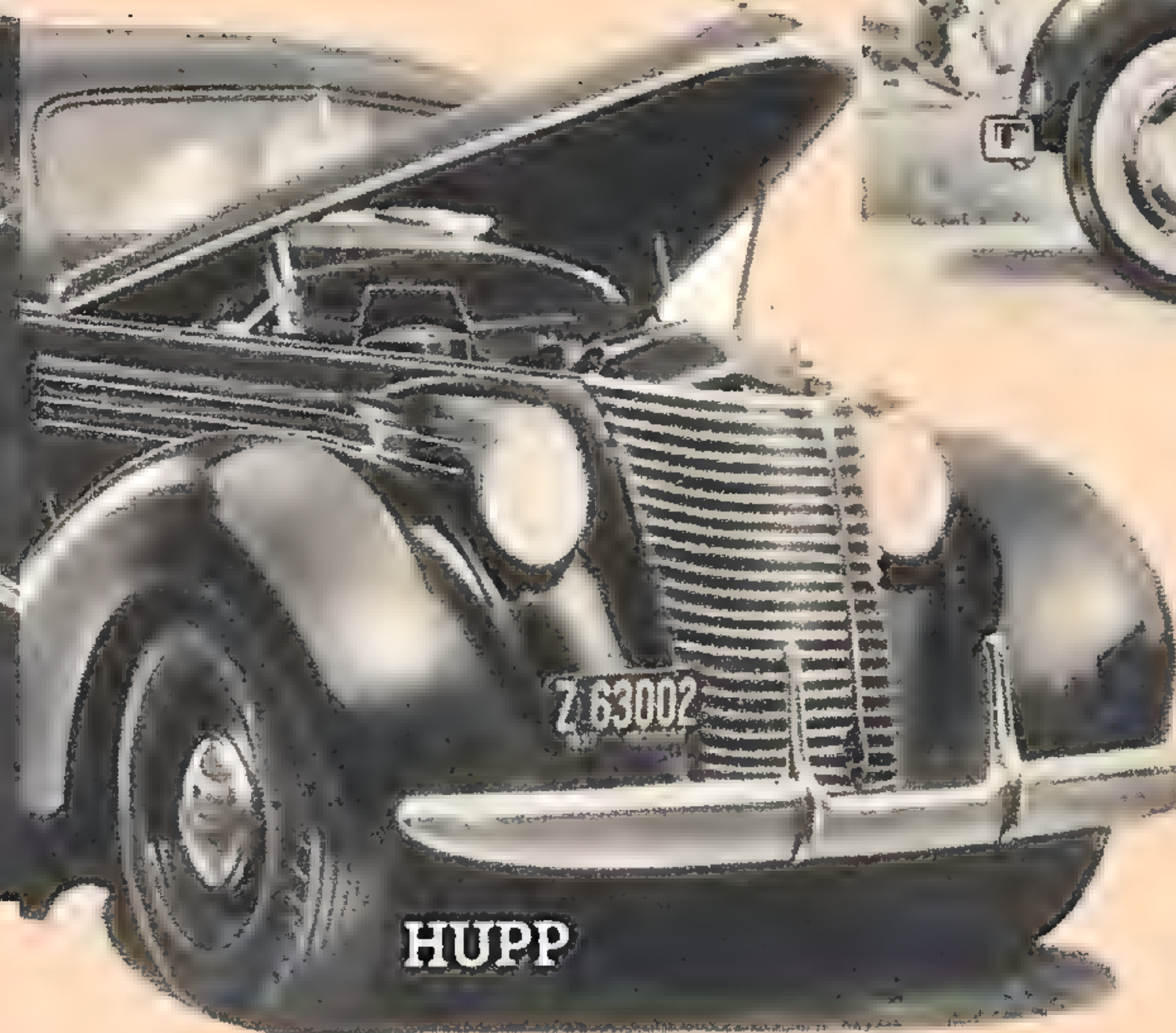


De Soto's distinctive new "face" (above) features a radiator grille made of horizontal die-cast chromium bars. A new frame, wider and deeper than before; bigger, more powerful hydraulic brakes and a new rubber-insulated steering set-up that isolates road shock from the wheel are the highlight features of the many mechanical improvements in the 1938 models.

Successor to the Austin is the new American Bantam, selling at prices from \$75 to \$125 below any other car in the low-price field. Shown at right is the 1938 Bantam "60" coupe, powered by a 4-cylinder, 20 h. p. motor suspended on live rubber. Performance claims include speeds of 60 m. p. h., 60 miles to the gallon of gas and an operating cost of ¾-cent per mile. In addition to the coupe, the manufacturers announce a complete series of "60" models.

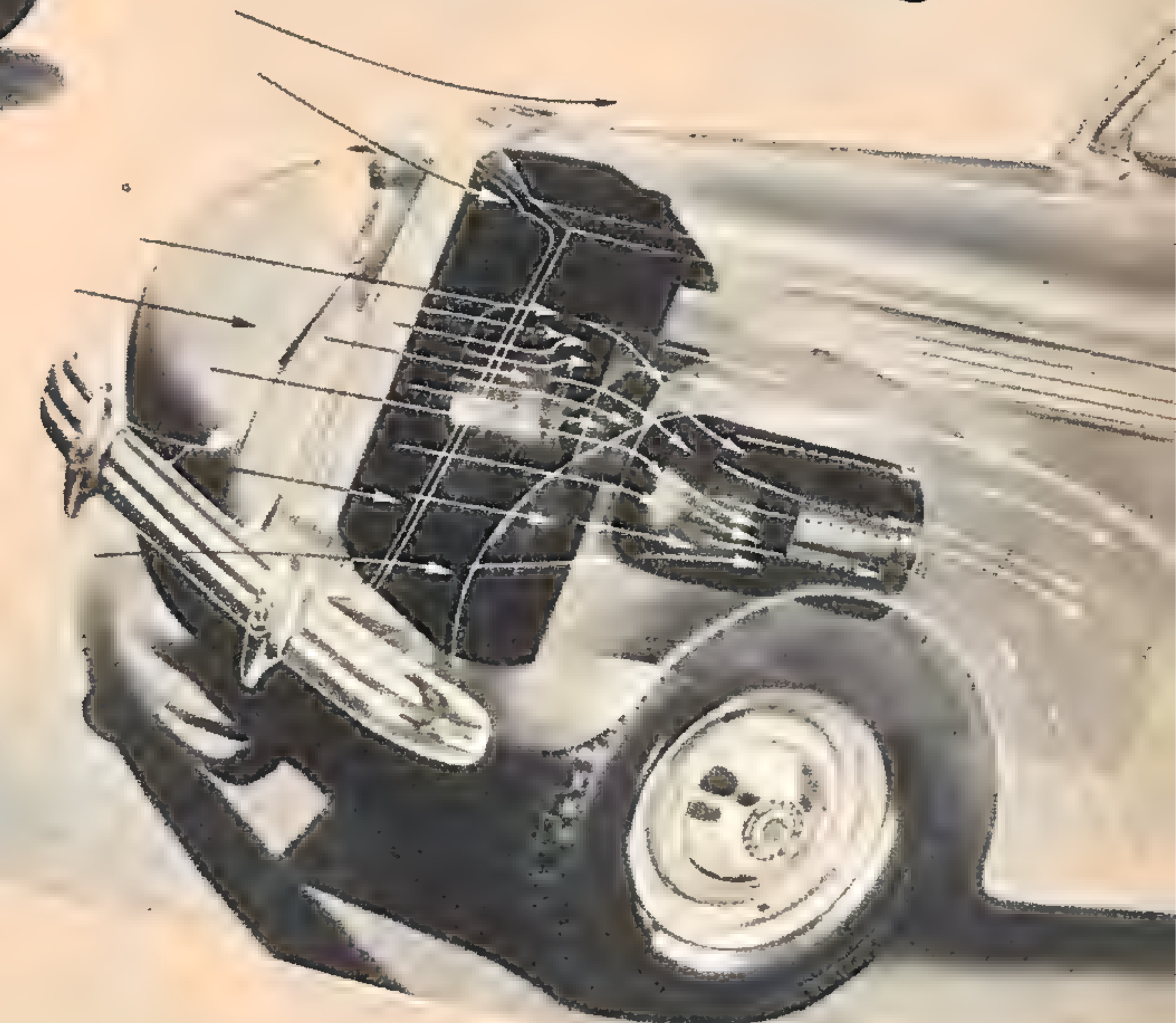


Below—All four models of the 1938 Packard incorporate scores of new details. One novel feature is the expulsion of engine heat through louvers located under the front fender skirts. The outstanding feature of the new "Junior" series is a revolutionary type of rear spring suspension.

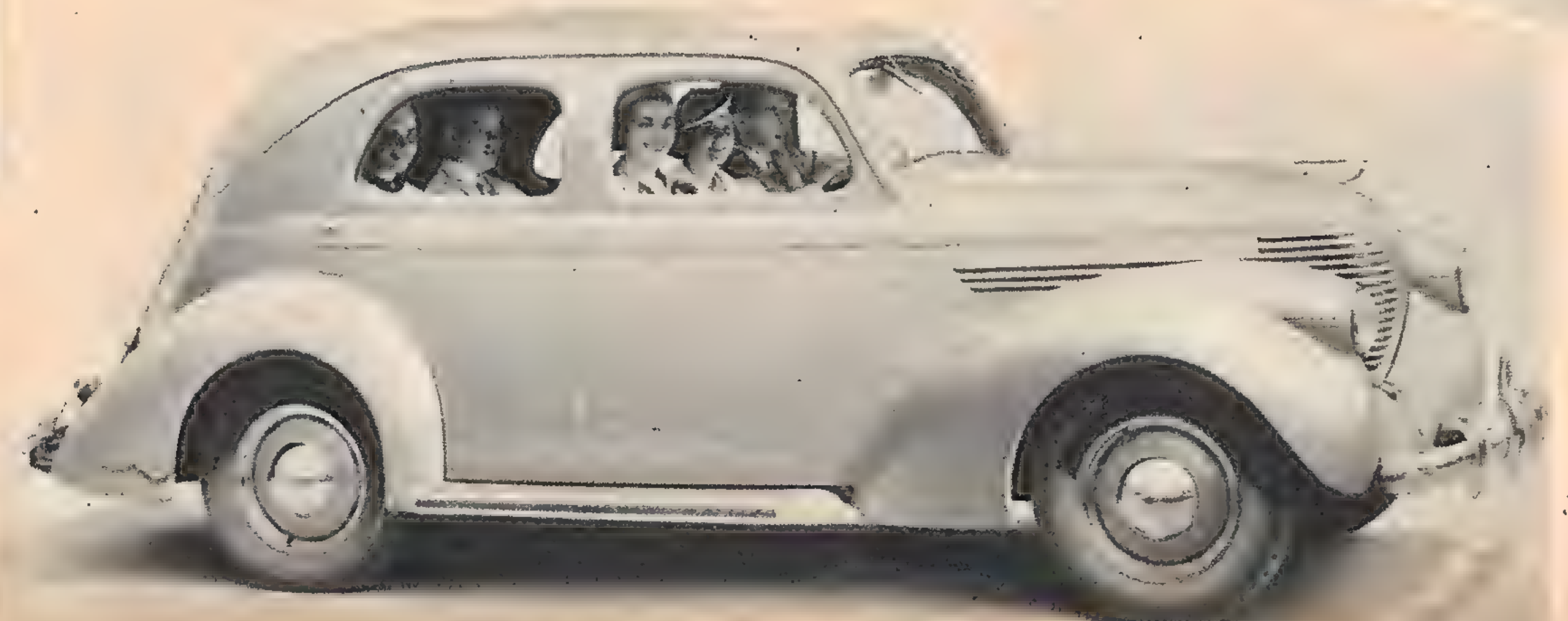


The new Hupmobile series includes two models, a six and eight, powered by an L-head engine. Both models provide greater body width and length. A distinctive radiator grille design gives both models a dynamic head-on appearance. Radiator decoration serves as handle to permit access to motor. Headlights are built into the hood.

Below—The new Willys Sedan for 1938 features a patented all-steel body and top, 178-inch overall length, safety type duo-servo brakes, improved steering and safety glass. The power plant is a Willys-built 4-cylinder engine providing economical operation up to 35 miles to the gallon of gas. Two models, a 5-passenger sedan and 3-passenger coupe, are available in a wide range of colors.



WILLYS





Few persons could tell whether this is a real or staged war scene, so realistic does it appear to the camera.

FILMING A MOVIE WAR



A swinging boom (above) enables the cameraman to secure an action "shot" of soldiers marching from a trench. Left—Even movie "wars are hell" agree actors John King and "Slim" Summerville, warming their hands between scenes of the photoplay "The Road Back."

by Earl Theisen

No expense or detail is spared to make battle scenes realistic.

BURSTING bombs failed to stop scores of German soldiers charging across the scarred battlefield under cover of night. The ground was rent by machine-gun bullets. Soldiers dropped hopelessly in barbed wire entanglements.

It was the World War all over again for many American Legion men and ex-German soldiers acting as extras during the filming of *The Road Back*. Every exploding shell and spattering of machine gun fire brought back memories of war's deadliness. But this was a movie war—nobody was being killed! Hollywood's explosive experts, through years of experience, have developed tricks that make acting in a movie war safer than crossing a busy highway.

The script called for a night scene in the

trenches in November, 1918, shortly before the Armistice was signed. It was bitter cold in France then. Universal Studio's special effects department had little difficulty obtaining this impression, as the spring nights, when the battle sequences were shot, were extremely cold for California. The air was frosty and smudge pots blazed in orange groves nearby. But there was no snow such as blew over the Western Front in November, 1918. To accomplish this desired effect studio workmen simply sprayed white paint over the ground.

Several acres on the studio's back lot was marked off for the battlefield. Official U. S. Signal Corps photos were scanned in order to get authentic detail into the battlefield set. A huge sky drop was built in the background, across the width of the battlefield. The sky drop consisted of a wooden scaffolding, some forty feet high, from which a great canvas curtain was hung. Painters were busy for several days spraying on "clouds." This gave

the effect that the war ground's horizon was several miles away.

Twelve pieces of digging equipment—tractors, scrapers, and steam shovels, were required to dig trenches, grade the battlefield and to give it that shot-to-pieces appearance. Each day, after the night war episodes were shot, workmen would dig up the ground and sprinkle it with water to make the mire deep for the coming night. Realism of the first order.

Real war is costly. So is a movie war! Thousands of rounds of blank ammunition for the 8 mm Mauser rifles were fired. One thousand pounds of black powder, five hundred pounds of dynamite, and 2,000 detonating caps went up in smoke for the combat scenes. Four hundred parachute-flares and seven hundred night flares were consumed during night film warfare.



Workers prepare a shell-blasted farmhouse (center right) which will collapse in a later scene, while explosive experts (right) prepare a smoke bomb to provide thrilling action for the same scene.



It requires a combination of practical science and infinite patience to record a movie war. In the photo above, a sound man is shown at his control board. The horn is part of a loud-speaker system used by directors to address the movie army before it goes into "battle." Right—Spraying on a "sky" backdrop.



Over a hundred gallons of liquid smoke, the preparation, ingredients and manufacturing processes of which are a carefully guarded military secret, were employed in the battle scenes. Navy planes use this liquid smoke to hide ships during maneuvers.

Two "inventions" were worked out in the battle sequences. Ground oyster shells were found to give a better photographic reproduction of dust, in shell-explosions, than dust itself. And by balancing the charcoal content in black-powder bombs, greater photographic value was given to explosions.

Months of research must go into a war film before the cameras begin to roll. Hundreds of historic photos must be studied by the technical department. The wardrobe department must correctly tailor the exact type of uniform worn by a certain regiment at a certain time. The studio arsenal must be sure to supply the correct rifle model. More care must be taken for carefully depicting recent wars than those of a century ago, as many veterans are film fans.

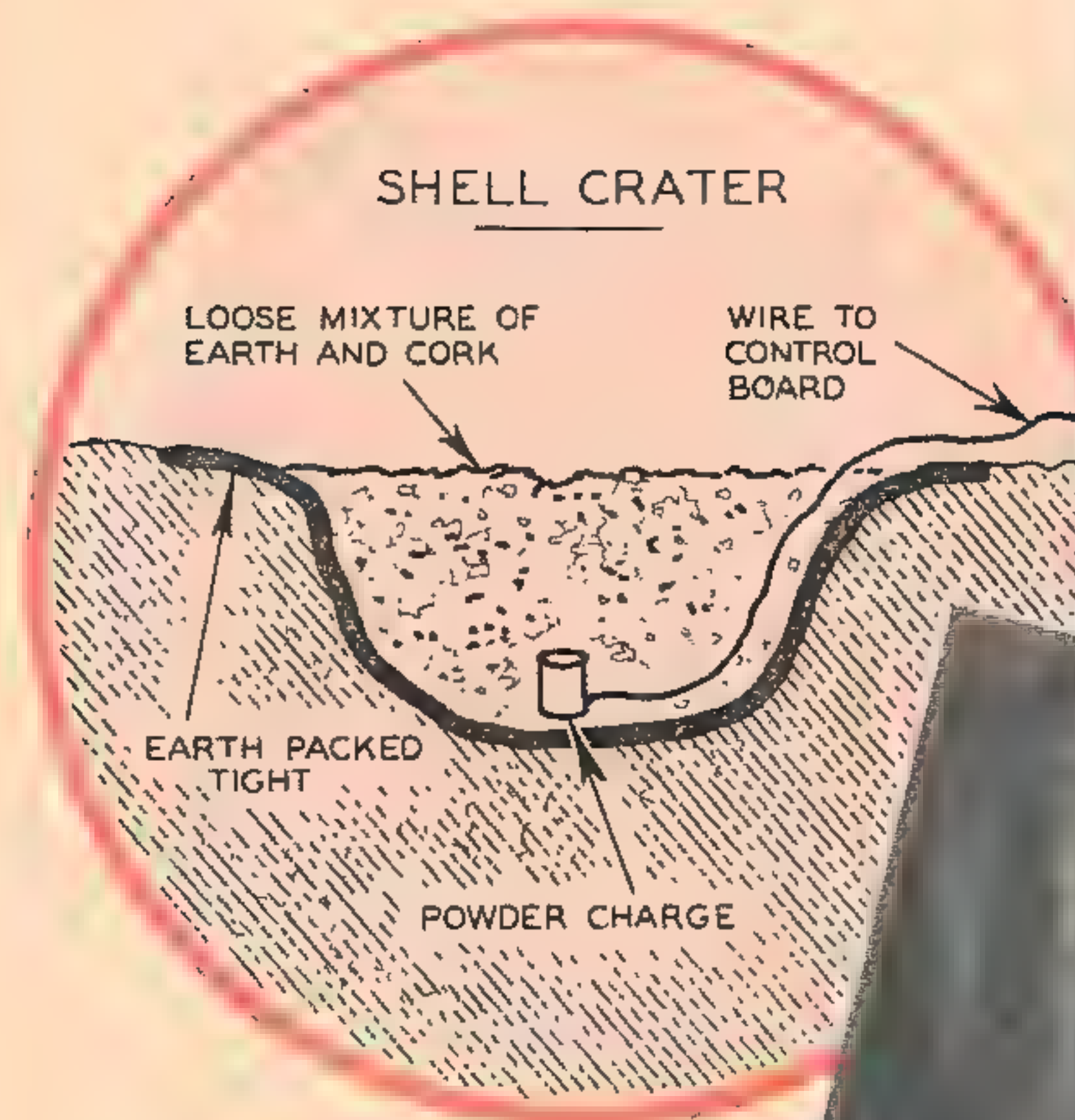
Ralph Morgan, head of Universal's special effects department, who has worked on many war films, including *The Big Parade*, tells how one of the war illusions is achieved:

"To get the effect of a shell striking the

ground and exploding we first dig the shell hole. The shell crater is dug in hard earth. The earth on the sides of the hole is tightly packed. Next the explosives man plants his powder charge in the center of the crater in such a way that it will blow straight upward. Then into the shell hole is sifted a mixture of earth and cork until it is even with the rest of the terrain.

"A wire connects this prepared hole with the head explosive expert's control board. These shell holes are often marked by an odd clod of dirt, an old gun carriage wheel or a fake stump. Sometimes the danger spot is dabbed with a bit of paint that will not show in the film. The players, who have previously been coached by the director and his assistants, will avoid passing directly over these shell explosives. A shower of soft earth and ground cork will be the only discomfort actors who pass near these shell hole explosions will suffer."

When you see a performer being blown skyward by an explosion you can be certain it's a dummy. The dummy is usually made from rubber. Often an actual life cast of the actor the dummy is supposed to represent is made from rubber. This type dummy is more realistic than those formerly



The method used to prepare ground to get the effect of a shell striking and exploding, leaving a gaping shell crater, is sketched above. The crater is dug in hard earth, the sides of the hole being tightly packed. Next, a measured powder charge is planted in the crater and covered with a loose mixture of earth and cork. A wire connects the powder charge to the explosive expert's control board located directly behind the scenes.

used, which were stuffed with sawdust.

The effects of bullets striking are obtained by two different methods. The usual system is to fire away with the rifle or machine-gun at the top of an entrenchment or building while the camera is safely located at one side filming the hits. Special care must be taken that bullets do not ricochet. This stunt is used when actors are not in the scene.

To get the effect of bullets striking near players in trenches, tiny powder charges are embedded in the dust. These explosives have about the same power as toy torpedoes youngsters throw on the Fourth of July. In fact some explosives men have used torpedoes for this effect. A thin wire is attached to each charge and to a control board. As a man presses the control board buttons the small explosives go off, giving the effect of



In filming "The Road Back," the script called for snow flurries such as blew over the Western Front on Armistice Day, 1918, so studio workers sprayed white paint over the ground and trenches to create the proper background effect.

a bullet biting the dust. The action of machine-gun bullets striking can be had by firing a series of these minute explosives in a row, all within a few seconds.

A new trick was used in *The Road Back* to get the realization of a French bullet crashing a mirror in front of "Slim" Summerville,

[Continued on page 122]

WHY

Iceboats Quadruple The Wind's Speed!

The cockpits of modern iceboats are designed not only for speed but for comfort as well. The two-place iceboat shown below possesses both of these vital features.

The speed of an iceboat depends to a large extent upon its construction. Hollow oval-shaped or streamlined masts and tear-drop runner planks should be incorporated in the design of a speed craft.

SAILING four times faster than the wind is a remarkable phenomenon alien to every other wind-driven vehicle but iceboats. Early craft, that only doubled the velocity of the wind, established the time-honored question, "Why do icecraft outpace the wind?"

Improvements based on scientific development increased the speed ratio to 3 to 1. Today, ultra-modern ice-fliers achieve the

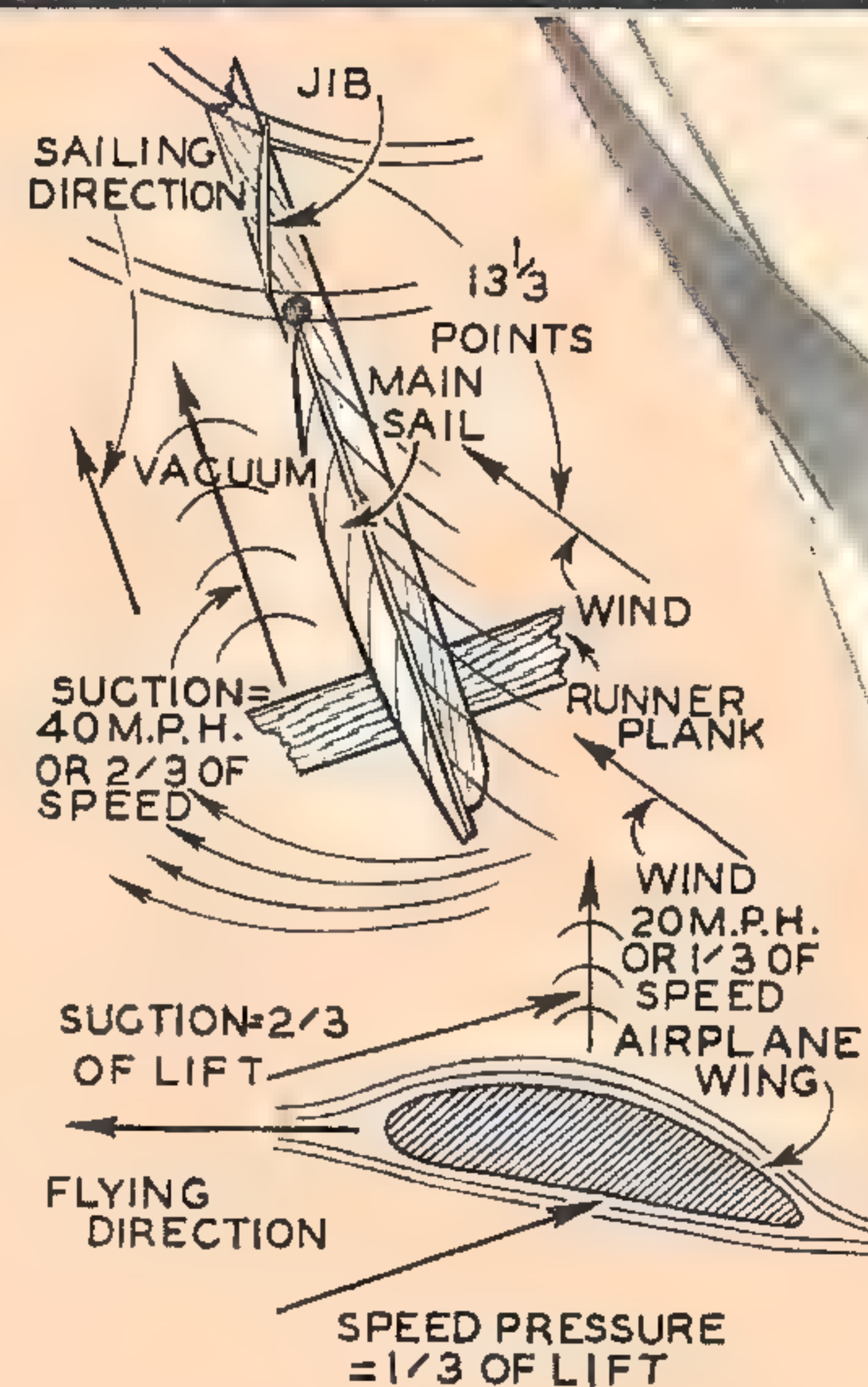
4 to 1 ratio with greater frequency than the question is answered.

Unless wind and ice conditions are favorable, relatively high speeds on ice are not obtainable. On smooth ice, a 10-mile breeze will propel a light-weather craft 40-miles an hour. Let's see what causes this phenomenon.

To avoid complicated problems in physics and mathematics, a simple factor in aeronautics will illustrate the forces that contribute to iceboat speed. The wing of an airplane appropriately compares to sails. The curved top surface of an airplane wing has the sole purpose of creating suction, or lifting power, to hold the ship aloft. The greater the curvature, the greater the lifting power, while flying. It may be surprising to know that two-thirds of the total lift of the wings comes from top-surface suction and only one-third from the pressure brought to bear against the tilted bottom surface by flying speed.

Similar factors are manifest in iceboat sailing. As the wind strikes the sail, it bellies. The curvature resulting on the lee side corresponds to that of the airplane wing's upper side. An efficient non-porous sail protects a vacuum behind it, while the wind is blowing.

The presence of the vacuum can be determined by holding a match close behind the



The iceboat sail compares with the lifting surface of an airplane wing, as shown in the above detail. Like the airplane top wing surface, two-thirds of the lift or pull on the sail is developed on the bellied side.

sail, even while the craft is standing still, with sail filled. For lack of air, the match will go out. Hold another match farther from the sail, protected by the wind, and the flame will be drawn outward by the suction.

While under way, the vacuum causes a terrific suction behind the sail with a pull greater than the wind's actual driving power. That pull provides two-thirds of the speed of average craft and three-fourths of that of racers.

All this is predicated on the fastest point of sailing, which is 150 degrees or $13\frac{1}{3}$ points off the wind. Beam winds would seem to cause or create lateral suction or "sidepull." But resistance of the runners prevents leeway and directs the pull forward. Because

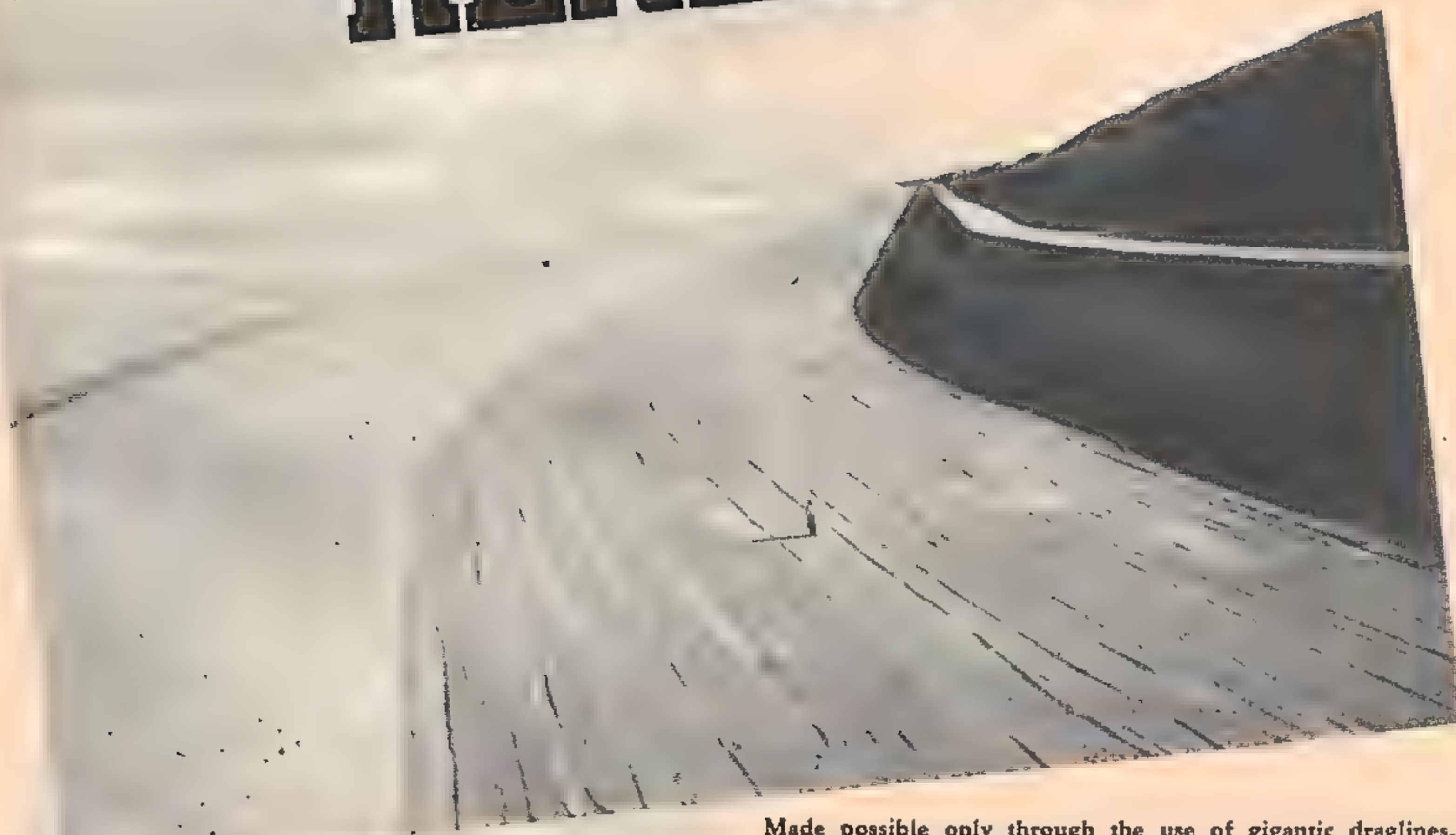
the vacuum is greatest in quartering winds, sailing down-wind limits momentum to the wind's speed. Speed consistency is impossible in puffy winds; rough ice and heavy snow are also speed deterrents.

Another explanation is that an iceboat is like a wedge between the resistance of the runners and the lateral pressure of the wind. Between these opposing forces, the craft escapes the pressure by seeking the line of least resistance, which is forward. Because ice resistance is negligible, the craft, like a bar of soap wedged in one's wet hand, shoots ahead with incredible speed.

Again, an iceboat creates its own wind as it moves along. Its momentum sends a rush of air back to the sails to enhance driving power. Puffy winds, especially, furnish an example of this. As the craft gets under way,

[Continued on page 120]

HERDING The



Made possible only through the use of gigantic draglines, the All-American Canal (above) cuts through the desert for 80 miles and will be one of California's major watercourses when completed in 1939. The canal bed is over 200 feet wide and will carry water from Colorado River to Imperial Valley. Note how figure of man in photo is dwarfed by canal's width.

WHEREVER dirt has to be moved in huge quantities, there you'll find the dragline man at the throttle of his snorting, puffing machine. He well earns his ten to fifteen dollars a day, for few workmen put out as much actual mechanical labor as he. Lately, engineers have given him a new tool—a gigantic dragline so huge it makes the kind you see digging foundations for a skyscraper look like toys. So far only eight of these monsters have been built, and it is safe to say there aren't more than a couple of dozen men in the whole world who have sat at the throttle of one of them.

In the Iowa coal fields, one of the great-granddaddies of all steam shovels is uncovering a four-foot vein of coal, forty-eight feet below the surface. It reaches down like a monstrous ostrich, gulps off a fifty-ton bite, lifts it high as a seven-story building, and dumps it out of the way. Each bucketful would fill a good sized room. Two more are gouging the All-American Canal through sand hills of the Arizona desert. Several are repairing the ravaged Mississippi levees, and the biggest one in the world is in a Brazilian



Elevated skyward, the boom of this huge dragline looks like an oil derrick. In operation, the boom enables the dragline bucket to go into action at any point within the boom's radius.

Mechanical Dinosaurs

by
Maxwell R. Grant

With a single scoop, man-made monster equals the work of hundreds of strong men.



cement quarry. Its boom is slightly more than half a block long!

Even if you have the half-million dollars to buy one of these big draglines, the chances are you won't want to buy it outright. There aren't many jobs big enough to keep this voracious machine busy long. Even the government usually rents one, for interest alone on the investment amounts to more than eighty dollars daily. Then, it costs a lot to get it on the job. When one of the big machines was shipped out to the All-American Canal job in California, it took eighteen freight cars to hold its dismantled parts.

One of the weirdest sights imaginable is to see one of these huge diggers actually walk.

December, 1937



Picking up an auto is child's play for the bucket of a dragline used to make the All-American Canal (circle). Top—The bucket "on the move." Right—Control cabin of huge dragline.



This queer looking machine picks up dragline bucket loads at its left end (above) and deposits dirt at its right end, more than one hundred and seventy-five feet away.



This dragline scoops up enough dirt in one "bite" to fill a waiting truck to overflowing. Note men at work in pit.

The giant machine, with mighty rumbles and groans, arches the eccentric cams on its two sides, raises itself on its huge flat-footed shoes, and hunches forward, seven feet at a step. Then the eighteen-ton shoes lift and move forward ready for another step. The machine would make no speed records—its average gait is about a fifth of a mile per hour; yet it can wheel sharply, turn at right angles, or sidestep like some huge, awkward duck. Steering is just like backing a trailer. Point the boom the opposite way from the direction you want to go. Marshes, sand hills, mud flats, don't make any difference to this fantastic creature. Despite its million pounds of weight, it can walk over any ground that will

support a man. Its tread is light because its giant shoes, seven feet wide and forty-four feet long, spread this weight over an area half as large as an ordinary bungalow. When one was delivered for work on the Florida ship canal, it was assembled at the station; it then "tramped" eight miles overland to the job, saving an immense amount of trucking expense and labor.

The cab, which from the front looks much like a ferryboat, is a nest of giant motors—a big five-cylinder Diesel, the main power plant; a couple of big 100-horsepower electric motors, which swivel the dragline on its base; and a battery of smaller motors that pump oil, keep water circulating, clean the air for the intake, and generate power for the lights—for on a big job they don't stop at night. Powerful floodlights bathe the excavation with their brilliance. Weather doesn't matter, either. The operator is snug behind his glass windows and it's warm by the big purring Diesels. Not even a desert sandstorm halts operations on the All-American Canal job; the machines are equipped with special air cleaners that take out grit that would score cylinder walls.

One man doesn't operate one of these giants alone—he has an oiler and several "pit men" to help. Certain parts of the machine have to be oiled every two hours, others every four, so the oiler has a continuous round of duty. On big parts like the cams which operate the walking shoes, he can smear heavy grease with a paddle. Other bearings take a good grade of lubricating oil.

When the boom dips into a deep hole, the operator is so far above his work that distorted perspective makes distances deceptive. Pit men below wigwag where to drop the bucket, using a private sign language of their own development.

Now and then the oiler must go up the narrow cat-walk along the boom and lubricate the sheaf of pulleys at the end. It takes nerve to creep along the latticed frame in a stiff wind while the big machine monotonously weaves back and forth. As you look down, things on the ground seem small, for you are as high as a ten-story building. Objects blur before your eyes as you swing along on the boom at forty miles an hour.

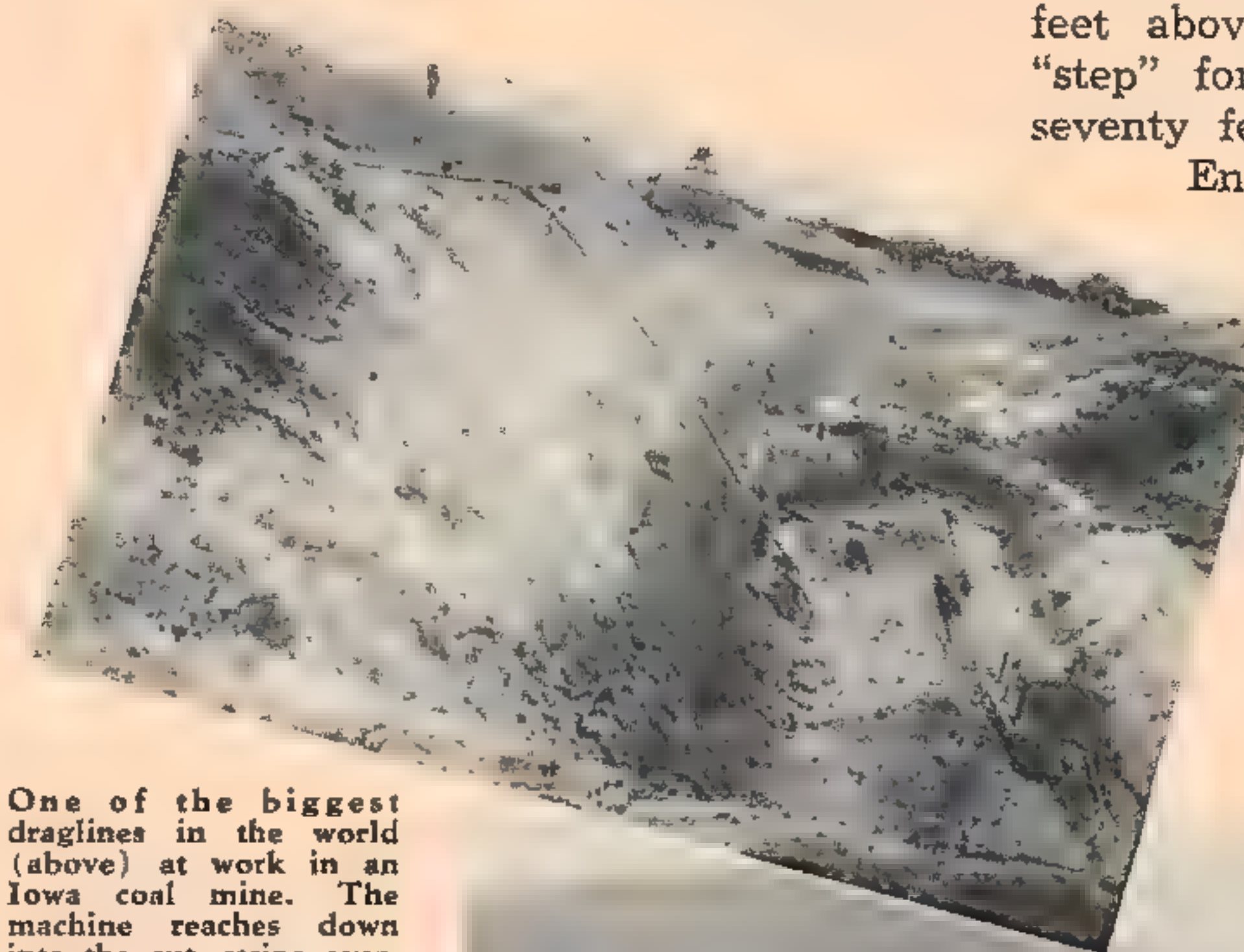
Up the center of the latticed boom, the cable races along, first in one direction, then the other. It is almost as thick as your wrist, a one and three-eighths inch bundle of twisted strands of steel, for it must stand a terrific pull when the

operator gouges the twelve-yard bucket into hard, rocky formations. When he lets go, down it plunges, 154 feet a minute. The "pit man" waves his hand; the boom whips like a trout pole as the power comes on and the bucket scoops into the earth. Cables taut, it begins to move again as the cab smoothly turns on its seventy-six conical roller bearings, as big as dinner plates in diameter. As it nears the end of its arc the bucket begins to descend, while huge asbestos-block brakes check the cab's pivot. With the precision of a well-oiled clock, the bucket halts directly above the waiting truck and tilts. A single bite fills the big truck to overflowing and off it starts, while the operator gently flicks his levers and starts the great dinosaur moving again—all within a few minutes time.

This big machine can pick up a load of dirt, pivot 180 degrees, and set it down nearly a block away. It can reach down 104 feet into an excavation, bring its bite of dirt to its own level or higher, or deposit it fifty-nine feet above where it stands. Or, it can "step" forward or back and add another seventy feet to its reach.

Engineers on the Florida Ship Canal faced the problem of moving huge quantities of dirt over a distance too far for one machine, yet too short for trucks to haul it efficiently. They designed a machine that looks like a gigantic bird with outstretched wings. It is a huge walking dragline with a 175-foot arm extending from each side. Along each

[Continued on page 120]



One of the biggest draglines in the world (above) at work in an Iowa coal mine. The machine reaches down into the cut, strips overburden away, gouges out a load, and swings it back out of the way. One bucket load represents work of hundreds of men.

Regardless of the job, there is a dragline fitted for the work. Because of its big flat feet, this medium-sized dragline (right) can safely "walk" back and forth over the mud without fear of sticking as it scoops away at its job on the banks of the Columbia River, helping to construct Bonneville Dam in the state of Oregon.





—King of Sports



Are HOME—

Letters from readers indicate a rebirth of interest in amateur aviation field.

Flying a home-built plane (right) is a privilege enjoyed by residents of only a few states. Right lower—An "Air Camper", built from MM Flying Manual (1932) plans.



Circle—Many men now prominent in the aviation industry can be thankful that more liberal air laws were in force during their early days, enabling them to secure low-cost aviation knowledge through construction of their own planes. Above—Many an amateur built his plane in his back yard.

CAN the amateur airplane builder successfully construct a light airplane which he can depend on to perform reliably in the air? Having constructed it, can he use the knowledge thus acquired as a stepping stone to a worthwhile job in aviation? The answer is, "YES—if it weren't for government restrictions that keep the amateur plane builder grounded except in a few liberal-minded states that encourage amateurs."

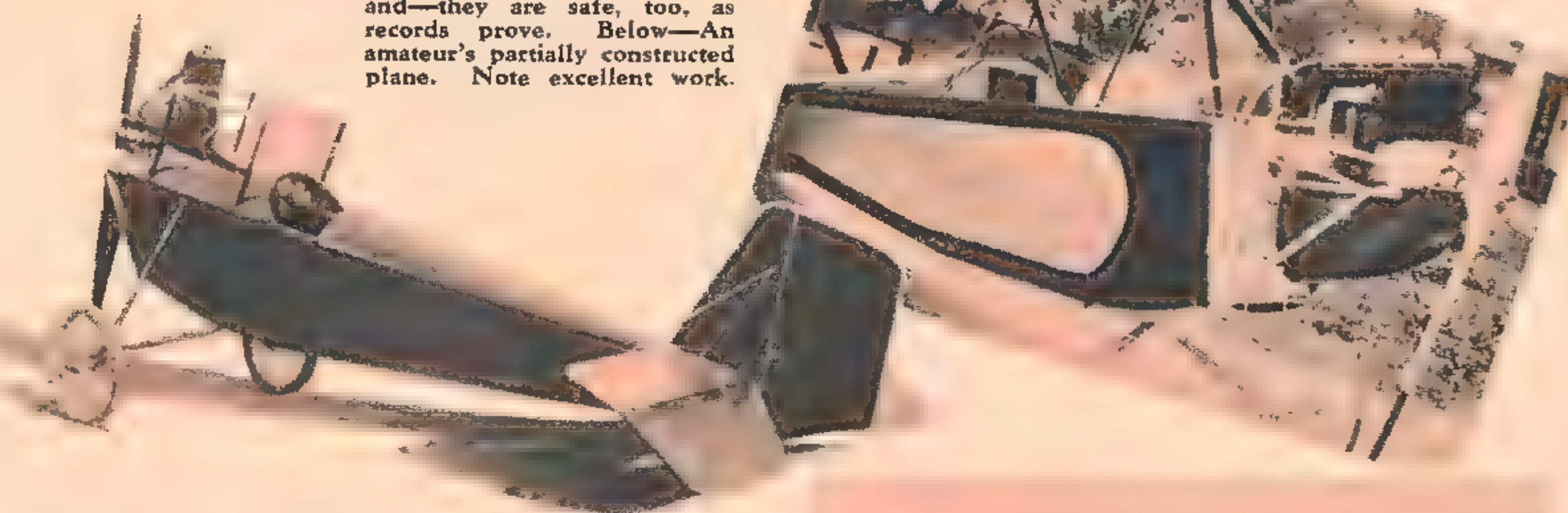
Home-built aircraft, if constructed to reliable plans, can be as safe as any aircraft of equal size and power that carry an NC license. The experience of Oregon, and several other states that permit home-built aircraft to be flown, bears out this statement.

Modern Mechanix

Built Planes Safe?



Above—Amateurs CAN build aircraft that rival commercially-built planes in craftsmanship, design, and beauty of finish, and—they are safe, too, as records prove. Below—An amateur's partially constructed plane. Note excellent work.



From 1929 to 1933, inspired by the belief that thousands of young men throughout the country were intensely eager to own and fly their own airplanes, MODERN MECHANIX published annual Flying Manuals containing reliable plans from which amateurs could, and did, construct dependable light airplanes at a moderate cost. The sales figures of the manuals proved that our belief was correct, and MODERN MECHANIX only stopped publishing an annual Flying Manual (although back issues of the 1931-32-33 editions are available at 50 cents each) when federal restrictions on the flying of home-built planes were adopted by a majority of the 48 states.

Recently, we received quite a few letters from readers interested in building airplanes—letters asking us to provide the latest information regarding government laws on the subject; asking us to campaign for more liberal laws relating to the building and flying of home-built planes; and letters urging us to propose some plan that would help the light plane enthusiasts and still be approved



The welded tubing motor mount of the home-built plane in the upper photo can be favorably compared with any found on commercially built "fiverplanes". Lower photo—A home-built airplane powered with a converted Ford auto engine.

by the government aviation authorities.

The re-birth of interest in home-built airplanes, as indicated by the number of letters received, caused MODERN MECHANIX to investigate the possibility of changes in the laws now in force. Sad to relate, there seems very little chance of any changes occurring in the near future, if ever.

A bulletin issued by the Bureau of Air Commerce states that its engineers feel that the requirements for light airplanes can be

[Continued on page 147]

December, 1937

Bungalows



Rows of adobe bricks drying in the sun.

The main requirements are a supply of ordinary dirt that does not contain too high a percentage of sand, enough water to thoroughly dampen the adobe mixture, and plenty of sunlight. Add to these a truly Spanish disregard of time, infinite patience and a *strong pair of legs*, and you are as well equipped as others who have successfully built their own houses out of native soil.

It is well known to students of California history that most of the missions built by the Spanish padres who first explored that state were made of adobe. The prime reason for this was the scarcity of timber in some sections. Yet, after more than a century of



Above—Scraping loose soil from dried adobe slabs. Right—Heavy timber poles are used to make the door frames.

FANTASTIC as the statement may seem at first glance, it is quite possible for anyone without previous experience in building to construct a modern, durable and artistic dwelling out of mud, or—to use the old Spanish-Californian name—adobe. This has been proved by a number of residents of the San Ramon Valley in central California.



of Mud

by
Robert
McLean

Modern adobe dwellings are easy to build.



The roof rafters, of native timber, are supported at the ridge by a log extending through each gable end wall, as shown in above photo. Right—Setting in the window frames. Below—When completed, the outside of the novel house is whitewashed to create a real Spanish appearance.



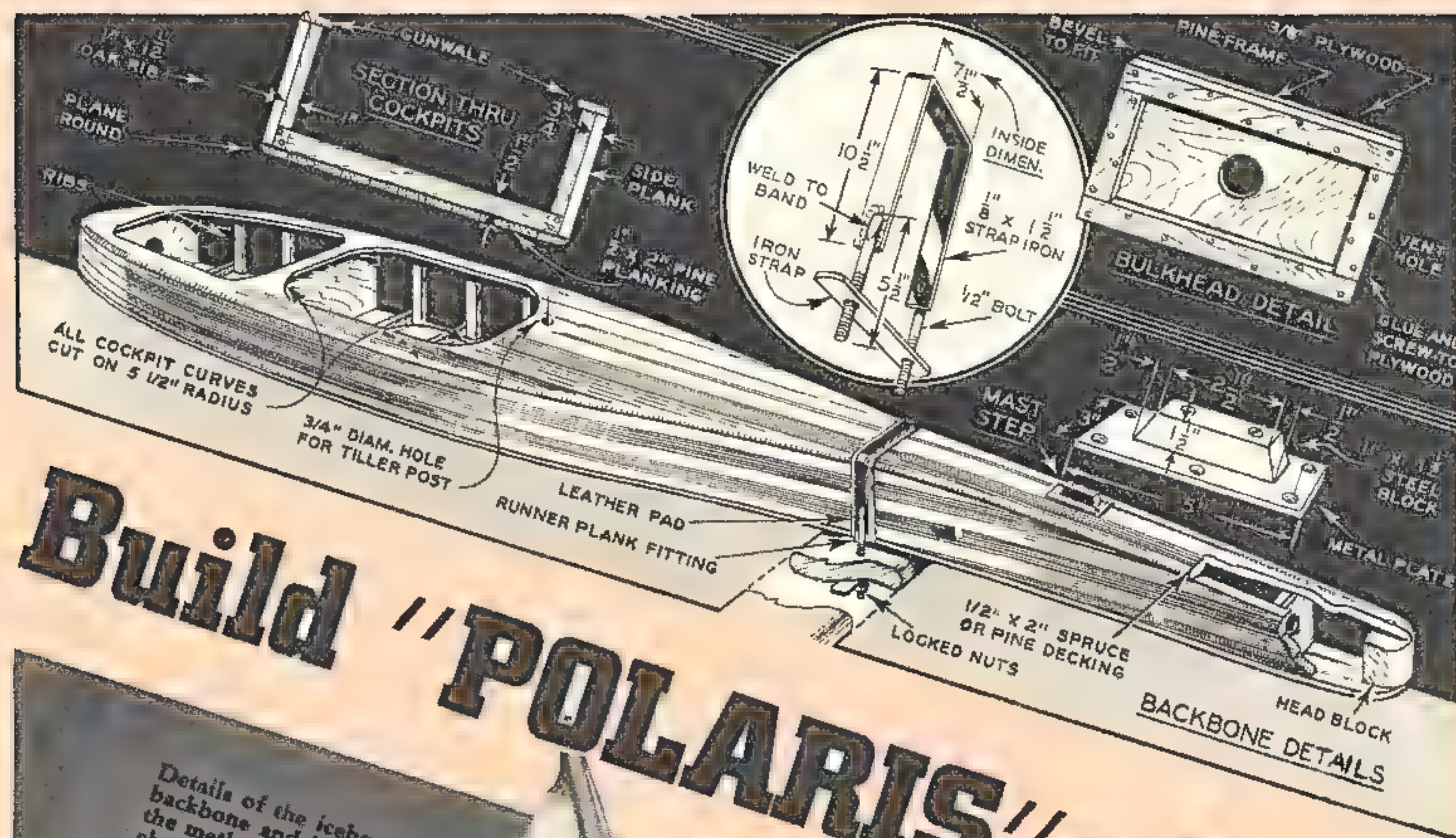
use, many of the old California missions are still standing and habitable. In Mexico and other longer settled countries, adobe buildings over two hundred years old are still occupied.

During the past few years a revival of interest in adobe construction has taken place in California. Although he does not claim the distinction, Harry H. Hindman, a resident of San Ramon Valley, is credited by

his neighbors with being the "pioneer" of this renaissance of an ancient craft. Hindman's adobe house has served as a model for a number of others in that part of California.

Departing radically from the classic Spanish design which consisted of a square, box-like structure surrounding a court or patio, Hindman and his neighbors have built

[Continued on page 148]



Build "POLARIS" - New

by
J. Julius Fanta

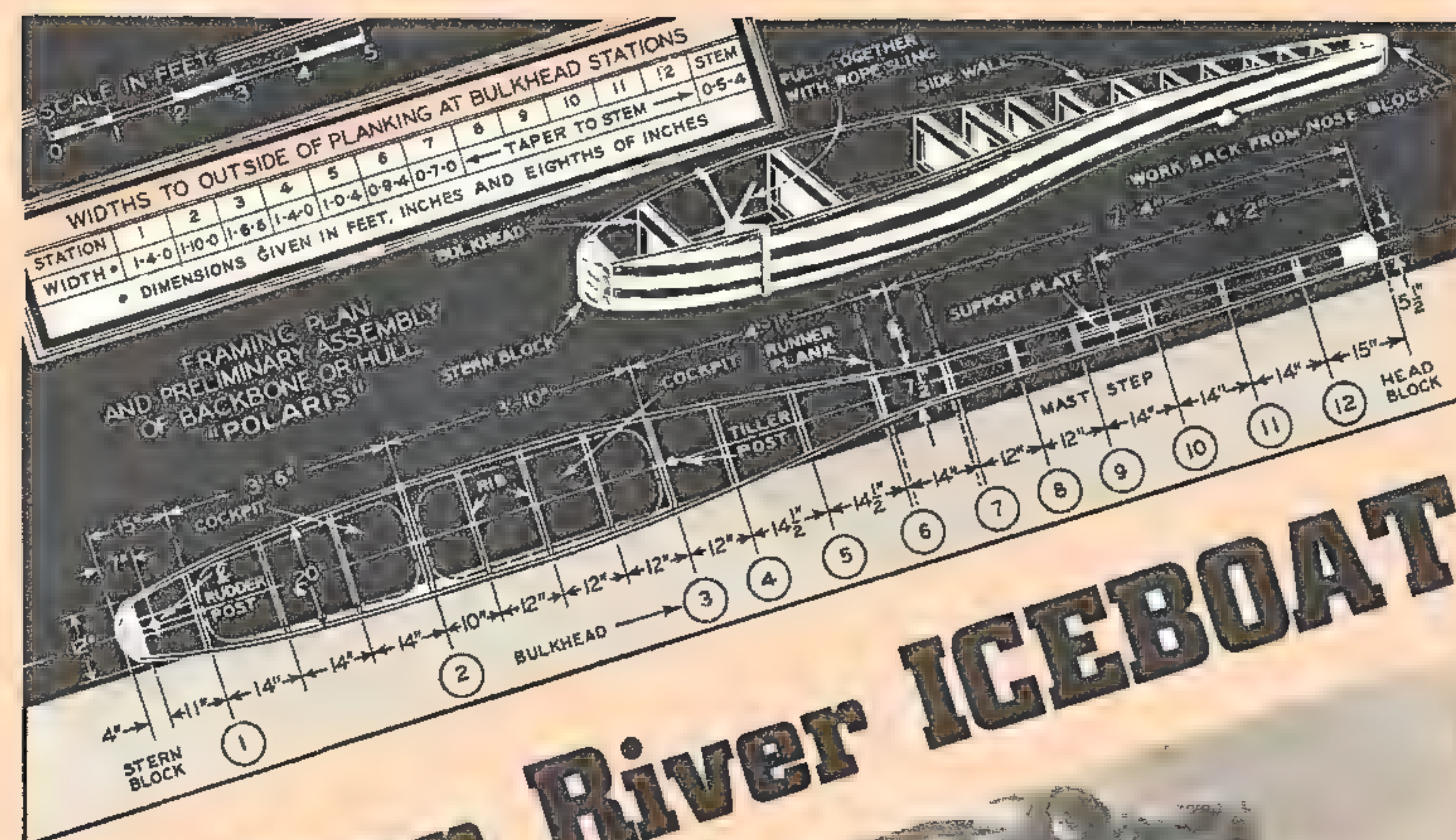
Details of the iceboat's backbone and hull and the method used to anchor the runner-plank are shown above. Dimensions for the bulkheads are taken from the details on the opposite page; depths are taken from the "Polaris". But the

by
J. Julius Fanta

IF YOU'RE looking for a new iceboat design, you'll like *Polaris*, the latest creation of the Hudson River type and a fast, trim racer with a moderate rig. This craft is a departure from the usual "banjo" cockpit model in that the crew sits upright and steers like a car.

A comfortable boat in heavy winds, *Polaris* is 20 feet long and carries 90 square feet of sail. No jib is necessary, as this sail has proved useless on iceboats. There are two cockpits, one located in front of the other. The T-angle iron runner blades prescribed are designed for sailing in snow as well as on clear ice.

The laminated backbone construction, which is relatively simple, makes the hull extremely staunch and check-proof. *Polaris* is steered by remote control, with the steering quadrant coming back into the fore cockpit. Specifications given here provide not only for a weatherable craft but an attractive one. At the outset, get a good conception of the

[illegible]

The bottom of the backbone is shown in the photograph above. Note how the crossed steering cable is drawn taut around the 8-inch grooved wheels with a turn-buckle. Left—The laminated deck with tiller and sheet traveler just ahead of the fore cockpit. Drawings should be followed so as to obtain correct hull shape and the proper spacing for the bulkheads.

construction by studying accompanying plans. Note that *Polaris* calls for improved methods of building; so keep in step with modern ice-boating by adhering to details.

Clear, straight-grained Sitka spruce should be used for the side walls of the backbone or center body. Saw the $\frac{3}{4}$ -inch stock of 20-foot lengths into 2-inch strips for the laminating work. Reverse alternate ends of the strips so that the wood, when glued up, will bear greater strength. For appearance's sake, alternate strips of mahogany or walnut may be placed between spruce. But it would be vain to glue the strips without reversing the grain, as no benefit will result.

Casein glue is essential, because it is stronger than the wood. Mix the powder-form glue with cold water and beat until it becomes a thin batter.

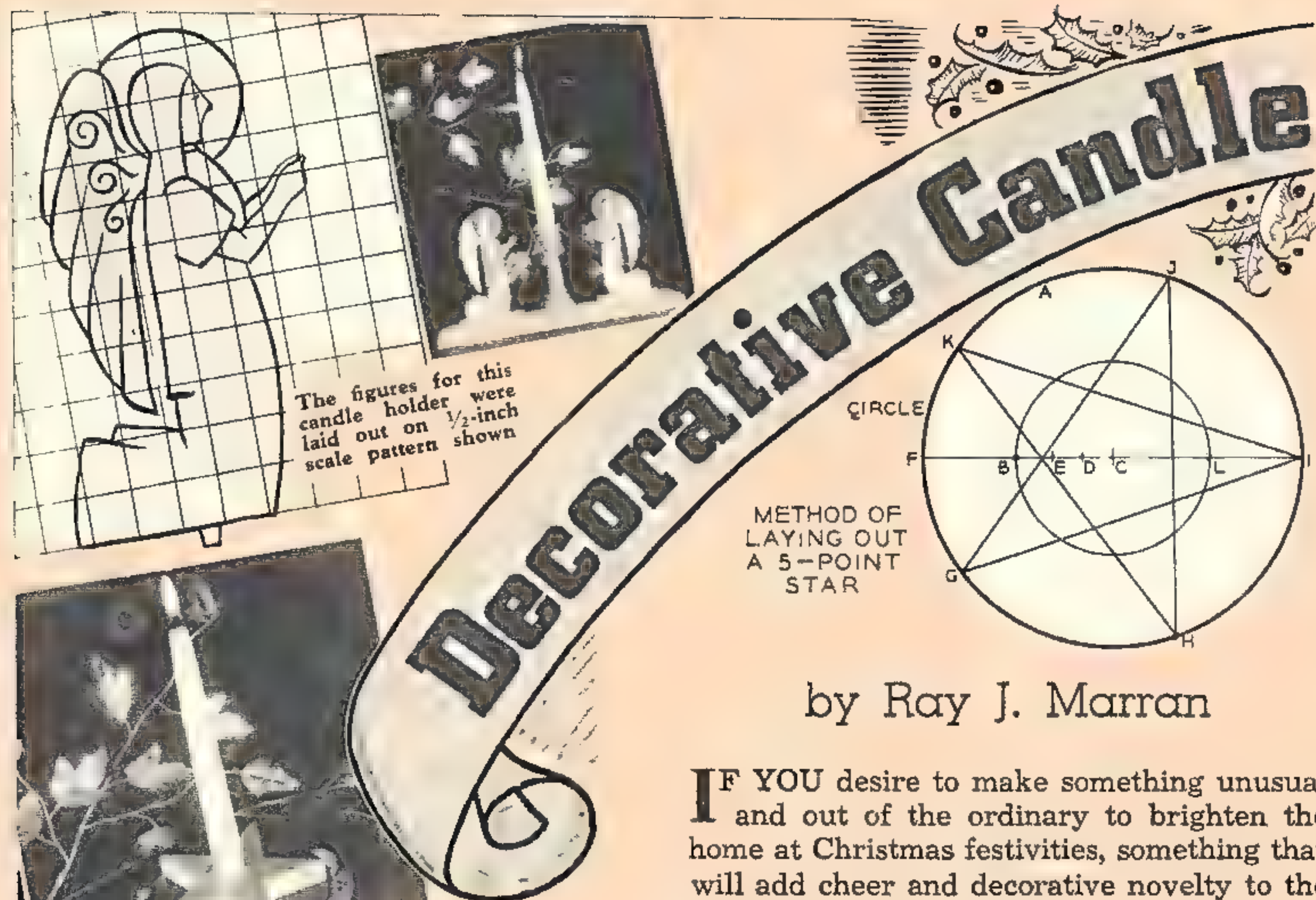
To laminate, glue the strips as aforementioned.

tioned to build 12-inch wide side walls. Clamp the job and allow the glue to dry 24 hours before removing the clamps. Chisel away the glue which has oozed from the seams. Now taper the sides to the dimensions given in drawing. The bottom of the sides bear a 2-inch arch.

The bow, or head piece of solid 4 by 6 by 6½-inch oak, is glued between the fore ends of the sides and screwed with 2-inch F. H. brass screws.

Work back from the bow in placing the bulkheads at the required distances. Use $\frac{3}{8}$ -inch plywood for bulkheads, bordered with cheek pieces of $\frac{3}{4}$ by $1\frac{1}{2}$ -inch pine. Fasten the plywood to the frames flush. Spread the side walls until the proper width is obtained; then fit in the bulkheads by beveling as necessary.

All bulkheads forward of the cockpit



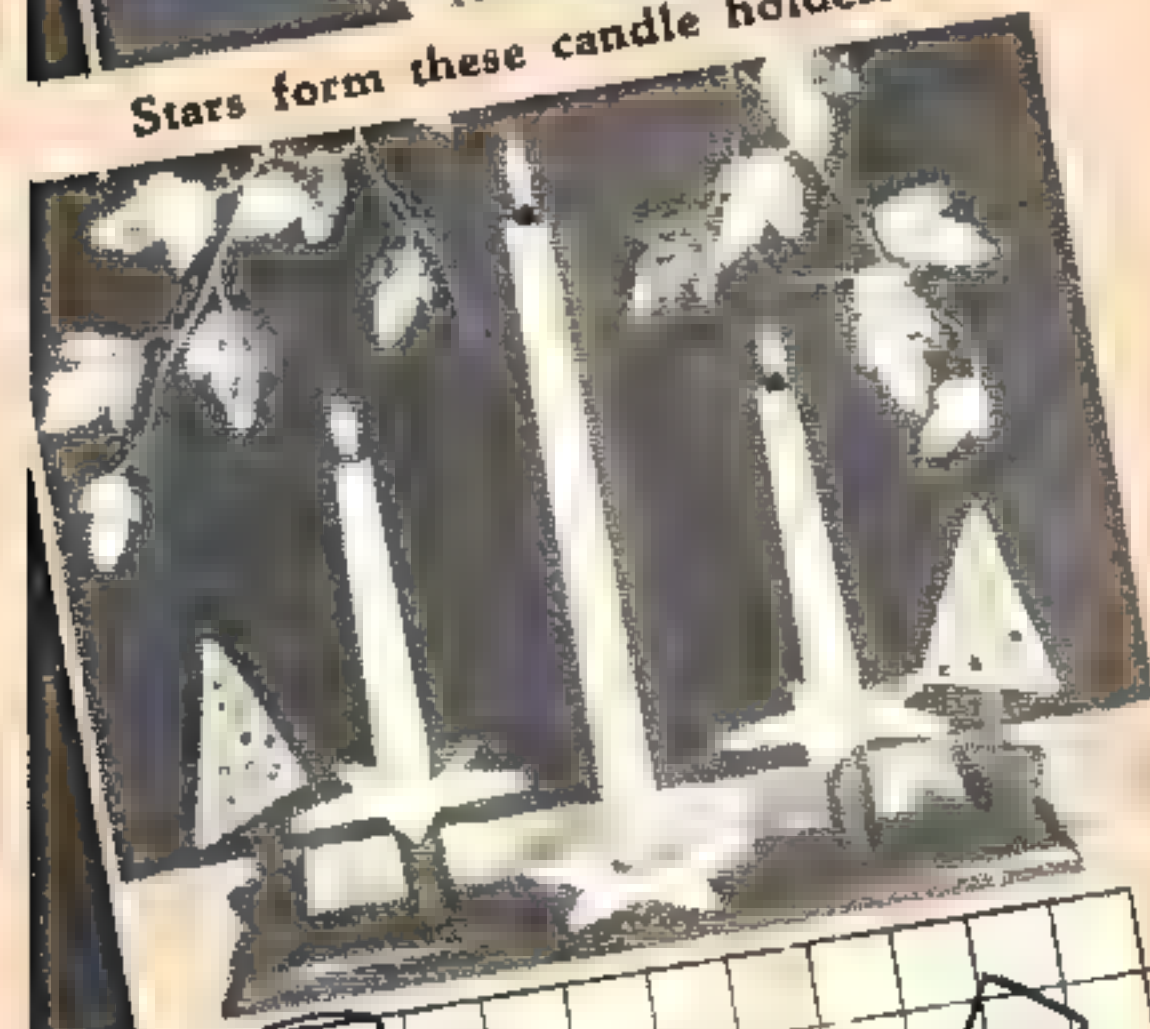
by Ray J. Marran

IF YOU desire to make something unusual and out of the ordinary to brighten the home at Christmas festivities, something that will add cheer and decorative novelty to the Christmas dinner table, try your hand and power tools in producing a few of the novelty candle holders illustrated on these pages.

All of these holders were specially designed for the Christmas candle. They are easily and quickly constructed by cutting the parts on a small jig saw and a lathe. When carefully painted with several coats of quick drying enamel in the regulation Christmas colors of red, green, white and silver, these candle holders make exceptionally attractive and appropriate center-piece decorative units for the Christmas table, or for the mantel shelf.

Cut the parts from white pine and three-ply paneling, following a design unit similar to those in the illustrations.

To lay out a perfect 5-pointed star, scribe a circle "A" the desired size. Divide the diameter into $\frac{1}{4}$ —points F, B, C, L and I. Scribe the



These Old English Carolers are cut from thin plywood, laid out to the $\frac{1}{2}$ -inch pattern shown.



circle "B". Divide the line "C" to "B" into $\frac{1}{3}$ —points B, E, D and C. The line from "I" to "D" will be exactly $\frac{1}{5}$ the circumference of the circle "A"; this measurement is used to mark the points J, K, G, H and I. Straight lines drawn to these points form the outline of a perfect 5-pointed star as shown.

The stars required for the decorative unit are then cut on a jig saw. Stars cut from 3-ply paneling may be cut four to six at one

time by bradding the stock together as shown.

Note that a $\frac{3}{4}$ -inch center hole for the candle butt is bored in the plywood before the design is cut.

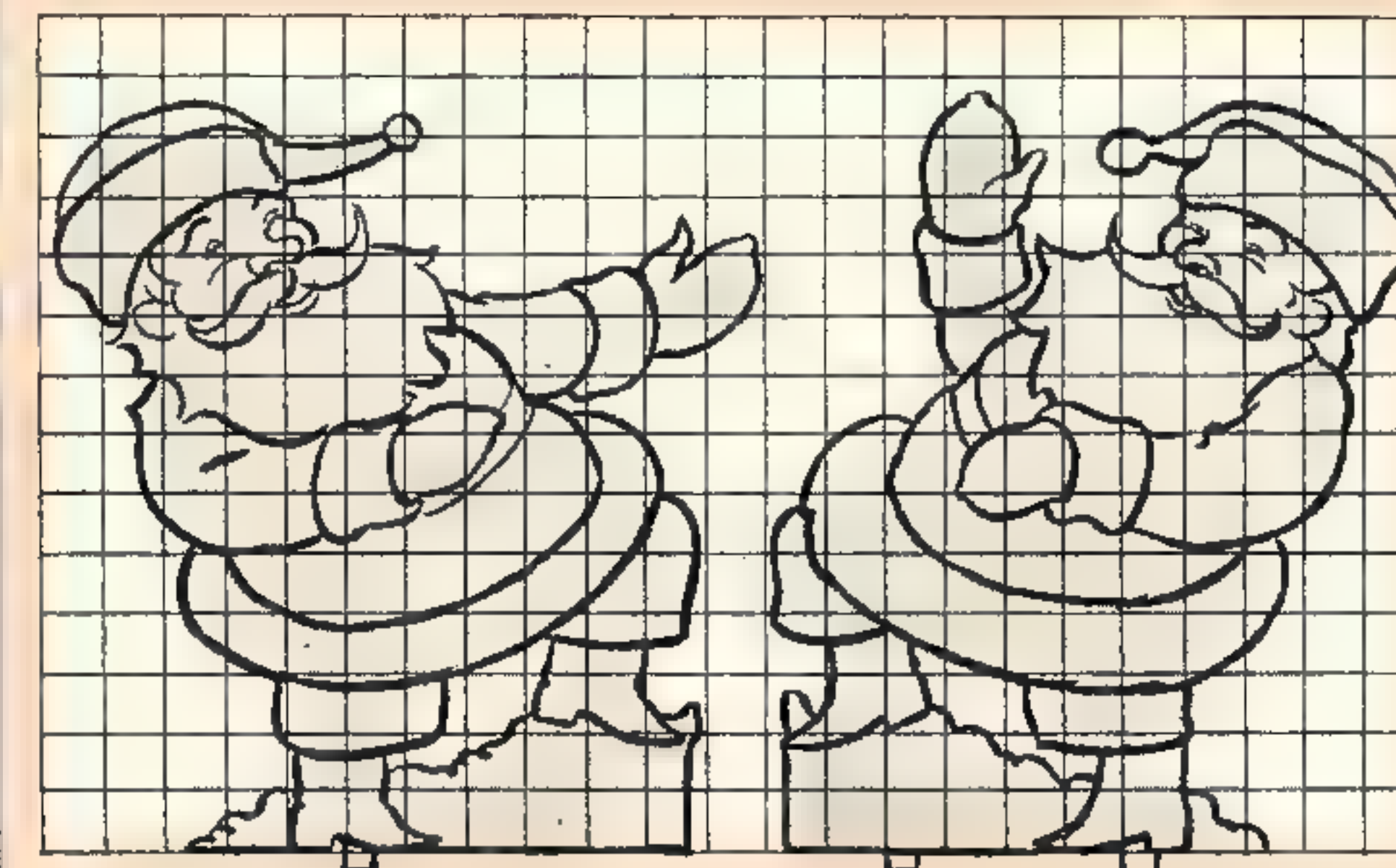
Star candle holders may be used as a single unit; or they may be mounted on a circular disk cut from $\frac{3}{4}$ -inch stock and painted aluminum or bright red.

A combination of stars, mounted on a base-board, or elevated slightly with round up-rights, makes attractive decorative units for three or more Christmas candles. The base is enameled glossy red, the stars glossy white and the trees a combination of bright reds, greens, yellows and silver.

[Continued on page 126]



Left—Before cutting the star candle holder to shape, drill a hole in the center of the plywood block large enough to accommodate the tall white or red Yuletide taper.



The craftsman can vary the antics of the Santa Claus characters by making several different kinds. In each instance they are made to $\frac{1}{2}$ -inch squared patterns, laid out on tissue paper or sketched directly on the wood. The characters are then cut to shape, sanded, painted and attached to the base.

COMBINING the beauty of natural walnut with shining brass fittings, this useful and attractive nut bowl and mallet allows the craftsman to display his skill twofold.

While both a wood and a metal turning lathe were used in making the original set, the potential constructor will not be handicapped if he does not possess the latter piece of shop equipment. Lacking a metal lathe, the mallet rings can be cut to the required $\frac{1}{2}$ -inch height from brass tubing and shrunk to fit over the ends of the walnut mallet head. Otherwise, the mallet may be turned in its entirety from solid brass. A form of opening flower motif is imparted to the bowl although its size prevents this idea

from being obvious. However, the lines are distinctive and very appropriate.

Turn the bowl from a block 2 inches thick and slightly more than 10 inches in diameter. Before the center spindle is turned down to exact diameter, bore a $\frac{1}{2}$ -inch hole, 1-inch deep in its center, make a similar hole in a block of walnut or other appropriate wood with the grain running vertically. Glue the flat and also the dowel joints, bring the tail stock center tight against the piece and let the glue set.

Get and smooth a ring of brass about $\frac{1}{8}$ -inch thick, $\frac{1}{2}$ -inch wide and 2 inches in diameter. First turn down the top of the upright so the ring barely starts on. This turning should have a slight taper. Tap it snug, start the lathe and, holding a block of wood against the brass, make it quite hot by rubbing. This expands the brass so that

it can be driven tightly against the shoulder before cooling. The whole bowl is then gone over lightly, turned to shape, sanded, rubbed and finished. Lacquer, shellac or varnish, which is later rubbed with No. 000 steel and finally polished with wax, provides a good finish.

The mallet handle is

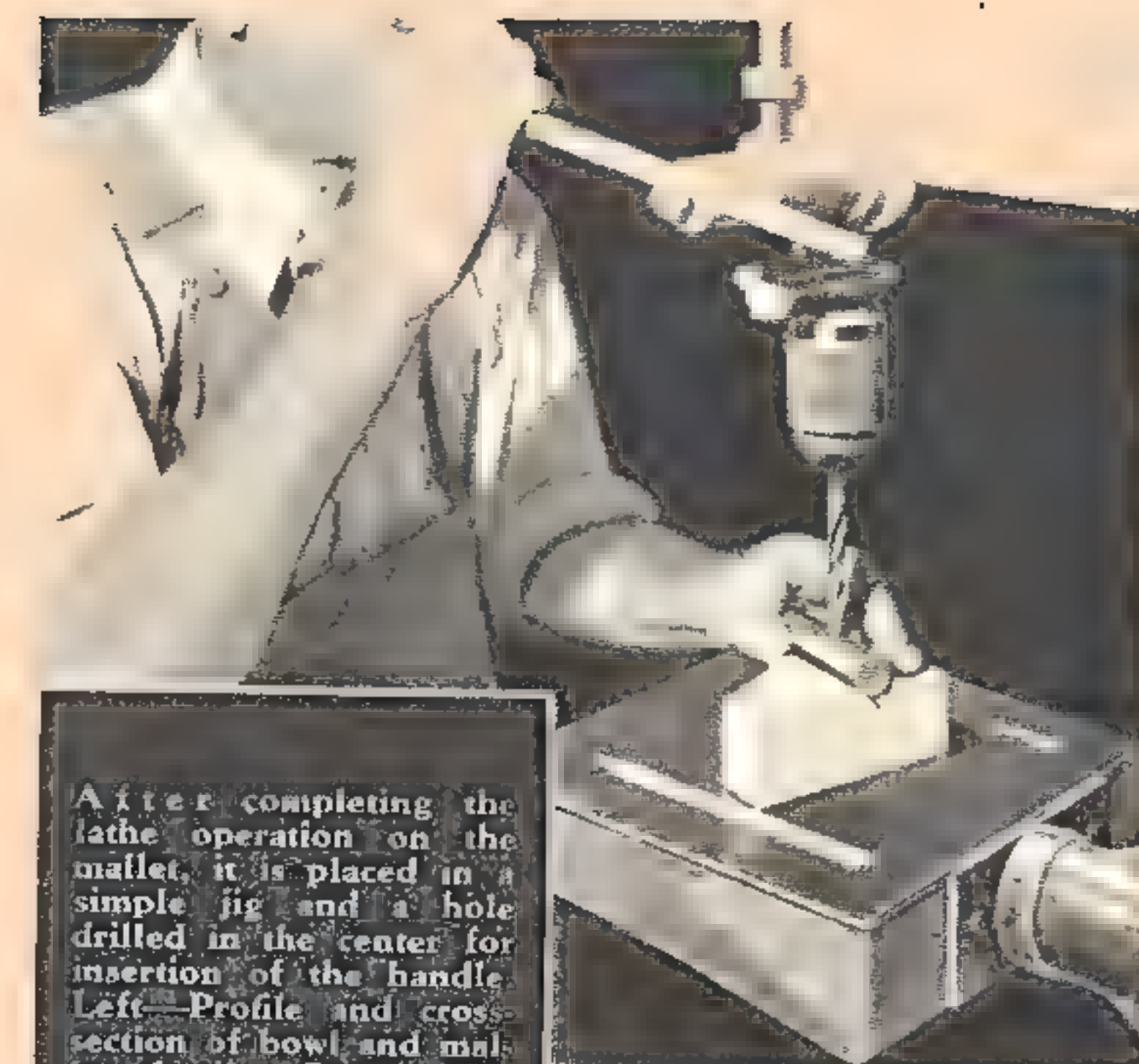


This walnut and brass nut bowl is a distinctive workshop project.

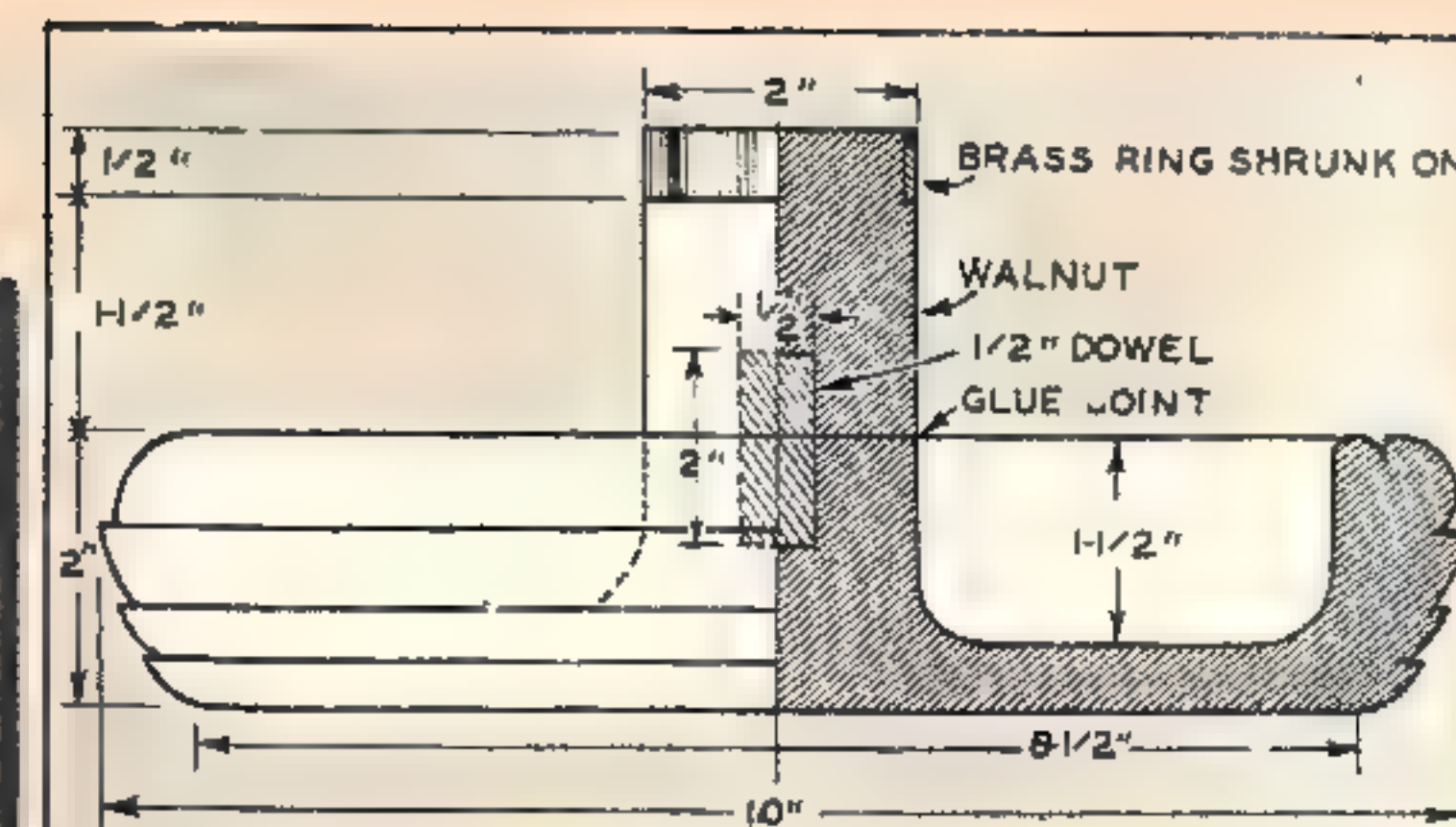
BRASS TRIMMED NUT

The mallet head is turned down to a spindle and the $\frac{1}{2}$ by 2-inch brass rings slipped on and shrunk in place as pictured above.

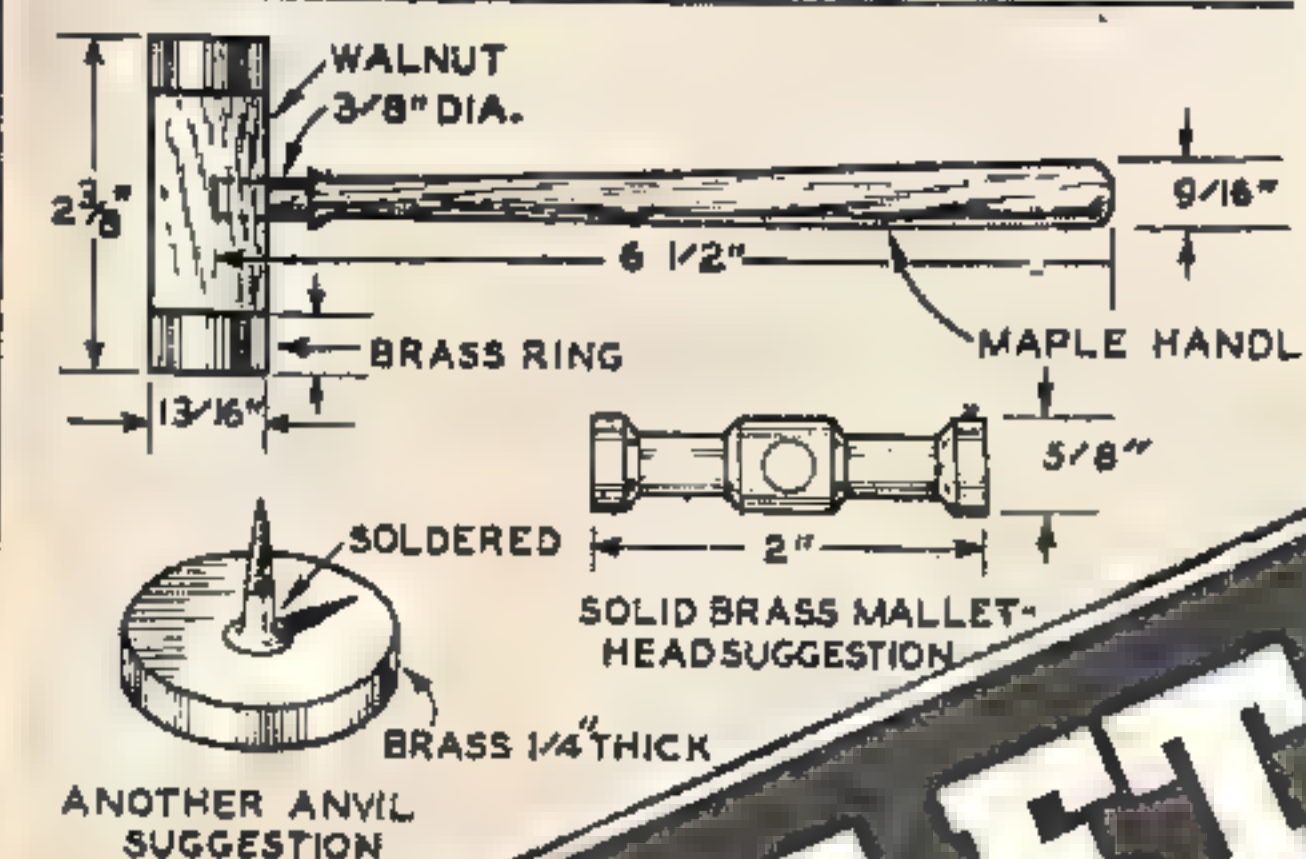
Left—The nut bowl near the stage of completion. Polishing is done with the project attached to the faceplate. Right—After partially turning the bowl, shape the anvil stud and shrink a $\frac{1}{2}$ by 2-inch brass ring over it.



After completing the lathe operation on the mallet, it is placed in a simple jig and a hole drilled in the center for insertion of the handle. Left—Profile and cross-section of bowl and mallet details. Below—Fitting the maple handle to the brass trimmed mallet.



BRASS TRIMMED NUT BOWL AND MALLET



BOWL AND MALLET

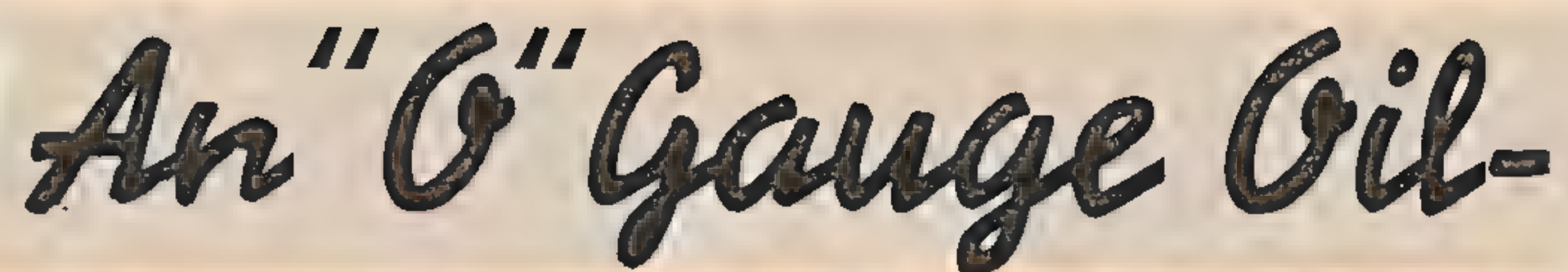
turned to shape from a maple dowel. The head is turned down to a spindle and the brass ferrules of brass to $\frac{1}{8}$ -inch in width, diameter and wall thickness shown. In the same manner as was described above, the brass rings are heated and driven to a tight fit.

For the walnut, filler should of course be used to fill the grain before applying the finish. The whole unit can be made entirely of walnut, or the bowl can be turned from figured gum or birch, while the mallet and top half of the center spindle, or "anvil," can be of walnut to provide a pleasing contrast.

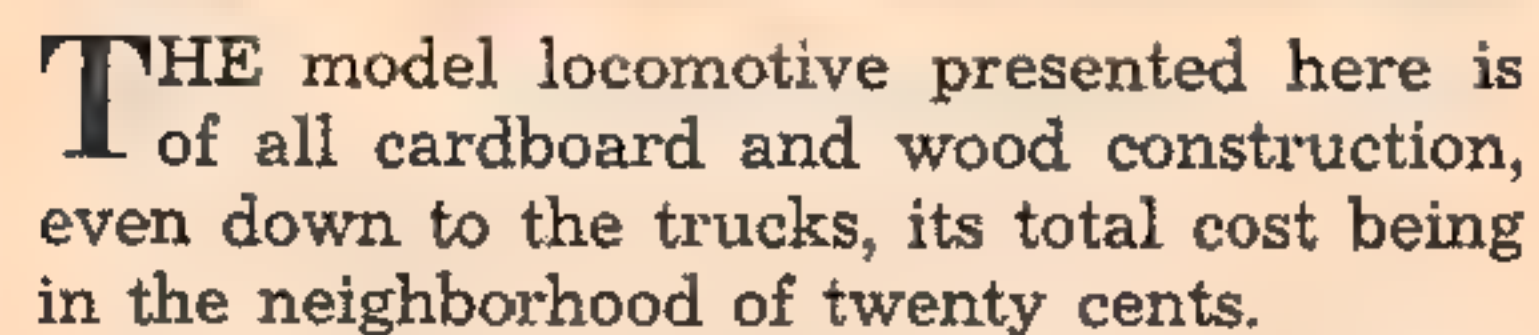
Completed this bowl will take two pounds of nuts without appearing over full. It is an ideal wintertime project and, of course, has commercial angles which the enterprising home shop owner can work out to his advantage.

If a solid brass mallet head is used, it can be of the same dimensions as the brass trimmed wood head shown. or shanks can be turned between head center and the end faces. Another way to provide a neat brass trim is to dispense with the glued-up center block by soldering a large, flat head wood screw to the under side of a brass disc about $\frac{1}{4}$ -inch thick and turn the screw into a hole drilled in the original center portion. This will make the anvil just $\frac{1}{4}$ -inch higher than the bowl rim, but the heavy metal will not blemish with use as much as will the end grained hardwood block. When this arrangement is used the center hole must be slightly countersunk to accommodate the screwhead so as to permit the brass disc to fit tightly against the wood. The protruding edges of the solid brass are then turned down flush with the wood center and finished in the usual way.

by Dale R. Van Horn



OF CARDBOARD



The materials, with the exception of glue and cardboard, were bought in the five and ten. However, the trucks may be purchased complete with a motor and the rest of the construction built up of cardboard from "O" gauge plans given here. Metal may be used in place of the cardboard and wood.



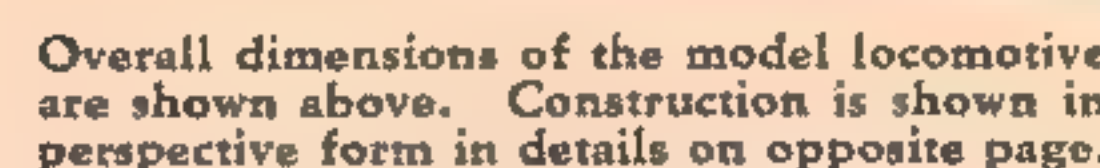
Electric Locomotive

by Herbert Lozier

CONSTRUCTION

This unique model is an authentic version of a Union Pacific oil-electric locomotive. It can be built for 20 cents.

As either a display model or motor driven, this flashing oil-electric locomotive is an interesting and simple model project.



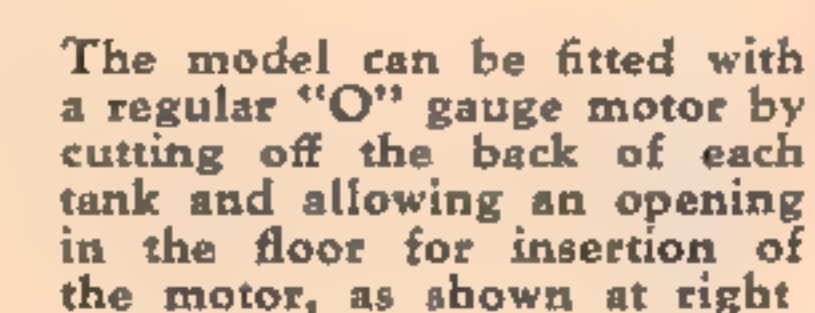
This locomotive is a composite of several different types used on the roads. Either the mufflers or exhaust stacks may be left off at will, depending upon the builder's creative desires.

Begin the model by making the trucks, building them up on a section of "0" gauge track so as to avoid any chance of mistakes when spacing the wheels.

The pattern for both inside and outside frames of the trucks will be found on the accompanying plan. Make the inside first by folding the patterns over into box shape and gluing them securely at the seam. After they have dried, add the top and pivot disk.

The model can be fitted with a regular "O" gauge motor by cutting off the back of each tank and allowing an opening

[Continued on page 140]





The perforated portion of the shaker cap is removed with a sharp knife or chisel (above) and the rough ends turned down with pliers, as shown in photo below.

THERE are many instances where it would be convenient to apply a moderate degree of heat to a small area. Keeping small quantities of paraffin warm in the microscope laboratory, rapid drying of small objects or areas, instances where a hot water bottle might be used but where ordinary bottles are too large and clumsy—these are but a few examples.

For such work, the simple and inexpensive lamp illustrated will be found useful. The lamp, the general idea for which was originated by G. F. Prideaux, a Cleveland, Ohio, lighting engineer, consists of a 10-watt bulb enclosed in a metal housing that concentrates the heat and light rays at one small spot, about the size of a silver dollar.

For assembling the heat applicator the following materials, most of which can be obtained at a local hardware or dime store, will be required: 1 brass socket for standard medium screw base bulb, preferably keyless; a ½ to 1-inch piece of brass tube, threaded to fit socket hole; 1 nut

A Local HEAT APPLICATOR

A wooden handle, 10-watt bulb, 6-foot fixture cord, and inexpensive aluminum drink shaker constitute the materials used in the applicator's construction.



For Home And Shop Use

by Walter E. Burton

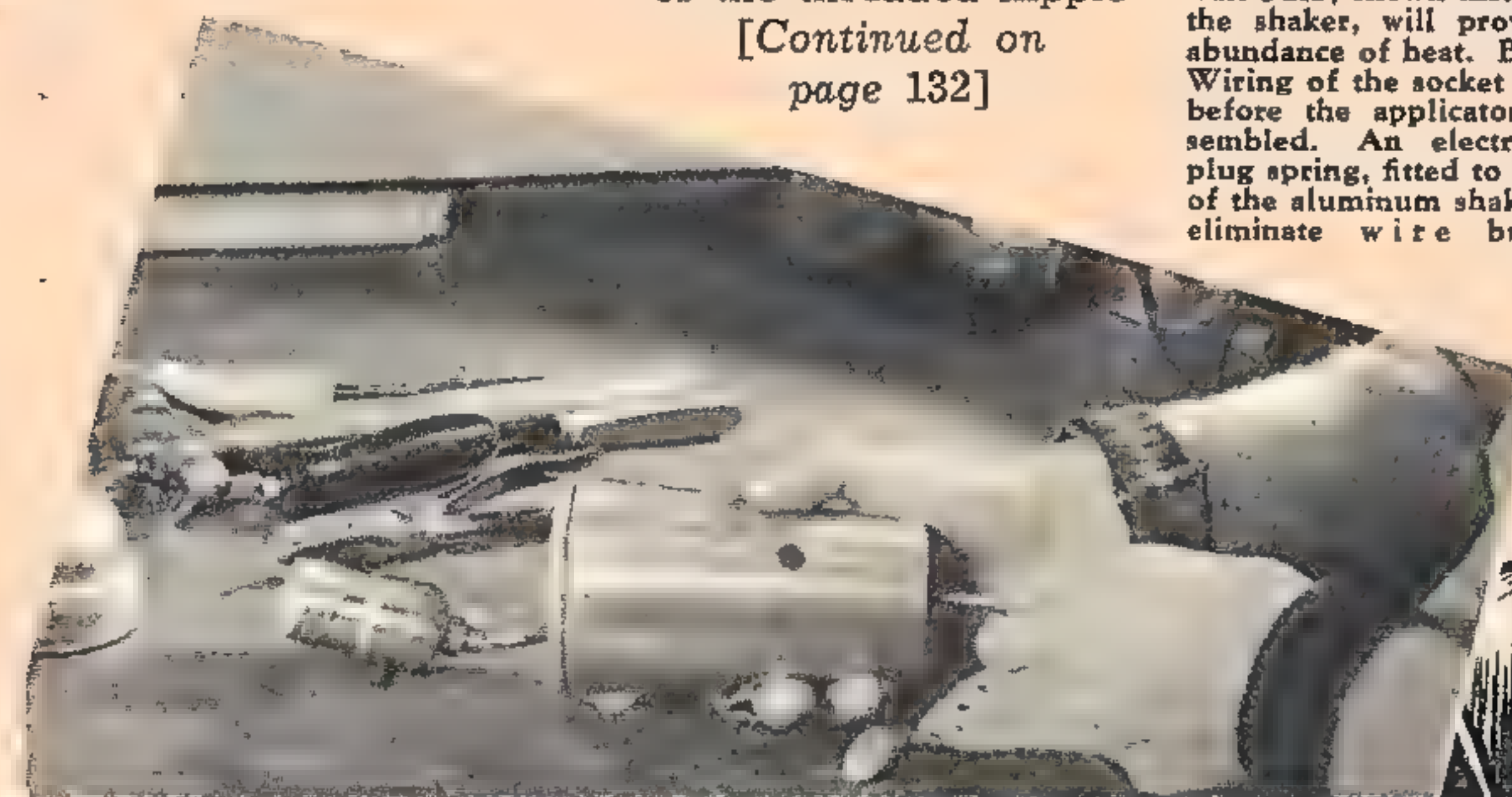
One of the applicator's many uses: an aid in relieving rheumatic and muscular pains.

to fit threaded tube; 1 aluminum drink mixer of the type illustrated; 1 10-watt, clear-glass lamp bulb; 6 feet of lamp or asbestos-covered heater cord; 1 separable plug for connecting to lamp socket or wall outlet; 1 wooden handle, which can be a 5-inch length of broom stick. If desired, a spring-type cord protector, like the ones found on electric iron plugs, can be added, for further protection of the wire.

In the bottom of the drink mixer, punch a hole and enlarge it so that it will receive the threaded nipple. Connect one end of the wire to the socket, screw the threaded nipple into the socket, and run the wire and nipple through the hole in the mixer bottom, from the inside. Clamp the socket in position by screwing the nut over the nipple, centered with respect to the sides of the container and attach the connection plug to the other end of the wire. It is a good idea to provide some means of preventing the edges of the threaded nipple

[Continued on page 132]

Though small in size, the 10-watt bulb, shown installed in the shaker, will provide an abundance of heat. Below—Wiring of the socket is done before the applicator is assembled. An electric iron plug spring, fitted to the end of the aluminum shaker, will eliminate wire breakage.



These suggestions will help overcome car starting difficulties in cold weather.

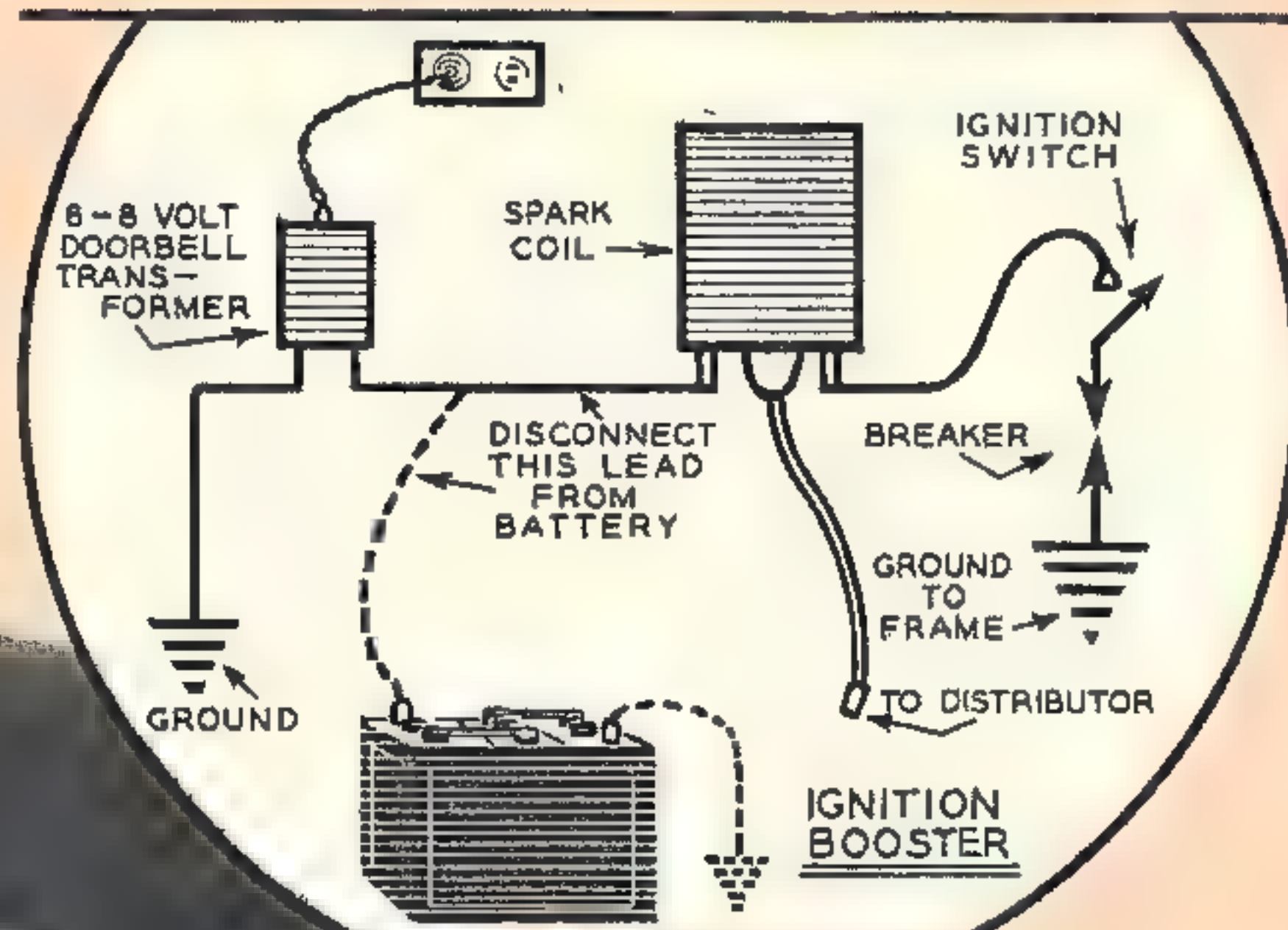
SIMPLIFYING

by
Thomas A. Blanchard

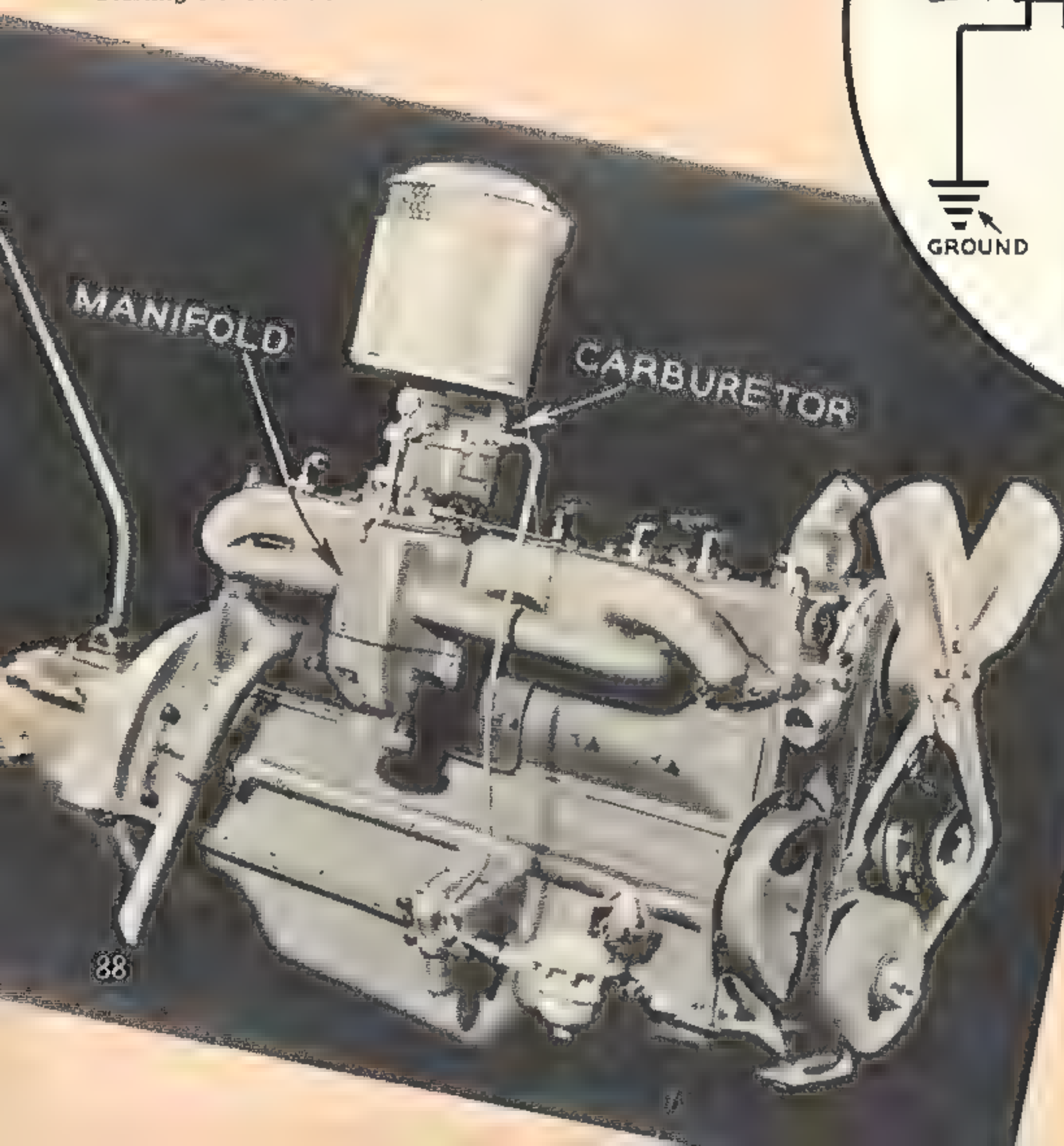
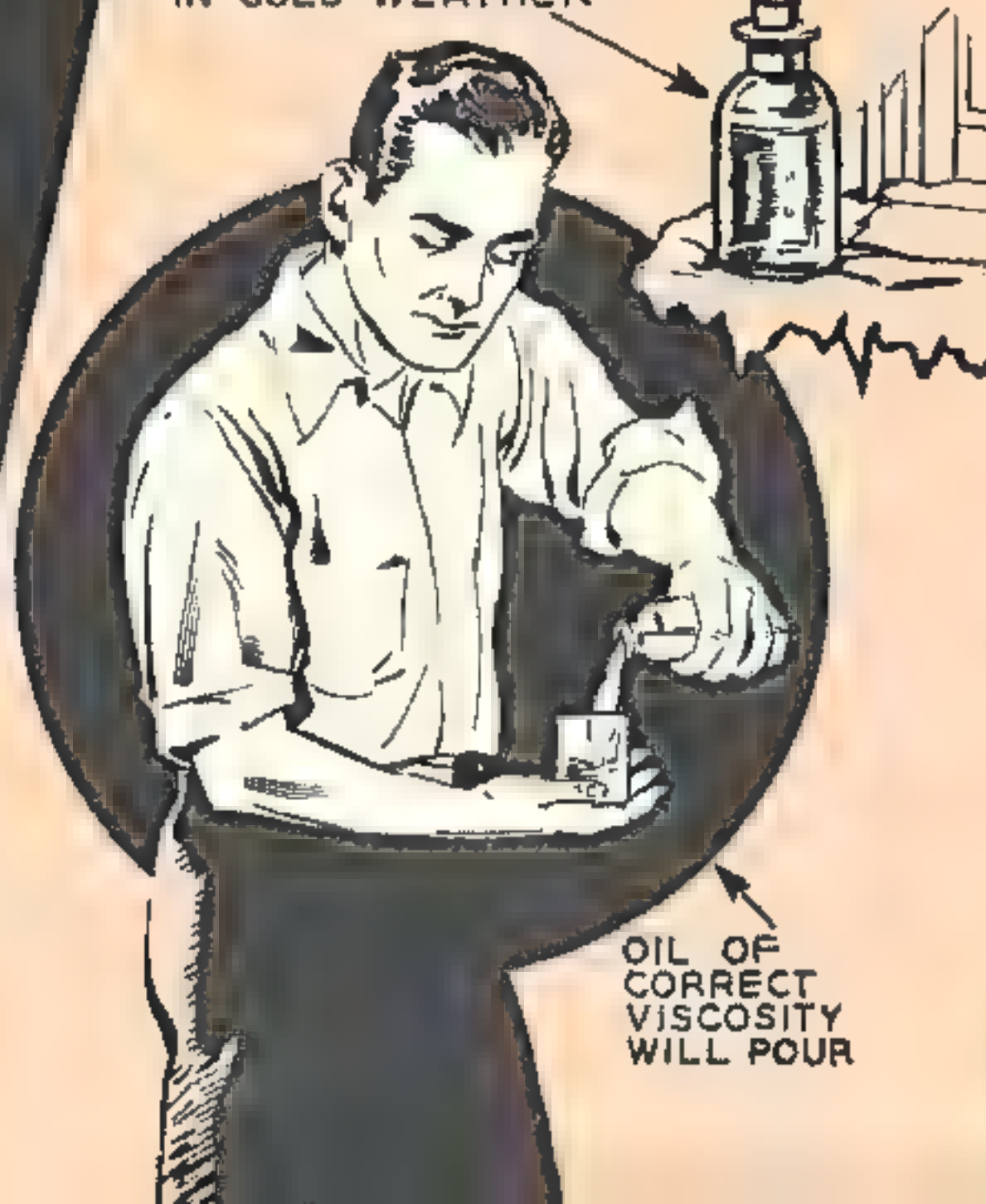
winter starting can be made just as pleasant as it is during the summer.

EVERY motorist knows, only too well from past experience, the numerous troubles that develop in the car's motor during the winter months. Run-down batteries, broken high-tension cables and short circuits in the distributor are only a few of the many annoyances to be contended with. To say that these temper-shattering troubles can be avoided is by no means an exaggeration. With a better understanding of the factors involved in the motor's proper operation,

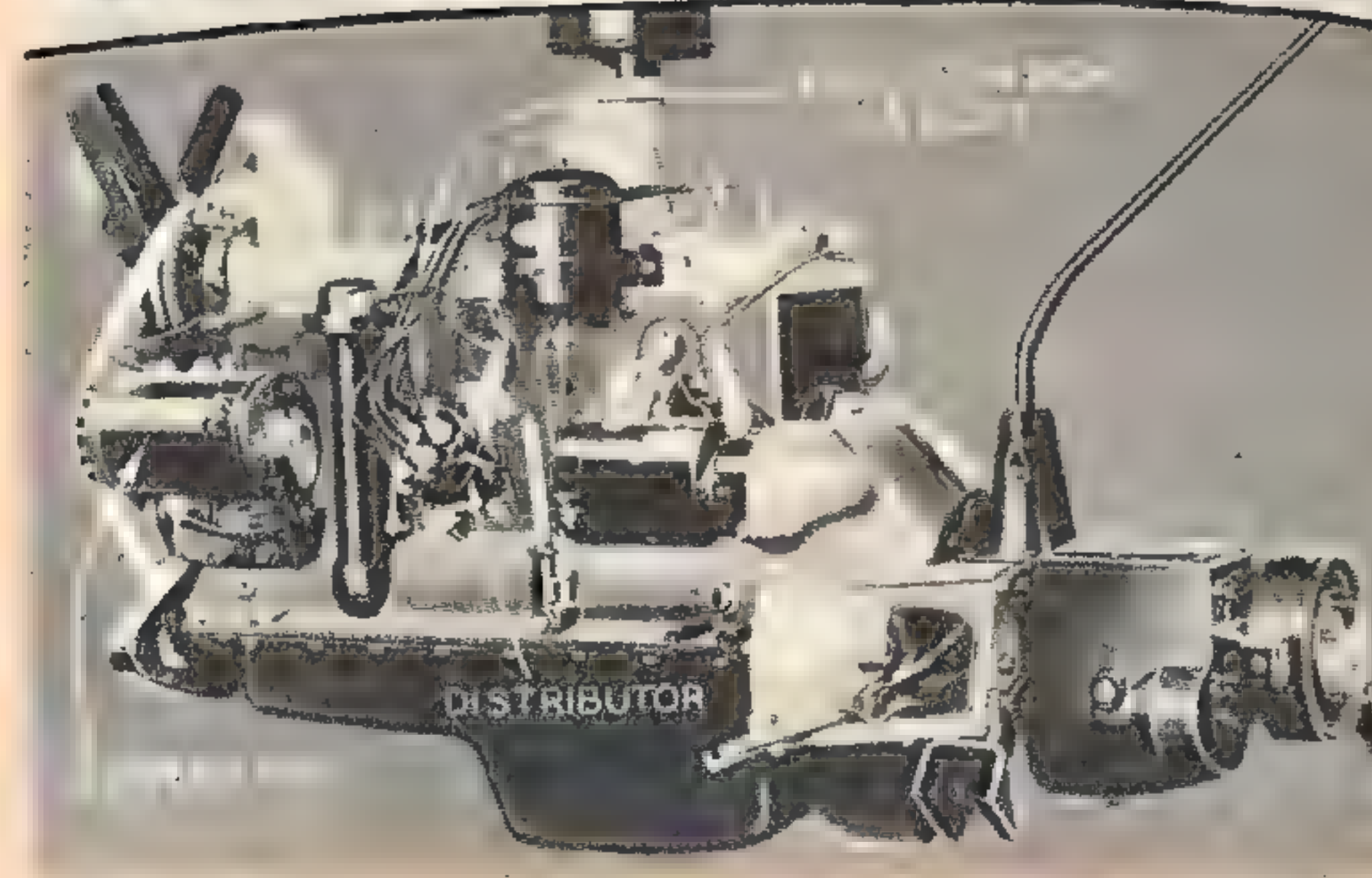
When the car battery is too weak to permit starting, even by cranking, the problem may be solved by inserting a doorbell transformer in the ignition circuit as illustrated at right. Once motor has warmed up, original battery connections may be restored. Lower right—If a small quantity of cylinder oil placed outdoors overnight will pour from the bottle the next morning, its viscosity is satisfactory for winter use. Below—Starting troubles are often traced to carburetor and manifold



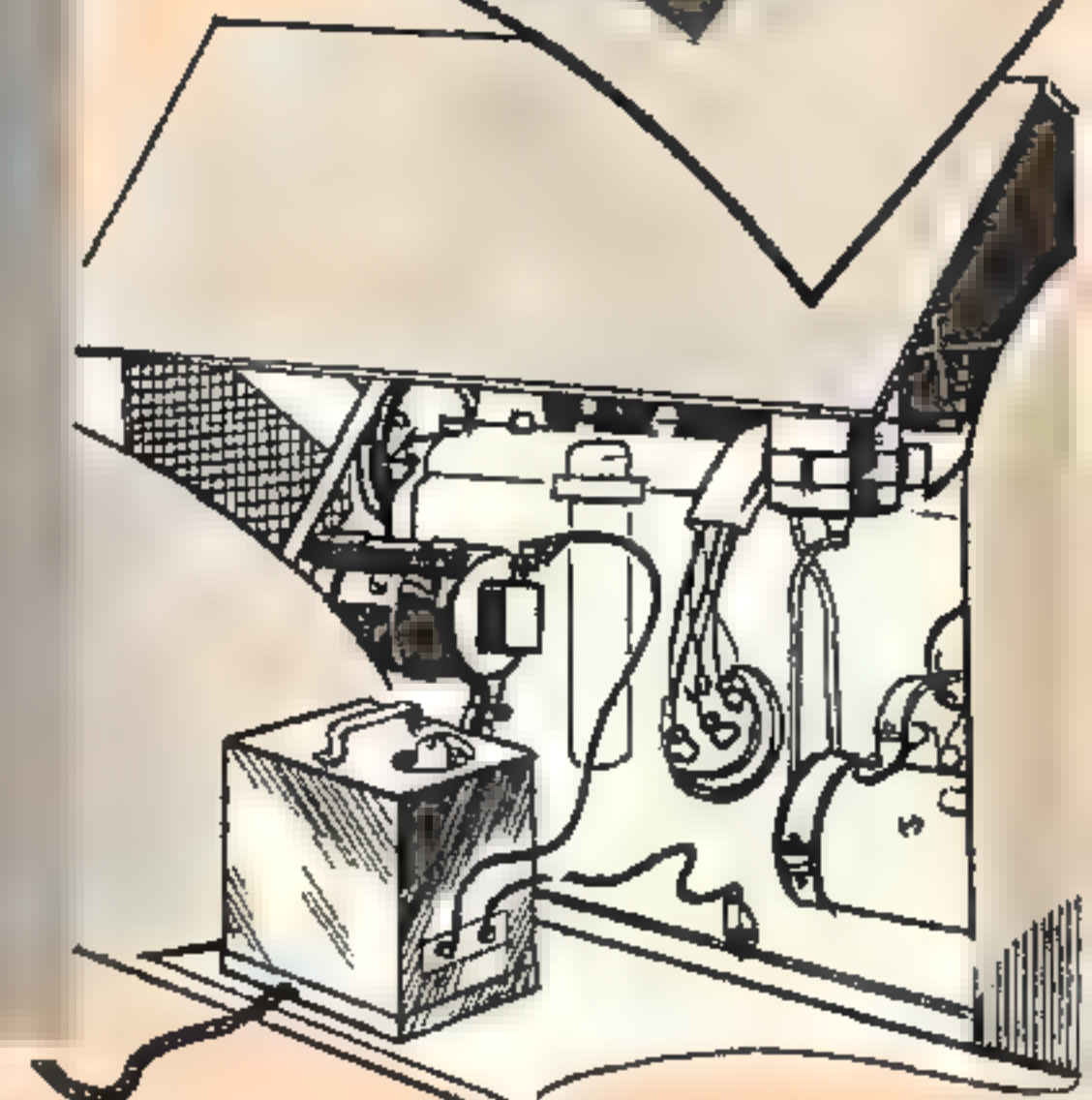
EXPOSE OIL OVERNIGHT IN COLD WEATHER



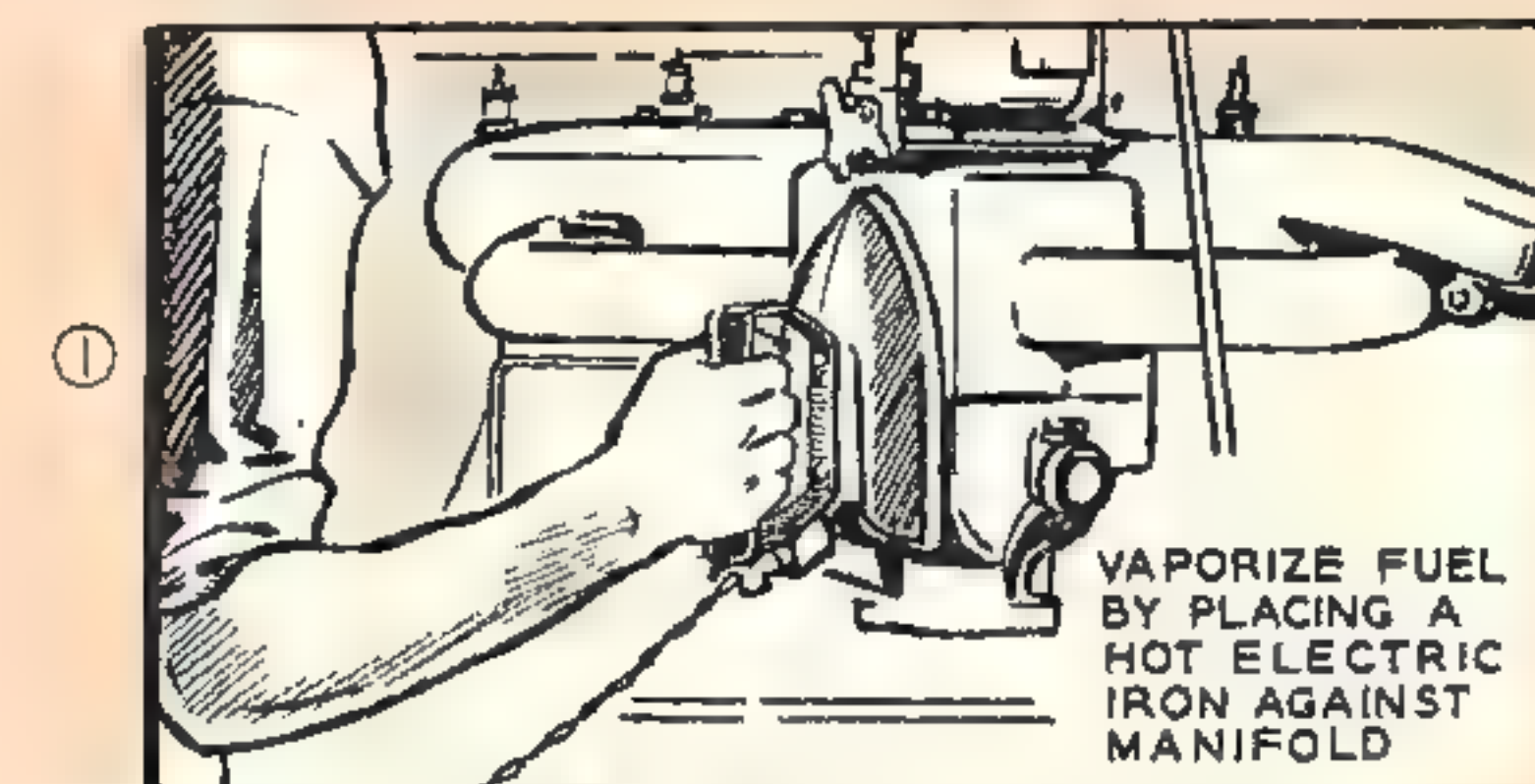
WINTER STARTING



This photo of a modern automobile motor shows where to look for trouble in the ignition system. Trouble often occurs in the cables, distributor or generator. Sometime all three may be at fault. Right—A simple way to charge a weak battery.



CONNECT A STORAGE BATTERY CHARGER TO TERMINAL OF GENERATOR CUT-OUT, WITH OTHER TERMINAL TO FRAME OF CAR TO MAINTAIN STRONG CAR BATTERY

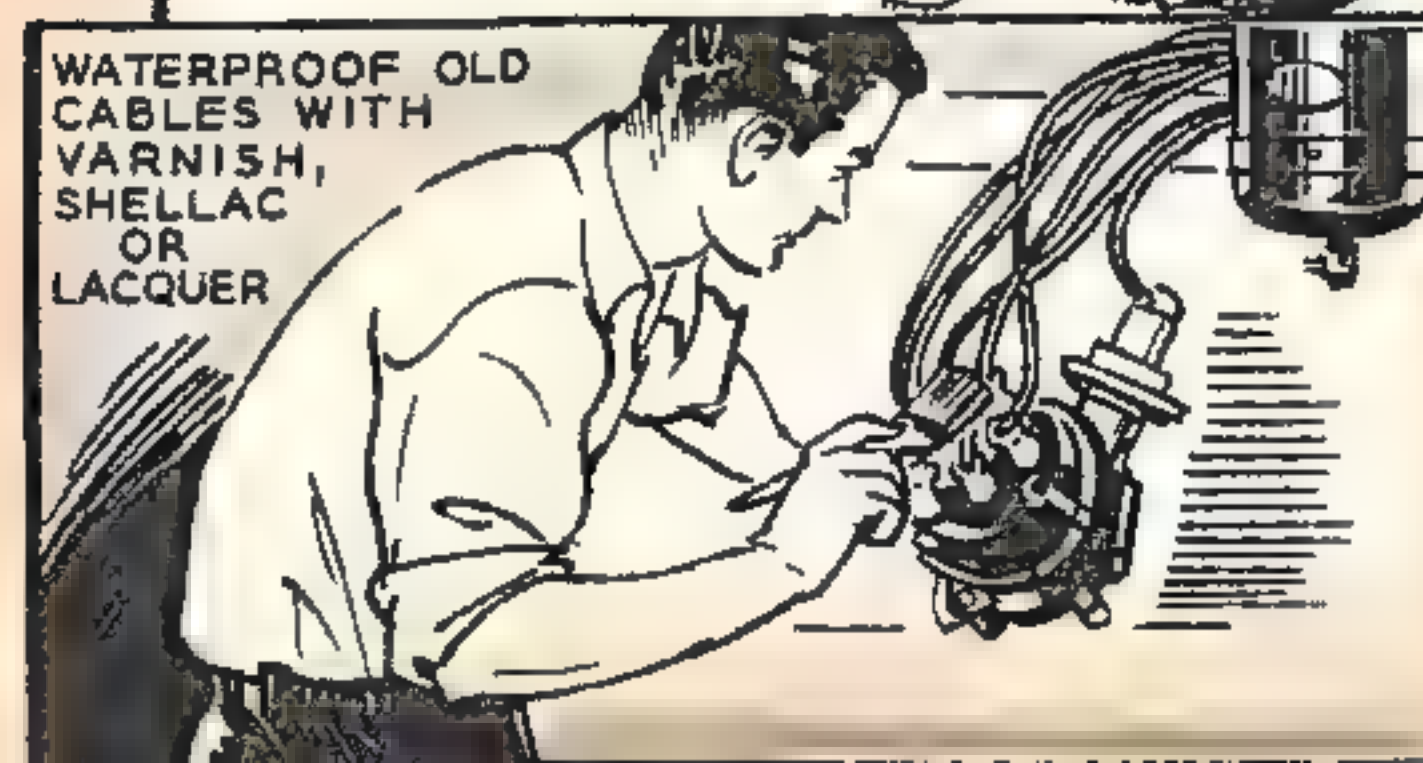


you can determine this yourself by a simple viscosity test.

Place a tablespoonful of oil in a small bottle and allow it to remain outdoors overnight during a cold spell. If the oil, after being exposed to the elements, becomes too hard to pour, you may be sure that it is not suitable for use in the crankcase.

In order that the gasoline is converted into vapor for firing the cylinders, a certain amount of heat is required. Even the best grades of gasoline cannot be expected to function properly unless the chemical changes they require are given proper consideration. The quickest way to accomplish vaporization of the fuel is to heat the manifold of the engine externally. This may be done by resting an electric iron against the manifold or playing the flame of a blow torch on it for a few minutes. With this simple treatment the motor will start almost instantly if the engine is first turned over a few revolutions with the choke momentarily pulled out before the ignition switch is turned on.

[Continued on page 142]



Many winter starting annoyances can be remedied if the suggestions outlined in the illustrations at left are carried out. 1—An electric iron held against the manifold will aid in vaporizing the gasoline. 2—Clean both inside and outside of bakelite distributor with a clean cloth and alcohol, then (3) file rotary points and contacts. 4—To prevent power leakage, waterproof high-tension cables with several coats of shellac, varnish or clear lacquer.



Experiments in



Ordinary household gelatin, vinegar, water and a few common and inexpensive chemicals provide all materials for performing these novel experiments.

by E. Mason Marcus

PROBABLY the most discouraging factor to all embryo home chemists is the lack of costly equipment that is outlined as necessary in most experiments. The experiments described in this article are unique in that the only necessary equipment consists of a few test tubes, jars, a pan, and a teaspoon.

Perhaps you are wondering what a colloidal chemistry is all about. Colloidal chemistry is concerned with suspensions, emulsions, and all other phenomena of finely divided particles.

Colloids are quite common in our everyday life. Milk is a colloid. Steam, fog, ink, butter, and gelatin are all colloids. The red of a beautiful sunset is due to the finely divided colloidal particles of dust suspended in the air and refracting the light. Some of

these colloidal particles are so small that they cannot be seen in a regular microscope which shows particles in transmitted light but must be viewed in an ultra-microscope which uses a dark-field and the particles are seen by reflected light.

There are two types of colloidal systems. One of these is a watery system and is called a "sol." The type that we are going to experiment with are called "gels" for they are in the form of a jelly-like substance such as the gelatin desserts which we eat.

There is a beautiful phenomena in the chemistry of gels which we call rhythmic banding. These can be made in gels of gelatin or of silicic acid. Beautiful bands of bright red and colorless can be made to appear in an ordinary test-tube. All of these

Rhythmic banding effects, as picture at left, are produced by mixing $\frac{1}{2}$ teaspoonful of water glass with 2 teaspoonfuls of water. To this is added a few crystals of potassium iodide dissolved in 2 teaspoonfuls of vinegar. When poured into a test tube a jelly-like mass is formed. Adding a solution made from a few mercuric acid crystals, will produce beautiful red bands. Below—Cross-section view of Liesegang's rings formed from a solution containing unflavored gelatin, silver nitrate, or lunar caustic, and water.



Colloidal Chemistry for the Home Chemist



Anyone can perform these unique experiments in colloidal chemistry. The only equipment required is a few test tubes, a teaspoon, pan and several small bottles.

experiments have a gel for a base. For the first experiment in which we get the red bands, we will use silicic acid for a base. Do not let the name scare you, for silicic acid gel is nothing more than a mixture of common water glass and an acid such as white vinegar. It can be made by taking $\frac{1}{2}$ -teaspoon of water glass which can be purchased at any hardware or drug store, and mixing it with two teaspoons of water. This forms solution "A." Solution "B" consists of two teaspoons of white vinegar or 5% acetic acid which is found in all vinegar and which gives it its sour taste.

When solution "B" is poured into solution "A" a colorless solid mass is formed, known as pure silicic acid gel. It will be noticed that it is quite rubbery and will produce a metallic ring when the test-tube is tapped.

To make the red bands in the test-tube, a few crystals of potassium iodide are added to the acid solution "B," and then "B" is added to "A." When this has set, which should require no more than a few seconds, a

[Continued on page 130]



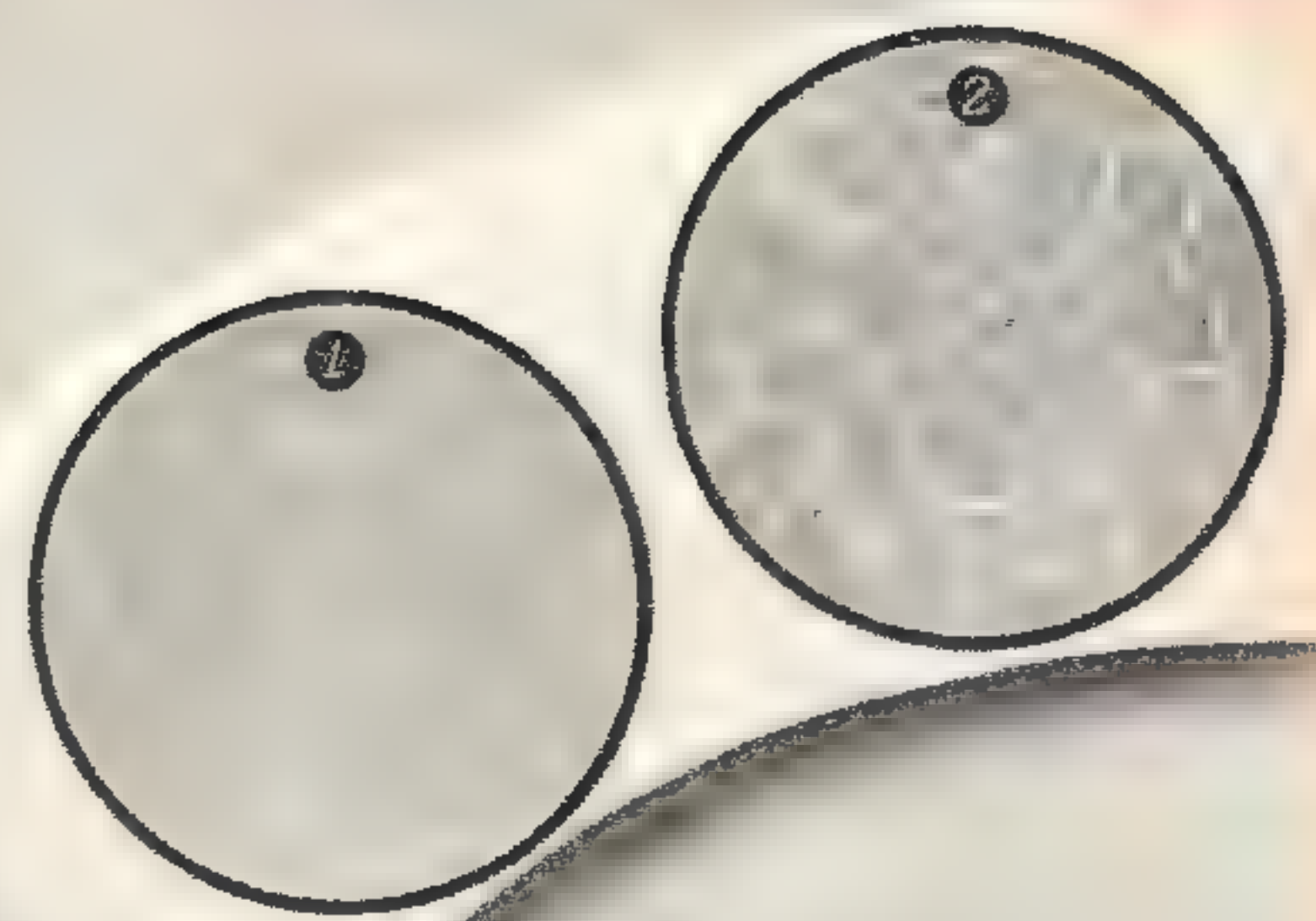
This unusual "lead tree" experiment provides one of the most unusual displays in colloidal chemistry. In a small vial place $\frac{1}{2}$ teaspoonful of water glass mixed with 2 teaspoonfuls of water. Next dissolve a few lead acetate crystals in 3 teaspoonfuls of white vinegar and add to the water and water glass solution. Insert a small strip of zinc in the vial and allow it to remain submerged for several days. Resulting effects are shown in these pictures. Top picture shows the "lead tree" after 2 hours while at left tree is shown after 24 hours.



Hitching a Microscope



Many set-ups may be used in taking photomicrographs. Here a plate camera is supported over the microscope on a tripod, while blocks of wood elevate the microscope to correct height. Desk lamp light source appears at the extreme left.



The results obtained when a slide of human blood is photomicrographed are shown in the above series of pictures. The first print made (1) showed lack of contrast. In the next, (2) orthochromatic film was used with a moderately short exposure. Results still were not satisfactory, so a longer exposure was given the ensuing print (3) with noticeable improvement. The amateur expected better results and purchased a set of light filters. The first print was jarred during exposure (4) so another attempt was made. In realigning the lens, the condenser was moved slightly, resulting in an off-focus image (5), but the experimenter finally triumphed with excellent photomicrograph of blood (6).

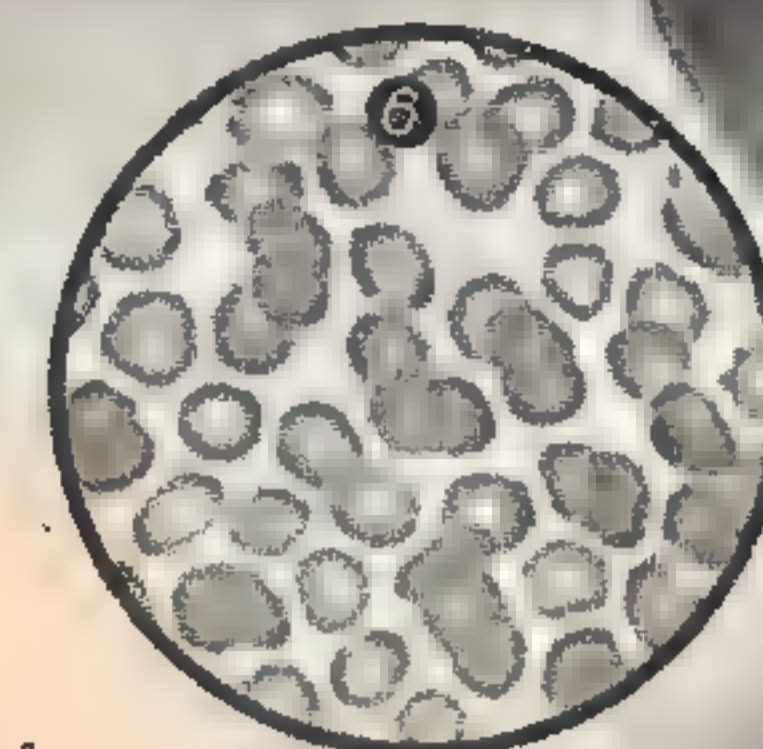
a few at a time or made at home, according to preference. Naturally, the better the equipment, the better the results. But it does not follow that one should put off trying his hand at a few pictures just because his instruments happen to be of the cheaper or cruder sort. Take some shots anyway and learn the rudiments of the game; it's loads of fun and good experience. Better pictures will then come more easily when a better outfit is obtained.

Complete photomicrographic apparatus is commercially available at prices covering a considerable range. Some of the professional outfits run into elaborate and expensive designs that would appall the novice as much by their complexity as by their cost. Nevertheless all of them, from simplest to most intricate, operate on a single, elementary principle that we can easily and quickly demonstrate.

Roll up a cone of cardboard and tie or glue the overlapping edges, so that the smaller

To Your Camera

by Julian D. Corrington, Ph.D.



Photomicrographic slides from Wards Natural Science Est., Inc.

opening of the apex will fit snugly over the eyepiece of the microscope, the cone being inverted, base upward. This base should be some 10 inches above the eyepiece and from 4 to 6 inches in diameter. Paste a sheet of white tissue paper across the open base. With a slide in position on the microscope stage, and performing the demonstration at night in a darkened room, shoot as much light as possible through the microscope, secure a focus, and there is the picture of the object upon the tissue paper. This is actually a case of projection, just like that of the motion picture or lantern slide projector.

Now it is obvious that if we were to replace the tissue paper with sensitized film or plate, we should be able to make a photograph of the object in this same manner. And that is just what is done by photomicrographic

Photographing microscopic wonders is a new and interesting hobby.



This 9x12 cm plate camera, attached to a home-made stand, makes excellent photomicrographs. A sheet of photo mount paper between camera lens and microscope eyepiece serves as a light-tight adapter. Black "scotch" tape will also provide effective results.

cameras, which are no more than black boxes; the word "camera" means a chamber and a box is a miniature chamber. When hooked up to a microscope, all of the accessories of modern cameras may be dispensed with, since the microscope already has lenses for focusing, and exposures may be made by snapping the light source on and off, thus eliminating the necessity of a shutter.

One of the best methods of building your own camera is to center the construction

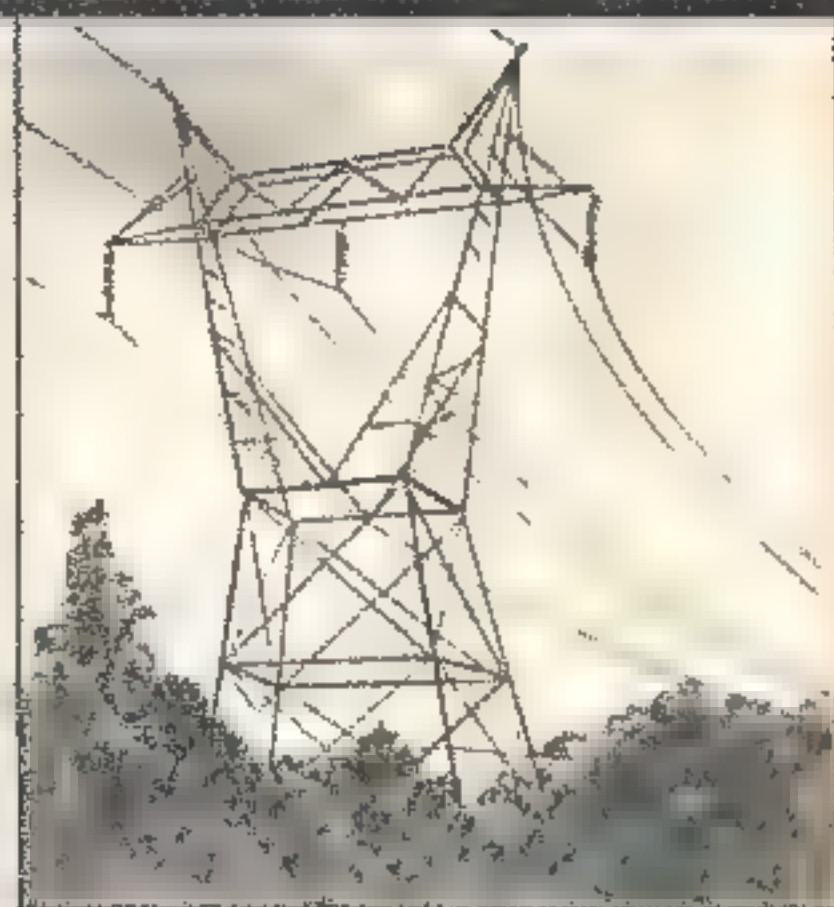
THE mere inspection of bugs and other specimens under a microscope, or the making of permanent slides, is a fascinating pastime. But *photography* through a microscope is something else and a job worthy of the most enthusiastic devotee and one of the most engaging of all hobbies.

It must be admitted at the outset that photomicrography is probably the most difficult of all forms of the photographic art, assuming that perfection is the goal. But *reasonably* good pictures can be secured by the beginner within a week. Thereafter, as in any type of photography, improvement is a matter of skill gained by patience, care and practice.

Of decided importance is the fact that contrary to expectation, one does not need a lot of expensive equipment for this work. Any type of camera can be hitched to a microscope, and the accessories either purchased

The Cause and Cure

Faulty power lines are sometimes responsible for the interference heard on sets. Power companies stand ready to track down troublesome lines.

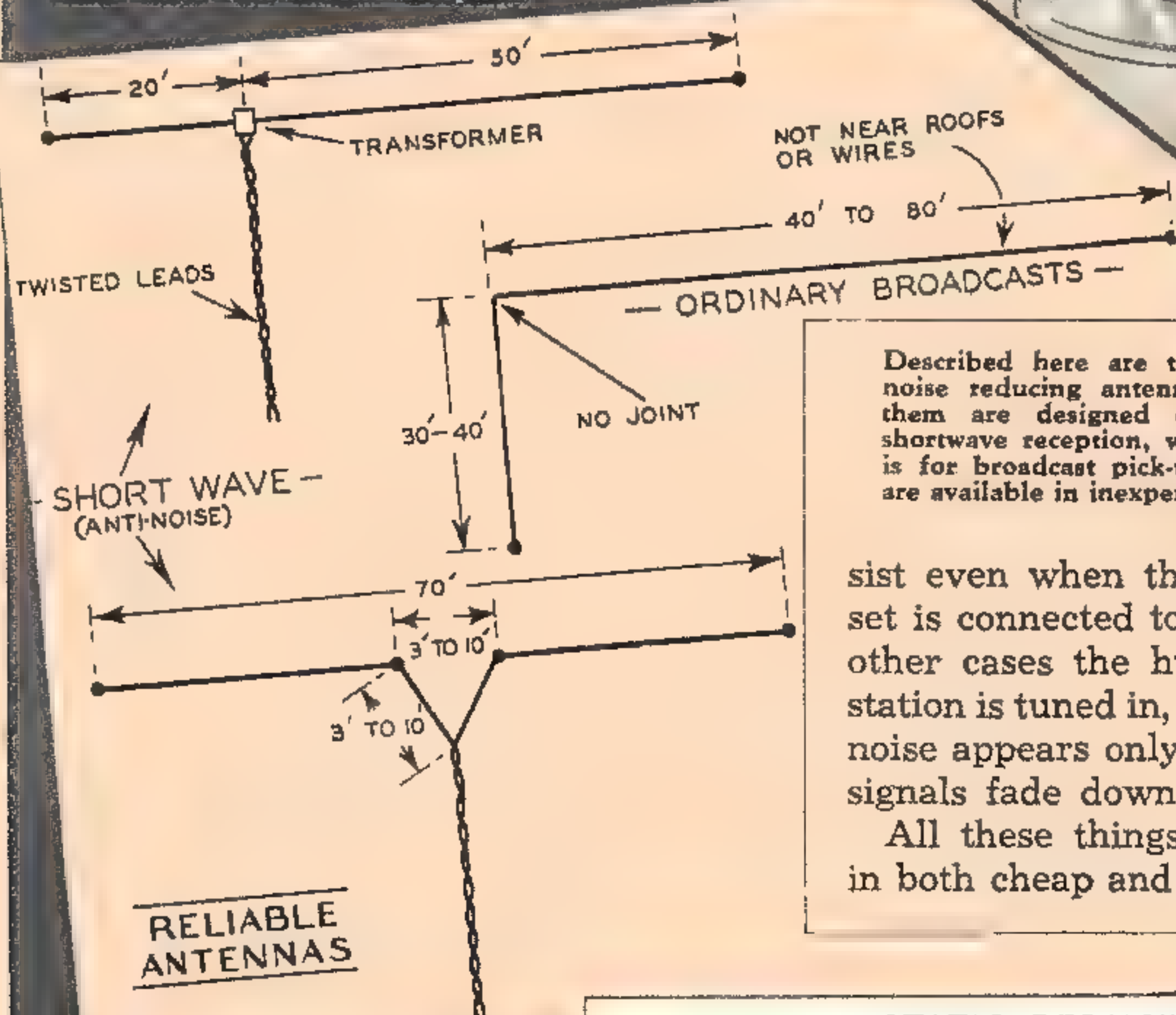


by Robert S. Kruse, E. E.

IT IS no good to plug a crack in a rowboat while water is pouring in through a 6-inch hole at the other end. In just the same way one cannot get quiet radio reception with the best anti-noise device while noise is pouring in through some other gateway—and there are 5 ways for the noise to get in. Let us examine the 5 gates, to see how they may be closed.

Very many radio receivers, even when in good repair, are noise-factories on their own account. These noises take the form of hums or "Shhhhhh" noises, which may per-

Broken light sockets, worn heating pads, toasters and irons all tend to create noise that hinders reception.



Described here are three types of noise reducing antennas. Two of them are designed especially for shortwave reception, while the third is for broadcast pick-up only. All are available in inexpensive kit form.

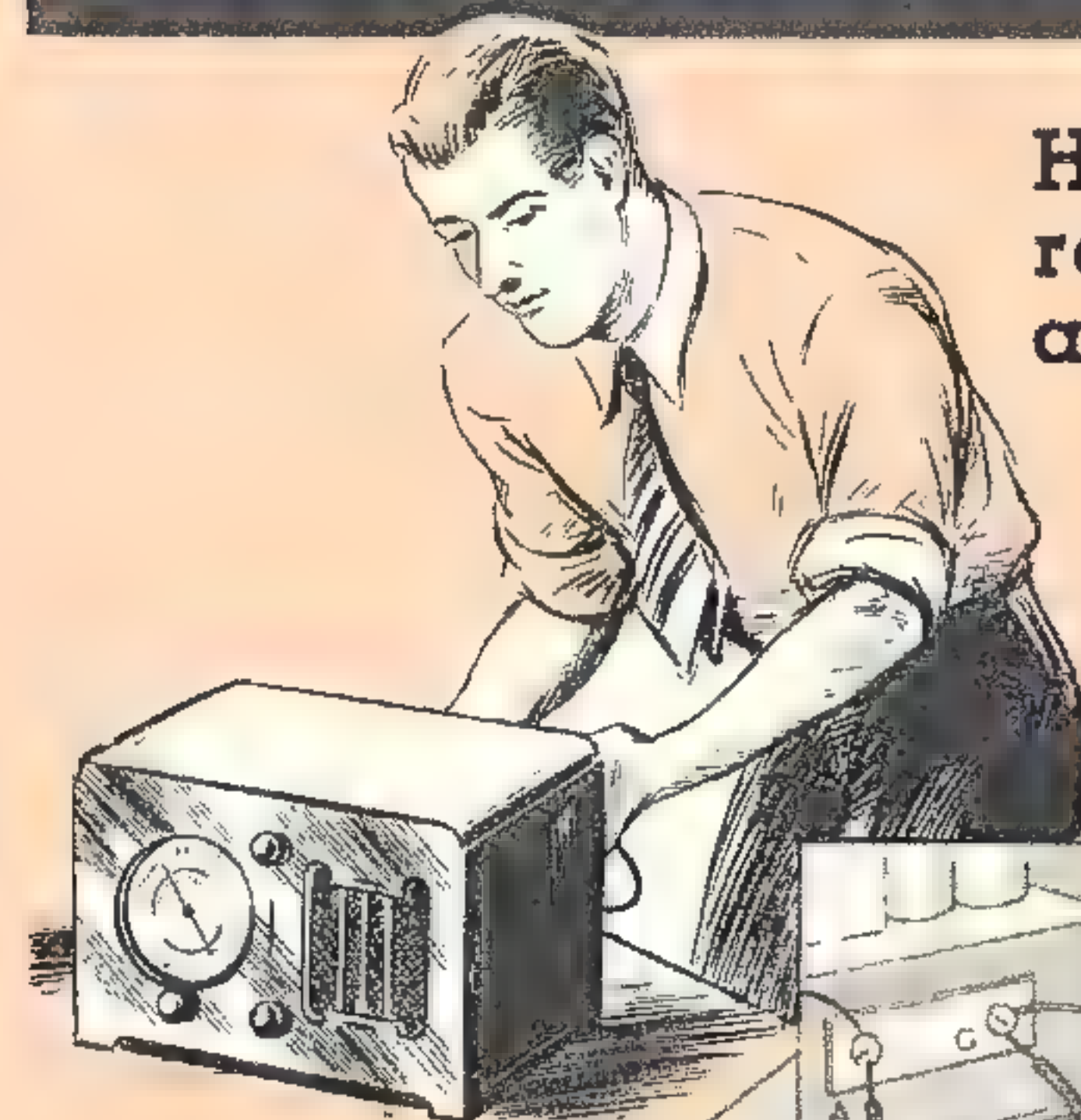
sist even when the antenna terminal of the set is connected to the chassis of the set. In other cases the hum is heard only when a station is tuned in, and still others the "shush" noise appears only on weak stations or when signals fade down.

All these things are design-defects found in both cheap and costly receivers. A really

Right—In localities where static is excessive, an antenna located only a few feet above the ground will often reduce annoying radio disturbances.

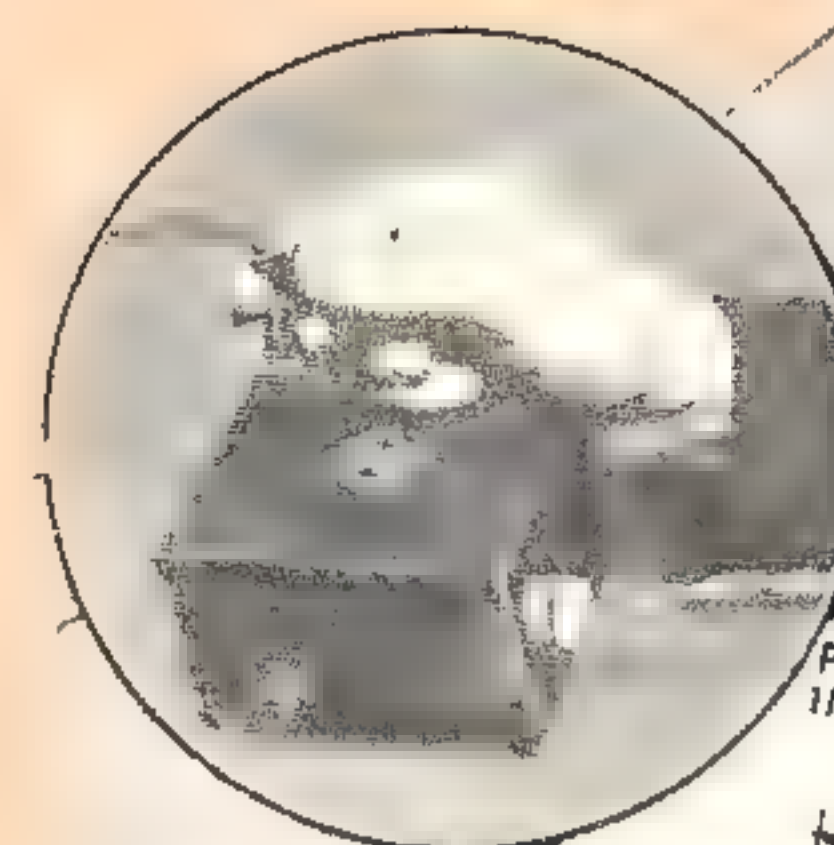
of RADIO NOISES

How to check radio noise at its source.



If noise persists when antenna is grounded to chassis, it is entering set through the power line.

Natural static, as caused by thunderstorms, cannot be entirely eliminated. Special antennas will aid in partially reducing it.



NOISE FILTER

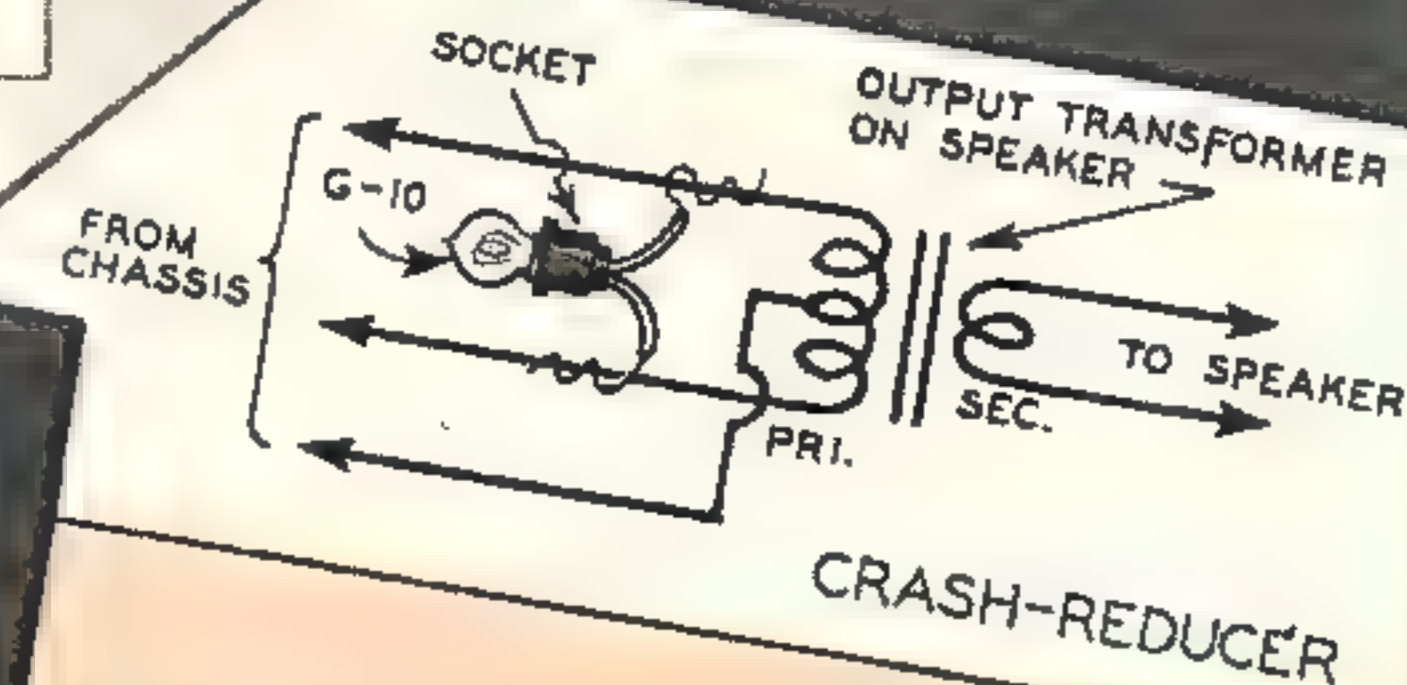
METAL CONTAINER

PLUG SET IN HERE

200 TURNS NO. 18 D C C WIRE

110 VOLTS

1 MFD.



Sharp crashes of static may be reduced in some instances by connecting a G-10 neon bulb across the speaker transformer.

A noise filter consisting of two choke coils and two condensers, connected as shown, will often reduce power line interference.

good serviceman will understand what causes them and you may learn whether to trade in the set for a better one or have him make changes in its circuit to get rid of the noise. Sometimes the receiver can be made decently quiet if given a 100-foot antenna but if that seems to overload it, compromise with a 75-foot antenna.

On Jack Benny's program, and in the funny papers, any fool noise is called "static," but

there is no mistaking the real article when it has once been recognized. Static is infrequent in winter and frequent in warm weather, especially after sundown. It never squeals or buzzes as the funny-men say, but is always and every time explosive in nature—a crash or pop for a single "splash" of static on a grating or frying sound but never a steady noise. It cannot be stopped at the source, for nature is responsible, but we can cover moderately strong static by using a larger antenna, as already mentioned, provided we make the antenna merely longer—not higher. Broadcast reception can be made fairly acceptable with an antenna 5 feet high and 100 feet long when the ordinary antenna nearly ruins the speaker.

Most people now know that pitched noises may be reduced by turning the tone control to "bass" or "low pitch" and accepting the

[Continued on page 134]

BUILD THIS TWO-TUBE "AMATEUR SPECIAL"



by Clifford Peters

THE "Two-Tube Amateur Special" will fill the wants of the future radio amateur, or the person who desires to listen only to the short waves with all their interesting broadcasts. For the person who now is learning the code, this receiver will supply all the code practice desired.

Simple to construct, the entire outfit can be assembled and wired, ready to operate, during a weekend. A metal cabinet serves the double purpose of furnishing adequate shielding and giving the finished product an attractive appearance. The outfit was constructed with the power supply as a separate unit to remove the possibility of a. c. hum pickup so predominant in many home-built regenerative receivers, using a power pack.

Before starting the actual construction, the builder would do well to study carefully the wiring diagram and the placement of parts. Slight variation of parts placement will not materially affect the operation of the receiver.

The builder will notice that the two tuning condensers are connected in parallel. The .0001 mf. variable condenser is used for band-setting purposes, and the .000035 mf. condenser, mounted near the center of the panel, for spreading the section of the band selected by the band-setting condenser.

Although this receiver is not recommended for loudspeaker operation, it will furnish sufficient volume on some stations to be heard throughout the room. It will, in any case, give signals loud enough to be read with headphones.

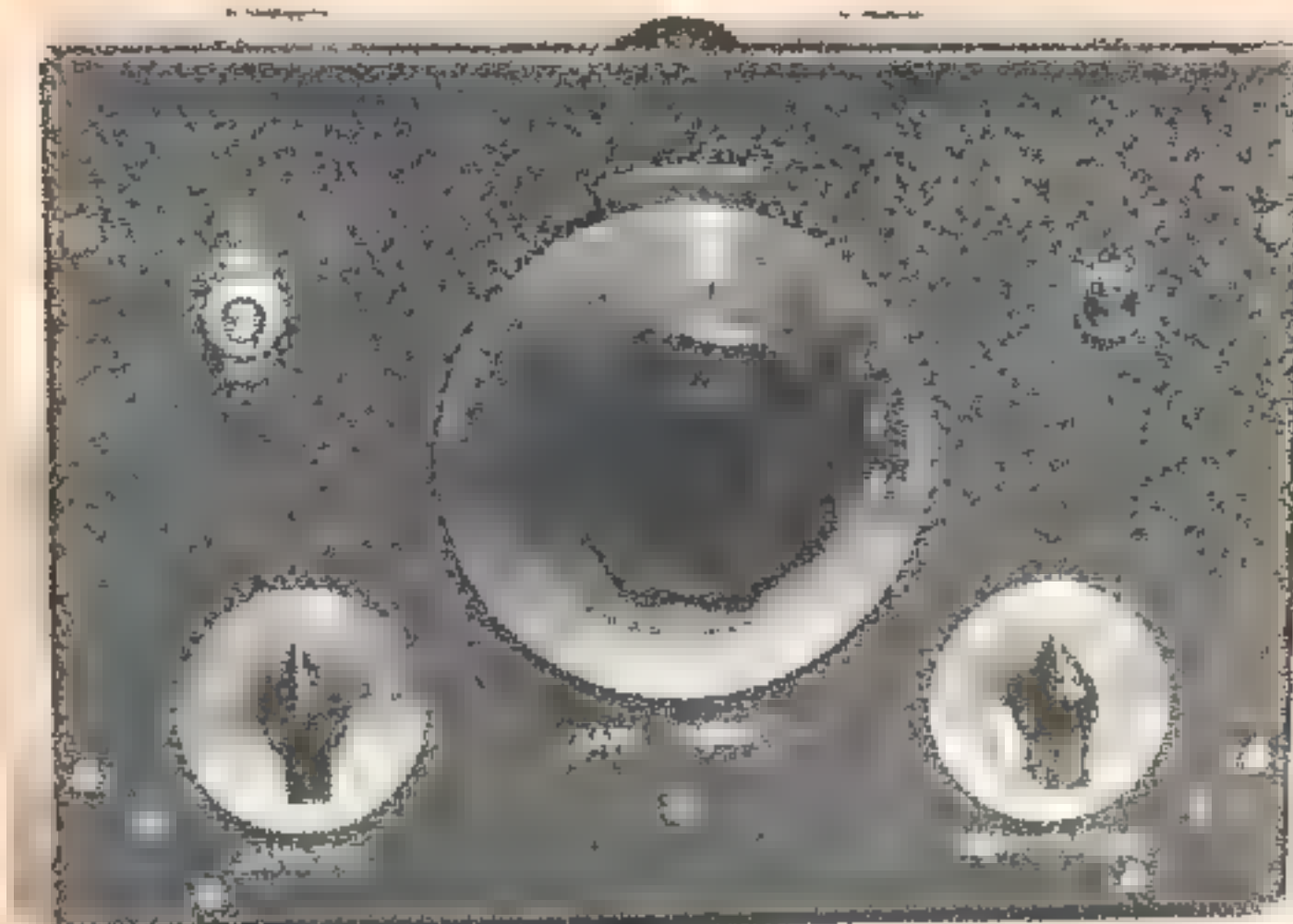
Actual construction should start with the panel layout. A cabinet measuring seven by ten inches long and eight inches deep will be found to be most suitable. This cabinet should have a removable panel so that layout and drilling can be done with it removed from the rest of the cabinet.

The location for the band-spread condenser was obtained by drawing diagonal lines from the corners of the panel, and measuring up one-quarter of an inch from the intersection of these lines.

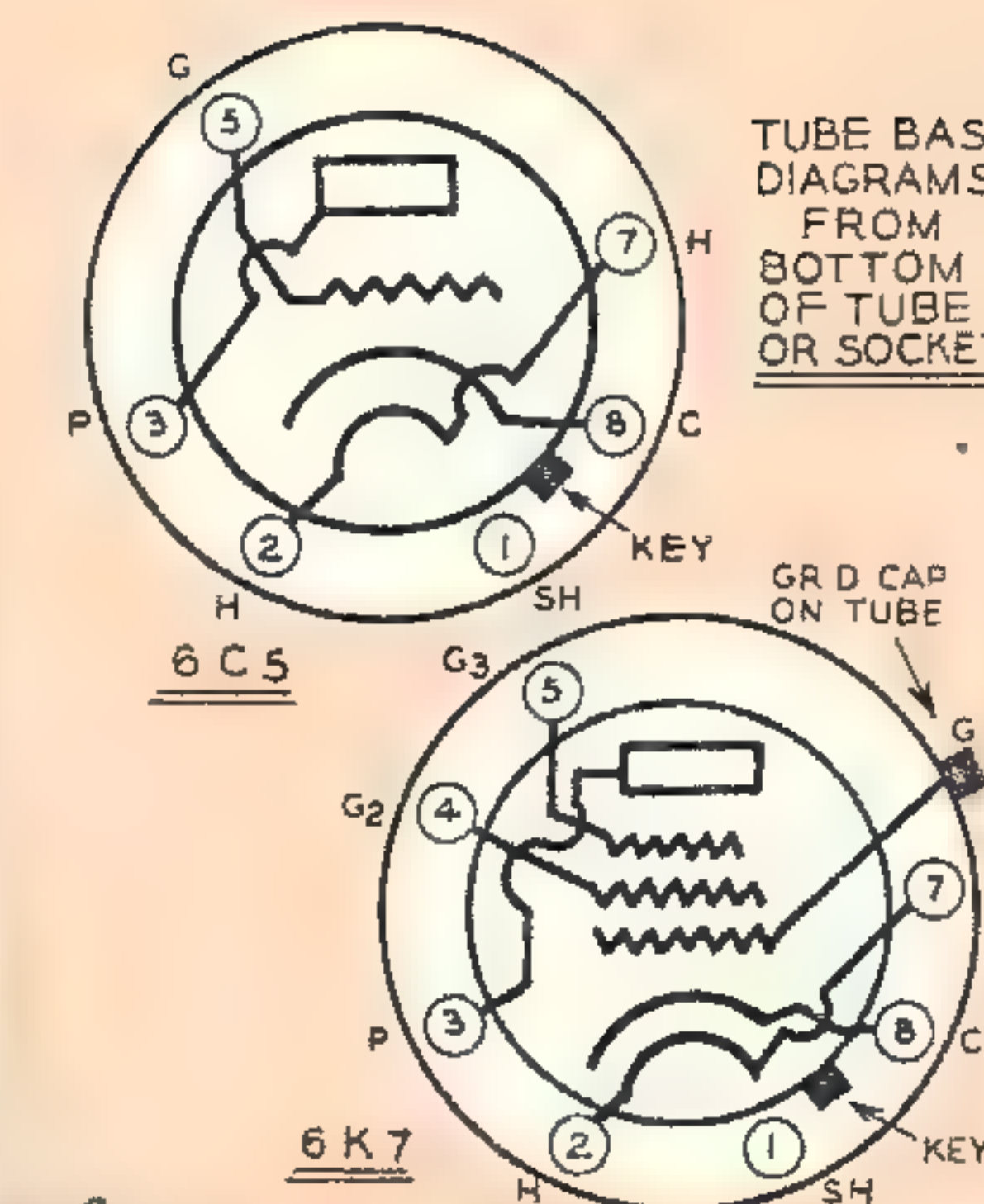
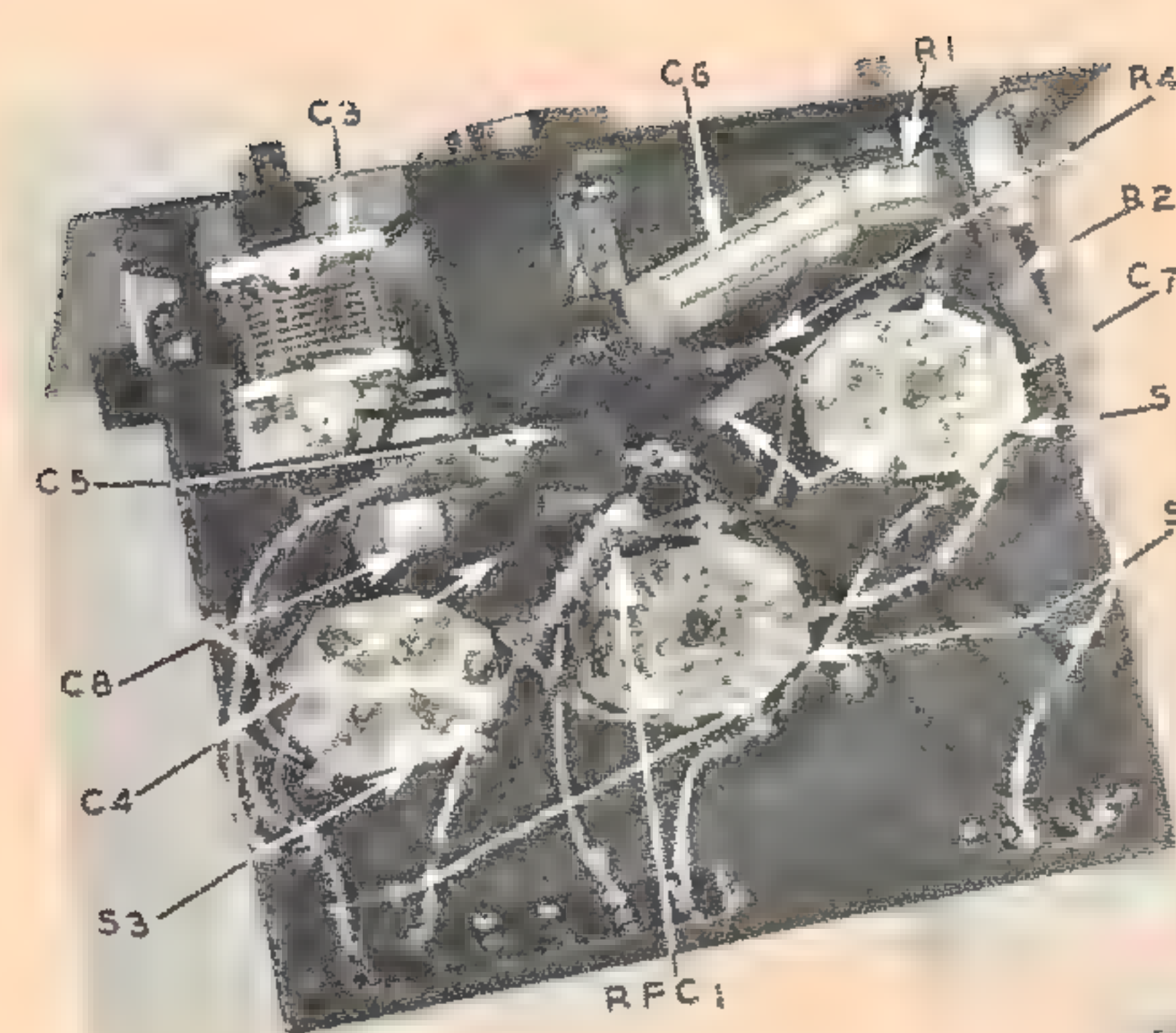
The centers of the holes for the band-set condenser and the potentiometer are obtained by measuring up two inches from the bottom of the panel and two inches in from each side. The pilot light and the "B" switch are located one and one-half inches from each side and two inches from the top of the panel.

A plyboard subpanel measuring eight by seven inches deep is attached to the panel by three one-inch angle brackets. The subpanel is mounted approximately one and a half inches from the bottom. Because the potentiometer and the band-setting condenser are mounted only two inches from the bottom of the panel, it is necessary to cut sections out of the baseboard to accommodate these instruments.

It will be noted that the power supply is larger than most of those used for receivers. It can therefore be used with an amplifier for this receiver, or as a source of power for a crystal oscillator.

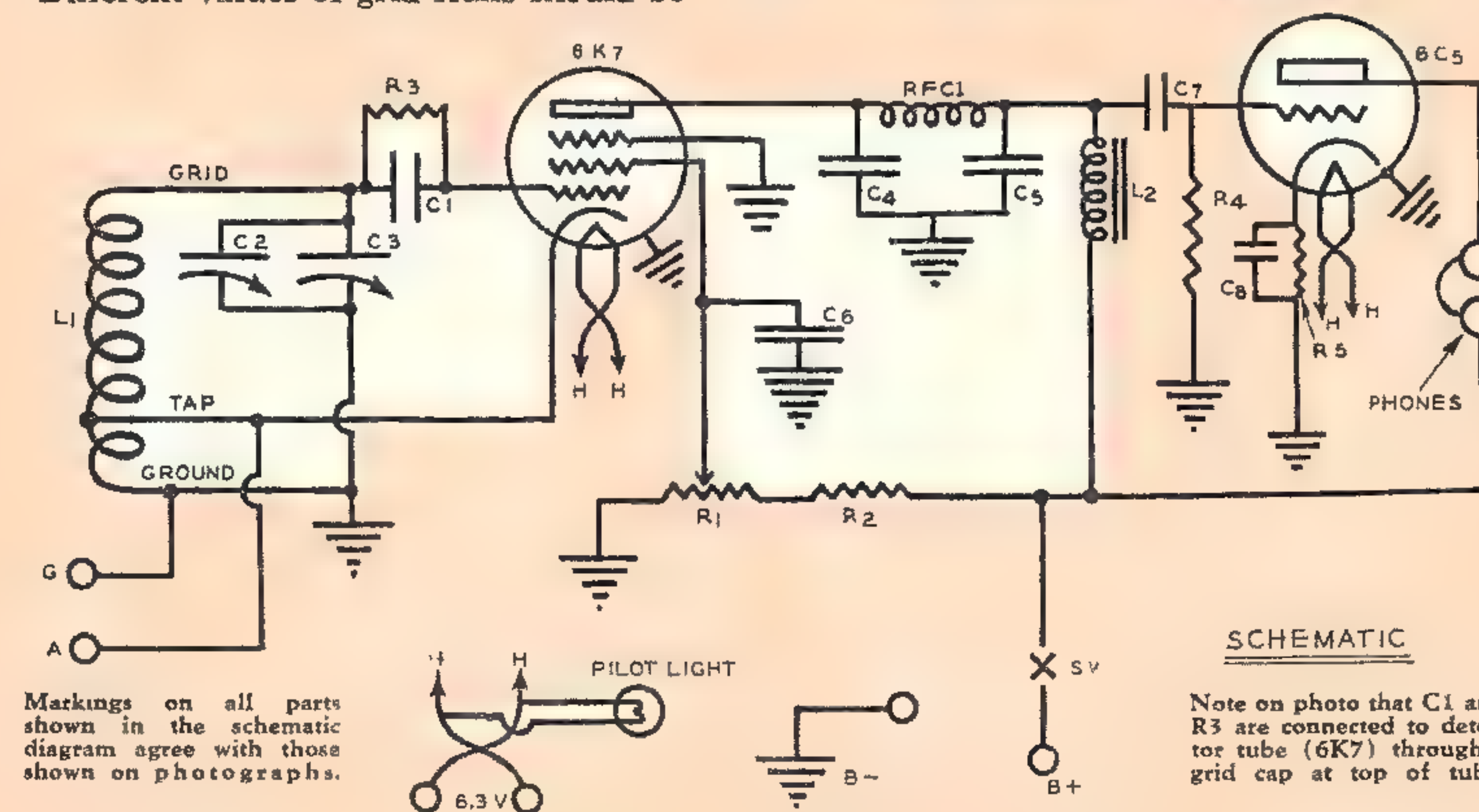
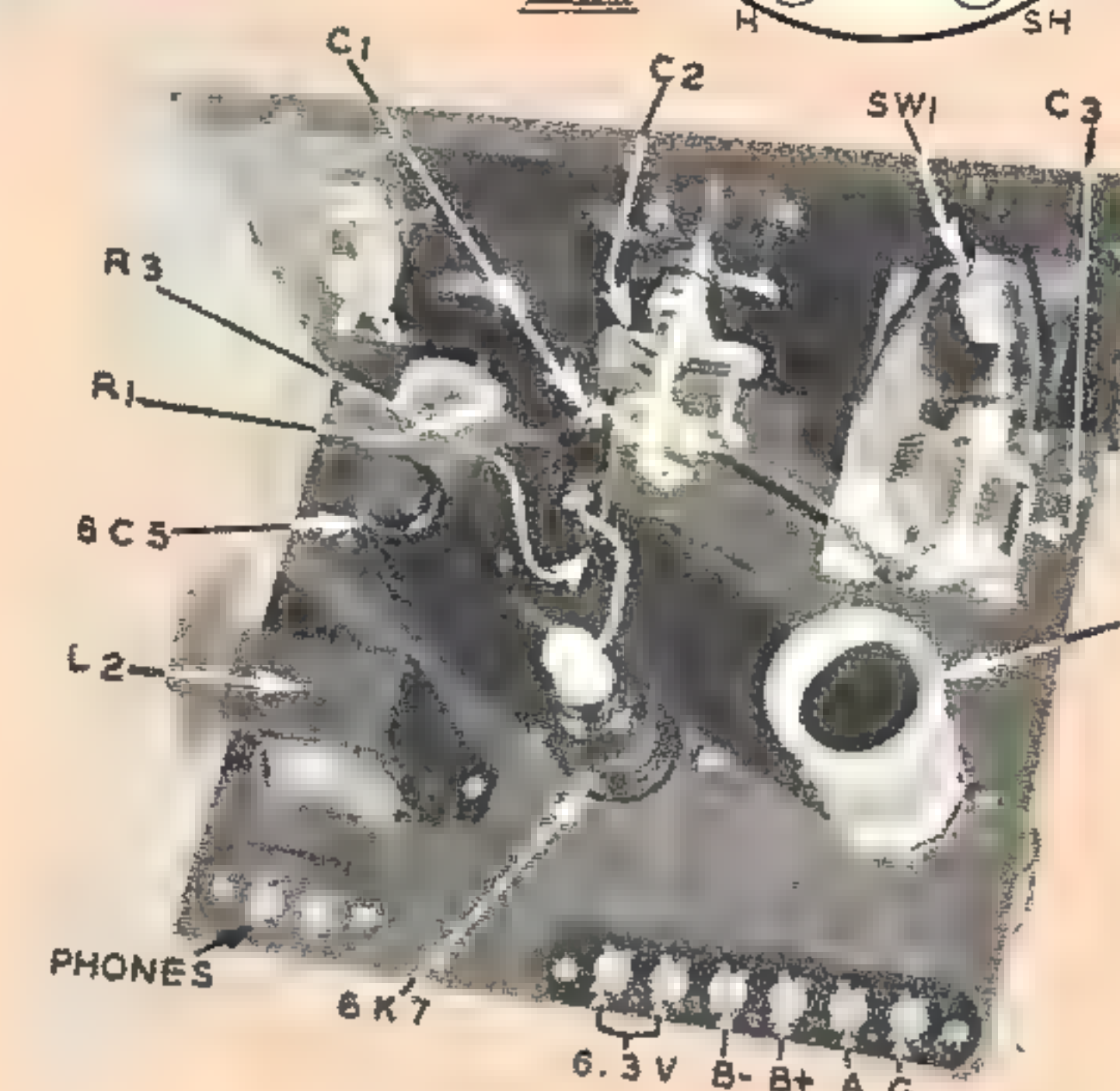


The completed receiver as viewed from the front. "B" switch shows at the upper left corner of the panel. The pilot light is at the right. The panel measures seven by ten inches long.



A switch is placed in the "B" plus lead so that the receiver may be shut off temporarily without turning off the filaments. When the receiver is used with a transmitter, this "B" switch will be found especially useful. If the entire receiver, including the filaments, is turned off, approximately twenty seconds are required before the tubes are again at operating temperature. The "B" switch eliminates this time lag. The pilot light indicates that the receiver is turned on even though the "B" switch is turned off.

Different values of grid leaks should be





Designing Photographic

by Paul Hadley

THE popularity of photographic greeting cards increases each year among amateur photographers, who have developed many interesting and unique ways of making them. Yet, there is one branch of this hobby, though especially well adapted to the making of greeting cards, that has somehow been overlooked. This is table top photography, by means of which little scenes can be built up on a table in the quiet of the home, and photographed by artificial light.

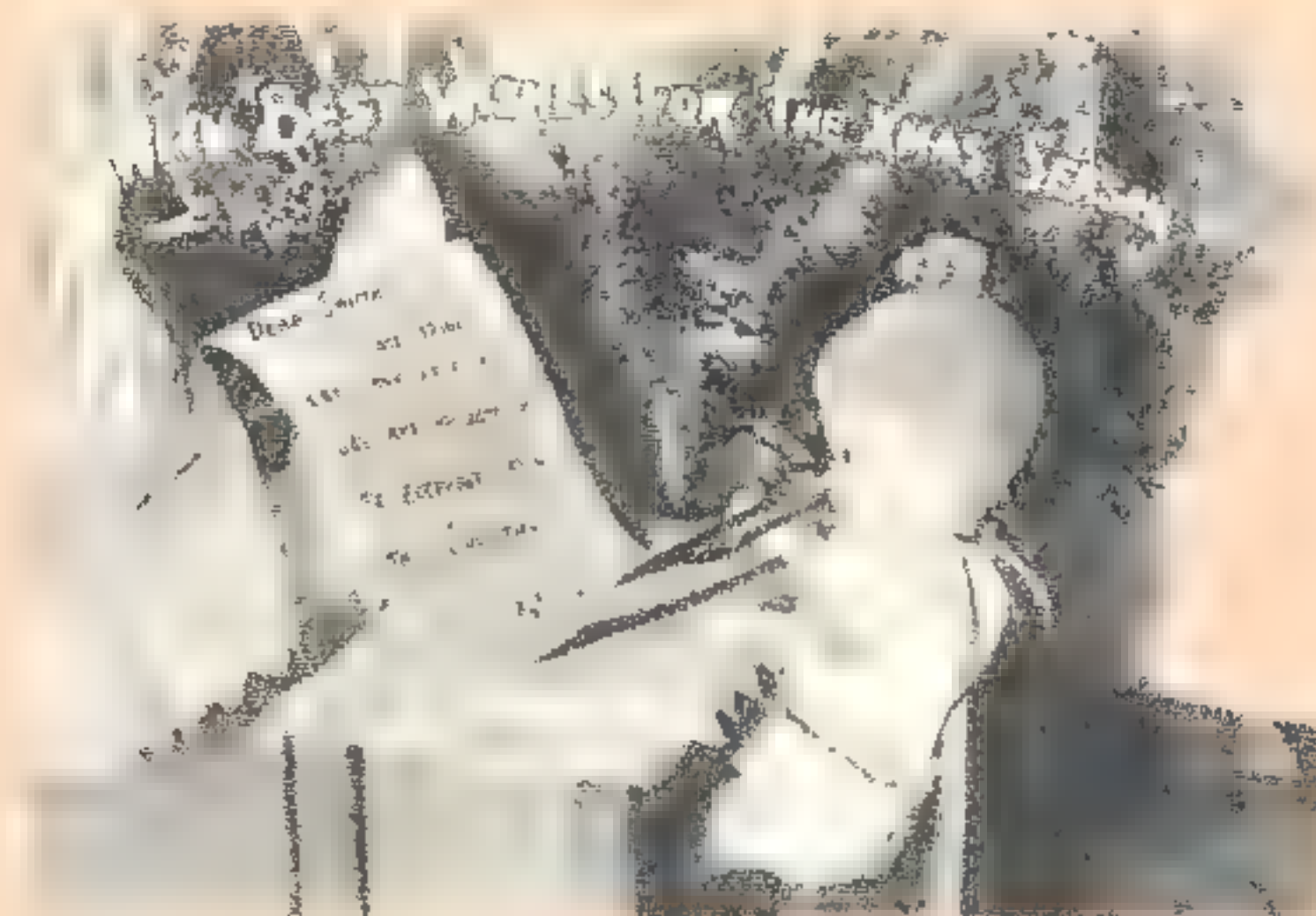
Many are the effects that can be produced with a few simple "props," such as a toy doll or two, miniature Santa Claus and reindeer, or other miscellany found in any toy store. No particular equipment is needed; any available camera that can be focused on objects within a foot or two of the lens is well adapted to the work. As the objects are necessarily stationary, time exposures of any length may be given so that even the most simple lighting can be made to produce good results. All of the accompanying illustrations were made with a simple focusing camera, using one or two photoflood bulbs for illumination.

Ordinary lighting bulbs would have served just as well however, by increasing the time of exposure.

One of the accompanying illustrations shows a small doll seated at a table, much as any child would sit, just finishing a letter to Santa Claus, in which she requests him to bring lots of pleasant things to the recipients of the card. This little scene was simply made. The doll was an ordinary ten-cent china doll from the toy store, about 5 inches high, seated at a table made from a small wooden box. For a background, a sheet of white cardboard was placed immediately back of the table, with a window and cur-

tains, made from black paper and two scraps of white cloth set up in front. An evergreen twig, decorated with a bit of tinsel, add a bit of Christmas atmosphere. The note was printed on white paper with black ink, and propped into place against the curtain. One photoflood bulb, at the same height as the set-up, and located beside the camera, furnished the light. The exposure was made in 6 seconds at f. 22 stop.

The same tinsel decorated cedar limb was used in making the other three pictures in which the symbol of Christmas appears. In two of these the little trees, decorated with



Though distinctively different, these novel greeting cards are easy to make. Properties consist of odd pieces of cloth, cardboard, two ten-cent dolls and a few miniature "prize package" toys. Draw greetings on resulting negatives with black show card paint.

Your Own Holiday Cards

A small camera and simple props provide all equipment needed to make these clever greeting cards.



Simplest of all to make, this card is nevertheless very effective. A lighted candle, pen, inkwell and evergreen twig provide a cheery setting for the friendly Yuletide greeting.

making this, the table was first covered with a layer of newspapers, and the "aurora" background, of dark colored cardboard with the designs painted on it with white ink, set in place. A half inch layer of flour was then sifted over the paper covered table top and a small pile made where the "North Pole" was to stand. The pole, by the way, was nothing more than a large peppermint stick as sold in all stores at Christmas time. Santa, his

[Continued on page 128]

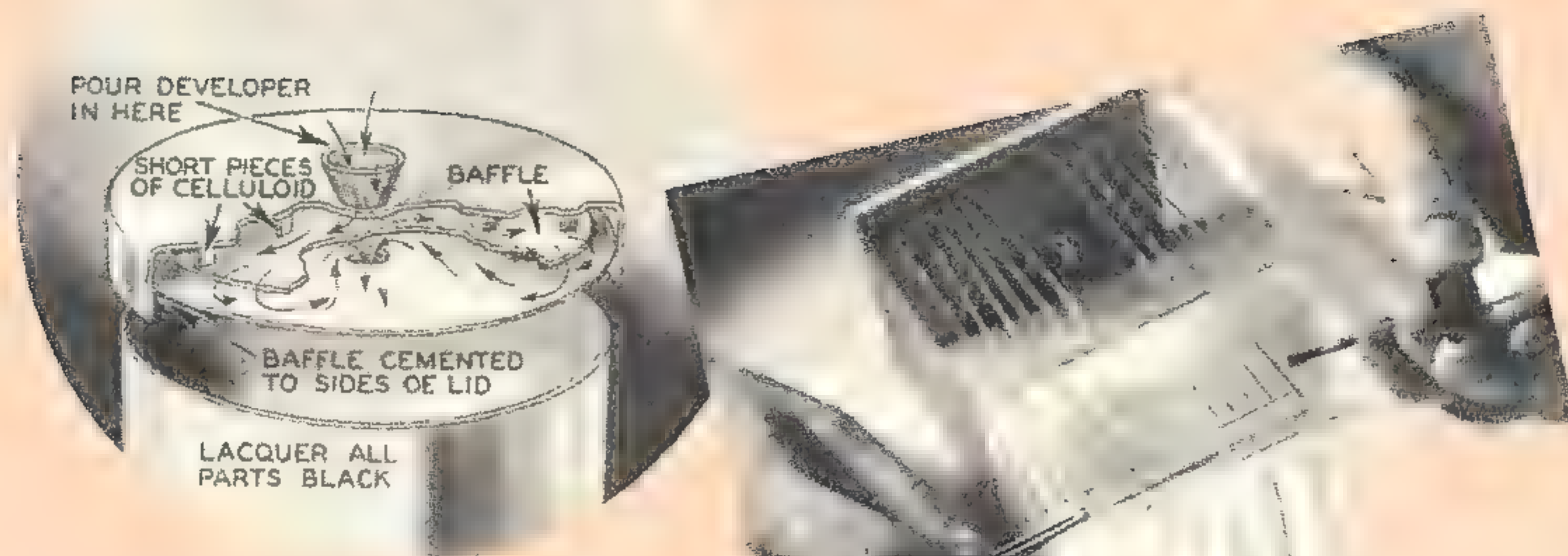
gifts, in a homelike setting, was made with the same window and wall background, but with the use of an additional doll character. The toys used to decorate the tree were a tint chair from a set of kiddie's doll furniture, supplemented with a striped whistle and a few marbles to look like balls. Lighting for this scene is the same as that used in the first except, that the lamp was moved a bit farther to the left, so that more sharply defined shadows are cast.

In the North Pole scene, we find old Santa, himself, about to leave on his yearly round, while the Aurora shines brilliantly around the North Pole. This scene took but a little over an hour in the making and photographing, and proved to be one of the favorites with the children to whom it was sent. In



Bits of tinsel, an evergreen twig, a doll chair and a pair of china character dolls are incorporated into this original greeting card. The window frame in the background is formed of black cardboard and thin strips of wood. Star and snow effect are painted in.

CELLULOID DEVELOPING



In order that the developer mix thoroughly when poured into the tanks and all light shielded from solution, the lids of the developing tanks are fitted with baffles made as shown in the above phantom detail. The baffle is cemented to the lid on short celluloid tabs. The funnel, on top is cemented with acetone.

Pictured at right is a completed roll film tank, loaded and ready for the developing solution. Although shown transparent, the tank when in actual use should be given one or more of black lacquer.



To insure tank rigidity, the bottoms are fitted with plywood and rendered waterproof with a sheet of celluloid, secured to plywood with acetone cement.

MOST professional photographers develop their negatives by the time and temperature method in a tank, to assure results that are uniform from day to day. A high average of good negatives is one of the secrets of the successful photographer. When the amateur wishes to follow this method, however, quite often he is confronted with one or more problems. First, a suitable tank may be too expensive. Again, one of the right size, particularly for roll film, may not be available. Finally, if you wish to make your own tank and are lucky enough to have a sheet of non-corrosive metal, such as monel or stainless steel, it is difficult to put together. Solder cannot be used, as it would contaminate the developer.

Heavy sheet celluloid, which you can purchase at any auto supply store, is the ideal answer to the problem. It is not expensive, does not affect the developer and can be welded together easily. Hold two pieces together lightly and touch the edges with a drop

This box-shaped developing tank is designed expressly for taking cut film. Insertion of the film spacers is accomplished through the use of acetone cement. A fingernail applicator and stamp tongs are used in mounting the strips. In order to maintain uniform spacing of strips, a ruled cardboard template is laid underneath celluloid.

TANKS ARE EASY TO MAKE

by Kenneth Murray



Though inexpensive to make, the celluloid developing tanks will be found superior to many commercial types. The photo above shows a cut film tank in use.

Below—When winding roll film on the developing tank spool, squeeze the edges of the film, as it is wound up, so that it bulges sufficiently to permit its insertion in the film tracks.



Spiral strips of celluloid are cemented to the inside of the spool so that the surfaces do not contact each other during the developing process. Note holes in upper disc for developer to pass through. Make these with a small machine drill.

A rubber bulb circulator inserted in the cut film tank insure the developing solution of proper agitation at all times. Roll film is agitated by gently shaking the covered tank.

First cut a piece of thin plywood to the desired size and shape for the bottom of the tank, then bend a sheet of celluloid around it to make the sides. Cover the plywood with a piece of celluloid of identical size and flow acetone along the edges so that the two will be bonded to the walls. This forms the real bottom of the tank and protects the plywood from moisture. If the tank is large it is advisable to reinforce the corners and edges with additional strips of celluloid, welded in place with acetone.

In the case of the cut-film tank, bend narrow strips of celluloid and weld them in orderly fashion on either side, with acetone, to form troughs or grooves into which the

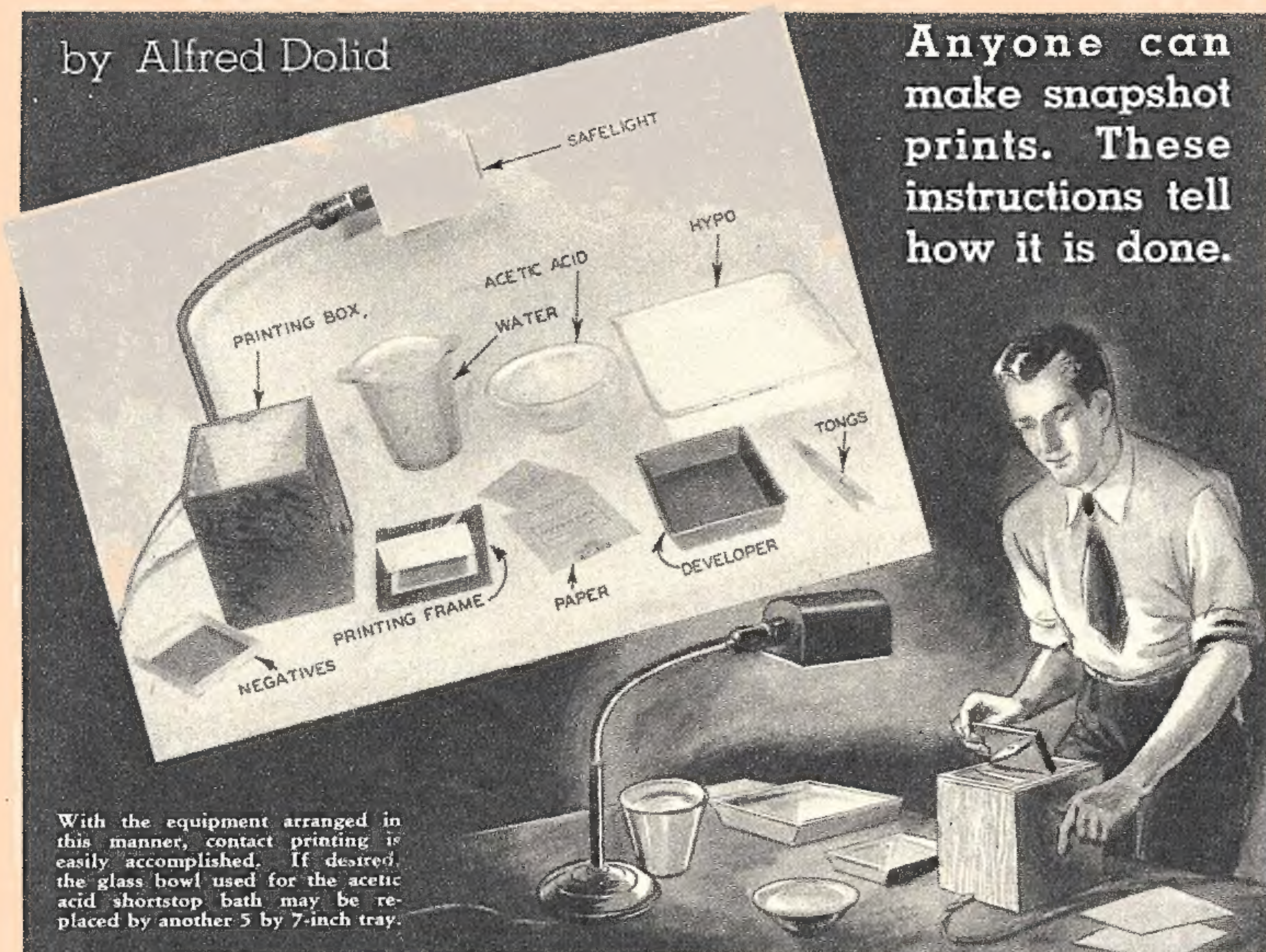
[Continued on page 136]

of acetone. Like a flash the latter penetrates and makes a secure, waterproof bond.

The illustrations show how to make tanks for developing either cut film, film packs or roll film. The roll film tank is supplied with a celluloid spool on which the film is rolled for development.

by Alfred Dolid

Anyone can make snapshot prints. These instructions tell how it is done.



With the equipment arranged in this manner, contact printing is easily accomplished. If desired, the glass bowl used for the acetic acid shortstop bath may be replaced by another 5 by 7-inch tray.

How To PRINT

FULL instructions for developing roll film at home were given on pages 104 and 105 of the November issue of *MODERN MECHANIX*. The next operation is "printing," which is the process of producing actual black and white pictures on paper from the developed negatives.

There are two kinds of photographic "printing"—contact and projection. In contact printing, the negative is placed directly against the surface of a sheet of sensitized paper while light is flashed through the negative so that it hits the paper directly. The size of the resulting print is thus exactly the same size as the original negative taken by the camera.

In projection printing the negative is placed behind a lens in a sort of lantern, and the image is thrown onto sensitized paper a short distance away. By proper adjustment of the optical system, the print can be made many times larger than the

original negative. This form printing is commonly known as "enlarging."

The person just beginning in photography should learn contact printing first, as it is very simple and requires only one very inexpensive and easily-made instrument—a printing box. This is a plain box, constructed of three-ply veneer or pressed wood, with an electric bulb in the bottom. The top is left open to accommodate a "printing frame," a device for holding the negative and the sensitive paper firmly and evenly together. You can make such a box in less than an hour if you follow the accompanying plans.

The dimensions shown are for a 4 by 5-inch printing frame; that is, a frame that takes negatives up to 4 by 5 inches. This is large enough for all standard roll or film pack negatives in the popular amateur sizes. An opening in the center of the glass, to take your particular negative, is easily masked

off with black "scotch" tape, which costs only a few cents a roll.

In making the box, be sure that the printing frame fits loosely over the top, so that it can be put in place and removed quickly.

Besides the printing box, the following items, all obtainable at very reasonable prices from any photo supply house will be needed: an "OA" yellow filter for the darkroom safe-light; several fresh tubes of "MQ" developer; the same hypo saved from the negative developing process; a one-pound bottle of acetic acid; two trays, one 5 by 7 and the other 8 by 10 inches; a few glass bowls or shallow jars; a wooden clip or pair of tongs for handling wet prints and a supply of contact paper.

As a starter, get one envelope each of Azo E-4 and E-2 paper. This is semi-matte paper, the first of "contrast" grade for flat negatives and the other "normal" grade for normal negatives. This material is surprisingly cheap and therefore permits a lot of experimenting.

Half fill the 8 by 10 tray with hypo. Mix the MQ developer as per its label for contact prints and put it into the 5 by 7 tray.

Measure out $\frac{3}{4}$ -oz. of acetic acid, mix with cold water to make a pint of liquid, and pour into the flat bowl or, better still, into another 5 by 7 tray. Last, fill the tall jar with plain water.

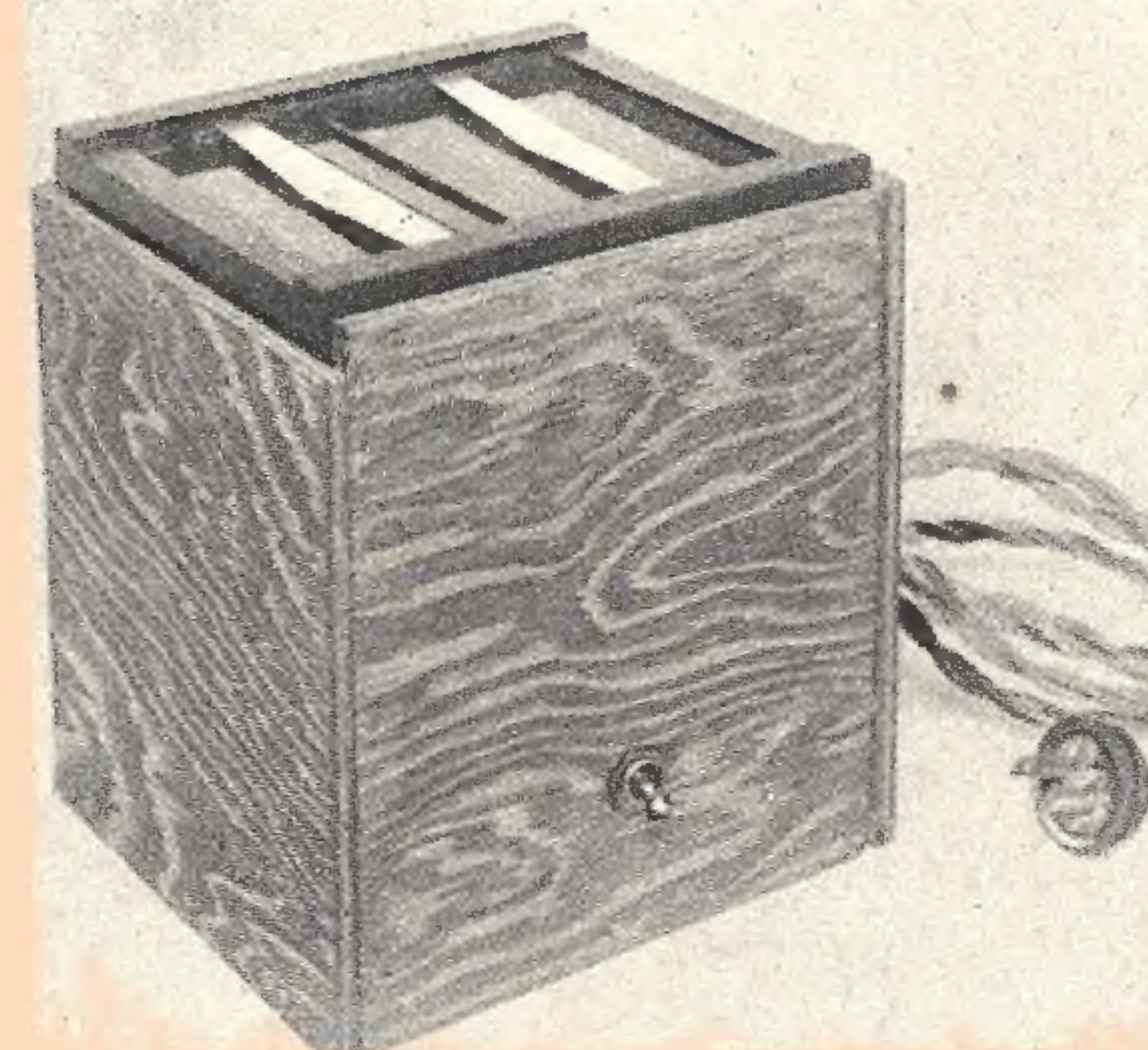
The arrangement of apparatus as shown in the large picture is a convenient one. To commence, darken the room and turn on the safelight. Don't be alarmed by the brightness of the yellow light. Photographic paper is much less sensitive to light than negatives, and can be handled in perfect safety under the "OA" filter.

The ability to judge the "contrast" of negatives will come only with experience. Normally-exposed negatives, which have been developed in MQ developer, usually take "normal" grade paper; therefore start with that.

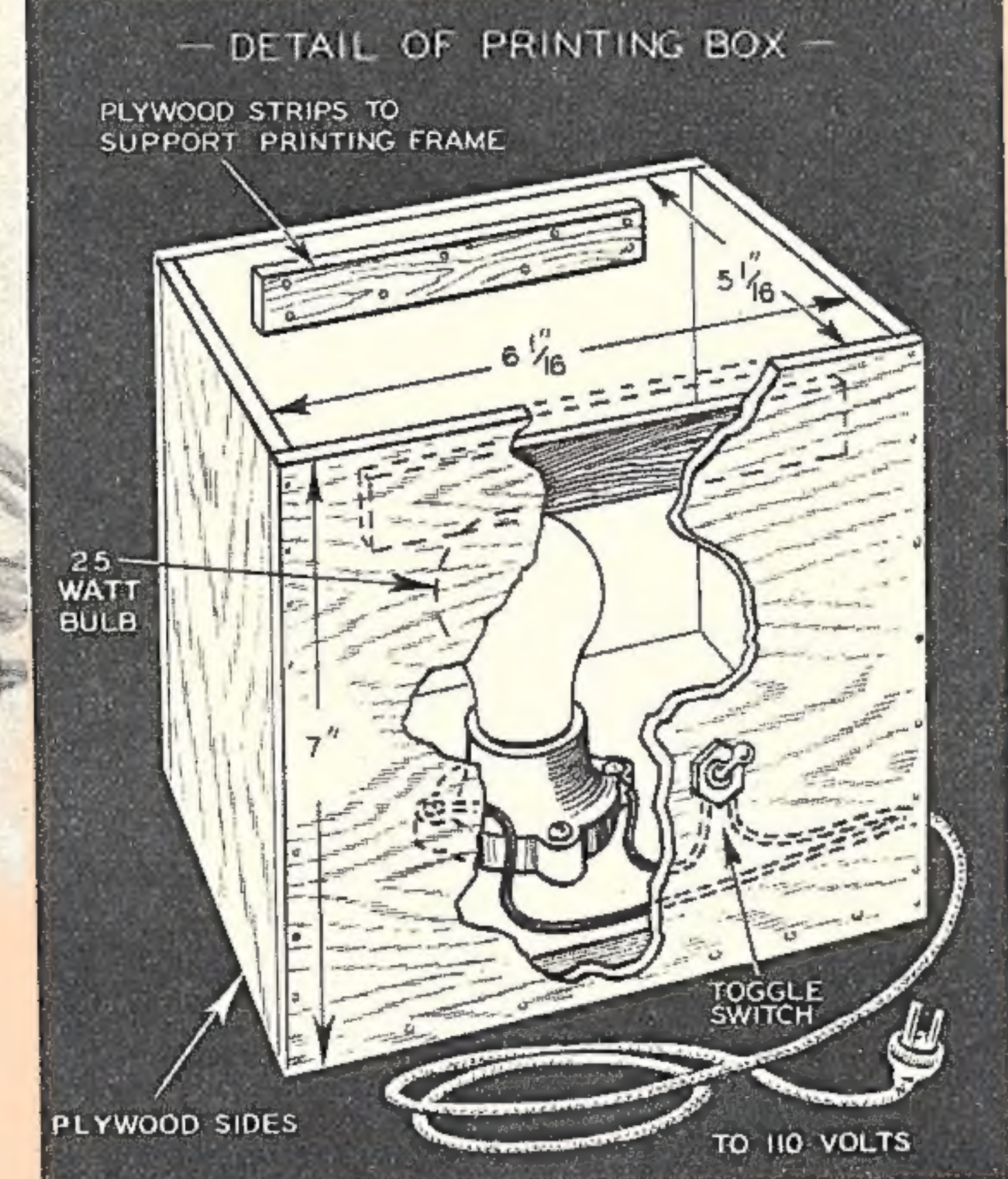
Open the printing frame and clean glass pane carefully with a soft handkerchief. Place the negative on it, with the dull (emulsion) side up. A sheet of Azo paper is then laid evenly over the negative, with its chemically-treated side against the latter. By examining the paper under the safelight, the

[Continued on page 142]

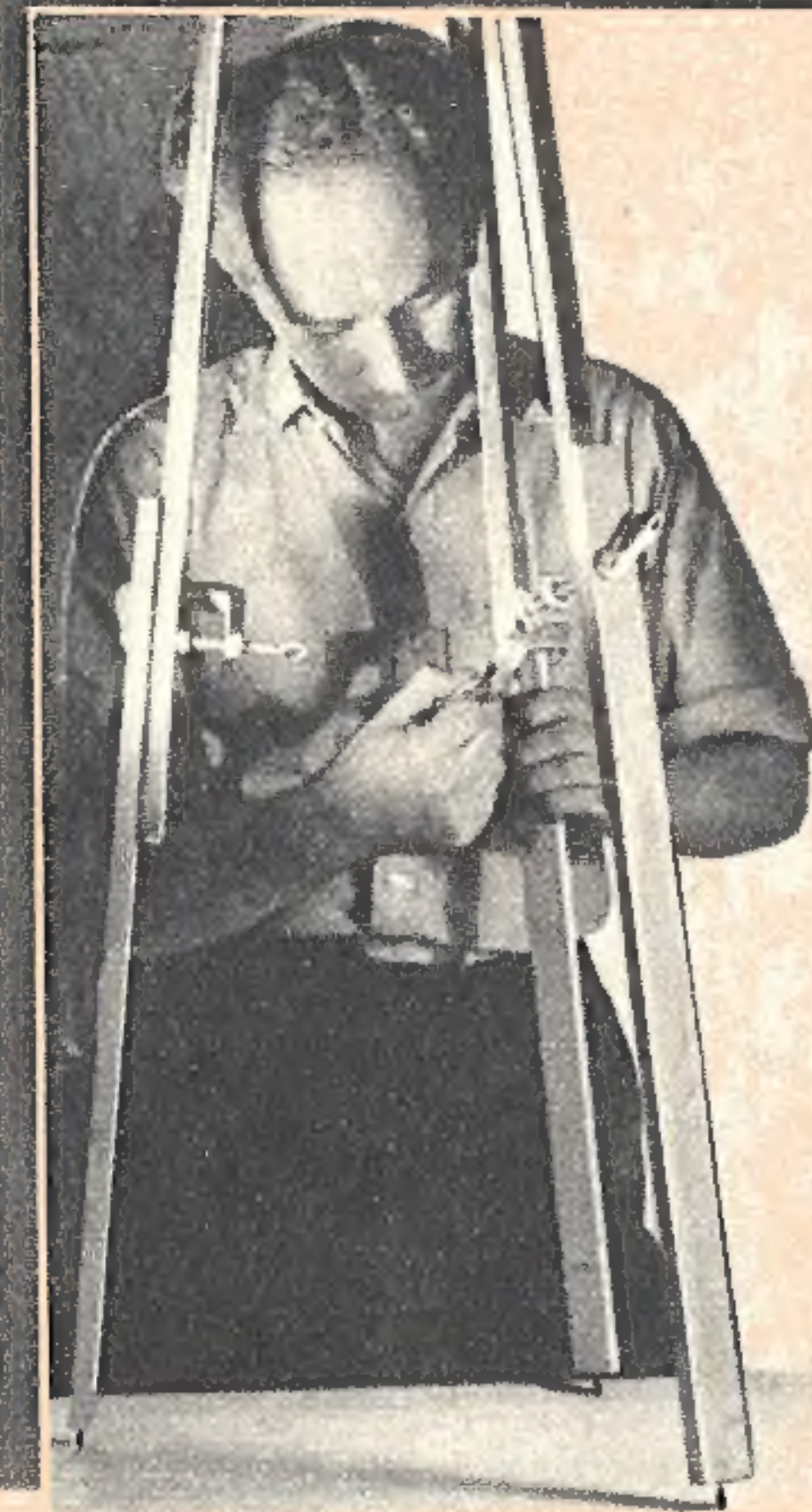
Your Own Pictures



The printing box is of simple plywood construction, made to the dimensions given in the detail at right. A cleat socket, fitted with a 25-watt bulb, is mounted in the bottom and wired to a radio toggle switch and a length of fixture cord. Printing frame fits on top.



New Aids and Ideas For



Three narrow strips of wood, each fitted with sharpened nail prods, provide a handy means for extending the legs of a tripod. The strips are attached to the regular tripod with small "C" clamps as is illustrated at left.

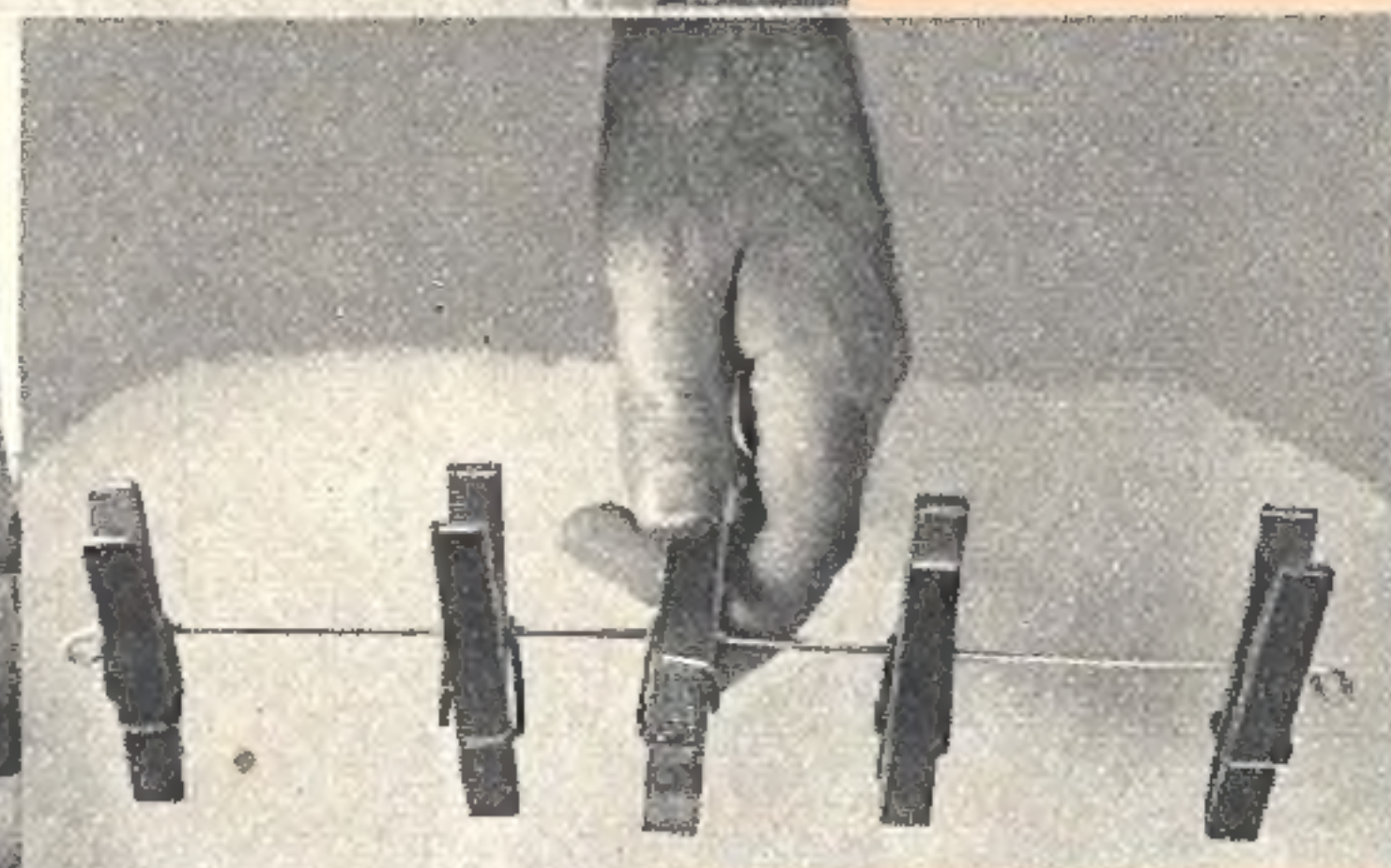
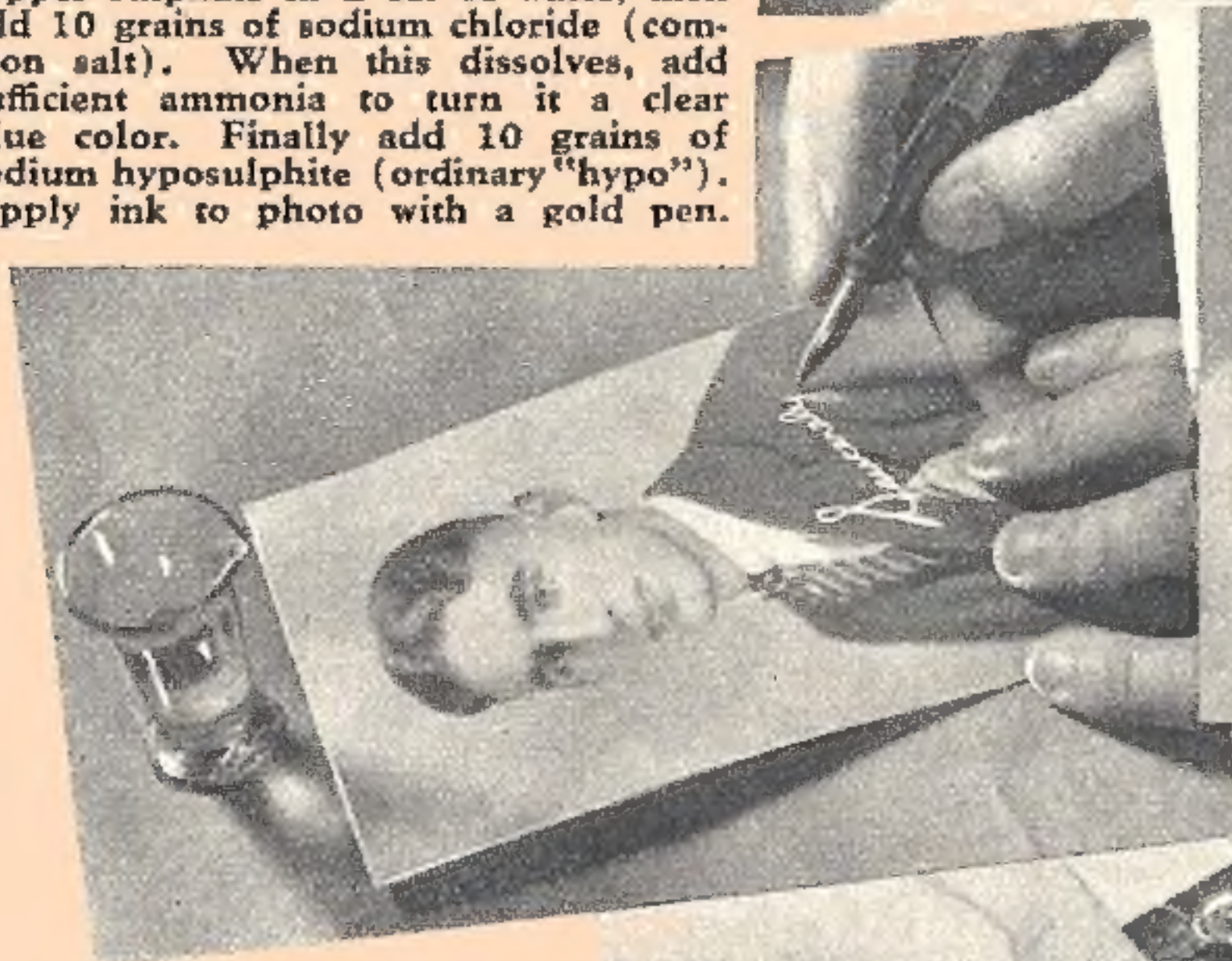
L-shape cardboard boards, like the one shown at right, are excellent for determining the correct amount of trimming a print requires, in order that it shows up most effectively. Once determined, it is an easy matter to mark the print with a China marking pencil and trim it down to correct size.



Left—A 2½ v. flash-light bulb and battery, connected in series with a photo-flash lamp, will instantly tell its condition. If 2½ v. bulb glows, photoflash lamp is in working condition.

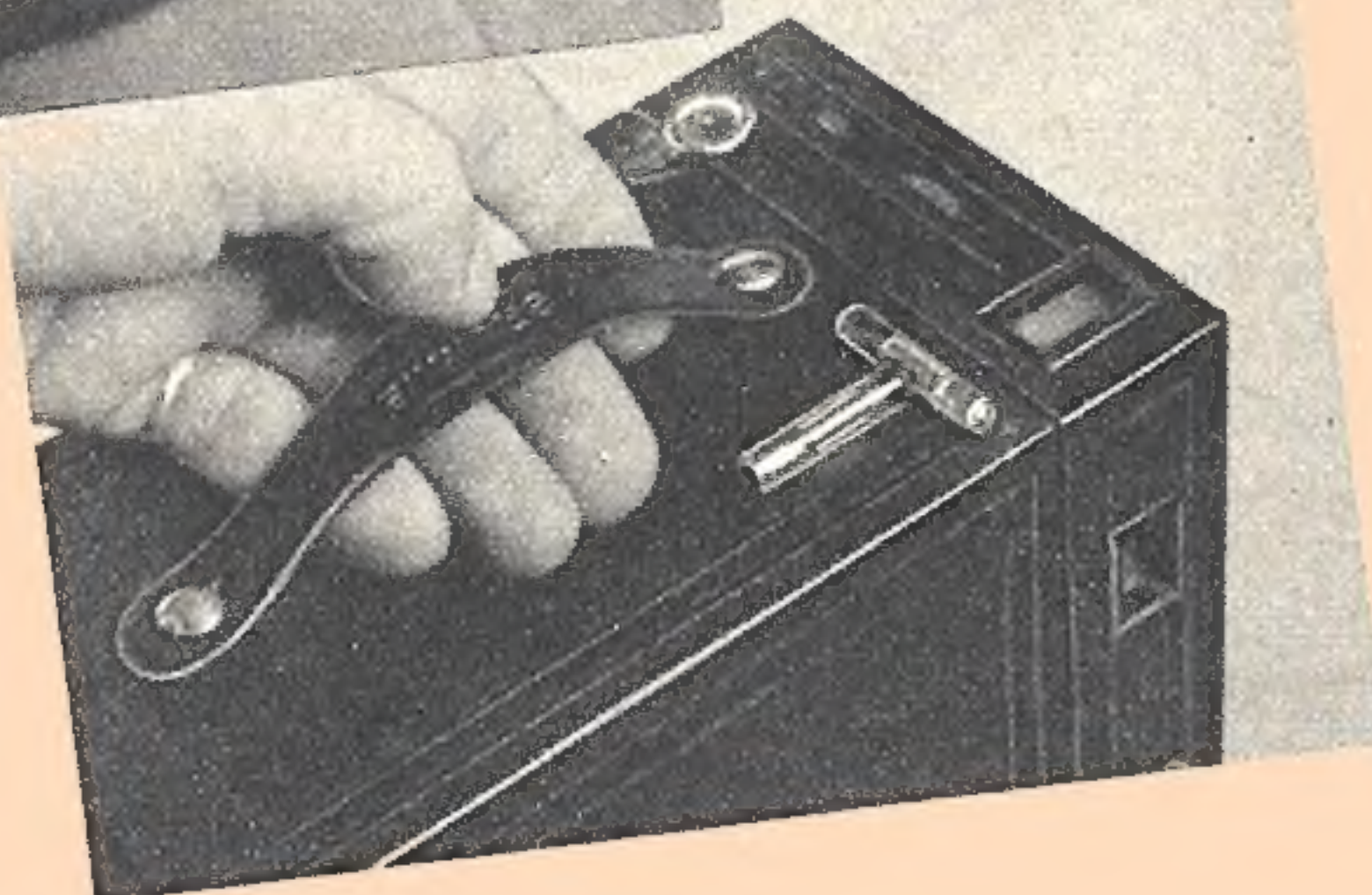


Below—An ink that will chemically react with a photographic print so as to produce a lasting white signature is easy to make. First dissolve 20 grains of copper sulphate in 2 oz. of water, then add 10 grains of sodium chloride (common salt). When this dissolves, add sufficient ammonia to turn it a clear blue color. Finally add 10 grains of sodium hyposulphite (ordinary "hypo"). Apply ink to photo with a gold pen.

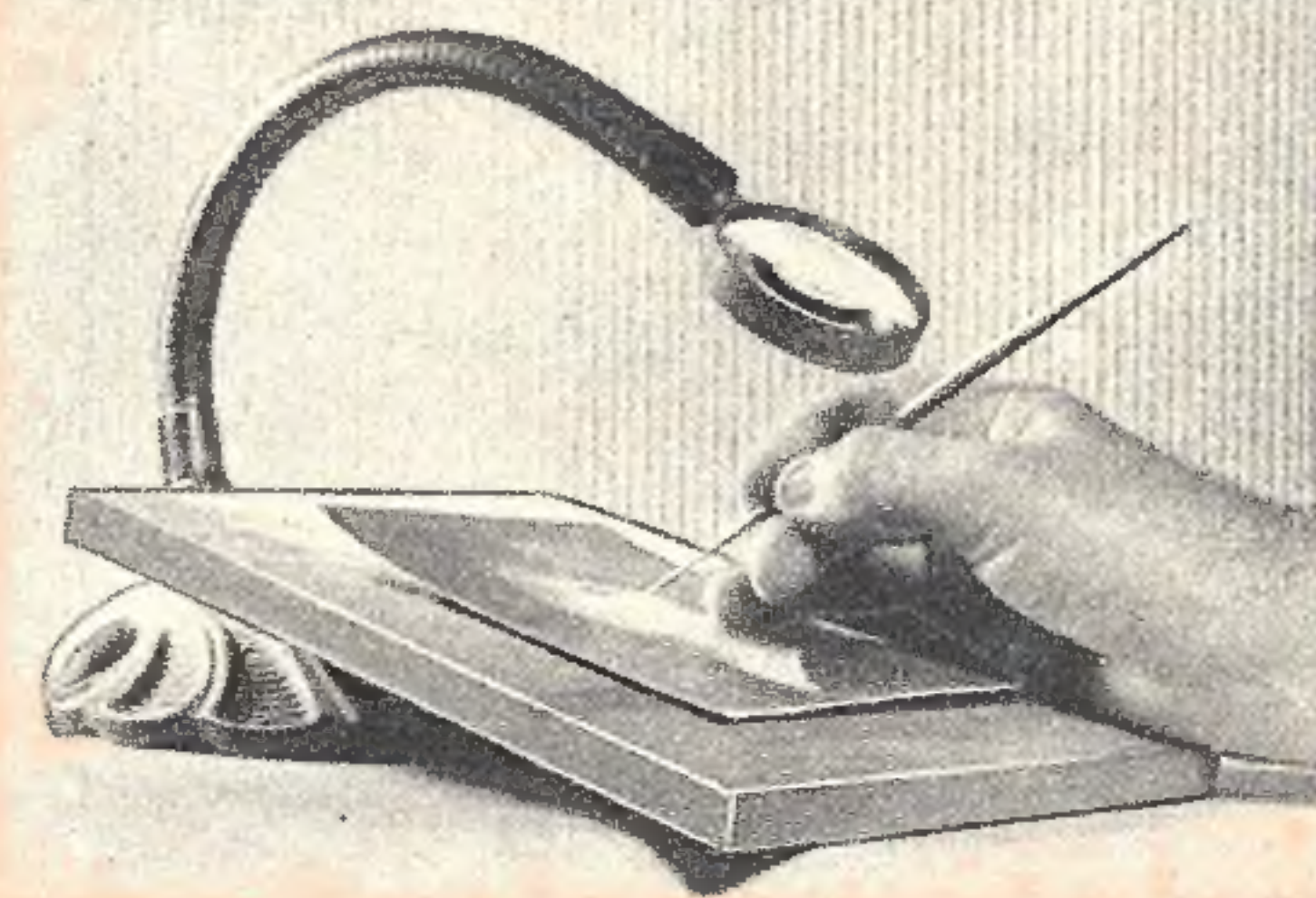


Above—Where the darkroom facilities are too cramped to permit drying of film by suspending it from a long cord, this clip holder will prove extremely useful. Several spring clothes pins are threaded on a length of iron wire in the manner shown. The end clips may be attached to a chair with the center clips serving to suspend the strip of wet film.

Right—Amateur photographers who take their pictures with a box camera can be sure of level "shots" by equipping the camera with two small spirit levels. The levels are nothing more than automobile fuses partly filled with alcohol or red ink, sealed and attached to the camera with cellulose cement. If old fuses are not available, short lengths of glass tubing, plugged with small corks, may be substituted.

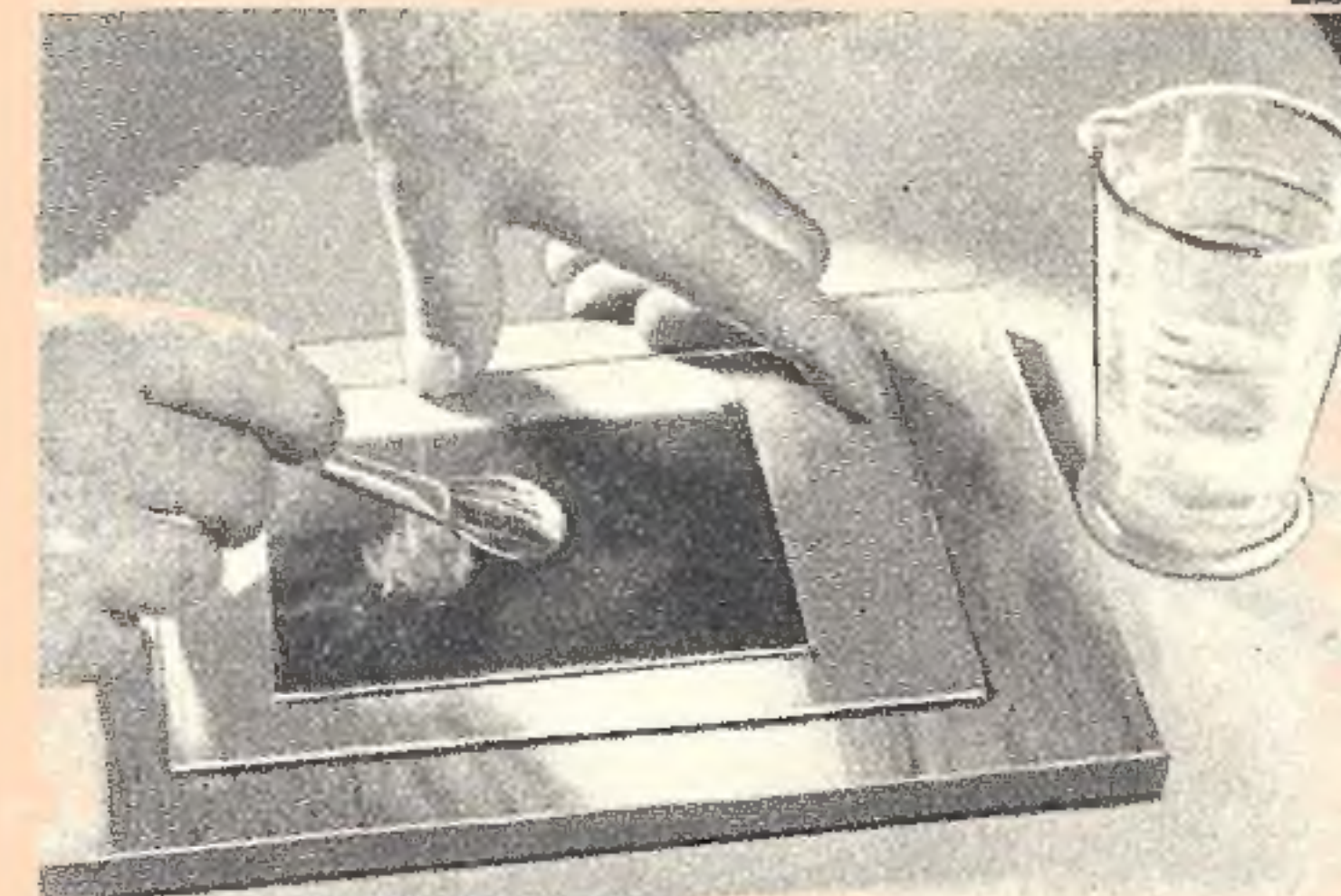
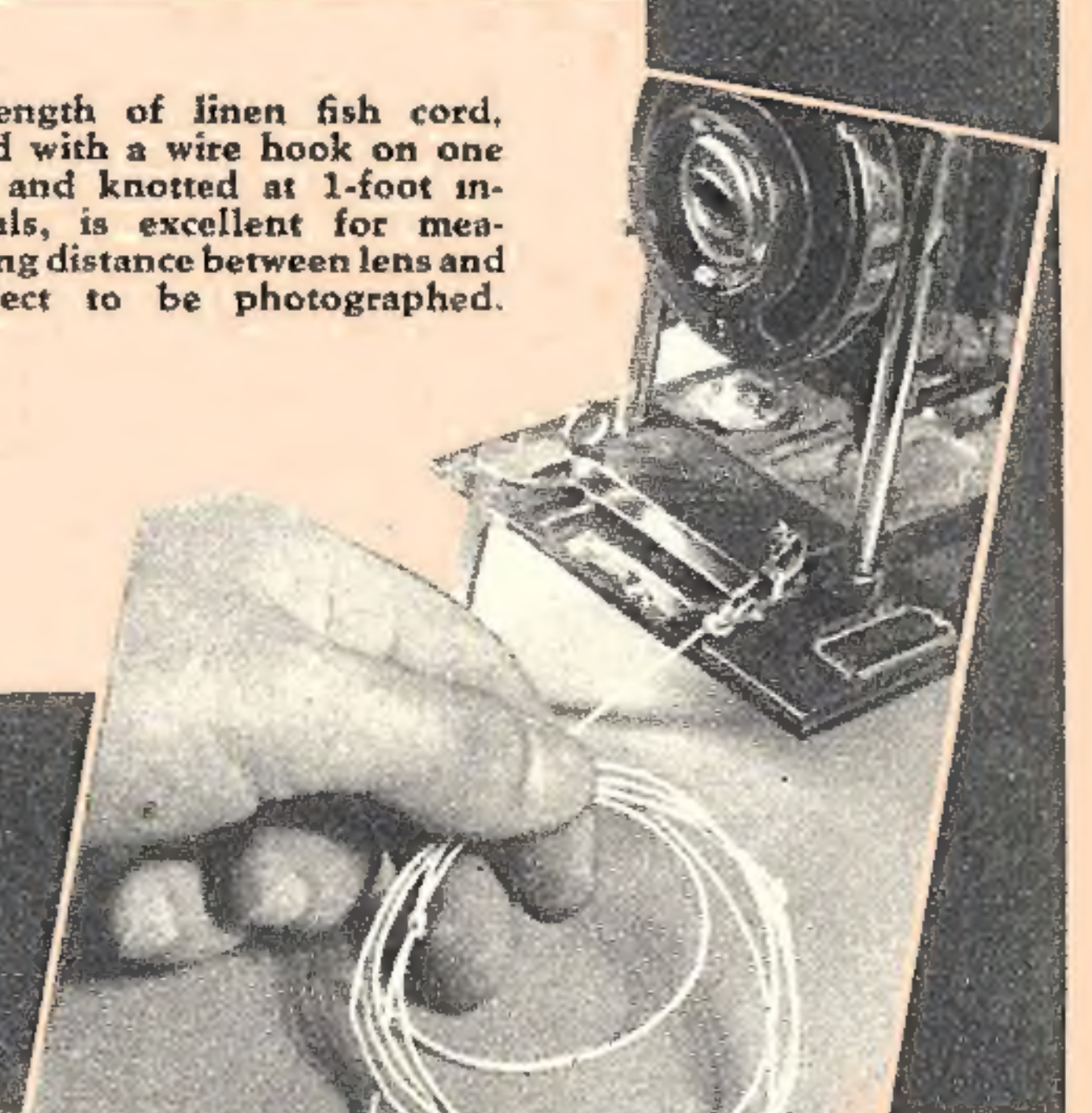


The Amateur Photographer



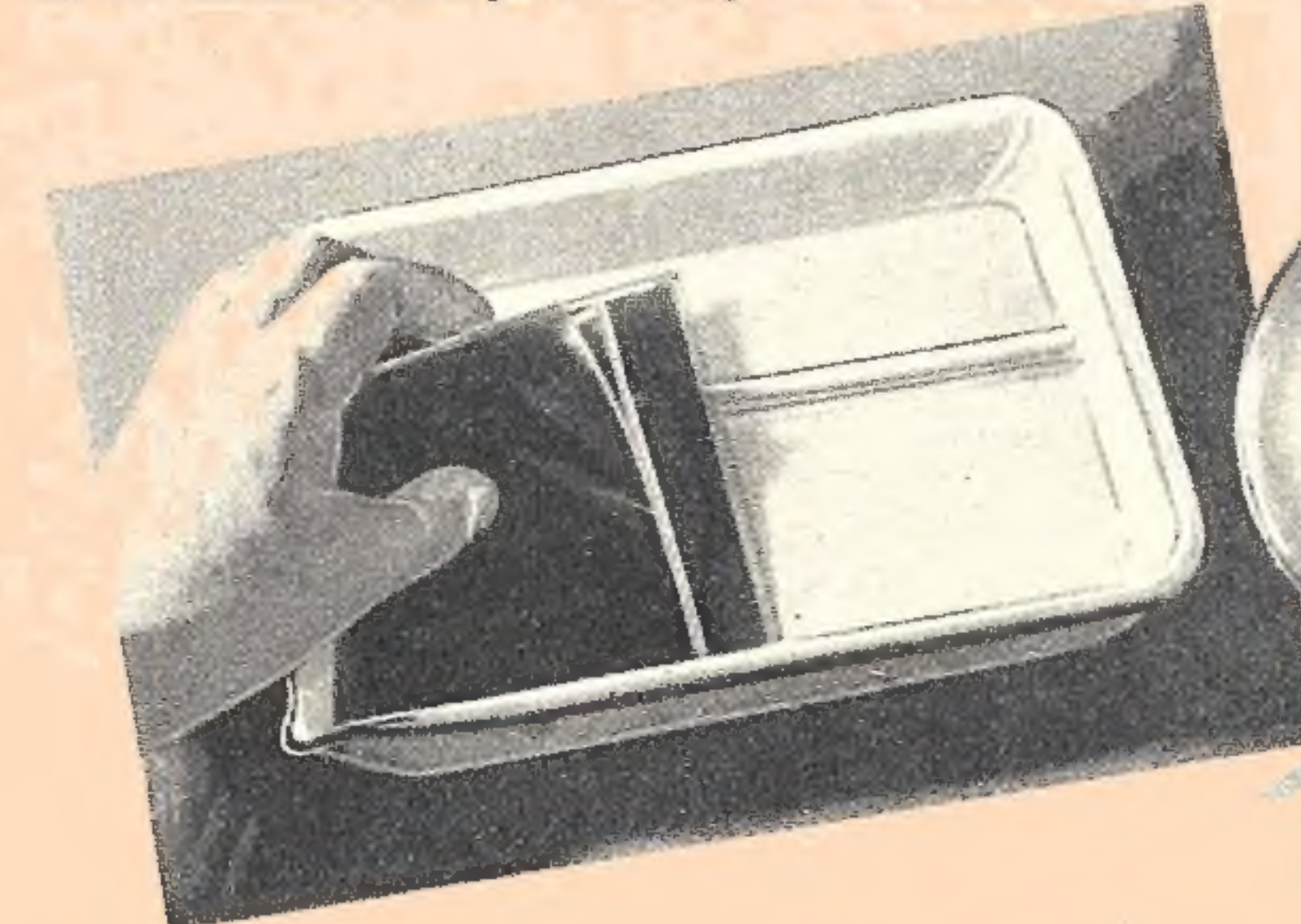
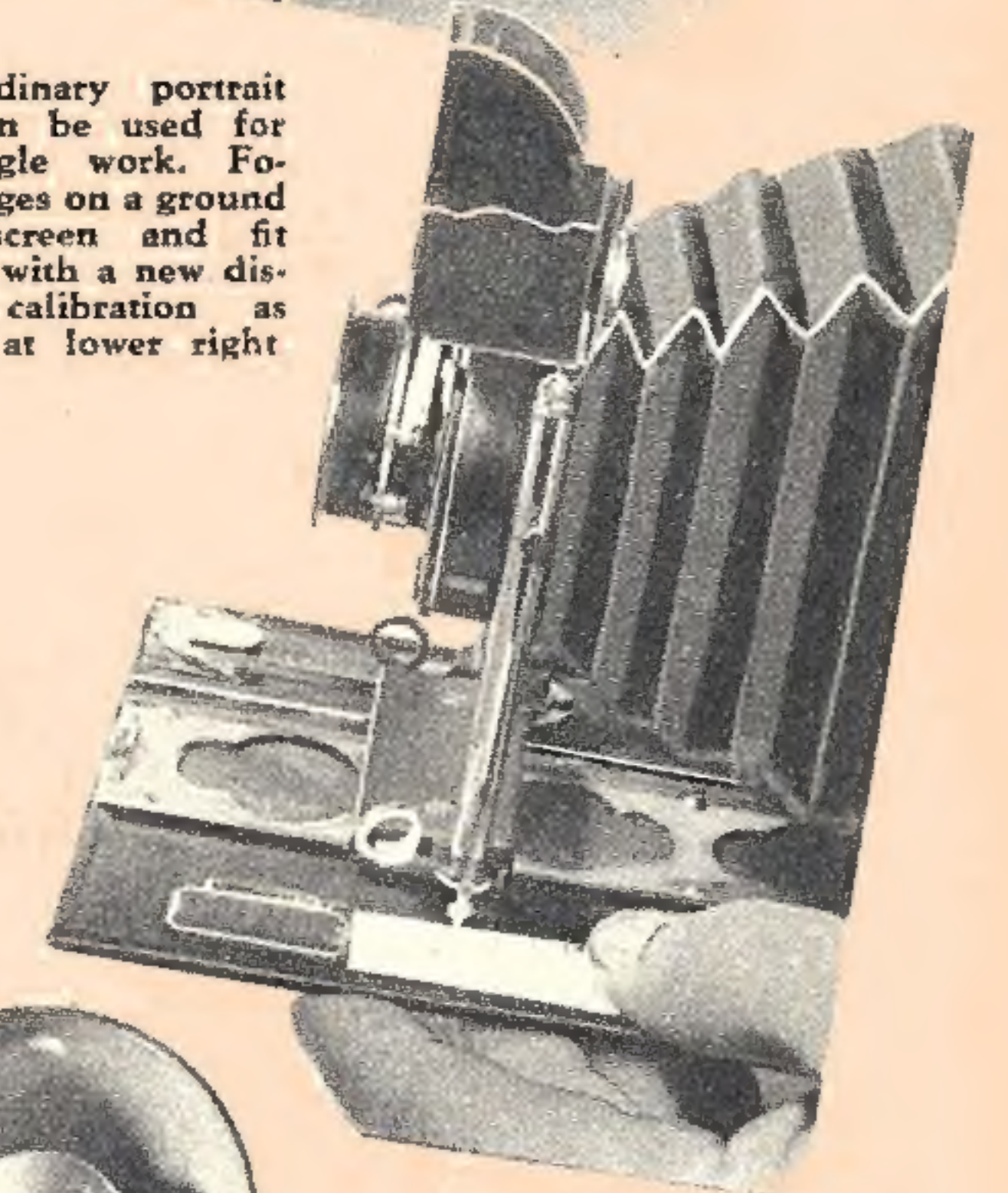
By removing the socket and shade from a flexible desk lamp it can be fitted with a reading glass so as to leave both hands free when "spotting" print blemishes.

A length of linen fish cord, fitted with a wire hook on one end and knotted at 1-foot intervals, is excellent for measuring distance between lens and subject to be photographed.



Where the celluloid backing of a negative is stained or scratched, the emulsion can be saved by application of acetic acid to backing. Attach negative, emulsion side down, to a glass plate with rubber cement. After backing comes off, remove emulsion from plate and wipe off all rubber cement.

An ordinary portrait lens can be used for wide-angle work. Focus images on a ground glass screen and fit camera with a new distance calibration as shown at lower right

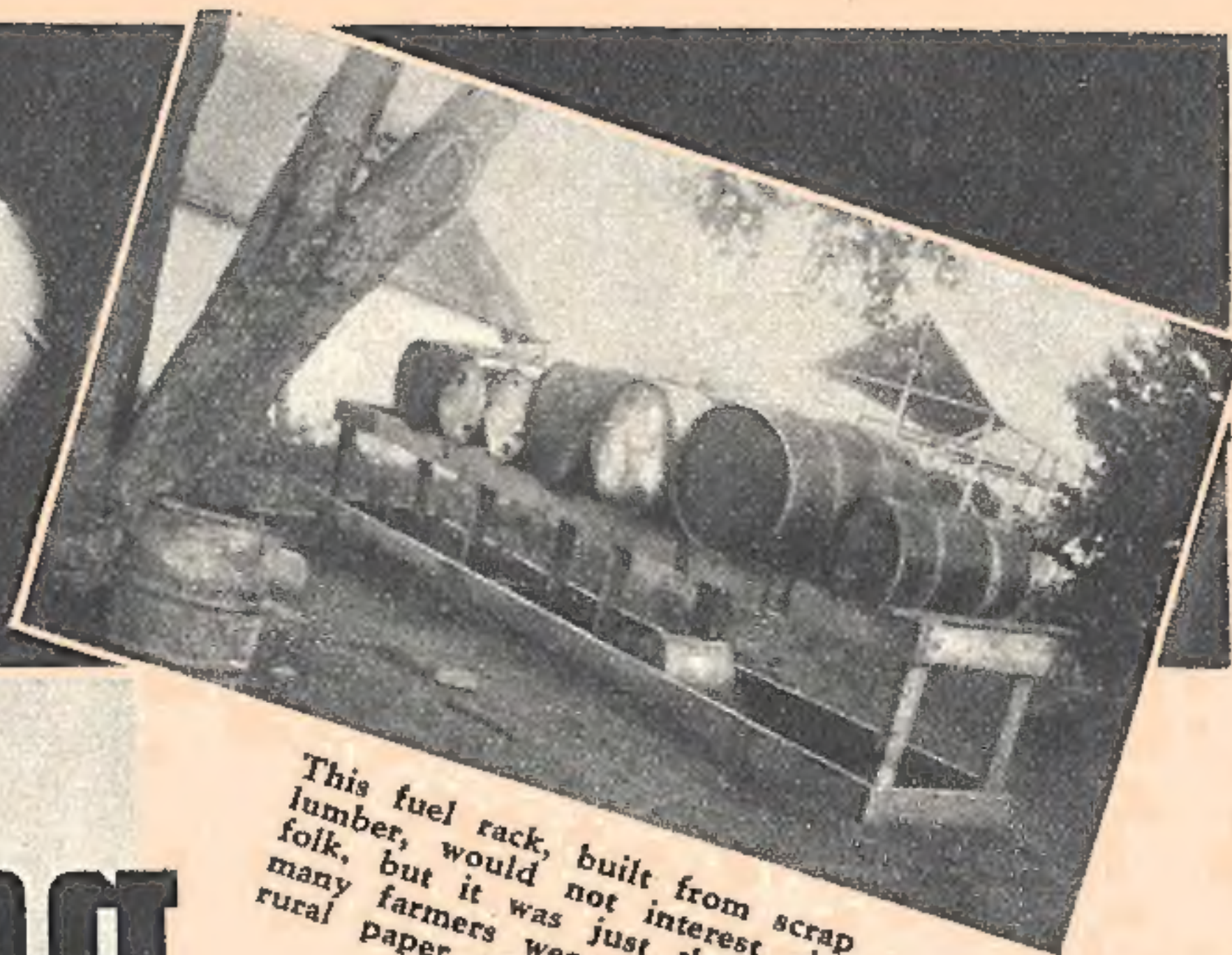


Very often the presence of small scratches on the surface of a cut-film negative can be attributed to the action of the finger nails from attempting to lift it from the developer. To overcome the difficulty, place a glass rod in tray as shown. The rod will elevate the negatives and permit easy removal.



Below—This useful hand reflector consists of a desk lamp shade and socket fitted to the wooden handle and threaded copper tube of an old electric soldering iron. Light is provided by a No. 1 or No. 2 size photoflood bulb.

Seven prints of this freak egg were sold for \$26 to a newspaper syndicate.



This fuel rack, built from scrap lumber, would not interest city folk, but it was just the thing many farmers were seeking. A rural paper purchased the idea.

Making Your Camera



This homemade corn stalk cutter would not appeal to the average newspaper reader, but a photo and short article on its construction resulted in a \$10 check from a mechanical magazine. Left—A fast lens is needed to catch action pictures of home-built devices such as this trapeze ring-bar.

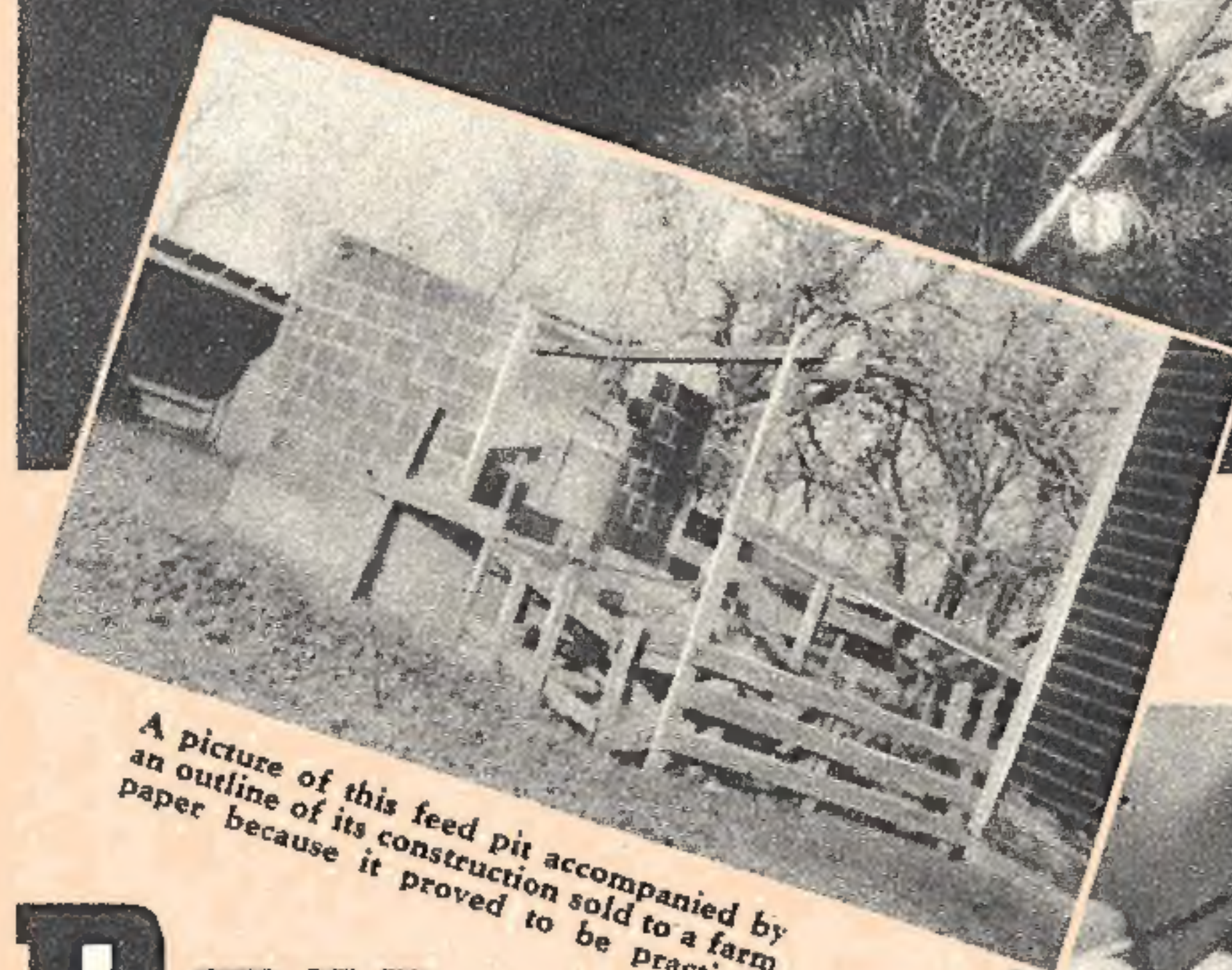
THIS camera business gets into your blood. No matter how good the last roll of film may turn out, you say to yourself, "This shot is undertimed. That one is over. I got too much scenery in this one. Boy, next time will be different!"

Not long ago, three men got together for an evening. All were interested in photography. Two were amateurs, the third a commercial photographer who had a great outlay in equipment. No matter what the shot, he could get it. One of the two alleged

amateurs was not actually that in the strict sense, because for years he had been selling prints to magazines and newspapers. Yet the commercial man regarded him as such because he used a small folding camera which cost perhaps \$30 when new. The third man owned a camera, too, though all he had was expense, and was about fed up because, while his pictures were usually good, he failed to find any market for them.

Now here's the odd part of that meeting. It came out, after much talking, that the first amateur who was selling an occasional picture to magazines was getting more for his prints than was the commercial chap using an 8x10 camera. The reason was simple. A great many magazines, including the one you

Newspapers and magazines are constantly seeking new and novel pictures. Here is how you can supply their wants and also be paid well.

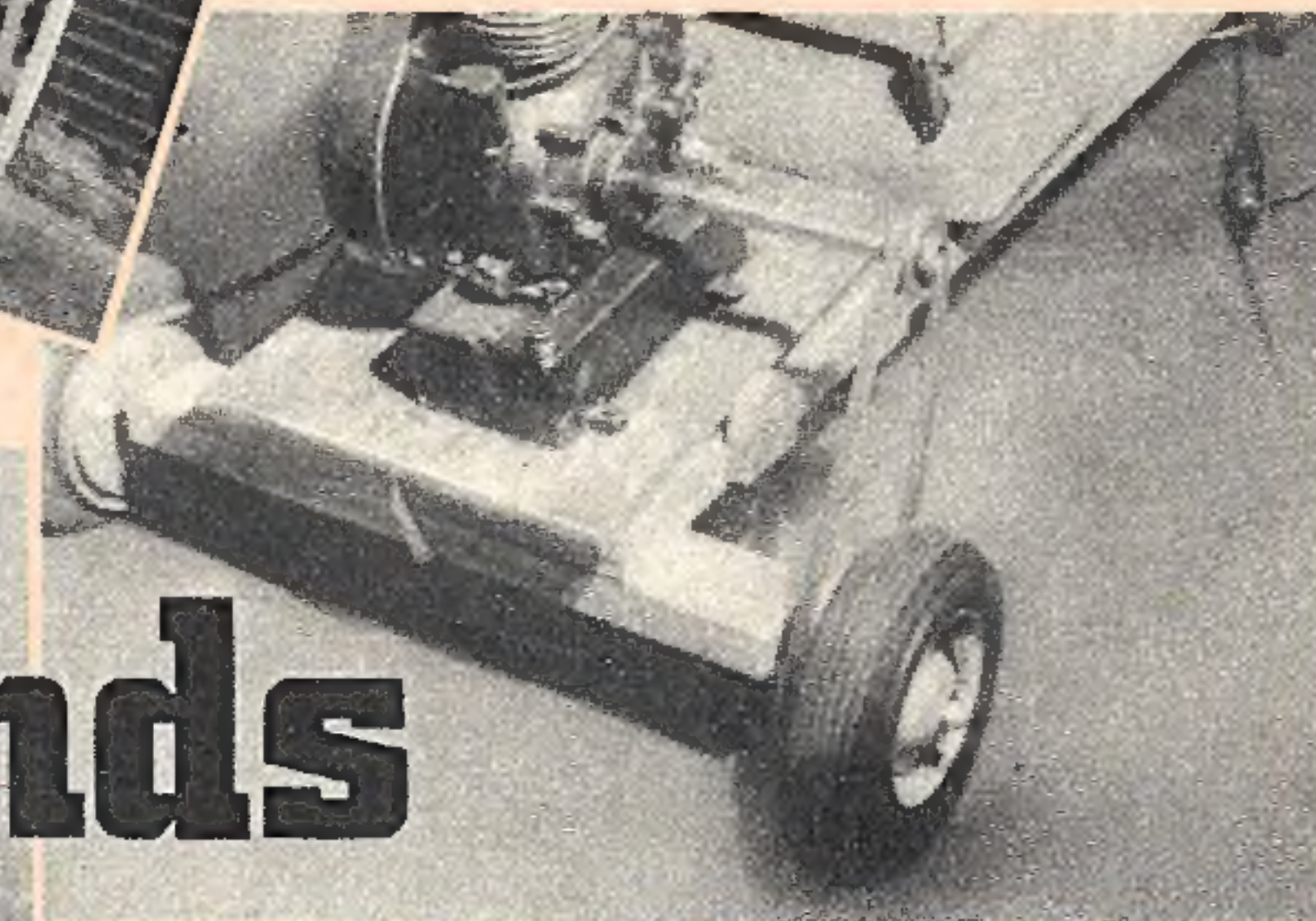


A picture of this feed pit accompanied by an outline of its construction sold to a farm paper because it proved to be practical.

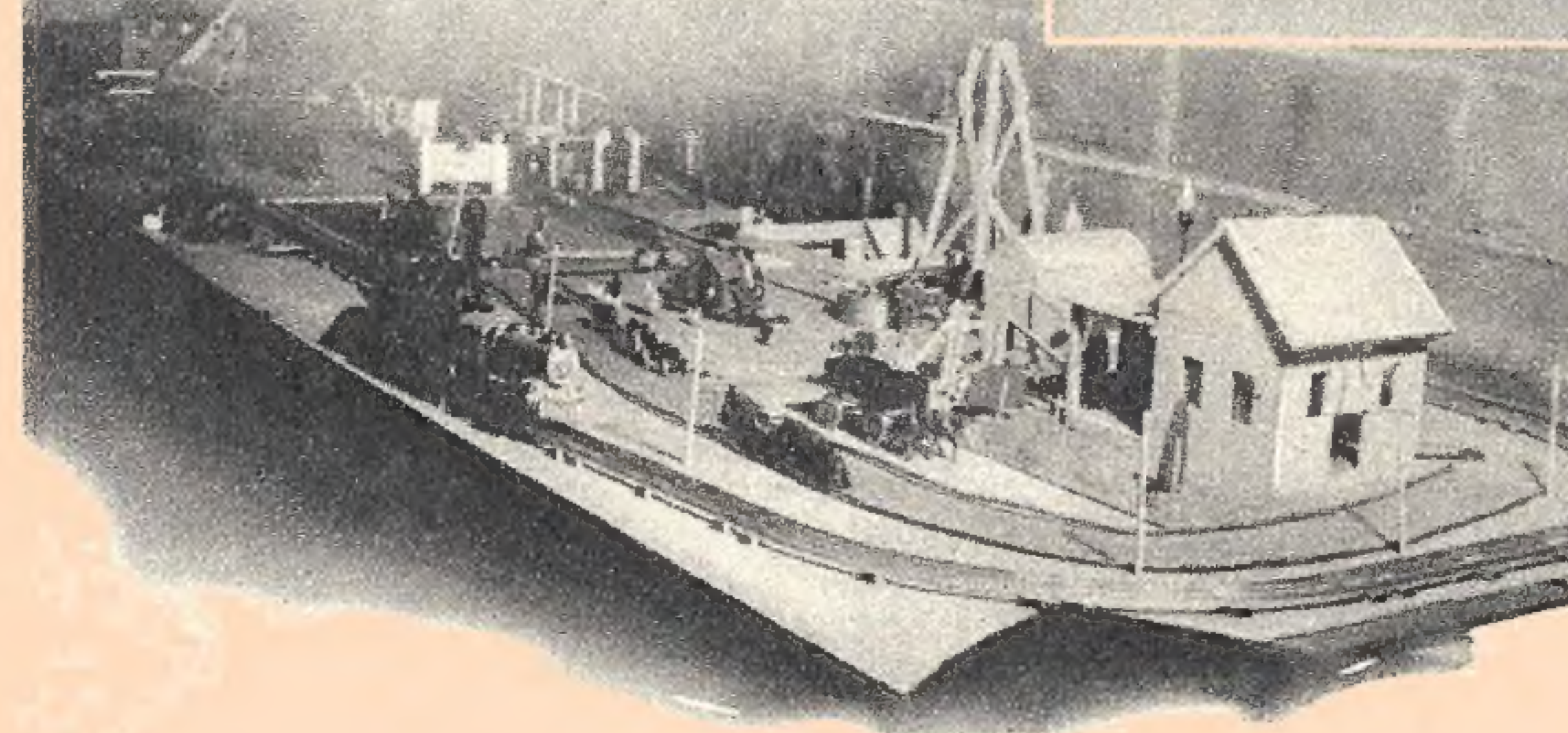


In spite of the excellence of this picture, it would be hard to sell alone. Accompanied with a story on fishing, it would have the interest needed to sell it.

Pay Dividends



This picture, showing the engine which supplied power to a midget auto, proved to be the keystone of an entire set of construction pictures. It sold the story! Left — Two photos of this model train layout and a detailed caption earned \$7 for an ambitious photographer.



are reading, pay \$3 or more for pictures with a story to tell. Often an idea, photographically shown and with a short, but accurate description, having two or three pictures included, will bring a \$10 check, or even more.

But, lest they be overlooked in the rush for stamps and envelopes, there are a few *buts* and *ands* which are mighty important. Pictures of the kind that sell must convey a specific idea and must also be in sharp focus,

and on glossy paper. The larger the print the better of course, but in known instances, an old Brownie, taking a 3 1/4 x 5 1/2 print that cost \$4 second-hand, earned over \$2,000 in less than two years for its owner. The prints averaged \$3.48 each, proving that the size or quality of the camera isn't so important as knowing what kinds of pictures will sell and to whom to send them.

[Continued on page 138]

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