

WAR BIRDS WITHOUT WINGS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



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SEE PAGE 221



The Guide to Better Value in '41



- 1 Advanced streamlining on longer, lower, wider body.
- 2 More spacious interior with wider front seat.
- 3 Concealed running boards and door hinges.
- 4 Doors hinged at the front for greater safety.
- 5 Streamlined door handles harmonize with exterior.
- 6 Dome light operates automatically as well as manually.
- 7 Wider door entrances.
- 8 Door swing-stops hold doors open for more convenient entrance and exit.
- 9 New flowback slant to windshield.
- 10 New double-curved back window.
- 11 Wider steel floor further strengthens Unisteel structure.
- 12 New steel reinforcements front and rear.

THERE'S no doubt that the 1941 Unisteel Turret Top Body by Fisher does more this year than ever before to set the new General Motors cars apart from the rest. Here Fisher craftsmen have truly scored one of automotive history's greatest achievements—by dressing a more spacious interior in the sleekest, fleetest lines a Body by Fisher ever had. Above and below you see the brilliant result as adapted to the new 1941 Chevrolet. And on the right are a few of the major new features this new Body by Fisher brings to 1941 General Motors cars in every price class. No wonder they're saying, "Body by Fisher is '41's guide to better value."

You'll say "CHEVROLET'S FIRST BECAUSE IT'S FINEST!"—and you'll see one reason why in the breath-taking new Body by Fisher on the 1941 Chevrolet Special De Luxe Sport Sedan. It's a longer, lower, wider Unisteel Turret Top Body by Fisher than Chevrolet has ever had.



BODY BY
Fisher

ON GENERAL MOTORS CARS ONLY:
CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • CADILLAC



WANTED

New FULTONS,
EDISONS and CHRYSLERS

The great strength of the United States is not its billions of gold, its tons of metal or its giant industrial capacity. It is the native mechanical skill and inventive power of its people.

In a crisis, this democracy always gives us the men and the ideas the nation needs.

Usually, we imagine that these ideas come from the scientific laboratories or from the drawing boards of engineers. Many do. But just as many and just as great ideas come from the men at the machines of industry.

For scientists, there is the Nobel Prize. For engineers, a score of awards. But there is no award for the gifted men now working at the lathes, forges and work benches of industry.

As a contribution to our national security, Revere Copper and Brass Incorporated is establishing an award of \$10,000.00 for the workmen in America's metal working industries.

Donald Dallas

PRESIDENT

REVERE COPPER AND BRASS INCORPORATED



The REVERE AWARD

of \$10,000 for Wage Earners in America's Metal Working Industries

THE Revere Award is made by Revere Copper and Brass Incorporated to help speed national defense by encouraging the mechanical genius and inventive talent of American wage earners.

The Revere Award totals \$10,000.00 divided as follows:

1st Award.....	\$5,000.00
2nd Award.....	2,500.00
3rd Award.....	1,000.00
4th to 9th Awards.....	250.00 each

The Revere Award is open to all wage earners (foremen and workmen) in the metal and metal-working industries and to all machine maintenance men.

Each entry remains the property of the sender.

Selection will be made by an impartial Jury of

Award consisting of men high in science, labor, the Army, the Navy and industry. The decision of the Jury of Award will be final.

Winners will be chosen for the inventions, devices, improvements or ideas which, in the Jury's opinion, contribute most to speeding up America's Defense Program.

It is desired that all entries be placed at the command of the Defense Advisory Council at Washington, D. C., subject to the entrant's own written consent.

Two or more men may cooperate in any entry.

Entries close on midnight, April 30th, 1941.

For booklet giving complete details of the Revere Award and for Entry Blanks simply write to THE REVERE AWARD COMMITTEE, Washington, D. C.



FEBRUARY, 1941

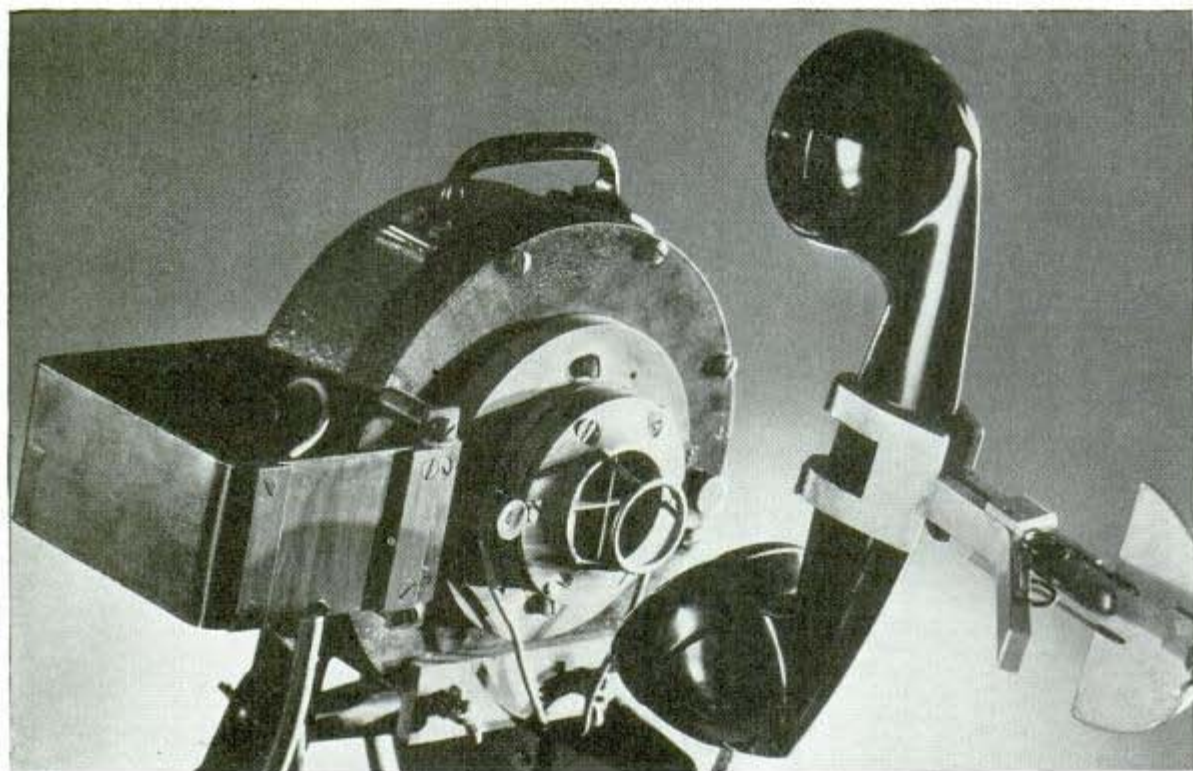
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1A



SAID THE ELECTRICAL MOUTH TO THE ELECTRICAL EAR . . .

*“Joe took father’s shoe bench out.
She was waiting at my lawn.”*

If you were passing through the Bell Telephone Laboratories today you might hear an electrical mouth speaking this odd talk, or whistling a series of musical notes, to a telephone transmitter.

This mouth can be made to repeat these sounds without variation. Every new telephone transmitter is tested by this mouth before it receives a laboratory or manufacturing O.K. for your use.

This is only one of the many tests to which telephone equipment is subjected in the Bell Telephone Laboratories. And there is a reason for the selection of those particular words.

It happens that the sentence, “Joe took father’s shoe bench out,” and its more lyrical companion, “She was waiting at my lawn,” contain all the fundamental sounds of the English language that contribute to the intensity of sound in speech.

Busily at work in the interest of every one who uses the telephone is one of the largest research laboratories in the world. The outstanding development of the telephone in this country is proof of the value of this research. In times like these, the work of the Bell Telephone Laboratories becomes increasingly important.

*The Bell System is doing its
part in the country’s program
of National Defense*



BELL TELEPHONE SYSTEM

Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

February, 1941

Vol. 75, No. 2

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How Fast Can We Fly?

SOME of America's new fighting planes would probably hit 700 miles an hour in a power dive, but no pilot will ever try it. From 30,000 feet such a plane would hurtle down to sea level in twenty or thirty seconds; there wouldn't be time to pull out. Lockheed's chief test pilot actually supercharges himself before taking up the P-38, breathing pure oxygen for a half hour to lower the nitrogen in his bloodstream lest a fast climb give him the "bends." A pilot today, as you'll read in an article next month, can actually race a bullet fired from his own plane.

Little Giants of Industry

LOCKED away in War Department vaults are hundreds of miniature working models of the weapons yet to be built for war. In industrial laboratories the wheels of scale models turn to pre-test an inventor's dream. A March feature tells how engineers use these Lilliputian machines as working blueprints for the industrial giants of tomorrow.

Next Month

TWO hundred warships are on order. Naval bases and shipyards are expanding. Defense factories are mushrooming. Yet most of these ships and plants would lie idle and useless without the life-giving power of the steam turbine. It takes six months to two years to build a turbine—and only five American companies build the big ones. Some of them require 11,000 blades, installed with watchmaking precision. An important article in March tells how "Uncle Sam Gets Up Steam."

Travel Tomorrow

OTTO KUHLER, the noted designer, takes you next month for a preview of the transportation of tomorrow. He foresees air liners standing still in the stratosphere while the earth whirls past at 1,000 miles an hour; planes run by sun power, turbine, radio-beam power or magnetic current. He anticipates flying freight trains, air-conditioned three-day ships to Europe, steamless railroads without a sleeping car. Take a look for yourself in the March issue.

Number One Airport

EVERY fifty-six seconds in the rush hour an air liner takes off or lands at New York's LaGuardia airport. Twelve men keep constant vigil in its control tower, by night watching an electric board that reveals the passage of planes on the runways as they trip controls. Visit the "Grand Central of the Airways" in next month's Coloroto section.

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Do You Know this?



This is the third and last of a series of advertisements telling car owners exactly how Pyroil safeguards their automobile investment. How it can keep the engine of your car running more smoothly and better while protecting its vital parts from many common damage dangers. Reading time only 1 1/2 minutes!



Imagine the strain on this engine when it is called upon to start. Pyroil makes cars start more easily in coldest weather and saves drain on the battery.

THE ENGINE STARTS! This immediate lubrication results in quicker starting and less battery drain. It also reduces excessive cylinder and bearing wear.

PREVENTION OF ACID-CORROSION IS ESSENTIAL

Pyroil prevents acid-corrosion attack. Acid-corrosive substances are formed as products of combustion and as products of the oxidation of oil. Only by protecting the metal surfaces against contact with these substances can destruction of the metal be prevented.

PYROIL REMOVES SLUDGE AND GUM

Formation of sludge and of gum deposits within an engine may have serious effects. Pyroil removes this material and holds it harmlessly in suspension. The gum and sludge solvent action of Pyroil maintains a clean engine in a clean and efficient operating condition.

REGULAR USE IMPORTANT

Only two ounces of Pyroil are needed for each quart of oil used in the crankcase. Only one ounce of Pyroil for each five gallons of gasoline in the fuel tank. BY REGULAR USE PYROIL GIVES YOU LONGER USEFUL ENGINE LIFE. Ask your service station or garage attendant to add some Pyroil to your car, today. Manufactured and guaranteed by Pyroil Company, W. V. Kidder, Founder, 52 Pyroil Bldg., LaCrosse, Wisconsin, U. S. A.



ADD MERELY OUNCES TO GAS & OIL

WOULD YOU LIKE TO KNOW WHAT AUTOMOBILE MANUFACTURERS SAY ABOUT THE USE OF PYROIL? MAIL COUPON BELOW FOR FREE PAMPHLET.

DISTRIBUTORS: CHECK AND MAIL COUPON FOR FRANCHISE FACTS.

PYROIL COMPANY;
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 Please send me a Free Copy of your pamphlet containing information of interest on "What Motor Car Manufacturers Say about Pyroil."
 Send Details of your plan for Distributors.
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 City or Town..... State.....

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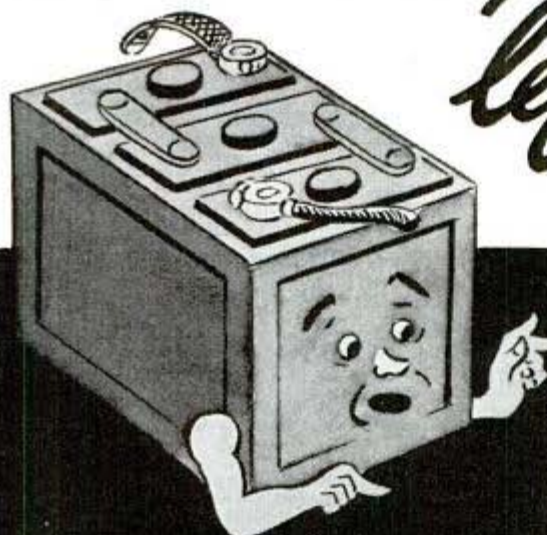
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"NO WONDER YOUR POWER IS

'left at the post!'"



Battery with Clean Connections: "Believe me, your owner had better get you to a Packard Certified Re-Wiring Station in a hurry if he doesn't want to run into a heap o' hard starting this winter. Look at that corrosion and dirt at your post connection!"

Battery with Dirty Connections: "You're not telling me a thing, big boy. I've already been blamed twice for not getting this car started, when it would take two batteries to force enough current through this dirty, corroded cable connection. What are these Certified Re-Wiring Stations you mentioned?"

Battery with Clean Connections: "They're specialists in electrical service. Every Packard Certified Re-Wiring Station has a mechanic specially trained to check for trouble in connections, cables and electrical units. He'll put the electrical system in A-1 shape—and use quality Packard cable for all cable replacements."



For Quick Starting—Improved Performance—

Get **PACKARD CERTIFIED RE-WIRING SERVICE**



High-resistance "bottlenecks" in the electrical system are common causes of trouble—hard starting, poor gasoline mileage, slow pick-up, dim headlights and many other complaints.

themselves. You'll save yourself a lot of trouble—and avoid more costly repairs later on—if you stop in at a Packard Certified Re-Wiring Station *today*. Packard Electric Division, General Motors Corporation, Warren, Ohio.

Every Certified Re-Wiring mechanic is specially trained to *find* and *eliminate* these "bottlenecks," whether they are in the connections, cables, or electrical units

Packard

REG. U.S. PAT. OFF.
TRADE MARK

THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY

HAMMER-SMITHING

The Fascinating New Art

NEW
Power Tool
Sensation
of 1941

HANDEE

Artizan



- HAMMERS
- SURFACES
- SINKS
- SHAPES
- FORMS
- PIERCES
- ENGRAVES
- CHASES
- FILES
- SANDS
- REPOUSSE

NEW and DIFFERENT HOBBY TOOL

This marvelous invention enables anyone without previous experience to produce a beautiful hand hammered finish on aluminum, copper, brass, pewter or silver—a finish that defies detection from expensive hand-wrought articles displayed in gift shops and museums.

EASY TO USE—In one evening at your work bench, desk or even the kitchen table, with the ARTIZAN you can make valuable and decorative pieces for a few cents each. No more exertion on your part than it takes to guide this amazing tool—and what a thrill you'll get! This companion tool to the famous Handee Tool of 1001 Uses does all the hard, back-aching work formerly done with hammers and punches.

Plugs in any socket, weighs only 1½ lbs. Speed of reciprocating plunger, 800 strokes a minute. Stroke variable 1/8 to 3/8".

In steel case with hammering and forming accessories, directions and materials for making artistic trays, **\$29.50** Postpaid

ORDER ON 10 DAYS TRIAL

See Editorial Page 25, Jan. 1941 issue of Popular Mechanics.



A PRIZE TOOL FOR JUNIOR DAD AND GRANDPA

Does just about everything on metal, wood, alloys, plastics, horn, bone, glass, etc. A whole shop full of tools in one. Uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave. Plugs in AC or DC socket.



Save Hours of Hand Work

FREE 64-page CATALOG

Describes all Handee Products and their wide application in crafts and industry all over the world.

10-DAYS MONEY-BACK TRIAL
For your own hobby enjoyment or as a gift. DeLuxe Model weighs 12 oz. Speed 25,000 r.p.m. \$18.50 with 7 Accessories.

CHICAGO WHEEL & MFG. CO. 108 S. ABERDEEN ST., CHICAGO, ILL. TM-2

- Send ARTIZAN on trial DeLuxe Handee
 64-page Catalog

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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.

Unusual 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 UNIVERSITY

A Correspondence Institution

Dept. 264-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.

- | | |
|--|--|
| <input type="checkbox"/> Higher Accountancy | <input type="checkbox"/> Business Management |
| <input type="checkbox"/> Law: Degree of LL.B. | <input type="checkbox"/> Traffic Management |
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| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Stenotypy | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Modern Foremanship | |

Name Age

Position

Address



LaSalle Extension University
A CORRESPONDENCE INSTITUTION



P. W. REPAIRS FURNITURE

Plastic Wood handles like putty — hardens into lasting wood. Makes quick, yet permanent repairs to broken furniture; resets loose drawer pulls and casters. In cans or tubes at Paint, Hardware, 10¢ Stores. Try it!



PLASTIC WOOD



USE "3-IN-ONE" ON RAZOR BLADES

Rust dulls razor blades quickly! A drop or two of 3-IN-ONE Oil applied to the edges after shaving prevents rust — lengthens blade life! Get it at Hardware, Drug, Grocery, 10¢ Stores.



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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.



PARTNERS IN THE BUSINESS OF DEFENSE !

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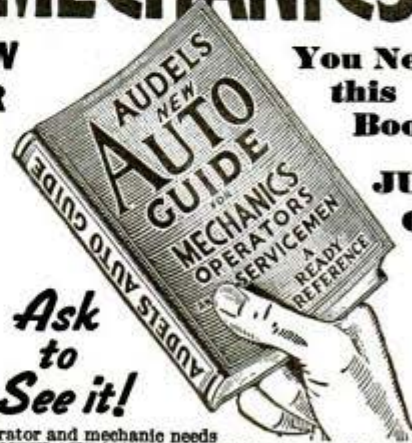
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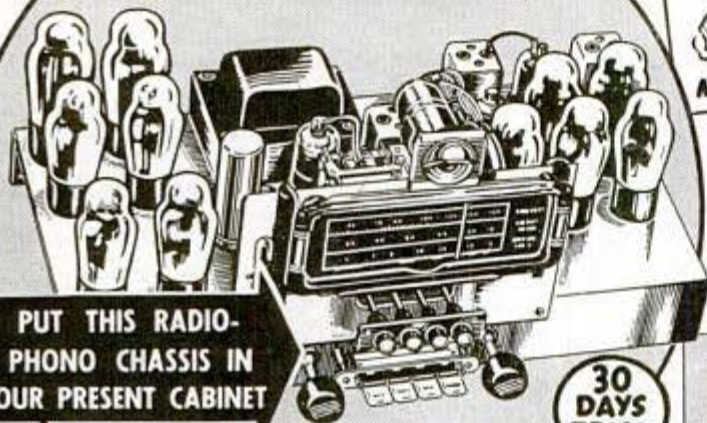
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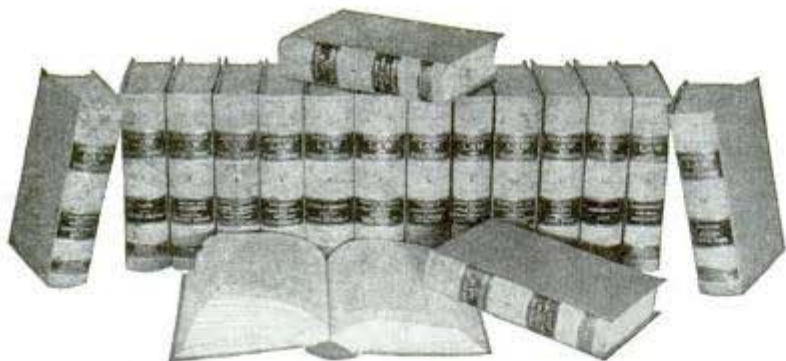
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ART Films, Sample dime, specials, Passion Play \$60, Aircraft, 1221 East 6th, Gary, Ind.

SENSATIONAL Films! Positively unobtainable elsewhere. Sample artistic film, 10c. Box 1504, Hollywood, California.

"ALL-AROUND" Reflector Company's new motion picture reflector guaranteed to increase screen illumination 40%. 10111 Euclid, Cleveland, Ohio.

16MM. Silent and sound film, sold and exchanged; also 8mm. Cine Film Mart, 110 West 34th, New York.

BARGAINS Galore. 16mm.-8mm. No-Wat-Ka, 255 Main Ave., Passaic, N. J.

FREE 16mm., 8mm. bargain lists. Home Movies, Box 216, Easton, Penna.

8-16-35MM. Silent-sound subjects, complete \$3.00. Odd reels \$1.50. Art lists, Catalogue 5c. Covel, 2120 Strauss, Brooklyn, N. Y.

GENERA Films for movie cameras. Save 50%. Send 10c—get two usable "The End" titles and big bargain circulars. Genera Company, Davenport, Iowa.

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CLOSE Outs 8—16—35. New, used equipment. National combination film library. Trades accepted, bought. Catalogues. Easy terms. Mogull's, 64 West 48 Street, New York.

LEARN Motion picture theatre projection, management. Free catalog. Give age. Theatre Institute, Elmira, N. Y.

35MM. Sound programs \$7.50. Silent features \$5.00. Bargain equipment list. Simmons, 1275 So. Broadway, Dayton, Ohio.

FREE—Sample copy Hollywood's newest movie magazine. Cin-O-Grams, 317 N. Vermont Ave., Hollywood, California.

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16MM. Laboratory, Color, black and white. Sound recording. Titles. Send for list. Film Associates, Dayton, Ohio.

UNUSUAL Art catalog; sample film dime. Erwine's Laboratories, Allentown, Penna.

SELLING Out. Lists 3c. Clifford Hoffman, 57 Broad, Albany, N. Y.

GUARANTEED 8mm., 16mm., 24-hour reversal, processing. Eso-S, 3945 Central, Kansas City, Missouri.

MONEYMAKER! "The World's Greatest Passion Play" 16mm. and 35mm. Specify sound or silent. Rent or purchase. Superior than Oberammergau play. Hemmenway Film Co., 377 Church Street, Boston, Mass.

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MUSIC Printed \$5-100. Composing, arranging. Auto-Litho Co., Jensen, Fla.

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MUSIC Composed to poems. Frank Wildt, Music Publisher, Lancaster, Penna.

SONGS Composed special dance arrangements, excellent opportunities. Basil Alt, Ottoville, Ohio.

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

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INVENTION Finance Magazine, 80-G Wall Street, New York. Important particulars free.

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OPERATE Mail order business at home. Details dime. Maples, 3418 South Marshfield, Chicago, Illinois.

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BIG Mail! Circulars, propositions, 3c. Warner, 2012-P Leroy, Jackson, Michigan.

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250 MONEY Ideas 25c. Literature 3c. Morrelle, 130N State, Chicago.

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STOVE Lining—Furnace. Iron. Fits all. Patented. Circulars free. Benjamin Co., Granite City, Ill.

WE Pack products under your label. Cleaners, food products, etc. Big profits, low prices. Samples free. Bestco, 5007 Irving Park, Chicago.

HUGE Profits selling new "20-in-1" kitchen necessity. Retails 25c. Costs you \$1.00 a dozen or \$7.20 a gross F.O.B. here. Sample 10c. New Method Co., Box PMM-98, Bradford, Penna.

SELL 1941 Tax records—Every type business. Huge profits. Records Co., 2626 N. Irving, Minneapolis, Minn.

FREE Water and our concentrates make 68 products. We supply labels, bottles. Enormous profits. Quilco, E-20030 Russell, Detroit.

MAKE Easy money visiting friends with display of gorgeous dresses. Amazing values. No investment, experience. Samples free. Harford, Dept. 5-242 Cincinnati, O.

ELGIN And Waltham wrist and pocket watches reconditioned like new, from \$2.95. Write for catalog. Dearborn Watch Co., 5 So. Wabash, Chicago.

ADAMS New roach gun to kill cockroaches. Tremendous market. Sensational profits. Territory information. Sample 10 cents. Adams Products, Whittier, Calif.

AMERICA'S 1941 Smash hit \$1 greeting card assortments. Everyday. Easter, etc. Sample cards 10c. Evers, 5156K Simonson, Elmhurst, N. Y.

EARN \$10-\$15 Daily applying beautiful, goldlike sign letters. Cost 1c. Sell for 25c. Free samples. Hurry! Modernistic, B-3000 Lincoln Ave., Chicago.

START Life-time repeat business on \$5.00. Brand new product. Exclusive franchise. Over 500% profit. Thermolab, Peoria, Ill.

SELL Old 97 remedies, La Charma cosmetics for white and colored. Build life-time route, or supply agents. Old 97 Manufacturing Company, Tampa, Florida.

GIVE Cosmetics free with vanilla. \$2.00 value 69c. National Sales, Box 194, Toledo, Ohio.

EARN A camera, sell 12 tubes Clearvu at 25c per tube, return \$3 and receive a guaranteed camera. Center State, Box 218, Courtland, Kas.

AGENTS: Smash on 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 Company, P.O. St. Louis, Mo.

MAN In every factory, sell gritless hand soap. No chap. Trial size quarter. T. L. DeCamp, Sta. "A," Cincinnati, Ohio.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-U Dodder, St. Louis, Mo.

CALL On service stations. New item, necessity, big profits. Kaipp, Long Beach, California.

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.

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AGENTS—300% Profit selling gold leaf letters; stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

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AGENTS—Opportunity make money; book containing 127 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

CAR Runs 50 miles without oil; new gas-oil pills, 200 mile sample, 10c. "Reardon," Peoria, Ill.

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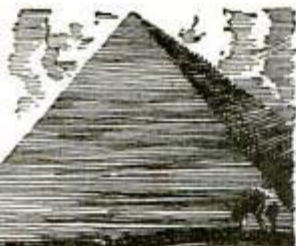
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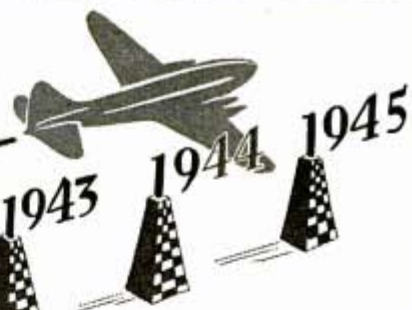
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Vol. 75

FEBRUARY, 1941

No. 2

JOBS *from* RESEARCH

By Everett S. Lee

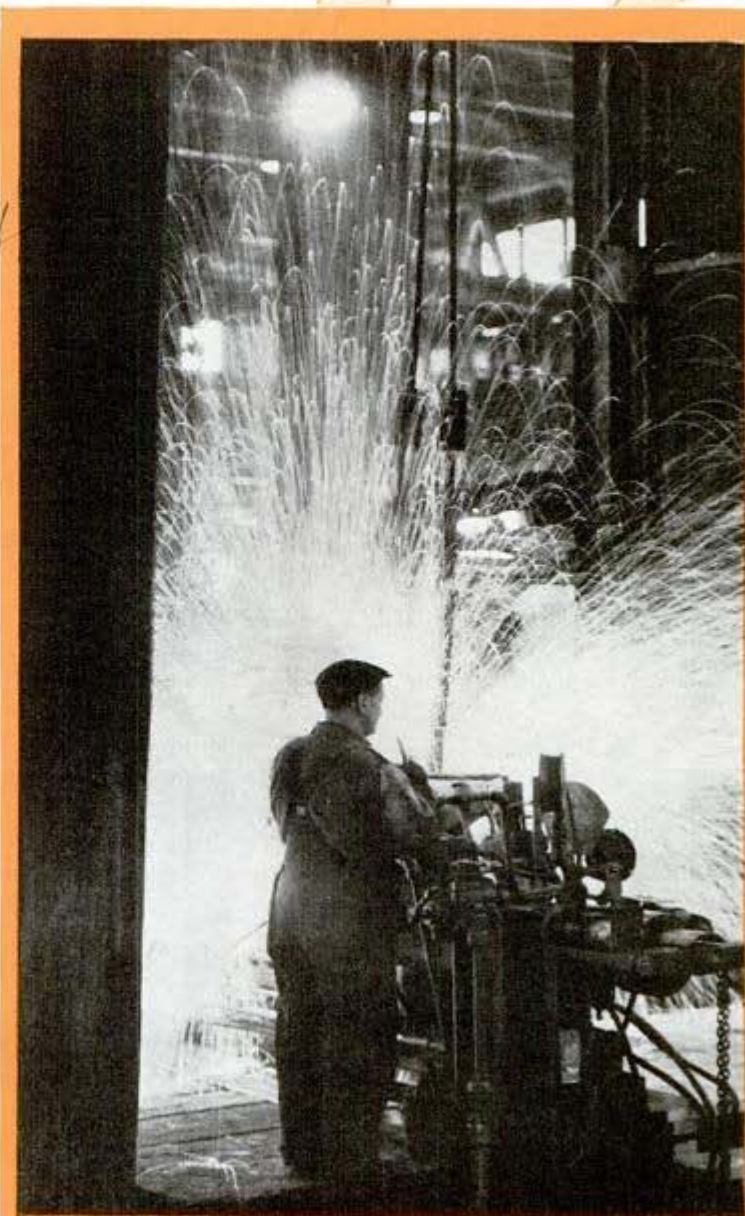
Engineer-in-Charge, General
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Schenectady, N.Y.
FIFTEEN million

Americans are at work today in jobs that did not exist in 1900. These jobs exist today because, through research, industry has been able to develop hundreds of new products and to make them so inexpensive that people have been able to buy them, thus creating a demand for more of the products.

The recent report of over 1,700 distinct research groups in this country, affording employment to some 50,000 workers, with an annual expenditure of from 150 to 200 million dollars, with an existence dating back some forty years indicates the importance of research. Yet there is room for more because 150,000 manufacturing concerns recently were found to be without research laboratories.

The job of research is to find out new things. "Test-tube babies," we



Here's what happens during the flash welding of two pieces of steel which are being fused into a magnet frame for a direct-current motor. Asbestos curtains restrict the sparks shooting from welder

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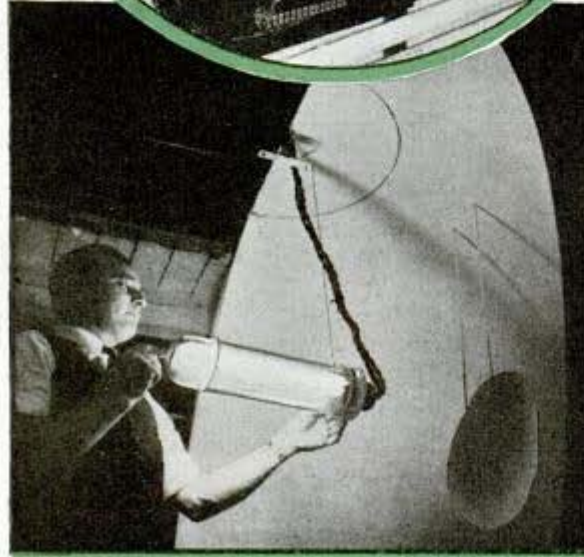
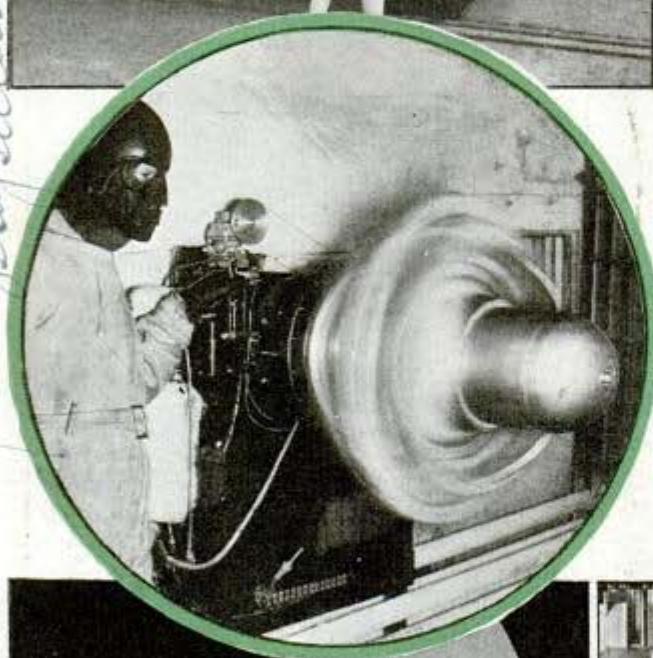
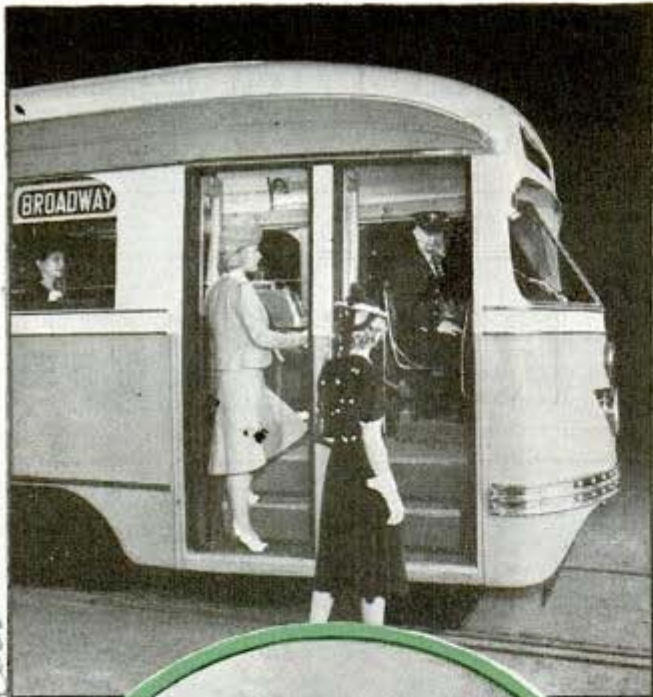
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call them. Some of them are problem children which require years of struggle before they are of value. Others develop smoothly into important roles of daily life.

Tests, research and study during a period of fifteen years brought the first hydrogen-cooled turbine generator into commercial operation in 1937, and at the beginning of 1940 there were thirteen hydrogen-cooled turbine generators in operation, with a combined rating of 816,000 kilovolt amperes, with another 1,500,000 kilovolt amperes under construction or about to be delivered.

A more familiar test-tube baby is the electric refrigerator. Electric refrigerators had existed for years practically unknown until Chris Steenstrup designed a mechanism from which came the first sealed-in steel refrigerator mechanism. Now electric refrigerators are in at least 14,000,000 American homes.

Sympathy for research on the part of those who direct is the fountain head of new achievement. This is recognized in the electric-light and power industry where expenditures for research are continuous both on the part of

Top, a new PCC streetcar, a product of research. Circle, cold-room test of aircraft propeller. Bottom, left, sodium safety lamp for illuminating highway. Right, highway lamp reflectors

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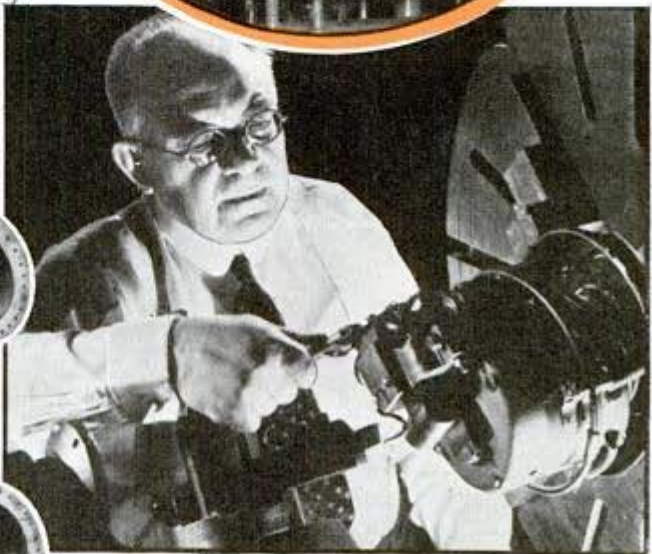
Mary E. Heil, Schenectady
E. S. turbine buckets

the manufacturers who produce the equipment and on the part of the operators who use it. One result is that the average resident today uses three times as much power, compared with 1913, at an increase in total cost of only thirty-five per cent. At the same time the number of users of electricity increased so much that the central station industry increased its employes from 79,000 in 1913 to 270,000 in 1938, a 341 per cent gain.

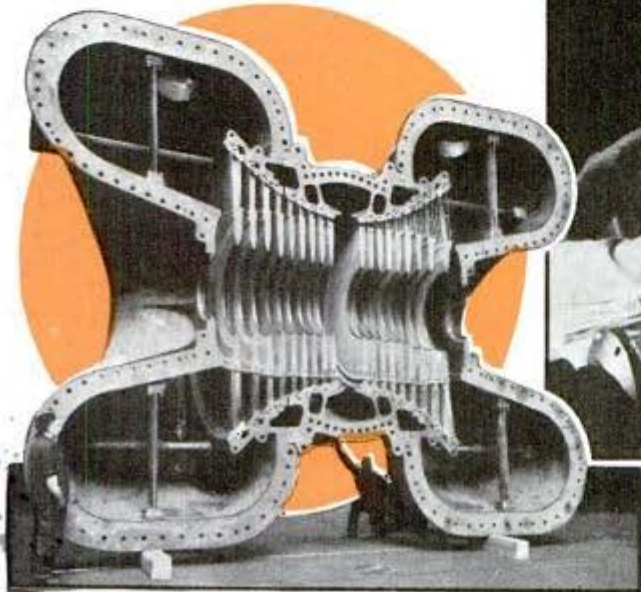
Research recently produced a new enameled wire, called Formex, of less bulk and greater durability than formerly because of a remarkable insulation derived from coal and lime. To prove this advance a new measurement had to be devised—a heat shock test in which the old product blistered while the new product remained durable and firm. To test Formex these instruments were developed: abrasion tester for measuring the durability of the film; compression tester for determining the solidity of the film; continuity tester for assuring that the film is perfect throughout without any holes or flaws; reflection meter for determining that the film has been

(Continued to page 128A)

Top, young lady posing with "shirt" of steel blades which turn a huge turbine. Circle, Dr. Francis Norton, research scientist, performing experiment with liquid air



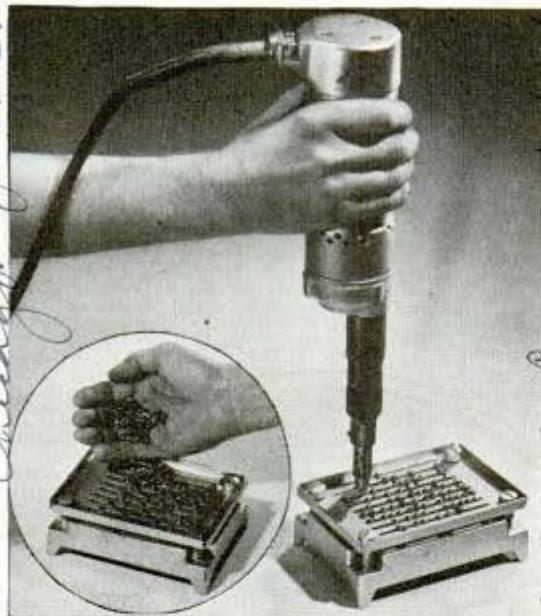
Left, steam turbine casing and exhaust hood. Note figure of man kneeling between the huge sections. Right, Chris Steenstrup at work on electric refrigerator mechanism



10-20-41 E. S. for Ford motor

K1279.

Screws Line Up in Tray for Automatic Pick-Up

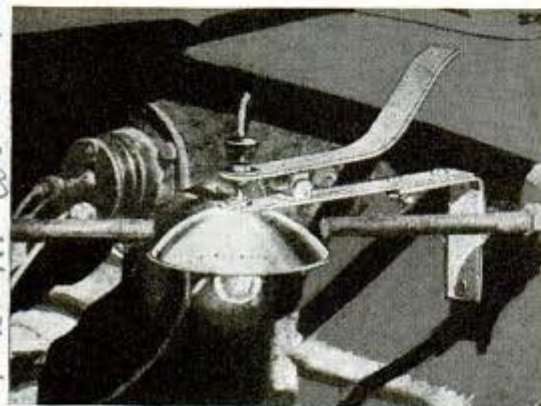


Screws dropped into slots array themselves "heads up" for automatic pickup by power screwdriver

Using a power-driven screwdriver and a tray that arranges the screws for automatic pick-up, you can load and drive screws with one hand. The screws turn heads up when dropped and shaken on a tray that has longitudinal slots. The electric driver has a "finder" head that picks up a screw, holds it firmly in alignment and drives it into a tapped or drilled hole. No hand starting of the screw is necessary.

Light Mounted over Car Engine Turned On by Lifting Hood

Installed above the automobile engine, a handy lamp lights automatically when the



Electric light mounted in reflector over car engine is switched on automatically when you raise the hood

Chicago

hood is lifted. It is bright enough to illuminate the entire engine for making emergency repairs, checking the oil gauge, and for other inspection. The lamp may be fastened either with or without brackets.

K1274.

Folding Reflector Set on Road Protects Stalled Motorist

Protection for motorists while fixing tires on the highway at night is offered by a folding pocket-size reflector that stands up when



opened so it may be placed on the road to warn drivers of approaching cars. It folds up flat, the lids, which are made of plastic material, closing upon the reflector. It may be carried in the coat pocket, glove compartment or in the pocket of the car door.

K1059

Photo Album Displays Prints and Film Negatives



Filing away a negative inside a loose-leaf envelope that has a print fastened on its face

Both prints and negatives can be filed conveniently in a photographic album just made available. It is of the loose-leaf type, the films and duplicate prints being filed in detachable envelopes while the exhibit pictures are fastened on front and back of the envelopes. The album holds at least sixty prints and films.

Rough paint may cut the speed of a fighting plane by as much as eight miles per hour, and projecting rivets can decrease its speed by fifteen miles an hour.

POPULAR MECHANICS

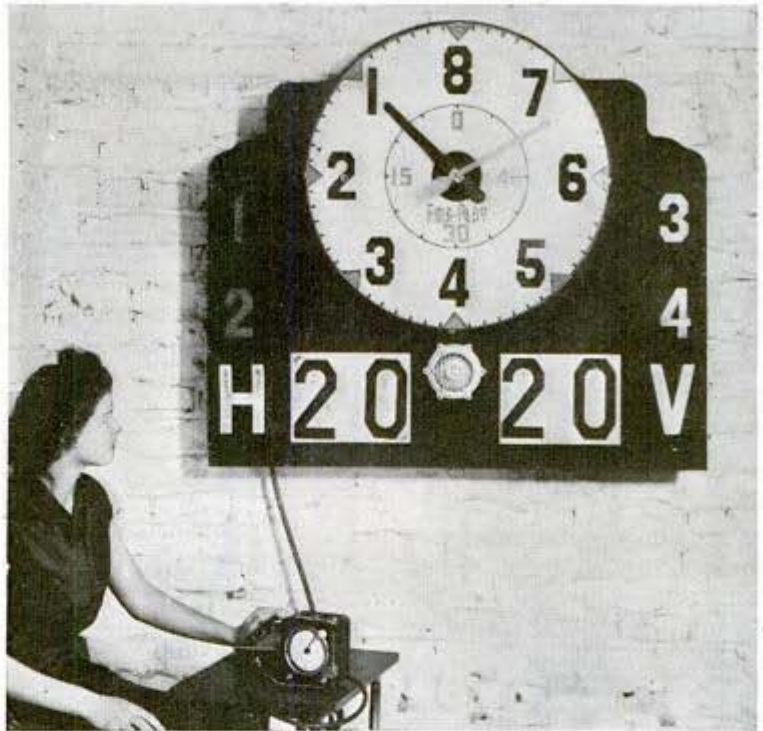
Illustrated London News
8/10/40

Independent Pneumatic Tool Co. 600 W. Jackson. Chicago, Ill.
Telco. Inc. 112 N. Evans St. Tecumseh, Mich.
Lynrite Mfg. Co. 1029 S. Warren. Chicago, Ill.
Russell Mfg. Co. Paugh-Keefe. Chicago, Ill.

K12 78. Fair-Play Mfg Co
Les machines d'ava

Electric Scoreboard Is Set by Remote Control

Remotely operated from the timekeeper's desk, an electric scoreboard for basketball and other gymnasium games shows the score, time left to play in minutes and seconds, and the quarter being played. The clock can be set from the control desk to time the game, or re-adjusted for overtime periods or errors in starting. Illuminated numbers are automatically displayed when the score is recorded at the control desk. There is also a built-in signaling horn.



Master keyboard on the timekeeper's desk operates this big electric scoreboard, which shows the time left to play

K12 89 Punching Bag Is Set Upside-Down on Portable Platform



Spring holds punching bag vertical on portable stand

Mounting the punching bag upside-down above the platform, instead of suspending it below, has made possible the construction of an easily portable stand that is adjustable in height. A strong coil spring holds the bag upright. Small rollers built into the base of the stand permit it to be moved anywhere in the gymnasium or in the home.

K12 22

Plastic Shade Clips over Bulb to Eliminate Harsh Glare

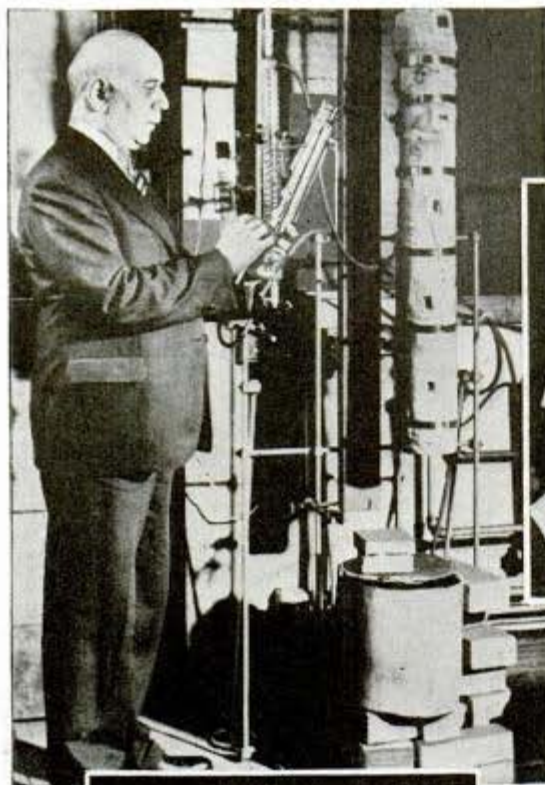
Bare electric bulbs lose their harsh glare if you cover them with a translucent plastic shade now available. It is equipped with a spring that clips on any size bulb up to 100 watts, reflecting strong light toward the ceiling and softening the downward rays. The clip attachment is firm enough to hold the shade horizontally where bulbs are set at an angle.



LaSalle Lighting Products, Inc.
143 Schenck Buffalo, N.Y.

K127 L. (Leggett)

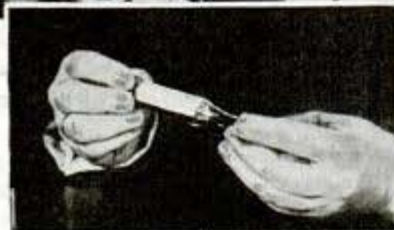
Gasoline and Coal Made from Farm Crops



Left, Dr. Berl in laboratory. Inset (below laboratory picture), holding a bottle of oil produced from plants found on farms and in forests



Left, jar of substance having same properties as coal. The substance also came from farm crops. Below, how oil is made in bomb. Steel door is closed when bomb is active



Pittsburgh, Pa.

FROM farms instead of mines and oil wells will come the coal and gasoline of the future, Dr. Ernst Berl, research professor at the Carnegie Institute of Technology, predicts. Already, in his laboratory, crude oil, bituminous coals, asphalts and coke have been produced from materials like corn, wood, algae, seaweed, leaves and molasses. These are rich in compounds known as carbohydrates, of which cellulose, starch and sugar are examples. The resulting coals, asphalts and oils, he says, have the same properties as the natural products.

Great advantage of the new process is that a fuel source is provided that can be renewed constantly. Nature's supplies of coal, gas and oil are fixed and when exhausted will not be replaced until many ages have passed. Dr. Berl states that he can make coal or oil from carbohydrates in

from one to two hours. The method, he says, is "rather simple." It involves heating the carbohydrate material under pressure with limestone. At present, it cannot compete in price with crude oil obtained from the ground, but, he declares, it is cheaper than making gasoline from coal by the hydrogenation process, which requires expensive high-pressure apparatus.

"In the United States at present there is

no industrial interest in producing crude oil from cotton, wood, leaves, grass or molasses," Dr. Berl points out, "but the time is not very far away when most of the easy-to-produce oil will be exhausted. Then, from all kinds of carbohydrate-containing raw materials, which the farmer can produce to a large extent, important amounts of asphalts and crude oils can be produced at prices which can certainly compete with other methods of the future. The transformation of carbohydrates furnishes an excellent liquid fuel which, thanks to the rather large amount of aromatic hydrocarbons, shows a rather high anti-knock value."

Estimates have been made that the United States possesses about sixty per cent of the world's coal reserves and more than fifty per cent of its oil reserves.

"We have coal for perhaps 3,000 years and probably oil also for at least one generation," Dr. Berl says. "In the future, when the low-priced crude oil will have been exhausted, methods like the distillation of oil shale and the hydrogenation of coal and carbon monoxide will be carried out. To these methods the production of different classes of substances with asphalt and crude oil properties from carbohydrates can be added. Especially in warmer climates carbohydrates are produced much in excess of what mankind would need for foods, textiles, explosives and lacquers.

Dr. Berl holds no hope for a farmer of the future making his own gasoline, for, he says, the process needs high-pressure apparatus. He would have to send his material to a central plant, as he does now with beets for beet sugar.

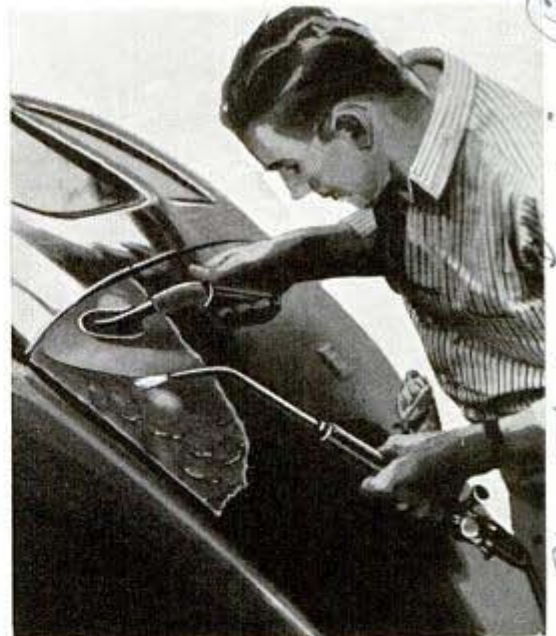
An important point about Dr. Berl's studies is that old ideas of the formation of coal and oil in nature are disproven. It has been held that lignin, the woody skeleton of trees, was the main source of all solid fuels. It has been suggested, natural oils were formed from dead fish. Dr. Berl says that the work in his laboratory has established that true bituminous coals are produced in nature from plant carbohydrates, not from the lignin, and that asphalts are the parent material of crude oil.

☐ The 31,400,000 motor vehicles in the United States could carry at once every man, woman and child in the nation and a large number of Canadians and Mexicans besides.

FEBRUARY, 1941

K1238

Oil-Filled Paddle Smooths Dents with Molten Lead



Paddle feeds occasional drop of oil to molten lead so it will not stick as it rubs lead into auto dents

Damaged fenders or car bodies may be "ironed out" easily with the aid of an oil-filled plastic paddle that spreads molten lead to fill the dents. Pressure on a thumb valve releases just enough oil to prevent the lead from sticking to the paddle.

K1246

Four Three-Leg Coffee Tables Nest Beneath Fifth One

Four coffee tables, with their wedge-shaped tops designed in quarter circles, nest neatly under a full-size table of the same circumference while they are not in use. Frames of the tables are wrought iron, with removable tops of stained glass.



Four tables, like that in hand, nest under round one

Lee L. Woodward
1684 Merchandise Mart
167

Paddle 6
 I maintain leading Paddle 6
 1552 Cleveland Pltces
 Fuller

King

Conf. Andrew Hamilton, 10999
Wellworth Ave. West Leo



MAN AGAINST

Angels



Boring into a snowdrift on one of California's mountain highways, this huge combination rotary plow has a special revolving claw attachment for reducing snowbanks

EACH year from October to March, America braces itself to meet an invader which sweeps down from Alaska and marches from the Pacific to the Atlantic. When King Winter and his storm troops attack, snowflakes rain to earth like platoons of parachutists, wintry winds uproot houses and trees with the destructiveness

of aerial bombs, and sub-zero temperatures numb men and machines like a secret "nerve gas."

America has learned how to defend itself against this annual invasion. On ships at sea, in lighthouses, from mountain-top lookouts men keep watch on the enemy's position. By radio and telephone they flash

every movement to G.H.Q. where weather experts warn the country at large.

Then, when winter strikes, a huge army of street clean-



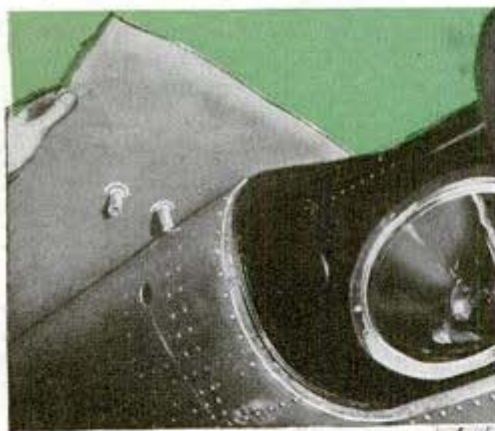
Bell

Two telephone line crossarms and lower wires are buried by snow after a storm in the California sierras, above. Right, snow is piled nineteen feet deep and wires have broken from lower crossarm

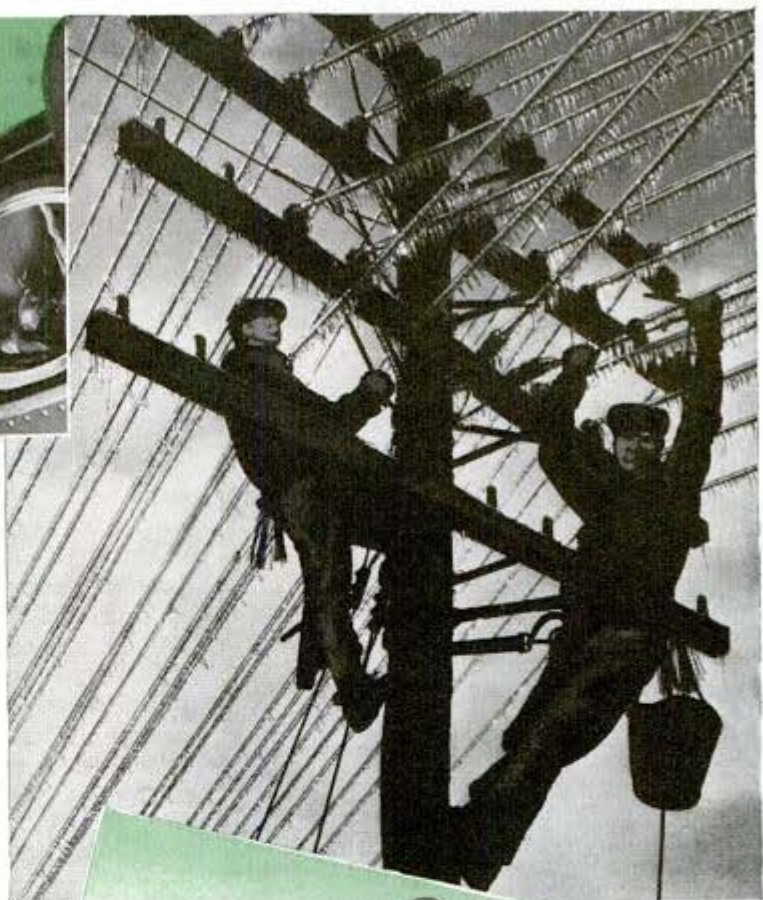


K1190

KING WINTER

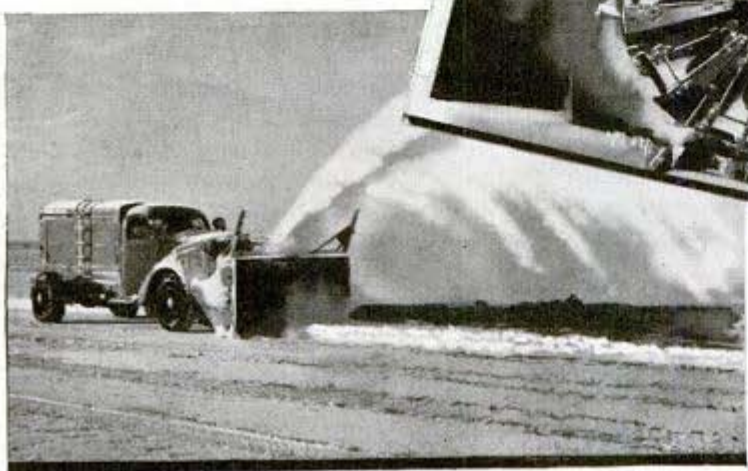
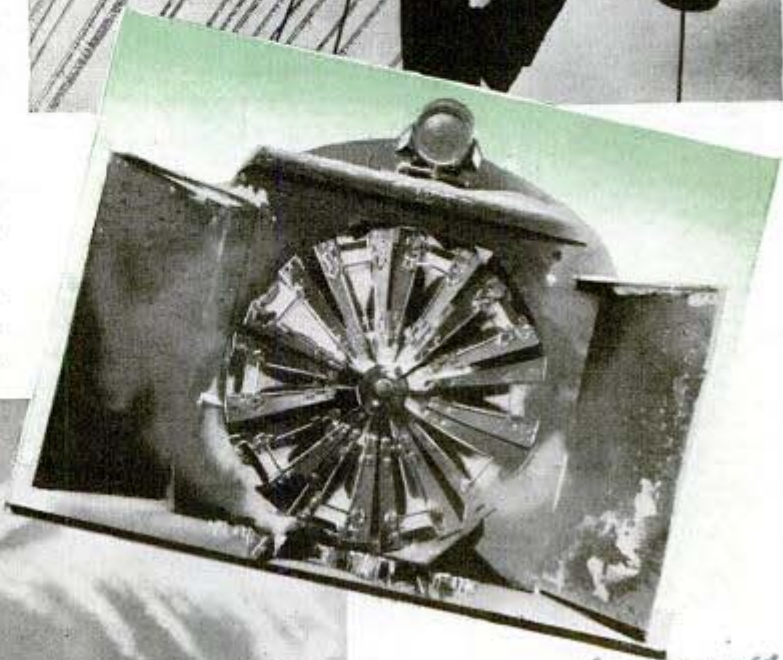


Airplane mechanic holds up one end of a rubber de-icer strip, above, showing the air insert valves. At right, telephone linemen fight a "silver thaw" that snaps wires and fells poles



ers, snow removers, telephone trouble shooters, railroadmen, airplane pilots, farmers, highway engineers and Coast Guard officers stand ready. Even when blizzards are raging, the snow fighters are working feverishly to keep lines of traffic and communication open. They are highly trained and equipped with machines scientifically designed for their battle.

The advent of the automobile placed the problem of snow squarely in



elles moines
Left, clearing an airport of snow to assure safe landings. Above is the "business end" of one of the Southern Pacific railroad's wide-wing rotary plows in the sierras. The wings give four feet extra width on each side, permitting the plow to sweep a path nearly twenty feet wide



Top, giant rotary plow in action near Truckee, Calif. Center, smudge pots fight frost in citrus grove. Below, a snow canyon in Donner Pass

America's lap. By 1915 the battle against winter had become a civic problem and the first Municipal Snow Removal Conference called upon American engineers for help. From 1915 to 1920 all sorts of weird inventions were dreamed up to remove snow from highways, streets, railroads and harbors. One proposed sprinkling the streets with hot water; another suggested electric heating units under all sidewalks; a third would have placed huge

mechanical agitators in harbors to keep the water so stirred up it could not freeze.

During the 1920's, snow fighting really began. Today it is a highly skilled profession and its emergency nature almost equals that of fire fighting.

Reliable figures have never been computed on the cost of battling snow and ice in the United States. Here, however, are some good guesses: Federal and state highways, \$13,000,000; county roads, \$20,000,000; cities, \$150,000,000; railroads, \$13,000,000; telephone companies, \$10,000,000; miscellaneous, \$25,000,000; a grand total of more than a quarter of a billion

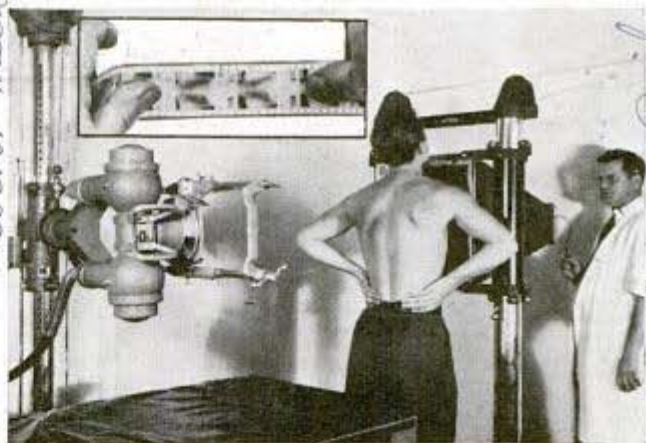
dollars annually. In a city the size of New York, it is estimated that removal costs run about \$1,000,000 per inch of snowfall.

In 1935 New York suffered one of the worst combinations of sleet, snow, rain and falling temperature — resulting in a coating of four to six inches of ice for two months. As a result of this devastating attack, the city fathers devised a special plan for training snow fighters. The trainees are sent to Lake Placid, which receives snow three or four weeks before New York. The men undergo intensive training, and mechanics

(Continued to page 146A)

Fast X-Ray Pictures Taken on Movie-Size Film

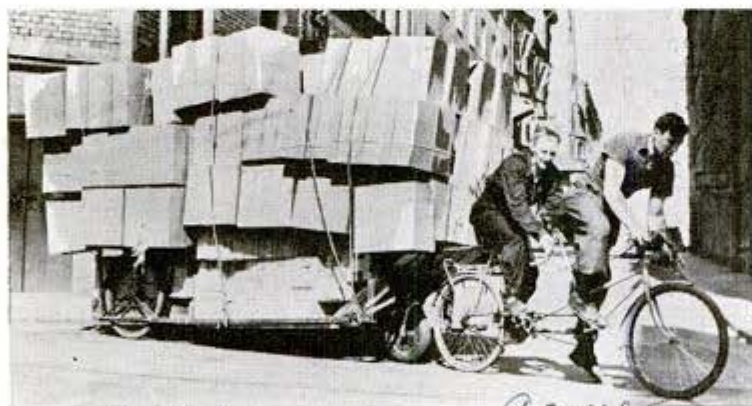
Mass health surveys are made possible by an X-ray machine that takes pictures on thirty-five millimeter film in one-tenth of a second. The new method and machine are being used in the Cadillac automobile factory. Heretofore, X-ray examination in large organizations has been almost impossible, due to the cost of making the pictures on expensive film. The new instrument, known as a photo-fluorographic unit, combines the camera and fluorescent screen. X-ray photos of a worker's chest can be made at an exposure of one-tenth of a second and those of seventeen employes can be made and keyed on a short roll of film. This film is studied under light for detailed examination. Lung ailments can be



Taking X-ray picture of worker's chest with fast camera that uses small, inexpensive film

arrested readily if detected in incipient stages, by this method. Mass examinations by governmental agencies using the equipment may be one result of the development.

Tandem Bike Tows Loaded Cart in Gas-Rationed Europe

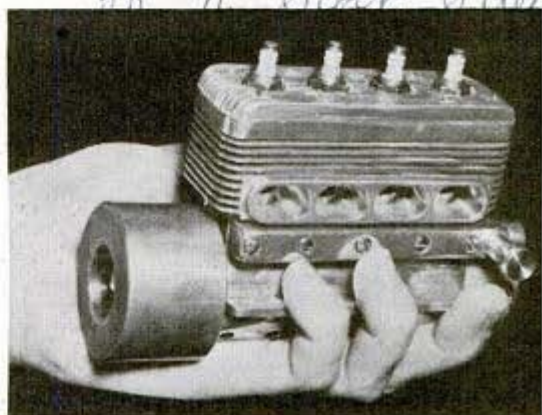


Many ingenious methods of cartage have been devised in Europe because diversion of gasoline for war purposes has curtailed the use of automobiles and motor trucks. In Sweden two youths pedal this tandem bicycle to tow a loaded cart in truck-and-trailer fashion.

Muscles instead of gasoline, supply power for hauling this trailer-load in Europe

Builder Makes His Own Tools and Alloy to Construct Tiny Engine

To build his midget engine, J. M. Moody of Tucson, Ariz., not only made his own tools but also the special aluminum alloy that went into its construction. Without the flywheel the four-cylinder power plant weighs only fifteen and one-half ounces. It is three and one-quarter inches high, and has a seventeen-thirty-second-inch bore and stroke.



Four-cylinder handful constructed of special alloy

In the refining of crude oil into gasoline and its marketing and final sale at retail, more than 500 manufacturers of 500 kinds of products contribute something in equipment or supplies.

K 1286

Electric Fan Built into Bed Keeps Sleeper Cool

Chadwyg
36 24 S. Margaret
Banner Bed Co.



Cooling breezes are wafted over the bed on hot summer nights by this built-in electric fan

Comfort for the sleeper on hot summer nights is provided by an electric fan built into the head of the bed. The fan has several speeds and the breeze can be regulated further by means of a lever that controls the vent in front of the fan. The bed is of all-metal construction.

K 1273

Skid Chains Put On with Rod without Jacking Up Car

D. W. Taylor. Chain Co.
Hammond, Indiana
chud

Fitted with a hooked rod for connecting the two ends inside the wheel, a skid-chain can be applied easily without jacking up the car. In starting, the rod is placed on



Rod held in the right hand is poked under car, behind the tire, to connect with other end of chain

172 West Albia Ave
Battery Co. 610.
W. 35th Chicago

Ho-Ray Lamp Co
1432 S. Michigan

the inside and after the chains draped over the tire, the rod is poked through, under the car, until it extends far enough so it may be reached from the other end. Then it is in position to be hooked with the loose end of the chain. Once the inside connection has been made it is simple to complete adjustment of the chain and join the ends that meet on the outer portion of the tire. The chains can be applied readily to disk wheels as well as all other designs, the manufacturer claims, even though the car is stuck in mud or snow.

K 1037

Flexible Mount for Truck Lights Bends to Fit Any Surface

Made of heavy rubber, a flexible holder permits mounting the triple lights of trucks on any curved or flat surface. Orange lights are used for front, cab mounting, and

#7 214,1240 - \$2.50



Lights mounted in the heavy rubber strip can be attached to truck regardless of irregular surface

red lights for the rear. All contact strips are vulcanized into the one-piece body, the screws are inserted beneath the light bulb and there is nothing to rust.

K 1327

Plaster Made Twice as Strong by New Heating Process

Although it is chemically the same as plaster of Paris, a new gypsum plaster, announced by E. P. Schoch and William A. Cunningham of the University of Texas, has about double the strength of ordinary plaster, and is nearly as strong as Portland cement. Instead of being made by the dry calcination or burning of gypsum, like plaster of Paris and common wall plaster, the new product is prepared by heating gypsum in a magnesium sulfate solu-

Austin Texas

POPULAR MECHANICS

Scientific Service Nov 30, 1940

Material, authorized author's own photo

1029 S. Wabash, Chicago

Leit: Lentzen & Associates

KR 77

tion. From experiments it has been estimated that it can be produced at a cost of \$8.82 per ton, but this figure probably could be reduced by large-scale production. It is believed that the chief application of the new magnesium sulfate plaster will be in the manufacture of wallboard, tile and other factory-cast articles.

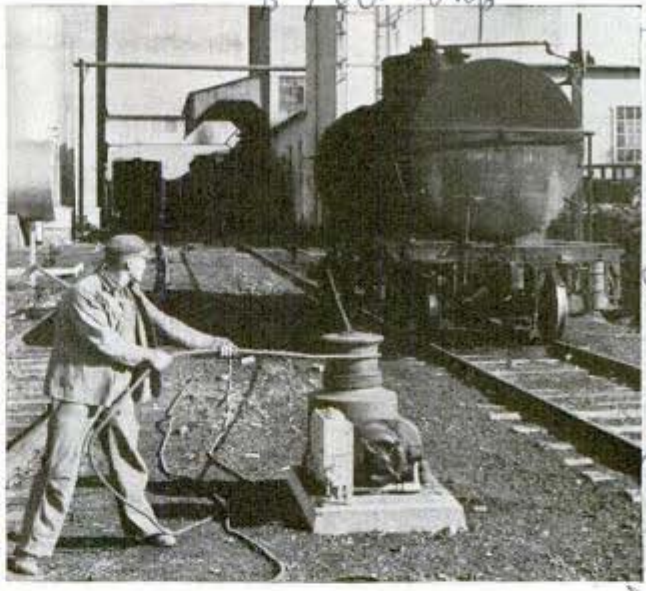
"Headlight" on Tape Reel Helps Read Numerals

Figures and markings on a steel tapeline may be read easily in the darkest corners as it is pulled from an electrically lighted reel. A small bulb at the front of the reel illuminates the tape when a switch in the base of the handle is pressed. Ordinary flashlight batteries, stored in the handle, supply the power.



Bulb in "nose" of tapeline reel lights up figures, making them easy to read in dark

Electric Spotter Hauls Rail Car Saving Switch-Engine Work



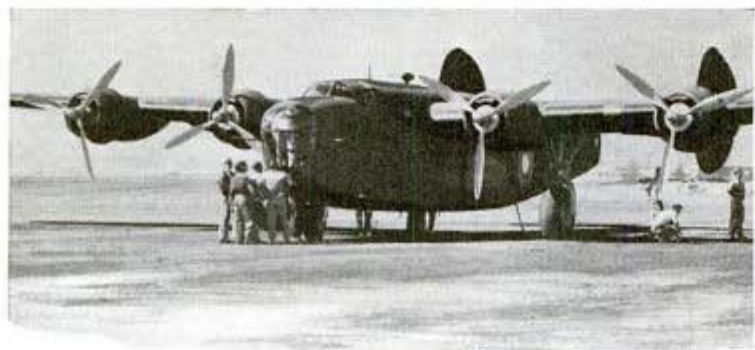
Wrapping the rope around the capstan, the operator turns on the electric motor and hauls the tank car to the desired spot

Moving freight cars in an industrial siding is a one-man job with an electric-car spotter that does the work of a switch engine at a fraction of the cost. One end of the rope is hooked to the freight car, the other is wrapped around the capstan. When the electric motor is turned on the car rolls to the spot where it is needed. A portable model can be set anywhere in the yard. Besides its use in handling freight cars, the electric capstan pulls cars in and out of ovens, warps vessels through drawbridges and along docks and drags heavy material along the ground in shipyards, quarries and the like.

Plane Flies 3,000 Miles with Four-Ton Load of Bombs

Giant bombers, rolling off assembly lines in American factories, are being camou-

flaged and test flown for a possible long hop across the Atlantic to Great Britain where they will join the royal air force. One four-motored ship, built by Consolidated Aircraft Corporation and designated as B-24 by the United States army, is capable of carrying four tons of bombs more than 3,000 miles at a speed of 300 miles an hour.



Four-motored Consolidated bomber, just off assembly line, ready to be test-flown and camouflaged for long flight over Atlantic to England

There are three and one-half pounds of salt in 100 pounds of sea water.

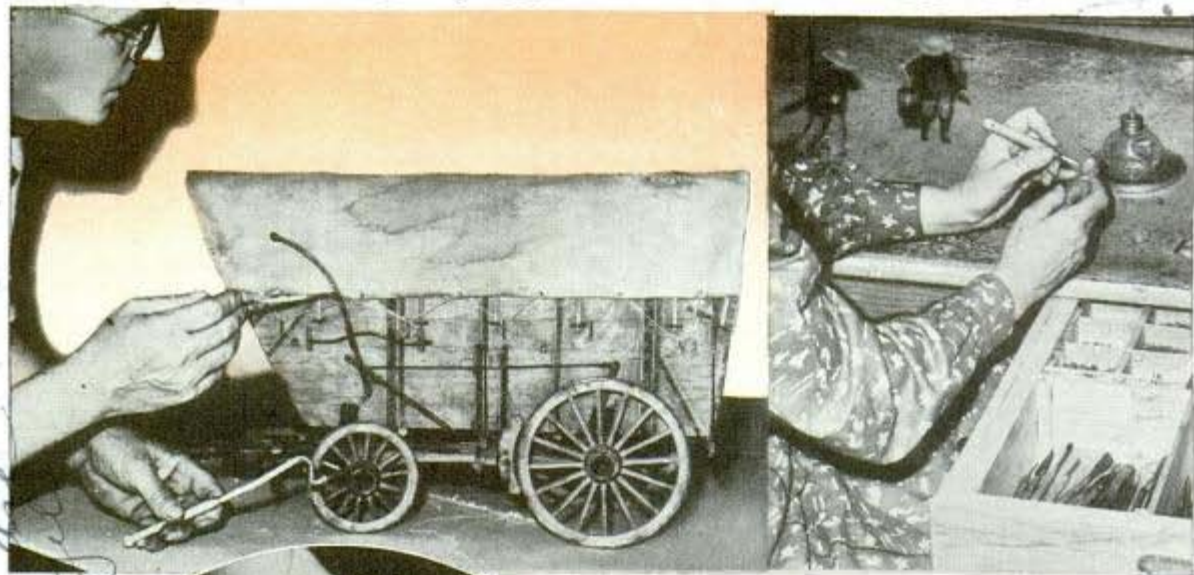
Pa. R.R. 173
Mutual Mag.

Leit: Bell Co 300 W
Washington Road, Chicago
San Diego, Calif.

Wide World

K1203

FREEZING HISTORY



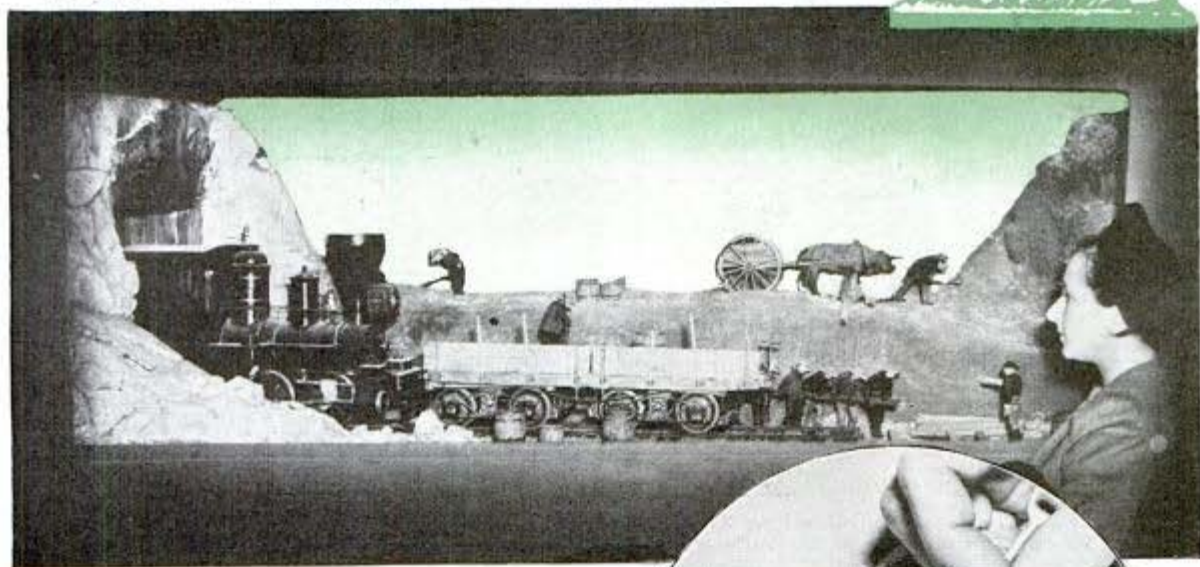
Arthur Woodward recreates moments from history. Scenes from the past are modeled for the Los Angeles Museum in such faithful detail that they differ from reality only in dimensions and life. No two soldiers in the miniature troop are of the same build or expression. Each tiny figure, scaled one inch to the foot, is sculptured of wax, and human hair is used. Research determines every detail of the setting, including lighting and weather conditions at the actual historical event being portrayed. For example, extensive study was made before reproducing the scene of the first raising of the American flag at Monterey, Calif., to ascertain that the weather was fair and the scene flooded with bright morning sunlight

Top, left, applying aging solution to brake handle of a prairie freight wagon; made of ordinary steel, it was originally the same color as rod in workman's left hand. Every detail of miniature wagon is correct, even to tar used as wheel lubricant. Upper right, sculpturing a tiny wax figure. By careful attention to facial expressions and natural positions of body, Mr. Woodward creates a feeling of reality; the figure in circle is a loafing engineer from scene depicting a moment in building of Central Pacific railway. At the right is part of the scene of the first flag-raising ceremony in California. Elaborate research was done to determine type of sea gulls to include in scene

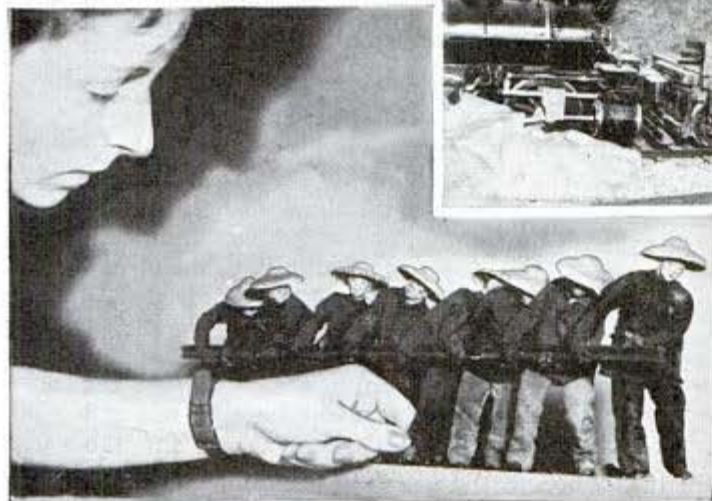
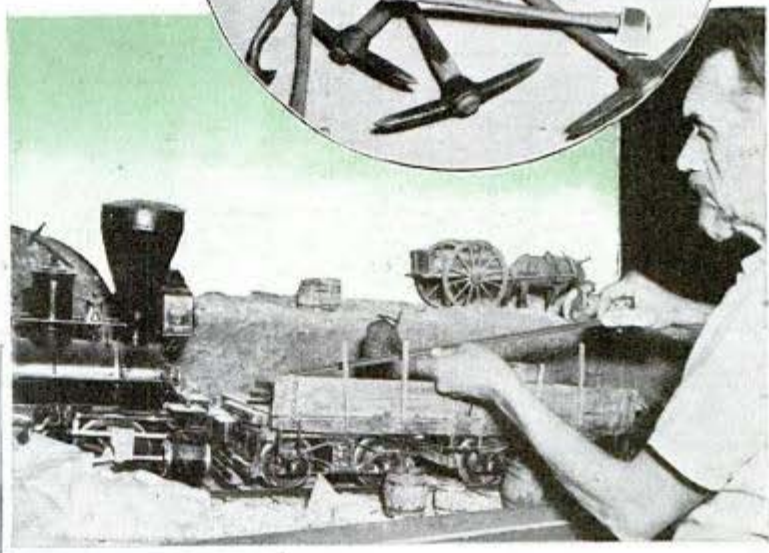


in MINIATURE

K1203



Building of the Central Pacific railroad is brought to three-dimensional life by the scene above, which required months of work. Even the miniature tools in the hands of the tiny workmen were individually hand-wrought and aged by the application of a solution of graphite, umber and sienna. Mechanical devices and guns in these museum scenes are working models, the bolts of miniature rifles and the gears of windlasses actually operating. Soldiers' sword blades are cast in plaster molds. Scabbards made of varnished cloth are then fitted around the swords, so that the blades slide in and out easily. Bayonets are fitted to the ends of the rifles in regulation manner. Another trick is the arrangement of lighting so that a glint from a gun barrel, sword blade, tool or bottle attracts the eye of the spectator to the center of action



First step in "freezing" a moment from the past is to write a scenario specifying every detail of the setting. Final step is assembling of the scene, as shown above. Steel rail being placed in the car is actually cast metal, and barrels in foreground are made in same manner as full-sized nail kegs. At left the final adjustments are being made on clothes of Chinese coolies, who are carrying a rail. Note how individual treatment of figures prevents any wooden sameness

K1266

A. L. L. Co. of America
2548
A. L. L. Co. of America
2548
A. L. L. Co. of America
2548

Front Wheels Turn Lamps Mounted on Bumper



These automobile road-lights, mounted on special brackets, turn in same direction wheels are turned

Night driving on curves is made less hazardous by mounting fog or road lights on a special bracket that automatically turns the lamps in line with the front wheels of the car, thus keeping a beam of light always pointed in the direction you are traveling. The bracket can be adjusted to hold any auxiliary light and to fit any automobile, including the latest models.

H. Lentgen & Co. Chicago
1029 S. Wabash
K1196

Hammer Blows Operate Shears Cutting through Thick Metal

For cutting through bolts, screws, rods and similar metal pieces there is a small



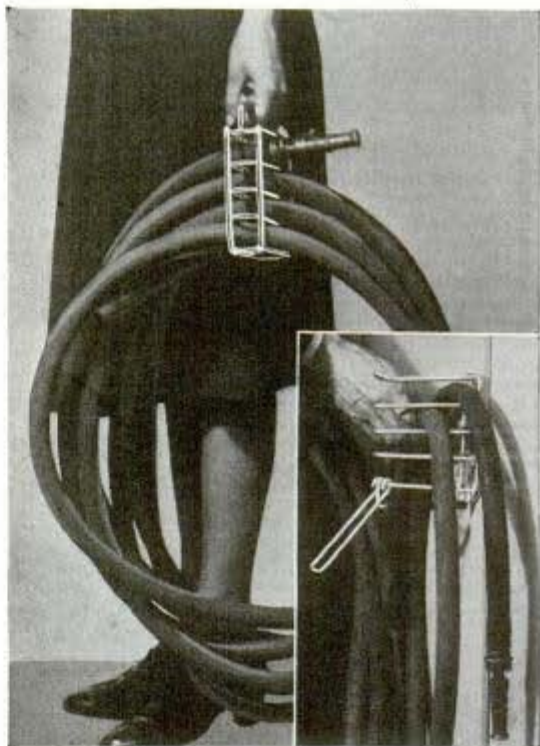
Cutting a bolt with the hammer-operated shears, which will bite through a half inch or more of metal

Harmony Products
1418 Merchandise Mart
shearing unit operated by hammer blows struck on its flattened knob. The jaws, popped open by a strong spring, will shear off bolts up to a half inch wide and with repeated blows of the hammer will bite through even thicker diameters. The unit can be carried in the tool kit, and larger ones are available for bolting to a bench.

K1167

Bracket Reels Out Garden Hose Needed for Sprinkling

Handling the garden hose is made easy by a combination carrier and wall bracket, consisting of a wire frame with sections for the coils to be inserted. The hose may be reeled on or off without disconnecting it from the faucet if desired. The bracket



Garden hose bracket may be carried by convenient handle, or mounted on the wall as shown in inset

may be hung on a wall or post, and only the length of hose required for the sprinkling job need be unreeled. It holds ten to 100 feet of hose. A clamp prevents the hose from slipping off accidentally. The rubber-covered handle forms a comfortable grip.

☐ Telegraph stamps acceptable in payment of any Western Union company services have been issued in one, two, five, ten and twenty-five cent denominations for the convenience of travelers.



1854

UNCLE SAM'S SCHOOL *for* SAILORS



177

Training ashore fits the American sailor for his duties afloat. In the world unrest of today, a knowledge of ship and armament is highly essential, so recruits study guns large and small in the shore school before their first cruise. Here a petty officer instructs a group that might be members of a gun crew aboard ship some day, in the technique of loading.





When a sailor ties a knot aboard Uncle Sam's ships, it must be a good one, so the class shown above goes about its business seriously. Below, boat crews with oars tossed, learning how to handle a small craft in an emergency, such as a rescue job in a stormy sea.

By Thomas E. Stimson, Jr.

3872 Franklin Ave Los Angeles, Calif

WHEN you march through the main gate of the Naval Training Station at San Diego, Calif., as a raw recruit you leave the land behind. You will spend two months learning to be a sailor before you are assigned to the battle fleet but even though you are still on dry land, things are a lot like they are at sea.

In a couple of days you will know that a floor is really a deck and you'll not make the mistake of calling a bulkhead a wall. You will ask whether the smoking lamp is lit instead of whether you may smoke and you will be telling time by ship's bells instead of by hours.

During your first day aboard the station you get a thorough physical examination and draw

your uniforms and personal outfit. Your uniforms don't fit and if you wonder why you'll be told that you are going to gain from six to ten pounds in the next



K854
 Perry Wood
 78
 U. Commander
 Public Relations Officer
 San Diego, Calif.

179

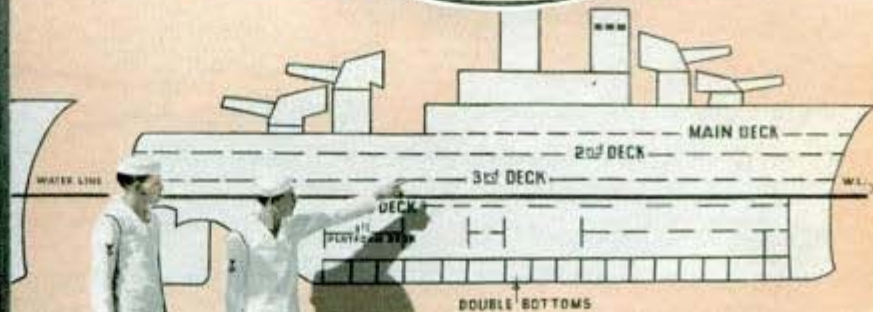
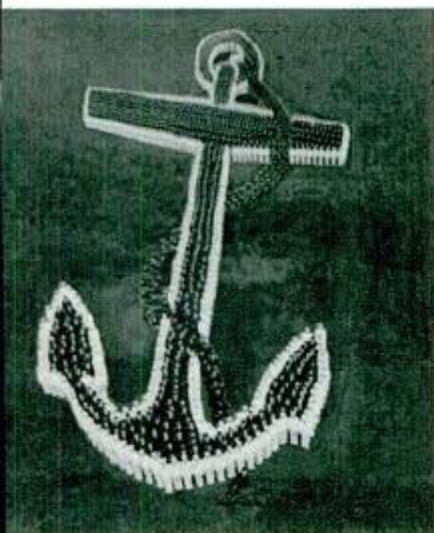
K854

eight weeks, so the clothes are issued with that in mind.

For the next several weeks you and the rest of your class are kept in quarantine in special barracks while you learn the rudiments of taking care of yourself and your equipment. You have to make your own bed and wash your own clothes and take two showers a day. If you skip the showers some of the gang are apt to give you a sand-and-canvas bath, a hard scrubbing with coarse sand laid on with canvas gloves.

In this period you learn the manual of arms with a Springfield and how to march and drill in the new extended order. You are instructed in defense against air attack and you get a dose of gas to prove how well your gas mask works. Gas instruction is held inside a building that is filled with tear gas. You put on your mask and march inside. In spite of the gas it's perfectly comfortable if you fitted the mask to your face the way you were told. Later on the gas is blown away and you take the mask

Top, recruits taking their rifles from stack in barracks on way to drill. Circle, instructing recruits in operation of aerial bomb, shown cut away to expose its firing mechanism. Bottom, left, 2,200 recruits forming anchor. Right, drawing giving names of ship's parts.





180
K854
off. Then, "accidentally on purpose," the instructor happens to drop another tear-gas container and you run for the door with smarting eyes, thoroughly convinced of the protection your mask had given.

After the quarantine period you study seamanship. Every recruit has to be on his toes because instruction previously given as a three-months course is now be-

ing crammed into two months. The Naval Training Station at San Diego and the training stations at Norfolk, Va., and at Great Lakes Training Station on Lake Michigan are turning out sailors as fast as they can be qualified because the fleet is growing and each ship's crew must be brought up to full strength.

Your classmates range from eighteen to thirty-one years. Most of them are



Above, blinker practice in which recruits send code messages by operating the shutters on ship's searchlight. Below, class learning just what makes a torpedo cut its way through the water to a target with such high accuracy. In wartime a torpedo crew may have only one chance at the enemy, so great skill in operating the torpedo mechanism often may be a matter of life or death.



181 K854

around twenty-one and most of them have come from the middle west. Like you, they have all signed up for a six-year period. But recently the Navy lowered its enlistment age to seventeen and these recruits are permitted to sign up for a four year period instead of six with the consent of their parents. If you are ambitious you find that your officers and instructors are anxious to help and that you will be advanced as rapidly as your capabilities warrant. Out of each company of 133 men one honor student is selected for special instruction. Approximately 100 men a year are selected from the fleet to attend the U. S. Naval

Above, instructor lecturing class of recruits in connection with operation of torpedo tubes. Aboard certain of Uncle Sam's fighting craft, this training is highly essential in time of war, or in fleet maneuvers. Bottom of page, petty officer explaining details of complicated-looking mechanism that sends torpedo speeding toward its target.





Top, studying model of warship that contains full set of navigating and signal lights. Center, recruits lined up for inspection of their equipment. Bottom, recruits learn how a small boat is made by studying cutaway section, part of equipment employed at naval training schools.

4854.

Academy at Annapolis, Md., and the Navy will send you to a preparatory school to help you qualify for the academy if you seem to have the command and leadership possibilities that an officer needs. On the other hand, if you shirk your job as a recruit student some smart instructor is going to put you in command of a company for a few hours. The responsibility of leadership opens the eyes of a slack individual and teaches him better than anything else the need for proper training.

When you join the Navy you are surprised at the care with which selections are made. Not every one can join the Navy simply because he wants to and Uncle Sam turns down thirteen or fourteen applicants for every one he selects. You must have high physical, mental, and moral qualifications, the equivalent of a high-school education, letters of recommendation from leaders of your community, no dependents, and no police record. One physical qualification is that you have both of your incisor teeth because sometime you may wish to volunteer for submarine duty, in which case you need both incisors to hold the breathing lung escape mechanism in your mouth. Your schooling and citizenship records are looked into before you are sworn in and you are investigated by the F.B.I.

One reason for this carefulness is that the Navy has no room for dumbbells. Battleships cost about three times as much as they did thirty years ago, mainly because they are now filled with expensive machinery and complex electrical control and firing gear. It takes brains to be a sailor today and nearly every man is trained to be a specialist.

But during your recruit period you receive basic training alone. You must be able to coil a line and tie a knot before you are ready for a class in gyroscopes. Seamanship classes include rowing ship's boats and heaving the lead. You are surprised to find that there is a knack to heaving the lead that makes a beginner clumsy until he masters it.

You learn to steer a ship while you are still on dry land, learn the com-

182.

183 | 1854

pass points and how to use a block and tackle. You receive practical instruction with the real equipment. Such pieces of gear as an engine-room telegraph, a lifeboat in davits, torpedo tubes, naval guns, and searchlights and flag hoists are installed at the station for training.

As the weeks go by you learn the rudiments of radio and how to semaphore with flags. You study gunnery and listen to lectures on torpedoes and bombs. Some of the subjects are taught by motion pictures and you even receive advice on how to spend your pay. You may spend it as you please, of course, but some sailors have been talked into buying more than they could on the installment plan, so the lecture on personal economics is for your own good. The \$21 a month that you receive as a recruit doesn't seem very much but you have no living expenses and your money goes a long way at the ship's store where you receive a big discount. Your pay goes up to \$36 a month when you graduate to seaman second class and every boost in rating from then on brings more money.

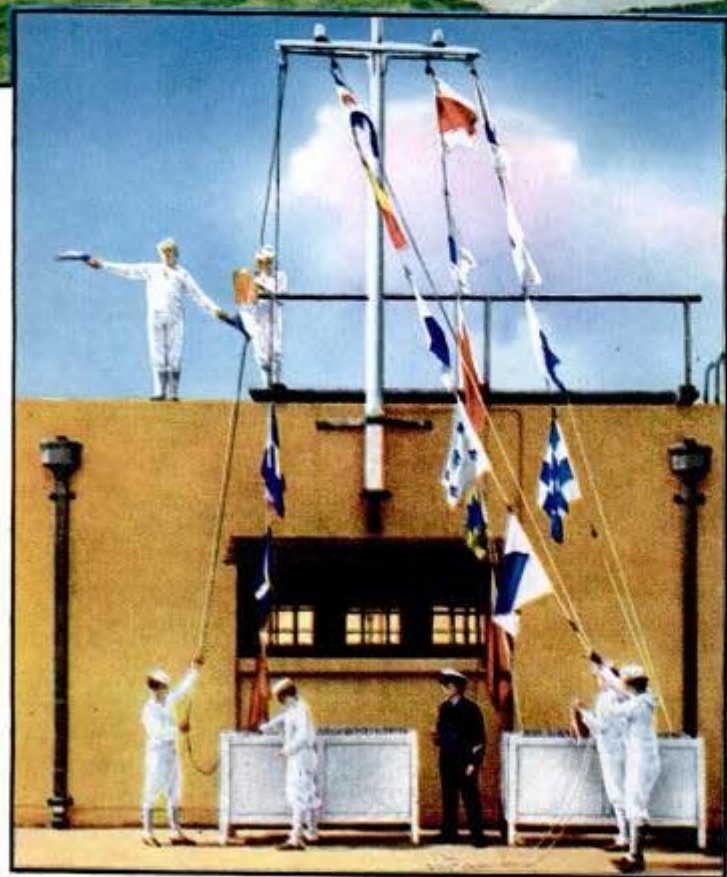
Classes and drills keep you busy until 4:30 in the afternoon and then, if you are in the watch that may go ashore, you have liberty to leave the station. Often you eat dinner and attend the free motion pictures instead. If it isn't too dark you are apt to go fishing or swimming or play golf on the station's course. There are facilities for a number of sports. On Sunday you attend church.

Ordinarily you will go to sea as soon as you receive your recruit graduation diploma. Depending on the needs of the fleet, you will be assigned to any class of ship except submarines. At sea you begin to specialize, selecting deck or engine-room duty and possibly signing up for instruction in Diesels or aviation so that later on you can be sent to one of the advanced schools ashore.

If you are in the top quarter of your graduating class you are considered petty officer material and you may be kept ashore for another sixteen weeks of special schooling in-



Top, Semaphore students spelling the initials "USNTS" of their training station. Center, recruits cleaning their guns, with daily washing rigged up to dry in the background. Bottom, marching with gas masks through smoke to learn how this equipment protects them from fumes.



Above, examining early type of naval gun, covered with camouflage paint, on display at training station. Below, signal mast and flag lockers. Note semaphore students at work, while other recruits run up signal flags just as they would if aboard a fighting ship.

K854
 Instead of going off to sea at once. Your arithmetic, spelling, English, and mechanical aptitude are all considered in your advancement and you have a first and second choice in selecting the instruction you desire. Among other subjects, training is given that fits men as aviation machinists mate, ship fitter, metal smith, and pattern maker. Every sailor learns a trade and there are special schools for musicians, cooks and bakers, radio experts and stenographers, among others. There is even a school for sound motion-picture operators. Movies are exhibited on nearly every ship.

Young men join the Navy for adventure and security. They obtain both because they see the world and at the same time learn a trade that qualifies them for good jobs if they re-enter civilian life. If they remain in the Navy they retire on half pay at the end of twenty years duty.

K1305

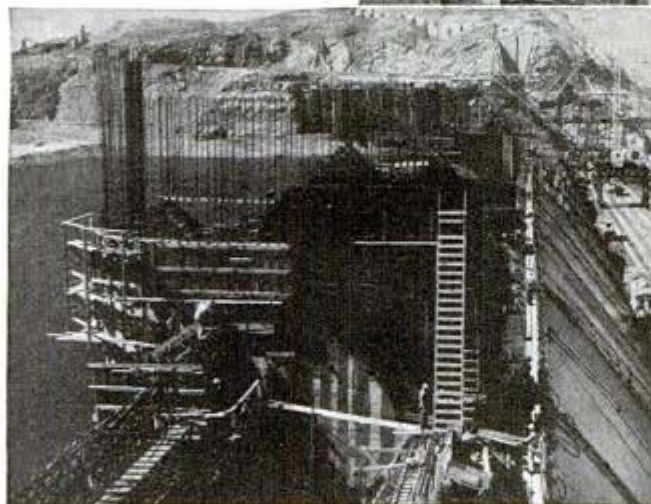
American Transformer & Newark N.J.

Huge Heaters Defrost Gates of Dam in Winter

What probably are the world's largest defrosters, consisting of about three-fourths of an acre of steel plates and more than nine miles of electric cable, are being installed at Grand Coulee dam to insure proper winter operation of the spillway drum gates. There are eleven gates, each 135 feet long and twenty-eight feet high, which regulate the flow over the spillway through flotation in water. Without "de-icing," the ends of the gates may stick to the spillway piers during freezing temperatures, or ice could bind



Bureau of Reclamation, Dept. of Interior, Washington, D.C.



Installing cables of defroster system behind steel facings, top. Bottom, to raise level of reservoir, drum gates are floated by admitting water into pockets at crest of spillway

them tightly to the steel seats on which they rest. The larger heating plates are 135 feet long by eight and one-half feet wide, one for each gate. There are also twenty-two pier plates, one at each end of each gate, containing approximately 875 square feet each. Heating will be by induction. The cable produces heat by setting up an electromagnetic field around itself in the steel plates wherever it is strung through them, thus generating heat in the plates instead of in the wires.

K129

Inside Diameters Gauged Easily with Measuring "Pistol"

Inside diameters of small holes or tubes may be determined easily by "shooting" the plugs of a gauge mounted on a pistol grip. Pulling the trigger retracts the contact points, and when it is released the inside diameter of the hole is indicated immediately on the dial. The gauge measures openings three-sixteenths inch or greater, and it reveals out-of-round, bell-mouth and taper conditions. Interchangeable plugs of various lengths are available.



Inside diameters are measured quickly by releasing trigger after inserting gauge into the hole or tube

FEBRUARY, 1941

Federal Products Corp. 185
1144 Eddy St. Providence

K1290

Car Siphon Removes Water for Adding Anti-Freeze



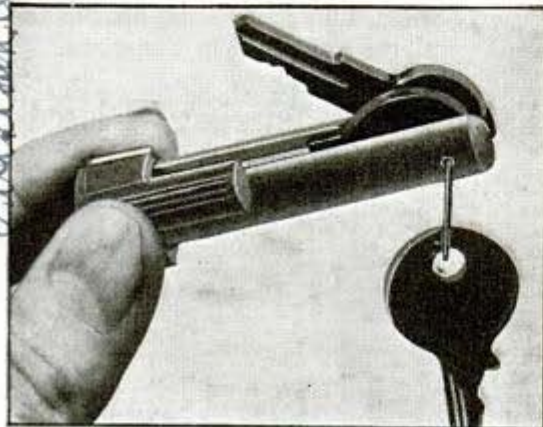
Filling station attendant removing water from radiator with siphon before adding anti-freeze solution

For removing water from an automobile radiator to permit adding anti-freeze solution, a handy siphon saves the trouble of opening the drain valve. Pressure applied to the rubber bulb starts the water flowing into a container, and in ten seconds the siphon draws off a quart of liquid. It is useful also for siphoning other liquids.

K1284

Automatic Holder Flips Out Key When Base Is Turned

Holding two keys in a slot, in the manner of blades in a jackknife, a newly patented key case flips out the key you want at a slight turn of a knob located at its base. Twist the knob to the left and out



Key pointing upward is released by turning base to right. Loop at top of holder carries a third key

Inv. J. W. Ismetter
Astoria, Oregon

comes one key; turn it to the right and the other one is ejected. A stop prevents both keys from being released at a time. The automatic holder is made of plastic.

K1291

Deadly Auto Fumes Destroyed by Burner for Garages

Garage workers can escape the danger of carbon-monoxide poisoning with the help of an eliminator that uses a patented catalyst to burn up the fumes. Mounted with a battery upon a rolling platform, the eliminator is connected to the tail pipe of the auto muffler. Controlled by a thermostat, its operation is automatic. The burner



Auto exhaust gases lose their death-dealing fumes when they are passed through this catalytic chamber

contains porous earth to which copper oxide has been applied. Hot exhaust gases mix with air drawn in through a vent in the burner, the oxide acting as a catalytic agent in burning the gases. Its compact form and easy portability make the device suitable for use in crowded garages.

K1324

Film "Grain" Is Not a Solid Dot but Lacework of Lines

Former beliefs about "grains" in photographic film have been upset by the discovery that what seemed to be solid dots

N.Y. Times Nov. 24

Lacey, Weber, Kalumay, Mc...
R.C. Dimpkins, P.O. Box 1, 2100 Eastman Ave.

Rochester, N.Y. K1247

of silver are in reality patches of lacework consisting of incredibly fine lines. Since this may point the way to get rid of the "graininess" which limits enlargements of photographs, it is hailed as one of the most remarkable discoveries in photography within recent years. The finding was made by Dr. C. E. Mees, of Eastman Kodak company, who used an electron microscope which enlarges 25,000 diameters, as compared with 2,000 diameters of an ordinary microscope. Under this greater magnification the grain was revealed as a tangle of lines, many of which are only a few silver atoms in diameter, some being straight and some curved.

Fluorescent Bars in Lamp Replace Electric Bulbs



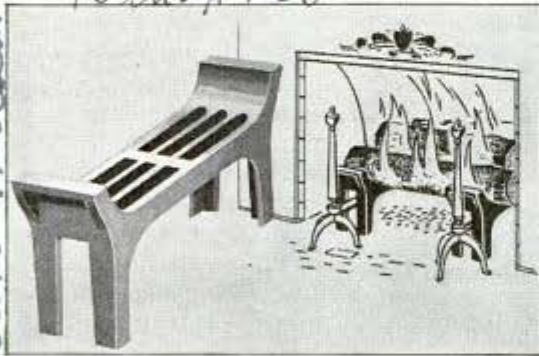
Lamp with fluorescent bars in crisscross arrangement makes modern lighting available for homes

Several fluorescent bars replace the traditional bulbs in a new type floor lamp to produce a pleasant reading effect, and may burn twenty-four hours straight without emitting noticeable heat. The average life of the fluorescent tubes is about 2,500 lighting hours, and the stand can be fitted with a standard lamp shade.

Fire-Log Holders for Fireplace Help to Improve Draft

By raising burning logs off the floor of the fireplace, firedogs now available assure a good draft and permit a more enjoyable fire. They may be placed astride the andirons and thus protect them. Made of iron, the firedogs are furnished in three lengths of fifteen, eighteen and twenty-four inches.

15 in. \$4.50



Vents in benchlike firedogs provide draft so full length of the logs will burn with a lively blaze

Auto Fan with Swivel Adjustment Is Mounted in Roof

Suitable for mounting anywhere inside the car, including the roof, a small electric fan may be turned on its swivel holder to blow in any direction desired. Bolt attachments permit instant installation without marring or defacing the upholstery. In winter when the car windows are closed and several of the occupants may be smoking, the fan is useful in driving away smoke.

(Near Schenectady, on the Delaware & Hudson railroad, is a 7,700-foot rail, the longest continuous rail in the world.

FEBRUARY, 1941



Fan in auto ceiling can be tilted in any direction

Photo Beam Mfg Co. 187

3300 Indiana Ave Chicago

Canton Malleable Iron Co. Canton, Ohio

Atlas Jewellery Co. 167 N. Racine, Chicago

Photo Beam Mfg Co. 3300 Indiana Ave Chicago

15 N. 32nd St. Photo

Pa. A. Mutual mag. Oct. 1940

K1125 Court Thomas & Stevenson Jr.
2872 Franklin Los Angeles

Pat. 2,012,119, 542 N. 1st St. Los Angeles



The "TALKING MACHINE"



Top, left, using gas flame to prepare thin wax disk on which professional recording is made. Right, making record with modern combination equipped with home-recording device. Below, dubbing in conversation on record to be used with home "talking" picture

HOW would you like to make a record of your favorite radio program to play on your phonograph? Or reproduce an historic radio speech, or the voice of a friend singing to the accompaniment of a world-famous orchestra?

You can do all that and more with the

latest all-purpose musical instrument, the combination radio, phonograph, and home recorder. Using the recorder attachment, you can collect and save the voices of children, reproduce music from the radio or from other phonograph records, and create music and dialogue for home movies. Your records will have almost the same quality as professional recordings and you can play them back on the phonograph as soon as you have made them. The disks cost as little as fifteen cents for a size that plays one and one-half minutes. Each

record may be played a hundred times or more before it wears out.

The home recorder is part of the story of an amazing comeback. Ten years ago the phonograph was as dead as a dodo. Advent of radio broadcasting killed interest in talking machines after the phono-

Acoustic Victrola, Home Recording Model. VHR-207 \$1125.



Comes **BACK**

graph had enjoyed years of popularity. Nevertheless, nearly as many phonograph records were sold last year as in any year before. America spent \$36,000,000 for phonograph combinations and records in 1939. In a few years time the phonograph has become as popular as ever, again due to the influence of radio.

Today's instrument bears little resemblance to the machine that the radio drove out of existence. You wound up the spring motor of the old-style phonograph by hand, placed a heavy mechanical head on the record, and listened to tinny music of poor quality and range.

Even the early radio receivers gave better music than this and the public stopped using its phonographs. Then the pendulum began swinging the other way. Listening to classical music on the radio produced a desire to listen to operas and symphonies at will, without the delays and advertising plugs that are a part of radio broadcasting. At the same time the radio itself was being improved vastly and when the pho-



Top, left, bending record of acetate film on cardboard backing. Right, inexpensive electric phonograph with record changer. Center, old-style phonograph. Bottom, dictating letters into home recorder "mike"

K1125



Top, professional wax record in vacuum chamber where thin gold plating is applied prior to making copper plate. Below, large radio transcription record used for fifteen-minute broadcasts compared to two small disks for home recording

nograph was ready for re-introduction it adopted many of the improvements that had been made to radio. The motion picture likewise played a part in perfecting the new phonograph because many of the advances in sound recording and reproduction that have improved the talkies were adopted.

Such improvements made possible the "juke box" record players that are installed in restaurants and other places and these coin-operated phonographs also helped restore the talking machine's popularity. The latest thing in automatic music is to "pipe" the music over wires from a

central exchange when a customer deposits a coin in the speaker box and uses its microphone to tell the central operator the selection he wishes played.

Today's phonograph is all-electric. A motor drives the turntable at a constant rate of speed, being "hitched" to the cycles of the house current like an electric clock. The light crystal pick-up head weighs only a few ounces instead of up to a pound and one manufacturer is using an electric eye type of pick-up that is lighter still. The vibrations from the pick-up arm are amplified in an audio amplifying circuit that employs vacuum tubes and the music is produced in a radio-type dynamic speaker. The result is an instrument of great musical clarity and range with complete control of tone and volume. For the first time the phonograph gives a close approximation of the actual sounds that were recorded.

The first combination ra-

(Continued to page 152A)



One of the lightweight portable instruments which incorporates a radio and a phonograph. Some portables are to be plugged into an electric outlet, others house batteries for operating the radio, and the phonograph is hand-wound

K1270 Presto Recording Corp
242 W. 50th St. New York

Voice Added to Home Movie by Synchronizer



screen. Controlled to run at a speed corresponding to the silent film rate of sixteen frames a second, the disk record plays back the spoken words in split-second accuracy with the movement of the lips. The units are suitable for use with either eight or sixteen-millimeter film and operate satisfactorily with any type recorder. Special recorders are available for screening from five to fifteen minutes of continuous programs. A complete combination unit for making sound movies, contained in a single case, also can be obtained.

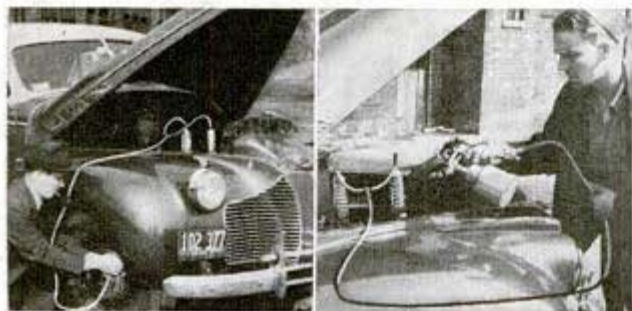
Recording amplifier, left, is plugged into turntable as picture is made. Below is complete set of equipment



Without great expense, home movies can be made to "talk" by means of locking devices that hold the camera in synchronization with a turntable disk recorder at the time the picture is taken. Another unit, locking the projector to operate in unison with the sound reproducer, synchronizes the recorded voice with the lip movement while the picture is being shown on the

K1174

Air Compressor Powered by Auto Operates Spray Gun



Twin air compressor with pumps mounted in openings for spark plugs can pump up tire, left, or spray paint, right

Quickly attached to an automobile engine by unscrewing two spark plugs and replacing them with two small cylindrical pumps, a twin air compressor obtains power from the cylinders to operate a paint sprayer or to pump up tires. At idling speed, the pump develops pressure sufficient to operate an all-purpose spray gun. For inflating tires a special chuck is attached to the hose in place of the spray gun.

FEBRUARY, 1941

W. H. Brown Corp.
5720 Armitage Ave. Chicago 191

K1258.

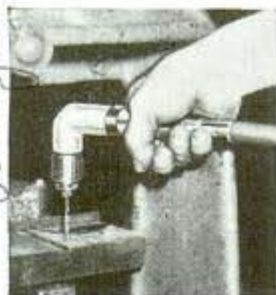
Snipers in Camouflage Nets Difficult for Invaders to Spot



Will Work
British soldier covering sniper with netting to hide him so he cannot be spotted by invader. Tests have shown this camouflage to be effective

England's army includes a trained corps of snipers to help impede the progress of attackers. Besides being an expert marksman, a sniper must know many tricks of camouflage, one of which involves covering himself completely with a large-mesh net that effectively conceals him under certain conditions.

Angle Head for Flexible Shaft Works Tool in Tight Spots



Attached to a flexible power shaft, an angle head permits operation of tools such as drills and rotary files in close quarters or in corners which would be inaccessible

otherwise. Its chuck, which screws onto a vertical spindle, accommodates tools with shanks up to one-quarter inch. For closer work, drills with three-sixteenths inch shanks can be inserted directly into the spindle and held in place by a set-screw. Having an overall dimension of two and one-eighth inches, the device can be used in small openings.

K1292

Pencil Made to Use Thin Lead Writes with Fine Lines

Leads of small diameter can be used, without breaking the point, in a newly patented tip for a mechanical pencil which is offered specially to draftsmen and artists who must draw fine lines. One advantage is that the slender tip, made of thin stainless steel, does not obscure what you are writing. When using the new lead of .036-inch diameter, you can bear down hard without fear of snapping the point, since the pencil writes efficiently with the lead extended less than one-sixteenth inch.

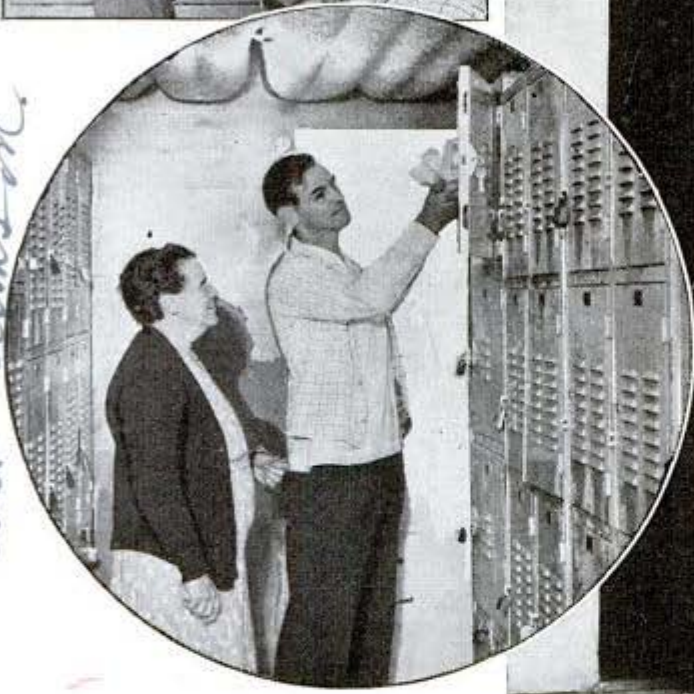


Magnifier shows how slender tip guards pencil point from breakage, yet permits clear view as it writes

Stow Mfg. Co. Binghamton, N.Y.
W. P. K. Co.
1501 W. Park Chicago

K 1186 Union Ice Company, Astoria, Ore. *Calif.*

Cold Lockers Rented for Storing Frozen Food



Ant. Stinson

Top, left, frozen foods are wrapped into bundles for storage in community lockers; circle, attendant opening locker for a customer. Right, game brought in by hunters is butchered, cut up and stored

By renting lockers in community cold-storage plants, where quick-frozen foods will keep indefinitely, farmers and rural residents are eating fresh vegetables out of season and choice cuts of meat bought at low prices. Patrons rent a locker box of 200 to 400 pounds capacity costing ten to fifteen dollars a year, each patron holding the key to his own locker. The heavily insulated locker rooms are kept at a controlled temperature of five degrees above

zero by ammonia systems. Renters may have their own freshly picked vegetables quick-frozen for storage, and can buy meat in wholesale quantities or at seasons when prices are low, removing only their daily needs from the locker from time to time. The plant offers facilities for butchering animals and cutting up meat into steaks, chops and roasts and wrapping them in packages of convenient size, so hunters may bring in their game for storage.

Lead Wool Used for Calking Pipe Joints Does Not Require Melting

Lead wool, made of long, fine strands of metallic lead wound into a loose rope, is being used for calking joints of cast-iron pipe, replacing melted lead. It is useful in making joints under water or in bad mois-

ture conditions, also where the use of fire would not be safe as in the presence of inflammable gases. One or two turns of the lead-wool rope are calked at a time, forming a solid mass when finished.

Pub. Lead - Lead Industries
200 West 49th St. - New York City

K1096

FIGHTING



20%

PEDESTRIAN
CROSSING BETWEEN
INTERSECTIONS

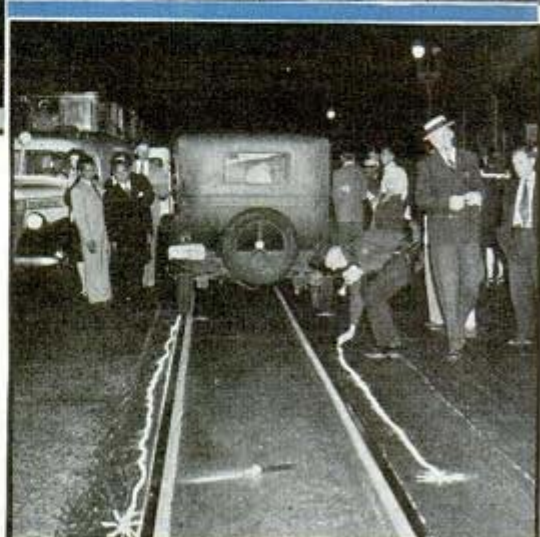
7%



PEDESTRIAN
WALKING
IN ROADWAY

6%

9%



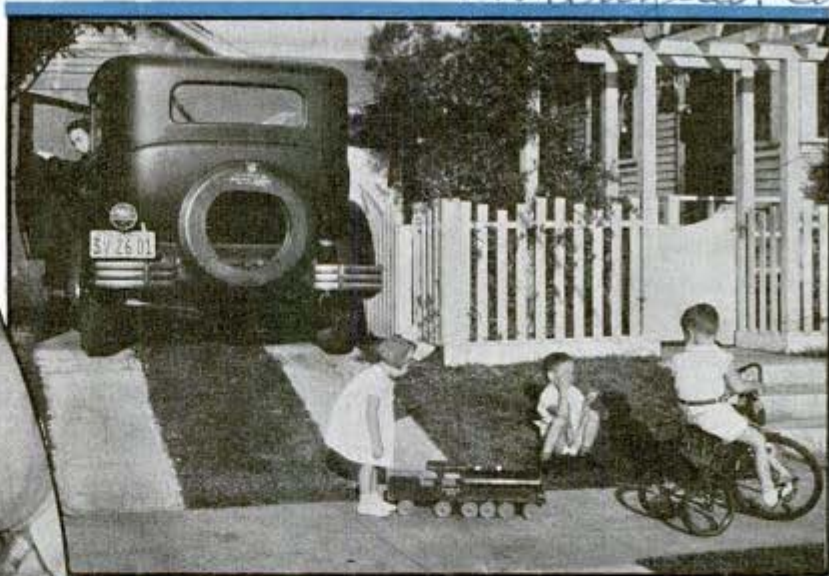
SEVENTEEN serious accidents at one intersection constituted a problem that the police department had to solve. The corner was protected by a standard set of automatic signals and had good visibility, yet motorists who obeyed the rules everywhere else kept smashing into each other at this point.

When the growing cluster of pins on the accident map of the Los Angeles police department revealed that this intersection had become a hot spot an investigator was sent out to visit it. He noticed that motorists frequently jumped the signal bells and barely missed crashing into cross traffic. Then he learned why. At a service station near by an attendant dropped a tire iron, a motorist mistook the clang of the tool for the

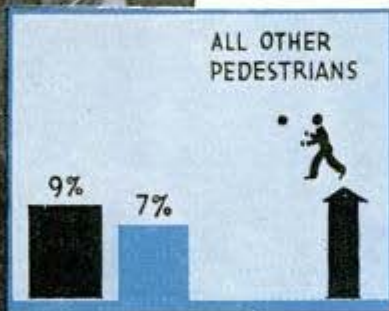
Top, pedestrian dashing in front of car. Center, left, traffic sign in India. Right, pedestrians confuse driver by hesitating. Bottom, skid marks outlined in chalk after crash. Sketches show two causes of fatal accidents in city (black) and rural (blue) communities

Cont Thomas E. Stevenson, Jr. Los Angeles
3872 Franklin Ave.

DEATH in the STREET



Left, accident-frequency map on which each pin shows where accident occurred. Above, looking behind car before backing out may save a child's life. Below, showing pedestrian accidents from causes such as playing in the street



sound of the signal bell, and stepped on the gas without watching for the green light. A crash was narrowly averted. Today all of the tire irons at the service station are wrapped in tape

and accidents have fallen to a minimum.

In several similar cases the ringing of bells in service stations at busy corners were mistaken by pedestrians for traffic bells and they stepped into the street, occasionally being struck by motorists. Once a four-car collision resulted when drivers mistook the same bells. The remedy in

each case was to eliminate the bells in the service stations or to change their tones so that they could not be confused with traffic bells.

One corner was having a number of high-speed crashes after dark, caused by motorists running through a red traffic light into cross traffic. The trouble was that a store at the corner was using a green lantern as an advertising feature and motorists who saw the green lantern instead of the red stoplight failed to stop. In another instance a flashing red advertising sign behind the signal lights blotted out the red light of the signals, and motorists drove through the red signal without realizing it.

Los Angeles is adopting stringent measures to reduce its high accident rate. The city's average is forty deaths per month and thirty-nine injuries per day. This is because Los Angeles is the world's largest city in area with 451 square miles. There are more than 8,000 miles of city streets with some 28,000 intersections. Contributing factors are that there are one and a quarter million cars in Los Angeles county and that drivers use their cars extensively in the west. The 400 traffic officers issue as many as 25,000 traffic tickets in six months and yet they cannot patrol the whole city adequately.

To help combat these aggravated condi-

K 109 /



Above, jay-walking in front of parked car. Below, traffic signs. Bottom, "morgue" containing cars wrecked in collisions. Right, another specific cause of pedestrian accidents in city and rural communities (black line denoting city accidents; blue, rural)



tions the collision prevention bureau uses a "hot spot" map. For each accident involving injury or death, Traffic Analyst H. C. Heinritz sticks a colored pin on a large map of the city. When pins begin to cluster around a particular intersection or along one short length of street there must be a special reason for the accidents and an officer is sent out to investigate. Possibly the existing traffic

signals are obscured by growing trees, possibly a steep down grade leading to a corner needs more positive warning signs, possibly illumination after dark is poor.

Construction of a large building is apt to increase accidents temporarily on adjoining streets both because the noise of construction drowns out the traffic bells and because some motorists crane their necks to watch the building activity. When a new market or group of stores is under construction, the traffic department tries to anticipate the increased traffic that will result and to save lives ahead of time by installing proper signals or warning signs.

Now that drivers have been led to expect properly illuminated streets, poor lighting can be a major cause of accidents.

As compared to the records for the two previous years there were ninety-two per cent fewer deaths and seventy-nine per cent fewer injuries in the two years following the installation of adequate sodium vapor lamps at twenty-five important intersections in one city.

Having such a large territory to patrol, the Los Angeles traffic officers use a program of selective enforcement, concentrating their activities in the areas that temporarily are the most dangerous. This selective enforcement brings results, in one

(Continued to page 144A)



K1202 Built at Havel Works Berlin Germany

Amphibian Glider Takes Off from Land or Sea



Towed at a speed of fifty to fifty-six miles an hour, this amphibian glider, built at Berlin, can take off either from land or water. The craft has a wingspread of fifty-nine feet and weighs 375 pounds

All three elements—air, land and water—are home to an amphibian glider of the German Lufthansa. Just given its test flights at Berlin, where it was built, the "Chaser 71," as it has been named, is a

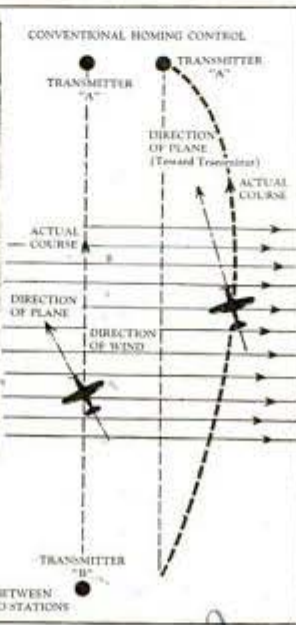
shoulder-decker with a fifty-nine foot wingspread and weighs 375 pounds. It can take off from either land or water after a short run, having a starting speed of fifty to fifty-six miles an hour.

Radio Control Flies Plane Straight to Port without Drift

Automatic radio controls that will fly an airplane on an absolutely straight course regardless of cross winds, fog or other conditions are the latest contribution to air safety and precision. The new instrument is a combination of radio direction finder and automatic pilot. Former "homing" de-

vices using one radio signal kept the plane's nose pointed toward the station, but a cross wind would blow the plane off a straight course. The new automatic pilot uses two radio stations instead of one, mixing the two signals so that the plane is lined up with the stations from takeoff to

landing. The rudder is held automatically at a position to point the plane up-wind at all times. The two stations may be ahead of the plane, behind it, or ahead and behind, just so they line up in the desired course of flight. For military purposes, two portable transmitters could be lined up at the home port in a direct line with the objective to be reached. With both receivers in the plane tuned to the "from" position, the airplane would fly in a straight line to the objective; then reversing the controls, the pilot could return directly on the same line.

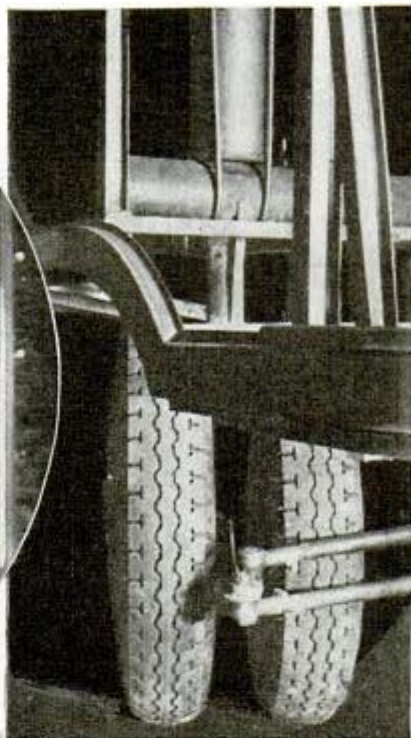
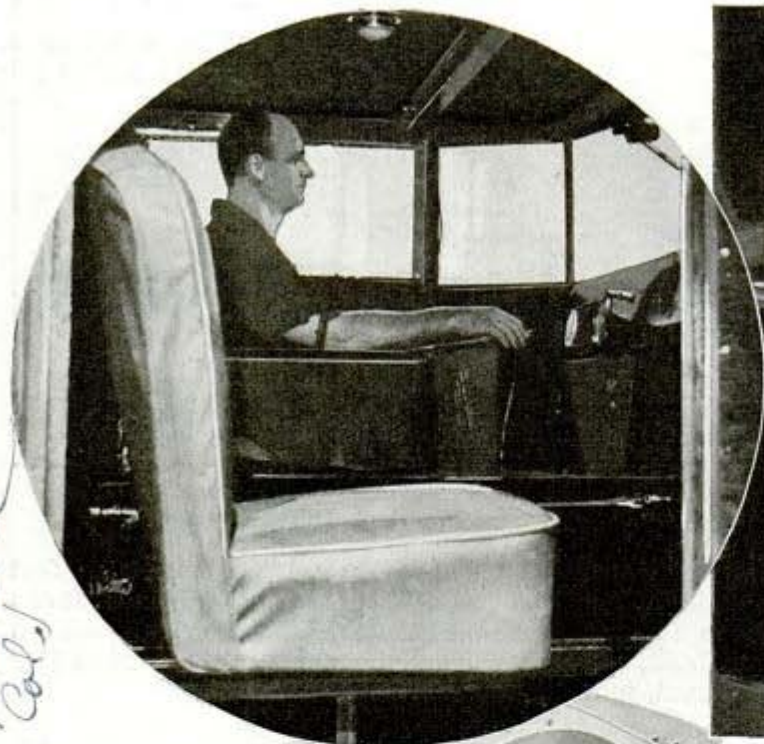


Above, bank of selector and control knobs used by pilot in airplane. Right, sketch compares new with old type radio control; dual system points plane upwind to keep it in straight line, while former system does not allow for drift

Harvey Machine Co 197
6201 Avalon
Los Angeles

K1223

Dual Front Wheels Support Load above Cab



At left is the twelve-wheel truck, with a cargo capacity of twelve tons. Notice its roomy cab (top); beneath it is the engine, and above it a large space for freight. Closeup of the dual front wheels, above, shows the overhead cylinder which houses a coil spring providing a smooth ride

Edward Sarnethy
2130 Market St.
Denver, Col.

Dual front drive

Unique wheel suspension, dual front wheels and a large cargo space above the cab are features of streamline freight trucks designed by a Denver engineer. The cab is roomy and comfortable, with wide vision, and in the van-type body the construction is so well balanced that a considerable pay load can be carried over the driver's head. Triple-coil springs mounted in a cylinder over the wheels give a smooth ride, and with the dual front wheels the truck can carry a heavy load well distributed, weave in and out of traffic with ease, and travel on soft ground. The double wheels also provide the additional safety factor in case of a front-tire blowout.

Rubber Like Liquid, Gas and Solid Is Made of Knotted Chains

Although rubber appears to be but one kind of substance, it really possesses the properties of three, according to a report by Prof. Hubert M. James of Purdue University, and Dr. George Guth of the University of Notre Dame. In retaining a definite shape rubber is like a solid, but like a liquid it can be forced easily to change shape, and like a gas its internal tension increases when it is warmed and decreases when it is cold. The two scientists also explained what happens inside a rubber band when it is stretched. Its structure is

Lafayette, Ind.

W. L. ... Co.
205-5 ... Ave
a series of chains of molecules curled into compact knots, according to their theory. In stretching the band you simply pull these chains of molecules out of their knotted shape. Release it and the molecules curl up again. When a rubber band has been stretched to its limit, the molecular knots have been opened out as far as they will go.

K1261 nyl.
**Electric Tester for Photo Bulbs
Also Checks Flash Timing**

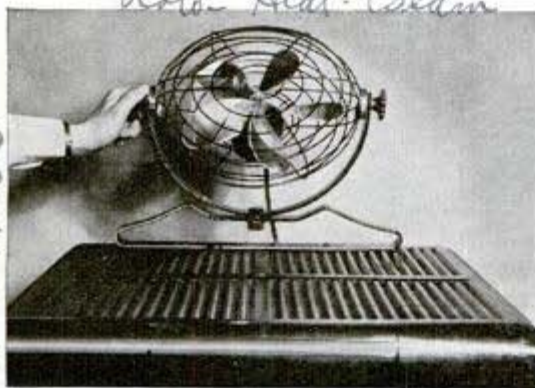


Photographers may test their flash bulbs for dud's with a resistance unit that cuts the current from a small battery to a point where it will cause

a small bulb to light but is not sufficient to fire the bulb. With the front end of the device removed it may be placed on any type flash gun to facilitate the checking of the gun for synchronization and it will also test the power of the batteries.

K1248.
**Electric Fan Mounted on Heater
Spreads Warmth in Home**

Better circulation of heat in the home or office is obtained by mounting a new style electric fan on top of your gas, wood, coal or oil heater. It may be tilted up and down or sidewise to force the rising heat to flow in any direction desired. The motor has two and three-speed control and the entire fan unit is enclosed within a wire guard. The fan also may be mounted on hot-air registers to help distribute heat.



Fan attached to top of heater can be tilted in any direction so it will spread heat to corners of room

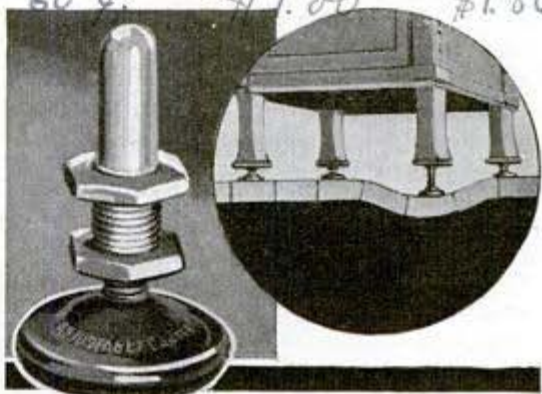
K1185
**Plane Tire Deflated Quickly
with Aid of Vacuum Pump**



Portable vacuum pump driven by one-quarter horsepower motor speeds deflation of big airplane tires

Time required to deflate the tubes of huge airplane tires can be reduced from ten minutes to less than two minutes with a portable tire deflator that sucks out the air. Housed in a steel case, the device consists of a vacuum pump driven by a quarter-horsepower motor.

K1122 Serujah
**Furniture Made to Stand Level
by Adjustable Casters**



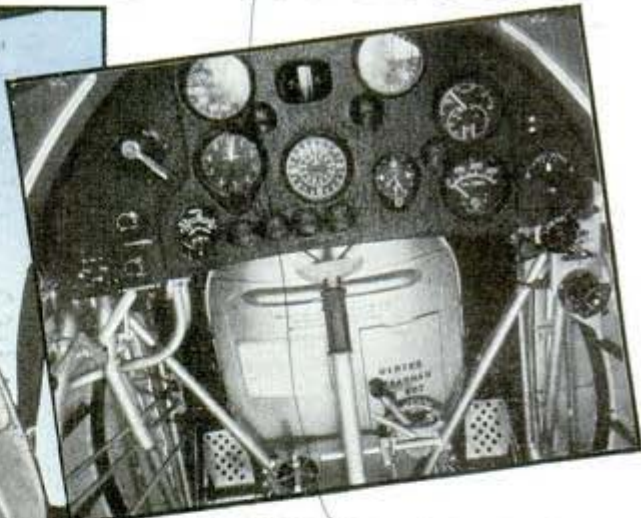
Threaded glide extends when turned to left. Inset, furniture leveled by lengthening one of the glides

Furniture that wobbles because its legs are of unequal length or because the floor is uneven, can be made to stand solidly with the aid of adjustable casters or glides. Adjustment of the caster is provided by its threaded stem and socket interior.

Photo Beam Co. Chicago
3300 Indiana Ave
Adjustable Caster Co.
1411 Walnut, Phila.

K1065 (Reggett) Pitcairn Autogiro Co. Willow Grove Pa.

WAR BIRDS without



Left, Harold F. Pitcairn points out motor location in new-type autogiro that rises vertically (see photo at bottom) before starting forward motion. Above, instrument board of Kellett autogiro

planes. Too, these speedsters have such a small fuel capacity they can remain on patrol for only two hours, less if drawn into a fight. Anti-aircraft guns, fired from the ground, have their limitations, too, particularly on range, accuracy and dependence on visibility.

HAVING watched with alarm the havoc wrought by explosives-dropping aircraft of warring nations, civilian and military scientists are searching for a new weapon to combat the giant multi-engined bombing plane and the dive bomber.

One possible solution to the problem is the autogiro, according to American manufacturers of that type of ship. Another, says Aviation Designer Igor Sikorsky, is the helicopter, an experimental model of which has been test-flown successfully. Both are capable of maintaining their position above any objective to be protected—literally hovering while fighting off enemy raiders. In this role, these craft might prove to be the missing link in the air defense chain, supplementing the fighter plane and the anti-aircraft battery, both of which have certain disadvantages.

The pursuit or fighter plane has such a high speed that it experiences difficulty in protecting property or a ship below, being forced to employ short dashes back and forth across the sky in repelling attacking

Wingless and suspended in flight by an overhead, three-blade rotor system, the autogiro gets forward power from an engine and propeller like that on an airplane. It has a minimum speed of about fifteen miles per hour; in a head wind of that in-



Flight designed by Adolphus Kellett

K1065

WINGS



tensity it can hover over a given spot without appreciable motion. It ascends or descends rapidly and its speed can be altered at will from zero to maximum. It turns and maneuvers readily and sharply. Only small areas are required for taking off and landing.

This type of aircraft, says R. G. Kellett of Kellett Autogiro Corporation, could be adapted easily to military purposes, such as those possibly contemplated by the U. S. Army Air Corps, which is testing several autogiros purchased several months ago. Mr. Kellett explains:

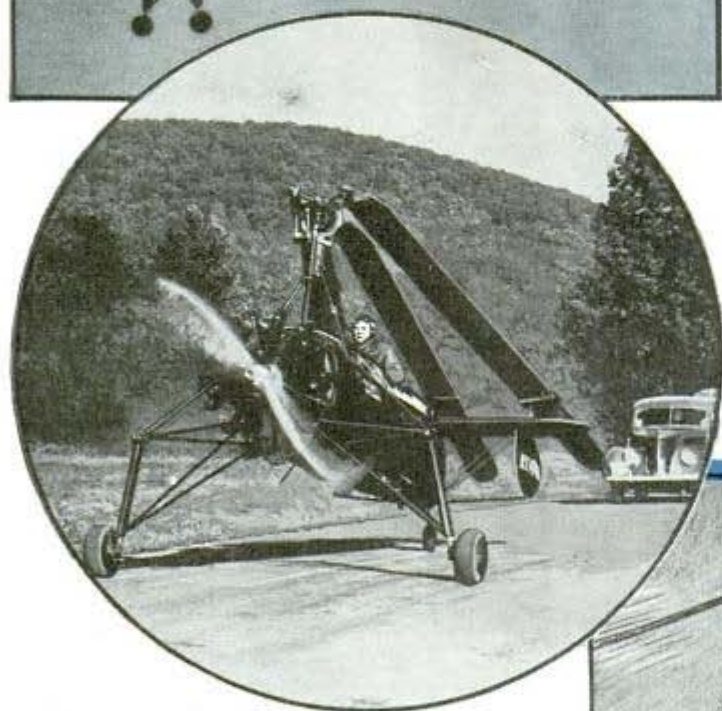
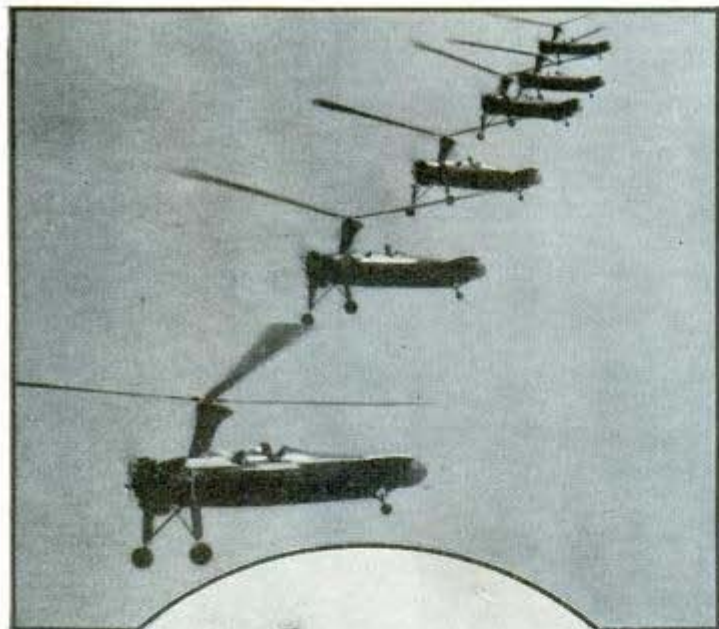
"Designed to incorporate power, improved maneuverability and armament, the autogiro would be an air weapon worth reckoning on. Its peculiar manner of flight, wide range of speeds and "cleverness" of behavior in the air would be a decided asset and it could operate, of course, independent of prepared or extensive landing fields.

Above, tomorrow's autogiro may be expected to carry machine guns or cannon for use in war. Center, artist's idea of how giro would protect shipping; bomb and shadow of submarine are drawn on photo. Bottom, Sikorsky flying his helicopter



FEBRUARY, 1941

*Island Road and Layport Ave
Photo delphia. Pa*



of low-ceiling when planes would be helpless. Lack of visibility would not handicap a low-flying giro bomber greatly and in low-lying fog it would be immune to attack from pursuit planes which could not venture out or fly so low.

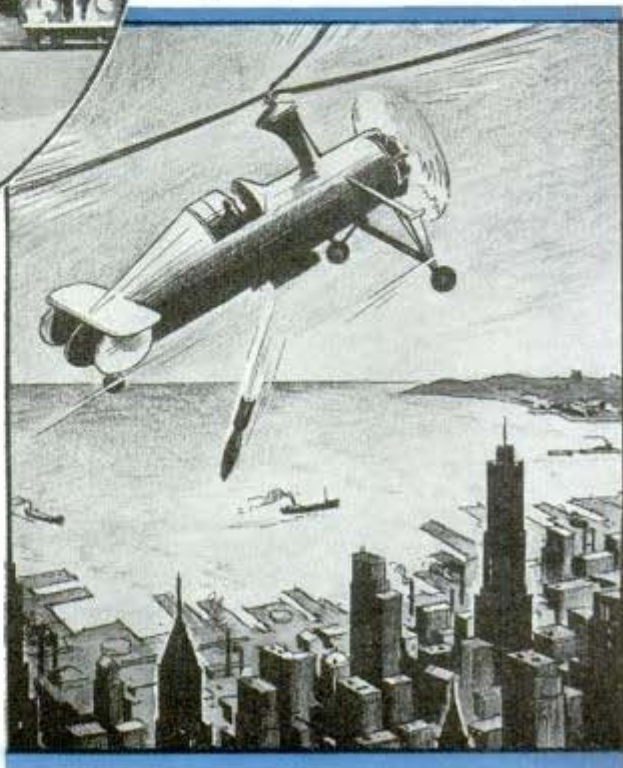
"If the giro were built to carry six, eight or ten men, a fleet of them could bring a new element of attack to warfare—the sudden onslaught against a specified objective behind enemy lines—an ammunition depot or some other key point. Too, the attacking force might escape immediately after the attack because the giro transports could rise almost vertically from the spot where they had landed.

"For defense purposes, the giro has fully as great possibilities. Suppose a nation at war desired to protect a cer-

Top, U. S. Army's autogiros flying in formation. Circle, Kellett giro moving along road; note giro blades folded. Bottom, sketch shows how giro might be used for bombing

Courtesy the Cavalry Journal

"With sufficient funds made available, it should be possible to produce in the near future an autogiro with much greater payload than is available today. It would appear such an autogiro would have a much wider military application than our present observation types, which are neither armored nor equipped with armament. Protected by armor from enemy gunfire, able to give a good account of itself by means of cannon mounted in the ship and powered by engines able to give it the necessary load-carrying capacity, such an autogiro would be of practical use as a bomber because it could operate in cases





Top, helicopter hovering while bag is removed from basket by man standing on the ground. Circle, giro may operate easily from ship since it may ascend or descend almost vertically. Bottom, Kellett autogiro being used by the U. S. Army



tain arsenal from enemy bombers. A fleet of super-giros, heavily armored to stand off raiding planes, might hover over the arsenal, ready to meet dive bombers or any other attacking aircraft with a deadly barrage of shells discharged from cannon aboard each giro. This would constitute a real aerial defense line.

"Rotorcraft patrols for protection of merchant shipping might be established. One way to accomplish this would be by flight from shore, to patrol a given area of sea for the purpose of spotting submarines and mines and destroying them. The most interesting possibility lies in putting the autogiros on the merchant ships. Landing platforms might be built on individual ships traveling a little-used course, and therefore, not included in convoys. Going further, a landing deck might be installed over the entire hull of the merchant ship or tanker, thus converting such a vessel into a rotorcraft carrier which might thus become a means of protecting not only itself but other vessels in a convoy. Five to ten autogiros, equipped to fight off bombing planes, might be kept in the air at all times. Naturally adaptation of the



giro to convoy protection would release surface ships, such as destroyers, for more important duties."

Following tests of the experimental helicopter which he designed, Mr. Sikorsky

(Continued to page 120A)

K1262

Electric Tool Opens Drains Clogged by Roots



Electric drain-cleaning tool spins cutters capable of slashing opening through pipe clogged by roots

Powered by electricity, a portable drain cleaner saves labor for plumbers in clearing roots, grease and other obstructions from pipes. The new cutting machine automatically feeds into the drain a rotating, flexible line having a spiral or pronged head that drills through the clogging material. Weighing eighty-five pounds, the unit rolls on casters or may be carried.

Pocket-Size Surveying Instrument Used with Camera Tripod

Attached to an ordinary camera tripod, an inexpensive hand-sighting level, similar



Hand-sighting level is converted into simple surveying instrument by mounting it on a camera tripod

to the type used by army engineers, makes a simple surveying instrument that can be carried in the pocket. It is about five inches long by one inch square. A spirit level bubble at the top is reflected onto the objective lens by a prismatic-mirror arrangement. In taking a reading with the eye held to the peep-hole, the observer is guided by etched lines. When the bubble is centered, he can sight a level line as far as the eye can see, or straight lines may be "shot" in any direction. The instrument is handy in lining up fences, ditch, pipe lines, grading, and for rough surveying. A clamp adapter which can be used for attaching the level to the tripod may be obtained in most camera shops.

K1256

Colored Lights Warn of Frost in Citrus Groves



Electric lights on pole, hooked up with thermostats in citrus grove, indicate where frost is prevalent

One citrus grower has installed a "light signal corps" that flashes immediate notice when frost threatens. High on a pole near his house he has mounted a panel containing a series of colored bulbs—red, blue and green—wired to the thermostats hung in various parts of the grove, which has been divided into three sections. Here is how it works: When the temperature goes down to twenty-eight degrees in the lower

The Oster Mfg Co, 2057 E. 6th St, Cleveland Ohio
The Oster Mfg Co, 2057 E. 6th St, Cleveland Ohio
Swiff and Anderson, 11 Summer St, Boston, Mass

Corona
Blodgett's
Corona Calif
Apham, 236 E. Corona
Havy sa

Corona Calif
S. W. W. W. 236 E. Corona Blvd.
Blanche

K1210.

orchard, the red light comes on; a blue light means the danger exists in the middle section, and green indicates frost in the upper part of the grove. Thus he and his helpers do not have to read thermometers spread through the groves, but go directly to the threatened area to fire the control heaters. As soon as the temperature in any one section has been driven above twenty-eight degrees the light for that section goes off and does not come on again unless there is another drop in the mercury.

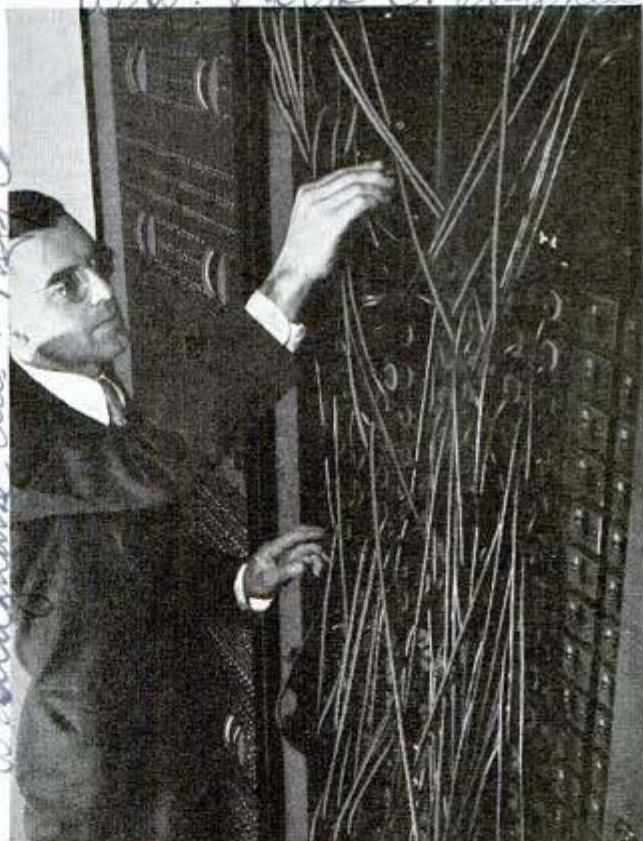
X1136

30,000-Foot Beams Cast by Anti-Aircraft Lights

Anti-aircraft searchlights on wheels, throwing a beam of 800 million candlepower, are rolling from the General Electric plant into the U. S. army service. Of the same type being used in the defense of London against air raiders, these lamps are five feet in diameter. They are mounted with their own power units on rubber-tired trucks for swift movement, and their beams, reaching five and one-half miles into the sky, can be directed from side to side or up and down with the ease of steering an automobile. In a test, a newspaper twelve miles away was read by the light of one searchlight.

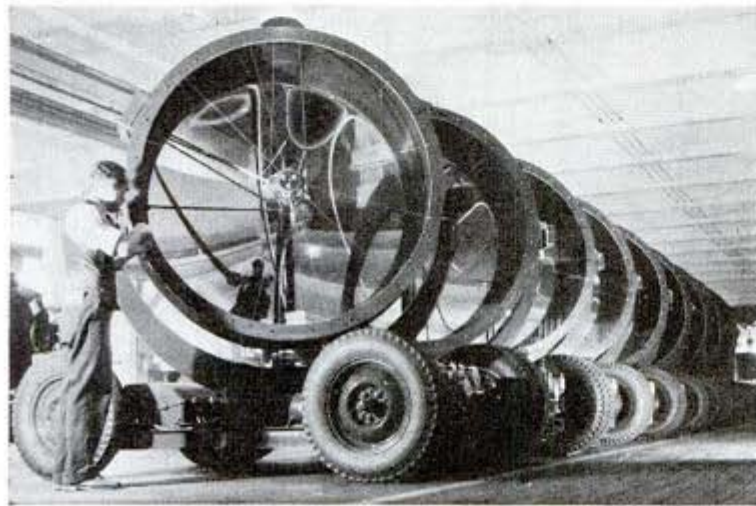
Miniature Electric Power System Gives "Preview" of Network

W.W. Parker, engineer



Engineer plugging-in one of the 300 circuits of the "network calculator" that can determine the future of new power system

When electrical engineers complete plans for a new power system, they can try them out on a "network calculator" before buying any equipment. Although it uses only a ten-thousandth of the power in the actual system, the machine tells in advance how a new network, or even proposed changes in an existing system, will operate when completed. With its 300-wire circuits it can reproduce a small-scale model of any electrical system in the world, and in practical use has saved millions of dollars and countless hours of laborious calculation. In fact, the calculator answers some questions which are almost impossible to solve without its use.



These five-foot eyes of U. S. army anti-aircraft batteries can be hauled quickly to the scene of an aerial attack to probe the sky for bombers

K 1188

Teaching Young AMERICA

Capt. R. de Witt Miller 457 S. Serrano Ave
 Los Angeles



Teaching young Americans how to shoot safely is objective of an organization established by police department of Alhambra, Calif. Weekly classes are held at a special range. Members bring their own guns, or if they have none, guns are furnished. Age limit is ten to eighteen. Working in cooperation with National Rifle Association, the group conducts matches and awards medals. Top, left, youngster sighting at Alhambra range. Below, .22-caliber bullet is shown to have penetrated four inches of wood



NO!



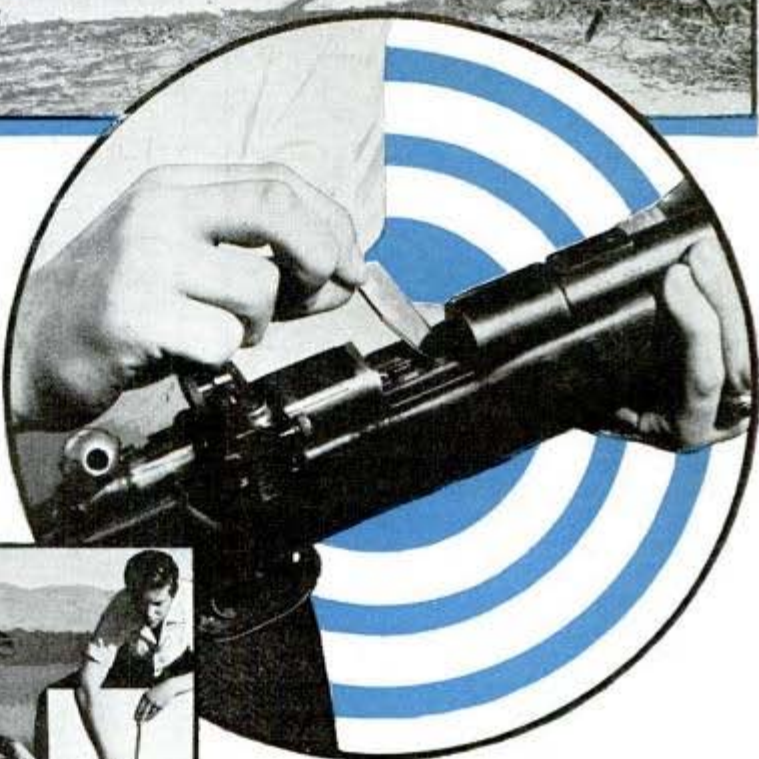
Left, center, the pupils are taught NOT to look down a rifle barrel to see whether it's clean. Bottom, shows WRONG way to cross a fence. Never climb over one while carrying rifle. Instead, lay rifle between lower rails, one post from where you intend to climb over. After you're over, pull rifle through fence, butt first

K118 S.

to SHOOT ★★★ SAFELY



Above, typical group of boys and girls shooting at Alhambra range. They fire only one shot, never attempting to operate automatic rifles. Telescopic device shown at right in photo is used for checking hits on targets. Circle (at right), correct way to examine inside of rifle barrel is to place a piece of mirror in firing chamber. Muzzle is then pointed toward the sun and inside of barrel is inspected easily in the mirror. At the range the breech of every rifle must be kept open except when actually on the firing line



Below, rifle is fastened on box; bull's-eye is held in front of white paper twenty feet away. As novice sights, bull's-eye is moved until lined up with sights. Then pencil mark is made through its center on the paper, left. Process is repeated. Usually a novice's dots are far apart. To pass test, three dots must be within one-eighth inch of each other

K1204. Fort Belvoir, Va.

Soldiers in Camouflage Suits Blend with Trees or Snow

Company D, 84th Engineers



Soldiers putting on new camouflage uniforms said to be more effective than those used in European war

Camouflage uniforms developed by United States army engineers blend snipers into trees, shrubbery or snow, making detection by the enemy difficult. Believed to offer greater concealment than designs used by European armies, some of the suits are worn like long coats and others like regular uniforms.

K1094

Snap-On Diffuser Reduces Glare from Fluorescent Lamp

Light diffusers, available in five different colors, fit over the tubes of fluorescent lamps to eliminate harsh glare and prevent



Made of plastic material, these light diffusers for fluorescent lamps are easily snapped on the tubes

Mr. J. A. Maxfield,
U. of Chicago and
reflection from eyeglasses. Weighing less than an ounce, the plastic diffuser is shatterproof and snaps on and off the tube without any adjustment.

K1297

Blood-Purifying Cells Traced with Radioactive Element

Using naturally radioactive thorium as a "tracer," scientists are studying the manner in which cells of the body, located in the liver, spleen, bone marrow, and lymph nodes, absorb foreign matter from the blood and carry it away. When injected into rabbits, thorium was first absorbed at a slow rate; then the rate was increased to a uniform speed until it reached the final stage when the rate dwindled once more.

K1255

Vacuum Cup Powered by Engine Removes Headlight Lenses

Besides gripping headlight lenses for quickly removing or replacing them, a powered vacuum cup now offered automobile mechanics has many uses around



Suction cup, for removing headlight lenses and for other tasks, gets vacuum from intake manifold

the shop. Through a small rubber tube attached to the cup, it obtains vacuum from the intake manifold where the windshield wiper gets its vacuum. This assures positive action so it will pick up heavy objects or hold auto window glass while it is being installed. The cup also helps remove dents in doors or bodies where the metal is thin.

POPULAR MECHANICS

Utility Vacuum Cup
Kup Co., Clarion, Iowa

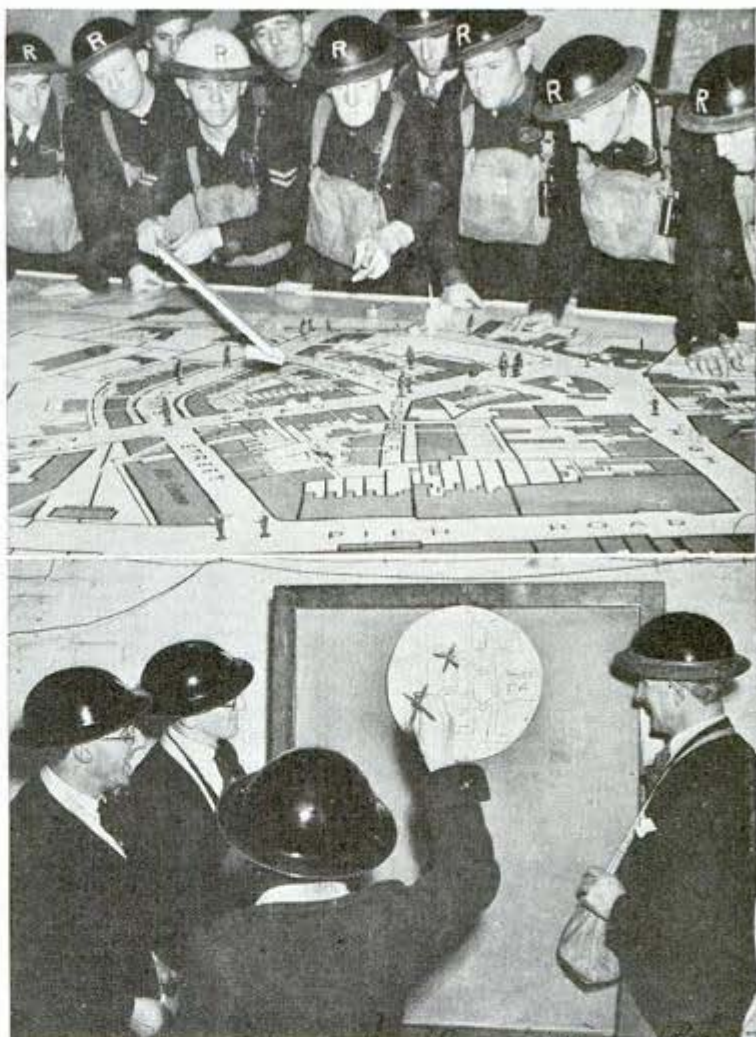
W. O. A. Mortenson, U. of Wisconsin

The Edwin J. South Co.
2615 Washington Blvd. St. Louis, Mo.

X1244.

Maps and Models Teach Air-Raid Wardens

Systematic training of England's air-raid wardens—those "minute men" who co-ordinate the work of rescuers, firemen and others when a bomb strikes—includes the use of a tactical table consisting of a map showing streets and structures of a large part of the city. Toy models of ambulances, fire apparatus, wardens and police are moved about to illustrate lectures and instructions. Fire hose is represented by strips of rubber. To simulate an air attack, paper disks representing bombs are dropped upon the "town." Students then demonstrate their ability in dealing with the areas hit. Air-raid wardens also show their knowledge and skill in a game of darts. On the dart board there is a chart of a district with the names of principal streets, and to the darts flights are affixed bearing reference to certain emergency air-raid messages. One of the wardens selects a dart, tosses it into a "street," and then reports by telephone the instructions called for in the emergency message. The head warden, at the other end of the phone, compares the warden's instructions



British air-raid wardens, top, studying their duties with aid of table-top map; bottom, darts and target demonstrate efficiency of students

with the official copy corresponding to the message on the dart's flights. If any errors have been made he corrects them through a loud speaker.

K1218 Long-Frame Floor Scraper Works under Low Fixtures

Scraping floors under low fixtures, such as radiators and stoves, is accomplished



Radiator is not an obstacle to this floor scraper

easily with a scraper equipped with an extra long frame for applying leverage. The pistol-grip handle may be removed or adjusted to lengthen or shorten the tool as desired. The blade is detachable for sharpening or replacement.

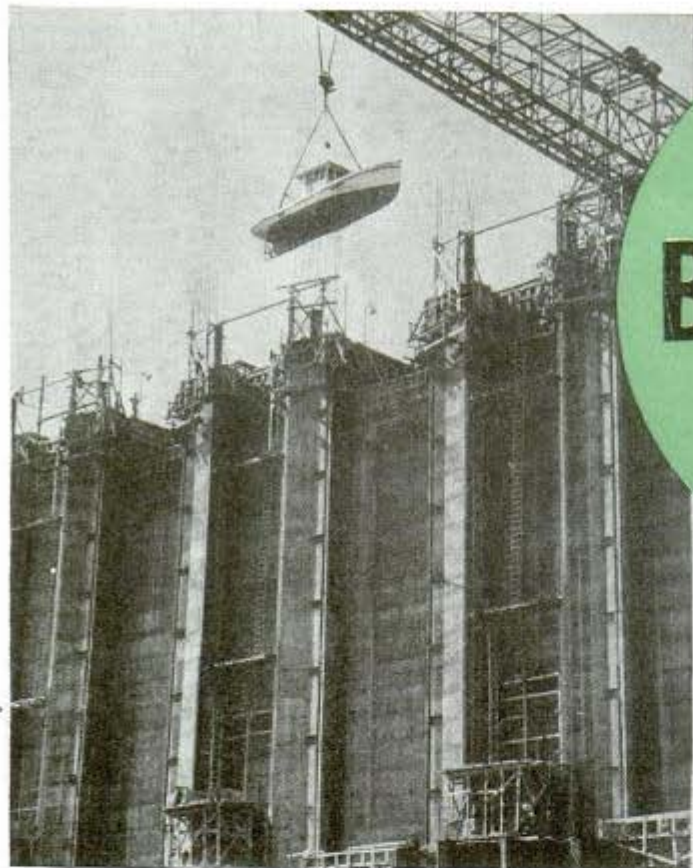
By feeding silkworms concentrated soybean milk along with their preferred diet of mulberry leaves, experimenters have increased the weight of silk produced, while decreasing mortality of larvae and pupae.

FEBRUARY, 1941
 Clark + Barlow,
 Dist. 123 W. Lake.

Technology Review
 Nov. 1940

K 1116.

Karl Stajel, Wauatchee
Daily World, Wauatchee, Calif.



PAUL BUNYAN'S POND

Launch being lowered into lake above Grand Coulee dam with 326-foot crane used in handling concrete buckets. Bottom, left, two-story house being moved five miles to higher ground. Right, launch gets a ride on flatcar

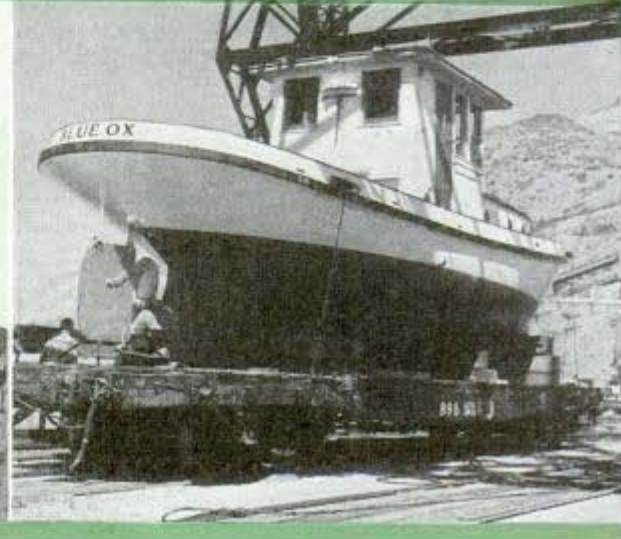
ELEVEN million dollars for a shave and a haircut seems like a lot of money, yet it's about what Uncle Sam's Reclamation Bureau is paying for the biggest tonorial job on record out in the Columbia river valley of Washington.

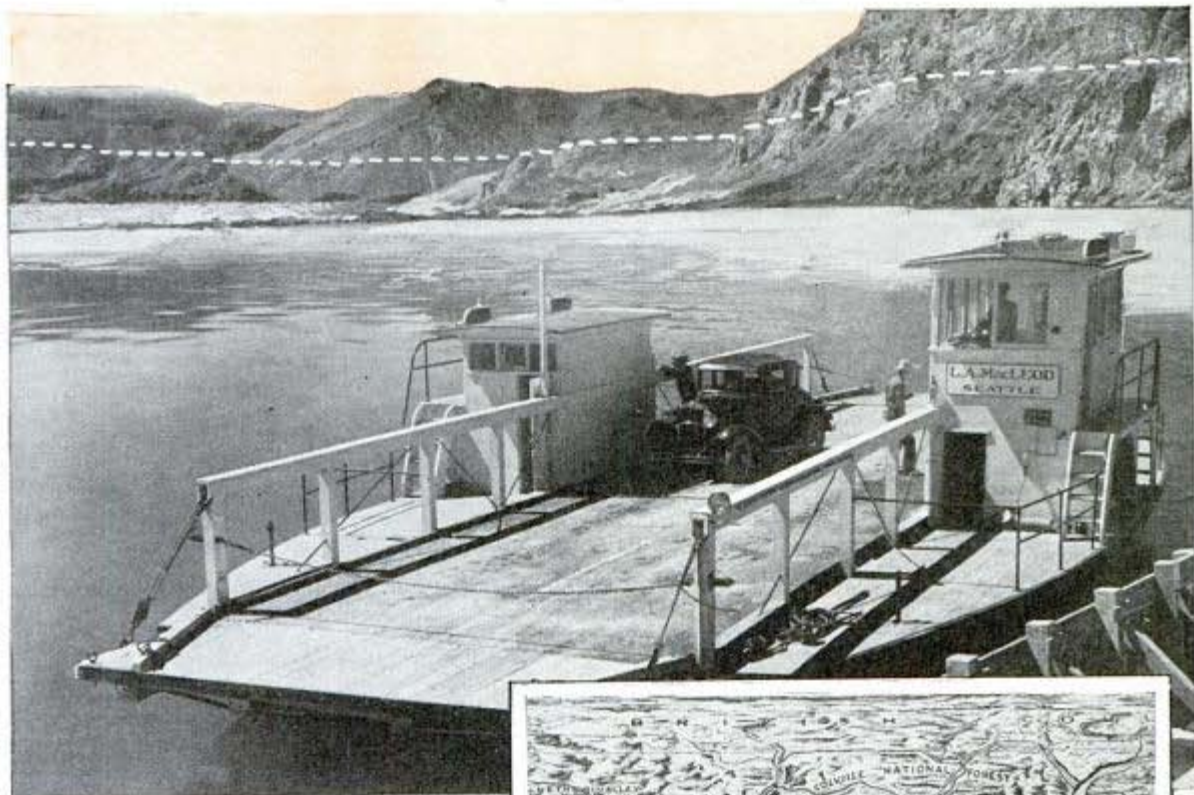
The three thousand men who have been on the job for two and a half years haven't been cutting the hair and shaving the

whiskers of the timber giant, Paul Bunyan, but their task is big enough to have delighted this mythical man of the Northwest who liked things on the grand scale. They have been clearing the way for the longest man-made lake in the world.

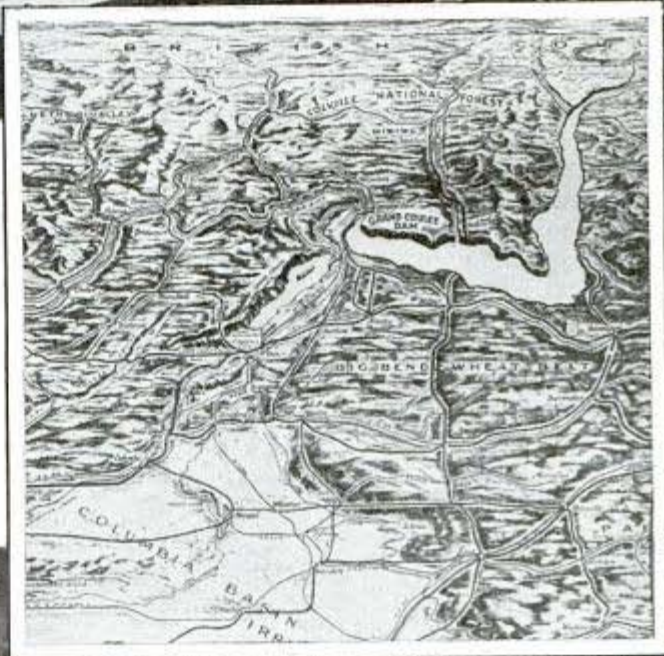
This lake, which is backing up for 151 miles behind Grand Coulee dam on the Columbia river, for sheer water volume is

Highland, Washington, D. C.





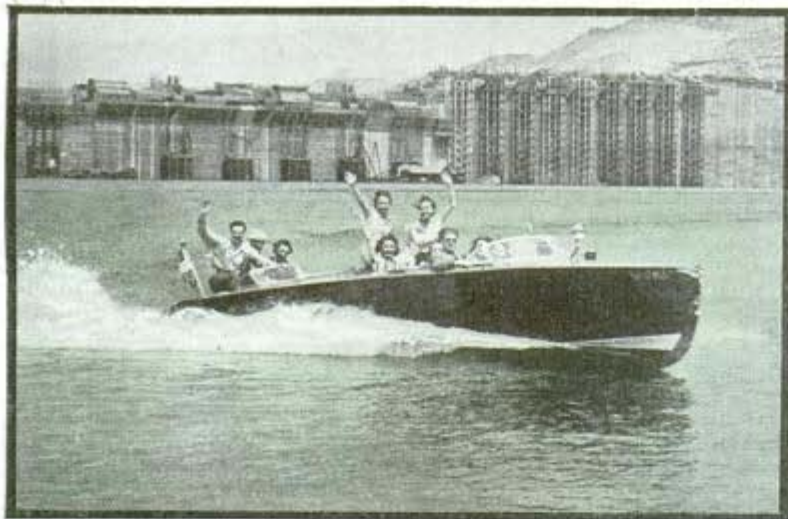
Above, power ferry has replaced old cable-operated boats. Line on hillsides shows height water will reach when lake is full. Right, map showing lake now forming behind Grand Coulee dam and extending to Canadian border. Bottom, abandoned shack being burned



second to Lake Mead behind Boulder dam in the Southwest. Lake Mead has a capacity of 30,500,000 acre-feet; Lake Columbia, 10,000,000 acre-feet.

One of the most unusual jobs in engineering records, the clearing of this 84,000-acre reservoir in Washington was supervised by the Bureau of Reclamation. The job was started in 1938. It has to be finished before mid-summer of 1941. It includes such individual performances as digging up and reburying the bones of more than a thousand Indians; buying out and moving four or five thousand people; dismantling ten complete towns and villages; moving thirty-five miles of railroad and constructing a new terminal;





height water would reach when the dam was finished. This survey was made by triangulation methods over a period of many nights in order that uneven daytime temperature would not affect the delicate instruments. It was so accurate that a slight discrepancy of the United States Geological survey levels, made years before, was discovered. Had this error not been rectified,

replacing 125 miles of highway and completing 840 land transactions with two thousand owners. In addition, bridges are being moved and rebuilt, timber disposed of, brush burned, and debris of all sorts moved out of the way of what is becoming a lake.

The Columbia is a big river, bigger than many people realize. Its flow ranges from a maximum of 700,000 cubic second feet in flood stage to less than 50,000 second feet in winter. It raises and lowers as much as fifty feet between high and low-water stages. The problems of handling this volume of water in a storage pond were, therefore, on the Paul Bunyan scale.

There had to be an exacting survey made of the river valley above the dam. It was necessary to reckon to the exact inch the

height water would reach when the dam was finished. This survey was made by triangulation methods over a period of many nights in order that uneven daytime temperature would not affect the delicate instruments. It was so accurate that a slight discrepancy of the United States Geological survey levels, made years before, was discovered. Had this error not been rectified, and had the original elevations been used, a flood in the Columbia at some future time might have backed up beyond the 151-mile limit and into Canada, flooding Canadian towns and causing international complications.

There are numerous smaller streams



Top, pleasure boat on Lake Columbia. Right, the steps remain, but the building is gone. Bottom, Kettle Falls before being dismantled and moved

R1176

and rivers emptying into the Columbia between Grand Coulee and the boundary, and each of these channels and valleys had to be cleared ahead of rising water. In one instance, the Spokane river will be backed up twenty-eight miles, bringing a new fresh-water lake to within twenty-five miles of this inland empire metropolis.

Clearing crews have cut down and trimmed merchantable timber, twenty million feet of it. They still have sixteen million feet to cut. This timber is floated down river to a private sawmill which has a contract with the government. The crews, living on floating and in mobile camps, also have chopped and burned brush and

(Continued to page 139A)

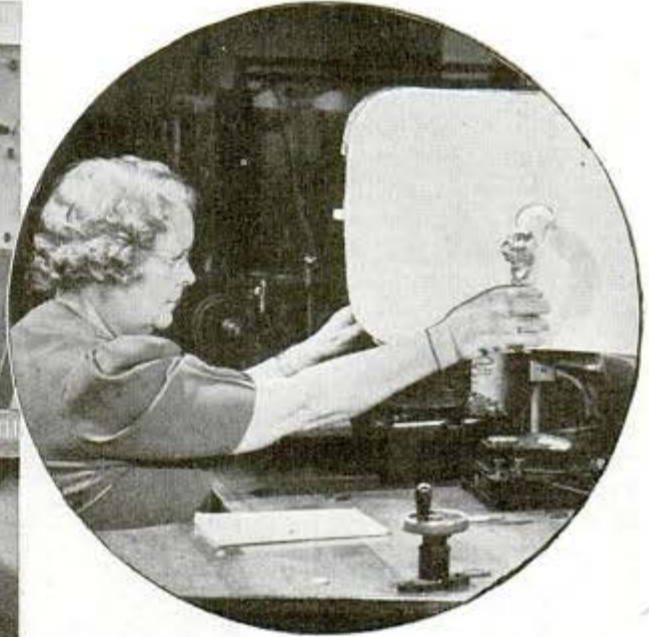


Top, clearing crew boarding barge. Center, crew at work clearing the way for Lake Columbia. Bottom, Grand Coulee dam nearing its 550-foot height. Lake will rise approximately 170 feet above level shown

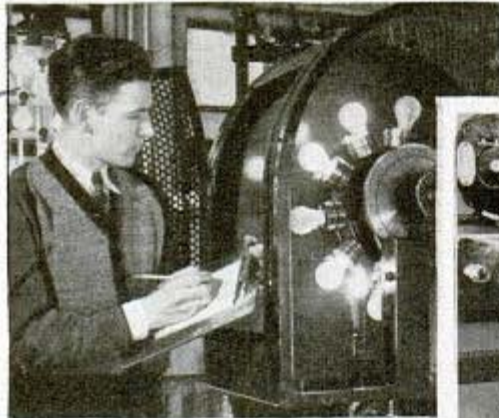
K1245

1117

Electric Lamps Tortured To Improve Them



Thousands of electric lamps are deliberately pounded, dropped, bumped and burned out at Westinghouse's lamp division each year to improve those offered the public. Top, left, bumping lamp against board to test its shock resistance. Some lamps must weather forty bumps. Right, placing photoflash lamp in tester. There it is set off to permit calibration of duration of flash



Center, left, rotary shock tester which revolves electric lamps around their own axis and around periphery of large drum. Thirty-six times a minute the forty-five pound drum drops a short distance to simulate service on vibrating machinery. Right, rough-riding merry-go-round for tiny lamps produces vibrations similar to shocks if lamps were used on automobile instrument panel. Bottom, boxlike drum treats lamps roughly, some of them being subjected to equivalent of bouncing down 400 steps varying six to fifteen inches each in height. This "torture" reveals strength of globes, bases, filament, lead and support wires and all other parts

at Westinghouse Lamp Div.
Blomfield. U.S.

R. 1129. Designed by E. S. Fitch, Engineering Dept., General Electric Co. Field Park, Caledonia Public School, East Cleveland, Ohio

Man-Made Sky Spreads Light Evenly in Room

Glare-free and uniform lighting has been brought into a Cleveland classroom with an overhead system of fifty daylight-type fluorescent lamps, each four feet long and tubular in shape. The result is a man-made sky emitting cool, "natural" light from specially designed reflectors. Although it provides more than twice the illumination found in adjacent rooms equipped with filament lamps, the new installation consumes only 2,500 watts, which is no more than the energy used by the other rooms.



Fluorescent lamps in specially designed system of reflectors illuminate each pupil's desk in this classroom with wealth of daylight. On bright days system helps make light uniform for all

Shotgun Fires Insecticide Powder to Destroy Tree Pests

Powdered poisons, packed into cartridges, are fired from a shotgun in one method of controlling insects in trees. Twelve-gauge cartridges are available containing arsenic

and lead for control of leaf-eating insects, nicotine dust for sucking insects, or sulphur dusts for preventing infection by leaf diseases. The paper "projectile" bursts on contact with the air after it leaves the muzzle, the insecticide scattering widely and settling on the leaves. By calculating wind drift a single tree can be covered with one cartridge, and in an orchard a cloud of dust can be sent drifting along a row of trees by aiming the gun carefully.



Charge of powder insecticide, left, spreads over wide area when fired from shotgun. Right, reloading with cartridge and paper "projectile"

Seventy-one per cent of the world's passenger automobiles are registered in the United States; in 1939 a world record of 45,027,000 cars and trucks was reached.

Huffman Chemical Co. Bedford Hills, N.Y. Auto Inj. Assn.

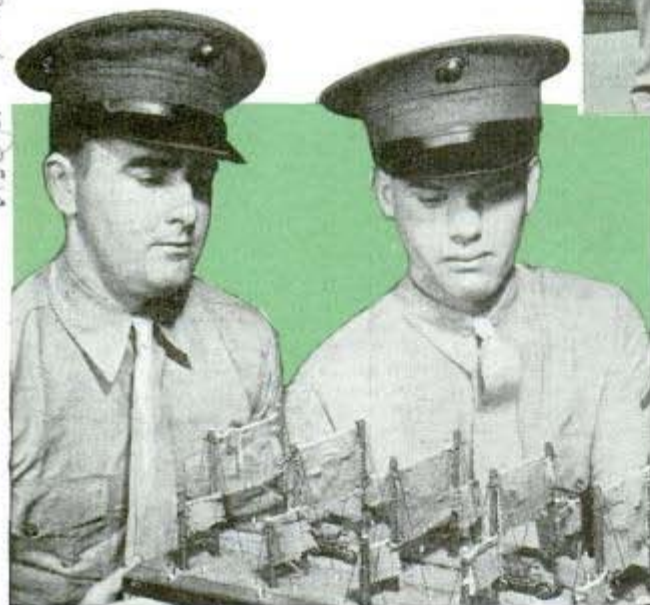
92
 Cont. Thomas E. Stensme 4/1
 3872 Franklin Ave
 San Francisco, Calif

SEA-GOING



SAN CLEMENTE is a rugged, inhospitable island off the California coast that is captured several times a year by the United States Marines. Smoke-laying airplanes swoop across one of its narrow beaches and cruisers offshore stand ready to shell its cliffs.

Crouching out of sight in their shore boats until the breakers are reached, the marines spring up and dash through the surf with their rifles at the ready. While the first group is taking cover more men arrive and the detachment begins to spread out over the ground that commands the



Upper left, practicing prone firing; right, loading a heavy field gun. Center, recruits on rifle range. Model at bottom illustrates use of tarpaulins and poles to camouflage a road or strategic position

beach. By now machine guns have been carried through the surf and assembled and the special beach boats are bringing in loads of tanks and anti-aircraft artillery.

This mock warfare is conducted in private because in an actual war such a landing party might have to fight its way ashore against a superior force, hence the soldiers of the sea use secret equip-

Ref: Major Bales, Twelfth Detachment, U.S. Marine Corps, San Clemente, Calif.

SOLDIERS

A926.

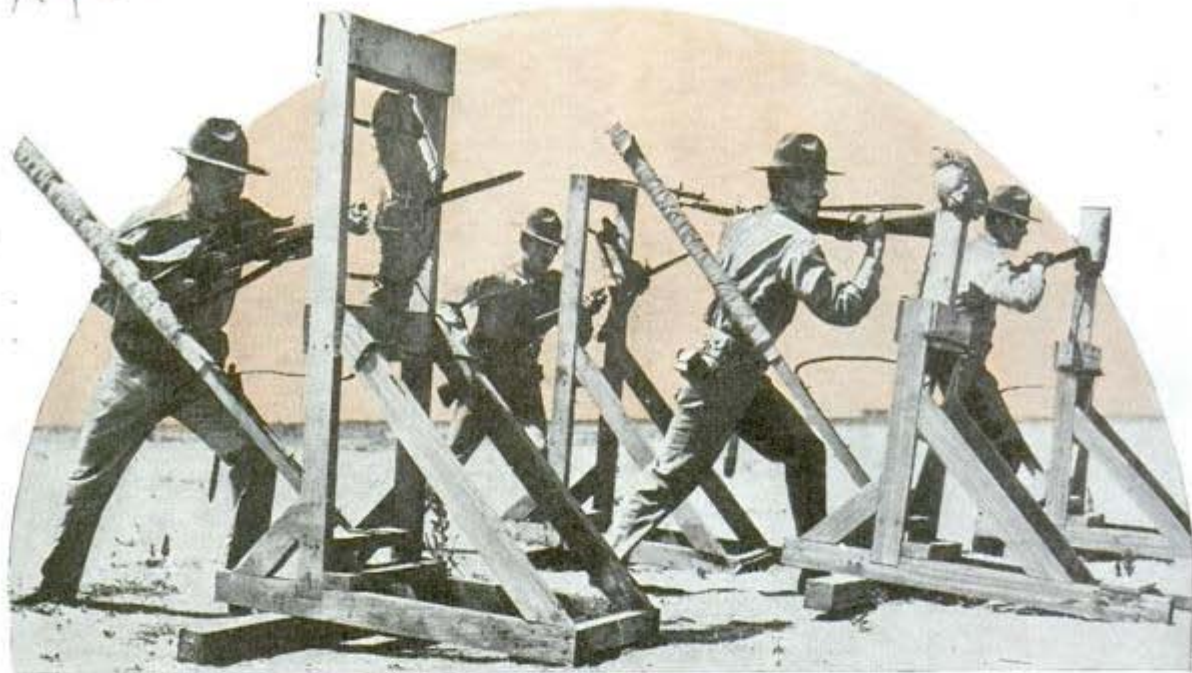


Above, classroom model illustrates fighting plane in dive-bombing maneuver. Left, marines with light field equipment landing on beach from surf boat. Below, bulldog mascot, "Private James Jolly Plum Duff," of the San Diego base with a player on the marine base football squad

ment and technique to increase their chances of success. One thing that the Marine Corps doesn't keep a secret is its emphasis on marksmanship. From the day he first joins up a marine recruit is never allowed to forget that he must become an expert shot because some day he may be fighting against heavy odds where superior shooting may save his life.

Why should the marines practice beach landings? Suppose an enemy established a base somewhere in Latin America preparatory to launching an attack on this country. Our airplanes might be able to destroy such a base but the final mop-up

K'9:25



Marines engage in bayonet practice against mechanical dummies, above. Below, pistol range practice, and a hand-to-hand battle with bayonets as training for rushing enemy positions

would be done on the ground. That's an army job, with the marines acting as a spearhead, capturing a beach and spreading out to defend it while the soldiers are being landed.

The leathernecks are one of the crack fighting forces of the world. Active duty is a tradition and today there are marines serving in China, the Philippines, Guam, Panama, and the Caribbean, as well as with the fleet. These sea-going soldiers are military descendants of the naval marines of the days of sail, who did the actual fighting while the sailors worked the ships. Since the United States Marine Corps was established in 1775 the marines have participated in a wide range of duties, from fighting pirates and quelling rebellions to serving as legation guards and guarding the mails. The marines were with Washington at Trenton, at New Orleans in 1815, at Samoa in 1841. They fought in every major engagement of the World War in which Amer-

ican forces participated and today are on duty at nearly all of the outlying possessions of the United States.

Adventure and travel are highlights of



K925

life in the Marine Corps, as well as occasional hardship, for the marines are trained to take punishment. Many have been cited for conspicuous bravery in the face of danger. In 1928, when a small group of marines was surrounded in Nicaragua, Lieut. C. F. Schilt landed his plane ten times on a village street to carry to safety a number of badly wounded men. Each time he returned he brought ammunition and supplies, although parts of his plane were torn by bullets. A few years previously Private Albert J. Smith, doing sentry duty at Pensacola, watched a plane crash on the field and burst into flames. Instead of wasting time running for help, Smith rushed out and worked his way under the wreckage. He rescued the pilot although both men were burned by flaming gasoline before they got clear.

During the World War a marine who was captured by the enemy knocked one of his captors down, grasped the fallen man's bayonet, and slew the other guard. He escaped to his own lines and a week later rescued a wounded officer who

(Continued to page 124A)



From top to bottom, marines are shown rehearsing for battle in a cloud of gas; studying classroom models of a trench for trapping tanks, and a shallow pit such as is used for a temporary machine-gun nest; practicing loading and aiming one of the U.S.S. "Chester's" guns; and pitching hand grenades

K 1191

Fire Hose Erects "Curtain" to Protect Firemen

The Lum Pro. Sec. Live Fire
No. 903, 8903, Mandale & Detroit



Fog-shaped spray of water between men and fire they are fighting dispels some of the heat and smoke

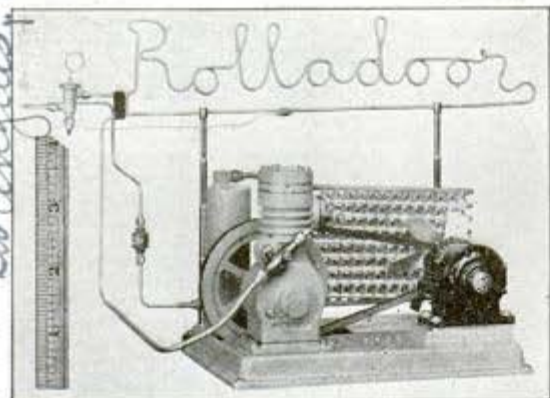
Firemen can work at closer range to raging fires with a fire-hose nozzle that dispels heat and smoke by setting up a circular spray of water about the men. Direction and size of the protective water curtain are adjusted at the nozzle.

K 1230

Tiny Refrigerating Plant Model Frosts Tubular Sign

1828 W. 43rd Place,
Los Angeles, Calif

Capable of performing real service, a midget working model of a refrigerating plant is only three and five-eighths inches high and five and three-eighths inches long. The miniature, built by W. A. Pruett,



Refrigerating plant is just a baby, yet it is capable of keeping sign above it covered with frost

National Roller Stamp
Society, 2443 W. Maine Ave

research engineer, during spare time, cools a small tubular sign, mounted over the machine, sufficiently to keep it coated with thick frost. A one-twentieth horsepower motor drives the unit at a speed of 400 revolutions per minute. Bore and stroke are five-eighths inch, and piston displacement is .191 cubic inch. The flywheel has a diameter of three and one-fourth inches, crankshaft bearings are one-fourth inch in diameter, and wrist pins, which are hollow, measure nine-sixteenths inch long and one-eighth inch in diameter.

Clary

K 1074

Collecting of Poster Stamps Is the Latest Hobby

One of the popular new hobbies is the collection of poster stamps. It is sponsored by a national society which has laid down certain standards which must be met by the states, cities and industries issuing the stamps. The stamps, for example, must be printed in colors and measure approxi-



Here a collector is pasting some of the colorful poster stamps into a special album

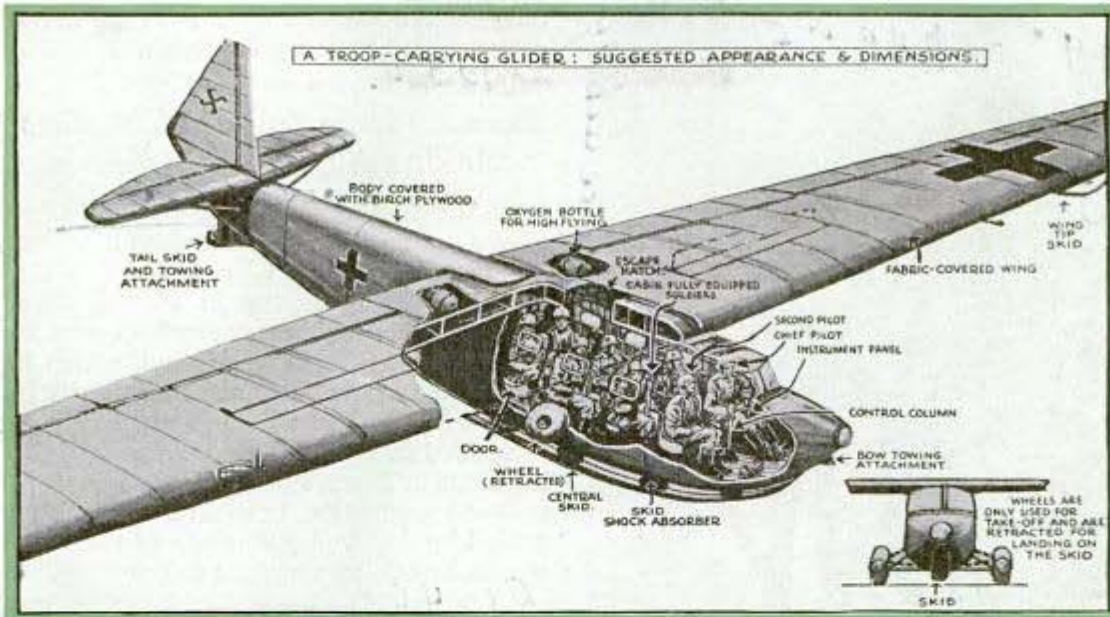
mately one and seven-eighths by two and three-eighths inches. Albums are available for collecting the various series. The state of Maine, for example, has an album for its own series of twenty-four pictorial stamps, on which are pictured various historical or scenic spots—Longfellow's home, Mt. Katahdin and a winter sports scene, among others. There are travel series, sports, religious stamps, and several foreign issues.

Static-free rubber for tires, particularly valuable for large vehicles and gasoline trucks, is now being produced.

Clary, Akron, Ohio

K 11.0.4

Glider 'Trains' Land Invading Troops Silently



For several years the Russian army has been experimenting with tow trains of troop-carrying gliders, and this is one of the methods of invasion against which the English people have been warned to be alert. Trains of huge gliders, each glider carrying eight soldiers, including two pilots, could be towed aloft by a powered airplane and then cut loose to glide silently to a landing in enemy country. From 20,000 feet a glider with favorable wind might travel seventy to 100 miles, unseen in darkness and of course unheard. Whether Germany plans to use this weapon is unknown, but an English artist drew these pictures to forewarn the public. He points out that a glider seen in the sky is easily distinguished from an airplane by its broad wing span. A glider can skid to a stop in a few yards.



Illustrated London News July 20th

K 1242

Vise Controlled by Pedals Frees Hands for Work

The Automatic Vise Sales Co
2845 Sunset Place Los Angeles
Calif

4" - \$49.75



Service Service Lab 29

With one foot applying pressure on the pedal, the operator has both hands free to hold work in vise

Foot pedals operate an automatic vise just put on the market, its purpose being to save the time and labor required by the hand-screwed vise and free both hands of the operator for the work. The main clamping pedal gives enough pressure for general work, but an auxiliary pedal can be used for additional pressure if needed. Two side pedals are used for releasing.

K 1243

Dial Opens Alphabetical Index at the Right Place



To find the desired card in an alphabetical index now available, you simply dial the individual's initial as on a telephone dial, press a button, and the index opens automatically at the right

The Brates Mfg Co
Orange, N.J.

Prof Elizabeth M. Coy

place. Cards for entering names, addresses and phone numbers are attached by ring binders. Rubber feet anchor the file to the desk without marring the finish.

K 1224

Bacteria from Soil Aid Chemists Making Alcohol of Molasses

On the campus of the University of Wisconsin a species of soil bacterium has been discovered which is helping develop the butyl alcohol industry in Puerto Rico. This germ has a high capacity for converting molasses into butyl alcohol, which is used as a commercial solvent, especially in the paint industry. The industry has been hampered in Puerto Rico by a germ-killing virus or bacteriophage which seriously reduced production, but this difficulty was solved by developing a strain of the Wisconsin bacterium resistant to the virus.

K 1240

Suction Lifter Picks Up Glass or Sheets of Metal

Forming a convenient handle for smooth objects like glass and sheets of metal, a suction lifter is designed to hold as much weight as one person can lift. The stout handle is shaped to fit the hand comfortably and does not require the use of gloves. Suction can be broken instantly by an automatic release located near the finger tips.

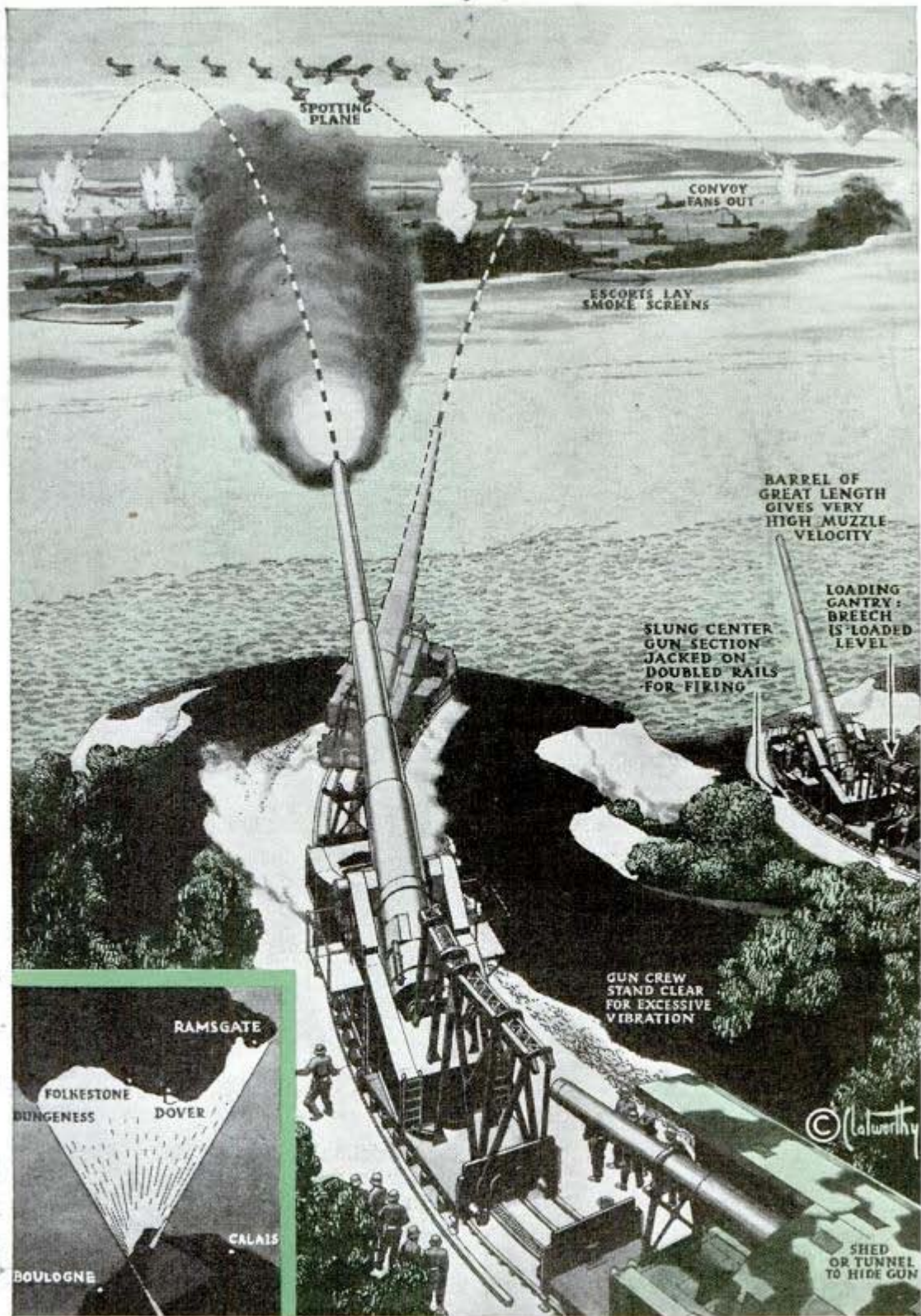


Two suction-cup lifters provide carrying handles for heavy flat sheets of metal or plate glass

Madison, Wis
Sara Curie, N.Y.
W. B. Clancy, Inc. 1070 W. 3rd St. - Cal.
J. N.

R1194, Cont. S. W. Cratworthy, 84
 Lewin Road, London, S.W. 18, England

How Big Guns Shoot Across English Channel



Here's how German guns on French coast imperil shipping in English Channel, as well as towns on opposite shore. Gun runs on curved rail to attain large traverse (wide side-to-side range) and is mounted on two carriages of twelve wheels each

K 118

**Net in Ceiling Rings Alarm
if Fire Bomb Hits Roof**



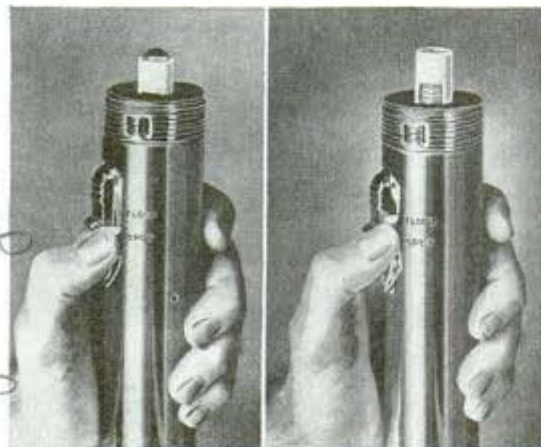
Alarm netting in ceiling of London store sounds a warning in the event building is struck by bomb

Immediate warning will be sounded in one London store if an incendiary bomb should fall on its roof. Slung below the ceiling of the top floor a net completes an electric contact to ring the alarm bell as soon as any object penetrates the roof.

K 113 2

**Sliding Sleeve on Flashlight Bulb
Makes Spot or Floodlight**

Both a powerful long-range spotlight and a brilliant diffused floodlight are combined in a single flashlight with the aid



Left, drawn backward, sleeve permits rays to strike reflector; right, forward, it throws out "flood" beam

Bemis Bros. Bag Co
601 S. Fourth Street
me

of a sliding sleeve. Made of white translucent material, the sleeve slides backward and forward over the socket and bulb, being controlled by a small button on the outside of the flashlight case. When the sleeve is drawn back it permits the light from the filament to strike directly against the reflector, resulting in a piercing spotlight. Push the sleeve forward and the flashlight throws an evenly diffused floodlight free from dark rings because no bright rays from the bulb can reach the reflector.

K 113 5

**Friction-Drive Sewing Machine
Closes Tops of Bags**

Requiring no electric power, a portable sewing machine for sealing the tops of bags is operated by friction drive. As the machine is drawn across the top of the



Notice the label that has been applied automatically as sewing machine was drawn across top of bag

bag, friction rollers rotate and transmit power to the needle, which seals the bag with a single thread twisted-loop chain stitch. A slot is provided to feed labels automatically for fastening along with the top.

Seven southern states shipped 382 tons of live bees by express—representing perhaps four billion bees—to northern "honey farmers" this year.

Railway Express Agency

News Bureau, Publ. are
2 30 N.Y.C.
53 60

Montgomery Ward - Chicago

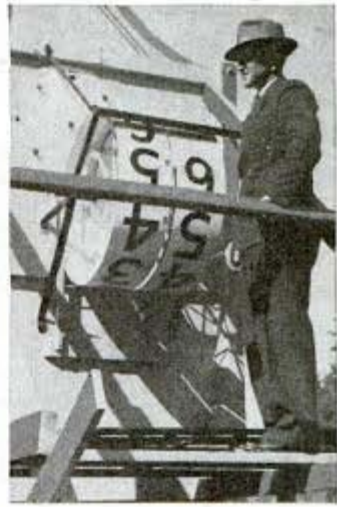
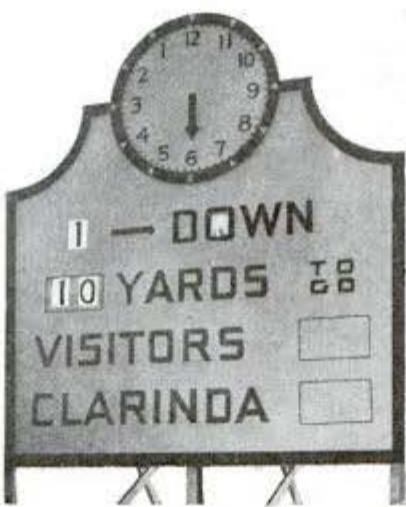
D. Lambert

601 S. 4th St.

K1131 Parris. Dunn Corp
Clarinda, Iowa

Wheels Change Football Scoreboard Quickly

To keep pace with the fast progress of football games, markings on the scoreboard can be changed more speedily with a wheel mechanism introduced recently. The common practice of showing "yards to go" and the "downs" involves the use of cards or tabs hung on a hook, which have to be changed after virtually every play. With the new system numbers from zero to nine are fixed on the outer rim of two wheels which are mounted side by side behind openings in the scoreboard. By rotating the wheels the numerals can be changed rapidly to indicate the number of yards left to go. A disk mounted flat against the



Scoreboard tender makes rapid changes on face of scoreboard, left, with aid of a pair of wheels, right, bearing numerals to show "yards to go"

back of the scoreboard, marked from one to four, shows the number of the down. The disk and wheels are indexed on the back for the operator's convenience.

K1172
Lieut. K.L. Johnson

Models Show How "Slow Roll" Is Performed in the Air



Group of student pilots at Randolph Field demonstrating the "slow roll" maneuver, with model planes in respective positions

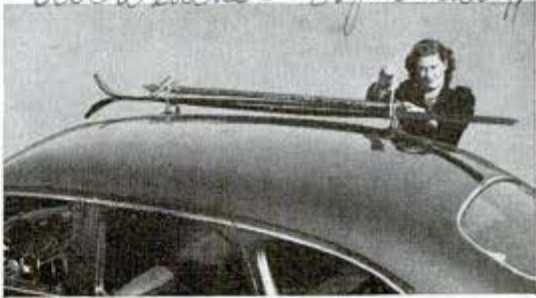
By using model planes, students at Randolph Field, Tex., illustrate how a "slow roll" is performed in flight. Thus, they learn the respective positions in which their planes should be at certain stages in the maneuver. Starting level, the plane is rotated around its longitudinal axis with the ailerons. If done correctly, no altitude is lost.

K1236

Luggage Carrier on Roof of Car Rests on Four Suction-Cup Feet

Lengthy luggage, such as skis, fishing poles and oars, can be stowed away on a rack fastened to the top of the automobile by four live-rubber vacuum cups three inches in diameter. Attached to each pair of these tightly gripping cups is a steel bar capable of bearing heavy loads. Two chains eighteen inches long, included in the equipment, wrap the load securely. Since only the soft rubber feet touch the car's roof it is claimed that the carrier will not damage even the glossiest finishes.

All Weather Top Car \$1.00



Rack on top of car provides ample space to load a pair of skis or other luggage too long for trunk

Peerless Chain Co.
Winona, Minn.



RADIO

IN THE radio drama, two gangsters were supposed to be seated in a car plotting a crime, but one listener didn't hear it that way.

"I don't get the 'feel' of the inside of a car," Ted Sherdeman, a radio producer, commented. "Sounds just as if two fellows were standing on top of a mike, pounding words into it."

Engineer Joe Kay agreed. That was the chief fault with most air dramas—no matter what the locale, a telephone booth or the rim of the Grand Canyon, the "sound depth" was the same.

They began casting about for some convincing way of creating the illusion of space so the listener would "see" the scene of action, whether it be a car, a bedroom, or a zoo. Into NBC's Hollywood studios

At upper left, swords clash for swashbuckling air drama; right, sound effect for car rolling on gravel alongside bushes. Wind machine and splash in tank simulate man jumping from cliff to sea (center); below, playing pool for the mike



R 798. Cont. James Mc Greeney
4600 W 83rd Cleveland Park,
Kan



Makes it SOUND RIGHT

they lugged a barrel of gravel, palm fronds, motor-car parts, a black-board, and a score of other items. Carpenters were set to work building special effects and enough microphones to man a political convention were corralled.

An experimental program finally was aired. Listeners commented on the realism of the sound effects. The action seemed to switch from a small room to the outdoors, from inside a sedan to a pool room.

Bound up in the program was a new production technique for gaining depth, variation and realism in all voices and sounds. Instead of two or three microphones, nine were brought into play and the cue sheets from which players and engineers worked were scribbled with charts. Only when the auditory equivalent of the movie close-up was desired were the actors permitted to speak directly into



Water sounds are produced by unit at top, left; right, a cabbage is smashed, men grunt and one falls to floor to simulate knockout punch. Below, recording train noises

a mike. Areas were chalked out on the floor; within their boundaries the actors could move about without even facing the mike. Through this flexibility of motion a score of different voice tones were effected.

K-7-95



Acoustical devices and realistic props furnish "sound perspective," top; right, some of the material for imitating sounds of artillery and tanks, including "thunder drum" of elephant hide in background. Below is a roomful of "battle noises"

noises ranging from the sound of rolling a cigarette to the bombing of the carillon of a famed Belgian cathedral.

When N. Ray Kelly, head of the NBC sound effects division, was asked for an estimate on the number of sounds available he smiled.

"We thought," he explained, "it would be a good idea to catalogue our different effects, and last year I began compiling them. By the time I was half through the

But the mike technique was only half the story. To make players seem actually to be talking inside a motor car, a small one was wheeled into the studio so the players could read their lines from inside it. Actors in cowboy boots and spurs strode over a planked floor built into the studio to simulate an old western saloon; lines were mouthed against a background of pool-room noises, which sound men supplied with regular cues and balls on a miniature table. A tire was rolled off a chunk of pavement through a box of gravel into some bushes. Effect: a driver steering his car over the curb into a gravel driveway, and pulling up alongside a row of bushes.

The experiment reflects the advances made in the "scenery" of broadcasting. Less than a decade ago, not one man devoted full time to sound effects; today in Radio City alone there are thirty men who set the stage for more than 150 shows a week with



K-798

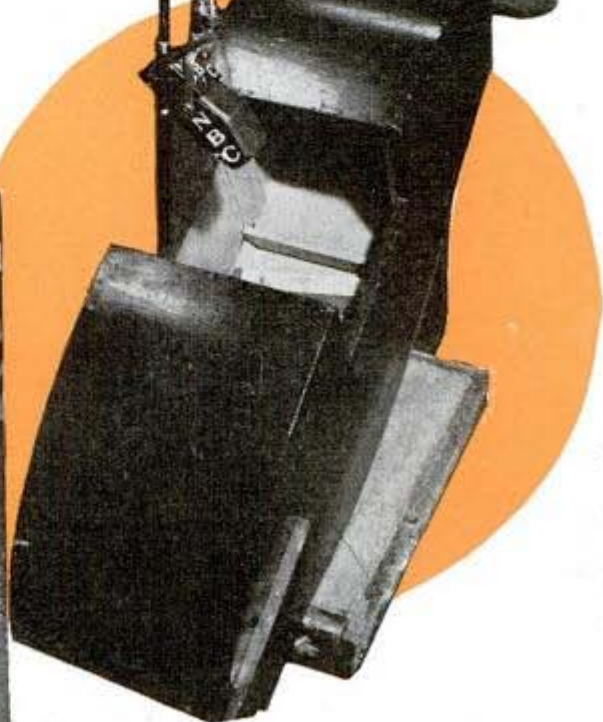
D's I had more than 5,000 listed."

The most common bit of "business," the opening and closing of a door, reflects the evolution of sound effects. Where once it was done by simply banging the lid of a studio piano, the network has twenty-five different type doors set in frames and mounted on casters so they can be wheeled from one studio to the other. There are jail doors, cottage doors, screen doors, and office doors; doors that "creak in the wind"; doors with eery squeaks, and doors with crash panels the forces of law and order can break when the international jewel thieves have been trapped.

The extent to which the listener has grown ear-wise is the chief reason sound men have gotten away from faking or approximating sounds. Should an incorrect number of toots be made by a locomotive at a crossing or an incorrect ship

(Continued to page 114A)

Cowhide drum, top, sounds like thunder, earthquake or what you will. Sound man (center) takes a fall for an actor. Below, squeezing water from syringes to simulate milking; right, water rocked in buggy sounds like the sea



K1207

Voice Silencer on Telephone Lets You Talk in Secret

Telephone Services Co
10 E. 43rd. New York City



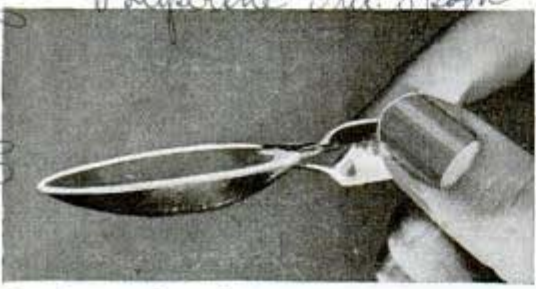
You can't hear the words spoken into this "silent" mouthpiece unless you are at the other end of line

Your telephone conversation can be made inaudible to others in the same room if the phone is equipped with a new mouthpiece that prevents sound from escaping. It is easily attached to any hand instrument and fits snugly around the speaker's lips. There is no distortion of the voice. Part of the midget "telephone booth" telescopes to fit the standard cradle phone.

K1234 ——— Standard Medicine Dosage Spoon Measures Exact Quantity

How much is a teaspoonful of medicine? Investigation by medical authorities shows

Sold thru
Druggists only



Plastic spoon for medicine assures correct measurement when prescription calls for teaspoonful

230 Owens-Illinois
Glass Co, Toledo
Ohio

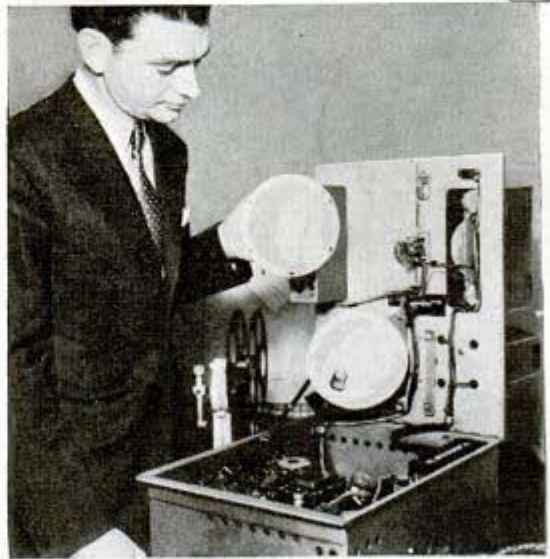
Electrical Measuring
Products, Inc.

there are twenty-nine different size teaspoons, resulting in hit-or-miss measurement of medicines in the home. To end this uncertainty, a standard-size spoon, made of plastic, is being supplied to druggists who will distribute it by attaching one to each medicine bottle. The spoon will not be sold direct to the public. Instead of the usual long handle, the spoon has a short, stubby handle. It has a capacity of exactly one-eighth of an ounce or one dram, which is the size accepted by the American Medical Association as standard.

19503 Broadway
New York City

K1253 ——— Mechanical Eyeball Measures Density of Movie Film

Hollywood's new counterpart of the pocket exposure meter familiar to the amateur camera enthusiast is a mechanical eyeball so highly sensitive that, as one engineer said, "let one lightning bug in a swarm of 500 stage a blackout and the Integrating-Sphere Densitometer can spot him!" The Densitometer traps in its hollow sphere that portion of a light beam



Inside the hollow sphere, light that has passed through film is reflected to photoelectric cell

which passes through a test sample of motion-picture film. All the light entering the "eyeball" is reflected, as a thoroughly mixed product, to a photoelectric cell and then registered on a meter. This enables the technicians to regulate the developing of the film with extreme accuracy, indicating the time of development much as the ordinary exposure meter advises the time for exposure of a film.

*Designed by Dr. E. Engelke, New York
Built at Cleveland Lighting Works*
Electric Lamps 'Blend' Sunlight in Art Gallery



Miss Nancy Weston
 Above, installing "sunlight" battery over art gallery; in circle is one of the lamp units, and beneath it, through ceiling window, can be seen paintings on wall. Below, visitor sees painting in natural light.

spectrum of nature's north light was reproduced by blending the warm light of 220 incandescent lamps using about 33,000 watts with that of 206 cool fluorescent lamps of thirty and forty-watt ratings. These banks of lamps are arranged above water-white plate glass that has been sandblasted on one side to diffuse light properly. Typical of the results of this improved lighting is the change in appearance of a portrait by Whistler. Under previous lighting the legs and feet of the figure were invisible in the blackness of the background. Now the shoes of the figure can be seen. By adjusting the amount of light, dark paintings are toned up and brilliant ones subdued.

Isabelle Eugene & Pechee
 Man-made sunshine pours through the heat-treated glass roof of a gallery of famous paintings in Pittsburgh, bringing out the true colors of the masterpieces as the artists painted them. The 112-foot gallery appears to be bathed in real daylight. The

1233 Carnegie Institute
Ultraviolet Lamp Aids Surgeon in Removing Cataract

Specially designed for cataract surgery, an ultraviolet lamp just developed renders the crystalline lens of the eye fluorescent and thus helps guide the specialist in the operation. Under its beam of light the lens is brilliantly visible and any remnants which might cause trouble afterward if not removed are easily located by the surgeon and extracted.



*American Optical Co
Dorchester, Mass.*
 Invisible light from hand lamp makes crystalline lens of eye fluorescent and guides operating surgeon

Forest fires in 1939 destroyed lumber enough to build 330,000 six-room houses.

*Forest Service
Washington, D.C.*

K 118 O.

Wrench "Swallows" Wheel Lugs as It Removes Them



Auto wheel wrench retains lugs in magazine (see inset, right) as they are removed. Upper left, handle loosens hub cap

Removing tire and rim from an automobile wheel is accomplished easily by using a magazine wrench now on the market. Designed in the shape of a "T," the tool has a hollow stem in which the nuts, bolts or lugs remain after they are turned off the hub, eliminating the possibility of their loss. In putting them on again the magazine delivers the nuts or bolts one at a time, like a repeating shotgun, as the wrench is pressed against the threads.

K 1212

Position Indicator for Airplane Is Aid to the Pilot



All a pilot needs to know about the position of his plane in relation to the earth's surface is shown constantly by a new type artificial horizon instrument.

Its low cost makes it available for every kind of plane. The instrument includes a gyroscope-controlled needle that always points perpendicularly to the earth's surface regardless of the attitude of the air-

plane. For easy reading the needle is housed in a transparent hemisphere marked off in degrees. It combines in one unit the functions of bank-and-turn, rate-of-climb and artificial horizon indicators, and when flying blind the pilot can read his position relative to the horizon without computations.

K 1176 — Chicago

Electric Fan Drives Pump Useful to Experimenter

Experimenters and home workshop owners will find many uses for a small reciprocating pump that is driven by the air current generated by any electric fan. The pump has a small fan at the top. When the electric fan is turned on, its wind stream rotates the pump's fan which in turn turns the simple mechanism for pumping water, oil and chemical fluids. Typical performance at 500 revolutions per minute is ten quarts of water per hour. Aside from experimental work, the pump may be employed in a homemade fountain, by using it to force water up through tiny jets from a supply in a bowl or other container. For delivering oil streams to drill-cutting presses and lathes, the pump is handy, also, and it has uses in connection with creating unique window displays and tricky effects with water or colored liquids.



Here's how small pump may be used to force liquid from one receptacle to another

Mr. Westwood to the Mfg Co, due
 from City of
 Major Frank E
 Benedict, 958 S. Fair

J. B. Spiegel Corp
 3958 Calumet St

master magazine 2.50

4/1/75

K1187

J. J. McKinnon
The Carpenter
R. J. Thornton
Pittsburgh Pa

All-Aluminum Sailboat Shows Speed in Races

After supervising the building of three aluminum sailboats, three engineers of the Aluminum company of America pooled their skill in assembling a fourth boat. The result is a fast, all-aluminum sailboat fifteen feet and ten and one-half inches long, with a five-foot beam, and weighing 250 pounds fully rigged. Already the craft has defeated boats ranging from fourteen to twenty feet, in two free-for-all races. Because the three men lacked welding equipment, they put the boat together with more than 3,000 aluminum alloy rivets. Only floorboards, tiller, rudder and stainless-steel stays are not of aluminum. The twenty-foot mast is made of aluminum tubing which is tapered at the top.



All the aluminum sailboat, right, needs to keep going is a puff of wind, but, as inset shows, the craft carries a two-cylinder outboard motor to bring her home if the wind dies down entirely

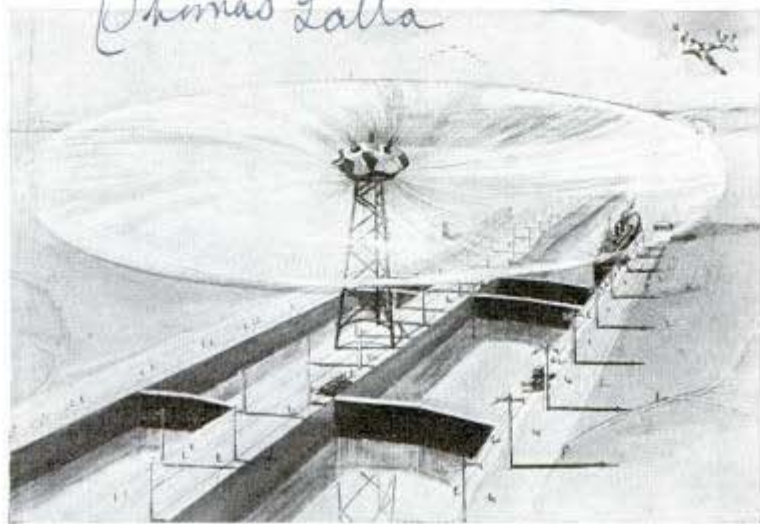
K983

Whirling Steel Cables Offer Bomb Protection for Canal

Thomas Latta
Burke Wilford Pres and

Two aircraft engineers have invented a system of whirling cables which they propose as a protection against aerial bombs for such vital spots as canals, locks and ships passing through them. On the top of a 150-foot steel tower would be a rotating hub fifty feet in diameter. Around this hub

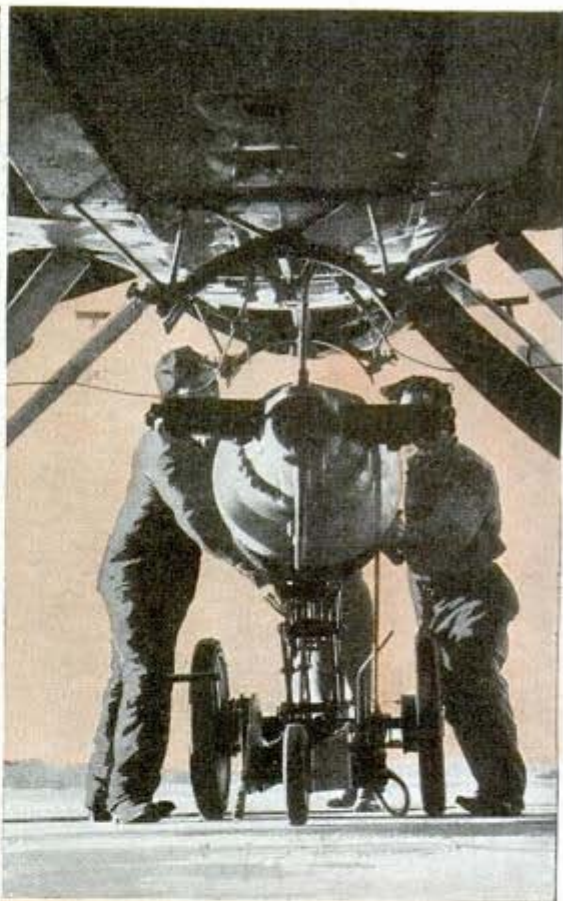
would be a dozen cable drums with 225 feet of two-inch flexible cable on each, spaced two degrees apart. As an alarm signals approaching bombers, the hub would start revolving and the drums would gradually unwind until the long cables are spinning around fifty times per minute,



covering an area 500 feet in diameter. Each cable in this centrifugal bomb guard would have such weight and speed that it would strike the bomb with a force double that of the bomb itself. A 1,000-pound bomb falling at 400 miles an hour has about 5,000,000 pounds of kinetic energy; each cable would have 10,000,000 pounds, enough to destroy or deflect the bomb. A working model of this apparatus has been demonstrated to American military experts.

Here is an artist's conception of the spinning cables as they might appear during a bomb attack over the Panama Canal

Pennsylvania Aircraft
Industries, Ltd. 33rd and Arch
Pittsburgh, Pa



O. J. Tarkenton
 Bomber School
 Liverpool, Lancashire, England

WAR the DESTROYER

Mighty machines of destruction are razing homes, churches, schools, factories and other buildings of Europe's warring nations, converting the struggle into a contest of civilian stamina, rather than a meeting of armed forces. Air armadas, heavily laden with bombs, attack the enemy's principal cities, sometimes in raids lasting virtually around the clock, and leave horrible trails of desolation; yet the civilian population rises from the ruins and begins a never-ending task of clearing away the debris and repairing the damage even before the roar of departing raiding planes vanishes. And so the battle for air supremacy goes on. Above, a home "somewhere in England" with bathroom caved in by bomb explosion. An air-raid officer removes articles from the home and hands them to the girls standing on debris. Right, wheeling up a torpedo to be fixed in rack beneath a British bombing plane that will take off to strike in retaliation at some German city. Below, concussion from a bursting bomb hurled this huge bus against a building in London. Its occupants had time to seek shelter before the bus was upset. Here air-raid workers are lowering the vehicle to the street. Scenes like this have been common in raided cities



K 1112

Alfred, Ronald and Ronald Brooks



Above, actual photo of German plane dropping its deadly load over England. Right, British children peering from air-raid shelter while in the background appears the wreckage of what had been their bedroom



Center, workmen rolling out a ponderous aerial bomb to be placed in rack of a German raider. In background is a row of big bombing planes. Below, British workmen carrying part of fuselage of a wrecked German plane to the dump, where other wrecked planes are visible. As the enemy bombing and fighting aircraft are brought down by anti-aircraft fire and British air defenders, they are carted off to dumps like this before being broken up and the parts used for building British planes. Thus, the raiding plane bringing destruction to one side or the other may be used, in time, to carry destruction back to the very spot from which it ascended on its original mission of death

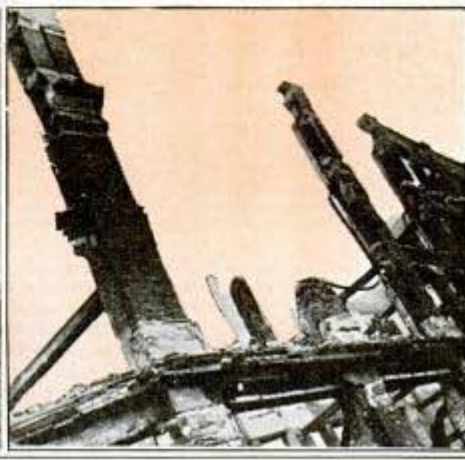
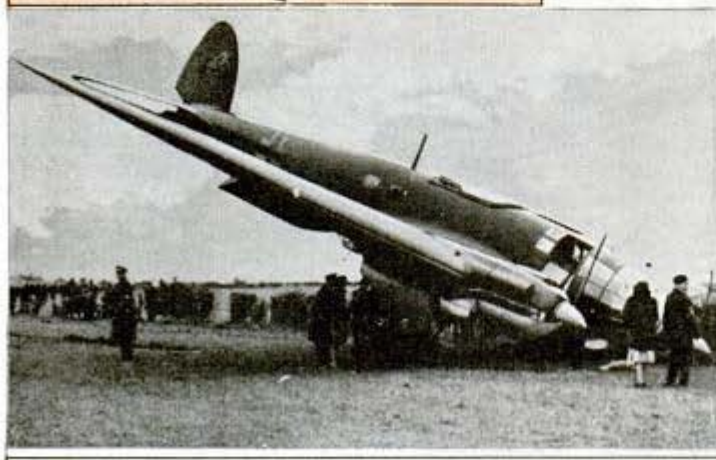
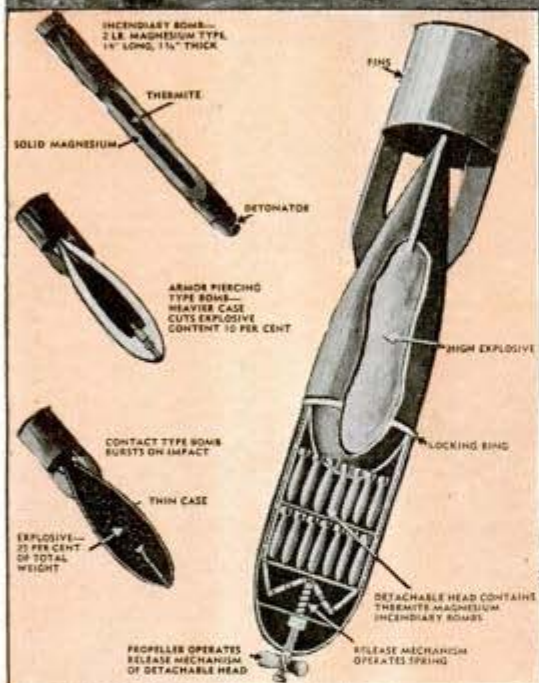


FEBRUARY, 1941

Ritzungen von Maien



Left, Royal Air Force pilot and ground crew man checking over a cargo of bombs before the plane takes off to pound at the enemy. Below, left, drawing shows construction and destructive features of some of the latest type bombs. The large projectile, which has a detachable head, was used by Russian bombers in raids over Finland. Its nickname is the "Molotov breadbasket," because when the propeller unscrews the detachable head, a shower of incendiary bombs falls from the large projectile, thus spreading fire over a large area on which it falls. In addition, a large amount of high explosive is set off when the bomb strikes, increasing its destructiveness



Center, right, London apartment dwelling after a bomb blasted out walls on three sides, leaving roof and floorless section suspended in midair. Bottom, left, German Heinkel bomber after crashing on English coast. It was brought down by Royal Air Force defenders. Right, grim reminders of war's horror, these pillars point skyward from whence came the bomb that wrecked and set fire to the buildings in London



Above, left, firemen dousing ruins with water after German bombs demolished this church during a night raid. Right, German recruit being taught use of a machine gun in flying school. Center, burning buildings beside the Thames



Above, mechanics loading thousands of rounds of machine gun ammunition into magazines of a Spitfire pursuit plane in England. Spitfires are the fast fighting craft which rise to meet German bombers. Right, bomb dropped during a raid blasted this channel through an English apartment house

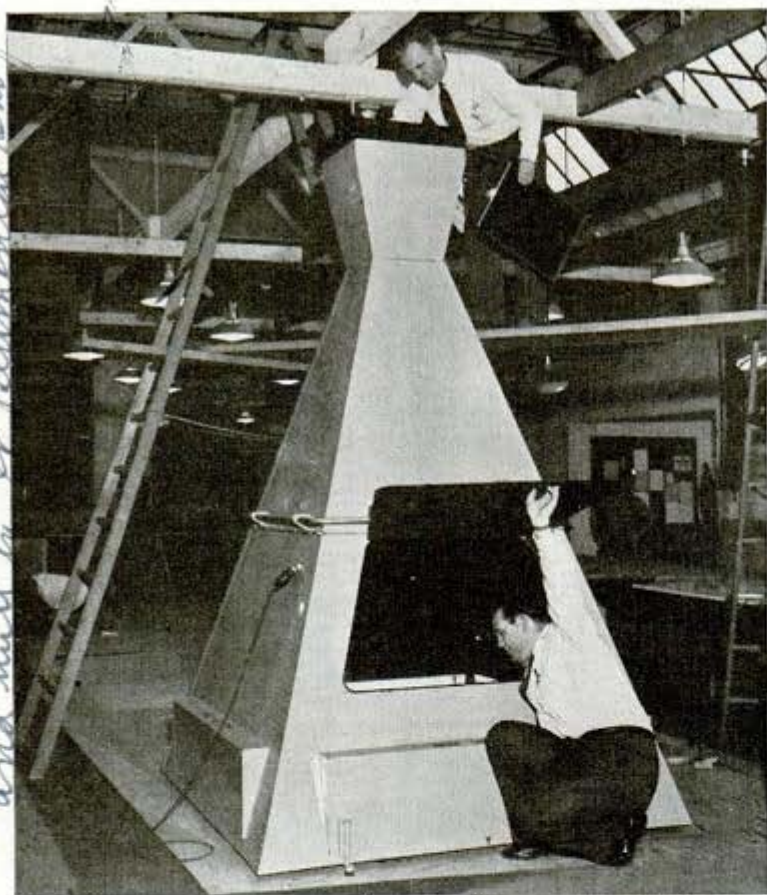


K1213. Cont. - Johnson

Huge Camera Cuts Airplane Production Time

Designed by Robert Moore, engineer, in consultation with photo dept. and built in permanent shop

Burbank Calif



Looking more like an incinerator than a camera, the instrument at left is used to photograph engineer's drawings laid out on loft of aircraft plant. It is ten and one-half feet high; inside is a battery of eight fluorescent tube lamps

The giant lens below projects the negative back to full size; it has a seventy-inch focal length, is about six inches wide and ten inches long. Beside it for comparison is the lens used in a newsman's camera

Two giant cameras, one of them thirty-four feet long and the other ten and one-half feet high, have been put to work in the Lockheed Aircraft plant to "cut corners" in the translation of the engineer's drawing into the finished airplane. The vertical camera is used first to photograph the engineer's drawing of an airplane part, which has been laid out on a sheet of metal-surfaced wood forming the top of a twelve by ninety-six-foot loft. Inside the metal-covered camera are eight forty-eight-inch fluorescent tube lights. The drawing is reproduced on a fourteen-by-seventeen-inch glass process plate, which is developed, then put in the thirty-four-foot camera and projector. With this it is projected upon sensitized metal in the exact dimensions of the parts to be fabricated; these prints on metal are cut out and used as the templates or patterns for the shop. Prints are also made on sensitized



tracing cloth for the blueprint department. This giant enlarging device will handle metal sheets up to four-by-twelve feet. After exposure, these are handled by an overhead electric crane and developed in a vast tank holding 115 gallons of developer. By eliminating duplication of work, this photographic method of making metal templates from original drawings is expected to shorten time between engineering and test flight two to four months.

K1237 Richard W. Boerstler
Watertown, Mass

Lightweight Boat Made of Transparent Plastic

What may be the forerunner of a line of "invisible boats" was launched recently by a Watertown, Mass., youth. It is a small boat of transparent plastic, the material being known chemically as acrylic resin. Both water-proof and shockproof, this plastic is so sturdy that it could be shaped into ribless boats that virtually would be invisible on the water and perhaps useful for army or navy purposes. With a four and one-half horsepower motor, the boat travels twenty-five miles an hour.



This boat is made of transparent plastic material so strong that ribless plastic boats, which would be practically invisible, are predicted

Square. Phila.

Wide World

K1200 Robin & Haas, Inc. 222 W Washington
\$72.50 Job. meshback manifold

Skating Rink Frozen Quickly with Multi-Nozzle Spray



Spreading water in a mist over a wide area, this sprayer quickly builds up layer of ice thick enough for skating rink

Safe and smooth ice, an inch in thickness, may be formed speedily on skating rinks with an economical sprayer adaptable to any hydrant. The sprayer, consisting of a series of nozzles, is moved back and forth over the pond as spraying continues, the thin layer of water freezing as it hits the surface. Because of the shallow depth and immediate freezing, there is no need for embankments. Satisfactory skating ponds can be made at temperatures as high as twenty-five degrees above zero.

Russell mfg Co
Plattville, Wis

K1206

Army Scout Car Pierces Wire Coils That Jam the Tracks of Tank

Barriers of coiled wire spread over a road in recent war tests at Fort Belvoir, Va., failed to stop an army scout car, although similar entanglements effectively clogged the treads of army tanks. In real war, however, it is probable that there would be a series of coils capable of stopping any kind of vehicle.



Army scout car penetrates entanglements that would halt tank

K1166

Quick-Change Cargo Plane Serves as Army Ambulance



With enough space for twelve cots, this airplane which usually hauls freight can be converted into flying ambulance within twenty minutes

As a forerunner of its new aerial ambulance division now in process of development, the army medical corps recently demonstrated the C-39 airplane. Used primarily as a cargo plane, the large ship can be changed into an ambulance plane in twenty minutes. It carries twelve cots, and the crew consists of a pilot, co-pilot, doctor, nurse and a radio operator.

K1202

Venus Pictured as "New World" and Mars as Dying

Venus today is at the same stage as the earth was when life began here millions of years ago. Dr. H. Spencer Jones, British astronomer, believes and it seems to him that Venus may be the next planet to support life. The astronomer also reports that the red planet Mars, on the other hand, appears as a world of spent or nearly spent life, representing conditions like those that probably will exist on the earth many mil-

240 Science Service.

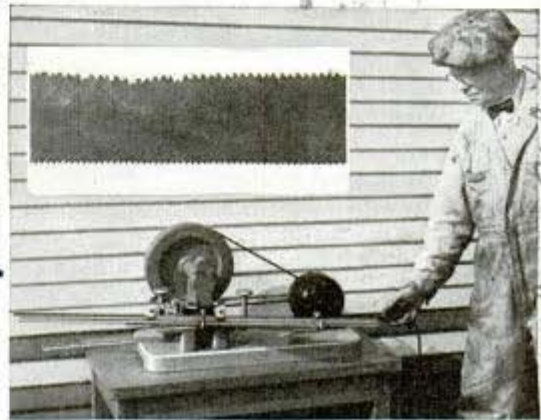
10/23/40

lions of years hence when most of our present atmosphere will have been lost. Life on Venus today, however, cannot be of a very high order unless organisms have been able to make adjustments to conditions of atmosphere and temperature not imaginable on earth. Spectroscopic studies show no trace of water vapor in the planet's atmosphere, which is strange considering its clouds. No free oxygen is evident on Venus, but there is much more carbon dioxide than in the air of the earth.

K1218

Electric Tool Puts New Teeth in Nicked Saws

Good hand saws that have been badly nicked by striking hidden spikes can be mended now by a machine that puts new teeth in any saw, no matter how worn or damaged. The tool is electrically operated, and restores the saw in less than a minute. It is not merely a filer; after putting in the new teeth they must be set and filed. It can change cross-cut teeth and set to rip, or vice versa.



Inset shows the type of repair work this electric mender can do, in short order, on a badly nicked saw

POPULAR MECHANICS

Beurr
9301
Vehnie Co. Blvd.

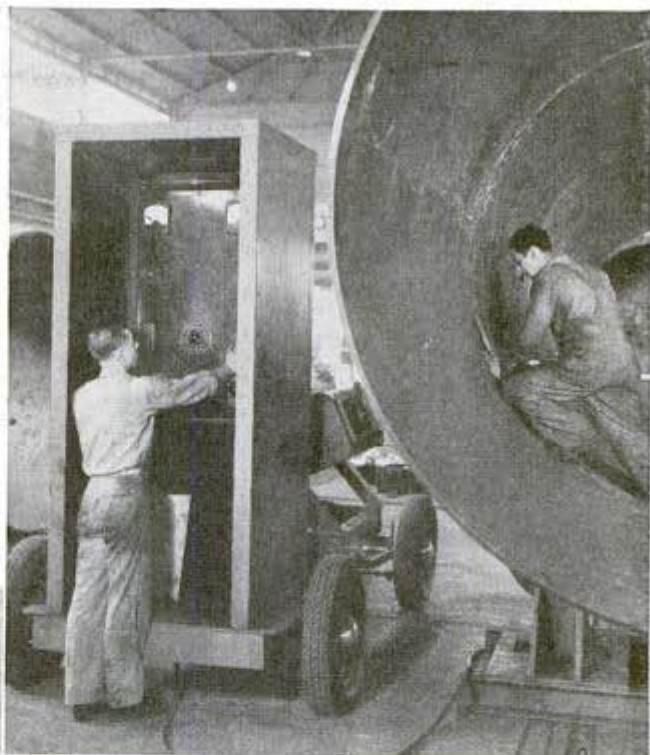
Royal

200 ampers

R1228. General Electric Co
2012 Jackson Blvd Chicago

Portable X-Ray Sees through Three-Inch Steel

For the inspection of weldings in fabricated structures and castings too heavy to move, there is a mobile X-ray unit mounted on a rubber-tired truck that can be moved about the factory easily. Its powerful X-ray can penetrate three inches of rolled steel or three and one-half inches of cast iron or steel. The controls are housed in a well-protected lead-lined cab. The tube rotates 360 degrees and travels four feet horizontally and six feet vertically for easy and accurate positioning. The unit is so well balanced that, if necessary, it can be moved from place to place by overhead crane.



Baldwin Locomotive Co, Eddystone, Pa.

Above, the portable X-ray turns its penetrating eye on a welding in a locomotive plant. The view at left shows its mounting; the tube head rotates a full 360 degrees and moves six feet vertically, four feet horizontally. Notice the lead-lined steel cab which protects the operator

at Wyatt metal and Boiler works Houston Texas

Five-Foot-Long, Fluorescent Lamp Lights Large Areas

R1241.
To meet the need for more illumination in large spaces, a 100-watt fluorescent lamp, sixty inches long and two and one-eighth inches in diameter, is being offered. Its average life is rated at 2,000 hours. With an initial output of forty-four lumens per watt, the new lamp produces an average of 880 lumens per foot of its length, as compared with 530 in the forty-watt size.

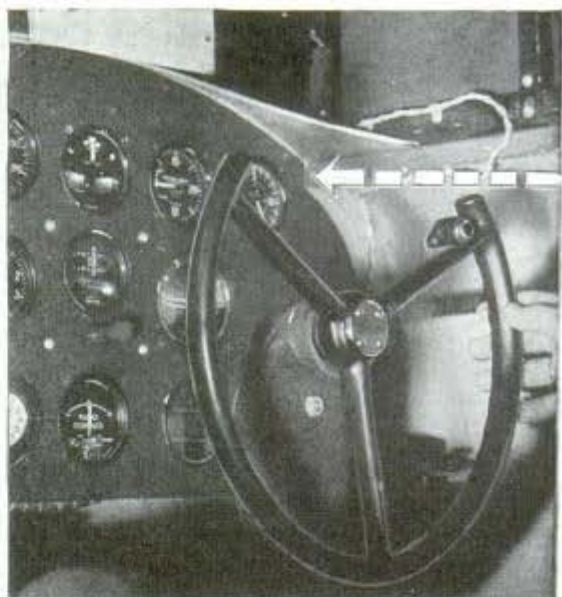


Five-foot fluorescent tube will illuminate large area

Ⓢ Buggy whips worth three hundred thousand dollars are still produced annually.

Coyne School Head
FEBRUARY, 1941
nuw

K946



BIG SHIP



"Mechanical crab" at upper left traces in ink the course you fly in Link trainer; right, cockpit of the trainer. Operator in LaGuardia field control tower, at lower left, keeps up an incessant conversation with incoming and departing pilots

By

Ernest K. Gann

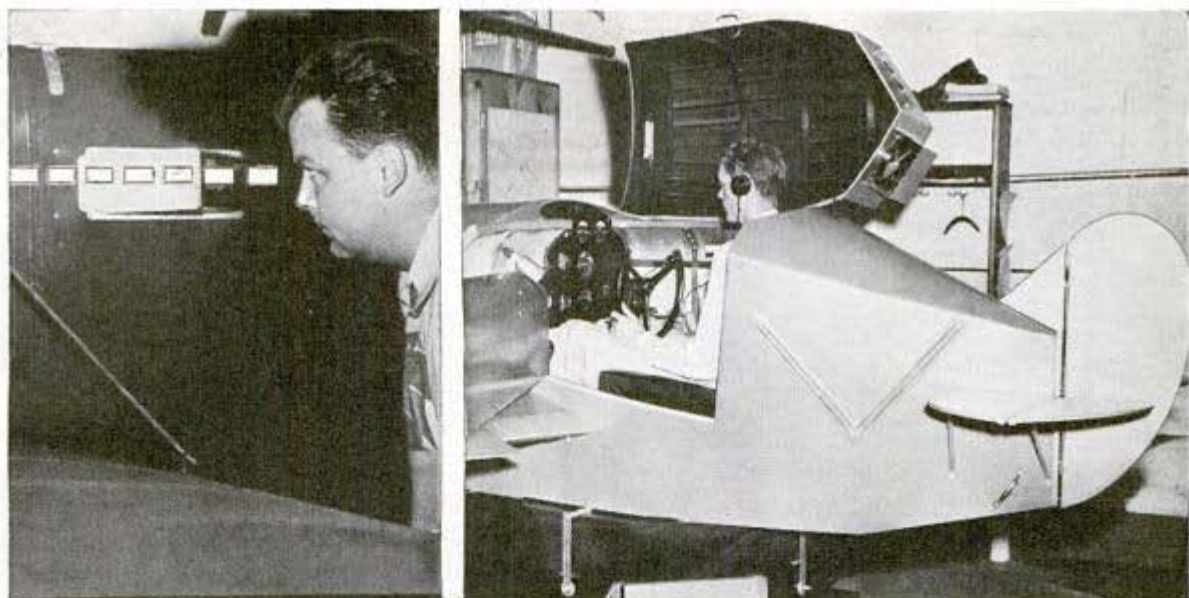
American Airlines Pilot

*LaGuardia Field
New York City*

THERE is one school from which no student ever really graduates. This ultra-modern institution, so hard to get into and difficult to get out of, is the pilot's training school of American Airlines. Although it is primarily designed to train new co-pilots, veteran line captains frequently return for refresher courses. No really good pilot ever feels he has learned all about flying.

In the old days the air lines simply

picked pilots from the cream of the crop, put them in an airplane and told them to go to work. They still hire only the most able pilots, but modern flying is so complicated and air-line work so different, that the prospective pilot must be given a very intensive six weeks training. He enrolls in the "Big Ship School" and learns what it means to fly twenty-one passengers day and night. His hours are long, the work hard, his instructors extremely exacting.



COLLEGE *of the* AIR

Air-line flying is nice work if you can get it, but like everything worth while, it's not easy to get. You are no different from thousands of other people if you've always had a sneaking desire to get at the controls of one of those big gleaming air-line ships. With many American youths the desire to be captain of a sky liner has become a burning ambition.

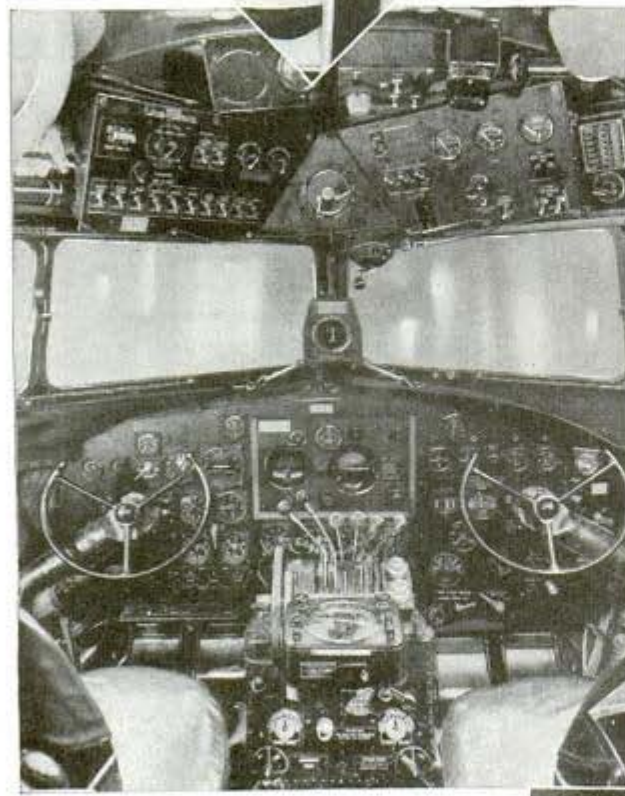
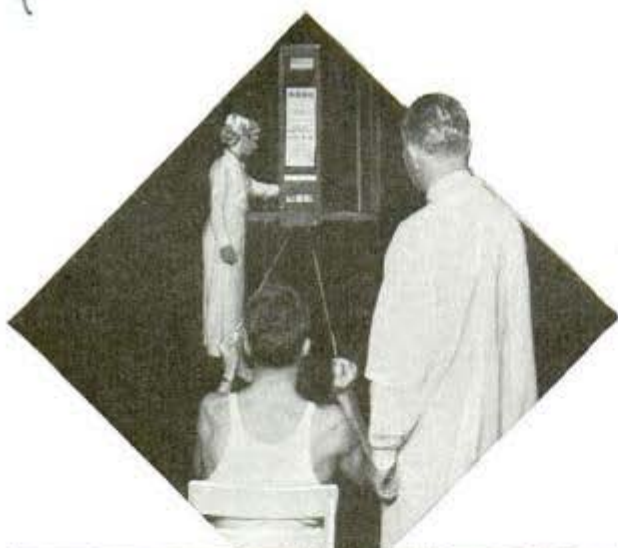
Suppose you could? Suppose you are under thirty, have two or more years of college, 20-20 eyes, are sound of heart and limb, offer top character references, and a great capacity to learn. Suppose you've built up a thousand hours of flying and are ready to start all over again with new thinking, new methods, and big ships. Given these blessings, you qualify. Just now, the air lines will be delighted to talk to you.

On a certain morning at nine

Top, inspector peers at instrument in Link trainer to check on pilot's performance. Right, pilot in trainer. Center, flying "under the hood," the instructor can see out. Bottom, examining battery on a sleeper



K 94-C



Top, testing an applicant's depth perception. The cockpit of a transport, center, is student's nightmare. After a flight to nowhere (right) the novice climbs out of the cockpit of the trainer to learn how he performed

you report to the flight surgeon for a "physical." You've seen the chief instructor and perhaps a chief pilot. They like you. Now the first hurdle. An air-line entrance physical usually begins in the morning and always goes on forever. Every pilot is sensitive about his physicals; who knows, some little thing might crop up that would

ground a guy, and there's a broken heart for every grounded pilot. The air lines want to be sure you'll last a long time. Before you finish this first inspection you're scared to death! The flight surgeon establishes a speaking acquaintance with every corpuscle you own. You emerge hours later limp and suspicious—but marked "Fit to Fly."

The next six weeks you trade your personal liberty for a pair of four-inch gold wings. You are too busy to worry about freedom anyway. A notice on the pilot training board tells you to report to a Mr. Jenkins for assignment at eight a.m.

Mr. Jenkins is a quiet man, not greatly impressed with your flying prowess. Mr. Jenkins flew the mail for hundreds of nights in an open-cockpit ship over the rain-lashed Pennsylvania mountains and went on to pushing tri-motored Fords across the plains of Kansas. He is friendly but wary and has to be shown. He has a right to be.

"We'll just work out a few problems in the Link," he says. The "Link" is a cleverly contrived sweat box which looks much like a miniature airplane. Bolted to the floor, it never gets anywhere but it certainly seems to. A mechanical "crab" traces in ink the course flown by the Link pilot. When the problem is done, the written evidence is sometimes embarrassing. You cannot argue with a Link trainer. Either you do



K 946

K 1164

1940

a perfect job of flying under the hood or you don't. Your mistakes, however slight, are recorded forever and stand out like a Broadway sign. You sit in the Link and bounce around for an hour as Mr. Jenkins gives you the radio signals required for the problem. You have nothing to think about in that black interior but a flock of wiggling instruments, each demanding constant attention.

Mr. Jenkins has it all down on paper for you when the hour is finished.

"You were down to 700 feet here," he points out. "That's bad." It is. There happened to be a hill at that particular location 800 feet high! In a real plane you would have flown right into it.

"Your air speed was down to 100 several times . . . watch it next trip," says Mr. Jenkins. "You got in all right and hit a nice cone of silence but it was a miracle. Why didn't you get a better bracket on the beam?" There are several reasons why, but somehow it seems Mr. Jenkins wouldn't think much of them. You maintain a discreet silence while he outlines the rest of your misdemeanors and assigns you to Link time the next morning. Four out of five days in the next six weeks you'll spend at least an hour "flying" the Link. When you're finished, you'll be handling orientation problems the right way.

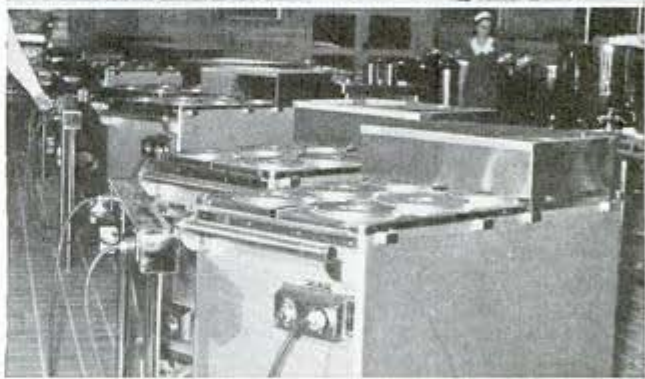
"Here's your schedule for the rest of the day," Mr. Jenkins smiles finally and hands you a slip of paper. It's ten a.m. You are to spend two hours in the propeller overhaul department of the air line. Two hours watching the mechanics polish, set, and re-balance the glistening blades are worth fifty propeller diagrams. The schedule designates an hour for lunch but you must pick up a navigational computer, maps, and sun-glasses from the stockroom. You have twenty minutes left for a sandwich.

At one you report to the airport

(Continued to page 116A)

FEBRUARY, 1941

Food Train for Group of Hospitals Serves Many Cafeterias



Top, tractor ready to haul food cars to their respective hospital cafeterias; bottom, cars lined up in kitchen for loading

Tribble, Colo.
 Many cafeterias located in various buildings of the Colorado state hospital are served by a streamline, stainless-steel food train towed by an electric-battery tractor. All the food is prepared in a single kitchen, where the cars line up for loading at plug-in stations resembling hitching rails. Each car has compartments for both hot and cold foods, the temperatures being controlled electrically, and when the train is ready the tractor hauls it through a subway tunnel to the several buildings. At each building one car is detached from the train, placed aboard an automatic elevator and sent up to its assigned cafeteria. There it is rolled into place and forms part of the serving counter.

On top of a factory near the Chicago airport is a huge neon advertising sign directed only at air travelers, for it can be seen only from the sky.

Bureau of Industrial Science Oct. 1940

K1237

Dive Bombers and Seaplanes Swell Navy Fleet

Fleets of training planes and warplanes are joining the navy as American aircraft

factories push the production of new machines for defense. The "SBD" dive bomber, already in quantity production at the Douglas Aircraft plant at Santa Monica, Calif., is one of the latest additions to the naval air arm and is reported to be superior in performance to the German "Stukas." For training purposes the Ryan Aeronautical company is building two-seater seaplanes. The "STM-2" is a low-wing open cockpit monoplane with a 150-horsepower, air-cooled, in-line engine.



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Ryan Aeronautical Co.
Santa Monica, Calif.

Acme.

The low-wing training seaplane above is a Ryan "STM-2" on one of its test flights. From the Douglas production line at Santa Monica comes the "SBD" dive bomber shown at right, intended for cooperation with the U. S. Navy. Reports indicate it is superior to the German "Stuka"

Calif



K1216

Make-Up Kit and Mirror in Auto Clips over Sun Visor

Auto Visor Kit



Make-up kit on visor unfolds in convenient position for use of the driver or passenger in front seat

Kept out of sight while it is not being used, a kit containing mirror and toilet accessories for the car may be unfolded quickly when there is a need for tidying up. It fits over the visor, being held by two clips. Included in it are comb, vanity case, nail file, cleansing tissue, matches and cigarettes, pen and pencil set, and it has pockets for driver's license, maps, stationery, memo book, sun glasses and gloves.

K1227

Felt Hats Are Made from Milk to Meet Fur Shortage

Due to the decline in exports of rabbit and cony from Europe, American hat man-

Trivial. I. V. Inc.
500 N. Dearborn
Chicago

K1192.

Manufacturers are experimenting with felt made from casein wool. It is expected that 500,000 to a million pounds of casein fiber will be used in hat manufacture this year. Synthetic wool from casein was developed five years ago, but since there has been no serious wool shortage in the United States the conversion of casein into clothing materials has not grown rapidly. Milk producers with an annual surplus of skim milk are anxious to develop this outlet for their product. It takes thirty quarts of milk to furnish the casein to make a dress of synthetic wool.

K118 3.

Long-Flame Torch Has Many Uses in Small Shop

Discharging an intense flame from six to twenty-four inches long, a "flame thrower" is now available for many tasks that require application of heat. Chief among its uses are crisping paint on stone or brick, thawing out frozen pipes, sweating pipe fittings, preheating and annealing. Both the length and intensity of the flame can be controlled easily by the operator.



With this torch a two-foot flame is available for crisping paint on brick wall or other uses in shop

Man-Made 'Thunder Cloud' Creates Million-Volt Crash



This "skyscraper" of capacitors reproduces the action of a thunder cloud in storing up electric charges and releasing them as lightning

Storing up electrical charges and then releasing them in one flash of lightning, like a real thunder cloud, a surge generator built by Westinghouse has been placed on public exhibition at the Chicago Museum of Science and Industry. The tower-like apparatus takes its power from an ordinary 110-volt line, packing it into a discharge of 1,000,000 volts compared to a force of approximately 100,000,000 volts in natural lightning. The tailor-made cloud shoots its bolt across a gap, accompanied by a sharp thunderclap, shattering a heavy pine block into small pieces. Patterned after lightning surge generators used in the electrical industry for testing transformers, insulators, circuit breakers and other equipment, the "cloud" stores its electrical charges into ten capacitors made of thin sheets of aluminum foil, approximately 33/10,000-inch thick. These capacitors are so arranged that they may be controlled to produce discharges of any desired force between 100,000 and 1,000,000 volts.

Christo. Isaac Corp. / Detroit 247
1900 E. Jefferson Ave / Mich

X1145

see Nov 1938. 7 14

A GEM FACTORY

Emt. Andrew Hamilton 10999
Wellworth W. Los Angeles



The pearl is the only precious stone which is created by a living animal. Its chemical composition is calcium carbonate and the protein, conchiolin. Essentially it is the same material known as mother-of-pearl which lines the interior of many shells. Built of overlapping concentric layers, a cross-section of a pearl looks like an onion sliced in

Mihimoto Pearl Farm

JAPANESE scientists have perfected a method of growing lustrous, shining, big-as-peas pearls and today pearl culture is a \$1,000,000 industry in that country. The industry is carried on at twelve places in Japan and the South Seas. Fishing grounds and laboratories cover 40,830 acres; more than 1,000 workers are employed; and approximately 5,000,000 oysters are under cultivation. From New York to Rio de Janeiro, from Hollywood to Singapore the throats and wrists of lovely ladies glow with Japanese culture pearls.



Top, Japanese diving girls at work bringing oysters to surface and depositing them in the tubs. Circle, opening oyster to extract pearl. Bottom, culture pearls which cannot be told from natural pearls in size, shape and luster

R1145

on the HALF SHELL ...

half. Highest quality pearls are those in which the layers are extremely thin. The peculiar warm-hearted iridescence of a pearl is an optical phenomenon caused by refraction and reflection of light from the tiny corrugations on the pearl's surface.

How pearls are formed has been a matter of discussion by scientists for many centuries. Some thought that a grain of sand becomes the nucleus of the pearl.

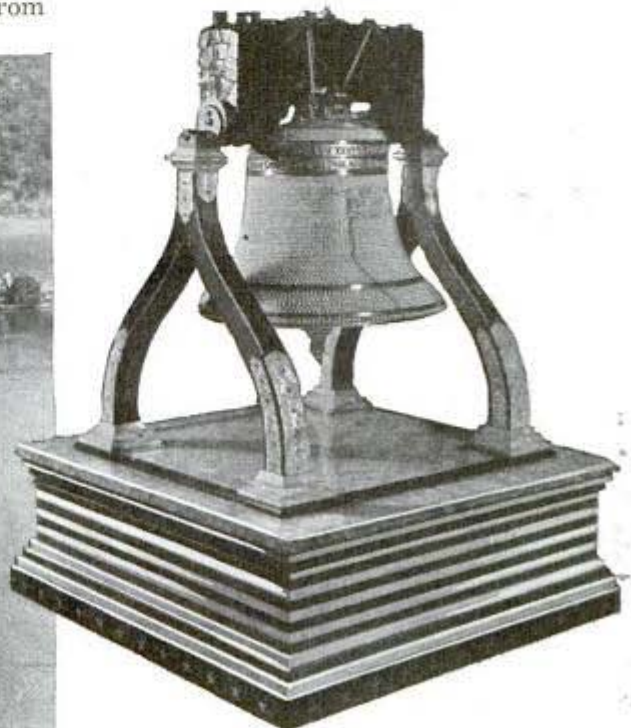
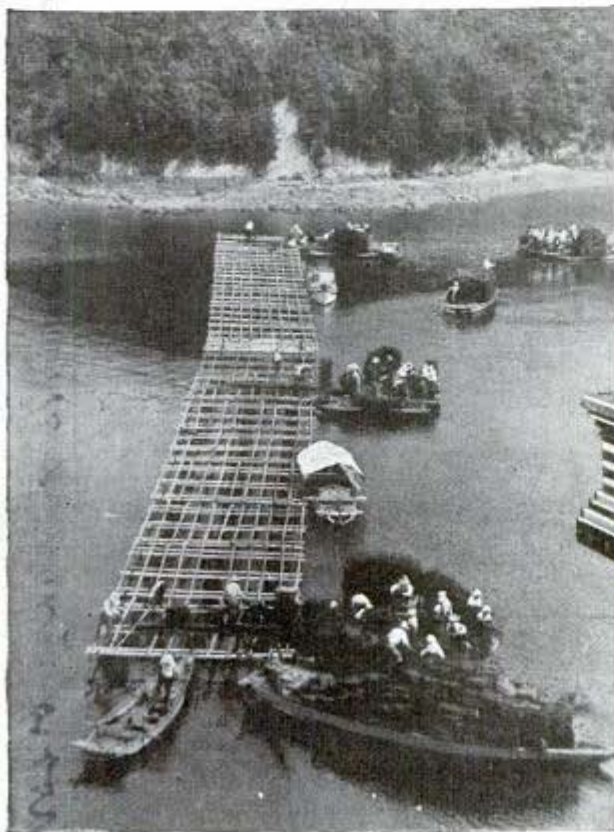
Others were of the opinion that internal pathological conditions caused the pearl. Still others advanced the theory that the pearl is formed in the presence of parasites. Some pearls have no nucleus while in others it is a grain of sand, a chip from



an oyster shell, a small crustacean or even a fish.

The pearl oyster in Japan is known as the Japanese "lingha" and is a species of

(Continued to page 122A)



Top, baskets, each containing 100 oysters, being lowered into bamboo rafts which float, there to remain for years. Bottom, left, oyster rafts can be towed away if oysters are threatened. Right, model of "Liberty Bell" containing 11,600 pearls

Exhibit, New York Fair

R 1225 Ill. State 2754

Letter rec'd 11/17/45 not found

Hand Snowplow on Wheels Clears Wide Path

1956295



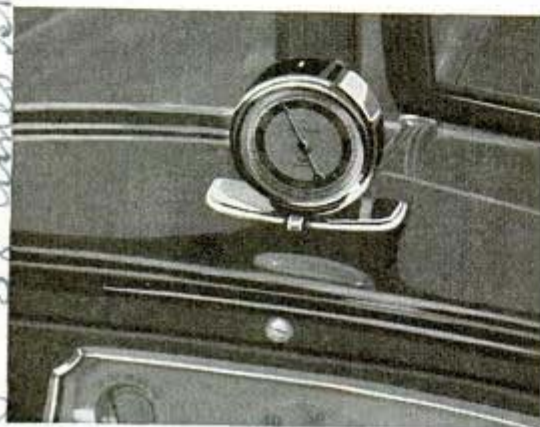
Plow built like hand truck saves labor in pushing snow off sidewalk; wheels help in moving it about

Removing snow from sidewalks and driveways may be accomplished quickly with a wheeled snowplow patterned after the hand truck. The blade is curved and tilted to throw snow off to one side. Wheels are rubber tired and the frame is electrically welded. The plow cuts a thirty-two-inch path in snow up to eight inches deep.

R 1209

Altimeter Designed for Auto Used in Mountains

Motorists who drive in mountainous country frequently notice a change in the performance of their cars due to variations



Altimeter shows driver when car reaches high level

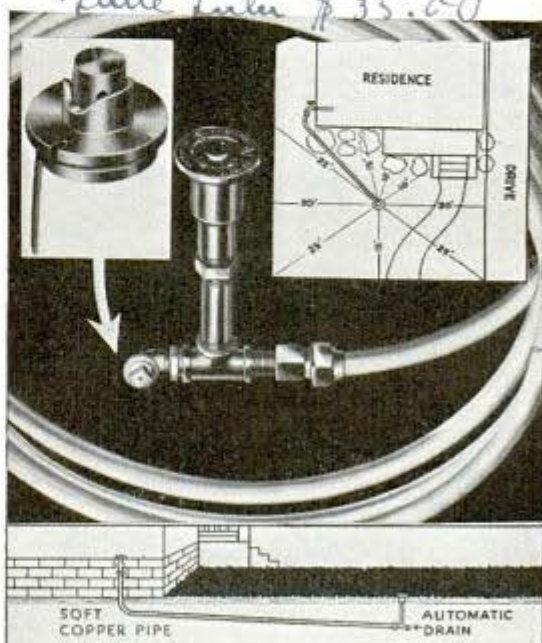
in air density at different altitudes. An altimeter made especially for automobiles now enables them to watch engine operation more closely. One model, reading in 100-foot divisions, ranges from 500 feet below sea level to 5,000 feet above, and another is graduated in 200-foot intervals and reads from 1,000 feet below, to 10,000 and 16,000 feet above sea level. The instrument, two and one-half inches in diameter, can be attached easily inside the car, as on the center post of the windshield.

R 1226

"Tailored" Sprinkler Confines Water to Lawn

Water is spread only where it is wanted by a permanent sprinkler "made to order" to suit the shape of each individual lawn. The unit is installed flush with the ground, and connects with the faucet through flexible copper tubing under the sod. When water is turned on, the sprinkler rises and

"Little Lulus" \$35.00



Sprinkler unit, center; insets show shield and plan of lawn. Bottom, how sprinkler would be installed

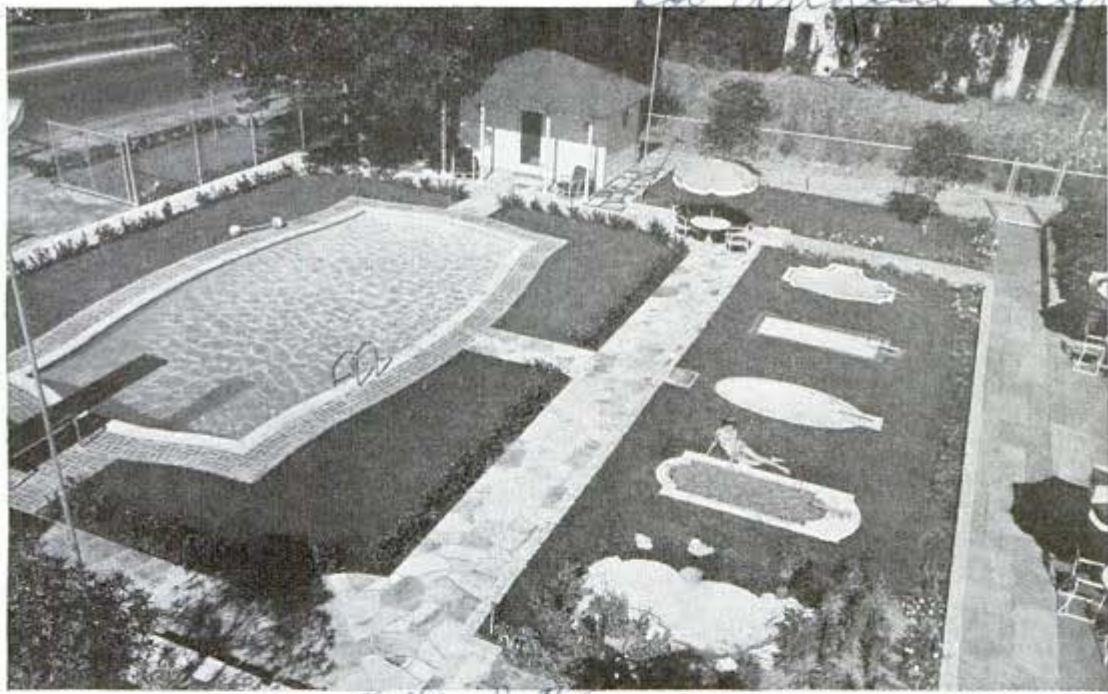
sends its spray skirting along the edge of the lawn, regardless of its shape, but avoids sidewalks, porches, etc. The heart of this action is a small shield surrounding the sprinkler head and having hills and valleys that govern the distance that the spray will travel in any direction. This shield is "tailored" to fit any lawn. An automatic drain under the sprinkler opens when the water is shut off, so the pipe cannot freeze.

185 N. Wabash Chicago
Taylor Instrument Co. Rochester, N.Y.
38 Ames St.

Second Blvd. Detroit, Mich.
19528
Down
Brook

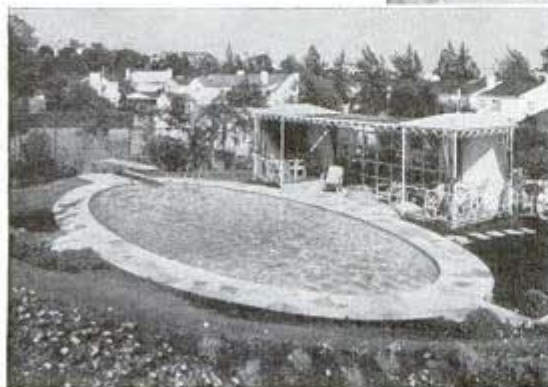
*KH 65. J. J. Addock Engineering Co.
7014 N. La Brea
Los Angeles Calif*

Back Yard Swimming Pools Built at Low Cost



See file 14 46 8 9

Mass production methods have made it possible to build a swimming pool in your back yard for as little as \$1,335, the cost including an underground filter plant, recirculating equipment, submarine lighting and a diving board. Above is the "display room" of sample swimming pools built by a Los Angeles firm



Typical pool is eighteen by thirty-three feet with maximum depth of eight and one-half feet. Network of reinforced steel is laid in excavation, then concrete is shot under high pressure to form one-piece shell four inches thick with compressive strength of more than 4,000 pounds to the square inch, proof against frost or earthquake. At right center is the rough-finished concrete shell; bottom, spraying concrete at high pressure. Left, the finished pool with colored tile trim and smooth alabaster finish



ELECTRONS



Electron microscope (upper left) magnifies up to 30,000 diameters; right, fountain flows as drinker breaks light beam. Center, a photoelectric relay. "Electric eye" in circle turns on red lights on tower near LaGuardia airport during darkness or fog

WHILE millions of men throughout the world have been frantically engaged in destructive warfare waged by new and secret devices, during the last few years, several hundred earnest American scientists have been just as busy training an army of their own and perfecting a weapon which may go a long way toward making a better civilization tomorrow.

The army of the scientists is an army of

electrons, countless billions strong. The weapon is the electronic tube—no secret weapon, to be sure, because among the common types are the tubes in your radio.

If these electronic soldiers wore uniforms, the uniforms would be overalls, for America's research geniuses are just learning how many novel and super-human tasks can be performed by the docile little workers, so tiny that an electron is smaller, compared to a grain of sand, than is the grain of sand compared to the whole earth.

So feeble that a dim beam of light can push them around, these electrons are so powerful when put on the job in vacuum

*Cont: Allen Warren
Elect, 120 E. 34th St. New York.*

*R.C. Electron
Microscope
Electronics Research
Lab.*

*Mr. W. H. Zwoygen
Photographer
Washington*

*John Kovacs
Blumie elec.
Electron, W.E. Electronics Co. N.Y.*

Sladys Whitlock
K 1048

in OVERALLS



tubes—some tubes the size of a peanut shell, others the size of a man—that they can start, stop and otherwise operate industrial machines weighing hundreds of tons.

Their versatility is shown in the General Electric plant at Schenectady, N. Y., where a tube is manufactured that can detect one-quintillionth of an ampere, while other tubes are being made that will pass a peak current of 15,000 amperes.

Many jobs now performed by electrons in overalls formerly required one of the human senses such as sight, hearing and touch and the proper response by hand and foot, but did not really require

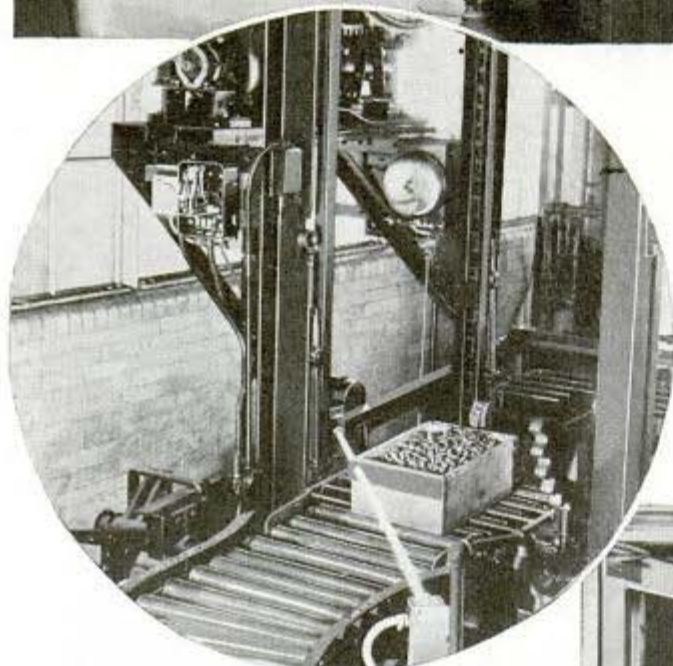
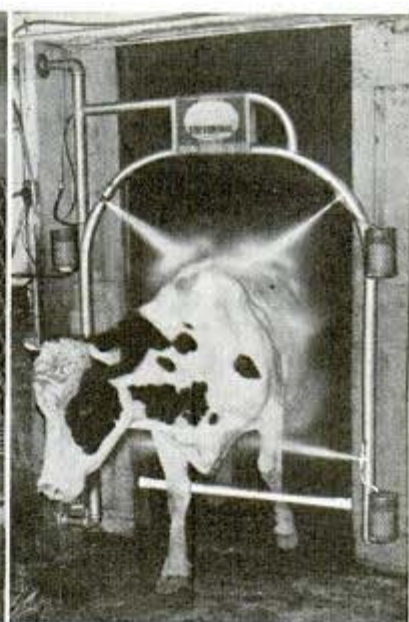


Giant stamping machine (top, left) stops safely when hand interrupts beam of Westinghouse Phototroller. Right, high-voltage tubes. Left, center, treating cable insulation in electric oven. Bottom, placing elements in a fifty-kilowatt radio tube

TS-6

Babson Bros. Co. 2815a. 19th Chicago

X1048 Elizabeth La Rosca 2 1/2 tube factory

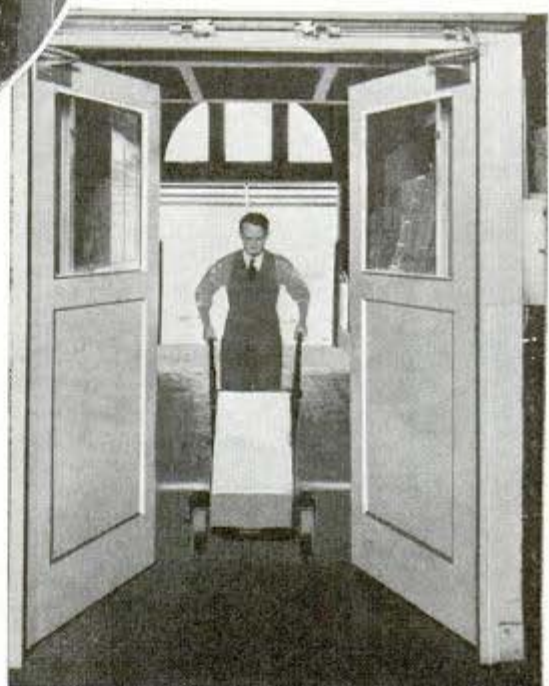


Top, left, testing General Electric tubes used for therapy machines; right, "electric eye" starts insect spray as cow enters barn. Circle, photo-control regulates conveyor. Bottom, electrons open door

a brain. The phototube, microphone, and thermocouple can now replace the eye, ear, and sense of touch, and other vacuum tubes form the "nerve system" to transmit instructions to other electrical devices like motors and magnets, to act in place of fingers, arms and legs.

A remarkable example of their efficiency is provided in the manufacture of steel for tin cans which is now produced in strip at high speed, and reeled. The resulting rolls are pulled out and cut into squares to be tin-plated. The strip goes through a pin-

hole electronic-tube detector. Holes over fifteen mils are "detected," but nothing is done about it right then. The strip goes through a thickness gauge and any part over .0003-inch too thick or too thin is detected, but again nothing is done about it at the moment. Now the strip goes through a shear and is cut up into sheets that stream away on a conveyor. Just at the critical moment the control re-



K1048

K1168

members some holes and a trap opens in the conveyor and the bad sheet falls through into a cart. The control also remembers a thin spot, so another trap opens at the proper time and down goes the thin plate. The same occurs at another trap if a thick spot were found.

At the end of the conveyor a phototube counts the surviving sheets. Every time ten sheets have passed, the frame on which they are stacked is moved an inch. After the next ten it moves back an inch, resulting in a pile in which each ten sheets is offset for easy pick-up for annealing.

The average American is best acquainted with those infinitesimal toilers-in-tubes in connection with radio, television, telephone and other means of communication. Some have seen how they open and close doors, start and stop elevators, check traffic on highways, count, sort and inspect packages, switch off and on city lights and measure illumination for thousands of camera users. They know that geologists dispatch battalions of electrons from a miniature portable broadcasting station down into the earth and some of them come back to report the presence of metal among the rock and sand formations far below. Other electronic tubes indicate the location of oil pools.

Many realize the roles they have played detecting submarines and airplanes, in aiming guns, in forming beams to guide planes to safe landings, in advising fliers just how high they are flying over a mountain and in heating tissues and speeding up blood circulation while streaming into the body in the form of health-giving short waves. Not so well known is the fact that these same health-giving short waves are being employed in packing plants to kill the deadly germs of trichinosis in pork.

And relatively few are aware that electronic tubes will "frisk" visitors to a penitentiary by revealing the presence of metal on a person passing through an electromagnetic field, or that by magnifying the slightest sound in a closed building or vault the lightest footfall of an intruder can be broadcast to a watchman like the beating of a huge drum.

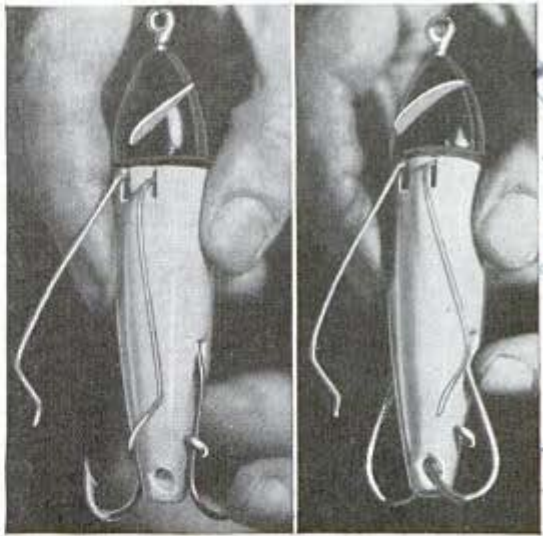
Known to comparatively few, also, is the increasing part these electrons in overalls are taking in assembly lines, reducing costs, hustling output and improving products and processes.

(Continued to page 137A)

FEBRUARY, 1941

see May 1940 - 722 Woodchuck

Closed Hooks of Weedless Lure Snap Open as Fish Bites



Left, hook in position to make the catch. Right, hook closed against the lure

When a fish bites, the closed hooks of the latest weedless lure snap open and snag the nibbler. A wire underneath releases a spring which snaps the hooks into the open position. Before the bite, the lure may pass easily through weeds, since the hooks are closed and fitted snugly into holes in the lower end.

Specialties Co. Chicago Ill. C.S. 1823

Chair with a Foldaway Back Converts into a Stool



Serving a dual purpose, a high-seat chair is convertible into a stool. It has a comfortable back which swings forward and down when a stool is desired. The chair can be adapted to many uses throughout the home—for work at the kitchen counter, the laundry, in the game room, and at the drawing board or workbench of the home shop.

The Comfort Series 255 1735

K1177

Sun-Tan Lamp for Traveler Fits Compact Suitcase



Quickly set up wherever you stop, this health lamp folds into small case for traveler's convenience

Built into a compact suitcase, a portable sun lamp you can take along while traveling gives a healthful tan with only a few minutes use each day. A quartz mercury arc tube produces the twelve effective bands of ultraviolet. The unit weighs less than seventeen pounds.

Handwritten: *Harmonia Chemical Co. 100 W. 4th St. Newark, N.J.*

K1137

Release of Trigger Fires Gun as Safety Latch Is Pressed

Instead of firing when the trigger is pulled, a new type trigger fires the shot when it is released. An additional safety factor is a latch which must be depressed to permit the gun to fire. The trigger is adaptable to firearms of both slow and rapid fire. When the weapon is grasped,



Notice the safety latch in front of revolver butt, which must be depressed before revolver will fire

Handwritten: *I. M. Samuel I. Keene, 10 North Union Court, San Francisco*

Handwritten: *Beverly Blair Co. 3007 W. 110th Place*

the trigger is pulled completely back, and at the same time the safety latch (behind the trigger guard on a rifle, or in the butt of a revolver) is depressed by the remaining fingers. The trigger then moves forward three-twentieths of an inch to fire.

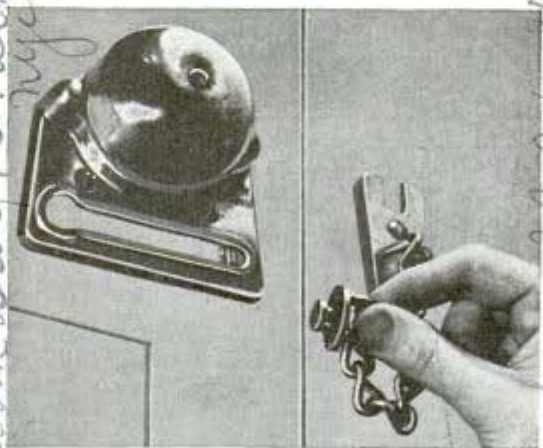
Throatless Sheet-Metal Shear Cuts Large Size Pieces

For small shops and basement workbenches, a throatless shear is available that uses a long-handle lever instead of the customary grasping motion. There are no projecting parts to limit the size or shape of any piece put under the cutting blade. Safe to operate, it is sturdily constructed and works swiftly.



Handwritten: *4/3/41*

Chain Door Guard Rings Alarm and Protects Home



Bell forms part of lock mounted on door. If door is forced open, catch presses trigger, ringing alarm

Automatic warning is sounded by a door guard of the chain type if the door is forced to the limit of the chain's length. It is simple to attach to house doors, since its action is entirely mechanical and there are no wires or batteries to install. The sliding catch on the chain presses the bell-ringing trigger when it reaches the end of the slot.

Handwritten: *Sold by Pulliam Bros. 6 Park Ave.*

Handwritten: *20-26 W. 11th St. New York, N.Y.*



The CRAFTSMAN

Simplified Paste-and-Stencil Process



To ETCH GLASS



WAX
MAY BE
APPLIED WITH
BRUSH, OR
SPRAYED



YOUR name, initials or any other design can be etched on glass by using a simple paste solution and a stencil. The etching paste consists of an acid solution, which is mixed with a quantity of Mallinckrodt roach-killing powder, containing 95 per cent of sodium fluoride. If this specific powder is not available at your local druggist, he will be able to obtain it for you.

First make up the acid solution as given at the top of the next page. Then add the powder until you get a smooth paste. This will produce a mat finish when applied to glass. The etching paste must be mixed in a lead or wax-impregnated container. If a very small quantity is to be mixed you can do it on a sheet of waxed paper. It is applied to the glass with a toothpick-and-cotton swab or with a lead spatula. Be careful not to

Paper doilies provide stencils to cover work to be etched while spraying with wax

FEBRUARY, 1941

Mallinckrodt Chemical Works
2nd and Mallinckrodt, St. Louis, Mo.

*Chicago, 128 N. Wells St.
New York, 72 Broad St.*



**ACID-SOLUTION
FORMULA**
Glacial acetic acid, 3 parts;
distilled water, 3 parts;
sulphuric acid (add
cautiously), 1 part

allow the paste to touch the skin, as it will cause burns and for this reason it is advisable to wear rubber gloves. Should any get on the skin, wash off immediately with running water.

First get a suitable stencil to cover the portion of the surface to be etched. The stencil can be stuck to the glass with rubber cement. Then, apply a coat of yellow beeswax over the entire surface not covered by the stencil. One method of applying wax is by means of a brush. Dip this in turpentine, rub it on a cake of wax and then apply it to the glass. The wax must dry before the stencil can be removed. Another method of applying wax is to spray it, using equal parts of paraffin and yellow beeswax over both stencil and work, the wax being dissolved in gasoline to make a solution suitable for spraying. In using the spray gun, the wax will run if it is held too close to the stencil; if too far away, the deposit will be in tiny beads. The correct distance is found easily by trial. Suitable stencils can be obtained at any paint or wallpaper store, if you do not wish to cut your own. Small paper doilies make excellent sten-

cils and are available in many designs. Masking tape also comes in handy for straight lines and blocking off areas.

A wax china marking pencil can be used to draw on glass and will form a good etching resist when you want the lines instead of the background to be protected. Cut pieces of adhesive tape into small stencils such as stars, moons and other tiny figures, and stick them directly to the work as a resist. Coat the back of the tape with wax and cover the adhesive side with waxed paper while cutting the design. The waxed paper will peel off readily afterward. Another practical resist is a soft, heavy cord soaked in melted wax. Shape it to form the required design and stick it to the glass while the wax is warm.

By following this simplified process, anyone can make glass etching an enjoyable hobby. Only ordinary skill is required and there's no end to the number of



Etching paste applied with swab



Design traced with wax pencil



Tape is best for small stencils



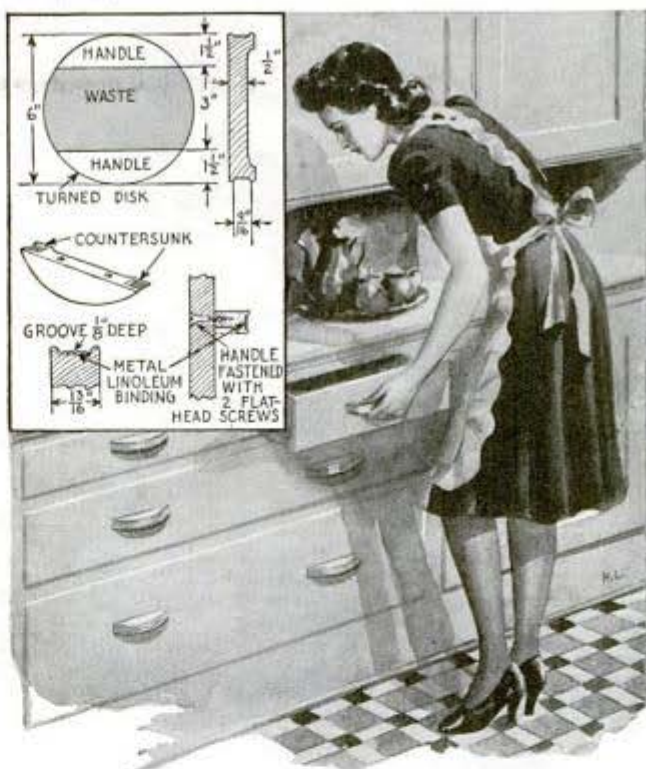
Waxed cord used on flat surface

attractive designs that can be etched in mirrors, tumblers, plates and other dishes. Even silhouettes of yourself or members of your family can be copied from photographs and used to provide a personal touch.

Turned Cabinet Handles Have Metal Inserts

Bright, metal linoleum binding give these wood cabinet handles a neat, modern appearance when the handles are painted to harmonize with the cabinets. Semi-circular in shape, the handles are made by turning wood disks and then cutting off portions of opposite edges to produce the handles. Before doing this, however, grooves are cut in the edges of the disks to take the metal binding. Also, the backs of the handles must be countersunk to take the ends of the binding. The handles are attached with screws driven through the drawer fronts from the back side. When the handles are attached horizontally the underside of each one is hollowed out to provide a grip. If mounted vertically, shallow depressions made on each side of the handle serve the same purpose.

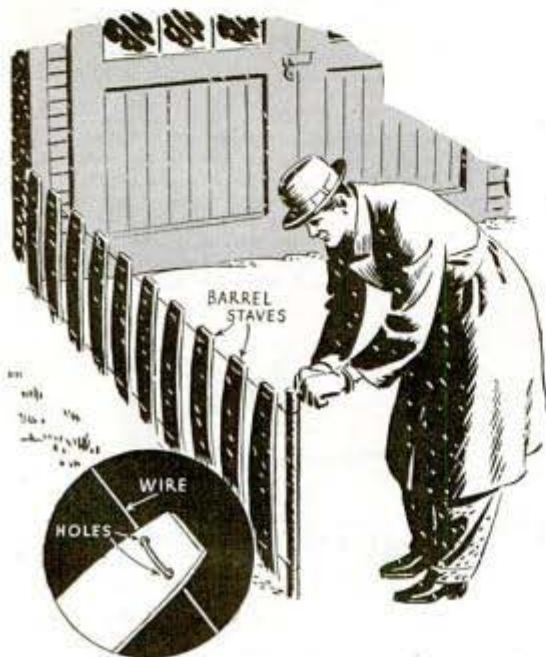
—Axel E. Ogren, Chicago.



Barrel-Stave Snow Fence Rolls Up for Convenient Storage

To keep snowdrifts away from the door of his garage, one homeowner made a cheap snow fence. It consists of a number of barrel staves, drilled and strung on lengths of stout wire or rope. The fence is

easily erected or removed and rolled compactly for storage, and saves many tiresome hours of shoveling to get into the garage after a heavy snowstorm.



Upholstery Tacks Hold Checkers from Sliding on Board

To permit playing checkers on a train or in an auto trailer on the road, without danger of the checker men sliding about on the board, drive upholstery tacks into the centers of the black squares and drill holes of corresponding depth in the centers of the checkers. The rounded heads of the tacks allow the checkers to be pushed on or off the squares without actually lifting them each time, yet prevent the checkers from being dislodged by jiggling the board, especially when it is supported on the laps of the players.



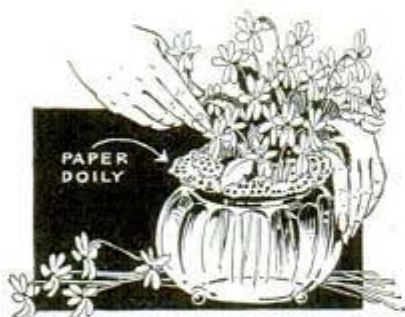
Solving HOME



Removing large pictures to clean them is done easily without a ladder by using a notched stick to lift the cord off the hook as above



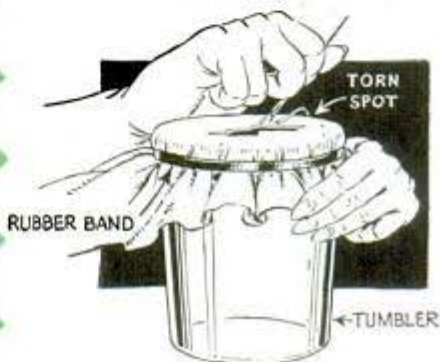
Instead of pouring paraffin over glasses of jelly, shave it into the glasses and pour in the hot jelly. The wax will melt and rise to the top, providing a seal. Below, slotted clothespins slipped over rim of a pan hold strainer cloth stretched in place



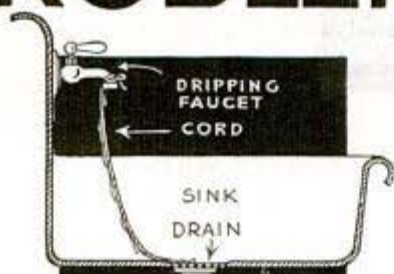
When putting cut flowers in a vase, push the stems through a paper doily, which rests on top of the vase and keeps them in neat arrangement



Left, wire mesh stretched over the top of a large can provides a portable cleaner for a dust mop. Bricks weight the can to prevent tipping. Below, mending a tear in a sweater or similar garment is simplified by stretching the cloth over a glass tumbler and holding it with a rubber band



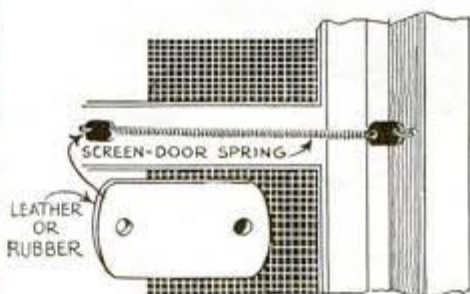
PROBLEMS



An annoying faucet drip may be silenced temporarily by tying a string to it with the end trailing into the basin as above. Damaging cellar doors when opening them against a stop is avoided by using the shock-absorbing stop at the right, which has a spring to cushion the jar

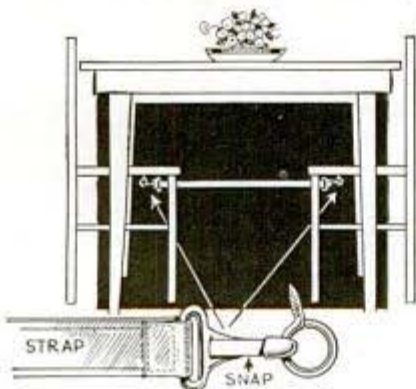


If you have a chimney extending in one corner of a room, the bookcase shown at the left will utilize waste space and dress up the corner



Hum of a screen-door spring can be silenced by inserting pieces of leather between the hooks and spring as above

Children will be unable to climb up on chairs and onto a table if the chairs are fastened together on opposite sides of the table as below. Right, a clip on the underside of a lamp table will keep the cord off the floor



Small Metal Articles Polished Quickly with Hand Drill



Having a number of small copper bowls to polish, I did the job easily with a hand drill. The handle of the drill was clamped in a vise carefully, after which steel wool was twisted and held in the drill chuck. Then by holding the work on the wool and turning the handle of the drill, the job was done in a jiffy. If desired, the wool can be inserted tightly in a short metal tube, which is put in the drill chuck.

—Sam C. Donaldson, Pasadena, Calif.

Repairing Hollow Silverware with Portland Cement



When one of our silver candle holders broke at a crimped joint I repaired it with portland cement. The wax that was originally placed inside the holder at this point was melted out in boiling water. I then replaced the wax with portland cement mixed in water to the correct consistency, inserted three finishing nails in

the wet mixture at the point of the break and assembled the holder. This was held in a correct position in a vise for about three days to give the cement time to set permanently.

—W. F. Schaphorst, Newark, N. J.

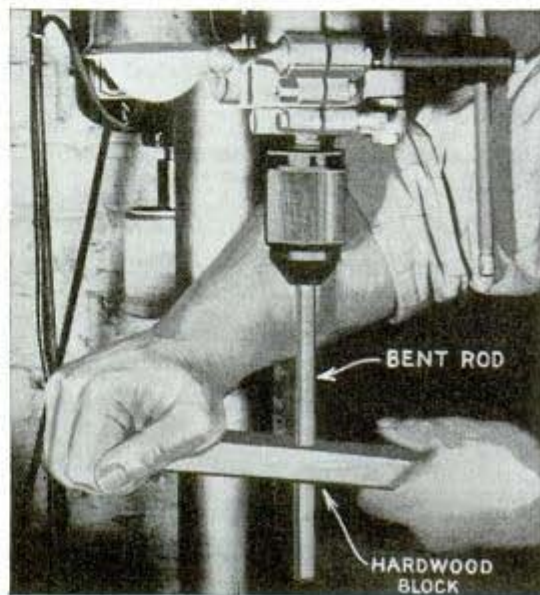
Twisted Wire Makes Simple Rack for Sorted Nuts and Washers

A practical rack for a supply of nuts and washers may be made by twisting several strands of wire together. The rack may be hung on a wall or set on a bench for greater convenience.



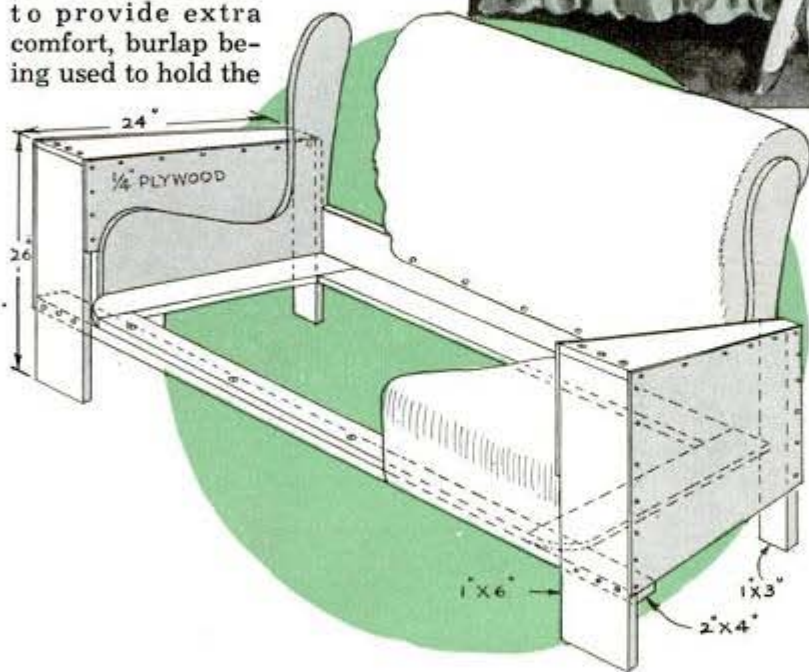
Bent Shafting Straightened Easily

A short length of small drill rod or shafting that has become bent may be straightened by clamping it in the chuck of a lathe or drill press and rotating it at a speed not greater than 700 r.p.m. Bore a hole slightly larger than the rod in a piece of oak or other hardwood. Press toward the chuck with one hand and pull away with the other. Holding this position, slowly move the wood the length of the rod. If the bend is bad, it may require several pulls before the bend vanishes. If the wood binds and smokes, use oil or grease.



Dressing Up Old Auto Seat for Use on Porch

Ideal for your porch, sun room or recreation room, an old auto seat can be changed completely like the one shown. An entire seat taken from a four-door sedan is screwed to a simple, inexpensive wood framework, after which a slip cover is dropped over the assembly. The framework consists of two box ends having feet to raise the seat to a convenient height, and a rail at the front and back to permit attachment of the seat. The ends are covered with plywood, pressed wood or other suitable material, and the arm rests can be padded to provide extra comfort, burlap being used to hold the



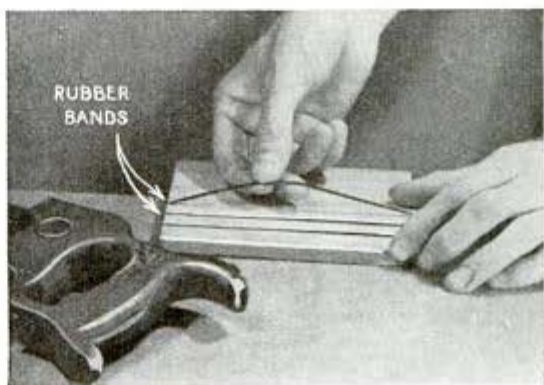
padding in place. It is a good idea to make the legs longer than necessary so that they can be cut down later to the exact length desired, with the rear ones slightly shorter than the front ones to give the seat the most comfortable tilt. Also, if you wish to make a de luxe job, you can upholster the entire assembly, padding the ends all around, in which case a slip cover is not necessary.

Rubber Bands Prevent Twisting of Block When Sawing

When you have a short piece of wood to saw and it is difficult to hold in position while sawing, slip two or three rubber bands around the work as indicated. Friction between the rubber and the surface on which the work is supported will aid greatly in holding the work firmly in place.

—William Swallow, Brooklyn, N. Y.

☛ A little talcum powder sprinkled inside ice bags or hot-water bottles before storing them will help prevent the sides from sticking together.



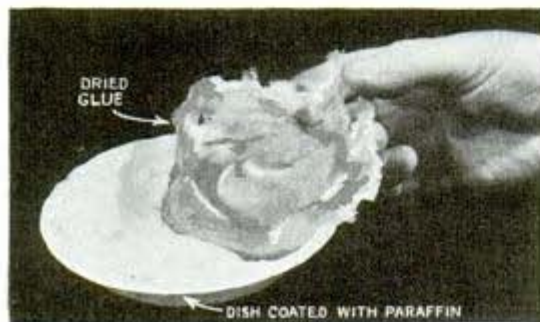
Carpenter's Square Used as Guide When Hanging Wallpaper



Difficulty of maintaining a true margin when hanging strips of wallpaper may be overcome by placing a steel square on the floor with one end resting against the wall and on the edge of the strip previously attached. The loose strip may be swung against the edge of the square and the brushing and attaching begun in full confidence that it will be straight and smooth at the bottom.

Container Releases Dried Glue

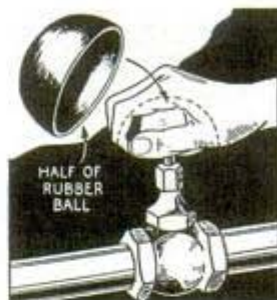
No trouble will be experienced in cleaning out a container that has been used for mixing waterproof casein glue, if you use a porcelain or china dish and coat the inside with a film of melted paraffin. After you are through with the glue, merely al-



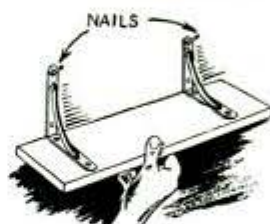
low the excess to harden in the dish and it will form into a shell-like piece, which can be lifted out and discarded, leaving the container ready for the next batch.

Half of Hollow Rubber Ball Hand Grip for Tight Valves

To aid in opening or shutting hot-water and steam valves, one janitor carries in his pocket a half, hollow rubber ball. This provides a cool and comfortable grip for easy turning.



Inverted Brackets on Shelf Make It Portable



Having occasion to use a shelf that could be moved about the shop from place to place, I first attached the brackets in the regular manner. Then the shelf was reversed and screw hooks were driven into the wall so that the shelf could be suspended from them.—G. E. Hendrickson, Argyle, Wis.

Adjustable Circle Glass Cutter

A small vacuum cup and a 6-in. ruler are all you need to make this circle glass cutter. The vacuum cup should be of the type that has a small bolt molded in the top to fit through a hole in one end of the ruler. A circle can be scribed by just slipping a notch in the cutter over the ruler edge at the right dimension to give a correct radius for the circle.



Use crumpled soft tissue paper dampened with furniture polish to remove dust from the corners of polished floors.

Turned NOVELTIES with personality

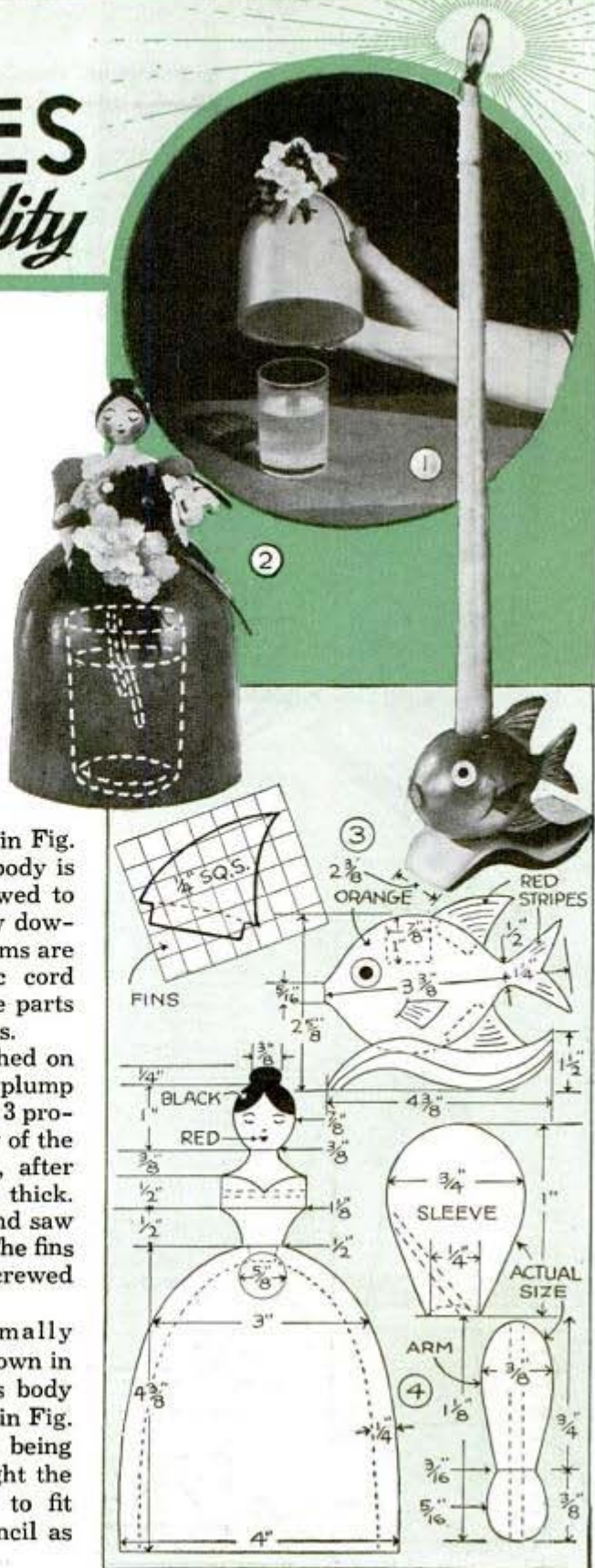
By BESS LIVINGS

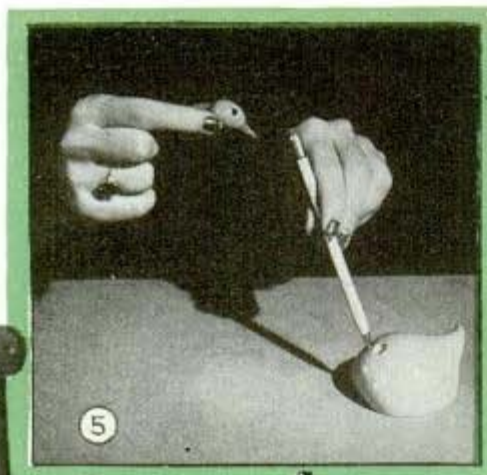
HERE'S a chance to put your woodworking lathe to work in making up a number of attractive novelties for various practical purposes. Painted in bright colors, each one catches the eye as something clever and unusual.

Flower girl: It's puzzling how flowers will stay fresh in the hands of the demure maiden shown in Figs. 1 and 2, until one discovers that her skirt conceals a tumbler into which the flower stems extend. The skirt is shaped on the faceplate from a solid block of pine, first hollowing out the inside to correspond with the shape given in Fig. 4, before turning the outside. The body is spindle turned, flattened and hollowed to receive the sleeve pieces, and finally doweled to the skirt. The sleeves and arms are held to the body with an elastic cord threaded through holes made in the parts as indicated, and knotted at the ends.

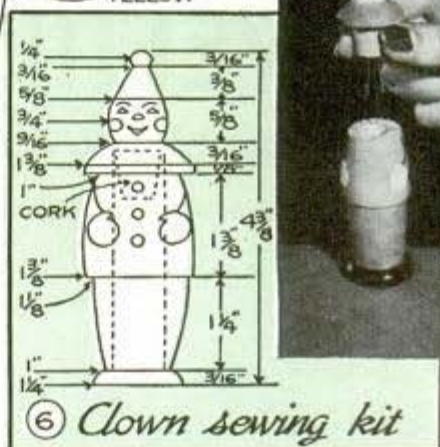
Frolicking-fish candlestick: Perched on waves which form the bases, two plump little fishes of the kind shown in Fig. 3 provide novel candle holders. The body of the fish is turned $2\frac{5}{8}$ in. in diameter, after which the tail is flattened to $\frac{1}{4}$ in. thick. Whittle the fins from $\frac{1}{4}$ -in. stock and saw the base from a block $2\frac{5}{8}$ in. wide. The fins are glued in slots, and the fish is screwed to the base.

Paper-weight duck: The abnormally long neck of the squat little duck shown in Fig. 7 is actually a pencil, while its body serves as a paperweight. The detail in Fig. 7 shows how the body is cut after being turned. Melted lead is used to weight the body. The duck's head is drilled to fit snugly on the upper end of the pencil as in Fig. 5.





Desk duck



Clown sewing kit

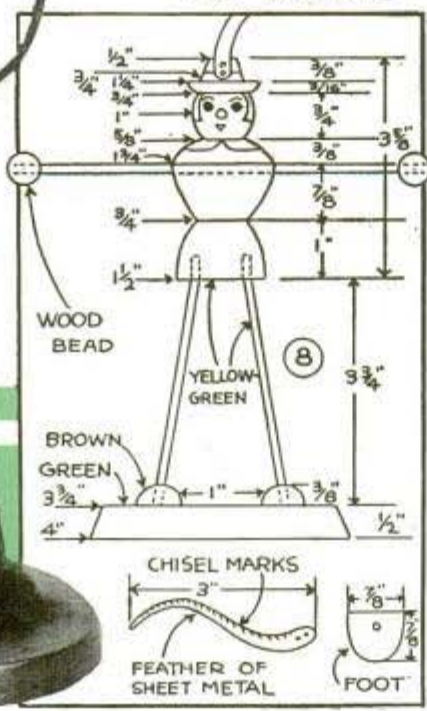


7



9
BROWN
GREEN

Jack-of all-trades



Clown sewing kit: Hidden away in the body of this conical fellow, Fig. 6, are practically all the items needed for mending. It is turned in one piece, after which the head is cut off below the ruff. Then the body is bored lengthwise for small spools of darning cotton, needles and a thimble. A cork pincushion is glued to the bottom of the head.

Jack-of-all-trades: Pretzels, doughnuts and cookies, or jewelry, such as bracelets, necklaces and rings, are but a few of the many items that can be displayed on the spindly arms of the versatile chap shown in Fig. 9. Wire from a coat hanger may be used for the arms and legs. Fig. 8 gives dimensions of the body and base. Wooden beads are used for the hands and nose.

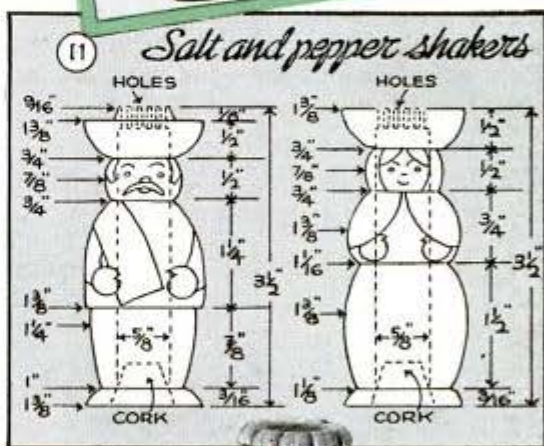
Mexican powder box: Concealing a supply of face powder in his rotund body and a lipstick in his sombrero, the colorful gentleman shown in Fig. 10 will prove a favorite on any dressing table. The lid and box are turned separately on the faceplate, turning out the inside of each and rabbeting the edges to fit together snugly. Then the two pieces are placed together and mounted



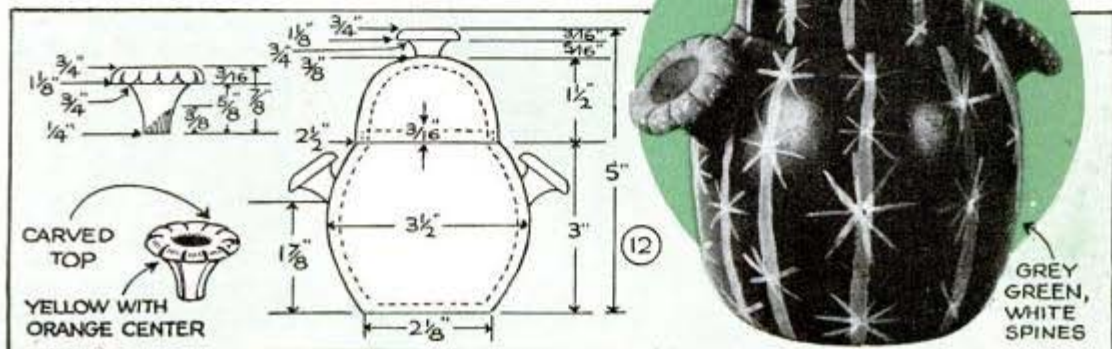
Mexican
 ⑩ powder box

between lathe centers to shape the outside. The lipstick forming the crown of the hat should fit loosely in a hole at the top so that it may be removed easily. Allow it to project about $\frac{1}{2}$ in. above the top. The base is notched at the front and back to simulate feet. The inside should be sanded smoothly and shellacked.

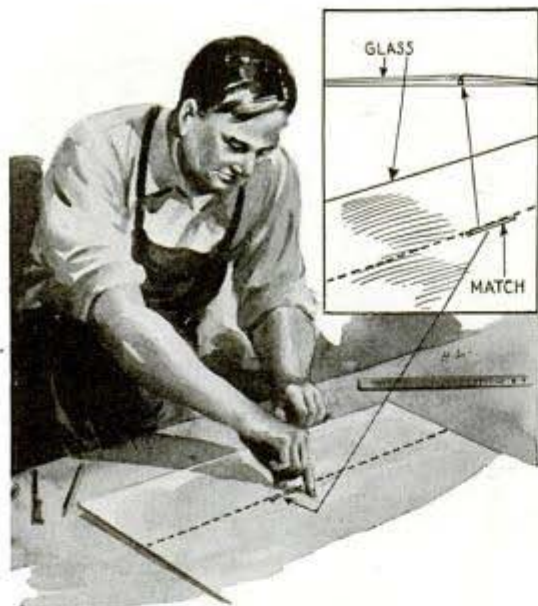
Mexican table set: The Mexican couple shown in Fig. 11, and the "jumbo" cactus in Fig. 12 provide novel containers for salt, pepper and sugar. The cactus is turned by following the method described for the powder box. It should be finished smoothly on the inside. The handles are notched around the edge and hollowed out in the center to resemble flower blossoms. The one at the top can be turned with the lid and later carved, while those glued to the sides are turned separately. Holes bored lengthwise through the salt and pepper shakers are tapered at the bottom to fit the corks, after which a number of small holes are drilled through the top to meet the center opening.



Cactus
 sugar bowl



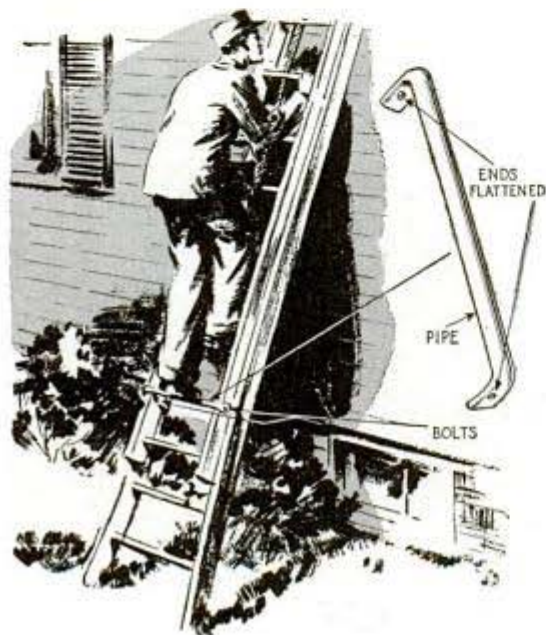
Match Stick under Scored Line Breaks Glass Quickly



To break a pane of glass quickly and evenly along a scored line, one glazier places a match stick under and parallel with the line, then presses down on the glass at either side with his fingers. The glass breaks quickly and smoothly.

Extra Rung on Extension Ladder for Additional Safety

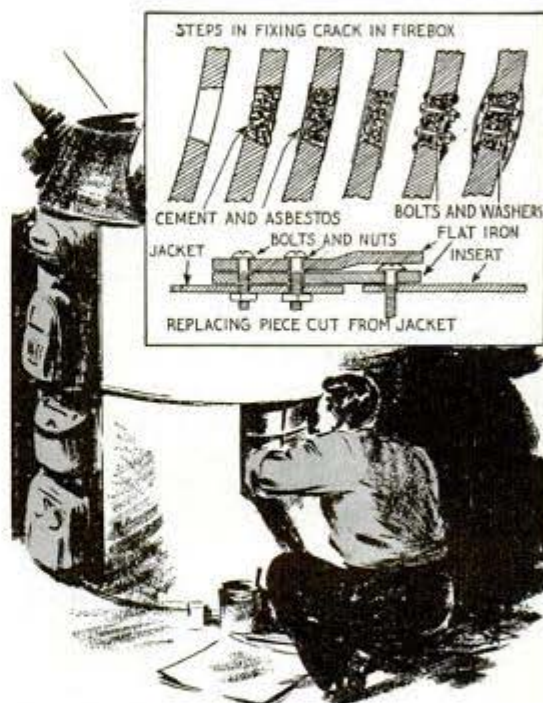
On extension ladders that have one rung missing where the automatic locks are



placed, there is a certain amount of danger presented by absence of the rung. To overcome this hazard, one painter installed an extra rung made from a length of pipe, as shown, without interfering with the operation of the locks. The ends of the pipe were flattened and drilled to take bolts, which hold it securely in place.

Repairing a Cracked Firebox in Your Furnace

Here's the way to repair a crack in a furnace firebox so that it will give service for ten years. The crack and the inside and outside surfaces for 2 in. around it are cleaned and these areas swabbed with a

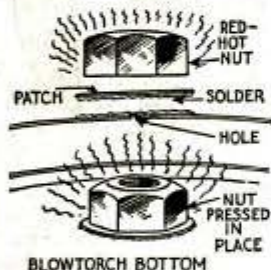


rag soaked in a thick water-glass solution. This liquid is then wiped off until nearly dry. Next, furnace cement (black paste type) is rubbed in thoroughly on these surfaces to effect adhesion not only within the crack but around it. Strips of asbestos paper 1 in. wide are coated thinly on both sides with the cement and then wadded into the crack, using a blunt stick. Then apply more cement and smooth off. Cover these areas with asbestos paper which has been cut and had one side thinly coated with cement before applying. With an ice pick or awl, carefully punch holes through the patch for an inch or so and insert machine bolts fitted with washers large

enough to straddle the crack. Tighten these and smear more cement over them. Again put on patches of asbestos paper with cement and smooth over with the fingers. Be certain the edges of these patches feather off and are cemented firmly where their edges touch the metal of the casting. —Linus M. Webb, Syracuse, N. Y.

Patch on Blowtorch Soldered with Red-Hot Nut

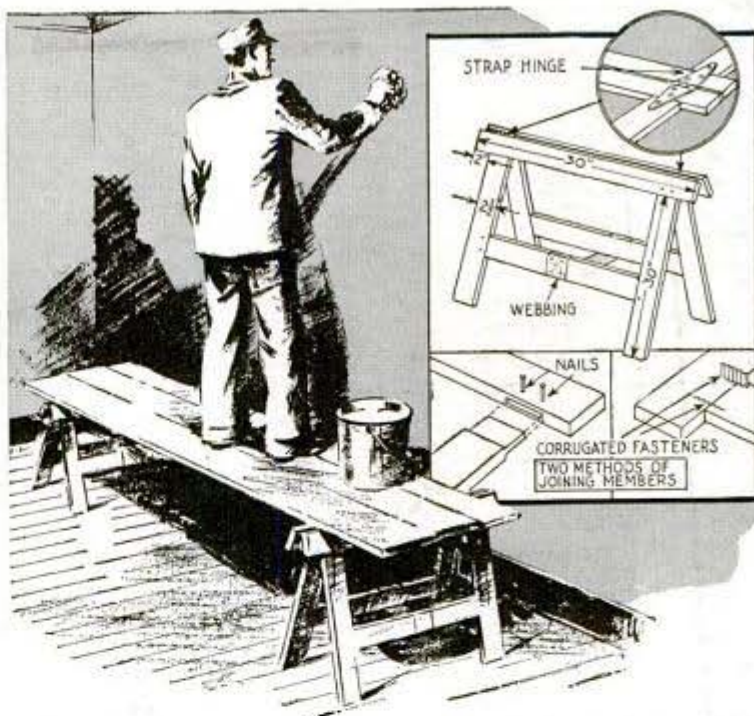
Soldering a hole in a gas lantern or blowtorch bottom where solder alone would soon be worn away is best done by applying a protective patch of sheet metal. The patch



is shaped to a good fit and both contacting surfaces scraped until bright, after which acid-core solder is applied to each surface. A large nut is then heated red hot and laid on the patch. As soon as the solder melts, the nut should be pressed down firmly to force out the excess solder before it is removed. —George Nealley, Santa Rosa, Fla.

☛ Tears in rough-woven window curtains can be mended neatly by joining the ends of the torn threads with clear finger-nail polish.

Collapsible Trestle Folds Flat and Can Be Transported Easily



Especially handy for paperhangers, picnickers, etc., collapsible trestles of the type shown can be made easily in the home workshop. Parts are all cut from $\frac{3}{4}$ by $2\frac{1}{2}$ -in. stock. Side members are identical and are hinged together at the top as indicated. Cross rails either can be mortised and nailed or butted and secured with corrugated fasteners. A small piece of webbing tacked in the center prevents the trestle from collapsing. —G. Marks, Chicago.

Old Auto-Tire Rim in Screen Sifts Sand Quickly

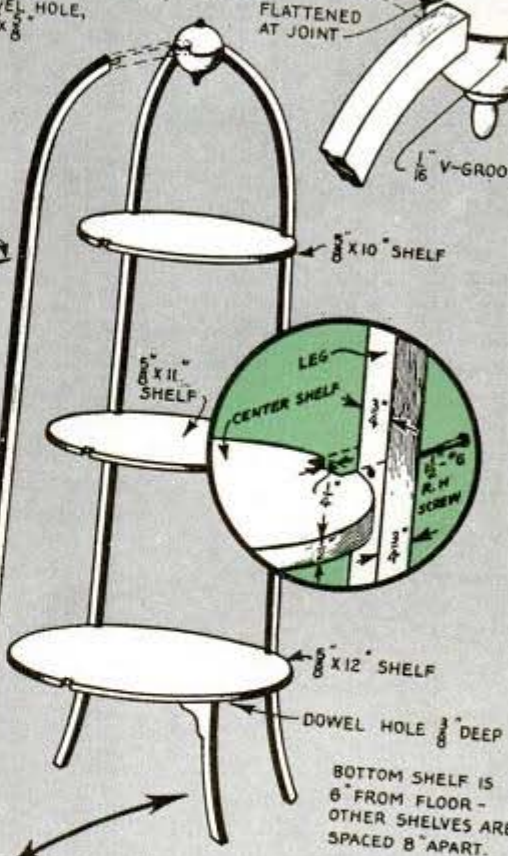
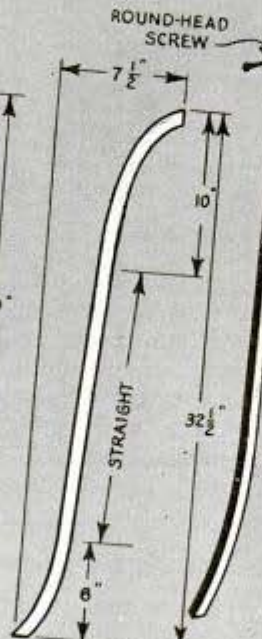
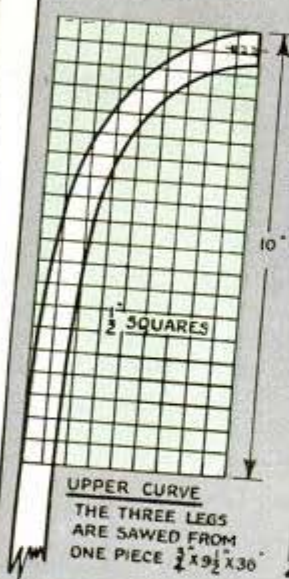
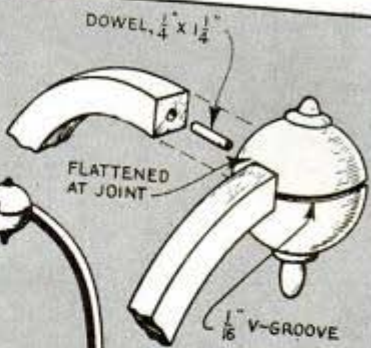
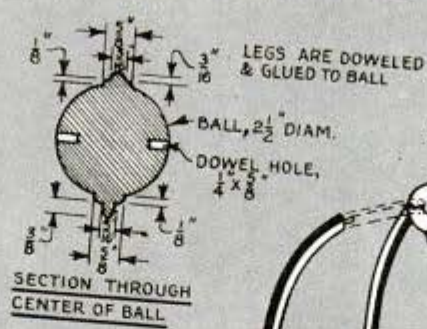
To speed the sifting of sand, one mason placed an auto-tire rim in the sand screen. The sand was shoveled into the rim by one of the workmen while another moved it back and forth to force the material through the screen. Smooth the side of the rim so it will slide easily on the screen.



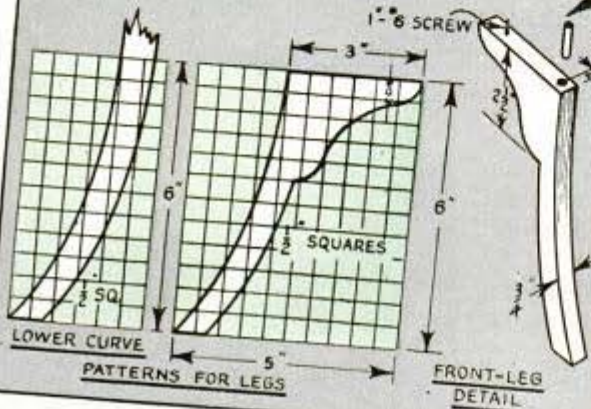
Triple-Deck SMOKING



(A)

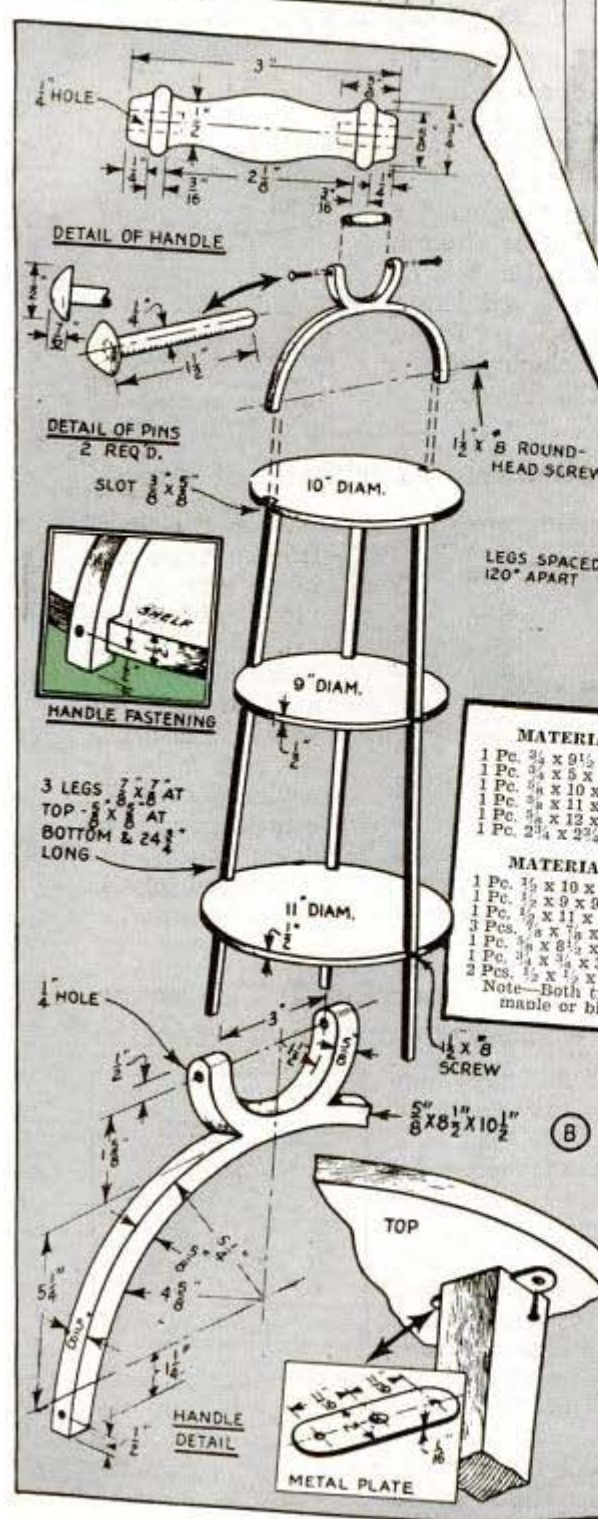


BOTH SCREWS & GLUE USED TO SECURE LEGS IN SHELF SLOTS



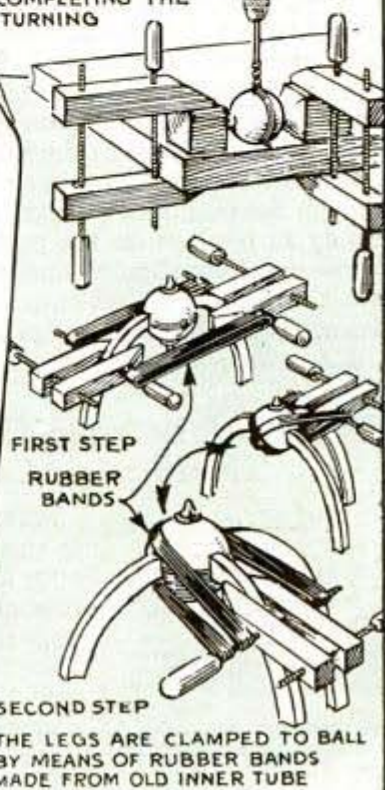
Patterned from its prototype, the muffin stand, either of these two graceful smoking stands will be found useful as well as pleasing in appearance. Walnut and mahogany are the most appropriate woods to use, although for a bone-white finish, any hardwood can be selected. The construction of one stand requires the use of power tools, while the other can be made entirely by hand. The circular shelves are notched to receive the legs which are fastened with screws. The legs of type "A" terminate in a ball turning, while in type "B" a separate piece is added to the top shelf to provide a handle

STANDS



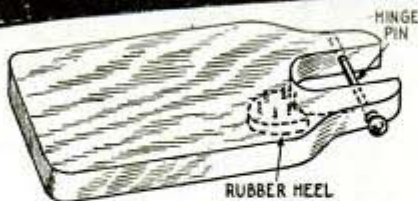
- MATERIAL LIST—Type A**
- 1 Pc. $3/4 \times 9\frac{1}{2} \times 36$ in.—Legs
 - 1 Pc. $3/4 \times 5 \times 6$ in.—Front leg
 - 1 Pc. $3/4 \times 10 \times 10$ in.—Top shelf
 - 1 Pc. $3/4 \times 11 \times 11$ in.—Center shelf
 - 1 Pc. $3/4 \times 12 \times 12$ in.—Bottom shelf
 - 1 Pc. $2\frac{3}{4} \times 2\frac{3}{4} \times 5$ in.—Ball
- MATERIAL LIST—Type B**
- 1 Pc. $1\frac{1}{2} \times 10 \times 10$ in.—Top shelf
 - 1 Pc. $1\frac{1}{2} \times 9 \times 9$ in.—Center shelf
 - 1 Pc. $1\frac{1}{2} \times 11 \times 11$ in.—Bottom shelf
 - 3 Pcs. $3/8 \times 1\frac{1}{2} \times 24\frac{3}{4}$ in.—Legs
 - 1 Pc. $3/8 \times 8\frac{1}{2} \times 10\frac{1}{2}$ in.—Bow
 - 1 Pc. $1\frac{1}{2} \times 3 \times 3$ in.—Handle
 - 2 Pcs. $1\frac{1}{2} \times 1\frac{1}{2} \times 2$ in.—Pins
- Note—Both types to be made of maple or birch

THE DOWEL HOLES ARE BORED BEFORE COMPLETING THE TURNING



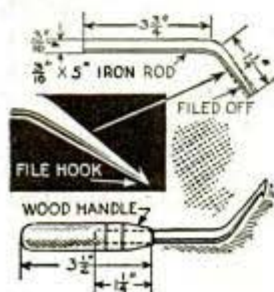
THE LEGS ARE CLAMPED TO BALL BY MEANS OF RUBBER BANDS MADE FROM OLD INNER TUBE

Extra Table on Drill Press Catches Small Parts Dropped from Chuck



To avoid damaging drills accidentally dropped through the center hole of his drill-press table, and to hold small parts handy, one mechanic attached a wooden table under the regular one. The notch in the end of the board fits snugly over the drill-press post, and a loose hinge pin inserted through holes in the fork allows for attachment and removal in an instant. Although the weight of the board will hold it firmly in position on the post, it may be prevented from slipping under vibration if a rubber heel is tacked onto the underside in such position that the edge of the rubber contacts the post.

Bent Hook Better to Make Rugs Than Straight One

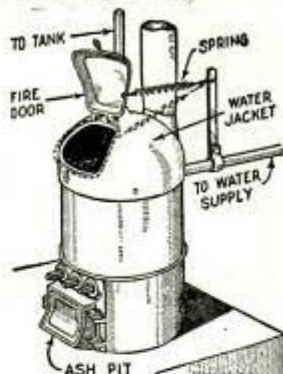


An efficient hook to use in making rugs is one that is bent about an inch or so from the end. You will find this superior to the average straight hook as the arm may be held in a

natural position while working. To make one, bend a length of rod to the shape shown, taper the bent end to $\frac{1}{32}$ in., and fit a wooden handle to the other end.

Fire Door on Hot-Water Heater Kept Open by Spring

The fire door on a coal-burning hot-water heater will stay open while adding fuel if you install a spring as shown. As indicated by the dotted lines, the spring is not detached when the lid is closed.



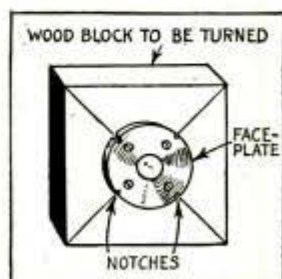
Removing Tackiness of Tape



After a strip of friction tape has been wrapped in place as insulation around a wire, it is frequently difficult to pull the joint through a narrow tube or orifice due to the adhesiveness of the material. The tackiness can be removed if the outside of the taped joint is sprinkled liberally with talcum powder.

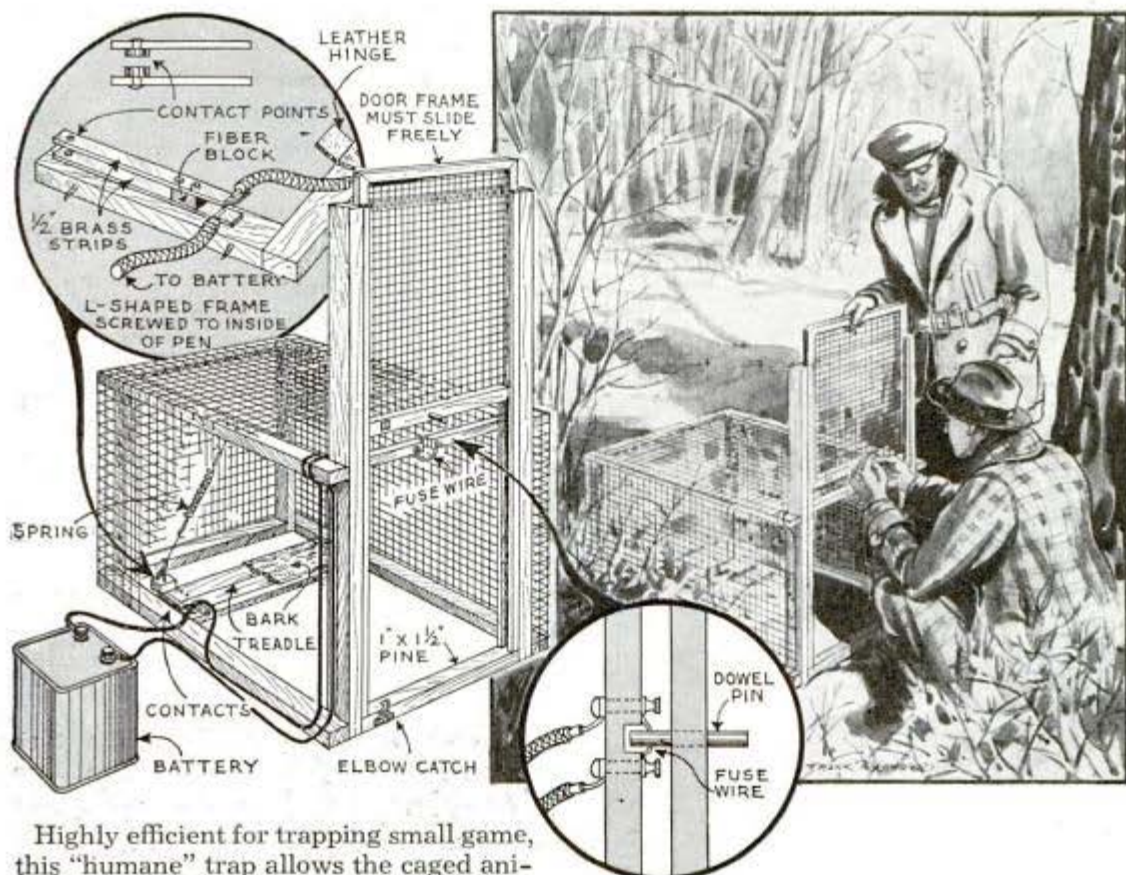
Notched Faceplate Is Timesaver When Turning Square Work

I find that four equally spaced notches filed in a lathe faceplate are a timesaver when centering square work to be turned. After drawing two lines across the end of the work in the usual way to locate the center, place it on the faceplate and adjust it until the lines match the notches as indicated. Then mark the work for the screws, drill the holes and attach it.



—Martin Mittermiller, Marshfield, Wis.

This Small-Game Trap Is Sprung Electrically



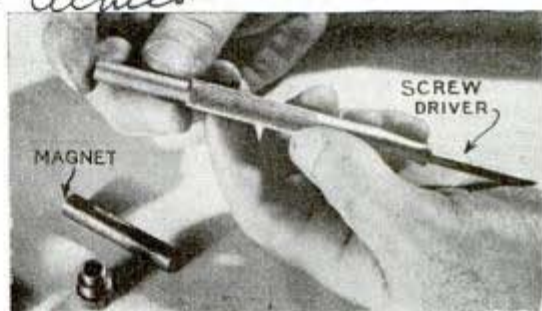
Highly efficient for trapping small game, this "humane" trap allows the caged animal to move about, permits the "catch" to be observed and studied closely and to be released without handling if desired. Here is how the trap is sprung: The animal, when within the trap, must step upon a critically adjusted treadle to reach the bait which is placed on the floor at the far end of the cage. Movement of the treadle produces an electrical contact which melts the fuse wire supporting the raised trap door, allowing the latter to drop. Although pine can be used, hardwood is best for the framework, which is covered completely,

including the bottom, with suitable wire mesh. The upper circular detail shows how the contacts are attached to an inner L-shaped frame to which the treadle is hinged. A small block, to which a light spring is attached to hold the circuit open, is fitted to the treadle to overhang the edge directly above the contacts. A No. 32-ga. iron wire is suitable for the fuse wire, and several dry cells or a storage battery will furnish ample current to operate the trap.

—Major Lenox Loehr, Chicago.

Screwdriver Blade Magnetized with Magnet in Handle

A small screwdriver of the type having a very short blade and a hollow metal handle in which extra screwdriver blades are carried, can be magnetized by merely keeping a small alloy magnet in the handle. A magnet of this type has a much greater charge than can be given ordinary steel, and when placed in the handle will enable the screwdriver to pick up and hold iron or steel screws of almost any size.



FEBRUARY, 1941

Almes
 Central Scientific 293
 1700 Irving Park
 23rd Chicago

Portable Step on Ladder Rungs Eases Strain on Workman



Tired feet caused by standing on a ladder may be avoided by using this step. It can be made in a few minutes from scrap pieces fitted to form a box with one side open, the ends being slotted to slip over two rungs on the ladder. Cleats are nailed at the top of the slots for added strength, and the top is covered with a rubber stair tread. When used on some ladders with rungs close together, it may be necessary to cut an opening in the side of the box so that the lower rung can be used.

Auto Tires Mark Fishing Holes Cut in the Ice

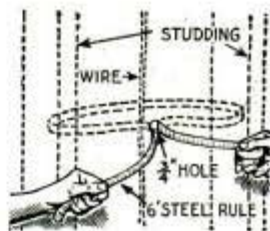


Ice fishermen in a Wisconsin community employ old auto tires to mark holes cut in the ice. Also, the tires support a signal flag and a short fishing pole as indicated. The same

idea can be carried out as a safety measure for skaters, by using the tires to hold warning flags where there are air holes in the ice that might be dangerous.

Steel Tape to 'Fish' Electric Wire Through Small Hole in Wall

When "fishing" wire from inside a wall out through a small hole, a steel tape will enable you to do the job quickly. The tape is unreeled, folded



in the center and pushed through the hole. It conforms to the space between the walls to provide a loop through which the wire is pushed or dropped. Then when the tape is pulled out, the wire comes with it.

—Eugene L. Smith, Ellington, Mo.

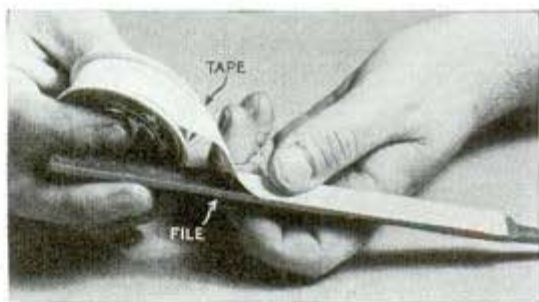
Artist's Brushes Held on Tumbler by Bobby Pins



Bent to the shape indicated, a couple bobby pins make an ideal rack for holding your art or showcard brushes conveniently at hand. The pins clip over the tumbler containing a cleaning solution

Tape Protects Work from File

In using a file, it often happens that the opposite side would mar or ruin the work were it to come into contact. In such cases, it is a good precaution to cover one side of the file with a strip of adhesive tape, which may be stripped off easily afterward.

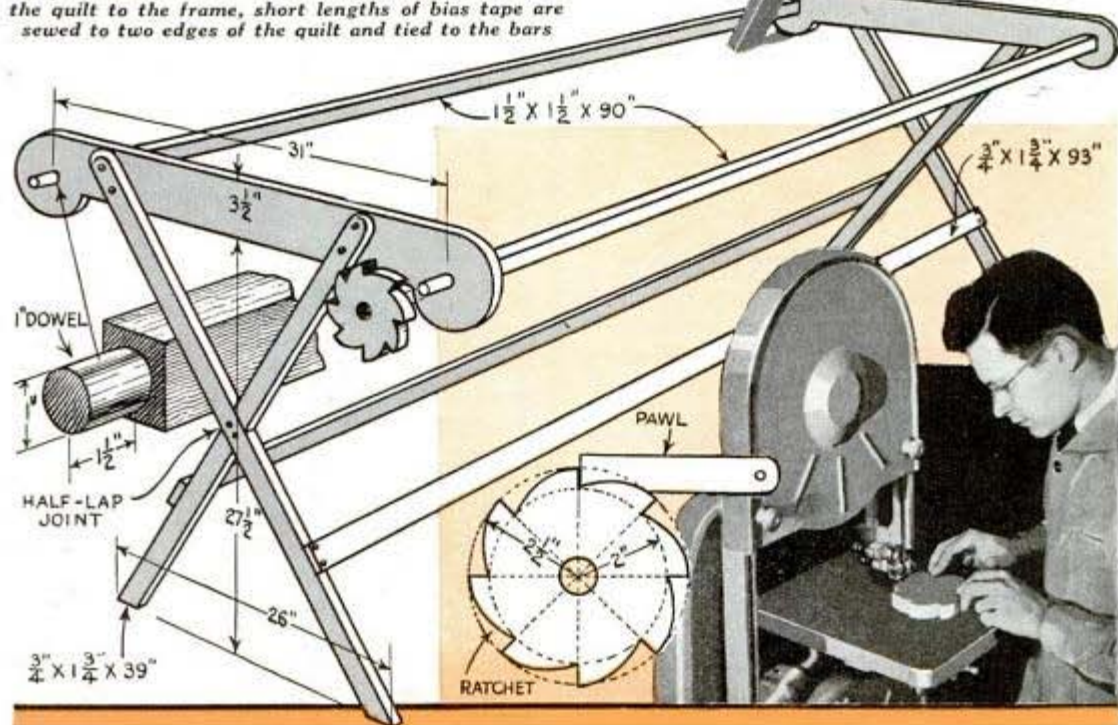


Adjustable QUILTING FRAME

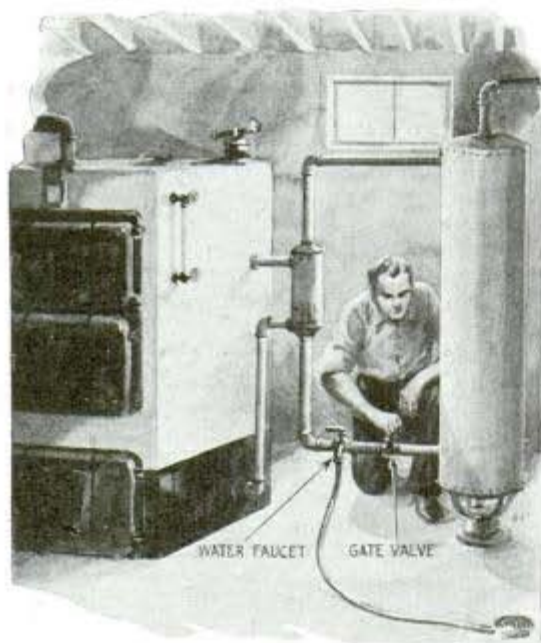
is easy to make



Quilting can be done at home more conveniently when supported by this handy work frame for the quilt which is always taut, and it can be advanced toward the worker from where the tufting may be carried on from a sitting position. Common pine will do for the framework, but hardwood should be used for the pivoted quilt bars to prevent sagging. Using screws in assembling will permit the frame to be taken apart easily for storing. The tenoned ends of the quilt bars can be formed by gluing short dowels in centered holes, or the stock itself may be rounded at the ends with a wood rasp. Ratchets fitted with pawls to hold the quilt taut, are attached to the ends of the bars. To fasten the quilt to the frame, short lengths of bias tape are sewed to two edges of the quilt and tied to the bars



Indirect Water Heater Flushed by This Simple Hookup

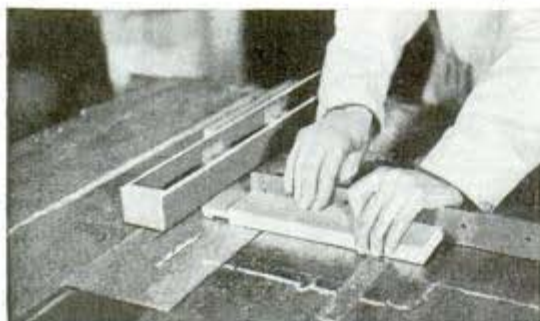


If you have an indirect hot-water heater on a boiler of your home-heating system, here's a good way to flush it at intervals, which is necessary if corrosion on the coils is to be kept at a minimum. In the cold-water or outlet side of the pipe leading to the heater install a gate valve and a faucet as indicated. To flush the heater, merely close the gate valve and open the faucet. This will cause water to flow from the tank down through the heater and out of the faucet, thus carrying away rust and other foreign matter that will accumulate in the coils unless it is removed.

—Edward N. Avery, Dunmore, Pa.

Cutting Tenons on Circular Saw

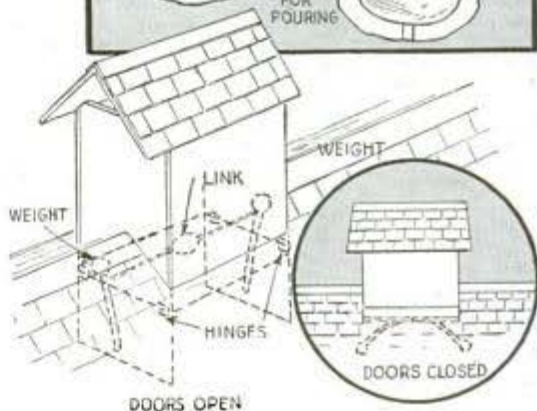
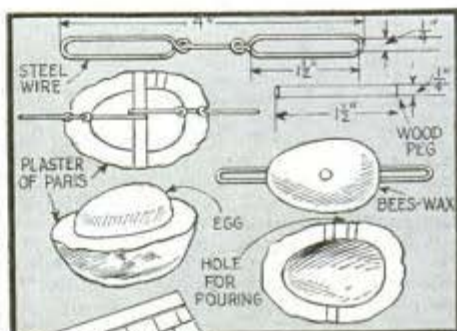
Most woodworkers saw tenons by standing the piece on end and turning one side to the saw ripping fence. When the less experienced worker tries this method, he



leans the piece one way or the other and the tenon is tapered. You can be assured of a flat, even-thickness tenon if you lay the piece flat on the table, raise the saw, remove the amount needed and use the rip fence as a butt gauge to assure even lengths of all tenons. A series of cuts, close together, removes most of the wood and then the piece is pushed across the saw from side to side of the blade and this cleans up the surface, leaving it flat but rough enough to make a good glue surface. If you have a dado head, you can clean up the job in one cut by using cutters as wide as the length of the tenon.

—D. C. Marshall, Manhattan, Kan.

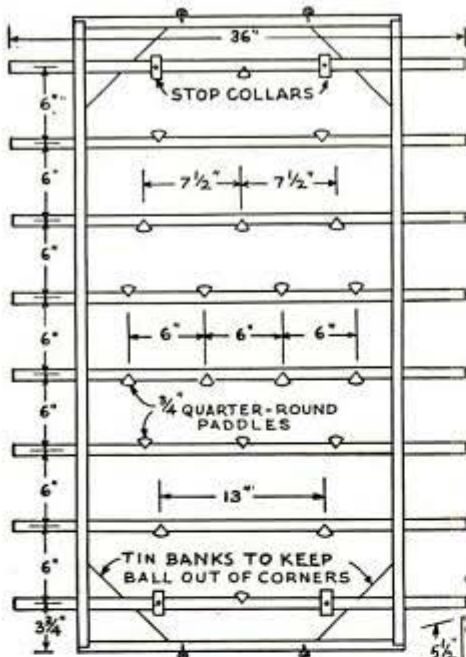
Ventilators Closed Automatically if Fire Starts in Building



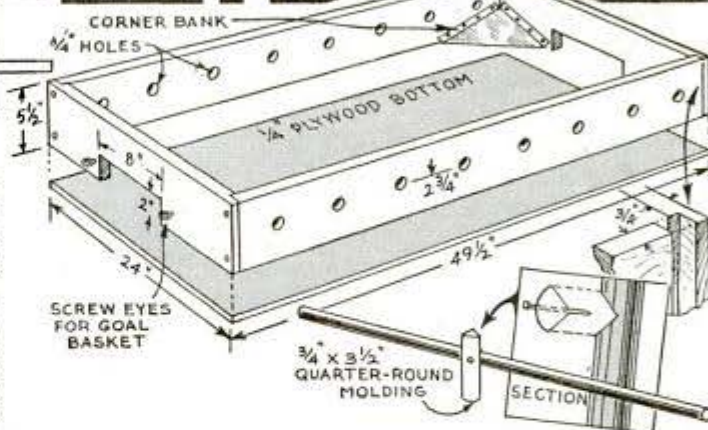
Closing of the ventilators of a barn or other building to slow up a fire should one break out inside the building can be done automatically by fitting the ventilators with weighted, hinged flaps or doors, which are held open by fusible links. These are cast readily from beeswax as shown and will melt at approximately 145°. First form two wire links as shown in the upper detail, to be fastened to the flaps. Then cast the wax, using an egg as a pattern to make a plaster-of-paris mold. The various steps are given in the drawing.

—A. Campbell, Clarendon Hills, Ill.

It's Fun to Play This Indoor Football Game

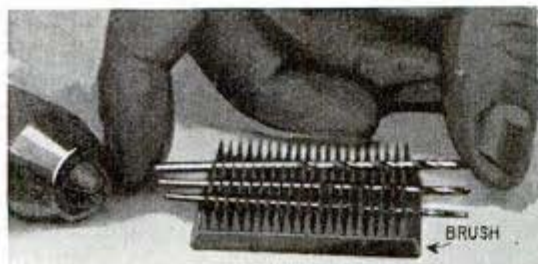


Played by two to six persons, this game provides endless fun for members of your family or your party guests. The object of the game is to drive a table-tennis ball into one of the two goal baskets at opposite ends of the box. This is done by hitting the ball with wooden paddles attached to dowel rods, which are turned and pushed back and forth by hand. There are eight rods; the two center ones have four paddles each, the next two toward each goal have three each, while the next pair have two paddles each and the last two next to the goals have only one paddle each. The last two rods are equipped with stop collars or pins, which prevent pulling the rods out of the holes. Alternate rods have paddles facing in the same direction. With four persons playing,



opposing teams on either side of the box, each player grasps two rods having the paddles facing toward his goal. To play, a ball is dropped at the center of the field and both teams engage in driving the ball. More than four people can play by having some of them, or all of them, operate only one rod each. The goals are simply wire baskets, hooked to small screw eyes. The paddles are pieces of quarter-round molding, lattice strips or other material.

Suede Brush with Rubber Teeth Is a Handy Holder for Small Drills



When working with a number of small drills around a workbench, a rubber suede brush provides a good holder to keep them from rolling or getting lost. The drills lay neatly between the rubber teeth where they are easy to pick up, and can be kept in the order on which they are used on the job. This is handy on duplicate work where different drills are used alternately.

CLEAN GUNS



② WHEN GUNS MUST BE CLEANED FROM MUZZLE, USE A CAP TO PROTECT BARREL



HOW VARIOUS TYPES OF PATCH TIPS ARE USED



A SWAB THE BORE WITH NITRO SOLVENT ON PATCH B RUN A BRASS BRUSH THROUGH BORE THREE TIMES

INCREASED accuracy, smoother shooting and longer gun life will reward the shooter who spends a little time in keeping his guns in first-class condition. Given a new gun to start with, a few minutes cleaning time will keep it in perfect condition whereas the neglected gun becomes increasingly difficult to clean satisfactorily.

Cleaning a rifle or shotgun involves five simple operations, as shown by the photos A to E inclusive. The bore is first swabbed with a flannel patch well saturated with nitro solvent. Cleaning should be done from the breech of the barrel if possible, and the muzzle of the gun should rest on a clean magazine or a block of wood. The patch should be run up and down the bore several times to saturate the powder residue thoroughly with the solvent oil. Any brand of powder solvent available at a hardware store will do. Operation No. 2 calls for a brass brush. Running this up and down the bore will remove the sticky powder fouling partially loosened by the action of the solvent. The brush should be pushed out of the barrel on each down stroke. Reversing the direction of the brush inside the bore does nothing but ruin the brush. Next repeat the first operation. The object of the fourth operation is to dry the barrel thoroughly. Start by wiping the rod clean. You will need four to six clean patches. Run the first patch down, up, down and out at the muzzle end. Run the rest of the patches through the bore once only, discarding each at the muzzle end. The final patch should

for GOOD SHOOTING



C. REPEAT SWABBING WITH NITRO SOLVENT

D. DRY THE BORE WITH FOUR TO SIX CLEAN PATCHES

E. OIL WITH GUN OIL ON PATCH



HOMEMADE GUN VISES FACILITATE CLEANING OPERATIONS

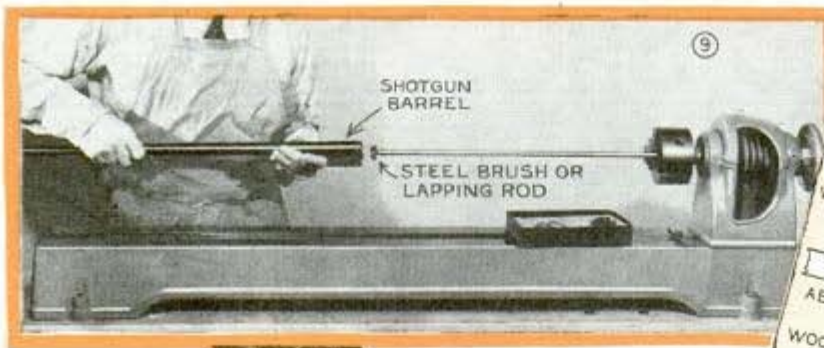


show perfectly clean and dry. If it shows dirt, the preceding operations must be repeated. The final operation is oiling. This is done with a clean patch. Use any good gun oil. This will protect the gun for a period of four to eight weeks. If the gun is to be stored for a longer period than this, use gun grease instead of the lighter oil.

As previously mentioned, cleaning should be done from the breech. Cleaning the gun

from the muzzle permits the rod to rub at this vital point, causing wear which may influence the accuracy of the weapon. Some guns cannot be cleaned from the breech. In this case it is advisable to use a wooden or brass muzzle cap, Figs. 2 and 3, to protect the muzzle. If you use a plain jag tip for cleaning, the chamber should be fitted with a cartridge case plugged with wood. This will prevent the patch from working loose as it sometimes does when pushed into the larger diameter of the chamber.

Fig. 1 shows the five types of cleaning tips commonly used. The single slotted tip is the simplest. It has the advantage of holding onto the patch under all conditions, but has two disadvantages in that the patch sometimes jams when reversed inside the bore, and, the cleaning action is often one-sided, permitting the bare sides of the tip to rub the bore. The plain jag tip gives a uniform cleaning action, and reverses perfectly inside the barrel. The patch sticks to the tip as long as it is inside the barrel, but any chance movement beyond the muzzle or chamber will cause



METAL-FOULING SOLUTION

- Ammonium Persulfate . . . 1 oz.
- Ammonium Carbonate . . . 200 gr.
- Water 4 oz.
- Stronger Ammonia 6 oz.

Powder the first two ingredients together and dissolve in water. Add the ammonia. Keep the solution in a large bottle having a rubber cork

METAL-FOULING AND LEADING REQUIRE SPECIAL TREATMENT

rotate inside the bore, following the rotation of the rifling. Without this rotation, the patch will drag at right angles across the lands and will quickly destroy the sharp

edges of the rifling. The patch should be of such a size as to require three or four pounds pressure to force it through the bore of the rifle. A shotgun cleaning rod does not require a swivel joint, as this weapon has a smooth bore. Other than this variation, the cleaning technique is exactly the same, with the exception that most shooters prefer a wire-gauge cleaner or a brass worm instead of a brass brush.

The cleaning operation as described can be simplified greatly if some type of vise is made to hold the gun. Rifles are easily held in a simple jig consisting of two wooden chocks nailed to a baseboard, Fig. 7. Shotguns can be clamped in the jig shown in Fig. 8. Clamping in a standard wood vise is also satisfactory, but care should be exercised in exerting too much clamping pressure.

Other than powder fouling, the shooter must sometimes give consideration to metal fouling. This is a deposit of metal left by the bullet in the bore. If you shoot lead bullets, the fouling is more specifically designated as "leading." It is obvious that a perfectly smooth, polished bore will pick up very little metal fouling, whereas the roughened, neglected bore will always foul to a greater extent. Metal fouling in itself does no particular harm to the bore, but it may trap powder residue beneath it, leading to corrosion of the bore. Metal fouling can be detected by a careful examination of the bore, in which the fouling will show as long streaks, flaky deposits or even ac-

it to come loose. The same applies to the jag tip with point. The point is an advantage in centering the patch previous to insertion in the bore. The double-slotted tip is a first-rate cleaner, with a uniform action. The roll jag permits rolled or wrapped patches, and is preferred by many shooters on this account. The patch is wrapped around the jag as shown in Fig. 6, and can be made tight or loose as desired. Fig. 5 shows how the plain jag is used, the patch simply being centered on the tip, while Fig. 4 shows the obvious way of using either the single or double-slotted tip.

The cleaning rod itself can be brass or steel and should be of a proper diameter to fit the bore of the rifle. It must be fitted with a swivel joint so that the patch will

tual lumps of metal sticking to the lands and grooves. The fouling is easily removed, if attended to promptly, by using the metal-fouling solution specified in Fig. 11. The liquid is kept in a tightly corked bottle at all times except when actually using the solution, since it loses strength quickly when exposed to air. This can be applied with a cloth patch in the usual manner if the deposit is light. For a more thorough action, the solution is poured into the bore of the gun after first plugging the chamber with a rubber cork. When first poured in, the solution will be as colorless as water but will assume a deep blue color as it begins to dissolve the metallic deposit. The action is complete in about 15 min. Care should be taken in using the metal-fouling solution as it will remove bluing or the finish on the stock. After the solution has been removed from the barrel, the regular cleaning procedure should follow immediately.

Leading can be removed with the metal-fouling solution. Many shooters, however, prefer mercury. A few ounces of this are placed in the barrel. A finger over the muzzle will hold it inside, and a few tips up and down will cause the mercury to amalgamate with the lead deposit. The solution can be used many times. Mercurial ointment is a satisfactory remedy for leading as is also common vinegar or a dilute solution of glacial acetic acid.

Metal fouling in shotgun barrels or any condition of rusting or pitting can be removed usually by mechanical methods as the smooth bore permits almost any type of polishing. The cleaning operation is most conveniently done in a lathe, mounting the polishing barrel or abrasive in the lathe and holding the gun barrel in the hands, as shown in Fig. 9. Steel brushes and polishing heads for this purpose can be purchased, or the shooter can make his own, as in Fig. 10, to be used with paste abrasive, steel wool or abrasive paper.

Faded Awnings Renovated Easily

Awnings that have faded, but are otherwise in good condition, may be freshened in appearance by painting them with a solution of raw linseed oil, 2 parts, and turpentine, 1 part. The oil deepens the color and removes the faded appearance, while the turpentine thins the oil and helps it penetrate.—G. C. Sonntag, Berkeley, Calif.

Plumb Bob with "Long Handle" Saves Climbing



In building and construction work where it is often necessary to establish a plumb line from a high ceiling to the floor, much time can be saved by using the line with a handle as shown. The line is tied to the handle, which is then braced between the ceiling and floor so that the line at the handle comes at the desired location.

Initials Transferred to Leather with Sandpaper Letters

When you wish to impress an initial or monogram onto leather, or similar surface, cut the design from coarse sandpaper and lay it onto the part to be treated. Cover the cut-out with a hardwood block and tap the latter with a mallet. In the case of leather, the surface should be moistened in the same manner as when it is to be tooled.—Kenneth Murray, Colon, Mich.

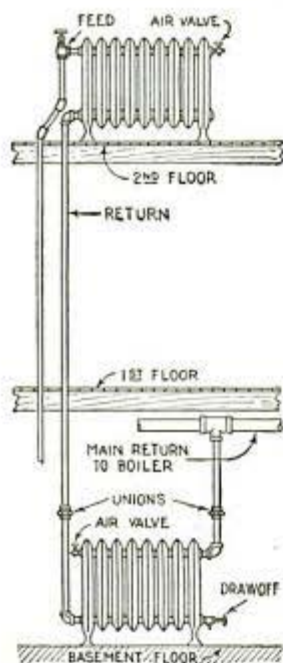


Small Corks on Sweeping Brush Straighten Linoleum Rugs



Instead of stooping to move or straighten linoleum rugs on polished floors when sweeping them, a janitor moves the rugs with his floor brush. Rubber corks inserted in holes drilled in the back of the brush make it easy to do this when the brush is inverted to bring the corks in contact with the rug.

Hot-Water System Hook-Up for Basement Radiators



Trouble often experienced with radiators in the basement heating inefficiently can be avoided by hooking them up as shown. The return from the highest radiator in the building is run to the radiator in the basement, which is in turn hooked up with the main return line to the boiler. Notice that the hot side of the piping is made to the lower connection in the radiator and that the out-

flow of the radiator is made at the upper connection. Hot water returning from the high radiator will circulate through the one in the basement, thus putting an end to sluggish basement radiators. I have used this hook-up on many jobs and it has worked perfectly in every case.

—John Starker, Albany, N. Y.

Rubber Straps on Bicycle Basket Keep Books from Bouncing Out

When carrying books or other small objects in the basket of your bicycle they can be kept from bouncing out by use of a couple of straps cut from an old inner tube. These are fastened to the bottom of the basket so that they can be stretched over the article carried.



—Clifford Tombyll, Maplewood, N. J.

Pails Protect Ends of Linoleum When Rolled for Moving

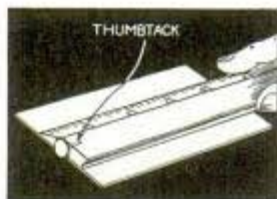


To avoid damaging rolled linoleum when moving it, a truck driver slips pails over the ends. The bails are removed and twine threaded through the pail ears to keep

them in place. This makes it possible to stand the roll on end without tearing or breaking the linoleum.

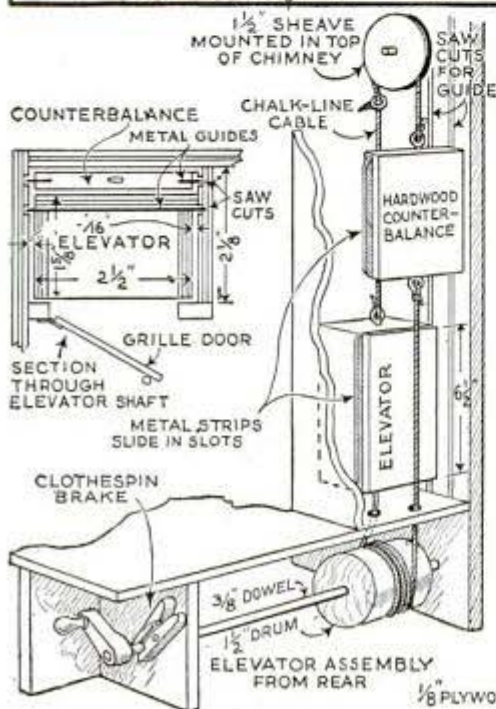
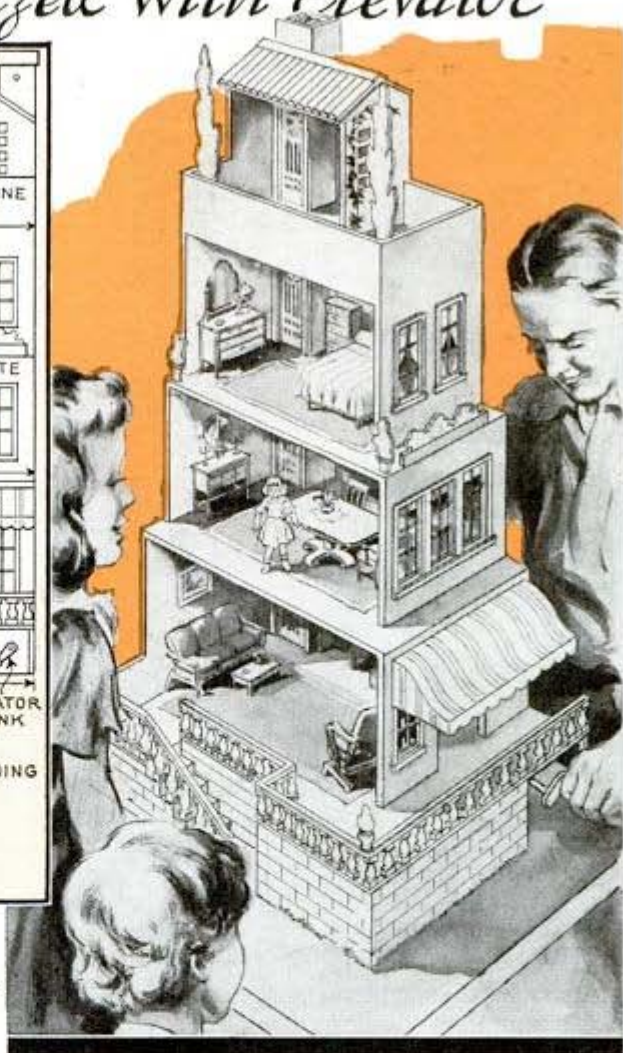
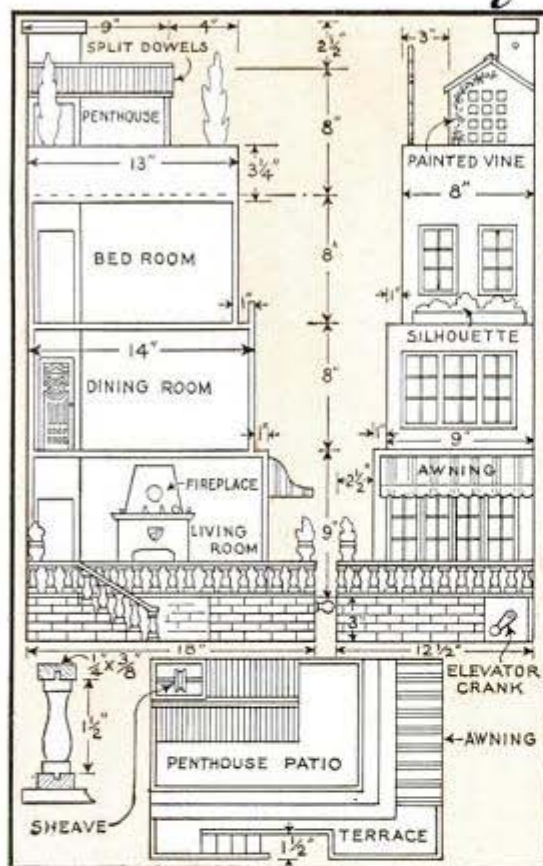
Thumbtack Driven in Ruler Aids in Measuring Cards

Driven into the end of a ruler, a thumbtack will serve as a stop to assure accuracy and save time when measuring cards, photos, etc. Be sure that the lower side of the tack head projects sufficiently to engage the card.



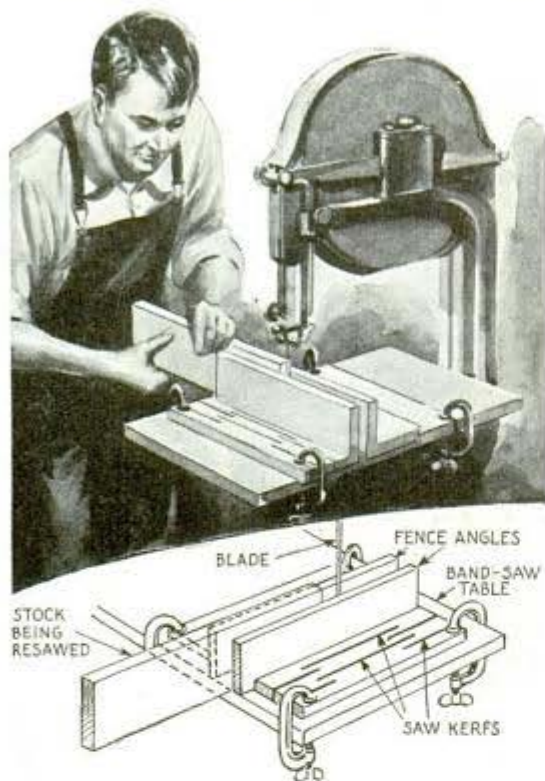
APARTMENT DOLLHOUSE

Modernized with Elevator



THE four-story, step-back construction of this pressed-wood or plywood dollhouse gives it more room than the average dollhouse, without taking as much floor space. One side of each room is open and only one wall of each room is provided with windows. The elevator shaft is incorporated with the chimney and has a door on each floor. A crank projecting from the basement wall operates the elevator, which remains at any floor by the braking action of a clothespin on the axle. A balustrade around the terrace and a tin awning add to the appearance.

Jig for Ripping Stock on Band Saw Has Tensioning Arrangement



Here is a ripping jig for a band saw that permits handling stock of slightly varying thicknesses without changing the fence angles. Each fence angle and its base piece are nailed together, the base pieces being saw kerfed, as indicated, to give them a spring action. Note that the kerfs alternate as to their position. First, a pair of kerfs run in from the ends of the piece, then a parallel kerf is run into the center of the base, followed by another pair from the ends, etc. This combination of kerfs works together to allow the board to give at all points. Any desired degree of flexibility may be had by spacing the kerfs closer or farther apart.

Slots in Concrete-Form Boards Hold Tie Wires



When building concrete walks, one workman claims that much time can be saved by sawing slots in the form boards to receive the tie

wires instead of boring holes for them. The wires are merely bent, dropped into the slots of the form boards, and twisted around the supporting stakes.

Furniture Gliders in Pigeonholes Lift Papers for Easy Removal

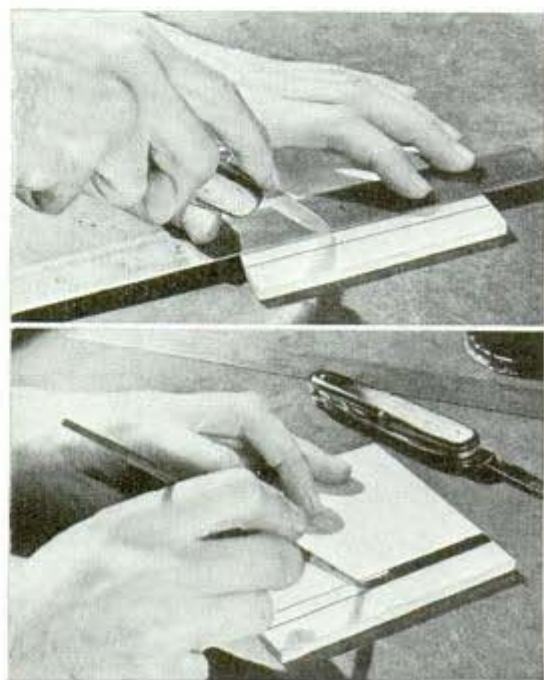
To make it easy to remove letters or papers from pigeonholes of his desk, one office worker attached small furniture gliders to the front center of each opening. These kept the papers lifted at the outer ends so that they were grasped easily with the thumb and finger.



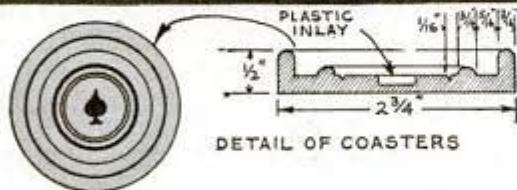
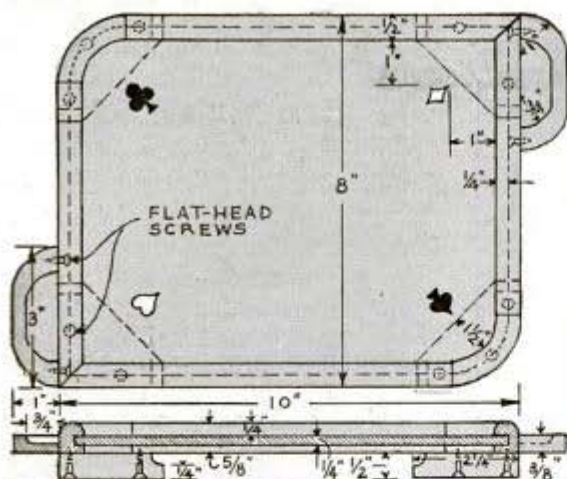
Painting a Straight Line on Wood Without the Paint Creeping

Painting a straight line on wood, composition material or metal is made easier if the line is first scribed with a sharp knife blade. The cut forms a barrier beyond which the paint does not spread easily. The scribed line should be very light, just enough to break the surface.

—Walter E. Burton, Akron, Ohio.



Bridge-Party Serving Tray and Coaster Set



routed to form a grip, and the feet are shaped to fit flush at each corner. Before assembling, fasten the handles to the molding with glue and small, flat-head screws, countersunk from the inside of the groove. With the panel in place, glue the parts together and fasten with flat-head screws through from the underside of the feet. Finish with spar varnish or clear lacquer.

—J. Brumfield, Philadelphia, Pa.

Appropriate for serving at bridge parties because of its playing-card markings, this tray and coaster set will be prized by any hostess. The set is made from maple or birch with inlays of black and red stick shellac. The handles and feet of the tray are walnut or mahogany. First turn the coasters to shape, then rout out the centers and fill the resulting depressions with the shellac, red for the diamond and heart, black for the spade and club. Smooth these down carefully with a warm knife. When cold, scrape the excess shellac from the wood and sand carefully by hand. Power sanding is apt to soften the shellac and cause it to run. The tray panel is made from 1/4-in. maple or birch. Rout, fill and smooth the designs as was done with the coasters. The molding is rounded across the top and grooved to fit the panel. The rounded corners of the molding are turned in a lathe, then quartered. The handles are

Rubber Boots Hung on Wall with Tire-Section Clamps

Sections cut from an old auto tire and tacked on the wall of a fisherman's cabin, were used to suspend his rubber boots in an inverted position. The tire sections permit free circulation of air inside the boots.



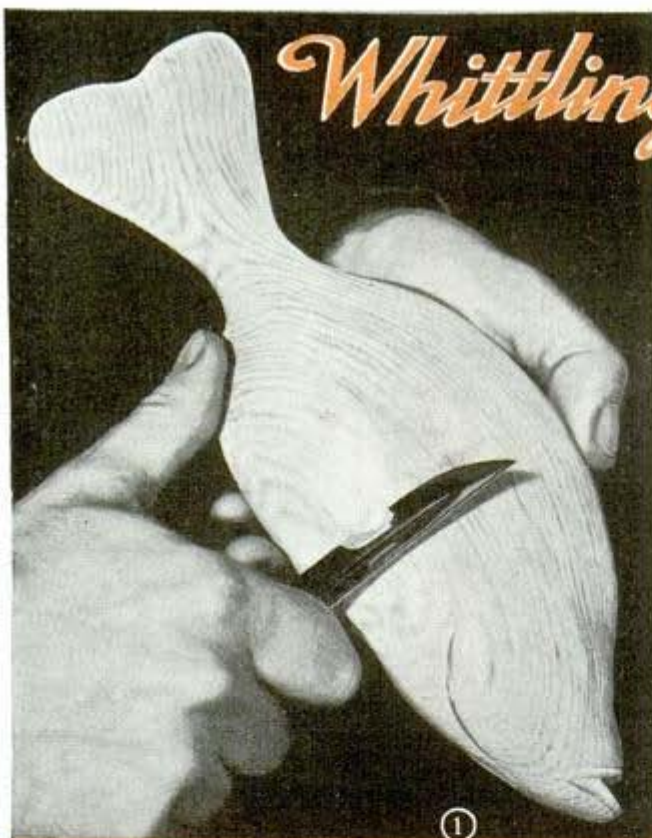
Whittling a FISH

By JOHN RODELL

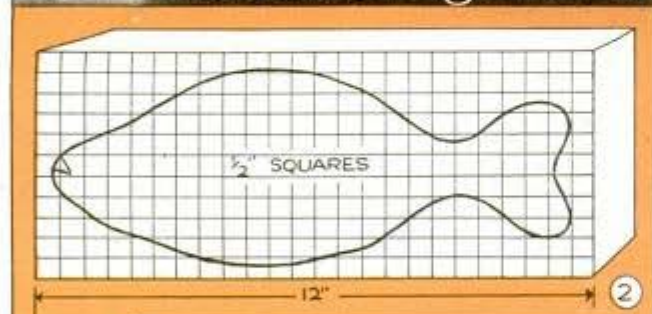
CATCHING a fighting beauty is only the beginning of the fun, for you can both eat your fish and have it—in wood. The time to carve and paint a model is while the fish is still fresh and the colors are bright. With a sharp knife, a small gouge, hard pencil, sandpaper and a box of oil colors you can copy your fish in wood and get a realistic trophy. However, you can save time and work if you can cut the rough blanks from a block of white pine with a band saw. Put a curve in the body and a flip to the tail, and your fish will look full of life and fight, as well as thrilling and beautiful.

But first you must have practice. In Fig. 8 are the lines and details of a crappie. You will notice that in a mounted model only the front half is detailed. The reverse side is roughed out and the tail left thick and substantial, Fig. 1. The rough blanks, Fig. 2, are dressed to shape and size after the fish has been caught. There is a vast amount of delicate detail in a fish. The more pronounced bulges and depressions are carved and sanded, then the features are outlined and carved in relief. Here the edges are left sharp. The fins and tail are shaped with the small gouge to detail the spines and membranes. The scales, Fig. 3, are lightly outlined with a pencil. There is a different pattern on each fish. When ready, the after edge of each scale is heavily scored with the pencil. The heavy back scales are made deeper than the delicate ones on the underside.

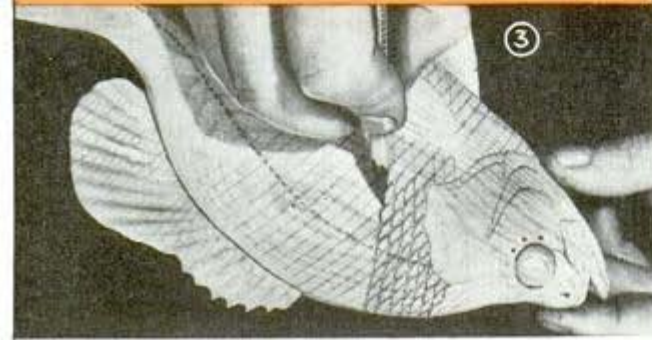
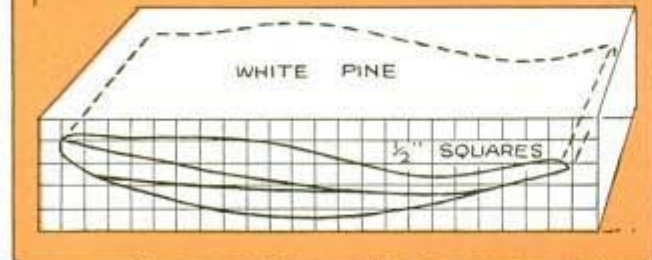
Fins, Figs. 5 and 6, are made from delicate slices of pine. They are carved separately and mortised in place and held there with cement. Painting, Fig. 7, is the most interesting part, for here you



①



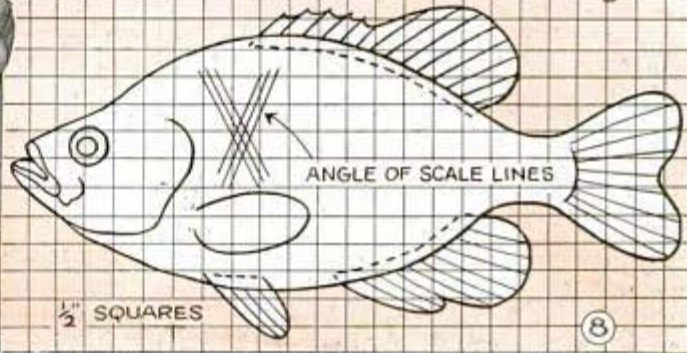
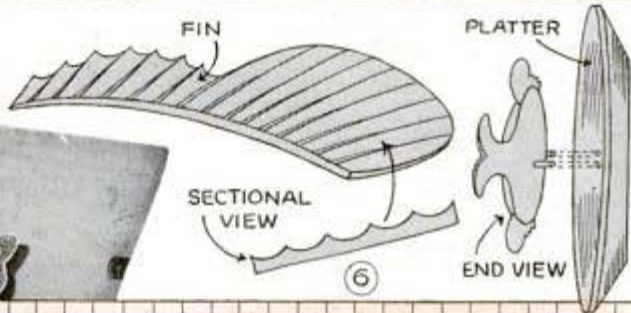
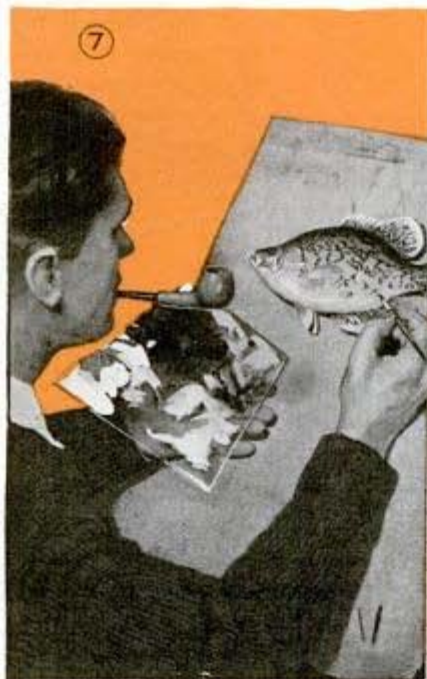
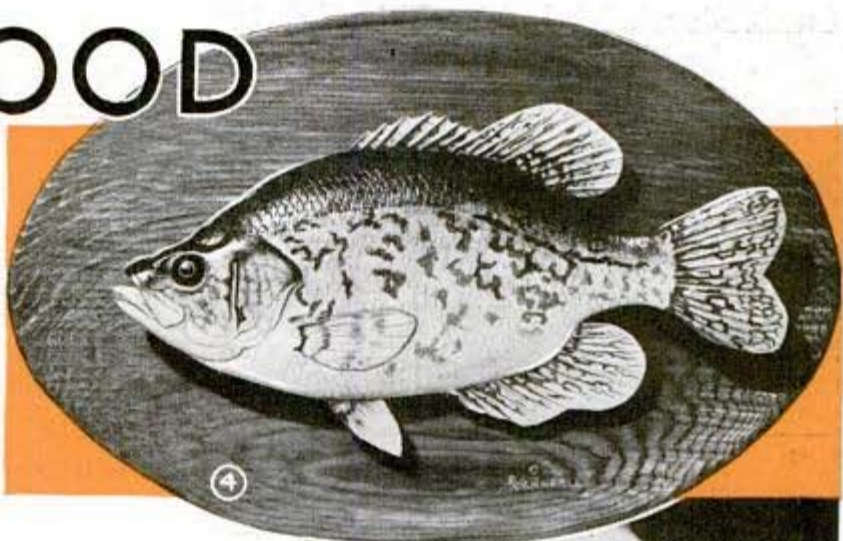
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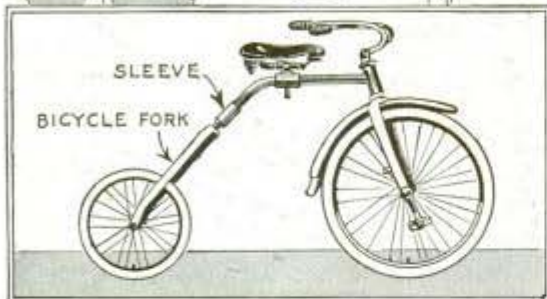
③

in WOOD

see your model turn from a wooden form into a colorful replica. Apply a priming coat of shellac, then a base coat of artist's creamy yellow oil color. From here, lay on the general tones of blue, green or yellow, as the case may be. Blend these carefully, using a finger to soften the tints and smooth down the ridges. Outline the features with deeper tones, then paint in the eyes, mouth and body markings. You will see the scales beginning to stand out as the paint dries, each edge a strong highlight as in the real fish. When dry, in about a week, coat the entire fish with shellac for a lifelike sheen. A plaque on which to mount the model, Fig. 4, is rough-carved from white pine to resemble a platter, the model being fastened to it with a couple of wood pegs. Using a gouge to dish the plaque without smoothing down the gouge markings is effective as this produces a slight simulation of water.



Small Bicycle Made from Tricycle by Using Old Parts

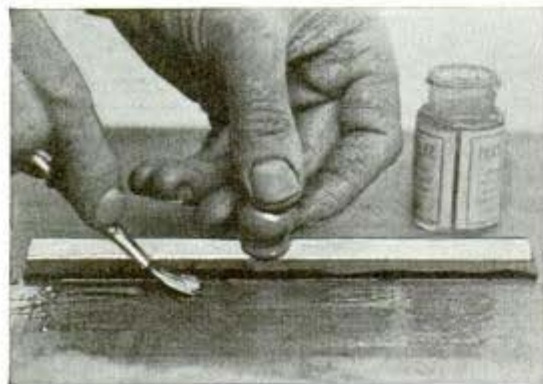


Any boy can have a lot of fun riding this bicycle, which is made from an old tricycle. The tricycle frame is cut off about 3 in. back of the seat post and threaded with a pipe die. Then a standard bicycle fork is cut off $1\frac{1}{2}$ in. above the crown and likewise threaded with a pipe die, after which a sleeve or pipe coupling is used to connect the two parts. If both parts are not of the same size tubing, a reducer can be used instead of the coupling.

—E. E. Youngkin, Altoona, Pa.

Windshield Wiper Blade Aids in Applying Glue

The next time you have the job of applying glue in either a straight line or when one edge must be perfectly straight,

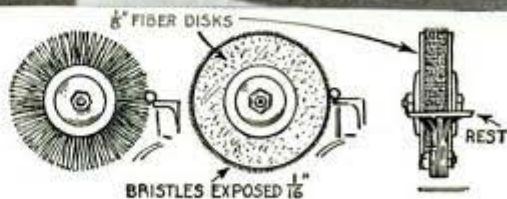


try using an old windshield wiper blade as a straightedge. For ease in handling, attach a potlid knob in a hole of the blade where the actuating arm was formerly attached. In use, simply place the blade along the work where the limiting glue is to be and wipe back and forth with the glue brush. In lifting the blade after the job has been finished, tip it over on the rubber edge, press firmly and pull slightly toward the glue. This will squeegee any of the adhesive that has tended to pass beyond the limits of the desired line. Then lift it up and wipe off any glue that may be adhering to the rubber.

—Frank Bentley, Council Bluffs, Iowa.

Side Disks Prevent Scratch Brush from "Grabbing" Rods

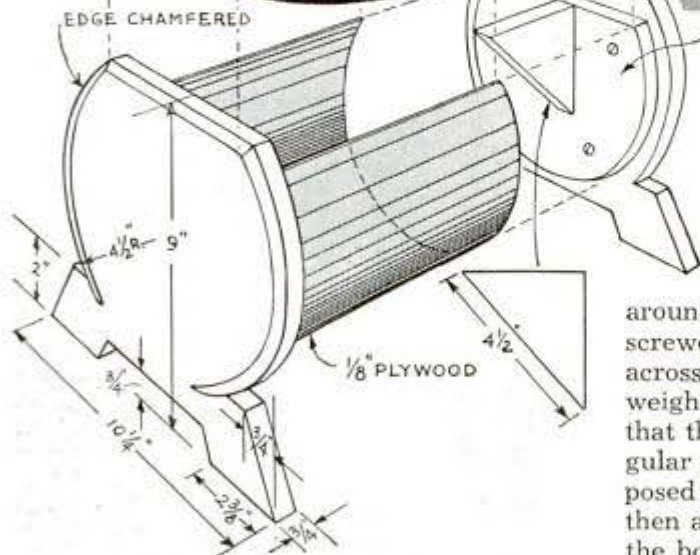
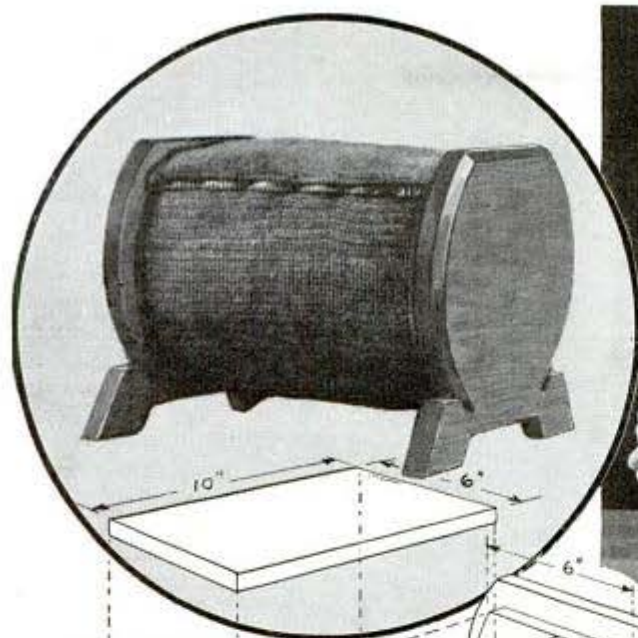
Anyone who has attempted to clean or smooth up a rod or tube of small diameter with a motor-driven scratch brush has found that the bristles have a tendency to grab the rod and pull it between the wheel



and the tool rest. Aside from any injury done to the tool or the work when this occurs, there is danger of drawing the hands into the rotating wheel. As a safety feature for use while polishing or removing rust from this work, I attached a fiber disk on each side of the scratch wheel so that the bristles are exposed only $\frac{1}{16}$ in.

—W. C. Wilhite, Carlinville, Ill.

Upholstered "Log" Footstool Easy to Make



Unusual in appearance, this footstool is inexpensive to make and will fit in well with any type of home furnishings. It is cut out easily with a scroll or band saw or with a hand coping saw, and requires only the simplest upholstery. First saw out the end pieces to the dimensions given and chamfer the front edges of the circular

portions. The reinforcing pieces screwed to the inner surfaces of the end pieces are attached with the grain running at right angles to that of the end pieces for added strength. The body of the stool is thin plywood or pressed wood which is bent around the reinforcing pieces and screwed to their edges. A strong piece across the top of the body supports any weight put on the finished stool. Notice that the top piece is braced with triangular pieces at the ends. Finish the exposed wood of the stool as desired, and then apply the upholstery material to the body. This material should be of a type that will harmonize with that on the furniture in the room where the footstool will be used. Padding under the cloth around the main part of the body can be light, but it should be fairly thick on the top part so it will provide a cushioning effect when the stool is used as a seat.

—Wm. E. Boyd, Newmarket, Ont., Can.

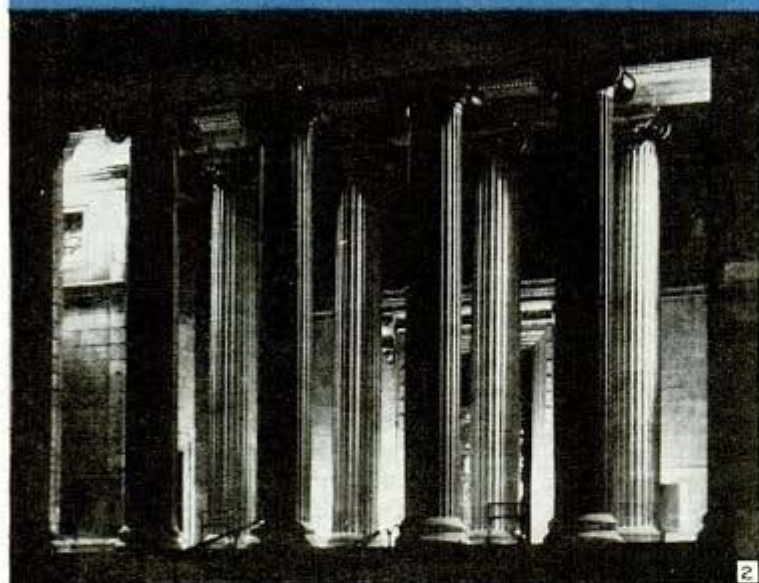
Denatured Alcohol Removes "Gum" from Saws and Abrasive Cloth

By experimenting, I have discovered that the "gum" picked up on saw blades or abrasive cloth when working sappy woods can be removed by using denatured alcohol on a cloth "swab" or old toothbrush.

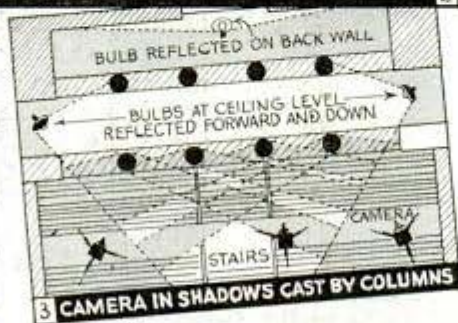
This method has enabled me to keep my saw blades perfectly free of fouling and has increased the effective service of garnet sleeves, disks and belts.

—Charles H. McNutt, Champaign, Ill.

PICTURES



The illuminated skyline at the top was a composite exposure requiring 5 sec. at $f:6.8$, at dusk, to obtain slight outline effect of buildings, and after dark a second exposure of 45 sec. Film had artificial light speed of 50. The dimly lighted entrance to the Chicago Field Museum above, was made with an exposure of $2\frac{1}{2}$ min. at $f:6.8$, illuminated by lights on building



By THOMAS P. LAKE

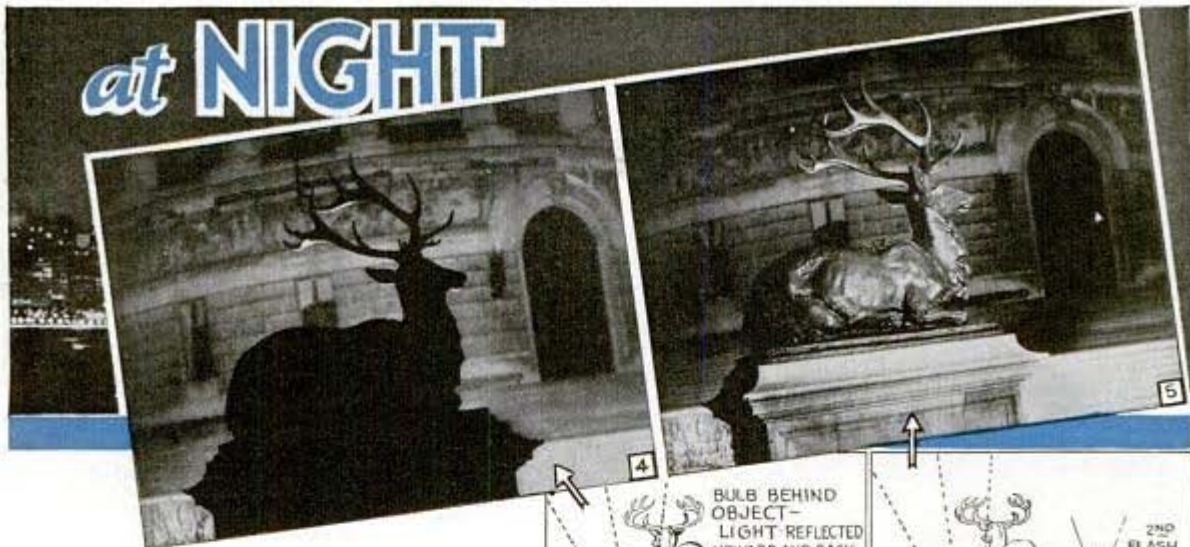
WITH the increase in speed of modern panchromatic emulsions, no amateur photographer need forego the pleasure of night photography, even with the most inexpensive equipment. Where it was formerly necessary to make time exposures of many minutes duration, today a few seconds will suffice. Any camera capable of being held without movement on a tripod or other support can be used.

Most cities, even the smallest, have some

vantage point from which the skyline can be viewed. Take your camera there at dusk and select a good viewpoint before total darkness sets in to make moving about difficult. Compose a picture so that a building with many lighted windows, or with a floodlighted wall, is near the center of the negative, or have the building to one side or the other to achieve the most interesting composition. Perhaps a row or two of street lights can be made to lead to it; or a tree might be made to silhouette a drooping branch against part of the building. If your city is large and well lighted, perhaps you can make pictures like those shown in Figs. 1 or 9.

The camera, of course, will be fastened on a tripod, or held securely on a box or stone wall. Have a small flashlight handy to inspect the lens diaphragm and to look at the second hand of your watch during exposure. In your camera you should have one of the fast panchromatic films; one with a speed in artificial light of about 50 is excellent. And even if you don't use a light meter, many cameramen find it convenient to use these ratings, which can be obtained from almost any camera dealer. For closeup pictures a hand flash-gun is useful, although many beautiful pictures can be taken without the use

at NIGHT



of flash bulbs. For exposures, check the data given with the accompanying pictures and compare the photo you are to take. Keep a careful record with complete data, and you will soon become familiar with your equipment and peculiar conditions.

Fireworks are an especially dramatic subject. Focus the camera on the spot where rockets or bombs are bursting, and open the shutter. If you are lucky in anticipating the correct moment, a rocket will curve into the air and then explode, dropping a shower of bright lights. Close the shutter when the burst has reached its widest expanse, just before the lights have begun to fade away as they fall. The negative will show the trace of the rocket as it rises, and the path of each ball of light after the rocket bursts. Avoid more than one exposure until you become familiar with the results.

Time exposures of buildings are a surprising source of interesting photographs. In pictures of imposing entrances, such as shown in Fig. 2, see that the camera is set on its tripod at a location where direct lights are shielded by columns, etc. This was done in taking this photo as detailed in Fig. 3. Bright lights may be included in a picture, but the exposure must be shortened to avoid halation (fog) around each light. The shorter exposure records less detail. Fires often give the photographer spectac-

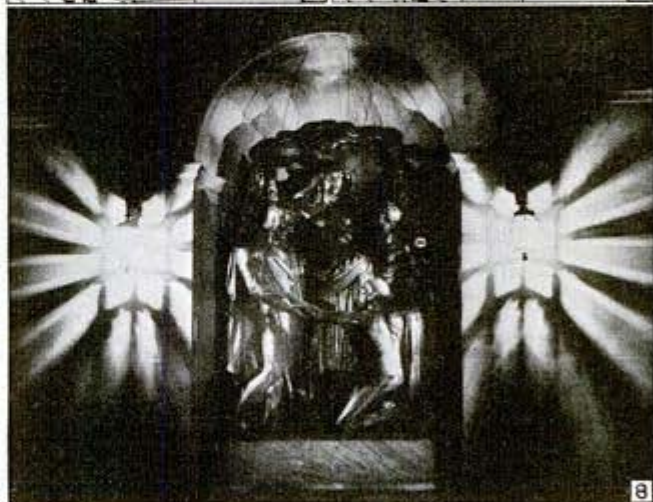


Photo 4 taken with lens shutter open and the diaphragm set at $f:6.3$, with one bulb flashed behind the statue. Photo 5 taken the same way except that a second bulb was flashed in front of statue and 25 ft. to right of camera. Lower photo is a composite exposure—3 sec. at $f:11$ for lights and background, after which a bulb was flashed from camera position to give detail in the shadows and to highlight the reflections on the statues

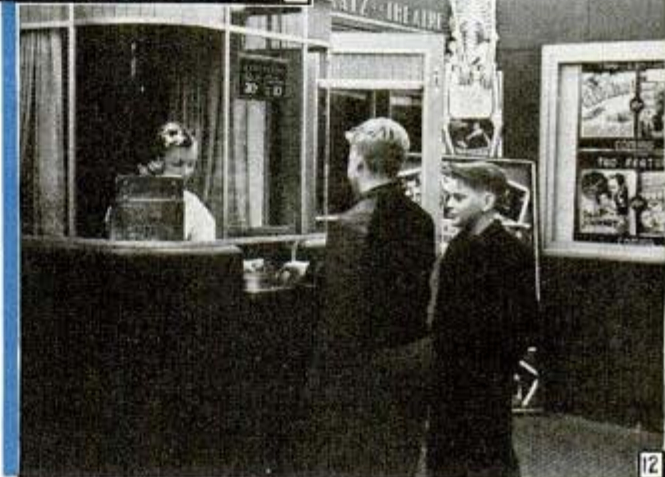
ular pictures. It is difficult to overexpose, because the rapid action of the flames and the hurrying firemen demand a fairly quick exposure. The picture in Fig. 13 was taken at dusk with an exposure of $1/75$ sec. on the fastest press film.

Figs. 4 and 5 show two different effects of a single setting. Fig. 4 was made with a bulb flashed behind the statue, the light



Photo 9 was produced by a 3-min. exposure with diaphragm set at $f:11$. Photo 11 was taken from front seat in theater at exposure of $1/100$ sec., and diaphragm set at $f:2$, while the scene in photo 12 required a 2-sec. exposure at $f:11$ without flash bulb

being directed upward and toward the building. Fig. 6 gives the details of arrangement. Fig. 5 was made in exactly the same way, except that a second bulb was flashed in front of the statue about 25 ft. to the right of the camera. The second flash bulb is responsible for the strong modeling light on the statue, and makes it stand out against the dimly lighted background. Fig. 7 gives the details of arrangement. Fig. 8 illustrates the effects that occur when seemingly ordinary lights are photographed. This is a composite exposure. First, a 3-sec. exposure for the electric lights and background at a lens opening of $f:11$, and second, a small bulb flashed from the camera



position to fill in detail in the shadows and also to make the highlighting reflections on the statues. Interesting pictures can be made of this pattern of light from such a common thing as a lantern.

Stage photography, or pictures taken from the first few rows on the main floor, requires a very fast lens as well as fast film because the exposure must stop movement on the stage, Fig. 11, and do this without the assistance of flash bulbs. Yet it is possible to take $1/10$ sec. and even $1/5$ sec. exposures without a tripod, if one of the methods of holding the camera motionless is practiced and mastered. Fig. 10 gives the most commonly used methods.

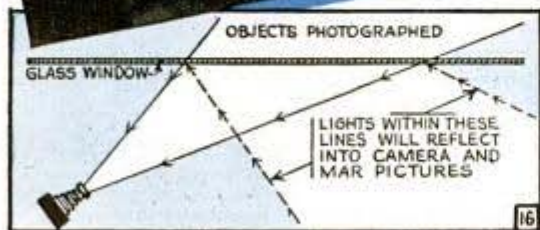
Close-ups with figures can be made, however, with lenses of normal speed where conditions are such that the figures can pause for a few seconds. The photo in Fig. 12 was made in this manner with a 2-sec. exposure at $f:11$ with only the usual theater lights. Almost anyone can remain motionless for this short in-

terval, and the variety of such pictures that can be obtained is endless. This picture could have been taken with an $f:2.5$ lens as a snapshot, when $1/10$ -sec. exposure would have sufficed. A lens hood is very important in such a situation, for the bright lights are likely to cause lens flare, or streaks and circles of white fog in the picture.

Figs. 14 and 15 were made with the light from the show windows only, and the exposure was only 2 sec. at $f:11$. Pictures made through window glass require special



Fire-fighting scene demanded fairly fast exposure of $1/75$ sec. on fastest film. Store-window photos taken with illumination from windows only avoiding reflections from passing cars. Exposure was 2 sec. at $f:11$

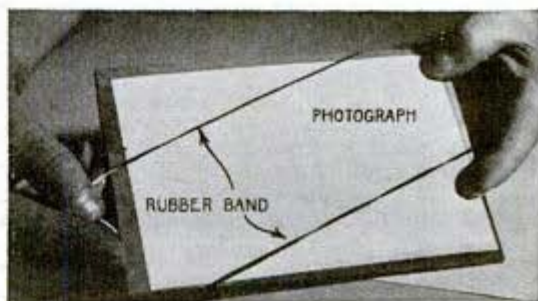


precautions to avoid reflections which usually appear as bright spots or streaks in the print. The diagram in Fig. 16 shows where the troublesome area lies. Particular care must be taken to avoid reflections from the lights of passing cars.

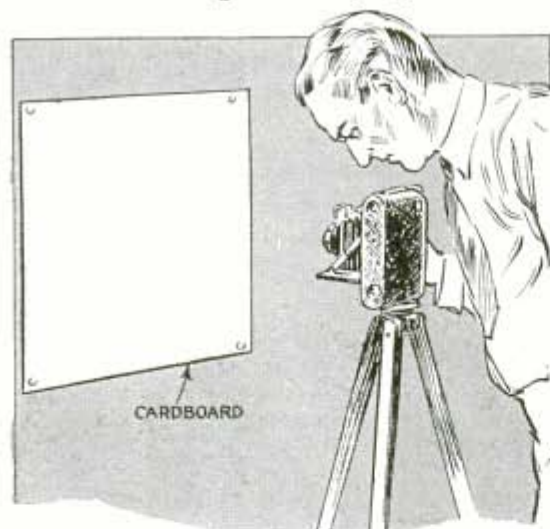
Rubber Band on Mailed Photos Lessens Chance of Bending

As a protection for photos sent in the mail, be sure to slip a rubber band over opposite corners of prints and corrugated board. This keeps the prints from slipping beyond the edge of the board and being bent.

Small round tins in which powder and rouge are packed make excellent filter cases. The color and exposure factor of the filter may be lettered on the lid.



Accuracy of Shutter Speeds Tested without Special Equipment



Accurate enough for all practical purposes, this method of testing shutter speeds requires no special equipment. The camera is focused on a moderately illuminated piece of light cardboard, and a control exposure made. Then, to test the shutter at any given speed, a number of exposures equal to the control exposure are made on

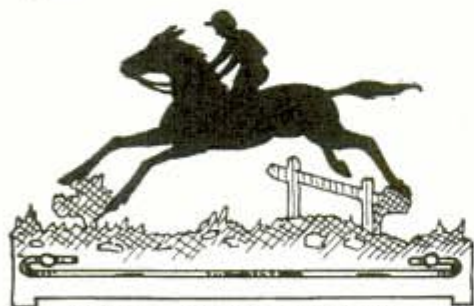
a separate film. By comparing the density of the two negatives, it is possible to detect inaccuracies in the shutter. It is not necessary to use an entire section of film for each test exposure. A mask may be placed in front of the film in the camera, covering all but a narrow strip at the end nearest the winding spool. In this way a complete test may be made on a short strip. The following table is based on a control exposure of 1 sec. at f.22 and gives the number of exposures and the correct aperture for testing at each shutter speed. Be sure to adjust both the shutter speed and the iris diaphragm for each test.

Shutter Speed Being Tested	Number of Exposures	Stop Opening
1/2 second	1	f. 16
1/5 "	5	f. 22
1/10 "	5	f. 16
1/25 "	3	f. 8
1/50 "	3	f. 5.6
1/100 "	6	f. 5.6
1/200 "	6	f. 4.5
1/250 "	4	f. 3.5
1/300 "	9	f. 4.5
1/500 "	8	f. 3.5

For cameras which do not stop down to f:22, the control exposure can be made at f:16 and the number of test exposures at any given speed doubled.

—John G. Roberts, Chicago.

Spare Time Profit from Your Scroll Saw



No. CR405. Tie Rack, 13 in. by 10 in.
Full-size pattern 20c

WALL BRACKET—CR514. Attractive peacock cutout. Ends are 10 in. by 24 in. Full-size pattern 25c.

PIPE RACK—CR529. Silhouette of sailboat in background. 9½ in. by 12 in. Full-size pattern 15c.

PRETZEL STICKS—CR422. Figures in Colonial dress 4 in. by 9 in. form novel pretzel holders. Full-size pattern 20c.

CHILD'S CHAIR—CR408. Two "Scotty" cutouts 12 in. by 12 in. support plywood seat. Full-size pattern 20c.

POPULAR MECHANICS PRESS
Dept. CR-1, 200 E. Ontario Chicago

Turn your spare time into money by making and selling attractive jigsawed novelties. Any of the following plans will be sent to you postpaid upon receipt of the amount listed. Also ask for our complete 128-page catalogue of over 500 practical handicraft plans and over 1,700 helpful books.

CORNER SHELF—CR488. Shaped like large butterfly. Sides are 5½ in. by 12 in. Full-size pattern 15c.

LAWN FIGURE—CR458. Small girl with sprinkling can. 18 in. by 23 in. Full-size pattern 30c.

MAIL BOX—CR532. Attractive leaf design worked into front panel. 7 in. by 12 in. Full-size pattern 20c.



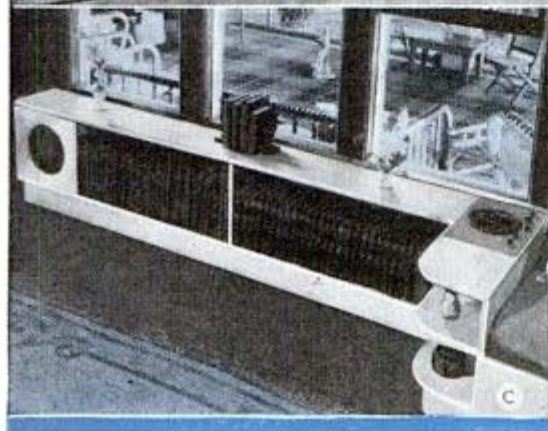
No. CR572. Book Ends, each 3 in. by 5 in.
Full-size patterns, both for 20c

RADIO



“Built-In” Receivers

WHILE planning your new home, or remodeling an old one, you have an excellent opportunity to include convenient and decorative “built-in” radio installations. Modern interiors automatically suggest ideas that are easily carried out at low cost. In older homes, and in rooms decorated and furnished in period style, wall niches, bookcases and wall cabinets offer ideal locations for concealed instal-



lations that do not introduce a modern note with furnishings that may be Colonial or mid-Victorian.

The built-in bookcase shown in photo A is utilized to accommodate complete radio and record-playing equipment that is completely out of sight when the doors are closed. In photo B we see a pair of custom-

built cabinets of knotty pine, to match the paneling in the room. The cabinet at the left houses the receiver and automatic record player with a record cabinet below; the twin cabinet at right contains a special high-fidelity speaker. Photo C shows a simple modern arrangement in which the radio chassis, with special matching panel, is let down into the top of the built-in combination bookcase-divan. Wires leading to the speaker at the opposite end of the bookcase are concealed under the shelf.

GENERAL-PURPOSE TUNER

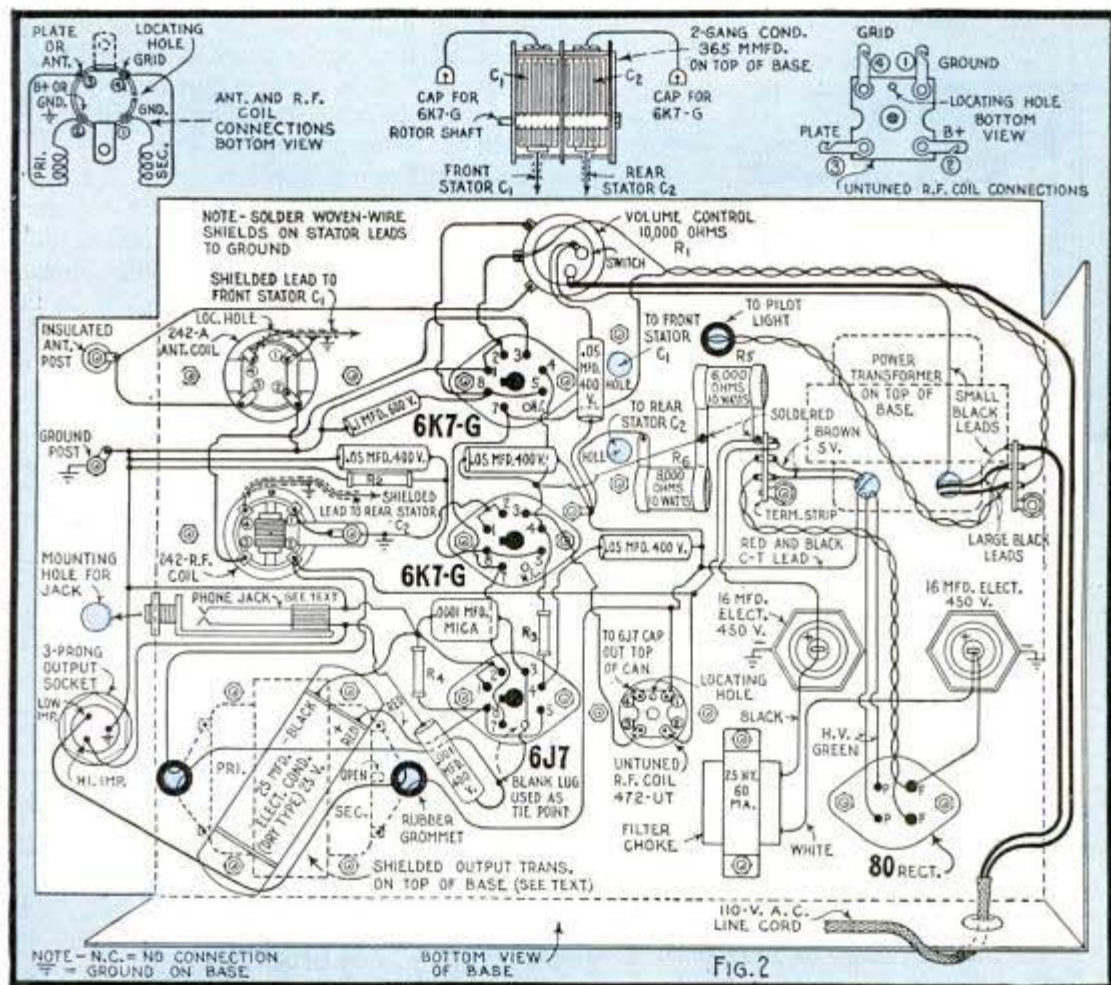
Shielded "Miller" coils are used, and the coil coupling the detector is of the untuned type. The circuit is just selective enough to separate the local stations, but is sufficiently broad to pass the entire group of side bands required for high-quality reception of musical selections.

Forming and drilling details for the sheet-metal base are given in Fig. 1 for those who wish to make their own. However, this chassis base drilled as shown, is available from several of the large radio mail-order parts houses. Photos A, B and C show various views of the completed unit, with and without the tubes in position. The builder should ex-



amine these and the underside view, photo D, carefully before starting construction. A simplified wiring diagram is given in Fig. 2 and the schematic circuit diagram

(Continued to page 132A)



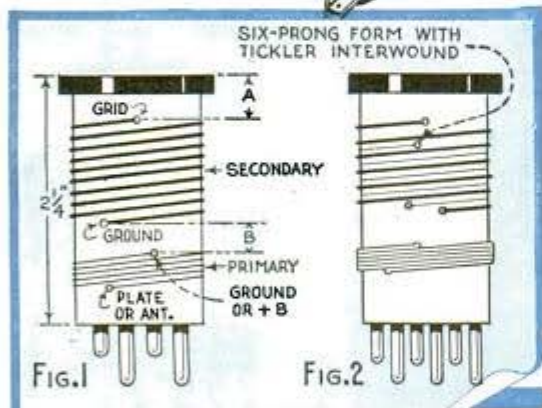
How to Wind a Complete Set of Plug-In Coils



ALTHOUGH considerable effort can be saved by purchasing ready-wound coils, the beginner should take the time to wind the coils for at least the first set he builds so that he will understand exactly how they are made. Coils are wound with magnet wire on forms usually made of Bakelite or similar material. For convenience in changing bands, especially in the popular low-cost short-wave and all-wave hookups, the coil forms have prongs at the base exactly like those on radio tubes. Therefore it is a simple matter to change bands as you merely remove one coil from its socket and plug in another that covers the required band. The number of turns of wire on a coil determines the portion of the short-wave or broadcast band which can be covered with a tuning condenser of given capacity. As the favorite capacity for receivers of the type referred to is .00014 mfd. (140 mmfd.) the chart given in Fig. 3 contains complete coil data for winding four and six-prong plug-in coils to cover all commonly used short-wave and broadcast bands. Any ribbed or round coil forms can be used but they should be $1\frac{3}{8}$ in. in diameter and $2\frac{1}{4}$ in. high.

All coils should be wound in the same direction, whether clockwise or counter-clockwise. P.E. on the chart refers to plain enamel wire, and D.S.C. means double silk covered. To start, drill a tiny hole in the coil form about $\frac{3}{8}$ in. below the top edge, as shown in Figs. 1 and 2. Pass one end of

(Continued to page 134A)



Wavelength covered with .00014 mfd. condenser	A	SECONDARY		B	TICKLER OR PRIMARY		In 6 prong coils, use this winding as the tickler, and the tickler as primary†	
		TURNS	WIRE		TURNS	WIRE	TURNS	WIRE
10-20	1"	3½	16 P. E.*	¼"	3	30 D. S. C.	2	30 D. S. C.
17-41	1"	8½	"	¼"	3	"	6	"
33-75	½"	17½	20 P. E.‡	¼"	5½	"	11½	"
66-150	½"	38½	"	¼"	10½	"	24	"
135-270	½"	78	28 P. E.	⅛"	16½	"	45	"
250-560	½"	160	"	⅛"	32	"	82	"

† Wind tickler over or between secondary turns.

* Space between turns $\frac{1}{8}$ inch.

‡ Space between turns $\frac{1}{16}$ inch.

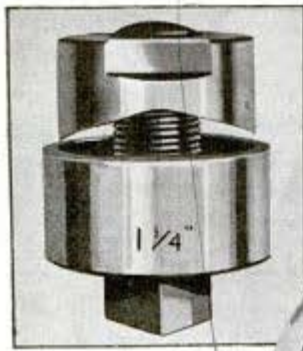
COIL WINDING
CHART

FIG. 3

POPULAR MECHANICS

*Aspen's Tool Co.,
Rockford, Ill.*

Hints for RADIO EXPERIMENTERS



(1) Handy tool for radio workers provides a quick, easy way to cut holes in radio chassis; available in 10 sizes

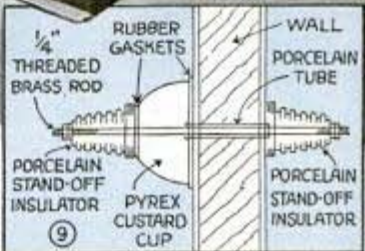
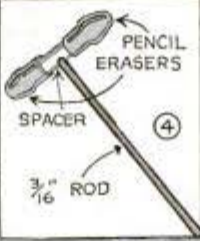


Above, operation of tool is simple matter of drilling a small hole for the cap screw and then using an ordinary wrench

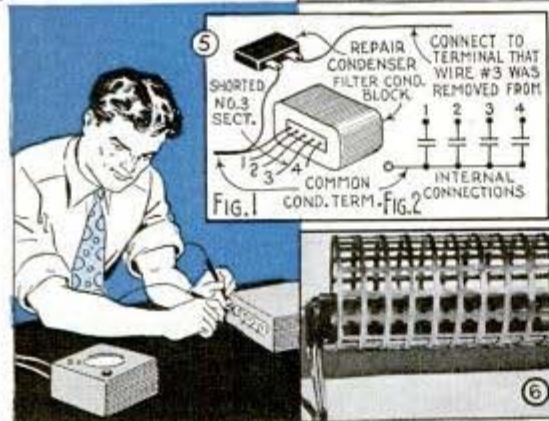


(2) Paper dial marker cemented to panel. (3) Wafer-type sockets mounted up-side-down with thumb tacks on plywood for temporary hookups

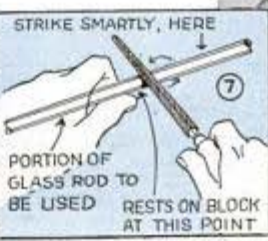
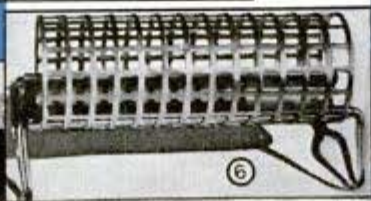
(4) Tiny test hammer used to tap radio parts for locating trouble due to faulty tubes or loose connections. (5) Emergency repair on filter condenser block in old sets where one section is shorted, see Fig. 1. Repair unit should be 2-mfd., 400-volt type for average case



(8) Flashlight cells, now commonly used in pocket-type receivers and testing equipment, may be taped together in compact A or B-battery units. Cells should be arranged for polarity as shown to permit use of short soldered leads for series connections. (9) Inexpensive lead-in insulator assembly made from porcelain tube, stand-off insulators and a "Pyrex" custard cup on external side. To drill custard cup for the threaded brass rod, place cup on a block of soft wood and pour in a little turpentine. Use 1/4-in. drill, or preferably a piece of 3-cornered file



(6) Soldering-iron stand with protective shield to prevent accidental burns. (7) Glass towel rod, for supporting large coils, easily cut by ringing with sharp file. Rest rod on wood block and strike off



*Ulbrake Electric Co., Chicago
3656 Lincoln Ave.*



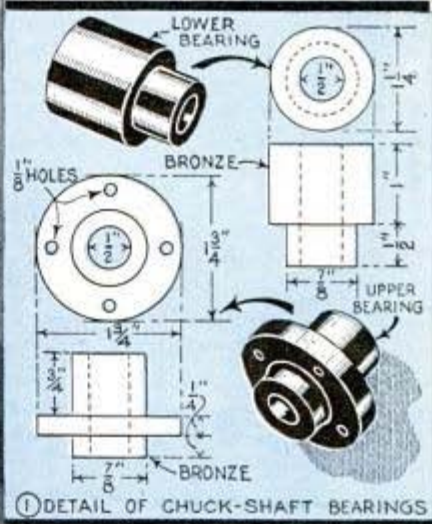
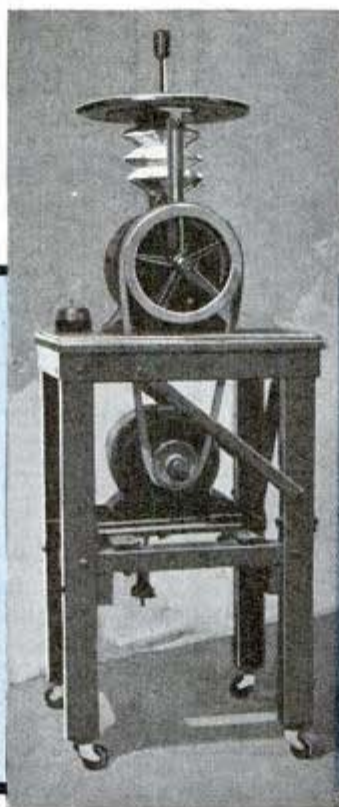
SHOP NOTES

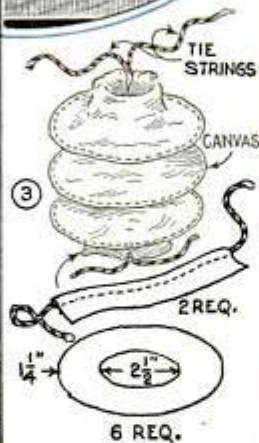
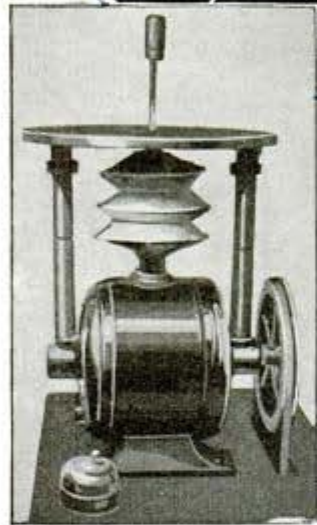
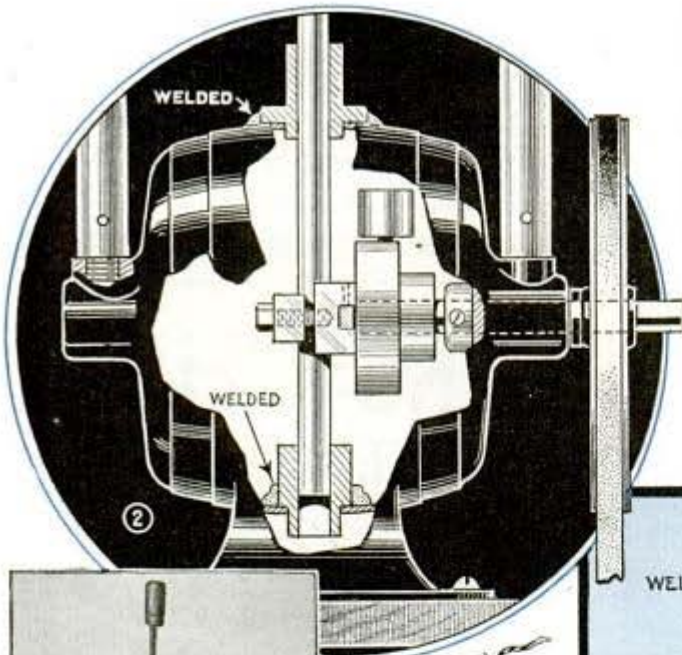
Homemade **FILING MACHINE** *saves time in the shop*

By VINCENT EVERSON

UTILIZING the casing from a discarded $\frac{1}{4}$ -hp. motor to form the base for this efficient filing machine, shown in the photo below, not only produces an exceptionally sturdy and smooth-operating mechanism, fully protected from filings and dust, but simplifies its construction greatly. Select a type of motor having vertical oil cups and remove the armature and the field coils. The bearing on the pulley side is replaced with a longer bearing, turned to the dimensions given in Fig. 7. This extra-length bearing is necessary to support the single-bearing crankshaft. Next, a centered 1-in. hole is made in the top of the casing, after which a corresponding hole is drilled, in line, through the bottom as shown in the cutaway view in Fig. 2. In these holes are brazed the two chuck-shaft bearings detailed in Fig. 1. The bearings are turned from bronze, but are not brazed in place until the chuck shaft and eccentric can be used to align them.

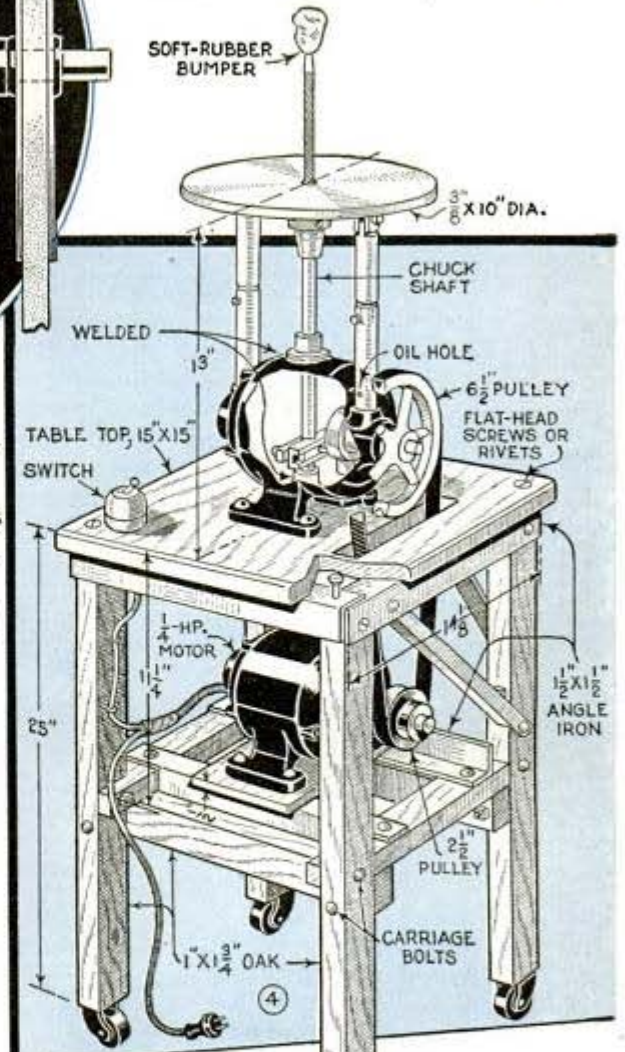
The eccentric is made up of four parts, namely: the crank, sliding bar and the two clamping pieces. These parts are fully dimensioned and detailed in Figs. 5, 7 and 8, while Fig. 2 shows the relative position





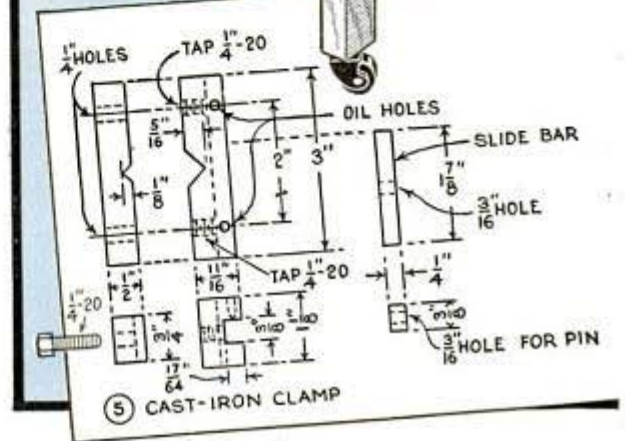
come about $\frac{1}{8}$ in. above the top of the upper bearing.

Fig. 4 details the construction of a simple, caster-fitted stand on which the machine can be mounted and belted to a motor set below. The circular machine table is supported by two adjustable



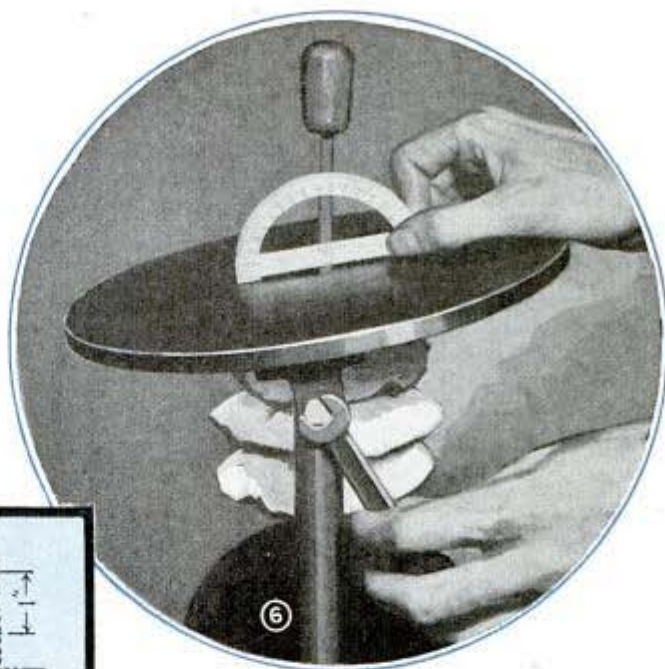
of each when assembled. The crank pin engages a hole in the slide bar, which in turn fits in the keyway of the clamp. The face of the eccentric disk as well as the face of the clamp should be polished to provide a smooth-rubbing surface. To produce a quiet-running unit, the eccentric must be counterbalanced as shown in Fig. 9. This is merely a turned piece which is located directly opposite the crank pin.

It is important that the chuck shaft be set exactly at right angles to the eccentric. To do this, first the crankshaft and disk are installed. Then, with the rear bell of the motor casing removed, the chuck shaft and bearings are set in position. After that you engage the crank pin in the clamp, fasten the upper chuck-shaft bearing to the casing with machine screws and finally braze the bearings as in Fig. 2. At the bottom of the eccentric stroke, the chuck should



posts, Fig. 7, which are threaded to fit the oil-cup holes in the motor casing. To keep filings from entering the chuck and the upper bearing, a bellows-shaped cover of cloth is made as in Fig. 3 and fitted over the chuck as shown in the photo at the left of the detail. The table is locked at the desired angle by tightening a bolt at the top of each post as shown in Fig. 6.

Before enclosing the eccentric mechanism, lubricate well the sliding bar and the face of the disk with light grease. Also pack

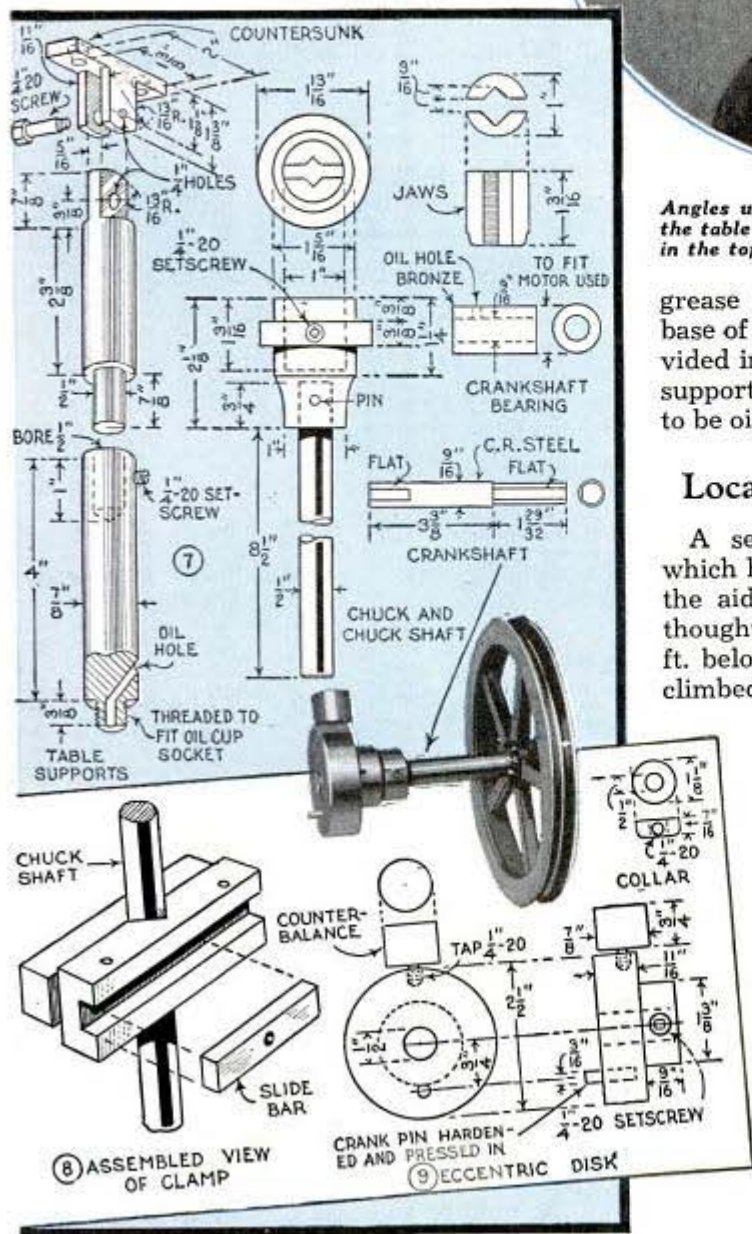


Angles up to 12 degrees may be filed by providing the table with a removable insert, or by filing a slot in the top sufficiently large to clear the chucked file

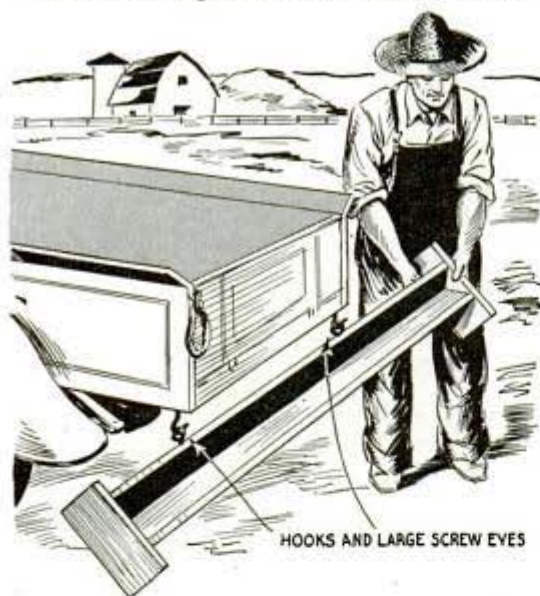
grease around the lower bearing in the base of the casing. Note that a hole is provided in the lower end of one of the table supports to permit the crankshaft bearing to be oiled.

Locating Forgotten Sewer Inlet

A sewer inlet, the exact location of which had been forgotten, was found with the aid of a toy balloon. The inlet was thought to be somewhere around 25 to 30 ft. below one of the manholes. A worker climbed down the manhole, tied a toy balloon to the end of a ball of string and gradually payed out 45 ft., letting the balloon float down the main sewer. Then a workman above ground turned the water through the inlet sewer, and the worker in the manhole wound in the string, listening closely as he did so. When the balloon came back by the inlet opening, the water could be heard striking it. A knot was tied in the string at that point. When the string from knot to balloon was stretched on top of the ground along the line of the main sewer, with the knot at the manhole, the balloon marked the exact place to dig for the inlet.



Hooks on Truck Support Trough for Moving from Place to Place

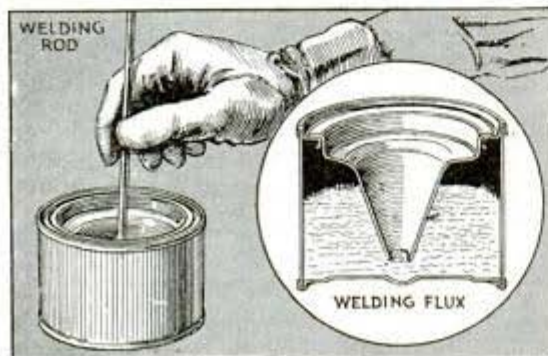


HOOKS AND LARGE SCREW EYES

To move his hog troughs from one place to another in a large pasture, without going to the trouble of loading them onto the farm truck, one farmer drove large screw hooks into the truck body as indicated to engage screw eyes in each trough. To move a trough, the truck is backed into position above it, one end is lifted to engage the hook and eye, after which the other end is lifted into similar position. This is accomplished with little labor and the trough is unloaded as easily, after being hauled to the desired location.

Welding Flux Cannot Spill from This Container

The possibility of spilling your welding flux if the can is tipped accidentally is avoided with this container. As shown in the detail, the container is nothing more than a can having a compression-type lid,



the center of the lid being cut out to take a funnel-shaped section that is soldered to the lid rim to extend down into the can. To fill the can, the lid is merely pried off.

—R. A. Huttash, Jacksonville, Tex.

Headlight Lens Admits Light Through Cellar Ventilator

By soldering the rim of a discarded auto headlight onto the storm-cellar ventilator, and inserting the lens as the cap, rain and snow may be kept out and light admitted to the interior. Such caps may be employed on roothouses, vegetable cellars, poultry, hog houses and other places underground.

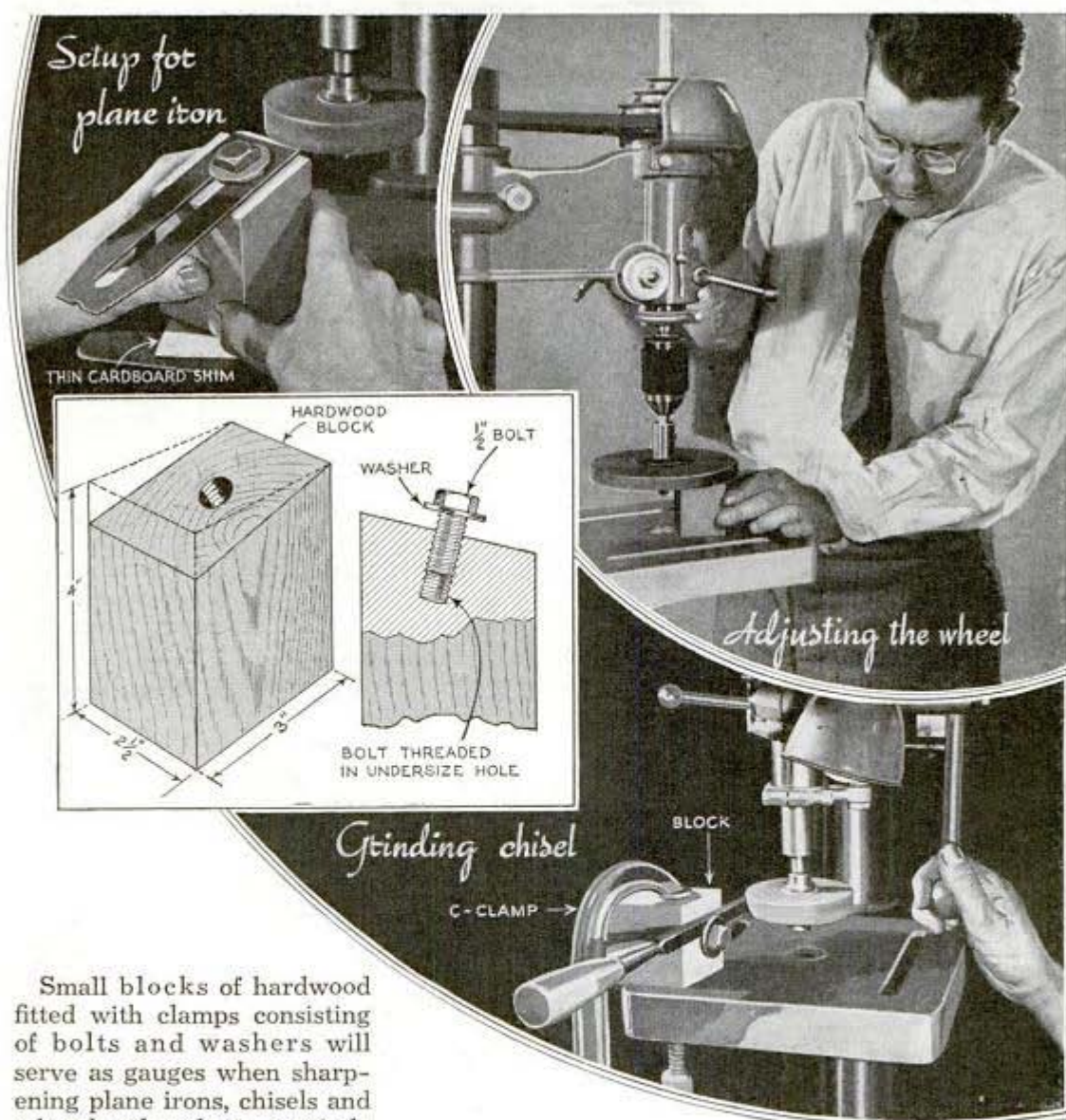


Barrel Staves Prevent Children from Climbing Ladder



Annoyed by the possibility of accidents to small children who frequently climbed up the ladder behind him, a painter avoided the danger by forcing several barrel staves under and over the bottom rungs. These effectually covered the rungs so the small children could not get a foothold, but the staves were sufficiently flexible to permit the painter to push one in with his foot to ascend or descend.

Simple Gauge to Grind Tools on a Drill Press



Small blocks of hardwood fitted with clamps consisting of bolts and washers will serve as gauges when sharpening plane irons, chisels and other hand tools on a grinding wheel chucked in a drill press. One end of each block is beveled and drilled to receive a $\frac{1}{2}$ -in. bolt, which is threaded into the hole. A large washer under the bolt head provides enough grip for most chisels and plane irons. The bevel will depend on the tool being ground; 20 to 30° for plane irons and 20 to 25° for wood chisels. To use the block, adjust the table and grinding wheel so that the tool makes the proper contact with the edge of the wheel, and hold the block so that if it tips, the tool will not dig into the wheel. Be careful in feeding not to burn the tool. A flat grinding wheel can be used, although a cup type is better. After the first cut, place

a sheet of paper under the block to raise it a trifle for the second cut. Repeat this paper shimming as much as necessary. This affords a more accurate control than feeding downward with the drill-press spindle. For hollow-grinding chisels after the bevel has been ground, lay the block on its side, bring the edge against the wheel and feed the spindle up and down.

☛ An enduring white paint that does not turn yellow can be made by substituting sodium silicate for the linseed oil. Zinc white mixed with sodium silicate makes an excellent paint and brushes out easily.

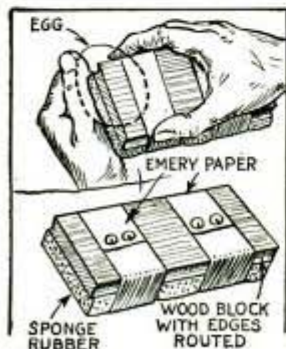
Vise for Quick Harness Repairs Made from Barrel Staves



One workman used a pair of barrel staves to hold the heavy straps and traces, as shown, when making emergency repairs on farm harness. A steel hoop was bent to form an oval loop and this was slipped over the staves to lock them together and hold the strap.

Homemade Egg Cleaner

After trying unsuccessfully to find a suitable egg cleaner for use by those who have only small flocks, we finally made the one shown. It consists of a wood block about 2½ in. wide and 6 in. long faced on one side with sponge rubber around which is wrapped two strips of emery paper, one fine and the other coarse. This is secured with thumbtacks



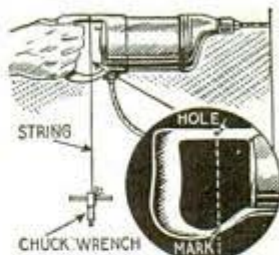
and is placed near the ends of the block. In using the cleaner, any heavy dirt can be removed quickly by the coarse emery paper and the cleaning finished with the

fine paper, after which dust can be wiped off with the sponge rubber.

—Edward S. Dean, Syracuse, N. Y.

Electric Hand Drill Lined Up with Chuck Wrench

Electric drills having a handle grip of the type shown, at the back can be held perfectly true horizontally by using a chuck wrench and a length of string. The string is tied to the handle as indicated, after which the wrench is suspended from it. After doing this, hold the drill perfectly horizontal as indicated, by use of a level, and file

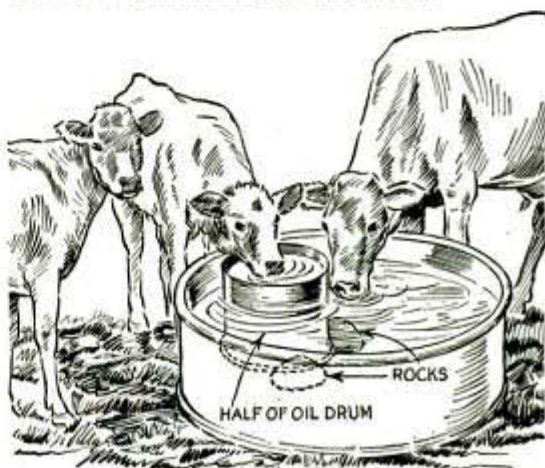


a shallow notch on the lower end of the handle at exactly the point where the string touches it. Thereafter, when the string touches the notch you are sure that the drill is being held in a perfectly horizontal position.

—H. Moore, Kirkstall, Leeds 5, England.

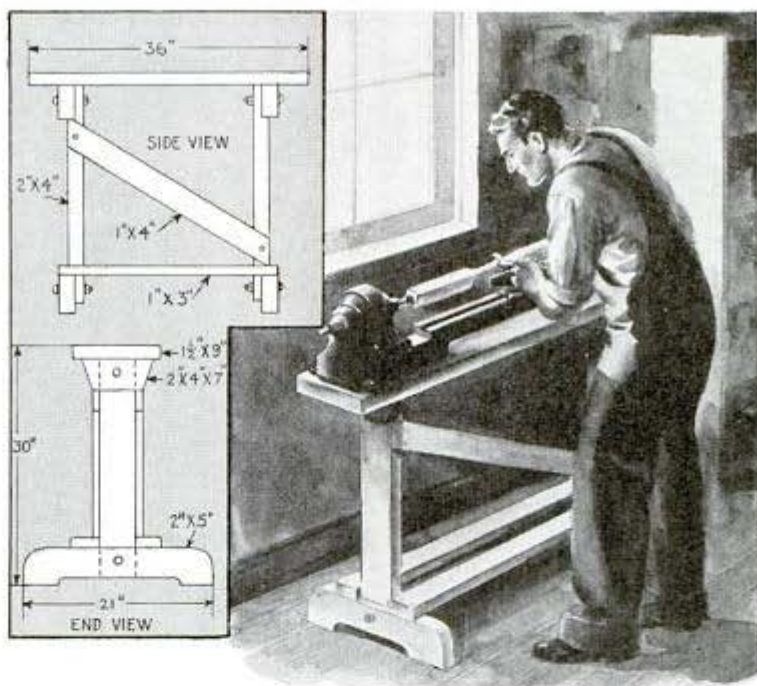
Assuring Water Supply for Calves

To be sure that calves would always be able to reach water for drinking, a farmer cut an oil drum in half and set the lower part inside the regular stock tank near one edge, and anchored it in place by setting large stones against it on the outside. The pipe from the pump then ran directly to this smaller tank which soon overflowed and began to fill the larger tank. In this way the smaller vessel was always full so that calves could reach the water.

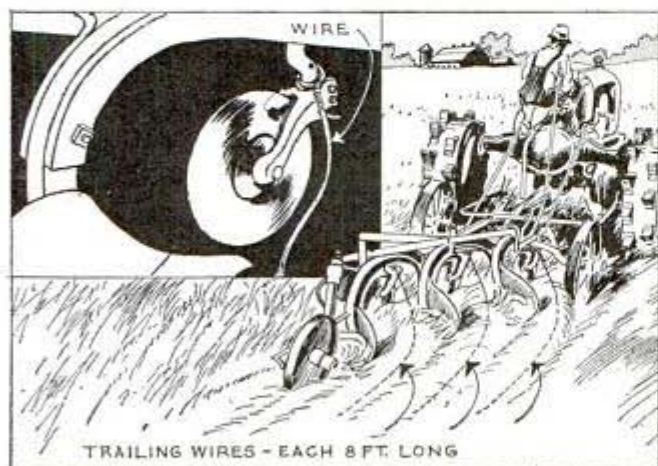


Shop-Machine Stands Built Cheaply of Wood

After assembling several stands to support shop machines, I found that the type shown was best from the standpoint of ease of construction, economy of materials and general usefulness. The dimensions given are only general and may be altered to suit. Oak or maple is best to use as it gives the necessary weight as well as ruggedness. Parts are assembled with glue, bolts and wood screws. Provision for mounting a motor may be made either on top or underneath the stand.—John Twitchell, Port Jervis, New York.



Trailing Wires on Plow Pull Trash under Furrow Slice



For clean plowing under extremely trashy conditions, or where a heavy, green cover crop is to be turned under, many farmers equip the tractor gang plow with long trash wires as shown. These are cut from heavy smooth wire, each about 8 ft. long, and usually are attached to the colter shank as in the detail. Tension caused by the wires dragging under the furrow slices keeps them taut at all times while the plow is in operation.

—W. C. Lammey, Naperville, Ill.

Mimeograph Stencils Folded Ink Side In Will Not Dry Out Quickly

When mimeograph stencils are to be retained for use from time to time, usually they are filed between sheets of waxed board or paper. With the ink against the filing sheet, it often dries and sticks so that the stencil is ruined if left for any length of time. By folding the used stencil ink side in, I have preserved stencils in excellent condition for a period of as long as a year. The stencils, thus folded, need no papers or other separators between them.—G. E. Hendrickson, Argyle, Wis.



☞ An old or cheap fountain pen filled with ink eradicant is a handy applicator when removing tiny ink marks.

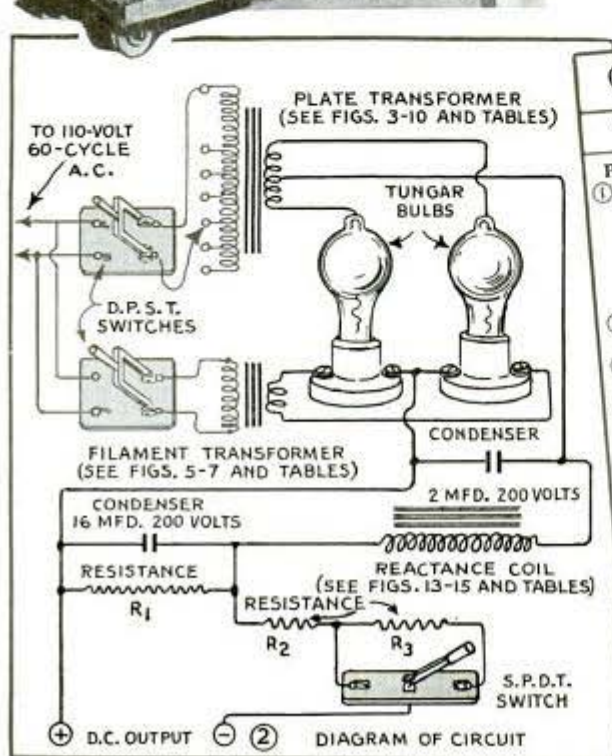
Semi-Portable TUBE

Two large Tungar tubes convert a.c. to d.c., supplying 30 amps. of current for light welding and electroplating

By C. A. CROWLEY

MOUNTED on a dolly, this tube converter, Fig. 1, supplies up to 30 amps. d.c. at voltages up to 60 volts when used on a 110 to 120-volt or 220 to 240-volt, 25 to 40-cycle or 50 to 133-cycle a.c. line. Complete information to make one to operate on your particular line supply will be given. The outfit draws a maximum of about 2 kw. On 110 volts the draw is 20 amps., and on 220 volts the draw is 10 amps. The circuit is shown in Fig. 2. Units needed are a tapped plate transformer for output voltage regulation, a filament transformer to supply current for two Tungar rectifier tubes (No. 217283), a choke coil, besides resistors, condensers and switches. You make the transformers and choke coil.

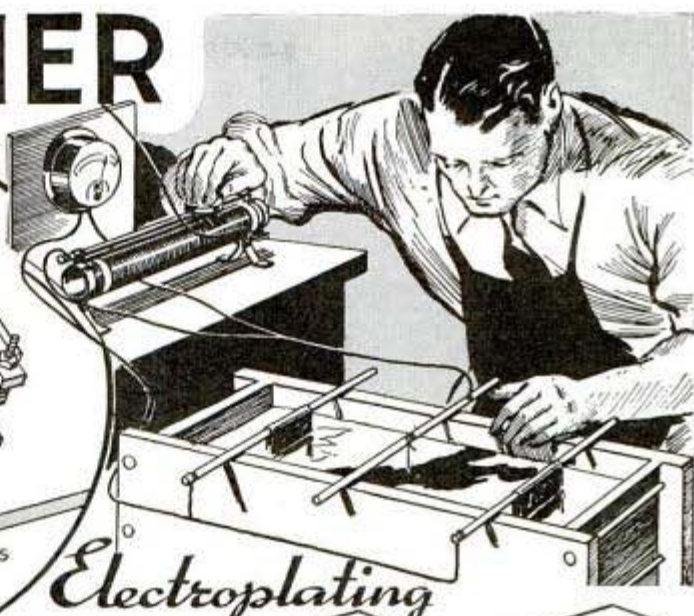
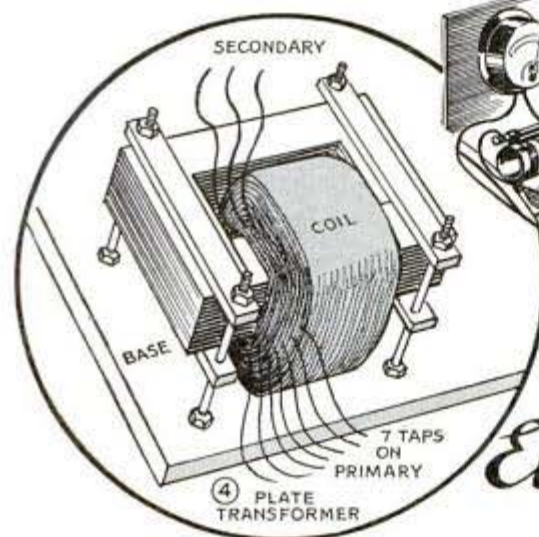
Plate transformer: Cut the core pieces from No. 26-ga. silicon steel. Two sizes,



③ WINDINGS ON PRIMARY OF PLATE TRANSFORMER

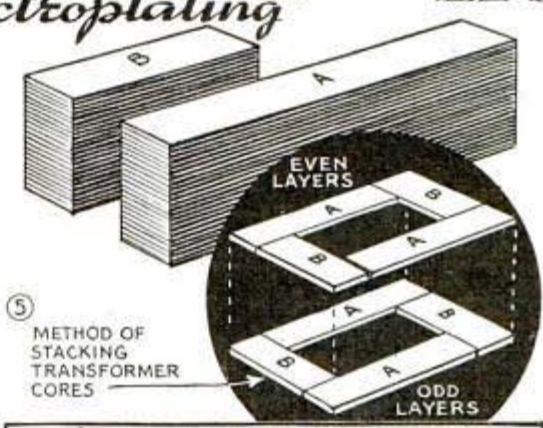
Tap	110-120 Volts		220-240 Volts		Approx. Output Volts
	Wire Size B&S	Turns	Wire Size B&S	Turns	
①	No. 8	312	No. 11	624	60
②	No. 8	62	No. 12	124	50
③	No. 10	62	No. 13	124	42
④	No. 10	62	No. 14	124	37
⑤	No. 12	126	No. 16	252	30
⑥	No. 18	624	No. 22	1248	15
⑦	Secondary				
Start	No. 8	156	No. 8	156	100
Center	No. 8	156	No. 8	156	100
End					

RECTIFIER



"A" and "B" are required. See Figs. 5 and 6, which give the sizes and show the method of stacking alternate layers of laminations. Core-piece dimensions depend on line frequency. Assuming that you are to build this outfit to operate on 110-120 volt, 60-cycle a.c., the "A" laminations are 2 by 10 in., and the "B" laminations are 2 by 4 in. in size. As the thickness of the completed core is to be 2.08 in., you need a stack of each size laminations 4.16 in. high. After the core has been assembled as in Fig. 11, wrap a turn of friction tape around each long leg and one short leg. Then clamp the taped short leg in a vise and remove the other short leg as in Fig. 12, so that you will be able to slip the coil on one of the long legs, after which the removed laminations are to be woven back in position.

Winding the coil: The coil is wound on a form detailed in Figs. 8 and 9. Dimensions given in Fig. 9 correspond to core sizes given in Fig. 6. Place the fiber insulation in the form, binding it in place with friction tape. The secondary goes on first. See Fig. 3. In the 110-volt, 60-cycle plate transformer the secondary consists of 200 turns of No. 8 d.c.c. (double-cotton-covered) wire. A tap is made at the 100th turn. Wind the coil in tight, even layers. After finishing each layer, wrap a piece of brown paper around it. The tap is made by merely letting a length of the wire project and doubling or folding it so that it returns to the coil before continuing the



5 METHOD OF STACKING TRANSFORMER CORES

6 CORE DIMENSIONS IN INCHES

	25 to 40 Cycles			50 to 133 Cycles		
	A	B	Thick	A	B	Thick
Plate Trans.	2½ x 12½	2½ x 5	2.58	2 x 10	2 x 4	2.08
Filament Trans.	1½ x 6½	1½ x 2¾	1.48	1 x 5	1 x 2	1.31

winding—the tap being long enough to reach to the point where it is to be connected in the finished assembly. The second 100 turns are wound in the same direction. If it is necessary to make a splice, follow the method shown in Fig. 17, wrapping the joint with No. 26 or 28 bare wire. The leads from this coil should be identified with tags as "start-secondary," "center-secondary" and "end-secondary."

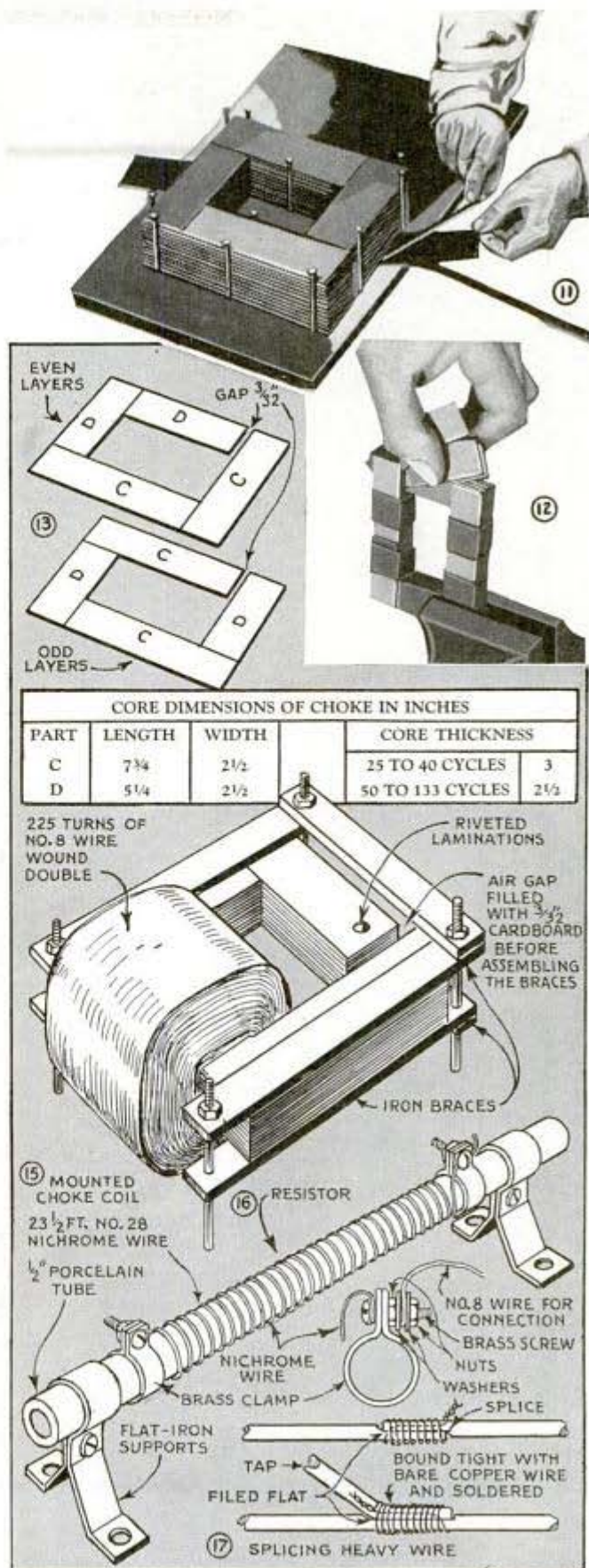
After finishing the secondary, a layer of brown paper is laid over it and the winding of the primary is begun—again winding in the same direction. This winding has seven taps as indicated in Fig. 3. For the 110-volt, 60-cycle converter start winding with No. 8 d.c.c. wire, marking the lead

permanently. Do not wrap the entire coil with tape. The coil is finished by soaking it in insulating varnish. When dry, the coil is slipped on one of the long legs of the core and the short laminations are woven back in position as already referred to. Coil-mounting brackets, Fig. 10, hold the transformer permanently. It is shown completed in Fig. 4.

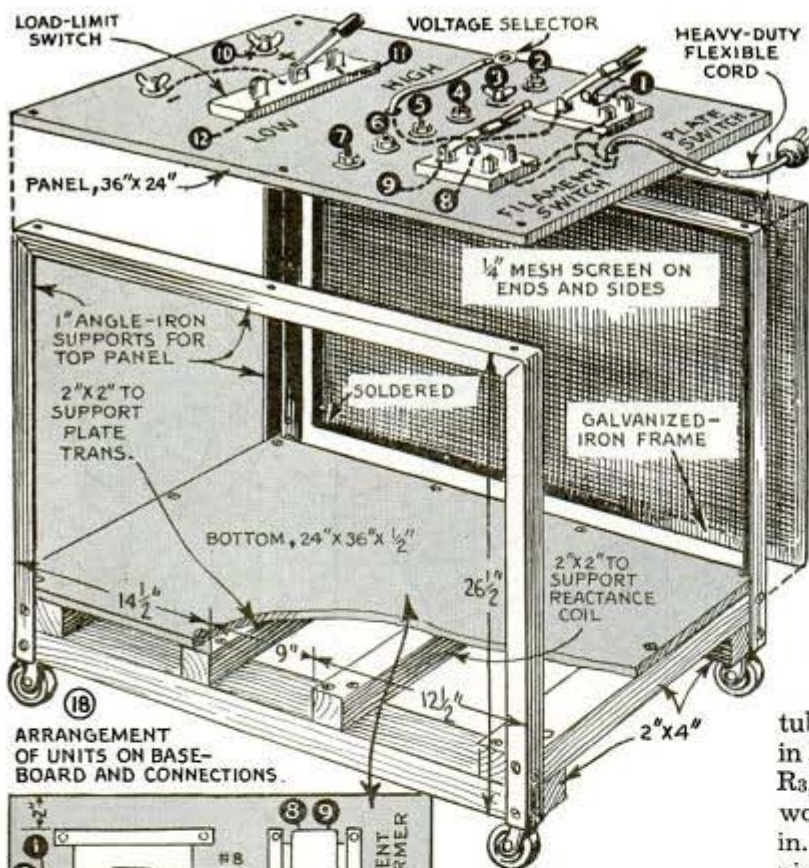
Filament transformer: Construction of the filament transformer is similar, except that only two connections each to the primary and secondary are required. Core dimensions are given in Fig. 6 and winding specifications are given in Fig. 7. The primary is wound first, the form being made to the dimensions given in Fig. 9. The secondary leads from the transformer should be so marked, and the primary leads should be tagged "No. 8" and "No. 9."

Choke or reactance coil: The specifications of the choke-coil core are given in Fig. 14. Stacking of the core is entirely different from that of the transformers, and Figs. 13 and 15 should be studied carefully. A $\frac{3}{32}$ -in. air gap, as shown, is essential. Only a single coil of 225 turns is needed, and this should be wound on a form of the dimensions shown in Fig. 9, with two No. 8 d.c.c. wires wound in parallel; that is, instead of winding a single length of wire, you wind two lengths side by side at the same time. The easiest way to do this is to wind from two spools at once. A permanent splice between the two wires can be made at the same time the coil is connected in the circuit. The coil is slipped onto the core after removing the laminations from the short leg next to the air gap. A $\frac{3}{32}$ -in. thickness of cardboard is placed in the air gap before replacing the laminations. Finally, a rivet is put through the core as shown in Fig. 15.

Resistor units: Three resistors are required, designated in Figs. 2 and 21 as R_1 , R_2 , and R_3 . Resistor R_1 is wound on a $\frac{1}{2}$ -in. porcelain



CORE DIMENSIONS OF CHOKE IN INCHES				
PART	LENGTH	WIDTH	CORE THICKNESS	
			C	7 $\frac{3}{4}$
D	5 $\frac{1}{4}$	2 $\frac{1}{2}$	50 TO 133 CYCLES	2 $\frac{1}{2}$



ARRANGEMENT OF UNITS ON BASE-BOARD AND CONNECTIONS.

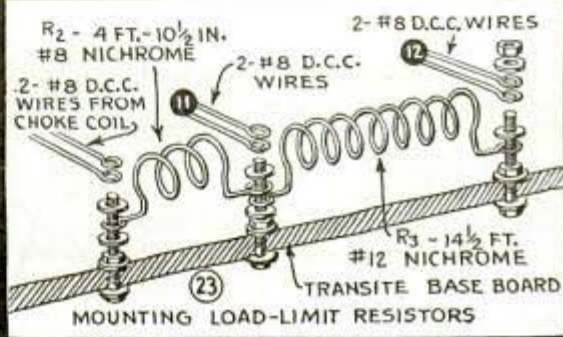
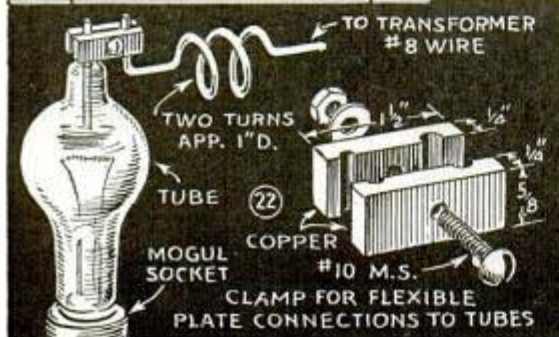
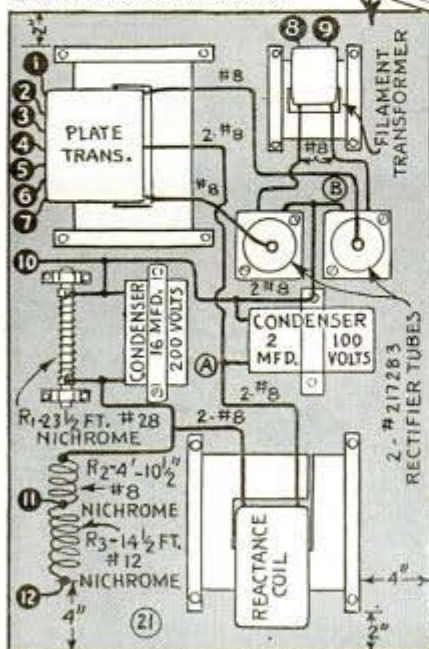


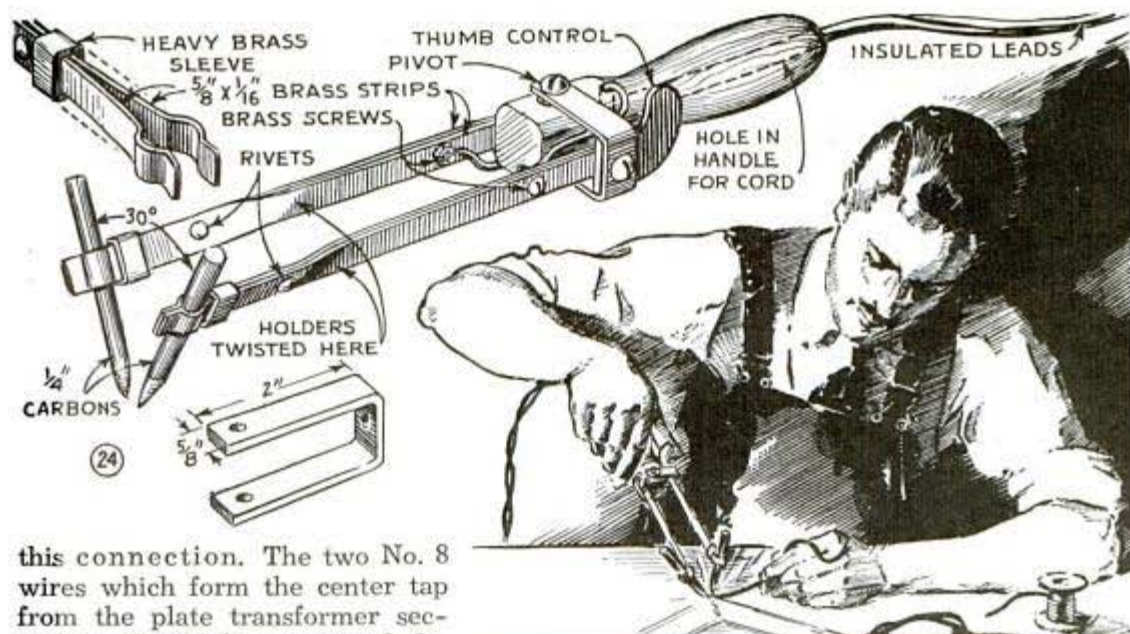
tube, about 6½ in. long as in Fig. 16. Resistors R_2 and R_3 , shown in Fig. 23, are wound on a mandrel 2 to 3 in. in diameter. After slipping them off the mandrel, stretch R_2 to a 3-in. length

and R_3 to a 6-in. length, and bend the ends of the wire into loops for mounting with screws.

The dolly: Construction of a dolly is shown in Fig. 18. Transite is required as a baseboard and a control panel. The various units are arranged on the Transite baseboard as shown in Fig. 21. The plate transformer and the choke coil each should be supported directly by crosspieces underneath. See Fig. 18. The frame of the dolly is assembled with wood screws and bolts, and is mounted on four heavy casters.

Connections must be made short and tight. The "start" and "end" leads from the plate transformer secondary are clamped to the top wire connections of the tubes, using copper clamps as shown in Fig. 22. Two loops in these wires will give flexibility to

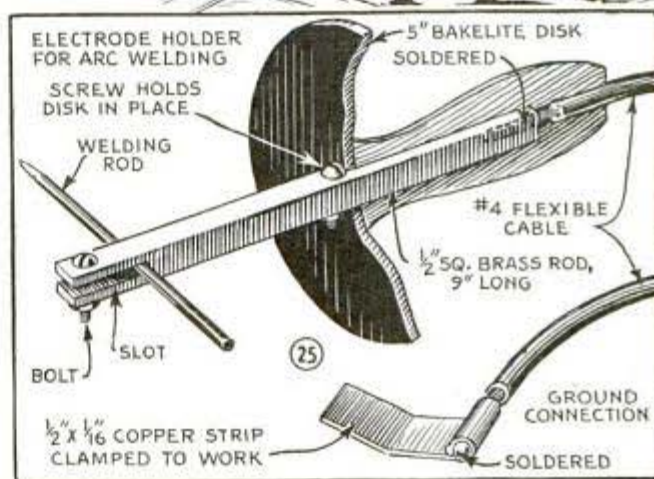




this connection. The two No. 8 wires which form the center tap from the plate transformer secondary should be connected directly to one lead from the choke coil (also two No. 8 wires) at the point marked "A" in Fig. 21; this procedure will save unnecessary splices. A single wire, No. 8 or smaller, runs from this point to the 2-mfd. condenser. The other lead from the choke coil (two No. 8 wires) is connected to the resistor R_2 . The secondary leads from the filament transformer are each connected to one of the tube sockets, and No. 8 wires are attached to the other terminals of the two sockets, and are spliced together at point "B" in Fig. 21. The two No. 8 wires are marked "10" and left long for connection to the control panel. Connections of the two condensers and the resistor R_1 to these two wires are made by tapping. The leads marked "11" and "12" in Fig. 21 also consist of two No. 8 wires, and are to be connected to the control panel.

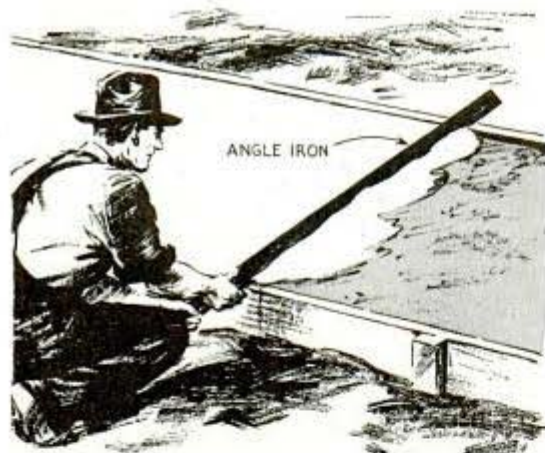
After splicing and taping all connections, the angle-iron supports for the control panel are screwed to the dolly and the Transite panel itself is screwed to these supports. The layout of the panel is shown in Fig. 18. The binding posts are detailed in Fig. 19. A single cable, from the plate switch, can be connected to any tap from 2 to 7. See Figs. 18 and 20.

Operation and use: For plating, simply connect the two d.c. terminals to the proper electrodes, connect the lead from the plate switch to the desired transformer tap, and with all three switches open, connect the



unit to the a.c. supply. To operate, first close the filament switch, and after a few seconds close the plate-transformer switch. The load-limit switch should be thrown to "high" or "low," depending on the desired current. For light welding, an arc torch as shown in Fig. 24 is handy. The procedure is the same except that the carbons are held apart until after the plate switch is closed, touched together to start the arc and then moved apart at once and held to maintain the arc. For heavier welding, a single electrode in a holder of the type shown in Fig. 25, and a ground clamp are used. The converter is started as directed above, and the arc is drawn by touching the electrode to the metal and quickly withdrawing it; d.c. arc-welding electrodes should be used. When arc-welding, it is advisable that the operator wear welder's goggles to protect his eyes.

Angle Iron Is Good Straightedge to Finish Concrete Walks



Used as a straightedge, a length of angle iron is much better than a board for smoothing and finishing concrete walks and floors. The weight of the iron helps to hold it firmly on the form edges, ready for movement in either direction.

Flashlight Supported on Joists by an Ice Pick

An electrician whose work often requires the use of a flashlight claims that he finds an ice pick and rubber band provide a good holder to direct the light where it is needed.



The pick is forced into a joist or beam and the flashlight attached by slipping a rubber band over it in the manner indicated.

Improving Ink-Bottle Quill



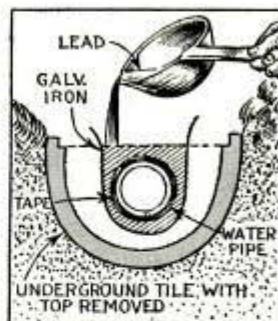
shown. Ends of the thread are passed through small holes drilled or punched

The quill in a drawing ink bottle often delivers too little ink, particularly if the bottle is half empty. One way of overcoming this trouble is to wrap a few turns of linen thread around the quill as

through the quill toward the cork end. A third hole, near the tip, serves to hold the lower end of the winding.

Repairing Leak in Pipe Laid Underground

A high-pressure pipe line laid underground that developed a leak on the underside so that it was impossible to weld it, was repaired as shown. After digging down to the pipe, a half tile was placed under it and the pipe wrapped with a couple of layers of tape to cover the hole. Then sheet metal was bent around the pipe to give a 1/2-in. clear-

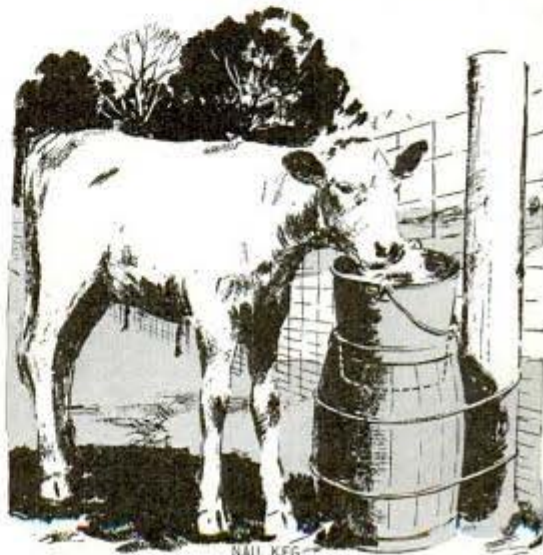


ance all around and provide a form. Dirt was then banked at both ends of the form, after which junk babbitt and lead were poured around the pipe. The repair withstood a pressure of 150 lbs. and has been in service for some time.

—Wm. L. Pipkin, Chicago.

Nail Keg Attached to Fence Post Supports Calf Feeding Pail

A calf can drink comfortably without you holding the milk pail, if the latter is set in an empty nail keg. One end is knocked out of the keg, which is then set on the ground and tied to a post with wire.

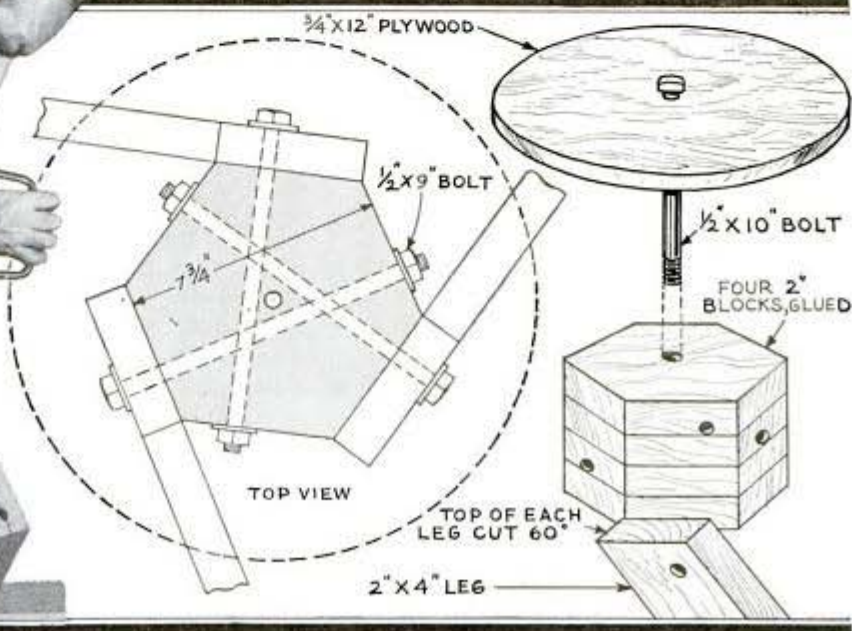


FOLDING TRIPOD *Holds Small Machines*

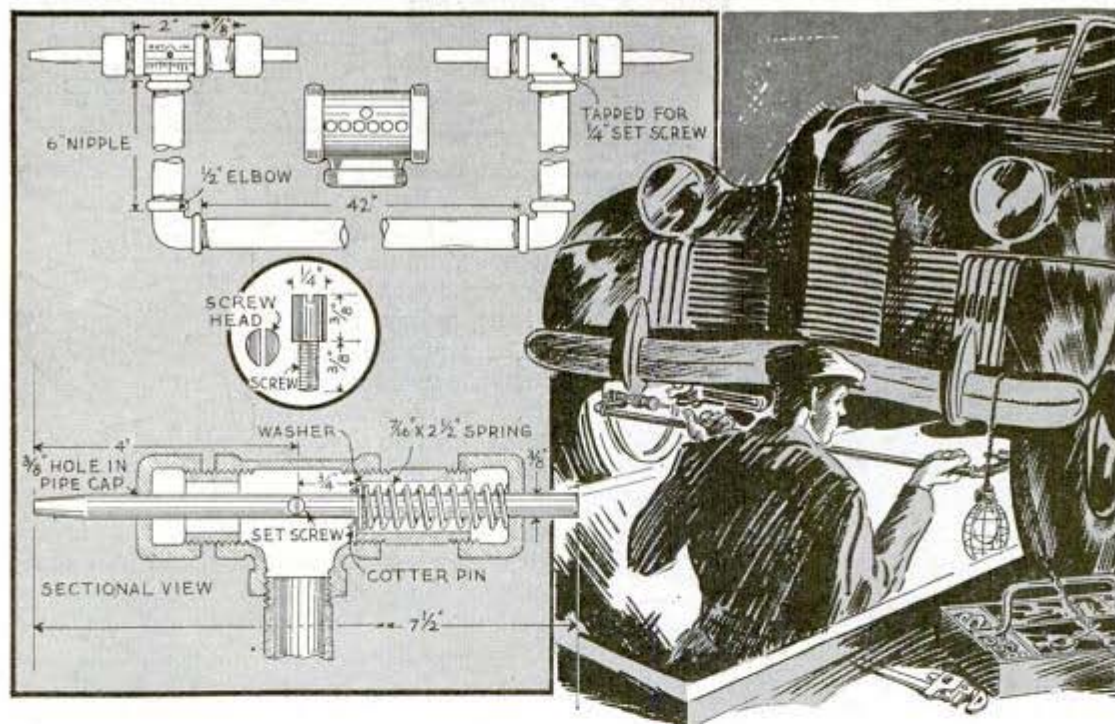
IN SMALL shops

where space is limited, this tripod will solve the problem of a support for small machines that are used only occasionally. Each machine is mounted on a large wood disk having a long bolt projecting from the center for attaching it to the tripod. The machines are stored away, and when

needed, are slipped in place on the tripod and the single bolt tightened. Legs of the tripod may be spread slightly for minor variations of height. If still more rigidity is desired, each leg and the body can be drilled below the pivot bolts to take removable pegs. When all three leg bolts are tightened, the tripod is rigid, sets solidly on the floor and will not sway, slip, nor wobble.



Wheel-Aligning Gauge of Pipe Is Inexpensive



Solving the problem of a simple wheel-aligning gauge for the mechanic or owner of a small garage this one was assembled from 1/2-in. pipe and fittings. Construction is just a matter of assembling the pipe, except the gauge head. This consists of a pipe tee, a close nipple and one 1 1/2 in. long, two pipe caps, a coil spring and a spindle all assembled as shown in the lower detail. One side of the tee is slotted 1/4 in. wide to take an indicator, which is a set screw shaped as in the circular detail, and tapped into the spindle. A notch at the center of the slot holds the indicator at the zero marking of the scale when taking measurements from the rear side of the front

wheels. The scale is scored in the tee in 1/16-in. divisions. The other head is similar in construction to the gauge head except that there is no indicator or pressure spring, the tee being drilled and tapped for a set screw, which holds the adjustable spindle in place. To use the gauge, push the indicator into the notch to hold it at zero. Place the two spindle ends between the inside edges of the wheel rims at the rear of the front wheels, and adjust the movable spindle. Then lock the adjustment with the set screw. Now move the gauge to the same position on the rims at the front and release the indicator. Amount of toe-in will be indicated on the scale.

Road Map on Sun Visor Is Easy for the Driver to Read



The sun visor in front of the driver's seat is an ideal place to keep your road map. In this position, it can be studied at a glance without taking your eyes from the road more than a second or two at a time. Just fold the map so that the portion to be seen is on the front side of the visor. A couple of rubber bands snapped over the visor and map will keep the latter in place. This does not interfere in any way with the regular use of the visor.

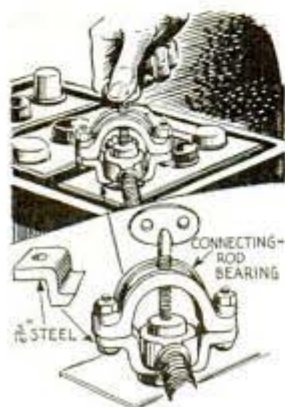
—Opie Read, Jr., Chicago.

Torn Upholstery Mended Easily with Aid of Barbless Hooks



Torn upholstery can be pulled together for mending with needle and thread by stringing a number of barbless fishhooks on a stout line, attaching one hook permanently at either end. By engaging the hooks in the fabric in the arrangement indicated, and drawing the line taut, the fabric will be pulled together for easy sewing.

Lifter Made from Bearing Cap to Remove Battery Terminals

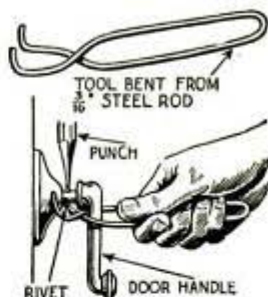


To avoid damaging storage-battery connections when trying to loosen them with a pair of pliers, one mechanic uses a simple tool like the one shown. A connecting-rod bearing is drilled and tapped to receive a stout thumbscrew, and a pair of hooks, made from $\frac{3}{16}$ -in. steel, are attached in the positions indicated. When the thumbscrew is loosened the hooks may

be slipped under the battery connection, and the operation of the bolt against the battery post will lift it without difficulty.

Tool to Compress the Plate of Window Crank

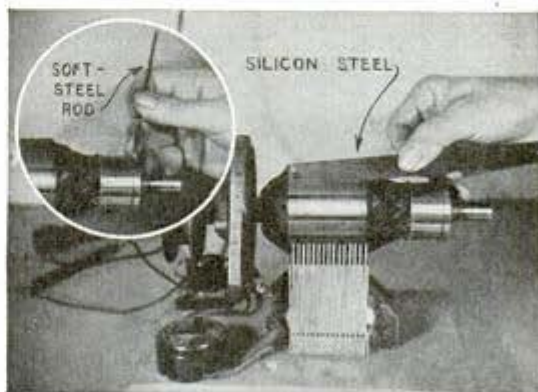
The difficulty of compressing handle plates of auto-window cranks for the removal of the rivet, when repairs were to be made, caused one garage mechanic to devise this tool.



It consists of a length of $\frac{3}{16}$ -in. steel rod, which is bent and twisted as shown. Slipped over the crank and pulled outward, the tool compresses the plate against the upholstery so that the rivet of the shaft may be driven out with a punch.

Hints on Testing of Armatures

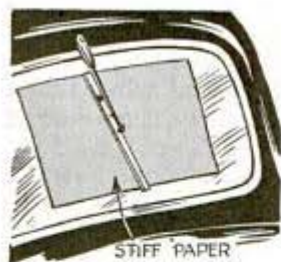
A greater degree of sensitivity while testing an armature for short circuits on a growler can be attained by using a strip from a transformer lamination as an exploring piece instead of the usual hacksaw blade. The soft silicon steel will respond to a much weaker magnetic field caused by



a slightly shorted coil than will the hard steel comprising the blade. The circular detail shows a test for open circuits with a soft steel rod instead of the hacksaw blade to make and break the circuit between commutator bars. The very sharp points on the rod end, caused by breaking or cutting without subsequent smoothing, will allow a longer, hotter and more easily dis-

cernible spark when the connection between the bars is broken than will the blade of the saw. There is also less danger of injuring the ends of the copper bars or the mica insulation between them.

Paper Keeps Windshield Clear on Frosty Nights

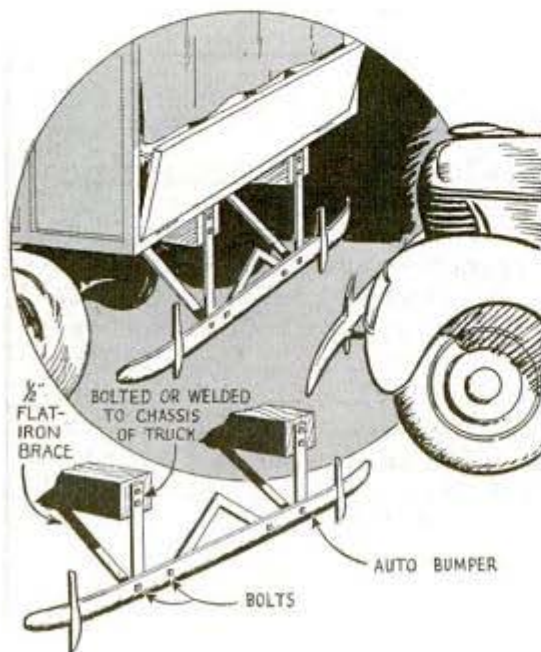


When you park your car outside on frosty nights, slip a sheet of stiff paper under the windshield-wiper blade as indicated. This will keep frost from collecting on the windshield where you look through it.

—M. J. Rucker, Greenville, S. C.

Bumper on High Truck Extended So Car Can't Run under It

After having an accident in which a car at the rear damaged its radiator grille and the front portions of the fenders, one truck driver installed a bumper like the one



shown. It is supported at the same level as the front bumpers of most cars. With this arrangement, there is little danger of a car in the rear damaging the radiator grille, as the bumpers will make contact.

Welding Tray Made of Junk Parts Is Handy in Garage



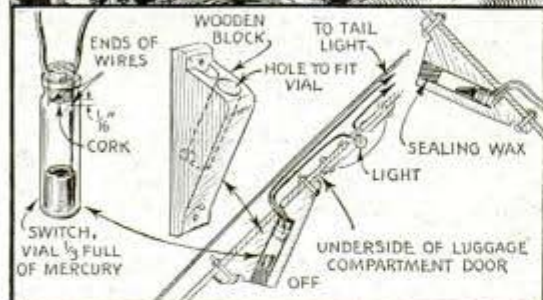
Assembled from old auto parts, this tray will be a useful addition to garage equipment where light welding jobs are handled. An old differential housing forms the base and a discarded rear brake drum is used for the tray, which is filled with sand. Short lengths of 1½-in. pipe secured to the base, and tray as indicated, provide an ideal place for extra welding rods.

Holder for Battery Hydrometer

Unless a hydrometer is washed every time it is used, a drop or two of acid may leak from it and damage something. A remedy for this is a remedy for this is a glass drip jar with a holder made from a tin can. Cut away most of the sides of the can except a strip about 1 in. wide which includes the seam. By means of this strip, nail the can to the wall or to a post.—A. S. Clark, Oakland, Calif.



Trunk Light Works Automatically When the Lid Is Raised



Desiring to illuminate my car trunk, I installed a lamp that was turned on automatically when the trunk lid was raised. A suitable lamp and socket, such as a dome light, are installed on the underside of the

lid and wired to a mercury switch, which in turn is wired into the cable leading to the taillight of the car. If the car's electrical circuit is a one-wire type, using the car frame as one side of the circuit, then one of the wires from the lamp will have to be grounded. The switch consists of a small vial partly filled with mercury and having the bared ends of the wire extending into the bottle through the cork. A wood block, attached to the underside of the lid, holds the switch, which is installed so the mercury is away from the bared wires when the lid is closed, but covers them when it is open.—Harold Larison, Elwood, Ind.

Rope in Pocket Protects Watch

After damaging his watch by lifting heavy objects against his chest, a truck driver lined the watch pocket in his overalls with



$\frac{3}{8}$ -in. rope as shown. The rope, being thicker than the watch, took all the pressure when an object was held tightly against his chest.

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Radio Makes It Sound Right

(Continued from page 229)

signal be given in a radio play, the network is bombarded with complaints.

On a tour of Kelly's domain in the New York studios, your imagination is taxed trying to figure out the uses for all the gadgets in the storage rooms—dishes, town pumps, wrenches, bells, whistles, alarm clocks, sewing machines, toys. A machine resembling a medieval torture rack catches your eye. Iron-rimmed wagon wheels are mounted on a circular base of rock that can be varied to produce the sound of a



Five revolvers fired in quick succession close to the microphone give an exciting effect of action

wagon going over cobbles, dirt, gravel or asphalt. Another strange affair resembles a wheelless baby buggy. When half filled with water and rocked, there comes forth the effect of waves lapping the shore.

Despite the inroads made by realistic sound props, the most successful rain making is still accomplished without water. On one machine there's a hopper containing bird seed; the press of a button sends them trickling down onto a revolving disk about the size of a phonograph record. Here a windshield wiper brushes them off in a scattered stream, some falling directly on a tilted surface of tightly stretched muslin, others bounding against a ping-pong ball, a child's marble, and a piece of Cellophane. These obstructions produce "raindrops" of a higher frequency than those falling directly onto the cloth and the blend of the different sounds makes an almost perfect patter of rain. Other water sounds such as the running of a shower or kitchen faucets emanate from a running-water unit operating independently of the building's water supply.

A few years back, when there was need

of thunder, bowling pins were dropped on the floor. This plan was dropped in favor of a thin sheet of metal suspended on four uprights. The sound-effects chief wasn't satisfied with this as he could detect a faint ring of metal when the slab was bent.

While taking down the screens at his home one day a screwdriver slipped from his hand. The tool slid over the screen with a harsh rasp, but Kelly heard another sound. Next time a program called for thunder he came in with a screen frame and upon getting the cue from the director, he rapped the screen with a tympany hammer. No sound in the studio. From the control room, the director nodded approvingly at the rumbling peals of realistic thunder. The lowest sound made by the hammer on the screen is picked up by an electric needle and amplified before going into the microphone.

Recorded effects, once a network taboo, have come into their own, NBC having some 7,500 in its library, ranging from the sound of marching armies to bird chirps. Train whistles, traffic and harbor noises were recorded at their source, the remainder made in the studios. A cattle stampede was recorded when two animal imitators and seven sound men with rubber drain plungers combined their talents. Thirteen toy whistle blowers made a record marked "crickets chirping." The sound of a one-lung motor dory was put on wax by a sound man denting and undenting a derby.

Recordings of certain effects can be speeded up or slowed down to produce entirely different ones. A thunder recording, slowed down to one-third normal speed, becomes artillery fire. Similarly a rooster's crow changes to a dog's bark, and a baby's cry becomes a chilling groan for a spook drama.

The extent to which realism is being carried was evinced in a studio telephone unit that furnishes the dial tone, a bell, a busy signal and the sound of the phone being taken off the hook. Written in large letters on it is the legend: "No Slugs."

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Find out **Free** and quickly why everybody—even grumpy old Chief Eaglebeak—is mighty excited over Mead's big, new 14-foot portable **Outboard KI-YAK!** Think of it! ANYONE, without previous experience, can build OK-4 at home in a few evenings and save nearly **HALF** the factory-built cost—or sell to others at Big Profit! And get these **startling OK-4 features:** Carries 4 adults comfortably, and duffe—takes motors 9 h.p. or less, oars and sail—weighs only about **75 pounds** for easy portability on shoulders or car-top for fishing, camping, touring, hunting, Seneworthy. Dependable. Durable. Double canvas bottom for **double-safety!** The biggest, lightest, strongest boat of its kind—AND—made only by **MEAD**—in **knockdown kits** for quick home-assembly, or factory-built ready for the water. Send for **FREE** lavishly illustrated Circulars.



THE FRAME IS THE HEART OF ANY BOAT

This **GENUINE MEAD CK-1 Scotch KIYAK KIT**

YOURS for only \$5

PERFECT FRAME

Mead's "SCOTCH" Kits contain one full set of **Patented Aluminum Ribs** pre-formed to correct shape, all Rib Screws, Drawing and Specifications. Also Valuable List of Materials you may buy locally to save you money! **MEAD'S REGULAR KNOCKDOWN KITS**—containing everything needed to build your Ki-Yak—cost just a few dollars more. Write!

4 OTHER GREAT KI-YAKS

A Mead for every need! **Paddle-and-sail models:** The sturdy "CK-1," 10 footer, 20 pounder! The Sportsman's 30 lb. CK-2! The "Big head CK-3" with 90 square feet of sail on 45 pounds of boat—the sailor's delight! Then there's the 50 pound "OK-2"—Spirit of The Fleet—takes up to 4 1/2 h.p. motor, masts, sail and **REMEMBER**—Mead is America's largest Ki-Yak manufacturer—so buy your Ki-Yak Kit from **HEADQUARTERS**. Rush Coupon or Postal for **Free** illustrated Circulars, low Factory-To-You Prices!



"MAIL 'UM COUPON!"

To: **CHIEF EAGLEBEAK**
c/o MEAD GLIDERS,
15 So. Market, Dept. B-21, CHICAGO

Rush 'um new **FREE KI-YAK Boat Circular!** Me much interested in heap low Factory Prices. (Please PRINT plainly.)

Name

St. and No.

City State

MEAD GLIDERS
15 S. MARKET ST. DEPT. B-21 CHICAGO, U.S.A.

K946

Big Ship College of the Air

(Continued from page 245)

control tower. For an hour you try to get in a word edgewise with the operator while he talks to ships coming and going from all over the land. It's interesting, but—the first day is well along and you haven't been near an airplane! When are you going to get some actual flying?

The paper slip shows two hours in Stinson number 27 beginning at two. You walk across the concrete ramp to a cabin monoplane. A Mr. Cobb awaits you.

"We'll shoot a few landings first just to get you used to the ship," he explains. "Then you can go under the hood and



An hour daily for six weeks this man sends beam signals to trainer, using mike for "ground" messages

buckle down. Ever flown one before?" You haven't, so he goes over all the tricks with you. Fifteen minutes later, you're in the air. This is more like it. You make two landings which you consider little better than "arrivals" but Mr. Cobb is satisfied you won't kill yourself when you go it with another student pilot. After this first day, he won't be with you.

Flying an airplane under the hood is very much like putting your head in a basket and walking a tightrope—unless you know how. Air line pilots must be experts at it. The main reason, of course, for instrument training is to combat bad weather, but in addition the big ships are largely

flown "on instruments" whether the ground is visible or not—it's simply easier that way. The smaller ships you've been flying had an engine cowling ahead and wings to look at for flying reference. In an air liner you sit out in front with nothing between you and space but a pane of glass and a sheet of aluminum.

Mr. Cobb takes over the controls and you button up the hood—a few pieces of canvas which cover up the windows on your side. Mr. Cobb can see out the other side—just in case. Your vista is three feet to a familiar flock of instruments. You nudge Mr. Cobb and take the ship back from him. For the next hour you execute time turns, climbs, descents, and a stall or two—all without seeing anything but the instruments. You'll do this every day for six weeks, progressing to range flying, orientations, and low approaches to airports. Another student will take Mr. Cobb's place as safety pilot for an hour, then you'll exchange places. It's your turn to sit and watch the other fellow make mistakes, and profit from them.

Meantime, save for these two blessed hours a day in the air, you'll continue with your work in the school day and night. You'll study hydraulics, engine overhaul, code, navigation, cockpit procedure, heating plants, even sit in with the reservations department. At night you work more navigation problems, horsepower problems, and wade through six big manuals of air-line policy and procedure.

In the last two weeks, the pace quickens. You are assigned as an observer on a regular air-line flight from New York to Chicago. The ship leaves at noon. You are to return the same night. You report to the operations office with the regular crew and introduce yourself to the captain.

"The first officer is making out the flight plan," he smiles. "Go over and sit in on it." An hour later you're all in the cockpit.

As the big engines fire into action you try to remember all you've learned in the school. You experience a sudden rush of blood to the brain, a strange queasy feeling that you've never flown an airplane before. When the ship roars down the runway you marvel at the half-hundred quick, sure movements of the pilots. You get an ink-

(Continued to page 118A)

Top Sport for Thrills

—Motorcycling



SOMETHING doing every minute when you ride a Harley-Davidson. You get more fun out of life — visit famous beauty spots — explore distant places — go on glorious vacation trips at little cost. Take in exciting club rallies, hill-climbs, race meets and other thrill-packed motorcycle events. Visit your Harley-Davidson dealer today — see the 1941 models with their airplane styling, zooming power, rugged dependability and important mechanical improvements — and ask about his Easy Pay Plans.

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WORLD'S CHAMPION MOTORCYCLE

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Send pictures and descriptions of smart 1941 models.
Also FREE copy of big 24-page ENTHUSIAST magazine
filled with thrilling motorcycle photos and stories.
Stamp enclosed for mailing cost.

Name

Address

200-Mile National Speedway Championship again won by Harley-Davidson. Louis Guanella first — setting new A.M.A. record. First seven places go Harley-Davidson!

K 016

(Continued from page 116A)

Go right where they



• Sneak up on the deep, dark pools where the big ones hide. It's easy in a perfectly balanced Old Town Canoe. This modern birch-bark is built for sportsmen. Steady and strong, yet light to carry. Made with Old Town skill to last for many a moon.

FREE CATALOG shows all kinds of canoes, rowboats, dinghies and outboard boats. Write for one today. Address Old Town Canoe Company, 732 Main Street, Old Town, Maine.

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**COMPLETE CARVING KIT
STONE, BOX, AND 5 KEEN CUTTERS**

Here's top value in carving tools for linoleum blocks or wood—Millers Falls Set No. 107: Bent Chisel, Skew Beveler, Bent Gouge, U Tool, and Veiner, plus Carborundum Stone to keep their razor-keen edge, and stout lacquered box for protection on your bench. Best cutler's steel blades, carefully heat treated; selected to permit widest variety of work.

Maple handles fit palm comfortably. Only \$2.75, at your hardware dealer's or postpaid (U. S. only). Satisfaction guaranteed or money back.

FREE WITH CARVING KIT
Tool Book 42—240 pages crammed with pictures and details of hundreds of fine tools, sent promptly for 10c to cover postage and handling . . . or FREE with carving kit. Send for yours now.



MILLERS FALLS CO.

PM6 GREENFIELD, MASS.

Enclosed is: \$2.75 () Send me Carving Tool Kit No. 107 and Free Tool Book
10c () Send only Tool Book

Name _____
Address _____

ling of the skill and precision the air line expects from you.

Two hours later you are half way to Chicago and have taken over the first officer's seat. You've made position reports on the radio, flown the ship, and kept the flight log—all under the watchful eye of the captain. You've learned a lot and are painfully aware of how much more you must learn.

On the ground in Chicago, you hand the captain an envelope. In it is a form report which he must make out. It is his considered opinion of your capabilities. You must return it to the chief instructor at the school. Before the six weeks are done there will be a number of such reports on file about you, each one written by a different captain. This one sums up your first trip:

"Needs further familiarization with position reporting procedure . . . handles ship nicely but does not bracket beam well . . . learns fast however . . . simply needs time . . . good man . . . will do."

That's hardly a rave notice, but at least the chance of bettering it on the return trip is easier. Then eight more observation flights and you're ready for assignment to schedule. That is a big day in your flying history.

For six weeks you have worked and studied night and day. Your head is bursting with new knowledge but where are you going to apply it? A new first officer seldom has anything to say about where he shall live in these United States or where he shall fly. You may have spent your entire life in the gulf ports of Texas and be assigned to duty at Boston. You go wherever a vacancy exists. No matter what your assignment, your new job as an air-line pilot is a guarantee you'll see most of America before you reach retirement age.

The phone rings. It's the airport calling.

"You leave on the noon non-stop for Chicago . . . that's trip four." With that simple statement your career as an air-line pilot is really launched. If you keep on your toes and work and study, there's a long smooth road ahead—and a certain return to the big ship school.

☐ Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.

\$148 My First Week



... Now in my OWN Business.

Would you like to own a business where it was possible to take in as much as \$148 the first week, as did L. A. Rowe in his new business?

We want more reputable, honest men. These men need not have any special experience or more than ordinary ability, but they must be honest and courteous.

To such a man we offer an opportunity to start in business for himself. If you are that man you can make far above average profits in the rug washing business—a high grade business all your own.

NO SHOP NECESSARY

The rug washer cleans rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly efficient method that removes dirt and grime, thus bringing out the natural beauty of floor coverings.

There are hundreds of customers in your vicinity and nearby towns. The business should grow steadily. Simply wash a few rugs or carpets. These customers tell others as well as giving you their work in the future. Soon you should have a prosperous, money making business. Send coupon for booklet explaining everything.

PROFITS ENOUGH TO PAY FOR HOME

Men take in \$100 to \$150 in a single week. R. E. Traynor took in \$56 in one day and nearly \$800 in one month. W. F. Drake took in \$186 in three days and \$152 one Saturday night and Sunday. You, too, should be able to enjoy a large income.

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Send at once (no obligation) your free booklet illustrating rug washer and telling how I can own my own permanent business; how I can earn large profits at prices below other methods; how I can become financially independent in a short time; and how I can pay on easy terms.

Name.....
Address.....
City..... State.....



"NEVER A COMPLAINT"

C. J. Wright wrote, "Did \$100 business in six days with never a complaint." That is the nicest part of this business. Customers are more than satisfied because of the fine cleaning job you do, and because you do the work right in the home, so they do not have to be without rugs and carpets.

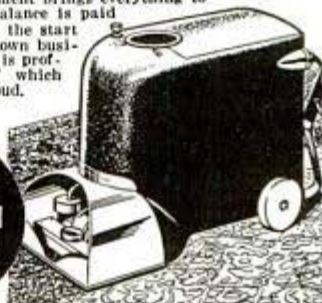
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You take no risk. These machines have been manufactured since 1918 and are used by the United States Government and by many of the world's largest hotels. They are fully guaranteed.

EASY TERMS

The complete equipment is inexpensive. A reasonable down payment brings everything to you and the balance is paid monthly. From the start you have your own business—one that is profitable and of which you can be proud.

MAIL
COUPON
Today



\$13.95
Full
Set



MICROMETERS

Six piece set, in velvet lined leather case. Special price, only \$13.95. Precision machined in one thousandths, up to 4" outside and .333" inside measurements. Guaranteed accurate, easy to read and adjust. Satisfaction guaranteed or money back.

FREE FOLDER
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MICRO PRODUCTS, 211 Jos. Campau, Detroit, Mich.



PUSH BUTTON CONTROLLED GAS TANK LOCK

NO KEYS—Electrically operated from dashboard. One model fits all cars including fender door type. Greatest thing out! Sells on sight! Fully guaranteed. Distributors, dealers, here is your money making opportunity. Write for free literature and NEW sales plan.

SNAP-UP GAS CAP CO. Dept. K, ASHLAND, KY.

New
Only \$4.95

REAL ENGINE VALUE

The G. H. Q. is a miniature gasoline engine that really operates. Over 15,000 sold in the last year. Now is your chance to buy the New Improved kit for \$4.95. Absolutely complete with coil, condenser, plug, instructions, etc. Only a screwdriver needed. For boats, planes, midget cars, etc. All parts guaranteed. Send only \$1.—Shipped Collect C. O. D. same day. Send for FREE literature or 6c for Jumbo catalog.



GHQ MOTORS, Dept. B, 40 East 21 St., New York, N. Y.

LAWN ORNAMENTS

New, unique, colorful, easy to make. 20 full size patterns, birds, animals, etc. 25c. Dutch Windmill, 36 in. high, complete plans 25c. Flying Duck, Hen and Chick, Rooster, Parrot, Dutch Boy, Dutch Girl, Sprinkling Girl, 15c each, any two 25c. De Luxe collection 31 patterns (\$1.85 value) only \$1.00 postpaid. Limited time offer.

WICKMAN CO., Dept. 259, Dayton, Ohio



HERE I AM!
To Fix That Broken Chair

Just apply Rogers Glue to broken section—place piece, joint or splinter in position—clamp... then chipped, splintered and broken articles will become, look and remain like new when repaired with Rogers Glue... *incredibly strong*—easy to apply. Sells 10c and up in tube, jar or can at hardware stores *only*, or send 10c for full size jar plus free illustrated book giving new ideas, new plans for making useful articles—New 1940 sets of free projects sheets are also available—write Dept. A-1.

ROGERS GLUE, GLOUCESTER, MASS.

OLE DOC. "GLUEKY"



ROGERS

"A TON OF STRENGTH IN EVERY DROP"

K1065

War Birds without Wings

(Continued from page 203)

says it now appears possible to produce a two-seater helicopter powered with a 200-horsepower engine. Such a craft would be able to take off and land in small spaces, to travel forward at any speed between zero and slightly above 100 miles per hour, to move sideways or backward at velocities up to twenty-five miles per hour, to hang motionless in the air and to climb at better than 1,000 feet per minute.

The Sikorsky helicopter has a single large lifting rotor, similar in some respects to the overhead rotor of the autogiro, and three small auxiliary rotors or propellers, supported by an outrigger. The main rotor furnishes most of the lift that supports the machine in flight. The change of the pitch of this rotor forms the basis of the control of the machine for up-and-down motion. Two of the auxiliary rotors that are situated on vertical shafts on both sides of the outrigger furnish means for longitudinal and lateral control. Varying the pitches of these propellers in the same direction produces longitudinal control; variation in the opposite direction gives lateral control. These control motions are connected to a pilot stick, giving an effect similar to the conventional airplane. A mechanism that varies the pitch of the rear propeller is connected with foot pedals and furnishes means for directional control.

By operating the controls and engine throttle properly, the pilot can hold the helicopter at a given altitude or cause it to descend or to jump up momentarily. Thus the pilot is able to ascend or land exactly when he sees the right moment. In case of engine failure aloft, the rotors continue to turn automatically, permitting the machine to come to earth gently.

Of the possibilities of this machine, Mr. Sikorsky says:

"The airplane, by nature of its design, will always be faster than the helicopter—perhaps in the order of about five to three, or 500 miles an hour to 300 miles an hour in future designs. However, for defensive and special military purposes, the helicopter can do many things impossible to the airplane which make it of vital significance. For example, to interpose an effective defense against bombers or dive bombers, the helicopter seems to me to be ideal. It



57,256 Pipe Smokers are still missing!

Among hard-to-please pipe smokers a high percentage naturally enthuse about BOND STREET. Applying this percentage we know that about 57,256 pipe-smoking readers of this magazine—for whom BOND STREET is a "natural"—still have this grand discovery to make.

So come out of hiding—and try BOND STREET!

It contains a rare aromatic tobacco not hitherto used in a popular price mixture. Rich-tasting, bite-free—leaves no tobacco odor in the room—even the ladies approve.

Try it—today! Only 15¢.

15¢ GENEROUS SIZE POCKET TIN

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1065

can stand still in the air, thus affording a stable gun emplacement from which the gunner can await the moment—which must come either in bombing from altitude or in dive bombing technique—when the bomber ceases all zigzag maneuvering and flies a perfectly straight line for its quarry. Then the bomber is comparatively easy to hit. The helicopter, of course, easily can have altitude performance up to 15,000 feet or more and can carry large caliber machine guns or even cannon.

"The helicopter, in naval use, would require only a platform or deck space about forty feet square from which to take off and on which to land. It could follow every dodging movement of surface craft, flying backward, forward or sideways at will, and always itself afford a steady firing point for its guns defending a battleship.

"Landing gear for the helicopter would be rubber bags rather than wheels. On these bags the machine could use land, water, ice, snow, a vessel or a building for a take-off or landing."

A Pitcairn-built autogiro, in a demonstration recently, exhibited an ability to make jump take-offs, rising vertically twenty feet or more, then pulling away in a normal climb. Thus, no run along the ground is necessary to attain flying speed, an advantage in operations in small spaces.

Preparatory to the jump, through a hydraulic system, a single-control lever locks the wheel brakes, sets the rotor blades at zero pitch and engages the rotor clutch for power to the rotor, during which time the gear ratio within the transmission is set at two to one. Then the pilot advances the throttle and when full power is reached and the rotor is turning three hundred revolutions per minute, the mere pressing of a lever causes the machine to leave the ground, shooting straight upward.

Thus independent of vast air fields for moving away from or coming to earth, as well as incorporating many other characteristics which aviation experts regard as highly desirable, the wingless aircraft seems on the verge of development into an important weapon of defensive—perhaps even offensive—warfare.

☐ Stamped, self-addressed envelope, sent to our Bureau of Information, will bring you the name and address of the maker of any article described in Popular Mechanics.

TOUGH
but oh so gentle



TOUGH on Oil-Pumping • GENTLE on Cylinder Walls

● Of course you can continue driving an oil-pumping car. But the longer you go, the greater chances you take—because excessive oil consumption forecasts rapid cylinder wear.

Save oil, and save your cylinders too... install Hastings Steel-Vent Piston Rings at the first sign of oil-pumping.

Note to Used Car Buyers: Ask the dealer if it's Steel-Vent Reconditioned. It's a better buy if it is.

HASTINGS MANUFACTURING COMPANY
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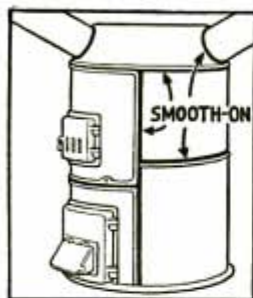
HASTINGS

STEEL-VENT PISTON RINGS

Stop Oil-Pumping.

IN CARS, TRUCKS AND TRACTORS

HOUSEHOLD and AUTO REPAIRS that save money



Sealing Leaks



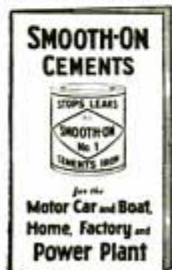
Tightening Loose Parts

Cracks in boilers, heaters, auto engine jackets or gear cases, leaks in piping, tanks, auto radiators, or utensils, loose parts of apparatus, machinery, fixtures or tools, can all be quickly, economically, and lastingly repaired with Smooth-On No. 1.

Smooth-On requires no heat, no special tools, and no previous experience. Each application requires but a small amount, and frequently saves a complete new part or avoids an expensive and lengthy repair.

Prepare Now for Emergencies

Every household should have a can of Smooth-On to be ready for emergencies. Smooth-On is obtainable in 1 $\frac{3}{4}$ -oz., 7-oz., or 1-lb. or 5-lb. can from your hardware store or if necessary, from us. For your own protection, insist on SMOOTH-ON, used by repair men and mechanics since 1895.



For the
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Do it with **SMOOTH-ON**

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Describes dozens of practical, ingenious repair jobs, with diagrams showing how to fix things that go wrong in the home, on the car and at the shop. Send the coupon TODAY for your copy.

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574 Communipaw Ave.,
Dept. 37, Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name

Address

2-41

A Gem Factory on the Half Shell

(Continued from page 249)

the Margaritifera—which produces most of the genuine precious pearls and mother-of-pearl shell. This oyster is represented in most of the tropical regions of the world and is a first cousin to the edible scallop.

The secret of Japanese culture pearls is to duplicate and control scientifically the natural process by which "wild" pearls originate. This takes patience, for culture pearls are nine years in the making. The process officially starts when the immature larvae of young oysters are collected in the warm, sheltered bays of Southern Japan. The collecting cages are painted with lime and arranged on a long, triangular form. The walls and bottoms of these screen baskets are surrounded by black boards. The cages are then lowered into the depths where larvae are most abundant. If let down in July, the cages are taken up in November. Each basket may be expected to contain from 1,000 to 16,000 spats (young oysters). The spats are then planted in specially prepared fishing grounds where they may be watched. At the end of three years they have attained an average size of three inches in width and one inch in thickness.

The young oysters are ready to begin producing pearls. In white bathing suits and wearing glass masks, Japanese girl divers plunge into the green, translucent water to bring the three-year-olds to the surface. The girls collect the shells in small hand nets and deposit them on the surface in floating wooden tubs. The divers work in groups of five or six and each has trained herself to stay under water several minutes. And now comes the most important and most delicate part of the whole process. The oysters are carried into the laboratory where they are opened by skillful workers. As the two shells are forced apart with powerful tweezers, a tiny mother-of-pearl bead, surrounded by the tissue of a living oyster, is popped into the shell.

The oysters are then closed and placed in culture cages. These are oblong wire baskets which hold around 1,000 oysters each. Each basket is tagged and dated before being suspended in the water from wooden rafts. The greatest enemies of the culture pearls are the starfish, the octopus, and muddy currents which create condi-

K1145

tions unfavorable for growth. When these enemies threaten, the rafts can be towed to other areas by tug boats.

For six more years the oysters remain captives in the culture cages—each with a gleaming pearl slowly taking shape around the bead or nucleus. Twice a year rubber-booted workmen haul up the cages to scrape off seaweed, barnacles and other growths which attach themselves to the shells. Then back into the water they go. At the end of this period—after nine years of care—the oysters are taken from the culture cages, thoroughly cleaned and sent into the laboratory again. Here the fully matured oysters are opened and lustrous pearls scooped out. In luster, color and shape they cannot be told from the finest "wild" pearls.

Not every shell, of course, will produce a perfect specimen. A good average is five or six perfect pearls from 100 oysters. The imperfect specimens—blisters, pear-shaped and dumbbells—are destroyed.

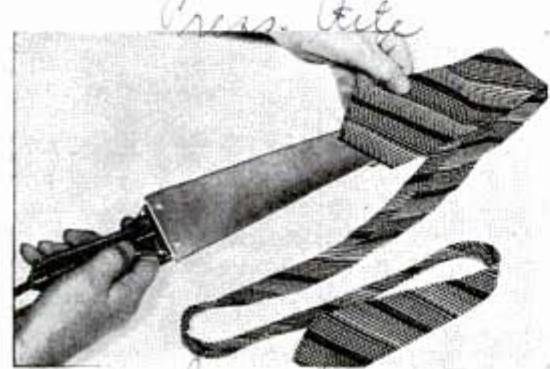
Having been extracted from the oysters, the pearls are sent to another room in the laboratory. Here great glowing mounds of pearls are sorted, sized, graded and polished. Soon they become necklaces, stick pins, brooches, amulets and wrist bands.

A culture pearl is much cheaper than a natural wild pearl, but placed side by side and rated as to size, luster and beauty they are as alike as two peas in a pod.

K1201

Electric "Blade" Necktie Ironer Applies Heat Inside

Shaped to fit snugly inside the necktie, an electrically heated ironer removes wrinkles in one-half to two minutes. If creases are stubborn where the knot has been, moistening helps straighten them.



Cross-Kite

Cole Tannery Co., Inc.

FEBRUARY, 1941

30, Rockefeller Plaza, New York City

WE'LL SEND YOU FREE PLANS FOR THIS NOVEL SERVING TABLE



A PRIZED POSSESSION in any home—and you can build it! Materials are polished pine and Tempered Presdwood*—a Masonite* wood-fibre hardboard—the board that won't warp, chip, split or crack when properly used. Tempered Presdwood makes anything you build permanent, able to stand up under the hardest kind of usage.

The top of this table is removable and can be used as a serving tray. Each of the shelves slides out for the same purpose. The table is 30 inches high and moves on rubber casters.

Your nearby lumber dealer can supply you with Masonite Tempered Presdwood. And Masonite Corporation will send you free plans and working drawings, as well as a free sample of Tempered Presdwood. Just mail the coupon below.

*Trade-Mark Reg. U. S. Pat. Off. "Masonite" identifies all products marketed by Masonite Corporation.



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THE WONDER WOOD OF A THOUSAND USES
Sold by Lumber Dealers Everywhere

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FREE PLANS AND SAMPLE

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111 W. Washington St., Chicago, Ill.

Please send me free plans of the easy-to-build Masonite Serving Table and a free sample of Masonite Tempered Presdwood.

Name _____
Address _____
City _____ State _____

2 Bushels of Ripe TOMATOES from ONE VINE



2 or 3 vines will produce enough tomatoes for the average family.

New BURGESS CLIMBING TRIP-L-CROP

TOMATO rapidly grows to a height of 10 to 18 feet. Grow on trellis, side of house or barn or as a bush in garden. Beautiful crimson, solid, meaty fruits of best quality, some weighing over 2 lbs. each. The most productive of all tomatoes. Trial packet 10c—3 for 25c, postpaid.

CASH PRIZE CONTEST
Send for FREE Garden Book giving full details about CASH PRIZES to growers of this wonderful tomato.

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LOST DIRECTIONS ARE WORSE IN WINTER

KNOW YOUR WAY WITH A **HULL Streamline AUTO COMPASS**
SAPPHIRE BEARING • BUILT-IN COMPENSATOR
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SAW-FILING

MAKES A GOOD LIVING

"Last year I sharpened 2309 hand saws, for which I got \$1154.40. The Foley Saw Filer has made a good living for me" — John Joseph, Calif. Louis P. Wadowick says: "I have filed 764 saws in spare time." Thor Nedribe, Iowa, says: "I have filed 550 saws, made \$350. As I'm a Carpenter, I just file saws in spare time—have more than take care of." With a



FOLEY AUTO SAW FILER

you can do expert work easily, quickly, without eyestrain. The Foley files hand, band and circular saws better than the best hand filer. The new 1940 Model F-16 is the result of 40 years' experience in building saw filers, and is unequalled for accuracy, ease of adjustment and long life. Patented jointing principle brings uneven teeth back to uniform size.

FREE PLAN shows you how to start your own cash business in spare time with small investment—no canvassing. Send coupon now,—no obligation, no salesman will call.

Mail Coupon for FREE PLAN

FOLEY MFG. CO., 216-1 Foley Bldg., Minneapolis, Minn.

Send Free Plan on Saw Filing business—no obligation.

NAME.....

ADDRESS.....

Sea-Going Soldiers

(Continued from page 219)

had been surrounded by six Germans. Another marine in the World War, single-handed, attacked two machine-gun emplacements, captured their crews, and then took forty more prisoners from a dugout.

The Marine Corps is a comparatively small force and only recently was its authorized strength raised to 34,000 men. It is organized like an army but it is part of the navy. Detachments up to sixty-five men serve on battleships, heavy cruisers, and aircraft carriers. On board ship they man several of the secondary batteries, some of the searchlights, and fly some of the airplanes. Their other duties are to make landings and in case of a major expedition to make up the initial striking force that lands and contacts the enemy. Each marine is a picked man, proud of the fighting traditions of the corps.

Because of their amphibious nature even the marines who do sea duty spend some of their time ashore. They sleep in tents in the field, fire machine guns and artillery, and learn to swarm across rough country. A marine airplane pilot may spend a year being shot from a battleship's catapult and the next year picking his way in and out of small fields in a tropical jungle.

The requirements for joining the Marines are similar to those of the navy. As a rule an applicant must be between eighteen and twenty-five, although men with unusual qualifications may be accepted up to the age of thirty. Applicants must be unmarried citizens, in good health, and of good moral character. They sign up for four years, with a starting pay of twenty-one dollars per month. Increases are possible up to a top pay of \$157 per month. After his initial training a young marine is assigned to one of the seven branches of the service for which he shows aptitude. These divisions are musicians, signal and radio, quartermaster, line, paymaster, aviation, and mess.

Recruits east of the Mississippi are sent to Parris Island, S. C., for training and those from the west to San Diego. At either school a recruit spends the first three weeks in the drills and studies of an infantryman. He does setting-up exercises, bayonet drill, learns to wear a gas mask

(Continued to page 126A)



HAROLD F. HUNT
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(Continued from page 124A)

and throw hand grenades, the new extended order drill, and how to handle a rifle. He listens to lectures on scouting and patrol duty, use of a compass, and chemical warfare. He attends sound motion pictures that teach first aid, musketry, and other military subjects.

He spends the next three weeks on the shooting range with the service revolver, rifle, and automatic weapons. Finally, he spends another week back at the training depot.

Out of each group, the fifteen per cent who receive the highest marks in this training period then spend an additional three weeks at sea school and are then assigned to the fleet. The others are shipped to schools for specialized instruction, to duty at navy yards, or to outlying bases. The corps operates schools in photography, aerography, aviation, radio, field telephony, fire control, optics, and kindred subjects. In addition, numerous correspondence courses are offered free by the Marine Corps Institute.

Enlisted marines who are properly qualified may compete for enrollment at Annapolis. Men who desire aviation training are usually assigned to the aviation branch of the Marine Corps although the number who can be given flight training is restricted. One way of getting into Marine Corps aviation is to join the Marine Corps Reserve instead of the Corps itself. Reserve cadets spend a year at Pensacola after a thirty-day primary instruction period and are then commissioned as second lieutenants in the reserve and are ordered to four years active duty with aircraft squadrons.

Like their brothers in arms afloat and ashore, marines are constantly studying, drilling and practicing. The result is that the armed forces of the United States are better prepared to resist an enemy than the public might suppose. Enlistments are increasing and modern weapons are being provided. The American military machine is known the world over for its fighting spirit, which in the last analysis is the intangible factor that wins battles.

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Jobs from Research

(Continued from page 163)

properly baked, and the scrape tester for measuring the stick-to-it-iveness of the film to the wire.

Much of the progress in metallurgy is the result of the measurement of the "creep" of actual materials under stress in the laboratory. This has improved turbine material, and instruments like the transverse pressure recorder have helped improve turbine design. Air is blown through a turbine nozzle section and the resulting pressure, mass flow and energy are automatically recorded on this device.

At the edge of a sheet of steel going through the mill may be seen an electric gauge which tells the thickness, and which can be made to control it. The electric gauge, together with electric drive features has made possible an increase of sheet speed through the mill from 300 to 1,500 feet per minute. Research has so broadened the market for steel products that today the steel companies employ approximately 500,000 persons compared with 275,000 in 1907, at the same time reducing the price of steel by forty-six per cent since 1923.

The new trains in our transportation system are known to all. They, too, are the products of research. When new steels are welded, a little instrument, the ampere-squared second recorder, which automatically evaluates the welding current, stands guard to stop the operation if the current is not correct to give a satisfactory weld. So quickly does it operate that it summates its story in one-tenth of a second, allows the process to proceed if right, stops it if wrong.

Time was when the streetcar was generally accepted and not much was done to improve it. Then came competitors, and the streetcar had harder going. Then came the formation of the Street Railway Presidents' Conference Committee; a research engineer was brought from a prominent utility; measuring equipment was put to work, together with brains and study and thought, and the PCC car was born. This was in 1936. Today there are more than 1,200 such cars in use or on trial in fourteen cities. Here research revived; and here research is keeping alive; there will go into service shortly 100 of these cars without air, the use of electric braking

having been so perfected that the air is now not necessary, thus eliminating compressors, pipes, valves, fittings, and their maintenance. Soon the PCC car will go into the subway.

It was not so many years ago that aluminum cost eight dollars a pound. Very few people were able to afford aluminum pots and pans. But a new refining process by electricity from research reduced the cost of aluminum to twenty cents a pound and opened up a wide market for aluminum products in many new fields. This electrolytic method not only brought many additional benefits into the household but also increased the number of people employed by the aluminum companies from only a few hundred to around 25,000 men.

The rayon industry is in itself a story of the most remarkable research. Starting in this country about 1910, it has shown one of the greatest advancements and expansions of any of our industries. During the first ten years, this industry produced an average of 8,700,000 pounds per year. In 1939, its production was 331,200,000 pounds. This increase must be attributed in a large measure to research in the industry itself together with that in the electrical industry, resulting in the production of motors and control for the manufacture of this synthetic fiber.

There are similar stories in radio, the advances in the automotive industry, the petroleum industry, the extension of electricity to the farm, and the creation of an electrical standard of living in the home. Not all of the advance has been due to research, but that research is prominently there we know, and that we cannot separate it shows how it permeates the whole train of complex events from even before the inception of new ideas to their ultimate useful application.

The year 1929 was not a happy one. We all remember what happened then. But in 1929 we did not have streamline trains, television, transoceanic passenger air service, synthetic rubber, fluorescent lighting, colored home movies, new plywoods stronger than steel, many new plastics and resins, polarized glass, glass building blocks, fiber glass for insulation and textiles, synthetic hosiery replacing silk, syn-

(Continued to page 130A)



"Hurry Up Now! Pa's Waiting!"

THE kitchen stove used to feel pretty good on a winter's Saturday night when the thermometer was down around zero. So did the heated flatiron in the foot of the bed. But how many of us would trade the comfort and privacy of our modern, heated bathrooms for the cramped discomfort of the wooden tub and the sting of the homemade soap? And who wants to lug out the water afterward and mop up the kitchen floor?

There are a lot more of today's home conveniences that we wouldn't trade for their counterparts of the "good old days." The electric washer, for instance, for the scrubbing board; the electric light for the coal-oil lamp; the furnace for the parlor stove.

Most of us are incomparably richer than the people of a generation ago—not so much in money, perhaps, but in the things our money will buy. And in most cases these are the products of American industry—manufactured articles that have been developed by industry, improved, made less and less expensive so that more millions of people can afford to own them.

In almost every manufacturing improvement that has made this progress possible, electricity has played a vital part. And the scientists, engineers, and workmen of General Electric, who have done so much to make electricity more useful, are still seeking ways for electricity to help in the creation of More Goods for More People at Less Cost.

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(Continued from page 128A)

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available for the kitchen by development
of a tubular lamp fixture that can be
plugged into an ordinary socket. It is de-



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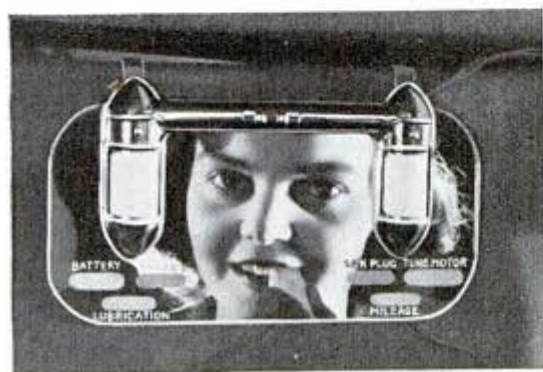


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Face is illuminated by side lights while looking into vanity mirror hooked on automobile sun visor

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New Delta Lathe for Wood and Light Metal Turning

Inside Secrets of Delta Quality "Acme Threading"

The Acme threads used on certain Delta machines are another extra quality feature, often overlooked, that assures better work from power tools.



Ordinary Machine Thread



Acme Thread

On an ordinary machine thread, the top and bottom of the grooves and ridges are sharp. This type of thread is accurate enough for use on certain places such as

on lathe spindles where the actual face plate is screwed on.

But in other places, as in a circular saw arbor where the blade is not threaded and where the blade is held on by a nut, the ordinary machine thread is not accurate enough. There you will find Delta uses "Acme" threads.

In an Acme thread, the top surface of the thread is flat—accurately ground by precision grinding to a true diameter on which the saw blade fits—thus making the saw run absolutely true. This is impossible with the ordinary machine thread which permits the saw blade to ride on only a very thin knife-like edge. Moreover, this thin knife-like edge of the ordinary machine thread cannot be kept absolutely true and round, a condition which is necessary for true accurate work. Acme threads have more "heft"—are a stronger thread. They are used exclusively on all heavy industrial machines. Another advantage of Acme thread is that the side of the groove is steep so that in the case of a saw arbor, the nut has a better bearing surface and this holds the saw blade more securely. Acme threads are another of the many exclusive Delta features, which mean that dollar for dollar you get much more in Delta machines. Before purchasing a circular saw—check it carefully to be sure you are getting this extra quality that you should have.



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YOU can use new model BENJAMIN AIR RIFLES WITH LEVER HAND PUMP anywhere, for practice firing or just plinking, around the house or camping, fishing, hunting, etc., at lowest cost. Shooting force is adjustable with amazing maximum power and accuracy—no recoil or forward lunge to disturb your aim. **Belt Action-Hammer Fire-Hair Trigger-Safety Lock-Hand Pump**. Single Shot BB with 1 lb. Shot \$8.50; Single Shot Cal. .177 or .22 Rifled with 500 Pellets \$10.00; BB 25 Shot with 1 lb. shot \$10.00. Also a complete line of BENJAMIN GENUINE COMPRESSED AIR PISTOLS from dealer or factory. Write Today. BENJAMIN AIR RIFLE CO., 835 Marion St., St. Louis, Mo., U. S. A.

DOES OIL WEAR OUT?

U. S. Bureau of Standards states: "Oil does NOT wear out mechanically and may be used over and over again." (After reclaiming).

Thousands of car, truck and tractor owners have proven the truth of this statement with the use of **'RECLAIMO'**. This revolutionary device filters and reclaims crankcase oil as you drive. Saves Time, Trouble and Money! Our 36-page illustrated booklet, "OIL FACTS," contains complete details and startling oil truths that will amaze you. Write for your copy today—It's FREE.

(Sold direct and by reliable dealers everywhere.)
RECLAIMO MFG. CO., 2306 N. Western, Dept. 51. CHICAGO

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WE SPECIALIZE IN WHEEL SETS, ENGINES, ETC., for building Cars, Scooters, Trucks, etc. We carry only the best at the lowest prices. Send 10c for parts catalog and plans for three Midget Racers, Scooters and other vehicles. It pays to use only reliable plans and parts—We guarantee satisfaction. **Build-Or-Own** Devices, 536 North Parkside, Dept. PM-2, Chicago

Save Money use our Proved Plans and Parts

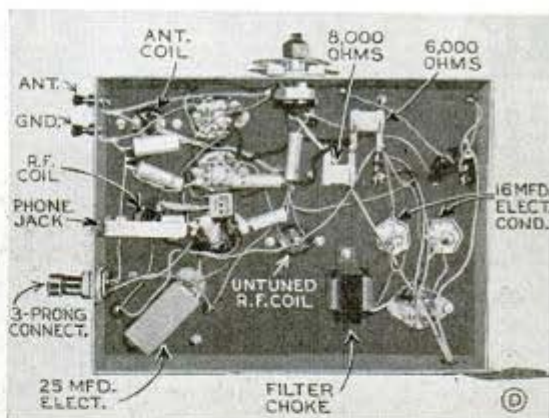
STOP Scratching

Relieve Itch Fast or Money Back

For quick relief from itching of eczema, pimples, athlete's foot, scales, scabies, rashes and other externally caused skin troubles, use world-famous, cooling, antiseptic, liquid D. D. D. Prescription. Greaseless, stainless. Soothes irritation and quickly stops the most intense itching. 35c trial bottle proves it, or money back. Ask your druggist today for **D. D. D. PRESCRIPTION**.

(Continued from page 132A)

be obtained to suit the input requirements of the audio amplifier used. The power transformer high-voltage secondary winding is 675 volts center-tapped; 60 ma. To



balance set, turn variable condenser $\frac{3}{4}$ s open and adjust trimmers (Tr.) for maximum volume. The blueprint number for this article is R-287.

Complete Set of Plug-In Coils

(Continued from page 298)

the wire through this hole, down through the coil form, through one of the hollow prongs in the base. Your circuit diagram or coil instructions for the circuit you are using will tell you which prong is to be used in that particular circuit. When the bare wire protrudes through the hole in the bottom of the prong, solder the wire to the prong, completely covering the tip end of the prong smoothly. Next wind the other end of the wire tightly around the coil form for the number of turns specified on the chart. When the turns are completed, cut off the wire leaving about 3 or 4 extra inches. Pass the wire through another hole drilled at the end of the winding on down through the coil form and proceed to pass it through another prong, and solder it as described above. This completes the secondary winding of a 4-prong coil. The primary winding will be connected to the other two prongs. The first hole for the primary winding will be drilled about half way down the coil form and the winding procedure is the same. Six-prong coils are wound in the same manner, the tickler coil being interwound with the secondary as shown in Fig. 2. When the coils are completed, apply a coat of "coil dope" lacquer.

LET YOUR DREAMS COME TRUE with a NEW RANGER SCOOTER

MAKE BIG MONEY!

RIDE, RENT, OR SELL!

The 1941 models are ready, and selling like hot cakes—but order your demonstrator while territory is still open! **You can make money** sell to stores for quick cheap delivery, or to riders who admire your demonstrator. Start your own delivery service. Rent for easy hourly profits at resorts, beaches, gas stations. **You can save money** 120 miles per gallon, 30 m. p. h. Store owners build up business by quick cheap deliveries. Employees going to work, farmers to town—a Ranger pays for itself. Vacationers cross U. S. for \$6.00 gas!

8 MODELS Solos, Tandems, Delivery, Sidecar —also Power-Units for bikes. All have the sparkling performance and reliability for which the Ranger is famous.

Specifications: 1½ or 2½ h.p. 4-cycle motor, positive oil pump lubrication, automotive float feed carburetor, mercury clutch, starter, lights from generator, wonderful new automatic gearshift, all-steel X-member frame, spring fork, double tube balloon tires, finger tip controls.



Tandem



Delivery



Side Car



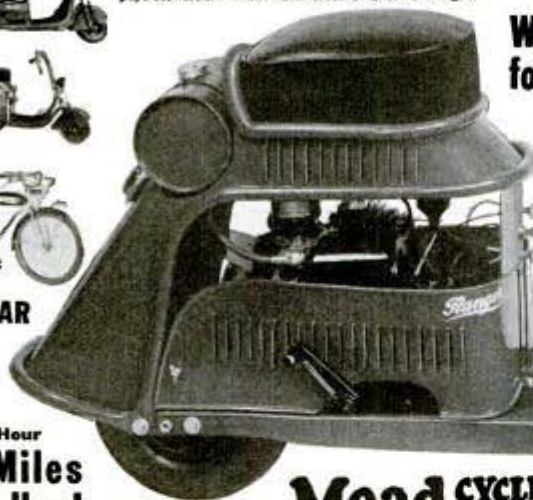
Power Unit for bicycles

CIRCULAR FREE!

30

Miles Per Hour

120 Miles per gallon!



Write today for Full Details!

If you are in a position to sell or rent Ranger Scooters, there is good territory still open—but hurry! Please indicate if you are interested in sales or in personal use of Rangers.

EASY TERMS

available in most states.

Amazing Low Direct-To-You Prices

Mead CYCLE COMPANY
DEPT. R-1, CHICAGO

Ranger Bicycles
For 51 Years



NEW TURN SIGNAL

FLASHES from REAR WINDOW—DASH Control
AGENTS A whirlwind seller. Drivers buy on flash demonstration. Dealers buy 3 to 12. Your profit mark-up as high as 264%. Biggest sensation of year. Rush name quick for facts and Demonstrator sample plan. All Free! Rush. **WATCH-MY-TURN SIGNAL CO., Dept. W-162, Walnut Bldg., Des Moines, Iowa**

Big Money for Workers In Home or Shop



MONEY-MAKING PROJECTS. Color-glazed concrete lawn, cemetery pottery made without molds or cores. New, Patented method. Use only sand, cement, cheap materials. Tiles, walls, gravestones. Statuary, giftware. Basement waterproofing. Booklet, details 3¢ stamp.

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Dept. 6, 13 W. 26th St. Minneapolis, Minn.



Just Guide It!

More like magic than any tool you ever saw. Imagine an electric scroll saw only slightly heavier than a hand coping saw . . . a tool that takes no effort to run, no pressure to feed. Works at any angle—on big assembly jobs or on the tiniest piece you can hold in your fingers. Runs 7200 strokes a minute . . . so fast the blade seems to stand still. Sturdily built . . . only two moving parts . . . never needs oiling. Easily cuts intricate designs—so smooth it eliminates sanding. Noise or craftsmen, a thrill awaits you when you get a Moto-Saw in your hand.



DREMEL MFG CO.
Dept. 5-111-R
RACINE, WISCONSIN

Safe as a Hand Saw

It's fast . . . cuts on an average of 1 ft. per minute up to ¾" medium hard wood. Operates on 110-120 V. 50 or 60 cycle alternating current. If your dealer does not yet have MOTO-SAW, send \$4.85 . . . we'll pay postage. Or send \$1. pay postman balance plus postage. **SEND NO MONEY BACK** if not delighted after inspection.

RED-E Model "Z" Tractor

Profitable Power of Low Cost
1 or 2 H.P. Cultivating, light plowing, etc., 50-200 ft. minute. High clearance, space-saving power turn. Trouble-free, economical, safe. Low factory price. Guaranteed. 2 weeks trial. **FREE book—Write today.**
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Dept. ZV-21 West Allis, Wis.

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Over 80 pages! Beautifully Printed and Illustrated! Trailer Suggestions and Ideas galore! Catalog shows America's greatest line of Trailer Parts and Equipment at lowest prices. Everything from wheels to top. Rush 25c (in U.S.) today. Satisfaction guaranteed!
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PLANS FOR NINE NEW JIM DANDY TRAILERS Ready

Build your own trailer! Send 10c for Jim Dandy's interesting new **TRAILER PLAN CATALOG** which illustrates and describes **NINE** new models including 6 modern house trailers, plus sport, camp, and utility trailers. Rush 10c (in U.S.) for Catalog today to **JIM DANDY, BOX 125-A, WAUSAU, WIS.**

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Tests Everything Electrical From 100 to 550 Volts

A real necessity for electricians and home because it has 1001 uses. Equipped with a Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, all kinds of electric appliances, etc. Tells A. C. from D. C. Far superior to ordinary clumsy test bulb. Fountain pen size with clip for carrying in vest pocket. Lifetime guarantee.

PATENTED
L. S. BRACH MFG. CORP.
55 Dickerson St., Newark, N. J.



NEW!
See it at your dealer, or send for Free Booklet!

Sensationally Improved
Auto-Glide

Equipped With
"FLOATING DRIVE!"

What a thrill you have coming when you ride this newest Auto-Glide! Now equipped with "FLOATING DRIVE"—new centrifugal principle that operates as easily and smoothly as the famous Fluid Drive! No clutch pedal! No gear shift! You start, speed up, and climb ordinary hills without touching shift lever or clutch pedal! Gives flashy new pick up... remarkably smooth power. You can't "kill" the engine when starting or on steep grades!

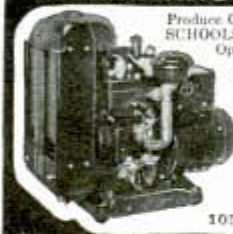
AMAZING "SMOOTH-RIDE" COMFORT! Coil springs, longer wheel base, larger balloon tires, wider seat! Low center of gravity, easier to ride than bike!
SAFER! Heavier brakes, stronger drive chain, better lighted most rugged machine built.
Electrically welded, all-steel frame!
BRILLIANT PERFORMANCE! Super-powered, almost 3 H. P. Cushman engine gives 125 miles per gallon. That's real economy! Up to 35 miles per hour!

WRITE! See the new AUTO-GLIDE at your dealer's store. Or write for free illustrated booklet. Send Now!

DEALERS: Write for special offer, facts about rental profits!

CUSHMAN MOTOR WORKS, Dept. P-2 Lincoln, Nebr.

ONAN ELECTRIC PLANTS
ALTERNATING AND DIRECT CURRENT



Produce Current, same as City Power Lines, for FARMS, SCHOOLS, THEATRES, PUBLIC BUILDINGS... Operate Lights, Radios, Motors, All Appliances.

Over 40 STOCK MODELS—150 to 50,000 Watts.

Any Voltage—Any Frequency.

Combination A, C—D. C. Types.

Manual, Full Automatic and Self-Starting. \$79 up.

Shipped—COMPLETE, READY FOR OPERATION.

THOUSANDS IN USE IN ALL PARTS OF THE WORLD.

Write for Complete Details.

D. W. ONAN & SONS

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100X TELESCOPE
LENS KIT \$1.95
100 Power Complete Lens Kit



Make your own high powered telescope in one evening of easy work. All optical parts completely finished for 6 ft. long refracting telescope. Kit contains 3" diameter 75" F. L. ground and polished objective lens and 2 astronomical eyepieces 50X and 100X. See the mountains and craters on the moon, the ringed planet Saturn, the moons of Jupiter, double stars, etc. Complete lens kit with full directions for mounting at the special price of only \$1.95 postpaid.

EXTRA LARGE 200X LENS KIT contains completely finished 4" diameter 100" focal length ground and polished objective lens, three 1 1/4" diameter eyepieces giving 60X, 133X, and 200X, an aluminumized diagonal for overhead viewing, and a color filter for insertion in any eyepiece, postpaid \$3.95. Prompt shipment guaranteed.

BROWSCOPE CO., Dept. 42, 5 W. 27th St., New York, N. Y.



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More City and Rural Dealers

Start your own business with our capital. It pays better than most occupations. Buy everything at wholesale—sell at retail. Be your own boss. Make all the profits on everything you sell. We supply everything—Products, Auto-Bodies, Sample Cases, Advertising Matter, Sales and Service Methods, etc. 15 Factories and Service Branches. Prompt shipments. Lowest freight and express rates. Superior Rawleigh Quality, old established demand, lowest prices, guarantee of satisfaction or no sale, makes easy sales. 200 necessities for home and farm, all guaranteed the best values. Rawleigh's Superior Sales and Service Methods secure most business everywhere. Over 41 million Products sold last year. If you are willing to work steady every day for good pay, write for complete information how to start your own business with our capital.

W. T. Rawleigh Co., Dept. E-38-PPM Freeport, Ill.

Say you saw it in Popular Mechanics!

GIVEN NOTHING TO BUY

Send No Money—Send Name—BOYS! LADIES! GIRLS! POPULAR WATCH or CASH GIVEN. 25¢ Just sell only 12 boxes White CLOVERINE Brand SALVE for chaps, mild burns, shallow cuts to best friends at 25c a box (with picture free) and return only the \$3 collected—not one penny more. Many other premiums GIVEN. 45th yr. Be First, Write for Salve and pictures NOW! Sent postage paid by us.

WILSON CHEM. CO., INC., Dept. 49-P, TYRONE, PA.

BURN YOUR NAME ON TOOLS WITH THE ARKOGRAF

PROTECT YOUR TOOLS FROM THEFT
Write with electricity any name or design on the hardest and finest tools and instruments, or any metal. Use writing on gear with pen or pencil.
Complete Outfit \$3.50—Fragile Anyhow
Interesting illustrated circular free. Write today. Agents wanted.
ARKOGRAF PEN CO., 3927 S.E. Stark St., Portland, Ore.

HOLD-E-ZEE AUTOMATIC GRIP SCREWDRIVERS

Hold, start and set-up screws in unhandy places. Gripper instantly released by spring action, sliding up out of way when not in use. Finest materials throughout, chrome vanadium blades; many have transparent, insulating unbreakable handles. (Illustrated.)
No more expensive than ordinary screw drivers. Models for round-head screws. Handiest ever. Get one today. At auto-supply, hardware or electrical stores.
UPSON BROS., INC. 86 EXCHANGE ST. ROCHESTER, N. Y.

GOLDENTONE... 50% OFF

AGENTS WANTED
Deal Direct, Factory Prices Over 60 models to choose from—4 to 12 tubes. Portable \$8.00 up. Farm sets \$8.95 up. Car sets \$8.95 up. Foreign hand sets \$5.00 up. Samples 50% off. Quantity discounts. Free 1941 Bargain catalog gives details of 10 day FREE trial, agent's proposition and discounts. No obligation. Mail postcard to GOLDENTONE RADIO CO. Dept. P.M., Dearborn, Mich.

BUILD AN ARC WELDER FROM OLD GENERATOR

For Light or Heavy Work. 75-200 amperes. Complete PLANS and valuable catalog 35c. Over 1000 Electrical Supply Bargains.
LeJay Mfg. Co., 1347 LeJay Building, Minneapolis, Minnesota

New Adding Machine Fits Vest Pocket!

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells to offices, stores, homes—wherever figures are used. Write quick for FREE AGENTS sample offer and Money-Making Plan.
VE-PO-AD, Dept. 212, 303 W. Monroe St., Chicago

Sani-Flush
Cannot Injure Aluminum Cylinder Heads or Fittings
CLEANS OUT AUTOMOBILE RADIATORS

BUILD THESE PROJECTS

For garden or lawn. Easy to build. Easy to sell. Detailed blueprints Model #25 Dutch Windmill 50c. Model OM-69 Old Mill, 85c. Lawn Figure Patterns—Sunbonnet Girl, Dutch Boy, Tulip Girl, Holland Pair, 50c each, all 4—\$1.00. Catalog illustrating many models, send 10c, today.
CRAFTSMAN'S MODEL CO., Dept. P-49, 2030 N. 41st St., Milwaukee, Wis.

KINKADE GARDEN TRACTOR and Power Lawnmower
A Practical Power Plow and Cultivator for Gardeners, Suburbanites, Florists, Truckers, Nurserymen, Fruit Growers
Low Prices - Easy Terms
American Farm Machine Co.
1058 33rd Av. SE. Minneapolis, Minn. Catalog Free

K. 1048

Electrons in Overalls

(Continued from page 255)

Electronic tubes in factory chimneys give instant warning if smoke thickens, indicating a wasteful fire; others sort cigars or match colors in fabrics and paint samples. Coffee, corn flakes, face powder, toothpaste and dozens of other common products are tested for uniform color by these little electrons in overalls.

Thermoelectric sextant detectors can peer through fog or clouds and register the warmth of a man's face a mile away. They are aiding ships to avoid icebergs.

A cotton picker is regulated by electrons in overalls which instruct the mechanism to reach only for the bolls which are white and therefore ripe. Other tubes stop and start conveyors, detect fouls in bowling matches, run dumb-waiters, weigh cement and baking powder, inspect storage-battery parts and warn of paper breakage on printing presses. Used in X-ray devices, they spot flaws in castings and weldings, show up foreign particles in packed candies and peanuts and bone splinters in prepared hams.

And now, a whole new field has been opened by experiments with an electronic device which probes the action of the brain, just as the geologist investigates interior strata of the earth. The very process of thought itself may be measured by the electronic reaction it sets up. Another school of medical research is having success in locating brain tumors and diagnosing similar disorders with electronic-tube devices. A revolution may be impending in the study of virus diseases which some believe are caused by germs too small to be seen by the most powerful microscope. Researchers are speeding their experiments with microscopes activated by electrons in vacuum tubes and responding to light waves invisible to the eye. They are satisfied these little toilers can unfold secrets long concealed from mankind—perhaps the secret of life itself.

And, finally, another group is hard at work to make practical use of another discovery that may have far-reaching effect on human existence—the conversion of sun rays into work-a-day electricity through electronic tubes. It not only can be done, but actually has been done. The problem remaining is production in quantity.



Change the toughest job in your shop into minutes of effortless pleasure with the New

SKILSAW Zephyrplane Jr.

-2 1/4 IN. BELT SANDER

You'll be proud of the satin-smooth, professional finish you will produce with ZEPHYRPLANE JR.—easier and faster—and you'll get more pleasure out of your work when you eliminate the tiresome job of hand-sanding. Easy to handle—weighs only 9 1/2 lbs., perfectly balanced for uniform pressure on the entire sanding surface. Never any ripples, ridges or scratches. Ideal for wood or metal. Link-belt drive. Touch control lever makes belt-changing easy. Works from any light socket.

SKILSAW, INC., 4779 Winnemac Ave., Chicago

• SEE IT AT YOUR HARDWARE OR MILL SUPPLY DEALER'S . . . OR WRITE US TODAY FOR FULL INFORMATION!



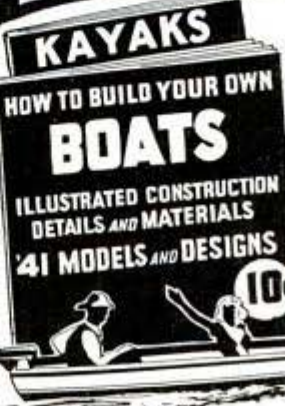
FREE SEND FOR THIS AMAZING BOOK

Tells about dry air dangers; tells about a simple machine that moistens the air, guards against winter ills, protects drapes and furniture; LOW PRICED. Send postcard today, no obligation, to

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EASY TO BUILD



U-MAK-IT

KAYAKS, ROWBOATS, OUTBOARDS, INBOARDS, RUNABOUTS, DINGHYS. Cut-to-fit boat kits for home assembly, with illustrated building instructions. No experience necessary. Simple as A-B-C. Save money—Enjoy building your own in a few evenings.

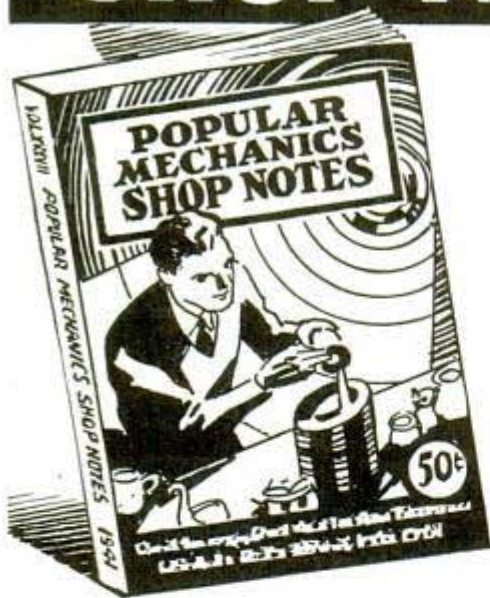
THOUSANDS OF SATISFIED BUILDERS RUSH—SEND 10c

postage for both these colorful illustrated booklets—greatest selection we have ever offered.

CAPTAIN! I want both illustrated booklets at once. Enclosed find 10c.

KAYAK BOAT CO. Name
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 New York, N. Y. City State AP
 "Designers and Builders"

SHOP NOTES for 1941



WITH the publication of the 1941 volume, there are now available six editions of POPULAR MECHANICS SHOP NOTES which readers have described as the most valuable book in the world for the man who uses tools.

The following are a few of the subjects covered in these amazing volumes:

1941 SHOP NOTES

- belt sander fits lathe
- shop light adjusts three ways
- rack for chisels
- electric wiring in the home
- electric pencil tools soft metals
- money-saving kinks on lubricating car
- speeding up metal turning
- tires for lawn mower
- working with wall-board
- shadowless light stops eye strain
- midget circular saw
- liquid plastics
- outdoor fireplace
- tumble for perfect finish
- wood joints
- from pattern to casting
- blast burners you can make
- laying out work on sheet metal
- the right weld in the right place
- lathe work turned off center

1940 SHOP NOTES

- novelty finishes
- cement mixer
- setting calipers
- machinist's sliding hammer
- density meter for color photo work
- novel photo backgrounds
- modern plant stands
- hand loom weaves cane
- garage doors burglar-proof
- self-feeding bin for stokers
- darkroom timer
- high speed cutting
- workshop for limited space
- motorize lawn mower
- reducing noise in heating plant
- gem-cutting bench
- tractor built from old car parts
- making castings in home shop
- building & using wattmeters
- cementing glass,
- metal and celluloid
- rocking photo print washer
- photo stamps
- machine tools turned on lathe
- soldering tricks
- universal photo enlarger
- lasting beauty in wood finish
- photo negative drier
- silk stencils
- tap & die holders
- correct lathe centering

1939 SHOP NOTES

- turning alabaster
- cleaning car upholstery
- helps for machinists
- homemade wood lathe and shaper
- glass blowing
- midget gas engine for model airplanes
- complete guide to successful wood turning
- keep auto headlights in top efficiency
- window displays
- imitation marble
- "sawing" glass on lathe
- power driven jig shear
- telescope mount
- stainless steel soldered, brazed and welded
- electro-engraving with bottle cork
- chemical coloring of metal
- lumber storage rack
- wind-driven generator

1938 SHOP NOTES

- feeding shade trees
- midget gas engine turned from castings
- jigsawed lawn ornaments
- fitting home darkroom
- pipe - thawing transformer
- table lamps
- power - driven table saw
- cabinet humidifier
- plastic ornaments
- plating without cyanides
- electric arc torch
- using drills properly
- luminous paint
- sail rig for canoe
- concrete drive-ways
- garage time savers
- boring jig spaces holes accurately
- cutting sheet plastics

1937 SHOP NOTES

- two belt sanders
- electro-plating leather, wood, etc.
- furnace humidifier
- oil finishing
- metal furniture
- rewound auto generator gives 110 volts
- designing and building thermostats
- horizontal photo enlarger
- electro-plating with alloys
- truck lift
- resilvering mirrors
- working with plastics
- servicing electric motors
- concrete garden furniture
- finding gold
- window sign
- folding bed for auto
- soldering aluminum

1936 SHOP NOTES

- serviceable windmill from junk parts
- casehardening iron & steel
- electric test bench
- electric brooder for 500 chicks
- how to use micrometer & other measuring tools
- milling cutters reground without annealing
- clamping kinks for craftsmen
- tools for the modelmaker
- homemade electric drill
- efficient ball-bearing band-saw you can make
- repairing golf clubs
- belt sander for lathe
- metal turning tool equipment
- electric lights for your cottage
- handy gun cabinet
- sturdy circular-saw table
- metal finishing
- dust disposal in home workshop
- welding & cutting with oxy-acetylene

I enclose remittance for \$_____ for which you may send me the SHOP NOTES checked below.

- 1941 Shop Notes—50 Cents
- 1940 Shop Notes—50 Cents
- 1939 Shop Notes—50 Cents
- 1938 Shop Notes—50 Cents
- 1937 Shop Notes—50 Cents
- 1936 Shop Notes—50 Cents
- Shop Notes for 6 years as above—\$2.45

Name _____

Address _____

City _____ State _____

Mail to POPULAR MECHANICS PRESS,
200 E. Ontario St., Dept. 241, Chicago, Ill.

Paul Bunyan's Pond

(Continued from page 213)

weeds, cut down fruit trees and dismantled buildings. There were 600 farms in the valley. Fence posts and utility poles were pulled out. Miles of fence and wire were rolled up. Cattle and stock were moved to higher ground. Whole communities simply disappeared. You can ride in a launch now on water a hundred feet over former farms, villages and homes.

As this is written, the river has become a lake more than sixty miles. Water has climbed 170 feet behind the dam. It has another 170 feet to go.

A hundred miles up the river from the dam is a stretch of white water known as Kettle Falls. A rocky island splits the channel and the river tumbles over rocks and falls on either side. Kettle Falls will disappear beneath a hundred feet of water, and with it will disappear the island, which to Indian tribesmen of the region is hallowed ground. In the shallow soil of this island were buried hundreds of red men. Some were buried before the coming of white men to the valley, and others in more recent years. There was a cry of dismay among the Indians when they learned that the bones of their ancestors were to be washed out or covered by the white man's lake. In other secluded benches and nooks along the stream were still more burial grounds. Cries of the Indians were heeded by the Reclamation Bureau. A contract was let for digging up the bones and for reburial in selected plots above the rising water.

In some of the burials, bodies had been wrapped in deer hides, long molded and decayed. Others had been shrouded in silken cloth and then wrapped with hides, and in most of the uncovered mounds were found copper beads, arrow heads, stone implements, most prized possessions of those who had died. The government contract was for removal of 600 graves, but before the Bureau called a halt, 1,200 had been uncovered.

Moving day in the valley was not without its human sorrows and disappointments brought about when families were uprooted from the land and scenes they had called home. Nor was it without its comedy.

(Continued to page 140A)



Speedline
Corona Silent
Model

CORONA

THE PORTABLE WITH
THE OUTSTANDING FEATURES

FLOATING SHIFT—speeds up work, saves your energy. **SPEED BOOSTER**—gives lightning action. **TOUCH SELECTOR**—adjust keys to your own touch. **ALL AROUND FRAME**—Coronas are built to take it.

See your dealer for free home trial.

L. C. SMITH & CORONA TYPEWRITERS INC.
Desk 2, 723 E. Washington St., Syracuse, N. Y.
I'm thinking of buying a Corona. Please send me
free illustrated booklet.

Name _____

Address _____

State _____

City _____

EARN MORE MONEY GRINDING LAWN MOWERS "THE UNIVERSAL WAY"

FULL OR SPARE TIME

Build a Business of Your Own in Your basement or garage and earn \$135 a month. Mr. Felber of Ind. writes, "My UNIVERSAL GRINDER is faster and more accurate than any other grinder. Its efficiency enabled me to sharpen 450 mowers in 4½ months." More than paid for itself the first month. Every customer satisfied. **Only on the UNIVERSAL** can the inside face and edge of stationary blade, as well as the edge of the reel blades, be ground to proper clearance **ALL IN ONE SET-UP** without removing any blade from the mower. Tool Grinding Rest included.

"The Universal Way is the Modern Way"
Write for Free Folder

Rogers Mfg. Co., Dept. 4A, Lindsey, Ohio



ACTUAL SIZE V-PLUG



65c

MODEL BUILDERS—ATTENTION!

Champion has designed 3 spark plugs for model gas engines which give the same dependable performance as the regular spark plugs. Silliment sealed. Sillimanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	1/2"	3/2"	5/32"
Weight, Grams	8	3 1/2	2 1/2

CHAMPION

SPARK PLUG CO.

900 Upton Ave.
Toledo • Ohio

HERE'S YOUR '41 FREE FISHING GUIDE



Shakespeare's Wondereel

LONG CASTS • NO BACKLASHES

For Bait Casting \$6.50, \$8, \$10, \$15
For Surf Casting \$8.50, \$9.50

Anyone can learn to cast in 5 minutes—now fishing's fun for all the family. Fish at night without backlashes.

NO
THUMBING



NEW GLOLITE WONDERBAIT—glows 5 hrs. if exposed 3 minutes to sun or flash-light. 50c postpaid (90c value—limited supply). Send cash or stamps.

FREE 80 pg. Fishing Guide and Catalog with or without bait. Write today.

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KALAMAZOO, MICH.

Shakespeare **BALANCED TACKLE**

WATCH this publication for announcement by **UNIVERSAL CAMERA CORPORATION** of its spectacular program for 1941!

New WITTE 40 H.P. DIESELECTRIC



Your present power bill will buy a WITTE that produces power and light for 1c a K.W.H. Save up to 75%—a size for every need. 2500 to 30000 watts; 1, 2 and 4 cylinders.

Write today for finance plan, literature and name of dealer.
WITTE ENGINE WORKS 1742 OAKLAND AVE.
KANSAS CITY, MO.

MAKE BIG MONEY at HOME! NEW INVENTION *Electroplates by Brush*



New, patented invention makes possible big earnings AT HOME. Replate auto-parts—worn articles in homes, stores, hotels, restaurants, etc., with durable, sparkling, new coat of metal—with stroke of brush. Easy, simple, quick. Genuine Gold, Silver, Nickel, Cadmium, etc. Everything furnished. Outfit complete, ready for use. No shop required. Clear from \$2 to \$5 an hour in lifetime business. Small investment starts you in business. Steady repeat. Machine can pay for itself in week. Send TODAY for FREE SAMPLE and illustrated BOOKLET how you can have a life income from a business of YOUR OWN built upon satisfied customers. Act at once!

**FREE
SAMPLE and
BOOKLET
EXPLAINS ALL**

WARNER ELECTRIC COMPANY
225 N. Wabash Ave., Chicago, Ill., Dept. 5-K

(Continued from page 139A)

Kettle Falls, an old town, had to move out of the way of the rising water. The people liked their town's name, and yet they couldn't legally take the name along. So they voted to extend the city limits for four miles to take in the little high and dry community of Meyers Falls.

Meyers Falls didn't like it but they were not incorporated and they were outnumbered, so they lost their identity. Meyers Falls is now Kettle Falls, although the names of some of the stores and buildings still read "Meyers Falls."

A few years ago, stern-wheeler steamers plied the upper Columbia creeping cautiously through the swirls, lining the rapids, and taking days on end to haul passengers and freight a hundred miles or less. Now those steamers have disappeared and in their place have come pleasure boats of all descriptions. On week ends and holidays, excursions are run from the dam up the new lake in streamline Diesel-powered launches. Half a hundred boats are in the Grand Coulee Yacht Club, and a few miles above the dam, prospective summer home sites have been surveyed.

Substitution of a placid lake, five miles wide in places, for a turbulent river, opens a vast new field for recreation in central Washington. Sportsmen, with the aid of state and federal agencies, will stock the water with game fish. Docks and harbors are to be built. When the dam is completed and rapids have vanished for the entire 151 miles, it will be possible to make boat trips into the scenic Arrow Lakes country of British Columbia in Canada. And because the Reclamation Bureau intends to keep the level of the lake nearly constant through regulation of the flood water runoff and subsequent irrigation pumping, there will be year around use of the lake's smooth surface.

It is true, too, that though many farms will be inundated, a much greater area of land will be made available for farming along the reservoir through the use of cheap power for pumping.

At the start, the lake bed included 17,000 acres of brush and 30,000 acres of timber which had to be cleared. Because some of the river land was inaccessible from existing roads, engineers built floating barges on which camps were established. These

(Continued to page 143A)

BIG MONEY

SHARPENING LAWNMOWERS
WITH THE
IDEAL SHARPENER

WALTER ROTH SHARPENED 893 MOWERS IN EIGHT MONTHS!

Yes, sir, if you want to make real money, send for our free book, "How to Build a Profitable Business of Your Own." With the Ideal Sharpener, most men earn up to \$25 per week, even in spare time. Walter Roth, Mich. sharpened 867 mowers last year, 893 the first eight months of this year. G. A. Blanchard, Mass. sharpened 300 mowers in two months. J. H. Kellogg, Mich. paid off \$1200 on his home this year. **NO EXPERIENCE NECESSARY.** Any man can operate an Ideal Sharpener. Simply set the mower in the Ideal, make a few simple adjustments and the machine does the rest. Sharpens any mower to perfect edge in 15 to 20 minutes. Unusual price \$1.00 to \$1.50 per mower. **SHARPENS LIKE MAGIC.** Makes old, dull, badly worn mowers cut like new. One customer tells another—and so you build a sound, profitable business of your own. Start in your basement or garage. Work spare time or full time. Attachments for grinding skates, grass shears, hedge shears, sickles, scythes and axes. Our **FREE PLANS** show you how to get started. Write today.



THE FATE-ROOT-HEATH CO.
241 Bell St. Plymouth, Ohio

**EXCELLENT
SIDE-LINE
BUSINESS**

EASY TO OPERATE! PRACTICALLY 100% PROFIT!

**PISTON TYPE
COMPRESSOR**



EASY PROFITS IN PAINT SPRAYING

Paint walls, ceilings, screens, furniture, radiators, machinery faster, better! 1/4 H. P. motor 110 Volt 60 Cycle AC, complete with Spray Gun, 15 ft. hose. Weighs only 44 lbs. Carry anywhere. **FULLY GUARANTEED.** Complete with motor only \$31.15, or only \$25.00 less motor, f. o. b. Chicago. 85 Deposit, Balance COD, or SEE YOUR DEALER. Circular FREE. Get started making money NOW!

Ideal Automatic Pump Co. \$25.00 Less Motor

Dept. PM-2, 801 Washington Blvd., Chicago, Illinois

STANDARD GARDEN AND SMALL FARM TRACTORS

**Plow
Seed
Cultivate
and Lawns**

Powerful Gas Tractors for Small Farms, Gardeners, Florists, Nurseries, Fruit Growers, Poultrymen.
1 & 2 Cylinders
High Wheels, Rubber or Steel Tires. Walk or Ride.



Do Belt Work—Free Catalog

STANDARD ENGINE CO.
Minneapolis, Minn. New York, N. Y. Philadelphia, Pa.
3221 Como Ave. 617 West 26 St. 2546 Market St.

10 NEW SETS OF STANLEY PLANS

Each set includes five interesting things to make. Complete instructions.

- Set No. 1 Hanging Shelves 10c
- Set No. 2 Lamps 10c
- Set No. 3 Trays 10c
- Set No. 4 Tables and Stands 10c
- Set No. 5 Book Ends and Small Articles 10c
- Set No. 6 Flower Pot Holder
and Desk Articles 10c
- Set No. 7 Mirrors, Footstool and Table 10c
- Set No. 8 Magazine Stands and Tables 10c
- Set No. 9 Chests and Boxes 10c
- Set No. 10 Smokers' Stands 10c

Select the sets you want; send check, money order or stamps to

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS
122 Elm Street, New Britain, Conn.

ENGINES

A real Money Maker for farm or factory. Uses cheap fuels—pays for itself out of savings. Low factory prices—Easy Terms. Write for Engine and Lopsaw Catalog.



WITTE ENGINE WORKS 4742 OAKLAND AVE. KANSAS CITY, MO.

LEARN TO WORK WITH SHEET PLASTICS

Plastics sheets can be formed easily by my process—make embossed panels, raised letters, decorations for stores and homes, lamp shades, Christmas ornaments, displays, bottles, trademarks. I show you how to get depth and third dimension. Make transparent organs, heart, brain, etc. Unlimited possibilities for the artisan and home craftsman. Plastic sheets are obtainable in various sizes, thickness, colors—clear, transparent or translucent. Send \$1.00 for complete instruction course (fully illustrated) and experimental sample sheets. **R. H. VAN MARGER, 55 WEST 42nd STREET, NEW YORK CITY**

OTTAWA LOG SAW \$39 BIG BOOK FREE



PUTS THIS OTTAWA to work for you. **MAKE MONEY!** Wood is valuable. Does more than 10 men. Easily operated. Falls trees—saws limbs. Use 8 hp. engine for other work. Write for **FREE BOOK.** **OTTAWA MFG. CO., 4027 Wood St., Ottawa, Kans.**

START A BUSINESS AT HOME.. LIKE JOHN LEHMAN—WHO SAYS



This popular Fyr-Fyter has provided me with a **STEADY INCOME** during the past Eight Years

We need more men like John Lehman. Are you looking for a steady and permanent connection with a nationally known company which will offer you an opportunity for independence? No capital required for store, stock or fixtures. We deliver, collect and mail profit checks each Friday and help you with Direct Mail Advertising. Write today about your past experience and we will mail you a money making plan which has brought success to hundreds of others. Address **FYR-FYTER FACTORY, Dept. 90-62, Dayton, Ohio**

FINE BUSINESS FOR MEN PAST 40

I'M SO HAPPY NOW
THAT CHARLES IS
DOING SO WELL IN HIS
NEW BUSINESS



**TOOK IN \$217
in 10 DAYS
WASHING WALLS**

times faster and better than by hand. Newly invented machine washes walls 6 Charles Stelle took in \$217 first 10 days. We want more men to go into business for themselves. Customers everywhere—homes, schools, offices, stores, churches, lodge halls, hotels all have walls that need washing. You don't have to rent a store or office. You operate this business from your home. The expense for materials is small. What you take in is practically all profit. On a \$10 job cost for materials is about 20c. Write now for complete facts on this Von Schrader Wall Deterger which washes paint beautifully and postpones repainting many years.

Harold Jones writes: "I landed a \$40 job the first day."

J. Cranston says: "I have several jobs to start on Monday, thanks to your help."

Clyde Brandt writes: "I made a demonstration in a public school and got a contract which will more than pay for my machine in the next few days."



Easy Payments
It takes only a few dollars to get started in this money-making profession. No experience necessary. The total price is so small and the payments so easy that anyone with ambition should get started NOW.

SEND FOR FREE INFORMATION
There is No Obligation

VON SCHRADER

MANUFACTURING CO.

772 Pl., Racine, Wisconsin.



Do more
Earn more
Work less
with a

**Red Universal
E Tractor**

You plow, disc, cultivate, mow, haul, do belt work, for about 33c a day. Safe, trouble-free long life. New plow lift, new reverse. Hundreds used. Save by buying from maker. Two weeks trial. FREE catalog. Write today.

PIONEER MFG. COMPANY
Dept. V-21 West Allis, Wis.

**SAVE! PRECISION BUILT HOME WOOD-
WORKING MACHINERY NOW AT
LOWEST PRICES!**



Better built for heavy duty work just like the new streamlined Blue Star Lathes. It's a big lathe, 48" structural steel bed, 10" tool rest. Sealed ball bearings. 4-step Cone Pulley. V-Belt and dozens of other fine features all at amazing low prices. A complete line of accessories,

too. Write today for big Blue Star Book of precision built equipment... the kind you've always wanted to own. See the money-saving prices.

BLUE STAR PRODUCTS, 602 Lawn Ave., Fairfield, Iowa

**NEW MYSTERIOUS
BLACK LIGHT
ELECTRIC EYE**

FREE BURGLAR ALARM and ANNUNCIATOR

Send your name—no money—for free facts about the sensational sales success—**RAY-ALARM**—the first electric eye at a low price. Tremendous national publicity has created huge market with stores, homes, shops, factories as a burglar alarm and in gas stations and offices as an annunciator. Salesmen and distributors are now **CASHING IN** on spectacular demonstration and magical performance. If you can sell, don't lose a minute. This is the biggest profit opportunity in years. Send name today to: **RAY-ALARM, Dept. R-162, 225 Fifth St., Des Moines, Iowa**

Spindle SHAPER \$3
less cutters (C. O. D. or outside U. S. \$5.25) Postpaid
Make tongue and groove joints, shape mouldings, picture frames, plaques, etc. Limitless projects can be given a professional finish with this shaper. It has 8" x 5 1/2" steel table; stands 5 1/2" high. Uses standard 5/16" hole cutters. (Cutters 55c each.) Oilless bearings. Your fractional H. P. motor runs it.

FREE CATALOG describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 41 other cash and merchandise prizes). Cat. illustr. complete power tool line: Jig Saw, \$1.50; New Jointer, \$6.00; Circ. Saw, \$3; Drill Press, \$2.00; completely equipped Lathes, \$2 & \$4.00; Sander, \$1, etc. Sold direct only. Order today or send card for Catalog.

J & H Metal Products Co. 5 Commercial St. Rochester, N. Y.

FACTORY TO YOU
WRITE for FREE CATALOG

NEW SUPER-QUALITY KITSELMAN FENCE
Heavier, amazingly improved galvanizing. Tougher, longer-lasting Copper-Bearing Steel. Low Factory Prices. WE PAY FREIGHT. Farm, Poultry and Lawn Fence; Steel Posts, Gates, Barb Wire, Electric Fence, Poultry Supplies, Paints, Roofing. Write: **KITSELMAN BROTHERS**, Dept. 94 Muncie, Indiana

RINGS \$1.50
PINS 30¢

FOR YOUR CLUB
Knit your group closer together and enhance pride of membership with pins or rings. Bastian's big selection, low prices, traditional clean-cut quality work has led the field for 46 years.

WRITE TODAY FOR NEW FREE CATALOG!
BASTIAN BROS. Dept. 74, Rochester, N. Y.

ONE-MAN SAWMILL LOW AS \$59

Makes Lumber, Shingles, Posts, Crating, etc.

TURN TREES INTO MONEY WITH A BELSAW
Pays for itself quickly—thousands in use. Capacity 10 to 30 ft. Mechanical feed. Write for Free Lumber Hand Book and catalog of New Improved 1941 Models. **BELSAW MCH. CO., 3542 C-2 Main St., Kansas City, Mo.**

TRAILER BUILDERS' GUIDE & CATALOG only 10¢
Build a Trailer easily in spare time with world's best line of trailer parts, axles, hitches. Complete working blue prints only 50c. Universal Draw Bar, readily attached to any car. SEND 10c TODAY FOR CATALOG.

HAMMER BLOW TOOL COMPANY, Dept. 102, Wausau, Wis.

FLUORESCENT FIXTURES — ALL KINDS — FACTORY PRICES
Desk Lamp—\$4.85. Bench light, 40-watt—\$5.35. Complete—with lamps. Radio kits—\$3.95 up. Catalog—FREE. McGee Radio, F-22, Kansas City, Mo.

SAVE 1/2 ON WELDING OUTFITS
Heavy-duty Welding Outfits, \$28.73 to \$63.34; Heavy-duty Welding Torches, \$11.52; Sheet Metal & Airplane Torches, \$8.08; Heavy-duty Arc Welders, \$59.90 to \$90.00; Regulators with gauges, \$8.98. Superior Machine Company, Hamilton, Ohio.

OWN A Printing Business
Cards, Tickets, Stationery, etc. Good profit in spare time. **PRINT YOUR OWN** greeting cards, movie titles, church work, etc. Save money. Easy rules supplied. **Junior Press \$8, Senior Outfit \$16 up.** Have home shop. Raised printing like engraving too. Sold direct from factory only. Write for free catalog and all details. **KELSEY, INC. X-37, MERIDEN, CONN.**

CATCH FISH!
minnows, ois, milk, muskrat, with our folding galvanized Steel Wire Traps. **Walton's Automatic Hooks** are so constructed that when a fish gives the slightest pull on the bait the upper hook reaches down and gets a hold that lands him, 3 for 50c. Write for descriptive catalog of Traps, Hooks, Lures, and other specialties. **Walton Supply Co., 3507 Juniata Ave., St. Louis, Mo.**

BUILD YOUR GRANDFATHER CLOCK
Send 25c for Simple SHOP TESTED COPYRIGHTED BLUEPRINT. The Simple Sensible Red-Kut way as thousands have. **DIME** brings PLANS and sixty picture "HOW" Book pricing many fine brass weight Westminster, tube chime, electric and battery movements showing one beautiful colored grandfather clock cases. **Build now and save half!** **KUEMPEL CHIME CLOCK CO., Bldg. 45, Guttenberg, Iowa.**

Always write your name and full address clearly when answering advertisements.

(Continued from page 140A)

camps were then towed up and down the river at will, and men could be taken directly to working locations. One towing barge is appropriately named Paul Bunyan, and another the Blue Ox.

Land and property purchases in the reservoir amount to three million dollars, and there are a few scattered condemnation cases yet to be decided. One involves the power site at Kettle Falls. Clearing expenses make up the rest of the \$11,330,000 total lake bed cost. People of the Northwest call it Lake Columbia but engineers on the job call it Paul Bunyan's Pond.

Small Folding Table for Kitchen Disappears under Counter

Incorporated in a kitchen cabinet unit is a folding table handy for cleaning and preparing vegetables or for serving a snack.



Inset shows how the small work shelf folds down into a vertical compartment under the counter.

It is really a small shelf twenty-eight inches above the floor, a comfortable height for work while seated. When not in use it folds down and disappears in a narrow vertical compartment under the counter.

Send stamped, addressed envelope to our Bureau of Information for name of maker of any device described in this magazine.

only **EVINRUDE**
GIVES THIS SMOOTHER
4 cylinder
PERFORMANCE

EVINRUDE ZEPHYR NOW ONLY \$122.50

S-M-O-O-T-H! . . . here's silky smoothness . . . surging responsiveness . . . thrilling performance that packs more pleasure into every mile! Evinrude 4-cylinder power is a different kind of power because it flows from a different kind of motor . . . a motor with two decks of precisely matched opposed cylinders firing alternately in pairs, and delivering an effortless torrent of 8,000 balanced power impulses per minute! Evinrude offers 4 thrilling "fours", including the sensational

TWO GREAT EVINRUDES
now with **FULL REVERSE**

Zephyr . . . light as a "twin" . . . smooth as an "eight".

FULL REVERSE

Now yours in two famed light motors, Evinrude's advanced development of *Full Reverse!* Steer in any direction . . . reverse the course . . . back away from crowded docks! In the Sportsman and Sportwin models, Evinrude offers Full Reverse combined with all the advantages of Evinrude Underwater Silencing and Automatic Exhaust Relief!

WRITE FOR 1941 CATALOG! Send for new, handsomely illustrated, full-color catalog of 1941 Evinrude models — also catalog of 6 Elto models priced as low as \$26.50, handy Boat-and-Motor Selector and Boat Guide of Leading Builders—FREE! Write today! **EVINRUDE MOTORS**, 4623 N. 27th St., Milwaukee, Wis. Evinrude Motors of Canada, Peterboro, Canada All Prices F.O.B. Factory

AN EVINRUDE FOR AS LITTLE AS \$29.95

Fighting Death in the Street

(Continued from page 196)

instance reducing accidents by forty-five per cent along one busy boulevard.

Monster traffic checks is another kind of enforcement that is being used. In one of these drives as many as 500 law enforcement officers gather at thirty-six selected intersections and thoroughly investigate each passing car and driver. During one four-hour period more than 43,000 cars were stopped and inspected, 6,000 warnings were issued, and 2,899 arrests were made.

More frequently than has been realized in the past, pedestrians are to blame for accidents in which they are involved. Like other cities, Los Angeles is conducting an intensive educational drive to cut down traffic injuries and deaths. The campaign uses newspapers, speeches before clubs and groups, and radio programs. In each case an effort is made to impress on individuals the part that they can play in reducing accidents. National and regional statistics are so abstract that most people fail to grasp their implication, so in this educational work an officer addressing a community club or a school class, describes the number and kind of accidents that have occurred recently in the immediate neighborhood, making his listeners realize that safety is a personal problem. The radio program consists of answering questions asked by listeners, together with driving tips and advice on changes in traffic laws.

Most traffic collisions result from common mistakes made by normal drivers in clear weather, operating cars that are in good condition. Yet in spite of education, enforcement, and engineering—the three E's of traffic safety—traffic deaths on the whole seem to be increasing almost in direct proportion to the increased mileage that is being driven each year. During its history the United States has engaged in wars that extended over a total period of sixteen years, yet nearly twice as many Americans have been killed in traffic in the last sixteen years as the total number of soldiers killed in action or who died of wounds.

Automobiles are safer now than they used to be at the speeds that were considered reckless in the past but many drivers seem to desire to go as fast as their cars will carry them. Ten years ago high-speed fatalities were mainly in the forty-five to

fifty mile per hour range and two years later crashes began to occur at from sixty to sixty-five miles per hour. Five years ago crashes at seventy-five miles per hour were being reported and in 1939 came the 100-mile per hour wreck. With such extreme speeds have come two new accident classifications that were unknown in the past. One is the "multi-car" accident in which following cars are involved because there is not time enough to stop when the car ahead has an accident. The other is the "multi-death" type in which all passengers within a high-speed vehicle are killed instantly.

One driver who rolled up 1,025,000 miles at the wheel without an accident lists seven don'ts that have helped him: don't forget road courtesy, don't drive with less than one hand, don't watch the scenery instead of the road, don't use the car for parlor visiting, don't try a squeeze play even though it may be legal, don't speed or cut in, and finally, don't become careless just because you have never had an accident.

Plastic Salt and Pepper Shaker Combined in Colored Unit

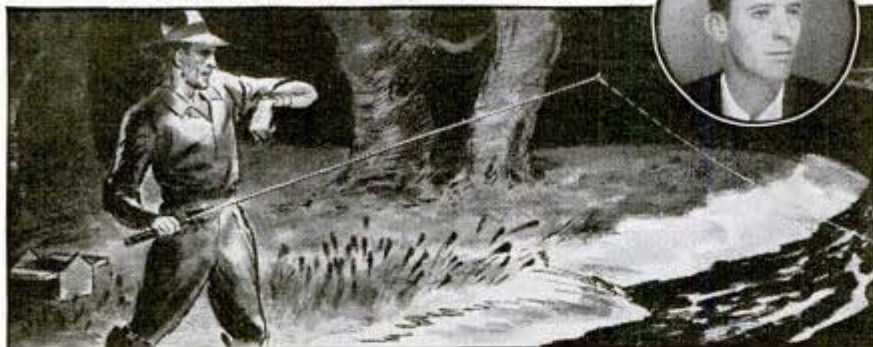
Offered in bright color combinations, a plastic salt and pepper shaker made in a unit lends a modern touch to the table. The plastic will not chip, break or wear and is unaffected by its contents or by soap. It is filled through a leakproof cap.



Pepper and salt shakers are combined here in a unit, made of plastic in bright colors

"BLACK DEATH CLOSED IN ON ME!"

A true experience of WILBUR MOSLEY, Mt. Airy, N. C.



"TORRENTS OF RAIN had been coming down all afternoon when I arrived at my favorite fishing spot—a place where the river turned at a sharp angle. My luck was so good that I lost track of time until I glanced at my watch at 10 P.M.

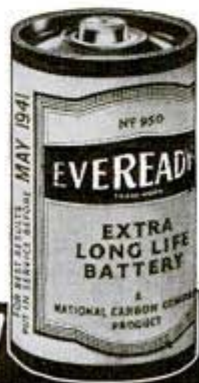
"HASTILY GATHERING UP my equipment, I started back to my car. Suddenly, to my horror, I saw that on each side of me was a hundred yards of black rushing water. The river had overflowed its banks and even now was engulfing my 'island.'



"WITH THE AID of my flashlight and a pole for sounding the water's depth, I struck out into the flood. Sometimes I slipped into water over my head—but the drenched flashlight burned on—and I reached higher ground. Believe me, that night 'Eveready' fresh DATED batteries saved my life!

Note: An "Eveready" flashlight with "Eveready" batteries, will normally continue to burn under water. (Signed) *Wilbur M Mosley*

The word "Eveready" is a registered trade-mark of National Carbon Company, Inc.



FRESH BATTERIES LAST LONGER... Look for the DATE-LINE

NATIONAL CARBON COMPANY, INC., 30 EAST 42nd STREET, NEW YORK, N. Y.

Unit of Union Carbide UCC and Carbon Corporation

ANNOUNCING

The Sensational New

PECK POSTCARD PRINTER



Ink rollers, 4 x 6" chase, standard type, ink, paper, sample Xmas cards, ready for orders

\$20 VALUE
Only **9⁹⁵**

15" High
Sho. Wt. 20 Lbs.

Send No Money

FOR THE FIRST TIME, if you are ambitious and work, you can quickly build a business of your own, and as proprietor make profits 3 times wages. There's a large volume of small printing to be had—all kinds of slips, tags, tickets, blotters, office & shop records, postcards.

CHRISTMAS CARDS, MOVIE TITLES, IMPRINTING
Church & Lodge tickets, meeting notices, menus, dance programs, prize lists, Grocery & Drug store week-end specials, Memorial cards for funerals, statements, line cuts, electro, linoleum blocks, mouse screen halftones, black and simple color work.
B. Franklin, America's first great printer, admired this handpress. Now, modernized, simplified, streamlined, and built—not one at a time—but on a production basis like motor cars, with all the evils passed on, you get an amazing big value for your money. Double toggle action, multiple force impression. Clean. Sharp. Speed, 1000 in hour. Two rollers, revolving ink plate, even ink distribution. Type area 4x6" exact. Max. sheet 8 1/2 x 11".

COMES COMPLETE—276 pc. set (2 boxes) of 12 pt. standard metal Composite Gothic, spaces, rickets, lock-up screws, paper, ink, sample Xmas cards, ready for your first order.
PONY OUTFIT—Extra 12 pt. Gothic, font "small Gothic (8 pt. on 12)", **24 pt. Outline, Extra 12 pt. quads & spaces, Wood type case, Tweezers, 34 lb. block ink, 50 Xmas cards. Reg. val. \$6.85. Special with press \$4.95. Mail order today before steel prices advance. 7 day trial. **MONEY BACK GUARANTEE**. If ordered C.O.D. give bank references or attach \$1. bal. on delivery. All prices F.O.B. factory. Ship. wt. 20 lbs.
PECK BROTHERS, 2983 WHITNEY AVE., MT. CARMEL, CONN.

*AAA + A
+ AAA A

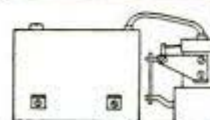
LIGHT and RADIO POWER

Only 1¢ PER HOUR WITH **TINY TIM Plant**

Tiny Tim powered by the famous Continental Red Seal Engine is easy to own—easy to operate and easy on your pocketbook. And if you are a dealer, you'll find it easy to sell. Easily carried. Push button starting. Automatic shut off. Heavy duty generator. 7 - 9 hour gas tank. Write today.



CONTINENTAL MOTORS CORPORATION
MUSKOGON, MICHIGAN



MODEL BOAT FANS! Use easy starting, reliable steam power. Model SE-3, a two cylinder, slide-valve steam engine with burner and propeller. Bore 5/16", Stroke 1/2", Length 7", Width 3", Height 4". Price ready to run, \$3.00. Postage extra, shipping wt. 1 1/2 lb.
SHAWNEE ENGINE CO.
Box 162, Station D, Cincinnati, Ohio

WOODWORKERS

1941 MASTER MANUAL

Get the brand new Constantine Master Manual for Woodworkers and Big 1941 Bargain Book, listing and describing over 100 different kinds of wood in 980 different items in veneers, lumber, panels, inlay work, turning squares, and helpful woodworking aids. Printed and illustrated articles on How to Make Inlaid Pictures; How to Make Veneered Panels; How to Finish Different Kinds of Woods. A source of supply for you in small sized quantities—every kind of wood you are looking for. Send 10c today in stamps or coin.
ALBERT CONSTANTINE & SON, INC., 791-K, East 135th St., N. Y. C.

10¢

X1190

Man Against King Winter

(Continued from page 170)

from the snow equipment companies are on hand to demonstrate correct operation of machines. This costs New York City around \$10,000 but it is repaid many times in efficiency during storms.

In most cities, snow is entirely removed from the downtown business districts. It is loaded on trucks to be dumped into sewer manholes, vacant lots and rivers. In the suburban districts, powerful snowplows shove it to the curbing.

When rain falls on cold pavement, it frequently turns to ice—a condition more dangerous than snow. To eliminate this hazard, snow fighters spread a thin layer of rock salt on the pavement to prevent ice formation. Where ice has already formed, the streets and sidewalks are covered with sand or cinders to eliminate skidding. The Iowa Engineering Department has found that an automobile traveling twenty miles per hour on an icy pavement requires 157 feet in which to come to a dead stop; if the ice is sanded, the stop can be made in seventy-nine feet.

"Traffic must go through!" is the slogan on the highways as well as the city streets. Roads must be cleared of snow, bridges must be repaired, fallen trees must be hauled away, and stalled cars must be pulled out of drifts. In California, boosted as the land of sunshine, snow is removed each year from more than 3,000 miles of highways in forty-two counties.

About \$500,000 a year is spent in keeping California's winter highways open. It has nine huge blower-type rotary snowplows and twenty-five modern rotary plow units, as well as many ordinary push-plow units. Many of these are equipped with two-way radio so that the operators can keep in constant touch with their maintenance stations.

When motorists are known to be snowbound, Forest Rangers or CCC lads on skis help rescue them. In Nevada, Montana and Idaho, during heavy storms, food and medical supplies have been dropped by parachute to isolated ranches and mine camps.

Transcontinental railroads prepare carefully for winter's attack so as to insure maximum comfort and safety for passengers and freight. The New York, New

(Continued to page 149A)

AMAZING PERFORMERS NEW MONEY-MAKERS

EFIFEL-GEARED PIERRENCH KIT-7" & 8 1/2"



"Pocket Machine Shops" that do the work of \$50 worth of other tools. Amazingly Quicker, Better - Easier!

- Now of ALLOY Steel - 65% Stronger! • NEW PLANT.. Quadrupled Capacity.
- Now have your Own Business in a New Selling Case. Full-time men making \$1,500 to \$4,000 Yearly... Part-timers in proportion. We need Many More!



NEW FREE

Bottle-Cap Opener, etc.

Mail Your Address Today (on a post card will do) Get FREE—this 6-Edge End-Angle Screw-driver and 101-Picture Manual of Mechanics, with... User Offers: or, with... DISTRIBUTOR, Territory, Demo. and SELLING Kit Offers!

AMERICAN PIERRENCH CORP'N 2PM-4611 N. RAVENSWOOD AV. CHICAGO, ILL.

Ask Bass FOR HIS New CINE BARGAINGRAM

Fascinating collection of thousands of bargains in 8-16 and 35 mm SILENT AND SOUND equipment... Get your free copy by writing to Department P

Bass CAMERA CO.
179 W. MADISON ST. CHICAGO, ILL.

Use Your Bench Saw for Jointing and Cutting Mouldings

ATTACH THESE SIX INCH TOOL STEEL CUTTERS IN PLACE OF SAW CUT DEVICES SHOWN AND MANY OTHERS.

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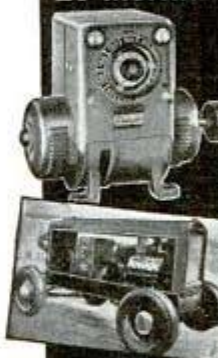
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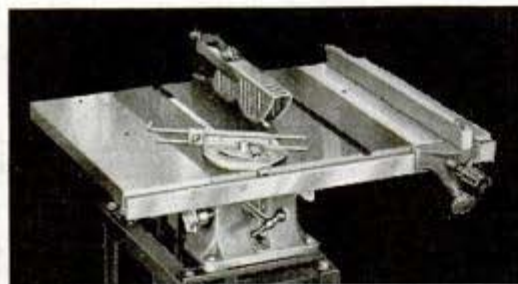
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(Continued from page 146A)

Haven and Hartford Railroad reports that one severe winter cost the company more than \$600,000—half of it for snow removal and the rest for increased consumption of fuel, overtime pay, reduction of trains and feeding of passengers on delayed schedules.

In snow country, railroad and interurban switches are equipped with electric or oil-burning snow melters. These prevent mechanical parts from freezing tight. Special trains with huge blowers patrol the tracks during high winds when powder snow is likely to drift into switches. Chloride cars help remove ice and snow from third rails. In the west when the trains must cross the Rockies, the Cascades, and the High Sierras, snow fences are erected along the tracks to stop drifts and snow sheds are constructed where snowslides most often occur. Huge rotary plows clear the tracks after heavy storms.

Equally alert to the dangers of winter are the transcontinental air lines. Weather experts chart the courses of storms so that pilots may be advised by radio how to avoid them. T.W.A. has recently added "selected route flying" to its winter operation. It was found that thirty-seven per cent of the weather-interrupted flights of 1939-40 could have been completed by dodging storms. Now, on a flight from New York to California, a plane may be routed around the weather, either by way of Fort Worth or Amarillo.

While snow or rain may freeze on a cold airplane, the pilot is in most danger when he flies through clouds of super-cooled water droplets or wet clouds at temperatures below freezing. The water particles freeze almost instantly upon contact with the ship—the larger the particles and the higher the speed of the plane, the more ice that accumulates. Under certain conditions as much as two or three inches of ice may form within five minutes.

This ice adds to the plane's weight, impairs the lift by changing the shape of the wing, increases the air drag by roughening wires and surfaces, and causes dangerous stresses and vibrations by its unbalanced distribution. Most planes are equipped with de-icers; on T.W.A. planes, for example, a de-icer consists of a piece of rubber which is pulsated to break up the ice as it forms on cowling and wings.

(Continued to page 151A)

Skilled hands deserve skilled tools



DESPITE the wonders of mechanized production, this machine age still has thousands of jobs which require tools that respond to the trained human touch. Die-sinkers, model makers, instrument finishers can do their best work only when their precision files are *right for the job*—in shapes, sizes, cuts and *quality*.

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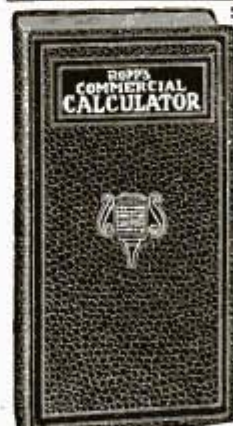
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The United States Coast Guard plays a conspicuous part in protecting human lives and property from the ravages of King Winter. Following the sinking of the "Titanic" on April 14, 1912, the Coast Guard has maintained an international ice patrol. Since that time not a single life has been lost from icebergs or ice fields in the Atlantic. Small bergs are dynamited to pieces; larger bergs are spotted, their rate and direction of drift noted, and ships warned by radio of their position. When harbors and rivers freeze over, the Coast Guard opens channels through the ice to free fishing, passenger and private boats.

Telephone and power companies maintain eternal vigilance on the millions of miles of lines that criss-cross America. Ice accumulating on poles and wires can snap huge cables and pull down sturdy steel towers. Then it is the job for the "troubleshooters" to repair the damage so that messages and power can flow normally again.

Telephone linemen watch thermometers and barometers in fear of the "silver thaw" which sends poles and wires crashing. In Oregon one "silver thaw" built up on the windward side of the poles to a thickness of eighteen inches and coated the wires five inches thick.

Southern California orange growers spend more than \$1,000,000 yearly in fighting frost. When temperatures drop below twenty-eight degrees, it is the signal for the citrus growers to take measures to save the golden fruit from freezing. It is a dramatic fight between men and the elements. A government meteorologist with headquarters in the center of the citrus belt presents nightly temperature forecasts by radio. Men ride circuit on thermometers posted around the grove. When the temperature reaches the danger point, a battalion of workers with gasoline torches spreads quickly through the groves lighting smudge pots. The heat and smoke that rise from hundreds of thousands of pots cover the trees with a layer of warm air which Jack Frost cannot penetrate.

The future of snow fighting lies in the further development of techniques like those of the fire fighters. Speedy light equipment will be called out at the very threat of a snowstorm, followed up by the "heavy artillery." Taxpayers demand better service and are willing to pay the cost.

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SYRACUSE GUILDTOOL COMPANY, 1741-2C N. Salina St., Syracuse, N. Y.

"Talking Machine" Comes Back

(Continued from page 190)

radio and electric phonograph appeared on the market about twelve years ago and sold for several hundred dollars. The same combination, vastly improved, is now available for less than \$100. Prices begin at a few dollars for an electric record player that uses the audio circuit and speaker of your present radio. Next come the portable and table model phonographs that have no radio attached but are equipped with vacuum-tube circuits and radio-type



Building a simple phonograph which will have a home-recording attachment

The easiest way to paint!



Get a professional finish with lacquers, enamels; cover rough surfaces as wickerware, screens and radiators, quickly and easily. Dozens of other uses: spraying insecticides, moth-proofing, humidifying, etc.

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speakers. Next on the list is the combination radio and phonograph that costs as little as thirty dollars and that is made in a wide range of models from portables to the full console cabinet instruments.

The radio side of the combination is ordinarily equipped with built-in antennas for short-wave and overseas reception, and in many models the phonograph has an automatic record changer that places a new record on the turntable and plays it as soon as the last record has finished. Half an hour or more of music may be enjoyed without touching the instrument and on some models the automatic changer can handle records of mixed sizes. On still others the changer, in addition to replacing

(Continued to page 154A)

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Back Geared
Screw Cutting
PRECISION LATHES
\$125
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... products of SpeedWay, for 30 years leading manufacturers of electric tools. Specially wound high torque 110V universal tool motors. Improved design, correct speed, 1000 RPM Drill with diecast handle has 1/2" capacity in steel. 20,000 RPM Hand Grinder has speed essential for efficiency and collects for both 1/2" and 3/32" arbors. Drill and Grinder sold singly or together with accessories in fitted Steel Kit. Stand takes either drill or grinder.

Router Frame converts grinder into router. **Beach Grinder** is complete with motor. Write for Circulars. **SpeedWay Mfg. Co., 1842 S. 52nd Ave., Cicero, Ill.**

ROUTER \$3⁹⁵ **GRINDER \$9⁸⁵**

BUILD THE DESTROYER PRESTON
CARVED HULL
Included!
24" Super Detail Model
Catalog—10c

Complete Kit \$2.50 Post Paid

Makes perfect building easy

IDEAL AEROPLANE & SUPPLY CO., Inc., 26 W. 19 St., New York

BRUSH PLATING OUTFITS
for autoparts, reflectors, faucets, bicycles.
No tanks necessary. Free particulars.

GUNMETAL CO., AVE. M, DECATUR, ILLINOIS

Choose from World's Largest Line of Power Tools!
FREE New 1940 Catalog covers Metal and Woodworking Tools, accessories, motors for every purse. Write Walker-Turner Co., Inc., 121 South Ave., Plainfield, N. J.

DRIVER Engineered POWER TOOLS

ATLAS STICK-ON LETTERS
Beautiful Gold Colored, New Styles, 5 Year Guarantee, Large Sizes, Penny Each, Tremendous Demand, Amazing Profits. Write for FREE Samples—Starting Outfit. Hurry!
ATLAS Sign Works, 7345-A Halsted, Chicago

WINDOW SIGNS

MYSTERIOUS DEVICE WELDS BRAZES AND SOLDER
ANYONE CAN OPERATE

Now, an electric welding, brazing and soldering torch, complete with power unit, goggles and supplies. **Works INSTANTLY off any light socket.** Does a thousand and one repair jobs at amazingly **LOW COST** on aluminum, iron, steel and other metals. **Indispensable** for Auto, Body and Fender Repairs, and home repairs—shop, factory, farm, engineer, janitor, sheet metal, radio and bicycle repairs. Anyone can handle without previous experience with our **sim-10-DAY HOME TRIAL** instructions.

Write at once for Special Introductory Low Price Offer. Try 3 in 1 Electric Torch for 10 days at one dollar, or get one free by helping to introduce it. **ELECTRO-TORCH CO., 2613-MG Michigan Ave., Chicago**

HOT WATER with SPEED KING



From Any Electric Light Socket

MILLIONS of homes, stores and offices everywhere need **SPEED KING**—the new, amazing **Water Heater**—that heats water boiling hot so fast it takes your breath away. No muss! No waste of time or fuel! Just a simple "plug-in" at any 110-volt light socket—and presto... just the amount of hot water you need for the bath, for shaving, for dish-washing. **CHEAPER** because you don't have to heat gallons when you need only a few quarts. **FASTER** because the intense electric heat goes directly into the water. Sells fast on a 60-second demonstration. Small in size—fits the pocket, easy to carry. Anyone can afford it.



60-SECOND Demonstration
Amazes Housewives

SAMPLES for AGENTS

I WANT you to know the almost uncanny heating action of this speedy water-heating invention. Write quick for my **SAMPLE OFFER**—a post card will do. Get an actual Sample **SPEED KING** for demonstration. You can make plenty of cash as my agent. **HURRY!** Big season starting now. **SPEED KING** solves the hot water problem when furnaces shut down. Act quick and I'll show you how to make the fastest money of your life. Send No Money! — Just your name.

JUST SEND

NAME
WRITE your name and address in the margin, clip & mail this coupon or send penny postcard to Dept. 162.

Name.....
Address.....
City.....

NU-WAY MFG. COMPANY
Dept. 162, Walnut Bldg., DES MOINES, IOWA

START THIS BUSINESS
in Your Spare Time at Home

This Is the Way To Make MONEY!

That is what hundreds are saying about the Foley Electraken Lawn Mower Sharpener business. J. LeVert, N. Y., made up to \$104.50 a week clear profit last season. C. A. Butlerbaugh, Ill., says, "Am doing fine... paid for my machine in 4 weeks."

No Canvassing Necessary Free plan tells you how to start. The Foley Electraken Lawn Mower Sharpener turns out perfect work quickly and easily, no experience needed. Simply put the mower in the machine and turn on the power. Uses same system as lawn mower factories. Sharpens all sizes and types in 15 or 20 minutes. You get \$1.00 or more for each job.

FOLEY MFG. CO., 207-1 Foley Bldg., Minneapolis, Minn.
Send Free Plan and Special Offer on Foley Lawn Mower Sharpener.

Name.....
Address.....

Special Offer:
Attachment for grinding axes, hatchets, knives, etc. FREE with Foley Lawn Mower Sharpener. Send coupon today.

R 1125

(Continued from page 152A)

How to remove sharp edges from glass



● It's easy to take the sharp rough edges off glass with a small Carborundum Brand Silicon Carbide Mounted Wheel. You can also etch designs, remove projecting ends of screws, slit tubes and cut slots. These are only a few of the hundreds of ways you can save time and effort on any project in your home workshop with these handy mounted wheels and with other Carborundum Brand Abrasive Products.

How to grind a big steel casting



● Wheels specified by Carborundum are setting new records of speed and economy in grinding steel castings. These wheels are made of exactly the same material that is used in the manufacture of the Carborundum Brand Products that help make work in your own shop easier and more fun. Send 10¢ for souvenir sharpening stone and 95 page illustrated manual on home craftsmanship.

CARBORUNDUM
ABRASIVE PRODUCTS

Write Dept. M 21

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Niagara Falls, N. Y.

{Carborundum is a registered trade-mark of and Indianapolis manufacture by The Carborundum Company}

one record with another, turns over each record so that both sides may be played, giving a continuous program of about three hours.

This year many manufacturers have rounded out this combination by adding a home recorder to the radio phonograph. As a recording device it preserves on a record the sounds that its microphone picks up. Some people are making a history of the present war by preserving on disks all the important war speeches delivered on the air. Others record the radio voices of their favorite film stars as well as making complete records of programs that they like. Classical selections played by famous orchestras on the radio are also copied.

Using the recorder microphone, a singer can mix his voice with the music coming in over the air. The home recorder is used by schools for teaching diction and by music teachers for both vocal and instrumental instruction. Business men dictate letters with it and it is used by the police for recording confessions. Conversations between pilots and their ground stations are preserved on records. It makes a handy way of preparing musical and conversational accompaniments for home movies. Turn a switch and it may be used as a public-address system for speeches or for amplifying phonograph music.

The home recorder uses the same turntable as the phonograph. A blank disk is placed on the turntable and is prevented from slipping by an off-center pin. The switch is moved to the recording position, the cutting head is placed on the record, and the instrument is ready to copy whatever the microphone hears. As soon as a record has been cut the cutting arm may be moved aside, the pick-up arm placed on the record, and the phonograph is ready for an immediate play-back.

The cheapest record blanks are made of cardboard, faced on each side with an acetate or nitrate sheet. Aluminum disks are preferred by some and blanks of ordinary black record composition are also on the market. A design of dots and squares printed on some records gives the stroboscopic effect of standing still at one speed or the other so that the operator can regulate his turntable speed accordingly.

(Continued to page 156A)

Atlas TOOLS OF INDUSTRY

For Personal Craftsmanship

Fortunate is the mechanically minded man who has a natural skill in working with tools. His greatest satisfaction comes from developing that skill to its highest point—precision work in metal. These Atlas machine tools help realize such an ambition. They are soundly engineered, modern in every construction detail, and easy to operate.

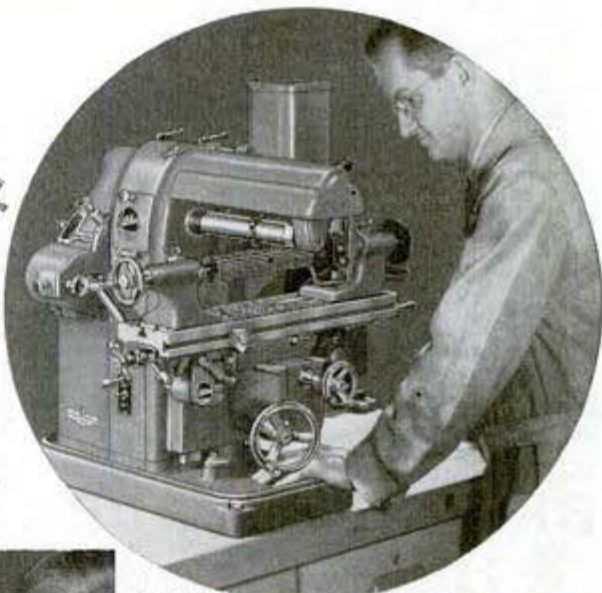


10" - 6" LATHES

Industrial tool rooms, metal working shops, and workshop owners throughout the world praise the versatile operating features, accuracy, and sensible low prices of Atlas Lathes. Ask your dealer to show you the 10" lathes as low as \$107 less motor, and 6" lathes as low as \$66.50 less motor.

DRILL PRESSES

Atlas "floating drive" spindle design with SKF ball bearings gives you a drill press that is famous in industry for smooth operation and dependable accuracy throughout its long service life. There are models to suit every purse and purpose priced from \$18 to \$47. Ask your dealer and send for the new 1941 Catalog for details.

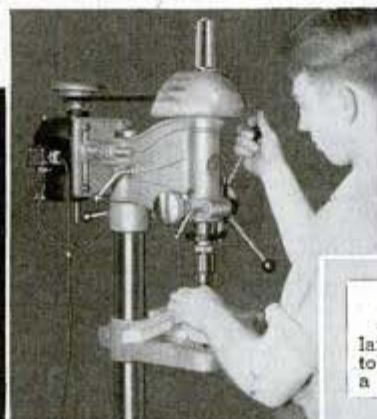


NEW MILLING MACHINE

For the first time in history you can now buy a compact precision bench Milling Machine as low as \$205 to handle the full range of milling work from slabbing and facing cuts to end milling, keyway cutting, finishing, and layout work. It's the machine tool sensation of 1941! Be sure to read about it in the new Atlas Catalog.

FREE

1941 CATALOG



7" SHAPER

Precision and power of larger machines built down to scale for everything within a 7" stroke. \$265 less motor.



ATLAS PRESS CO., Kalamazoo, Mich.

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ATLAS PRESS CO., 243 N. Pitcher St., Kalamazoo, Mich.
Please send me your 1941 Catalog on:

- | | |
|--|---|
| <input type="checkbox"/> New Milling Machine | <input type="checkbox"/> 10" Metal Lathes |
| <input type="checkbox"/> Drill Presses | <input type="checkbox"/> 6" Metal Lathes |
| <input type="checkbox"/> Arbor Presses | <input type="checkbox"/> 7" Metal Shaper |

Name

Address

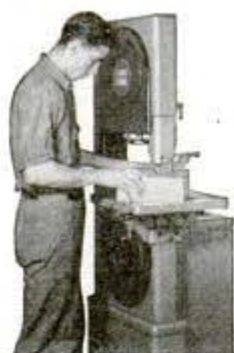
City and State

K1125

(Continued from page 154A)

How to equip a better Home Shop

Vague printed claims alone don't make one brand of merchandise better than some other. That is especially true of power tools. Buy carefully! Make actual comparisons of capacity—materials used—precision or lack of it in machining and assembling of vital machine parts.



Industry buys equipment just that way. That's why industry indicates preference more often for Boice-Crane. Make sure your homework shop is most up-to-date, one that gives maximum enjoyment of precious spare time. Get the 1941 Boice-Crane FREE power tool catalog NOW, and hurry and see them at your local, friendly Boice-Crane dealers. See what quality tools really are!

SEND FOR NEW 1941 CATALOG OF FULL LINE

Include 10c for 16 pg. book that tells how to spin metal on your lathe.



BOICE-CRANE COMPANY
DEPT. 420 TOLEDO, OHIO

Home Craftsmen, Schools, Hobbyists BRONZE FOUNDRY



In your own workshop allows you to design and build your own GASOLINE ENGINES, STEAM ENGINES, TANTALUM ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc., \$13.50, \$19.00, \$27.50, f.o.b. Kansas City. Domestic gas supply and 110 volt 60 cycle energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
Box 6022, Dept. P-12 Kansas City, Mo.

FREE! WHOLESALE CATALOG

4000 OPPORTUNITIES

Household goods, display card items, wearing apparel, cosmetics, fashions, jewelry and toys are a few of the thousands of articles shown in this exciting catalog, for salesmen, agents and dealers.

260 PAGES

Chock-full of interesting money makers. Sales Ideas that may increase your earnings \$2 to \$15 a day and thrilling values, galore. Each and every item sold under a money-back guarantee. Get your copy by sending for it today.

SPORS CO., 12-40 HURON, LEICESTER, MINN.



SIGNS AND SHOWCARDS EASILY AND EXPERTLY PAINTED WITH LETTER PATTERNS MANY SIZES AND STYLES WRITE FOR FOLDER 1330-31 CENTRAL AVE. JOHN F. RAHN CHICAGO, ILL.

Commercially made professional records are still made by Edison's method of recording on wax. The original wax then goes through several dozen treatments before the pressed reproductions are turned out. Some of the earliest wax records, made forty years ago and of great historical and artistic importance, that have been stored away ever since, are now being replayed without injury. Modern reproduction equipment makes it possible to reproduce the voices and music almost exactly the way they sounded when uttered nearly half a century ago, not the way they sounded in the old tin horn phonographs of a decade or more ago.

K685

Hand-Grip Vacuum Cleaner Convertible for Floor Use



Light enough to be handled like an iron, this suction machine has a detachable handle for floor use

Provided with a convenient grip for hand use, a new lightweight vacuum cleaner is easily converted into a floor machine by adding the conventional long handle. It has a tubular steel frame.

MONEY MINDED MEN

Amazing Success Possibilities in POTATO CHIPS

There are real profits in potato chips. Extraordinary profits in chips you make with my complete outfit. It peels, slices, fries the chips, then degreases them. Result—a mouth watering premium potato chip that wholesalers, groceries, restaurants, taverns, etc., grab for and you make a handsome profit. No previous experience necessary. Complete, simple, authoritative, instructions, trade marked bags, advertising material, window displays. Very small investment necessary.

GET POTATO CHIP PROFIT FACTS FREE

Let me send you facts and figures on the potato chip business. It will open your eyes to the profits and the market of really fine chips. Everything is sent to you absolutely free. If you are tired of the old grind, if you want to make some real money, rush me your name. Get "Potato Chip Profit Facts" at once for the asking.

LONG EAKINS COMPANY, 228-S High St., Springfield, Ohio

ROTARY SLICER
Slices potatoes like a
flash any thickness
desired.



**MECHANICAL
PEELER**

Peels potatoes fast,
quick, with minimum
waste.



**VITREOUS ENAMEL
VAT.** As easy to
clean as a china dish.
Preserves Frying Oil
—restricts rancidity.
Helps chips retain
natural flavor.



**GREASE EXTRACT-
TOL.** Whirls away ex-
cess grease from hot
chips so they stay fresh
longer. Look "grease-
less".



NEW! NO BATTERIES DURABLE PLASTIC CABINETS

1941 MODEL Pocket Radio
Tubes
Batteries
Plug In

Dual Bands—Magitenna—Microdial
Fits your pocket or purse—Wt. 6 ozs. Small as
cigarette package. Receives standard & some short
waves. **PATENTED POWER CRYSTAL.** No
tubes, batteries. Hi-ratio easy tuning slide "MI-
CRO-DIAL." M. L. OF HILL SAYS: "MIDGET
RADIO WORKS FINE!"

ONE YEAR SERVICE GUARANTEE!
Sent complete ready to listen with instructions
& tiny phone for use in homes, offices, hotels,
in bed, etc. **SIMPLE TO OPERATE—NO ELECTRICITY NEEDED!**

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\$2.99 (Check, M. O. Cash) and yours will be sent postpaid. **A MOST UNUSUAL
VALUE! ORDER NOW! FREE! PLUG IN "MAGITENNA"—ELIMINATES
OUTSIDE WIRES!**

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Dept. P-2

Kearney, Nebr.



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Small sizes, for gardens and
lawns. Larger sizes do ALL
JOBS on small farm—small jobs
on ALL FARMS. Walk or ride;
sizes 1/2 to 8 H.P. Write for
Factory prices—Free Catalog.



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City; 668-G North 4th St., Columbus, Ohio.

PINS
30¢
UP

FREE CATALOG

Artistic pins, rings and emblems for classes
and clubs. Attractive prices. Finest quality,
gold plated, silver, etc. Over 300 designs.
Write Dept. N, METAL ARTS CO., Inc. Rochester, N. Y.



**DO YOU WANT THE MOST EFFICIENT, FINEST CUTTING AND THE
EASIEST OPERATING SAW, THEN GET**

THE NEW SHEBEL SAW FILER

and you will have saws that the costliest filing machine cannot equal.
Files all saws. Experience not necessary. For full particulars just
write your name and address on a postal.

A. P. SHEBEL 730 S. 2nd ST. MILWAUKEE, WIS.

AGENTS 300% Profit SIGN LETTERS

For Store Fronts and Office Windows. Anyone can put
them on. Free Samples. Liberal Offer to general agents.
METALLIC LETTER CO., 438 N. Clark St., Chicago



MIRACLE WALL CLEANER

AGENTS

Saves Costly Redecorating!

HOT SELLER! AMAZING INVENTION. Banishes old-
style housecleaning mess and mud. No
rust—no sticky "dough"—no red, swollen heads.
No more dangerous stepladders. Literally erases dirt
like magic from walls, ceilings, window shades, upholstered
furniture, etc. **Ends danger!** SAVES REDECORATING!
Approved by Good Housekeeping. Low priced. Home-
wives wild about it. AGENTS WANTED EVERYWHERE.

SAMPLE OFFER Samples sent on trial to first person in each
locality who writes. No obligation. Get
details. Be first—send in your name TODAY!
THE KRISTEE PRODUCTS CO. 671 Bar St. Akron, Ohio

Syncro
PC-2



MODEL ENGINE for \$3.95

Build this engine to develop
1/7-1/6 HP. Qualifies under
NAA rules as Class B. Bore
1 1/2". Stroke 3/8". Weight 5 1/2
oz. We furnish all parts and
instructions. You assemble. This
is the engine buy of a lifetime.

SYNCRO JIG SAWS

The handiest tools ever designed.
Make thousands of useful and orna-
mental articles. Needs no motor.
Plugs into light socket. Cuts 7200
strokes minute without danger.
Three sizes \$5.95, \$10.95, \$12.50.
At your favorite dealer.



Get catalog A40

SYNCRO DEVICES, INC.
743 BEAUBIEN STREET - DETROIT, MICH.

Increase Your 1941 Model Flying Fun & Winnings with CLEVELAND MODELS

Record-Breaking **PLAYBOY SENIOR**. Span 80".
The gas model that broke world's record twice in one
week! Class C. Complete Kit GP-5017 **\$3.95**
(except power unit).
PLAYBOY JR. Span 46". Class B. Com-
plete Kit GP-5006 (except power unit) **\$2.50**



**CLEVELAND
AIRCAR
\$4.50**

Bremer Whirlwind Race Car..... **\$19.50**
Bullet-Polished Cast Aluminum Car... **23.75**
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BABYPLAYBOY. Span 33". Class
A. Complete Kit GP- **\$1.00**
5008 (except power unit)
84" CONDOR Soaring Glider.
Easily built. Complete **\$1.00**
Kit only.....
Big Catalog of Gas & Rubber
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Ships, RR's, etc. Send name, ad-
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(None free).

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process producing permanent construction with
savings of 1/3 labor, 1/2 mortar, and 1/3 ma-
terial costs—ashlar, hollow, veneer or solid
walls—plain or 40 colors.
WE EQUIP YOU with Automatic Machinery—
large production only one or two men. Equip-
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INVESTIGATE—let us show you why building
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growth, expansion and profit in a business of
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600 West 24th St. Holland, Mich.

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You can ski better
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markable durability...
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6-H.P. riding type, 3 & 5 H.P. walking types,
also 1-H.P. cultivator for the small tracts. Prices
start at only \$94.50 with cultivator and equipped
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Before you buy—Write for FREE 48 page
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AMAZING CHEAP OIL BURNER

Sweeping the Country!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—
No Drudgery, Dirt or
Ashes—Intense Heat
Quick at SMALL COST.

OVER 40,000 SOLD

Beats any cheap burner ever gotten out for low cost,
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flowing oil without pre-generating or clogging up. Quick
intense heat regulated by
Simple Turn of Valve.

30 DAYS' TRIAL

Prove its efficiency, con-
venience and economical
operation without risk.

Write Immediately
for SPECIAL
OFFER TO AGENTS

who will demonstrate and take orders. Write quick, be
first to learn how to make REAL MONEY right now,
space or full time—mail to postmarked today.

UNITED FACTORIES, B-751, Factory Bldg., Kansas City, Mo.

Say you saw it in Popular Mechanics!

AGENTS Salesmen BIG MONEY

F. Silver says:
"I can dispose
of 250 HEAT
KING'S before
this year ends."
Write us now
for agents' offer.



Slips Into
Any STOVE
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**Quick HEAT.
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OPPORTUNITY KNOCKS

a
Thousand
Times
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Teaches beginner to play
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Everything craftsman
needs to know... \$1.50

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Start own business
making statuary,
artificial marble, etc... \$3.00

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101 designs, costing
from \$3,500 to
\$15,000... \$1.00

Send No Money!

Order from above list. If in U. S. A., and order amounts to \$1.00
or more, pay postman on delivery plus small C.O.D. fee. We
pay postage if remittance is sent with order. Send for big 128-
page book of helpful books and plans FREE. Order today.

POPULAR MECHANICS PRESS

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K1280. Built by Herbert Laundry
40 Commercial, Herbert
Adams, Mass.

**Traveling Blacksmith's Shop
Built on Back of Auto**



This Massachusetts blacksmith built a mobile shop on the back of his own automobile

Instead of the horse going to the blacksmith shop, the "village smithy" of Adams, Mass., can take his shop to the horse. The blacksmith has built his complete shop into the rear of his car, with the forge and anvil occupying the place of the trunk. Wire lath, asbestos and cement were used in building the equipment into the traveling shop.

K1317

**Dogs Released by Remote Control
When Truck Nears Quarry**

One coyote hunter saves valuable time in the chase by using remote control to release the hounds from his truck. This permits him to run the quarry with the truck and loose the dogs within close range. The doghouse, built of plywood, fits in the truck box, and a pull on the rope by the driver springs both doors open.



Pulling the rope that extends to driver's cab releases hunting dogs through rear doors of the truck

Cont. L. F. Mashino
2021 Forest Ave. S
Isreal Falls, Mont

FEBRUARY, 1941



Fixing versus Building!

Seems like there's a couple of schools of thought about just what your tool-kit's for — fixing things that get broken, or building things from scratch.

One thing sure, a good kit needs a good soldering iron and a can of Kester Metal Mender — the solder that's best for building and best for fixing, too.

Lots of men get busy this time of year and put together some good-looking metalware—using Kester Metal Mender. Things like lamps and wire baskets for flower-pots and ash-trays come in mighty handy around the house. And it's a cinch to build 'em with this handy home solder that carries its own flux inside — and always works just right.

Other times a man gets the fixin'-itch and saves himself a lot of money repairing broken metal kitchenware for the Missus, and all kinds of other metal things from door-knobs to down-spouts. Kester Metal Mender hits a homer when it comes to making perfect repairs—all you supply is heat and a little elbow grease.

Find out how easy Kester Metal Mender is to use, and how many ways there are to use it. Clip the coupon and mail it in today—for a good-sized free sample of this special solder, and free "How-to-Use-It" Booklet.



**KESTER
METAL MENDER**

Kester Solder Company, 4251 Wrightwood Ave., Chicago, Ill.
Please send me free sample of Kester Metal Mender and "How-to-Use-It" Booklet.

Name _____
Address _____
City _____ State _____
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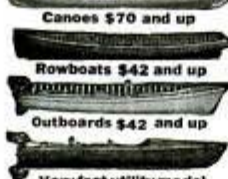


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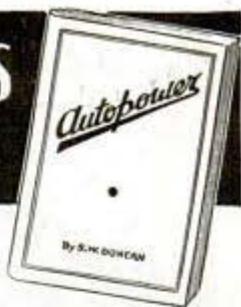
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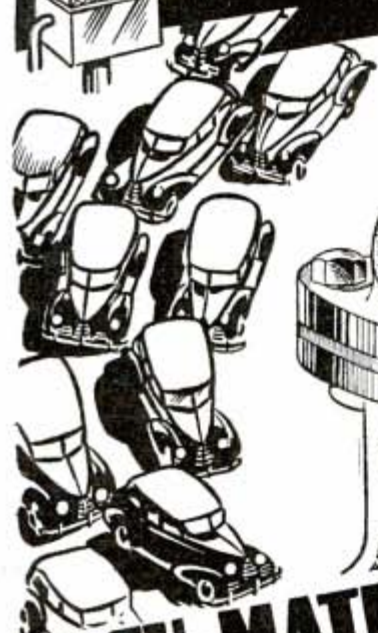
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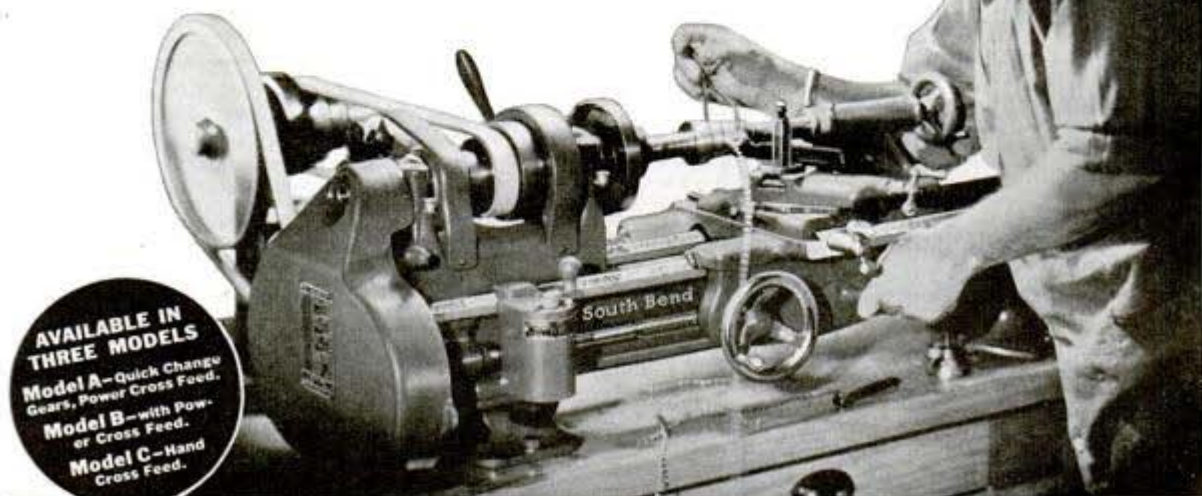
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