

The 1942 CARS

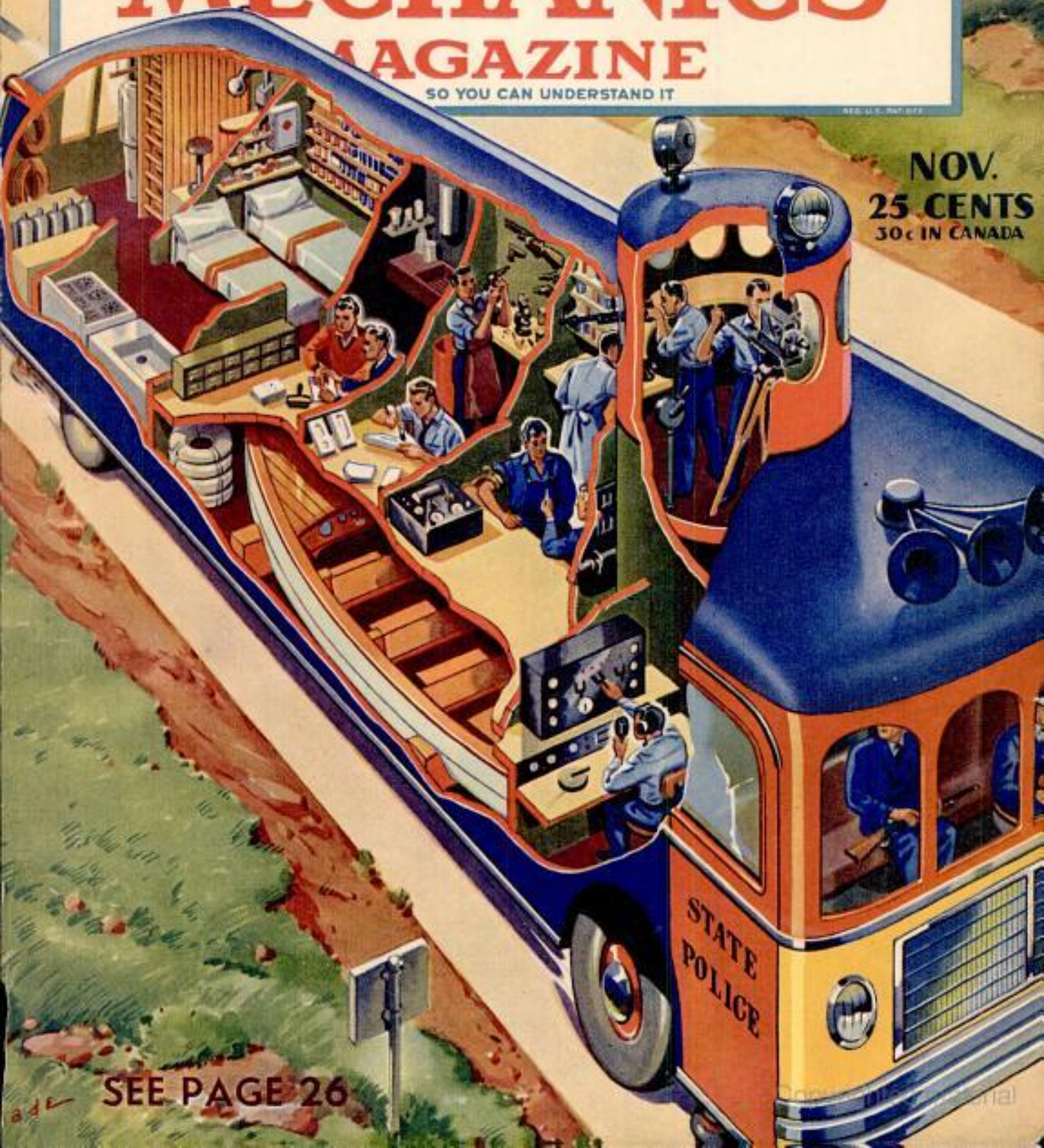
POPULAR MECHANICS

MAGAZINE

SO YOU CAN UNDERSTAND IT



NOV.
25 CENTS
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SEE PAGE 26



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“Leaks” or “bottlenecks” anywhere in the primary or secondary wiring circuits of a car cause a loss of pick-up, power, gasoline mileage or lighting efficiency. If your car has these symptoms, it's high time to stop in at your nearest Packard Certified Re-Wiring station for a thorough check-up of the wiring and electrical units. All necessary replacements will be made with genuine Packard cable and original equipment parts.

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THE RAW MATERIALS used in making “Prestone” anti-freeze are first-line defense necessities. Thousands of tons of these raw materials which, under normal conditions, would go into “Prestone” anti-freeze for the public’s use, are now being diverted to manufacture vital defense equipment of many different kinds. In fact, some of the uses to which these materials are being put were born in the laboratory but a short time ago.



IN ADDITION, great demands are being made on the finished product, “Prestone” anti-freeze. Liquid-cooled tanks and reconnaissance cars... fighter planes and gun tractors... trucks and staff cars... must be protected. The cooling systems of our speedy patrol torpedo boats must be safe from freeze-up and *lay-up*.



THE ARMY and the Navy... for years large users of “Prestone” anti-freeze... now need unprecedented quantities of this dependable winter protection. *Their orders must be filled.*



ALTHOUGH MILLIONS of gallons of “Prestone” anti-freeze will be available to American motorists... although production facilities have been increased to the utmost... your dealer may not be able to supply you in this emergency.



TO THE MILLIONS of motorists who every year rely on “Prestone” anti-freeze, we say:—*See your dealer early.* Late comers who wait for cold snaps may be disappointed.

NATIONAL CARBON COMPANY, INC. • UNIT OF UNION CARBIDE AND CARBON CORPORATION 

NOVEMBER, 1941

This One



1TQ7-B07-STAR

1A

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Democracy—in Action

While ours is a new nation, we have conceived and developed some ideas which are, in spirit and in service, essentially American.

One of these is the institution of home-study. Here is a method by which an ambitious individual can sit "at one end of a log" with a teacher interested in him and, through the magic medium of mail, learn the things he needs most to learn in order to realize his dearest aspirations. Here is a citadel to which the individual, deprived of educational advantages in his earlier years or in need of modernizing his instinctive or acquired talents, can turn in the assurance it's never too late to learn.

Indeed, the home-study idea is American to the core. It is democracy in action. It stands for individual opportunity—today! Under it the individual—voluntarily—does something for himself.

The proof of this democratic opportunity is what people do with it. Every field of industrial activity today has its share of top-flight executives who have come up the ladder the home-study way.

This month—October 16th, to be exact—a great American home-study school is celebrating its Fiftieth Anniversary. It was no accident that caused the International Correspondence Schools to come into existence. The need for specialized training in a certain field existed. I. C. S. was created to meet that need. Along with other distinguished educational associates, it is today meeting broad needs in American business and industrial scenes.

Popular Mechanics joins with other home-study schools and American business generally in a salute to this American idea as it rounds its first half-century of service to millions of men who signed coupons in declarations of courage and then proceeded to carve careers for themselves—the finest kind of proof that opportunity is still a vibrant force in the American way of life.

POPULAR MECHANICS MAGAZINE

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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

November, 1941

Vol. 76, No. 5

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Gargantua of the Rails

NUMBER 6100 is the Grand Coulee of locomotives. Stack this giant Pennsylvania steam engine against a 14-story skyscraper and it will jut past the roof. Engineers whisper that it's already set a world record for railway speed, that it would do 150 miles an hour if they didn't hold it back. It's so long that only two tracks in Chicago's Union Station are straight enough to accommodate it. "Riding the Gargantua of the Rails," a feature in the December issue, takes you into the cab for a 100-mile-an-hour ride at the head of the "General" on the racetrack of the rails.

Our Newest Birds of War

WARPLANES with 400-miles-an-hour ratings are flowing from the production lines, and already aviation circles talk of a mystery plane that flies 500 miles an hour. Bombers that range 3,500 miles, fighters that climb a mile a minute are part of America's air arsenal described in the December Coloroto section, with its eight pages of color photographs.

Next Month

WHEN it's nice, the streamline ferries can see their way through the busy waterways of island-studded Puget Sound. When fog descends, the skippers steer by ear. A blast of the whistle bounces back from a rocky shore two seconds later. Timing the sound at 1,000 feet per second, the pilot knows he is about 1,000 feet from some unseen point of land. A December story, "They Steer by Ear," tells how the ferries churn safely through 300-foot passes without seeing them.

Metallurgic Magic

VAST iron deposits untouched since the Civil War are yielding now to the metallurgist, who uses the chemistry of natural gas to purify the ore. Magnesium is wrested from the ocean, Boulder Dam's power is extracting manganese from low-grade ores, gigantic tools are mining a mountain of copper. Read next month how we are becoming independent of foreign sources of ores through the "Wonders of Modern Metallurgy."

Adventures at Sea

FISHERMEN of the refrigerated tuna clippers and purse seiners have come a long way from the days of the sailing schooners. Today they fish by radio compass and sonic finder, with Diesel power and automatic pilot. Still, there is plenty of adventure left in deep sea fishing, as you'll find when you read the thrill-packed story of the fishing fleet next month.

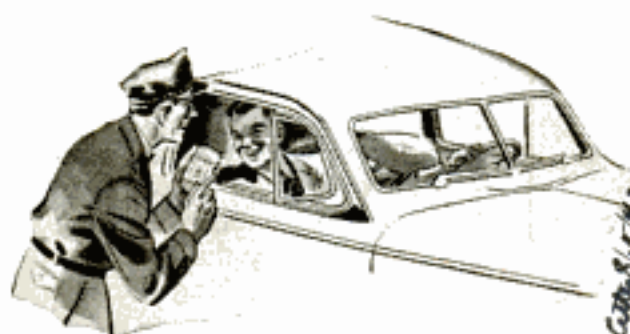
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PREPARE

... for colder weather
CLEAN OUT summer
 contaminations

CONSERVE

... on gas, oil and other
 operation expenses



Prepare and Conserve: these watchwords are of concern to you and to every motorist. Because hot summer-time running has likely exposed the engine of your car to many contaminations. So, prepare for colder weather and its attendant troubles by removing them without delay.

Then, too, there's no telling how long you may want to run your present car. So, conserve. Keep operation expense down. Keep your car running safely and more smoothly for as long as it will last.

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Great auto racers and other automotive authorities use the same Pyroil that you can buy at your favorite service station or garage for a mere few cents per treatment. Try some, today! Mail coupon for further interesting facts about this ten-year-famous money saver for motorists. Manufactured and guaranteed by Pyroil Company, W. V. Kidder, Founder, 511 Pyroil Bldg., La Crosse, Wisconsin, U. S. A.



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Where no name and address appear directly under an item, the product is not believed by us to be commercially available

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"I WAS BOUND AND GAGGED AND LEFT TO DIE!"



A true experience of JOSEPH J. KARES, Charlestown, Boston, Mass.



"THUGS HELD ME UP one bitterly cold night as I left our docked lumber ship," writes Radio Operator Kares. "After taking what cash I had, they left me bound and gagged in an inky dark alley between great piles of stacked lumber.

"FURIOUS STRUGGLING only tightened my bonds. My arms and legs grew numb with cold. My plight was desperate! Then, remembering my flashlight, I managed to reach it . . . started flashing SOS against the top of the lumber.



"FOR MORE THAN AN HOUR I kept signaling. Half dead with cold . . . about to give up hope . . . I was at last rescued by two officers from my ship. If it hadn't been for those dependable 'Eveready' fresh DATED batteries I would have been a goner.

(Signed) *Joseph J. Kares*

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Thomas A. Edison
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Edison was a pioneer in developing this rating type spark plug.

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These advantages Edison alone offers in a spark plug to fit your pre-'41 car. It's the Edison HC* adopted from the tiny racing type plug.

Edison HC* Spark Plugs will modernize the power of your car at a cost no higher than ordinary spark plugs. Replace with Edison HC Plugs—now.

Edison-Splitdorf Corp., West Orange, N. J.

*High Compression



LEAK-PROOF GASKET

Only Edison Spark Plugs have the patented spun-on, solid copper gasket, always perfectly centered. Assures 100% compression-tight fit, and never needs replacement.

Columbus, Ohio

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To Men of 35 and Over:



Ordinarily in business life, youth is the age of opportunity.

Today that is all changed.

National Defense demands youth and the call for men is doubled in industry.

So—you men of thirty-five and over have a golden opportunity—to combine your mature judgment with the opportunities abounding on every side—a real chance to go ahead with minimized competition—the chance of a lifetime—literally.

But—you must add one thing to maturity and experience—if you really want to go places.

For the difference between just a "good job" born of a scarcity of men, and a chance to quickly shoot ahead *and stay there*, lies in one thing—in training.

Let's analyze a moment. Millions of men called back to work in expanded and new plants: they must have supervision. Where can they get it except from you? Other thousands moving out of former jobs and companies—leaving openings that must be filled. And those openings will be in every phase of business and industry—in factory and store and office—in the very fields to which your experience or preference point.

What an opportunity if you will but add quickly to your present equipment the



specialized knowledge and ability called for by most of these jobs! If you will but cap your today's ability with the latest principles and methods in your line—make yourself above the average!

We can help you in that. In 33 years we have enrolled over a million men and women—we know how. Our training is condensed, practical, geared for the busy man on the job. It is interesting, up-to-the-minute, moderate in cost. What you study tonight, you can use on the job tomorrow.

Why not tell us your field of interest—ask if and how we can help you grasp this present opportunity? There will be no obligation. And the opportunity of this crisis will never come again in your lifetime.

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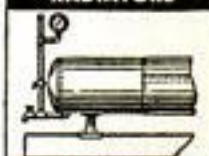
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WITH U. S. DEFENSE

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Would sound, practical, modern training help you do *your* part better? Then mail this coupon, and learn how an I. C. S. Course in your line of work will prepare you for the bigger opportunities that lie ahead—fit you for *success!* You'll be surprised to find how little it costs to become a trained man the I. C. S. way!



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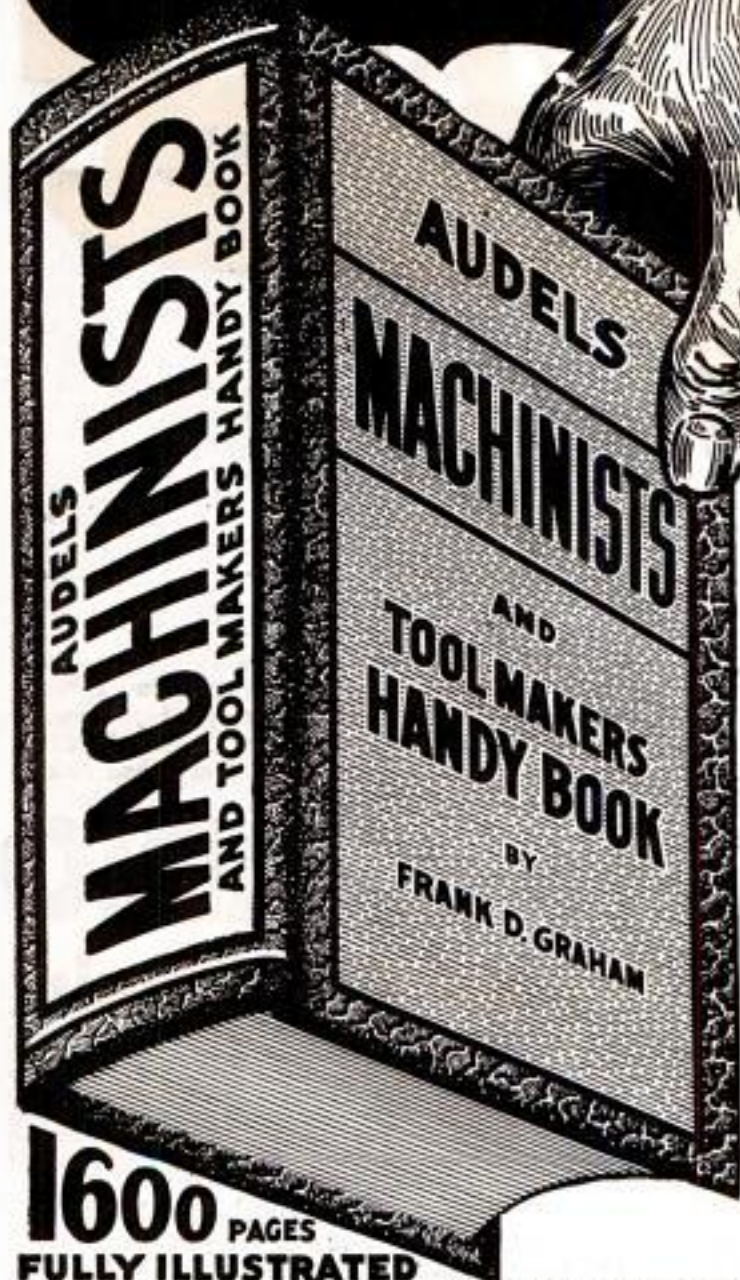
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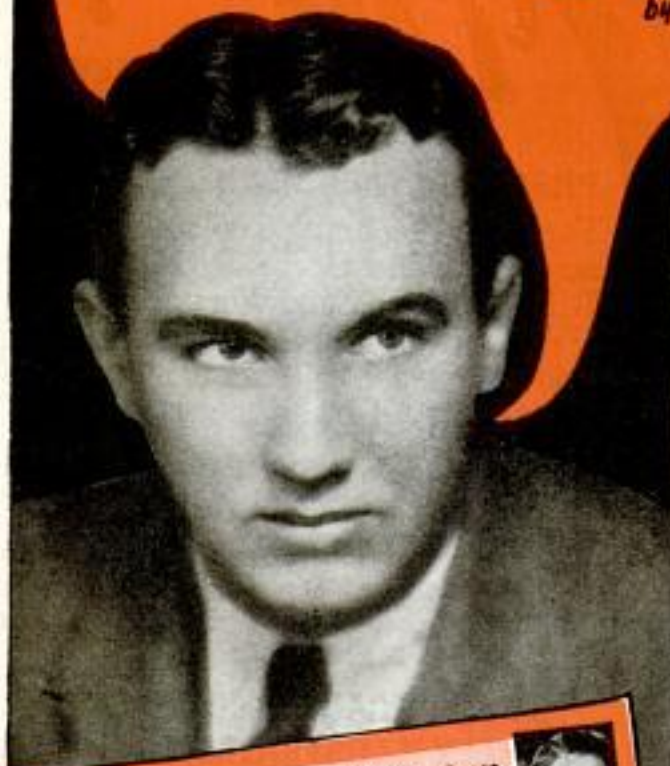
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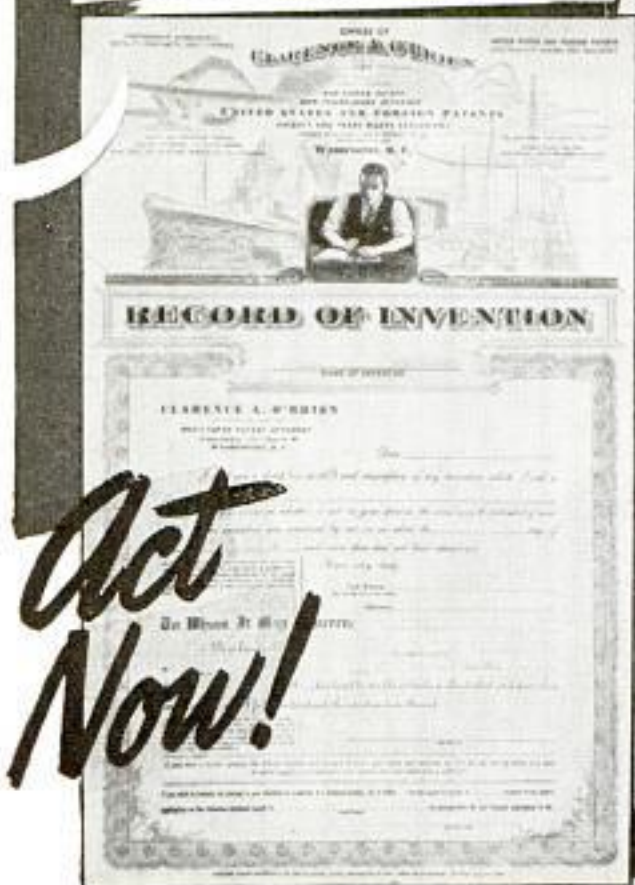
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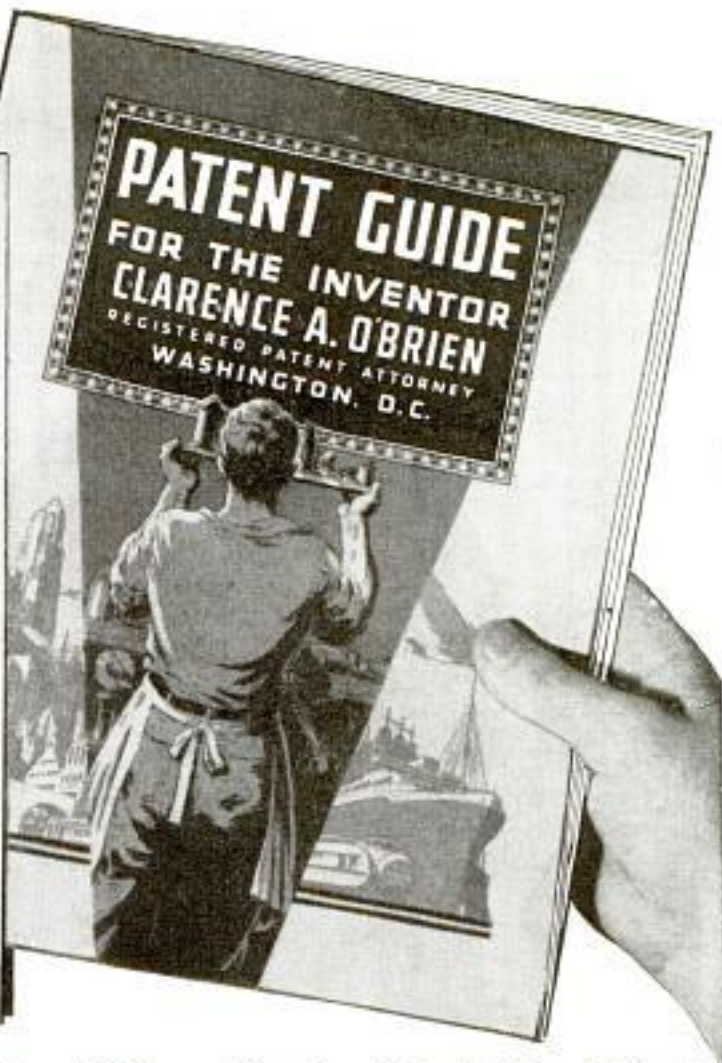


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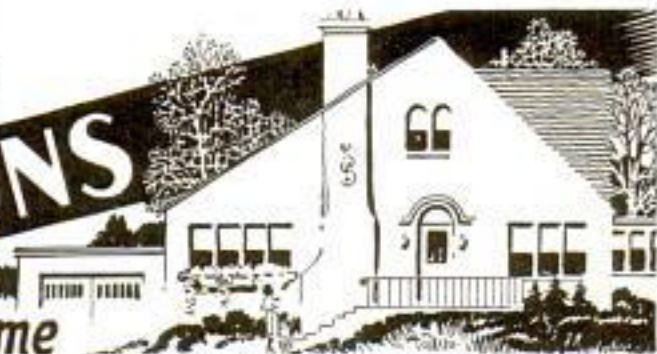
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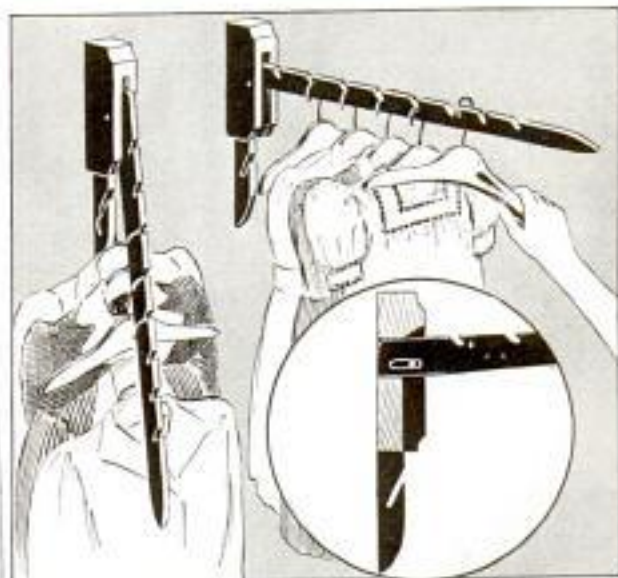
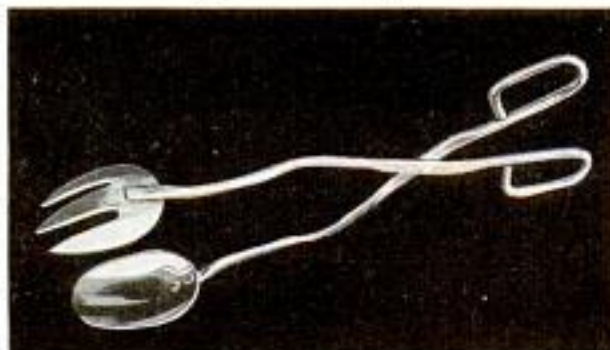
When hair, lint and threads are embedded in the rug too firmly for pick-up by the large opening of a new vacuum cleaner nozzle, a small-size inner nozzle may be brought into action immediately by pressing down on the extension tube. Use of the small nozzle, built within the bigger one, concentrates the suction on a small area of the rug to dislodge stubborn particles of dirt.

Folding Clothes Hanger for Wall Takes Little Space in Closet

Requiring little more space than a single hook, a space-saving clothes rack consists of a folding arm with notches to hold several garments. A garment may be hung or

Tongs Made of Fork and Spoon Are Handy for Serving

Fork-and-spoon tongs form a handy combination for serving various foods, as well as for preparing them in the kitchen. They are useful alike for lifting hot foods out of pots, for serving meats and vegetables or mixing and serving salad.



removed without disturbing the others by lifting the arm to horizontal position, where it remains until lowered by hand.

WHERE-TO-BUY-IT INDEX OF POPULAR INVENTIONS

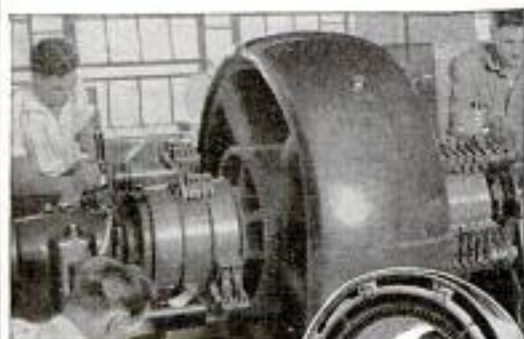
Dual-nozzle vacuum cleaner
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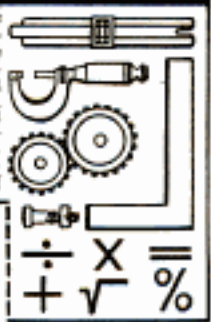
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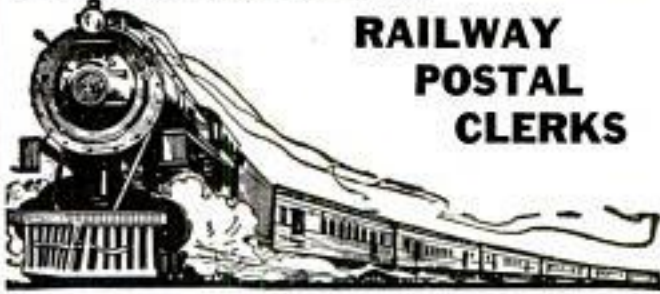
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PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings good returns. We are now placing big Xmas chain store orders with manufacturers. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

INCORPORATE Your business. Delaware laws. Sell shares. Free details. Corporation Fiscal Co., Box 1472-R, Wilmington, Del.

COLOR Concrete with chemicals. Washing wells. Stucco-rock. Benches. Spin concrete pottery. Cement artistry. Garden ornaments. Cold glass. Concrete paints. Marbling. Sample 10c. Hollywood Cement Craft, 8527 Wonderland, Hollywood, Calif.

ENJOY Permanent business making profitable fast-selling products. Write: Law, 1700-M Madison Avenue, New York.

PROFITABLE Home business, easily learned. Small capital. Aristo B, Plainfield, N. J.

100 WAYS To make money 25c. George Beach, Hanover, Mass.

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WORLD'S Fastest money maker. Sell 50c packs of razor blades for 5c. Tharp, 514 Lexington, Cumberland, Md.

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write Sprinkle, Plater, 127, Marion, Indiana.

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SELL By mail! Ready-made circular service! Books, novelties, bargains! Catalog free! Eifco, B-440 North Wells, Chicago.

PLEASANT Quick paying mailorder business in your own home. Booklet, bulletins, details—25c. None free. Wassberg Publications, Box 5636P, Chicago.

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MECHANICALLY Inclined men—Own and operate general appliance repair shop. Complete, illustrated course shows you how. Welding, refrigeration, motor repair, how to get business, etc., all phases covered. Free literature. Christy Supply, Dept. 108, 2835 N. Central Ave., Chicago.

LIQUID Marble—Colorful, glazed! Mold, brush, spray! Composition floors, rubber-lastic molds. Particulars free. Marbleizing Service, Edwardsville, Illinois.

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

ELITE Collection of business plans, contains 137 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

WE Successfully sell inventions, patented and unpatented. Write us, if you have a practical, useful idea for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

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

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

GOOD Paying business silvering mirrors, plating autopaarts, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

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

MAKE Money by mail, the way we do. Free information. Maywood, P-1107 Broadway, New York.

GET The dollars now. Amazing information for dollar bill. Arscott Service, Box 5211, Chicago, Ill.

SWISS Music box works—\$1.25 to \$2.10. Suitable for many novelties. Mermord Manufacturers, 147 West 45th Street, New York.

YOUR Ad in this space will bring amazing results. I'll prove it to you. Write at once for interesting information. P. W. Johnson, Room 300, 200 East Ontario St., Chicago.

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EARN Money evenings, copying, duplicating cartoons for advertisers. Ad-Service, Argyle, Wis.

MAKE Money at home raising worms for us. We buy all you raise. For details write Manager, Seidrich Worm Farm, West Chicago, Ill.

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WILL You give us 5% first \$600 you make? Afternoons free! Work home. \$1,000 month reported (exceptional—full-time). Expect surprise. National, Box 1240, San Bernardino, Calif.

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write Sprinkle, Plater, 287, Marion, Indiana.

TWENTY Dollars daily reclaiming lube. Boussot, Box 483, New Orleans, La.

WHOLESALE Sources, 500,000 articles. Free directory. Marwood, 1107 Broadway, New York.

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KNOWLEDGE For job hunters. Free information. Richard Service, 4340 Maple, Dallas, Texas.

MAGIC Clothes brush. Revolutionary invention. "Erases" dirt like magic. Saves drycleaning. Sensational seller. Samples sent on trial. Rush name. Kristee, 129, Akron, Ohio.

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HOW To get a job! Thirty model application letters, information on interviews, and sources of available positions. \$1.00 postpaid. Guidance Service, Box 175, Crosby, North Dakota.

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AGENTS WANTED

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SHOW Friends sensational lowest priced personal Christmas cards, stationery. Also magnificent 21 card \$1.00 assortment. Profit, 50c. Experience unnecessary. Personal card samples free. "Jewel Box" on approval. Wallace Brown, 225 Fifth Ave., Dept. E-34, New York.

SELL Nylon hosiery and give fine silk hose for half price in combination order. Guaranteed against holes, snags, and runs or replaced free. Hose for your own personal use given with large outfit. Rush name and hose size today. Wilknit, Desk BR-37, Greenfield, Ohio.

CHRISTMAS Card leaders bring you quick cash earnings. Name-imprinted Christmas cards, 50 for \$1. up. Sensational "Prize" 21-card assortment sells \$1.00. You make 100% profit. 14 fast-selling assortments. Samples on approval. Chilton Greetings, 147 Essex, Dept. K-2, Boston, Mass.

AGENTS. Big line including food products. Fast selling premium and bargain deals. Low prices. Send card for big outfit offer with gift. Ho-Ro-Co., 2701 Dodder, St. Louis, Mo.

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SELL Men's air conditioned leather belts and suspenders. Sietema, 905 E. 10th, Kansas City, Mo.

RAZOR Blades. Free wholesale catalog. Bulger, 132D Rindge, Cambridge, Mass.

FREE Water and our concentrates make 72 products. We supply labels, bottles. Enormous profits. Qualco, E-20030 Russell, Detroit.

MEN'S—Ladies' topcoats 35c, winter coats 40c, suits \$3c, pants 23c, dresses 10c. Other used, new bargains. Catalog free. Portnoy, 566-V Roosevelt, Chicago.

MAGIC Drop makes odors vanish. Toilet, urinals, etc. Ross Products, Maywood, N. J.

\$1 STARTS You in business selling men's ties, ready tied Slide-On-Ties and boxed novelties. Write today for descriptive wholesale catalog, free sample materials. Phillip's Neckwear, 20 West 22nd St., Dept. P-9, New York.

CHRISTMAS Cards, 18 different assortments. Also 50 for \$1 with names. Fast sellers. Big profits. Samples on approval. Freeman Company, 33 High, New Haven, Conn.

CREAM Separator disk washer, new, automatic. Profitable item for country route men. Earle Specialty Co., 1353 N. Clark, Chicago, Ill.

SELL New and used clothing from store, home, auto. Men's used shoes 15c, ladies' used dresses 10c. Other bargains. Experience unnecessary. Free wholesale catalog. Superior, 1250-ME Jefferson, Chicago.

FIFTH Avenue neckties. Big profits. Free sample swatches, guaranteed sales plan. Danforth Company, 545-L Fifth Avenue, New York.

CHRISTMAS Card money makers. Outstanding 50 for \$1 name imprinted cards. Quick selling \$1 assortments cost 50c. Other boxes 25c up. Free samples. Howard P. Ellis, Dept. PM, Pittman, N. J.

SELL 50 For \$1.00 personal Christmas cards—Free samples. 35 boxes 30c up. Famous 21 assortment on approval. Special offer. Hedenkamp, Dept. P-4, 343 Broadway, New York.

SELL Ties, wonderful proposition. Eureka, 307 W. 38, New York.

INITIAL Sale of low-priced new convenience serving the whole family starts endless chain of profits. How? Ask Servisette, P.O. Box 165, Chicago, Ill.

NOKOROSO Cures battery corrosion 25c. Free literature. Aristo, Plainfield, N. J.

MEXICAN Glass novelties, leather cards; sample dime. Deluxe Creations, Box 944, Laredo, Texas.

SELL New, used clothing from home, auto, store. Men's suits 77c, leather jackets 29c, overcoats 43c, dresses 10c, ladies' coats 32c. Other bargains. Catalog free. S&N, 565-A Roosevelt, Chicago.

NEW Invention, also good for mail order. Sample 10c. Blue Boy Co., Chicopee Falls, Mass.

SELL Tax records, now, every type business. Records Co., 2626 N. Irving, Minneapolis, Minn.

PERSONAL Christmas cards 50 for \$1.00. Also 15 other box assortments. Free samples. A. B. Plateless Co., 243 Canal Street, New York, N. Y.

INCREASE Your everyday greeting and Christmas card sales, with embossed gold. Five colors. Over 100% profit. Sample outfit 25c. Particulars free. Thos. M. Troxell, Dushore, Penna.

GASOLINE Shortage! Sell Exolene! Increase mileage! Increase power! Big profits! Free offer! Thermodx, Peoria, Ill.

AMAZING Cleaner! Makes cleaning easy. Premium deals gets orders. Free sample. Zimco, 5097 Irving Park, Chicago.

500% PROFIT. Just invented. "Thumb Tacks for Glass." Get in on ground floor. Hot seller, will turn millions. 25c brings samples, particulars. Est. 1910, 2718 W. 7th, Los Angeles, California.

COMIC. Clever Xmas folders. Samples. Straley, 1015 Mulberry, Springfield, Ohio.

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

MAKE Easy money selling foremost line Christmas cards. "Leader" assortment 21 gorgeous folders going like "wildfire." Sells for \$1.00, costs as low as 50c. Actual retail value \$3.00. Other bargain assortments. Also, 50 Christmas cards imprinted with name for \$1.00. Finest low-priced imprints in America. Write for sample "Leader" assortment on approval, also three albums imprint cards and free gift offers. Silver Swan Studios, Inc., 320 Fifth Avenue, Dept. 43, New York.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. If you sell printing and advertising specialties we have an excellent sideline featuring Decalcomania name plates in small quantities. "Ralco," 727 Atlantic Ave., Boston, Mass.

YOU'LL Like resilvering mirrors, tableware, making chipped glass nameplates, signs. Write Sprinkle, Plater, 128, Marion, Indiana.

WINDOW Sign letters. New "Roman" style. Large sizes, penny each. Absolutely beautiful. Free samples. New catalogue. Atlas, 7941 Halsted, Chicago.

GAS Stations want this new patented necessity. Knipp, Long Beach, California.

"FREE!" Mexican curios, novelties. 100% profit! Marquez, Apartado 1176, Mexico City.

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.

GOOD Paving business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures by late method. Free particulars and proofs. Gunmetal Co., Ave. N. Decatur, Ill.

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

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

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BIG Money daily. Sell business stationery, advertising specialties, book matches, gummed tape, 700 other necessities to stores, offices, professional men. 33-1/3% profit paid daily. Biggest, best line of its kind. No experience needed. Big outfit free. Wilens, 2130 Gladys, Dept. 411, Chicago.

SENSATIONAL All-occasion greeting card sundial. Actually tells time. Good commissions. Robert McMichael, Allenhurst, N. J.

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SELL Hats made to your measure. Leons Men's Shop, 909 N.W. 2nd Ave., Miami, Florida.

SALESMEN. Good proposition. Prazee Electric, 547 Fulton St., San Francisco, Calif.

ANIMATED Displays; new, amazing, clever. Merchants wild about them. No competition. Sells like wildfire. Priced low. Tremendous profit. Write immediately. Animation Engineers, 2707 McVickers Ave., Chicago.

SALESMAN With car to sell grocery, drug and general stores, nationally known product. Permanent job, big pay. Act while territories are open. Handee Products Co., 1133 Broadway, New York.

MAN With car to cover retail store route. Openings almost every locality. Handle orders for nationally known manufacturer-employer. Average 50% commission. Steady big pay opportunity. Sales experience unnecessary. World's Products Co., Dept. 10-T, Spencer, Ind.

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EXPERIENCED Salesmen for direct selling of patented made to measure form fitted shirts. Cannot be purchased in stores. Excellent side line for tailoring salesmen. Prices \$2.50 to \$6.00 Very attractive proposition. Welltext Bona-Pit Shirt Co., Paterson, N. J.

A REAL Future for you with Red Comet fire control products. Low prices. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick, 704 Red Comet Building, Littleton, Colorado.

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WELDING—Electric arc. Learn profitable trade quickly through actual practice. Individual welder instruction at bare cost of materials. Full particulars free. Valuable welding lessons book 50c. Hobart Welding School, Box M-1115, Troy, Ohio.

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CLINICAL Laboratory technic taught in your own home. Practice outfit supplied. Bulletin free. Imperial Technical Institute, Box 494-E, Elkhart, Indiana.

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FADO The new scientific India ink eradicator for the drafting room. Time saver, guaranteed non-injurious to cloth. Fifty cents post-paid. Aarons Chemical Specialties, 276 W. Fishers Avenue, Philadelphia, Penna.

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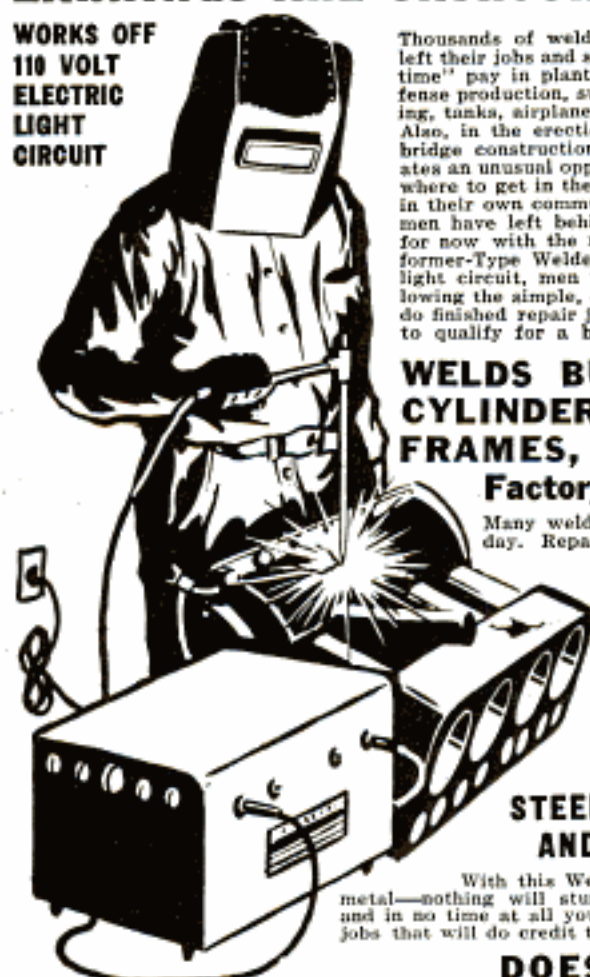
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These pictures show how easy it is to operate the Dynamic Super-Charged Welder.

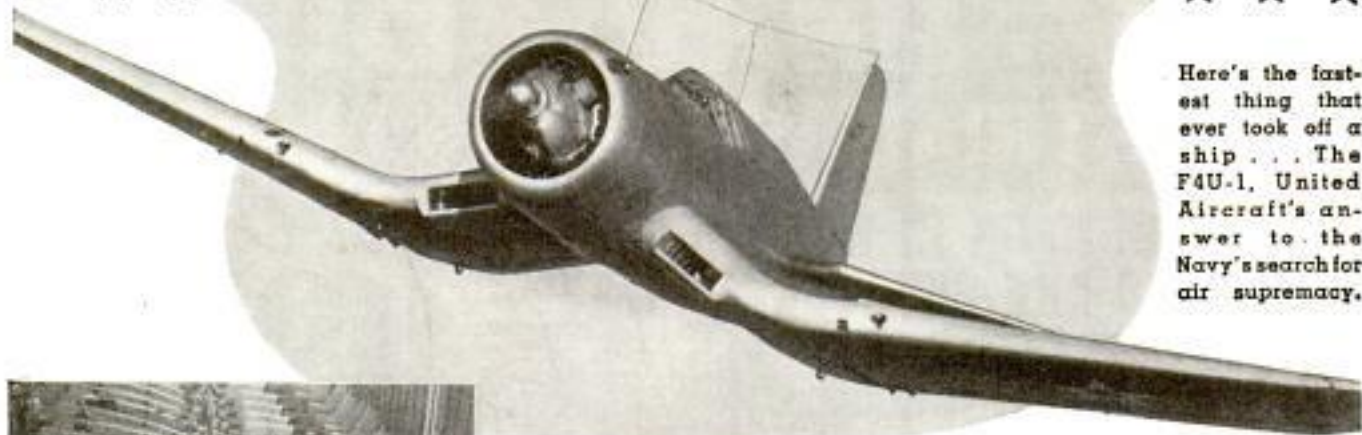


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Vol. 76

NOVEMBER, 1941

No. 5

MORE MILES PER GALLON



BUICK

By Julian Leggett

FACED by gasoline supply restrictions, American buyers may choose any of several 1942-model automobiles with every assurance of getting exceptional fuel economy. In the hands of careful drivers, the "baby" of the industry, the Crosley, will deliver close to 50 miles per gallon, the Willys Americar between 30 and 35 and the Nash "600" between 25 and 30.

Close behind in the gas-saving parade are Chevrolet, Ford, Plymouth, Studebaker, Champion, Hudson Six, Mercury, and two or three others, all of which are designed to give 18 to 25 miles per gallon. Heavier and more powerful cars achieve better econ-

This Buick convertible is distinguished by its front fender lines. Concealed running boards and a 95-horsepower engine are but two features of the Plymouth. This is a four-door sedan.



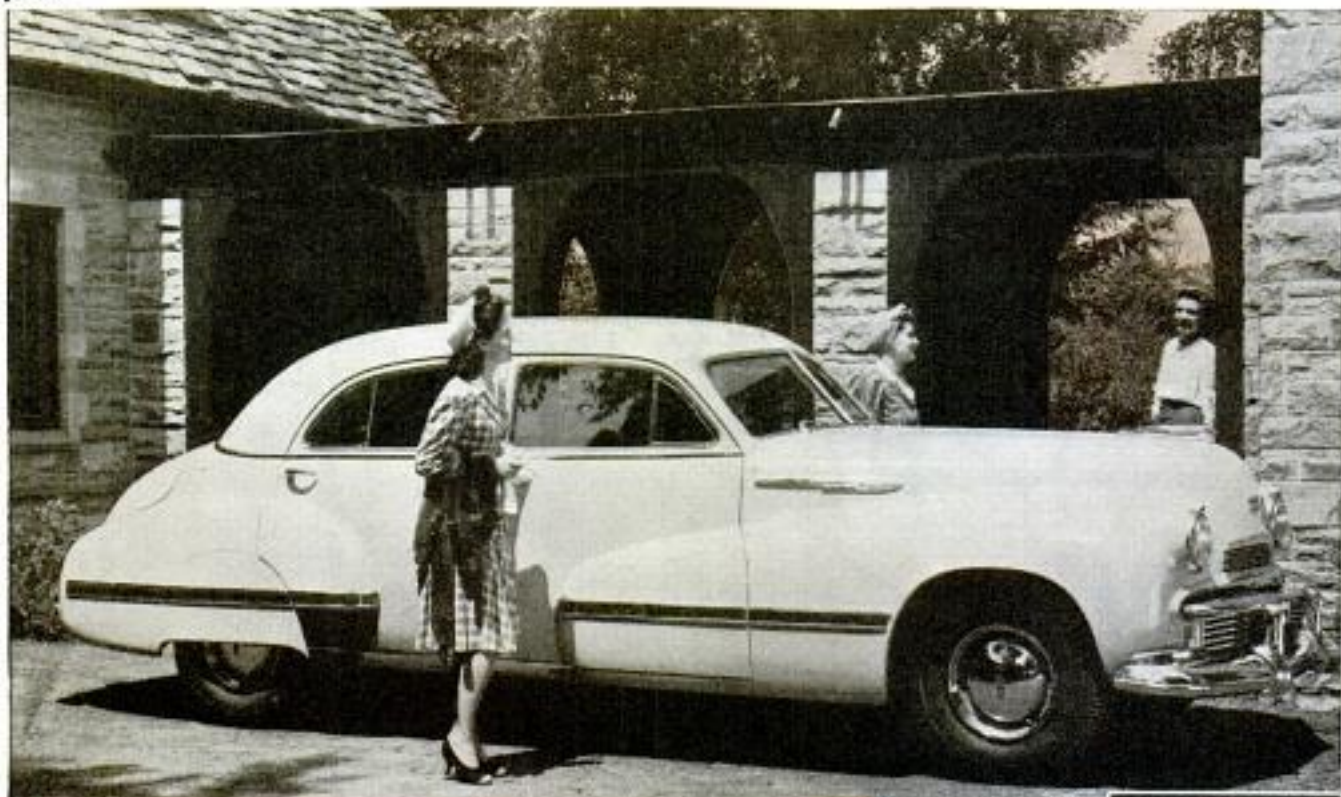
PLYMOUTH

NOVEMBER, 1941

*ad inside back cover met 2/4/1
left all. Cincinnati, Ohio*

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2997



OLDSMOBILE

↑ This Olds Custom Cruiser is marked by front fender extending half way of the door and by a massive front bumper assembly. Horsepower is 110



DODGE

← Enclosed running boards and a neat arrangement by which the radiator grille and the front lamps are tied together are Dodge features



omy than in 1941 through the use of special equipment, such as the twin carburetor system on Buick and some form of semi-automatic or automatic drive offered on other makes at extra cost. Another means of cutting down gasoline consumption is by increasing horsepower and decreasing the rear axle gear ratio, which results in slower operation of the engine without a reduction in road speed.

The trend toward no-shift driving gains impetus with Hudson introducing the Drive-Master, Studebaker the "Turbo-matic" drive and Lincoln a form of automatic drive. Already well known are the Fluid Drive, offered on Dodge, De Soto and Chrysler; the Hydramatic, offered by Oldsmobile and Cadillac, and the Electromatic,

A neat touch in the 1942 Pontiac—umbrella and case attached to back of front seat. Note also attractive door lining treatment and concealed running board

2977



CHEVROLET

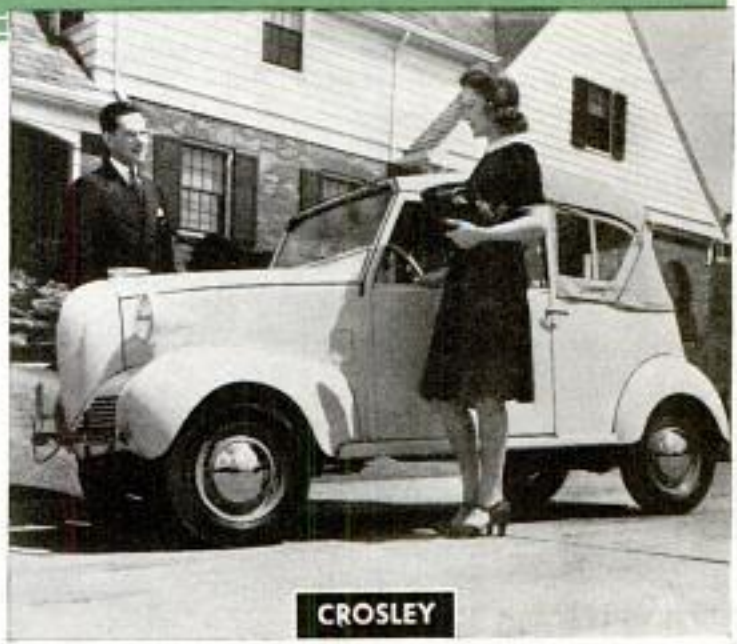
↑ Dubbed by those first to see it as the "magnificent Chevrolet," this car is longer, lower and roomier. Note front door carrying end of fender



This is the De Soto Custom Brougham, a racy-looking car with 115-horsepower engine. Note the low-set cascade grille adorning the front

DE SOTO

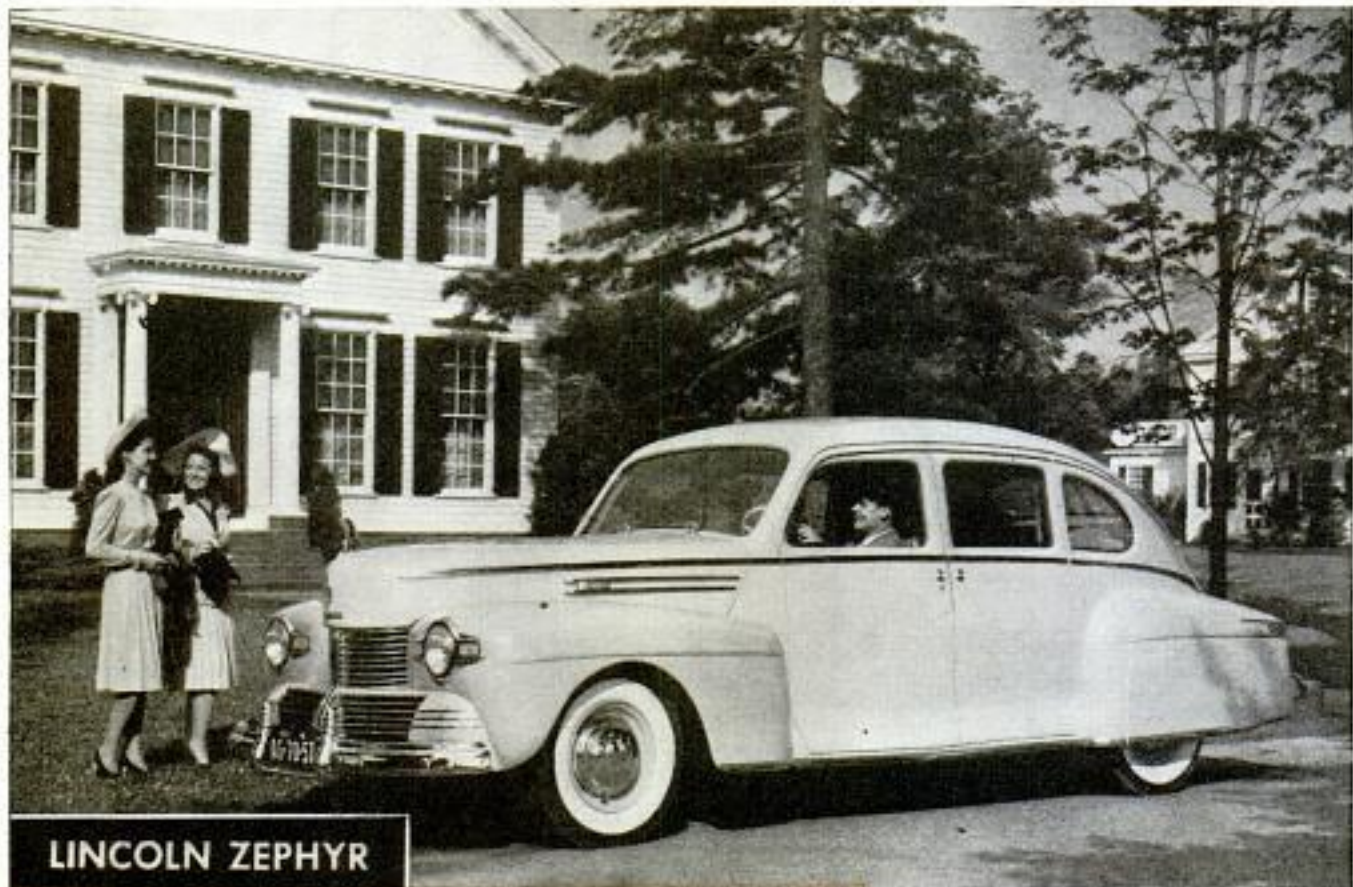
a Packard feature. The Drive-Master eliminates operation of the clutch, save as a safety precaution when starting the motor, and shifts gears automatically and silently under the complete control of the driver. A "pick-up" gear designed for smooth, rapid acceleration is a feature. The gear shift from "pick-up" to high is automatic, depending upon the speed of the car. Releasing pressure on the accelerator causes an automatic shift



CROSLY

Super-economy is the outstanding feature of the 1942 Crosley, which offers a sturdier motor than in 1941, self-equalizing brakes and other improvements

2977



LINCOLN ZEPHYR

This new Lincoln is lower, the tread is wider and the center of gravity lower than in 1941. Note use of buttons instead of door handles



Pressing a button opens luggage compartment of Lincoln-Zephyr



Range-selector of Studebaker's clutch-eliminating drive

This Chrysler Windsor is featured by its smartly styled front end, ↓ whose lines are reminiscent of the Thunderbolt shown last year



CHRYSLER

from high to "pick-up" gear. Low and reverse are selected by a lever. The Drive-Master is adaptable to all types of drivers through the use of a three-button switch that permits the driver to shift gears automatically or semi-automatically or manually. For instance, when the "VAC" button is pushed, manual gear shifting with automatic operation of the clutch is provided. The clutch is operated by a power cylinder utilizing engine vacuum and the gears are shifted by another, with the shifting actuated by a mechanical governor and controls.

The Turbo-matic drive consists of a fluid coupling with an automatic clutch and overdrive transmission, making for economy. Clutch pedal operation is eliminated. The driver, through the use of a range

2977



PONTIAC

↑ The 1942 Pontiac is marked by General Motors styling—extension of fender into front door
 ↓ Smart Studebaker President Sedan-Coupe; note extension of rear bumper to protect fender



STUDEBAKER

selector, or shift lever, chooses the gear ratio he wishes. A switch on the shift control forestalls operation of the car's starting motor until the shift lever is in neutral position.

National defense restrictions on the use of certain materials bring the cast iron piston—substituting for the aluminum piston—into the 1942 picture. Research in this field has gone so far that the modern iron piston is

This Nash "600" has a striking front-end appearance. Remarkable
 ↓ economy—up to 30 miles per gallon—is another outstanding feature



NASH

2977



Packard Club Sedan, offered with six or eight-cylinder engine, is distinguished by Clipper styling which has been extended to entire line for 1942. Note the simple, yet attractive appearance of the front end. The new Packards are set quite low to the ground



Another gas-saver is the Willys Americar, rated at close to 35 miles per gallon. It has iron alloy pistons. Enamel is used instead of chrome plating where parts are not subject to weather ravages, thus helping to conserve materials vital to national defense



highly efficient and the new car buyer is unlikely to detect any difference between the performance of his engine and that of a car equipped with aluminum pistons. Indeed, in some cases, horsepower and compression have been increased. The Studebaker is using a lightweight iron alloy piston treated by special process to form a thin protective coating that minimizes scuffing and scoring. The Lincoln, which has been using cast steel pistons, appears with cast iron heads on each bank of its V-type engine. Buick's switch to iron pistons is accompanied by employment of two means of relieving the heavier load which they impose—an oil-cushion finish on crankshaft journals and specially-designed connecting rods which are 25

(Continued to page 188)

Hudson Six De Luxe 2-door sedan has the longer, lower more flowing body lines, sleekly flared to conceal running boards, that are characteristic of the Hudson line for '42

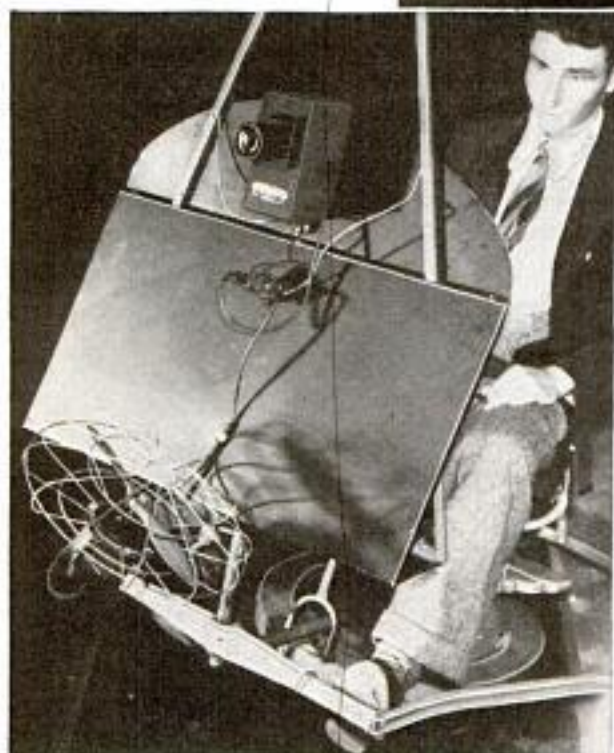
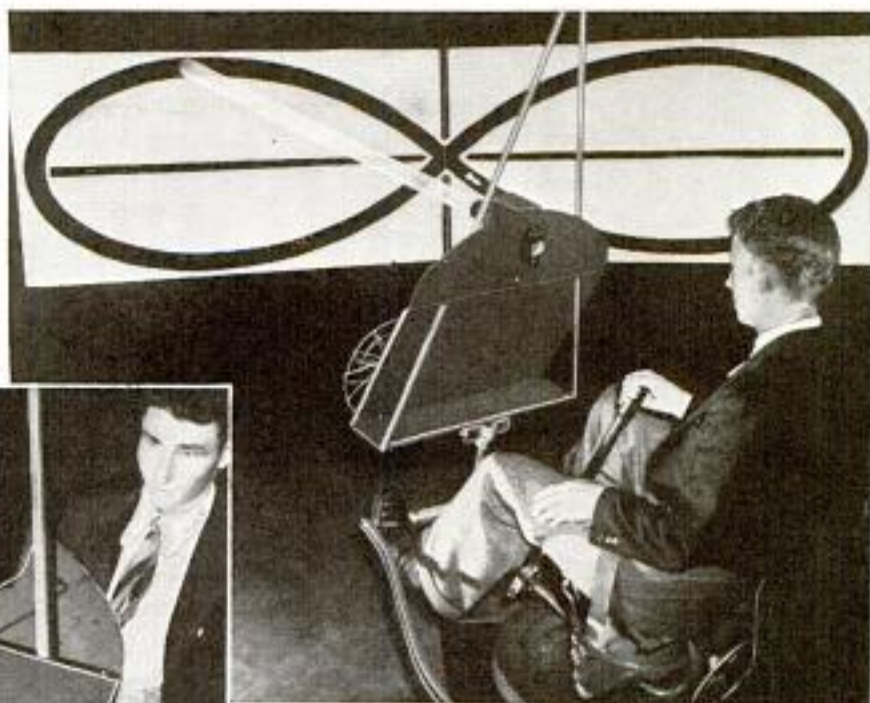
2896

Chas. John E. Crowell
Charlotte N.C.

Spotlight Charts Course of Robot Pilot Trainer

Trainee manipulates controls so that spotlight follows the straight lines, and later the figure 8, on the wall chart

Front view of the dummy pilot trainer shows the fan, which swings with the rudder bar as pilot guides it with his feet



Novice airplane pilots are learning the "feel" of the controls in a new dummy trainer whose spotlight traces the course of the robot on a chart facing the pilot.

The trainer consists of a cockpit seat beneath which an 80-pound weight is suspended; a joystick and rudder bar, a fan with small propeller blades, the spotlight and chart. The stick moves the weight back and forth, raising and lowering the nose of the trainer as it is unbalanced, and the rudder bar has a similar effect sideways. The fan, swinging with the rudder bar, accentuates the motion and causes the trainer to turn on a ball bearing connection. At first the trainee practices centering the spotlight where the lines intersect on the wall chart; later he learns to manipulate the controls so that the light follows accurately the vertical and horizontal lines, and finally the figure 8.

2987
Inexpensive Full-Color Prints Made From Kodachromes

Full-color prints now may be made from 35-millimeter and Bantam-size Kodachrome transparencies at a price within reach of thousands of owners of these types of cameras. Called Kodak Minicolor Prints, they are processed in the laboratories of the Eastman Kodak Company. One limitation is that the prints are made only from Kodachromes in 2x2-inch mounts with the standard central openings. Enlargements are available in two sizes, the "2X" size being about 2¼x3¼ inches and having rounded corners but lacking margins, and the "5X" affording a

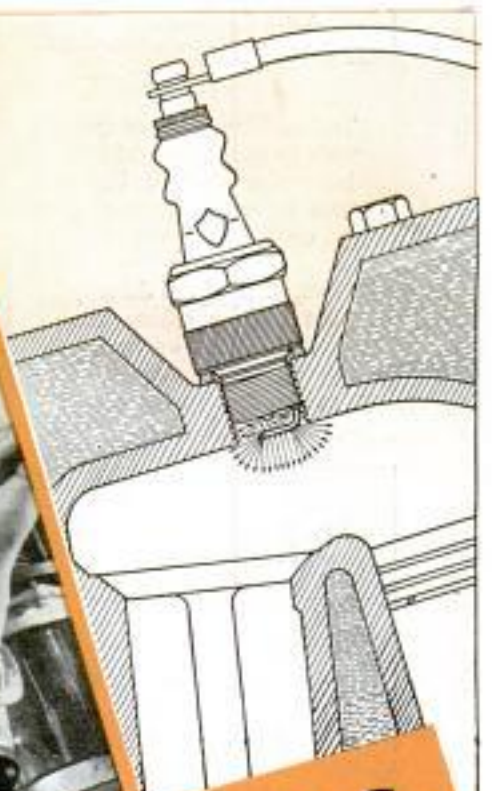
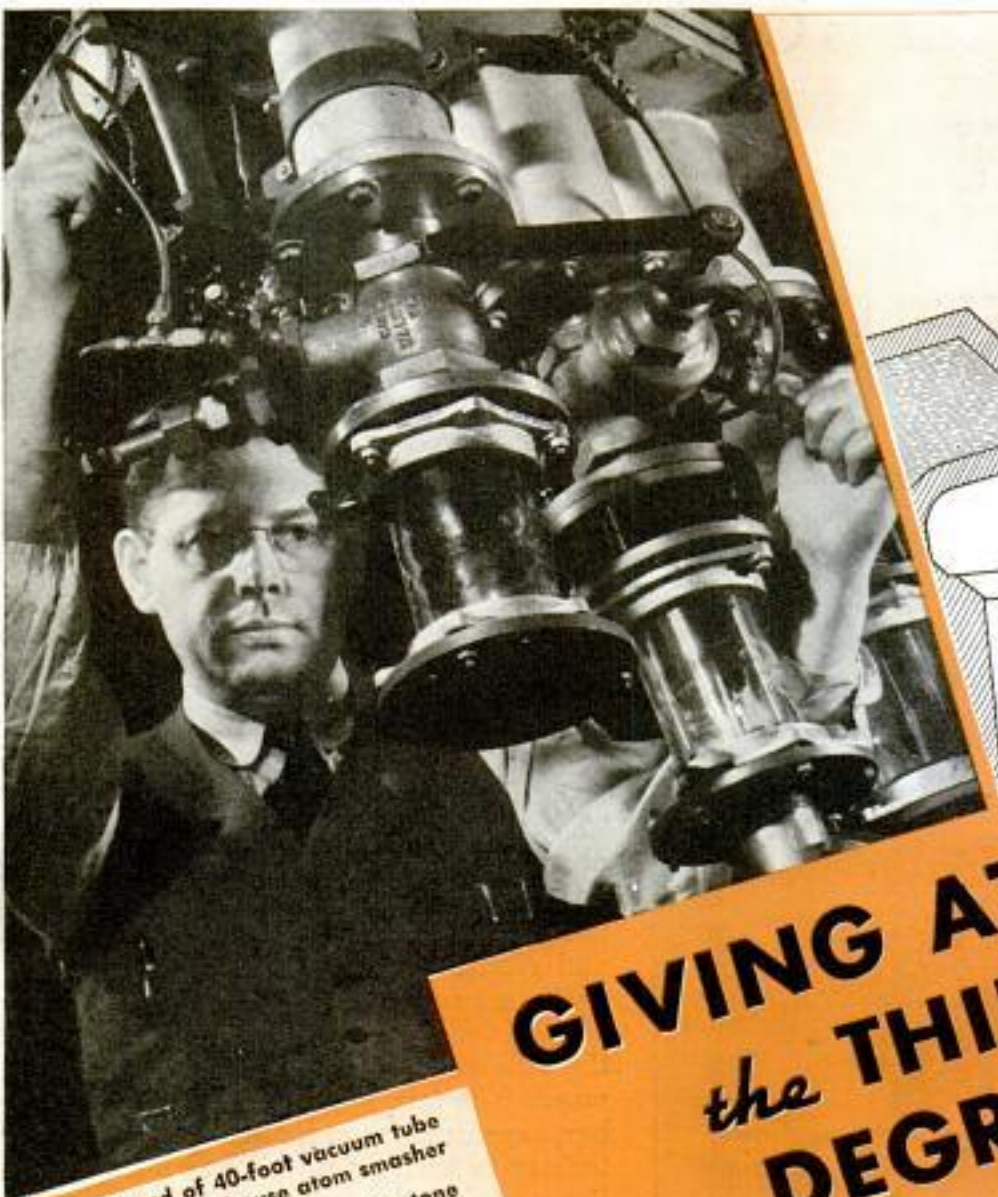
print 5¾x7¼ inches. These prints are returned in mounts, for horizontals 8¾x10¼ inches and for verticals 8¾x11½ inches. The picture opening or area measures 5x7½ inches. The quality of the print depends upon the quality of the Kodachrome transparency from which it is made. The "feel" of a Minicolor print, particularly in the smaller size, is that of an unusually fine playing card.

(See index, page 4-A, to find where to buy articles described in this magazine. Say You Saw It in Popular Mechanics.

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280.3

Dr. J. E. Hill Westinghouse



GIVING ATOMS the THIRD DEGREE

↑ Target end of 40-foot vacuum tube in 90-ton Westinghouse atom smasher
Upper right, diagram of the Firestone spark plug with Polonium electrodes
Measuring gamma rays emitted by fluorine under proton bombardment to determine the voltage of a giant atom smasher

Dr. Frederick W. Stallman Westinghouse



By Dr. L. W. Chubb

Director of the Westinghouse Research Laboratories
Pittsburgh, Pa.

THE benefits of the physicists' assault on the atom are already beginning to be realized. Several hundred different kinds of atom-smashing reactions have been discovered. But apparently there are many more to be found. So the search goes on. As the first, and thus far the only, industrial concern to become active in this scientific field, Westinghouse built an electro-static

Chubb & Co
Akron, Ohio

Dr. William E. Sharp



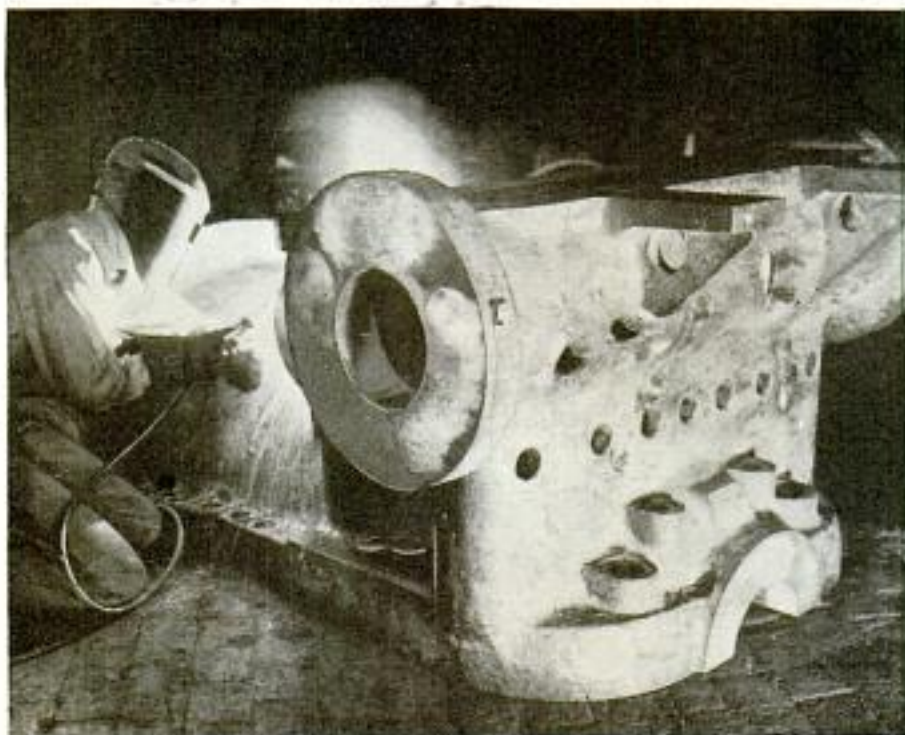
Testing "radium hound," which tracks radium, under X-ray machine
 Gamma rays from small capsule of radium sulfate will penetrate three inches of steel, revealing its flaws on film strapped around metal

generator, or "atom-smasher," and now has three research physicists operating the machine under the direction of Dr. E. U. Condon, associate director of the laboratories.

Last year these physicists discovered a new way of releasing the enormous pent-up energy of the uranium atom by exploding it with gamma-rays—energy radiations similar to light or X-rays but of shorter wave length and much greater penetrating power. Before that it was known that the uranium atom could be split with neutrons, solid particles extracted from the cores of atoms. The discovery does not mean we are any nearer the day when a ship can travel around the world on the energy from a handful of uranium. But it is another fragment of evidence about atoms that may lead some day to atomic power machines or to some other



28.0.3



Welder fills in flaw areas shown up in gamma ray inspection of casting. After the repairs, a final gamma ray check of the welded area is made

Radium sulfate is transported in lead-lined carrying case

benefit we are not capable of visualizing.

Recently, Dr. William E. Shoupp, one of the Westinghouse atom-smashing physicists, worked out two devices that are expected to put atomic research to work on a relatively large scale. They are not fundamentally new instruments, since they have been used in different form in research laboratories for a number of years. But Dr. Shoupp has improved the devices until they can now be manufactured for general use in medicine and industry.

First of the new instruments is the "radium hound," which can track down lost specks of radium and test the intensity of X-rays in hospitals. With a "nose" made of wire screening and a metal rod, and a "head" full of radio tubes and wires, the "radium hound" can find as little as two hundred-millionths ($2/100,000,000$) of an ounce of radium by tuning in on the rays sent out by the radioactive substance. An ounce of radium is about as big as a large pea and is worth more than \$700,000. So a few thousand dollars' worth of this substance could be fairly easily misplaced in laboratories and hospitals.

In hospitals the "radium hound" can be used to measure the amount of X-rays it is safe for a patient to undergo in treatment for malignant diseases, and to protect doctors and nurses by testing X-ray leakage.

When the rays from radium or X-rays pass into the "nose" of the

Below the engineer's hands are coils of electromagnet which sorts various sub-atomic particles used in bombarding elements under investigation



Dr. William E. Shoupp

2803

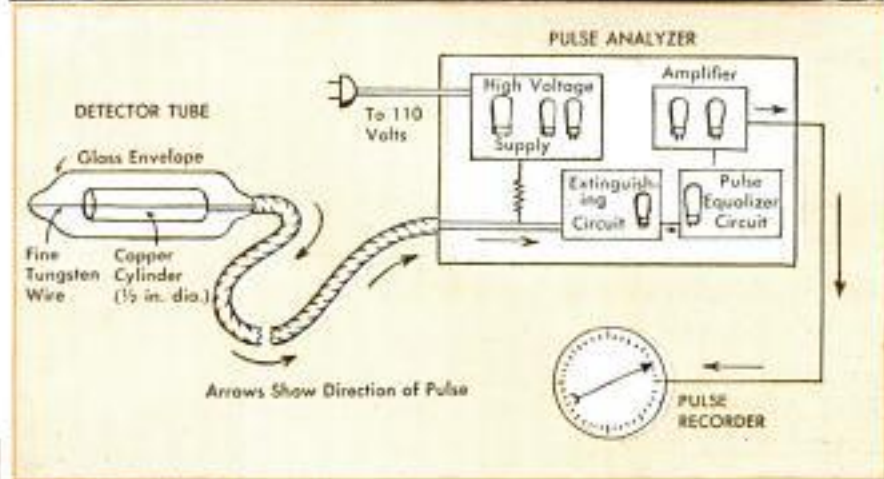
Mr. William E. Shaeffer
Westinghouse

New style Geiger counter used to trace radioactive atoms

"radium hound," they ionize, or electrify the air inside, by knocking off electrons from some of the atoms in the air. Then a small electric current starts to flow between a cylinder of wire screening and a metal rod. Radio tubes amplify the current until it is strong enough to swing the pointer of an electric meter.

The other device which is putting atom smashing to work is the Geiger counter, an electrical "detective" that tracks down atoms for the scientist, doctor and industrial worker. This device is similar to the radium hound, but is more intricate and counts exact numbers of atomic disintegrations.

This tool of science can sort atoms of chemicals by weight



↑ Diagram of Westinghouse "electrical detective," the Geiger counter, which detects and counts rays



The electrical "detective" works with special agents known as tagged atoms or "spies." These are atoms or minute particles of matter that have been made unstable by bombardment in an "atom smasher." When they explode they send out radiations similar to those from radium which can be picked up and recorded by the Geiger counter. The atomic spies mingle with others of their kind and follow them around. Like fifth columnists they broadcast waves, revealing their location to the "detective."

These devices have already unraveled such mysteries as how growing plants make sugar, the distance atoms wander, and where such food elements as calcium and phosphorus go in the human body. For example, if a medical scientist is interested in learning where sodium goes, he can mix a little radioactive sodium with

(Continued to page 180)

Mr. L. A. Happele
Westinghouse

2.9.16

Steel Helmet Inside a Helmet Is Shaped to Shed Bullets

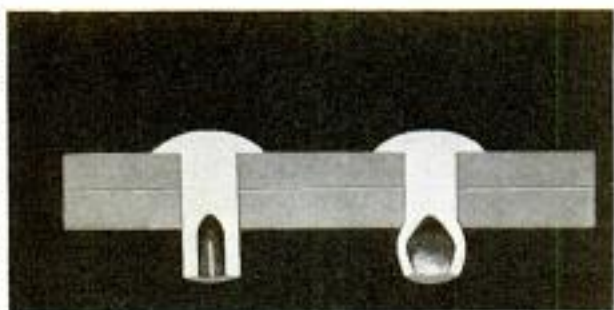


Inner helmet gives extra protection at battle front

"Reblocked" in a new shape scientifically curved to deflect bullets harmlessly, the U. S. Army's 1941 "tin hat" offers better protection for the eyes and the back of the neck than the helmet worn by the American Expeditionary Force of 1917. A special inner helmet adds extra protection for front-line trench duty, and army tank crews are given an additional padding similar to that of football headgear.

Self-Locking Explosive Rivet Speeds Airplane Building

One of the "bottlenecks" in airplane construction is the driving of thousands of rivets, many of which must be installed in places accessible from only one side. En-



Rivet at right has been locked in place by explosion

gineers say an all-metal pursuit plane has as many as 800 fastening points which can be reached on but one side, while a big bomber may have 10,000. This fabrication bottleneck may be solved by the new explosive rivets developed by DuPont, rivets that explode with heat and set themselves permanently. The whole operation is performed from one side with ease and speed, one man setting 15 to 20 rivets a minute after they have been placed. The rivet itself, weighing about one-fourth as much as the ordinary mechanical "blind" rivet, has a charge of high explosive in a cavity at the end of its shank. Once in place, an electric riveting gun weighing less than five pounds applies heat to the rivet head, and when it reaches 130 degrees Centigrade the charge explodes, expanding the shank and setting it firmly. The explosive charge can be regulated accurately to control the expansion to 20 thousandths inch.

"Electric Ear" 10 Feet Long Gives Sound Perspective



Highly directional microphone picks up distant sounds

So sensitive that it will pick up the smack of two football players clashing together in midfield, a microphone with a 10-foot "ear" introduces sound perspective to the movie and radio field. It is being field-tested in Hollywood by RCA engineers. Highly directional, it has a pick-up angle of only 30 degrees and can be swung easily to focus in any direction. It is mounted on a tripod moving on rollers. Because of its long-distance pick-up ability the perspective microphone can be posted in the location of a theater audience, or beside the camera on the movie lot, thus eliminating the necessity of swinging booms and drop suspensions. The new microphone is effective through all frequency ranges.

Cont Allen Warren Elliott
343 E 33rd New York

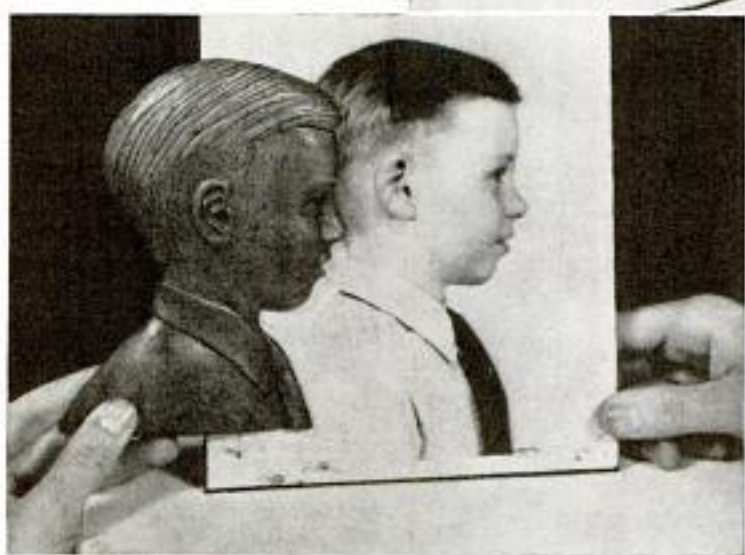
Wilmington

RCA Bldg. 30 Rockefeller Plaza New York

2926 Anderson Tool Supply Co
4322 W. Chicago Ave
Chicago, Ill.

Electric Wood Carving Machine Traces Model

Home craftsmen with no particular carving skill can sculpture wood into distinctive articles both useful and ornamental with an electric wood-carving machine that traces a model. Drawings and pictures can be translated into wood sculptures in mahogany, walnut and other fine woods.



The "electric sculptor" is shown at work, at top, with a vase and several statuettes ranged on the table. Below, notice the fidelity with which the boy's photograph has been carved in wood

The machine is equipped with a table for carving flat work. By adding a special attachment, round work such as statuettes, lathe work, etc., can be carved. The machine will follow contours of intricate objects in glass, metal, wood, plaster or other materials. Amateur shop workers can shape with it such articles as book ends, wooden bowls and tableware, name plates and plaques, jewel or cigarette boxes, salt and pepper shakers, lamp bases and novel jewelry.

Infrared Bulb Fires Invisible Flash for Blackout Picture

Black-coated flash bulbs with which you can take pictures in total darkness on infrared film have just appeared on the market. Army photographers and newsmen equipped with these invisible-light bulbs can "shoot" pictures in air-raid blackouts without fear of exposure of their light, although as an extra precaution the camera may be equipped with a visor shielding the flash reflector. The blackout lamp, which is treated and coated with a special black infrared filter that dries hard and would not be affected by ordinary chemical, atmospheric or mechanical conditions, may find uses in darkened theaters, lecture halls, crime laboratories and the like.



Black bulb in reflector emits only infrared light

The average tree with an 18-inch trunk may evaporate from 200 to 500 gallons of water per day.

J.D. Bartlett
Research Laboratories
Bartlett Tree Laboratories, Stamford Conn.
Copyrighted material
13
Walsh Photolamp Corp. 335 Carroll St. Brooklyn N.Y.

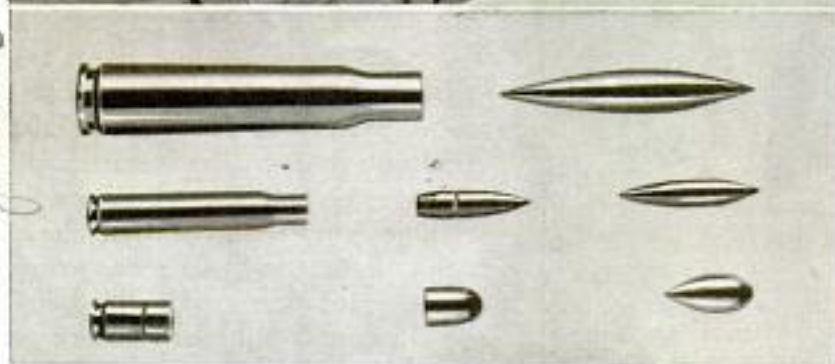
L7 35 Cont. Thomas E. Stearns, Jr.
3872 Franklin Ave
Los Angeles

HUNTING NEW WEAPONS



chute-troop release gear by which 24 men and their equipment can be discharged from an airplane in six seconds, from an altitude of only 85 feet? These are two ideas brought in recently.

One inventor designed and tested streamlined and teardrop bullets that have a flatter trajectory, longer range, and greater penetration than present bullets. But this improvement may be too late because the Army is trying out a bullet with four small tail fins that is discharged without spin from a smooth bore gun. The bullet has two small



Blackout light, top, gives some illumination invisible to bombers

← Bullets of streamline shape fit .50 .30 and .45 caliber guns

Models of offset propeller and of cluster bomb, whose units separate and spread during fall

INVENTIONS for Defense" might be the subtitle on the office door of the Crosby Research Foundation in Pasadena, California.

In the reception room of these private investigators you are apt to find, waiting for consultation, a landscape architect with an idea for a new camouflage system in his briefcase; in another corner, accompanied by a bodyguard, a chemist with the formula for a new super-explosive.

Even if neither invention proves practical, it will get the benefit of rigid tests for the investigators never know when an outstanding idea may be brought in. The Crosby organization is financed by a group of men who chose this way to help defense, and is headed by Larry Crosby, business manager for Bing Crosby.

What would you think of a nonmetallic cartridge that is entirely consumed when the bullet is fired, thus speeding up and simplifying automatic guns? Or a para-



John B. Rathinell
170 E. California St.

L735

of WAR

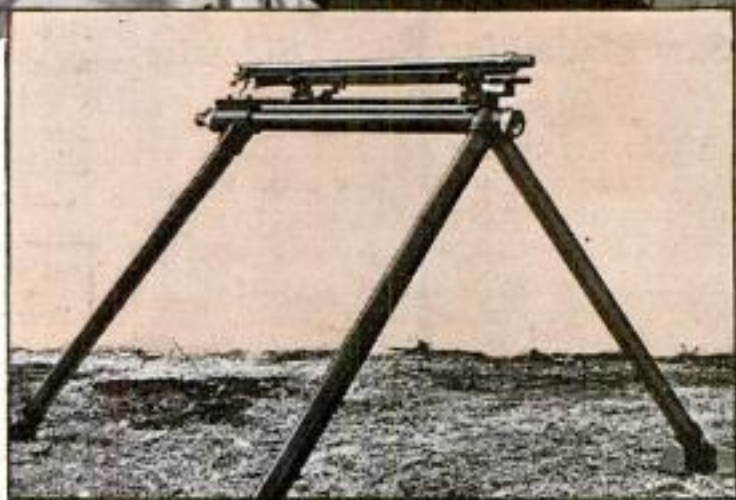


Three-inch anti-aircraft gun, one phase of defense on which inventors are working

copper skirts to prevent the gas from escaping past it in the barrel and is said to have an 80 percent increase in range and a 100 percent increase in velocity over conventional designs.

A method of taking time-exposure photos from fast-flying planes has been badly needed and it may be that the answer is contained in one device submitted to the Foundation. A time exposure from an airplane sounds silly but the fact

(Continued to page 168)



This stable gun rest and recoil mechanism, with its sighting telescope mounted in a tube under the barrel, is used in making tests of the fire power of small arms and ammunition

L 816.

Model Plane Guided by Line Stunts in Loops and Dives



Putting the plane through its paces with double line

Controlled by its operator with a 50-foot line, a model plane can be put through a variety of stunts—hedge hopping, power diving, spot landing and looping. The plane is offered in kit form, and will fly 50 or more miles an hour. It has made a record of nine consecutive loops. All the necessary parts except the engine, which is purchased separately, are furnished in the kit and can be assembled in a day. A speed finder is included.

Saw Blade May Be Set Sidewise To Cut Long Panels

Wider use of an electric scroll saw has been made possible by an improvement that permits the blade to be set so it will cut at 90 degrees toward either side of the



Long cuts in panel were made with blade set sidewise

frame. This enables the operator to make longitudinal cuts inside any length board or panel without being limited by the frame. The saw will cut to the center of a board 19 inches wide, and the manufacturer points out that it is easier to swing this saw around on a large piece in following the design than to swing a long board on a bench type saw. The blade runs at 7,200 strokes a minute, cutting so smoothly that no sanding is required.

L 385

Inspectors Ride Tunnel on "Jeep" Driven by Storage Batteries

With several hundred miles of tunnels to inspect constantly in the operation of southern California's water systems, employees of the Department of Water and Power have built a powered "jeep" to save endless walking. One of the tunnels



Electric three-wheeler for tunnel can haul three men

stretches almost fifty miles. Three men can sit on the riding platform. The car has three small rubber-tired wheels. Two big storage batteries provide current for the electric motor and twin spotlights in front. It makes about fifteen miles an hour.

TRY THE TIME-SAVING INDEX

You can obtain additional information quickly about any commercial product described in the Editorial pages by writing to the manufacturer or distributor whose name is listed in the Where-to-Buy-It index. Note the page on which the article appears and turn to the index, page 4-A, for the name of the maker or seller. To save time write directly to him instead of to us. If no name appears directly under the indexed item, the product is not known by us to be on the market. When writing—Say You Saw It in Popular Mechanics.

American Junior Aircraft Co.
1166 N. B. Street
Pasadena, Calif.

Revised July 9.
14 H. and Clark
Pasadena, Calif.

note - saw



17

L723

One of the Navy's combat planes equipped with floats undergoes a rough-water landing test. A new scout bomber designed for the Navy is said to be superior to any similar plane in the world

Below gun crew mans an antiaircraft weapon aboard one of Uncle Sam's fighting ships. Anti-aircraft defense is a subject receiving close attention from the strategists of the American fleet

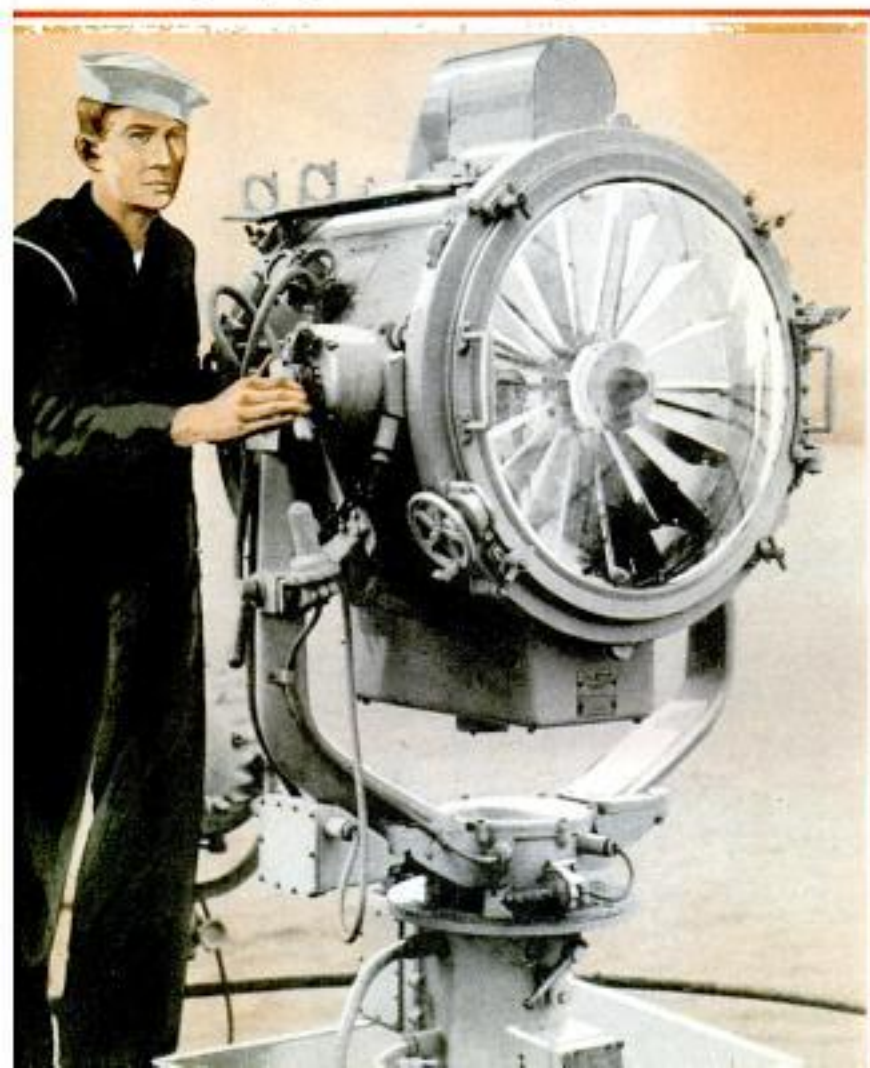
The BOMBER CHALLENGES the BATTLESHIP





2923
This four-engined patrol bomber of the Navy permits keeping a close watch on America's sea approaches, for the plane can range hundreds of miles out over the ocean

Below, operating a searchlight aboard a fighting craft. Personnel of the U. S. Navy is said to be the equal of, perhaps superior to, that of any sea force in the world



18 Washington H.C.
By Lt. Victor F. Blakeslee
Rm. 1603, Navy Bldg.

TREMENDOUS possibilities that lie within the airplane as a method of attack are not being overlooked by the United States Navy.

Thus today our country's defense program calls for 15,000 combatant planes and a fleet capable of fighting in the Atlantic and Pacific at the same time against all combinations of enemies.

That remarkable results have been achieved in the present conflict is recognized and our experts are studying these results. For instance, the torpedo plane, invented by our own Admiral Fiske, has been used to advantage, especially in closed harbors against Italian ships lying at anchor. Diving in and discharging their torpedoes before vessels could get under way or were even aware of their approach was a great accomplishment in crippling major elements of Mussolini's fleet.

Value of the airplane has been further emphasized by the part played by torpedo and bombing aircraft in the spectacular chase and sinking of the German battleship Bismarck, crippling the vessel and retarding its



19 1923

speed so that it fell victim to British surface craft.

The recent victory of the Germans in attacking successfully and taking the Island of Crete in twelve days virtually by the employment of airpower alone, gives pause also to the naval strategist of the future. It seems to prove conclusively that to defend advanced bases—and Crete can be considered as such—defending aircraft must be of nearly equal weight to those of the attacker in order to prevent effective landing of troops in great numbers from above the earth.

The sinking of the Bismarck is not regarded by naval strategists as proof that battleships are obsolete or can be sunk from the air. To the contrary the crippling of the Bismarck from the air resulted in her loss later because of the gunfire of superior numbers of surface ships. The German strategy of sending the Bismarck to sea almost unaccompanied can now be said to have been poor, but it is cer-

Here is an inspiring picture for any American—the Salt Lake City, one of our formidable surface fighting craft

Below, parachute jumpers entering nonrigid airship—a blimp—during the Navy's experiments with modern war methods



Copyrighted material



Air power at sea—the big aircraft carrier Saratoga

Below, formation of Navy planes ranging overland

2723

tain from reports that she took a terrific amount of punishment from vastly superior forces before sinking. The lesson to be learned from this engagement would seem to be that had she been a unit of a fleet containing a dozen or more Bismarcks and sufficient covering aircraft, the position of her type as ruler of the seas she was built to protect would be scarcely open to dispute.

Similarly, the Crete invasion does not prove that units of the British fleet, which were unsupported from the air, practically, are in any way obsolete. These ships of war did prevent water-borne transportation to the island and had aircraft support been available, the Germans undoubtedly would still be knocking at the door.

So, in the present organization of the United States Fleet the battleship remains our first line of defense. Of course, complete coordination of sea and air power is necessary to achieve victory in any modern naval engagement that involves all types of craft in large numbers. Recognizing this, the Navy has always insisted that its air officers not only have a knowledge of defense and attack in their own firmament, but that to carry out

20



Copyright

L 723

missions of scouting, screening, spotting, horizontal and dive bombing, and attacking with torpedoes from the air requires a working knowledge of surface vessels and their potentialities. Therefore the naval air arm must at all times cooperate with the fleet from carriers as well as from shore-based aviation centers, always cognizant of the probable tactics, strategy and strength of all types of naval ships.

The striking power of aircraft and their great speed, ever increasing the dangerous element in surprise attack, is thoroughly understood. In consequence, control of the air becomes a matter of absolute necessity in a fight between equal or nearly equal surface forces. The modern sea battle would find our own aircraft engaging those of the enemy long before the gunfire of the big ships came into play. Realizing this, and the importance of aircraft support to the fleet, the 1940 building program



One of the Navy's older type planes above the clouds on training flight

Below, division of American battleships firing heavy guns. U. S. Navy gunners are regarded as the world's best



Copyrighted material

L 723

Keeping phone watch aboard one of our fighting ships. The Navy is regarded as prepared for any emergency—and is growing stronger every day

craft spotters could judge the patterns of falling salvos and transmit to the ships of the fleet the proper changes in range and deflection to achieve direct hits.

That the airplane does hold a challenge for surface vessels is fully acknowledged, so it has become expedient to protect American combatant ships above decks in order to resist better the effects caused by dive and horizontal bombing aircraft. Exposed equipment, such as fire-control instruments and range finders, aboard ship must be armored against splinters. Thicker

upper and lower decks on major units must be so designed as to assure heavy bombs bursting outward and upward, rather than entering fire rooms, ammunition-handling rooms, magazines and oil compartments before exploding. Resistance to the bomber and the torpedo plane also demands rapid-firing antiaircraft guns, and plenty of them. Mounted in series, much as the British pom-pom has been used effectively in pouring metal into enemy planes, these guns can shake the attacking plane from its course and target.

On the other hand, our strategists find it advisable to improve constantly our naval aircraft, armoring the planes against attack, equipping them with selfsealing gas-

called for more and better aircraft carriers, constructed in the ratio of two-to-one over other types of combatant vessels which were to double our navy in size and give us a two-ocean fleet.

Control of the air as a precedent to surface action would allow our aircraft to harass the enemy. Torpedoes launched from planes, as well as destroyer squadrons, would attempt to force opposing battleships to turn from their course, throwing the big guns off their targets. It also would permit bombing and aircraft spotting of falling shells, the latter a development since World War No. 1. After the Washington Disarmament Conference of 1922, which had as its major contribution to peace the ten-year battleship building holiday, the angle of fire of our turret guns was raised. This resulted in increased ranges which would find projectiles dropping beyond the horizon and the vision of our own gunners and ship's spotters. With control of the air, air-

U.S.S. Gleaves, another hard-hitting surface vessel, snapped at a speed of 35 knots



Copyrighted material

oline tanks and devising ways to make them faster and give them fire power superior to those which they might encounter. One important ship in the air arm is the giant patrol bomber, capable of ranging thousands of miles and of carrying large loads of bombs. Another, just announced, is a new but smaller craft, a scout bomber, which is regarded as faster, more heavily armed and capable of ranging much farther afield than any similar plane in the world.

At the time of the first World War it was generally believed that four direct torpedo hits placed in particular spots of vulnerability would be necessary to sink a battleship. Improved designs in torpedo "blisters" and increased thickness of armor belts have swelled this figure. The exact effect of torpedoes, bombs and shell fire on the Bismarck will be studied with interest by the naval experts as soon as that information becomes available.

The importance of the aircraft carrier seems to be growing rap-



23

View of big guns on an American battleship. Our battleships are heavily armed and armored, but slower than those of some nations

Below, closeup view of a Navy plane on a routine training flight





L 923

Inspiring view of the Saratoga—
aircraft carrier—during a speed trial

Wings for the fighting craft of the
United States, as well as other na-
tions, in North American Aviation
plant. This colorful picture is re-
produced from a natural-color film



24

idly. In addition to the Navy's large "mother" ships carrying as many as 72 planes, American merchant ships are being converted into small-size carriers for escort or patrol work. These vessels are scheduled to carry about 15 planes. Within 90 days, a merchant ship's funnels can be moved to one side, a flight deck installed and other changes made to complete the conversion. As patrol craft, these small-size carriers would be able to send planes aloft to watch for submarines and enemy surface

ships, covering a vast area of the ocean's surface. Once spotted by the patrol ship's planes—scout bombers, for instance—the submarine would have difficulty in escaping because the aircraft could attack immediately or call in other planes to drop destructive bombs.

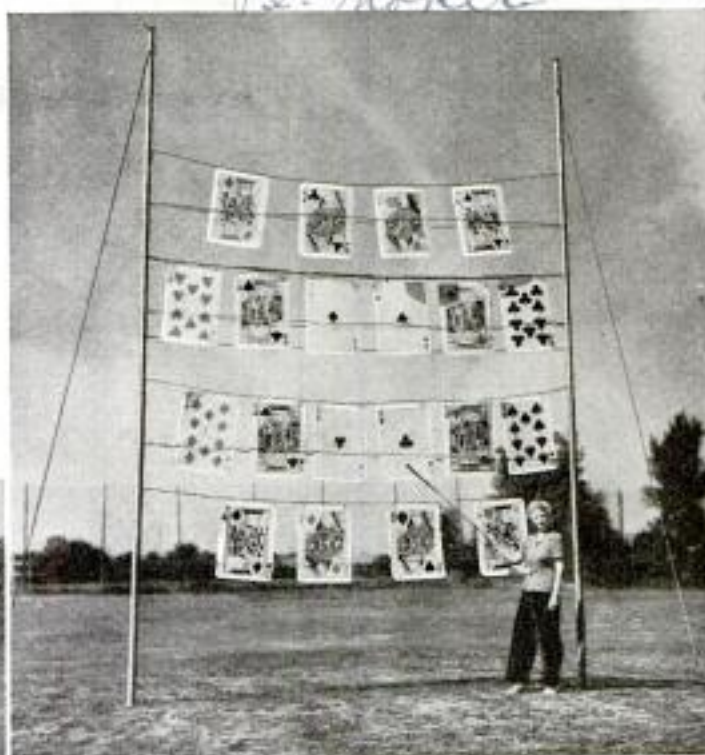
To the oft-expressed opinion that air power is greater than sea power, Secretary of the Navy Knox says that this is no time to argue over the relative merits of one against the other, that it is a time to build more battleships, more planes, more submarines, cruisers and destroyers, that all

(Continued to page 176)

1965

Poker-Golf Game Teaches Driving Accuracy

Golf and poker are combined in a new kind of target-practice game that induces the golfer to place his shots carefully. The target consists of large playing cards in the four suits including the Ten, Jack, Queen, King and Ace, and the player "draws" a hand by driving golf balls at the target. Cards are made of cold rolled steel twenty by thirty inches, and are placed 50 yards from the players. A smaller target is available for backyards or basements.



↑ Cards of highest value are arranged nearest center of target and the ones which are hit by a player are used to make up his poker hand

← To hit the target from tee 50 yards distant requires accuracy instead of mere power, making players take pains in placing their shots

1924

Working Model of Truck Used as Salesman's Sample

As a "demonstrator" of its big trucks, a Los Angeles manufacturing company has built a scale model complete in every detail except that its power plant is electrical instead of having the usual internal combustion engine. It has eight rear and two front wheels, all equipped with brake drums, and there is the standard chain drive used on its larger trucks. The forward rear wheels are on a "walking beam" which adapts to the roughest roadway. Even the transmission and differential are perfect copies in miniature.

See index, page 4-A, to find where to buy articles described in this magazine. Say You Saw It in Popular Mechanics.



Driven by an electric motor, this miniature is otherwise an exact copy of a big ten-wheel truck

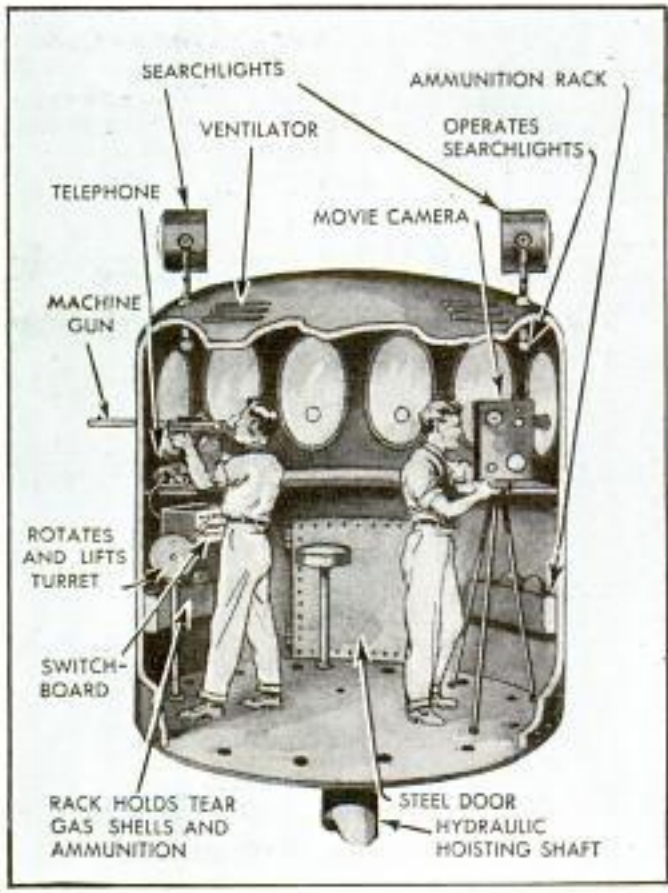
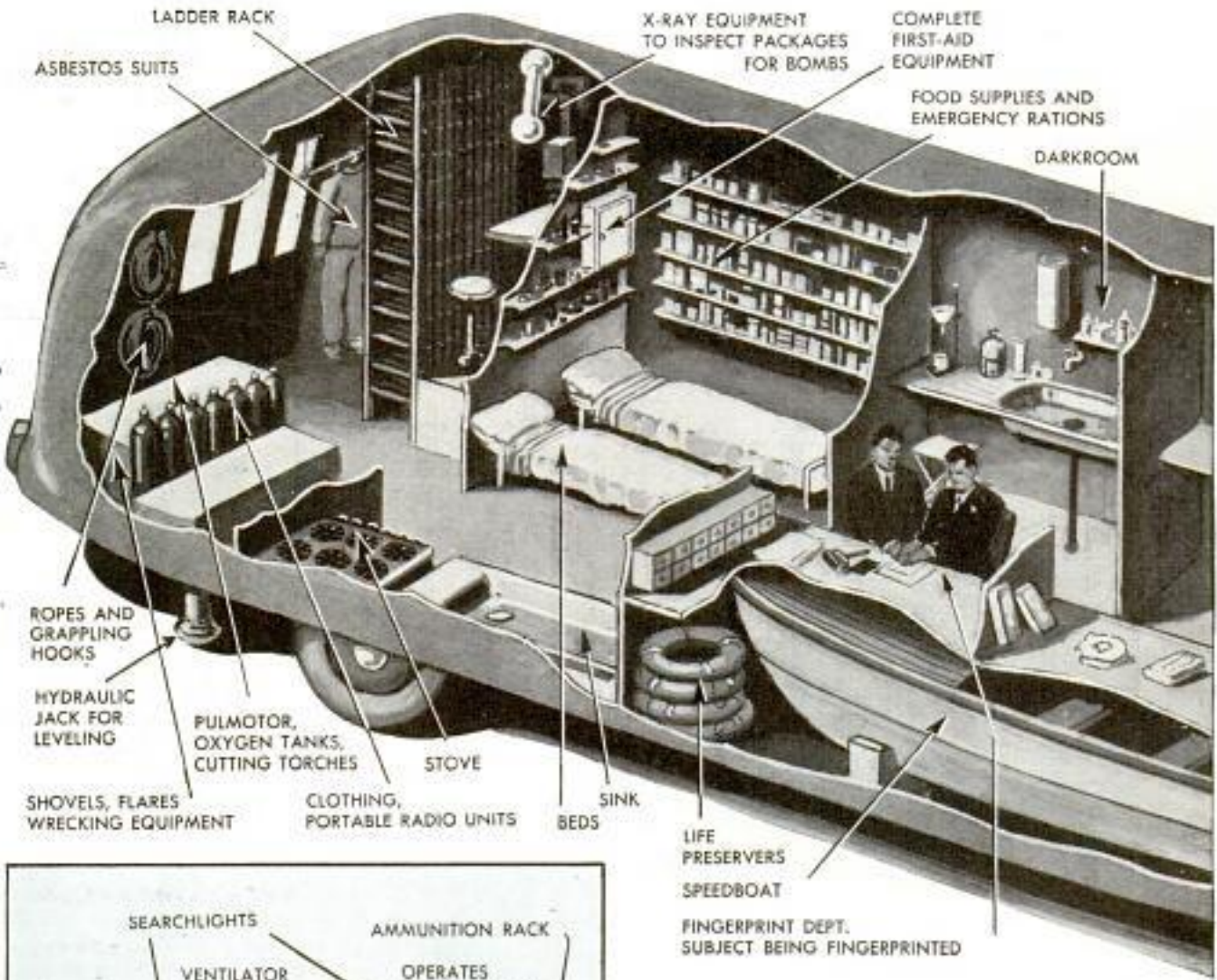
*Dr. Lloyd DeLongchamps
Grandolph, Chicago
Nov 65*

*Six wheels, drive 20 hp. d.
1572 for Angeles*

2976 Cont. Elie Read, Jr. 5424 Cornell Ave Chicago

CRIME LABORATORY

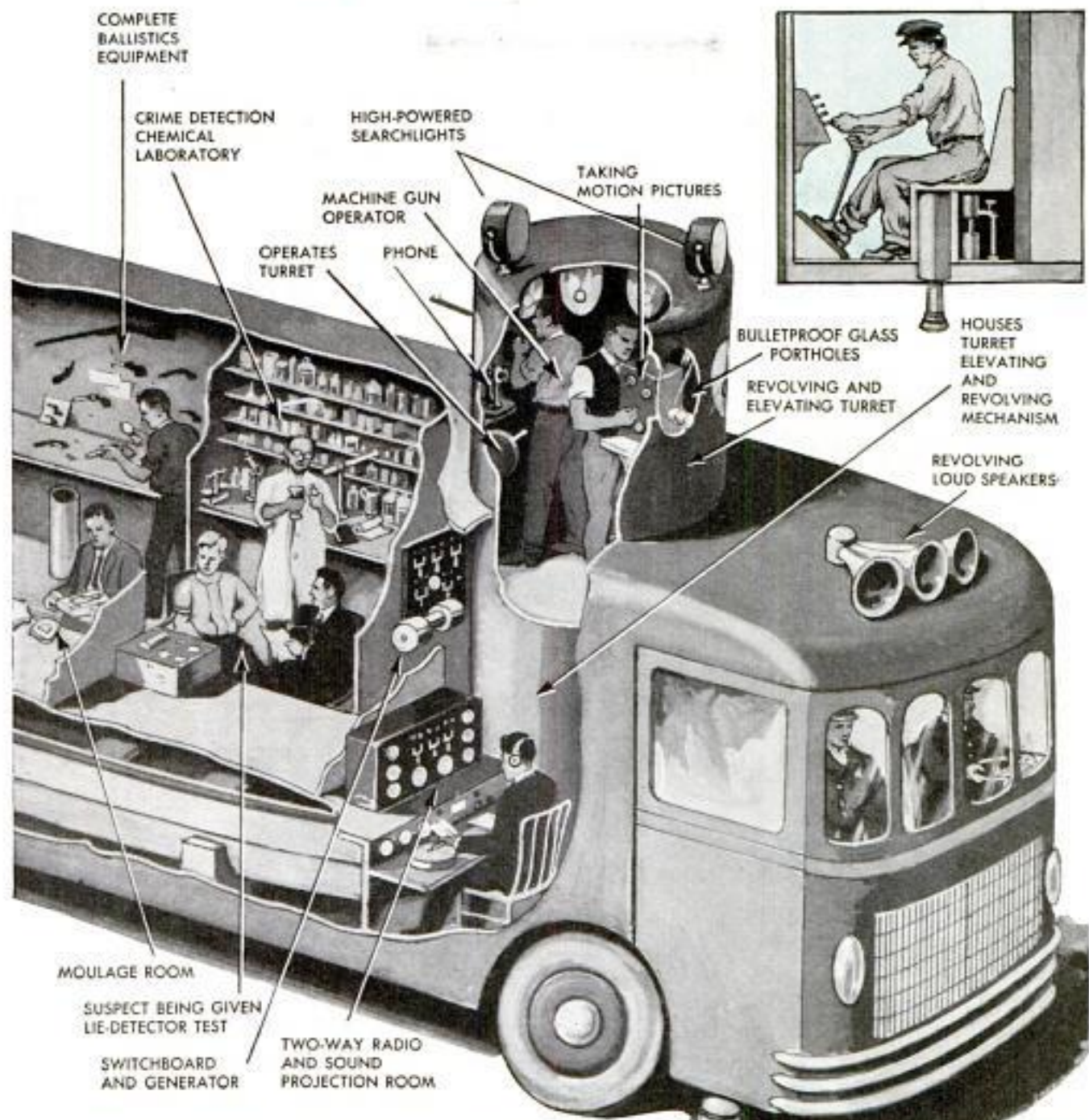
Built by General Body Co. 3067 Elston Ave. Chicago



A secret weapon for combatting crime soon will be ready for use by law-enforcing agencies of the State of Illinois. It is a crime detection laboratory mounted on a 30-foot truck chassis and it will be manned by expert technicians and investigators. On these two pages are drawings which show how the mobile laboratory will provide full investigative coverage for fires, floods, explosions, tornadoes, coal mine disasters, riots and crimes of violence throughout the state. It has a hydraulically controlled turret (see drawing at bottom, left) which is operated from a bullet-resistant cab in the unit. The turret rises four feet above the roof of the vehicle, providing a point from which an officer may command and direct a force combatting a riot. Guns, cameras and searchlights can be aimed and operated through ports in the turret. Among the 1,200 items with which the laboratory is equipped are a speedboat, asbestos suits, shovels, flares, pulmotor, oxygen tanks, cutting torches, X-ray equipment, fingerprint equipment and many others. The laboratory is being built at the direction of Governor Dwight H. Green and under the supervision of Director T. P. Sullivan of the Illinois Department of Public Safety

L976

ON WHEELS



The anticrime laboratory also houses a chemical outfit, ultraviolet and infrared ray equipment for examining bloodstains and similar evidence, mou-
 lage materials and complete ballistics equipment and a lie detector for the questioning of suspects. One feature of the vehicle is a four-point hydraulic jack system, operated from the driver's cab, which will level the laboratory even when it is parked on an incline. In addition to keeping the vehicle level while chemists and others work inside, the jacks could be employed to raise the turret to the level of windows in a barricaded building in which criminals have taken refuge, or to elevate the cameras to a level for better photographs of a crime scene. At upper right is the turret-operating mechanism; at bottom is an illustration of how the hydraulic jacks may be used to level the laboratory on an incline. A powerful engine will give a top speed of 65 miles per hour, enabling the laboratory and its crew to reach any part of the state within a few hours after an emergency call has been received



2996

TESTING THE WORLD'S



↑ A tiny army fighter plane nestles beneath a wing of the biggest bomber of them all, the B-19

← At the controls of the dreadnaught is Lt. Col. Umstead, the author, with his chief of crew



3872 Franklin Ave
Los Angeles

Wright Field, Dayton Ohio
By Lt. Col. Stanley M. Umstead

U. S. Army Air Forces

As Told to Thomas E. Stimson, Jr.

ONE day recently I climbed into the cockpit of a small trainer, opened the throttle, and pulled away from the ground on a routine test flight.

The next day I was sitting in a space the size of an ordinary living room, with wide

windows all around me. Six other men were reclining in comfortable chairs. It was a vastly different place from the cockpit of the little trainer, yet my job was exactly the same. Open the throttles and pull away from the ground.

Yesterday the throttle controlled a 150-horsepower engine. Today the throttles in front of me had charge of 8,000 horsepower. The engines would drag more than 50 tons of airplane into the air when I opened them up.

Or would they?

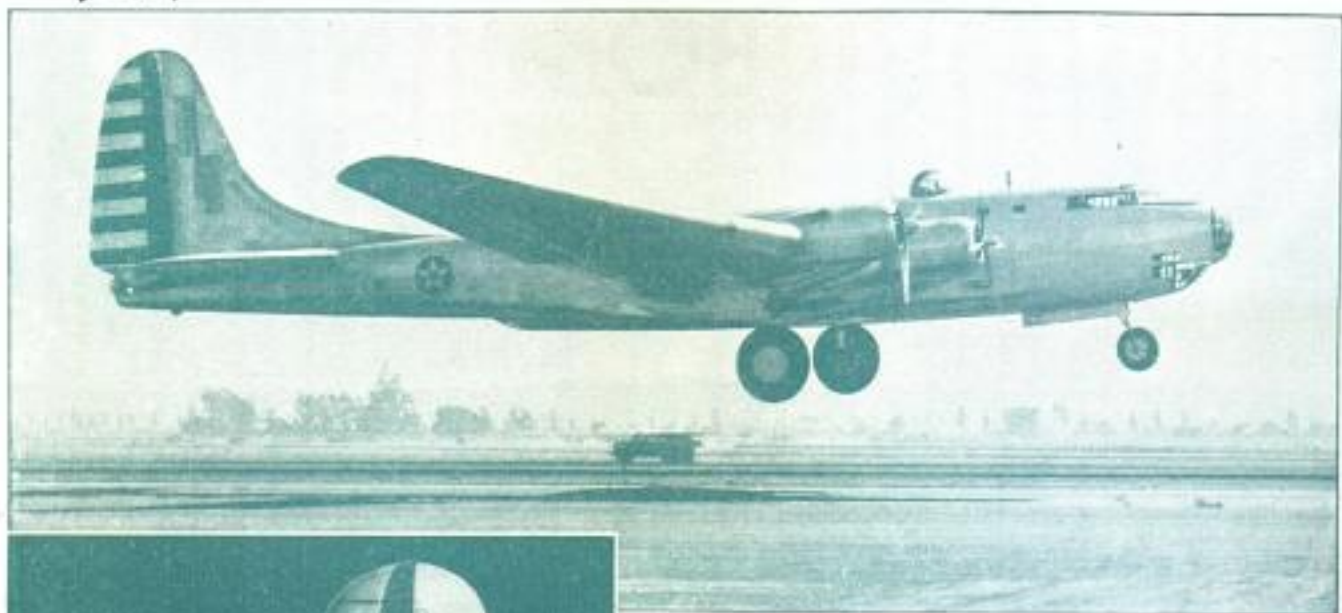
This was the largest airplane ever built. Like every new design, it was bound to have "bugs" that can be found only by trying to fly it. The only way to find out what

2996

BIGGEST BOMBER



Inspecting the "skyscraping" tail surfaces of the B-19. The rudder alone has 237 square feet of movable surface. Huge as it is, Colonel Umstead believes it is but the forerunner of far larger planes of 500-passenger capacity, or greater, which will be built when there is a need for them



With an 8,000 horsepower roar, the infant giant of the Army Air Forces takes to its element for a test to correct but it was enough to give me a momentary flutter.

Up in the air I received another surprise. The monster B-19 was handling as easily as a smaller airplane. Although the wing is a tenth of an acre in area and the control surfaces are correspondingly large, the "big experiment" was easy to fly. There was a wide grin on the face of Col. James G. Taylor, the man who first proposed building the great ship and who was sit-

Ground checking manifold exhaust pressures and calibrating cockpit instruments just before a test flight



↑
Test engineers on skyscraper scaffolds are running vibration tests on tail group flaps

would happen was to try it. I pulled open the master throttle and the uneven rumble of the four power plants 30 feet behind me broke into a steady roar. The brakes were released and we started down the field.

In a moment we had flying speed and were ready to climb, so I pulled back on the stick. Nothing happened. I pulled back still more but we stayed on the ground. Then, finally, we lifted. There was a flat spot in the elevator controls, evidently. It was a little detail that wouldn't take long



2966



↑ Troops march past the B-19 as it rests on an army air field in California

ting in the navigator's chair on this first flight.

There are a lot of things about such a large plane that can't be foretold in wind tunnel experiments and ground tests. For instance, would the great holes into which the wheels retract in the wing have a bad effect during take-off and landing? You could almost park two automobiles in each space. There was no telling whether these air traps might set up dangerous turbulences. We didn't want to find out on this first flight because there were too many other things to be concerned with, so for the first hop these compartments were sealed with plywood and we flew with the wheels down. Later it turned out that the open wheel spaces have no appreciable effect on the plane's performance.

It takes two to two and a half months to run tests on a plane like this, of which possibly only 30 hours are spent in the air. The rest of the time is consumed in making the changes and adjustments

(Continued to page 172)



The air throbs with the beat of four 2,000-horsepower engines. Here the propellers of two right wing motors flash in the sun

Engineers gather around one of the giant wheels to inspect it after exhaustive brake tests. The 24-ply tire is eight feet high



see Sep. 1941. 187

Weight Super Cyclone

2876 *Estman Kodak Co.*
10 E 40th St.
Headlight on Darning Egg
Helps Mend Stockings
New York



Darning egg with light in nose shows up small holes

Illuminating the sock from within, a lighted darning egg now available helps the housewife turn out a neater job. Worn spots and the tiniest holes are shown up distinctly by the light which also makes it easier to find threads that should be "caught" to produce neat repairs. The egg, made of lightweight Tenite, has space for a battery and a bulb whose light shines through the translucent top.

L 864
Self-Reflecting Sunlamp Bulb
Works in Ordinary Socket

With all the necessary operating parts built inside, including a mirrorlike reflecting surface, a self-contained sunlamp bulb



Sunlamp bulb may be used in ordinary bridge lamp

that may be used in the ordinary electric lamp socket produces a wealth of ultra-violet and infrared radiation. Called the G-E Mazda RS sunlamp, it consumes 275 watts and operates on 110-125 volts and 50-60 cycles. No external transformer or controls are needed. Within the lamp is a special tungsten filament supplying infrared rays and controlling operation of the mercury arc that burns in a small quartz bulb and provides the ultraviolet. Made of special glass that screens out unwanted rays for which users otherwise would require goggles, the bulb is hermetically sealed so dust, dirt and moisture cannot reach the reflector.

L 922
Venetian Blinds Convert Porch
Into a Living Room

Weatherproof enclosures of Venetian type can be installed around an open porch to convert it into another room—a living



Open porch becomes an extra room when metal blinds, controlled by crank, lower right, are installed

room or sleeping room. The fireproof "blinds" are made of metal, and controlled by cranks to let in air and light. Built in various sizes, styles and colors to match the house, the enclosures are also made to fit the door, and are provided with removable metal-bound screen and glass panels for year-around use.

Chicago-842
S. Canal.

The J.C. Applegate Co.
POPULAR MECHANICS
6535 Euclid Ave

General Electric Co.
Nela Park Cleveland Ohio

Cleveland Ohio

1918

Biggest Water Wheel Harnesses Grand Coulee



Installing the first giant water-wheel generator at Grand Coulee dam, which delivers 108,000 kilowatts

Pent-up power of the waters behind Grand Coulee Dam, man's mightiest structure, is being harnessed to three gigantic generators—the largest water-wheel generators ever built in the United States. When engineers turned the valves to let Columbia River waters spin the first of these wheels, 108,000,000 watts of electric power began flowing at the speed of light over a new 230,000-volt transmission line to Bonneville Dam. There a transformer steps down its voltage, and the power flows

on to operate a new aluminum manufacturing plant at Vancouver, Wash., and other industries of the Pacific Northwest. Each of these generators—the third is scheduled to be operating by next spring—is rated at 108,000 kilowatts and is driven by a 150,000-horsepower water wheel turbine. The generator housing is 45 feet in diameter and 24 feet high. The 1,000 tons of parts forming each generator required 38 freight cars for shipment from the Westinghouse plant at East Pittsburgh, Pa.

2853

Truck Slides Steel Fingers in Grooves to Pick Up Load

Eight large sacks can be picked up at one time with a specially designed truck without touching the stack by hand. At the lower front end of the truck are six long steel fingers. These are spaced to fit down between two-by-two inch boards nailed two inches apart on the platform floor. When the bags, bales or boxes are stacked up across the two-by-twos, the truck fingers can be slid in the grooves beneath them and the load picked up by tilting the truck backward. By flooring the unloading platform similarly the truck can be unloaded in the same manner.



Steel fingers slide in spaces between boards to pick up load

Henry Kottleson,
Milan, Minn.
Copyrighted material

L642

AERIAL

BLITZ tactics have speeded aerial photography to a point where a photograph can be shot, developed and printed in five minutes. Aerial observers were good enough for World War I; but in World War II they are being replaced by flying cameramen.

Not long ago the United States Army Air Forces organized the First Photographic Squadron—which has a special assignment status comparable in a rough way to a GHQ force. The squadron consists of 15 twin-engined Beechcraft planes built with special camera mounts. In addition, there are other photographic units connected with bombing and observation outfits.

The research of Lt. Col. George W. Goddard at

↑ Shooting aerial motion pictures through an airplane window

Here are some cameras used by U. S. Army Air Forces; tall one in center is large-scale spotting camera with telephoto lens



Capt. Alexander Hamilton
10999 Wellworth Ave.

Copyrighted material
Los Angeles

L'642

MAPPING *for* MODERN WARFARE

Wright Field, and others, has given America's new army one of the most advanced aerial photography and mapping techniques in the world. The tactical advantages of quick photography are obvious. Suppose a ground troop concentration is expecting an attack from an enemy on its right flank. Then suddenly the commanding general is advised that the enemy is assembling mechanized units on his left flank for a surprise attack at that point. Prompt, accurate information on the truth of this report is absolutely essential while he still has time to dispose his troops to meet the new threat.

Observation planes are directed by radio to obtain quick photographs of the dis-

Night aerial photo of New York City made by latest methods



Aerialcraft

↑ Army Air Forces cameraman taking photo through side of plane with oblique camera
↓ Tossing the metal tube, which contains a finished print, over side of the camera plane

53B





↑ John Hancock, project engineer on Air Forces quick photography work, making picture from rear cockpit

Huge 9-lens mapping camera → which is hauled from photo laboratory to plane on specially designed 4-wheel truck

Lt. Col. George W. Goddard with flash bombs of the type used in making night photos remarkable for their detail



position of enemy troops on the left flank and to drop prints immediately to field headquarters. Within the space of a very few minutes the general has definite proof, substantiating or disproving the second report.

Most important factors in the Air Forces quick photography method are: (1) a compact processing tank with four compartments which may be installed in any army tactical ship larger than a single-seat pursuit plane; (2) a special type of cut film holder designed by the photographic laboratory which is used continuously as a camera holder and a processing holder; and (3) a small but

highly efficient printer operated in a lightproof zipper bag.

Let's follow Army photographers at Wright Field and see how they make a "quick photograph." They take off and fly high over an airport which they have selected as their pictorial objective. The pilot swings the plane over the objective and the cameraman "fires" his 20 or 40-inch telephone-lens camera, designed for making oblique intelligence photographs. Incidentally, he doesn't have to focus his camera. He is far enough away from the ground so that the camera has a fixed focus, at infinity, except for infrared film where

2642

a special focus is required. All he has to worry about is exposure and lens opening.

As soon as the exposure is made, he takes the holder from the camera and immerses it in the first section of the tank. He pulls the slide up out of the holder so that it sticks above the tank and uses it as a handle to agitate the holder in the tank so that the negative is fully treated in the developer for one minute. Replacing the slide, he removes the holder and transfers it to the second section of the tank, where it gets the same agitating process for 15 seconds in a "stop bath" solution. The negative then gets 75 seconds in the third tank, a "fixing" solution, and a 5-second water rinse in the fourth tank.

Incidentally, each section of the tank has a nonspill lid, so that the plane can do any ordinary maneuvers without spilling chemicals. The tank is jacketed in an insulation material one and one-half inches thick, which is electrically heated to a constant temperature of 75 degrees.

After its rinse, the negative is quickly sponged off with a rubber squeegee, like those used by window washers, to remove extra moisture, and is then ready for printing. It is placed on the printer contact surface, and covered with a sheet of transparent material, to keep the printing paper from getting wet. The sensitized paper is taken from a container and placed over the negative, and the lid is brought down to make the exposure.

To the trained photographer there is nothing unusual about this procedure, but it must be remembered that the quick-work photographer has his arms thrust into that black zipper bag, and is doing everything blindly—with his laboratory moving at 300 miles per hour.

As soon as the print is exposed, the paper is placed in a holder similar to that used for the film, and is speeded through the same four processes of developing, stopping, fixing, and rinsing.

It requires a total of two minutes, 35 seconds to process the film, 30 seconds more to squeegee it, and from 5 to 10 seconds for printing. Now it takes 20 seconds to develop the print, 20 seconds for stop bath, 15 seconds for fixing, and 5 seconds for rinse. The time totals 4 minutes and 15 seconds! Wright Field officials have clocked the complete process many times in under 5 minutes.

(Continued to page 164)

NOVEMBER, 1941

2814.

Super-Flexible Air Hose Bends Without Kinking



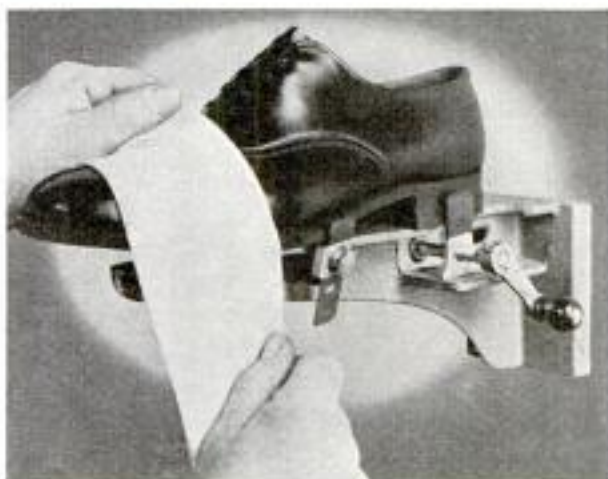
Almost tied in a knot, the air hose refuses to kink

So flexible is a new lightweight air hose that the half-inch size can be bent to a three-inch radius without collapsing or kinking and shutting off the air supply. Designed for use with pneumatic tools where minimum weight and ease of handling are desirable, the hose will stand working pressures of 80 to 125 pounds. It is made of oil-resistant rubber.

2905

Clamp Holds Shoe of Any Size In Firm Grip for Polishing

Shoes of all sizes from a child's oxford to military riding boots can be held in a portable clamp that facilitates polishing. A bracket is supplied for fastening the clamp permanently to the wall. The clamps are adjustable quickly to a sole of any size or shape, and the rear clamp is tightened with a small crank.



Clamps on wall bracket hold shoe tight for polishing

W. E. Landers 37
1514 W. Howard Chicago

B. J. Woodruff Co
Akron, Ohio

Gun Cage Is Ready for Breaks on Lion Farm

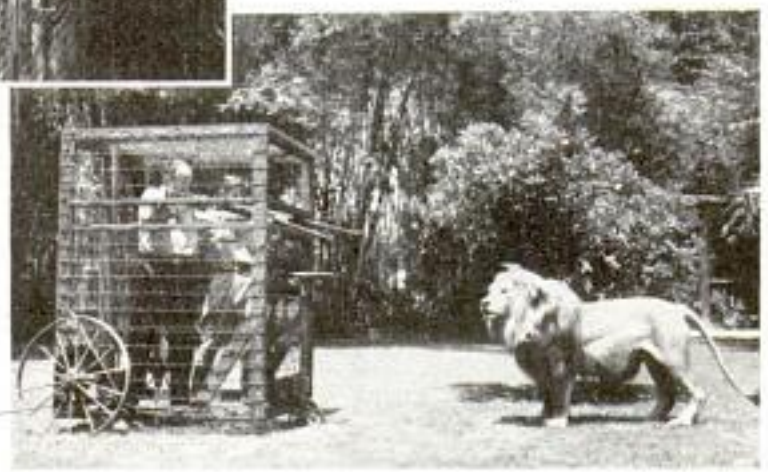


movie lion, enjoy basking in its warmth on a cloudy day. The oversized lamp is also used when one of the lions get a shampoo. Out on the grounds of the farm is the wire gun cage, just big enough for two trainers and their rifles. It is ready for instant use if a lion should break loose into the open farm.

If a lion should go on a rampage, here's how the caged riflemen go into action
↓

↑ Aladdin of the movies takes an artificial sun bath from the ultraviolet lamp

Sun lamps and gun cages are two of the necessities of life on a lion farm. Lions are just as apt to catch cold in rainy weather as are human beings, so the sun lamp has been installed at Gay's Lion Farm in El Monte, Calif., and big fellows like Aladdin, the



*The Liberty Tank Co. San Francisco
688 Market St. Calif.
2737*

Child's Track-Laying Tank Climbs Over Small Obstacles



Children can imitate "panzer" warfare with a new toy tank of the track type that packs dummy guns and can crawl over ditches or small obstacles, and can be steered in a complete circle within a small space. Operated either by hand or small gasoline engine, the tank is large enough to hold the average size youngster. The power model runs at a fair rate of speed and, according to the manufacturer, five cents' worth of gasoline will last four days.

2732 Tornadoes Given Blame For Hurricane Damage

The destructive force of a hurricane is laid to a series of tornadoes that accompanies every severe tropical storm, in a theory advanced by the Rev. Eulogio Vazquez of the Jesuit College of Cienfuegos, Cuba. This contention is based on observations that

news paper clip

Youngster can drive this toy war tank in blitzkrieg fashion

2824 Charles V. Holbrook
Plumber

Wooden Tower Guards Antenna Of Television Station

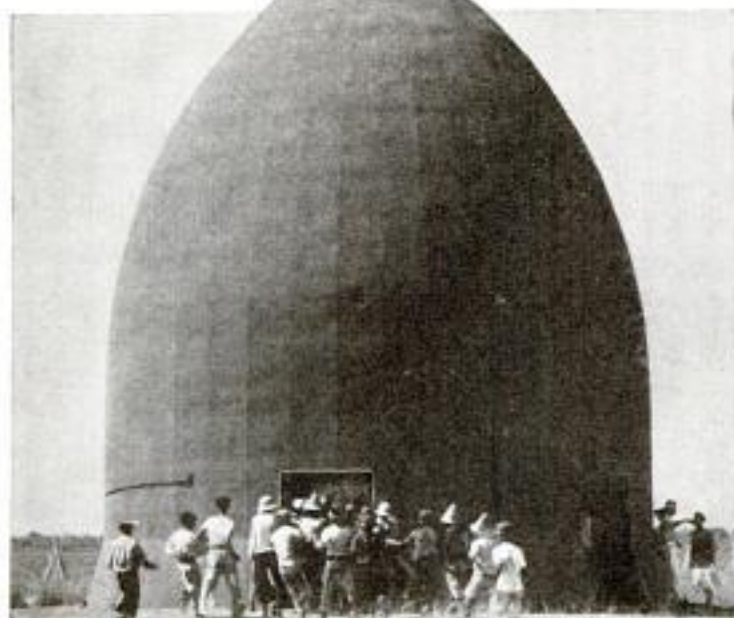
indicate the presence of whirlwinds, varying widely in size and intensity, when hurricanes strike. In the path of one hurricane trees were twisted spirally, the usual result of tornado winds. The winds in a hurricane are intermittent, comparatively calm periods following dangerous gusts, and the wind changes direction quickly. Observers also told of ground being drenched by salt water, which Father Vazquez stated was probably sucked up from the sea by tornadoes. To support the theory further, a graph was produced showing a rapid fluctuation of barometric pressure during the passage of a major Cuban storm. It was reasoned that sudden drops in the barometer were caused by successive waves of tornadoes.

2797

Bomb Nose Pointing to Sky Is an Air Raid Shelter

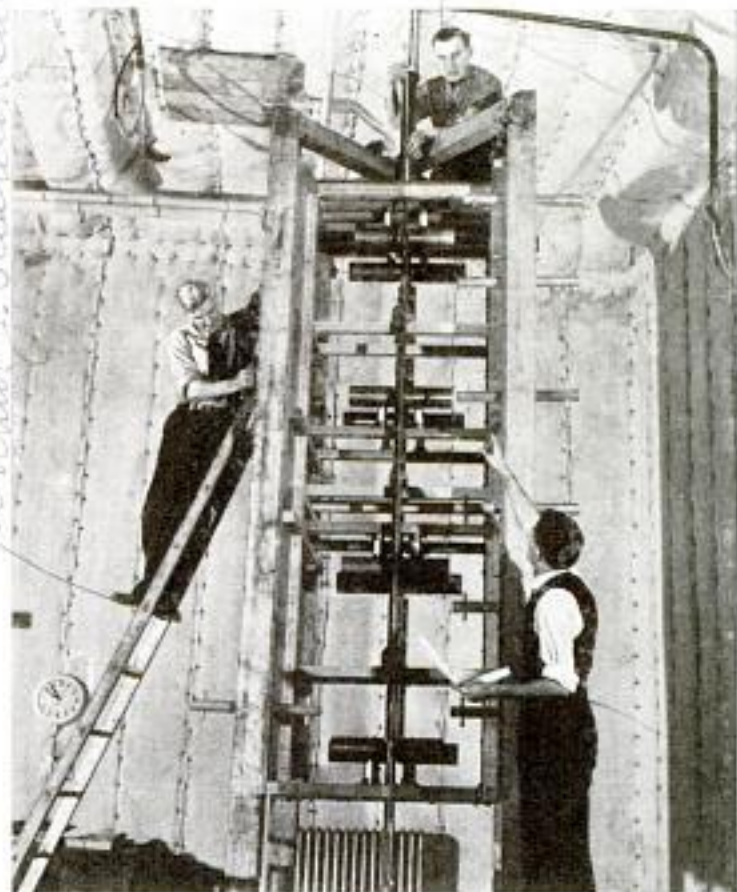
When the siren shrills its alarm for a practice air raid in the Dutch East Indies, the natives run toward what appears to be the nose of a gigantic bomb, pointed skyward. In reality it is a spacious air-raid shelter of a new type, its curved roof designed to let bombs bounce or slide off harmlessly.

Batavia



Natives of Dutch island rush to shelter during practice alarm

NOVEMBER, 1941



Installing the ladderlike antenna in its weatherproof house

To guard the antenna of General Electric's television station, W2XB, from rain, sleet and snow, a special wooden house has been built atop the 128-foot tower on the studio grounds at Schenectady, N. Y. The ladderlike antenna itself is made of brass tubing and copper bars. From it the television waves will be relayed to the transmitting station 12 miles away in the Helderberg mountains. The weatherproof box protecting the antenna is 13 feet tall, four feet square.

Plastics to Replace Metal In 1942 Refrigerators

There will be more than 50 plastic parts in your 1942 electric refrigerator, a survey of manufacturers' plans indicates. The average 1941 refrigerator has 39 plastic parts, and more will be used next year as the industry seeks to reduce the amount of metal required.

E. I. du Pont de Nemours & Co.
Wilmington, Del.

2-7-86 Prof. Wayne S. ... Waterlos

Soldier 'Hikes' on Treadmill To Test Vitamin Values



Soldier walking treadmill to test effect of vitamins

To help determine the value of adding vitamin concentrates to army fare, one soldier marched the equivalent of untold miles on a treadmill at University of Minnesota. Before each long "hike," which lasted 1 1/2 hours, he was dosed with vitamin pills. Electrodes strapped to his chest recorded heart action. *Minneapolis*

Speed Writer Types Syllables In a Single Stroke

Legibility of typewriting and the speed of stenography are combined in a writing

*Joseph Leeweeney
51 Madison Ave
New York*



Fast typing machine writes a syllable at a time

machine on the keys of which the operator strikes a syllable at a time much as a pianist strikes chords. Called a "syllabic typewriter" by its inventor, the portable machine operates quietly and employs no code, using only letters of the English alphabet and spelling the syllables as they sound. For instance, in 13 strokes the name and address of the president would be written thus: FRANK LIN D RO ZE VELT WASH ING TON DC HYD PARK NY. Vowels usually appear as in normal spelling except that the silent ones are omitted. Spacing between words is automatic and does not require an extra operating stroke. The words are recorded one after another on a narrow strip of paper and are easily read.

2833

Lawn Edger Propelled by Handle Cuts Under Foot-Pressure

Eliminating the necessity of bearing down with the hands, a new-type lawn edger may be operated without getting

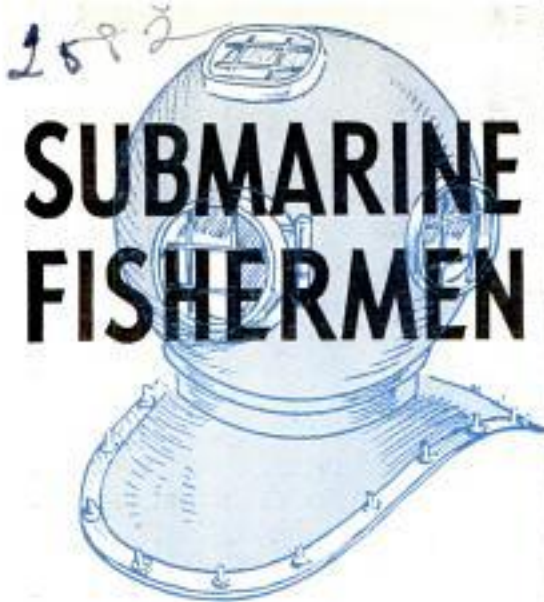


Gardener stands on edger and propels it with handle

blistered hands and aching back muscles. Adequate pressure for cutting is obtained by standing on a little wooden rest. To propel it you pump the handle up and down and thus, through a gear arrangement, a friction wheel that rests on the concrete at the edge of the lawn is turned and provides traction.

POPULAR MECHANICS

List: Sears, Roebuck & Co. Chicago



SUBMARINE FISHERMEN

THIRTY feet below the surface the two underwater men were swimming leisurely along the edge of the brown kelp forest. Suddenly one of them sighted a red Garibaldi perch and with a kick of his swim fins he was off in pursuit. The perch dived for the bottom, moving frantically in a desperate effort to avoid this strange invader of its element. But with a flick of the spear the fish was captured and the two divers rose to the top with their quarry.

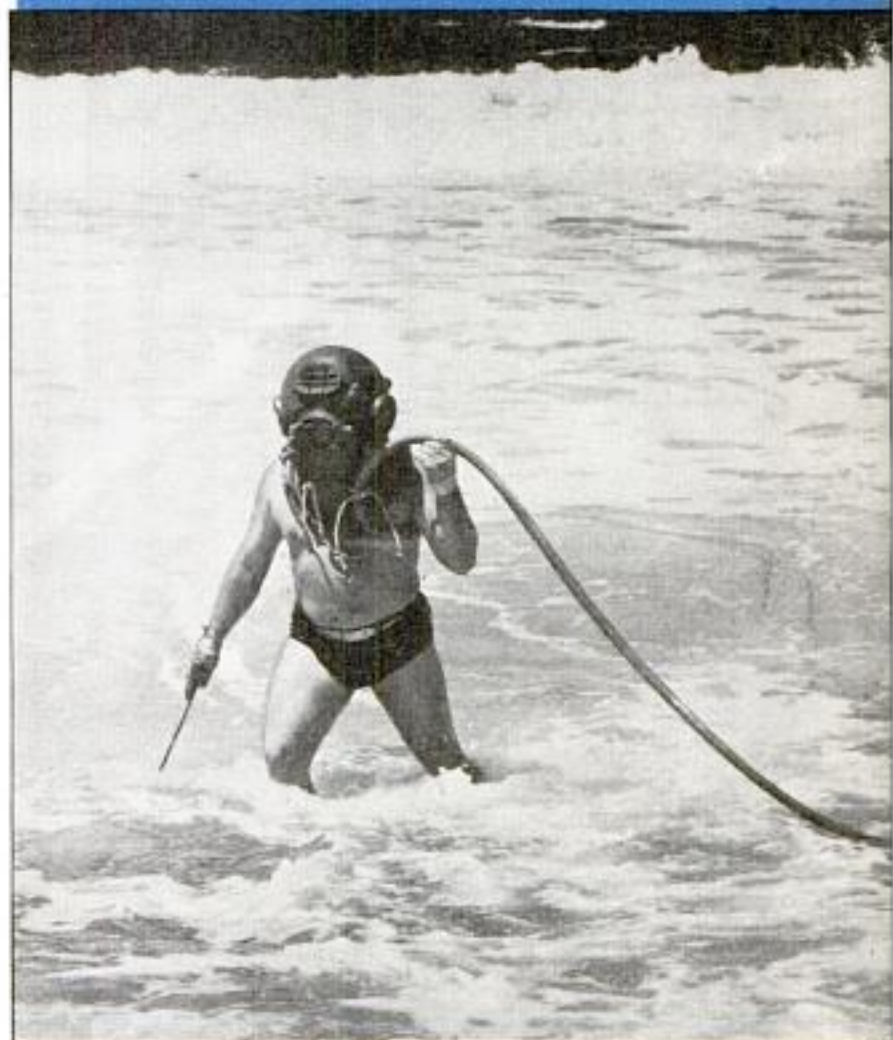
These underwater adventurers belong to a small group which has learned to live beneath the surface for minutes at a time. Composed of expert swimmers and divers, the group engages in skin diving, so-called because only bathing trunks and water glasses are worn instead of deep sea diving outfits. Its members hunt sea animals in their native element, on equal terms.

The sport is a hardy one calling for plenty of courage and endurance. Along the coast of southern California no more than 50 life guards and expert swimmers practice it.

In spite of the beauty of the sea, danger lurks in the shadow of each rock and behind every clump of kelp. Once when Searle Bennett was striking abalones from a rock, twenty feet down, his short iron glanced from the back of a shellfish and jammed sideways in a rocky hole. Bennett was trapped,



↑ Back from an undersea trip, a diver wearing a face mask breaks the surface to exhibit a captured lobster
 Carrying his air line, a helmeted diver returns through ↓ the surf after an exploratory walk on the ocean bottom



NOVEMBER, 1941

Cont. Thomas E. Stinson, Jr. 41
 3872 Franklin Ave. Copyrighted Material
 Los Angeles.



for the iron was tied tightly to his wrist by a short length of stout cord. He got down on his knees and reached in, trying to free the iron bar. It wouldn't budge. By that time he was desperately short of oxygen. But with a final surge of strength he wrenched at the bar and broke it free, then rose to the surface. To avoid that hazard, some divers now attach their irons to their wrists with rubber bands. Others wear sheath knives.

Another diver, chasing a big lobster into an underwater cave, was slammed against the rocky

↑ The modern Neptune and his trident emerge from the deep, bringing back to the boat a fish he has speared on his underwater excursion

Two divers, one with goggles and the other a face mask, put on their rubber swim fins, which increase their speed and power in water →

Down go a pair of divers for a look at life in the ocean, their rubber fins flashing grotesquely as they submerge in surface dives ↓



roof by an unusual surge of water and knocked unconscious. Fortunately the wash of the sea drifted him back through the entrance and the air in his lungs floated him up to the surface where he paddled feebly until his companions pulled him into the skiff.

Abalones, lobsters and a dozen varieties of fish are the game of the underwater swimmers. With his iron a diver can strike three or four abalones from a rock,

1582 1605 S. Catalina St.
Redondo Beach, Calif

gather the shellfish in the crook of an arm, and swim up to the surface. Lobsters are chased to their rocky lairs and pulled free. After dark they can be trailed along the sea bottom by the phosphorescent gleam of their eyes. Big lobsters up to 20 pounds in weight, too large to be taken ashore under the game laws, are brought to the surface for inspection but only after a struggle. Most fish are more curious than alarmed when swimmers approach and are easily speared.

Wrestling a six-foot dogfish under water is fun to Houghton Ralph, one of the originators of the sport. Grab a dogfish by the tail and he immediately turns, his great tooth-lined mouth opened for a slashing bite. A strong yank on his tail straightens him out. Then he tries again. Once a diver grabs one he must hang on and wear the dogfish down before letting him go. Ralph's seal-like ability under water has helped him in marine salvage work and more recently has



Houghton Ralph wearing a deep-sea diving helmet as he starts an underwater hunting trip. Note gloves protecting his hands

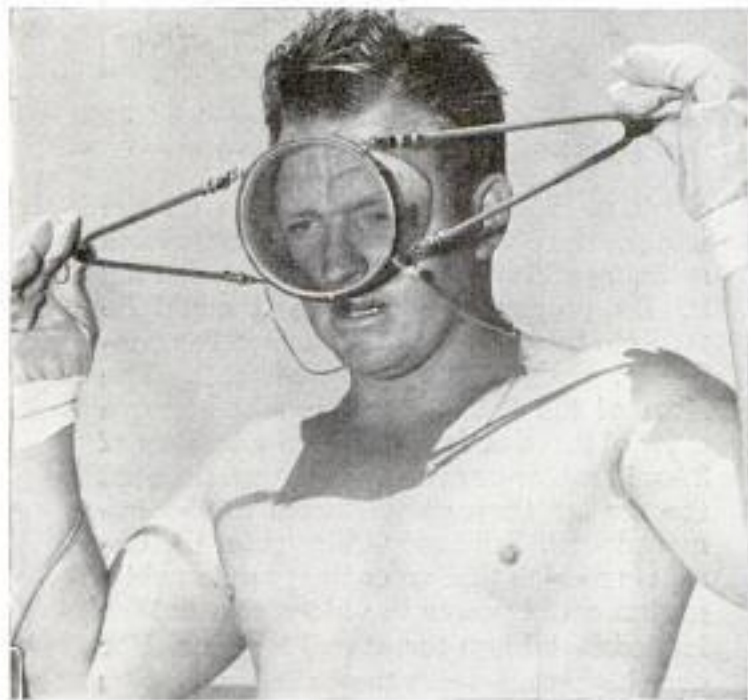
brought him contracts from motion picture studios. He has appeared in a number of pictures, both as a "skin diver" and as a deep sea diver.

Spearing a shark larger than a dogfish under water is like stabbing a piece of lightning, and the divers do it for sport. They use a lily iron that is attached to the

(Continued to page 170)

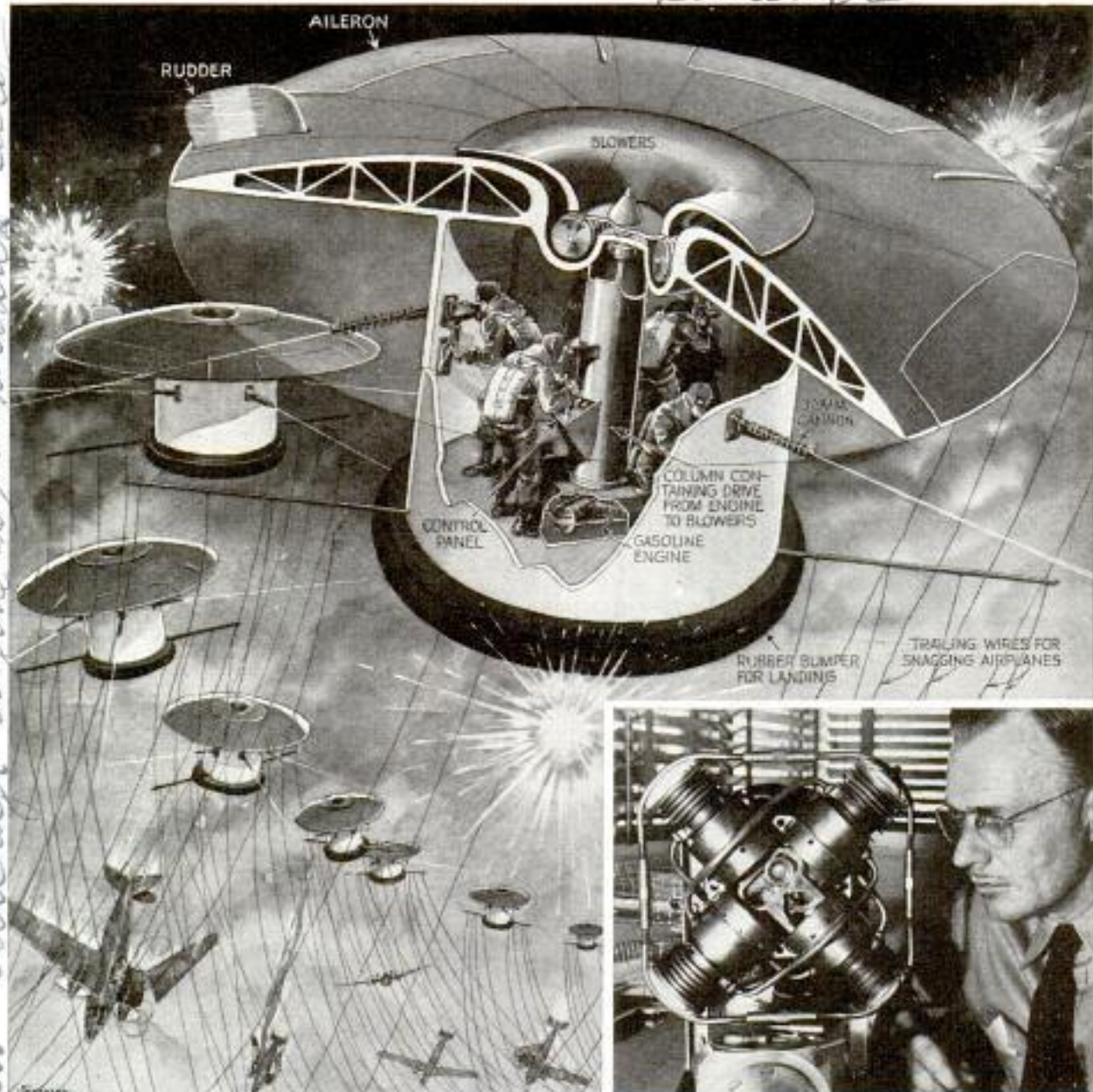
Diver fastening face mask that gives him wide vision while swimming under water

Sea urchin, abalone and sheaf of fan coral brought up by a skin diver



L666. Capt. Thomas & Stinson, Jr.
 3872 Franklin Ave
 Los Angeles

Charles H. Roberts
 Roberts Aircraft Engine Co. / Burbank, Calif.
 1203 N. Zayko



The drawing shows "flying mushrooms" trapping bombers in trailing wires and gunfire, sectional view indicating how air is drawn in, then blown over wing surface. Right, working model of 80-hp. rotary engine

Propellerless aerial gun turrets that could fly straight up at 70 miles an hour are proposed by a California aircraft inventor as a novel means of air defense. Already his "flying mushrooms" have proved satisfactory in scale-model form and a full-scale demonstration is being planned. The top of the "mushroom" is a circular wing, its outer circumference the thin "trailing" edge. The "leading" edge surrounds a central hole, a conical pit into which air is drawn down by powerful blowers and then discharged radially over the upper surface of the wing. This creates lift just as it is created in a conventional

airplane. Movable control vanes on the wing surface would prevent the craft from spinning and would facilitate maneuvering it. By proper manipulation it could be made to travel horizontally as well as vertically, dodging attacking aircraft. The stem of the "mushroom" would house a crew of three or four men and a battery of 37-millimeter or even larger guns, firing at the enemy through portholes in the armored wall. Efficiency claimed for the design is so high that an ordinary automobile engine could power the blower to lift the loaded aerial gun turret and its crew. For even higher efficiency the inventor, Charles

*Robert Aircraft
Engine Co.*

L 711

H. Roberts, who is president of an aviation engine company at Burbank, Calif., has designed an air-cooled rotary engine with but three moving parts, the opposed pistons being connected rigidly by means of a Scotch yoke. The engine weighs about one pound per horsepower. Each cylinder has a pre-compression compartment where the fuel charge is compressed, similar to the operation of a displacement-type supercharger. The design is said to be practical up to 150-horsepower, above which the moving mass becomes unwieldy. A swarm of "flying mushrooms" could be shot into the air at the moment an air raid alarm is given, to flood the sky above any fortress or defense factory with anti-aircraft shells. Each turret, too, could suspend wires that would form a dangerous fence against the invading planes. Mr. Roberts was an aerial gunner in the world war.

Speed and Energy of Golf Balls Measured in 15-Foot Tube



Machine automatically tees up golf ball and drives it through 15-foot tube, recording its speed, distance ability and other qualities

To determine the carrying or "distance" ability and many other qualities of various brands of golf balls, a new kind of driving course has been designed by Dr. Carl G. Anderson of Armour Research Foundation, Chicago, at the behest of U. S. Golf Association. It is a self-contained machine that automatically "tees up" and drives a golf ball through a 15-foot tube to a receiver which "absorbs" the energy of the ball. On its flight through the tube the ball's speed is also recorded. The purpose of the research is to limit the carrying qualities of future golf balls to about the maximum possessed by most first-grade balls now on the market.

Factory - 326 N 4th Libertyville, Ill.

L 839

Illinois Institute of Technology

Moist Filter Screen in Open Window Cools Air in Room

Fresh outside air, filtered through a screen saturated with water, may be

brought into the room with a cooler and ventilator that is installed in the open window. The window sash closes against the top of the unit and a panel slides sidewise to fill any opening that may be left. The filter screen is moistened by two troughs, one above and one below it, which are kept partly filled with water or ice cubes. To spread the fresh air throughout the room the humidifier is supplied with an electric fan to be mounted inside the window, but if the owner chooses he may use his own fan, placing it as close as possible to the filter screen. In winter months the unit can be placed within the room to humidify the air.



Moistened screen in window filters air and fan distributes it

*Fresh Air Products
404 N Wells, Chicago*

2752 (Leggett) Chevrolet. Signal Corps 4th 16
U.S. Army



UNCLE SAM CALLING



↑ The moment an army division reaches camp, Signal Corps trucks spread a network of telephone lines throughout encampment. Truck carries a complete switchboard; parked by post command tent, it is quickly ready to connect the general and his staff with all sections of the division

← Plugging in a call at mobile switchboard



Phone booths on way to army camp. Meeting defense communications demands is a big job
Courtesy Western Electric Co.



↑ Telephones, too, are the nerves of a ship, connecting bridge with engine room and turret. Here two men with headsets watch gauges

Panama City, Florida

Edwards

1952

E. A. Isaac
Albion, NY



Battle Creek Mich

↑ Linemen pulling a 303-pair cable at a pole on Camp Custer reservation during a speedy installation job

↑ Equipping the mushrooming armed forces and defense industries has put the telephone makers to work at top speed. Here a Western Electric man adjusts a switchboard

Without an efficient network of communication lines, the modern army, navy and air forces and the civil and military industries behind them would be unable to function. To tie America's defense structure into a smooth operating unit, manufacturers are turning out miles of cable, vast quantities of other equipment; telephone companies are plowing new lines underground, such as the cable below, linking a huge munitions plant at Wilmington, Ill., with the Bell system; Signal Corps units are being trained to keep communications open from headquarters to the army afield with mobile switchboards

Alfred Bell



2887

Boat Built of Crushed Rock Painted Over Wire Mesh



Crushed rock compound applied over wire mesh forms the thin but sturdy walls of this 26-foot boat

Painting a secret crushed rock compound over wire mesh, a California inventor has built a boat of rock 26 feet long. Other than the wire mesh, the boat has no reinforcements of any kind, nor were wood forms used. The sides are only a quarter inch thick. It took the inventor just forty hours to bring the boat to the stage illustrated here, applying the material much like plaster. The boat weighs 1,150 pounds.

Burglar Alarm "Hears" Intruder, Fire Alarm "Smells" Smoke

Vibrations of an intruder's steps and vapors from burning objects operate two alarms invented recently in Switzerland. In case of the fire alarm, it is explained that parts of a burning object are vaporized, become charged with electricity and make complex structures of millions of atoms which float through the air. A small amount of radium in the detector ionizes the air molecules and sets up a small electrical current. When the big clumps of molecules come along, this current is greatly increased and sets off the warning signal. A little smoldering cotton or an ounce of burning wood, wool or paper

would be enough to cause an alarm in a medium-sized room. Yet the detector may be adjusted so no signal is sounded by the smoke of a few cigarettes or a cigar. The burglar alarm, operating like a miniature seismograph, responds only to vibrations of very high frequency which travel short distances and may be set up by the forceful opening of a door or window, or even by a person's steps. Outside noises reach the instrument as low frequency vibrations, and it is not tuned to these. The alarm contains a little ball hanging in a sealed glass tube. From the bottom of the ball a metal pin projects touching a wire ring, which completes an electrical circuit. Quick vibrations cause the ball to move, thus momentarily breaking the circuit, which operates a relay and sets off the alarm. The sensitivity of the alarm may be adjusted by varying the size of the ball.

Pointed Cane Stuck in the Earth Holds Cut-Flower Basket

Gathering flowers in the garden is made easier with a basket mounted on a pointed cane. The cane can be stuck in the ground while you select and cut the blossoms and fill the basket.



This cane is stuck in the ground while flowers are gathered, the basket remaining at convenient height

POPULAR MECHANICS

Carson Pirie Scott & Co. Chicago

Cheslean Paid
Agassa Colod

Described in
Mechanical Engineering
76 7986

Patented June 8/1914

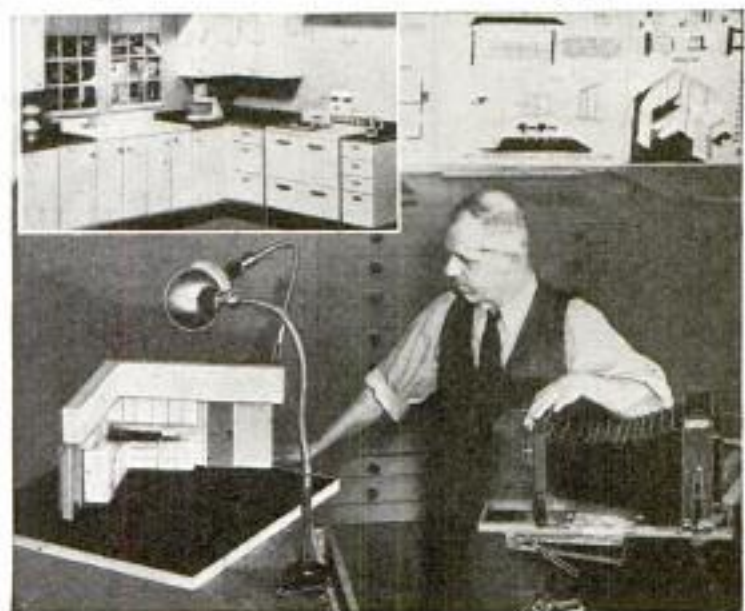
48 make unknown.

2815.

General Electric Co. Bridgeport, Conn

Miniature Kitchen Helps Sell Remodeling Plan

Before adopting any remodeling plan for the kitchen you can visualize the effects of various changes by means of scale models. One manufacturer of electrical appliances furnishes prospective customers with photographs of miniature kitchens embodying the new equipment planned. The pictures include even the tiny flower pots, skillets and other utensils, and as a final note of reality a view of the neighbor's house is "dubbed in" the window of the "preview" model kitchen.



Suggested equipment for new or remodeled kitchen set up in miniature for camera

Sea Sled for Invasion Maneuvers Toboggans Into Water



Sliding down inclined rails, a big Sea Sled took its first dip in Atlantic waters in Massachusetts recently. Similar boats have been used by the First Division of the U. S. Army in making practice "invasion" landings along the coast. This new sled is being shipped to Canada to test its efficiency in comparison with craft in use by the British.

Sea sled designed for landing invasion troops slides down the rails to take its first dip

Stop-Motion Stroboscopic Viewer Tells Speed of Moving Machinery

Small enough to be held in one hand, a spring-driven tachometer measures quickly the operating speed of machinery. It is a stroboscopic instrument. While holding the eyepiece to the eye, the housing is turned until the moving object appears to stand still. Then a pointer on a scale outside the housing shows the operating speed of the engine or machine. The instrument can be used for measuring revolving, reciprocating and vibration motions.



Sighting through the eyepiece, operator turns the housing until the engine or machine appears to be standing still, then reads dial

NOVEMBER, 1941

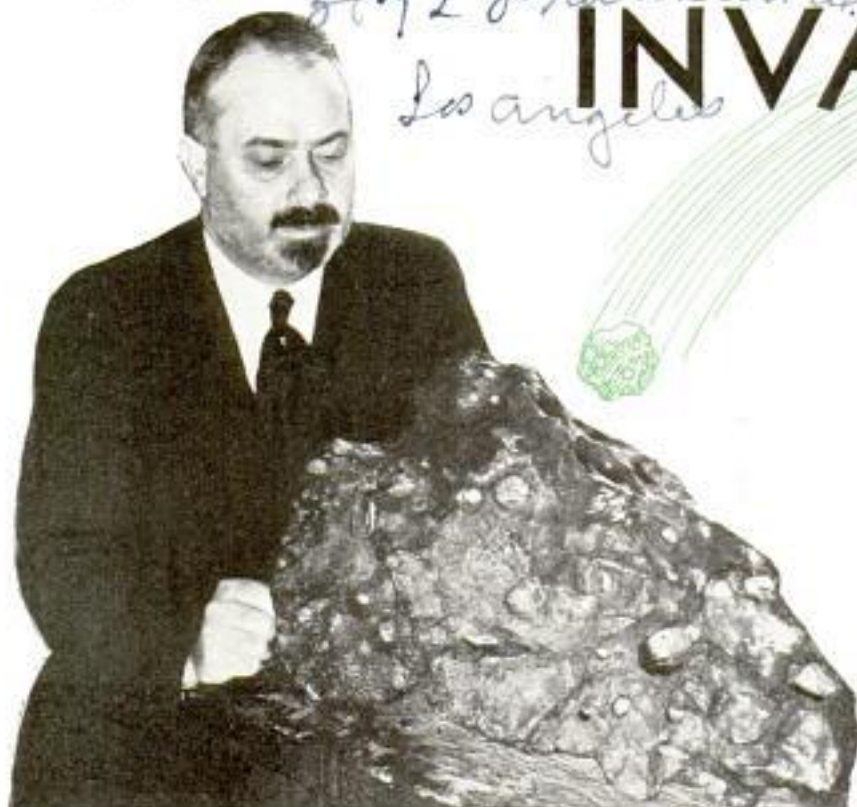
*Boulton Instrument Corp. - 49
65 Madison Ave. New York*
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*Murray and Tregentia
Matthewson Atlantic, Mass*

287

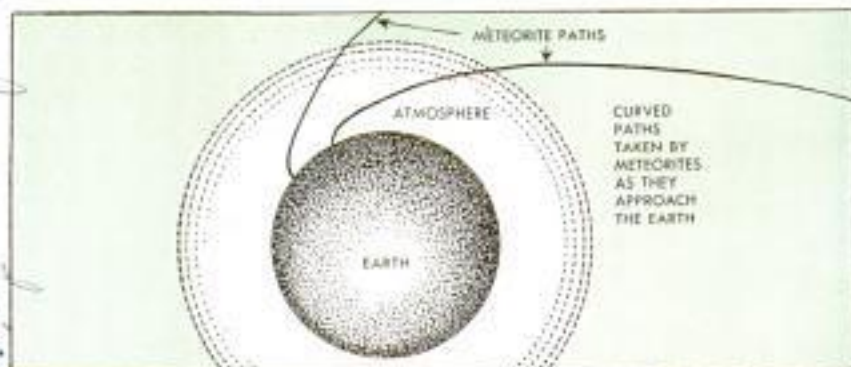
Cuth Thomas E. Stimson, Jr.
3872 Franklin St.
Los Angeles

INVADERS



Dr. Leonard examines iron meteorite weighing several hundred pounds

Diagram, not drawn to scale, shows how meteorites curve toward earth



for the meteorite was far out in space in a region of intense cold only a few seconds before it landed on earth. Ordinarily only a thin exterior layer becomes incandescent from friction with the atmosphere and there is not time for this heat to penetrate into the interior. It may happen, even, that by the time you reach it the "ball of fire" will be covered with frost.

Only an infinitesimal fraction of the scores of millions of meteorites that are daily attracted into the earth's atmosphere reach the ground. Most of these celestial immigrants are probably nothing but specks of cosmic dust and so are entirely vaporized before they can land. Meteors, the so-called shooting stars, are the light phenomena produced by me-

By Dr. Frederick C. Leonard

Ex-President and Editor, The Society for Research on Meteorites

As told to Thomas E. Stimson, Jr.

ONE of the most awe-inspiring and scientifically exciting experiences possible for a human being is to be present when a meteorite strikes the ground. Entering the atmosphere at a speed of 8 to 48 miles per second, the visitor from space flares like a rocket and roars like a waterfall.

If this rare experience is ever yours, let me ask you to hurry over and pick up the meteorite.

Don't be alarmed. In spite of its spectacular exhibition, all you should find is a small rock, probably not too hot to handle. Its low temperature is easy to understand,



Weighing a small stony meteorite known as an aerolite. Typical aerolites are shown in front of scales; they consist largely of silicon and magnesium oxides

Dept. of Astronomy
Univ. of California
Los Angeles

287

from SPACE

*on display
at Hayden
planetarium*



Williamette

teorites as they plunge through the atmosphere. Probably several hundred meteorites per year are large enough to reach the earth but only about a dozen are recovered because most of the earth's surface is uninhabited or covered with water.

Once in a long time a stony meteorite bursts high in the air and we have one of the showers of stones that must have seemed supernatural to early man. The most recent such shower that is known occurred near Holbrook, Arizona, in 1912. More than 14,000 fragments were collected after the rain of rocks.

Some tremendously heavy chunks of iron and



↑ The largest meteorite found in this country, a 15½-ton discovery in Oregon

← This is an etched section of a siderite

Determining the magnetic properties of a siderite by means of dip needles



Soldak Co., 1031 - d Broadway, Los Angeles.

281

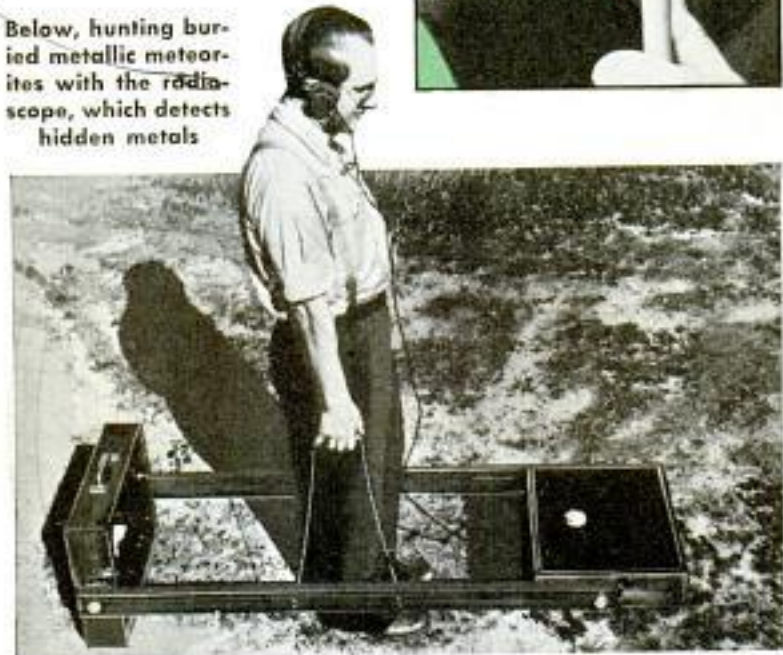


↑ Air travelers over Arizona see the Meteorite Crater caused by giant meteorite striking the earth
 ← The "Goose Lake" siderite, with a yardstick
 The small magnet attached to stick is used for
 ↓ picking up small metallic meteorites

stone have plunged out of the sky in past ages but there is no authentic evidence that a person has ever been struck by a falling meteorite. A cow in Pennsylvania, injured by a small aerolite, is one of the few cases known



Below, hunting buried metallic meteorites with the radioscope, which detects hidden metals



in which a living creature was hit.

It must have taken a veritable mountain of metal, falling from the heavens, to gouge out the great Meteorite Crater near Winslow, Arizona. This hole is more than three quarters of a mile in diameter and is at present some 600 feet deep. Fragments of meteorite iron have been found six miles from the crater and some people think the main body of the meteorite, composed almost wholly of nickeliferous iron, lies buried a few hundred feet below the crater. Thousands of dollars have been spent in exploring for this valuable mass which, however, has not yet been certainly located. The conclusion has been reached by some that the meteorite exploded upon impact and blew into countless fragments that scattered all around the crater.

The largest meteorite that has been examined in detail is a 60-ton block of iron in southwest Africa, discovered in 1921.

281

2870

Peary brought back a 36½-ton iron meteorite from Greenland in 1897. The largest meteorite found recently in the United States is the 2,573-pound Goose Lake siderite of Modoc County, California, discovered by deer hunters in 1938.

Meteorites are the only samples we have of the extra-terrestrial universe. One bit may be part of a disintegrated comet, another a fragment of a dead world, and a third a bit of the primordial nebula from which the solar system may have evolved.

The specimens fall into three classifications: siderites, mainly iron mixed with 5 to 20 percent nickel; siderolites, in which the metal is mixed with a roughly equal amount of stone and aerolites, mostly stone, largely silicon and magnesium oxides. Some contain black diamond, gold, and platinum.

Farmers, stockmen, prospectors, hunters, vacationists, all have good chances of finding meteorites worth from a dollar a pound up to their weight in gold. If you find one, send it to me at the Department of Astrology, University of California, Los Angeles, and I shall be glad to examine it. But only one out of a hundred or more specimens that people send in proves to be a meteorite, so I shall list a few tests that may help you.

Easiest to recognize are the irregular "nuggets" of iron called siderites; usually they have a deeply pitted surface and are incrustated by a dark glossy

"Peep" Is Slung in Canvas Hull And Floated Across Creek



Soldiers wrap scout car in canvas, then pump out water to make it float

Using a square section of canvas, soldiers can make an amphibian of their quarter-ton reconnaissance car, known as a "peep." In a demonstration at Fort Benning, Ga., men of the Fourth Motorized Division floated one of the autos in 18 inches of water, pushed it across the stream, and drove it up the opposite bank. They spread the canvas in water near the bank and, after driving the "peep" on it, they pulled up the corners and edges and fastened them as in tying a package. Water in the canvas was then pumped out until the canvas "hull" displaced enough water to float the vehicle.

Low-Rate Charger Keeps Batteries Fresh

To keep batteries on dealers shelves fully charged there is a "charge preserver" that operates continuously at an extremely low rate—about 100 milliamperes. This assures the customer a fresh battery. There is a small green light that fits over a pole, showing that the charger is operating and attracting the attention of customers.



6-battery \$10.95.
9- " 12.96
12- " 15.90

The United States has more railway mileage than all South America, Africa, Asia and Australia combined.

Pennsylvania RR Mutual 53

(Continued to page 178)

NOVEMBER, 1941

Copyrighted material

Tree Surgeon in Gas Mask Kills Grubs in Soil



Masked to protect himself from poison gas, the operator works a plunger sending fumigant into soil

Scientists and tree surgeons recently watched demonstrations of the latest techniques in the care of shade trees and ornamental shrubs, one of these methods being an experimental process for killing grubs in the earth. The demonstrator used a hand-operated fumigator, shooting a poison gas into the ground. For his own protection he wore a gas mask and protective coat and gloves.

"Blood" Transfusion of Pectin Prevents Surgical Shock

Transfusions of pectin—that old standby of the housewife in jelly-making—soon may be saving lives of soldiers dying from shock of battle wounds or of civilians stricken by surgical shock. Dr. F. W. Hartman and his associates at Henry Ford Hospital in Detroit have found pectin solutions a satisfactory substitute for human blood in conditions of shock. Dried human blood

plasma is being collected for this purpose and blood "banks" have been established, but this method is slow and costly. The primary need in cases of shock and hemorrhage, the Detroit physicians point out, is to replenish the volume of blood in the veins with a fluid having similar characteristics to the fluid part of the blood; the red cells may not be needed, may even be undesirable. Tests on guinea pigs, rabbits, dogs and on human patients showed that properly prepared pectin solutions have the right characteristics for transfusion and do not impair kidney and liver functions. Pectin is available abundantly at nominal cost and is not difficult to prepare for transfusions. Thus far it has been used chiefly to ward off shock from surgical operations in a small number of cases.

Large Fan Built in Smoker's Stand Helps Ventilate Room

Driven by a noiseless, smooth-running motor, an electric fan housed in a smoking stand stirs up a steady stream of air, bringing ventilation to the center of the room or wherever it may be needed. There is no noticeable vibration and the fan does not interfere with cigarette ashes. Several speeds provide control of the fan.



Electric fan mounted inside smoker's stand, as shown by inset, helps keep room air in constant circulation

Mr. Stanley Bromley and Entomologist

Wide World

269

4331 Duncan Building on 42nd St. N.Y.C.

Scene 7/25/41

2915

2884.

2nd Corps, First Meade

Antitank Gun Rolls in Armored "Blitz Wagon" Ind.

Antitank gun and crew ride in the protection of armored walls in a fast "blitz wagon" designed by Maj. Howard P. Johnson and submitted to the U. S. Army. The 37-millimeter gun can be fired from the car when its back is let down, or can be wheeled down the back and rolled into action. These guns are normally hauled by trucks, but the new car gives more shelter to the crew and can travel faster with more stability. Besides the antitank weapon, the "blitz wagon" carries four machine guns and has portholes for rifles.



At top the 37-millimeter gun is rolled down for action. Notice machine guns and portholes in lower scene

inner layer - inner shell

1921

Self-Sealing Hose for Airplanes Guards Fuel From Bullets

Bullet-sealing hose has been developed to protect America's warplanes from "bleeding to death" from bullet wounds in fuel lines. The new hose, announced by the B. F. Goodrich Co., is an outgrowth of the self-sealing fuel tanks already in use. Despite numerous punctures from high-caliber machine gun bullets, the sealing member in the hose prevents fuel leaks even under 10 to 15 pounds pressure. The hose wall is less than 1/16 inch thick and is available in several different diameters.

chronology 2-3

Mural Painted With Air Brush Resists Rain and Sun Rays

New and striking effects have been produced by using lacquer applied with an air brush in painting a mural of futuristic design for the Fisher Body display in the General Motors Parade of Progress. Lacquer gives the scene a brilliance and blended effect which could not be obtained by

Delbert, Mick



Painted with lacquer applied by air brush, this mural is unaffected by rain or sunshine and may be washed with water like an automobile body

other means. Being identical with the finish of an automobile, it will similarly withstand punishment by rain and sunshine, and it may be cleaned like the body of a car. The scene is 14 feet long and 35 inches high, painted on ordinary plyboard. It is believed to be the largest mural of its kind ever done entirely with lacquer and air brush, and its successful completion may lead to new methods in the production of murals, particularly for outdoor work.

There are 1,975 "trailer cities" in the United States, and one leading authority on sociology estimates that 15 percent of the population will choose trailer homes in a generation.

Scene Service 55
6/28/41

2186.

Comb. Marshall P. Bingham 1128 Sleams
Blume, Los Angeles, Calif.



One pickpocket made his dog an accomplice, teaching the animal to tangle his victim in the leash while the master lifted the wallet



These rackets are highly unprofitable, for so effective are modern police investigation methods that an unsolved crime of the "bunko" category is a rarity. A stray hair, a bit of fingernail, the imprint of a shoe or tire, is often sufficient to run down the perpetrator and obtain a conviction. But that is little consolation to the victim.

Any place where people with money gather in crowds is good hunting for the pickpocket. Depots, race tracks, fairs, theaters, and sporting

POLICE race down to the depot to investigate a robbery.

"I paid the cab driver from my wallet," the victim explains. "Turned to hurry to the train, and bumped into a man. When I reached for my tickets, they and the wallet were gone. He must have got them—but I don't see how."

"It was a cinch for any pickpocket," says the officer. His voice is grim, for he is thinking of the steady increase in losses to racketeers, petty thieves, and the like.

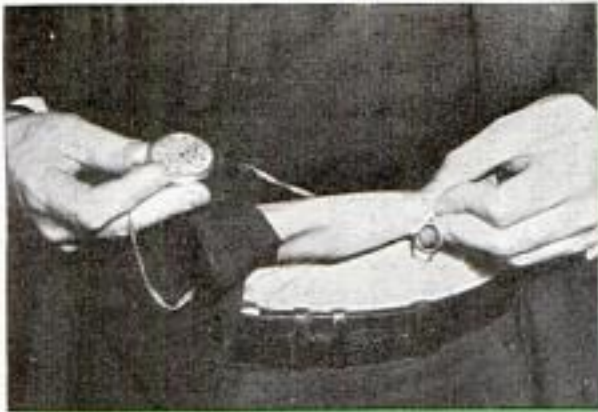
The big rackets are broken up, leaving the men who once worked them "unemployed." So they have gone in "business" for themselves at small crimes, pocket picking, shoplifting, purse snatching, check raising, and petty confidence games.

events teem with them. It always helps if he can bump into a victim, diverting his attention and in crowded places, jostling usually is unnoticed.

However, just because you are not in a crowd does not mean you are free from the pickpocket menace. One recently apprehended had trained his dog to approach



Shortchange artist lifts half dollar after counting it back to customer, screening the operation with bills



↑ Safest way to wear a watch is to have a buttonhole worked inside a vest pocket, through which the chain can be passed. This makes it almost impossible to snatch



Shoplifter slides a package with false bottom over parcel on counter to hide theft



Left carelessly beside her on a tipping seat, the woman's purse is an easy prize for the thief reaching under the seat

strangers, wagging and fawning. When the stranger stooped to pet him, the dog would circle, winding his leash around the man's legs. While the dog's pickpocket master and the victim were laughing good-naturedly and untangling the leash—goodbye watch, wallet, and valuables.

It is astonishing to the average person how stealthily pickpockets work. A man's pockets can be picked clean, and he will swear he has lost nothing. A woman's purse can be opened and rifled while she waits for a bus, or walks through a store.

But if certain rules are observed, you can make the pickpocket's job so difficult he is not likely to risk it. First rule is never to carry a wallet anywhere except in an inside coat pocket, with the coat buttoned. Loose, flapping clothes make pocket picking easy, and valuables in trousers pockets or outside coat pockets can be lifted even by crude operators. The wallet inside the coat presents a problem that requires two hands; the pickpocket must lift the lapel with one hand, and reach inside with the

other, or he must risk alarming you with the pressure of his hand inside your coat. A button or zipper on the inside pocket affords even better protection. Clever pickpockets can get them open, but few try.

Many men drape watch chains across their vests, running them through a buttonhole en route, and think they have protection for their timepieces. A clever pickpocket can slit that buttonhole with a razor-sharp knife, and be gone with watch, chain, and all. The safe way to carry a pocket watch is to have a special buttonhole worked inside the vest pocket, into which the bar or ring at the end of the chain can be looped. Fair protection is obtained by wrapping the chain once about a vest button. Pickpockets can unwrap it deftly, but it is usually so unexpected they give a tug which betrays them.

Another slick-handed robber is the shortchange artist. Fallacious is the belief you need only watch as change is counted. Count it yourself.

One apprehended shortchanger cheer-



Here's the way to carry a purse and keep it.
Theft would be impossible without violence

Pickpocket collides with victim, snatching pocketbook just as reflex closes victim's eyes



fully admitted he had been a magician.

"I can make more money behind a counter than in front of an audience," he told police. "The public wants to be robbed."

His best trick was to count silver into the victim's hand, then screen it with bills while his dexterous fingers flipped a coin back into his sleeve. Another was to count three or four one-dollar bills over and over, using such clever sleight of hand that the victim would swear he had from five to twenty dollars. This was easy when the victim was accepting change in one hand, while the other was loaded with packages.

Shoplifting was once profitable, and is still practiced somewhat, but police and department store associations have practically obliterated the professionals. However, a first cousin of this racket, called "houselifting" relieves many innocent persons of their valuables. Houselifters come to the door, representing themselves as agents of a reputable concern. Look well at their credentials before you let them in. Even then be careful. Credentials can be forged or stolen. If they are carrying any bundles, insist hospitably that you take them. Put them out of reach. Favorite tool of the houselifter is an innocent looking package that has a false bottom or trick door into which can be slipped a purse, an art object, china, or silver.

Many of them have secret pouches about their persons, into which they can put almost anything but a grand piano. So keep your eye on strangers in your house. You



† A button on the inside coat pocket, where the wallet and valuables should always be kept, makes pilfering far too risky for the average pickpocket

LR6

LR60

will be far more likely to pass the family silver along to your grandchildren.

Another house-to-house swindler is the fake fur salesman. He asks a price that would be very low for a fine fur, but is sheer robbery for his worthless product. How can good furs be told from bad? Only experts can be certain, but there are a few tests which may reveal the worst fakes. Examine the armpits for signs of wear and perspiration. These indicate used garments which may have been stolen. Rub the fur the wrong way. If you can see the hide, it is inferior. The hairs should be long, distinct, and silky. Rub a small area vigorously with your knuckles. A poor fur will wear down, leaving a bald spot. A good one will stand the test without damage. If these tests are passed, and you are interested, get the appraisal of an expert.

One type of fake fur salesman has been cashing in handsomely of late. He is the "war importer," who approaches with a fur he confidentially explains is inexpensive because it is smuggled, and adds that the government is winking at smuggling from Canada to build England's war credits. Never buy such a garment! If it is really smuggled, the government was not a party to the smuggling, but you as the purchaser would be. If it is a fake, as is more likely, you will be robbed.

Your duty in a case like this is not simply to protect yourself, but to aid your law enforcement officers in bringing the criminal to justice. Give no indication that you suspect him. Pretend to be interested, but tell him to come back later, when you will have the money, or will have consulted another member of your family. Then have the police waiting.

Strangely, one of the most effective rackets so far as escape goes, is not clever, but strong-arm. This is purse snatching, and as high as 15 percent of these cases go unsolved.

A woman should never take chances with her purse. It should never be allowed to dangle, but carried under the arm, with the strap wound as high around the arm as possible. This not only makes snatching difficult, but it prevents having her purse picked. But of all the persons who make themselves easy marks for criminals, the thieves' delight is the woman who puts her purse on the vacant theater seat beside her. There are crooks who do nothing but haunt

(Continued to page 174)

Motorless Autos in Europe Are Drawn by Horse



Horse-drawn auto is lightened by removing front seat

Automobiles are no longer "horseless carriages" in German-occupied Paris. With no gasoline to feed their engines, some Frenchmen have cut off the front sections of their autos to lighten them so a horse can be hitched where the engine had been. The driver perches himself in a dickey seat atop the two-wheel vehicle.

Detector Tunes-In on Termites

Termites, nibbling silently inside wooden beams of a building, no longer can keep their destructive work secret because now they can be made to broadcast the inaudible sounds so man may hear them. Picked up by a special microphone detector which is pressed against infested wood, the sound of crunching is amplified thousands of times into a noise similar to that of rice falling on a piece of paper.



Radio detector amplifies sound of gnawing termites

2895
James Walter Durr
Frank Eugene Co.
475 N. Randwood

270

Lawn Table With Wheels Rolls Like Wheelbarrow



Two wheels at one end make lawn table easy to move like a wheelbarrow to a shady or more pleasant spot

Easy to move from one place to another, an outdoor picnic table has two strong solid wheels at one end so it may be pushed like a wheelbarrow to a shady or more pleasant spot. Strongly made, it is suitable as a piece of furniture for the home garden or for use in parks, summer camps and other outdoor eating places.

2822

Extension Holder for Paintbrush Reaches Difficult Places



Painting in places that are awkward and difficult to reach is made easier with an extension brush holder that adjusts to any angle. Handles of any length, tapered to fit the socket, can be screwed to the holder, while the brush is gripped

Christian Science Monitor 5/19/4

by a wing-nut clamp. Hours of work may be shortened to minutes, especially where time is consumed in raising and shifting ladders and scaffolds. The holder is useful also for painting floors without stooping.

2697

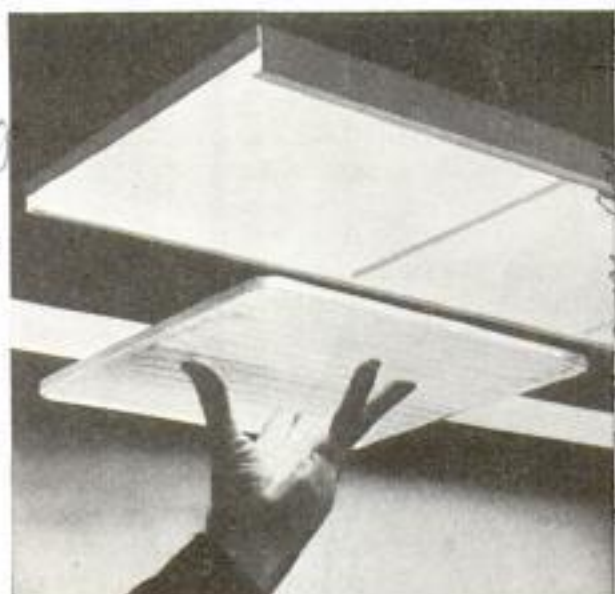
Plastics Made of Sugar Cane Form Basis of New Industry

Discovery that a plastic material with highly superior qualities can be made from bagasse, the refuse of sugar cane, promises the development of a new industry. Sugar, in fact, may become the by-product and cane plastics the most valuable product of the tropical plantations. A pilot plant in Louisiana has already turned out quantities of the plastic material which proved unbreakable in hard use, stood bending strains of 13,000 pounds, was a non-conductor of heat and electricity, and acid-resistant. Sheets can be welded together and the resulting blocks machined like steel. Possible products include automobile bodies and airplane wings, roofing materials, gears, gun stocks and telegraph-pole crossbars.

Southern Regional Research Laboratory plantation near Lakeport

Lenses for Fluorescent Lamps Spread Light as Desired

Better control of fluorescent lighting in the home is provided by lenses that slip over the lamp and permit the beams to be focused for specific purposes. They are made in three designs. One lens gives normal, uniformly spaced lighting in rooms of average height; another permits confined



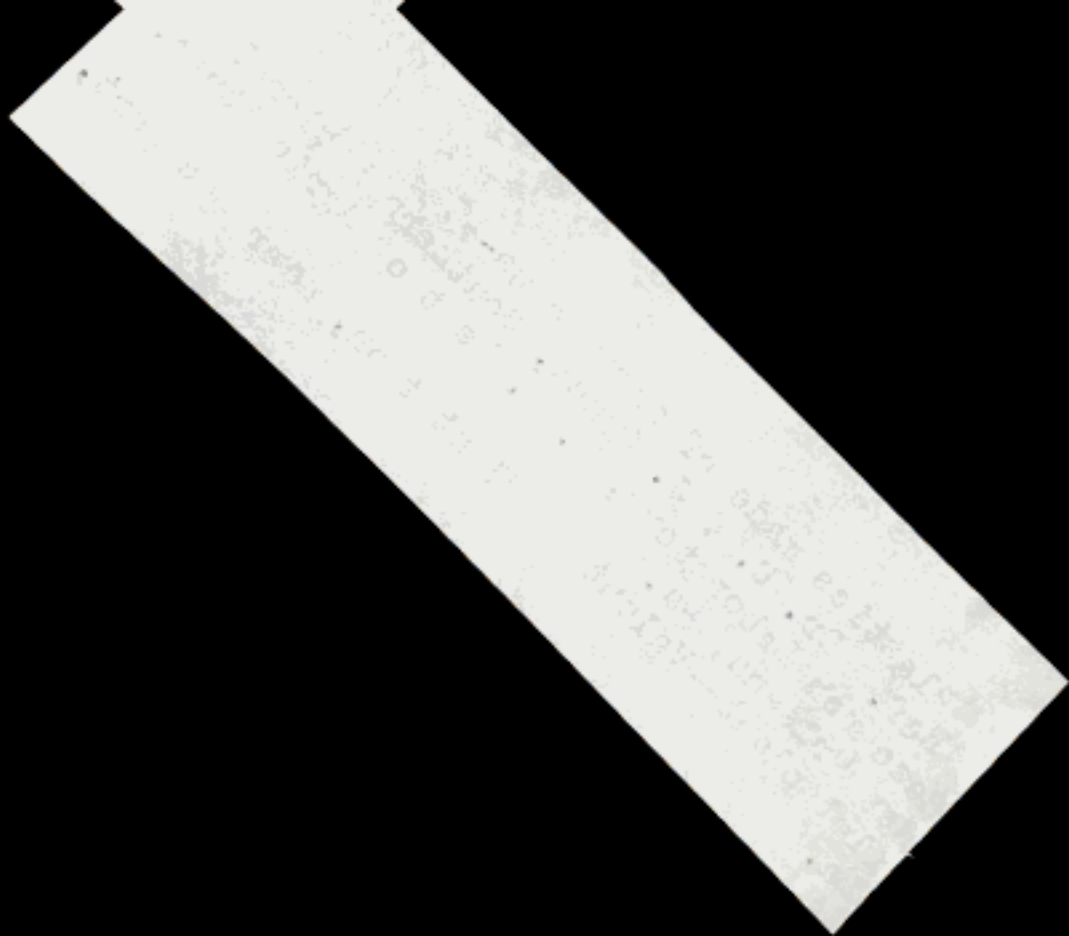
Lens permits better control of fluorescent lighting

POPULAR MECHANICS
Holophane Co.

vertical text on the right edge of the page, including 'near Lakeport' and 'Copyrighted material'.

Vertical text on the left edge of the page, including 'Sold Medal Folding Furniture Co. Racine, Wis.' and 'Best uses, E. Waterman Co. 164 W Lake Chicago'.

Plastics made of sugar cane--
Ref. Dr. D. F. J. Lynch, Southern Regional
Research Laboratory, U. S. Dept of Agriculture,
New Orleans, La.
Pilot plant--Valentine Plantation, near Lockport,
La.



*Bureau of Plant
Industries*

27.09

focusing at the point where accentuated illumination is desired; and the third type is for lighting vertical surfaces and is suitable for rooms with low ceilings where the units may be spaced widely.

2900

Jack Rabbits Taste-Test Grasses For Western Cattle Ranges

Western cattlemen have found a use for jack rabbits—for a few of them, at least. It happens that the grasses jack rabbits prefer are also the favorite diet of cattle. So federal agronomists at Mandan, N. D., are using jack-rabbits as "taste testers" for new breeds of grass they are developing. It would be impractical to seed wide ranges to trial breeds of grass for the cattle to taste for themselves, so small plots are planted and the rabbits turned in to see whether they find the diet palatable.

2135

Pushbutton Electric Flour Sifter Leaves Hand Free to Stir

Flour is aerated three times by an electric sifter that is operated by a pushbutton, leaving one hand free for stirring the batter. It is aerated first when passing through slots in cone-shaped discs, again when tossed up from the sieve by vibration, and a third time when the flour drops through the sieve. A container full of flour can be sifted in ten to fifteen seconds.

1.95



You can stir batter while one hand operates sifter

Poison Sprayed on Hot Plate Vaporizes to Kill Insects



Insecticide is vaporized when sprayed on hot plate

Death in a new form has been invented for flies and mosquitoes, cockroaches and other common household pests. Instead of using the two insecticides, pyrethrum and rotenone, as sprays or dusts, they are converted into a powerful fumigant by spraying them against a hot plate. The best fumigants previously used were dangerous to man, but pyrethrum and rotenone are harmless to use but deadly to insects. As fumigants, too, they penetrate cracks, furniture and rugs where insects might escape an ordinary spray. The apparatus used is a specially constructed cup that revolves, breaking up the pyrethrum or rotenone solution into minute particles which are then distributed over a hot plate, to rise in a thick fog. This method has successfully passed preliminary tests by the U. S. Department of Agriculture.

*Developed by W. N. Sullivan
and L. H. Goodhue Bureau of Entomology
Washington, D.C.*

See index, page 4-A, to find where to buy articles described in this magazine. Say You Saw It in Popular Mechanics.

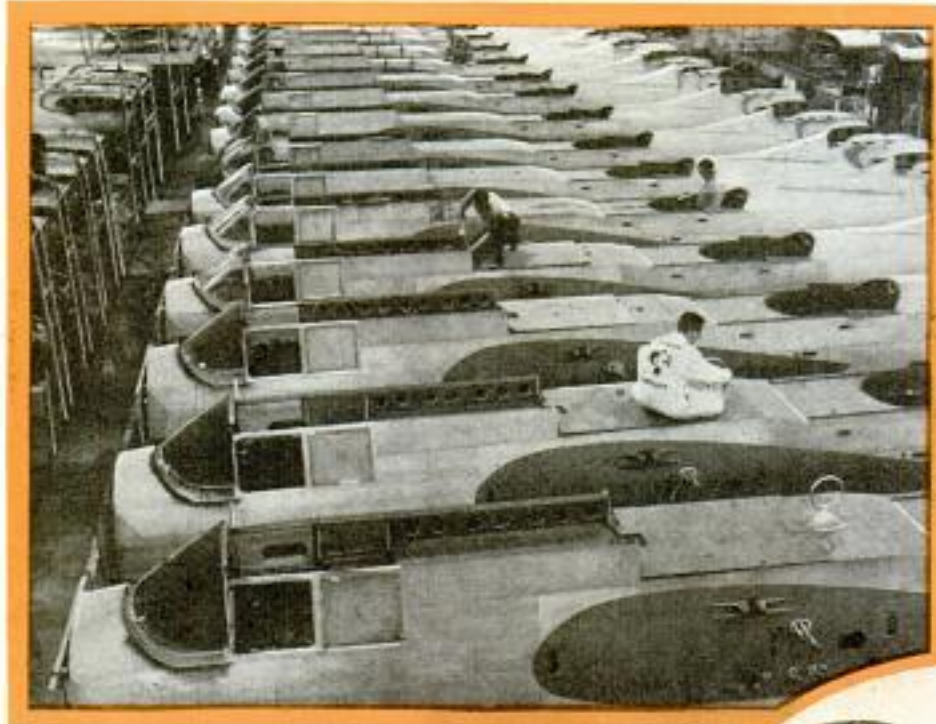
NOVEMBER, 1941

*Miracle Products, Inc.
36 S. State, Chicago*

P 7 41

Carl Thomas E. Stinson Jr.
3872 Franklin Ave Los Angeles

WAR PLANES on the



Automobile production methods, including overhead rail conveyors and construction by finished sections instead of building a hollow shell and filling it with instruments, wiring and equipment, have been applied to the military airplane thus speeding up work and increasing output. At the Douglas Aircraft Company, production of attack bombers and night fighters has been tripled in a year by these methods, although employment has increased only 70 percent

↑ Line of fuselages receiving finishing touches. The men work at permanent stations and at timed intervals, a bell rings and each fuselage is moved to the next station where the new crew repeats the process it had just finished on the last one. The system includes a 500-foot conveyor track on which wing stubs are finished, complete to fuel tanks, engines, retracting gear and wheels

Materials must be delivered to each assembly station on the conveyor line on a clocked schedule to keep the line moving smoothly. Here a stockman is collecting a full set of hydraulic control tubing for another group of warbirds that will come down the line within a short time. Bottom, right, carburetors, exhaust manifolds and magnetos are installed on engines, then they are wheeled to waiting planes and hoisted into place

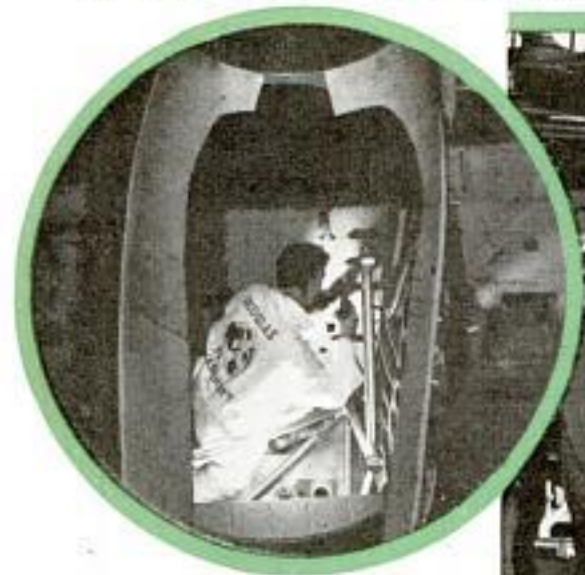


Moved outside the factory when assembly is completed, the war planes are checked and otherwise prepared for test flights. This is a view of tail assemblies



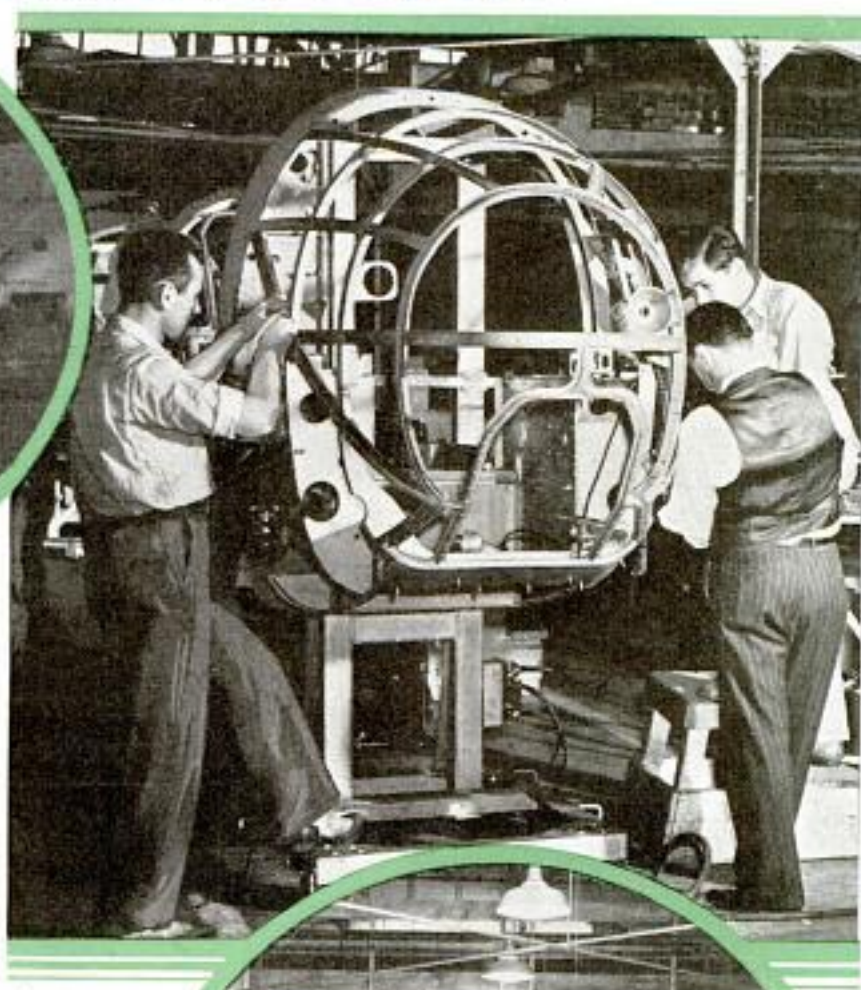
2741

PRODUCTION LINE

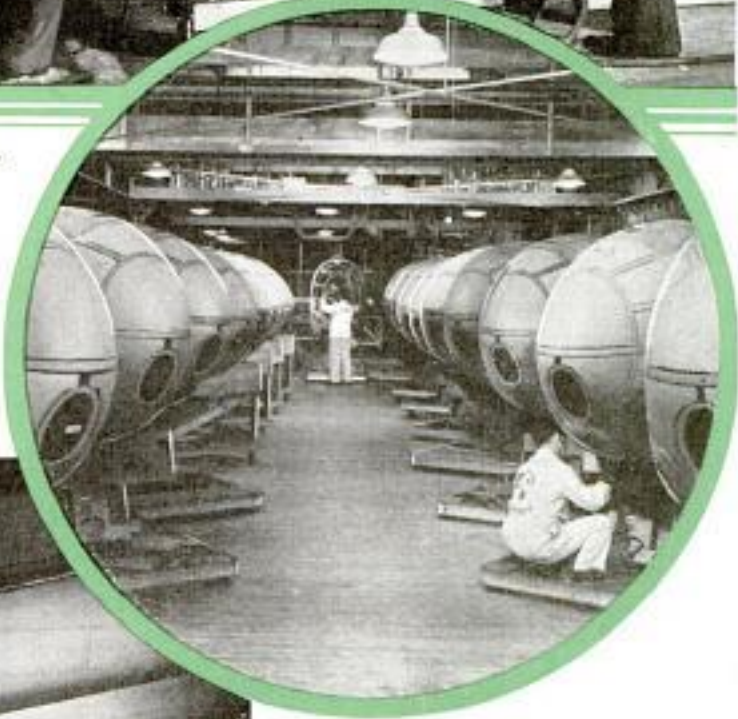


↑ Riveter inside retractable wheel housing; this gives some idea of the war plane's size

→ The planes roll on wheels all the way through the factory, from the time the different units take shape on the jigs. Here a nose section is being finished to move to another station where transparent windows will be installed



→ Nose sections, still on wheels, are shown in the Douglas factory in readiness for painting. The window material is covered with paper to keep it clean during the painting process. Assemblies do not stop for painting, but slide along their tracks through air-conditioned paint shops built over the assembly line. Here painters in masks use spray guns in camouflaging each ship as it goes by



← Fuselages are built in two parts, each side being finished as a separate unit, complete to wiring, control wires and armament. Then the two sides are fastened together to form a complete fuselage and the connections are made. Here mechanics finish the assembly

L909

Hobbyist's Binocular Loupe Magnifies Small Objects



Scrutinizing a stamp album with the binocular loupe

Stamp collectors and other hobbyists or workers who habitually do close reading or inspection of small objects will be aided by a binocular loupe now available. Its special lenses magnify the object and prevent eyestrain.

Hack Saw in Adjustable Holder Slides Out for Keyhole Use

Sliding in a slotted steel rod, a hack saw can be projected as much as four and one-half inches beyond its holder for use in keyholes and other small crevices. The



Reaching a difficult place with extensible hack saw

Dayton Rubber Mfg Co
Dayton, Ohio

holder is adjustable for the work at hand, a clamp and set screw gripping the blade at the point desired. The projecting blade will go into a quarter-inch opening.

L897

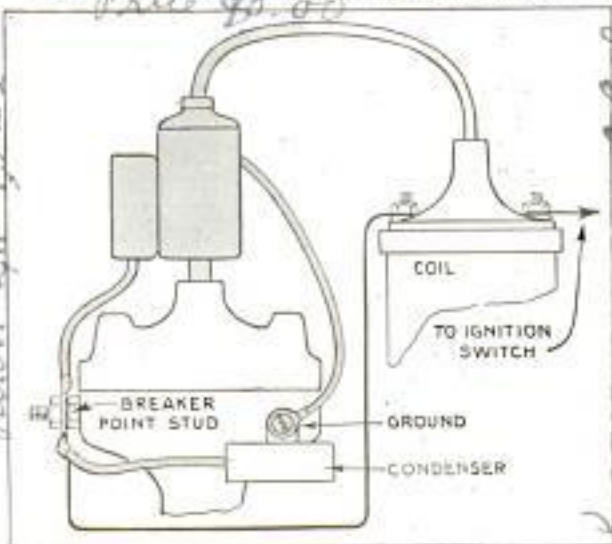
Tire-Tread Grip of Drive Belt Has Greater Pulling Power

Greater pulling power on a flat pulley surface is achieved in a new drive belt that has a tire-tread grip. Its cogs make the belt highly flexible and provide a maximum contact arc and longer life under high-speed flexing.



L843

Transformer for Auto or Truck Improves Engine Performance



How transformer may be installed on top of distributor to pep up car or truck

Designed to give smoother performance and to pep up the engine, a high-frequency transformer for the auto or truck may be installed easily in vehicles using either six or twelve-volt ignition systems. The device, which fits on the distributor, develops high frequency alternating current. Its makers claim that its use results in longer life for points, absence of fouling in spark plugs and in more positive starting.

See index, page 4-A, to find where to buy articles described in this magazine. Say You Saw It in Popular Mechanics.

American Optical Co
Southbridge, Mass

Stebbins Hardware Co
15 W. Van Buren, Chicago

Stebbins

Pat. H. 2,117,422

W. W. Evans, Chicago Laboratory, 5978 W. Evans, Chicago

Holtzman

2879

Invasion Barge Lands Tanks and Motorcyclists

Preparing for the eventuality of an invasion of continental Europe, the British are making practice landings of their "panzer" equipment on the Scottish shore, using huge barges that carry tanks and troops, motorcyclists and Bren gun carriers. The barges are driven ashore, then let down their forward walls which become ramps for landing the tanks. Similar armored barges were used in the British sortie into the German-occupied Lofoten Islands.



Forward wall of the "invasion barge" drops down to form a gangplank, and the British light tanks and motorcycles roll ashore for practice landing

2809

Indoor Tennis for One or Two Played on Folding Table



Features of table tennis and squash are combined in a new indoor game played on a wooden table that folds into a carrying case. Like squash, the ball is bounced off a backboard, and this feature makes it possible for either one or two persons to play. Regular table tennis balls and paddles are used, but the table takes up only one-fourth the space occupied by a regulation table.

A table tennis ball heads for backboard in game combining squash and indoor tennis

Mines Athletic Products Co. 200 Fifth Ave. New York City

2789

Midget Electric Bulb Is Easy to Conceal When Used in Showcase

So small that it can be concealed easily, yet powerful enough to deliver a flood of concentrated illumination, a midget bulb is offered for lighting showcases, shadow boxes, refrigerators, scales or machines. Five inches long and three-quarters inch in diameter, the bulb has a built-in reflector of silver and is hermetically sealed to prevent tarnish. According to the manufacturer its life is rated at 1,000 hours. It is available in 15, 25 and 40 watts.



Slender bulb can be concealed easily inside cabinet or showcase so direct rays will not strike the eyes

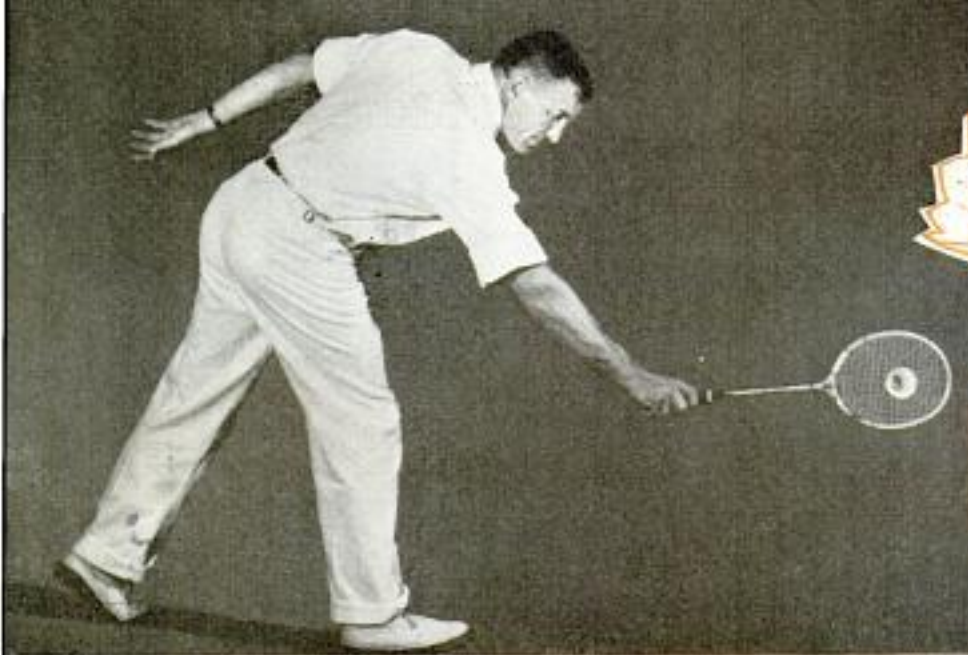
Operating an automobile today costs no more per mile than tire expense alone thirty-five years ago.

no data

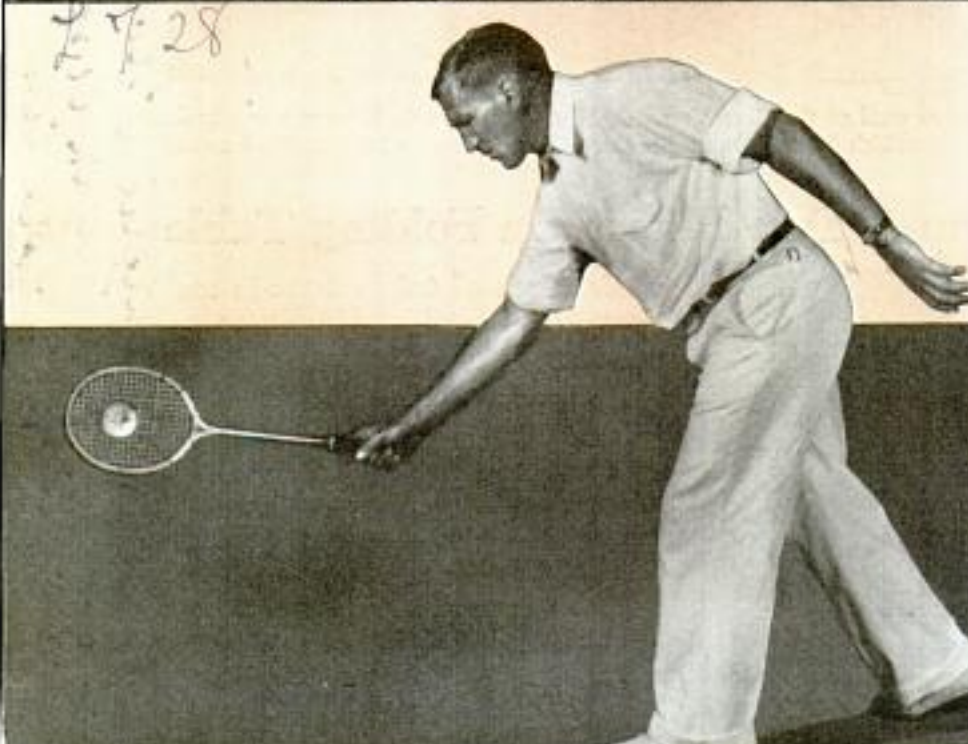
NOVEMBER, 1941

Wabash appliance Corp. 335 Carroll St. Brooklyn, N.Y.

KEEP YOUR EYE on the "BIRD"



← Reaching for a backhand shot; here the racket has been shifted slightly in the hand and the weight is on the right foot as the player steps in for the stroke



← The author demonstrates proper stance for forehand drive: arm and wrist are relaxed, left foot is forward. The swing is much like that used to skip stones on water

Keep the feet rather close together for the serve—and mix your serves: a short one just over the net, a high one to back court. Deception is important in badminton



By William "Agate" Martin

Badminton Coach

873 Oak St. Winnetka, Ill

FEW games have the action, fun and excitement for all members of a family that badminton offers. A small child has strength enough to swing a racket that does not weigh over five and one-half ounces. A shuttlecock weighs approximately 78 grains, about the same weight as our five cent piece.

Don't get the impression that badminton is a simple game that requires little or no practice. If one is to play a better than average game he must practice until he masters the fundamentals, as with any game. I have discovered, however, that badminton has a fascination to the beginner that is not found in other games. Most

*Constance
O. Monoran*

A Detroit Badminton Club player demonstrates how she goes after a difficult low forehand shot



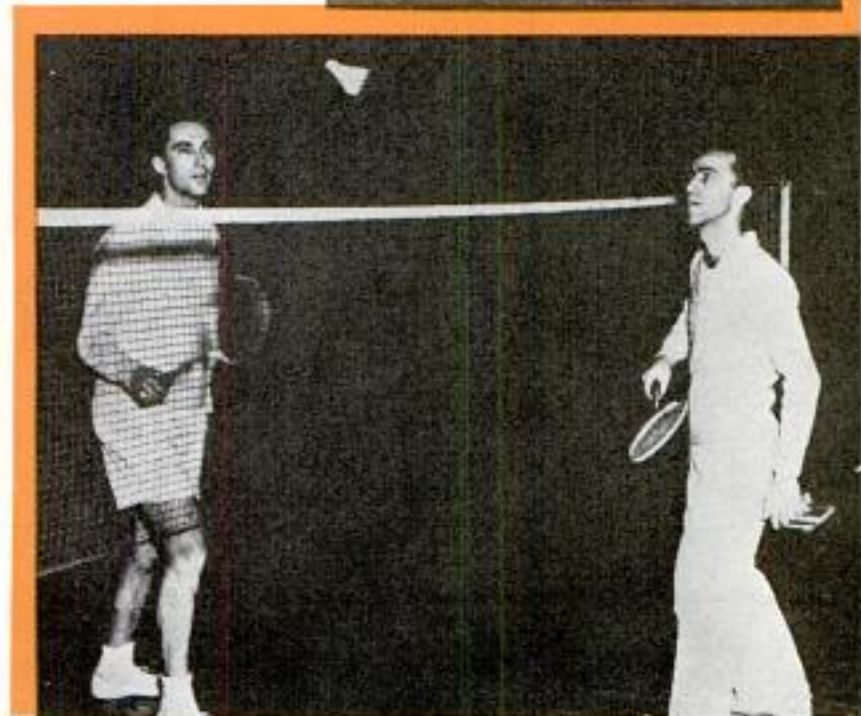
In an overhead smash, weight is shifted from right to → left foot. The stroke is like the motion of throwing a baseball. Keep your eyes on the bird until it hits racket

people are able to hit the shuttle with some degree of skill very soon after starting to play. This immediate success is encouraging and, as a result, I find that very few people who start badminton do not continue playing. For even bad badminton has its thrills.

Where did this fascinating game come from? It seems to be an accepted fact that the game was brought to England by army officers who were stationed in India. The game became very popular in England and during the winter months one will find some tournament booked for every weekend. One of the outstanding badminton players touring the United States today, Kenneth Davidson, is a former English champion. Probably the highlight of his career was his command performance before King George VI.

The game was soon brought to Canada, and Canadian championships have been held annually since 1920. As for the United States, sporting goods dealers report that

The camera catches a bit of fast action close to the net





In this backhand grip racket is shifted a quarter turn, thumb lined with shaft



Don't take a death grip on the racket. Stand it on edge and "shake hands" with handle for proper forehand grip

badminton equipment during the last few years had one of the largest percentage increases in sales of all sporting goods. Some clubs have been in existence for thirty years, but badminton received its first great impetus in the early 'thirties, when such players as "Jess" Willard and Jack Purcell, the Canadian "pro," started touring the country and giving exhibitions. The first United States championships were held in Chicago in 1937, with 107 entries. In 1941 at Cleveland there were 236 entries—the largest number of entries being in the mixed doubles. Badminton is a family affair now.

It is not necessary to go to the gym for your workout. There are dozens of courts in backyards of private homes. It requires a space only 44 by 20 feet. To develop outdoor badminton, manufacturers weighted the shuttle to make it more playable in the wind.

← Don't be afraid to stretch: shots that seem impossible can be retrieved

Now about the game itself—let us start from the beginning. In selecting a racket, choose one that feels well balanced in your hand. The balance in rackets varies, and the one that feels right is the one to buy. The grip is important. Stand the racket on edge and then shake hands with it, the heel of your hand touching the leather button. Avoid taking a "death grip" on the handle.

Holding your racket in this position, you are ready to serve. Stand a few feet back from the short service line. The object is to serve the shuttle just over your opponent's short service line or deep in his back court. If you use the short service the shuttle should barely clear the net. For deep service the flight of the shuttle should be very high. A player, through practice, will soon be able to make

Used in place of the backhand, this round-the-head shot often enables you to catch your opponent off guard



27:28

2856

both shots look alike, and this deception will tend to put his opponent off balance.

Most people like to hit the shuttle hard, and the overhand "smash" gives a player this opportunity. In hitting an overhand shot pretend you are throwing a baseball overhand, shifting your weight from your right foot to your left as you make the stroke. Do not try to kill the shuttle as this shot is being learned.

In making the forehand shot the right handed player should step across with his left foot, using the right as a pivot. With the arm and wrist relaxed, the swing is very much like that used in skipping stones.

The backhand shot probably has as many variations as there are players. Many leading players shift their grips slightly as they make a backhand shot. I have found that if I suggest to a beginner that he may shift his grip for the backhand, he soon finds excuses for shifting his grip too frequently. Here are a few fundamentals to keep in mind in making backhand strokes: use the cross step as you approach the shuttle for the return; follow through with your racket head as you stroke the shuttle; take the racket head well back as you get set to make the shot. Bringing the racket head back will give your shot more force. Many players have a tendency to wait too long before hitting the backhand shot. By learning to hit the shuttle while it is still high in the air in using the backhand stroke you will develop speed and deception. Return the shuttle as soon as possible after your opponent has made his shot and he will have little time to get set. The backhand shot usually tends to give your opponent time to get set. To overcome this delay, develop an "around the head" shot.

Because of the speed needed to cover a court in singles, the doubles game has become very popular. Most sportsmen playing a better-than-average game of singles would have about all they could stand after a half hour of play. A men's doubles game is probably the fastest and most spectacular for spectators as well as players. This brings up the question of team play, or rather, systems used in doubles.

Let us look at mixed doubles first. The girl always covers the front part of the court or net shots, the man being responsible for the back court. With players of equal ability a mixed doubles team that consistently lets the girl player be caught

(Continued to page 179)

Policeman Wears Earmuffs While Firing at Target



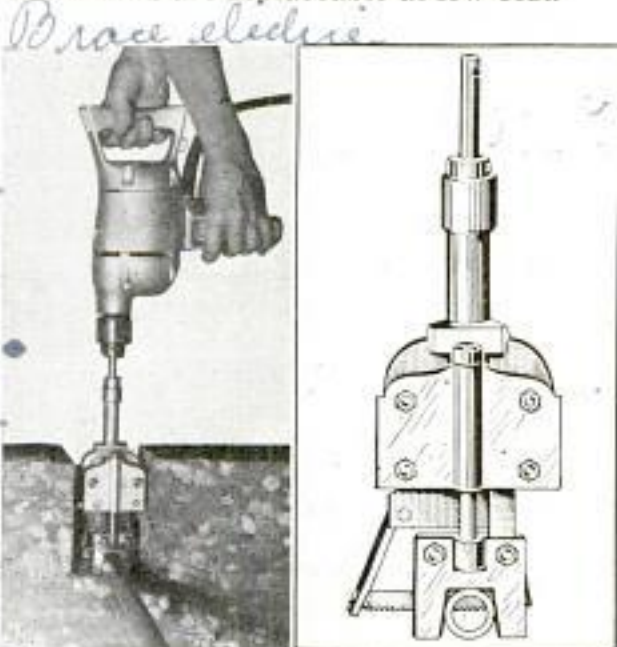
Marksman wearing ear guards while shooting indoors

To deaden the noise of firearms while they practice marksmanship, Chicago park policemen cover their ears with sound-proof pads. The earmuffs are useful, especially in indoor target ranges, to protect eardrums against reverberations.

2637

Motor-Driven Hack Saw Tool Speeds Pipe-Cutting Job

With an electric hack saw tool just brought out, pipe cutting in difficult places can be done in a fraction of the time required with hand tools. It is particularly adapted for work in corners and recesses, and is automatically positioned by merely pressing the blade against the pipe. The saw blades are replaceable at low cost.



Electric saw reaches places impossible with hand tool

Hasko Utilities Corp 119 E 27th St New York

2834

Science Service
May 24

Steel Cage for Mountain Tunnels Descends Deep Into Shafts



Giant crane lifts men in steel cage from aqueduct tunnel shaft

To reach the depths of shafts dug far down into mountains when the tunnels of Los Angeles' great aqueduct were driven through, a steel car has been built for hauling men and materials up and down. Because of its weight of many tons, needed in its rugged construction to give certain protection in a hazardous assignment, a large crane was required to pick it up.

Vitamin A Treatment Seen as Aid For Color Blindness

First experiments with vitamin A treatment to find a remedy for color blindness, reported by Dr. Robert D. Loken of the University of California, were successful enough to encourage the belief that at least a partial cure of this hereditary defect may be possible. A group of eight color-blind students that made an average of 11 errors in tests before the treatment, averaged only five errors per person after 12 days of vitamin A dosage. In other words the group made only half as many errors in the second test. In the experiments each

student took 12 capsules containing 25,000 units of vitamin A, at the rate of one capsule per day. This is more than four times the amount recommended for an adequate daily diet. Dr. Loken pointed out that vitamin A cannot yet be considered a cure for color blindness, since his experiments were only preliminary.

Fuel Lost by Poor 'Tuning' Hits Three Billion Gallons

Sheer waste of gasoline from one major cause alone totaled 3,240,000,000 gallons in 1940. This one cause was failure of the automobile driver to maintain his car properly adjusted for best fuel economy. The waste represented 14.7 percent of the 22,000,000,000 gallons consumed by American motor vehicles. The figures resulted from tests made by the U. S. Bureau of Standards with the American Automobile Association.

Snap-On Milk Bottle Cap Pours Without Dripping

Made of a plastic material, a cap for pouring milk, cream or other beverages fits on any milk or cream bottle, regardless of size. Fastened on the bottle by means of a spring clasp, it pours smoothly without dripping.

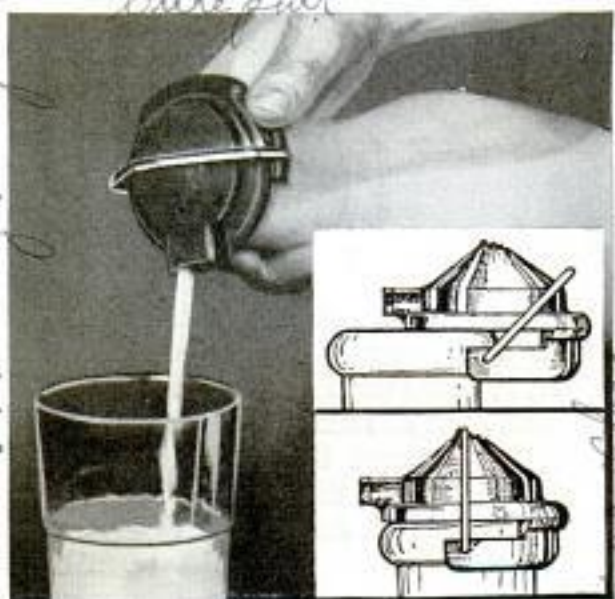


Diagram shows how clasp holds cap over milk bottle

POPULAR MECHANICS

Columbus Plastics Products, Inc.

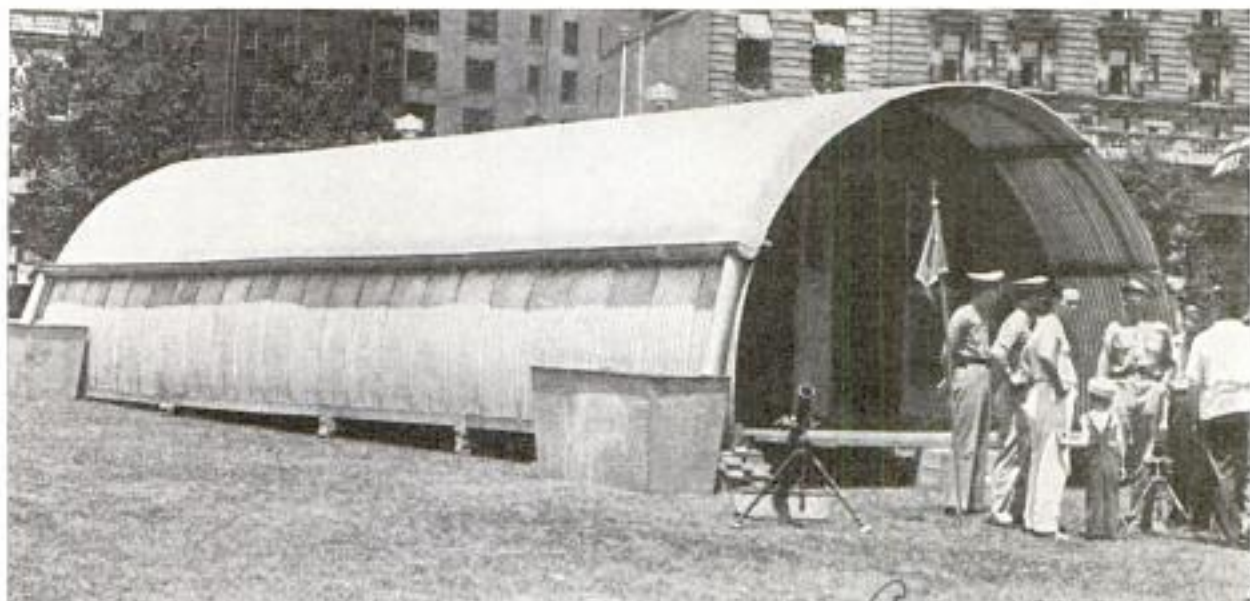
Psychology Dept

Los Angeles

Washington, D.C. and Pennsylvania, Washington

2830.

Tin Field Huts for Marines Built in Nine Hours



Roomy hut intended for use of the U. S. Marines in tropical service is built of prefabricated arches of tin

Using arches prefabricated of corrugated tin, a tropic hut for field operations of the U. S. Marines can be erected within nine hours. After being set up the hut may be

camouflaged by covering it with dirt, foliage, grass or sandbags. If sandbags are used for covering they will also protect the hut from shell splinters.

2866

Electrically Heated Flying Suits Warm Pilots at 60 Below



Here is one of the electrically heated flying suits, designed for the U. S. Army Air Forces, undergoing test in a cold room

Pilots of the United States Army Air Forces will be comfortably warm in temperatures as low as 60 degrees below zero when they receive new flying suits heated by electricity, which are being made by ~~General Electric Company~~ at Bridgeport, Conn. The amount of heat supplied may be adjusted to meet changes in temperature. Many pounds lighter than the sheepskin-lined garments now used, the new suits give far more flexibility for manipulating controls and guns. They are heavy woolen union suits with wires sewed in parallel waves to stretch as freely as the wool in conforming with movements of the body. The suits have a lining of 100-percent cotton cloth which permits radiation of heat to the body, while the outer woolen fabric reduces heat loss. For the feet an electrified boot is worn.

Five million gallons of paint are used annually in marking highway lanes and pavement warnings.

2481

STREAMLINING OUR HIGHWAY

Comb. Andrew Hamilton 109999
Hollywood Ave. West Los Angeles



Motion picture camera in Los Angeles police car collects evidence of crashes, speeding cars and other traffic violations

Highway police must be prepared for any emergency. Here Michigan officers, wearing snowshoes, pick up an accident victim

THE hard-boiled speed cop, a relic from the days of the "Model T," is on his way out. He's rapidly being replaced by the modern highway patrolman—a traffic expert who is courteous, educated and scientifically trained to cope with all the problems of America's 3,000,000 miles of roads.

Speed traps have been abandoned. The "where's the fire?" attitude is disappearing. Equipped with two-way radios and motion-picture cameras, automobiles are outnumbering motorcycles, which are of little value at night or in bad weather. Science is playing an increasingly important part in the training and everyday duties of the highway patrolman.

This evolution has taken place all over the United States during the past ten years, necessitated by the steady growth in highway traffic. In 15 years the num-



PATROLS



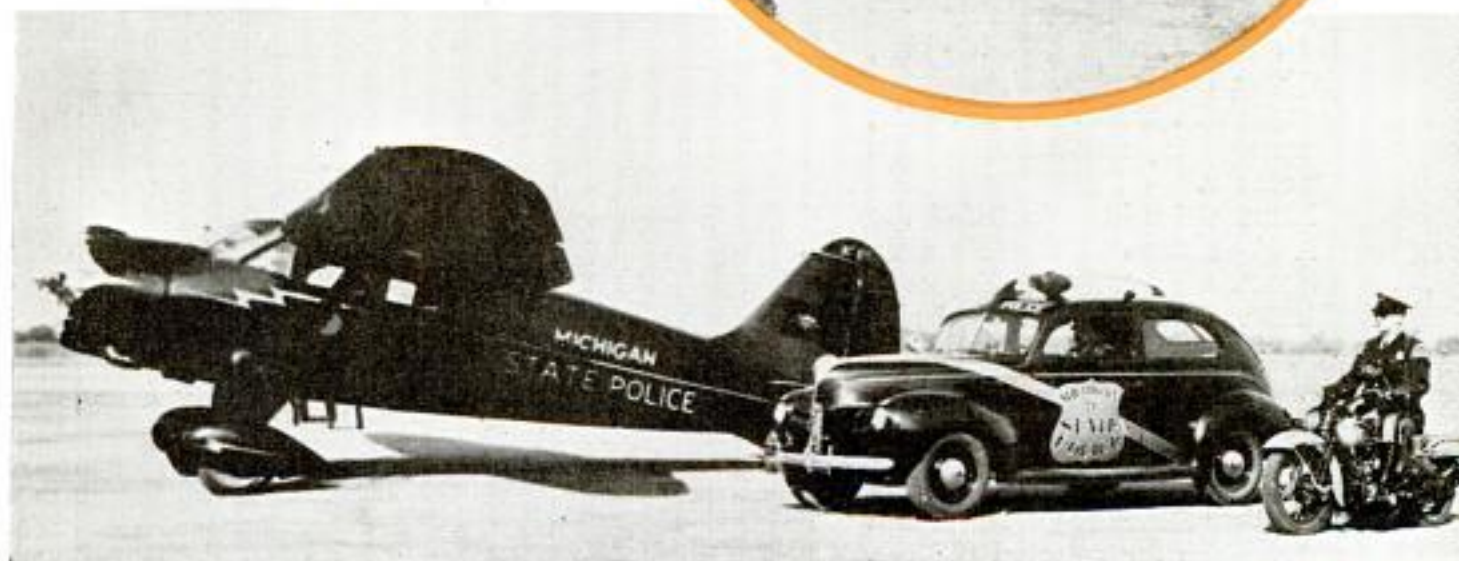
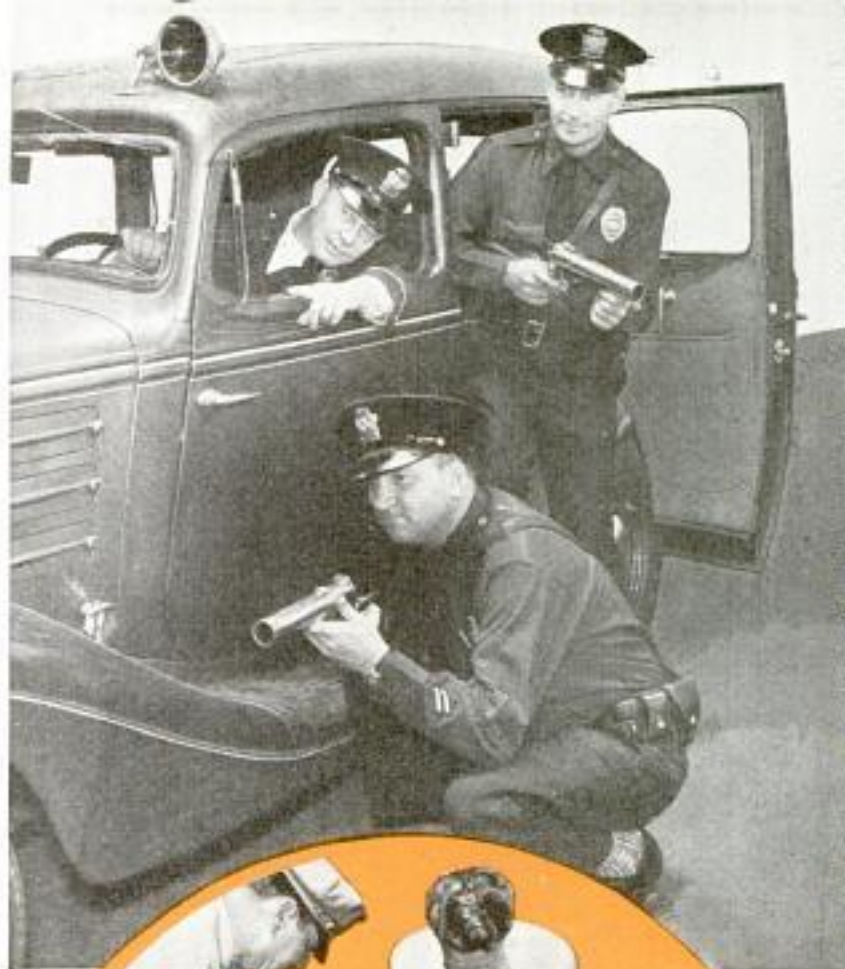
Training in the use of tear-gas guns is routine today for most traffic forces

ber of automobiles has increased from 20,000,000 to 30,000,000; better-built highways have increased average speeds.

The modern traffic trooper is carefully selected and thoroughly trained. In the state of Washington, for example, an applicant for a patrolman's job must have a high school education, must be less than 30 years old, stand more than 6 feet in height and must be "built" in proportion. In many states, rookie patrolmen serve as clerks for the first year or two so that they may become acquainted with office routine. When they have shown aptitude for highway work, they are put through an intensive training course of 30 to 120 days. In California, for example, candidates take a stiff physical and mental test. Because the jobs are under Civil Service, there is no favoritism and the sheriff's nephew stands no better chance than any other candidate. Under the direction of Supervising Inspector W. H. White, California rookie pa-

Brawn as well as brains is essential for → the officer who is to do an efficient job

The airplane, automobile and motorcycle are all used by Michigan highway police ↓





The old-time speed cop who kept a "speed trap" for motorists is passing out of the picture

trolmen are given an intensive course at Sacramento in riding motorcycles, handling firearms, learning first aid and Red Cross methods, traffic regulations and the law of arrests, and criminal detection. When the training course is over, new men are paired with veterans for highway duty. During the first two weeks a new man isn't even given a lead pencil. He soon learns that promotion comes not with the number of tickets he writes but with the decrease of highway accidents in his district.

A traffic officer's training does not stop when he gets his gun, uniform and badge. Special instruction in traffic safety, law, firearms, etc., continues through his career.

Many cities have installed the Kreml system of traffic safety, named after Lt. Frank Kreml of Illinois. It has already been adopted by Oakland, Cleveland, Detroit, Atlanta, Cincinnati, South Bend, Los Angeles and other cities. Special courses are given at Northwestern University and other American colleges and universities for selected officers.



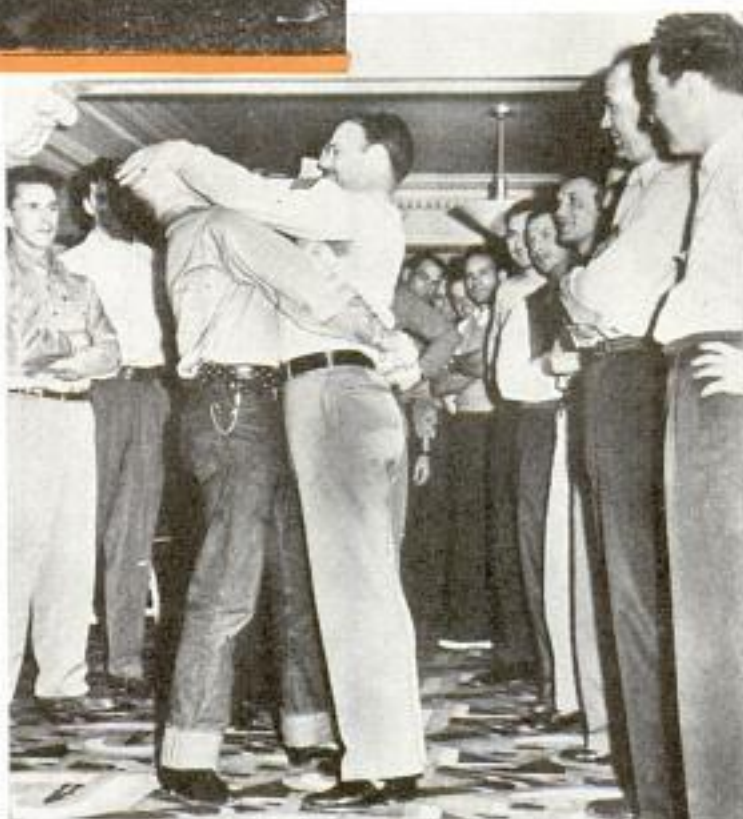
The Kreml plan is simple and direct. First, all accidents are analyzed by traffic experts as to type and cause. Second, every effort is made to prevent a recurrence by enforcement, education and engineering.

For example, several pedestrians are injured at a certain intersection. The accidents occur mostly at night and investigation reveals that the lighting is bad. This difficulty is soon remedied. In another case it is found that motorists are driving too fast in a certain area and are ignoring rights of pedestrians. Officers are concentrated in that area to enforce the law and caution both drivers and pedestrians.

"The entire program of traffic law enforcement

← State police study enormous enlargement of a fingerprint

To be ready for anything, a police "rookie" studies jujitsu



2481

2840

has changed greatly," according to Capt. F. T. Corcoran of the Minnesota Department of Highways. "The enforcement program today is directed toward high-accident locations at the times and on the days of most frequent accident occurrence. Accidents are investigated to determine whether they were caused by carelessness of the driver, by defective vehicles or defective roadways."

In Pasadena, Calif., the problem of highway safety was attacked scientifically by W. W. Harper, a former physicist at California Institute of Technology. In three years he halved the cost of traffic accidents to that city. He discovered that about 50 percent of all accidents occur between 3 p.m. and 11 p.m., the most dangerous hour being from 8 to 9 p.m. He also learned that 60 percent of all accidents and 77 percent of all pedestrian injuries occurred on eight principal streets. Thursday, Saturday and Monday nights were the most dangerous to pedestrians. As a result, the night shift was doubled on "multiple accident" streets and every effort was made to encourage motorists in danger areas to drive carefully—not by wholesale arrests but by the "slow down, there's a cop!" technique of patrolling the streets.

The highway patrolman no longer relies on "speed traps." According to Major John A. Warner, superintendent of New York State Troopers, "the work of the traffic enforcement officer has become more like that of an educator instead of lying in wait for violations. Hiding behind trees and billboards is no longer practiced."

Likewise, the hard-boiled attitude toward traffic offenders is passe. Instead of the sarcastic greeting "Where d'ya think yer goin'—to a fire?" the motorist today get a courteous "Good morning, sir. I'm a traffic patrolman and I've been following you for two miles. Maybe you don't realize it, but you went through that last safety zone at 40 miles an hour. For your own safety as well as that of others on the road, it is my duty to bring these things to your attention. May I see your driver's license, please?"

Traffic troopers are taught that the average motorist who exceeds the speed law or fails to make a stop may be ignorant or careless—but he is not a criminal.

This is the prime reason why so much stress has been laid upon educating the

(Continued to page 176)

Washtub and Inner Tube Make Boat for Fisherman



At top, fishing from washtub made un-tiltable by inner tube. Bottom, craft is carried easily on back

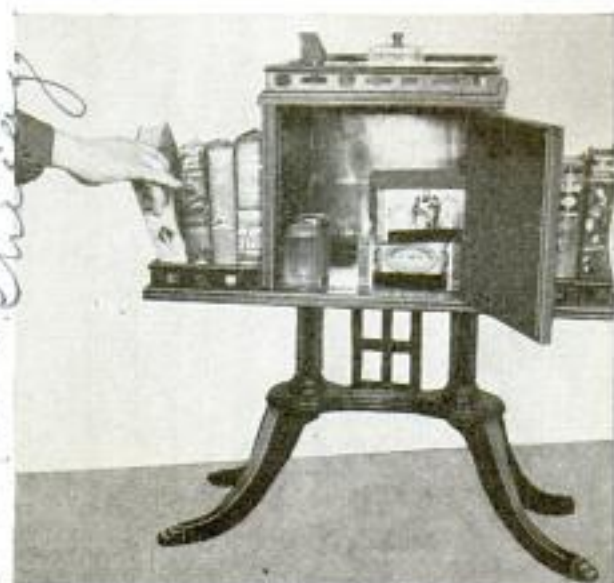
Encircled by an inner tube to keep it from upsetting in the water, an ordinary washtub has been converted into a one-man fishing boat. A plywood collar on the tube holds it fast to the tub when the tube is inflated. A tailpiece, which is slung over the shoulder for carrying the craft, serves as a rudderlike stabilizer and prevents the tub from turning in circles. Paddles and bait buckets are attached to the rig by lines and are permitted to float in the water nearby while fishing. The tub is fitted with a seat, beneath which are drawers for holding lures and extra tackle. The fishing rod is set conveniently in a whip socket, and the edge of the tub is covered with rubber hose for a hand rest.

☐ To learn where to buy commercial products described in these pages, see the index.

*C. J. Slawley
8001
Lake of the Park
D. M. Co. I saw
St. Peters, Mo.*

272

Smoking Stand in Dual Role Holds Books and Tobacco

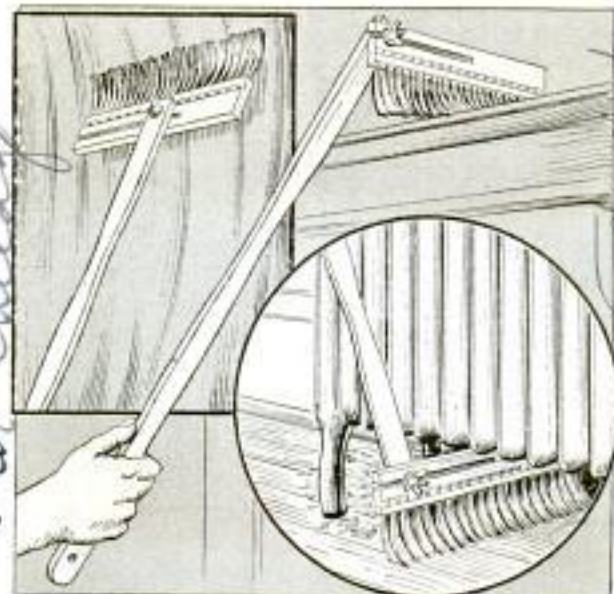


Inside the stand are a humidior and smoking supplies

Your favorite books and your favorite smoke can be kept within reach of the easy-chair on a smoking stand equipped with shelves at the sides. Made in either mahogany or walnut, the cabinet has a glass top and brass trimmings. There is a humidior inside and plenty of storage space.

Adjustable Long-Handle Brush May Be Set at Any Angle

Fastened to its long handle with a single bolt, a household brush now available may be tilted readily to any angle that best suits the dusting job. It may be fixed in any position from parallel to right angle to the



Here are three jobs done easily with versatile brush

handle, with the bristles turned inward or outward. The long handle saves climbing to reach high places, and stooping to get at the low ones. The wing nut is easy to loosen or tighten in adjusting the brush.

2948

Diamonds Graded for Color Under Uniform Light

Closer and more accurate grading of diamonds for the amount of color in them is now possible with a scanning instrument, called a Diamolite, which provides a uniform and constant light to permit comparison of the gems by scientific methods. Formerly this grading was left to the personal judgment of individual experts. With the instrument, available to jewelers who are members of the Gemological Institute



Grading diamonds by comparison under Diamolite

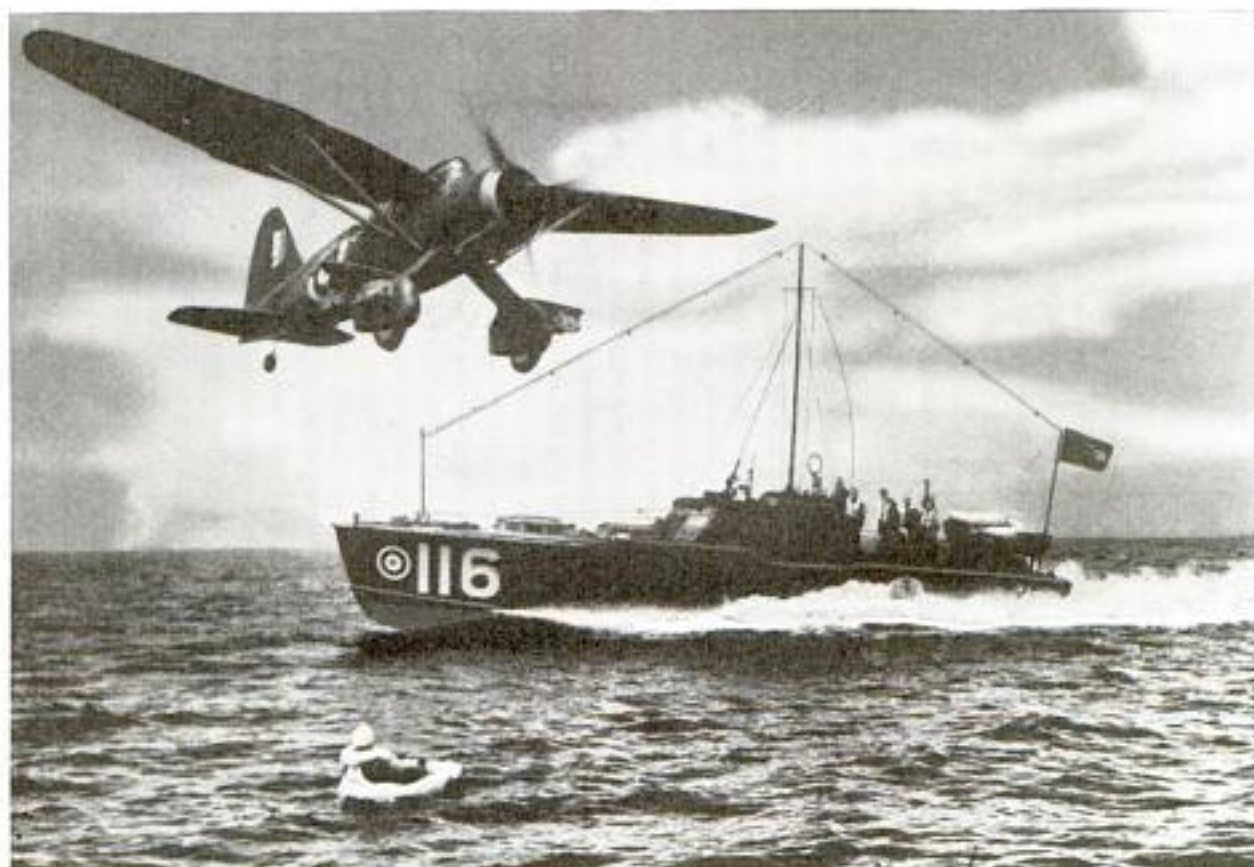
of America, the individual jeweler may compare stones with samples which have been graded previously with the aid of a Colorimeter which distinguishes 13 grades of color, whereas under previous grading methods only seven grades were recognized. Colorimeters are in operation at laboratories of the Gemological Institute, one at Los Angeles and the other at Boston. The jeweler will send a series of his own diamonds, each of a slightly different nuance of color, to be graded by the Colorimeter. He then will use this series as a scale for comparing his diamonds.

Morris Novelty Co. American Furniture Chicago
Carson-Pine I call
Cherry
designed by Robert M. Shipley

541 I like the material

L750 Air Sea Rescue Service

Plane and Boat Team Up to Save Pilots in Sea



After dropping rubber float to fallen British airman, rescue plane summons boat and circles until it arrives

Saving the lives of airmen shot down over the English channel is almost the daily task of the sea rescue service of the British Royal Air Force. How airplanes and boats cooperate in this work was shown in a demonstration conducted off the English

coast. Upon spotting a fallen pilot, the patrol plane drops a rubber boat. Radio directions then are sent from the airplane to a high-speed launch, and the plane continues to circle the spot until the boat reaches the scene and completes the rescue.

L704.

Army Men Play Ball in Gas Masks as Part of Training

In any ordinary baseball game only the catcher and umpire wear masks, but in a game at Camp Lee, Va., recently all the players were masked. Not, however, for protection. The teams were made up of army men, and they wore gas masks to become accustomed to their use during strenuous exercise.



Army trainees wear gas masks for practice in a baseball game at Camp Lee

There are about 50,000 railway passenger or passenger-freight stations in the U. S. and 10,000 exclusively freight stations.

NOVEMBER, 1941

copy: Calvin Perry

Pvt. Carl L. Jammal, new

Com. Allen Warren Elliott, 343 E 33rd
New York City



BRING YOURSELF BACK ALIVE

↑ Peeking down the barrel of a shotgun or rifle which they think is unloaded is one cause of hunting accidents which result in more than 1,000 deaths and thousands of wounds each year in the United States. Other common causes of hunting accidents are presented on this and the page opposite

Here is the wrong way to carry a gun, say safety experts, because bullets and shot may ricochet from stones and injure a companion. It is safer to carry the gun on the shoulder. Being careful would help reduce hunting accidents as much as 75 percent, authorities agree



← Failure to unload your gun before getting into your car at the end of the day, when you are tired and more apt to be careless, is another cause of hunting deaths



↑ Unless the hunter remembered to unload his gun before entering the car on the way home, this man is jeopardizing the life of everyone within range
Photos courtesy American Mutual Liability Insurance Co.

142 Copyrighted material
Boston, Mass



↑ Dragging a gun like this, with the attendant danger of the trigger being released by a twig or bush, seems ridiculous, but many hunters do it and cause the accident toll to rise



↑ Never lean a loaded shotgun or rifle against a tree, safety experts warn, because a jar might upset it and cause it to discharge

Carrying a weapon with your finger on the trigger is a careless habit and may spell the doom of a hunting companion. Position of the gun on the shoulder is good, however

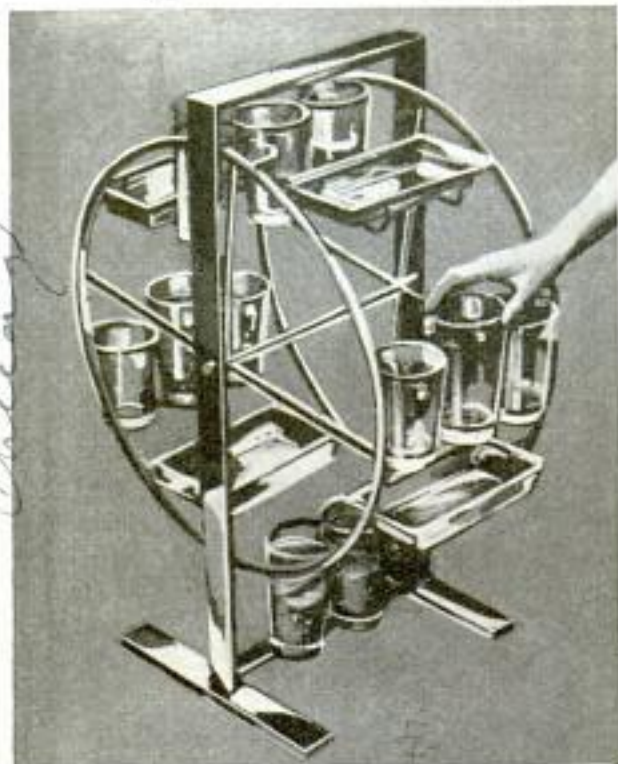


Dragging gun through a fence with muzzle pointed your way is another suicidal practice



2665.

"Ferris Wheel" for Serving Keeps Glasses Upright



Dishes and glasses remain upright as the wheel turns

Attractive for serving guests and convenient, as well, for storing glassware, a revolving "Ferris wheel" holds glasses and dishes upright as it turns. It is three feet high, and made of bright metal. The cross pieces support the soft-drink glasses and dishes for canapes or desserts.

Coffee Maker Shuts Off Current When Water Boils



Here is a coffee maker you do not have to watch, since it shuts off automatically as soon as the water comes to a boil. Simply fill the upper container with water and the basket with coffee, according to the number of cups desired, press a button on top and let the unit do the rest. When it reaches boiling point and the current has been turned off, the water drips through the grounds at a speed timed to make good drip coffee. Unlike other coffee

makers, this one has its electrical heating element in the upper container instead of in the base of the lower container.

Robot "Radio-Wave Sprinkler" Aids Forest Fire Fighters

Fire fighting crews in the national forests are now using a "radio-wave sprinkler" to extend emergency communication. Known technically as an automatic relay station, the apparatus picks up radio waves from one point and transmits them to another, being operated by dry batteries and needing no attention except for servicing at infrequent intervals. Carrying a small six-pound portable transmitter, dependable only for a few miles under unfavorable conditions, smoke chasers and searching parties can contact the "sprinkler," which automatically turns on its transmitter and with a powerful wave rebroadcasts messages to the base station. The sprinkler enables one party to communicate with another or with the base station under virtually all conditions.

Holder Attached by Suction Cup Is Handy for Cleanser Can

Readily attached without screws to any smooth surface, a spring clip holds a drinking glass or can of soap powder in a place



Clip holds a drinking glass or soap can conveniently

where it may be reached conveniently. Mounted by means of a rubber suction cup, it adheres to the wall, sink, or side of a scrubbing pail. Spring clips at the sides and bottom grip the glass or the cleanser can firmly.

Carson Pyrie Scott & Co

Iron Service

2630.

K1254

Pat. 4,120,628

Chicago
Adman Ave
4042
J. F. Williams

2772: Carlos Walter Van Werk Albin. *Flart Beaming*
lva.

Novice 'Chutists Swing by Cable on First Tests

Suspended by a cable attached to his back, a "rookie" parachutist starts for a 150-foot ride

Even in preliminary training on the parachute tower the trainee wears full harness and helmet



*Stanley Kitchell
 Ahorn*

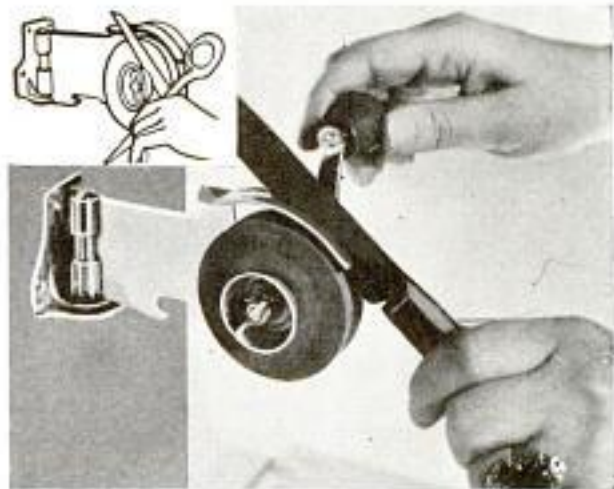
*512 rd. Parachute
 Division*



Parachute troops of Uncle Sam's new battalions are introduced to the upper air in easy stages. For instance, one of the preliminary exercises involves a trip to the top of a 150-foot tower. The recruit dons his parachute harness and is then hooked at the back to a cable and hauled up.

K1159 Knife or Scissors Grinder on Wall Swings Out of the Way

Kitchen knives can be kept sharp on a small size grindstone that hangs on a bracket. It swings flat against the wall when not in use. Knives are sharpened on the center groove and scissors on the side of the stone, which is turned by a crank.



Its bracket hinged, sharpener folds against the wall

*merchandise mail
 Chicago*

*Sung. A. Way 81
 Steel Products, Inc.*

Paint Oils Made Quick-Drying By "Tung Oil" Process

Common vegetable oils may be given the quick-drying properties of tung oil by a process just developed at the University of Minnesota. This would free the United States of dependence on imports of tung oil, the most powerful fast-drying oil known. It is substituted for linseed oil in paints, varnishes and lacquers because it dries quickly with a glossy finish. Under the new process, cotton, corn, peanut, soybean, linseed and other oils can be treated to produce a clear, tough, smooth film in about two days.

James May 05

NOVEMBER, 1941

Minneapolis
 Patent # 2,242,230.
 George O. Burr.

L. 439. Cont. Thomas & J. Simpson, Jr. 3872

SECRETS of RETOUCHING

Los Angeles



Comparing original and retouched prints. Notice how the skin lines and shadows under eyes have been removed in retouched picture at right



Here a stick of nail white is used to brighten the teeth

Softening a line on the negative by filling in with pencil. Notice the extremely sharp point of the retouching pencil



BY LEARNING a few tricks of retouching you can remove blemishes from your films and improve your portraits by reducing freckles and wrinkles, even reshaping a nose or chin.

Tools are inexpensive. They include a magnifying glass, etching knife, retouching pencils with 2H, 4H, HB, and 2B leads, a pointed soft eraser, a set of commercial spotting colors, a fine camel's-hair brush, a small bottle of retouching medium, and a small bottle of new coccine. These will cost \$3.00 and up at a photo supply store.

To do good work you also need a transilluminator which you can make yourself. This is nothing more than a window, say 4x5 inches, in a table top or cut through a slanted easel, with a 40-watt blue electric globe behind it. The window should be fitted with a piece of opal glass, preferably blue, and the light behind it should be placed so that illumination across the window is even and not too bright. Professional retouchers work in booths that

Ref: Marylee Richmond (Mrs.) 5529 Wilcox Crest Ave. North Hollywood



clean face



Before: "X" marks guide retoucher. Observe freckles and shadows

exclude all side light but the simpler apparatus will do as well if you work in a darkened room.

Most of the retouching should be done on the negative instead of on the print. Use the etching knife to shave down parts of the emulsion that are too thick and use the pencil or spotting colors to build up parts that you wish to make denser. Remember that the areas that you etch will appear darker on the finished print and that the points that you build up on the negative with pencil or spotting color will be lighter on the print. Use the softest leads on the lightest blemishes on the negative.

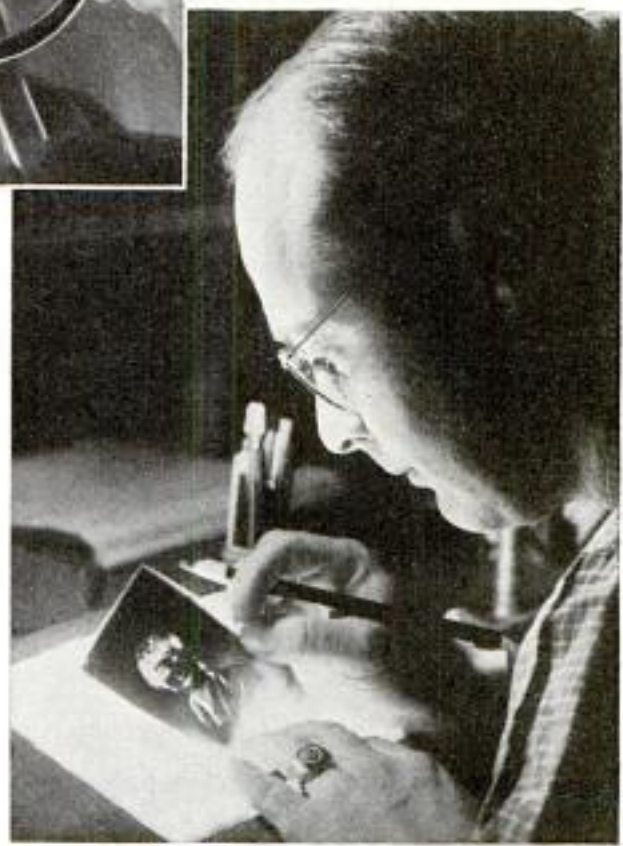
The secret of good retouching is to blend or match the skin tones. Too little is better than too much because every mark will be magnified when the negative is enlarged. A 2 1/4 x 2 1/4 film is about the smallest on which retouching is worthwhile and retouching is easier on cut film than on the thinner roll film. You can expect to spoil a number of negatives before you acquire the light touch that is necessary.



After: the freckles have vanished, blemishes and shadows are gone

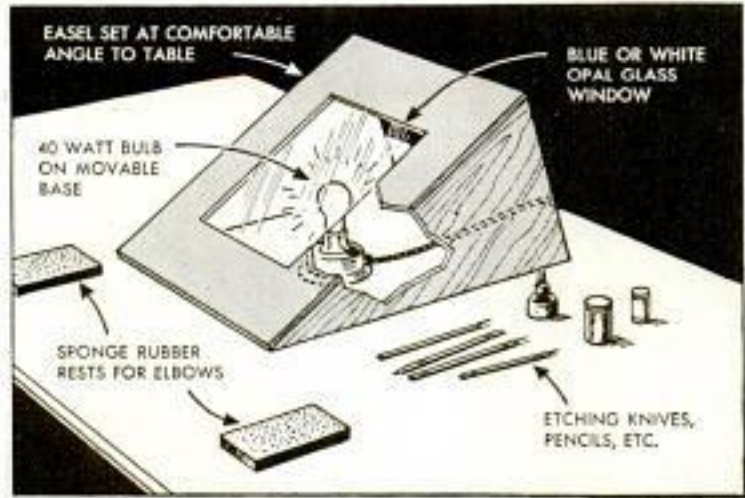
← Etching knife under magnifying glass scrapes away dense emulsion

Light shining through opal glass window illuminates the negative





Working in a special booth that has side and front walls, the retoucher is free from extraneous light and reflections



The drawing shows the transilluminator and other equipment on retoucher's desk

Suppose that you have a portrait negative that has a scratch and a few pin holes in it. You may also wish to lengthen the eyelashes and eliminate a pimple on the cheek. The first thing to do is to lay the negative on the window of the transilluminator, emulsion or dull side up, and study it under the magnifying glass. The scratch that you wish to eliminate probably has a dark

edge where the emulsion has jammed up and with your etching knife, under the magnifying glass, carefully scrape away at the darkened area until it matches the adjoining film. Use the point of the knife also to make the longer eyelashes, remembering to curl them in the proper direction and remembering that the deeper you cut, the blacker the marks are going to appear on the print. Smooth off all places that you have etched by rubbing gently with the eraser.

When the etching is finished, apply a few drops of retouching medium to the emulsion side of the negative and with a wad of soft absorbent paper tissue, smear it over the surface evenly and wipe it all off. Use only enough to cover the surface, which should have the same appearance afterward as it had before the medium was applied. The medium supplies a "toothy" surface on which pencil marks and spotting colors are retained.

To fill in the clear streak of the scratch, moisten the thin tip of the spotting brush and pick up enough color from one of the spotting color panels to match the density of the negative, and fill in the scratch. Use the magnifying glass to help guide the tip of the brush. Spotting colors, lightly applied,

In applying retouching medium to emulsion side of negative (below) it should be wiped over entire negative and then wiped off



L439

may also be used to fill in pin holes with enough color to match the surrounding area, or you can use the soft 2B pencil to darken them.

To reduce the pimple on the cheek, shade it in very lightly with the pencil. That will make it less noticeable on the print.

By now it is time for you to study what you have done, so make a proof of your work on glossy sun paper. This inexpensive paper, carried by photo supply houses, requires no development and you merely expose it under the negative in a contact frame to the sun for a couple of minutes. A dark print will reveal your work better than a light print. A sun proof will turn dark on continued exposure to light but it is a cheap and rapid way for you to check up. At first you probably will find that you are over-correcting the blemishes that you wish to eliminate. Some of your mistakes can be remedied by working over the finished prints.

You won't be able to do fine work if your tools are dull. Keep the etching knife sharp by dressing it on a hard Arkansas oilstone. If you wear its point down, reshape it on a 118S Carborundum stone. Your pencil points must be needle-sharp. Double up a piece of the finest sandpaper and hold it inside an envelope. Then gently push the pencil in and out, at the same time rotating it, between the sandpapers until it is as sharp as a needle.

In the past, many professional retouchers worked over the entire face of a portrait with soft pencil, giving an even texture to all of the skin. This removes all blemishes but at the same time it gives the face a mask-like appearance. The trend today is to leave most of the skin area alone and to tone down rather than remove entirely the lines or wrinkles. If you have had any art instruction you can use it to advantage in fitting pencil strokes to parts of the face just as

(Continued to page 166)

NOVEMBER, 1941

L795.

Cow Carried in Plane to Alaska For Summer Pasturage



The cow needed some persuasion to board Alaska-bound plane

Other cows have spent a whole season moving out to pastures in Alaska, and many have died on the journey by land. But a plane made it easy for Bossie to make her trip this spring from Palmer, Wash., to McGrathe, Alaska. It took a bit of urging to get her up the ramp and into the cabin, but once inside she was lashed fast and flown northward to her summer home.

L764

Toy Carrier Launches a Tiny Plane From "Catapult" on Deck

From the deck of a toy airplane carrier a tiny U. S. warplane shoots into the air, then glides down to alight on the water. The "catapult" is a coil spring in a groove of the deck. The miniature plane with metal wings is fitted into the slot and pressed back against the spring until it locks in position. A touch of the finger to the plane's tail sends it into flight.



Wire spring in deck of toy carrier catapults the tiny plane

Best? The Fair 85

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Chicago

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number. \$157.50

Truck Body With Hidden Crane Used for Pick-Up or Towing



Top, the crane on a wrecking job; below, it folds into truck

Handy for the operator of a garage, a truck body, made to fit either large or small chassis, contains a folding crane that disappears into a "false" bed to be out of the way when the truck is used for ordinary pick-up. To perform a towing job, the crane may be set up in less than a minute, and it is just as easily dismantled. The manufacturer reports that in one test, with the body mounted on a three-quarter-ton truck, the assembly lifted and towed a wreck weighing 8,020 pounds.

Gold Extraction From Sea Water Tried by New Process

Although small quantities of gold have been extracted from sea water, the expense is five times the value of the gold obtained. Electroplating methods have

been used, but the metal precipitates out too rapidly, falls away and fails to collect in a solid form on the cathode, the negative terminal. The only way to get a visible gold deposit is by using a rapidly spinning cathode in place of a stationary one, and the cost of providing the spinning cathode has been prohibitive. Now it has been discovered by Dr. Colin G. Fink of Columbia University that, when gold passes out of solution, two distinct steps are involved. First it goes into countless minute particles of colloidal gold, and then later into the crystalline form of the metal. The problem is to convert this colloidal gold into metal crystals and trap them. To find the answer Dr. Fink plans to try high voltage electric currents or the bombardment of electrons. Whether the gold recovery is achieved or not, the discovery may hasten development of formulas for electroplating some metals.

Eggs Poached and Boiled In Cooker at Same Time

Several eggs can be cooked at once, some of them poached and others boiled, in a "two in one" cooker just brought out. When the eggs are done a whistle blows, like that in a whistling steam kettle. Using small pans which fit on the rim of the cooker, several eggs can be poached while others are being boiled.



Whistle blows when eggs are "done" in cooker

Caro Motor Sales
Cards much

Home Service
6/19/41

2797

2 in 1 Whistling Egg Cooker
Cup and Plate
Brand 4
Chicago
Hall Lake City Wash

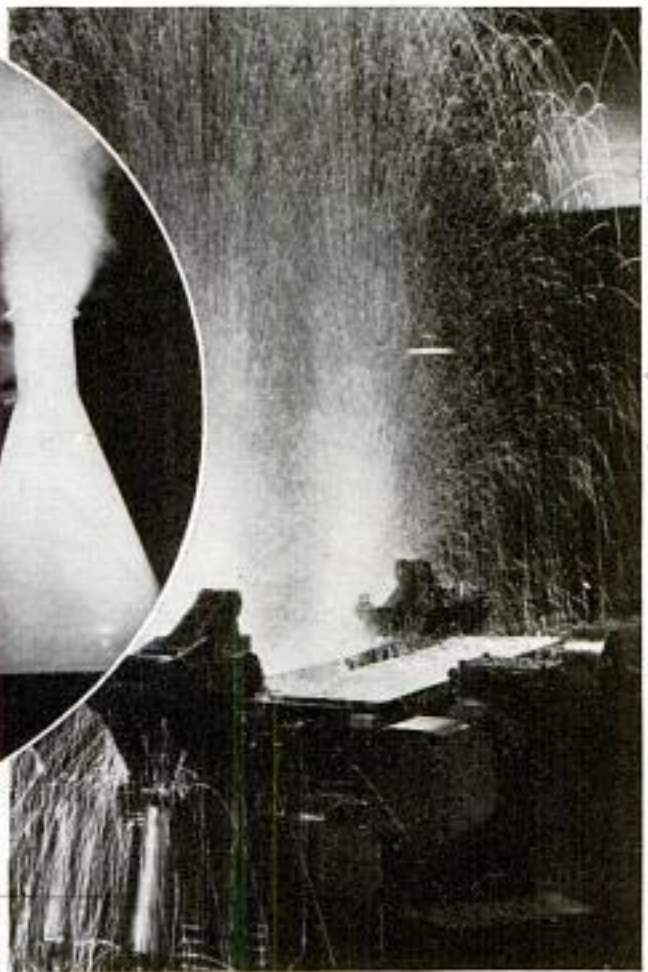
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POPULAR MECHANICS
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L747. E. Veritable Research

Every Day Is a "Fourth of July" in Factories



↑ There are fireworks displays every day in booming mills and factories. Here a Westinghouse laboratory smoke generator—used to study air pollution—resembles a July 4th fireworks flowerpot



↑ This might be a holiday scene, but it's really a busy day on the production line. The spray is from a welder forming the frame of a refrigerator

A Roman candle? Well, it's a cool one—a fluorescent tube. Its light is cool and economical



← Why burn up powder? Here's a fountain of fireworks touched off by a high-speed power grinder as it smooths the welded edges of a fluorescent tube lamp housing, or reflector, at the Westinghouse Lighting Division at Cleveland. A stack of reflectors in background awaits grinder

plant. Mansfield, Ohio
Laboratory, High Speed
Lighting Div. Cleveland, O.

2548.
Big Guns of Army Blast Target 30 Miles Away

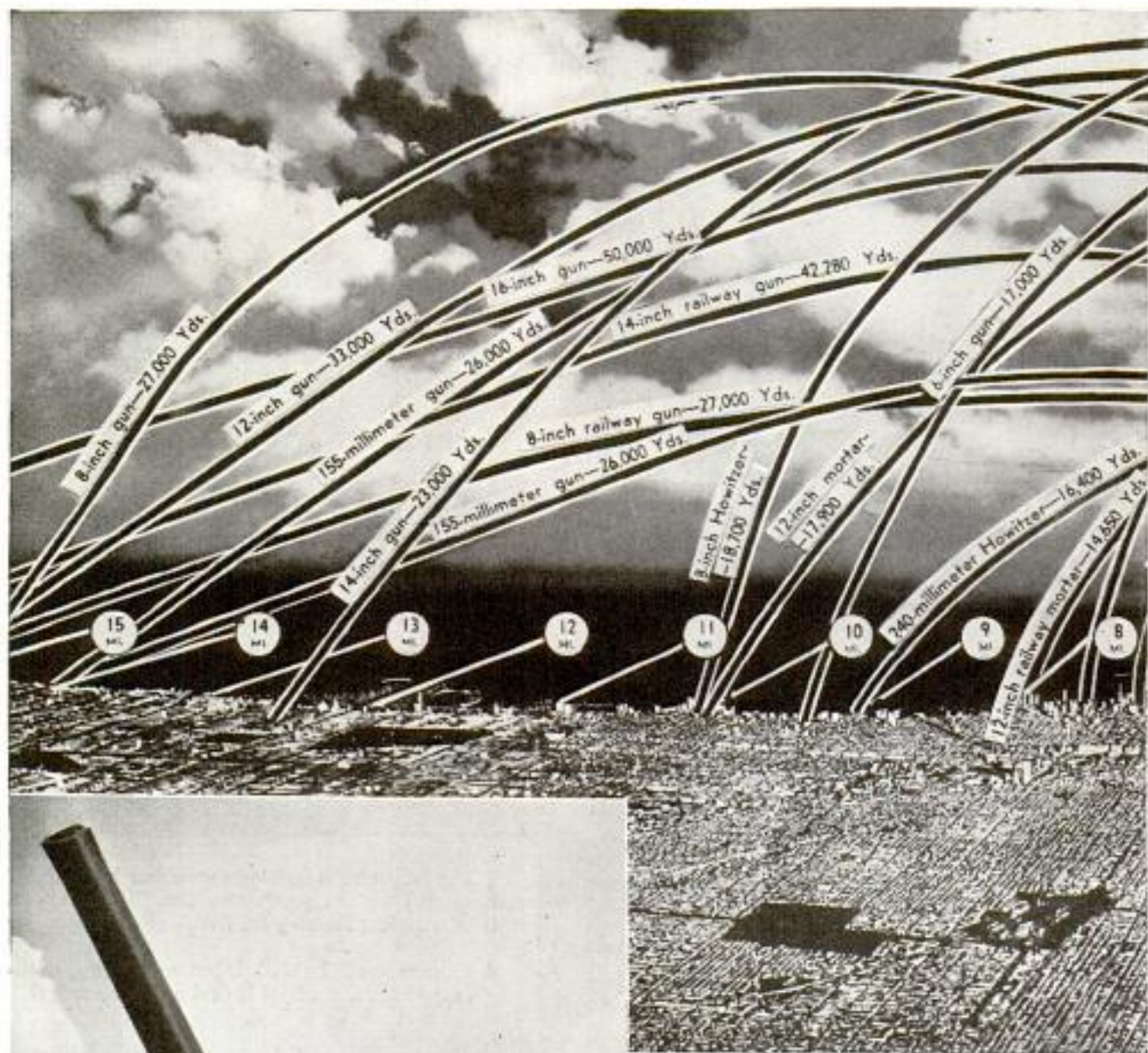
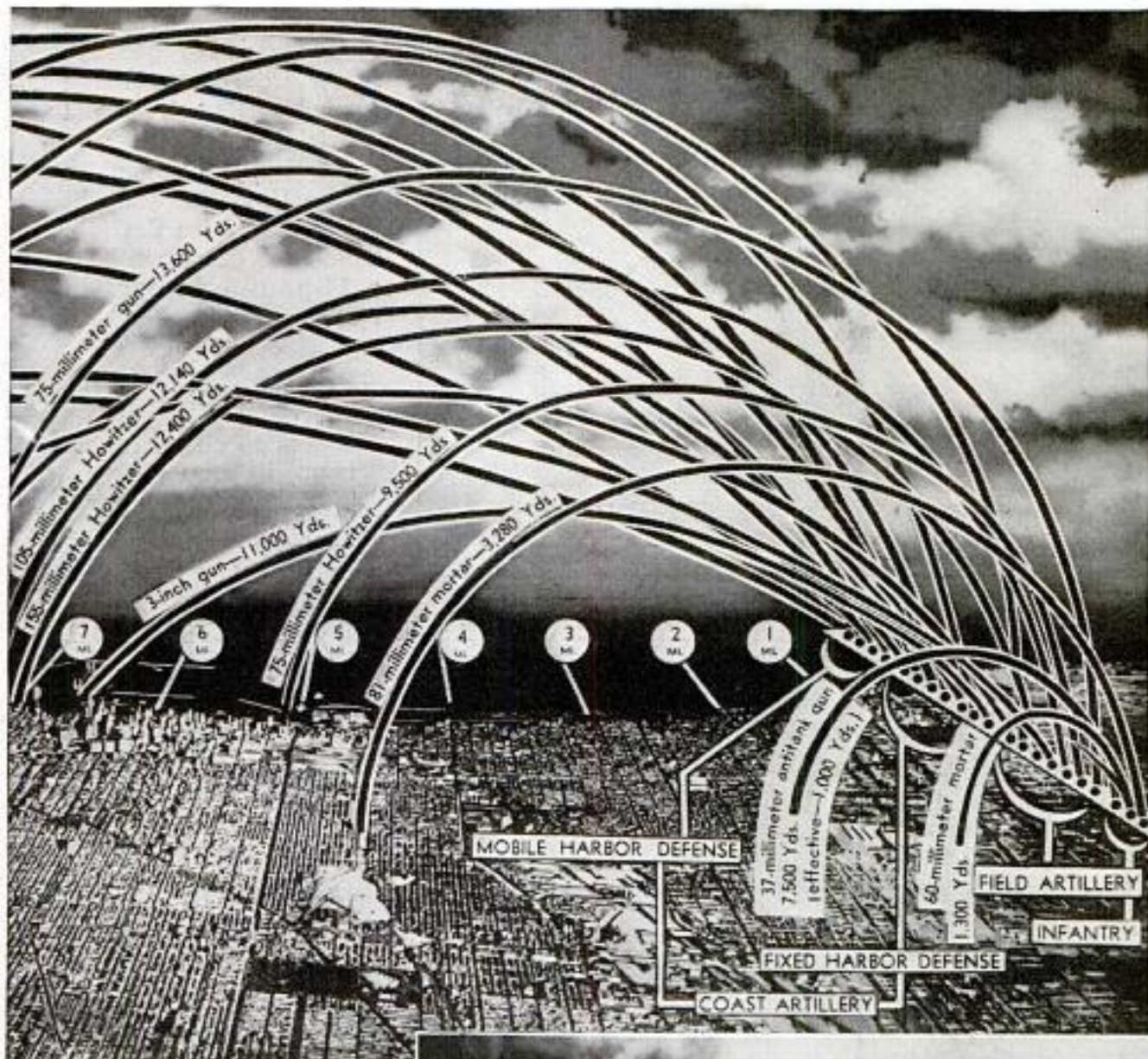


Photo-Diagram from Chicago Daily News

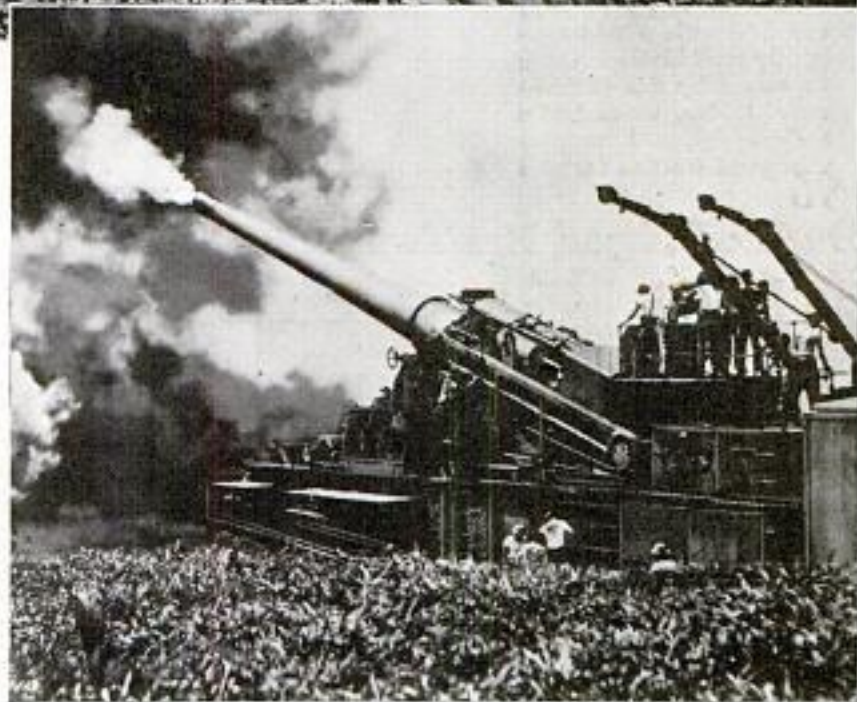
Some conception of the vast range of modern weapons of destruction is afforded by the photo-diagram across these pages. Over an aerial photograph of the city of Chicago arch the trajectories of the various artillery pieces, ranging from the short lob of the 16-millimeter mortar, effective for only 1,300 yards distance, to the thundering 16-inch coast defense gun that could pierce the steel armor of a battleship 30 miles off shore. Seldom used, its very presence is enough to keep hostile ships away. Fired from the southern limits of Chicago, its ton of death would alight in a suburb beyond the northern boundary of the mid-western metropolis. At lower left is the U. S. Army's new 8-inch field gun, a powerful mobile piece that can fling a 200-pound projectile carrying a 35-pound charge of high explosive over a range of 18,000 yards, the shell taking but a minute to make that flight. One of the gunners is sighting through its telescopic finder



Shells Trace a Rainbow of Steel Across a City



Purely for comparison the big and little guns are here lined up side by side, their trajectories forming long and short rainbows across the sky. It will be noticed that the 37-millimeter antitank gun, from whose slender barrel issues an armor-piercing shell, has a top range of 7,500 yards but its effective distance is 1,000 yards in actual warfare. At the right is one of the 14-inch coast-defense weapons; some of these are mounted on railway carriages, others have disappearing mounts at permanent emplacements. Their range varies from 13 to 24 miles. One of the most formidable new weapons is the 155-millimeter gun, tractor-drawn, which with its carriage weighs 90,000 pounds and hurls a 95-pound shell 15 miles



L 594 see Oct. 1941 -

Archers Play "William Tell" Golf on Desert

Yermo, Calif.

Golf, the kind you play with little white balls, is a pretty easy game compared with the William Tell variety. The tee-off is fairly simple. A good archer can twang his "drive" with bow and arrow up to 325 yards; Ken Wilhelm, one of two brothers who originated the game out on the Mojave desert, once made a 509-yard shot with his powerful foot bow. The approach shot requires more accuracy. And "holing out" is plenty tough. The game, growing in popularity around the country, is played differently in various "clubs." Some use a small cardboard disk set in the ground about three feet from the flag as the "hole." Some use sacks of sand. One popular method of putting is to knock a four-inch cotton ball from the top of a metal rod 28 inches high. The Wilhelm brothers play archery golf with their hunting bows, but most devotees use the regulation bow with 35-pound pull. For driving, a light "flight arrow" with small feathers gets greater distance. The approach arrow has large feathers and a long point to stick in the ground. The putting arrow is heavy, with a blunt point, made to fly accurately. The best distance is gained by aiming up at a 45-degree angle. Ken and Walt Wilhelm often play around a 30-mile desert course in cars of their own design, built for hunting and prospecting; greens are 250 yards apart. Regular golf courses are often used for archery golf, and tournaments are being organized.



Top, desert golfers "tee off" with bow and arrow. Below, "holing out" at the thirteenth "green," two arrows pierce the disk

Corncocks to Yield Munitions at New "Synthetics" Plant

As a result of six years of research in his laboratory, Francis E. Wilkinson of Glendale, Calif., has devised a process that converts corncocks into munitions. A plant being erected near Missouri Valley, Ia., is expected to turn 40 tons of corncocks a day into nitro-cellulose, a base for explosives, and into a synthetic rubber which can be

fused with natural rubber in making tires. Eventually, Mr. Wilkinson hopes, his company will use annually for defense products, 26,000,000 bushels of cobs which otherwise would be burned as waste. Other products which are said to be obtainable from cobs are guncotton, alcohol, motor fuel, plastics and rayon.

New York Times, May 4

Walla Walla River near Ariz

The COMEBACK of the

*Legg
12 48*



This cute little fellow is a marten, difficult to raise on a fur farm



Alfred Gollman

Beaver weighing 55 pounds trapped in Oregon to reduce damage along an irrigation canal

Trapped by Federal Trapper H. G. ... near Selma, Ariz



Bobcat which killed more than 30 lambs from one band before being trapped

FUR trapping and fur raising, sidelines by which farmers have turned spare time into cash for years, are taking on new importance, due to the war's interruption of imports.

America, the world's largest user of furs, produces only 40 percent of the supply needed to meet a retail demand ranging from \$400,000,000 to \$500,000,000 in a prosperous year. The rest comes from countries whose ships are carrying

war essentials. With the foreign supply cut off and the domestic supply insufficient for our own needs, a shortage is in prospect. Prices of fine furs have been down for the past decade, thus broadening the market to include more buyers, and new methods of processing cheap furs have resulted in production of expensive-looking products that the low-income worker could afford, so the American woman has become accustomed to having her desire for furs satisfied.

Brown bear demonstrates fishing prowess, taking salmon from river



Photos courtesy U. S. Fish and Wildlife Service

K1348.

Jornado Range
Reserve. N.M.

FUR BEARERS



↑ Litter of pups resulting from experiment in breeding a silver fox with a red fox

→ Showing method of holding coyote while ear-tagging it in U. S. survey work

Setting trap for coyote. Equipment includes gloves, trapping mat, special shovel, wooden mallet, scent bottle ↓



Fur raising is no get-rich-quick scheme; in fact, it means many hours of hard work and persistent study of the animals, as well as careful attention to what the market requires. Too, it calls for an investment in breeding stock, pens and feed, so starting on a "shoestring" is discouraged. But the chances of making a profit seem better than those of the trapper, who cannot control the quality of the skins and who cannot be certain of the number of skins he will be able to supply.

Of the many animals having value as fur-bearers, the two holding the greatest possibilities for the fur raiser are the silver fox and the mink. Martens and fishers have potentialities if satisfactory reproduction can be obtained in captivity. Attempts to raise skunks, badgers, racoons, beavers and muskrats for their furs have failed because of the costs.

Federal, state and college experts have been working on the problem in the hope of

NOVEMBER, 1941

Ref: Fish and Wild Life Service, Dept. of Interior
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Washington
D.C.

7-1348



↑ Here's how the hunter must handle a mountain lion. The animal is tied, but not yet helpless



Fox in trap barks defiance as photographer-trapper comes to bag his catch →

its full possibilities in the fur market were not realized until 25 of the pelts sold for an average price of \$1,339 and one pelt brought an all-time high of \$2,627 in 1910. That launched a boom that collapsed when the World War started and most of the development has taken place since 1918. From 6,000 in 1923, production of silver fox pelts jumped to 200,000 in 1935, and has increased since.

With increased production have come lower prices, of course, and at a special sale held by a New York auction company last November, 2,308 full silver pelts brought an average price of \$33.42. At the May, 1940, sale, 3,819 pelts brought an average price of \$37.12, with a top price of \$100. Such a price, government experts say, allows a fair margin of profit to the fur raiser who manages his business properly and who avoids taking pelts before they are fully developed.

Foxes are being grown successfully throughout

Comical-looking black bear up a tree, but not far enough to escape the camera's eye



broadening the field of the fur rancher. For many years the U. S. fur-animal experiment station at Saratoga Springs, N. Y., maintained a number of species, but by 1938 all had been eliminated except silver foxes, minks and martens. Equipment, pens and kennels have been tested, trial feed formulas checked, methods of handling and management tried out and diseases and parasites studied. As a result the Fish and Wildlife Service, U. S. Department of the Interior, is able to provide fur ranchers with valuable information that may prevent costly mistakes. Anyone contemplating an entry into fur raising may obtain help also from his county farm agent.

The silver fox resulted from the secret experiments of two Canadian farmers but

Washington, D.C.

K1348

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the northern half of the United States, from New England westward to Washington and Oregon, and in the cooler parts of California. The greatest numbers are produced in Wisconsin, Minnesota and Michigan, these states producing more than 50 percent of the American crop. The two largest companies in the world producing silver foxes operate in Wisconsin.

One of the fur raiser's problems in recent years has been the increase in food costs, tending to reduce profits. This problem has not been as perplexing to the small producer as the large, principally because the former regards pelt production only as a sideline. Yet the small producers, as a group, today market about three times as many pelts as do the large fur ranchers. For the small producer, fur farming fits in well as a sideline to general farming because it utilizes certain parts of the farm not adaptable to growing other crops. It also provides a winter occupation and brings in additional revenue during the season when both are needed to balance farm operations.

The number of farm-raised mink pelts also has increased rapidly in recent years, with prices exceptionally good. Through selective breeding the desirable sepia color with a darker stripe down the middle of the back has become prevalent in the better herds. Pelts from ranch minks are now considered superior in quality and color to those taken in the wild.

Minks must be kept in separate pens because of their tendency to fight. Pens are of various sizes, but satisfactory ones are about six feet long, two feet wide and two feet high—an indication that comparatively small space is required. From four to five ounces of feed per day is sufficient for the mature mink.

While not as extensive as in former years, fur trapping still offers a means of increased income to the older boys of the rural community, as well as the professional. Millions of dollars pour into the trapper's hands each year, all without the expenditure of a single dollar for pens or feed. But the trapper must study the habits of the animals he expects to take, he must place his traps carefully and follow the line regularly and he must prepare the skins properly in order to make the most money out of each. In other words, fur trapping

(Continued to page 162)

NOVEMBER, 1941

Life Suit Protects Wearer In Sea in Zero Weather



Bulky in appearance, the suit weighs only 12 pounds.

Life preservers may keep men afloat, but leave them unprotected against exposure to frigid water in winter. To give some measure of protection against cold, a life-saving suit of rubberized cloth has been devised to be worn over the life preserver, covering the entire body. The inventor says it will protect the wearer in weather as cold as 12 degrees below zero.

Lamp on Outdoor Thermometer Lit by Indoor Push-Button

Mounted outside the window, a thermometer with built-in light is easy to read at night. The lamp, mounted in a bell-shaped housing at the top of the instrument, is connected with a battery and switch within the room.



George W. Willard
525 Main St. Holyoke Mass

Acme
 Dr. J. H. Peauvrie 101 Poland
 + Cornelius - S. Co. Buffalo, N.Y.

2679

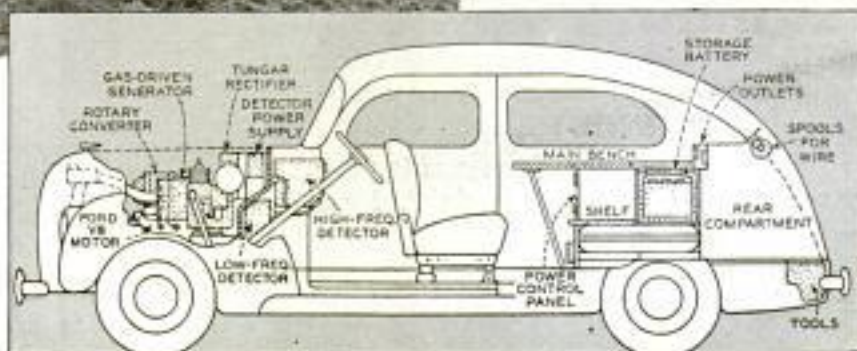
Laboratories
463 West St. New York

Laboratory on Wheels "Rides" Coaxial Circuit



For the testing of a coaxial cable between Stevens Point, Wis., and Minneapolis, Minn., an automobile has been converted into a mobile laboratory that can be used in all weather and in almost all places. It accommodates two Bell Telephone engineers and more than half a ton of equipment. Practically the entire inside of the car was rebuilt to make room for test benches, power control panel, magneto telephone and other apparatus. A converter mounted under the hood provides a 110-volt, 60-cycle power supply from the main battery. Also beneath the hood is a small gas-engine-driven generator which is used for keeping the battery charged.

Test board of the mobile laboratory is shown at top; it occupies rear seat section of sedan. In the center is the car during a test of coaxial cable, and at right a diagram of its equipment



"Howgozit Curve" Plots Flight of Trans-Ocean Clippers

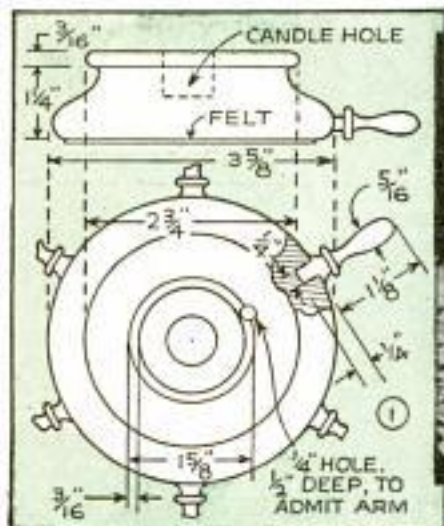
Under the odd yet formal name of the "Howgozit Curve" the flight engineers and shore crews of Pan American Airways plot highly important data concerning fuel consumption on transatlantic flights. Its purpose is to keep the crew aloft and the home base continually informed as to fuel reserve aboard and requirements for completing the flight or returning in emergency. It consists of five curves. One is based on the calculated flight plan, and shows the estimated normal consumption of fuel on a curve of miles versus gallons.

The second curve shows gallons versus hours of flight. The third shows hours versus miles of actual flight. The fourth and fifth curves show miles versus gallons based on the contingency of three-engine operation to destination and return to base. The "Point of No Return" is also plotted, designating the limit before which any engine failure would require a return to the point of departure. Fuel reserve practice insures the plane's ability to reach the port ahead on three engines in case of engine failure beyond the "Point of No Return."

Chrysler Dodge New York



Where to Put Your Candles

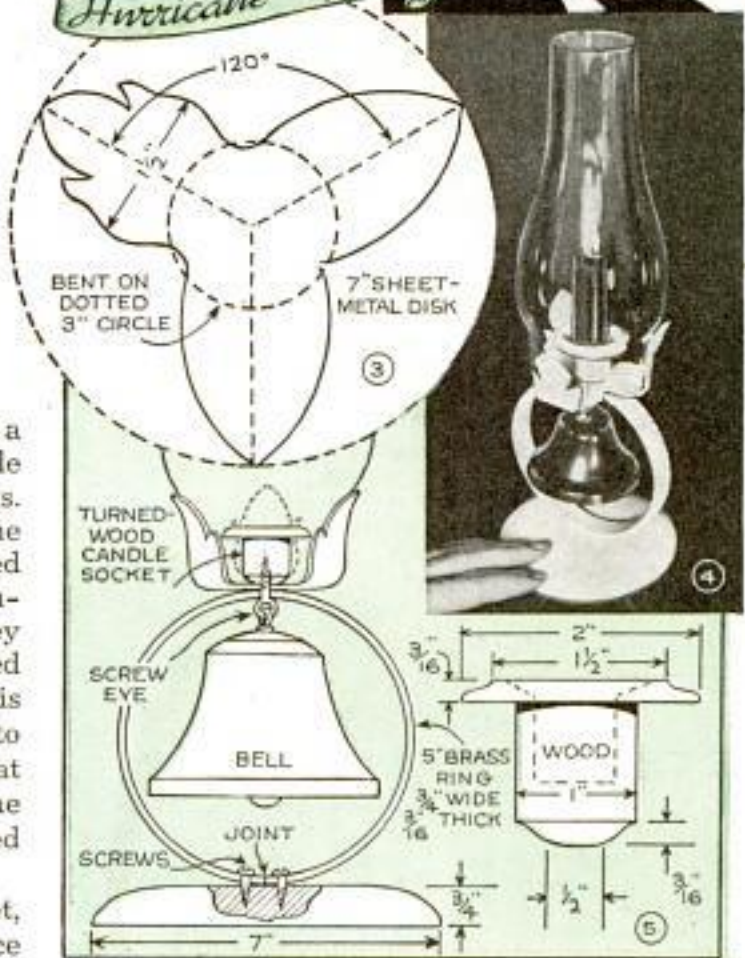


IF YOU like the soft, cozy glow of candle light, why not make up some of these holders? Reminiscent of early New England homes, the hurricane type in Fig. 2, with a companion match holder, if desired, adds a nautical touch. Both have a ship's-wheel motif, and the parts are turned on a lathe. Dimensions of the candle holder are given in Fig. 1.

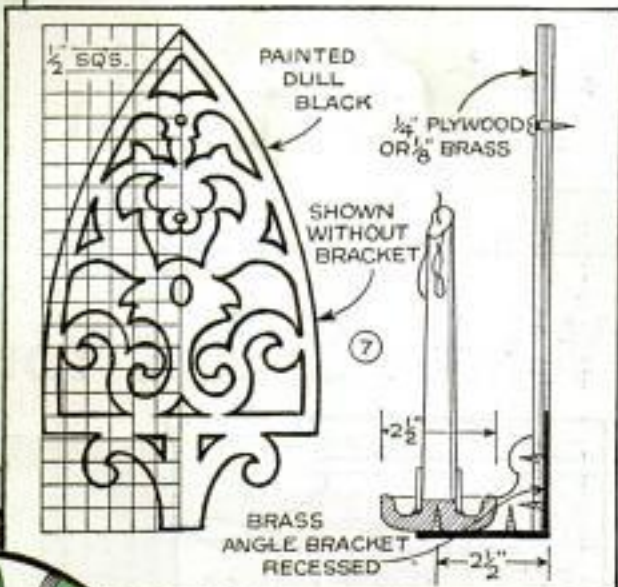
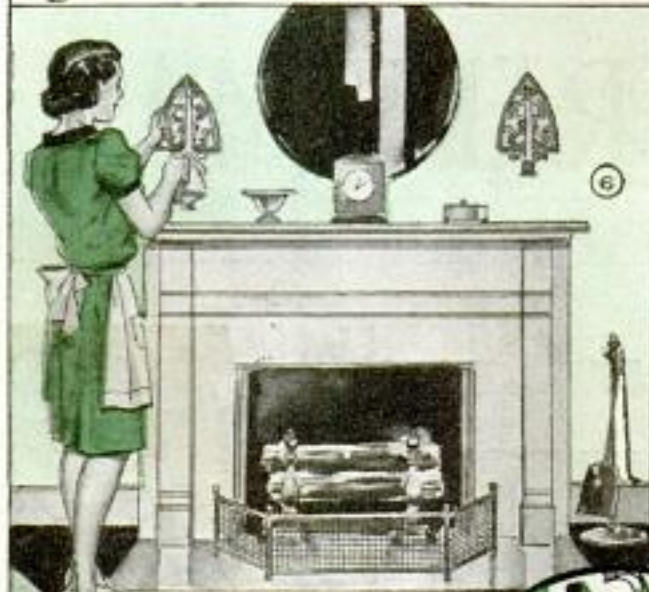
Especially designed for use on a dining-room table, a pair of candle holders like the one shown in Figs. 3 to 5 inclusive, will also serve the purpose of a bell, which is sounded by a gentle swing. The base and candle socket are wood, and the chimney holder is sheet metal cut and shaped in leaf design as in Fig. 3. The bell is hung from a screw eye driven into the candle socket. The ring that holds the assembly is screwed to the base and all the parts are enameled in white or other suitable color.

Hung above a fireplace or buffet, the candle sconces in Fig. 6 produce

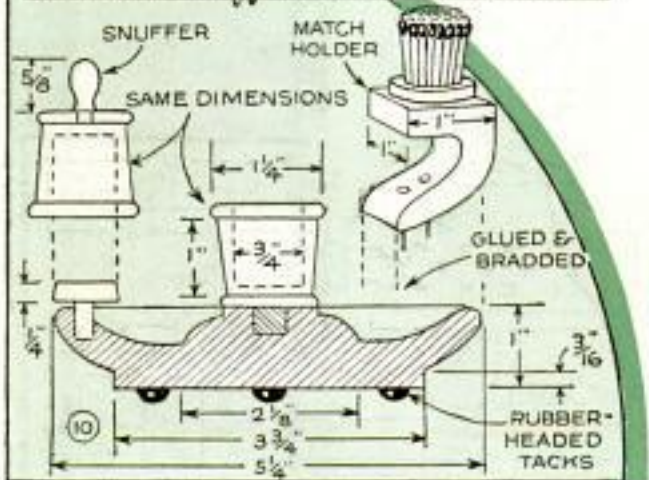
"Hurricane" types



Brass sconces over mantel



Has snuffer and matches



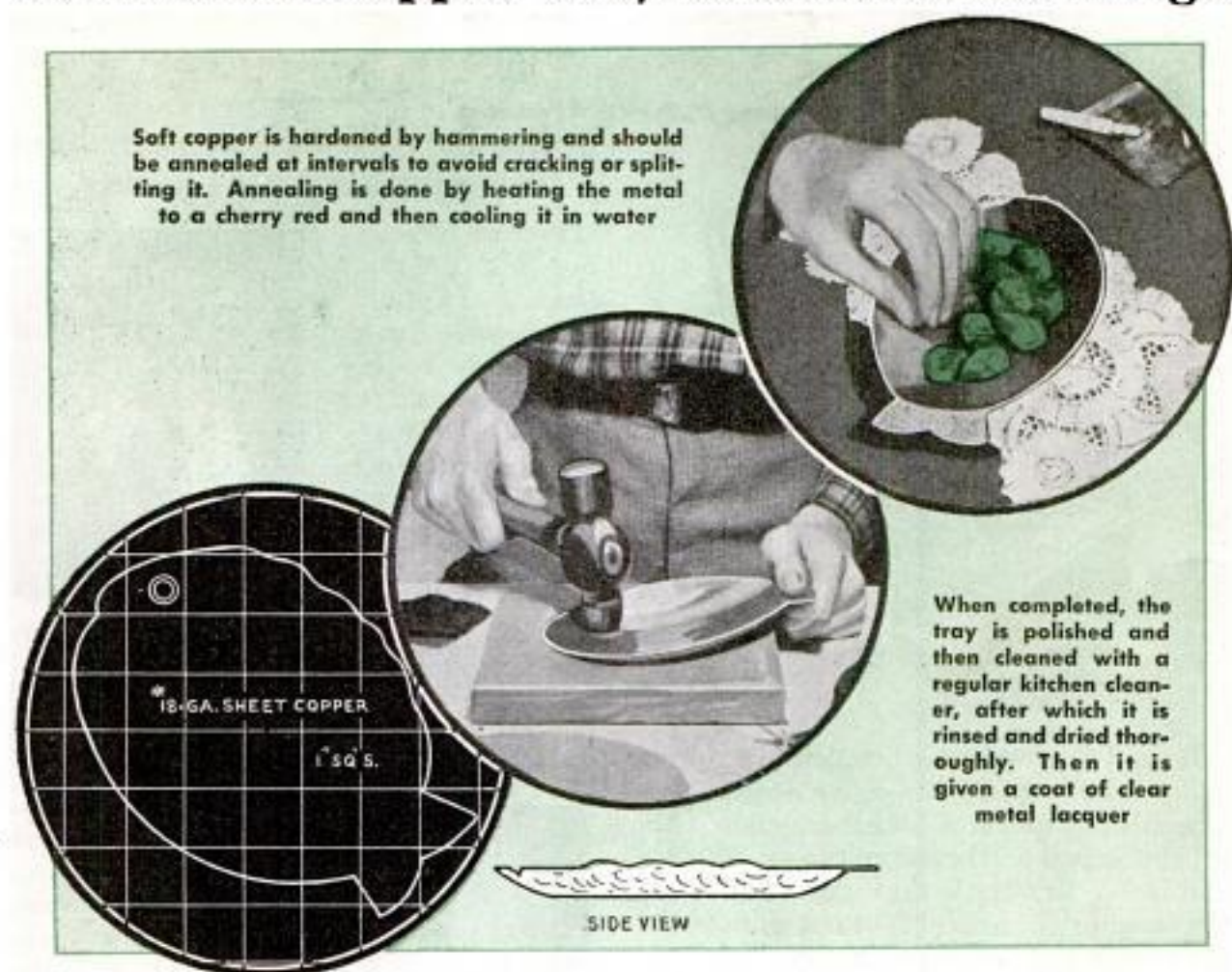
an unusual effect. They may be scroll-sawed from plywood if used only for decorative purposes. The pattern can be sketched on a sheet of paper marked off in 1/2-in. squares as shown in Fig. 7. If desired, the plywood can be hammered with a ball-peen hammer and coated

with flat black paint to simulate the appearance of iron. If the candles are to be lighted, it is best to cut the sconces from heavy sheet brass, which can also be done on a scrollsaw by using a metal-cutting blade. Details and dimensions are given in Figs. 7 and 8. Notice how a brass angle bracket is used to hold the candle socket to the back and how a small scrollsawed piece conceals the horizontal portion of the bracket.

If you would rather have a holder with plain, colonial lines, the one in Figs. 9 and 10 is just the thing. A bundle of small, paper matches fits into the top of the handle, and a candle snuffer, attached to the edge opposite the handle, is always at hand. Although walnut or mahogany varnish stains may be used to match other furnishings, maple finish is the one most consistent with the period of the design. On this holder, as on others that are used on tables, you can provide rubber-headed tacks or pieces of felt on the underside to avoid marring polished surfaces.

☞ Cactus plants should not be put in too small pots as the spines might catch and uproot them.

Hammered Copper Trays Made in Fish Design



Made in pairs, these trays provide an attractive table decoration as well as useful containers for tidbits. A blank of soft copper is all you need. The hammered effect on the metal, suggestive of fish scales, adds to the natural appearance. By using a ball-peen hammer, the soft metal is hammered

into shape easily with the aid of a wooden forming block. The eye of the fish is outlined by indenting the metal with a piece of $\frac{1}{8}$ -in. pipe. Polishing with emery cloth and fine steel wool brings out the natural beauty of the metal.

—George A. Smith, Quarryville, Pa.

Tape Handles to Hold Small Work Against Disk Sander

When small pieces must be finished on a disk sander, strips of adhesive or cellulose tape will provide handles for holding the work. Fold each strip in the center and stick the ends to the work to provide a tab. The same piece of tape can be used several times.

What Have You Done?

Have you solved some troublesome everyday problem of a mechanical nature pertaining to your home, work or occupation, your hobby, play or recreation? If so, why not send a short description and a sketch or photo to our Homecraft Editor? Many other readers might benefit from what you have done. We pay promptly for accepted material and return that which we cannot use.

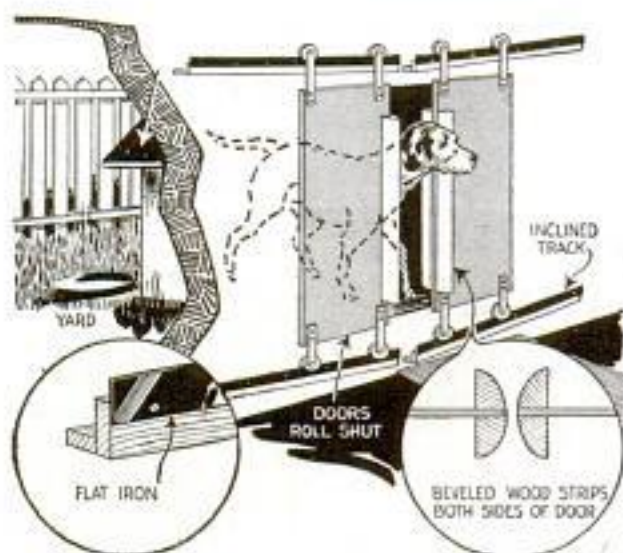


Gravel Mixed With Fine Sand Aids in Sifting It



If sand for small construction jobs is too damp to sift rapidly through a screen, toss a couple of shovels of coarse gravel in with it. The gravel will break up the sand lumps and aid in driving it through the mesh of the screen. The gravel does not go through the screen and is used over and over.

Self-Closing Doors on Dog House Opened Easily by the Pet



The doors on our dog's house are always closed to keep out drafts yet the animal can enter or leave the house at will. Rollers and an inclined track make this possible. The tracks are sloped just enough to

permit the weight of the doors to close them. Beveled wood strips at the edges permit the dog to push the doors apart with its nose.—J. Lippegau, Chicago.

Fuller Ball Shortens or Lengthens Plumb-Bob Line Quickly

Instead of looping and knotting the line of a plumb bob to shorten or lengthen it as desired, try using a fuller ball. This is slit across both ends and the string looped and pulled through the center hole in the rubber. When pulled into the slits, the line will keep the loop of string from slipping.



Keeping Shoe Laces Fastened

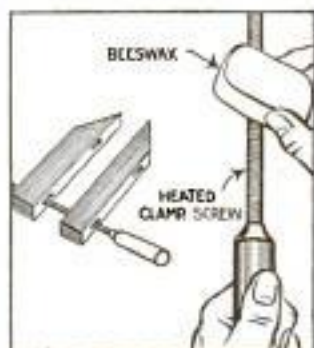


then pull the bows tight. They won't come loose until you untie the knot by pulling one end of the lace.

If you are troubled with shoe laces becoming loose at the knot, try this simple trick: Just tie the knot in the usual way, but after forming the second bow, slip it through the center loop again and

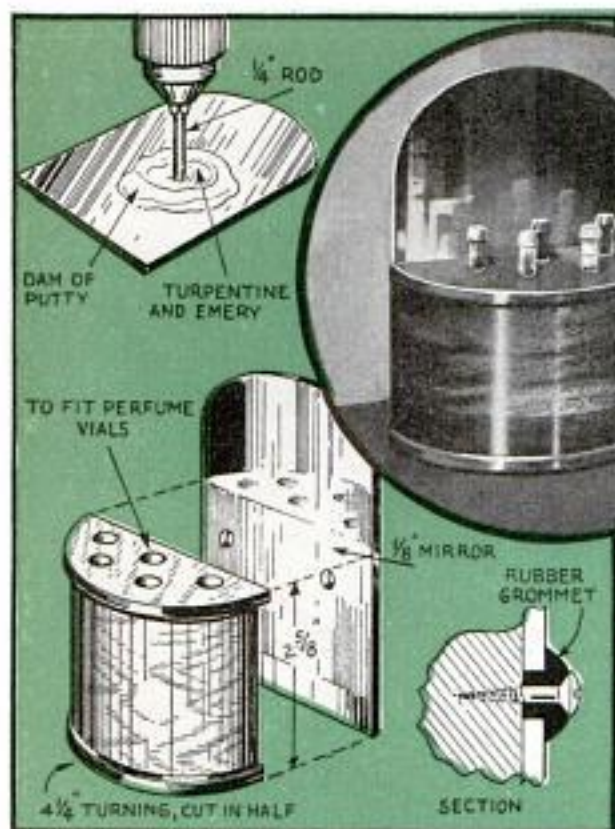
Beeswax Improves Wood Clamps

Beeswax applied to the screws of wood clamps will not only make them work easily, but will prevent glue from adhering to the threads. To apply the wax, heat the screws and rub the wax over them. Then heat again slightly to distribute the wax uniformly.



—Martin Mittermiller, Marshfield, Wis.

Mirror-Backed Perfume Case Holds Five Vials



Just the thing on a dressing table, this perfume cabinet is a useful ornament for your bedroom. To make it, turn a cylinder of walnut with $\frac{1}{8}$ -in. beads at both ends. As an alternative for a solid piece of walnut, you can glue up two or three pieces and let the grain run vertically to give a quarter-grain effect. Or, you can glue up 1-in. stock and have the grain run horizontally. Next, the cylinder is sawed in half and drilled for the perfume vials, after which a mirror is attached on the back

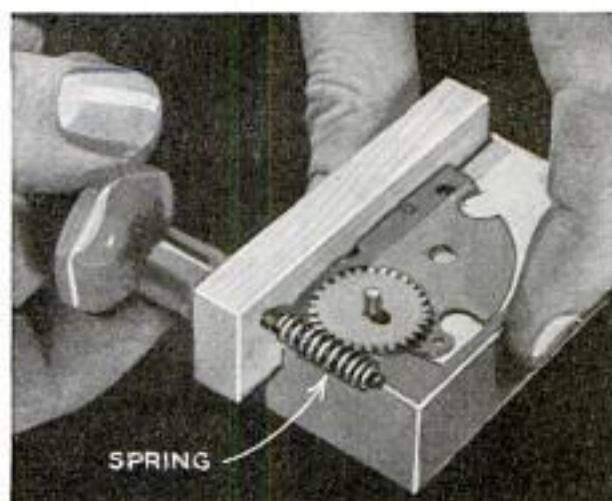
with two screws. To drill the glass for the screws, use a rod with the end ground flat. Chuck it in a drill press, raising and lowering it in a puddle of turpentine and fine emery powder held by a putty dam. Drill halfway through the glass, then turn it over and complete the hole. In this way, you avoid chipping the glass when the drill "breaks through." Use rubber grommets around the screws so that expansion and contraction will not break the glass.

—Dale Van Horn, Lincoln, Nebr.

Coil Spring Soldered to Shaft Serves as Light Worm Gear

A worm gear for use in animated window displays, models, toys and similar devices can be made by slipping a coil spring over a suitable shaft. The spring is stretched to spread the coils so they will engage the teeth of the driven gear, after which it is sweat-soldered in place. Holes can be drilled in the shaft to take the ends of the spring to keep it in position while soldering.

☞ If you will wipe perfectly dry all articles and utensils to be placed in your electric refrigerator, you will find that less moisture collects on the freezing unit.





1

Hanging plants can be watered right in the living room if an oiled-silk dish cover is slipped over the bottom of each pot to catch the drip as in 1. Alarm clock used as cooking timer by putting bobby pin on alarm key, 2, to strike alarm-set knob when key makes partial revolution

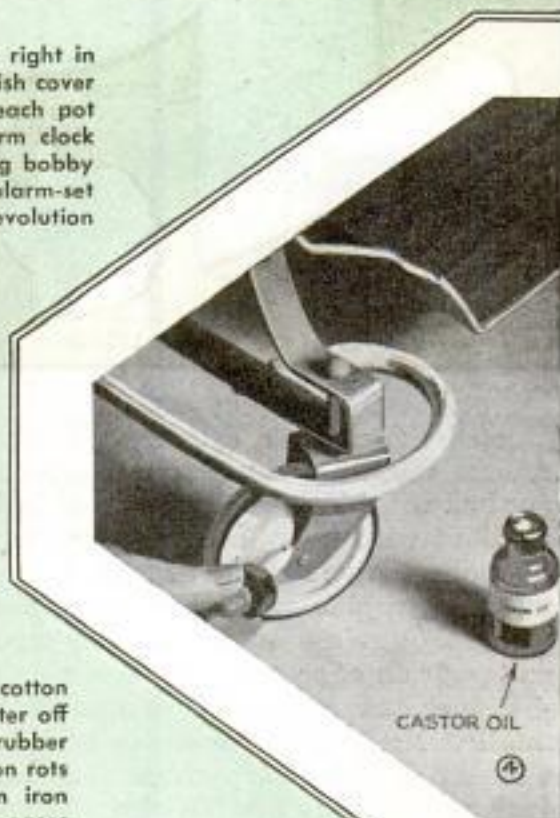


2



3

3—Wrists of rubber gloves folded over cotton form absorbent bands to keep dirty water off the arms. 4—Use castor oil to lubricate rubber casters instead of machine oil, which soon rots the rubber. 6—Rubber bicycle grip on iron handle provides comfortable grip and eases finger strain when ironing for long periods



4



5

OILCLOTH



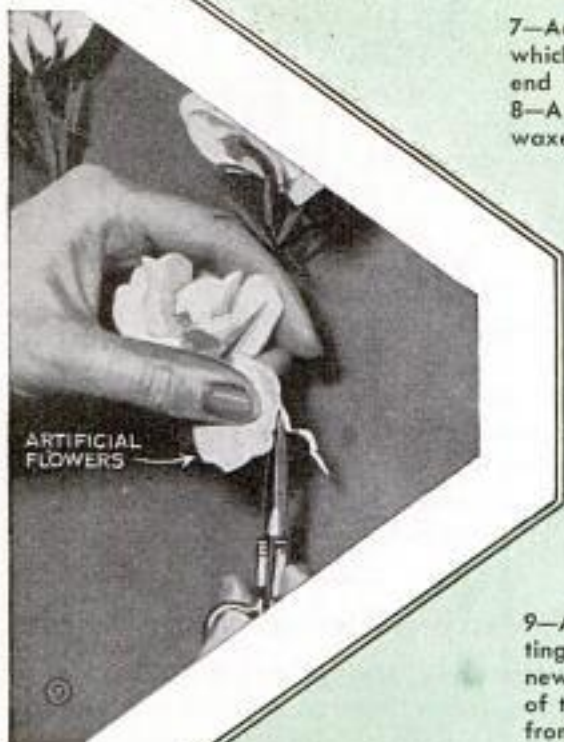
6

5—Worn like an apron, a large oilcloth pocket in which to empty ash trays and put scraps and odds and ends picked up while cleaning a room will save you many steps

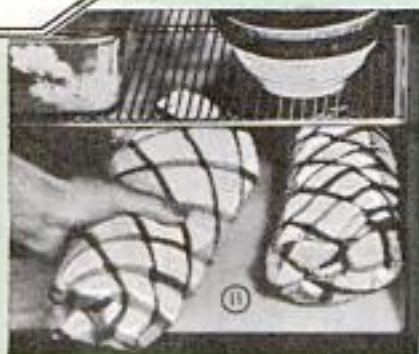
PROBLEMS



7—Adhesive tape containers provide spools on which to wind embroidery thread. Let the thread end project and snap shut the container ring. 8—A cake lifts from the pan easily if you put a waxed-paper disk in the bottom along with a strip to provide tabs



9—Artificial flowers are renewed by cutting off soiled edges and then curling the new edges by pulling them over the blade of the scissors. 10—To prevent nail polish from being upset, attach the bottle to a large square of heavy cardboard, using some of the polish as an adhesive



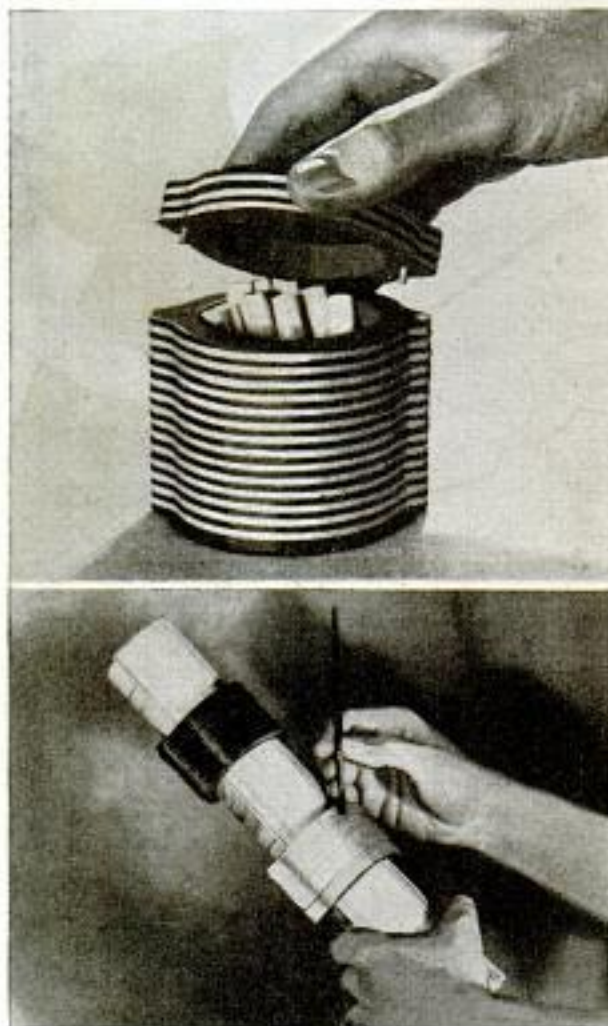
11—When clothes dampened for ironing must be kept for a while, they will not mildew in a refrigerator. 12—A bottle of poison cannot be mistaken if a small bell is tied on it

RUBBER BAND



BELL

Alternate Layers of Jar Rubbers Assembled Into Novel Humidor



An unusual cigarette humididor can be made by using an equal number of both dark and light fruit-jar rubbers. If desired, you can have two contrasting colors or any desired effect by painting the edges of the rubbers to suit. This is done by slipping them over a rolled newspaper and painting them. After this, the rubbers are slipped off the roll and are put together to form a humididor, cementing the assembly together with ordinary rubber cement. The top and bottom of the humididor are made from disks of heavy cardboard. The lid, also made of fruit-jar rubbers, is provided with two small pins which fit in holes drilled into the top of the humididor to hold it in place.—Robert Scott, Saltsburg, Pa.

Killing Insects on Plants

A simple preparation that may be sprayed on ornamental bushes and vegetation to kill insects on the foliage is made by dissolving any good grade of soap chips,

5 lbs. in hot water, 10 gals. When the soap has dissolved completely and the mixture has cooled, nicotine sulphate, 1 oz., is stirred in. Next, kerosene, 10 gals., is added while stirring vigorously. This will form a milky preparation. Although the nicotine sulphate is poisonous, the small amount contained in this preparation does not offer any particular hazard in using the spray. If a quantity of this spray is made it may be kept for future use if stirred immediately before applying. A garden sprinkler can be used to apply the insecticide.

Socket Wrenches From Screws

While working in a shop I needed a few small socket wrenches, and not having any on hand I made them from set screws of the type that have hexagonal shaped holes in the heads. These were welded or brazed to the end of small steel rods as shown, the rods serving as handles. Obtaining these set screws in a number of different sizes will enable you to provide a set of socket wrenches for almost any size bolt you may encounter.



—James Cunningham, Verona, N. J.

Shoestring Tipped With Polish

If the metal tip comes off a shoe string, dip the end in fingernail polish and twist it. When the polish dries, the string will be as easy to lace in your shoes as when it was new.—Wm. Swallow, Brooklyn, N. Y.



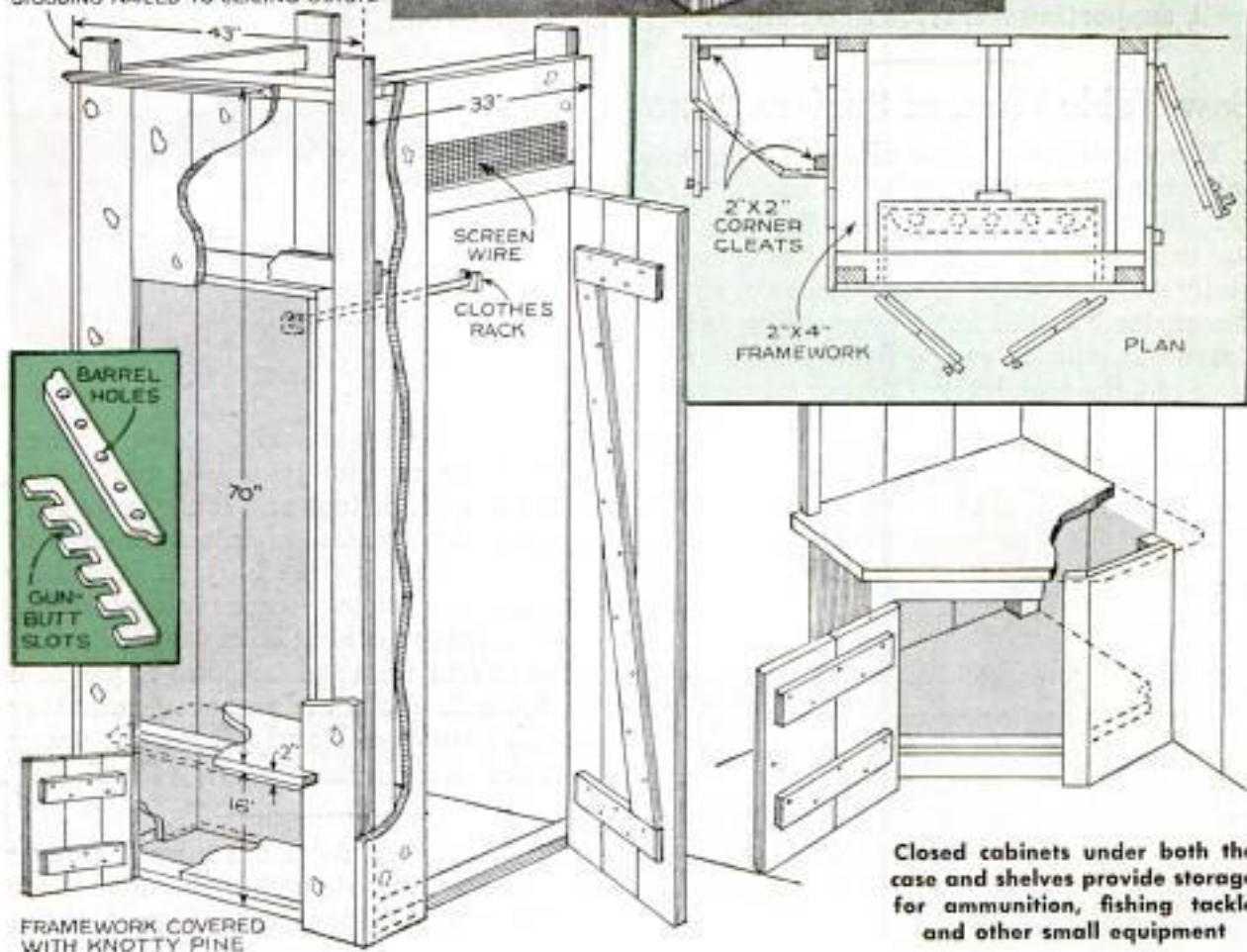
GUN-and-TROPHY CASE

conceals storage closet

BUILT in a den or recreation room, this case not only protects and displays your guns, but it also provides a closet for your hunting clothes, and corner shelves for your trophies. In some instances where the closet is not needed in the den, it may be used as a closet for an adjoining room, by providing a door in the wall. Construction is shown in the details and is simply a "hammer-and-nail" job if knotty pine or other fabricated materials are used. Note screen for ventilation above door.



STUDDING NAILED TO CEILING JOISTS



Closed cabinets under both the case and shelves provide storage for ammunition, fishing tackle and other small equipment

Card Table Hung on the Wall Serves as Drawing Board



The home artist who occasionally needs a drawing board can improvise one from a card table. To do this, just hang one side of the table on a wall by means of screw eyes and hooks so that the legs on the opposite side of the table rest against the wall, supporting the table at an angle.

Saw Table Used as Surface Plate

The machined surface of a power jigsaw table can be used as a substitute for a surface plate for nearly any operation requiring this type of tool. For some work, especially with model parts and others of small dimensions, it will not be necessary to remove the table from the frame, or even to take out the saw blade. Larger work will,



of course, require that the table be removed and placed horizontally on bench blocks to allow freedom of movement of the gauge.

Paint Remover Burned Off Work To Avoid Messy Job

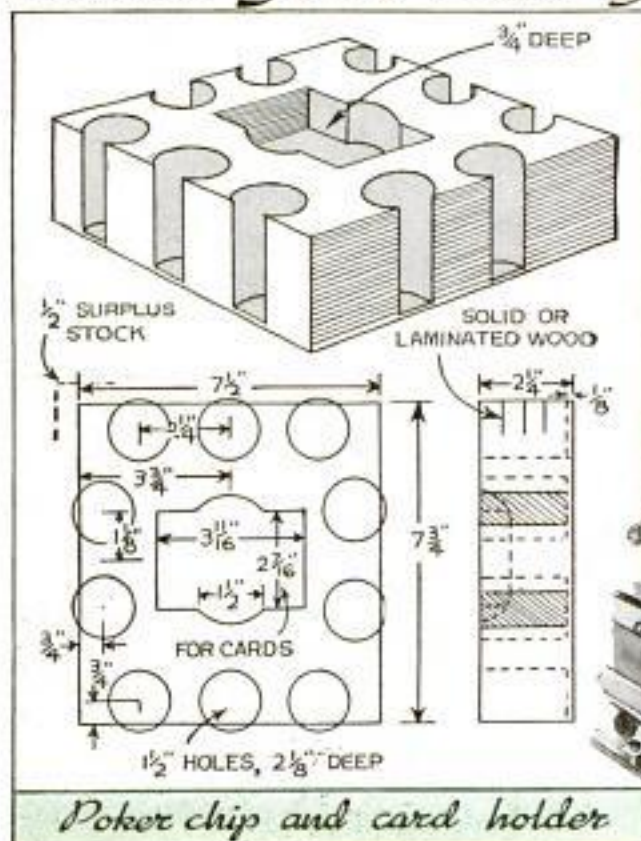
If you dislike to use paint and varnish remover because of the sticky substance resulting from its use, try burning off the softened paint or varnish. The remover is applied to the surface and allowed to stand the usual length of time required to soften paint. Then it is ignited. Do this very carefully outdoors as the remover and softened paint or varnish are highly inflammable. Combustion burns off the surface chemicals and oils, leaving only dry flakes of paint, which are scraped away easily. The wood is not charred or scorched



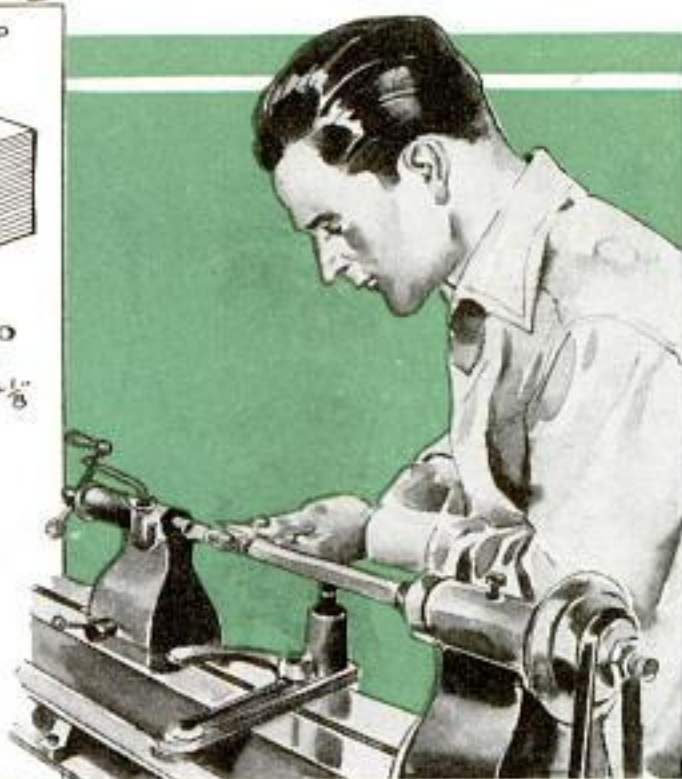
by this method because the flame burns out too rapidly to penetrate below the paint coat. Table tops and other large surfaces can be treated in this manner, but areas of not more than 1 sq. ft. should be handled at a time. Under no condition should a large flat area be covered with the remover and then ignited, due to possible fire hazard. Also, the remover container should be covered and placed far away from the work before applying the fire.

Small mats cut from old inner tubes or rubberized raincoats and used under vases and other plant containers will protect the finish on your furniture from moisture.

Make Your Own Game Accessories

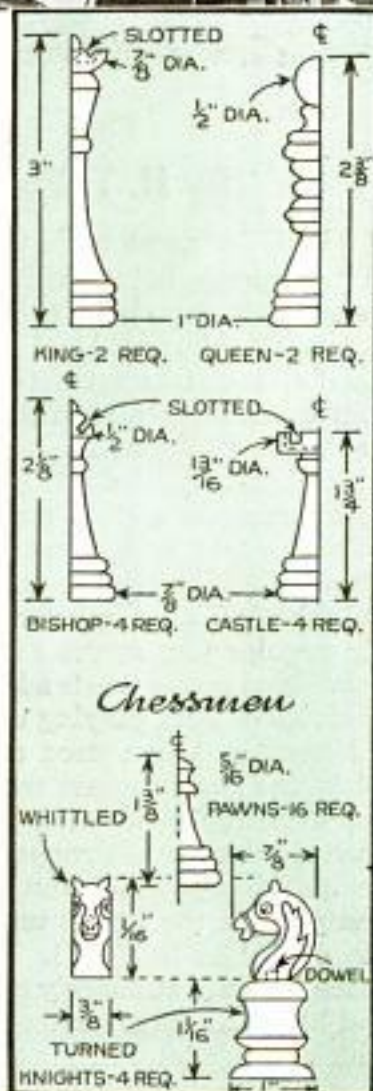


Poker chip and card holder

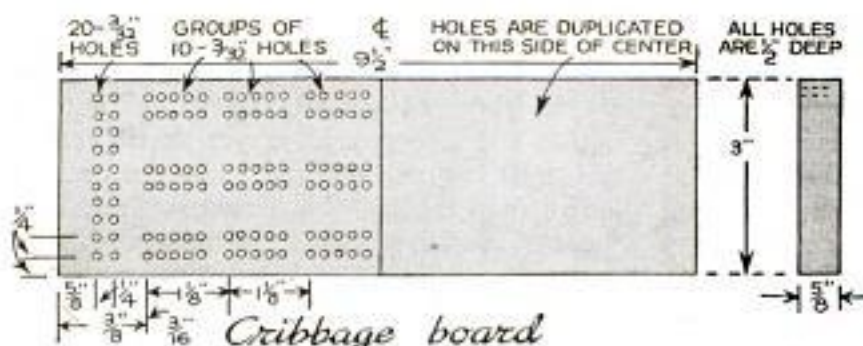


YOU can make your own game accessories such as poker-chip holders, cribbage boards and also chessmen if you have a lathe. The block for the chip holder should be about $\frac{1}{2}$ in. larger than the finished size. The holes are bored with a sharp expansive bit after which the edges of the block are trimmed down to the finished size on a saw, which produces the finger slot for each hole. A thin piece of wood the same size as the block is glued and screwed on the underside. A recess cut in the center of the block keeps the cards handy.

Chessmen can be made of plastic or of fancy hardwoods. The needed general dimensions of the chessmen are given in the drawing but no detailed dimensions as the average lathe craftsman should have no difficulty in following the indicated contours by eye. The horses' heads for the knights are whittled and attached to the bases with small dowels. If the heads are first sketched on wood of the proper thickness and their outlines cut with a jigsaw, much whittling can be avoided. The features may be painted on or carved.



Chessmen



Multi-Purpose

BACKGAMMON BOARD



Pull the leaves apart for backgammon

and drop the leaves if you wish, as in Fig. 2, while for chess or checkers you just reverse the insert as in Fig. 4.

There's no complicated joinery as you might expect, and any craftsman of average skill will find the job of making the table an easy one. The entire construction of the frame is shown in Figs. 5

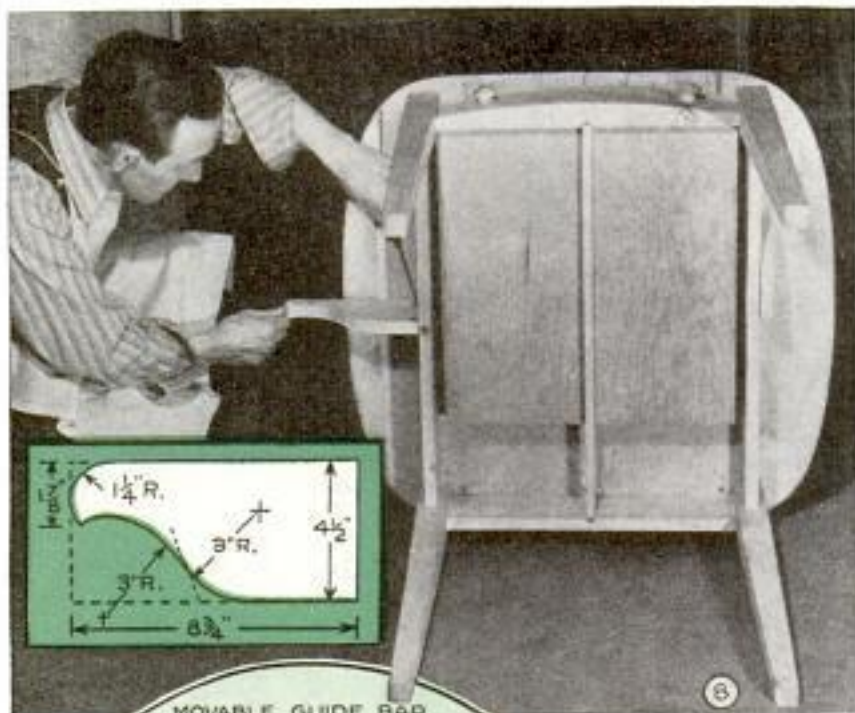
to 7 inclusive. As you will see, the table is of simple colonial styling, and while it can be made of softwood to keep down the cost, it will be a finer piece if made of hardwood. Start by making the legs. They are 2 in. square at the top and down for a distance of $4\frac{3}{4}$ in., then tapered to $1\frac{1}{4}$ in. square at the bottom. Mortises are cut in the top sections of the legs to receive the tenons of the front, back and side pieces. The two front pieces are only 1 in. wide and are spaced for the drawer to fit between them. All the mortises are $\frac{3}{8}$ in. wide and $\frac{1}{2}$ in. deep. After gluing the joints, a finishing nail can be toenailed through each tenon, from the top, and at an angle into the leg, which will spread the tenon slightly and tend to lock it in position. Next, you install the backgammon board, which also serves to increase the rigidity of the table framework. This is $\frac{3}{8}$ -in. plywood fitted snugly inside the apron and upper front cross-piece. It is glued and nailed to the underside of two rabbeted strips across front and back of the table. See Figs. 5 and 9. These strips serve as guide bars for the sliding leaves, which have corresponding guide bars on their underside to fit the station-

Card table for four

By H. T. Bodkin

HERE'S a game table that serves many purposes, being small enough for two persons playing chess, checkers and backgammon, yet capable of instant enlargement so that it is perfectly convenient for four or six persons at bridge or poker. The top consists of two sliding, hinged leaves which can be pulled out and dropped over both sides, and a sliding center insert, one side of which is a checkerboard and the other side is finished to match the rest of the table. A false, sunken top, just below the regular top, serves as a backgammon board, and under this is a large drawer that holds all of your playing equipment.

Normally, when used as an occasional table, the center insert with its plain side up, fits snugly between the two folding leaves, which are dropped down. For a bridge table, you slide out the center insert and push in the leaves until they meet at the center as in Fig. 1. When you need space for six, you merely replace the insert and keep the leaves extended as in Fig. 3, which gives a total length of over 50 inches. Then, for backgammon pull out the insert

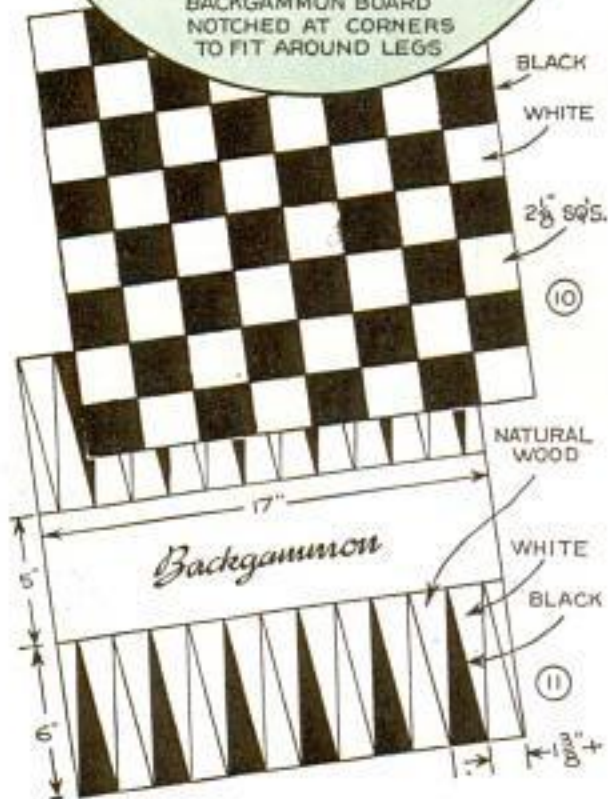
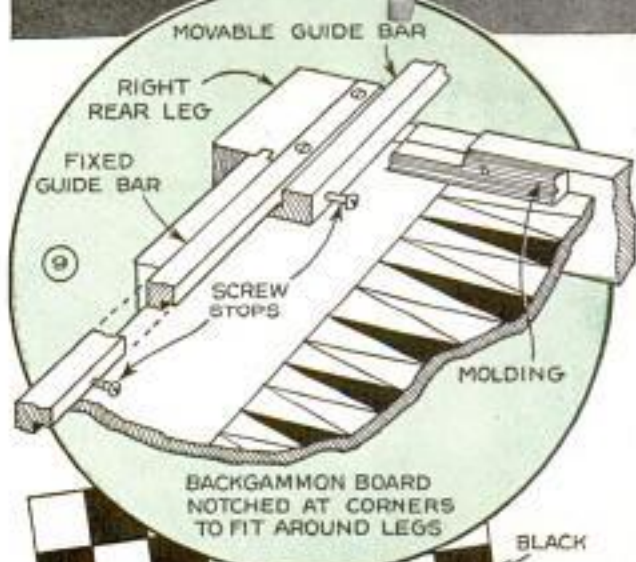


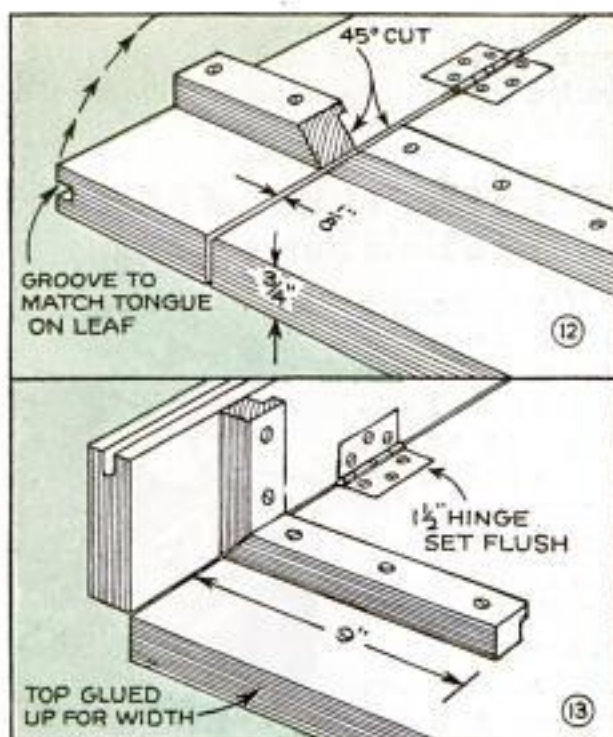
ary ones. Quarter-round molding is used to fasten the other two edges of the backgammon board as in Fig. 9. Hard maple is recommended for the guide bars.

The drawer is shown in Fig. 7. The shallow channel cut for the guide rail does not extend through the drawer front but is cut in the bottom only. If no power saw is at hand, this channel may be cut out with a backsaw and a flat chisel. When completed, the drawer is fitted between the front pieces of the table; it should be given just enough clearance to work

freely, yet not so much that there are wide spaces around it. After the fitting has been done, the drawer guide rail (also maple) is fitted by bringing it up from below and marking both the rail and the pieces it is to fit. When located by trial fitting, the rail is glued and nailed into the mortises cut for it. See Figs. 5 and 7. Two hinged brackets to support the leaves when they are raised, are cut and attached to the side aprons as in Figs. 5 and 8.

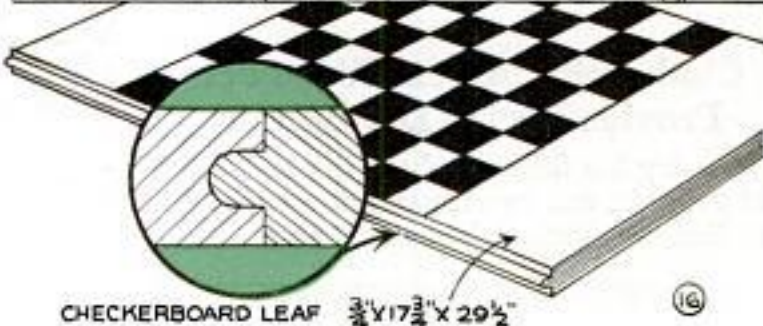
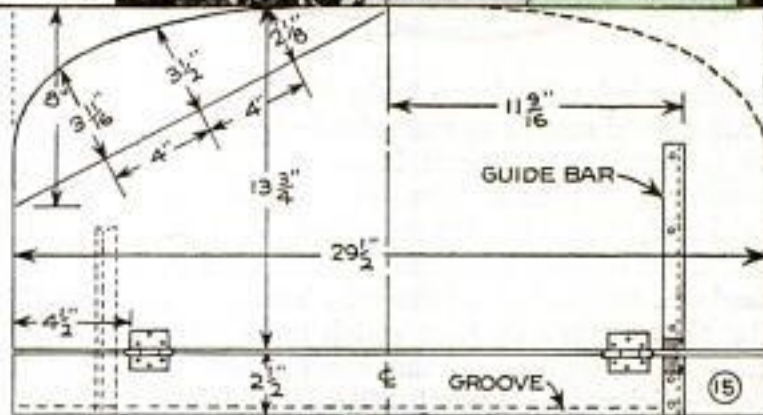
Stock for the top is $\frac{3}{4}$ in. thick. To prevent warping, it is best to glue and dowel two or three pieces together to form each leaf. Fig. 15 shows the correct curves, dimensions, location of the guide bars, etc. Note that each leaf is hinged to a narrow strip which lies horizontally on the table at its edge when the leaf is dropped. A groove is cut in the exposed edge of each strip to fit the center insert leaf which has a tongue on each side. See Figs. 12, 13, 15 and 16. The outer edges of the leaves and the ends of the center leaf are rounded, which can be done accurately on a shaper, and is sanded smooth by hand as in Fig. 14. Before gluing and screwing the guide bars on the leaves, it is best to nail these on lightly and then make minor adjustments to assure that the top units will slide freely on the stationary guide bars, yet not be excessively loose. After this fitting has been done, the permanent locations of the bars are marked after which they are glued and screwed in place. Also, a screw at the inner end of each movable guide bar will





prevent the leaves from coming off the table entirely, as the screws stop outward movement at the point where the leaves are dropped. These screws are shown in Fig. 9. The movable guide bars are cut at a 45-degree angle at the joint where the two parts of each leaf are hinged. See Figs. 12 and 13, which also show where the hinges are located. As the hinges project slightly from the underside of the leaves, the aprons at both sides are notched to permit the hinges to move in and out freely.

Layouts for the checker and backgammon boards are shown in Figs. 10 and 11. You can paint or stain the design on the surface of the wood, or if you like, you can enhance the appearance greatly by inlaying or overlaying. For both inlay and overlay work, woods such as holly (light), and ebony (black) give the needed contrast. Final finish of the table is determined mainly by the wood used and therefore only general suggestions can be made. If mahogany, oak, or other open-grained wood is used, a liquid stain is first applied. This is permitted to dry overnight. Then a coat of paste wood filler is brushed on. If necessary, it can be thinned with turpentine. When the filler begins to appear dull, rub across and with the grain with cheese-



cloth. After another overnight drying, the surface is sanded lightly and several coats of clear varnish are applied, drying and sanding between coats. Maple and birch woods are finished similarly, except that no filler is required. A thin shellac coat is applied over the stain, allowed to dry overnight, then sanded before varnishing.

☛ If cane seats in your chairs sag, they can be tightened by shrinking them with warm water and soapsuds. Plenty of time should be allowed for the cane to dry before using the chair.

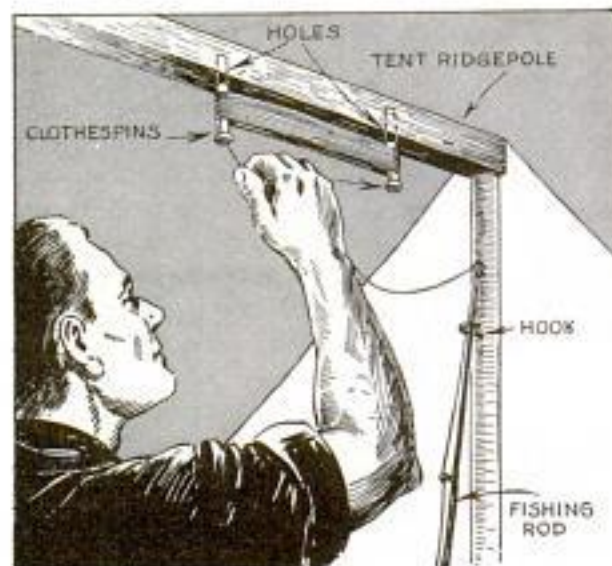
Wire Wall Brackets for Flowers Made From Lampshade Frames



Discarded wire lampshade frames provide a good source of material from which to assemble novel wall brackets to hold small potted plants. The difficult bending is already done, so all you have to do is to cut them up and reassemble them by soldering into the desired designs. The drawing shows three designs which are only a fraction of the number that can be worked out.—Richard F. Nugent, Milford, Del.

Clothespins in Tent Ridge Pole Provide Reel to Dry Fishline

To dry his fishline where it will be out of the way, one sportsman has a couple of clothespins stuck in holes on the underside



of the ridge pole of his tent. The line is wound around these while the rod is supported against the end pole by means of a screw hook.

Extra Slide in Box of Matches To Hold Burned Ones

If you keep a box of large size matches in your kitchen for lighting gas or oil stoves and lamps, a place to put the burned matches can be provided by using two slides in the box, one to contain the new matches and one for the burned ones. Of course, the slides will have to project from each end a little bit.—D. B. Caswell, Amsterdam, N. Y.



Sponge-Rubber Protects Glasses When Carried in Case



Having broken a pair of glasses which were in a case, one man avoided a repetition of this accident by cementing pads of sponge rubber to the case

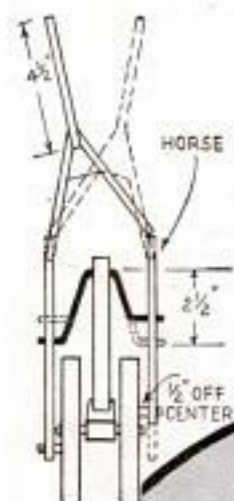
at the points indicated. In this position, the rubber tends to cause the glasses to "float" in the case so that any severe shocks caused by dropping them are absorbed.

Rope Swing to Carry Glass

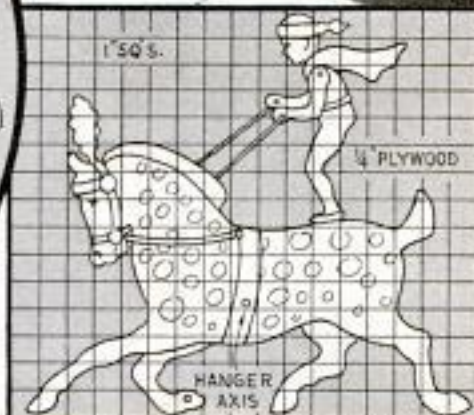
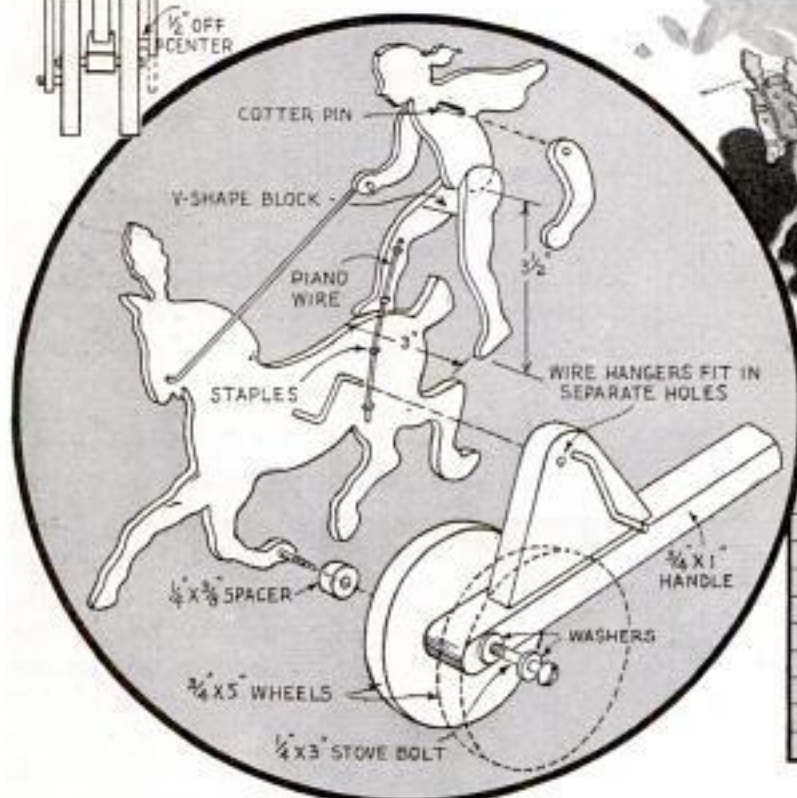
You can carry a large pane of glass by using an endless rope, which is slipped over the pane as indicated. If several pieces of glass are to be carried, it is a good idea to use padding where the rope contacts it to prevent the sharp edges of the glass from cutting into the rope.



Circus-Rider Toy Performs in Realistic Manner



Galloping in a realistic manner when pushed on a floor or sidewalk, this little bareback rider never falls off his horses because each of his legs is attached to a horse with a length of piano wire, which permits much freedom of movement. His arms are pivoted at the shoulders and move in a lifelike fashion as he holds the reins of piano wire.



Scrollsawed from plywood the horses are painted gray with darker dappled spots. The harness should be bright red with a touch of gold, and the rider painted in flesh pink tights with a blue cape and red bandeau. Galloping motion of the

horses is achieved by screwing the foreleg of each horse to the disk wheel on its side, $\frac{1}{2}$ in. off center. The horses are hung on wire hangers, which allow them to swing forward and backward as the foreleg makes the circuit of its crank.

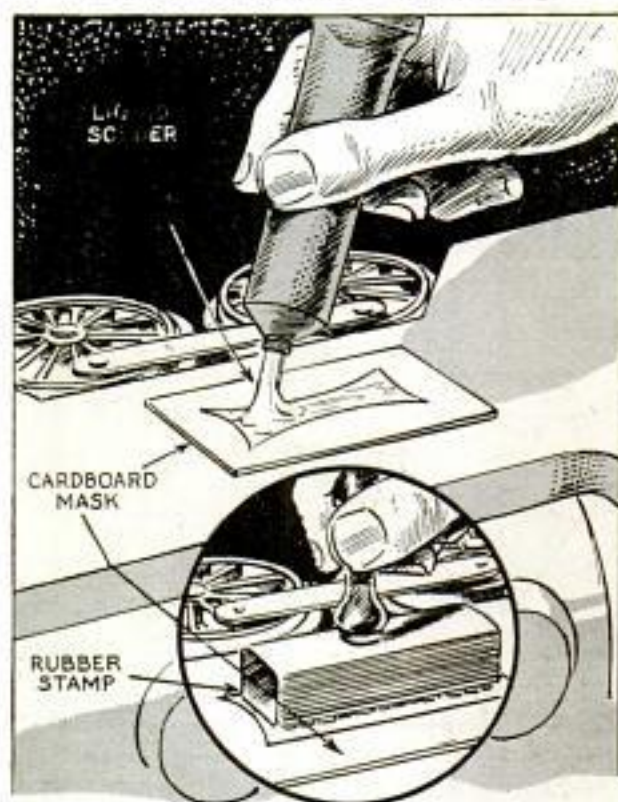
Engraver's Bit Routs Soft Materials Without Gumming

If a bit like the one shown is used for routing soft materials such as linoleum, it will not gum up. These bits are the type used by engravers when working in very soft metals. A bit that has been worn down so that it is unsuitable for its original use will do for linoleum routing, and usually can be obtained for practically nothing at large printing houses.

☛ Ribs from old umbrellas make good plant stakes for either indoor or outdoor use. Pipe cleaners twisted around the stakes will hold plants securely without cutting the stalk.



Attractive Nameplates for Models Made With Liquid Solder



Metallic nameplates for models can be made without a lot of tedious engraving by using liquid solder and a rubber stamp. First cut out a template from cardboard about $\frac{1}{16}$ in. thick. Then lay this on a smooth surface and fill the cutout portion with the solder, and just as it starts to harden, make the desired impression in it with the stamp. Now let the assembly set for three or four hours and then wipe any desired color over it.

Neat Signs From Colored Tape

Neat, colorful signs can be made in a few minutes by using narrow strips of adhesive cellulose tape, which is available in colors of gold or silver and in mottled combinations. First, sketch in the lettering and



then cut the tape to the required lengths and press it into position. Signs of this type can be applied to practically any surface, including cloth, glass, Cellophane, rubber, photographic enlargements, etc.

Furnace Chain in Door Spring Acts as a Stop

To prevent heavy screen and storm doors from being blown against the side of a building, insert a length of furnace chain inside the spring. Attach the spring near the top center of the door frame, and determine the length of the chain by holding the door open to the desired angle.

—Everett Hanson, Argyle, Wis.



Tight Joints of Rule Loosened With Fine Abrasive



When the joints of a folding rule are hard to work, or are rough due to wear and an accumulation of dirt on the friction surfaces, clean the joints with gasoline and then paint the contacting surfaces with fine valve-grinding compound. After the rule has been in use for a time, clean off the abrasive and put a drop of oil on each joint.

Greased Cotton Is Good Bait To Catch Mice in Traps

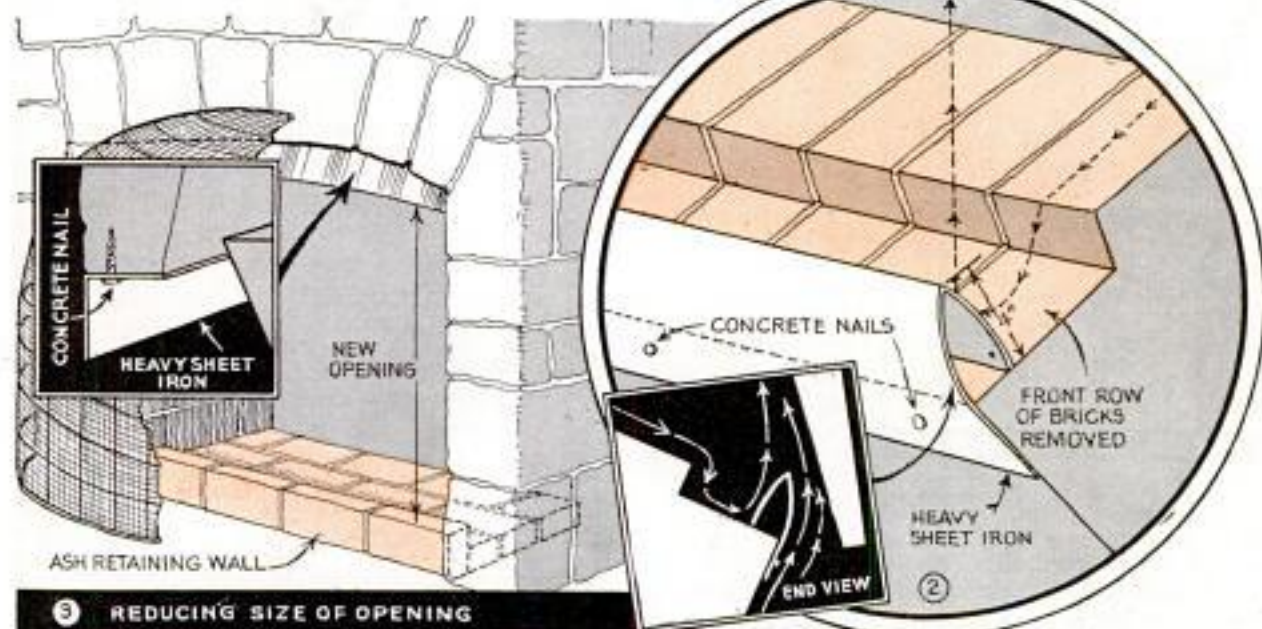
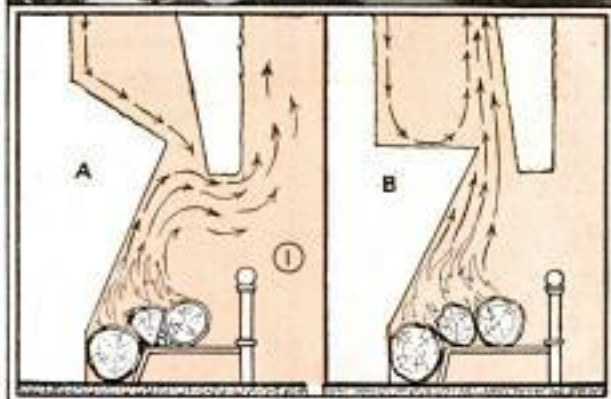
If you have been unsuccessful in trapping mice, try using cotton soaked in lard or bacon grease. Such a bait has a double attraction for mice. They like lard as a food and cotton for their nests. The cotton can be fastened to the bait pan of the trap with a tack.

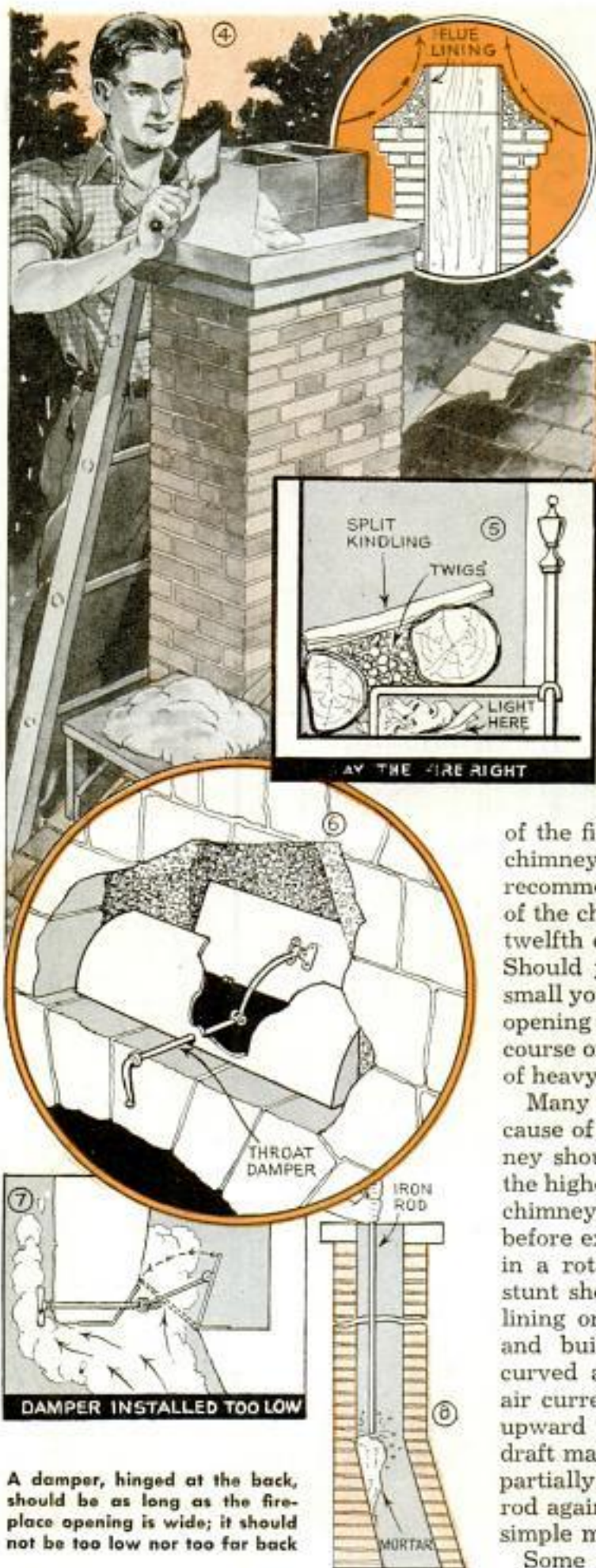


Easy Ways to Cure SMOKY FIREPLACES

Also, simple tricks of starting
and keeping cozy fires

HAVE you a fireplace that occasionally smokes? If so, there's no need of letting this condition go on. In most cases you can apply an effective cure yourself. Some fireplaces smoke because of a slanting smoke shelf as shown in detail A of Fig. 1. Note how a descending column of cold air in the chimney rolls down the shelf and forces the fumes and smoke from the fireplace out into the room. The builder of such a fireplace thought only of the column of hot fumes from the fire but overlooked the fact that the chimney must also accommodate a heavy column of descending cold air. A modern horizontal smoke shelf is shown in detail B. From this you will see that the cold air descending along the back of the chimney strikes the shelf, is retarded, and is heated by the hot front part of the shelf and also the fumes from the fire, causing it to turn back up the chimney. Of course, it may not be possible in your case to change a slanting shelf to a horizontal one like this, but the same results can be gained by the simple alteration shown in Fig. 2. Here a row of bricks





A damper, hinged at the back, should be as long as the fireplace opening is wide; it should not be too low nor too far back

has been removed and a heavy sheet-iron "fence" has been attached to project upward from the lower edge of the slanting shelf, which warms and turns the descending column of cold air. Iron heats up rapidly and transfers heat to the cold air coming down against it. Another method of overcoming this trouble is to install a throat damper which should be just as long as the width of the fireplace opening. It should be hinged at the back of the smoke chamber as shown in Fig. 6, and must not be installed too low as in Fig. 7, nor too far back, which would leave insufficient space for an effective smoke shelf. Also be sure that there is an adequate smoke chamber between the damper and the fireplace opening. When raised, the damper will have the same effect as the sheet-iron "fence" shown in Fig. 2, and besides, such a damper gives adequate draft control.

Another common cause of smoky fireplaces is that the size of the fireplace opening and the size of the chimney are not of correct proportions. It is recommended that the cross-sectional area of the chimney should not be less than one-twelfth of the area of the fireplace opening. Should you find that your chimney is too small you can reduce the size of the fireplace opening by either raising the hearth with a course or two of bricks, or by adding a piece of heavy sheet metal at the top, Fig. 3.

Many well designed fireplaces smoke because of chimney faults. The top of a chimney should project no less than 3 ft. above the highest point of the roof. The higher the chimney, the better will be the draft. But, before extending your chimney or investing in a rotating chimney top, try the simple stunt shown in Fig. 4. Set a section of flue lining on top of the lining in the chimney and build around it a cement shoulder curved as shown. This deflects horizontal air currents upward and results in positive upward draft in the chimney. Insufficient draft may also result from mortar or debris partially clogging the chimney. Ramming a rod against the obstruction as in Fig. 8, is a simple method of dislodging it.

Some other causes of smoky fireplaces

are as follows: Double use of a flue for two fireplaces—as for instance, a basement fireplace below one in the living room—or the use of a single flue for both a fireplace and a furnace or a kitchen stove. Off-center flues above the fireplace smoke chamber cause eddy currents and consequent slow exit of smoke. Sometimes gas-vent pipes from a hot-water heater or gas furnace project too far into the chimney and reduce the cross-sectional area of the chimney. Also, the same effect comes from a chimney top of smaller size than the chimney itself. Flue linings that are not joined flush, but in which one length of lining is allowed to overlap the one below it, where the chimney is slightly slanted, are likely to cause trouble by reducing chimney capacity. Joints of flue linings may be leaky because of disintegration and falling away of the mortar between them, allowing cold air to enter and interfere with chimney draft. If smoke seems to come from a crack between the mantel and the wall, find out whether a crack extends from the smoke chamber to the mantel.

Laying a good fire is an art. Burning a large heap of crumpled newspapers on the hearth will produce more fumes in a few moments than most ordinary fireplaces can dispose of. Fig. 5 shows how to lay a fire. A heavy log is placed on the hearth against the back wall—not on the andirons. This is the traditional “backlog,” one purpose of which is to protect the back brickwork. Then, a smaller log of long-burning wood—not a split piece—is placed across the andirons about 6 in. from the backlog. On the floor and in the space between the logs, a few crumpled newspapers, some very small pieces of wood and possibly pine cones or dried bark, are inserted, extending forward under the front log. Finally, small twigs and a dozen pieces of kindling are piled loosely between the logs. Now, all that is needed to start the fire is a match. As the kindling ignites, knock it down between the logs and add some fresh pieces until the front log is burning, after which it is pulled forward to make room for a fresh log. A good material to take the place of kindling is sawdust moistened with kerosene. This is kept nearby in a can and is thrown under and about the logs. Where a fireplace does not have a damper, you can prevent the fire from burning too fast by piling ashes under and on all sides of the logs.

Inexpensive Roof Scaffold From Plank and Rods



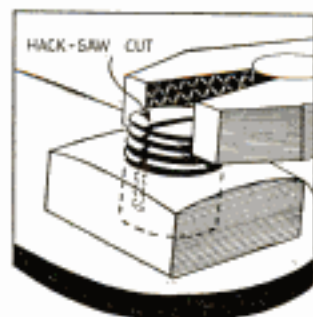
A roofing scaffold that can be hooked between the sheathing boards and moved up the roof as required, is made easily from two iron rods and a length of 2 by 6-in. stock. The latter is drilled near the ends to take the rods which are threaded and fitted with wing nuts. The other ends of the rods are bent to form hooks. With this type of scaffolding, it is unnecessary to use nails, which must be driven through the roofing and into the sheathing to hold it in place thus causing leaks when the scaffold is removed.

—R. M. Cooley, Kellerville, Ill.

Threaded End of Bolt Slotted To Unscrew Rusted Nut

The next time you bolt together parts that are to be exposed to the weather, slot the threaded ends of the bolts as shown. Then when the nuts have to be removed and they have rusted tightly to the bolts just pinch the slotted ends together with a pair of pliers. This will break away the rust so that the nuts can be unscrewed easily.

—W. C. Lammey, Downers Grove, Ill.



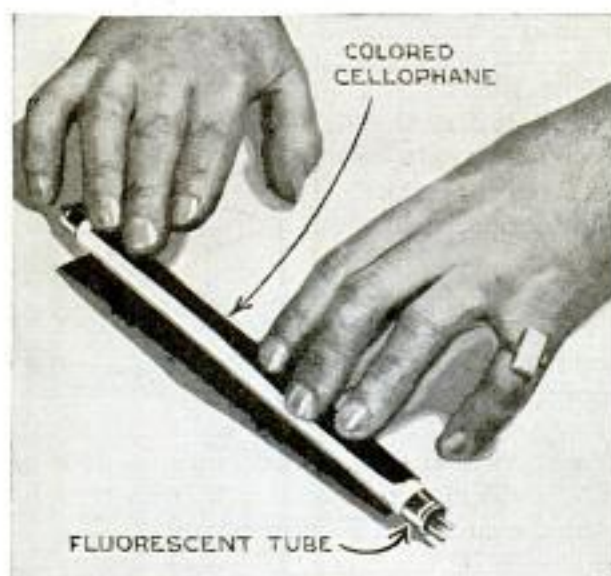
Empty Gun Shells Ignite Easily To Start Camper's Fire



The next time you are on a hunting trip and have no dry material for kindling a fire, a couple of empty shotgun shells will do the trick. There is enough wax in the paper of the shells to make them ignite easily if they are split into narrow strips with a knife.

Daylight Fluorescent Tubes Colored With Cellophane

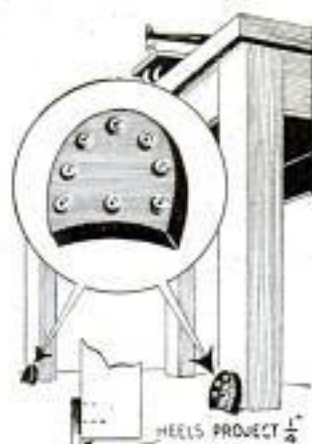
An effect that is identical with the use of fluorescent lamps in different colors, but permitting a change from one color to another without investing in more than one lamp, is obtained by covering the tube with a single thickness of Cellophane. Cellulose



tape can be used to seal the covering at the joint so that the Cellophane can be removed from the lamp in the form of a tube.

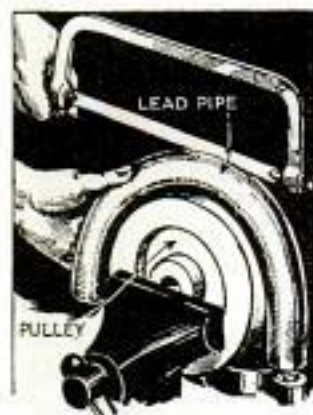
Rubber Heels on Legs of Bench Help Prevent Creeping

When my workbench had a tendency to creep away from the wall under the vibration of a motor, I stopped the trouble by tacking rubber heels to two of the legs. The heels projected about $\frac{1}{2}$ in. beyond the lower ends of the legs to make a binding contact with the floor.



—G. E. Hendrickson, Argyle, Wis.

Hacksaw Splits Lead Pipe



Instead of risking the use of a knife to split open one side of a length of lead pipe, bend the pipe over a pulley or a wood disk clamped in a vise. Then you can easily split the pipe with a hacksaw as indicated. It is best

to use a V-pulley so that it will be easy to hold the pipe in place.

Charring Enlarges Pipe Stem And Makes a Tight Fit

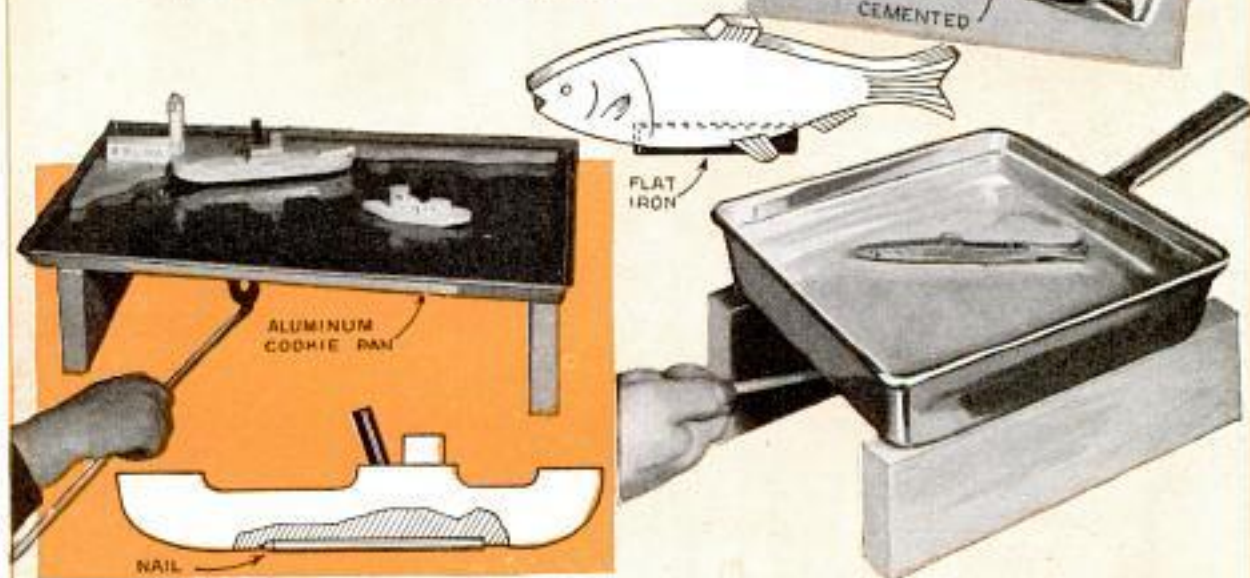
If a rubber pipe stem does not fit tightly into the bowl, char it with a match to increase the diameter of the portion that fits into the bowl. Hold the stem in the match flame until small bubbles appear in the rubber, then stick it into water to harden.



Toys That Move *by magnetism*

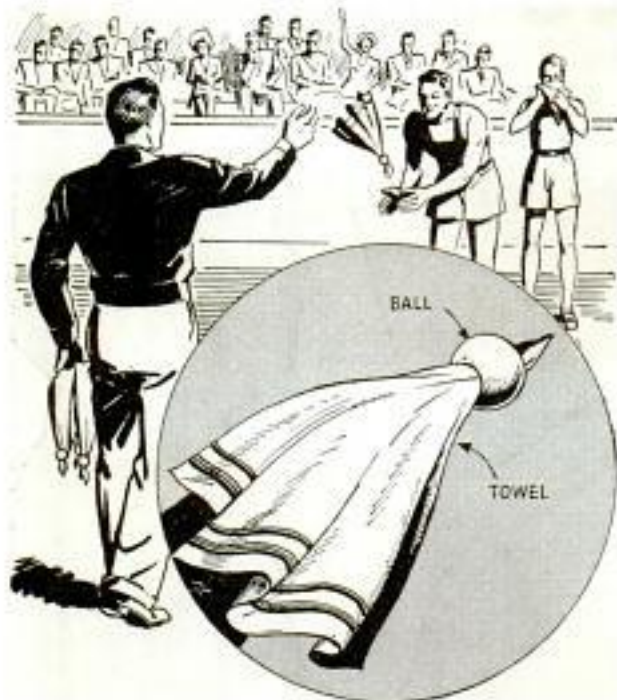


Toy autos that move around, fish that dive and swim as though alive and boats that mysteriously follow the wish of the young performer, are just a few of the many stunts that you can do in this unusual table-top theater. The cost is slight, as you get ten-cent models or make them from wood, and use permanent magnets. By attaching a magnet at the end of a dowel, you can hold it anywhere under the "stage," or you can hold the magnets by hand if there is enough space. The magnet and your movements can be concealed from spectators by closing the front side under the stage. If models are wood, plastic or other nonmagnetic material, a strip of iron or steel is cemented on the underside



To move objects on or in water you get an aluminum pan of sufficient size and depth, because aluminum is nonmagnetic. A sheet-metal pan would cause the magnet to "stick" to it inconveniently, and the boats and fish would not respond. Two persons can conduct a lively naval battle, causing the opponent's "destroyers" to be "sunk" and removed from the game by ramming them amidships

Weighted Towels Tossed Easily To Basketball Players



To permit quick passage of towels to his players during time-out periods, one basketball coach punched holes in sponge-rubber balls and used them as weights. The corner of the towel is pulled through the hole in the ball.

Stencil Kept in Close Contact With Work While Painting

Creeping of paint underneath the edges of paper stencils when the paint is applied with a brush can be avoided, and a neat job done, by attaching the stencil to the



work with rubber cement. Just coat the edges of the stencil with the cement and press it firmly in contact with the work. After the cement has dried, be sure to rub off any of it that might have collected on the surface to be painted.

Steel Tubing Good Sanding Block For Use on Scrollwork

A short piece of seamed steel tubing with the seam open provides a handy sanding block for smoothing scrollwork. The abrasive paper is merely wrapped around the tube, the seam of which has been spread slightly to permit insertion of the ends of the paper. When released, the seam will close and hold the paper tightly.



Lighted Candle Waxes Fishline



When you have a fishline to wax and there is no regular equipment at hand, you can do the job with a candle. Just ignite the candle and then pull the line through the well of melted wax at

the base of the wick. Care must be taken, of course, not to burn the line.

Staples Locate Pages in Catalog

If you have frequent occasion to refer to certain pages in a large catalog, you can save time by simply clinching a paper staple through the upper corner of each page desired. The book will then automatically open to the stapled pages.



TELESCOPIC RANGEFINDER

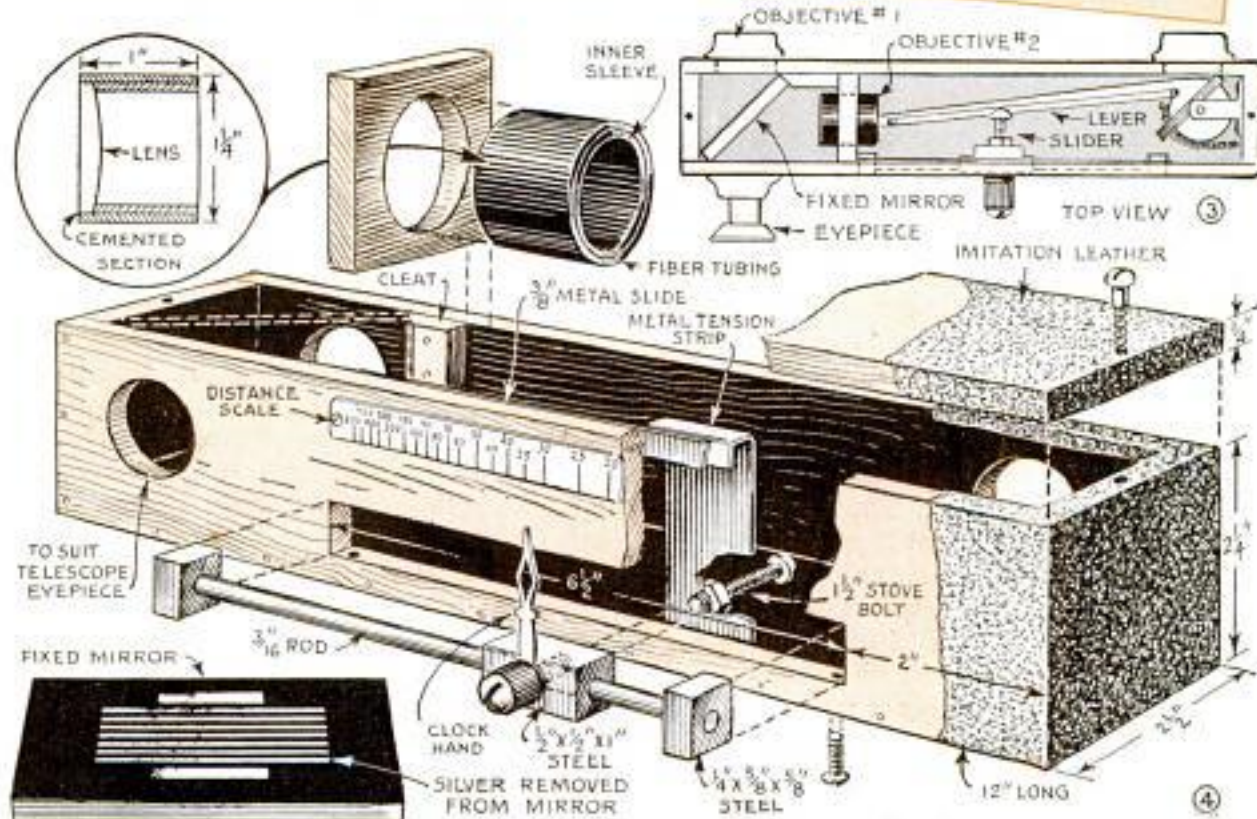
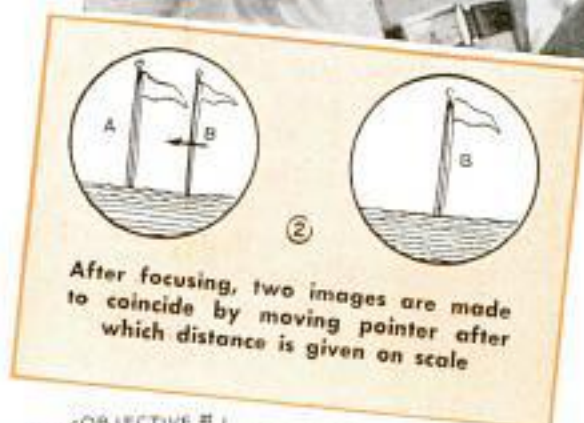
Helpful in both play and work to estimate distances accurately, as in outdoor photography

By Len Marcelius

FOR maneuvers of the "junior army corps," it's an easy matter to estimate quickly the distance to "enemy emplacements" with the aid of this simple rangefinder that can be made at the cost of slightly more than a dollar, most of which goes for a set of cheap opera glasses that can be found in many toy and novelty stores. However, this rangefinder is really more than just a toy as it can be made to work accurately, especially within a distance range of 3 to 50 ft., and thus be of service to those doing considerable outdoor photography.

In using it, you look through the eyepiece on the back as in Fig. 1, focusing in the usual way by sliding the eyepiece in or out. You will see two images A and B, as in Fig. 2. Then, by moving the sliding pointer on the back as in Fig. 5, you make image B coincide with A, after which you merely read the distance on the scale.

The opera glasses used in this particular

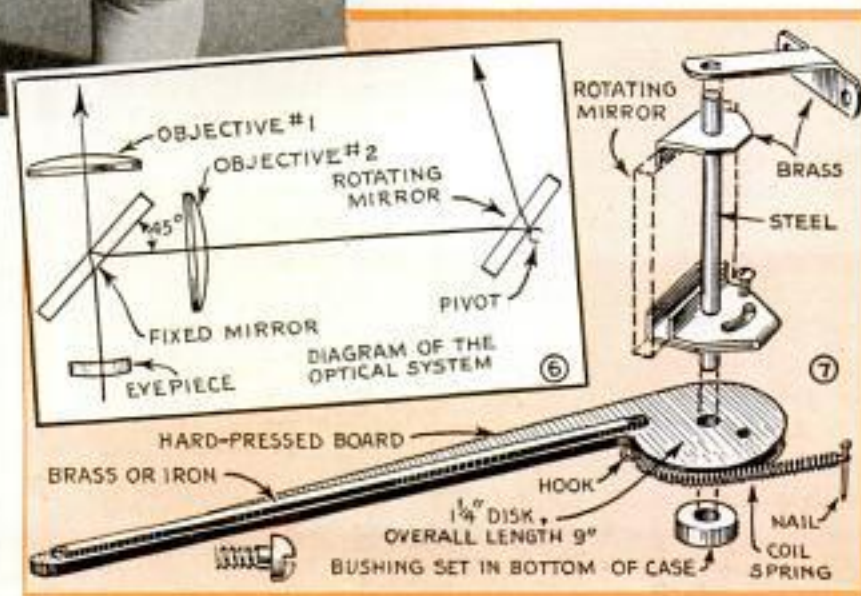




or a number of thin, parallel lines can be scratched on the silvering, as is shown in the lower left detail of Fig. 4, in order to make the fixed mirror semitransparent.

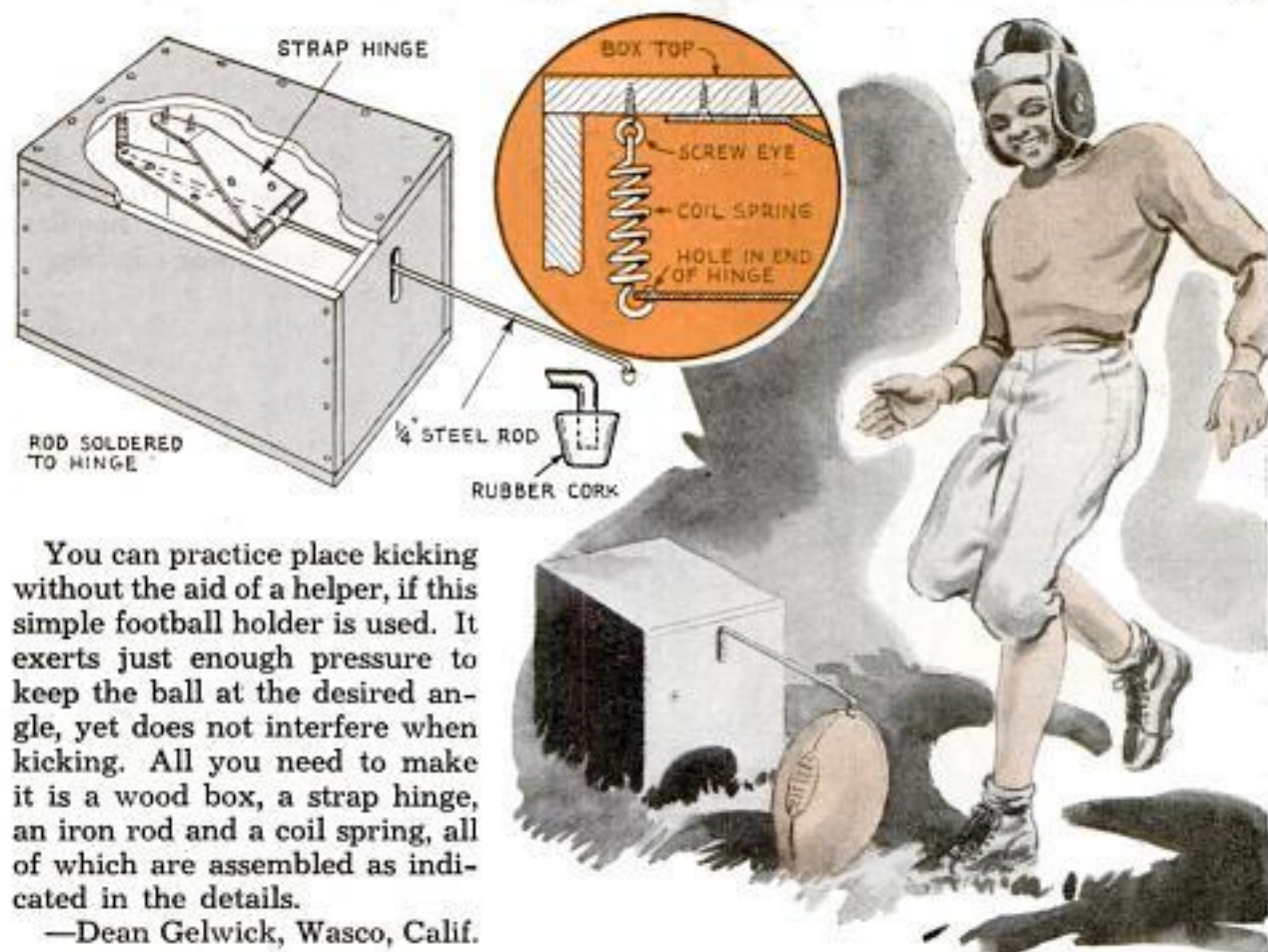
The length of the lever attached to the rotating mirror, the straightness of its edge and the precision of the moving parts determine to a large extent the accuracy of the instrument. The lever is detailed in Fig. 7. It consists of a piece of hard-pressed wood as shown, having a strip of

case magnified 2.5 times and were 4 in. long when fully extended. A longer or shorter pair will also serve the purpose if the dimensions of the box are changed accordingly. One eyepiece and both objectives (lenses in the front end of the barrels), and two plain mirrors of good quality are used. The internal arrangement of the rangefinder is shown in Figs. 3 and 4, and the diagram of the optical system is shown in Fig. 6. You will note that the rotating mirror on the right side, Figs. 3 and 6, is placed directly behind the front part of one barrel from which the lens has been removed. The mirror is attached to a movable lever which is adjusted by means of a slider. The image caught by this mirror is reflected through objective No. 2 which is the lens removed from barrel, and cemented in a length of fiber tubing which is held securely in position as indicated. The image, after passing through objective No. 2 falls on the second mirror, which is fixed at a 45-degree angle at the left end of the box. The fixed mirror is semitransparent so that it will reflect the image coming from the right into the eyepiece at the back, and will also pass the image from objective No. 1 to the eyepiece (objective No. 1 is front of other barrel with lens intact.) This accounts for the double image that you see before adjusting the slider to merge both into one. Either a partly silvered mirror can be used



brass or iron screwed to the top. A screw attached to the slider runs against the strip. Note that half of the screw head is filed away. A small coil spring on the lever at the large end, gives a positive action. The spring is kept in place by a shallow groove in the rounded end of the lever. The rotating mirror is locked securely to the lever by means of a small setscrew on the mirror holder. You adjust this mirror to bring the infinity distance to the extreme left of the scale and then lock it. Infinity is determined by sighting on the moon or a large star. Calibration of the scale is easy if you sight objects at measured distances, and mark these distances on the scale at each location of the pointer. After a paper scale has been made you can duplicate it on a strip of metal or you can just cover the paper with a piece of celluloid. A covering of imitation leather will add considerably to the appearance of the case, which should also be provided with a nut in the bottom so that you can mount it on a camera tripod.

Football Holder Helps to Practice Place Kicking



You can practice place kicking without the aid of a helper, if this simple football holder is used. It exerts just enough pressure to keep the ball at the desired angle, yet does not interfere when kicking. All you need to make it is a wood box, a strap hinge, an iron rod and a coil spring, all of which are assembled as indicated in the details.

—Dean Gelwick, Wasco, Calif.

Hand Bolt Cutter Is Operated by Foot for Production Jobs



Needing several thousand pieces of short lengths of rod, and having no power tool at hand with which to cut them, I rigged up a bolt cutter so that it could be operated by foot, thus enabling me to snip off the rods rapidly. The main or pivot bolt of the cutter was removed and one long enough to reach through the apron of my workbench and take a nut was substituted, using a block of suitable thickness behind the cutter to bring it flush with the edge of the bench. The ends of the handles were drilled to take a length of chain. This was slipped through a piece of pipe which served as a pedal. Screen-door springs were fastened to the lower ends of the handles and to the apron of the bench to pull the handles apart. In use, the rod was fed into the cutter against a stop block, after which foot pressure was applied.

—Arthur Jennings, Derry, Pa.

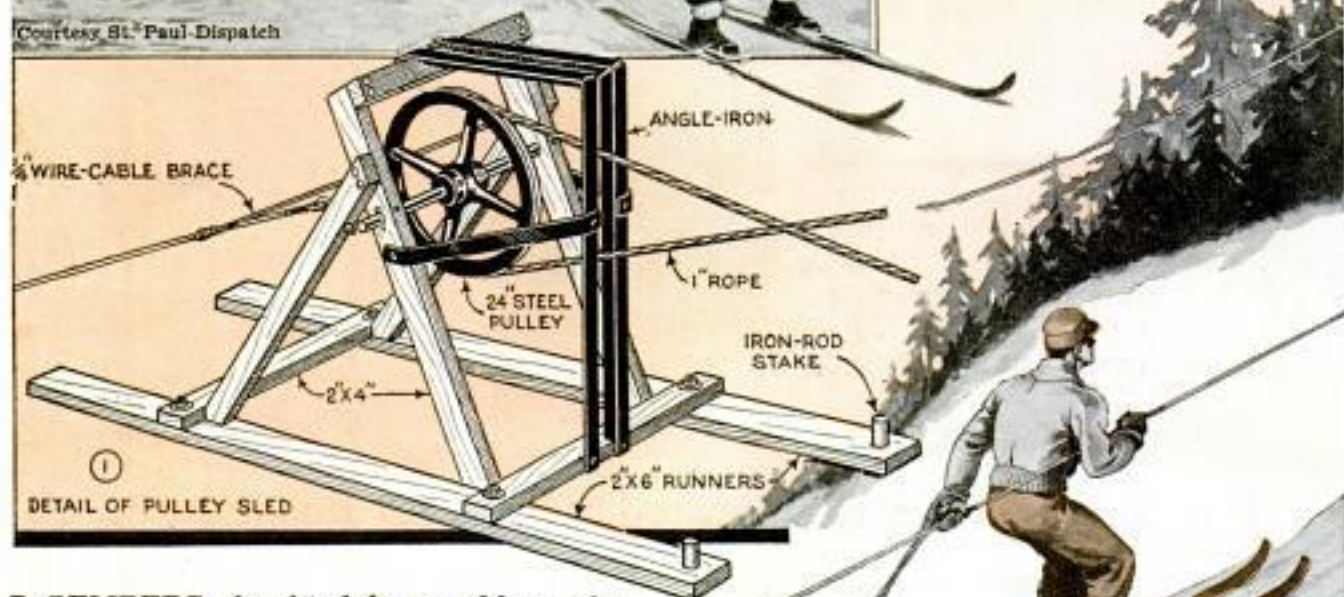
☞ Dip a measuring cup or spoon into very hot water before using it for lard, butter, etc., and the fat will slip out easily.

Start Now to Build This

There's much more time to ski if you take this safe tow back to the top and avoid the needless fatigue of climbing



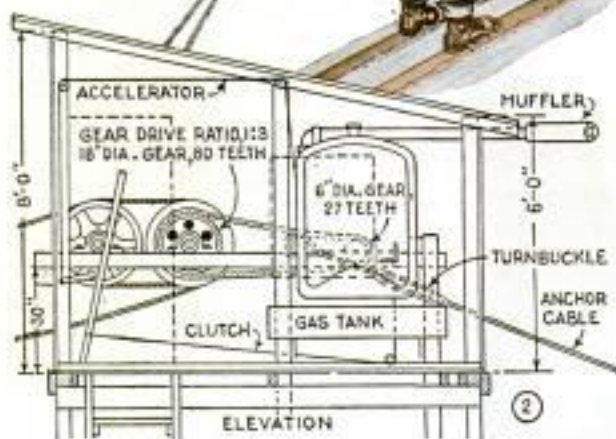
Courtesy St. Paul Dispatch



MEMBERS of a ski club can add greatly to the enjoyment of skiing by building a tow to pull them back up the hill. The original tow was built for less than \$350 which likely could be reduced to \$200 by careful selection of parts, and by constructing the motor house with used lumber, or by eliminating it entirely.

Selecting a hill is very important. This tow is located on the north side of a hill near Bayport, Minn., where direct sunlight seldom touches the snow until late in February. Trees help to catch the snow and protect it from the sun, but should not be so numerous as to interfere with the skiing. The tow track must run straight with a minimum clearance of 3 ft. on both sides. All rocks and stumps should be removed, and the track should have a constant incline from top to bottom. Some dips can be allowed, but any bumps or sharp rises must be graded smooth.

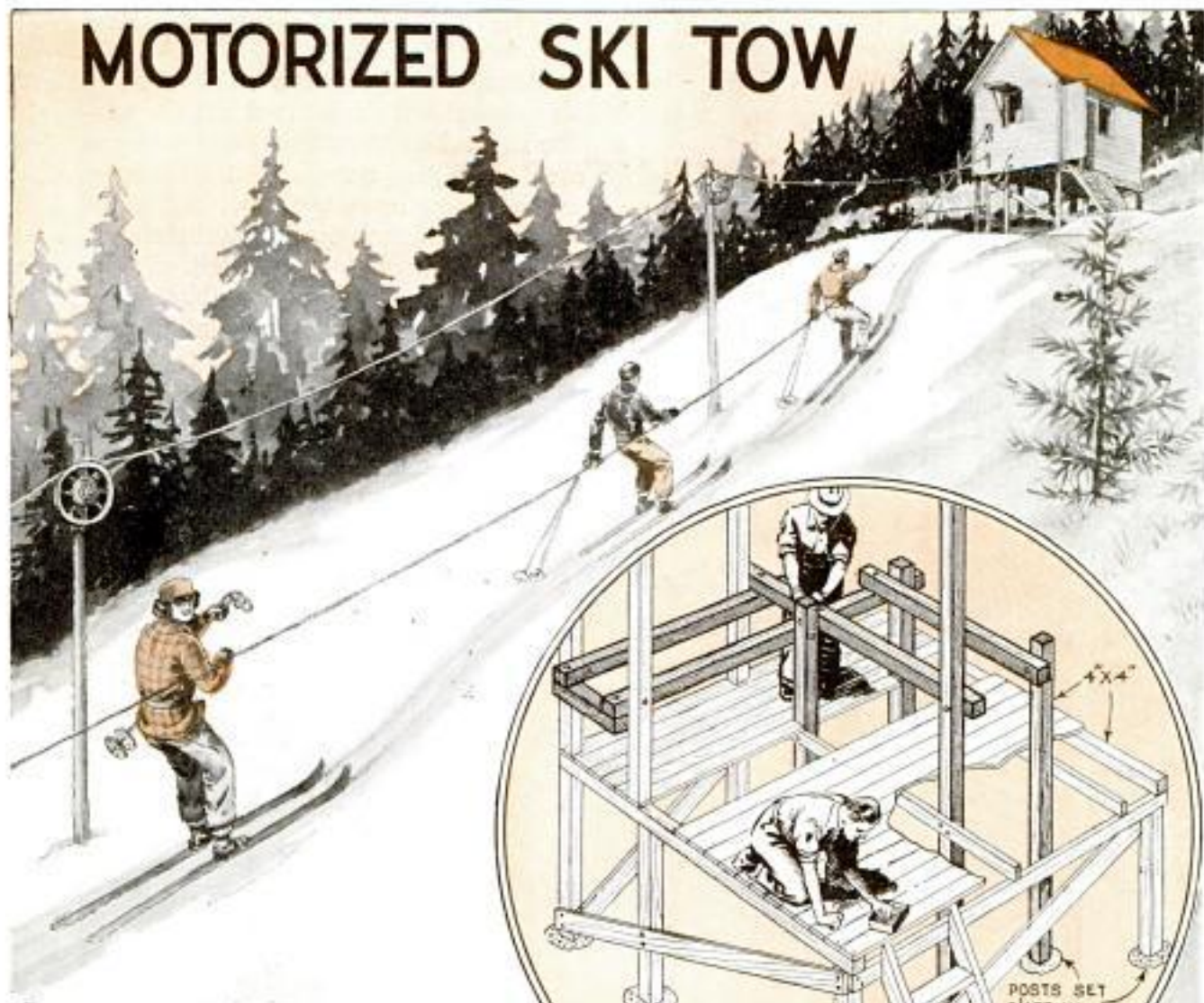
The tow motor should be located in a house at the top of the hill, far enough back



from the edge to allow skiers to leave the rope and ski away on level ground. The uphill rope must clear the top of the hill by at least 4 ft. Hence the motor house must be built up on supports, Fig. 3.

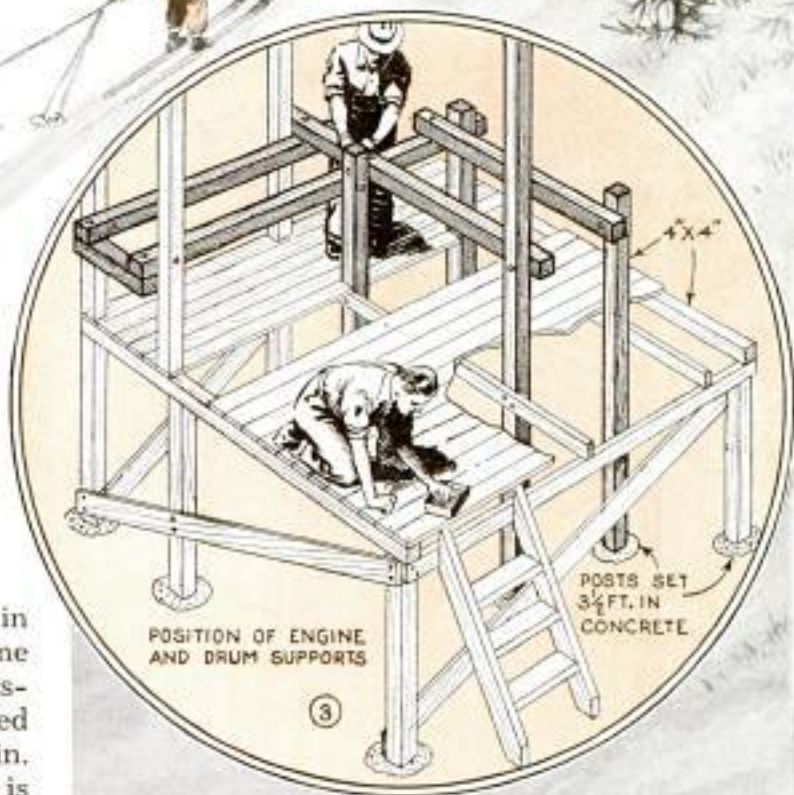
To keep costs at a minimum, secondhand parts are used. It is best to use ball-bearing pillow blocks for the shafts. In the tow

MOTORIZED SKI TOW

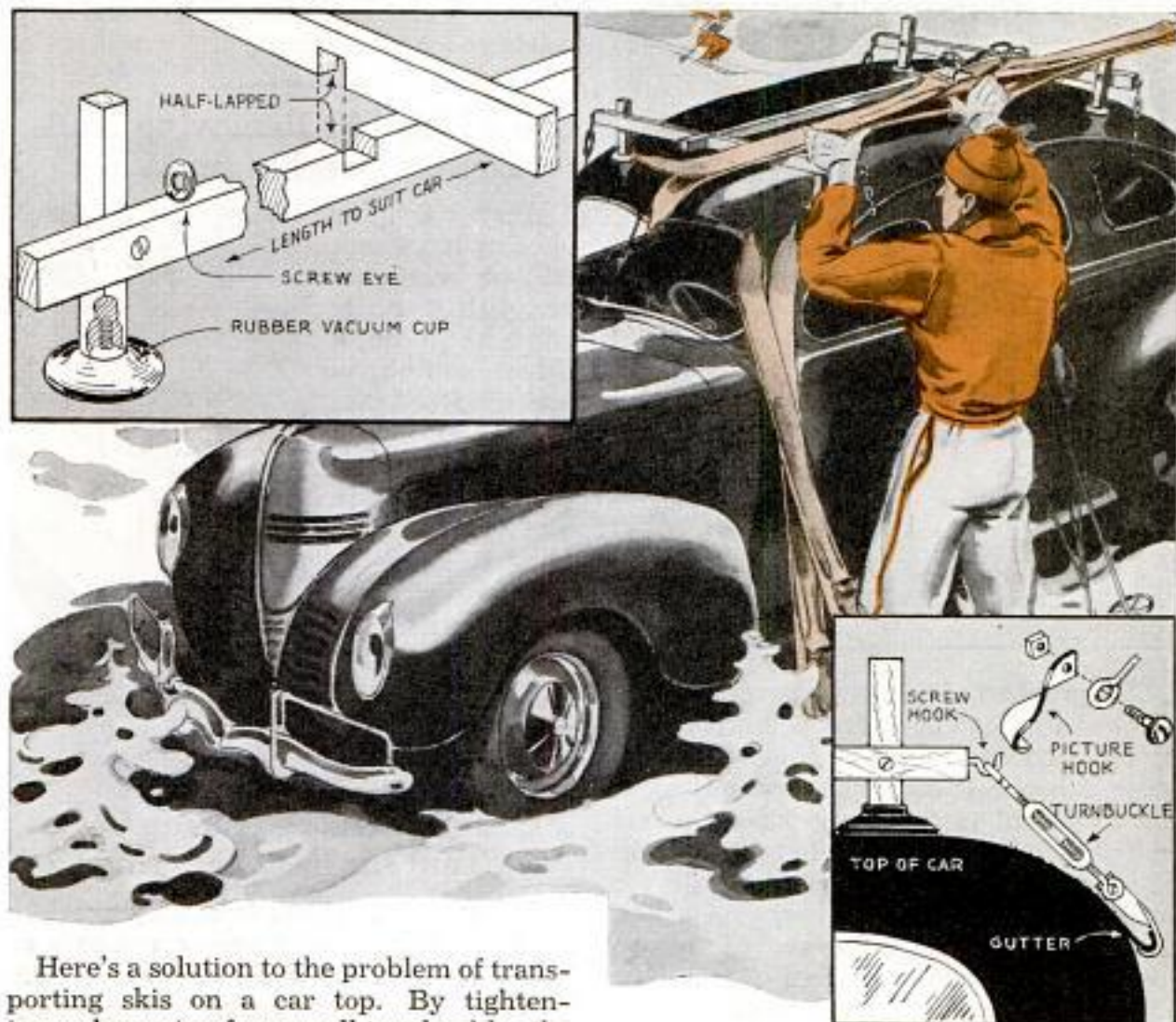


shown, 24-in. pulleys were used in the drive assembly. They came from a discarded belt-drive system and had three grooves turned into the surface to grip a 1-in. rope. A used automobile motor is the cheapest source of power. Be sure to have all parts of the ignition checked to assure quick cold-weather starting. An auxiliary dry battery may be connected to the ignition to help starting when the storage battery is straining to turn over the cold motor.

A heavy-duty 10:1 worm-gear reducing unit or something secondhand like the chain and sprocket drives formerly used on Mack trucks, can be used. The chain drive used on the model shown gave a 3:1 speed reduction. However the transmission must run in low and there is considerable wear on the gears. In the illustrated tow, the motor turns at



Car-Top Ski Rack Removed or Attached Easily



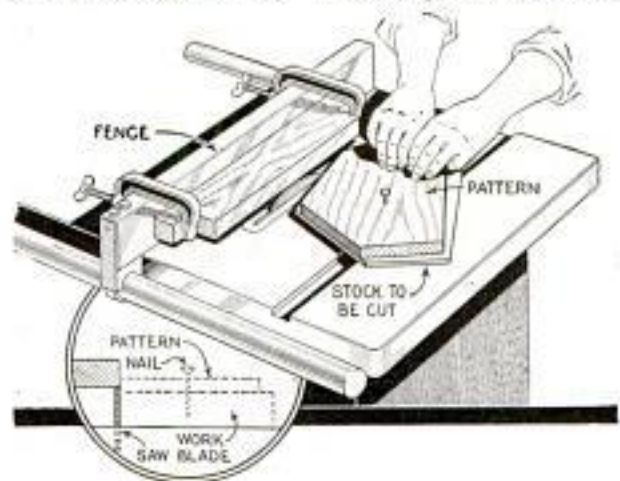
Here's a solution to the problem of transporting skis on a car top. By tightening or loosening four small turnbuckles the carrier can be removed or attached in a few moments. It will fit almost any car and, consisting of only three light pieces of hardwood, it can be stored away with your skis when not in use. Four small vacuum cups contact the car top so that there is no

likelihood of marring the finish. In addition to the vacuum cups, the carrier is hooked to the roof gutters and a small turnbuckle assembly at each corner as shown tightens the hooks.

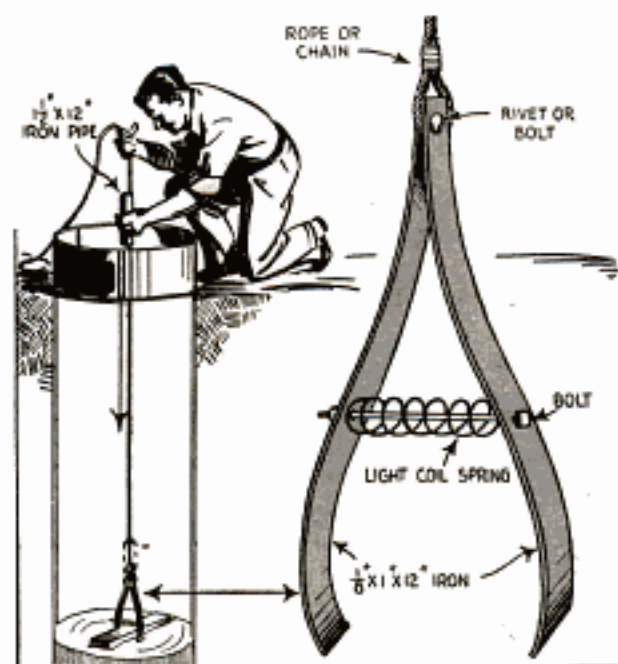
—Emile C. Schnurmacher, New York.

Irregular-Shaped Work Sawn Rapidly by Using Pattern

When you have a number of duplicate wood pieces to cut having sides that run at various angles, try the saw setup shown. First, saw an accurate pattern in wood of the pieces and then cut them roughly to shape. Next, clamp an auxiliary wood fence to the saw fence, spacing it above the table a trifle more than the thickness of the stock to be cut. Now fasten the pattern to the work so that the latter projects beyond the pattern on all edges. Then trim the work, sliding the pattern against the auxiliary fence and the waste portion of the work under it.



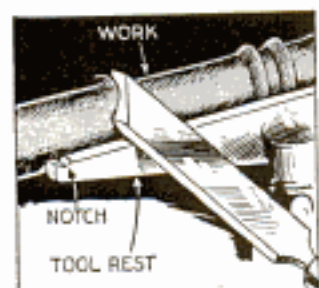
Foreign Matter Fished From Well By Improved Grapple Hook



The problem of removing several pieces of wood that had been dropped into a well by children was solved by this improved grapple hook. It consists of two pieces of flat iron bent to the shape indicated and bolted together at one end to take a length of rope or chain for lowering it into the well. A coil expansion spring over a bolt fitting loosely about the center of the two iron strips tends to keep them open so that they can be dropped over the piece to be removed. When this has been done, a short length of large diameter pipe threaded over the rope is released to fall down over the grapple hook and cause it to grip the block firmly for removal.

—Charles Ellison, Hinton, W. Va.

Notched End of Lathe Tool Rest Aids in Controlling Chisels



Did you ever have a skew chisel or parting tool unexpectedly slip off the tool rest when you were working close to the end of the rest? Usually only a nick or gouge in the work results from this, but there is always the possibility of a dangerous mishap. A good precaution against this is to file a shallow V-notch at each end of

the rest. Note that the notch is shallow and just wide enough to catch the corner of the tool blade as it comes along and keep it from slipping off the rest.

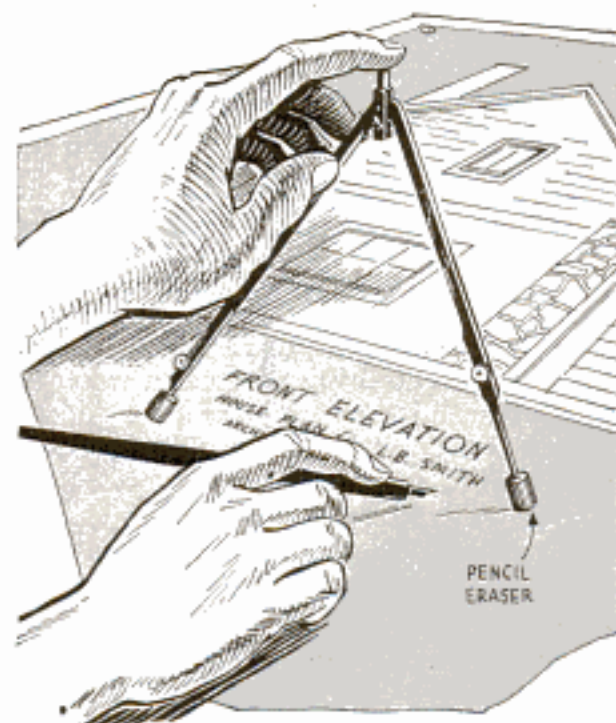
Nut Helps in Removing Nails Driven Deeply Into Wood

When salvaging old lumber, a nut will be helpful in removing nails that have been driven so deeply into the wood that you cannot get under the head with a puller. In using the nut, place it over the nail head and tap it with a hammer to depress the wood around the nail. This will allow the head to project so that it can be reached with a puller.

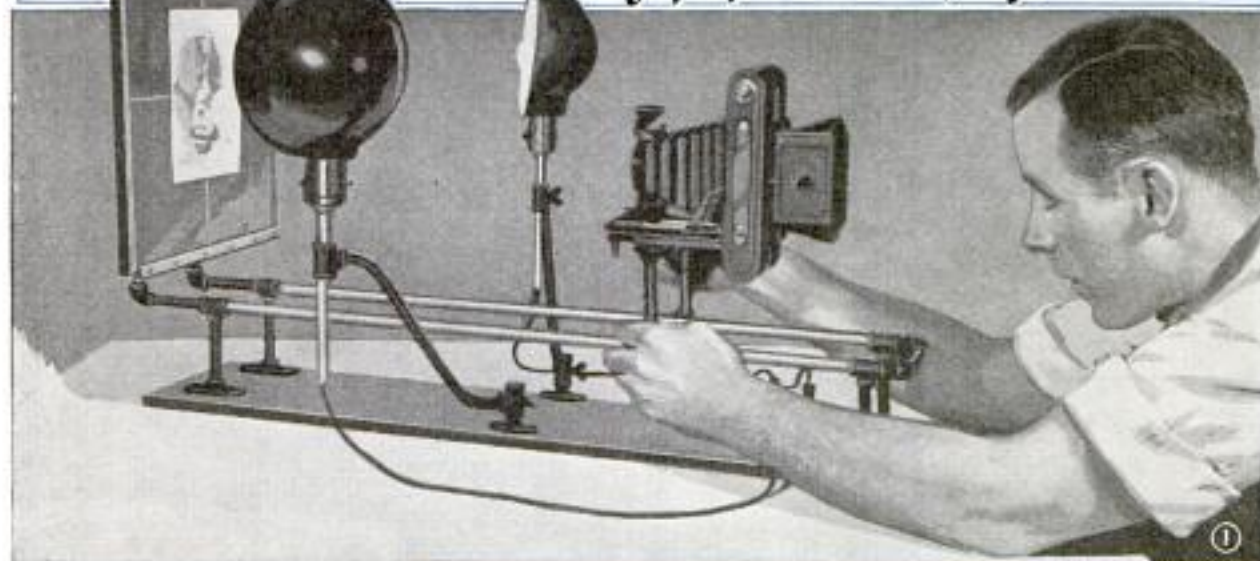


Compass Holds Tracing Cloth Taut for Easy Lettering

To keep tracing cloth from bulging while lettering it, one artist uses a compass as shown. Pencil erasers slipped over the points of the compass give the necessary friction between the compass and cloth to stretch the latter.



Photographers' **COPYING EASEL** *of pipe and plywood*



RIGID and light in weight, this copying easel is inexpensive and can be used with any camera suitable for copying. All you need is some pipe and fittings, and some $\frac{3}{8}$ or $\frac{1}{2}$ -in. plywood for the base, camera support and the easel board. Although $\frac{1}{8}$ -in. pipe was used in the original easel, any small size pipe that is available will do. The only threading necessary is on the ends of the slide rails as the rest of the unit consists of nipples, tees, elbows and floor flanges.

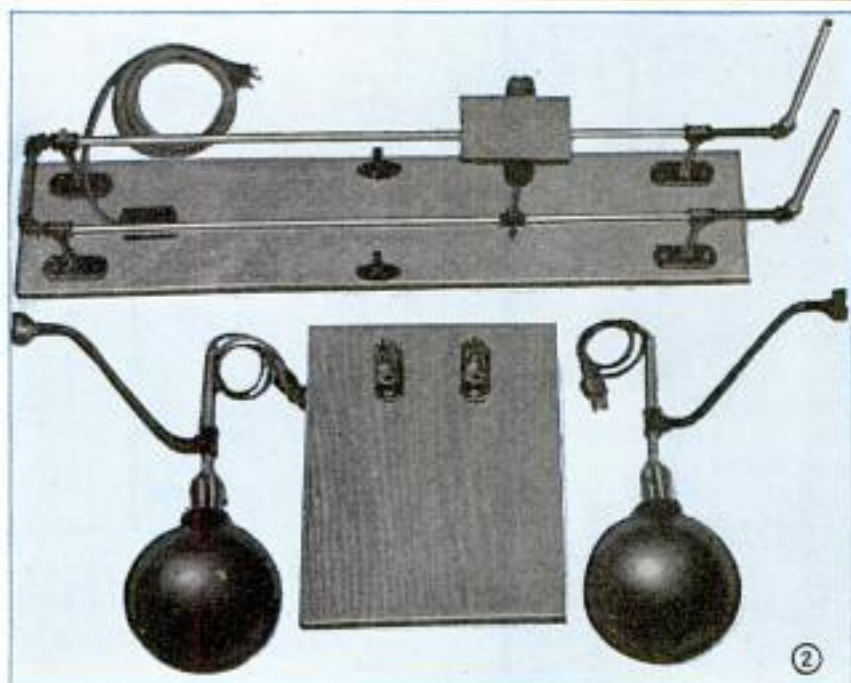
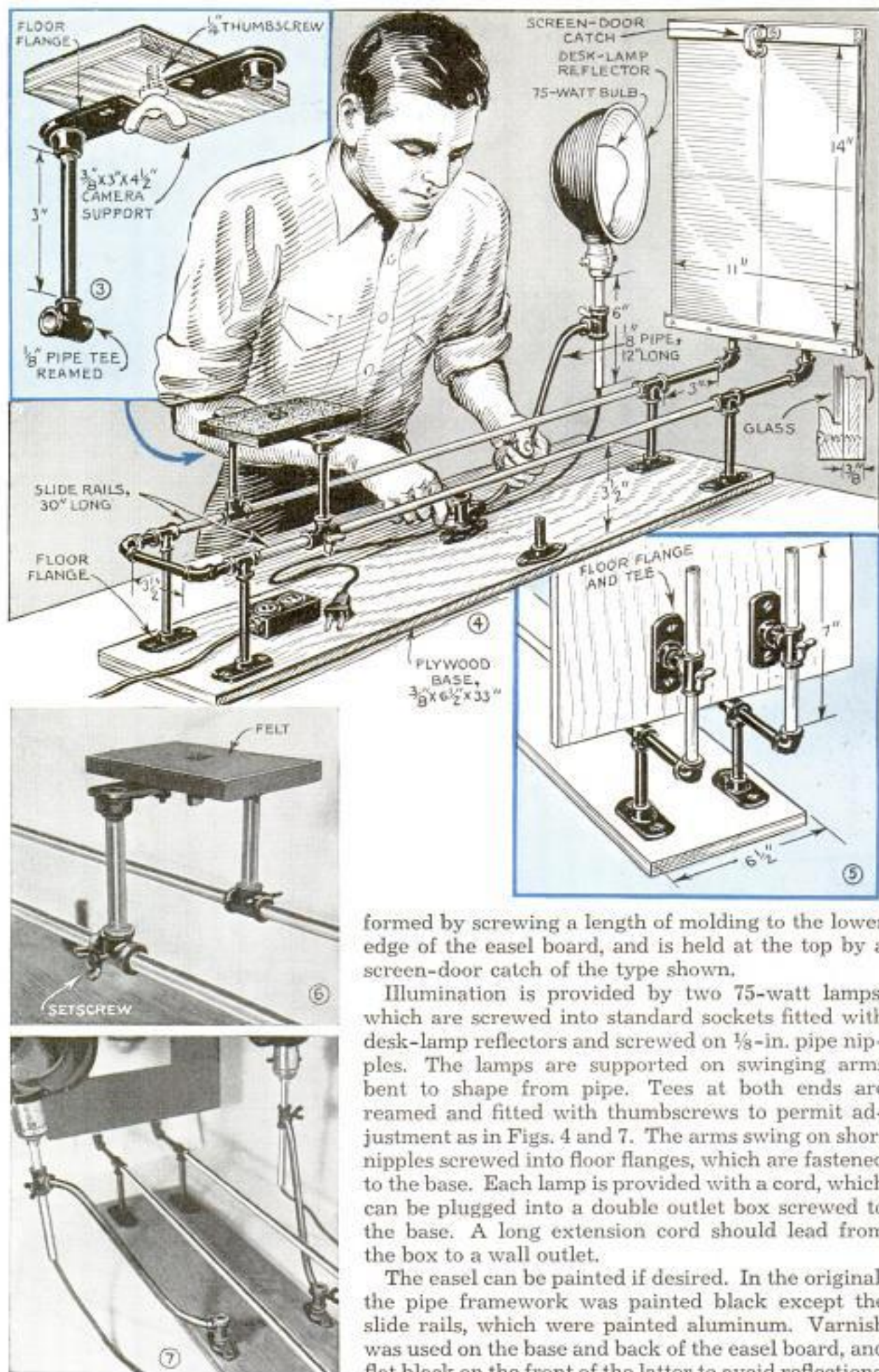


Fig. 1 shows the completed easel, while Fig. 2 shows the various parts. Begin construction with the front half of the slide-rail assembly, and follow this with the camera support, Figs. 3 and 6, which must be slipped over the slide rails before the rear legs and easel support are attached. As the tees at the lower ends of the support must slide on the rails, they will have to be reamed to fit. Also, they must be drilled and tapped for setscrews or thumbscrews to lock the adjustment on the slide rails. If floor flanges of the type shown are not available, you can use round

flanges and if desired, you cut these down for appearance. After completing the camera support, put it in place and finish the slide-rail assembly, including the vertical easel supports, which are a continuation of the slide rails.

Mounting of the easel is shown in Fig. 5. Here again, the tees must be reamed to slide over the supports, and they must be tapped for thumbscrews, which lock the adjustment of the easel. Now, the assembly is screwed to the base, and the easel is completed. The plate-glass face of the latter rests in a groove at the lower end



formed by screwing a length of molding to the lower edge of the easel board, and is held at the top by a screen-door catch of the type shown.

Illumination is provided by two 75-watt lamps, which are screwed into standard sockets fitted with desk-lamp reflectors and screwed on $\frac{1}{8}$ -in. pipe nipples. The lamps are supported on swinging arms bent to shape from pipe. Tees at both ends are reamed and fitted with thumbscrews to permit adjustment as in Figs. 4 and 7. The arms swing on short nipples screwed into floor flanges, which are fastened to the base. Each lamp is provided with a cord, which can be plugged into a double outlet box screwed to the base. A long extension cord should lead from the box to a wall outlet.

The easel can be painted if desired. In the original, the pipe framework was painted black except the slide rails, which were painted aluminum. Varnish was used on the base and back of the easel board, and flat black on the front of the latter to avoid reflections.

To Photograph Lettering on Glass

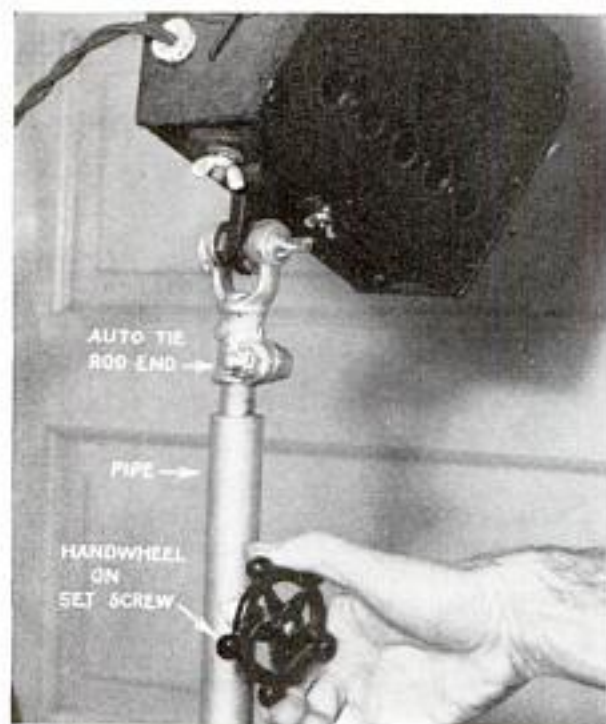


Lettering on a fruit jar, fancy bottle or glass dish which is difficult to show in a photograph, can be cast into high relief so it will show clearly by the following method: Fill the vessel with granulated sugar, then place one light beside the camera and another of twice the illumination

above and slightly behind the subject. Use panchromatic film and a dark blue background and the effect will be striking.

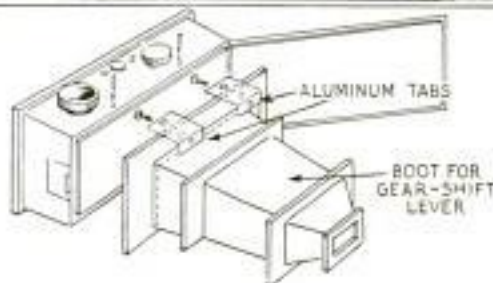
Homemade Stand for a Spotlight From Pipe and Auto Tie Rod

Sliding inside a length of pipe mounted on a suitable base, an old auto tie rod provides an excellent mount for a spotlight. A setscrew with a hand wheel, running through a nut welded to the pipe, locks the rod at any height. Most tie rods, especially those from older cars, can be adapted to the spotlight bracket, allowing the light to be tilted.—Walter E. Burton, Akron, Ohio.



NOVEMBER, 1941

Shield on Back of Small Camera Aids in Ground-Glass Focusing



When using a small camera, critical focusing in table-top photography can be made easier by attaching the rubber boot from an auto gear-shift lever as shown. Such a boot can be purchased inexpensively at an auto-supply store. When using the attachment the film is removed from the camera and a small piece of ground glass inserted in the film track. If it is necessary to focus between groups of shots, the exposed film is removed and replaced in darkness.—Allen Fiske, Chicago.

Wire Keeps Prints From Sticking To Bottom of Developer Tray

A length of stiff rubber-covered wire, bent and laid in the developer tray so that it hooks over the edges as shown, will keep prints from sticking to the bottom so they have to be "dug" out with the fingers or tongs. This trouble occurs frequently when prints are being made on single-weight paper with the result that the edge is sometimes damaged. The wire holds a portion of the print off the tray bottom, making it easy to grasp.



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Avoid These



Camera's greatest enemy is sand or grit. Sand scratches lenses, jams shutters and works into other delicate parts. Keep your camera in a pouch or case when not actually in use, especially on windy days or when at the beach



Rubbing lenses with a grimy handkerchief may result in tiny, permanent scratches. Optical glass is softer than window glass, and many scratches will impair definition of lenses. Dust the lenses with a small camel's-hair brush. Then polish gently with a clean linen handkerchief or lens tissue. Oil and other sticky substances on the glass should be soaked with special cleaner for spectacles obtainable at opticians and drug stores



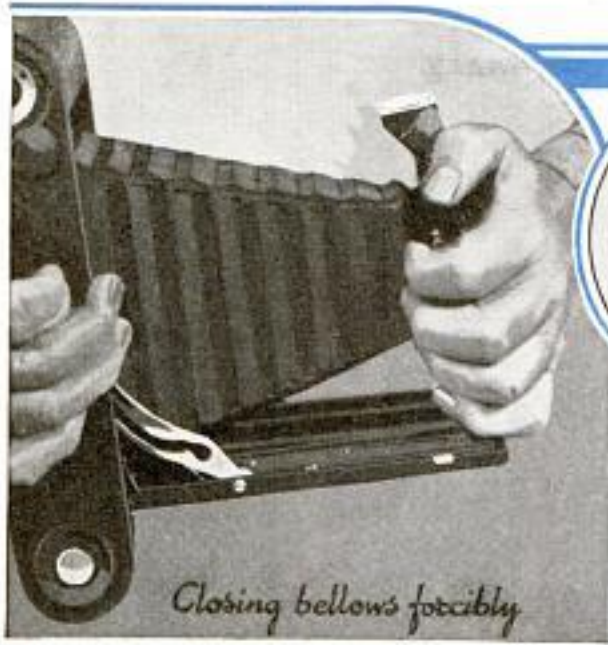
Instead of using a pair of scissors to loosen lenses, or a jackknife to turn screws, keep at hand a small spanner key that fits your lenses, and a tiny screwdriver. When removing lenses, avoid fingermarking them as this leaves an oily deposit and perhaps a trace of acid from perspiration. When replacing them, be careful not to strip the fine threads



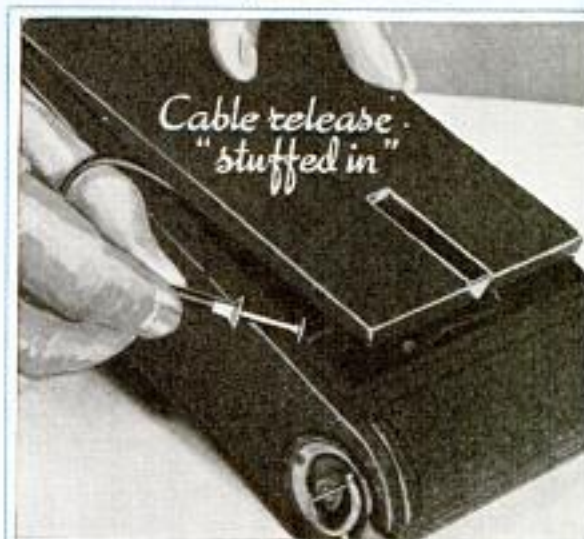
Oil on shutter mechanism courts disaster. Shutters are built to work efficiently when perfectly dry. Oil gums up the parts causing sluggish action and often complete failure. If the shutter sticks, take the camera to a competent repair man who will remove the lens and rinse the shutter in chloroform, or he may even have to straighten one or more shutter plates if they are bent



Abuses That Ruin Cameras



Bellows of a camera won't stand up under an "accordion treatment." Don't close them violently or they will puff out of shape. Close the camera slowly, allowing the air to escape gradually. Good bellows treated kindly should last the life of the camera without developing pinholes or cracks. On cameras having a ground glass, cut off one corner to permit faster escape of air



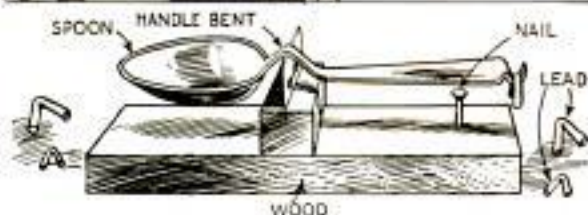
Stuffing a cable release into the camera case when closing it may jam the cable into the catch so you won't be able to open the camera again—or this practice may cause the cable to wedge against some delicate part inside, and even result in breaking it. If the cable release does not fit inside readily, it should be removed before closing the camera and stored elsewhere



A hard twist on the diaphragm housing may bend or warp the thin plates and you should avoid using the diaphragm lever as a grip to turn the housing. Shutters of the focal-plane type should not be left under tension for long periods of time. The spring should be released or it may suffer fatigue and lose its life. Besides, the cloth may be stretched out of shape



Old Tablespoon Serves as a Scale Weighing Small Quantities



Small amounts of photographic chemicals can be weighed in the home darkroom with a scale made from an old tablespoon. First make the base, with a piece of sheet metal mounted upright to serve as a fulcrum. After filing and bending the end of

the spoon handle to form a small hook, find the spoon's center of balance; file a nick in the handle at this point and bend an inverted V as indicated. Weights are made of strips of lead. The nail under the end of the handle prevents it from going too far down when a weight is hung on the hook before the chemical to be weighed is poured in the bowl.

Photographs Are Mailed Safely In Cardboard Protectors

Ordinary thin cardboard, such as is inserted in shirts at the laundry, may be used to protect mailed photos. Cut two pieces of the cardboard slightly larger than the print that is to be mailed. Lay these together and fasten them on two



sides with a stapler. Then slip the photograph between the cardboards and staple the other two sides.

Latest Plan Catalogue for Home Craftsmen

Hundreds of useful and attractive things to make in your workshop
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- RADIO EQUIPMENT, receivers, transmitters, amplifiers.
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The only cost to get this new catalogue is a three-cent stamp. When ordering be sure to print or write your name and address carefully

POPULAR MECHANICS PLAN SERVICE, 200 E. Ontario St., Chicago, Illinois



A Modern Paul Revere

WITH Mayor LaGuardia of New York City, the National Director of Civilian Defense, David Sarnoff of RCA recently demonstrated an "Alert" receiver that turns on automatically when it receives a special inaudible robot signal from a broadcasting station, rings a bell to summon listeners, and then shuts off when an all-clear signal is received.

At the transmitting station, photo A, a vacuum tube oscillator generates sub-audible "on" and "off" frequencies



which are fed directly into the broadcast station transmitter and control all local receivers equipped to be actuated by it. Within a few seconds the impulses turn on the "Alert" receiver shown in photo B, a green and red light glow, and the bell on the receiver rings. This 3-tube receiver can be operated 24 hours a day over a long period of time at low cost, and may be fixed-tuned to any one broadcasting station. It is then receptive to the inaudible signals from that transmitter. Its loudspeaker is normally silent until the special flash is received which energizes an electric relay that clicks the speaker into the circuit to reproduce the warning broadcast or special program. Simultaneously the bell rings.

"DX" ECONOMY SPECIAL

By Stanley Johnson, W9LBV



FOR THE beginner who wants to graduate from the crystal set stage, or the radio experimenter who enjoys DX-ing with a simple broadcast receiver, this one-tube "Economy Special" has a host of interesting features. Designed in breadboard fashion for easy construction, it has unusual "DX" (distance getting) ability with good headphone volume.

No A-battery is required, as the type 117N7-GT tube operates directly off the 110-volt a.c. or d.c. power line. Another feature is the 30c 4½-volt "C" battery which serves as a B-battery to provide ample power, thanks to the effectiveness of a screen grid regenerative detector circuit. Drain is so low that this battery should last about 6 months with ordinary usage.

All parts, including the tube and battery, less headphones cost only about \$4.50 even at the slightly advanced prices quoted in the new fall catalogs issued by the large mail order radio parts houses. The wood base is detailed in Fig. 1 and the location of the various parts indicated. Sand the board smooth and bevel the top edge slightly for a neat effect. Each part is mounted with short wood screws except the variable condenser. A hole is drilled through the board and countersunk on the underside for a 6-32 machine screw to mount this condenser. The antenna and ground binding post strip is raised to clear the board by means of washers or short bushings through which the wood screws are inserted. An Eby octal socket mounts directly on the baseboard. Photos A, B, C and D

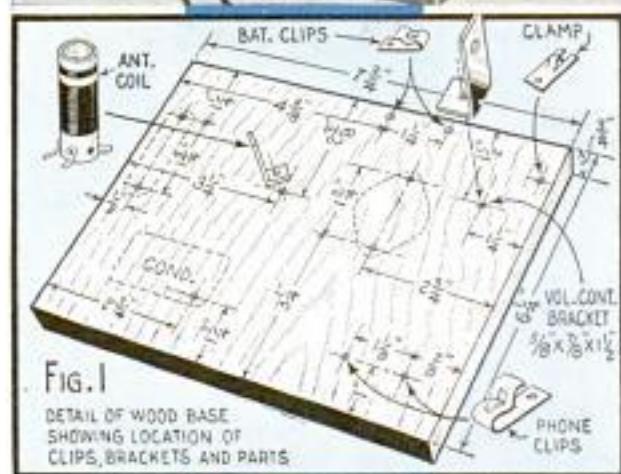


Fig. 1

DETAIL OF WOOD BASE SHOWING LOCATION OF CLIPS, BRACKETS AND PARTS

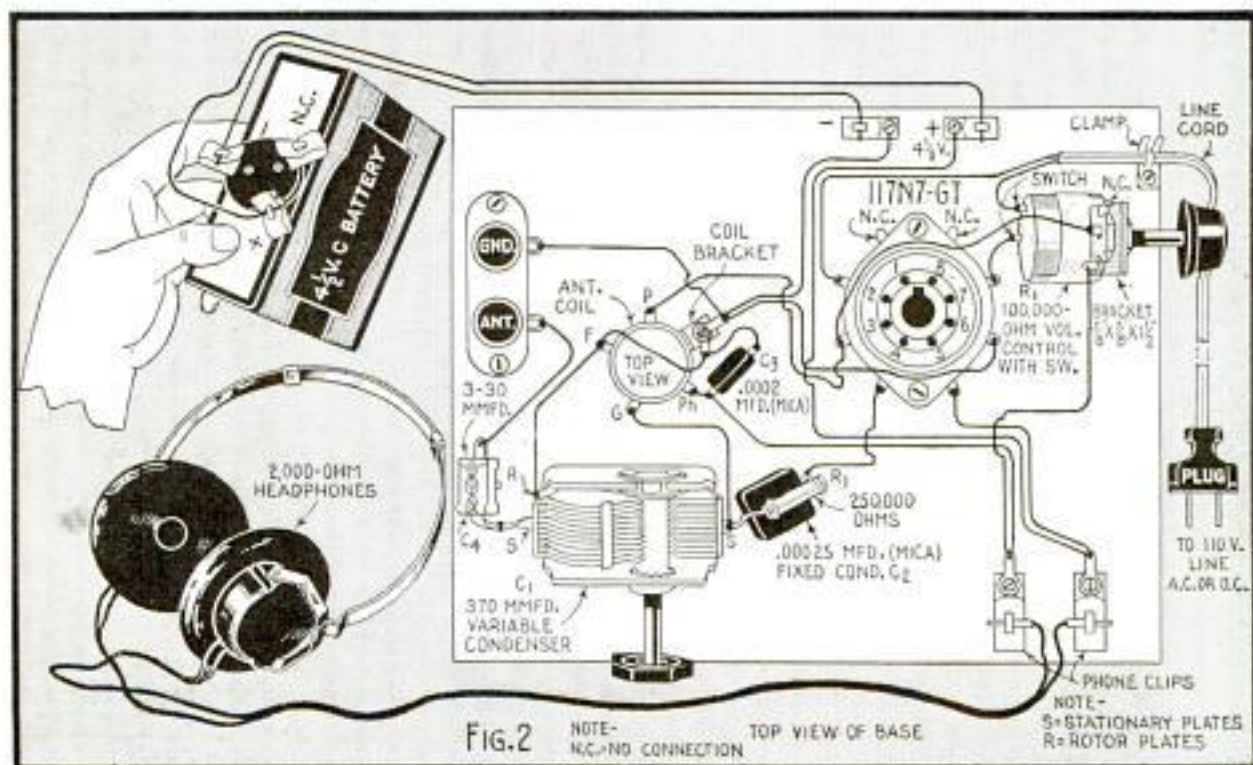
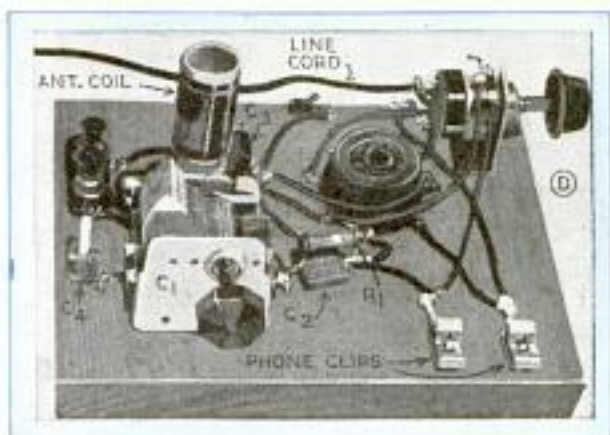
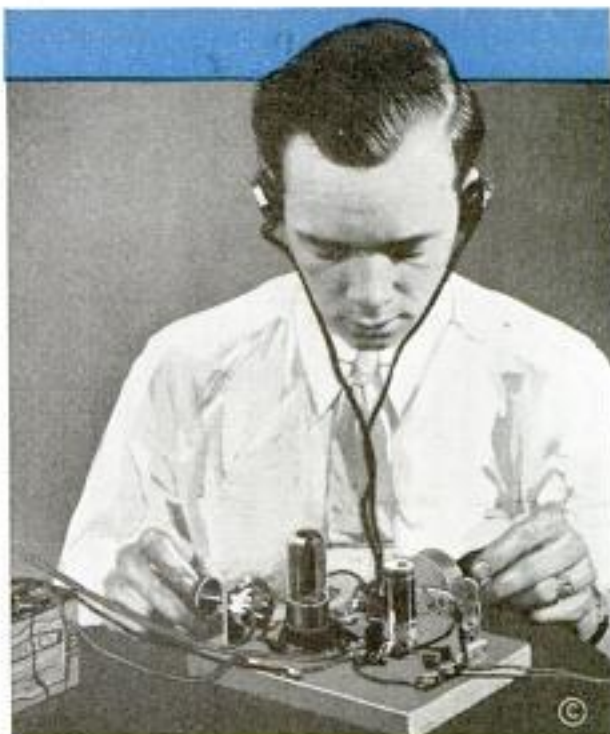


for BEGINNERS

show various views of the assembly, and all connections are clearly indicated in the simplified wiring diagram Fig. 2, which is a top view of the baseboard. It will be noted that the frame of the tuning condenser (C_1) is common with the rotor plates R; terminal lugs (S) for the insulated stationary plates will be found on both sides of the condenser.

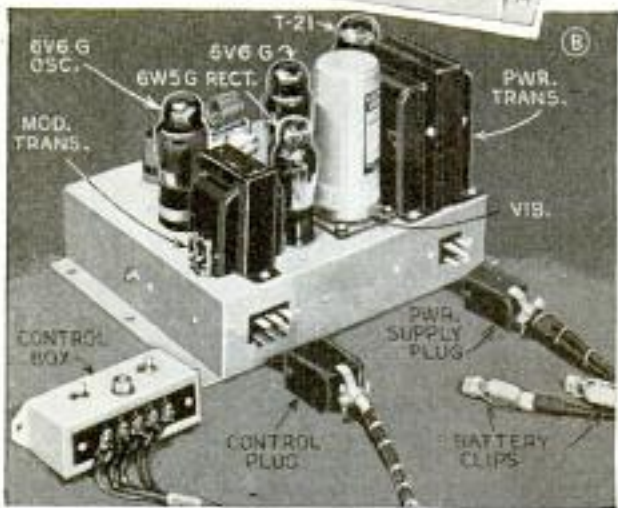
The antenna coil may be any low impedance solenoid single layer wound type, for a 370 or 365 mmfd. tuning condenser; do not use a high impedance type. This coil consists of two windings, one large and one small, as indicated in the schematic circuit diagram Fig. 3. The coil terminal connections shown in diagram Fig. 2 at F and G are for the ends of the large winding in the particular coil used in the model. Some coil manufacturers locate the terminals in a different sequence, therefore be sure to trace yours out and connect them accordingly. Either end of the large winding may be used for the ground end; in other words, the (F) end which is to be connected to the soldering lug under the coil mounting-bracket screw. The "tickler" or small winding terminals are P and PH. and should be connected to the leads shown although the small coil terminals

(Continued to page 182)



Thorndarson Electric Mfg. Co.
500 W. Huron Street

Portable Mobile Radiophone for 5-10 Meters



OF RUGGED chassis type construction especially planned for use in automobiles, this compact emergency unit operates from a 6-volt storage battery using a vibrator power supply which may be remotely controlled from any convenient point. Separate plugs and sockets are provided for the power supply and the control wiring. Modern improvements are included for simplified operation under all emergency conditions.

A front view of the completed kit unit is shown in photo A; the three variable condenser adjustments are made with a screwdriver and then locked with special nuts. The metering of the oscillator cathode current, the final grid current and final cathode current is done by plugging in an external meter in the jacks provided. Rear view photo B shows the cable plugs, battery clips and control box.

The schematic circuit diagram is given in Fig. 1; the R.F. tube line-up is as follows: a 6V6-G tri-tet crystal oscillator, and a T-21 final amplifier. The oscillator stage operates with a 20-meter crystal, and doubling is carried on in the plate circuit. At no time is operation of the crystal stage "straight through" recommended. The oscillator plate tank is capacity-coupled to the T-21 grid; this T-21 tube operates "straight through" on 10 meters, and, for 5-meter operation doubling in the final is accomplished. The final tank condenser is of the split stator type, and the final amplifier is neutralized in a conventional manner. The cathode tank coil is wound on a 1-in. form, and the oscillator plate and final plate tank coils are wound on National PB-16 bases with heavy copper wire. Power is taken from the final tank by means of a link.

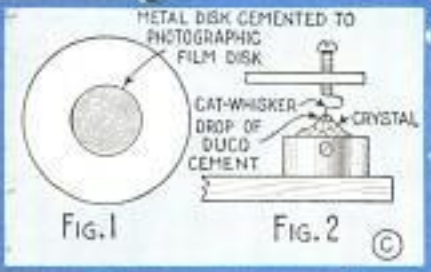
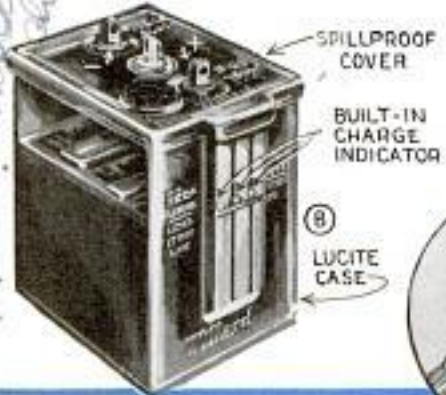
Power input to the final amplifier plate, when it is properly loaded, is from 10 to 12 watts. The final stage cathode current should be between 50 and 55 ma. A single 6V6-G tube operates as a Class A amplifier to modulate the T-21 tube. Provision is made for remotely connecting a carbon microphone to the primary of the microphone transformer which is installed on the underside of the chassis. A control with a screwdriver adjustment permits regulation of the gain of the audio system.

All parts are available from mail order

(Continued to page 184)

Practical RADIO SUGGESTIONS

(A) With "music in their heels" as well as in their fingers, Valley and Lynne startle audiences with taps coming through the loud-speaker of a P.A. amplifier, sounding like a whole regiment in perfect time. Contact-type "mikes" placed in heels and on stringed instruments are employed in this specialty act. (B) Miniature storage battery for portable sets, supplies both "A" and "B" power; the former direct and the latter by means of a separate vibrator unit. Has built-in charge indicator and is housed in a spillproof transparent plastic case 4 in. long, 3 in. wide and 5½ in. high



(C) Hints for crystal set users: cheap headphones can be improved by substituting the diaphragm shown in Fig. 1. Remove the thin metal diaphragm and use it as a pattern to cut one of the same size from thick photo film; cement a thin iron disk in exact center and replace in phones with metal disk shown. Fig. 2 old type cat-whisker may be cemented to sensitive point on crystal for "fixed" contact. (D) Compact tube shields with vertical grooves for flexible fit



(E) Headphone or speaker adapter; wafer disk goes under output tube, outlet coupler provides screw terminals for speaker leads, and tip-jacks for phones. Available in 3 types, for 4, 6 or 8-prong output tubes; two units are employed for sets having push-pull output. (F) Four-range rheostats; each unit has 4 different resistance values with corresponding current capacities, for regulating current and voltage in experimental applications. (G) Tiny thermometer mounts on auto antenna. (H) Handy holder for short lengths of solder



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Good Metal Stampings 314 Main St. Brooklyn, N.Y.

Chubbuck & Co. 37 W. 20th St. N.Y.C.

RCA info. C. Camden N.J.

Both Sides of Records Are Played Without Turning Them Over



This automatic record player with tandem tone arm plays both sides of double-faced records without turning them over. There are no needles to change. The tone arm returns to rest after playing the last record and shuts off the mechanism. The instrument provides two hours of music when the starting button is touched. The 9-tube receiver has three American and foreign bands; built-in loop antenna and continuous treble and bass tone controls.

Radio Interference Filter



Designed primarily for use on marine generators, this filter is also useful on all types of d.c. motor and generators for eliminating radio interference generated at the commutator. It is

said to use the largest duo-lateral wound chokes ever made. The unit is 18 in. long, 16 in. wide and 10 in. high.

Illuminated Speaker Cabinet

Illuminated by two 110-volt lamps reflecting light through colored plastic panels, this speaker is designed for use in clubs, restaurants and theaters. The decorative "pipes" are finished in gold lacquer.



Sound-on-Film for Dictation

This compact unit is designed for both recording and playback. Forty sound tracks are indented across the width of the film. The location of each track is indexed for each recording so that any particular track may be found quickly for playback.



Blueprints covering simplified radio construction articles in this and past issues are available for 25c each. Many popular tested circuits to choose from. Original detailed parts lists with names of supply sources, can be obtained from Popular Mechanics Radio Department upon receipt of postage.

NEXT MONTH—How to Build the Miniature Portable "Microtube" Three. Probably the smallest 3-tube broadcast receiver ever designed for home construction. New low-drain tubes, no larger than ordinary radio pilot lamps, used in a simple efficient circuit. Also—**How to Find "Hidden Transmitters" With Homemade Loop.**

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SHOP NOTES

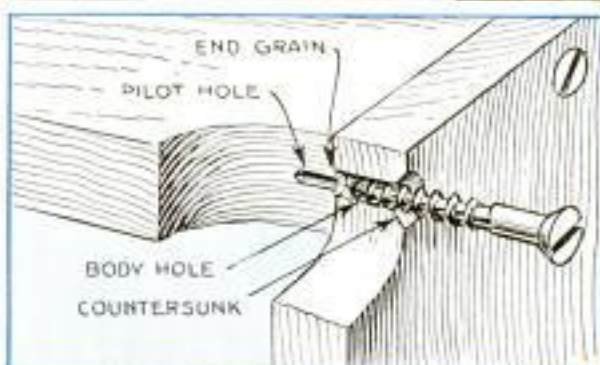
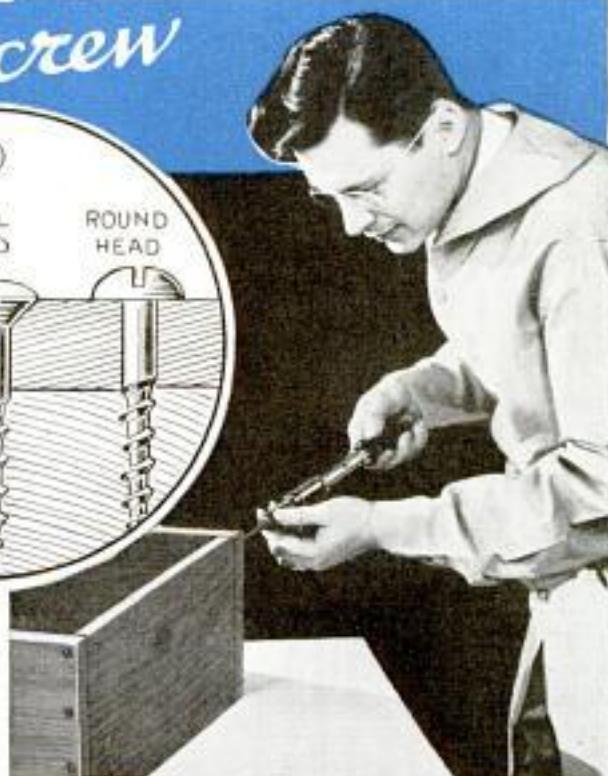
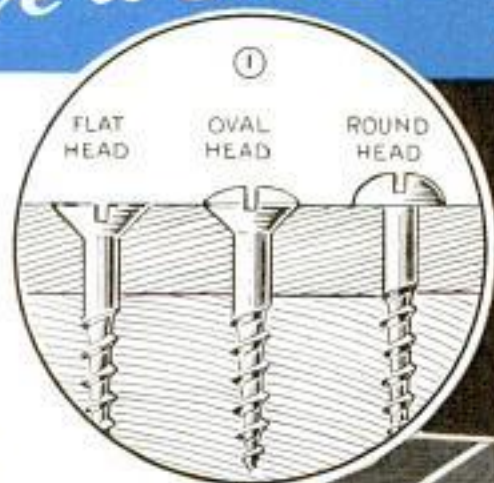
To Drive a Screw

Little tricks and proper procedure will make screws hold effectively

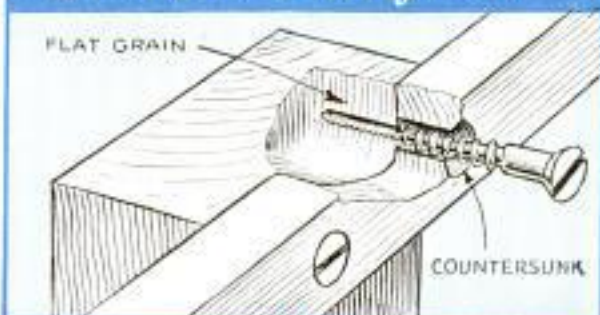
By
W. Clyde Lamme

UNLIKE glue or bolts as a means of joining parts made of wood, the holding power of a screw depends on the resistance of the wood structure to tearing or pulling strains. When being driven, a wood screw taps its own thread and relatively little of its power to hold parts together depends on the wedging pressure of the wood fibers, as is true with a nail.

In joining any wooden pieces it is necessary first to consider the type, size, number and length of the screws to be used. Fig. 1 shows the three types in most common use, any one style being made in a variety of sizes and lengths. After selecting the desired length, you take into account whether the assembly requires that the threaded section of the screw is to be driven into end grain, edge grain or flat grain, Figs. 2 and 3. Edge and flat grain are about equal in respect to the holding power of screws in most common woods with the exception of knots or other defects at the point where the screw is to be driven. When screws are driven into end grain, the smaller diameter of the counter-bore or body hole for the screw, is really a pilot hole and should be drilled only deep enough to start the threads, Fig. 2. In the common softer woods the threads will cut their way into end grain without the ne-



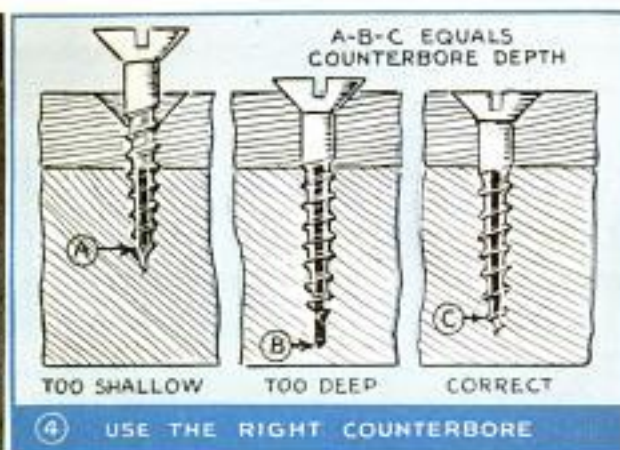
② ... into end grain



③ ... into flat grain



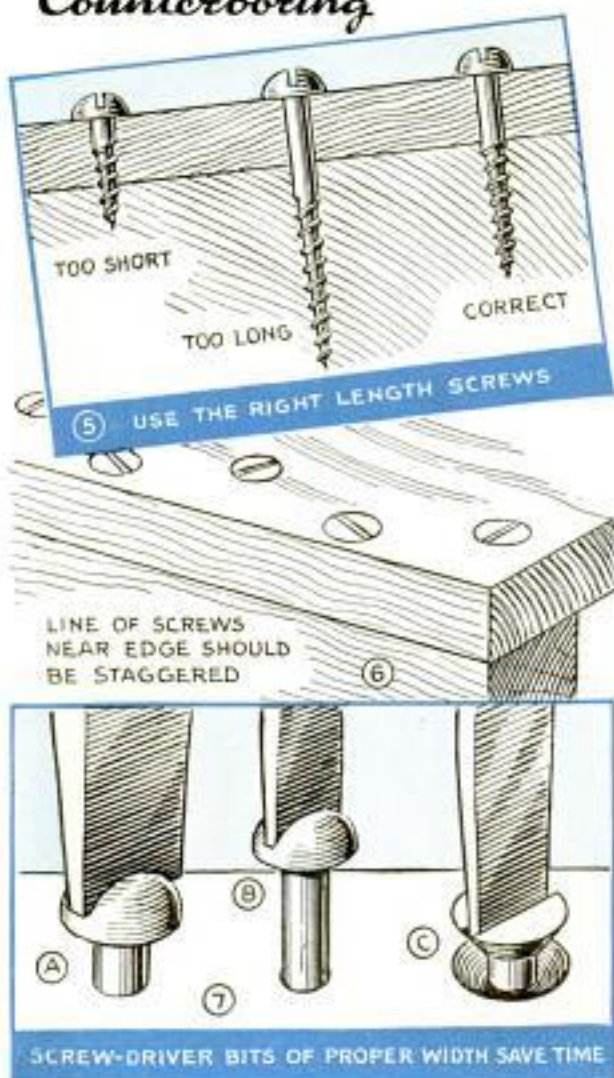
Counterboring

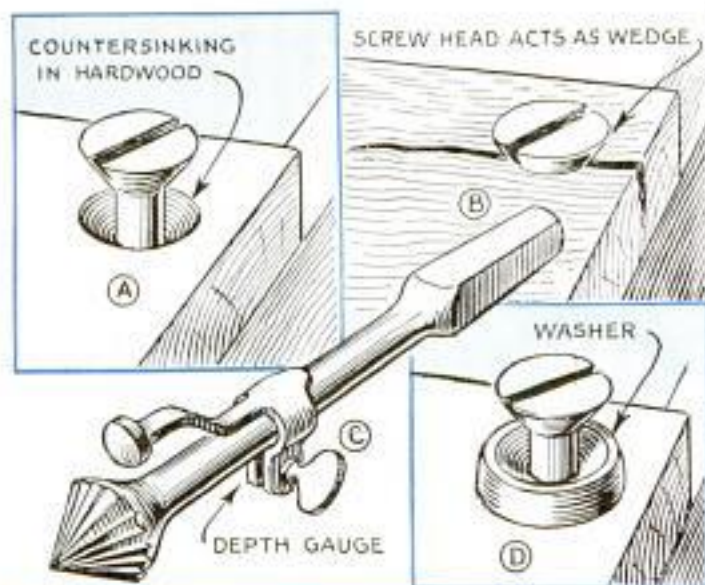


cessity of counterboring for a greater length of the threaded section. The only exceptions to this are the very hard, close-grained woods such as "rock" maple. In end grain the wood fibers lie parallel or nearly so to the axis of the screw and those directly in the path of the screw are either severed or forced aside. When driving screws into flat grain of hard close-grained woods, the small diameter of the counterbore should be just

slightly less in depth than the length of the threaded section of the screw as in detail C of Fig. 4. If the counterbore is too shallow in hardwood as in detail A, the undue twisting strain necessary to drive the screw may break it. On the other hand if the counterbore is too large or too deep as in detail B, the threads may pull loose before the countersunk head of the screw is seated flush. In hardwood, the diameter of the counterbore should be the same or a trifle larger than the body of the screw measured at the bottom of the threads, while in softwoods the diameter of the counterbore should be smaller in most cases.

To say that a screw is too long does not imply that its effectiveness is lessened, but means that there is little point in using a screw longer than necessary. An example is shown in the center detail in Fig. 5. In the detail at the left the screw is obviously too short to hold the parts together while a screw of the proper length as in the extreme right-hand detail, will result in a joint of maximum strength. When you drive a line of flat-head screws near the edge of the stock it's generally best to stagger them as in Fig. 6. Using a screw-driver bit of the proper width is also important. See Fig. 7. In detail A the wide bit is likely to twist out of the slot. Details B and C show bits of the correct size and



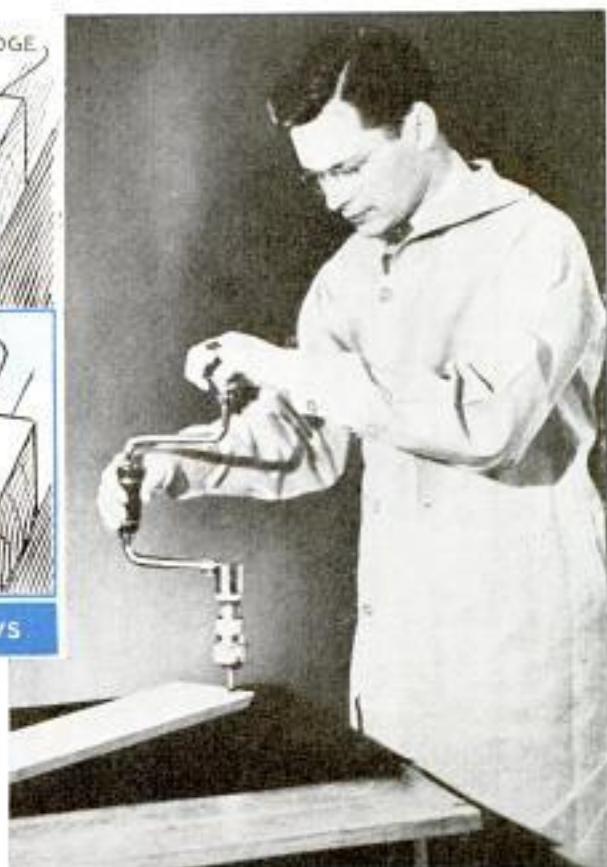


B COUNTERSINK HOLES FOR FLAT-HEAD SCREWS

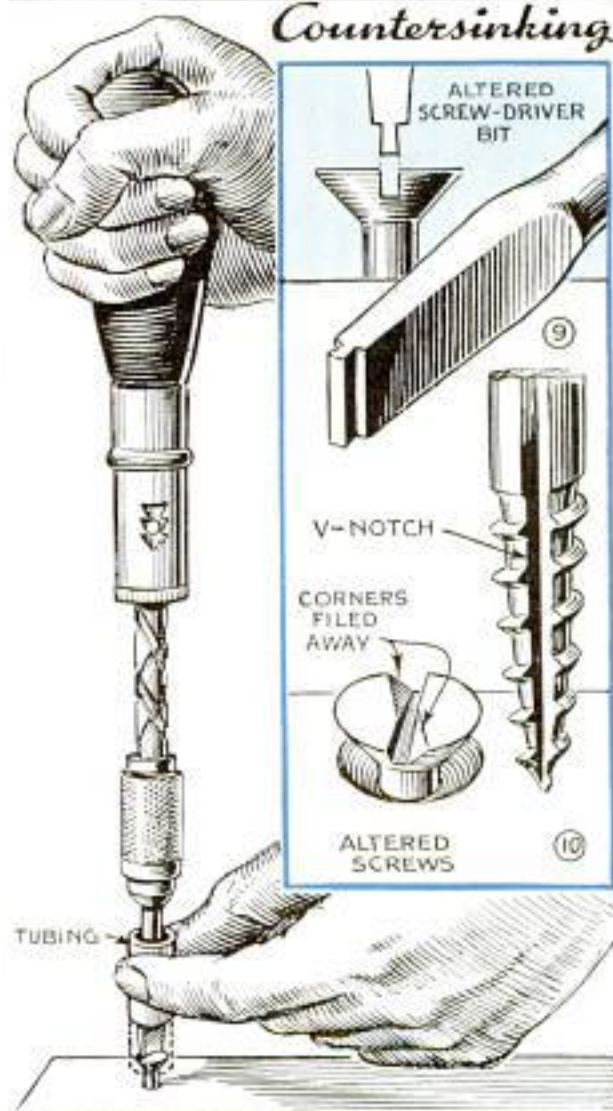
width for the size and type of screw. Countersinking flat-head screws to the proper depth in hardwoods is shown in detail A of Fig. 8. Countersinking to a diameter less than the head of the screw as in detail B sometimes results in splitting the wood. Use a depth gauge on the countersink as in detail C. A metal countersunk washer of the kind shown in detail D may be used with either a flat or oval-head screw to prevent splitting where the screw must be driven close to the edge of thin stock.

Grinding reverse bevels on the screw-driver bit as in Fig. 9 will help to give larger bits a better "bite." Fig. 10 shows one way of filing the screw slot to prevent the screw being turned out. Sometimes this is desirable, as on door hasps. Another kink that helps when driving screws into very hard woods or hard fiber is shown in the right-hand detail of Fig. 10. Filing a V-slot along the length of the screw causes the threads to cut through the hard material much like a tap. When driving a large number of screws of the same size you will find that a short piece of tubing slipped over the head of the screw prevents the screwdriver bit from sliding out of the slot. Using a little soap on screw threads should also be kept in mind as this helps to reduce friction.

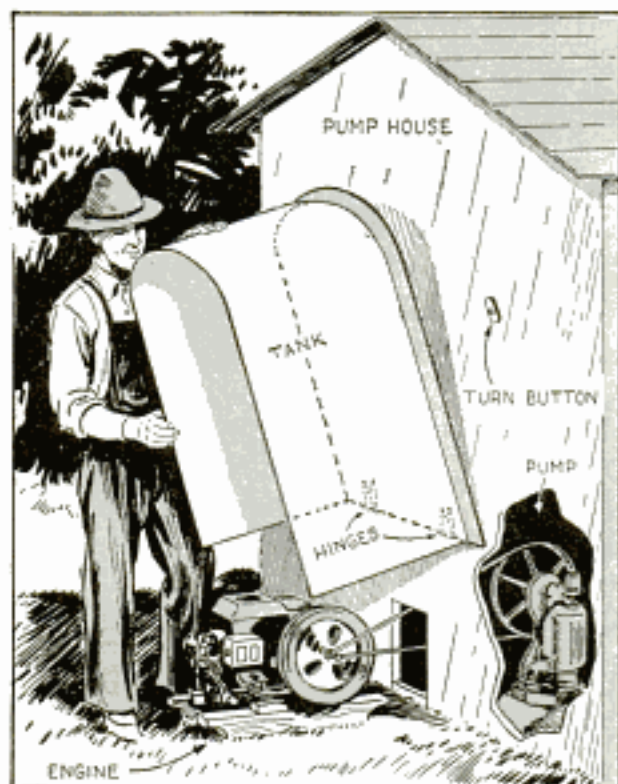
☞ Copper, brass and pewter may be cleaned successfully by applying a paste made with equal parts of flour, vinegar and salt. Let the paste stay on for about an hour, then rub it off, and wash the metal with warm water before polishing.



Countersinking



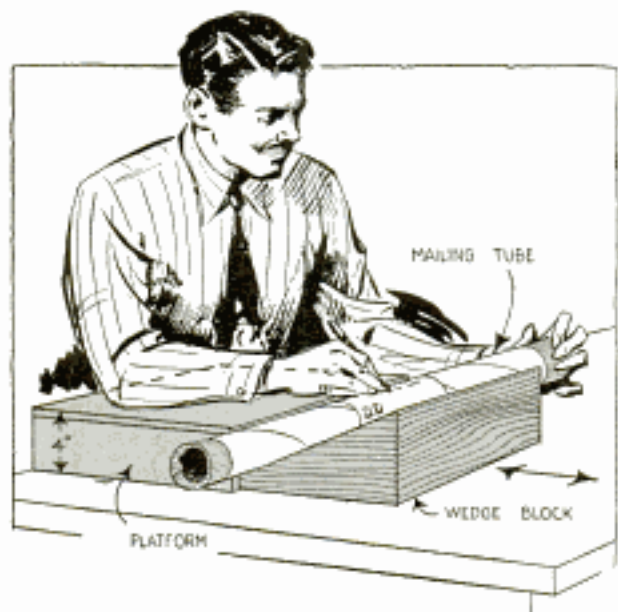
Stock Tank Makes Handy Cover Over Gasoline Engine



Not having room for his gas engine in the pump house, a farmer placed it outside the building as shown and covered it with an old steel stock tank. One end was cut out of the tank, which was hinged to the side of the pump house so that it could be raised off the engine when necessary.

Plywood Jig Holds Mailing Tubes While Addressing Them

Having large numbers of mailing tubes of varying lengths and diameters to address each day, one clerk made a jig like

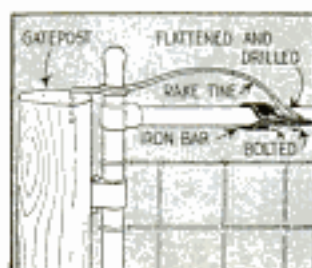


the one shown to hold them while writing the addresses. The jig is made of plywood and consists of two parts. One is made like a platform and the other is made wedge shape to slide under the platform. The mailing tube lies in the trough formed by the joining of the two parts.

—W. C. Wilhite, Carlinville, Ill.

Rake Tine Used as Spring Keeps Gate Closed

A good spring to keep stock gates closed can be made by using a rake tine as shown. The coiled portion of the tine is slipped over the end of the gate, and the bent end is driven into the top of the gate post. Then the pointed end of the tine is flattened and bolted to a steel bar, which is clamped to the top rail of the gate.



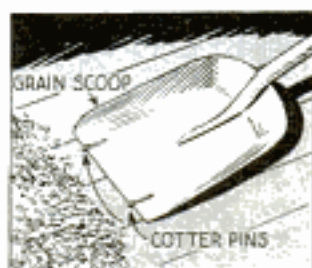
Horseshoe Handle on Ladder Balances It for Carrying



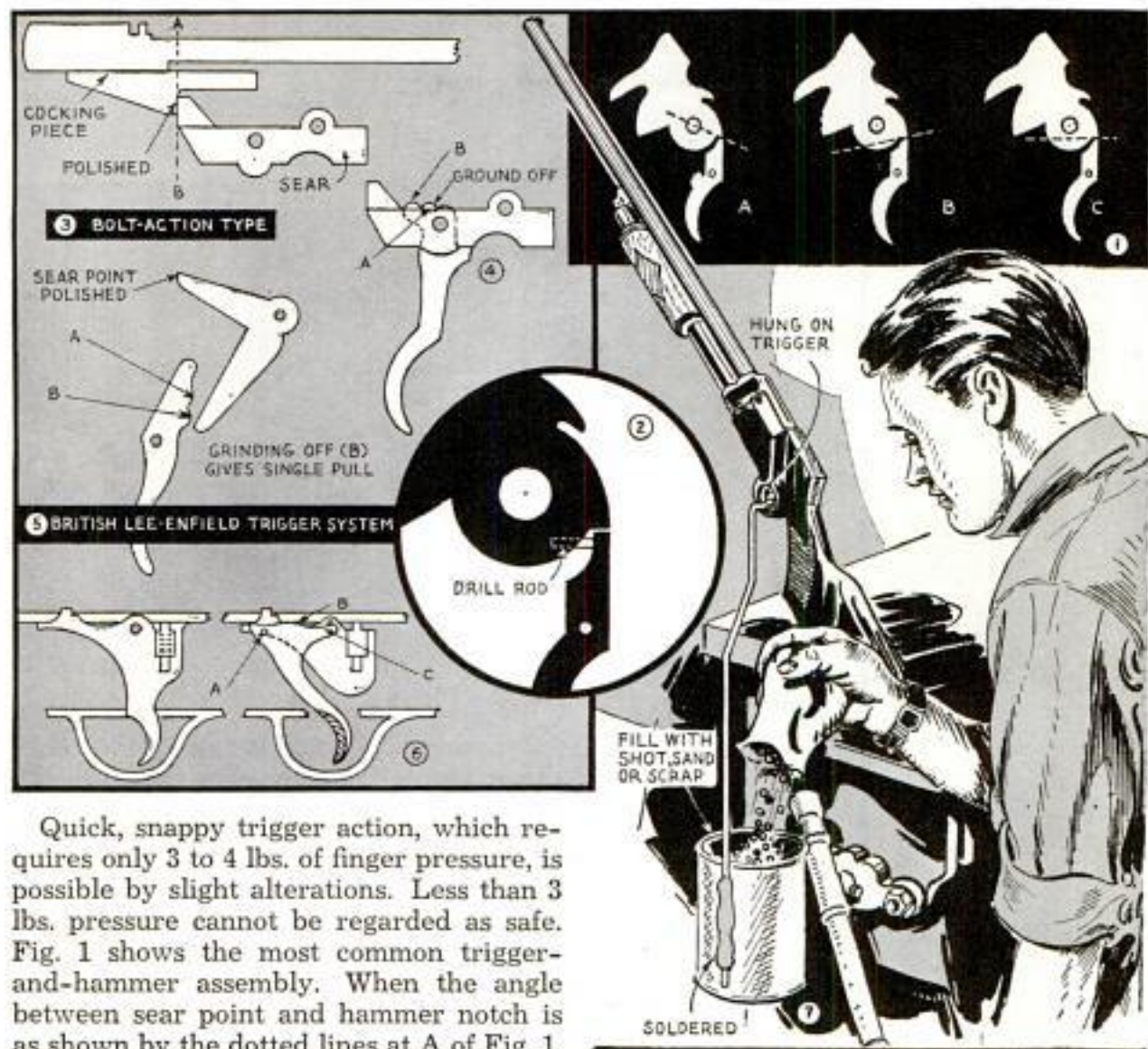
To avoid loss of time in finding the center of balance of a ladder for easy carrying each time it is picked up, nail a horseshoe to one of the side rails at the proper location. In this way, you will always have the correct balance so the ladder can be picked up and carried easily.

Cotter-Key Gliders on Scoop Protect Wood Floor

To keep a grain scoop from chipping or slivering the wood floor of a granary or wagon box, one farmer slipped a couple of cotter keys over the edge of the scoop. These serve as gliders and allow the work to be done without the edge of the scoop digging into the floor.



Adjusting Triggers of Rifles to Get Easy Action



Quick, snappy trigger action, which requires only 3 to 4 lbs. of finger pressure, is possible by slight alterations. Less than 3 lbs. pressure cannot be regarded as safe. Fig. 1 shows the most common trigger-and-hammer assembly. When the angle between sear point and hammer notch is as shown by the dotted lines at A of Fig. 1, the trigger pulls hard. By reshaping the parts as at B, the trigger works too easily which is unsafe, but if shaped as in detail C, it will work smoothly, quickly and safely. If the hammer notch is too deep, resulting in a long, slow pull, don't file away the front of it. It is much better to "pin" the hammer with a small piece of drill rod, as indicated in Fig. 2.

Fig. 3 shows the usual bolt-action type of firing mechanism. To reduce the pull, polish adjacent surfaces of the sear point and cocking piece along line AB. Be sure not to grind either point shorter, and do not bevel or round these surfaces, or the gun may discharge accidentally. Most bolt actions have a double pull for safety. In Fig. 4, the hump A, bearing against the underside of the receiver, is the fulcrum for the first two thirds of the trigger movement, drawing the sear point down out of cocking-piece notch, after which hump B

becomes the fulcrum. If you don't like a double pull, grind off hump A. Fig. 5 shows the change for British Lee-Enfield system. Never attempt stoning or grinding on any guns having sensitive firing mechanisms. Triggers of the kind shown in Fig. 6 can be improved. The original trigger is cut off and changed into a sear and a new trigger with double fulcrum B and C is attached by pin A.

Triggers of shotguns usually do not require much attention. When they must be lightened, however, the general principles explained in Fig. 1 usually will apply regardless of the type of action. For weighting trigger pull, spring scales are sometimes employed, but they quite often are inaccurate. A trigger weight made by soldering a wire hook to a small tin can, Fig. 7, is better for this purpose. The can is filled with shot or sand to exact weight required.

Hole Drilled in Tubular Track To Oil Door Hanger



To avoid the job of rolling heavy sliding doors off the track for oiling the hanger trucks, one farmer drilled a $\frac{1}{2}$ -in. hole through the weather shield and the tubular track. This made it easy to oil the rollers of each hanger by simply sliding the door to the proper location. Before drilling the hole, make sure that it is located so that both hanger trucks will pass by it when the door is opened wide.

Lathe Work Illuminated Brightly With Lamp on Carriage



work at all times. A desk lamp of the type having a flexible standard is best for this purpose. The base is removed and the

Eye strain caused by watching intricate work in a lathe under changing light conditions can be reduced to a minimum by mounting a lamp on the carriage so that it follows the cutting tool. This assures that the light will be of the same intensity on the

standard is fastened to a flat-iron bracket, which is bolted to the carriage.

—James R. Westbay, McKeesport, Pa.

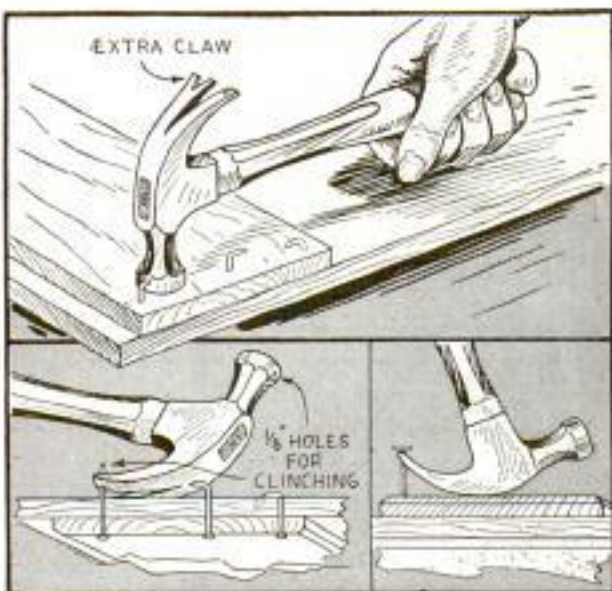
Bent Comb Makes Handy Rack For Drying Price Tags

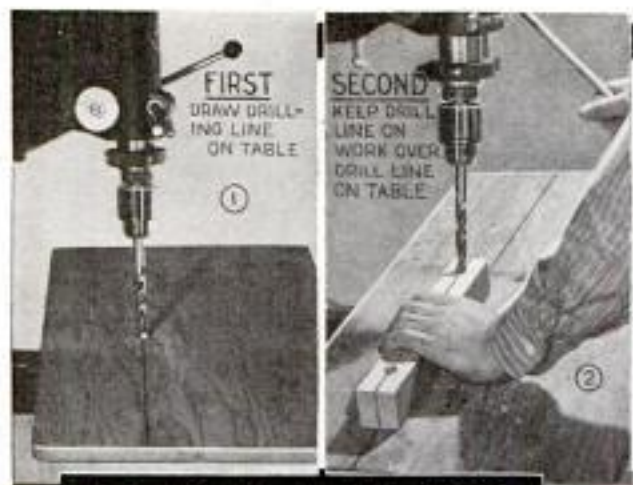
When bent as indicated, an ordinary celluloid or rubber comb provides a handy rack for drying price tags and other small cards. If a number of such tags are made up at regular intervals, it will be a good idea to bend several combs for the purpose and keep them on hand for future use.



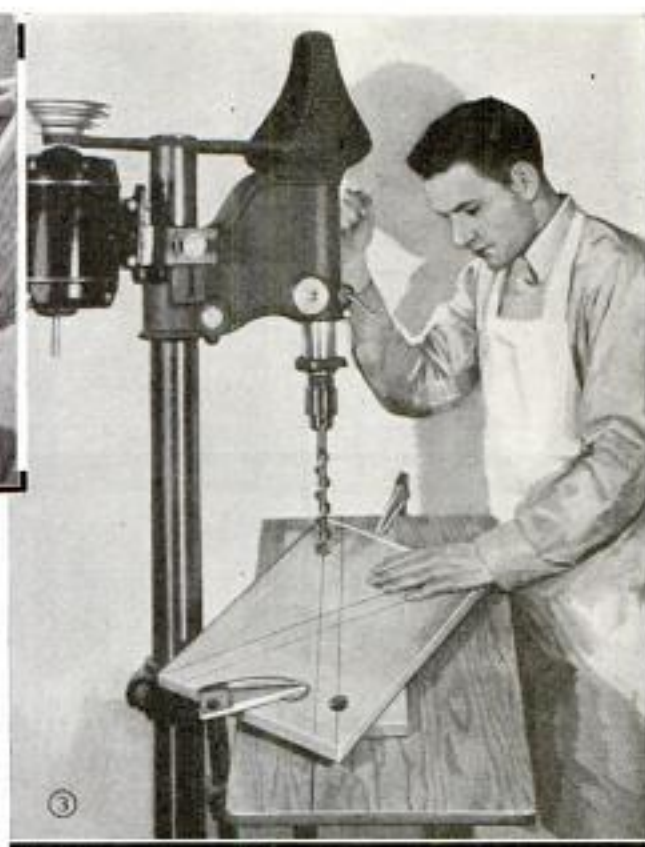
Improvements on a Hammer That Aid in Clinching

By filing a V-notch in one of the claws of a carpenter's hammer, as shown in the lower right-hand detail, you have a simple means of pulling long nails after they have been pulled part way in the usual manner. As proper clinching of nails in some kinds of work is very important, it is a good idea to fix your hammer so that this can be done both easily and rapidly. A hole drilled through one of the claws as shown in the lower left hand detail, and one drilled in the hammer head as shown in the upper detail will enable you to clinch a nail easily regardless of its position.





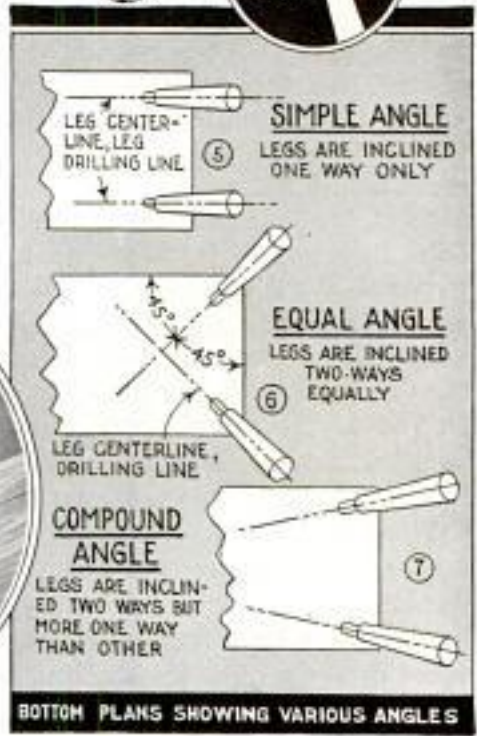
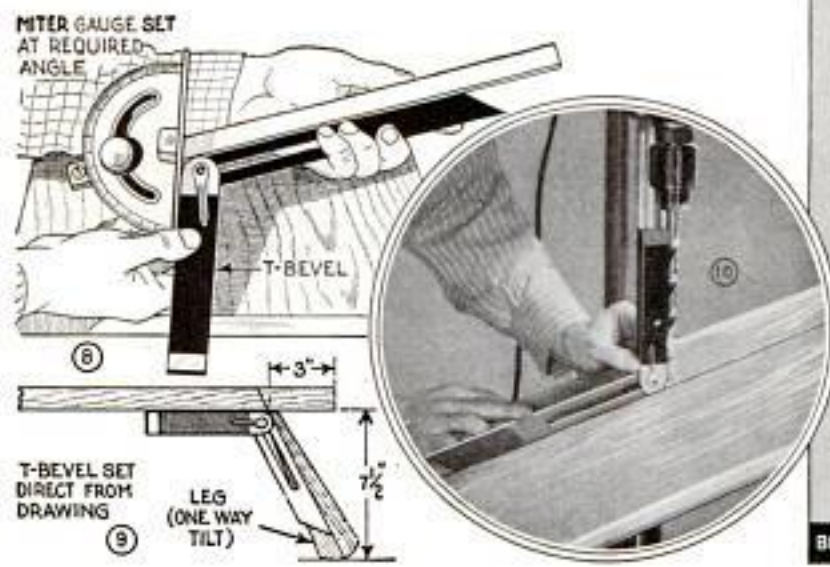
DRILLING *at an angle*

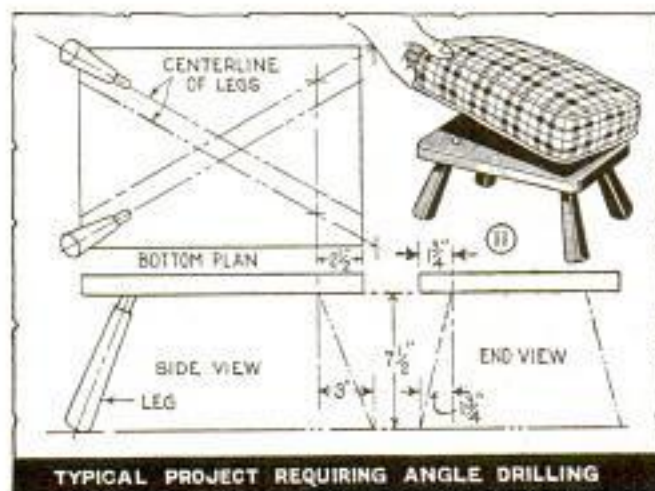


MANY furniture projects require the drilling of holes at an angle. The stool shown in Fig. 4 is a typical example. In this project, the legs may be tilted one way only, as in Fig. 5, to make a simple angle with the top, or they may be tilted both ways as in Figs. 6 and 7, to form a compound angle.

In drilling at an angle it is necessary first to have a drilling line marked with pencil on the auxiliary wood table of the drill press, as in Fig. 1, the line being directly under the drill point and parallel to the back edge of the drill table. Second, in all drilling operations the centerline of the hole to be drilled must be directly over the drilling line marked on the drill table. See Fig. 2.

The first actual step is to determine how much the drill table must be tilted. In the case of a simple angle, the tilt is often given in degrees and can be conveniently taken off by setting a T-bevel to a miter gauge set at the required position, as in Fig. 8. When



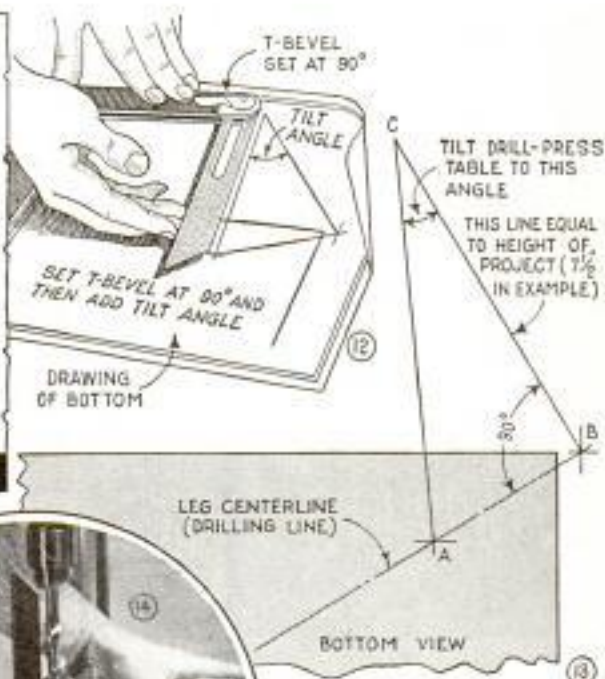


TYPICAL PROJECT REQUIRING ANGLE DRILLING

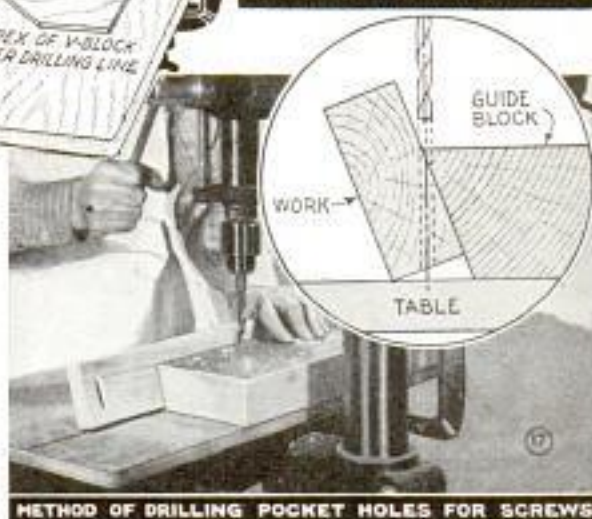
the degree tilt is not given, the T-bevel can be set from a drawing of the project, Fig. 9. Then the drill table is tilted to the angle determined, keeping the blade in line with the drilling line as in Fig. 10, after which the work is placed in position for drilling.

The drill table tilt for compound angles is determined by making a simple full-size layout of the bottom plan of the project. In a typical project of this kind, Fig. 11, the tilt of the legs is usually expressed in terms of inches. The bottom plan may be given, or, if not, can be readily constructed from dimensions given in the side and end views. Only one corner of the bottom plan need be drawn, as shown in Fig. 13. It should show the centerline of the leg, line AB. At right angles to line AB, erect a line BC equal to the height of the project. Join C to A. The angle at C will be the tilt angle. In taking this off, set the T-bevel at 90 degrees, and then add the angle, as shown in Fig. 12. Tilt the drill table to this angle, Fig. 14. Use the paper plan of bottom to mark the leg centerlines on the underside of work and then drill, keeping the leg centerline over the drilling line on the drill press table, as in Fig. 1.

When the work is round, the drilling lines of holes always radiate from the center. After determining the required tilt, work of this kind should be mounted on a pivot directly over the drilling line on the drill press table, as in Fig. 15. Equal angles,



USE PIVOT ON RADIAL ANGLES

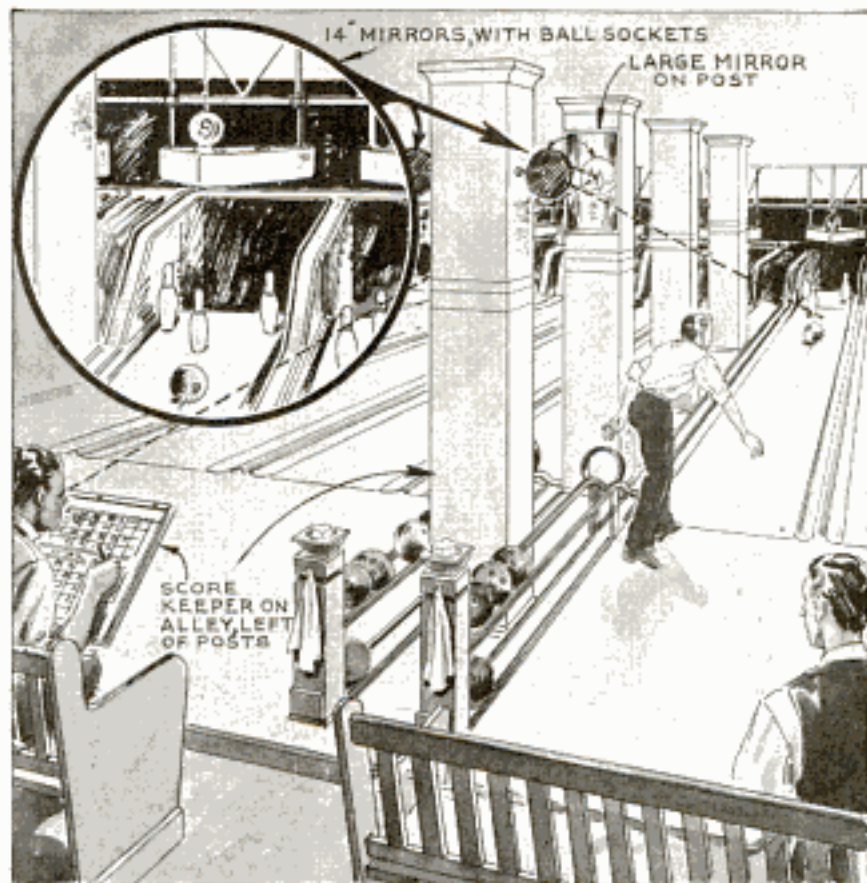


METHOD OF DRILLING POCKET HOLES FOR SCREWS

see Fig. 6, are conveniently worked with a V-block placed as shown in Fig. 16. The one other type of angle drilling (pocket holes for wood screws) requires no calculation, and you can work the tilt most easily by supporting the work against a guide block which is cut at a 15-degree bevel, as shown in Fig. 17.

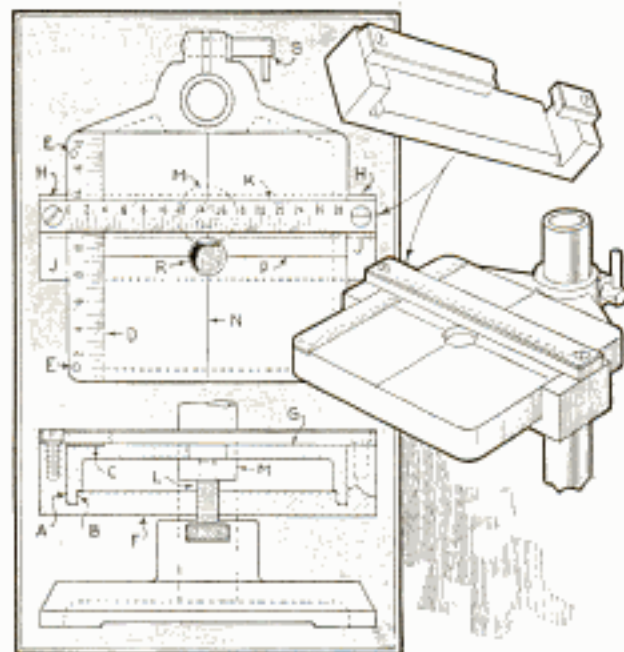
Mirrors in Bowling Alley Aid the Score Keeper

In a Chicago bowling alley where a row of posts made it impossible for a score keeper to see the pins in both alleys adjacent to the posts without moving from one to another, a couple of mirrors were arranged to take care of the trouble. As indicated, a small, adjustable mirror was mounted on the first post so that it reflected the image of the pins in the right-hand alley on a larger mirror attached to the second post. With this arrangement, the score keeper sat where he could see the pins in the left-hand alley, and also see into the large mirror.—C. M. MacChesney, Chicago.



Scales on Drill Press Table Help in Drilling Spaced Holes

To save time when drilling spaced holes in sheet metal and other material, the table of a drill press was fitted with two scales, one on the table and the other on a carrier. First the table sides A were milled true and short steps B were milled on the inner surfaces to take a guide or carrier, after



which the left edge C was milled to take scale D flush with the surface, the scale being held in place by pins E. Then the table was divided equally by guide lines N and P, which intersect directly under the drill. Next the guide F was machined to fit. A steel strip was then fitted over the top of the table to carry a standard scale K, both the strip and scale being screwed to the carrier. A hole was tapped through the center of the guide to accommodate the knurled screw L and the clamp disk M. Hole R was reamed out to a standard size so that a plug could be set in the chuck to line up the table. When drilling a series of holes laterally, the guide is adjusted the desired distance away from the line P as indicated on scale D, after which the clamp screw is tightened. To position holes longitudinally, the edge of the work is located the correct distance from line N as indicated on scale. After the first hole has been drilled, other holes are positioned by moving the end of the work in either direction until the proper distances are read on the scale.

—John Honegger, Bloomfield, N. J.

Hollow-Tile "Stove" Heats Sand On Winter Construction Jobs



To keep sand warm and dry on a winter construction job, a workman made a stove of hollow tile, piling the sand and stone over it as shown. Fuel is inserted from both ends of the tile.

Underground Tank Is Removed Easily by Floating It

Having a large fuel-oil tank to remove from underground, one workman did the job singlehanded with little labor. First the tank was emptied, and then the soil was dug away from around it, after which water was applied to the hole to float the tank. A minimum amount of water can be



150

used by applying just enough to float it, and then shoveling the dirt slowly back into the hole. This displaces the water, causing it to rise and bring the tank with it. It may be necessary to replenish the water as the work progresses to replace the water that soaks into the back fill.

Electrician's Shockless Tweezers Made From Toothbrush Handle

An electrical worker and radio technician solved the problem of working around "live" equipment without danger of short circuits by using a pair of nonmetallic tweezers. These were made by slotting an old toothbrush handle to form jaws as shown.



—Paul H. Smith, Norfolk, Mass.

Flag Reverses to Change Color



Instead of carrying two signal flags of different colors to indicate caution or danger, one workman uses a sack flag. The inside is green, and the outside is red so that it can be reversed at will to expose either color.

"Spread Feet" Support Ladder And Help Prevent Tipping

The tendency of a long ladder to tip when used in an orchard was minimized by bolting feet to the lower ends of the side rails. The feet were made from quarter sections cut from an old auto wheel rim and bent as indicated.





Molds to Cast MODEL-LOCOMOTIVE WHEELS

MODELMAKERS who build locomotives need not go to the expense of purchasing the wheels, Fig. 1, if they cast them in these brass molds, which can be used repeatedly. The molds shown are not dimensioned to a particular scale, but by following the instructions you can make them to any desired scale. All you need is two small pieces of brass, one a little thicker than the wheels to be cast to serve as the mold, and the other to serve as a cover.

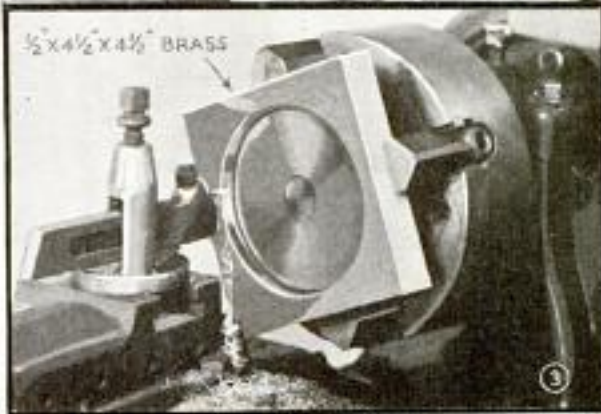
First, chuck the thick piece in a lathe and turn it to form a profile of the wheel to be cast, Fig. 3. Turn the depression for the hub, tire and tire flange, and then turn the rest of the profile to equal the thickness of the spokes. Be sure to allow a 2-degree draft or taper on the hub and tire-flange depressions. This is necessary to assure easy removal of the casting. It may be necessary, after turning the hub depression, to use a mill to elongate it to form the crank lug.

The next step is to cut segments and rivet them in the mold to form the spokes, Fig. 2. These can be cut from brass on a jigsaw, using a jeweler's blade. Tilt the saw table at a 2-degree angle to taper the segment edges to get the necessary draft. Now, cuts or scores should be made in the face of the mold from each spoke position as indicated by the dotted lines in Fig. 2, to allow air to escape when pouring the metal.

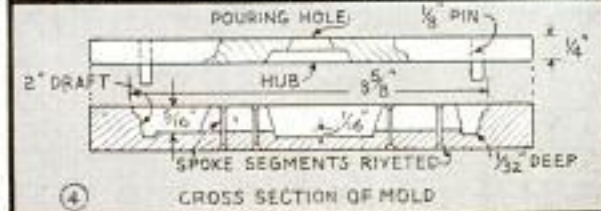
The upper half of the mold is quite simple to make. It is fitted with four pins to



WHITE METAL
OR LEAD



$\frac{1}{2}$ " X $4\frac{1}{2}$ " X $4\frac{1}{2}$ " BRASS



POURING HOLE $\frac{1}{8}$ " PIN
HUB $3\frac{5}{8}$ "
SPOKE SEGMENTS RIVETED $\frac{1}{32}$ " DEEP
2" DRAFT
CROSS SECTION OF MOLD

engage holes in the lower half of the mold. A tapered hole is bored out on the lathe to form a hub for the inside of the wheel, and is continued right through the plate by drilling, Fig. 4. This hole is for pouring and should be countersunk on the inside to permit easy removal from the casting. Before using the mold, it should be heated slightly and smoked well on the inside.

Fence-Splicing Crank Pulls Wires To Make Repair Easily



For quickly stretching broken fence wires, one farmer uses a tool shaped like the handle of a speed wrench. In use, loops are formed on the ends of the broken wire and the splicing wire is tied to one loop and run through the other. Then the splice is run through a hole in the end of the tool, which is then rotated, winding the splice on the tool and pulling the two broken ends of the wire as close together as possible.—I. N. Mast, Fayetteville, Ark.

Brake Drums Anchor Gate Posts

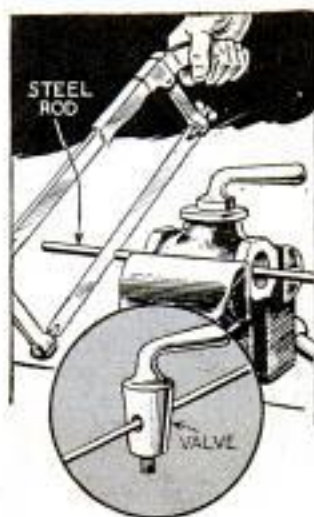
To keep steel gate posts from loosening in the ground, drive them in the usual manner, then drop an auto brake drum or discarded disc-harrow blade over each post and drive it down level with the sur-



face of the ground. Lateral movement of the post will thus be restricted so that it does not loosen easily.

Discarded Valve Holds Rods While Cutting Them

Having a number of small steel rods to cut into short lengths, a plumber clamped a valve of the type shown in a bench vise and used it to hold the rods. Inserted through the opened end, the rod was gripped or released by turning the handle of the valve.



Glove Slipped Over Sledge Handle Is Emergency Stop Signal

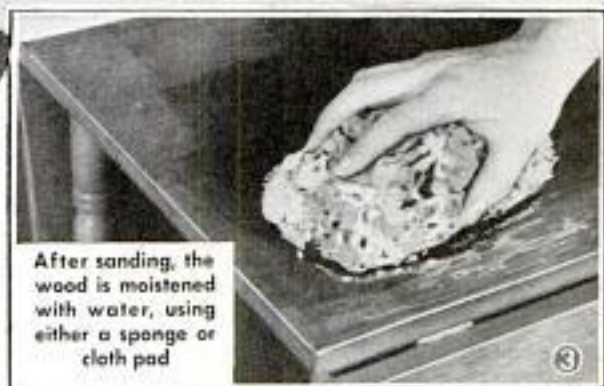
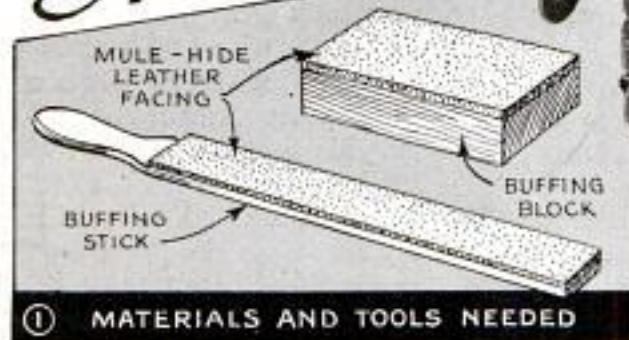
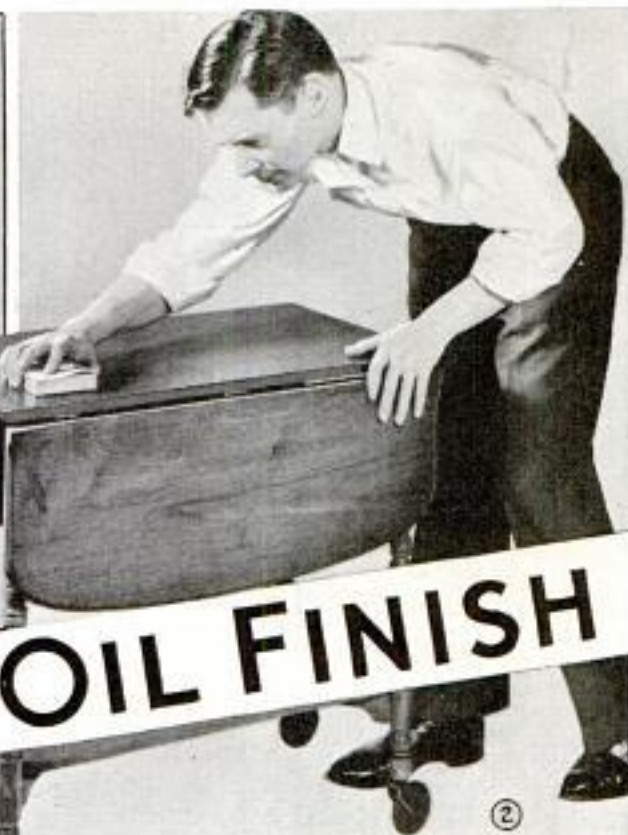
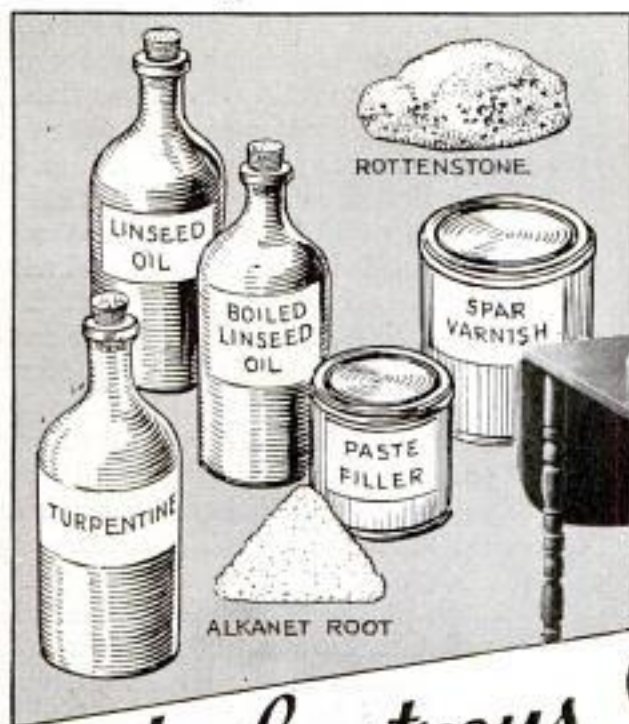


When a dangerous place in a road was found, and there was no flag at hand, one worker placed his sledge at the spot and slipped his glove over the handle to serve as a stop signal to motorists. A leather glove will retain its shape and be easy to see.

Rubbers Avoid Slipping of Ladder

Besides carrying his storm rubbers for protection against dampness, one painter also uses them to keep his ladder from slipping on a sidewalk or other smooth surface. The bottoms of the side rails should be rounded, as sharp edges would damage the rubber heels.





① MATERIALS AND TOOLS NEEDED

MANY articles made of wood, particularly of walnut, mahogany, and other hardwoods, can be beautified and the life of their finishes increased if the worker follows to some extent the methods of gunsmiths, to produce a soft, beautiful oil finish. The finish is in the wood, not on it—the surface is quite bare—but it is highly resistant to moisture and ordinary use will not scratch it.

Few materials are needed, and only two tools—a buffing stick and a buffing block, Fig. 1. The stick is used somewhat like a file, to buff off legs, spindles, arms and other rounded surfaces while the block is used on table tops and other flat surfaces. The working surfaces of both tools are covered with a leather known to saddlers as mule hide. For materials you need a lump of rottenstone about the size of your fist, 1 pt. each of pure raw linseed oil and boiled linseed oil (no fishoil substitutes), ½ pt. good spar varnish, ½ pt. pure turpentine, and a small can of any dark col-

After sanding, the wood is moistened with water, using either a sponge or cloth pad

Then the surface is steamed by playing the flame of a blowtorch over the dampened wood

This raises the grain which is removed by sanding lightly with very fine sandpaper



Apply a coat of raw linseed oil and turpentine to the sanded work, wipe off after 30 min., and then let the work stand overnight

ored paste filler. Keep the can of raw linseed oil closed tightly, but the can of boiled oil open—but protected from dust—and let it oxidize and get as thick and syrupy as possible. A small amount of aniline red, or a handful of alkanet root may be added to the oils to produce a reddish tinge, which greatly enhances the appearance of most brownish woods.

First, the work should be sanded thoroughly, beginning with coarse abrasive and ending with the finest, Fig. 2. Aluminous oxide cloth, or garnet paper will do the job much better than sandpaper. Next, moisten the entire surface with a wet sponge or pad of cloth, and dry quickly by playing a blowtorch flame over it, Figs. 3 and 4. This will raise the grain, after which it should be sanded down very lightly, with the finest grade of abrasive, Fig. 5. Repeat the process of wetting, flaming, and sand-

ing until the grain does not rise. If you have no blowtorch and the work is too large to hold over a gas flame, place a layer or two of cloth over the work and press with a hot flat iron.

The first treatment of the sanded wood consists of spreading on a coat of raw linseed oil, 3 parts, mixed with turpentine, 1 part, Fig. 6. Let this stand 30 min., then wipe off the surplus oil, and let stand overnight. Next, seal all end grain against further absorption of oil, with a coating or two of paste filler consisting of equal parts of spar varnish and japan drier, well



Next, seal all end grain against further absorption of oil with a coat or two of paste filler well rubbed into the wood surface



After 12 hrs., apply from three to six coats of boiled oil 24 hrs. apart, rubbing each coat into the wood with the bare hands



Follow the oil treatment with a coat of boiled oil and drier and let dry until tacky; then rub it off across the wood grain

rubbed in, Fig. 7. When nearly dry, rub off the surplus paste and let dry hard for at least 12 hours. Now apply from three to six coats of the boiled oil, well rubbed in with the bare hands, 24 hrs. apart, Fig. 8. Allow the last coat to dry 24 hrs. or longer, after which you apply a coat consisting of equal parts of boiled oil and drier. Let stand until quite "tacky," rub off surplus across the grain with burlap or other coarse material, Fig. 9, and let dry 24 hrs. By this time the pores in the grain should be almost filled up. If not, hasten the work with a coat of filler, well thinned with turpentine and a little boiled oil. Rub off the surplus when dry, apply another coat of boiled oil and drier, and rub off all surplus when it gets tacky.

Now comes the rubbing. Take your buff stick and rub the leather surfaces several times over a lump of rottenstone, Fig. 12, and use it with a light, brisk filing motion, diagonally across the grain on legs and other rounded surfaces. Use the buffing block in the same way on all flat surfaces, Fig. 11, always working at a slight angle with the direction of the grain. Rub the leather over the rottenstone frequently—and be sure you do not pick up any small

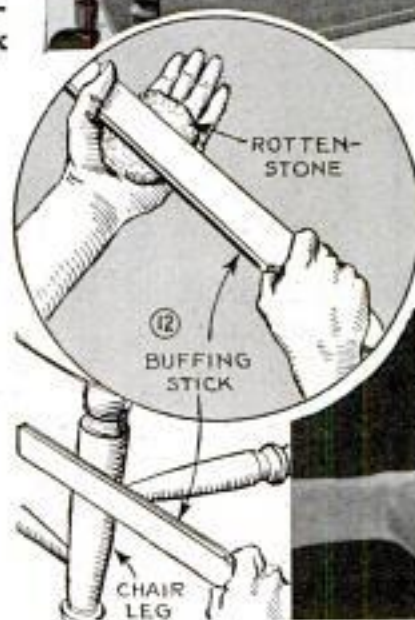
⑩ POLISH FORMULA

Heavy boiled linseed oil	16 oz.
Turpentine	2 oz.
Japan drier	1½ oz.
Venice turpentine	4 teaspoonfuls
Carnauba wax	400 grains

particle of grit that would make a scratch. As the leather becomes slick and shiny from the oil it picks up, scrape it clean with a knife, Fig. 13, and apply more rottenstone. The more you rub the better will be the finish. This finish is never completed, but is renewed at intervals as needed. A drop or two of the syrupy boiled oil on the heel of the hand may be rubbed in over a square foot or two of surface, whenever you feel ambitious but not too often—say once a month or so for six months. Age—and rubbing—bring out the beauty even in plain grained woods.

When satisfied that you have done your best, fill the formula in Fig. 10 and use it, and nothing else, as a polish in the future. Melt carnauba wax and Venice turpentine over a water bath, add the oil and drier, and simmer slowly for 10 min. Then add the spirits of turpentine, and stir until the mixture is cool. It can be stored in a screw-topped glass jar. A small amount of this polish applied with a rag and rubbed vigorously gives a superior and lasting finish to any wood and is harmless to varnished surfaces. It will not cause the finish to check, no matter how long it is used.

Maple and some other light colored woods possess many hidden beauties brought out by judicious darkening with stains. One of the best stains for maple is a strong solution of potassium permanganate. After applying, allow the solution to dry for an hour or so and then play a torch flame over the sur-



When the leather face of the buffing stick becomes slick from the oil, scrape it clean with a knife and apply more rottenstone, repeating this as may be necessary



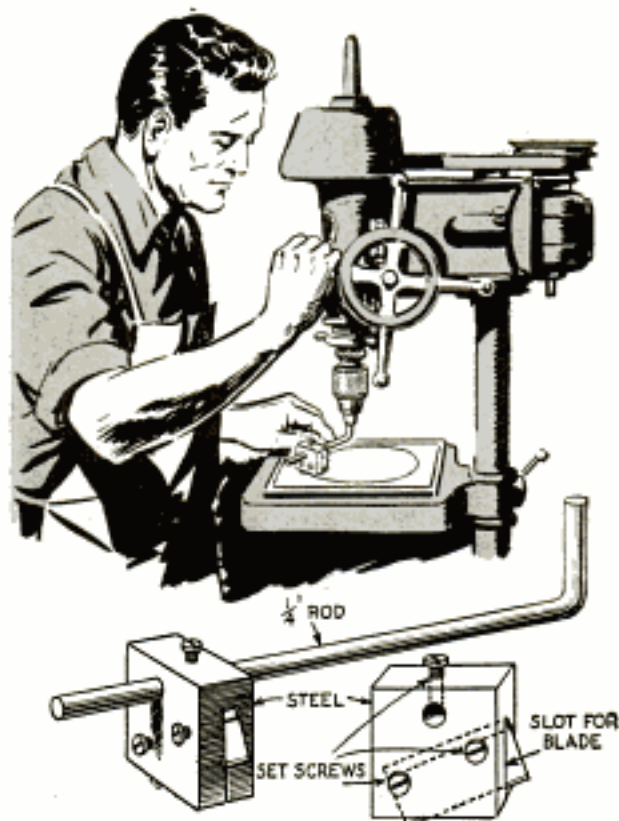
face, which changes the color to a deep, rosy brown. After staining, sand the surface lightly with very fine abrasive to bring out the highlights, and proceed with the oil finish as already described.

Silage Packed in Trench Silo by Driving Tractor Over It

A trench silo, having less depth than the upright type and, consequently, less tendency to pack the silage under its own weight that it may sour properly, presents a problem in packing. This is especially true when the trench silo is large. A very

efficient means of packing is by running an ordinary rubber-tired farm tractor over the silage at intervals as the trench is being filled. A trench silo as large as 15 by 100 ft. can be thoroughly packed in this manner in less than 15 min.

Gasket-Cutting Attachment For Your Drill Press



Rapid cutting of round gaskets and disks from composition materials can be done on a drill press by using a cutter of the type shown. It consists of a length of rod bent at right angles at one end to slip in a chuck and fitted at the other end with a steel block, which carries a razor blade. The block is slotted at an angle so that the blade, which is held by set screws, projects slightly at the lower edge. In use, the work is laid on a wood block so that the blade will not be dulled as it cuts through the material.

—Geo. Olsen, Jr., Black Earth, Wis.

Removing Sickle Sections Easily



Instead of using a chisel to cut off rivet heads from mower-sickle sections, try setting the sickle in a partly opened vise and hitting the back of the sections with a heavy

hammer. Usually, a good stiff blow on the section will shear the rivets. In placing the sickle in the vise, open the jaws of the latter just sufficiently to take the lower end

of the section loosely, allowing the sickle bar to rest on the edge of the jaws.

—Fred Kindel, Jr., Ashley, Mich.

Sand and Charcoal in Sack Filter Spotting Fluid

One tailor employs a filter made from a mixture of sand and charcoal to clean volatile cleaning fluids used for removing spots on garments. This is placed in a cloth tobacco sack so that it may be dropped into a funnel and the fluid poured through it into a container. An occasional washing of the filter bag in naphtha keeps it in working condition.



Crayons Pointed in Hot Water



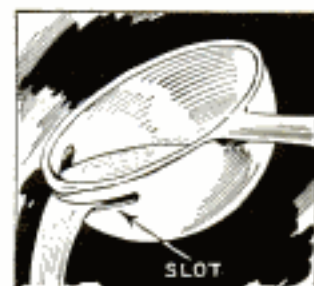
Teachers of small children who do color work in their classes will find that the slight effort required to keep their wax crayons pointed is well

worth while in the improved progress that they make. The crayons can be pointed by dipping the ends in hot water to soften the wax, and then rotating them between the tips of the thumb and first finger to draw them to points.

—T. K. MacDonell, Coconut Grove, Fla.

Slotted Ladle "Strains" Metal

To keep dross on top of molten type metal from running out of a ladle when pouring into casting molds, one printer uses a ladle with a narrow slot in one side. This slot is located just under the pouring lip of the ladle and allows the hot metal to flow through easily but restricts the floating dross.



HELPFUL HINTS *for the* MOTORIST



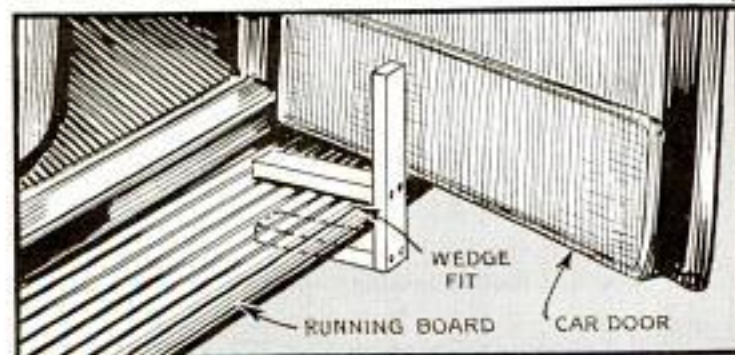
Above, bicycle clamp serves as a handy piston-ring compressor, while a felt-faced shoe brush, as below, makes a good polisher for headlight lens, door handles and other plated parts of a car. Be sure that the brush is kept clean and free of grease



Both hands are left free to make tire repairs if your flashlight is fitted with a large paper clip so that it can be fastened to the fender as shown above



Suspended on a piece of spring steel as above, a bell serves as a warning so you won't bump the wall when backing into the garage. Below, wood clamp to slip over the running board is handy when you want to keep the door open



Above, heat from a smoker's pipe will thaw a frozen door lock. Below, if a valve core leaks, remove it and dip the rubber seat into brake fluid, which will soften the rubber to renew the seal



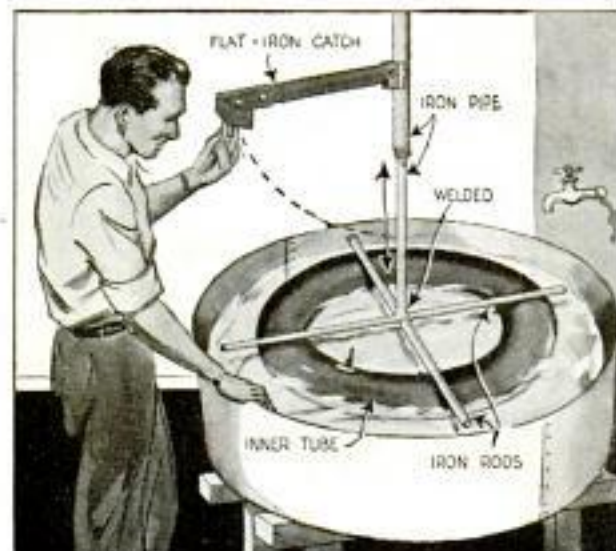
An Inexpensive Trouble Lamp From Sealed-Beam Light



If you burn out one of your sealed-beam headlights and one of the elements is still in good condition, you can convert it into a handy trouble lamp to carry in the car. Just solder the ends of a two-wire cord to the contacts of the good element. A couple of battery clips on the other end of the cord will enable you to connect the lamp to the battery in a jiffy.

Movable Spider Submerges Tube For Testing in Water

In a garage where I had a tire repaired, I noticed a novel way of keeping the inner tube submerged in water to locate the puncture. Directly above the water container, a spider or cross consisting of iron



rods welded together was suspended so that it could be lowered to hold down the tube. A flat-iron bracket or catch extended from a suspension pipe to hold the spider in the raised position.

—G. A. Wesenfeld, Wilmington, Calif.

Removing Spring Shackle Bolts Of Transverse Springs

When you have to take out the shackle bolts to remove a spring or axle of a Ford car, try using a heavy C-clamp to raise the spring ends to release the pressure on the bolts.



The clamp is placed over the rear cross member and under the spring, and the latter raised up into the cross member by tightening the clamp.

Chamois Strainer for Gasoline Supported by Coil Spring



An auto-seat spring is handy for holding a chamois or cloth while straining gasoline that has been used in cleaning machine parts. The spring is merely set in a pan and the chamois or cloth spread over it, pressing the

chamois down into the coil to form a depression into which the gasoline is poured.

Battery Produces Heat to Remove Corroded Terminals

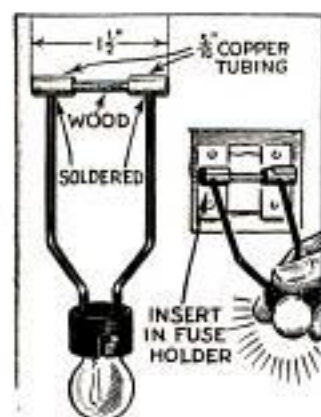
When removing a battery from a car and the terminals are corroded and stick tightly to the posts, I loosen them by heating them with a carbon. To do this, a carbon is clamped



in a battery cable, which is connected across the battery as shown. If the battery is run down, a second battery can be used, grounding one post of it to the corroded terminal of the dead battery.

—N. B. Allison, San Mateo, Calif.

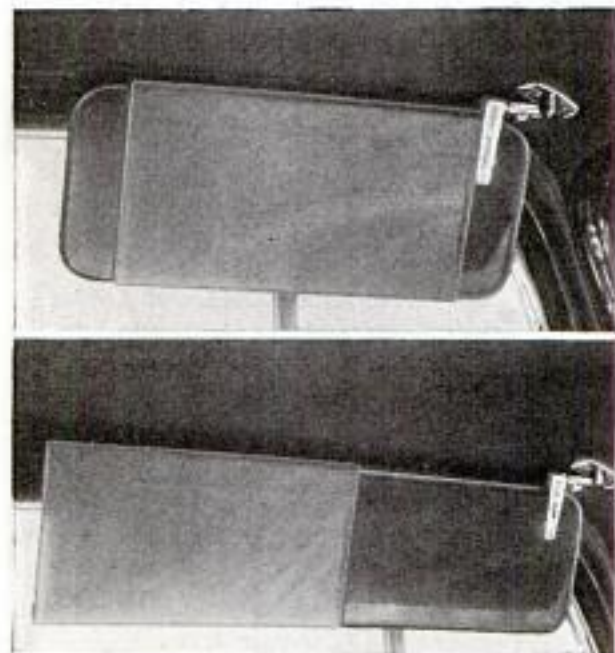
Lamp to Replace Fuse in Circuit Helps Locate "Shorts"



Quickly connected into the car electrical circuit by simply substituting it for the fuse, this lamp will be helpful in locating short circuits. Also, it can be used as a handy source of illumination when working behind

the instrument panel where a regular drop or trouble lamp is difficult to use.

Extension on Sun Visor Protects Neck and Shoulders



When driving with the sun visor turned around above the door to shield your eyes from the side, an extension sleeve will enable you to lengthen the visor to protect your neck and shoulders. The extension can be made from light sheet metal and covered with cloth or leather, or it can be painted to match the interior of the car.

NOVEMBER, 1941

Salvaging Drain Oil From Cans Opened at Filling Station



An old brake drum placed over a pail is used by the owner of a filling station to save the oil that adheres to the sides of sealed cans when they are emptied. Letting the cans remain inverted in the drum for several hours assures that every bit of the oil has drained out.

Clamp Over Handle of Car Door Keeps Child From Opening It

There is no danger of a small child opening the rear door of a car and falling out while the car is in motion if this clamp is used to cover the door handle. It is bent to shape from a piece of sheet metal to slip down in the glass slot of the door, and is fitted with two wood blocks, which slip down on both sides of the handle. The latter will have to be placed so that it is in a vertical position when the door is closed.



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Marring of Luggage in Trunk Avoided by Strips of Hose



If your luggage has been marred by rubbing against the back of a trunk compartment, four or five strips of garden hose spaced along the back will avoid this trou-

ble. The pieces of hose are fastened in place with screws as shown in the circular detail. If the trunk back is metal, sheet-metal screws can be used.

—Opie Read, Jr., Chicago.

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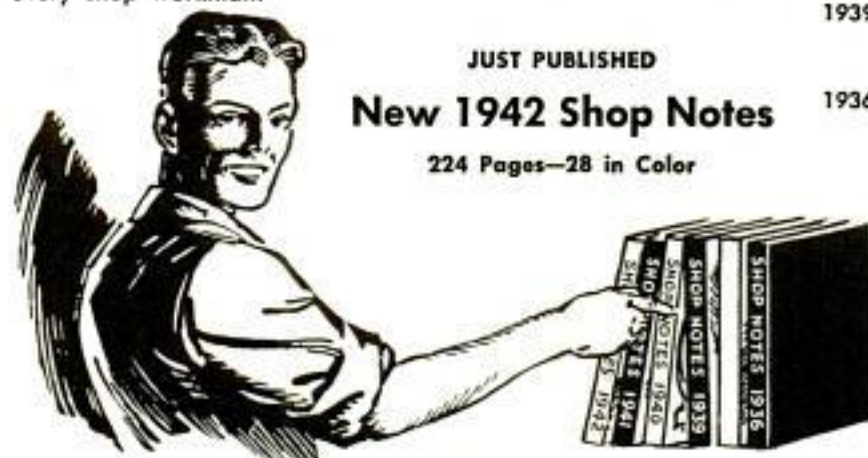
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The Comeback of the Fur Bearers

(Continued from page 95)

calls for hard work, just as does fur raising.

One tip of value comes from the government—the amateur would do well to consult a veteran trapper, perhaps one connected with the Fish and Wildlife Service, to learn fundamentals of the business. Significant is the fact that the trapper has a much larger field than the fur rancher, in that he may take many animals now impossible to produce profitably in captivity. One drawback is that fur resources are depleted to an alarming extent, due to unrestricted trapping practiced for so many years. Even today, in spite of efforts to conserve, it is estimated that far more animals are taken than are produced and some of the more valuable fur-bearers, including martens, fishers, wolverines and others, are near the point of extinction.

Among the bad practices which have reduced the number of fur bearers without benefitting the trappers are: using poison which kills many animals that are not found before their skins are spoiled; smoking animals out of their dens, which often suffocates them instead of forcing them out; destroying dens, which either leaves the animals without suitable places in which to rear their young or drives them out of the neighborhood altogether; trapping early in the fall, which catches animals having small, unprime pelts before they are old enough to be suspicious of traps, and trapping late in the spring, which destroys breeding females with young. Muskrat and beaver pelts are best in February and March, while those of other fur bearers are best from late in November to about the end of January.

Government experts are doing all in their power to encourage older boys and young men in rural communities to learn to trap coyotes and other predatory animals—those contributing to the large losses of livestock and poultry on the farm and of game in the wilds. When fur prices are high, say these experts, many private trappers are at work and there is a marked decrease in the numbers of predators. Beginners are advised to seek the aid of experienced trappers in learning to select the best locations and to make trap sets. Proper preparation of the trap will reduce the

chances of making peg-leg coyotes, the kind most destructive to livestock. A peg leg is an animal whose leg has been damaged in a trap. An injury like this not only makes a bad disposition worse, but sends the animal on the trail of domesticated animals, because the animals on which it ordinarily preys in the wilds are able to escape the cripple. On one Colorado ranch forty lambs were killed in two weeks by a two-footed coyote.

A special trap, an old design which has been improved, is giving satisfactory results in the campaign to reduce the number of peg legs. Its jaws are offset one-quarter inch to provide gripping power without the bone-crushing effect of standard traps. This trap is recommended for coyotes and bobcats.

Predators are in the greatest abundance in the states west of and including the Dakotas, Nebraska, Kansas, Oklahoma and Texas. Due to the extensive trapping of coyotes and wolves they have learned to be more cautious, therefore are harder to take than in earlier years. Not many states, and only a few localities are now paying bounties on predators, as once was the case. Those interested in taking animals on which bounties are paid should inquire of their county or state governments.

Under a cooperative program in which the federal, state and county governments and livestock associations participated, these predators were taken in one year: 93,093 coyotes, 1,214 wolves, 9,033 bobcats and lynxes, 495 bears and 241 mountain lions.

In this work the trapper not only helps himself, through the taking of skins for which he receives a fair price, but also aids the farmer by contributing to predatory animal control.

Measure Distance Carefully

If your camera has a footage scale to set for distance, it is very important that it is set as nearly correct as possible. Many fuzzy pictures are the result of a wrong guess of the distance from camera to subject. Therefore, it is well worth while to carry a small tapeline in your pocket to measure accurately. And, remember that the nearer the subject is, the more accurate the focusing must be.

DELAY is costly when your car begins to use too much oil. Oil-pumping is the warning that all is not well within your motor. Usually it means rapid cylinder wear has started . . . and that can be much more expensive than buying extra oil. At the first sign of oil-pumping in your car, truck or tractor, install Hastings Steel-Vent Piston Rings.

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Aerial Mapping for Modern Warfare

(Continued from page 37)

The drying of the print is eliminated because the paper used is wax treated so that it sheds surplus moisture, and the print is immediately ready to be placed in a light metal tube container with sponge rubber shock absorbers, and dropped over the side.

Quick photography, Army style, has been a subject of research ever since the days of the old McCook Field laboratories in Dayton in the early 1920's. The first quick photograph of unusual significance was



U. S. Army's giant 60-inch telephoto camera being operated by Lt. Col. Goddard

made by Lt.-Col. Goddard and Camera-man Ben Thomas. It was a picture for President Coolidge, made at Dayton, from an airplane. And the plane followed the the presidential train to nearby Xenia, where the finished print was dropped to the station and handed to the president.

The present day speed of the process clearly indicates improved methods and equipment. The photographic laboratory has more tricks in its bag. A new type photographic paper holder is being experimentally produced, which will eliminate the need for the hood over the printer. The new holder will have the sensitized paper pasted in place, so that it can be laid on the contact surface, the top can be brought down, and then the slide can be pulled from the holder, making the exposure. As soon as the exposure is completed, and the paper is processed in the four tanks, holder and all can be dropped to the ground, with a streamer attached, thus making unnecessary the use of the tube container. The new holder will be of plastic, or some other

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material that may be discarded without great loss, after a single use.

In addition to providing quick prints to indicate the disposition of enemy troop concentrations, aerial photography plays many other important roles in warfare. Aerial mapping, for example, is rapidly replacing the slower and less accurate methods of ground mapping.

We are accustomed to think that the United States is well surveyed, but Army experts declare that only 25 percent of this country is adequately mapped for military purposes.

An industrial area like New York City, for example, changes so rapidly that old-style methods of mapping are far too slow. Aerial mapping is the answer to show where newly built roads, docks and airfields are located. Last winter the Army and the WPA broke all records in making an up-to-the-minute map of the New York area in several weeks—and at a cost of less than \$65,000.

Aerial photography is also useful in detecting enemy camouflage and in determining the adequacy of the Army's own camouflage methods. Color photography and stereopticon examination of photographs reveal hidden details of terrain or troop movements that cannot be detected by the human eye. Use of infrared photography allows flying cameramen to shoot pictures on days when the ground is obscured by haze or light fog.

Photographs have several important advantages over visual reconnaissance, Army experts point out. A photograph can be brought back to headquarters and studied at leisure by experts. A visual observer on the other hand, gets only a quick look at the ground from a speeding plane and is likely to miss many important details.

Army experts also say that aerial photographs are helpful in checking the effect of their artillery fire and aircraft bombing. Enemy guns seldom waste ammunition to bring down a single, high-flying camera plane; yet another plane might draw fire of enemy anti-aircraft guns if it swooped low enough for an observer to note the damage.

The Army has done a good job in developing its aerial photography and mapping techniques. It is finding that the old Chinese proverb has a modern application: "One picture is worth 10,000 words."

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Secrets of Retouching

(Continued from page 85)

in charcoal drawing. A chin can be made to appear rounder by faintly etching the sides. Collar bones can be removed by filling in the shadow with soft pencil. A good retoucher can remove a person's hat, put one on, or fill in or remove a beard. Don't try anything like that at first.

The lighting arrangement used in taking a picture often accentuates lines in a face and these can be toned down by softening slightly with the pencil. Areas under the eyes are often too dark on the print, and should be built up with pencil on the negative. Amateur lighting arrangements often leave one side of the face in deep shadow and you can equalize such portions by applying new coccine with a brush. The thicker the new coccine mixture, the lighter such areas will appear on the print, so it is best at first to apply a thin mixture, make a proof, and then go over the areas again if needed.

After you have finished work on the negative and have made an enlarged print, careful examination probably will disclose several things you would like to change. You can do considerable work on the print itself, provided you made the print on dull or rough paper. The less work done on the print, the better, but here is where you can catch any errors you made in retouching the negative. With one of the retouching pencils you can gently shade in the eyebrows to make them heavier and can spot out the white dots that you may find, caused by dust particles on the film when it was in the enlarger.

Use your fingers to smudge the pencil marks on the print. This helps to tone them down and they are not so noticeable. A stick of nail white that you can buy at the dime store, carefully used, will whiten eyeballs and teeth and can be used to make a tiny catchlight in each eye.

Practically every negative needs some retouching yet you can minimize the need in taking care when you take pictures. You will save time and trouble, in making a portrait, by using a reflector light to fill in shadows of a face, instead of having to fill the shadows in with new coccine on the negative. The so-called luminous make-up paint helps eliminate freckles when a photograph is being made and does away with the need to retouch them out.

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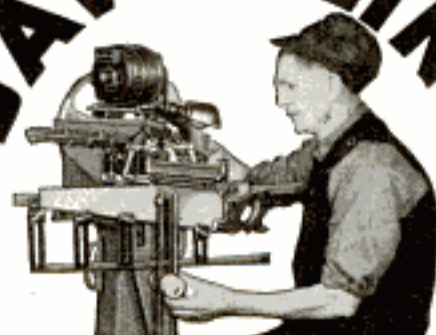
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Hunting New Weapons of War

(Continued from page 15)

is that aerial military photographs are not as clear and sharp as they used to be because camera planes now have to fly three or four times faster than before. An optical distortion results, even at fast shutter speeds, and creates poor photographs that are difficult to interpret. The new device is intended to compensate for such camera movement and is said to produce clear pictures of the ground from an altitude of only a few thousand feet, even though a one-second exposure is made from a plane flying 300 miles an hour.

Another device that has promise is a four-bladed airplane propeller in which the blades are staggered around the central shaft, permitting each blade to bite into fresh undisturbed air. The design is said to be 30 percent more efficient than present arrangements but the drawback is that a longer propeller shaft must be used. The Foundation is trying to work out such production "bugs."

Of possible importance is a proposed new street lighting system giving some illumination during blackouts. The unit consists of a shielded lamp holder that directs all of its light downward and is fitted with a blue bulb and blue reflecting surfaces. Traffic on the street would be able to move in illumination somewhat better than bright moonlight, yet the reflective qualities of blue light makes the illumination invisible at altitudes greater than a few thousand feet.

The Foundation finds that only one among a thousand or so military inventions that are submitted have any marked merit. Items in the news stimulate many people who have creative imaginations, with the result that many submit practically identical ideas at about the same time. How to prevent torpedoes from striking ships is a popular subject at present and most suggestions are based on placing a sturdy net around the ship. The investigators have to point out that the net idea is both old and impractical and would have been adopted years ago if it worked. One man had a notion to place a metal roof and side plates over a battleship, the roof and plates resting against powerful recoil springs. The idea was that if a bomb or torpedo struck the surfaces the springs

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would bounce the missile harmlessly away.

Unknown inventors are neither encouraged nor discouraged to consult the foundation. When one does, he is put through a routine. First he is appraised in a non-technical interview by John B. Rathmell, ex-machine gun officer and director of the organization. The inventor must prove he has protected his idea so that, if it proves valuable, it can't be stolen from him. If he passes this test he may submit his invention for study, and if the device interests the organization it is scientifically studied by a staff of consultants. Improvements may need to be worked out to make it practical. Passing this stage, it is then studied by engineers and production men from the standpoint of manufacturing and costs. Finally there is a market survey that is the final test as to whether an invention should be a success.

Among recent military inventions brought in are a punctureproof gasoline tank and a machine gun cooling device, invented by a priest; a lethal projectile of a new principle, conceived by a motion picture extra; a remote-control mechanism for sighting and firing wing and tail guns from the pilot's cockpit; and a new airplane detector originated by a physician.

Why waste time looking over the ideas of untrained people from various walks of life? The answer, of course, is that almost anyone is apt to conceive the germ of an important invention. Bicycle repairmen don't know a great deal about aerodynamics, yet the Wrights were in the bicycle business when they built and flew the first airplane. Gatling and Maxim, each of whom invented an automatic gun, were respectively a physician and a farmer.

The Crosby group first intended to limit itself to the handling of inventions directly related to war but now it is realized that anything that speeds production, or saves time, or replaces strategic materials with more common ones, contributes to the defense effort. Accordingly they are studying a number of ideas that may be as valuable in times of peace as in war.

☐ You can obtain additional information about products described in this magazine by writing to the firms listed in the Where-to-Buy-It index, page 4-A. Say You Saw It in Popular Mechanics.



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Submarine Fishermen

(Continued from page 43)

spear handle by a few feet of line. A fixed spearhead would tear free but the lily iron doesn't and the alarmed shark sets off at full speed, towing the diver after him. But if a diver isn't armed and he sights a leopard shark in the water he heads straight for shore, turning at intervals to thrash his arms and legs to prevent the leopard shark from attacking.

Murky water is what the divers dread because when their vision is curtailed they



Undersea huntsman holding a large lobster which he captured on ocean's bottom

can't spot dangerous fish at a safe distance. A moray eel can dangerously injure a man in the water. The ferocious manta ray can smother a swimmer. A big sting ray might kill with a stroke of its poisonous barb. A giant octopus, given a chance to get a good grip, would hold a diver on the bottom until resistance was over. Even a big seal has the edge in an underwater battle if he is in a fighting mood.

Sheer bluff is the diver's best defense against such dangers. A vicious fish, already set for launching his attack, will pause and flee if the diver charges toward the fish, waving his arms wildly and blowing bubbles from his mouth. In murky

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2582

water the first warning may be the swishing sound of the attacker's approach, so divers try to pick days when the water is clear and the sun is bright.

Catalina Island is a favorite spot for diving because the water is crystal clear and you can see the bottom 100 feet below. Occasionally groups of divers drive down to the Mexican coast to hunt varieties of tropical fish that are not found farther north. Skin diving after dark is another adventure and aquatic life seems to be most active then. For night dives the divers carry an automobile headlight unit with them, trailing wires from a battery in the boat overhead.

An experienced underwater man can swim down to 50 feet below the surface and can stay under water for two and a half to three minutes, two feats that seem unbelievable until you witness them with your own eyes. The average person can't hold his breath for even 45 seconds without exerting himself meanwhile. Practice is what gives the divers their endurance. Most dives average a minute in length.

Descending 50 feet without pulling oneself down an anchor line or carrying a weight is also a remarkable exploit. The pressure squeezes every square inch of the body and it is dangerous to descend so deep unless the diver blows air through his nose to equalize the pressure inside his face mask and prevent it from caving in, at the same time keeping his mouth open to balance the pressure on his ear drums.

The paralyzing cold of long exposure limits the divers to not much more than an hour a day in the water. If the water is very cold a diver sometimes greases himself with vaseline for protection and takes a few spoons of honey for energy.

Five or six years ago when the sport was young most of the divers worked from boats, returning to the boat after each dive and depositing their catch. Now they can get along without a skiff and they often swim out from the beach, through the surf. On such a trip the diver tows behind him a 2-gallon tin can float to which a gunny sack is tied. Once over a likely reef or rocky stretch of bottom the diver lets go the float and paddles around with his face under water, looking for fish. The fish and shellfish that he brings up are placed in the sack and towed to the beach.

(Continued to page 172)

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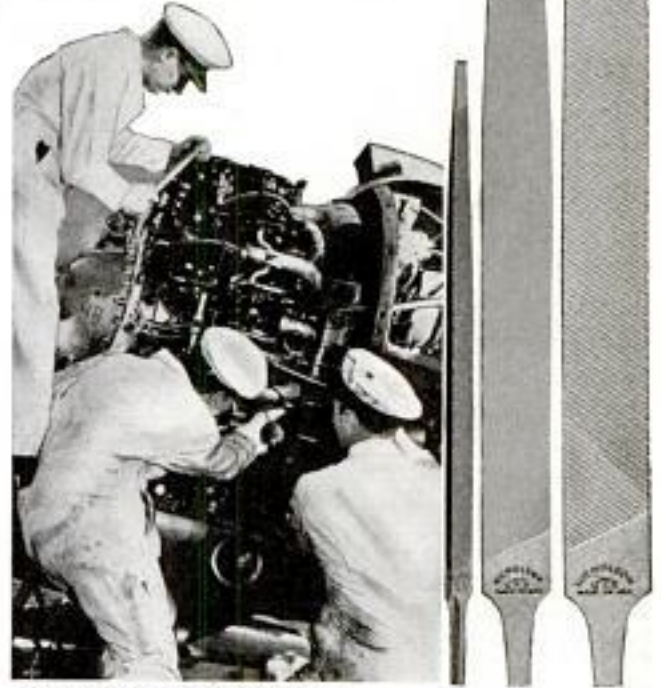


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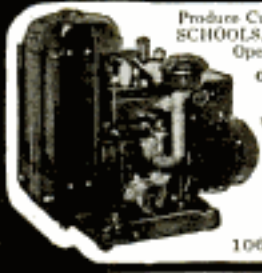
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See WOODSTOCK TYPEWRITER

To protect their eyes from the water and to give them normal vision, the divers first tried wearing Japanese pearl diving goggles. Some still use them but others prefer a large watertight face plate with a glass front that gives them wider vision. The divers wear canvas gloves to protect the hands from rocks and rough shells. Most of the divers wear swim fins on their feet because of the extra drive and speed that the rubber attachments give in both diving and swimming. Some have experimented with self-contained compressed-air breathing apparatus by means of which, wearing a weighted belt, they can take long walks on the sea bottom. Others occasionally wear a deep-sea diver's helmet, supplied with air from a compressor on the beach or in a skiff, and carry a sack for collecting half a dozen or more abalones at a time. When the helmet alone is worn, water rushes inside when the diver stoops over, but this is no inconvenience to an experienced underwater man. He simply holds his breath until he is ready to stand up again, when the incoming air forces the water out of the helmet once more.

Testing World's Biggest Bomber (Continued from page 31)

to the plane that the flights suggest. All sorts of odd and unexpected things may crop up. I recall the first test flight of a big bomber several years ago. The plane looked perfect but when we got off the ground it performed very poorly and had a bad tail flutter. The test engineers on board were perplexed and worried, then one of them noticed that the de-icing boots on the leading edge of the wing were stretching and rolling in the wind. The rubber blankets were simply so large that they were flapping, spoiling the lift and setting up currents that buffeted the tail surfaces. Fastening them down in a different way, unnecessary on smaller airplanes, corrected all the troubles at once.

One man alone can test a small trainer or fighter airplane but it takes a crew of 17 to study such a plane as the B-19. Five are in the flight crew and the other 12 are engineering test specialists. I'm 45 years old and have been flying and testing planes for 24 years. Even so, I went back to school before we took the new bomber off the ground. For two weeks the test crew at-

2966

tended lectures given by Douglas specialists. We listened to them every morning and spent the afternoons studying features on the plane itself. The B-19 is so large and is so filled with gear that it looks more like a battleship inside than an ordinary airplane. But when we graduated from ground school we could find our way around inside the plane in the dark and we knew the location and function of every part of the electric and hydraulic systems.

Today the large sleeping compartment aft of the bomb bay is filled with test instruments and panels. Automatic tape recording machines, automatic cameras that snap the readings of the artificially lighted instrument dials, and even a phonograph recorder for cutting discs of the conversations of the test engineers on the plane's interphone system, are all used.

Beside the usual recording instruments there are pick-ups leading to strain gauges installed at vital points in the plane's structure. Air pressures at many stations both inside and outside the plane are also recorded. Before we finish the job we will have tested the plane's performance when empty, when carrying loads of up to 28 tons, at different altitudes, on two, three and four engines, and under every conceivable condition. When fully loaded the plane will have a gross weight of some 80 tons.

Does a plane of this size, with a wing spread of more than 200 feet, represent the practical limits of airplane construction?

Not in my opinion.

I think that today we have reached the harbor craft stage in airplane sizes and that in the future we may travel in giant airplanes equal, in this comparison, to large ocean liners. The wings of the big planes of the future will be so thick that we will be able to place many engines on each propeller shaft, using 10,000 horsepower or several times that amount to turn each propeller.

The 500-passenger airplane or a plane of two or three times that capacity, the population of a small town, will be built as soon as there is a need for it. Such planes will have room enough inside for passengers to dance their way across country to the music of the plane's own orchestra.

As bombers these giant planes will be such powerful weapons that today's mightiest bombers will seem like toy air rifles loaded with BB shot compared to them.

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2186

Don't Be Robbed!

(Continued from page 59)

the theaters; some alone, some in partnership with ushers who act as spotters. When a purse on a vacant chair is discovered, the crook endeavors to get the seat right behind it. At a dramatic moment in the show, he will tip the seat the purse is on, slide it into his hands, and dart away. Even persons beside him will be unaware of what he has done.

It would be impossible to warn against all of the petty confidence games. However, if you follow one rule, you will be



Two furs are tested by drawing aside hairs. Woman's left hand sinks in deep, rich matting; her right lies on surface and reveals skin beneath the thin pelt

well protected. The rule is—never give money to anyone unless you are sure it is adequately protected. Most Chambers of Commerce list the legitimate enterprises. Consult them if in doubt. Otherwise, never put a dollar in the hands of anyone unless he gives you something worth an equal amount.

The police are on the alert against this petty racketeering, and are holding it well. But single handed, they cannot beat it. They ask the help of everyone. Do them and yourself a favor. Keep on the watch for petty racketeers, and don't become one of their victims. Whenever someone arouses your suspicion, call the police.

Write to the firms listed in the Where-to-Buy-It index, page 4-A, to learn more about products described in this magazine. Say You Saw It in Popular Mechanics.

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The Bomber Challenges the Battleship

(Continued from Colorado Section)

factors of our defense be as powerful as possible.

One lesson learned from engagements in the present struggle is that from the destruction of the British battle cruiser Hood, which was sunk in a few minutes by the Bismarck, prior to the sinking of the German battleship. Our experts say that this demonstrates the greater effectiveness of the latest battleships, with equal speed and increased armor, over battle cruisers built twenty or more years ago. Our naval constructors and engineers have always held out for the heavily armed, more ponderous battleship that can take it, as well as give, against superior speed with a sacrifice in armor. It is necessary, however, to have

some major components of a fleet endowed with great speed, heavy gun power and less defensive equipment. Our newest cruisers will partly fill this requirement.

Of course, speed has become a highly important factor in modern sea fighting. The ability of the Gneisenau and the Scharnhorst, German battle cruisers, to operate effectively against British convoys in the Atlantic, has been due to the fact that few ships of equal strength were able to catch them.

In the air power against sea power argument, the battleship meets the challenge of the enemy bombing plane with heavier armor, anti-aircraft guns and the fighting and bombing planes of its own fleet.

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Streamlining Our Highway Patrols

(Continued from page 75)

motorist. Rigid tests are required in most states before a motorist is given a license. Constant offenders are sent to traffic schools. Highway patrolmen discuss traffic safety before clubs, schools, and over the radio. In Massachusetts, motorists are given warnings instead of fines for minor offenses. This frees traffic officers from appearing in court to testify, and allows them more time on the highway.

Two-way radio and teletype are standard equipment with most highway police. They allow rapid communication, and radio broadcasts create a network from which the criminal finds it hard to escape.

Traffic police in Los Angeles are experimenting with a special camera and recording car, invented by two Inglewood officers. A 35-millimeter camera in the top of a regulation police car records every action that might be seen by the driver through the windshield. Primary use for the "camera car" is to take "on-the-spot" pictures and sound records of accidents, traffic law violations, riots and strikes. It is possible to get dying statements, conversations between officers and participants in accidents and reports of witnesses while the scene is still fresh in their memories.

One of the newest developments is directing traffic from the air by radio. Last New Year's Day, the 1,000,000 persons and 400,000 automobiles which crowded into Pasadena for the Tournament of Roses and

the Rose Bowl Game were expertly handled from the air. Chief of Police Charles H. Kelley flew above the city and directed his men on the streets by short-wave radio.

Rookie patrolmen are no longer taught to detect drunks by whiffing their breath and making them walk a chalk line. Science removes all doubts. The alcometer used by Michigan State Police was invented by Dr. R. N. Harger of the University of Indiana. The suspect inflates a small balloon and the alcoholic content of the blood is measured.

The patrolman uses the scientific crime detection laboratory to make casts of tool marks, tire tracks and fingerprints; to examine fibers from clothing in hit and run cases; it is used for ballistics or firearms identification, examination of questioned documents, restoration of serial numbers stamped in metals, chemical analysis, ultraviolet and X-ray examinations, etc.

Trained and equipped for any emergency, the modern highway patrolman may be called upon to render first aid in a traffic crash, track down marihuana smugglers, help children across dangerous streets, enforce the state liquor law, patrol strike areas and apprehend kidnappers.

Modern traffic officers—on the road and in the office—are no longer looked upon as boogymen of the highways or ogres to misbehaving children. "Speed cops" have been streamlined.

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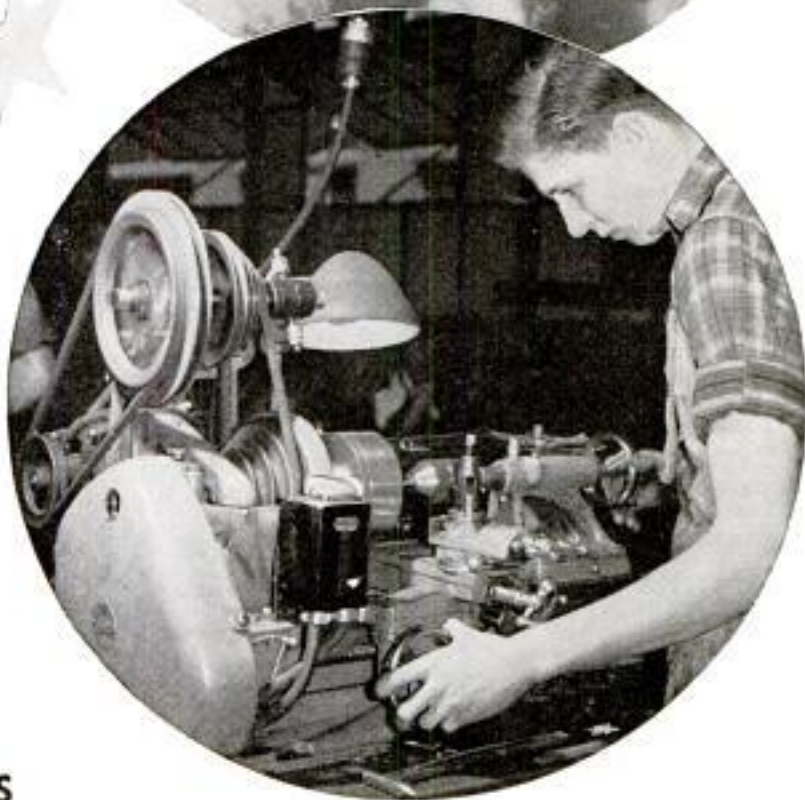
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Typical Plan from Set No. 1 Hanging Shelf with Drawer

281

Invaders From Space

(Continued from page 53)

reddish-brown veneer. The heavy weight, irregular shape, pitted surface, and metallic composition are definite tests for siderites. Such an iron should not be heated, hammered, or mutilated. When a siderite is cut open and a section is polished and then etched with dilute nitric acid a crystallike pattern called Widmanstetten figures is often revealed. A powerful magnet attached to the end of a stick helps the meteorite seeker working in such a location as the vicinity of Meteorite Crater. The radioscope metal detector, although bulkier, is a good indicator of buried specimens.

Siderolites are the rarest type. Instead of being solid iron, their interiors contain bits of rock intermixed with the metal. Aerolites superficially resemble terrestrial stones. They are among the heaviest of rocks for their size and may be recognized often by their black or dark brown covering. They are never porous or cinderlike and do not resemble chunks of slag from an industrial furnace, which are frequently mistaken for them.

A freshly fallen aerolite often looks like a piece of gray cement, incrusting by a thin coating of dull or even glazed tarlike substance that has been chipped off in places, revealing the light interior. This fusion crust turns brown with age and eventually disappears. The interior of an aerolite may be almost any shade of gray or it may be brown, pale green, or greenish gray. A good procedure is to grind a small corner off on an emery wheel and look for tiny grains of free metal embedded in the rock.

Adhesive Tape on Movie Film Fastens It to Rewind Reel



If you find it difficult to slip the end of movie film in the slot of the rewind reel, use a piece of adhesive tape. It is left on the end of the film and is simply stuck to the center of the reel when rewinding.

2028

Keep Your Eye on the "Bird"

(Continued from page 69)

in the back court will usually lose. Very few women players have the strength or stamina to cover the back court, hitting the shuttle the full length of the court for long periods of play. This "up and back" system as it is sometimes called will also be used in a women's doubles match or a men's doubles match.

The two systems usually followed in doubles play other than mixed, however, are the "side by side" and the "rotation." However, any system of play a team may choose cannot be followed 100 percent. A system only gives a team some basis from which to work. In the "side by side" system, for example, each player covers his half of the court from the net to the base line.

The "rotation" system is a bit more complicated but, to me, more fascinating both to players and spectators. It tends to keep both players on their toes and also keeps them on the move. The two players move in a counterclockwise motion around the court. The player in the right side of the court moves toward the net while the player on the left half of the court moves backward and crosses to the right hand court and then forward. Many players make the mistake of running in a circle like two squirrels around a tree. The system is not so fast as that. The secret lies in a player's ability to be ready to move in the proper direction when the shot calls for such a move, and not to have both players caught going after the same shots.

The true value in any game is the pleasure, health and recreation derived from participation. Badminton may be played well and enjoyed after a very short induction period. Players who can develop a deceptive game combined with wicked smashes and cross court shots will soon be in the tournament class. And Dad and Mother will be taking their children on for an evening of badminton, grand exercise and fun for the whole family.

Names and addresses of makers or sellers of commercial products described in this magazine are listed in the Where-to-Buy-It index, page 4-A. Write to them for additional information and be sure to Say You Saw It in Popular Mechanics.

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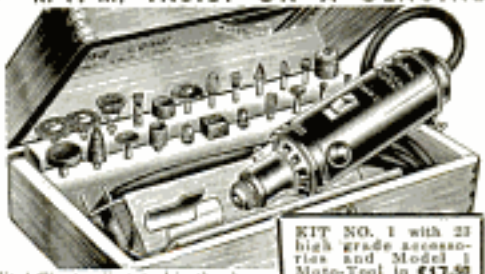
SEE PAGE 1A

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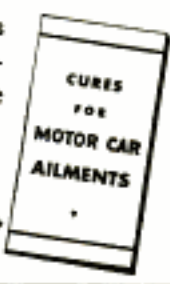
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Giving Atoms the Third Degree

(Continued from page 11)

the sodium in the salt a person sprinkles on his mashed potatoes. Then as digestion and assimilation proceed, the Geiger counter traces the progress of the salt through the person's body to its final resting place as a part of the bodily structure. Such tracer food elements have become a valuable tool in the study of such ailments as goitre, tumors, anemia and leukemia.

The electrical "detective" has also investigated the process used by green plants to manufacture sugar and starch from soil minerals and carbon dioxide from the air. Our school books always told us that growing plants need sunlight to carry on this process—called photosynthesis. But by putting tagged atoms of carbon in plant food and tracing them with the counter, biologists have discovered that plants can make sugar in the dark, although the process is greatly slowed up.

The Geiger counter is also valuable in many phases of chemical and metallurgical research. Recently it has been used in studies of diffusion in silver, the manner in which silver atoms wander about inside a piece of metal. Knowledge of this phenomenon is valuable to such industries as metal plating, since it would reveal how much one metal would "soak into" another.

At its plant in South Philadelphia, Westinghouse is making use of nature's own atom-smashing. Radium is continually deteriorating, as its atoms break up and give off energetic rays. Most penetrating of these are gamma rays, which can pierce thick slabs of steel. Gamma-rays are being used to examine the interior of steel castings for turbines and propulsion gears, much as X-rays are used to "look through" human bodies. A few hundred milligrams of radium sulphate are placed on one side of the casting and photographic film is placed on the other. Rays pass through flaws more easily than through solid steel, and the flaws show up on the film as dark spaces.

As a step in speeding up national defense work, the South Philadelphia plant recently acquired 500 milligrams of radium sulphate. Gamma rays from that amount of the substance will penetrate 10 inches of steel to register the metal's internal condition on photographic film.

These uses for the discoveries of atomic physicists are important; but they are almost insignificant compared to the benefits we feel sure will come out of the laboratories in time. Progress seems slow, because the atomic researcher is an explorer in a new world. He is not looking for anything in particular, but is just learning the relations of energy and matter. He doesn't know whether his studies will eventually result in a new cure for diabetes or a better mouse trap. But he knows the chances are good that some definite benefit to humanity will eventually come from his work. That is the way really important discoveries are made: by constant study and penetration at the frontiers of man's knowledge, not by looking for some specific thing that will fill the prescription of man's desires.

Important scientific discoveries are often revealed when a search is being made for something entirely different and much less important, just as Columbus stumbled upon a new continent while looking for a new route to the East Indies. To take one example, radium turned out to be the first thing that could be successfully used to treat cancer. But hundreds of years of research for a method to treat cancer would probably never have led to the discovery of radium. A French scientist, Henri Becquerel, was studying the fluorescence of uranium salt. That is, he was measuring the radiations given off by that compound after being exposed to sunlight. Quite by accident he discovered that the uranium salt gave off rays when not exposed to sunlight. Thus he discovered the phenomenon of radioactivity, and further work by him and Madame Curie revealed that the most potent source of these radiations was a new substance contained in the uranium. They extracted the new substance and called it radium.

Later someone discovered that radium should be handled with care, because its rays could burn human flesh and even cause death in time. Then danger was turned into benefit when it was found that, with proper care, radium could aid cancer sufferers, since cancerous tissues are more easily destroyed by the rays than healthy tissue.

To smash an atom means to produce some violent rearrangement in its tiny cen-

(Continued to page 187)

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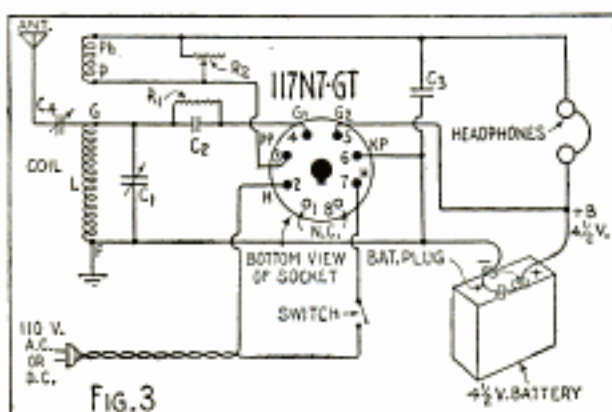
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"DX" Economy Special Receiver

(Continued from page 137)

may be in a different location on your particular antenna coil.

It will be noted that the power cord is secured to the baseboard with the clip portion of a Fahnestock clip; or an insulated double pointed tack may be used for this purpose. This power cord should be kept as far as possible from the rest of the wiring, to eliminate hum pickup. Use No. 18 or 20 hookup wire with push-back insulation for all connections and solder each connection carefully with rosin-core solder. A detailed list of materials is available from Popular Mechanics radio department without charge if desired.



When all wiring is completed, check your connections carefully with diagrams Figs. 2 and 3. To place the set in operation, connect the antenna and ground and insert the battery plug as indicated in the photo B. A 15-foot indoor antenna will do for local reception, however, for "DX" it will be necessary to use a long outdoor antenna. The ground connection should be made to a clamp on a cold water pipe if possible. Now, with the headphones on, snap on the switch and wait a moment for the tube to heat up. Then, with the volume control advanced, turn the variable condenser (C_1) until you hear a whistle. Finally, retard the volume control until the whistle stops and the station is clear. Adjust trimmer condenser (C_4) with a small screwdriver as indicated in photo A for best results with the particular antenna you are using. It will be found in most cases that it should be turned completely shut for greatest volume. In case no whistle is heard, and stations cannot be tuned in, merely reverse the connections P and PH on the small "tickler" coil. The blueprint number for this article is R-296.

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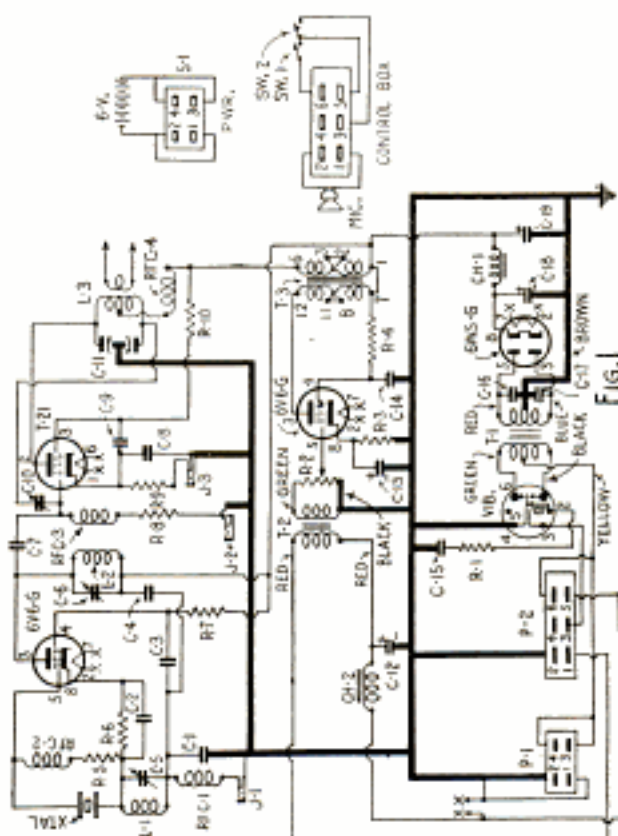
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Portable Mobile Radiophone

(Continued from page 138)

radio parts houses in complete kit form except the vibrator, crystal and tubes. This Thordarson kit also includes an 11 by 8 by 3 in. punched and drilled chassis, miscellaneous hardware, and a large size circuit diagram with all parts values listed. All leads carrying current to the 6-volt primary of the power transformer should be of heavy wire, No. 16 or larger. This is nec-



PARTS (Fig. 1)

- | | |
|--|--|
| T-1 Power trans. T-14R38 | C-1 .002 mfd. 500 v. (mica) |
| T-2 Microphone trans. T-86A03 | C-2 .01 mfd. 400 v. |
| T-3 Modulation trans. T-19M13 | C-3 .002 mfd. 500 v. (mica) |
| CH-1 Filter choke T-87C53 | C-4 .002 mfd. 500 v. (mica) |
| CH-2 Filter choke T-14C61 | C-5 100 mmfd. variable |
| R-1 200 ohms 1 watt | C-6 35 mmfd. variable |
| R-2 500,000 ohm vol. control | C-7 .0001 mfd. 500 v. |
| R-3 300 ohms 10 watts | C-8 .002 mfd. 500 v. |
| R-4 20,000 ohms 10 watts | C-9 .002 mfd. 500 v. |
| R-5 50,000 ohms 1 watt | C-10 neutralizing cond. |
| R-6 350 ohms 10 watts | C-11 35-35 mmfd. variable |
| R-7 12,000 ohms 10 watts | C-12 100 mfd. 25 v. elect. |
| R-8 50,000 ohms 1 watt | C-13 10 mfd. 25 v. elect. |
| R-9 350 ohms 10 watts | C-14 .1 mfd. 400 v. |
| R-10 10,000 ohms 10 watts | C-15 .1 mfd. 400 v. |
| Vib.—No. 427 Electronics or equivalent | C-16 .05 mfd. oil imp. cond. |
| | C-17 .05 mfd. oil imp. cond. |
| | C-18 and C-19 Double 8 mfd. 400 v. condenser |

essary so that the full battery voltage is available at the transformer. The polarity of the storage battery when connected to the transmitter is not important. However, when one battery serves both the transmitter and the car electrical system, attention should be given to the polarity.

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(Continued from page 181)

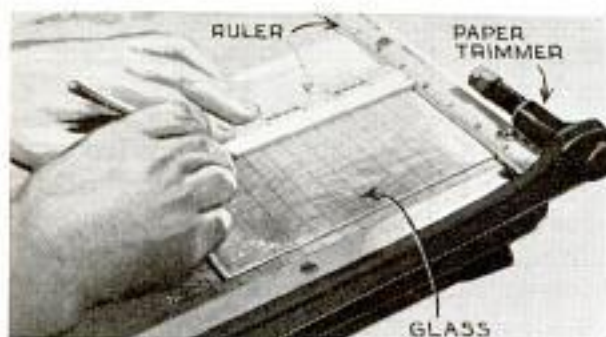
tral nucleus, or heart, perhaps knocking out some of its parts. The smashing is done by hurling parts of other atoms at the nuclei. One type of machine that does this hurling is the electrostatic generator—the type built at Westinghouse. In this machine, electric charges are sprayed onto a rapidly moving belt which carries them up to a steel shell, or electrode, at the top of a large steel pressure tank. These charges accumulate on the electrode until they have built up to as much as 4,000,000 volts. Connected to a 30-foot, vertical vacuum tube, this voltage shoots the atomic "bullets" down the tube at 30,000,000 to 100,000,000 miles an hour. Such speeds are often necessary to break up the firmly bound hearts of atoms and release fragments.

Like workers in other atomic laboratories in this country, the physicists assigned to the Westinghouse atom smasher are studying the basic forces inside atoms. They are measuring the forces required to break up various kinds of atoms, learning what kinds of atoms are formed when other atoms are smashed. None of these things is very spectacular. They must be viewed as so many pieces added to the jig-saw puzzle that must be solved before atom-smashing can hope to have a prominent effect on everyday living.

Progress seems slow, but after all we have been smashing atoms for less than ten years. Hertzian waves were discovered before 1890; it was 30 years before they were put to use in radio broadcasting.

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More Miles Per Gallon

(Continued from page 6)

percent stronger than those used previously, but weigh no more. Instead of being highly polished, the crankshaft journals are ground so that their surfaces contain a predetermined number of minute depressions—millions of them to the square inch. These depressions serve as millions of tiny reservoirs that trap oil and hold it in reserve to replenish the oil film at any time



FORD

This is the greatly changed front end of the new Ford; note grille treatment

the normal flow might be interrupted, thus helping to maintain a constant oil cushion between the crankshaft and bearing surfaces. The connecting rods, made of a new type of alloy steel, are shot-blasted to produce microscopic depressions that act as checks against possible rupture.

Aside from the pistons, so-called substitute materials are used mostly in parts subject to little or no strain, such as radiator and radio grilles, oil pump covers and other parts. The Lincoln radiator grille is made of rustless steel and the Buick radio and radiator grilles are steel stampings instead of die-cast zinc. An attractive copper finish appears on Pontiac's instrument panel, radio grille and clock, replacing the chromium plate of former years. Plastics advance another step, being employed at

(Continued to page 191)

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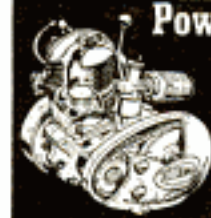


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many more places than in the 1941 models. A graceful hood ornament of transparent plastic adorns the new De Soto and a clear Lucite Indian head ornament appears on the Pontiac. The latter also uses plastics in the form of ash tray handles, numerals



LINCOLN ZEPHYR

Note the new crest that adorns the "face" of this 1942 Lincoln Zephyr

on instruments and clocks, horn button covering, interior door lock handles, window cranks and knobs for all controls.

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(Continued to page 192)

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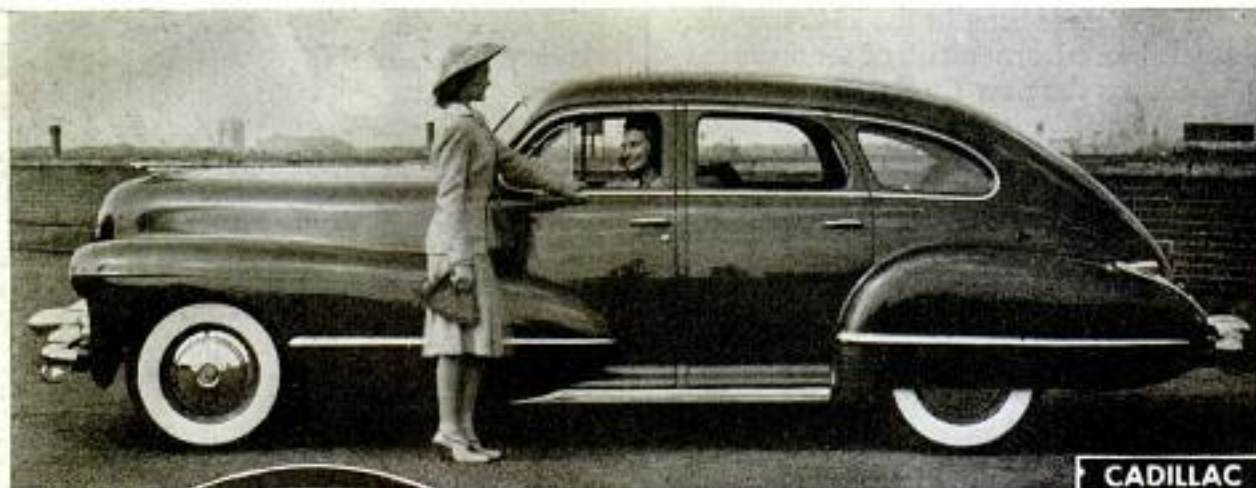
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CADILLAC

↑ Cadillac's "61" has smart lines; note bullet-shaped rear end of front fender extending into the door
← This photo of the Chrysler Windsor will remind many readers of the special Thunderbolt of 1941



CHRYSLER

ignition engines is unnecessary and the possibility of "pinging" when the engine is hot is minimized. A portion of the cylinder head is flat directly over the area of the piston opposite the spark plug. As the piston approaches the top center of the compression stroke, the mixture under this area is forced out into the combustion chamber at a high velocity toward the spark plug side of the chamber, creating a high turbulence or circulation action. This breaks the mixture into finer particles for better combustion.

Ford swings into the new model year with the six-cylinder engine introduced recently. The lowest-priced, or economy, Ford is offered with the six-cylinder power plant; two other models with either six- or eight-cylinder engine. Both engines are 90 horsepower. Other features of the Ford are:

(Continued to page 194)



STUDEBAKER

↑ Headlamps, fog lamps and fender lamps, set in vertical groups, give distinction to Studebaker's front end
↓ And here is the attractive front end of the Pontiac; the air intake blower is located behind that left grille



PONTIAC



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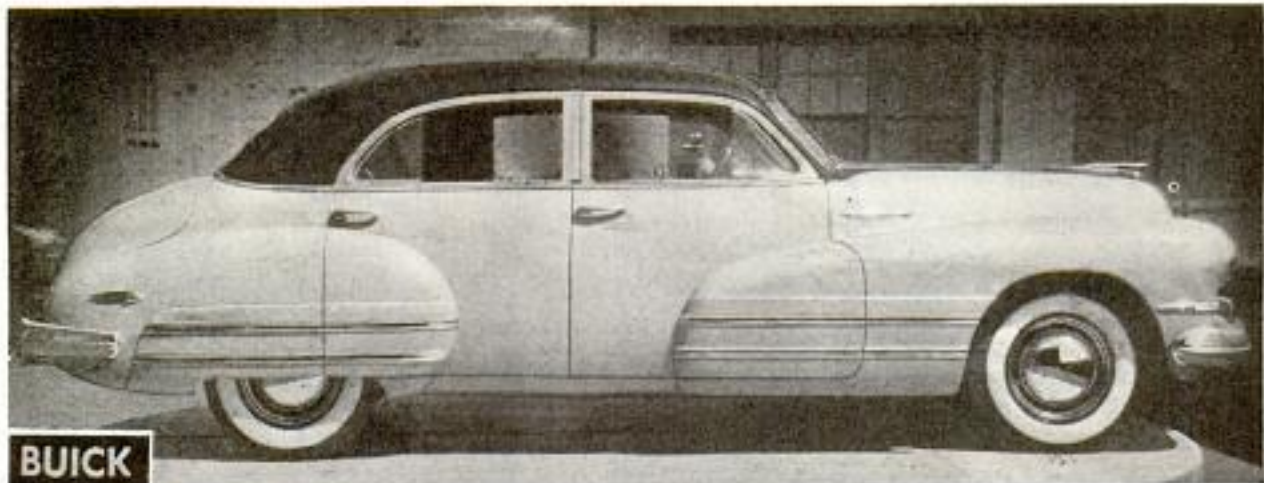
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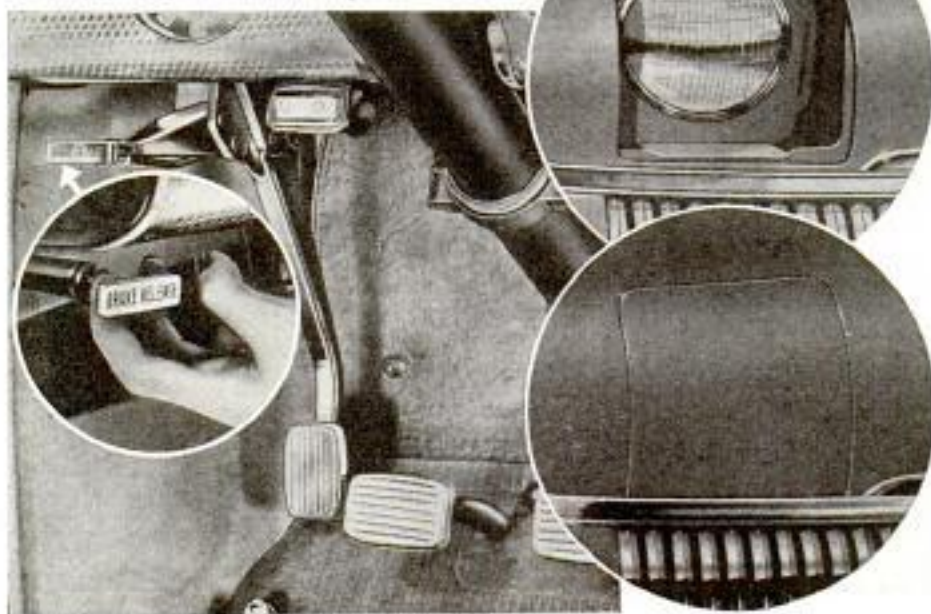
BUICK

- ↑ This is another view of the Buick; this car's fender lines do not extend as far to the rear as those in the convertible
- ↓ Note the massive front bumper treatment on this Olds; the upper bar fits right into the grille ensemble and indicates ruggedness



OLDSMOBILE

- ↓ View of Buick's parking brake pedal (left of clutch pedal); inset, release on instrument panel



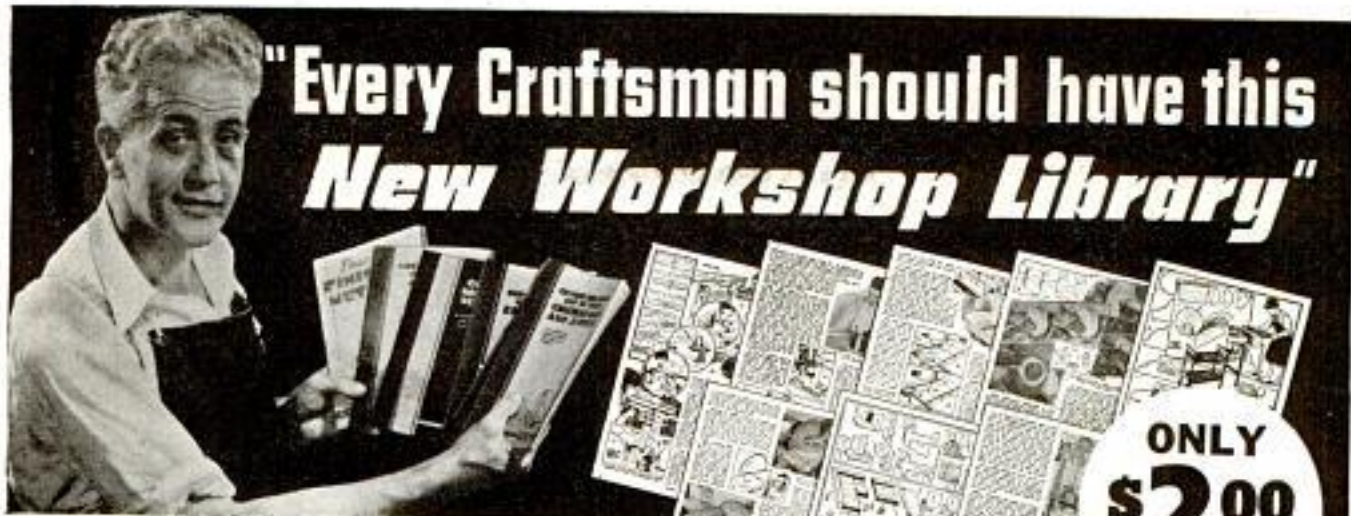
new front end styling, wider fenders that flare into the body, fully enclosed running boards, wider tread, a stiffer frame and improved stabilizing of the steering system.

Like the Lincoln, the Mercury offers as optional equipment a fluid transmission that makes driving much easier and saves the gas ordinarily wasted in gear-changing. The Mercury incorporates a number of engine refinements and body improvements.

Man-hours and materials must be conserved for national defense purposes, thus causing curtailment in the output of automobiles, but the industry insists upon new styling for those cars that will be produced. General Motors, in each of its divisions, features the front fender extending into the front door.

(Continued to page 196)

Circles, left, two views of De Soto front fender; top, headlamp ready for use at night, with sliding panel retracted; bottom, panel in place, concealing headlamp during day



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In the Buick "70" convertible, this styling is carried to a speed-line extreme, with the front fender line sweeping across the front door and ending at the rear fender. And even at that point, the rear fender is so



DODGE

This view of the Dodge illustrates how radiator grille and headlamps are tied together

treated that the front fender line appears to extend all the way to the rear bumper.

The Chrysler is distinguished by effective front-end styling that recalls the specially designed Thunderbolt displayed at automobile shows last year. Horizontal bars appear to sweep across the front of the car and into the fenders on either side. This treatment begins about half-way down on the front, just below the head-



CADILLAC

And this is the front view of the new Cadillac "61"—simple, but attractive styling

lamps. And the front bumper is so arched that it appears to be another—and wider—bar in the group.

(Continued to page 199)

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Common to the Chrysler-built cars—Plymouth, De Soto, Dodge and Chrysler—is the concealed running board. Opening the door reveals the running board, which is hidden by a flaring skirt at the bottom of the door.

One of the most novel touches of the year is found in the De Soto, which might well be called the only car on the market with "eyelids." The headlamps are recessed in the front fenders and protected during the daytime behind sliding panels which, when closed, blend fully into the fender surfaces. Both the sliding panels and the lights are controlled by a small lever on the instrument panel. Pulling the lever causes the panels to open and turns on the lights at the same time. That operation is necessary only in night driving. Pushing the lever closes the panels and turns off the lights. Weather cannot affect operation of the panels, the manufacturer asserts. When



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the lever is operated to open or close the panels and to turn the lights on or off, the observer has the feeling that the car is opening or closing its "eyes."

Dodge has a distinctive note in the manner in which its radiator grille and the headlamps are "tied" together to give the appearance of unit construction. Horsepower of the Dodge has been increased, in line with the Chrysler Corporation's policy for the new year.

The latest Cadillacs are wider and lower, one of the sedans measuring 81 inches in width and 63 inches in height. Hood louvers and the cowl ventilator are missing,

(Continued to page 201)



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having been replaced by a new controlled circulation system that feeds fresh air into the passenger compartment. Rear wheel shields are standard equipment. Strikingly changed for 1942 are the "62" and the "60 Special," with seven inches added to the wheelbase of the Special to increase leg room for passengers in the rear seat. Cadillac also introduces something new in seat construction—stationary seat frame with cushions adjustable to varied statures.

Pontiac presents something different in car interior heating—manually operated thermostatic control similar in many respects to that in homes and offices. The temperature of the water flowing through the heating element under the seat can be raised and lowered by a control knob on



Below the Plymouth bumper is an air scoop that makes the cooling system more efficient

the thermostat. The system also incorporates a means of introducing fresh air, forcing it to the heater through a large pipe by means of an electrically driven blower placed just below the left headlamp back of the radiator grille. A valve, controlled by the thermostat, regulates the flow of hot water to the heater. A branch from the main air pipe leads to the defroster assembly in the center of the dash. Either cold air or hot "de-icing" air can be led through the defroster.

Buick is introducing a new type of parking brake. Instead of the familiar "pull-up" hand brake, a step-on pedal is used. Located on the extreme left, the pedal applies the parking brake at a slight pressure of the foot. The brake is released by pushing a small hand control on the dash.

Other features on various cars are:

Olds—a massive front bumper assembly that is attached sturdily to the structure

(Continued to page 202)



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SEE PAGE 1A



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behind the radiator grille, as well as below it; the bumper has the appearance of being integral with the radiator grille.

Chrysler—horns that cannot be blown when the ignition is turned off.

Buick—wider rims on the wheels, reducing tendency to "heel-over" on turns and eliminating the need for stabilizers.

Lincoln—no handles on doors or luggage compartment lid; buttons are used instead.

Nash—manual control substituted for automatic control on the "Weather Eye," the heating system.

Plymouth—an air scoop located below the front bumper to bring fresh air into the engine compartment.

De Soto (and other Chrysler-built cars)



Distinctive wider horizontal treatment of front end design marks this Hudson Commodore

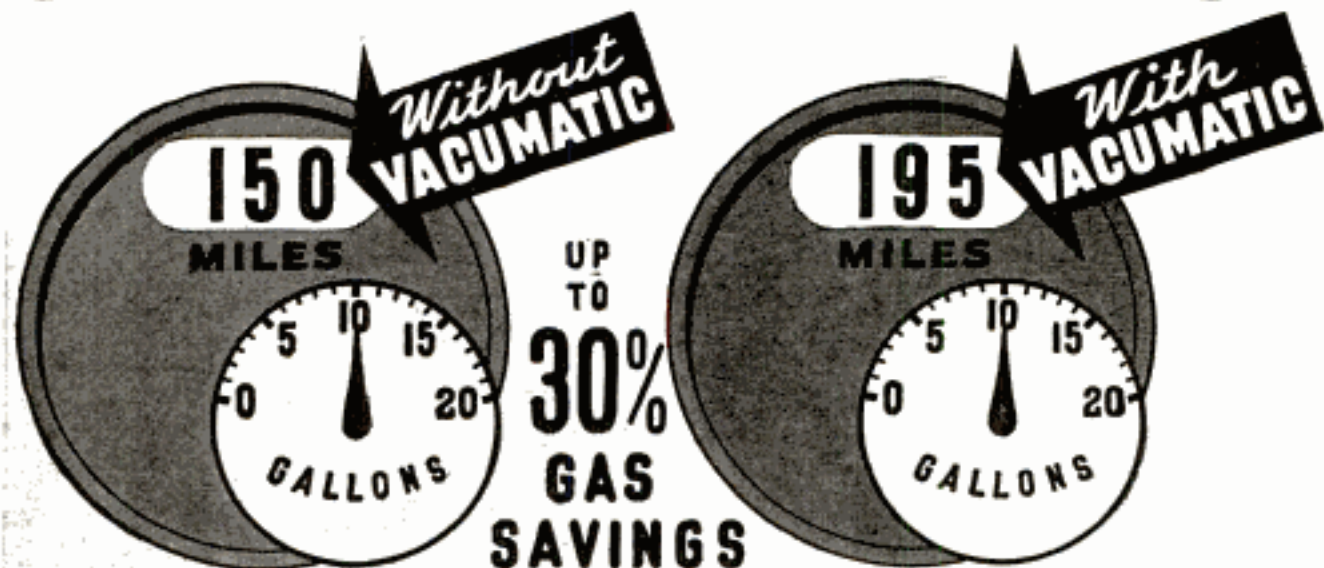
—improved "Safety Signal" speedometer on which pointer, numerals and face of the instrument glow at night to indicate the speed range; up to 30 miles per hour, the lighting is green; from 30 to 50, amber, and above 50, red.

Chevrolet—a shoe scraper, for removing mud or snow, located at forward end of enclosed running board.

The industry is helping to conserve materials vital to defense by making changes which often make parts more costly but which do not sacrifice quality. For instance, General Motors divisions, through design changes, will effect a total saving of 210,000,000 pounds of defense materials, including 14,000,000 pounds of aluminum, nearly 6,000,000 pounds of nickel, 92,000,000 pounds of zinc, 55,000,000 pounds of copper, nearly 3,000,000 pounds of tin, 34,916,000 pounds of lead and almost 5,000,000 pounds of chromium. These savings are figured on the basis of a greatly reduced output in automobiles.

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Maxwell J. Clark
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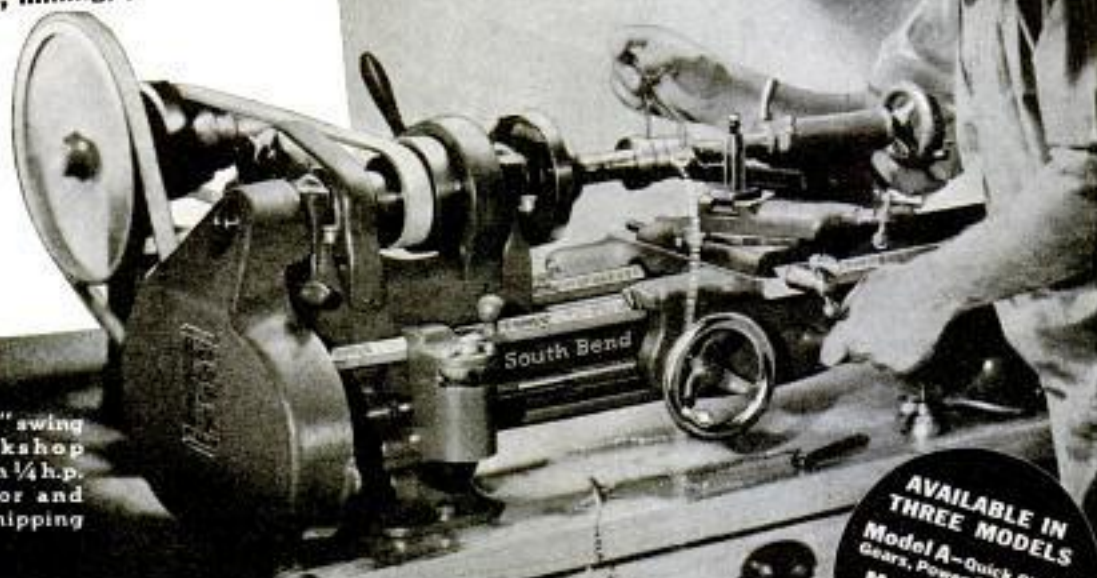
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