

PHANTOM FLEET OF THE HIGHWAY

POPULAR MECHANICS

MAC

WRITTE



REG'D. TRADE MARK, GREAT BRITAIN, NO. 40338

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SEE PAGE 687



3 GRADES OF GAS—3 Grades of Car Performance



HERE'S WHY POWER DEPENDS ON THE GRADE OF GASOLINE YOU USE

You'd be surprised to hear some of the "dizzy" ideas uninformed people get about their cars. They even expect top-grade performance from low-grade gasoline. Here's what a man can reasonably expect... and why:

TESTING CAR PERFORMANCE on different grades of gasoline at an Ethyl Motor Clinic.

Poor performance

with "low-grade" gasoline



There is no anti-knock fluid (containing tetraethyllead) in "low grade" gasoline. Power is lost because the spark *must* be retarded by your car dealer to prevent "knock" or "ping."

Good performance

with "regular" gasoline



Most regular gasoline has in it anti-knock fluid (containing tetraethyl lead). The spark can be considerably advanced for more power without "knock" or "ping."

Best performance

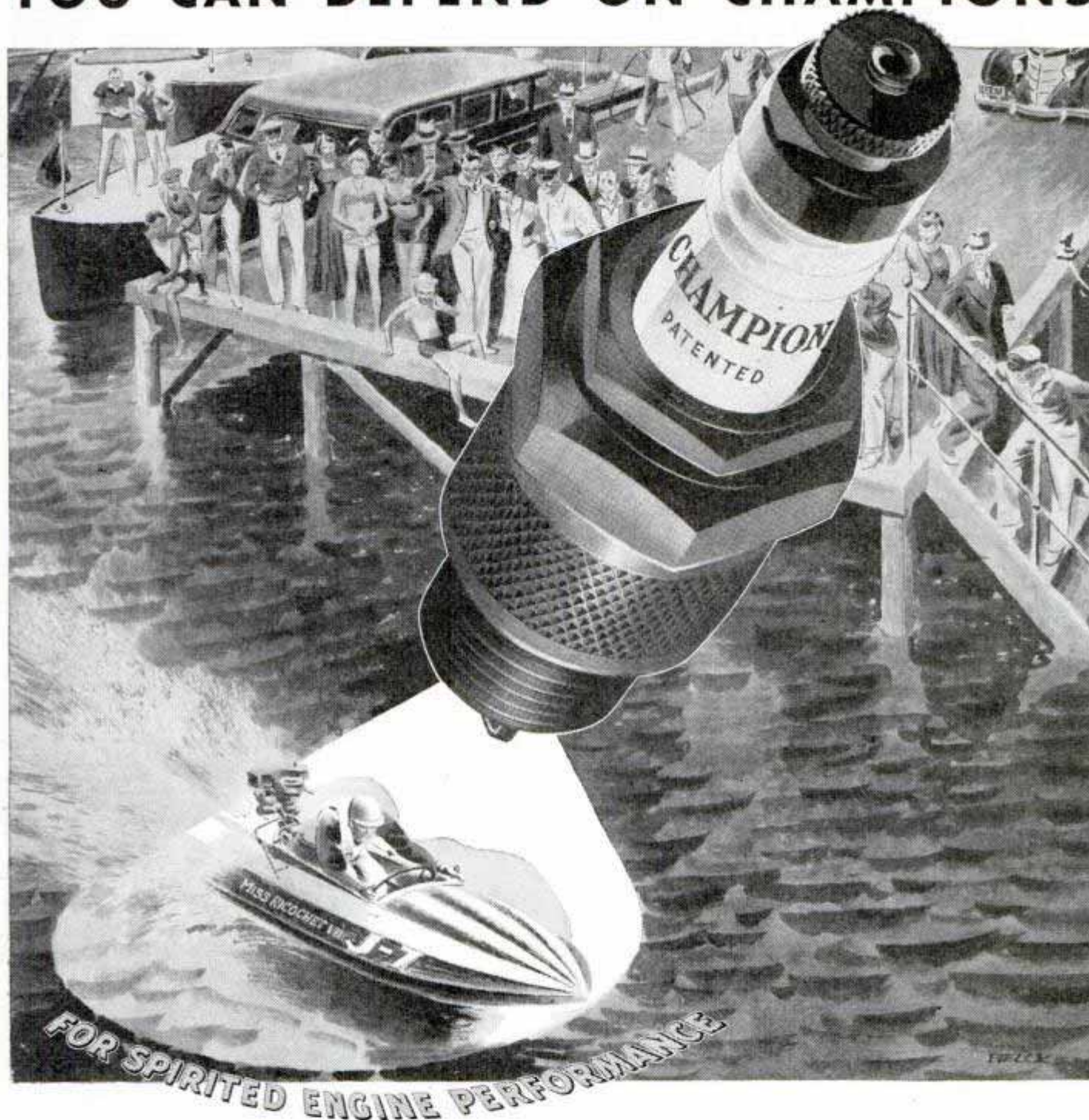
with gasoline containing "ETHYL"



Gasoline "with ETHYL" is highest in all-round quality. It has *enough* anti-knock fluid (containing tetraethyl lead) so that the spark can be *fully* advanced for maximum power and economy without "knock" or "ping."

ETHYL GASOLINE CORPORATION, manufacturer of anti-knock fluids used by oil companies to improve gasoline

YOU CAN DEPEND ON CHAMPIONS



When an outboard racing driver guns his eager, whining mount across the starting line, his hopes are firmly pinned on a few all-important factors in his engine—not least among them spark plugs—to see him first across the finish line.

Like most racing drivers who look only for the utmost in dependability and performance from their spark plugs, the champions of outboard racing, almost without exception, use Champions exclusively.

CHECK AND CLEAN SPARK PLUGS WHEN YOU CHANGE OIL

Douglass C. Fonda, sensation of the 1937 outboard racing season, achieved a record never before compiled by a single driver in one year. Winner of three national awards, he always uses Champions "because of their absolute dependability."

Every engine, whether automotive, aircraft, marine, truck, tractor or stationary, will perform better with Champion Spark Plugs.

Demand Champions because you can depend on them. Wherever

you find good service you will find a Champion dealer.

Champion "V" Spark Plugs



$\frac{3}{8}$ " 24 Thread
Actual Size, 65c

Specially designed for model gas engines giving the same dependable performance as regular Champions. Absolutely gas-tight, alloy needle point electrode, one-piece construction. If not available through your dealer, write Champion Spark Plug Company, Toledo, Ohio.

FIRST CHOICE OF MILLIONS

NOW
POPULARLY
PRICED!



Triple-Thrift REFRIGERATOR

MORE THAN TWO MILLION USERS are justifiably proud of their investments in G-E Refrigerators. Last year America bought more G-E refrigerators with the famous automatic Thrift Unit than ever before. And this year a General Electric is even a bigger buy! Every 1938 G-E model has the famous hermetically sealed-in-steel Monitor Mechanism that carries 5 years performance protection.



YOU CAN DEPEND ON THAT MECHANISM. G-E's Monitor Mechanism has an unbeaten performance record. Vacuum-sealed-in-steel, it requires no attention. Forced-feed lubrication and OIL COOLING assure quiet operation, low current cost and long life.

- 1. THRIFTY IN PRICE!** Now a bigger dollar-for-dollar value than ever.
- 2. THRIFTY IN CURRENT!** Now produces more ice, more cold, with even less current.
- 3. THRIFTY IN UPKEEP!** An unsurpassed record for enduring economy and long life.

These three are the *all-important* refrigerator values. But with a new G-E you get multiple additional savings—savings in food, in ice, in time, etc. It's the *thrifty* refrigerator to buy and to use. Get *full* value for your dollar—see the new G-E 1938 models. Now on display.

GENERAL ELECTRIC CO., SPECIALTY APPLIANCE DIVISION, NELA PARK, CLEVELAND, OHIO

GENERAL ELECTRIC

THE ORIGINAL ALL-STEEL REFRIGERATOR

Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

May, 1938

Vol. 69, No. 5

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U. S. Drivers vs. the World

AUTOMOBILE racing has gone international with the result that European cars and drivers, backed by government funds, will compete this year with the best America has to offer. Pitted against this well-heeled foreign invasion will be a fleet of Yankee cars built piece by piece in small machine shops and then assembled in back-yard garages. In some cases old engines and bodies have been rebuilt to meet the foreign challenge. In other cases, owners and drivers have pooled everything they possess to construct new cars. But unequal as the competition appears, almost anything is likely to happen when America meets the world this year at Indianapolis and Roosevelt Raceway. An article in the June issue may enable you to pick the winners in advance because it gives you the strong and weak points of both the American and European cars.

Next Month

BEING a poor fish today has its advantages. Doctors and dieticians labor to guard your health while fish architects work to supply a comfortable home. But here's the catch. It's all done so you'll be ready for some angler next summer. Restocking depleted waters with game fish has become big business as you'll find by reading "Don't Pity the Poor Fish," next month. There are eight pages of Coloroto pictures.

Modern Paul Bunyan

PAUL Bunyan, mythical superman who mowed down forests, has a modern counterpart—a woodsman who can fell a forest giant and drag it to market singlehanded. But this modern Paul Bunyan does it with hoist drums, tractors, electric log carriages, automatic skidders, Diesel trucks. An article next month reveals how the lumberjack has become a forest technician.

Riches from the Air

MAN today is squeezing riches from the air—riches in the form of nitrogen, a substance more precious than gold or diamonds. The story of nitrogen is an amazing tale of human achievement interspersed with touches of irony because without nitrogen we should starve but, by nitrogen, sometimes, we die. Don't miss this article next month.



PISTON HAPPY: "Probably your owner doesn't know that Pyroil will stop all that sludge, carbon and gum from stealing your vitality and power."

PISTON SAD: "I wish someone would tell him. I'm on my last legs right now."

PISTON HAPPY: "I sympathize with you. I used to get that way, too—before my owner began using Pyroil."

PISTON SAD: "Oh, my head!"

PISTON HAPPY: "Poor fellow. His owner will soon have to foot a big bill for restoring him—for carbon removal, sticky valves, or even more serious trouble. Yet only a few ounces of Pyroil could prevent all of that! Poor fellow."

Don't let carbon, gums, sludges—and corrosion—steal pep and power from your car—to bring about early wear and costly damage. Pyroil safeguards against these. *It offsets repairs.* Yet it costs only a few cents per treatment! Ask at your service station, or mail coupon. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 55 Pyroil Bldg., La Crosse, Wisconsin, U. S. A.



SIMPLY ADD TO GAS & OIL

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A 4-Year Loafer Graduates with Honors

*Idling in the wood 4 full years
BRIGGS comes forth as the world's
richest and friendliest tobacco*

THIS IS THE STORY of the loafer that goes to the head of the class!

Briggs is *born* rich. It starts life as a blend of nature's choicest tobaccos. Then it enters college for a 4-year course in magnificent idling.

For 4 long years it loafs in stout oaken casks, getting richer . . . doing nothing! Just naturally maturing and ripening into the smoothest, coolest and mellowest pipe

tobacco you've ever touched a match to.

When it finally graduates to your pipe, Briggs has been aged longer than many fancy pipe mixtures that sell at \$5.00 a pound . . . or more!

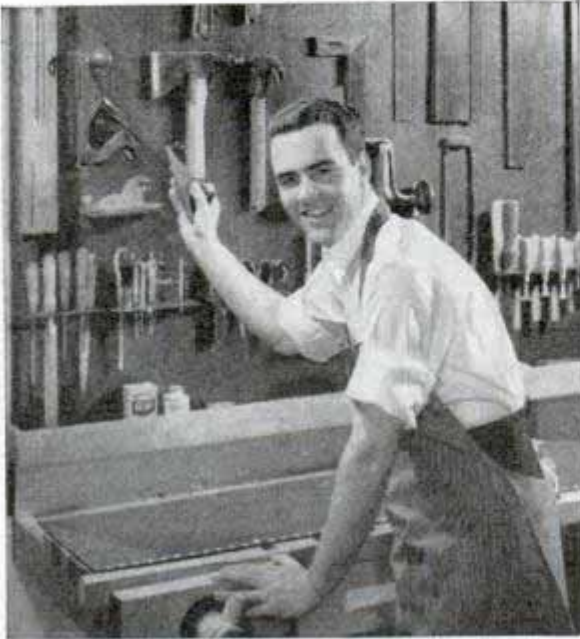
At 15¢ the tin, Briggs costs a few cents more than ordinary uneducated tobaccos. But those extra pennies are *miracle* pennies . . . in the extra enjoyment they bring to your smoking. Ask any Briggs smoker.

BRIGGS

4

CASK - MELLOWED FULL YEARS

"HERE'S A SWELL WAY TO KEEP TABS ON YOUR TOOLS!"



BUILD THIS MASONITE TOOL BOARD AND BENCH TOP

At last! A practical solution to the "lost, strayed or stolen" tool problem. The MASONITE TOOL BOARD provides a special place for each and every tool. Convenient to reach. Easy to replace in its proper space. Small pieces of MASONITE TEMPERED PRESWOOD, individually shaped for each tool and attached to the MASONITE base, form the racks and holders.

A MASONITE TEMPERED PRESWOOD BENCH TOP gives you a smooth, clean, hard working surface. Protects your new bench. Rejuvenates your old bench. One edge is marked off boldly in feet and inches, always ready for quick measuring.

Modernize your workroom. Mail the coupon today for FREE working drawings of the MASONITE TOOL BOARD and BENCH TOP. We'll also send FREE sample of the MASONITE TEMPERED PRESWOOD you'll use in their construction.



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OF A THOUSAND USES
A MISSISSIPPI PRODUCT

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WHERE DO YOU GO FROM HERE?

YOU'RE like a million other men—you're facing a big question. The depression turned business topsy-turvy and now the rebuilding period stares you in the face.

Are the things that are happening today going to help or hinder you—what will they mean in your pay check? Where will they put you five, ten, twenty years from now? How can you take full advantage of this period of opportunity?

We believe you will find the answer here—a suggestion the soundness of which can be proven to you as it has been to thousands of other men.

The whole trend today—legislation, spirit, action—is to put men back to work, raise earning and spending power, *give every man a fair chance to work out his own salvation.*

The road to success remains unchanged but, bear this in mind, *what it takes to win is radically different!*

No employer today would dare risk an important post in the hands of a man who had not learned the lesson of '29. Why should he, when right at this moment he can pick and choose and get almost any man he wants at his own price?

Business organizations are rebuilding—reorganizing for the new conditions. Before it is over every man and every method will be judged in the cold light of reason and experience—then dropped, remade or retained. This spells real opportunity for the man who can meet the test—but heaven help the man who still tries to meet today's problems from yesterday's standpoint! Out of the multitude still

jobless there are sure to be many frantically eager to prove him wrong and take his place.

Some Men Have Found the Answer

Seeing these danger signs, many aggressive men and women are quietly training at home—are wisely building themselves for more efficient service to their employers.

You naturally ask, "Has your training helped men withstand conditions of the last few years?"

Our answer is to point to a file of letters from many of our students reporting *pay raises and promotions while business was at its lowest ebb*—together with a myriad of others telling of greater success during these recent months of recovery.

Amazing evidence is ready for your investigation. We have assembled much of it in a booklet that is yours for the asking, along with a new and vitally interesting pamphlet on your business field.

This is a serious study of the possibilities and opportunities in that field. It is certain to contain an answer to vital questions bothering you today about your own work and earning power.

Send for these booklets—coupon brings them free. Be sure to check the LaSalle training that interests you most. We will tell you also how you can meet and take fullest advantage of today's situation. No cost or obligation—so why not mail the coupon now?

LASALLE EXTENSION, Dept. 564-R, Chicago

Please send me—without cost or obligation—full information about how I can, through your training, equip myself for the new problems and opportunities in the business field I have checked.

- | | |
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Name

Position

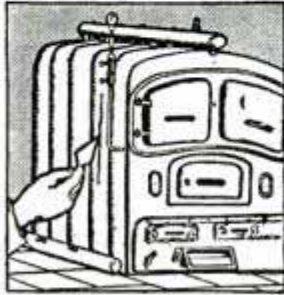
Address

CAN YOU USE an EXTRA \$10.00 to \$25.00?

This FREE booklet will show you how to get it easily



Holding onto money you already have is as good as making more that would have to be spent. You can easily save the amount indicated or possibly much more every year by making with Smooth-On No. 1, the repairs for which you otherwise employ a professional "fixer."

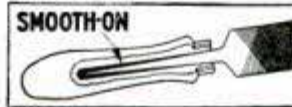


Stopping Leaks

For instance, where a pipe, tank or water heater leaks, a heating boiler cracks, any kind of a pressure joint opens, a lock or hinge comes loose, screw threads or nuts strip, a handle won't stay on, or a leak or loose part appears on your car, you can usually make a perfect repair with Smooth-On

On at a cost of only a few cents for material, and no labor expense or delay.

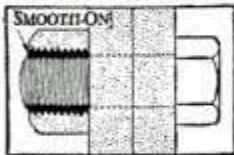
Smooth-On hardens into solid metal, but is easily applied with the simplest of household tools and without heat or fire risk.



Tightening Loose Handles

Judiciously made Smooth-On repairs are dependable and permanent, and usually make the performance of the repaired part fully equal to that of a renewal that would cost far more and in addition involve the labor of replacement. Even an emergency Smooth-On repair will at least tide over until a permanent repair can be made with greater convenience and at lower cost.

The free Smooth-On Repair Book gives complete instructions with diagrams for making the commonest household and auto repairs in the easiest and most effective way. Every "handy man" should have a copy of this booklet and a can of Smooth-On in his repair kit.



Making Stripped Threads Hold

Be ready for emergencies. Mail the coupon for this free booklet and get Smooth-On No. 1 in 7-oz., 1-lb. and 5-lb. can from any supply store, or if necessary, direct from us.

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574 Communipaw Ave., Jersey City, N. J.

Please send Smooth-On Home Repair Book.

Name.....

Address.....

5-38



Do it with SMOOTH-ON

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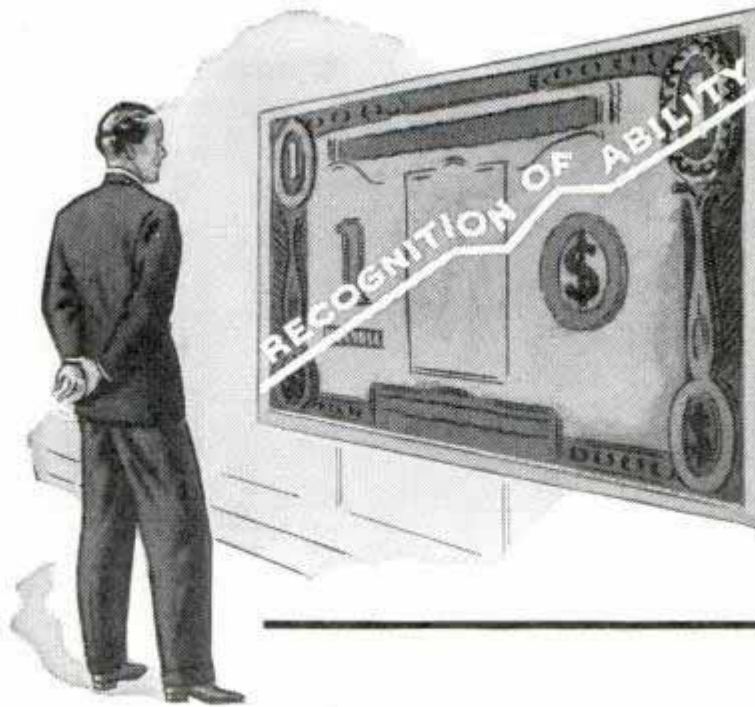
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IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.



Money is MORE than pay

• "He's a twenty-dollar-a-week man" means far more than the actual cash a man receives in his pay envelope. It indicates the type of man he is. It indicates at least one thing beyond doubt — his training is limited. And thousands of men, tired of being twenty . . . thirty . . . forty . . . fifty-dollar-a-week men, have removed this limitation of training by mastering International Correspondence Schools Courses. When you complete an I. C. S. Course, you are a trained man! And you can do it in spare time. The coupon will bring you complete information.

INTERNATIONAL CORRESPONDENCE SCHOOLS

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★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

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| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Automobile Mechanic | | | <input type="checkbox"/> Agriculture |
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BUSINESS TRAINING COURSES

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| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Lettering Show Cards |
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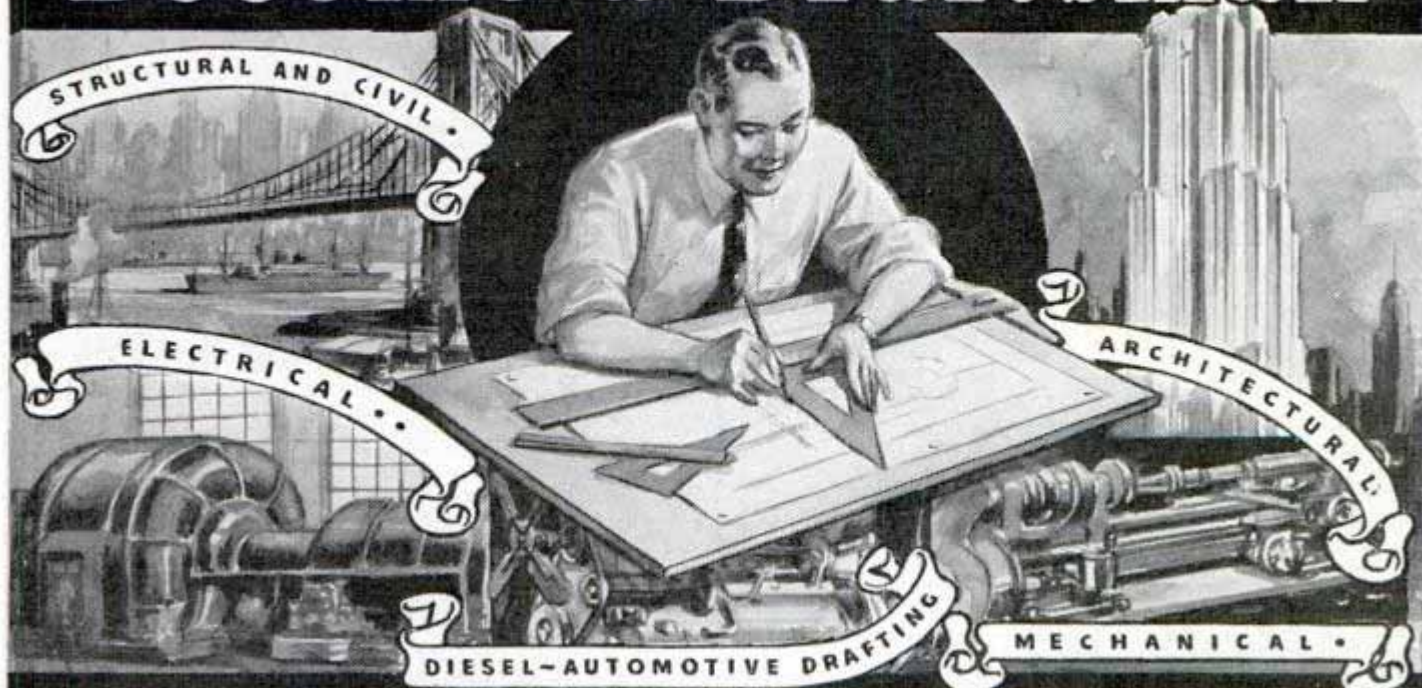
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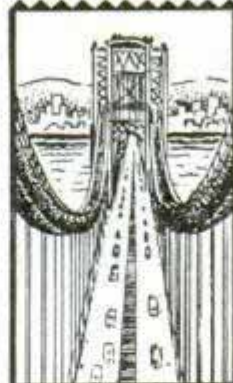
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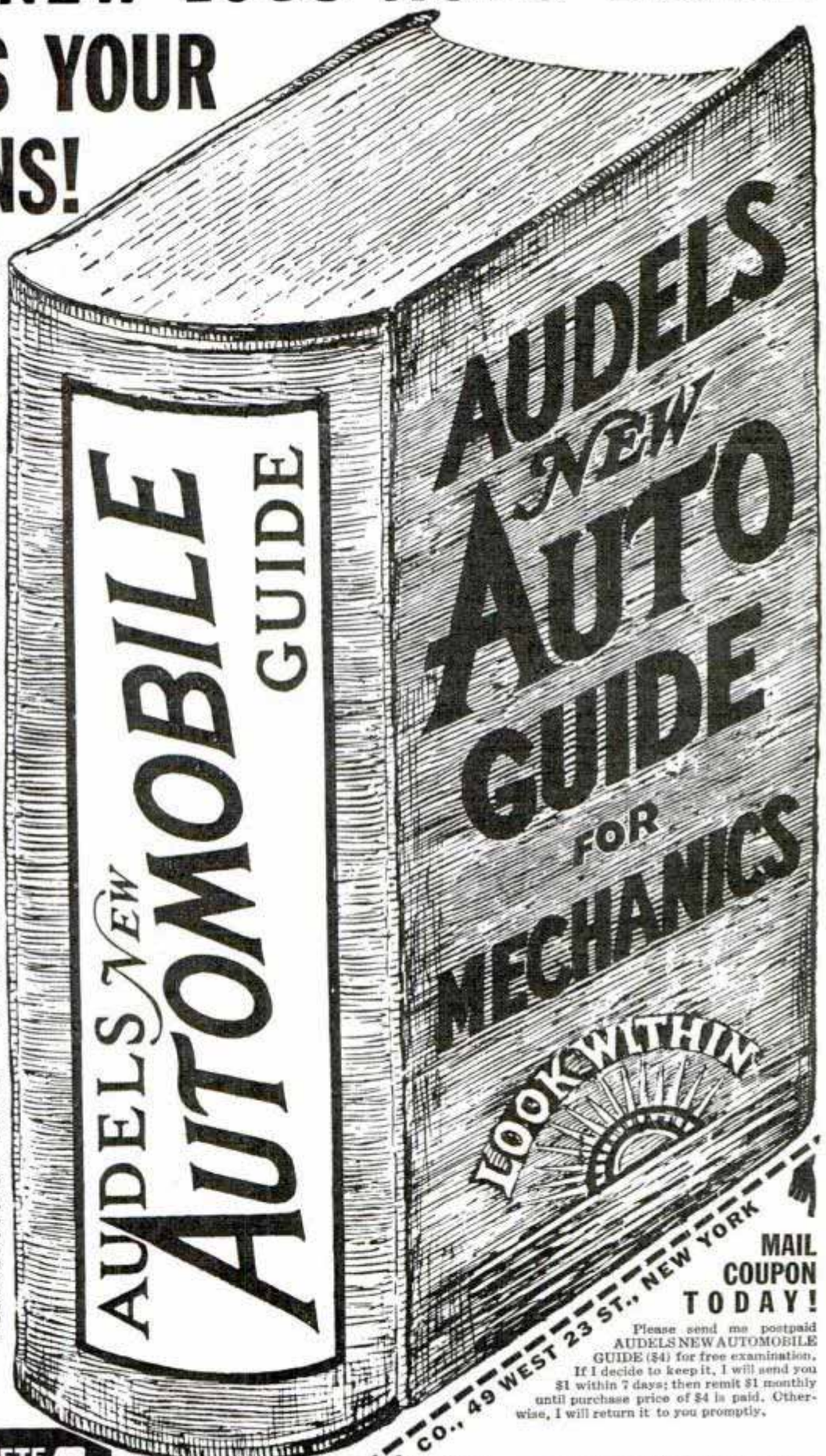
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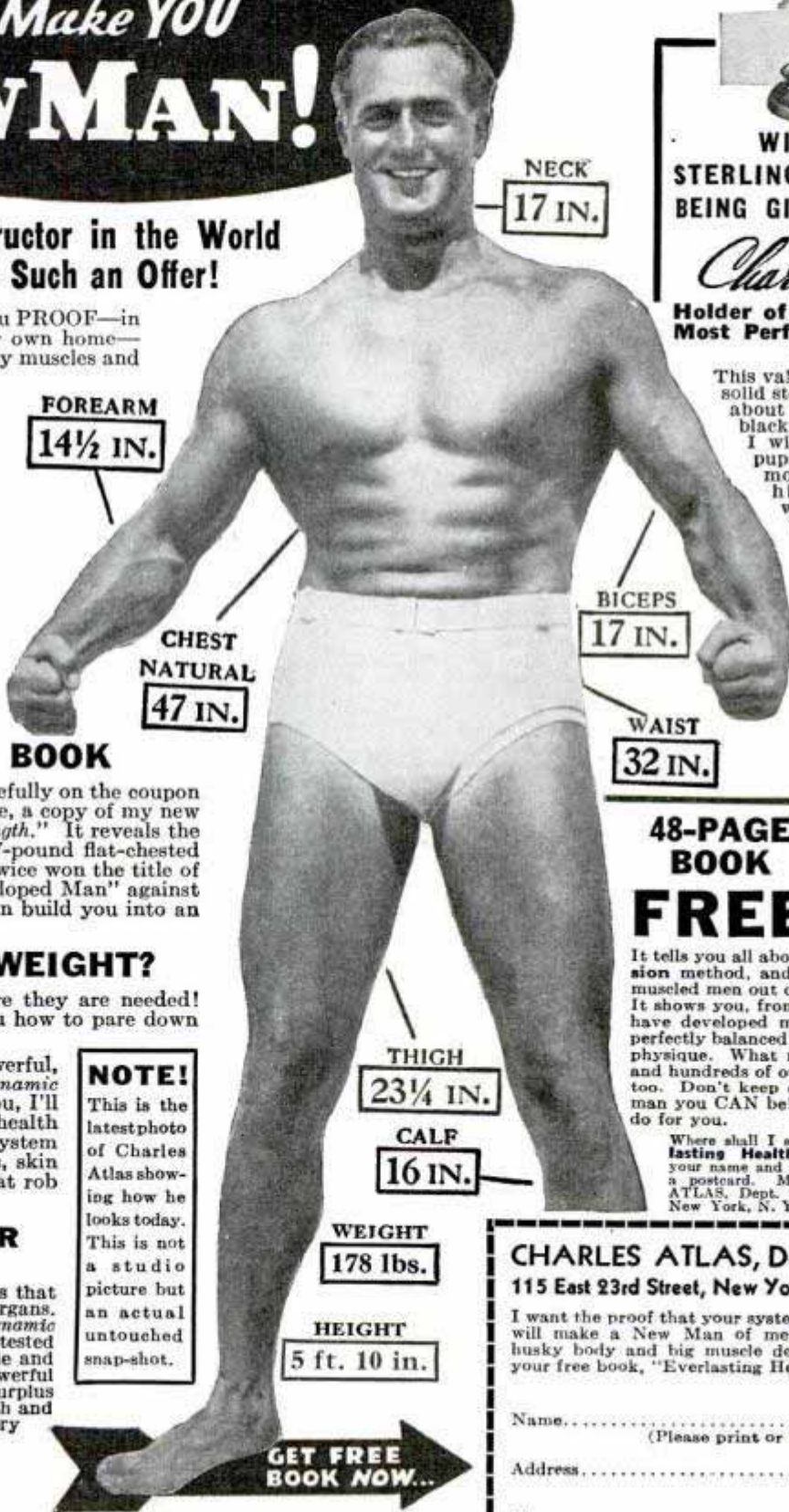
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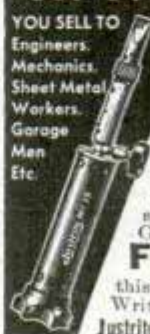
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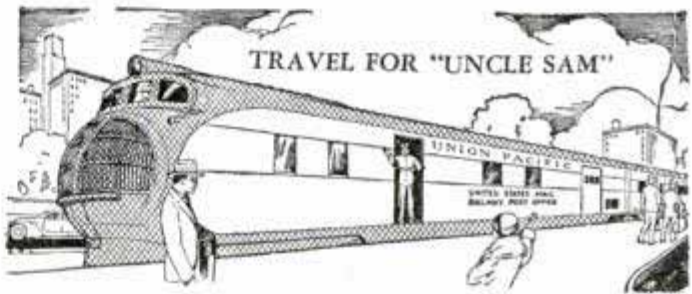


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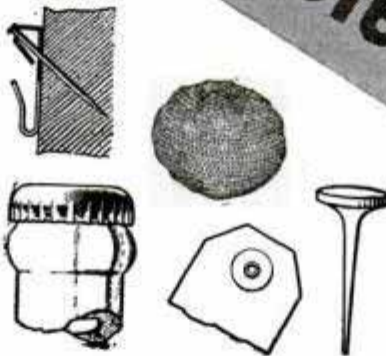
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SOMETHING new for the fisherman is found in a patented bait which consists of a jacket of stretchable material that is attached to the fish-hook and leader.

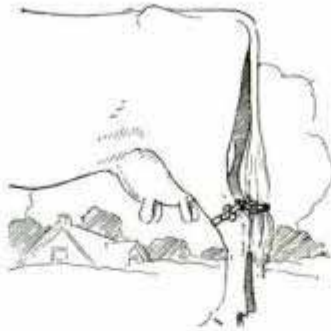


The jacket is delineated on its exterior to resemble live bait. It can be opened and closed

to facilitate filling and emptying of the jacket with bait material of the desired color. Coloring matter comes in a tube.

INTENDED to prevent the cow from switching her tail into the milker's face or the milk bucket, a special garter has been patented.

One end is attached to the cow's tail, the other to her left leg. In order that movement be not restricted too much, the garter is made of an elastic material which will give slightly.



FOR controlling and directing the swing of a golf club, a body harness has been patented.



It comprises a hip girdle with means for adjusting its girth, a cord connected at one end to the girdle at the left hip of the golfer and at the other end to the neck of

the club. The cord is adjustable for length. Then, if it is kept taut while the golfer swings, the club head is forced to swing in a circle about the golfer's left hip in the proper playing position.

FOR the sports fan, particularly a spectator at golf matches and similar events, a newly patented stool provides support for the body and reduces fatigue.

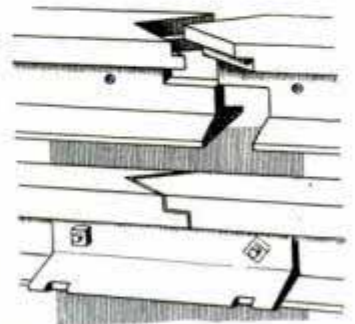


It consists of a supporting post, at the top of which is a small seat with waist and leg straps.

The stool does not have to be removed when its user is walking. When it is in use for a seat, the supporting post assumes an almost vertical position. The straps are partly resilient, so that they yield to the various movements of the body in walking and sitting.

REDUCTION in the noise made by train wheels passing over rail joints and increased comfort for passengers are two features of a patented joint for railroad tracks.

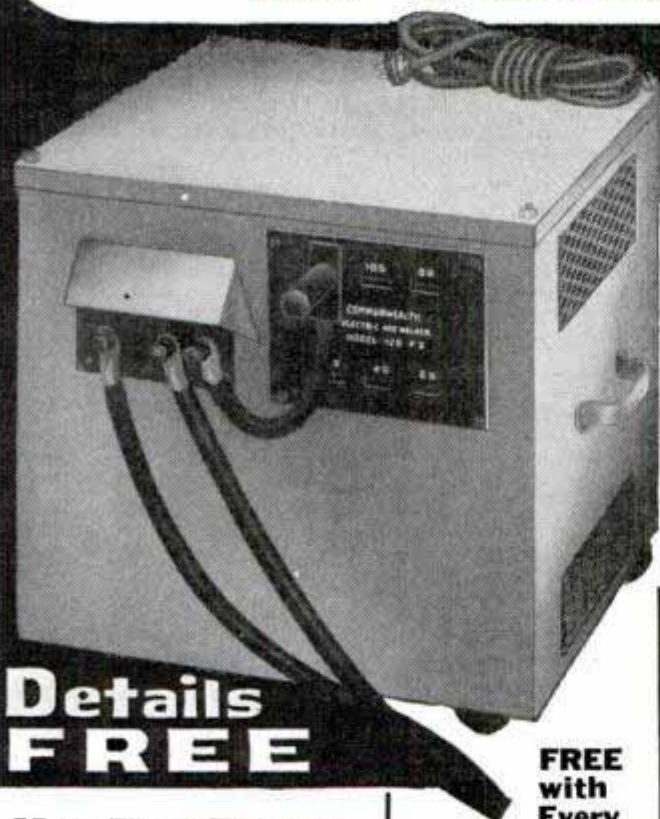
One rail has a V-shaped end into which the specially shaped end of the adjacent rail fits. Then the two rails are bolted together. The V-head eliminates all deviation to right or left, especially on curves. This



(Continued to page 34A)

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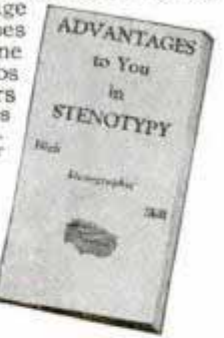
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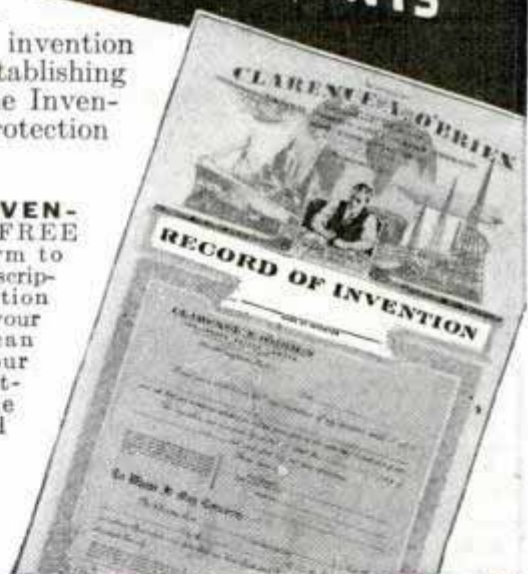
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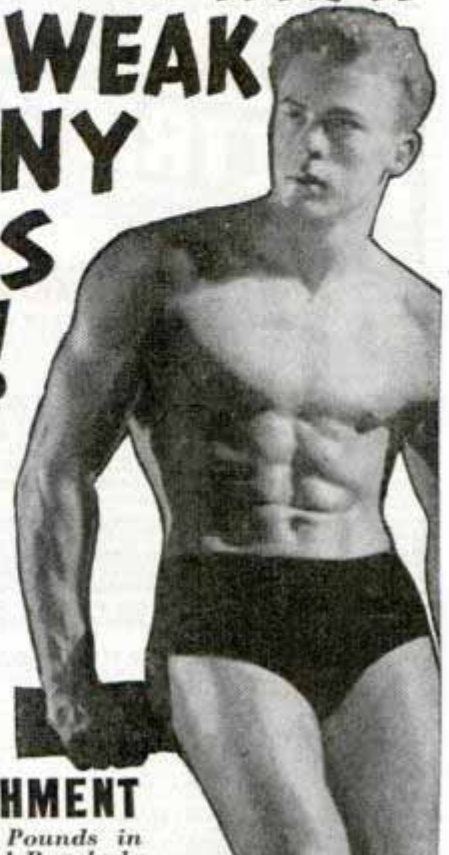
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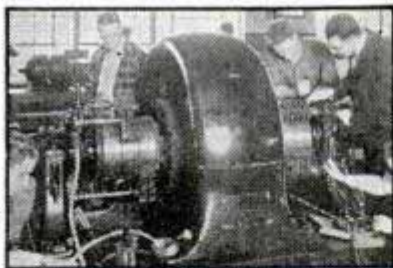


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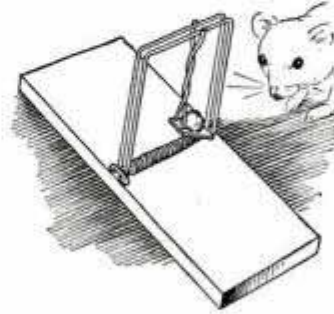
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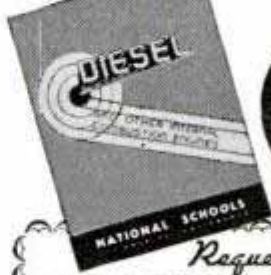
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NAME _____ AGE _____
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When writing please mention Popular Mechanics

Amazing Invention GROWS HAIR



In Many Thousands of Cases

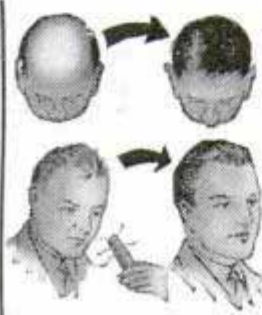
For many years hair and scalp specialists have known that inner stimulation of blood circulation in deep-lying scalp blood vessels stimulates growth of hair. Here is an amazing machine which, through principle of "Intermittent Vacuum," actually pumps blood to starved and stunted hair roots, stops falling hair, and results in new growth of hair. Yes, results are obtained even in many so-called hopeless cases of baldness.



Amazing Reports from Users

The Rand is simple to use. Hook up to any faucet — place helmet over head — turn on water — that's all! No water touches your head or you. Only power of water is used to create intermittent vacuum.

Results!



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You men who have tried everything else — you men who are losing your hair and are rapidly approaching embarrassing baldness — you men who have given up hope of ever regaining your hair — YOU are invited to try the Rand Hair Growing Machine on our amazing Guaranteed Offer. Stop being laughed at behind your back! Stop being called "Baldy"! Stop looking old before your time!

NEW HAIR IN 90 DAYS!

The exact time it takes for the hair to appear varies with the individual case, but in many cases new hair appears in as little as 90 days. Usually hair stops falling out after first few treatments, scalp glows and tingles with new vigor due to stimulated circulation. Often results are quick and startling. You use the Rand at home, while resting or reading. Several 15-minute treatments per week are sufficient.



The illustrations above explain the Rand principle of growing hair. At left is a starved hair root—too weak to shoot hair through the scalp. At right is a strong, active hair root—GROWING HAIR—because it is properly nourished by rich blood supply.

PRICE Only \$9.95

SEND NO MONEY—YOU PAY ONLY IF SATISFIED

You may have spent hundreds of dollars to regain your hair. The Rand costs you only \$9.95, complete, but you pay this only if you are satisfied with results. Send no money with coupon below. Pay postman small deposit of only \$5.00 plus postage on arrival of the Rand. Then use it for 30 days according to directions. If you are then convinced that it is helping you, pay balance of only \$4.95. Otherwise return the Rand to us for full refund. You risk nothing and you may again enjoy a thick, luxuriant growth of hair! Hurry—rush coupon below today.

RAND HAIR GROWER CO., Dept. H-1662, 402 E. 4th St., Newport, Ky.

Rush this Coupon SEND NO MONEY!

Rand Hair Grower Company, Dept. H-1662
402 East 4th St., Newport, Ky.
Please ship the Rand, complete, to me C.O.D. for \$5.00 plus postage. I agree to pay balance of \$4.95 if after 30 days, I am satisfied with results. Otherwise I may return the Rand to you and you will refund my money.

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AMERICAN FROG CANNING CO., Dept. 133-E, New Orleans, La.

NEW INVENTIONS

(Continued from page 34A)

ATTACHMENT of a small motor to a bicycle is made possible by a form of construction patented recently.

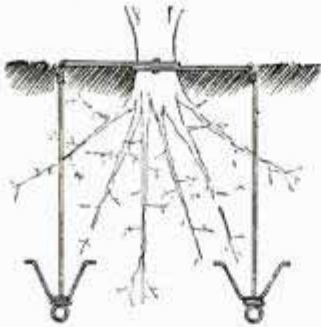


The motor is mounted between the front wheel and the drive sprocket. Gears connect the motor to the sprocket, for propulsion. A special reinforcing bar between parts of the bicycle frame helps to support the weight of the motor and to increase resistance to the motor's vibration.

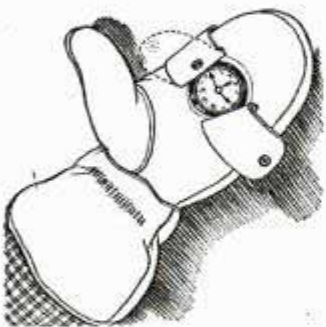
The motor is mounted between the front wheel and the drive sprocket. Gears connect the motor to the sprocket, for propulsion. A special reinforcing bar between parts of the bicycle frame helps to support the weight of the motor and to increase resistance to the motor's vibration.

PREVENTION of theft of small trees and plants is the purpose of a device patented recently.

It consists of an attachable collar which is fastened closely around the plant stem or tree trunk directly above the roots to prevent removal of the rooted portion. One or two ground engaging anchors attached to the collar prevent removal. The anchors are buried in the ground adjacent to the plant.



FOR timing speed events in winter, a mitten with an opening in the palm for a stop watch has been patented.



The opening is smaller than the watch, to keep the watch from slipping out, but permits full view of the watch face. The watch is inserted through a slit at one side. A flap adjacent to the slit has a small opening for the knurled stem of the watch. Snap fasteners on this flap and another on the other side of the palm provide for closure when the watch is not in use.

The watch is inserted through a slit at one side. A flap adjacent to the slit has a small opening for the knurled stem of the watch. Snap fasteners on this flap and another on the other side of the palm provide for closure when the watch is not in use.

(Continued to page 55A)

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(Original letter on file in our office)

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FREE. U. S. \$1, \$2, \$4 and \$5 stamps. Unbeatable U. S. approvals. Nelson, 78 E. 5th St., St. Paul, Minn.

FREE, Prodigious packet diamond shaped airmail, coronations, animals, ships, etc., providing your minimum purchase over 25c from approvals. Progress Stamps, Kirklund, Washington.

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FREE—The Stamp Finder! Our new 24 page edition, fully illustrated, which will enable you to instantly identify all difficult stamps. Also fine packet of odd and unusual stamps from Bosnia-Herzegovina, Monaco, Patiala, Cyprus, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 900, Calais, Maine.

U. S., Canada, Newfoundland, Mexico: 300 mixed only 10c (60 different guaranteed) to applicants for "Four Star approvals." Kessels, Tucson, Arizona.

40000 VARIETIES First quality stamps available on approvals 1/4c up. Suitable selection on request, adults only. Keigwin Stamp Co., Vineland, N. J.

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51 DIFFERENT United States, cat. \$1.60. Airmail, commemoratives and \$5 or 51 different Canada 18c with approvals. Jones, Box 146, Norristown, Penna.

SWITZERLAND'S Automobile postoffice stamp. This rare beauty and 50 other fine stamps sent approval applicants for 5c. Kumlir, King, Lancaster, Ohio.

PENNY Approvals with premiums. Bargains! Clark, 3024 Lakeview, Dayton, Ohio.

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LIMITED Offer: Latest Ecuador airmail constitutions, 3 varieties 5c. (Approvals.) Widgren, 1301 Addison Street, Chicago.

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6 ECUADOR 1938 Constitution comms. 7c with approvals. Co-operative, 130 Bates Ave., St. Paul, Minn.

MEMBERSHIP 10c. Dime Stamp Club. Exchange correspondence. Box 5287, Philadelphia.

PANAMA Canal Zone: 40 diff. \$1.00; 60, \$2.00; including Olympics, Bomberos, recent surcharges. Panazone Stampco, No. 1,000, Balboa, C.Z.

DIAMOND Shaped air mail—Big packet 105 all different, including air mail, commemoratives, Congo, Epirus, Manchukuo, etc.; set of two ex-King Edwards and Costa Rica diamond shaped air mail; scarce U. S. telegraph, cat. 30c; pkt. British Colonies—Gwallior, Hyderabad, Silver Jubilees; big lists. Everything for 5c to approval applicants. Send today! Mystic Stamp Co., Dept. 80, Camden, New York.

15 AIRMAILS 7c. U. S. airmail approvals. George Davis, Webster, Mass.

60 DIFFERENT Countries in packet, 10c. Ralph Tanner, Red Creek, N. Y.

EXTRAORDINARY! Free collection! Azerbaijan, Tanganyika, Belgian Congo, including approvals. Rosenberg, 3544 12th Place, Chicago.

KING Edward and coronation stamps are the best and most popular stamps this year and will prove to be immensely valuable. Set of 3 King Edwards, 2 coronations, Queen Victoria stamps over 56 years old, beautiful submarine telephone stamp and South Australia commemorative. All for only 5c to serious approval applicants. Potomac Stamp Co., Dept. 104-B, Washington, D. C.

U. S. Mission mixture, 40c pound. Stamps, Box 64, Racine, Wis.

300 DIFFERENT 20c; 500, 35c; 1000, 90c. Spears, 934 Blake Ave., Brooklyn, New York.

OPPORTUNITY! Triangles and diamond shaped stamps, United States commemoratives, Latin Americans including airmail, scarce Eritrea, Lebanon and multitude other different stamps. Everything 10c to approval applicants. Towson Shop, Towson, Md.

MALAY Tigers, cranes, maps, birds in fine packet 65 diff. 10c with approvals. Niagara Stamps, Stamford, Ont., Canada.

1/5 CATALOG Approvals, no German, sent with 250 different; or 150 (no German) choose—10c postage. Booher, Lomita, California.

SAMPLE Dozen printed to order stationery 25c. Siccan, 2038 Obeart, St. Louis.

TRY My approvals 1/2c each. Olivo Alvos, Box 132, Guadalupe, Calif.

NEW Irish souvenir stamps. A set of beautiful and interesting souvenir stamps has been issued by Irish Hospitals' Trust Ltd. A specimen sheet of 24 of these stamps may be obtained free of charge on applying to Dept. P.M. Mr. J. O'Sheehan, 28 Earlsfort Terrace, Dublin, Ireland.

500 MIXED Foreign 10c. Approvals included. Hecht Co., Belle Plaine, Iowa.

FREE! Two coronation sets. Postage 3c. Roberts, 312P Shearblg, Bay City, Mich.

GIANT-SIZED Russian zeppelin stamp, cat. val. 20c, and beautiful Lithuania air mail triangle; also big packet of 53 different stamps including Azerbaijan, Epirus, new Martinique, etc., and illustrated lists, all for 5c to approval applicants! World-Wide Stamp Co., Box 600, Camden, New York.

FREE. Beautiful loose-leaf album to approval customers. Freeman, Tobey Road, Belmont, Mass.

UNPICKED! 100 U. S. revenues on documents, 10c! 1,000, 60c. Vanvoorhis, Hyndman, Pennsylvania.

FREE 100 Different stamps to approval applicants. 3c postage. Evanston Stamp Shop, Box 200, Evanston, Ill.

UNITED States—45 different, perforation gauge, hinges, bargain pricelist—all for 10c. Seidenberg, Baroda, Mich.

FREE—Eight beautiful airmails including triangle, to approval applicants enclosing postage. Green and Company, Norwood, Ohio.

DIAMOND-SHAPED Stamp, Liberia gunboat triangle, two other triangles, silver jubilee, 27 others, 5c. Crowder Co., 127E North, Baltimore, Md.

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CANNON! Set of stamps showing cannon, firing squad, cavalry charge and 200 other different stamps, only 10c to approval applicants. L. H. Reich Stamp Co., 4225 Broadway, Chicago.

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PANAMA Triangle and 50 others free to approval applicants sending 3c postage. Tatham Stampco, Springfield-30, Mass.

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300 DIFFERENT Stamps 20c; 600, 50c; 1000, \$1; 2000, \$3; 3000, \$7. Fred Onken, 630 79th St., Brooklyn, N. Y.

QUEEREST Stamps packet. Receive one of world's smallest stamps; scarce Vatican City; Greek Red Cross (coiled snake in Garden of Eden!); Manchukuo; Soruth (mountain lion); Mozambique (giraffe); Palestine; many others. Also big packet 25 dif. Japan, (including earthquake stamp) and pkt. 15 dif. China. Everything for only 5c to approval applicants! R. M. Stamp Co., Box 230P, Port Chester, N. Y.

50 DIFFERENT, Fine U. S. including perforation gauge, 10c with approvals. The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

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NEWFOUNDLAND, 15 Different 5c with approvals. Frederick Brown, Plainfield, N. J.

FREE! 110 Different stamps to approval applicants. 3c postage. Zephyr, 5124 George, Chicago.

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STAMPS. A superb selection sent on approval. Quality at low prices. Fred Herzberg, Box 91-P, Elmhurst, Ill.

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ASK For our wonderful one cent approvals. Prospect Stamp Co., 225 Broadview, Toronto, Canada.

WHOLESALE Catalog for dealers. Illustrated. Postage 5c. Frank Co., 4900 Chalmers, Baltimore, Md.

PENNY Approvals, that satisfy. Neil Gronberg, Box 5441-P, Philadelphia, Penna.

WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

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FREE, 50 Stamps, Manchukuo, etc. Postage 1c. Album 3c. U. S. bargains. Bulard, 268 Northampton, Boston, Mass.

APPROVAL Sheets, One to three cents. Frederick B. Driver, 2009 Finance Bldg., Philadelphia, Penna.

STAMP Dealers, your ad here will bring wonderful returns. Ask me for proof. P. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

25 UNITED States, including \$4 and \$5 stamps free to approval applicants. 3c postage. Brownie Stamp Shop, Flint, Mich.

REDUCED—1c Daily, establishes permanent mail address. Co-operative Mail Service, 126S Lexington Avenue, New York.

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JUST Published—1938 directory of hobbies and spare-time opportunities. A guide for amateur and professional hobbyists. 25c per copy. Park City Book Supply, Dept. 8, 1078 Pembroke Street, Bridgeport, Connecticut.

HOBBIES. Sports, recreation, etc. Exchange ideas with other hobbyists, whose interests are similar. Details—send 10c coin for handling charge. American Hobby Bureau, 254 Drexel Bldg., Philadelphia, Penna.

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DEVELOP And print your own pictures. Save time, money with our complete outfit. \$1.95 plus postage, or sent C.O.D. Includes electric ruby lamp, printing frame, photo paper, chemicals and equipment. One of hundreds of amazing bargains in our free, newest, money-saving bargain book. Send for it today! Central Camera Co., 230 So. Wabash, Dept. 25-K, Chicago.

ROLLS Developed, 8 prints in Velox, 25c. 5x7 enlargement in handsome easel mount, 49c; 3 for \$1.25. Photoshop, Box 218, Augusta, Ga.

PHOTO Mill. Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 double weight professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. Reprints 2c each. The Photo Mill, Box 629-12, Minneapolis, Minnesota.

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IMMEDIATE SERVICE! Better pictures. Two beautiful heavy-weight professional enlargements and eight guaranteed Perfectone prints 25c coin. Eight beautiful enlargements from roll only 25c. Candid rolls developed free! Prints enlarged to 3x4, only 4c each. Pictures sent back same day film is received. American Studios, Box B, LaCrosse, Wis.

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EXPERT Photo finishing 8 genuine expensive Velox prints, two double weight professional enlargements 25c. Expert Studios, LaCrosse, Wis.

OIL Painting from photograph \$5. Portraiture, 826 Noble, Chicago.

AMAZINGLY Beautiful, roll developed, 8 Natural Color prints, 25c. Reprints, 3c. Natural Color Photo, D-54, Janesville, Wis.

SPECIAL Enlargement offer! Ten 5x7 enlargements 50c with this ad only. Enlarging Company, 6444 Diversey, Chicago.

ROLL Developed, 16 guaranteed prints 25c. Smart Photo, Winona, Minnesota.

GUARANTEED. Film developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas.

SNAPSHOTS Expertly colored 10c. Price list free. Mumber's Color Service, 5410 Wellington, Chicago.

FILMS Developed 2 prints of each 25c; 20 reprints 25c. Pine Photo, M-5134 Nevada, Chicago.

QUALITY Not quantity! Roll developed, 1c; prints, 3c each. Economy Photo, Box 157-P, Greensburg, Penna.

FILMS Developed—8 glossy, Neverfade, Perfotone, Velox prints 25c. Satisfaction guaranteed. Lookout Studio, Fort Payne, Alabama.

BE Convinced—Globe photos are unexcelled. 8 Duo-Tone prints, 2 5x7 enlargements. Send next roll 25c coin to Globe Photo Shop, La Crosse, Wis.

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20 REPRINTS 25c. Films developed, 16 prints 25c. Enlargements 8x10, 25c; 5x7, 10c. Low Photo, M-2657 Neva, Chicago.

ROLL Developed and printed. Two enlargements, one of them in colors, all for 25c coin. The Photo Finisher, Station E, Box 42, Columbus, Ohio.

PROFESSIONAL Quality service. Rolls developed, 8 prints and 2 enlargements 25c. The Film Capital Service, Box 504, Rochester, N. Y.

REPRINTS 1c Each. Film finished 15c. Henke Studio, Armstrong, Iowa.

PROMPT Service, guaranteed work. Two beautiful portrait type double weight enlargements, eight neverfade gloss prints, each roll 25c. Dubuque Film Service, Dubuque, Iowa.

DEVELOPING. Printing, enlarging for the discriminating. Any roll developed and printed. Eight prints 25c roll. (127 to 122 eight exposures) developed and 5x7 enlargements of each negative 50c. Knickerbocker Photo Co., 129 West 27th Street, New York City.

MAKE Money in spare time with your camera. See adv. Cameras and Supplies column. Cooperative Photographers.

ROLL Developed and 8 guaranteed prints including two enlargements, 25c coin. Super Snapshot, Winona, Minnesota.

ROLL Film developed and one print each in individual album 25 cents coin. High class work, fast service. King's Photo, Box 447, Rockford, Illinois.

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LATEST in photo finishing. Miniature rolls developed and printed 3x4—5c each print. Radio Film, LaCrosse, Wisconsin.

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BE Modern! Get Modern service. Modern quality. Modern prices. Our modern methods give quick service and bright guaranteed neverfade pictures. Roll developed 16 prints, 25c coin. 16 reprints, 25c. Enlargement coupon. Send next roll or reprint order to Modern Finishers, 3537-C, St. Paul, Minn.

TWENTY Reprints 25c. Roll developed and two prints each negative, 25c. Star Photos, 109 N. Dearborn, Chicago.

GET The best. Roll developed, beautiful hand colored enlargement, 8 neverfade border prints, 25c coin. Prompt service. Sun Photo Service, Drawer T, St. Paul, Minn.

INTRODUCTORY Offer. Beautiful Platesunk etched enlargement free with roll developed printed 25c coin. 24 hour service. The Artists, Box 230, Minneapolis, Minn.

ROLL Developed, 8 brilliant fadeproof Velox prints and two professional enlargements 25c. Overnight service. Young Photo Service, 405-C, Albany, N. Y.

MILLIONS Now know "Hollytints Means Better Prints." Two professional enlargements with trial roll—25c. Fascinating premiums. Unequaled service. Hollytints, P-1350, Hollywood, California.

LIMITED Time only. 4x6 Natural Color enlargement from your negative, 10c. Natural Color Photo, Janesville, Wis.

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LARJARGRAPH Reprints: Five 5x7 enlargements 25c. Cardinal Photoers, Summit, N. J.

ROLLS Developed, two sets prints plus enlargement coupon 25c. Reprints 3c. Over 19 reprints 2 1/2c. Jones Studios, Davenport, Iowa. "Where the West Begins."

AT Willard's, Box 3535-A, Cleveland Heights, Ohio, you'll get quicker service, beautiful quality. Roll developed, 2 prints each negative 25c. Enlargement coupon. (Trial offer.)

ROLLS Developed, 2 prints each and 2 free enlargement coupons, 25c; reprints, 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

ENLARGEMENTS 4x6, Five for 25c. 5x7 three for 25c. 8x10 three for 35c. Hand colored and framed each 4x6, 30c. 5x7, 35c. 8x10, 45c. Send film negatives. Enlargers, Maywood, Ill.

ROLL Developed and 8 beautiful Velox glossy prints 25c coin or stamps. Reprints 3c each. Fotoprint Service, Box E, Roanoke, Va.

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ROLLS Developed—Two new Beautitone Dublwaite professional enlargements, 8 guaranteed fadeless Beautitone prints, 25c. Giant Snapshots, Inc., 667A, Green Bay, Wis.

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MAKE Money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 3432, Chicago.

FREE! Book, "How to Sell Snapshots." Fomo Company, Canton, Ohio.

ARGUS Camera Ever-Ready cases with shoulder strap, genuine leather, very special \$1.89. Mirotext, 6241 Southwood, St. Louis, Mo.

MANY Makes of candid cameras delivered at cut prices. Catalogue free. Camera Store, Sac City, Iowa.

PHOTOGRAPH Without films. Instructions \$1.00. Sample 10c. Koch's Studio, De Beque, Colo.

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ABSOLUTELY Free! During this advertising campaign! New Moviematic, all purpose, 3-in-1 camera. Included with this remarkable Moviematic all purpose camera, a Keystone motor driven projector at no cost to you. Write today! Right now! Enclose 3c stamp for details of this amazing offer. Master Distributing Corp., 18 East 48th St., New York City.

BASS—Camera crossroads of the world. We will mail you at once our new 52 page still camera special Bargaingram No. 233 teeming with good values in candid and other cameras, new and used and complete list of photo accessories. Note unusual values: Dollina 0 candid camera, 36 shot, F:4.5 extremely fine Anastigmat lens at only \$18.90. Dollina Model II, coupled range finder, F:2.9 Anastigmat lens, Rapid Compur shutter, \$49.75. DeFranne Argonaut half No. 120 candid camera, with fine Anastigmat F:2.9 lens in Compur shutter at only \$27.75. These and other values mailed under our fourteen day money back guarantee. Write for your copy of this great new Bargaingram No. 233 and read what real service and value means. Bass Camera Company, Dept. AG, 179 W. Madison St., Chicago, Illinois.

TOPE Blueprints to rich black or brown! Formula for toning blueprint, photographs and drawings on paper, cloth, etc., 25c. Blueprint sensitizer formula for paper, cloth, etc., 25c. Both 35c. Coin please! Hollywood Blueprint Company, Box 1928-B, Hollywood, California.

GENERA Film; use in any 8mm. camera. 200 feet \$1.95 postpaid. Separates without slitting. Sample free. Fromaders, Davenport, Iowa.

WANTED. Your name and address to send you catalogs and prices. German cameras, field glasses, movie cameras and projectors. Ask for prices and catalogs. Mexico Camera Specialist, Foto Mantel Sncr. Rudolf Rudiger, V. Carranza 11, Postbox 1459, Mexico City, 105. Branch: Tijuana, Baja, California.

MAKE Money in spare time with your camera. Learn photography quickly at home by new easy method. Our 30 years experience and helpful cooperative methods will aid you earn while learning and conduct your own studio with success. Opportunities unlimited. No contract to sign. Information free. Cooperative Photographers, Patchogue, N. Y.

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INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 W. 33rd St., New York.

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WE Purchase and accept in trade used photographic equipment. Send for bargain list. Fotoshop, 134R W. 32nd, New York City.

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16-35 MM. FILMS. List 5c. Bedner, 5300 S. Talman, Chicago.

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LEARN Motion picture theatre business. Home-study training; management, advertising, projection. Free catalog. Give age. Theatre Institute, Elmira, N. Y.

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NEW! Movie equipment! Wholesale prices. Superior, 126 Fourth, Paterson, N. J.

AMAZING—16mm.-8mm. Bargaingrams, stamp. No-Wat-Ka, 151 Broadway, Paterson, N. J.

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1000 FEET 35mm. 75c. Projectors, Talkies. Savarese, Woodcliff Lake, New Jersey.

SMASH. Free film samples with 35mm. list 3c. Visual Products, 459 West 22nd Street, New York City.

BIG Bargain lists 35mm. 10c. Calderara, 5119 South St. Louis, Chicago.

COMPLETE 16mm. And 8mm. rental library. Films shipped anywhere. Include postage for free catalogue. National Cinema Service, 3 West 29th Street, New York.

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LIKE New bargains! Cine-Special \$295, with motor \$415; Victor sound film projector including amplifier, speaker, complete \$148; sound film, odd reels, 400 feet, \$5.00; Victor camera f3.5, \$35; Ampro 400 watt projector \$50; 30x40 beaded screen \$2.29; 16mm. 100' comedies, travelogs \$1.19; 35mm. silent, portable projector \$25; DeVry sound film, new soundhead, amplifier, speaker, complete \$198; 9x12 screen \$12; 35mm. silent shorts, features, perfect condition \$1 reel, up. Road showmen, churches, schools, dealers get our bargaingram free. We maintain national 8-16mm. silent sound film library. Films sent anywhere. Trades accepted, bought. Mogull's, 1944-J Boston Road, New York City.

BARGAINS 8mm. Cameras, projectors. Folder 363P. Spicer Photo, Beloit, Wis.

BEADED Screens wholesale. Size 30"x40" mounted on spring roller. Complete with brackets, ready for mounting, \$5.00 value. Introductory price \$2.75 postpaid. Beads only, for making your own screen \$1.00 lb. postpaid with complete directions. Illinois Mail Order, 441 South Blvd., Oak Park, Ill.

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8MM. PROJECTORS, Cameras, splicers, large discounts. Large variety 8mm. films. Stamp for free catalog. Abbe Films, 1265 Broadway, New York City.

8MM. AND 16MM. positive title film, 35c up. Developing, 25 feet, 50c. Titlers for 8mm. and 16mm. cameras, \$3.75 and \$5.45. New 8mm.-16mm. film rewinds, \$3.50 pair. Catalogs free! Hollywood Cine Film Distrib., Dept. P-4, 1431 No. Highland Ave., Hollywood, Calif.

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15% TO 25% Discount on still or movie cameras. Free circular. Paramount Co., 327 E. 92nd St., New York City.

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NEW 6 Tube RCA auto radios in factory cartons, reg. \$44.95. Special \$19.95. Lindgren Radio Co., 1316 E. 63rd St., Chicago.

AGENTS Wanted, nationally advertised radios. Philco, GE, RCA, Zenith, etc., send for bargain set and part catalog. United Radio, N-Newark, N. J.

REPAIR Your own radio. We tell you how. Send name of radio, model, and complaint. Enclose \$1.00. Seventeen years experience. Instructor, 630 Enright, Cincinnati, Ohio.

TELECHART! Learn radio code by quick, easy, copyrighted method. One dollar. Telechart, Dept. 11, Box 25, Knoxville, Tenn.

TALK Over electric light wires, plans 25c coin. Modern Labs, Box 53, Schuylerville, New York.

PLANS 18 Distance record crystal sets, with "Radiobuilder" year, 25c. Laboratories, 7700-C East 14th, Oakland, Calif.

BRAND New table model radios. 5 tubes. Built in aerial, illuminated dial, ac. or dc. operation. Outstanding bargain, \$7.95. Radio Specialties, 1218 Seventh N.W., Washington, D. C.

RADIO Bargains. Save half. RCA, Philco, G.E., Zenith, electric appliances. Free bulletin. Mack Bros. Supply, 2047 Chicago Ave., Chicago.

RADIO Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

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LEARN Swing piano! Self instructor makes it easy. Postal brings free folder. Christensen, 751 Kimball Hall, Chicago.

WONDER Sound post, 50c. Improve violin 50% sound. Money back guaranteed. J. Naboznik, 530 Parkview St., Winnipeg, Canada.

REBUILT Band and orchestra instruments. Honestly rebuilt, fully guaranteed. Send for prices. Specify instrument interested in. Weymann Co., Dept. M-5, 1613 Chestnut St., Philadelphia.

MUSICIANS Slide rule. \$1.00. Free circular. Poper Co., 2 Ellwood St., New York, N. Y.

MELODY Composing course! \$5.00. Littig, 215 Mason Theatre, Los Angeles, California.

LEARN Hot playing, phonograph records. Trial lesson. Send \$1. money back. Name instrument. Ratcliffe's School, 713 Kentucky, Vallejo, California.

MUSIC Composed to words. Rhyming pamphlet free. Phonograph recording of song free. Send poem. Keenan, 259 Beach St., Bridgeport, Conn.

SONGS: Words or music, at once, brilliant opportunity. Vanburen, B51, Rockhaven, Kentucky.

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LEARN Piano by ear! Ascertain your talent; quarter brings good lesson. Complete method one dollar. William Mulveney, Toronto 3, Ontario.

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SONG Writers. Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

LATE Phonograph records, some new, some slightly used. Fifty—\$2.50. Davis Sales Company, Syracuse, New York.

"ART Of Songwriting"—by Hollywood's famous author, Al Dubin—a concise, scientific volume containing valuable information on how to write lyrics, titles and melodies. \$1.00 postpaid. Gotham Music Service, Inc., 1619 Broadway, New York.

SENSATIONALLY Economical instrument instruction books by masters. Descriptive literature 10c. Pasreno's, Laurier, Manitoba.

VIOLINS—Handmade masterpieces, best since Stradivarius. Free trial. John Lehto, San Pedro, Calif.

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MUSIC Composed, arranged, revised. Charges reasonable. Len Fleming, Wellsboro, Penna.

SONGWRITERS! Marvelous opportunity. Investigate. Standard Song Service, 1412 Great Northern Bldg., Chicago.

SONGS Published, arranged and composed. Royalty basis. West Coast Music Publishing Co., 942 Market St., San Francisco, Calif.

SONGWRITERS Wanted, write for free book. Indiana Song Bureau, Salem, Ind.

MUSIC Composed to song-poems. Orchestration arranged. Frank Wildt, Lancaster, Pennsylvania.

SONGWRITERS—Get "How to Write Songs" by famous Broadway composer and free rhyming dictionary. Songwriters Institute, 1234-C Broadway, New York City.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

WANTED Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 42, Toronto, Can.

PIANO, Self Instruction. Play within an hour. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

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GLASS-LIKE Color Glaze for concrete pottery, tiles, blocks, walls. Exclusive, patented process. No experience needed to make 2,500 designs glazed pottery without molds. Build your own equipment from our plans. New, money-making business for men. Colorplate, booklet, details 10c. None free. Write: National Potteries, 13 West 26th, Minneapolis, Minn.

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"MAKE Mirrors at home." Big profits. Little outlay. Also emboss, grind—foil, gold leaf, frost, chip and make imitation stained glass. Instruction course \$1.00. Bestovall, 4047-M N. Whipple, Chicago.

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\$3 DAILY Making raised donuts. Best known recipe 50 cents. No machinery. Church Aide Co., Altoona, Penna.

FORMULAS—Fast selling products. Guaranteed. Laboratory tested. Lowest prices. Catalog free. Kemico, 55W, Park Ridge, Ill.

SPARE Time business opportunity, selling formulas and printed specialties by mail only. Waldo, Box 266, Dallas, Texas.

"AMAZING Opportunities." Start your own "spare time" mail order business. Make "extra dollars." Write L. Process Co., 4437 Lincoln Ave., Chicago, Ill.

START Home factory. Men, women, whole families operate this. Big profits. Manufacturers Service, 489 Arcade Bldg., St. Louis, Mo.

1939 PROPOSITION Offered to opportunity seekers. Dime brings particulars. Hutchison, 314 North 4th, Camden, New Jersey.

BEAT Depression! I did! Big profits; police co-operation. Details stamp. Reich, 661, Huntington, W. Va.

MONEY, Easy, Legitimate. No canvassing. Satisfaction assured. Goode, Paragould, Arkansas.

BIG Money-maker. Builds income anywhere. Stamp brings special new, depression bargain. Seneca Specialties, Geneva, N. Y.

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"\$35 WEEKLY For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-F Riverside Drive, New York.

LUCKY Seven money making formulas, own your own business, become independent, money back guarantee. Send 25c silver. Plan Distributors, No. 900 Faxon, Memphis, Tenn.

PAINT, Brush cleaner, powder. Every painter, hardware store prospect. One dollar brings formula. Full directions. Industrial Laboratories, 1200 Niagara, Buffalo, N. Y.

NO Easy money! Increased income, yes! 24 Money making formulas, 25c coin. Details free. Geo. Ellsworth, 6 Judson St., Binghamton, N. Y.

WATERPROOF Leaking buildings. Protect new structures. Permanent. Essential. Profitable. Specialized. Manufacture, sell or apply our outstanding effective waterproofings developed through long specialization north and south. Write enclosing stamp. Waterproofing, Box, East Cleveland, Ohio.

MAKE Money growing vegetables, fruits, flowers, plants without soil. Use only water and chemicals. Complete formula and process \$1.00. Kemixal, 179, Park Ridge, Ill.

PLANOMANIA—The naked truth about mailorder—packed with dynamite. Supplement "P" 10c. Opportunity Digest, Woodside, N. Y.

NEED Money? We'll help U! Send stamp. Sanvoy, Arlington, Kentucky.

OPPORTUNITIES, Profits, independence await you. No canvassing. Macco Plans, 13127 Birwood, Detroit.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

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EARN \$25.00 Weekly working two hours daily. No canvassing or manufacturing. Business Opportunities, St. Paul, Minn.

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\$10 GROWS To \$7,050. "Compounding Profits—the most fascinating game on earth." March issue, 10c. Opportunity Digest, Woodside, N. Y.

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DOLLAR Kit makes three rubber molds. Colonial Art, Derry, N. H.

MEN, Women! Write today about jobs, opportunities making money in California without canvassing. Send no money. Crampton, Soda Springs, California.

WANT A mailorder plan that is really workable? Details stamp. Raymond Diederichs, P. O. Box 756, Jefferson, Ohio.

MANUFACTURE Writing inks. Tremendous profits. 15 gallon size \$1.50. Labels free. Samples 25c. Pilgrim-Atlas, Malden, Mass.

NEW Industry! Literature, sample 10c. Box 384, Fargo, N. Dak.

SELL Photo snapshots to newspapers, magazines; big pay; instructions and list of buyers 10c. C. Lewis, 828 Carpenter, Oak Park, Illinois.

HANDY Men—Earn money home operating community "Fix-It" shop. Stafford, Makanda, Illinois.

FREE! "Dynamic Dollar" plan. Start home mailorder business day received. Bert-Bert, Box 1436, Long Beach, Calif.

OPERATE Home mail business. Plans, instructions, formulas. Complete 25c. Steitle, 6605 Murray, Mariemont, Ohio.

POPCORN, Crispette, carmelcrisp, potato chip, salted nut machines. Long Eakins, 1960 High St., Springfield, Ohio.

START A factory at home. Particulars free. Draper, Culver City, Calif.

FASCINATING Occupation. Gourds raised from imported seed. Six different sizes, shapes sent prepaid with full illustrated instructions how to make many useful, decorative, artistic, saleable articles \$1.00. Escamilla, Ramona, California.

QUICK Earnings; good income; mirror making. Write R. R. Randall, Beloit, Kansas.

MAKE \$15-\$75 Weekly; home business, 107 successful plans. Century, 1261-PT Broadway, New York.

SELL Books, plans, folios by mail. Plan and details 10c (coin). Tillberg, 126 Lexington Ave., New York.

MAKE Money! Particulars and 2 mail order opportunity magazines for 10c. W. Strauss, Owings, W. Va.

REPRINT, "Breniser" dollar mail treatise and pulling circular. 25c coin, 6c stamps. Green, 15788 Parkside, Detroit, Mich.

NEW! Proven! Money making propo-sition. Write Cormack, 8 Hazel, Norwalk, Conn.

MEN Photo 40 and younger men! Start a steady, lifetime business of your own. Handle nationally known "necessities" for filling stations, garages, schools, and business places. Supply customers regularly. 100% profit. Write Harper Mfg. Co., 950 Adams St., Fairfield, Iowa.

\$200 STARTS "Chain" of chewing gum and confection vending machines. Steady cash income. Details free. Robbins Co., 1141P DeKalb Ave., Brooklyn, New York.

PRINT Individual show cards and price tickets for stores. Interesting, clean, very profitable home repeat business. New, portable machine. Term or rental basis. Seth Kline Manufacturing Company, McLean, Virginia.

OPPORTUNITIES Aplenty! Money-makers that "click"! Unusual "idea" service! Bulletin A free! Cee-Tee Company, 1079 Madison St., Brooklyn, N. Y.

"WORLD'S Newest Co-op Plan" sells your product or ours. Easy, simple, sure, no canvassing. Particulars 10c. Lewis, Box 243, Minneapolis.

FOR A highly profitable lifetime busi-ness, operate a collection-credit agency. Free information. Cole Associates, Syracuse, N. Y.

MAKE Your own rubber molds. We teach and make molds. Cut rate. Use marbelike cement. Sets hard in 15 minutes. Novelties and slabs take high glossy finish. Send dime for large illustrated novelty list, and marble sample. The Novelty Supply Co., Grayling, Michigan.

SELL By mail. Suggestions free. Steinger, 706 West North, Pittsburgh, Penna.

MAKE Artificial marble, glazed tiles, un-canny. Tabletops, plaques, floors, bones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

EIGHTEEN Money making automobile specialty formulas, including the celebrated petrolube gas saving formula with complete plan for selling by mail, all for only 63 cents. A. Bucknam, 177 State St., Boston, Mass.

MONEY Making mail order business for sale. Good for \$5000.00 per year. \$1500.00 required. Box 27, Boston, Mass.

DOLLARS And leisure on few cents cap-ital! Make alluring enduring marble, granite, flooring, roofing, wallboard, tile, etc., at home. Sell on sight. Free information. Cement Arts, 514 Davis Building, Portland, Oregon.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

DISTRIBUTORS Wanted for protected territories to establish Moto-Scout dealers. Must be able to finance own sales office. State qualifications and define territory you can cover thoroughly. See our display advertisement on page 152A. Moto-Scout, 227 S. Western Ave., Chicago, U.S.A.

REDUCED—2c Daily, opens New York business office. Co-operative Mail Service, 126B Lexington Avenue, New York.

SNAP Into it! Be independent! Send now for full, unusually valuable particulars. Marlborough Co., Box 81, Astor Station, Boston, Mass.

COLOR Concrete surface with chemical solutions. Beautiful pottery without moulds. Garden wishing-wells. Stucco rock. Glazing concrete. Sample 10c. Hollywood Cement Craft, 8527 Wonderland, Hollywood, California.

PRACTICAL Furniture finishing—old or new—walnut, oak, mahogany. Complete \$1.00. Bergh, 232 W. Keefe, Milwaukee, Wis.

INDEPENDENCE! Earn substantial in-come, prosperity; year-round, no canvassing. Free facts. McArthur, Drawer 339-5, Butte, Montana.

FREE! New home money making plan. No canvassing. Julius, Amarillo 12, Texas.

AMAZING, New, economic plant fer-tilizer. 25c. Sanquist Co., Pomeroy, Iowa.

LIQUID Marble—anyone can make! Col-orful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

107 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

AFTERNOONS Free for outdoors, shows, \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-F, Station D, Los Angeles.

ADDED Income ideas. Mail Sales News magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1938 season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, Ohio.

DONUT, Potato chip, cheezed pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

WE Start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.

OPERATE Chain world's finest money making vending machines. Sells four products, same time. Instant success! Small capital, profits immediately. Penny King, 1233 Chouteau, St. Louis.

SUCCEED With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Elfco, 438 N. Wells, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 300 E. Ontario St., Chicago, Ill.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

CASH Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

ARTIFICIAL Marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 127, Marion, Indiana.

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MERCHANTS. Proven sales-plans worth weight in gold! Satisfaction guaranteed! Send \$1.00 for three. W. S. Finigan, Oneonta, N. Y.

EASY Money formula for making best penetrating oil on the market. 300% profit. Big repeater. Directions for making and selling 50c. W. A. Farnsworth, 801 West Main St., Bellevue, Ohio.

MONEY Making propositions, practical and legitimate. Free particulars. Schembri, P. O. Box 1271, Detroit, Mich.

"SPARETIME Roads to Riches," explains hundreds new easy moneymaking opportunities, 10c. Lewis Co., 828-M Carpenter, Oak Park, Illinois.

TAKE In the dollars with the "Money by Mail" system. Particulars free. Key Systems, Box 323, Jeannette, Penna.

FREE Circulars describing moneymaking mail order and local business plans. Robert McGuire, Johnson City, Tenn.

ALL Kinds, forty pages, three, 10c. Home Industries, Benson, Nebr.

WANT Money? Send your address. Enclose stamp. Stettlee, 6605 Murray, Mariemont, Ohio.

KEROSENE Or electric lamps made out of fruit jars with Century Lamp Jar Caps. Send 25c for sample and money making proposition. Century Home Appliances, St. Paul, Minn.

453 AMAZING Moneymaking exposures. Dollar gift, free plan. 33c stamps. King, Ahwahnee, Calif.

PAYING Mail order business, your own. Write Dixie Mailers, King, N. Carolina.

HOMEWORK Opportunities Magazine—10c. Sample 5c. Schumacher, 3503 Hirsch, Chicago.

1,000,000 ARTICLES Wholesale. Directory 10c. Jelmsmith, 163 Myrtle, Waltham, Mass.

TURN Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! Dime brings information, none free. Ace-PMC, 322 Empire, Birmingham, Ala.

"NEWEST Mail proposition"! Different! Safe! Profitable! Food concentrates, vitamins, endocrines. "6000 word folio." Samples, dime. Gardena Institute, 128P, Station "S," Los Angeles.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

WINNING Plans that click. One year 50c. Winner, 1433 Tenth, Charleston, Ill.

MONEY, Easy. Legitimate. No canvassing. Satisfaction assured. Goode, Paragould, Arkansas.

CASH In, 300 tested moneymakers. 64 page book, over 40,000 words. 10c postpaid. Business secrets, formulas, wholesale supply sources galore, no ads, meat only. Moneyback is dissatisfied. National Plans Institute, 246M Fifth Ave., New York.

"\$35 WEEKLY For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-F Riverside Drive, New York.

FORMULAS, Odorless clothes bleach and other new fast profitable sellers easily manufactured in home. Bon-A-Ben, 1008-D So. 64th, Milwaukee, Wis.

EARN Money collecting reptiles, toads, frogs for us. For particulars send dime. Biological Research Laboratories, Dept. 14, Springfield, Missouri.

COPY National Mail Order News 10c. Box 1773PM6, Roanoke, Virginia.

SEE Sensational animal creation. Direct from owner. Earn living by mail. Sample and particulars 25c coin. None free. P. O. Box 151, Dallas, Penna.

CASH For clippings! Prepare clippings for publishers. Simple plan has proven profitable. Free details. American Press Bureau, B-1026, San Jose, Calif.

FASTEST, Biggest, easiest money-making plan. Free particulars. Rucla, Box 292, Albany, N. Y.

EARN Money sparetime. Tested plan gets dimes. Complete plan, \$1.00. National Specialties Guide, West Branch P. O. 486, Los Angeles, Calif.

SWAP & Sell magazine, "The Nation's Market Place." Get the things you want without paying for them. Magazine prints your ads free. Sample copy 10c. Swap & Sell, 99M Hudson Street, New York City.

NOW Make money! A \$1.00 magazine (40th year), filled with schemes, tips, business opportunities, formulas, sent six months for only 30c. "Schemer Monthly," Alliance, Ohio.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

GET Dollar bills in your mail daily. Nearly all profit. Particulars free. Homecraft Arts, Lakeside, Calif.

SELL By mail; big profits; free literature. Hunt Products, 49 Edgemere, Trenton, N. J.

STOP Squealing—Start crowing! Work mornings home—country drives or movies—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information. Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

AUTHENTIC Prosperity plans bring \$8.75 daily. Start on \$1.25. Literature free. Direct mail. Box 344, Summit, New Jersey.

PROFIT In vegetables, flowers, using chemicals. Remarkable yields. Proven formulas. Chemicals for 48 gallons solution. Instructions \$1.00 postpaid. Quick Growth, Hollywood Sta., Box 648, California.

START Mailorder business. Details free. Pederson, 1609 1/2 East Fifth, Duluth, Minn.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

MOULDS, Guaranteed, for casting toy soldiers, Indians, trappers, warships, stinkermoulds, 244 kinds. Send 5c for illustrative catalogue. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 287, Marion, Indiana.

FORMULAS, PLANS, ETC.

BRUSHLESS Shaving cream. Latest scientific manufacturer's formula \$1.00. Send 25c coin for sample. Geo. Twidle, 502 - 15th Ave., Belmar, New Jersey.

GROW Without soil—Flowers, vegetables, plants. Year round, anywhere. Only water and common chemicals used. Formula \$1.00. Bestovall, 4047-W North Whipple St., Chicago.

MAKE Bleach water. Formula 50c. Capotosto, 1707 Cranston St., Cranston, R. I.

NEW Mechanics soap, guaranteed remove grease, formula 25c coin. Modern Labs, Box 53, Schuylerville, New York.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49W, Park Ridge, Ill.

ANY Formula 30c or money back. Catalog free. Ogg Laboratories, Tampa, Fla.

EIGHTEEN Money making automobile specialty formulas including the celebrated Petrolube gas saving formula with complete plan for selling by mail. All for only 63 cents. Bucknam, 177 State Street, Boston, Mass.

ANY Ten formulas, guaranteed best, 25c coin. Press Service, Station G, Buffalo, N. Y.

KAR-O-MEL. Ten other popcorn formulas, including cheese, directions, etc. \$1.00. Dietz, Toledo, Ohio.

OUR Formulas are money makers. Trade secrets, special formulas. Catalog free. Industrial Laboratories, 1200 Niagara, Buffalo, N. Y.

BRUSHLESS Falseteeth cleaner 15c. Makes 1 gallon. Formula \$1.00. Walsh, 248 Whittenton St., Taunton, Mass.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

SOILLESS Plant culture. Raise tomatoes, potatoes, flowers, etc., in shallow tank of water containing 21 chemicals. Tomato vines 20 feet, bear for year, 20 pounds per vine, quality better than soil grown. Instructions, formula \$1.00. Purdy's Chemicals, 1852 E. Slauson Ave., Los Angeles.

CHEMICAL Analysis. Practical formulas. Ideas developed. Associated Chemists, Indianapolis, Indiana.

10 PROVEN Money-making formulas 50c coin. Broukings, Box 82, Stoneham, Mass.

STAMP Brings free instructions for making fastest selling, big profit products. No formulas needed. Concentrated Products, Dept. 1591, Tampa, Florida.

MEN! Shave without razor! Send 25c for formula for self-shaving soap. Carl Greiner, 5112 N. Oakley Ave., Chicago, Ill.

FORMULAS! Best produced for exceptional popular necessities. All lines. (Not stock-formula catalog stuff.) Get these unusual offers—stamp brings them. Miller, Manufacturers' Chemist, Tampa, Florida.

100 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

FIREWORKS. Ten formulas 25c. Free chemical catalog. Meshna, Malden, Mass.

CHEMICALS, Laboratory glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

CHEMISTRY, Biology, mineralogy supplies, microscopes, telescopes. Catalog free. Teeko, Evanston, Ill.

HANDBOOK For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

AGENTS WANTED

PROFIT By other men's "ups and downs." Wear and sell "Anchor Pads." Comfortably holds "shirt down—pants up" without pressure. Retails 25c. Worth dollar for comfort and looks. New and desirable. Unit sales average 1 to 4 sets. Each set on flash display card. Sells on sight. Sales repeat. Profit harvest for spring and summer. Send 10c for sample set and particulars. J. V. Pilcher Mfg. Co., Louisville, Ky.

AGENTS Make bigger profits on food products—bargain deals. Low wholesale prices. Big display case sent on trial. Ho-Ro-Co, 2810-R Dodier St., St. Louis, Mo.

450% PROFIT Quick-Action automatic gas lighter. No flint. 25c seller to every home, office and restaurant. Sample 10c. New Method Co., Box PMG-65, Bradford, Penna.

100% PROFIT. Sell water softeners. Sizes \$5.50 and up. Get free demonstration outfit offer. Master Inc., 5057 Queen South, Minneapolis, Minnesota.

GIANT Moth killer. Weighs 1½ lbs. Home and industrial use. Steady repeats. Sample 75c postpaid. Elkay Products Corp., 323 West 16th Street, New York.

SALES Agents. We offer exclusive territory to live wires for the fastest selling product in America. Every owner of table radio sets a buyer. Low priced, big profits. Write for particulars to Columbia Pad Co., 124 West 31st Street, New York City, N. Y.

JUST Out! Amazing fast selling 25c household necessity. Saves hundreds of dollars. Sell 3 to 4 each home. Make up to \$6 daily. Free sample. Puro, 3107 Pine, Dept. E-298, St. Louis, Mo.

A BUSINESS of your own, making Palmer's original chipped glass name plates, numbers, mirrors, signs. Illustrated literature and sample free. E. Palmer, 512, Wooster, Ohio.

UP To \$6.00 an hour. Amazing Karnu refinishes autos like new without rubbing, polishing, waxing or painting. Inexpensive—costs little. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. E-8, Cincinnati, Ohio.

NEW Kind of heat boils water instantly. Make to \$30 daily. Pocket size minute demonstration. No installation. Free offer. No investment. Write the Lux Co., Dept. B-205, Elkhart, Indiana.

500% PROFIT Selling new 20-in-1 kitchen utensil. Retails 25c. Costs you \$1 a dozen or \$6 a gross. Sample 10c. New Method Co., PMM-65, Bradford, Penna.

SELL An old established line. 100% profit, make big money. Ampco, 32 Union St., Malden, Mass.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. E-842, Cincinnati, Ohio.

AMAZING Sharpener—100 shaves from same blade. 400% profit. \$1.00 sample 25c. Dallas Ruth, Wheelersburg, Ohio.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

100% PROFIT In new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retails 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PM-65, Bradford, Penna.

TAKE Orders for genuine Indian moccasins for men, women and children. Edwards Factory, Jamaica Plain, Mass.

NEW Waterman product. Vis-O-Pen. One dollar seller. Remit for sample. Martin Company, Farmingdale, New York.

MILLIONS Of motorists need Reflectolite, a new auto accessory. Sample and confidential prices 50 cents. Apollo Mfg. Co., 319 Union, Memphis, Tenn.

AGENTS—Millions spent yearly by public on relief of colds, coughs, catarrh, bronchitis and sinus infection. Offering something new. 100% profit and steady repeater. Sample and particulars sent for 25c. Jackson Inhalation Co., Box 1613, Jacksonville, Fla.

AGENTS Wanted. Razor blades. Big profit. Louis Eugene, 277 Broadway, New York.

MAN And wife—to run local coffee agency. Earnings up to \$240 in a month. New Ford sedan given you as bonus. I send complete outfit. You don't risk a penny. Details free. Albert Mills, 6223 Monmouth, Cincinnati, Ohio.

MAGIC Electric brush retails \$1.50—your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket, unbreakable. Send for sample and particulars. Donald Brush Co., Advertising Dept., Camden, N. J.

SENSATIONAL 99c Flavoring deals with 62c profit! Twenty-three flavors! Experience unnecessary! Glenwood Products Company, McLean, Virginia.

NEW 50c Stenographer-typist necessity, indispensable time-labor saver. Minute demonstration sells dozens. Hundreds prospects any large office building. Sample, particulars 10c. Feedeasy Manifold Company, Box 731, Dallas, Texas.

500% PROFIT. JiffyHook curtain tie-back holder. New. Beautiful sample 6c. Weldon, Mfr., Maryland Hts., Mo.

STOP Job hunting! Start own light manufacturing business. Millions need product! Supply your territory. Brand new! Tremendous profits! Particulars free! Thermo F-F Works, Peoria, Ill.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

YEAR-ROUND Best sellers. Huge profits! Samples, literature free! Specialties, 4931-N Hamlin, Chicago.

HAN-DEE-CLOTHS Quickly polish all metals. Rapid 25c seller. Gratifying profits. Ruskin Company, 1907 Rosemont, Cleveland.

FREE Typewriter. Outfit 25c. Details free. Associated, Southside, Oil City, Pennsylvania.

BOYS! Girls! Easy to earn cash. Sell concentrated vanilla flavoring to neighbors. Send dime for full size package and details. General Products, 776R, Springfield, Mass.

"\$35 WEEKLY For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-F Riverside Drive, New York.

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

GENUINE Black calf leather belt. 138 separate pieces 89c. Agents wanted. Jos. Reno, 1519 N. 27th St., Milwaukee, Wis.

BUILD Profitable business selling soaps, cleaners, polishes, waxes, deodorants. Every product guaranteed. Big profits. Buy direct from 50 years old manufacturer. Write immediately. Baum's Castorine, Rome, N. Y.

NEON-LIKE Signs. 8"x14" cost 3c—retails 25c. Over 1000 designs. Catalog and sample free. Lowy, Department 807, 8 West Broadway, New York.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

SELL Roof paint; good proposition. Flanagan Bros. Company, Youngstown, Ohio.

STRETCH Your dollar to three. Sell "Stick-Foam," the new waterless, bottleless shampoo. None finer. Retails 25c. Guarantee 50c value. Costs you \$1.00 per dozen, postpaid. Three assorted odors. "Sunset," "Sweetbreeze," "Pinetar." A. P. Straub, Beatrice, Nebr.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Mfg. Co., Box 1118, Chicago.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

GIVEN—Packard Lektro shaver. Make \$10 quick. Free sample card. Details. Golden Rule Co., Box 285, Altoona, Penna.

200% PROFIT. Noknot clothes line reel sells on sight at 25c. Carl Clouser, 11 Glynn Terrace, Quincy, Mass.

PRIVATE Brand cosmetics and toilet preparations. We print your name on the labels. 200% to 400% profit. Send for complete details and prices. National Scientific Laboratories, 1910W Broad, Richmond, Va.

EXCLUSIVE Representatives appointed. Faucet water softener. Revolutionary. Luxosoft, Sausalito, California.

MONOGRAMMING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 9360, Philadelphia, Penna.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 106 E. 19th, New York.

ATLAS Windown sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

MEXICAN Curios, tremendous money-makers. Samples 10c. Marquez-P, Apartado 1176, Mexico City.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

300% PROFIT Selling bankrupt bargain merchandise. Southerners, 164-M Henry, New York.

BIG Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, uniforms, etc. Sales equipment free! Experience unnecessary. Write Nimrod, Dept. 8, 4922-28 Lincoln, Chicago.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

AGENTS: Smash go prices! Santos coffee 12c lb. 4 oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

GUARANTEED Gold leaf letters for store and office windows. 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H. Decatur, Ill.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-F Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

BUSINESS Proposition: Resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

150% PROFIT. Supplement your present line with natural herb laxative. Dandy repeat item. Everyone uses laxatives. Write Desk 100, National Health Service, Orlando, Florida.

HIGH-GRADE SALESMEN

WANTED—By tool manufacturer, three salesmen between 30 and 40 years of age. One for eastern states, one for southern states and one for Rocky Mountain states, to travel by automobile calling on hardware dealers, machinery dealers, manufacturing plants, automotive service trade, and schools. Our lathes have been on the market for 31 years and are nationally advertised. Want salesmen who have had some mechanical experience or technical training. State age, experience, education, etc. South Bend Lathe Works, South Bend, Indiana.

EXPERIENCED Salesman. Good commissions, exclusive territory, take orders finest year around line clothing for entire family. \$350 samples furnished; sweaters, underwear, snowsuits, mackinaws, etc. Car necessary. Patrick-Duluth, Duluth, Minn.

SENSATIONAL! Full size, sturdy, guaranteed adding machine, retails only \$9.95 complete. Also multiplies, divides, subtracts. Enormous demand among retailers, professional offices, factories, schools, insurance men, etc. Big commissions—\$100.00 weekly easy. Write, Addomatic, Dept. B-12, 430 N. Oakley, Chicago, Ill.

SELL America's most complete line of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, engraved like stationery, shipping room supplies, office supplies, printed gummed tape, advertising chewing gum, advertising pencils, thermometers, business stimulators, complete line standardized printed business forms and hundreds of other fast sellers. Business cards \$1.50 thousand. Stationery \$2.70 thousand. All competition undersold. Cash commissions advanced daily, plus extra bonus. Experience unnecessary. Brand new huge 1938 outfit free. Federal, AC-301 South Desplaines, Chicago.

MYSTERY Electric sign. Third dimension. Salesmen coin money showing to merchants everywhere. Get details today. Jones Brothers, Merchandise Mart, Chicago.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Little or no capital needed. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 5810, Spencer, Ind.

SALESMEN: Sell business stationery, book matches, advertising gum tape, advertising pencils, shelf moulding, labels, salesbooks, pricing sets. Business cards \$1.50 thousand. 35% commission daily. Free deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. ZF, Chicago.

SELL Salesbooks, cafe checks, etc., as a sideline. Big commissions weekly. Write for handy kit. K. C. Salesbook Co., 1016-P Baltimore, Kansas City, Mo.

GET Own suits free as bonus. Make big profits. Show friends movie star styles in made-to-measure clothes at big savings. New fashions and fabrics, inspired by Buddy Rogers, Cesar Romero, other movie stars—\$15.95 up. Guaranteed to fit and satisfy. Big commission for you on every order. 100 large samples and big book movie star pictures and styles free. Jim Foster, Inc., 2250 So. Spaulding Ave., Dept. A-5, Chicago, Ill.

SELL Nothing. \$95.00 weekly. \$500.00 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C125, 6227 Broadway, Chicago.

20,000 MILES From weak, discarded tires with Tire Armor—A selling sensation! We deliver. Liberal commission. Motor Products, 1760 Lunt, Chicago.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Religious mottoes. J. A. Baxter, Cambridge, Ohio.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. Sales way up this year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U-PPM, Freeport, Ill.

BLADES. Factory prices. Free delivery. Ace Blades, Dept. 5-C, Rochester, N. Y.

SELL Grooved felt back changeable signs with double prong celluloid letters to all stores. Big commissions. P. Pricing Press, 124 White St., New York.

BRUSH Salesman—if you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

SALESMAN Wanted, \$250 weekly profits made selling special tool set to garages. No competition. Write Mesco, Box 205P, Beaver City, Nebr.

ADVERTISING Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash commissions. Full-part time. Big repeats. Samples and kit free. Match Corp. of America, Dept. E-5, 6041 Grand, Chicago.

IMMEDIATE Opening selling advertising matches to taverns, cafes, beauty shops, politicians, etc. Cash commission. Outfit free. Gem Match, 74 West Washington, Dept. 55, Chicago.

NEW Specialty. Sells every business. Forced demand. Large earnings. Rimer Company, Silver Springs, N. Y.

"35 WEEKLY For 3 hours homework." 204 other moneymaking plans. Particulars free. Stamford, 836-F Riverside Drive, New York.

FORTUNES, Selling Gro-All, grows larger flowers, vegetables, without soil. Retails 50c. Exclusive territory. Wisconsin Growers, 2509 N. 3rd, Milwaukee, Wis.

SALESMEN. Amazing magnetic brush. Pocket size. Money maker. Creates static electric suction. Excels vacuum cleaner. Neway Brush Company, Hartford, Conn.

A SURE Cure for clogged drains. This tool sells on sight. Get a city and become independent. Silent Valve Co., 3420 Fletcher Drive, Eagle Rock, Calif.

SALESMEN: Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

BIG Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, uniforms, etc. Sales equipment free! Experience unnecessary. Write Nimrod, Dept. 65, 4922-28 Lincoln, Chicago.

EXECUTIVE Past forty interview church societies. Ramo, Brighton, Rochester, N. Y.

WANTED, Monumental salesman everywhere. Marble-Granite Company, A-17, Oneco, Fla.

ATLAS Window sign letters. Large sizes. Penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

OUR New 1938 complete line of brushes now ready. Largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, P. E. Armstrong, President, Dept. PM, Mobile, Ala.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

HELP WANTED

MAN Wanted—by shoe manufacturer established 35 years, for sales work. Ready cash daily. No experience needed. Your own shoes at factory prices. Complete line of almost 300 styles for men and women, including famous Velvet-Eez air cushion nailed insole shoes, sent free. Write Mason Shoe Manufacturing Company, Dept. R34, Chippewa Falls, Wisconsin.

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 37-E, Greenfield, Ohio.

ABLE Men to distribute advertising circulars and handle routes. Make up to \$42.50 first week. Brand new Ford sedans given producers as bonus. Details free. Albert Mills, 6217 Monmouth, Cincinnati, Ohio.

ACCOUNTANTS Earn good incomes; learn at home; catalog free. National Commercial Institute, Huntington, W. Va.

RESPONSIBLE Men and women to handle effective and economical mothproofing compound. Protected territory and substantial commissions to workers. Mothkill Company, 25 Hudson Ave., Troy, N. Y.

STOP Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-A Federal, Pittsburgh, Penna.

STEADY Work, good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 137, Freeport, Ill.

EDUCATIONAL AND INSTRUCTION

LEARN All about earthworms for profit. California Earthworm Farms, Highland Park, Los Angeles.

DEGREES Earned through home study—Psychology, theology, law—others. Air-conditioning and Diesel courses. Request free bulletin. No obligation. Temple Bar College, Missoula, Montana.

BECOME An investigator. Remarkable "Test Question, Problem and Lesson Correction Method." Modern, practical, thorough. Profusely illustrated. Particulars free. International Secret Service Institute, PM 58, Hoboken, N. J.

"UNCLE Sam" 1938 jobs. Start \$105-\$175 month. Full particulars, list positions, sample coaching free. Write immediately. Franklin Institute, Dept. R3, Rochester, N. Y.

STUDY For a degree in psychology, metaphysics, truth, theology. Home study. Chartered college. Free catalog. College of Universal Truth, 1100 N. Dearborn Chicago.

PIPING Draftsmen are in demand. Draftsmen learn piping by mail from an experienced designer. Write L. C. Andrews, 126 Lexington Ave., New York.

SELL Insurance. All kinds. Training and placement service. Vocational Guidance Institute, Boonton, New Jersey.

PRACTICAL Arithmetic, algebra, geometry, and slide rule, for home study. Simplified short cuts. Complete course \$1.00. Slide rule free. Mathematician, Box 434, Duluth, Minn.

SUCCEED! Helpful booklet free! Johnston, 257-P North Washington, Tiffin, Ohio.

"SHORTHAND Simplified" complete \$1.00. Folder-lesson 10c. Simmons, Rocky Hill, Conn.

TELEGRAPHY Taught thoroughly. New railroad retirement act creating demand for operators at good salaries. Enroll now. Expense low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Indiana.

SUCCESSFUL Men are "realists." Send 10c and learn to become one. Realist League, 45 Abbey Court, Brooklyn, N. Y.

INSIDE Legal information. It pays to know the answers. Price 25 cents. Dept. B, 234 Hurst Bldg., Buffalo, N. Y.

SECRET Investigations. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, New York.

BE A radio announcer, actor, singer, writer. Learn at home. Free information. Radio Arts Academy, 3823 Wilshire, Hollywood, Calif.

MASSAGE, Hydrotherapy, dietetics, drugless therapeutics, chiroprody, taught by mail. Evans Correspondence School, Montgomery, Ala.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write, Instruction Service, 101, St. Louis, Mo., immediately.

GOVT Jobs start \$1260-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

DEGREES Earned by home study in arts, sciences, philosophy, education, psychology, theology, law, chemistry, engineering, business, agriculture. McKinley-Roosevelt College, Chicago.

EARN Extra money! Clipping and preparing newspaper articles for publishers. Simple; fascinating; profitable. Send stamp. Division 55A, National Press, 3923 W. Sixth, Los Angeles, Calif.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

PICTURE Enlarger. Drawings, pictures enlarged, no camera necessary. Complete outfit, 25c. Tempo, 158 Grand Street, New York.

FINE Lettering fast with modern Speedway Patterns. Unique method. Free samples. Display-Letters, Station 235-G, New York.

EASY Method cartooning, commercial art or sign painting. Circular free. Matthews, 1925 Franklin, St. Louis, Mo.

ART Work at reasonable prices. Doug's Falcon Art Studio, Falconer, New York.

DID You see Disney's "Snow White?" Be an animated cartoonist! Earn up to \$300 a week in this new and lucrative profession. Guaranteed easy complete illustrated course by Hollywood experts. Plan for assembling own professional animator's desk free! Chance of a lifetime! Course complete \$3.50. For limited time only. Don't delay! Send money order today! The Hollywood Correspondence Studio of Animated Cartooning, Box 2468, Hollywood, California.

25th ANNUAL Art supply catalog on request. Ask for yours. Bart Supplies, Dept. M, 915 Marquette, Minneapolis, Minn.

ART Magazine. Helps you sketch human figure, paint, model, carve, cartoon, sell drawings, exhibit, form clubs. Regular 50c value—two for 25c while samples last. Artist, 320 West Doty, Madison, Wis.

ARTISTS Earn big money with our practical plans. Particulars free. Publishers' Exchange, Bedford Bldg., Chicago.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

PLAYS, STORIES, MANUSCRIPTS

\$10 A WEEK writing poems. Full instructions and 50 best markets sent for 25c. Charles Olive, Willmar, Minn.

I PLACE Stories on market. Hursh, Box P-1013, Harrisburg, Penna.

WANTED—Authors' manuscripts. Immediate marketing. Revel, 41 West 45, New York.

WANTED, Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

ADVERTISING AGENCIES— FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3432, Chicago.

ADVERTISE 30 Magazines, 3 months, \$6.00 inch, 25 words \$1.50. List special offers free. Bucknam, 177 State Street, Boston, Mass.

YOUR Ad in 1,500,000 Sunday newspapers (guaranteed, national circulation) \$15.40 inch. Ratebook all leading newspapers, magazines, free. Chicago Union Agency, 20-P West Jackson, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

BUSINESS SERVICE

\$2.00 MONTHLY Maintains Washington, D. C., office. Business or personal purposes. Hawkins Mail Service, 817 Fourteenth.

FLORIDA Mailing address. \$3.00 per month. Ace, Box 3191, Miami.

WHERE To buy anything! Manufacturers, wholesalers. (25c.) Kings, 66 Newton, Jamestown, N. Y.

MAIL Received and forwarded. \$1 monthly. Personal problems answered. Confidential Service, 3059 16th St., San Francisco.

CHICAGO Mail address; branch office; representation; \$1 monthly. Letters, etc. forwarded daily. Established 1919. General Service, 56 West Washington.

MESSAGE Bureau. Mail forwarded daily. 200 Lumber Exchange, Minneapolis, Minn.

25c MONTHLY Maintains mailing-forwarding address. 207 East 84, New York.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Mounted, three lines, 30c; 1000 business cards \$1.00 postpaid. Advance, Pewaukee, Wisconsin.

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

CUSHION Mounted one-two lines 25c; three 35c. 100 letterheads, 100 envelopes \$1.00. Hauer Press, 1314 Ford, Youngstown, Ohio.

ORIGINAL, Cushion mounted. One, two lines 25c; three 35c; four 45c. Facsimile signature \$1.50. Stamp Works, 814 Bradley, Peoria, Illinois.

CUSHION Mounted one, two lines, 25c; 3 lines, 35c. Stamp Works, Hastings, Nebraska.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

TYPEWRITER Ribbons, 40c; three, \$1.10! Guaranteed! (Salesman wanted.) Galluzzo, Wilksburg, Pennsylvania.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302-D, Altadena, California.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, handwrite, draw or trace. Colors, \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

PRINTING, MULTIGRAPHING, MIMEO- GRAPHING, GUMMED LABELS

BUSINESS And personal cards, 35c for 100; postpaid. No stamps. Neads Printery, 3315 Oxford, St. Louis, Mo.

LABELS And fine printing. Samples. Artcraft Label Co., Asheville, N. C.

500 STICKERS, 250 Letterheads, 250 envelopes, all \$1.50. Cott's, Spickard, Missouri.

PHOTO Engravings—Zinc line cuts made, 10 square inches, \$1 up; halftones; electros; artist; speedy; free price list. Riteway Engraving, 1457P Broadway, New York.

500 VELLUM Business cards \$1.00. 250 envelopes \$1.00. Le Blanc, Box 564, Mt Vernon, N. Y.

QUALITY Envelopes 1,000, \$1.69; 5,000, \$6.99. Banner Print, Statesboro, Georgia.

QUALITY Printing, complete line. Low prices. Send order for estimate. Castellazo, 3717 Redwood, Oakland, Calif.

3"x6" CIRCULARS 1000, \$1.00; 5000, \$3.50 prepaid. Keelerprint, 4237 West Cermak, Chicago.

\$1.00 POSTPAID: 125 8 $\frac{1}{2}$ x11 Letterheads and 125 6 $\frac{3}{4}$ envelopes. Benneville, 907 West Roosevelt, Philadelphia.

500 LETTERS Reproduced exactly as if typewritten, \$1.70 (20 lines). Multigraphers, Box 8275, Ashland, Virginia.

250 LETTERHEADS, Envelopes, billheads, cards, blotters or labels, \$1.00. Race Printery, Hudson, N. Y.

25 LETTERHEADS And 25 envelopes 25c. Osborne Printery, McVeytown, Penna.

HAMMERMILL Letterheads, 300, 8 $\frac{1}{2}$ x11, any color paper and ink; 6 lines; \$1.48 postpaid. Free particulars. Woodruffs', 217A Lewis, Duluth, Minn.

UNION Printing, 500 envelopes or large letterheads \$1.95, 5000 bond 6 $\frac{3}{4}$ envelopes, samples, \$8.90. Printery, Mariemont, Ohio.

1000 2 $\frac{1}{2}$ x4 LABELS \$1.50; 1x2 50c. Paramount Press, Atlanta, Mo.

250 5 $\frac{1}{2}$ x8 $\frac{1}{2}$ BOND Letterheads, 125 envelopes, \$1.25 postpaid. Universal Supply, Orange, Mass.

1000 LETTERHEADS, Envelopes, circulars \$2.00; 5000, \$8.00. Prepaid, Frederick Shore, 8009 Atlantic Avenue, Woodhaven, L. I.

QUALITY Printing. Low cost. Write Wolverine Envelope Co., Grand Rapids, Michigan.

FINE Value. Printed stationery. 300 Maxwell bond note sheets 6x7, 150 envelopes to match. Send \$1.00 postpaid. Established 1927. Franklin Printing Co., Franklin, Ohio.

ENVELOPES, Letterheads, 1000, \$2.00 postpaid. Marcus, 1627 S. Hamlin, Chicago.

FREE 1938 Pricelist and samples letterheads, envelopes, statements, blotters. McCall Printing Co., 1326 So. 27th, Omaha, Nebr.

1000 STATEMENTS, 5 $\frac{1}{2}$ x8 $\frac{1}{2}$, \$1.95. Samples. Michael Hyhaluk, East Paterson, New Jersey.

300 BOND Letterheads, 6x7, 150 envelopes, neatly printed blue ink, \$1.00. Edgewood Press, Edgewood, Maryland.

PRINTED Letterheads, 1000, \$2.25; mimeographing \$2.85. Samples. Cop-Y-Cat, Box 840, Milwaukee.

WHOOPIE! Business "Comic Kards." Surprise! Packet, 10c. VanDorn's, Ottawa, Illinois.

COUPON Books—Ice, gasoline, merchandise. CVDS Coupon Co., Ottawa, Illinois.

MATCHES—1,000 Books \$3.95. Advertise your business! Sanderson's, Ottawa, Illinois.

100 LETTERHEADS, 100 28 lb. envelopes, postpaid \$1.00. Evans Print, Reading, Penna.

PROFITS! Turn out your own circulars, statements, etc., inexpensively. No machinery to buy. 25c brings complete instructions. Address A. B. Kayes Co., 13 State St., Schenectady, N. Y.

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NEARGRAVURE Embosso! Distinctive, striking, different. Samples. Solidays, Letterhead Specialists, Knox, Indiana.

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HAND Presses, type, supplies. Big lists 3c. Landis, Richland, Penna.

BARGAINS, Presses, type. List 3c. Exchange D-15, 22 Orient, Meriden, Conn.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

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Two years later he became chief draftsman of the Muncie Gear Works.

Following this he was assistant chief engineer of the Chevrolet Motor Company. In 1918 he began a thirteen-year association with the Hyatt Roller Bearing Company. In this position he built up a nation-wide acquaintanceship with implement and industrial machinery manufacturers.

In 1931 he became general sales manager of the Roller Bearing Company of Trenton, New Jersey, and left this position to become district manager in New York and Pennsylvania of the Chevrolet Motor Company. Looking back over his career, here is what Mr. Johnson says:

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| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Lettering Show Cards |
| | | <input type="checkbox"/> Railway Mail Clerk | <input type="checkbox"/> Signs |
- DOMESTIC SCIENCE COURSES**
- | | | | |
|---|---|--|--|
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Millinery | <input type="checkbox"/> Foods and Cookery |
| <input type="checkbox"/> Professional Dressmaking and Designing | | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering | |

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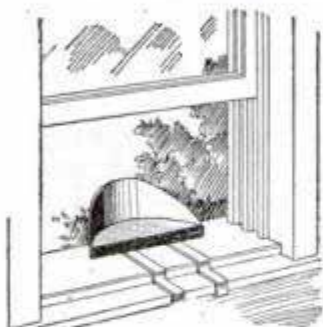
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minnows, eels, mink, muskrat with our folding galvanized Steel Wire Traps. Greer Patent Lever Hooks are so constructed that when a fish gives the slightest pull on the bait the upper hook reaches down and sets a hold that lands him. 3 for 50c. Write for descriptive catalog of Traps, Hooks, Lures, and other specialties. **Walton Supply Co., 3507B Juniata St., St. Louis, Mo.**

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LeJay Mfg., 447 LeJay Bldg., Minneapolis, Minn.

NEW INVENTIONS

(Continued from page 37A)

MEETING that need for an extra seat in small home or apartment is a device patented recently. Installed in the window, it consists of a seat with low back, strap-iron brackets with hooks at the inner end and a support for the seat at the other



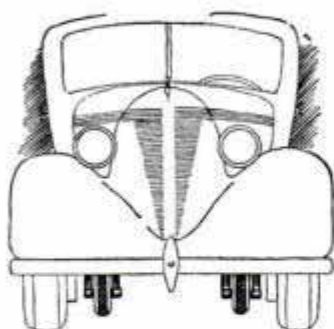
end, a bearing bracket depending from the seat between the supports and a clamping screw in the bearing bracket. The window sash is lowered to a point just above the seat, giving extra back support.

PATENTED recently, an illuminated street sign makes it easier to find directions in the city. The sign has glass panels on which appear the name of the street and the number.

An incandescent lamp inside the housing provides illumination. Made in rectangular shape with a pyramidal-shaped top, the sign is mounted on a post.



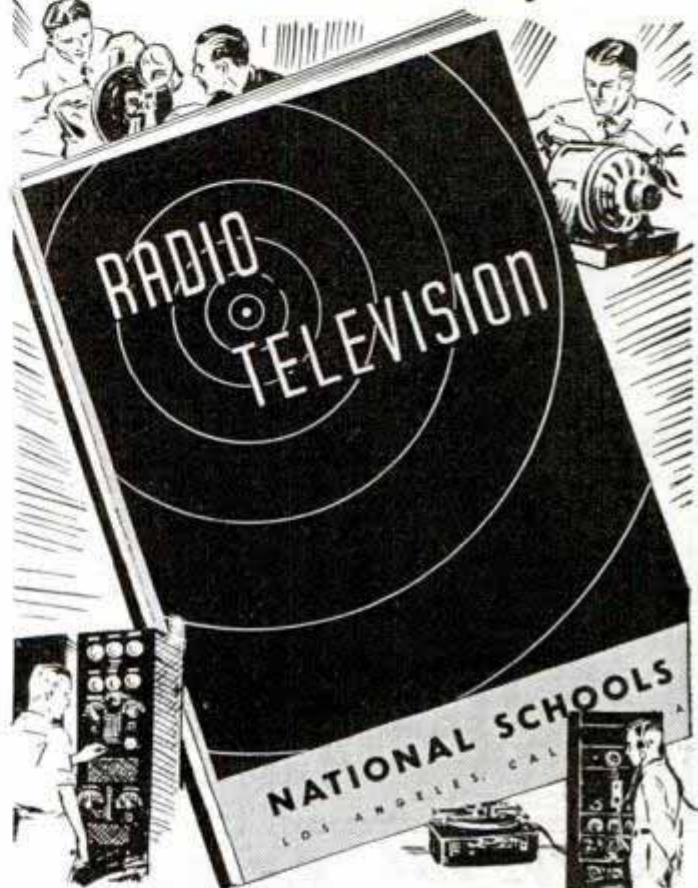
REDUCTION in the danger from blow-outs of automobile tires is the purpose of a newly patented auxiliary wheel system. Two auxiliary wheels are attached to the automobile's "knee-action" spring equipment.



Upon deflation of the auto's front tires, the auxiliary wheels contact the ground immediately and support the car through the knee-action assembly. When the small auxiliary wheels are supporting the car, the regular steering apparatus may be used for steering the car, preventing accidents that otherwise might occur from inability of the driver to hold the vehicle on the road after a blowout.

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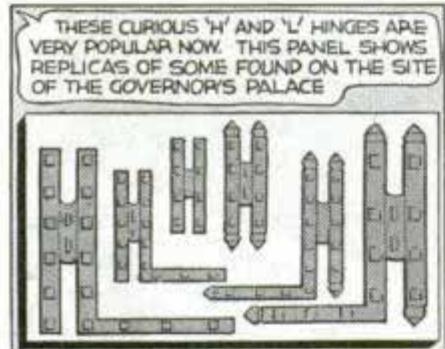
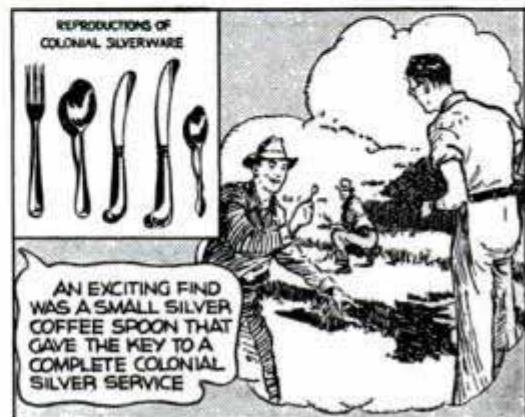
ADDRESS

CITY STATE



HOW COULD ANYONE TELL WHAT WILLIAMSBURG LOOKED LIKE IN PRE-REVOLUTIONARY DAYS?

WELL, FOR ONE THING, THEY WERE GUIDED BY RELICS WE'LL SEE IN THIS OLD COURTHOUSE. THERE'S KEN WAITING FOR US



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 —A MILDER PIPE TOBACCO THAT'S TASTIER TOO!



RICH TASTE COMES FIRST WITH ME. PRINCE ALBERT IS **FULL-BODIED**, YET NEVER HARSH



I FIGURED OUT WHAT ASSURES **BETTER PACKING AND DRAWING AND MELLOWER SMOKING.** SO I SWITCHED TO P.A.—IT'S **CRIMP CUT**

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BETTER—OR IT'S OUR TREAT!

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina.

PRINCE ALBERT
 THE NATIONAL JOY SMOKE

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 69

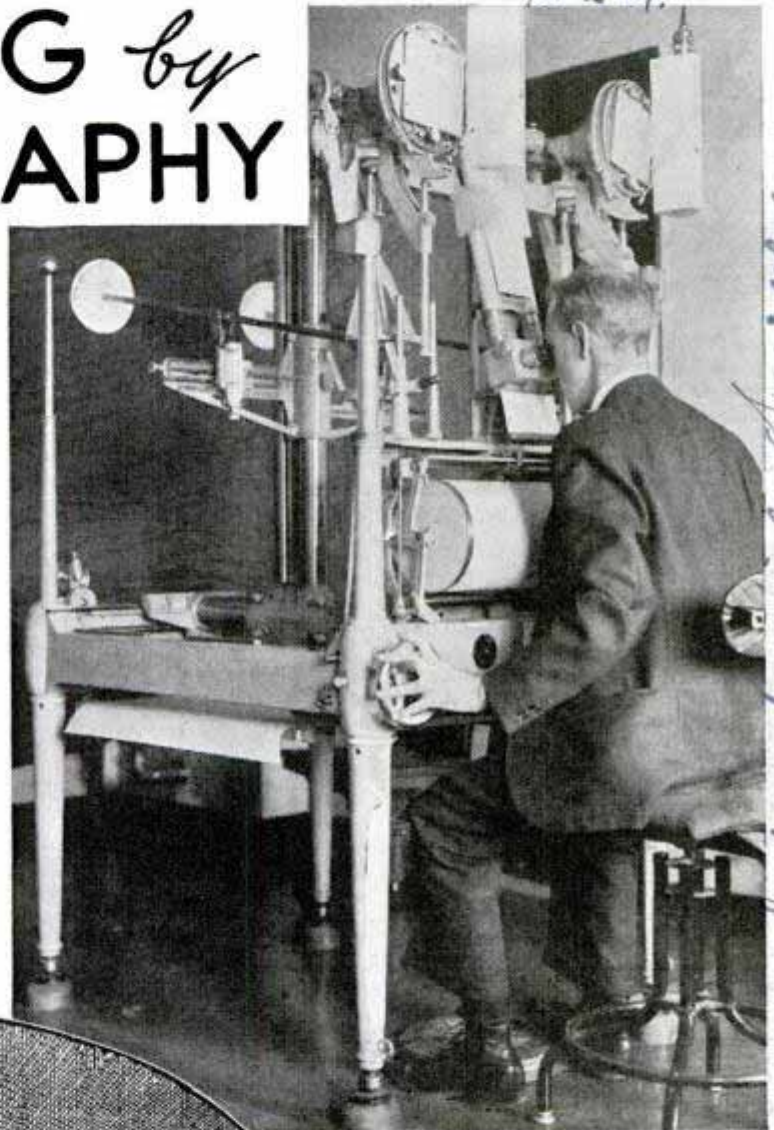
MAY, 1938

No. 5

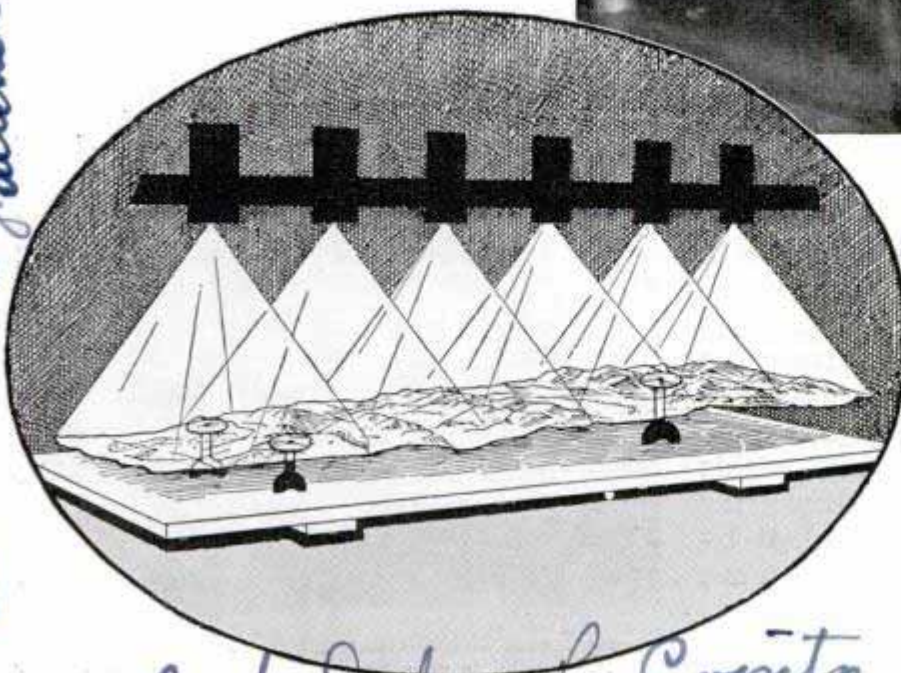
SURVEYING *by* PHOTOGRAPHY

MODERN engineers may survey a jungle coast of a Central American republic or frozen Arctic wastes without stirring out of their private offices. A revolutionary method of surveying has been brought about by the high development of aerial photography and its application. The new science is called photogrammetry.

Not many years ago the engineer who wished to know features or boundaries of any section of the earth ran his transit lines on foot. Days and weeks were required for this operation, even over a small territory. In tropical countries, his crew had to chop through jungles and wade swamps and reptile-infested streams. In Arctic lands,



U. S. Geological Survey



Carl Zeiss Jena
Cameras
Zeiss
Carl

Top, photogrammetrist making contour of topography maps from aerial photographs. The operator is peering through a stereoscopic lens and his hand rests on an adjustment wheel. The resultant map is traced on a paper record on the revolving drum. Bottom, drawing shows how multiplex projector works. Light from the projectors overlaps on the photograph so that the operator sees it in a third dimension

Carl - John L. County, The Maury
Apartments, 19th and 4th Sts. N.W.

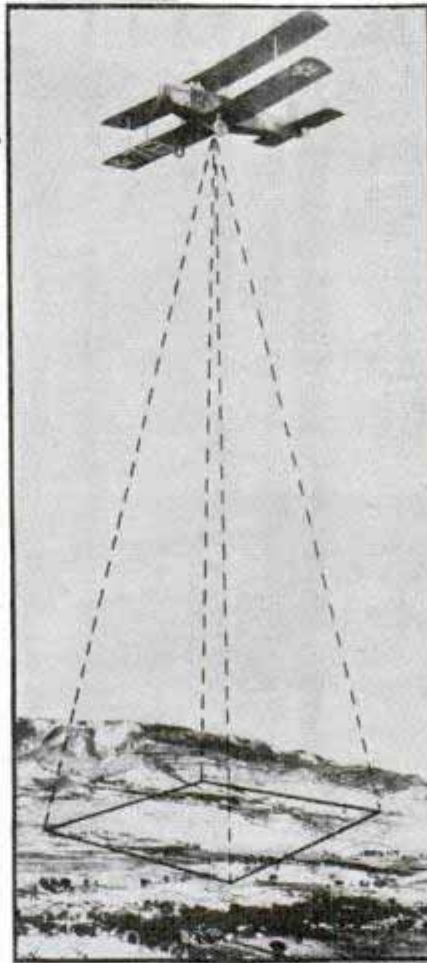


Top, old-fashioned stereoscope's optical illusion of a third dimension is the basis of the photogrammetrist's art. He catches it on his complicated machine and transfers it to paper in the form of topographic or contour map

snow, ice and extreme cold had to be conquered.

Everybody recalls the small stereoscopes our families kept on the parlor table at home and which were used as a means of entertainment in looking at twin pictures mounted on a card. Looking through the stereoscope, it was possible to see the view in three dimensions. One felt that it might be possible to reach in and touch the objects shown in the view with accurate judgment as to their distance. This same principle is employed by the photogrammetrist, with one difference. He actually does reach in and touch the objects shown and reproduces them in their true aspect on a map. Two successive overlapping pictures taken along the flight of an airplane are used as a pair to produce the stereoscopic effect. A pointer in his hand does the rest. In this manner the photogrammetrist draws the ground in relief as one would see it by natural vision, hills, valleys, mountains, canyons, showing.

The photographs show perspective views of the ground with variations in scale be-



Center, how aerial camera works. Section marked off on ground is resulting picture. Bottom, surveyor working on foot has difficult job

cause of the variations in the altitude of the airplane at the various times the pictures were taken. Distortions in the views of the ground exist because it is impossible to level a camera accurately in a moving airplane. It is here that the photogrammetrist takes hold. He converts these perspective views of an area into a true plan, correct in scale and shape, by correcting all the distortions in the pictures themselves. Where photographs of the ground area are too large to be shown by a single picture they are pasted together like the parts of a large picture puzzle. Such an assembled picture is called a mosaic. It is not complete or accurate enough to be called a map.

In making a topographic map at a desk from aerial photographs several types of instruments have been devised. In these the operator sees an image of the ground to be mapped spread out before him in

(Continued to page 149A)

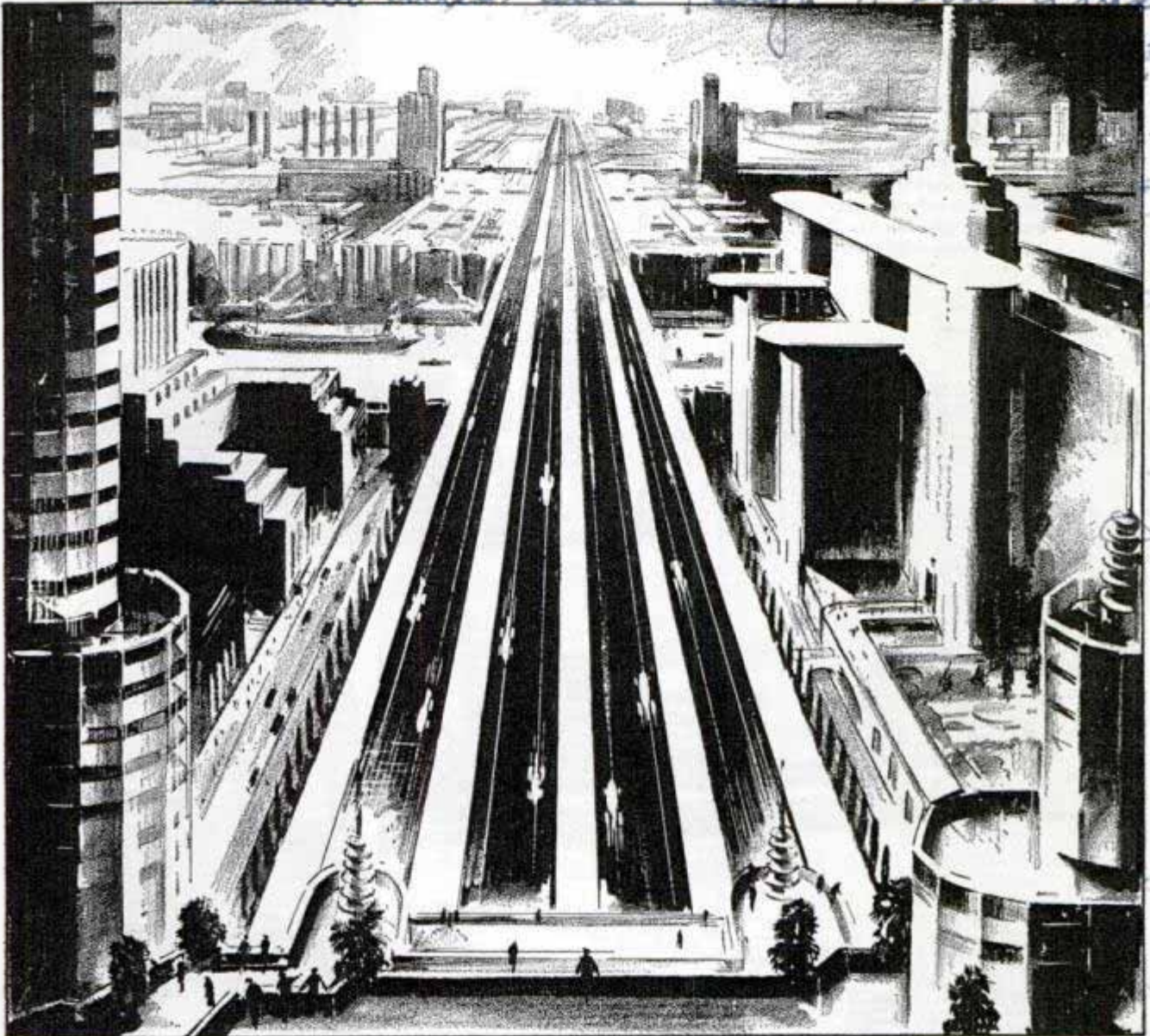
A photograph of a surveyor working on foot has difficult job

H 252.

Hofmeister, Associate Architects
Rockefeller Centre, New York City

Super-Highways for 100-Mile Speed Proposed

collaborated with Hugh Ferriss artist



© Warren Bros. from Wide World

Here is the artist's idea of how the super-highway of the future might appear. Present plans call for twelve lanes of traffic, six in each direction

Twelve lanes wide and constructed so that speeds of 100 miles per hour might be attained in comparative safety, super-highways have been proposed to meet traffic needs of the United States. A bill for construction of ten such highways, three running east and west and seven north and south, has been drawn and given serious study by the government. The cost would be between \$6,000,000,000 and \$8,000,000,000, with the roadways to be operated on a toll system that would make them self-liquidating. Besides tolls, a concession plan is proposed to increase revenue. Sites would be leased for hotels, service stations and for many other purposes. Every effort would be made to keep

the highways attractive. A generous park strip would separate traffic into two-way streets or roadways, with six traffic lanes in each direction. Already the war department, seeing national defense advantages for its motorized army with such a network of super-highways, is interested in the bill. Among features of such a road operating between New York and Boston would be a block signal safety system. This roadway would run beneath cities and could be traversed in two and one-half hours, according to research experts.

Experimental heating plants to dispel fog around airports are proposed by the British Aeronautical Research Committee.

Compressed Air Magazine

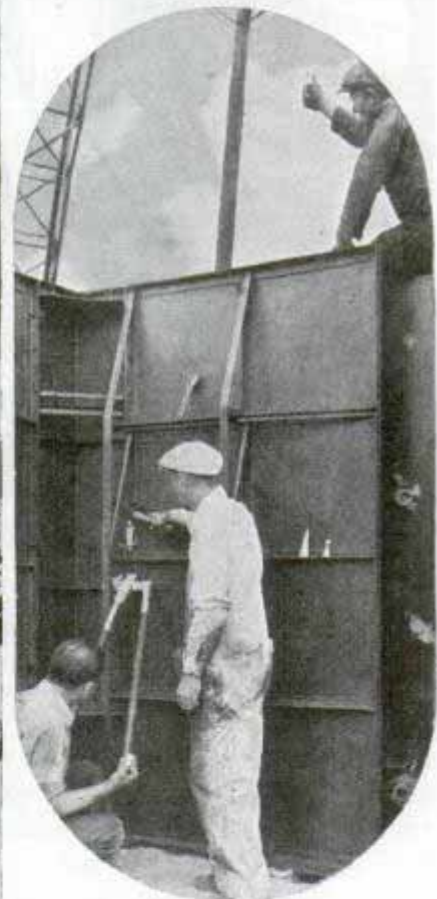
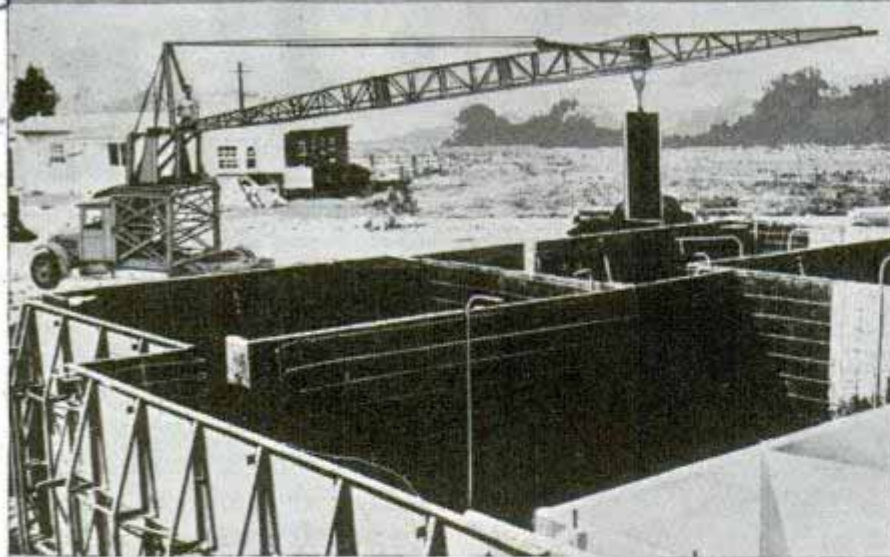
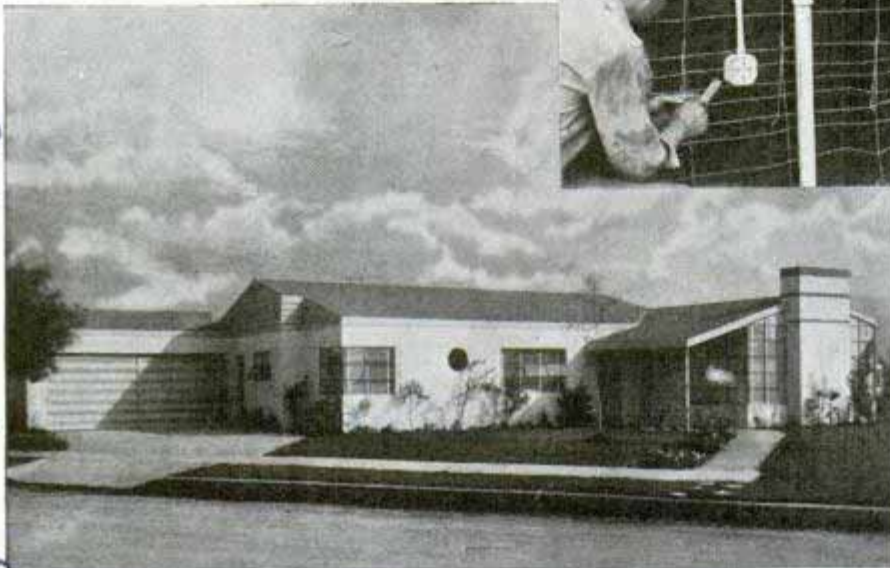
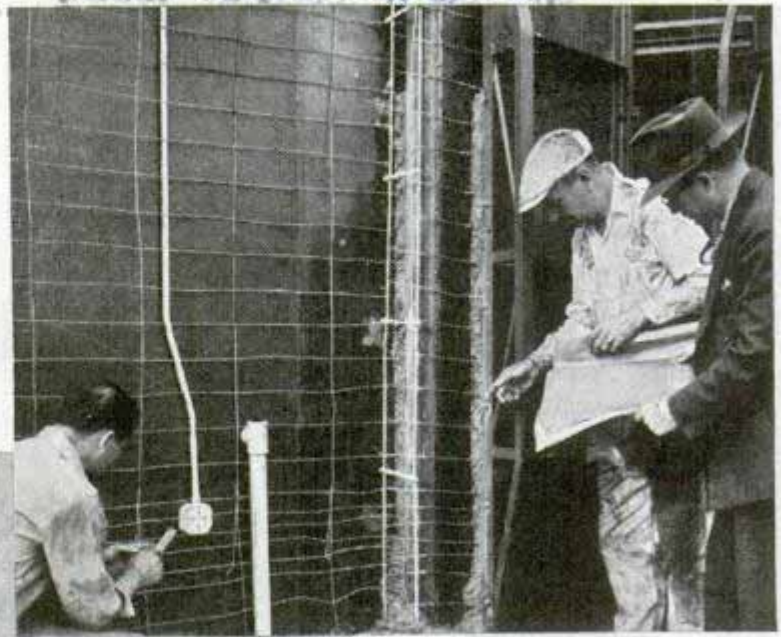
Low-Cost Concrete Home Is Built Quickly

H 20633

Handwritten: (Mrs. Hal A. Hayes, Los Angeles)

Handwritten: Hayes Forming Co., 2466 Fletcher Drive, Los Angeles, Calif.

Right, how electric conduits and water pipes are installed. Below, placing form for pouring of concrete. Bottom, left, long crane used in building the house. Top, left, completed house



Low-cost houses for millions is the hope held out by a new system of building concrete homes at great savings in time, materials, lath and plaster, window and door frames, trim and installation of utilities. The homes have double exterior walls, reinforced concrete partitions, moisture-proof floors and prefabricated concrete roofs. A huge aluminum alloy crane,

mounted with a concrete mixer on a truck, lifts room-high steel forms for both outer and inner walls upon prepared foundations within a day or two. Newly patented forms are any width desired, to follow any architectural design. Collapsible cores, twenty-four inches long, six inches deep and the height of the wall, make possible hollow sections in the exterior wall. These

H-237
Hunters Ride "Swamp Cruiser" through the Everglades

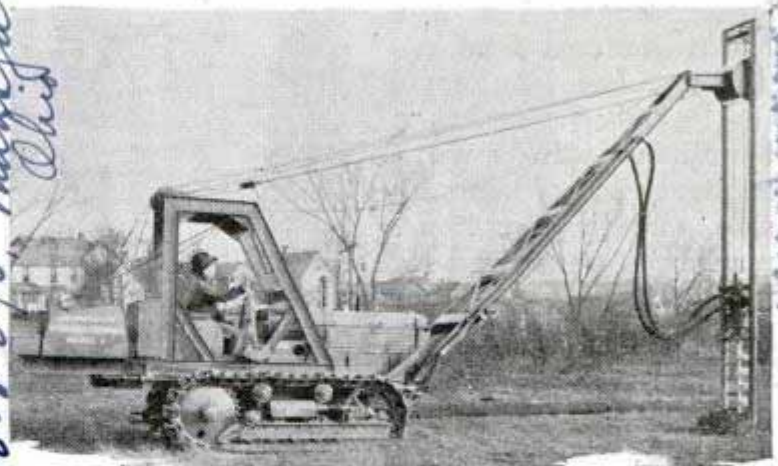
are separated by steel rods, vertically and horizontally, which form reinforced concrete studs about twenty-six inches apart. As the forms are set, steel wire reinforcing is placed on the inside, as also are electric wiring conduit, plumbing lines, window and door forms. The latter are removed after concrete is poured. When a new mix is poured continuously into the forms and placed electrically, no cement paste is lost by the close-fitting steel. Concrete sets rapidly and the forms frequently may be stripped one day after pouring. Ten-inch hollow walls, partitions as thin as two inches, even closets and bathrooms of single collapsible forms are thus formed in a remarkably short time, and the building is well advanced toward completion. At this stage windows and doors are framed in concrete, plumbing and electric lines are poured in and accessible, and most trim is eliminated. The steel forms eliminate objectionable form marks, giving a wall smooth enough to require no plaster. The hollow sections provide insulation against extremes in heat or cold and condensation of moisture. The system includes new methods of pouring moistureproof floors on the ground. Roofs for many low-cost houses may be precast on the ground in sections and lifted into place by the crane, to be cemented in. One model concrete house has seven rooms, forced-draft air cooling and heating, corner windows up to roof line, poured concrete chimney and mantel, concealed metal gutters and downspouts, lightweight metal doors and cabinets, deep window reveals and a living-room floor sunken below ground level. Its cost, including the cooling and heating plant, is approximately \$6,000.



Hunting deer, boar and wildcats in the Florida Everglades aboard a truck that can wade three feet deep in the swamp

Guy Peebles, Miami sportsman, goes hunting in the tangled Everglades of Florida much as tiger hunters in India go mounted on elephants. He has built an "Everglades cruiser," a powerful truck that can travel in swampy water three feet deep.

H 248
Hole-a-Minute Hydraulic Borer Reaches over Fence or Ditch



Driving the auger at any angle, this borer can drill an ordinary post hole in a minute and then set up the pole

Lifting its long arm over fences and past ditches, a hydraulic borer with a twenty-foot reach can dig post holes and then set up the poles, saving time by doing both operations. It can bore holes up to a sixteen-inch diameter and seven-foot depth.

ⓂThe word "Teletype" is the registered trade mark of the Teletype corporation. 1400 W.

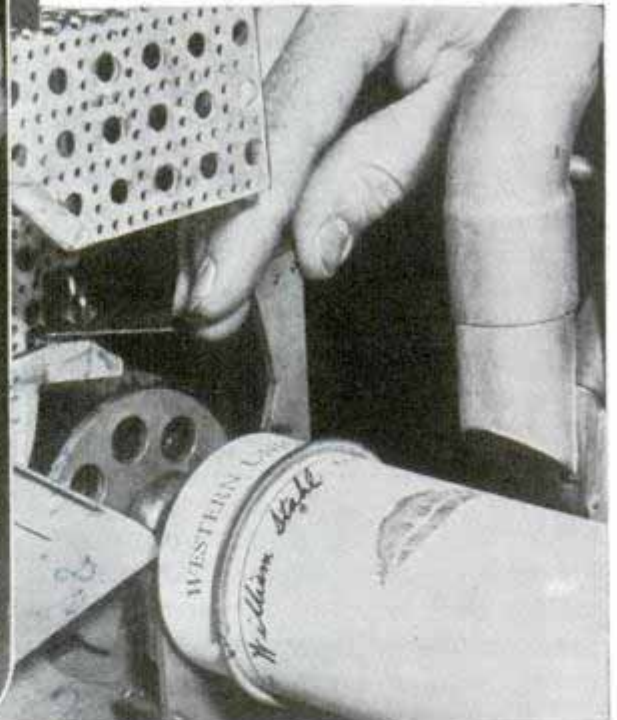
W. H. ... Hughes ...

Kiss Sent by Telegraph on Facsimile Machine



Latest means of promoting romance is the sending of a kiss by wire. A girl in New York pressed her lips to a telegraph blank, leaving a lipstick outline. This copy was rushed by a messenger on roller skates to a facsimile operator, put into the transmitter and sent to Chicago. A few minutes after its reception at destination, it was delivered to a Chicago man, a perfect reproduction of the outline of his New York girl's lips. The Chicagoan then touched his lips to the facsimile kiss, completing the long-distance osculation.

Top, kissing telegraph blank. Center, rushing copy to facsimile machine. Bottom, kiss coming from the receiving machine



club.

Tiny Moth Halts Million-Pound Coal Shovel

One moth conquered 750 horsepower in a strange engagement in a Montana coal field recently. A stripping shovel that weighed more than a million pounds went suddenly out of commission, and for two hours mechanics searched for the trouble. At last they found it—a tiny moth miller. The insect had alighted on the contact fingers of one of the contactors in the machine.

"Water Wings" for Ocean Ships May Smooth Out Pitch and Roll

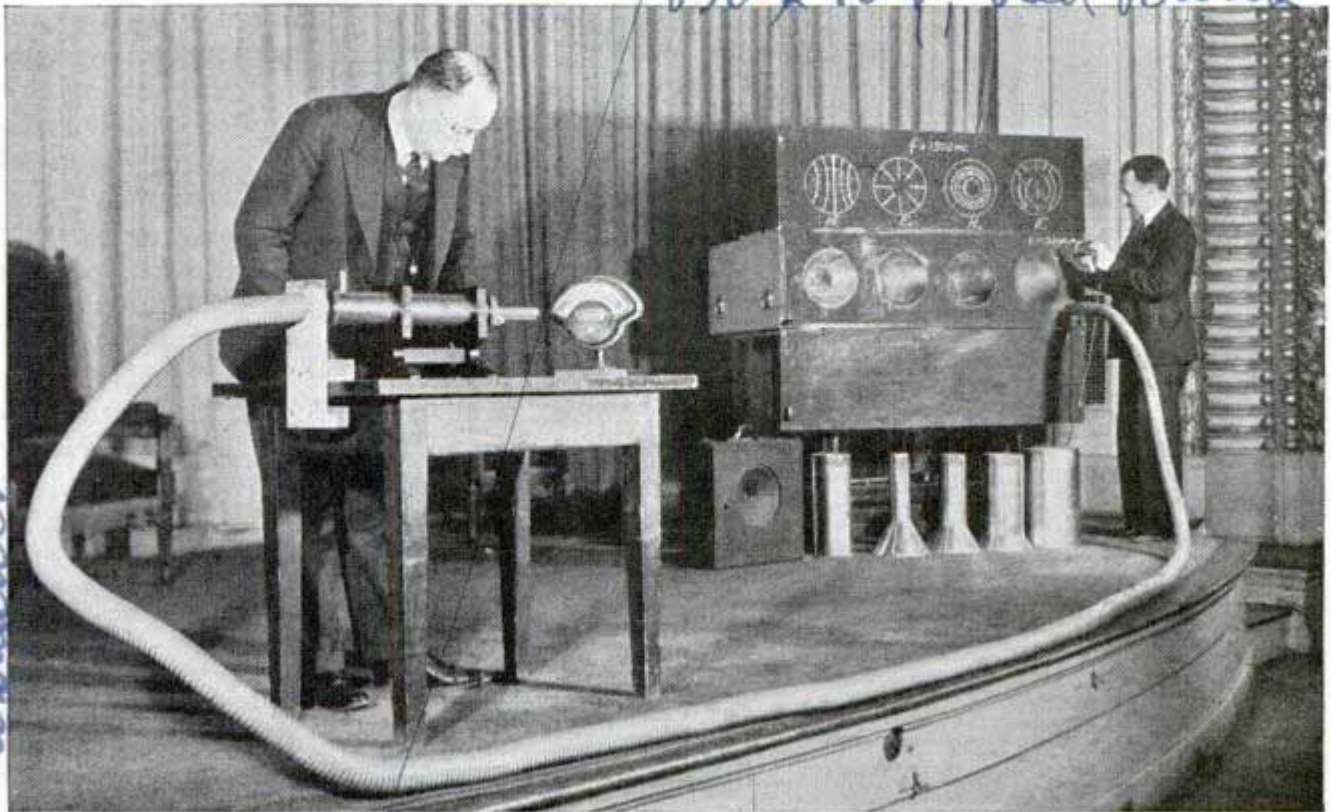
Ocean liners may grow "wings" to smooth out the pitching and rolling if the theory of a German shipbuilding engineer is adopted. He proposed that wings or planes be attached to the vessel to serve as

balancers. The method has been tried on small boats with success, but further study and experiment, with respect to wind and water resistance, must be carried out before it can be applied to ocean liners.

H 233 Western Union
H 289
Emb. Floyd
German Railroads
Emb. at the nose
H 253
Mr. Pellstab

Mr. Pellstab

Television Signals Flow through a Metal Pipe



Substitution of flexible tubing for the expensive coaxial cable is seen as a possibility through the success of this experimental transmission of ultra-short wave television signals through a thirty-foot pipe

Until now, costly coaxial cable has appeared to be the only means of "wiring" television signals. Dr. George C. Southworth of the Bell Telephone Laboratories proposes to "pipe" the ultra-high-frequency waves through a metal tube. He demonstrated the transmission of short

waves through a flexible metal pipe thirty feet long, and in experiments has transmitted frequencies as high as 3,200 megacycles, waves less than four inches long, for a distance of 1,000 feet. Coaxial cable at present is limited to frequencies of only two or three megacycles.

Power Saw Is Run by Tractor with Takeoff Attachment

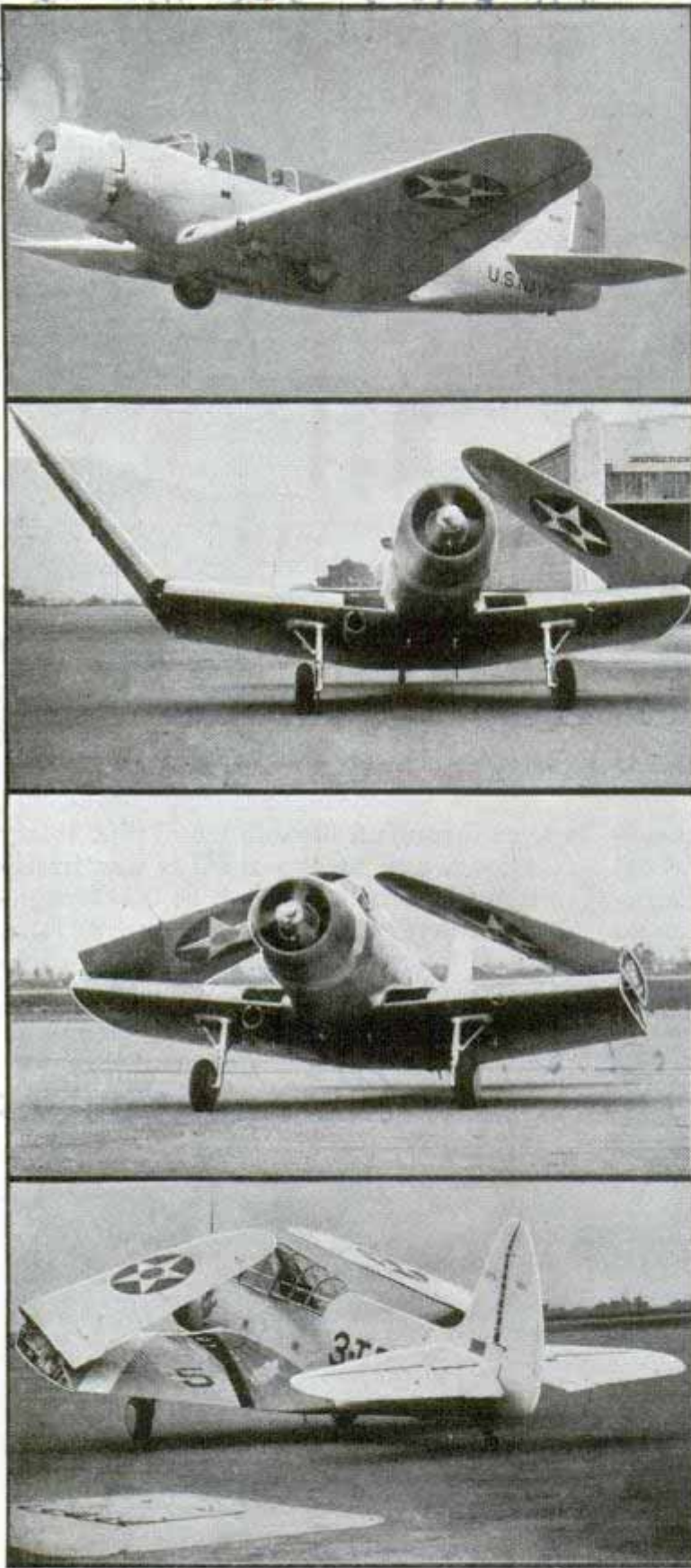
Operated by the power takeoff attachment on tractors, a new drag saw cuts logs into blocks for splitting into fuel. One man, working the power saw, accomplishes the results of ten men using cross-cut saws. A small sprocket pinion, clamped and keyed to the power takeoff shaft, drives the saw. The saw blade can be lifted easily from one cut to another as the tractor is moved along the log. Equipped with an adjustable safety slip clutch which automatically throws it out of gear if the blade pinches or meets an obstruction, the saw has a nineteen and one-half inch stroke.



Sawing logs with aid of power takeoff attachment on tractor

Tractor saw, Box 542

Navy Plane Folds Wings as It Taxies on Deck



Navy aircraft carriers can multiply their "broods" of fighting planes if this folding type is adopted generally. Power from the motor winds up the wings while plane is still rolling along carrier's deck, and it is speedily ready for storage below decks

Torpedo bombers that crank up their wings as soon as their wheels touch the deck of an aircraft carrier are the navy's latest answer to the problem of space limits on "mother" ships. This new breed of fighting birds does not wait for a crew of mechanics to unlock its spread wings and fold them back. As he taxies along the deck the pilot operates the controls which, taking power from the single motor of the plane, folds each wing upward until it nearly rests against the cockpit. Almost as soon as it alights, the plane is ready to ride down the carrier's elevators to its cramped storage space. The first of these low-wing monoplanes has been turned over to navy test pilots for trials. Engine power is used both for folding and unfolding the wings.

Car Air Cleaner Is Washed by Fluid under Pressure

Automobile air cleaners must be "taken to the cleaners" themselves periodically, and a special washing machine for this service has been developed. First it forces a stream of cleaning fluid through the air cleaner by compressed air. Then the fluid is drained off and air is driven through the cleaner until it is thoroughly dry. Finally a spray of oil is forced through, completely re-oiling all parts of the cleaner.



Crater lake in Oregon is the deepest in this country, so deep it never freezes over although it lies in a cold, high region of the Cascade mountains.

Douglas Aircraft Co., Santa Monica, Calif.

A 284
10555 Hollywood Ave
Los Angeles Calif

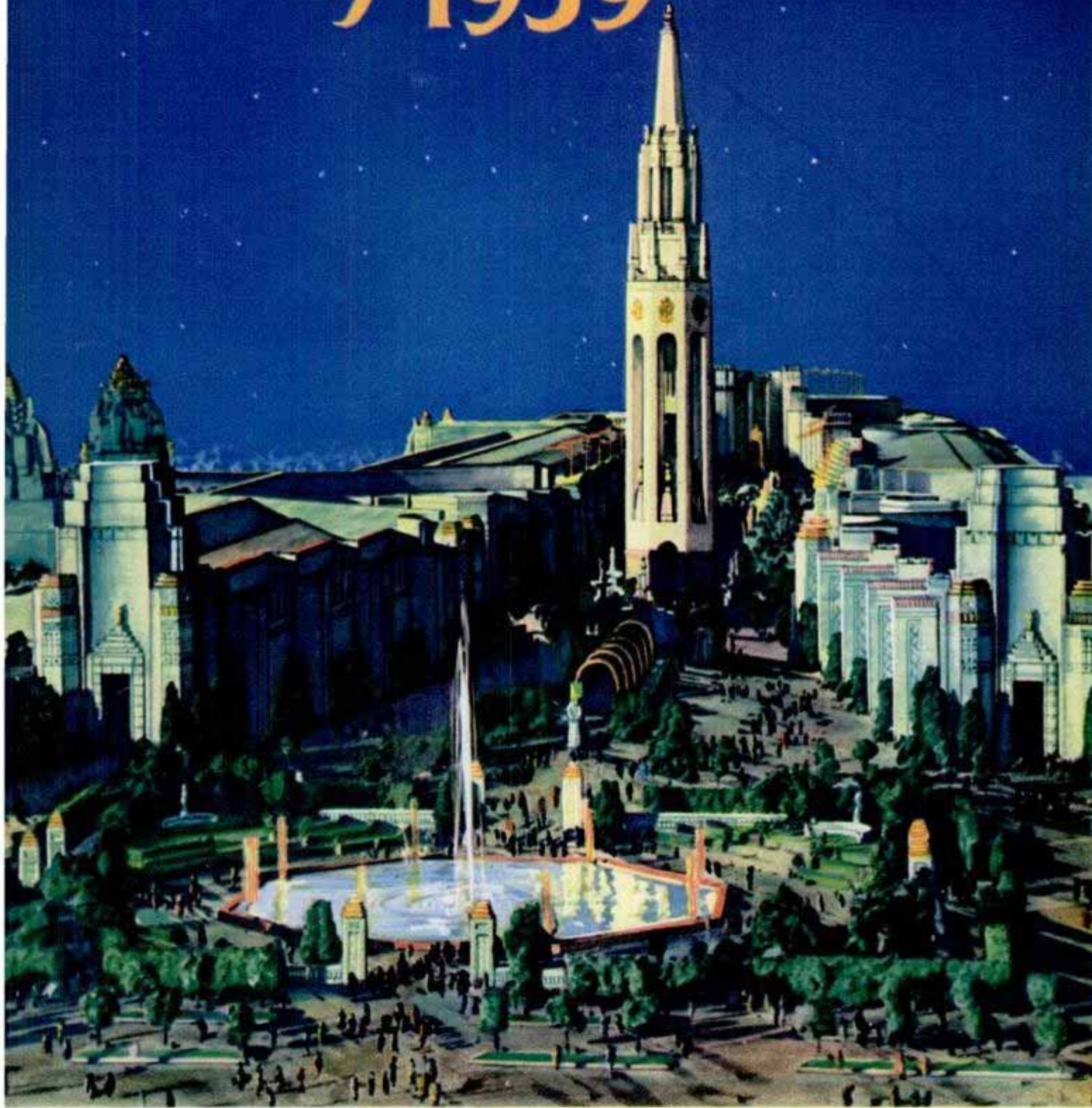
H271

Vulcan mfg Co. St. Louis, Mo.

Scientific Monthly
July 1928

Left foreground - Hall of Mineral Empire p. 5130

TREASURE ISLAND of 1939



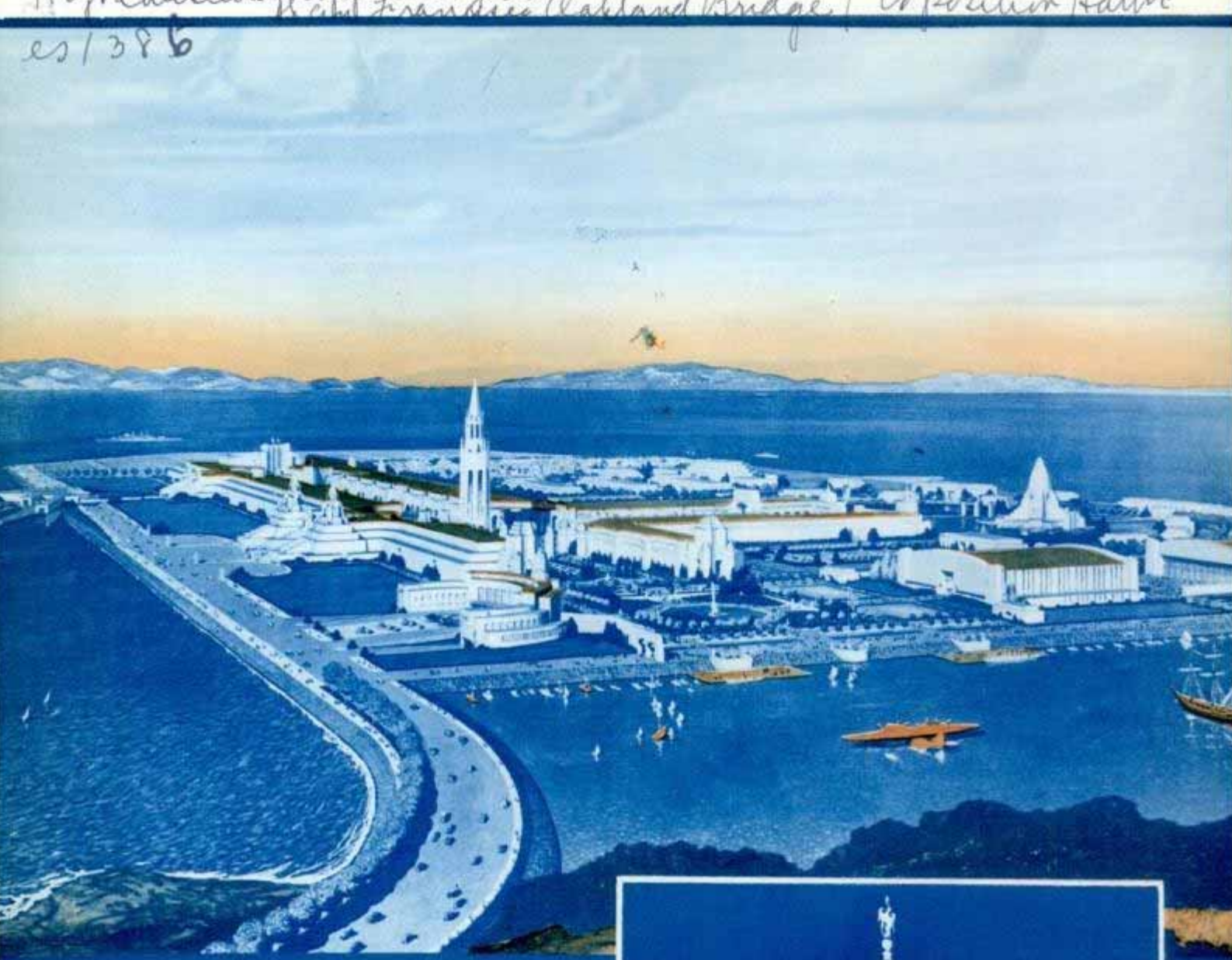
649

Right. Palace of Homes and Leaders

MODEL of south gardens of 1939 Golden Gate International Exposition as they will appear on Treasure Island in San Francisco Bay. The view is north, past the 400-foot central tower and along the "Avenue of the Seven Seas" to the terminal "Theater of the Sky."

*Designed by late George W. Kelham, A.I.A.
for the Board of Supervisors, S.F.A.*

es/386



from shore of Yerba Buena Island.
GOLDEN Gate International Exposition Island in San Francisco Bay as it will appear in 1939. Right, painting depicting the "Spire to the Sun" at night.
Designer - Arthur Brown, Jr.

Cont. Thomas G. Stearns Jr.
10655 Holman Ave. Los Angeles

NEXT year millions of people are going to explore a brand new island in San Francisco Bay more fabulous than the treasure island of storybook literature. Raised from the bottom of the sea, the 400-acre tract of land will be the scene of the 1939 Golden Gate International Exposition.

Visitors will walk down a flower-lined street, the "Avenue of the Seven Seas," to dozens of buildings containing exhibits of the world's industries and crafts, gathered from lands on all sides of the Pacific. Native villages, trade ships from foreign countries, entertainers from many lands, spectacular shows, and working models of recent scientific developments will be on display.

At this exposition visitors can take part in actual gold-mining operations



650



651 SKETCH of exposition's main portal, blending several forms of architecture. The pyramids converge into towers supported by formalized elephants.

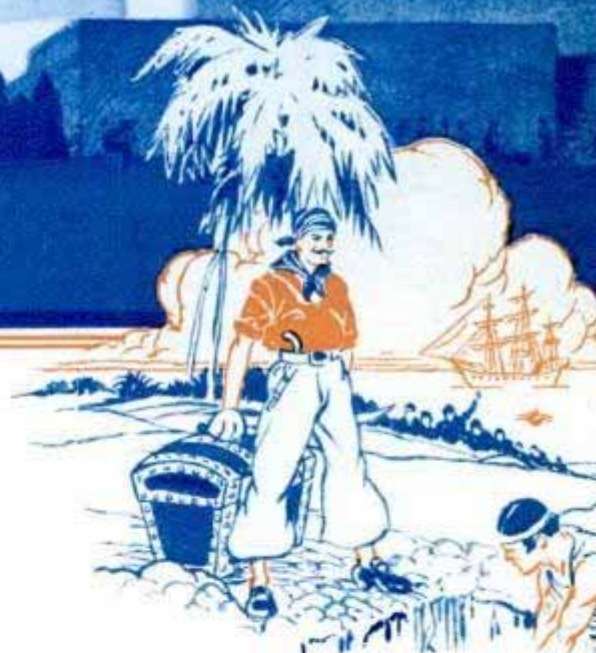
conducted in an artificial mountain of ore hundreds of feet long and fifty feet high. They may climb into the latest sub-stratosphere transport planes, or descend to the bottom of the bay in captive submarines. Robot planes and rocket planes will be there for inspection. Visitors will see beans growing in a bathtub without soil, a full-scale working model of "Old Faithful" geyser, and a \$1,000,000 relief map of western America so large they can walk along paths that represent state borders.

Inside the buildings they will find industrial and cultural exhibits galore. They may have ringside seats at demonstrations of smashing the atom, uses of black light, the electric eye, electronic music, television, and other marvels of research. Chemical agriculture, high-

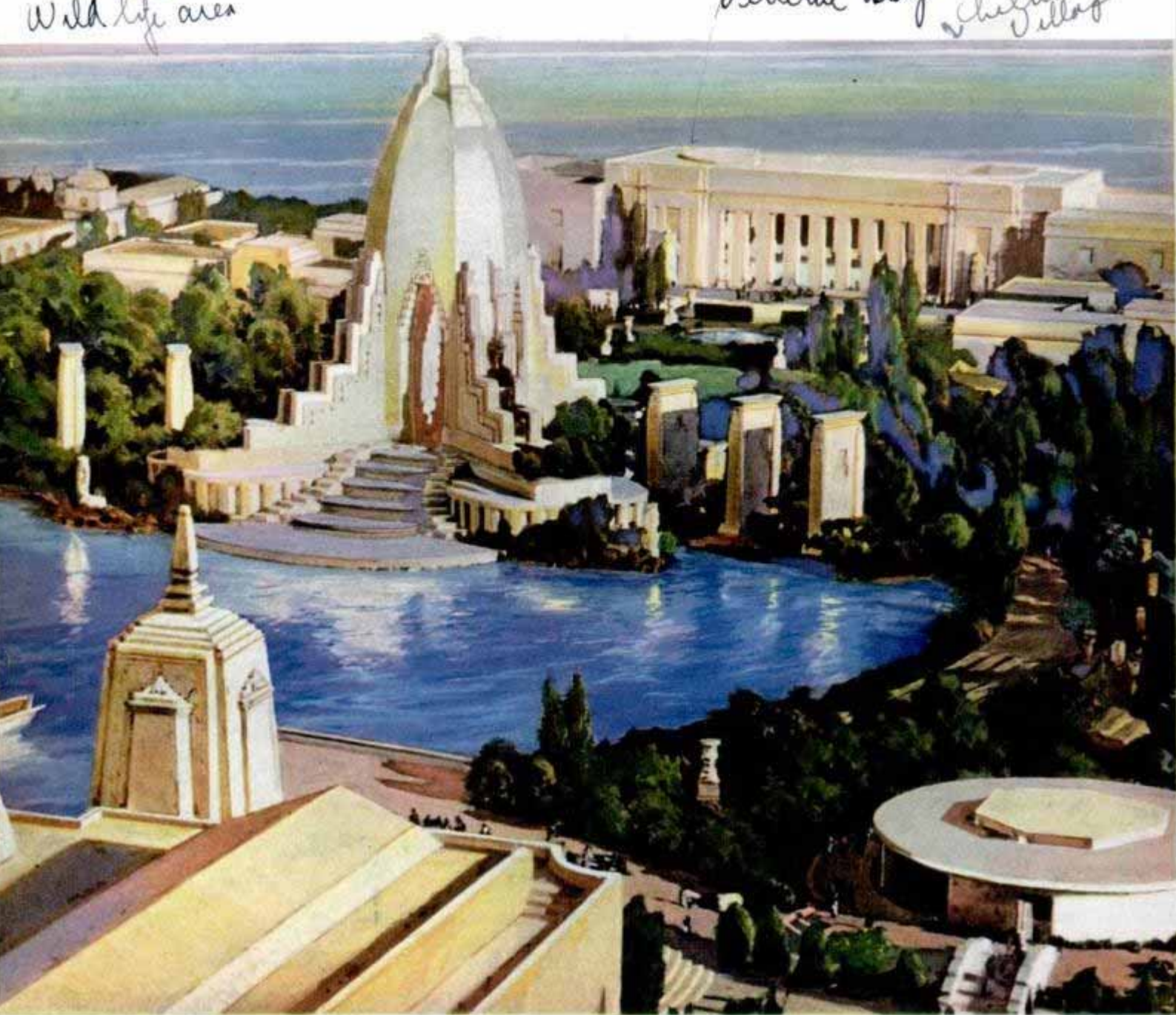
speed indoor farming without soil, will show the possibilities of vegetable culture by city dwellers. There are no crop failures on a chemical farm and most vegetables may be harvested from three to six weeks after the seeds are planted.

These and thousands of other wonders will be housed in a city of twenty-seven major buildings. The architectural scheme of the exposition is that of a walled city with a system of interior courts, employing a style of architecture that applies to the whole Pacific, and in which spectacular phases of Occidental and Oriental design are incorporated. Buildings reveal Mayan, Cambodian,

Reference - Paul Conant, manager, magazine



583 Bush
San Francisco

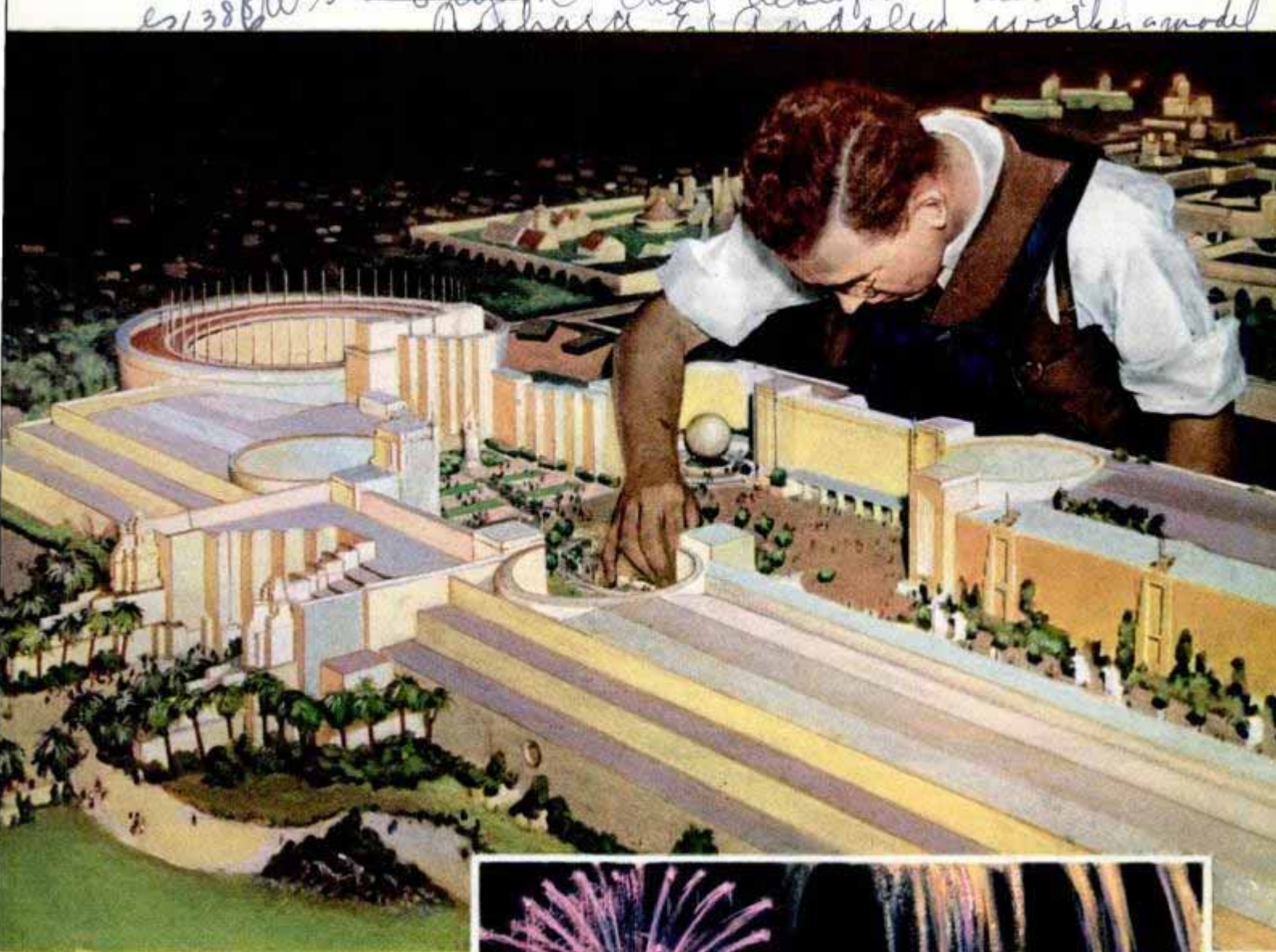


"LAKE of All Nations" and "Temple of Music" as they will appear next year. In the background is depicted the federal building group.

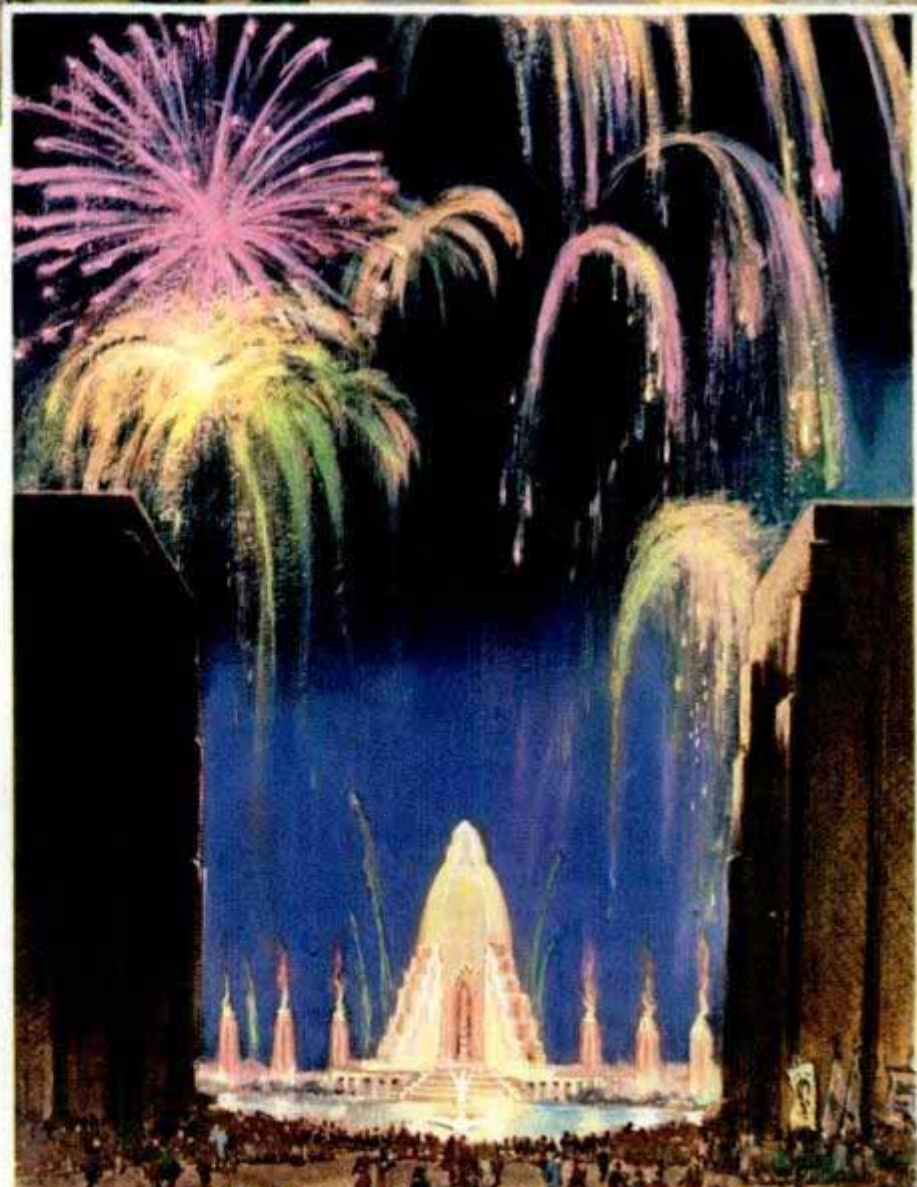
652
and Incan themes in shape or decoration. Some are flat-roofed, others have domed exteriors, and still others are set off by multi-colored towers. The exhibit halls will be windowless, artificial light being used all through the exposition as well as up-to-date air conditioning.

The elephant, mammoth beast of pageantry, will be a predominating decorative note, first apparent in the majestic pyramids that flank the main entrance to the island. Flaming banners and "sound" pylons containing hidden loud speakers for music and with flambeaux of flames and colored vapor streaming from their tops are being erected throughout the grounds.

Exterior illumination is to work magic after dark. Floodlighting will throw soft glows against the colored walls. Newly developed shades of apricot, peach, and golden light are to be used in some areas, with a "moonlight blue" and a lifelike sea green in others. Some surfaces are to be treated with new mixtures of fluorescent paints that glow when exposed to the rays of "black light." The board of architects has had the problem of creating a colorful and stimulating group of buildings that at the same time harmonize with the sweep of the bay, the near-by giant bridges, the Golden Gate, and the skyline of distant hills and cities. One of their achieve-



MODEL builder working on one of the exposition groups. Right, golden-domed "Temple of Music" as it will appear during night fireworks display.



653
ments has been the planning of a "visitor-circulation" system that places every part of the island within easy reach by direct step-saving routes.

Still a year away, plans for this fair started almost a decade ago. Preliminary construction has been going on since 1936, when the site was merely an area of shallow water known as Yerba Buena Shoals in the middle of San Francisco Bay, not far from an island through which the San Francisco-Oakland Bay bridge passes. The shoals were from two to twenty-six feet under water. First 20,000,000 cubic yards of sea bot-

es 1386



654

INSIDE the towering Midway entrance will be found "Forty Acres of Fun" where the weird wonders of Oriental lands will contrast with the sophisticated showmanship of the Occident.



tom were dredged up and placed inside rock walls to an elevation of thirteen feet above the water. The island today is more than a mile long and three-fourths of a mile wide. It required sixteen months of continuous pumping by eleven dredges to complete. It is connected to the bay bridge by a 900-foot permanent paved causeway. Ferry slips and terminals are being built on two sides of the island at a cost of \$500,000 and provisions have been made for small craft and flying boat landings. After the exposition is ended the island will be converted into a great mid-bay airport.

When the island was completed it was necessary to "unsalt" its sandy soil by a leaching process so plants would grow readily. In addition, the soil is being improved by the admixture of 50,000 cubic yards of rich loam brought across

the bay by barges. The horticultural program includes the planting of 4,000 trees, 70,000 shrubs, and 700,000 flowering plants. One of the marvels will be a twenty-five acre "Persian rug" of blooming flowers planted closely in a typical design. Another will be a collection of orchids ranging in value up to \$10,000 per plant, with a demonstration of orchid growing by the seedling method.

Many of the trees and shrubs already gathered for the exposition, including orange trees, hibiscus, datura, eucalyptus, Birds of Paradise and rare silver trees and palms, are being acclimated in a "tree hospital" in San Francisco, which also contains electrically heated propagation beds in which small plants will be brought to bloom just as they are needed.

Since the island is to be converted



HERE is how the exposition grounds are linked with the San Francisco-Oakland Bay bridge. Right, part of south court and gardens as they will appear at night.

655 designed by *George W. Kerkham*

into an airport after the fair, only three of its buildings have been constructed for permanence. These are an \$800,000 concrete air-terminal station that will serve as administrative quarters for the fair, and two huge \$400,000 steel and concrete hangars, each 335 feet long and seventy-eight feet high, which are to be used temporarily as the palaces of fine and liberal arts and for foreign exhibits. Plaster-covered wooden structures of similar size, bolted together for ease in dismantling, will house the exhibits of electricity and communication, agriculture, business progress, health and education and similar subjects.

A spectacular hall of western states will be centered around a diorama of vacation trails of western America and will contain full-scale exhibits of typical scenery, including flowing waterfalls and growing trees.



W. G. Pigeon, chief designer of model of Golden Gate International Exposition



A \$2,000,000 livestock pavilion is being constructed on the San Francisco mainland as an adjunct of the exposition.

The hall of the mineral empire will contain a heaped-up mountain of ore, with a stream flowing along its base so scale miniatures can demonstrate placer mining, gold boat dredging, hydraulic mining and gold mill operations. Tunnels through the mountain will permit visitors to go underground to see true reproductions of hard-rock mining operations.

A \$20,000,000 art exhibit is to be displayed, probably for the first time under perfect lighting conditions. Weeks of experiments have been undertaken in a model gallery, involving thousands of light meter tests, so exact lighting can be determined for properly showing the oils,
(Continued to page 128A)

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Golden Gate bridges in background

WHEN the fair is finished, the man-made island will become the airport pictured here. Top, W. G. Pigeon, chief designer of model of Golden Gate International Exposition.

Complete Office for Writer Built in One Piece

Designed as a compact workshop for writers and artists is a "one-piece office" now on the market. It combines with a comfortable upholstered chair virtually all the appurtenances of a modern office. There are file drawers and stationery compartments, bookshelves, work desk, typewriter table and telephone stand, and a swivel stand that will hold a large dictionary. An adjustable shaded reading lamp and a leg rest are included.



Writer's nook

"Robin's-Egg Blue" Hides Blimps in the Sky

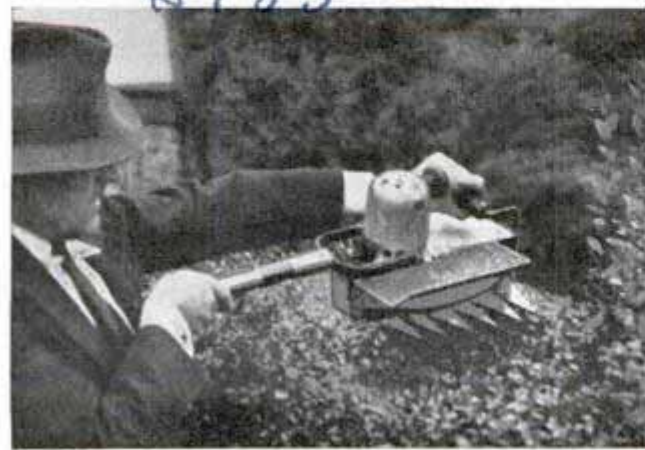
Closely resembling "robin's-egg blue," a color developed for painting U. S. Navy blimps matches almost all color conditions of the sky, thereby serving to camouflage the ships. The color has a dull finish and does not cause the glitter resulting from use of aluminum paints, making it less conspicuous to observers. Aluminum paint has been used because it refracted the sun's rays, protecting the gas from expansion resulting from absorption of the sun's rays by the bag.

Dr. C.M. ...



Three views show how complete is this one-piece office, with bookshelves, filing drawers, writing desk, dictionary stand and comfortable chair

Vacuum-Cleaner Motor Gives Hedge "Electric Shave"



With a vacuum-sweeper motor furnishing the power, you can give your hedge an "electric shave" in fast time. This hedge trimmer weighs only ten pounds and can be plugged in on any light circuit, using a long cord. Both motor and handle are borrowed from the vacuum cleaner. Two blades cut the hedge neat and smooth. The lightweight trimmer is easy to operate.

On one western railroad's mountain excursion train there is a photographic dark-room for developing and printing pictures on the homeward trip.

Trimming hedge with cutter driven by light motor

Yantis Electric Hedge Trimmer
Business Week
Feb 5 1938

H. W. Magee

THE PHANTOM



A test driver "goes to town" in a sand pit. He is giving the steering gear of this Plymouth some severe punishment. Left, engineer examining chart which shows spring has taken two days of "bumps" in the laboratory

By H. W. Magee

PART I

THE guinea pigs of the auto industry used to be the early birds who bought the first new models each year. These unsuspecting martyrs to engineering progress unearthed the "bugs"—the flaws in materials or the errors in design which had crept into the new cars. Those days, happily, are gone forever. Each factory today

has its own guinea pigs—the torture chamber and the "hell driver"—which find mistakes before they are carried into production. When you buy a new car now, you buy a triple-tested product.

Modern cars, first of all, are tested before they are built. Although their 1939 models are not yet assembled as complete cars, Chrysler engineers, for example, know almost as much about the performance of next year's models as they used to know about models which were in production.

They know what next year's cars will do because each approved part has survived the torture chamber—the test laboratory where, in a few hours or a few days, each unit under consideration for a new model is given more punishment than it will receive in years of driving. But the fact that a part withstands a laboratory beating is not enough. Perhaps road conditions were not duplicated exactly in the test room.

So the supreme ordeal comes when the laboratory tested parts are assembled into complete cars. Then, in the case of Chrysler, a phantom fleet—next year's models in disguise—takes to the open road. And there, on the greatest proving ground in

FLEET of the HIGHWAY



the world—America's 3,000,000 miles of highways—the 1939 models will be put through their paces. Into production will go the parts which survive the worst the torture chamber and test crews can offer.

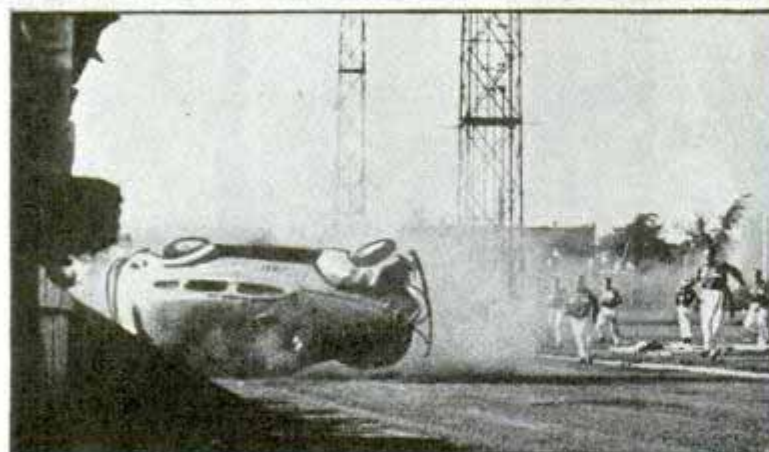
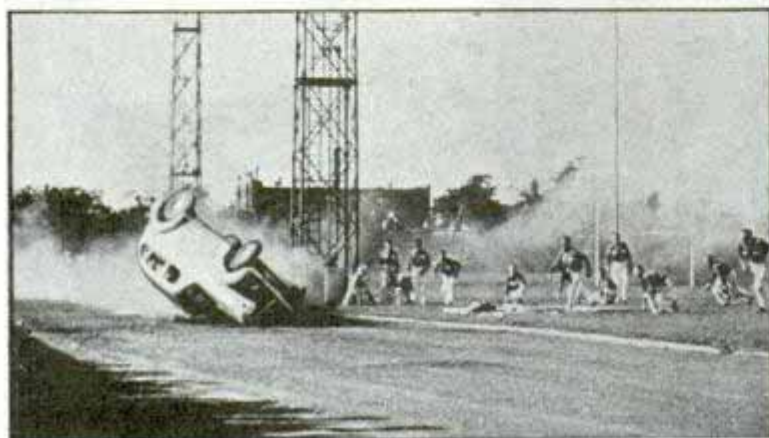
But long before any part goes into the phantom fleet, it has emerged with flying colors from a road test more severe by far than any punishment it is likely to receive in service. If the part comes unscathed from the laboratory third degree, it is turned over to a merciless driver with orders to "give it the works." He installs the part on a test car and proceeds happily to the meanest spot he can find for a workout. Then he cuts loose.

Two policemen in a scout car were creeping cautiously along an icy pavement near Detroit last winter when they observed a crazy driver seemingly intent on wrecking his car in a frozen cornfield near the road. Bumping, pounding, skidding, he was racing a big black sedan in erratic circles. With wild bursts of speed, he aimed straight for the deepest ruts, jolted along until he stalled, then shot into reverse and whizzed backward in a dizzy turn. Bouncing and swaying, he reached one end of the field, then backed toward



Photos courtesy Chrysler Corporation

Plymouth
The smiling fellow standing on the windshield is about to drop a steel ball on the safety-glass-to-test its shatter-proof qualities. Below, steering wheels are tested by dropping bags of sand on them



A stunt driver in a Plymouth demonstrates that the modern car can "take it" by doing a double roll. Top photo shows him running onto a ramp to start the roll-over. The second picture shows him half way through the first roll, the third shows him completing the roll and the fourth shows him going into the second turn—perhaps a trifle dizzy by this time

the road with throttle wide open.

Hastily the officers leaped from the squad car. But the maniac at the wheel met misfortune before he reached them. Two wheels slid into a shallow ditch. He spun them forward, backward, forward again. The car only settled deeper. He was stuck. Whistling, he hopped out, sized up the situation, then beckoned to the cops. Cautiously they approached.

"Having lots of fun?" one of them asked sarcastically.

"Nope," replied the wild driver. "Just working. I'm a Chrysler test driver. Giving some experimental springs, brackets and shock absorbers a little workout."

"They must be pretty good," hazarded one of the officers.

"Wait until I finish and I'll tell you," answered the test man. "How about helping me out of this ditch?"

Soon he again was hammering over the ruts. Down the road the officers stopped to investigate the actions of another unusual driver. He was backing onto glare ice, then, with the accelerator pressed to the floor and engine roaring he waited hopefully until the car crept forward to dry pavement and the wheels grabbed. He, too, was a test driver.

"They told me," he explained, "that I couldn't snap this axle shaft with the full force of the motor. Looks like they might be right."

In a near-by sand pit a third driver went plowing and twisting through deep sand and dirt.

"What's that fellow doing?" demanded the officers of the axle tester.

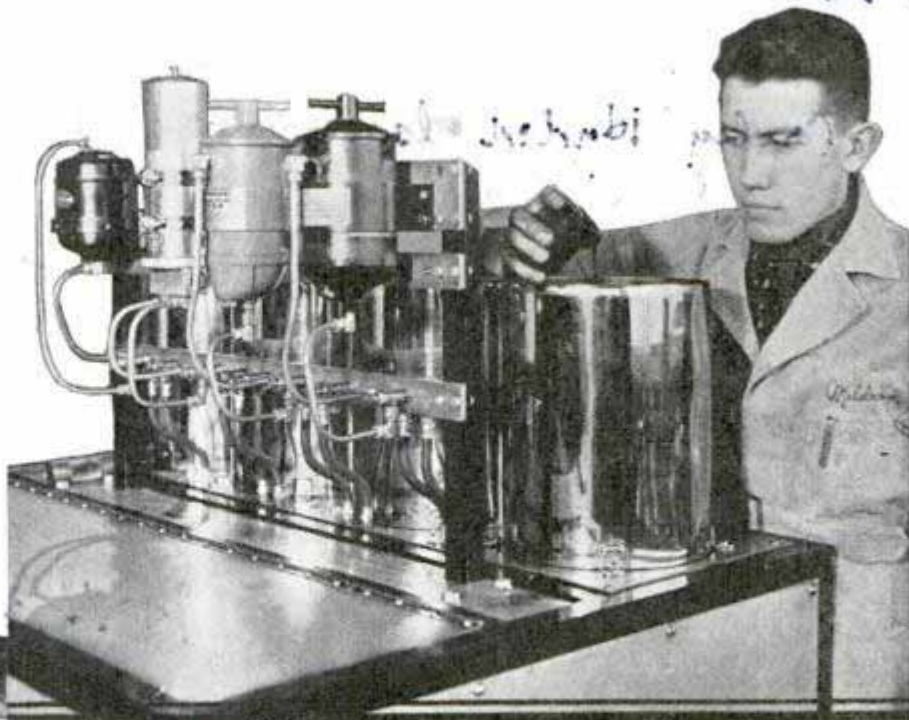
"He's trying the steering gear which may be on your patrol car next year," replied the test man. The policemen were impressed, so impressed that they never batted an eye a little later when a motorist skidded at a slippery corner and executed a complete about face.

"Just another fellow testing

something or other," they told each other.

Day after day these hard-boiled drivers abuse and misuse one experimental part after another. If a part fails, the driver returns grinning. Engineers may know their stuff, he opines, but it takes a test driver to prove it.

Eventually, even the test drivers can find no more flaws. Weak spots they uncovered have been



Adding sludge, above, to clean oil during a test of oil filters. Left, engineer reading "flowmeter" on Chrysler test car



dallions have been removed and adhesive tape covers all identifying names and insignia. The cars are nameless—a phantom caravan.

Now comes the supreme test, —a 25,000-mile run over the very roads next year's owners will drive. At the steering wheels are the hell drivers, six keen-eyed men with half a million miles of driving behind them, professionals who know the country's roads like a book, men prepared to shove these cars mercilessly, hour after hour, day after day, up and down mountains, across deserts, through mud, pounding over gravel, struggling through sand.

In each car is an array of apparatus for measuring performance. With the hell drivers are two or

corrected, where necessary, by changes in design or materials. The engineers have the drivers licked. Time after time, the test boys report the parts have withstood all they can give them.

And then, a few weeks later, a phantom fleet of hand-made cars rolls quietly through the gates of one of the Chrysler plants some morning at dawn. These six cars may be next year's Plymouths or Dodges or De Sotos or Chryslers but no one who sees them will know because me-

three engineers making the trip to watch their brain-children perform. Lead plates make up the weight of missing passengers. There's no babying the phantom fleet. Once out of Detroit, the leader tramps with heavy foot on the accelerator. From forty-five, speedometers creep to fifty, sixty, sometimes seventy miles an hour. Before sundown the caravan rolls into Dubuque, Ia.

Back to headquarters goes a long telegram filled with data and performance fig-

(Continued to page 146A)

14180.

Hydraulic Airplane Starter Adapted to Small Craft

Coleman Under Isas

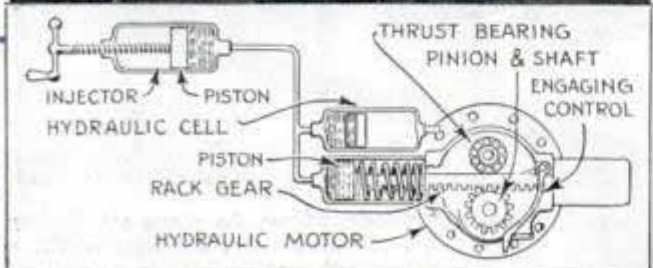
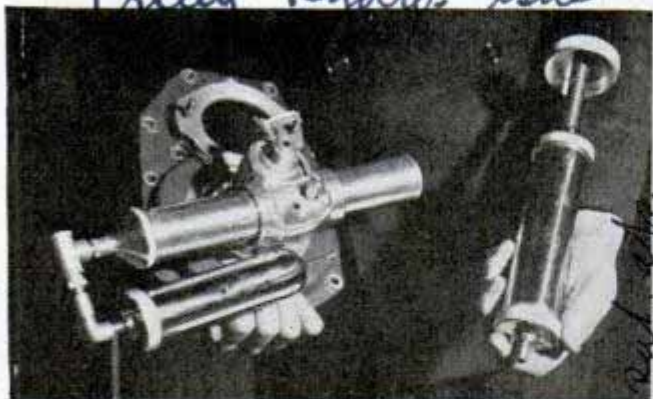


Photo and diagram show mechanism of hydraulic starter for light planes. It weighs under five pounds

used on Cub

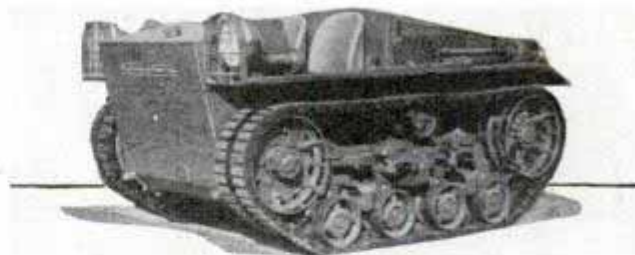
Adaptable to the eighteen or more makes of small airplanes now being manufactured, a hydraulic starter weighing just under five pounds has been developed. Its cost is low, and maintenance expense is kept down by standardization of automotive hydraulic parts.

metallic material. The backing is waterproof and flexible. Because of the backing, the steel can be attached easily to plaster, wood, fiber board, concrete and other surfaces. A special waterproof cement has been developed for this purpose. The backing deadens sound and has insulating qualities. The steel can be cut with heavy scissors, shaped or bent by hand and nailed, screwed or cemented into place. Moldings of stainless steel for trim and for covering edges and intersecting surfaces are available in adaptable shapes and styles. The material is manufactured in rolls two feet wide and fifty and 100 feet long, also in tiles four inches square.

14163

Fast Tractor Runs in Water Thirty-Six Inches Deep

Capable of operating in water three feet deep, the latest tractor attains a speed of twenty-five miles per hour. It has a track, a continuous band of rubber with a smooth



Two views of speedy tractor which can wade through water three feet deep

inner surface and plenty of "legs" on the outside. The track will not stretch nor lose its shape because it has a core of twenty to thirty endless, flexible wire steel cables gripped at intervals by the track guide or drive lugs. The drive sprockets impart their power directly to the cables and the rubber is used as a cushioning medium. The tractor may be pivot turned either from a standing position or from the highest forward speed. Its center of gravity is so low that it can be turned on the face of any hill it will climb.

Maxwell-Derrington Co. Inc. 111 St. Charles St. N.Y.C.

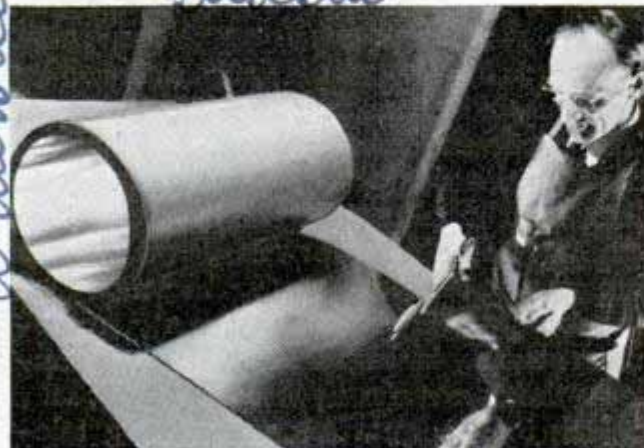
Piper Aircraft Co. Lock Haven Pa.

14170

Stainless Steel in Handy Rolls Latest for Home Builder

Made in convenient rolls for easy handling, stainless steel is available for home modernization, new homes and industrial use. Its surface is a sheet of strong, thin stainless steel, backed by a tough non-

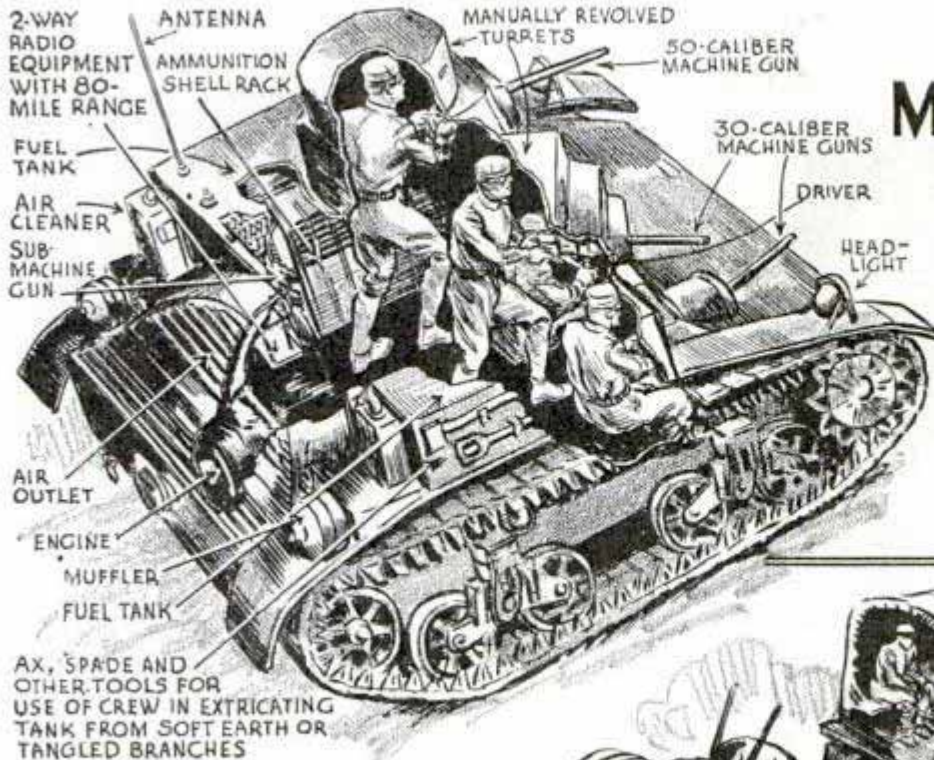
lubrite



Demonstrating the ease with which the stainless steel sheet may be handled

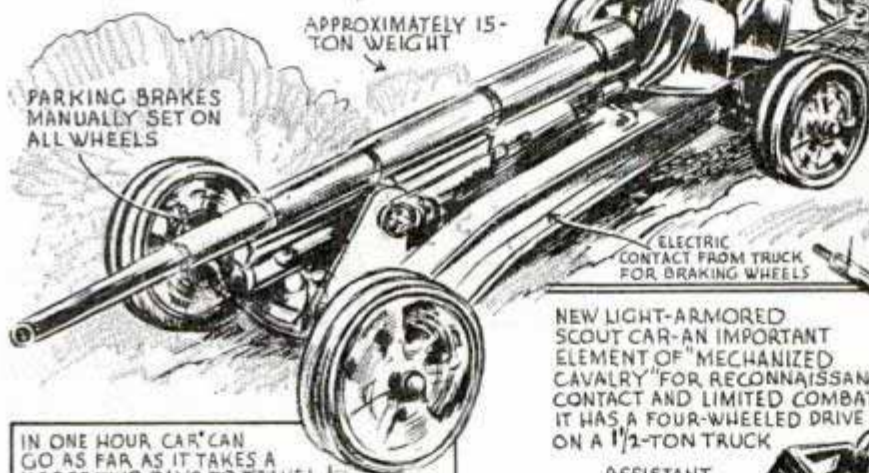
Ludlum Steel Co. of Waterbury

OUR MECHANIZED ARMY



SOME OF THE IMPROVEMENTS WHICH ARE PUTTING THE UNITED STATES ARMY AHEAD OF THE OTHER GREAT POWERS

UNCLE SAM'S 10,000-POUND ACE MYSTERY TANK WHICH CAN REACH A SPEED OF MORE THAN 50 MILES PER HOUR ON GOOD SURFACES, AND 15 MILES PER HOUR ON 12% GRADES. IT HAS MADE A THOUSAND-MILE TRIP—INCLUDING PASSAGE THROUGH CITIES—AT AN AVERAGE SPEED OF 30 MILES PER HOUR



WHICH USED IN EXTRICATING GUN IF IT BECOMES BOGGED SPEEDING UP THE TRANSPORT OF A 155-MM-GUN. BY USING BALL-BEARING, RUBBER-TIRED WHEELS ITS SPEED COULD BE STEPPED UP FROM 6-8 TO 15 MILES PER HOUR

IN ONE HOUR, CAR CAN GO AS FAR AS IT TAKES A HORSE TWO DAYS TO TRAVEL! THE HORSE AVERAGES 25 MILES PER DAY ON GOOD SURFACE.

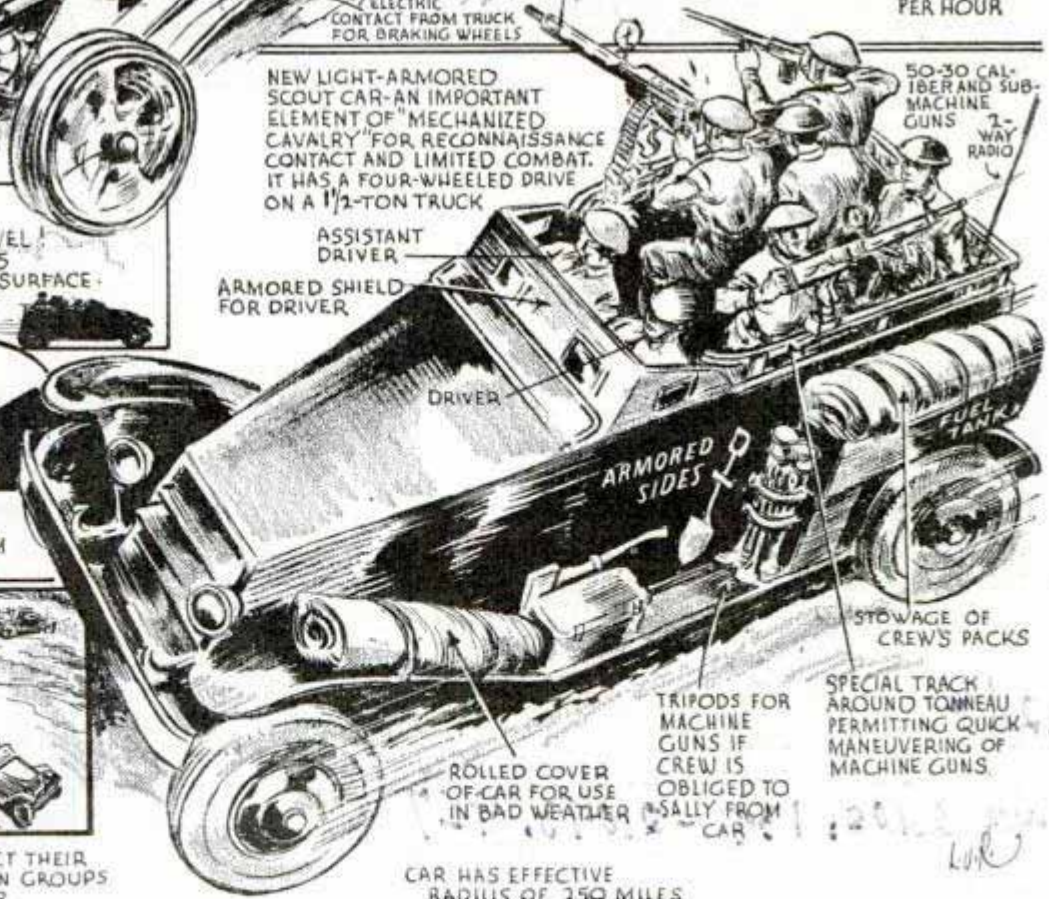
THE OLD CAVALRY AND THE NEW

GEARING ENABLES THE CAR TO CLIMB A 30° HARD DRY SLOPE FROM STANDING START



CARS WILL CONDUCT THEIR MISSIONS USUALLY IN GROUPS OF THREE OR FOUR

NEW LIGHT-ARMORED SCOUT CAR—AN IMPORTANT ELEMENT OF "MECHANIZED CAVALRY" FOR RECONNAISSANCE CONTACT AND LIMITED COMBAT. IT HAS A FOUR-WHEELED DRIVE ON A 1 1/2-TON TRUCK



50-30 CALIBER AND SUB-MACHINE GUNS 2-WAY RADIO

In addition to the U. S. army's budget estimate of \$421,000,000, the President has asked appropriation of \$17,330,000 for increasing modernization of army by such swift fighting machines as these

Logan H. O'Leary, 145 W. 45 St, New York City

600 Front St
Cleveland Ohio

Water Softener for Laundry Attaches to Home Washer

Edna Meyer

Hi-Filow Jodice



Inserting fresh cartridge in the water softener which treats water as fast as it flows into washer

Soft, filtered water for the laundry can be had by attaching to the home washing machine a softener just put on the market. Its use is said to save fifty to ninety per cent in soap and considerable time in washing and rinsing, besides the protection afforded to clothing by filtering out any rust, pipe scale or sediment in the water supply. The metal cylinder, thirteen inches high, contains a softening element in replaceable cartridge form. The water is softened as fast as it flows from the faucet. The element can be regenerated by pouring in two cups of table salt and flushing it through in two minutes.

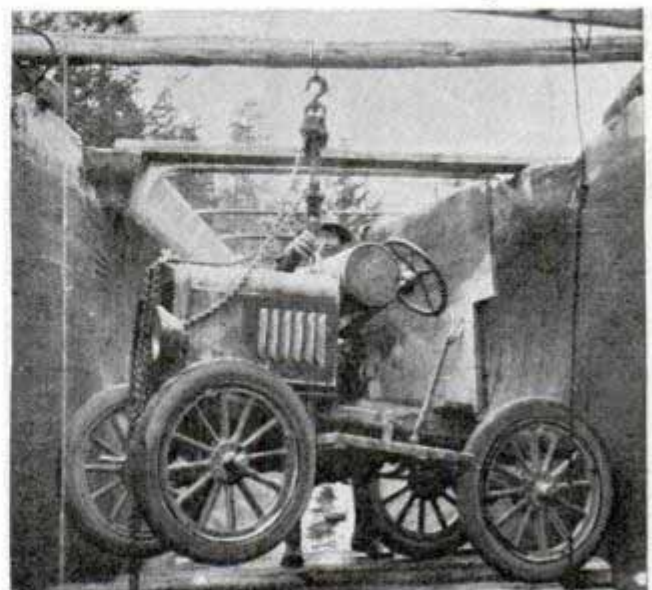
Horton Mfg. Co. High Wayne, Ind

are the nuts and bolts valuable in the designing of metal appliances. For example, welding nuts may be applied in the internal parts of gas meters for the purpose of hanging or assembling brackets or other parts without incurring any danger of leakage through the metal shell of the meter. The same advantages arise in manufacturing electric transformers for outdoor use, electric refrigerators and storage tanks. Assembly of metal products, ranging from steel furniture to stoves, radios, automobiles and locomotives, is made easy by use of this nut. It has four welding points or projections which are of uniform height, thereby insuring satisfactory flow of electric current through the points of contact. The welding points are so spaced as to obviate any difficulty in setting up the necessary electrodes on the welding machines or any difficulty from molten metal splashing into the threads. Time required for welding the nuts to a sheet-metal surface is practically instantaneous. In many cases the nuts may be welded to sheet metal, eliminating the use of costly forgings and castings.

H 175

Tight Squeeze in Irrigation Ditch Makes Car "Pull in Its Belt"

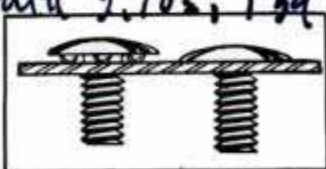
There is not much room for automobile traffic in an irrigation ditch. Nevertheless, a car has to be driven along the floor of a canal in the Yakima irrigation project in Washington to carry supplies for repairing concrete in dry seasons. The canal has



One man working a chain hoist turns abbreviated truck around in close quarters of irrigation ditch

H 216 Welding Nuts and Bolts Find Wide Use in Industry

Pat# 9,105,139 - 2,073,467



Many uses are being found in the industrial field for welding nuts and bolts. Especially

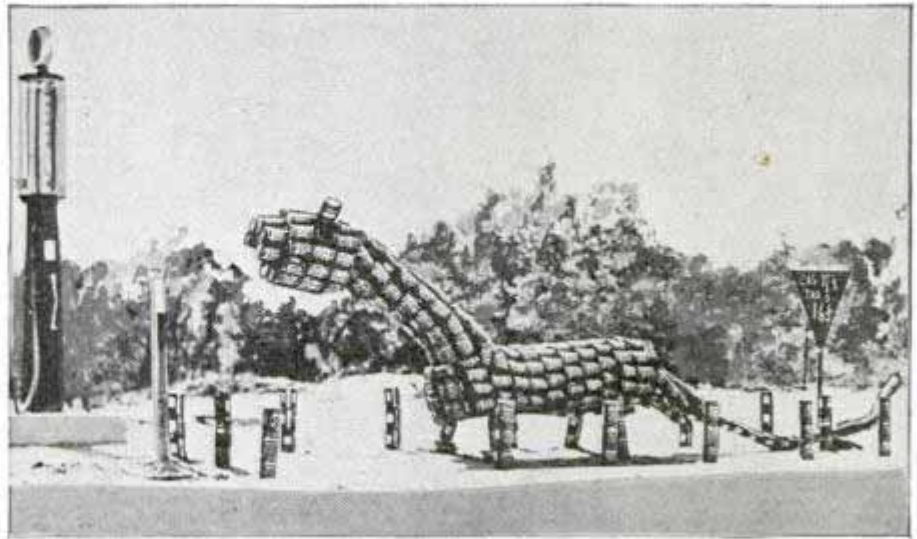
J. D. Moore
supervisor

Travis, 202 N 6th.
Yakima, Wash.

1404 Walnut St.
Cincinnati Ohio

tunnels six feet one and one-half inches in diameter and its open sections are eight feet three and five-eighths inches in diameter. That's a tight squeeze, particularly when the truck must be turned around; so the engineers obtained an old Model T Ford chassis and cut it down to a thirty-eight-inch tread and a fifty-eight-inch wheelbase. It can be turned around in the radius of the open sections with a chain hoist operated by one man. A folding freight platform which can be tipped up when the truck is being turned was devised. When water is drained from the canal, the truck hauls a 1,000-pound load along the ditch at twenty miles an hour.

Dinosaur Made of Oil Cans Attracts Gas-Station Patrons



To catch the eyes of motorists, this "dinosaur" was built of empty oil cans at a filling station. A practical table was also made of cans

Tin cans can be put to novel and practical uses when life as a container is ended. Here is a prehistoric dinosaur "sculptured" in old oil cans, attracting attention of motorists to a gasoline filling station. A table sturdy enough to be practical was also constructed of tin cans.

H 225.

Infertile Egg Detector Saves Space in the Incubator

Slight changes will convert the ordinary egg candler into a detector that will re-

veal infertile eggs incubated only fourteen to twenty hours. Removal of these eggs results in saving space in the incubator. Light from a seventy-five watt electric-light lamp in the candler is passed through two glass slides, one green and the other yellow, and the egg is held up to this light. Identification is made easier if the operator wears blue eyeglasses. The embryo, at such an early age, covers an area on the yolk about the size of a dime and appears before the candler as a small dark spot. No such development can be seen in infertile eggs. Since ten per cent of all eggs set for hatching are infertile, removing these so early in the incubation period will greatly increase capacity. The average capacity of each commercial hatchery in the United States is 25,000 eggs, so removing all infertile eggs would increase the capacity by 2,500 eggs.



Inset, equipment for detection of infertile eggs. Below, candling the eggs

☛Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Dr. W. W. Knox
Pulitzer Prize

es 139... magels

TORTURING METAL

P. J. Mc Vetty, Westinghouse
Research engineer



The whine becomes a high-pitched squeal and both men press hands tightly over plugged ears.

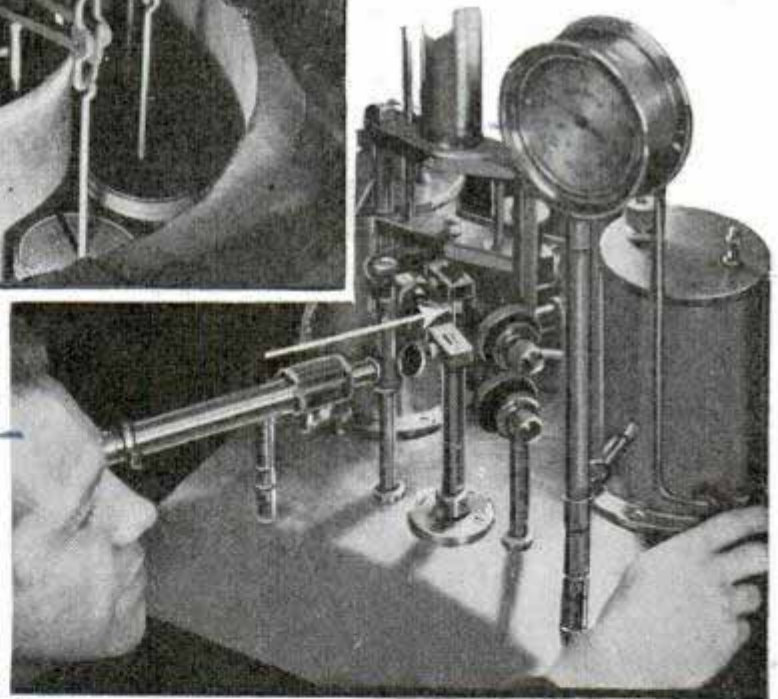
Finally the squeal changes to a piercing, continuous scream as the flywheel reaches a speed of 12,000 revolutions per minute. The bits of metal on its rim are traveling at bullet speed—more than thirteen miles a minute.

Quickly one man removes hand from ear, reaches for a water valve and opens it wide. As the water spurts from the nozzles inside the housing

IN a little red brick building atop "Miracle Hill" in East Pittsburgh, a Westinghouse research man hovers over a sturdy motor mounted on a heavy concrete base, its shaft extending into a thick-domed concrete housing. The apparatus looks something like a motor generator. But it isn't.

Opening a window in the housing, he screws two pieces of polished steel, each one-eighth of an inch thick, into the rim of a flywheel on the shaft so they will pass in front of two water nozzles as the flywheel spins. Then he carefully closes and locks the window and steps back.

"Let 'er rip," he calls to an assistant standing at a switchboard. A switch clicks home and the motor begins to hum. Hastily both men fish rubber plugs from pockets and stuff them in their ears. The hum rises to a whine as the motor gathers speed



Electric furnace, top, for measuring "creep" of metal samples. Below, fatigue test machine which can measure strength of human hair

J. J. Bengtsonberg

onto the bits of metal, the scream becomes a shriek—shrill, inhuman, blood-curdling. Hands over ears the men watch tensely—one minute—two minutes—three minutes. Then one turns off the water. The other opens the switch. The shriek subsides to a moan. The moan becomes a hum. The flywheel stops.

Eagerly the men open the window and

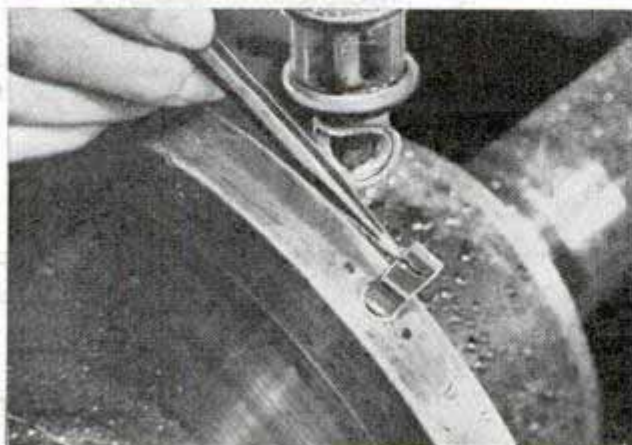
Frank Cassin

J. J. Pennington

To Make It "TALK" *es1397*

detach the metal pieces. Three minutes ago the bits of steel were smoothly polished. Now each has a jagged notch cut almost a quarter of the way through it—a notch cut through steel by water under no more pressure than that at your kitchen faucet.

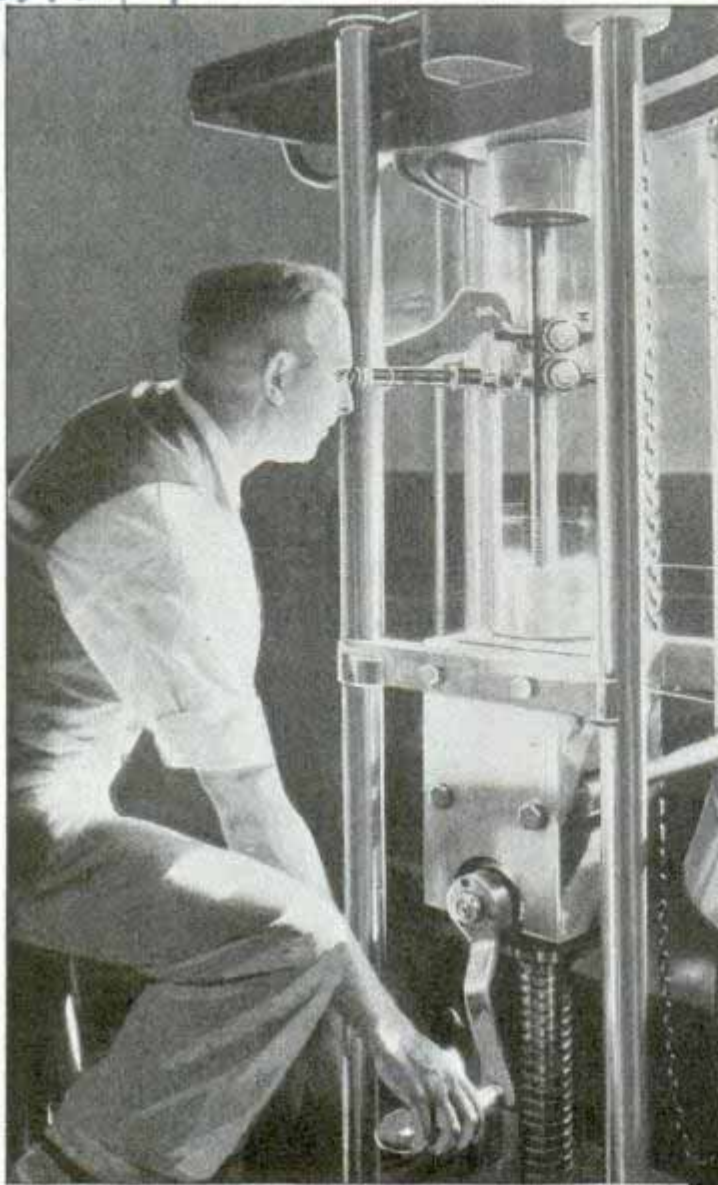
Here is an astounding demonstration of the power of a little jet of water. But why did they do it?



Machine, top, which cuts steel with water. It sets up an ear-splitting screech. Below, machine with cover removed, and steel sample cut by water stream

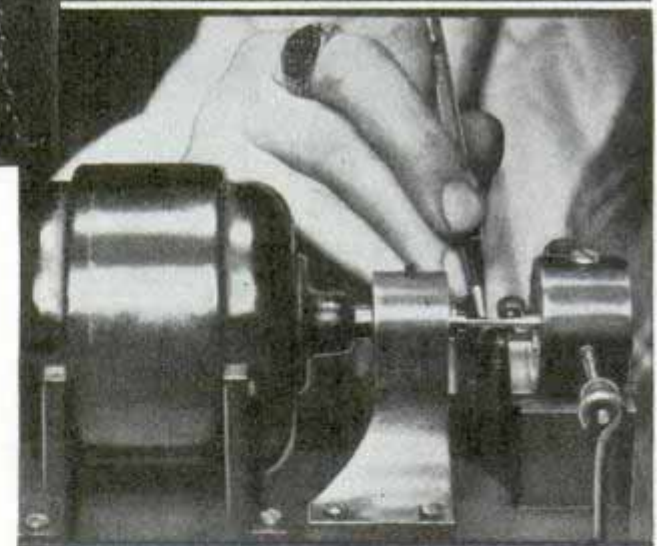
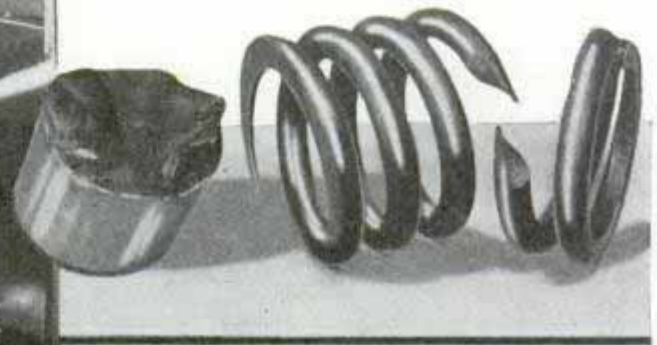
Here's the answer. Just as the continuous drip, drip, drip of water wears away stone, so also does the impact of water wear away metal if the force is great enough. Tips of airplane propellers are eroded by coming in violent contact with nothing more than drops of rain and particles of fog. Steam turbine blades whirl at tremendous speeds and, in the low-pressure stages, where the steam contains some water, show this erosive effect after a few years.

But some alloys erode faster than others and Westinghouse turbine engineers wanted to know which ones resist erosion best. So research men built the apparatus which cuts hard steel with a little stream of ordinary drinking water in order to find out. And they not only have a quick check on the relative merits of different alloys for turbine blades, but they have learned many other things. They have found, for example, that the rate of erosion for some metals is not constant as we might suppose. Stainless steel erodes rapidly at first, but the rate decreases gradually until it be-



for metals produces better turbine blades and more efficient airplane propellers. Other trials by torture for metals—corresponding to the rack and the wheel inflicted on humans—result in the development of alloys able to withstand the punishment of continued stress and vibration.

Metals, like men, become tired from over-exertion. Bend and straighten your arm repeatedly and eventually the muscles become fatigued. Compress a coil spring and extend it continuously and, after a much longer time, the spring also becomes fatigued. Your tired muscles soon repair themselves but the tired spring does not. This characteristic



comes fairly constant. Another alloy does exactly the opposite—wearing slowly at first, then increasing in rate.

Our medieval ancestors had cruel but effective tools for prying secrets from stubborn lips. Torture made men talk, they found, and they used the rack, the wheel and ordeals by fire and by water to loose men's tongues. Torture makes metal "talk," too, men of science have discovered. So today, when researchers want to pry from a stubborn alloy the secrets of its strength and weakness, they do to the metal what the ancients did to men. They torture it to destruction.

Strangely enough, metals are put through the third degree by instruments of torture which inflict on metals the same cruelties of endurance once practiced on men. The test for erosion of alloys may well be compared to the ordeal by water which human beings used to suffer. This ordeal by water

Making tension test, top, on steel bar. Below, shaft and spring tested to destruction, and small shaft which is being turned until it fails

of metals which causes them to tire under continuous stress, strain and vibration is known as metal fatigue. When the metal becomes over-fatigued, it breaks. Without thinking, you probably have taken advantage of this very characteristic when, lacking a pair of pliers with which to cut a piece of wire, you have twisted and bent it

(Continued to page 122A)

Simon Aircraft Co. Pasadena and Central Air Terminal
Two-Motor Transport Has Safe Landing Gear
Designer - Wally Simon

Among the first of the larger aircraft to be equipped with the safety tricycle landing gear, a new two-motor transport plane has completed test flights. The ship is adaptable for six, eight or ten passengers. "Slots" which function automatically, flaps and ailerons, with the tricycle gear, reduce the landing run and the takeoff run considerably. Powered by two 425-horsepower engines, the transport is a high-wing, semi-cantilever monoplane. It has a top speed of 207 miles per hour at 5,000 feet and a cruising range of about 800 miles. The nose wheel is steerable, being hydraulically controlled. All wheels are equipped



Club.
 Here is the latest transport about to land on its tricycle gear. Note position of the two motors, with cabin between

with hydraulic brakes. The ship was designed according to specifications laid down by air-line and charter operators, sportsmen pilots and industrial concerns using planes for business purposes.

H 183
Model Stagecoach Is Complete to Candles in Lanterns
Pasadena Calif.

Tiny but complete in every detail, a model stagecoach was among exhibits at a

recent show staged by the California Graduate School of Design. Modern industrial design and the historic forces behind it were portrayed. The display contrasted 3,000 years of European development with 330 of American progress to show the need for planning and design. The miniature stagecoach's tiny glass lanterns contain still smaller candles.



Applying brake lever on miniature stagecoach. Note the detailed construction

M. Clayton and National
Dual Wheel Springs for Bicycle Give "Knee-Action" Comfort
Twin-flex

Twin-springing on both front and rear axles of the bicycle is being introduced this year by one manufacturer to add more comfort. Separate cushioning action on both wheels prevents "galloping" and offers a "knee-action" ride, allowing better control on bumpy roads. The springs can be adjusted according to the weight of the rider.



*The Huffman Mfg Co
 Pasadena, California*

Tug Pilot Watches Mirror for View of Tow Astern



Looking in this mirror from wheelhouse, tug skipper can see beyond his own decks to the tow astern

When the skipper of a tug in the harbor of Port Alice, B. C., found he could not see the stern from the wheelhouse, he borrowed an idea from automobiles and installed rear view mirrors. Brackets were attached at both sides of the wheelhouse; the mirrors, about twelve by fourteen inches, are held in with angle clamps and are adjustable to any angle.

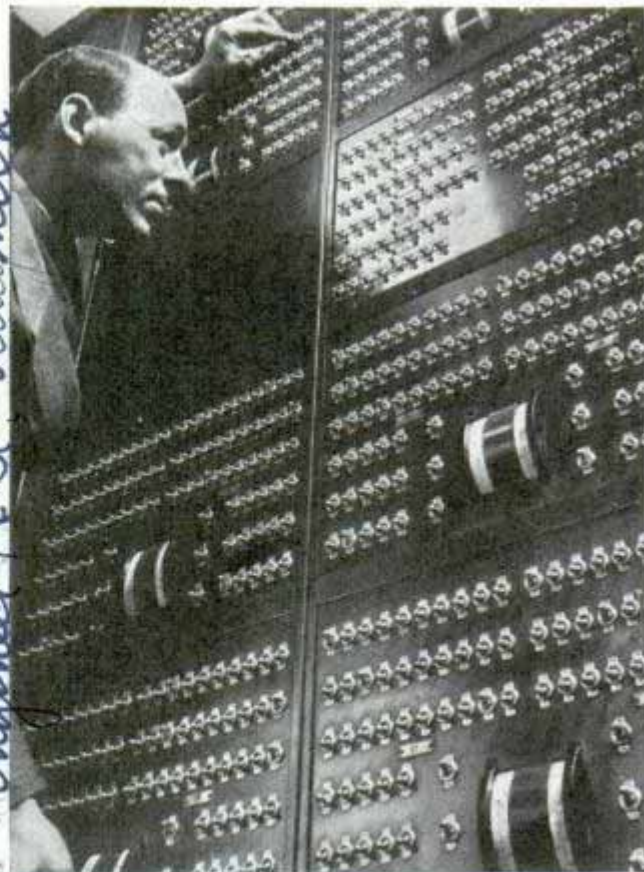
Metal Found in Meteor Crater by Electrical Prospecting

Scientists have found evidence that beneath Arizona's famed Meteor Crater there exist large masses of what may be parts of the meteor. Despite the name of the giant pockmark in the earth's crust, scientists have not been sure that it was caused by a meteor striking at that spot. Yet scattered tiny surface fragments indicated that a meteor, containing ninety-two per cent iron and eight per cent nickel, probably plunged into the earth there. New measurements, by electrical prospecting, have disclosed five giant masses of magnetic material, probably iron, lying

1,200 feet beneath the crater. Through the years drilling operations have sought to strike what scientists have thought may be underground iron deposits large enough to bring wealth to the finder. But the fractured underground rock structure and swift currents of underground streams hampered the work. Drilling was abandoned in 1931, but the recent discovery may result in its revival.

Power Systems Made Safer by Load Calculator

Exactly the load a power system may carry with safety and economy can be determined quickly with a calculator which reproduces a miniature replica of any power system in the world. The device also determines what additional equipment a system requires for expansion of power transmission services. It discovers why, for no obvious reasons, transformers are overloaded and determines means of better controlling the circulation of power. Studies conducted with the calculator have saved power consumers many millions of dollars by enabling the utilities to carry



This board permits electrical engineers to reproduce power systems in miniature

Westinghouse

same device 2/10/38

Ernest H. R. Laughlin

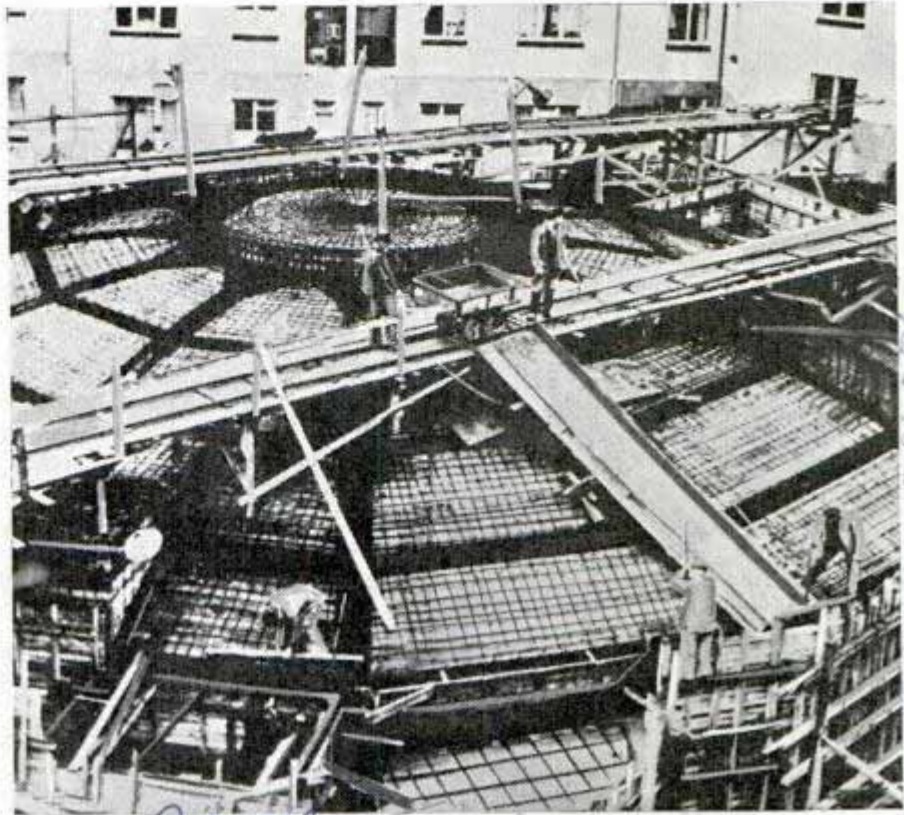
American Institute of Mining and Metallurgical Engineers

Canadian geological

part Alice B.C. Canada

larger loads efficiently, safely and economically without the expenditure of money on unnecessary extra equipment. In a room surrounded by panels like a telephone switchboard, Westinghouse engineers insert plugs, turn dials and bring the electric networks under the microscope of the calculator. The device includes a labyrinth of coils and condensers which duplicate the electrical characteristics of "big fellows" of the power world. Its sources of electrical power are packed away in cabinet drawers. By plugging in on the proper combination of units, the engineers produce a small-scale model of any electrical system, either in actual operation or merely drawn on paper for proposed construction. With the aid of the calculator the engineers solve in two or three days questions that would require several months under the usual methods of human calculation.

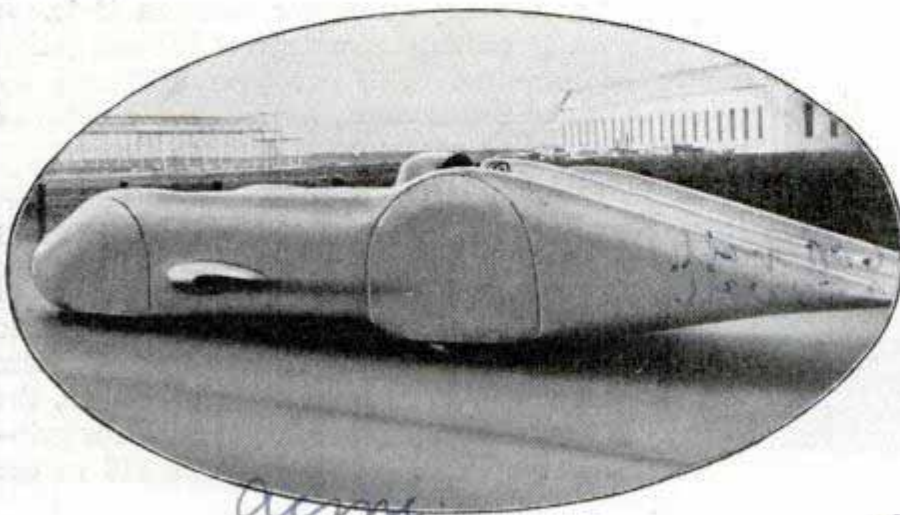
Underground Movie Theater Has Entrance Like a Subway



Workmen are finishing roof of underground motion-picture house in Hamburg, Germany. It will be entered by stairway leading down from street

Hamburg, Germany, is to have an underground movie house. Its domelike roof of steel-ribbed concrete has already been poured, and when the surface is covered—on a level with first floors of the surrounding buildings—the exterior will be complete. The new theater will have an entrance stairway like that of a subway station.

Latest Streamline Race Car Sets Records in Germany



This strange-looking vehicle is one of Germany's latest high-speed racing cars, which recently established two records

Its huge power plant housed in a long, streamline body, the latest German racing car has established two new speed records. One was the one-kilometer record, at a pace of slightly more than 270 miles per hour; the other the one-mile record, at a speed of slightly above 273 miles per hour. Both records were set on the German auto track at Frankfort-on-Main.

News - Rudy Caracciola

*Chas. W. Jeff. Co.,
Salesburg, Kans*

Gas Tractor 'Jockeys' Old Steamer from Mud



After being abandoned in mud for nine years, a broken-down steam tractor twenty-four years old and weighing 22,000 pounds was driven from its anchorage by a little three-horsepower garden tractor. The 450-pound tractor might not have been equal to the job of hauling the old steamer from the mire by direct pull, but it was mounted on top of the boiler to obtain leverage through the transmission gears of the two machines. One wheel of the gasoline-driven tractor was removed, the differential was locked and the other wheel used as a belt pulley. A belt transmitted the power to the big tractor and drove it easily.

In circle, riding atop boiler of the old timer, is the little garden tractor that drove the big fellow out of the mud

Rear-Engined "Teardrop" Car Is Designed for Safety

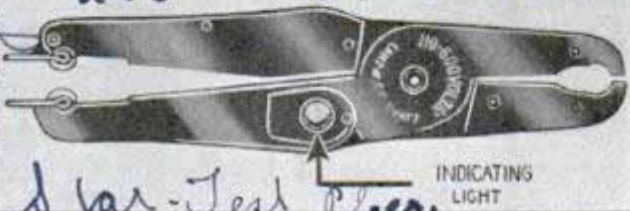
Equipped with many safety features, the latest "teardrop" automobile is driven by a motor located in a rear compartment. The vehicle has headroom of six feet four inches, and a road clearance of ten inches. It weighs 3,800 pounds and has an over-all length of twenty-two feet on a 140-inch wheelbase. The car has electric gear shift, vacuum brakes and a periscope that gives the driver clear vision of both sides and the rear. Stop and signal lights on both sides at the rear revolve when the brakes are applied or the driver desires to signal his intentions. The body construction is aluminum, steel and wood ply. With a cruising speed of fifty miles per hour, the car has attained a top speed



Specially built automobile provides for driver to sit close to the front, giving a wider range of vision

of eighty-six miles per hour in tests. It averages about seventeen miles per gallon of gasoline. The car was designed by Grover Branstrator, well known creator of streamline commercial cars and buses.

Tiny Test Bulb Mounted on Pliers Replaces Unwieldy Bank of Lamps



With tiny indicator bulb mounted on pliers, one hand can spread contact points and test circuit

In place of the cumbersome bank of lamps ordinarily used for testing electric circuits, an inventor offers pocket pliers carrying a tiny, removable test bulb, the pliers being a handy and safe tool for gripping blown fuses. Circuits of 110 to 600 volts can be tested. The tungsten bulb is mounted on one arm of the pliers, which can be manipulated easily with one hand.

*Body
Wayne
Branstrator
235 Canal
Star June Co*

Small

118

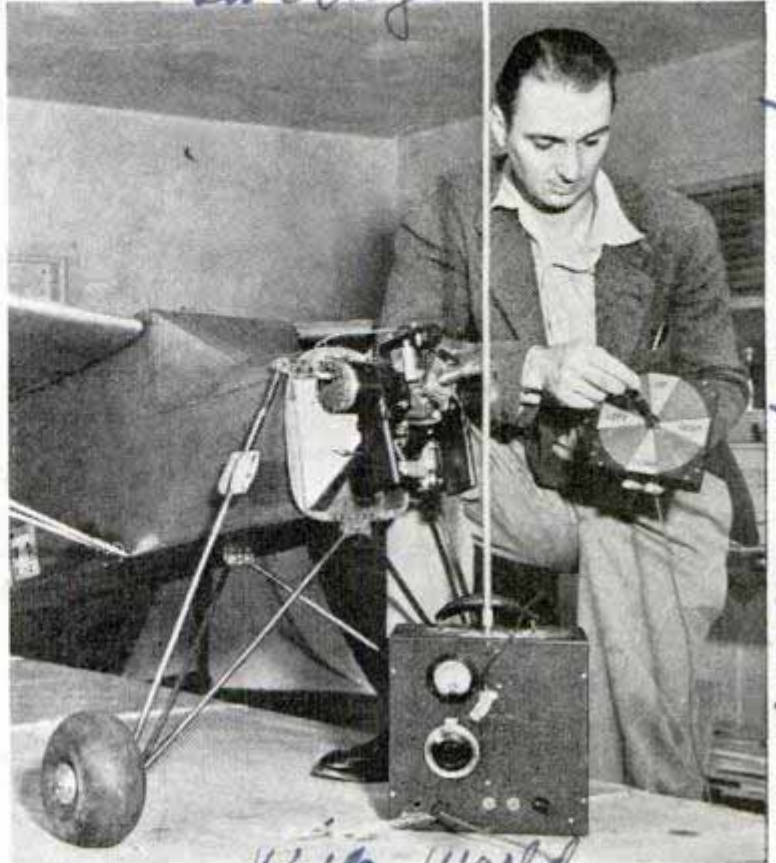
*4.00 per 110-600 volt
2.50 " 110-250 volt*

Reginald Security, 5751 Hollywood Blvd. Los Angeles.

Radio-Driven Model Plane Is Target for Guns

Sixty-Third

Anti-aircraft batteries of the coast artillery are trying their marksmanship with a radio-controlled model airplane for target, and if the test is successful these miniature pilotless ships may be used regularly to train army gunners. A three-horsepower gasoline engine drives the craft, which has a wingspread of twelve feet and is eight and one-half feet from propeller to tail. In the fuselage is a three-tube radio set sending impulses to tiny electric motors which operate the tail, rudder and elevators. On the ground is a short-wave sending set and a control box with contact points by which the operator can modulate the wave lengths of the radio impulses to guide the plane up, down, to left or right.



Motor-driven model plane and the radio control box by which it is guided in flight

Well not give out

Wide World.

Two-Way Diesel Engine Runs on One to Four Motors

Caterpillar Diesel Co. Peoria, Ill.

Equipped with four engines that can be operated singly or in union according to the load being hauled, a Diesel-electric switching locomotive achieves both elasticity and economy. Its cab is at the center, and there are two V-type eight-cyl-

inder Diesels at either end. A fifth engine beneath the cab operates pumps and air compressor. The locomotive can handle fifty to 100 freight cars, developing 60,000 pounds tractive effort when the four engines are teamed. If the job requires only

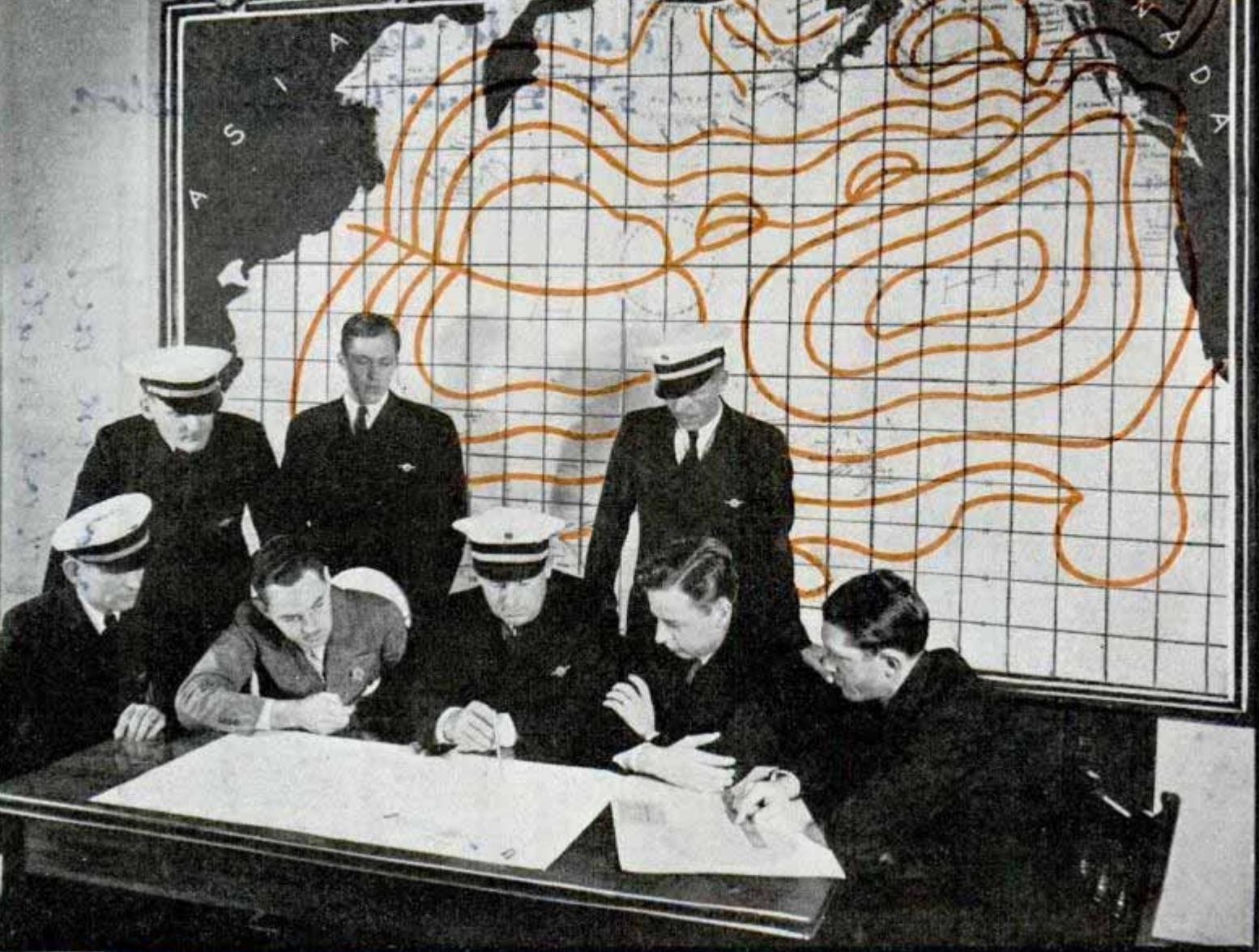


Designed for flexible, economical operation in switchyard, this Diesel locomotive has four eight-cylinder engines which work singly or teamed

the shunting of a short string of cars, however, the engineer can cut out one, two or three of the 175-horsepower motors and thus save fuel. Provided with dual controls, the locomotive may be driven in either direction with equal ease and need never be reversed on a "Y" or turntable. Each engine is coupled to an electric generator, each generator produces power for four electric motors of which one is located on each of four axles. The engine will have a top speed of about forty miles an hour.

1922 E. ...

Lavenport - Besler Corp. ...



How FLYING CLIPPERS



A STRONG west wind at Manila, a storm far at sea, a twenty-mile wind 10,000 feet above San Francisco—unrelated bits of weather information like these govern departures and arrivals of trans-Pacific flying clippers.

What the weather happens to be in Hawaii influences the hour at which one of the big flying boats will leave its base at Alameda on San Francisco bay. The weather regulates the amount of cargo that the plane can carry and even fixes the hour that it will arrive in Honolulu.

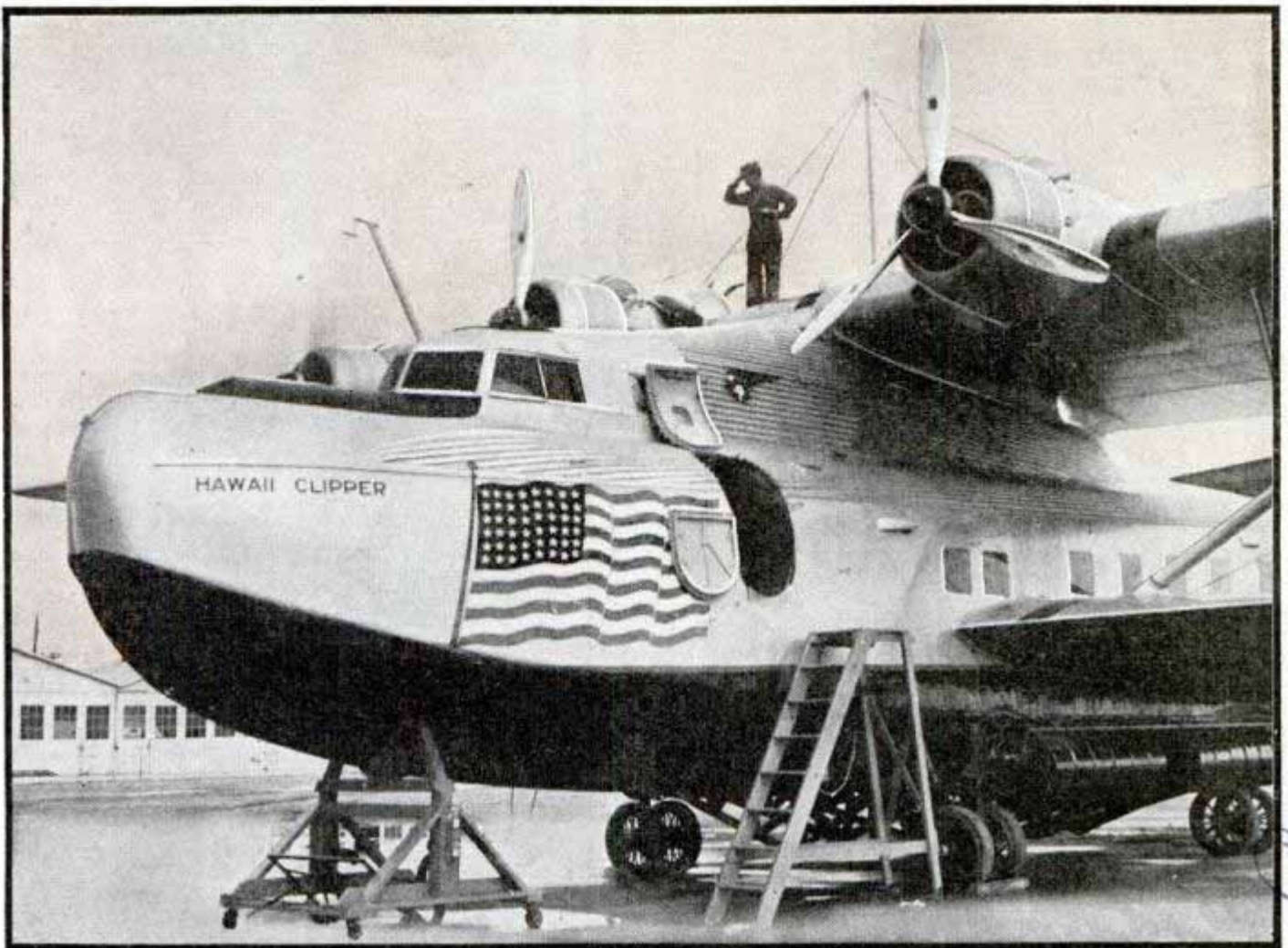
But far from allowing the weather to run the airway, Pan American's meteorologists have almost reversed the process. Instead of running the weather, they have put it to work. By getting an upper hand on the elements they are able to maintain transoceanic flights as regular as steamship schedules. No matter in which direction a plane is bound they usually find a tail wind to boost it along.

Top, conferring on flight. Note weather map. Bottom, ship officers gather weather data

*10/14/49
Cm. Thomas E. Stinson Jr.
10556 Holston Ave
San Francisco, Calif.*

Nation Pacific

How to fly with



DODGE STORMS

There is always rough weather somewhere on the Pacific. On the 9,000-mile airway to China there is hardly a day when the weather everywhere is perfect. Instead of waiting for storms to die down the meteorologists have worked out ways of putting them to use. So competent have they become that during the past year Pan American has lost the equivalent of only one round trip in delays due to weather.

At Alameda the Pan American Airways Pacific division meteorologist outlines the way that the clippers take advantage of the elements. On the desk in front of him he has a large map on which storm centers and wind directions on all parts of the Pacific have been marked. He has just finished the forecast and flight-time analysis for the last leg of Trip 160, the Honolulu-Alameda jump marking the completion of the eightieth round trip across the Pacific.

"Data for this map were gathered at four o'clock this morning," the meteorologist



Top, inspection before flight. Bottom, releasing balloon to study wind direction and speed

Reference: William Clover, Chief Meteorologist Pan American

Base - Alameda Pan American Air Lines



way between the coast and the islands. There's a twenty-knot east wind blowing toward Honolulu from the storm center. That means head winds half way across and the chance of running into rough weather on the direct great-circle course. On this direct route, figuring from the present weather conditions, today's flight would require twenty-two hours.

"But north of this storm center we find some arrows showing a westerly wind with speeds of up to twenty-six knots. That means a tail wind instead of a head wind. Obviously, we are routing the eastbound clipper over the northern route. The boat will fly 250 miles farther and get here quicker.

"Continuing this analysis of the weather, the wind flags on the map indicate that at 4,000 feet the

explains. "The clipper will not leave Honolulu until two o'clock this afternoon but already we can tell what the weather is going to do in the meantime and what the conditions will be while the plane is in the air.

"It's 2,400 miles to Hawaii. Over such a long distance one might usually expect to encounter a storm or strong head winds. So there are three alternative routes that the clippers can fly. First is the short great-circle route used by steamships. Next is a northern route, 250 miles longer, that takes the clippers considerably north of the steamer track. Then there is the southern route, also consisting of two legs, on which a San Francisco-bound clipper flies directly toward Mexico for half the hop, then heads up toward its destination.

"On today's map here you can see a high-pressure area centered about half



Top, steward checking supplies and baggage while mechanics inspect clipper engine at Midway island. Bottom, radio operator at Alameda base

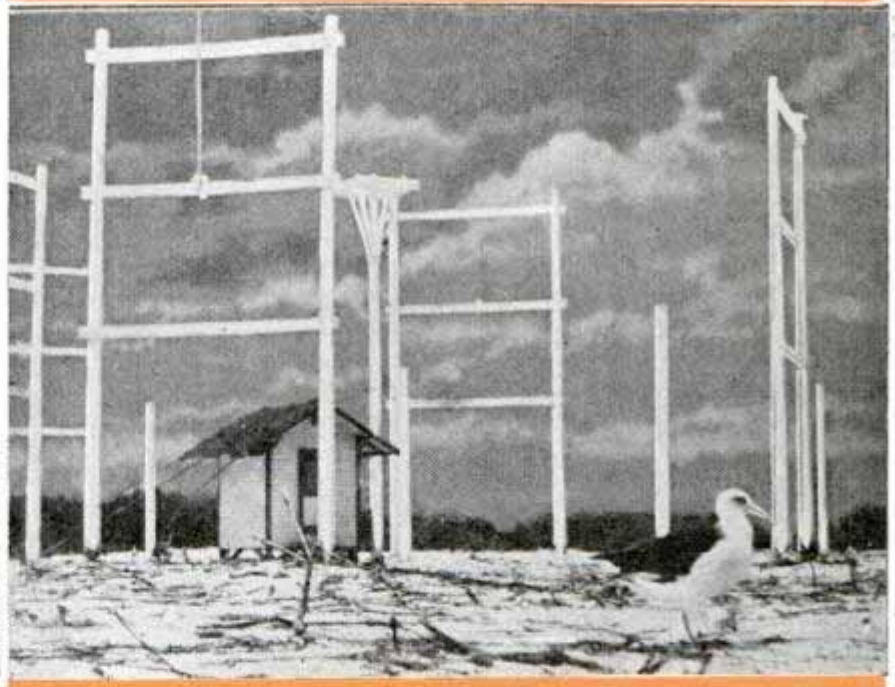
flight will take 19.9 hours. At 7,800 feet better winds would cut this time by an hour and a half. At 11,500 feet there are even stronger tail winds, permitting a flight of only 17.8 hours. But because of passenger comfort in the thin upper air the flight is going to be made at 7,800 feet. That will permit a saving of three and a half hours over the time possible on the shorter direct route. Incidentally, because less fuel

Isuan base

will have to be carried to fly the longer distance, about three-quarters of a ton more payload can be carried."

If there were a west-bound flight due to leave San Francisco at the time this map was drawn, the plane also would have a fair wind under its tail even though it were going in the opposite direction, because the chief meteorologist would route it over the southern course where the map shows a strong east wind, there being a 180-degree difference in the wind track direction around the central high-pressure area. Each route is divided into four zones and the details of the weather in each zone are analyzed for the captain of the departing clipper.

This smart way of anticipating the weather and putting it to work is



Meteorologist preparing flight plan after studying weather indications

Top, copying radio message from clipper. Center, aeriels of Midway's direction-finding station

based on analysis of the major air masses that control the Pacific weather. The chief meteorologist and his four assistants at Alameda draw maps every day that show the weather at every point on practically half of the northern hemisphere, from ninety degrees east longitude to ninety degrees west longitude and from the equator to the arctic circle. They make forecasts covering the airway as far away as Guam, 6,000 miles to the west, up to thirty-six hours in advance. Three men at Manila prepare similar forecasts covering the

(Continued to page 142A)

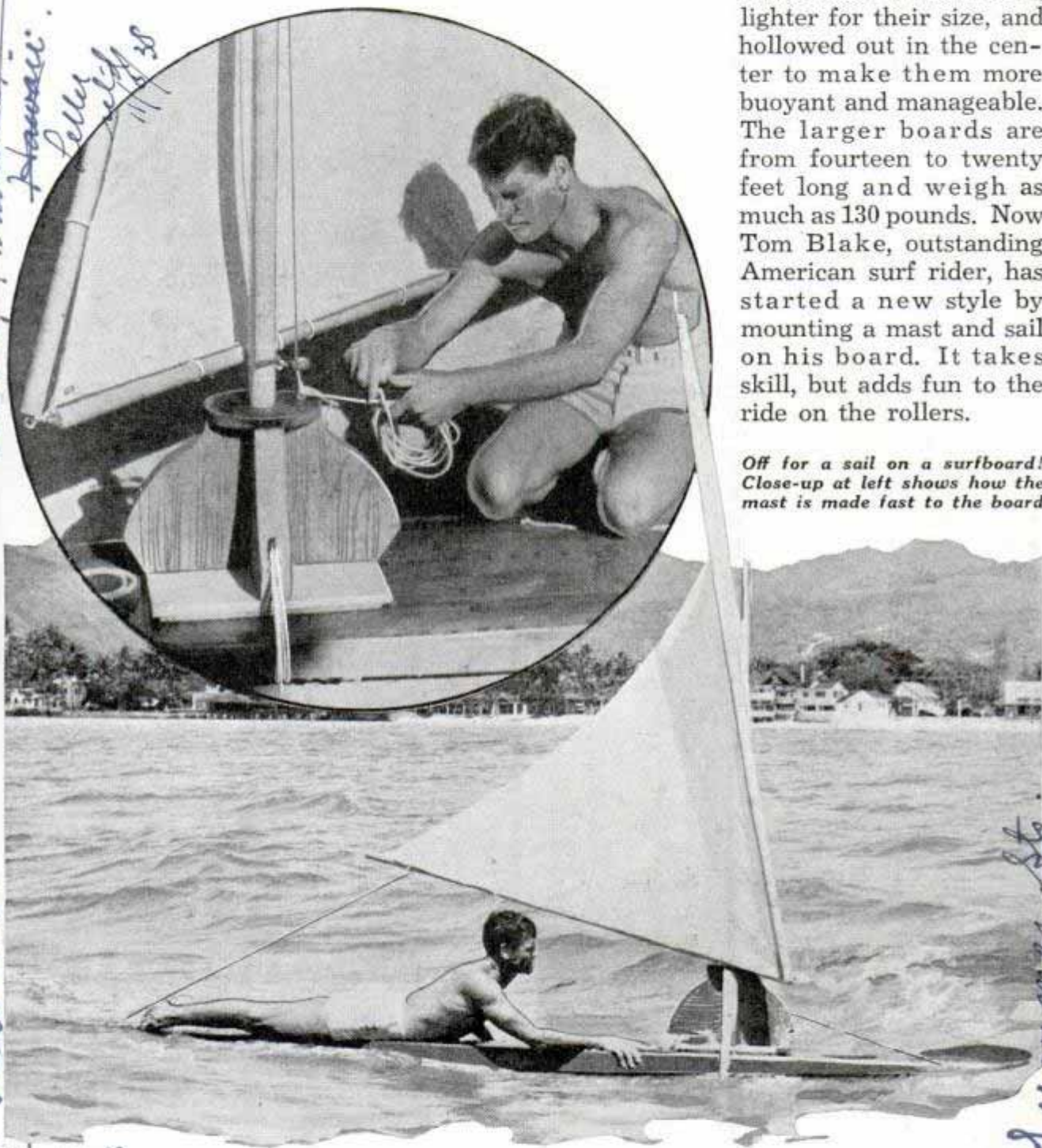
Surfboard Sail Puts New Thrill in Old Sport

Sailing on a surfboard is the newest of water sports. From the crude sport of riding the waves on makeshift boards, surf

riding has gained in popularity and "science" with the refinement of the board; it has grown longer and narrower, new woods

have been introduced, lighter for their size, and hollowed out in the center to make them more buoyant and manageable. The larger boards are from fourteen to twenty feet long and weigh as much as 130 pounds. Now Tom Blake, outstanding American surf rider, has started a new style by mounting a mast and sail on his board. It takes skill, but adds fun to the ride on the rollers.

Off for a sail on a surfboard! Close-up at left shows how the mast is made fast to the board



Tom Blake
431
Hawaii
11/1/38

Edvard
Phila
N. Park Ave

Summer St

H 127

Building Brick in Many Colors Made from Same Clay in Same Kiln

Made from the same clay in the same kiln, building brick of many colors is being produced by a process called "flashing." Theoretically, all that is required is to generate the proper vapors in the firebox of the kiln and to keep these vapors

in contact with the brick long enough for the complex chemical reactions to take place. The best flashing results are obtained at extreme temperatures. Various chemicals are placed in the firebox, but the most varied and pleasing effects are

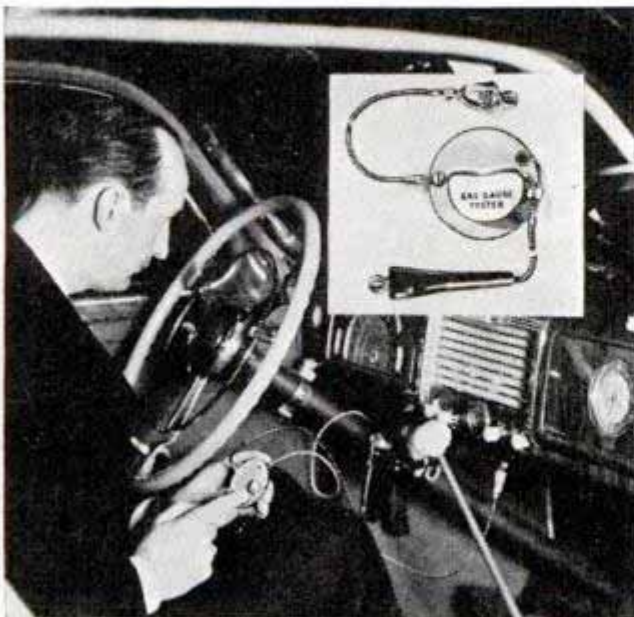
Authority - George C. Betty Ceramic
16th St Phila

obtained with zinc. It is not uncommon to see a blending of rich greens, purples and violets, with warm shades of brown, tan and tangerine coming from the same kiln. Temperatures usually above 1,800 degrees Fahrenheit are required and 200 to 300 pounds of zinc are needed to color 50,000 to 80,000 bricks. The green color imparted by zinc becomes more vivid upon exposure to the weather and some plants wash the bricks with a stream of water as they are taken from the kiln. Copper has been used to give brick a bronze or coffee color. Here the temperature must be above 1,900 degrees to get the best results.

#136.

Simple Gas Gauge Tester Checks for Accuracy

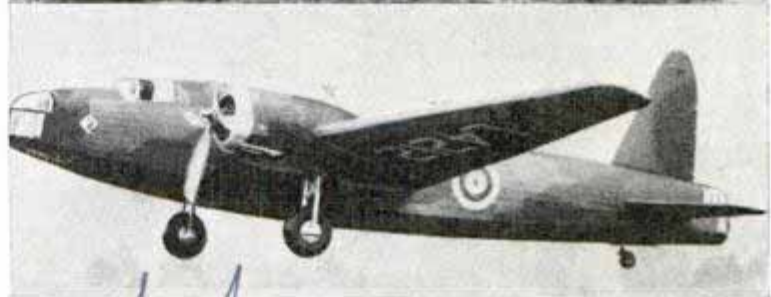
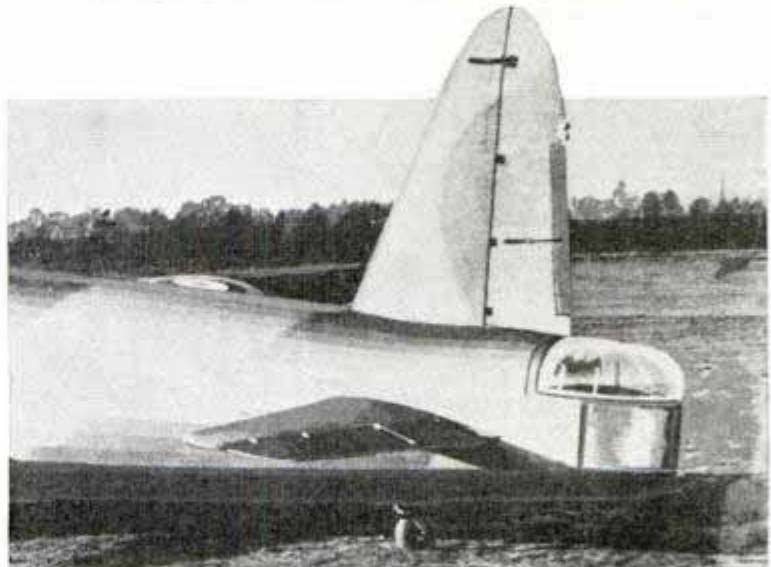
Accuracy of the gasoline gauge in the modern automobile is checked easily with the aid of a simple testing unit developed recently. The instrument, which tests only electric gauges now used as standard equipment on about ten million cars, checks both the instrument panel indicator and the tank equipment in determining whether the gauge is registering the exact amount of gasoline in the tank.



Checking accuracy of gasoline gauge. Inset, simple equipment for making the test

ac spark plug dev.
Essex motor dev.

Bombing Plane Carries Sting in Both Its Tail and Its Nose



Twin-engined bomber of the British Royal Air Force in flight, and a close-up showing the bombing cockpit under the rudder

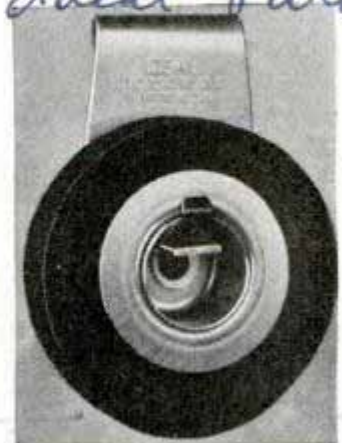
Britain's latest bombing planes carry a sting at both ends. Named the "Wellington I," this twin-engined warplane of the Royal Air Force has extra bombing cockpits in the nose and in the tail, the rudder being mounted above the latter. The new plane is of the midwing monoplane type.

#134.

Friction Tape Clipped to Belt Is Always Ready for Use

Worn on the belt, a reel and clip for holding friction tape keep the tape at the finger tips, ready for instant use. The reel snaps on to the clip, preventing loss of the tape and assuring that it will be used to the last inch, for the roll is not thrown away when it becomes too small for handy use.

Adel Path.

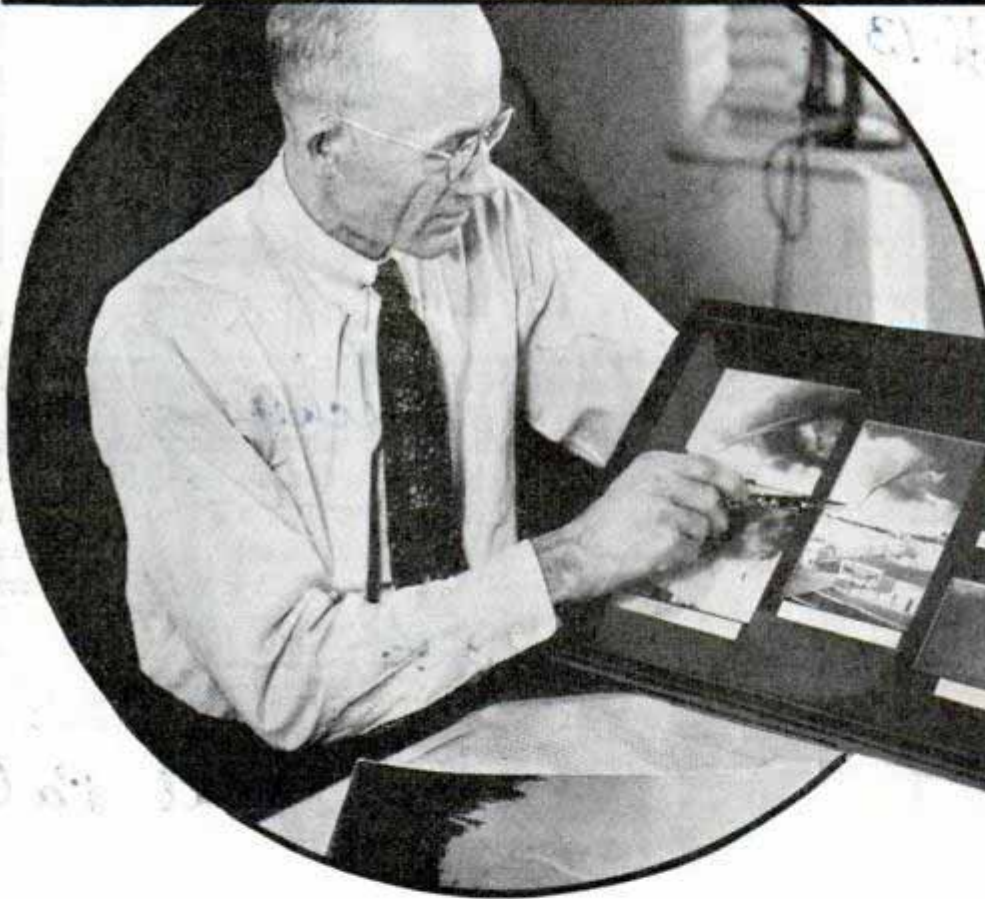
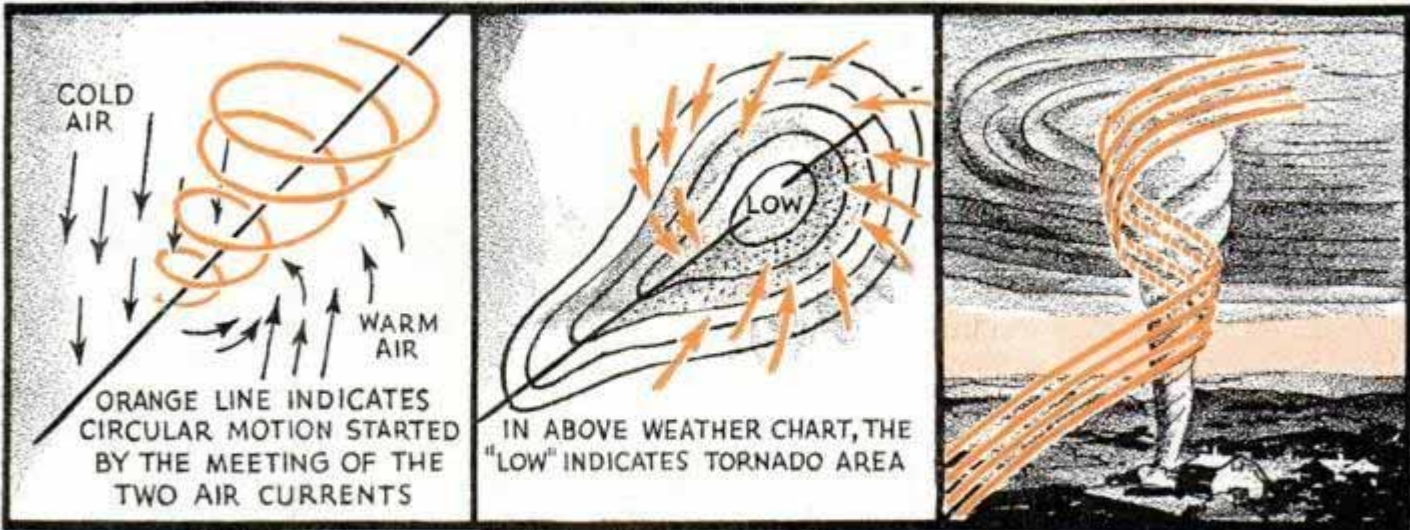


Ideal commutator
Essex Co 5053-111

201544

Mr. James M. ...
431 W 60th Terrace
Kansas City, Mo

TORNADOS are HIS



Top, how tornado forms and how it appears, with orange lines denoting the whirling motion. Bottom, weather observer studying tornados

S. D. Flora

Jopoka (2) A DENSELY black, funnel-shaped cloud whirling out of the west with the roar of a thousand express trains—that is a tornado.

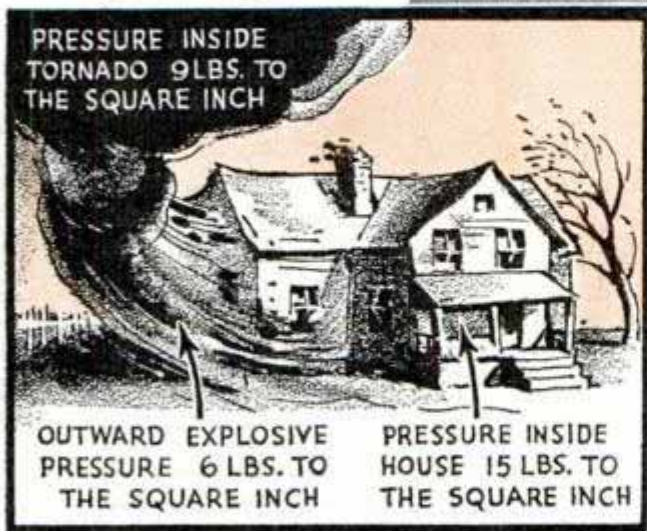
It is the master devastator. Not even the West Indian hurricane can compare with its concentrated fury or destructiveness. You can take S. D. Flora's word for it. Thirty-five years a meteorologist of the U. S. Weather Bureau in Kansas, he has had ample opportunity to examine evidences of its violence.

Tornados are his specialty, a hobby he has followed in and out of office hours. Although an expert on the subject, he has never seen one. On one or two occasions, a tornado passed within a few miles of his office but he did not hear about it until the show was over.

However, in the wake of these whirling clouds that resemble giant, weaving elephants' trunks, Flora has seen locomotives that had been lifted from their tracks, wagons in tree tops, skeletonized buildings,

5154.4

HOBBY



Above, showing how house literally "explodes" in tornado. Right, remarkable photograph of an approaching tornado

*at Eszenburg
Kans*



uprooted trees, and many other exhibits of havoc.

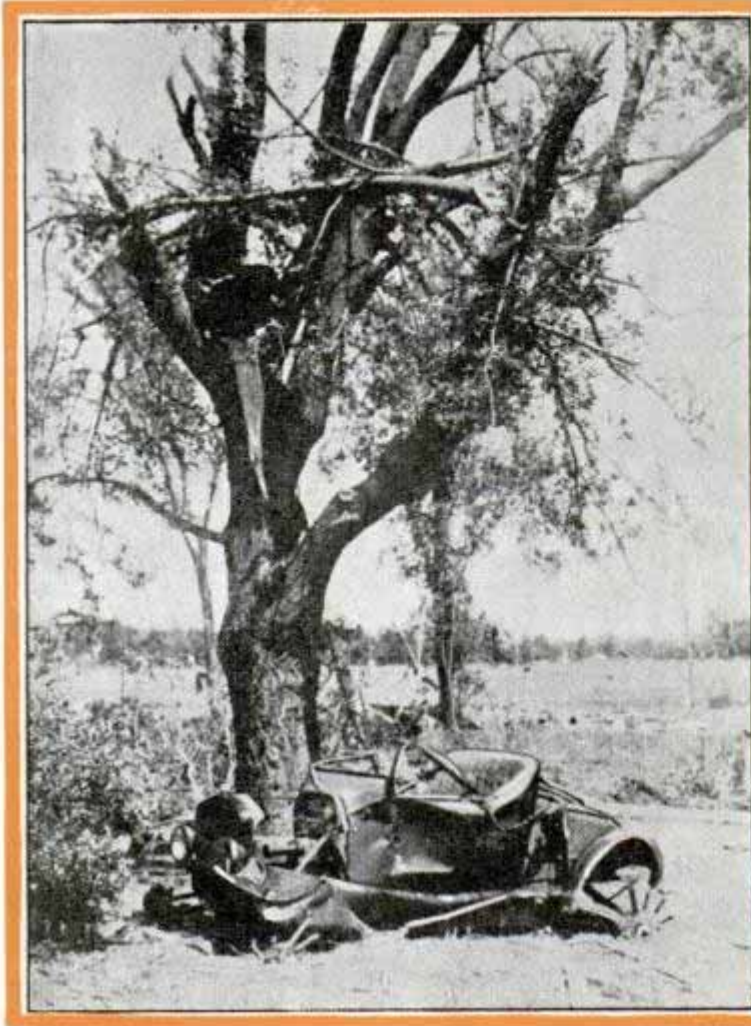
When a tornado struck a southern Illinois city a few years ago, the weather observer relates, a hard-pine pole was driven completely through an eighteen-inch poplar tree. Into the trunk of another tree a two by eight plank was driven more than eight inches by the force of the wind. So firmly was it imbedded that the protruding end was strong enough to support a man's weight.

Chickens have been stripped of their feathers and there is record of at least one hen miraculously surviving such a catastrophe. Straws frequently are blown with

such force into doors and fence posts that they stick out like whiskers.

Several years ago the railroad station of Elmont, Kans., was wrecked. Flora found the window of the ticket cage several blocks away from the depot site with a heavy scale resting on it, but the glass was unbroken.

A tornado generally travels from southwest to northeast at a rate of forty to fifty miles an hour, and can be outdistanced by a motorcar. Unaware of this, a motorist near Topeka, Kans., last summer abandoned his car and ran for cover in a schoolhouse when he saw an ominous cloud approaching. The school door was



April, May, and June are the peak tornado months and during the past twenty years, the annual total for the United States has varied from sixty-five in 1919 to 260 in 1933. Death toll reached an unprecedented high of 794 persons in 1925, the year in which the most destructive tornado in history swept over an unusually long path across Missouri, Illinois, and Indiana.

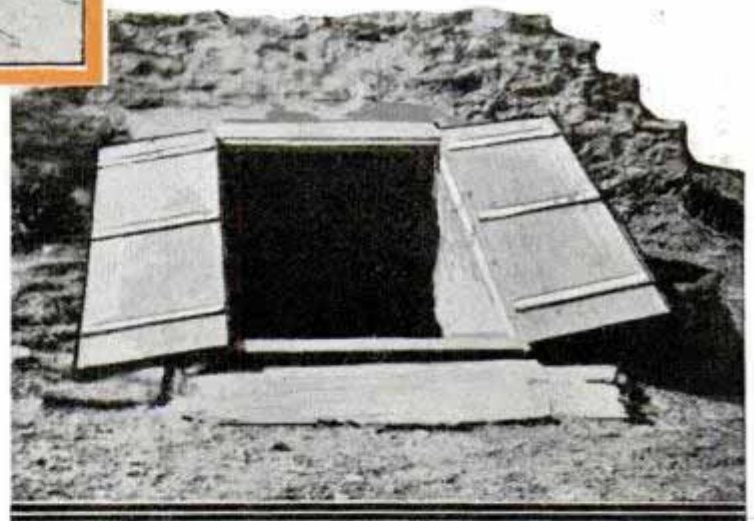
If the ferocious spiral has a virtue, it is the shortness of its life. While a hurricane may last for days, the tornado rarely goes beyond the hour limit. However, this is small comfort when you consider one swept across St. Louis in 1927, killing eighty-five persons and injuring 1,300 and chalking up \$15,000,000 worth of damage, all in the space of five minutes.

The air making up the elephant's

locked so he dived into the coal shed in the rear of the building. A moment or two later, the tornado struck. His car was blown off the road, the schoolhouse was reduced to kindling wood but the coal shed remained intact and the fortunate motor-car driver was unhurt.

Tornados do not follow any hard and fast rules of conduct. Sometimes, they touch the earth for only a moment, other times, they travel 300 miles or more, hitting here and there and then disappearing into space. Their path of destruction may be only twenty-five or fifty feet wide or it may be one-half mile. As a rule, their course is about a city block in width. Whole blocks of city homes have been wiped out by these storms while residents in other sections went about their business unmindful of what was happening.

Regular business hours for the tornado are between 2:00 and 6:00 p.m., Flora's records show, but the greatest disaster in recent years, the 1936 storm at Gainesville, Ga., in which 203 persons were killed and \$13,000,000 worth of property destroyed, occurred at 8:30 a.m.



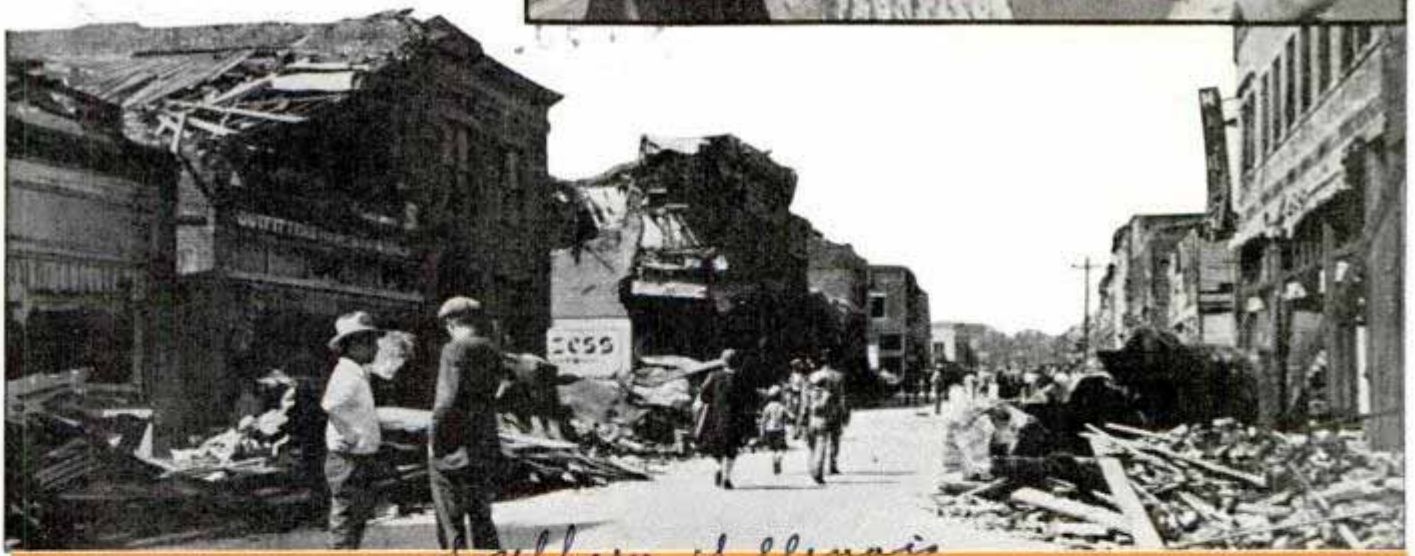
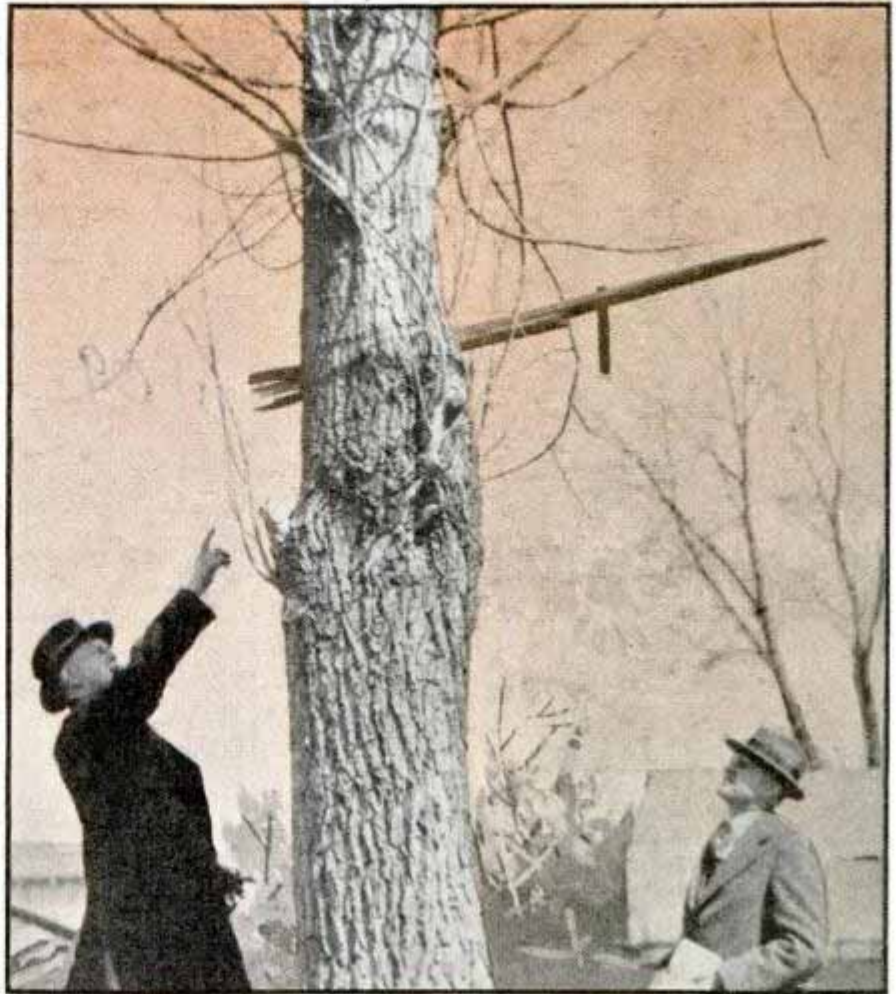
Top, auto wrecked after being carried several blocks by tornado. Bottom, entrance to tornado cellar, commonly known as cyclone cellar

trunk whirls at high speed, variously estimated at between 300 and 500 miles per hour. No instruments rugged enough to withstand the wind's terrific force have ever been developed to measure this velocity accurately. In the center of the spiraling cloud, pressure is reduced by the centrifugal force of the whirl. A partial vacuum is created, which may be compared to the whirlpool forming when the plug is pulled out of a washtub except that here the motion is inverted. The partial

vacuum accounts for freakish performances of the tornado.

"In order to understand this," says Flora, "we must recall a few facts about atmospheric pressure. The ordinary pressure is around fifteen pounds per square inch, or approximately one ton to every 144 square inches. We know the reason our houses do not cave in is because there is an equal amount of pressure on the inside as well as outside.

"When the vacuum-like cloud envelops a building, pressure on the outside is reduced. Inside it remains the same. Consequently a higher pressure exists indoors than outdoors so that windows and walls are forced out-



Top, pine stick driven through trunk of tree by terrific force of a tornado. Bottom, business street of a Missouri city after it was struck by the tornado

ward. In other words, a building literally explodes. It's the same effect that is produced by firing off a charge of gunpowder in a closed room."

The condition giving rise to a tornado is described in weatherman's language as a state of unstable equilibrium in the atmosphere. In one-syllable words, Flora says it is brought about by hot, moist air being overrun with cold air. Being lighter

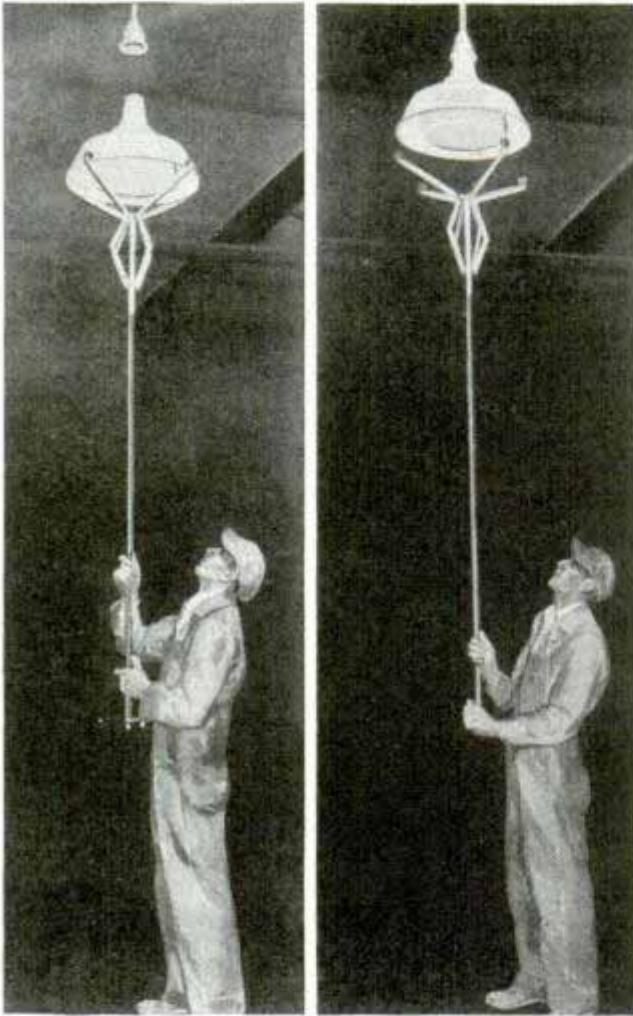
than cold air, the warm air starts to rise and the cold air comes down. When this occurs the whirling motion begins; it is a matter of scientific fact that a vortex forms whenever moving fluids or gases start traveling up or down.

As the moisture condenses, heat is added to the warm air, making it still warmer and causing it to rise still faster. And the

(Continued to page 120A)

*Benjamin ...
Les Plaines
H 77*

Four Fingers on Long Shaft Install Ceiling Light



Light fixture is thrust into hood and locked by bayonet coupling, then jaws are released by crank

By means of a long shaft with jaws that are adjustable by a crank at the bottom, ceiling light fixtures can be removed and replaced quickly. Globe and reflector as a unit slip into a ceiling socket. The bell-mouth hood and reflector are locked together by a three-point bayonet coupling, and both electrical and mechanical connections are made with engagement of the bayonet lock.

H 142 Rolling Shutters in Air Tower Guard Tunnel from Smoke

Rolling shutters of aluminum stand guard in the ventilation tower of the new Lincoln Tunnel at New York, ready to protect traffic in the tunnel from smoke in the event of a near-by fire. The tower was necessary to furnish a constant flow of fresh air throughout the tunnel. Its fresh-

*Kennel ...
731 ...
Covers ...*

air inlets are equipped with aluminum louvers and screens to prevent an inrush of snow, sleet, rain, birds or insects. There was danger, however, that the fans might suck in smoke if a fire broke out in the neighborhood, polluting air in the tunnel and causing suffocation or traffic accidents. The rolling doors were therefore installed so that they can be closed singly or in unison by electric buttons.

H 89 Punch for Opening Milk Cans Is Adapted to All Sizes

Sanitary and safe, a kitchen tool for punching holes in milk cans is adapted to cans of standard, tall or short size. It consists of a strong wire which has "steps" at intervals to hold cans of various sizes. At the top is a hook-shaped punch, which punctures the can when the handle is raised.



H 150 Flag Signals to Stop Irrigation When Water Raises Float

To save himself steps in irrigating his fields, a California farmer has devised an automatic signal that unfurls a flag when



Signal arm drops into horizontal position and flag unfurls when irrigation water raises its float

*William L. Jacobs
California*

*Beach Calif
1637 W. Cowley Blvd
H 1637 W. Cowley Blvd*

Mr. J. A. ...
921 Calaveras St.
Altadena, Calif.

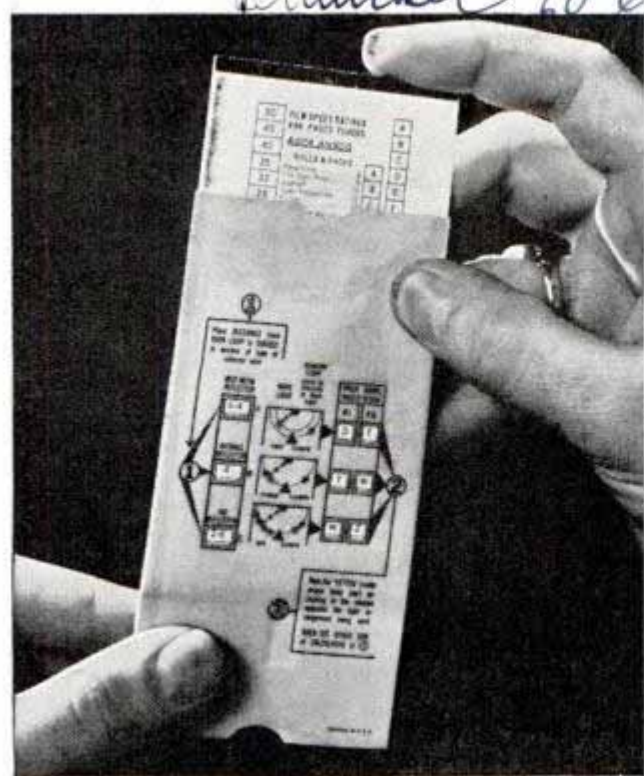
it is time to turn off the irrigation flow. Several of these signals are placed at the low ends of the fields to be irrigated. A hollow post, five feet tall, is mounted on a galvanized-iron box containing a copper float so arranged that when irrigation water reaches it and lifts the float an inch or so, a signal arm springs into horizontal position and the flag unfurls. The farmer, a half mile away, knows it is time to direct the water to another part of the field. The signal saves him the long walk down the field and back. At night a red light is used as a signal, operated by storage battery.

H/4.

Photography Calculator Gives Floodlamp Data

Inexpensive and easy to operate, a small calculator helps amateur or professional photographer take pictures under floodlamps. It shows properly balanced lighting and correct exposure, insuring the operator of good results. Diagrams on the calculator suggest arrangement of floodlamps.

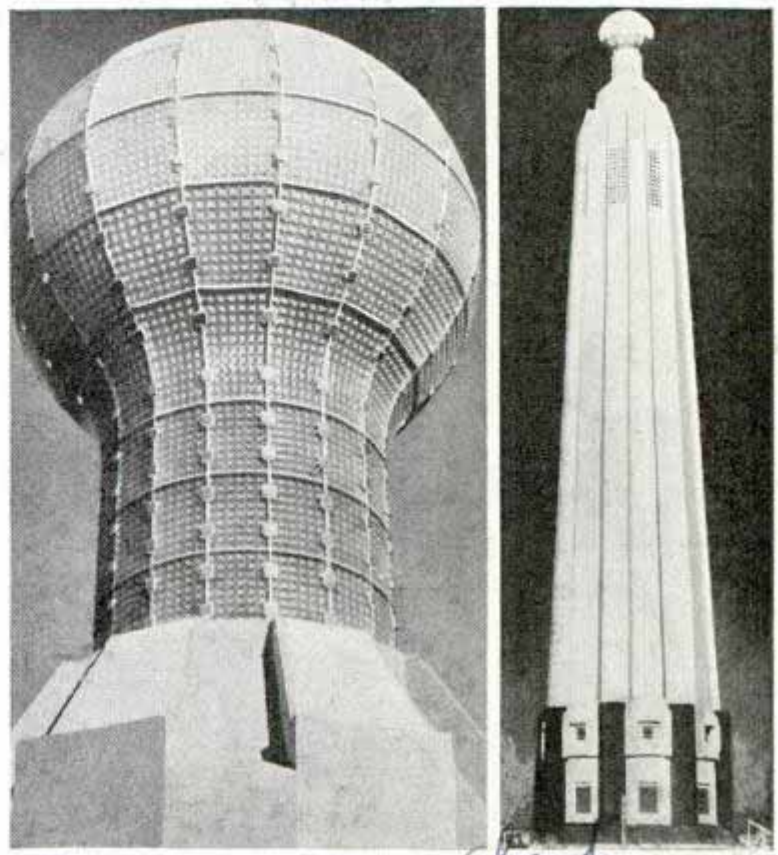
brancher 100



This handy calculator helps the amateur or professional take photoflood pictures

Mundel Electrical Co
- principal -

Giant Edison Memorial Tower Is Topped by Three-Ton Light



Left, close-up of giant lamp which will top Edison memorial. Right, view of the 131-foot memorial tower

Erected at the spot where the original laboratory of Thomas A. Edison stood when he invented the first practical incandescent electric light, a 131-foot memorial tower has been completed. It is surmounted by a giant electric-light bulb containing some 6,000 pounds of glass and 6,000 pounds of steel framework. Made in 153 pieces, the bulb is fourteen feet high.

H/191

Garden Hose Sold in Package with Hand-Slot for Carrying

Garden hose is being sold this year in a package designed both for attractive display purposes and for convenience, for it has a handhole in the center for carrying. The metal-edged container is so arranged that the hose can be inspected without damaging the package.



United States Rubber Products Co.
Inc., 1237 Buchanan St.,

#130
686

Tenderness of Peas Tested by Blade Linked to Dial



Testing peas for tenderness. Dial measures force required for knife to cut through sample of peas

To be sure that canned peas meet the standards required, a machine for testing their tenderness has been developed. The sample being tested is placed in a hopper, and as a blade cuts through them the needle indicates on a dial at the top the amount of force required to shear the peas. This measuring device is intended for use in canning factories.

advance, the instrument is set to correspond with these known weights, and constant check can then be kept of the center of gravity as fuel is consumed or cargo shifts position. The pilot consults the instrument before arranging distribution of new cargo at an intermediate stop.

#199

Straight-Knife for Cutting Cloth Follows Pattern Accurately

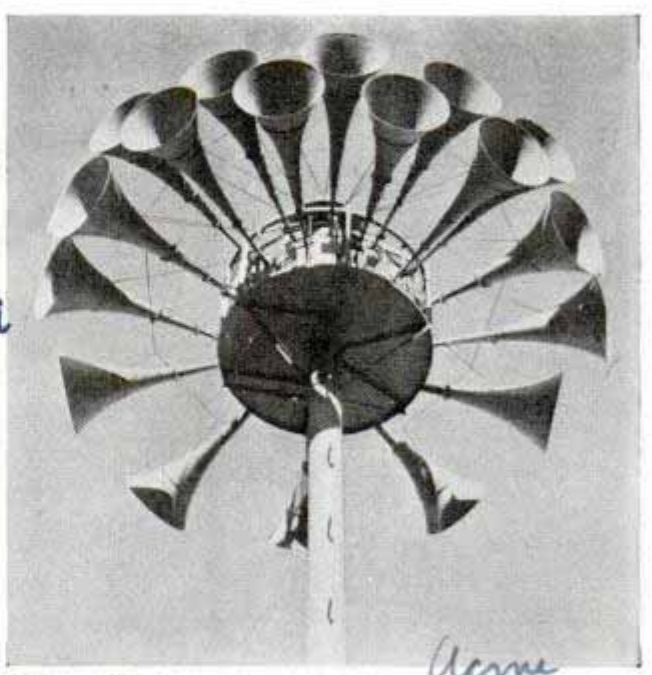
Highly accurate cutting, without leaving ragged edges, is achieved by a straight-knife cloth-cutting machine just introduced to the clothing industry. It is simply constructed and durable, with a guide lamp over the blade.



#164

Loudspeaker System at Track Announces Race Results

Results of races and other information for spectators at Santa Anita race track in California are announced with the aid of a system of loudspeakers. Several large public-address speakers, mounted on a vertical standard, carry the announcer's voice to every part of the track and stands.



This multiple-speaker system carries announcement to all parts of race course

Airplane Is "Weighed" in Flight to Tell if Cargo Balances

Continual watch on the balance of an airplane during flight can be kept by the crew by means of an instrument adopted recently by some leading air lines. Distribution of the express and passenger cargo and of the fuel load on long and short flights must be figured carefully to keep the big ships properly balanced throughout the trip. In using this balance computer, the empty weight of the plane and the weight of the crew are determined in

Libroscope Balance Computer

#140

Meredith Instrument Co. Hollywood, Calif.

80

Esophageal Dept. & Subvt. to
Aaron, Chas.
(Frank Petree, Public Relation Dept.)

PHOTOS TAKEN from BALLOONS help solve traffic tangles

Carl V. Bergstrom

LONG used as "eyes" of warring armies, the captive balloon is being drafted by traffic engineers to help solve their problems. At Milwaukee, Wis., during the last few months, experiments in the use of aerial photography have been conducted for the purpose of perfecting a new technique in obtaining traffic layouts of actual field conditions. The goal is to produce flat photographic scale layouts of intersections and traffic areas with the aid of pictures taken directly above the intersection. The equipment employed

body of Balloon

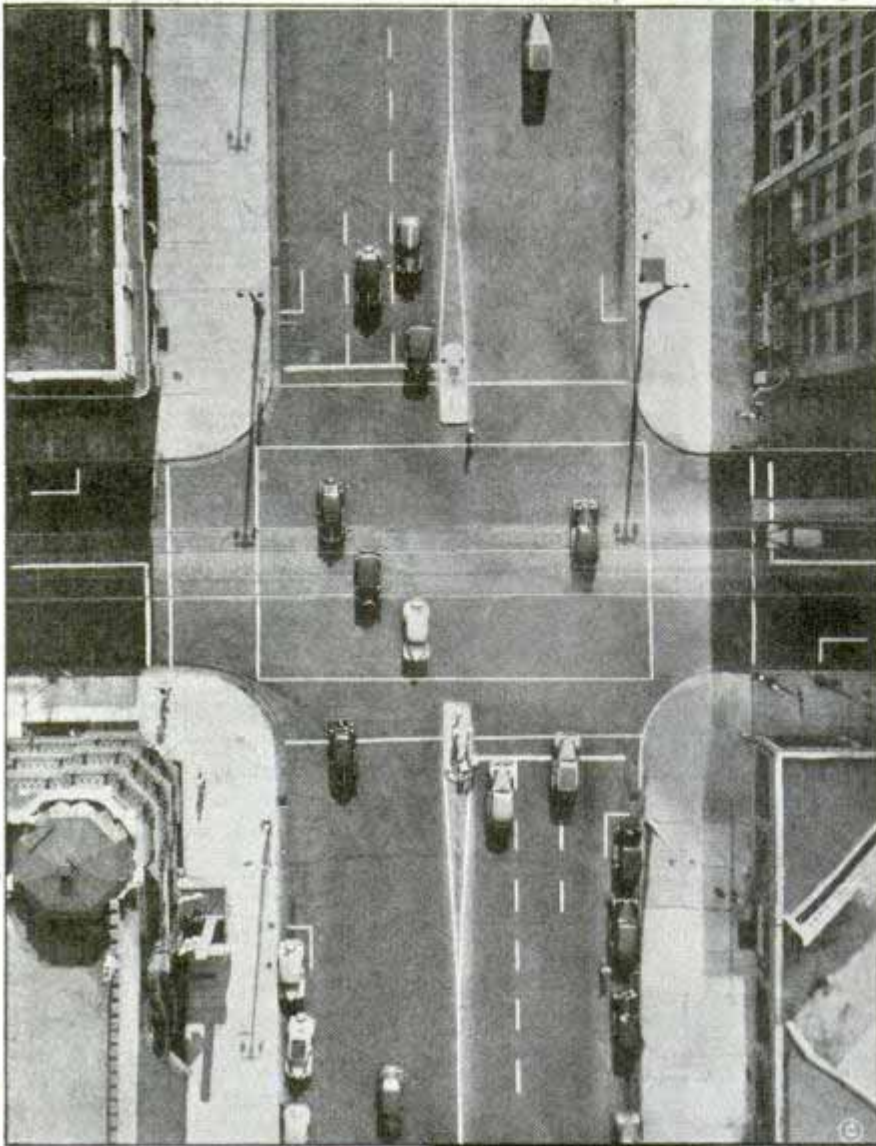


Cooperating with U.S. Army & Wisconsin County Highway Commission



is a captive balloon from which a camera is suspended. The balloon is positioned above the intersection by using a guy rope. By means of a push button in a battery circuit from the ground to a solenoid shutter release on the camera, the plate in the camera is exposed by remote control. Electrical impulses to the camera shutter are conveyed by the guy rope, which also is a two-conductor cable. The camera is so attached that its downward focus is assured while in flight. Best road coverage is obtained, according to Carl V. Bergstrom, traffic engineer, when the balloon is flown at a height of about 300 feet. The balloon can be operated under ordinary weather conditions with a wind velocity up to ten miles per hour. Used in the latest experiments is a camera, number 33A, five-by-seven view model, equipped with an anastigmatic lens of five and one-fourth

Milwaukee Journal photos
Top, adjusting camera before sending balloon aloft.
Bottom, balloon carrying camera above an intersection to take pictures



ment with auto and small trailer, take one picture every fifteen minutes, or thirty-two pictures in an eight-hour day. To make thirty-two drawing layouts, with which traffic studies previously were conducted, at considerably greater expense than that for which the balloon camera can be operated, would require the time of two draftsmen working ten to fifteen days. Plans in Milwaukee and Milwaukee county call for photographing all of the 100 active intersections in the county. A new camera is being designed to use a special wide angle lens which will give approximately a ninety-degree angle of coverage consistent with good definition. This camera will be equipped with a mo-

inch focal length and f.4.5 aperture rating. This lens normally covers a four-by-five area, but when used with a five-by-seven plate it acts as a wide angle lens, taking in more area. The shutter is operated at $\frac{1}{200}$ of a second to stop all camera and traffic movement. Twelve feet in diameter, the Goodyear-made balloon has a 900 cubic-foot hydrogen gas capacity. After deducting weight of camera and equipment, the balloon has a surplus lifting power of twenty-five pounds. Ground control equipment consists of batteries, button control for the camera shutter, a checking meter and a large reel for winding the balloon cable, all contained in a convenient box. Two men, handling the balloon and other equip-



Milwaukee Journal photo

Top, typical photo of street intersection clearly shows traffic conditions. Bottom, balloon attached to small trailer for easy transportation

tor-driven gyro to maintain vertical stability while in the air. This will act as a positive means of centering the picture on the negative. Traffic Engineer Bergstrom finds photographs made with the balloon camera quickly reveal potential hazards to motorists, enabling him to call for changes which will solve the problems by eliminating dangerous factors.

Taken at N. Third St. and W. Johnson St.

Man's Conquest of Air Dramatized in Pageant



On a stage at one end of an arena vast enough to exhibit four seaplanes and a sky liner, man's conquest of air was dramatized at the 1938 aviation show in Chicago. Blinking lights simulated motion pictures while dancers performed routines representing great moments of aviation, from feeble attempts in pre-motor centuries to flights of Wright, Bleriot and Lindbergh. Such events as Bleriot crossing the English Channel were dramatized by miniature planes gliding down a wire across the amphitheater

60.

Mr. Thomas O. Thomson Jr.
10555 Holman Ave.
Los Angeles, Calif

PUTTING the ATOM to

Ref: Dr. Sigvald Cooksey Radiation Laboratory U of California Berkeley



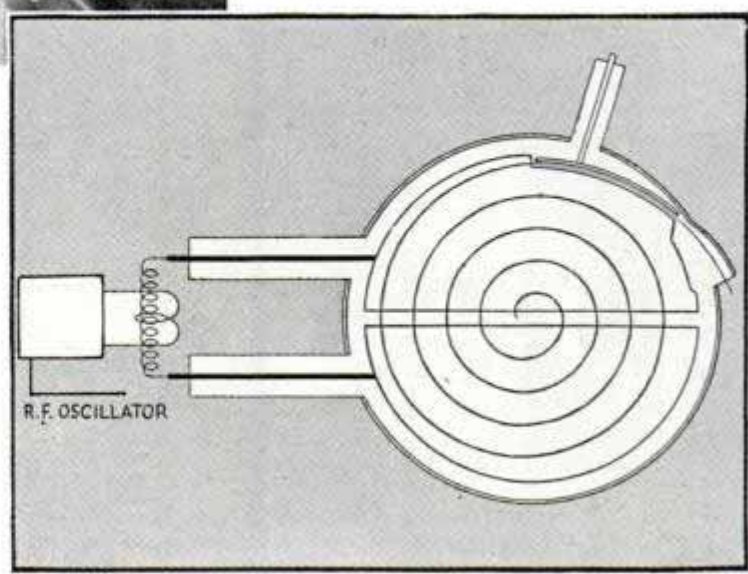
able to create synthetic radium and to produce temporary radioactivity in any element. In some cases these elements can then be used as radioactive food, providing "tracers" by which the transformations of food inside the body can be followed and studied. Such work may provide solutions to many of the puzzling questions that perplex biologists and doctors. Powerful new rays are being released that have far greater destructive power than X-rays. When some of these rays can be controlled it is possible that they will replace expensive radium in the treatment of disease. Actual transmutation of one element into another can be accomplished easily, although so far in only sub-microscopic quantities.

In the radiation laboratory of the University

FOR a long time man has been wondering whether he ever would be able to take the atom apart and harness its energies. Today, in a dozen laboratories, scientists are doing that, but the atomic power that they are releasing is not likely to perform the world's work. So far its usefulness seems to lie in other fields.

"Actually, smashing the atom is leading to things far more important to humanity than simply providing a convenient source of power," states one physicist. "It is becoming a valuable aid to biology and is providing powerful rays to study cancer and other ailments."

By juggling parts of atoms scientists are

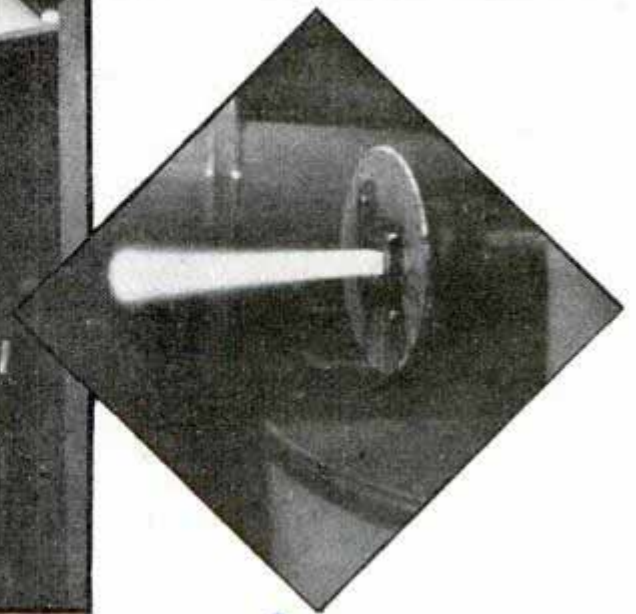
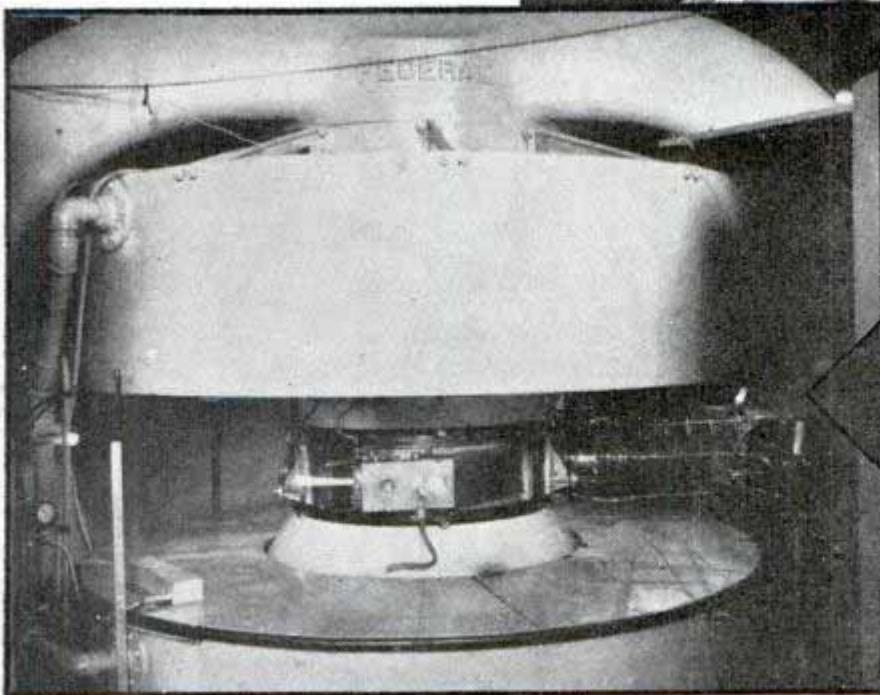


Top, cyclotron's vacuum chamber. Bottom, diagram of cyclotron, representing a cross section of the vacuum chamber which fits between poles of magnet

California Institute of Technology, Pasadena

WORK

of California at Berkeley, where Dr. Ernest Orlando Lawrence and his staff are exploring beyond the outskirts of knowledge, elaborate precautions have to be taken to prevent over-exposure to the invisible, lethal, and possibly unknown rays they are creating. The eighty-five ton atom-smashing cyclotron which Dr. Lawrence invented is literally submerged in a submarine vault. It is surrounded by walls of water three feet thick to stop or slow down the rays that it generates. Lead shields are almost useless. A thick roof of water above the cyclotron protects workers on the floor above from the effects of the rays, some of which are five times more powerful than



Top, half-million volt static machine being tested for transmutation of elements. Note hair of worker as he approaches machine. Bottom, cyclotron in action. Note beam at right



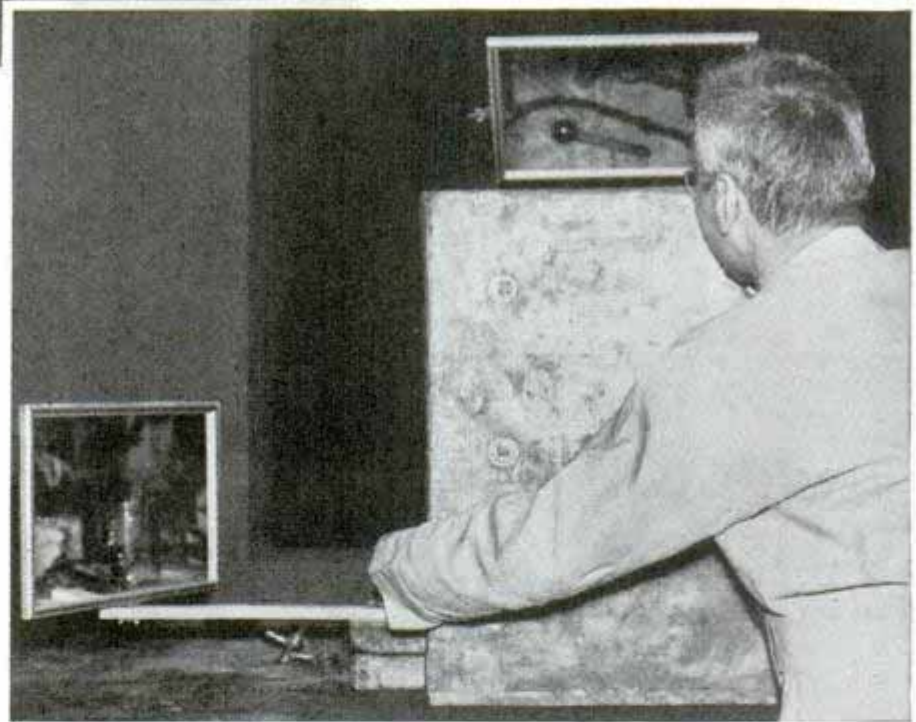
a reasonable explanation," one of the physicists says. "The largest atom is only .00000001 of an inch in diameter and many are much smaller. You can think of an atom as consisting of a nucleus made up of bundles of positive electricity, called protons, and a number of particles without any electrical charge called neutrons. Around this nucleus revolve electrons, tiny bits of negative electricity that balance the total positive charge of the nucleus. An atom is electrically stable."

One amazing thing about atomic physics is the results accomplished and the things scientists are able to do with atoms when the particles they deal with are so small as to be beyond human comprehension. If a baseball and an electron were to be simultaneously mag-

X-rays. Control panels of the machine have been moved sixty feet away and as a final precaution every member of the laboratory staff carries an electroscope in his pocket to measure his "daily dose" of rays.

When the cyclotron is operating, an eerie beam of blue light flames through the air from the small metal door of its snout. This radiance is created by the countless atomic particles that emanate from the machine and crash into air molecules at speeds of thousands of miles per second. The beam is a visual warning of the destructive forces that are present. Photographs of the weird display are made by standing outside the protecting wall of water and aiming the camera at a mirror placed in a window.

"So far, about all that we know concerning the atom might be called merely



Top, heavy lead case in which radioactive elements may be carried safely. Bottom, radiation worker protected behind heavy lead shield while he watches through mirrors to direct his hands in handling small quantity of salt made radioactive with cyclotron

nified until the baseball became as large as the earth, the electron still would be too small to be seen under a microscope.

A few years ago the atom was often compared to the solar system, with the electrons revolving like planets around the central nucleus. The more up-to-date idea

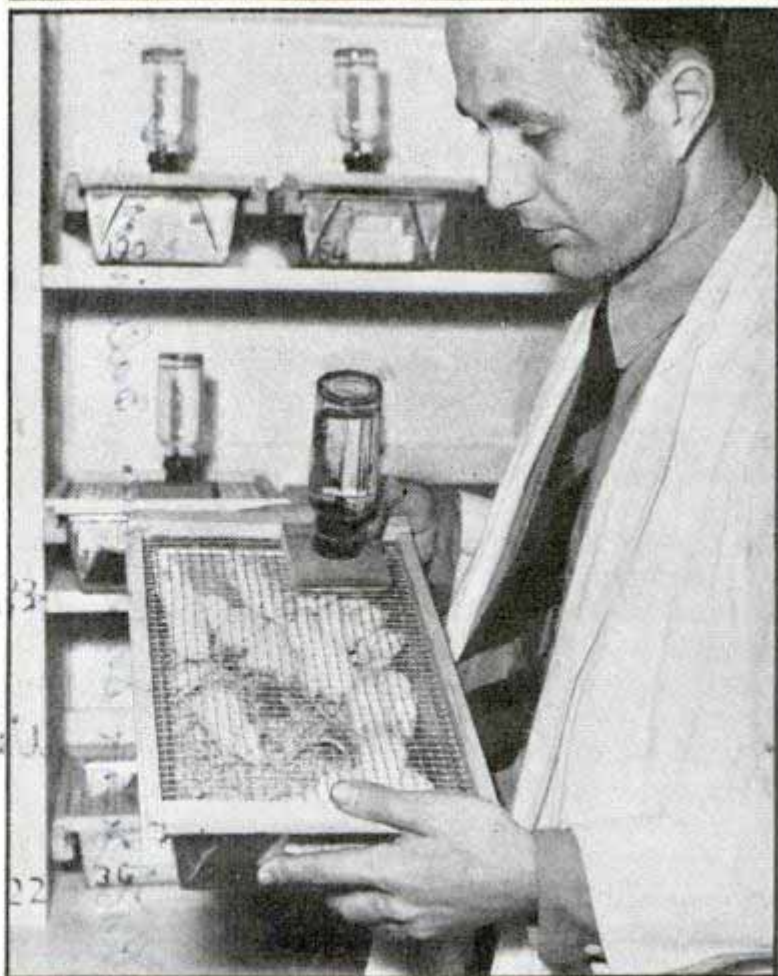
suggests a diffused orange-shaped cloud of electrons spinning about a pin point in the center that represents the nucleus.

The difference between an atom of one element and an atom of another lies in the mathematical combination of protons and neutrons in the nucleus. These, of course, are always balanced by the proper number of electrons outside. Hydrogen, the lightest element, has only one proton and no neutron in the nucleus, with a single electron spinning around it. Uranium, the heaviest basic element, has a nucleus consisting of ninety-two protons and 146 neutrons, balanced by ninety-two electrons.

The way to smash the atom is to unbalance the nucleus, either by breaking it apart or by making it over-weight. This is done by bombarding it with projectiles of the right size and speed. Protons, usually obtained by stripping the electrons from atoms of ordinary hydrogen gas, are one convenient type of bullet. Deuterons, nuclei of heavy hydrogen, are another. Any atom smashing machine is simply a device that creates these projectiles and gives them speed enough to smash into the cores of the atoms under bombardment. Such speeds are obtained by placing the missiles in an electrical field where the difference in potential gives them a high rate of motion. Tremendous speeds are necessary, and tremendous voltages are required for creating the high speeds.

Such speeds are necessary to overcome the effect of the mysterious "glue" that holds a stable atom together. If it were not for this atomic gravity, billions of times more powerful than the terrestrial gravity that we know, every element would break down into hydrogen. The world and the universe would become nothing more than a fog of hydrogen gas.

(Continued to page 116A)



Top, assembling new oscillator for cyclotron. Bottom, white mice used for experiments with radioactive elements

at Berkeley, Calif

Electric Piano Tutor Helps Novice Play Tune

Piano master Keymaster



Left, player roll lights chord on transparent keyboard attachable to any piano; below, it controls lights beneath plastic keys of piano itself. Ruby signal for pedal is seen on keyboard, left, and on player case below



With the guidance of an "electric teacher" just invented, even the beginner can play tunes and chords on a piano. This robot instructor consists of a keyboard beneath which are guide lights controlled by a paper roll similar to that of the conventional player piano. Its purpose is to quicken and hold the interest of the novice pianist by letting him play tunes, albeit slowly, at the outset instead of mere exercises; and to aid the teacher himself in illustrating fundamentals. Two types are being introduced; one comprising a dummy transparent keyboard that can be installed on any piano; the other is a constituent part of the piano itself, which has a keyboard of translucent plastic, with a tiny electric bulb under each of the fifty-six central keys. Virtually indestructible and flame-resistant, these plastic keys are ivory and blue; any color combination however, can be furnished to harmonize with modern decorative schemes. As the player roll winds slowly past a brass bar, tiny electric wires drop through slots in the paper to make contact and light the corresponding key. A tiny red light calls for the pedal. Speed is governed by a rheostat; the roll can be stopped at any point to study a chord or fingering, the proper fingering being indicated by num-

bers at the left of the paper roll, while words, if the selection is vocal, are printed at the right of the roll. The player mechanism plugs in on ordinary house current, and is easily removed when not in use. It is possible to transpose to higher or lower key simply by changing the position of a multiple contact switch which plugs in at the back of the piano.

Automatic Humidifier Control Stops Window Condensation

Windustal



Comfortable humidity in the house without condensation on the windows and outer walls is made possible by a control which can be installed in

18.00 for Baltimore and Central Ave.

Piano and Keymaster combined - story and Clark, 64 E. Jackson Blvd. Chicago. Portable Keymaster - Carl Rupp, Piano master blue 614 N. Carpenter St. D.C.

Whien P. Grey & Sons. Inc. Baltimore

Comp. 30 Rockefeller Plaza N.Y.C.

Reudas Acaden N.Y.C.

Esport - Reudas Acaden N.Y.C.

the window. In cold weather it is difficult to maintain indoor relative humidities of forty to fifty per cent without water running down the windows to the sills and even the walls and floor. The new window control, however, incorporates an element sensitive to high humidity; it detects a condition approaching condensation and automatically shuts off the humidifier unit until further moisture can be added without condensation occurring.

H 204
**Half-Size Propellers
Cut Plane Weight**

Twin propellers, mounted tandem eight inches apart and whirling in opposite directions on concentric shafts, may solve the problem put to aeronautical engineers by the constantly increasing size and power of aircraft motors. Today the largest army airplanes call for thirteen-foot propellers, and even larger and heavier blades would be necessary if motors progress further. By using the tandem propellers, however, their size could be cut in half, and this method is being tried by army engineers at Wright Field, Dayton. An Italian plane, the only tandem-propelled ship now flying, set the world's airplane speed record of 440.681 miles an hour in 1934. A difficult problem is the designing of concentric propeller shafts, one rotating inside the other.

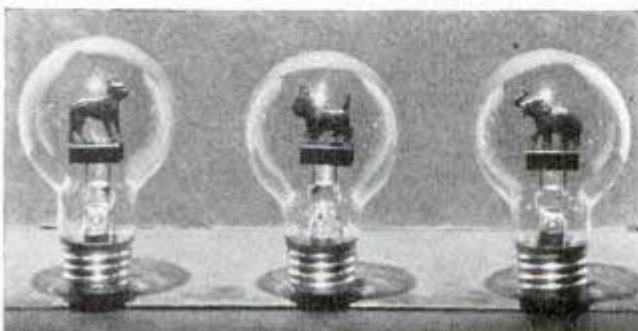
H 139
**Big Flag Painted on Ship Deck
Is Warning to Raiding Pilots**



Unusual photograph of British battleship, showing giant Union Jack painted on deck to warn airmen

To prevent Japanese and Chinese air raiders from making a mistake, a huge Union Jack has been painted on the deck of the British battleship "Cumberland." The ship has been operating in Chinese waters where craft of other nations have been attacked, by mistake, during the undeclared war.

H 137
"Cold Light" on Figure in Bulb Gives Varicolored Glow



Bulbs with small figures that glow in "cold light"

Operating on a new principle of electronic ionization of rare air vapors, a bulb now on the market employs "cold light" for novel effect. Inside the bulb is a molded figure of an animal, a person or a flower. When the bulb is switched on, the figure glows softly in various colors. Used primarily for decorative purposes or as a source of subdued illumination, the bulb is guaranteed for 2,000 hours.

Aerolux Corp. 653 11th Ave New York

Science & Invention 2/6/38

2906 E. 18th Kansas City, Mo.

A 177

What Happens in Rear Axle Is Revealed by Gauges



Apparatus in place to test rear axle's operation under driving condition loads

Twelve gauges measuring every possible deflection assumed by the parts in an automobile's rear axle under a given load constitute one laboratory test in the Chevrolet plant. A weight is hung on the end of the drive shaft, corresponding to a maximum load on the axle under actual driving conditions. All movements or deflections of the drive shaft, pinion and ring gears and axle shafts are then read on the gauges. This checkup results in better mounting of bearings to prolong axle life.

Vise Aids in Mounting Negatives in Lantern Slides



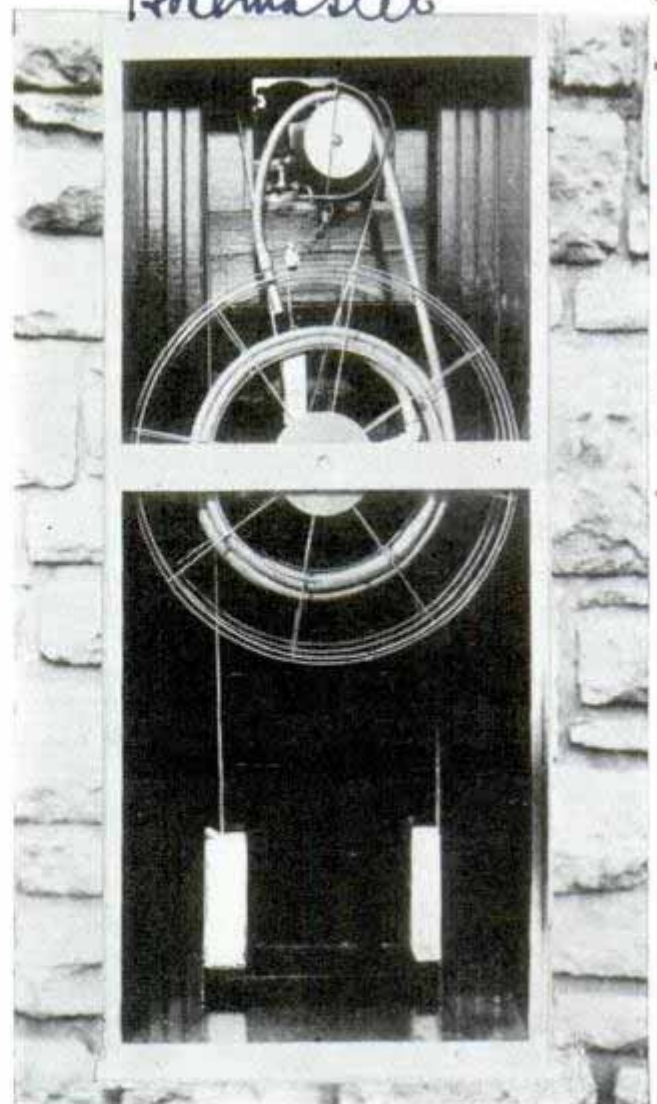
Designed for mounting lantern slides from photographic negatives, a new vise holds the slide tightly until released. By pressing a lever, the slides may be inserted or removed quickly. Short rubber feet

keep the vise in position on smooth or rough table surfaces. All sizes of slides can be handled by the tool.

A 151

Hose Housing in Basement Wall Has Opening to Outside

Equipped with a port opening to the outside, a garden hose housing may be built into the basement wall, thus making the hose available for inside or outside service. Pulleys make the hose easy to handle. A large pulley acts as an automatic stop, preventing the hose from reeling back. When the water is turned off, the automatic stop hook, accessible from inside or outside, is disengaged, permitting the hose to go back into its housing. The inside opening in the basement is two and one-half feet by six and one-half feet, while the outside port is twelve inches square. The housing is complete with frame, shut-off cock, plumbing pipes, reel and pulleys.



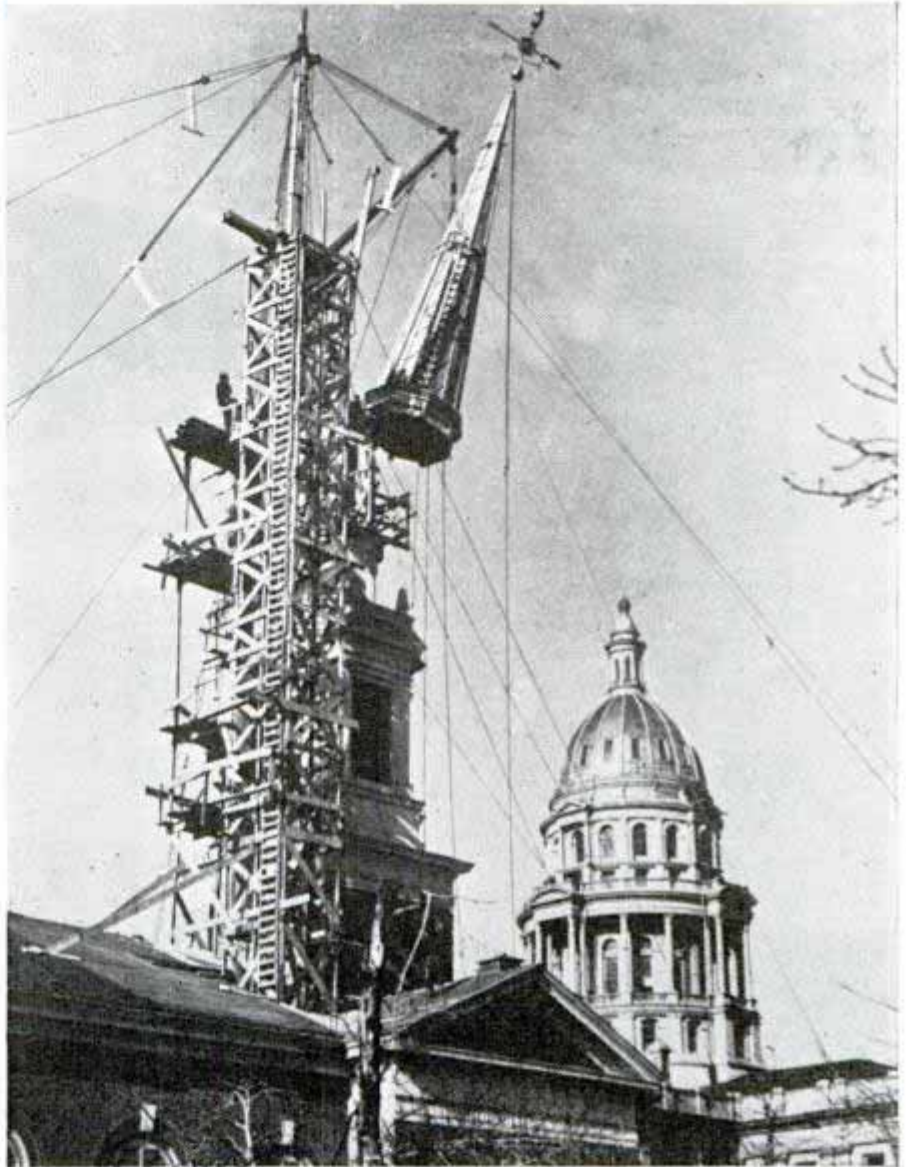
This is basement side of hose housing

Spindler & Sapppe, Inc. 3044 W. Grand Blvd. Detroit Mich. A 162 San Francisco Calif. 2101 E. Third St.

RE: 10/15/35

160-Foot Steeple Hoisted to Church Tower

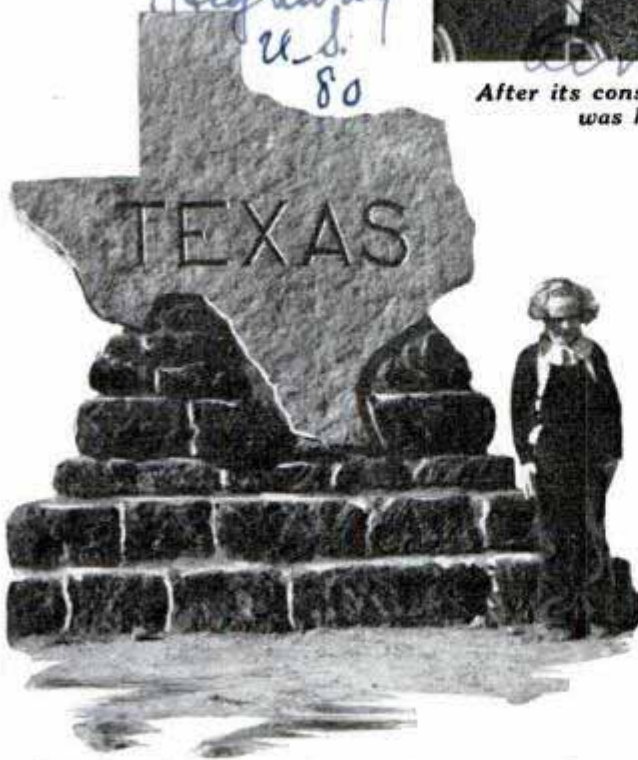
After being constructed on the ground, a 160-foot steeple for a Denver, Colo., church was raised into place by derrick. This procedure reduced the hazard of building the steeple high above the ground. Use of the derrick simplified the job of hoisting the spire to the top of the church.



After its construction on the ground, the steeple of a new church was hoisted to its place atop the building's tower

Granite Outline of State Marks Boundaries

Outlining the state's borders and with the state's name across it in large letters, a big granite block marks boundaries on all principal highways entering Texas. The granite block, shaped like the state, is set in solid masonry, heavy enough to resist vandalism. The markers replace wood-and-metal signposts.



State's outline in granite is shown mounted on permanent foundation

Home Transformer Adds Power to Operate Appliances

For homes receiving insufficient electrical power to operate refrigerators and other appliances, a power booster transformer is available. By plugging in the transformer to any convenient outlet, the unit permits selection of three different voltage taps. The taps, of 100, 115 or 125 volts, are selected by a convenient switch on top of the transformer.



Jefferson Electric Co
2012
d d l l

A 30.

Mr. James McQuerry
437 W. 60th Terrace
Kansas City, Mo

Life Saving INVENTIONS

Mine Safety Appliances Co
230 N. Broad Street
Pittsburgh Pa.

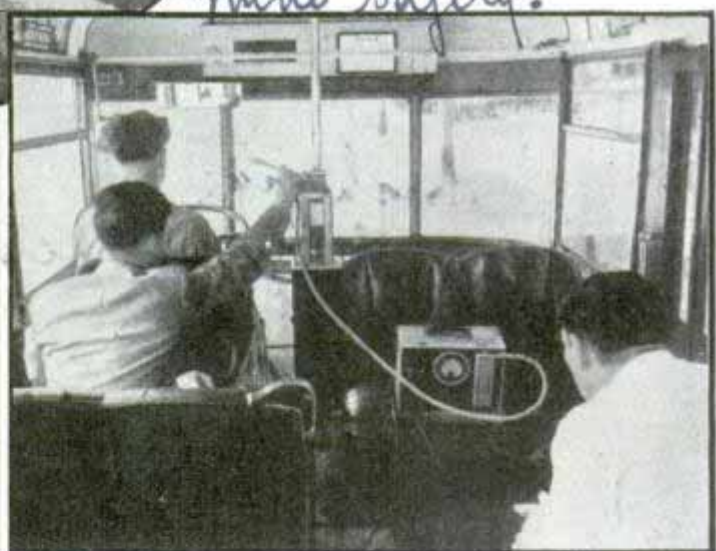


Top, worker with eyes protected by goggles. Bottom, left, using pocket-size gas indicator. Right, testing motor coach interior for carbon monoxide

Accidents considered an inevitable part of the construction business, steel mills, railroads or any other field. Business has found it profitable to tackle the causes of accidents and to anticipate them. Apart from its humanitarian aspects, safety is regarded as good business.

In 1920 the rail-

Mine Safety



WHEN America was growing up, it was regarded as certain that one workman would be killed for each million dollars worth of dam or bridge construction. Steel workers had their own adage: every time a trainload of steel left the mills, one employe went to the undertaker. Skyscrapers were figured at one life to a floor, and railroads frequently were estimated to have cost one fatality for every tie in a transcontinental route.

Times have changed. No longer are ac-

roads' bill for accidents hit \$215,000,000. Officials launched an intensive campaign to reduce accidents and by 1936, the dividends earned by this safety program in a single year amounted to \$162,253,971. Only \$53,000,000 was paid out in personal injury and damage claims in 1936, compared with \$215,000,000 in 1920. Safety devices, equipment and education have cost United States Steel company \$24,860,500 but in return the company has saved approximately \$117,000,000 in accident expenses.

Goggles. Wilson Products Co

PAY DIVIDENDS

Dr. of gin machinery apparatus # 38
 Mine Safety Affiliate
 Braddock Thomas and Meade
 Pittsburgh
 Pa



Top, rescue crew testing for carbon monoxide with special detector. Bottom, taking trash from mechanism of moving farm equipment is dangerous

A tractor company saved an eye every eight days on the average—an actual dollar-and-cent saving of \$90,000—by putting goggles on all workers engaged in grinding tasks. A large manufacturing company experienced the loss of sixty-three eyes within a short period before it became accident-conscious. For more than three years after their application of approved methods, only two eyes were lost. When a worker refuses or is careless about wearing his goggles, he generally changes his

mind when a foreman hands him a small package with a casual, "Here, buddy—you'll be needing this before long."

Upon opening the package he finds a glass eye and a small card which asks, "Would you swap one of yours for this?"

Likewise, work shoes with safety toes and other special features have achieved popularity for the same reason.

"Before we paid attention to work shoes," asserts the safety director of a motorcar company, "our cost per foot injury amounted to about \$125. We decided to give the special shoes a trial and by equipping ninety per cent of our men in this manner, we have reduced our cost per foot injury to approximately two dollars and fifteen cents."

The economy of this simple measure was brought home to the employes of a steel mill recently. One employe happened to



*William Products Inc
Reading Pa*

place a mill roll weighing 1,000 pounds on a board at the end of a lathe bed. The board had cleats on the under side and when the chain block was removed the board tipped upward causing the roll to fall on the worker's foot. Because his shoes had a steel box toe, his foot was uninjured.

That same day, a worker in the same mill dropped a brick on his foot and broke one of his toes. When asked why he wasn't wearing safety shoes, his reply was he couldn't afford them. Because of the injury he was off four weeks. Inasmuch as the compensation paid to an injured worker is seventy per cent of his weekly earnings, the man lost thirty per cent of his wages for four weeks, which, in this instance, amounted to \$26.88.

Thousands of persons have found a profitable career in this science of keeping people from killing themselves. Because of their work, 270,000 persons are working at their jobs instead of having been killed, that figure being based on the rate men and women were losing their lives in industry before the safety movement began.

There are many ramifications to the safety engineer's work. While one is showing a farmer the correct method of chopping wood another may be designing a guard or an automatic stopper for a machine to prevent its operator from feeding his fingers into its hungry knives or gears when he starts day-dreaming.

"Last month in Chicago," explained W. H. Cameron, one of the country's leading safety men, "a child was killed in the wringer of an electric washing machine. It was a death that should not have occurred because there was an invention last year which automatically stops the electric wringer when it clogs. We followed up on the case and as a result, the association of washing-machine manufacturers has announced that within a few months every machine will have an automatic stop device on it."



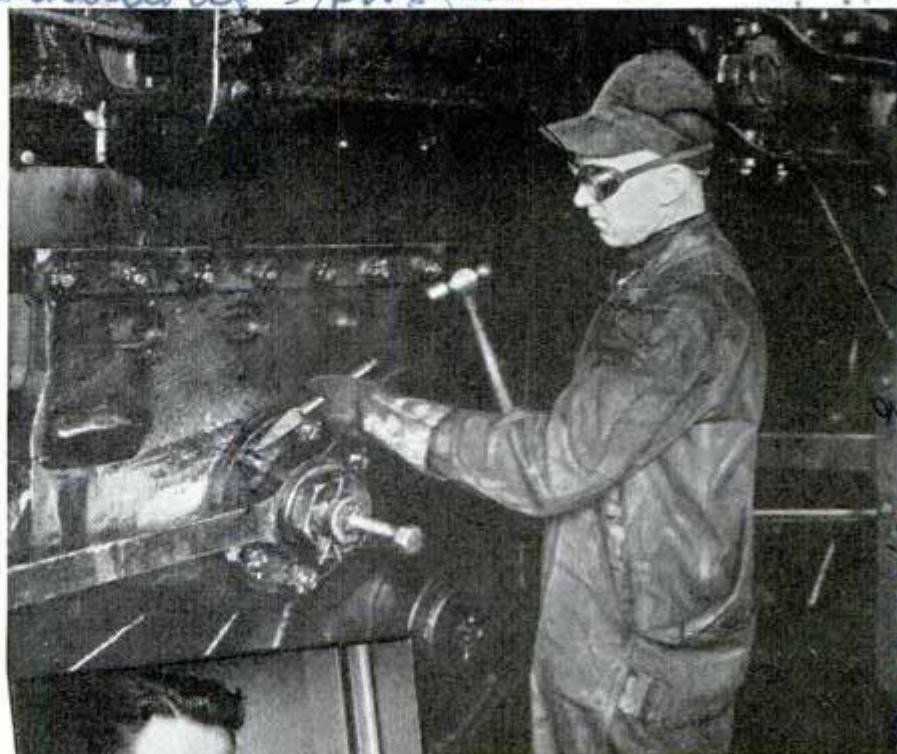
Top, latest type of sandblast helmet protects the worker's head without obstructing vision. Bottom, farm workers should stop the tractor before leaving the seat

Within the last few years, serious study has been given to the dust menace by these engineers. In the wood products industry, for example, dust was at one time looked upon simply as a nuisance that could be removed by broom and shovel methods when it began to cover up the tools. But the engineers found wood dust was a serious fire and explosion hazard and a threat to the workers' health. Many respiratory diseases were traced to the minute particles of wood, synthetic materials, and abra-

sives breathed into the lungs. The toxic properties of certain wood—generally of tropical origin—also have been recognized as a health hazard.

The prescription was ventilation, moving air to carry away the dust to a place of safety. This gave rise to another fire hazard however, as the ducts used to carry out the dust also carried the fire. Constant study has resulted in better equipment and more efficient methods.

Work on this problem has been intensified greatly since 1933 when public attention was directed to an industrial disease known as silicosis. Full realization of this disease's significance was manifested by a flood of claims in states providing workmen's compensation for silicosis and similar dust diseases and a large number of com-



mon-law actions in states not compensating for the disease. As a result, a major study of the disease was made and dust-control equipment and special respirators are being used to fight it.

The latest dust-control equipment not only guards the workers' health and saves machinery from the ravages of dust abrasion but also gives particular attention to removing from the atmosphere very fine dusts which have a commercial value. Some of the well-known products are: dry powdered chemicals, cement, ground-rock products, and dry powdered foods. The reclamation of these materials frequently pays the cost of the equipment in a short time.

Laboratory-made noses also have played a great part in cutting down the number of deaths and accidents in certain indus-

Top, eyes are saved in this manner. Center, sensitized paper being placed in mercury vapor detector. Bottom, testing tank car for combustible vapors

(Continued to page 152A)

Q 30 to Braden's Mine Safety Appliances Co.

Foundry Equipment Co. Meshipawah and

American

Applesauce Co. Braden's Mine and Meade, Pittsburgh Pa.

Folding Bathroom Scales Hangs on Wall or Door

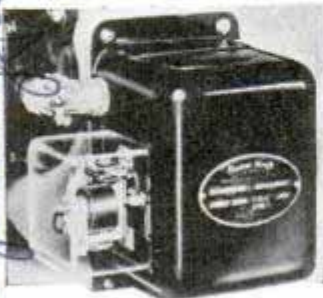
old A. Weigh



Top, scales in normal use. Bottom, folded and hanging on the bathroom door

Folded and hanging on door or wall, a small bathroom or dressing-room scales is ready for instant use. A slight outward pull frees it from the wall and unfolds it to rest on the floor, there to be used in the usual manner. Folding and restoring the scales to the wall occupies only a few seconds. Two screws hold the scales firmly on the wall or door.

Oil Burner Cut Off Instantly by Safety Control



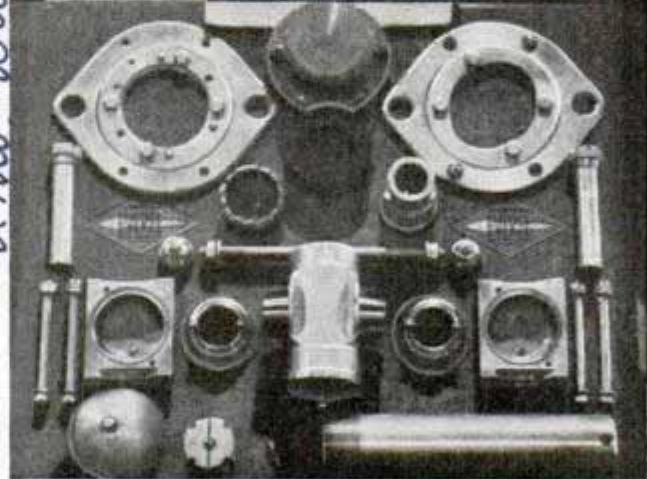
Among the latest safety devices for control of home heating plants is a device which shuts off the oil burner instantly in case of ignition failure.

This prevents the burner from continuing to pump oil into the combustion chamber after the flame has gone out. Most controls permit operation of one and one-half to three minutes after the flame stops. The

latest control is wired in with the transformer of the burner so that if the transformer fails, and hence the ignition fails, the current to the motor is shut off at once.

"One-Armed" Aircraft Propeller Varies Pitch Automatically

By adjusting its pitch constantly to the most efficient angle, a single-bladed propeller always delivers the maximum power at all speeds and under changing atmospheric conditions. Tests indicate that this "one-armed" propeller develops twenty-five per cent greater thrust in an air stream than the conventional two-blade "prop," and reduces vibration. Stub and blade are balanced. The mechanism in the hub permits the blade to swing forward and back; with the airplane standing still and the motor at top speed the blade inclines forward and pivots to the "low pitch" ideal for takeoff and climb. As the ship moves forward, centrifugal force in-



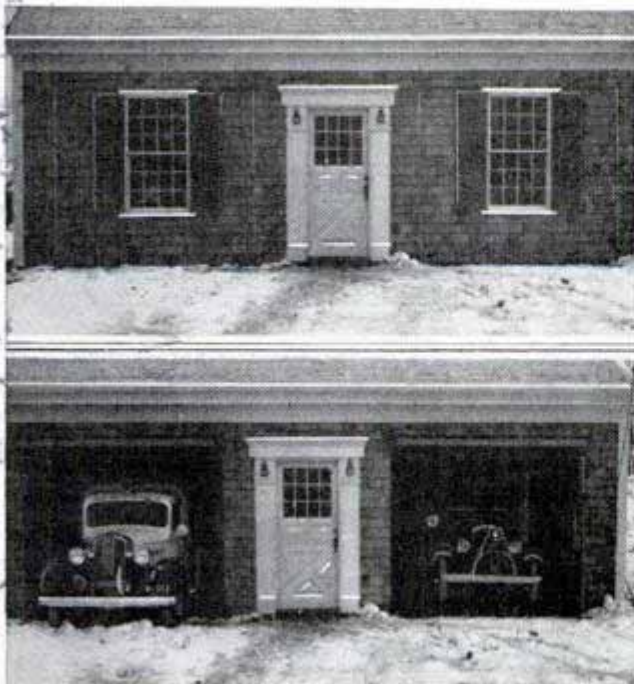
Top, variable pitch propeller with weighted stub balancing single blade; below, parts for mounting it

Handwritten notes in the left margin:
Harvey Whipple, due to...
469 E. Ohio
Chicago, Baltimore, Md
1008 Murray Bldg.
H 117
H 181
H 205
and Walter H. Gerts

clines the blade backward to right angles with the crankshaft, and at the same time the blade pivots to a higher pitch. The balance between centrifugal force and the air load always keeps the blade at the best pitch for the speed of the plane.

#145
'Cape Cod' Cottage Is Fire Station with Vanishing Doors

To the passerby, a Cape Cod cottage at Truro, Mass., appears to be a simple little home with shingled walls, shuttered windows and a white Colonial door with ship's lanterns. Appearances are deceptive. It's really the fire and ambulance station. When the alarm rings, two sections of the front wall, including the two windows and blinds, slide up and disappear under the eaves, leaving wide exits for the fire truck and ambulance.



Above, it seems to be a Cape Cod cottage. Below, the doors swing up and it proves to be a fire station

#179
Flaming Oil Well Is Tamed by Asbestos-Clad Firemen



Earth slide on far side of crater helped smother flames of this oil well. Observe the pressure in the jet of burning gas escaping from casing

La Blanca Oil fields
 It took three weeks of steady—and hot—work by asbestos-clad fire fighters to tame a blazing oil well in southern Hidalgo county, Tex. A slide of tons of dirt into the "crater" smothered the flames. The firemen had to straighten the surface casing and lay a concrete apron around it to hold it in place. The terrific pressure of burning gas escaping through the casing is indicated in the picture. The crater was flooded with water so that gas escaping at any point could be detected by the bubbles.

#220
Lighted Gauge for Mixing Paint Signals to Stop Pouring

When the matching of color samples requires exact measurement of paints, an illuminated gauge just put on the market is helpful. It measures the paint as it is added in the can. This gauge has a light inside it which appears to go out when the exact amount has been poured.



Cont. Jack Johnson, Sherwin-Williams Co. 101 Prospect Ave. Mass.

817 Main St

Cincinnati Ohio

Ironer Controlled by Elbow Leaves Both Hands Free



Table-top ironer, easily portable yet big enough to handle sheets, is operated by elbow touch on lever

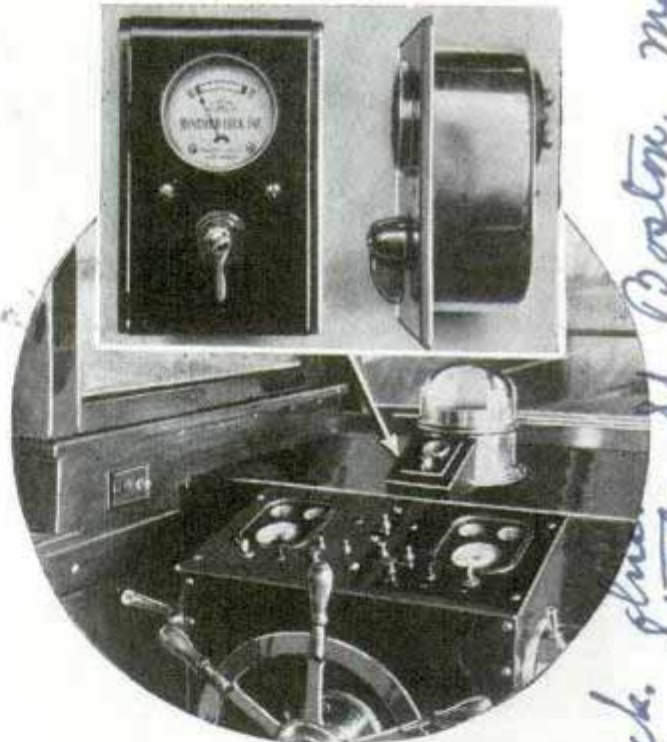
Operated by the touch of an elbow on a lever, a portable ironer just introduced leaves both hands free to guide the work. It is a table-top model weighing only twenty-three pounds, large enough to handle anything from handkerchiefs to sheets. When not in use this electric ironer stands on end, occupying only ten square inches on a closet shelf.

course measure and a course protractor. The calculator helps to determine the speed of a boat, the distance run or the time of the run, if the other two quantities are known. The course measure, used with standard charts, shows the length of straight or bent courses in nautical miles. The protractor is used for determination of course directions in either degrees or compass points. The navigation tool is made of heavy white celluloid and brass.

144

Synchronizer for Twin Motors Lessens Boat Vibration

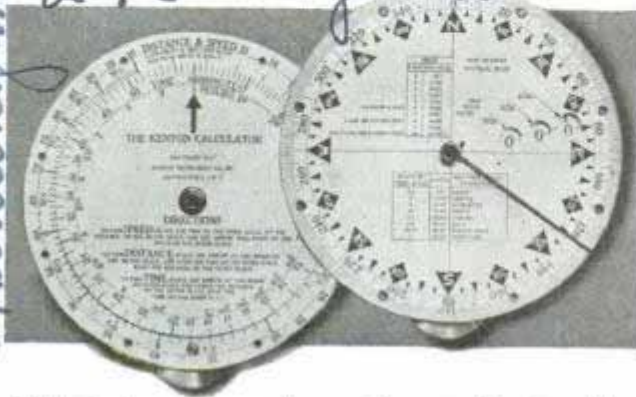
Decreased vibration is said to result from the use of a device which helps to establish and maintain rotational synchro-



Arrow points to synchronizer which controls boat motors. Inset, the synchronizer

Three-in-One Navigation Tool Fits into the Pocket

Small enough to fit into the pocket, a three-in-one navigation instrument is on the market. It consists of a calculator, a



This instrument, serving as three navigation aids, is handy for the yachtsman

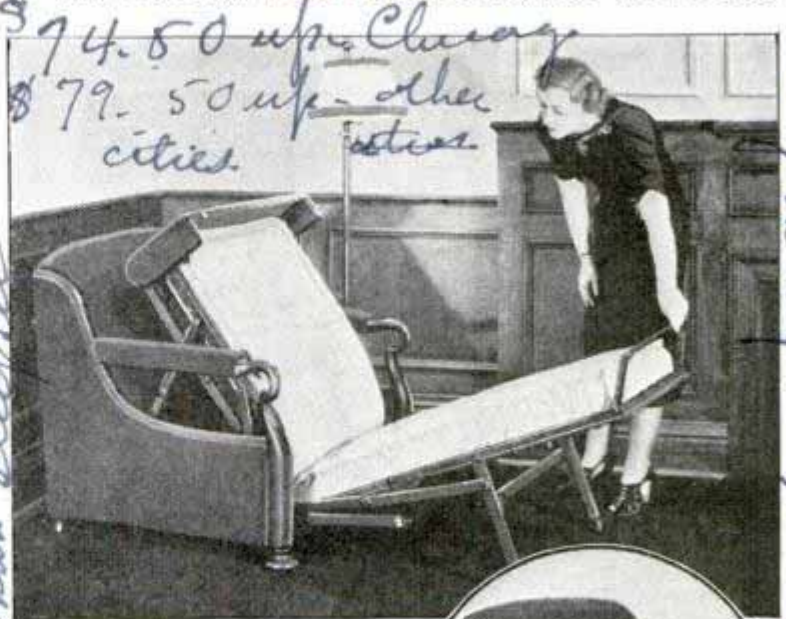
nism between two battery ignition motors. The device is handy on a cruiser or yacht equipped with twin motors. First, one engine is brought to the desired cruising speed by means of the throttle. Then the speed of the second engine is matched with that of the first. An indicator on the device's dial shows when the motors are synchronized. Then a switch is operated, locking the motors together, after which neither rough seas nor putting the helm over hard will disturb the balance. The synchronizer also may be used as an indicator of ignition trouble.

Kenyon Instrument Co. Inc. 273 New York Ave. Washington D.C.

Synchronizer - 131 State St. Boston, Mass

Living-Room Chair Is Convertible into a Bed

If the unexpected overnight guest drops in, the small home or apartment dweller need not be embarrassed by lack of beds. A chair recently placed on the market is convertible into a comfortable bed on short notice. Looking like a smartly styled living-room chair, it has concealed within its structure a bed which unfolds upon being pulled from its hiding place. A soft inner-spring mattress attached to the bed offers comfort to the guest. The mattress may be removed easily for cleaning or airing. The bed is full length and supported at proper height from the floor. Bedclothes of the standard size may be tucked in all around. A guard rail prevents pillows from falling off the bed. In use at night, none of the chair's upholstered parts, cushion, back and arms, is used as a part of the bed. Due to careful balancing, the bed is easy to open or close.



Top, unfolding the bed-chair. Bottom, ready for sleeping and (circle) for normal use as a comfortable chair

\$74.50 up Chicago
 \$79.50 up other cities

live back - live new york city. Ohio new york falls

Culman electric

practically full furniture stores

H-72

Expansion Joint for Concrete Takes Bumps Out of Road



Showing automobile about to pass over expansion joint that makes riding easy

Mercell Expansion Joint

Suitable for sidewalks, retainer walls, loading platforms, airport hangars and runways and other large concrete areas, a non-extruding joint filler is available for the builder. It eliminates the unpleasant bumps so often experienced when a car is driven on highways over ordinary asphalt joints which have extruded under the pressure of expanding concrete. The joint filler is made of cane fiber impregnated with a durable asphalt by a patented process which coats all the fibers for necessary moisture protection, but leaves their cellular character practically unchanged. The fact that the filler re-expands when compression is relieved, coupled with its bond to concrete, eliminates cracks and the necessity for refilling the joints each season.

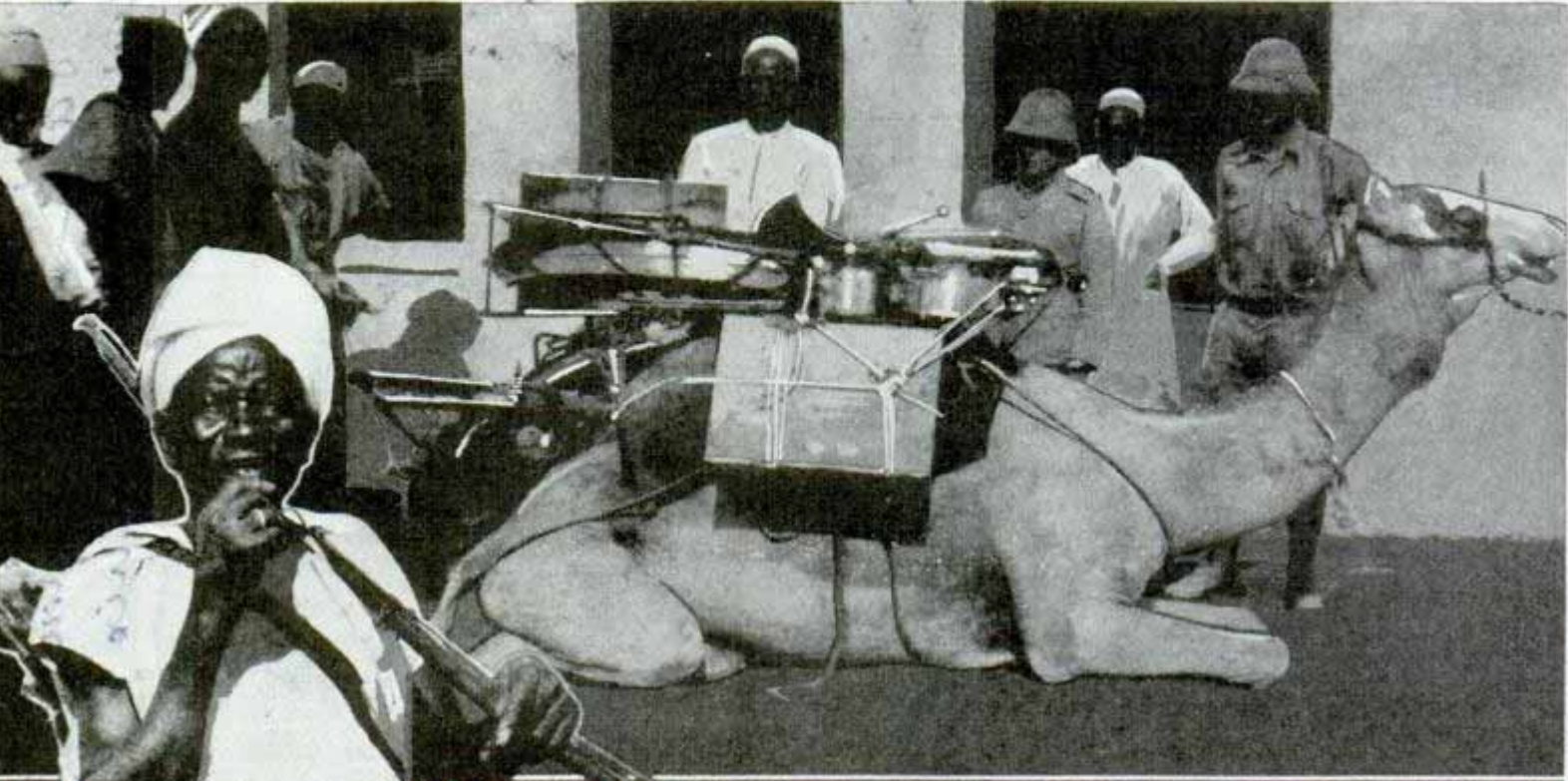
Carbon monoxide can be detected in caissons and similar enclosures by its action on a tomato plant, which is wilted in a minute or two by this gas.

Celotes Corp, 919 1/2
 2nd Ave

National Safety Council
 20 N Wacker Drive

es 1084

ACROSS AFRICA



Top, at Rig-Rig, almost out of gas, the adventurers loaded one motorcycle on a camel and hauled it ninety miles. Left, a pilgrim bound for Mecca

2 load

PART III

2340 By James C. Wilson

Laurel St. Denver, Colo

IT LOOKED as if the Flood-Wilson Trans-African expedition was bushed. Thirty-six hours without water under the Sahara sun—and lost. Too weak to push on, we had laid down in the scanty shade of our motorcycles. We told each other someone surely would come along. But we knew it wasn't so. We were miles off the caravan trail.

Desperately thirsty, we suddenly thought of our acetylene generators! Feverishly we unscrewed the lids of the water reservoirs. There was half a pint altogether—stale, tainted stuff, but it would sustain life, perhaps for twenty-four hours. We allotted ourselves one swallow apiece to last till morning.

A solitary jackal appeared out of a clump of bushes and sniffed the air. Many times, camped beside a water hole, we had seen the little dogs of the desert trotting in at dusk to drink. Jackals trotting down to a water hole to drink at dusk! It was now five o'clock. Maybe, if a fellow could hold out, and had luck—

We drew straws to see who would go.

"You take the water, Jim" said Flood. "I'll get along." Bloodshot eyes, parched lips—he looked like a haggard

251084

on ONE LUNG

Top, when the motorcyclists reached the fort at Mao they looked like this. Bottom, creaking water wheels along the Nile



ghost. For two hours I stalked that jackal. The sun went down. The jackal was now only a faint gray blur. Up over a low saddle I followed to the rim of the next cuvette. And there in the bottom was a stinking little pool! I scraped off the scum of algae and dead insects and lowered my canteen. Exultantly I staggered back to camp. We strained it, settled it with alum, and made tea. It was the rottenest tea we

ever tasted, but it saved our lives. Back on the trail again, we dropped down through a series of bluffs and dunes into a scorching little valley, found the ground covered with huge thorns, and before we could stop, had punctured all six tires. Luckily there was a village near by. While friendly tribesmen pulled out the thorns, we got a tanned antelope hide from the village leather worker, cut it into strips



and installed it as puncture-proof linings in all six casings. No more flats.

The story of mankind in north central Africa is the story of a never-ending search for water—water for the thirsty herds, the parched and shriveled crops, for man himself. We camped with herdsmen who watered their cattle and drove them out to pasture on the first day, pastured them the second, and drove them back to water on the third. For two months, their cattle didn't drink at all! They ate the wild watermelons that grow like big green basketballs out of the sand.

When we reached the fort of Rig-Rig, ninety miles from Mao, we were two tattered, bleary scarecrows, but the little Corsican commandant welcomed us. The first white men he had seen



for seven months. Flood's piston pin, which had burned out from lack of oil, was pounding like a riveting hammer, and we were almost out of gas. How to get to Mao?

"I have eet!" exclaimed the commandant. "We will load M'sieur Flood on one camel and his motorcycle on another, and you shall drive your machine until ze petrol is finish' and zen you shall have a motor zat eat grass—a horse."

First we had to make a harness out of antelope hide. Then we had to break the horse. For two days we plodded up and down those dunes, teaching my emergency motor to pull its load. The trip to Mao was no fun for Flood. He was seasick all the way. The camel wasn't properly designed, he claimed. Twelve miles from Mao my gas gave out and I hooked onto my horse.

Mao was typical of those French forts across the southern fringe of the Sa-



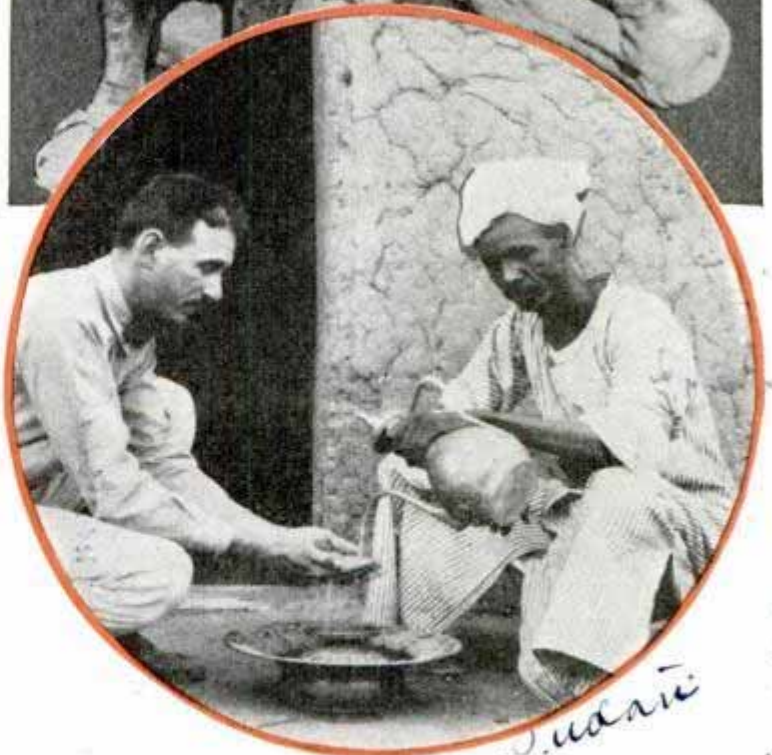
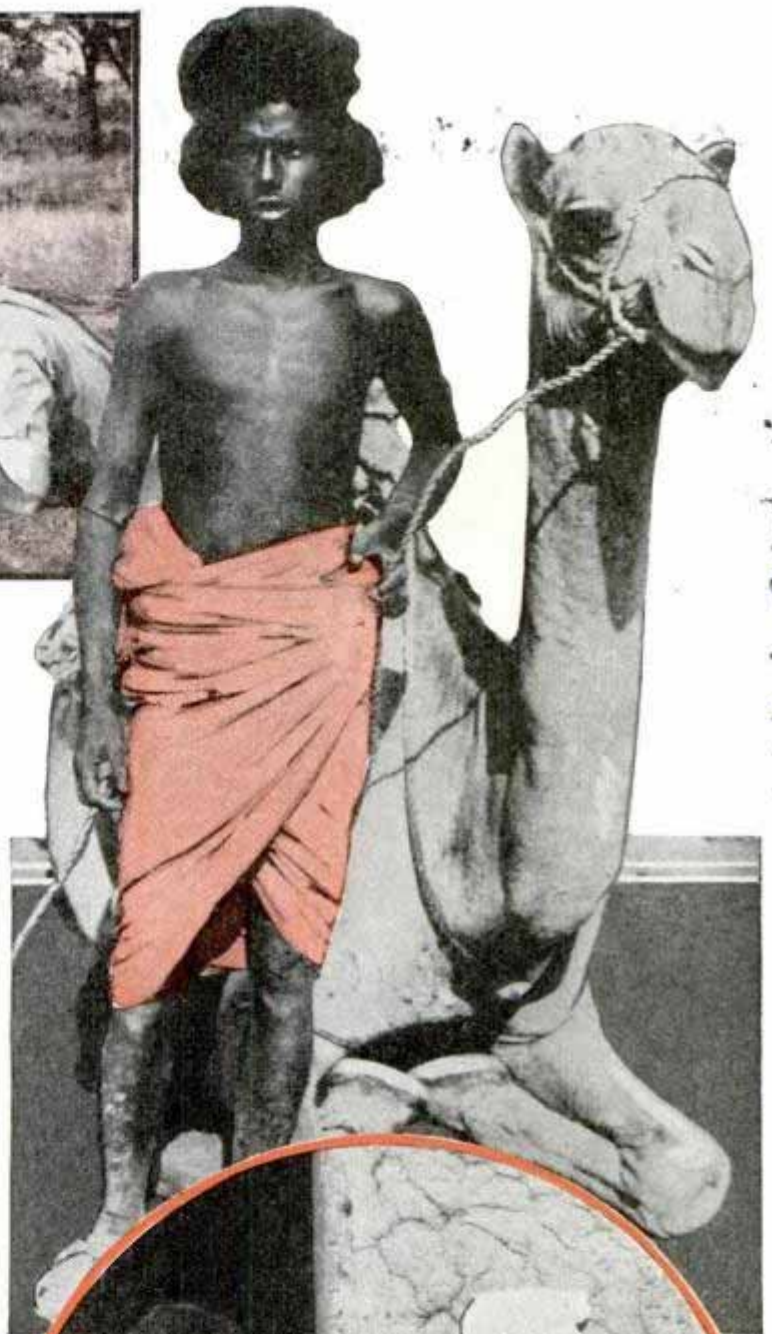
Top, Arabs at one of the three wells between Khartoum and Kassala. Center, Hausa girl spinning cotton. Bottom, time out for repairs at rest house in French Equatorial Africa



hara. A square-cut crown of grim clay battlements, often several acres in extent, rising out of a mountain of gray sand. Always a village in the cuvette at the bottom, and the village millet and cotton patches, wells, spreading palms and paw paw trees, and the fort garden. Here in these far-off outposts of the white man's authority in the Sudan lives one Frenchman, or perhaps two or three, commanding a battalion of native soldiery and serving as administrator over a territory of several thousand square miles. Except for articles of native manufacture, everything in the fort at Mao, including the primitive spark radio transmitter and gasoline to power the engine, had been brought up twelve days by river steamer, five days by motor truck, and forty-five days by camel to get it there. The French government had agreed to let us have what gas we needed, at cost. We picked up forty gallons and wrote our check for \$140.

Now, what about a wristpin bearing to fix Flood's engine? The radio operator had several extra bushings, but none the right size. But he had junk boxes. In the last one, I discovered a heavy bronze pipe, half buried in greasy dirt. The inside diameter was too small, but the radio operator had a rattail file, so I soon fixed that. We heated the top of the connecting rod, forced out

(Continued to page 130A)



Top, improvised blacksmith shop for repairing the bikes. Center, a "Fuzzy-Wuzzy" from Red Sea hills. Bottom, guests of a Sudanese sheik

2/10/38

Plastic Letters for Titling Have Lasting Adhesive Back

also at photo supply houses



Spell-o-Tex
These plastic block letters can be used indefinitely for movie titling, for their adhesive backing does not wear out

Interchangeable plastic letters that will stick to any smooth surface are the latest thing for titling movie films. They are deep-cut block letters backed by an adhesive that never wears out, so that they can be removed or changed about readily yet hold their position while being photographed. They are used also for merchants' counter and window display signs. Striking effects can be produced by side-lighting the thick letters or mounting them on glass with back-lighting.

"Barrel Roll" of Surface Water Caused by Cooling Wind

Have you ever noticed, on an ocean voyage, long parallel streaks of floating seaweed pointing in the direction of the wind with spaces of clear water between them? Dr. Irving Langmuir, Nobel prize winner, observed this phenomenon and theorized that the seaweed was carried to its position by cross-wind currents on the surface. Later he experimented, and found that wind causes the formation of invisible, slow-turning rollers that extend

downward for several feet, their long axes parallel to the direction of the wind. They turn in opposite directions, one roller to the right, its neighbor to the left, with a corkscrew or "helical" motion. This, Dr. Langmuir believes, results from the wind cooling the surface water and causing it to sink as water rises to the surface. In observing this rolling motion Dr. Langmuir set afloat dyes, oil, white strings supported with corks and umbrellas with lamp bulbs as floats, and watched their movement in the water.

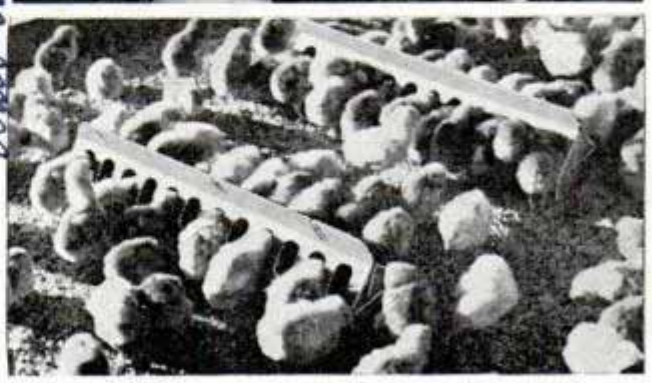
H-25

Paper Chick-Feeding Tray Is Inexpensive and Clean

Costing much less than a metal feeder, a cardboard feeding tray for chicks promotes healthy broods because it is sanitary and can be replaced as frequently as desired. Folded flat for shipping, it is printed on an ordinary printing press and lends itself to advertising by hatcheries and feed dealers. Each brood can be started on new, uncontaminated trays which last until larger equipment is needed. When set up, the trays are held together by paper clips.



5 cent each



Shipped flat, the cardboard pattern folds easily into feeding tray, held in shape by paper clips

*Besbee Product Corp.
Inventory 7 of*

*General Electric Co.
Schemelady - 212*

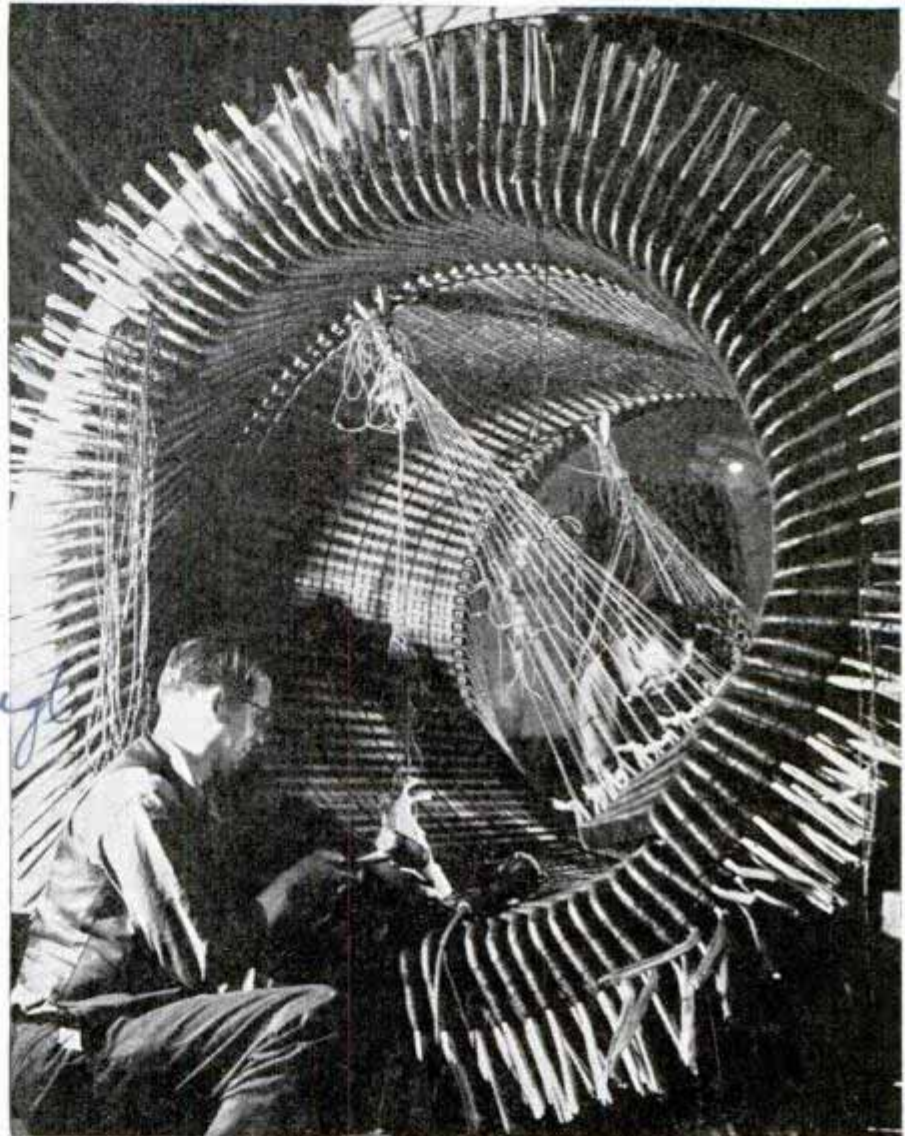
Universal

*General Electric
Co. Inc. 200*

Fitting Coils in Big Condenser Is Expert's Job

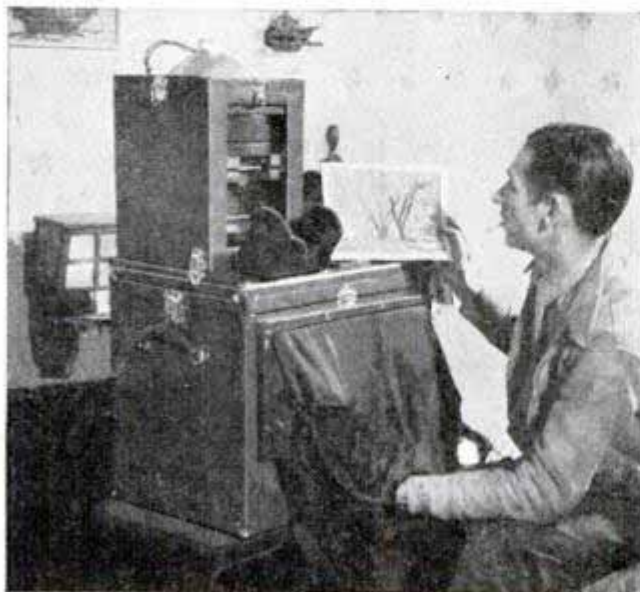
Calling for the hand of skilled operators is the task of fitting insulated copper coils in the grooves of an armature of a giant condenser. This job is called "putting in the throw." Just recently a photographer caught the experts at work on a 13,200-volt, 7,500 kilo-volt-ampere synchronous condenser being built by the Westinghouse Electric and Manufacturing company. A condenser of this type can be used to control the power factor or regulate the voltage on a power line.

*E. Pillsbury
Pa.*



Right, expert workmen fitting insulated copper coils into the grooves of a giant condenser's armature. The craftsmen call this job "putting in the throw"

A 'Suitcase' Photo Darkroom Includes Enlarging Camera

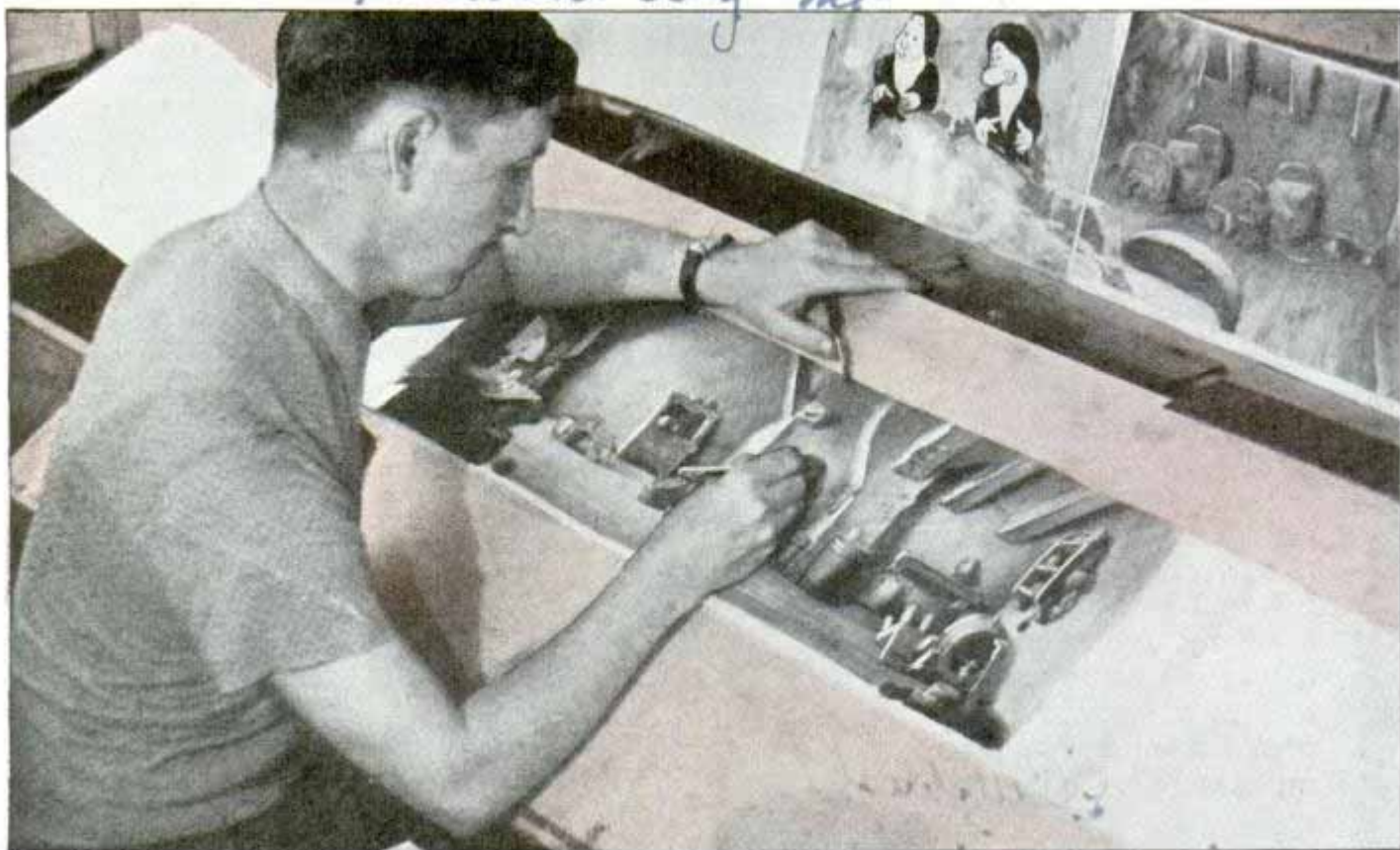


Photographer examining an enlargement he has made in portable darkroom set up in his hotel room

In a compact carrying case not much larger than a suitcase, a news cameraman has built a darkroom for developing and even enlarging his pictures on the road. The entire outfit weighs about twenty-five pounds, and holds tanks for developing cut film up to the five-by-seven size. The enlarging camera accommodates negatives as large as five by seven, and makes enlargements up to eight by ten. Handy for any photographer on vacation or business trip, it enables a news cameraman to develop and print his pictures in the field or in an automobile, in hotel room or trailer, for the power line can be cut into an automobile circuit or other supply. The parts are telescopic and fit into a case twenty by eighteen by fifteen inches.

*Chas. C. Belin, Oklahoma
2143 N. 11th St. P.O. Box*

2/11/50 Mr. James M. Schreyer
431 W. 60th Terrace
Kansas City, Mo.



LATEST TRICKS *of the*

By William E. Garity

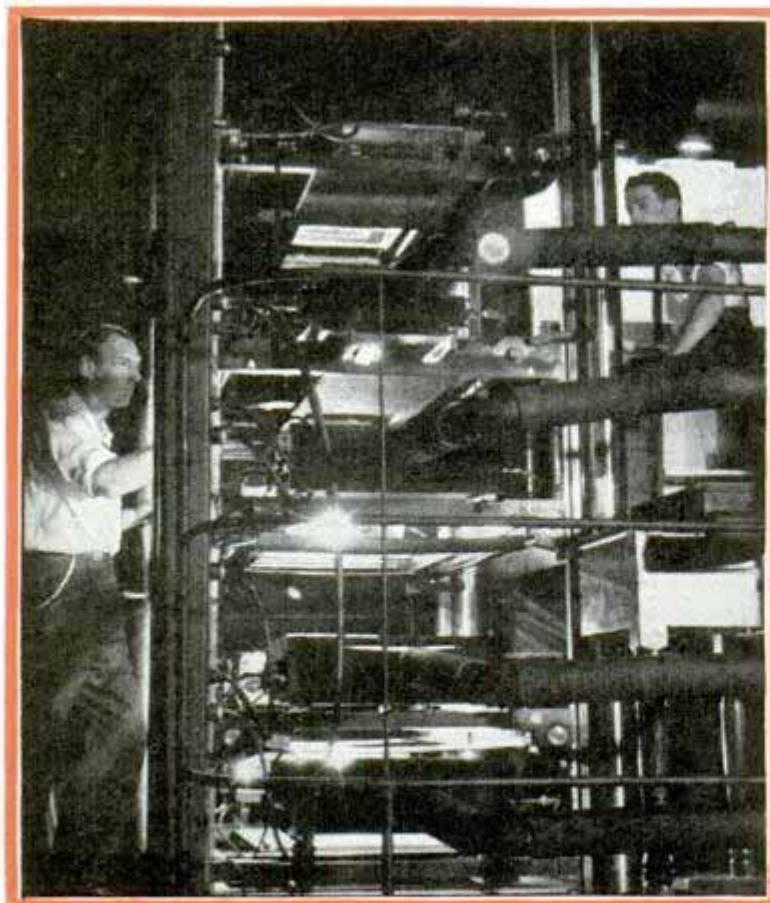
Production Manager, Walt Disney Studios

A NEW technique in film animation has been developed in the production of Hollywood's first full-length color cartoon.

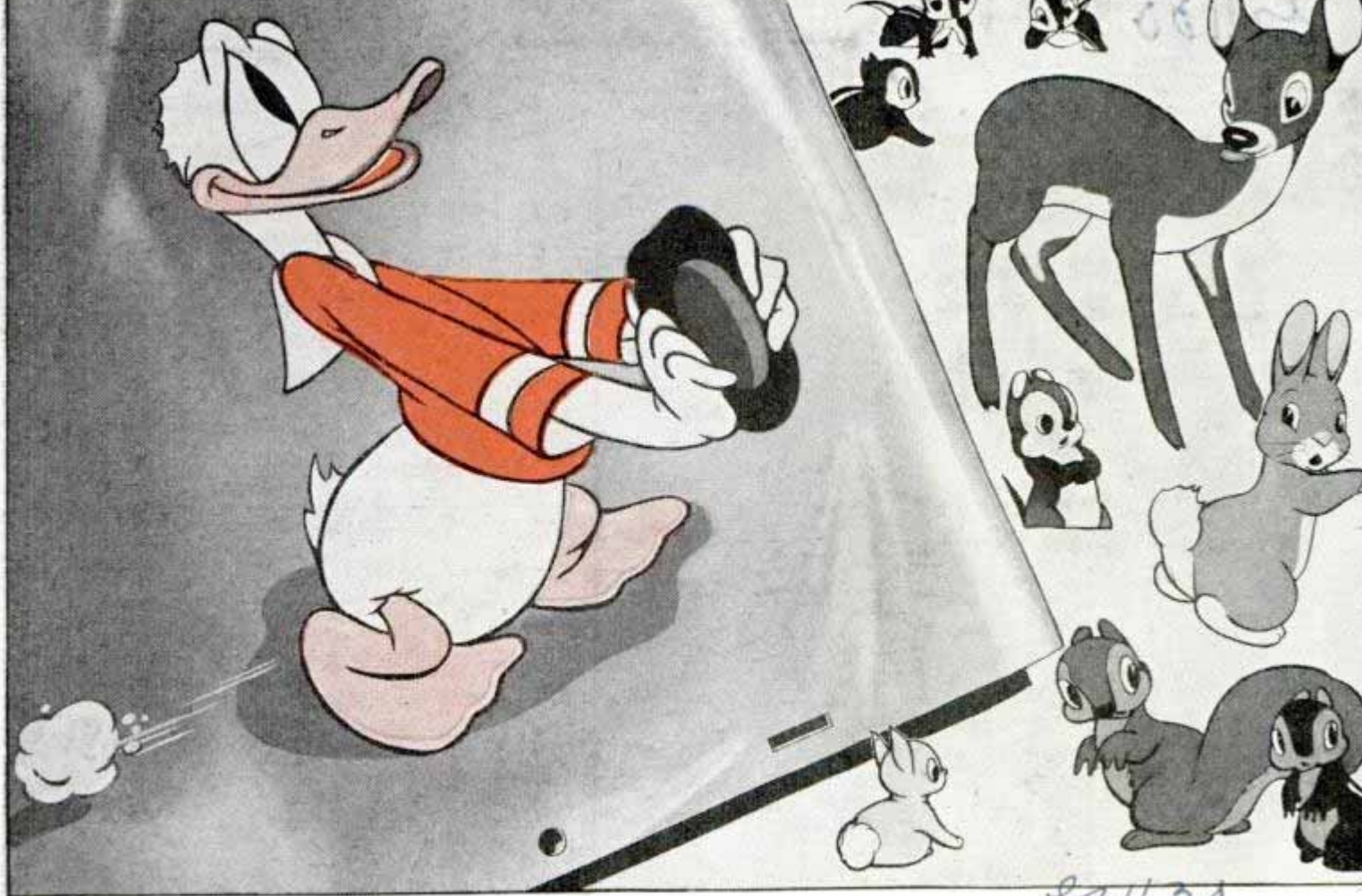
For nearly three years, writers, artists, musicians, sound-effects men and technicians have been at work on a million-dollar investment in movie making that combines the quaint delightfulness of imaginary characters with real story and production values.

This picture embodies many new animation principles, in fact, the technique employed in the making of this fantasy may modify our branch of the industry as greatly as did the invention of sound and color.

Our new background treatment makes possible the dream of every motion-picture producer: the illusion of a three-dimensional effect. Backgrounds, as you prob-



*Top, artist working on background used in animated film.
Bottom, special camera for filming multiplane backgrounds
to give three-dimensional effect*



ANIMATED FILM *Makers*

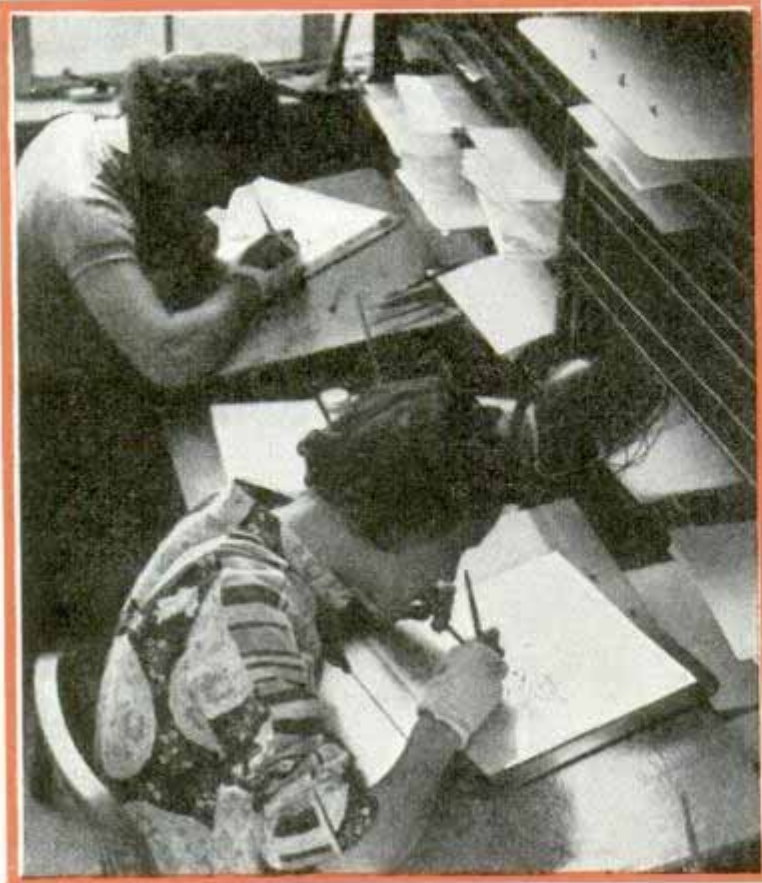
ably know, are made separately from the figures which supply the action. They correspond to the sets erected on the sound stages of the regular studios. Under the new plan, these backgrounds are constructed on a multiplane principle and photographed with the characters, which are still being drawn on flat surfaces. With soft focus lens and special controlled lighting effects on each of the background levels, which are physically set apart from one another, we have given scenes a depth that is three dimensional in effect. A camera, costing more than \$75,000 to build, is required for this work.

In filming a scene of a cabin in the valley, for example, we have a cardboard strip that represents the immediate foreground; a short distance under it is another strip for the foreground in which the cabin is shown and, perhaps, the place where the action takes place; back of this another card for the middle distances showing the trees and foothills, and lastly, the background proper on which appear the far-away mountains and the sky.

The multiplane background has given us



Top, drawing of Donald Duck and some of the animal characters that appear in "Snow White and the Seven Dwarfs." Bottom, film animator



a number of production aids. We can obtain special effects by using lights and filters behind each of these levels. Supposing a couple are shown in the moonlight. They can be brought into a close-up with the moon remaining in the same position as before. A mathematical system has been devised by which the background maker can determine the speed with which the background elements should move so as to preserve the artist's original conception of the scene. If a man is shown riding along in a motor car with certain objects moving toward him, the people and buildings that are but a few hundred yards away must appear to come along much faster than the mountains many miles in the distance. Then, too, in a panorama shot, the correct perspective principles must be observed so that the elements move in proportion to the relative distance away from the person who is viewing them and with due consideration of the speed at which he is traveling.

When this production was first begun, it was evident it would have to be "sold" to the audience on an emotional basis. In the early minutes of the film, we felt, the theatergoer would have to be convinced he was not looking at so many colored drawings but real personalities, animations which lived and breathed. An elongated Silly Symphony was the wrong approach. It would not be able to hold the audience's interest for ninety minutes. Likewise, a straight pen-and-ink translation of a live film was ruled out on similar grounds. To be a success, the production needed drama, pathos, humor and the other essentials, so we combined live-action picture methods with the cartoon technique.

We have tried in this picture to caricature rather than simulate human traits and actions. Because the story is based on the immortal Grimm's fairy tale, "Snow White and the Seven Dwarfs," the characters live in the realm of fantasy but are imbued with many human traits. In the Seven Dwarfs, which answer to the expressive names of Doc, Grumpy, Bashful, Dopey, Sneezy, Sleepy and Happy, you probably will recognize qualities, foibles, and mannerisms you have observed in yourself, your boss, the



Top, artists tracing original drawings on sheets of celluloid. Bottom, recording musical background for animated film at the Disney studios. Receivers are worn to hear the tone beat

5 1130

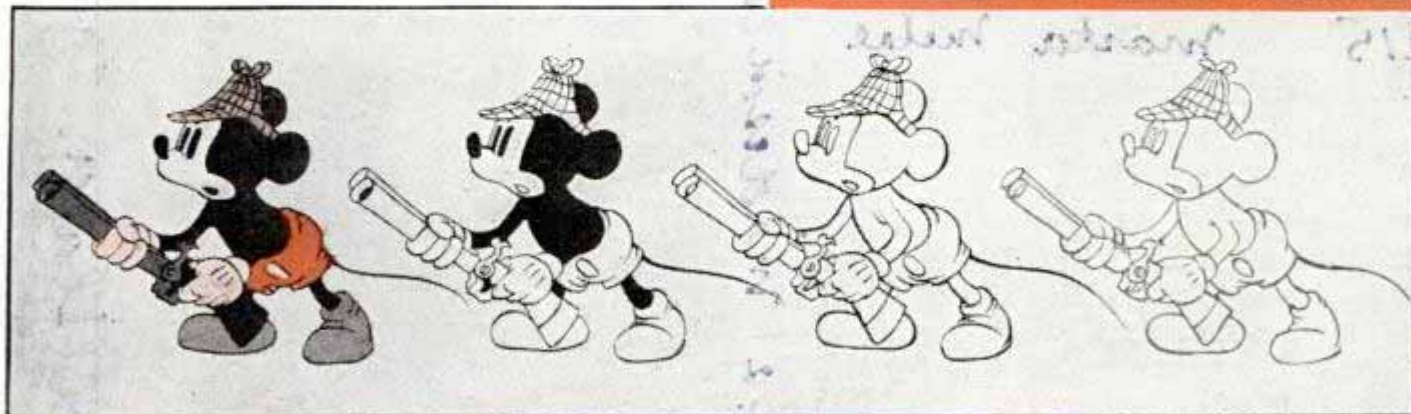


fellow next door or someone you know.

The question of color treatment presented a fresh set of difficulties. The bright hues of the short subjects were taboo. The audience might suffer eyestrain looking at such colors for an hour and a half. We had to select soft hues that were restful on the eyes and that harmonized with each other. Color, when expertly used, can help set the mood of a picture and aid in the advancement of a plot without the audience ever being conscious of it.

Great precision was shown in the making of this picture and as a result it is virtually free of the inaccuracies that pass unnoticed in the seven-minute cartoon film. The infinite pains taken by men who supply the action cartoons may be gathered from the fact that their working tools

(Continued to page 114A)



Top, colorist examining painted "cell" of Mickey Mouse drawing. Center, "cells" under camera. Bottom, step-by-step drawing of Mickey Mouse in color

#132. *Rockhill Road Kansas City, Mo* Big Colored Easter Rabbits Attract Spring Shoppers



This big bunny looks at you with electric-bulb eyes at night. It is on duty attracting shoppers

Brilliantly colored rabbits, bigger than a man, are used to attract shoppers around the Easter season in a suburban section of Kansas City. The eyes are electric-light bulbs, and reflector lamps shed a festive glow on the painted figures at night. Various figures are used at other seasons.

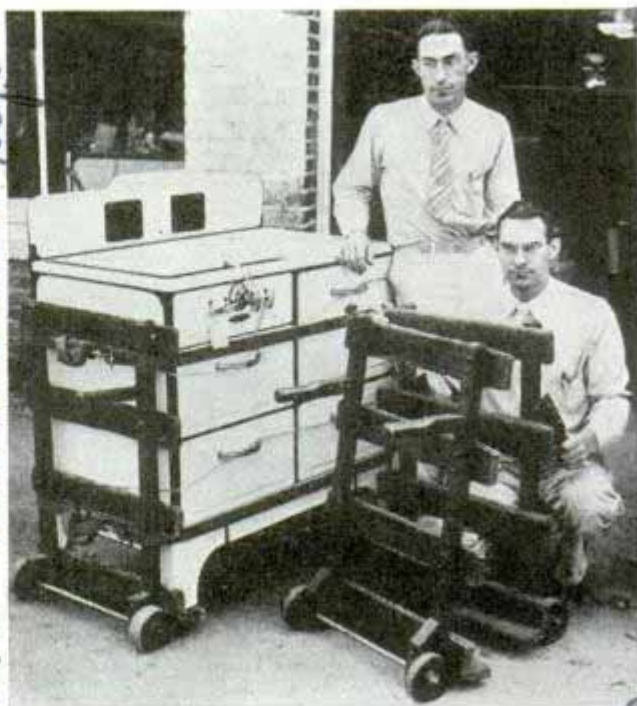
#215 *Master Metal* Imperishable Metal Movie Film Reflects Pictures to Screen

Movie films of metal, reflecting their pictures to the screen by mirrors instead of transmitting them through transparent cellulose film, may solve the problem of preserving records through coming centuries. The photographic industry is still too young to know how long cellulose nitrate and acetate films will last. But an inventor has developed an imperishable metal film on whose opaque surface the

photographic image can be printed. Pictures printed on non-ferrous metal sheets twenty years ago show no signs of fading. Similar metal film suitable for projection has now been prepared; it is flexible, and withstands the heat of projection machines and the attack of photo-developing chemicals. Highly reflective mirrors carry the image to the silver screen. One test film used continuously for four weeks showed no signs of wear. Such films could be used to preserve master copies from which cellulose duplicates could be made.

#154. *Madison Ave. N.Y.* Twin Trucks Strapped to Load Make Handling Easy

Handling stoves and similar heavy objects is made easy by small twin trucks that may be strapped to the load. Each unit is constructed along the lines of the standard single hand truck, but has smaller wheels to facilitate loading. A truck is placed at each end of a stove and the stove is lifted to rest on a narrow felt-lined ledge on each truck. Two straps secured about the trucks and the stove tie the load, permitting it to be lifted, wheeled or pushed about. Handles of the trucks are on hinges so that they may be turned down. Thus, the stove may be wheeled up an incline to the delivery truck. The twin trucks are left on the stove, making it easy to unload at the delivery point.



Showing how twin trucks, shown in front of stove, are strapped on the load

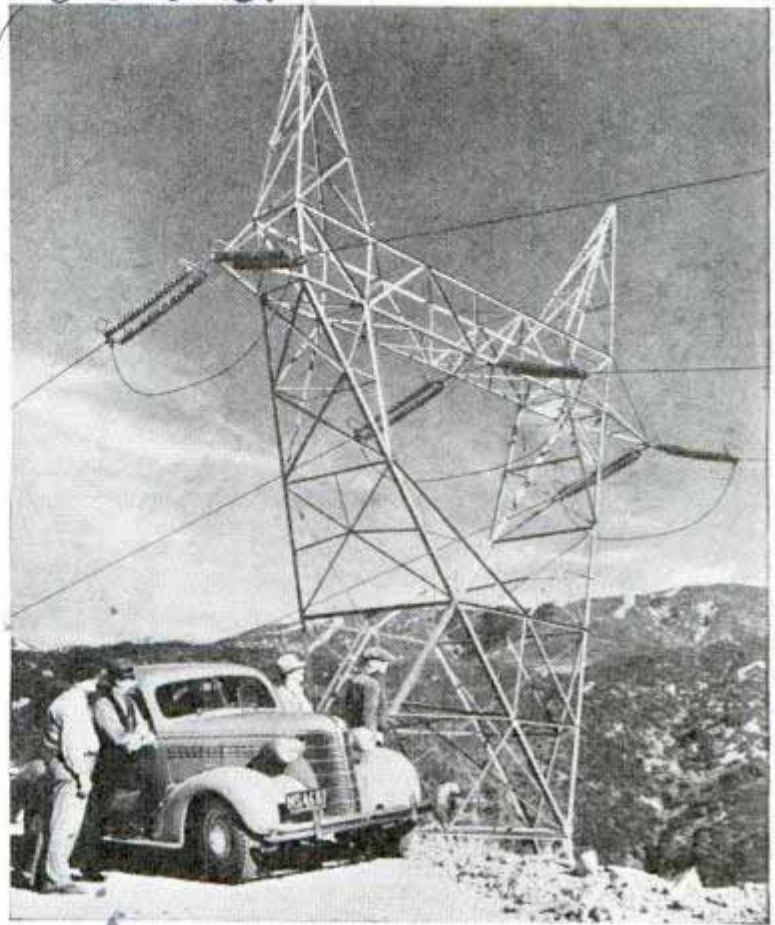
Dr. nos and info. Alvin and Carl Reed.

Dr. Robert W. Carter, Taylor-Stoane Corp

Wellflower, Calif.

It Takes Nerve to Patrol 266-Mile 'High-Line'

Responsible for maintaining a constant check on the 266-mile transmission line which carries power from Boulder dam to Los Angeles, Calif., thirty-four patrolmen drive their fleet of radio-equipped automobiles over one of the most exacting, most grueling roads in the world. A private highway built for servicing the power line, the road dips and twists through mountain passes, runs across miles of desert, sinks to an altitude of 100 feet, then rises abruptly to 5,000 feet, pounds over sharp gravel and wallows through hub-deep mud. Every hour of the day, the patrolmen push their cars relentlessly so that the flow of power may be uninterrupted. The "high line" is draped over a series of 2,700 steel towers, spaced several hundred feet apart. The road is split into seven sections, thirty-five to fifty miles in length. Patrolmen keep in touch with headquarters at Boulder and Los Angeles by radio.

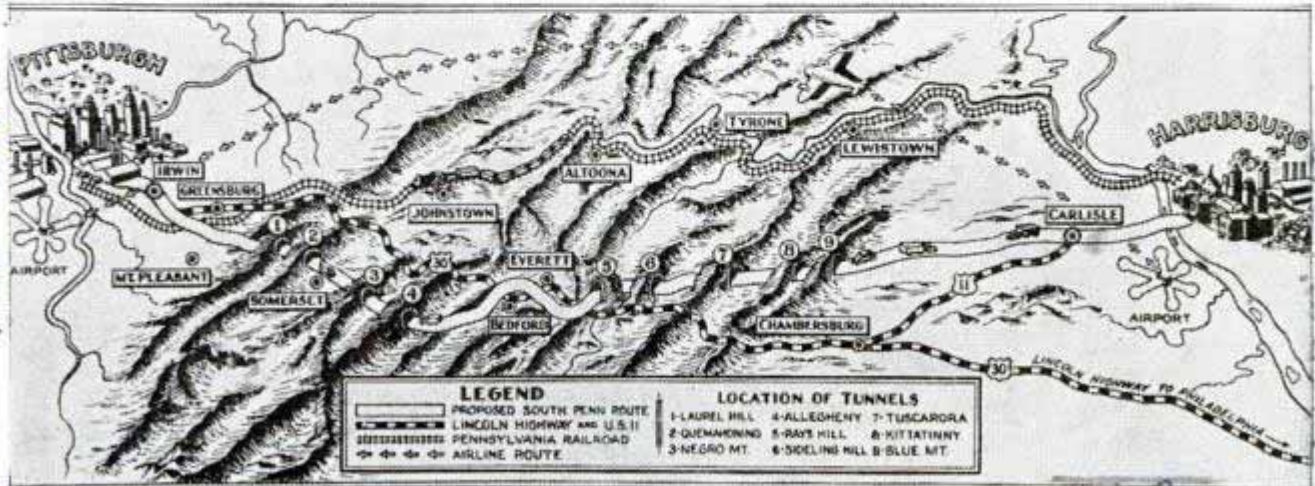


Here is the patrol car at one of the lofty stops along the "high line" road. This line carries 287,500 volts of electricity from Boulder Dam

Super-Road under Mountains to Follow Old Rail Bed

Construction of a new superhighway through the mountains between Pittsburgh and Harrisburg, Pa., has been simplified by using an old railroad right of way for the road bed. The "all-weather" highway, seven miles of which will run through tunnels under the mountains, will

have no speed limit, no red lights and will not be exposed to foggy weather experienced in passing over near-by highways. Using the old railroad bed also eliminates crossing hazards on the 160-mile stretch. The highway will be paid for by a toll of one or two dollars per car.



Sketch shows how super-road passes through several mountain tunnels

Duplicator Prints in Colors from Type or Writing

Keen-Kopy

49.50 for Chicago



As many as sixty smudgeless copies a minute are turned out by this rotary duplicator

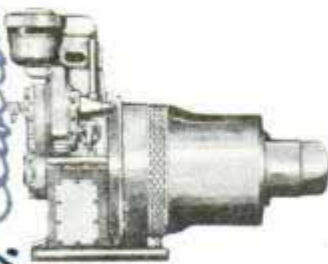
As many as four colors can be printed simultaneously by a rotary duplicator by means of special purple, green, red and blue carbons. Anything that can be written, typed or drawn can be duplicated on this office appliance by transferring the original to a master copy, which can produce seventy-five to 200 copies at a rate of forty to sixty per minute. There is no smudging or offset.

"Baby" Diesels for Small Jobs Are Lightweight, Compact

H-81

Diesel Engine Dies: General Motors Diesels Corp. Cleveland Ohio

Lightweight, two-cycle Diesel engines for the low-power field are being produced by General Motors. "Little brothers" of the giant power plants which drive



many high-speed passenger trains, the small engines extend in varying sizes down to a one-cylinder twenty-two horsepower model. Previously General Motors had limited Diesel activities to

production of larger two-cycle engines of 600 to 1,200 horsepower. The company also plans "packaged power" units consisting of the small Diesel engines and generators, in either stationary or portable

Minkdale Farms, Newstead.

models, which can be set up quickly to power small industrial operations, theaters, hospitals, irrigation projects, parking lots and other developments. The engines also may be employed for any direct-drive prime mover operations, such as tractors, hoists, trucks and pumps. The line is being built in such a manner that additional horsepower may be obtained by the use of additional units. The production program includes two series of models, based on different cylinder sizes. The small engines have seventy-one cubic inches per cylinder, the other 223 cubic inches per cylinder. The small seventy-one series includes one, three, four and six-cylinder models rated from twenty-two to 160 horsepower. The larger series includes models rated at 200 to 400 horsepower.

H-192

Vacuum Cleaner Used on Goats to Improve Sanitation

Animals on a modern goat farm in Connecticut are relieved of their dirt and dust with a hand vacuum cleaner. The owner says that this method of cleaning the animals improves sanitation of both the goats and their milk. Pastures and barns on the farm are models of sanitation and modern methods characterize everything, from breeding to producing the milk.

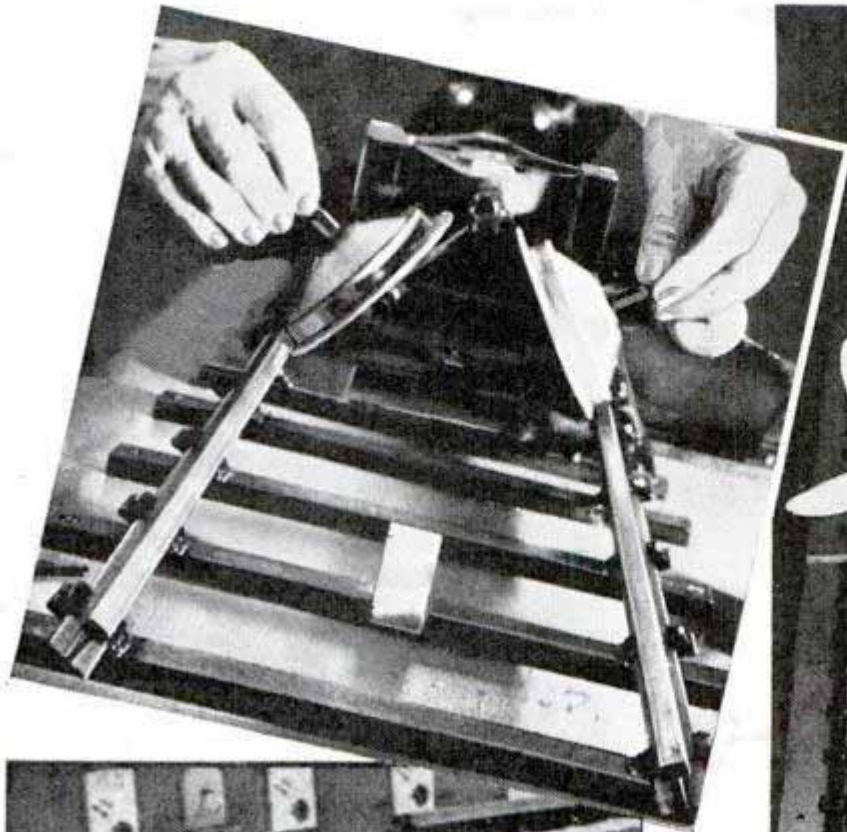
Oliver-Alex F.A. Kolnig



Here is the way the hand vacuum cleaner gets the goat's dust and dirt

From Engineering Magazine, Chicago, 1931

Fast Train Runs on Model Super-Railway



Top, left, showing how train's wheels and rails are inclined inward. Right, propeller-driven car. Bottom, model of super-railway

drastic weight reduction, all wheels of the train, as well as the rails, are inclined inward about thirty degrees. This makes it practically impossible for the wheels to jump the rails and also allows a very steep banking of curves so that these may be taken at much higher speeds than hitherto possible. Two model trains built by Prof. Wiesinger are about four feet long. One is driven by a small gasoline engine, the other by a propeller and motor. The pitch of the propeller may be varied, permitting it to be used as an air brake. A model of the super-railway measures about 900 feet and on it speeds of seventy miles per hour have been reached by the rail cars, corresponding to a speed of about 230 miles per hour for a full-size car of like design. Built overhead, without interfering with property, the tracks for such a super-railway could be brought into the heart of large cities.

PRESENT conceptions of rail transportation may be changed completely as the result of a system devised by Prof. Kurt Wiesinger of Zurich University. A scale-model one-car train constructed by the professor weighs about one-fifth, inclusive of freight, as much as a present-day railway car. In order to prevent derailment which might be caused by such a

Technical Lecturer,

H 190

More World

Vertical handwritten notes on the right margin.

Revolving Shelves for Store Allow Access to Stock



By twirling the shelf, the druggist brings to the front any bottle or package he is hunting

Revolving shelves built into the wall as cylinders rotating on a steel axle save valuable space in a western drug store. This method affords easy access to the stock, too, for the druggist can simply twirl the cylinder and reach any bottle he is hunting. The cylinders are seven feet high and have a diameter of two feet.

'Garlic' Odor Changed into Light Similar to Sunshine

Lighting engineers have found that tellurium, a semi-metallic element which produces a "garlic breath" if inhaled, gives off a continuous spectrum like sunshine. Three Westinghouse research men have been experimenting with tellurium vapor as an artificial light source. The tellurium was given a demonstration in an inverted U-shaped bulb equipped with a reservoir containing neon gas, which was used as a starter. The bulb is made of quartz because glass would not withstand excessive temperatures developed in the liquid tellurium and would turn black. A reddish light glowed in the bulb as the direct current was sent through the electrodes. That was from the neon gas. As the temperature moved upward the red lines of the neon light disappeared, absorbed by the

tellurium. Then a blue-white glow appeared, changing to a golden yellow as the hot tellurium vapor gave off a continuous spectrum like that of a hot solid. At one stage the light was nearly a pure white like sunlight. Within a few minutes the glow ran the gamut of the spectrum by a gradual change, instead of giving off the separate spectrum lines of individual colors emitted by most shining gases, such as neon. When the lamp burned the brightest, the temperature at the electrodes varied between 1,300 and 1,500 degrees Fahrenheit, two and one-half times hotter than molten lead. The research men said that if the problem of heat can be solved, the tellurium lamp some day may bring the natural beauty of flowers indoors, by the artificial duplication of sunlight. They indicated that the lamp may be used for decoration of the home of the future.

Non-Skid Tires Date Far Back to Chariots of 2800 B.C.

As long ago as 2800 B.C. non-skid wheels were invented. The Iraq Expedition of the University of Chicago's Oriental Institute has discovered a copper model, only three inches high but done in careful detail, of a Sumerian war chariot of that period. Its wheels were "milled" with copper studs, probably for the same reason that automobiles and trucks today use chains, lugs and non-skid tires.



Photo courtesy Oriental Institute, University of Chicago Notice the copper-studded tread on the wheels of this three-inch model of an ancient war chariot

Handwritten notes on the left margin:
Cont. David H. Martin
Box 282, Ogden, Utah
Lighting done in laboratory at Bloomfield, N.J.
H-185

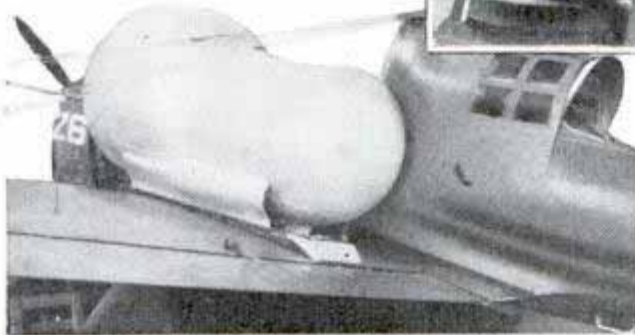
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a new...
H-183. no address

Handwritten number:
712

Handwritten notes at the bottom:
at Tell Agrab, northwest of Baghdad, Mesopotamia

Plane's Lifesaving Aids Are Inflated with Gas

Gas used in making ice-cream sodas is employed to inflate lifesaving equipment devised by the U. S. army air corps. The equipment includes a life raft for airplane crews, "water wings" for planes forced down on the water and a "horse collar" that will keep a man floating for hours. The life raft is entirely automatic. The pilot pulls a lever, causing the raft to inflate and fall free of



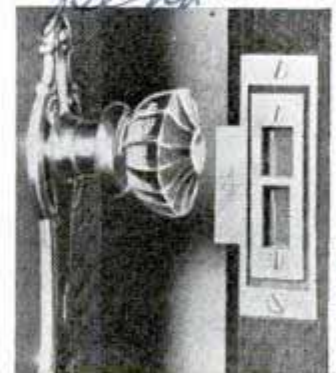
Top, left, the "horse-collar" life-saver in position. Right, using gas-inflated raft. Center, plane's water wing. Bottom, gas tube for inflating equipment

then flows into the tank, replacing the fuel. Then the valve closes and the gas floats the ship. The horse-collar lifesaver is so designed that even if a flier is thrown out of his ship unconscious, he will float, face up, for a long time. His equipment also is inflated with the bottled gas.

H 15 3.

Adjustable Lock-Strike for Door Takes Up Shrinkage and Sag

There is no need for calling the carpenter when doors begin to sag, shrink and rattle if you have installed the adjustable lock-strike marketed recently. The old method was to have a carpenter move the strike, which left a fresh cut on the door jamb that required plugging and painting. Anyone can adjust the new type lock-strike by moving its center plate vertically or horizontally and then tightening the set screws.



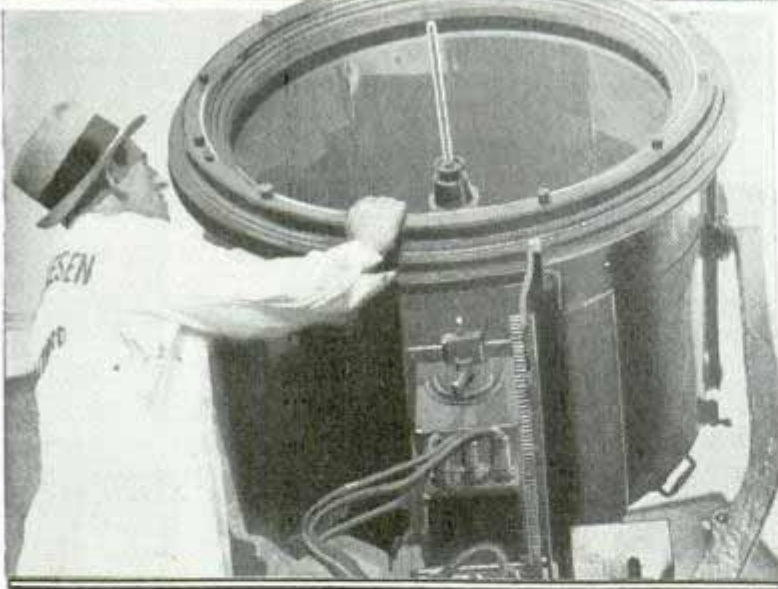
the plane within a few seconds. It is housed in the fuselage, behind the pilot's headrest. The water wings, concealed within wing panels, are inflated automatically through the action of water pressure on a valve in the wings. The valve releases carbon-dioxide gas, which provides the pressure required to pull out pins fastening the compartment. In larger planes the fuel tanks are utilized. Built into the wings, these tanks are constructed so that carbon-dioxide gas, inert and noninflammable, opens the gasoline dump valve and

Flora Lynn Co
 517 1/2 Hallbrook Ave
 Danville, Va

TURNING NIGHT



Top, softball game in progress. Illumination totals 39,000 watts, enough current to light forty homes. Bottom, huge sun arc used in special lighting



BEHIND the glare of the huge "inkies" that turn night into day for sports, you'll find men accustomed to using light on a big scale. They pour it on by the thousands of watts, drenching hockey rinks, golf driving ranges, bowling greens, and even horseshoe tournament grounds with a brilliance like noonday.

After-dark sports are coming into their own. Nowadays, no town is too small to

have its own night playing field. One Oregon village of 2,600 population recently spent \$12,000 on lighting equipment for a hardball field. Another hamlet of fewer than 1,500 built a softball field that drew crowds from the surrounding farming region. Within one year, cash admissions rolled up enough money to make the town's football field one of the best lighted on the Pacific coast. Kern County, in California, built a night softball field which proved so popular that soon the number had grown to twenty-seven, each the nucleus for a complete night playground to be built later. One high school changed to a night football schedule because ranchers near by couldn't get away during the day, and on Saturdays, conference college games drew the fans. Gate receipts from the first game netted more than the entire preceding sea-

Es 15 50
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 Cant. Maxwell Reid Grant.

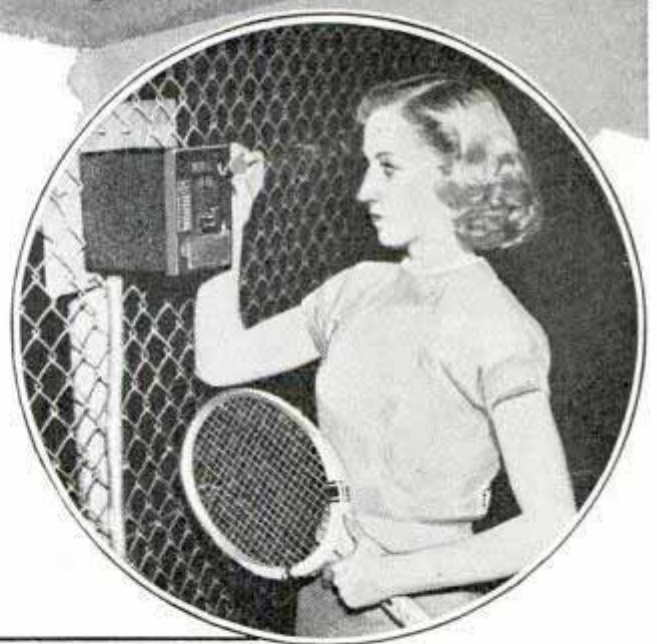
INTO DAY



son, and the same was true of every night game that fall.

Police have found that providing a place for clean night sports lightens their worries. One city cut its juvenile crime one-third by setting up a series of lighted playgrounds. Los Angeles has a large network of recreation centers equipped for many kinds of night sports. Tennis fans can have the use of a well-illuminated court by putting twenty-five cents into an automatic slot machine which turns on the floodlights for thirty minutes.

Two cardinal rules for sports lighting are: "Always light the ball," and "Keep



Top, playing table tennis under the "inkies." Center, dropping twenty-five cents into meter provides light for thirty minutes on tennis court.

Tennis courts with floodlights turned on for night play
 Lighterog installations
 Electric Mfg. Co. Westinghouse
 East Pittsburgh Pa 723



San Bernardino
 Top, view of a California baseball park brilliantly illuminated for night game. Note how the light is directed from each lamp. Bottom, control panel for announcing and broadcasting night sports events in stadium

glare out of people's eyes." The first calls for individually set reflectors, tailored to fit the needs of the game. The second usually is a matter of putting the lamps so high that the light falls nearly vertically, like natural daylight.

High brilliance for night sports is obtained at Los Angeles' Gilmore Stadium through use of large numbers of high-powered incandescents, or "inkies," mounted around the rim of the stadium on high poles and focused to give a uniform flood of light. Sixty such units, each a big 1,500-watt lamp mounted behind a lens ground to narrow the beam vertically, but widen

it horizontally, burn at ten per cent over-voltage to give an intensely white light. On the field it's so bright you may read a newspaper. But Tom Curtis, lighting expert, is adding more "top light" to boost to 105,000 watts, enough current to illuminate more than 100 average-sized homes. That means that in baseball, players will stand out clearly against the field.

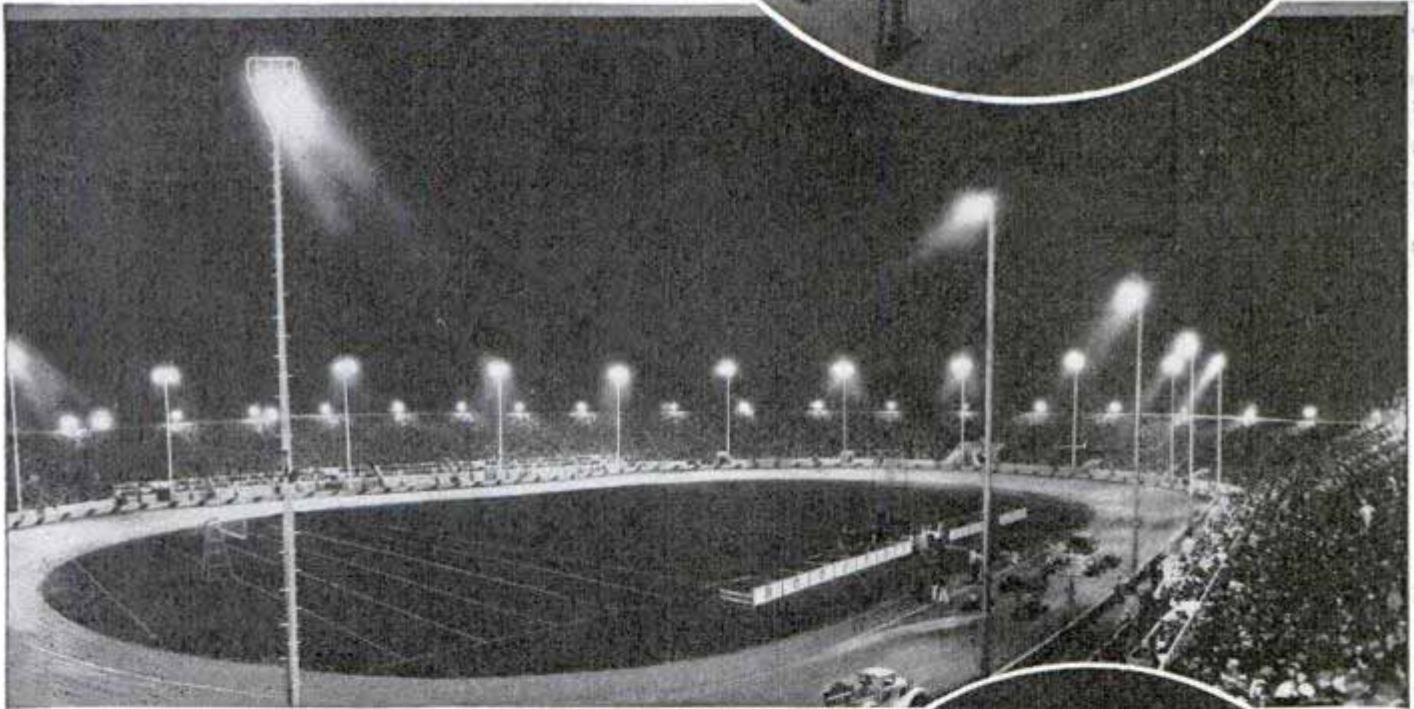
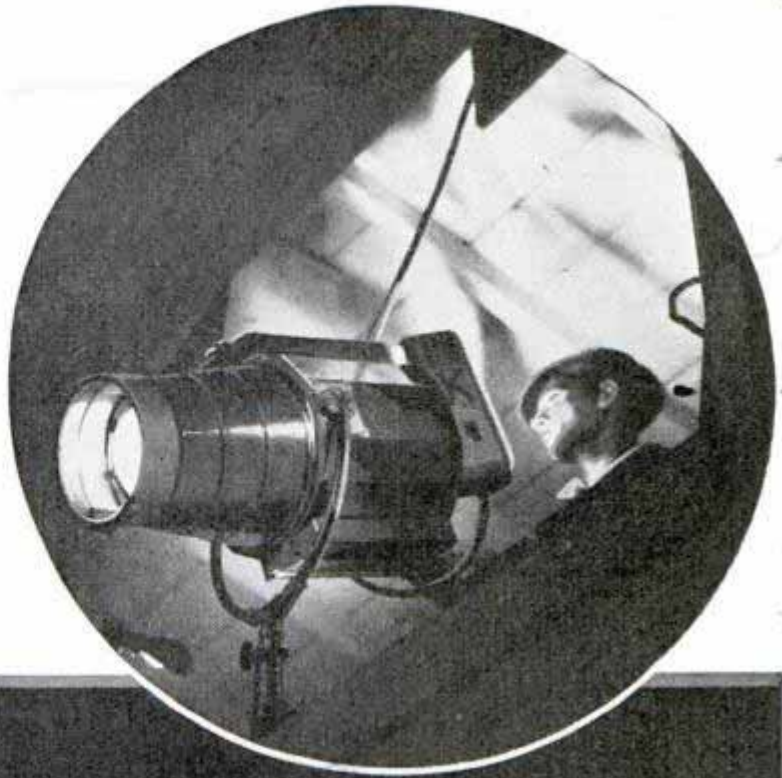
Many early lighting systems were unsatisfactory because of a low "ceiling." Now and then the ball would rise beyond the level of the floodlights and disappear. To lift the ceiling, Curtis will add another 30,000 watts at the bases of the poles, directed upward. That paints the under side of the ball and helps the fielders when a high fly is struck.

In case of a foul tip or a hot grounder, an extra group of five 1,500-watt units with diffusing lenses banked opposite first base will brighten the ball. Additional groups of five will be placed near third base and home plate for the same purpose. Still others will illuminate the outfield from the fielder's angle.

es/530

Getting ready for a game doesn't mean that the electricians can simply walk out to the field and turn on the lights. Every unit must be cleaned, tested, and focused frequently. Formerly the big floodlights were lined inside with heat-resistant glass reflectors like those used in battleship spotlights. But under the intense heat, huge blisters the size of goose eggs would raise in the glass and finally burst. Now a specially polished, spun aluminum reflector which resists the high temperatures is used. Other types are of brass, chromium-plated.

Each sport requires a different

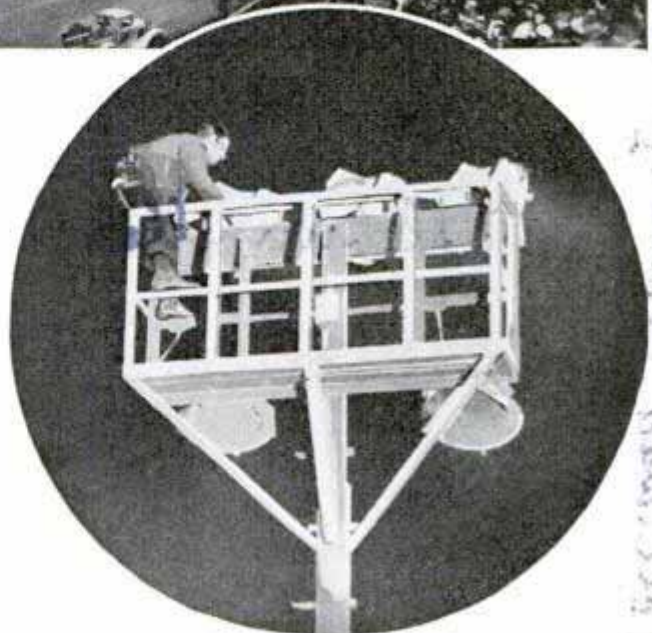


Top, one of the "juicers" spotlights a sports event.
Center, stadium illuminated for night auto race

set-up and to change over takes about eight hours. To build up the light evenly all over the field is a ticklish job. Each reflector must be adjusted individually to eliminate "ghosts," dark spots that really are black images of the lamp's filament. Then you turn a light on one spot and throw other lights to wash out the shadow. When this is accomplished, you walk about the field. Everywhere you go, you cast faint shadows evenly in all directions.

The settings are double-checked over the entire field with a photoelectric meter,

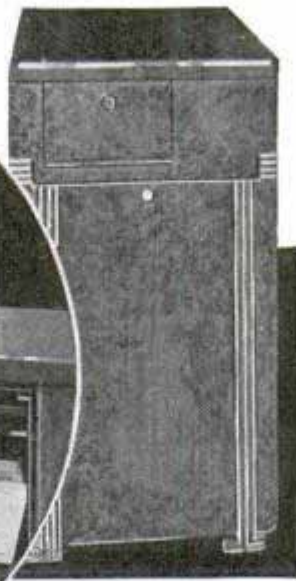
(Continued to page 150A)



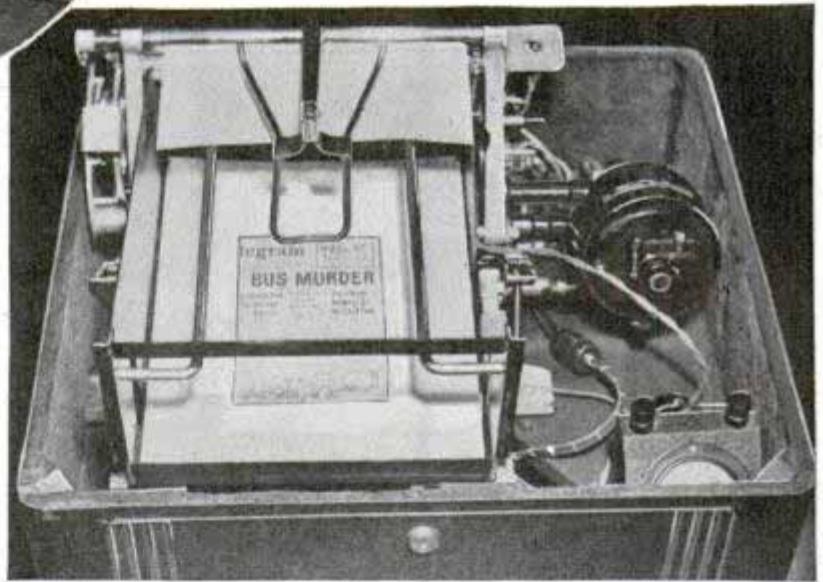
Adjusting floodlights sixty feet in the air

The "juicers" are the big floodlights that illuminate the stadium at night. They are mounted on tall poles and are adjusted by workers on scissor lifts. The lights are used to illuminate the stadium for night auto races and other sports events.

Newspaper Sent into Home by Facsimile Radio



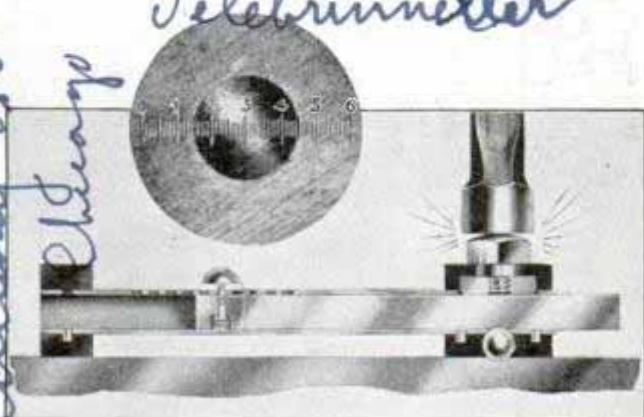
Circle, reading facsimile sheet of newspaper. Right, cabinet receiver. Bottom, interior of receiver, showing sheet of news received by the facsimile method. Each sheet is cut off and dropped into tray automatically after completion of reception



Prospects are that radio delivery of facsimile newspapers directly into the home may be a reality in the near future. Only perfection of certain technical details stands in its way, according to radio experts. Broadcast licenses for this field already have been issued. The perfected system will permit reception of the newspaper on a machine during the night. Present equipment transmits and receives pages the size of the standard letterhead. As each page is received, automatically, the receiver cuts it off and drops it into a tray. Next morning, the owner reaches

through a door of the receiver's cabinet and takes the sheets out. In order, the sheets comprise the newspaper. Facsimile radio has been used commercially.

Test Bar Measures Metal Hardness by Hammer Blow



Dents in two metals are compared to test hardness

Testing metal for hardness is reduced to a simple arithmetical problem by means of a "yardstick" just devised. Conveniently small, this measuring stick can be taken into the field for tests of railway rail ends, high-pressure pipes, welded joints and similar metal parts which cannot be sent to laboratories for inspection. The device consists of a short metal bar of known hardness, which is laid over the metal surface to be tested. In direct contact with the under surface of the bar is an impres-

*Radio Corp. of America 30
Cochranville Pa. new job
#146
#121
Televised. Inc.
Chicago
Chicago
Chicago*

Chicago 727

sion ball. When an anvil exactly above the contact point of this ball is struck with a hammer, the impact is transmitted equally by the ball to the test bar and the metal undergoing test. The diameters of the impressions on these two surfaces are exactly relative to the hardness of the two metals, and by measuring the impressions with a microscope and applying an easy arithmetical formula the hardness can be figured quickly.

H 82.

Squad Car's Cable-Claw Catches Fugitive's Auto

Crowding fugitive automobiles off the road at risk of injury to police and law violators would be eliminated by a device, attached to the front of the squad car, which grabs the rear bumper of the fleeing auto. The device consists of a self-fastening claw, a steel cable and a drum, all contained in a unit attached to the front cross member of the police car. In action the police car is driven up behind the fleeing auto until the claw touches the rear bumper, releasing a catch. The claw drops and snags the bumper. Then the police car drops back a few feet, unreeling the cable and controlling it by means of a brake on the drum. Application of the police car's brakes halts both cars.

Folding Mattress in Sleeper Provides Room for Dressing



Sleeping car bed folds up on hinged metal sheet, allowing passenger standing room and a seat while dressing or undressing

Mattresses that fold vertically, leaving ample dressing space in the section, are the latest convenience being installed in Pullman sleeping cars. Instead of using the two seats to support the bed, one seat is left in its usual place and a metal sheet

is laid across to hold the mattress. This light steel sheet is hinged, and while the passenger is dressing or undressing it is strapped to the mattress and bedding and raised to the vertical position. Thus there is not only standing room but a seat for the passenger's comfort. When ready to retire he can stand behind the curtain and lower the bed. This arrangement is to be made available when a passenger occupies the entire section.



Demonstration of how fugitive car is halted by claw-and-cable on police car and how suspect may be captured easily

608 American Band Blog

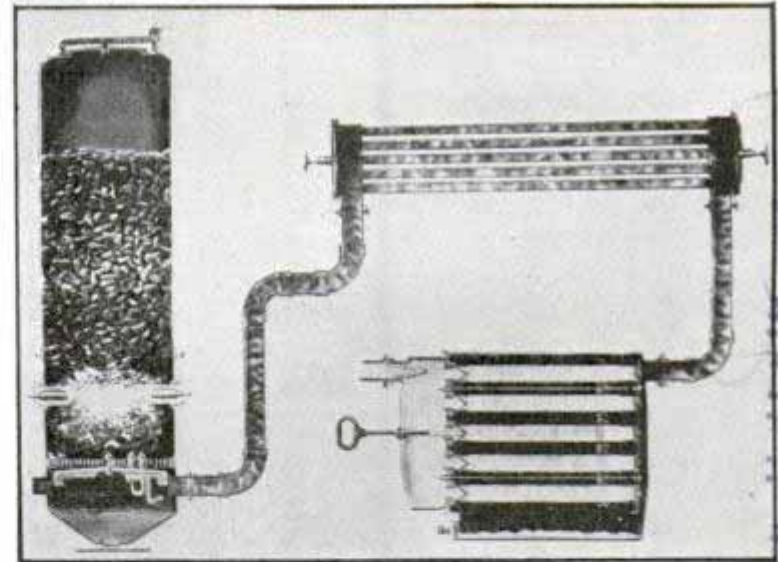
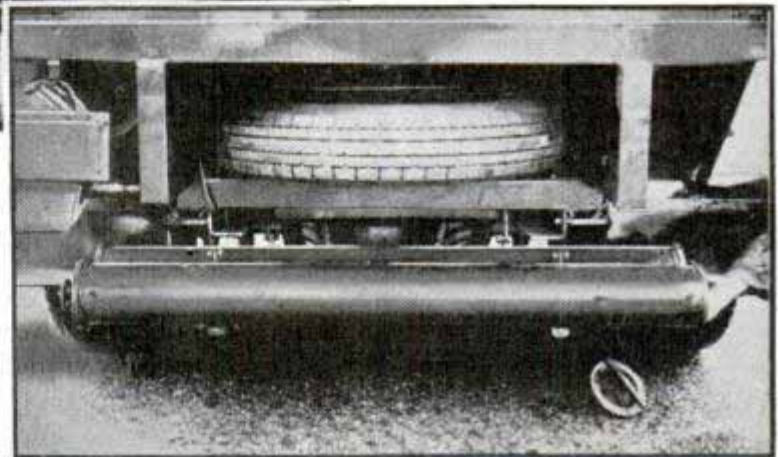
Edw. J. W. Thompson

no answer to letter 6/29/38

French Truck Runs on Wood or Charcoal Gas



Top, testing flame before starting motor. Center, gas cooling tubes at rear of truck. Bottom, showing how gas is generated and flows through cooling tubes and purifier to the motor



Realizing that war might bring interruption of their gasoline-operated truck and bus service, the French are hunting a substitute fuel. As a result, they have developed a means of running vehicles on gas generated from wood or charcoal. The apparatus consists of a burner, a cooler and a purifier. Once sufficient gas has been generated for a start, the vehicle may be started like any other fitted with an electric starter and carburetor. The equipment has been tested on light trucks and on passenger buses. Before starting the motor, the operator tests the quality of the gas. The motor is ready to run within six minutes after the fuel has been ignited. The generator is simple. On one side is the burner, connected to a gas cooler and to the purifier from which gas is fed to the motor.

"Hypo" Pollinates Pine Cones at Tree-Breeding Station

Faced with the fact that our forests are being used up three times as fast as they are being replaced, scientists at a California experiment station are endeavoring to breed faster growing trees that will resist insects and fungi and thrive in different climates. In crossbreeding pines to develop better strains, they cover the female flower or cone with a canvas bag which

has a celluloid window to permit observation. Then the catkins are taken from the desired parent tree, dried and shaken in a tight container and given a germination test. Finally the pollen is introduced into the bag covering the female cone by means of a sterilized hypodermic needle and syringe. By this fertilization scheme the forest station is developing healthy trees

No further information

Empressed Air May. Jan. 1938

institute of Forest Genetics

vertical text on right margin

Comp. Radio Station, Columbia Broadcasting Station, Wrigley Bldg

Cast Uses Studio's Dead End for "Outdoor" Sound Effects

to meet the specifications required by various industries — construction, furniture, box manufacture, wood-pulp. Less than one-sixth of the original forested area of the United States remains today, and the virgin forests are being decreased every year at a rate of twenty-five billion cubic feet of wood.

H 157

Pump Fills Tractor Tank from Barrel without Spilling

Buckets, funnels, faucets and the attendant danger of spilling gasoline on a hot engine are eliminated by a fuel pump developed by a farmer for filling tractor tanks. The pump is at the spout end of the hose, so that the tank can be watched as it is filled. A brass tube attached to one end of the ten-foot hose is dropped into the top of the fuel barrel and the seven and one-half pound pump, at the other end, is held in the hands while pumping. The pump can fill the average tractor in two minutes. It primes itself even when dry.



Refueling a farm tractor with hand pump controlled at spout end, reducing danger of overflow



This is no broadcast of the stage play, "Dead End." The actors are using the non-resonant "dead end" of studio to simulate scene in open air

Dead end means outdoors in the broadcasting studio of station WBBM, Chicago. When the script calls for a scene out of doors, actors and "mike" move down to the non-resonant dead end of the room, where walls and floor are treated to prevent any rebound of sound and the effect over the radio is that of open air. When the scene shifts indoors the microphones move to the live end of the studio, and you notice the resonance in the reception.

☐ Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

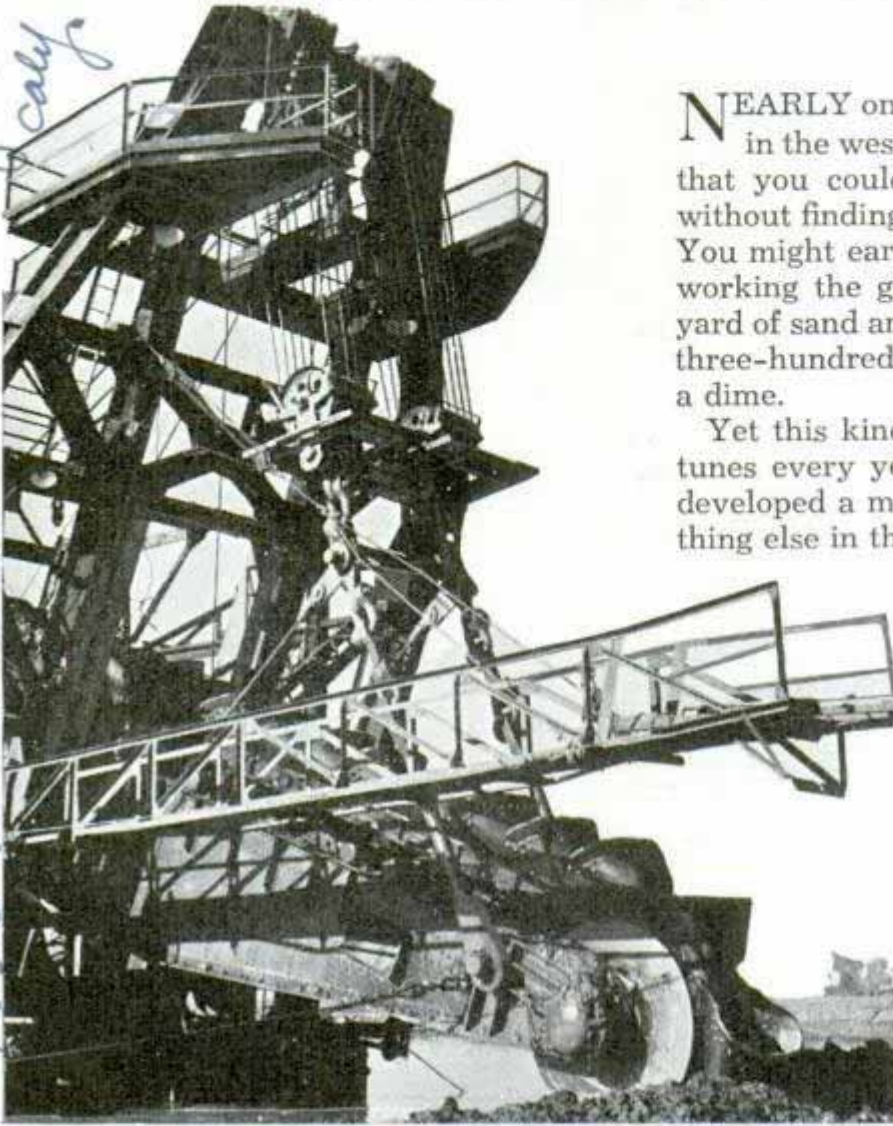
Sheldon Tractor Fuel Pump

FLAGSHIPS *of the*

NEARLY one-third of all the gold mined in the west comes from ground so poor that you could sift through it for hours without finding a flake of the yellow metal. You might earn ten or twenty cents a day working the ground by hand. In a cubic yard of sand and gravel you might find one three-hundredths of an ounce, worth about a dime.

Yet this kind of ground is yielding fortunes every year. Mining engineers have developed a monster machine unlike anything else in the world, a giant dredge that scoops up thousands of yards of material every day to sift through it and find and save every tiny particle of gold.

These great gold boats have been assembled at the tops of mountains and "sailed" downstream a few yards a day, eating away at the deep gravels of old river beds until they finally arrive in the lowlands again. The Cali-

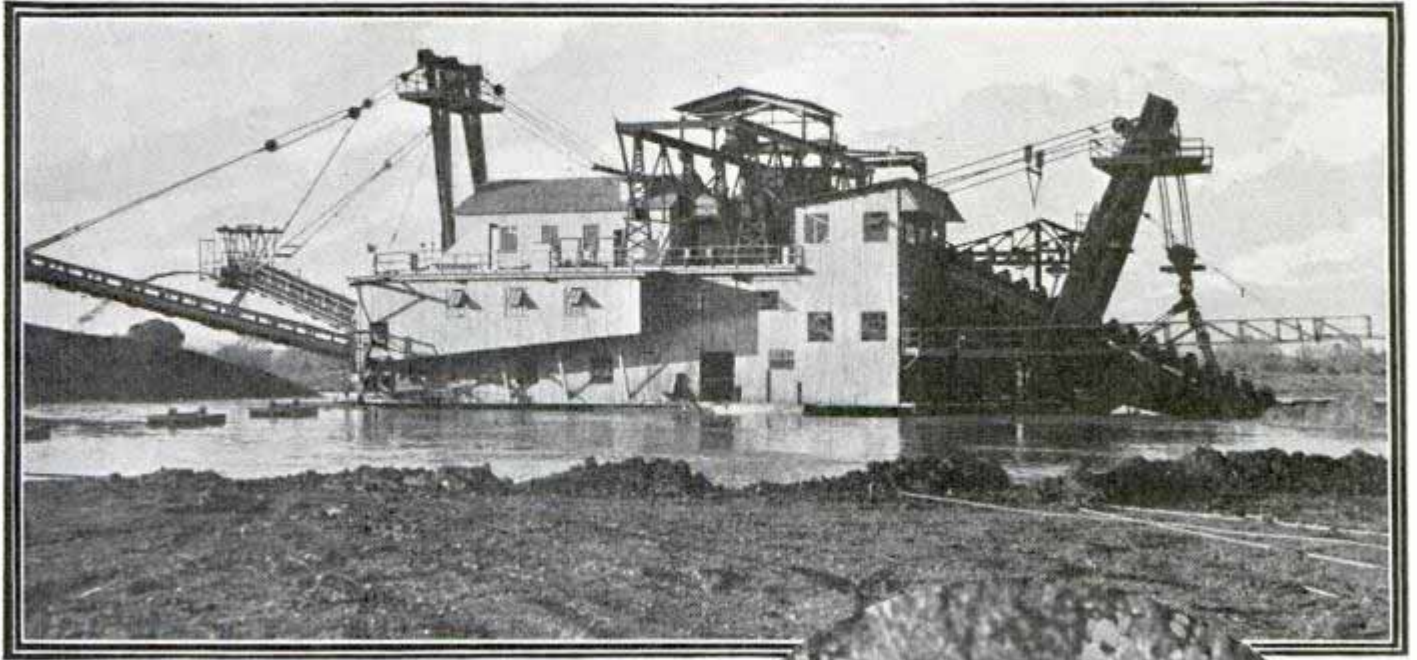


Top, bow gantry of giant gold boat, showing digging ladder raised to start new cut. Bottom, night view of a gold-dredging machine. These big machines weigh 2,200 tons

Es-1551
Cmt. Thomas & Stinson Jr.
10555 Tolman Ave. Los Angeles
Calif

Reference: U. S. James, Esq. 1551
Natoma Co, Nevada Bldg
Sacramento, Calif

GOLD FLEET



fornia type dredge, known all over the world, is so efficient that it is being used on every continent where large quantities of low-grade material are found. These dredges have been flown piecemeal through the air and assembled in the almost impenetrable interiors of New Guinea and Africa. The boats are recovering platinum in Russia, tin in Malaya, and are at work in Alaska, Chosen and South America.

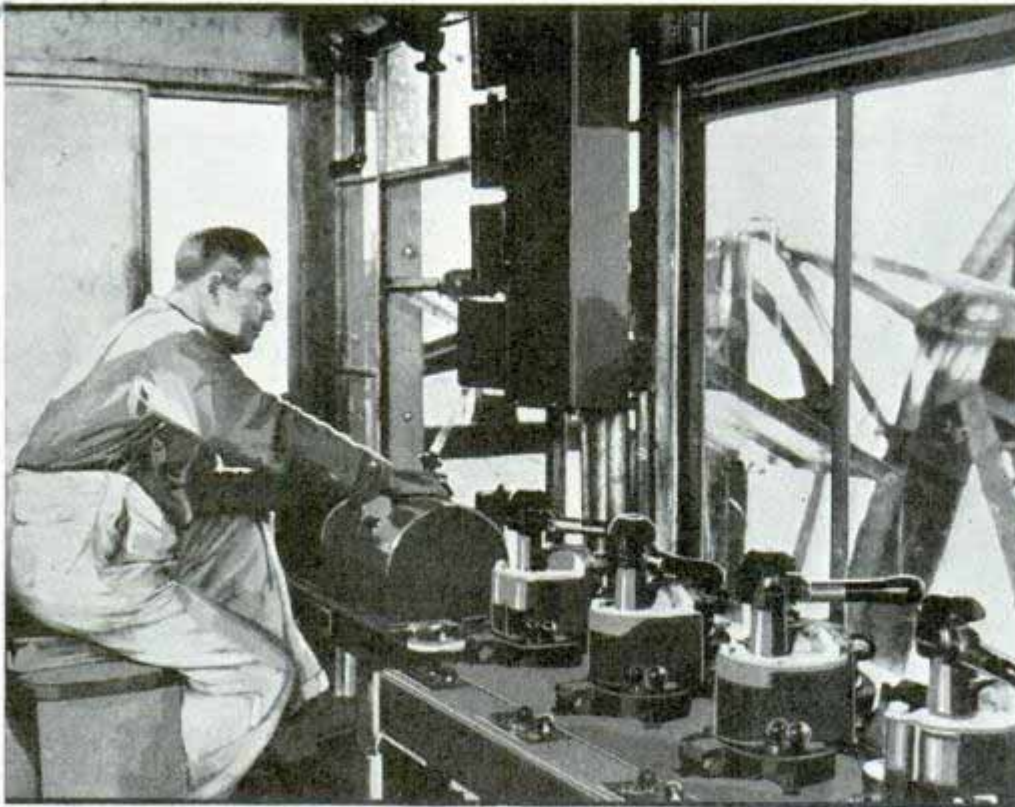
The thing that strikes the casual visitor as almost ridiculous when he watches a gold boat in operation and witnesses the weekly "clean-up" is that the tremendous dredge, costing half a million dollars, weighing 2,000 tons or more, and employing up to eighteen men in three shifts, works night and day for a full week and produces material hardly bulky enough to fill a cigar box. To get even this small amount the boat may have sifted through 90,000 cubic yards of gravel during the week. But the small gold brick that is melted down from the cleaned-up material every Saturday is worth \$10,000 or more.

Old river channels with bed-



Photo by Auto Club of So. California

Top, gold boat, digging ladder at right and long stackers at stern discharging material after gold has been recovered. Bottom, portable dry washer with which small amounts of gold may be recovered from rich earth

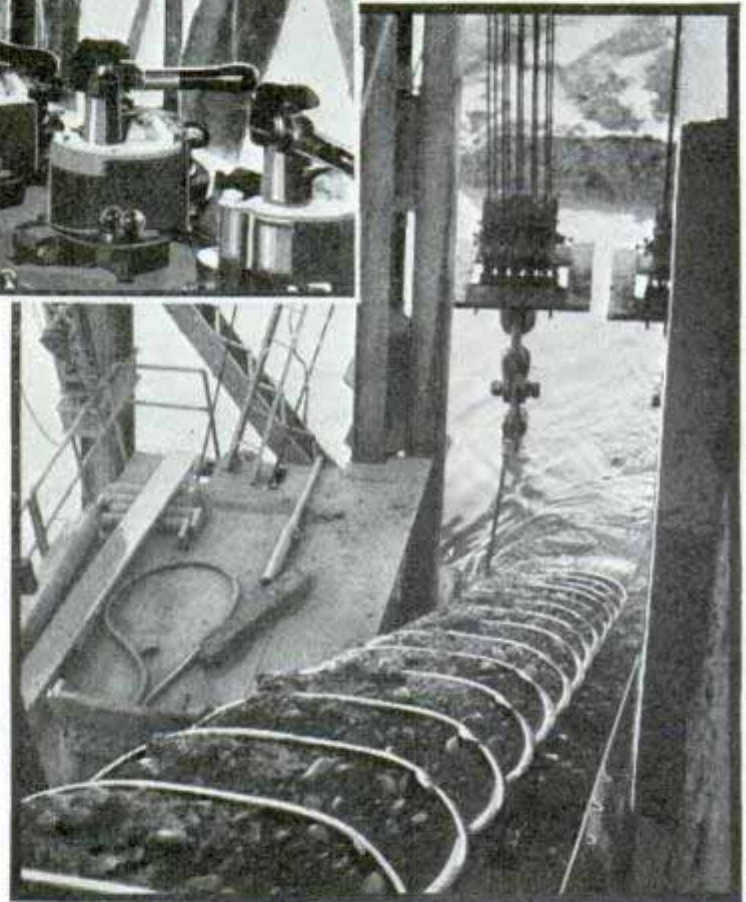


Left, winch room overlooking digging ladder contains controls for operating gold boat. Bottom, view of digging ladder from high in the boat

rock as deep as 100 feet below the surface, are one kind of formation in which the big dredges can make money if small amounts of gold are present, either scattered all the way through the ground or concentrated in a thin layer on top of the bedrock.

One gold-bearing area in California, not many miles from where Marshall discovered gold in 1849, is thought to be a piece of old sea bed instead of an old river channel. The gold particles found there range in size from pin points to pin heads and not even the best gravel in the area contains much more than twelve cents worth of gold per cubic yard. Yet half a dozen gold boats have been at work there for years, steadily chewing down into the ground. Due to the tremendous quantities that a dredge can handle, the total costs of operation may not amount to more than four cents per cubic yard, leaving a good profit even with poor ground.

On board the "Natomas No. 1," "flagship" of the Natomas Company's fleet of six dredges in the vicinity, the operator in the winch room high above the digging ladder controls all the operations of the vibrating, roaring vessel. The bow of the boat sweeps back and forth in 150-foot arcs, the line of buckets far below the surface cutting steadily into the gravel and sand. The 2,200-ton boat, as large as many an ocean freighter, is moored in its own artificial



lake and 750 gallons of water per minute are fed into the lake from the company's own canals.

There are sixty-five buckets on the digging ladder, revolving up and down like an endless chain to scoop up the material and dump it into a big hopper on the boat. Each bucket weighs two tons and has a capacity of sixteen cubic feet. Variable speed motors permit the bucket line's speed to be varied through a digging rate of from eighteen to forty buckets per minute, allowing faster digging in soft ground. Direct-current motors totaling 12,000 horsepower are installed on the boat for

operating the different drives. Incoming gravel that is discharged into the hopper on the boat feeds into a long revolving cylinder with perforated walls. This trommel is nine feet in diameter and thirty feet long, and powerful streams of water from monitors are pointed into it to break up all consolidated material. All the large stones and rocks fed into the cylinder are discharged from its lower end while the finer materials, up to a half inch in diameter, pass through its perforated wall.

These fines and the flowing water fall into long slanting troughs under the trommel. All of the heavier particles in this moving material are caught behind riffles or cleats fastened across the bottoms of the troughs. To assist in catching every particle of gold, small amounts of mercury are placed behind the riffles to absorb and hold the gold flakes as they drift down. The combination of gold and mercury, called amalgam, is scraped out every week.

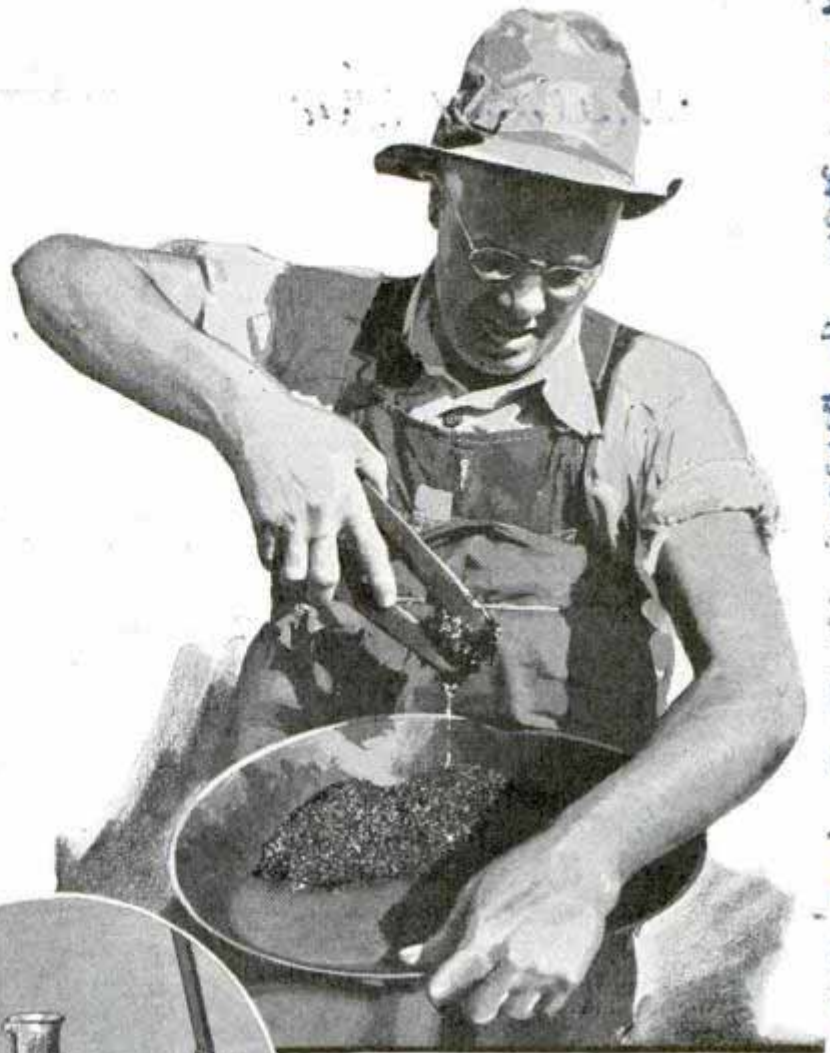


Photo by Auto Club of So. California

Top, magnetic iron particles trapped behind riffles of gold-saving machinery. Center, vial containing platinum recovered by gold dredge. Bottom, prospector panning ore he has crushed with mortar and pestle to learn gold content of the rock



By the end of a week's operations this amalgam is about half gold and half mercury. It looks like a lot of crumpled-up tin foil. To separate the two elements the amalgam is placed in a retort and the volatile mercury is distilled off, being collected for re-use with a water condenser. The spongy gold left in the retort is melted down and poured into small molds.

When the material that the gold dredge scoops up has passed through the gold-saving equipment it is moved onto endless belts at the stern and is carried out to the ends of long stacking booms to be discharged behind the boat.

Gold dredges have two heavy

(Continued to page 141A)

157
Plastic Box at Front Door
Lights House Number
Cleveland Ohio



House numbers show up clearly against lighted box made of sheets of a translucent plastic material

In a neat, translucent frame that harmonizes with the modern architecture of his new home, a Cleveland man has mounted his house number, illuminated so that it can be read easily from the street. The numerals are six inches high, of sheet bronze; the surface of the six-foot case is of synthetic resin in sheet form. Only a three-watt lamp is required to light the number. When the entire box is illuminated, three lumiline lamps are turned on.

4135
Filing Spindle Comes Apart
for Removal of Any Paper

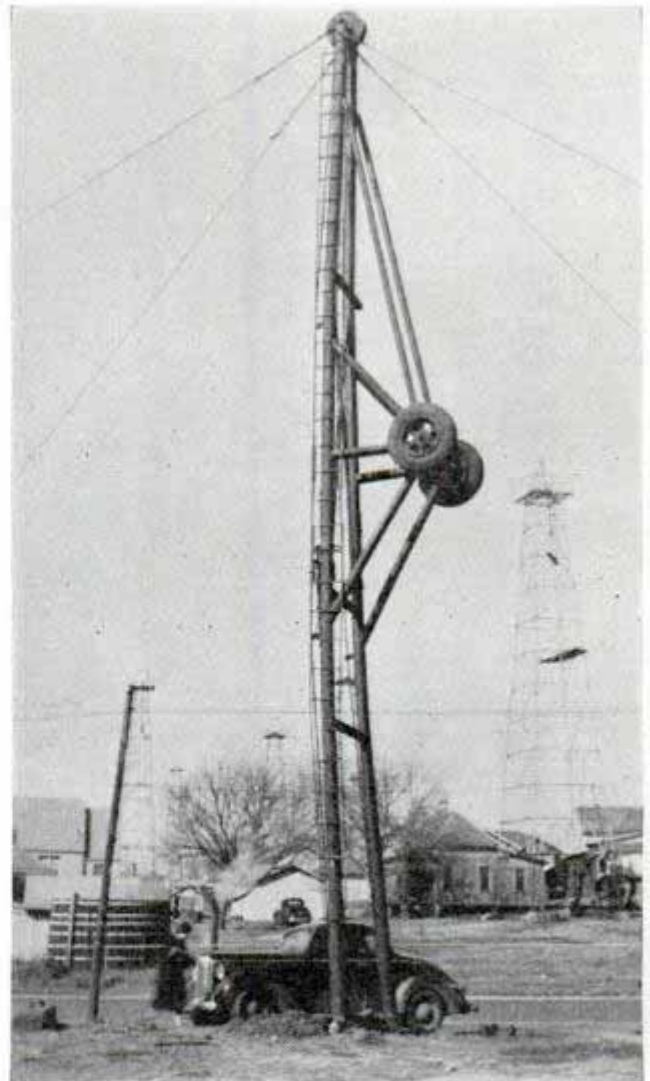


Any memorandum or bill may be removed from a filing spindle that comes apart. When a paper is to be removed, it is pressed down on the bottom part of the spindle while papers above it are lifted

off with the top portion of the spindle. This leaves the desired paper in position for easy removal. It is possible to reverse the spindle pin so that the papers first placed on the pin will be on top. This means that the items on the spindle may be withdrawn in the order in which they were filed. The point of the spindle is rounded.

H 168
Forty-Foot Trailer Forms Mast
for Oil-Field Work

For pulling rods, tubing or casing in wells not provided with a servicing derrick, a forty-foot trailer forms a mast in the oil fields. The trailer's frame is A-shaped, and is combined with an axle and a pair of wheels. Since the wheels are twenty feet in the air when the mast is in use, they do not interfere with work. Rigid tie-in of wheels to frame makes a vehicle which can be transported from one well to another quickly and safely.



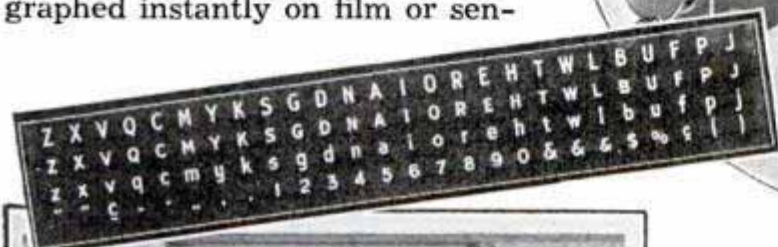
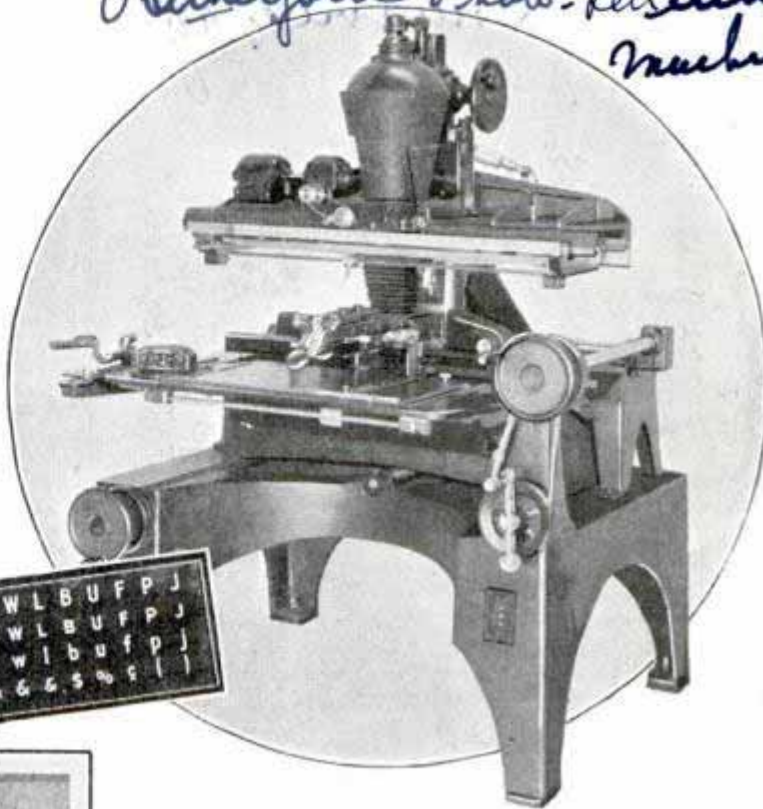
Trailer mast in place for oil-field work. Note position of the wheels

E. C. Markham

Dr. J. Prudeaux, es. per m. miniature lamps, General Electric & Reba Park
Seper: File Spindles in the Sale. Cleveland

Robot Artist Imitates Hand-Lettering by Photo

Typesetter that uses no type, artist that uses no pen, the latest instrument of the printer and lithographer is a mechanical artist which operates photographically. It produces an effect of hand-lettering or fine typesetting, but instead of type it uses master alphabet plates—glass plates of transparent letters which slide back and forth semi-automatically, bringing one letter after another into focus over a small precision camera. As each letter comes into position it is photographed instantly on film or sen-



Top, the photo-lettering machine. Left, a master alphabet plate and layout board, and below, variations produced by machine from one master alphabet

PHOTO-LETTERING
JUSTIFIED AUTOMATICALLY

PHOTO-LETTERING
WIDTH EXTENDED HEIGHT MAINTAINED

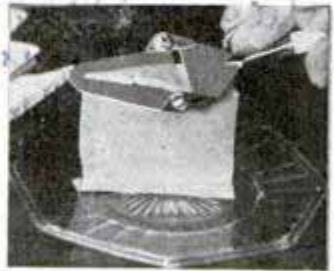
PHOTO-LETTERING
HEIGHT EXTENDED WIDTH MAINTAINED

PHOTO-LETTERING

matically justified, and trademarks, signatures, borders and repeated designs can be stepped up or reduced in any size and arrangement. More than 200 styles of master alphabets are available, and by using the condensing, italicising and other features about forty different type fonts can be reproduced from a single master plate.

Adjustable Knife Slices Cheese to Any Thickness Desired

Cheese can be sliced to the desired thickness with an adjustable knife which also acts as a server. The hinged blade is set to the angle at which it cuts the proper slice, and then its sharp edge is drawn through the cheese, slicing it and laying it in a position for serving. The knife may be used similarly for serving butter.



sitized paper. The operator, working in daylight, visually controls the mechanism with a layout and arranges the letters exactly where he wants them. This method is not intended to do the work of the Linotype, but to arrange layouts which ordinarily would be handset or lettered by an artist. The photo-lettering machine will expand or condense the letters, stipple, screen or shade them; by changing focus it can produce any size from small text letters to giant headlines. Lines are auto-

Handwritten notes: 14126, As M. Thurnauer Co, 20th Street

Anchor Pads at Trousers' Top Keep Shirt in Place



Two views of anchor pad, with drawing of manner in which it is attached

Made of rubber, anchor pads to be inserted at the top of trousers to keep the shirt in place are on the market. The rubber side is against the shirt. A wire clip attached to the pad extends over the top of the trousers and around each belt loop. Then the belt is inserted over the clip and under the belt loop.

Secrets of Skidding Revealed by 20,000 Tests

After 20,000 tests on skidding tendencies, it has been found that regardless of tire tread design, adhesion between road and tires decreases with the speed of the vehicle, reducing resistance to skidding and increasing the difficulty of bringing the automobile to a stop in an emergency. The tests, conducted under the direction of Professors K. W. Stinson and C. P. Roberts, also revealed that a light sprinkle causes the average road to be about one-

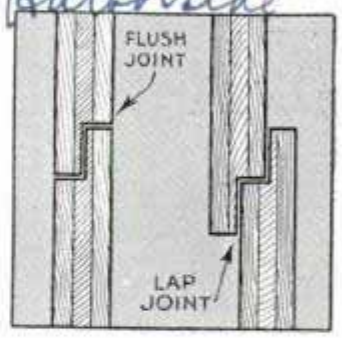


Trailer with which skid tests were made. It has one-wheel hydraulic brake

third more slippery than a drenching rain; that sliding the wheels of an automobile when applying brakes results in the vehicle traveling much farther before it is brought to a stop; that tires which have been worn smooth may as much as double the tendency for wheels to slide when brakes are applied, and that increasing or decreasing tire pressures on ice or in snow does not help traction. In the tests, a two-wheel trailer, with a Linderman hydraulic brake on one wheel, was used, the other wheel running free. The trailer was attached to a tow car through a diaphragm connection which translated the effort required to pull the trailer into hydraulic pressure. The latter was recorded on instruments in the tow car. The type of brake and the particular installation made it possible to increase braking effort gradually and smoothly until the wheels locked and the tires slid. In every test on straight ahead sliding, the skidding tendency was shown to increase with the speed of the car. In some tests, as little as one-quarter the resistance to sliding was found at forty-five miles an hour as at five miles an hour, with the resistance to skid dropping off even faster at higher speed. From a car operating standpoint the tests would indicate that brakes which lock too easily are a hazard rather than a help in bringing the vehicle to a stop.

Weatherproof Siding of Plywood Reduces Building Costs

Plywood siding, made weatherproof by its synthetic resin binder, is being introduced as an inexpensive building material readily adaptable to various architectural effects. Faced with fir or redwood and available in four and eight-foot lengths with exposures of twelve and one-half to twenty-three inches, this plywood saves both original and maintenance costs. Its wide surface makes it inexpensive to install, reducing the nailing considerably; and the resin binder, poisonous to termites and rodents, stops the passage of moisture.



Warbur Plywood Corp

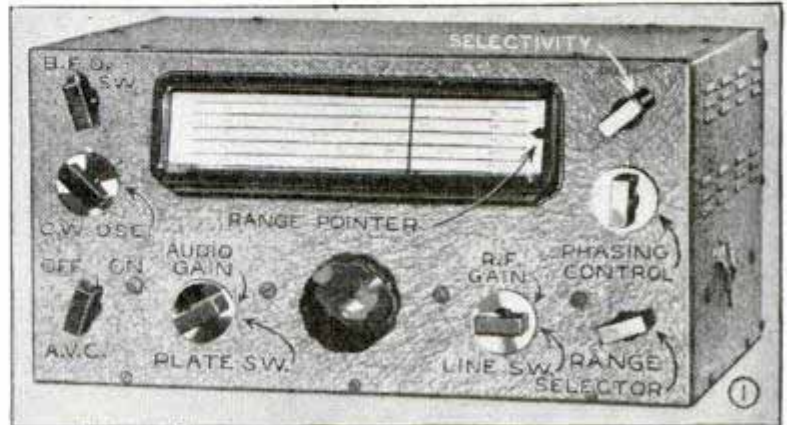
disc. not successful.
 5/5/39.
 149 Broadway New York
 Linderman Devices.
 Dept. used equipment made by Linderman Devices.

J. V. Palcher N.Y.C. Co. Inc.
 H 159. 709 Esray St.
 Snrville, Ky.

Johns State University
 Columbus Ohio



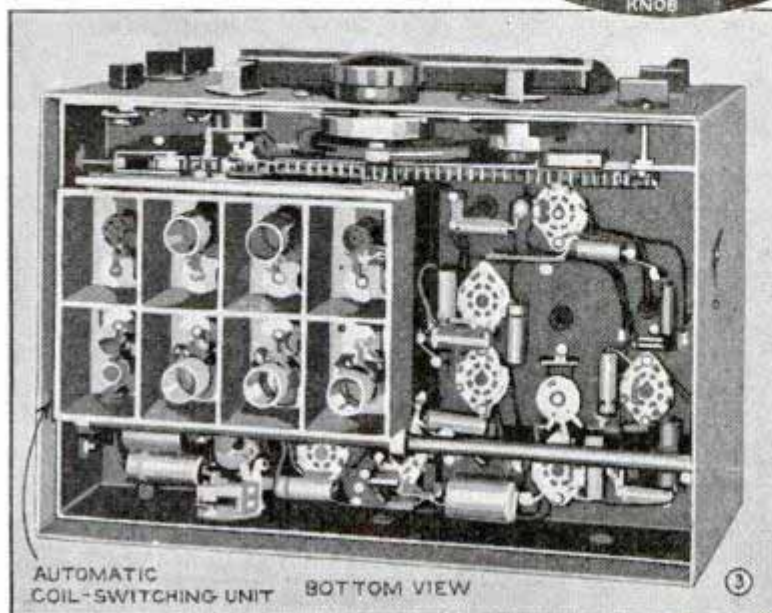
TEN-TUBE SUPER *of advanced design*



SEVERAL unusual features are included in this inexpensive 10-tube superheterodyne receiver which is available in two models designed to meet the requirements of amateurs and short-wave listeners, as well as all-wave listeners who are interested in a communication-type set for DX reception on all



bands. The NC-81X model, shown in the photos, is fitted with a special tuning condenser and coils to provide full band spread on the 10, 20, 40, 80 and 160-meter amateur bands; frequencies between these bands cannot be covered with this model. For short-wave listeners and those who wish an all-wave DX receiver, the



NC-80X employs the same circuit, covering frequencies from 540 to 30,000 kilocycles in four ranges. This means everything from 10 meters to the top of the broadcast band.

Both of these models operate on 110 to 120-volt, alternating or direct-current, power lines. This a.c.-d.c. feature is of special interest to many Canadian readers and others located where direct current is employed. The same models are also available for battery operation where no 110-volt line supply of any kind is within reach.

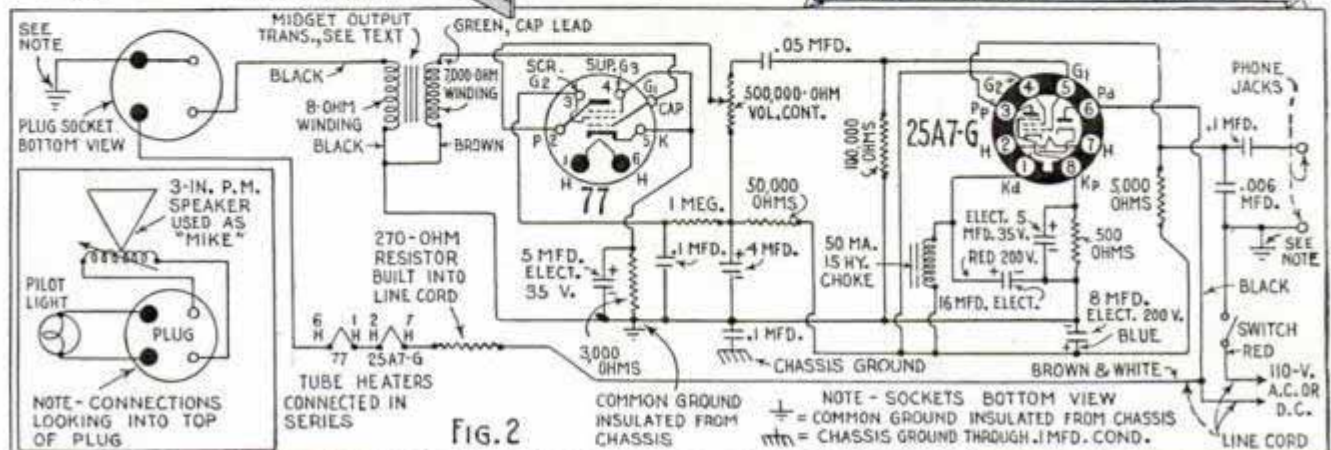
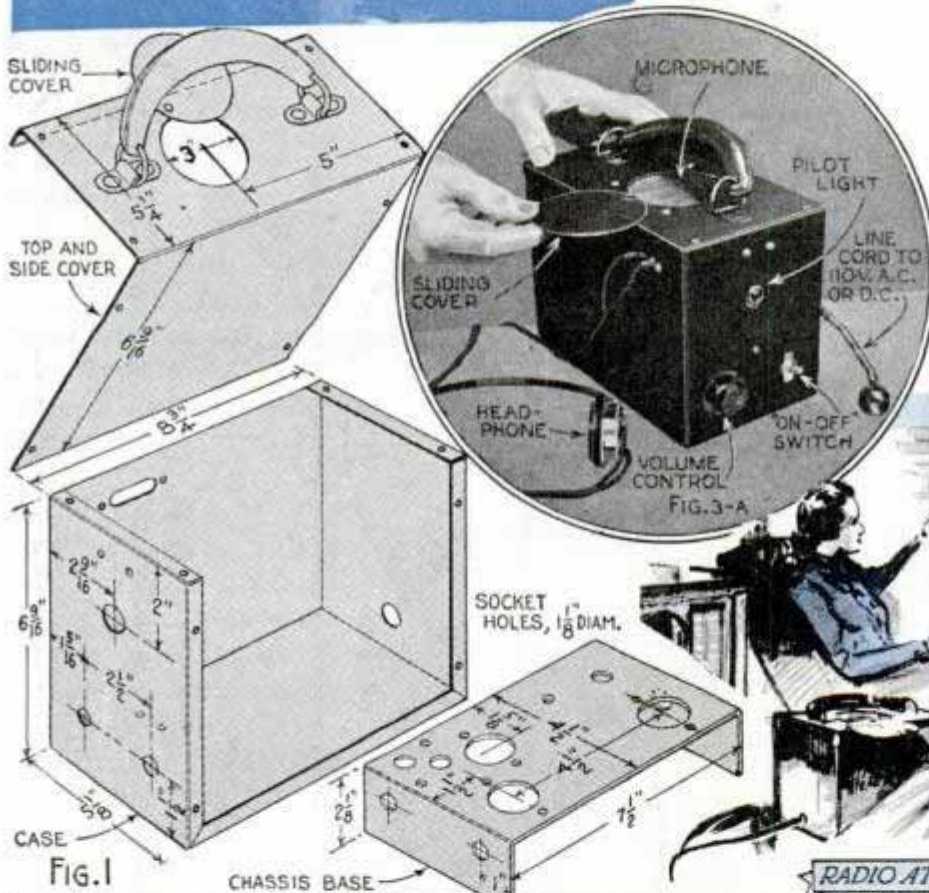
(Continued to page 136A)

PORTABLE HEARING

By M. N. Beitman



ANY radio experimenter can build this compact and efficient a.c.-d.c. hearing aid for about \$7.00. It combines high fidelity and sensitivity in a compact portable unit that will enable the hard-of-hearing to join in conversations, listen to the radio at normal volume level, and amplify ordinary telephone conversations. Also suitable for use as a detectaphone, or sensitive noise analyzer, it is easily portable and no batteries are required. Entirely electrical in operation, the source of power may be 110 volts, d.c. or a.c. of 25, 50 or 60 cycles commonly used for ordinary house lighting in the United States and Canada.



AID operates on A.C. or D.C.

When plugged into the wall socket, and the switch is turned on, all sounds within a 12-foot radius of the unit will be amplified and reproduced in a single or double headphone, or bone-conduction unit if preferred.

The tubes are wired in series and the extra voltage is dropped in a standard line-cord resistor of 270 ohms; this circuit is a conventional, well-filtered type. A 3-in. permanent-magnet speaker serves as the microphone. Since this speaker has an 8-ohm voice coil, it must be coupled to the tube with a transformer. This midget output transformer has

(Continued to page 148A)

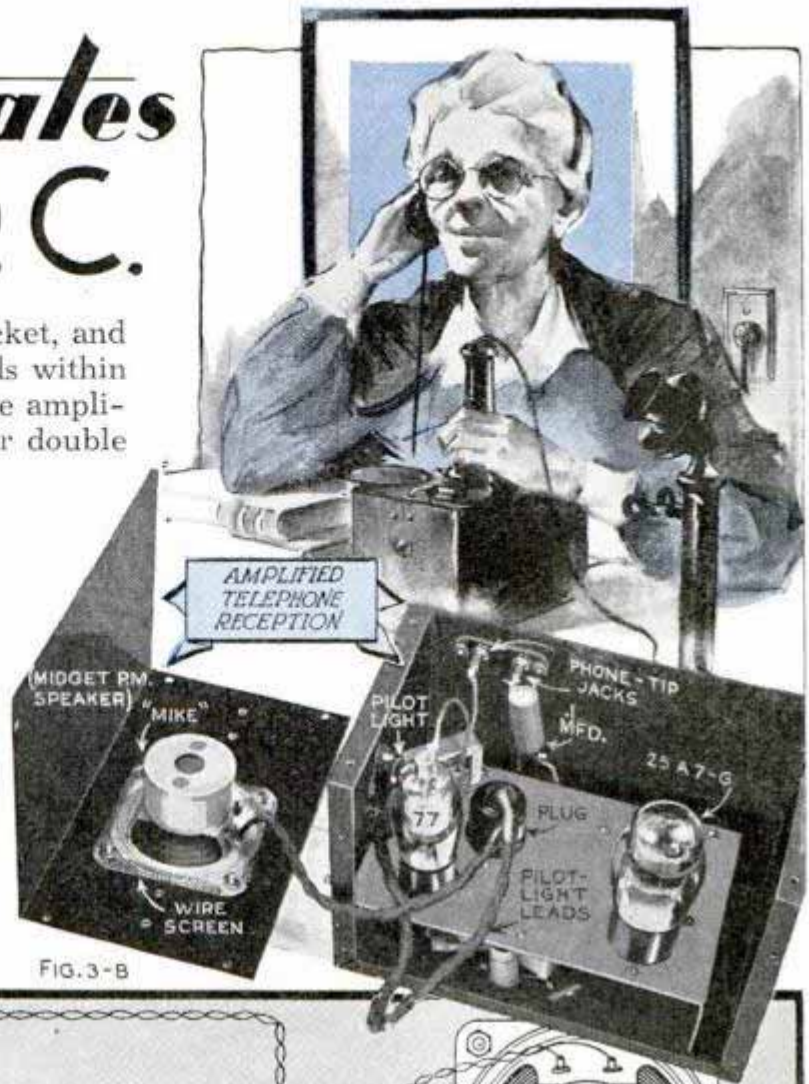
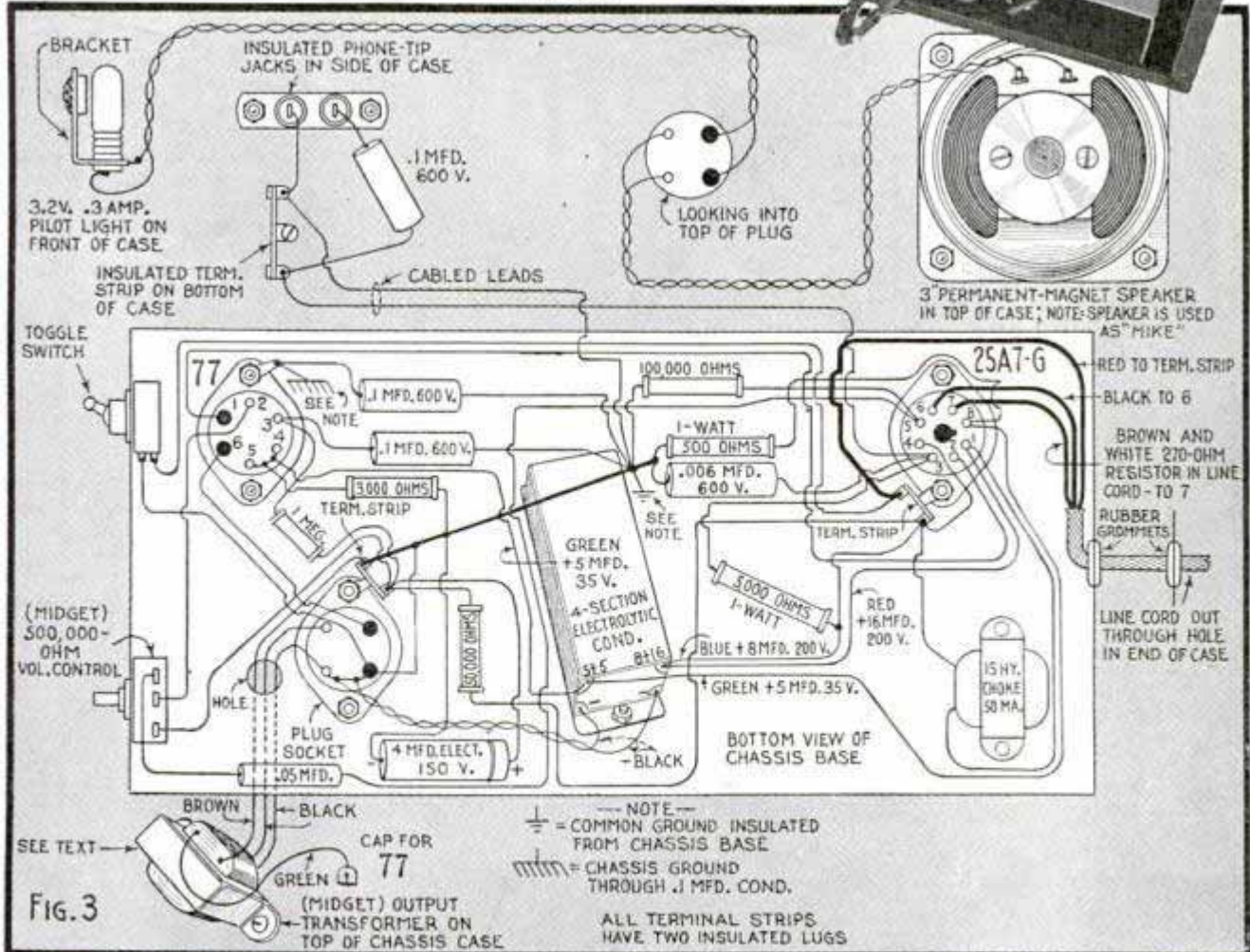


FIG. 3-B

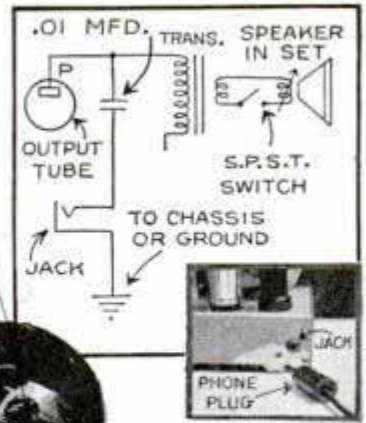


*Murphy Co. 2288
Wabash, Chicago*

Practical Hints for the Radio Experimenters



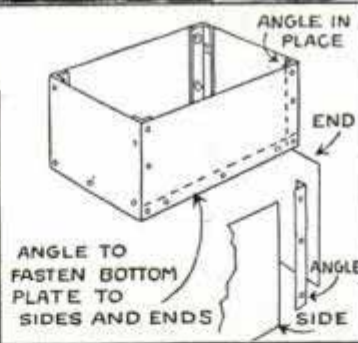
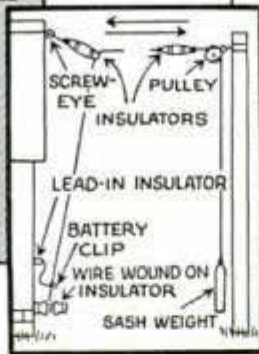
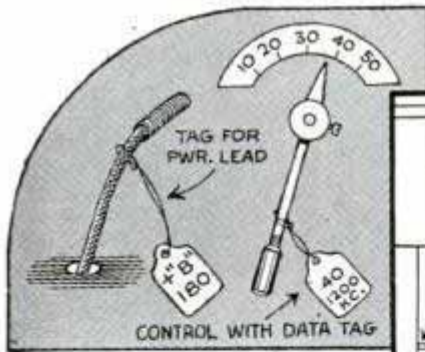
Right, headphone jack easily added to any set; plate connection necessary on one output tube only. Parts required: single-circuit jack; .01 mfd. 600-V. fixed condenser. Switch in voice-coil lead to silence speaker



Below, small price tags provide an excellent means for marking leads when apparatus is removed for test or repairs; also handy for tagging controls with data for certain adjustments. A great time and patience saver on controls easily moved out of position

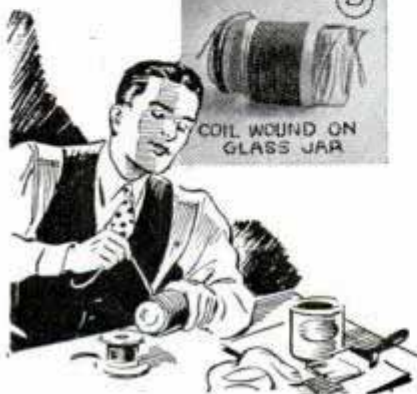


Above, portable sound recorder and electric phonograph that may be connected across the speaker voice coil in your radio receiver to record domestic and foreign programs off the air. Anyone can make records of favorite music, famous speakers and outstanding news events with this home recorder which reproduces the records as soon as they are made

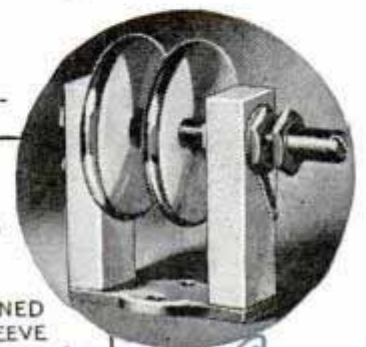
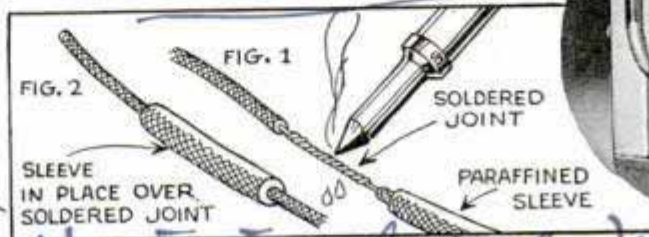


Above, 1/8-in. sheet aluminum and 1/16 by 1/2-in. brass angle stock may be used for shield boxes of any required size

Above, adjustable experimental antenna to determine the best length for any particular receiver or locality. The antenna wire should slide freely through the end of the insulator on the building; a rope through pulley to a sash weight on the far end keeps antenna taut. Wire is wound around knob insulator until exact length is obtained as determined with battery clip. Clip is then removed and a soldered connection made at correct point



Left, A and B, low-loss transmitting coils easily wound on glass jar. Below, soldered joint protected with insulating sleeve. Right, compact neutralizing condenser for transmitter



*Hammarlund Mfg Co
424 Wabash*

SPEAKER CABINET

Extends Tone Range

By Paul H. Nelson

HERE is a speaker cabinet that you can build for less than ten dollars, which will enable you to use any good medium-sized magnetic or dynamic speaker and bring in the low notes with a quality not present in an ordinary speaker, and about an octave lower than with the usual type of cabinet. These low notes have a rich, velvety quality, and the high notes lose none of their brilliancy.

The high-fidelity performance is due to a long torturous path coupled to the back of the speaker cone as indicated in

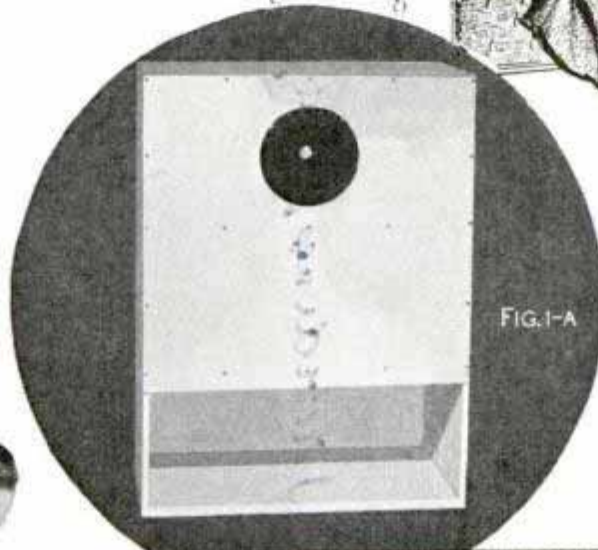


FIG. 1-A

Fig. 1; this long sound-path between the front and back of the speaker increases the radiation resistance in the same manner as a large baffle.

(Continued to page 138A)



FIG. 1-B

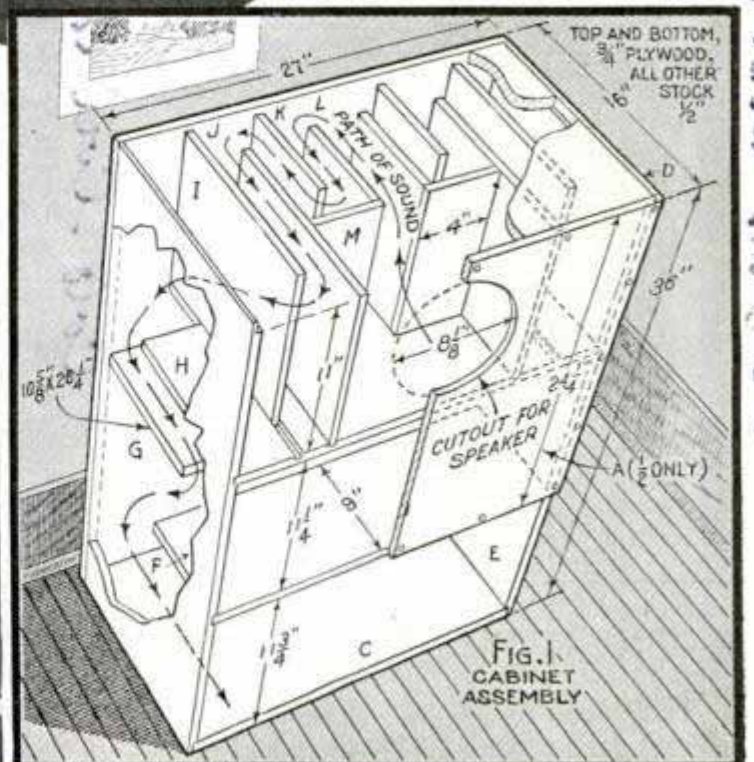


FIG. 1-C
CABINET ASSEMBLY

Allen as a...
Labs. div.
upper montclair N.J.
Cathode-Ray Tube for Television

240 W. 23rd St. New York 240 W. 23rd St.
position, the dial being perfectly legible in either case. The high-gain circuit includes automatic volume control and type-41 pentode output tube.



Table Model Radio-Phonograph

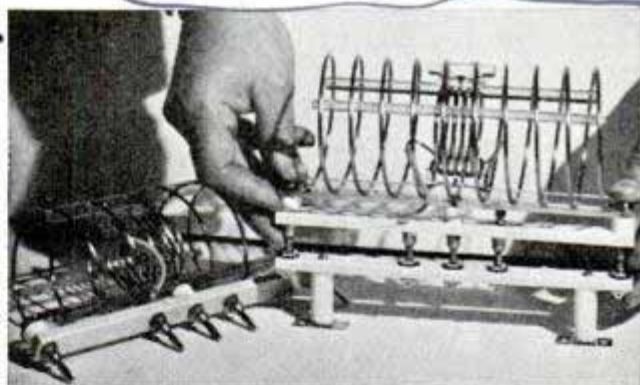
Housed in a cabinet measuring 16½ by 11½ by 13½ in., this compact a.c.-d.c. combination radio and phonograph employs a dynamic speaker with extra large field coil and transformer for tone quality. Radio covers broadcast and short-wave 16-50 meter bands; phone pickup is of the crystal type.



Alley Radio Corp.
H. W. W. 23rd St.
240 W. 23rd St.

Rated at 6,000 volts, this large television tube has a screen 12 in. in diameter and is designed to prevent de-focusing of the spot when the video signal modulates the tube. It is claimed that a sharp focus is maintained at all signal values thus giving a clear-cut television picture.

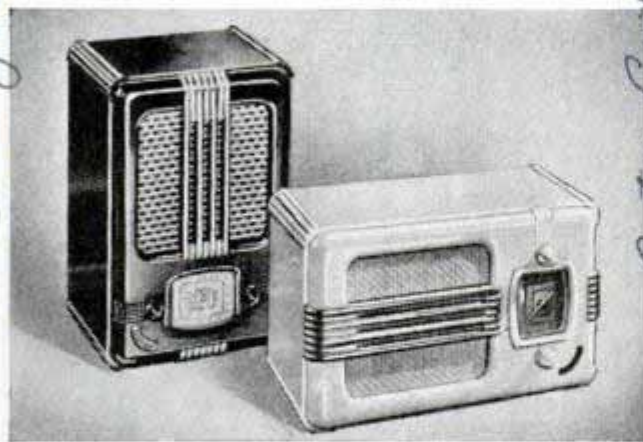
Plug-In Inductors with Link Coils



Low-loss transmitting inductors for all-band operation are available with internally mounted, fixed or variable, link coupling coils. They are mounted on "Steatite" bars equipped with plugs to complete connections when inserted in the standard jack base shown in the photo.

Set Operates in Two Positions

This 5-tube a.c. superheterodyne receiver is housed in a plastic cabinet and can be placed either in the upright or lay-down



Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a Three-Tube Radio Direction Finder. An inexpensive battery-operated loop set which works on the same principle used in aircraft and marine direction finders; can also be employed to receive broadcast programs for entertainment. The simple circuit uses type-6J7 and 6F5 high-gain tubes.

Alley Radio Corp.
833 W. Jackson St. Chicago

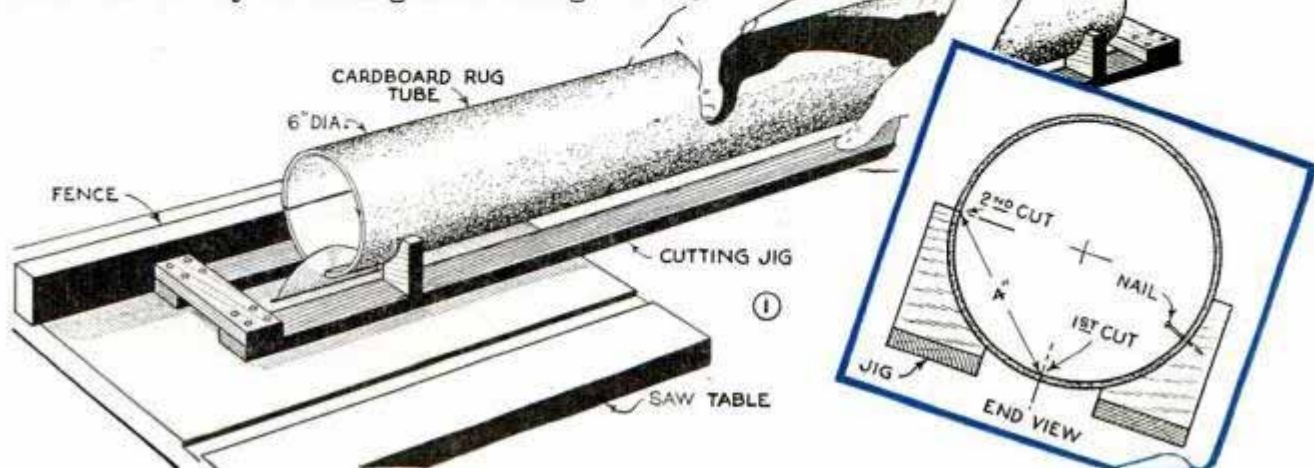
Radio-Phonograph
Cable-Cord Co. Providence, R.I.

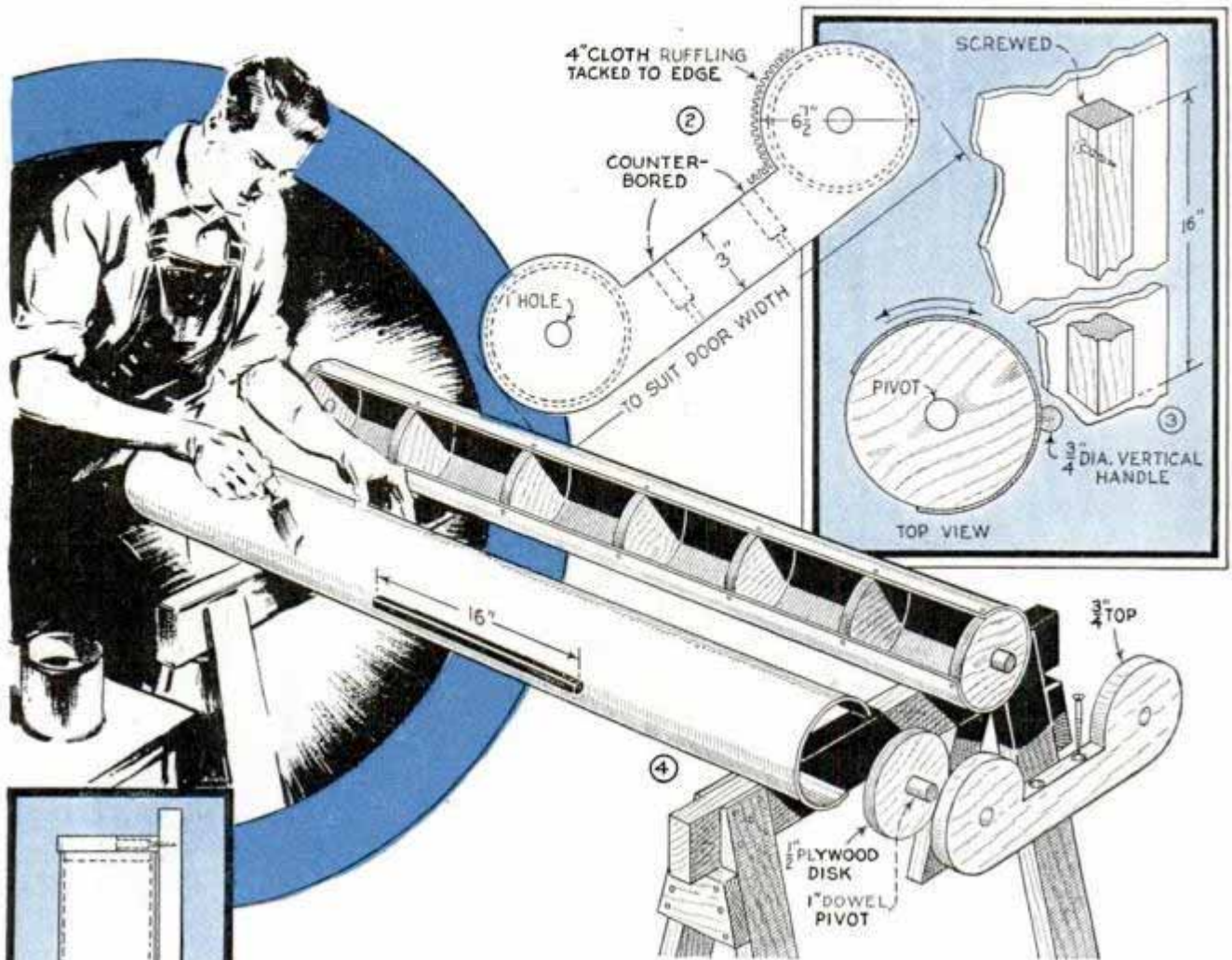


“On-a-Door” VANITY CABINET

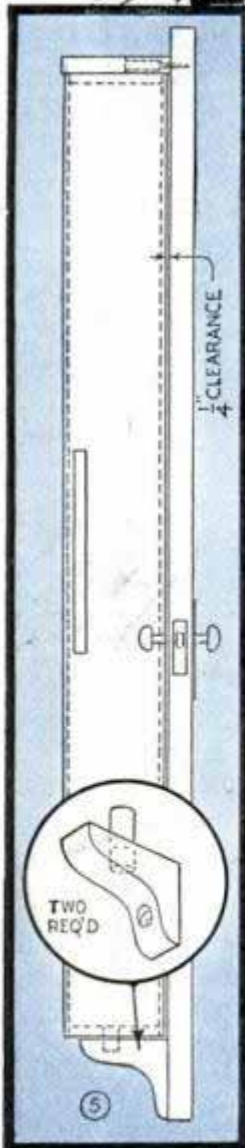
BESIDES contributing to the conservation of space in the small apartment, converting a mirror door into a convenient vanity by fitting twin-shelf space at each side and wiring for an overhead lamp, will also furnish milady with an extra “powder room” with ample space for numerous jars of cream, lotions, etc.

The columns are made from stiff cardboard rug tubes which can be obtained from a local furniture dealer. No over-all dimensions are given because the door on which the case is to be hung determines the proper size and measurements. Allowance should be made so as not to interfere with the opening and closing of the door. Fig. 1 shows a simple method for holding the tube in alinement while cutting the opening in it. A cradle-shaped jig similarly made from scrap stock, as shown, holds the tube firmly as it is guided along the

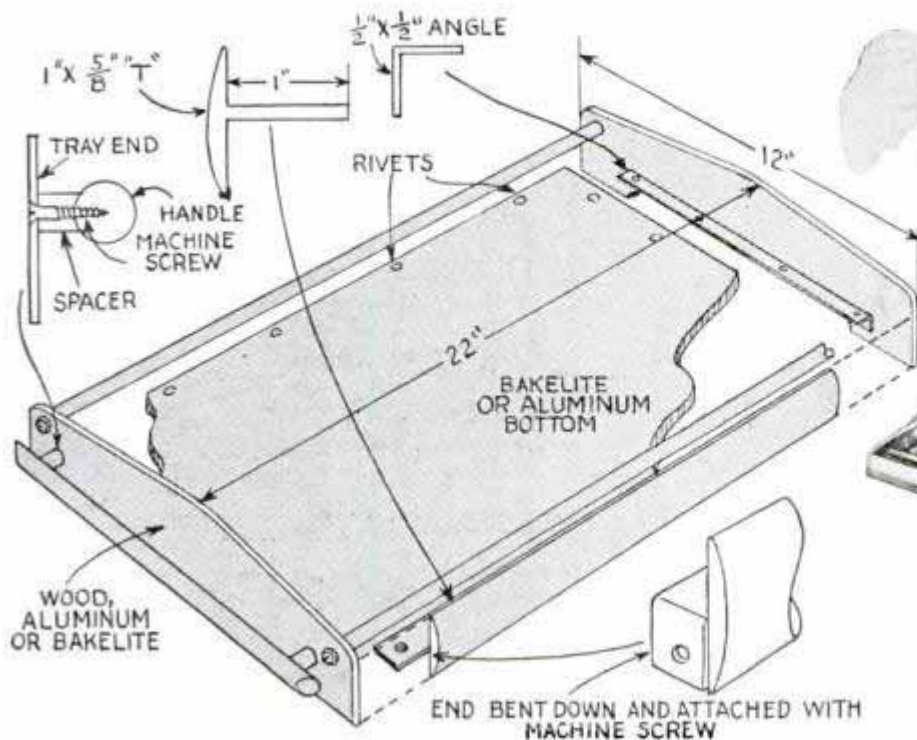




fence of the circular saw. A small brad is used to hold the tube temporarily to the jig. After making the first cut, the work is turned in the jig to make the second cut. Although rather difficult to hold, the section can be cut out with a fine-tooth hand saw and the rough edges can be smoothed with a sandpaper block. However, before cutting the tube, it is best to make a trial fit in the end with a disk of wood to obtain a correct fit after which the shelves are cut from this pattern. The fit is determined before cutting as the tube will lose its true shape when cut. Any number of shelves can be fitted to the tubes and it is best to band-saw these in sandwich form to insure uniformity. The disks which close both ends of the tube are bored in the center to take short length dowel pivots as shown in Figs. 2, 3 and 4. These are made to rotate freely in a header piece cut from $\frac{3}{4}$ -in. pine, which is fitted to the top of the door with two screws driven through the edge in counterbored holes. As shown in Fig. 2, the diameter of the circular ends should be slightly larger than the tubes to provide sufficient clearance for rotating. A 16-in. length of $\frac{3}{4}$ -in. dowel stock, flattened on one side and screwed to the side of the columns as in Fig. 4, serves as a handle. The lower end of the columns is supported with a small bracket screwed to the door as shown in Fig. 5. A large washer placed over the dowel pivot will permit the column to turn more freely. Before painting, a coat of glue-sizing applied to the cardboard will prevent absorption. At the top, a 4-in. width of gaily patterned ruffling is tacked to the edge of the header piece. Access to the shelves is cleverly made simply by rotating the columns halfway around. When not in use, the opening is turned to the back.



Serving Tray Made from Colorful Materials



Just imagine this tray with a black Bakelite bottom, aluminum end pieces and side rails, set off with red plastic handles. Or, the same tray can be made up in other attractive combinations. It may be heat or acid proof, as you desire, and the cost depends on the materials used. The sides are strips of T-shaped aluminum molding. The bottom, ends and handles can be any material desired, and the rods, which serve as side rails, may be wood, metal or plastic. The bottom is riveted to the T-shaped

strips and to angles bolted, screwed or riveted to the ends. Note how the sides are attached to the ends. Part of the rounded portion of the T-strip is cut away at the end, after which the remaining piece is drilled and then bent down to take a bolt or screw in the end of the tray. Handles are attached with screws driven through from the inside of the tray. Spacers between the handles and the ends of the tray afford easy gripping with the hand.

—H. H. Ragatz, Denver, Colo.

Garden Seeds Are Stored in a Handy Matchbox Cabinet

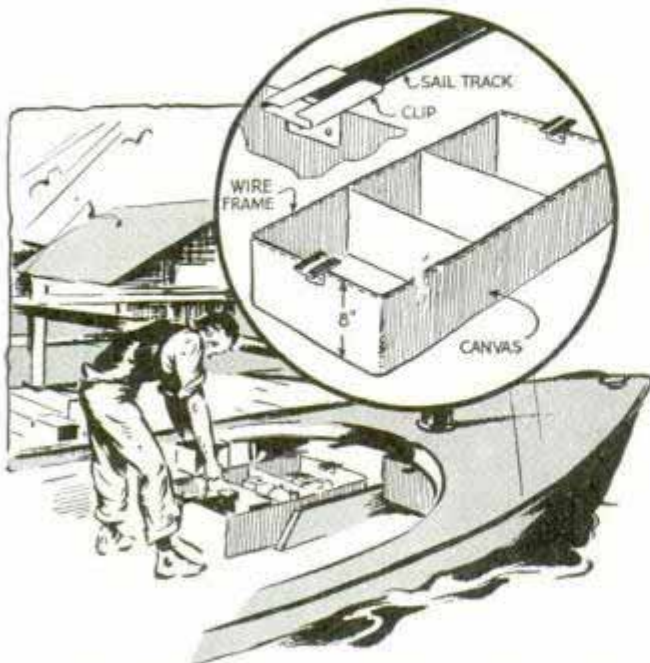
Empty, safety-match boxes glued together provide a neat little cabinet for storing garden seeds. Appearance of the cabinet is improved and rigidity is added by wrapping the sides, back and top with oilcloth, wallpaper or fancy wrapping paper, which is glued or pasted in place. If a paper covering is used, it's a good idea to apply a coat of white shellac. Two-pronged paper fasteners pushed through the fronts of the boxes serve as drawer pulls.—Bess Livings, Batavia, Ill.

☞ When packing eggs in a case, put the longest ones in the corners and set them in a slanting position so that they will not project above the filler and be crushed.



Small seeds are quickly stored and labeled in this small cabinet, which keeps them safe until spring

Sliding Basket under Boat Deck Serves as Locker



This basket provides a dry place for food, clothes, camera and other articles on a sailboat

On sailboats and runabouts that have large forward decks and no lockers, this basket solves the problem of storage for food, cameras, clothing, etc. It consists of a canvas basket stitched around a heavy wire frame, which is fitted at the ends with clips to slide on a piece of sail track. This is screwed to the underside of the deck. If desired, the basket can be partitioned, and it can be provided with a lock by slipping the shackle of a padlock around the track between the deck and frames.

—Edson E. Foster, Evanston, Ill.

Floating Lids for Photo Solutions Cast from Paraffin



Floating covers to protect solutions in photo, plating or processing tanks, are easily made from paraffin, which is acidproof and non-absorbent. The covers are cast in a flat container, such as a cake pan, by

pouring the melted paraffin into it to a depth of $\frac{1}{2}$ in. When cool, the hardened castings are removed by warming the con-

tainer, and handles, shaped from small square pieces of the wax, are attached by softening the contacting surfaces with heat.

Strainer Cloth on Paint Bucket Held with Twisted String

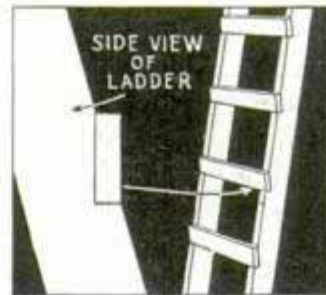
Instead of tying the string that holds the cloth when straining paint, I twist the ends together and pull it tight as indicated. Held in this way, the string will not loosen of its own accord, yet it is easily unfastened to remove the cloth.

—Ted L. Robbins, Los Angeles, Calif.



Rungs on This Homemade Ladder Set at Angle to Ease Foot

Set the rungs of a homemade ladder at a slight angle, as indicated in the detail, instead of nailing them flatly to the sides, so that the worker can stand on the narrow flat side instead of on the edge. The notches for the rungs are formed in the sides of the

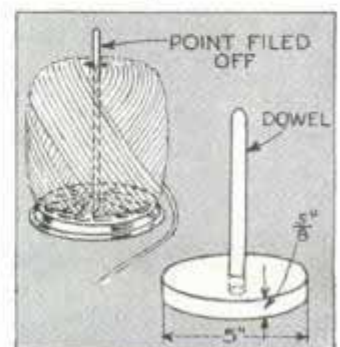


ladder by making two saw cuts. Another way to accomplish the same purpose is to bevel the top side of each rung with a plane and then nail it on the ladder sides in the usual manner.

—R. L. Allen, Dothan, Ala.

Yarn on Bill-File Spike

A bill-file spike of the type that has an iron base serves nicely as a holder for a ball of knitting yarn. The spike is heavy enough to stand firmly, and the yarn ball is kept

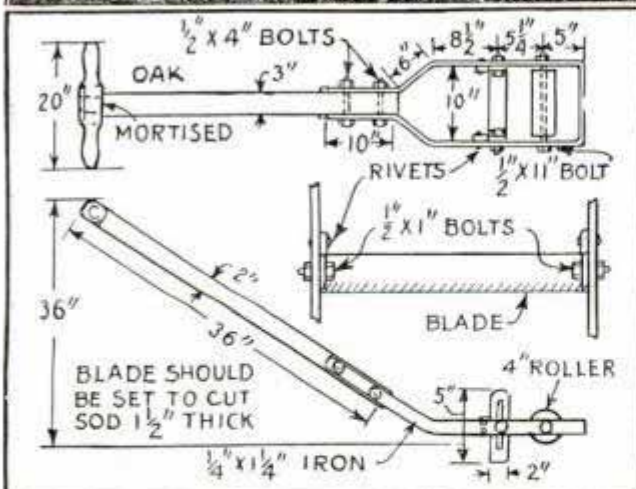
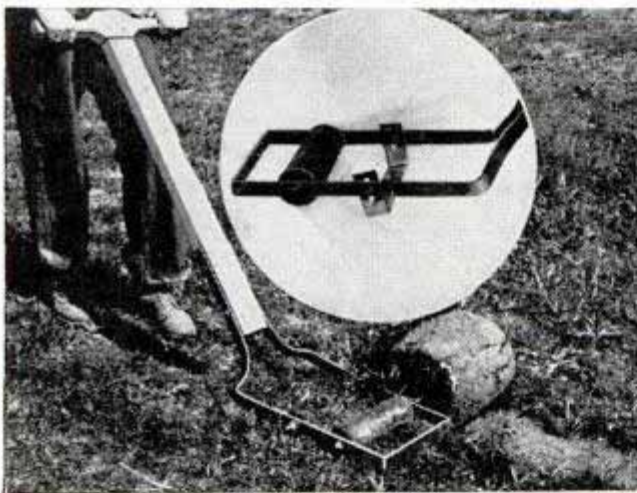


clean and untangled. The pointed end of the spike should be filed off to avoid injury to the hands. A similar holder can be made by inserting a dowel in a wood base. If the holder upsets easily, make a recess in the underside of the base, drive a couple of wood screws part way into it and then fill it with molten lead. The screws anchor the latter in place. A piece of felt glued to the base will protect varnished surfaces.

—Bess Livings, Batavia, Ill.

Cutter Peels Sod Rapidly

With sod finding more and more use in stopping gullies and in other forms of erosion control, this sod cutter will save labor and time for the home owner and farmer. It consists of a $\frac{3}{8}$ by $1\frac{1}{4}$ -in. flat-iron frame, a cutter adjustable for depth and a roller



Several hundred square feet of sod can be stripped off in a short time with this cutter

to hold the cutter at the depth to which it is set. The assembly is fitted with a strong handle, and is pushed along the ground to strip off the sod.

—Wyman S. Smith, Des Moines, Ia.

Artist Matches Paints on Glass with Tints of Landscape

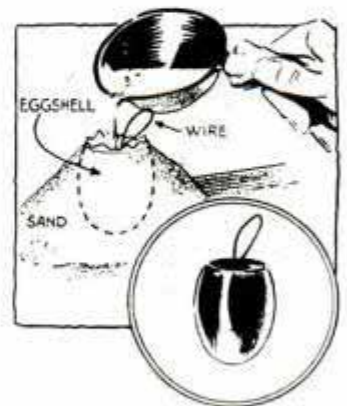


Artist compares paint with color of landscape by observing both paint and scene through this test glass

To match tints when painting a landscape, one artist uses a piece of glass on which he applies the paint. By looking at the landscape through the glass adjacent to the painted portion, he is able to compare the colors closely. If desired, the glass can be fastened on a wood handle, a slot in the end of the handle fitting the glass snugly.

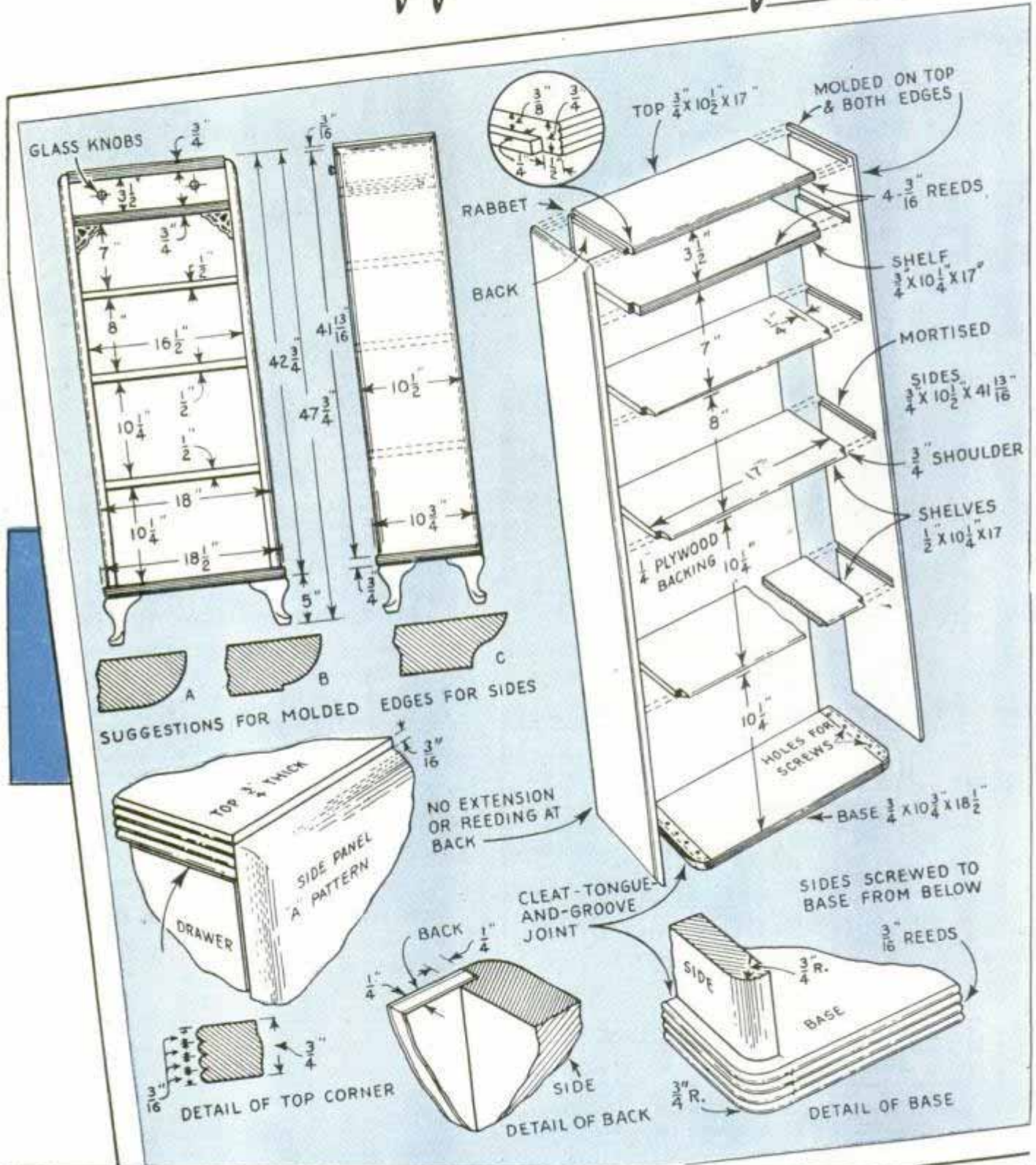
Fisherman's Lead Sinkers Cast in an Eggshell

When spending a few days at a lake, one fisherman needed some heavy sinkers, and having no mold at hand in which to cast them, used an eggshell. The end was broken from an egg, the contents removed and the shell set in sand as indicated. An anchoring wire was placed in the shell and molten lead poured into it.



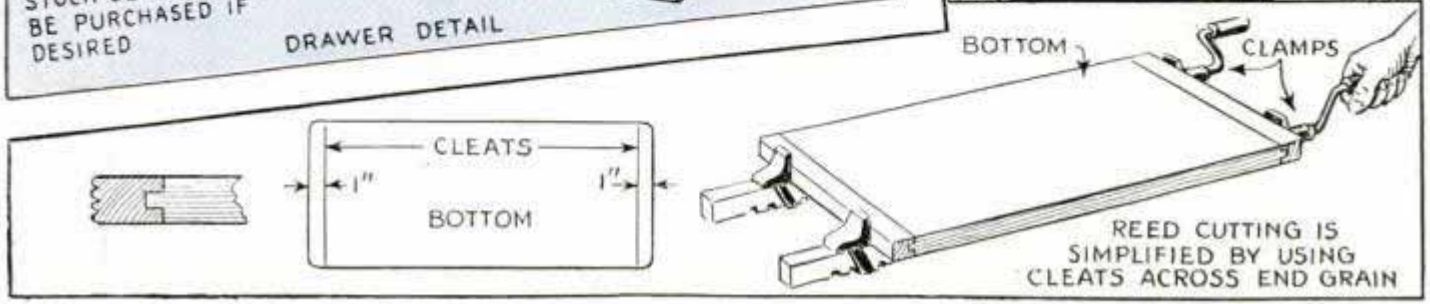
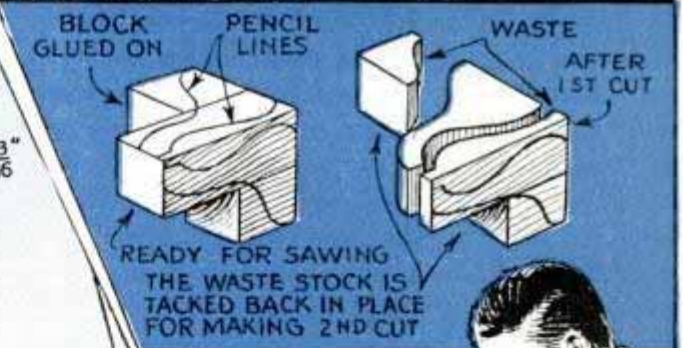
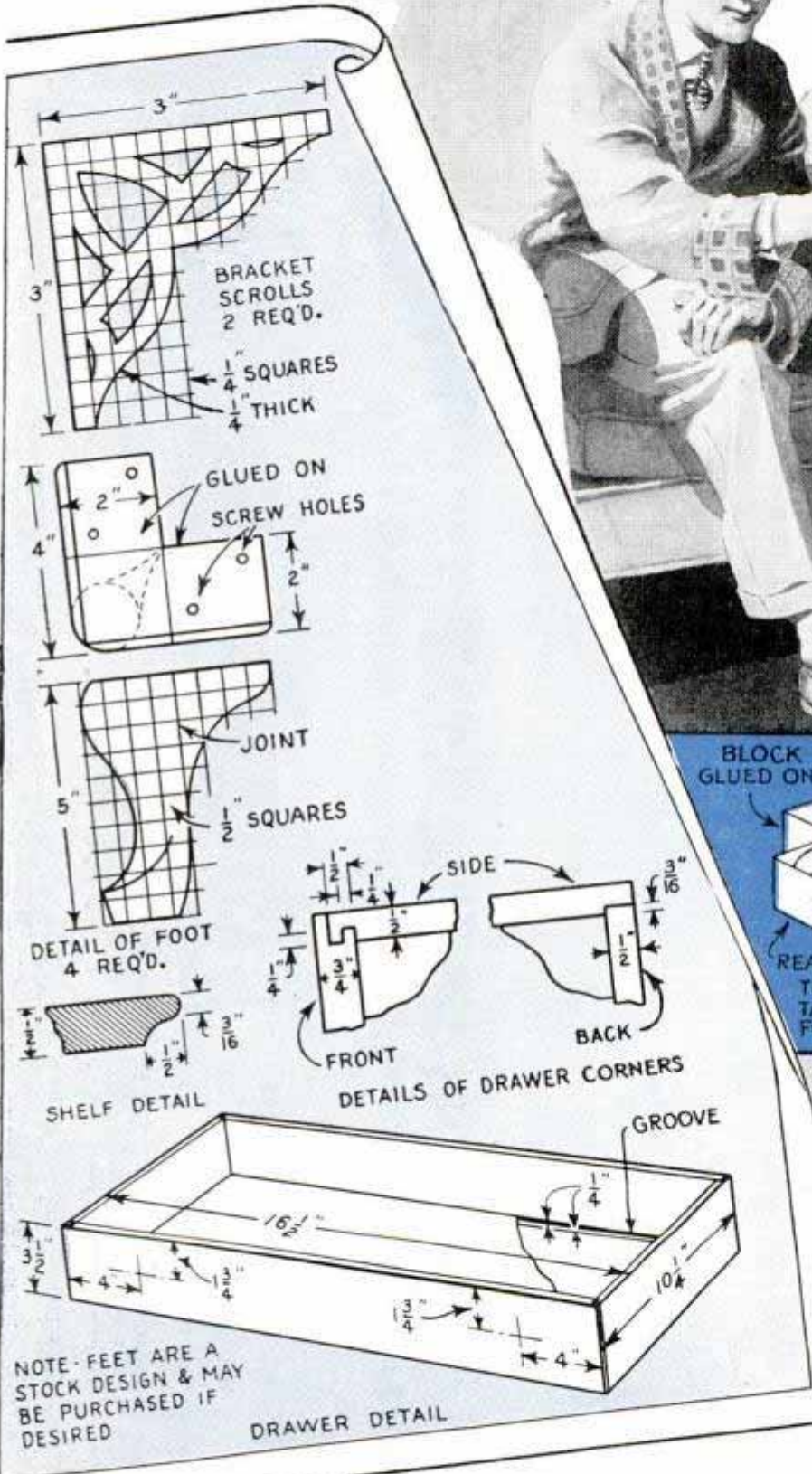
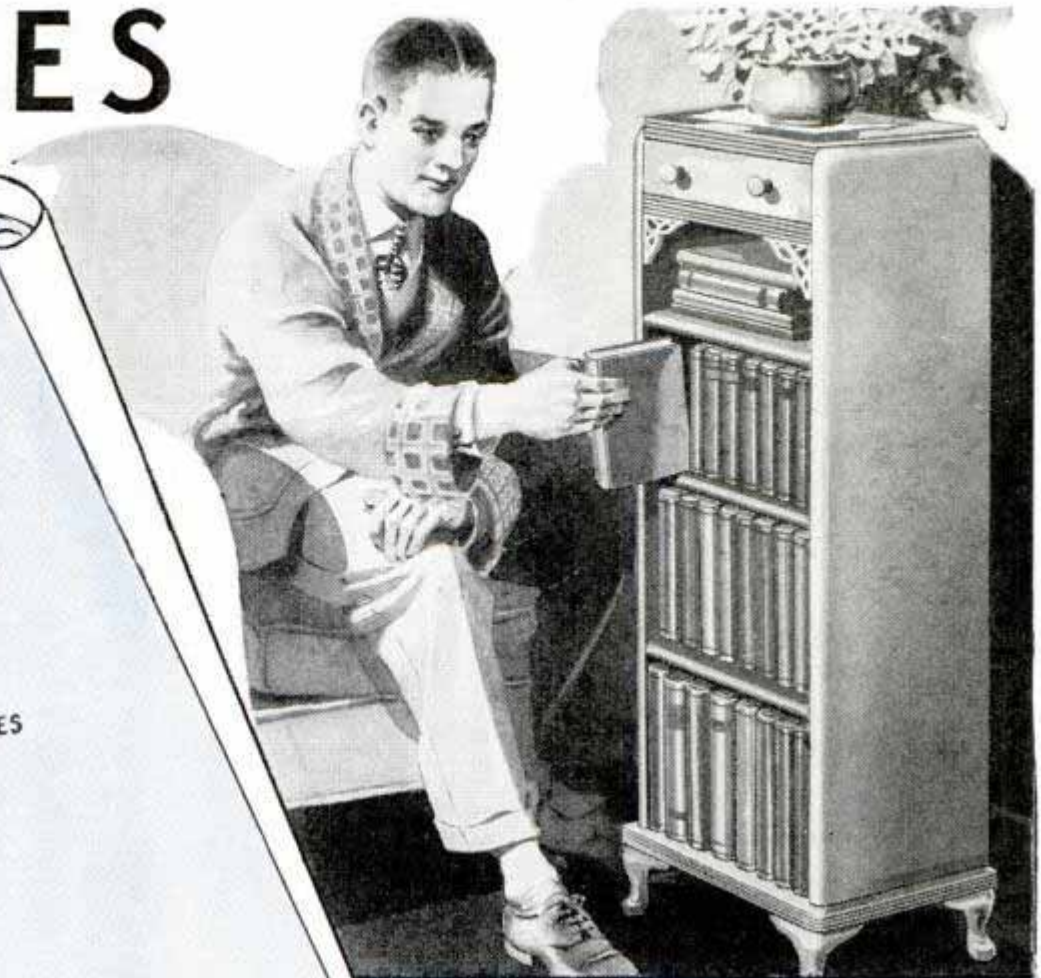
—G. E. Hendrickson, Argyle, Wis.

Living-Room BOOK- in Chippendale style



Modeled after an original from the shop of a famous designer, this bookcase will supply a distinctive decorative touch for your den or living room. Sides and shelves should be of solid mahogany with a backing of birch plywood. Use mahogany plywood for the drawer front, with the grain running the short way

CASES



Mailbox on Porch Is Viewed with Aid of Mirror

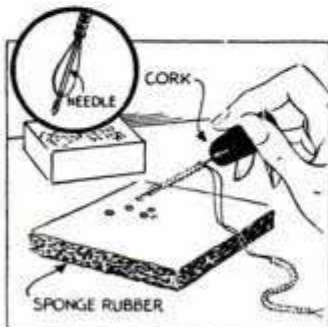


Mirror on porch post enables you to see mailbox by looking through a window or door

In order to see the mailbox without going outside, one home owner mounted a mirror on one of the porch posts so that the image of the box was reflected to a window. If moisture condenses on the window glass during cold weather so that it is difficult to see the mirror, a small celluloid defroster, of the type used on cars, can be taped to the glass on the inside.

Bead Stringing Simplified

Instead of inserting the pointed end of a needle in the holes of beads when stringing them, insert the eye end. The thread loop near the eye tends to expand after the beads pass over it and helps prevent them from slipping off. A cork is slipped over the sharp point to avoid pricking the hand, and is removed, after a number of beads have been picked up, to slide them onto the string or



thread. A further convenience in bead stringing is to place the beads on a piece of sponge rubber instead of in a dish so that they are less likely to slip around.

Young Plants Protected by Coils from Old Bed Spring

A gardener who wanted to transplant some flower and vegetable plants before danger of frost was past, solved the problem of covering the plants on cold nights by setting a coil from an old bed spring over each one. The coils supported a blanket laid over the seedlings.



Handling Litmus Test Paper to Avoid Finger Marks



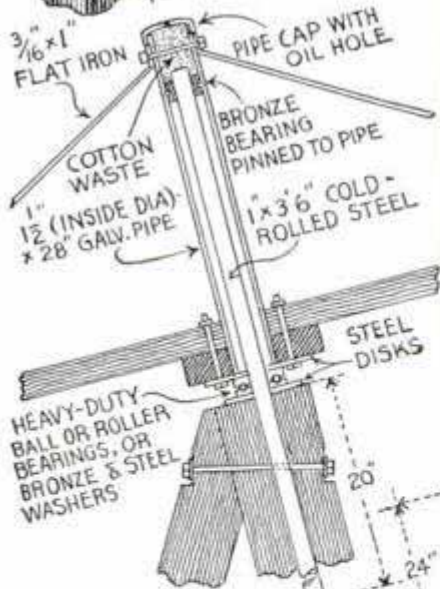
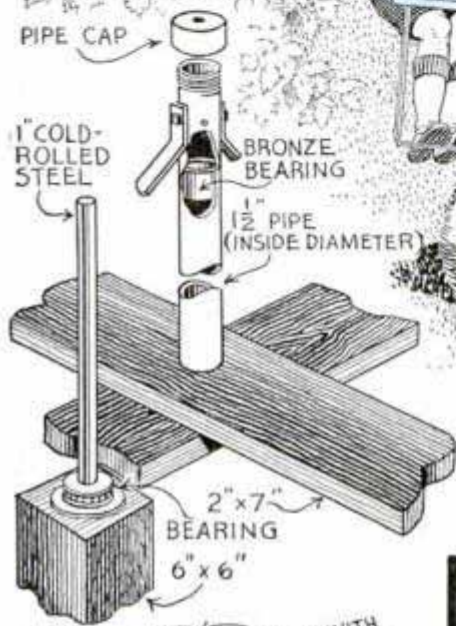
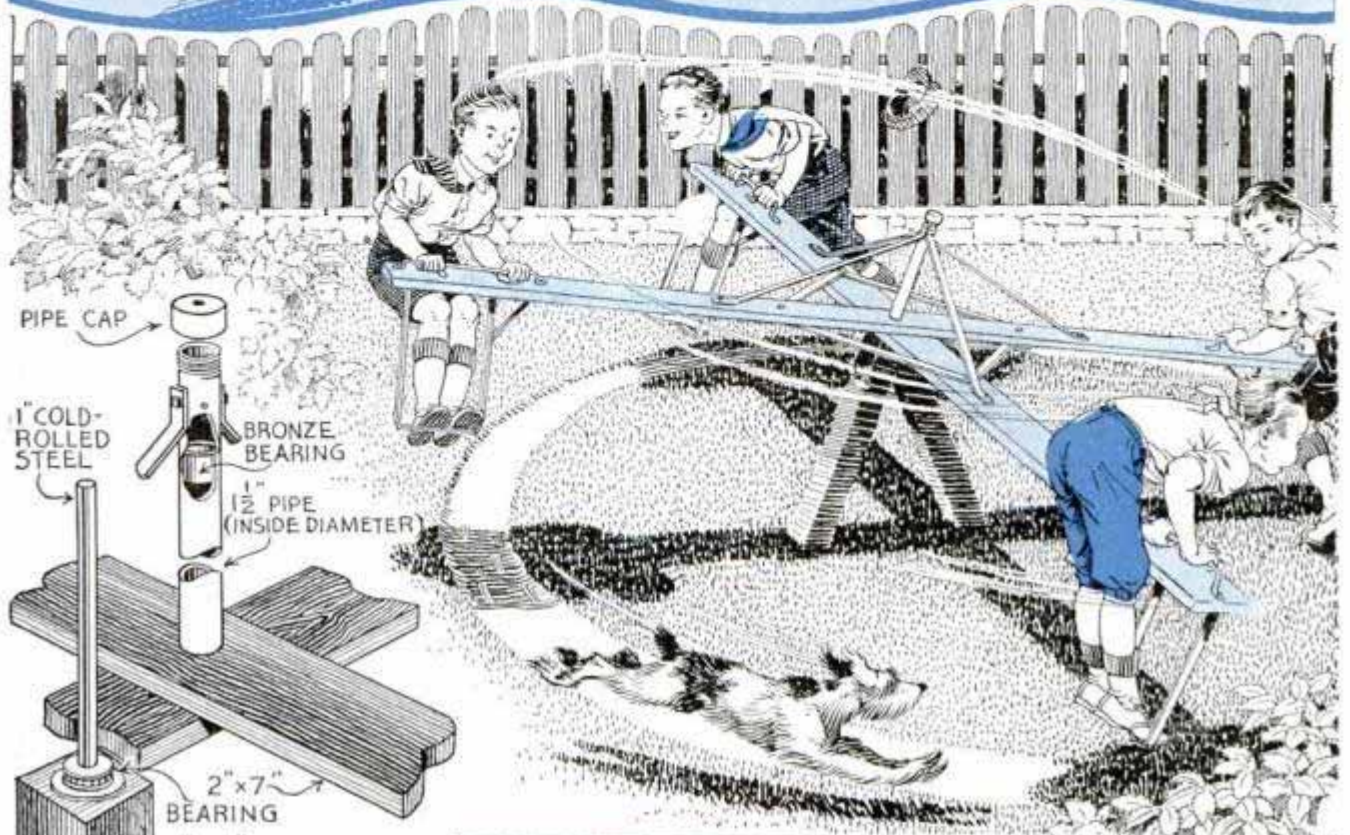
When removing litmus paper packed in vials for test purposes, take it out with a pin or needle stuck into the lower end of the cork of the vial as indicated. If the paper is removed with the hand, acid from perspiration on the fingers is likely to damage paper remaining in the vial.

Dog's Play Stick Rubber-Sheathed

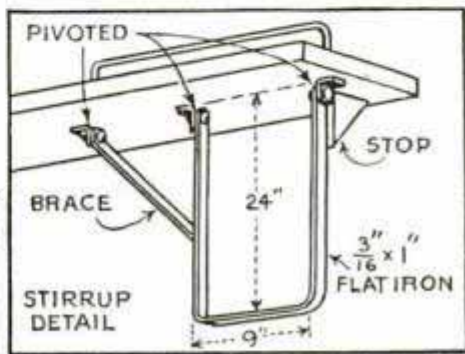
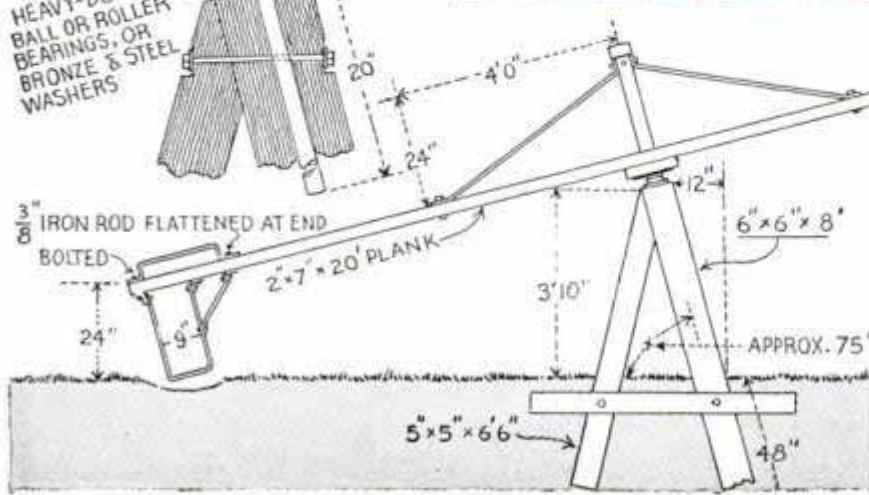
If your dog likes to play with sticks he picks up around the home, why take a chance of having him get a splinter in his mouth or throat? Give him a rubber-sheathed stick, which you can make by cutting down a piece of broomstick to the desired length to fit and slipping it inside a piece of garden hose.



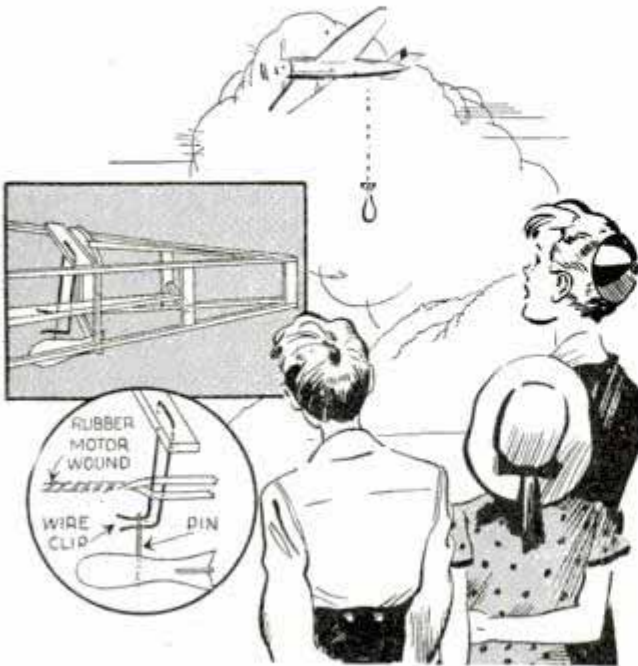
"Ocean Roll" MERRY-GO-ROUND



Whirling around on this merry-go-round gives you a sensation somewhat like that on a boat in a heavy roll. The axis is set at an angle to give an up-and-down movement while rotating. There's a handgrip and a stirrup on each crosspiece, the stirrup being pivoted so that it will swing back and not injure anyone who might accidentally fall in its path at the low point. A block in front of each stirrup keeps it from swinging forward too far. Weight of riders traveling from the high to the low point helps to keep the thing moving and each one has to push only about one quarter of a turn before he hops on.



Bomb Rack for Toy Airplane Drops Objects in Flight



This bomb is released when the rubber-band motor of the plane is nearly unwound

You can have a lot of fun "bombing" if you fit your model airplane with a bomb rack of the type shown. The rack, which is intended for airplanes operated by rubber-wound motors, is a piece of wire bent to a U-shape, run through a cross member of the fuselage and then bent at right angles near the ends. The wire is inserted between the rubber strands of the motor so that when the latter is wound, the strands twist and press the ends of the wire together to grip a pin pushed into the bomb or other object you want to drop. As the motor unwinds in flight, the wire ends spread and release the bomb, which then falls in a realistic manner.

—Roger Bennetts, Ishpeming, Mich.

A Non-Reflecting Paint

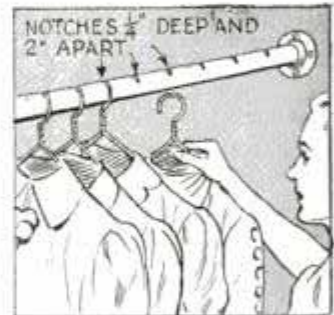


Suitable for covering the inside surfaces of cameras, telescopes, binoculars and other optical instruments, a paint that will not reflect light is made by mixing lamp-black with shellac, varnish or lacquer

which has been thinned with a solvent. The paint must be stirred frequently while using, to prevent settling of the pigment.

Closet Clothes Pole Is Notched to Keep Hangers Apart

Creasing of garments by having them pressed together on a crowded clothes pole in a closet, is avoided by cutting notches or grooves 2 in. apart, in the top surface of the pole,



to take the hanger hooks. For accommodating overcoats and other extra bulky garments, the spacing of the notches should be increased.—B. Livings, Batavia, Ill.

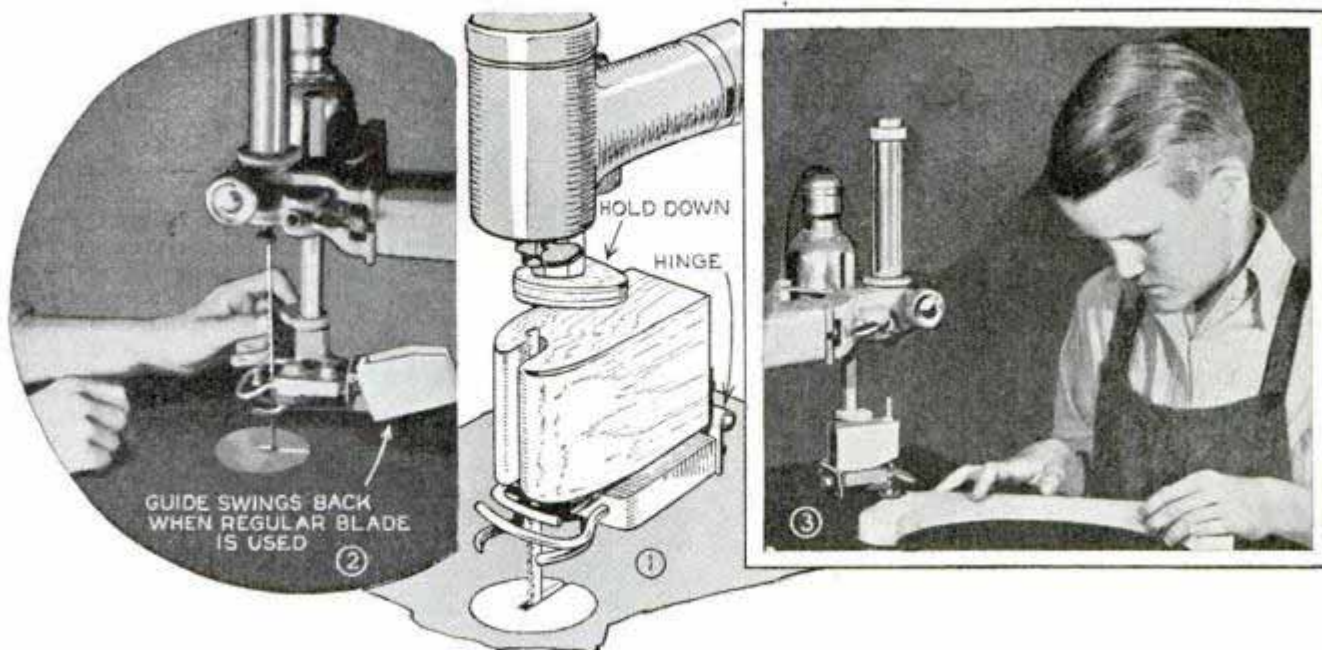
Ladder Tied on Wheelbarrow to Move It About

Disliking the task of carrying a heavy ladder from place to place on his shoulder, a painter provided a pair of leather straps on the sides as indicated so that it could be attached to a wheelbarrow. The straps are looped to fit snugly over the handles of the wheelbarrow.



Attached to the handles of a wheelbarrow by means of straps, a heavy ladder is transported easily

Guard on Jig-Saw Blade Protects the Fingers



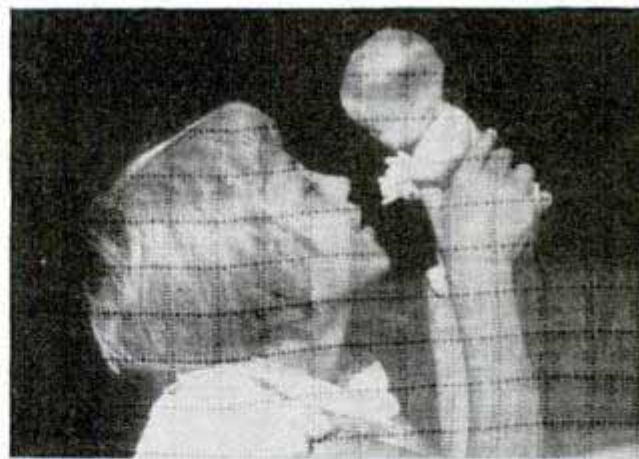
Exposed saber blades used in a jig saw are completely covered by the guard shown in Figs. 1, 2 and 3, which assures protection for the fingers so that even a small boy can operate it safely. The guide is shaped as shown, from a hardwood block

and is hinged to the rear of the pressure-foot assembly. A plywood holddown or cam on the shaft of the pressure foot is swung around to keep the guard from tipping back if the hand should strike it.

—Edwin M. Love, Monterey Park, Calif.

Photographs Printed Through Cloth Have 'Fabric' Finish

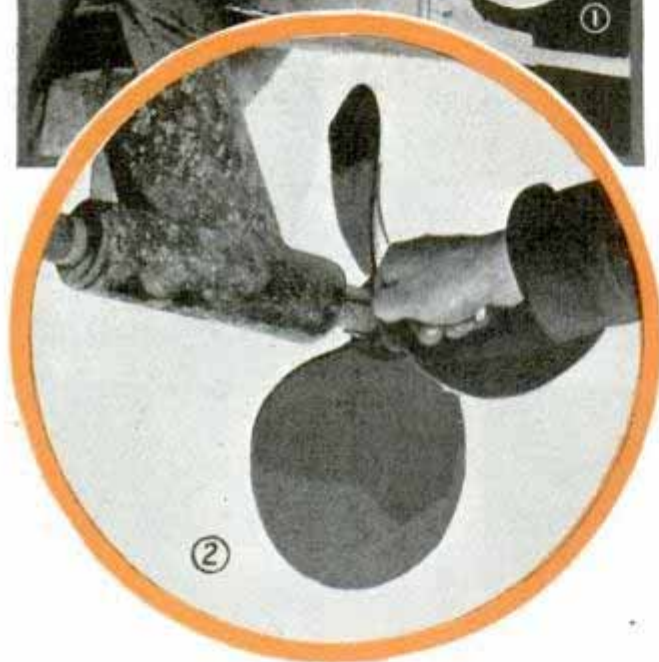
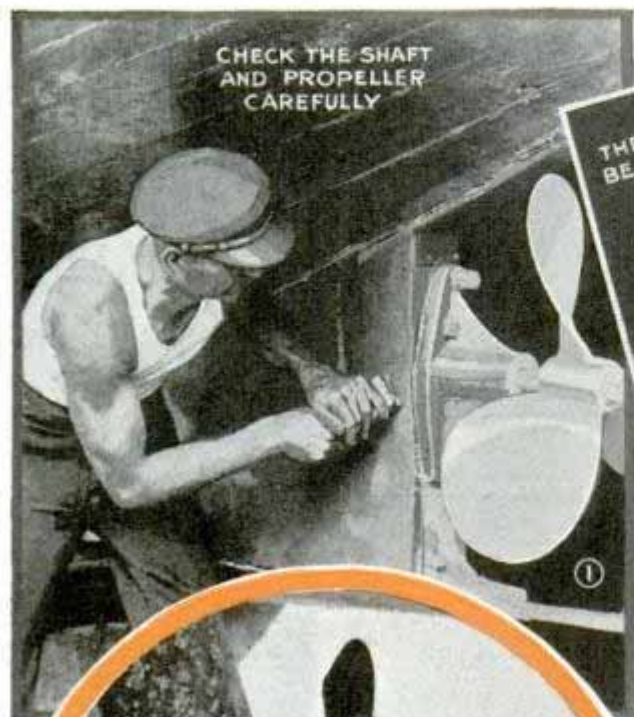
You can give your photos a distinctive fabric-like finish, that makes them stand out from the usual run of pictures, with equipment no more elaborate than a piece of cloth. In selecting negatives, use only those that have good contrast and those in which the details are large enough not to be blurred by the mesh finish. Any kind of thin cloth will do, and various effects can be had by selecting fabrics of different weaves. To print the photos, place the cloth between the glass of the printing frame and the negative. Then print the photos in the regular way. Longer exposures will be necessary because of the cloth.—Paul Hadley, Piggott, Ark.



Salvaging Scraps of Soap

Save your small pieces of soap and boil them in water, 5 parts, to soap, 1 part. The resulting solution can be stored in a bottle that has a small hole in the cap to convert it into a dispenser. It's best to select a bottle with a screw cap, which can be removed for refilling.

BEFORE LAUNCHING



By Walter E. Stewart

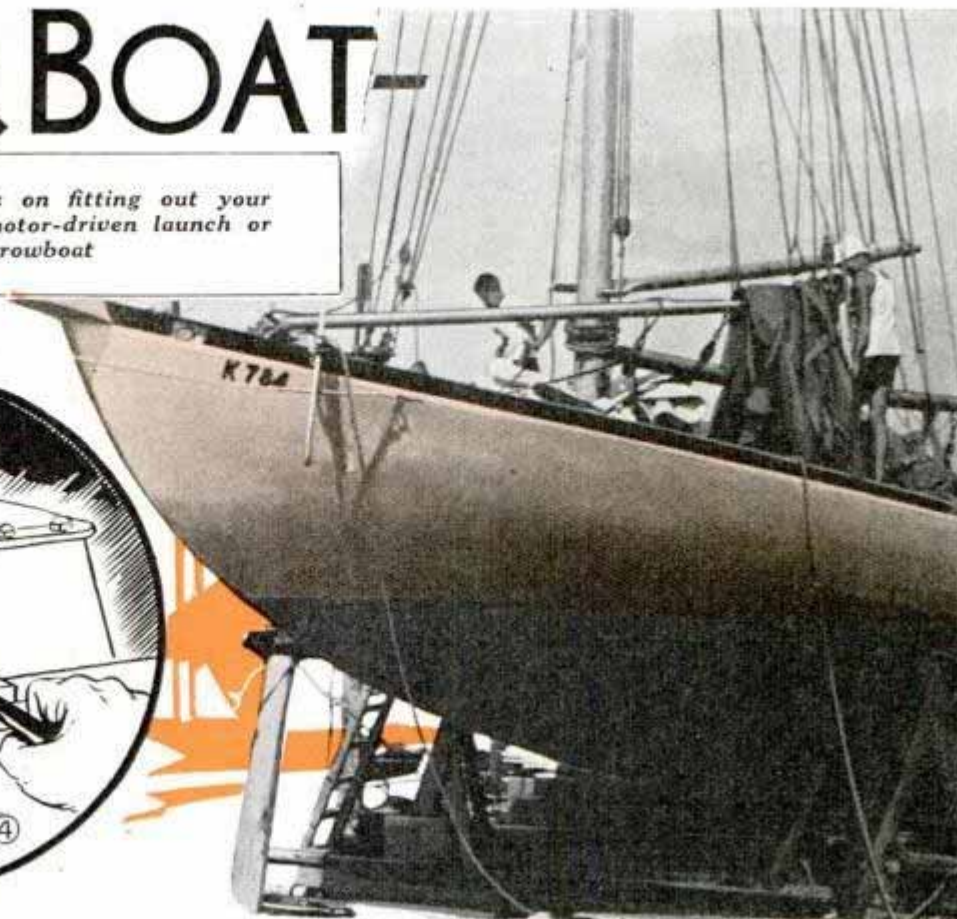
PART I

THE first thing to do is to throw back the winter cover, open up the cabin, icebox, lockers, and every other inclosed space to let in fresh air. If the motor ran smoothly at the end of the season, it is not likely to need any detailed overhaul. On the other hand, if it did not operate satisfactorily, now is the time to locate the trouble and apply a permanent remedy. Loose hold-down bolts or lag screws, Fig. 4, which permit the whole motor to vibrate often cause a noise easily mistaken

for a main-bearing knock. Quite often a metallic click, thought to be due to loose connecting-rod bearings, is in reality due to too much tappet clearance. You can check this without disassembling the motor. On most motors you can check main bearings by slipping a bar under the flywheel as in Fig. 5. If you suspect worn piston rings or leaky valves, drain the old oil, refill with new, run the motor until warm and then test compression by turning the flywheel. Each cylinder can be tested individually by leaving the spark plugs out of all the others. Any one of these defects should be eliminated by adjustment or the installation of new parts. Periodic checks of the ignition system are always advisable. If there is a handhole opening into the water jacket of the motor, take it off and clean out all the rust and crystallized salt. Be sure to use a new gasket when you replace the cover. Do not fail to repack piston-type water pumps, either on the motor or in connection with other fixtures, Fig. 7. With the motor running properly the next thing is a thorough job of cleaning the block. Use kerosene to wash off all the old grease, a wire brush to get off the rust, and plenty of rags to clean up. Never use gasoline to clean a motor which is still in the boat as the fumes will inevitably drift to the bilge and stay there to form a constant menace. Finally give the block a coat of engine

YOUR BOAT-

Many helpful pointers on fitting out your boat whether it's a motor-driven launch or a small rowboat



enamel, and the exhaust manifold, line, and muffler a coat of aluminum enamel.

If the propeller, Figs. 1 and 2, is dented or nicked it will pay to have it trued up by a professional. However, if you must do the work yourself, fill in scratches and small dents with solder, and carefully hammer any bent edges back into their original shape. Nicks in the edges of the blades had best be filled in by brazing with new bronze. Bent propeller shafts waste power, cause serious vibration, and make it impossible to keep stuffing boxes from leaking. To check up, disconnect the shaft from the motor and turn the propeller over by hand. It should not bind at any point in a complete revolution. Such binding is sure evidence of a bent shaft. Sometimes loose bearings prevent slight bends from showing up by this test, but you still can detect a bend by supporting a pencil point just clear of the shaft while a helper rotates it. If the pencil touches at one part of the revolution and does not at another, the shaft is bent and must be straightened. Propeller-shaft stuffing boxes always should be repacked. Twisted calking cotton, saturated with waterproof grease, is as good as anything you can get. If your boat is an auxiliary hav-



ing a feathering propeller be sure to flush out all the old grease and water with thin lubricating oil, then refill completely with waterproof grease. Do not reconnect the propeller shaft to the motor until the boat is in the water.

Now, the bilge. First, remove the metal ballast, clean it thoroughly and paint first with red lead, then with a good preservative paint. Clean out all the recesses of the bilge, and if necessary, scrub it with a strong solution of tri-sodium phosphate. Check up on frames and planking while doing this. When the bilge is thoroughly dry apply one or two coats of a good creos-



⑥
THE BILGE MUST
BE CLEANED
AND PAINTED

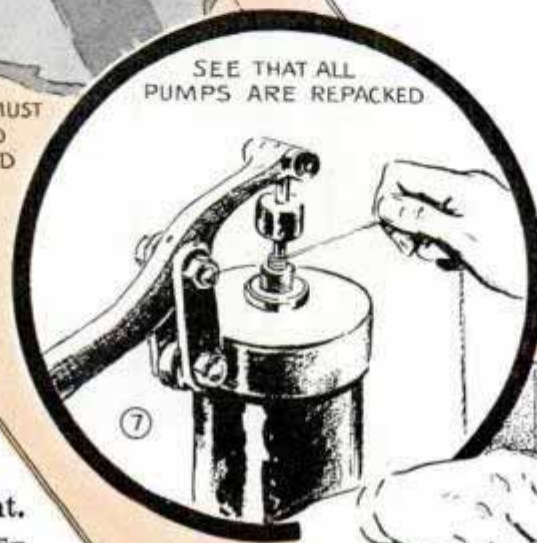
sote-base paint, Fig. 6. If you have a dinghy, Fig. 2, it will probably need the same paint treatment. Figs. 8 and 9 show two essential steps in connection with the interior varnishing. Surfaces always should be sandpapered smooth. When varnishing panels as in Fig. 9, coat all moldings, edges and corners first so that you can work away from them and prevent sagging of the varnish film. Peeled or blistered paint and varnish never can be covered up. The only remedy is to remove it completely and start again from the bare wood.

There is likely to be some water, collected by condensation, in the gasoline tank. Few tanks have outlets at the very lowest point, and the water tends to collect in the low spot until its level is up to the outlet. If there is a handhole in the tank you can dry out the interior with a cloth. Otherwise, use a suction pump and a length of rubber tubing to draw out the water. A part of the cleaning job is to blow out the tubing which connects gas tank to the carburetor. An automobile tire pump is excellent for this. After cleaning, put a little of each liquid in the gas and water tanks, and search for leaks. The most fre-

quent sources of trouble are compression joints in tubing. Usually such leaks can be stopped permanently by running back the coupling nut and straightening the tubing so that the ends come together evenly.

If you find it necessary to solder the gas tank, remember that a mixture of gasoline fumes and air is dangerous. One safe way of ridding the tank of fumes before soldering is to drain the gas and mop out the inside of the tank with a cloth. Tie the cloth onto a stiff brass wire and bend the latter so as to get at every

part of the tank. Never use a steel wire. Next, connect a length of rubber tubing onto the tank outlet and run it outside the boat to a point lower than any opening into the boat. Use a tire pump



SEE THAT ALL
PUMPS ARE
REPACKED



SANDPAPER
BEFORE
VARNISHING



SPAR VARNISH
FOR THE
CABIN AND
TRIM



RIGGING
SHOULD BE
CHECKED

and a tight improvised coupling at the filler hole to force a stream of air through the tank. After a few minutes pumping the dangerous fumes will be displaced.

The steering gear and rigging, Fig. 10, may need nothing more than a close inspection. See that the rudder has not been weakened by rust, if it is steel, or by rot if it is wood. You may find large cracks between the sections of a wooden rudder. The remedy is to take the rudder entirely apart and refasten it with new through bolts. Looseness in the rudder bearings sets up vibrations in the rudder which will reduce the speed of the boat seriously. Often, in keel sailboats, a lower rudder bearing in the form of a lag screw is employed. If this is loose, the surest remedy is to replace it with a machine screw. Bore a hole through the keel at right angles to permit placing of a nut. The hole can be plugged up after the nut is in place. If your rudder is of the inboard type, repack the stuffing box. Many an irritating rudder-post squeak has been stopped by the installation of a grease cup at the top rudder-post bearings.

(To be continued)

Tent Attached to Sand Bags on the Beach

Instead of using stakes to anchor a tent or sunshade on a beach, where the soil is loose and a wind is likely to cause the stakes to loosen, try sand bags. A strong ring to take the tent rope can be attached to each bag, near the mouth.



When soil is too loose to hold tent stakes, substitute large sacks filled with sand

Creeping of Washer Is Avoided When Set on Perforated Mat

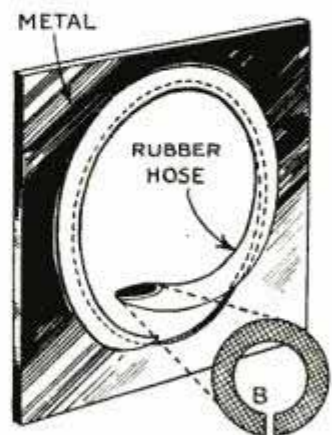


This mat will keep your washing machine in position, yet allow it to be pushed about

To keep your washing machine from creeping or rolling when in operation, cut a circular mat from a piece of discarded linoleum and make four small openings in it to take the casters. When the machine is rolled onto the mat, the casters will drop into the openings and remain in position unless the machine is deliberately pushed.

Grommet for Opening in Metal from Rubber Hose

When tubing or cables pass through large openings in metal, grommets to line the holes to prevent chafing are made easily from pieces of rubber tubing or hose. The rubber is slit along one side to slip over the edge



of the opening, and the ends are cut at an angle to provide a lap splice, rubber cement being applied to the edges of the latter to hold them securely.

Simple Photo Press Assembled from Two Wood Blocks



This photo press is easy to make and costs no more than the price of two bolts and hardwood blocks

Combining low cost with simplicity of construction, this photo-drying press is assembled from two wood blocks 2 in. thick, which are clamped together with two bolts and handled nuts of the type used by wagon makers. When drilling the holes for the bolts, square up the blocks exactly the same size, lay one on top of the other so that the holes will be in the same position in each block. Then, if they tend to warp in use, you can turn them over with the warped side next to the photo print. It is necessary, of course, to use blotting paper between the print and the blocks.

Ivan Grosvenor, Richmond, Ind.

Small Plants Sprayed Quickly with Whisk Broom

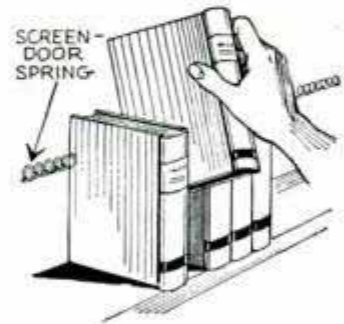


If you have a number of plants to spray and there is no sprayer at hand, you can do the job with a whisk broom. Just put the spraying liquid in a pan, wet the end of the

broom and then push it across the edge of the pan as indicated. You'll be surprised how efficiently you can spray a plant after a little practice.

Coil Spring Keeps Books Upright on Workshop Shelf

To keep books and catalogues from slipping sideways on his workshop shelf, one home craftsman stretched a screen-door spring on the wall across the rear of the shelf as indicated. When the edges of the books are pushed into the open coils of the spring, it keeps them in position.



How to Splice Extension Cords

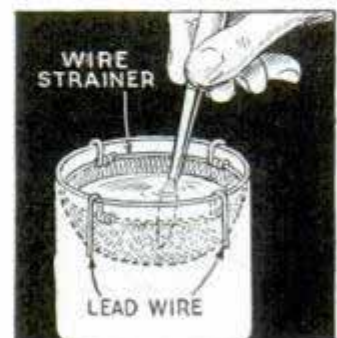


When you need an unusually long extension cord, and have to plug two of them together to get the necessary length, tie the two ends as indicated in the photo. Then, if there is any unusual strain on the two cords it will be taken by the knot, which prevents the plugs from being pulled apart.—Dan Marvosh, Flint, Mich.

Brush Supported on Strainer in Paint Can

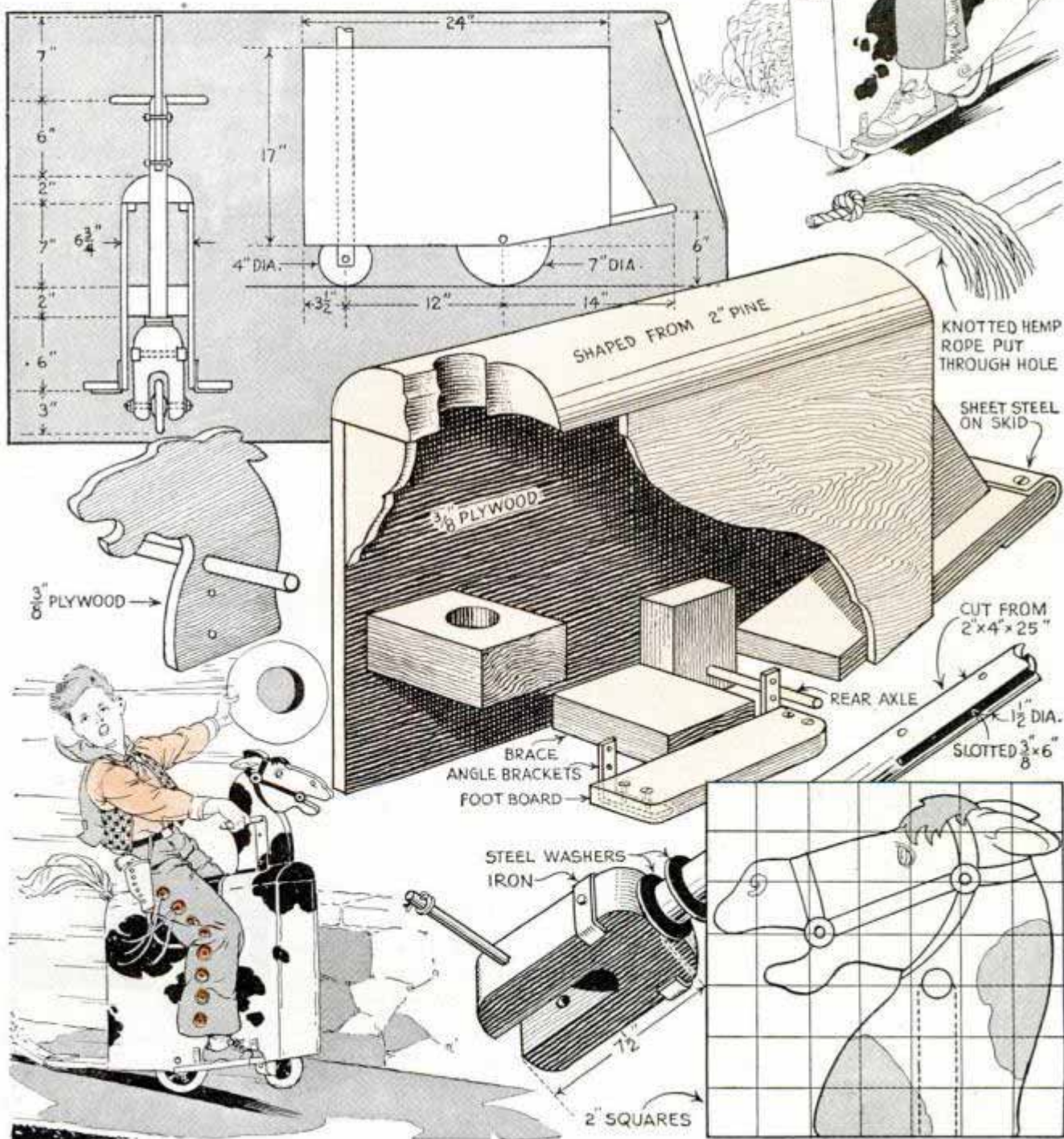
When using water colors or paints, take a small strainer and suspend it inside the container with lead wires as indicated. The wires allow the strainer to be suspended at any depth by

merely bending them over the edge of the can. The strainer will prevent the brush from being dipped far enough into the paint to get the ferrule dirty.

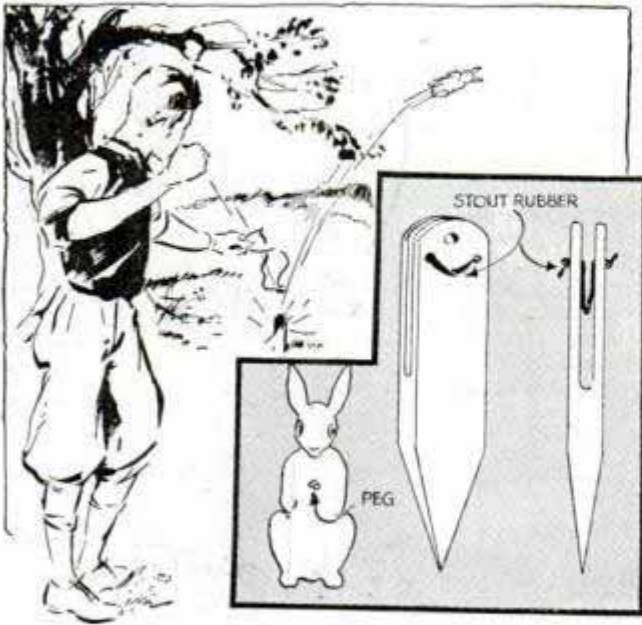


TRICK RIDING *on this* COWBOY COASTER

This little bronco on wheels gives great sport when coasting down an inclined sidewalk. With a bit of practice, you will be able to balance on a single wheel for short distances. By a little maneuvering, the horse can be made to rear in a realistic manner, but spilling over backward is prevented by a steel-bound skid. On level pavements the coaster is pushed along in scooter fashion. A jig-sawed horse's head fits a slot in the upper end of the steering post, which has a fork at its lower end to take a small cart wheel. A rounded back provides a comfortable seat and an unraveled piece of rope forms the tail



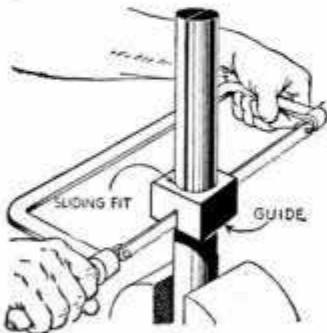
Realistic Jumping-Rabbit Target Improves Slingshot Practice



When you score a direct hit on the rabbit, it jumps into the air in a realistic manner

You'll have a lot of fun with this rabbit target, which jumps high into the air in a lifelike manner when a hit is scored. The target consists of a jig-sawed rabbit and a slotted stake or support. To set the target, the rabbit is pushed into the slot against a strong rubber band stretched across the slot and anchored in two holes by knotting the ends as indicated. A peg projecting from the front of the rabbit engages a third hole in the stake to hold it. When the target is hit, the peg is forced out of the hole and the rubber band pitches the rabbit into the air.

Shafting Is Slotted Lengthwise with Aid of Hacksaw Guide



rides the back of the blade and follows the cut so that all the operator has to do besides working the saw is to keep the cut vertical. By using a guide pin to engage a cut already made in the shaft, and stop-

This hacksaw guide for cutting metal shafts and tubing lengthwise is simply a metal or hardwood block that slips over the work and has a slit to take the blade. The guide

ping each cut near the lower end, it may be sawed into any number of pieces.

—Charles E. Kew, Los Angeles, Calif.

Decorative Lamp Shade Is Made with "Cellophane" Ribbon

All you need for this attractive lamp shade is a wire frame and a couple rolls of colored Cellophane ribbon, which you proceed to weave over the frame. The design and beauty of your



shade are determined to a great extent by the amount of ribbon that you use and the angle at which it is wound. This should be done so that no space is left open.

Simple Dropper for Liquids



Bent to an L-shape, a small glass rod provides a good guide for dropping or pouring liquids from bottles. The rod is inserted into the bottle neck, and when the bottle is tilted, the liquid flows down the rod as indicated. The

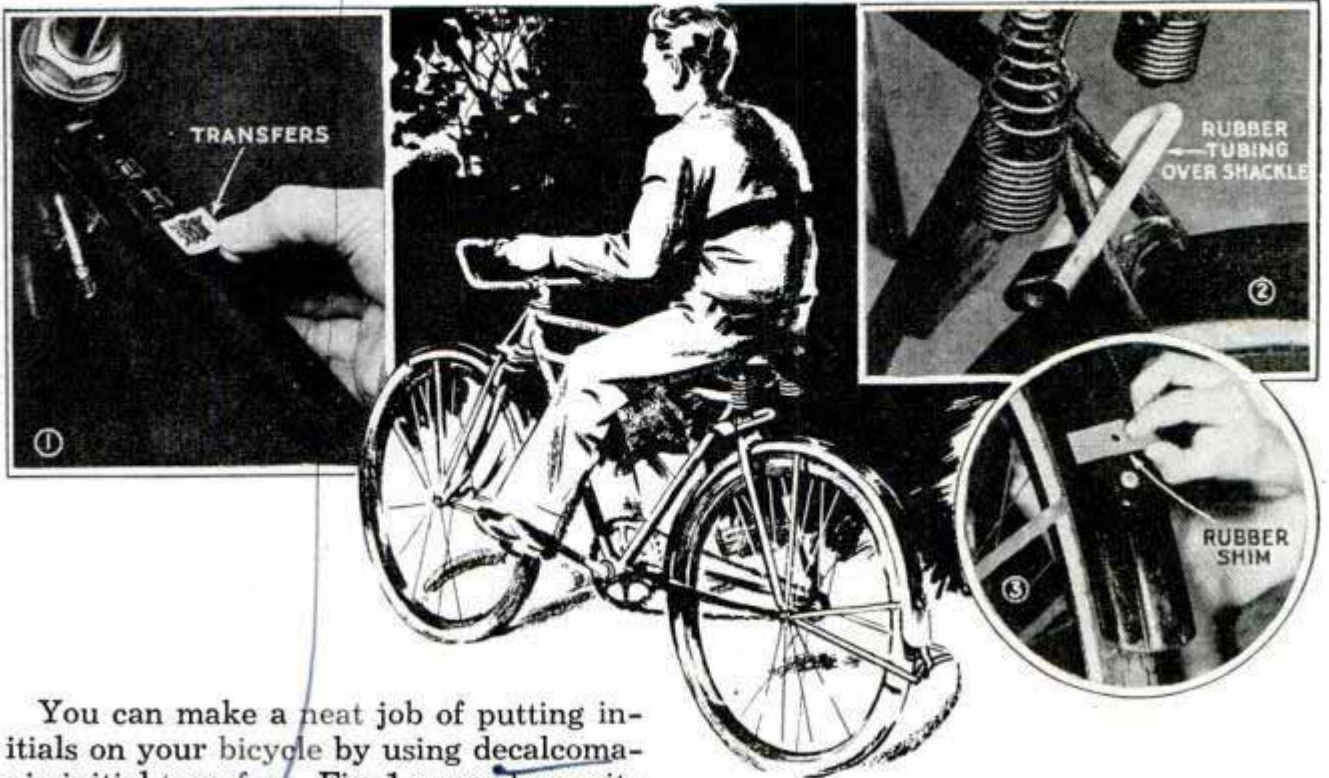
rod should be about $\frac{1}{8}$ in. in diameter and 1 to 2 in. long.—Walter E. Burton, Akron, O.

Auto Casing Provides a Buffer for the Camp Ax

Splitting tent pegs when they are driven with a camp ax, can be avoided by using this buffer, which is a piece of auto casing. It is held over the blunt end of the ax by a wide rubber band.



Three Handy Ideas that Will Help the Cyclist



You can make a neat job of putting initials on your bicycle by using decalcomania initial transfers. Fig. 1 suggests a suitable location for the letters, on the top bar of the frame. If you carry a lock regularly, slip a length of rubber tubing over the shackle and then snap the lock over the rear fork under the saddle as in Fig. 2. You'll always know where your lock is and it won't rattle. A clattering mudguard

may be silenced by placing a rubber shim cut from inner tube under the guard between the latter and the supporting frame as in Fig. 3. Don't neglect to use a lock washer under the nut when you tighten the assembly in place.

—Raymond B. Wailes, Bethesda, Md.

Colorful Slip Covers Improve Appearance of Iron Beds

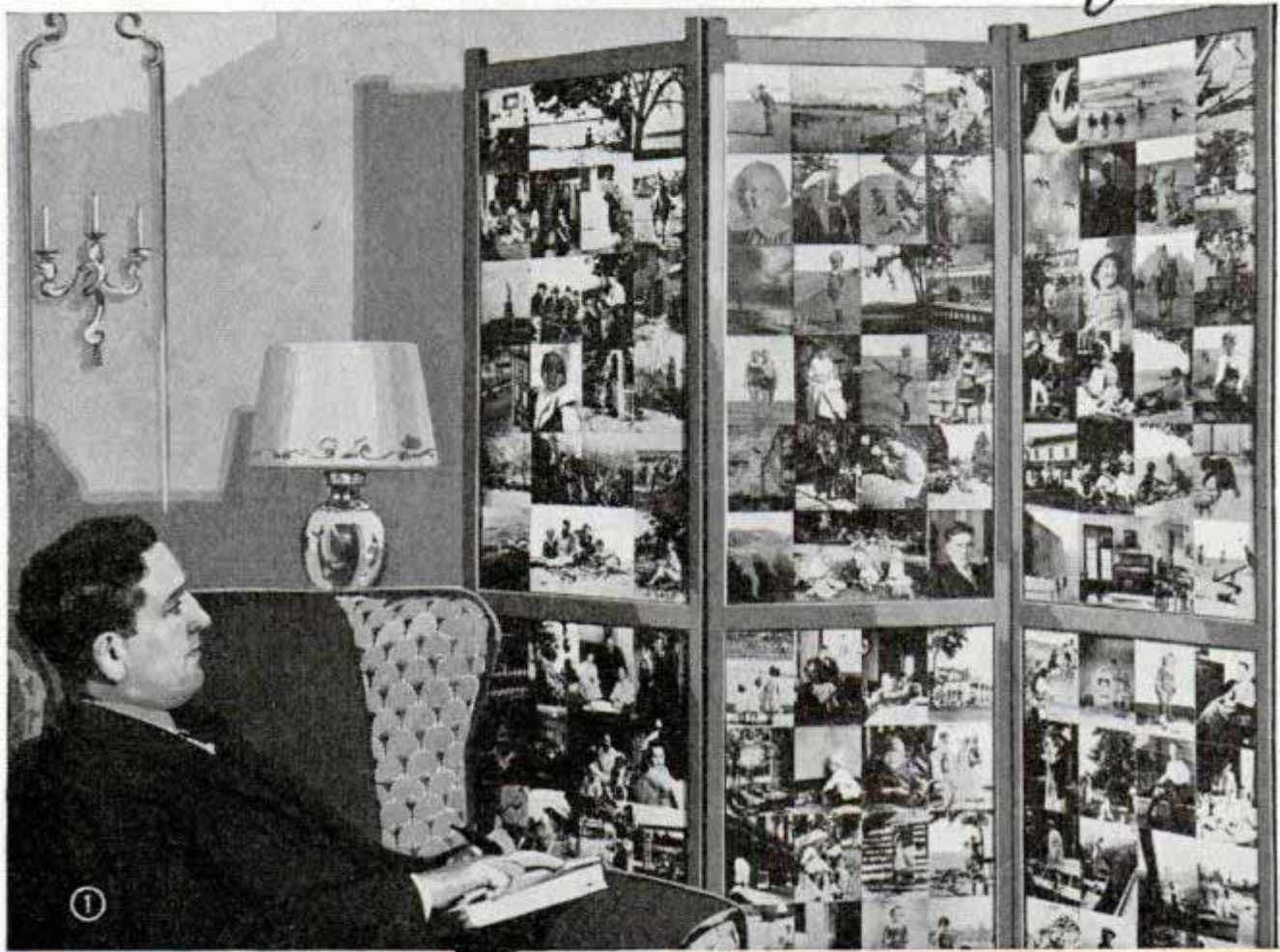
The appearance of old iron or brass bedsteads, used in summer homes, cabins or children's rooms, can be improved greatly by slip covers of striped awning cloth, or plain canvas which is bound with bright tape. Cretonne, chintz or gingham to match the window drapes also creates a pleasing effect. The same is true of colored burlap, crash and other fabrics of similar body. To make the covers, cut a length of material for each side of the head and foot of the bed, shaping it to fit the top. Allow a small amount for seams and sufficient extra to extend over the top and around the posts. Sew the pieces together on three sides and bind with tape, leaving openings at the upper corners for knobs to project.



Striped awning cloth, cretonne, chintz, gingham and even colored burlap make attractive coverings

☐ When packing bottles for a trip, dip the tops in melted paraffin, getting it well around the stoppers to avoid any leakage.

New "ALBUMS" for



WHETHER you're a photo fan or somebody who likes to keep pictures around to show friends, here are several suggestions on how photos can be displayed to advantage. For the den, a photo-covered screen may take the eye and it's certainly a novelty. Or, any group of pictures may be arranged artistically under the glass of a serving tray, although perhaps you prefer a single enlargement for this purpose. Then there's the idea of photo transparencies on a lampshade, or a photo checkerboard.

The essential thing is to get some enlargements with the principal point of interest in each one as near uniform size as practical. Making up the photographic screen in Fig. 1 is a simple process, although the arrangement of the photos should be worked out very carefully beforehand. An excellent method of mount-



your SNAPSHOTS



ing the prints on the screen is to brush thin muslin onto the surface with thinned vegetable glue. When this is dry the prints are dampened, placed in position and rolled down to remove all air bubbles and enable the glue to obtain a firm hold.

A photo-mural such as that shown in Fig. 2 is made by much the same process, except that as a backing for the prints you would use plywood or hard-pressed board nailed or screwed to the wall at the edges. The screw or nail heads are then covered with a black molding. The mural can be in sections, as shown, or it may extend around the four walls of the room at eye level.

The foundation of a photographic lampshade, Figs. 3 and 4, is merely a wire shade frame. Paper templates are cut to the size of each panel of the frame, the desired negatives are selected and the enlarger is focused on the templates until the picture is composed to your liking. Then instead of using the ordinary enlarging paper, you make the exposure on safety film, which is then developed in the regular way to give a positive transparency. The latter is then mounted on the wire frame with cellulose tape or the edges can be punched and laced with ribbon or leather. Or, you can mount such photo transparencies on clear, translucent lampshades as shown in Fig. 3. Figs. 5, 6 and 7 suggest methods of decorating trays and making photographic checkerboards. The latter are simply mosaics of small prints trimmed square and placed under glass.



How to Produce Relief Lettering with a Jig Saw



First dip letters in the color to show on the edges, then apply printers' ink to the upper surfaces

I have found that a laborsaving method of producing relief coloring on jig-sawed letters is to cut them out, Fig. 1, dip them in paint of a color that is to appear on the edges, Fig. 2, let them dry face up and then coat the upper surfaces with printers' ink. This can be applied quickly with a roller as in Fig. 3, and can be purchased in a variety of colors.

—Jos. L. Horton, Cleveland, Ohio.

Correct Developing Temperature Marked on Thermometer



To see at a glance whether or not your photo-developing solution is at the correct temperature, wrap a narrow strip of white paper around the thermometer behind the tube as indicated. Apply the

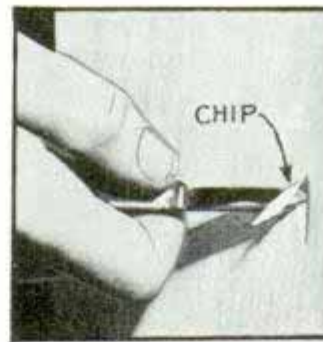
paper so that it covers the 65° mark. If the end of the mercury column can be seen in the space occupied by the paper the temperature is within the correct range.

Attaching Neck Strap to Camera

If you are a miniature camera enthusiast who likes to carry the camera around without a case, here's a good method of attaching a neck strap to the camera so that it will not be lost. A thumbscrew that fits into the tripod socket of the camera is drilled to take the strap or cord. The edges of the hole in the wing should be filed smooth so that they will not cut.



Nail Heads in Finished Work Hidden under Chip



Instead of countersinking a nail head in work to be varnished or waxed and then filling the hole, which often shows, one craftsman cuts a V-shaped chip in the surface of the work with a sharp knife or razor blade. The chip is pried up carefully at narrow end, the nail is driven under it, and the chip is pushed back into place after applying a tiny drop of glue to hold it.

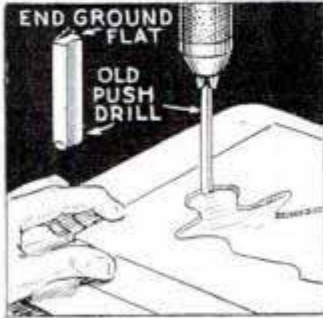
Galoshes Hung from Wire Line

Rather than allow the children to pile their rubbers and galoshes in a corner of a school-room or scatter them over the floor, provide the cloak rooms with



the type of hangers shown in the photograph. This consists of a length of wire threaded through the springs in clothespins and stretched taut across the cloak rooms. When galoshes and rubbers are hung up in this manner they are out of the way and dry thoroughly.

Router Bit from Pin Drill

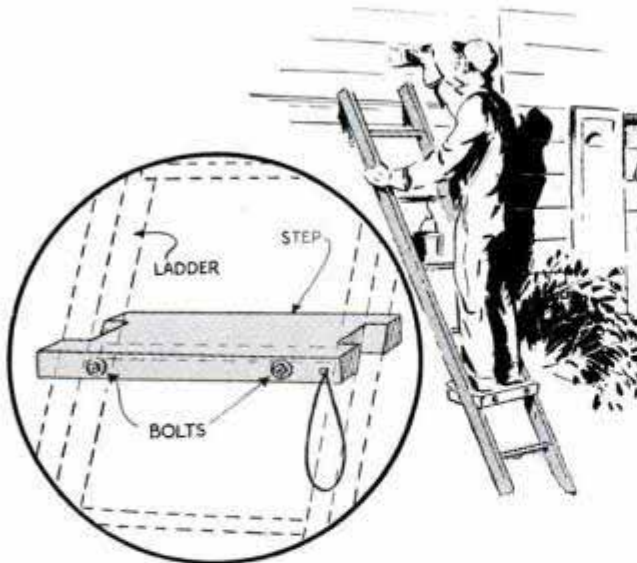


When you need a small router bit for some delicate work, and none is at hand, just take an old pin drill of the type that has fluted sides and grind off the end flat. A bit of this type is handy for very small work and can be used up to a depth of $\frac{1}{32}$ inch.

—Harold Glaser, Corona, L. I., N. Y.

Movable Step on Ladder Round Easy on Your Feet

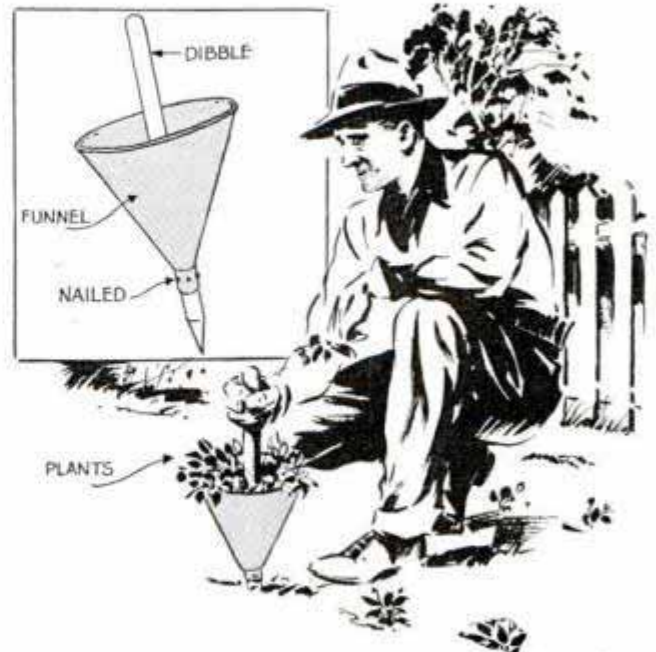
Workmen who must stand on a ladder for long periods, will find this movable step helpful in easing the strain on their feet. It is cut from a 3-in. block to the shape



You'll find this movable, flat step much easier to stand on than a ladder round

shown, and is reinforced with two bolts against splitting. In use, it is placed over the ladder round from which you are working, the notched ends fitting the ladder sides to prevent tipping.

Funnel on Plant Dibble Holds Small Seedlings



This dibble carries the plants so that you don't have to walk back and forth after a supply

For transplanting cabbages, tomatoes, etc., fit your dibble with a large funnel as indicated and you can carry the plants right in it. This enables you to keep the plants at hand as you work down the row, and the roots are not unduly exposed to the sun, which sometimes happens when the plants are left in a pile on the ground.

Mildew Removed from Leather

Mildew that forms wide patches on leather-bound books, traveling bags and other leather articles can be removed with vaseline. Rub this over the spot liberally, let it remain for a while and then wipe thoroughly with a cloth. This treatment



also tends to preserve the leather by renewing its oil content.

—Walter Burton, Akron, Ohio.

☞ To save money on window shades, purchase them long enough so that the bottom may be cut off and hemmed when it is faded or torn.

NEW CHAIRS

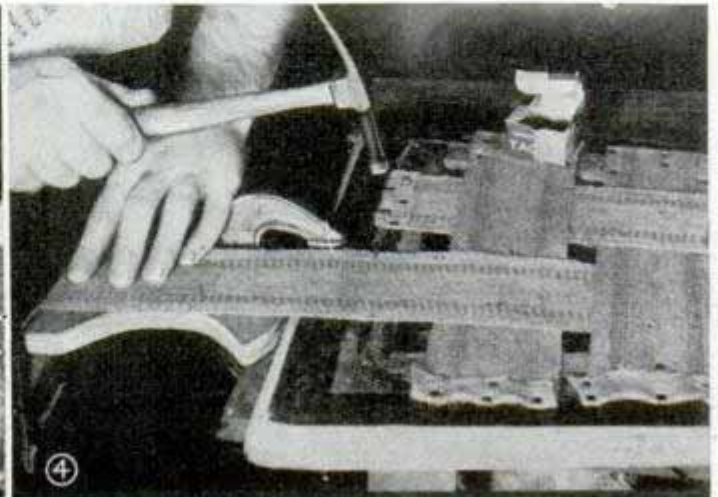


By
Alexander Maxwell



IN NEARLY every basement or attic can be found a chair which is too good to discard, yet too scarred and worn from long use to be presentable. The varnish is probably black and checked, the joints loose and squeaky and the seat tattered and broken. To renew such a chair you start by dismantling it completely. When you find screw heads concealed by round wooden plugs, bore a hole into the center of the plug, for which a metal drill should be used. The remaining pieces can be removed easily with a screwdriver. A dow-

eled joint which has opened must be coaxed apart with light taps of a wood mallet. Removing the old varnish or paint need not be a messy job. Follow the directions on the can, as all varnish and paint removers are not alike. One simple trick that saves a lot of trouble is to apply remover to only half of the piece at a time. This leaves you a dry, clean section as a handhold. When the first half is finished use it for a handle and work on the other



from OLD...

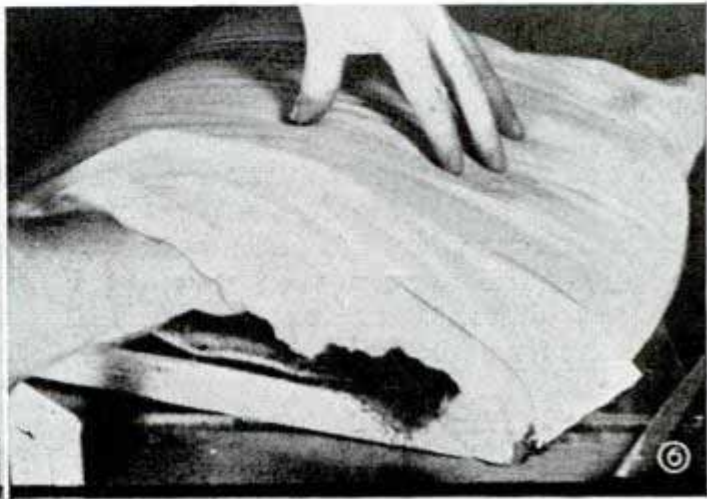
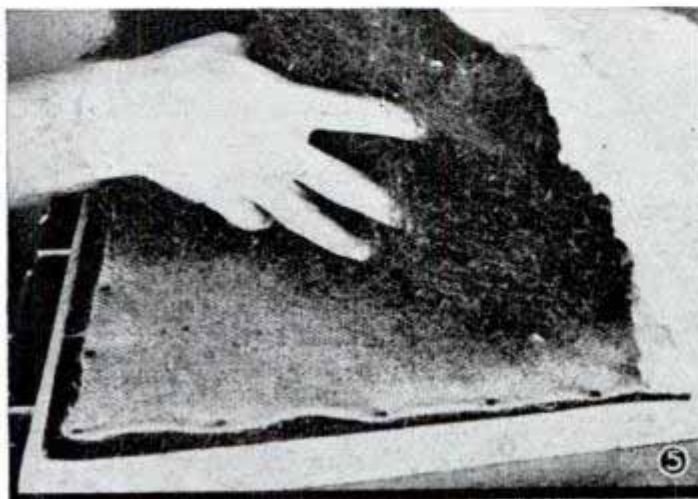


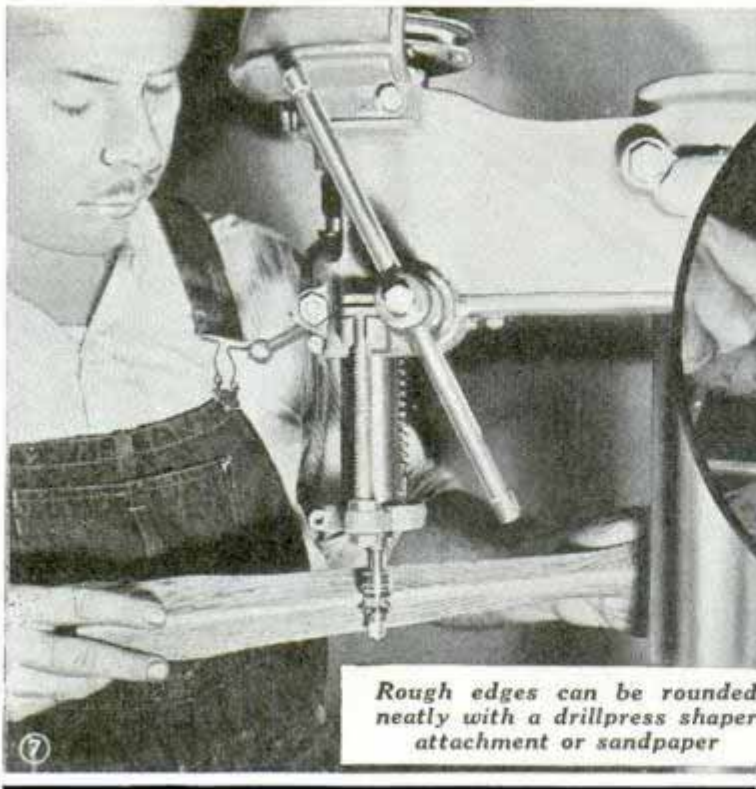
end. Once the varnish is off, take the whole thing outdoors and scrub each part thoroughly with gasoline. Should the chair be made of oak there are likely to be sharp, angular edges full of splinters. If you have a shaper or a shaper attachment for your drill press you can round these edges neatly as in Fig. 7. Doing this by hand with a scraper and sandpaper takes longer but is just as effective.

When re-gluing the frame, use casein

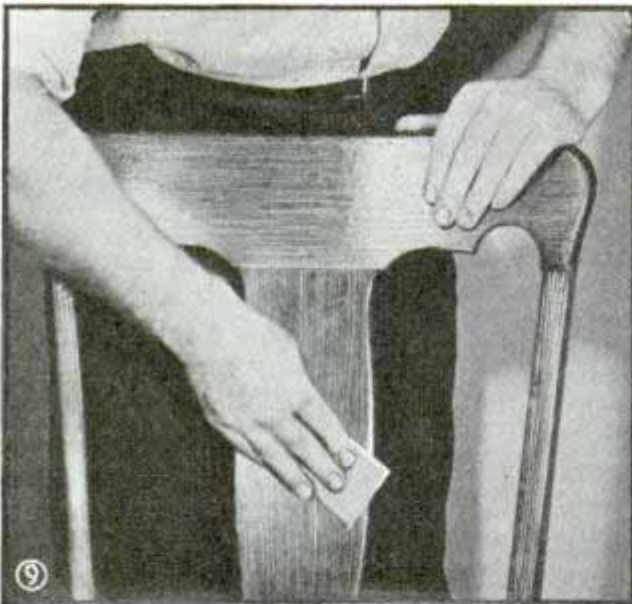


glue and bar clamps as in Fig. 2. Take out all the old dowels and replace them with new stock. Flatten each dowel slightly to allow the escape of glue entrapped in the holes when the joints are drawn up. If this is not done the wood may be split because of the pressure when forcing the parts together. Thoroughly clean the meeting surfaces of the joints. A casein-glued joint should have both surfaces lightly coated with glue and be allowed to set for 5 or 10 minutes. Then more glue is applied and the parts drawn up tight with clamps. It is better to glue and clamp only one or two



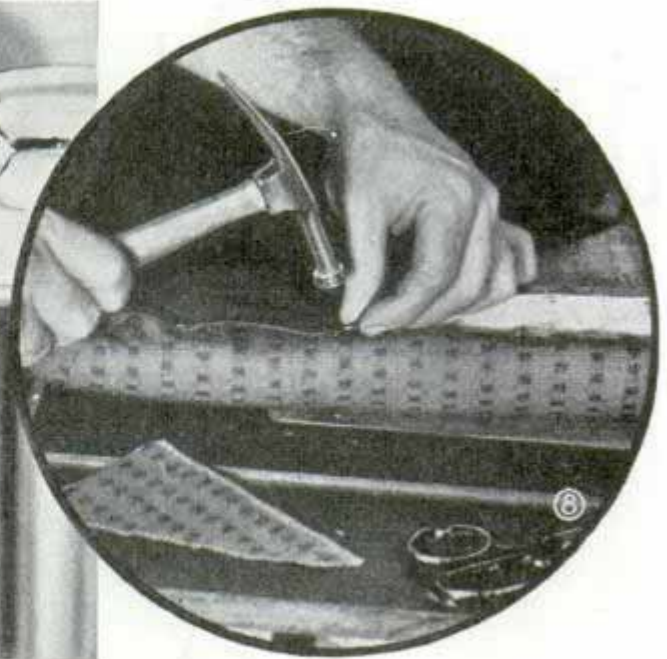


Rough edges can be rounded neatly with a drillpress shaper attachment or sandpaper



joints at a time than to take them all at once. When clamping up the final assembly, set the chair on the floor and see that all four legs remain on the floor when the clamps are drawn up. Wipe off all surplus glue with a damp rag or a toothbrush. With oak, no pads need be used under the clamp jaws but if the frame is walnut, gumwood or mahogany, it is better to place a felt pad between the jaws and the wood to prevent marring the surface. Leave the frame in the clamps for at least 24 hours.

While the frame is drying, you can be working on the seat. Smooth up the edges of the seat frame with a plane as in Fig. 3,



and finish with sandpaper. It's likely that your local upholstery shop can furnish you odds and ends of material for upholstering the seat. Webbing comes first and it must be stretched as tight as a bowstring. Make a webbing stretcher and use it as shown in Fig. 4. Double back the ends of each strip of webbing and use tacks long enough to hold securely. On top of the webbing goes a burlap cover, which is tacked lightly in place as in Fig. 5. The padding is upholsterers' moss. Before inserting the latter, tack the cotton batting to the back of the seat frame so it will fold forward. Lay the moss in place and pick the bunches apart till it fluffs up into a springy mass, then bring the cotton batting forward and tack to the underside of the seat frame. The muslin cover comes next. Tack the back, then bring it over to the front, drive a single tack at the center and work in both directions. With the front tacked, adjust the padding by inserting your hand under the batting as in Fig. 6. Finally trim the sides of the batting, fold down and tack to the edges of the seat.

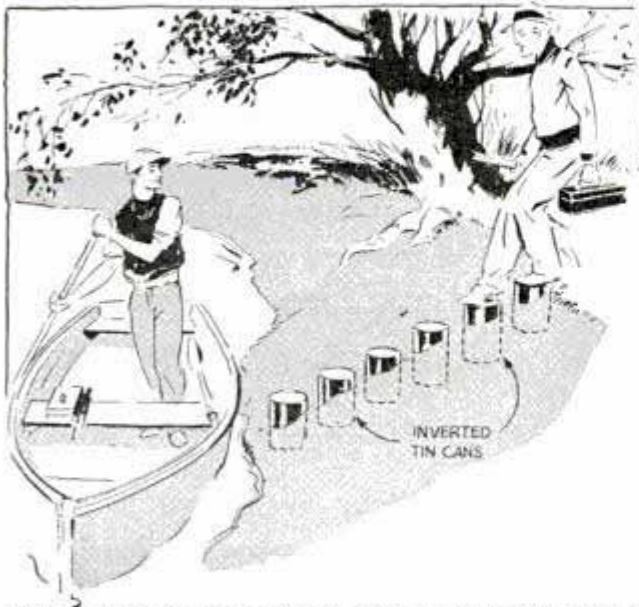
The covering may be tapestry, mohair or rep, whichever you choose. Cut the piece slightly oversize to allow for holding the edges under, then start the tacks at the back and work forward, Fig. 8. Keep the pattern straight and the wrinkles smoothed out. The trick in getting a smooth, neat corner is to make a series of small pleats in the cloth and tack each one before the next is made. The number of

pleats at each corner is determined largely by the thickness of the material. A dust cover of black cambric tacked to the underside of the frame completes the seat.

The simplest finish to apply to the chair frame is a walnut or oak varnish stain. Dilute the stain as it comes from the can with one-fifth its volume of turpentine. Lay on a thin coat, Fig. 1, brushing it well into the wood, and let it dry for two days. Then rub lightly with fine steel wool until all the luster is gone. Put on a second coat of the varnish and repeat the rubbing. Apply the third coat undiluted. When thoroughly dry rub first with fine steel wool then brush away the dust and continue the rubbing with a felt pad, Fig. 9. The heat generated by rubbing with the pad softens the surface of the varnish and causes it to take on a velvety luster. Finally, rub down with furniture wax and polish with a fleece buffer. Last of all, screw the seat in place and insert new screw-hole plugs which have been stained and varnished to match the chair.

Emergency Stair to Boat Landing

When a camp site is located temporarily where a steep bank leads to your boat, just take a few empty cans, invert them and set them in the bank as indicated to serve as a stairway. It is best to first fill the cans with dirt or push them deeply into the ground so that the soil tends to support the bottoms to keep them from pushing in when you step on them.



When there is a steep bank leading from the boat to your camp, set inverted cans in the bank as steps

"Loaded" Hose Removes Scaffold without Damage



Dismantling a scaffold with a "loaded" rubber hose which distributes the blow and avoids splitting

When a scaffold or concrete form is to be dismantled with as little damage as possible to the boards, a length of rubber hose is often better than a hammer. Fill the hose with shot or sand and plug the ends. The hose distributes the blow over a larger area of the work so that undue splitting of the boards is avoided.

Chinese Lanterns in Garden Have Sand "Ballast"

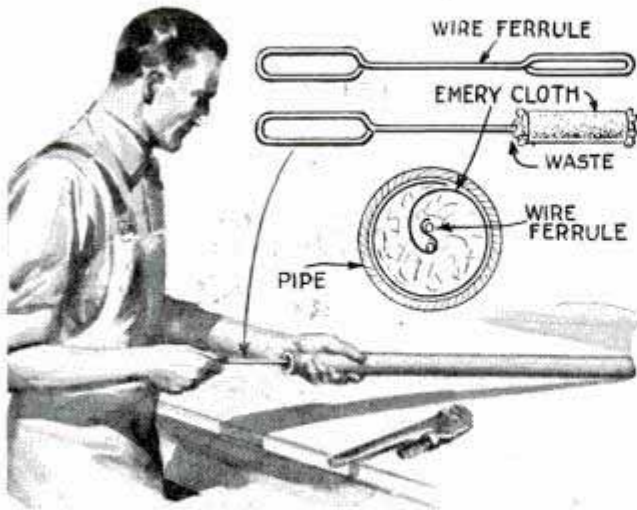
During a garden party, where the lawn was illuminated by Chinese lanterns containing candles, a double handful of sand was placed in the bottom of each one to stabilize them in a strong breeze. Of course, the wind swayed them some, but the weight of the sand kept them from swinging at an angle sufficient to allow the candle flames to ignite the paper sides.

—Dale R. Van Horn, Lincoln, Nebr.



☞ When peeling onions set the electric fan near by to blow the odors away, and it will prevent much "weeping."

Simple Tool Removes Corrosion Inside Used Pipe



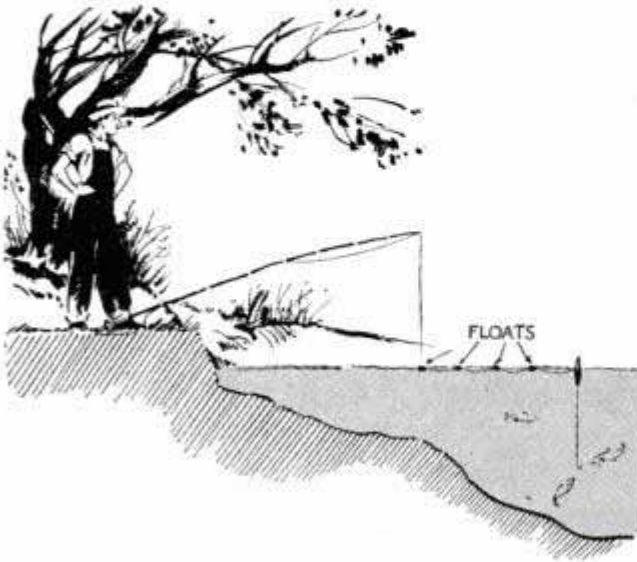
Waste and emery paper wrapped around end of wire handle quickly remove corrosion inside used pipe

If you have a few pieces of old pipe that need cleaning on the inside, you can do the job efficiently with this tool. It is nothing more than a length of heavy wire bent as indicated and having cotton waste around one end to serve as a flexible backing for emery paper. The end view shows how the waste and paper are wrapped.

—M. M. Warren, Monterrey, N. L., Mexico.

Several Floats on Your Fishline Keep Long Line from Sinking

Use several floats on your line when still fishing from the bank of a lake or stream. They will support the line on the surface of the water instead of allowing it to sink and tend to pull the hook close to the



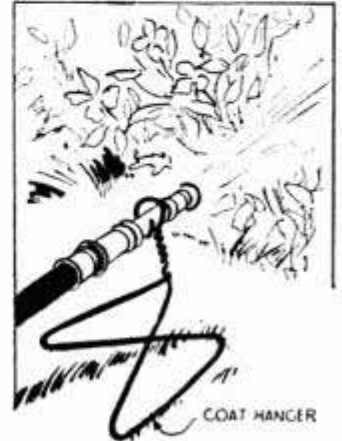
Several floats on your fishline keep it on water surface and prevent hook from tangling

bank. When the line is kept on the surface of the water, minnows playing with the bait cannot tangle the hook into it, which they often do if it sinks.

—Hobart Mark, Spencerville, Ohio.

Nozzle of Lawn Hose Supported on Wire Coat Hanger

When you want to direct a light spray of water on shrubs, flower beds, etc., and there is nothing at hand to support the nozzle of the lawn hose, get a wire coat hanger and bend it in the manner indicated.



This may not support the hose if the water is turned on full, but will do the job when spraying lightly.

Holder for Strip Abrasives

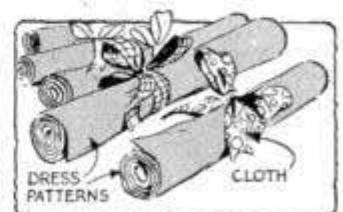


Strip abrasives stretched over this flexible holder are handled easily for all kinds of work. The holder is a piece of thin spring steel cut to the length and width desired and fitted with a wood handle.

In use, the abrasive strip is folded over the blade of the holder, and a rubber ring is pushed over it to keep the ends in place. The ring is a piece of rubber heel carved out in the center to slip snugly over the assembly.—A. H. Waychoff, Tempe, Ariz.

Identifying Dress Patterns

After you have finished making a dress, roll the pattern and tie it with a piece of the same material. When it is laid away with



other patterns, the cloth will identify it by serving as a reminder of the last dress.

The Latest HASSOCKS have storage space

Disguised drawer fronts or hinged tops conceal handy spaces to put books, sewing, baby's toys, etc.

By WAYNE C. LECKEY

YOU'LL find these invitingly comfortable hassocks with their cleverly concealed storage space convenient and very attractive. They can be made easily right in the home shop, using inexpensive, scrap stock for the frames, and tailoring to suit.

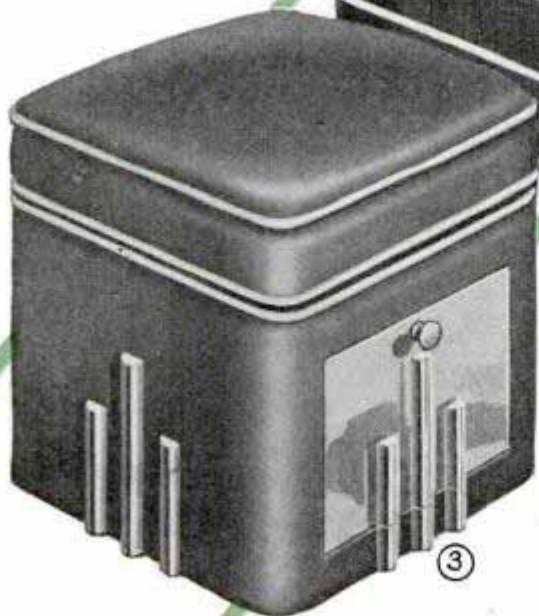
Of the three designs presented herein the one shown in Fig. 2 is the simplest and requires the least work to complete. To make this hassock, a box-shape frame should be made first following the dimensions given in Fig. 5. It is best to use plywood for this as it is strong and will tend to keep the weight

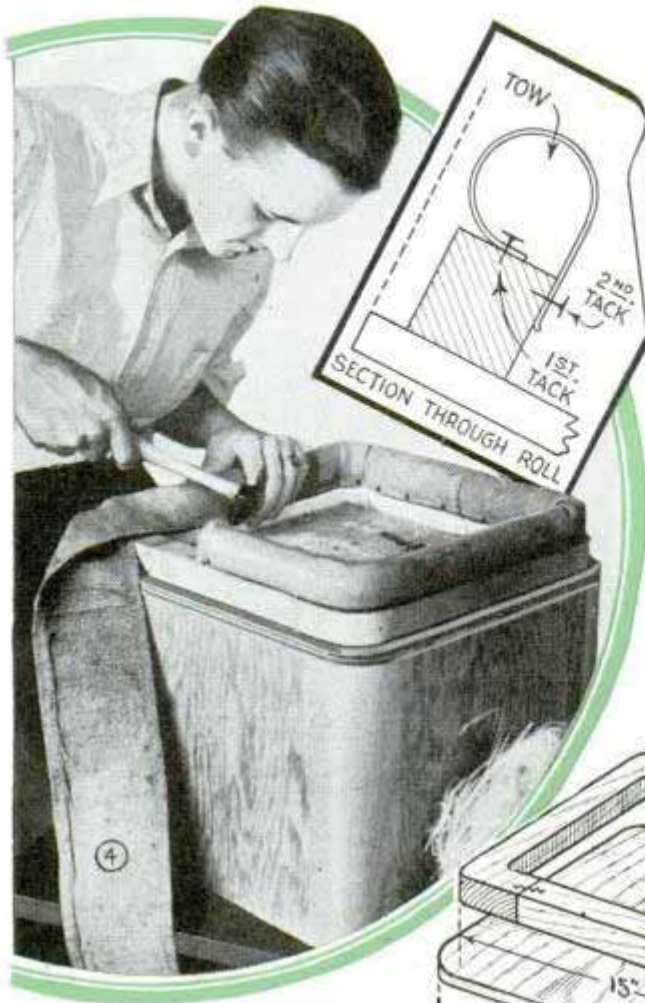


of the finished hassock at a minimum. You can form the corners for the frame from a length of common 2 by 4-in. white pine, making the required right-angle cuts for the sides by tilting the saw table. Do not round the corners until after assembling, which is then done with a hand plane to remove the waste and

a sanding block to smooth flush with the sides. A $\frac{3}{8}$ -in. plywood bottom is then fitted, nailing through as shown. A lid is cut to conform with the top of the box and in turn is glued to a 14-in. framework, roughly cut and joined from $1\frac{1}{8}$ -in. stock. This is centered to allow a $\frac{1}{2}$ -in. margin all around. Before upholstering, the inside of the box as well as the underside of the top should be enameled bone white, lightly rubbing between coats with fine steel wool.

Your first step in upholstering is to form a roll edge around the top as shown in Fig. 4.



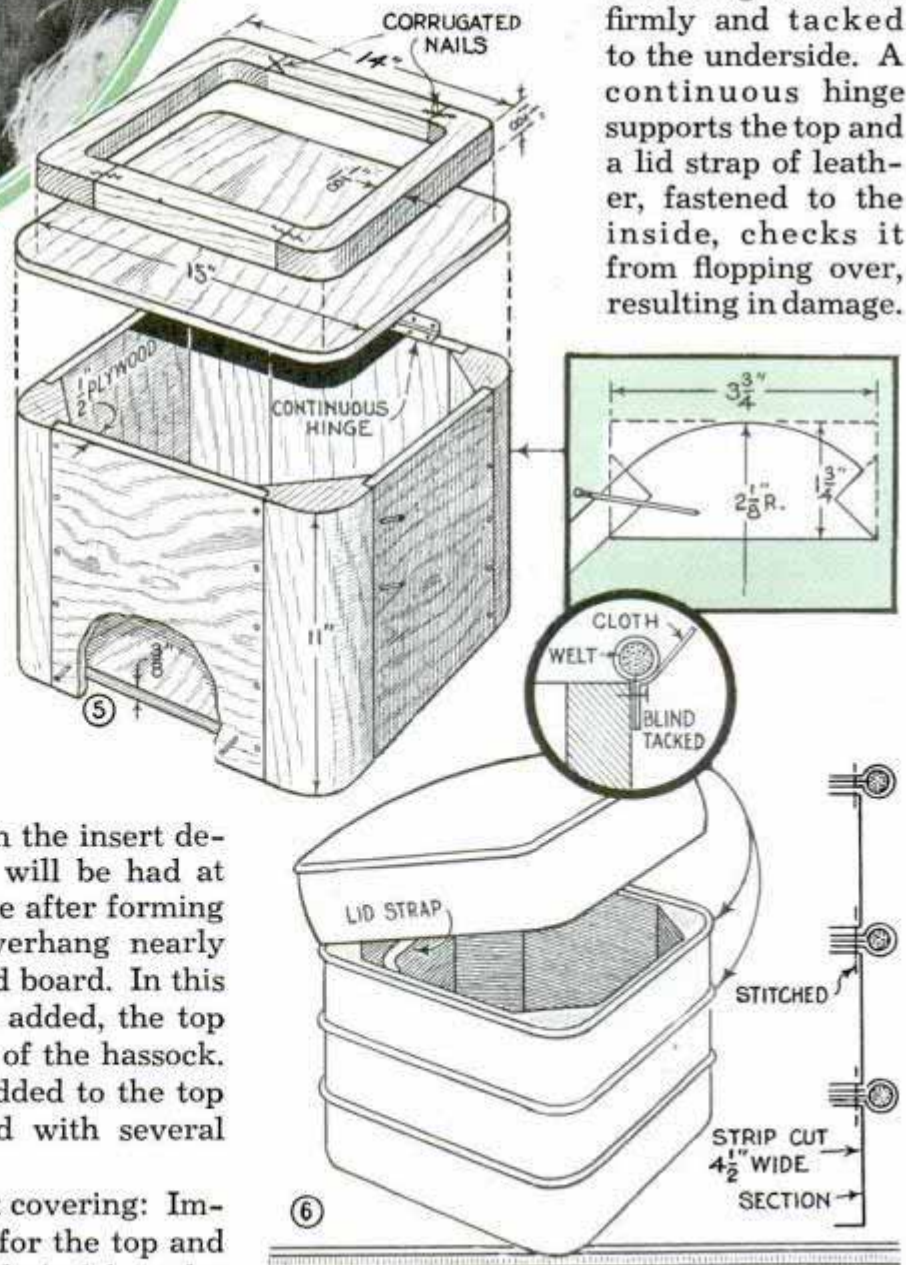


For this you will need a strip of burlap about 5 ft. long and $4\frac{1}{2}$ in. wide. By hemming the edges evenly you will be able to make a neater roll. Begin tacking the edge of the burlap along the outer edge of the frame first, then add enough tow filling to produce a uniform roll about $1\frac{1}{2}$ in. in diameter and, finally, gradually tack the other edge along the inside as shown in the insert detail, Fig. 4. Better results will be had at the corners if you tack these after forming the sides. Let the roll overhang nearly even with the edge of the lid board. In this manner when the cotton is added, the top will be even with the sides of the hassock. Hair filling is generously added to the top of the seat and is covered with several thick layers of cotton.

Now for making your box covering: Imitation leather can be used for the top and welt seams, with a dark cloth fabric for

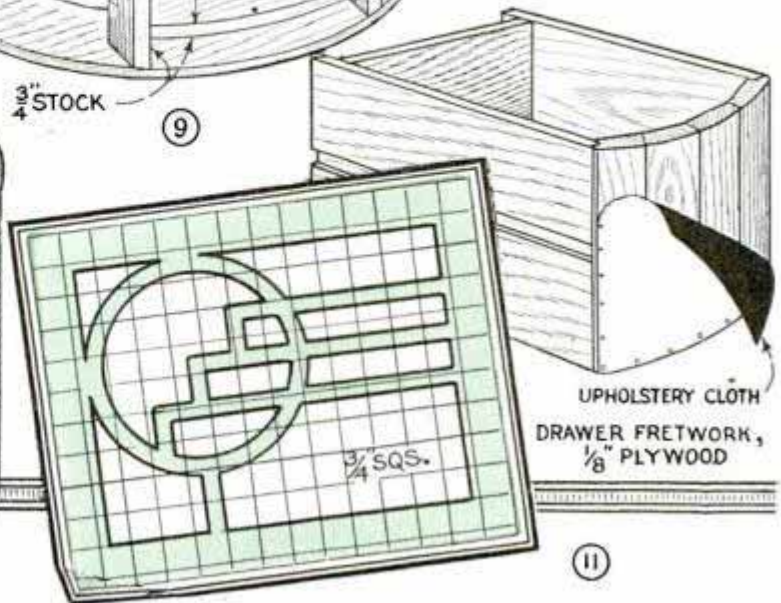
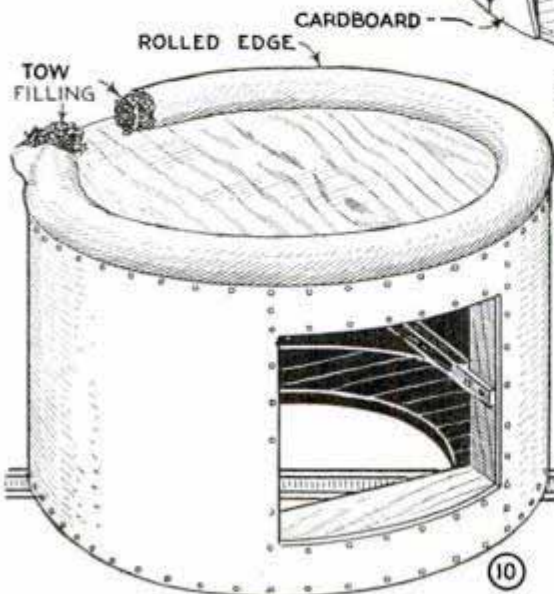
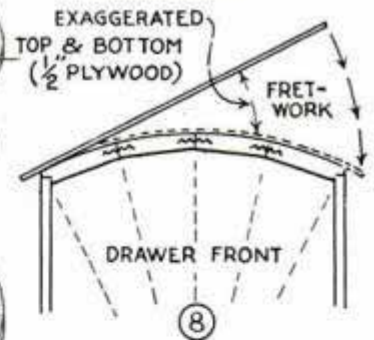
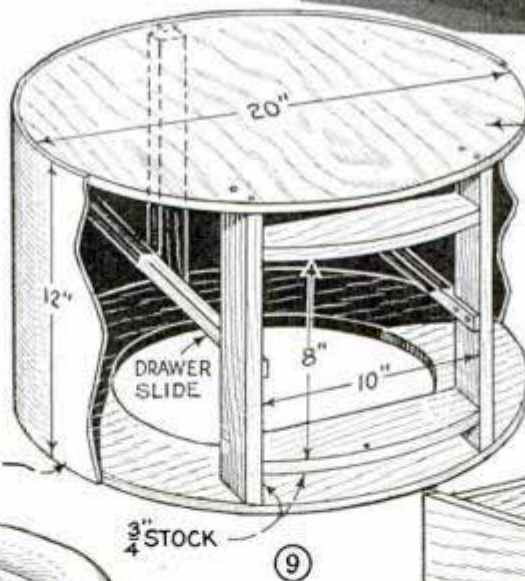
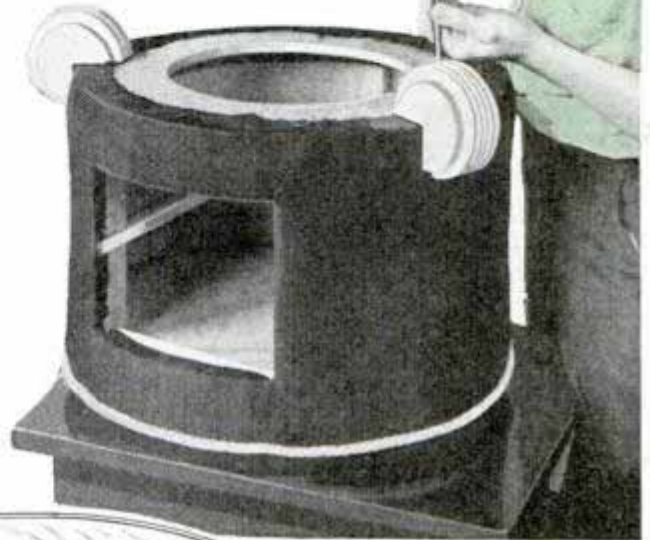
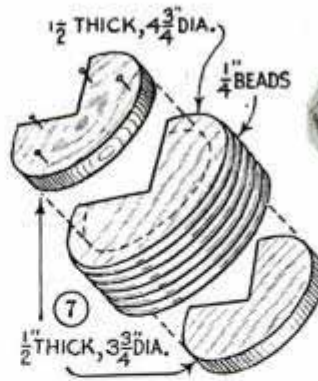
the sides. This arrangement is preferred as it makes the hinged top inconspicuous. The cover material is cut 16 in. square, rounding the corners. The border strip is to be cut $4\frac{1}{2}$ in. wide and is sewed to the top cover with a leather welt between. If you do not have an attachment on your machine for sewing welts, an upholsterer will do this for you quickly once you have the pieces cut. The cover is tacked neatly to the underside of the top, adding a strip of braid to cover the raw edges. The material for the sides of the box is cut up into straight strips $4\frac{1}{2}$ in. wide and sewed with welts between as shown at Fig. 6. This forms a continuous band which in fitting is first turned inside out and the top welt is blind-tacked around the top edge of the box as shown. With this done, the material

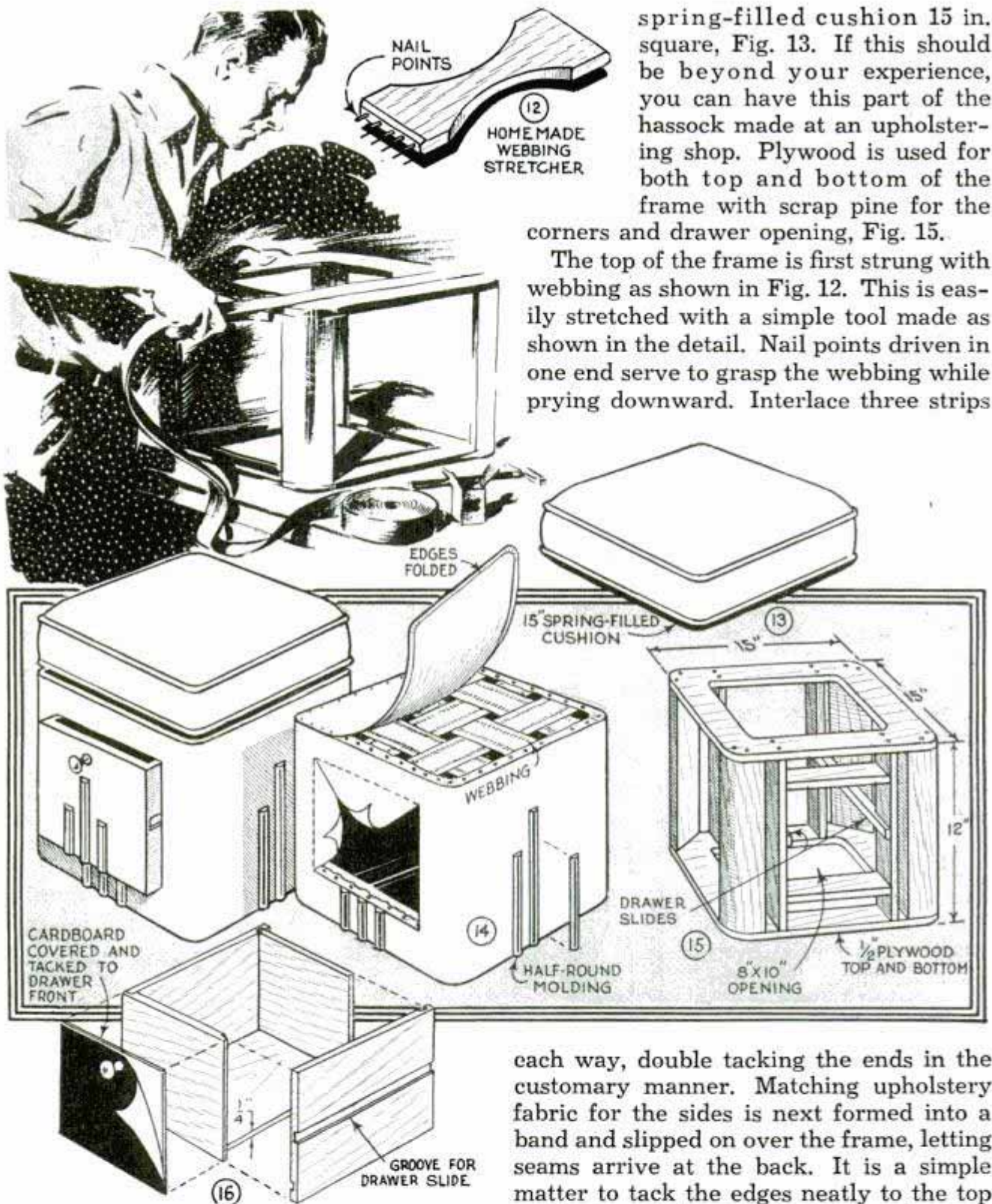
is brought down firmly and tacked to the underside. A continuous hinge supports the top and a lid strap of leather, fastened to the inside, checks it from flopping over, resulting in damage.



The hassock shown in Fig. 1 is upholstered over a drum-shaped framework consisting of two 20-in. disks nailed to uprights forming the drawer opening and covered with stiff cardboard tacked to the edges and joined at the back, Figs. 9 and 10. If the center is removed from the bottom disk, it will facilitate fitting the drawer slides. The cardboard over the drawer opening is cut out after nailing has been completed. The slides are fitted after the drawer is fitted to the opening. As described before, a roll edge is applied around the top 1/2 in. from the edge. Hair and cotton are used for padding. The cover material should be cut 21 in. in diameter and joined with a welt between to a border measuring about 15 in. Seams in the border should be placed at the back of the hassock. The cloth that covers the opening at the front is slit diagonally at the center and folded and tacked neatly inside.

Fig. 8 details the construction of the drawer and the curved front. Four segments angle-cut 82 degrees, glued and nailed with corrugated fasteners, are sanded to the proper contour to form the curved front. Grooves cut into the sides of the drawers should slide freely. The front of the drawer is covered with a scrap of upholstery fabric over which a fretwork cut from the pattern in Fig. 11, is screwed to overlap evenly on all edges. The fretwork should be painted, of





spring-filled cushion 15 in. square, Fig. 13. If this should be beyond your experience, you can have this part of the hassock made at an upholstering shop. Plywood is used for both top and bottom of the frame with scrap pine for the corners and drawer opening, Fig. 15.

The top of the frame is first strung with webbing as shown in Fig. 12. This is easily stretched with a simple tool made as shown in the detail. Nail points driven in one end serve to grasp the webbing while prying downward. Interlace three strips

each way, double tacking the ends in the customary manner. Matching upholstery fabric for the sides is next formed into a band and slipped on over the frame, letting seams arrive at the back. It is a simple matter to tack the edges neatly to the top and bottom. The webbing is likewise covered, using small gimp tacks. The opening is slit, folded inward and tacked, Fig. 14. The drawer is made as in Fig. 16, allowing ample clearance to slide freely in the opening. A piece of stiff cardboard cut to fit the drawer front, is first covered with fabric glued to the back and fastened with brads to the drawer. The cushion is attached by reaching up through and sewing securely at the center, using a curved needle.

course, beforehand and the screw heads countersunk, puttied and touched up. Use a chrome pull on the drawer. The four legs for the hassock consist of two thin disks, glued and nailed to opposite sides of a thick center, one beaded on the edge as shown in Fig. 7. These are finished bone white and are fastened, evenly spaced, with screws in counterbored holes.

The design shown in Fig. 3 calls for a

Simple Valve Stopper for Funnel

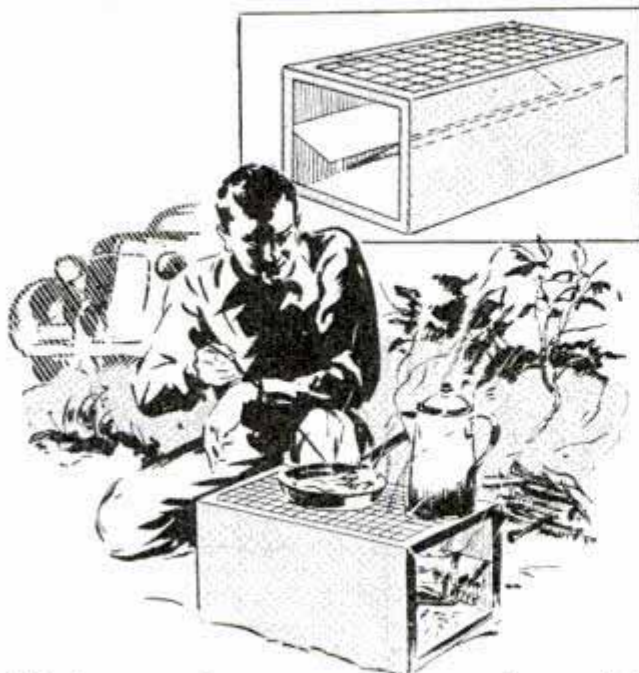


When a number of bottles are to be filled by means of a funnel, the work may be accomplished rapidly, and without overflowing the containers, if this small, finger-operated stopper is employed. It consists of a cork ball attached to a wire, one end of

which is bent in a loop to fit over the index finger of one hand. In filling the bottles the funnel is held as shown, the finger being raised or lowered to operate the valve.

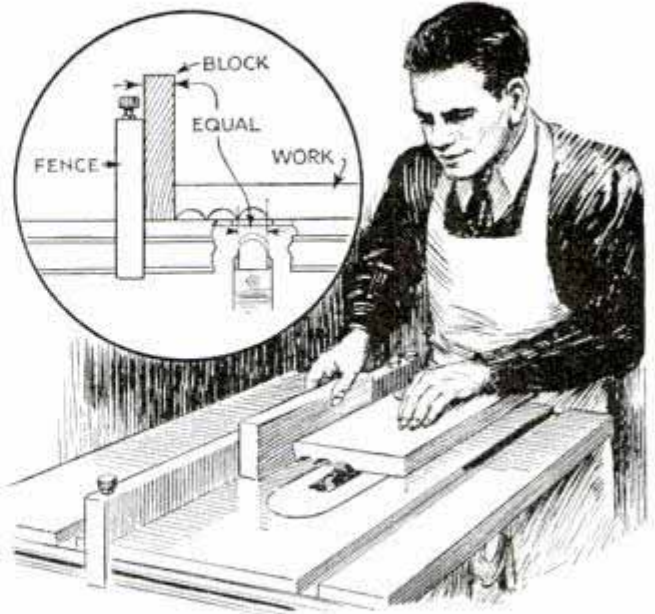
This Portable Camp Stove Is Light in Weight

Here is a handy stove that one camper made from an old oven such as used on kerosene and gasoline stoves. The top of the oven is cut out and fitted with a grating to support cooking utensils, after which the original door of the oven is removed to provide an open front. The pan support inside the oven is cut in two in the center and bent down until the severed edges are about 2 in. apart. This forms the grates of the stove.



This kerosene-stove oven provides a good camp stove when the top is removed

Spacing Parallel Cuts Accurately for Molding Head



This method saves marking off equal divisions when using a molding head for cove or reed cuts

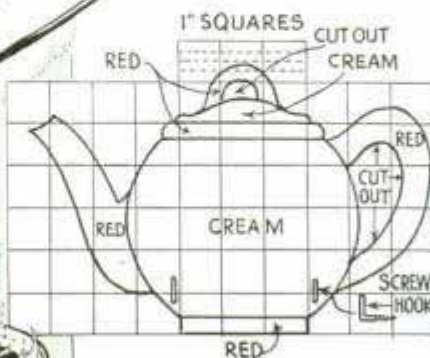
The next time you have to make a series of parallel cove or reed cuts with a molding head on a circular saw, try this simple method instead of marking off equal divisions on the edge of the work. After the first cut has been made, hold the work in its present position and move the fence enough to insert a scrap of wood, the thickness of which is the same as the width of the cut or space. This gives you the proper position of the fence for the next cut. The procedure is repeated after each cut, resulting in identical divisions.

Testing Board for Camera Bellows Has Photoflood Lamp

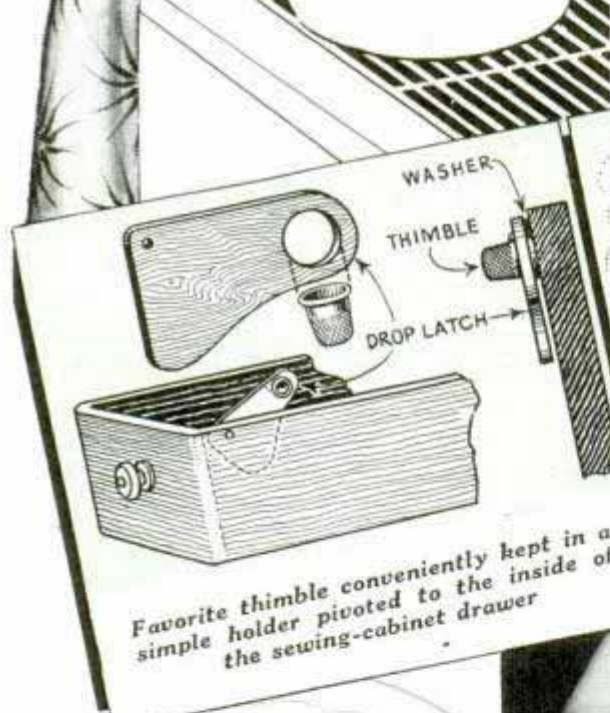
Mounted in a porcelain socket on a suitable wood base, a photoflood lamp provides a good tester for camera bellows. The lamp produces a brilliant light that will show leaks that cannot be detected easily by other means. The face of the base which contacts the rear of the camera is lined with black velvet, and the lamp cord is brought to the socket through a hole in the base.



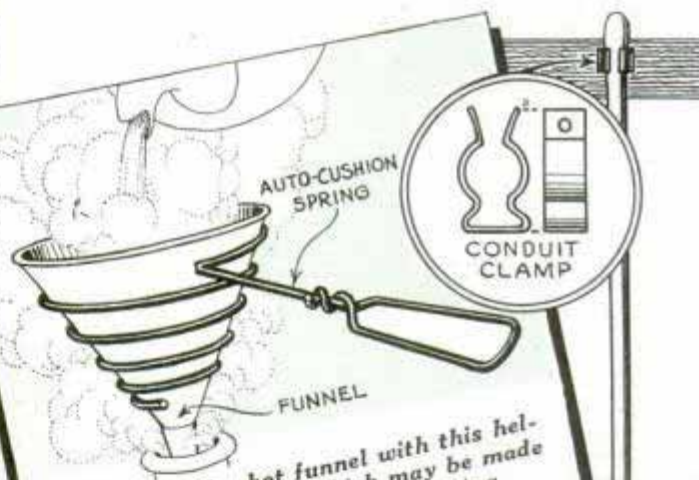
SOLVING HOME



Sometimes you'll find it handy to slip a large cork on the stirring spoon to keep it floating. And, for hanging hot pads in the kitchen, this little "teapot," jigsawed and suitably painted, is just the thing



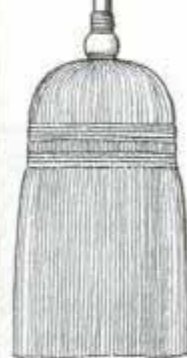
Favorite thimble conveniently kept in a simple holder pivoted to the inside of the sewing-cabinet drawer



You can hold a hot funnel with this helical support of wire, which may be made from an old auto-cushion spring

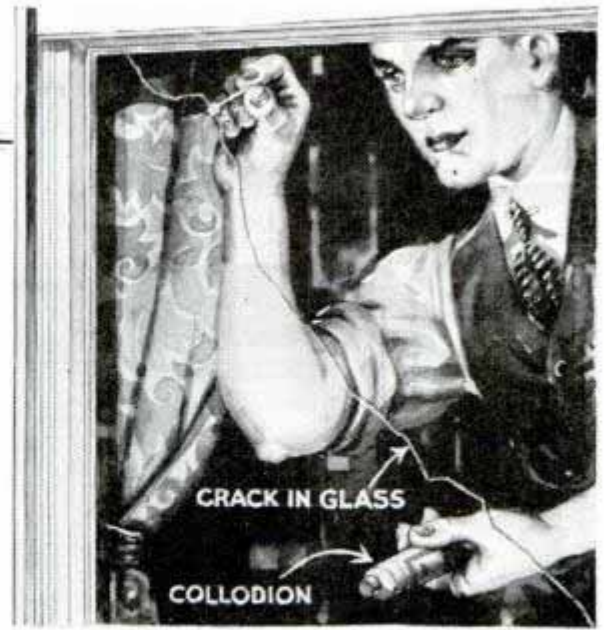
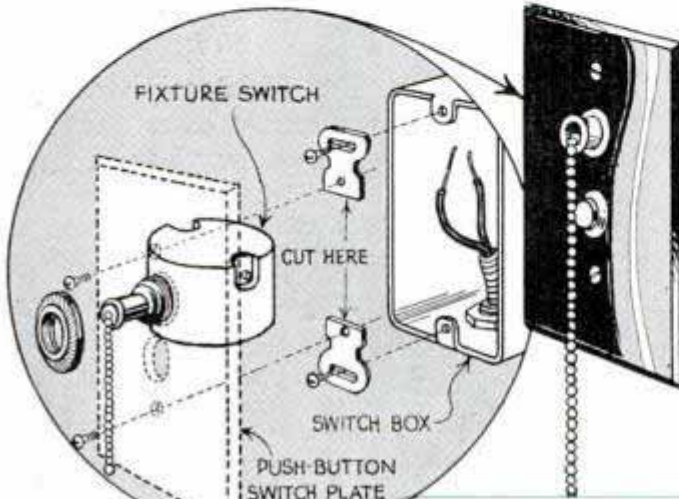


Left, an occasional application of brushing lacquer or shellac on a wire clothesline prevents rust stains on clothes and permits quick and easy wiping. Center, as a temporary repair, ordinary nail polish will often mend small breaks and pinholes in hot-water bottles. Dry thoroughly inside, spread the break, and work the polish in with a toothpick so that it "anchors." Right, single-screw conduit clamps, obtainable at electric shops, make good broom holders

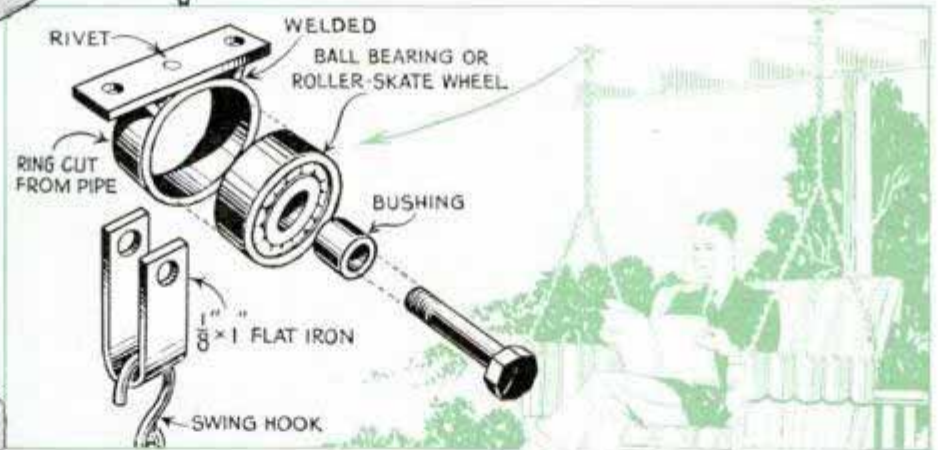


PROBLEMS

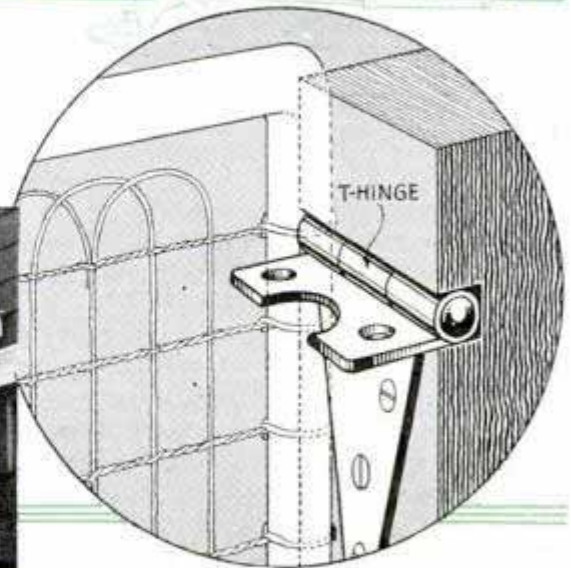
When you want the youngster to be able to operate a wall switch without climbing on chairs, substitute a toggle-fixture switch of the type shown below for the usual flush wall switch. The metal tabs of the latter are cut off and retained so that the plate can be fastened



Above, crack in windowpane can be filled with collodion which is applied on both sides, providing an airtight joint. Below, cure creaking porch swings by providing ball-bearing hangers through which the swing hook is slipped



Extra cork inserted under the screw cap on an insulated bottle keeps the regular cork in place. The photo below shows how simple roll-up shades can be fashioned from strips of wood and tape. In this case wood lath was used



Strong gate latch formed by filing notch in large T-hinge. Ends may be turned up so that pressure of gate against latch will raise it



It looks easy to drop a hoop over the balloons, but just stand off and try it once

"Balloon Dodger" Hoop Game Tests Your Skill

An interesting and amusing game that looks easy but proves difficult to score may be made from several sausage-type toy balloons. These are inflated and painted to resemble caricatures, after which they are attached to a base. In playing, the contestants stand at a predetermined distance from the balloons and endeavor to toss embroidery hoops over them. As the balloons move at the slightest touch, the hoops must drop directly over them to score a point. The game may be rendered more difficult by inflating the balloons so that a hoop will just slip over them.

☛ Keep a package of picnic spoons in your medicine cabinet for dispensing medicine instead of using silver spoons, which tarnish easily.

Plenty of Fun at a Safe Speed



MORE BLUEPRINTS ON GOOD SPRING PROJECTS

"ROAMER"—765 to 770: Outboard cabin cruiser. 16 ft. long, 66 in. beam. Requires outboard motor of 20 to 36 hp. Set of six prints \$1.00.

"SEA SAUCER"—893: 9½-ft. sail boat. Deck, bottom and sides are 3/16-in. plywood. 25c.

"ZIP," MODEL RACING YACHT—880 to 883: 50 in. long. Four prints \$1.00.

17-FT. KAYAK—928 and 929: Light framework covered with canvas. Two prints 50c.

LAWN CHAIR—529: Plain sawed from ¾-in. stock. Easily made with hand tools. 25c.

ORNAMENTAL WOOD FENCES—640: Five artistic designs for standard wood stock. 25c.

VENETIAN BLINDS—926 and 927: Three different styles covered on two prints. 50c.

This small car, having a 58-in. wheelbase and 28-in. tread, is very easy to operate and may be powered by a ½ to ¾-hp. gas engine of the washing-machine type. It is equipped with effective brakes and pneumatic tires. Plans show three alternate methods of body construction. Easy to build. Our blueprints Nos. 906 to 909 incl. give you all the information necessary. This set will be sent postpaid on receipt of \$1.00.



LAWN AND GARDEN FURNITURE—920 to 922: Collection of designs for arbor-and-seat combinations and swings. (3 prints.) 75c.

METAL WEATHER VANES—520: Scroll-sawed from sheet aluminum. Complete assembly details. 25c.

Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00

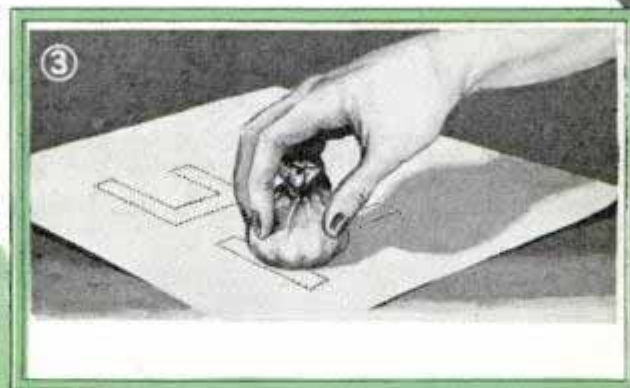
Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



SHOP NOTES

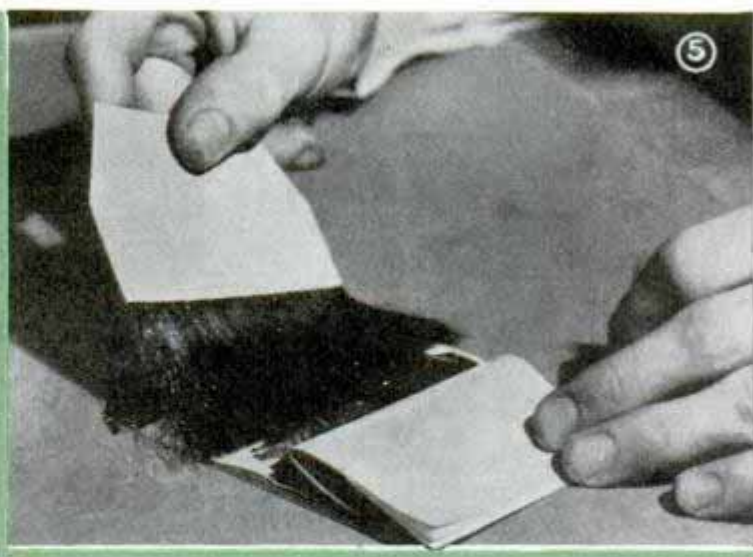
Working with GOLD LEAF

GILDING with gold leaf is a fascinating art and although some skill is required to handle this fragile material, a bit of practice will enable anyone to produce excellent results. The necessary materials are not expensive; the gold leaf, a few camel's-hair brushes, and a "pounce" bag will include almost everything needed. Kits can be purchased which contain all the necessary equipment for gilding. The surface to be gilded must be perfectly smooth and nonporous, as any irregularities, even brush marks in paint, will show through the gold leaf. If the surface to be gilded is porous, it must be given several coats of paint, varnish, or shellac. Flat



paints are to be preferred for this purpose. The size alone cannot be depended on to seal the pores, as its only purpose is to secure the gold to the surface. After the latter has been smoothed with fine pumice, be sure that it is perfectly clean and dry, as the gold will stick to a wet surface.

The design which is to be gilded should be laid out on a thin sheet of white paper and the pencil lines perforated as shown in Fig. 1. The back of the paper should be lightly sanded with No. 00 or finer sandpaper to keep the holes from closing. The design paper is then laid in the proper position and rubbed lightly with the pounce bag, as shown

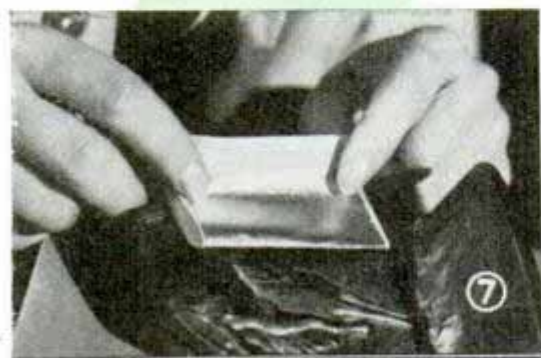


in Figs. 2 and 3. The pounce bag is made by folding up the corners of a small square of cheesecloth, filling with whiting, and tying at the top. The pattern will show up on the work in white. On white work, use a pad of absorbent cotton dipped in powdered charcoal.

Now brush a thin coat of gold size on the part to be gilded. This is not to be spread beyond the design as the gold will stick wherever there is wet size. There are two kinds of size, quick-drying or japan size, and slow-drying or oil size. The latter takes about 10 to 24 hrs. to reach the proper condition for gilding, while the quick size will be ready in from 20 to 60 min. However, the oil size will permit a better burnish of the gold. During drying, the work should be protected against dust and lint.

The gold is to be applied when the size reaches the proper "tack" or stickiness. This can be tested by touching the size with your knuckle. It is right when the knuckle sticks very slightly and a little "tick" is heard when the knuckle is pulled away. Experience is the best guide in judging the right time to gild.

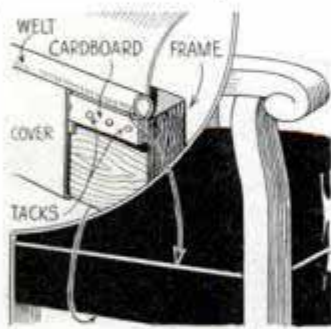
Gold leaf comes in books of 25 leaves, each leaf being $3\frac{3}{8}$ in. square. There are two general types, the plain leaf and the patent gold leaf, which is lightly adhered to a sheet of tissue for ease of application. The ordinary gold leaf cannot be touched or handled, and must be applied directly from the book, or with the gilders' tip, which is a thin, 4-in. brush of camel's hair. To use the tip, draw it lightly across your hair several times and then lay the slightly greasy side flat on the gold leaf, as in Fig. 5. Pick up the leaf and lay it flat over the sized surface, Fig. 4. Avoid crumpling the leaf and be careful not to let the tip touch the size. Do not breathe toward the gold leaf, and avoid drafts. Pat the gold lightly with a pad of cotton and burnish by rubbing lightly with the



cotton. The size is still wet and the gold is fragile, and too much pressure will ruin the surface. Brisk rubbing without pressure will give a high burnish. Scraps of gold or "skewings" which are brushed off in the burnishing process may be used to patch imperfections, which are called "skippers" or "holidays" in the trade. On a small job, the leaf should be cut to prevent unnecessary waste. The method is shown in Fig. 6. The book is held in the left hand with a piece of stiff cardboard underneath it, and the first piece of tissue folded back to expose enough of the gold leaf for your purpose. It can then be cut with your fingernail while resting your finger on the tissue paper. Only slight pressure is required.

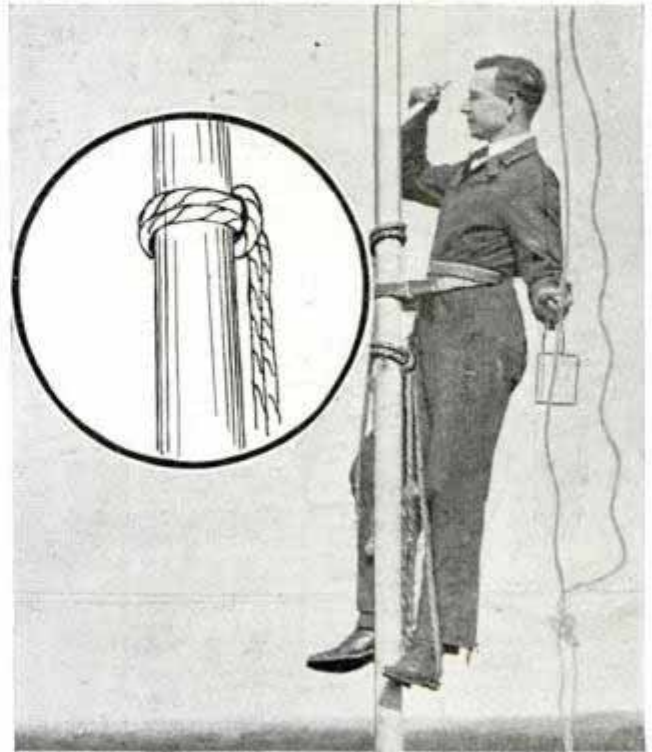
Patent leaf is adhered to a sheet of tissue which may be handled with the fingers. It is applied directly to the work, as in Fig. 7, and patted with a cotton pad to insure adhesion to the size. The tissue is then pulled off with the excess gold still adhering to it. This gold can be used on other jobs. It is not usually necessary to cut the leaves, but if desired, scissors can be used. The gold can be burnished as usual. While easier to apply, patent leaf will not take as high a burnish as ordinary leaf. If the gilded surface will be subjected to wear, it can be given a coat of varnish to protect it. Before applying the varnish, allow 24 hours for the size to dry completely.

Tacking of Upholstering Material Concealed by Cardboard



In "blind-tacking" borders, which is frequently required in upholstery, the location of tack heads often can be noticed through thin material by a wrinkle or pull in the cloth at each tack. To overcome this, one workman cuts strips of cardboard $\frac{1}{2}$ in. wide through which he drives the tacks into the border. This gives a straight edge which permits the border to be drawn down smoothly without wrinkles appearing in the material.

Rope Sling Lessens Hazard in Painting Flagpole



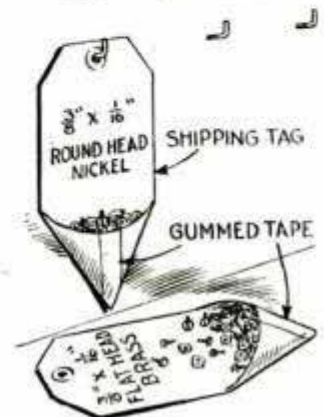
This flagpole sling supports you in a standing position and leaves both hands free

With a safety belt and this simple rope sling you not only stand in a comfortable position for work, but you can "walk" up and down the pole easily. The loops of rope snub about the pole at points above and below your waist as shown. To ascend, shift your weight to the left foot and slide the right loop upward with the hand. Then shift your weight to the right foot and move the loop supporting the left foot the same distance upward. To descend the pole, you simply reverse the process.

—Clifford B. Paul, Moline, Ill.

"Bins" for Screws and Small Parts Formed from Shipping Tags

Shipping tags folded as shown and hung on a wall or bench provide handy storage "bins" for tiny screws, nuts, etc., used in repairing radios and clocks. The size and kind of parts are written on each tag.



"Drain Finishing" Small Articles Saves Time and Labor



"Drain finishing" of small duplicate parts leaves a uniform paint film on flat and irregular surfaces

By a simple system which reverses the usual procedure of dip finishing, you can speed up production painting of a large number of duplicate units. The process makes use of two tanks, one on a sturdy stand which is just high enough to allow the second tank to stand directly underneath as shown. The tanks may be of any convenient size or shape. Articles to be painted are arranged on racks which are lowered into the solution in the first tank. Then the faucet is opened and the solution allowed to drain slowly into the second tank. Steady lowering of the paint level leaves a smooth, unbroken finish on the work.—Geo. O. Trier, Park Ridge, Ill.

Split Link for Repairing Chain Closed with Monkey Wrench



When inserting a split link to repair a chain, it can be closed snugly with a monkey wrench. The link is clamped in the vise as indicated and is given a slight twist with the monkey

wrench or any other tool with which you can grip the link.

—Victor Albrecht, Forestburg, Alta., Can.

'Cellophane' Given Ground-Glass Finish to Diffuse Light

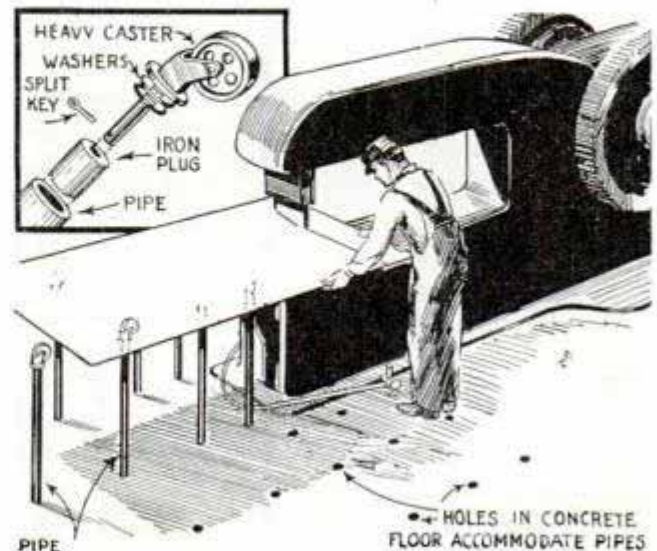
Cellophane given a ground-glass finish and used in a photo lamp or enlarger to diffuse light, will be found more efficient than a ground glass as it is much thinner and will pass about three times as much light as a glass. The surface of the Cellophane



can be given the finish by rubbing each side two ways with fine steel wool.

Casters Support Heavy Plates at Power Shears

Lengths of pipe fitted with casters and set into holes in the floor about the machine make a one-man job of handling heavy metal plates at the shear. The pipes should be of equal length and the casters of a uniform size so that the work is supported level and at the proper height to be fed through the machine. Holes in the concrete floor should be arranged to suit the varying sizes of work likely to be handled.—T. L. Moore, Detroit, Mich.

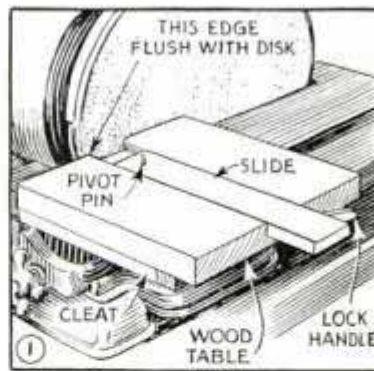


These inverted casters eliminate the hard work when shearing heavy metal plates

Pivot JIG for disk sander

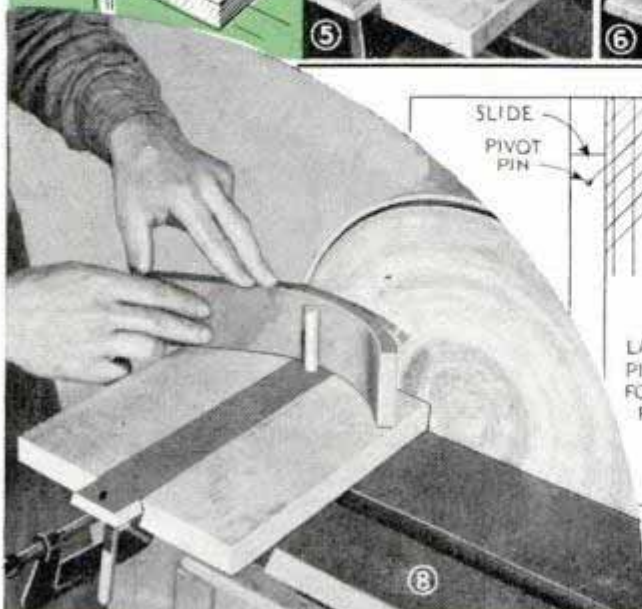
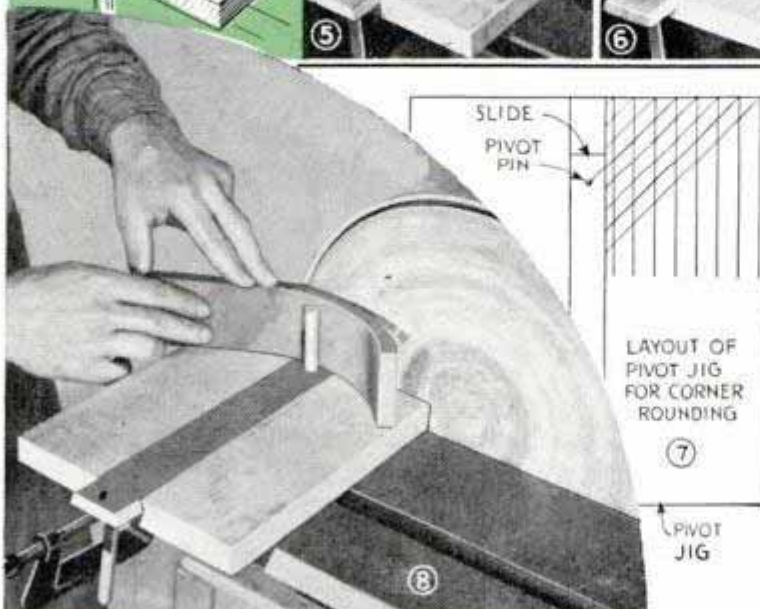
OF THE many types of pivot jigs to aid in sanding work, the one shown in Figs. 1 and 2 is probably the simplest and most practical. It consists of a wood table of a size proportional to the size of the sander table. A dovetail groove is cut in the center on a circular saw by tilting the table about 30°. While the saw table is tilted, a slide should be cut to fit snugly inside the groove. It is advisable to make three or four slides so that each one can be fitted with a different style of pivot point to suit various work.

A feature of the jig is the lock handle, Fig. 3, which, when pushed down, locks the slide securely. Figs. 4 to 6 show how the jig is used for rounding corners. A wood guide is nailed to the edge of the jig table, as shown in Fig. 4, after which the slide is locked at the required radius. A pencil



mark is made on the table, the mark being the same distance from the pivot pin as the latter is from the face of the disk. The work is pressed onto the pivot, one edge being aligned against the face of the disk and the wood guide, while the other end is set even with the pencil mark. If desired, the jig table can be pencil-marked as shown in Fig. 7. The angle line intersected by the pivot pin locates the guide line to which the work should be set.

Another use for the jig is shown in Fig. 8, where curved work is being sanded to exact thickness. The work is first band-sawed and smoothed on the inner side, after which it is advanced between the pivot pin and sander disk to emerge smoothly surfaced to an even thickness throughout the length.



☛ A good way to start a rose slip is to stick the end in a potato before planting.

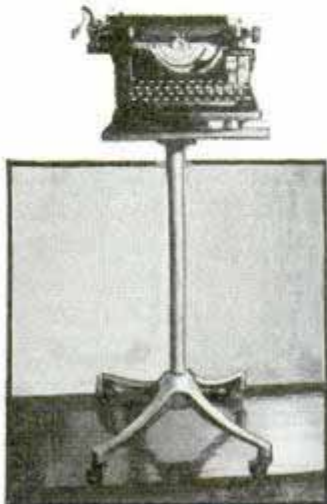
Window Has an Overhead Spray to Simplify Washing



No need to carry a bucket of water for window washing when you have this sprayer system

Saving in time alone will pay quickly for this installation. It consists essentially of two lengths of $\frac{1}{2}$ -in. pipe connected to the water supply through a wheel valve. A row of $\frac{1}{16}$ -in. holes, spaced about 2 in. apart, is drilled through one wall of the horizontal section of pipe, the combined spacing of the holes being only about 4 in. less than the width of the glass. When assembled as shown, the horizontal pipe is turned so that sprays of water strike the glass at an angle of about 45 degrees.

Homemade Typewriter Stand from Junk Parts



As most tables and desks in the home are too high to support a typewriter at the right height, look around in your attic, basement or storeroom for some discarded article that has a base similar to the stand shown. Old organ and piano

stools and similar articles offer possibilities, and all you have to do is fit them with a standard to support the typewriter. The stand in the photo was assembled from the base of an old health lamp, which was cut off at the proper height. The upper part of the stand is a 12 by 14-in. board having the footplate of an old tire pump screwed to the underside so that the barrel or cylinder of the pump can be inserted inside the lamp standard. A short piece of pipe and a floor flange can be screwed to the board to serve the same purpose.

—Norval Burch, Chicago.

Memo Paper on Night Stick to Take Notes Quickly

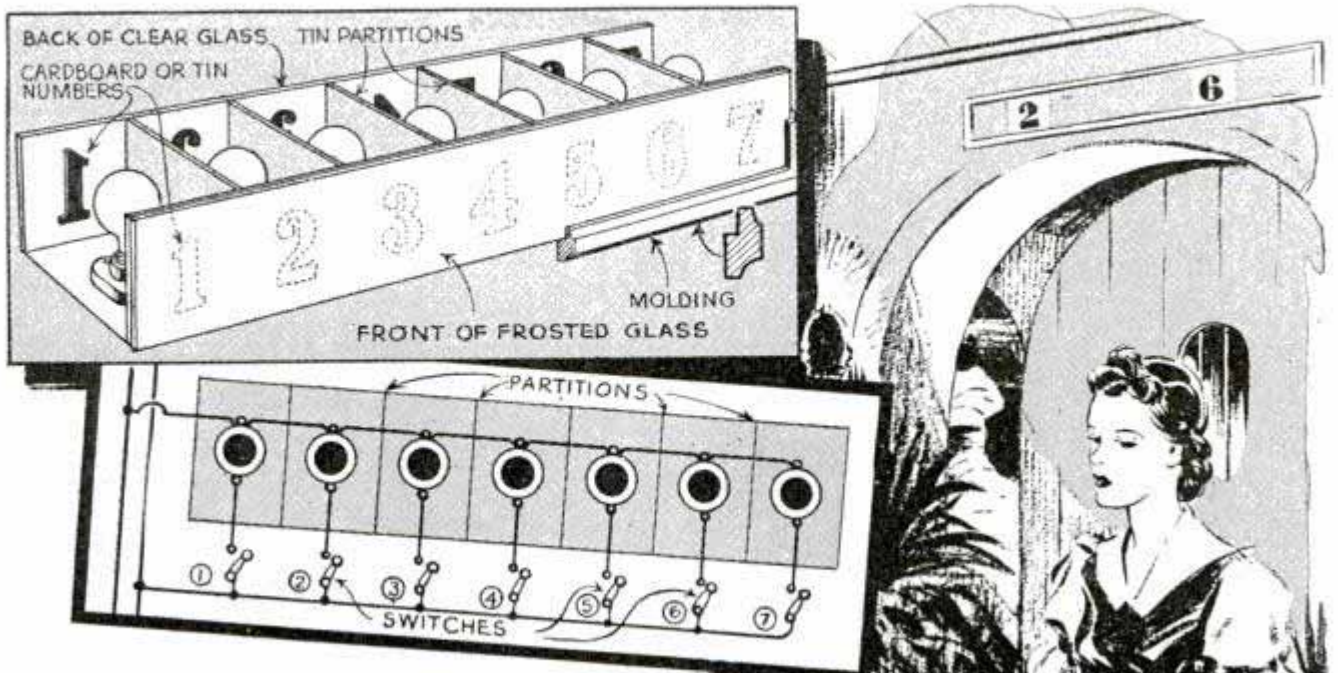
One police officer carries a memo paper on his night stick so that it is always ready for instantly making notations. The paper is wrapped around the handle and is held in place with a cylindrical piece of brass.



Memo paper on handle of night stick is covered with brass cylinder, which has opening for writing

This has a window cut in it to expose the paper for writing, and is moved around the stick as the paper under the window is covered with notes. Several paper sheets can be rolled on the stick at one time, assuring a supply for the day's work.

Waitresses Called Silently in Dining Room



To eliminate the ringing of bells or buzzers and to reduce disturbance in the dining room to a minimum, a cafe owner installed this silent caller in which illuminated numbers notify the waitresses that their orders are prepared. Set flush in the wall above the door between the kitchen and dining room, the caller consists of a number of electric lamps separated by tin partitions with a front of frosted glass and a back of clear glass. Opaque numbers are cemented to the inside surfaces of both pieces of glass, and the lamps are controlled individually by switches located near the chef, the wiring being done as indicated in the lower detail. When a switch

is pushed, the lamp illuminates its particular compartment so that the number appears black against the frosted glass. The clear glass with its numbers showing in the kitchen serves as a check for the chef.

—Don W. Sigler, Lincoln, Nebr.

Angle Adjustment on One End of Spirit Level Saves Time

In construction work, where a spirit level is used in determining the slope of certain surfaces, positive adjustment is obtained by slotting the butt plate of the level as indicated and attaching it with two screws. These are loosened to drop the plate to the desired position and then tightened to hold it. Marks may be made on the plate to correspond with an indicating point on the wood to aid in adjusting the level to predetermined degrees.



☛ A lump of dry starch rubbed over grease spots on wallpaper will usually absorb the grease, after which the starch is removed.

Auto Casing Relieves Arm Strain When Carrying Buckets

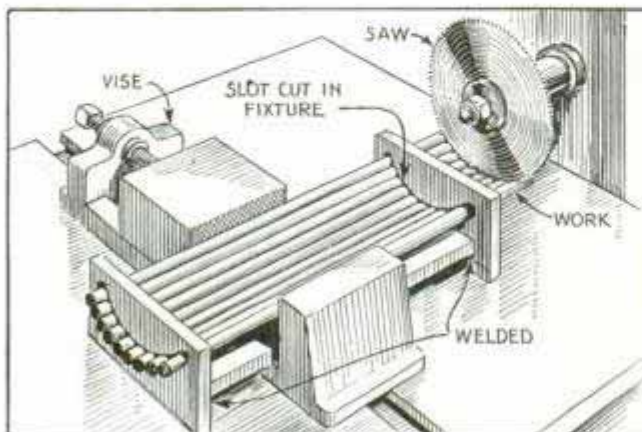


Piece of auto casing under armpit when carrying heavy load helps to reduce tension on arm muscles

Engaged in carrying heavy pails of hot asphalt on a highway repair job, a workman found that he could reduce the strain on his muscles by fitting a section of auto casing under his arm to serve as a resilient cushion. This served to hold the pail away from his body without constant tension of the upper-arm muscles.

Iron Bars Sawed Simultaneously with This Fixture

Unlike many other bar-sawing fixtures for milling machines, this one holds the bars or rods so that they are all sawed off at one time. The fixture consists of three



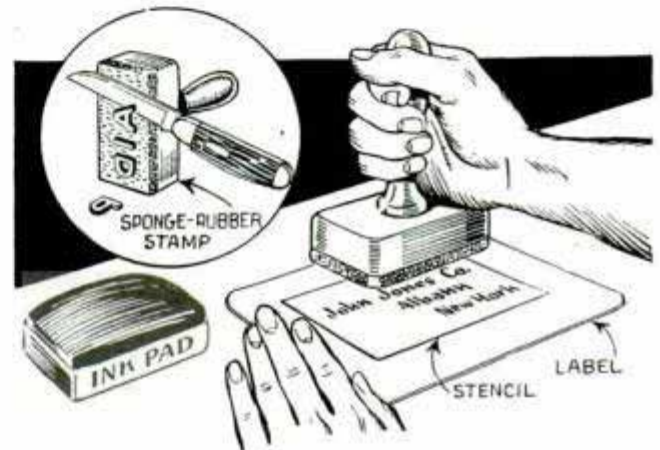
This fixture holds a number of iron bars at the same curve as the radius of the saw

pieces of steel plate welded together as indicated, slots to take the work being cut in the endpieces at the same radius as the saw. The width of the base must be the same as the distance horizontally between the ends of the slots. This permits the milling-machine vise to grip the base in which the fixture is clamped and also the bars so that they will be held rigidly.

—H. Moore, Leeds, England.

Rubber Stamp Replaces Brush for Tag Stencils

To avoid the mess and inconvenience of employing a brush and ink to address shipping tags, labels, etc., with small stencils, one shipping clerk designed a stamp

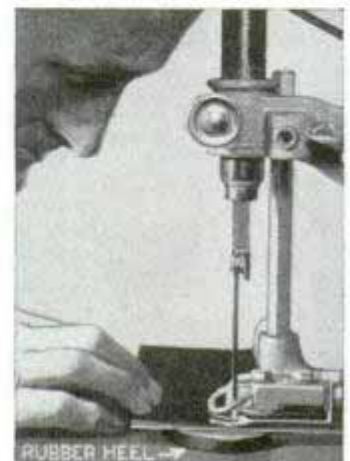


Rubber stamp with type removed applies ink from pad to stencil when addressing shipping tags

which could be inked from a pad. A discarded rubber stamp, with the type shaved off, provides the blank with which the ink is applied over the stencil.

Rubber Insert in Jigsaw Table Reduces Noise of Vibration

Workmen who dislike the noise caused by vibration when sawing small pieces of metal on a jigsaw, can reduce it considerably by substituting a rubber insert for the metal one in the saw table. A rubber heel is good



for this purpose when the underside is trimmed to fit snugly in the insert hole. The untrimmed upper part of the heel rests on the table and provides a noise-deadening pad on which to rest the work.

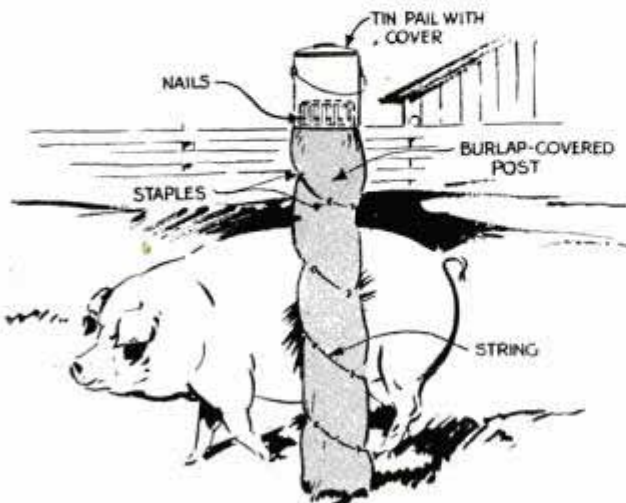
Price Tickets Laid on Sandpaper Are Lettered Rapidly

When lettering a number of price tickets, showcard writers will find that they can hold the cards down without undue strain on the hand by laying them on a sheet of fine-grain sandpaper, which has been tacked to the drawing board with the abrasive side up. A piece of rubber having the exposed surface roughened slightly will serve the same purpose if sandpaper isn't at hand.



Automatic Hog Oiler Improvised from Post and Burlap

To provide an inexpensive oiler for his hogs, one farmer drove a post into the ground, wrapped it with burlap and then forced a bottomless pail down over the burlap, nailing it firmly to the post. The pail served as a reservoir for the oil, and the burlap acted as a wick to absorb and apply the oil as the pigs rubbed against it. Once the burlap is saturated, the flow of oil will be gradual.



Oil slowly seeping down the burlap-covered post is applied to hogs when they rub against it

Glass-Paneled Sign Displays Vegetable "Specials"

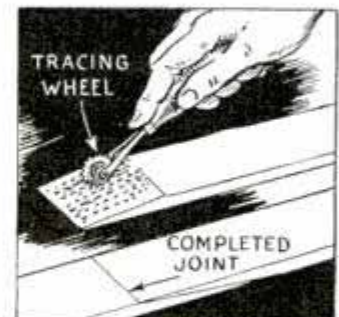


This sidewalk sign names the price and displays the goods for the customer

Specially priced grocery items will move faster if you display them attractively along with the price tag. One good way to do this is shown in the illustration—a triangular-shaped sign open at the back and fitted with shelves and glass panels on which the cost of the items can be lettered. The display is equally effective inside the store or outside on the sidewalk.

Belt Ends Roughened for Cement with Tracing Wheel

Workmen who often have leather belts to splice, will find that a dress-maker's tracing wheel is handy for roughening the beveled ends that are to be lapped and cemented. The wheel makes hundreds of tiny impressions in the surface of the leather, which allows the cement to get a good grip on the joined surfaces.



☐ If a wire brush to clean a file is not available, rub the end of a piece of soft pine over it in the same way a brush is used.

STAINLESS STEEL



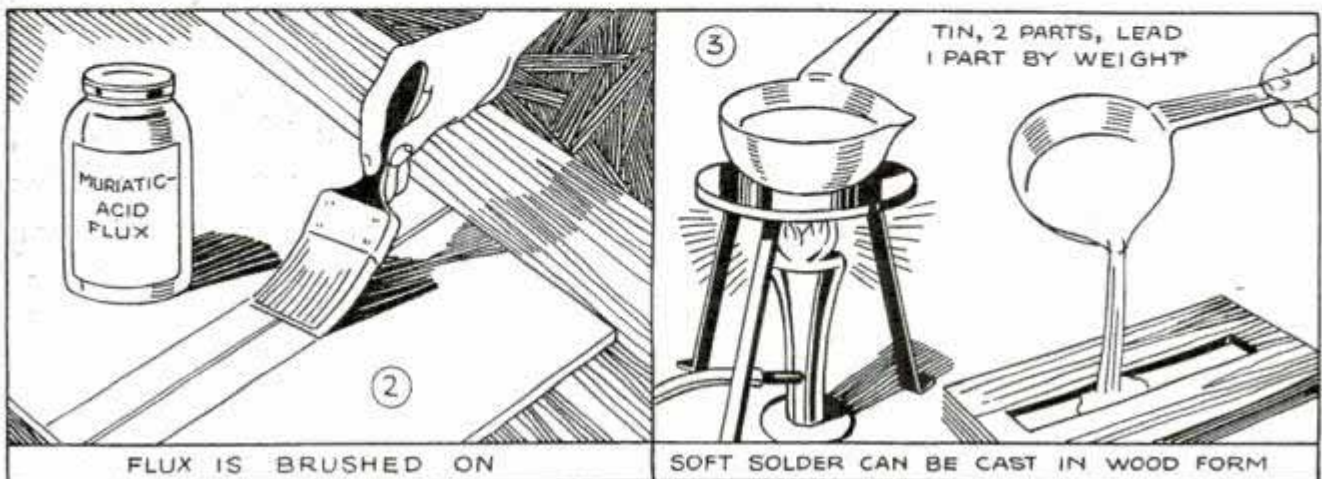
By C. A. CROWLEY

ALTHOUGH it is quite generally believed that stainless steel cannot be soldered, brazed or welded readily, proper technique renders these operations easy and the results highly satisfactory. No special equipment is necessary to perform these operations. Slight but important alterations in the usual technique as applied to ordinary metals will insure excellent joints on all kinds of stainless steels.

Soldering: Stainless steel can be soldered with ordinary soft solder if a few

precautions are taken. The flux used must be rather strong. Hydrochloric (muriatic) acid is excellent. There are also several special fluxes on the market designed especially for use on stainless steel. The flux must be brushed on as shown in Fig. 2, so that it will not spread beyond the area to be soldered. Stainless steel is a poor conductor of heat; therefore, in order to get the work heated to the proper soldering temperature, it is necessary to use a large soldering iron and to apply heat to the work for a longer time than when soldering ordinary steel. This does not mean that the iron is to be heated to a higher temperature than for ordinary work, as excessive heat will discolor the steel and may also cause warping or buckling because of the high rate of thermal expansion of these alloy steels.

After the work has been clamped in position and the flux brushed on, the solder is applied in the usual manner, using a large, well tinned iron as shown in Fig. 1. Ordinary 50-50 solder is satisfactory, but better results are obtained by using a solder having a higher tin content, such as 60 per cent tin and 40 per cent lead or 70 per cent tin and 30 per cent lead. If you are making your own solder, use tin, 2 parts, and lead, 1 part by weight. This is about the composition of the alloy called tinman's solder and is excellent for stainless steel. Soft solder can be cast in a wood form as in Fig. 3. After the soldered joint has cooled, it should be washed well with a solution of washing soda, $\frac{3}{4}$ to 1 lb., and soap,



see June 1940.

Soldered, Brazed and Welded

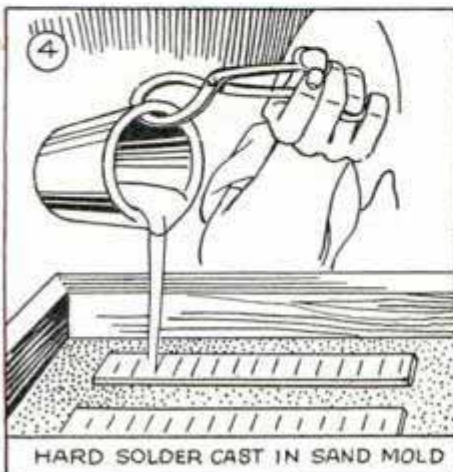
in water 1 gal., as shown in Fig. 7. This solution will remove any excess of the corrosive acid flux and prevent dulling of the stainless steel.

Brazing: Precautions similar to those involved in soldering stainless steels must be observed in brazing these metals. The work must not be heated to a higher temperature than is necessary, because of the rate of expansion of stainless steel under the influence of heat. Borax may be used as the flux. Good results can be obtained by using ordinary 70-30 brass as the brazing material. A special hard solder for stainless steel is made by melting together manganese, 20 parts, copper, 25 parts, nickel, 5 parts, silver, 49 parts, and gold, 1 part. Silver solder is made by alloying together silver, 2 oz. to 7 oz., copper, 5 oz. to 2 oz., and zinc to make a total of 10 oz. Both formulas are given in Fig. 5. The silver is first melted in a crucible as shown in Fig. 6, then the copper is added and the heat withdrawn. The mixture is then cooled almost to the solidification point before adding the zinc. The finished alloy is cast into bars or rods for use in a sand mold as shown in Fig. 4. There are also available on the market a number of special hard solders which work exceptionally well.

The parts to be brazed must be cleaned thoroughly, and for good results must be fitted closely. The brazing alloy should not be used as a filling material on a loose joint. This is not only wasteful, especially with a silver alloy, but the joint formed



will not be strong. Lap joints are to be preferred to butt joints or fillet joints. The flux, borax in water, should be brushed on to all the surfaces being brazed and also on to the brazing metal itself. Brushing insures the thorough wetting of the surface with the flux and therefore prevents oxidation or corrosion. The work must be preheated thoroughly with the torch



HARD SOLDER CAST IN SAND MOLD

HARD SOLDER	
MANGANESE	20 PARTS
COPPER	25 PARTS
NICKEL	5 PARTS
SILVER	49 PARTS
GOLD	1 PART

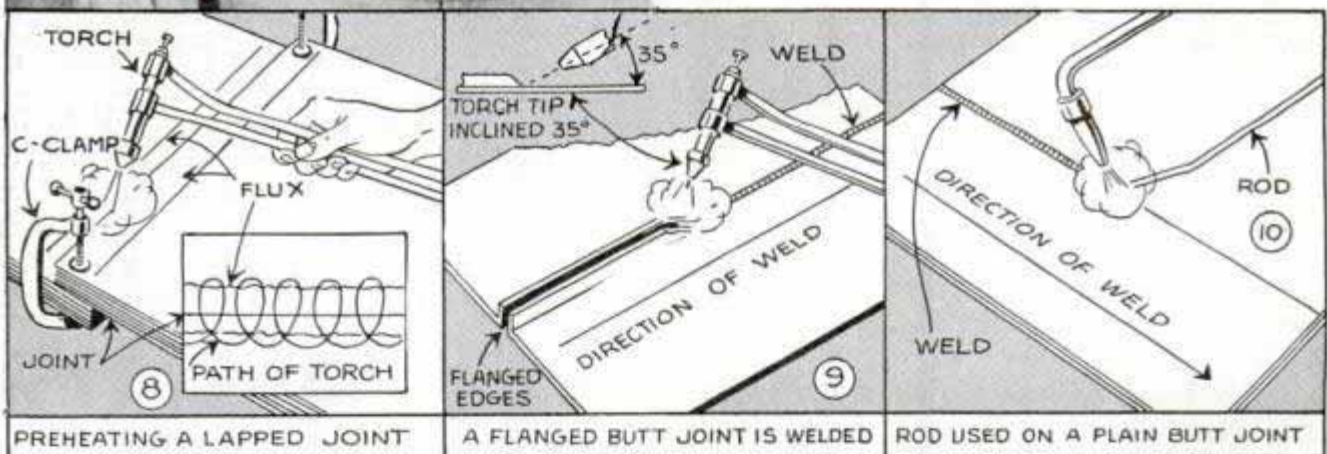
SILVER SOLDER (5)	
SILVER	2 TO 7 OZ.
COPPER	5 TO 2 OZ.
ZINC ADDED TO GIVE TOTAL OF 10 OZ.	





ing and polishing, or by pickling in a solution consisting of nitric acid 20 to 30 per cent, in water. The pickling solution should be used at a temperature of 125-145° F. Detailed directions for finishing will be given later in connection with welding, since the problem is the same.

Welding: Stainless steel is well adapted to welding, and if its characteristics are taken into consideration good results can be obtained. Before any kind of welding can be carried out, it is absolutely necessary that the surface of the metal to be welded be cleaned and free from grease, rust or scale. Cleaning is accomplished by grinding, pickling or sandblasting. A pickling solution for stainless steel as shown in the detail above Fig. 11, is made by slowly adding sulphuric acid, 1 lb., to cold water, 1 gal., in a stoneware crock, and dissolving in this dilute acid, common salt, 1 lb. This solution is heated to 180° F. on a water bath as shown in Fig. 14, and the work is



not only directly on the joint, but also on the surrounding metal. The proper method is shown in Fig. 8. If the parts are of unequal thickness or of different metals, the thicker part or the one which is the better conductor of heat should be heated more than the other. When the work has been heated to the melting point of the hard solder or spelter to be used, apply it to the hot work and permit it to melt and flow into the joint. While applying the solder, the torch must be kept in motion, as in preheating, without permitting the flame to concentrate and overheat sections of the work.

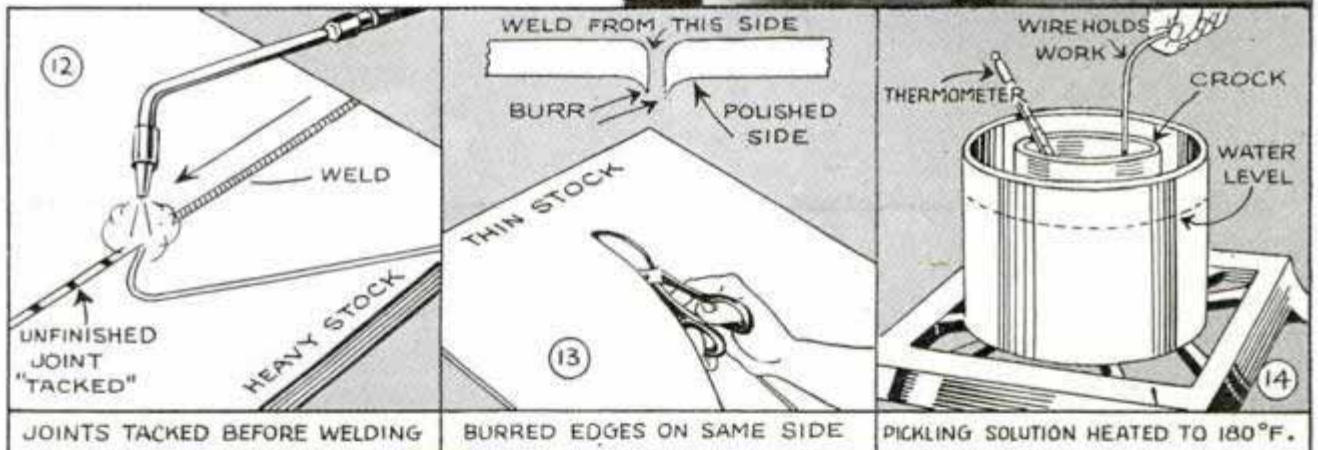
Because of the higher temperatures necessary in brazing, discoloring of the stainless steel hardly can be avoided. Discoloration can, however, be removed by grind-

dipped into the hot solution. After pickling, the work must be rinsed thoroughly in hot and then cold running water.

When stainless steel is sheared, there is always a deformation at the cut edge, the top edge being rounded off and a burr being left on the bottom edge. In butt welding, it is desirable to have this burr on the polished side, or the side that is to be finished. This is indicated in magnified form in Fig. 13. Then the weld is made from the opposite side, and in finishing it is only necessary to grind off the burr and polish the joint. The rough surface of the weld itself does not have to be ground and polished. The work is held in place most readily by "tacking."

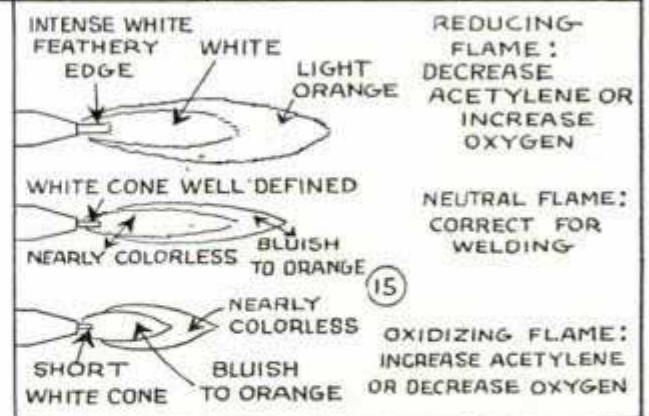
Spot Welding: Stainless steel is easily spot welded because its surface makes good

contact with electrodes, has a lower melting point than ordinary steel and, further, because of its high electric resistance which makes for quick heating. The method of spot welding stainless steel is the same as for ordinary steel, and the same equipment can be used. Successful spot welding depends on careful adjustment and control of current, the time of flow, diameter of the electrode contact points, and applied pressure during the weld: The diameter of the electrode contact points is governed by the thickness of the metal being welded; for heavier gauge metal large points must be used. Pressure must be governed largely by experience. Too great a pressure lowers the resistance and therefore the heat which is produced. Excess pressure also has the undesirable effect of indenting the surface of the weld. As for current and

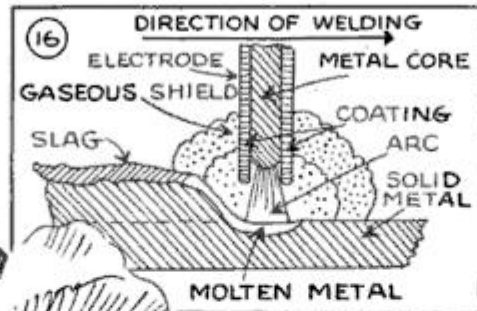
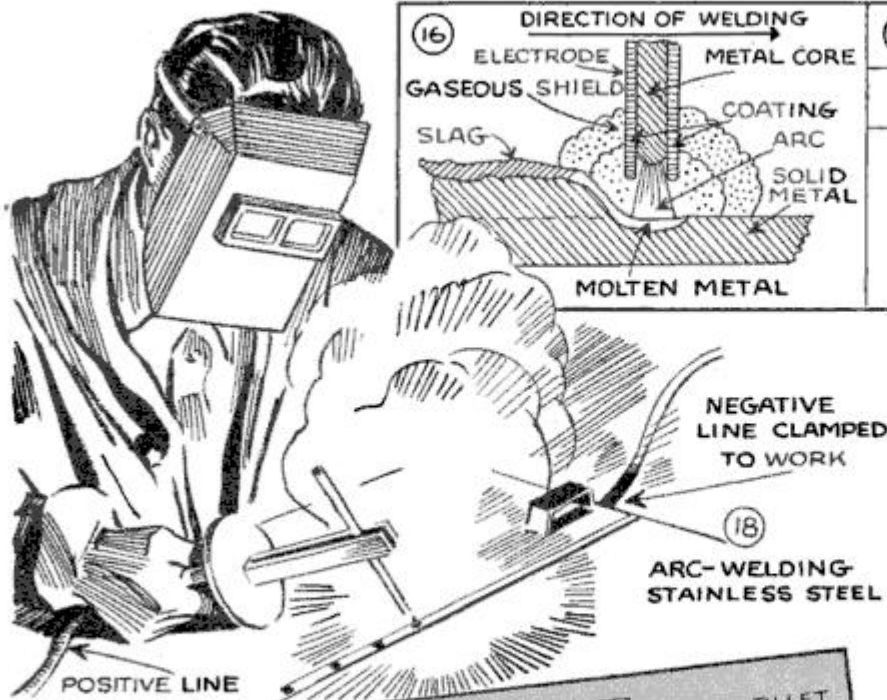


time of flow, it is desirable to use a heavy current flow for a short time, rather than smaller current for a longer period of time. With corresponding currents, the time for spot welding will be shorter for stainless steel than for ordinary steel. The best method is to make sample welds on scrap pieces of stainless steel, and adjust current, time and pressure to give strong welds. A spot weld in stainless steel should be strong enough to be twisted 80° before shearing through. Fig. 20 illustrates this and other methods of testing welds. It is particularly recommended that test welds be made before starting a job and that the experience thus gained be applied to the job. This will insure good results and save a considerable amount of time and expense.

Gas Welding: Stainless steels fall into

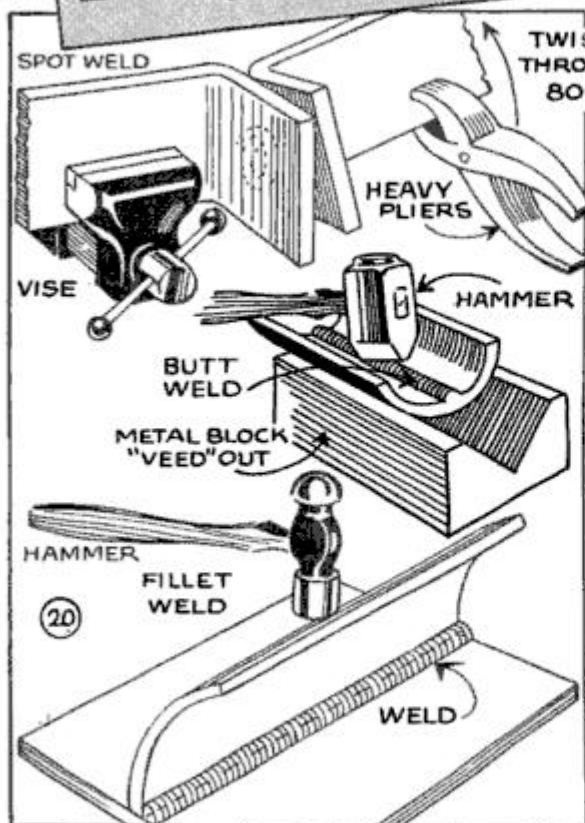
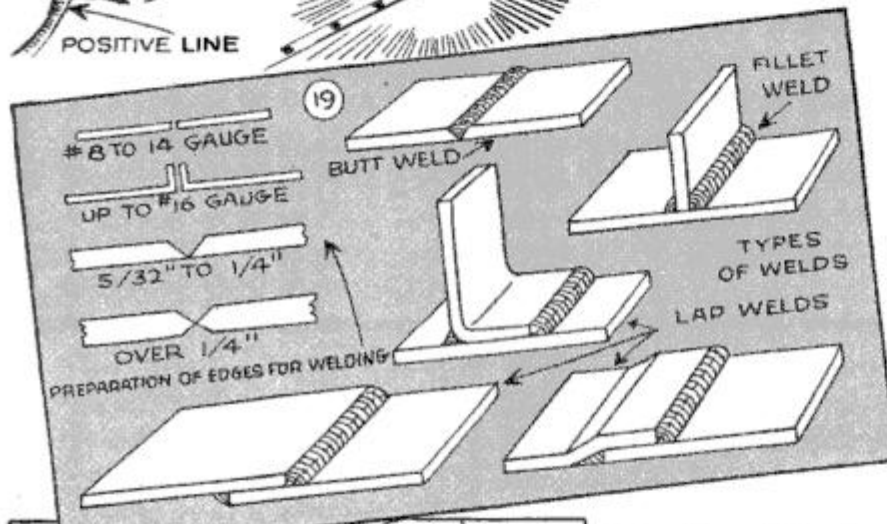


two main classes, those that contain both chromium and nickel, generally from 8 to 25 per cent of chromium and 7 to 22 per cent of nickel, and those that contain chromium only, usually about 12 to 18 per cent. The most common varieties are those known as "18-8" (18 per cent chromium, 8



ELECTRODE DIAMETER	CURRENT AMPERES
3/32"	50-75
1/8"	75-100
5/32"	110-140
3/16"	150-175
1/4"	175-200

per cent nickel) and "17" (17 per cent chromium) stainless steels. These are also sold under many trade names, but can be identified by these numbers, which refer to their composition. The composition of the stainless steel being used is important as the characteristics of these two groups differ widely, and they must be handled differently in welding, and especially after welding. In either case, the welding rod used must be approximately the same composition as the parent metal. On light sheet metal, less than No. 16 gauge, a flange of about 1/8 in. should be raised on



the edge of each piece to be joined. During welding operation this will be melted down, as shown in Fig. 9, and the use of a filler rod is avoided. Various other types of joints are shown in Fig. 19. On heavier gauge work, it will be necessary to use a filler rod. Use a rod of about the same composition and thickness as the parent metal. The flow of gas should be adjusted to give a neutral flame, so as to prevent oxidation of the metal. Various characteristic flames are indicated in Fig. 15. A very slight excess of acetylene is desirable. Special "cromaloy" welding flux may be brushed on the parts being welded. The flame should be directed toward the unwelded part so as to preheat the work as in Fig. 10. On heavy stock the joints should be "tacked" together as illustrated in Fig. 12.

Arc-Welding: Some stainless steels have a very high coefficient of expansion, and hence have a tendency to warp under high temperature necessary in welding. For this reason, speed in welding is desirable to reduce this effect to the minimum. Arc welding, therefore, is

to be preferred to gas welding on stainless steel because of the greater speed of operation possible; but with care gas welding will give good results.

Metallic electrodes for use in arc welding stainless steel should have approximately the same composition as the metal being welded. Coated electrodes as shown in Fig. 16, are essential. There are special electrodes made by reliable manufacturers especially for use on stainless steel and these must be used for satisfactory results. The diameter of the electrode depends on the thickness of the metal being welded, and should be approximately the same as the thickness of the metal. Stainless steel is always welded with reverse polarity as shown in Fig. 18; that is, the work is made negative and the electrode positive, which is just the opposite of the procedure ordinarily used for welding common steels. Smaller currents are used on stainless steel than on ordinary steel. The current values recommended for ordinary welding will be found in Fig. 17.

Treatment after Welding: Stainless steels containing nickel as well as chromium will require no heat treatment after welding, as the weld is soft and ductile. Stainless steels without nickel, however, must be annealed by heating to 1,200-1,300° F. in an oven for half an hour, and permitted to cool slowly.

The scale and oxide film on the welded metal must be removed by grinding or pickling. The burr which was left after cutting the metal, can be ground off, and the surface polished. Polishes used on stainless steel must not contain iron. Use aluminum oxide grits for polishing, for example Nos. 80, 100 and 120. The articles may be buffed on a rag wheel at very high speed. Throughout the polishing process, care must be taken to avoid overheating and consequent burning of the work.

Establishing Resistance to Corrosion: Maximum corrosion resistance on the polished metal is developed by immersing the article in a solution of nitric acid, 3 parts by volume, in water, 7 parts by volume. The acid is added to the water in a stoneware crock. The solution is heated to 140° F. and the work is dipped into the solution for 20 min. or more. It is rinsed thoroughly in hot and then in cold running water and dried. For highly polished pieces, the last polishing operation is repeated.

Colored Overlay on Job Press Speeds Up Feeding



Printer's eyes follow colored area on tympan, and hand accordingly directs paper to guides

A Wisconsin printer claims that high speed can be attained in feeding paper in a platen press if a sheet of brightly colored paper, the same size as the stock being printed, is glued onto the tympan or impression sheet. The eyes of the press feeder follow the color area easily and the hand accordingly directs the paper to the guides accurately.

Foot Scraper on Painter's Ladder to Keep Mud off Rounds

While engaged on an outside painting job, the foreman of a crew of workmen noticed that mud tracked on the ladder rounds made them so slippery that there was danger of an accident. To avoid



this, he had foot scrapers cut out of steel and screwed on to the side of each ladder as indicated, so that the men could clean their shoes before climbing the ladders.

Lighted Panel Helps Jeweler in Assembling Watches

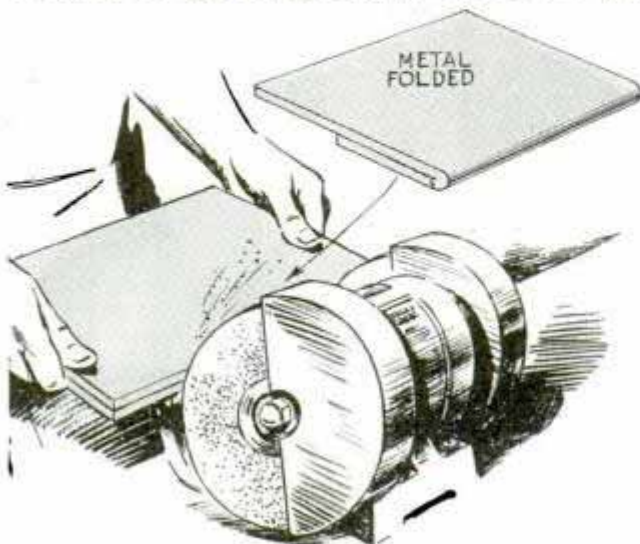


Intricate parts of models or watches are easily assembled on this lighted ground glass

One jeweler found that a lighted ground-glass panel set in the top of his repair bench was a help in assembling the intricate mechanism of a watch. By holding the work directly over the lighted portion of the glass individual parts are shown clearly, the diffusion of light by the ground glass eliminating glare and shadows.

Heavy Sheet Metal Is Cut on Grinding Wheel

I had a piece of sheet metal, which had to be cut in two, but it was too thick to cut with a pair of shears, and it was too much of a job to use a hack saw. To do the job



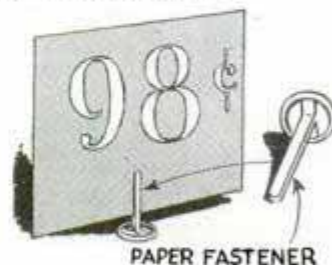
Heavy sheet metal cut in two by folding work and grinding off edge at the fold

quickly, I folded the work where it was to be cut in two, and then ground off the edge at the fold. This took only a few minutes and resulted in a neat job.

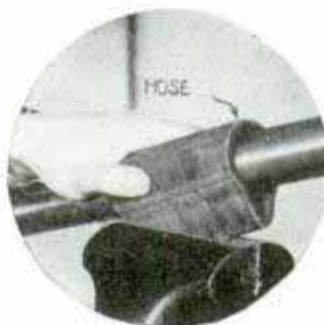
—Alfred J. Klatt, Philadelphia, Pa.

Price Tags Neatly Displayed with Paper Fasteners

Small price tags are supported neatly on paper fasteners of the type shown. They are hardly noticeable, and when the tags are slipped between the legs of the fasteners, you can set them on any flat surface.



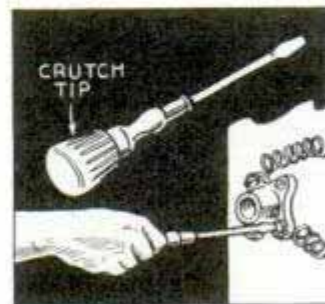
Glass Tube Clamped in Vise Is Rubber Protected



When working with tubes of glass or soft metal, they can be held firmly in a vise without breaking, as indicated. A piece of rubber hose somewhat larger in diameter than the work is slipped over it and is then pinched in the vise jaws.

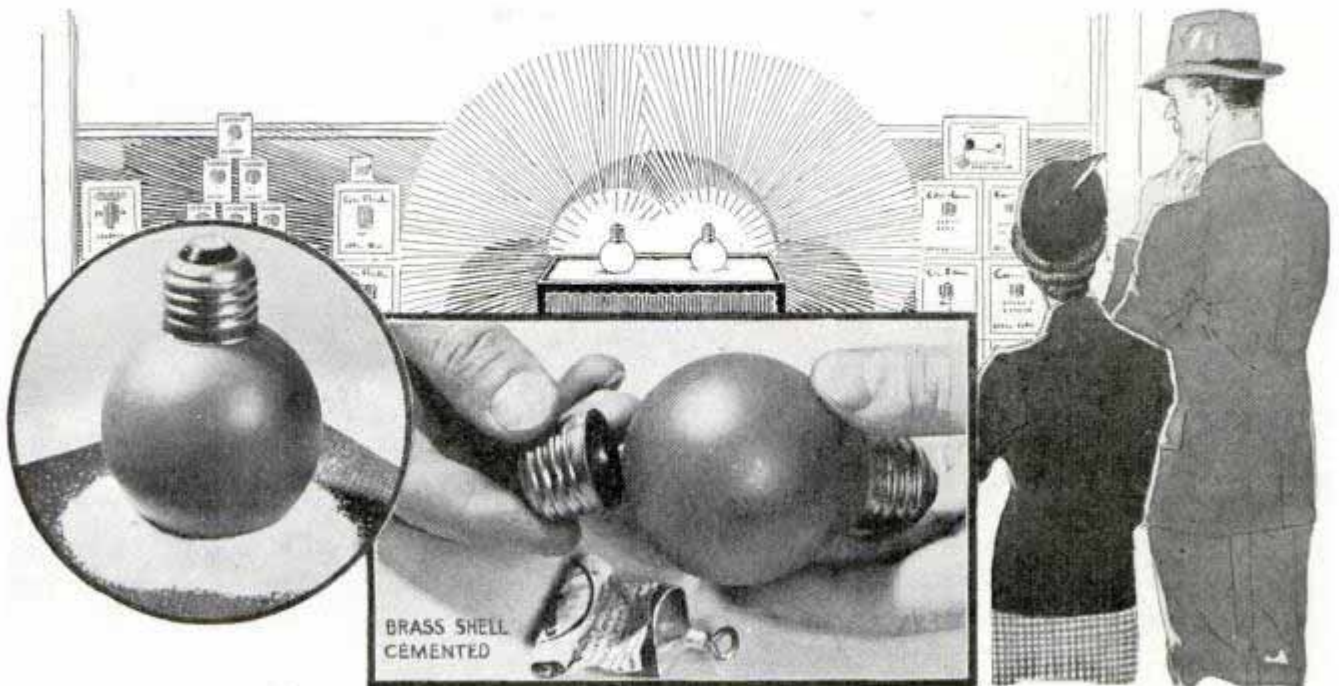
Exposed Shank in Screwdriver Insulated by Crutch Tip

Electricians, auto mechanics and others who frequently use a screwdriver around wires carrying electric current can often avoid accidental shocks by simply slipping a large rubber crutch tip over the end of the handle as indicated.



This idea is particularly intended when using a heavy screwdriver where the shank is exposed at the end of the handle. Besides this, it tends to cushion the palm.

How Does Current Enter This Electric Bulb?



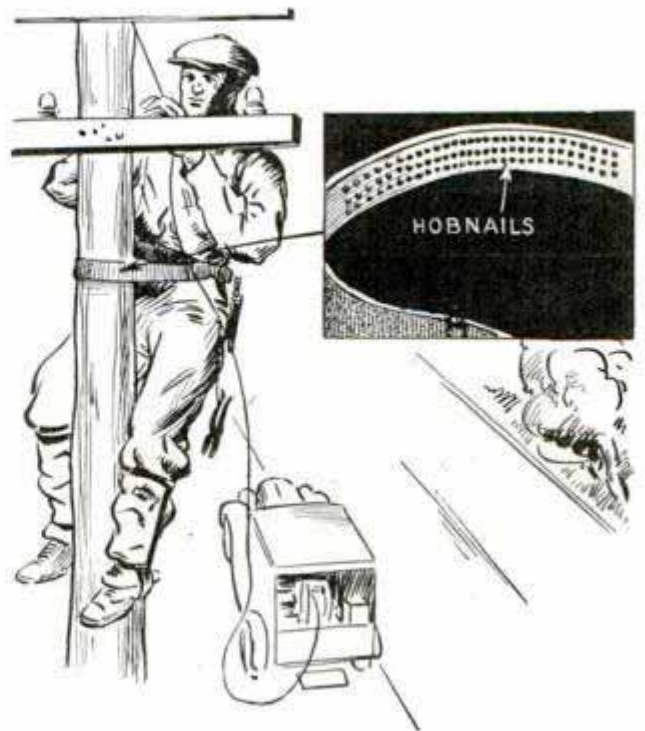
Setting in a show window, an illuminated electric bulb with its threaded brass shell exposed to view will attract attention and lead to much speculation regarding the source of current supply. The secret is a round bulb on which a false, threaded shell is cemented. This shell is exposed but the real one is imbedded in a

pile of dry sand and is screwed into a socket also concealed. Or, the socket may be eliminated by soldering insulated wires directly to the terminals on the bulb. Care must be taken in attaching the false shell and in concealing the wires to avoid easy detection of the secret.

—Kenneth Murray, Sturgis, Mich.

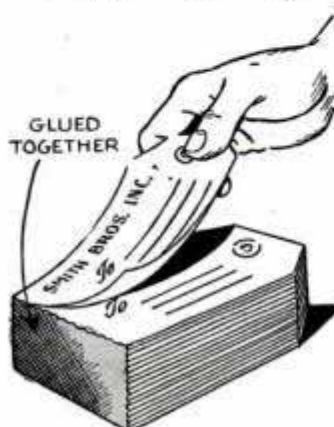
Hobnails Driven in Lineman's Safety Belt Prevent Slipping

After having a bad fall from a telegraph pole because his safety belt slipped, a lineman improved it with hobnails. These were driven through a portion of the belt so the heads came in contact with the pole. The heads dig into the pole and keep the belt from slipping.



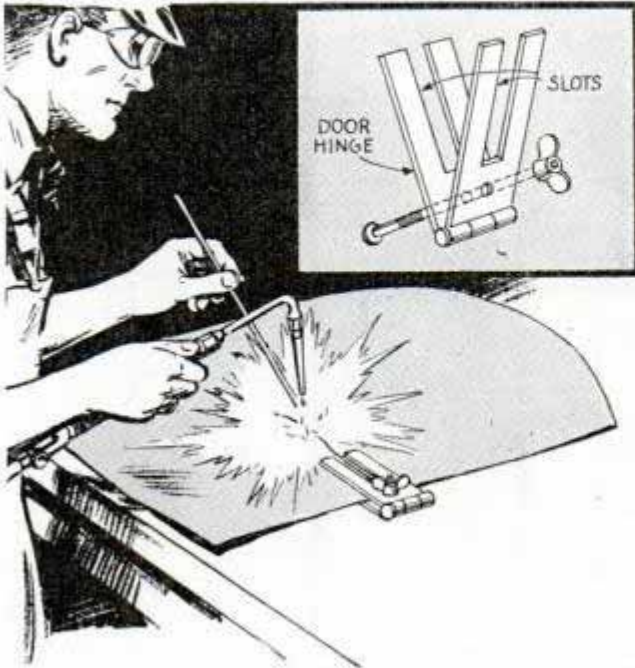
Hobnails projecting from lineman's safety belt contact surface of pole to provide non-slip surface

Shipping Tags in Tablet Form



To avoid waste or loss of tags, one shipping clerk has them blocked in tablet form. The additional cost is more than offset by preventing loss or damage when loose tags are thrown in a drawer or left on a desk.

Slotted Clamp Holds Thin Metal When Welding

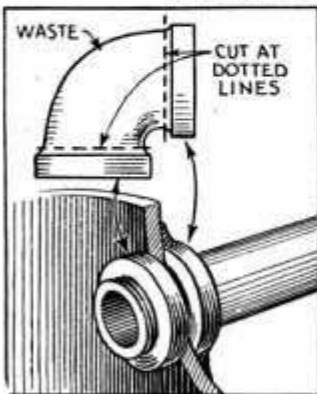


The slotted jaws of this homemade clamp hold thin sheet metal in position for welding

When welding thin sheet metal you need this clamp to hold meeting edges of the work in alignment. It's made from a heavy hinge such as that taken from an auto door. Both leaves of the hinge are slotted as shown, and are curved slightly so that they will grip the work. A stove bolt and wing nut are provided for tightening. When placed on the work, the joint should center between the projections of the jaws so that the meeting edges of metal will be in perfect register.

—A. H. Waychoff, Tempe, Ariz.

Pipe Connected to Tank by Rings Cut from Elbow



On a job of connecting a pipe to a water tank, where there was no tap available, the work was done with threaded rings. These were obtained by sawing off the ends of a pipe elbow. After screwing one of

the rings over the pipe on each side of the tank and drawing them tight, molten solder was brushed over the outside ring to

help make the connection watertight and to provide a neat appearance.

—W. C. Wilhite, Carlinville, Ill.

Paint-Bucket Hook Has Handle

To simplify lifting and carrying his paint bucket, a painter uses a strong wire hook, which has a loop in the center to serve as a handle. When he wants to move the bucket, he just grips the handle and carries the whole assembly to a new location without first removing the bucket and then the hook.



Customers in Self-Service Store Handle Vegetables with Tongs

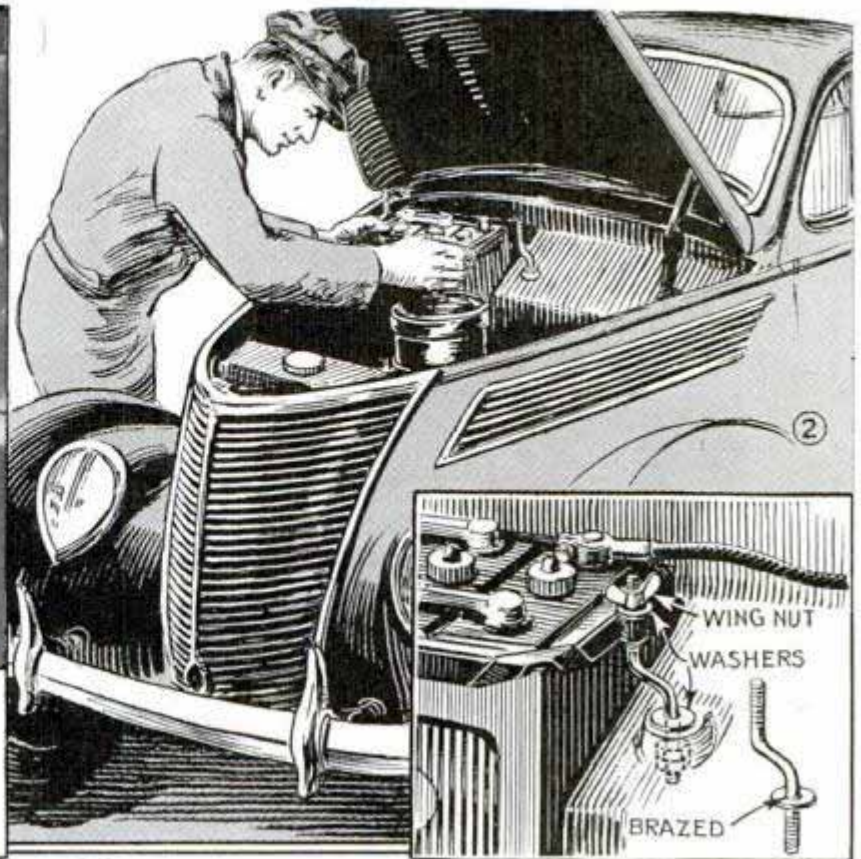
Noticing that many of his customers disliked to handle vegetables because they soiled their hands or gloves, the manager of a self-service grocery store provided each vegetable bin with a pair of tongs. These are made by pivoting two wooden spoons together with a small bolt, which is located near the ends of the handles.



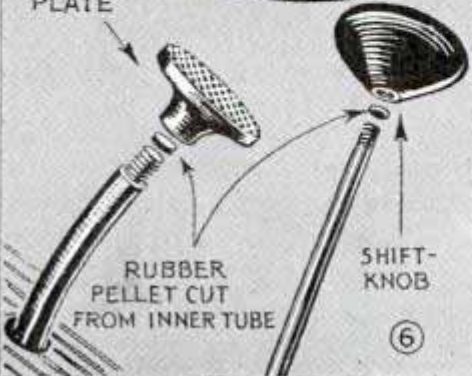
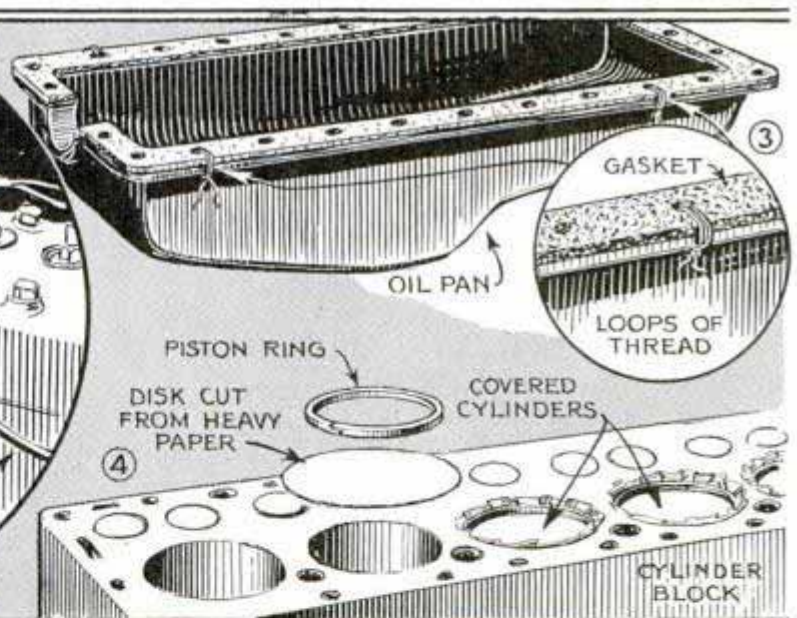
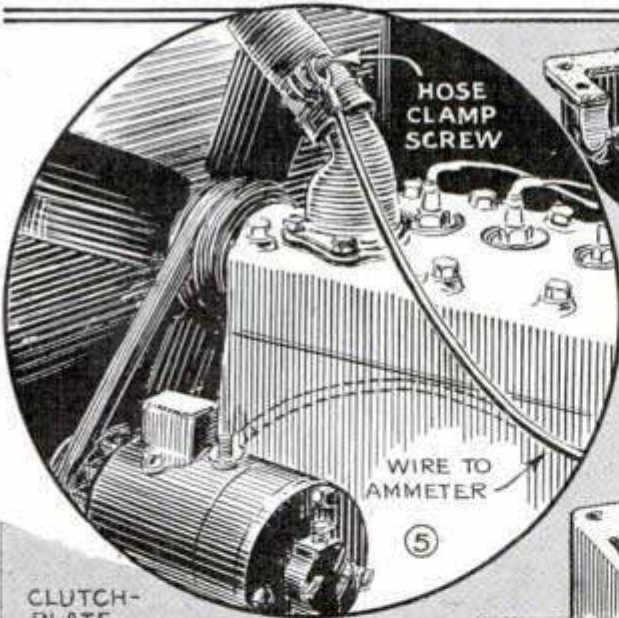
Customer uses tongs to pick up vegetables in self-service, to avoid soiling hands or gloves



1. Bumperettes bolted over front bumper of tow truck aid in pushing cars. 2. Inverting battery-box clamps makes it easier to remove battery from dash

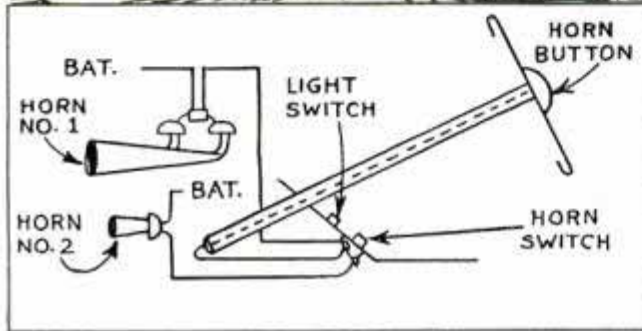


AUTO SHORTCUTS



3. Tying loops of thread through holes in the gasket and oil pan will prevent the parts shifting while replacing the latter.
4. Before starting a valve job tap an old piston ring into each cylinder over a disk of heavy paper to keep out chips and dust.
5. Instead of taping the "hot" battery-to-ammeter wire just hang the lug terminal on a hose-clamp bolt.
6. Tiny rubber pellets placed under the pedal plates and gear shift knob will prevent these parts loosening.

Auto Horns of Different Tones Controlled by Foot Switch



A loud horn for country driving or a soft one for city use is cut into the circuit by pressing a foot switch

Motorists who desire a loud horn for country driving and a soft one for city use, will find the following method of wiring them ideal as it permits either horn to be operated with the horn button by merely pressing a foot switch of the type used to raise or lower the headlight beams. Both horns are wired to the battery or ammeter, and one of the wires leading to the horn button on the steering wheel is connected to the third terminal on the switch.—L. A. Johnson, Omaha, Nebr.

Hook Keeps Rattan Seat Cover from Tipping Forward



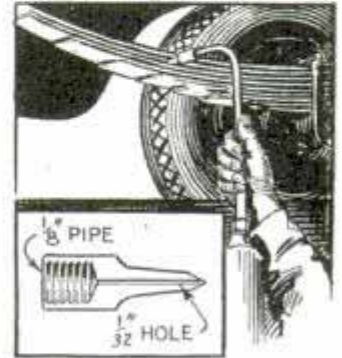
Disliking to hold up the backs of my rattan seat covers when entering the car, I fitted each one with a strip of elastic and a clip to slip over the back of the seat. The clip was

shaped from a piece of clock spring or spring steel, and the elastic link between the clip and cover was used to prevent undue strain on the seat from tearing the top of the cover.—R. F. Gornoll, Chicago.

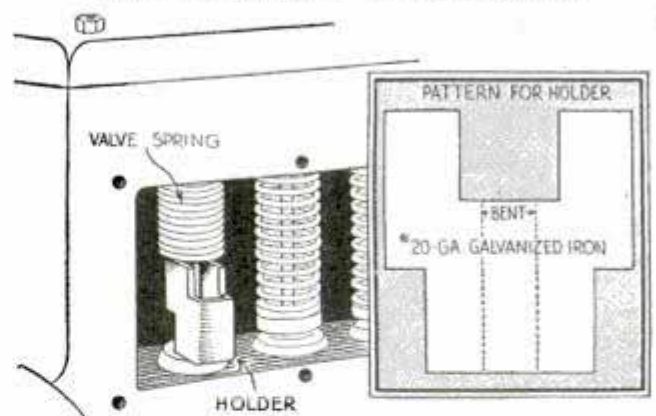
Fitting to Lubricate Springs with Grease Gun

You can do a good job of lubricating springs with this fitting, which attaches to a grease gun. For uncovered springs, the leaves are spread with a chisel or screwdriver and the grease forced between them. When the springs are covered, small holes are prick-punched in the cover to take the pointed end of the fitting. It is merely an old-type tip from a Zerk gun with the end ground to a point. When used on uncovered springs, it's a good idea to grind the end to a chisel shape. Small pipe or tubing adapters can be made to use it on any gun.

—Arnold Austin, Janesville, Wis.



Valve-Spring Compressor Works When Motor Is Cranked



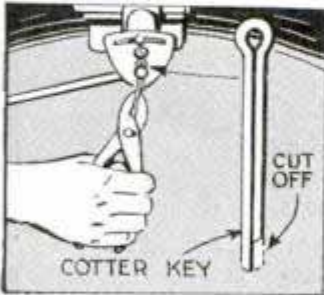
You don't have to squeeze handles or do any twisting or pushing to get this compressor into place

There's no danger of injuring your fingers with this valve-spring compressor or holder, because it won't slip out of place, and you don't have to twist it from side to side or squeeze handles to get it into position. Just crank the motor until the valve is raised as high as it will go, set the compressor under the spring-retaining washer

and then turn the motor enough to release pressure from the tappet. You can now remove the keeper and take out the valve without disturbing the spring.

—A. S. Wurz, Jr., Rockyford, Alta., Can.

Altered Cotter Key Spreads Easily

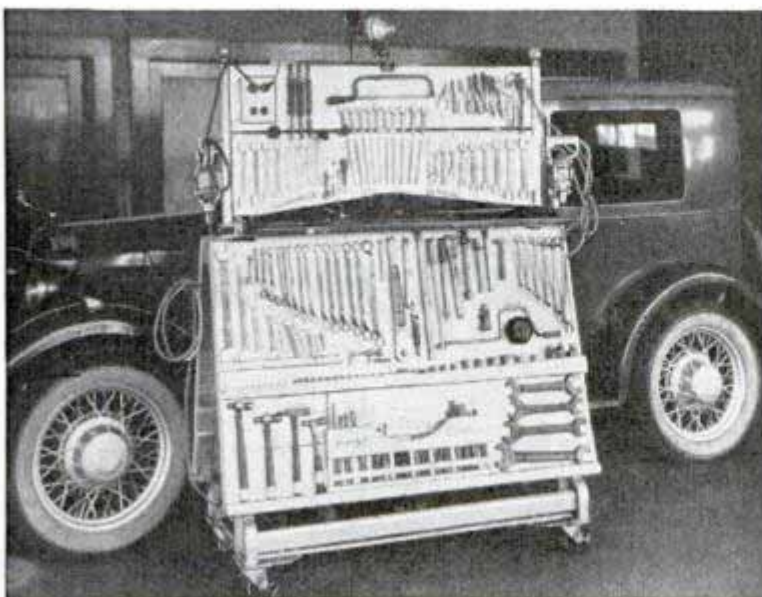


Before inserting a cotter key into a place that is hard to reach, cut off a piece from the end of one of the legs as indicated. You'll find that this makes it easy

to grip the end of the other leg with a pair of pliers to spread the key.

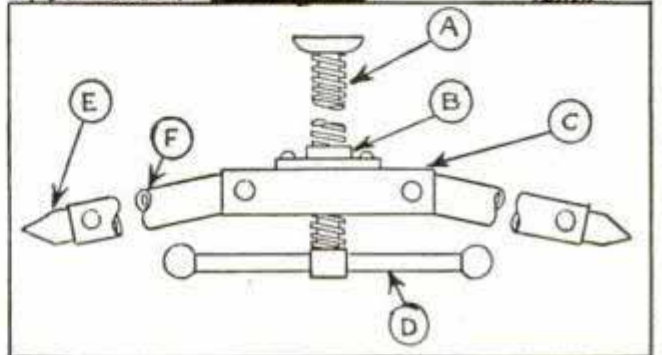
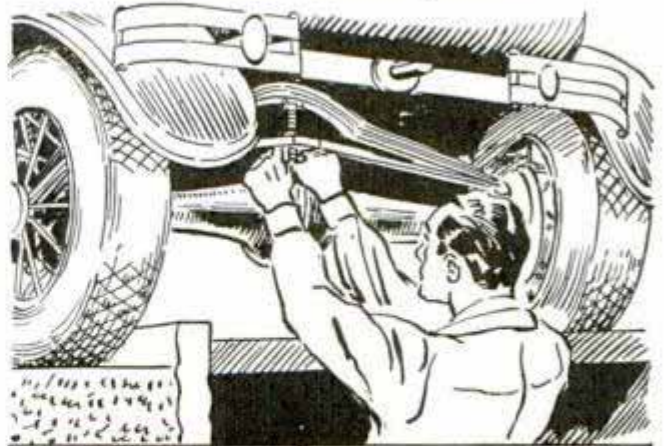
Portable Tool Rack Has Outlets to Connect Lamps and Drills

A Florida garageman is the owner of this portable tool rack, which keeps the tools close at hand and in plain sight so that they can be selected at a glance. The rack is fitted with electrical outlets for plugging in drills, grinders, extension lamps, etc., and it has a strong spotlight at the extreme top that can be adjusted to throw light on a motor or into a car body. It is fitted with small wheels so that it can be rolled right up to the job at hand, and has a long extension cord, which is plugged into the nearest wall socket.



This rack brings all your tools to the job at hand where they are in plain sight for rapid selection

Changing Transverse Car Springs Easy with This Spreader

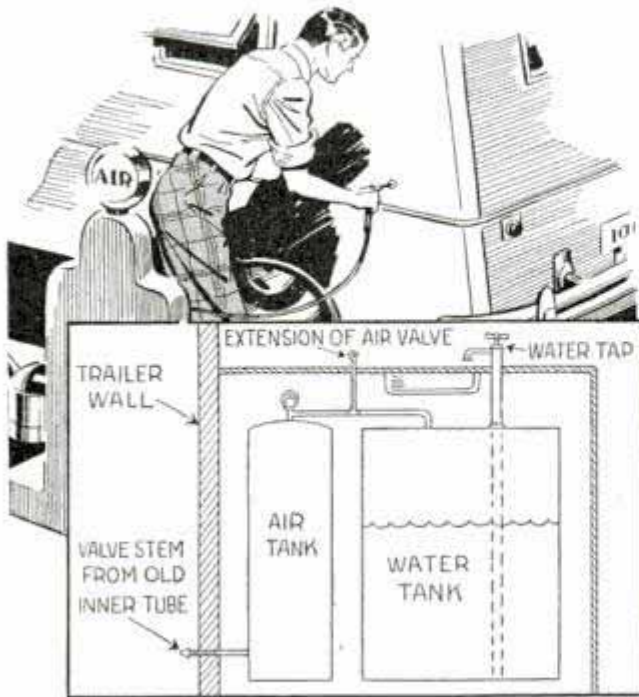


Ford springs are easily sprung into position to insert the shackle bolts with this spreader

Ford mechanics will find this spreader just the thing when removing or releasing springs. And it costs very little to assemble as the main part is an old screw jack of the type furnished with Ford cars several years ago. The jack is stripped and the screw A, and the flange B, are used. The flange is bolted to a piece of channel iron, C, which is drilled to let the screw pass through it. Pieces of $\frac{3}{4}$ -in. pipe, F, are pivoted to the angle iron to serve as arms, which have short lengths of $\frac{1}{2}$ -in. pipe, E, projecting from the ends. These are ground or flattened to a chisel shape and are held in the ends of the arms by bolts, a series of holes being drilled in the $\frac{1}{2}$ -in. pipes to permit adjusting the width of the spreader. Brazing a handle, D, to the end of the screw completes the tool.

ⓁNever switch on your bright lights when you suddenly run into a fog as the stronger the light is, the more it is reflected into the driver's face.

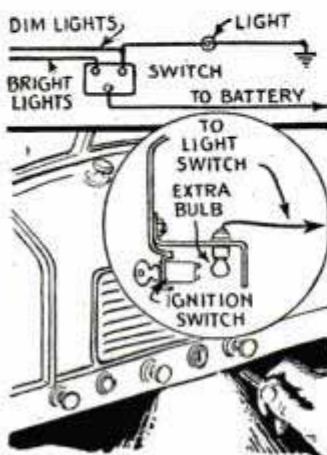
Pressure for Trailer Water System Comes from Auxiliary Tank



Auxiliary tank in trailer water system stores air to replenish pressure as required

One trailer owner who had a water-pressure system, installed an auxiliary air-storage tank so that he could raise pressure in the water tank by merely turning a valve. The air intake, which was a tire valve soldered to a pipe nipple, projects slightly from the side of the trailer, where it is reached easily with an air hose at a filling station. The valve to control the air supply to the water tank can be located wherever desired. In the original installation, an extension handle from the valve was provided so the pressure could be controlled from inside the trailer

Extra Lamp on Instrument Panel Illuminates Ignition Switch

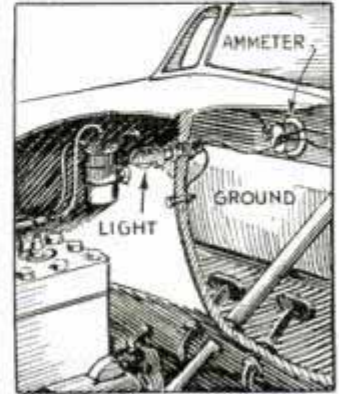


I installed an extra lamp behind the instrument panel of my Chevrolet to illuminate the ignition so that I could see to insert the key at night. The lamp was mounted as indicated in the circular detail, and was wired

into the circuit controlling the dim or parking lights. By connecting the lamp into this circuit, an extra switch was unnecessary, and the lamp was not on while driving.—Edward R. Grogg, Cincinnati, O.

Motor Illuminated by Lamp Installed under Hood

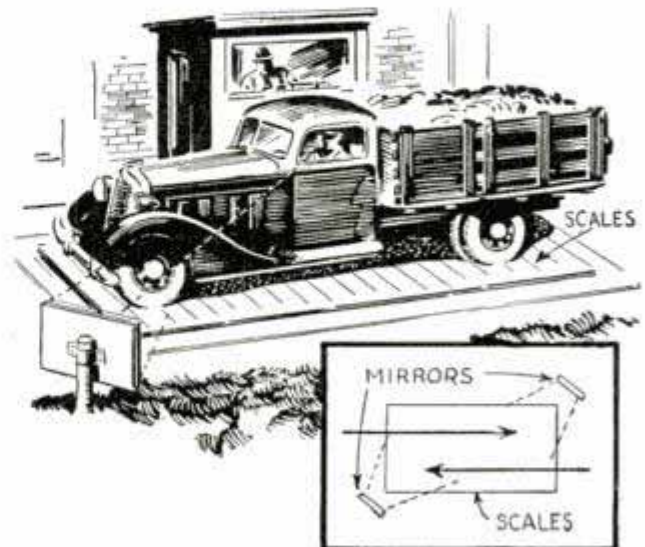
Mounted on the dash under the hood of your car, a switch-type dash lamp will illuminate the motor at night, or serve as an electrical outlet for a trouble light and other accessories. Also, it serves as a



handy receptacle for connecting a home battery charger. One wire from the socket is grounded and the other connected to the ammeter.—A. Amos, Fort Wayne, Ind.

Mirror Tells Driver When Truck Is on Scale Platform

As some drivers had trouble in determining when all four wheels of a truck were on the scale platform, mirrors were mounted on posts at the corners of the scale as indicated in the detail. The mirrors enabled a driver approaching from either side to see the reflection of the front wheels and the edge of the platform.



A glance in the mirror shows the driver when the front wheels are near the edge of the scale platform

"TIPTOE-MATIC" CLUTCH IN 1938 CHEVROLETS HAS NEW, EASY-ACTING DIAPHRAGM SPRING



(Above) Units of the "tiptoe-matic" clutch; the diaphragm spring is seen within the assembly at the left.

(Below) When a disc goes through the Magnaflex test, even the slightest crack is revealed.



A single disc-like spring, instead of nine separate coil springs formerly required, is the unique feature of a new type of clutch used in all 1938 Chevrolet cars and trucks.

Besides reducing the number of operating parts, the new design effects smoother engagement and requires less pedal pressure. Although the spring exerts a pressure of 1100 pounds, only 25 pounds' pedal pressure is needed to release the clutch. Because of its easy action, the clutch is called "tiptoe-matic."

The spring is a slightly-dished, slotted diaphragm of spring steel. When the pedal is depressed, eighteen radial tongues formed in the disc act as levers to cause the rim of the disc to recede from contact with the pressure plate, thus releasing the clutch.

Clutch engagement is smoother, because the diaphragm spring applies a more uniform pressure around the circumference of the pressure plate; formerly, pressure was applied at nine separate points by the coil springs.

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Latest Tricks of the Film Makers

(Continued from page 715)

scale down to plus or minus a thousandth of an inch. Imagine the tedious, nerve-racking task of supplying animations in the single picture of a scene with nine characters in it, as frequently happens when Snow White and the Prince are with the Seven Dwarfs. The drawings first had to be executed on sheets of paper seven and seven-eighths inches by ten inches. Supplying the animation was comparable to writing on the head of a pin. Before the picture was half completed, we had to adjust our standards so that the drawing field could be increased twenty per cent, thus

filmed with a thirty-five-millimeter camera. From this, thirty-five-millimeter negative reduction prints were made with a special wash-off relief emulsion. Here only the emulsion which was exposed remained on the film. This emulsion could be dyed-tinted, then turned over to the painting and inking department for coloring in the usual manner. Thus, we have been able to get fine detail into the drawings that would not be possible otherwise.

In order that you can fully understand the advances that have been made, let me briefly sketch the making of an animated film in color.

Since the "Three Little Pigs" became world-wide box office successes, the story has become the thing in animated film. The old formula of stringing together a few gags is as dead as last month's song hit. So, into a huddle with Walt Disney go writers, an animator or two, the musical director and the sound engineer. They pool their talents in fashioning a story idea. After three or four meetings the animators rough out a few of the principal scenes, while the musical head and effects men make suggestions regarding appropriate music and sound. The drawings then are placed on a large board in front of Walt Disney and his assistants and the story begins to take shape. The finished scenario is broken down into scenes and these are numbered and passed along to the animators together with two sheets. One furnishes him with specific drawing instructions, the other, an "exposure sheet," is a break-down chart of the music and sound effects in a scene, which the animator uses as a guide in his drawing. The reason for this is that the music as well as the dialogue and sound effects are made separately from the cartoon frames and in the final production stage are pieced together by means of a precision mechanical tone beat.

Basically, our film production is simply a mathematical process. Since film is standardized at sixteen frames to the foot and run by projection machines at twenty-four frames per second, it is possible to make these three elements separately and then accurately synchronize them. In the color-



Conferences on the film include study of preliminary sketches of suggested gags

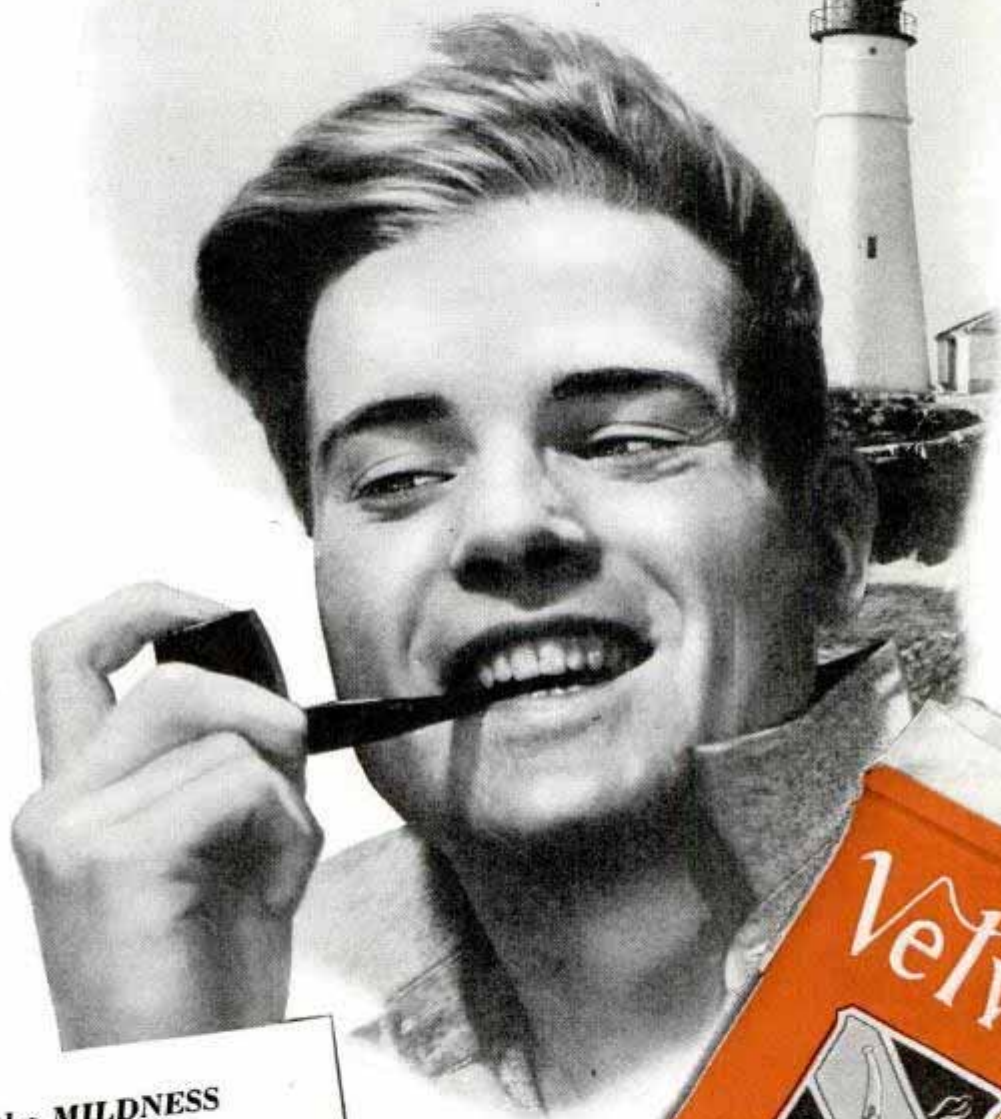
making it possible for the artist to get the proper detail into the different frames.

Camera angles and tricks of the live-film photographers were used in certain scenes. One of these concerned Snow White as she stood sobbing on the front stoop of her cottage. We wanted to give the effect a photographer gets on a truck-back from a close-up. She was to be shown full length at first and then as if a mythical camera were being moved away from her, she was to telescope out into a spot. The actual drawing of this shot had the animators talking to themselves until we devised a method by which it could be handled. The artists were permitted to work on larger paper than was normally used so that they could produce accurate detail. When these large drawings were completed they were

(Continued to page 116A)

*“Three’s
company*

when it’s me..
my pipe.. and
VELVET”



- the **MILDNESS**
of fine old
Kentucky Burley
aged in wood
- the **FLAVOR**
of pure maple
sugar for extra
good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Draws right in both

*Better
smoking
tobacco*



(Continued from page 114A)

ing process, let's look at the figures first and then the backgrounds. With his preliminary sketches approved, the animator proceeds to rough out the sequence he has been given to draw. He prepares the sequence with skeletonized figures and then has it photographed with a thirty-five-millimeter camera. With a magnifying glass he looks into a "movieola," a sound-equipped device that gives him an idea how the scene is going to look on the screen. If he isn't pleased with the result, he can start over or revamp his sketches until they suit him. The animator does not concern himself with color, this work being handled by specialists. When he is satisfied with his first rough tests, the artist proceeds to refine the most important drawings of the sequence. It is in these frames that the action is set; the figures are drawn in poses that delineate their character. Once the key drawings are completed, the assistant animators swing into action. They do the "extremes," which may be best described as those frames in which the start and finish of a specific action are depicted. The relatively unimportant parts of an action are drawn by the "in-betweeners."

The painting and inking department traces the completed drawings on sheets of celluloid in ink and then paints them on the reverse side, according to the instructions given by the colorists. The colors are all indexed, there being between 750 and 1,000 shades and hues in regular use. This work completed, the "cells" are ready to be photographed by the color camera.

The multiplane backgrounds are traced on heavy drawing board, colored and then fitted into place in the intricate camera. The stop-motion color camera takes one exposure at a time. It is a large affair and shoots downward on the material to be photographed. In front of the background is placed the celluloid sheets, one for each character in the scene. After "cells" in the No. 1 group are photographed, they are taken out and the No. 2 set put in their place against the same background. This is carried out until the scene is finished. Then a new background is set in place and other cells are snapped until the picture is completed. The music, sound and dialogue added, the picture is ready to be shown on the screen.

Putting the Atom to Work

(Continued from page 693)

One type of atom smasher builds up its voltage by cascades of transformers and condensers. Another stores up great quantities of static electricity. The cyclotron, a third type, is a complex machine that cleverly builds up tremendous speeds in atomic particles from comparatively low voltages.

The cyclotron consists essentially of a shallow round vacuum box placed between the poles of a mighty electromagnet. Inside the vacuum chamber are two flat hollow D-shaped high-voltage electrodes. The eighty-five-ton magnet of the cyclotron is so powerful that ordinary watches are stopped by it. Liquid oxygen, having magnetic properties, swirls toward it instead of falling straight to the floor when poured into the air. The magnet even tries to unwind the coiled filaments of heat elements placed between its poles.

In use, the vacuum chamber of the cyclotron is pumped out until only one thousand millionth of the normal number of air molecules remain inside. By means of a radio frequency oscillator an alternating potential of 50,000 volts is maintained between the two electrodes inside the vacuum chamber. The polarity of these electrodes changes 23,000,000 times per second. From a central heated filament in the vacuum chamber a stream of electrons ionizes heavy hydrogen atoms that are present, forming a source of deuterons which are to be used as bullets. These deuterons, having a positive charge, are attracted toward the D-shaped electrode that happens to be negative at that instant. But as they move toward this electrode the tremendous effect of the magnetic field in which the chamber is located pulls the deuterons into a curved path. The strength of the magnetic field is so adjusted that the deuterons make one-half a revolution in one-half a cycle. Thus as the polarity of the two D-shaped electrodes reverses, the deuterons will be attracted toward the electrode from which they formerly were repelled, and so gain in speed or energy.

As their speed builds up in 50,000-volt jumps the deuterons spiral out toward the circumference of the chamber. After being kicked 150 times by 50,000 volts they

(Continued to page 118A)



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Buy a thrifty big tube and try Barbasol for just ten days. When you see how it speeds up the cleaning up of whiskers — when you see what a wonderful improvement it makes in your skin — you'll never change from cooling, soothing Barbasol. At all drug stores, large tube, 25¢. Giant tube, 50¢. Family-size jar, 75¢. Five Barbasol Blades for 15¢.



(Continued from page 116A)



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attain an energy of 7,500,000 electron volts, which means a speed of 70,000,000 miles per hour. As they approach the rim of the chamber the deuterons are guided by an electrostatic deflection plate to pass through a thin metal window out into the air, where they crash into any target placed in their path.

When the deuterons smash into the target some of them pierce the nuclei of the target atoms. If they happen to lodge in the nuclei they create overweight, unstable bodies which begin radiating beta and gamma rays until they become stable again. This kind of radiation is radioactivity and hence the atom is temporarily radioactive. The activity varies for each element, radioactive lithium having a half-life of only part of a second, while radioberyllium has a half-life of several years. Sodium, which can be used as common salt, has a half-life of a little less than fifteen hours.

Chemically, the radio isotope of an element is exactly the same as the stable atom. They can go through exactly the same chemical processes and transformations. That is the reason why they are so valuable as "tracers." Their radioactivity indicates their presence to electrical detecting instruments. By tagging phosphorus atoms by making them radioactive and then using the phosphorus as food, the absorption of phosphorus by the bones can be followed step by step. Iron, calcium, and other common food elements can be tagged the same way and their absorption by the body traced. Such tracer studies are going to require years to complete. Eventually this work alone may be regarded as important biologically as the development of the microscope.

The use of temporarily radioactive elements in studying and combatting cancer also holds high promise but such applications will not arrive for several years. At Berkeley and at other research centers such investigations are going ahead slowly because the scientists want to know exactly what the benefits will be before they start in. Two thousand white mice are being treated and observed at the Berkeley laboratory and if the effects of the rays on these mice turn out as well as hoped, cautious treatments will be tried on human patients.

One of the things receiving special study is the neutron, the comparatively unknown electrically inert particles that help form the structure of the atomic nucleus. Discharged as rays, neutrons in some respects are from five to ten times as lethal as X-rays. They are the chief reason for the water barrier around the cyclotron and the many elaborate precautions taken to protect the workers. Destructive as they are, they may become a new tool of medicine because they seem to be more deadly to cancerous tissue than to normal tissue.

There also is the possibility that metallurgical knowledge will be vastly increased when current experiments are completed. It is hoped that a definite idea of the migration of atoms during the heat-treatment of metal can be obtained, through studying the movements of atoms made radioactive before heat treatment. Late in 1937 the cyclotron created two elements comparatively new to science, elements Nos. 92 and 94.

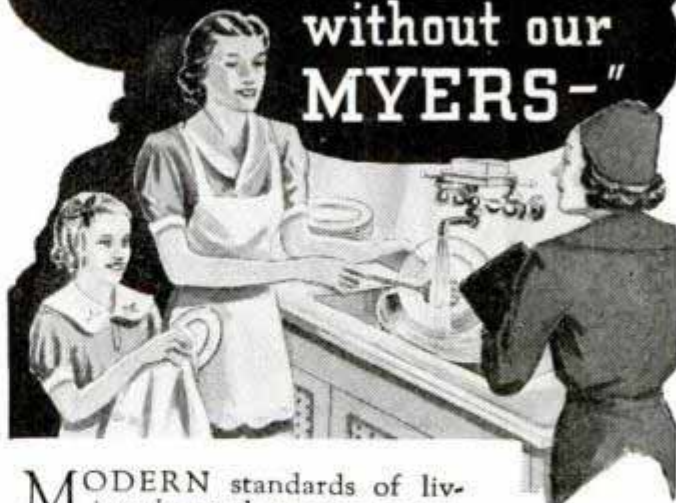
This year a gigantic cyclotron with a 220-ton magnet is being erected at the University of California. In this tremendous machine deuterons will be hurled with a force of 20,000,000 volts and alpha particles will be speeded up with an energy of 40,000,000 volts. With this machine, it is hoped, far more can be learned about the atom than ever before.

Physicists think that the study of the atom may open up brand new fields of knowledge.

"While the view that some day power plants may be run by the release of sub-atomic energy and that the nuclei of atoms may be used as fuel appears fantastic," one of them declares. "Nevertheless proof of the equivalence of mass and energy is none the less of great practical importance. It is conceivable that in our lifetime this great principle will play a vital role in technical developments which are far beyond our dreams—for such has been the history of science."

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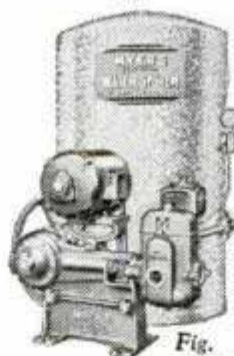


Fig. 3012

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es 1544
Tornados are His Hobby

(Continued from page 683)

faster it rises, the harder it whirls. Because of this, a small area of low pressure is produced; the temperature is reduced and condensation of moisture takes place. The water vapor condenses as steam or cloud and thus the twister becomes visible. When it hits the earth, the dust it sucks up changes its color to deep black. Many of the tornados starting at cloud level gain in size and energy as they move toward the earth, others lose their force. Some never reach the earth.

The state of Kansas is generally regarded as the cradle of the tornado but on a per unit area basis, the weather man's charts show that parts of Iowa, northwest Missouri, and parts of Arkansas outrank Kansas in this regard. Although the tornado belt lies in the mid-central section, the southern and eastern states receive a share of these vicious storms.

Inasmuch as the tornado can be seen in the open country at such great distances and its direction of motion can be so well charted a person in its path may have ample time to get out of its way. The best place of refuge is in a cellar or cave. Tornado cellars, commonly known as cyclone cellars, are built adjacent to farmhouses and double as refrigerators for the storage of fruits, vegetables, and dairy products.

If it is your misfortune to be caught in a tornado and you are in a frame dwelling, Flora suggests you get into the southwest corner of the basement. No matter what happens to the house, it's not likely you will be hit by any falling debris there. Stay out of the basement of a brick house; when a tornado hits a house of this type, the wreckage falls directly into the foundation.

"Out in the open country," explains Flora, "the best thing is to lie down in a ditch or gully, the deeper the better. But in such a crisis, you can't be too particular. I knew of a man and his wife who were trapped in a storm near Topeka. They crouched in a shallow excavation that had been used for storing apples and although it was not more than three feet deep, they escaped injury, while their house and barns were carried away.

"There is record of a Kansan lying behind a tree and locking his arms about it.

251544

Luckily, the tree was not uprooted but the man's face was severely cut by sand and fine splinters whizzing through the air.

"If you have no other alternative, run as fast as you can to the northwest, at right angles to the movement of the storm. When the tornado is only a few hundred yards in width, it is possible to evade it in this manner."

It's problematical what a tornado would do to a modern steel reenforced type of concrete building. The chances are one might resist the force of a storm to a marked degree, the meteorologist says. If you should be in one when a tornado is getting ready to strike, your best bet is to crouch against one of the inside partitions.

According to Flora, the nautical equivalent to a tornado is a waterspout. The suction in the center of the cloud lifts up a column of water. It may not rise very high, perhaps not over twenty feet.

Although the hurricane has no funnel-shaped cloud, its wind velocity often reaches 125 miles an hour, blowing over an area of several hundred miles for several days at a stretch. They do not occur north of the Gulf of Mexico or the South Atlantic states and quickly lose their force as they pass inland.

H 34.

Car Parking Lights Turned on by Photocell on Dash

Operated by a small photocell device mounted on the instrument panel, automobile parking lights turn on and off au-

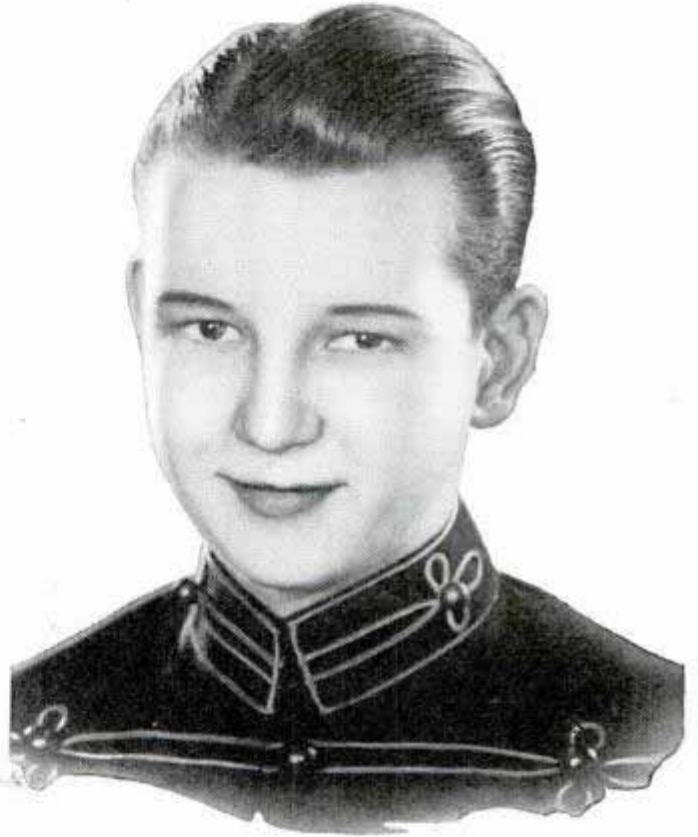


tomatically at the proper hours. The unit, no larger than a matchbox, switches on the parking lamps when the sun sets and switches them off when the sun rises.

Socute Tubest - D. Francis

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TOOLS GOOD!**



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3-IN-ONE OIL

201397
Torturing Metal to Make It 'Talk'

(Continued from page 668)

back and forth repeatedly until it snapped. Perhaps you have noticed that the wire became warm to the touch at the point under stress—heat due to the friction of molecules sliding back and forth over each other.

In the early days of the automobile, rear axle failures were frequent. Even today, when an auto axle breaks, it is almost invariably the back one. Why not the front one? Because most axle failures are due to the fatigue of the metal and most such failures are due to the bending of rotating



Setting limit of compression for small spring about to undergo fatigue test

parts. The front axle does not rotate, hence is not subject to so much fatigue. A rotating metal part under load is subject to alternate tension and compression, like a spring—stresses conducive to metal fatigue. An airplane propeller, on the other hand, is subject mostly to fatigue from vibration.

The treacherous thing about the fatigue of metals is that there is no warning. Examine a car axle about to break from fatigue and you will find no deformation, no sagging, no visible cracks. The axle appears sound, yet within the next five miles it may give way from fatigue. Garage mechanics usually refer to such a failure as "crystallization" of the metal but metallurgists dislike the term since the micro-

scope shows that metal is crystalline to start with and retains its crystalline structure throughout a fatigue test. They prefer to look upon fatigue as a breakdown of the atomic structure of the metal caused by the atoms sliding back and forth over each other like a deck of cards being flexed in the hands.

How to tell when failure from fatigue of a particular alloy is likely to occur? That was the problem faced by Westinghouse and other industrial research men. They solved the problem by putting metal samples on the rack and torturing them to death.

If a metal part is to be subjected to a pull, twist or vibration in actual use, samples of various alloys being considered are placed under a comparable stress in a testing machine which subjects them to the strain they must withstand until they fail.

Let's assume a metal for a spring in a refrigerator door is being sought. Samples of various alloys are placed in motor-driven machines and subjected to alternate tension and compression like they would receive in service, a counter recording each cycle until each sample fails. Suppose one snaps at 500,000 cycles, the second at 750,000 and the third at 1,000,000. If it has been estimated the refrigerator door in which the spring is to be used will be opened and closed half a million times during the lifetime of the machine, the research men do not select the alloy which failed at 500,000 cycles. They pick the one which failed at 750,000 or even 1,000,000—to provide the added safety factor. They know the longer-lived ones will outlast the refrigerator.

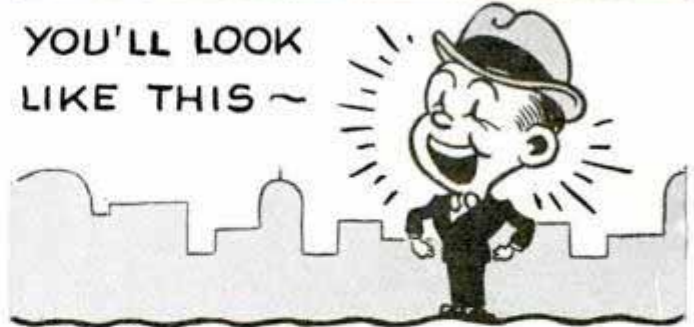
It's the same with other metals for other purposes. They torture metals to destruction and choose for specific purposes only those which are tough enough to withstand a lot more than the strain they will be called on to bear, whether it's a straight pull, a twist under load, or continuous vibration.

Some automobile factories today specify rear axle gears able to stand sixty miles of travel in low gear at full engine torque, more strain than the gears are likely to bear during the life of a car in ordinary travel. Not so long ago no one could have guaranteed a particular alloy to meet this specification. The metals were available, were even used, but no one knew beyond

(Continued to page 125A)

Treet Topics

YOU'LL LOOK
LIKE THIS ~



AND THEY'LL
LOOK LIKE
THIS ~



~AND YOUR
BANKROLL WILL
LOOK LIKE THIS ~

IF YOU
DO THIS:



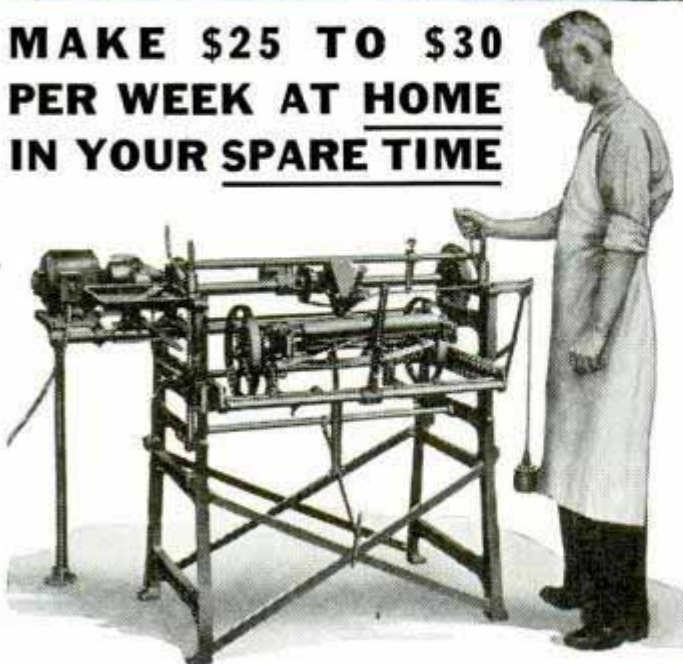
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(Continued from page 123A)

any question whether a particular alloy, if used in gears, would go thirty miles or sixty miles in low gear at full engine torque without failing. The only way to find out would have been to try it. Now there's no guesswork. Research men know in advance what the metal will do. They find out by torturing it until it fails.

Heat treatment gives added tensile strength to steel but does not always add proportionately to its ability to withstand fatigue. Cold working, however, increases the resistance to fatigue of some kinds of steel. Most common alloys have been subjected to so many types of fatigue tests that metallurgists are familiar with the general fatigue characteristics of each. But they still continue to test metals to destruction. Why?

The answer is simple. They do it to improve design. The shape as well as the composition of a metal part subject to continuous stress determines its strength. So after the alloy best suited to withstand a particular strain is determined, the shape of the part must be decided. Various shapes which can be utilized are tested in the torture machines until they fail. The one which lasts the longest may be selected or perhaps even the shape of this one is altered to increase its strength still more. Sharp corners usually are avoided in metal parts where strain is a factor because a sharp corner is one place where failure is most likely to occur. Increasing the radius of such a corner almost invariably increases the strength.

In addition to the ordeal by water to determine resistance to erosion, metal also is subjected to an ordeal by fire, a form of torture calculated to determine the rate of "creep" of an alloy. Metal under stress at high temperature has a tendency to "creep" or elongate like hot taffy under the stress of pulling. In the case of certain turbine parts, for example, this creep continues year after year. But these parts fit to extremely close tolerances. So unless turbine engineers know exactly how far the material will creep in twenty years, they may use a part which fits nicely when installed but which will not function properly in a few years.

So research men today use a creep testing machine to find out in a short time just

(Continued to page 126A)



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and Learn to
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THE WORLD'S FASTEST SELLING AIRPLANE

(Continued from page 125A)



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Muncie, Indiana

FREE Send for illustrated folder giving details and prices.

NEPTUNE Motors

BUILT FOR SALT WATER AS WELL AS FRESH WATER

how much metal will creep in a long time. It is a cylindrical electric furnace with twelve holes for test specimens under different stresses, and a larger compartment for pretreatment of specimens without stress. Test specimens are supported on knife edges and loaded by levers and weights. Two methods of measuring creep are used. A dial gauge reading to one ten-thousandth of an inch is employed to measure the relative vertical displacement of comparison rods extending to the top of the furnace. The furnace also is surrounded by a track on which a micrometer-microscope carriage moves. Measurements are taken with this instrument by sighting through quartz windows in the wall of the furnace upon engraved platinum targets. Even the material used for bolts in a steam turbine must be creep tested in this fashion, because if a bolt creeps enough it may relax and lose its tension.

All this torturing and testing of metals adds years of useful life to your automobile, your refrigerator, your electric fan or any other machine containing metal parts subjected to strain. The tougher the job the metal must do, the more cruel the torture it must withstand before it is accepted. But, once approved, it's a tailor-made metal for the job to be done.

Not so long ago the user tested the product. Today the research man does the test work. He breaks axles and motor shafts and refrigerator door springs in the torture chamber so they won't break after you buy them.

1494.

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Incorporated into printing ink, fluorescent materials make the words glow when the page on which they are printed is subjected to ultraviolet rays, or "black light," so called because it is invisible. Under ordinary light the words are difficult to read, but in black light, the letters stand out boldly in violet. Books and magazines printed with this ink can be read under sun lamps of the ultraviolet type. Two-watt argon lamps, now on the market, give a glow too feeble in visible rays for reading, but they make it possible to read pages printed with fluorescent ink.

Use - Fluorescent Product

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Powerful - Accurate - Economical - Practical - Adjustable Shooting Force - Amazing Maximum Velocity - cal. 177 or 22 and BB - For Target and Small Game - the only Genuine Compressed Air Pistol for Shooting BB on the market - Single Shot with Bolt Action - Hammer Fire - Hair Trigger - Safety. Price \$7.50. Holster \$2.00. Also 177 and 22 Single Shot Air Rifles \$7.50 - Single Shot BB Air Rifle \$6.00 - 25 Shot BB Repeater Air Rifle \$7.50 - not Dealer or Direct - No license required - Safe for indoor use. FULL DETAILS - TARGETS - FREE - WRITE TODAY Benjamin Air Rifle Co., 891 Marien St., St. Louis, Mo.

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for small boat models complete with propeller, shaft, fire screen, denatured alcohol torch and fuel tank. Torch will start cold engine in 2 minutes, run it for 12 minutes.

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Sani-Flush **Safe NOT CAUSTIC**
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When writing please mention Popular Mechanics

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PIERCE GOVERNORS
THE BRAINS OF ANY GAS ENGINE

es 386

Treasure Island of 1939

(Continued from Coloroto Section)

water colors, and prints. Prismatic reflectors will be used to help give the proper illumination.

Hundreds of exhibits will represent various industries and separate companies, some of which are erecting their own buildings. One great palace will be filled with architectural, building, and building-supply exhibits, with room outside for model homes and landscaping.

Two systems of avenues and courts, intersecting at a central 400-foot tower, form the main design around which the larger exposition buildings are grouped. The Avenue of the Seven Seas leads to the "Court of the Hemispheres" and this in turn leads to an open air "theater of the sky." The main cross-avenue terminates in a great lagoon which is to be used for water pageants and fireworks shows. The north end of the island contains parking space for 12,000 cars and adjacent to it is an amusement zone, called "forty acres of fun," where thrills, stunt rides, sideshows, and restaurants and typical carnival concessions will be located. In all, 600 concessions are to be granted for the amusement area.

A group of native villages transplanted, inhabitants and all, from the South Seas, will be located near by. At the south end of Treasure Island, protected on three sides, is the "Port of the Trade Winds" where trade ships, junks, square riggers, and yachts will be moored. A roadway lined with olive trees and four miles in length will circle the island.

The exhibition palaces will have a combined floor space approaching one million square feet and will cost \$7,000,000 to complete. It would take 20,000 freight cars, a train 200 miles long, to haul the lumber, steel, and concrete used in construction and 100,000 timber piles are being used as foundations for the buildings.

Foreign participation is to include official exhibits from Japan, Egypt, Cuba, Mexico, Netherlands, East Indies, Panama, Santo Domingo, Honduras, Nicaragua, Peru, Venezuela, and other countries of the Orient, the South Seas, and South America. Canadian provinces will be represented and exhibits are being prepared by Hawaii and Alaska. More than half the

4.1386

states are participating, some of them planning to spend more than \$100,000 each on exhibits and displays. Exhibits are also being prepared by several departments of the federal government.

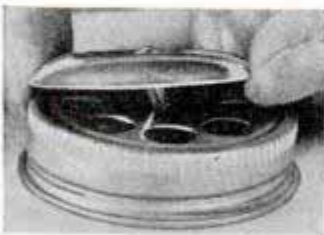
With an expected attendance of 20,000,-000 visitors during its nine months of life, and perhaps 50,000 guests per hour during attendance peaks, the exposition engineers have had to arrange for every convenience of a complete city. A pipe line to carry water from San Francisco via the bay bridge to the island, fire-protection systems, sanitary systems and telephone and telegraph lines, are some of the details. Water alone will cost \$600,000, supplying an estimated average demand of 1,600,000 gallons daily. A six-lane roadway connecting with the bay bridge and arranged so that there are no intersecting left turns against traffic streams at any point is under construction. Thousands will travel to and from the fair by fast, convenient ferry-boat connections.

The exposition will open February 18, 1939 and continue for 288 days until December 2. Approximately \$50,000,000 is being spent on the exposition, including federal, state, and public subscriptions, under the guidance of a non-profit exposition corporation.

The theme of the fair is to be a celebration of progress in the west since the last world's fair in San Francisco in 1915. It is dedicated to the two great bridges of San Francisco Bay, largest and newest in the world, to the China Clipper flying boats, and to the recent hydroelectric projects of the west, all symbols of western progress.

H-193

Water Pours from Bottle Cap without Unscrewing It



pouring water without unscrewing the cap. Essentially, the cap is a simple valve.

Although it is tight enough to keep out dust, foreign matter and odors, a water-bottle cap just introduced permits

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

W. O. Freeman Jr.



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Now you'll find it easier, quicker than ever to make your car mirror-bright. A little brisk rubbing with Du Pont No. 7 Polish, and your car sparkles like new. No. 7 Polish is made by Du Pont, world's largest maker of modern car finishes. That's your assurance it's right for the finish on *your* car.



Sample for You! Send 6c. part mailing cost, for sample can of No. 7—enough for fenders and hood. (Offer good in U. S. only.) Write Du Pont, Dept. PM-1, Wilmington, Del.

Always ask for
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IN A JIFFY!**



CANNED WOOD MAKES HOME REPAIRS EASY

Anybody can do a fine job of repairing quickly—broken chairs, loose casters, holes in wood, nicks, cracks, screw holes, loose drawer pulls, etc. with this canned wood that handles like soft putty and quickly hardens into wood you can drive nails and screws into, paint or carve. Try it. Paint, hardware and 10¢ stores sell PLASTIC WOOD in 10¢ and 25¢ tubes, 35¢ cans.



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Old English CEMENT

Auto-Glide

120 MILES PER GALLON

POWER—1½ or 2 H. P. Cushman engine. New 2-Speed Transmission—9-to-1 ratio in low! Starts up steepest hills, pulls Side-Car with heavy load to the top! Regular speed in high, 35 mi. per hour. ECONOMY—a drug store has driven its Auto-Glide 9,000 miles in 8 months for deliveries, uses only 3-gal. of gas a week—¼¢ a mile RUGGED—one owner has traveled 1,000 miles a month for 6 months, no replacements! 3 models: (1) Auto-Glide, illustrated, (2) Kari-Pac, with parcel carrier, (3) 3-wheel Side-Kar model—carries an extra passenger, or 300 lb. load. Ideal for deliveries, etc. Side car quickly removable.



WRITE Send for free book and prices on new improved models. DEALERS: Write quick for details of Special Offer! CUSHMAN MOTOR WORKS, Dept. Q-5, Lincoln, Nebr.

Across Africa on One Lung

(Continued from page 709)

the old bushing and fitted the new one.

There had never been a motor vehicle over the 500 miles from Mao to Abeshr. But scarcely a day passed that we didn't meet a caravan of from two to 100 camels. And there were always the pilgrims, crowning a life of religious devotion with their sacred journey to Mecca. Old men, frail and feeble, walking across Africa.

Once a big "hyena" jumped out into the trail. The hyena is a notorious coward so I chased him a quarter of a mile before discovering he was a lion. Often we raced with antelope and ostrich where the trail was hard and smooth. One morning we stopped to photograph one of the great



Repairing the tires after thorns caused sixteen punctures at the same time

herds of long-horned, humpbacked cattle that roam the grasslands of the Sudan. The herdsmen shouted a frantic warning, but it was too late. They charged! We fled to our machines, leaped on and started. But there wasn't a chance of out-running those monsters in the heavy sand. They were only thirty feet behind us when my eye fell on the hand oil pump on the frame.

"Pump!" Frantically I motioned to Flood.

Desperately we worked the plungers up and down. Thick blue clouds of smoke began to pour from the exhausts. Snorting and pitching, the maddened animals broke ranks and plunged past.

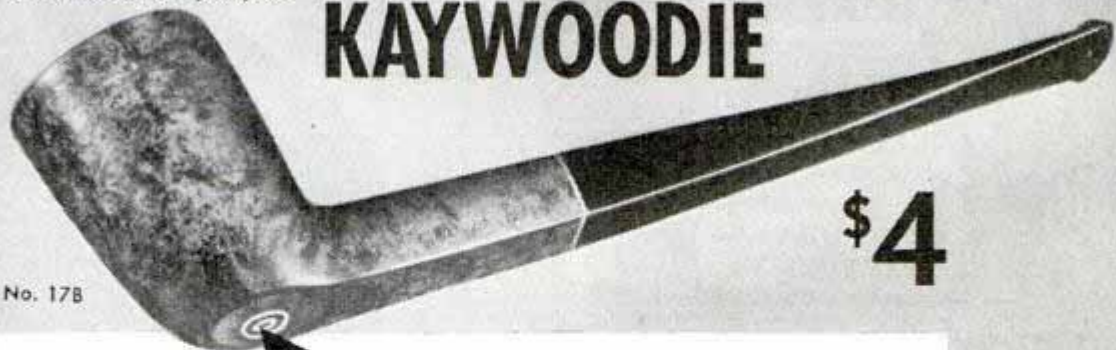
Then came a week's run of bad luck with

(Continued to page 133A)

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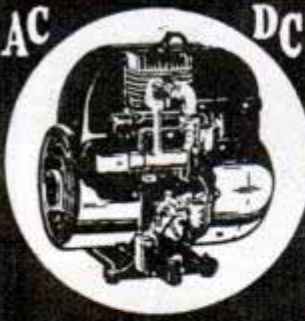
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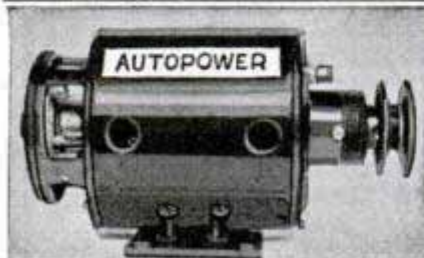
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(Continued from page 130A)

our machines. A worn magneto chain climbed the sprocket teeth and broke. We made a new one out of emergency repair links. Another sidecar spring leaf broke. Our strap-iron supply was used up, so we sawed off a fender bracket and made a clamp. Then Flood's luggage carrier snapped in two. I had borax and brass rods, but no forge. Back in Nigeria I had used a pair of handlebars as a blowpipe. Now, with Flood for the bellows, and charcoal, which we could manufacture from dead trees in the cuvette, nothing was lacking but the firepot. I sawed an empty gas can in two, punched a hole in the bottom to receive the end of the handlebars, and lined my "firepot" with clay. With this improvised forge and a big rock for an anvil, we stuck that carrier together.

Three days later, the cap dropped off Flood's magneto breaker box, and a tiny fiber bearing fell out and was lost. The bike wouldn't run without it. On hands and knees we combed that desert for three hours, but it wasn't any use.

Flood had his face stepped on while playing college football and his four upper front teeth were mounted on a quick detachable partial plate.

"Flood," I said, "spit out that plate."

I touched a match to it, and the stuff began to melt. It was hard rubber, so I molded a bearing out of that partial plate that got us the rest of the way across Africa.

Slowly we were crawling toward our goal. But at Athi, Flood was stricken with violent shooting pains in his right side. For three days we kept him in cool wet packs. On the third morning the pains began to subside. Several months later, after we got home, the pains came again. That time, the doctors took out his appendix.

At Adre, last post in French territory, we told the commandant we had come from the west coast on our motorcycles but not until we had shown him our passports, signed by the authorities of every civil and military post, would he believe us. At last, El Fasher, capital of Darfur province of Anglo-Egyptian Sudan. White men who could speak English!

"It's 400 miles from here to El Obeid," said the governor of Darfur, "and absolutely the worst road in Africa. I'll give you a military escort and a truck."

(Continued to page 134A)

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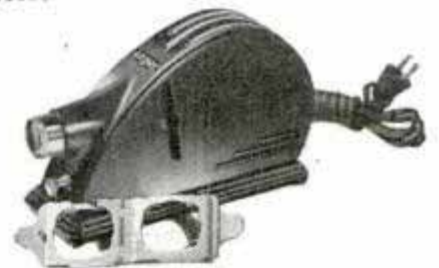
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(Continued from page 133A)

"What!" gasped Flood, "has a truck been over the road?"

Four days later we were in El Obeid. The "worst road in Africa" had been the best trail we'd struck since leaving Zinder, almost three months before. From El Obeid to Khartoum there was a railroad. It was not made for motorcycles, but we took it.

And then the Nile, at last. There were the creaking water wheels of an irrigation system centuries old, and the two sleepy oxen endlessly plodding their rounds. And a few miles beyond, the great Sennar dam, which does the work of a million oxen.

We were passing from one world into another, and the transition was accompanied by bizarre and curious compromises. Two lumbering camels hitched up to a red-and-green farm wagon, labeled, "Made in Moline, Ill." A barefoot, turbaned native weighing cotton on a set of platform scales, in front of a grass hut. I felt like a man gradually awakening from a 2,000-year sleep. And then we sighted Khartoum, capital and metropolis of Anglo-Egyptian Sudan, shimmering in the heat a dozen miles ahead.

"We've made it!" I shouted to Flood.

Half an hour later we were there. There was mail, the first in four months. A real garage. And an Austrian dentist who could make Flood a new set of teeth. There were 700 Englishmen asking, "How did you do it?"—a question we couldn't answer, because the more we thought of it, the more incredible it seemed.

It's 400 miles from Khartoum to Massawa, on the Red Sea. First, 250 miles of desert and only three wells in the whole stretch. Then, Kassala, and the Italian frontier. Up and over the Red Sea hills on a good military road, and then—Massawa in the distance, and that blue sheet of water toward which we'd started almost five months before. Down the little main street of Massawa to the beach we drove our motorcycles and stood silently looking out over the water. "Well," said Flood, "we're here. What next?"

Five days later we shipped for India on a luxurious liner. Africa had taught us that no matter what happens, you're never licked as long as you've still got your tool kit and a pal to do the praying when the wrench slips.



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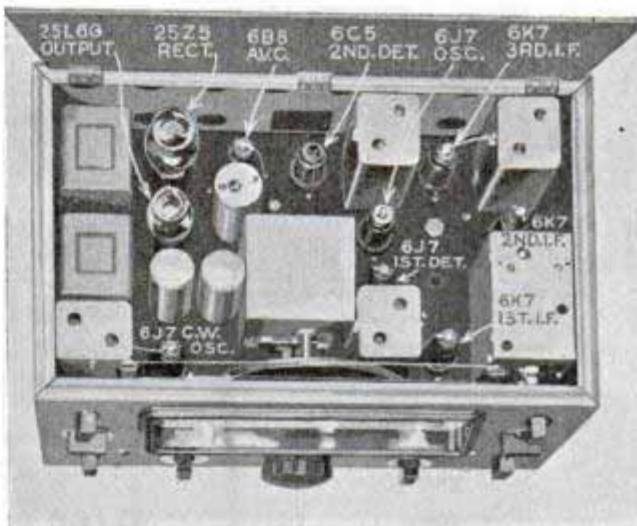
Receiver of Advanced Design

(Continued from page 737)

In this case the receiver is fitted with a suitable cable and plug for making the connections.

Photos Figs. 1 and 2 show front views of the set, with the various controls plainly labeled. Fundamental design advances include an automatic plug-in coil system, indicated in bottom view, photo Fig. 3, which combines all of the desirable features of plug-in coils, and coil switching by means of the single range-selector knob on the front panel. A crystal filter provides continuously variable selectivity over a range of from 300 cycles to 7 kilocycles.

The tuning system is claimed to be an entirely new design and employs a multiple-scale dial of the full-vision type,



accurately calibrated in megacycles, a megacycle being 1,000 kilocycles. Several unusual features are incorporated, such as a mirror for overcoming parallax, an auxiliary linear scale numbered from 0 to 100, and six adjustable frequency markers by means of which any particular stations or frequencies may be "logged" on the dial itself. A dual vernier reduction drive is used which provides a 55 to 1 reduction over any narrow band of frequencies with automatic shift to an 11 to 1 reduction for conveniently and rapidly moving the pointer to another section of the scale.

Tests made with model NC-81X in Popular Mechanics radio laboratory, on both a.c. and d.c. operation, were satisfactory in every respect. A separate speaker is supplied in a small cabinet finished to match the receiver; a top view showing the tube arrangement appears in the photo above.

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Many exclusive features. Uses any model airplane engine. 67 in. span, length 47 in., but will easily fit in your car.

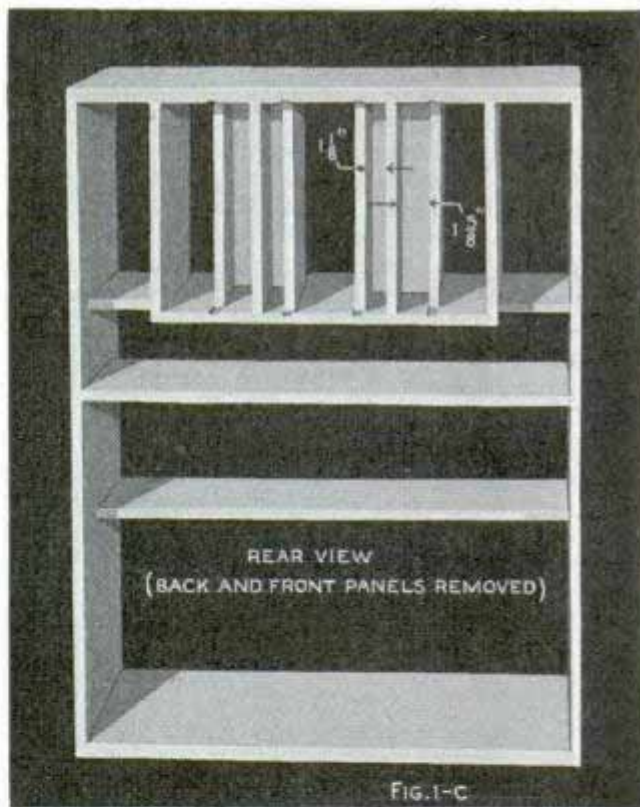
SHIP MODEL Kits—famous windjammers, liners, and yachts from 10c to \$6.00. MAYFLOWER, shown here, length 17½ in., printed deck piece. \$2.50 or \$3.00 with carved hull. By mail, postage 15c ex. MODEL SPEED BOAT with clock mechanism, motor and prop in one unit, capable 800 ft. drive, \$1.95 with elec. outb. motor less batteries, \$4.95. Postage 15c. Send 5c for illus. catalog including ready-made parts, engines and supplies.

MEGOW'S Dept. P.M., Howard & Oxford Sts., Phila., Pa., or 217 N. Desplaines St., Chicago, Ill.

Homemade Speaker Cabinet

(Continued from page 741)

Approximately 32 square feet of ½-in. veneer panel, and 5½ feet of ¾-in. veneer panel are required. Begin construction by cutting out parts A to M according to the dimensions given in the cutting table. Partition H has two 4-in. squares cut out of the rear corners. Rabbet sides for partitions H, G and F; top of partition H is rabbeted for the labyrinth partitions, all rabbets being ⅛ in. in depth and width to take stock. Fig. 1 and photos Figs. 1-A, 1-B and 1-C show all details clearly. The speaker hole is centered 6¼ in. from the top of front panel A, for an 8-in. speaker. Round head No. 6 wood screws 1 in. long are used with washers to fasten front and back panels. Glue all partitions in their rabbets; sides can be clamped or temporarily held with nails until glue dries. Putty up nail holes and paint or finish as desired.



CUTTING TABLE

Part	Name	Length	Width	Thickness	Required
A	Front	24 ¼"	27"	½"	1
B	Back	36"	27"	½"	1
C	Bottom	26 ¼"	15"	¾"	1
D	Top	26 ¼"	15"	¾"	1
E	Sides	36"	15"	½"	2
F	Partition	26 ¼"	9"	½"	1
G	Partition	26 ¼"	10 ⅝"	½"	1
H	Partition	26 ¼"	15"	½"	1
I	Partition	11 ¼"	12"	½"	2
J	Partition	11 ¼"	13"	½"	2
K	Partition	11 ¼"	6 ½"	½"	2
L	Partition	11 ¼"	7"	½"	2
M	Partition	11 ¼"	3 ⅞"	½"	2

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AMAZING Improved GAS ECONOMIZER

When you get MORE MILES per gallon of gas you get money saving results, YOU SAVE UP-KEEP COST. Hundreds of letters in our files from auto owners of every make tell us our wonderful gas economizer has saved money for them and reduced auto running expense by getting MORE MILES PER GALLON OF GASOLINE. Note a few in this ad and write us for complete revealing details of this world famous invention and our trial plan whereby YOU can try one on your own car and if you don't think it's wonderful, the trial costs you nothing. Anyone can attach to any auto—as inexpensive as a good wrench—absolutely automatic and self-regulating.

New Improved Gas Economizer SENT ON TRIAL 30 DAYS

Costs Nothing if it Does Not Save Gas
 Yes, you may try this new improved gas economizer on your own car under our liberal 30-day trial offer—check your gas mileage BEFORE you install it, CHECK it again AFTER you install it—then, you be the judge, and if it does not save gas, save money for you, and you are willing to return it under our liberal guarantee within the 30-day trial period, it costs you nothing—but, that's not all, we will even pay you a bonus for testing it if not delighted—so, you can't lose. Without obligation, send name and address on coupon below—or paste on 1c postcard and mail NOW.

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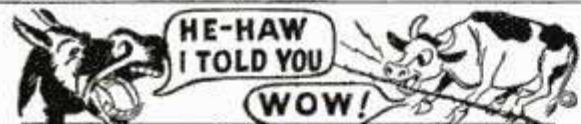
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 with one used barbed wire on light stakes—permanent or portable. PARMAK proven by use on thousands of farms—now PARMAK has Amazing New FLUX DIVERTER invention that increases efficiency—long service from SAFE 6 VOLT Batteries.

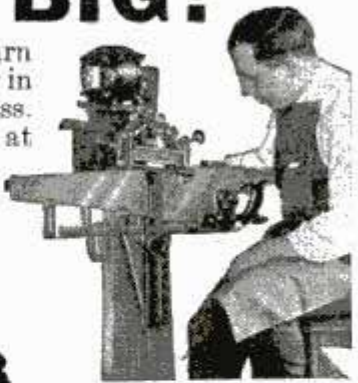


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 Send me FREE PLAN, for starting my own business in spare time filing saws on the Foley Automatic Saw Filer, without obligation to me.

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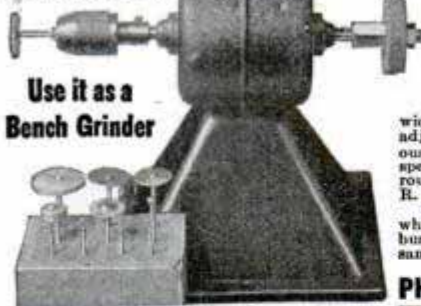
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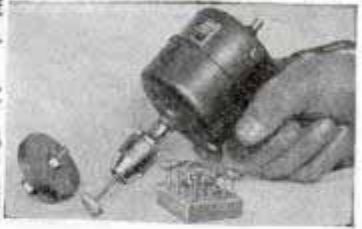
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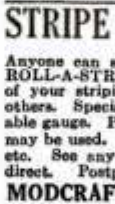
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Flagships of the Gold Fleet

(Continued from page 733)

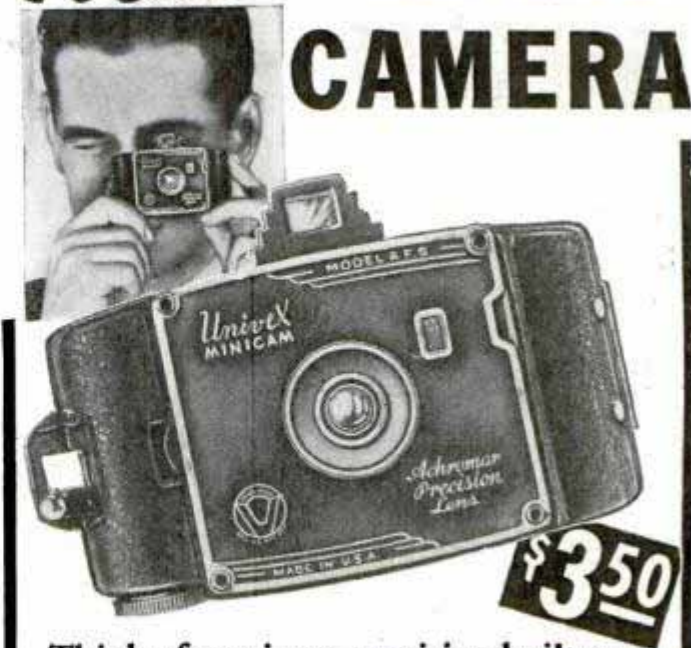
steel legs, a "digging spud" normally driven deep into the ground under the boat to provide a pivot on which the dredge swings, and a "stepping spud" by which the boat can be moved ahead in eight-foot steps whenever the bucket ladder has brought up all the material within reach. Heavy steel cables leading to anchorages on the banks of the lake are used for swinging the boat to and fro.

The "Natomas No. 1" picks up 605 cubic yards of material every hour, almost 15,000 cubic yards in a twenty-four-hour day. In a year's time the boat will scoop up about five million cubic yards of gravel and earth. To get through a schedule like this hardly any time can be allowed for possible breakdowns and all of the boat's machinery and equipment is constructed for the utmost durability and reliability. Operations are hardly ever stopped except for the weekly clean-up. The parent company maintains huge machine shops, forges and electrical shops adjacent to its fleet of boats so that repairs can be started at once if a breakdown does occur.

Instead of being launched like ordinary vessels, gold boats have to be assembled at the sites at which they will operate. First a dragline scoops out a hole a few feet deeper than the draft of the boat and 200 feet square. Next the hull is assembled in the hole, water is admitted to float the hull, and then the superstructure, digging ladder, and the rest of the gear are installed on board. Depending upon the depth being dug, one of the boats may dredge twenty acres or more during a year.

Gold is by no means the only metal recovered by the dredges in California. Tiny flakes of platinum, including osmium, iridium and other associated metals, are saved by the riffles. A thousand dollars worth of platinum may be gathered by one dredge in a year's time. In some localities small but perfect diamonds are found occasionally. Gold, silver, and copper coins are recovered, some being of modern coinage while others date back to the days of '49 and earlier. Old silver coins are cut up and used in assay work. Lead is the largest by-product, one dredge alone usually collecting 500 pounds of this heavy metal every year.

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How Clippers Dodge Storms

(Continued from page 677)

route from Guam to China. So ably can the meteorologists gauge the weather that their estimates of flight time are always within one hour of the actual time made by a clipper and often the clippers land within a few minutes of the time predicted for their arrival.

With all of its storms, weather over the broad Pacific is not so difficult to follow and predict as weather over land areas. This helps to make up for the great distances that are covered in the forecasts. Lack of terrain to create friction and absence of the vertical turbulences characteristic of mountainous areas permit storms to follow more or less natural courses, allowing forecasts of extreme accuracy. The meteorological departments draw two maps per day of the Pacific, checking up on their own forecasts by weather reports sent in from ships at sea.

Simply as a safety factor, the clippers have flown thousands of gallons of excess fuel back and forth across the Pacific. This is because of the slight possibility that unanticipated weather changes might keep the flying boats in the air longer than expected. A clipper always carries enough fuel for the expected flight time plus a reserve for another six hours. If the weather analysis for the long hop to Honolulu shows that a flight would require longer than twenty-three and one-half hours to complete, the trip is postponed until the weather improves. Finally, if a captain gets half way across and finds that he has used half of his fuel, his instructions are to turn around and go back. The head wind that has run up his fuel consumption then will be on his tail and he returns in a hurry.

Pan American draws the information for making its maps and forecasts by fast radio service from about 400 different reporting stations. It maintains fifteen completely equipped meteorological depots on the Pacific and receives data from some sixty stations in the Orient, even the weather in Siberia having an important effect upon future conditions over the ocean. Weather in eastern United States also may have some effect and has to be considered even though the normal weather trend runs from west to east. An average of thirty

(Continued to page 144A)

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The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 42 seconds, engraves intricate designs on jewelry and does 1001 other jobs. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates tedious labor. Plug into any socket AC or DC, 110 Volts. Chuck 1/2" capacity. Ball bearing thrust. Powerful, triple-gear motor. "Worth its weight in gold!"



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MANUALLY STARTED PLANTS
1500-2500
4000, 8000 Watts

WITTE ENGINE WORKS

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(Continued from page 142A)

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HIS STINKO PIPE MIXTURE knocked out everyone but the court jester, who pleaded: "Just clean that pipe of yours and switch to the Brand of Grand Aroma."



"**IT DOES SMELL GOOD!**" the king agreed, after he puffed those mild, ripe burleys in Sir Walter. "Give this man half my kingdom, and get me *another* 2-oz. tin!"

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**HOW TO
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TUNE IN Tommy Dorsey and his orchestra. Every Wednesday, 8:30-9:00 P. M., E. S. T., coast-to-coast NBC Red Network.

ships at sea report their local weather, two of the Matson liners on the Pacific conducting three upper air balloon runs every day and reporting wind directions and velocities at different altitudes. Radio reports from other ships consist of surface observations. In addition to all this, radioed weather reports from the clippers themselves are used for checking and correcting the maps.

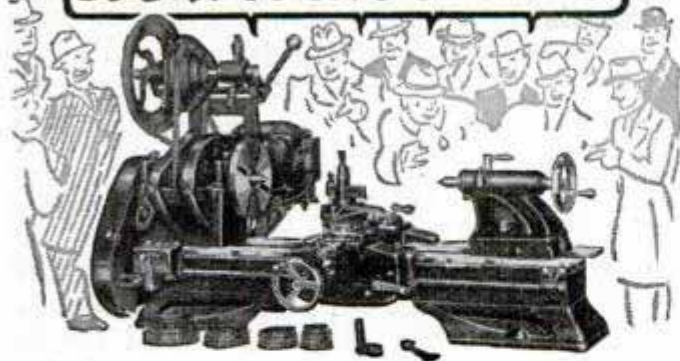
Typhoons have been the bane of mariners ever since the oceans were first sailed, but instead of dreading them the captains of the clippers often welcome these violent circular storms. They offer no hazard to airway operation because they are so small in area that the fast flying boats can skirt them without trouble. Often a typhoon on the route simply means that a clipper will make better time than it would in still air. North of the equator the winds revolving around these storms move counterclockwise, so a westbound clipper sets a course to pass to the north of the storm center and thus gets a favorable tail wind. Bound east, the clipper flies south of the center and is boosted along by the same wind, which by now has circled the storm center and is traveling in the opposite direction.

For the past year Pan American has maintained a staff of forecasters scattered through the south Pacific, drawing weather maps and making forecasts in preparation for the projected airway from San Francisco to Australia.

South of the equator storms normally travel toward the southeast instead of toward the northeast and the circulation of wind around the storm centers is reversed from those in the northern hemisphere. Not a great deal has been known about the details of equatorial weather in the past. The present work is in the nature of valuable research and is leading toward real understanding of the formation of tropical air masses and of the formation and movement of typhoons. Eventually, this ocean meteorology work is going to contribute to the knowledge of world weather.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

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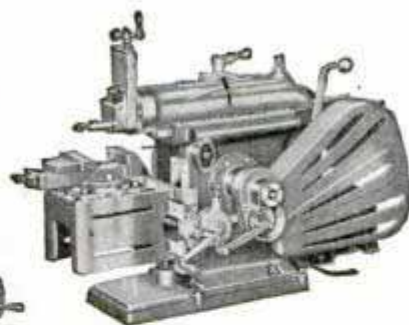
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Typing Course & Table Free. Write for Bargains! Name what you want. Send No money! Low as 10c a day!
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VELVET SPRAYED FROM A GUN!!

Anything from a candy box to walls and ceilings can now be covered with suede velvet felt or velour finish with our newly developed hand spray set. (See page 253 February issue.) The Binder is first applied, the object is then sprayed with pulverized fabrics! Can be applied to paper, cloth, wood, leather, plaster and metal—Drying time 15 minutes.
Introductory offer 1 Binder Gun, 1 Fabric Gun and enough binder and pulverized fabric (suede) to cover about 15 sq. ft. for only \$1.95 plus postage (shipping weight 3 lbs.) in any of the following colors—tan, blue, navy, brown, black, red. Be the first to profit by this new discovery! Order your outfit now! Send for free circular—10c brings four attractive finished samples.
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Net wt.—10 1/4 lbs. Ship. wt.—12 lbs.

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Ratio 144 to 1; Ball bearing; white metal housing; rating up to 1/2 H. P. Equipped with friction Clutch for overload protection. Originally sold for \$25.00. 12" long, 6" wide, 5 1/2" high. Close out price **\$3.95**
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When writing please mention Popular Mechanics

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10 DAY MONEY BACK TRIAL saves time and labor on all craft work

Everybody who works with his hands—at home, shop, school, or profession—can use the efficient, attractive Moto-Tool to advantage. With this practical machine you can do in seconds jobs that require hours of hard hand work. Moto-Tool handles hair-line precision work or does power jobs with equal ability. Plugs in any AC or DC socket. Absolutely safe. There are thousands in use.

Model 1 \$9.85 POSTPAID

Two sturdy Moto-Tools serve every purpose of the craftsman. The No. 1 machine—weighs 6 oz., 25,000 r.p.m.—is recommended for light bench jobs. Model 2—weighs 13 oz., 27,000 r.p.m.—is a more powerful, rugged machine with extra mechanical refinements that shop men want and appreciate. Order on 10-day money back trial. Send for FREE booklet.

Model 2 \$16.50 POSTPAID

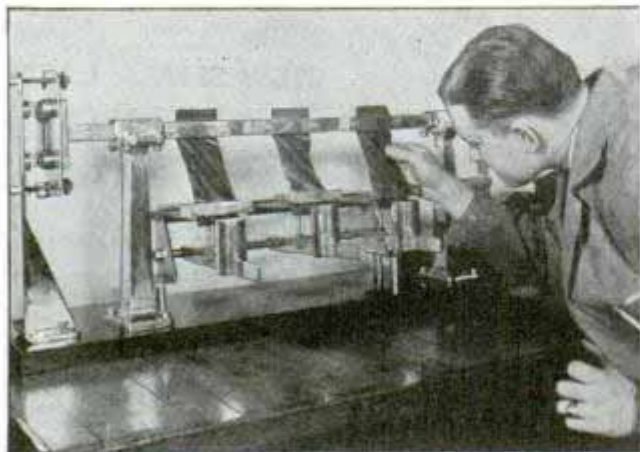
20 pc. craftsman's tool set, for either model **\$5.75 Post-paid.**

DREMEL MFG. CO
2829 CT., Racine, Wisconsin

Phantom Fleet of the Highway

(Continued from page 661)

ures with perhaps a suggestion or two for minor changes or adjustments. The first day's run was over smooth pavement. The second day the hell drivers begin pounding ing gravel. They swing into Minnesota,



This flexing machine subjects fabrics and leathers for upholstery to violent twisting

then into Canada, hammer over dry, dusty roads to Medicine Hat, then tackle the twisting, hilly highways to Banff.

Before they hit Spokane and Seattle, they know what the phantom fleet will do in the mountains. Then they sweep through Oregon and Idaho, across the desert to Salt Lake City and on to Cheyenne. Next they try the high Rockies.

Three weeks after the glistening caravan of cars rolled through the factory gates, the mud-spattered, travel-stained fleet glides back into Detroit with more than 8,000 miles on the speedometers. The test crew climbs wearily out, there's a hasty check-up of the cars, and six fresh hell drivers climb in. The caravan is off again, this time headed for St. Louis.

From there they zigzag into Kansas, Texas and Oklahoma, searching for the worst gravel, dirt and stone highways the section has to offer. Then the cars careen through Colorado, New Mexico and Arizona. Possibly the hell drivers head for the rocky wastes and sullen heat of Death Valley and reach the Golden Gate.

But wherever they may be each evening, long, detailed messages flow back to the plant in Detroit and lights burn all night in the engineering department as last minute refinements are made as a result of the information from the test crews. Another three weeks and the second group of

drivers is home. Speedometers of the phantom cars now read 16,000 miles. But there's no breathing spell for the cars. A third crew heads south and perhaps reaches Mexico City before it turns back.

And so it goes, day after day, week after week. Steady, merciless pounding over good roads and bad, building up mileage until the speedometers click off 25,000 miles, equal to the distance around the world. Then the cars come home to be dismantled. Parts are examined and measured carefully for wear.

Still, the job is only half done. Once in production, the first cars off the assembly line are hustled out on the highway for another 25,000 miles. Perhaps some minor point has been overlooked the first time. Or perhaps someone wants a super-test for some particular unit of the car. If so, the hell drivers know where to go.

Mississippi's dust is ideal for road-testing oil filters, shock-absorber seals and the dustproofing of body interiors. If it's brakes, the mountains of Pennsylvania will tell the story, while Arizona is the place to test radiation. Colorado is the proving ground for a vacuum clutch, and



Testing carburetor and air cleaner to determine most economical fuel mixture

to give steering gear "the works," the crews head for the twisting roads in some parts of North Carolina and Tennessee.

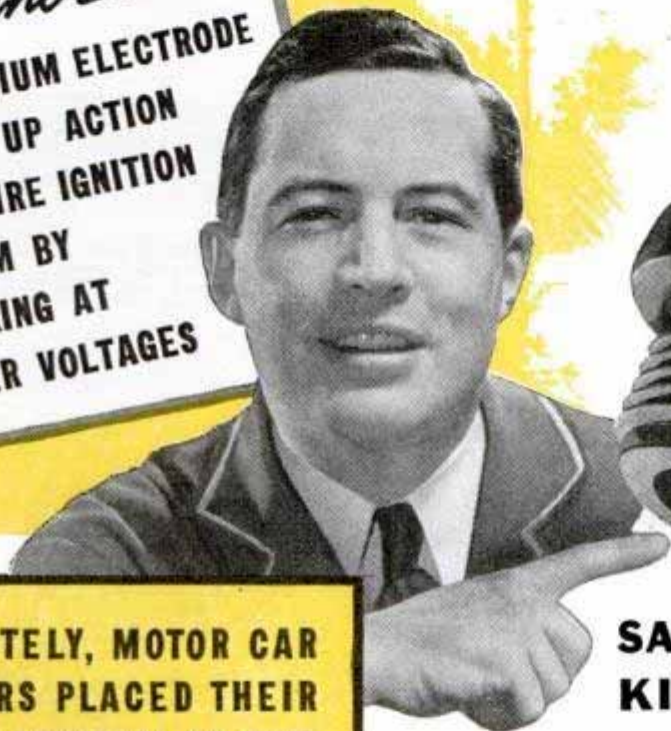
And long before you see the first new model, it has received the stamp of approval of the first fellow to sit behind its steering wheel—the "hell driver."

(Concluded next month)

CARS START EASIER

With New **FAST ACTION**
AUTO-LITE SPARK PLUGS

Here's the Secret—
NEW KONIUM ELECTRODE
SPEEDS UP ACTION
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FOR 26 years the engineers of Electric Auto-Lite have specialized in starting, lighting and ignition equipment for motor cars.

To improve the present-day ignition system was one of their pet aims. To do it, they found they needed a better spark plug than any they could buy. So they perfected a new kind of spark plug—one engineered as an integral, balanced unit of the ignition system *instead of as an accessory*.

They developed an entirely new electrode which, *under identical conditions*, requires a much lower voltage to produce a spark. *Faster action!* Cold motors start easier! Gasoline waste is eliminated! Top speed is increased!

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SPARK PLUGS

THE BIGGEST HANDFUL in Radio History!

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Size: 6 1/2" wide x 4 1/4" high
HERE is small size and high quality in a radio that sounds like a big set. Not a toy or a novelty. Built with highest quality RCA licensed parts. 3-in. FULL DYNAMIC speaker. Weighs only 5 1/2 lbs. Operates on either AC or DC current, 110 volts. In ivory, red or walnut finish. Complete with tubes and aerial—ready to play.

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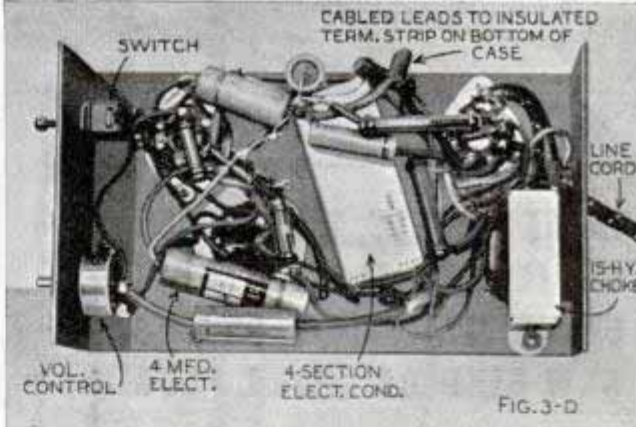
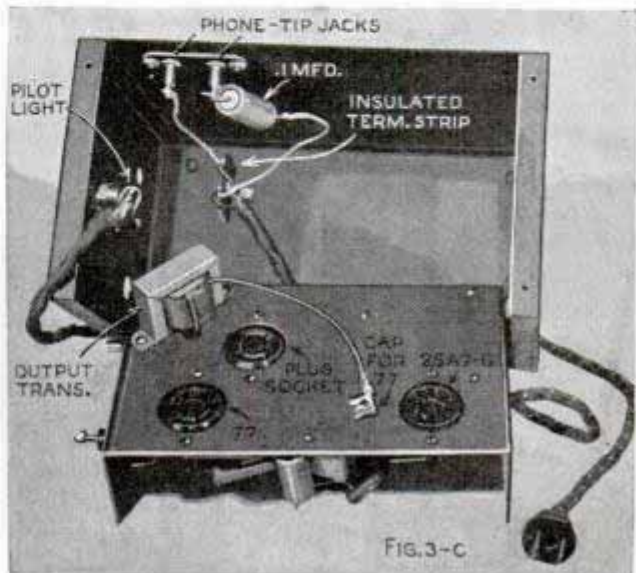
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Complete set of two foils (swords) and free instruction booklet, only \$1.75 postpaid. Two additional fencing swords FREE for limited time. (Regular price of these two sets of foils \$3.95.) **ORDER NOW.**
ALL-AMERICAN FENCERS GUILD
48 West 48th St., New York, N. Y.
Dept. 5PM

Portable Hearing Aid

(Continued from page 739)

one 8-ohm winding and one of 7,000 ohms; see diagrams Figs. 2 and 3. To identify the windings in case your transformer does not have the colored leads, connect the pilot-light bulb and two No. 6 dry cells in series and complete the circuit through



each winding. The 8-ohm winding will light the bulb and the 7,000-ohm winding will not.

All case and base details are shown in Fig. 1; these cases are available formed and ready for drilling, if desired. A list of the original materials used can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-253. Photos Figs. 3-A, 3-B, 3-C and 3-D show the assembly details, and every connection above and below the base is clearly indicated in the simplified wiring diagram Fig. 3. The floating ground eliminates the possibility of shock if the person using the unit touches the metal cabinet and an external ground at the same time.

800: 4-26/

Surveying by Photography

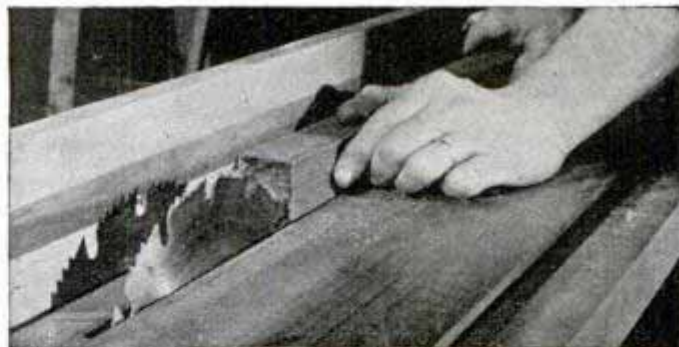
(Continued from page 642)

such manner as to make it appear as though he were actually looking down upon the area from an airplane. The relief of the hills and valleys is reproduced perfectly. No important feature is concealed.

The various instruments provide the operator with a pointer which, by optical means, is made to appear as if it moved around in space over this view of the ground. The operator can move this pointer back and forth or up and down by manipulating the controls of his instrument. The instrument at the same time records upon paper the position of the pointer. All the operator needs to do, therefore, is to guide the pointer around over the features he wishes to map and a pencil automatically traces, on the scale of the map, the route followed by the pointer in outlining features to be mapped. One of these machines, called a multiplex projector, is capable of producing results at a greater rate, per square mile, than any of the other types, because several operators can work with it at the same time. As many operators as can be seated around the instrument, each using his own pointer, can be drawing at the same time parts of the map from the optical relief model visible to them all. Other instruments popularly in use are the aerocartograph and the stereoplanigraph.

The use of photographs does not liberate entirely the map maker from the necessity of some ground surveys. Before the photographs from the air can be used to fill in the details of the finished map they must be located with respect to absolute position and altitude. A few points on the ground must be located on foot so as to locate a few points which will show in the pictures and fix them in position.

A good example of how photogrammetry saves time and labor is the survey of unmapped regions of Alaska now being conducted by the geological survey. Here only 314,400 square miles of a total area of 586,400 square miles have been surveyed. This represents fifty years of labor with pack horses and dog teams. Some of this unsurveyed land is so wild and desolate that it is doubtful if a human being has ever visited it. Planes are at work over this virgin northland and it is only a matter of time until the whole of Alaska will have been conquered.



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7" (3/4" hole)	\$3.10	10" (3/4", 5/8" hole)	\$4.50

Pax Hollow Ground			
Rip—Cross-Cut—Combination			
6" (1/2" hole)	\$4.30	8" (1/2", 3/4", 5/8" hole)	\$5.40
7" (3/4" hole)	\$4.90	10" (3/4", 5/8" hole)	\$6.90

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MICROMETERS

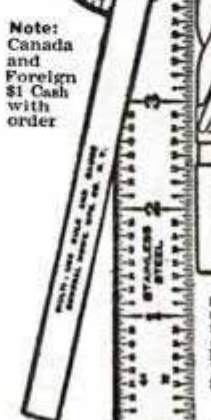
Six piece set, in velvet lined leather case. Special price, only \$13.95. Precision machined in one thousandths, up to 4" outside and 3 3/4" inside measurements. Guaranteed accurate, easy to read and adjust. Satisfaction guaranteed or money back.

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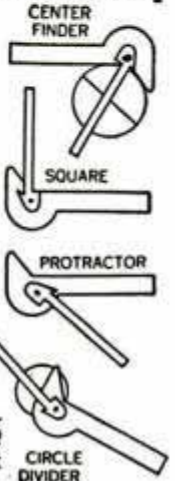
MICRO PRODUCTS, 529 E. Jefferson Ave., Detroit, Mich.

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Turning Night into Day

(Continued from page 725)

to be sure illumination everywhere is up to standard. For baseball the infield is lighted to twenty-five footcandles, while the outfield gets thirteen to sixteen. Automobile racing demands twenty-one footcandles on the entire track. That's about four times as bright as the average home. Down lighting only is used, and both straightaway and curves are lighted from behind the drivers, so they never have to face a glare.

In tennis, the speed of play and small size of the ball require intense illumination, all downward. Lacrosse is similarly exacting. The playing field, measuring 80 by 172 feet, is walled in with wire screens twelve feet high. Electricians string an overhead latticework of cables from which are hung dozens of brilliant 1,500-watt floodlights, pointing straight down. The playing field thus is one brilliant rectangle upon an entirely dark field where players can be seen clearly darting to and fro.

Auto racing is the most exacting of all sports in its demands. Imagine what would happen if the lights suddenly went out during a contest! But the "juicers" behind scenes are prepared. Through the stadium's own sub-station, a 900-ampere current constantly pours into the huge battery of incandescents. Cables bring power from two separate lines belonging to entirely different power companies. A magnetized relay, cut into the line at all times when the lights are in use, stands by for emergency. Should the power go off, a powerful impulse automatically throws the big relay levers across and switches over to the other company's lines so fast that you can't even see the lights blink.

Drivers in the midget auto races say they like night competitions better because the light is uniform and the sun never gets in their eyes. At dusk the track is watered down to exactly the right consistency. Since there is no sun to draw out the moisture, the dirt remains in perfect shape for fast driving. The tiny cars make work for the technicians, though. One man has to spend all his time keeping the lights in mechanical shape, cleaning, polishing, and adjusting. The put-put of the exhausts leaves behind an oily film on the lenses that absorbs much light. Three races cut down lighting efficiency by twenty per cent.



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Find new thrills with a new 1938 Indian! Prices begin at \$215 for the twin-cylinder Junior Scout—America's greatest motorcycle value. All models, including DE LUXE 4, CHIEF 74 and SPORT SCOUT, can be purchased on Indian's easy pay-as-you-ride plan.

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16-19 years 20-29 years 31 years and up under 16 years

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 Complete with instructions and data on plant needs

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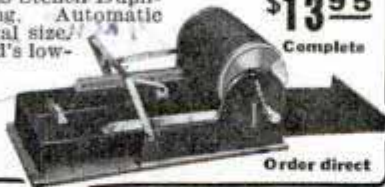
New 100 page book contains most complete list of woodworking supplies in the world—Standard American woods cut-to-size at bargain prices. Rare imported woods, Veneers, plywoods, inlays, carved legs, mouldings, decorations, special tools, Hard-to-find ornamental hardware, scroll saw patterns, wood-finishing instructions—How to make Venetian Blinds at 1/3 store prices. Send only 10c for Catalog No. 10 to Craftsmen's Wood Service Co., 2727 S. Mary Street, Dept. 3395, Chicago, Ill.

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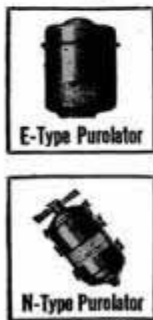


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Life Saving Inventions

(Continued from page 701)



To keep your motor healthy — keep your oil clean! Purolator removes solid impurities from your motor oil. If allowed to circulate, these impurities may stick to the bearing metal and cause sufficient friction to seriously damage the bearings! Prevent this damage by providing Purolator protection. Replace your Purolator cartridge every 8000 miles ... or whenever examination of the oil indicates the need. Motor Improvements, Inc., Newark, New Jersey.

Replace your Purolator cartridge regularly!

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THE OIL FILTER ON OVER 85% OF ALL 1938 FACTORY EQUIPPED CARS

Attention: Compressor Users THE SMITH AIR COMPRESSOR cuts the cost of compressed air

If you use a compressor, by all means, investigate THE SMITH. Powered by a FORD MOTOR it gives smooth, low-cost performance. Used the world over to replace large, cumbersome compressors in a majority of work such as drilling rock, breaking pavement, riveting, sand blasting, spray painting, metallizing, and general use with pneumatic tools.



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tries. Ranging in size from the portable devices used by utility workers in testing manholes for leaking gases to the large automatic mechanisms that determine, record and control the carbon-monoxide fumes in great plants, these devices have a wide application.

When a refinery worker has an assignment to go into a bulk storage tank to do some welding he wants to be certain it has been sufficiently purged of gases to make the job safe. If he's smart, he runs a sampling line of a combustible gas indicator into the tank. In a jiffy he knows if it is safe for him to enter. Another type detector, known as the Hoolamite, used in checking for the deadly carbon monoxide, makes accurate tests in ten seconds, even when there are fumes, smoke, and other gases in the atmosphere. This detector has come out of the chemistry laboratory. Essentially, it is a small tube filled with granules of an inert, white solid substance impregnated with iodine pentoxide and fuming sulphuric acid, and connected through a small receptacle filled with gas purifying material to a rubber hand bulb aspirator. Any carbon monoxide in the air drawn through the detector reacts with the iodine pentoxide to form carbon dioxide, and liberates free iodine. The liberated iodine imparts a greenish-blue color to the white granules. The color produced by a different number of squeezes of the bulb is compared with a standard color scale, and the amount of carbon monoxide estimated.

Another detector warns of the health hazards from hydrogen sulphide. Its basis is the reaction of silver cyanide with hydrogen sulphide. The latest of these instruments is the mercury vapor detector.

Other items of industrial safety include respirators for protection from smoke, flame, and chemical fumes; safety hats and helmets to prevent skull injuries, shields to protect the worker's skin and his eyes from injurious light rays; pads for the stomach to prevent injury from wood thrown from a saw, and protective coverings for arms, fingers, hands, and legs.

For example, if a packing-house butcher were to don all the equipment worn for

(Continued to page 155A)

William Products, Inc. Safety Ap

Mine Safety Ap

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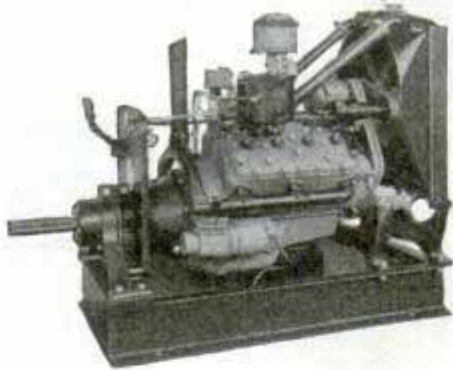
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Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks **out of actual savings!**

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(Continued from page 152A)

different jobs in his plant he would resemble a knight in full armor. A hard fiber helmet is worn in departments where meat travels on an overhead conveyor. To preclude being cut, a leather apron, leather and mesh forearm guards, and finger guards are standard equipment. Boots have non-slip soles and heels and metal-capped toes; knives have a safety guard between the handle and the blade.

Many savings in accident costs have been brought about by dressing exposed moving parts of machines with guards. Adequate lighting also has proved a valuable ally in the fight on accidents. Damage claims have been decreased as much as forty per cent in manufacturing plants by revamping the illumination system.

Although this accent on safety practices has cut the number of industrial deaths to less than half the 1913 figure, the safety engineers cannot rest on their laurels. Destructive machinery is constantly being developed ahead of the techniques for controlling it and new applications of science are being brought into industry before their dangers can be fully studied.

The safety engineer has found the farm a fertile field. Agriculture hasn't paid much attention to safety methods and statistics show that it is the country's most hazardous industry. And the principal cause of accidents on the farm as in other lines is carelessness!

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Raising or lowering the volume of the automobile radio according to driving conditions, an automatic switch available on 1938 Oldsmobile cars utilizes the variation in air speed created by the engine fan. Turned up to compete with engine noise during fast driving on the open road, the radio must be quieted when the car slows down in town or at intersections. The switch performs this duty automatically. A slightly curved vane extends into the air stream from the motor fan, and at approximately fifty-seven miles an hour the air pressure moves the vane backward, closing the booster switch and lifting the radio volume. As car speed decreases the vane moves forward and breaks the booster circuit.

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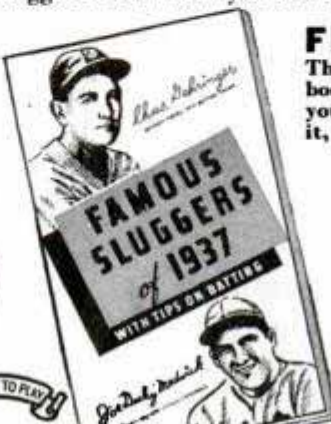


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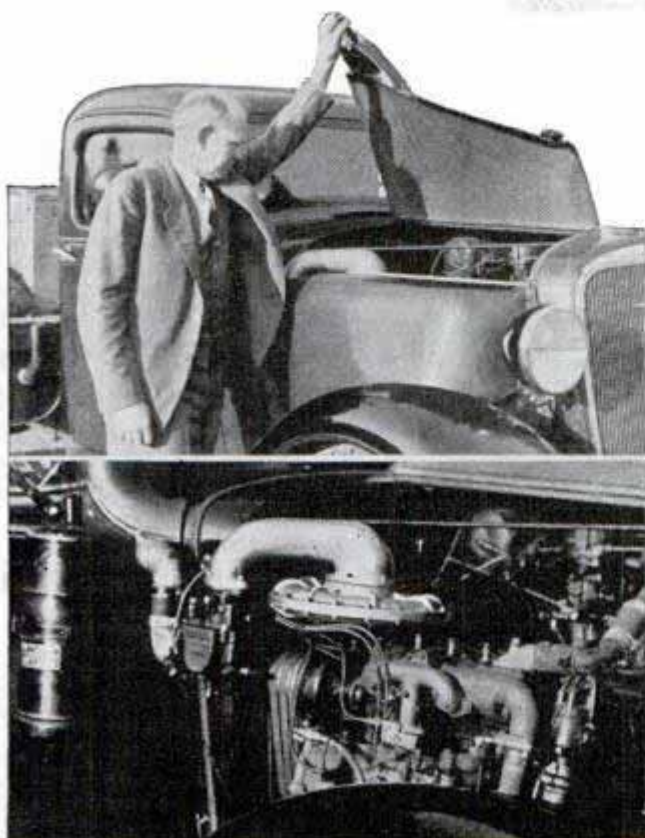
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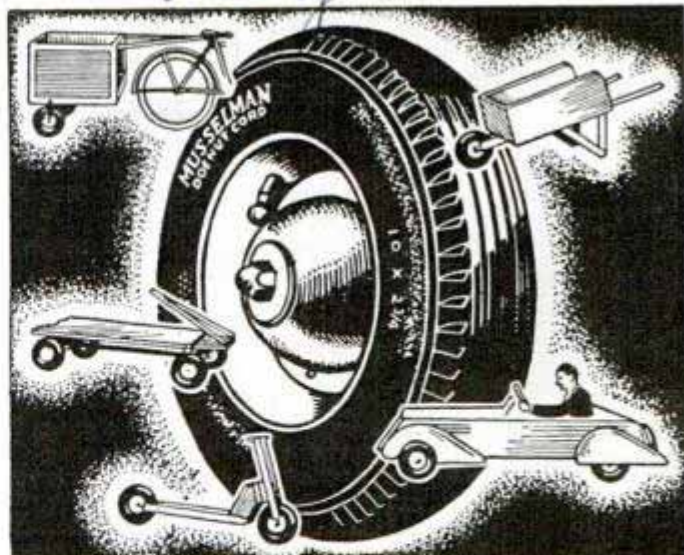
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Supercharger for Truck Saves Time on the Road



Top, side of hood is rounded to accommodate supercharger motor shown in bottom photo

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Above shows photo of American Holly rooted in 6 weeks. An astonishing performance!

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Millions of users know Graphite in dry form is longer-lasting and far superior to oil or grease for thousands of miscellaneous lubricating applications. Heat, cold, water, oil, other solvents, pressures, and speeds cannot destroy or displace it. Never hardens, gums, drips, smells, or fails... In other applications, Graphite added to oil or grease makes the truly super-lubricant. A "shot" of Graphite makes everything work, run, or operate noiselessly; drives and keeps out power-wasting friction. Keep a "Gun" near you for daily use in your home, car, work or play.

**"JUNIOR"
MODEL 30¢**

Made of Flexophane—throw away when empty—contains 900 applications—individually mounted on directions-and-display card.

**RUBBER MODEL
REFILLABLE 75¢**

Lasting, durable construction—for shop, bench and all servicing—often preferred by mechanics. 8 refills cost only 50¢. Full directions on wrapper.



JUST SQUEEZE!

**Users, dealers, jobbers: write Dept. C-G 26
JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.**

**DIXON'S GRAPH-AIR GUNS
AND MICROFYNE GRAPHITE**
PATENTED U. S. AND FOREIGN COUNTRIES

Thrilling NEW

**EVINRUDE
"Ranger"**
ONLY \$47.50



A brand new Evinrude... amazingly light, handy and powerful. Weighs only 16 lbs., and cruises 3 hours on a single fill! Literally packed with big-value features including famed Hooded Power—Evinrude Co-Pilot—Underwater Silencing. Starts instantly!—spins into action with a flick of the starting cord. Costs less than 3¢ an hour to operate. Send for catalog!

ELTO PAL only \$37.50

Elto PAL (built by Evinrude) weighs only 14 pounds, and drives boats at twice the speed of oars. Elto ACE, \$47.50—the husky Hand-twin, only \$67.50. Each an outstanding value! Address **EVINRUDE MOTORS, 5462 N. 27th St. Milwaukee** Prices F. O. B. Factory

FREE Catalogs!
Write for 1938 Evinrude and Elto catalogs... Be Director of Boat-and-Motor Selector.



EVINRUDE OUTBOARD MOTORS

NEW! IVORY ZEPHYR RADIO



Lots of 6 **\$10.75** Sample \$11.30
FULLY GUARANTEED

Another "scoop" for ZEPHYR is this marvelously beautiful new radio with beautiful chromium bands and illuminated red and green dial. 5-tube AC-DC, short-wave switch, full 5-inch electro-dynamic speaker, self-contained aerial, size 15" x 7 1/2" x 5 1/4". RCA Licensed.

\$14.45 CLEAR PROFIT
On salescard plan giving away radios free. Send 10¢ for sample salescard and plan.

1938 Catalogue FREE
53 MODELS—LOWEST PRICES. All-wave Radios that get Europe. Automatic Tuning. Car, Farm, and Beautiful Console Radios with 16 tube circuits.

Write for your Catalog NOW.

INSPECT IT FREE
Rush \$2.00 deposit for sample. Pay balance C.O.D. If not completely satisfied, return radio within 10 days for full prompt refund.

J. M. Bregstone & Co.
536 S. Clark St. Chicago, Ill.

SERA'MO AMAZING NEW POTTERY CLAY

... fired in your Kitchen Oven

EASY to shape! Fire in kitchen oven. Make beautiful vases, plaques, art objects, etc. inexpensively. 1 lb. 25¢, 5 lbs. \$1.00. **ORDER TODAY. FAVOR RUHL & CO., 425 S. Wabash Ave., Chicago, Ill.**

See Article April Popular Mechanics—Page 611

For Economy BUY — For Income SELL

The FIFEL-GEARED PLIERENCH KIT



NEW 7" and 8 1/2" Sizes —
Each with 3 instantly changeable Jaws
A \$50 Service at the Cost of One Tool!
Mail this Ad Today with your address
Get **FREE**—7-Edge End-&-Angle
Screwdriver, 101 Picture Manual of Mechanics, with



User Offer, or Distributor Territory and Demo. Kit Offer.
Be a Plierench Man, They're making \$35 to \$85 Weekly!



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Outstanding . . . SKOOT - MOBILE

America's Finest Motorized Scooter

WRITE FOR FREE LITERATURE

See our advertisement page 145A April 1938 Popular Mechanics
Quality Hardware & Mch. Corp., 5839 Ravenswood Ave., Chicago, Ill.



LEARN TO SWIM IN ONE HOUR!

Great fun—learn to be a good swimmer. Develop stroke and kick. Sure-Swim keeps body in proper position. Prevents drowning. Enables good swimmer to be better and poor swimmer to be good. Can't leak. Can't get water soaked. Can't slip. Full freedom of arms and legs. Get full information **FREE. PADL-EZE SALES, INC. 1016 W. Mitchell St., Milwaukee, Wis.**

YOU'LL FIND a lot of valuable information when you have read

our new booklet, "A File For Every Purpose." Free on request. Send for it to-day. **Nicholson File Company, Providence, R. I., U. S. A. ● A FILE FOR EVERY PURPOSE**

TRAILER BUILDERS

Lowest prices in the trailer industry, for windows, couplers, lifting devices and other items. Catalog Free. Write today.
MARVEL TRAILER PARTS CO.
19020 Celestine Detroit, Mich.

New 3-Way Surface Test Indicator

SHOP AGENTS WANTED
For Machine and Tool Work and Quick Set-ups. Price \$5. Send for descriptive literature.
J. R. REICH MFG. CO.
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SPARE TIME MONEY . . .

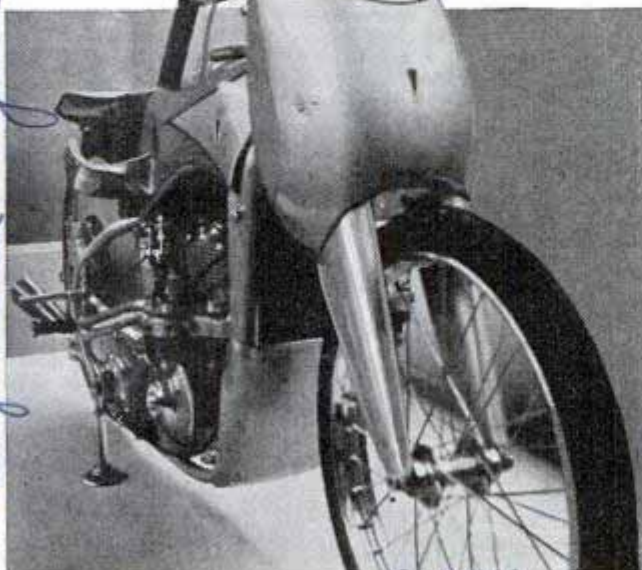
There's a big demand for the many hand-tooled articles you can make with the Easco Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores or order direct and pay postman on arrival, \$2.50 outside U. S.

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Free When ordering direct, clip name of your Department Store to this ad, and we will include with your set, one extra free project. Illustrated catalogue 10¢.
E. A. SWEET CO., Dept. A-12 Binghamton, N. Y.

Berlin, Accrdrasse,

Water-Cooled Motorcycle Engine Sets Speed Record



aerom.
This streamline motorcycle has water-cooled engine which enabled driver to set record

Equipped with a 250-cubic centimeter, water-cooled engine, a German motorcycle was driven recently to a world's record of 114 miles per hour, with flying start. The motorcycle is streamline in accordance with latest racing principles. It was displayed at the international automobile and motorcycle show at Berlin.

Control of Gravitation by Man Would Be Greatest Invention

Looking into the future of invention, a British engineer predicts that man may some day discover how to control gravitation—a revolutionary inventive step that would have a greater effect on human living conditions than any previous discovery. He foresees steam power for huge aircraft, and the transmission of power through the air. Airplanes could be flown without fuel, drawing their power from beams of energy radiated along their routes. Some measure of weather control on a wide scale may one day be possible, radio will permit men to see and speak to each other throughout the world, and production machinery will become so thoroughly automatic that man's needs will be turned out with very few hours of work by the individual.

H.A.L. Charlton

NEW KIND OF WORK GLOVE

Full Grain Wolverine Horsehide

Pony-white Horsehide
Driver's Slip-on
Pattern No. 8565



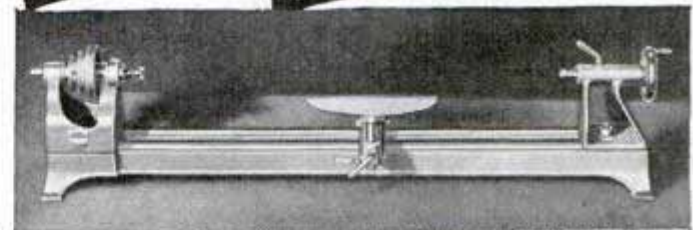
DRIES SOFT . . . STAYS SOFT!

They'll never get stiff and clumsy no matter how much they're soaked! They're triple-tanned by a secret process that makes Full Grain Horsehide soft as baby lambskin! Mighty comfortable. Plenty tough! Heat-proof. Steam-proof. A bulldog can't rip 'em. Seams lock-stitched with 4-cord work-shoe thread. Get a pair at your dealer's today. If he can't supply you, send us his name and 75c, and we'll mail you a pair postpaid. Ask for special offer No. 8565. Sizes 8 to 12. You'll swear Wolverines are the swellest work gloves in the world! They're made by the makers of famous Wolverine Shell Horsehide Work Shoes.

WOLVERINE SHOE & TANNING CORP., Dept. P5-38, Rockford, Mich.

WOLVERINE HORSEHIDE WORK GLOVES

DURO LATHES



Lead in THIS BIG LATHE \$1395
SIZE QUALITY LOW COST

10 in. Swing—31 in. Between Centers

A new Lathe designed for those who want a high quality Lathe at a low price. Bed, headstock and tailstock are made of high quality, gray iron castings, machined to the same close tolerances as all other Duro tools. The large self-lubricating bearings are mounted directly in the headstock, no die cast bearing mountings to wear and cause misalignment.

Ball bearings take up end thrust. Three quarter inch spindle with three-eighth inch hole drilled through. Both head and tailstock spindles machined for No. 1 Morse taper. Shipped complete with spur center, cup center, tool rest and holder, and wrench.

Duro Metal Products Company
2649 N. Kildare Ave., Chicago, Ill.
New York Showroom
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Weight
320
lbs.

\$85.00
Less Motor Drive
Sold on Easy
Payments as
Low as \$6.00 a
Month for 12
to 18 Months.

No. 415-YA, 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Driven Adjustable Countershaft, 1/4 h.p. Reversing Motor, Switch and Belts. (\$15 Down—\$6 Monthly for 18 Months)

\$117.00

**INVALUABLE TO INDUSTRIES
EVERYWHERE FOR HANDLING
PRECISION OPERATIONS . . .**

**SOUTH BEND
BACK-GEARED
SCREW-CUTTING
PRECISION LATHE**

This 9-inch South Bend Lathe used by:
**MANUFACTURERS
TOOL ROOMS
LABORATORIES
MACHINE SHOPS**

- Automotive
- Electrical
- Gun Smiths

**U. S. GOVERNMENT
SCHOOLS
HOME WORK
SHOPS
INVENTORS**

The 9" x 3' South Bend Precision Lathe does these operations:

- TURNS—BORES**
- CUTS SCREW THREADS—FACES**
- DOES MILLING, CHUCKING, REAMING, DRILLING, FILING AND HUNDREDS OF OPERATIONS IN STEEL, IRON AND OTHER METALS.**

There are 5 sizes of South Bend Lathes—9", 11", 13", 15" and 16" swing with bed lengths 3' to 12'. In motor or countershaft drives. Priced \$85 to \$1500.

WELL-KNOWN industries everywhere are using the 9-inch Workshop South Bend Lathe—and finding it the most profitable investment they can make. Designed and constructed for precision accuracy, this 9-inch Lathe handles machining operations to the most exacting specifications. Workmanship and new features insure speed, accuracy, and versatility. Industry finds it cannot afford to overlook this remarkable tool.

Features include—Twin Gear Reverse to Lead Screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads from 4 to 112 per inch, 3/4-inch hole through spindle taking collets up to 1/2-inch, V-ways on lathe bed.

38 attachments are available for milling, grinding, draw-in collet chuck work, taper work, and many other operations. Made in 3', 3 1/2', 4', and 4 1/2' bed lengths. Costs less than 2 cents per hour operating from ordinary lamp socket.

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WRITE FOR THESE BOOKS

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- No. 46, "9-inch Workshop Catalog," Free.

SOUTH BEND LATHE WORKS,
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Please send the books checked here.

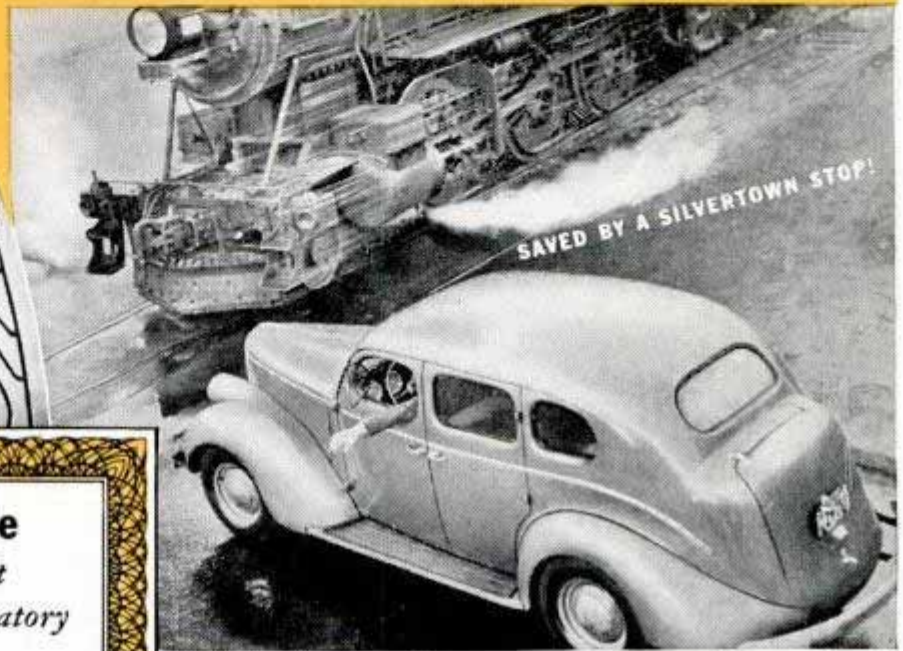
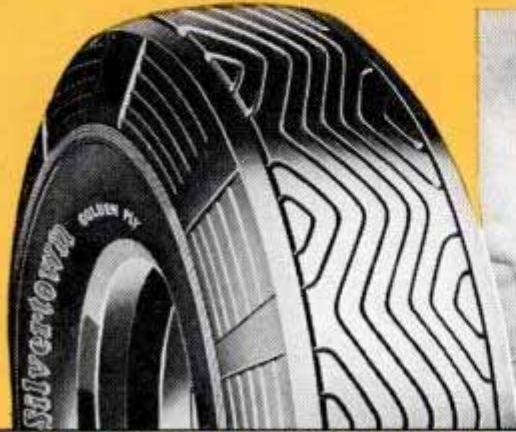
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SOUTH BEND Precision LATHES

NEW KIND OF TIRE

GIVES THE *QUICKEST* NON-SKID STOPS YOU'VE EVER SEEN!



Here's the Evidence

from America's Largest
Independent Testing Laboratory

"BOTH regular, and also the premium-priced tires of America's six largest tire manufacturers were submitted to a series of exhaustive road tests made over a three months' period by us, to determine their resistance to skidding and wear, with the following results:

"NON-SKID—The new Goodrich Silvertown with the Life-Saver Tread gave greater skid resistance than any other tire tested, including those tires listed at from 40% to 70% higher in price.

"MILEAGE—The Goodrich Silvertown gave more non-skid mileage than any of the other tires tested in its own price range—averaged 19.1% more miles before the tires wore smooth.

"BLOW-OUT PROTECTION—Despite the severe nature of these tests, no Silvertown blew out, or failed from any cause, while two tires of other makes failed."

A. R. Ellis, Pres.

PITTSBURGH TESTING LABORATORY



Wins Hands Down in Competitive Road Tests by Famous Testing Laboratory

AGAIN Goodrich makes tire history! With a new Goodrich Silvertown that is really *two* great tires in one! For *inside* the tire is Golden Ply protection against high-speed blow-outs. And *outside* is the new Life-Saver Tread that, in exhaustive road tests by the impartial Pittsburgh Testing Laboratory, gave "greater skid resistance than any other tire tested."

This tread is actually a *road dryer*! Its never-ending spiral bars, acting like a battery of windshield wipers, sweep water from under the tire, force it out through the *deep* drainage grooves—make a *dry track* for the rubber to grip.

No Extra Cost!

Go to your Goodrich dealer or Goodrich Silvertown Store for a *free* demonstration. Remember, this new skid-protected Goodrich Silvertown also has the famous Golden Ply protection against blow-outs. So you get *two* great life-saving features—AT NO EXTRA COST!—to say nothing of 19.1% greater non-skid tire mileage—which means you get EVERY 6TH MILE FREE!

The new Goodrich SAFETY Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ◆ ◆ GOLDEN PLY BLOW-OUT PROTECTION

MEL KOONTZ—FAMOUS HOLLYWOOD ANIMAL TAMER—WRESTLES A LION!



Here is Mel Koontz in the cage with four hundred and fifty pounds of lion. Man and lion clinch while onlookers' nerves grow tense. Even with

the lion's jaw only inches from his throat, Mel Koontz shows himself complete master of the beast. No doubt about *his* nerves being healthy!

"I'll say it makes a difference to me what cigarette I smoke"

says

MEL KOONTZ to
PENN PHILLIPS



PEOPLE DO APPRECIATE THE
COSTLIER TOBACCOS
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THEY ARE THE
LARGEST-SELLING
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MEL KOONTZ was schooling a "big cat" when Penn Phillips got talking cigarettes with him. Mel gives his slant, above. And millions of other men and women find what they want in Camels. Yes, those *costlier tobaccos* in Camels *do* make a difference!

Camels are a matchless blend of finer, MORE EXPENSIVE TOBACCOS — Turkish and Domestic

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ONE SMOKER TELLS ANOTHER...

"Camels agree with me"