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MAGAZINE

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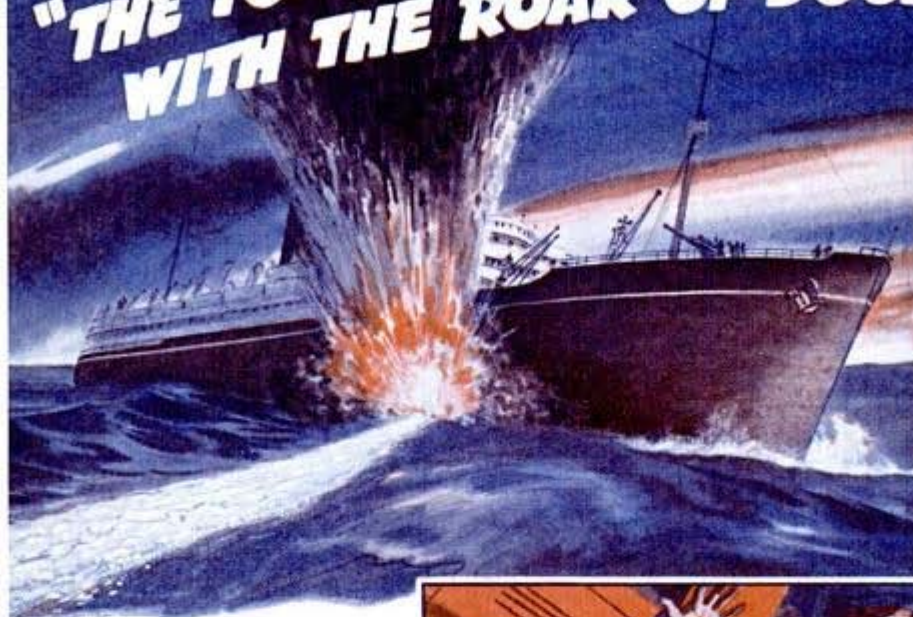


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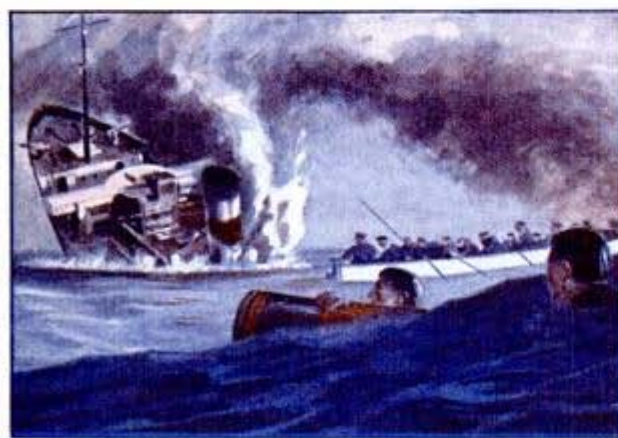
"THE TORPEDO STRUCK US WITH THE ROAR OF DOOM!"



A true experience of Frank C. Davidson, Truro, Nova Scotia, Stoker First Class on the torpedoed H. M. S. Rajputana.

1 "HAD WE EXPECTED a second torpedo to strike the wounded British Cruiser, *Rajputana*, two of the boys and I would never have scrambled below to save a few of our belongings.

2 "BUT THERE WE WERE, in the stokers' mess, when torpedo number two ripped into us with a terrific explosion. Instantly, we were in utter darkness . . . trapped by tables, chairs, and lockers crashing about us. Escape seemed impossible . . . until I remembered my flashlight.



3 "WITH THE AID of that light, we managed to fight our way, dazed and confused, to the boat deck, just as the captain gave the order to abandon ship. I shall never forget what might have happened out there on the Atlantic had it not been for my flashlight and 'Eveready' fresh DATED batteries.

(Signed)
Frank C. Davidson"



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OCTOBER, 1941

1A

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

October, 1941

Vol. 76, No. 4

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Giving Atoms the Third Degree

RADIUM costs more than \$700,000 an ounce, and an ounce is about the size of a large pea. But if a hospital should misplace so minute a quantity as one 50-millionth of an ounce of it, the sensitive nose of the "radium hound" would spot it. That is one of the scientific wonders described in a November article by Dr. L. W. Chubb, Director of Westinghouse Research Laboratories. Another is the Geiger Counter, with which medical scientists follow radioactive salt through your body and botanists have seen plants manufacture sugar in the dark.

Bomber Challenges Battleship

SINKING of the Bismarck and aerial invasion of Crete have not convinced navy men the battleship is obsolete. They still call it our first line of defense, but insist on coordinated sea and air power for victory. Read a Navy officer's appraisal of the situation in the November Coloroto section, with its eight pages of fighting ships and planes in color.

Next Month

NOT many men have the courage and endurance for underwater fishing. It's a beautiful world, deep down there among the tall kelp trees and exotic sea life. It's also thrilling, if your oxygen lasts and you get back to tell it, to wrestle a six-foot dogfish or spear a shark or grab an armful of lobsters and abalones. Only about 50 swimmers along the southern California coast go in for this dangerous sport. Some of their adventures are told in a November feature, "Submarine Fishermen."

Invaders From Space

KEEP your eyes open for meteorites. A good specimen may bring from a dollar a pound to its weight in gold, and they come in any size from pebbles to boulders like the record 60-ton block of iron found in Africa in 1921. An article next month tells of science's interest in these invaders from space, how to identify them, what to do if you're nearby when a meteorite hits earth—pick it up; it's probably cool enough.

Don't Be Robbed

LIVING costs enough these days without having to support a pickpocket or petty thief. Be on your guard! The ex-racketeers have gone in for shop-lifting, purse-snatching, confidence games and the rest of the small-crime category. One pickpocket even trained his dog as an assistant. Take a tip from a November article, and "Don't Be Robbed."

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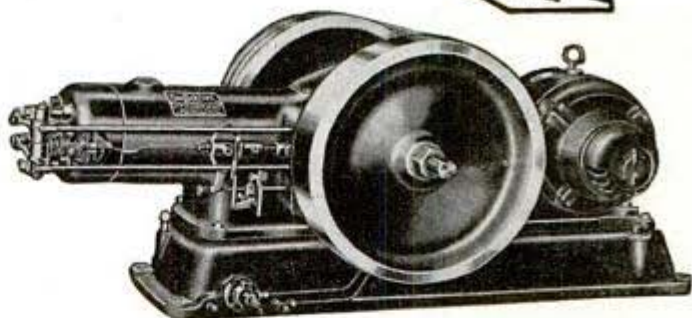
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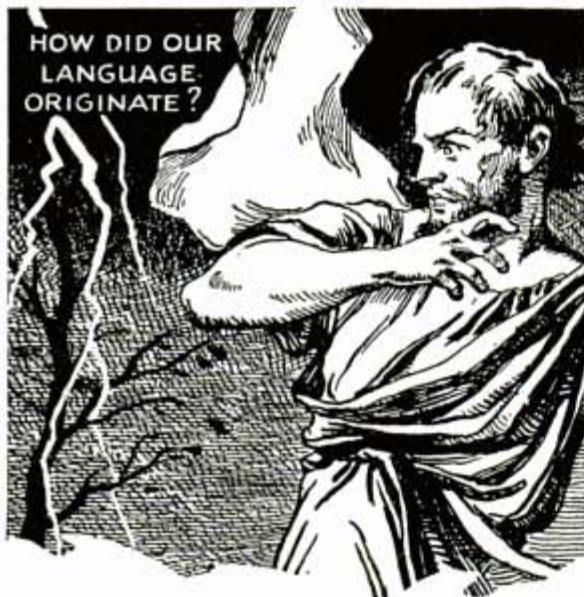
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Astonished

actually means thunderstruck

WHEN we trace our English word *astonish* back through the Middle English *astonian* and Old French *estoner*, we find its original source in Latin *ex*, "out," combined with *tonare*, "to thunder." The first meaning of *astonish* was "to stun," "to render senseless," as by a thunderbolt or a blow. But the word has lost its physical significance and now suggests great surprise, sudden fear, or wonder.

To *tantalize* is to torment with the punishment of Tantalus as told in Greek mythology. *Disaster* literally means "the stars are against you."

These are a few of the thousands of interesting word origins given in the unabridged Merriam-Webster, WEBSTER'S NEW INTERNATIONAL DICTIONARY, Second Edition. This great reference book provides a wealth of general information. It contains 600,000 entries—122,000 more entries than any other dictionary. 12,000 terms illustrated; 3,350 pages. **WARNING:** The only genuine Webster is the MERRIAM-Webster. Look for the Merriam-Webster name and circular trade-mark on the cover. Ask your book dealer to show it to you. Write for free illustrated booklet of interesting word origins to the publishers, G. & C. Merriam Company, 747 Federal Street, Springfield, Massachusetts.

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the Genuine Webster

**WEBSTER'S
NEW INTERNATIONAL
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How Big Is YOUR PAY-CHECK?

*If you earn under \$3,000,
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be the answer for you*

"THE size of my pay-check? What business is it of yours?" Perhaps that's the first reply that comes to your mind.

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Maybe you're one of those ever hoping for "breaks" that will give you a higher standard of living. Yet that's precisely what most of 30,000,000 other employees in this country are doing.

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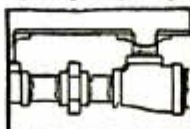
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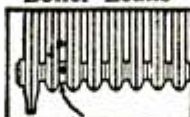
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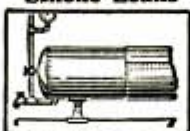
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"Yessir, I'm IN A CLASS BY MYSELF!"



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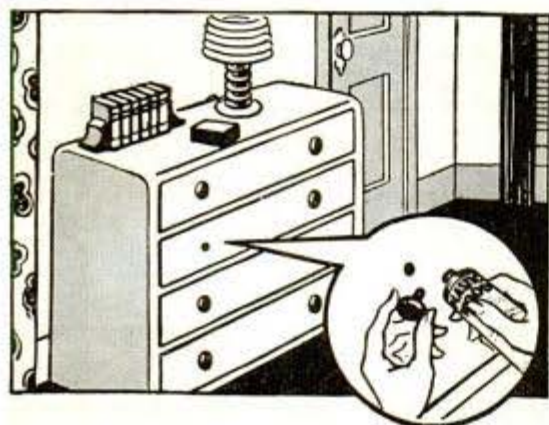
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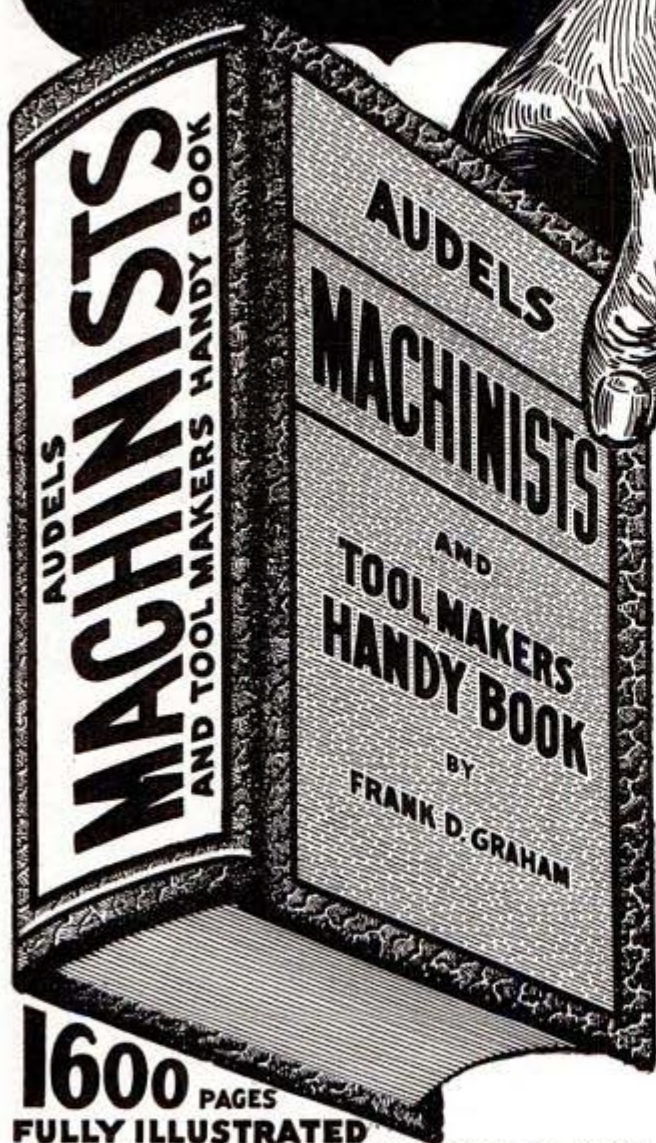
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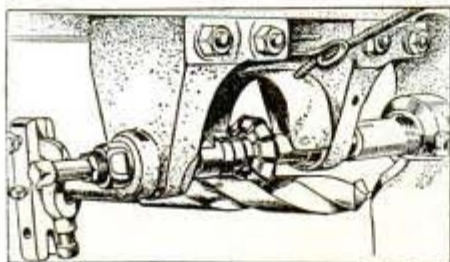
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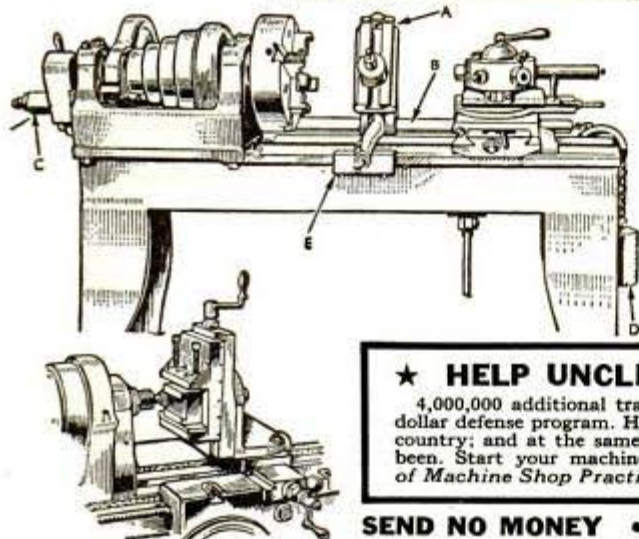
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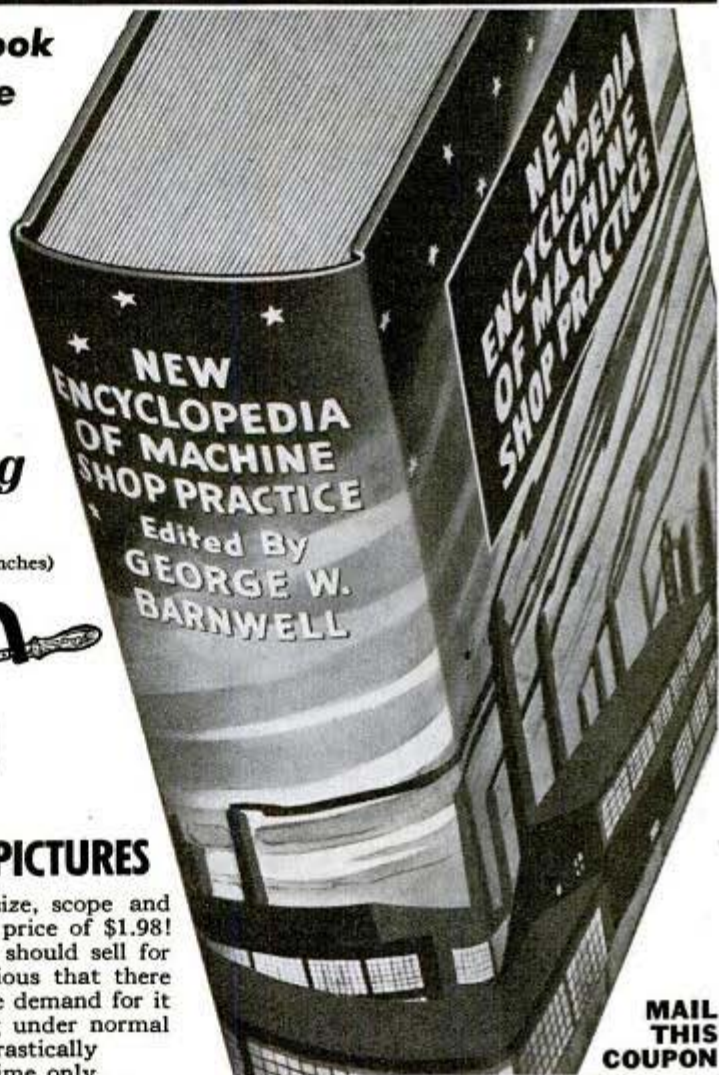
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YOU, OLD
BOY?

BILL! GOSH, I DIDN'T
KNOW YOU IN THOSE
NEW CLOTHES AND
THAT SNAPPY CAR.
SOMEBODY LEAVE
YOU A MILLION?



ONLY A SHORT TIME
AGO YOU WERE
SLAVING AWAY AT
THE SAME JOB AS
THE REST OF US.
NOW LOOK AT YOU.
HOW COME?

WELL, TOM, I DECIDED
I'D NEVER GET
ANYWHERE UNLESS
I PICKED A BUSINESS
WITH LOTS OF OPPOR-
TUNITIES AND TRAINED
MYSELF FOR THEM--
SO I PICKED RADIO



YOU HAD THE SAME CHANCE, TOM.
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YOU A BOOK FROM NATIONAL
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THE OPPORTUNITIES AND FUTURE
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WELL-- I ENROLLED



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MINE NEVER
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A FEW MONTHS AGO AND I'M
ALREADY MAKING \$5 TO \$10 A
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YOU'VE GONE AHEAD SO FAST
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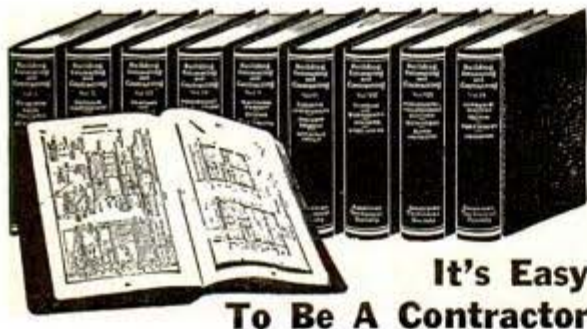
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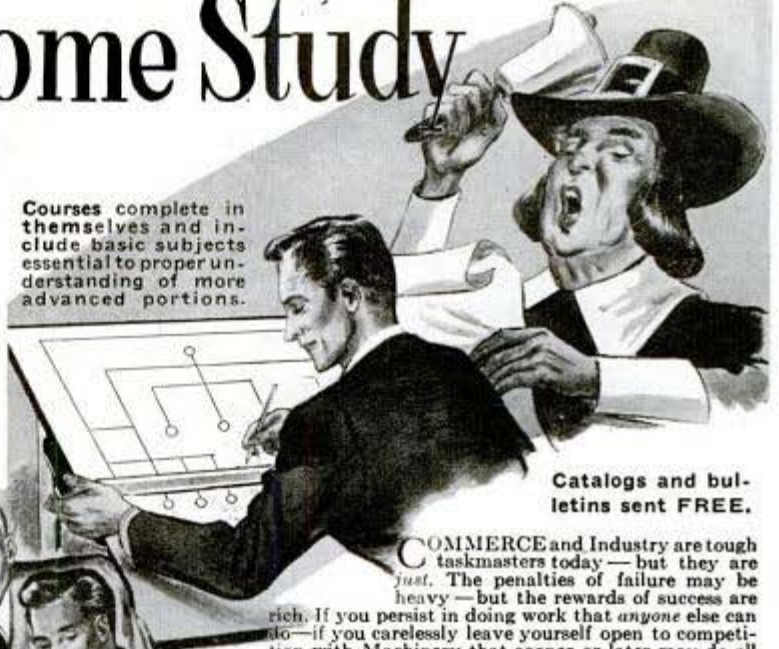
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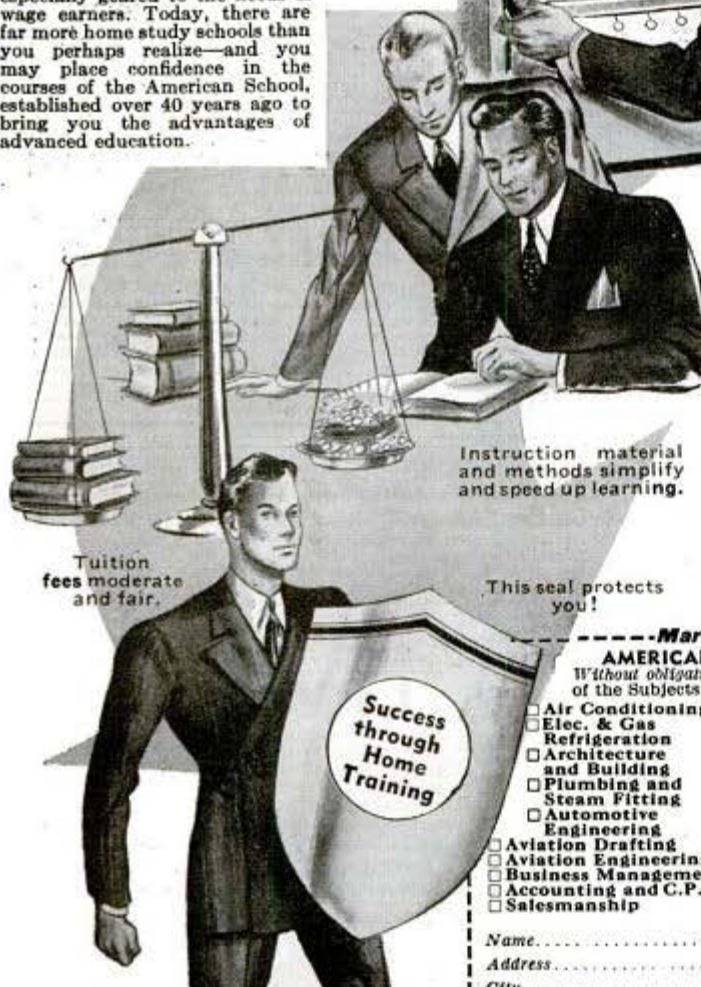
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POPULAR MECHANICS



the Case of the Crying Wife

1 Ann doesn't cry easily—but that night I found her in tears! "I can't help it," she sobbed. "All the things we were going to do—buy a car, build a home—remember? And here we are—married three years, and just barely making ends meet! I thought our dreams might come true—but it's no use." I made up my mind right then to "have it out" with the boss.



2 "Look here!" he said. "I can't pay you more unless you're worth more! And frankly, John, you lack the training a bigger job needs. Ever hear of the International Correspondence Schools?"



3 When I learned the boss was a former I.C.S. student, I signed up quick! And what a difference it made in my work! I'd never realized until then how little I knew about the business.



4 I'm happy, and Ann's happy, and I guess the boss is happy. (At least I've had two "raises" in the last year!) And here's the very same coupon that I mailed, staring you in the face!

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While attending a technical school I became very much annoyed with the inadequacy of one of the tools required in the course of my study. As a result I conceived an idea for an improvement which I felt so surpassed the tool then used, that I was certain other students and professional men would find it very valuable. I demonstrated it to my friends and they were so greatly impressed with its commercial possibilities that they advised me to get a patent on it.

Acting immediately upon this suggestion, I wrote to Clarence A. O'Brien, having been advised that he was a reliable and competent registered patent attorney. Following prompt instructions from Clarence A. O'Brien, I submitted my invention to him for the purpose of making a preliminary patentability search of the Patent Office records. The good word soon came back . . . my invention appeared to be patentable! I believe that this was one of the greatest moments of my life. Armed with this assurance, I promptly filed application for a patent. As soon as the patent was thus pending, I was in a position to commence volume production of my invention. I then arranged an interview with one of the largest manufacturers in the business, and demonstrated the model to him, since in the meantime Clarence A. O'Brien had secured the necessary patent for my invention. The manufacturer was so favorably impressed, that he gave me a substantial order. He was so pleased with the sales results of my invention that he is now reordering in great quantities. Other manufacturers caught up the idea, and today I am supply-

ing most of the market, and am protected against infringement by the patent obtained through the efforts of Clarence A. O'Brien.

I feel that the whole basis of my good fortune may be traced to the intelligent, careful cooperation of Clarence A. O'Brien in securing a patent on my invention. Without the assistance of Clarence A. O'Brien, my tremendous success would not have been possible . . . I can wholeheartedly recommend his services to any inventor who has an idea worth protecting by a U. S. Patent."

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L 664
Plate Holder Has Rubber Grips Which Move to Fit All Sizes

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market. Intended for use on a shelf or table, it has rubber separators which grip the plates. These rubber grips move vertically or horizontally to fit any plate.

L 856
Automatic Electric Percolator Controls Brewing Time

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built-in time switch at any point from weak to strong. Coffee is not "boiled" at any time, since the water is kept near 203 degrees and passed rapidly through the coffee for a controlled period. A light signals when brewing is complete.

WHERE-TO-BUY-IT INDEX OF POPULAR INVENTIONS

Midget washboard

Wade Wood Craftsmen, Chicago, Ill.

Plate holder

Carson, Pirie Scott & Co., Chicago, Ill.

Automatic percolator

Landers, Frary & Clark, New Britain, Conn.

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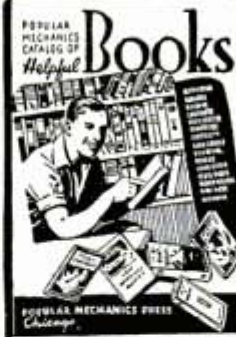
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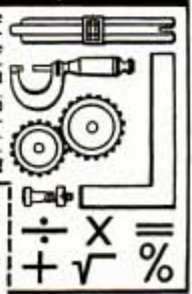
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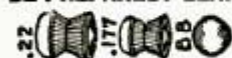
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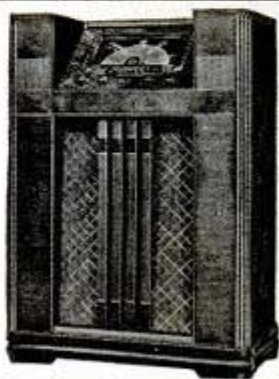
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SELL Nylon hosiery and give fine silk hose for half price in combination order. Guaranteed against holes, snags, and runs or replaced free. Hose for your own personal use given with large outfit. Rush name and hose size today. Wilknit, Desk BO-37,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

AMAZING New polishing fabric beating all sales records. Full size sample and particulars free to bona-fide agents. Berg Sales Co., 24 North Fourth St., Minneapolis, Minn.

CHRISTMAS Cards—Fast sellers. Sensational 21-card \$1 assortment pays 50c profit. Christmas cards with sender's name, 50 for \$1. Outstanding complete line moneymaking assortments. Experience unnecessary. Samples on approval. Schwer, Dept. D-4, Westfield, Mass.

ECONOMY Specialties sell fast, big profits. Two samples one dime. Economy, Box 869-Z, Lake Worth, Florida.

MAKE Money! Show exclusive Christmas cards with customer's name, 50 for \$1, up 100 designs. Also 21-card "Wonder Box" assortment \$1. You make 50c. Samples on approval. James Art Studios, 184 Anson Place, Rochester, New York.

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

CHRISTMAS Cards—America's finest assortments. Big profits. Samples on approval. Robinson Cards, Dept. 127, Clinton, Mass.

AVIATION. Leather jackets, raincoats \$1.98 up. Outfit free. National Leathercraft Co., 681G Broadway, New York.

EXTRA Money quick! Sell super-value personal Christmas cards. 50—with name—\$1. Finest 25-card assortment \$1. You make 50c. Complete line. Samples on approval. Waltham Art Publishers, 160 N. Washington, Dept. 495, Boston, Mass.

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

SELL Season's Christmas card hit! America's finest 21-card assortment. \$1. Your profit 100%. Big selection assortments, personal Christmas cards low as 50 for \$1. Free samples. Wetmore & Suggen, 749 Monroe, Dept. 70, Rochester, New York.

AMAZING Cleaner! Makes cleaning easy. Premium deals gets orders. Free sample. Zimco, 5907 Irving Park, Chicago.

SELL Christmas card sensation! New "Prize" 21-card assortment leads in value, appeal. Sells \$1—you make 50c. 14 fast-selling assortments. Personal Christmas cards with name 50 for \$1, up. Samples on approval. Chilton Greetings, 147 Essex, Dept. H-2, Boston, Mass.

SELL Different Christmas cards—21 for \$1. Free metallic gold seals can be used to "personalize" cards. Make 100% profit. Christmas cards with name imprinted 50 for \$1. Samples on approval. Friendship, 799 Adams, Elmira, New York.

DRESSES 10c, Shoes 50c, coats 75c, hats 40c. Slightly used. Free catalogue. Crown, 164 (PM) Monroe Street, New York.

500% PROFIT. Just invented. "Thumb Tacks for Glass." Get in on ground floor. Hot seller, will turn millions. 25c brings samples, particulars. Est. 1010. 2718 W. 7th, Los Angeles, California.

QUICK Cash earnings easy. Show friends and others big value Christmas cards with name, 50 for \$1. Also famous "Beauticraft" 21-card \$1 Christmas assortment. Pays 50c profit. 14 assortments—Gift wraps, etchings. Samples on approval. Hertel, 305 Adams, Dept. 1019, Chicago.

BEAUTIFUL Glass name plates for doors. Agents wanted. Harvey Richard, 70 Oliver, Southbridge, Mass.

OPEN Rawleigh routes are scarce but in so vast an organization expansion creates new opportunities. If ambitious, willing to start with good earnings and increase rapidly write for full information. We supply sales, advertising literature—all you need. Rawleigh's, Dept. J-118-PPM, Freeport, Ill.

MAGNETIC Sponge draws dirt from clothing. Used like brush. Saves dry-cleaning. Slick discovery. Samples sent on trial. Write "Inventor," 128 Kristee Bldg., Akron, Ohio.

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

DISTRIBUTORS For Aspercol carded merchandise. Discounts. 2617 - 38th Ave., Oakland, Calif.

ELGIN, Waltham wrist watches \$3.25. Send for free wholesale catalog. Louis Perloff, 729 Walnut Street, Philadelphia, Penna.

MERCHANTS Wall cards—Cost 1c. Sells 10c. Details. Eugene Collins, Biltmore, N. C.

QUICK Profits selling typeless printers \$5.45 up. Professional Products, A-1010, Cincinnati.

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

500% SELLING Needle books. Write Sweeper, 141 West St., Newark, N. J.

HOT-SHOT Electric stock prod sells on sight to livestock truckers and stock handlers. Big profit. Five sales per day net you \$12.00. Hot-Shot Prod Co., Box 612, San Diego, Calif.

AMAZING Cloth removes tarnish from metals without the use of liquid, paste, or powder. Retail, 25c. Sample. Baker, Box 227, Trenton, 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. Philip's Neckwear, 20 West 22nd St., Dept. P-5, New York.

OIL Burner. Powerful, cheap. Sell homes, dealers, industrial plants. Fits any stove. Established 30 years. National Sales Co., Raleigh, Tenn.

(VICTORY) New napkin holders. 100% profit, 9 out of 10 buy, sample 35c. Dainty Kraft, Raymond, New Hampshire.

AMBITIOUS School seniors—Sell classmates the "tops" in graduation name cards. Best commissions. Free cards. Agencies going like wildfire. Hurry! Craftcards, Box 235-L, Pittsburgh, Penna.

SENSATIONAL New concentrated wall shampoo. \$1.00 profit every \$1.20 sale. Free offer. Gallon sample 25c. Thermo-san, Peoria, Ill.

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

SELL New, used clothing from home, auto, store. Men's suits 77c, leather jackets 29c, overcoats 43c, dresses 10c, ladies' coats 33c. Other bargains. Catalog free. S&N, 565-A Roosevelt, Chicago.

CHRISTMAS Cards. Everyone uses. Fast sellers. Samples on approval. Freeman Company, 33 High, New Haven, Conn.

MEN'S—Ladies' used topcoats 35c, winter coats 40c, suits 88c, pants 23c, dresses 10c. Other bargains. Catalog free. Portnoy, 566-V Roosevelt, Chicago.

HOTTER Than a firecracker: new-amazing cleaner. Dry cleans for pennies. Whirlwind seller. Goldmine in profits. Write immediately. Home Products Co., 1116 S. Home Ave., Oak Park, Ill.

BIG Money selling water softeners. Hammond, 123 Elm, Long Beach, Calif.

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, Pitman, N. J.

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.

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

START Your own bargain clothing business. Sell new and used shoes, dresses, coats, etc. Experience unnecessary. Free wholesale catalog. Superior, 1250-MB Jefferson, Chicago.

ATTRACTIVE, Patriotic novelty. 3c stamp brings sample. Quick, profitable seller. Write now. Ufert, 19 East 17th St., New York.

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

CHRISTMAS Cards. Earn \$2 an hour. Take orders galore from friends. 50 exquisite folders with name \$1. Free samples. 25 designs. America's fastest selling 21 Christmas folder box. Costs 50c. Sells \$1. Request samples today. Sunshine Art, Dept. E, 115 Fulton St., New York City.

AMAZING Values, sundries, notions novelties, gifts, military and patriotic items. Postcard brings free catalogue. World's lowest priced wholesalers for 25 years. Mills Sales Co., 901 Broadway, 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.

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

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

"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 outfit, Emblem checks, check-fobs, name plates. Hart Mfg. Co., 393 Dezarw St., Brooklyn, N. Y.

GOOD Paying business silvering mirrors, plating auto parts, 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.

BIG Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, raincoats, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

HIGH-GRADE SALESMEN

ADVERTISING Book matches. America's largest manufacturer of union label book matches. Fast selling line. Large sales producing kit. Sample matches. Complete cut catalog. 13 color combinations makes selling easy. Commission in advance. Superior Match Company, 7530 Greenwood, Dept. M-10, Chicago.

GREATER Christmas profits! Fifty imprint cards 20c! Dollar box assortments 33c! Calendars, wreaths, pictures, novelties. Catalog free! Three boxes \$1.00. Fantus, 440 North Wells, Chicago.

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-Fit 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.

EVERY Business must buy printing, advertising specialties, book matches, etc. Take orders for the pioneer line—1000 necessity items at 50% price saving. Free deals. 40% advanced commission, bonus. Experience unnecessary. Outhit free. David Lionel Press, 312 So. Hamilton, Dept. 710, Chicago.

SELL Our big bargain work gloves to stores only. Catalog free. Kriewaldt Mfg. Co., Oconto, Wis.

ADVERTISING Book matches offer liberal earnings—full, spare time. Experience unnecessary. Factory direct. Low prices for fine quality, quick deliveries, help get orders; faster repeats. All business firms prospects. Free outfit, instructions. American Match & Printing Co., Dept. 610, 4622 South Trumbull Ave., Chicago.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

CALENDARS—Beautiful complete line, all sizes, including jumbos, samples free. Start now, be the first in the field. Fleming Calendar Company, 6539 Cottage Grove, Chicago.

BIG Money for real salesmen. Over 100% profit to you. Combination chart indicating interest rates, depreciation and maturity. Practically every business concern, both retail and wholesale, a live prospect. Make \$100 per week, and more. Sample sent to salesmen for only 25c to cover postage and handling. Sells for \$1. Full particulars regarding unusual propositions to salesmen. Money back if product doesn't do all we claim for it. George E. Hadden, Dept., 6808 Santa Monica Blvd., Los Angeles, Calif.

MAN With car to cover retail store route. Openings almost every locality. Handle orders for nationally known manufacturer-jobber. Average 50% commission. Steady big pay opportunity. Sales experience unnecessary. World's Products Co., Dept. 10-S, Spencer, Ind.

GEM Wants full or part time man in each county to take orders for advertising matchbooks and calendars. Cash commissions. Gem Match, 82-PM West Washington, Chicago.

CONCESSIONERS! Salesmen! Army camp workers! Hustlers! Perfumed Hawaiian Lel. New sensational seller! Particulars free. Mission, 2328 W. Pico, Los Angeles, Calif.

BLADES—Big profits. Best quality. Factory prices. Postpaid. Ace Blades, Buffalo, N. Y.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$270 weekly. Farrell cleared over \$1,000.00 monthly. Write F. E. Armstrong, President, Dept. PM, Mobile, Ala.

EDUCATIONAL AND INSTRUCTION

LEARN Welding! Get into aircraft, shipbuilding, hundreds of important industries that need trained welders. Prepare now for good pay and future. Learn spare time at home if preferred. Write for free facts, Utilities Engineering Institute, 1314 Belden, Dept. IIX, Chicago.

LANGUAGES—Oriental, Celtic, Slavonic; grammars, dictionaries, chrestomathies. Write wants. Paul Carr, Warwick, New York.

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-1011, Troy, Ohio.

1941 BATTERLESS Radio, plans 20 cents. Elrad, Box 44, Tipp City, Ohio.

BUSINESS Job counsel, personal, all questions answered. Send one dollar. Kautch, 3321 Grove Street, Berkeley, Calif.

ENJOY Health. Become professional acrobat. Free health book. Write! Emil Knoff, 2154M1 North 52nd Street, Milwaukee, Wis.

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USCEED With Super-Memory. Write "DO" Info Company, Box 1122, Chicago.

WATCHMAKERS Lessons, tools, supplies. Details free. Chicago School, 155 North Clark Street, Chicago.

GOOD Penmanship is valuable business asset. Learn to write in spare time. Send 25c today for six black cards with your name beautifully written in white, professional penpoint and free book, "How to Become a Good Penman." Tamblin School of Penmanship, 442 Ridge Building, Kansas City, Missouri.

LOCKSMITH Course. Lock picking, key fitting, etc. \$1.00 prepaid. Locksmith, Canadian, Texas.

LEARN Aircraft construction. Pay all tuition after employed. Over 1500 recent graduates now gainfully employed. Will accept limited number of qualified men for next beginning class. Write immediately. California Aircraft Institute, Inc., 1121 West Pico Boulevard, Los Angeles.

ARTISTIC Lettering simplified. Fascinating work. Unique lettering examples free postpaid. Thompson School, Pontiac, Michigan.

LEARN Practical blue print reading quickly at home, spare time. Engineering Service, Box 37, Hillside, Wichita, Kans.

LEARN Watchmaking. Material instructions for start and wholesale supply catalog, all \$1.00. Refund not satisfactory. Stewart's, 721 Olive St., St. Louis, Mo.

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

U. S. government jobs now open. New study course. No cost until on government payroll. Free information. Civil Preparatory Service, 1702-A N. LaSalle, Chicago.

LEARN Telegraphy! Splendid opportunities now prevail. All expenses low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Indiana.

HOME Study for degree. Psychology, Metaphysics, Philosophy, Bible. Free information. College of Universal Truth, 20-B East Jackson, Chicago.

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

LEARN Big day trades in a few weeks. Decorating, paperhanging, graining, marbling, sign and pictorial painting. Catalog free. Chicago Painting School, 102 West Lake Street, Chicago.

SECRET Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

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NEW Writers needed! Free test shows your ability. It's fun! No obligations. Rush postcard to Comfort Writer's Service, Dept. 722, St. Louis, Mo.

STORIES, Novels, poems wanted for publication. Many eager markets. Author will help you sell. Manuscripts marketed, revised, typed. Christopher Carr, 3636A Chestnut, Philadelphia, Penna.

BUSINESS SERVICE

PROTECT Your valuable legal papers, documents, plans, etc. Photostat copies made of anything written, printed or drawn. Reasonable. Photostat Service, 5017 Cermak, Cicero, Illinois.

\$1.00 PAYS For San Francisco office under your name. Personal, business mail received and remailed. "Contacts," 451 Turk, San Francisco, Calif.

HAVE A Hollywood or Los Angeles address. For business, personal, or social. We remain daily, 10c each or \$1.00 a month. Lost friends located. California Information and Service, P.O. Box 5571, Metropolitan Sta., Los Angeles, Calif.

CHICAGO Mail address: \$1 monthly—Receiving, reforwarding your business, personal mail. General, 30 West Washington. (Established 1919).

WASHINGTON, D. C., mail forwarding address. Hawkins Mail Service, 908G 14th.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

"STUDENT Cartoonist" current issue included with our helpful book, "Secrets of Cartooning." Dollar postpaid. Catalogue 3c. House of Little Books, 156 Fifth Avenue, New York.

NEW Illustrated method makes drawing easy, simplified. Send 3c stamp for eye-opening particulars! Leon, Com'l Artist, Box 253, Los Angeles, California.

CARTOONING Course—30 illustrated lessons, over 500 sketches, drawing paper, pens and pencils. \$1.00 complete postpaid. Montes Studio, Box 985, Pasadena, Calif.

AMATEUR Cartoonists, earn money evenings, copying cartoons for advertisers. Ad-Service, Argyle, Wisconsin.

CHALK Talks. Laugh producing program. \$1.00. Catalog 10c. Balda, the Cartoonist, Oshkosh, Wisconsin.

COMIC Pen and ink sketch made from your photograph. Picture returned unharmed. State hobby or pastime. Send photo and \$1 to Thomas Brouse, Rt. 1, Mifflinburg, Penna.

PEN And ink drawings. Let us draw your advertising and catalogue illustrations, from photos, copies or objects. Best work and fair prices. Heraldic Studios, 1914P Oakdale Avenue, Chicago, Ill.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

MAIL-ORDER Or agent ad reaching 1,000,000 families throughout United States \$14.00 inch. Newspaper, magazine, mailing-list, rate-book, free. Chicago Advertising Agency, 28-PM West Jackson, Chicago.

INCH Display advertisement fifty magazines, year \$15. Wood's Popular Services, Atlantic City, (N. J.)

ADVERTISE: 24 Words, 149 newspapers \$6.50. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

LEARN Advertising at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 1315 Michigan Avenue, Dept. 343C, Chicago.

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

ADVERTISING Placed all magazines, newspapers U.S.A., Canada. Lowest rates. Free service. 54-page catalog free. Baker Advertising Agency, A-189 W. Madison, Chicago. Established 29 years.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

OWING To pressure of national defense program we must sacrifice our \$9.95 Roto-speed Post Card Duplicators equipped with stencils, pads, stylo and ink for \$4.25. H. J. Otto Mfg. Co., Evansville, Ind.

"New Process" stencils for all makes duplicators, 5 quires (120) \$8.75. One quire \$2.00, inks and supplies. Automatic post card stencil printers \$6.75. Write Pittsburgh Typewriter Supply, Department K-22, Pittsburgh, Penna.

TYPEWRITERS. Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Pruitt, 28 Pruitt Bldg., Chicago.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Stamps. 1 line 25c, 2 lines 35c. Signatures \$1.50. Stamp Works, Hastings, Nebr.

3 LINES 30c. Indexed, cushioned. Pads 10c. Stamprite, Wauwatosa, Wis.

BLANK Gummed labels, 33 to perforated sheet. Samples? Dulco, 324 Pitt, Pittsburgh, 21, Penna.

SUPERIOR. Cushioned, indexed. Two lines 25c; three 35c. Signatures \$1.50. Slocum, 814 Bradley, Peoria, Illinois.

KNOB Handle, cushioned. 2 lines 25c. 3—35c. Stamp Works, Centerport, N. Y.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Nebr.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

1000 ENVELOPES, Letterheads, bill-headers, statements, embossed business cards, \$1.75 each. Quality service guaranteed. Standard Printing Company, Fairmont, West Va.

PRINTORAVURE Raised letter business cards, 1,000 \$2.70. Card case free. Samples. Goff Press, 5017 Cermak, Cicero, Illinois.

100 8 $\frac{1}{2}$ x11 BOND Letterheads and 100 envelopes \$1.00 postpaid. Hammermill \$1.25. Benneville, 907 West Roosevelt, Philadelphia.

PICTURE Labels—Hundred designs 10c refundable. Arrowprint, PM1041, Waterbury, Connecticut.

50 BEAUTIFUL Christmas name cards \$1.00. Gisold, 131-B Chestnut, Scranton, Penna.

300 BOND Letterheads, 5 1/2 x 8 1/2, 150 envelopes, \$1.00 postpaid. Bratcher's, 802 West Main, Owensboro, Kentucky.

PRINTING. Beautiful, economical, metallic and colored labels, letterheads, photoprinting, advertising novelties. Free art service. Samples 10c. Ultramodern, 1305 Walnut, Cincinnati.

250 MODERN, Distinctive, Hammermill letterheads (8 1/2 x 11) and 250 envelopes—\$1.75. Samples. W. D. Treaster, Milroy, Pennsylvania.

THOUSAND Business cards \$1.00. Send for samples. Eaton Press, 13101 Main, Gardner, Kansas.

1000 STATEMENTS \$2.25 postpaid. Samples. State requirements. RAB Publishers, Cincinnati.

5000 ELEGANT 6x9 Circulars, \$7.50. Folders, booklets, cards, stationery, lowest prices. Samples. Goodprint, Harrisonburg, Va.

1,000 6x9 CIRCULARS, 2 colors, \$1.50. Peerless Printing, Altoona, Penna.

\$1.00 EACH. 200 Letterheads, 200 envelopes, 500 business cards. Prepaid. 24 hour service. Press, 1417 Clybourn, Chicago, Ill.

THOMPSON Photo Offset Printing, Rockville Centre, N. Y. Illustrate advertising matter. Cuts unnecessary, samples.

500 3 1/2 x 2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

100 LARGE Envelopes, 100 letterheads \$1.00 prepaid. Crown Print, Adelphi, Ohio.

1000 BUSINESS Cards \$1.00. Willmar Press, 120 Beacon Ave., Providence, Rhode Island.

200 ENVELOPES \$1.00 Postpaid. Eleven other \$1.00 specials. Free folder. Economy Printing, San Antonio, Texas.

1000 BUSINESS Cards \$1.75. 1000 embossed letterheads \$1.95, 1000 standard envelopes \$2.25. Union label. Quick delivery prices quoted. M. Hall, Box 1351, Highlands, Texas.

300 BUSINESS Cards, 95c. Other printing. Church Press, Stanley, Wisconsin.

JOB Printing, quick reasonable. Samples. Atlantic, Box 653-H, Rock Hill, S. C.

BETTER Quality letterheads, envelopes, cards, statements. Reasonably priced. Samples. Franklin Press, 154-A Bloomington, Indiana.

SUPERIOR Quality shipping labels and stickers. Reasonable. Labelcraft, La Crosse, Wisconsin.

250 LETTERHEADS, Envelopes, billheads, cards. Combination \$3.50. Economic Press, Leonia, N. J.

OFFSET Printing without cuts. Circulars, booklets, etc. Active Press 1170 Broadway, New York, N. Y.

PRINTING Special—100 8 1/2 x 11 bond letterheads, 100 6 3/4 envelopes, 4 lines, both \$1.00. F. C. Cramer, Box 993, Chicago.

125 EACH 8 1/2 x 11 Letterheads, 6 3/4 envelopes, \$1.00 postpaid. Brennen, 2011-E Wayne, Middletown, Ohio.

HARVEY Labels, Berea, Ohio. Better label values. Interesting samples free.

MIMEOGRAPHING — 500 Postcards or 300 letters \$1.00. Additional hundreds, 10c. No lineage limit. Samples free. Dollar Letter Service, 180 W. Washington, Chicago.

QUALITY Printing—unsurpassed. Low prices. Samples free. Fame Press, Lathrop, Calif.

PRINTING OUTFITS AND SUPPLIES

INEXPENSIVE 6x9 Printing press. Details free. Novelty Shop, Downsview, Louisiana.

NEW Type reasonably priced. M. R. Landis Co., Richland, Penna.

HAND Presses, type, equipment. List free. James A. Fred, Mishawaka, Indiana.

PRINT Your own cards, stationery, circulars, advertising. Save money. Simple rules furnished. Print for others, nice profit. Junior outfit \$8.25, senior outfits \$16.55. Details free. Kelsey, Inc., T-11, Meriden, Conn.

PRINT At home. 10c will bring a complete catalog of presses, type and supplies. P. Peiffer & Company, 6 Columbia St., Newark, N. J.

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

USED Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

PATENT ATTORNEYS

INVENTORS: Take first step toward protecting your invention—without obligation. Write for free "Record of Invention" form for establishing date of invention. We also send free—48 page book, "Patent Guide for the Inventor"—telling importance of prompt action, confidential search service; how to sell and market inventions; details of convenient payment plan. Send for free "Patent Guide" and "Record of Invention" form today. Clarence A. O'Brien, Registered Patent Attorney, 1K1B Adams Building, Washington, D. C.

PATENT Your idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees. 43 years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 411-L Victor Building, Washington, D. C.

INVENTORS—Delays are dangerous—Secure patent protection now. Get new free booklet, "How to Protect Your Invention." No charge for preliminary information. McMorro and Berman, Registered Patent Attorneys, 1343 Barrister Building, Washington, D. C.

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\$35.00 ATTORNEY'S Fee in some cases. Free particulars airmailed. Robert Beck, 1210 Barrister Building, Washington, D. C.

INVENTORS—Send for free booklet "Patent-Sense." Information based on 64 years experience. Lacey & Lacey, Dept. 5A, 635 F St., Washington, D. C.

L. F. RANDOLPH, 302-B Victor Bldg., Washington, D. C. Low cost. Book and information free.

"INVENTOR'S Guide" free: full information about patenting, selling inventions. Frank W. Ledermann, 154 Nassau Street, New York.

INVENTORS—Before disclosing your invention to anyone send for form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Alwines & Rommel, 411 Bowen Building, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

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MERLIN M. Evans—Registered Patent Attorney—prompt, experienced, personal patent service. Reasonable fees. Strict confidence observed. Send today for legal "Evidence of Invention" form. 718-L 9th Street, N.W., Washington, D. C.

FOR INVENTORS

INVENTORS: Time counts. Take first step toward protecting your invention—without obligation. Don't delay. Send for free "Record of Invention" form—and new book "Patent Guide for the Inventor" containing instructions on how to patent and sell your invention; details of confidential search service; convenient payment plan. Write today. Clarence A. O'Brien, Registered Patent Attorney, 1K1A Adams Building, Washington, D. C.

PATENT Your idea. Write immediately for two free books "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, forty-three years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 412-L Victor Building, Washington, D. C.

DEVELOPING Your idea into marketing article, dies, tools, for rapid and cheap production is our hobby. Write us. 50 years of experience. H & H Tool & Mfg. Co., 308 E. 3rd, Cincinnati, O.

CONTACT 25 Buyers! Your invention drawn. 25 prints and 25 manufacturers. \$5. U. S. Drafting Co., 91 Wall Street, New York.

WANTED! Small inventions; patented, unpatented; cash, royalty basis. Trap-hagen Company, 307 East St. Clair, Indianapolis.

MANUFACTURERS Addresses—25 any line \$1; unpatented inventions wanted. Manufacturers Directory, 35P North Ninth, Columbus, Ohio.

PATENT. Trademark, drafting, searching, complete inventors service. Edward Corcoran, Chandler Building, Washington, D. C.

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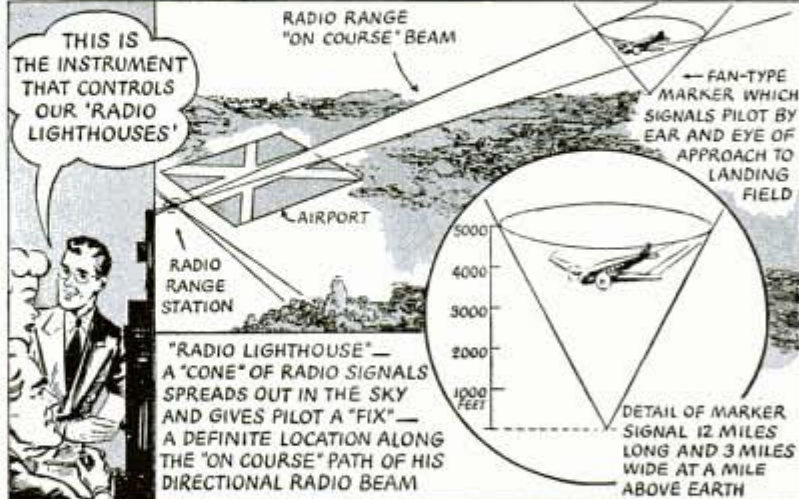
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Vol. 76

OCTOBER, 1941

No. 4

By Julian Leggett

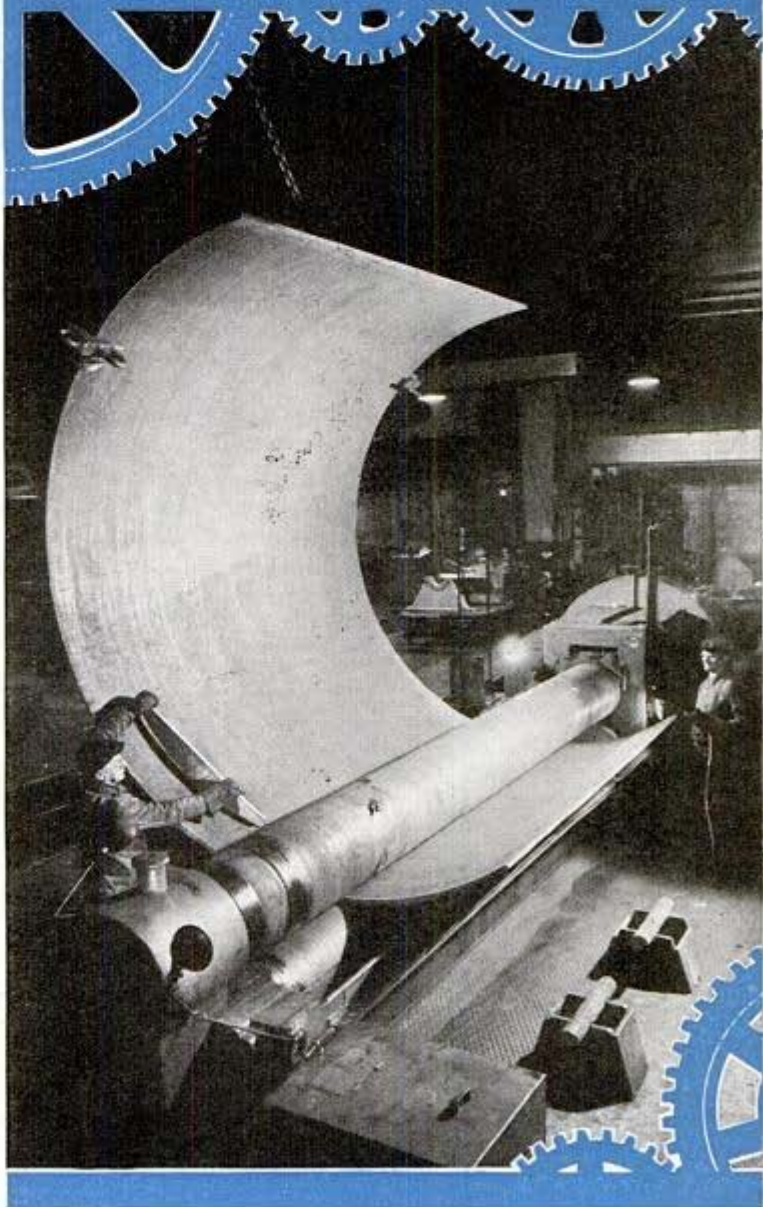
MORE than 8,000 separate pieces of metal go into a single large airplane engine and all must be shaped to size with metal-cutting tools. Machines that do this job, as well as thousands of other operations, are called machine tools and they are the secret of America's ability to produce amazing quantities of automobiles and vacuum sweepers, war tanks and cream separators, airplanes and guns.

Counting the 8,000 parts at one per second would take more than two hours; imagine then the task of machining every fraction of every square inch of practically every one. But the machine tool designed for each operation does it quickly, often faster than you can count, and accurately, in some parts to $1/10,000$ inch, which is about $1/30$ the thickness of a human hair.

These machines that make the machines of civilization come in all sizes, from those small enough to set up on a factory bench to others weighing more than 50 tons and standing as high as a three-story house. Some perform only a sin-

Measuring curvature of steel frame for turbine generator after it has been squeezed through giant "wringer"

MACHINES THAT MAKE MACHINES



2898
Ref: National Machine Tool Builders Assn, Cleveland, Ohio

OCTOBER, 1941

1



Workman watches huge cutting tool shaping a large metal frame. Accuracy is never sacrificed, even though the job is a big one



Huge press punches out stator laminations used in electric motors

gle operation, others can work on a dozen or more parts at once. There are midgets with a precision beyond the power of the human eye to distinguish and there are mechanical giants with a touch lighter than a feather.

One of these robots almost seems to think as it goes through the task of boring 20 holes at once in an engine crankcase. It completes the 280 holes necessary in 65 minutes; the same job formerly required 6 hours and 40 minutes. Another drills 14 holes simultaneously in an airplane engine in one minute. When the operator presses a button, the machine runs automatically, with drills coming from five different directions. In producing an exhaust

valve for an airplane engine, 31 different machine tools are required to perform 150 separate operations. One of them, weighing four tons, cuts seven surfaces at the same time and saves 30 minutes in the finishing of the valve. One four-engine bombing plane needs as many as 72 of the valves. It used to take two machines more than 30 minutes to cut all the grooves in one of the valves to the extreme degree of accuracy necessary, but this single machine completes the job in 36 seconds.

Three times as fast in firing as the Army's old Springfield, the Garand rifle is made of 72 metal parts. Shaving these parts down to the precise sizes and shapes required takes 1,040 separate cutting operations on machine tools. Metal for one rifle weighs 24 pounds at the start, but only 7¼ pounds after machining into finished parts. The rifle's trigger housing, on which four machines worked 11 minutes by former methods, now is machined in 58 seconds on a single new machine employing cutters working from six different directions at the same time. Similarly, the production of one 75-millimeter shell and fuse calls for more than 100 separate machining operations. During the World War, American forces fired as many as 325,000 of these shells in a day.



Courtesy National Machine Tool Builders Association

Master toolmaker finish-grinding broaching cutter with 380 teeth

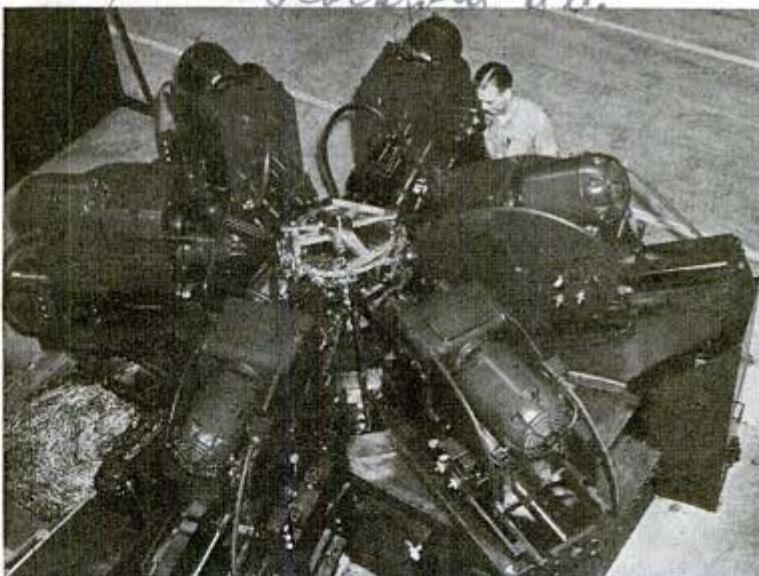
1898

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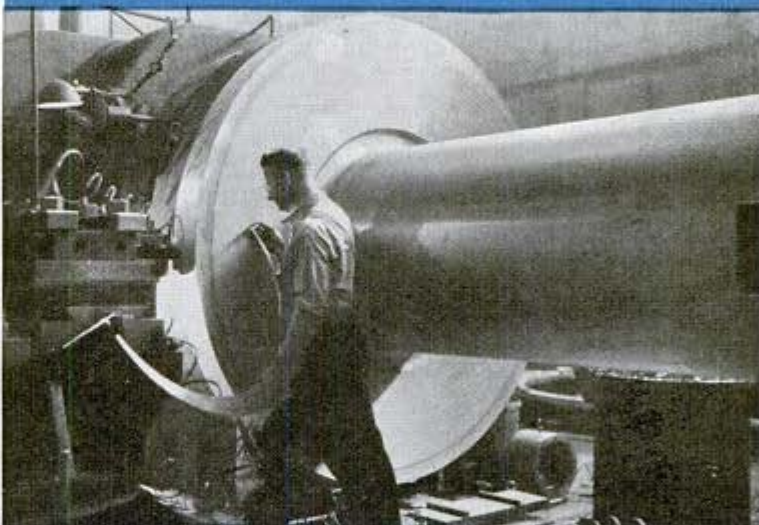
There are 3,390 separate machining operations on the parts of a .50-caliber machine gun. One automatic screw machine that weighs five tons and is 19 feet long must be operated 60 hours to provide enough armor-piercing bullets to keep the machine gun firing one hour.

Steel sheets which form the magnetic cores and rotors of electric motors are stamped out by punch presses which turn out about 60 sheets each per minute. When 200 of the sheets have been stacked up to form the core, it is thrust into the motor frame by a hydraulic press exerting a 10-ton push. Three-inch steel beams are bent into the proper shape for water-wheel generators by a 1,500-ton hydraulic press. A 40-foot boring mill has an 88-ton turntable on which 500-ton parts of electric generators are rotated while being machined to an accuracy of 4/1,000 inch. The turntable looks like that of a gigantic phonograph. The boring mill, which weighs

(Continued to page 187)



Greenlee super-tool machines airplane supercharger from six stations at once to speed up engine production. Below, checking huge steel rotor after machining on 96-inch lathe



Smoothing surface of gigantic thrust bearing, 105 inches in diameter, in Westinghouse plant



Ford workmen finishing one of immense dies used in forming steel top of auto



2793

Inflated Boat and Life Jacket Save Lives of Airmen

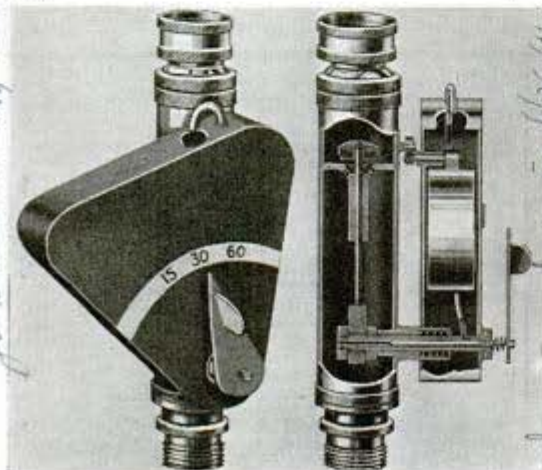


Compressed air from bottle at left inflates lifeboat

Parachutes are not enough for saving airmen forced down at sea. For such emergencies flyers of the British Royal Air Force wear a life jacket, including trousers and coat, capable of keeping a man upright in the water while he makes buoyant a small rubber boat by inflating it from a compressed-air bottle. The boat is carried in a flat container attached to his life jacket. When the dinghy is ready he clammers into it and paddles toward safety.

Meter Attached to Garden Hose Stops Flow at Desired Time

To "ration" water for the lawn or garden you can attach a timing meter to the hose, which will shut off the flow after the desired time interval. A needle valve on this

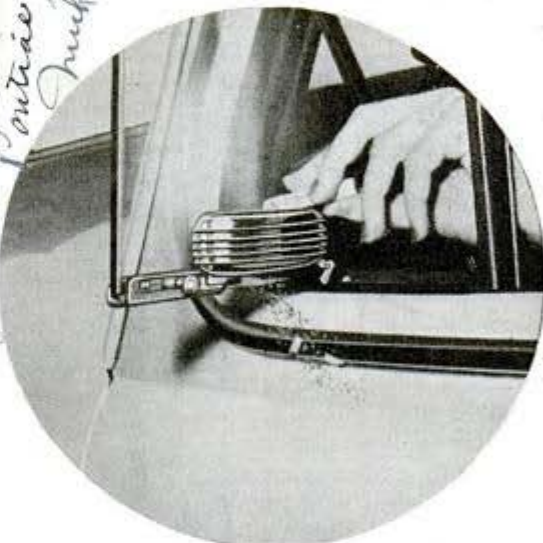


Float in tank at right rises at end of time desired

water saver can be set for any period from five to 60 minutes. At the end of the time set, a small float in the timing tank rises and the hose is turned off.

Self-Emptying Ash Tray for Car Clamps on Ventilator Window

Emptying itself automatically each time the no-draft ventilator window is opened, a safety ash tray offered automobile drivers is attached to the bottom part of the glass by clamps. With the ash receiver alongside him, the motorist can flick ashes and deposit stubs without taking his eyes off the road. Ash trays, chromium plated, are available for both left and right win-



Ash tray is emptied outside when window is opened, as well as for no-draft panes in rear windows of later model cars. A trigger opens the bottom of the tray to dump its contents when the window swings open.

"Sulfa" Drugs Fed to Plants Speed Their Cell Growth

Sulfanilamide and related drugs of the "sulfa" group, powerful in the treatment of human streptococcal and similar infections, have a potent effect, too, on plant growth. Experiments by the U. S. Bureau of Plant Industry indicate that solutions of sulfanilamide speed up evolutionary changes in plants. The size of plant parts, from pollen grains to leaves, increase greatly and under the microscope the cells in root tips are seen to have double the normal number of chromosomes.

Dr. H. S. Traub

Beltville, Mo.

W. V. Edwards, 208 Johnson St., Big Spring, Texas

Acme
Central Motor Blvd
Portage, Mich
2636
2870
S. W. Service 6/26/47

2806

New York, built by Chrysler.

Rainbow Crystals Lure Crowd to Sound Truck

Since big cities frown on unnecessary noise, some sound trucks used for advertising purposes in New York have been "soft-pedaled." The microphone is still used to address listeners around the truck, but instead of a blaring loudspeaker to attract an audience, the truck has on its roof a revolving crystal globe whose many mirrors reflect a brilliant rainbow of light from a battery of small colored spotlights. Current to operate these lights is produced by a gasoline-driven generator inside the truck.



Colored lights reflected by spinning crystal globe attract crowd to car

King Color Service, Inc.
 203 E. 26th St. New York

Two Men Can Lift a Glider Weighing Only 95 Pounds

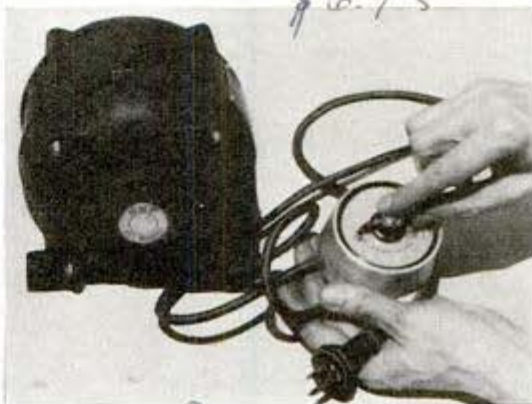


Two men hold 95-pound glider aloft, a third steadying it at the wing tip

For ease in handling it, W. Pfenninger, an engineer in Switzerland, has constructed a lightweight glider weighing but 95 pounds and having a wing span of 29½ feet. The craft can be carried by two men, one at the nose and the other at the tail, though sometimes a third helps steady it by grasping a wing tip. In one test flight the builder kept the glider in the air 3½ hours.

Timer Turns Off Paint Mixer or Appliance at Any Desired Interval

An automatic timer that shuts off the electric power at any desired interval up to 15 minutes permits the operation of a paint mixer without attention. The timer, in fact, can be used with any electric appliance where exact timing is a factor. One cord of the timer is plugged into the appliance line, the dial knob is set at the desired number of minutes and it is then connected with the power outlet.



Any electric appliance can be plugged into this timer, which shuts off power at desired interval

Muller Mfg. Co. 3238
 Bryn Mawr Ave. Chicago 5

L724

Inflated Rubber Life Suit Keeps Wearer Warm

Many seamen and others who face dangers of being thrown into the sea from mined or torpedoed ships in the battle of the Atlantic may save their lives with a one-piece rubber suit which keeps the wearer warm and dry. Developed by the Norwegian government, and demonstrated recently from a dock in New York harbor, the waterproof suit, which may be inflated, is made like a sack that fits over the body and has a pair of boots attached for the legs. Sleeves end in watertight elastic cuffs. When ready for use the suit stands folded down over the boots, and it may be put on in half a minute by stepping into the boots and pulling the suit upward until the hood covers the head. Life-saving vests are worn under the suits. In order to keep the air inside the suit from



Stepping into the boots and pulling on suit and hood takes a half minute

escaping and prevent water from entering at the neck, the hood is shirred with elastic and the string ties closely around the neck.

L799

Dummy Antitank Guns Are Welded From Junk Parts

One hundred yards away you can't tell these guns from the real thing—except that they don't shoot at you. The 104th

Ordnance company has been building dummy 37-millimeter antitank guns for the 29th Division at Fort Meade, Md. The

machine work is done in the army repair trucks. Acetylene torches and electric welders are used in assembling the dummy guns from old automobile and truck wheel and axle assemblies and other junk parts.



Ordnance men assembling dummy gun with acetylene and electric welders

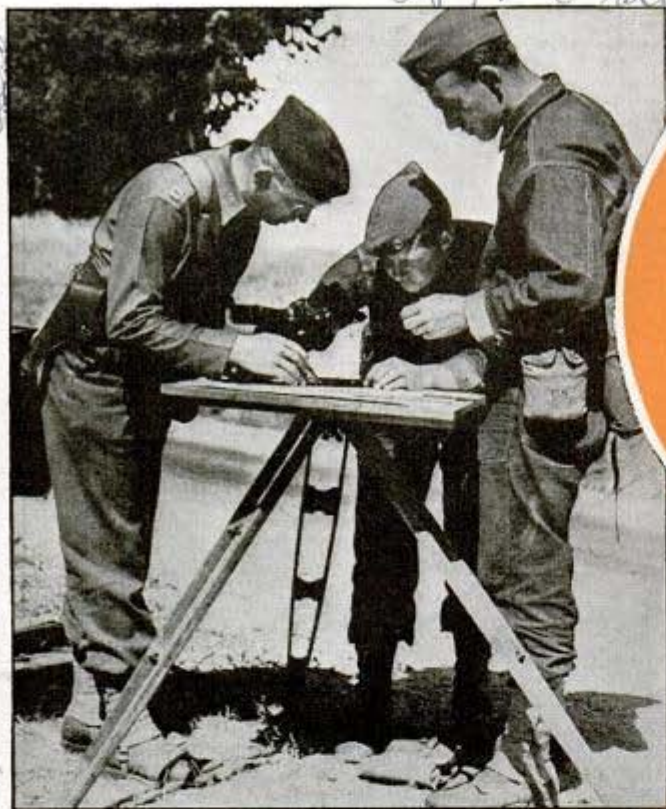
There are 241,856 gasoline stations in the United States—Texas leading with 15,738—and this does not include garages and country stores where gasoline and oil sales are not considered the major business.

Wesme
 Illinois Auto Club
 3401 S Michigan
 Chicago

2818

Cont. Thomas E. Steinson Jr.
3892 Franklin Ave
Los Angeles

Ref: Public Relations Officer 4th Army
Headquarters, 3rd Div, Ft. Starnes, Calif.



Artillery officers, using a tripod to support their work table, plot position of target during field maneuvers

Mixing fun with training, a gas-masked soldier perches the battery's pet duck on the barrel of an antitank gun



TUNING UP AMERICA'S DEFENSE MACHINE

BY RADIO, field telephone, and messenger, reports of the battle were beginning to come through to the command post of the "Blue" army.

"Air observation reports enemy air base at Paso Robles. Have dispatched bombing squadrons." "132nd Infantry finds area vicinity Jolon crossroads contaminated by gas." "Truck convoy destroyed by land mines at Road Junction 723." "Antitank companies knocked out 20 enemy medium tanks at Stony Creek."



† Burying a land mine in a road. When a truck crushes it, smoke released from bottles shows the truck is out of action



Thirty thousand "Blue" defenders were pushing back nearly as many "Reds" who were part of an invading force that had theoretically captured Los Angeles and was now advancing north. The war game was raging all over the 700 square miles of hills and valleys that make up Hunter Liggett Military Reservation in central California. Like similar war games that were conducted in other parts of the east and west last summer the play was in deadly earnest. So much so that it has been rumored that occasionally the troops disregarded the rule books and umpires and fought hand to hand for an objective.

With modern motorized equipment the speed of action in the games was at the tempo of recent European battles. Groups moved so fast that the main engagement broke down into scores of isolated fights. Each headquarters had difficulty keeping track of gains and losses. Newspaper correspondents who accompanied the armies were under strict though voluntary military censorship to prevent information to the enemy from appearing in the dispatches.

There were no halts to feed hungry

Netting over a field gun in a pit conceals it from overhead observers

Over his portable radiophone an infantryman reports enemy's position





↑ Mountain guns being moved into position on pack train

Symbols used in mimic war are shown being placed on map



One of the umpires in mimic warfare pointing to area of action on scale map of battleground



men nor any armistices to give them a good night's sleep, as in past maneuvers. Realism was the keynote in all the games because Uncle Sam's mushrooming army must be seasoned as soon as possible. Troops and trucks moved after dark, the drivers going as fast as they dared with blacked-out headlights over the narrow mountain roads. Now and then a supply train that dared air attack in the daytime was ruled out of action by the umpires, if the bombers really found it, and it was up to the supply officer to find some other way to feed his men. Isolated outposts had to be fed with supplies dropped by parachute. Even if it was a mock fight, it was real enough to the supply officers. Two hundred fifty tons of supplies a day had to be distributed to the men, some groups of whom were so well camouflaged against detection by aircraft that their own side had trouble finding them.

War games used to be simply exhibitions and each step of a game was planned before it started. Under the rules used this year there is no such control and the commanders may use their own judgment in placing their forces and planning their attacks, just as they would in actual war. One resourceful commander accordingly detached six armored cars from scout duty and sent them on a wide detour around the enemy's flank, where they attacked from the rear with machine guns blazing blank ammunition.

2818

The scout cars theoretically blew up supply centers and ammunition depots, disrupting communications, and causing much havoc.

Close co-ordination between all types of forces was one of the objectives in the games. In one campaign an army used its mobile radio loops to triangulate the positions of the enemy's radio centers and sent this information to its air officer, who then attacked with light bombardment planes.

A war game is played according to complicated rules that are based on the conditions of actual battle. Neutral field umpires who wear white arm bands assess casualties according to tables based on past experience. For instance, infantry loses one percent of its strength every hour the men are in range of opposing infantry. Infantry attacked by aircraft loses up to 10 percent of its strength, depending on how well the men are hidden.

When two forces meet, the umpires decide which one must fall back by adding up the fire power of each side, counting a rifle as 1, an automatic rifle as 3, a machine gun as 10, and modifying these figures according to the range. Prisoners are marched to the rear and must be fed and guarded, though they are released next day to get the benefit of more training.

One of the reasons for a war game is to get the men accustomed to the din and racket of a real fight. They may fire a quarter of a million

(Continued to page 192)



Portable field telephone exchange set up near mobile headquarters



"Blue" troops stand guard over group of "Reds" captured in battle

With its 75-millimeter and 37-millimeter cannons, four machine guns and a submachine gun the M-3 tank is the deadliest of its size

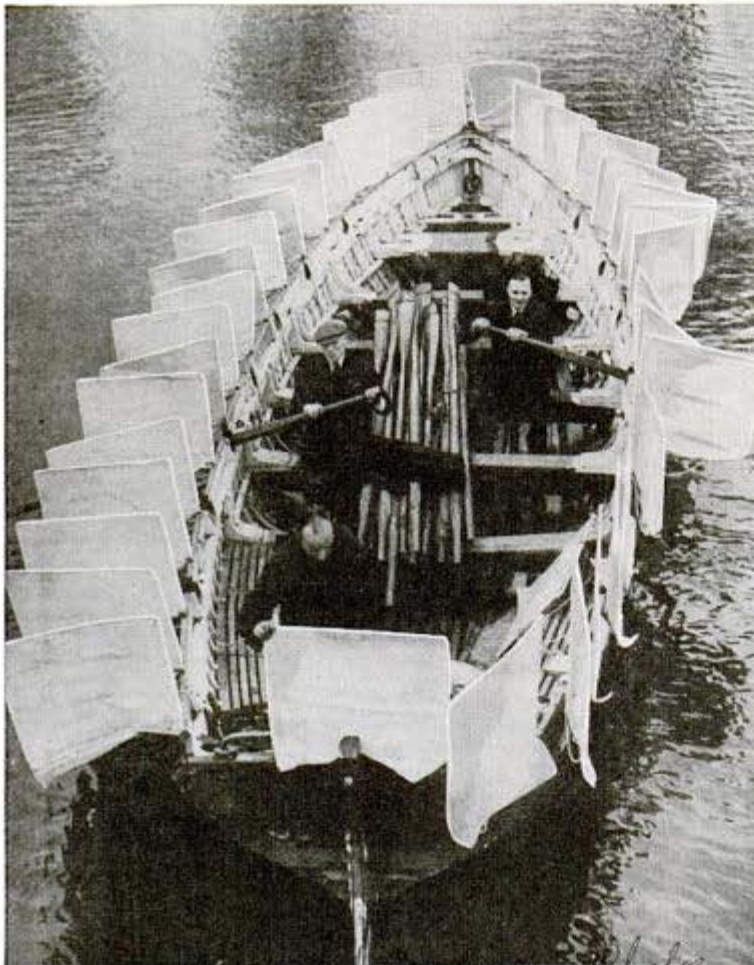


L730

Rockefeller Centre
New York

Asbestos Wings Protect Boat From Flaming Oil on Ocean

inated by a powder, developed by United States Rubber company, which is blown into each inner tube. The powder remains in suspension like dust, and it is said one tablespoonful is sufficient to neutralize the static in the radio under all conditions. A special applicator blows the powder into deflated tubes while they are on the car, and any loss in case of a puncture would be so small that it would not alter its effectiveness.



Odd asbestos wings on this lifeboat shield sailors from flaming oil. When clear of danger, the shields may be converted for use as sails

Crews of torpedoed tankers frequently find their lifeboats surrounded by a flaming sea of oil. To guard the men in such circumstances, some shipping concerns have fitted asbestos flaps at the sides of the lifeboat which may be turned as shields against the flames. As additional protection the hull of the boat is also covered to the water line.

L749

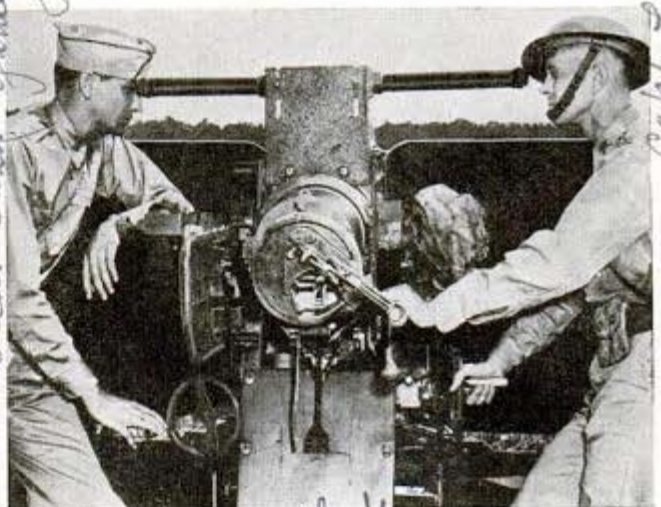
Powder Inside Inner Tube Eliminates Static in Car

Static electricity in an automobile, which causes radio interference and static shock, can be elim-

L748

Officers Build Better Gun Sight for \$6.38

Two army officers at Camp Forrest, Tenn., used their ingenuity to develop an antitank gun sight that cost them just \$6.38 to build. The small sum was invested in miscellaneous materials. Engineers commented that the sight was better than the type already being manufactured for the U. S. Army. Two eyepieces are used simultaneously, one for elevation and the other for traverse.

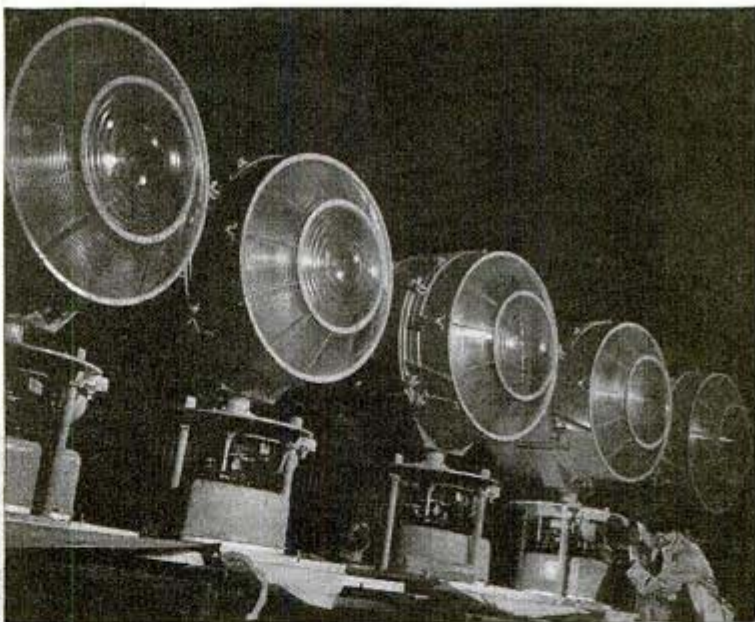


Two men at once use the range finder to spot gun on its target. One eyepiece is used for elevation and the other for traverse

L799. Lighting Division, Cleveland, Ohio

Airway "Light Buoys" Throw Beams 20 Miles

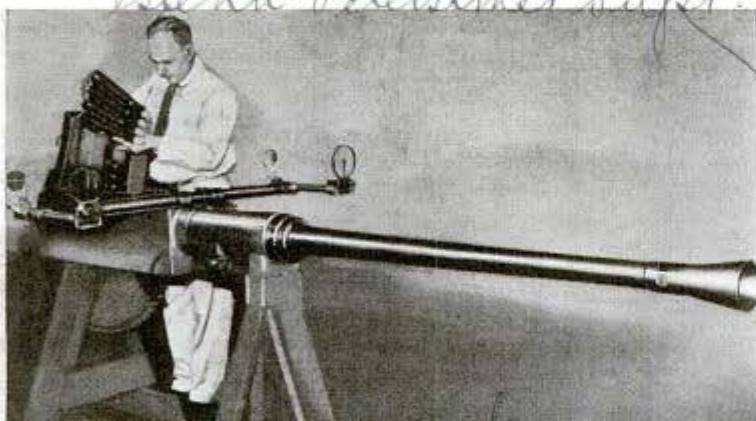
Powerful shafts of light, visible 20 miles on clear nights, soon will split the dark skies over mountains and plains to guide pilots. The great beacons, which are being produced by Westinghouse, are 36-inch, double-end-rotating lights. Each uses a 1,000-watt lamp that throws a 1,800,000 candlepower beam in two directions simultaneously.



"Lighthouses" for the airways, these 36-inch rotating lamps throw beams in two directions, visible to airplane pilots for a distance of 20 miles.

341 Massachusetts Ave
Boston, Mass

Fast-Firing Anti-aircraft Guns Pour From U. S. Plant



Loading shells into the first Bofors anti-aircraft gun built in America

Bofors "40" rapid-fire anti-aircraft guns soon will be flowing by the hundreds from the Chrysler Corporation arsenal at Detroit. First of these Swedish guns destined for America's defense was turned out in June, and production on an order for many thousands was expected to reach 300 a month this fall. The flare-mouthed gun fires 120 shots per minute.

U. S. Army's One-Man Flame Throwers to Attack Pillbox or Tank

Putting more power in the hands of the individual soldier, a new model flame thrower designed for the army can be carried by one man. The weapon is intended for the use of infantry in defense against enemy tanks and in attacks on fortifications. It was developed by the Chemical Warfare Service in collaboration with the Engineer Corps, U. S. Army.



One man can handle the lightweight flame thrower in attacking pillbox or tank

at Fort Ord, Va. 13

1794 American Television Laboratories Inc. L 773.

Collapsible Stove for Tents Burns Coal or Wood



Army's collapsible tent heater is easy to set up

Collapsible, so it may be handled easily by the soldiers, the army's new stove used in tents can burn either coal or wood. It will replace the conical-shaped stove which saw service in World War days.

Wind Deflector on Auto Window Reduces Roar Inside Car

Noises created by wind forced into automobiles at high driving speeds when no-draft "wing" windows are open can be minimized with specially designed deflectors installed beneath the offending wings. The deflector, a chromium-plated metal stamping six inches long, has the effect of extending the wing beyond the window, and thus prevents air from rushing in at the rear of the ventilator wings. The device fits between the car body and the rubber molding below the window.



Robot Lookout Would Warn Us Of Enemies Near Our Coast

Television and radio outposts may become the eyes and ears of our coast defense, automatically spotting the approach of enemy vessels, submarines and airplanes far out at sea. U. A. Sanabria, a Chicago radio engineer, in collaboration with Dr. Lee De Forest, has proposed that a series of automatic transmitters, each consisting of a television camera, several listening horns, and a submarine sound detector be anchored to buoys 300 miles off the coast. These instruments, equaling the efficiency of human eyes and surpassing human ears, would report to shore stations by cable, relay radio or direct radio, the sight and sound of any activities within their range. Wireless "feelers" could be sent from shore stations, and if they failed to establish the identity of any ship, scout planes could be dispatched to the scene. The television camera, with high-powered lens, would be mounted on a moving platform inside a transparent shell atop the housing that contains all the mechanism. Listening horns connected with an amplifier would be mounted above and below the camera. Sufficient power to operate the frequency modulation transmitter and to oscillate the camera would be generated by a five-horsepower Diesel engine. To minimize the effects of waves, the housing would be mounted high above the surface on long posts having their foundation in a huge buoyant tank anchored to the ocean bottom by chains that would hold it several yards below the surface. Within the tank would be stored 500 gallons of fuel oil which would be sufficient to run the Diesel engine unattended for three months. It is estimated that 300 such units spaced 20 miles apart could patrol all of our coastline. Enemy action might destroy many of the units, but the cost of replacing them would be small compared with the loss of a single naval vessel. Also ships would be relieved of considerable patrol duty. At shore stations, operators would watch television screens and oscillographs. A separate screen for each camera would show a picture of any ship or plane within its scope, and the oscillograph patterns would indicate unusual sounds, which could be heard by plugging-in headphones.

Wendell Hooper Co 15
410 Assn. Commercial Bldg

Stave & Co. Heater Company

Island Caputo, much

L726

3812

Non-Spin Plane Easy for Auto Driver to Fly

see Sept. 1940 - 345 (Escape)

*Lowell Mason
see June 1942 - 72*



← A wing flap acts as an air brake, permitting the plane to glide steeply and execute unusually short landings

Glance at the simple controls—merely a steering wheel which operates ailerons and elevators, and a foot brake



With only two hours of instruction, the average automobile driver would be able to "solo" a new General Aircraft company "foolproof" airplane designed for private pilots. This is said to be possible due to the plane's simplicity of operation and its resistance to spinning. The Skyfarer, as it is called, is controlled by a steering wheel, which operates like that of an auto but manipulates the ailerons and elevators instead of wheels. There is also a foot brake. The ship has fixed fins, and a special "air brake" wing flap that steepens the plane's gliding angle and enables it to make exceptionally short landings. The two-place monoplane has tricycle landing gear and a 75-horsepower Lycoming engine.

L828

Mobile 155-Millimeter Field Gun Travels at 75-Mile Clip



This enormous field gun fires a shell 15 miles, is towed 75 miles an hour

The first mobile 155-millimeter field gun for the U. S. Army to roll off the production line at Pettibone Mulliken corporation of Chicago, is a monster that dwarfs a street car. The range of this gun is 15 miles and the carriage can transport it over a highway at top speed of 75 miles an hour.

Ⓢ American aircraft manufacturers produced 6,748 civil aircraft during 1940; 81 percent over 1939.

*Sept. 1940 - 345
Esc. 2/27/41
Civil Aircraft*

(4710 W. Division)

SCIENCE RIDES *the* RAILS

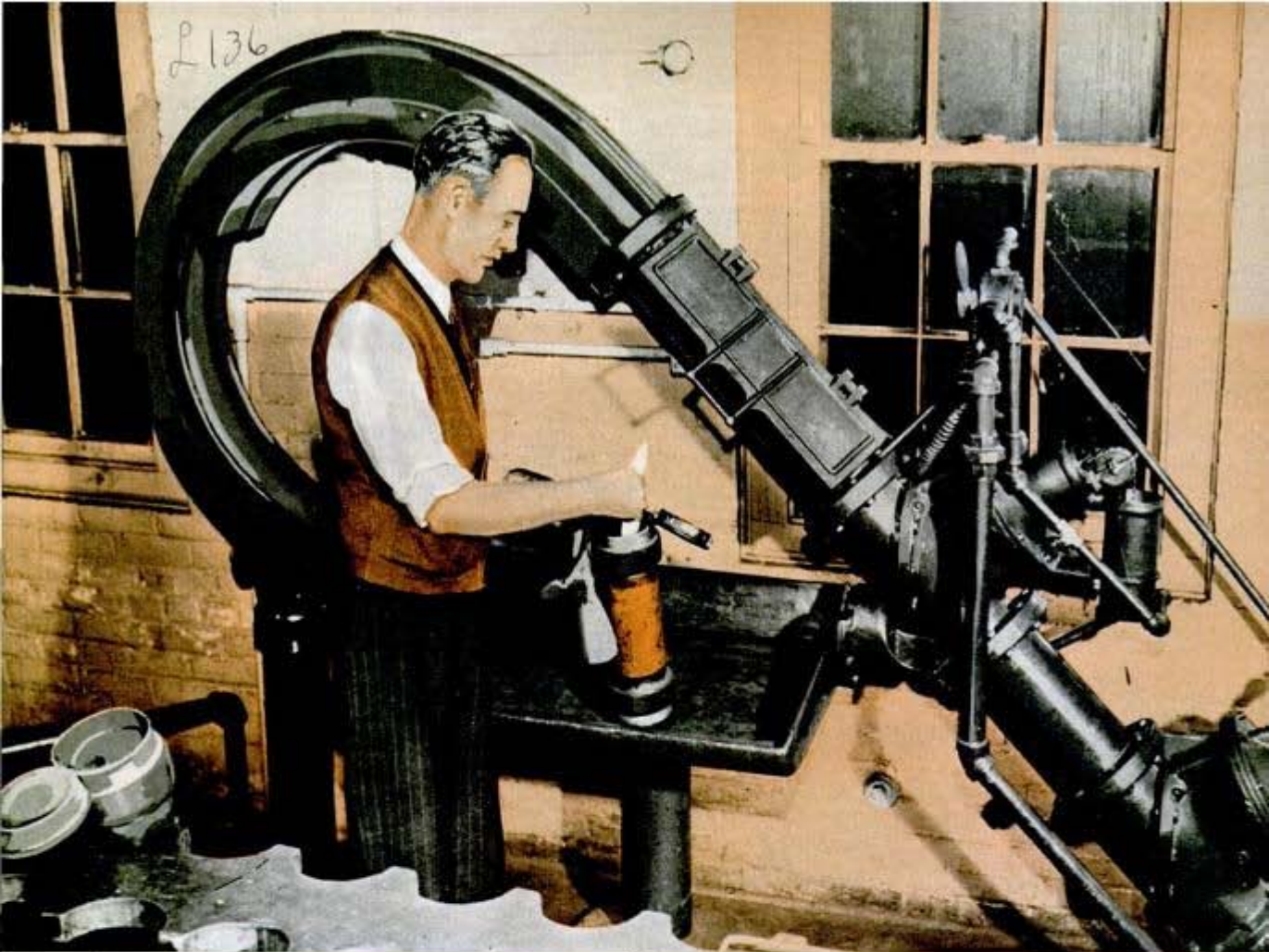


17

2136

Research never ends in railroading. The tiny locomotive in a test tube symbolizes collaboration between the practical work of train crews and track workers (top) and theoretical work of laboratory scientists

L 136



Cont. Allen Warren Elliott
34-3 E 3rd St
New York

Cedar Hill

By J. J. Pelley

President, Association of American Railroads

Transportation Bldg. Washington D.C.
WHY didn't the railroads do that years ago?

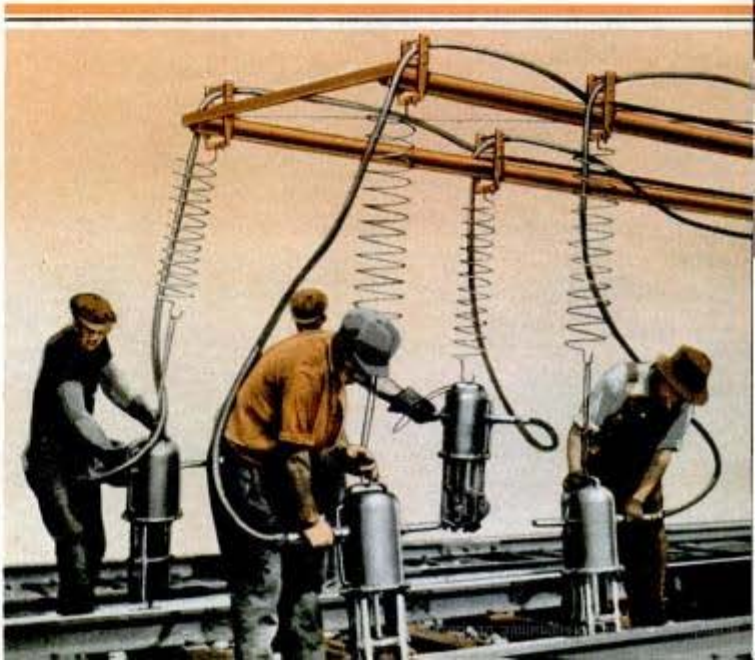
That seemed to be the universal reaction of the public to the sudden appearance on the American railroad scene, a few short years ago, of the new and colorful streamlined passenger trains.

What the public didn't know, however, was that away back at the turn of the century, the first American streamlined train appeared. Photographs show that this train, the "Adams Windsplitter," bore a remarkable resemblance to present-day streamliners. But at that time scientific tests made with the "Adams Windsplitter" proved it would be a waste of time and money to streamline anything which traveled less than a mile a minute.

Eventually, scientific research and experimentation brought other improvements which made travel at high speeds possible, thus bridging the gap between the experimental streamliner of the 90's and

Pneumatic tube nearly two miles long speeds waybills to main office and "hump" as New Haven freight train enters the classification yard

Below, pneumatic tampers pound ballast compactly and uniformly, preventing formation of pockets in wet weather and sagging of track



the ones which America has been applauding in recent years. The streamlined train should not, therefore, be hailed as a symbol of a "revolution" in railroading. On the contrary, it is a convincing reminder of the evolutionary process of change which has gone on in railroading from its earliest days. And in this evolutionary process, science plays a far larger role than most people realize.

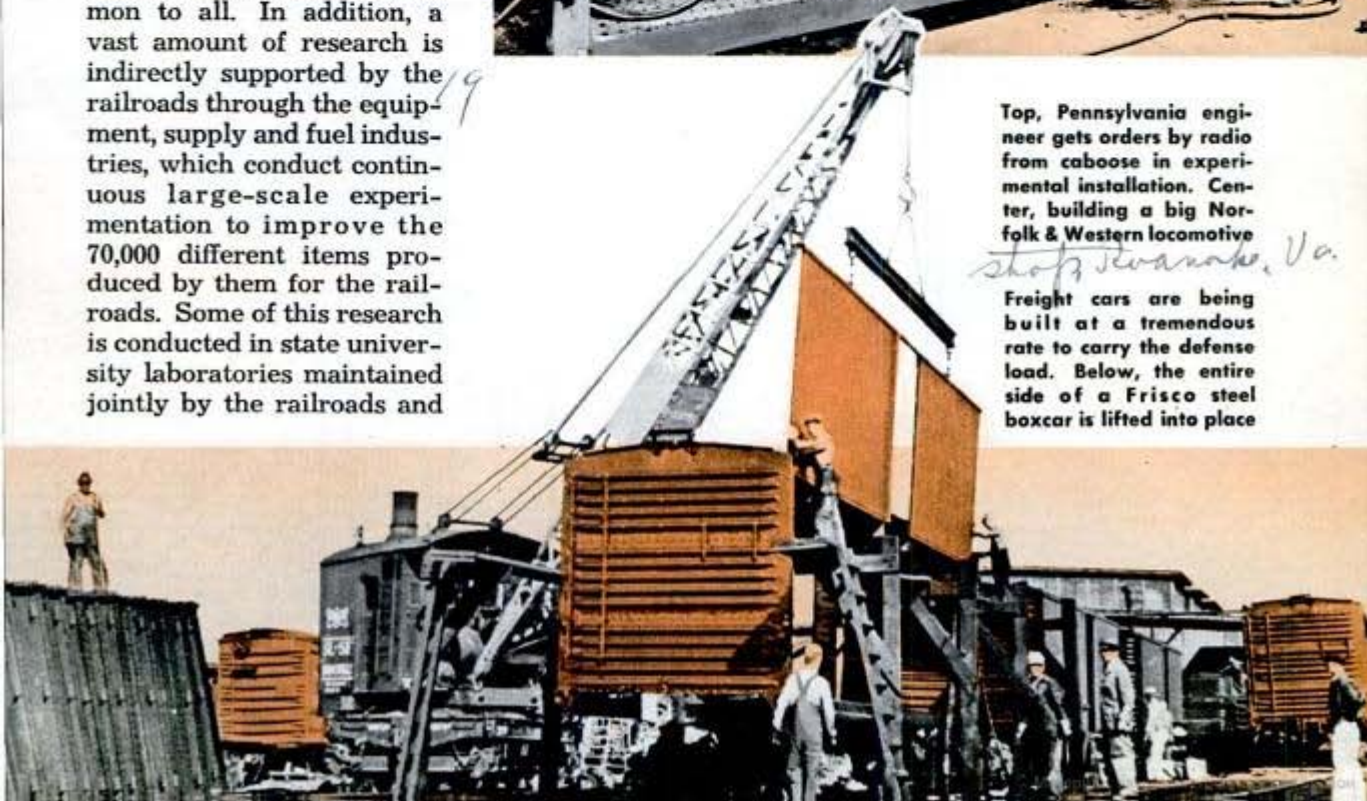
In fact, few industries have made better use of science. Since the earliest days, the railroads have continually adopted scientific discoveries, new inventions and improved technical processes and methods. The objective has been the constant enhancement of the utility, attractiveness and economy of railroad service.

To achieve this objective, direct research is carried on by the individual railroads to meet their own peculiar problems, and also collectively, through the Association of American Railroads, to deal with problems common to all. In addition, a vast amount of research is indirectly supported by the railroads through the equipment, supply and fuel industries, which conduct continuous large-scale experimentation to improve the 70,000 different items produced by them for the railroads. Some of this research is conducted in state university laboratories maintained jointly by the railroads and



Top, Pennsylvania engineer gets orders by radio from caboose in experimental installation. Center, building a big Norfolk & Western locomotive

Shop, Swansboro, Va.
Freight cars are being built at a tremendous rate to carry the defense load. Below, the entire side of a Frisco steel boxcar is lifted into place





Sandblaster at left wears "diving" helmet and breathes through charcoal filters while directing air and sand blast against steel boxcar, whisking off rust and dirt so car can be repainted

20

the manufacturers of railroad equipment.

Literally, as well as figuratively, science rides the rails. In dynamometer cars, for example, which are actually wheeled research laboratories equipped with sensitive instruments operated by experienced research workers. As the cars roll along in trains, their equipment gathers and records a vast variety of technical data on the performance of locomotives in actual road service under various conditions.

To supplement the road tests, scientific

2106

observation of locomotive performance is also conducted in the three locomotive-testing laboratories in this country. Incidentally, the first locomotive-testing laboratory in the world was established in the United States in 1891. In these plants, the locomotive itself does not move. The engine is carried on supporting wheels instead of rails. The axles of these wheels

Arrayed in the composite photograph below are some of the best of today's streamline locomotive designs



2136

are extended to receive absorption brakes. The turning of the locomotive driving wheels under power, as on the road, causes the supporting wheels to revolve against the friction of the brakes and the work done by the locomotive in overcoming this resistance is measured at the draw-bar by a traction dynamometer. So, by puffing away but going nowhere, the locomotives in the testing laboratories do their bit to give Iron Horses of the future even more power, pep, efficiency and economy.

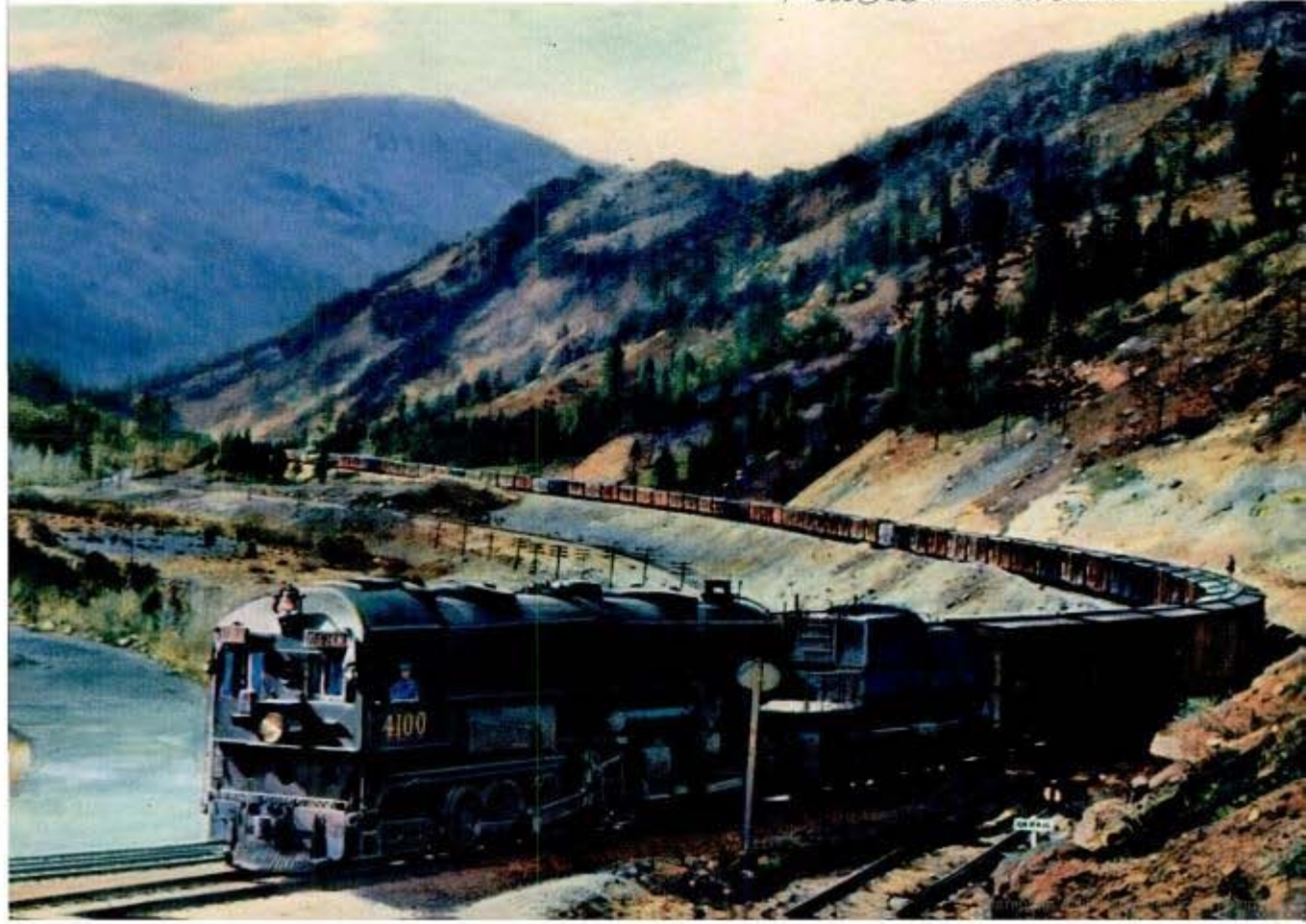
Speaking of economy, science has even been called upon to determine how much it costs to blow the locomotive whistle. Elaborate studies have been made to improve its tone and carrying quality. How much does it cost to blow the whistle? On one railroad, tests indicate that the cost, per toot, was nearly three mills. This cost, of course, will vary with the price of coal and water; whether the train is operated through a congested district or through open country, and other factors.

Even the water the thirsty locomotive drinks—and the railroads use about 600 billion gallons of water a year—comes



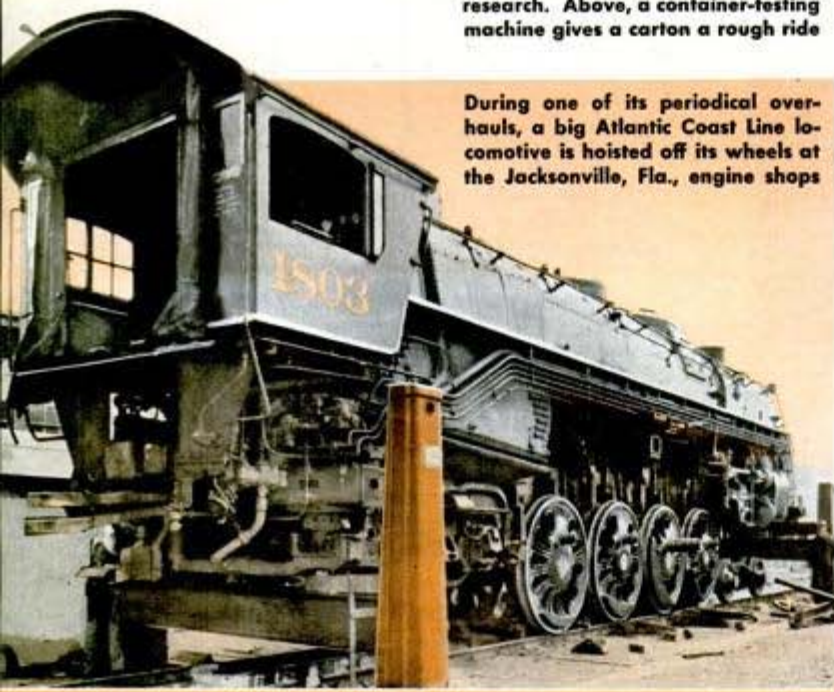
21

Arizona
Engineers on roof of refrigerator car, above, are making temperature readings as train crosses desert. Below, Southern Pacific engine has its cab in front to give the crew better view around mountain curves
mallet oil burner





Better ways of packing and loading freight are one subject of railway research. Above, a container-testing machine gives a carton a rough ride



During one of its periodical overhauls, a big Atlantic Coast Line locomotive is hoisted off its wheels at the Jacksonville, Fla., engine shops

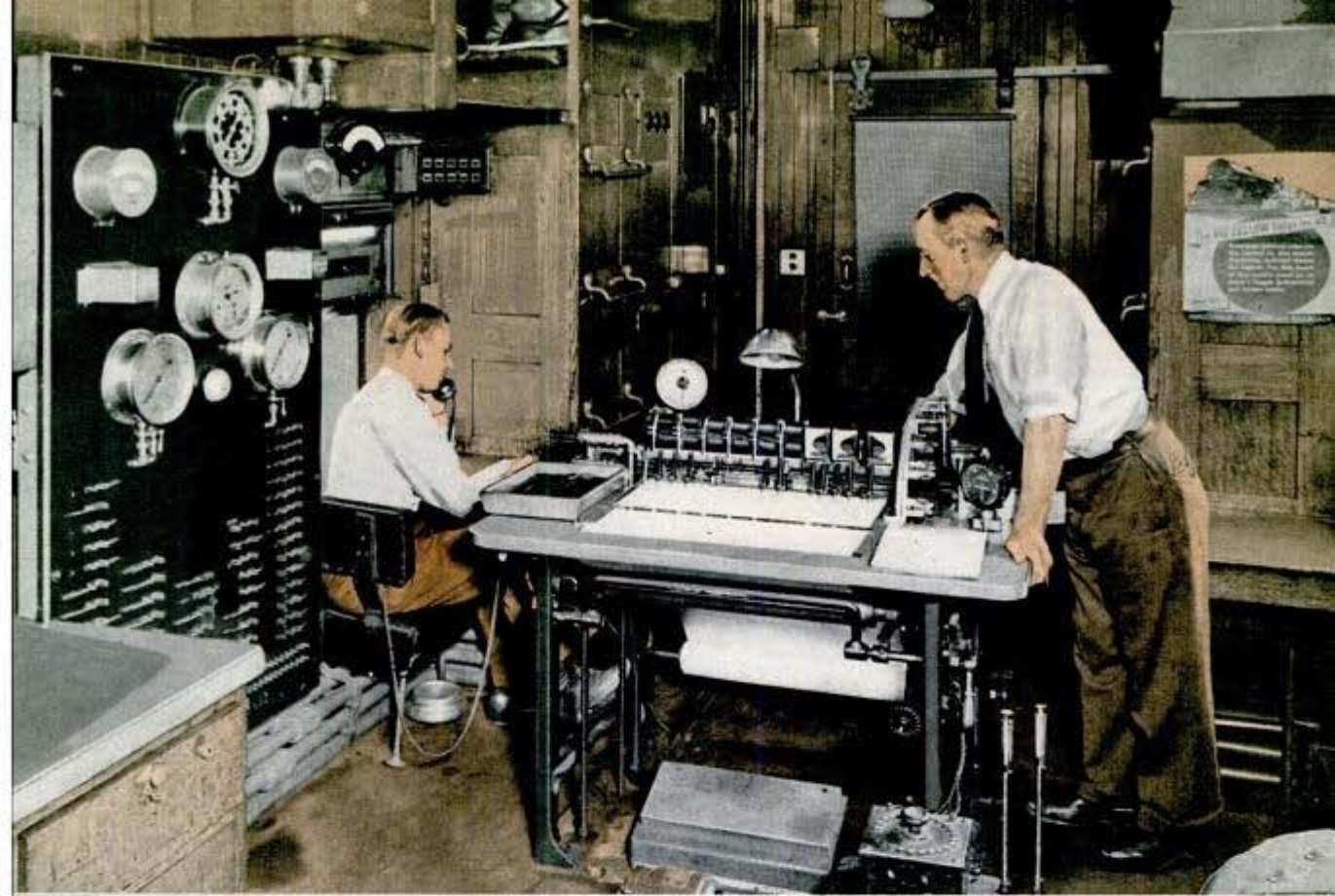


in for its share of attention. To remove the harmful ingredients which cause rust and scale to form on the inside of locomotive boilers, most of the water used by the Iron Horse nowadays is chemically treated in special plants. That too, is science working for the railroads, saving them money and increasing their efficiency.

Science also rides the rails in electric "detector" cars that travel all over the country, under their own power, and "feel" with magnetic fingers for flaws hidden within the rails. When a flaw is found it is recorded on a moving paper tape and, at the same time, a spot of paint is dabbed on the offending rail so that it can be located readily and removed promptly by the section gang following the detector car.

Steel rail, too, comes in for its share of attention in laboratories maintained jointly by the railroads and the steel companies. In these laboratories steel rail is pounded, bent and sliced on cumbersome-looking, but efficient, machines. Other testing machines operating under controlled conditions simulate the stresses set up in track under rolling traffic. Simultaneously in the field, experiments are being made on mile-long welded rail, and at several points in the country, special measuring devices have been installed under sections of track to register performance under actual traffic. By such studies and tests, better ways are developed to roll and treat steel rail and to make it stronger and tougher.

Block signals are brought right into the cab of modern locomotives. Left, a Pennsylvania engineer watches panel which reproduces track signals



L136 23

Something that most people don't know is that each rail carries its own biography carefully stamped on the side. This history of the rail shows the year and the month in which it was made, the name of the mill which rolled it, the kind of steel used, the heat number, the ingot number, and the position in the ingot of the steel from which the rail was made. By means of its biography every rail in use today can always be identified, if necessary, and its manufacture back-checked.

Many people wonder why the railroads continue to use wooden cross-ties. The answer is that, despite extensive tests made with various types of cross-ties, science and research have not yet found a satisfactory substitute for the wooden cross-tie. Science has, however, found a way of tie treatment that increases the average life of the untreated wooden cross-tie by as many as 20 years. The great importance of this is apparent when it is remembered that the railroads install about 50 million cross-ties a year.

Pennsylvania

Scores of recording instruments write a log of the trip as the dynamometer car, above, travels over the rails

Below, first section of a four-unit Diesel-electric freight locomotive for the Santa Fe is lowered onto its wheels



136



24

Norfolk and Western

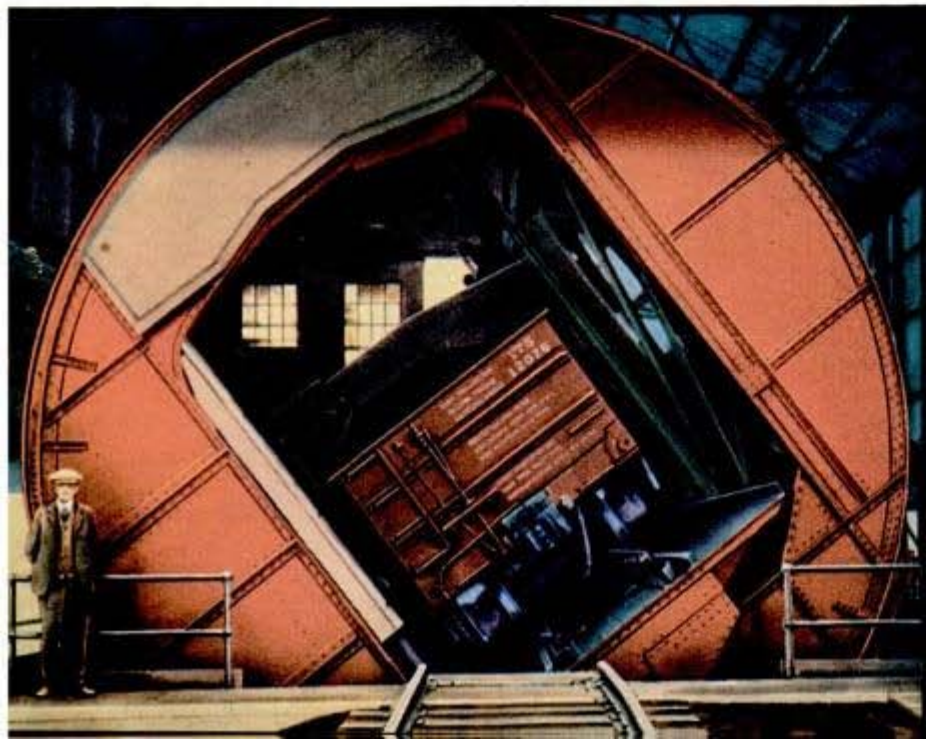
The model car above provides a figurative illustration of how the traffic executive, watching markets, can pull a carload of material out of a train and route it elsewhere to find better prices

It takes the rotary dumper, below, a minute and a half to dump an open car of 120-ton capacity and return it to normal position. This is used to empty cars of coal, grain, ore and the like

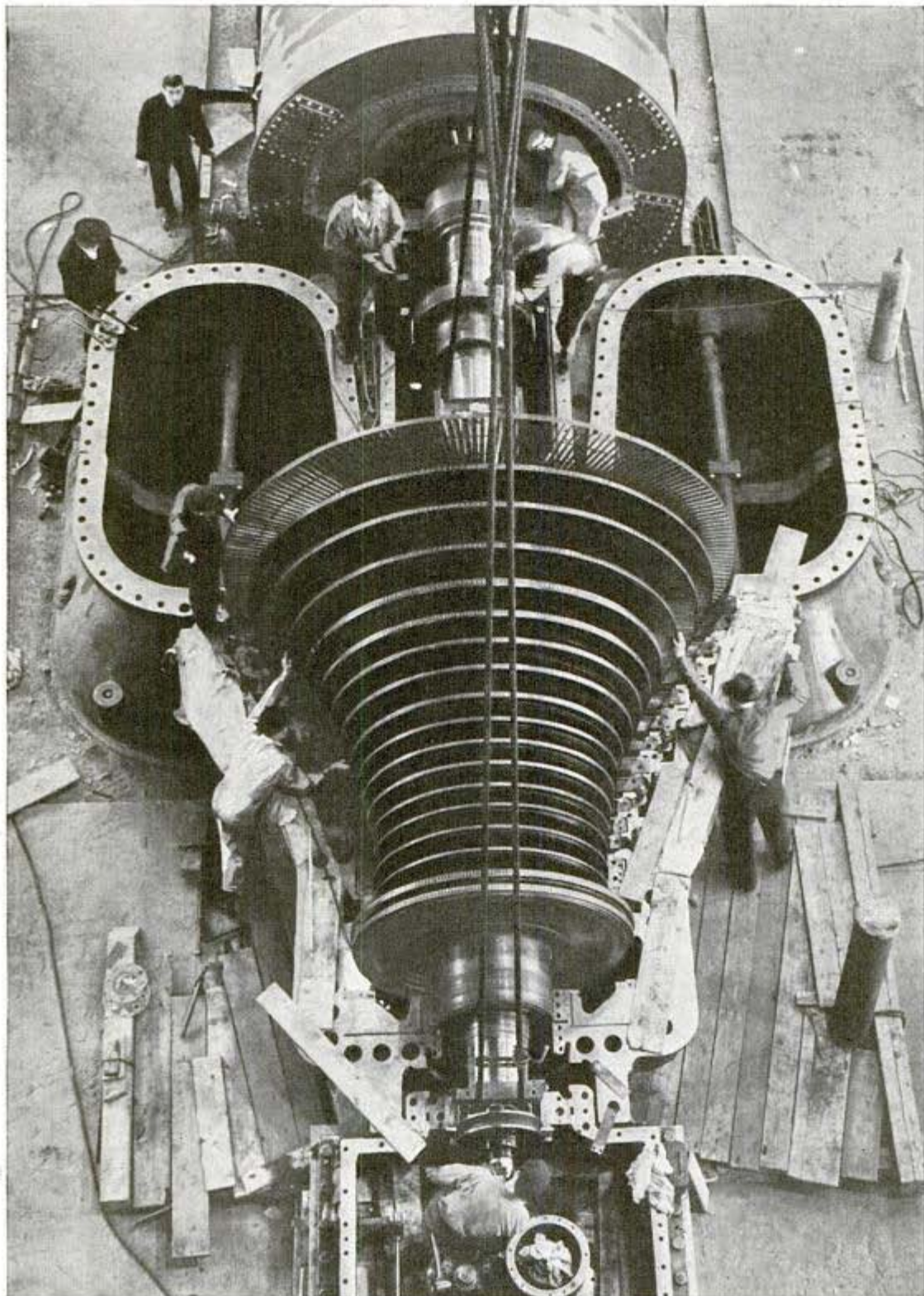
Millions of dollars have been spent in laboratories and in the field to study and improve such things as draft gears, couplers, brakes, and other mechanisms seldom noticed by the average person. In one recent 10-year period, for example, the railroads spent more than two and a half million dollars in laboratory and road tests of freight car brakes. But as a result, freight trains today stop more quickly, smoothly and safely.

To facilitate air-brake research, the railroads maintained a 100-car air brake test rack at one of the state universities. The scientific data gathered in this laboratory was checked and studied in road tests under actual service conditions. One series of road tests of a 50-car freight train extended over a period of 20 months. In these road tests, three dynamometer cars were used—one at the head end of the test train, one in the middle and one at the rear. A telephone line was run throughout the train with a main switchboard in the head dynamometer car

(Continued to page 176)



L 8.38. From the U. S. Power & Light Company
photo kept by the Company
500-Ton Rotor to Expand Power for Defense



With defense industries draining more and more electrical energy from every possible source, power plants are increasing their output. One long stride in that direction is this giant rotor of a steam-electric generator being lowered into its casing. The second to be installed by the Central New York Power Corporation, it weighs 500 tons, is 53 feet long, and will serve an 80,000-kilowatt turbine generator

OCTOBER, 1941

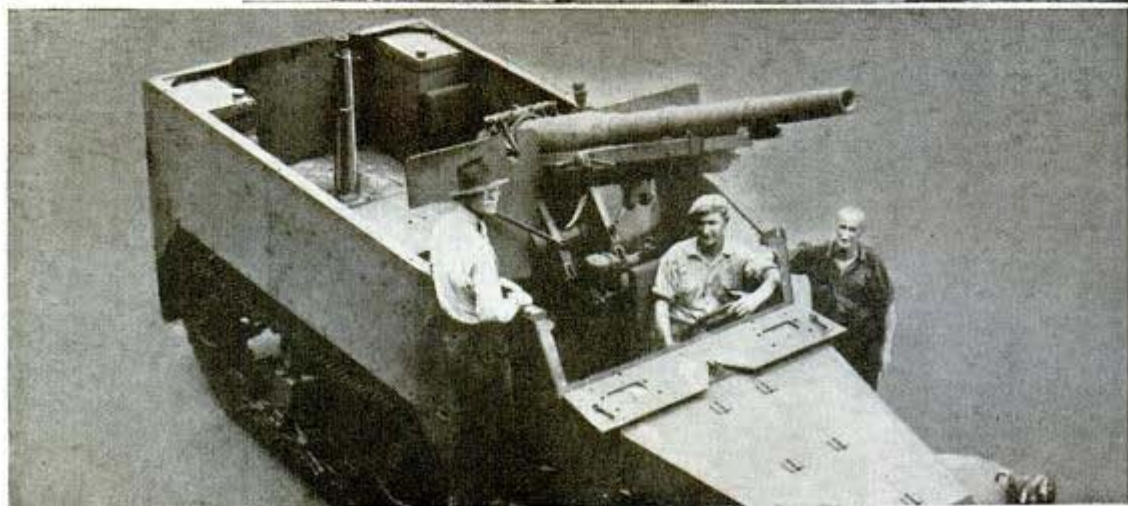
at Oswego Station

25

Syracuse, N.Y.
Mareplan, Institute for the development of aviation

1947 / Autocar Co, Ardmore, Pa.
Big Motor-Driven Guns to Fight Enemy Tanks

Self-propelled artillery will be included in the equipment of antitank units being organized in the United States Army. At right is an artist's idea of a tank destroyer, which might consist of the lower half of a large tank upon which would be mounted a 105-millimeter, or larger, gun. The weapon would be rotatable on a turntable; its gunners would be protected by a thick armor-plate shield. The gun would be of heavier caliber than those carried by tanks at present

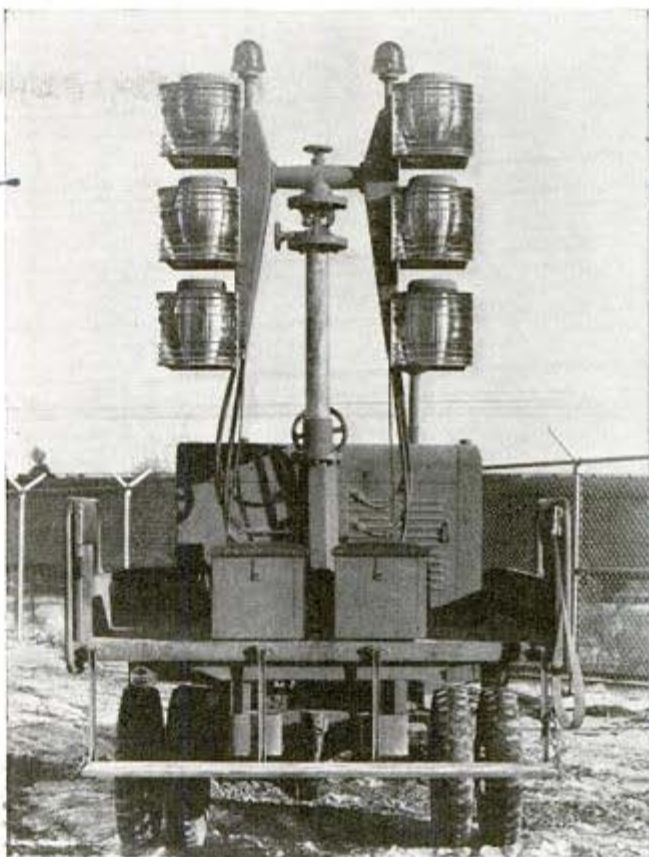


Latest weapon of U. S. "tank killer" forces is this half-track scout car mounting a 75-millimeter cannon that is highly effective against tanks and planes. The gun is fired from its position in the car

L846

Mobile Unit Floodlights Emergency Airport

Within a few hours any unlighted temporary airfield can be illuminated for night take-offs and landings with portable lighting equipment tested recently by the U. S. Army Air Forces at Wright Field, Dayton, O. A floodlight unit on wheels contains a 9-kilowatt, 32-volt, gasoline-driven power plant to light six floodlamps of 1,500 watts each. The beam lights a 90-degree sector and the lamps can be elevated and inclined at will. In addition, there are portable lights for outlining a landing strip up to 400 feet wide and 5,200 feet long. If desired the same lights can be used to outline a general landing area or to form one string of light up to 10,000 feet in length. These lamps and the reels of cable, together with a lightweight 500-watt, 110-volt power plant, weigh 1,800 pounds when packed in trunks, and may be carried in an air transport. A number of 1½-ton trucks, fitted with four-wheel drives for rough going, are being procured for transporting the apparatus.



This portable floodlight unit, carrying its own power plant, makes night landings possible at any unlighted army airport

Capt. J. H. Van Gleve, Capt. Air Corps
 Acting Chief Technical Staff, Branch
 War Dept. Air Corps, Washington DC

L8F2

Mid-Channel Float Saves R.A.F. Fliers Downed in Battle



Moored at intervals along the English Channel are a number of all-metal floats painted yellow and red, and marked with the Red Cross, serving as rescue stations for Royal Air Force fliers downed at sea. Steel ladders extend down below water level on all sides. The cabin is well stocked with provisions, first-aid equipment, and cigarettes. There is a radio, and a mast from which signals can be flown.

Red Cross painted on the deck marks this float as a refuge for R.A.F. fliers shot down in the English Channel

Acme

L706

Army Sgt. Frederick Hollenstein
Manchester, N.H.

WINGS OVER the ANTARCTIC

Navy Lieutenant
Lester McPherson
of second ward



↑ Brewing hot coffee for a sledging party during a noon halt

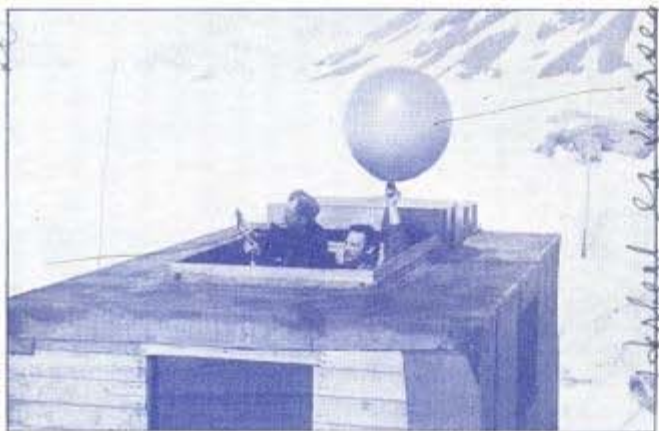
↓ A balloon starts up from East Base for meteorological data

AT FIRST glance the proposal that Uncle Sam build great naval and air bases on the frozen antarctic continent might seem fantastic. Can we build and operate huge airdromes, ship repair yards and naval storehouses on a shore constantly swept by gales, barren of vegetation, buried most of the year under ice and snow?

High ranking naval officers are giving the project serious thought, for it is the idea of the veteran explorer, Rear Admiral Richard E. Byrd, back from command of the U. S. Antarctic Expedition.

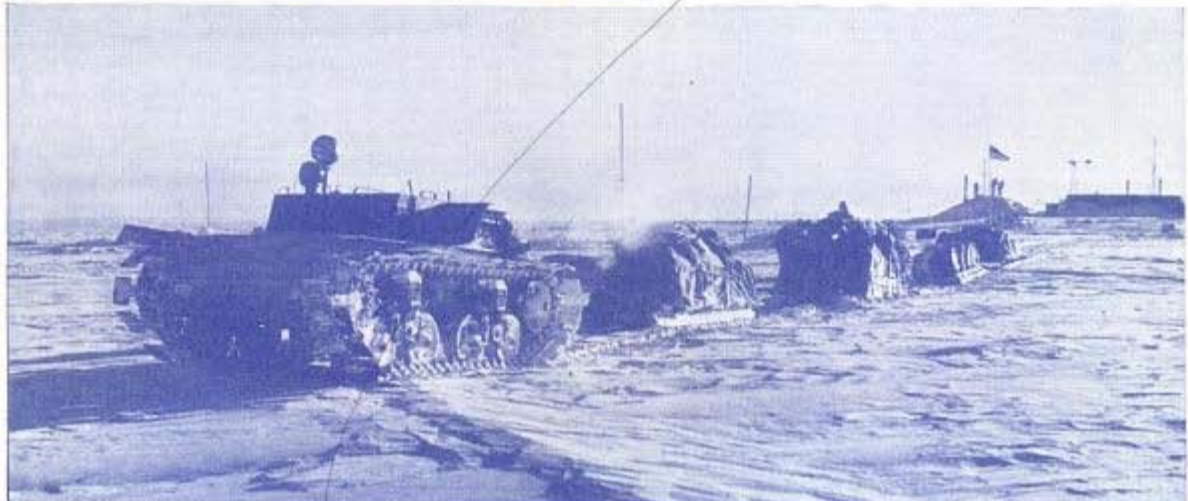
The plan of Admiral Byrd stems from a grave concern shared by many naval officers that the Panama Canal is the weakest link in America's defense chain. Serious damage to the canal in wartime would force American ships to take the longer, more hazardous route around Cape Horn. Safe convoy around the Horn would be a troublesome and expensive burden to the Navy. True, inside passages are available to vessels girdling South America; the Beagle Islands Channel, now in dispute between Chile and Argen-

Chief Pilot A. G. Smae
U. S. N., Washington



Official Photographs, U. S. Antarctic Service

Train of tractors, with extra wide tank treads for antarctic snow, leaves West Base to lay depots to the Rockefeller Mountains



Designed by Larsen
of Winchester Arsenal

Designed by Army Staff Sgt.
Robert Asman, Winchester Arsenal

Ref: U. S. Antarctic Service (2706)
 U.S. Navy, Washington, D. C.



Capt. Byger Hawthorne, 2023 | Haidelhofstr. 20
 Washington, D.C.

tina, and the better-known Straits of Magellan are alternate routes, but their entrances would be tempting lurking places for enemy raiders. The third and only remaining route lies around Cape Horn, and to defend the waters between the Horn and Palmer Peninsula, northern extremity of the antarctic continent, naval bases at the bottom of the world would be essential.

Only 400 miles of open sea lie between the grey-green cliffs of "El Cabo de Hornos"

- ↑ The expedition's transport biplane is seen above a survey camp
- ↓ Building a winter hangar for the cabin plane at 60 below zero



*Agnes Melioralaguet
 January 11, 1938
 Richard D. ...
 ...*

*Charles B. Price
 ...
 ...*

*Wig driver - Richard D. ... L706
 ...*



← Like it or not, one of the pups receives a dose of castor oil

vous of British and Norwegian whalers and recently the supply base, according to current rumors, of the Nazi's ill-fated Graf Spee.

Operation of flying boats or pontoon-equipped planes from an ordinary coastal base probably would not be practicable in the Antarctic but planes equipped with skis, Admiral Byrd asserts, might operate during many months of the year from almost anywhere on the Continent, even with the thermometer registering 40 or 50 degrees below zero. One expeditionary plane flew regularly in such temperatures and larger transport planes frequently took off from snow-covered "airports" with far heavier loads than normally flown from commercial airfields of the north. From the smooth

Heavy pressure fractured the ice in this fantastic form during the antarctic night at West Base



† U. S. Army and Navy representatives pay diplomatic call on penguin rookery in Marguerite Bay and the rocky promontory which marks Antarctica's northern limits. Much, however, of this mountainous peninsula lies north of the Antarctic Circle and escapes the blizzards and extreme low temperatures popularly associated with Little America 1,400 miles to westward. The recent expedition's ships U.S.S. Bear and U.S.M.S. North Star anchored in the vicinity of Brabant and Antwerp Islands with impunity for nearly four weeks while storms raged outside, yet these islands lie far south of the area proposed by Admiral Byrd for an American naval base. Best-known island of the archipelago is that which shelters Deception Bay, long a rendez-



*Mr. Russell ...
 Benjamin Canyon, Uta.*

L70 C.

Gump leader.
Dr. Paula Siple
Eric Pa

Shooting the sun at noon on →
an October day on West Base ice
barrier. Note length of shadows

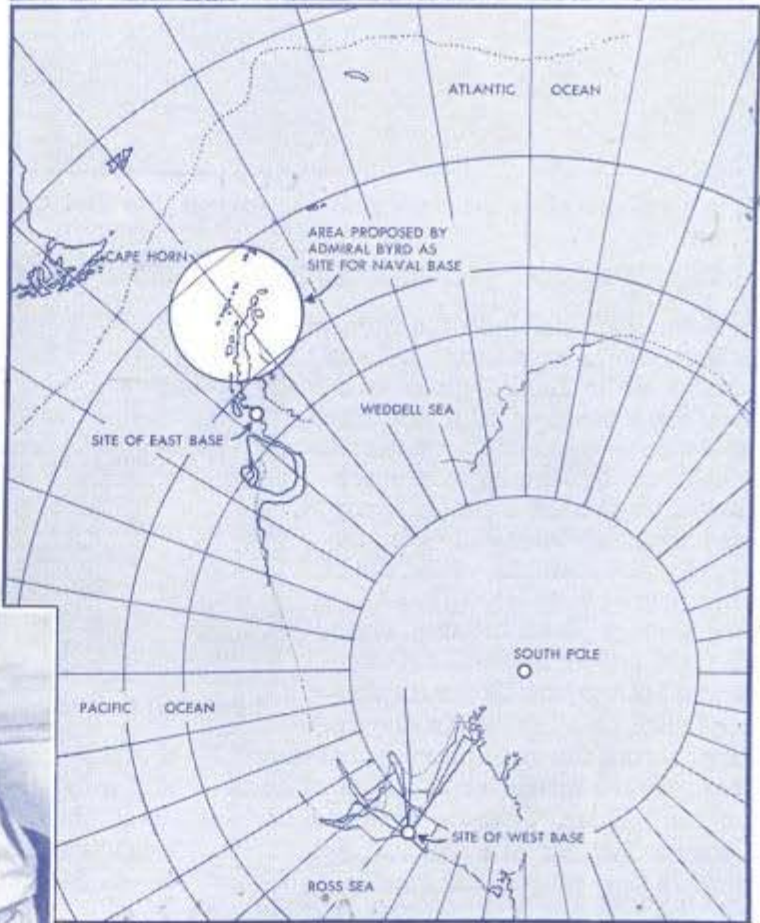
snow surface of Palmer
Peninsula's elevated pla-
teau long-range bombers
and swifter, shorter-
ranged fighters might op-
erate effectively over the
watery wastes which lie
south of the Horn.

Peering still farther in-
to the future, Admiral
Byrd also proposes estab-
lishment of a chain of air
stations and refueling de-
pots at several hundred
mile intervals across the
South Polar region,
equipped to service
freight and passenger
planes droning across the
bottom of the world be-
tween Capetown, Africa,
southern cities of South
America, New Zealand
and Australia. Such a
route, he points out,
would remove many of
the hazards of overseas
flights and shorten exist-
ing trans-oceanic routes

Taking snow sample from 25-
foot test well in studying snow
density and crystalline structure



Naval Aviation
James Mc Coy
Desiring N.P.



Map shows site proposed by Admiral Byrd for a naval base

by many hundreds of miles. Admittedly, it is only a
glimpse into the future but the proposal is made at
a time when the world sees many seemingly fantastic
suggestions become realities overnight.

The Antarctic Expedition as conceived by Con-
gress in June, 1939, and subsequently made possible
under the leadership of Admiral Byrd by joint ef-
forts of the State, War, Navy and Interior Depart-

(Continued to page 195)

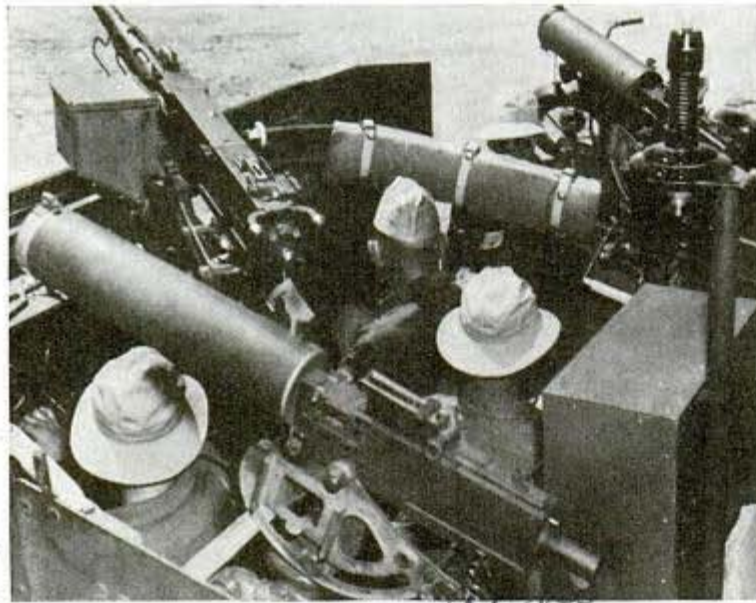


OCTOBER, 1941
Sergeant Scientist
Dr. F. Atan, Marine U.S. by Ford, Elmer

298 3

at Fort Bliss, Texas

Antitank Scout Car Packs Three Machine Guns



There's plenty of fire power in the scout cars of the antitank troop in Uncle Sam's First Cavalry Division. Formed last January, the troop now consists of 4 commissioned and 31 non-commissioned officers and 121 men. Each scout car carries a 50-caliber machine gun and two 30-caliber guns, a submachine gun, demolition kit and two Garand rifles. Each man also has a pistol. Communication between scout cars is maintained by motorcycle messengers, while the commander's car is radio-equipped.

Here is a glimpse of the gun power packed by scout car of antitank troop

2-7-36

Transparent Rowboat and Oars Made of "Lucite" Plastic

Virtually invisible in the water, a transparent rowboat made of crystal clear Lucite gives what may be a preview of ghostlike boats for fishermen. The material, plastic methyl methacrylate produced by the du Pont company, was used throughout the boat except for the oarlocks, which are of chromium-plated metal, and a few screws. Even the oars and a flagpole are of Lucite. Although it was built primarily for displaying beach merchandise in department stores, the craft proved its seaworthiness when launched on Long Island Sound by its builder, Clemens-Scheuer of the Scheuer Art Metal company, New York. Seating four people, the boat is eight feet



Transparent boat "floating" on imitation sea of Cellophane

and six inches long, has a beam of 44 inches, and weighs 96 pounds. The hull consists of three plastic sheets, one for the stern and two with a center seam for the bow. Joints are sealed with an extra plastic strip.

Flexible Steel Tape Inside a Foot Rule Extends It Three Feet More



By pulling out the flexible steel tape wound on a reel inside a twelve-inch ruler, it is extended an additional three feet. A ratchet prevents the tape from unwinding unless the knob is turned.

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

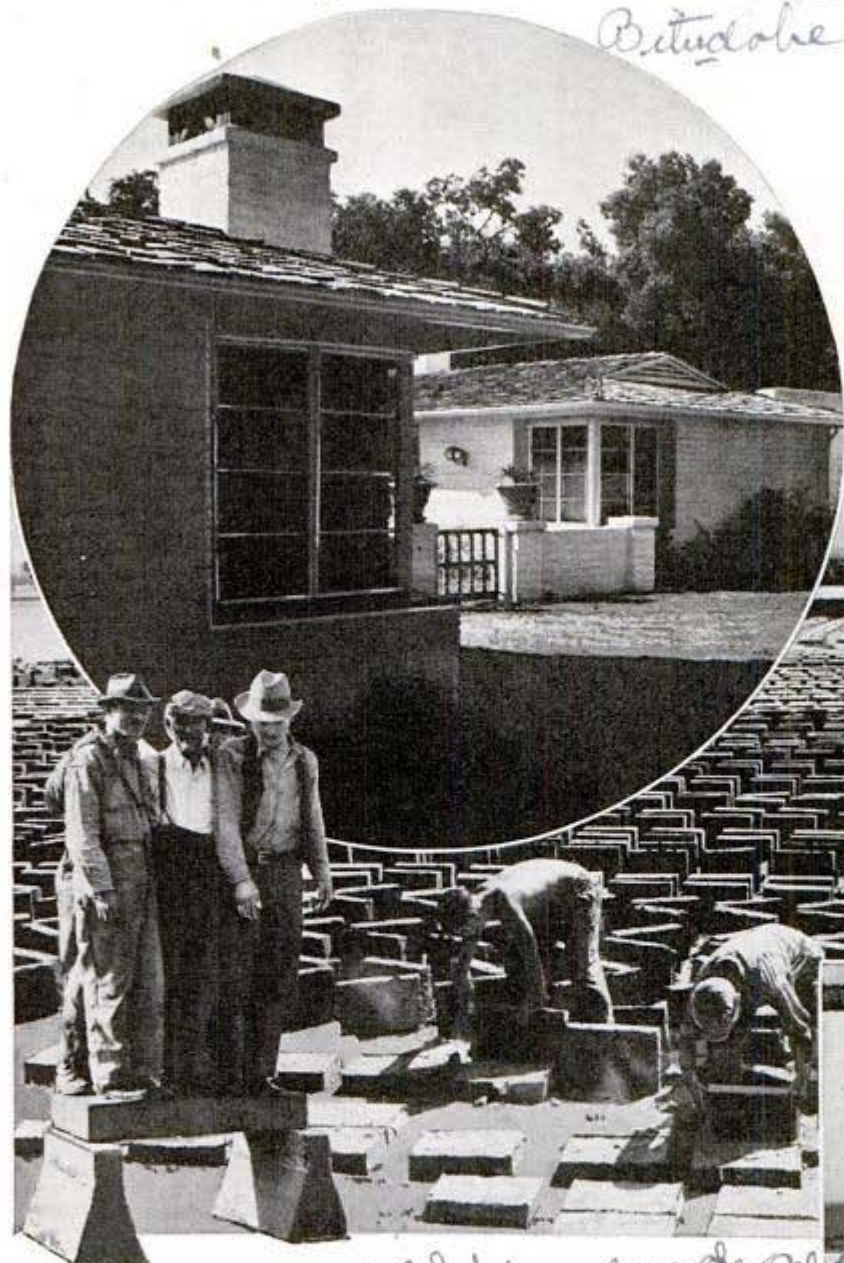
Ballard & Co
1141 Franklin Ave
Columbus Ohio

307 W. 38th

2617

Chas. Thomas & Stinson, Jr.
3872 Franklin Ave
Brentwood Los Angeles

Mud Plus Asphalt Makes a Waterproof Home



Hundreds of waterproof adobe houses like those at left have been built recently. Below, the bricks are turned on edge to dry for several weeks in the sun. Five men standing on one 18-inch brick prove its strength; it is able to withstand 300 to 1,000 pounds pressure per square inch



Thirty-minute water test does not affect adobe-and-asphalt brick above, but untreated mud brick below crumbles



Sun-dried adobe houses of early Spanish settlers lasted a couple of hundred years, but they took a bit of patching after every heavy rain or flood; and who wants a mud house that will dissolve every spring? Well, it needn't dissolve. They're making beautiful homes of mud in the west today, waterproofed by an emulsion of asphalt, and the same thing can be done in many parts of America. To learn whether your soil is suitable for waterproof bricks, send a test sample to The American Bitumuls Co., Los Angeles, Calif. If suitable, the mud and asphalt stabilizer are mixed, placed in forms 12 by 18 by 4 inches, then baked in the sun. The adobe house is strong, well insulated, soundproof and fireproof. Inside temperatures in summer are 20 to 30 degrees below the outside.

6088 Landers Rd
Oak Ridge

OCTOBER, 1941

200 Bush St.
San Francisco.

2441

Stop and Go



↑ Interior of control tower at Chicago municipal airport, with assistant operator at telephone to notify "airways" of arrival of big liner
 Map shows traffic control areas of Civil Aeronautics Administration—literally a simple view of the nation's principal sky routes



THREE airliners race toward Chicago at 180 miles an hour, due over the municipal airport in 15 minutes. Three others are ready to depart. A seventh glides in for a landing, two more circle the field and a mile away, a little biplane wings up. The problem is to direct all these ships in and out of the field in less than an hour.

Situations like this may occur several times a day at the Chicago port, for this is one of the nation's busiest crossroads of the skies. Arrivals and departures, not counting thousands of sight-seeing trips, totaled almost 100,000 last year and the volume is increasing. To handle the rush, the port has been enlarged and now has two sets of dual runways, the first in America, so two ships can land and take off at once.

To find out how the stream of traffic is managed, Supervisor John A. Casey directs you to the window-walled tower atop the administration building.

As you watch and listen while the chief operator and an assistant bring the ships in

Ground station and dispatching office, with operators in direct contact with crews of planes and with "airways," whose instructions are relayed to the planes



L.4.4 1

at the Crossroads of the Skies



11.4.41 La Salle St. Chicago

↑
Big recording phonograph "hears" every word that comes in and goes out of tower and makes a record of all orders

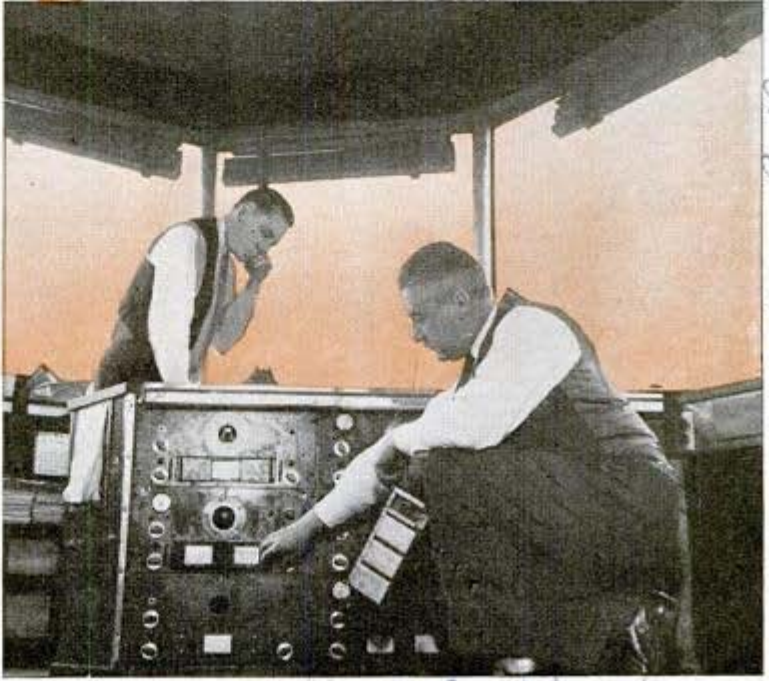
↑
Control operator and assistant on duty in traffic tower keep vigilant watch over plane movements in vicinity of municipal airport

Changing frequency of radio receivers in control tower. Planes radio to ground stations on set frequencies and change over to tower's frequency when they enter control zone
↓

and guide them out, you begin to understand how vital airport control has become to the task of carrying over 3,000,000 passengers yearly as the airlines are now doing.

The little cubicle resounds with the din of voices pouring from loud speakers in the ceiling. Two of the six telephones are ringing and the roar of a liner's motors sweeps up from outside. Amid all this apparent confusion, the chief operator talks calmly into a microphone:

"Chicago tower to United five. It's clear behind you and it's clear to taxi in to gate four."



Cont: P. D. Caddock

*John M. Becker
Chief Control Operator*



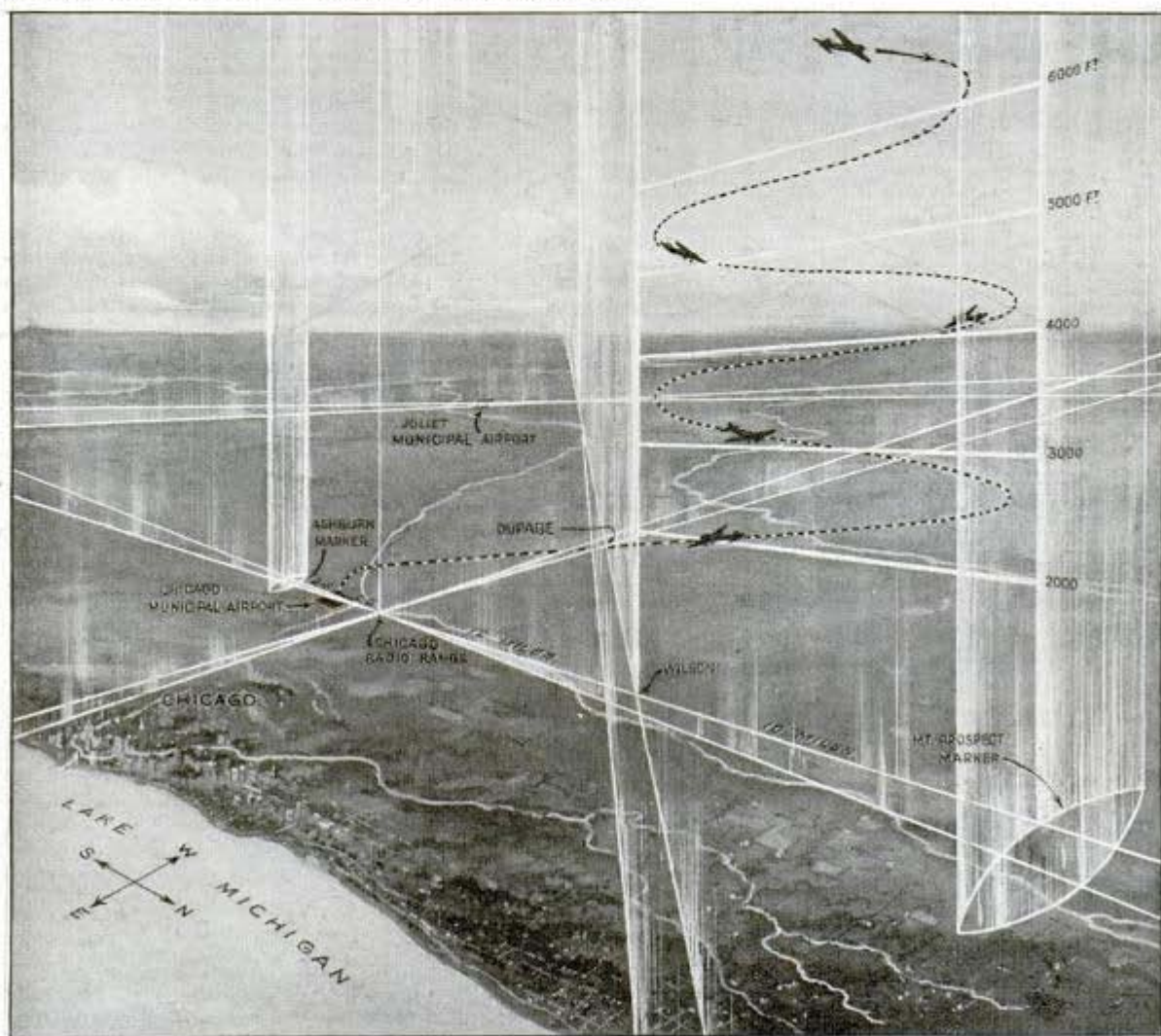
↑ Glimpse in cockpit shows some instruments plane crew uses in contacting control tower. Radio is one of the most important

Drawing shows Chicago control zone and radio guides. Planes are "stacked" at various altitudes and brought in, one by one ↓

"O.K. Gate four," a voice replies through one of the loud speakers.

The plane that was landing at the start of our story is now on the ground. By radio telephone, the chief operator has assured the captain that no other planes are immediately behind him and has assigned a gate number for the arrival.

Thus the operator handles the ships in smooth succession. The circling liners are brought in one by one, after the first one lands. One of the waiting ships is allowed to taxi out to the runway preparatory to taking off. Those speeding in toward the port are landed in scheduled order. The liner at the runway takes off when the coast is clear. The other waiting planes are directed out and off. Now the



2441

Little biplane is landing.

The tower keeps watch over all movements upon the field, directly over it and in the air above its immediate three-mile zone. But it must also keep track of departing ships until they have proceeded well beyond the inner zone so that other planes, incoming, may be advised of their presence. The tower "takes over" when the planes enter the outer zone, about 25 miles from the airport and



↑ Figures representing planes are grouped along "legs" of radio beams emanating from Chicago range station, as shown on the map. The "legs" serve as "side-tracks" in the air under instrument flight rules

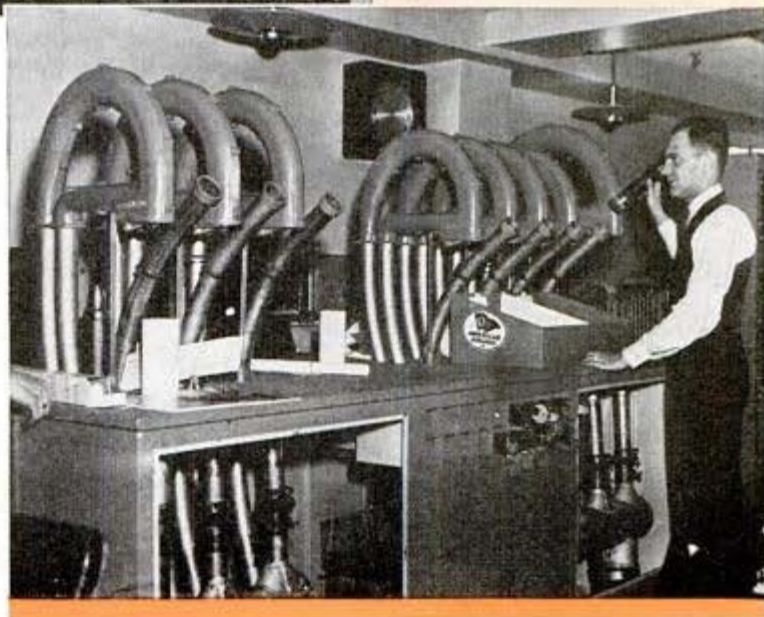
← View of "airways" office, with man at left passing message to operator in center. The big rack holds a separate slip of information for each plane on each trip

Some of the pneumatic tubes employed in speeding reports and messages at the municipal airport. Fast work is necessary to safeguard the hundreds of planes in the air and their many passengers



knows when to do this through a message from "airways," the control division of the Civil Aeronautics Administration which keeps all the air traffic moving along all the airlines. The division has a large control office at the Chicago port as it has at all the other 13 main ports in the country. Chicago "airways" clears incoming planes to the tower at the outer zone and the tower clears the ships or rather, hands

(Continued to page 168)



2613

Curtiss -

Warplane Held in Leash for Fire Power Test



As a demonstration of the firing power of a modern pursuit plane, the U. S. Army Air Forces anchored a Curtiss P-40 to the ground and turned its guns on a hillside target. The four .30-caliber wing guns and two .50-caliber guns in the plane's nose fired rapid bursts, and streams of tracer and ordinary bullets converged on the target.

With its fuselage leveled by raising the tail on special braces and tying it to stakes driven in the ground, this pursuit ship was used in exhibition of aerial firing power

Infrared Lamps Dry Negative in Less Than Two Minutes

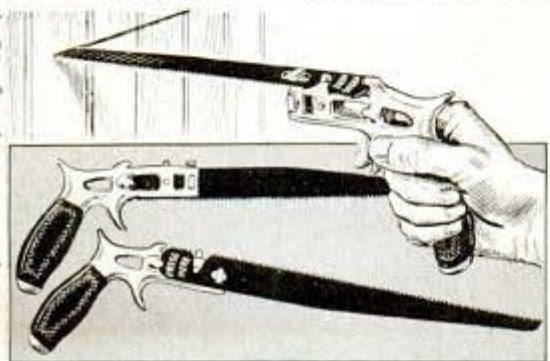
Speedy drying of negatives is possible with heat from infrared lamps now available. The film is placed between two lamps set about two feet apart, which transmit heat by infrared radiation. The rays penetrate through to the base of the film and start the drying process from within, cutting down the drying time to 1½ or 2 minutes. An electric fan is used with the lamps to drive off vapors. The lamps have their own built-in reflectors, called "sealed silver." The average life of a lamp is 6,000 hours. Old negatives ruined by water-marks caused by improper drying may be



Negative drying between two infrared lamps with aid of fan

restored by re-soaking them and then drying again between the radiant heat lamps.

Two-Way Saw With a Pistol Grip Makes Vertical or Lateral Cuts



Saw blade placed above handle for cutting sidewise

Removable saw blades snap onto the top or side of a pistol grip so that either vertical or horizontal cuts can be made. Lugs on the grip hold the blades firmly. There are blades of several sizes available, making this a versatile tool.

Improvement in the anti-knock quality of gasoline is reflected in an increase from 69.6 to 74.4 in the octane rating of regular price gasoline in the last five years, while premium-price gas rose from 76.7 to 80.2 octane and third-grade from 57.9 to 65.6.

dest: Stephen Hardware Co. 15 W. Van Buren Chicago 4700
Charles F. Bauer, % Dayton Journal, Dayton, O.

335 Capital St. Photo Lamp Corp. Brooklyn, N.Y.

2 Sept. 1941 POPULAR MECHANICS

2995

Singer Sewing Machine
Singer Sewing Machine

Plastic Form Cuts Dressmaking Time in Half



Left to right shows steps in molding plastics to figure, and how garment is fitted to dress form

developed by Research Laboratories

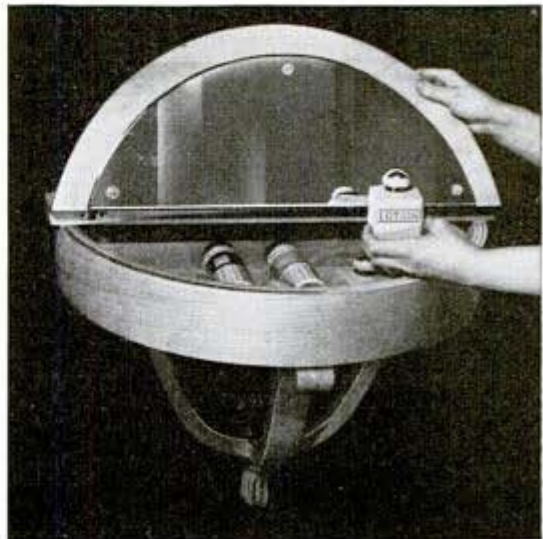
With the aid of a new thermoplastic dress form that will duplicate exact lines and curves of the figure, women may be spared the ordeal of repeated try-ons to fit custom dresses. It will reduce dressmaking time to one-half, and enable the seamstress to finish a fitted garment in the absence of her customer. The plastic material is made of rubber combined with a variety of waxes. It comes in sheet form rigid at ordinary temperatures, and may be molded to the human figure when heated with in-

frared rays to a few degrees above body temperature. To make a complete form, which takes only 30 minutes, four sheets are used, two at the front and two at the back. The plastic hardens almost immediately into a shell-like mold. Then it is removed, reinforced and finished with metallic lacquer for permanence, and is mounted on an adjustable stand. Retaining its shape indefinitely, the material is noninflammable, nontoxic, unaffected by weather changes, and easy to apply.

2666

Vanity Installed on Closet Door Has a Mirror in Its Lid

Inside the closet door a space-saving vanity can be hung. It is a neatly styled, semicircular piece with room inside for the necessary cosmetics. Two screws are driven into the door, furnishing anchorage for the vanity, which has two hook slots on the back. When the lid is opened it exposes a plate glass mirror.



Lifting lid of wall vanity brings mirror into view

make unknown

2769

Colored Ink Forecasts Weather By a Change in Tint

By changing color with changes in weather, a new ink on the market acts as a weather forecaster when applied to pictures, fabrics, artificial flowers and similar objects. A number of different color combinations are possible with the ink, which is applied with a brush.

OCTOBER, 1941

26 Court St. Brooklyn, N.Y.

Sold at Carson Pine Scott

OUR COASTLINE "WALL OF STEEL"



↑ Firing the latest anti-aircraft weapon in Coast Artillery — the 37-millimeter gun

← Lining up "enemy's" position for long-range shot from one of big coast guns



wall while still 25 miles from shore. It would be composed of heavy projectiles from guns of the Coast Artillery Corps, the arm which occupies garrisons at strategic points around our domestic coast line, and at vulnerable points in our overseas possessions.

With its fixed and mobile guns capable of firing one to 30 miles out to sea, the Coast Artillery Corps protects important parts of our shores—mainly the entrances to our largest harbors and ports, working in close cooperation with

the U. S. Navy.

In heavy artillery there is a trend toward mounting heavy guns in mobile carriages and aiming from fixed fortifications, but for protection of our seaport entrances the permanently emplaced gun is still of major importance.

New developments in heavy artillery carriages have been built to increase both

WHO ever heard of a "wall of steel" twenty-five miles thick? Probably not many people, but there is such a "wall" and it's of vital importance to the defense of our nation.

Should circumstances be such that the U. S. Navy and the Army Air Forces were engaged elsewhere, an enemy approaching this country would be confronted by this

518
Emb. Randolph Roberts
Washing. 4630
News Hampshire Co.
W. Wash. 2/2

258.



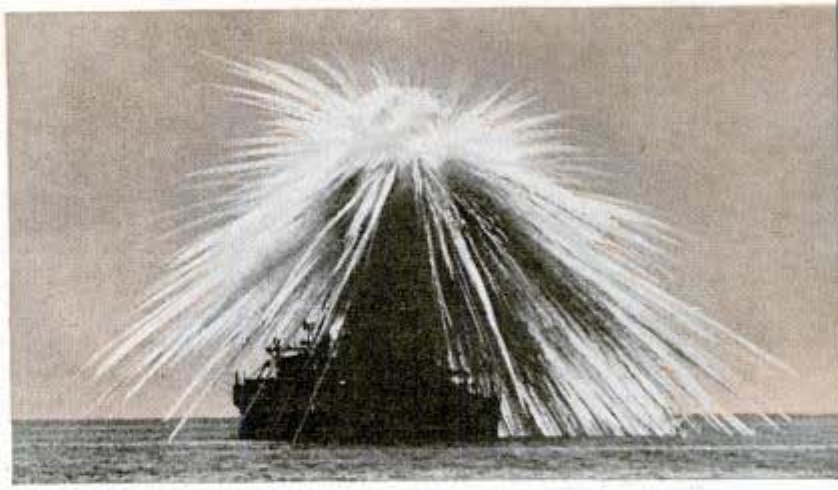
↑ Capable of hurling huge projectile 30 miles, this 16-inch gun is largest in use by Army to-day for defense of U. S. coastline

↑ View of 155-millimeter gun, motor-driven unit which can hurl a 95-pound projectile ten miles or more in defense of our shores

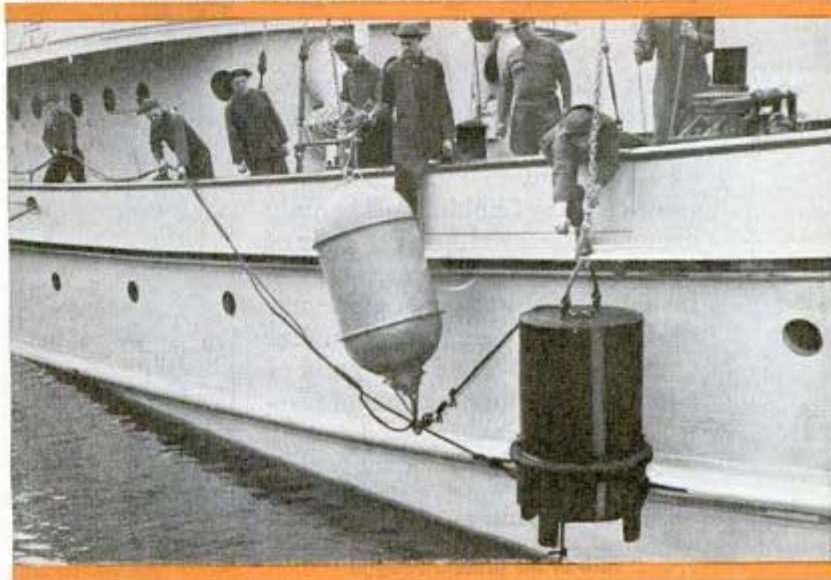
range and speed of the "Big Berthas." A striking example is in the combined 155 mm. gun-8 inch howitzer carriage upon which either can be mounted. Pneumatic tires and air brakes permit the gun to be towed behind high speed trucks. In firing position the carriage doesn't rest on the wheels, but is lowered to the ground by self-contained jacks. The range of this weapon is approximately 15 miles, which is 50 percent more than that of the somewhat similar type used in the World War.

The Coast Artillery also has units with powerful anti-aircraft guns whose purpose is to protect our most important centers of population and industry, and the main headquarters and installations of our armies in the field, from enemy war planes. Thus Coast Artillery regiments are of two main kinds—harbor defense and anti-aircraft. Sometimes two or more regiments are formed into a brigade under one commander.

Harbor defense regiments are of several kinds. Some are organized to man the big fixed guns in our coastal fortifica-



↑ Direct hit on an "enemy" battleship during maneuvers by coast defense units; military men regard this as a very remarkable photo
Vital part of coast defense plan, laying of mines at strategic points
↓ near major harbors. Here a mine and anchor are being planted





Ready to fire 8-inch railway gun which fires 260-pound projectile more than one and one-half miles, or a 200-pound projectile two miles

tions. Some operate the railway guns, also of larger calibers, which can be moved along the coast for any distance on railroads and set up for firing. Other regiments have guns that can be towed by fast, heavy trucks. All of these different regiments include within themselves anti-aircraft units for their own protection.

The Coast Artillery employs a variety of weapons. The guns of all calibers employed to protect our ports and harbors and fortified areas overseas, range from the 3-inch guns that fire a shell of 15 pounds for several miles, to huge 16-inch guns that can shoot an armor-piercing shell weighing over a ton for 30 miles. The three principal kinds of fixed harbor defense artillery are: (1) long-range, heavy guns of 12, 14 and 16-inch caliber for the purpose of holding off heavily armored enemy ships; (2) guns of 6, 8 and 10-inch caliber, and 12-inch high-firing mortars, for use against enemy ships of smaller types; and (3) rapid-fire guns of 3 to 6-inch caliber capable of protecting mine fields placed in the coastal waters by our own forces,

Firing a 75-millimeter gun, a weapon used with great success in the World War and also in the present struggle



stopping fast enemy torpedo boats, and helping our troops to repel landings by enemy forces.

Mobile railway and tractor or truck-drawn units are intended to defend our shores against landings attempted at points not protected by fixed defenses. The motor-drawn units are equipped with the 155-mm. gun, which is practically the same as the field artillery gun of the same caliber. It can hurl a 95-pound projectile some 10 miles. Railway weapons include 8-inch guns, 12-inch mortars and 14-inch guns. The 8-inch railway gun fires a 260-pound projectile

whose maximum range is 28,000 yards, and can also use a 200-pound projectile with still greater range.

The Coast Artillery also lays fields of electrically controlled submarine mines which can be exploded from shore as hostile ships pass over them. To install these mines in channels offshore, and to maintain them, the Coast Artillery uses boats ranging from ocean-going mine planters of over

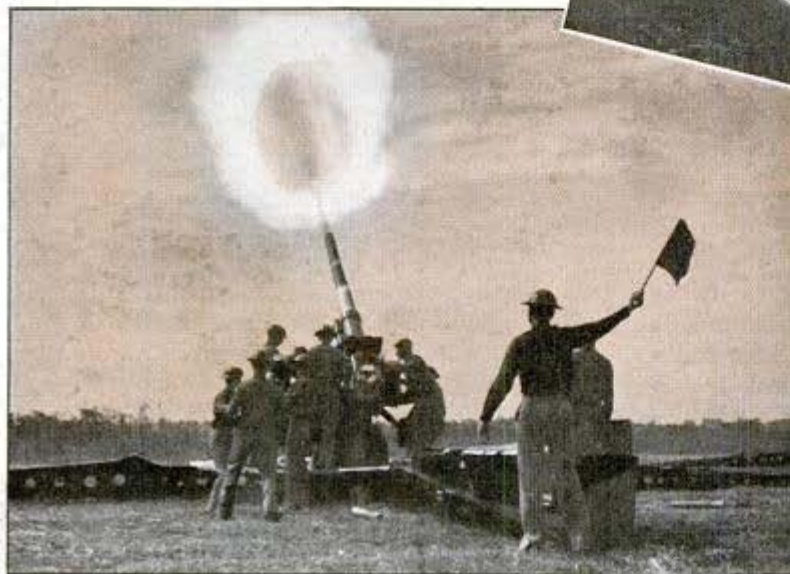
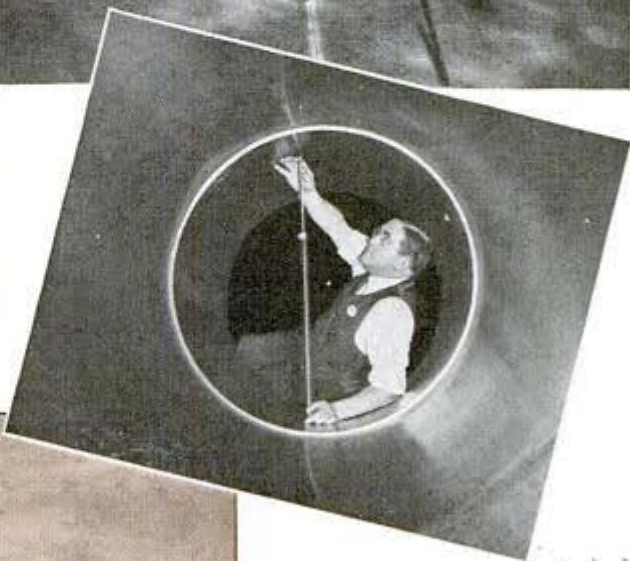
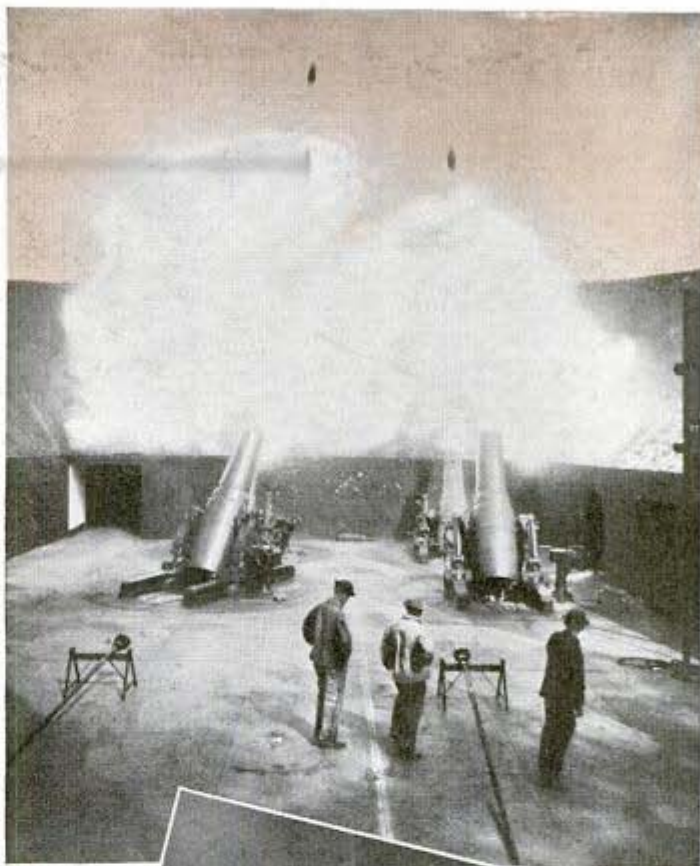
L518

1,000 tons to small motorboats.

Our coast defenses are all based on elaborate systems for locating targets on the water with great accuracy and speed. Since it takes anywhere from half a minute up to three minutes for the big shells to travel from gun to target, and since the target may be moving fast, the fire must be directed at the point where the ship will be when the projectile travels to it. The position of the target, in other words, must be predicted for each shot, and shells sometimes must be fired at a point half a mile ahead of the moving target. The effects of the wind, the temperature and even of the earth's curvature must be calculated for each shot fired. All these calculations must be made and the guns pointed correctly in seconds rather than minutes. In consequence, harbor defenses contain observation stations, plotting rooms, powerful searchlights and elaborate communication equipment.

In contrast to the heavy weapons of harbor defense are the light, fast-moving guns of the anti-aircraft units. Their batteries must detect and hit targets that fly several hundred miles per hour. They must also move rap-

(Continued to page 170)



Top, 12-inch fixed mortars in action. These weapons fire 700-pound projectiles about one and a half miles

Center, measuring the polished inside of barrel of big gun just completed for American coast defense

← Practicing coastal defense against enemy planes. Shells fired by this weapon have time fuses set to produce burst in air among enemy planes. A direct hit is not necessary to destroy a plane

2620

Low-Cost Folding Music Stand Can Be Set Up in 10 Seconds



Folding music stand as it appears in use; inset, assembling it

Selling at a low price, a folding music stand now on the market can be assembled for use in 10 seconds. Folded for carrying or storing, it is a compact package 13 by 18 by 32 inches. It is made of 200-pound-test corrugated fiberboard, weighs almost two pounds, and holds from 350 to 500 sheets of music.

2444

Plastics Make Sea Water Fresh By Attracting the Salt

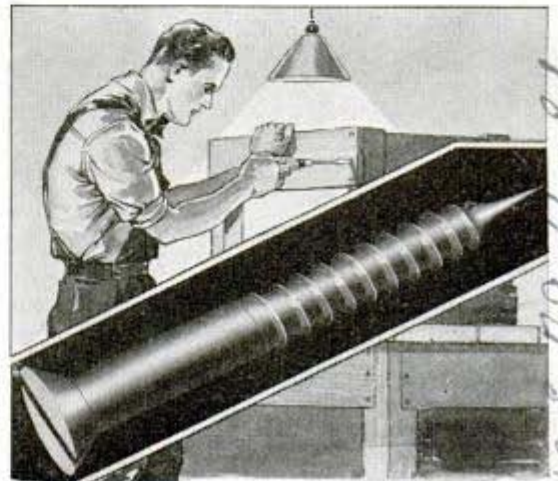
Sea water can be made to give up its salt by treating it with synthetic resins quite similar to the plastics used for radio cabinets and cigarette cases, according to Dr. Robert J. Myers, of the Resinous Products and Chemical Company, of Philadelphia, Pa. When sodium chloride, or ordinary salt, is dissolved in water, its atoms break up into ions, the chlorine ions having an electrical negative charge, and sodium

ions a positive charge. Most of the compounds dissolved in sea water, and the impurities in tap water, are similarly ionized. The resin used has some sodium atoms in its molecular framework, and when water which, for example, is hard because of the ions of calcium, magnesium and iron it contains, is passed over such a resin, the sodium atoms exchange places with the hardness-producing ions. After all the sodium atoms are used up from the plastic, they can be put back again by treating it with a salt solution. It is also possible to prepare the synthetic resins so they will take out the sodium and other positive ions from the solution and put hydrogen ions in their place. Dr. Myers said that treating tap water first with one, then with the other, of these "ion exchangers" produces "distilled" water of a high quality that compares favorably with laboratory-distilled water and in some cases is even better.

2673

"Nail Point" Screw Started Without Drilling Hole

Only a screwdriver is needed for driving a "nail point" screw which takes a starting hold in the wood when it is tapped. It has a slender tip sharpened at the point to cut its own way without the necessity of drilling or punching a hole.



Screw with slender tip starts with light hammer tap

Scenia Service
4/4/48

POPULAR MECHANICS
J. P. Armer, Jr.

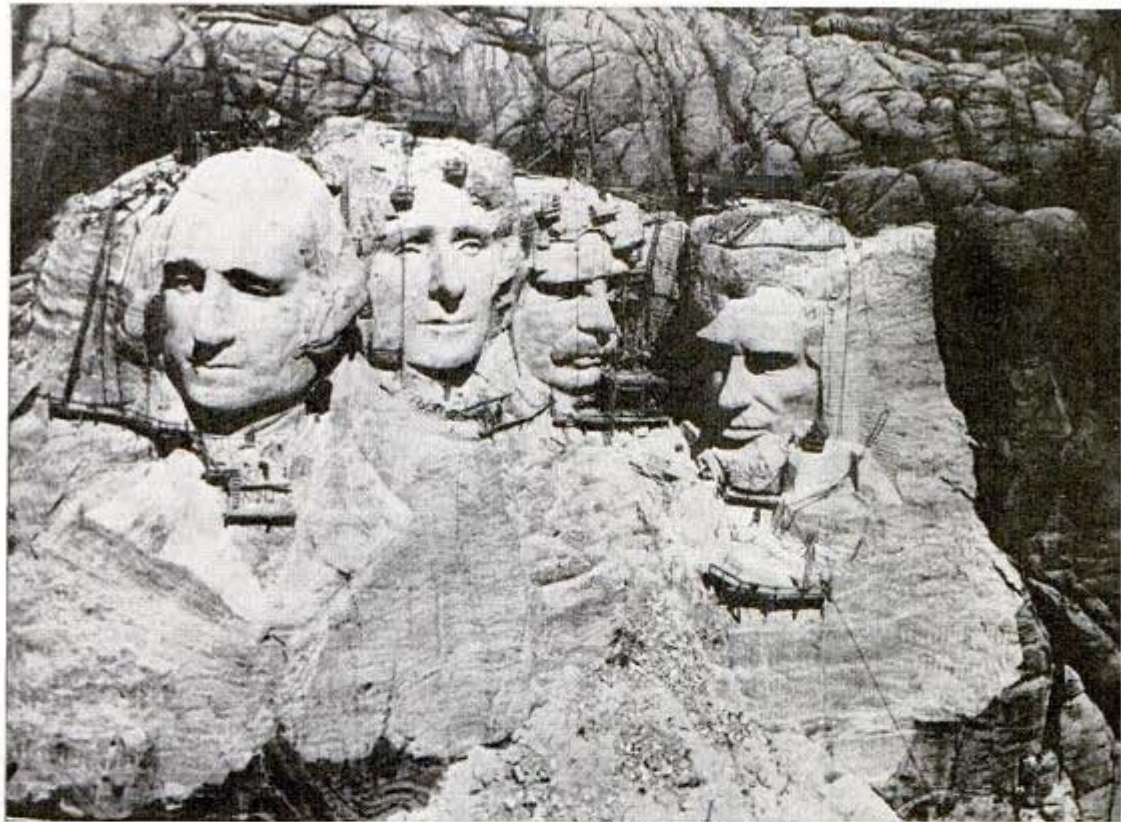
W. A. Edgier, Chas. Elbert, cond.

222 1/2 Washington Square.

642 E 79 St. Chicago

2743.

Big Mount Rushmore Memorial Taking Shape



Air view of Mount Rushmore shows how lifelike figures of four famous presidents are taking form

How the gigantic national monument of Mount Rushmore, in the Black Hills of South Dakota, has taken form is clearly illustrated in an aerial view showing the figures in a far more finished state than they have appeared before. Started in 1927 on the 700-foot sheer granite stone, the

heads of Washington, Jefferson, Theodore Roosevelt and Lincoln are now beheld in cognizable shape. The task of carving this mammoth memorial, the size of which may be judged by houses erected above the heads, is now in the hands of Lincoln Borglum, son of the late Gutzon Borglum.

2708

Versatile Compound Vise Serves Many Purposes in Shop



Vise with two slides holds work on rotating table

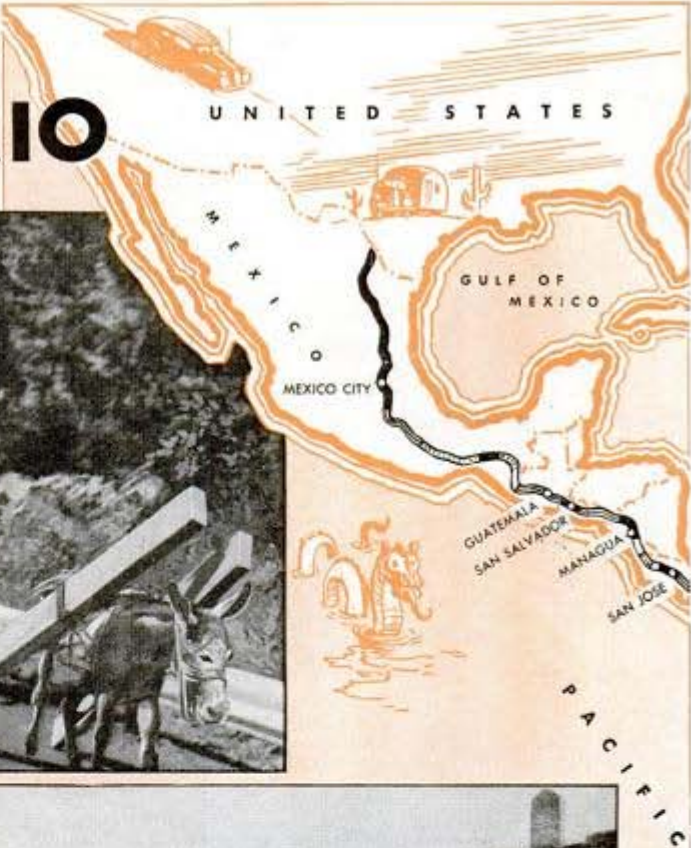
In the machine shop where a variety of work is done requiring accurate spacing—straight lines, radial, circular—a new compound vise is useful for many purposes. Built rigidly to permit adapting drill presses to light milling operations, it can be used also with shapers, milling machines, lathes and grinders on jobs that require accurate feeds in two directions. Its upper slide is graduated through 180 degrees to permit rotating the vise table to any angle. Transverse and cross slides travel in dovetail ways carefully machined. One jaw swivels to grip irregular work, the other has a movable face which is tightened after both jaws are clamped to the table.

Atlas Press Co
Kalamazoo, Mich 45

2701.

ROLLING DOWN to RIO

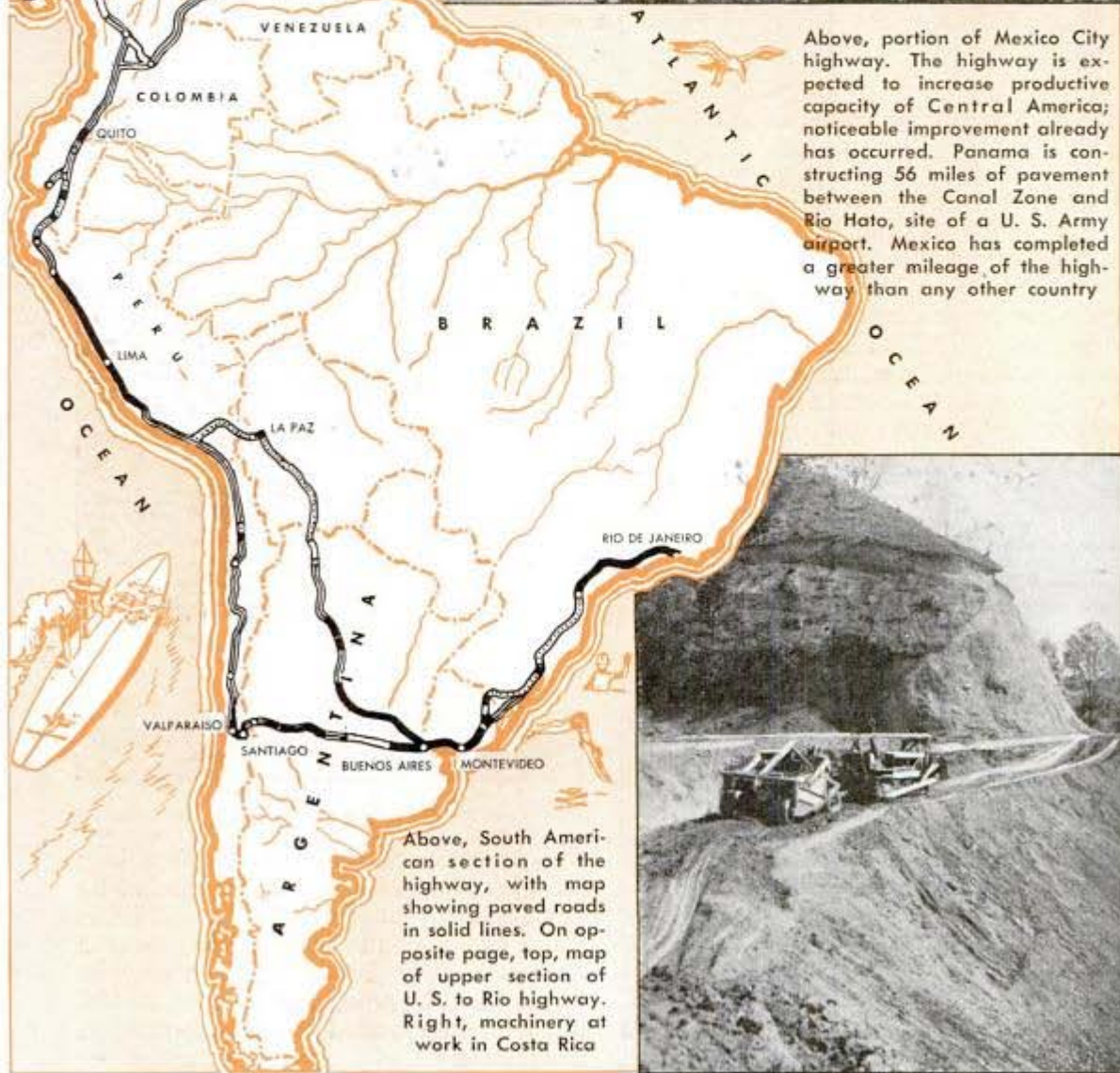
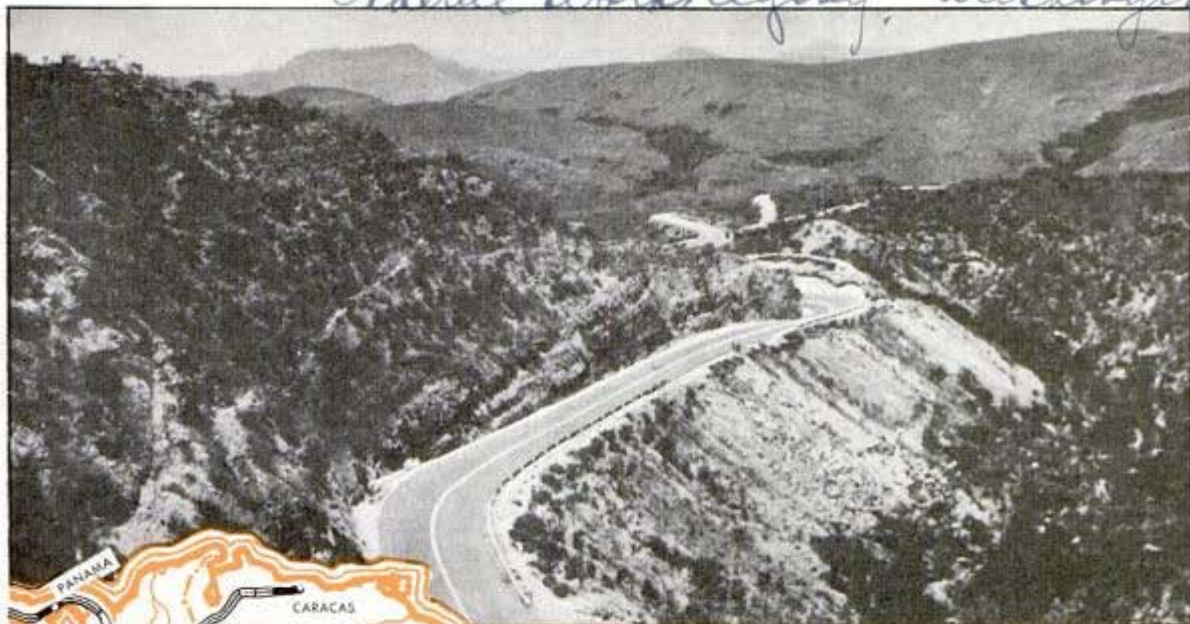
American Highway
Laredo, Texas
Mexico City
highway
Central



For American tourists interested in "rolling down to Rio," there is the prospect that most sections of the highway will be completed within eighteen months. More than half of the U. S.-to-South America stretch, covering 3,500 miles, is open to all-weather travel; three-fourths of the 8,097-mile South American section, from the Colombia-Panama border to Buenos Aires, Argentina, is passable during all seasons, and the Buenos Aires-Rio de Janeiro highway, 1,922 miles long, has 1,021 miles of all-weather surfaces. However, completed sections are not contiguous. Above, burros carrying lumber near Mexico City



Above, masonry arch bridge over Los Esclavos River, Guatemala. Left, native village in tropical region. The 1,100-mile stretch from Texas to Mitla, Mexico, is open to automobiles. Mitla is 365 miles south of Mexico City. Most of this route is hard surfaced. The dry season, December to April, is the most satisfactory time for auto travel in Mexico or Central America. It is difficult to pass from Central to South America because the highway ends in almost impenetrable jungle 50 miles south of the city of Panama



Above, portion of Mexico City highway. The highway is expected to increase productive capacity of Central America; noticeable improvement already has occurred. Panama is constructing 56 miles of pavement between the Canal Zone and Rio Hato, site of a U. S. Army airport. Mexico has completed a greater mileage of the highway than any other country

Above, South American section of the highway, with map showing paved roads in solid lines. On opposite page, top, map of upper section of U. S. to Rio highway. Right, machinery at work in Costa Rica



2733
2731
2740
2792
2340
1942
1943

Four Trays Nested in Stand Serve Drinks on Lawn

Lawn maid \$1.10



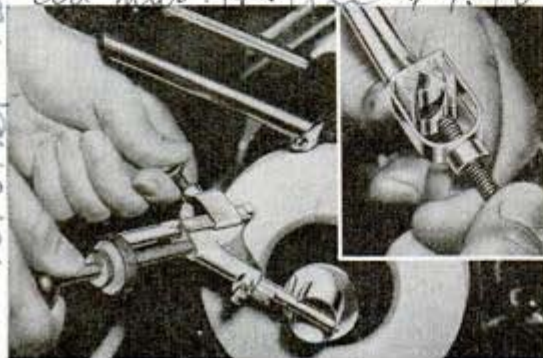
Each individual tray stands by itself on long spike

Convenience for both the host and guests is provided by a drink service stand that carries four small trays for use on the lawn. Near the base of the stand is a shelf with space for several bottles, and each individual tray, suitable for holding a glass or bottle, or for use as an ash tray, is mounted on a long spike to be stuck into the ground within reach of the guest.

Holder Aids in Sharpening Drills And Reclaims Broken Ones

Dull or broken drills can be made like new within a few seconds by using an inexpensive holder that simplifies sharpening. It fits all bench grinders and polishing

ad mar 1942. Price \$7.90



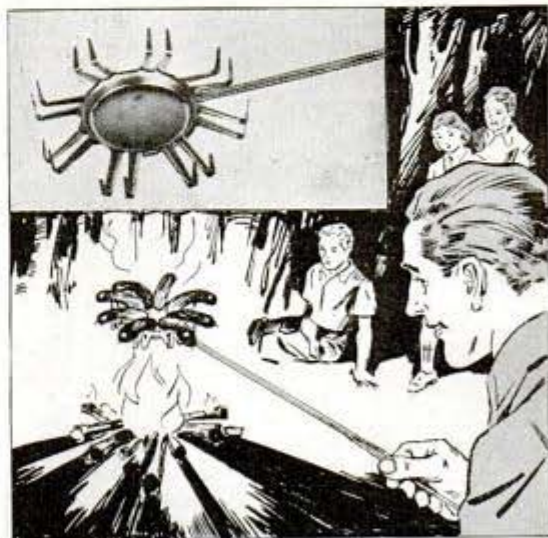
Holder grips broken drill at precise sharpening angle

heads, locking the drill at the precise angle for presentation against the grinder. Hence the holder enables any workman without experience to turn out a precision grind job. It handles drills from $\frac{3}{32}$ to $\frac{1}{2}$ inch.

Weather Maps Sent by Fast Wire On Nationwide Network

Weather reporting will be speeded up fourfold when a system being established by the U. S. government is completed. Formally described as an "express meteorological service," the system will consist principally of a high-speed teletype circuit linking about 250 key points, including 13 forecasting stations of the weather bureau, army and navy air bases, and major reporting stations of the Civil Aeronautics Administration which make hourly weather observations to guide commercial air traffic. At present the preparation of the nationwide weather map takes from four to five hours, whereas under the new system it will be completed in about one hour.

Picnic Roaster Toasts Redhots Or Fries Bacon and Eggs



Eight hotdogs and a bun can be toasted at one time

A versatile picnic roaster with a long wire handle, has a metal dish circled by eight sets of upturned prongs that holds about everything to be roasted or toasted over a bonfire. Several redhots may be impaled on the prongs, or the redhots and a bun may be toasted at the same time. A small steak fits nicely over the prongs.

POPULAR MECHANICS

Carsm Pure Scoll
Co Chicago

L 712.

Edward Barham
The Kintley Tech H.S.
Washington

Battery of Electric Eyes Measures High Jump

It may not be long before high jumpers and pole vaulters will be leaping over an invisible beam of light instead of the traditional bamboo pole. It was actually done at an interscholastic track meet at Schenectady, N. Y., recently, using a battery of electric eyes to measure the distance jumped. The photocells not only gauged the jump more accurately than the sagging pole, but gave the athlete the benefit of any extra inches by which he cleared the bar. General Electric engineers devised the system. A movable light source was located on one standard, and four electric eyes an inch apart vertically were mounted on the opposite post. For each beam of light the jumper failed to clear, a red button registered on one of the standards. Often a jumper makes his best effort on the first or second jump before he is exhausted by repeated trials, and with the



High jumper clears the bar with inches to spare, and battery of electric eyes on post gives him credit. Lower view shows assembly of photocells

bamboo bar he would get credit only for six feet if the bar is set at that level. With the photocells measuring, however, the jumper would be credited with the highest level registered regardless of the position of the bar when the jump was made.

L 599

Two-Piece Skis for Parachutist Easy to Sling Over Shoulder



Skis have been made less bulky and unwieldy for parachute troops by making them in two sections which can be taken apart and carried on a strap over the shoulder. Used first by the Swedish Air Force, they are now being adopted for sport skiing. When the two parts are fitted together the joint becomes invisible and is not noticed in use. Separated, they fit into a casing a little more than four feet long.

Two views at left show collapsible skis being removed from case and then joined together

2694

Week-End Foldboating Becomes Popular Sport

Foldboating Camp, 42-09 Hunter Ave
Long Island City, N.Y.



Photos, Des Moines Register and Tribune

Parking their car near a river, foldboaters unload the collapsible canoe packed in two parts, top. Center, slipping the framework for one end into the hull is one step in assembly operation. Bottom, they're off within twenty minutes for a day of paddling on the river far from commotion of city life

Taking week-end outings with a collapsible boat for paddling about in lakes and rivers is one of America's fast-growing sports, known as foldboating. As evidence of its popularity, special trains running out of New York City accommodate foldboaters who do not drive their own cars. The boats, when folded, can be stowed within an automobile or carried on a train as easily as hand luggage. One type consists of a demountable hardwood framework which can be assembled in 10 to 20 minutes at the water's edge and covered with rubberized fabric to form a canoe. Its center of gravity is below the water line so it will not capsize easily despite its lightness. Rips in the fabric can be patched like a punctured inner tube, but it is said that as a rule the boats will bounce off submerged rocks without damage. The paddles come apart to take less space. A standard 17½-foot boat, capable of carrying two or three people, is packed into two bags small enough to be stored in an apartment. Special lightweight camping equipment can be stored in the ends of the foldboat.

Lamp Guard Easy to Remove Is Locked by Rubber Ring

Having no screws, bolts or clamp to manipulate, a portable-lamp guard now on the market can be removed without tools for replacing the bulb or connecting wires. Held in place by a rubber ring lock, which can be dislodged by a flick of the thumb, the unit includes a waterproof socket that seals out dust, moisture and chemicals. A built-in reflector turns in any desired direction to shield the operator's eyes.



More than 115,000 miles of underground pipe lines carry crude oil and gasoline across the U. S., and if natural gas lines are included the total reaches 321,000 miles.

2501
One De Kull ave. Brooklyn, N.Y.

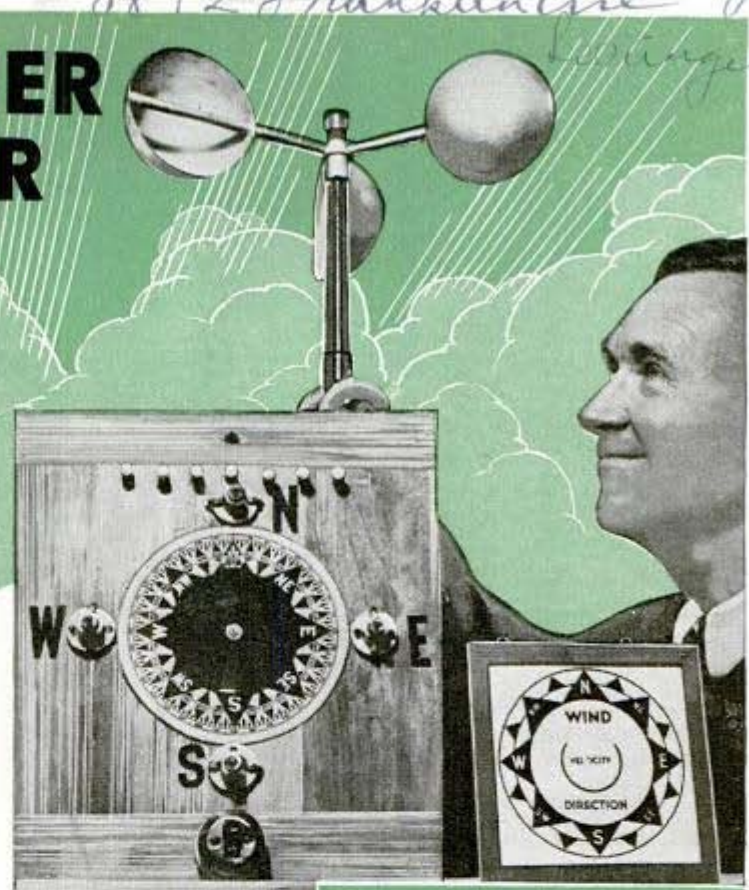
L 546 Cont. Thomas E. Stevenson Jr
 3872 Franklin Ave
 Los Angeles

WEATHER for WAR

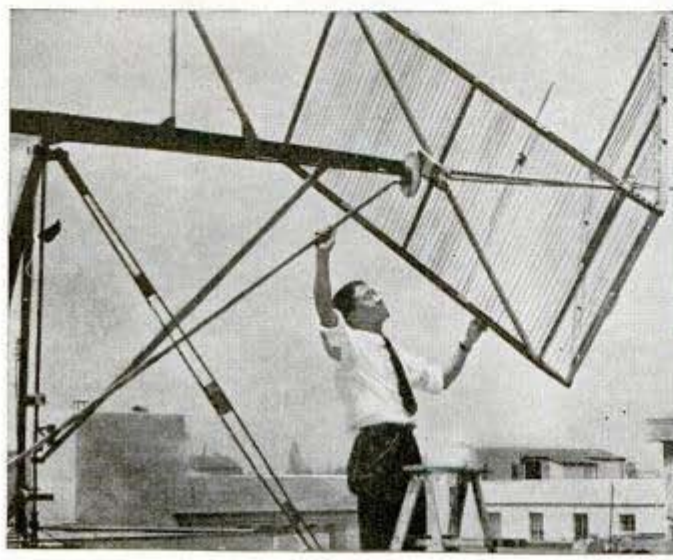
IN ANCIENT times, the leader of an army consulted an oracle to learn his chances of success; today an army commander planning a campaign, calls in a modern oracle—his chief meteorologist.

“Major,” he says, “I want to know what weather we will be having 60 days from now. See if you can find me ten days in a row without any rain, sometime in October.” Ten rainless days would permit his mechanized forces to swarm across country at blitzkrieg speed. A rainstorm halfway through the drive might bog down his steel cavalry and quite likely turn the fight against him. History is full of accounts of bat-

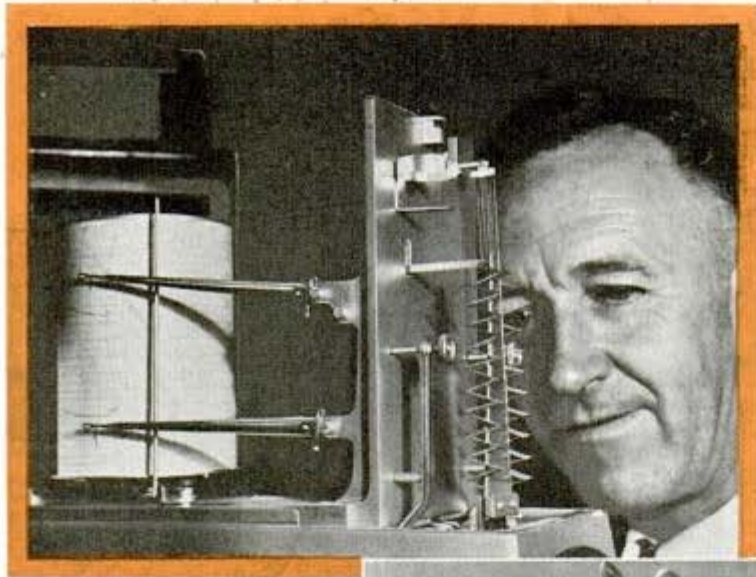
↑ Two types of instruments that show wind direction, with anemometer, which registers wind velocity, above



↑ Apparatus comprising “infrared telescope” used for measuring so-called black body radiation of atmosphere



← Antenna system employed in measuring vertical angle to radiosonde balloon 12 miles high in the sky



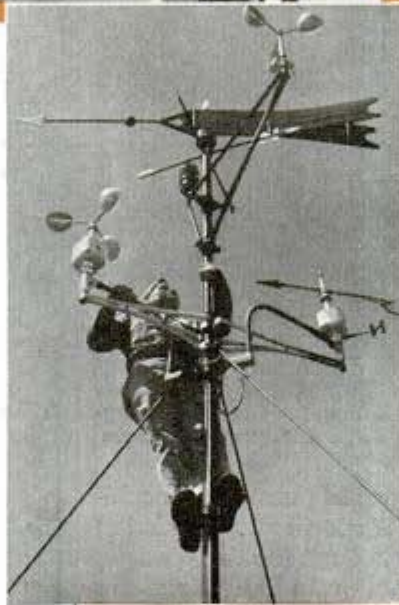
↑ Sensitive radiation fins on thermohydrograph, another instrument used to study weather

Weather instrument mast at Army air field. Fighting pilots need precise weather data →

files in which the weather, rather than strategy or strength determined the winner.

It seemed like sheer luck when the rains held off unseasonably and "General Mud" didn't arrive to slow down the German march through Poland. It seemed a coincidence when good weather also attended the invasion of Norway. But when campaign followed campaign, each fitting perfectly with the weather, experts concluded that Germany had found a way of foretelling the future and was taking advantage of it.

That's why, at the California Institute of Technology, among other universities, men from the Army, Navy, and Air Forces are absorbing new developments in military meteorology. Under Prof. Irving P. Krick, the Caltech students are learning weather secrets that may mean the difference between defeat and victory in war.

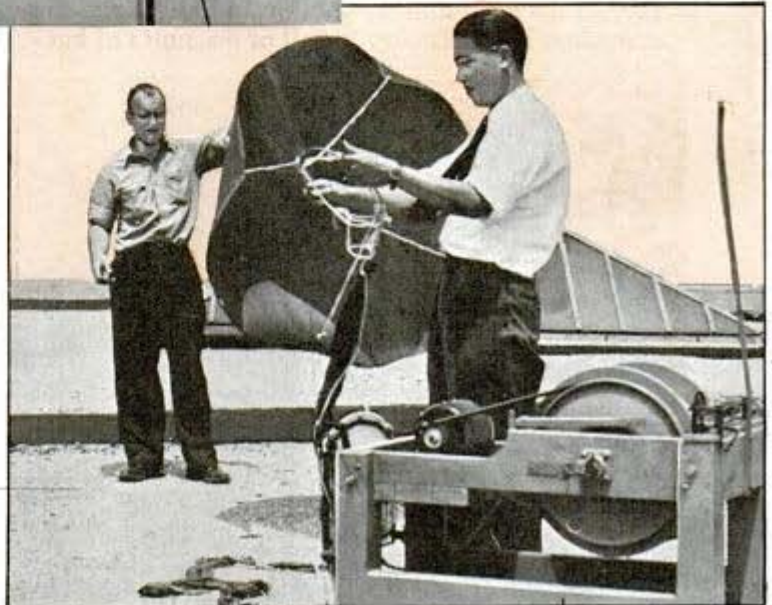


The day has passed when a commander was forced to wish: "If the wind would only shift, we could launch a smoke screen and start a counterattack behind it." Now he calls on the meteorology officer to tell him the exact hour when the wind will shift, and plans his attack accordingly.

Bombers can't afford to leave the ground for a long raid until the weather officer instructs the pilots at what altitudes to fly to get fair winds and what the weather will be at the home base when they return. Big guns could fire all day without hitting their targets except for the upper air data that the weather office supplies. Every command post, air base, and fleet depends on its weather service predictions in planning its operations.

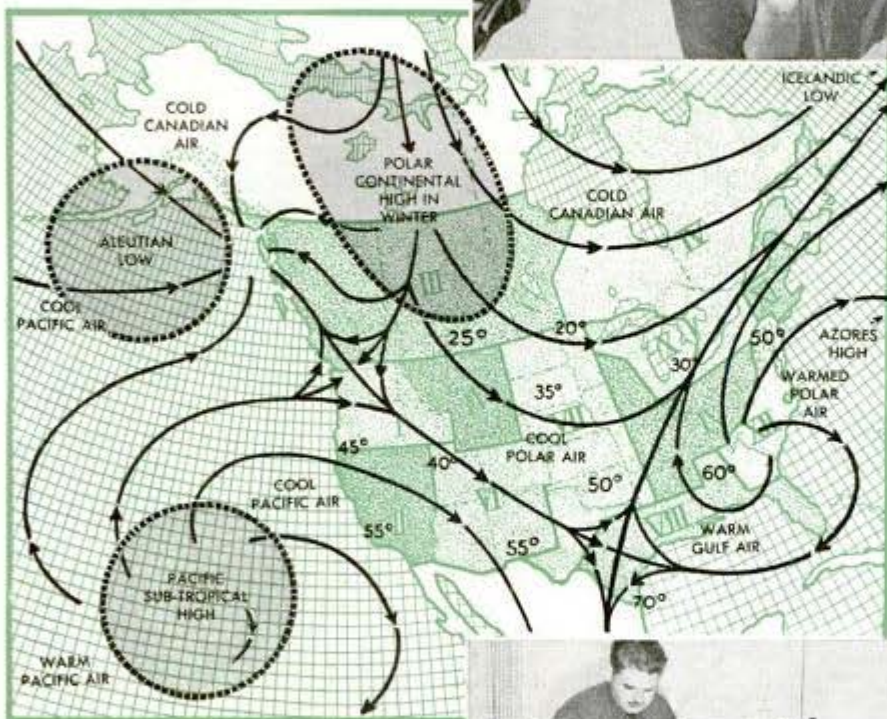
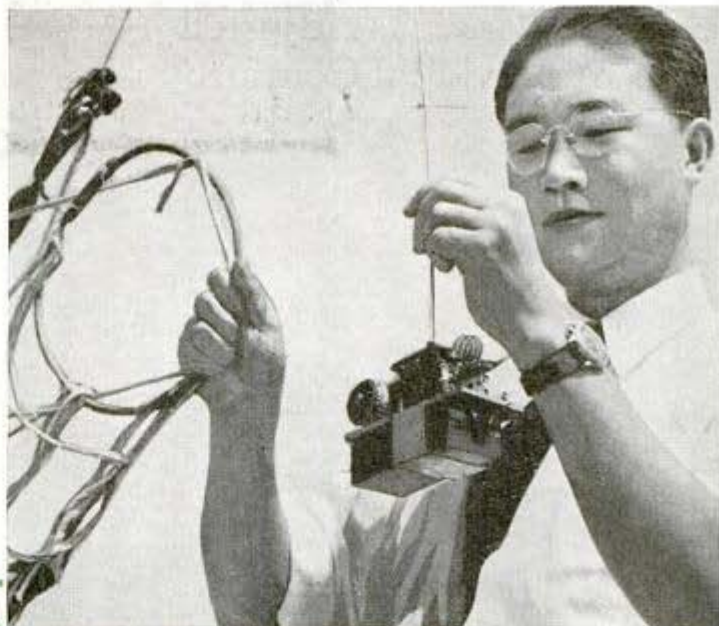
Weather knowledge has become so important that its present state and fu-

Parachute that lowers the tiny automatic radio transmitter to earth when balloon bursts ↓



Pasadena, Calif

ture trend are confidential information during war. Daily forecasts are no longer published in Europe. Weather ordinarily travels from west to east and in this respect a western country enjoys an advantage over an eastern opponent, so much so that the opponent is apt to send airplane patrols far to the west merely to scout the weather. If the United States went to war it is probable that some weather information would be curtailed or purposely made misleading. Short range forecasts are



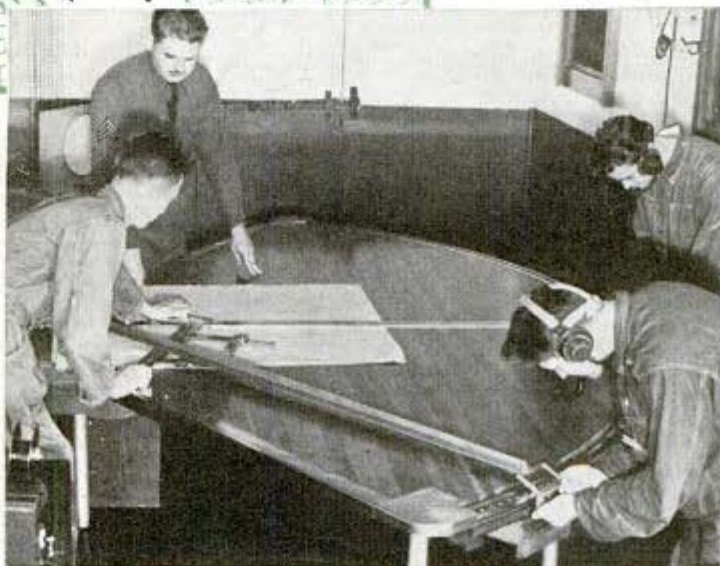
↑ Attaching small radio transmitter to parachute and balloon for weather research

← Typical map issued month ahead shows main weather trends for North America; areas enclosed by dotted lines are centers studied in long-range weather forecasting

Air temperature and winds aloft are necessary data in computing firing angles of big guns, shown being figured out on this plotting board

based on air mass analysis and this art has been developed to a high state during the last few years, especially since the number of reporting stations that deliver surface and upper air information to the forecasters has been increased. Small balloons are regularly carrying featherweight meteorological stations 10 miles or more into the sky and the readings

(Continued to page 166)



30 7 21
**Height of Chair Is Adjusted
 To Fit Individual Comfort**

\$8.36 — \$9.30



To raise chair, the lower end of each leg is unfastened, extended and bolted in new place

More comfort for the worker and less fatigue is possible with an adjustable chair that may be raised or lowered to suit individual taste. It is claimed that a restful sitting position at the bench, table or machine frequently results in increased production. To raise the seat, bolts are removed from the legs which may then be extended to the desired level. The back rest also is adjustable in height and may be removed if it is not wanted.

26 49
**Flameless Lighter for Pipe
 Works Out of Doors**



No flint or burning wick is part of a flameless lighter now available for pipe smokers. To get a light, the smoker simply places the open end of the lighter firmly over the rim of his pipe bowl, presses a button at the other end, and draws air through the stem as in smoking. Special fluid absorbed by material within

54 Lektrolite Corp
 1907 Park Ave. New York

the lighter serves to produce heat immediately as air is drawn through it rapidly, but no heat can be developed unless the button is held down.

L624

**Ten-Foot Model of Locomotive
 Pulls 30-Passenger Train**

Four years were required by F. W. Brown, a machinist of Ravenna, O., to build a model locomotive, which he boasts contains every device that is standard equipment of the big ones, including many automatic controls. Ten feet long and weighing more than half a ton, the model has air brakes, a turbine-driven generator for its electric lights, and an automatic water injector to supply the boiler from the tender. The usual sand box, valve action, oil cups and a steam-operated bell tapper, and the cab equipped with gauges for steam, air and water, as well as throttle



Inspecting locomotive model having all features of a full-size original. It develops five horsepower

and brake levers, help complete its likeness to a full-size locomotive. Developing between four and five horsepower, the miniature engine can pull a train of small cars carrying 30 people at speeds up to 30 miles an hour on its narrow track.

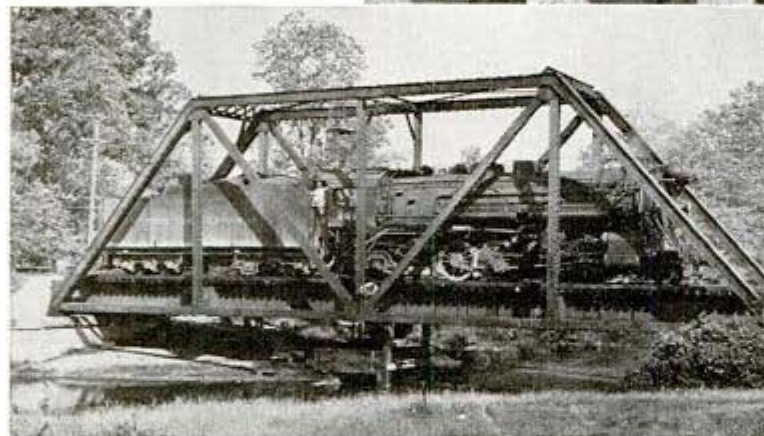
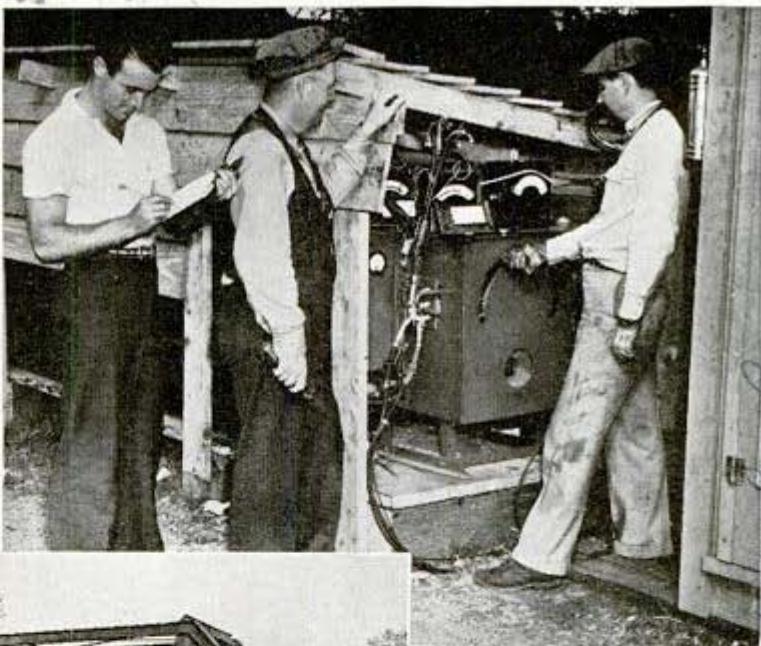
FOR YOUR CONVENIENCE

By using our Where-to-Buy-It index you can obtain additional information about any commercially available product described in this magazine in a fraction of the time required formerly—and you write but one letter instead of two. Just note the page on which the article appears, turn to the index, page 4-A, and find the name of the manufacturer or distributor listed under the indexed item. Write directly to him instead of to us. To be doubly sure of a prompt reply—Say You Saw It in Popular Mechanics.

L734

Vibrator Shakes Railway Bridge to Test Strain

Standing a locomotive on a railroad bridge and vibrating the structure at various rates of movement is one way used to determine the force exerted when a locomotive thunders across the span. Vibrations are developed by means of an oscillator, consisting of disks mounted off center on an axle. Two pairs of these eccentric disks, revolving at controlled speeds on a framework bolted to the lower section of a bridge,



↑ Engineer handles speed controls for vibrating mechanism, while an assistant makes notes of gauge readings showing effect of stress on bridge structure

← Here is engine on railroad bridge at Springfield, O., as it stood in position while oscillator mounted beneath the structure was driven at various speeds

can duplicate the force of a locomotive traveling at speeds up to 160 miles an hour. Delicate electro-magnetic gauges connected to the beams of the bridge record on a film the amount of "give" in each girder. In the first tests, conducted at Springfield, O., by the Association of American Railroads, engineers found that the greatest

amount of force exerted on the bridge occurred at locomotive speeds between 30 and 40 miles hour, and again at about 160 miles per hour. Results of the experiments to be conducted on various bridges throughout the country will be used as a basis for checking the safety of railroad bridges and in constructing new bridges.

"No Gulp" Feeding Bowl for Dog Forces Pet to Eat His Meal Slowly

Dogs can be prevented from gulping their food by a "no gulp" bowl fitted with fins at the bottom which force the dog to lick up his food little by little. The unit includes a water bowl, both bowls being set in an attractive metal holder with rubber suction-cup feet that hold it fast to smooth surfaces.



Fins in bottom of bowl force the dog to lick up his food little by little instead of gulping it

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

20. D. Mfg. Co. 55
5103 Lakeside

Contrib. Duffsch & Crayne, Old News and Science fields the

Washington 10 C

Coach Bar. 50¢

Cleveland Ohio

P 368 Comb Thomas & Stinson, Jr
 3892 Franklin Ave
 Los Angeles

Shoot Shorts for the MAKE MONEY with



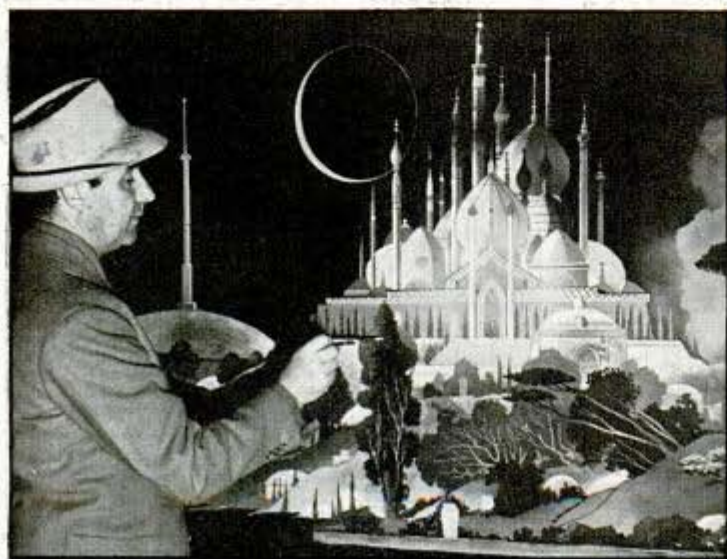
IF YOU are an amateur cinematographer there is a chance that you can profit from your hobby by producing short subjects for the new "meter movie" industry. Several amateurs have sold reels that they produced in their spare time and there is a demand for three-minute shorts that will appeal to the public. From \$25 to several hundred dollars has been paid for a film of good entertainment value.

Jeff Craig, a Hollywood amateur who doesn't even own his own camera, produced five shorts in a couple of days and sold them at once. He assembled a few of



Above, meter movie with scene being projected by apparatus inside

Top, left, threading film in projector to synchronize it for sound



↑ Apparatus inside movie box. Note continuous reel magazine on top

← Completing background for use in a three-minute motion picture

c/o Artists Vocational Bureau, Los Angeles
 Hollywood Blvd. 2513

L368.

Coin Projectors and- your MIDGET MOVIES

his friends who had talent, rehearsed them in dancing and singing numbers, and took his pictures with rented equipment. Not every one is that successful, usually because of poor selection of subjects or lack of technical ability.

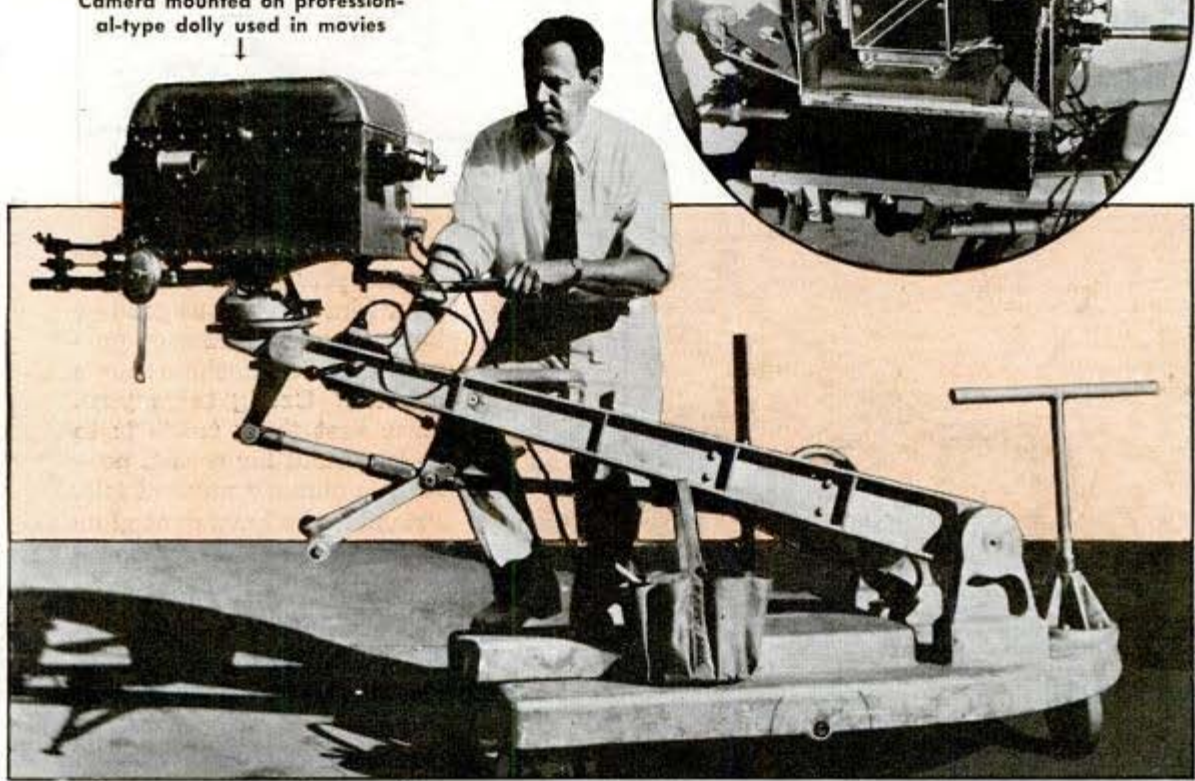
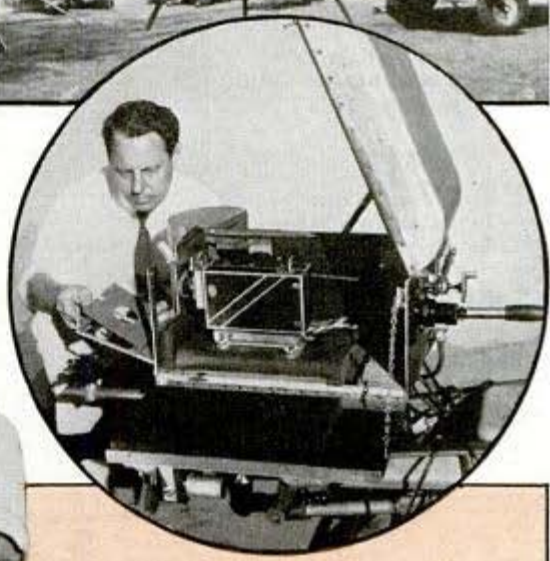
Coin-operated motion pictures are still in their infancy and no one knows yet which sort of pictures will have the most appeal. Singing or dancing numbers, or a visual accompaniment plot that works out the story of a song,



Preparing to film a scene with 16-millimeter equipment such as the amateur movie maker would use ↑

Sixteen-millimeter camera in "blimp" that prevents noise from reaching sound track during scene →

Camera mounted on professional-type dolly used in movies ↓

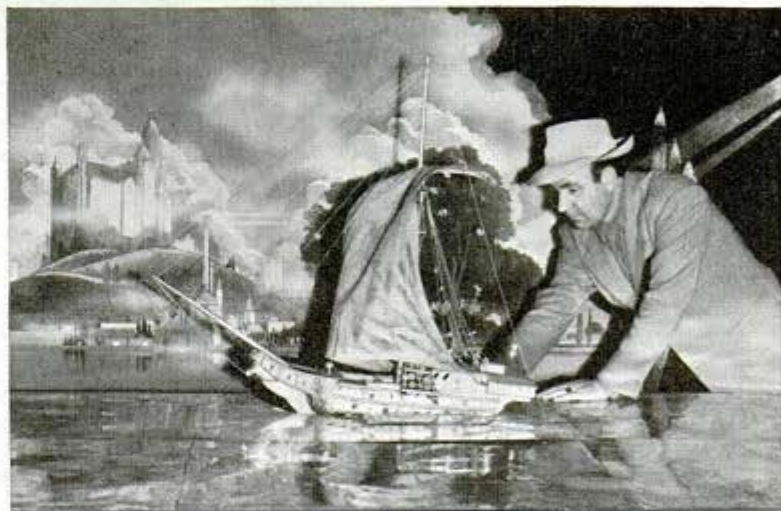




↑ Odd camera angles and properly placed sources of light help give a short movie speed and life

Neil McGuire arranging table-top ship before screening a short movie subject →

Adjusting lights before starting the camera for scene in a short motion picture ↓



seem to be the sort of pictures that the public likes. "Name" bands are not necessary for the short subjects and unknown amateur actors, if they are good, are just as worthwhile as picture stars in the new medium. Some professional producers have spent thousands of dollars on a three-minute subject, using a large cast, although the trend is toward simple productions in which only one person or a few appear. Clever close-up comedy and entertainment of a vaudeville nature is more popular than elaborate productions.

"If you try your hand at producing a short, remember

that you will be competing against professionals and that your film must be as good or better than the average picture in a slot machine movie cabinet," Craig tells you. "The first thing to do is to look around for a cast, possibly a comedy musical trio. Friends who have danced or sung on amateur radio programs should be good subjects. Second, you must select an appropriate tune or song for the musical accompaniment. If the actors have the correct costumes, a rollicking cowboy song or a

2968

2916

Spanish number may be appealing. Most songs at least 20 years old are in the public domain and may be used without royalties."

Offhand, a professional picture seems like a large order for amateurs to produce, and it is, for the average amateur. However, a number of nonprofessionals and clubs have produced film plays that in their field are every bit as good as those produced in Hollywood. Cinematographers who have advanced in their hobby to a point that is technically excellent, stand the best chance of cashing in.

On the other hand, you won't get a top price for a picture that isn't synchronized with sound, and few amateurs have recording equipment. The thing to do is to use a phonograph record with your reel so that a prospective purchaser can get a good idea of how the action ties in with the music. If the picture is bought it will have to be sent to a laboratory to have the music dubbed in and synchronized.

An 8 mm. camera is too small and you must use the 16 mm. size. Many of the professional shorts are made on 35 mm., then reduced to 16. Negative film is preferred to the reversal type. The ideal picture length is 90 to 100 feet. Film speed should be 24 frames per second, as this is the proper speed for dubbing in sound. You must avoid close-ups of lip movement and other actions that call for exact synchronization because few amateur cameras maintain exact speeds and it might be impossible to synchronize sound with the film. Fast action such as a tap dance is a good amateur subject because the action is so fast that the audience finds it hard to tell whether the music is synchronized to it.

Remember, in a short subject interest must be kept at a high pitch. Think of what you would like to see and try to produce your picture accordingly. Try odd lighting, angle shots, and trick effects.

You don't need to confine yourself to the standard type of movie, either. Neil McGuire, a small independent Hollywood producer, has made a name for himself in the box projection field by the high quality of "table top" productions that he originates and produces.

Manufacturers of the miniature movie boxes don't know yet what the future of their industry will be. Meter movies may turn out to be a flash in the pan like miniature golf or they may become a perma-

(Continued to page 175)

Arc and Flame Welding Unit Uses 110-Volt Current



Top, electric welder produces either arc or flame from 110-volt line. Bottom, using it as flame torch

Either flame welding or arc welding can be accomplished with a low-priced welder for use in the home or shop. It plugs into a 110-volt line, either alternating or direct current, and can be used safely on a fuse as low as 10 amperes. Its power unit, said to be burn-out proof, may be run all day with no time lost for cooling. The long, clean, pressureless and non-oxidizing welding flame, produced from electricity, develops 7,000 degrees, Fahrenheit, at the cone, yet in a split second it may be reduced to such a low temperature that it will scarcely flow soft solder. In arc welding, both the welding rod and work carry live electricity, and no flame is used. There are two ranges of heat control. Metals from the thinnest gauge up to about one-quarter inch thick may be handled. Other operations possible with the unit include brazing, fusing, tempering, sweating, preheating, and thawing pipes. The welding set is furnished complete with helmet, welding rods, fluxes, electrodes and asbestos block.

suggested Mills Hardware Co. 4110 W

Elect. Stephens Hardware Co. 15 W

Patent of Securities 4020-104

Van Duren, Chicago

*2690 Cont. John W. Yalton
17 West St. Akron, O.*

Auto Tire Modeled in Clay To Visualize Final Design



Expert modeler carves a new tire design in clay

Before incurring the expense of building molds for a new type of tire, an expert modeler for the Firestone Tire & Rubber Company shapes the tire in clay. All experimental tires first appear in clay. The sculptor, a 25 year old girl, works from engineers' drawings and is permitted to introduce any artistic ideas she desires, so long as the model remains within $\frac{1}{32}$ inch of specifications. The model then goes to the executives, who can visualize the finished product better than in blueprint form.

Automatic-Feed Space Heater Uses Coke Oven Principle

By an application of the by-product coke oven principle, a space heater has been developed which is self-stoking and burns

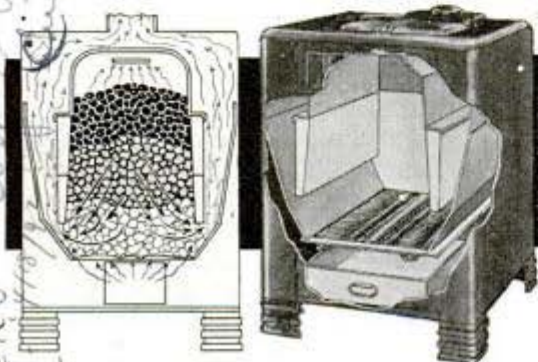
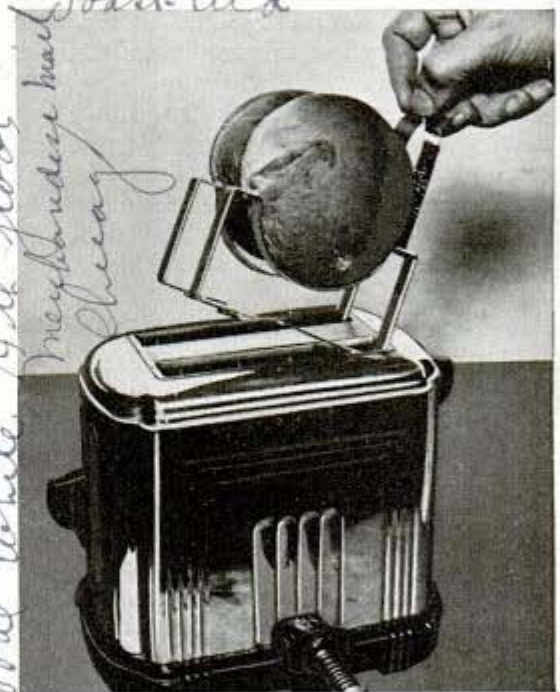


Diagram shows downfeed of fuel, forming coke base

any kind of coal from egg to stoker size with virtually complete combustion. Intended for small homes, shops, garages and cabins, it holds 100 pounds of coal, fed in at the top. As the full charge of coal in the magazine heats, it cokes slowly, and gas distilled off the top passes through a vent and down an air duct to be consumed at the grate line. The fuel feeds downward, forming a bed of slow-burning coke at the base, producing ample heat without clinkers. The sealed magazine prevents a draft from rising to ignite the entire fuel bed. Thermostatic regulators control dampers to maintain a uniform burning rate.

2699

Holder for Toasting Biscuits Avoids Burned Fingers



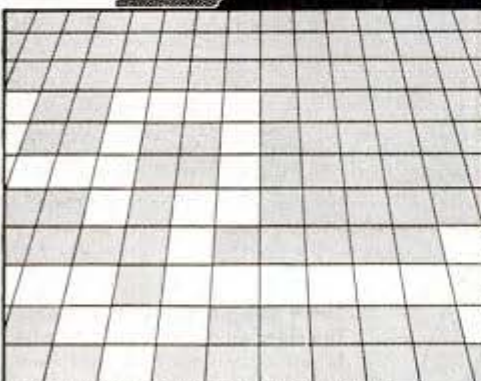
Lifting bun out of toaster with cool-handled holder

Made to fit the "pop-up" type of toasters, a special holder for biscuits, rolls and muffins makes it easy to lift them out without burning the fingers. The unit fits into the slots of the electric toaster and has a projecting handle so that it is not necessary to reach down into the slots to remove the muffins.

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.

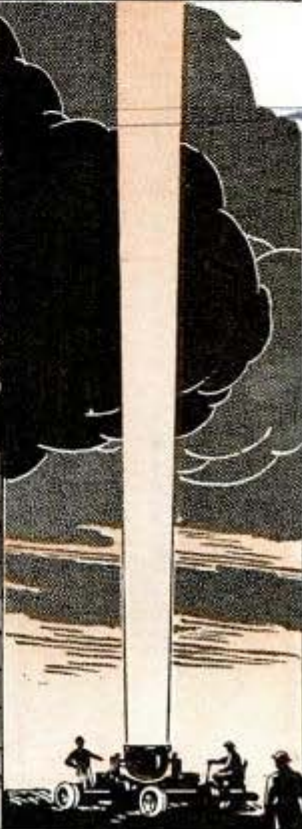
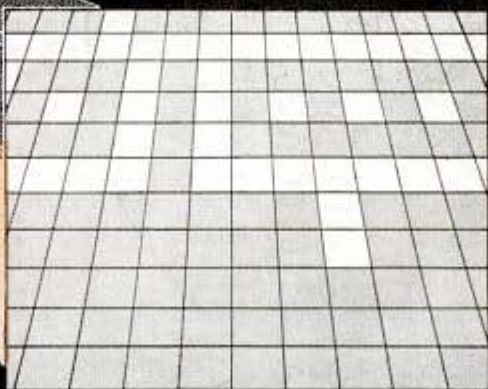
LP23 see July 1942 - 86

Camouflage With Lights May End Blackouts



As a substitute for blackout protection against air raids, A. F. Dickerson, General Electric illumination expert, suggests dividing city into squares in each of which he would install a floodlight turned skyward (top and right). By means of switch-board, certain floodlights would be turned off, others left on to form changeable patterns that would confuse enemy pilots (left and below)

Floodlights might be placed on floats in water, seeming to locate part of city where none would exist. Keeping some lights on would prevent accidents resulting from a complete blackout



acme

2684 Cuck. Marshall Perham
 N 28 Stearns Drive
 Los Angeles

The WORLD'S



In Argentina they play a game, outlawed by authorities because it is so dangerous, called El Pato. Players, mounted on horses, battle for possession of a stuffed leather device about the size of a volleyball, which has six protruding handles. The horseman reaching the ranch house first with El Pato—the ball—from the point where the game begins five or six miles away, is the winner. Left, referee holding aloft El Pato. Captains of the teams seize the handles and fight for the ball. The referee's only duties thereafter are to follow and care for the injured



There are no rules in El Pato. The rider on one team may tackle an opponent and hurl him from his horse—a highly regarded technique. He also may flail his opponent across the face with a short riding whip or club him with the leaded butt. Or, he may use the bolo, consisting of two weighted balls on the end of a lariat, to trip the horse or paralyze the rider. Center, left, rider transfers the ball from one side to the other as opponent rushes up to snatch it. Center, right, fighting for possession of El Pato, with one rider already off his horse. Bottom, passing the ball back to teammate as opponents close in

L6A41

MOST DANGEROUS GAME



Above, going at full speed, one player hurls himself upon an opponent and both hit the ground. A little rough, but all in fun. Right, player swooping upon the ball as it lies on the ground. The skilled horsemen scoop it up as they ride at full gallop. This player has a clear chance, but usually opponents are near enough to sideswipe his horse or club him to the ground. These photos are presented through the courtesy of RKO studios, which produced the game as part of motion picture, "They Met in Argentina"



Left, preparing to unhorse an opponent with the bolo. The weights wrap around any object at which the bolo is hurled and their impact is sufficient to stun man or beast. Stunt men of the studio, under direction of technical experts from the Argentine, played the game through to conclusion in the movie without injury

1092

Flyers Get Rid of Nitrogen Before High-Altitude Test



Top, flyers breathing oxygen to "wash" traces of nitrogen from blood so they will not suffer from aeroembolism in low-pressure chamber, bottom

How to remain conscious and alert in high altitude flying is taught airplane pilots with the aid of a sealed low-pressure tank that duplicates atmospheric conditions at 35,000 feet. Before entering the tank for a practice "flight" the crews must "wash" all the nitrogen out of their blood, which requires a half hour of mild exercise while breathing pure oxygen. Otherwise, when they reach thin air, this gas would expand into tiny bubbles in the blood vessels, causing a painful disease called aeroembolism—the aerial equivalent of a diver's "bends." Once denitrogenized, the flyer continues wearing his oxygen mask even at sea level to avoid breathing new nitrogen. In the strato-chamber he undergoes "stratosphere conditioning" at greatly reduced air pressure, where he develops confidence for journeys into

the stratosphere. Without an oxygen mask, the average man can retain consciousness up to about 18,000 feet. If his oxygen supply is cut off at 20,000 feet, the flyer will pass out in 10 minutes; at 25,000 feet, in three minutes, and at 29,000 feet, consciousness is lost in less than one minute, with complete coma soon after. Above 35,000 feet, a mask may furnish enough oxygen, yet breathing becomes difficult because the rarefied atmosphere doesn't supply enough lung pressure. With present-day oxygen masks, 40,000 feet seems to be the ceiling of human endurance. To fly at higher levels, sealed cabins or individual pressure suits might be used. The test chamber is used at Boeing Aircraft Company.

Seattle, Wash
"Pocket Behind Tie Conceals Money, Cards, Pencils"

Neckties with pockets in back, recently introduced in Germany, provide a hiding place for money as well as a convenient method for carrying identification cards, pencils, etc. A slide fastener closes the pocket.



European Pullover

at Lecky's 1941 Spring Fair

2622.

Sight Feed Generator Co. Richmond, Va.

'Chutists Practice Invasion From Dummy Plane

Parachute troops, or "paratroops," are being taught the technique of leaving an airplane and lighting on the ground, by leaping from an indoor dummy fuselage. A counterweight behind the jumper breaks the speed of his fall so it equals that of an actual jump.

"Cold Arc" Welder Fuses Thin Metal Airplane Parts

Fusing of thin metals, such as airplane parts, is possible with a "cold arc" welder just developed. Ordinary electric welding develops such intense heat that it burns through thin sheets before a weld can be made. With the new machine a low current is used which does not burn through. The "cold arc" current oscillates 195,000 times per second, and when this is passed over the regular 60-cycle alternating current a continuous flow of current is obtained

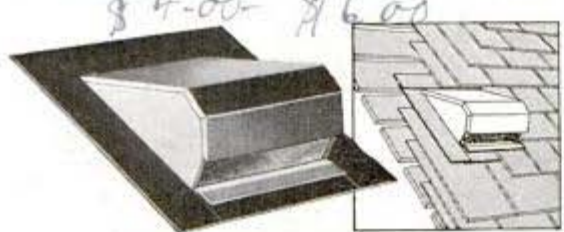


For indoor practice, England's parachutists leap from a dummy fuselage mounted high above the floor. Counterweight cuts speed of the descent

Louvered Vents in Roof of House Permit Attic to 'Breathe'

Attic ventilation, by means of all-metal louvers now available for pitched roofs and walls, helps cool the whole house in summer. Placed at high and low positions on the roof, they provide cross ventilation, permitting escape of heated air through the attic ceiling and allowing entry of cool-

er air through vents located near the floor level. In winter they solve the problem of ridding the attic of excess humidity that results from air conditioning during the heating season, thus preventing accumulation of moisture on floors, rafters and ceilings. Slant roof louvers provide a waterproof fit with the shingles or roofing material, and an internal baffle gives protection in all kinds of weather, while a bronze screen stops insects, birds, etc. The wall louvers are easy to install in brick, stucco or frame, and have the same protection against weather and insects.



Louver unit, left, makes tight fit around shingles or other material on slant roof as shown at right

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

OCTOBER, 1941

Leslie Welding Co 2943 Carroll Ave 65
Chicago, Ill.



↑ Working on scale-model live-steam locomotive designed to haul a load



PROGRESS

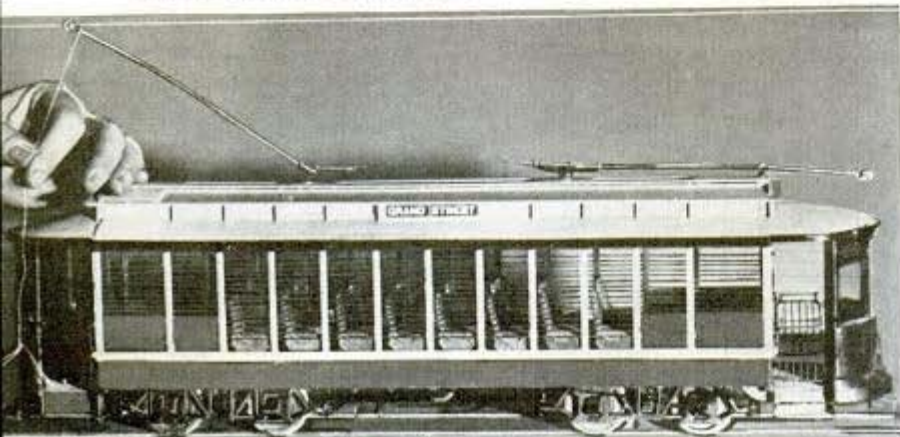


Group of tiny racing cars → ready for a race. Cars are powered by gas engines

Chart of World's New York World's Fair



↑ Model power boat driven by steam turbine engine
Here is an example of excellent craftsmanship in
↓ model of an old-fashioned New York street car



SYNCHRONIZED like a diminutive sprocket wheel to the fast-moving fly-wheel of the everyday world is the world of Lilliput, which is built up with millions of tiny models and is populated by the most enthusiastic group of people you can imagine, people who work for fun and even spend money for the privilege.

They are the model hobbyists, who construct miniature replicas of the devices and structures which have become a part of the scheme of civilized life. They number around 2,500,000 in the United States.

An industrial revolution has taken place in this world-of-miniature in the past few years, a sweeping series of changes that are still in process.

Principal factor in the upheaval has been the mass-production of powerful little gasoline motors. So cleverly are these little motors designed that they can be interchanged between model planes, model boats and model racing automobiles, producing speed thrills that draw an ever-increasing number of model fans into these three fields.

According to a New York expert in the field of models, a decade ago a census of Lilliput would have shown railroad model makers leading

*Designed by Mr. J. J. ...
Brooklyn ...*

2458
Cmbr. Allen Warren, Abbott,
343 E. 33rd, New York

IN LILLIPUT



Wolfgang Pfister holding class A hydroplane powered by air-cooled gas engine with overhead valves. Note long exhaust pipe. The craft has made 40 miles per hour. Hull is carved balsa wood covered with cloth.

Jersey City, N.J.
sailboat enthusiasts for supremacy in numbers. Today, the line-up has changed until a check-up would probably rate the various models in the following order: airplanes, racing automobiles, railroads operated by electricity, sailing boats, speedboats and live-steam railroads. This rating includes only the models which are manufactured wholly or in large part by the hobbyists themselves. Commercially manufactured models are just as popular as

at Little Ferry, N.J.
ever, with electrical railroads far in the van.

Among the fans who are not satisfied unless they create their own Lilliputian mechanisms, the contest for efficiency in small size and the race for affection in the hearts of the hobbyists is illustrated by the fact that just after the New York Society of Model Engineers showed a two-ounce railroad locomotive in its latest exhibition, a similar organization in Philadelphia, holding its third annual show, produced a

2458

Plan-a-Room
Paul Fullister



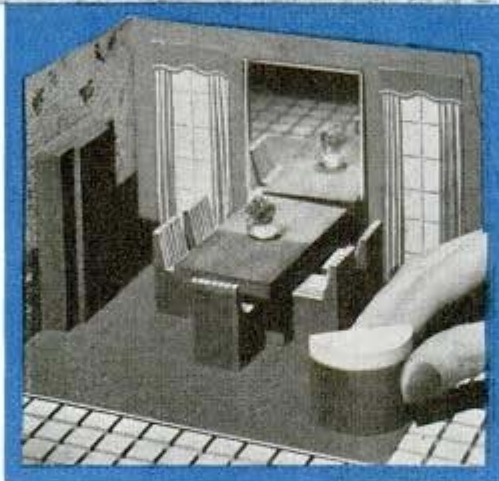
↑ Contestants working on models entered in a Chicago model-airplane contest

remarkable working model gasoline motor. This motor, mounted on an ordinary spectacle case, weighs $4\frac{1}{2}$ grains, has a genuine spark plug made out of quartz and runs for five minutes with its tank filled to capacity with three drops of gasoline and heavy oil mixed. The engine attains a maximum speed of 10,000 revolutions per minute.

Another example of the efficiency which miniature engineers have poured into the little motors is a six-pound racing boat, shown to the public in New York, which sped through the water at the incredible rate of 63 miles an hour, a figure checked by electric timers. Its one-cylinder gasoline engine develops 15,000 revolutions per minute.

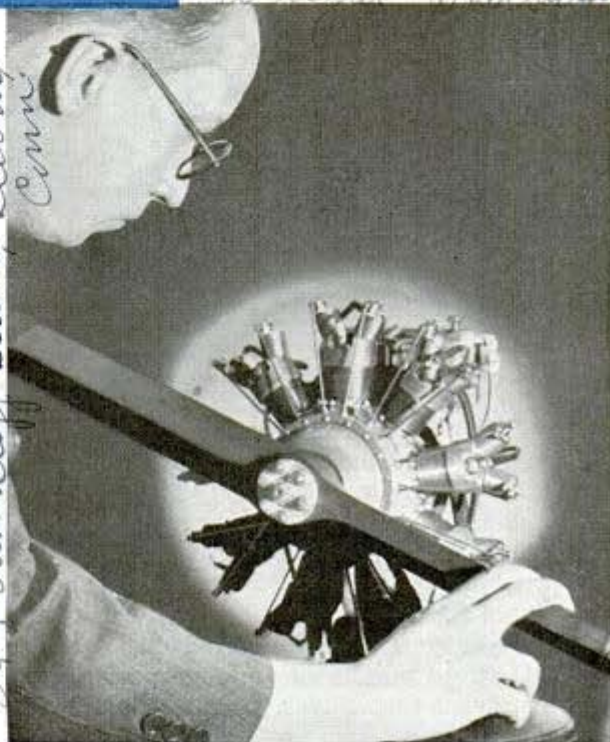
And, since there is no human hand to move the throttle on these little craft, inventors have devised automatic controls which advance the spark and change the mixture so that the tiny speedster does not hit the water at a mile-a-minute rate, but gradually increases its velocity just like a life-sized racing vessel.

Also new in the field of operating boats is a device which can be fitted to any model



← Model of room in which tiny pieces may be arranged to show how furniture will look before purchasing

Model of airplane engine runs smoothly at 250 to 1,250 revolutions per minute



349 Overcliff Lane, Leovon Conn

Builder and author -
POPULAR MECHANICS
Samuel R. Hodgson

more to building motor

weight utilization

2458

resulted in greater speed in miniature automobiles than in boats. One of these diminutive racing cars has set a record of 87.12 miles an hour attached to a cable so that it might be kept under control. Another has hit 72 miles an hour on a circular banked track. These records probably will be broken by new model boats and autos now being planned, experts say.

Military authorities have attributed the superiority of America's warplane fliers partially to the fact

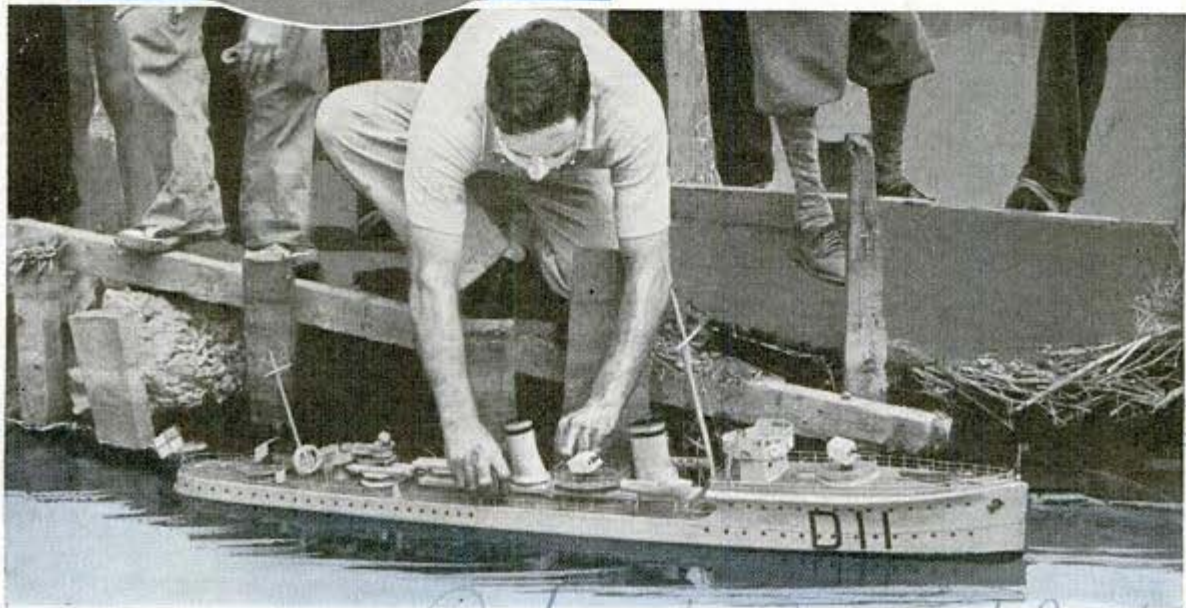
(Continued to page 178)



↑ Model of Spindletop No. 4 oil well in Texas. Derrick and machinery are wood

← Locomotive engineer helps a young engineer oil up his model locomotive

Adjusting five-foot scale model of British destroyer driven by steam engine



*Richard Barrett New York City
at Little Ferry, N.J.*

of Sherman Ave

26 682.

Robert A. Mander & Co. (Incorporated)
237 Jacksonville Road
Nashville, Tenn.

Range Cooks by Induction Without Hot Element



Top to bottom, sheet of paper placed between cooking unit and pan does not scorch as water is boiled

Faster heating and lower current consumption are claimed for an electric stove that depends on the principle of induction instead of a heated coil to transfer heat into cooking utensils. The unit itself does not get hot, but all the heat is generated within the utensil by means of the induction current. This can be demonstrated by placing a paper napkin between the unit and a pan of water. In a short time the

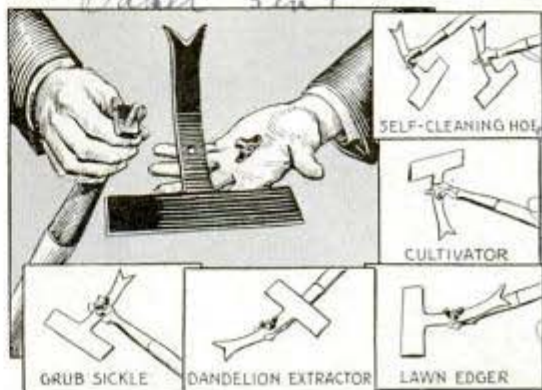
water can be brought to a boil without scorching the paper. Speed and economy in cooking are indicated by tests reported by the manufacturer. In one instance one quart of water was heated from 60 degrees to 212 degrees in 2 minutes and 44 seconds, using only 177 watts. With other heating units, the same operation required 5 minutes and 7 seconds and used 233 watts.

Quicksand Won't 'Swallow' You If You Remain Quiet

Scoffing at the common belief that quicksand will "swallow" anyone falling into it, Lawrence Perez, director of the soil mechanics laboratory at Cooper Union, explains that quicksand will support a man twice as easily as water. Anyone falling into quicksand should remain quiet and let himself go down feet first, with arms outstretched. He sinks until he reaches a depth just below his armpits, at which point, says Mr. Perez, his weight equals that of the material he displaces. Quicksand, he adds, is not made up of any particular type of material, but is a condition possible in granular soils where flowing water exists and the weight of solid particles is balanced by the water pressure.

Hoe Makes Five Tools in One By Simple Adjustments

All-around work in the garden is performed by a self-cleaning hoe that may be changed into a cultivator, sickle, weed extractor or lawn edger by adjustment of the position of the head. Unscrew a wing nut and the head may be tilted, turned upside-down or set parallel with the handle to make the desired garden tool. Each of the five uses is independent of the others.



Sketches at right and bottom show many uses of tool

L695

Ref: Ilare Bader, &
George Pal Productions,
1941, No. McCadden Place

Puppet Actors Star in Animated Film Cartoons



Carved wooden puppets star in a new series of film cartoons, or "puppetoons." Animated by stop-motion, an eight-minute "short" requires up to 6,000 miniature figures, each showing progress in action; 2,000 represent actions of the "leading man." Above, a castle for knighthood puppetoon. Right, preparing a "star" for closeups. George Pal introduced the technique in Europe, brought it to Hollywood



Assorted hands showing different actions will be placed on puppet actor's arms, a pair at a time, to carry on motion progressively. These details show the immense amount of work. Left, finishing six-inch knights scaled for middle-distance shots is a two-hour job. Advantage of the puppet over the drawn cartoon is the sense of three-dimension depth it gives

Photo by... Call

2681

Emergency Shower Guards Men in Peril of Burns



Workman imperiled by fire drenches self under shower

Instant protection for workmen against certain types of industrial accidents is given by an emergency shower that releases a drenching spray as soon as the valve is opened. The chain extending from the valve is fastened at the floor so in case of blinding accidents workmen can run under the shower located nearby and release water by bearing against the chain with arms or any part of the body. It is especially valuable for paint, ink and similar types of industries where workers are exposed to hazards of chemicals or flames.

Musical Tones of Any Instrument Produced Electrically

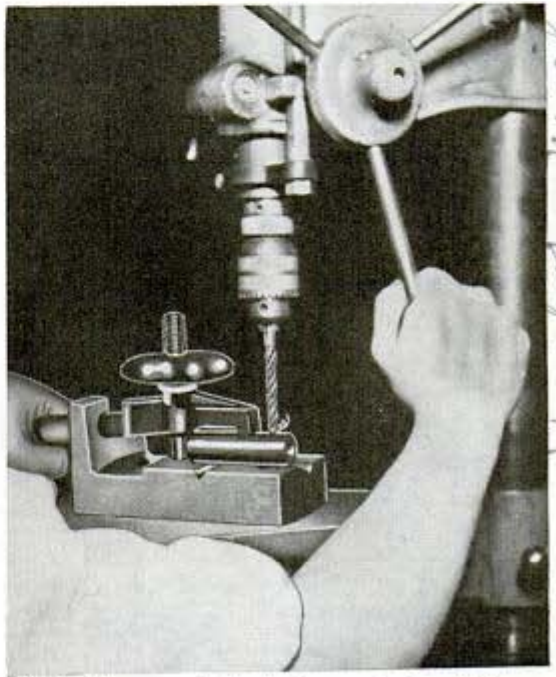
Tones of any musical instrument can be played with an electrical instrument, patented by Ralph W. Bumstead, Westfield, N. J., that uses tubes and electrical circuits like those of television transmitters. The fundamental tone is created by a single element, a scalloped wheel, or tuning fork. This also controls a beam of electrons which sweeps across the sensitive screen

of an iconoscope, the "film" of a television camera on which the picture is formed. There is also flashed on the screen, from a miniature projector, a silhouette of a mask which changes the vibrations of the tone to correspond with those of the instrument it is desired to duplicate, since the response of the screen is different in light and dark portions. Each mask is cut in a distinctive pattern to produce a wave form which, when amplified and converted into sound in a loud speaker, will simulate the instrument for which the mask was made. It is necessary only to change the mask to play a different instrument, and even tones which cannot be created by any existing instrument may be produced. One form of the invention uses a series of masks on a film, which may be rolled into place.

2656

Vise Grips Flat or Round Work For Drill Press Jobs

Combining several tools into one unit, a versatile vise designed to hold both round and flat work in a drill press is also suitable for use as a toolmaker's clamp, V-block, drill jig and angle plate. A V-groove grips small round stock so it can be drilled through its diameter; for drilling it through the end, the round stock can be clamped in a cross groove and the vise turned on its side. The vise also will clamp flat pieces together or hold templates on die blocks.



Vise holding round piece being worked in drill press

Speckman Co. Administration Bldg.

Assigned to Radio Corp. of America, N.Y. City. Bldg. 1587

Bentley Harbor, Mich.

2922

CONVOY

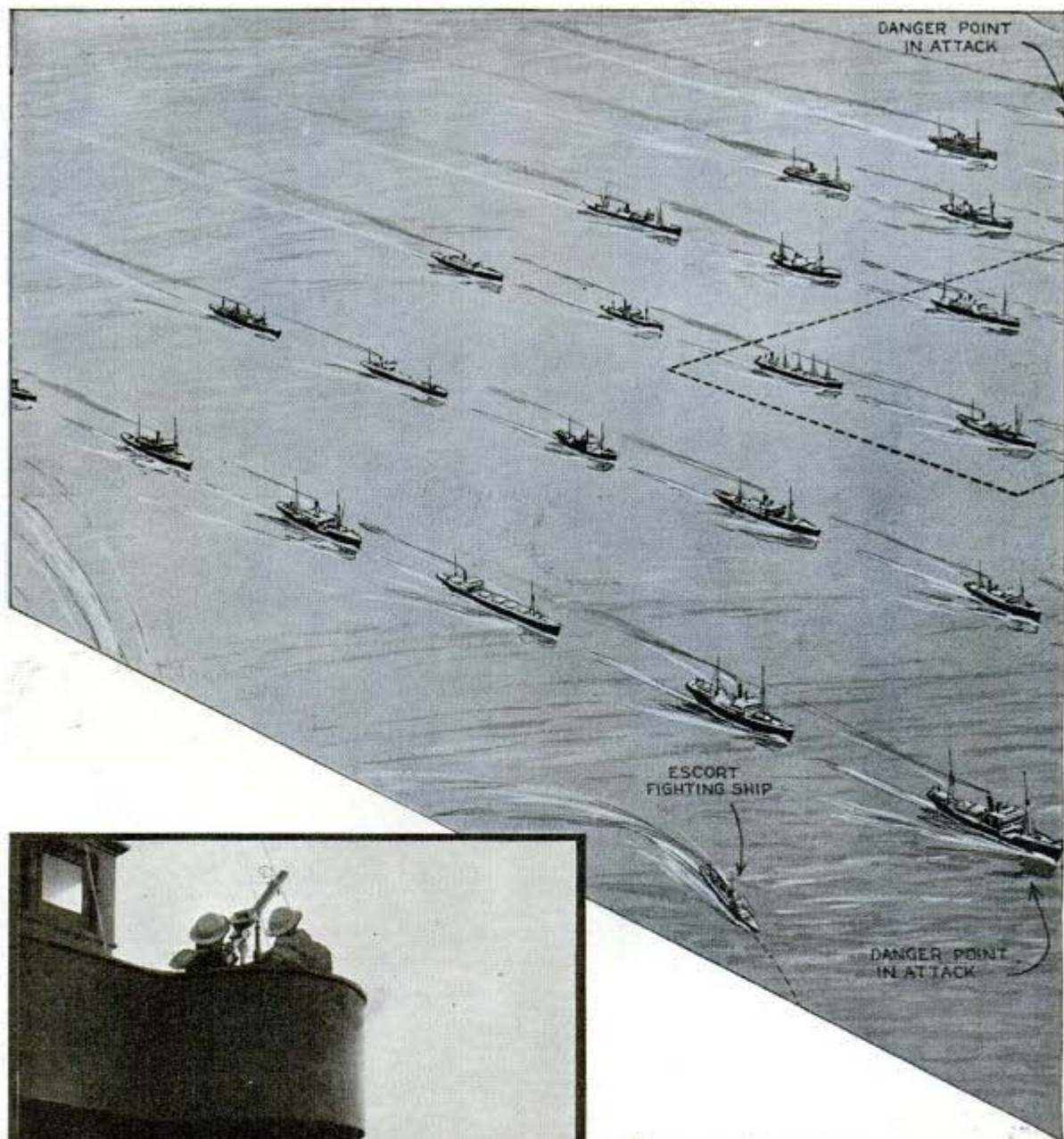
Protection of merchant ships from enemy submarines and bombing planes has been one of England's big problems in the present war. Almost everything England needs—food, materials and finished war-making goods—must come from overseas. The convoy system, in which from 20 to 100 ships gather at a specified port and proceed under guard of planes and warships, seems the best means of accomplishing the task of moving goods in comparative safety. Latest loss figures are low—about one ship out of 50 or 60. Left, bristling guns of a British warship on patrol duty, one phase of keeping the seas clear of raiders.



Typical convoy scene as viewed from patrol bombing plane engaged in guarding the ships in danger zone. Part of the plane is shown at left. Note spacing of ships in this convoy

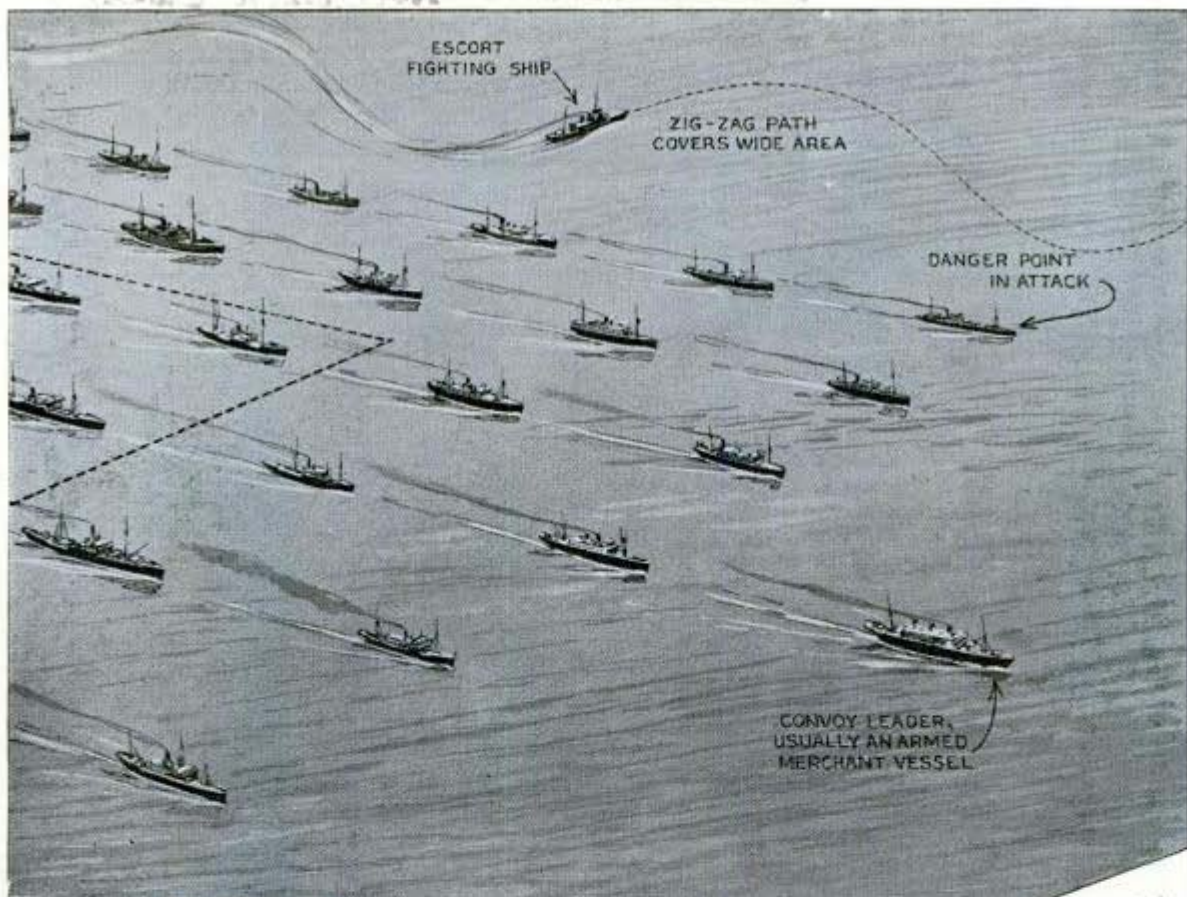
Sundelland

acm



Above, on this and page opposite, drawing of typical convoy moving in dangerous waters and therefore protected by larger number of warships than used far at sea. Dotted line in center forms rectangle in which ships laden with goods vital to prosecution of war are placed. Surface raiders and submarines usually attack at the corners of the convoy square. Far at sea, only an armed merchant vessel is on guard. Left, helmeted members of escort ship's crew firing at enemy plane. Corvettes, small vessels armed with anti-aircraft guns, depth charges and four-inch weapons for combatting the submarine, are used as convoy guardians where destroyers are lacking.

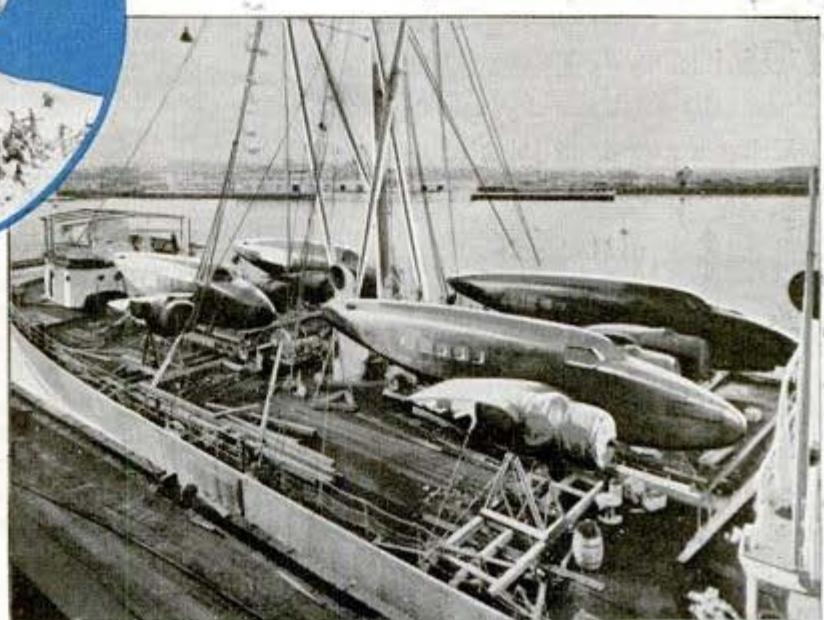
2922



*Lockheed Hudson
at Losang*

Below, bombing planes aboard ship ready for transport to England. The plane-carrying ship was one of many in a convoy which made a successful crossing of the Atlantic from the United States

Lookout on duty (circle) on bridge of destroyer escorting merchant vessels. In good weather and bad, a sharp watch must be maintained. The instant a tell-tale plume of water from a submarine is sighted, the destroyer makes a quick turn and swings over the spot to drop depth charges that may deal a death blow to underwater raider



2633 Carson Price Scott. 2447 St. Michigan, Chicago

Twin Mirrors on Tall Stand Permit Side or Rear View

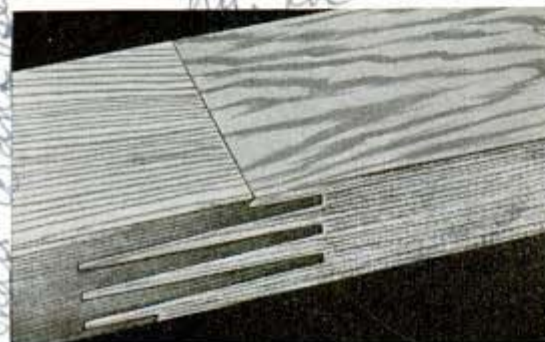


Double mirrors adjust for height and for any angle

Mounted on a six-foot upright extension stand adjustable to any standing or sitting position, a double mirror offers a convenient side or rear view. The individual mirrors adjust separately to any angle.

Useful Boards From Short Pieces Made With Fingerlike Joint

Using a new-type joint to splice short pieces of lumber, one company transforms the stubby lengths into strong, useful



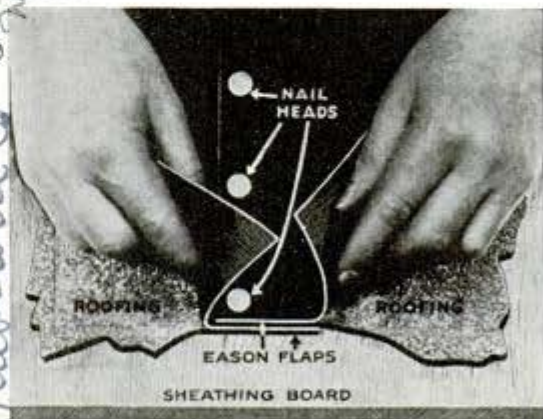
Dovetailed joint makes long board from two pieces

studding eight or nine feet long. The joining ends are cut in the form of interlocking fingers, which when cemented with water-resisting glue make a secure joint that is not affected by rain or snow falling during the construction period, although it is recommended that the lumber be stored under cover. Fashioned in 2-by-3 and 2-by-4 dimensions, the boards are intended for carrying vertical loads in residential buildings, and it is claimed they will stay straighter than one-piece studding.

2646. Touch-Up Colors for Car Bodies Match Factory Shades

Touch-up colors in convenient small-size containers are now available, enabling owners to repair and refinish damaged car bodies. The colors are exact duplicates of 300 different factory hues, and match the original body finishes of all 1939 to 1941 models. Each container is furnished with a convenient brush-in-cap and sandpaper for smoothing rusted spots and scratches.

2540 Flaps Cover Roll-Roofing Nails To Make Leakproof Seam



Flaps are folded over nails to make leakproof seam

Weakness at the seam of asphalt roll roofing has been remedied by protecting the edges with patented flaps to guard against leaking. The flaps, attached firmly to the longitudinal edges of the roll roofing, are two inches wide and fold smoothly over all nail heads, forming a seven-layer reinforcement at the seam.

Ⓢ Fifty workmen built a prefabricated, four-room frame house in 57 minutes, 58 seconds in a contest at Grand Prairie, Tex.

Wengerhauer Sales Co. St Paul, Minn. 717

2646. Touch-Up Colors for Car Bodies Match Factory Shades

2540 Flaps Cover Roll-Roofing Nails To Make Leakproof Seam

Product Co. Chicago

Multi-Color

500-600 ft. long

Amplewood, Carley

North American

Chicago, Ill.

L 7/10

Ignitron "Traffic Cop" Speeds Aluminum Output

One of the agents helping to speed up the manufacture of aluminum for defense industries is the Ignitron, a regulator of electric current. What it does is police the flow of current, changing alternating current into direct current that is essential for reducing alumina into molten aluminum to be poured into molds. Since it is also adaptable to measuring precise amounts of electric power, it is used also in spot welding stainless steel and aluminum. Suspended in the Ignitron's steel tank is a graphite electrode connected to the alternating current supply. At the bottom of the tank is a shallow pool of mercury, above which is an inch-long piece of boron carbide of pencil thickness. This dips into the mercury, acting as the "spark plug" or igniter. Positive electricity from the alternating-current line is conducted to the graphite electrode and to the igniter. The instant it reaches the igniter it forms a spark or "cathode spot" on the mercury pool. As the current changes to negative, the igniter is turned off and no discharge



Assembling an ignitron at Westinghouse plant, East Pittsburgh. It is used to change alternating into direct current for aluminum manufacture

passes through the mercury vapor. With 60-cycle alternating current this is repeated 60 times per second, producing a one-directional flow of electricity, or "direct current" from Ignitron to industry.

Harrison & Souffer

Used by - Fremont, Va. Engine Ford Agency Long Beach

Auto Supply "Cafeteria" Carries Full Line to Garages



Shelves on this truck form traveling salesroom for auto parts

Carrying a complete line of automobile parts and accessories, a "cafeteria" truck operated by a Long Beach, Calif., agency calls on outlying garages and repair shops regularly to speed up business in auto supplies. Side door panels lift and drop to expose the shelves of parts.

□ In the last 10 years the world's highways have increased in mileage from 6,582,001 to 10,036,233.

OCTOBER, 1941

National Safety Council

National Airport Rests on "Filled" River Bed



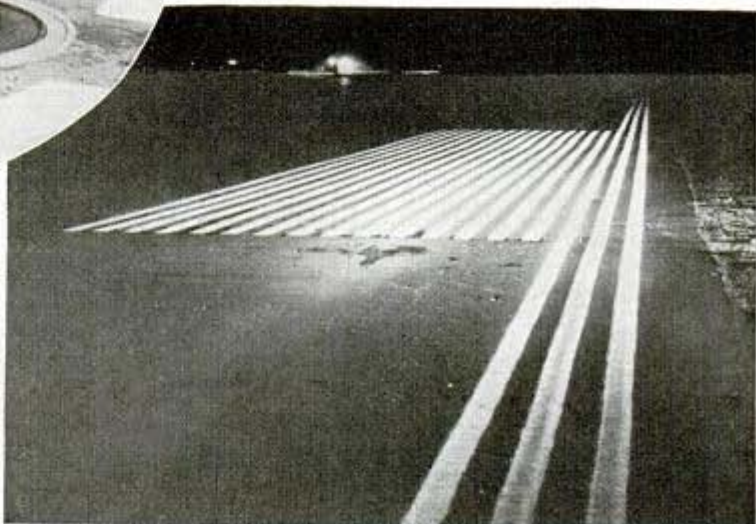
After three years, the National Airport at Washington, D. C., emerges as the last word in commercial service. Here are a few of its sidelights



Above, interior of the air traffic control tower. Top, left, operator, riding sliding door, opens and closes it by pressure of switch button; instantly as button is released the doors stop, reducing the chance of damaging planes that might be in the way. Hangar doors are interconnected and all move simultaneously but at different speeds so they all open and close together. Left, tiny turntable on which the pilot can place one wheel and pull the plane around with his propellers

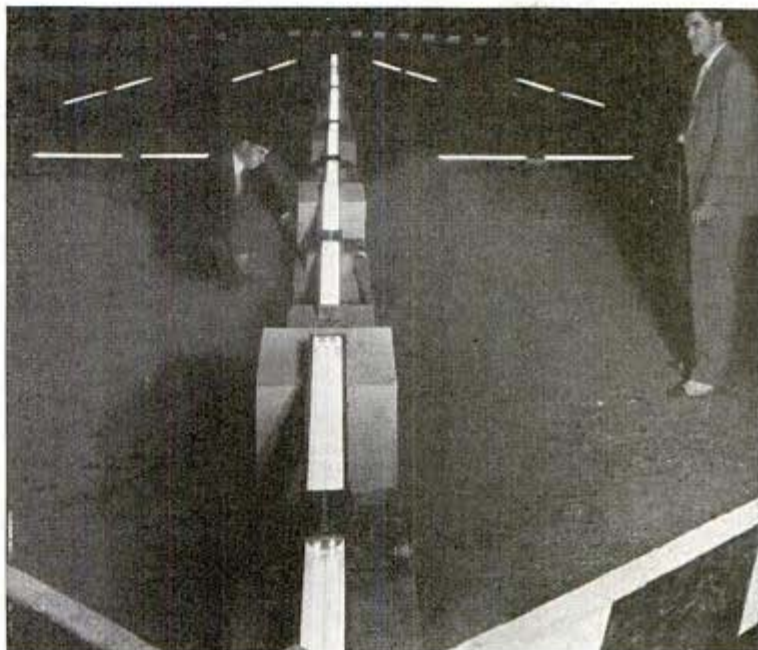


Right, light-reflecting lines show pilot his position in relation to runway ends. There are 15 lines, 6 inches wide and 6 inches apart; they blend into a solid block at a short distance. The airport, which cost \$16,000,000, was built on "made" land built up from the Potomac River bed. It is the first airport operated by the Civil Aeronautics Administration



Green Arrow, Red Cross Direct Sky Traffic

"Laboratory airport" of the nation is the new Washington National Airport, built on land made by filling in a shore of the Potomac River. Its busy lanes on the ground and in the air are controlled from a tower equipped with radio and with master switches that operate the most modern of lighting systems to guide sky pilots safely. On a panel is a plan of the runways, illuminated to show the position of planes. At the approach to the runway where a plane is to land, a green arrow of light—83 feet



↑ Visible night and day, this green arrow points out the runway to arriving pilots at Washington National Airport. At the touch of a switch in the control tower it changes to a neon-lighted red cross, warning fliers off

← At the master instrument panel in the control tower the chief operator watches an illuminated map of the airport, showing him the position of planes on the runways. Various switches set the signal lights on the field

long and 40 feet wide—gives the "all clear" signal. To cancel the landing orders the control tower can instantly transform this arrow into a great cross of red neon lights that flash 40 times a minute, warning the pilot to circle overhead pending further instructions. Rows of white lights outlining the mile-long runways change to yellow along the last 1,500 feet, telling the pilot he must land quickly or climb away again. Once down, the pilot is guided by a string of blue lights visible only from the ground. A white plume of smoke from a recessed pot of oil heated by electric coils

shows the ground-wind direction. The walls of the control tower are glassed in, arranged at angles to prevent reflection of ground lights, plane lights, sun, moon or stars. Each section has a window wiper; the glass is green-tinged to avoid glare, and it reflects the burning sun rays. Around the loading platforms of the planes, pits are arranged for servicing gas and oil tanks, electric connections and batteries, and for piping warm or cool air into the planes, as the season requires. Pneumatic tubes to these pits bring orders and information to the crews.

James Report of Commerce, C.A.A. Washington D.C.

L 650

Weakness in Extinguishers Found With Hand Pump



Portable pump creates pressure to test extinguisher

Whether a fire extinguisher will work in case of fire can be determined with a portable hydrostatic pump that cleans the unit as it reveals defects. The pump is connected to the extinguisher by a hose, and a few strokes on the pump handle brings it to test pressure as indicated on an attached dial. A fire extinguisher unfit for emergency use will give at the weak points under pressure. The pump is used also in testing fire hose, sprinkler systems and chemical engines.

678

Cross-Continent Radio Highway To Guide Military Planes

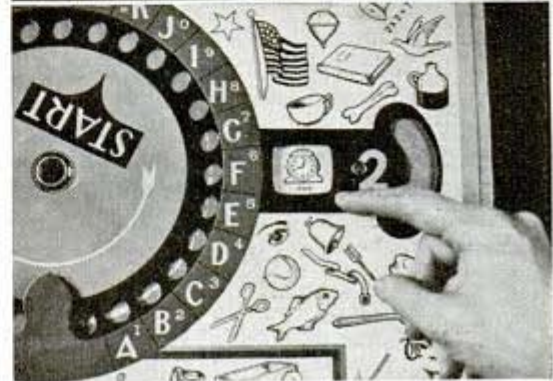
Across the continent from Newfoundland to Alaska the Canadian government is building an aerial military "highway," a chain of radio beacons 250 miles apart to guide bombers or fighters or interceptor planes crossing America in an emergency. The project is a part of the joint defense plan of the United States and Canada. Besides serving the functions of the radio beacons that guide commercial planes throughout the states, these transmitting stations will form a patrol line from which

Cairns - Ellis die
144 M. ft. Merchandise
 air raid warnings can be flashed to bases farther south. Each beacon tower has special protection against sabotage and insulation that will maintain signal strength at constant power regardless of weather.

L 718. Math. Cheax

Game Worked Like Dial Phone Helps Teach Spelling

Youngsters may check up on their spelling while playing a dial game that indicates if the player has spelled his word correctly by revealing a picture of the object in a window on the board. The board is divided into three sections, and grouped within each section are numerous objects which may be selected for spelling. Each section also has its own window. For instance, if the word "cap" is chosen, the player places the dial at the starting point and then spells out the word C-A-P in the manner of using a dial telephone. The picture of a cap then appears in the proper window unless a mistake has been made in spelling. Besides being a speller, the game provides simple problems in addition, subtraction and multiplication, showing the right answer in the window if a problem is correctly done.



Arrow set to start spelling, top. Bottom, window shows that word "clock" has been correctly spelled

Amuray bog Franck - Joanne
corpa g. omara m.
Swissair Science
Monitor

2676. National Photo Identity Corp.
 600 A. Michigan
 Chicago

Camera Films Worker on Identification Card

Complete identification cards can be made photographically in "one sitting" with a cabinet-type camera now on the market. A negative, complete with all desired information and bearing a picture of the person and his fingerprints and signature, is prepared as the subject sits in front of the camera. A card, blank or other document containing the details of identification is placed in a small compartment just below the lens so it will be photographed at the same time. Any number of prints may be made from the negative, and since the identification card is an actual photograph it would be exceedingly difficult to alter it. The camera, which is equipped with special lights and automatically operating reel for film, is offered for use in industrial plants and large institutions requiring identification cards for employes, and would be useful also in photographing



Camera makes photographic identification card, like sample, including descriptive details, fingerprint, and a picture of the subject

auto licenses and other records with the owner's picture. From the negatives, pictures may be made up into badges, buttons and many other forms.

2658.

Paper Sleeping Bag for Camper Is Warm and Waterproof

Campers who tried out paper sleeping bags in the California Sierras liked the idea so well that a paper company has put



Camping out with a waterproof paper bag to protect bedding

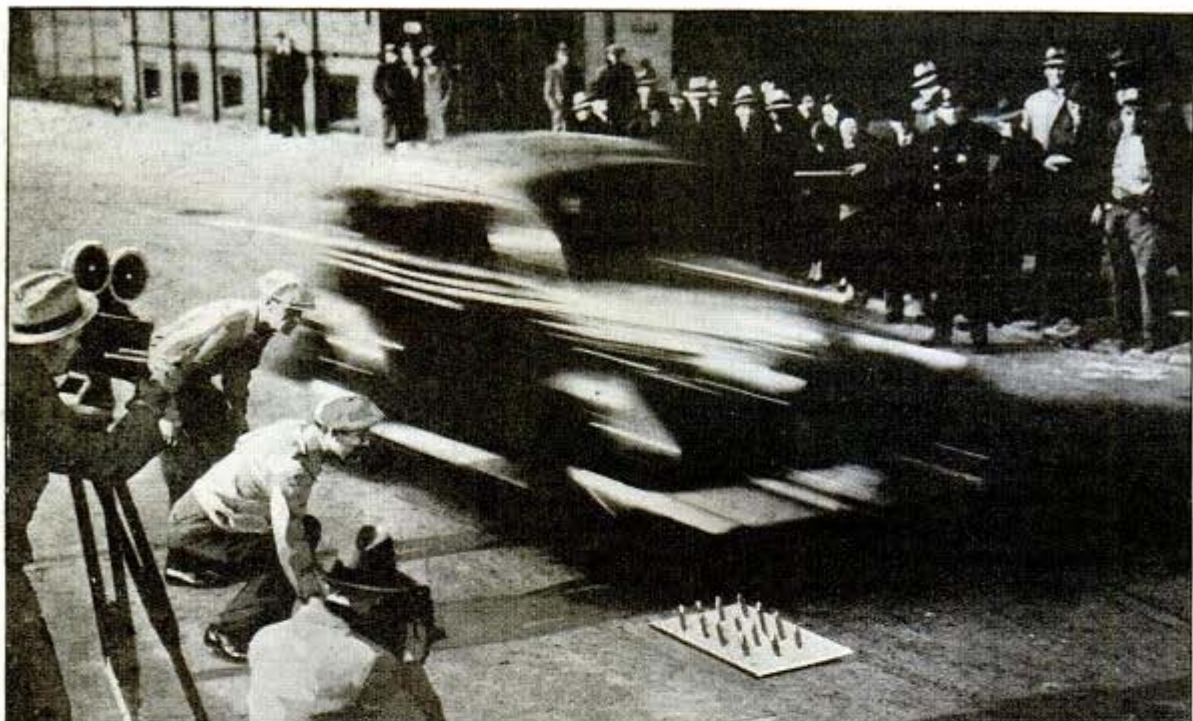
them on the market. Regardless of rain or snow, the bedding remained always clean and dry inside the heavy two-ply paper bag, which has a fabric backing and is waterproof. The paper insulation also added warmth. The bags weigh three pounds, are seven feet long and three and one-half feet wide, and there is a flap at the open end which can be pulled over the head for a wind-break if desired. Several of these bags have remained serviceable after many nights of use.

☐ To save metal, oil for the mechanized armies of Germany is carried in quart bottles made from waste paper.

Lib. Jante Co. 830 E. 10th
 Chicago, Ill.

27.44

SAVE YOUR TIRES ---

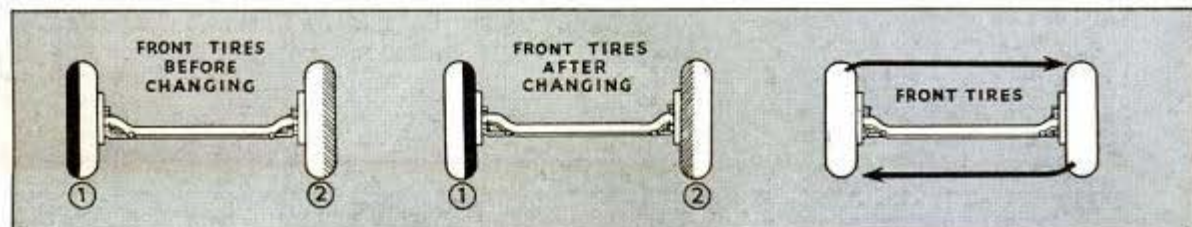


↑ Blowout test of tire and tube on speeding car just before wheel hits the spikes

↓ Recapping a tire from which the tread has been worn is one way to save rubber



↓ Suggested ways of switching tires on car so that wear will be even on all



By P. W. Litchfield

Chairman of Board, Goodyear Tire & Rubber Co.

Alvin Olin
EVERY driver of an automobile, truck or bus can contribute to the national defense if he will adopt this slogan: "Take it easy!"

By so operating his vehicle that the life of tires will be increased—and he can, by taking care of them and by avoiding high

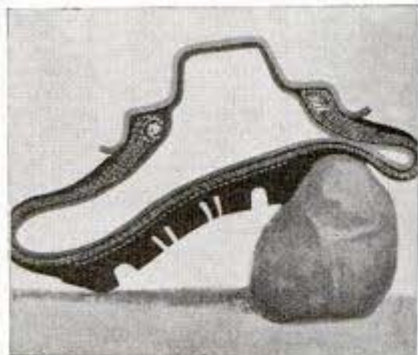
Editor's Note: Mr. Litchfield's suggestions are in line with governmental requests that crude rubber be conserved during the national emergency

speed, quick starts and sudden stops—the driver will help to conserve America's rubber supply, and he'll save some money, too.

We have in this country today what amounts to a normal six months' supply of rubber. Half is in the hands of manufacturers and dealers while the other half is

L-7 44

and MONEY TOO

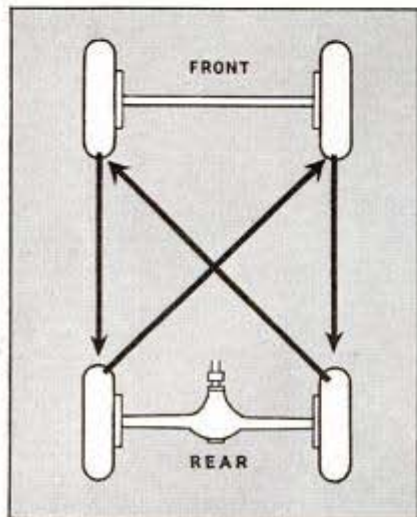


This shows what happens when a tire strikes a large stone

government-owned and subject to use only as national emergency needs may dictate. Our major supply source lies half-way around the globe where the plantations of the British and Dutch East Indies produce approximately 95 percent of all the rubber required by the whole world.

The problem which we will be called upon to face in the very near future is that of getting the rubber from the East Indies to America. The shipping situation is complicated

Another suggestion for changing tires around at 5,000 miles



↑ Buffing a tire in Goodyear recapping station. Note mask that protects operator's face. Recapping costs about one-third the price of new tire

Measuring tire width after a run in squirrel-cage testing device. Tires are ↓ run to destruction in this machine which simulates road conditions

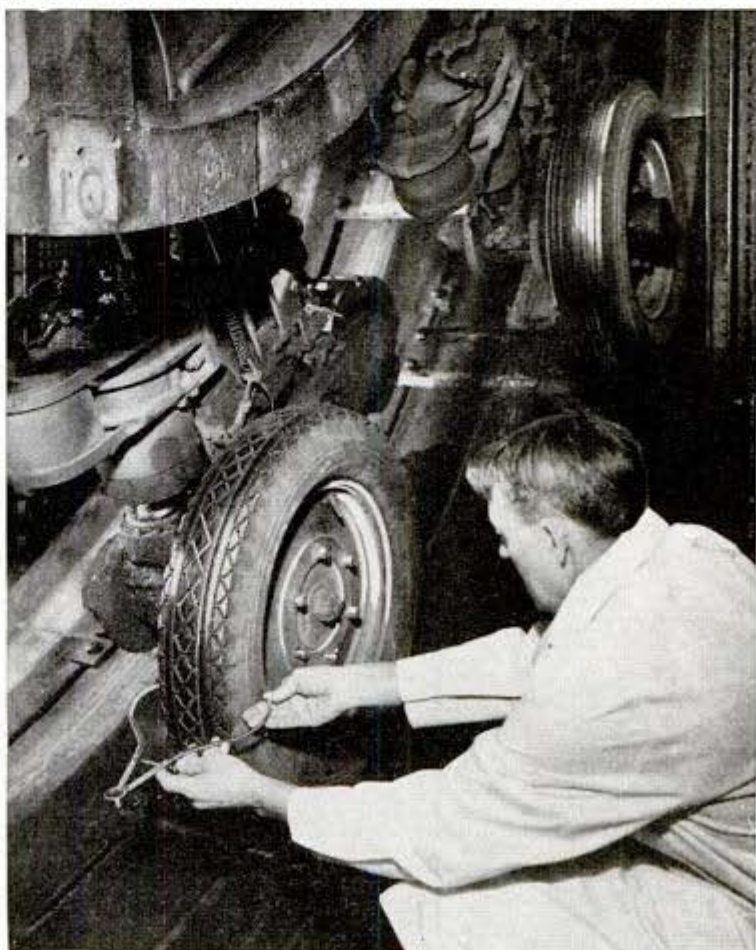
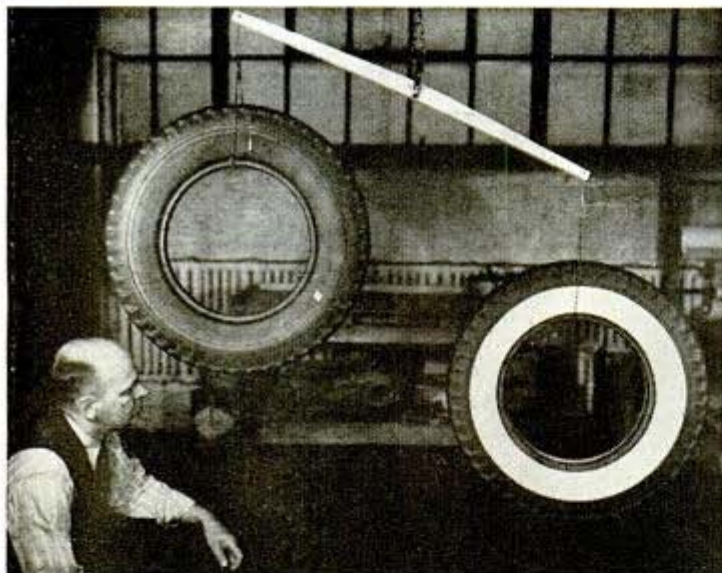


Fig. 4-4



A white-wall tire contains more rubber than a black one, as shown



Drawing shows how much rubber is left on tire after tread wears off

This in turn will mean that nonessential uses of rubber here will be sharply curtailed or completely stopped. If a white sidewall tire requires almost two pounds more rubber than a standard black tire—and it

by two factors: first, British ships are being destroyed by submarines and raiders more rapidly than they are being replaced; and second, to replace "blitz" losses and to meet the need for almost limitless supplies of munitions and food, England must import all manner of essential goods in larger quantities than ever before. This means that more and more ships must be taken out of normal service and utilized for vital defense needs. Thus, if some ships now transporting rubber to America can be released for Britain's pressing requirements, they undoubtedly will be so transferred.

actually does—then the white sidewall may be spotted as one of the things the American public can do without.

If a net saving in rubber can be accomplished through the process of recapping used tires—and it can—then the practice of recapping may be forced into much wider use. In this connection, the Good-year company is establishing recapping—retreading, the public calls it—stations in many cities throughout this country. If a tire carcass is sound, the sidewalls good and the fabric unbroken, installing a new tread by the proper methods will make the

Inspecting inside of a tire section to determine cause of failure

Stitching tread on a tire being recapped—one of the last steps in the operation. Many stations are ready to do this job for motorists



L744

L672.

tire serviceable and safe for many additional thousands of miles. And the cost is about one-third that of a new tire. Recapping has been employed for several years by many truck and bus fleet owners to stretch the life of their tires.

If American motorists can gain substantial additional mileage from their tires by reducing the speed at which they travel—and they can—then the public may have to be educated to travel at a slower rate. For instance, automobiles driven at speeds of 65 to 80 miles per hour will wear tires twice as rapidly as cars driven at 35 to 50. Higher speeds cause more slippage between tires and road; brakes must be used harder and tread rubber is scraped off, and rapid flexing due to high speed causes more tire heat, resulting in deterioration of rubber and breakdown of fabric. Even a 20-mile per hour reduction in the overall speed will produce amazing savings, for tires running at 50 miles per hour top speed can be expected to give 60 percent—three-fifths—better mileage than those traveling at a top speed of 70. There's also a substantial saving on gasoline and oil at the slower speeds.

One thought the fast driver should keep in mind is that a centrifugal force of about two tons is subjecting his tires to terrific punishment when his speed is only 50 miles an hour. Higher speeds vastly increase this force striving to pull your tires to pieces.

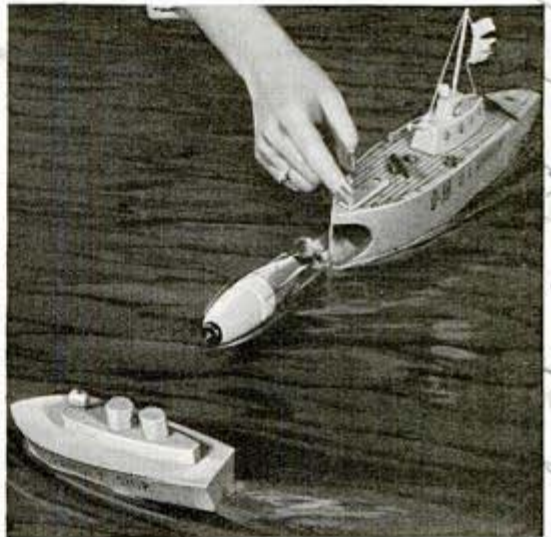
Proper inflation is another means of saving your tires. Engineers tell us that one pound of underinflation will take 600 miles out of a tire's life if continuous operation in that condition is permitted. It seems safe to state that about 20 percent of the average tire's life is lost through underinflation; thus one tire in every five literally is thrown away through the driver's neglect.

Sudden stops cause an alarming amount of wear, hence should be avoided. Slamming on the brakes at 35 or 40 miles an hour will scrape off enough rubber to carry your car a mile or more farther along the road. At 75 miles an hour, it might remove 50 percent of the tread, depending upon the kind of surface your tires have to grip. Only when the driver faces the possibility of an accident should he brake severely. Many motorists are guilty of the unpardonable offense against their tires of gunning their motors up to a red stoplight or a stop sign and then applying their brakes

(Continued to page 172)

OCTOBER, 1941

Toy U-Boat Fires at Target With Self-Driven Torpedo



Pulling trigger sends torpedo at toy "enemy" vessel

From the prow of a wooden toy submarine, a "torpedo" can be discharged, its tiny propeller spinning, to zip across the water toward an "enemy" boat. Before releasing the spring-ejected torpedo by means of a trigger on the bow, the propeller is wound up by turning a small crank. A target boat is part of the set.

Flexible Rotary Sanding Disk Reaches Uneven Surfaces

Tough rubber welded to a steel hub forms the backing of a flexible sanding disk to be used on curved and uneven surfaces. It is a rotary type, for attachment to a motor-driven shaft. The entire face of the disk can be used. Additional quick-change abrasives are available.



Note how sanding disk flexes to fit curved surface

V. W. Eslinger, Inc. 85
219 N. Congress Chicago

Sold by Sears, Roebuck & Co. Chicago

L 618.

Asbestos-Cement Strip Shingles Reduce Cost of Installation



Covering a wide area, these strip shingles reduce the time needed to nail them on the roof, thus saving labor expense

Shingles in strips that cover an area five times that of ordinary shingles can be applied quickly and easily, and thus reduce the cost of labor in nailing them on the roof. Made of asbestos and cement, the shingle is said to be fireproof, rotproof and as lasting as stone. It may be applied on both old and new roofs.

Safer Magnesium Method Uses Oil for Cooling

Experimenting with a method of producing magnesium metal that was tried recently in Europe, the U. S. Bureau of Mines has developed a simpler, safer and cheaper process. Differing from commercial methods used in this country, where production of magnesium metal involves the electrolysis of magnesium chloride in a fused salt bath, the new process reduces magnesia with carbon in an electric furnace.

Originally an atmosphere of hydrogen was used to chill the magnesium and carbon monoxide vapors in order to prevent reoxidation. Since hydrogen is a relatively expensive as well as highly inflammable gas, the bureau undertook to develop a safer method of chilling. Laboratory experiments followed which indicated that a spray of hydrocarbon oil could be substituted for the hydrogen. To conduct studies on a somewhat larger scale, a small pilot plant has been built at Pullman, Wash. A successful method for the flotation of the lower-grade magnesites, also developed by the bureau, has enabled the engineers to use the concentrates in producing magnesium metal.

Boat Rack on Top of Auto Held by Engine Vacuum

Vacuum power from the engine supplies suction to hold a new boat carrier on top of the car. The rack is handy for the vacationist or week-ender who wants to haul a small boat without using a trailer. A tube connects the feet of the rack with the engine vacuum.



Hose attached to rack support carries suction from engine

POPULAR MECHANICS

Vac. O. Corp. Co.

Johns Manville Co.
202 E. 40th Street
New York, N.Y.

New York Times
May 11, 1941

2023 Detroit Ave. Toledo, Ohio

L. 57. 5.

"Beauty Parlor" Applies Camouflage to Order

You can be camouflaged while you wait, any style, at the British Army "Beauty Parlor" — popular name for the Camouflage Development and Training Center. Concealment has been raised to a fine art. Here a soldier stands in his special uniform of draped fabric while experts paint it, with brush and air gun, to make him invisible against a background of bombed buildings.



Using a brush and air gun to camouflage the loose-fitting drapery worn by a British soldier. This is nicknamed the army's "beauty parlor"

L. 640. British Combine

Stretcher Mounted on Wheels Is Towed by a Bicyclist



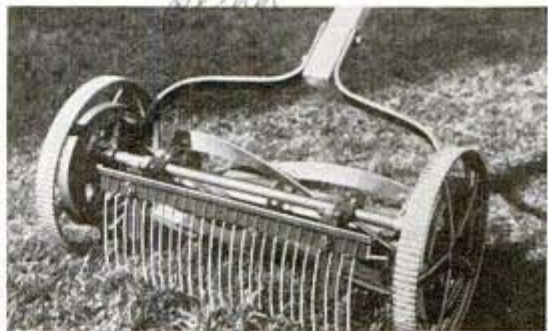
In Sweden a "bicycle ambulance" has been invented. The bicyclist tows a wounded or injured man on a stretcher which is mounted on two wheels. This is an economical method in a land where gasoline is strictly rationed, and is likewise a convenient way of moving army casualties to a first-aid station.

Stretcher on bicycle wheels is towed to first-aid station

L. 657 Wide World

Wire-Finger Attachment for Lawnmower Rids Lawn of Crab Grass

Crab grass, growing so low that it escapes ordinary cutters, can be destroyed with the aid of an attachment available for use on the lawnmower. With long wire fingers the device lifts the seed spikes from the ground, according to the manufacturer, so the mower can shear them off and prevent re-seeding. Installed with a screwdriver in five minutes, the attachment fits any lawnmower from 14 to 20 inches. It folds out of the way when not needed.



Crabgrass Eliminator

*Crab Grass Eliminator
86-06 — 117th St*

2388

Cont: Kenneth Murray
Colon. *Wesley*

TRICKS with

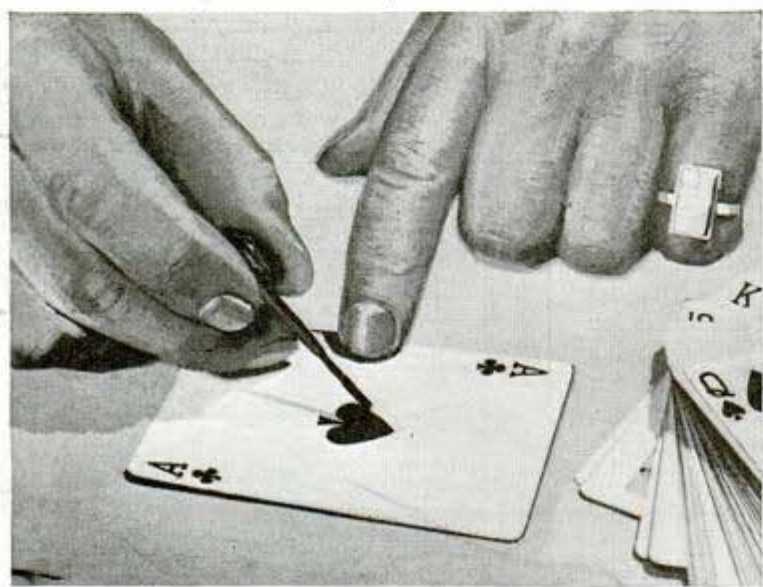


Fingernail polish mysteriously changes from one color to another or vanishes entirely. It has been touched up previously with some magic paint→

The magician passes his hand across what was a white sheet of paper, and presto! a photograph suddenly appears on its erstwhile blank face
↓



Black magic paint is applied with a small brush, transforming an ace of clubs into an ace of spades. This is done secretly. The audience later sees a baffling transformation into an ace of clubs
↓



PARLOR tricks that border on the supernatural are performed with a new Magic Paint that vanishes at the touch of your hand. An amateur magician in search of new tricks discovered it.

The paint can be black, white, or colored. It takes no skill to perform amazing feats—to make a pencil change color by merely shoving it through a closed fist or cause one of the pips on a playing card to vanish by touching it with a finger. The possibilities are endless.

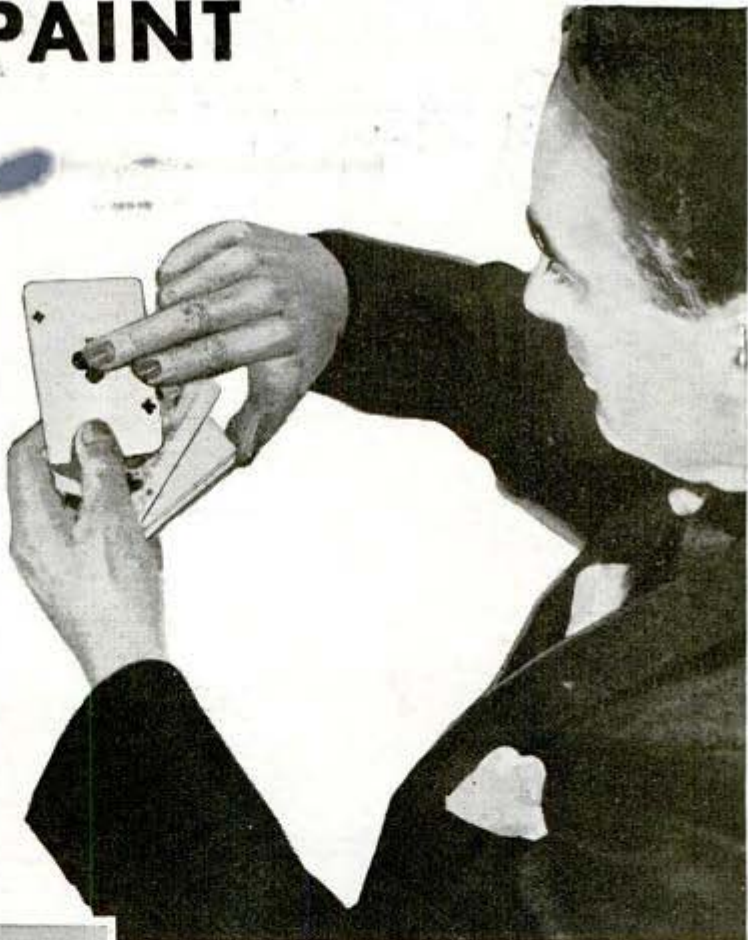
The original Magic Paint was a black rubber gasket cement which can be purchased at any department store. It dries to such a thin film that a touch of a finger causes it to roll into a ball smaller than a pinhead, which drops to the floor unobserved. To make white or colored paint is easy. The ingredients are some first-grade clear rubber cement such as artists use; a bottle of thinner such as carbon disulphide, benzol or even

Bavel

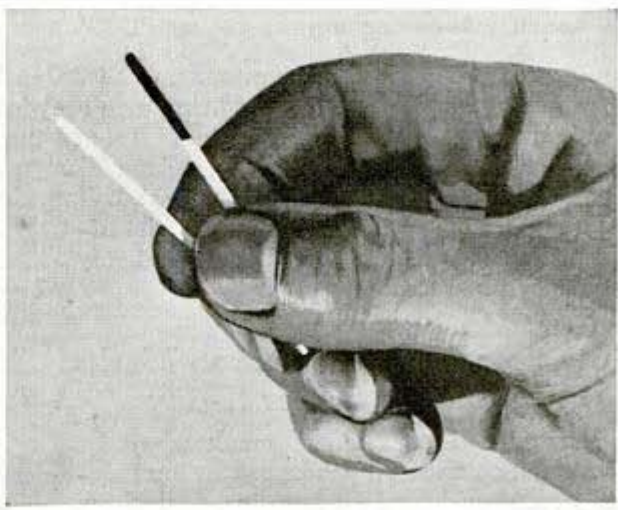
MAGIC PAINT

gasoline (in order of preference) and the desired pigments. Oil-soluble dyes may be used, but sometimes leave a slight stain. When this is objectionable, use finely ground artists' colors. Dilute rubber cement with an equal quantity of thinner, then add sufficient pigment to hide any surface to which the paint may be applied. More thinner can be added until it is of the right consistency, as determined by trial. Brush a little paint on a scrap of paper; it should dry to a thin film having no perceptible thickness, and it should vanish on merely rubbing a finger over it. Fingernail-polish bottles make good containers for the

(Continued to page 164)



↑ Finish of the magic ace trick begun on the opposite page. Merely touching the painted spade with one finger changes it swiftly into the ace of clubs



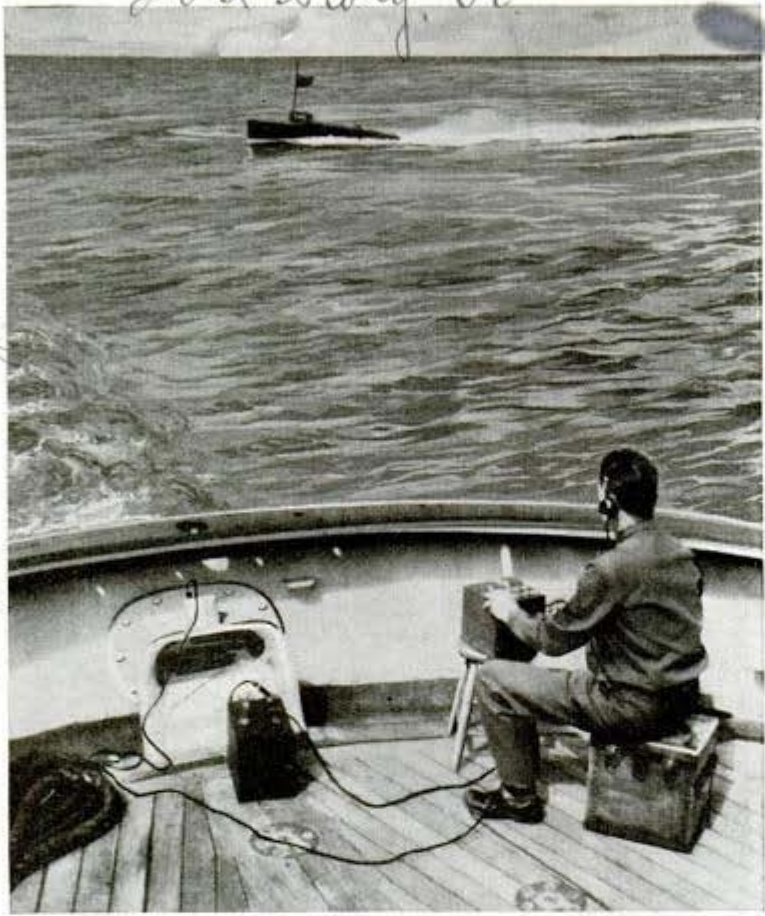
↑ Clever use of magic paint and skillful use of the hands make toothpicks appear to change color, finally to turn white

← What was obviously a red pencil turns into a yellow one as it passes through the fist, to the mystification of spectators

2610 Associated Press
 50 Rockefeller Plaza
 Radio Guides a Target Boat
 For Coast Artillery Practice
 2nd story, N.Y.C.

moves a section of the skin will eradicate the marks, since even minute amounts of the pigment remaining would be clearly revealed by the X-rays. Ordinary methods of removing tattoo marks are not effective for these. The invisible tattoo could be placed near surgical scars to enable the physician to determine the case history of a patient, and might also be used to "brand" habitual criminals.

at Ford's way, Va



Operating the crewless target boat by radio signals from mine planter

U. S. Coast Artillery gunners on the Atlantic seaboard are getting target practice by firing at a crewless boat that speeds along under remote control. Aboard the army mine planter "General Schofield," off Cape Henry, sits Master Sergeant John Lucas, operating the radio impulse transmitter that guides the test boat V-11. The little robot boat enacts the part of an enemy mosquito boat.

2619

Reel at Side of Boat Saves Leaving Seat To Raise Anchor

Hazards of upsetting the boat when standing or moving about to raise anchor may be eliminated by installing a handy reel that permits the oarsman to remain in his seat while lifting anchor. Used in pairs, the reels aid the fisherman who drops anchor for trolling but wants to avoid scaring the fish with movement of the boat. The reel is mounted outside the boat to keep it and the rope clean, and a positive locking device holds the rope at any point.

2648

Invisible Phosphor Tattoo Marks Seen Only Under X-Ray

Invisible identification marks may be tattooed on the body as an aid in identifying soldiers killed in future wars. Such marks can be made with compounds known as phosphors, and shine with various colors only when activated by X-rays. The inventors, Dr. Henry C. Dake and Jack De Ment, of Portland, Ore., say that only a surgical operation which completely re-



Anchor reels are within easy reach of the oarsman so he can raise the anchor without leaving his seat

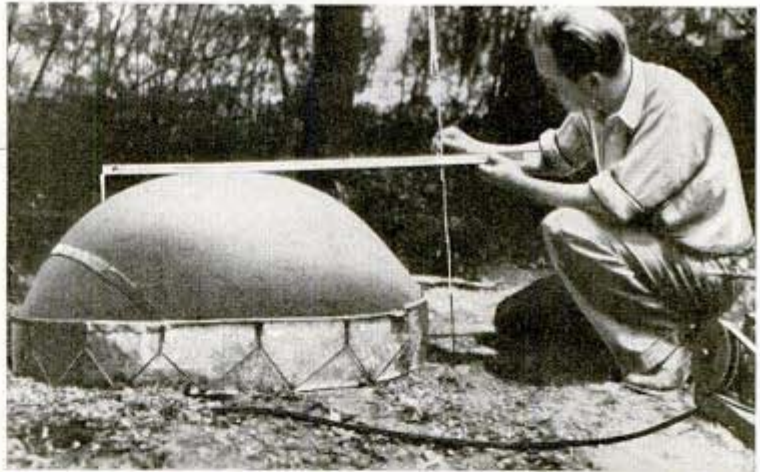
Science Service

POPULAR MECHANICS

Anchor Reels
 Advance Mechan

Balloon Is Mold for a Concrete Bomb Shelter

Bomb shelters formed by pouring wet concrete over a balloon are proposed by a Pittsburgh artist, John H. Fraser. As a demonstration in model form, he poured the mixture over a deflated rubber balloon and then inflated it, the blown-up balloon forming an "igloo" mold.



Balloon is inflated after pouring concrete over it, then allowed to set in the form of an igloo. Lower photograph shows the finished shelter

Covers on Bananas While on Trees Improve Fruit

Better crops of bananas are being produced in Australia where growers slip covers over the bunches while the young bananas are still on the tree. Brown paper bags are used, being fastened to the stalk or gathered in with a nail. The result of this protection is a more even development of the fruit, the back of the bunch filling out equally with the front, and there is less waste.

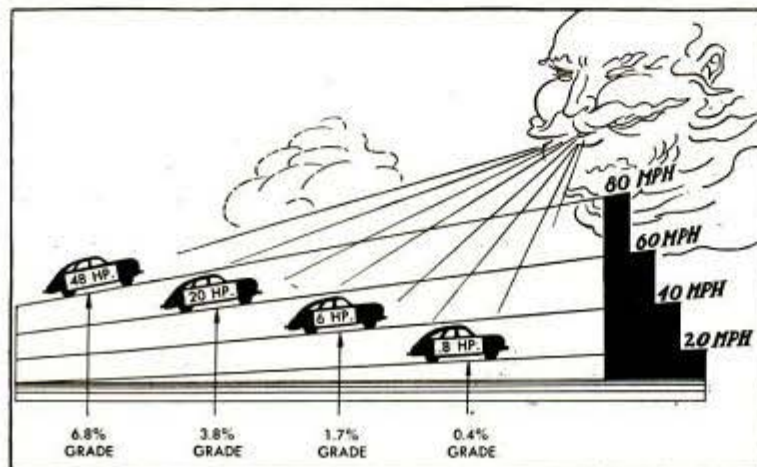


Balloon is inflated after pouring concrete over it, then allowed to set in the form of an igloo. Lower photograph shows the finished shelter

Cars Waste Fuel at High Speeds, Due to Wind Resistance

Drivers who "burn up" the road at high speed pay for their folly by also burning up an excessive amount of fuel. Recent

"mileage efficiency" tests, conducted by Plymouth experts with several popular makes of automobiles, showed a startling



loss of power and fuel at higher speeds to overcome wind resistance alone. At 80 miles per hour, the average car lost 48 horsepower just to buck the wind, which is equivalent to climbing a 6.8 percent incline. At 40 miles an hour, the loss was reduced to six horsepower.

Figures on cars show extra horsepower used at 20, 40, 60 and 80 miles an hour. Grade equivalents appear under cars

Christian Science Monitor. 5/7/41

2596

2645

2389 Cmk Marshall Perham,
425 Spear's Bldg
Los Angeles



Two bits of evidence burn in the intense heat of an electric furnace, to see whether they match in spectro-analysis

DON'T TAKE

sands of worthless dollars may be unloaded on an innocent public. And so the Secret Service, under Frank J. Wilson, has decided to show the people how to tell good money from bad, and what to do when "queer" money is offered them.

Contrary to popular belief, there is no physical test that can readily be made on coins or bills which will tell the real

from the spurious. Ringing a coin may or may not prove it genuine. A poor imitation will indeed have a dead sound, but a good imitation, made of babbitt metal, will ring almost as well as any. Likewise, a good coin may become slightly cracked and fail to ring. The old test of rubbing a bill on white paper to see if it makes a smudge is worthless. Ink will rub off either counterfeit or genuine.

But there are tests anyone can make that will tell whether money is good. Ringing a coin is one, though it is not positive. A better one is examination of the milled edges. On genuine coins, they are deep, cleanly cut, regular; on counterfeit coins, they are usually shoddy. Real money feels hard, dry, metallic, and when new, has a



Warning card distributed by Secret Service tells of dangerous types of \$10 bills

EVERY time you take a piece of money, there is a chance you are being robbed—as surely robbed as if a thug stuck his gun in your ribs and demanded your wallet.

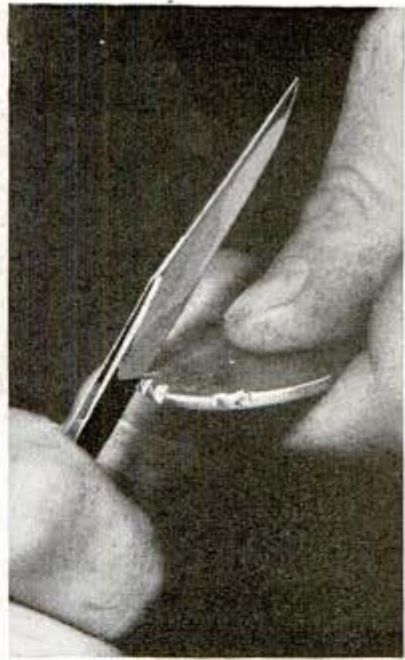
That the chance is slight is due to the tireless efforts of the United States Secret Service, which has been waging relentless war on counterfeiters since 1864. So successful have been their recent efforts through education that for the entire year 1940 official United States currency was supplemented by illegal money estimated to be about \$100,000; less than 10 percent of what it was a few years ago.

Yet the chance of your being cheated by a counterfeiter does exist, for plagues of "funny money" periodically sweep the land. Before the Secret Service can act, thou-

Treasury Dept. Washington D.C.

2389

A knife will not nick a real coin as easily as it does counterfeit coin at right. Below, captured tools of a counterfeiter and some worthless money manufactured with them



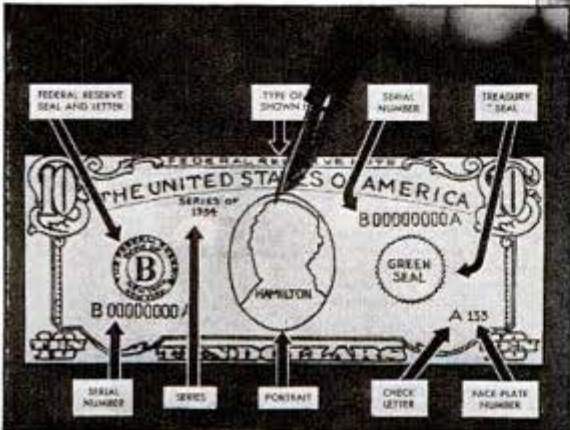
ANY WOODEN NICKELS

sharpness to the touch. If the thumb is pressed hard to the surface, and allowed to slip, it will go in little jumps. Counterfeit coins generally feel slick, greasy.

There are two other coin tests, more accurate, but not so easily made. One is the cutting test. Even a sharp knife has trouble nicking a good coin, but most counterfeits may be cut with little difficulty. The second is the acid test. A coin is scraped clean, and a chemical applied. A counterfeit not made of silver will turn black. A real silver coin will not be affected. This com-

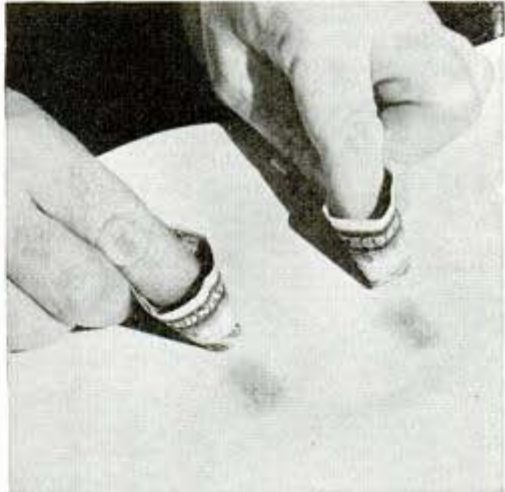
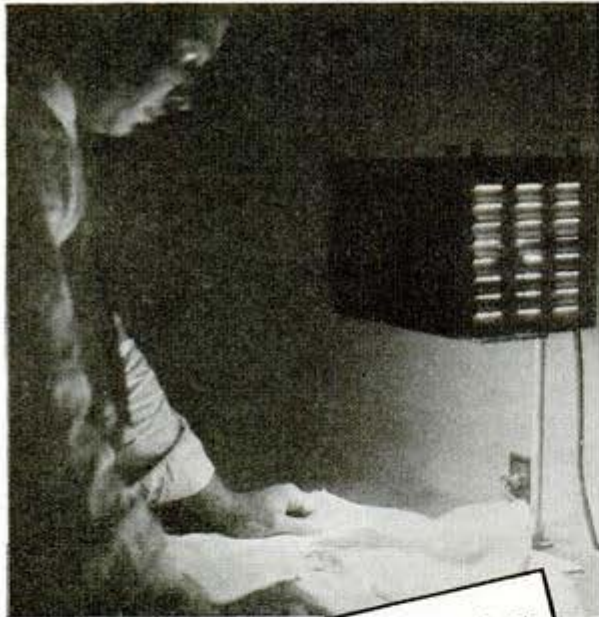


Wornout money and bogus bills end their careers in furnace

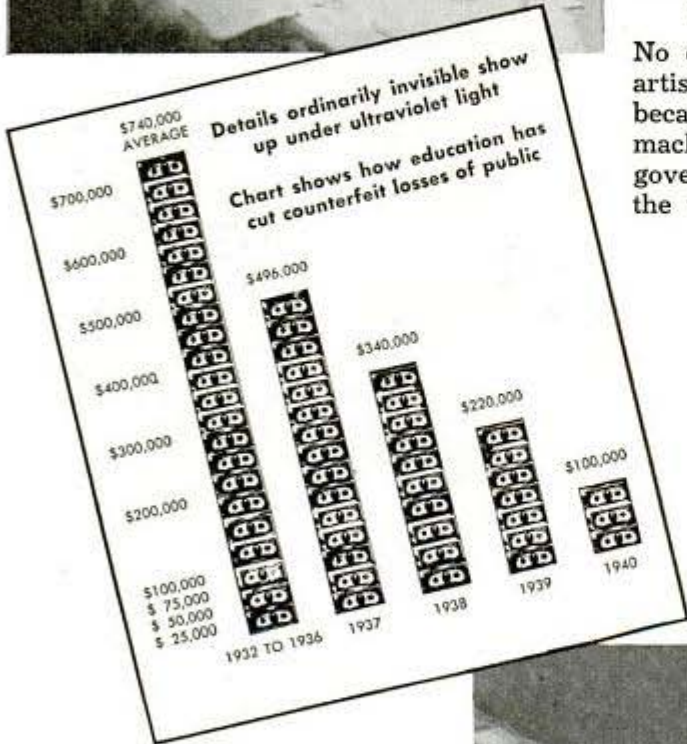


Left, features of note to watch for counterfeiting signs

2389



Rubbing bills on white paper to detect spurious note is no true test; ink of both real and counterfeit money will produce a smudge



No counterfeiter can duplicate their artistic workmanship and perfection, because a million dollars' worth of machinery would be required. Also, government engravers are the best in the world. For this reason, the fine screen of regular lines which forms the background of the portrait on a genuine note, usually becomes broken and ragged on a counterfeit, or the sparkling eyes become dull. The portrait on a good note stands forth from a clear, clean background while on a bad note, it blends into a smudgy background usually too light or too dark.

Below, testing real and spurious coins with acid, a quick and simple method

pound may be prepared for a few cents at any drug store to the following formula:

- Nitrate of silver.....10 grains
- Nitric acid1 c.c.
- Distilled water30 c.c.

Recognition of bad paper money is not difficult if you know what to look for. Of first importance is examination of the portrait. Use a magnifying glass if you desire, but generally it is not necessary. Portraits on genuine notes are beautiful examples of engraving.



2389

Another important thing about the portrait is that it distinguishes the note's denomination. This is to checkmate note raisers, who scrape denomination numbers off a small note, and substitute higher ones. You will never be caught by this if you know what denomination is represented by each portrait. Here they are:

Washington	\$ 1.00
Jefferson	2.00
Lincoln	5.00
Hamilton	10.00
Jackson	20.00
Grant	50.00
Franklin	100.00
McKinley	500.00
Cleveland	1,000.00
Madison	5,000.00
Chase	10,000.00

At least the first five of these should be memorized; when accepting paper money, always compare the denomination with the portrait.

Now look at the seal. On good notes, the saw-tooth points around the circle are identical, and sharp at the tips. On fake notes, they may be irregular or broken. The seal, with the serial numbers, distinguishes the type of currency. Federal Reserve Notes are identified by green seal and serial numbers, Silver Certificates by blue seal and serial numbers, and United States Notes by red seal and serial numbers. If colors of seal and serial numbers are different, the note is an imitation. Numbers on genuine notes are firmly and evenly printed. Counterfeit notes occasionally show different styles of type, and many have irregular, badly printed, and unevenly spaced serial numbers.

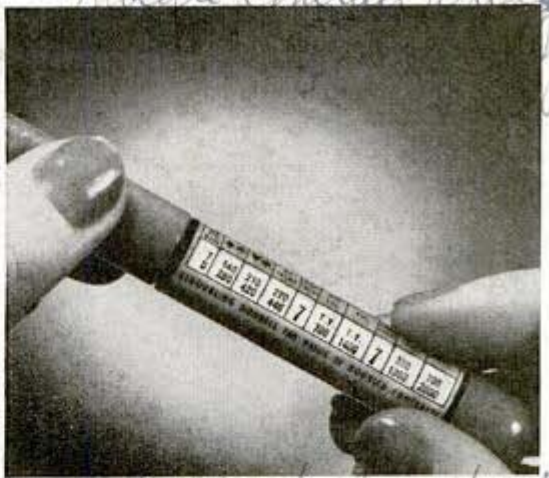
A final characteristic of paper money is the presence of fine red and blue silk threads, embedded below the surface. Counterfeiters have difficulty duplicating them, and they are usually large, coarse, imitated by pen and ink lines, or absent.

The Secret Service issues regular warnings, describing bills of which to beware. In these, reference is made to the check letter and face plate number, found above the signature of the Secretary of the Treasury, in the lower right corner. These warnings are sent to anyone on request.

However, someone must be cheated before the Secret Service learns the characteristics of a new issue of spurious money, and you may be the one. It is well to know

(Continued to page 162)

Pencil With Revolving Dial Figures Bridge Score



Rotating dial in window of pencil shows bridge score

Contract bridge scores are figured by a glance at the revolving dial of a "fountain" pencil just introduced. By turning the dial to the number of tricks bid and made, the value of the tricks, the premiums earned and penalties scored are shown.

Double Suction Cup Holds Shelf On Wall or Window

Hanging small shelves on glass show-windows or smooth walls is simplified with a double suction cup bracket now available. One of the two cups grips the wall and the other holds fast the shelf. Strong suction is created by pushing down a small lever at the back of the cup. The bracket is handy in the home bathroom or store show cases.



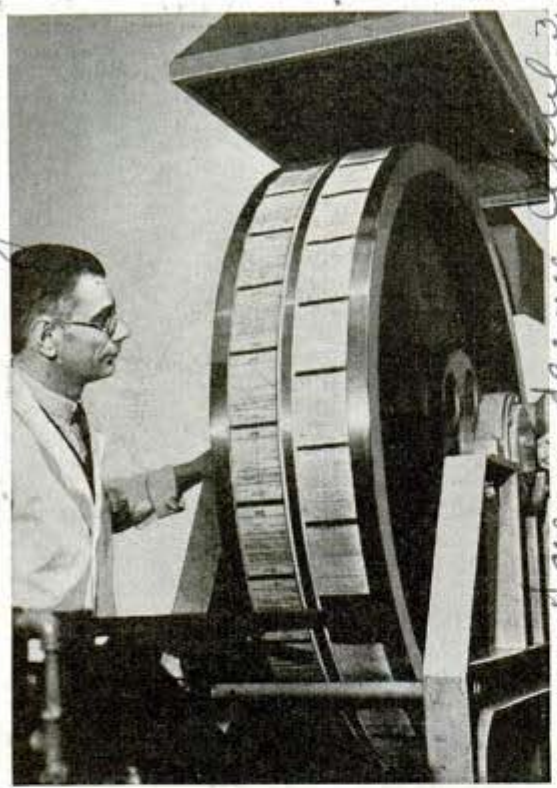
One suction cup grips window, other holds article

Alural Hoax Co. 95-53 W Jackson, Chicago

*Scoring Pencil
147 W. 24th St.
Chicago, Ill.*

2561

Soldiers' Mail on Small Film Flown Home and Enlarged



This drum dries enlarged letters four per minute

Mail sent home by soldiers of some of Britain's far-flung forces is speeded up by "airgraph," a new development in postal service. Letters are written on special forms 8 by 11 inches, which are photographed on miniature film and flown to England. At the foot of the form, space is provided for writing the name and address of the recipient. Upon reaching the homeland, an enlarged print is made from the film, and this is sealed in a "window" envelope for delivery in the mail.

Rubber-Covered Wall Rack Holds Eyeglasses Safely



A safe place to lay your eyeglasses is a special wall rack devised for that specific purpose. Installed as a permanent fixture on the wall of the bathroom, bedroom, office or

wherever the glasses are frequently taken off and laid down, the small shelf holds the glasses safely. It is rubber-covered to avoid scratching the lenses.

2436

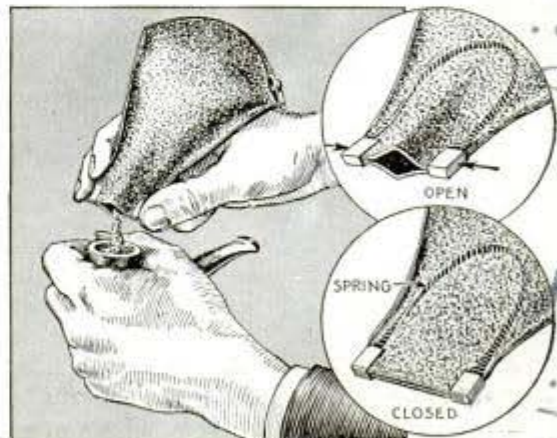
Small Iron Objects Magnetized With Ultraviolet Lamp

Using only ultraviolet rays from a sun lamp, concentrated by quartz lenses, Dr. Felix Ehrenhaft and Leo Banet, of New York City, have succeeded in magnetizing small iron objects like paper clips and nails. A dime-store compass needle was used to detect the magnetization. The iron pieces were placed at right angle to the magnetic field of the earth (approximately east and west) and exposed to the ultraviolet radiation for periods ranging from a few minutes to several hours. By this treatment, magnetic poles, mainly of the north-seeking type, were found to have been induced in them, and in some cases were present after several days.

2533

Funnel-Shaped Tobacco Pouch Fills Pipe Without Spilling

Smoking pipes can be filled without spilling tobacco by using a leather pouch shaped like a cone. The small end of the



Pressure at lower end opens pouch; spring closes it

pouch opens when a spring inside is pressed, allowing tobacco to flow into the pipe bowl. It closes tightly as soon as the spring is released. The top is opened by a slide fastener.

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

Carh L. Jacoby 45-20 Hazel St Chicago

Kimberly Co. 2043 N. Cicero Chicago

A new development

the inventor

I want to see it I want to see it

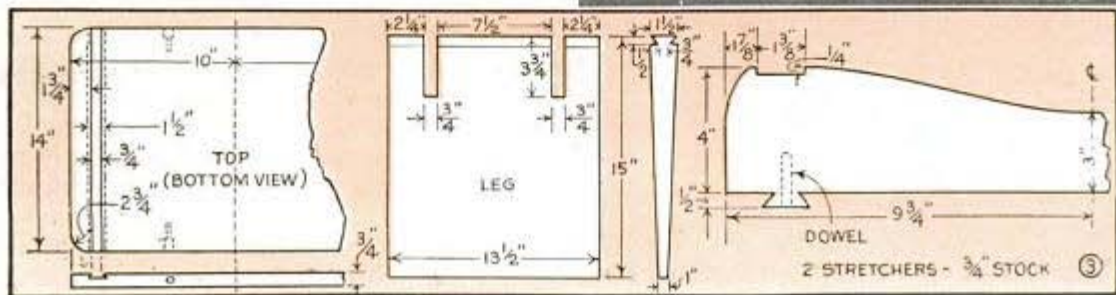


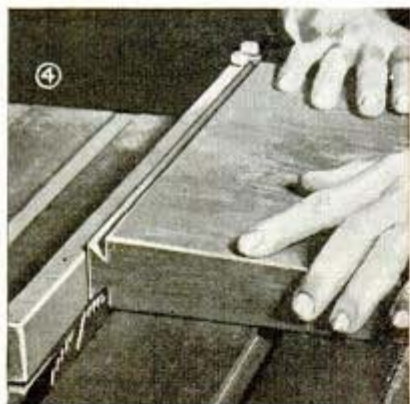
The CRAFTSMAN

VANITY SEAT *has removable cushion*



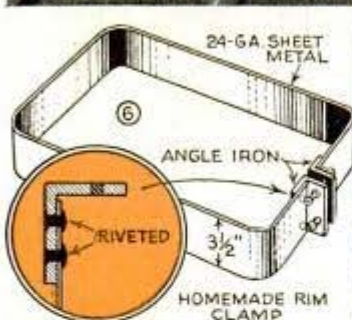
SIMPLE in design and sturdy in construction, any craftsman can make this pleasing vanity bench which has a removable cushion as shown in Fig. 1. Start construction with the top, legs and stretchers. Detailed dimensions for these parts are given in Fig. 3. The top may be shaped from a single board, or it may be glued-up to the required width. The dovetail tongues on the stretchers and the legs are cut to match corresponding grooves which are made in the underside of the top. Fig. 4 shows how you go about cutting the tongues on the upper ends of the legs by first making the 45-degree cuts, then the





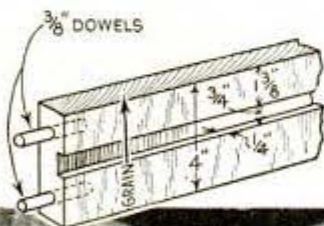
← This operation shows how shoulder cuts made to meet 45-degree cuts form the dovetail tongues

If the segments are glued together, the turned corner assembly must be sawed into quarters→

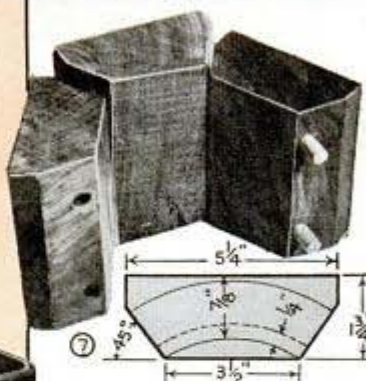


MATERIAL LIST
Walnut stock

- 1 pc. 1 3/4 x 5 1/4 x 19 in.—Rim corners
- 1 pc. 3/4 x 5 x 40 in.—Rim
- 1 pc. 3/4 x 14 x 20 in.—Top
- 1 pc. 1 1/2 x 13 1/2 x 31 in.—Legs
- 1 pc. 3/4 x 4 1/2 x 40 in.—Stretchers



A natural walnut finish is had by using filler, shellac and wax



shoulder cuts. This is done, of course, before the legs are tapered. Matching grooves in the top are similarly cut, using a dado head to remove the waste between the angle saw cuts. You will notice that the dovetail tongues on the stretchers are strengthened with short dowels inserted in the edge. In assembling the parts,

the stretchers are fitted to the legs first as shown in Fig. 2, after which the top is slipped on to lock the assembly together.

Now for the rim which encircles the top. The corners of this are turned from a built-up form consisting of four segments which are cut and doweled as indicated in Fig. 7. Cut the pieces about 5 in. long so that sufficient waste will be had for fastening the work with screws to the faceplate. If the dowels in the segments fit tight enough to permit the work to be turned without coming apart, no glue need be used. This will save you later from sawing the work into quarters as is otherwise required, Fig. 5, and also will permit the same dowels and holes to be used in

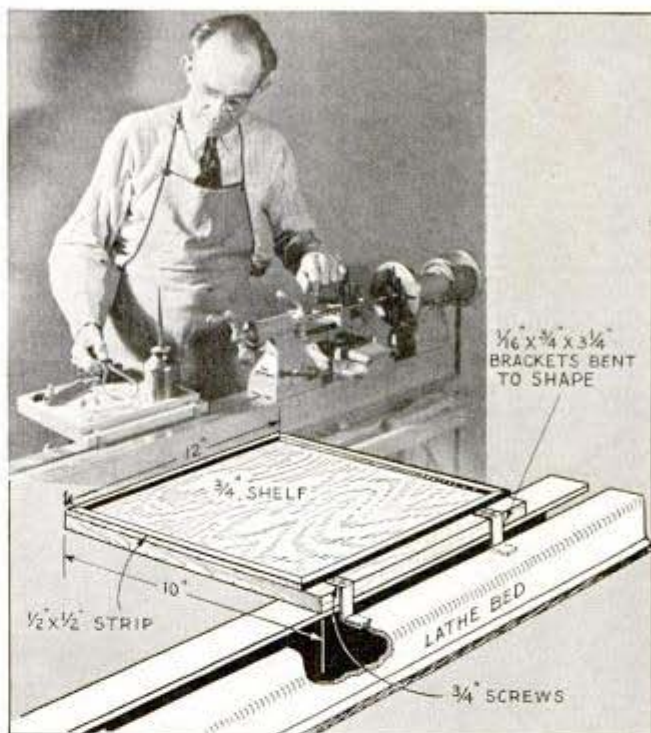


assembling the rest of the rim. See Fig. 8. After the work has been turned to a cylindrical shape, a $\frac{1}{4}$ by $\frac{3}{4}$ -in. groove is cut on the inside $1\frac{3}{8}$ in. down from the top, the edges are rounded and finally it is cut from the faceplate 4 in. long. The inner surfaces of the rim pieces which connect the corners are likewise grooved and finished to correspond. Note that the grain should run vertically. The rim should fit the top loosely with about $\frac{1}{8}$ in. play all around to allow for expansion. No glue is used in the groove, but one or two blind dowels are used along each side. These are glued in counterbored holes which are drilled in the edge of the top (Fig. 3), one end of the dowel being glued in the small part of the hole and the other end being glued in a hole located directly opposite in the rim. The enlarged hole around the top of the dowel relieves any shrinking or swelling strain that otherwise might crack the rim. If you find in checking the fit of the rim, that it fits without sufficient play, simply plane down the edge of the top to make the necessary clearance in the groove. When the sides of the rim are doweled to the top, the corners are glued and clamped with a sheet-metal band like the one shown in Fig. 6. When dry, the joints are sanded flush.

Bending Cane Handles

If you have attempted to bend canes or walking sticks with bark on them and met with failure, try the following procedure: Set a pail of sand on a gas burner and leave it until hot enough to heat the end of a stick thoroughly without charring. When the burner has been adjusted to maintain this temperature, push the sticks down in the sand and allow them to remain ten or fifteen minutes before bending them around a form. It is sometimes best to use winter-cut sticks for the purpose as bark adheres more tightly to this stock.

Shelf on Lathe Ways Keeps Tools Always Close at Hand

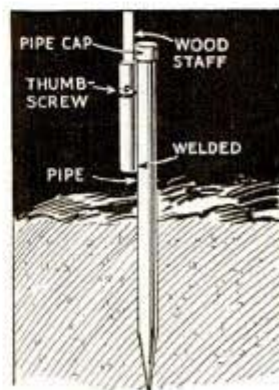


This removable shelf hooks under the lathe ways and will keep your tools right at hand regardless of the position of the tailstock. It is made from plywood and has brackets of flat iron bent as shown to slip between and under the lathe ways.

—Frank Hegemeyer, Monterey Park, Calif.

Metal Stake for Use in Rocky Ground Supports Tent or Umbrella

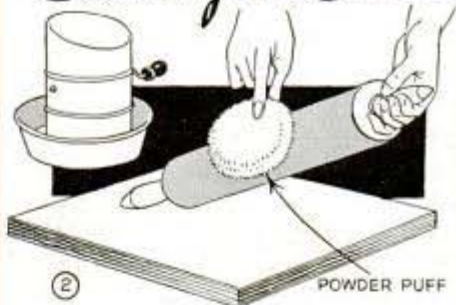
Anyone who frequently has to support a large umbrella or set up a tent on rocky ground, will find this stake just the thing. It has a socket welded near one end to take a tent pole or an umbrella standard. It consists of a length of pipe pointed at one end and fitted with a cap at the other to keep the metal from being flared and broken by hammer blows.



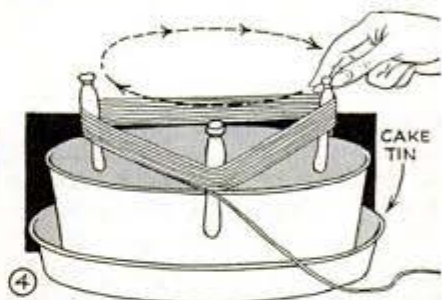
When entertaining guests, place a square of waxed paper under the child's plate at the table. Being transparent, the paper is hardly noticeable and may prevent stains on your best tablecloth.



Solving HOME



1—Small, hard berries and currants can be washed conveniently in a flour sifter, holding it under running water and turning the handle to agitate the contents as water passes through. 2—Dusting flour on a rolling pin or breadboard is accomplished quickly if you keep a large powder puff in the flour can for this purpose. This applies flour uniformly without wasting it.

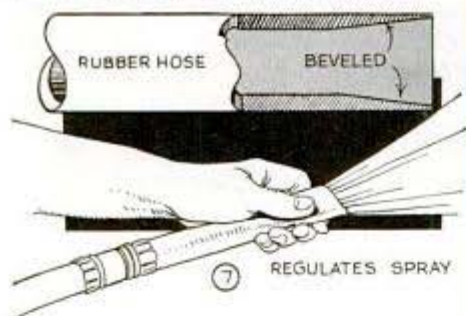


3—To keep a pressing cloth spread evenly, pin it to a wire clothes hanger, which is slipped over the ironing board. The cloth can be arranged with one hand while pressing with the other. 4—Slipping three clothespins on the rim of a pan, which is set in a cake tin so it can rotate, forms a reel on which to wind or unwind yarn.

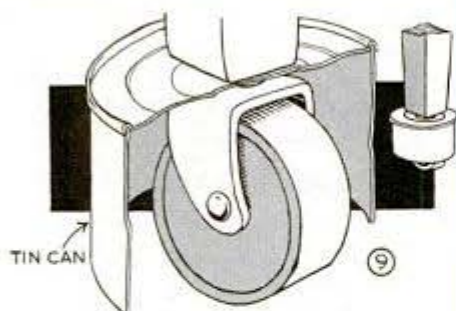


5—Two clothespins pushed through holes in a clothes pole provide a handy reel on which the line can be wound so it will always be at hand when needed. 6—Small pieces of clothing in a scalding hot boiler are picked up easily with a twisting motion, if a short length of hose, serrated at one end, is tacked to the clothes stick.

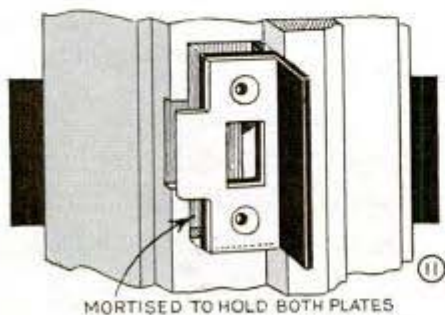
PROBLEMS



7—Here's a rubber nozzle to control garden-hose spray with your fingers. As the inside is beveled at one end, a slight pressure will alter the spray. 8—To give baby a ride in an ordinary swing, set a clothes basket on the swing board, then push the ropes through the handles to take lengths of broomstick to lock the basket in place



9—Splash shields made of tin cans prevent fouling of washing-machine casters due to soapy water. A hole in the bottom of the can fits the caster shank and the sides are cut down so that the caster projects $\frac{1}{4}$ in. 10—A window flower box is easy to hang in place because storm-sash hangers, concealed behind it, are used to hold it



11—This sheet-metal lock-plate shield prevents opening a door by pushing a blade between the door stop and jamb. The shield is bent at right angles so that the narrow portion comes flush with the edge of the stop. 12—Rugs won't slide off the line while beating them if you slip two clothespins over both thicknesses, just above the line



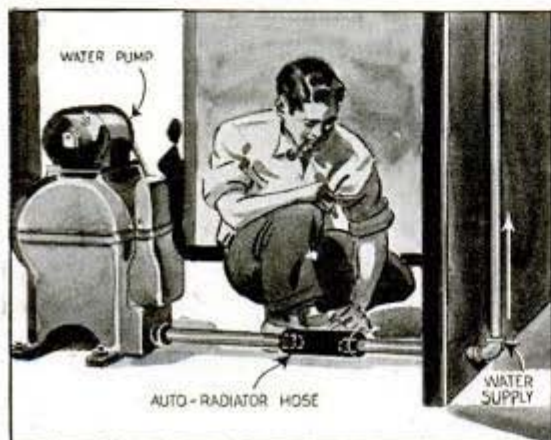
Work Held at Angle on Sawhorse With Hinged Blocks



To hold boards at a convenient sawing angle on a sawhorse, a carpenter hinged wood blocks at each end as indicated. The blocks are provided with dowel pegs for supporting the work, and holes bored into the legs receive the dowels when the blocks are folded down out of the way.

Vibration Dampener in Pipe Reduces Noise of Pump

Owners of electric water pumps are often annoyed by noise, which is caused by vibration from the pumps traveling along the



pipes. Such noise can be reduced to a minimum by inserting a length of hose in the pipe close to the pump. A piece of auto radiator hose of suitable size, attached with clamps, is ideal for the purpose.

Line Guides on Fishing Pole Made From Bamboo

When using a reel on a bamboo fishing rod, I make the line guides from bamboo also. A short piece from the small end of the pole can be used for this purpose. After shaping the guides as indicated, they are lashed to the pole with waxed thread. A slot just back of the end of the pole serves as a guide at that point.

—J. W. Reese, Daytona Beach, Fla.



Knobs on Hinged Brace of Ladder Prevent Pinching the Fingers



After pinching his fingers in a step ladder while closing it, one paperhanger removed the rivets of the hinged brace joints at the sides and replaced them with small bolts over which

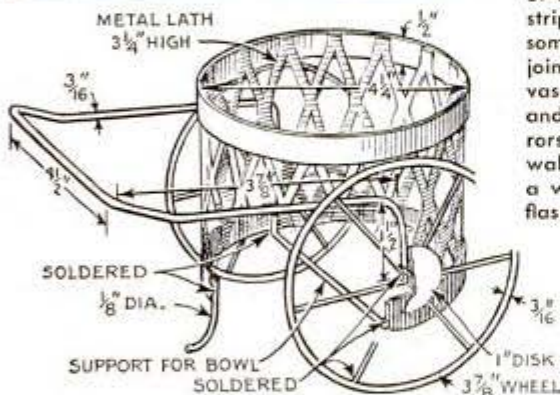
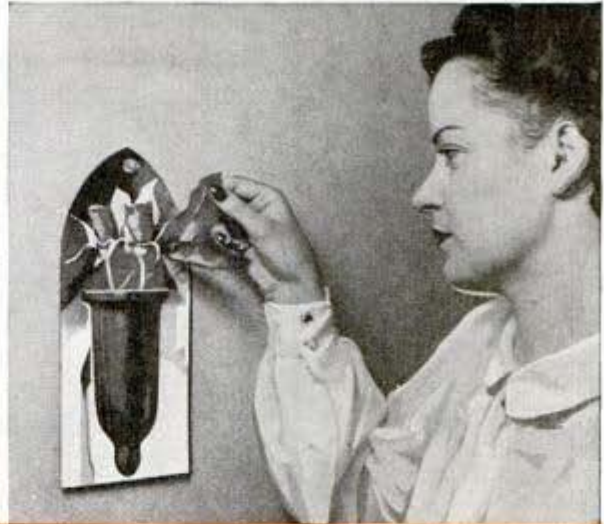
he slipped knobs. These afford a good grip for the hands in breaking the hinged brace to close the ladder.

Nose Plugs for Model Airplanes From Caps of Collapsible Tubes

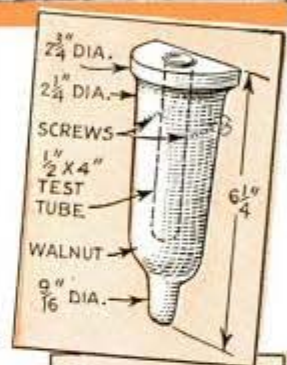
Screw caps from collapsible tubes can be used for nose plugs of model airplanes. Drill the cap in the center to take the propeller shaft, then fit it into a hole bored in the nose block.



Where to put your CUT FLOWERS

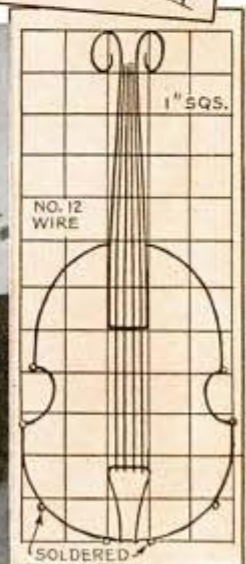


Pushcart at the left consists of a piece of wire lath, two strips of sheet metal and some galvanized-iron wire, joined by solder. Wood bud vases fitted with test tubes and mounted on small mirrors give relief to a plain wall as shown above, while a wire violin holding a flat flask is appropriate on piano



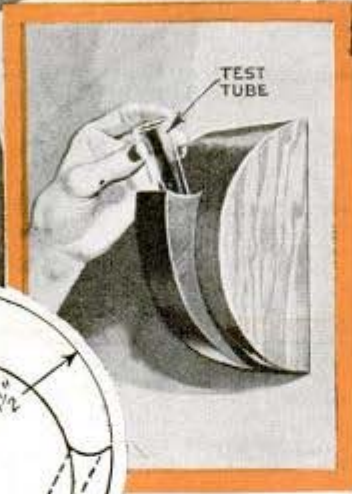
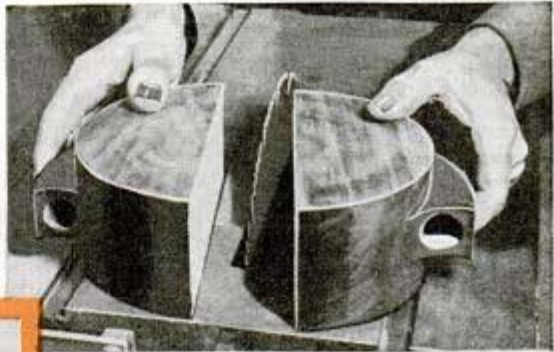
GOOD judgment in using the right holder in the right place has as much to do with effectively displaying your cut flowers as the flowers do themselves. The ideas given in this article do not hail from one author but come from different homes, bringing together a pleasing diversity of taste and design in flower holders.

Take for instance the pushcart above, which is made of wire and sheet metal and is enameled white. Its construction is facilitated greatly if you happen to have a spot welder, but most craftsmen will simply solder the joints. A pair of bud vases on small mirrors are made by turning a piece of walnut, maple or some fancy wood, sawing the turned piece in half and then boring a hole in each part to take a test tube which you can obtain from a druggist. Three holes are ground in the mirror by

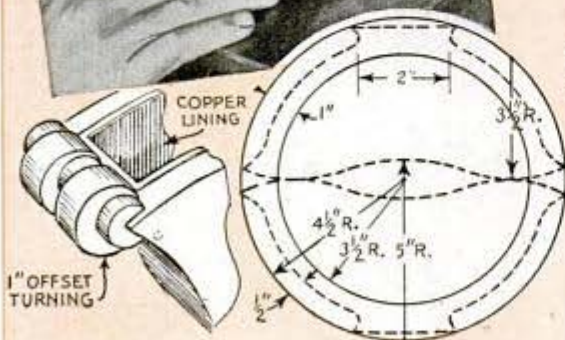
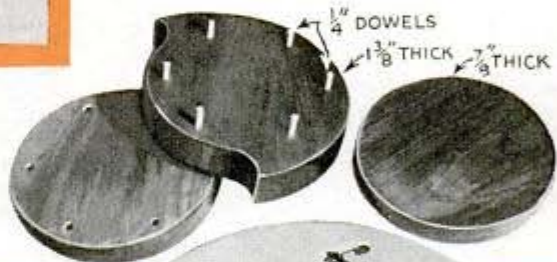
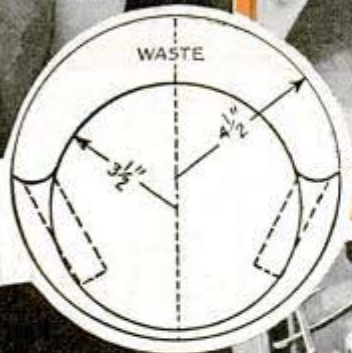


means of a steel rod held in a drill, using emery dust in oil as a cutting agent. Two holes take small screws which hold the wood part to the glass and the third is used for hanging the unit on the wall.

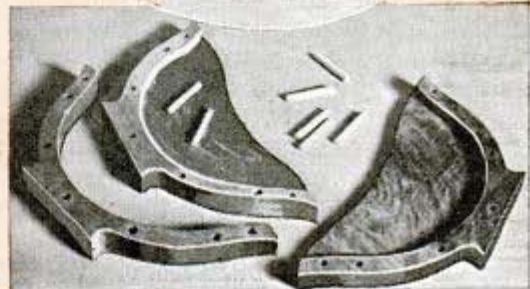
Delightful as a novelty, the wire violin



is slipped over a half-pint flat bottle, holding ivy. Painted white, the violin contrasts nicely, especially with a brown bottle, and is appropriate on the piano. Another pair of wall vases consist of three disks of contrasting wood, the center one projecting from the two side pieces in a graceful curve. The disks are assembled as a single unit and then cut in half as illustrated. A small, flat urn of wood, copper-



Wall bud vases as pictured at the top are made from three disks of wood, which may be of contrasting tones. The center piece, turned to a larger diameter than the end pieces, projects and is bored to take a test tube. All three pieces are held together with dowels glued in place. Similar construction is followed in the urn only it is sawed to shape and the center piece is just a spacer



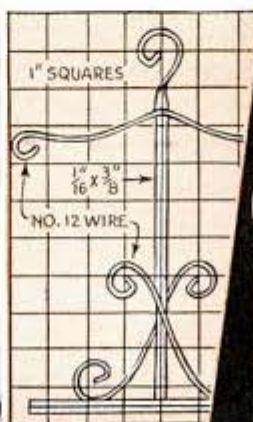
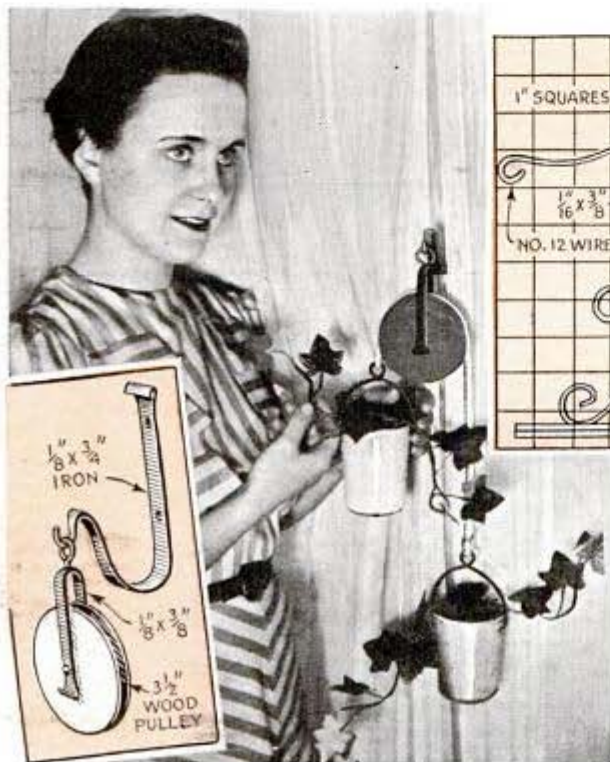
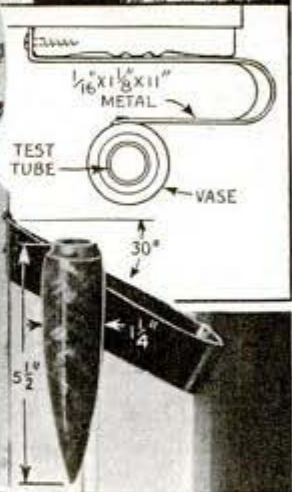
lined to hold water, is made by scroll or band-sawing three pieces—two sides and a spacer. Dowels pass through all three pieces and are glued in place.

Tiebacks on drapes or curtains are enhanced by adding small bud vases turned from wood. Each one is fitted with a test tube. Strips of flat iron are bent to a U-shape and are attached to the vase and to the window casing with small screws as shown. Novelty holders such as those simulating a balance in which glass spheres are carried, and the well buckets hanging from a rope that runs over a grooved wooden pulley, are two other examples of making novel flower containers that serve the purpose of ornament besides being of practical usefulness.

In connection with spherical jars of clear glass, it is well to remember not to set them in direct sunlight, which is sometimes focused on a small spot and may start a fire.



Curtain tiebacks like the one above are screwed to the window trim and support small bud vases turned from wood. Flat metal is used and it can be painted or plated



Two glass spheres are held in this balance-type holder, designed as a table piece. To make it, wire and a piece of flat iron are soldered together and a white-enamel finish makes it distinctive. Hung near a window, the well-bucket type at the left consists of a grooved wooden pulley over which runs a stout cord tied to two "buckets" which are set at different levels for best effect

Lap Table for Work in Kitchen Built Into Cabinet



Sitting in a chair while preparing vegetables for cooking is a pleasure when this lap table is used to support the utensils. It is built in a cabinet so that it can be pulled out when needed. Located about 25 in. above the floor, it can be made any size desired, and it is also ideal to serve a child's lunch, or for a child to play at while mother rolls pie crusts or kneads bread on a similar board at regulation height nearby. A regular bread board can be utilized for this purpose if desired.

Magnet Holds Lettering Brush In Cleaning Fluid



A fine-pointed lettering brush can be kept in a glass of cleaning fluid so that it will not rest on the bottom and destroy its shape if you use a toy magnet over the edge of the glass to hold the brush as indi-

cated. The magnet will attract the steel ferrule of the brush and hold it securely so that the bristles remain at any desired depth in the liquid.

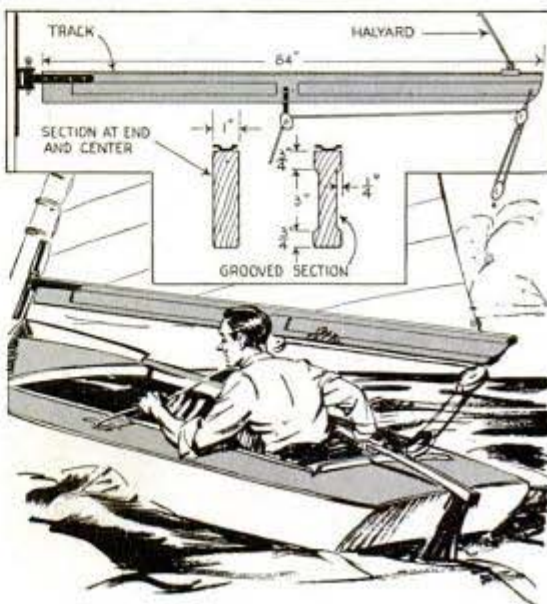
Corroded Tip on Soldering Iron Loosened With Cold Water

When the tip of an electric soldering iron corrodes so that it cannot be unscrewed, heat it and then hold it under cold water running from a faucet. This causes a sudden contracting of the metal which usually will break the grip of the corrosion so that the tip can be removed with a wrench. In doing this, care must be taken not to get water into the heating element of the iron.

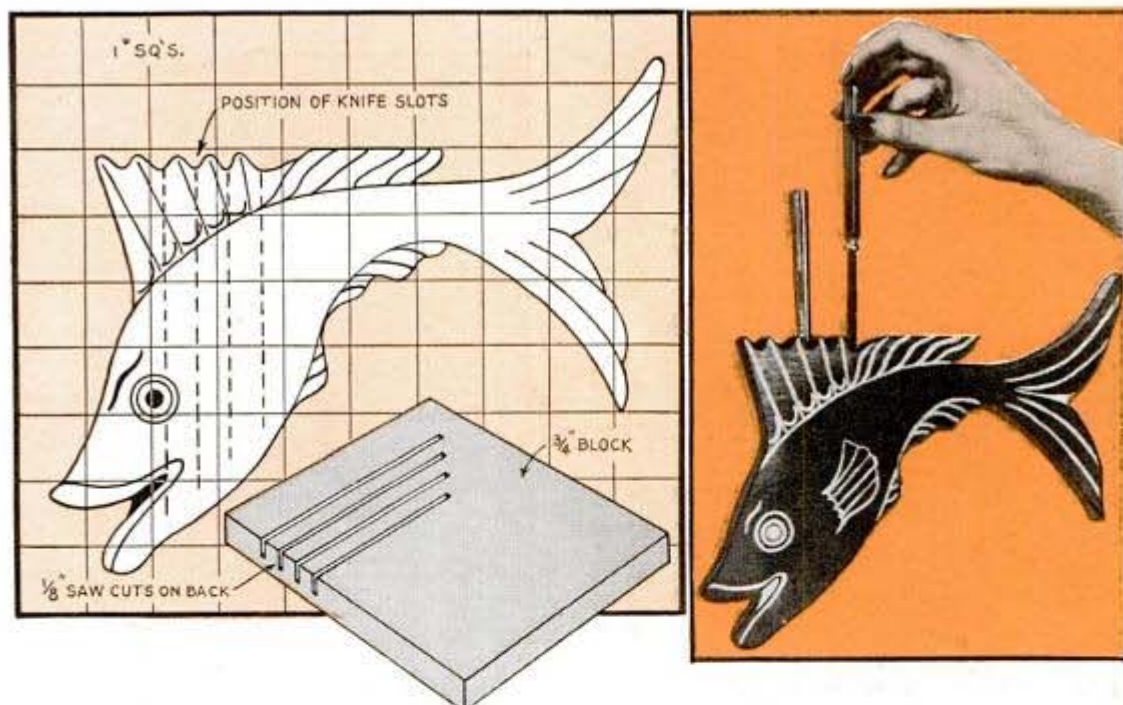


Boom Shaped Like an I-Beam Is Strong and Light

Suitable for small sailing craft under 18 ft. long, this boom combines strength with light weight. Made of spruce, portions of the boom are milled out at the sides to form an "I" as indicated by the sectional views. The dimensions given are only suggestive as the boom can be made to suit your requirements.



Scroll-Sawed Fish on Wall Holds Paring Knives



Painted to blend in with the color scheme of your kitchen, this fish-shaped cutout provides a safe and handy place to store paring knives. A piece of wood $\frac{3}{4}$ by 8 by 10 in. will be required. Mark the piece off in 1-in. squares and transfer the design. Next, cut out on the scroll saw and sand.

Slots for the knives can be cut best on a circular saw, although this job can also be done with a hand saw by cutting all the way across the fish. White outlines put on with a small artist's brush will make the cutout show up well against a light wall.

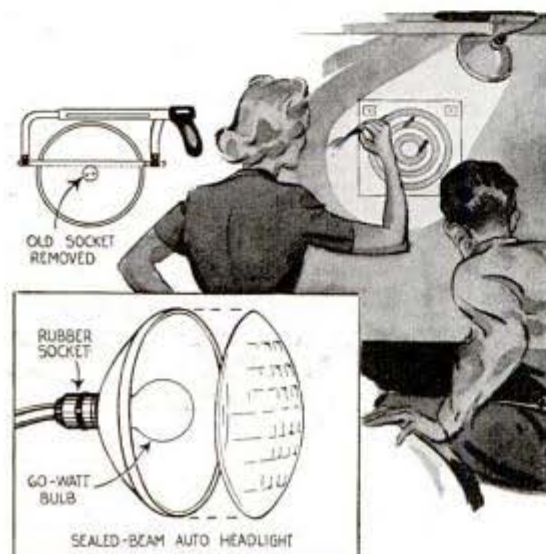
—Don Brooks, Chicago.

Burned-Out Sealed-Beam Lamp Converted Into Spotlight

Instead of discarding a sealed-beam auto headlamp after it has burned out, convert it into a 110-volt lamp as shown. You will

find many uses for such a lamp around the home and in the shop. I use one for a spotlight in our game room to direct light on dart targets and various other places where spot illumination is desired. To convert the lamp to 110-volt just cut off the original socket and enlarge the opening so that you can insert a rubber socket.

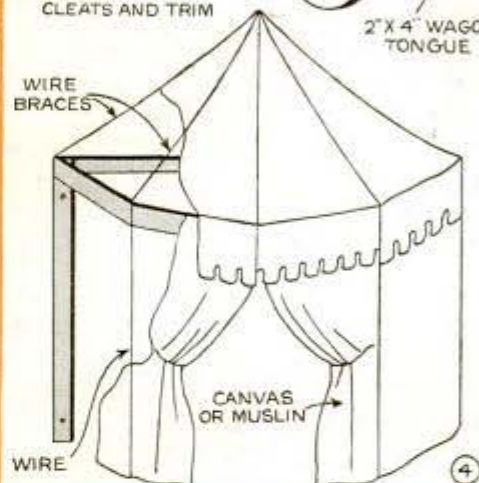
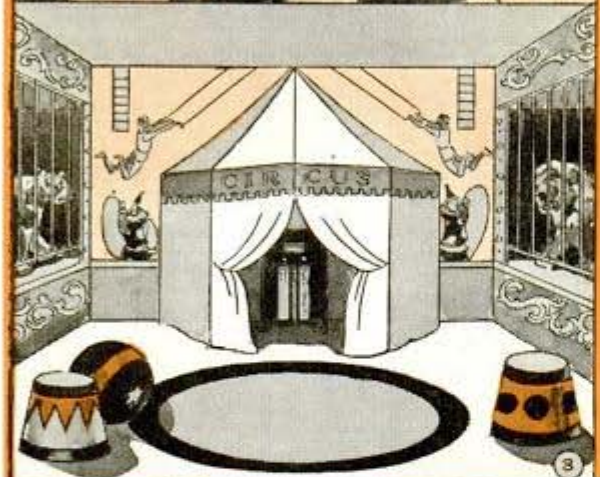
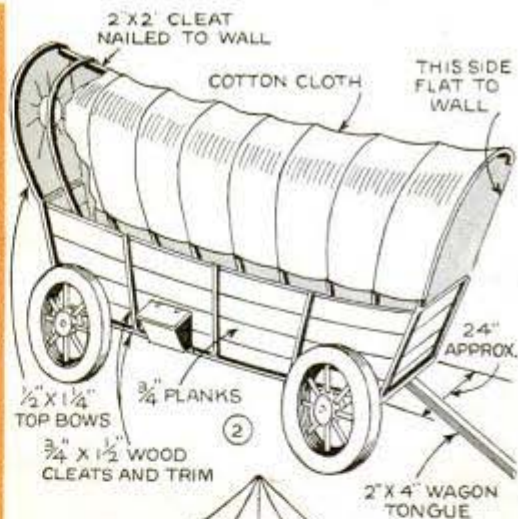
—C. W. Mudd, Normandy, Mo.



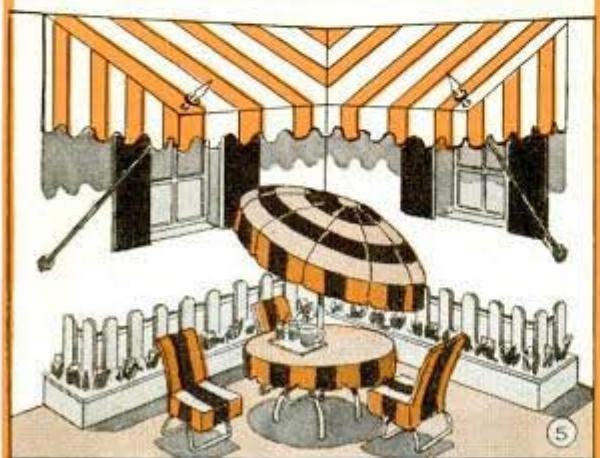
Comfortable Handle for Oilcan

Tired fingers will not result from carrying heavy oil cans if a clothespin of the type shown is slipped on the handle. It will provide a comfortable hand grip.





PORTABLE BASEMENT

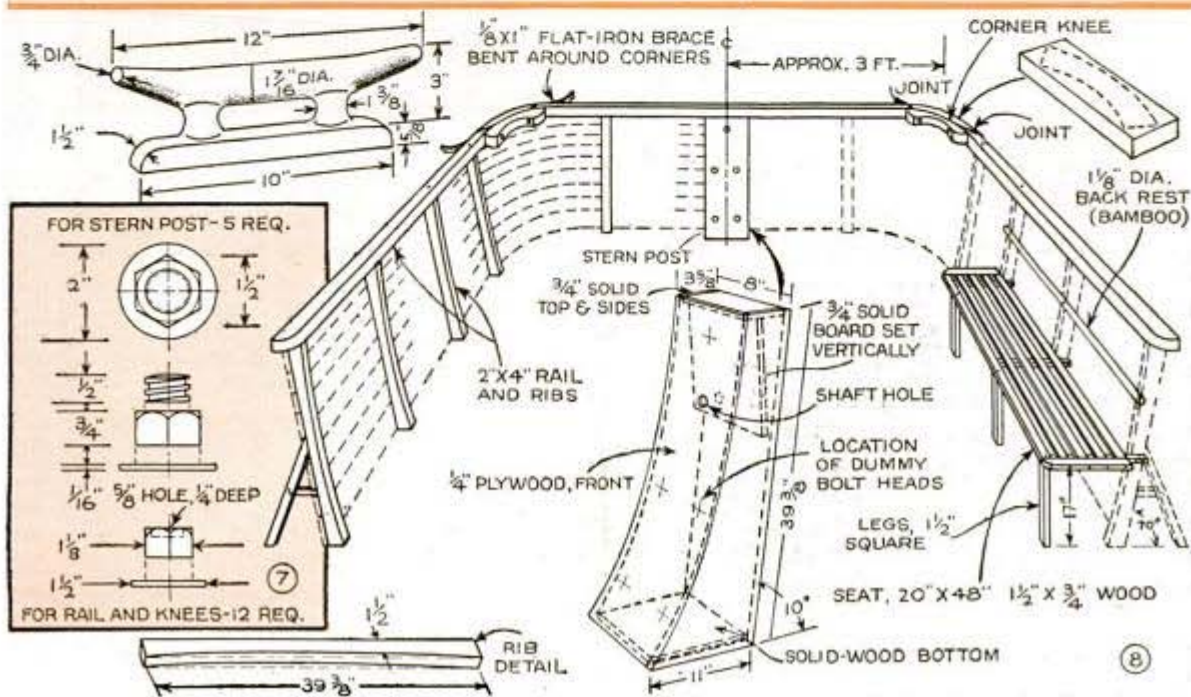


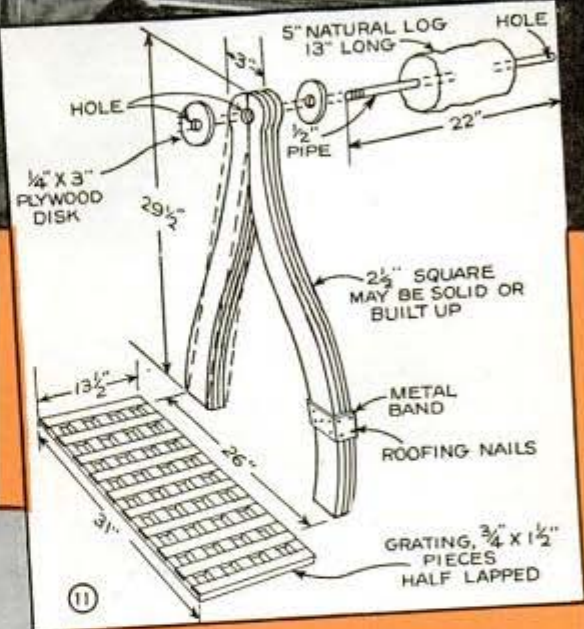
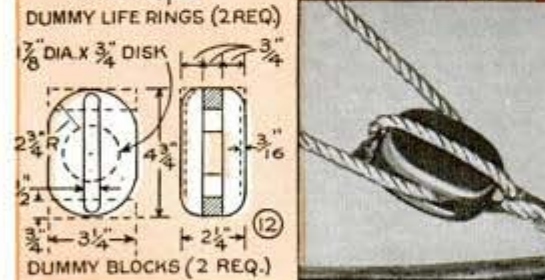
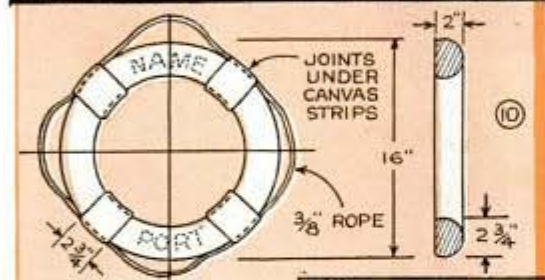
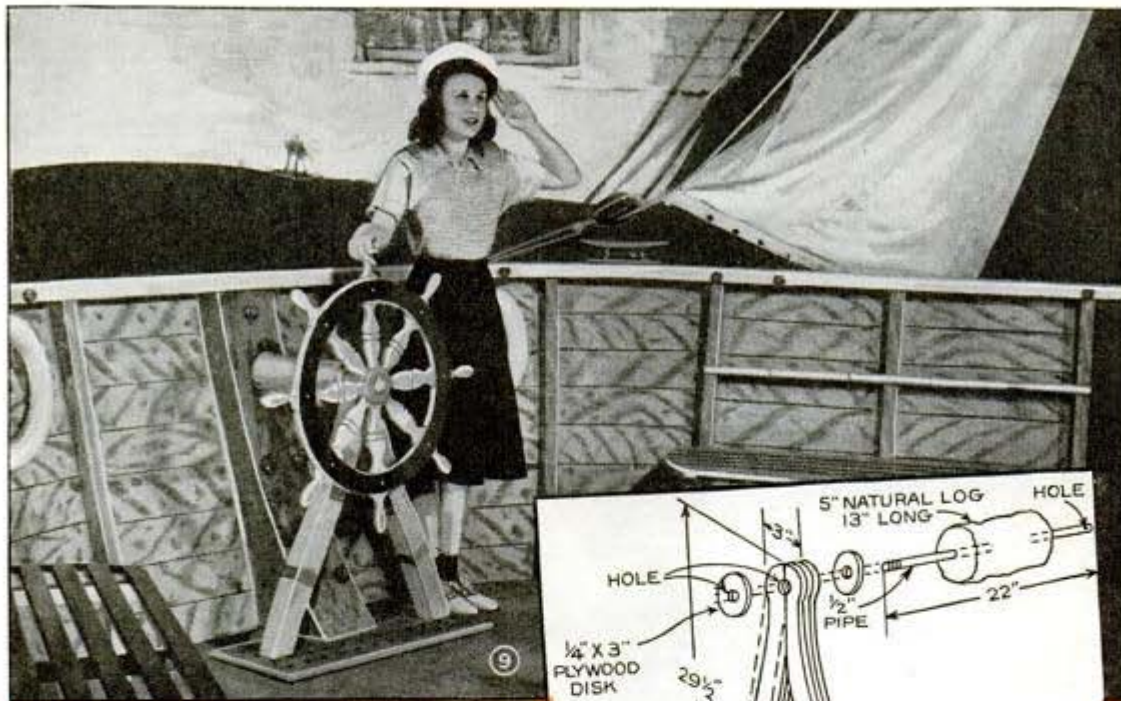
Lawn scene created by use of false windows and an awning in one corner of a basement. Flower boxes lined with pickets and filled with imitation plants tie in with a lawn table and chairs to give the corner a realistic appearance. Linoleum printed to represent tile will carry out the effect further

YOU need not deny your family the pleasure of a basement playroom if you rent a home, because you can make the furnishings portable and take them with you. And you will be surprised at the unusual effects that can be produced inexpensively by the "spot" treatment which may occupy only one corner or wall, yet creates the impression of an individual room. If necessary, drop curtains can be used to simulate walls, and with a little work and paint, it is easy to produce unusual and colorful effects, some of which are pictured in Figs. 1 to 5 inclusive. If you like something more elaborate, you can produce the nautical effect shown in Fig. 6. Here a representative quarterdeck of a schooner was built across the end of a basement room, with the sides of the



PLAYROOMS *by H. J. Bodkin*



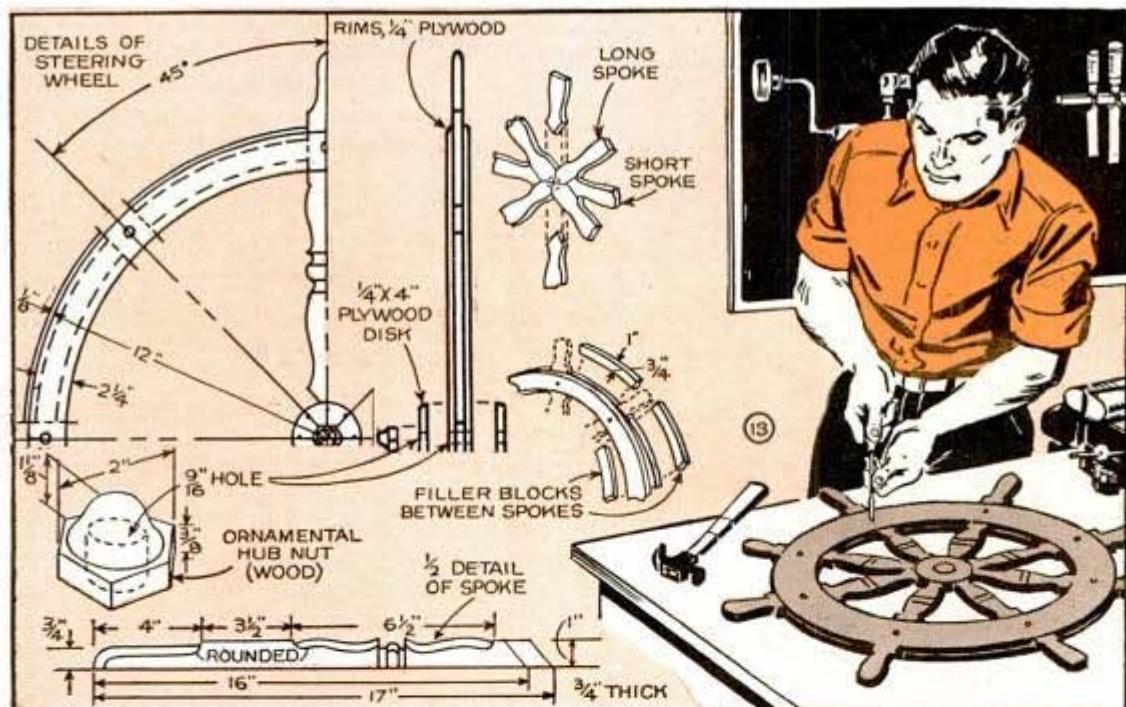


ship's railing extending along the side walls. Note in Fig. 8, the dimension across the stern is approximate; likewise, the side rails can be carried forward, or shortened, as desired. In planning the layout, the ship's rail should not fit flat against the walls. A better illusion of reality is evident if a space of 8 to 12 in. is left open between rails and walls. Also, the effect is more realistic if the side rails flare outward at the forward end, to simulate the gradual widening of a real ship's deck.

The rails and ribs are made from standard 2 by 4-in. stock. For added strength at the corners, flat-iron strips are bent around

and fastened to the corner knees, out of sight. Short floor braces extend diagonally downward from alternate ribs to the floor, making the rail structure self-supporting. After the rails and ribs have been assembled, the ship's planking is applied. This can be wallboard, 1/4-in. plywood or even random crating lumber, applied as strips or planks about 6 in. wide. Slat seats may be fastened in place at both sides, if desired. Otherwise, ordinary canvas deck or camp chairs will carry out the nautical effect.

The "massive" stern post is nothing more than an odd shaped box, having wooden sides, top and bottom, and faced on the front with flexible building board or plywood. A block is fitted vertically inside of



this box, to carry one end of the steering-wheel axle. Do not bore a hole to receive the axle until after the wheel mounting has been made.

A typical "wishbone" wheel mounting can be built up from $\frac{3}{4}$ -in. pieces, sawed to the curvature indicated in Fig. 11, and screwed together. Or, a straight-leg inverted V-type mount may be substituted, if desired. In either case, $\frac{1}{4}$ by 3-in. plywood disks are glued and screwed at the top for decoration and reinforcement. Metal bands are fitted around the legs and fastened with large-head roofing nails. The metal is given one coat of shellac, followed after drying, with a coat of common gold or bronze radiator paint. After the second coat is dry, brush over with flat black paint and, while this is still fresh, wipe off as much as possible with a soft cloth. The effect remaining is that of weathered bronze. The wheel drum and axle and grating are constructed as shown.

Complete details for making the steering wheel are given in Fig. 13. The wheel spokes—four short and four long—are bandsawed or jigsawed to shape. After sawing these, a spoke shave is used to round the edges to simulate turned spokes. Next, two rims are cut from building board as detailed, and are marked with eight equally spaced points, representing centerlines of the spokes. The spokes are glued and screwed together at the hub and

to one rim. When this is done, the opposite rim is fastened in place. Note the 4-in. plywood disks that reinforce the hub on both sides. Fillers of solid wood are sawed to shape and fitted between the spokes on both the inner and outer sides of the rim, to make the wheel appear as a solid assembly. A hole slightly smaller than the axle diameter is bored through the wheel hub so that the threaded end of the axle can be turned into it. When assembled to the wheel, the axle is turned into the hole and secured by a screw, which passes through the pipe diagonally and up into the wooden hub. The ornamental hub nut can be turned or whittled as detailed. It is painted weathered bronze as mentioned previously.

Bolt heads in two sizes, Fig. 7, a pair of cleats, two life rings, Fig. 10, and two blocks, Fig. 12, comprise the decorative details of the schooner. These are all made of wood. The smaller bolt heads are lightly nailed to the knees, and the rest are equally spaced along the inside of the rail. The large bolt heads are fastened to the stern post by light wood screws passing through to them from the back. Locations of these are shown on the stern-post drawing. Lengths of $\frac{5}{8}$ -in. rope are passed through the blocks, one to each side, and sweep upward to the basement ceiling. If it is desired to conceal a furnace or water tank, a cloth sail may be attached to one of these rigging lines as shown in Fig. 9.

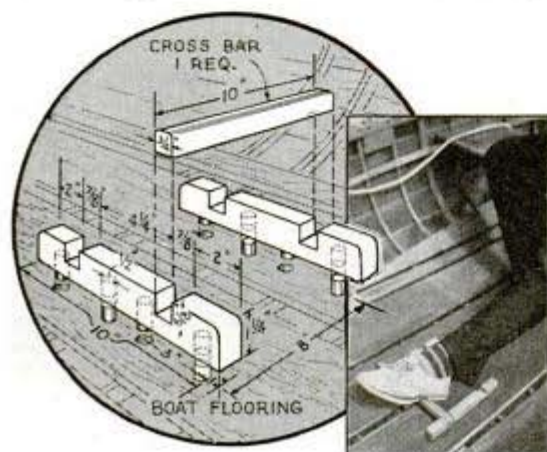
Candle "Floor Lamp" for Tent Moved Anywhere Desired



A length of bamboo split at one end to take a candle and at the other to form three legs will provide a floor lamp for your tent. Such a lamp will enable you to have light in any part of the tent. The legs of the lamp can be pushed into the ground to help prevent tipping it.

Removable Footrest for Rowboat

While a footrest is almost a necessity for rowing a boat, it is usually a hindrance if the boat is also used for sailing, especially if you sit in the bottom while sailing it. This footrest takes care of these problems as it can be removed in a jiffy. It consists of two supports and a cross bar. The sup-



ports fit over dowels set in holes in the bottom of the boat. They must be a tight fit and waterproof glue is used to fasten them in the holes. In use, the supports are merely lifted off the dowels to remove the footrest, leaving only the short dowels projecting in the boat bottom.

—J. C. Montgomery, Toronto, Ont., Can.

Place Painted Side of Board Down To Protect Saw Teeth

When working with old lumber that has been painted, turn the painted side down when sawing it. In this way, the hard chips of paint are broken away instead of being carried into the slot where they would dull the saw.



Simple Way of Tying Boot Laces When Walking Through Weeds



To keep the laces of your high-top shoes or boots from becoming untied when walking through weeds and brush, tie them as shown. Loop the ends of the laces and insert them through

the upper eyelets of the shoes. Then pass opposite ends of the laces through the loops and pull them up tightly.

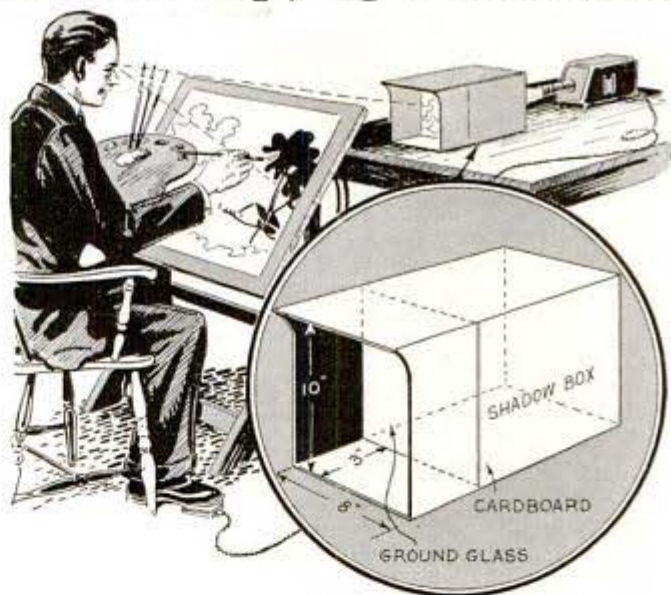
Roll of Tape Picks Up Tacks

Use a roll of electrician's tape to pick up tacks scattered over the workbench. The tacks will adhere to the tacky surface when the roll is pressed against them.



Shadow Box Aids Artist in Copying Color Slides

Projecting color slides in well lighted studios conveniently and without damaging the slides is a simple matter if this shadow box is used. It is made of black corrugated paper cut and folded to the shape indicated with inside dimensions of 8 by 10 in. A ground glass is placed in the box 3 in. from the front to serve as a screen. Pictures are projected into the box from behind, so slides must be put in the projector backward so the pictures will appear in the correct position. Pressing the foot switch illuminates the projector and the bulb need not be left on long enough to damage a slide.



Modelmaker's Pin Awls and Drills Made From Needles



Model builders will find that pin awls and drills have many uses when building ship and airplane models. The tools are handy for picking up small parts; for placing a drop of cement in a hard-to-reach joint, and for holding small parts while cementing or painting them. Also, they are ideal for punching holes in thin balsa wood, or for drilling shaft holes through balsa nose blocks and propellers. Sharp-pointed awls are made by inserting the eye end of a needle in a stick, while drills are made by inserting a needle, point first, in a stick handle. The eye is then broken off and the prongs sharpened. Drills can be made from music wire of various sizes by sharpening the ends to form drill or chisel points.

Turning With Curved End Is Made on Lathe and Finished on Sander

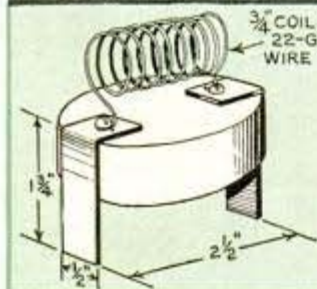
While repairing some antique furniture, I had to make a number of turnings, which were curved at one end. To save time and work, I turned the stock in the lathe leaving one end cone shaped. The curve was then formed on this end by sanding away part of the cone. It is surprising how quickly you can form such a curve on a sander.

—King Basham, Jr., Fort Smith, Ark.

☛ Cabbage worms can be killed with cayenne pepper mixed with flour if the plants are sprinkled while covered with dew.



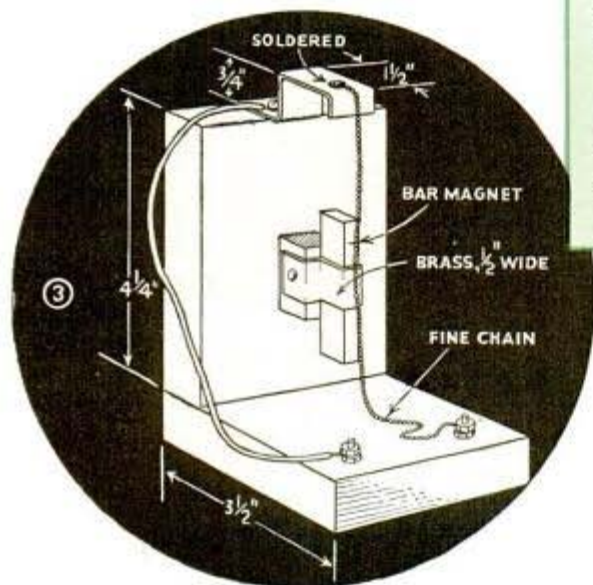
SIMPLE MODELS PROVE



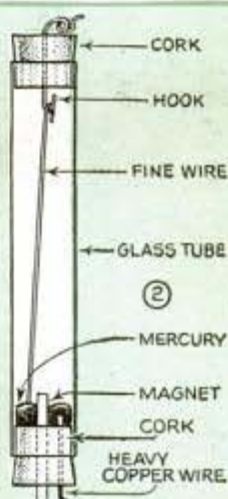
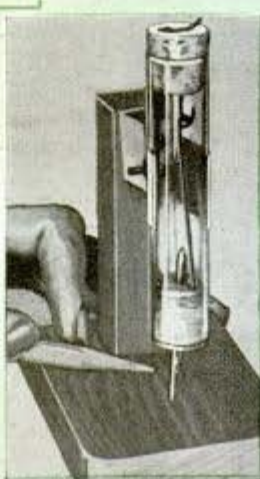
De la Rive's float: Coil on block floats in acidulated water. Slight current is generated and a magnetic field is produced, making coil susceptible to influence of a permanent magnet

acidulated, say with sulphuric acid, $\frac{1}{2}$ oz. to water, 1 qt. As acid burns, handle it with great care. If you should happen to get some on the skin, wash off immediately under running water and if you get some on clothes apply a strong solution of ordinary baking soda in water at once. Put the float in the acid solution, which should be in a glass jar, and a slight generation of electric current will result, the current flowing through the coil and producing a magnetic field. When you hold a strong permanent magnet near the float, the two magnetic fields will interact and one pole of the permanent magnet will repel one end of the coil and thus the movements of the float can be controlled.

FEW instruments in the study of electromagnetic dynamics are as fascinating as de la Rive's float, Fig. 1. It consists of a paraffin-impregnated wooden block having a small strip of copper attached to one end and a similar strip of zinc to the other. To these strips a small coil of light wire is connected. The float is placed in water that has been slightly



Hanging chain that conducts current is repelled or attracted to magnet in this demonstration



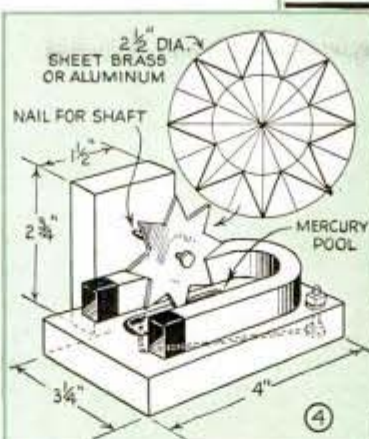
From Faraday: Wire in tube moves around magnet at bottom if direct current is applied

The principles of the electric motor were investigated by Faraday with a model like that shown in Fig. 2. To make it, get a glass tube. A short piece of $\frac{1}{8}$ -in. drill rod is hardened by heating until red and quickly immersing in oil. Then it is magnetized by bringing one end in contact with one pole of a strong permanent magnet. A wire suspended from a hook is free to move around the magnet and the lower end of the wire should just barely contact the mercury. When direct current is

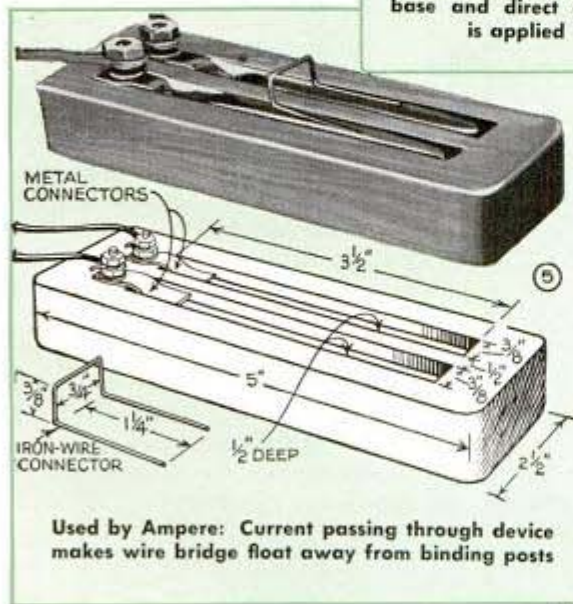
BASIC ELECTRICAL LAWS

passed through this instrument the wire will rotate continuously.

Another demonstration can be made with the device shown in Fig. 3. Hang or suspend a fine chain near a bar magnet. When a heavy current passes through the chain, one end of it will be attracted to the magnet and the other end will be repelled. Reversing the current reverses the effect. This proves that wires carrying current act like magnets.



Barlow's wheel: An 8-pointed star of thin brass or aluminum, which rotates when the tips contact mercury in pool at base and direct current is applied

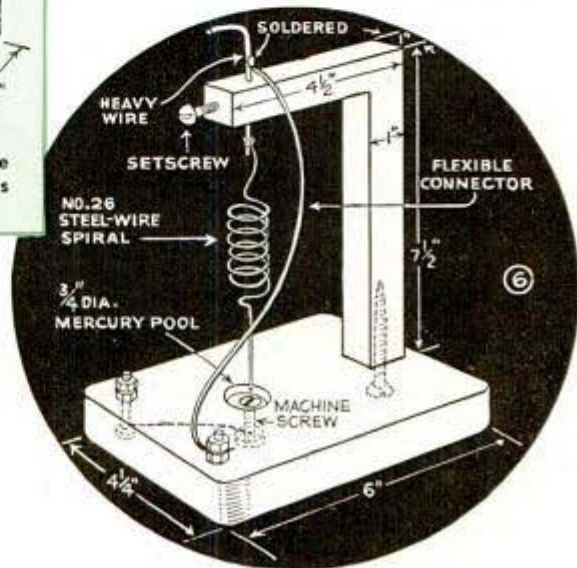


Used by Ampere: Current passing through device makes wire bridge float away from binding posts

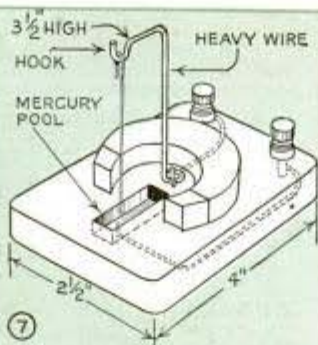
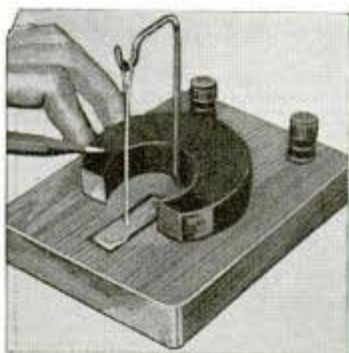
Barlow's wheel, Fig. 4, creates much interest. An eight-pointed star of thin sheet aluminum or brass, is mounted on a nail so that it turns easily. As it turns, the points of the star must barely touch the surface of a small pool of mercury. A large permanent magnet is placed as shown. The star will rotate when current from a dry cell is applied. Reversing the current will reverse the rotation.

Fig. 5 shows an interesting instrument once employed by Ampere. Two rectangular troughs to contain mercury are

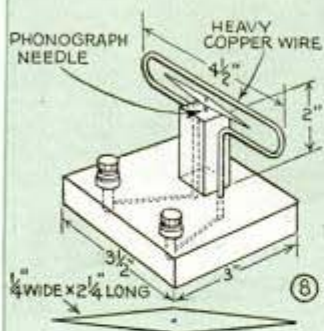
cut in a piece of wood. Two small pieces of sheet brass or copper wire connect the mercury to binding posts to which a dry cell is connected. Connection between the troughs is made by a piece of No. 22 iron or copper wire bent as shown, which will float on the surface of the mercury. When current is sent



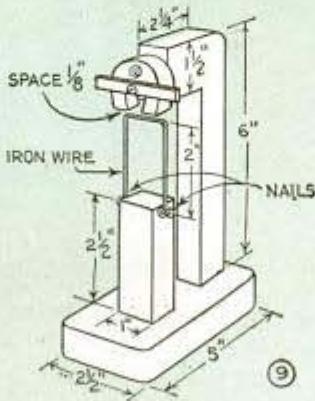
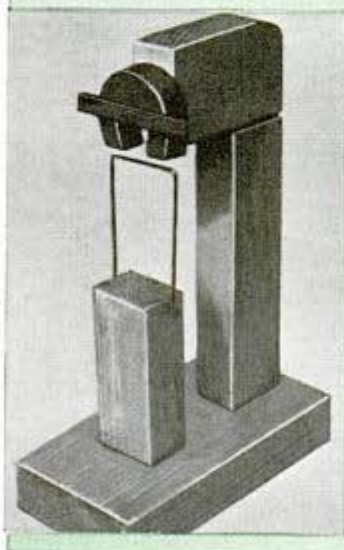
Vibrating coil shortens and lengthens when its lower tip makes and breaks contact with mercury



Somewhat similar to the device in Fig. 6. Instead of a coil, a piece of wire vibrates upon making and breaking contact with mercury when connected to direct current



Perfectly balanced on a phonograph needle, a magnetized needle of sheet iron will respond, the extent of movement varying with current applied through coil surrounding it



Pivoted iron-wire yoke vibrates like a spring when snapped but stops when another magnet is held close

vibrating spiral, Fig. 6. Make the coil of No. 26-ga. wire, experimenting a bit to get the proper distance between the turns. The top end of the coil is connected to the iron adjusting wire and the bottom just touches the surface of the small pool of mercury. When direct current passes through the coil, the attraction between the turns contracts it and breaks the connection to the mercury. The coil then again relaxes and the effect is repeated at high speed.

In Fig. 7 a length of light wire is suspended between the poles of a permanent magnet so that its tip contacts a small pool of mercury. When a direct current passes through the wire, it will vibrate, making and breaking the contact at the surface of the mercury. The direction of the motion taken by the wire may be reversed by reversing the direction of the electric current. In Fig. 8 a magnetized needle made of sheet iron moves in a loop formed of No. 8 or 10-ga. copper wire. The needle must be perfectly balanced on the point of a phonograph needle. When even a weak current passes through the loop, the needle will respond, the extent of its movement varying with the strength of the current passing through the loop. The simple instrument shown in Fig. 9 has a small yoke of iron wire arranged so that it is free to rotate on two nails that serve as bearings. Normally, the magnet will hold the yoke in the position shown. If the yoke is pulled away from the magnet and released, it will snap back and vibrate violently for a moment

much like a spring. Bring the right pole of another magnet near it while it is acting in this way and it will stop.

through this device, a mutual self-repulsion takes place in the circuit, and, being free to move, the wire bridge responds by moving away from the binding posts. Magnetic forces are actually set up between the turns of any coil carrying an electric current, which is proved by Roget's

Old tooth-brush handles can be shaped to form letter openers, fingernail cleaners, cuticle sticks and many other articles.

Empty Ice-Cream Cartons Have Many Uses



An empty carton makes a good temporary flowerpot, and if the top of the lid is removed the remaining rim will simulate the rim of a clay flowerpot



Punching holes in the lid converts a carton into a good shaker for soap and other powdered materials



As a holder for conical drinking cups attach a carton to a wall, first cutting a hole in the bottom to permit removal of the cups one at a time. The hole should have a diameter about $\frac{1}{8}$ in. less than that of the cups

When you empty a round carton of ice cream or other food, the container can be used for a number of practical purposes. Besides the uses shown, the containers are particularly useful in mailing small objects that might become broken with an ordinary wrapping. Be sure to use plenty of packing, such as crumpled tissue or news-

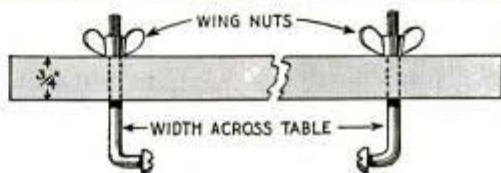
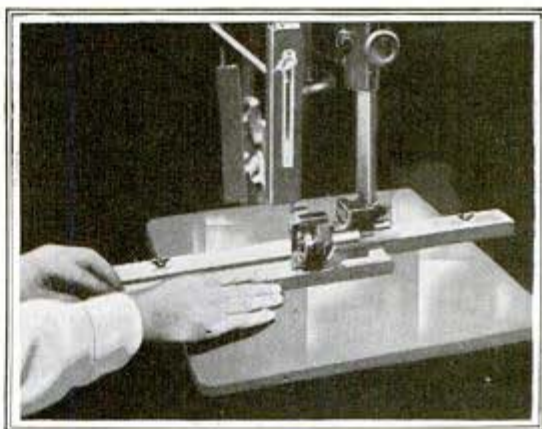
paper. Another use consists of decorating a carton with fancy paper and utilizing it as a tobacco humidior. Filling one with cotton and making a small hole in the lid forms a handy cotton dispenser in the home. A slot made in the lid of a carton converts it into a handy depository for used razor blades.

Simple Ripping Fence for Band Saw Clamps to the Table

If you need a ripping fence to use on a band saw, one can be made very easily from a strip of hardwood of suitable size and two slender bolts fitted with wing nuts. Holes spaced equal to the width of the band-saw table are bored in the wood strip. Then the bolts are bent at right angles near the head to hook underneath the table flange. In use, the bent ends of the bolts are slipped under the edge of the saw table, after which the fence is adjusted to suit and the wing nuts tightened to hold it in place.

—Edison Sprunger, Berne, Ind.

☛ A piece of linoleum the size of your table top will protect it from scissors or pin scratches when cutting cloth. Patterns can also be held securely on the cloth by pushing pins into the linoleum.



Cap-Screw "Tap" Cleans Threads Of Dirt and Corrosion



Instead of dulling or breaking good taps cleaning rusty threads in tapped holes, use a cap screw. It takes but a minute to file two V-grooves along the length of the threaded section, which then serves as the tap when screwed into a hole. The improvised tap is used in the same way as a regular tap, using plenty of oil and backing the tap a quarter turn after each complete turn.—W. C. Lammey, Naperville, Ill.

Hoe Across Mortar Box Is Divider For Sacks of Plaster

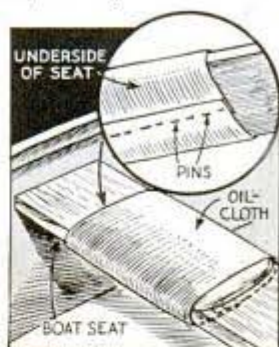
When working on a house-plastering job where the mortar is mixed in only half-sack batches at a time, the sacks can be divided accurately and with ease by laying



them over a hoe handle placed across the mortar box. The sack is cut in half with a sharp knife, after which one half is lifted aside and the other half dumped in the box.

Endless Pad for Boat Seat Is Always Dry

To avoid the discomfort of a wet boat seat when returning to your boat after a shower, or after the splash of "landing a big one," wrap a grain sack around the seat. Then pin it to provide an endless pad, which may be pulled around to present a dry side when needed.



Small Pieces Cut in Bench Vise Caught by Inverted Desk Lamp



When using a hacksaw to cut off short pieces from work clamped in a vise, an old desk lamp with the reflector inverted as shown makes a good receptacle in which to catch the pieces as they are sawed off. The lamp should be of the type having a flexible-tube standard so that the reflector can be twisted to any desired position.

Tin Can Used as Garden Tool

Holes for bulbs or plants can be made in the ground by using an old tin can cut as indicated. When the can is pushed into the ground to the desired depth, pressure of the fingers on opposite sides will hold the soil to lift it out. Releasing pressure lets the dirt drop from the can.



Chemical Mass-Attack Rids Lawn of Dandelions



Why waste time "knifing" dandelions individually each year? The roots will only bring a bigger and better crop the next. As long as any portion of the long root remains alive, more foliage will grow. Although mass eradication by chemical methods may not give the immediate effect of total riddance, it will be sure and complete, if properly done. For five years the State College of Agriculture at Ames, Iowa, has been highly successful in ridding lawns of dandelions by simply spraying with water-white kerosene. You can do the same, but it is very important that certain points regarding the method, time of application, kind and amount of kerosene and uniformity of distribution be strictly observed to avoid killing the grass. Only the water-white kind of kerosene is used, this being sprayed on—not sprinkled. Gasoline, furnace oil or distillates must not be used. For each 100 sq. ft. of lawn you use 2 qts. of kerosene. If spraying is done unevenly, serious grass injury will result. Also, do not attempt to do this at any other time than six to eight weeks before the average date of heavy snow or grass-killing frosts.

This period in early fall is the only spraying season throughout the year that has given consistently good results for five years at Ames. Spraying should be done at a temperature of from 60 to 70° Fahr., on an overcast day. Under these conditions the kerosene will not evaporate rapidly and will penetrate the roots, but the grass will recover before cold weather and it will not winter-kill as it will if sprayed too late. Individual dandelions may be killed at any time by applying to the crown of the plant, by means of an oil can, kerosene, gasoline or furnace oil, or a solution of kerosene, 9 parts, and coal-tar creosote, 1 part. It should be remembered that wind-borne seeds will result in large dandelion crops if they find bare spots of lawn, especially if the soil lacks nitrogen. Therefore a thick, close turf of grass, kept healthy by yearly fertilizations, is the best assurance in keeping out the dandelions. As a fertilizer, ammonium sulphate, which is inexpensive, is highly recommended. Broadcast this dry over dry grass, $\frac{1}{2}$ to $\frac{3}{4}$ lb. per 100 sq. ft., one application in early spring before hot days, and another in late fall. This chemical, used twice each year, will eliminate all dandelions eventually.

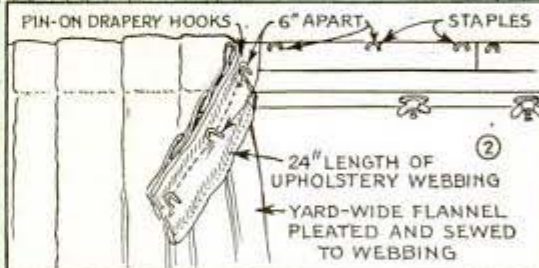


Portable STAGE

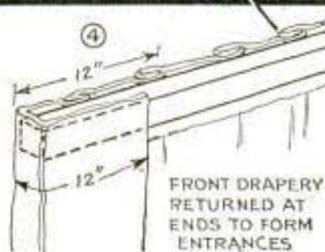
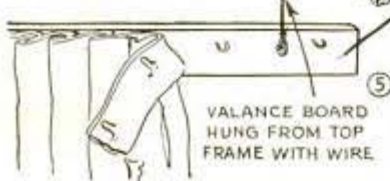
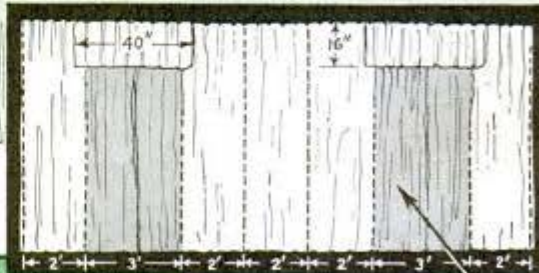


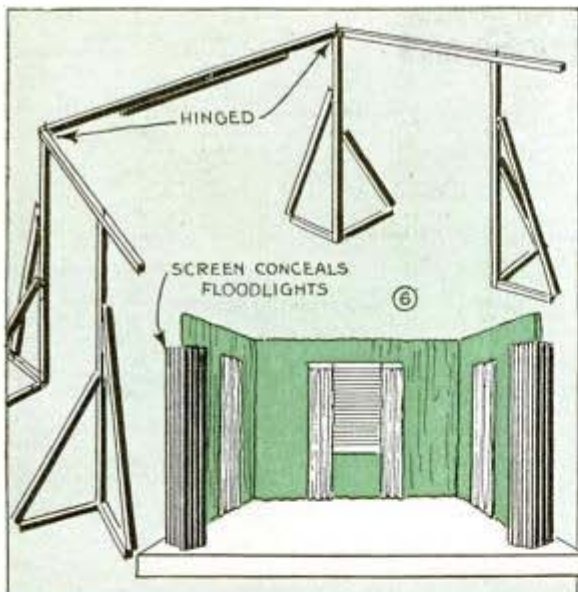
WASHERS AND WING NUTS

JOINT OF TWO TOP POLES



Vertical supports have hinged braces which fold flat when stored. Drops are hooked on to cross rails by using pin-on drapery hooks which engage staples or screw eyes



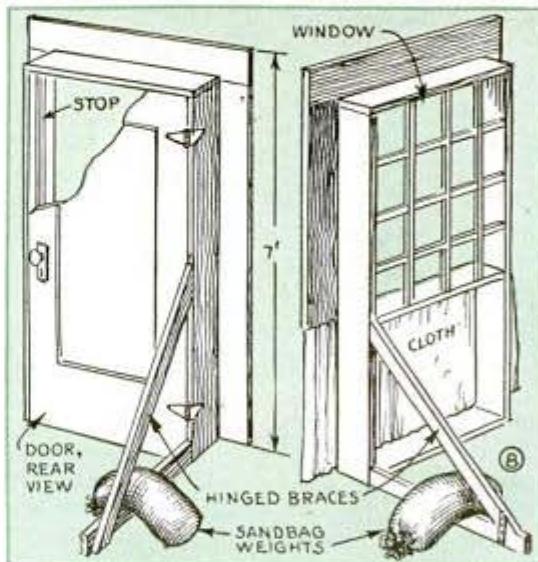


PROPS *stored in small space*

By Lester Lehnherr

AMATEUR drama clubs will find portable stage equipment a practical solution to the problem of storage, besides being relatively inexpensive to make. The props can be erected and dismantled quickly and have been found entirely satisfactory for the purpose. The cost depends on the size and number of the units, and on the type of material used for the hangings. You will find flannel inexpensive. It looks soft and rich under artificial light and can be draped nicely, but it is not as durable as rep or velvet, which are more expensive. Other suitable fabrics are bur-lap, duvetyne and monk's cloth.

The framework that supports the drops is shown in Figs. 1, 2, 3 and 6. Cross rails at the top, which may be 16 ft. long, are of 2 by 2-in. wood. Joints are reinforced by using additional lengths of the same stock overlapping the joined pieces and bolted to them. Or, the joints may be hinged together at corners, using loose-pin hinges. Each vertical support has two hinged braces, loose-pin hinges being utilized at the point indicated in Fig. 3, while a steel pin at the top of the support engages a hole in the cross rail. Sandbags can be laid on the horizontal parts of the braces. Staples or screw eyes in the cross rails permit quick attachment of the drops, which are fitted with pin-on drapery hooks, and are



reinforced with upholstery webbing to provide stiffness at the top edge as in Fig. 2. At the ends or at door openings the drop is brought around the vertical supports and fastened to them, Fig. 4. Valance boards over imitation windows can be hung from the cross rails with wire, Fig. 5.

Real doors and windows are set in wooden frames, which have support members hinged to the side members as in Fig. 8. Sandbags are necessary for stability. Screens placed at the ends of the drops provide a finishing touch, and conceal floodlights. See Fig. 6. When the play is over, the drops are rolled on the vertical supports as in Fig. 7.

Camper's Tent Frame Improvised From Oars, Stick and Pail



Assembled from equipment that can be found around almost any camp, this improvised tent frame can be set up quickly for an emergency shelter. A pair of oars and a stout pole of equal length are locked together in tripod fashion by dropping a pail over the upper ends as shown. Any piece of canvas or waterproof material available can be used for the covering.

Slender Wedges Remove Flooring Without Marring It

One of the most efficient methods of removing old flooring, drop siding or beaded ceiling is to drive long slender wooden wedges underneath it. The wedges can be made from lengths of 2 by 4-in. stock and



will loosen the flooring or siding very efficiently, after which the individual boards can be separated easily.

—Harry J. Ekdahl, Taylors Falls, Minn.

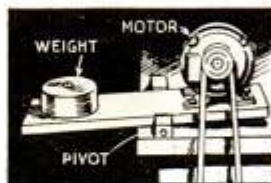
Chamois Held Tightly in Funnel With Old Piston Ring

When using a chamois or cloth to strain liquids through a funnel, an old piston ring of about the same diameter as the funnel provides a good retainer to keep the straining cloth in place. To remove the ring, simply press it together and lift it out.

—A. S. Wurz, Rockyford, Alta., Can.



Vertical Drive Belt Kept Tight By Counterweighting Motor



While it is not unusual to pivot a motor mounting so that the weight of the motor tends to keep the belt tight when it is at

the lower end, accomplishing the same thing with the motor at the top of the belt is another problem. However, this can be done by pivoting the motor mounting and then using a counterweight as shown. The weight should be just sufficient to keep the correct tension on the belt.

—W. F. Schaphorst, Newark, N. J.

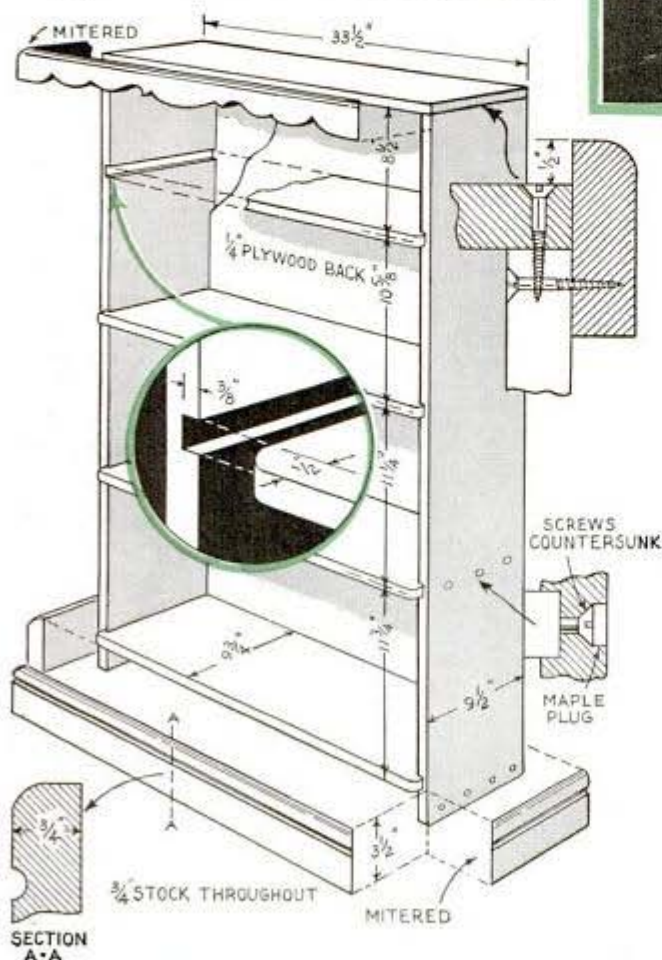
Leather Cover for Hand Grinder

Made of soft leather, this cover will protect the surface of a small grinder against scratches, and if the grinder is dropped, the cover will absorb some of the shock to help prevent breakage of the plastic case. A snap fastener of the type used on dress gloves holds the cover in place.

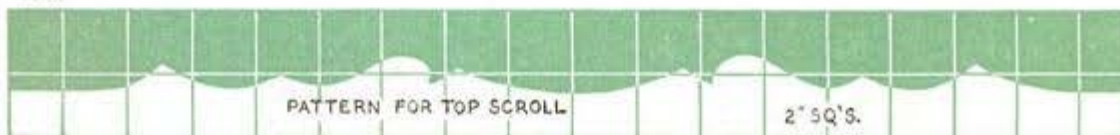


Open Bookcase in Maple

THIS simple bookcase is just the thing to go with maple pieces in your home, and it can be built and assembled with ordinary hand tools. While the whole piece can be made of maple, you can save on the cost by using maple for the sides and top, white pine for the shelves, and plywood for the back. The shelves and back are stained carefully to match the maple. The back is simply set in between the sides to make a



snug fit and then screwed to the rear edges of the shelves. If desired, it can be set in rabbets cut on the inner edges of the sides, and fastened to both sides and to the shelves with $\frac{3}{4}$ -in. flat-head screws, which gives the necessary rigidity. The scroll at the top is easy to cut with a coping saw. Both this and the trim at the bottom have mitered corners. After careful sawing, a hammer and chisel will groove the sides to take the shelves, which are screwed in the grooves, the screws being countersunk and plugged to hide them. The case is finished with maple oil stain and clear varnish. If you desire a reddish maple shade, add light mahogany oil stain to the maple stain. Follow the stain with a coat of shellac and two coats of rubbed-effect varnish as desired, sanding lightly between each coat. Rubbing with rottenstone will increase the rubbed effect besides removing dust specks.



Chain Underneath Closet Shelf Holds and Spaces Hangers



You can increase space in your closet considerably by suspending a chain underneath one of the shelves to support clothes hangers. Screw hooks or eyes can be used to attach the chain, after which the hooks of the clothes hangers are slipped into links to space them as desired.

Cart Sprinkler for Golf Greens Applies Poison or Fertilizer

Used for distributing poisons or liquid fertilizers on the greens of the Old Hickory Golf Club of Beaver Dam, Wis., this sprinkler has given excellent service. The front axle and wheels of a junked car are fitted with a welded frame, which provides han-



dles and a cradle for an old oil drum. A valve and a sprinkling pipe at the lower end of the drum spread the liquid.

Old Tire Rim Sunk in Ground Provides Boat Anchorage

Partly buried in the bank of a lake or stream, an old auto tire rim provides a good anchorage for tying up your boat. The rim will last much longer than a wooden post or large stake, and the boat chain cannot be slipped off when it is wrapped once or twice around the rim and locked with a padlock.



Crayon "Polish" for Shoe Soles



After cleaning a pair of white shoes and accidentally smearing some polish on the soles, I found that ordinary brown polish did not cover the white, and a damp rag only smeared it. Having a wax crayon

at hand, I rubbed it over the spots several times and covered them completely.

—Nick Destefano, West New York, N. J.

Grip on Scrub Brush Improved By Half of Rubber Ball

If you have occasion to use a heavy scrubbing brush for long periods of time, try cementing half of a sponge-rubber ball on the handle as indicated. The rubber provides a cushion for the palm of the hand and relieves much of the strain caused by gripping the brush.



Forced-Air Window Ventilator

Dampens Noise



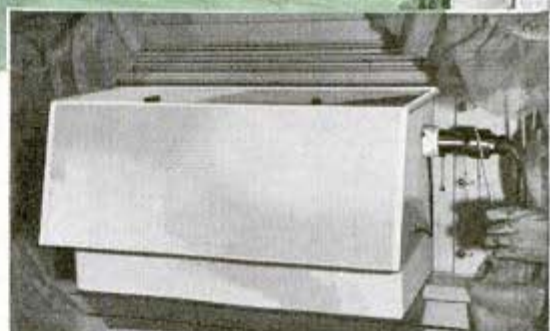
By Rollin H. Wampler

Two window boxes, one for entrance of air and the other for exhaust. Both keep out rain and are insulated to eliminate disturbing outside noises. Air, drawn in by electric fan is passed through a screen to keep out insects

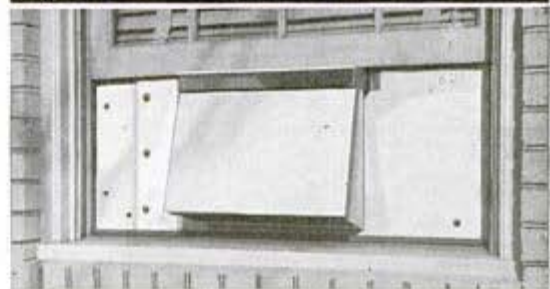
CONTROLLED ventilation without the annoyance of outside noise is inexpensively supplied in your sleeping room if you use a couple of window units like these. The rate of air change is variable, so that the air may be changed rapidly in hot weather and as slowly as desired in cold weather.

The system consists of two units: an intake, Figs. 2, 3, and 10, for one window, and an exhaust, Fig. 4, for another. Fig. 1 shows the units installed in a bedroom. The intake unit forces the fresh air into the room, giving it a positive pressure so that the stale air escapes through the exhaust unit. However, if the intake is closer than 3 or 4 ft. to your bed it may make an objectionable draft. In this case, either reverse the motor or the pitch of the fan blades so that the fan exhausts the air and produces a negative pressure. This induces fresh air to enter through the other unit and at the same time eliminates the draft around the motorized unit. A rheostat controls the speed of the motor.

Construction throughout is of water-



② INTAKE UNIT AS SEEN FROM INSIDE



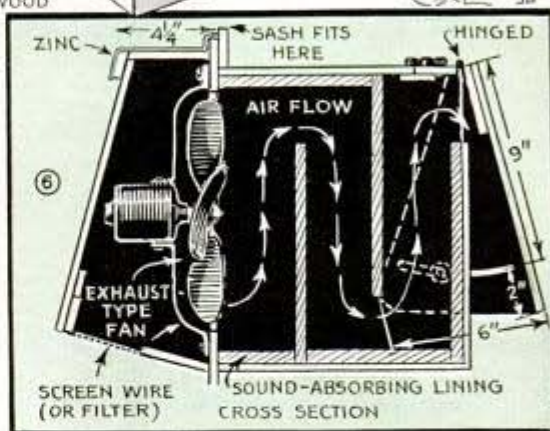
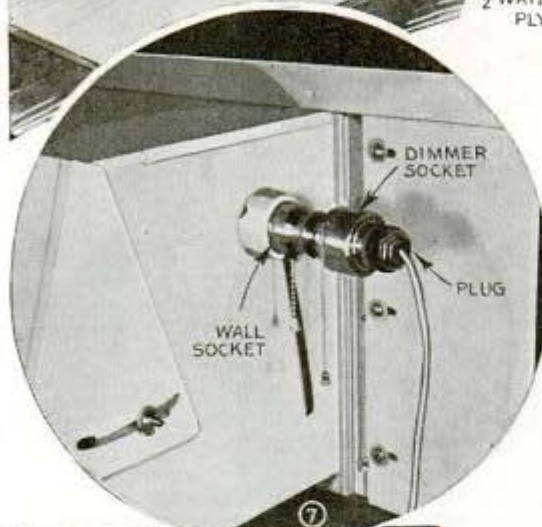
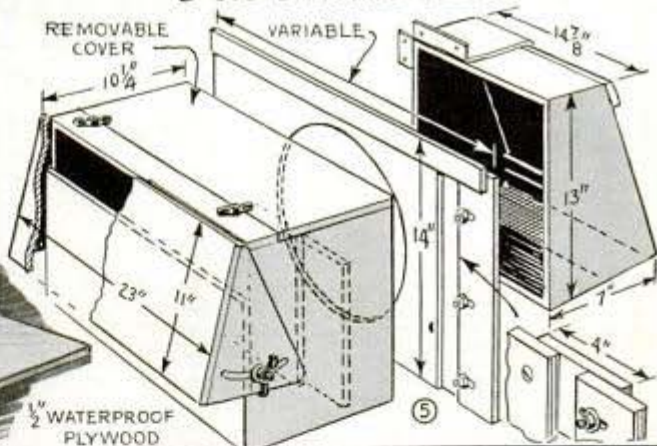
③ HOW INTAKE LOOKS FROM OUTSIDE



④ EXHAUST UNIT ON OTHER WINDOW

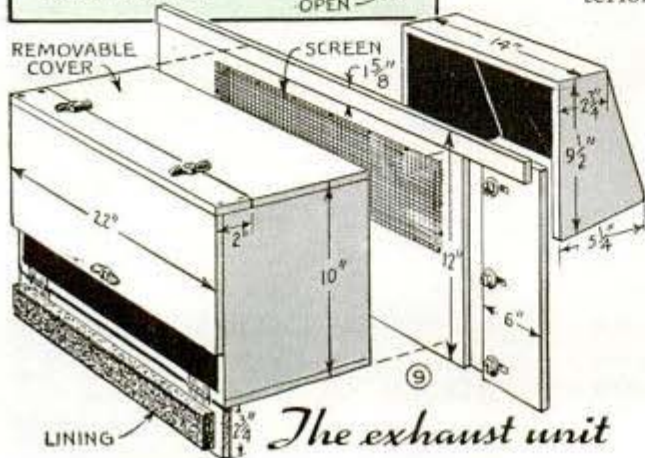
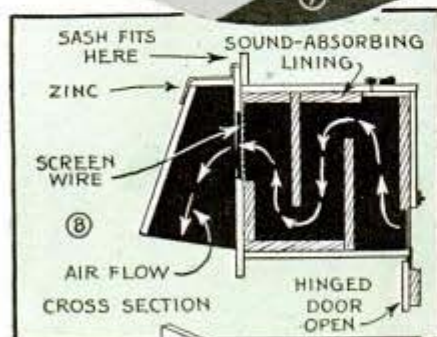


The intake unit

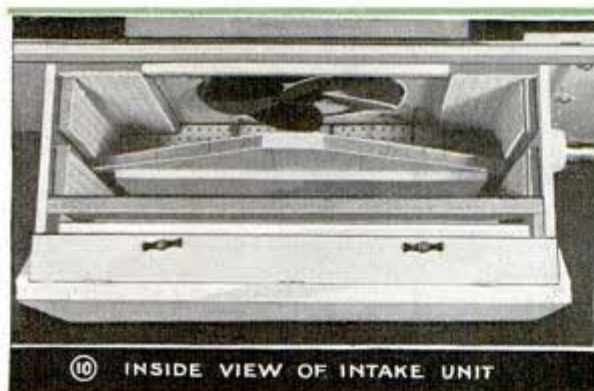


proof plywood and joints are fastened with screws and sealed with waterproof glue. Figs. 5 and 6 show the construction of the intake unit. It consists first of a plywood partition that fits tightly in the window, and is adjustable lengthwise by means of a slotted wing attached with three bolts. A 10-in. exhaust-type fan is mounted in the partition on pieces of rubber to eliminate vibration. Over the fan is built a box with removable lid to allow access to the interior. Air enters through a screened opening in the underside of the box, as seen in Fig. 6. The top is covered with a piece of sheet zinc as a further protection. If desired, an air filter can be substituted for the screen in both units, to minimize the entrance of dust and pollen.

On the inside of the partition is built the sound-absorbing box. It is lined entirely with 5/8-in. sound-absorbing wallboard, and has two baffles of the same material so arranged as to make the air flow over one, under another, and up again to the exit.



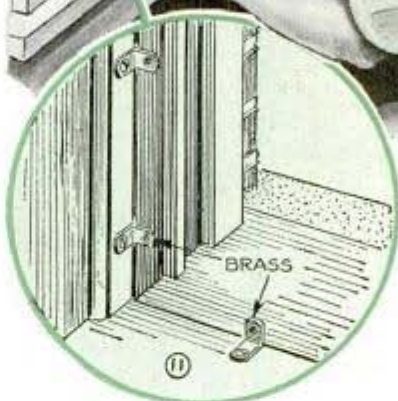
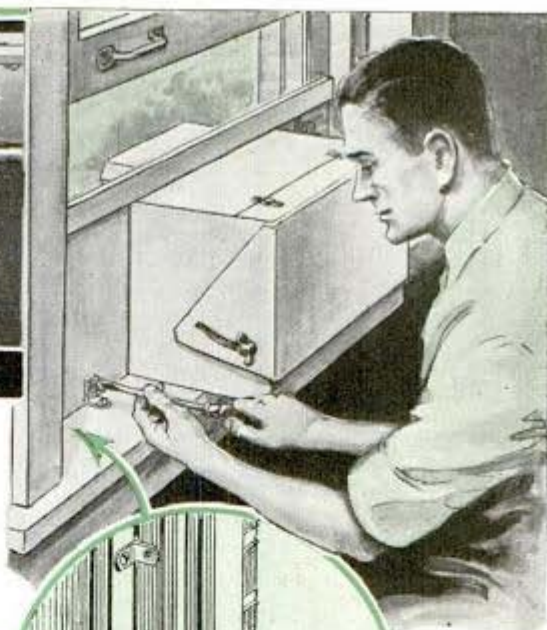
The exhaust unit



⑩ INSIDE VIEW OF INTAKE UNIT

Fig. 7 shows the rheostat arrangement at the end of this box. It consists simply of a socket into which is screwed an attachment widely used to dim an electric light bulb to any desired degree of brightness. The unit is fastened into the window by means of six brass angles, Fig. 11.

The exhaust unit is constructed in a somewhat similar manner except that no fan is used. Figs. 8 and 9 show details of its construction. In this case a rectangular hole is made in the partition that fits in the window. Screen is fastened over this hole and a box is built over the outside to keep out rain. A sound-absorbing box with two baffles is built on the inside. The opening into the room is at the bottom of the box and is fitted with a hinged door, which is closed when the system is not in use, as is the deflector on the intake unit. The main

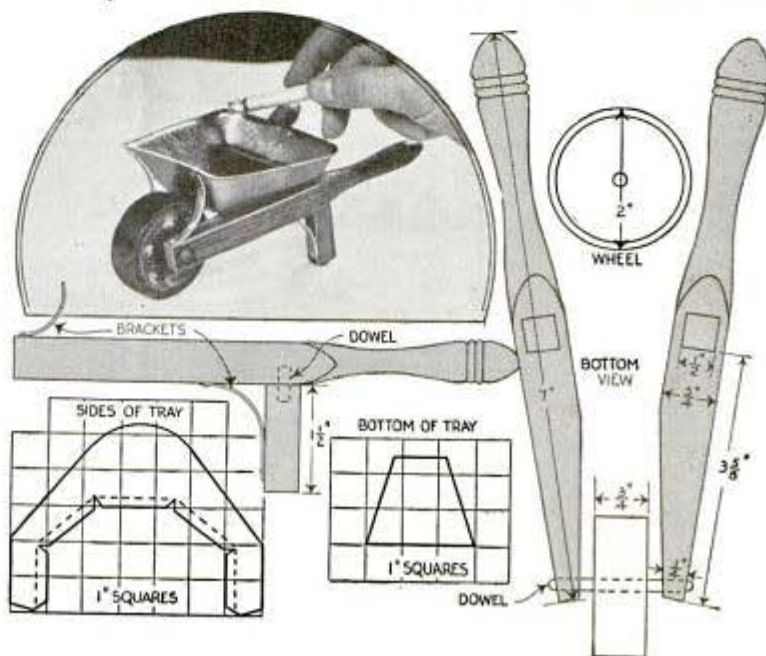


⑪

purpose of this exhaust ventilator is to absorb sound. It is not necessary if you only wish to introduce fresh air into the room and sound absorption is not an object.

Wheelbarrow Ash Tray Is a Novel Addition to the Den

A wheelbarrow built in miniature makes an unusual ash tray for use at your card games. Or, if desired, it can be used as a tidbit tray. The wheel, handles and legs are made of maple, and the body consists of two pieces of sheet copper shaped as shown in the squared diagrams and assembled with tiny copper rivets. A coat of clear lacquer will prevent tarnishing of the copper after it has been polished and the wooden parts can be waxed, varnished or stained to suit.—Fred Coffman, Columbus, O.



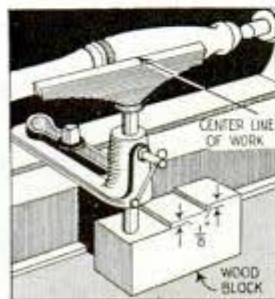
Towel Rack in Clothes Locker Saves Space



In order to save space and make it easy to remove clothes on a hanger from a small locker, one workman utilized a towel rack of the type having three or more pivoted arms. The rack was screwed to the inside surface of the locker near the door so that the garment he desired could be moved outside of the locker by merely swinging the arm. It will, of course, be necessary to form hooks on the ends of the rack arms so that the hangers will not slip off the ends.

Lathe Tool Rest Is Adjusted With Stepped Gauge

To set a woodturning-lathe tool rest quickly and accurately at the correct height for the work, I use a little three-step wooden gauge.



The height of the lowest step is such that when the gauge is inserted under the rest support and the set screw loosened, the vertical sliding rod will contact the gauge and bring the top edge to the center line of the lathe. The middle step being $\frac{1}{8}$ in. higher than the first one, locates the rest $\frac{1}{8}$ in. above the center line which is good practice for work of small and medium diameter. The third

step is $\frac{1}{4}$ in. higher than the first and sets the rest for larger work. In case the vertical support rod of the rest does not project at the lower end, a piece of steel rod may be used with the gauge to temporarily extend the support rod.

—W. C. Wilhite, Carlinville, Ill.

Slipping of Yardstick Avoided By Soaping Underside

When using a yardstick or straightedge as a guide in cutting a large pane of glass, rub the underside surface with a cake of laundry soap. This will help prevent slipping of the



guide so that a straight score can be made with the glass cutter. Brown soap is best as it has a tendency to adhere to the glass better than other types.

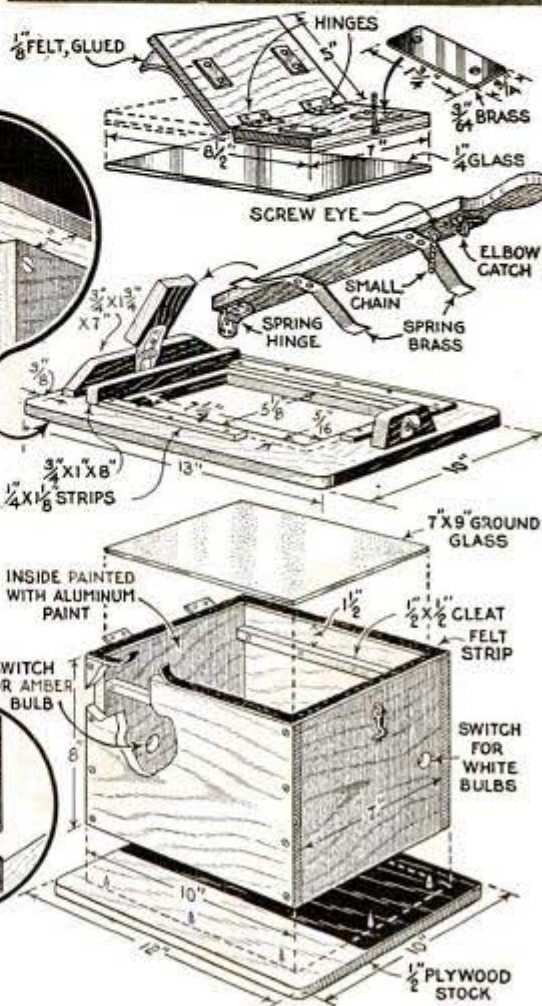
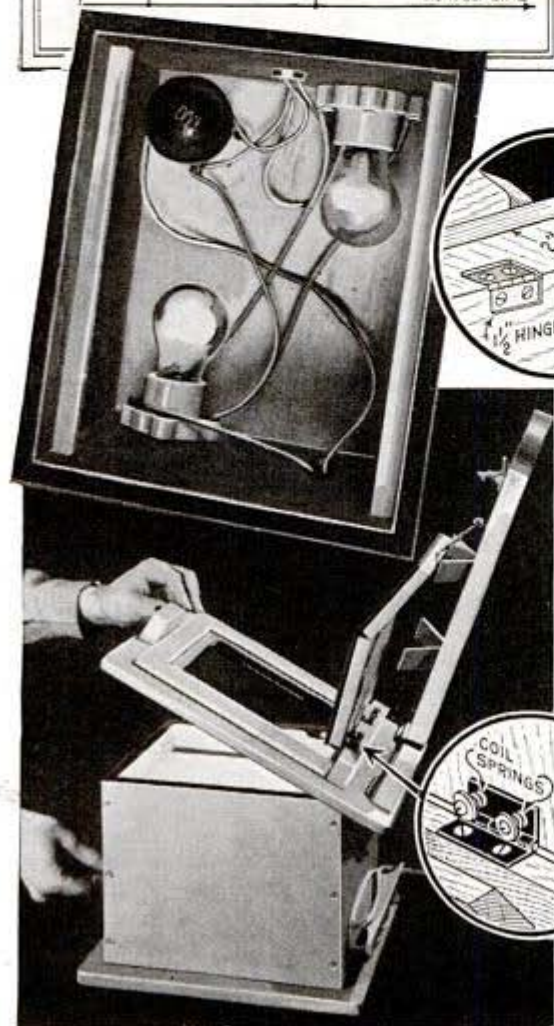
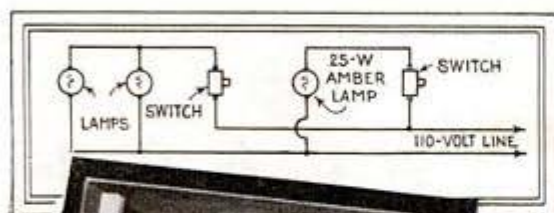
Tracing Wheel Aids in Caulking Seams of Leaky Boat

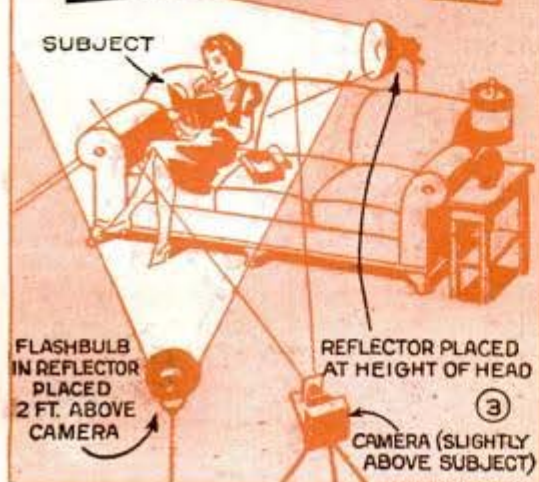
If you have no special tool at hand when the seams of your boat need caulking, you will find that a dressmakers' tracing wheel will serve the purpose. A tracing wheel can be purchased at most drygoods stores.



Small Photo Printer of Plywood Is Easy to Make

Particularly suited to the needs of amateur photographers who must do their work in small apartments or darkrooms, this printer is assembled almost entirely of plywood. It occupies only a small space and handles negatives up to 5 by 7 in. Fingertip control of the two printing lights is provided by a toggle switch mounted on the lamp box as shown. A spring hinge on the handle keeps it in an upright position when adjusting negatives. Special care should be taken in cutting and fitting the parts, especially those that make up the lamp box, to make sure there are no light leaks at the joints. The exterior surface can be either stained or painted.





FLASH

By Thomas P. Lake

YOU don't have to miss pictures if natural lighting is inadequate, because flashbulbs make it possible to take those hard-to-get photos. Take for instance a scene such as the interior of a dark dugout, Fig. 1. The interior was lighted by a flash while the outdoor background as seen through the opening was illuminated by sunlight. Other examples where flashbulbs are used to advantage are, unusual daytime outdoor effects, fast action photos, night scenes, interior studies and home portraits,—all within scope of the average amateur photographer. Where persons are the subjects of photographs as in portraits, flashbulb illumination has a distinct advantage over photoflood lamps, because the focusing and arrangement, which are more or less tiring to the subject, can be done under ordinary lights.

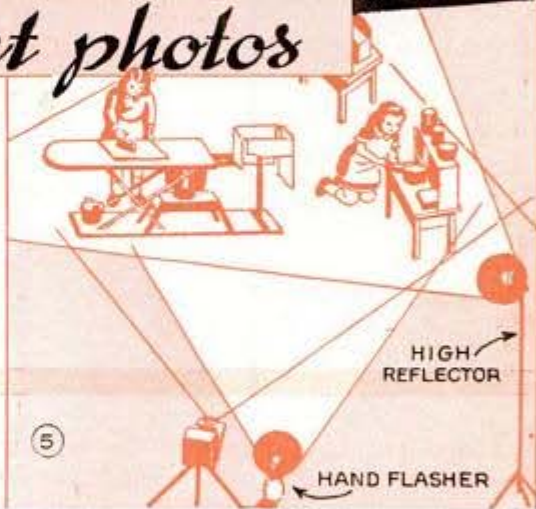
There are two methods of taking flash pictures. First comes the open-flash method, in which the bulb is flashed while the camera shutter is kept open. Then there is the synchronized-flash method in which the shutter is automatically opened only a portion of the duration of the flash. The first method is limited to situations where



those hard-to-get photos

about $\frac{1}{25}$ second is fast enough to stop motion, and where there is so little natural light that a "bulb" (hand-opened) exposure will not overexpose the film. The second method can be used in daylight as the exposure is limited only by the available shutter speeds of the camera.

Equipment needed for open-flash photos includes film having a fast panchromatic emulsion because of the high red content of flashbulb light, a tripod or other suitable rest for the camera, a hand flashgun or a socket with a switch and reflector to be used in the regular house circuit, and a few flashbulbs. The camera shutter must be capable of being set for either "bulb" or "time" exposures. For portraits as in Fig. 2, it is best practice to use two flashbulbs set in the positions indicated in Fig. 3, as this arrangement will produce some shadow effects that are far more pleasing than results obtained by using only one flashbulb near the camera, which





produces flat lighting. Pose the subject comfortably so that it will be easy to avoid motion for a few seconds. Place the camera on a tripod or other rest and compose the picture to get the best arrangement, holding a bright light such as a flexible desk light in the position the flashbulb will occupy. It need not be held near the camera but can be placed to obtain such interesting light and shadow pictures as the fireplace lighting effect in Fig. 9. Two flashbulbs on the same scene will produce a picture like that shown in Fig. 10. Similarly, two bulbs were used also in taking Fig. 4, their position being indicated in Fig. 5. When taking pictures like these it is often a great help to place a sheet of white cardboard outside of the camera range so that it will reflect some light into the deep shadows, which prevents them from be-

coming too black. However, for your first pictures it is advisable to follow the simple procedure of holding the bulb a little above and to either side of the camera. Carefully measure the distance from the subject to the flashbulb, from which you can determine the proper setting for the lens diaphragm. All makers of flashbulbs furnish accurate tables for this purpose, which are available where the flashbulbs are purchased. After setting the diaphragm, measure the distance from the subject to the film (back of camera), and set the focus accordingly. Then take a flashbulb and insert it into the flashgun, which may be an ordinary flashlight case adapted to hold medium-base bulbs and equipped with a suitable reflector. Turn off or reduce the lights in the room to avoid exposure from these sources, and when ready, make the exposure by first opening the shutter, flashing the bulb and then closing the shutter. A variation of the open-flash method is a combination of time exposure with a flash. In this case the normal light makes its impression on the negative during the time exposure, while the light of the flashbulb, usually directed on some object not receiving enough light from the normal sources, is superimposed at any time during the time exposure.

Flashbulbs require only a few volts to ignite but in this connection it should be remembered that low-voltage currents drop when run through long lengths of wire. When the bulb must be flashed from a position that makes it necessary to use a length of wire 20 ft. or longer, it is advisable to use fresh dry cells and to increase the voltage by adding another cell—a 3-cell flashgun. Many photographers use regular household current to flash their bulbs, using a pushbutton switch on an ordinary extension cord.

Synchronized flash pictures are possible by the development of flashguns that trip the camera shutter when set for a high speed, so that it is opened and closed at the peak of the flash. They consist of a battery case, which is usually fitted with a



socket for the flashbulb and a reflector, and a switch connected so that it opens the camera shutter either by a mechanical or an electromagnetic trip. If you are going to purchase a flash synchronizer, any good dealer will be able to recommend the type best suited for your camera. Pictures may be taken with a synchronizer in much the same way that they are taken with a hand flashgun, with the exception that the short exposures eliminate the need of a tripod. Synchronized flash is used where you want to "freeze" action as illustrated in Figs. 6, 7 and 8. In these cases the exposures were of exceedingly short duration. Notice how a synchronized



flash at high shutter speed, caught the thrilling basketball play in Fig. 6, where one player is entirely off the floor.

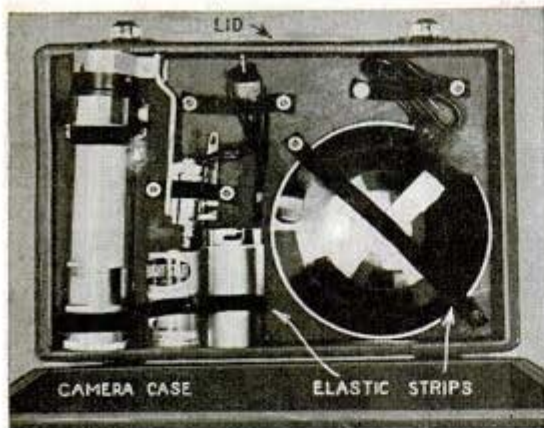
Guide Print Near Developer Tray Aids in Judging Tones

Difficulty encountered by most amateur photographers in judging, by the light from a safelamp, when a print has been developed sufficiently, can be overcome by the use of a guide print set up near the developing tray. Make a good glossy print, developing it for a full range of tones, and squeegee it to a piece of glass. Place the glass so it will receive the same illumination from the safelamp as a print in the tray. Full development of prints is assured by comparing them with the guide print until the same depth of grays is secured.

—Kenneth Murray, Colon, Mich.



Space in Camera-Case Lid Used To Store Accessories



There is considerable space in the lid of a camera case like the one shown, which can be used to store several accessories. These are held in place by strips of black elastic, fitted with grommets and screwed

to the inside of the lid. Of course, the accessories are arranged so they will not interfere with the contents of the case when the lid is closed.

—W. C. McHenry, Washington, D. C.

Waxed Reel of Developing Tank Makes Film Loading Easy

Before you load the next roll of film in your developing tank, wax the grooves in the reel. To do this, roll a piece of waxed paper like a bread wrapper



into a convenient shape and run it around the grooves of the reel. Then the film will slide in with surprising ease without catching or buckling.

—R. M. Thigpen, East Falls Church, Va.

Build "Falcon"—18-Ft. Runabout or Cruiser



Set of
Ten Plans
Available
for \$2.50



This sleek, roomy, modern craft incorporates the latest developments in boat construction, and the method of building eliminates many troublesome problems that confront the average novice. It is powered by an inboard motor (5 to 20 hp.); makes a speed of 17 m.p.h. with a 20 hp. motor; seats eight passengers; has a 66-in. beam, a 12-in. draft and a total depth of 42 inches.

Construction was completely described in the April to and including September, 1941, issues of Popular Mechanics Magazine. These articles show and tell how to build it as a runabout and how to add a cabin. If you do not have copies of these issues, they can be obtained for 25 cents each or the set of six for \$1.50. Order the plans by number—Nos. 1070 to 1079 incl. These give summary of procedure and the material list. Both plans and back issues sent postpaid for \$4.00 and can be returned if you are not fully satisfied.

"SKIPPER"—1018 to 1023: 14-ft. outboard runabout that can be built for \$30 to \$40. 54-in. beam. Weight about 275 lbs. Carries five passengers. Powered by 4 to 24-hp. outboard. 6 prints \$1.50.

"ROAMER"—765 to 770: Outboard cabin cruiser. 16 ft. long, 66 in. beam. Requires outboard motor of 20 to 36 hp. Set of six prints \$1.50.

"HI-HO," 14-FT. FAMILY RUNABOUT—840 to 845: Powered by 11 to 22 hp. outboard or light inboard motor. Beam 58 in. Set of six prints \$1.50.

"ARROWHEAD" SLOOP—944 to 951: A fast and able sailboat that handles easily and can be built by average craftsman as ribbed hull is constructed over form. Over-all length is 21 ft., beam 5 ft. 11 in. Accommodates up to 10 persons. Weighs about 750 lbs. Set of 8 prints \$2.00.

"SEA SAUCER"—893: Lightweight sailboat. Length 9½ ft. Beam 4 ft. Deck, bottom and sides are 3/16-in. plywood. Just the thing for small lakes. 25c.

15-FT. ROWBOAT—644: Flat bottom, all purpose. Heavy transom provided to carry outboard motor. Covered forward deck. Has three seats. 25c.

12-FT. UTILITY ROWBOAT—707: Flat bottom, four seats. Very sturdy design. Fine for boat livery rental purposes on small lakes. 25c.

CANVAS-COVERED KAYAK—928 and 929: Light framework covered with canvas. 17 ft. in length and weighs about 40 lbs. One-man size. Two prints 50c.

16-FT. CANOE—811 and 812: Canadian type. Has cedar planking covered with canvas. Steady on water and easy to paddle. 33-in. beam, weight 70 to 80 lbs. Two plans 50c.

Address Plan Service, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

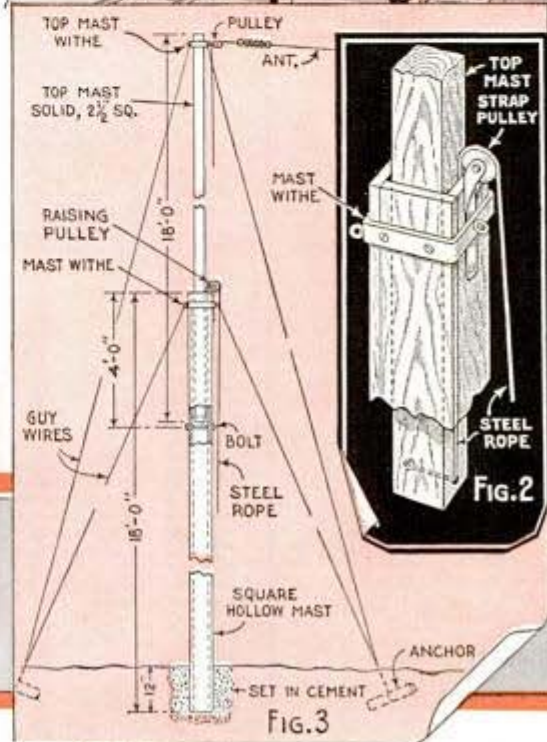
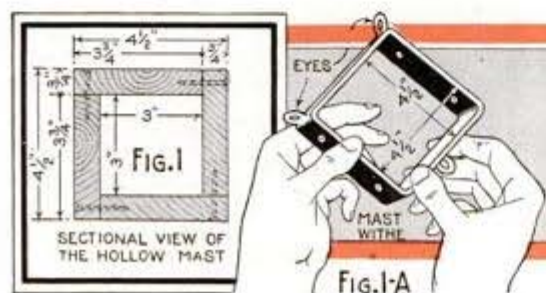
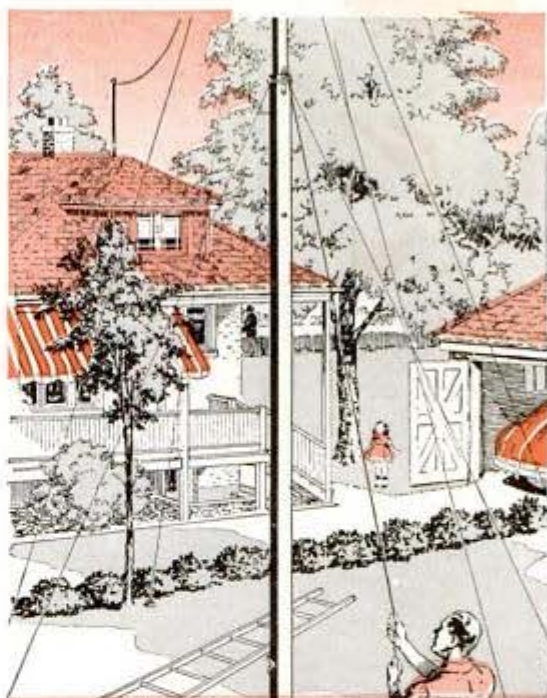


One-Man Telescoping Antenna Mast

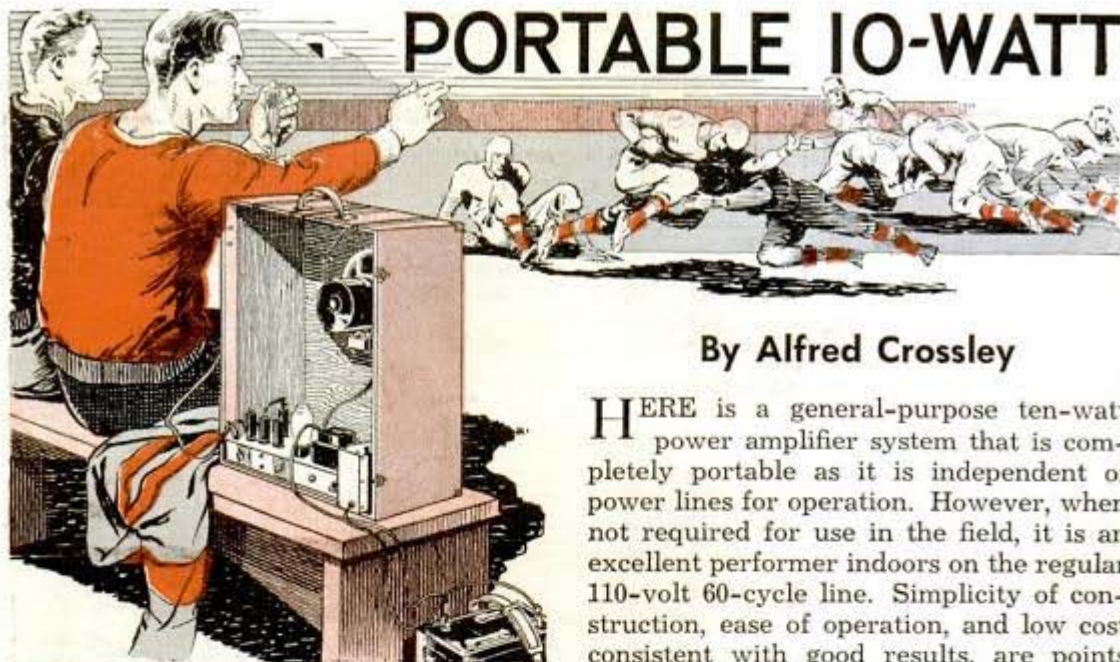
THIS simplified form of the popular homemade telescoping antenna mast is inexpensive and easy to build. It has the advantage of one-man operation, easily extends to a height of 32 feet, and, when lowered the top pulley can be reached with a 16-ft. ladder.

The main mast consists of a hollow square box, a cross section of which is shown in Fig. 1. This is made of four straight 18-foot lengths of $\frac{3}{4}$ by $3\frac{3}{4}$ -in. pine. Give the inside surfaces of the boards a coat of paint, and use 2-in. galvanized nails spaced about 4 in. apart. When completed give the outside two or three coats of paint.

Bolt the strap pulley close to the top end of the box so that the pulley comes above the top as indicated in Fig. 3. The strap-iron mast withe, detailed in Fig. 1-A, has three eyes welded in for guy wires, and is bolted around the pulley strap. The top mast member consists of an 18-foot length of clear spruce $2\frac{1}{2}$ in. square. Give this 2 or 3 coats of paint and fasten a smaller 3-eye mast withe to the top end, and a half-yard pulley to one of the eyes. Bore a hole through the stick a few inches from the bottom for fastening the end of the small steel rope as indicated in Fig. 2; also run a bolt through the main mast for the bottom of the top mast to rest on. The guy wires are anchored 10 ft. out from base of mast. See Fig. 3 for complete installation details.

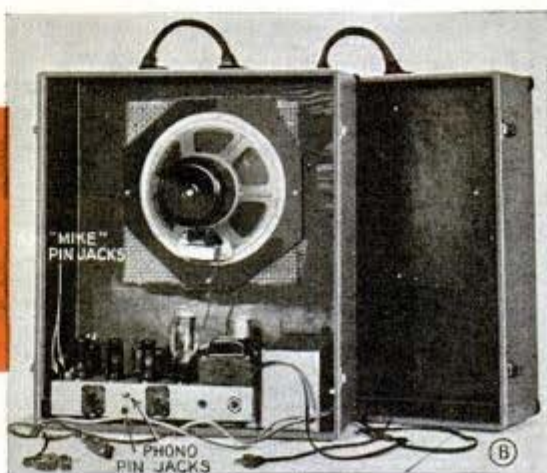
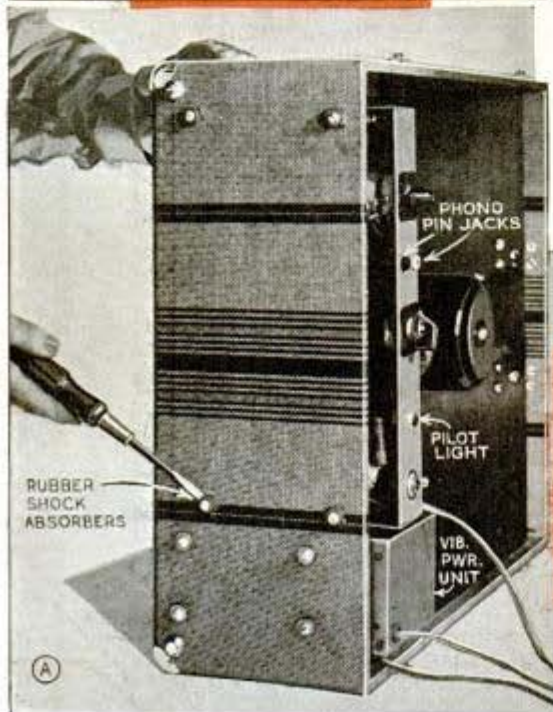
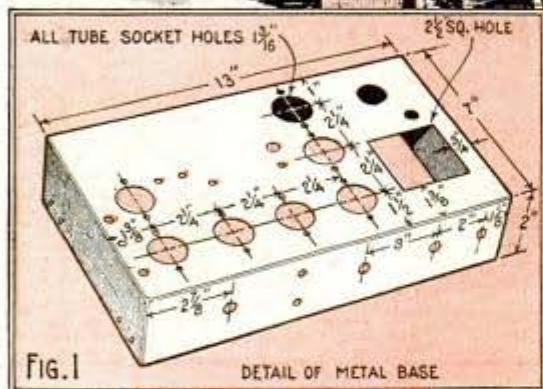


PORTABLE 10-WATT



By Alfred Crossley

HERE is a general-purpose ten-watt power amplifier system that is completely portable as it is independent of power lines for operation. However, when not required for use in the field, it is an excellent performer indoors on the regular 110-volt 60-cycle line. Simplicity of construction, ease of operation, and low cost consistent with good results, are points that have been well considered in the design of this flexible sound system. Numerous outdoor applications will present themselves to the builder as 10 watts of audio power, free from distortion, available from a compact portable unit that can be placed in service instantly by merely clipping a short cable from a built-in vibrator power unit to an ordinary 6-volt storage battery, has many possibilities. The school coach will find it useful in directing football practice and other field and track activities. Salesmen, auctioneers, musicians, political speakers, camp instructors and entertainers all find a battery-operated system of this type very useful. Indoors, on power line operation, it serves in small auditoriums for audiences of from 600 to 700 persons. Ideal for amplifying stringed instruments, record



Capacity Bridge Costs About One Dollar to Build



NOW you can measure the capacity of those fixed condensers of unknown value that you have in your junk box and put them to work in your next receiver. Only a few radio parts are required for this simple instrument which is based on the well-known bridge circuit, using the 60-cycle a.c. house voltage for a signal source.

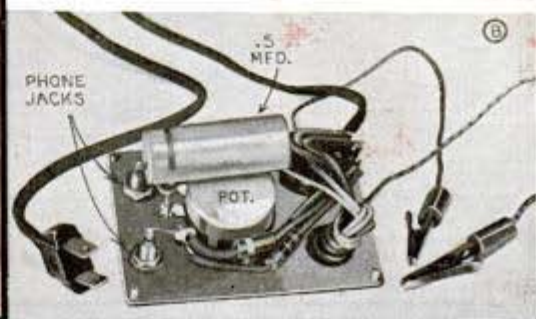
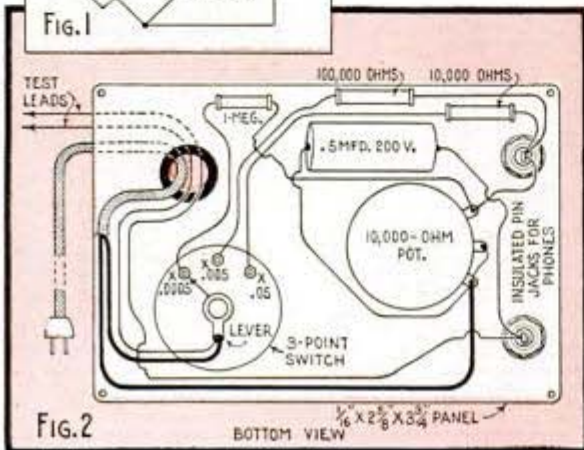
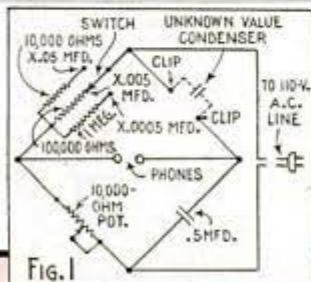
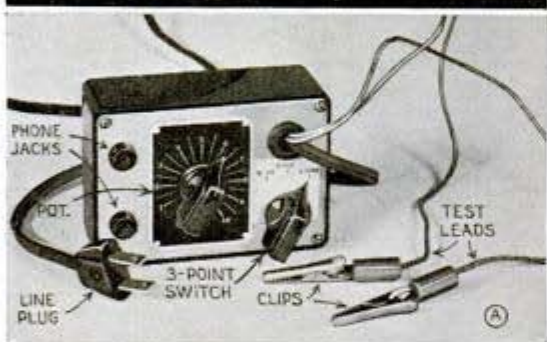
Capacities from .0005 mfd. to .5 mfd. of both the tubular paper and molded mica condensers may be measured within an accuracy of 20 percent. The 1/2-watt fixed resistors and .5 mfd. paper tubular condenser are the usual inexpensive type obtainable at any radio supply house. Greater accuracy may be obtained by using closer tolerance resistors and condenser; however, for other than laboratory use, greater accuracy is not necessary. The range selector switch may be any small single gang, 3-contact rotary switch. The potentiometer used in the original model is an I.R.C. type W10,000; however, any good 10,000-ohm wire-wound variable resistor may be employed if it has uniform resistance, without taper. Two insulated type phone-tip jacks, a volume control plate marked 0 to 10, and 2 pointer knobs complete the radio parts required.

All parts are mounted on the sheet metal panel as shown in the simplified wiring diagram, Fig. 2, and photo B. The instrument is housed in a small wood or Bakelite case 3 7/8 by 2 3/4 by 1 1/16 in. A schematic circuit diagram is given in Fig. 1. Use spaghetti sleeving on the resistor and condenser leads to prevent shorts.

The range switch dial was cut from a calling card and is fastened under the nut that holds the 3-point switch. Mark the dial at the three multiplier positions shown in Fig. 2; reverse sequence for top view as in photo A. In operation,

connect the test clips to the leads of the condenser to be measured, plug in the phones and insert line plug in an a.c.

(Continued to page 184)



*Jensen Radio Mfg. Co.
6601 Larabue Chicago*

Helpful RADIO HINTS

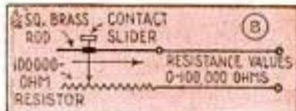
Bro. Radio, Inc. 5205 Cedar Ave. Cleveland Ohio

*General Electric Radio Corp. 1733 Milwaukee Chicago
570 Lexington Ave New York*

(A) Designed for either desk, wall or instrument-panel mounting, this sturdy and compact P.M. speaker handles up to 5 watts. Speech reproduction is clear and crisp, over-riding high room noise levels. The desk-wall type is enclosed and provided with tilt adjustment and base



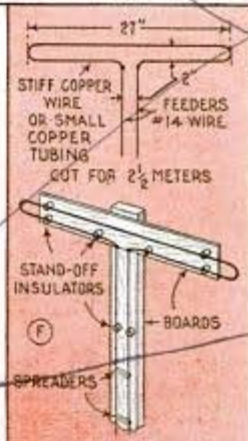
(B) Substitution resistor tester easily made with a single 50-watt 100,000-ohm wire-wound resistor assembled on a wood baseboard with contact slider. Serves for determining the correct resistor value to employ in any radio circuit. Providing a temporary substitute for various resistance values under operating conditions. (C) Inexpensive wave meter is accurately calibrated for all amateur bands from 10 to 160 meters. Has band switch



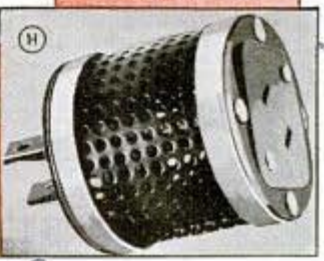
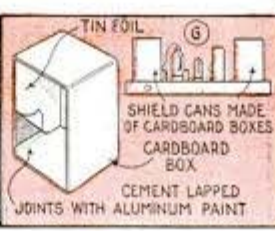
(E) Compact and easily portable, the battery-operated broad-band signal generators shown in Figs. 1 and 2 are especially useful for troubleshooting in automotive receivers. Unit Fig. 1 is 6½ by 4½ in. square and weighs 4½ pounds with batteries. Unit 2 is a pocket variety multivibrator type



(F) Simple folded ultrahigh frequency antenna cut for 2½ meter operation. Heavy bare copper wire, or copper tubing of small diameter, is bent into a double hairpin so that the ends meet across a 2-in. space; 3-in. porcelain stand-off insulators support this on the top of the "T." Space feeder wires 2 in. apart and fasten with stand-off insulators and 2-in. spreaders. (G) Cardboard boxes lined with tin foil make good substitutes for aluminum cap shields. Ground foil to metal chassis



(D) Non-spillable 2-volt storage battery powers this portable set. Connected to a.c. line the battery is re-charged during operation. (H) Automatic line-voltage regulator



*Clarostat Mfg. Co.
285 N. 6th Brooklyn, N.Y.*

D.A. Pachter Co
**Five-Tube Superheterodyne
 For Baseball Fans**

*merchandise mail
 Chicago*



Eight inches in diameter, and covered with horsehide, this replica of a baseball houses a 5-tube receiver with dynamic speaker and built-in antenna. Mounted on Bakelite base with bright metal trim; operates on 110-volt a.c. or d.c. line supply.

Radio Compass and Receiver



This compact radio compass provides small boat owners with a means for taking accurate bearings, and facilities for the reception of broadcast entertainment. It also includes the 1200-3000 kc. marine band. Accurate

Leas. Ana. dno

Null indications are provided both visually by a tuning eye and aurally by headphones. Operates on 6-volt storage battery.

Hayden, Chi

Three-Band Aviation Portable

Bringing complete radio intelligence within the reach of all who fly, this portable receiver features an extra band for airways communication, a.c.-d.c. and dry cell operation, and a built-in interphone system for intercommunication between cockpits. In addition to a built-in loop antenna for use on the ground, it also provides a special plug-in connection for using an external antenna on board aircraft, as well as a ground connection. Tuning range provides complete coverage on aeronautical and broadcast frequencies. Photo shows "mike" and headphones plugged in.



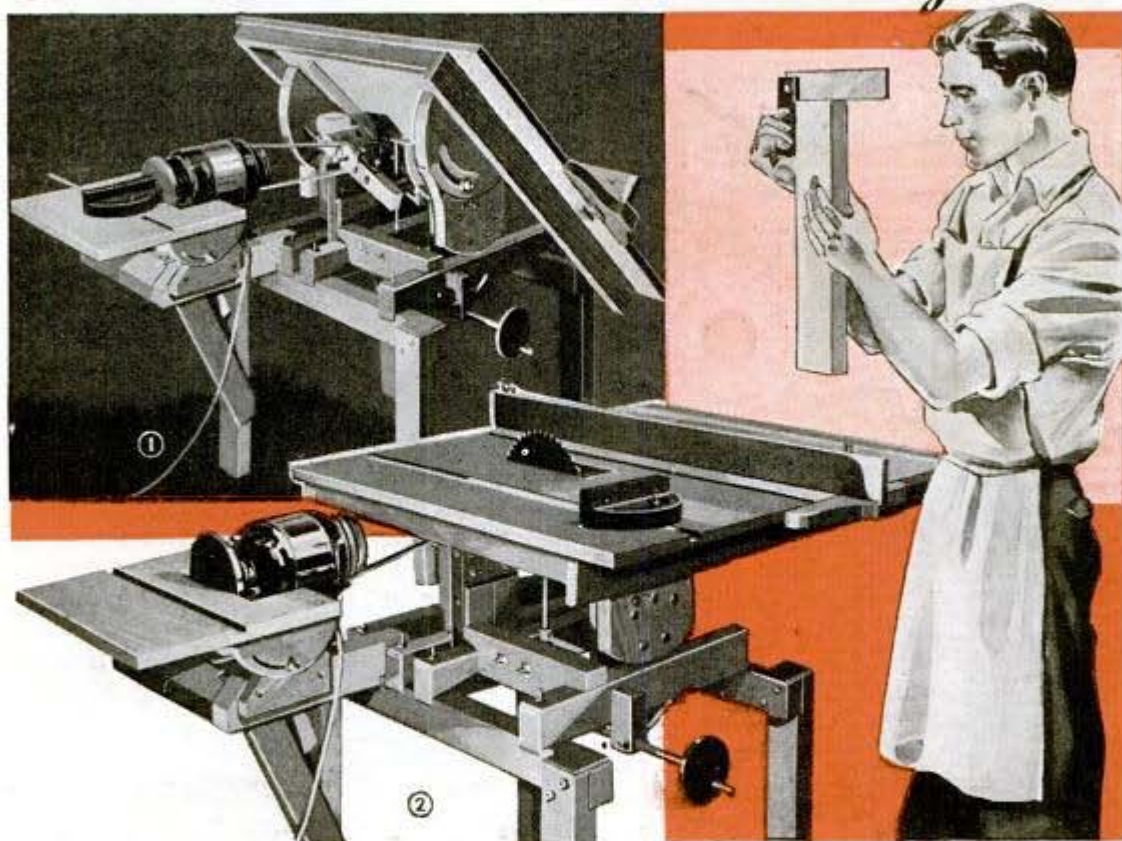
Blueprints covering simplified radio construction articles in this and past issues are available for 25c each. Many popular tested circuits to choose from. Original detailed parts lists with names of supply sources, can be obtained from Popular Mechanics Radio Department upon receipt of postage.

NEXT MONTH—"DX" Economy Special for Beginners. Although only a handful of inexpensive radio parts are required to build this simple "breadboard" type receiver, it is a real distance getter. It employs a single tube that operates directly off your power line; B-battery requirements are taken care of with a 27c "C" battery.



SHOP NOTES

SAW-SANDER UNIT *has tilting tables*

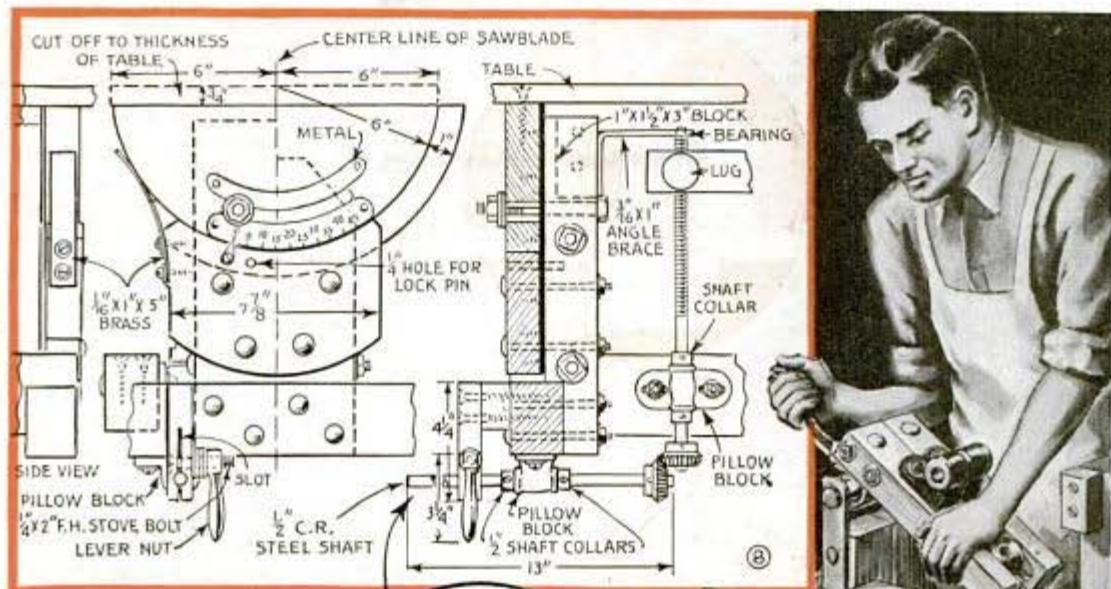


By **CARL W. BERTSCH**

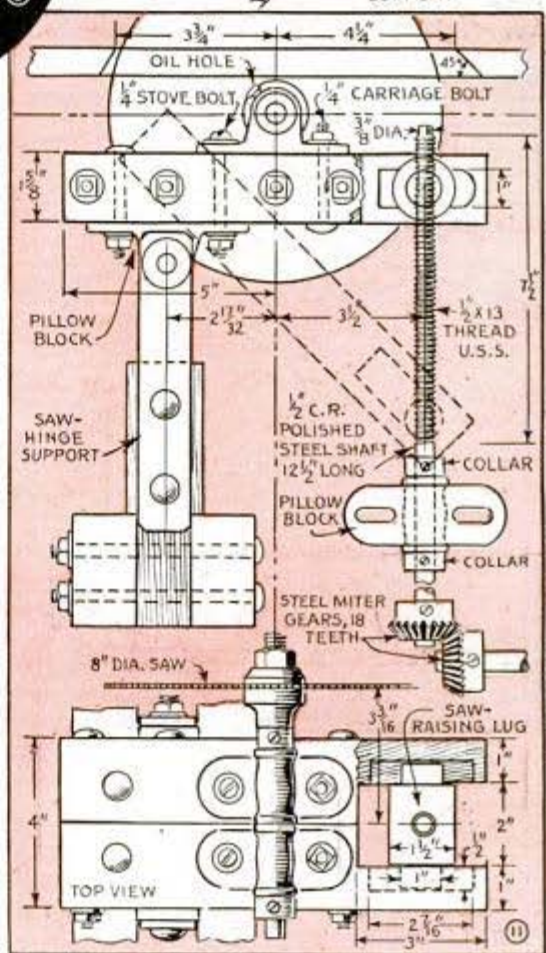
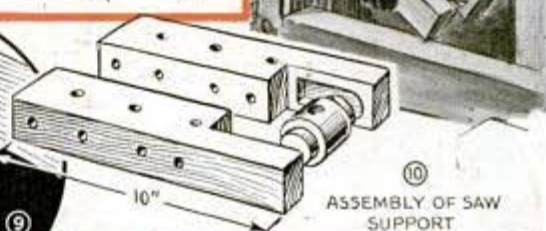
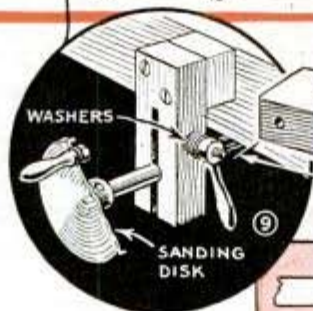
THIS combination workshop unit features an 8-in. saw having a 30 by 36 in. table that tilts 45 degrees, Fig. 1, a swinging saw mandrel, and a direct-drive disk sander. A $\frac{1}{3}$ -hp. motor operates both machines as shown in Fig. 2.

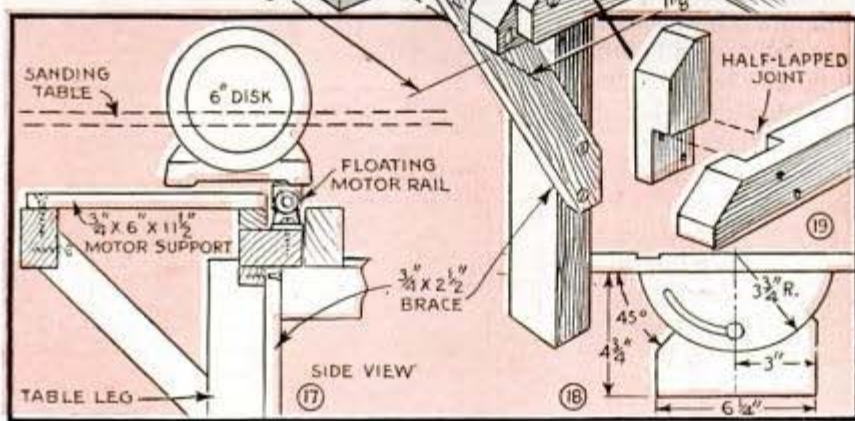
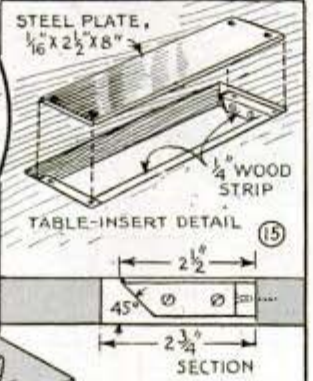
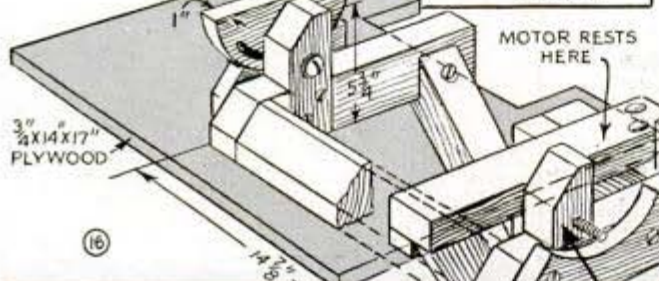
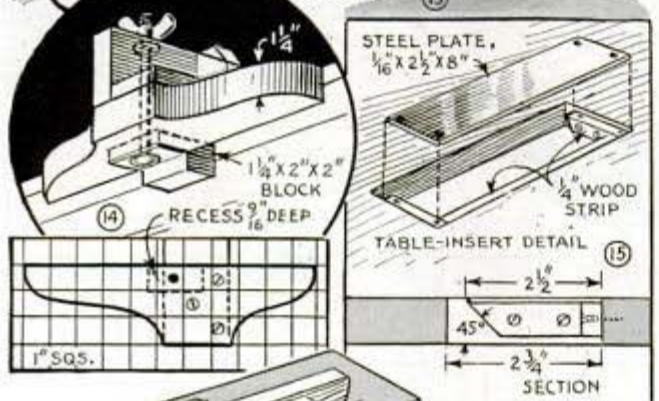
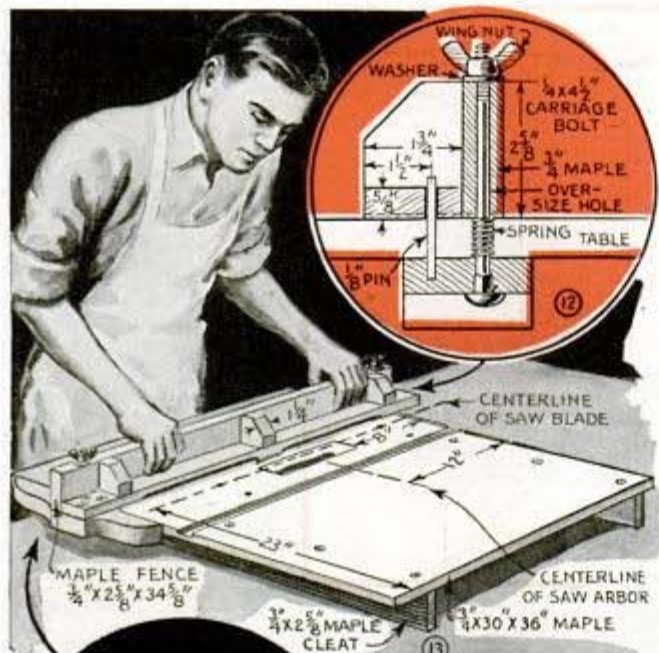
Construction begins with the stand. From Fig. 7 you can see clearly how it is put together with $\frac{1}{4}$ -in. carriage bolts. All stock measures 2 by 3 in., and note that the upper ends of the legs are notched for rigidity. The position of the two-piece front and rear trunnion supports can be marked at this time, and the holes drilled, but it is

best not to bolt them to the stand until after the complete trunnion assembly has been attached. The saw hinge support, detailed in Fig. 5, is set $4\frac{3}{8}$ in. in from the end of the rails between which it is bolted. Now for the trunnions and their slides. Make these of $\frac{3}{4}$ -in. birch or maple and take pains in laying them out from the pattern given in Fig. 8. The concave edge of the slide must make a perfect rubbing fit with the trunnion, and the curved bolt slot should equal the curve of the trunnion so that the latter will not bind. To the back side of each trunnion and its slide, guides



latter should move freely in the routed opening with very little side play. Standard bronze-bushed pillow blocks set end to end serve as a bearing for the saw mandrel and as a hanger for pivoting the block between the arms of the saw hinge support. See Figs. 5 and 7. The exact position for mounting the pillow blocks is given in Fig. 11. To align each pair of blocks it may be necessary to shim them with thin pieces of metal. Fig. 4 details the saw mandrel which can be made by threading the end of a length of standard steel shafting and fitting it with a flange. Collars are used on the mandrel at each end of the bearing. The mandrel block must swing without side play and for this reason the holes in one of the flat-iron arms of the hinge support should be slotted to permit adjustment. The vertical spindle passing through the lug is turned down at the upper end to engage a hole in an L-shape bracket attached to the trunnion support, while at the bottom it is held by a pillow block which is fastened to a cross rail. See side view in Fig. 8. By means of steel miter gears the shaft is extended through a second pillow block to the front of the stand and fitted with a handwheel which can be made from a small sanding disk. A simple arrangement for locking the shaft is shown in Fig. 9. Now for the table and fence. The former is built up of random widths of maple, using dow-





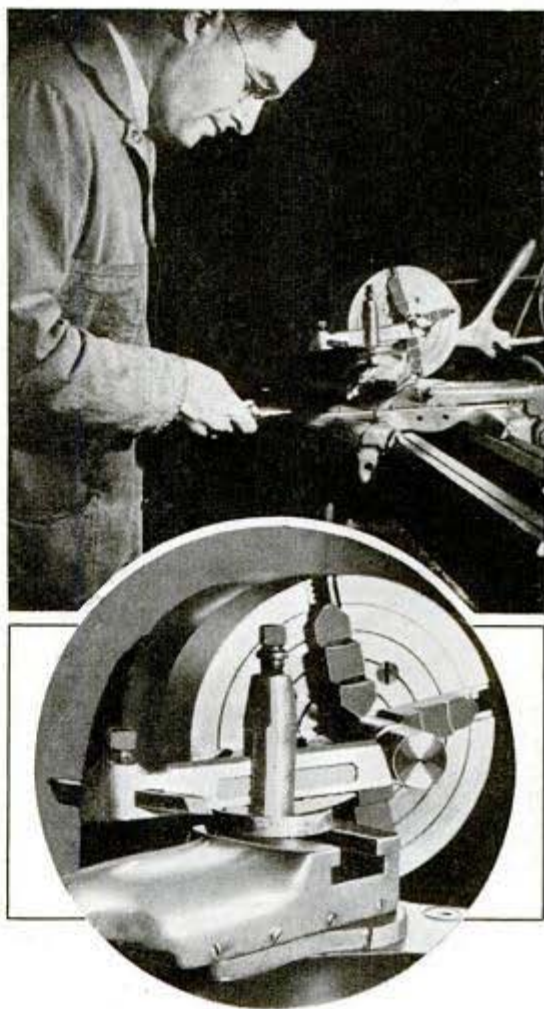
els and glue. The blade opening is cut to the size given in Fig. 15 and is fitted with cleats to support a metal insert plate. After this, $\frac{3}{8}$ by $\frac{3}{4}$ -in. grooves are cut in the surface on each side of the blade opening to accommodate a standard miter gauge and then cleats are screwed to the underside as in Fig. 13. The underside of the table above the 2-in. mandrel pulley must be recessed to clear the latter when the blade is raised to its maximum height. The table is attached to each trunnion with three flat-head screws, aligning the grooves so that they are parallel with the saw blade. The T-square fence is undercut to ride the table at three points. Figs. 12 and 14 show how bolts and wingnuts are fitted at the front and rear to clamp it in position. With a T-bevel set at known angles, the scale on the front trunnion can be marked for degrees by holding the bevel in contact with the table and the blade. A lock pin fitted through the front trunnion permits the table to be returned quickly to a horizontal position without need for checking the angle each time.

The framework of the sander and its tilting table, which is practically the same as the saw, is detailed in Figs. 16 to 19. Fig. 17 shows how the motor is mounted on a standard motor rail and fitted with a shelf on which to set when it is not belted to the saw. A 4-in. pulley on a 1,750 r.p.m. motor drives the saw at correct speed.

Three or four coats of clear lacquer or shellac will give the tables a smooth surface. Rub each coat lightly with No. 5-0 sandpaper and finish with wax.

Centering Work in an Independent Lathe Chuck

Micrometer collars on the cross-feed screw of a machine lathe can be used as an aid to center work in a four-jaw chuck. To do this, first center the jaws on the work as nearly as possible by watching the relation of the jaws to the circles cut in the face of the chuck body. After this has been done, the amount that the work is off center can be seen by rotating the chuck with your hand. This off-center condition can be corrected somewhat further by loosening the screw holding the work away from center and tightening the opposing screw. To finish centering the work accurately a tool holder is reversed in the tool post so that the smooth end can be brought up against the work by means of the cross-feed screw. Before doing this, however, the chuck must be turned so that one pair of jaws is horizontal. Now, note the reading on the scaled collar of the cross-feed screw, then back off the tool and take another reading with the chuck turned exactly one half revolution. The difference between the two readings is twice the amount that the work is off center. The chuck jaws can be adjusted to bring the work to center, as an accurate check of the movement can be made by readings taken from the cross-feed screw movement. When the work is centered in one direction, repeat the operation with the other pair of jaws.—John M. Avery, Holley, N. Y.



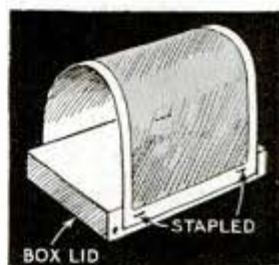
Bottomless Pail Raises Paste Bucket for Paper Hanger



Instead of setting his paste bucket on the floor where he has to stoop to reach it, one paper hanger places it in an inverted pail that has the bottom removed. The bucket wedges in the bottom opening of the pail so that the two may be carried as a unit.

Flypaper Stapled to Cardboard Is Moved About Easily

To keep sheets of flypaper from being blown about and to make them easy to move around, a grocer clips them to lids of cardboard boxes with paper staples.



Basket Held Under Grain Spout By One Hand When Filling



The difficulty of holding a large basket under a grain spout and operating the shutoff slide can be overcome by attaching a hook and strap to the spout as shown. The hook supports one side of the basket, leaving one of the workman's hands free to operate the slide.

One Man Crosscut Saw Started With Aid of Iron Pin

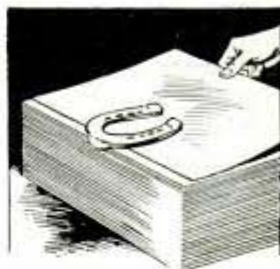
A woodsman who works alone with a one-man crosscut saw solves the problem of starting the saw to fell a tree by using



an iron pin as indicated. This is driven into the tree horizontally at the point where the saw is to be started. In this way, it serves as a rest for the back of the saw which then can be started true with ease.
—Charles H. Carr, Youngstown, Pa.

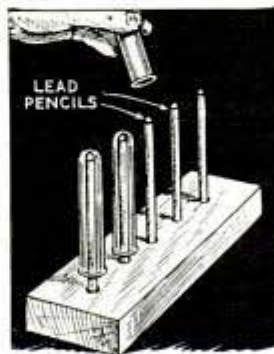
Horseshoe Paper Weights Permit Removal of One Sheet

In print shops and other places where paper sheets are often kept in stacks, horseshoes make good weights to keep the papers from blowing about. If the



shoes are placed on the stacks with the calks projecting over the edges as shown, one or more sheets can be removed without the weights being dislodged.

Pencil Erasers Provide Cushions For Test Tubes on Rack



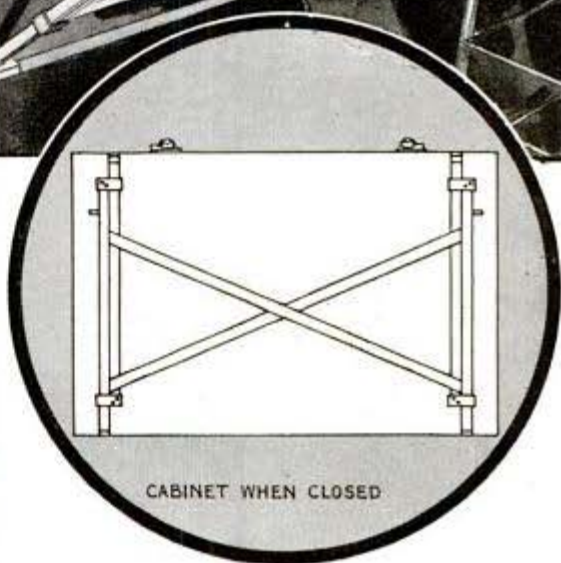
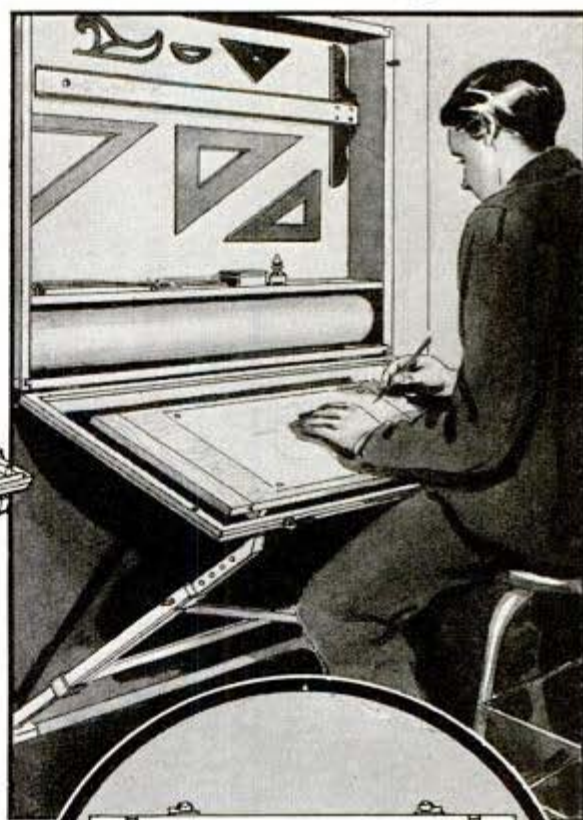
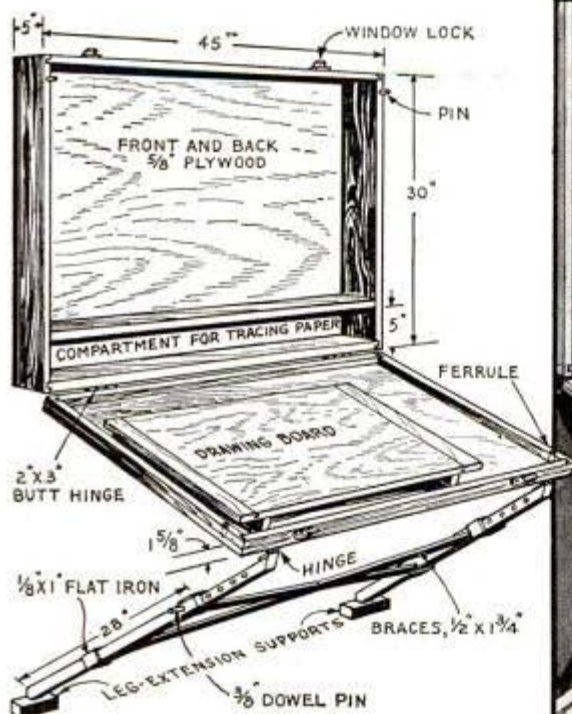
To avoid the possibility of breaking test tubes when dropping them over pegs for storage, use cheap lead pencils for pegs. The erasers of the pencils provide cushions on which the tubes drop.

Sack Held Open With One Hand While Sweeping Workbench

Nailed to the underside of a workbench, two empty thread spools will help you hold a sack open to receive dust and shavings while cleaning the bench. In this way, only one hand is required to hold the sack, leaving the other one free to use the brush.



Drop Front of Cabinet Forms a Drawing Table

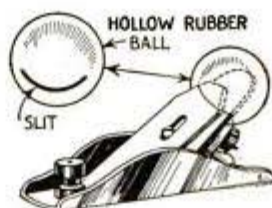


Craftsmen will find that this handy wall cabinet keeps T-square, triangles, drawing instruments and paper all together for instant use. The front, which is hinged along the bottom edge drops down and becomes a drawing table that can be adjusted to any convenient angle by means of telescoping legs. These are hinged to the outside of the front at the top. They hang flush against it when the front is closed and are supported on two small blocks when it is dropped. The cabinet is made of $\frac{1}{2}$ or $\frac{5}{8}$ -in. plywood, except the sides, shelf and the cleats inside the front. Window-sash locks located at the top are used to hold the front closed, while pins set in the edge of the sides, near the top, fit into ferrules pressed in the front to keep the latter in alignment when closed. A drawing board is screwed to the inside of the front, the shelf being set back to provide space for it when the cabinet is closed.

Changing a Typewriter Ribbon

To avoid soiled fingers when changing typewriter ribbons, slip on a couple of old rubber finger cots, which are commonly used to thumb through a stack of paper. They keep the fingers clean and provide a better grip on the ribbon.

Rubber Ball Pads Small Plane For Comfortable Hand Grip

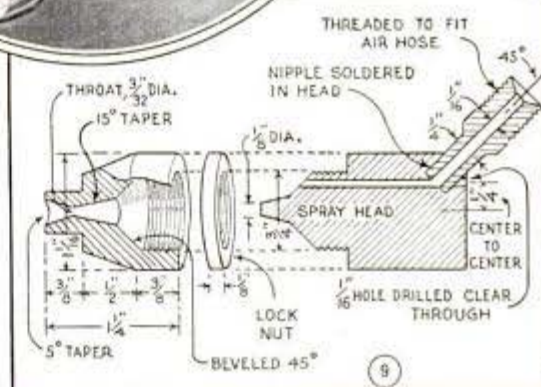


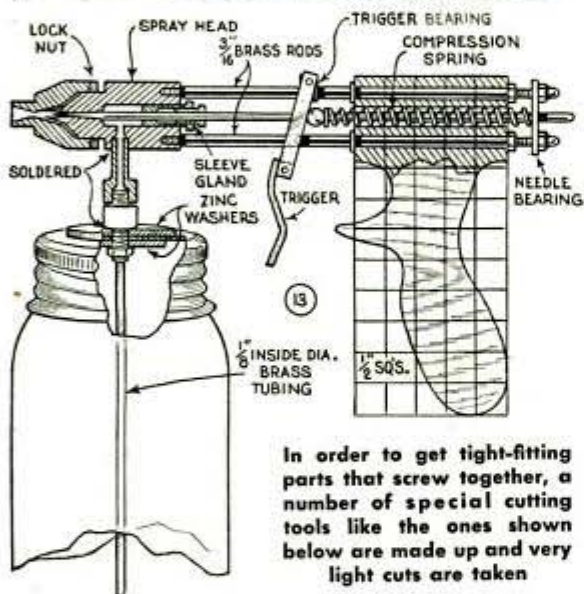
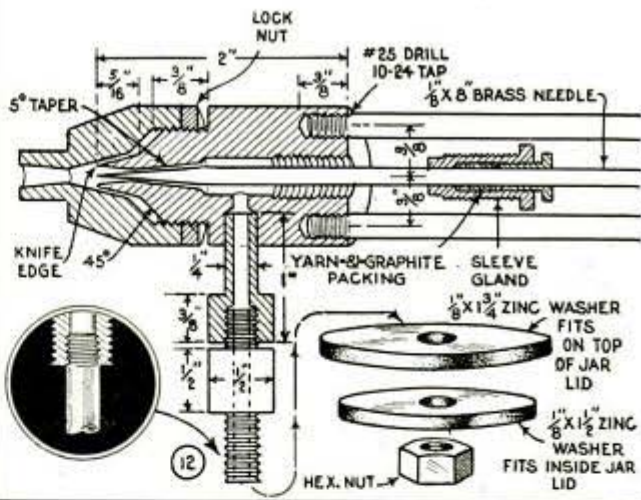
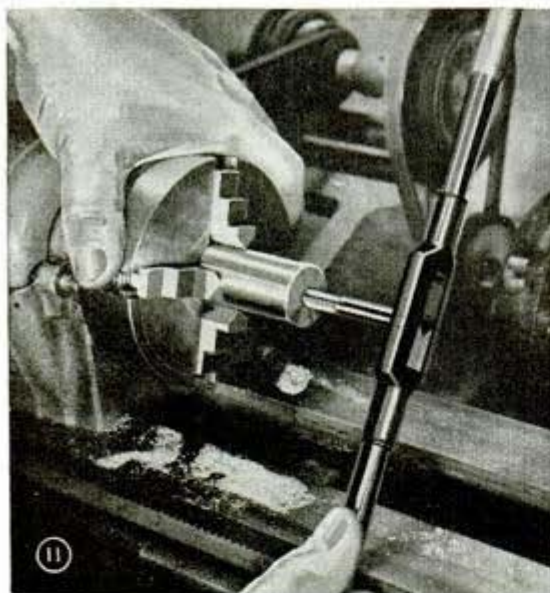
Slit along one side to slip over the iron of a small plane as shown, a hollow rubber ball provides a comfortable pad for the palm. A sponge-rubber ball can be used for the same purpose, and will provide a firmer grip than that produced by a hollow ball.

GUNS *handle your paint jobs*

mixed with the air stream and blown out in the form of a fine mist. Small changes in adjustment will give wide variations in performance; it frequently takes considerable experimenting to get correct atomizing with a given air pressure and density of paint. The syphon gun always works best when there is a slight air pressure in the jar. The lid must fit airtight, and the packing nut must not leak. To get pressure in the jar, hold your finger over the nozzle and pull the trigger momentarily. Air will bubble up through the paint in the jar, and upon testing it will be found that the paint sprays farther and finer than otherwise. If the pressure goes down before the jar is empty, repeat but be careful not to build up too much pressure, or the jar may break. The injector works on the same principle, only gravity pulls with the vacuum instead of against it. Even so, it is always advisable to dilute paint with thinner before using it. Thinned paint breaks up into finer mist and is less inclined to "bounce" when it strikes a surface. Always clean your gun when you have finished using it for the day. Take it apart and dip in varnish remover. The guns shown and described in this article are designed to come apart easily and quickly. After cleaning in varnish remover, rinse the parts in warm water, and when dry, reassemble. When removing the needle from the syphon gun always unscrew the entire sleeve gland. Disturbing the packing means extra work.

In making the parts for these guns the machine work is done within close limits so that the parts will fit perfectly. While the injector gun, Figs. 1 to 7 inclusive, has more parts than the syphon gun, its construction is much simpler as there is no needle, no packing gland, and only one joint which must fit perfectly. Also, it is easier to operate as there are no critical adjustments which must be mastered first.



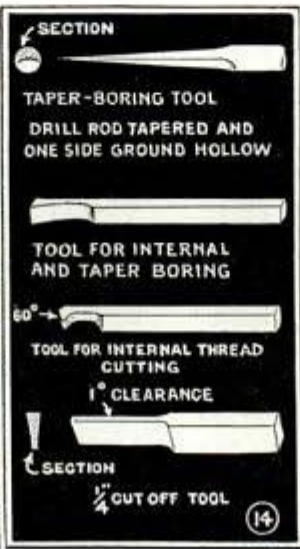


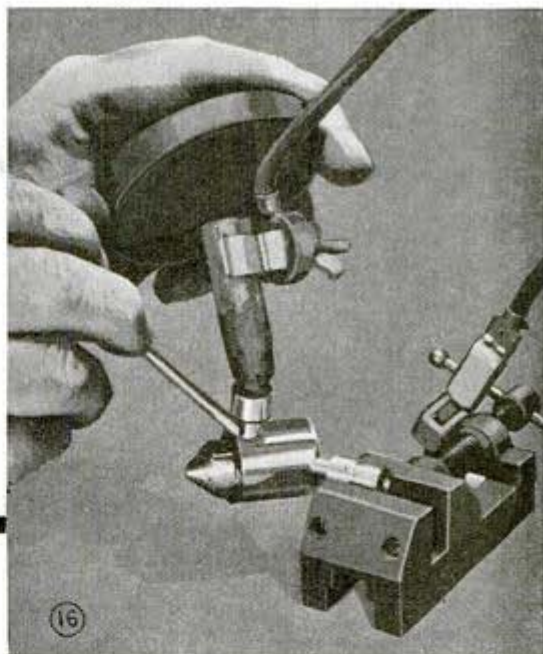
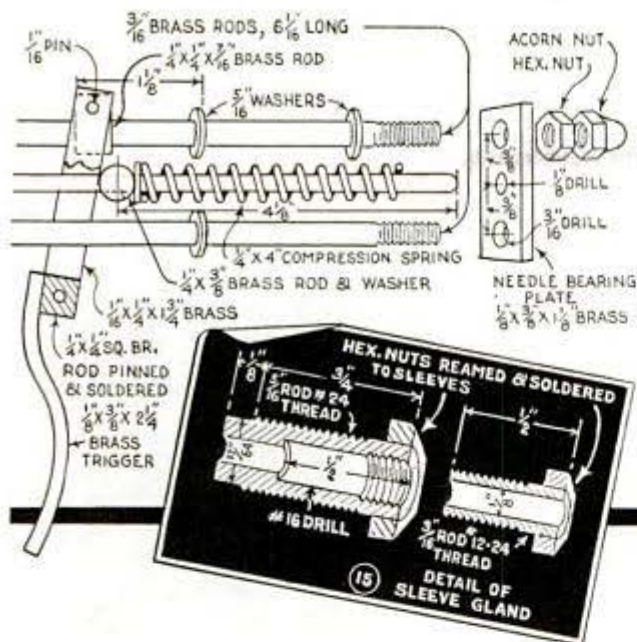
In order to get tight-fitting parts that screw together, a number of special cutting tools like the ones shown below are made up and very light cuts are taken

The nozzle, Fig. 6, and the air jet, Fig. 2, are both ground to fit. Silicon-carbide dust mixed in oil is used for this purpose and work is done carefully. A good job makes it possible to spray paint in a line so fine that you can write your name on the wall. Stock rod and tubing are used as far as possible and most of the machine work consists of threading one piece into another, which in most cases is done on the lathe. The paint cup is a matter of personal preference. It may be large or small, open or closed, a glass jar or a metal cone. Production workers, who use their guns all day long and frequently change from one color to another prefer a metal cone because it is easy to empty and refill.

To get perfect and delicate control, a two-finger trigger is used, Fig. 4. The air jet requires a movement of $\frac{3}{16}$ in., and a cam-and-lever arrangement, Figs. 3, 4 and 5, steps this up to $\frac{1}{2}$ in. at the end of the trigger, making possible a vernier adjustment of the spray. The pistol grip is another matter of personal preference. The size and shape should conform to the hand of the user. The hand should close around the grip naturally with the butt nestled in the palm. To get a good fit, a number of handles are cut from softwood, after which the most satisfactory one is duplicated in hardwood.

On the syphon gun, Figs. 8 to





16 inclusive, the spray head, Fig. 9, is turned first. All other parts are fitted onto it. Securely mounted in a four-jaw chuck, the head is turned to size, bored and counter-bored, then threaded as in Fig. 10. Small and deep internal threading is done best with a hand tap used while the work is mounted in the lathe as in Fig. 11, but the external and larger internal threads are cut on the lathe as at the right of Fig. 14. A well cut thread can be made airtight. The secret is to take a very thin shaving toward the last, and when the two parts will just barely mesh, apply oil and "coax" them together to remove the burrs and high spots until the threads slide like velvet. When using machine tools in combination with taps and dies always make sure that both have the same cutting angle. Professional spray-gun makers grind special tools for their work, four of which are shown in Fig. 14. An attractive type of knurling is possible without a knurling tool. With the threading tool, a series of V-grooves $\frac{3}{64}$ in. apart are cut in the cap, after which the tool is turned 90 degrees in the holder, the indexing gauge locked, and the sharp point plowed across the grooves like a shaper. As only light cuts can be made in this way, the carriage may have to be advanced five or six times to make the cut as deep as the V-grooves. With sixty index divisions, the perimeter is divided into sixty neat and sharp-edged rows of squares.

Parts to be united permanently are soldered. Alloy solder and an electric arc soldering outfit used as shown in Fig. 16, will give quick, neat and permanent joints. All details of construction and assembling can be obtained from Figs. 9, 12, 13 and 15. A wooden grip, Fig. 13, is easy on the hands, and if well waxed allows paint to be removed from it without difficulty. The trigger is assembled and fastened permanently in place. When the gun is dismantled for cleaning, the handle is removed and the needle is simply withdrawn until the point is clear. On a large job it is advisable to pour your paint into a number of identical pint jars all of which will fit the lid on the gun, so that they can be used in succession without filling them until all have been used. To make an airtight joint, paper washers and packing may be needed. That which usually comes in a commercial food container lid is satisfactory.

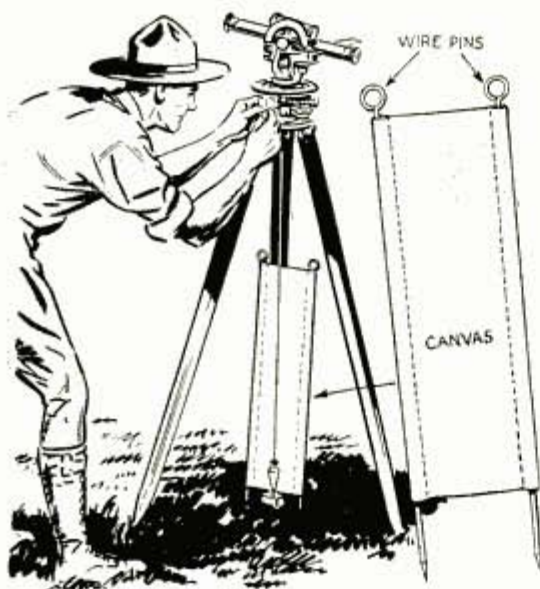
Ends of Band Saw Held Together By Key-Ring for Brazing

The workmen in a large planing mill hold the ends of band saw blades together for brazing by using a large key-ring.



The ends of the blade are pulled through the split ring, which holds them securely.

Guard for Transit Plumb Bob Aids the Surveyor



While surveying for an army camp, a strong wind blowing off a large body of water made it difficult to set up the transit accurately. To avoid this trouble, a canvas guard was used to shield the plumb bob. Two long wire pins to slip through hems in the canvas and into the ground kept the guard in place.

Wheelbarrow Handles Are Bent To Protect Hands of Workmen

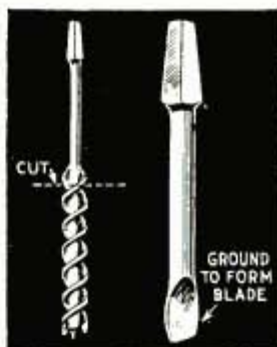
After several workmen had injured their knuckles while wheeling material through narrow doors and passageways, the foreman of a crew of workmen bent the han-



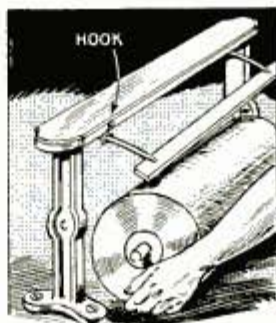
dles of each wheelbarrow inward to avoid this trouble. Heating the handles to bend them was done with a blowtorch, using a rod or a length of pipe in the end of the handles to get sufficient leverage.

Emergency Screwdriver for Brace Made From Old Auger Bit

When working on a job away from the shop, I needed a screwdriver for a brace, and not having one at hand, made one from an old auger bit. This was cut off at the beginning of the first twist and the shank was ground down as shown to form a blade.—F. W. Edwards, Barnesville, O.



Clamp on Paper Holder Hooked Up When Refilling



It's an easy matter to put a new roll of wrapping paper in a holder if the tension clamp is held out of the way, leaving both hands free to handle the roll. This can be done by attaching

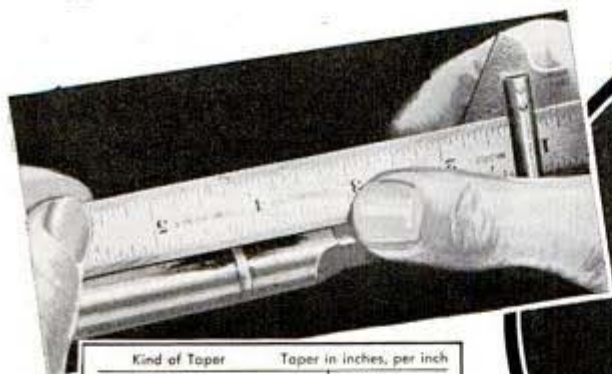
a hook to the upper crosspiece so that it can be slipped over one of the clamp supports when the latter are raised.

Belt Grips Grinding Wheel While Nut Is Loosened

Difficulty of holding a grinder to loosen the lock nut on the shaft can be avoided by using a length of flat belting. The belt is wrapped around the wheel and the ends are held with one hand while removing the nut with the other one.



Tapered Tool Shanks Used in Gauging Holes



Kind of Taper	Taper in inches, per inch
Morse No. 0	0.521
" " 1	0.05
" " 2	0.0502
" " 3	0.0502
" " 4	0.0519
" " 5	0.0525
" " 6	0.0522
" " 7	0.0521
Browne & Sharpe tapers	0.0416
Jarno tapers	0.05



With the tapered shank of a drill bit, chuck, lathe center, milling cutter, or other tool, a hole bored in metal can be checked with considerable accuracy to determine small differences in diameter at the ends, or two holes can be compared for size. Thus, in the absence of suitable calipers or micrometers, the taper of a hole in a spur gear can be measured. The taper shank must be in good condition. First spread a thin coating of bearing blue or white lead lengthwise on the shank in a strip about $\frac{1}{4}$ in. wide. Insert the shank squarely into one end of the hole to be measured, and rotate it slightly. Remove, and renew half of the width of the blue strip by rubbing it with your fingers. Insert the shank into the other end of the hole, and rotate again.

With a graduated scale, measure as accurately as possible any difference in the spacing of the lines wiped across the blue area. Use these measurements to determine any variation, by multiplying the taper per inch by the line separation in fraction of an inch. Standard tapers are given in the table. Actually, for greatest accuracy, measurements of line separation should be made parallel to the taper axis rather than to the taper surface. This can be done by holding the shank in a drill-press chuck or clamping it to a lathe cross slide and measuring with a scale or graduated collar the distance the shank moves to align first one wiped line and then the other with a fixed pointer.

—Walter E. Burton, Akron, Ohio.

Dumping Board Saves Labor for Workmen in Feed Mill



The tiresome work of lifting sacks of grain to dump them into the grinding hopper at a large feed mill led the owner to devise a dumping board to make the job easier. The board consists of a short plank with two half-round cleats across the center and a foot board at the lower end. In use, the plank is placed so that the two cleats straddle the edge of the hopper, and the sack of grain is placed upon it. In this way the sack is evenly balanced so that it may be tipped with ease and little possibility of spilling.

—G. E. Hendrickson, Argyle, Wis.

Oil-Soaked Cloth on Elevator Greases the Metal Bottom



Where a portable elevator is left set up between grain and corn harvest season it is necessary to lubricate the bright metal bottom to prevent rusting, which ordinarily is a tedious job. It can be done easily, however, by wrapping a cloth around one of the steel flights and soaking it with oil. Then, running the flight over the elevator two or three times after the last load of grain has been taken care of will thoroughly oil the bottom. It is a good idea to re-oil the cloth each time it makes one trip up the elevator.

Dividers Set With Micrometer



In mechanical drawing and in lithographic printing, especially when drawing ruled forms for reproduction, accuracy of the line spacing can be assured by using a micrometer to set the dividers. For example, suppose a space $8\frac{1}{4}$ in. is to be divided into 50 equal divisions. Just divide $8\frac{1}{4}$ by 50 and the result is 165 thousandths. Then set the micrometer to read 165 thousandths

and adjust the dividers so that the points will barely start between the mandrels of the micrometer.

—Frank Wood, Columbia, Mo.

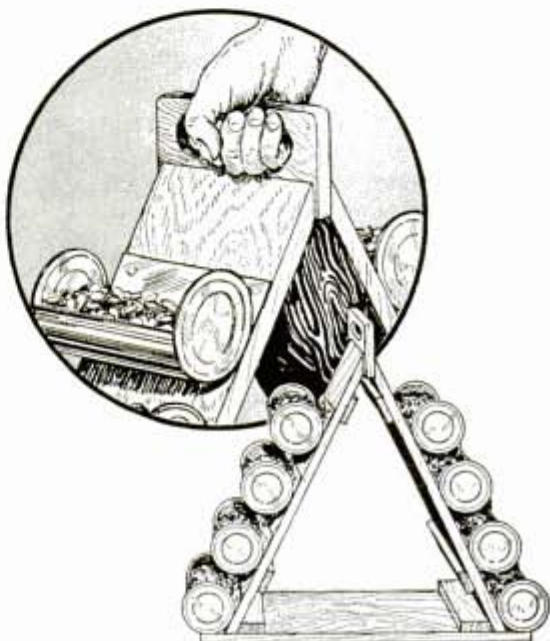
Extra Sponge on Letter Moistener Removes Excess Water

Office workers who use a letter moistener of the type shown will find an extra sponge attached to one end of the moistener handy to blot up excess water on the envelope flaps. A suitable sponge for this purpose can be cut from almost any old bath sponge.



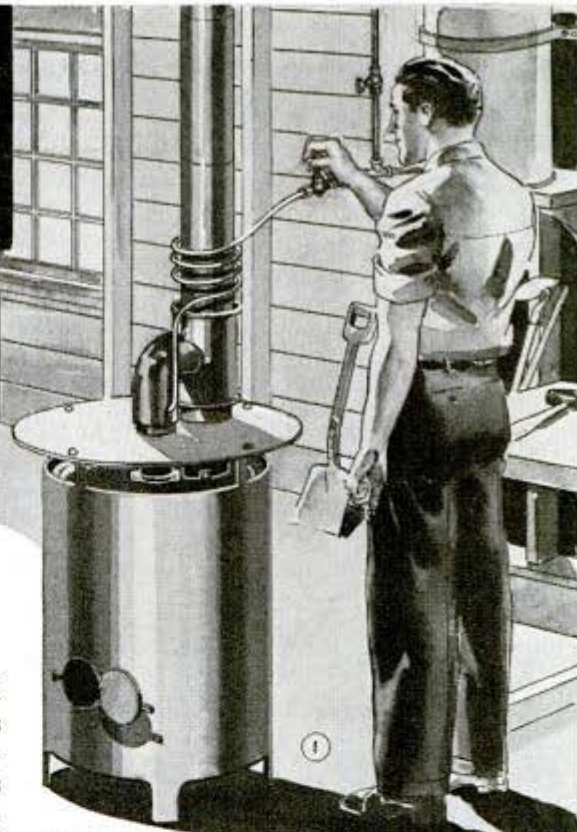
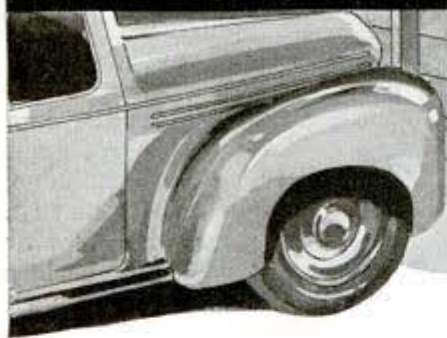
Portable Holder for Small Parts Has Tin-Can Trays

Handy to carry from one job to another, this portable holder for nails, screws and other small parts can be made in a few minutes. The frame is assembled in the form of a triangle and fitted with a handle as shown. Next the trays are made from tin cans of equal size by cutting them down the center and around half of each end, which produces a flap that is used to fasten them to the wooden framework.



see March 1928 526

Down-draft OILSTOVE heats garage



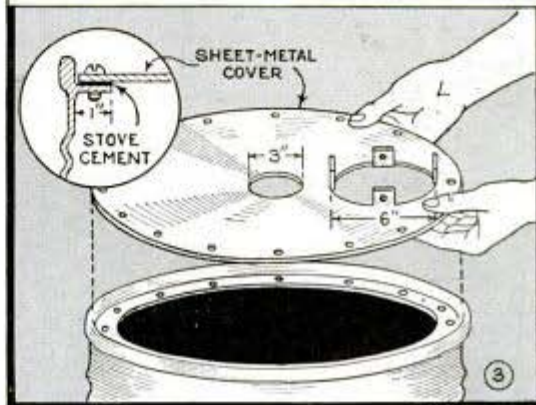
By F. Tellander

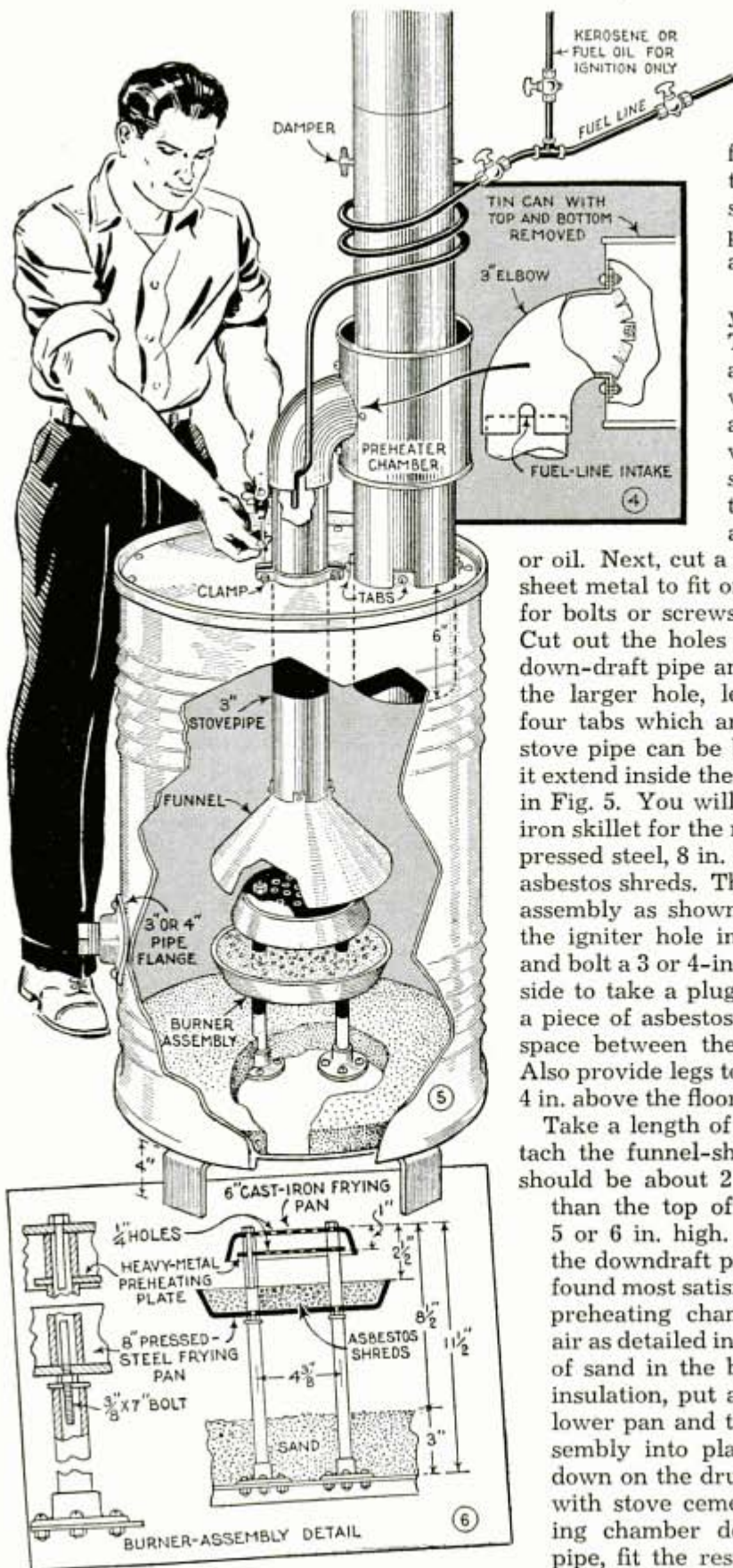
IN THIS type of oilstove, which was used in a small garage, crankcase drain oil is burned for fuel. The incoming air is preheated by contact with the stack and comes down against the flame, causing it to mushroom outward from the main burner and spread against the sides of the stove. In this way very good combustion is obtained because gases that might escape up the stack are forced directly against the burner.

The stove is started with fuel oil or kerosene, which is fed into the fuel line to the stove from a separate tank. After opening the main valve as in Fig. 1, the petcock in the fuel-oil line is opened momentarily and then closed again to allow a little fuel oil or kerosene to drain through the holes in the burner and preheater plate and soak into the asbestos shreds, which are ignited with a match or paper torch through the hole in the side of the drum. When igniting the fuel the damper is closed momentarily to prevent the match from being blown out. As the fire starts, the petcock on the drain-oil line is opened a little so that the oil drips slowly, passing through the holes of the burner and igniting in the flame. Then the igniter hole is closed, after which the preheater plate of thin steel will heat up rapidly and the oil will begin to burn on its surface, which heats up the main cast-iron burner. As this burner gets hot, the oil burns upon contact with it, while the preheater continues to ignite any residue that might pass through the main burner. After the entire burner unit becomes red hot,



After cutting out one end of an oil drum as shown above, you substitute a heavy sheet-iron cover to fit over the remaining lip as shown below





very little oil will come in contact with it, as the heat breaks it up while it is falling. As the flame goes out almost the instant the valve is shut off, no oil is dripping, unburned, into the asbestos pan.

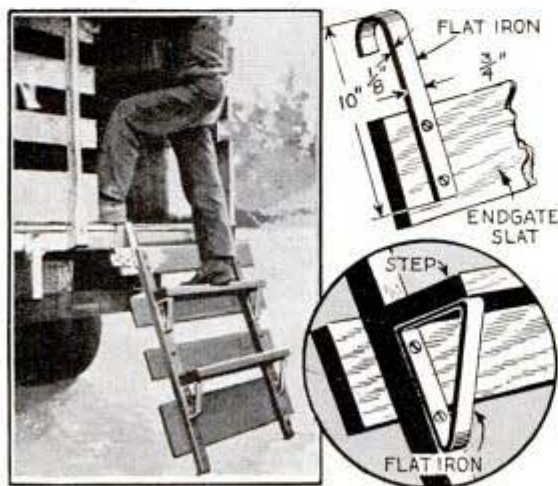
To make this oilstove you first get an oil drum. The top is cut out about an inch from the edge, which can be done with a keyhole hack saw or with a cold chisel as shown in Fig. 2. Then take the drum outside and burn out any grease or oil. Next, cut a cover plate from heavy sheet metal to fit on the lip and drill holes for bolts or screws as indicated in Fig. 3. Cut out the holes for the two pipes—the down-draft pipe and stack. In cutting out the larger hole, leave enough metal for four tabs which are bent upward so that stove pipe can be bolted to these, leaving it extend inside the drum for 6 in. as shown in Fig. 5. You will also need a 6-in. cast-iron skillet for the main burner, and one of pressed steel, 8 in. in diameter, to hold the asbestos shreds. Then make up the burner assembly as shown in Figs. 5 and 6. Cut the igniter hole in the side of the drum and bolt a 3 or 4-in. pipe flange on the outside to take a plug to close the hole. Use a piece of asbestos as a gasket to seal the space between the flange and the drum. Also provide legs to raise the drum at least 4 in. above the floor.

Take a length of 3-in. stovepipe and attach the funnel-shaped end piece, which should be about 2 in. larger in diameter than the top of the main burner, and 5 or 6 in. high. A simple clamp holds the downdraft pipe at whatever level is found most satisfactory. Next, make the preheating chamber for the incoming air as detailed in Fig. 4. Put a 3-in. layer of sand in the bottom of the drum for insulation, put asbestos shreds into the lower pan and then slip the burner assembly into place, fastening the plate down on the drum and sealing the edge with stove cement. Slide the preheating chamber down around the stack pipe, fit the rest of the sections of the

stack in place and the stove is finished.

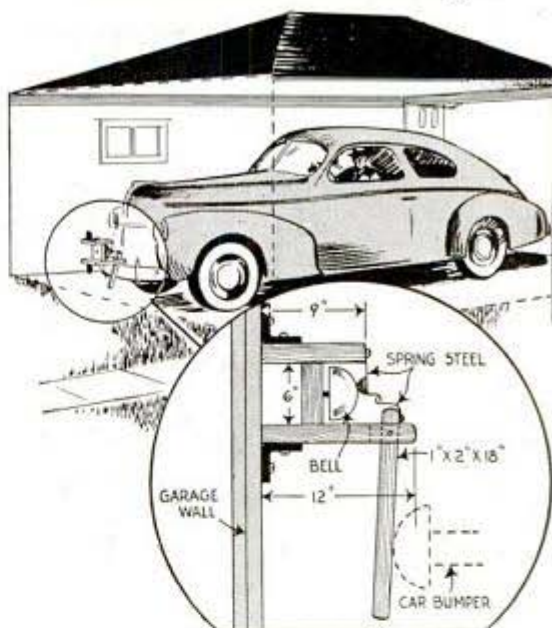
All that remains now is to install two tanks and hook up the copper fuel lines. A small hole in the top of each tank permits using a rod to check oil level. The fuel line must have a constant slant toward the stove, the steeper the better. Valves are installed as close to the stove as possible so that adjustments will have immediate results. Also, the fuel line may be coiled around the stack as shown to warm the oil. To adjust the down-draft pipe for position, start by locking it in position temporarily so that the lower edge of the funnel will be about 4 or 5 in. above the main burner. Then make necessary adjustments to suit the requirements of your drum and draft, after which the down-draft pipe is locked permanently in place. Never let the tank run completely empty because this allows oil to drip after the fire has gone out, which might cause a sudden puff-back if the burner is still hot. The heating efficiency of the stove can be increased if a piece of sheet metal is bent and placed around the stove as shown in Fig. 1, with a 3 or 4-in. space between the two. In this way cold air is drawn up from the floor and is heated while passing through the space between the stove and the shield.

Steps on Tailgate of Truck Body Provide Easy Entrance



Cattle and stake-type truck bodies can be entered easily from the rear if you fit steps on the tailgate. The steps are supported by brackets shaped from flat iron, and the gate is provided with flat-iron hooks to engage the bottom of the body and prevent slipping.

Warning Bell to Avoid Bumping Into Rear End of Garage

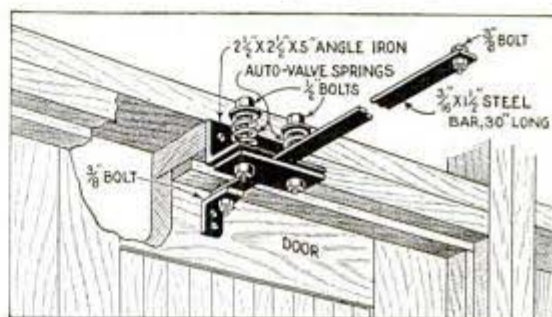


As my garage was just one foot longer than the car, we often bumped into the rear wall. To avoid this, I rigged up a warning bell that was sounded by the front bumper when it was a few inches from the wall. The circular detail shows how the bell was set up. With this arrangement, we are able to get the car in the right spot in the garage with little difficulty.

—Sam J. Schlappich, Lake Worth, Fla.

Friction Stop for Garage Doors

Mounted on the header above garage doors, a friction stop of the type shown is very effective in holding them open at any angle, even in a strong wind. The stop consists of a pivoted flat-iron arm, which slides between a couple of metal pieces on which a tension is maintained by two springs. The tension can be adjusted to suit by loosening or tightening the nuts of the bolts over which the springs are placed.



Safety Bar for Baby's Auto Seat Prevents Tipping Forward



A young father while driving with his small son in a seat which hooked over the back of the regular auto seat was forced to make a sudden stop. The right-hand half of the split seat was thrown forward by the baby's weight and resulted in a painful injury to the baby's head, which struck the instrument panel. To prevent a repetition of this, the father devised this simple safety bar. It is a 2-in. board or strip bolted to the ends of the hooks on the baby's seat and reaching across the back of the driver's half of the seat. Now, when the brakes are applied, the pressure of the driver's body against the seat back prevents the right half of the seat from being thrown forward.

Throat Light to Check Battery



A throat light is a small flashlight fitted with a curved plastic rod. The light from the concealed bulb follows the bend in the rod so there is no interference between the operator's eyes and the light source while

The operator of a battery service station uses a small throat light to examine the interior of defective batteries and claims that it is superior to the ordinary flashlight for this purpose.

looking down through the small filling hole. If the slightly luminous rod gives out too much light for easy examination it may be covered by wrapping tape over its length, leaving the extreme end open.

Opening Cans of Anti-Freeze Solutions for Radiators

You can easily pour anti-freeze solutions directly from the cans into a radiator without spilling the liquid, if you punch holes in the can as



shown. Lay the can on its side and punch small holes in both ends near the upper side. Then, holding your finger over one of the holes, tip the can so that this hole is on the lower side and hold it over the radiator filler hole. Quickly remove the finger, and the liquid will flow into the radiator without spilling.

—Blake Mills, Cambridge, Mass.

Dress Snaps Hold Trousler Cuffs Off the Car Floor



If your trouser cuffs rest on the floor and become soiled while driving a car, you can avoid this trouble by using dress snaps to fasten them up. The halves of the snaps

are sewed to the inner surface of the cuffs on opposite sides where they are invisible. When driving a car, just pull the cuffs upward and fasten the snap.

Carbon Brush Stops Brake Noise

When all other methods of curing a brake noise had failed, a generator brush was inserted in the lining at the end of a brake shoe to stop the noise.



The job was done by cutting out a square of lining down to the metal just large enough to receive the

brush. The sides of the brush were then filed a bit to roughen them and the hole in the lining was filled with cement into which the brush was forced and held until the cement had dried. The brush was then filed flush with the lining.

Handy Spark-Plug Cleaner



Especially useful in motorboats or where service stations are not convenient for servicing spark plugs, this cleaner is merely a test

tube containing a dozen large needles. When a plug is inserted and the tube shaken, the needles peck the carbon off the insulator and electrodes.

—C. E. Packer, Oak Park, Ill.

Scouring Pad Cleans Windshield

The next time your windshield becomes splattered with bugs, try cleaning it with a copper wool scouring pad dipped in water. Use the plain wool type, not the type that is impregnated

with a cleansing agent as this might damage the finish on the car body.



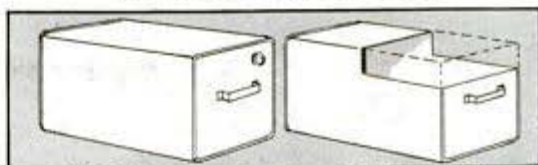
Base to Support Warning Flag



toolbox or in a rack on the body.

—Morris Katz, Aurora, Ill.

Crankcase Draining Container Made From Oil Can



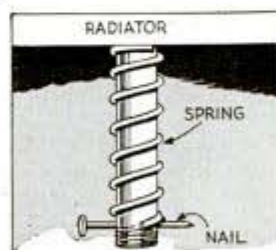
The crankcases of most cars are too low to permit using a pan or pail to catch oil drained from the motor. A good container for this purpose can be made by cutting away one side of a square 5-gal. cylinder-oil can as shown. In this way, the end from which a portion was cut can be pushed under the motor while draining, after which the can is removed and carried by the handle.

Easy Way of Compressing Springs When Installing Truck Radiators

When placing heavy radiators on trucks, the job of compressing the springs is difficult as the bolts are shorter than the springs when the latter are free. To

avoid this, we place a nail through the cotter-pin hole in the bolt and through the turns of the spring. Then by turning the bolt with a wrench the nail will ride the turns of the spring, compressing it until the nail is at the bottom of the spring. As the cotter-pin hole is always about $\frac{1}{2}$ in. from the end of the bolt, the radiator can be put in place and the nut started without any trouble.

—Wm. C. Acker, San Francisco, Calif.



Creeper Headrest Cut From Tire Filled With Cotton Waste

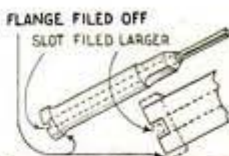


Besides providing a headrest on the garage creeper, a piece of old auto tire mounted as shown also makes a handy place to store cotton waste. If more comfort is desired for the head, a pad can be made to slip over the upper side of the

rest. When needed, a piece of waste can be pulled out one end without moving from under the car.

Valve-Core Screwdriver Is Made From Bicycle-Spoke Nipple

Needing a small tool to carry in his pocket to remove tire-valve cores, one mechanic made one from the nipple of a bicycle spoke. The flange on the end of the nipple was filed down smooth so that it could be inserted into the valve stem, after which the slot in the end of the nipple was widened and deepened to suit.

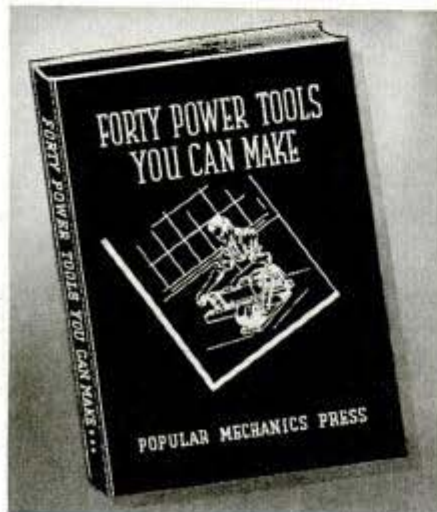


—James Vick, Church Road, Va.

Carbon tetrachloride swished around inside an empty gasoline tank before soldering will kill fumes that might cause an explosion. Wash out the fluid thoroughly with gasoline before using the tank.

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2389

Don't Take Any Wooden Nickels

(Continued from page 95)

good money from bad so you may tell instantly.

Another new racket, related to counterfeiting, is the theft and forgery of government checks. Since the rise of the WPA, this menace has been growing constantly, and with relief workers receiving thousands of checks per week many persons have come to regard relief checks like cash.

If they are not endorsed by the person to whom they were issued, the government will not honor them. Never cash a relief check without examining the recipient's identification card, which contains his signature and identification number. Have him sign the check, then compare this signature with that on the identification card. Then examine the check for his identification number, which should be the same as the number on his identification card.

Tracking down counterfeiters is one of the most difficult detection jobs in the world. The men who make bogus money seldom pass it, but sell it to "shovers" for 15 to 40 cents on the dollar, depending on how good it is. Shovers then try to get rid of it. Almost any small business is a likely victim. Big stores are avoided, since money goes to a cashier, and while the shover awaits change, police may be on the way. Unless someone recognizes the money as counterfeit and calls the police quickly, shovers are hard to locate. Constantly they are on the move, lost in big city crowds, gone in a few hours when "touring the sticks."

Gloomy indeed are the faces in a small town after counterfeiters have visited it. Grocery stores, florists, restaurants, clothing stores, filling stations are all probable victims. It is then up to the Secret Service to pick up a cold trail. It is easy to follow, for plenty of bad money will point the way—but catching up is another problem. The entire area will be blanketed with warnings, and sooner or later the crooks will pass one bill too many. Some storekeeper will detect it and call the police. A counterfeiter's biography invariably ends this way.

Finding the maker of fake money is more difficult still. Just how the Secret Service proceeds with this difficult job of tracking is not known outside the department. They have uncanny ways of getting information.

It is said that by looking at a bill the Secret Service can determine the engraver who made it.

We do know, for this is no secret, that the department possesses the finest crime detection equipment in existence, with the best experts to operate it. Spectrographs reduce evidence to its elements for minute analysis. Ultraviolet machines reveal hidden secrets in bills and bits of evidence the eye would never see. Analytical experts have been known to connect a counterfeiter with a fake bill by no more than a tire mark his car left—even after he had taken the tires off his car and thrown them away.

Once an arrest is made, fifteen years generally elapse before the counterfeiters are free again. And it might be well to say that anyone who knowingly passes a counterfeit is liable to the same penalty. If you should ever get any counterfeit money, don't try to pass it. Call the Secret Service or the police, and accept your loss with as much grace as you can muster.

If you catch someone passing bogus money, do nothing to arouse his suspicions. Don't give the money back to him, don't let him know you suspect it. Detain him some way; say you haven't change, or pretend you have to answer the phone in another room. Better still, work out signals with some associate, and while he is making the call, keep the counterfeiter as long as you can—hazard a guess about the weather or Saturday's ball game, spill change on the floor and hunt it. Do anything, but keep him there.

Not many counterfeiters will get frightened and run. That is sure to start an immediate pursuit. But in case one does, get the license number of his car if possible, and at least a description of him. Write down the information to avoid error.

Most important of all—know your money. Study it carefully, so you will be able to tell good from bad instantly.

And don't take any wooden nickels.

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Tricks With Magic Paint

(Continued from page 89)

paint as they have brushes attached to the caps. A small bottle is sufficient for preparing 50 to 100 tricks.

As an opening trick the performer exhibits a blue pencil. Pushing the pencil through his closed fist, it emerges as a red pencil. The trick may be done under the noses of the spectators and they can examine the pencil immediately. The secret is in the use of a red pencil which has been colored blue with Magic Paint.

With playing cards the magician can present a large number of perplexing tricks. A card, say the deuce of clubs, is selected by a member of the audience. The magician pretends to "discover" the card and holds up the three of clubs. The spectator objects that he selected the deuce. "Well, what card am I showing you?" asks the magician as he touches the center pip with his finger and it vanishes, leaving the two spot. The additional pip is of course filled in on the card with black Magic Paint beforehand. Any card pips can be concealed under a coat of white Magic Paint so as to mysteriously appear at the touch of the finger.

The following trick is reminiscent of the old mystery of finding the pea under the walnut shells, except that it is done without covering of any kind. The performer shows two small cubes or dice which are enameled white except for one side of each, which is colored. One may be red and the other green. The magician places them on a smooth surface, colored sides down, and moves them about to confuse the spectators. "Which die is of which color?" he asks each time, and of course the wise spectator is able to follow the moves and name the color of each cube. Finally, however, the magician shows the colored sides of both dice and returns them to the table without changing their positions. The wise spectator immediately points out the one he knows to be red, but it is found to be green instead. He naturally reaches for the other cube but all sides of it are white. The red has vanished. The performer then takes the red die from his pocket.

The cube with one side enameled red is placed in a pocket beforehand. Of the other two, the side of one is enameled green, then colored red with Magic Paint. The side of the other is merely painted

with green Magic Paint. In shuffling them on the table at the beginning, lift them for each move to avoid removing the Magic Paint. The latter vanishes at the conclusion of the trick by wiping it in contact with the table. This leaves a green die and a plain die, with a red one in the pocket.

For another trick, a small sheet of white paper is shown. Hocus Pocus! The magician passes the palm of his hand over the paper and it changes to a photograph. The white Magic Paint with which the face was covered is removed by a simple movement of the hand.

A black mustache gives a performer a more mysterious appearance, especially if the mustache is painted on and then made to vanish during the "act." Another diversion is to have colorfully lacquered fingernails (red Magic Paint). When a spectator comments on the colored nails, the magician can ask "Who is wearing nail polish?" and show that his fingernails are quite uncolored. A wipe of the nails on the clothing or palms erases the paint in an instant.

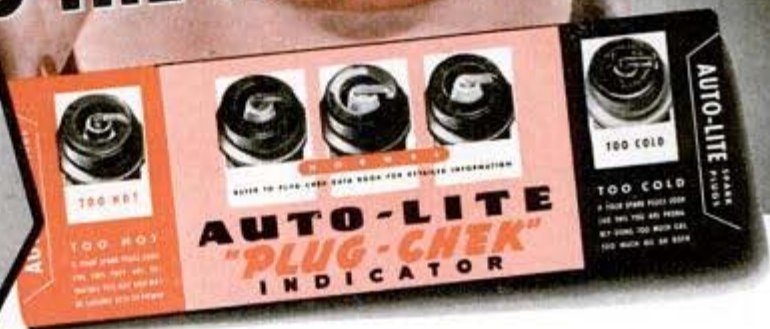
A good after-dinner trick can be done with prepared toothpicks. In effect, it appears that the magician removes two toothpicks from a holder and blackens one side of each with his fountain pen. He holds them between thumb and first two fingers of one hand, showing both sides. At first it is seen that both sides of both toothpicks are black; then one is black and the other is white; then the white and the black toothpicks change places. Finally they are both shown to be white and passed to the audience, the black ink appearing to have vanished.

The act of coloring the toothpicks with ink is misleading as they have been treated with black Magic Paint (applied to one side of each) beforehand. Held as shown, the toothpicks are given a half turn each time the hand is turned over so that instead of seeing both sides, the audience is in reality seeing only one side of each continuously. By actually turning over one toothpick, one will appear to be white and the other black, and they can be made to change positions when desired. At the conclusion the Magic Paint is merely wiped off, leaving plain toothpicks and astonished spectators.

REVEALS THE INSIDE STORY!

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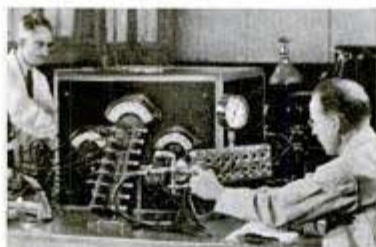
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1 out of 4 new cars Auto-Lite equipped.

AUTO-LITE *Ignition Engineered* **SPARK PLUGS**

Weather for War

(Continued from page 53)

of the instruments are automatically radioed back to earth. Because of the war, fewer ships at sea are sending in reports but those that do are supplying more information than in the past and are even reporting the direction and intensity of the swell.

Long-range forecasting is just as vital in war as are the short-range predictions, but such forecasts haven't been used in the past because no one could make them accurately. During the last three years Professor Krick has been developing a system for foretelling the weather two and three months in advance, as well as giving a general picture of the climate for a whole season ahead.

Krick's predictions are based in part on the discovery that the key to future weather may be found in the movements of the so-called semipermanent "centers of action" which are persistent features in the atmospheric circulation. The Aleutian low, for instance, is a low pressure center that remains in the vicinity of the south Alaskan coast and that is characterized by strong winds and bad weather. The Pacific subtropical high, the polar continental high, the Icelandic low, and the Azores high are other centers of action. Long-range forecasting is based on studies of the size, shape, and movement of each center inside its area. Long-range forecasts, just as short-range weather predictions, are more of an art than an exact science because the accuracy of the predictions depends on the judgment of the forecaster which to a great extent is dependent on his experience.

It seems odd that from a small office in Pasadena, Krick can foretell weather for points on the east coast as accurately as he can for local communities. He surveys the future for all parts of the United States and Canada. A month ahead of time he issues a long detailed bulletin to interested subscribers, parts of which are apt to read: "For March, rain and snow will be below normal in Montana, most of it occurring during the first few days of the month and between the 25th and 27th . . . rainfall in Texas will range from less than an inch in the southwest to two inches in the northeast, with temperatures above normal ex-

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2441

Stop and Go at the Crossroads of the Skies

(Continued from page 37)

them back to "airways" when they leave. In flight, the ships' crews are in direct radio telephone contact with their respective companies but instructions come from "airways" and are relayed to the crews by the companies' ground stations.

Directly involved in the landing and take-off of a liner are as many as 25 persons, including two in the tower. More than a dozen radio telephone calls are made and answered between each ship and the tower from the time the craft enters the outer zone, lands and goes on again out of the control zone. Besides constant communication with the planes, the tower keeps continual contact with "airways" to notify it of the arrival and departure of ships so that the time and ship identifications can be sent on by "airways" to other ports along the line. The tower also calls through the public address microphone when the ships are near the port to notify the waiting room and crews on the ramp that the liner is about to arrive.

The tower keeps a written record of all the ships in the station log and directly behind the chief operator's position is a huge recording phonograph that "takes down" every word that goes out from tower's radio transmitter and that comes in through the sixteen receivers. It uses a record that plays an hour and a half on each side. A red light flashes when the record has to be changed or turned over. The machine provides infallible proof of just what was said and what was answered. In cases of dispute, in studies to improve procedure and in the event of mishaps, it is of incalculable worth.

The flying procedure in progress as you entered the tower was what is called contact flying; that is, when the plane may be controlled by visual reference between it and the land or water. But a change in the weather outside brings a haze and then a robe of darkness about the port. The weather bureau, watchdog of the skies, finds the ceiling less than 800 feet and the visibility less than three miles. The letter "N" goes out with its coded reports, signifying that the port is now on instrument flying rules. The ships' crews get the word

2441

from their ground stations, relayed by "airways" from the weather bureau through the companies. Now, a wholly different routine is followed.

Under instrument control incoming ships point, not for the field, which is invisible from the airplane, but for the radio range station. Northwest of the field at Chicago, it is approached along any one of four beams or "legs" that go out at right angles from it and are identified by radio signals to the cockpit telling when the plane is on the course of any one of the beams or in any one of the four quadrants outside the beams.

When the ship is directly over the station, the radio signals cease and a light flashes in the plane's cockpit. This notifies the crew that they have reached the "cone of silence," a dead zone which immediately establishes the plane's position with reference to the range station and hence, its position with reference to the landing field. The plane flies on through the cone of silence, turns and comes back. When it reaches the cone a second time, the exact moment is noted. Knowing the speed of the plane, its altitude and the distance from the field, the crew can now proceed, watching altimeters and the clock and noting the radio signals along the beam until the time comes for a turn to the field for a glide down to a landing into the wind. If the port is not visible at 400 feet when the ship is directly above or at the edge of the field, the plane must resume flight and proceed on instructions.

Sometimes the plane will be sent on beyond the radio range station to fly back and forth between two points on the "leg," a "sidetrack in the air" until the tower can land it. Perhaps it may be necessary to keep several ships waiting outside the port. This is called "holding." At their various altitudes, previously assigned when their trips were started, they are thus "stacked" up in the skies along several "sidetracks." They are always separated at least 1,000 feet vertically and are from twenty to thirty miles apart horizontally. As the ship at the lowest altitude is allowed to proceed in toward the field, the one at the next level is ordered down and so on, until the "stack" is "unstacked" and all are in.

Instruments in the control tower are in-

(Continued to page 170)



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Sustained high speeds cause gas and oil consumption to go up by leaps and bounds. High operating temperatures oftentimes cause pre-ignition—that sudden, annoying loss of power with rough, uneven engine operation which shows that your spark plugs either haven't the proper heat range or have been thrown out of it by compression leakage through the spark plugs.

Champion's patented Sillment seal eliminates troublesome leakage common to ordinary spark plugs and holds each spark plug rigidly within its assigned heat range, thus giving Champions the widest possible operating range. Insist on Champions for best performance, with greatest economy.

You're always ahead with Champion!

teresting. At the operator's right is a switch for one of radio's most recent aids to aircraft operations at the ports, the ultra-high-frequency landing system. This is a slanting, directional radio beam, released from the ground at a corner of the field and sloping upward across to the opposite corner. Instruments in the liner's cockpit tell when the ship has contacted this beam properly. When the hookup is made, the ship can literally coast downhill on the beam with the automatic pilot working in the cockpit and with little left for the crew to do but put on the brakes when the wheels touch the ground.


Other aids for the control tower men are the Kollsman altimeter and barometer, the accurate guides now standard in most airliners, the control for the localizer radio beam that enables the planes to pick up the runways and come in more accurately, the wind gauge whose sensitive needle and flashing lights register the wind's direction and velocity, switches controlling the room's sixteen radio receivers which have quickly removable coils so that frequency changes may be made at any moment, three microphones, the radio transmitter and a special police and fire alarm.

2518

Our Coastline "Wall of Steel"

(Continued from page 43)

idly to reach new firing positions in protecting moving troops. There are a few fixed anti-aircraft guns at vital points, but all the rest are motorized and can move on highways—guns, searchlights, and all—at high speeds. Regiments of anti-aircraft artillery are capable of traveling more than 300 miles in a single day. The present standard weapon of Coast Artillery anti-



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2518
 aircraft units is the 3-inch anti-aircraft gun, which fires a 13-pound projectile that is effective against enemy planes 4 miles up. The shells have time fuses set to burst in the air among the enemy's airplanes. It is not necessary to make a direct hit on a hostile airplane to destroy it. In one minute a battery of four guns can fire 100 aimed shots. Each anti-aircraft gun battery has a director, or "mechanical brain." This complicated instrument, pointed continuously at an air target, automatically computes the right direction for pointing the guns and transmits it electrically to dials on each gun. The gun crew reads the dials and turns other dials to point the gun.

Anti-aircraft guns are supplemented by searchlights of approximately 800,000,000 candlepower which illuminate targets at night. To enable the searchlight crews to find the targets quickly as they approach high in the air over the guns, sound locators are used. These are really huge aids to hearing by which trained listeners can tell the direction from which the sound of approaching airplanes is coming, so that the searchlights can be pointed in that direction and can light up the targets accurately at the earliest possible moment. The searchlights, of course, are placed in a circle at a considerable distance from the gun batteries. Farther out are ground observers who give advance warning to the whole anti-aircraft defense.

To deal with low-flying enemy attack planes, our troops use the Browning caliber .50 machine gun and the 37-mm. anti-aircraft gun. The caliber .50 machine gun fires a stream of tracer bullets half an inch in diameter. The tracers burn with a bright light, so that the gunner's eye can follow this stream of destructive fire power for nearly a mile. Each machine gun pours fire at aerial targets at a rate of several hundred rounds per minute. The 37-mm. gun fires a small shell weighing about a pound at a rapid rate and is a powerful protection against hostile aircraft.

The current European war has shown our military high command the need for a more powerful anti-aircraft weapon; the Army has now begun production of a 90-mm. gun. Also in development is a 4.7-inch weapon of longer range and more effectiveness even than the 90 mm. Automatic loading equipment is being developed for firing the 90 mm. gun more rapidly.

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2744

Save Your Tires and Money Too

(Continued from page 85)

suddenly, often sliding the tires. It would mean money in their pockets if they would coast up to a stop signal, then brake their cars to a stop gently.

Bruises are a serious cause of tire failure because they're frequently unnoticed. There will be no mark of the injury on the outside tread or sidewall rubber unless the object struck is sharp, yet the tire—even a new one—may run only a few hundred miles before it goes flat. Bruises, or fabric breaks, are the result of a tire hitting an obstruction in the road which crushes or stretches and breaks the cords. Striking a hole in the pavement, a large stone or the curb with sufficient force will damage any tire.

Here are some things the car driver might remember:

Rear tires wear much more rapidly than front tires because the power is transmitted through them.

Tires installed in the late fall may give 25 to 30 percent more wear than tires put on new in the spring. That's because rain and snow act as a lubricant to tires while the heat of summer driving causes more rapid tire wear.

A wheel assembly one ounce out of balance will develop a 12-pound vibrating force at 60 miles per hour. In auto test lanes, wheels often are found six ounces or more out of balance, which means terrific punishment to tires, parts of the car and, of course, the driver at high speeds.

Wheels that do not run parallel with each other—are not lined up—lose their tread fast. A tire one-half inch out of line is dragged sideways 87 feet in every mile, scraping off the tread at an alarming rate.

Close to one-third of all the rubber used in automobile, truck and bus tires could be saved if drivers would follow a few simple rules drawn up by our engineers:

Watch inflation, making sure each tire has the recommended air pressure and check frequently.

Take your vehicle to a tire service station for an inspection every 5,000 miles. Thus you guard against hidden bruises and cuts, as well as improper balance and alignment.

Switch tires around every 5,000 miles.

(Continued to page 174)

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A recommended method is to move the front tires straight to the rear, then place the right rear tire on the left front wheel and the left rear on the right front wheel.

Don't start quickly or stop suddenly. Avoid excessive speeds—take it easy.

My objective here is to encourage a sensible middle ground view of the rubber situation, not to arouse alarm. As I see it, America can get along quite nicely. We have a supply of crude rubber on hand, we know how to make synthetic rubber, although many months would be required to provide sufficient productive capacity, and we have large reservoirs of scrap from which reclaim may be made. We can, so far as it is possible to foresee, continue the production of essential rubber goods.

We cannot, however, indulge in waste, therefore every driver should do his part in conserving our rubber, a highly strategic material in the national defense program.

Window Shade Used as Screen For Showing Home Movies

Coated with aluminum paint, a good-quality white window shade makes an excellent screen for showing home movies. It is mounted on a roller the same size as one in a window where it is used, and it is substituted for the regular shade. Two small metal or plastic rings, sewed to elastic strips at the bottom of the screen, slip over brads in the window sill to hold the screen tight.



P 368

Money With Midget Movies

(Continued from page 59)

ment kind of entertainment. Often proposed in the past, the idea had to wait for the perfection of satisfactory 16 mm. projectors. Only a few thousand boxes are now in use, but the expectation is that upwards of 20,000 will have been placed on location before the year is over.

Most people in the industry agree that the box movie is a logical improvement on the public phonograph and that eventually the present price of a dime per movie will be brought down to a nickel. Numerous technical improvements in the present boxes are being worked upon, including a selectivity feature by which the patron can select the subject that he wishes to watch instead of having to take the next picture in the magazine.

Other improvements that are forecast include air conditioning systems for the boxes to reduce film breakage, as well as improved methods of dissipating the heat from the projection lamp. Prisms instead of the present shutters, now satisfactorily used on some motion picture editing machines, may be another way of reducing the amount of servicing that the boxes demand.

Use of steel tape instead of transparent film stock is one proposal in which images would be taken from the tape by reflected light. Visual movies from recordings on ordinary phonograph records are a subject of research in which a television type of receiver is used to translate vibrations in the needle groove into light patterns. Already developed in a rudimentary form, this sort of motion picture would be automatically synchronized with its sound because two pick-up needles would be employed in adjoining grooves, one needle picking up the picture vibrations while the other picks up the sound.

Some enthusiasts in the industry foresee the day when miniature movies will be used as a sales aid or for demonstrations on department store counters.

At present, short subjects that are made for the meter movie market should be submitted to the manufacturers of the boxes. If you produce such a film and submit it for sale, remember that it will be bought or rejected on its merits just the same as a manuscript that is mailed to a publisher.



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Science Rides the Rails

(Continued from Coloroto Section)

and telephones in each of the other dynamometer and instrument cars. Seven steel caboose cars capable of withstanding severe shocks were placed throughout the train and, with the dynamometer cars, contained all the latest instruments for recording the tests. While the tests were in progress research workers were kept busy in the laboratory compiling the data from the records of the tests.

Science has given the railroads delicate and accurate scales to weigh loaded cars as they roll through yards. It has also given them great piers where railroad cars are picked up and turned over like toys, and their cargoes lowered gently into ship-holds. And it has given them modern yards with car retarders where cars on incoming trains are reshuffled quickly, and safely, by remote control, into outgoing trains.

The railroads' customers get continually better railroad transportation because of railroad research. For example, to study the effect of different temperatures on perishable freight, railroad research workers have ridden specially equipped refrigerator cars through the desert heat—gathering data of immeasurable benefit to fruit and vegetable growers.

Other railroad research workers are experts in freight container materials, construction, packing and testing, and are constantly developing better and cheaper ways of packing and loading freight of all kinds in order to eliminate damage and to reduce shippers' packing, container and loading costs.

As these few highlights show, the railroad industry definitely has been "awake at the switch" in the matter of utilizing scientific research to improve railroad services. In recent years, in common with most industries, the railroads' research and modernization program has been intensified—with amazing results, too.

For example, since 1920, railroad efficiency has more than doubled, as measured by ton miles per freight train hour. As compared with 1920, the average locomotive today is much more efficient than its World War predecessor, the average freight car has 20 percent more capacity, and the average freight train speed is 62 percent higher. Today overnight freight service between points four and five hun-

dred miles apart is commonplace. Freight loss and damage, which was \$2.66 per car in 1920, is now only 53 cents. And the shipper's dollar will send an average ton of freight 105 miles today instead of 78 miles as in 1921.

In 1930, the total mileage run by passenger trains at average speeds of 60 miles an hour, or more, was only 1,100 miles a day. Today passenger trains operating at 60 miles an hour or better, cover an average of 65,000 miles daily—and passengers travel with economy in comfort, even luxury, undreamed of even a few years ago. The passenger's dollar today will carry him 57 miles; whereas, in 1921, it would take him only 32 miles.

Thus, because science rides the rails, the American railroads are able to give continually better service at lower cost and to keep fully prepared to handle, at all times—smoothly and promptly—the peak loads of American industry, agriculture and the national defense.

Reflecting Cloth on Card Table Is Adjustable to Any Angle

When you take portraits at home, try fastening a piece of white cloth to the top of a card table for use as a reflector unless the card table already has a white top. The table can be moved easily wherever it is needed, and by changing the position of the legs, the reflecting surface can be placed at almost any angle.





BOTH must breathe!

AT 30,000 feet, above all animal life, 10,000 feet above the extreme limit of Alpine mountain vegetation, higher than Everest, higher even than the South American condor soaring over Chimborazo—**MAN FLIES!**

Another medium has been added to the land and the sea, almost another dimension has been added to the air itself—the stratosphere. Here, planes can travel phenomenally fast, amazingly far; here are the high roads for today's bombers and tomorrow's transports; here are the new high battlefields where a superplane may rise to dominate the skies—and all the earth below.

But at 30,000 feet in the stratosphere the air is so thin that no human lungs and no airplane engines can breathe deep enough to sustain life.

Yet with the aid of oxygen masks man breathes and survives; and, with

the aid of turbosuperchargers, American-built engines can breathe and fly nearly seven miles up—"on top" of the best combat planes of any other nation.

More than 20 years ago a General Electric engineer, Dr. Sanford A. Moss, equipped a Liberty airplane engine with a turbosupercharger that he had designed. And for more than 20 years, while America's aeronautical engineers designed ships to fly farther and faster, General Electric engineers worked to perfect the machine that would enable them to fly higher and higher.

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Progress in Lilliput

(Continued from page 69)

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that they have been accustomed to handling mechanical toys, working models, power tools and automobiles, trucks and tractors at various stages of their youth, thus getting early preparation for the operation of complex mechanical controls built into the skyfighters of this day and age. For this reason the government is expected to be lenient with regard to the manufacture of small engines which are used in model airplanes, motors so successful for their purpose that model authorities say that in recent months the model airplane enthusiasts have grown in number until they outclass any other single group of model enthusiasts.

In fact the government itself is behind a campaign to encourage the youth of the land to make airplane models in the hope that the youngsters will become airminded later on when the nation may need their services in the air. The campaign is intended to encourage the manufacture and operation of motorless models in elementary schools, power models in junior high schools and actual man-sized gliders in high schools.

The war situation is likely to have little effect on the enormous group which forms the original nucleus of the model hobby group—the railroaders. The draft and the recruiting which has enlarged Uncle Sam's armed forces have not reduced by any great degree the number of model railroad fans in the nation. The reason is that the average model railroad hobbyist whether a tinplater or a live steamer is a settled man in his thirties and is likely to have one or more dependents in the form of a wife and children.

Another factor has brought about a change in the model railroad field, however, and this is the continued trend toward smaller apartments and houses in new construction. The inclination is toward smaller model railroads, away from 0-gauge.

A surprising and entirely new development among the railroaders is the fad for the manufacture of street cars. Experts say that the average railroad fan is far enough along in years to have seen the rise, and the gradual decline in the popularity of street cars, and a sort of nostalgia

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for the things-that-used-to-be causes them to wish to preserve in three-dimensional miniature the trolleys they rode during their youth and early manhood.

Another general trend in models that move, but which are not powered, is toward oil wells, derricks, steam shovels, cranes, turbines, motors, generators and office building elevator mechanisms.

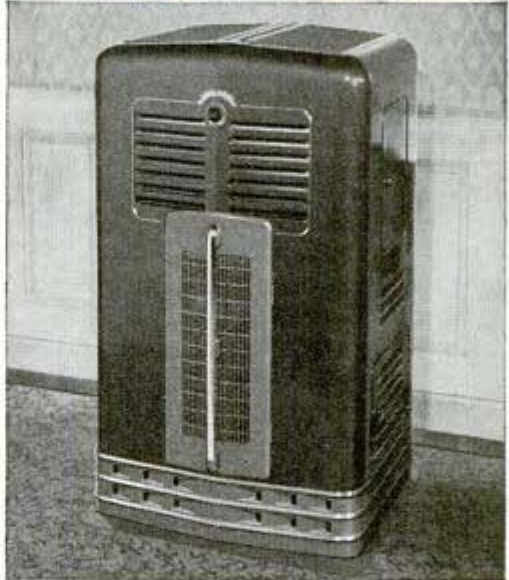
Among the hundreds of thousands of model fans who specialize in "shelf" miniatures—models which are not powered, but are for decorative purposes—the ship-builders are still in a great majority with trim little modern sailboats most popular because of their simplicity and ease of manufacture, but with a great leaning toward obsolete frigates, clippers and colorful and intricate sailing types which flourished throughout the centuries. Those shelf-model makers who are not interested in seafaring subjects, usually favor tiny scale models of modern homes, especially country houses, but the lure of the obsolete also shows itself in the favor shown for early American blockhouses and forts. The use of plastics has increased possibilities of shelf models.

A tremendous impetus to the making of models is expected to result from the inspiration of Paul McAlister, New York interior designer, who has evolved a miniature kit which enables the housewife—who has been generally immune from the blandishments of models—to set up the walls of a miniature room, cover the floor with a rug, and then from a wide selection of tiny model pieces representing furniture, to lay out the room and view the effect before buying real furniture. The room itself and everything that goes into it is in exact scale, so that it is impossible to get the arrangements out of proportion while placing walls, carpets, doors, windows and the 76 pieces representing standard furniture.

Fans say that you can't handle models without becoming hobbyists, so it may be that Miss and Mrs. America may soon join the millions of men who almost exclusively form the inhabitants of the present world of Lilliput.

(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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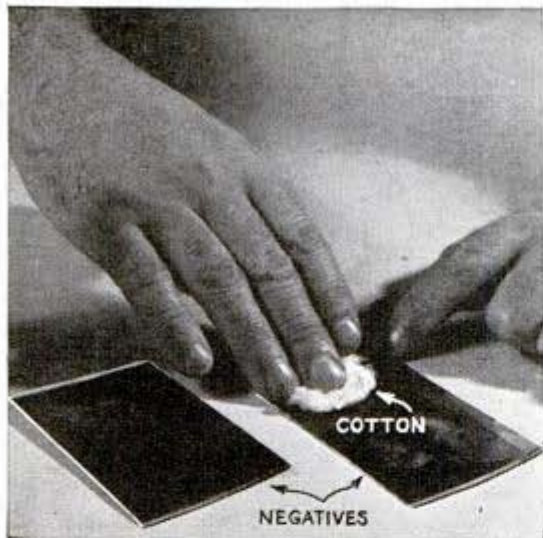
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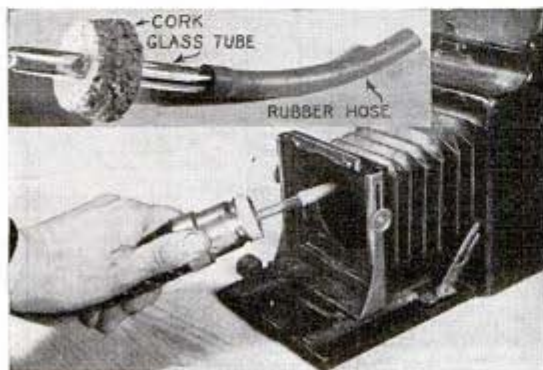
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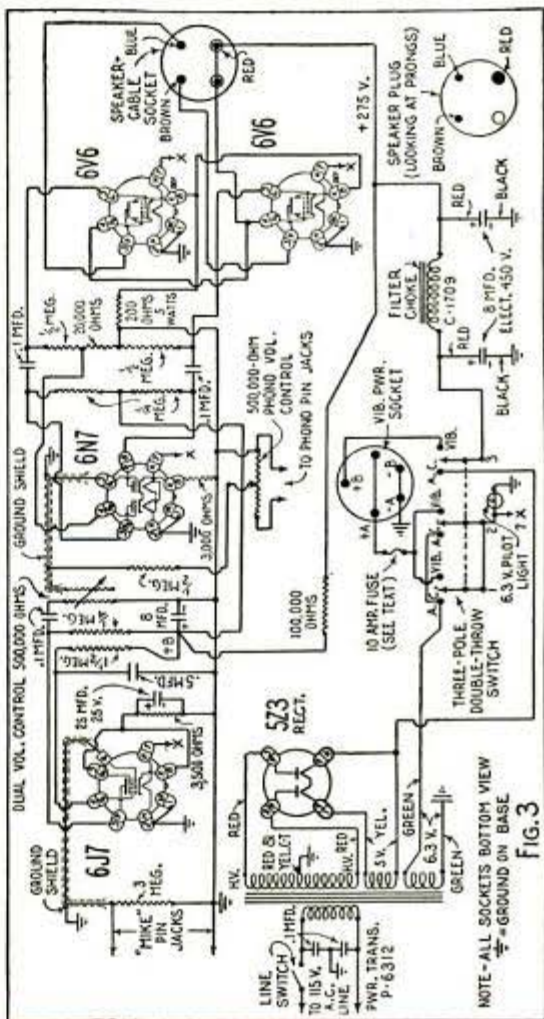
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(Continued from page 137)

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(Continued to page 184)

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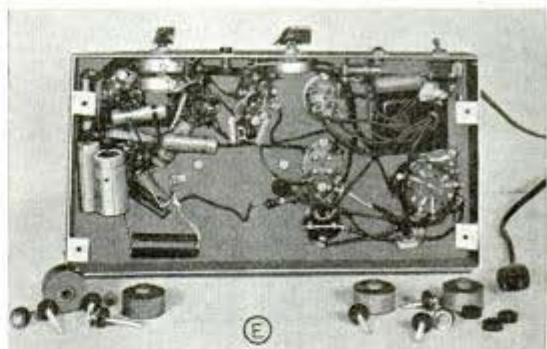
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size: 21½ by 18¾ by 14 in. deep, when both sections are closed. Speaker openings are provided in each case section. A 4-prong plug with a 2-ft. 3-wire cable connects to the 4-prong socket in the amplifier base. A detailed list of the original parts used is available from Popular Mechanics radio department without charge.

The amplifier unit and the vibrator power unit are "float" mounted separately in one section of the case on "Lavelle" type soft-rubber shock absorbers as indicated in photos A and B. When operating the vibrator power supply, be sure to connect the battery clip having the red marking to the positive terminal of the storage battery. A standard auto battery will operate the amplifier for 10 hours continuously. The blueprint number for this article is R-295.

Capacity Bridge

(Continued from page 138)

outlet. A hum will now be heard; set the range switch to X.05 and vary the potentiometer dial knob until a point is found where no hum is heard. This is the "null" point. If this point occurs below 1 on the dial, switch to X.005; if it still occurs below 1, switch to X.0005. Multiplying the dial reading by the range multiplier, the result will be the capacity in mfd. of the condenser under test. For example: if the "null" point was found at 5 on the dial, with the range switch at X.05, multiplying 5 by .05 equals .25 mfd. Avoid contact with any grounded metal while using instrument.

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Machines That Make Machines

(Continued from page 3)

350 tons, is one of the largest machine tools ever produced.

Electric motors as large as 40,000 horsepower and measuring 15 feet high, are made with the aid of machine tools. But smaller motors, one to 50-horsepower, which are turned out by the tens of thousands, do the lion's share of the work in mills and factories throughout the United States. They run lathes, milling machines, planers and other machine tools.

Thus, we see that the machine tool is power driven. It is a machine and also a tool, but not a hand tool, although its op-



Inspecting nose diameter of 75-mm. shells produced in volume with machine tools

eration usually is controlled by hand. Its basic jobs are boring, planing, turning, milling and grinding, all involving the cutting away of metal. In some types of grinding, the chips taken from the metal are so small that they can be seen only under the microscope. Made of alloy steel, the cutting tool on the machine tool is harder than the metal it cuts.

Few factories today lack machine tools; volume production is impossible without them. When Uncle Sam called for thousands of fighting and bombing planes, guns, tanks, shells, trucks and a myriad of other things necessary to national defense, the builders of machine tools were able to turn out the equipment for producing them quickly and in large quantities. First had to come the machine tool,

(Continued to page 189)



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Say you saw it in Popular Mechanics!

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then the defense goods. Fortunately the machine tool industry had had a "warmup" period for the "all-out" job. Machine tools are used to make vacuum cleaners, refrigerators, radios, telephones and thousands of other peacetime products. Too, the industry had helped to supply England and France with the machines for manufacturing war-making devices and supplies. The industry, therefore, knew in a general way what would be needed and set out to fulfill the need. It takes from four months to two years to build a machine tool because most types must be made to order, designed to perform a special job, or must be equipped with special attachments. So machine tool production, which in the four years of 1931-1934 averaged only \$30,000,000, jumped to \$200,000,000 in 1939, exceeding the 1929 peak. Then in 1940 the production was more than doubled—to \$450,000,000, and the 1941 output will total \$750,000,000, according to Tell Berna, director, National Machine Tool Builders Association.

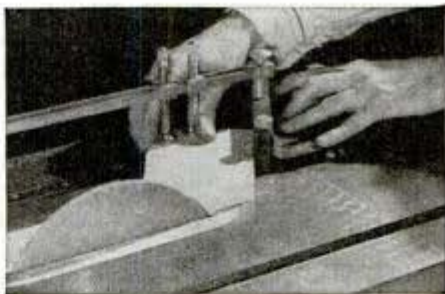
What the automobile industry has accomplished with the aid of machine tools is almost miraculous, some companies having reached production levels of 5,000 to 6,000 cars per day. But for the machine-making machines, the output of a single plant might never have exceeded a few hundred, no matter how many skilled craftsmen may have been employed.

Typical of these tools is a big automatic boring machine that in one swift operation establishes a 75-degree angle for all 12 cylinders for a V-type engine. It performs the boring with the finesse of a watchmaker—its accuracy is within 1/1,000 inch. Another is a huge lathe in which parts as large as a 16-inch coast defense gun can be handled. This tool is called the "watchmaker's lathe" by the operators, a tribute to its precision.

It takes the unerring skill of a master craftsman to produce a large broaching cutter to be used in manufacturing gear blanks. After the steel is "roughed out" and hardened, it takes him many hours to finish grind the teeth because there are as many as 380 on some broaches. The height, thickness and shape of each tooth, as well as the distance between teeth, are not allowed to vary more than a few ten-thou-

(Continued to page 191)

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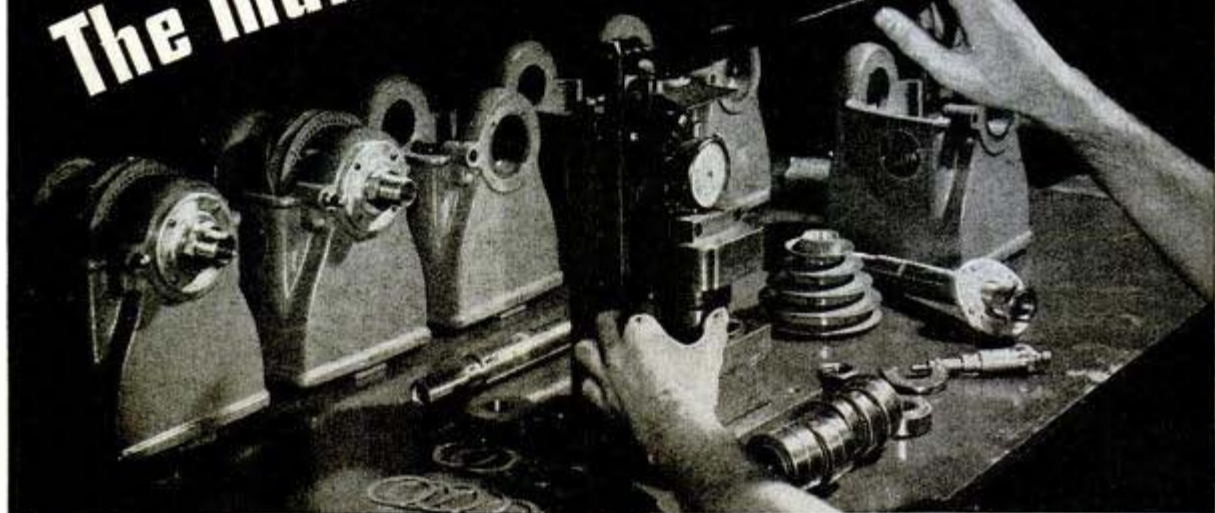
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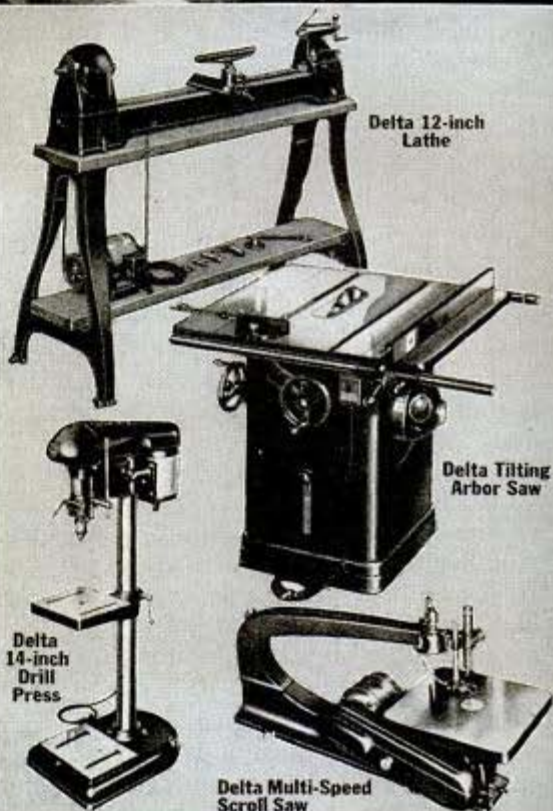
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sandths of an inch. Once set in a broaching machine, however, this cutter in the hands of a relatively unskilled operator can turn out thousands of gear blanks to extremely close limits of accuracy. Thus is the rare skill of a master toolmaker multiplied a thousandfold by modern machine tools.

In the early days of the automobile, it was considered an astounding feat for tool-makers to build a set of fender dies—forms for shaping the metal—in a year's time. All the work was done by hand. As time brought new machines, a power-driven milling machine was developed that could fashion the same metal dies in the record time of eight months. Now, with modern machine tools, a full set of dies for the modern car, which is vastly more complicated to manufacture than the early automobile, can be engraved in less than one month. Some of these machines actually duplicate in the steel die block the exact shape of a wooden or plaster model.

The inner shell of the hub cap of one automobile costs about 12 cents when made by machinery. But the dies to shape it cost about \$13,500 and the automatic press to stamp it costs about \$30,000—a machine cost of nearly \$44,000 to produce an article costing 12 cents. To pound out that inner shell by hand would cost only \$24 for tools. Yet one operator, guiding the machines, can turn out 2,160 of these shells in the time it takes to make one by hand. Similarly the cost of making a low-priced automobile by hand would approximate \$18,000. At such a price, only a few cars a year could be sold.

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2818
Tuning Up America's Defense Machine

(Continued from page 11)

rounds of blank ammunition in a couple of days although the crews of the big field guns merely display "firing" flags instead of shooting off blank shells. The factories these days are too busy turning out live shells to supply the artillery with blanks.

To make up for this, the commotion of battle is simulated with klaxon horns, smoke puff charges, smoke pots, tear gas, and suspended metal bars that are struck by hammers to imitate artillery fire.

Whenever possible, bombs are actually dropped if an attack plane strafes a column of trucks, although the "bombs" are noth-



Even in the mock warfare of summer maneuvers, the stretcher party carries out the realism of actual war

ing more than paper bags of confetti. Mustard gas is simulated by exploding gallon cans of a sticky, smelly molasses compound that splatters over the ground and trees. Such a gassed area may not be entered until a decontamination squad is brought up and time is taken to spread neutralizing chemicals.

Buried mines that blow up trucks are really small wooden boxes holding bottles of liquid smoke that is released when the truck wheels crush them. The engineers of a retreating force scatter booby trap anti-personnel mines among the trees and in the underbrush, that blow up harmlessly but convincingly when soldiers trip the hidden wires. The trip wire is attached to a wooden plug held between the jaws of a

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28/8

snap clothespin and when the plug is pulled out the jaws snap together, completing an electric circuit that fires the mine. All such devices help keep the troops on guard against actual contingencies and also notify the umpires what is happening.

Although the army is still far from being motorized to the extent that it is going to be, 7,500 motor vehicles were used at the Hunter Liggett war game alone, a truck-troop ratio many times higher than existed in the first World War. But horses will always be used extensively for cavalry and for some artillery movements because trucks are useless in some sorts of terrain and under some weather conditions.

The new motorized equipment ranges all the way from motorcycles and the small quarter-ton "jeeps" to the "six by six" six-wheel-drive personnel carriers and the big tractors that tow large field guns. The low-slung "jeeps" are almost comical in appearance and action yet they have turned out to be one of the surprises of the rearmament program. They are useful in a dozen ways, from stringing phone wire across country to carrying light guns and sharpshooters up to the tops of steep hills. One convoy of "jeeps" that ran into a road block during one of the war games refused to be captured. The drivers took off up over a hill, dodging trees with their agile four-wheel-drive blitz buggies, and escaping before an umpire had a chance to flag them down.

Aside from the actual training the troops receive, the army is emphasizing its war games today because it wants to find out what are the best ways for using heavy tanks, for example: what the best defense against such tanks is, and what in turn can be done to make the tanks proof against such defenses. The army wants to know all the answers, and to learn them it is trying out all the weapons and strategies used in Europe, as well as a few tricks of our own.

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P 70.6

Wings Over the Antarctic

(Continued from page 31)

ments, did not entirely foresee the usefulness of such a venture to national defense. Like previous, privately-financed expeditions its personnel was concerned primarily with pushing back frontiers, probing the mysteries of Antarctica's little-known interior, and following a scientific program which required painstaking observations and experiments in biology, meteorology, seismology, oceanography, bacteriology, geography and physiology. Government scientists were anxious to photograph Aurora Australis, the "Southern Lights," with cameras widely separated but synchronized by radio; to transmit photographs halfway round the earth by radio and to study chemical changes in the human body during extreme climatic changes. As on previous expeditions, continuous observations also were to be made of fluctuating radio and magnetic waves. All this was accomplished, and in addition Admiral Byrd's report to President Roosevelt tells of exploration by plane and dog sledge of more than 1,000,000 square miles of new or little-known territory; the mapping of 1,200 miles of new coastline; of his discovery of two great peninsulas jutting far into the southern Pacific, of seven new islands and many new mountain ranges whose rugged contours and prominent characteristics lend added weight to geographers' long-standing suspicion that the great, ice-shrouded peaks of Antarctica are extensions of the Andes. These are spectacular achievements, and equally important discoveries in 20 branches of science only await completion of studies now being carried on by a dozen cartographers, physicists, biologists, geologists and terrestrial magnetists at various government agencies, scientific institutions and colleges. But while these scientists, still tanned and hardened from 15 months' exposure to the rigors of antarctic life, are occupied with instruments and statistical reports, Uncle Sam is gaining a wealth of long-needed information of vital importance to the soldiers, sailors and marines now bolstering this nation's defenses in Iceland, Greenland, Alaska and on lonely sea lanes of the north Atlantic.

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(Continued to page 197)

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body when the thermometer plummets to 50 degrees below zero? What is the best treatment for frostbite and snow blindness? Does the darkness of an arctic night rob the human body of essential vitamins? Do wounds and bodily injuries suffered in cold weather require different treatment from those received in temperate climates? These are only a few of the problems for which the Antarctic Expedition is providing answers daily to war-minded government bureaus.

Cold weather clothing, always a serious problem to explorers in the past, was reduced to its lowest common denominator, expedition leaders have advised the War Department. Loose, well-fitting wool garments such as might be worn at home were found entirely adequate if supplemented with heavy wool parkas and outer garments of light, windproof material. Heavy furs were discarded except for plane flights and occasional use on the trail. Long-sleeved leather mitts containing wool "liners" kept hands warm at even 76.2 degrees below zero, while the best "mushing" boots were found to be ordinary garden-variety "arctics" with high felt boots inside. Because large ski boots played hobbs with woolen socks, most men preferred snigger sizes which allowed only room for two pairs of heavy socks and a thin felt inner sole.

Low temperature operation of tanks and tractors is of especial interest to the War Department and on that and related subjects the explorers brought back a wealth of information. Most tank treads are ineffective in deep snow but an Army tank driver and a Navy submarine engineer jointly devised a homemade contraption that enabled the heaviest tank at West Base to scamper around like a "Husky" puppy. Photos of the device were sent back by radio, another expedition experiment. Other devices included revolutionary radio equipment and exhaustive tests to determine the extent to which the Southern Lights and other electrical phenomena affected radio reception. Continuous records were also kept of cosmic ray and electron activities in high southern latitudes.

Tests were even made on window glass of several types to determine which would

(Continued to page 199)



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remain transparent despite a temperature difference, inside and out, of 140 degrees. Under such conditions most windows would coat over quickly with Jack Frost patterns pleasing to children but scarcely to plane pilots flying at high altitudes. Members of the ice party also conquered the greatest bugaboo of all polar explorers—cold feet. Double floors with warm air circulating between solved the problem.

Food is always important to armed forces, particularly in polar regions where the body consumes an abnormal amount of energy. A balanced diet, however, which included such delicacies as fresh fruits and vegetables packed in the States by modern freezing methods, and an ample supply of vitamin concentrates, kept the entire expedition in good health and spirits.

More technical were the expedition's experiments with preheated carburetion, condensation in gasoline lines, and relative efficiency of various antifreeze solutions. Each lesson learned was one step closer to successful operation of motorized United States forces in the far North. Surely, in ways undreamed of by earlier explorers, the recent Antarctic expedition yielded rich returns.

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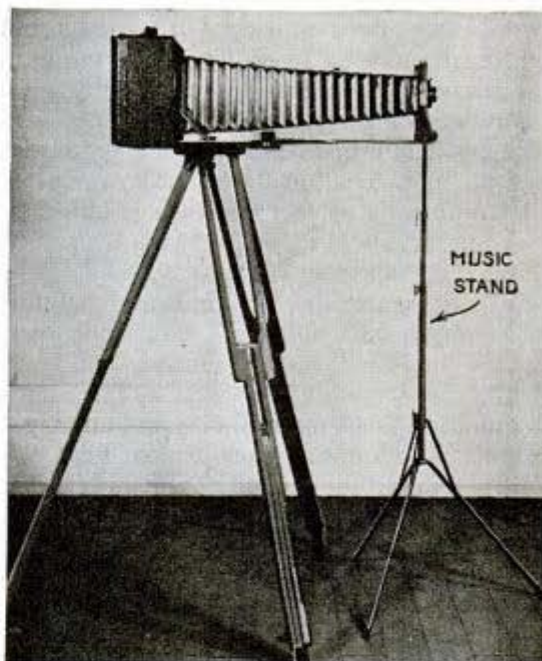


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washing tray. A
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garden hose, split
on one side, holds the cloth on the faucet.
The cloth also prevents a direct stream of
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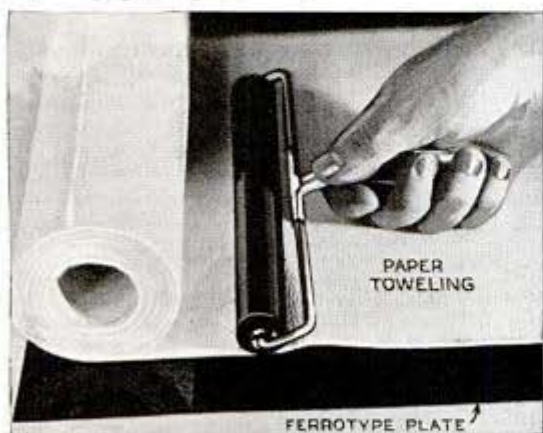
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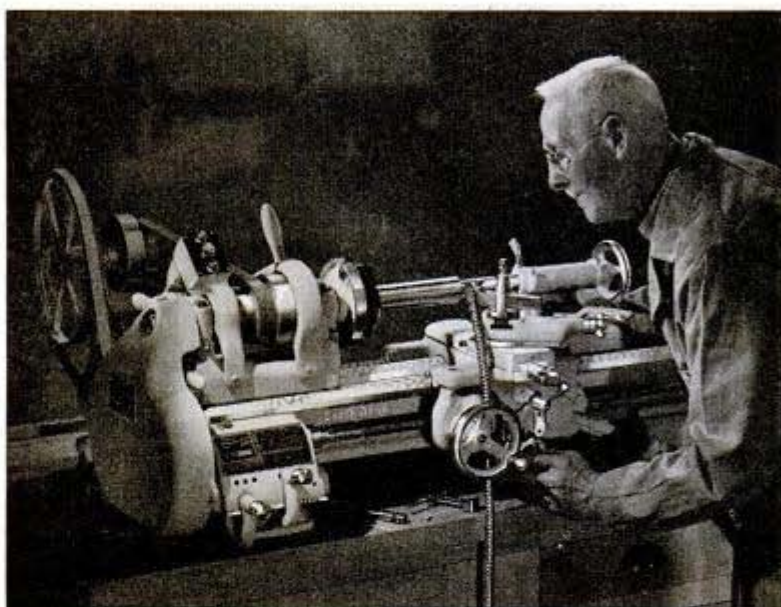
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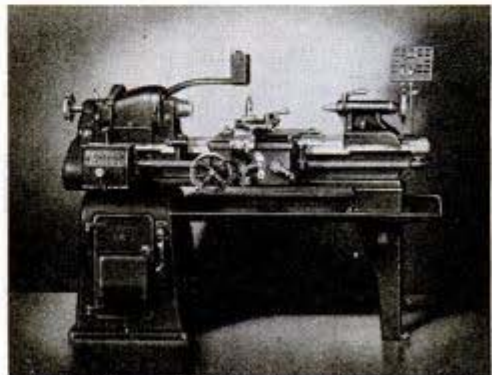


9" Model A South Bend Workshop Quick Change Gear Precision Bench Lathe

Sound design, expert workmanship, and quality materials are combined in South Bend Lathes to give them permanent accuracy. For more than thirty years they have been giving dependable, trouble-free service on the most exacting classes of machine work.

Throughout the process of manufacture, parts and units for South Bend Lathes are frequently inspected and tested to assure accuracy in the finished product. Final tests are made with the lathe in operation. Each lathe must machine work to extremely close tolerances before it is approved for shipment from factory.

South Bend Lathes are made in five sizes: 9", 10", 13", 14½" and 16" swing, 3' to 12' bed lengths, in Tool Room or manufacturing types, with countershaft or motor drive. Write for a catalog and name of your nearest dealer.



13" swing Underneath Motor Drive Tool Room Lathe



SOUTH BEND LATHE WORKS

909 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

LATHE BUILDERS SINCE 1906

“
KNEW HER WHEN
*she couldn't keep up
 with a kiddie car!*”



“The service man found several ‘bottle-necks,’ where worn cables were causing shorts and ‘leaks.’ He replaced them with Packard cable. Now Betsy buzzes along without a murmur—and she’s always first away when the light turns green!”

For Pep and Power

Get a PACKARD CERTIFIED RE-WIRING CHECK-UP

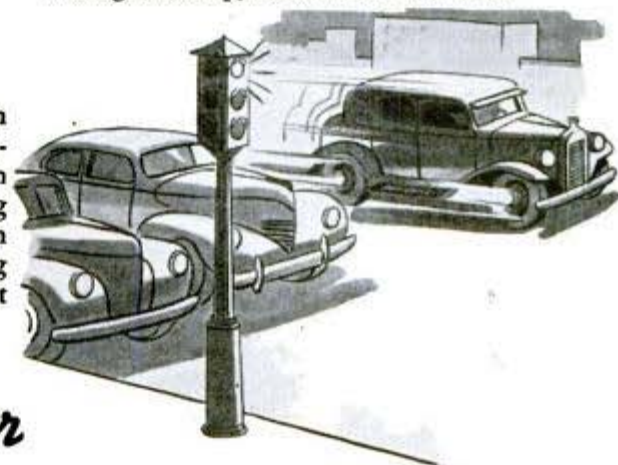


If your car is suffering from lost power and pick-up, unsatisfactory lighting or poor gasoline mileage, it's time to stop at your nearest Packard Certified Re-Wiring station. It takes only a short time for a thorough check of the entire electrical system, including all electrical units and accessories as well as the wiring. Packard mechanics have the technical skill and the proper equipment to do the highest-grade repair work. Any necessary cable

“Poor Betsy was in awful shape. Her owner had to coax her to start, and if she did start, it took all kinds of pampering to keep her going. No pep or power at all—traffic breezed by so fast she looked as if she were backing up!”



“It looked like the bone yard for poor Betsy. But one day a service man, after watching her struggle up to the gas pump, said to her owner, ‘Looks to me like trouble in the electrical system. If you'll let me give her a Packard Certified Re-Wiring check-up, we'll find out for sure.’”



replacements will be made with only genuine Packard cable of the right type and gauge.

A Packard check-up costs little, can save a great deal of expense later on. Don't let a faulty electrical system rob your car of its best performance—see your Packard service man today. Packard Electric Division, General Motors Corporation, Warren, Ohio.

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THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY



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FOR MILDNESS, for BETTER TASTE and COOLER SMOKING, Chesterfield is the winning cigarette... they're quick to satisfy with their *right combination* of the world's best cigarette tobaccos.

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Everywhere you go...

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