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WRITE FOR NEW 1936 CATALOG

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The above illustration shows the new 10-inch Delta Circular Saw—mounted on a special Combination Unit with the Delta 6-inch Jointer. Circular Saw is available separately as a bench model, or mounted on special stand, or in combination as shown above.

New SHAPERS - New GRINDERS IN 1936 "DELTA LINE"

The new Delta Shaper is one of the simplest and yet most complete Shapers ever designed for the workshop. Has numerous basic improvements. The new Delta Grinders are not just another line of grinders—but revolutionary new grinders in every sense of the word! Belt-driven, motor-driven and pedestal models—they all embody Delta's high standards of designs and construction. No pains have been spared to make these new Delta Tools ideal in every way—convenient, safe, accurate and efficient. Truly, here are the grinders that shopworkers have always wanted—and at the unusually moderate Delta price levels.



If proof of Delta superiority were necessary for the craftsman who knows good tools, it would be afforded by the fact that the Delta Manufacturing Company is now the largest manufacturer in the world making this type of machinery exclusively.

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Affectionately,
Bob

Dear Son:



Your logic is bad. You say you're saving money but want more. How come?

Dad

Dear Dad:



I need the five to pay a debt. I bet my roommate that the Dean's pipe mixture cost more than mine. I was judging by its fragrance and mildness. You could have knocked me over with a burned match when the Dean pulled out a tin of Union Leader. Imagine a tobacco like that for 10¢!

Affectionately,
Bob

Dear Son:



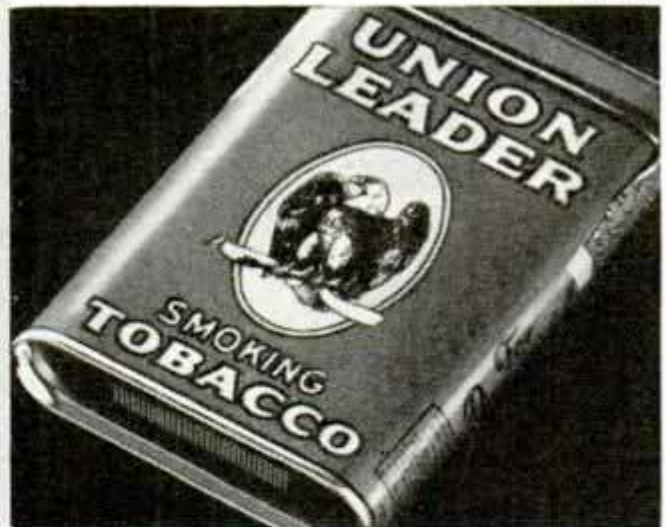
I don't have to imagine it; I smoke it. And now that you've taught your nose to appreciate Union Leader's aroma, you can start teaching your pocketbook how to pay the \$5 you owe.

Dad

LIGHT up a bowlful of Union Leader. Compare it with the most expensive pipe mixture you can buy, beg or borrow. Its mild, old Kentucky Burley tobacco gives you a cooler, mellow smoke, fragrant and friendly.

Then jot down the price of a full size tin of Union Leader. That's 10¢. Divide that by the 25 or more pipefuls in every package, and you've got the answer to why Union Leader is gaining more customers every day than any other smoking tobacco in America. (Good for cigarettes, too!)

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

January, 1936

Vol. 65, No. 1

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The Next Great War

IF THE discoveries and developments which have been made in science and engineering since the World War should be applied to the wholesale slaughter of human beings and the destruction of their property, the next great war will result in the annihilation of entire nations and the killing and maiming of millions of men, women and children. In this issue Hiram Percy Maxim paints a picture of the next war in the air. In February he depicts the next war on land, basing his predictions on actual proven scientific accomplishments. No greater argument could be found for peace than this picture of the horrors of any future world war. Eight pages of pictures illustrate the story.

Next Month

THREE million spectators saw it last year and twice that many will see it in 1936, so the Soap Box Derby is no "kid's race." Building a soap box racer is more than just nailing four wheels on a box. Getting real speed means solving many problems the engineer encounters in building an automobile. Read the first of a series of articles on "The World's Greatest Race" next month.

The Incredible "Rip"

THE earth is smoother than a billiard ball! Chickens have tails twenty-four feet long! These and hundreds of other seemingly incredible statements—all backed by fact—appear in Robert L. Ripley's "Believe It or Not" cartoons. Mr. Ripley has visited 180 countries in his search for the unusual. Today he finds the world so full of believe-it-or-nots that he has trouble making his selections. Read the story of his travels and experiences next month.

Flying by Ear

RADIO has revolutionized flying technique. An air transport pilot today stays on his course, locates an airport in fog or makes a "blind" landing—all with the aid of radio. Radio serves as the "eyes" of the airways and the pilot "sees" through his earphones. Read next month how aviation and radio have teamed up.

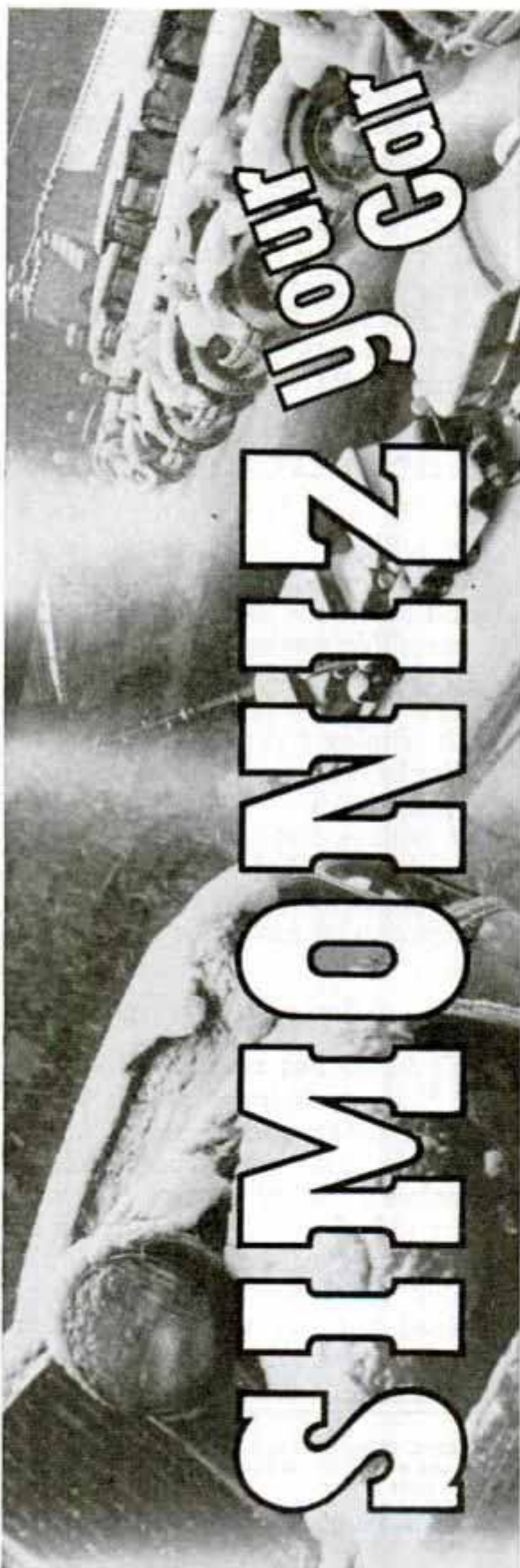
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"Did we have to hire a boy with a Skin like that?"



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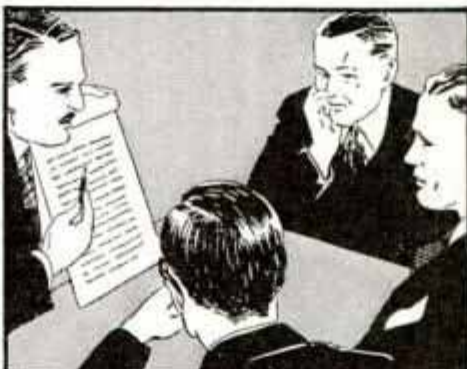
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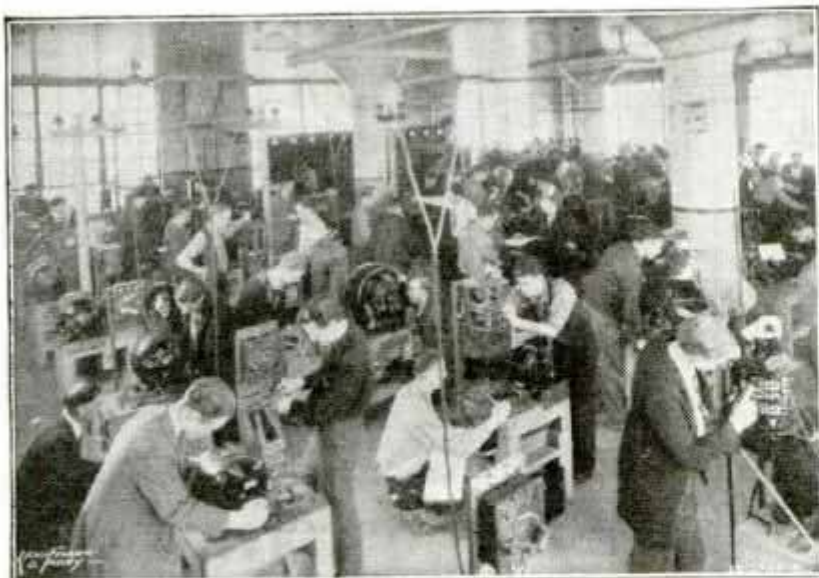
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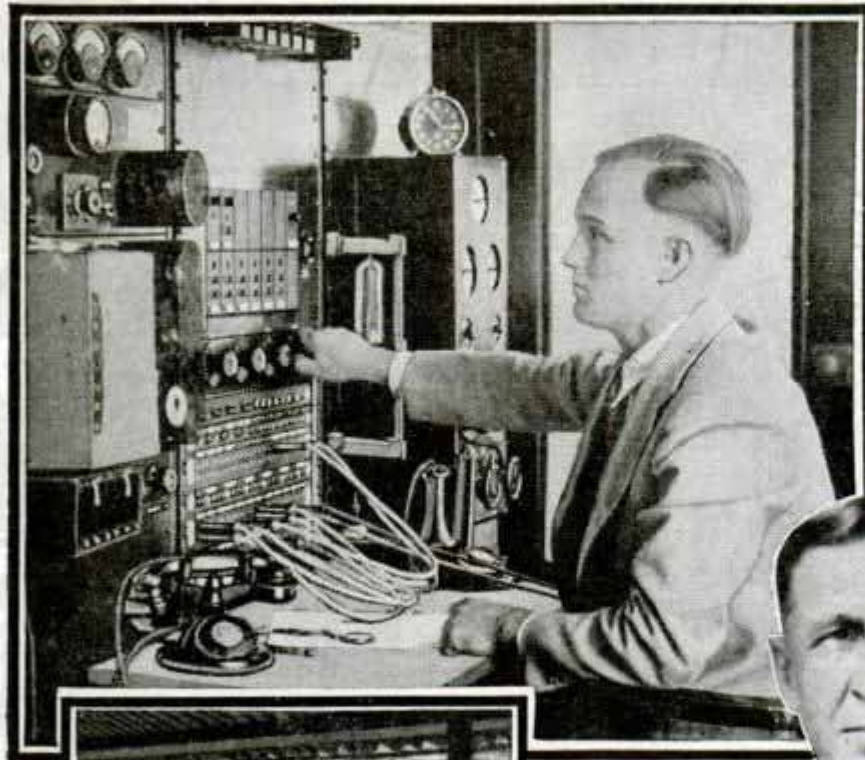
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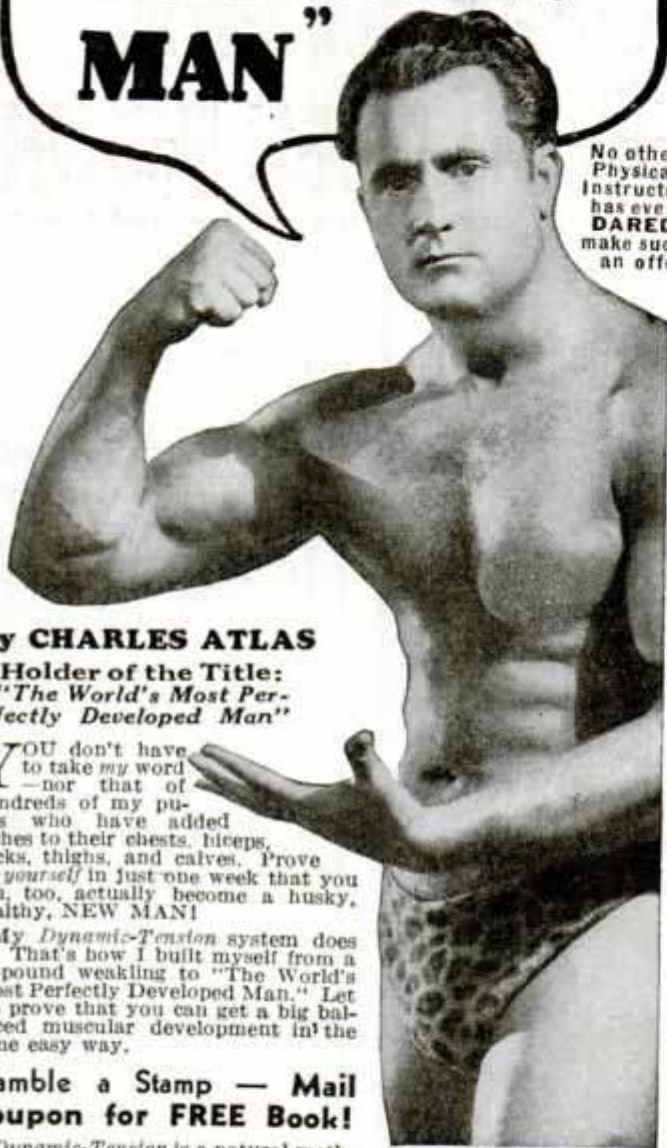
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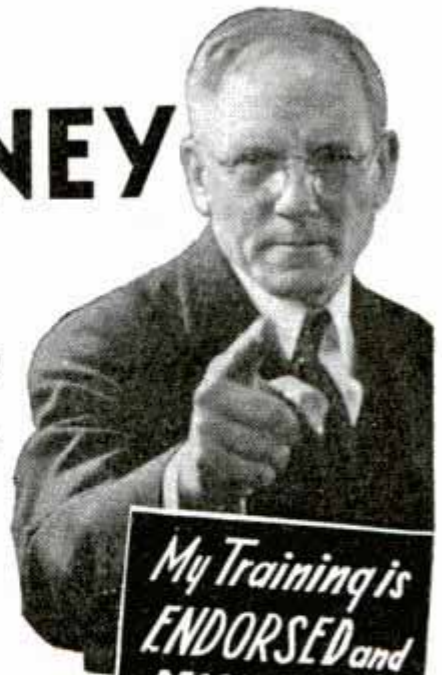
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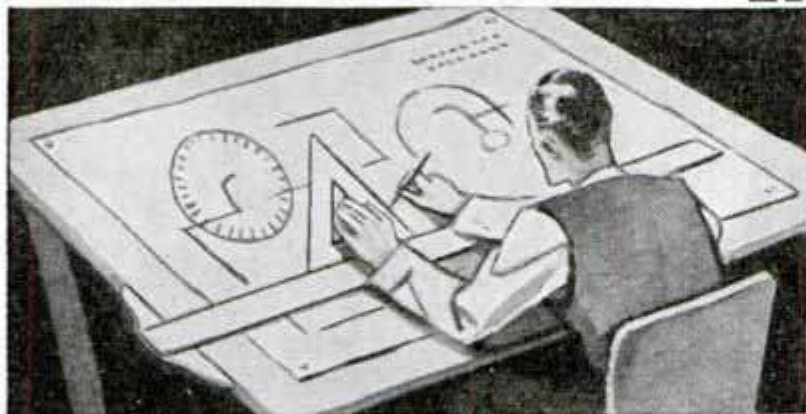
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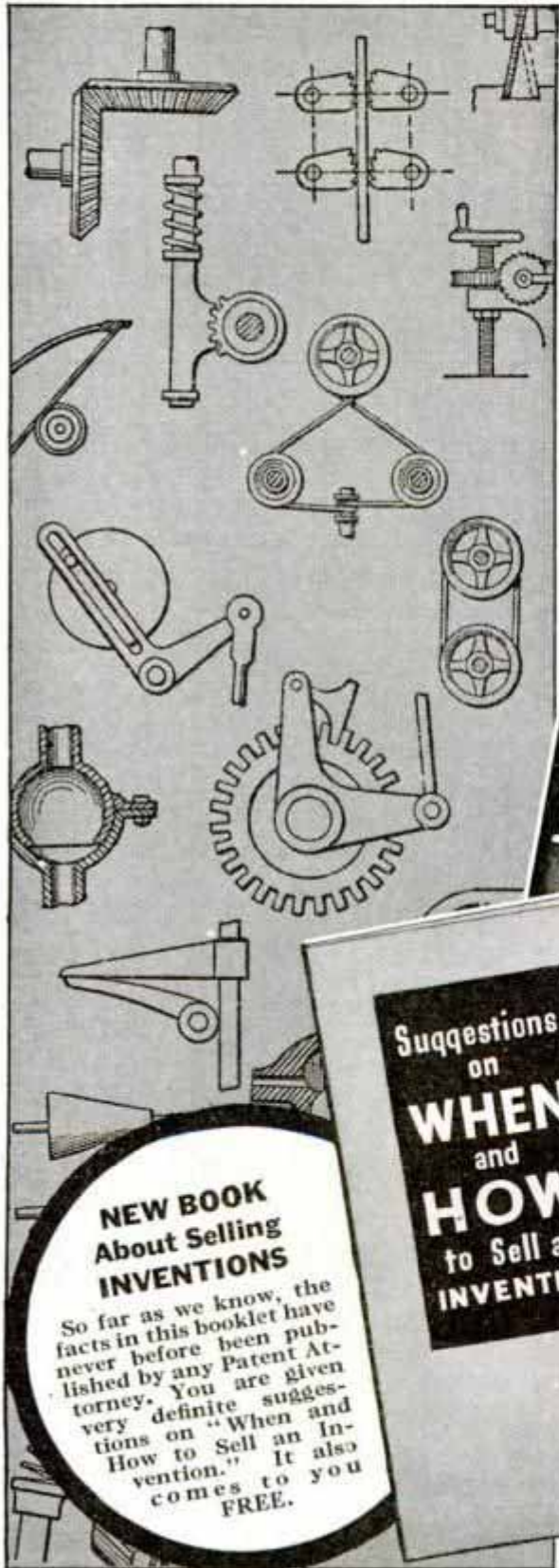
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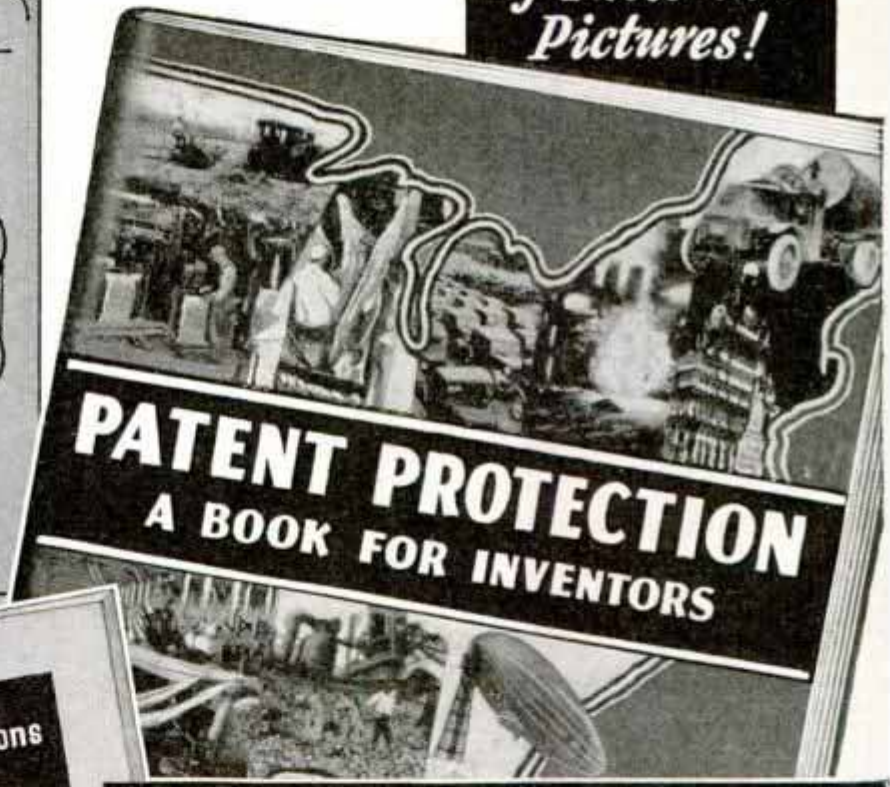
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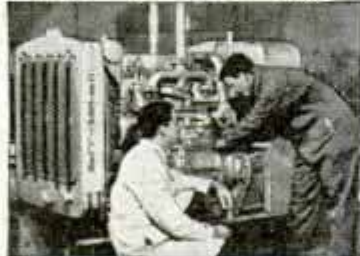
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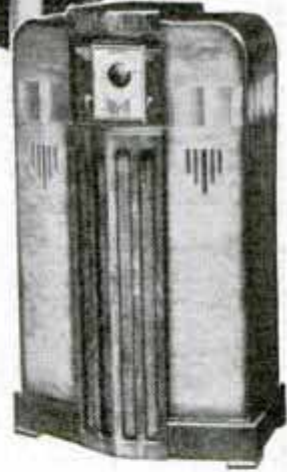
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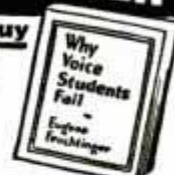


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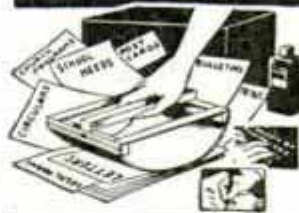
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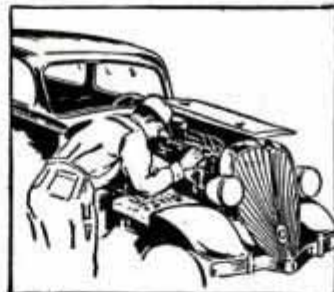
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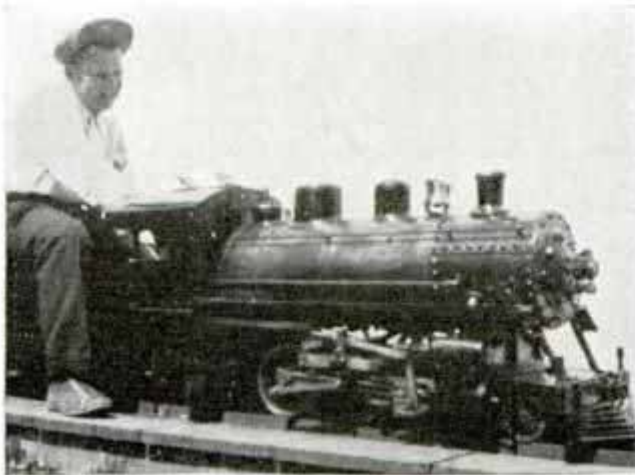


The Editor's MAIL BAG

(Continued from page 34A)

offender, making about one-third the total noise of the plane. The motor, with exhaust, makes less than one-third, and the two sources, motor with exhaust and propeller, are blamed for about sixty per cent of a plane's noise.)

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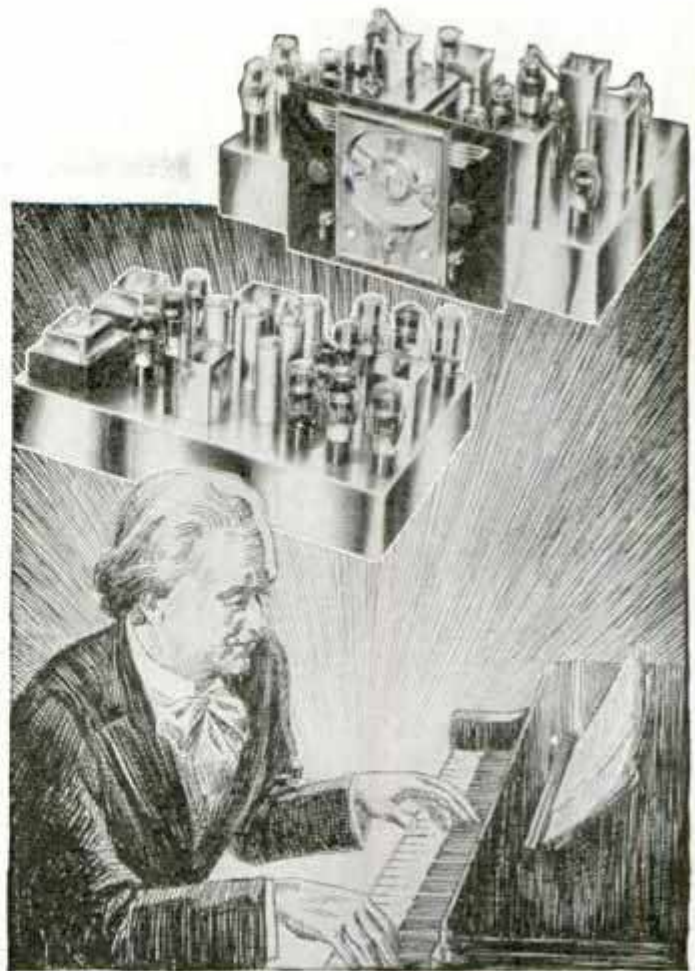
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(Continued to page 55A)



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HUNDREDS Of money making opportunities, plans, ideas. Northeast Agency, Ashland St., Boston, Mass.

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PROSPERITY For home workers. 52 page magazine. Sample, dime. Sizemore, 4917 N. Kostner, Chicago.

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EARN Extra money weekly—Spare or full time. 10c brings new amazing plan. W. E. Martin, Bassett, Va.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

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MAKE Useful articles from klinkers found in ordinary ashes. Real money-making opportunity. Write at once for details. Adolph Ringl, 12524 Moran Ave., Detroit, Michigan.

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

TO Win success you must do something different; particulars free. Publishers Sales Company, Box A-67, Nelson, Georgia.

HOMEWORKER Magazine—filled with profitable ideas! 3 months, 25c. Mailmarts, Cincinnati.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N, Decatur, Ill.

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HOW To identify and determine value of old precious metals. Where to buy. To whom to sell. Reliable and up-to-date information. Complete instructions only \$1.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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FIRE Extinguishers for the home. Liquid self-acting type easily made. Instructions one dollar. B. M. Holden, Box 32, Williamsbridge Station, New York.

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15 FORMULAS; 9 Food products, 6 toilet preparations. All for 25c. Donald Greenwood, 65 River, Southbridge, Mass.

FIVE Valuable beauty formulas 25c. Henry MacKeown, 2134 Hudson Avenue, Chicago, Illinois.

FORMULA—Compound menthol ointment, \$1.00. Universal, Box 546, Jacksonville, Florida.

10 PROFITABLE Formulas. Also "Amazing Money Making Opportunities," dime. Advance, 618 Manhattan Bldg., Milwaukee, Wis.

3,000 FORMULAS, Facts, processes, trade secrets in Dr. Brown's Book of Formulas—380 pages. Price, postpaid \$1.00. Ogilvie Publishing Co., 57 Rose Street, Dept. 25, New York.

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TRISODIUM Phosphate—Amazing chemical, dissolves paint, oils and grime. 10c gets supply sources and formulas. Waldo, Box 266, Dallas, Texas.

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500 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Indiana.

MAKE Money at home. Spare time. No canvassing. New plans. Write quick for free details. E'Dorie System, Box 2532A Central Station, Kansas City, Mo.

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ANY Formula \$.50, 3, \$1. Colo Laboratories, Bryant Pond, Maine.

BIG Profits making, selling your own goods. Large 26 page formula catalog 3c. Browns Formulary, 212 East Waters, Tampa, Florida.

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FORMULAS; Plans; bargain list free. Wieland, 6125A Tracy, Kansas City.

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

FORMULAS—Tried, tested, proven. Real money makers! Average cost only 4c per formula! Write for interesting information. Best-Formulas-of-the-Month Club, Mayo, Florida.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

10,000 MONEY-MAKING Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, mucilage, antifreeze solutions, battery solution, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. \$4 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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FREE Chemical catalog. Send 3c stamp. Waltman, Box 575, Laramie, Wyoming.

HANDBOOK For chemical experiments, revised and illustrated, 50c. Experiment booklet 15c. Chemical catalogue 5c. Scientific booklet free. Reading Scientific Co., Reading, Pa.

25 CHEMICALS With experiments, 35c. Kayare Chemicals, 5522 Ft. Hamilton Parkway, Brooklyn, N. Y.

CHEMICAL Set. Performs 35 experiments, 25c. Fleischer's Laboratories, Everett, Mass.

CHEMICALS, Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

AGENTS WANTED

AMAZING New moneymaker! Apex De-Luxe (combined) Wall Type Can Opener, Knife Sharpener and Bottle Opener. Opens square or round cans safely. No rough edges. Retail \$1.95, without sharpener \$1.75. Agents wanted, samples mailed on receipt of retail price. Apex Manufacturing Co., 720 Mission St., San Francisco.

SENSATIONAL Tested material provides thrilling opportunity for "something different." Material waterproofs cellar, walls, cistern, silo, etc. Big market, big money for you. Very simple. Get details of American Fluoresit Co., Cincinnati.

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

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 1-A, 4503 Ravenswood, Chicago.

100% PROFIT In the "Self Starting Cigar Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 25c. Costs \$1.75 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-1, New Method Bldg., Bradford, Pa.

BIG Profits selling 2 new articles. Samples 25c. 1432 Elmwood, Berwyn, Ill.

MEN Wanted for coffee routes. \$80-a-week opportunity. Automobile given producers as bonus. Write Albert Mills, 2633 Monmouth, Cincinnati, Ohio.

DOUBLE-EYED Self-threading needle packages, size 3/9. Blind people thread them, invaluable for failing sight, necessary for good sight. Five samples 25c. Twenty packages, dollar bill, 100 packages \$5.00. Particulars. Wm. Oglesby, Vandalia, Ill.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

FAST Seller—800% profit. Latex bandage—5 color box. Quick Bandages, 801 N. Sangamon St., Dept. PM, Chicago, Ill.

AGENTS Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfits. The Moss Company, 64 Searle Bldg., Rochester, N. Y.

FREE! Descriptions, 450 newest money making opportunities. Metromails, P-1, Cincinnati.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 1-PM, Chicago.

COLLECT Big daily commissions taking orders for "Famous Shirts" beautiful fast-selling line. Popular prices. Free sample outfit. Famous Shirt Co., Dept. 85X, Milan, Tennessee.

MAKE Products yourself—Tested formulas. Catalogue free. Grinstead Laboratory, Edwardsville, Illinois.

LOOK Men, women; earn \$5-\$10 daily, selling new window cleaning compound. 2 sales an hour does it. Seneca Specialties, Geneva, N. Y.

WHOLESALE Catalog free. 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

FREE Plans, books, circulars. Make thousands of dollars selling by mail. Home. Spare time. Mail Order Institute, 193-H Tompkins Ave., Brooklyn, N. Y.

WILL Rogers thousand jokes. Quick sellers. Sample 6c. Brewer, 157 Leonard, New York.

450% PROFIT In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-37, Bradford, Pa.

AGENTS. A whirlwind seller and coin getter. "Middy's Scissors Sharpener." Sample and particulars 10c. Edward Woehr, 808 S. 49th St., Philadelphia, Pa.

WONDERFUL Chinese herb tea; valuable in many sicknesses. Want live agents. Republic Co., 617 Montgomery, San Francisco.

BIG Profits selling MotoRex to automobile owners. Greatly increases power and mileage. Reliable Products, 5005 Euclid, Cleveland, Ohio.

WANTED: Men in all territories. 50% commission. Write about plan and samples. Home Tally Card Co., Box 586, Muncie, Indiana.

MEN—Women \$3 to \$6 daily. Selling 25c household necessity that repeats. Three to ten sold in every home. Free sample. Write Puro Company, 3107 Pine St., Dept. A-2046, St. Louis, Mo.

AMAZING New compact first aid kit—retails 25c. Sensational money making invention. Sample 15c, details free. Allenby Products, 1107 Broadway, New York City.

COSTS 1c—Sells 25c. Make non-explosive cleaner from Benzene Crystals. 1c gallon. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

UNUSUAL Proposition for a man of high integrity in every state and who has close connection with state government. Must stand close investigation. Give references and apply Engineering Office, 129 Southwest 15 Ave., Miami, Florida.

PERFUMED Laundry starch. Whirlwind 25c seller. Profit 17c. Duker, 433 Beiden, Chicago.

SPLASHLESS 25c Filters save glassware. Invaluable proposition. Free introductory tryout. Barnett, Box 63, Times Square Station, New York.

CONCENTRATED Vanilla flavor. Whirlwind seller. Package 25c. Darnell, Jackson, Tennessee.

\$3.00 HOURLY! Amazing automobile ornament. Produces revolving colored light. Propell-O-Lite Company, Mt. Washington, Ohio.

SELL Mechanical score-keepers to card players. Sample 25c. Score-Keeper Co., 3140 W. 25 St., Cleveland, Ohio.

MEXICAN Feather pictures. Great profit. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

CARTOONS. Art cards. Samples 25c. Rey, Box 83, Sta. N, New York.

SELL Key checks. Generous commissions. Stamping outfit not required. Free sample and particulars. Irvin Buschkowsky, 508 Oak St., Chaska, Minn.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

FUNNY Booklets. Novelties. Generous samples 30c. Buck, Sta. W, Box 2, New York.

AGENTS—Sell our luminous crucifix for handsome Christmas profits. Hannan Co., 2620 South Parkway, Chicago.

MAKE Commissions daily—Sell Goodyear raincoats, jackets; union made; lowest prices! Outfit free! Goodyear, BB1133, Milwaukee, Chicago.

SELL Men's neckwear, 100% profit. Four sample ties \$1.00. Free catalog. Artstyle Neckwear, Elmira, N. Y.

CASH Income daily silvering mirrors at home. Plating autparts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 128, Marion, Indiana.

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

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

GOLD Letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, 3004 Lincoln Ave., Chicago.

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

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 18 West 22nd, New York.

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

SELL New food specialty. Spicy butter. Colaviti's Co., Perkasie, Penna.

SUCCEED With your products. Learn how. Formulas. Processes. Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

BIGGEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 45 East Eleventh Street, New York.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

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

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co. Ave. H, Deatur, Ill.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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MAN Wanted by shoe manufacturer established 31 years for sales work. Ready cash daily. No experience needed. 3 line sales outfit free. Write Mason Shoe Manufacturing Co., Dept. M48, Chippewa Falls, Wis.

MAKE Big money—Commissions advanced, sell Popular Mechanics work shoes—complete line of dress shoes—outfit free. Dura-Tex Shoe, 80, Brockton, Mass.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2639 N. Third St., Milwaukee, Wisconsin.

EVERYBODY Likes dogs. Our metal dogs pay liberal commissions. Samples 10c each. Hiawatha Sales Company, Atchison, Kansas.

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

NEW Premium and direct item. Universal Publishers, 1553 Madison, Chicago.

PRINTERS New press attachment. Inexpensive. National Specialty, 1553 Madison, Chicago.

NEW Presto wind proof cigar lighter packed six chromium on 1000 hole punch board. Sells to dealer at \$8.00. It's a knock-out. You collect \$2.00 as your commission. We ship C.O.D. \$6.00. Get particulars. New Method Co., Box PMP-37, Bradford, Pa.

SALESMEN: Everybody now buying calendars, sales books, restaurant checks, gummed labels, Xmas cards, business stationery, etc. Special features. Free deals. Big comm. daily. Free sales portfolio. Willens, Dept. GF, 2132 Gladys, Chicago.

WANTED: Salesmen to sell business cards. 2000 cards delivered \$2.32. Commission 50c per order. Samples free. Werts Novelty Co., Inc., Muncie, Indiana.

SOMETHING New in fire extinguishers—Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 785 Burkhardt, Dayton, Ohio.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mdse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 1810, Spencer, Ind.

BIG Earnings, selling, installing kitchen range oil burners. Bennett Company, Islip, N. Y.

SALESMEN—Sell complete line quality printing. All business necessities. Gummed labels, adv. cards, salesbooks, calendars, Hammermill bond stationery, etc. New features. Large spot cash commissions. Complete sales outfit free. All-Trades Printing Service, Dept. PM-16, Rockford, Illinois.

RELIABLE Salesmen wanted in every town. Sell Venetian blinds and awnings. Experience unnecessary. Commission. W. E. Hettrick, Box 377, Toledo, Ohio.

STRANGE Chemical sponge cleans wall-paper like magic. Banishes housecleaning drudgery. Women amazed. Hustlers cleaning up. Outfit free. Kristee Mfg. Co., Dept. 251, Akron, Ohio.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

SALES Tax law forces merchants keep records; men averaging good daily commission; exclusive territories open. Mill-Green Publishing Co., 370 Seventh Ave., New York.

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

LARGE Steady profits. Make-sell amazing 30 below non-evaporating auto anti-freeze. Cheaper, better, easily-quickly made. Formula 30c. Allied Research, 2217 North Kilbourn, Chicago.

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

SELL Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. Outfit free. United, F-6155 South State, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

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FREE Suit and large cash profits for every six \$16.95 all wool tailor made to measure suits you sell. No limit to number of free suits you may earn. Three Star Clothes, 330 S. Franklin St., Chicago, Ill., Dept. 35A.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 16A.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 501, Toronto, Ont.

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848-A177 Lincoln Ave., Chicago.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-SD, 1956 S. Troy, Chicago.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. A-217, 500 Throop, Chicago.

SELL Rebuilt watches. Same guarantee as brand new. Low prices will amaze you. Everybody a prospect. Write for illustrated folder and prices. Grossman Jewelry Co., 4666 State Street, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

LEARN Diesel engineering. Rapidly expanding field. Good pay for Diesel-trained men for next 25 years. Home training possible. Get latest and right up-to-date Diesel Handbook. Authentic. \$5.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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MEN Wanted willing to learn landscape designing and fill big paying positions as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 400 Plymouth Bldg., Des Moines, Iowa.

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13 KNOCKOUT Blows without fists, by internationally known police instructor. Send 15 cents, coin or stamps. S. J. Jorgensen, 200 Maritime Bldg., Seattle, Washington.

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LOGA-GRAPH Solves mathematical problems graphically. Complete chart, three dimes. Geo. L. Thom, 2444 Sunnyside Ave., Chicago.

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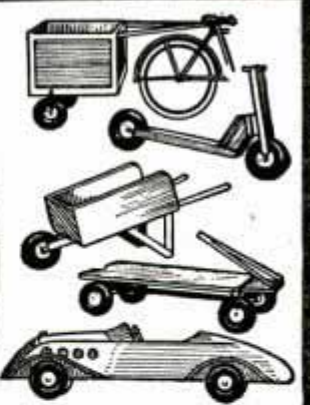
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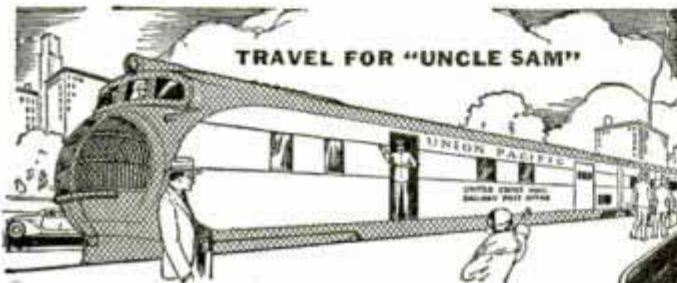
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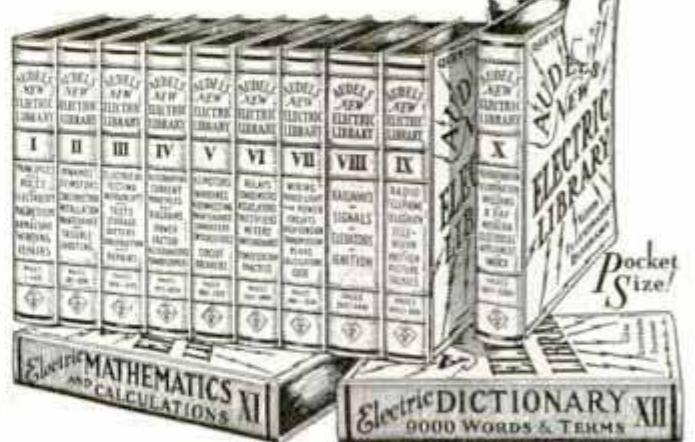
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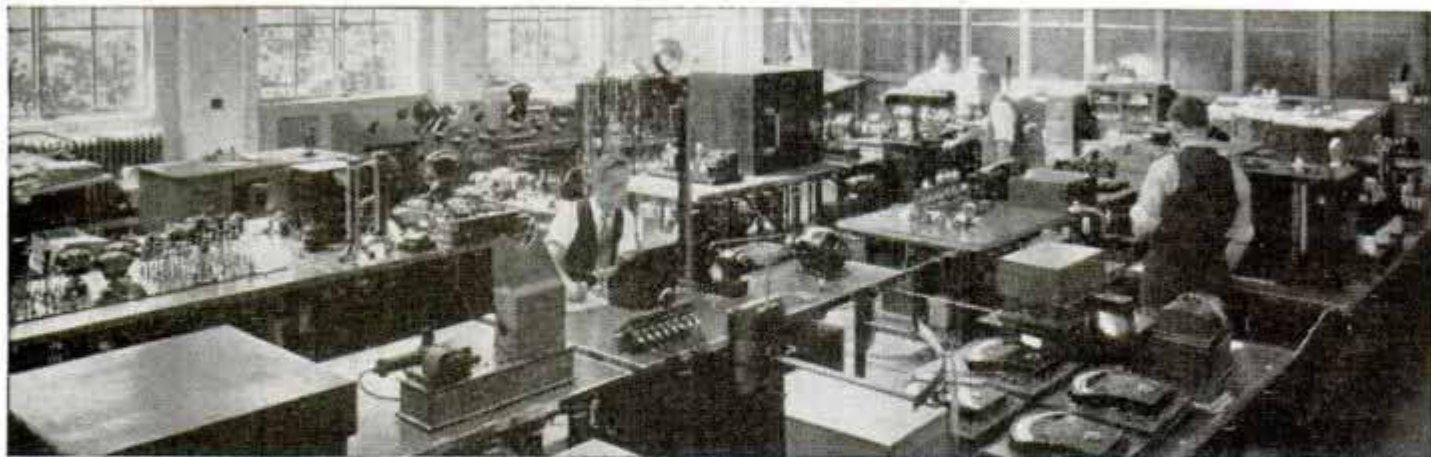
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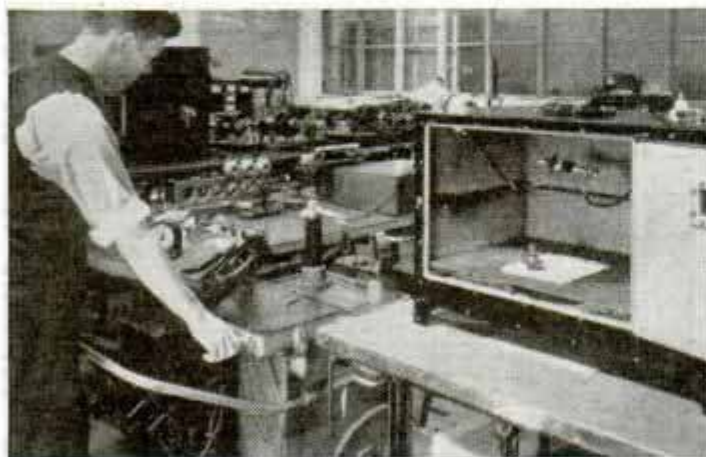
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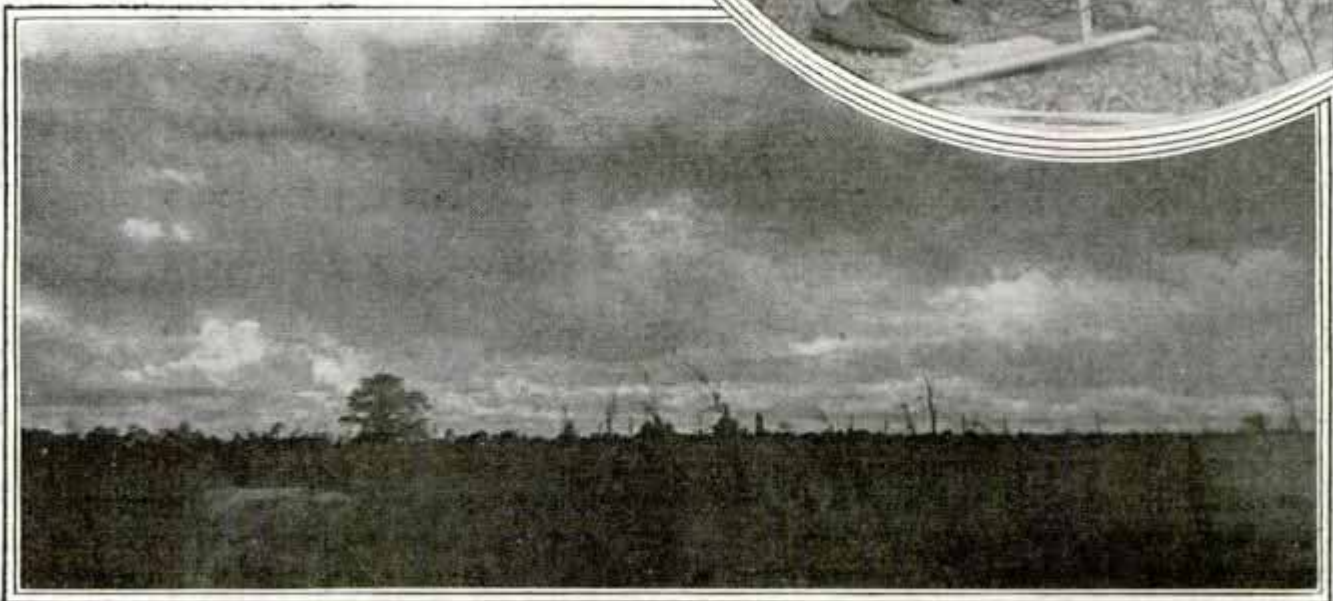
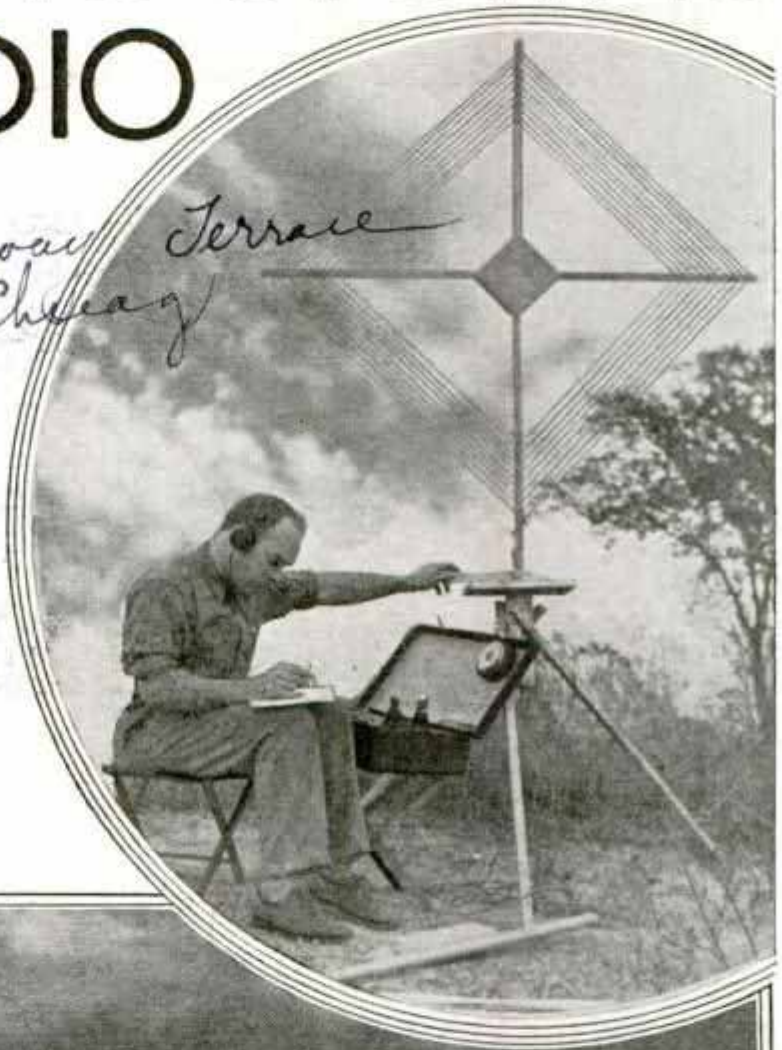
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By ALEXANDER MAXWELL

758 Juneway Terrace Chicago

MILLIONS of dollars have been spent trying to eliminate static. Wireless stations using sufficient power to light a small city have been built to push signals through it.

But in the light of recent experiments, static becomes a watchful sentinel, shouting a warning to save man from the wrath of the elements. As a rattlesnake warns before striking, so does a storm. Static is the tocsin of an approaching storm. It is loud, it carries a surprising distance and it may be interpreted by anyone so inclined.



Top, Loop Aerial and Set Used in Taking Readings to Locate a Storm; Below, the Billowing Clouds Piled High Tell the Story of an Advancing Cold Front Following a Storm



Checking our observations with weather maps we discovered that in every instance the loop pointed toward an area in which a squall or other disturbance was raging. Not only did it locate the general direction, but bearings taken hourly followed the storm as it moved. One station can only give the line upon which a storm is located but two stations located 300 miles or more apart could get a triangulation which would spot the exact location. In locating a hurricane, however, a



Top, a Portable Receiver and a Car Enable One Station to Do Work of Two by Moving Rapidly from Point to Point and Taking Triangulation Bearings on the Storm Center

Twelve years ago my brother, Prof. Selby Maxwell, broached the idea of a radio storm detector to enable ships at sea to steer clear of hurricanes. Operating an amateur radio station, the idea of storm detecting took root with me too, and I made experiments with directional loops and portable receivers. Last summer a special receiver was constructed and using it in Chicago, we took bearings on static disturbances and located them.

single bearing point is sufficient. The storm moves much faster than the speediest ship, so readings taken hourly would plot the course with sufficient accuracy to enable the captain to steer clear.

We were confident our radio could locate a storm. The final check was to do so. A long-range forecast prepared by my brother from mathematical calculations predicted a hurricane which would sweep in from the West Indies early in Septem-

ber, strike Florida and move up the Atlantic coast. When storm warnings were first flashed we loaded our car with the radio, a camera and a camping outfit, and set forth. Every few hours we took bearings, checking on the progress of the hurricane. Anyone who has listened to a radio knows all static does not sound alike. The rumbling roar of a hurricane sounds much like a fast freight thundering over a high bridge.

Our radio was made of standard parts, employed two tubes, a four-foot loop, and ran from airplane-type dry batteries. The complete set weighed twenty pounds. The loop was set on the running board and the radio was placed in a suitcase which also held our barometer, thermometer, compass and charts.

The receiver was designed to oscillate very violently but was even more sensitive than intended. We placed the loop fifty feet from the receiver. Even so, the scraping of feet on dry grass produced static charges which sounded like the rustling of silk.

Body capacity was so much in evidence we had to remain motionless while readings were being taken. A passing auto sounded like a burst of machine-gun fire. We always checked six times around the loop to eliminate the possibility of error.

The actual recording of signal intensity was accomplished by means of a fader such as is used on broadcast control panels. This was calibrated and rotated till absolute silence prevailed. The number indicated was placed on the chart and the loop turned to the next position. When

(Continued to page 143A)

Auto Seating Four Abreast Rivals Low Streamline Car



Wide Car with Room for Four Passengers in Front Seat and Low Streamline Model with Riveted Body Exhibited at British Auto Show

Some unusual contrasts were offered among models of the 1936 cars exhibited at the annual British automobile show in London. One very wide car boasted room for four passengers in the front seat. The extra width was obtained by building the chassis over the wheels so that the space usually occupied by running boards and fenders is devoted to additional body room. Another car which attracted attention was a very low, streamline automobile finished in aluminum, and having the appearance of an armored car, since body segments were riveted together.

Lancefield Coach Works, Wrenfield Place
Queens Park, W.10. London, England

4
E 1321

Three-Miles-a-Minute Threat Flung by Winged Speedboat



dent.
"Miss U. S. III" Sends Spray Flying on Test Speed Run; Notice Plane-Like Hull Design and Outrigger Support for Wings in Water

It is literally "flight" on the water when the winged speedboat "Miss U. S. III" starts its race for world speed supremacy, a goal that may see new records established near three miles a minute. The thirty-five-foot hydrodrome constructed by E. S. Evans and his twin sons, Edward, Jr., and Robert, is built like an airplane, with five sets of outrigger foils or wings which ride in the water, their upper and lower surfaces both exerting lifting power like the wings of airplanes. "Miss U. S. III" is eligible for the Harmsworth Trophy race and is expected to challenge the world record of 124.915 miles an hour set by Gar Wood's "Miss America X" in 1932. With a 650-horsepower Packard motor "Miss U. S. III" was expected to reach 150 miles an hour. Later an 800-horsepower motor developing 1,600 horsepower with supercharger will be installed to try for higher speeds. Extremely small wings suffice to lift the hull clear of the water.

E 1344

COMPRESSED AIR BLASTS COAL AND REPLACES DYNAMITE

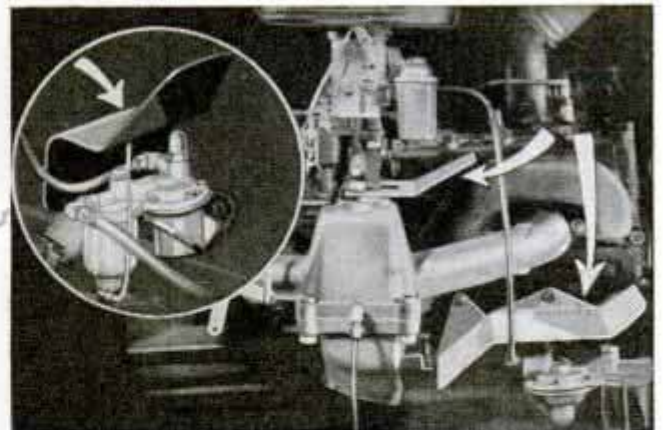
Compressed air, instead of dynamite, is being tried for blasting coal in some mid-

western mines. Large pieces of premium variety coal are politely pushed out of place by air pressure instead of being ruptured violently by dynamite. The air method localizes the blast and eliminates fumes. In pneumatic mining, a hole is drilled in the mine face and a cylinder containing air compressed to as much as 15,000 pounds to the square inch is inserted. This pressure can be released at will and is comparable to the pressures set up when a charge of dynamite is exploded. The steel cartridges used to store the air have a disk which can be ruptured by the operator and the cartridges can be used over again.

E 1324

MORE VOLATILE GAS REQUIRES FUEL-SYSTEM SHIELDING

As gasoline increases in volatility, its flash point lower, manufacturers are finding it necessary to give more attention



Arrows Show Studebaker Method of Shielding; Inset, How Chrysler Shields Float Bowl

to shielding of the automobile's fuel system. The more volatile the gas, the more susceptible it is to vaporization in hot weather and the more likely is vapor lock to interfere with starting. Most car makers recognize that this problem exists by protecting fuel pump, fuel line, float bowl and carburetor from the heat of the en-

Sullivan Machinery Co.
708 W. 11th St. Chicago

gine. For instance, Studebaker carefully shields the fuel pump and the carburetor by attaching heat deflectors at the proper places to keep down the temperature. Insulation also is used for the same purpose, serving to interrupt the flow of heat between the metal parts.

813/2

ROBOT DISPLAYS WALLPAPER TO AID SELLING

Operating automatically, a machine designed to help the wallpaper salesman displays two hundred patterns, one at the time, in room settings for which the particular design is intended. The machine provides an illuminated stage on which the patterns appear as the salesman presses a button. Continuous operation, for show windows, also is possible. Backgrounds, or room settings, for displaying the wallpaper may be changed quickly to present any pattern at its best. Several settings can be obtained.

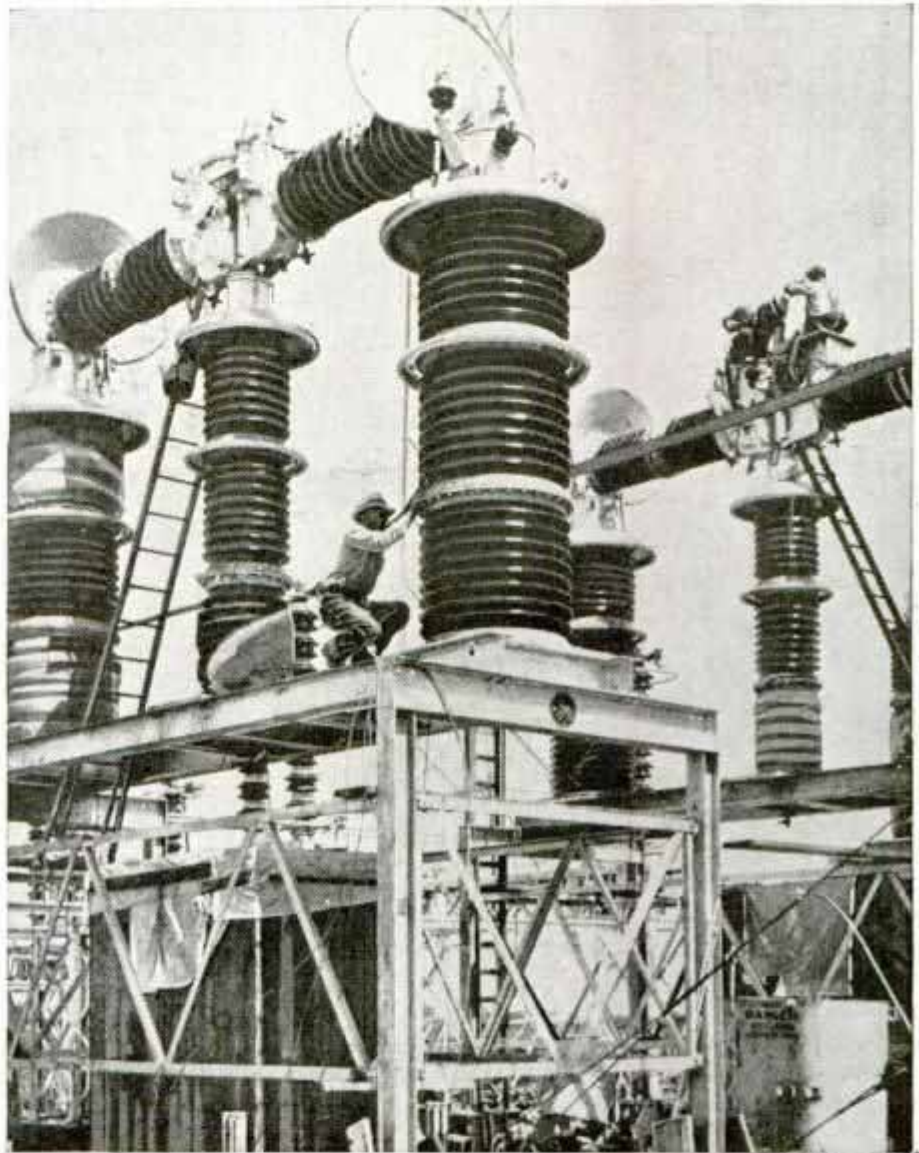
\$265.00
pend

Robot Salesman Displays Wallpaper Patterns at Touch of Button



Vitascope Co.
#10 Broadway

"Lightning Rod" in Desert Guards Giant Power Line



These Million-Dollar Circuit Breakers Are Posted along the Boulder Dam-Los Angeles Power Line to Stand Guard against Electric Storms

On guard against desert storms that might interrupt the great transmission lines from Boulder Dam to Los Angeles are million-dollar switching stations equipped with giant circuit breakers. These desert "lightning rods" can isolate any section of the power line with split-second speed when emergency demands. Twelve hundred men worked two years to build the stations, which are located at Silver Lake and Victorville.

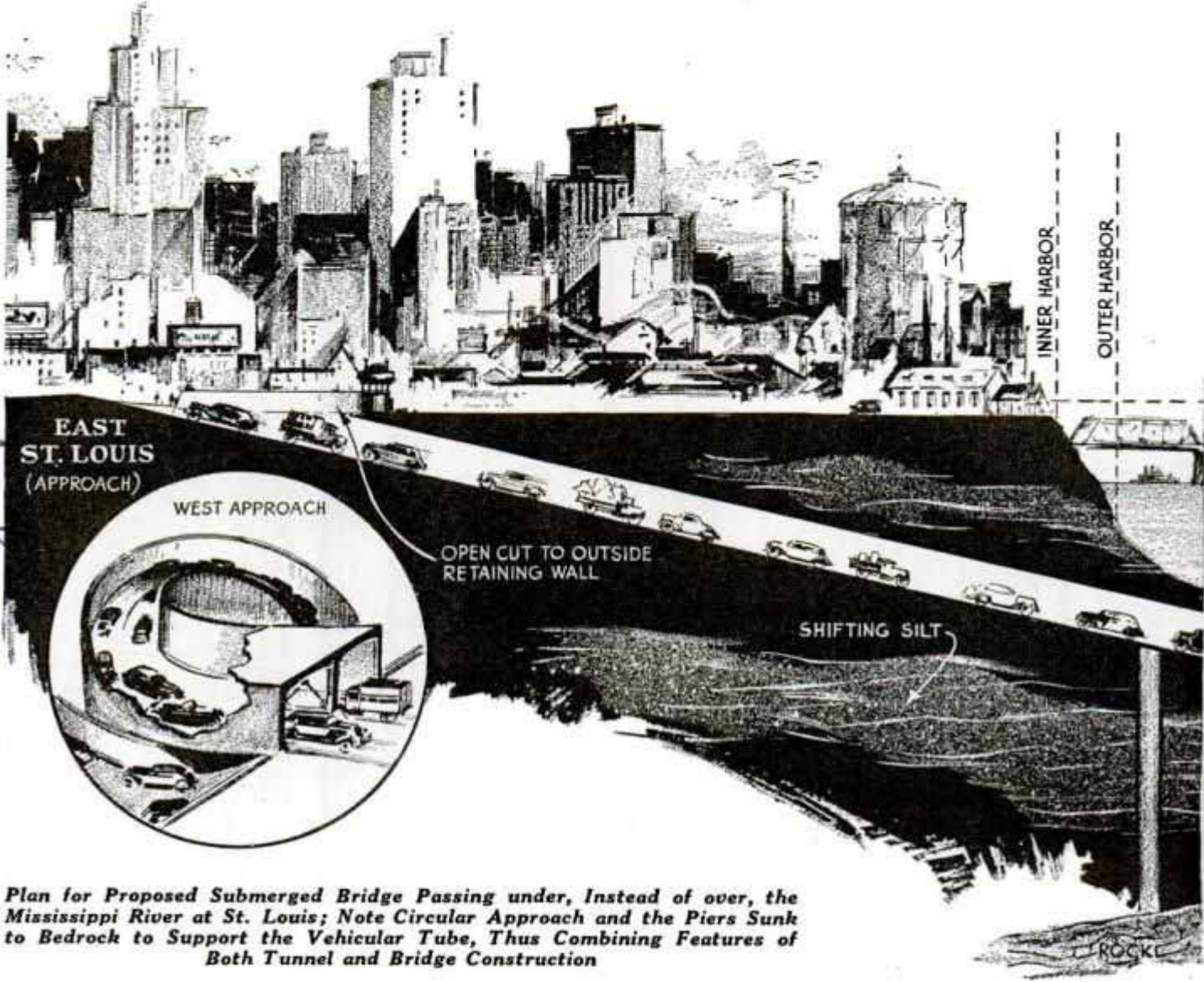
☐ Certain butterflies are frozen and inert more than ten months of the year in northeastern Siberia, where January temperatures average sixty degrees below zero, but revive in midsummer sunshine.

I will soon repair.
substitution

8 13 37

The SUBMERGED

Portland Cement Assn. National Press Bldg. Washington D.C.



Plan for Proposed Submerged Bridge Passing under, Instead of over, the Mississippi River at St. Louis; Note Circular Approach and the Piers Sunk to Bedrock to Support the Vehicular Tube, Thus Combining Features of Both Tunnel and Bridge Construction

COMBINING principles of both tunnel and bridge construction, a submerged bridge which would pass under, instead of over, the Mississippi river between St. Louis and East St. Louis has been proposed and application has been made for a government loan for the project which would cost about \$12,000,000.

While the submerged bridge would differ materially from the overhead type, it would be related to it since the roadway members would rest on piers carried to bedrock and spaced several hundred feet apart. The roadway, however, would be inclosed in a tube to resist hydrostatic pressure, the tube being designed to resist the vertical load and horizontal thrust of the water.

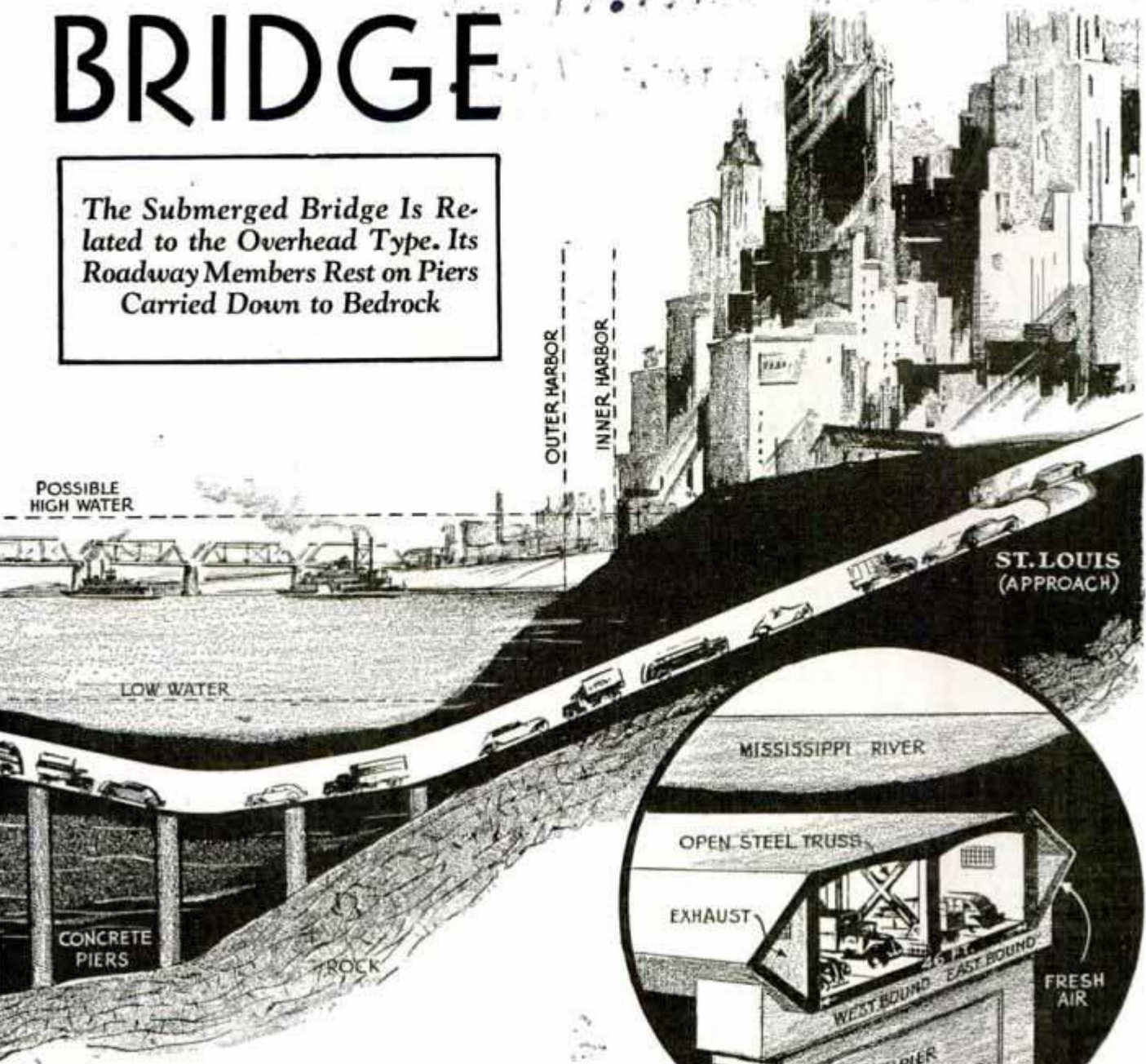
The bridge is planned for high-speed

traffic and would be of reinforced concrete, the bridge portion itself being 1,500 feet long and connecting at each end to an approach tunnel, the east tunnel being about 2,100 feet long while the west tunnel would be about 1,750 feet in length. On the Illinois side, the approach tunnel would terminate in an open cut about 1,250 feet long, while a circular ramp is considered as an approach in St. Louis.

Located near the shore on each side would be a building for ventilating equipment and a small pump house also is included. The inclosed portion of the bridge would consist of a wide tube of hexagonal shape, its top being submerged just below the low water bed of the river. It would have a four-lane main roadway about forty-six feet wide, divided for eastbound

BRIDGE

The Submerged Bridge Is Related to the Overhead Type. Its Roadway Members Rest on Piers Carried Down to Bedrock



Right, Cross Section of Proposed Submerged Bridge, Showing Vehicular Lanes, Pier, Ventilating System and Steel Trusses Supporting Tube

and westbound traffic by a steel truss supporting the middle portion of the tube between piers.

The side portions of the tubes between piers would be supported by reinforced concrete girders twenty feet high which would serve also as walls to separate the main roadway from side ventilating ducts. The tube portion would consist of sections built on shore of reinforced concrete with a waterproofing membrane inclosed in an outer shell of welded metal plates.

The sections would be launched, towed to position, then sunk into place. Each tube section would span about 300 feet, resting at each end on piers supported by

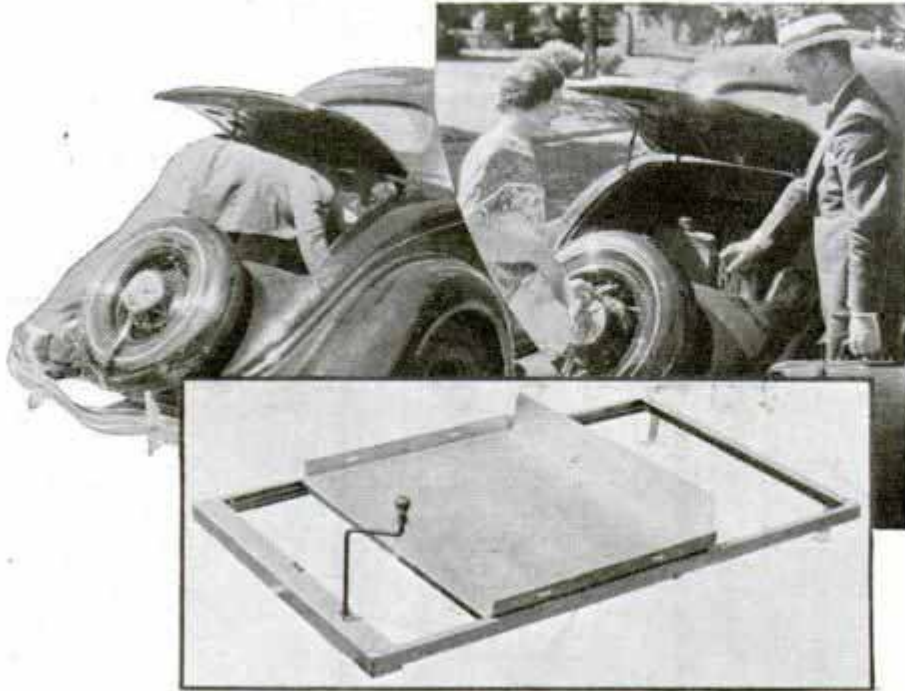
bedrock. Proportions of the tube sections are such as to make them buoyant, so that the vertical load between piers consists of little more than the weight of traffic.

St. Louis at present has two overhead bridges across the Mississippi river, the Eads bridge, nearly 6,500 feet long, and the Municipal bridge, more than 18,000 feet in length. The submerged bridge is intended to divert some of the traffic from the overhead structures, and also to relieve congestion in the business district since its tunnel approach is planned to connect with main highways having optional routes for through traffic that would by-pass the business zone.

*Mississippi River Toll Bridge
Trustee, 212 S. Elm Ave.*

8
e 1297

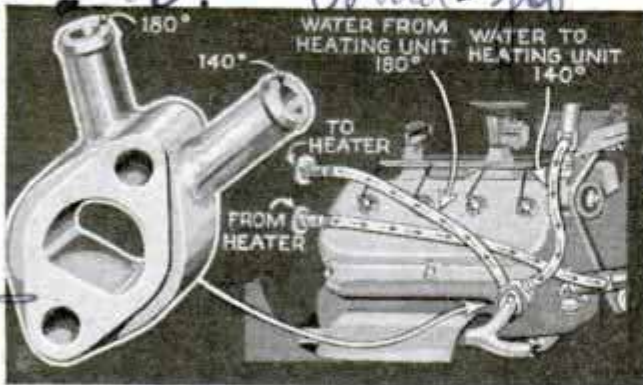
Coupe Deck Loaded Easily With a Sliding Platform



Old and New Ways of Loading Coupe Deck; Right, the New, Simple Method Made Possible by Using Sliding Tray Shown Below

Enabling the motorist to take full advantage of space in the rear deck of coupe automobiles, a new sliding tray makes loading of baggage easier. With this accessory the entire space is accessible from a standing position on the ground. The tray or carrier platform is operated by crank, running on tracks fastened to the floor of the rear deck. Removal of the crank locks the tray in any position.

BOOSTER UNIT FOR CAR HEATER INCREASES TEMPERATURE



Left, Booster Unit for Car Heater; Right, How It Is Installed on Motor

For raising the temperature of the hot-water heater in an automobile, a new de-

vice is attached between the exhaust manifold and the exhaust pipe. The metal unit is installed on the manifold outlet and the exhaust pipe is bolted on. Thus, heated air that would pass out through the pipe is first directed through the booster unit, warming the water that is on its way to the car heater. Tests show that the temperature of the water can be raised as much as thirty degrees by using the unit. This would permit the use of alcohol anti-freeze solutions without sacrificing heat, as there would be no danger of the alcohol boiling away. The alcohol's temperature drops before reaching a point where its vapor escapes.

Aluminum Welded

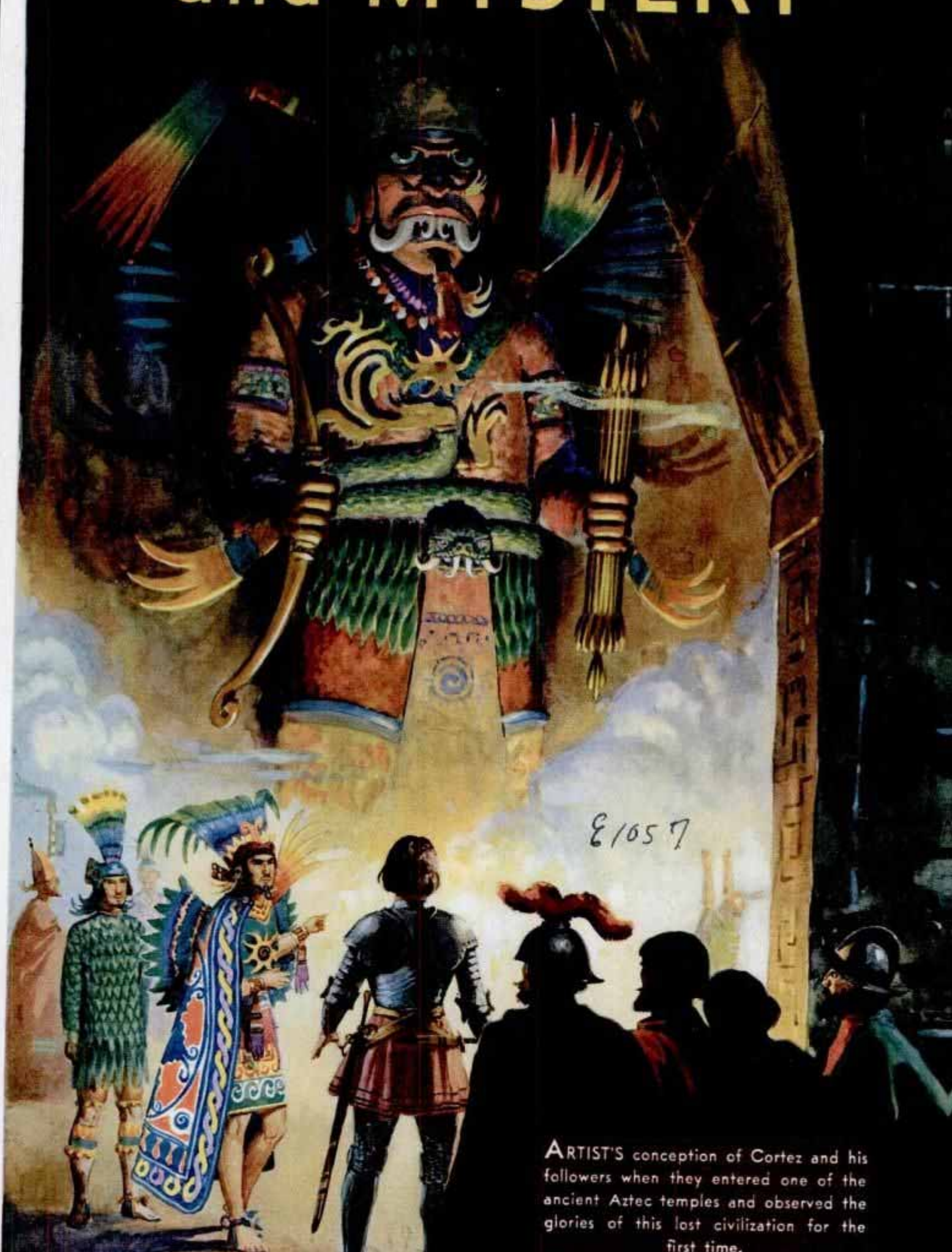
HOLDING promise for airplane and automobile construction, a successful process for welding light aluminum alloys has been developed in England. The welding material, known as "Alusol," will join aluminum in cast, rolled, sheet or tube form and fluxes freely at 200 degrees Centigrade. The method overcomes the old trouble wherein attempts to weld the metal in ordinary fashion destroyed the effects of the previous heat treatment. Test pieces welded together were pulled apart at forces of twenty-six tons to the square inch, but the welded joints were still intact. The welding material is unaffected by aging and can withstand corrosion, it is claimed. The process is analogous to soldering, except that no flux is required. Experiments are under way looking toward the production of an aluminum alloy bicycle, weighing less than five pounds, by this process.

and engineer in
Coventry

e 1323
Ever-Tite Mfg. Co.
Lavenport, Iowa

6/021
J. J. Heard
Ref. by
W. J. Heard
8/27/05
Refrigerated by General Williamson
W. J. Heard
Birmingham, Ala.

THE LAND OF GOLD and MYSTERY



ARTIST'S conception of Cortez and his followers when they entered one of the ancient Aztec temples and observed the glories of this lost civilization for the first time.



81057

NATIVE women and children panning for gold to buy food and clothing in a stream near Bacayopa in northeastern Sinaloa.

By J. A. HOGLE, JR.

*220 Cairo St.
Mt. Washington*

Address field. N.J.

DUE to the rise in the price of gold and silver, Mexico, which has been called by some "The World's Treasure House," is the scene of increased mining activity, particularly in that vast and only partly explored mountain range known as the Sierra Madre, which is the continuation of our Rocky mountains across the Mexican border.

The Sierra Madre mountains, despite their closeness to our border, are a land of mystery, containing many areas of which little or nothing is known. Recently there appeared in the news an article by Robert T. Moore, an American zoologist, describing the Barranca del Cobre, a supposedly mythical canyon, rivaling our own Grand canyon in size and beauty and which has remained hidden from the civilized world until Mr. Moore, on his expedition, penetrated the vast unexplored area in the vicinity of the Uriqui river where he found Tarahumara Indians who had never before seen a white man. Mr. Moore also stated

that the colors present in the rock formation indicated the presence of valuable mineral deposits.

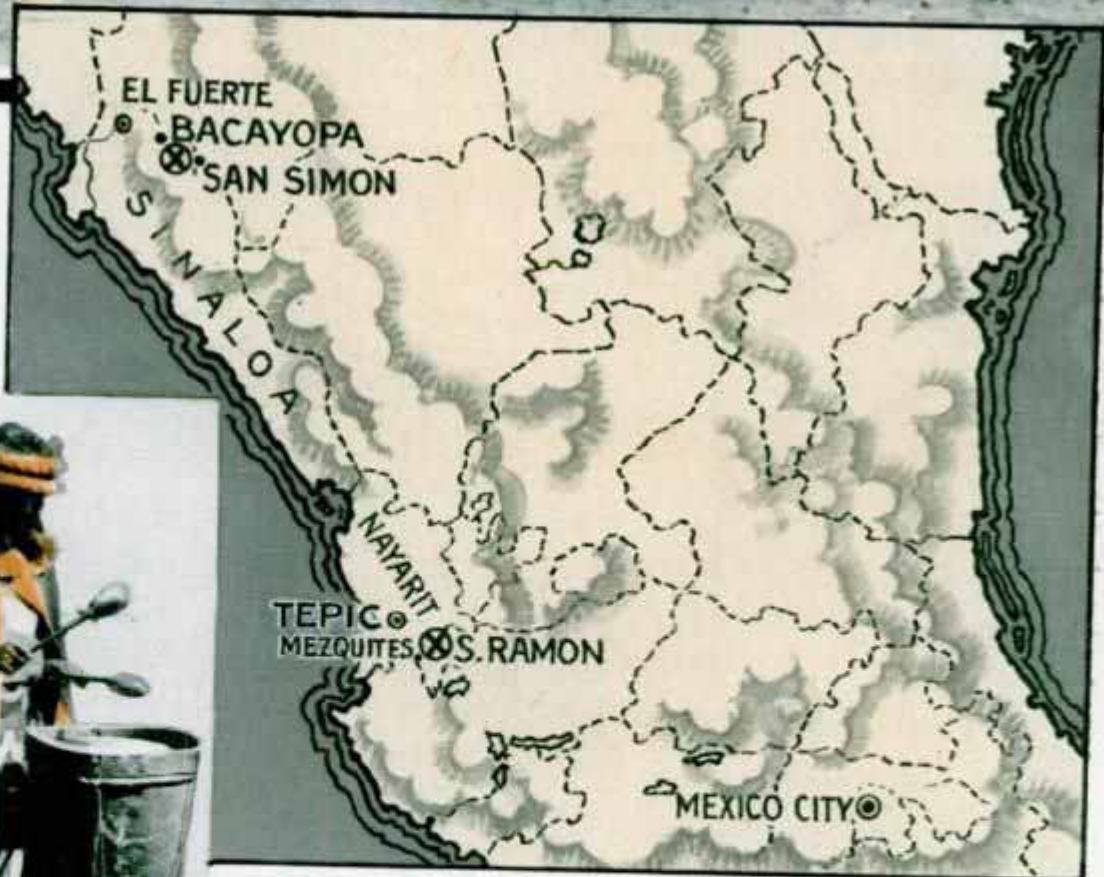
On a recent trip to the country around the upper Fuerte river, which lies a little to the southwest of the Barranca del Cobre, I found many natives engaged in placer mining, using wooden pans cut and shaped by hand, to aid them in washing the sand in the river bed for gold. This placer mining was a family affair, wives and children of the natives taking as active a part in the operations as the head of the family except in the matter of disposing of the gold which was always handled by the men, who took it to a near-by ranch and traded it for merchandise. The owner of the ranch, who happened to be a German, told me that the natives would only wash enough gold to satisfy their immediate wants and, for this reason, it was impossible to ascertain just how much gold a native could obtain in a given time were he to apply himself to his work so many hours per day.

Station, Pittsburgh

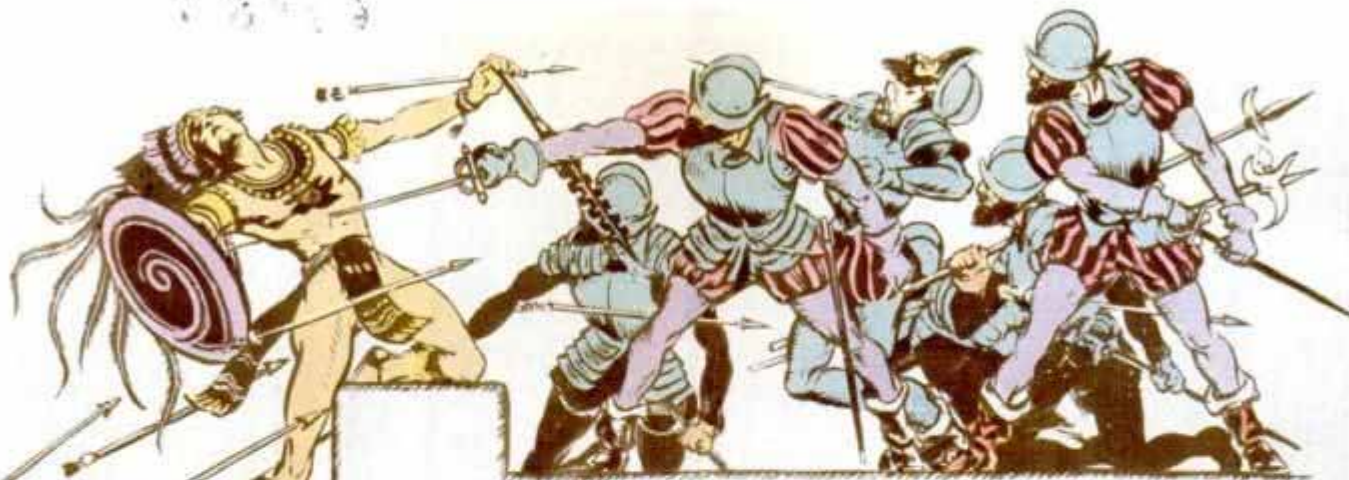
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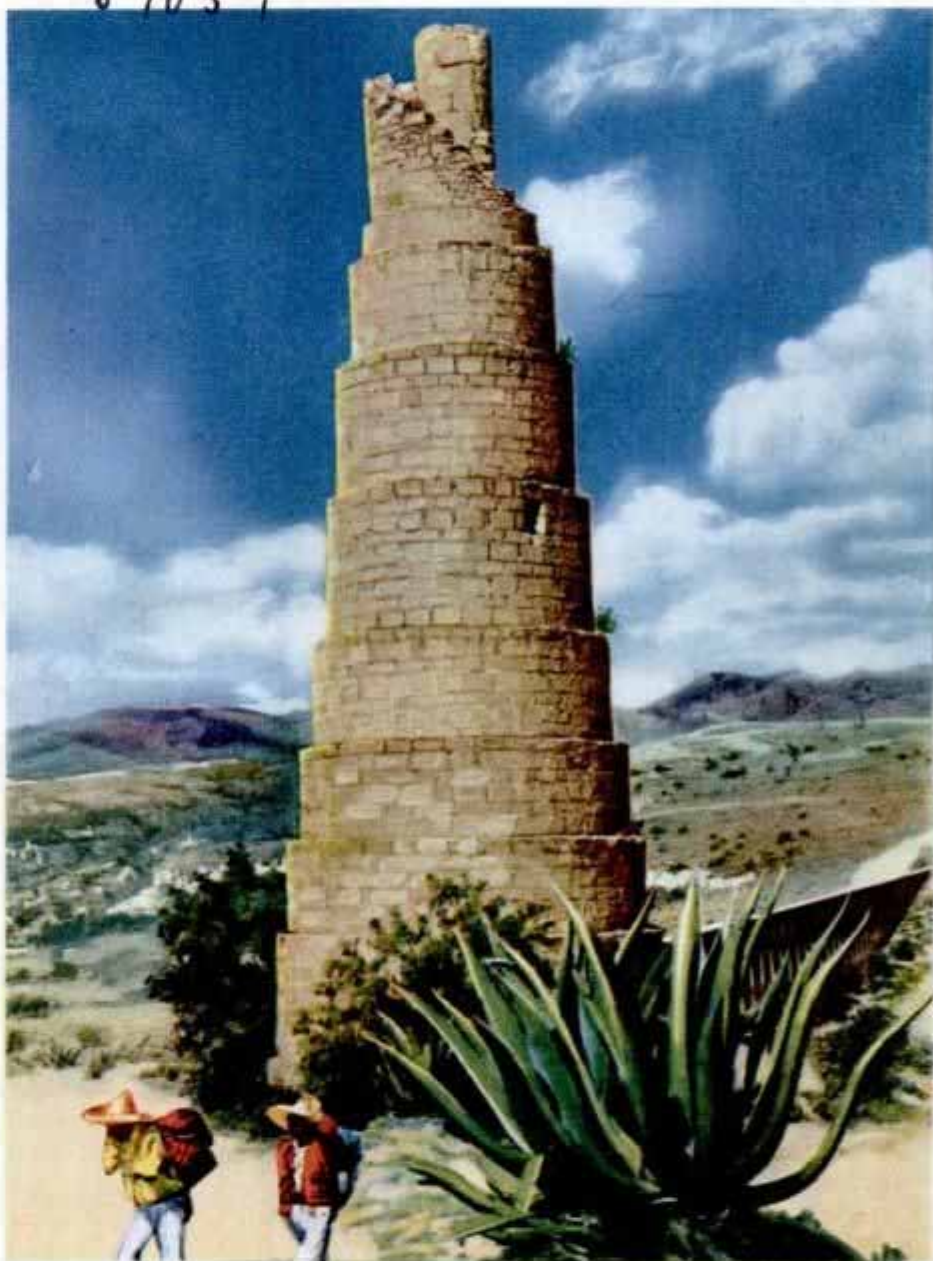
81057



TOP, some of the hundreds of persons in grotesque costumes reenacting an ancient legend at a ruin near Mexico City. Map shows state of Sinaloa where native placer mining is carried on. Left, native musicians playing during a festival celebrated once every fifty-two years according to the Aztec calendar.



8 1057



A TYPICAL Mexican scene is this ancient tower at Los Remedios, standing as a sentinel at the entrance to an equally ancient aqueduct.

Due to the immense boulders that fill the river bed in this section, placer mining with dredging machinery, such as is used on sandy river bottoms, could not profitably be done; however, sluices might be used to advantage. I encountered two American mining engineers a

little further south who had overcome the difficulties of transporting heavy machinery over the mountains and had set up two dredges of the suction and bucket type which were unable to cope with the huge boulders that cover bed-rock, where most of the gold lies. Their



81057

DRAWING depicting the Spaniards marching over a causeway as they entered the magnificent, stone-built city of Tenochtitlan, capital of the lordly Aztec empire.

surveys showed rich sand at bedrock but they were unable to reach it.

The Tarahumara Indians, who inhabit the interior of the Sierra Madre in northern Sinaloa, live almost entirely independent of the white man. They still hunt with bow and arrow and maintain their tribal customs, just as their ancestors did in pre-Columbian days. Their wants are few and, aided by nature, are met easily.

It is the belief of many that somewhere in a hidden inaccessible valley of the Sierra Madre exists the fabled seven cities of Cibola. There is no denying that these mountains, peopled as they are by various Indian tribes who have



shunned the ways of the white man and of whose past little is known, remain a fertile field for further exploration that may result in changing some of the fabled Indian stories into realities, just as Mr. Moore's expedition proved the Barranca del Cobre to exist instead of being a product of imagination as heretofore accepted.

Ever since Cortez invaded the land of the Aztecs, these mountains have yielded vast mineral wealth to the civilized world



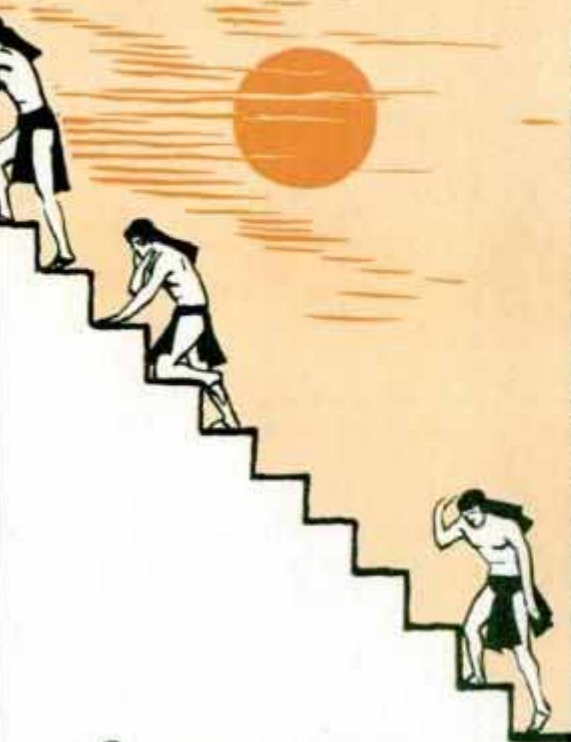
TERRACED walls of the fort where the Spaniards defeated the native Inca kings in the sixteenth century. Below, ruins of the aqueduct used to supply water to an ore-treating plant near San Ramon.

(Photo at top Copyright Underwood and Underwood)

81057



MUCH like the kettle drums of a symphony orchestra are these Aztec hand drums played in unison by these natives during the reenactment of a historic ceremonial.



COCK fighting still flourishes in Mexico. This Mexican porter is carrying a number of fighting cocks to the arena. Each bird is placed in a separate basket made for that purpose.

£1057



and today some of the mines of pre-Spanish days are still contributing wealth to their operators.

Stories of rich lost mines, unworked since the days when Spain ruled Mexico, are told of certain isolated sections in the state of Nayarit, where mining operations were carried on very extensively in colonial days by the Spaniards, whose cruelty to the forced Indian labor often resulted in the murder of their white masters by the Indians. After these massacres, mining activity ceased at these isolated mines as the Indians regarded the gold and silver as a curse that inspired the white man to enslave them, rather than as a source of wealth.

That these isolated mountain sections did contribute great wealth to the crown of Spain was proved to my satisfaction on a recent trip which took me back into the wild barrancas east of the still active Ceboruco volcano where I came upon

elaborate ore-treating plants built by the Spaniards. These plants were located at or near the old mine sites and have now crumbled into ruins, having been reclaimed, in part, by the thick growth of vegetation which, sometimes very effectively, screens them from view. This is due to their location, which is usually on a stream where plenty of water was available for sluicing or washing the ore. The Spaniards were good masons, and aqueducts, with their arched supports, still stand as they did in the days when the dons swaggered over their ramparts where they could better watch the activities of the unfortunate Indians below as they labored with the sluices and slave-powered mortars, which were nothing more than paved circles, over the surface of which huge stone rollers were rotated by the Indians. The ore crushed in these mortars was then put through the sluices and the gold and silver extracted.



81057

DRAWING depicting the pathetic Montezuma falling under a shower of stones and darts from his own people.

As operating at or near old mine sites of Spanish and pre-Spanish days constitutes most of the mining activity in this vast area today, new finds like the one at El Tambor in Sinaloa may reward the prospector of the future who penetrates to the unexplored, inaccessible, and sometimes forbidding, areas of this great mountain range.



2,1236
Billion Gallons a Day to Flow
Through Mammoth Aqueduct

Mexico is considered one of the richest countries in the world, if not the richest, in mineral resources. Its contribution of wealth to the civilized world began with the Spanish in 1521 and from then until 1922 Mexico has yielded 155,000 metric tons of silver having a total value of \$3,000,000,000. This represented at that time, two-thirds of all the silver mined in the world. In 1927, Mexican mines were still yielding one-third of the world's entire production of this white metal. In 1934 Mexico produced 2,306,168 kilograms of silver with an estimated value of \$35,799,436.

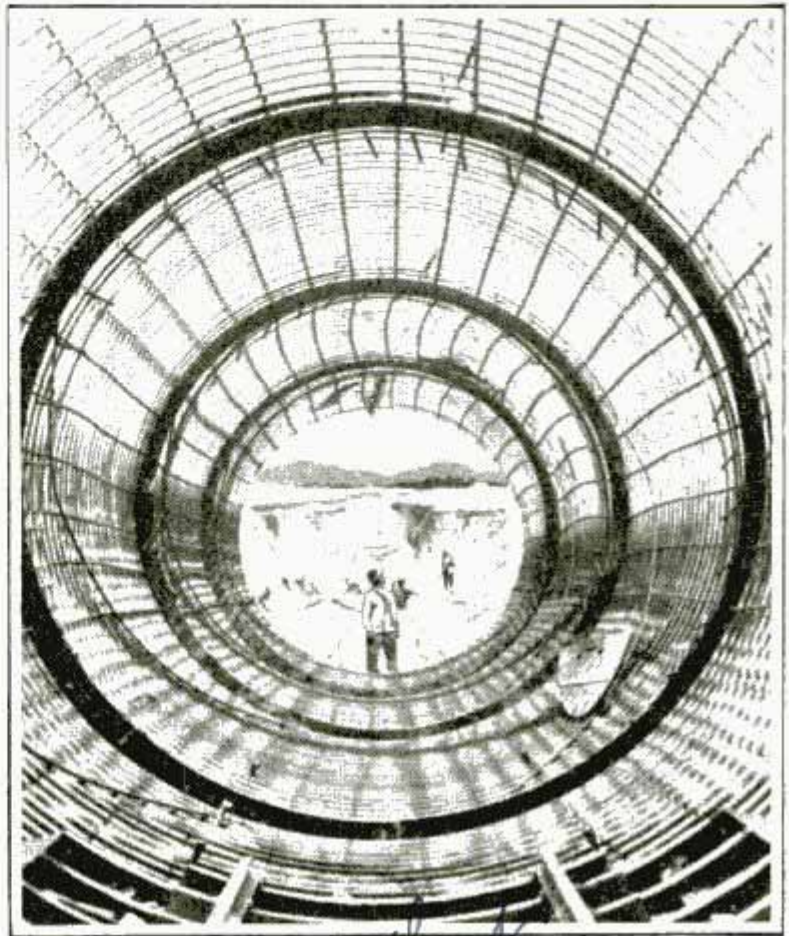
Mexico exports about six-sevenths of its annual production of silver which generally varies from 2,500 to 3,000 tons. The remaining one-seventh is used for making Mexican coins.

Gold is usually found in all Mexican silver mines. Some of the largest mines are at Pachuca, Zacatecas, Chihuahua, Michoacan and San Luis Potosi. Cortez worked mines in Taxco and Pachuca. The Real del Monte is the most famous mine in the Pachuca district having been worked since pre-Spanish days and is still yielding three and one-half tons of ore a day. Mining methods, machinery and smelters in use there today are modern and up to date. It was at Taxco that Cortez built the famous "Zocabon del Rey" or King's Tunnel which crosscuts the ore veins exposing them to view. Cortez wanted the tunnel large enough for a man to enter on horseback so that should the king of Spain visit the mine, he would be able to inspect it without dismounting.

The richest gold zones are Lower California, Chihuahua, Durango, Michoacan, Puebla, Sinaloa and Sonora. The total production of gold increased from twenty to twenty-four tons between 1919 and 1926. Two-thirds was coined in Mexico City and the rest exported. Mexico in 1934 produced 20,572 kilograms of gold with an estimated value of \$23,149,175.

Other minerals found in Mexico, in ad-

(Continued to page 141A)



Looking through the Steel Web Forming the Skeleton of California's Concrete Aqueduct Tapping the Colorado River

In place of the great arched trestles built by engineers of ancient Rome, aqueduct builders today are laying miles of giant concrete pressure pipes to "siphon" water from the Colorado river into the metropolitan district of southern California. Through these twelve-foot water mains more than a billion gallons a day will flow. A web of circular steel rings reinforces the concrete pipe.

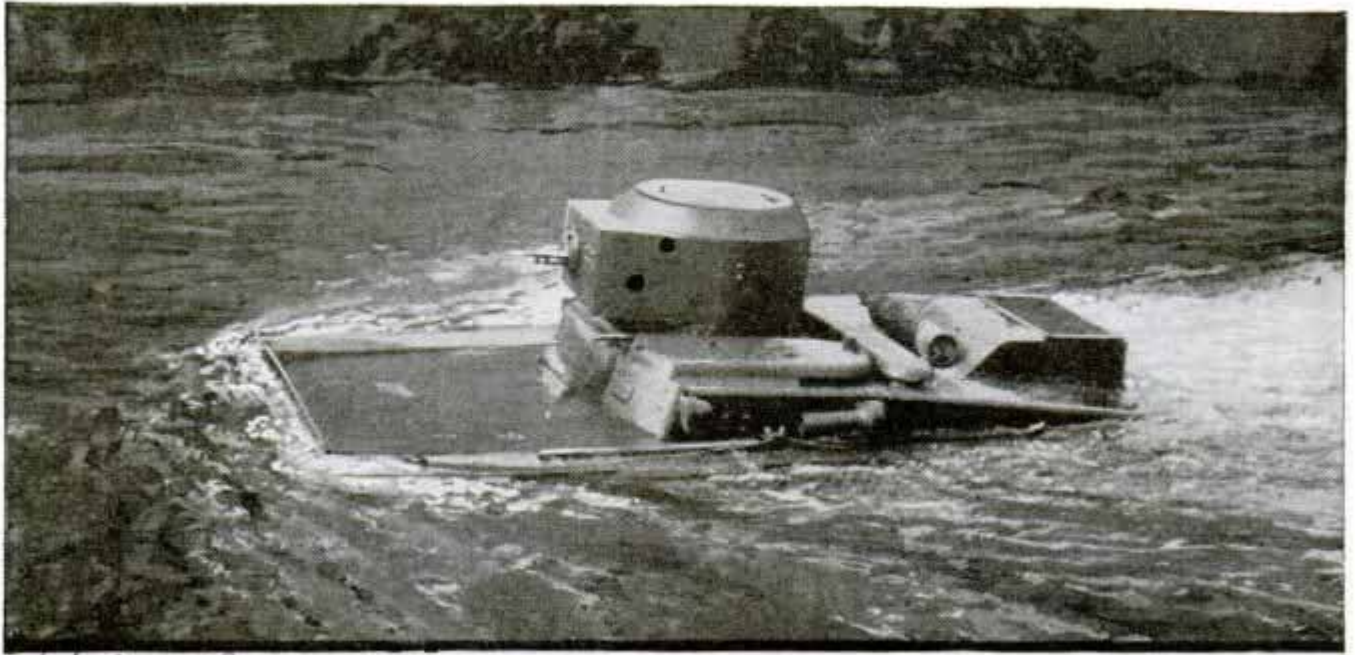
21320
FISH DROWN WHEN PLANTS DIE

So dependent are fish upon plant life that 400,000 fish "drowned" in a small Connecticut lake when its vegetation died and deprived them of oxygen. The bottom was covered with weeds until severe rains and abrupt temperature changes killed them. As the plants decomposed, bacteria of decay exhausted the oxygen in the pond and pickerel, perch, bass, bullhead and sunfish came to the surface to gulp air. In a day all the fish in the lake were dead.

near North Farm, Garrison, Conn.
Told by David Tomlinson
near New Haven, Conn.

8/1294.

Amphibian Tank Swims River in War 'Game'



Practically as Effective in Water as on Land, This Amphibian Tank Is Put through Its Paces in Military Maneuvers; Note That Guns Can Be Fired as the Tank Crosses River

Science has given military men something new with which the grim business of war may be pursued. It is an amphibian tank which swims rivers, firing as it goes, then climbs the bank to speed along the ground in an attack on the "enemy." Such

a tank was demonstrated recently in maneuvers of the Soviet army units of the Moscow military district. When the tank goes into the water, most of it submerges and leaves only the formidable gun turret above the surface, ready to open fire.

Rifle Team Score Improved by Captain's Spotting Scope

Better individual and team scores are said to be possible if a team captain's spotting scope is used in shooting. The in-

\$275.00 - \$297.00.

strument enables coach and captain to make more accurate estimates of windage tendencies and to explore quickly every foot from firing point to target. A long sunshade makes the scope usable under difficult light conditions. The instrument has an optical system of very large light gathering and transmitting power, with critically keen definition and sharp focus. Magnification powers found ideal in tests are provided.

81332

ALUMINUM-PLATED FOOD CANS AND IRON ROOFS SEEN NEXT

Tin cans may lose their tin, metal roofing may be made weatherproof and a vast new field appears open to industry through the discovery of a method of plating iron and steel with aluminum. Until now, an oxide film on top of molten aluminum has hampered successful coating of ferrous surfaces with aluminum. Prof. Colin G. Fink of Columbia University now has pat-

Science Service

Bausch & Lomb Optical Co. Rochester, N.Y.



Checking Up on Firing Conditions with Spotting Scope Designed for Team Captain

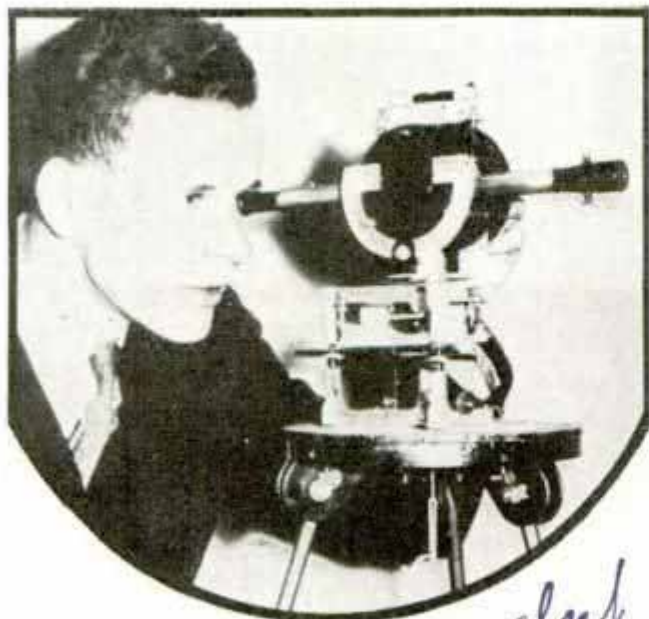
Electro-Chemist, etc.

ented a process of pre-treating the metal with hot hydrogen gas, then inserting it in molten aluminum below the surface. Aluminum-plated steel thus treated can be bent without harming the plating, and does not corrode. Aluminum, one-seventh as expensive as tin, could be used to coat food cans. Fireproof curtains and electric heater coils may be aluminum-coated and the building industry may use aluminum-plated iron for weather-resistant roofing and partitions.

81314

COMBINED TRANSIT AND STADIA MADE OF SPARE PARTS

Using parts from old radios, vacuum cleaners, washing machines and toys representing a total investment of \$2.50, ~~William B. Ahern, a Worcester, Mass., youth,~~ made a combination transit and stadia. So excellent was his product that he was awarded the Yankee ingenuity scholarship at Worcester Polytechnic Institute. A stadia, like the transit, is used in surveying work.



Transit and Stadia Made from Spare Parts of Old Radios, Washing Machines and Toys

Giant Model of 'Queen Mary' Built by Skilled Craftsmen



Workers Putting Finishing Touches on This Three-Ton Model of the "Queen Mary"

Skilled craftsmen worked three months to produce one of the largest steamship models ever built, a three-ton replica of the "Queen Mary," new superliner of the Cunard White Star line. It is twenty-two feet long, constructed on a scale of one-quarter inch to one foot. The hull is made of African mahogany. The planks were first built roughly into a hull and then the craftsmen whittled away three-fourths of a ton of wood to produce the shape of the liner. Superstructure, decks and upper works were built of kauri pine from New Zealand. Then 1,600 portholes and 214 windows were made by hand and fitted into place. Thousands of stanchions, with twenty-two gauge wire railings passing through actual holes in the stanchions, were fashioned, together with tiny bollards, ventilator cowls and other deck fittings. The model has been placed on display in New York City.

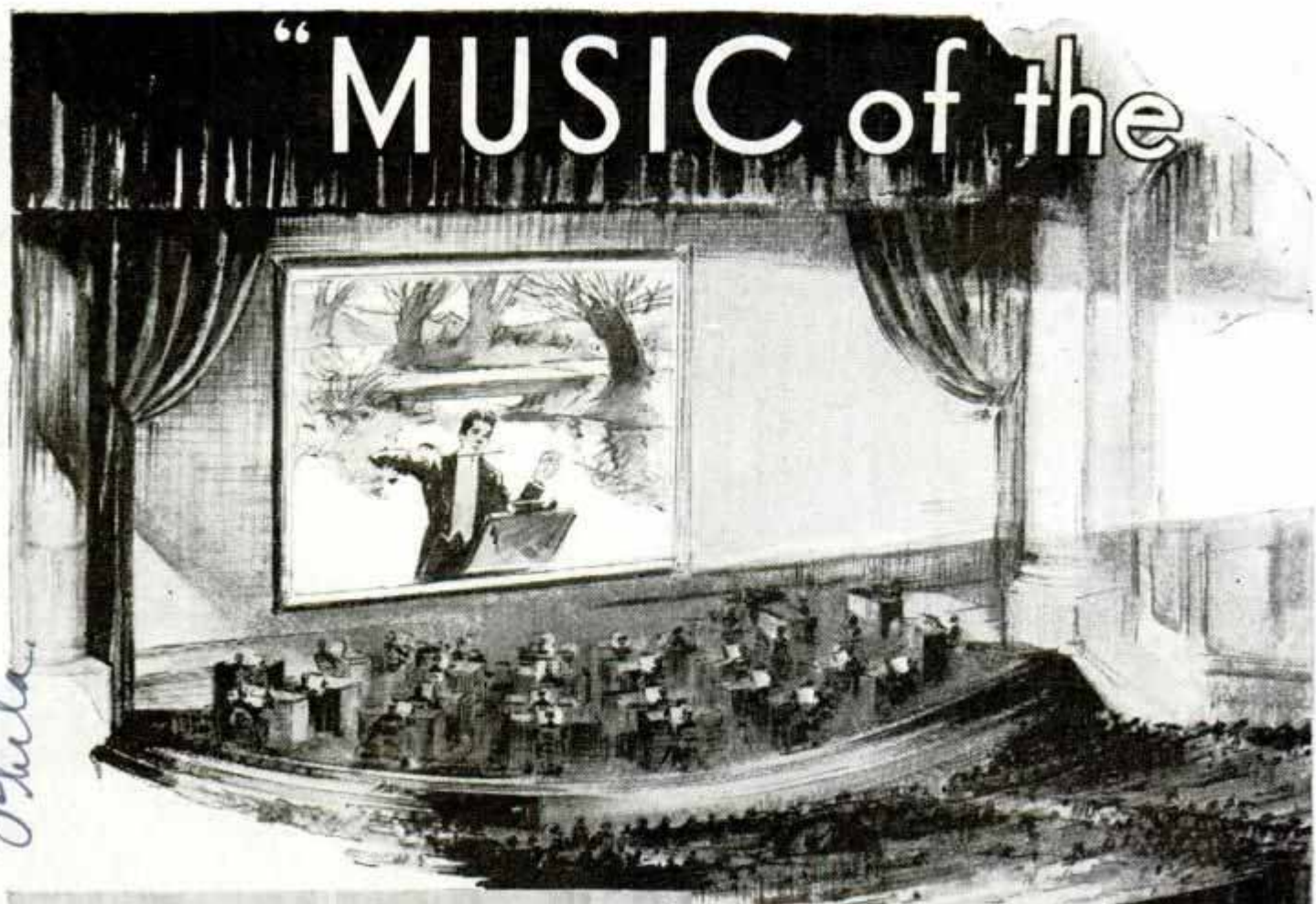
Thomas M. Johnson 417 W. 118th St. New York

25 Broadway New York

8/22/29

Com. George W. Eckhardt, 2047 N. Park Ave. Phila.

"MUSIC of the



Above, Concert of Future; Musicians Are Playing Sound Film and Watching Movie of Conductor, Background of Which Shows Scenes Connected with the Music; Conductor in Person Is Back of Audience, Operating Control Panel; Left, Mr. Eremeeff with Strip of Sound Film Which Constitutes Full Symphony Orchestra

twenty men, each carrying a small roll of film. This small group will be able to play symphonies and other selections with greater precision, and better effects, than could be obtained from an orchestra made up of hundreds of artists playing the finest of musical instruments. In fact, they will be able to obtain effects that cannot even be approximated with actual

THE symphony orchestra of the future will not be a band of a hundred or more musicians, carrying a carload of instruments, but a small group of fifteen or

musical instruments, since every instrument has its physical limitations. Such is the vision seen by Ivan Ivanovich Eremeeff, Russian sound and radio

1622 Chestnut St

8/22/29

FUTURE" *now a reality*

stead of the film moving before the light source, the light source, by means of shutters operated from a keyboard, moves across the film.

A strip of sound film, about one and one-half inches long, and nine inches wide, is made for each separate instrument in the orchestra. A master violinist, with a perfect instrument, for instance, plays all the notes on his violin in perfect pitch, and these are recorded on a strip of film. Each instrument in the orchestra does likewise. Then the sound strips of all of the instruments, sixty in number, are pasted together on one long strip of film. This constitutes the entire "orchestra."

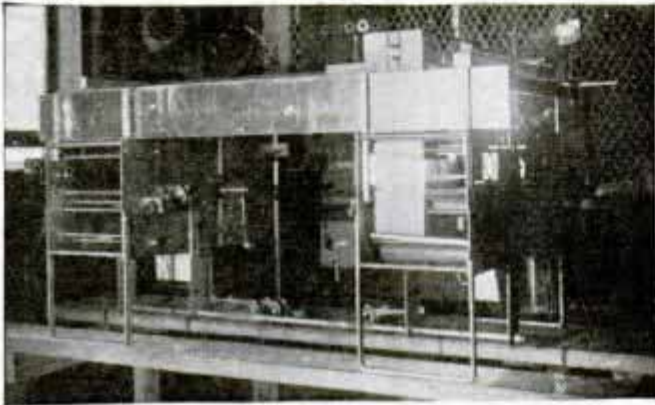
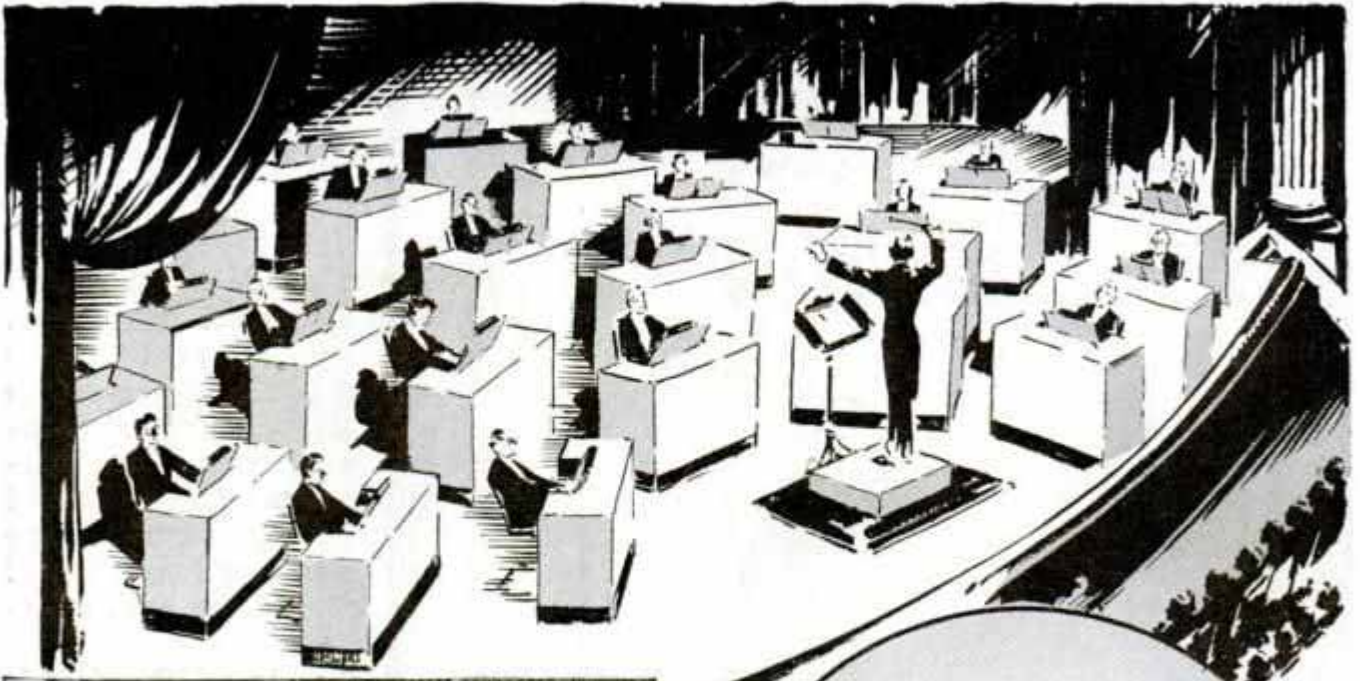
The nine inches in width of each strip of film, however, represents eighty-eight notes, or the full range of a piano. Many instruments haven't this full range of tone. The bass horn, for instance, is in the lower part, and the flute is only in the upper range. Yet, through an instrument made by Mr. Eremeeff, it is possible to take the sound track of the flute and duplicate it down to the lowest part of the scale, giving the quality of a flute that could play very low notes, a thing absolute-



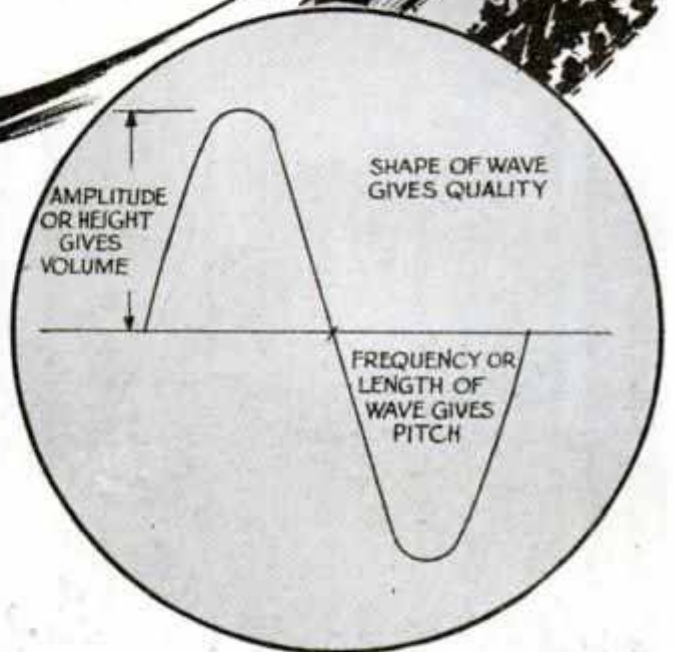
engineer, who, working with Leopold Stokowski, conductor of the Philadelphia Orchestra, has finished experiments and built apparatus that promise to revolutionize the art of music.

The sound effects from the sound track on motion-picture film are familiar to everyone. In the motion-picture projection machine the sound track of the film moves in front of the light source. In Mr. Eremeeff's invention, in-

Device for Playing Sound Film; Each Keyboard Plays One Strip and Pedals Play a Third Strip



Musicians Playing Sound Film, Each Controlling Two or Three Instruments; Below, Left, Interior of Device for Playing Film; Right, Parts of Sound Wave Which Determine the Volume, the Quality and the Pitch



ly impossible in making an actual flute. So well does this instrument that duplicates perfect sound waves work that the profile of a face can be taken, and "played" throughout the entire range, giving each individual profile an individual sound effect unlike any instrument or voice.

After the films carrying the sound tracks of all instruments are made up, they are placed in a device which works upon the principle of the sound projection used in motion-picture theaters, only in this device the beam of light travels across the film, being operated by shutters which, in turn, are operated by the keyboards. In this way a beam travels down the one and one-half inch of track which makes up a certain note. Each device is made so that it can play upon three parts of the film, or instruments, at one time.

The impulses from these various devices

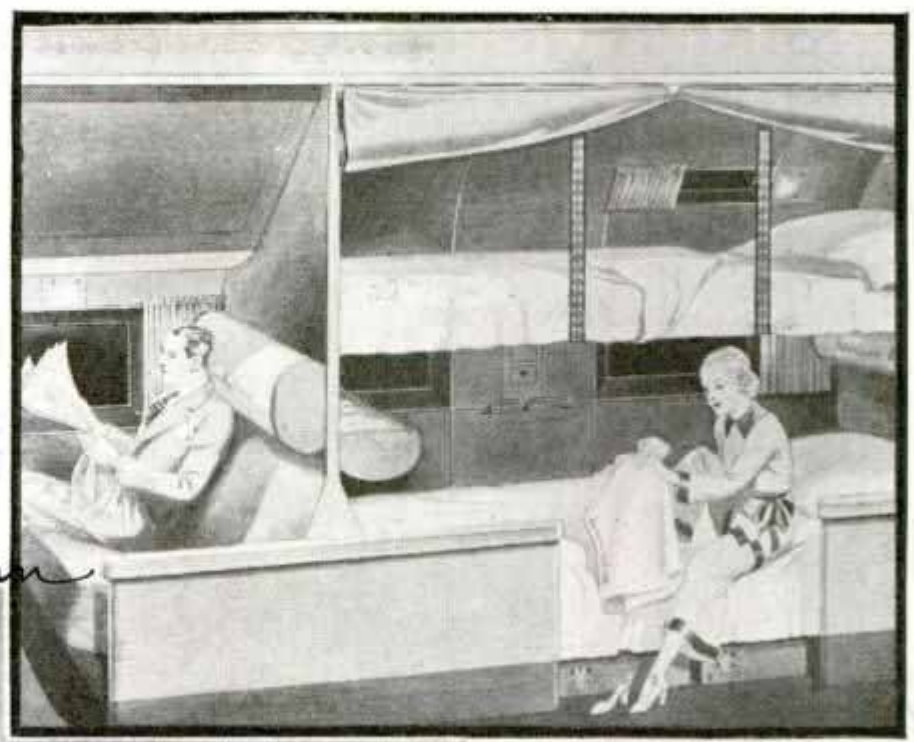
go to a "mixing board," where they are "mixed" and enter the loud-speakers. The man at the mixing board controls the volume of the various instruments. With this arrangement, the conductor will not stand before the orchestra, but a motion picture will be taken of the orchestra leader conducting. This picture will be shown on a screen, and the operators of the devices will follow his leading on the screen.

The conductor himself will sit at the control panels situated in the audience. He will be able to regulate the speed at which the film showing him conducting is run, and also regulate the mixing and volume of the sound. The conductor thus, at his ease, will get the same effect as the audience. The music itself will come from loud-speakers situated about the auditorium instead of emanating from the stage on which the musicians appear.

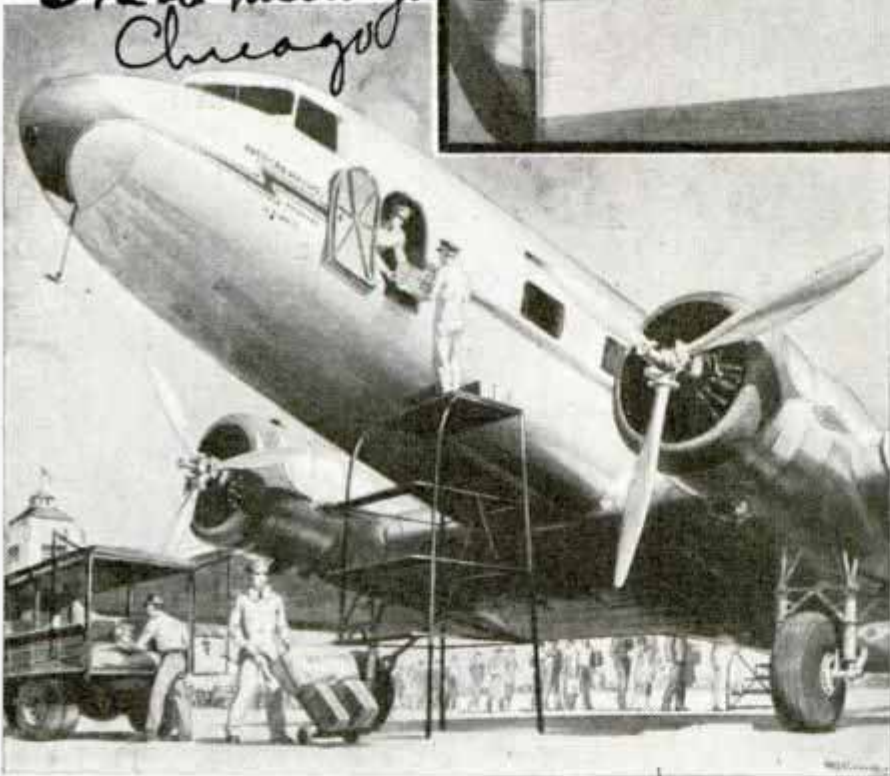
Santa Monica Calif

"Sleeping Car of the Air" Has Sixteen Berths

With a capacity of twenty-four passengers by day and sixteen by night, a giant transport soon will be placed in operation by American Airlines, Inc. The new ship, a Douglas with a top speed of 215 miles an hour, is an all-metal low-wing monoplane powered by two engines of 1,000 horsepower each. Lower berths will be formed by folding the



Top, Berths Made Up in New Air Liner; Bottom, Loading the Giant Transport



off the ground and fly with full load. Automatic constant-pitch propellers, which adjust their pitch to maintain maximum efficiency under varying conditions, will be used. Wheels will be completely retractable and a new type landing gear construction will provide unusual strength and smoothness of landing.

backs and bases of the seats together in the eight sections, while the upper berths will be dropped into position from the ceiling. Each berth will be six feet five inches long and nearly three feet wide, complete with reading lights, clothes nets, electric call buttons and baggage racks. The new transport will have separate dressing rooms for men and women passengers and these will be complete with running water, mirrors and linens. The pilot's cockpit will have every known aid to navigation, including automatic pilot and latest radio equipment. Power will be sufficient for either engine to take the ship

same driver 11/4/35

81003

IT'S FIFTY-TWO BELOW ZERO AT EIGHTEEN MILES HIGH

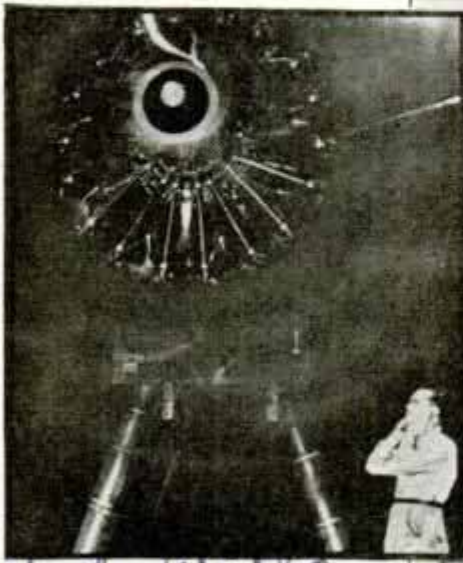
Although instruments on a soviet Russian balloon registered a temperature of fifty-two degrees below zero Fahrenheit at 18.3 miles above the earth, the highest altitude Russian scientists have recorded, colder weather was encountered nearer the earth. Automatic instruments on the small pilot balloon registered seventy below zero eight miles up, but the temperature rose to fifty-eight below at 11.8 miles and remained constant at fifty-two below from 16.7 to 18.3 miles high.

Pal. Institute of Aerology

312 Michigan Chicago

1485/35

Vertical Wind Tunnel Tests Strains on Falling Airplane



Testing Motor at Open Throttle and Exterior View of the Wind Tunnel



the elephant's, and tusks eight inches long. Unable to adapt itself to a changing world it became extinct. The fossil skeleton was found imbedded in rock in the Big Horn basin of Wyoming and months will be required to chisel the bones.

8 12 49

WHITE DISK WORN ON BACK GUARDS CHILD IN DARK

Children walking along the highway, at dusk or in the dark are protected by white disks which pick up and reflect the light from auto head lamps. The disks are worn on the back, being held in place by cords that run over the shoulders

to a fastening in front. The protective measure is used with success in England.

Systematic and thorough tests of experimental airplanes and motors are conducted in Germany by the Experimental Institute for Aviation in a suburb of Berlin. Part of the equipment of this aviation laboratory is a huge vertical wind tunnel in which artificial hurricanes of more than 150 miles an hour are produced to study the conditions which confront dropping planes. While the wind tunnel aids in determining the most efficient shape for airplanes and parts, another section of the institute deals with motors which are run to the limit of their capacity in another wind tunnel to determine their ability to withstand adverse conditions.

at Aldershof

Wide World



These White Disks Reflect Auto's Light and Protect Children on Dark Roads

8 13 35

ELEPHANT-FOOTED BEAR DUG UP AFTER SIXTY MILLION YEARS

For sixty million years or so a fossil in the hills of Wyoming, a huge animal that resembled a bear with the feet of an elephant has been taken to the Smithsonian Institution at Washington. Actually the great beast, probably a formidable creature in its era, was not closely related to either bear or elephant. Known as a Coryphodon, it had a heavy body like the tapir, probably a slow, shuffling gait like

Big Horn Basin

Charles Schmale, Curator, Vertebrate

White Disk
Sobelman
Syndicate 507

Ready-Made Weather Next for Car and Bus

After a year's test on a standard five-passenger automobile, an air-conditioning unit for cars and busses has been pronounced successful and will be placed on the market. Equipment for busses will be given first attention, it is understood, with the automobile's ready-made weather to come later. The sys-

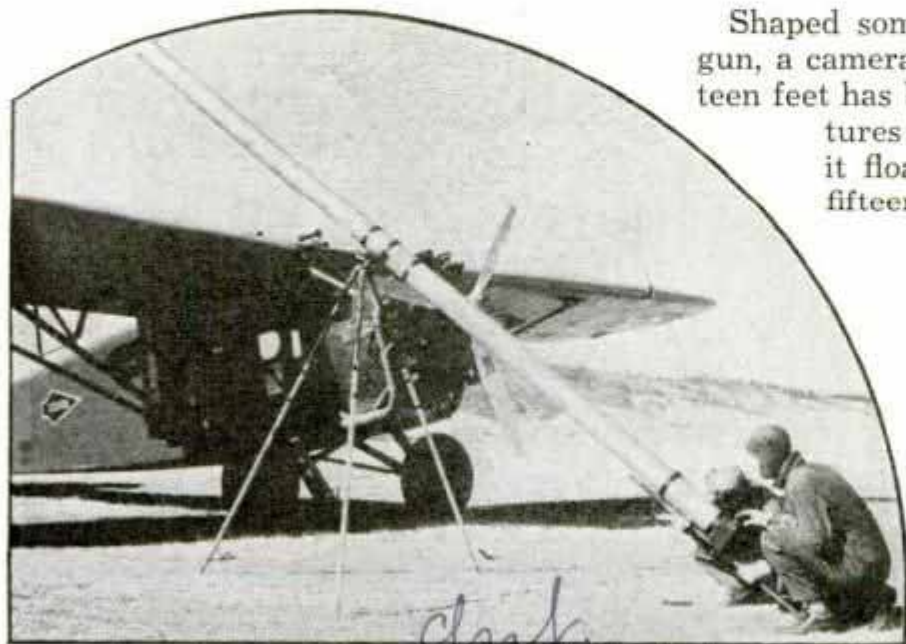


Top, Standard Test Car with Air-Conditioning Compressor on Top; Bottom, How Conditioner Would Work on Bus

tem calls for use of a refrigerating compressor driven by the car motor to supply a special refrigerant to an evaporator or cooling coil within the car or bus. A small fan draws air over the cooling coils and circulates it throughout the vehicle, while at the same time drawing in sufficient outside air to provide ample ventilation for dilution of smoke and odors. The air is fil-

tered to remove dust and dirt. The refrigerant is harmless, non-inflammable and non-explosive. The weight of the experimental system is 600 pounds and the space required is twenty-seven cubic feet. Operating cost is negligible, the vehicle's motor supplying the six horsepower necessary.

“Cannon” Camera to Get Shots of Balloon in Stratosphere



Shaped something like an anti-aircraft gun, a camera with a focal length of sixteen feet has been designed to obtain pictures of a stratosphere balloon as it floats with its crew twelve to fifteen miles above the earth. The

camera with the long barrel was made by George Magnus and is intended to be carried aboard an airplane following the stratosphere balloon. The plane lands at intervals, the camera is set up and a photograph made of the floating balloon after which the plane again takes up the chase

Carrier Engineering Corp Newark, N.J.
Infer from

Trade Engineering Corp
Doubleday, N.Y. 537 P.
Alfarran Car

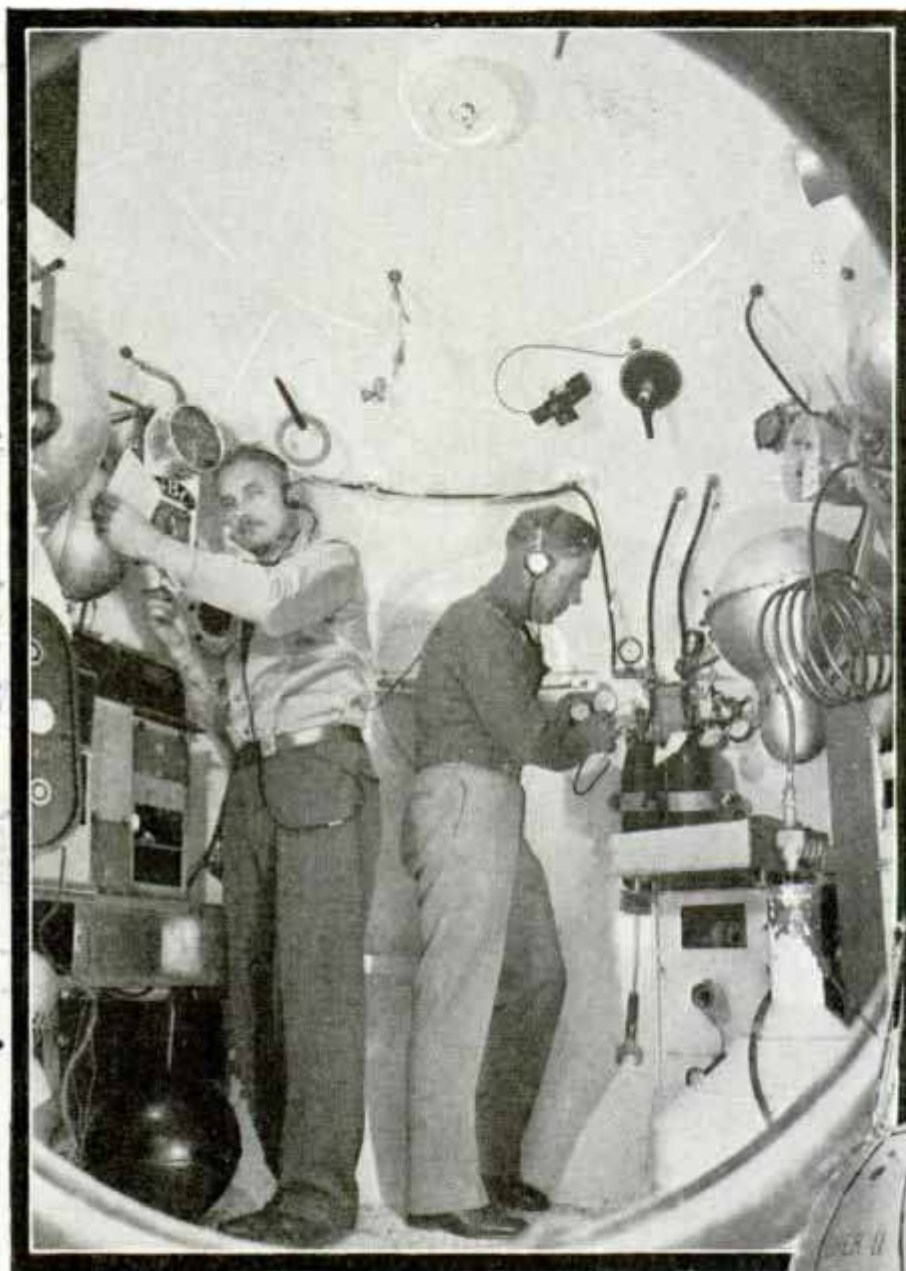
81303
Capt. George Holliman Wright Field

81241

Route 4, Anacostia DC

SKY HIGH -

Chapman Army Geographic Flight



of the gondola; weight of the equipment and finally, safety."

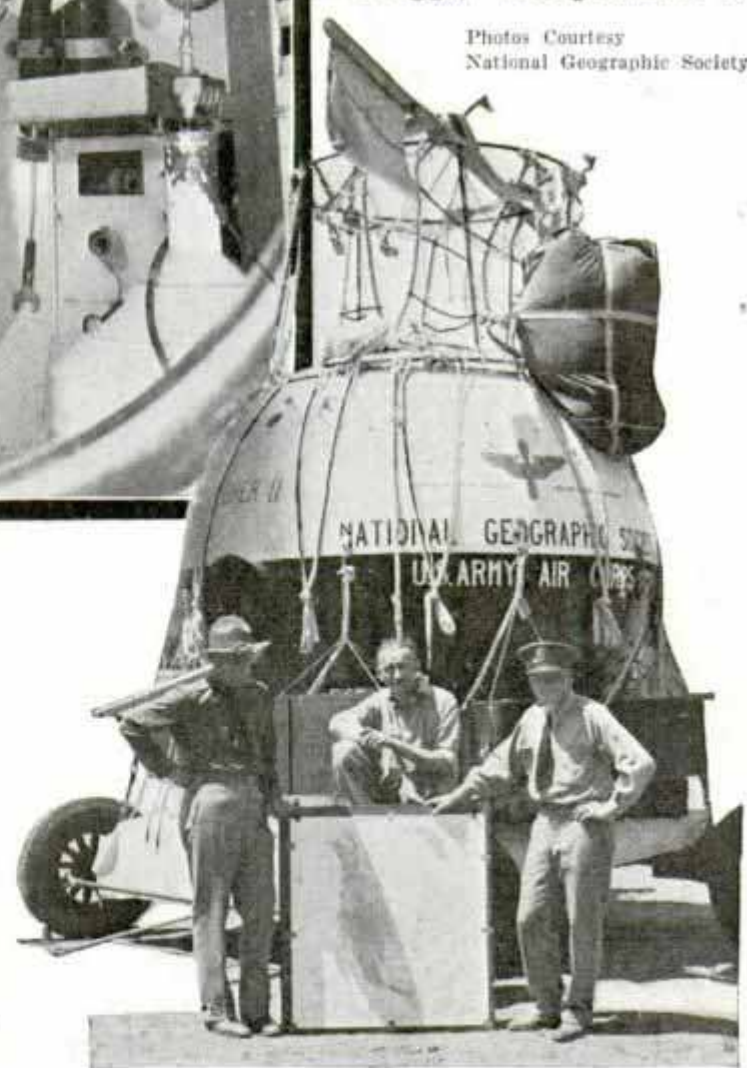
Apparently all we need for greater and greater altitudes are larger and larger balloons, based on the theory that balloon volume increases by the cube of the diameter while weight increases only by the square, as you increase the size of the bag. Thus the lifting power of the bag always stays out in front of its weight.

"But," explains Dr. Briggs, "the problem of

Photos Courtesy National Geographic Society

HOW high can a man fly into the stratosphere? Recently Capt. Albert W. Stevens and Capt. Orval Anderson set an unofficial record of about 74,000 feet in a stratosphere flight sponsored by the National Geographic Society and the army. In 1934 Vasenko and Usiskin, Russians, set an unofficial mark of 72,178 feet but lost their lives.

"Seventy to 75,000 is the possible altitude limit for man," says Dr. Lyman J. Briggs, director of the bureau of standards. "Four things must be considered in a stratosphere balloon flight; weight of the balloon; weight



Interior and Exterior Views of Stratosphere Gondola Constructed for National Geographic-Army Flight

Washington, DC

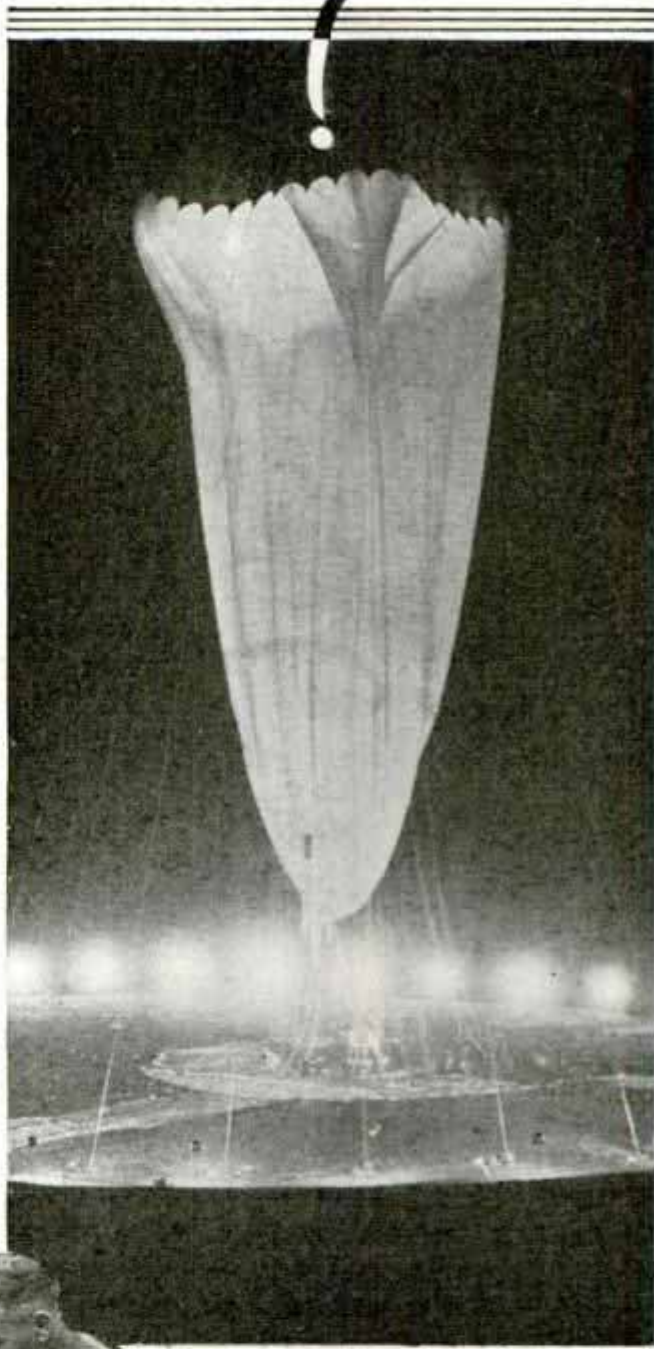
WHY NOT ?

altitude records is not that simple. You have other things to consider besides mere weight and volume of a bag. You have the gondola, the scientific apparatus and the safety of the balloonists."

The last, involving ballast, is most important. For without ballast it would be impossible to descend safely. All these make an additional load for the balloon to carry.

"Pressure height," the level at which the helium gas, with which the balloon is inflated, has expanded until it completely fills out the big bag into a sphere—about twelve miles up—does not mean ultimate altitude. The balloonist can still go higher by dropping ballast to lighten the balloon. But dropping ballast to attain height above pressure height is hazardous, for ballast is the balloonist's security for returning safely to earth. If too much is discarded he will come down too fast and not be able to check his descent when the earth looms up. The theory is that the Russians, Vassenko and Usiskin, threw out too much ballast to gain additional height, lost control of their bag on its descent and crashed.

Balancing the lifting power of a balloon against the weight of its ballast is one of the most delicate points of ballooning. To disturb that balance for other purposes than a safe return to earth is to take dan-



Stratosphere Balloon Being Inflated, and Balloonists Examining Aerial Camera Used to Make a Picture Record of a Flight

gerous chances because while in the stratosphere the gas in the balloon has absorbed heat from the sun. This heat represents the difference between the temperature of the gas in the bag and the air outside. It adds to the lifting power of the balloon. But once outside the stratosphere, on the way down, this heat be-

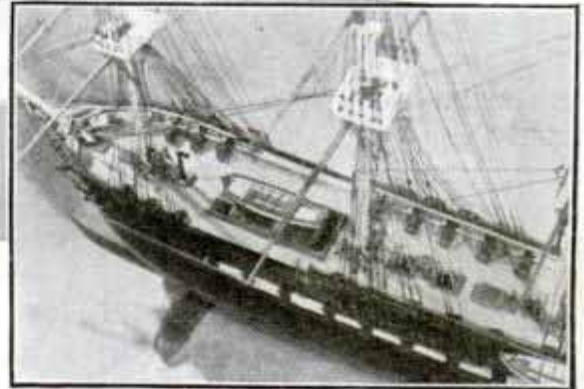
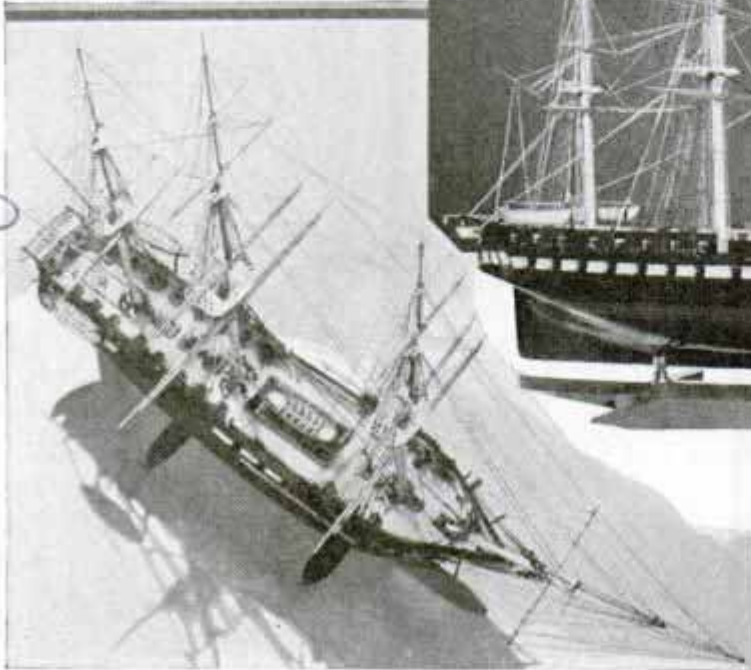
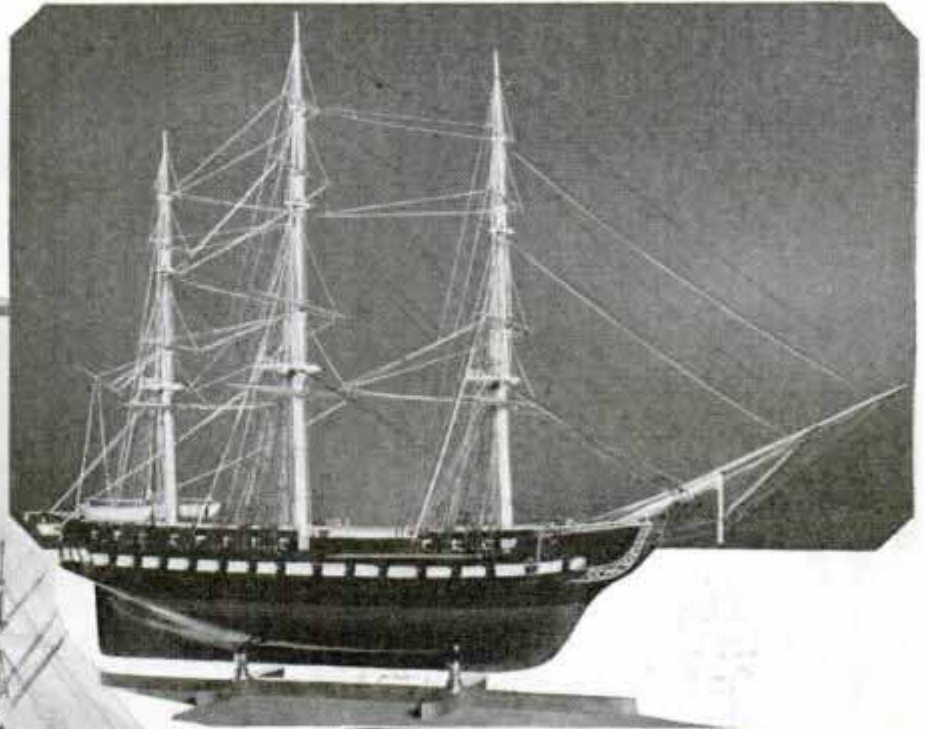
(Continued to page 136A)

340 W 57th

New York

Model of Old Boat Has Same Kind of Wood

Model of "Constitution" Made of Same Materials Used in the Original Boat; About 1,500 Hours Were Spent in Completing the Model, One-Third of the Time in Research



One of the most faithful reproductions of the famous old "Constitution" has been constructed in model form by C. E. de la Vergne who reproduced in his boat all the materials used in the original, wood for wood and metal for metal. The model represents the reconditioned boat as she appears today and is on a scale of one-eighth inch to one foot. The hull is twenty-two inches between perpendiculars and forty-two inches overall, including spanker boom and bowsprit. The height from keel to truck of main mast is twenty-eight inches. About 1,500 hours were necessary to complete the model, one-third of which was devoted to research among old navy records and to making measurements and pictures of the original boat. The hull is made of California redwood and all masts and spars are of well-seasoned beech. Most of the blocks are of lignum vitae and the deadeyes are of the same material. The small boats are of bass wood, the thwarts and cap rails being mahogany. The frigate carries twenty thirty-two-pound carronades and two twenty-four-

pound "Long Toms" and these are built up like the originals, even sliding on frames to take up recoil. On the gun deck the ports are fitted with hinged double-gun port lids and contain accurate models of the twenty-four-pounders. Such miniature parts as the ship's bell, stern lantern, anchor, galley stack and leaded windows all are faithfully reproduced to scale.

£ 1325

DAM MAY SPEED EVOLUTION OF FASTER SALMON

More "streamline" salmon may be one result of the construction of the Grand Coulee dam in Washington, which will cut 150 miles off the annual swim of the Columbia river salmon to their upstream spawning grounds. Salmon can climb rapids, but not the 300-foot dam, and the bureau of fisheries plans to trap them and transfer them to a hatchery where 100

128.97th St. New York

Capt. Francis Shcherba
Hills, Hawaii

million baby salmon can be raised each year. Glen O. Leach, chief of the government fish culturists, believes a new race of salmon may evolve, lighter and thinner, when the dam cuts the spawning trip short. Salmon have just enough energy for the migration to the spawning ground. After several generations have stopped at the dam, Mr. Leach thinks a type may develop with only enough energy to reach the dam.

8/286

SUPER-PHOTO CELL FOR TELEVISION AND TALKIES

Developed for sound motion-picture work, television and other applications of the photoelectric cell, a super-photo cell, or electric eye, is ready for commercial use. It is a tube which incorporates a photo cell and nine stages of amplification without a filament, but it is only slightly larger than the conventional radio tube.

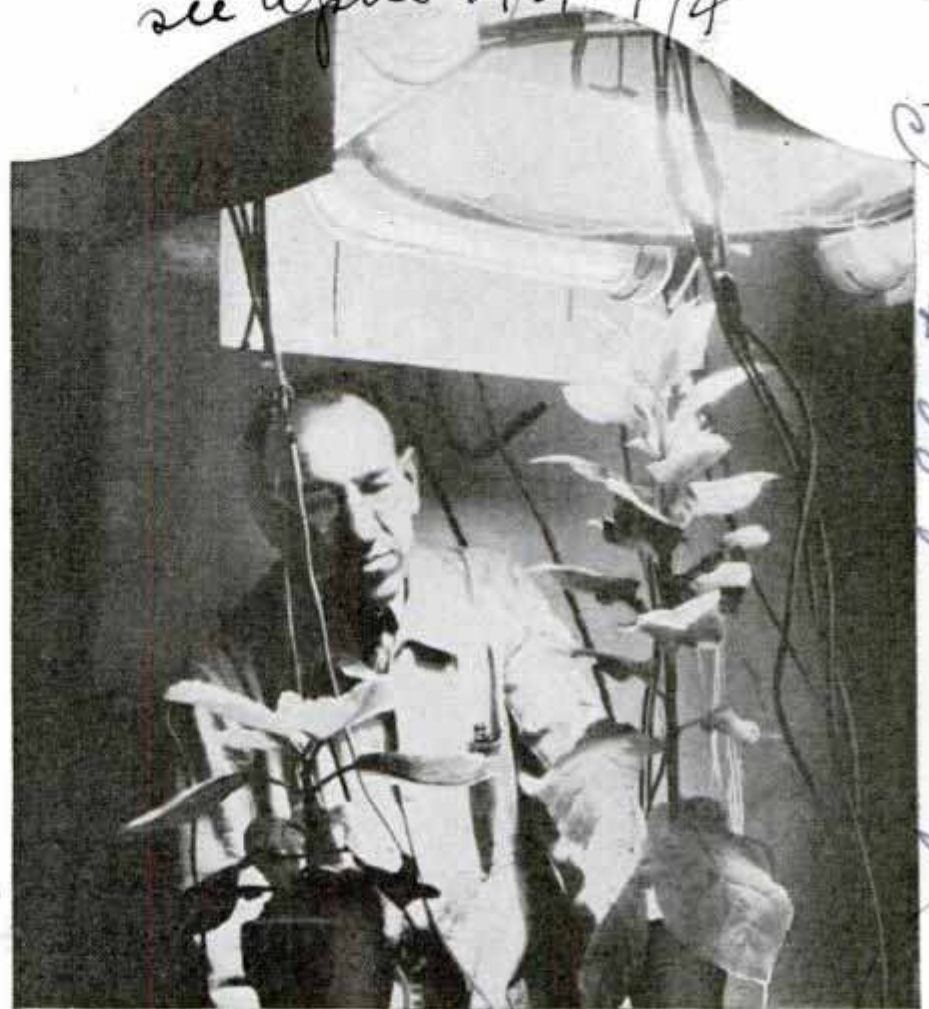
Dr. Vladimir K. Zworykin
R.C.A. Victor Co
Camden N.J.



Illustrating Small-Size Photo-Cell Tube Which Does Work of Several Tubes

Indoor "Sun" for Plants Is Sodium Vapor Lamp

see April 1934-494



Plants Grown under Sodium Vapor Lamps Which Offer a Form of Light for Indoor Gardens Rivaling the Sun Itself in Efficiency

For years scientists have dreamed of finding an artificial light which would make man independent of the sun in growing fruits, vegetables and other forms of plant life. Dr. John M. Arthur of the Boyce Thompson Institute for Plant Research claims he has found the answer in sodium vapor lamps which his tests have shown are not only superior to all other forms of artificial light for growing plants, but are even better than the sun itself. With such lamps it may be possible to grow plants heretofore raised only in California, Florida or the tropics by equipping indoor gardens with the lights. Giving forty-five to fifty lumens per watt, this lamp is one of the most efficient lights and its low cost of operation is a distinct advantage. The second best type of light for plants was found to be the neon tube.

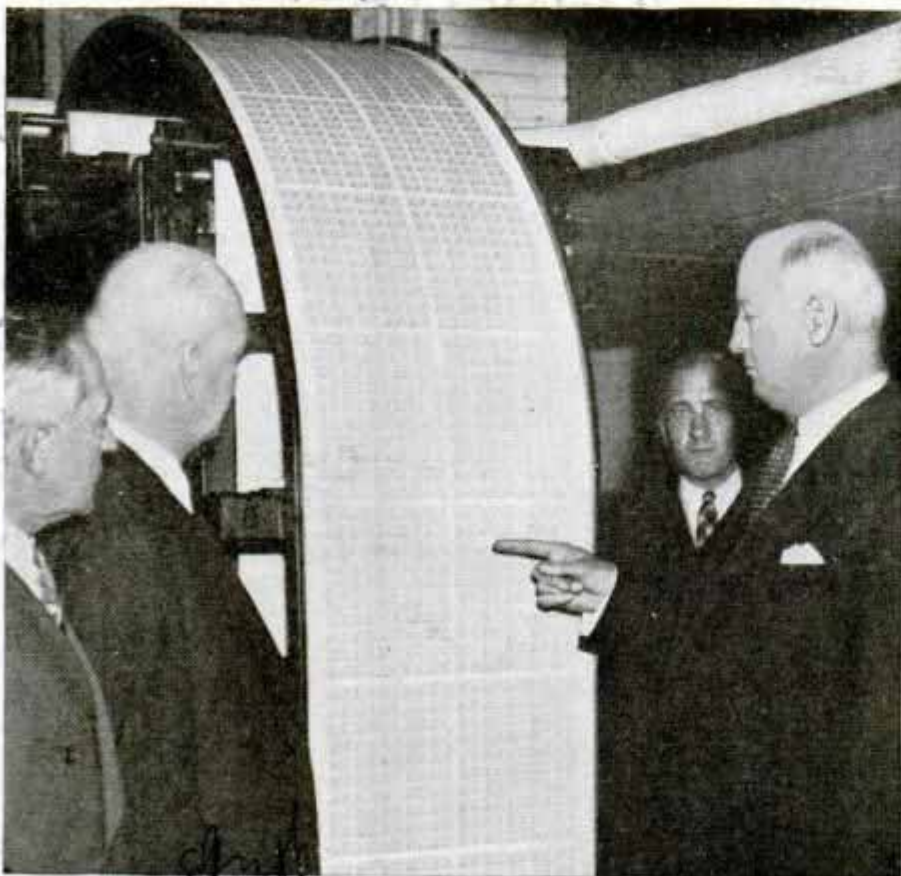
General Electric Co.

Wide World

Yonkers, N.Y.

8 1291

Latest Stamp Issue Run Off On Giant Printing Presses



Postmaster General Farley Points to Quality and Coloring of New Stamp as the Sheets Come Off the Press

While officials of the state and federal governments stood by, giant presses turned out the latest stamp issue at Washington, a three-cent Michigan stamp. A close watch is kept on first issues to prevent engraving and printing errors from being made on stamps offered to the public. Errors on stamps frequently occur, creating a big demand for that issue on the part of collectors. Each time a new issue appears, philatelists are eager to obtain this latest stamp and the sale of new stamps to collectors is becoming a business involving many thousands of dollars.

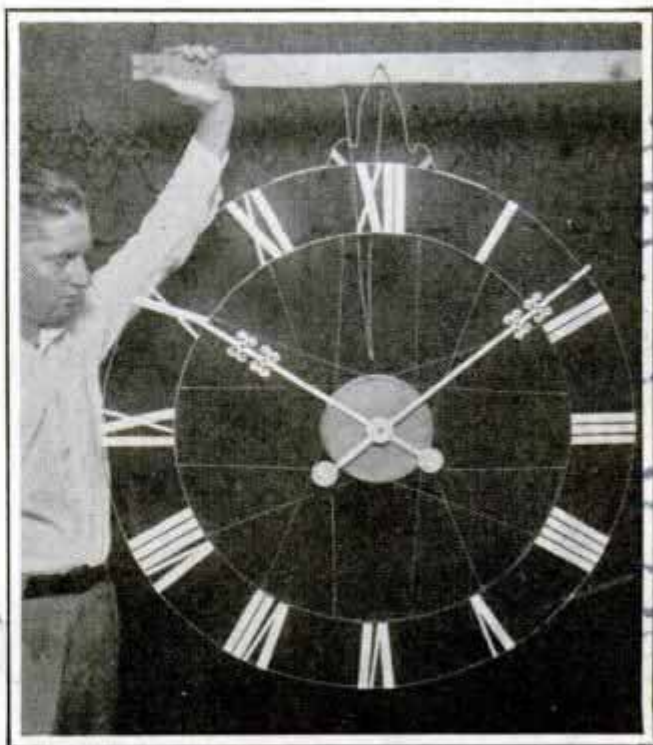
a telescope with two flat mirrors to catch the sun's light. One will revolve with the earth to keep focused upon the sun as it crosses the sky. The other will reflect light into a lens which will project a four-inch image of the sun into a building below. Beneath will be a spectroscope in a pit thirty feet deep. The sun's rays will be analyzed by the spectroscope, and movies will record the flamelike masses of hydrogen that burst out from the sun.

8 1279

ALL-WIRE CLOCK ACTS AS OWN PENDULUM

Made entirely of wire and designed so that it serves as its own pendulum, an eight-day clock built in Arkansas keeps perfect time. The whole clock swings, in pendulum fashion, through an arc of about one and one-half inches. The escapement wire

lump fashion, through an arc of about one and one-half inches. The escapement wire



This Clock Swings To and Fro to Operate Itself

MOVIES OF SUN'S EXPLOSIONS ARE SHOT WITH TELESCOPE

Motion pictures of the great solar explosions that fling flames hundreds of thousands of miles out from the sun are to be recorded at the McMath-Hulbert observatory of the University of Michigan. On top of a forty-foot tower will be placed

Science Service 11/4/35

8 1204 Lake Angelus Truck | Paul Hadley

running out of the top of the case is held by a heavy wire screwed to the top of the window case. Each swing causes the escapement to "tick" one notch.

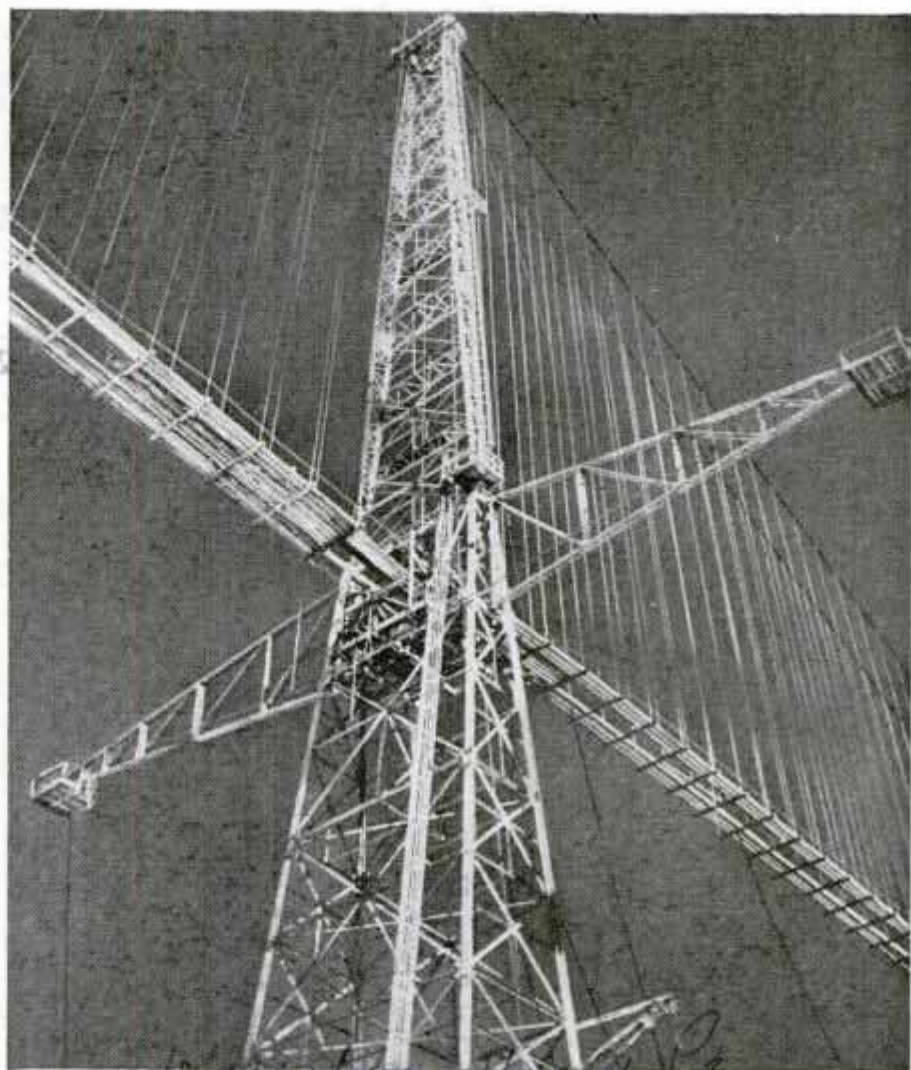
8/28/22

Steel "Spider Web" Carries Belt Conveyor for Big Dam

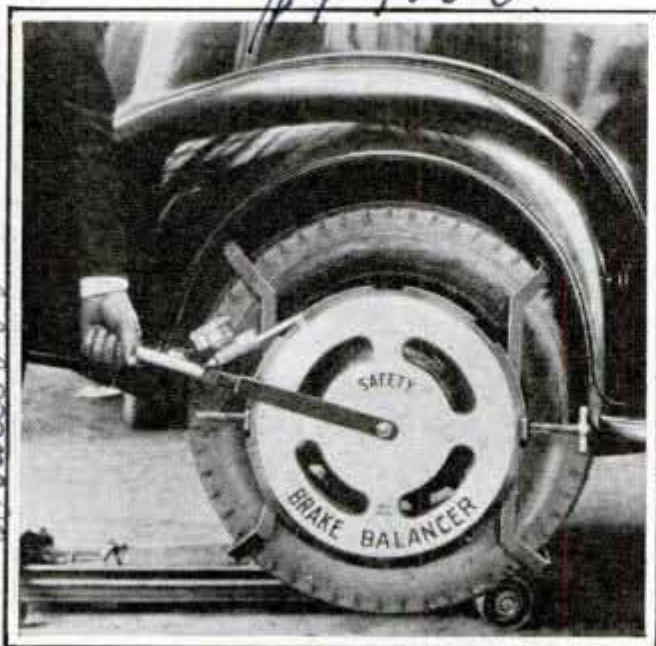
ONE-WHEEL BRAKE TESTER EASY TO OPERATE

Designed for one-man operation, a simplified brake balancing device tests one wheel at a time to show the setting for efficient braking power. The tester has claws which fasten on the tire and a hydraulic cylinder with a 750-pound pressure gauge. A pedal depressor is used to hold down the brake pedal at the point desired. Then the wheel is jacked up, the operator applies pressure by means of a rod and the hydraulic cylinder and the reading is taken. The reading enables repairmen to determine whether lining needs to be replaced or adjustments made.

\$44.50



Cables and Tower of Bridge at Grand Coulee Dam Site over Which Concrete Will Be Carried by a Belt Conveyor System



Testing Brake with Simple Balancing Unit

Supporting cables and the mighty 325-foot central tower of the suspension bridge spanning the Columbia river at the Grand Coulee dam site in the state of Washington appear like a vast spider web of steel. Sand and gravel used in the concrete for the dam are to be carried across the river on this bridge by a belt conveyor system. One of the features of the bridge is a long rocker arm at the bridge level which assists in bracing the tower.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

C + C Sales Corp.
57th St / 11

Carroll

£ 1174

Amphibian Tank Is Houseboat For Tropic Jungle Explorers



On Shore This Is a Tractor Able to Travel over Rough Terrain; Afloat It Is a Propeller-Driven, Steel-Armored Houseboat

At home in jungle lands or crocodile-infested rivers, a huge amphibian "tank" has been built for an expedition in the South American tropics. Ashore, it is a tractor. Afloat it becomes a steel-hulled houseboat, driven by a propeller. Its windows are heavily screened for protection against jungle beasts and insects. It is equipped with a short-wave radio set. Capt. John H. Ubique built the craft and will lead his expedition up the Cauca river from Barranquilla, Colombia.

81319

TALE OF EAGLE STEALING BABY AMONG NATURE'S FAKES

Eagles don't carry off children. An eagle can't lift more than its own weight of ten to twelve pounds, according to the audubon societies. Another "tall" story is about bats getting in your hair. Bats eat insects and don't care for hair. Still another un-

*Executive director
Nat'l Assn Audubon*

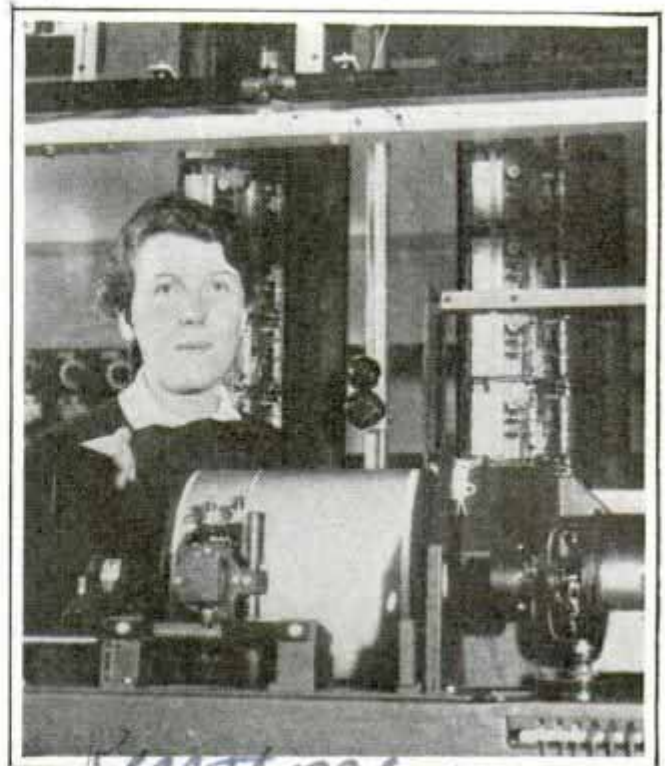
truth is that owls can't see in the daytime. And here are some truths which upset similar nature fakes: the mountain lion is the "biggest coward" in the woods and won't attack a man; the porcupine doesn't shoot its quills; "hoop" snakes and "glass" snakes are non-existent, the first being that mythical reptile which sticks its tail in its mouth and rolls and the other being the one supposed to break to pieces on slight provocation.

£ 1274

Society of Odd Fellows

ROBOT ANNOUNCES TIME ON TELEPHONE

When you push a button on the latest German telephone and hold the receiver to your ear, you hear a voice announce, "One-thirty-five" or whatever the correct time happens to be. The voice may sound like that of the girl usually employed as a time announcer, but it comes from robot mechanism. Sound film and sensitive hookup to a "master" clock are combined in the device, which tells the time for as many customers as may be calling at the same moment.



Equipment That Tells Time on Phone

Reverside Metal Co

Reverside Metal Co

See Wings on Pacific June 1935

"China Clipper" Is Giant of Pacific Air Fleet

135 E 42nd New York

It will be "wings over the Orient" soon for the "China Clipper," luxury liner destined for the transpacific passenger service of Pan-American Airways. Latest addition to the fleet that is preparing for regular scheduled flights across the ocean, the "China Clipper" is the largest aircraft built in America. From tip to tip its wings measure 130 feet, and its gross weight is 51,000 pounds. Of the sesquiplane type, this flying boat is powered by four motors developing 3,200 horsepower, and cruises at 157 miles an hour over a 4,000-mile radius. On its maiden flight Capt. Edwin C. Musick and a crew of four flew the "China Clipper" with thirty-eight passengers aboard from Baltimore, where it was built in the Glenn L. Martin plant, to Washington and return in a little more than an hour. The great ship is fully equipped for the comfort of travelers on long hops across the Pacific, and during the night flights the passengers sleep in commodious upper and lower berths.



Above, Double-Deck Berths Are One of the Features of the "China Clipper"



Control Cabin and an Exterior View of the "China Clipper," 51,000-Pound Luxury Liner Intended for Transpacific Service; Its Four Motors Develop 3,200 Horsepower

TOOLS MADE OF COPPER ARE RUSTPROOF

Saws, chisels and other tools now are being made of a copper alloy containing about three per cent of the element, beryllium. The tools cost a bit less than those made of stainless steel, take an edge like steel but do not rust and are proof against salt air and most acids. They are being used particularly in plants making explosives or gasoline where there is danger of fire from sparks if steel tools are used.

The temperature of the entire northern hemisphere is affected by that of the ice-coated polar sea.

Chicago Apparatus Co

Richard. H. ... 2047

Chicago Apparatus Co

BEHIND *the* SCENES



Left, Two Popular Comic Strip Characters, Buck Rogers and Wilma; Above, Billy De Beck, Who Draws Barney Google

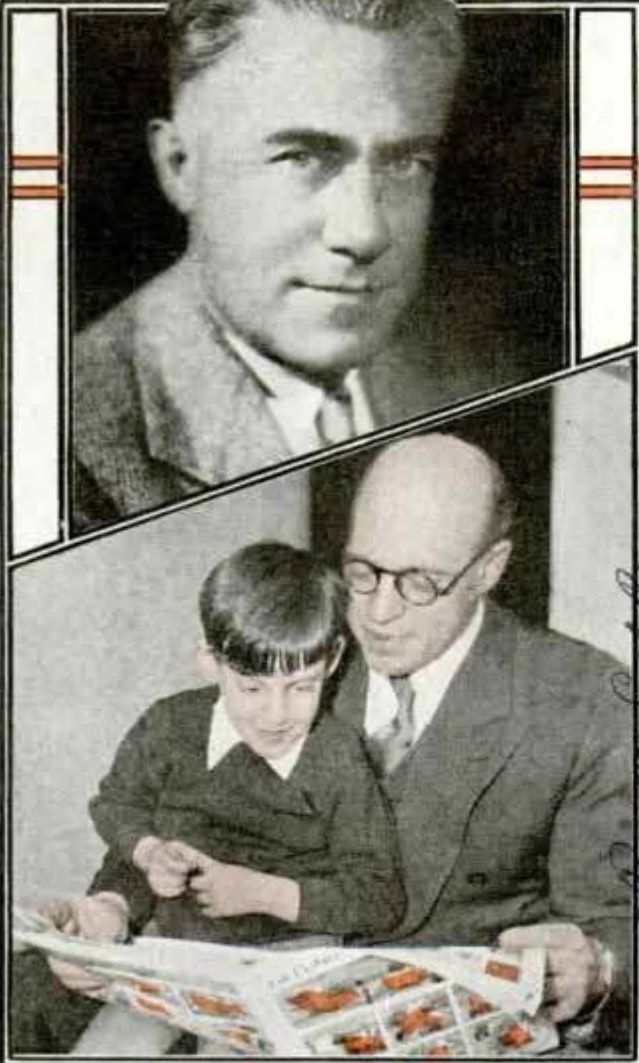
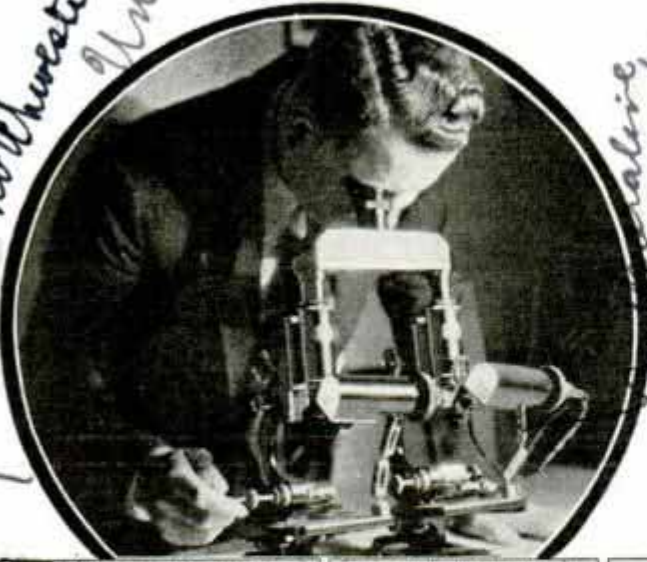
Mouse. Five years ago, John F. Dille, veteran comic-strip man, started casting about for a new idea for a strip. The



SHORTLY after the world war, a young aviator was put to sleep by a mysterious gas and when he awoke, found himself in the twenty-fifth century. His name was "Buck Rogers." Today his famed "disintegrator" flashes in the pages of the newspapers and the roar of the rocket ship that hurtles him from planet to planet reverberates in radio loud-speakers from coast to coast. Among juveniles, Buck's popularity is comparable only to Mickey

public, he felt, had come to regard science as capable of virtually anything so he began work on a strip with a pseudo-scientific background, one that would accept the theories of scientists as actualities.

After a slow start, the feature made a hit. Little boys and girls started dressing like Buck and his pal, Wilma, and imaginary cities in back yards all over the country were wiped out by the four-million rocket pistols that have been sold.



Top, Chester Gould, Creator of Dick Tracy; Center, Frank King; Below, Ed Anthony

reader grow sad, reflective, or philosophic. A new cycle is in the offing, the experts say. It may be a return to the original style comic or a vogue of pantomime in which all dialogue will be eliminated. Both are gaining a foothold. The most widely read of the current crop is, perhaps, "Orphan Annie." Drawn by Harold Gray, this curly headed tyke, with goose eggs for eyes, has been a hit since her debut eleven years ago. This strip is in no sense a comic, but rather the story of a little orphan told in cartoons. Mr. Gray's greatest trouble has been the names he has select-

ed for characters. No matter what name he chooses, there is certain to be somebody in real life with the same name who objects. Once, Annie caught an express company employe stealing the company's funds from the safe. The cartoonist had drawn the fellow as a desperate looking character and wanted a name to fit him. Finally he picked "Ruff." Then one day an irate chap came to his office.

"My name's Ruff," he said. "I've been an honest worker for the express company for fifteen years and I don't like your insinuations."

In Chester, Ill., people still remember E. C. Segar as a house painter and not as a famous cartoonist. "Ham Gravy" and "Olive Oyl" were the principals in his strip for years without creating much of a flurry, but with "Popeye," the humorous series reached the front rank.

A shot heard around the comic strip world was fired in the Dick Tracy strip the first day it started. A Mr. Trueheart fell victim to a bandit's bullet and Dick Tracy, a detective, vowed to bring the murderer to justice. The detective captured his man after an exciting chase and he's been doing it ever since in this popular strip by Chester Gould. It was an outgrowth of Chicago's rackets and gang

taking care in scenery crime Detective at Northwestern Univ.

Garbini Alley

Creator of Gray Cat Process



Above, Radio Cast of Orphan Annie; Right, Carl Anderson, Who Draws the Impish "Henry"



wars. Gould, an aspiring cartoonist with a string of three unsuccessful features behind him, was given the chance to present the law's point of view on crime and the methods used by the police to control it. Due to his thoroughness in crime research and the strong style of drawing, Dick Tracy has become a household word.



Gould likes to think of himself as Dick Tracy and looks a little like him, just as George McManus resembles his character, "Jiggs." The creator of Tracy reads everything he can find on crime detection and took a course at the Northwestern University crime detection laboratory. He clips crime items out of newspapers for his elaborate files and has long talks with detectives and "G" men.

One comic that sticks to the original idea is Frank Willard's "Moon Mullins." It is rough and rowdy and its incredible char-

acters, Moon, Kayo, Mamie, Willie and Lord Plushbottom have made it one of the most popular in the field. It's axiomatic in cartooning that characters should remain ageless but Frank King's greatest success with "Gasoline Alley" has come with normal growth of "Skeezix" and "Corky."

In this modern era of comics, the parade of new characters and strips changes daily. Only the hardiest of the veterans can withstand the competition. A comic character is like a movie star in that he sur-

(Continued to page 130A)

Lifesaving Rifle Fires Line from Shore to Ship



Wide World.
Rifle Used Instead of Cannon by Coast Guard for Firing Line from Shore to Ship

Modern rifles are being substituted for cannon by the coast guard for shooting life lines from shore to wrecked ships. The lifesaving rifle, equipped with a container for the coiled line, can be fired from the shoulder like an ordinary gun and will throw a line from 350 to 500 yards, depending upon the type of projectile used.

NEW OIL WELLS ARE LOCATED BY APPLYING AIR PRESSURE

Compressed air has taken the place of the divining rods and "oil-smellers" of pioneer prospecting days in the hunt for "pay" oil sands 2,000 feet deep in the soil of Ohio, West Virginia and Kentucky. Air pressure has been used since 1915 to speed the flow of oil through sands where natural pressure was low, and now it is employed to trace the oil streaks. The operator connects a gas-engine-driven compressor, usually of 200 horsepower, with a well known to be in the sand he wishes to trace. Air pressure of 300 to 500 pounds is applied. Within a few days, certain wells in that immediate area will respond

with increased volume of gas, salt water, or oil; the air has found its way through the sand at these points. Any drilling upon a line between the active well and the one in which the air is forced will strike that particular streak. The site for a new well is usually a few feet off the direct course. This method is quite simple where an oil streak follows a fairly straight line, but bends and upheavals of rock strata must be reckoned with. Starting with the well where air pressure was first applied, there may be discovered another well responding some distance away, far to the right or left. The operator then refers to his log of drilling operations in that field and finds one or more "edge wells" having only a small quantity of pay sand. By comparing the amount of sand in the air well with that in the edge well, and by moving over a few feet inside the bend, he finds the center of the streak. In this manner, a single streak of oil sand may be accurately traced for miles. Thus the oil operator can map his entire territory, locate his wells without guesswork, and save time, labor and cash in tapping underground reservoirs.

ANIMAL RINGS AND KEYBOARD TEACH CHILDREN TO TYPE



Latest Typewriting Method for Child; Note Animal Rings on Her Fingers

Devised to teach children as young as five years to use the typewriter, a new system employs a keyboard and adjustable finger rings decorated with a whimsical

L.C. Smith and
Corona Typewriter

make unknown
see Jan. 1935 - different type

see March 1936.
81257 394 - different type

Stockport, Ohio.

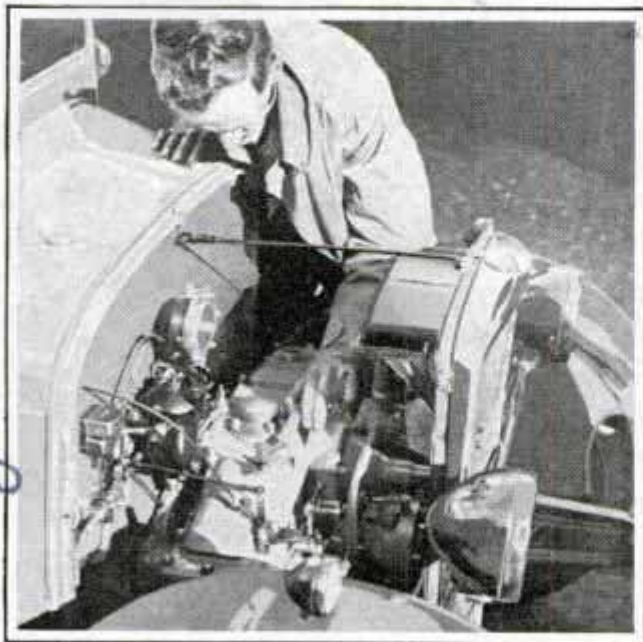
81208

animal and a color. Each group of letter-keys struck by one finger under the touch typewriting system is identified by a certain animal and a color. The finger that strikes these keys is identified by the ring bearing a similar animal and color. Each key also bears a small letter. The thumb wearing the elephant ring, strikes only the elephant-decorated space bar. Gay verses in the instruction book teach the system in this manner: "Little Birdies you can see, Perched on q and a and z; Little Doggie comes out next, Guarding w, s and x."

8/27/

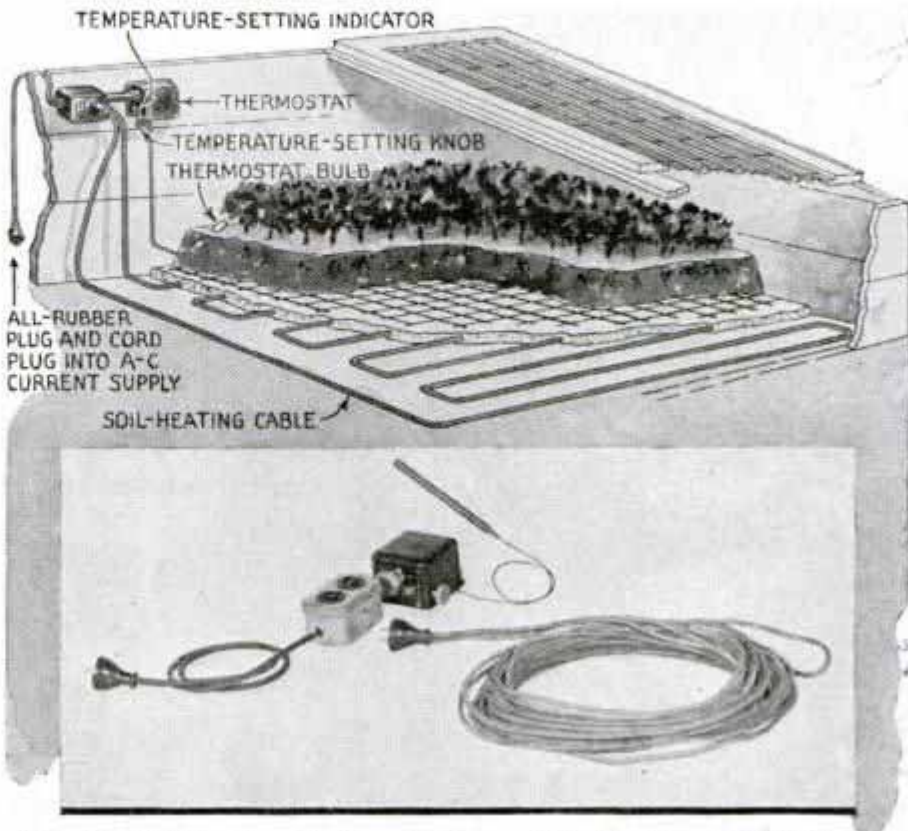
DIESEL AUTO MAKES SIXTY-FIVE MILES PER GALLON

Sixty-five miles to the gallon of fuel oil is claimed for a light automobile equipped with a small Diesel engine which was tested recently in England. The motor develops about eight horsepower and the car has been found exceptionally economical to operate.



© Planet News, Ltd.
Light Auto Equipped with Small Diesel Motor

Electric Soil-Heating Outfit Makes Garden Grow Faster



Electric Soil-Heating Outfit and Diagram Showing How Cable Is Laid under Ground to Maintain a Constant Temperature

Entirely automatic in operation, an electric soil-heating outfit for small growers and "hobby" gardeners requires no special wiring or installation expense. The kit, produced by the General Electric company, comes ready to plug into any convenient electric outlet, after which it is only necessary to adjust a knob to the desired temperature setting and then let the automatic control function. A 115-volt kit consists of a sixty-foot cable assembly for beds of thirty-six square feet or less, and a thermostat assembly with a duplex receptacle and three-foot rubber cord with plug. The duplex receptacle permits the use of two sixty-foot lengths of cable if desired. A 230-volt kit is similar but each cable assembly is 120 feet long. The soil-heating outfit provides protection from cold, maintenance of ideal plant temperatures, positive control of plant growth and saving in labor, time and care. Any bed temperature between thirty degrees and 100 degrees can be maintained. The cable is laid in parallel lines four to nine inches below the surface of the soil.

Creating Victor Motor Co. Creventy, England

Schepclady...

Victor Diesel Cub.

8809 Mrs. James the ...
20. W. Martin ...
"YOU can BECOME

Kansas City, Mo



Once the fear of falling is conquered, balance and position, the sport's two other important fundamentals, may be grasped quickly.

In taking your position on the ice, stand perfectly still, free of all tenseness, then after bending the knees slightly strike out. When, after a few yards, you feel yourself tightening up, it's best to stop and begin over. Push with the

unemployed leg and carry the weight with the skating foot. There's no smoothness in skating when the muscles aren't free flowing.

Don't skate stiff-legged. Bend the knees. In this way the stroke is vested with grace and power. Too, the bent knee acts as a shock absorber. The longer your stroke the more your knees should be bent. Many lose half the force of their stroke by not driving straight

for restor Johnson is skate to 9900 in Springfield Chicago

By **BOBBY McLEAN**
World's Professional
Speed-Skating Champion

ANYONE can become a good skater. It's merely the coordination of mind with some of the muscles. It's my contention there's no such thing as a weak ankle. Either your equipment isn't right or you're not skating properly. Of course, you may have to take a few spills before you acquire proficiency. That's part of the sport. When you have learned to fall properly you have mastered one of the cardinal principles of good skating—relaxation.

Most beginners live in constant fear of falling. When about to lose their balance, they go through a series of antics trying to regain it. In most cases they fail, so they might as well relax and flop gently. Taut muscles are apt to produce more shock than relaxed ones, and the possibility of injury is correspondingly greater.



Center Photo © Planet News, Ltd.
Bobby McLean Shows How to Make Speed and How to Take a Turn; Center, Sonja Henie

Handwritten notes at the bottom of the page, including "The ..."

a GOOD SKATER"



ahead. Weaving from side to side may seem flashy but it's not good skating. At the start of the stroke, have knees and feet together and see that they stay as close as possible throughout the entire movement.

You can usually tell how much a person knows about skating by watching his eyes. The dub looks at his feet or the marks his skates are making while the experienced skater looks in only one direction—straight ahead. Looking down changes the center of balance, the upper part of the body being thrown forward. If the eyes are straight ahead and the head erect, the center of balance is above the skates where it belongs and the chances of the skates sliding out from under the student are minimized.

The position of the arms in skating is opposite that of walking. When the right leg is forward, the left arm should be in front. This gives the stroke greater power and aids balance. No doubt you've seen skaters carry their shoulders as if marching in a parade. This is wrong. If the left foot is forward, the right shoulder and arm must be forward and up, the line of the shoulders being almost parallel to the



Top, One of the American Women's Olympic Teams; Below, Hockey Requires Expert Skating

direction of the stroke or the print of your skates on the ice.

Turning to the right, get your head and eyes around first and then the shoulders



its finish. With loss of momentum, the balance should be shifted and the stroke on the opposite foot started.

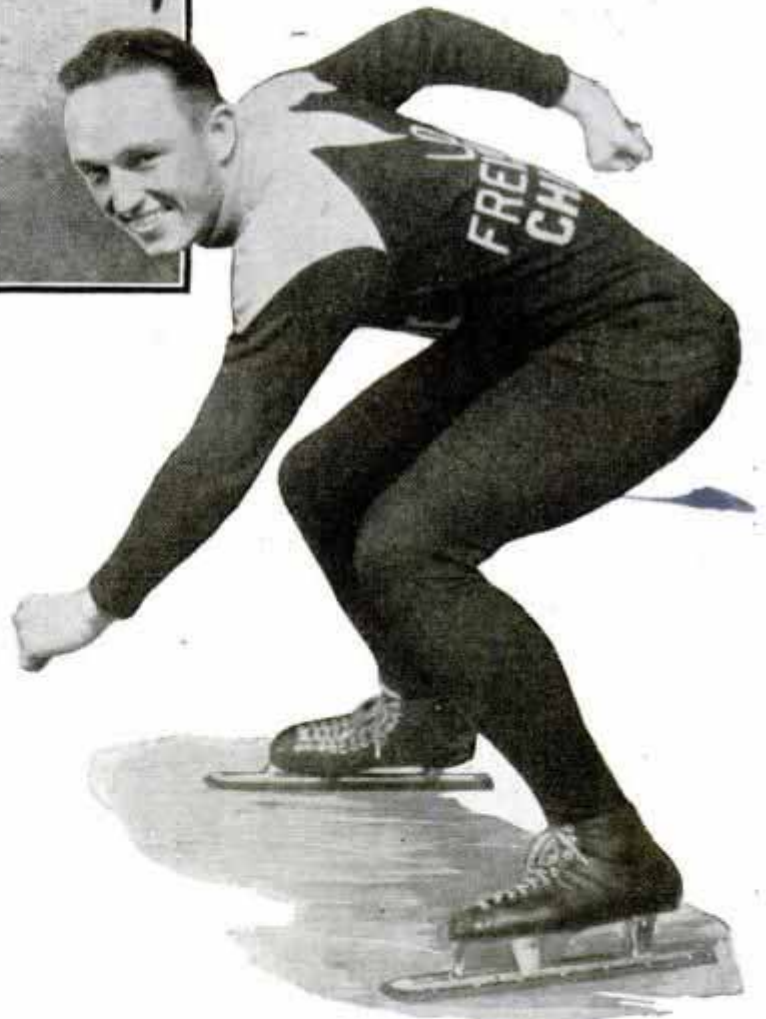
Practice stroking in a straight line as much as possible. If your stroke is choppy and goes off at too wide an angle, your forward progress will be cut down appreciably. When training for skating competition, learn the size of the rink so you can determine when and where to apply the pressure. Always work with other skaters, if possible, and under a stop watch.

Every two or three laps it's a good plan to change the pace. A three-minute mile is a good pace with which to build up general speed and strength. Do not sprint

and arms. This is comparable to bicycle riding or any other sport in which balance plays a part—you lean and look in the direction you want to go.

Now a word about the stroke. The heel of the skate should be placed on the ice first. Most stumbling is the result of a violation of this point. The unemployed leg should be brought up to and even with the one on the ice when stroking or slightly inside the skater's markings on the ice. Point the toe out and remember, the heel down first! In this way, weight is thrown on the leg on the ice, giving more power for the push on each stroke.

If you want to become a speed skater, knee-bending practice is advised. Get down as near to a squatting position as possible. The more you bend your knees with every stroke, the more power you have for pushing; the more push you have against the ice, the greater the length of your stroke. Speed skaters do not ride each stroke to



Top Photo © Planet News, Ltd.
Top, Burning Up the Ice in a Speed Contest; Below, This Position Gives Driving Force in a Race

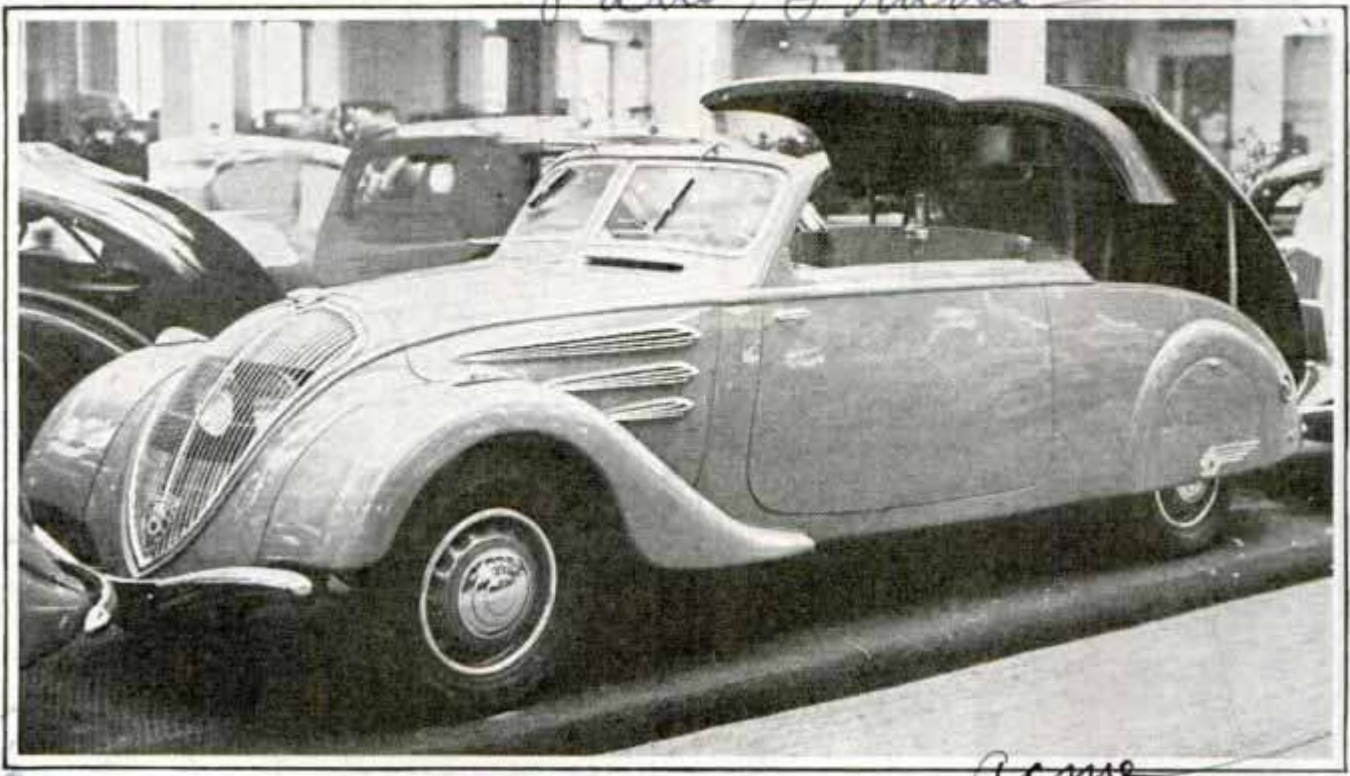
too much. After an intensive workout of three to five miles never end up by sprinting and leaving the ice. If you do, you're

(Continued to page 135A)

quai de Passy, 32

Paris, France

Latest Foreign Auto Has a Disappearing Top



Acme

One of the Latest Foreign-Built Motor Cars Features Disappearing Top; Note How Cover of Rear Deck Rises to Make Space for the Top; the Cover Then Lowers When the Top Is in Place

Automatic disappearing top and concealed head lamps are two features of the latest model Peugeot, a French automobile. The lamps are set closer together than on American cars and are inclosed,

1936

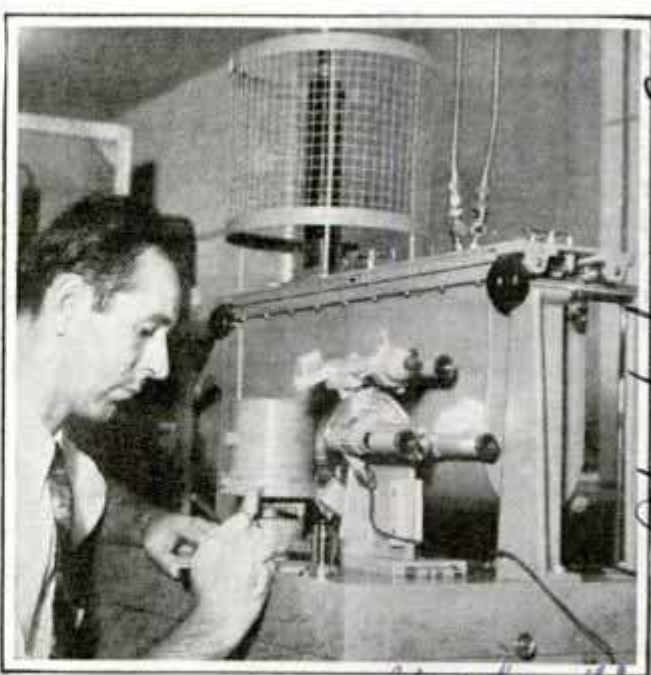
and partially hidden, by a radiator grille. Controls in the driving compartment cause the top to slide automatically to the rear where it fits compactly into the rear deck, converting the vehicle into an open car.

"Building Blocks" of Nature Are Revealed in Photographs

8/24/2

Any amateur can photograph a brick wall or paving blocks. Taking pictures of the "building blocks" of nature, those inconceivably minute particles of matter arranged in varying crystal forms, is a feat now possible to the laboratory scientist. Solid materials differ because of the infinite number of ways in which their atoms and molecules are arranged. At the California Institute of Technology is an X-ray crystal spectroscope by means of which man can actually take pictures revealing the crystal arrangements of solids. The magnitude of this task is manifest when one is told that 250,000,000 hydrogen atoms in single file would span only an inch.

Pasadena Calif



Atropine Laboratory

Apparatus Which Takes Pictures Showing the Crystal Arrangements of Solids—the Real "Building Blocks" of Nature

Wide World

Even rubber overshoes have their own proving grounds; women are employed to tramp over gravel, concrete, cinders and brick to test wearing qualities of the shoes.

Chicago Apparatus Co

Midway Hotel Sept 1935

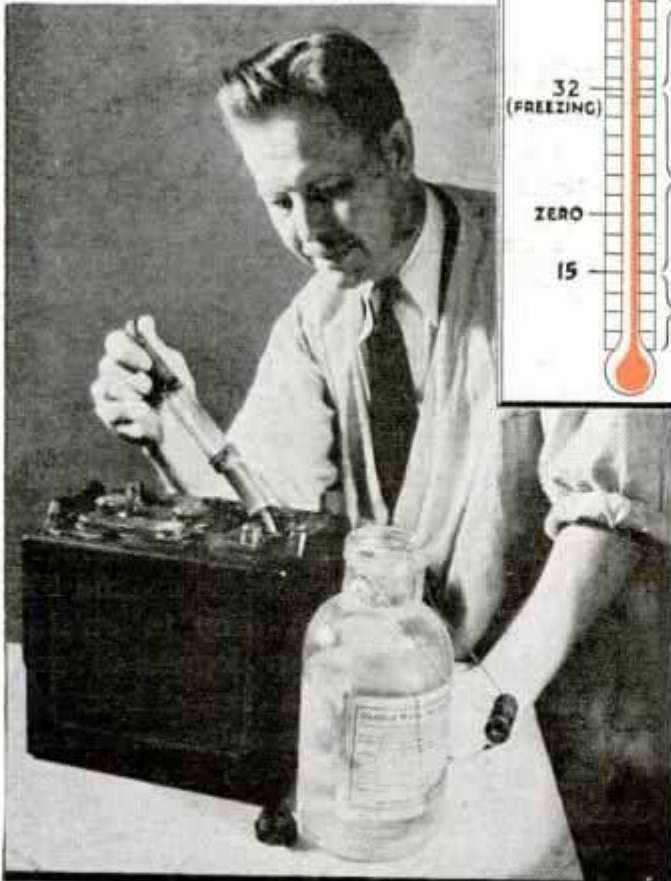
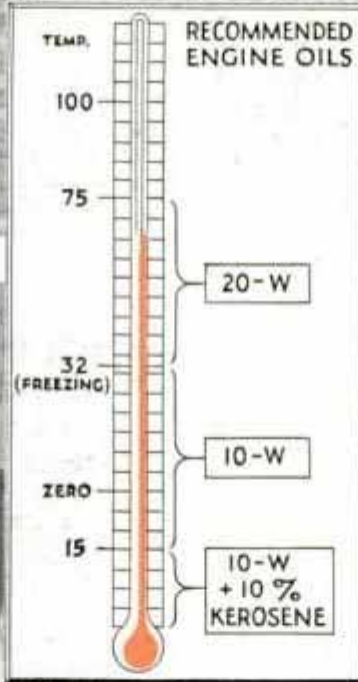
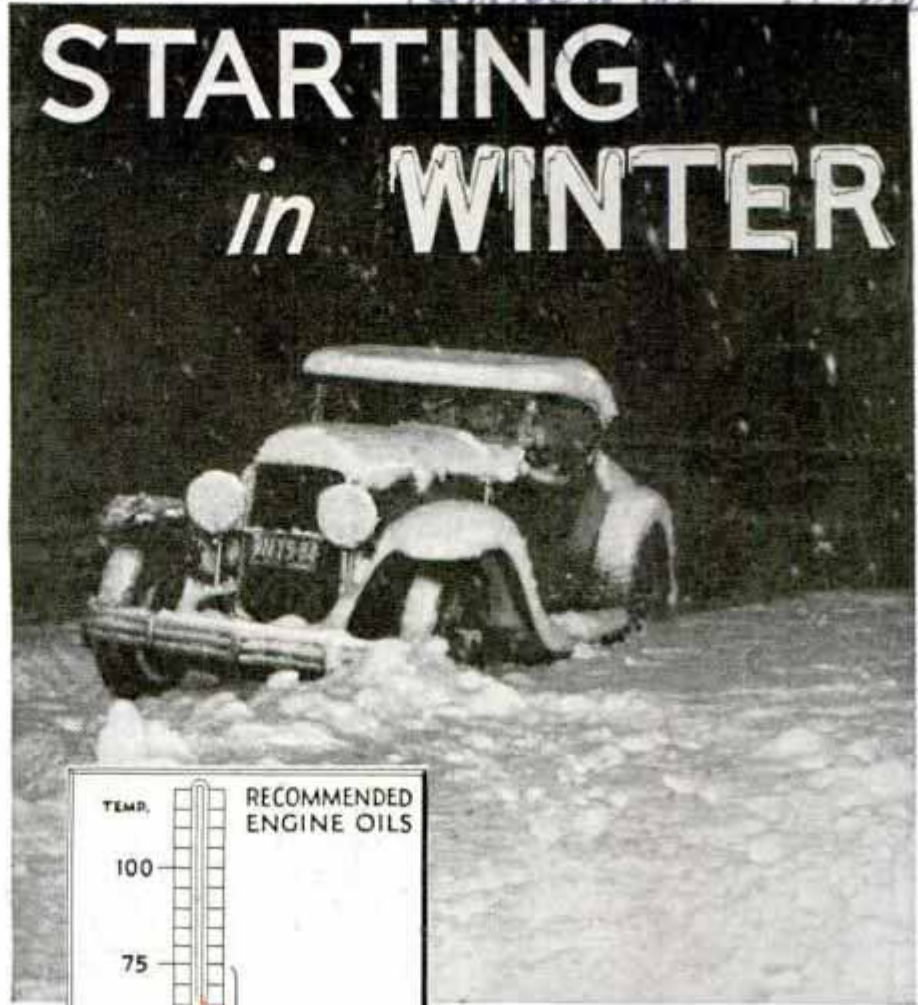
175 W albridge Road
Lancaster Penn

QUICK STARTING

in WINTER

WHEN the mercury drops to zero and a few groans from under the hood forecast a morning of trouble it is difficult for the car owner to believe that his engine should start just as easily as it did in summer.

There is just one reason why an engine in otherwise good condition may give its owner chronic starting trouble, and that is lack of normal compression. Given a normally strong battery, dry and properly timed ignition, good gasoline, proper compression, the engine ought to start the way it does in warm weather. But in few en-



Every Cell of Battery Should Give a Specific Gravity Reading of 1,275 to 1,300; at Zero a Battery Loses Half of Its Efficiency

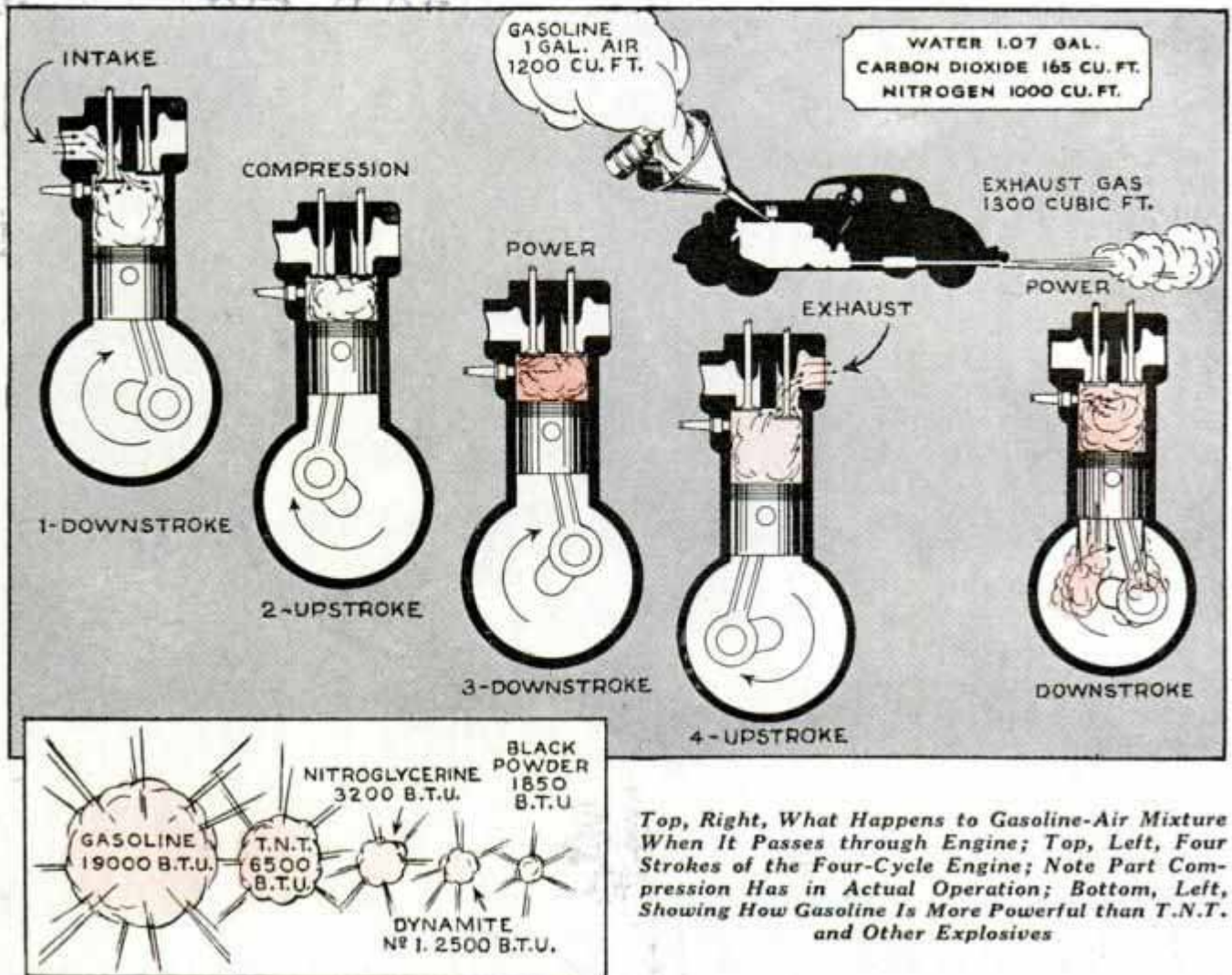
gines during winter is compression normal.

Compression is greatly affected by lubrication which, in turn, is very sensitive to temperature. There we have the customary winter starting trouble in a nutshell. The wrong lubrication!

A difference of some seventy degrees in outside temperature cannot contract the

metal of the engine enough to cause trouble, nor can it make the coil, ignition wires, plugs or distributor points any less efficient by chilling them. Gasoline, if the water is filtered out, does not congeal, or refuse to vaporize if mixed with cold air. But the oil—the wrong oil—is a different story.

Compression is dependent not merely on the fit of the pistons and the rings, and on the tightness of the valves, but also on lubrication. This is much more pronounced when the engine is cold. The wrong kind of oil, when chilled, flows so slowly that the starter-motor has all it



Top, Right, What Happens to Gasoline-Air Mixture When It Passes through Engine; Top, Left, Four Strokes of the Four-Cycle Engine; Note Part Compression Has in Actual Operation; Bottom, Left, Showing How Gasoline Is More Powerful than T.N.T. and Other Explosives

can do to turn over the crankshaft. There is no oil on the cylinder walls to aid free movement of the pistons and piston rings are sticky because of the congealed oil around the ring grooves. Everything else being equal, if you were to inject some engine oil into the cylinders just before trying to start you would find that the engine would get under way more quickly. Yet you would be doing nothing to increase the temperature of the engine.

For years motorists considered heat as the only logical answer to cold-weather starting, but today we know that we can get a summer start by using lubricants that help lift compression to normal.

Compression itself makes heat. It is the secret of Diesel engine operation. With compression of 350 to 500 pounds, the temperature inside the cylinders of a Diesel engine range from 800 to 1,000 degrees Fahrenheit. That is, the temperature will reach this degree even before there has been self-ignition of the fuel vapor. It explains why the crudest fuel

oil will ignite inside the cylinders of a Diesel engine without benefit of spark from an ignition system. Pressures and compression temperatures are not so extreme in a gasoline engine, but one thing is evident. A difference of even seventy degrees in the temperature of the ingoing air should not make any material difference in the ability of the gas mixture within the cylinders to fire instantly.

Let us say that the compression of your engine is around five atmospheres, an "atmosphere" being equal to 14.7 pounds at sea level. Under compression the temperature of the charge should be around 500 degrees Fahrenheit. A drop in outside temperature from seventy degrees to zero, therefore, would mean a drop of from 500 to 430 degrees inside the cylinders, which is not enough to slow up the starting process. Yet the engine balks—merely because incorrect lubrication prevents the engine from reaching its normal compression. That, in turn, prevents the engine

(Continued to page 122A)

Shapes Cut from Metal by Band File and Saw

Combining a band saw and band file in one unit, a tool-making machine which does inside cutting in metals has been developed. With either the file or the saw, it delivers continuous effort, eliminating the backstroke characteristic of the jig saw with its waste effort and dulling of the teeth. The change from file to saw can be made in three minutes. It speeds the cutting of tools and dies, and making special shapes and holes in cork, Bakelite, leather, brass, aluminum and other metals. Inside sawing is achieved by cutting the band-saw blade, inserting one end through a starting hole in the work, then rewelding the saw blade in a one-minute automatic electric brazing unit included in the machine. For inside filing work, the file band is uncoupled at a special joint. The file band is not flexible, but consists of three-inch segments of files mounted on a flexible spring steel band which runs over pulleys. The electric motor has a variable speed control. The worktable can be tilted forty-five degrees forward and will also tilt backward approximately five degrees.



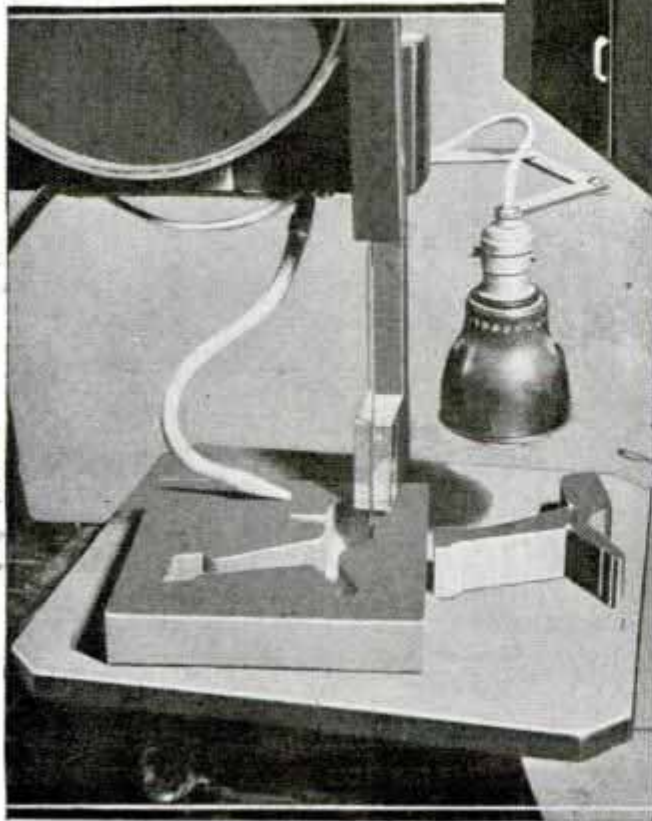
Blow Bell

Tool-Making Machine Combining Band Saw and Band File Which Speeds the Cutting of Tools and Dies and the Making of Special Shapes and Holes

8/13/16

MAN HIT BY LIGHTNING LIVES TO RELATE HOW IT FEELS

One man has been struck by lightning and lived to tell how it feels. He is Al Moore of the government forest service and he was stationed in a 100-foot steel lookout tower when a thunderstorm rolled up. The lightning scored a bull's-eye. "My first impression," said the lookout man, "was of a blinding flash, but I was not aware of any crash or noise. A hit like that leaves you with a very weak, limp feeling, soon followed by a cold sweat and an empty sensation in the pit of the stomach. For days afterward the recollection of the stroke raises goose pimples all over you." Moore says his perch always buzzes and hums as a storm approaches and small balls of blue flame hang to the corners of the cabin roof. He "insulates" himself by wearing rubber-soled shoes and keeps his hands off sides of the cabin and other metal parts.



Quartz Ridge

1301 Washington Ave. S. Minneapolis, Minn. Heavy duty \$750.00

20-9-16

Blow Bell

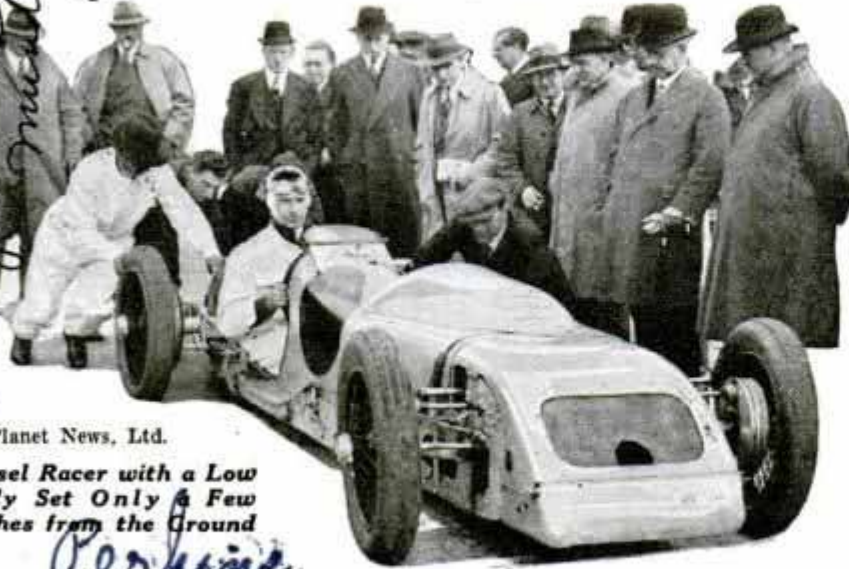
8/13/16

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Quartz Ridge

Diesel Racer with Low Body Hugs Road at High Speed



© Planet News, Ltd.

Diesel Racer with a Low Body Set Only a Few Inches from the Ground

Perkins.

Tests are being conducted in England with a Diesel-powered racing car which is quite unusual in design, aside from its oil-burning engine. The racer has an exceptionally low-slung body and frame, the chassis resting only a few inches above the road. This is said to give the car remarkable stability at high speed, greatly decreasing the chances for turning over when going around curves.

ual gold miner. Its controlled feeding system drops ore or gravel from a hopper over graduated screen-mesh riffle boards

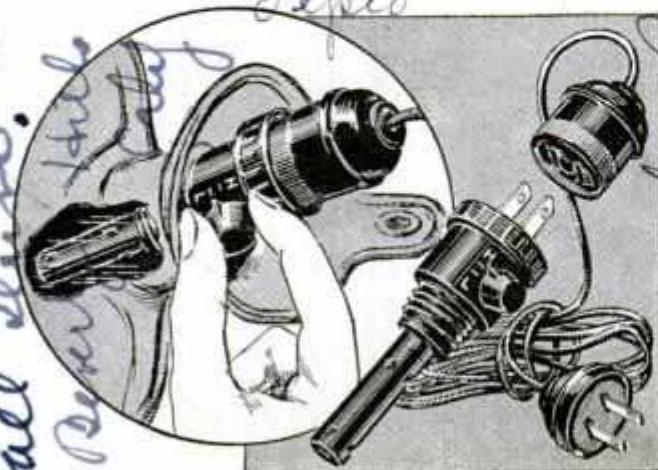
bular base and completes the circuit, setting up resistance that heats the water quickly. Thermostatic regulation allows for setting the water temperature at 100, 110, 120 or 130 degrees as desired, and cuts the current when overheated.

DRY GOLD WASHER IS ONE-MAN MACHINE

Weighing less than fifty pounds and designed for setting up or dismantling in two minutes, an all-metal dry washer is the latest aid to the individual gold miner. Its controlled feeding system drops ore or gravel from a hopper over graduated screen-mesh riffle boards

HEATING PLUG FOR WATER BAG HAS THERMOSTAT CONTROL

Water itself is the conductor that closes the circuit in an electric heating unit that fits into the mouth of a hot-water bag and can be used as well in an open vessel. It uses alternating current. When the plug is inserted in water, the liquid enters a tube



Electric Heating Unit for Hot-Water Bag Equipped with a Thermostat Control



Demonstrating Dry Gold Washer Which Can Be Assembled or Dismantled Quickly

which oscillate 750 times per minute. It is claimed that one person can run approximately one ton of ore through the washer in an hour.

The D & C Dry Gold Washers Co

Driven at Brooklands, Surrey, England by Reginald Percival on Monday

£1272

£1260

£1244

Clare - Dec 1934

James V. Purdy 68 Riverside Ave Long Beach Calif

Long Beach Calif. Letter sent 10/11/37

D. No. A. for California 163-n

Small reuse. Please write

Weird Figures Act in Shadow Plays of Java

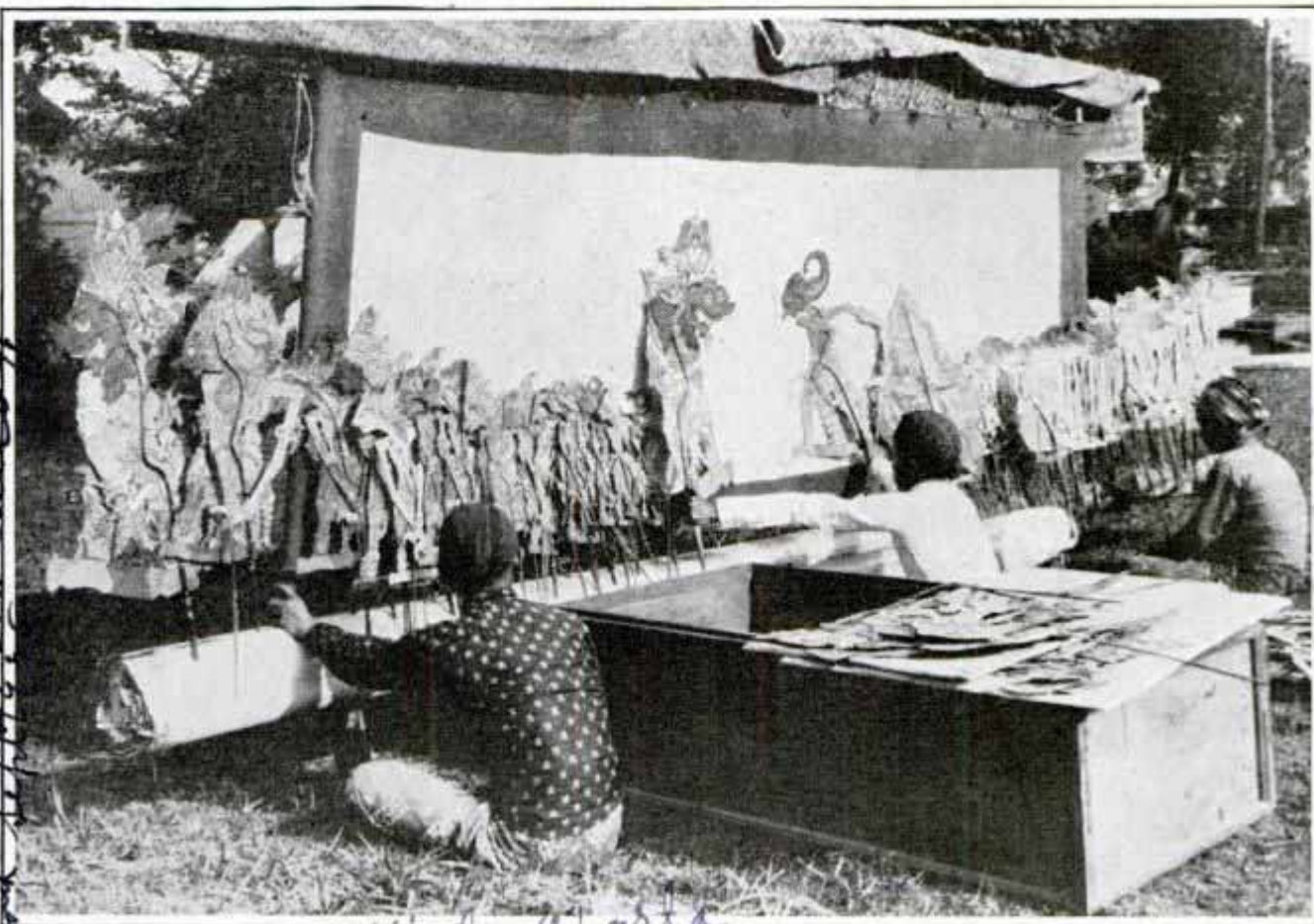


Photo by E. M. Newman
 "Backstage" at Javanese Outdoor Theater; These Three Men Manipulate Odd Cutout Figures Back and Forth across the Screen to Produce a Sort of Shadow Play; This Resembles American Puppet Shows

1935 in Chicago and Gen. Chicago
 money notebook

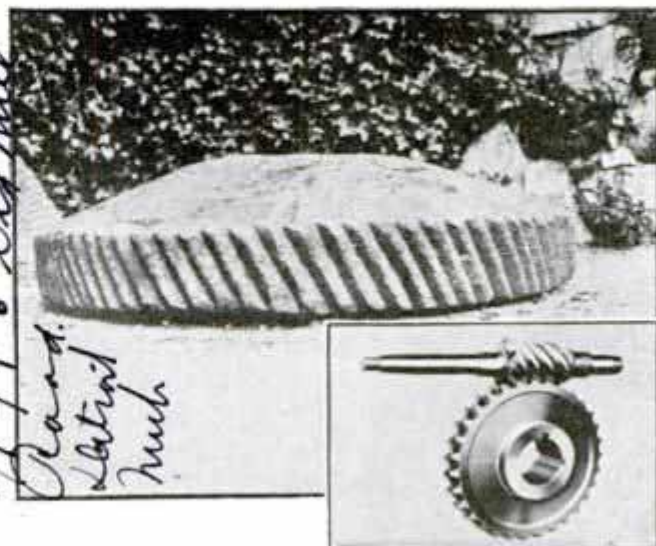
"Screen stars" in Java are grotesque cutout figures whose shadows strut and dance in the weird cadences of the drama. To the Javanese, shadow plays are what the movies and the stage, the puppet show

and the opera are to other peoples. The figures, with jointed arms in motion, are moved back and forth across the shadow curtain by manipulators, who hold them erect on poles.

81250

Stone Resembling Modern Helical Gear Is Centuries Old

Bearing a striking resemblance to the modern helical gear, a stone found in the ruins of an old castle in Sweden is believed to indicate that people of the eleventh and twelfth centuries had a clear conception of gear design. While it is likely this stone gear was used as a grinder for grain, it may have been one of a gear train used to drive a community grain crusher. Otto Lundell of the Michigan Tool company, who found it, points out that the stone is thicker at the hub than at the teeth, providing adequate bearing area.



Stone Cut Like Helical Gear; Inset, Gear Used in Modern Machinery

(An armored tank recently designed reached a speed of 104 miles an hour in a test run on smooth pavement.

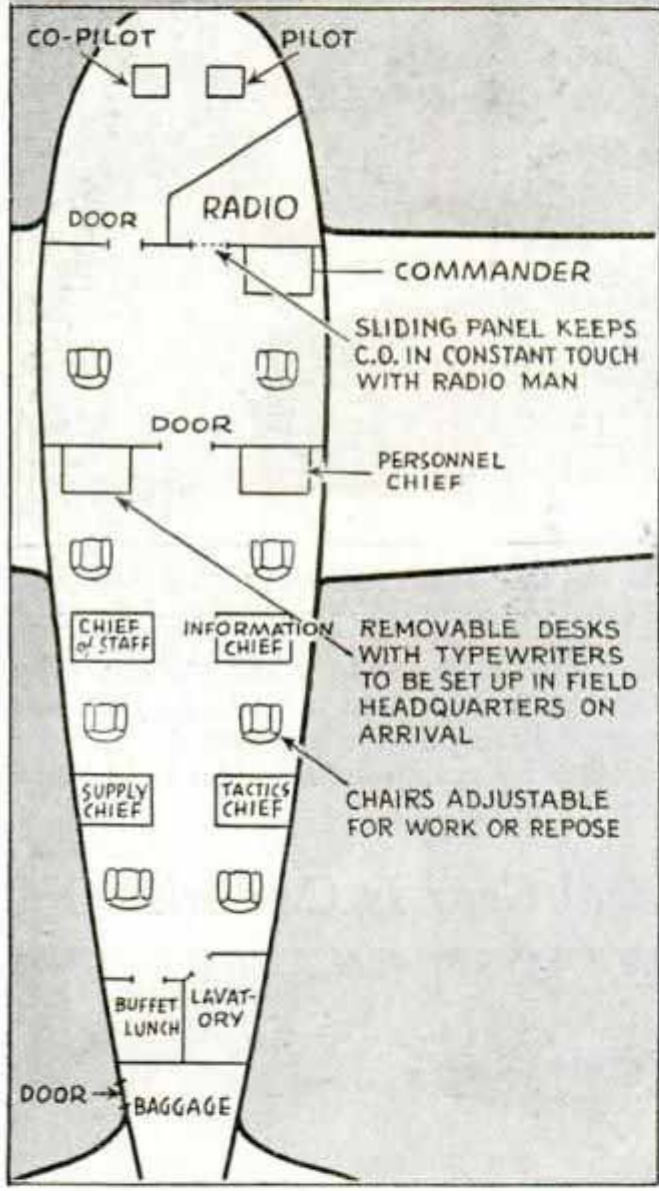
Chicago Apparatus

1971 & Dig out
 Hand
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This is made Road?

Amateur Editor
slightly news
Langston

Air Corps "Flagship" Is Flying Headquarters



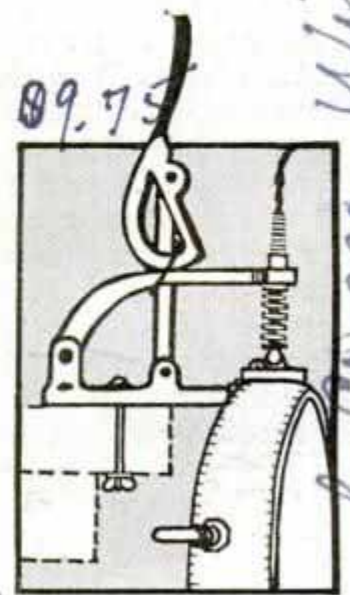
Army Air Corps "Flagship" and Diagram Showing How It Has Been Fitted as a Flying Office

office, carries no armament and would be escorted by fighting planes in wartime. Just behind the pilots' cabin and radio compartment is the office of Maj. Gen. Frank M. Andrews, commanding officer, always in touch with his forces on the ground and in the air by radio. The operator is within reach of his chair. About the center of the ship are desks for the personnel chief, the information chief and Col. Hugh J. Knerr, chief of staff. To the rear are offices of the tactics and supply chiefs. Chairs are adjustable, and the typewriter desks can be removed to field offices on land. The headquarters plane is located at Langley Field, Va. The "flying headquarters" ship is powered with two engines of 710 horsepower each and the airplane cost about \$85,000.

8 12 27

AUTO TUBES REPAIRED QUICKLY WITH ELECTRIC "WELDER"

For rapid repair work on automobile tubes there is a small electric "welder" with thermostatic control which operates economically on direct or alternating current. It can be clamped on a workbench or wall bracket. The tube is hung on a rubber-cushion base and the heat-



"Field headquarters" for the general staff of the army air corps is a transport plane recently purchased and equipped as a "flagship" of the fleet. It is a twin-motor Douglas monoplane with top speed of 205 miles an hour and cruising speed 175 miles an hour, capable of flying at 23,200 feet, well out of range of anti-aircraft guns. The ship, being outfitted as an of-

Tube Welder Info Co

ing unit is applied by lifting a lever. This heater is made of aluminum alloy, interlined with asbestos. Plugged into a wall socket, it quickly heats to 280 degrees Fahrenheit, the proper temperature for "welding" the tube in five minutes, and the current is cut off at that temperature by thermostatic control. A tension spring puts pressure on the tube.

8/207

MODEL OF OLD BOAT IS CONTROLLED BY RADIO

Combining the ancient with the modern, a model of the famous sailing warship "U.S.S. Constitution" has been equipped with radio controls so that its cruise can be guided from shore. The miniature "Old Ironsides" tried out its sails on Hempstead Lake, Long Island, recently, while its builder piloted it by radio remote control from the bank.

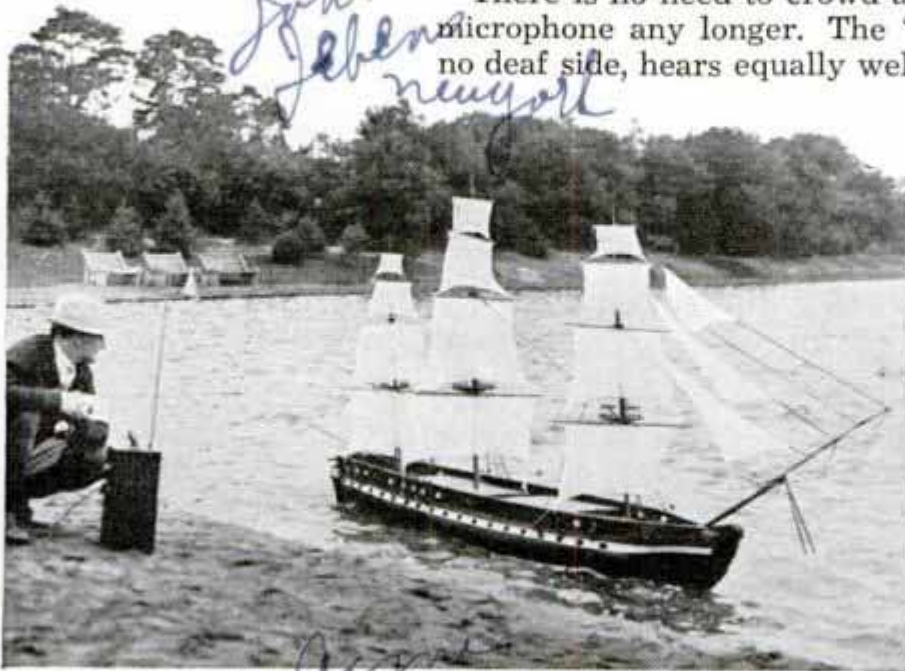
'Billiard-Ball' Microphone Hears from All Angles



Musicians at the Billiard-Ball Microphone Which "Hears" Equally Well, Regardless of the Direction from Which the Sound Comes

used at W O R.

There is no need to crowd around the "good ear" of the microphone any longer. The "eight-ball" microphone has no deaf side, hears equally well from any direction including ceiling and floor of the studio. This "mike," latest development in sound broadcasting, resembles a billiard ball mounted on a pedestal.



John J. Jeleny, New York

Model of the Famous Old "Constitution" Which Is Equipped with Radio Control so It Can Be Maneuvered by the Owner on Shore

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

John Jeleny, Long Island State

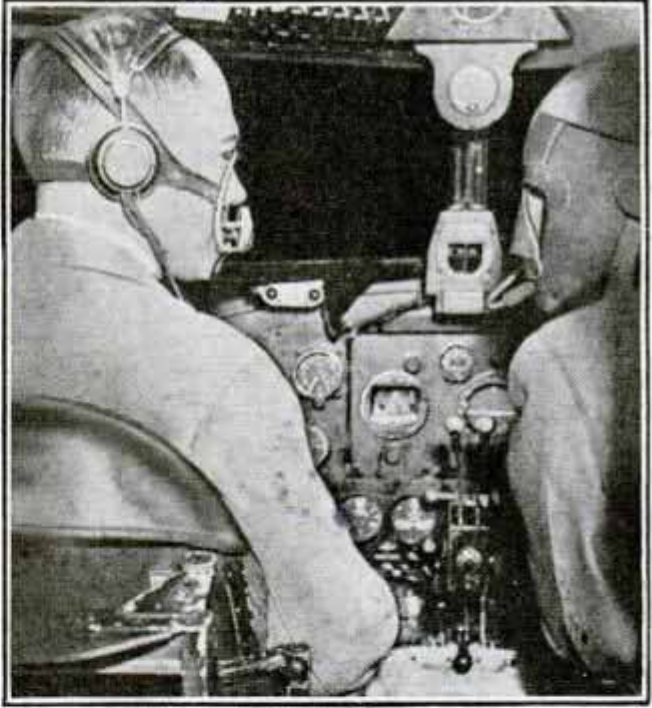
Western Electric Co. 195 Broadway New York

924
Kansas City
Mr. Thomas G. Lummis, Jr.
10555 Holman Ave.
Los Angeles, Calif.

There's SAFETY



Facts like these were discovered in working out the new technique of "optimum flight" that takes advantage of the idea that the higher you go the faster you fly. Pilots have known that for years but haven't been able to get the power out of their engines and also keep crankshaft speeds low. The engineers solved that by providing the variable pitch propeller. The thin air at high altitudes offers less resist-



Crew of T.W.A. Douglas Air Liner in Oxygen Masks Worn during Record-Breaking Flight from Kansas City to Newark Airport at 27,000-Foot Level

Refugee in Dist. Transcontinental and Western Air

WOULD you say the pilot of an air liner needs a thermometer to help fly his plane? Or that if he flies faster he uses less fuel? If you answer "No" to each question, you will be just 100 per cent wrong because today the thermometer is an important aviation instrument and at high altitudes a pilot actually flies faster on less fuel than at lower levels.

A whole series of new discoveries in the last few years has changed flying from an art to an exact science. For instance, instead of flying according to the feel of the controls, a pilot now consults his instruments, works out a problem something like an algebraic formula, then sets the controls according to the answer. Other things about modern flying that seem strange are that airplanes frequently fly faster against twenty-mile-an-hour headwinds at high altitudes than against fifteen-mile winds at lower levels and that engines can be "revved up" without increasing horsepower. In fact, high crankshaft speeds are sometimes easier on an engine than lower speeds.

ance to a plane but provides less pressure and oxygen for the engines. This was partly overcome by using superchargers that pack the air into the cylinders and thus give sea-level efficiency as high up as 14,000 feet. So powerful are present engines that pilots are not allowed to open throttles wide near the ground for fear the high cylinder pressures might wreck them. "This means that the same amount of

in HEIGHT

power will spin a fixed pitch propeller much faster at high altitudes than at low altitudes," explains D. W. Tomlinson, assistant to the president of Transcontinental and Western Air. "To compensate for this the pilot increases the efficiency of his propellers by setting them in high pitch so they take larger bites of air. When a correct balance is kept between the pressure in the cylinders and the propeller speed the airplane speed increases at high altitudes. Nowadays at cruising altitudes the pilot shoves the throttles clear forward to speed up the airplane although he is using only part of his engine power.

"Instead of flying as fast as he can, a pilot compromises so he gains a good deal of speed while keeping horsepower output within prescribed limits. He usually cruises at sixty-five



per cent or less of his available power. The exact percentage depends on his altitude, which is governed by the weather, the length of the hop, and the speed he must make in order to maintain his schedule."

Fuel economy and speed aren't the only advantages of flying high. Using only part of the power reduces the chances for engine failure. It is estimated that at 100 per cent of power three failures will occur in a million miles of flight while at sixty per cent of power only one and one-half motor failures will occur in a million miles. If an engine does cut out in flight the pilot merely switches over to the high octane fuel tank to give the remaining engine the best fuel and adjusts the Flettner controls to counteract the turning effect of the live engine and thus enable the plane to still fly "hands off." With a normal load the Douglas DC-2 can climb to 8,000 feet on one engine and cruise in high pitch.

Top, Watches Used for Celestial Navigation; Center, Calibration Card Showing Errors of Magnetic Compass; Bottom, Sextant with Artificial Horizon

Dr. D. W. Tomlinson

9924



grees, and the altitude is 4,500 feet. On the chart he glances along the standard temperature line to 4,500 feet, diagonally along the pressure altitude line to seventy degrees, and then horizontally to 155 miles per hour, where he finds a figure that reads 177 miles per hour. This is the true air speed of the airplane, corrected for temperature and altitude. If he is

“What held scientific flying back was that there were no exact ways to measure factors like engine power and propeller efficiency in the air,” Tomlinson says. “At sea level horsepower can be measured without bothering about the air pressure, which remains practically constant. But the tachometer pays no attention to changes in pressure and temperature, which vary with the altitude. A new instrument that would indicate engine pressures at different altitudes had to be invented. The answer was the intake manifold pressure gauge. Now a pilot can measure his horsepower from the revolutions per minute, the manifold pressure, and the temperature of the air entering the carburetor.

“Flying his airplane scientifically keeps a pilot busy because conditions like outside temperature, pressure, altitude and wind are always changing and he must make corrections for every change. To make his job easier most of the problems are reduced to graph form. Instead of making long calculations the pilot reads his instruments, consults a graph, and adjusts the controls according to the answer. He uses mostly the cruising chart and the air-speed correction chart.

“In using the air-speed correction chart, the pilot may find from his instruments that the air speed is 155 miles per hour, the outside temperature is seventy de-



Broadcasting Weather Reports to Pilots, and Using Calculator to Determine Engine Performance

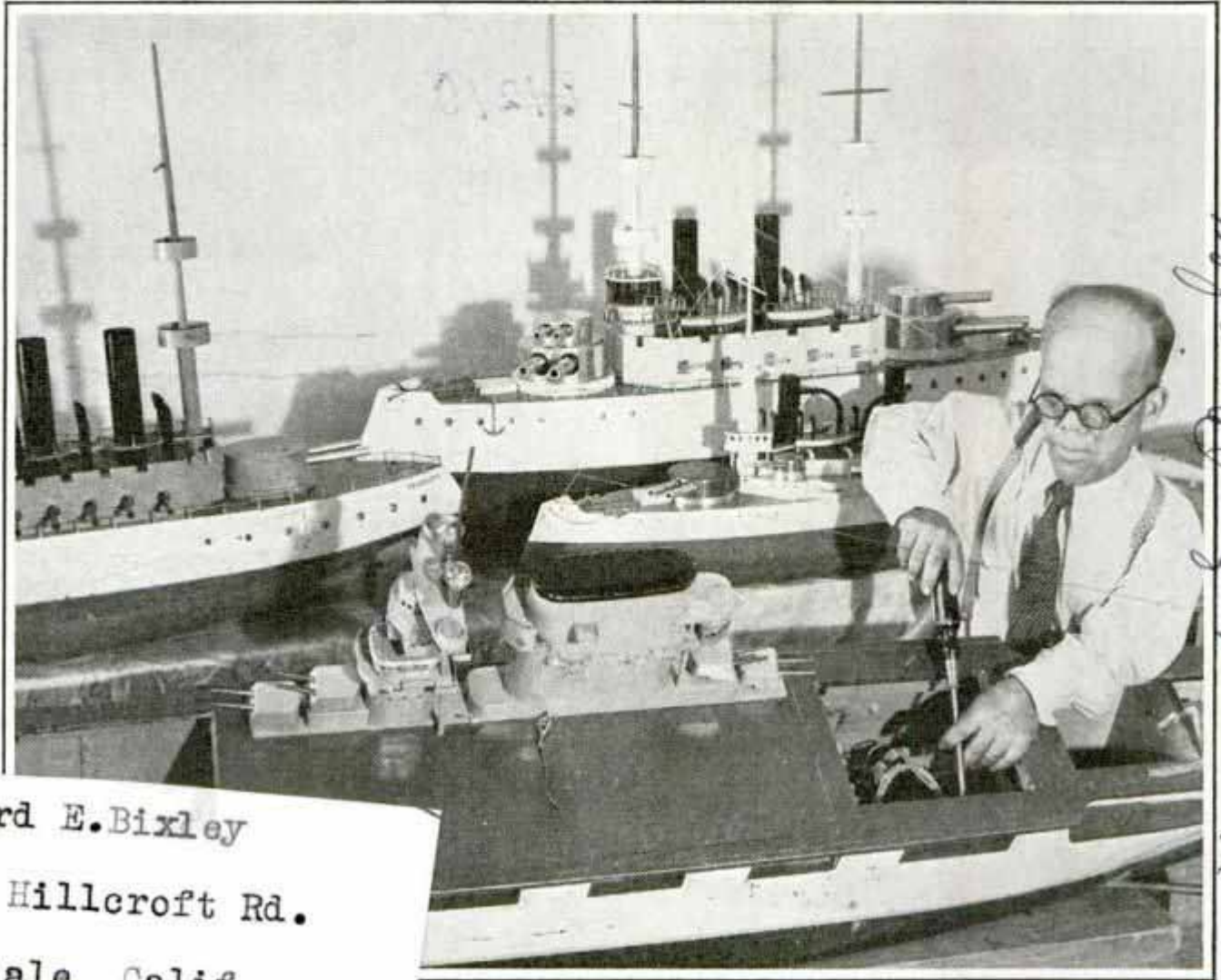
flying in a thirty-mile-an-hour tail wind he adds that to the figure and arrives at an actual ground speed of 207 miles per hour. If this happens to be faster than he needs to fly to keep his schedule he eases back the throttles.”

Part of the new science of flying is to use the potential energy acquired during the climb to cruising altitude by coasting down toward the destination with power on during the last part of the trip. On this last leg of the flight the ground speed may climb to as high as 220 miles per hour al-

(Continued to page 144A)

9924

Radio Pilots Cruise of Model Electric Navy



Howard E. Bixley
 105 Hillcroft Rd.
 Glendale, Calif.

Built by California Man; the Ships Have Electric Motors and Guns That and Are Equipped for Remote Control by Radio

Guns that really shoot are mounted on the battleships of a model navy being built at Glendale, Calif. Electric motors are installed in the ships, and the four engines of the miniature "U.S.S. Saratoga," copied after the airplane carrier, propel it five miles an hour on back-yard ponds. The ship is nine feet long. Like the "Saratoga," electric-powered models of the "Kearsarge," "Kentucky" and "Oregon," American naval vessels of the Spanish-American war period, all are equipped for remote control by radio. Howard E. Bixby, model engineer who is building the tiny fleet, has designed a scale model of the "U.S.S. California" with gasoline engines, intending to sail it from the mainland to Catalina island under radio control.

Braille maps of cities now enable the blind to "see" their way about the streets.

RAZOR BLADE DRYER SAVES TOWELS AND FINGERS

Cutting fingers and towels and turning safety-razor blade edges in cleaning are prevented by a blade dryer equipped with a suction cup for attaching to the bathroom wall or cabinet. The dryer consists of a metal case containing two layers of absorbent material between which the blade is placed and the top closed. There also is space for extra blades and a support for the razor.

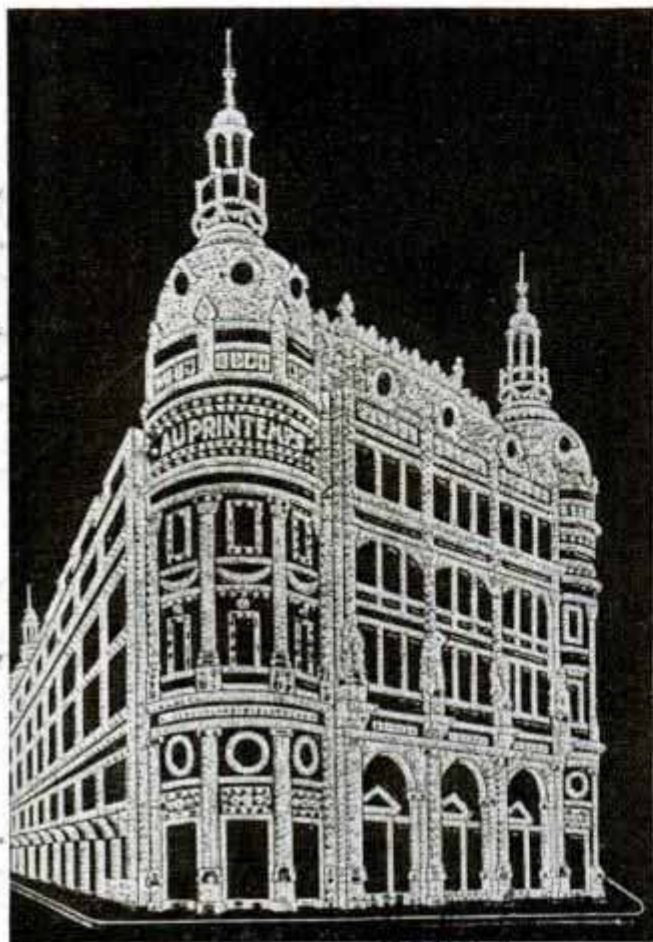


A. P. Brachman

Chicago Tribune

Howard E. Bixley
 105 Hillcroft Rd.
 Glendale, Calif.
 Leo Angeles
 210 W
 Hollywood
 210 W
 Hollywood

Model House of Diamonds Is Worth a Fortune



Model of Paris Jewelry House Made of Diamonds and Other Precious Stones

Constructed entirely of diamonds and other precious stones, a model of a Paris jewelry store is being used as a window display to attract passersby. The model, which contains thousands of stones worth a fortune, shows two facades of the store in perspective and is constructed to scale.

STREAMLINE HYDRAULIC JACK IS PAINTED TO MATCH CAR



Beauty is added to utility in a hydraulic jack now in production. Its trim, curved contours give a streamline effect, and it is offered in six colors that match the popular shades of late model automo-

biles. The entire base, cylinder, reservoir and pump of the jack is a one-piece die casting. It is rustproof, easily placed under the car, and proof against leaking. The jack will lift one and one-half tons.

HAND TEST FOR STUTTERERS AIDS IN TREATMENT

Stuttering often is caused by an ability to use both the right and left hands equally well, according to Prof. Eugene Hahn, director of the speech clinic of the University of Southern California. One step in his method of correcting the stutterer is to build up a single-handedness or sidedness in the individual. To find out whether a person is naturally right-handed or left-handed, a laterality test is conducted in which the individual uses both hands to perform similar tasks. After lat-



Test to Find Whether Person Is Naturally Right or Left-Handed, an Aid in Correcting Stuttering

erality is determined, the clinic attempts to build up the natural handedness through therapeutic measures and psychological technique. This in turn helps correct the defect in speech, it is claimed.

SEEDS IN MOWED DANDELIONS DO NOT GERMINATE

You don't have to rake up yellow dandelion heads after mowing the lawn, because

Printemps
Blackhawk
Co. 112 R
Brooklyn
W. H. Wood

1209

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the seeds will never sprout. To determine whether seeds would ripen in dandelions that were cut in the blossom stage, Prof. Carl D. LaRue of the University of Michigan cut a number of dandelion heads in various stages of development and left them on moss until dry. Then he placed them in favorable conditions for germinating. Only those cut after the white down had begun to appear sprouted; the heads which were cut in blossom all decayed without ripening seed.

Ann Arbor

'OUTRIGGER' ENGINE POWERS GLIDER WITHOUT TAIL

E 1197

An outrigger engine perched above the pilot, with pusher propeller, drives a French monoplane of glider type. It has no tail. The motor is a thirty-four horsepower A.B.C. Scorpion, British built. The plane is about forty feet wide and about twelve feet long.

Grass Track Adds to Thrills of Motorcycle Sidecar Race



© Planet News, Ltd.
Driver and Passenger Hanging On in a Turn during Motorcycle Sidecar Race in England; the Popular Contests Are Held on Grass Tracks

There are plenty of thrills for the "rail-birds" and the riders in motorcycle races on grass tracks in England. Pilot and sidecar passenger hang on for their lives as the three-wheelers roar around the turns on two wheels and bound along the straightaway. Grass-track racing is fast gaining popularity in the Oxford district.

Oxford



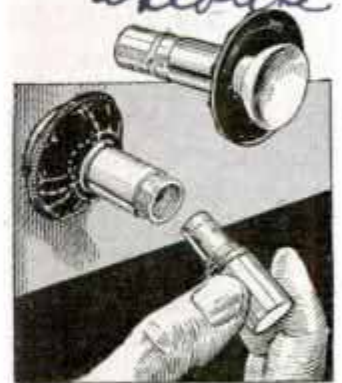
Tailless Glider Plane Equipped with an Outrigger Engine and Pusher Propeller

E 1133

CATALYST LIGHTER FOR DASH

Platinum

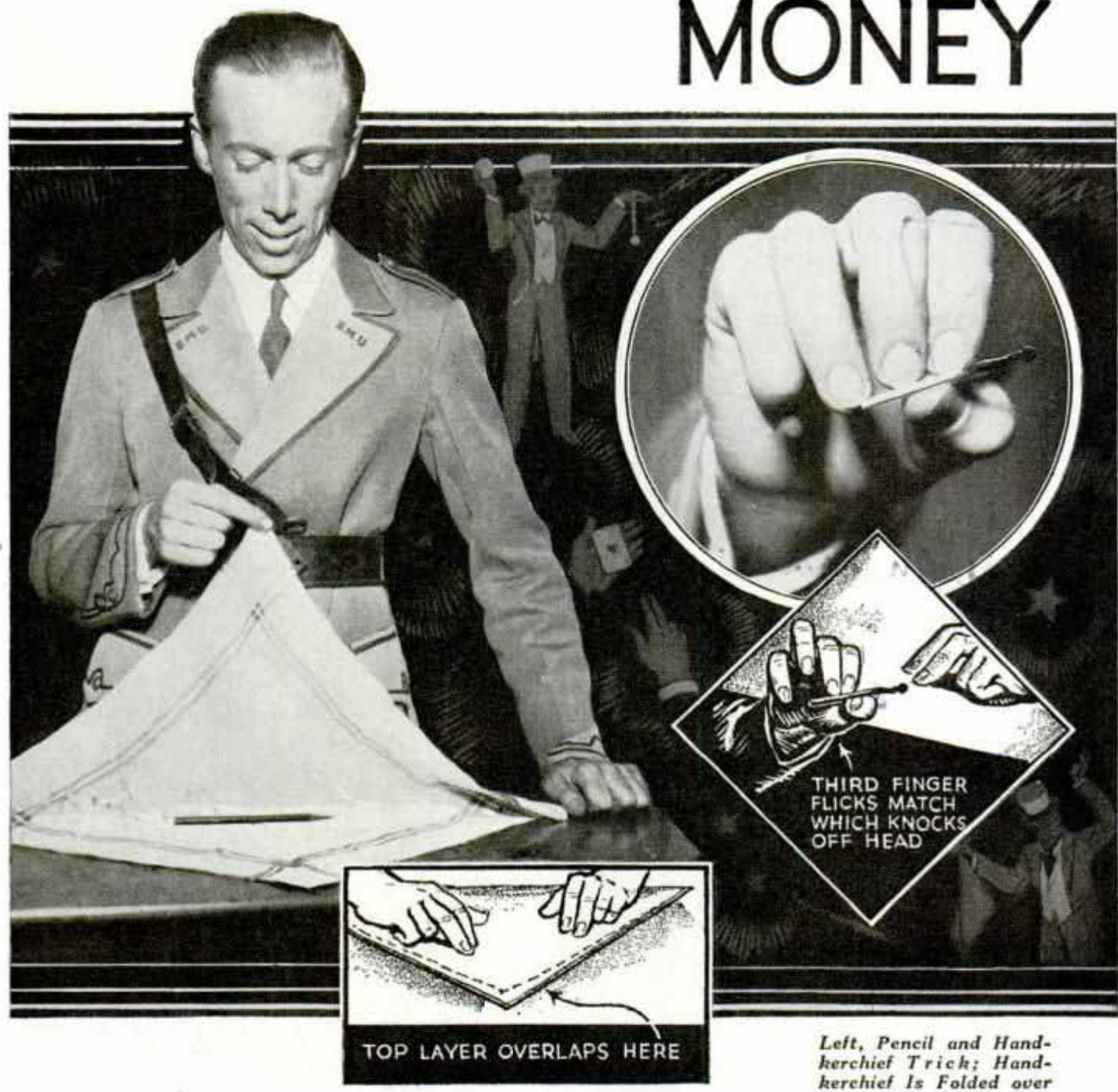
Flameless and windproof, a small catalyst lighter attaches to the dash, windshield or elsewhere in the car by the suction of a rubber cup. Puffing cigarette or cigar mixes air with vapor from the lighter fluid and draws the mixture through a platinum catalyst or heating element, causing it to glow. Chemical reaction is the secret of this safety lighter.



Platinum Products Inc.

9/12

MONEY



By **THOMAS MINNARD**
 (Professional Magician)

(How Secret)
FOR those willing to devote time to its study there is money to be made in magic. It helped pay my own way through high school and college and it has made a living for me since.

It's surprising how many outlets there are for a young magician's talent right in his own neighborhood. Church social groups, parent-teachers' associations and business men's luncheon clubs are but a few of the many organizations looking for entertainment features. The majority are willing to pay money to the magician of

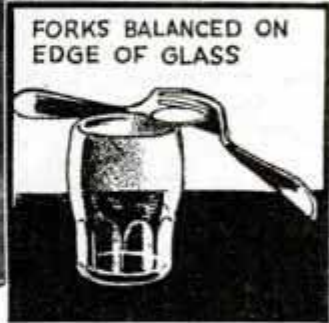
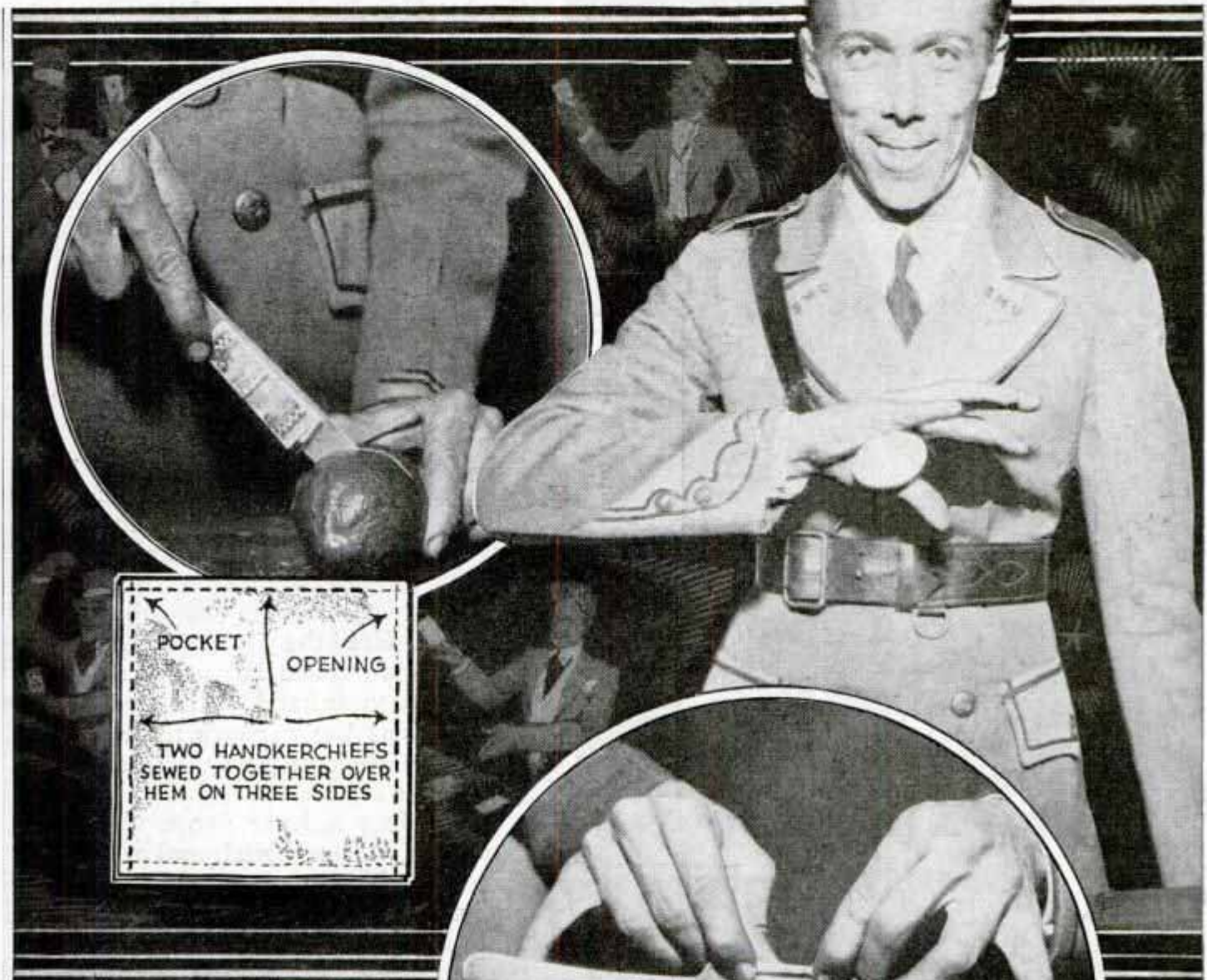
merit. Showmanship is the keynote of the magician's success. Every trick must be made as mysterious as possible. If you are uncertain about a trick do not attempt to work it in public until you have practiced it thoroughly. Concentrate on a few stunts until you can work them to perfection instead of trying to learn a whole repertoire at once. The more deft you are in putting on a trick, the more mystifying it will appear to others.

The following tricks can serve as a starter for the person who wants to do stunts for profit. They require no elabo-

Left, Pencil and Handkerchief Trick; Handkerchief Is Folded over Pencil as Indicated in Diagram; Right, Way to Hold Match When Unwinding the "Invisible Hair"; Inset Shows Finish of Trick

20 W. Marlborough Road
Kansas City, Mo

in MAGIC



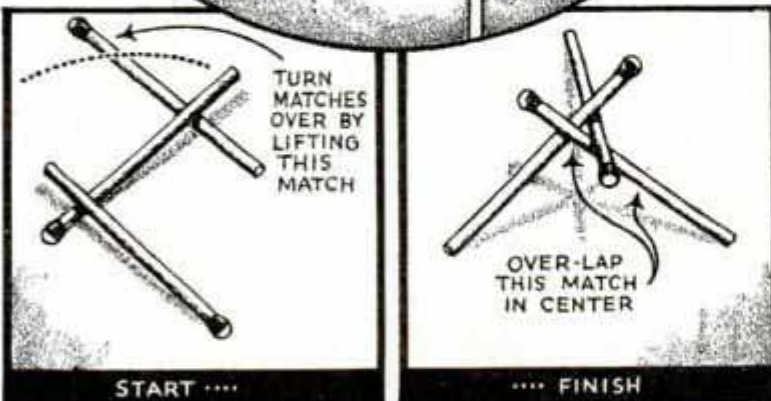
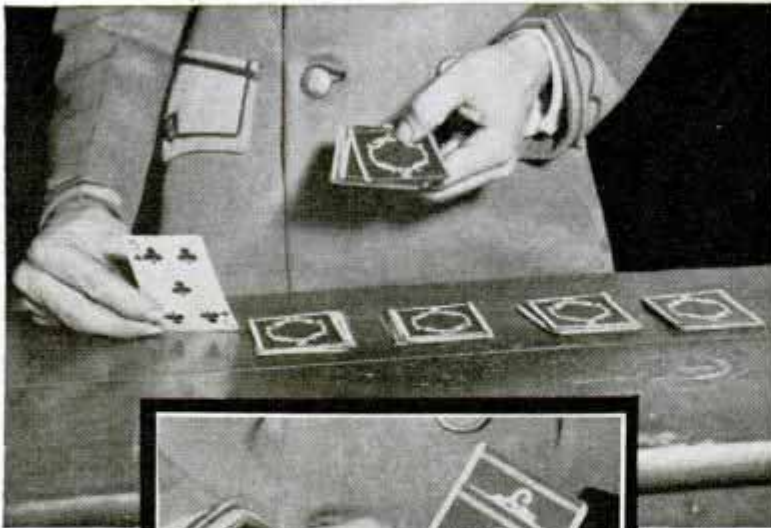
rate props and can be worked anywhere.

A balance feat can be performed with a half dollar and two table forks. Place the half dollar between the prongs of the forks, as shown. When placed on the rim of the glass the half dollar will balance the forks.

Here's another easy stunt. Place a pencil in a handkerchief. Bring the points of the handkerchief together and roll it across the table until it is wrapped up. When the handkerchief is unrolled, the pencil will be on the outside of the

handkerchief, not between the folds. The secret lies in bringing one corner to the right and forward of the other one when the two points are brought together. This

Author Showing How to Palm an Egg; Above, Left, Bill Attached to Knife Blade in the Lemon Trick and Handkerchief with Hidden Pocket; Below, Details of Fork-Balancing Trick



Top, Start and Conclusion of Card Trick; Center, How to Keep Match Upright While Removing Glass and Placing It over the Stick; Bottom, an Extremely Simple Match Trick Which Will Mystify Your Friends

will not be noticed if you work fast in bringing the tips together, then smooth out the wrinkles carefully. When this is done roll the handkerchief across the table several times and the pencil will be on the outside at the finish.

Place a match in the center of a handkerchief; fold the cloth and then ask a spectator to break the match into several pieces through the handkerchief. Then shake the handkerchief and the match will fall out uninjured. To work this trick, place a duplicate match in the hem of the handkerchief. This is the match that is broken, not the original one.

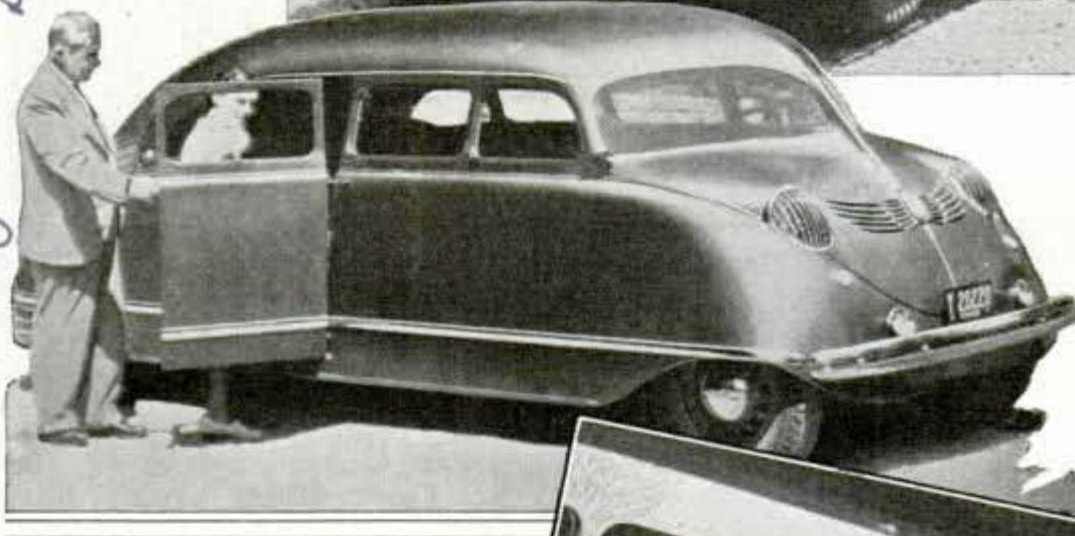
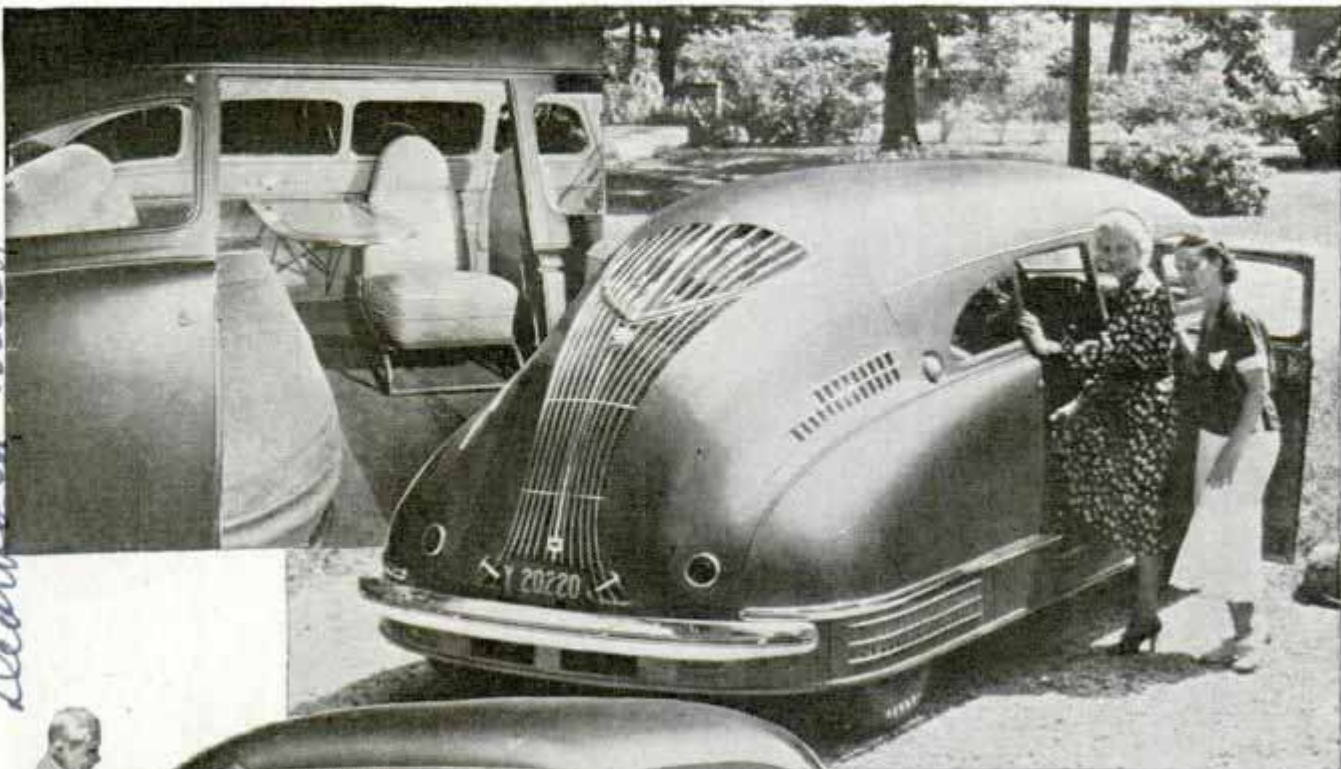
As someone is about to light a cigar, strike a match for him. He will reach for the unlighted end but as he does, walk away and leave him with only the fireless stump. To perform this trick, break the match in the center beforehand. Hold the parts together when you strike it and then stretch out your hand. Turn away the instant the person's fingers touch the stick to give the trick the finesse it needs.

Unwinding a hair from the head of a burned match makes a pronounced hit in any circle. The audience is told the hair is invisible. After burning the upper portion of the match and blowing it out, grasp the match in your left hand and unwind the "hair" from its tip with your right. After two or three turns, the hair is snapped, pulling the top of the match with it. The secret lies in the manner in which the match is held. The hair is imaginary but the illusion is created by the unwinding process. The climax of the trick comes with the pulling movement with the one hand while snapping the stump end with the fingernail of the third finger. This causes the burned end to drop off and it appears as if the hair has done the trick.

Ask someone to make three

(Continued to page 128A)

DeLuxe 'Bullet on Wheels' Has Rear Engine



Top, Left, Glimpse into Interior of New Stout Scarab; Top, Right, Stepping into the Car; Note Resemblance to an Oversize Bullet Mounted on Wheels

Center, Passengers Entering Scarab; Bottom, View through Windshield; Powered by Rear Engine, This Car Has Electric Buttons That Open Doors, Seats That Can Be Arranged at Will or Converted into Couches, a Table That Can Be Set Up and Other Appointments Suggestive of a Small Yacht; There Is No Chassis; the Seven-Passenger Car Weighs Less Than 3,000 Pounds; Oil Shock Absorbers and Special Spring Suspension Result in Smooth Riding and Easy Steering on Rough Roads; the Car Is on the Market



Stout Engineering Laboratories, Dearborn, Mich.

see march 1935
327
Sept. 1932-440.

California
Palo Alto, Calif
6/11/37

Fighting CRIME with MASKS

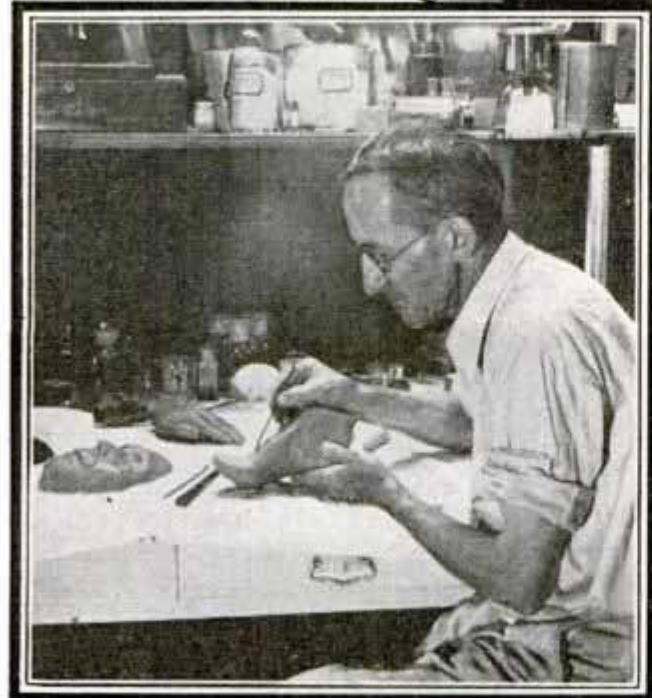
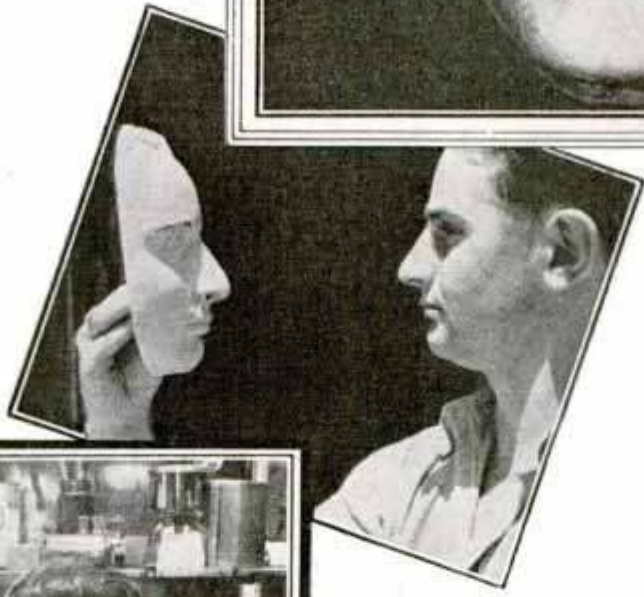
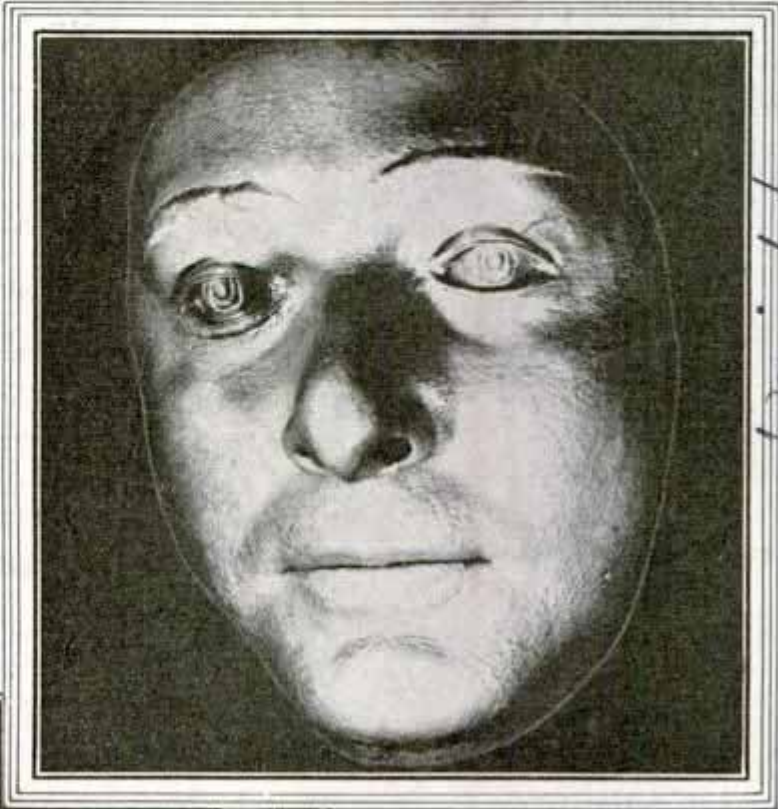
Plastic

By H. W. MAGEE

BANDITS wear masks to hide their features, prevent identification and thus stay out of jail. Today masks of a different kind are being used to identify and convict criminals.

When a burglar ransacked a Missouri home, he was careful about fingerprints but didn't bother about footprints. His oversight landed him in prison. Investigators found no worthwhile clues in the house but outside in the soft mud was a print of the heel and sole of one of the intruder's shoes.

A few years ago such a bit of evidence would have been worthless because it could not have been preserved. Today, thanks to a method of reproduction known as the moulage process, a cast



Top, Mask with Eyes Carved Open; Center, Mask and Original; Bottom, Making a Cast

was made of the footprint and filed away. Long after the original footprint was obliterated, several suspects were picked up but all denied the burglary. Then their shoes were examined. One man wore shoes, one of which exactly matched every detail of the cast. Confronted with this evidence, he confessed and pleaded guilty.

Here's another case. A series of robberies occurred in an Illinois town. In each case a small "jimmy" was used to pry open windows. Casts were made of several of the marks left by the tool. In the possession of a suspect a jimmy was found which bore marks identical to those of the casts. The evidence was so conclusive that the man confessed at once.

In a midwestern city several cars were stolen, the serial numbers were filed off and other numerals were substituted. The police recovered some of the cars but were not certain whether one gang or several were involved. By making casts of the

*Eastern Imp. to Warren - 1/13/36 n. 12th St. Philadelphia
Palo Alto, Calif.*

ad. Rec. 1938. 160 a. 63



made almost as simply and such masks are accurate even to tiny lines and minute details. From an original mask or cast, hundreds of reproductions can be made, if desired. Masks of faces are used in police work not so much in solving crimes as in making identifications of unknown persons. A death mask of an accident victim, for instance, can be used long after the body is buried as a possible means of later identification and is usually more lifelike than any photograph would appear. A cast of an injured hand or foot can be preserved as an exhibit in later litigation to show exactly

how the injury appeared when it was first inflicted.

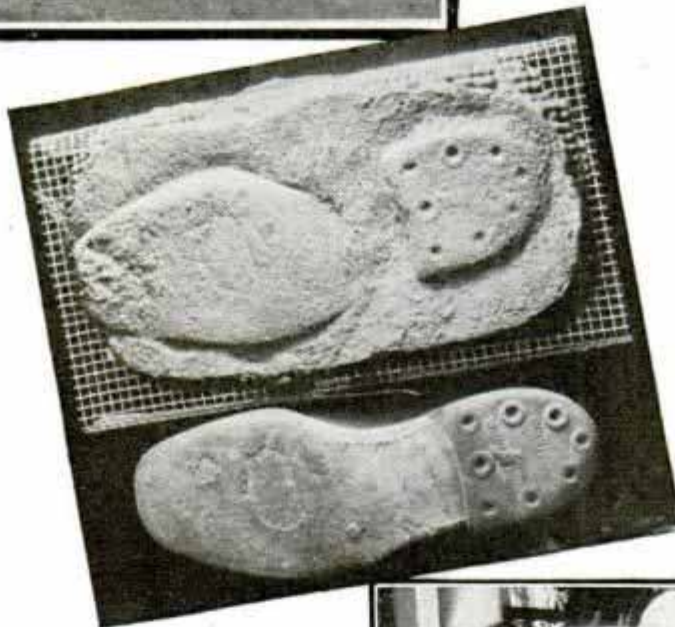
Making masks or casts has been reduced to such an exact formula that almost anyone can do the work after a little practice. In making a mask, the subject is placed in a reclining position, a hole is cut in a piece of heavy cardboard to fit the face

number blocks the officers determined the same set of dies had been used on all the cars.

When a country home was robbed, the thief left footprints in the mud as he fled. Casts were made of one print which had been made by a rubber boot or rubber shoe. The casts were exhibited among neighbors until one recalled that a former employe owned boots with heels and soles like those of the casts. The man was arrested but maintained his innocence until his home was searched and a pair of boots was found which matched the casts.

These cases illustrate how the scientific criminal investigator is employing casts and masks today to preserve evidence which later may solve a crime or aid in making an identification. The moulage process is one of the most accurate methods known to science for the reproduction of both animate and inanimate objects and with its aid anything from the inside of a gun barrel to the imprint of an auto tire in dust can be produced as imperishable casts quickly and inexpensively.

Masks of faces, living or dead, can be



Top, Making Cast of Footprint; Center, Cast and Shoe Which Made It; Bottom, Fixing Print in Dust

Handy Can Pours Asphalt without User Stooping

and placed in position, leaving the exact amount of the features exposed which later will appear in the life mask. The moulage, or gelatinous material, is heated and applied to the face while warm, care being taken to leave nostril openings unless tubes are inserted in the nostrils so the subject can breathe freely. After the first coat is on, a mask frame is placed in position and another coat is applied over it. Hair is reproduced successfully by laying the moulage on with a syringe.

When the mask has cooled and hardened it can be lifted off easily. Holes in the nostrils are plugged with flexible clay and the mold, supported by the frame to prevent distortion, is then filled with a second preparation, also heated, which becomes very hard when it cools and represents the finished mask. Wood braces usually are placed in the back of the cast to brace it and provide a convenient means of handling. When cool, the finished mask can be removed from the mold and, if desired, a strengthening or reinforcing coating can be applied to the back. From the original mold scores of duplicates can be made if desired.

The material does not injure the skin or hair and is easy to remove when cool as it does not adhere to anything in that state. With a little practice, it is not difficult to carve open the eyes and to color eyes and hair, and tint skin and lips to provide a lifelike resemblance. The making of casts of inanimate objects is even simpler than making masks of faces of living persons. A dust hardener is supplied for use before making casts or imprints of tires or other objects in soft dirt or dust.

The moulage process today has a wide variety of applications aside from its use in criminal investigations and identification work. It is being used successfully in dentistry, surgery, geology, botany, archaeology, agriculture and in the preparation of museum specimens. Many people are having life masks made in preference to other methods of reproducing the features because the mask of a face or a head shows such elusive qualities as texture of the skin and facial expression, and gives the third dimension of depth, all very difficult for the artist, or even the sculptor, to achieve.



Applying Asphalt to Crack between Concrete; Note Ease of Using New Container

Eliminating the back-breaking work of pouring hot asphalt into cracks of a concrete road, a handy can permits the workman to remain in upright position. At the tip of the pouring nozzle is a needle valve, controlled by one finger at the handle to regulate the flow of asphalt. This makes it possible to pour a crack six inches or less without wasting material.

LEAKPROOF LAP IN ROOFING E 1253 ELIMINATES SEALING

Sealing joints with tar, asphalt or other substances is eliminated by using a sheet-metal roofing that has leakproof laps. These laps consist of "air-lock" beads rolled horizontally across the end of the sheet one inch from the lower edge. This bead keeps the water



from rising by capillary action between the two metal sheets. In the new roofing, the water creeps upward less than one inch to the point where the capillary force is broken by the air-lock bead.

Newport Rolling Mill

W. B. Williams, Inc. Athens, Ga.

8 1156

The NEXT WAR



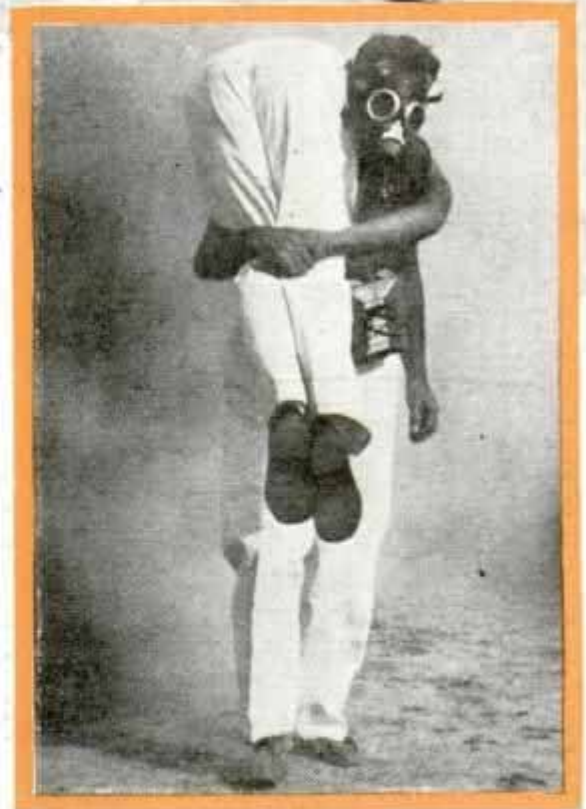
By Hiram Percy Maxim

(Noted Inventor, Author and Engineer)

Hartford Conn
PART I

THINKING men are asking themselves what the next war will be like. The World War was the most terrible event civilized man has ever witnessed. If another breaks out, and nations take advantage of all the amazing developments which science and engineering have made available since 1918, what are the consequences likely to be?

Warfare in the air should have first consideration. All we knew at the beginning of the World War about flying were the rudiments of wing, flipper and rudder design, and where the center of gravity should be. Engines were heavy and unreliable. Since then aviation has developed into one of the recognized forms of



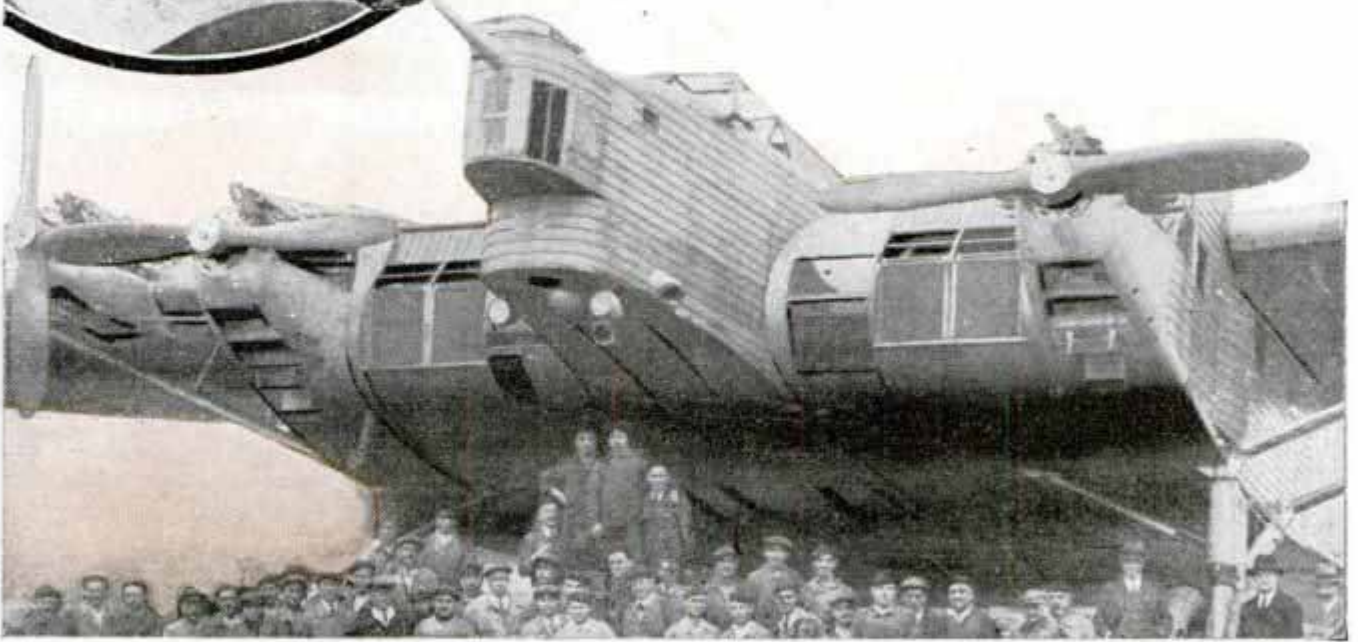
Top, Tokyo School Children in Air Defense Drill; Below, Gas "Rescue" by New York Police Rookies

in the AIR

Right, Royal Air-Force Gunner Peering through His Sights during British Maneuvers; Below, United States Army Pilot Dressed for Flying in Winter Weather



transportation. Lift per square foot of wing area has been more than doubled by improvements in the shape of the wing. Wing and fuselage structures have been simplified, strengthened and lightened. Stability in flight has been attained. The radial fixed cylinder engine has become standard. The weight per horsepower has been halved. Horsepower of two-seater ships has been increased from seventy-five to close to 1,000, and 3,000 horsepower is



This New French Bomber Is a Veritable Flying Fortress Capable of Raining Death and Destruction on the Land over Which It Flies; It Has Four Engines, Each of 800 Horsepower

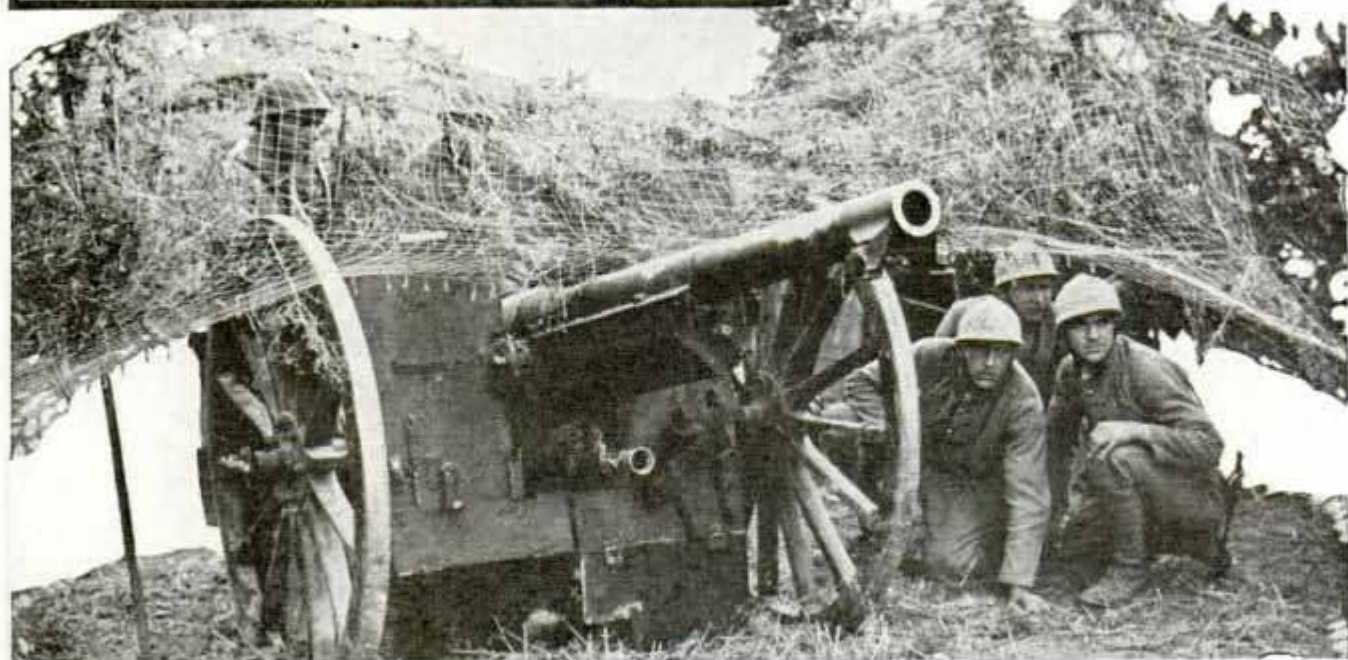


provided in the giant ships designed for carrying tons of high-explosive bombs.

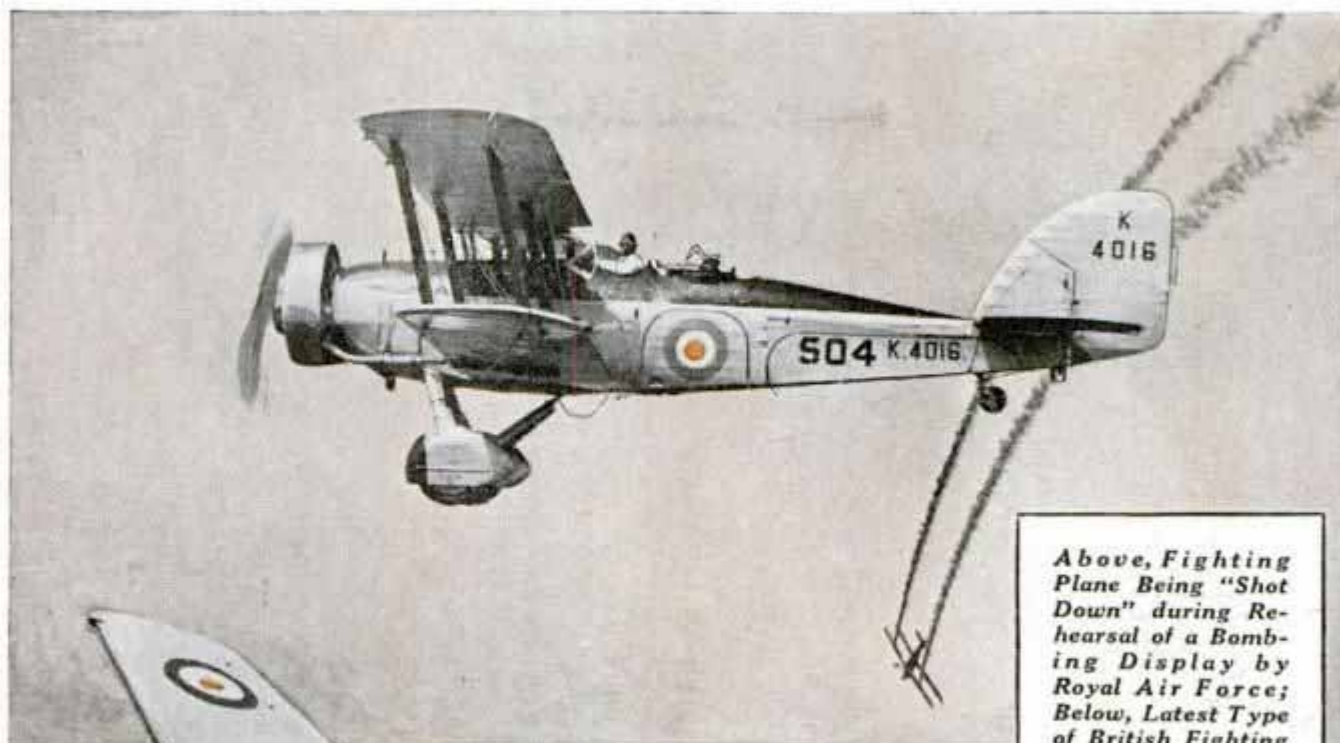
Instruments permitting blind flying have been developed. Armament the like of which we never dreamed would be carried through the air is commonplace. Finally, where the nations had a few hundred planes in the World War, there will be many thousands in the next war.

These developments cannot but revolutionize the warfare we witnessed in 1914 to 1918. If that were terrible, what indeed will the next war be?

The moment hostilities begin there will ensue the fiercest kind of a struggle to secure control of the air. Obviously, with control of the air in the sense that Britain has had control of the seas, bombing of enemy territory can be conducted with but little interference. Streams of giant bombers, each loaded with tons of high explosive, can shuttle back and forth, dumping their explosives almost as an aerial belt conveyor might accomplish it. Every living thing and every bit of property of the loser will be laid waste. Civil-

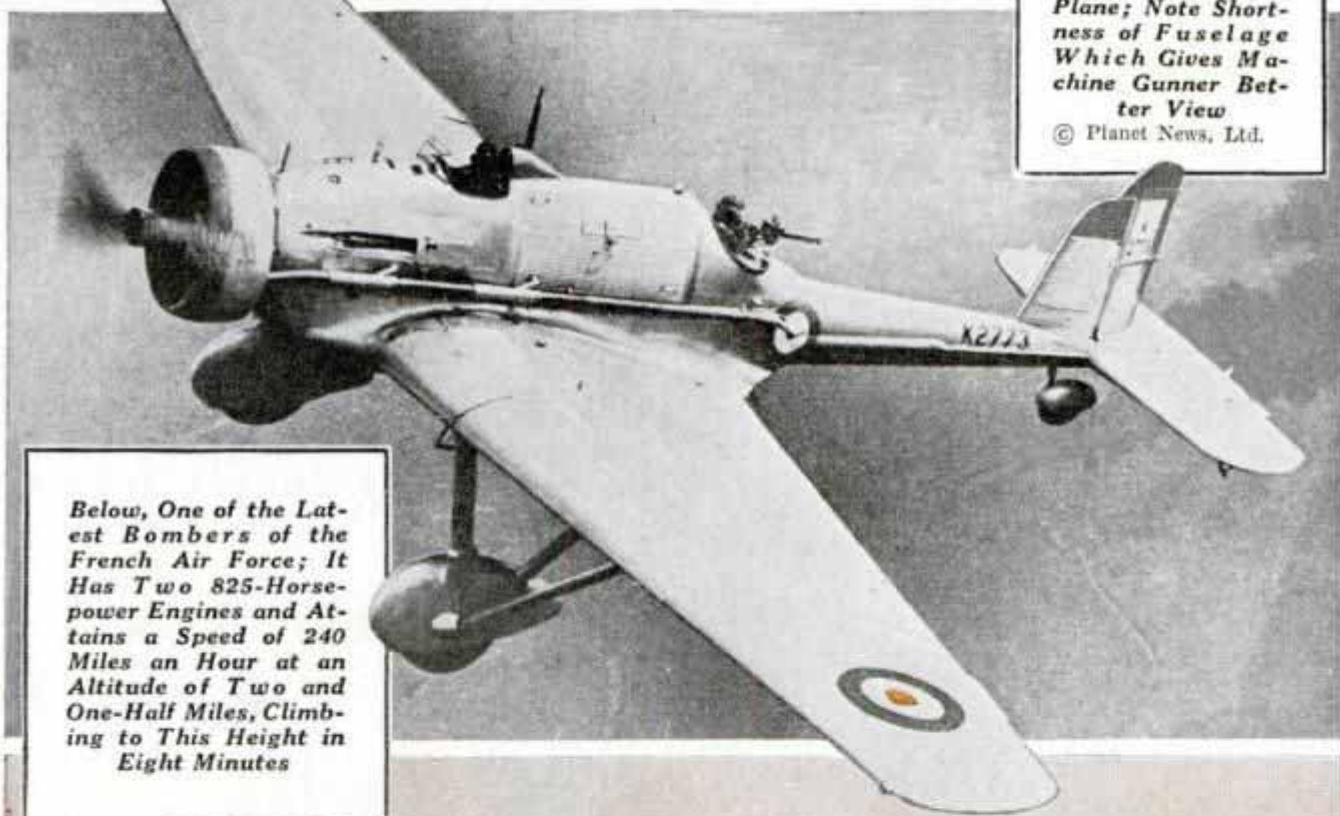


Officer Placing Warning Sign beside Imitation of a "Blind" Shell during Mimic Air Raids in Berlin; Below, One of the Famous French "Seventy-Five's" in Position under Camouflage

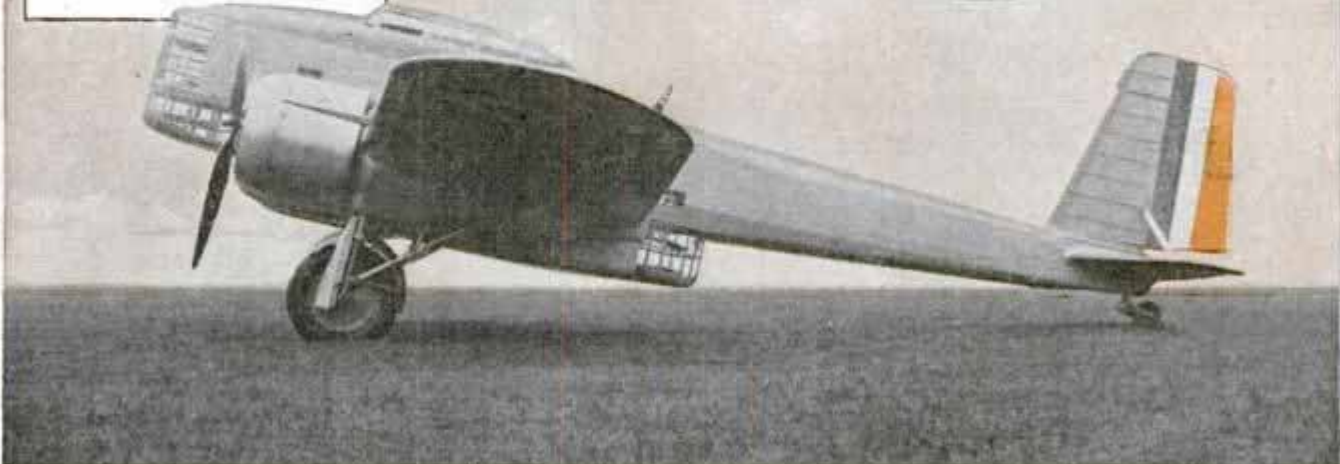


Above, Fighting Plane Being "Shot Down" during Rehearsal of a Bombing Display by Royal Air Force; Below, Latest Type of British Fighting Plane; Note Shortness of Fuselage Which Gives Machine Gunner Better View

© Planet News, Ltd.



Below, One of the Latest Bombers of the French Air Force; It Has Two 825-Horsepower Engines and Attains a Speed of 240 Miles an Hour at an Altitude of Two and One-Half Miles, Climbing to This Height in Eight Minutes



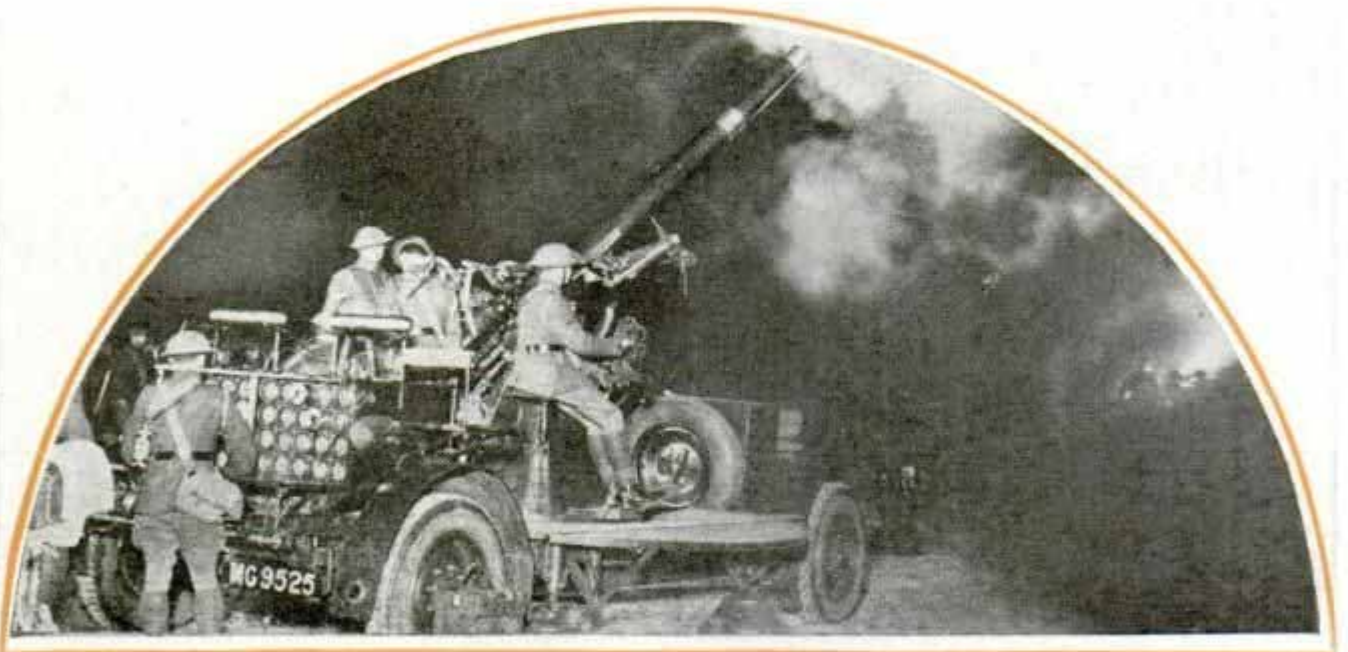


ian inhabitants will face extermination.

These giant bombing planes are able to fly 2,000 miles without refueling. Speeds will be 200, 300, and even 400 miles an hour. No place, no matter how far back from the main fighting lines on the land, will be safe. No country in all Europe, save huge Russia, is so large that a squadron of these modern giants could not reach its most distant city. Munition plants, concentration camps, ammunition depots, supply centers, military headquarters, capital cities and navy yards will be reduced to dust in the countries which lose control of the air.

If the two sides in the next war are

about equally matched, the fighting that will occur in the air between enemy scouting and fighting planes during the struggle for control of the air will transcend anything the wildest imagination has pictured. Thousands of young men, with a thousand or more horsepower at the hand of each, sheathed in armored suits, helmeted with oxygen hoods, will battle each other miles above the earth. Owing to the flexibility, easy control and enormous horsepower of the modern fighting ships, this combat will be conducted at close quarters. Crashing collisions will occur and most of these splendid young fellows may go to flaming deaths in falls of five and six miles.



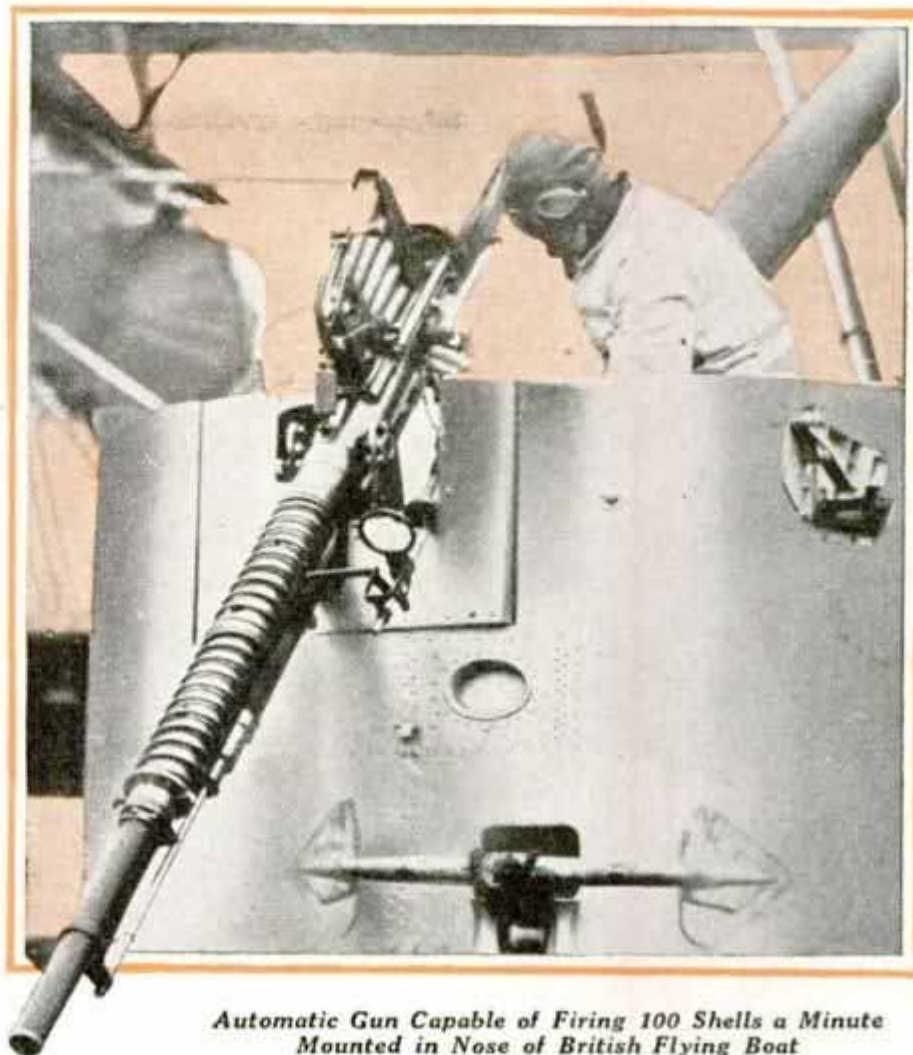
Top, Four-Motor Bomber Built for U. S. Army Which Crashed on Recent Test Flight; Bottom, British Anti-Aircraft Gun in Action during Maneuvers of English Forces

While this desperate fighting is going on, crewless planes, such as have been flown publicly in England, loaded with high explosives, will be sent out by the hundreds. These planes are directed by radio. A high-frequency radio beam is emitted and the crewless ship is adjusted to stay in this beam. The beam can be guided by its emitting station, so the plane can be led around as desired. Its position at every moment is known from radiations either automatically emitted by itself, or by reflections of the guiding beam.

Streams of these flying torpedoes directed at a large city, munitions manufacturing center or supply depot, and arriving and exploding every few minutes, day and night, have it in their power to deal death and destruction far back of the firing lines.

Also we face in the next war an unmanned airplane which is attracted by infrared heat radiations. It is claimed it

will follow the nearest plane discharging hot exhaust gases. These hot gases emit infrared heat radiations. Being small, carrying no load, the ships have superspeed, and also the corner cutting advantage of a



Automatic Gun Capable of Firing 100 Shells a Minute Mounted in Nose of British Flying Boat



Anti-Aircraft Gunners Ready to Protect San Francisco Harbor against the Attacking "Blue Fleet" Coming from Hawaiian Islands during War Maneuvers



pursuer. This unmanned craft will chase an enemy plane, overtake and crash into it. It would be difficult to imagine a more uncanny enemy.

These new systems of using infrared and other radiations have been developed from recent research work done by astronomers. At Mount Wilson, Lowell and other observatories, heat-detecting and measuring devices of such extraordinary sensitivity have been developed that the heat radiations of an area on Mars the size of the state of Ohio have been measured. Coblentz and Lampland at Lowell have actually made weather charts of Mars.

The arrangement by which these measurements are made is to mount upon the telescope, where the eyepiece normally would be, a box



Lower Photo © Planet News, Ltd.

German Soldier Training War Dog Equipped with Mask to Go through Gas Fumes; Below, Ambulance Unit Attending Civilians Who Have Been "Gassed" during a Mock Attack on London

containing a hair-like wire made of two different metals, butted together end to end and electrically welded. One wire is made of an alloy of rhodium and platinum. The other is made of bismuth. This forms what is known as a thermocouple which is extremely sensitive. Such a combination generates a feeble current of electricity whenever radiations fall upon the point where the two metals are joined. This current is indicated by a sensitive galvanometer. The quantity of current is proportional to the energy contained in the radiations.

This thermocouple, checked by three different systems of observa-

(Continued to page 124A)



Top, Tokyo Telephone Operators Being Trained to Work in Gas Masks; Below, Parisians Being Instructed on How to Don and Wear Gas Masks in Case the City Is Attacked

Distance Finder for Camera

Fits in Vest Pocket

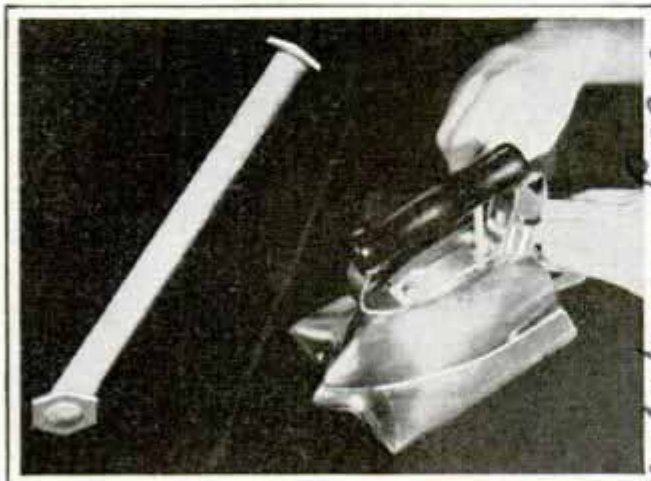


Range Finder for Camera Which Is Valuable When Using Fast Lenses at Wide Apertures

Focusing a camera accurately for distance is simplified by a range finder just placed on the market. Provided with a vest-pocket clip, it is carried as easily as a pencil. A translucent scale visible through the eyepiece makes it possible to read the exact distance while observing the subject. Such a meter is especially valuable when using fast lenses at wide apertures.

OFFSET SCREWDRIVER WORKS IN CRAMPED POSITIONS

When screws must be driven in exasperating positions that an ordinary screwdriver cannot reach, try an offset screwdriver. A six-edged blade mounted on the beveled end of a small shaft will reach



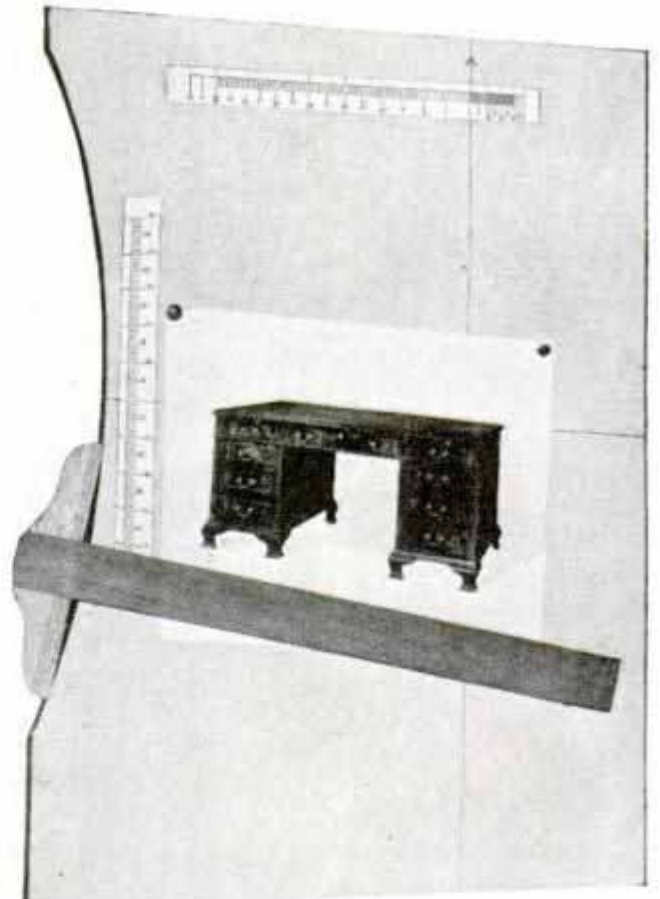
Offset Screwdriver Which Gets into Angles and Corners Otherwise Inaccessible

screws otherwise inaccessible, and requires little pressure to hold in the slot of the screw. At the opposite end of the shaft is another six-sided driver mounted at right angles to the shaft.

Trust Bldg!

DRAWING MADE IN PERSPECTIVE WITH SPECIAL BOARD

Home craftsmen can work out their own designs for furniture or other articles with the aid of a special sketch board which enables even a novice to make drawings in true perspective, something ordinarily quite difficult for anyone but an artist or other person with special training. The board, with one concave edge, is fitted with two rules and a T-square is used in making the perspective. The concave side



Sketch Board with One Concave Edge Which Makes It Easy to Draw Accurate Perspectives

is the left vanishing point and all front or length lines run parallel with the blade of the T-square when it is run along the concave side. For lines running up and down, the square is moved along the top edge of the board. To give width or depth, the square blade is held against a small nail on the right side of the board, all the lines of a side view of an object running

*Range Finder - \$7.00
Adapter - 75 cents*

*Research Institute
508 Island Rapids*

1248

Chas. H. E. Whitney

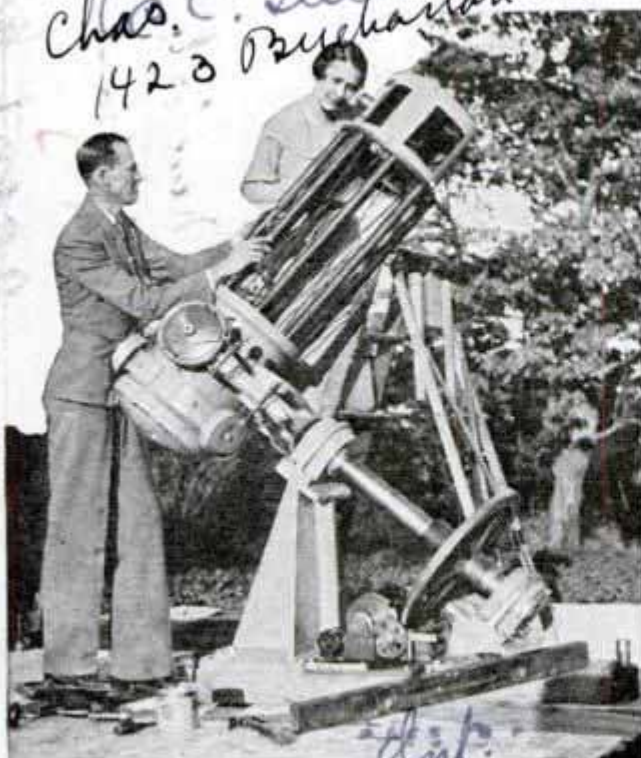
to this nail which forms the right-side vanishing point. The scale at the side is used for measuring height, and the one on the top is for measuring length and depth or width. Two intersecting lines on the board become the upper-right front corner of virtually any object drawn. When the line drawing is made, it is easy to fill in the heavy lines to form the finished perspective.

81228

POWERFUL "EYE" TO VIEW STARS MADE BY HAND

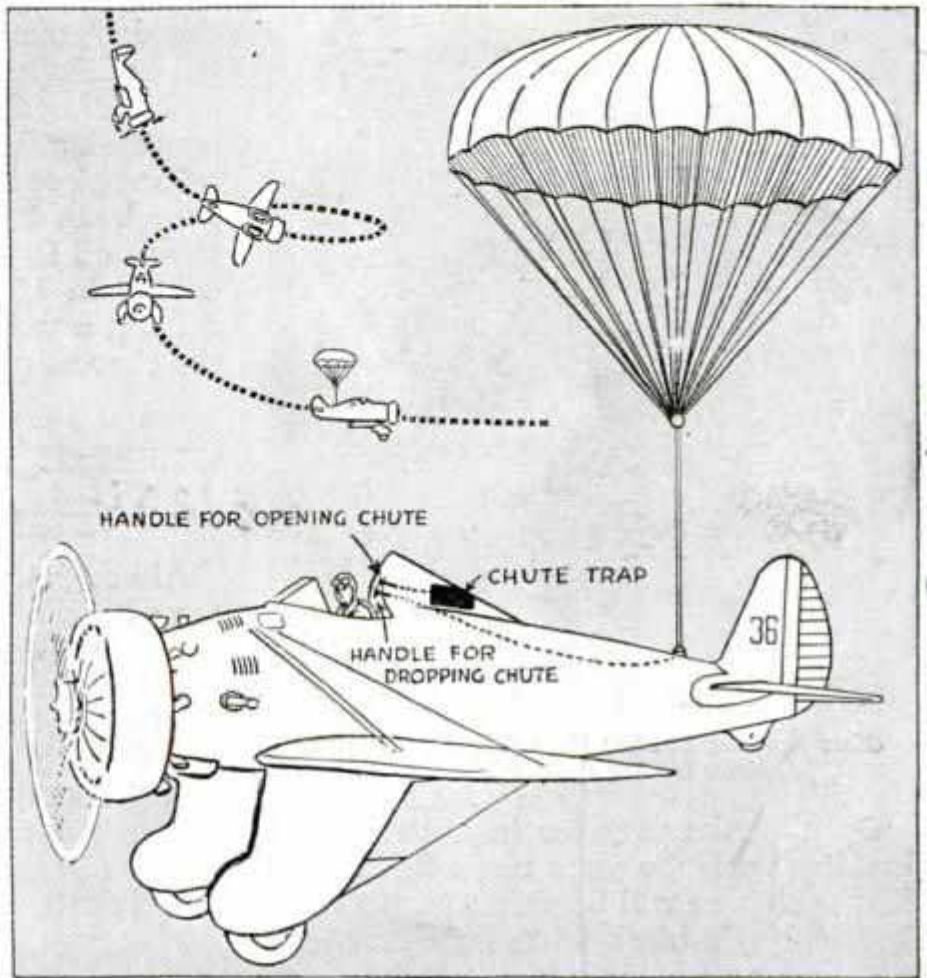
Doing almost all the machine work himself, a Washington, D. C., man has constructed a twelve and one-half inch reflecting telescope capable of photographing stars of the nineteenth magnitude. The builder has placed the homemade instrument at the disposal of the Catholic university in his home city.

Chas. C. Miller
1423 Buchanan St.



Twelve and One-Half Inch Telescope Made by Hand

Parachute in Tail of Plane Pulls Ship Out of a Spin



Plane with Parachute Attached to Pull It Out of Spin and Diagram Showing Path of Spinning Plane before Parachute Is Used

Makers of pursuit planes and some attack and observation craft intended for the army equip the ships with small parachutes which have been found effective in bringing the planes out of spins. The parachute is placed in a sunken trap in the side of the fuselage and over it is placed a releasable cover flush with the side of the ship. Test pilots are required to spin the ships five times or more in each direction, and should a pilot be unable to get out of such a maneuver, he need only pull a handle attached to a cable which releases the parachute cover and allows the "sky hook" to open. The arresting force of the parachute is sufficient to interrupt the spin. The pilot then pulls another handle to eject a spring bolt by means of which the parachute is attached to the ship. The plane then proceeds on its course, and the parachute, which is only six feet in diameter, floats away.

Major, Alexander de

Editor
Cant. Charles J. Bauer

Glass Blocks for Building Are Laid Like Brick



Glass Building Blocks; Note Side Roughened to Make Mortar Adhere Closely

Opening the way for improvement in building design, a glass block that is laid like brick soon will be placed on the market. A single block withstands pressures of 72,500 pounds, in addition to reducing heat flow, deadening sound, transmitting and diffusing light, deflecting sun glare and resisting fire. The blocks practically eliminate condensation on inside walls, tests showing no "sweating" when the outside temperature was sixteen degrees below zero and the inside temperature seventy degrees with forty per cent relative humidity. By a special process of enameling and sanding, the sides of the block are prepared to fit against mortar.

PITTSBURGH RISES AND FALLS AS MOON TIDES CHANGE

Pittsburgh is rising and falling from thirteen to twenty-three inches each day. Dr. Paul Foote, director of the research laboratories of an oil company located here, says long-time measures of the force of gravity showed the startling effect of rise and fall of land due to moon tides in the solid crust of the earth. Such gravity measurements are necessary in geophysical oil prospecting and are widely

used by field parties to detect oil deposits thousands of feet below the surface. Pittsburgh's rise and fall was disclosed by the constant check on the sensitive gravity apparatus conducted in the laboratories. The equipment detects forces equal to one ten-millionth of gravity, about the same as detecting the weight difference if a fireman on a 500,000-pound locomotive threw off one piece of coal weighing one-quarter pound. In the Texas Gulf coast region, where oil is plentiful, there is about one chance in 1,000 of hitting oil by simply drilling a well. By using this apparatus, the chances are one in ten.

Camera Three Inches Long Has Fixed Focus

Although its over-all length is about the same as an ordinary cigarette, a tiny camera with a fixed-focus lens makes exceptionally sharp pictures. It uses sixteen-millimeter film and takes six snapshots. The depth of focus of the lens is such that it renders all objects in sharp focus from five feet to infinity. The aperture of the lens is f.10 and the speed of the instantaneous shutter is one-thirtieth of a second.



This Little Camera with a Fixed-Focus Lens Is No Longer Than a Cigarette

Coronet Camera Co

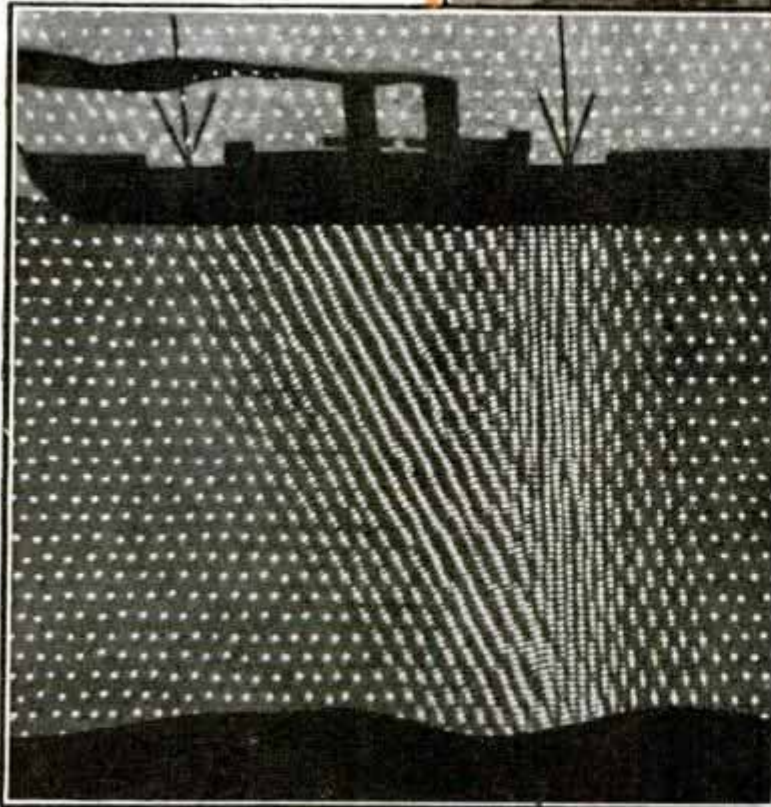
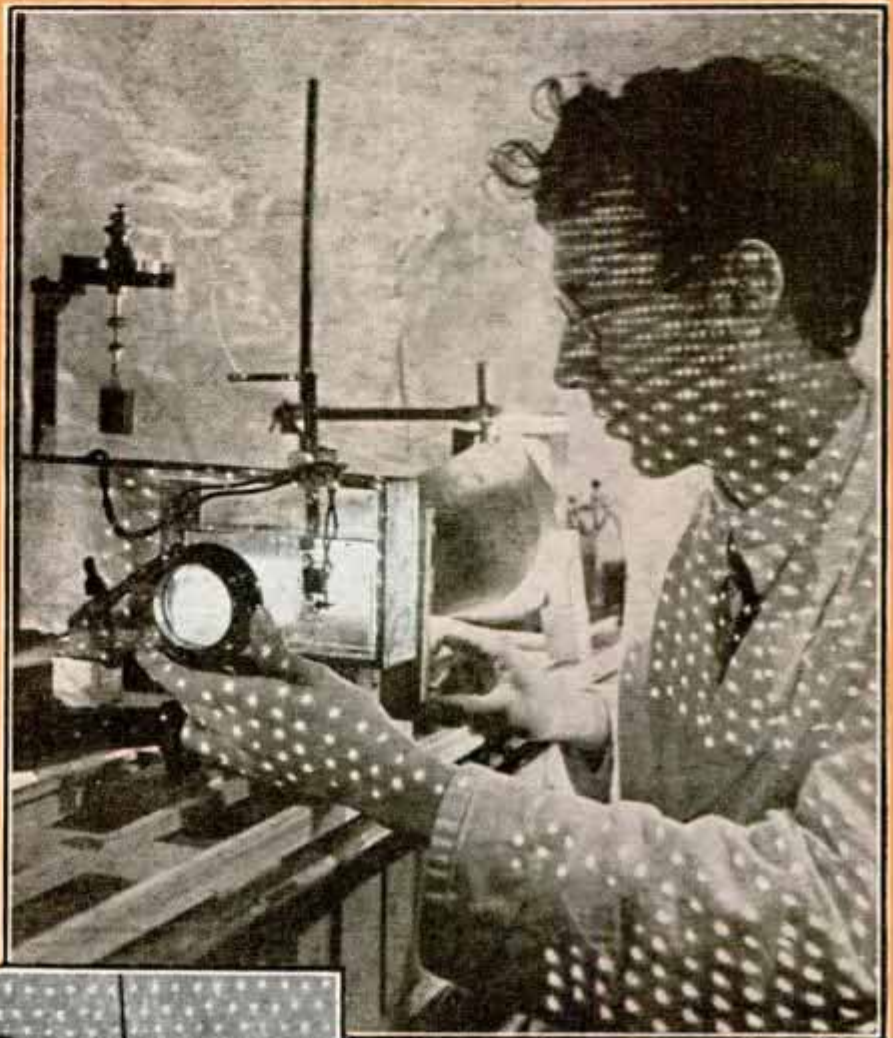
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Are Laid Like Brick
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10/25/35
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6 E. 11th St. nyc
6 E. 45th St. New York
H 250 - roll film - 20 ft.
Agent for...
Acme
Coronet Camera Co

The TRUTH about "DEATH RAYS"

THEORETICALLY, all sorts of rays can kill. It is simply a question of how much energy they can be made to carry. Some rays allow the development of relatively high energy charges with simple means.

This applies notably to the ultra-short sound waves. They are distinguished from ordinary acoustic waves by vibrating so much faster that they cannot be heard. The human ear is attuned only to a rather narrow range of sounds, up to such as are carried by waves with oscillations some thousands of times in one second, whereas it is possible to produce ultra-sound waves oscil-



Photos © A.B.C. Press Service

Photographs Showing Patterns Made by Inaudible Sound Waves; Note Waves Reflected on Face of Research Worker; Below, Taking Depth Measurements with Short Sound Waves

lating some millions of times a second.

Why is a soprano voice higher than a bass? Why do sounds differ in pitch? The explanation is simply that they differ in their oscillation frequency—the number of times a sound wave will vibrate in a second. The human ear perceives sound waves up to approximately 20,000 oscillations a second.

But human inventiveness has contrived to produce artificially sound waves incomparably faster—the so-called ultra-short sound waves. If, for example, a well magnetized nickel rod is inserted in a wire coil connected with a tube sender, rapid mechanical oscillations will be set up in the rod. Thus inaudible "sounds" are pro-



Above, Fish Killed as It Entered Path of Ultra-Short Sound Waves; Right, Photograph Showing Path of Ultra-Short Waves in Lecture Hall

duced, and their "pitch" will be higher or lower corresponding to how the sender frequency is varied.

Another more commonly employed method for the production of ultra-short sound waves rests on the fact that certain crystals, above all quartz, can set up rapid mechanical oscillations under the influence of alternating electrical fields. Place a quartz sheet, under slight pressure, between two metal coats, connect the miniature condenser so contrived with a tube sender, and your ultra-sound sender is ready. The thinner the quartz the higher the frequency of the ultra-short sound waves. In this way it is easy to produce "sounds" of ten million vibrations per second.

The effects of such sound waves are observable in liquids. If the sender is strong enough, portions of the liquid will be flung fountain-like from the container; at the same time the liquid will be-

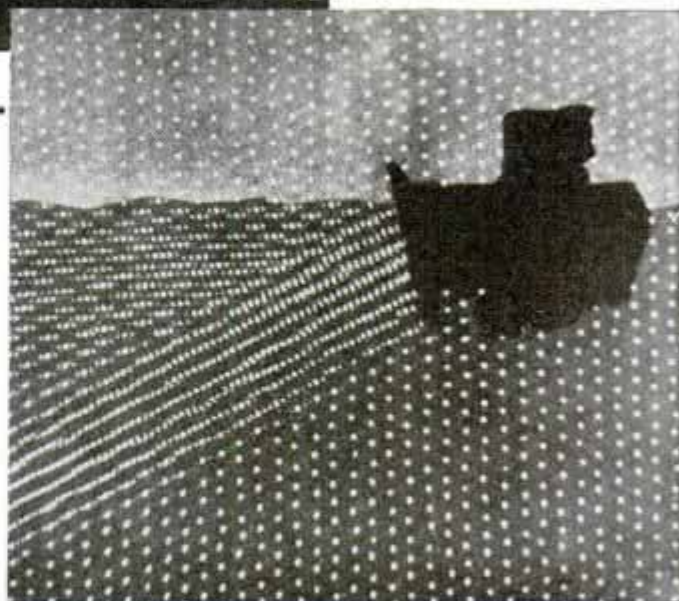
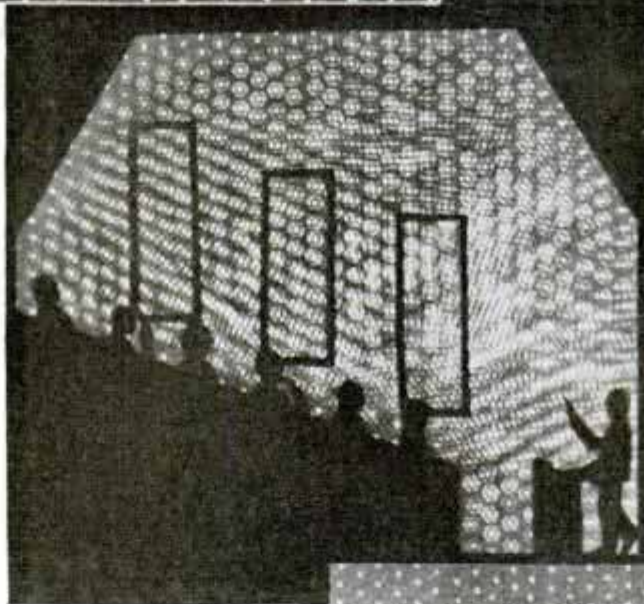
come much warmer. The force is sufficient to kill small fish or frogs. With the point of a melted-off glass rod, the bottom of which rests in the liquid, it is possible to burn through a wood sliver and even to drill glass. This is due to the fact that at the contact plane of two bodies traversed by ultra-sound waves there develops very strong friction, owing to the extraordinary velocity of their vibrations; and this greatly heightened friction causes a corresponding rise in temperature.

The effectiveness of ultra-short sound waves has also been established with respect to a number of chemical reactions. It has been

found that the starch molecule can be partly split by means of these waves. Noteworthy success has been obtained with them in the production of photographic emulsions, where they increase sensitivity and also improve the texture.

Inaccessible to the human ear, ultra-

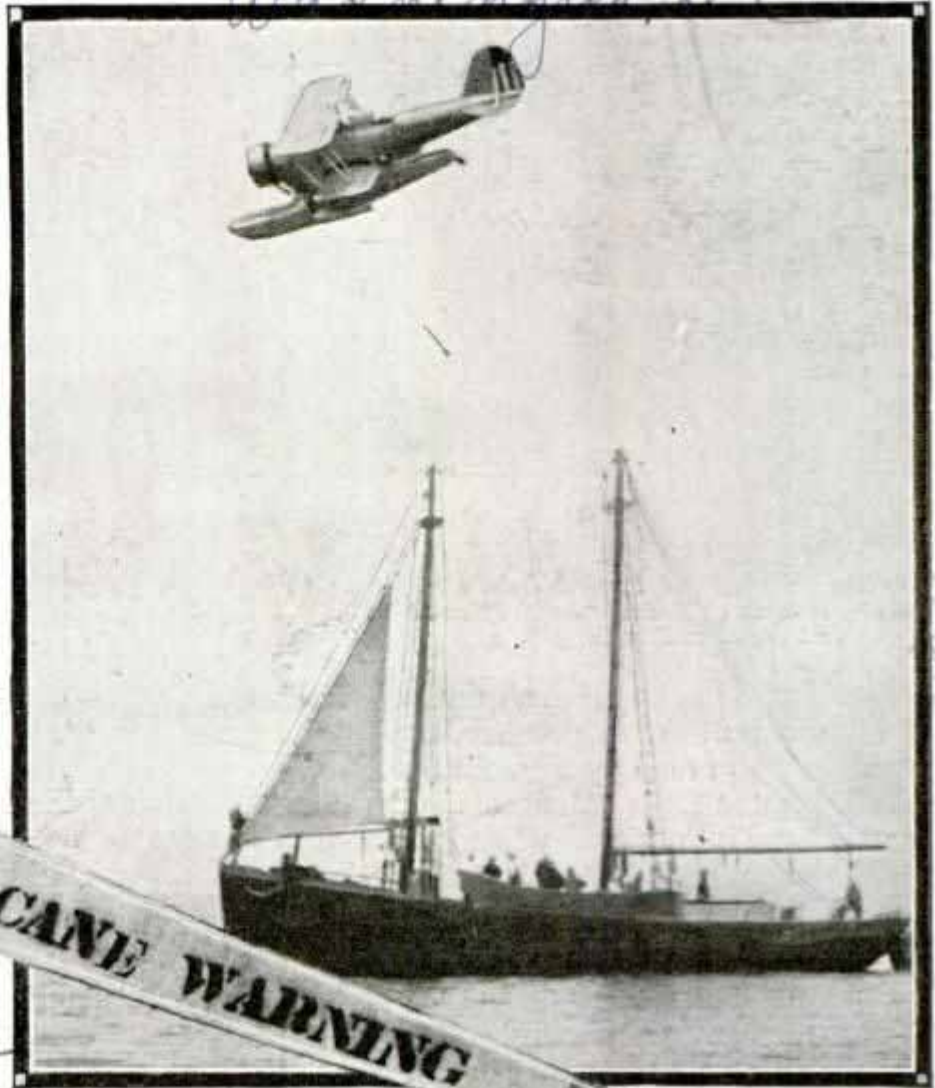
(Continued to page 118A)



Spotting an Iceberg by Means of Ultra-Sound Waves Which Are Reflected Back to Ship Where They Cause an Alarm to Operate

Planes Drop Storm Warnings for Fishermen

Hurricane warnings now are conveyed by airplanes to the sponge fishing boats operating in the northeastern waters of the Gulf of Mexico. Few of these vessels are equipped with radios and as they often stay out two or three weeks at a time, they can be reached quickly only from the air in an emergency. As soon as it is known that a hurricane is headed for the Florida coast, weather bureau officials at Tampa



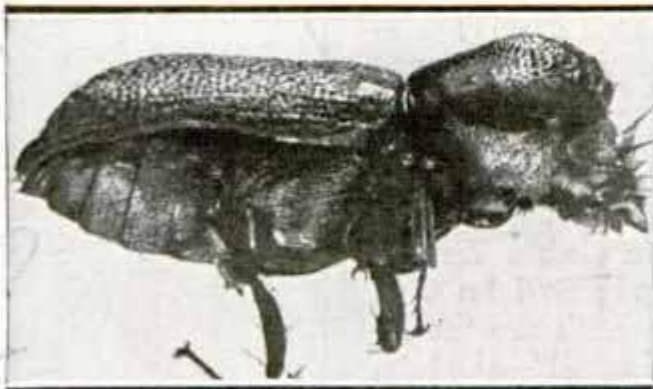
Hurricane Warning Streamer Such as Is Dropped by Planes to Boats in Gulf of Mexico; Above, Fishing Craft and Warning Plane

notify the coast-guard air base at St. Petersburg and seaplanes fly out to the fishing fleet. When a boat is spotted, the plane sweeps low and drops a warning in the form of a small wooden block carrying a three-foot yellow streamer lettered in black, "Hurricane Warning." The warnings also carry a message asking that those which miss the

boats and are picked up be returned to the air base. Many small boats were warned by this method when the hurricane hit off the Florida coast last September.

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Insect Bores Hole in Lead Cable and Causes Short Circuit

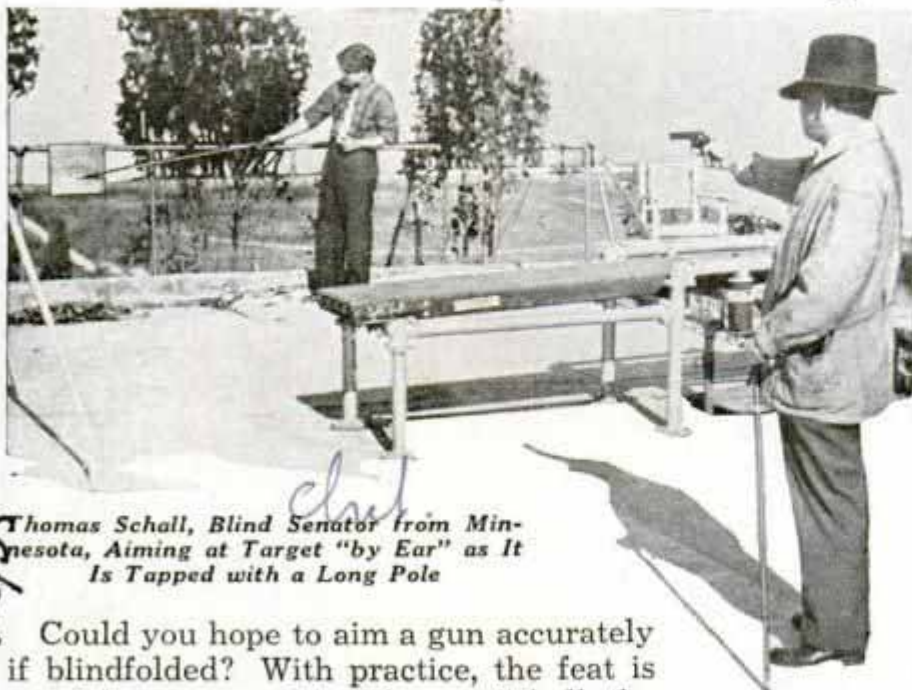


Enlarged View of Cable Borer Which Makes Holes in Lead Cables and Causes Short Circuits

If your telephone fails to function, a beetle may be to blame. And if a barrel of molasses in the basement springs a leak, the same beetle may be the cause. The cable borer, found in California and elsewhere, usually lives in the dead wood of broad-leaved trees. At times, however, it bores through the lead sheathing of telephone cables. The holes admit moisture sufficient to short-circuit the paired wires. At other times it bores through casks and tanks. One beetle hole bored through a fifty-gallon cask will empty it overnight.

Coop. H. E. Burke 1551 Emerson St.

Ear Instead of Eye Aims Gun When Blind Man Hits Target



Thomas Schall, Blind Senator from Minnesota, Aiming at Target "by Ear" as It Is Tapped with a Long Pole

Could you hope to aim a gun accurately if blindfolded? With practice, the feat is possible, as proved by Thomas Schall, the blind senator from Minnesota, who converts sound into "sight" when he practices on the pistol range—and he is considered a proficient marksman. He utilizes his enhanced hearing to direct the pistol at the target. He listens while someone taps the target with a long pole or tosses gravel against it and gauges the location of the target from the sound thus produced.

SAFETY LIGHTING USED ON ROAD AFTER TESTS ON MODEL



Latest Type of Highway Lighting Is Being Tested; Glare Has Been Eliminated

Increased safety on the highway at night is sought by engineers who recently installed a new illumination system on a heavily traveled road in Ohio. The system consists of thirty-nine lighting units

of revolutionary design properly spaced over a mile-and-a-quarter stretch to give uniform brightness. Each unit employs a "terraced" reflector and a 400-candlepower lamp. Reflectors are made of aluminum which possesses the highest reflectivity of any metal save polished silver and which is practically impervious to weathering. The units are coordinated to permit light from each to overlap or crisscross light from the next lamp without shining directly into the eyes of the motorist. A model highway, built to one-eighth scale and representing a 2,000-foot

stretch of the highway, was used by engineers to determine the kind of lighting that would illuminate the road and ditches efficiently. A majority of automobile accidents occur at night and many can be traced directly to the driver's inability to see. General Electric engineers estimate that proper lighting on the most dangerous 50,000 miles of highway in this country would save 5,000 lives and 50,000 injuries each year and that the economic saving in preventing these accidents would be three times the cost of the lighting.

MAILBOX LIKE A HUMAN FACE "SWALLOWS" THE LETTERS

Made of the same concrete out of which the building is constructed, a grotesque human face with open mouth serves as a mailbox for a building in Cuba. Letters placed in the mouth are "swallowed"—that is, they drop into a receptacle located inside the building.



Killed in auto accident 12/31

1273

W. A. W. Maedje Editorial Service Russell to E. C.

Call Co. Peely Cuba Habana, Bayes, Habana, Cuba

Havana

Camera Catches Cat in "Four-Point" Landing

*Sold by Burke James, Inc.
223 W. Madison, Chicago*



High-Speed Camera Records the Story of a Cat's Fall; the Kitten Was Dropped Upside Down, Twisted Feet Down before Falling Twelve Inches and Made a Perfect "Four-Point" Landing

Wide World

E/222

ADJUSTABLE TIRE SPREADER IS WORKED BY HAND

Inspection and repair of automobile tire casings is made easy by a hand-operated tire spreader. The tire is placed on a two-posted "table" and adjustable metal loops are inserted in the beads of the tire wall. By pulling a lever, the tire can be spread from nine to twelve inches and locked in place. The outfit is offered with either one or two loops, the double loop spreading the tire twelve to sixteen inches.



Chas. E. Miller Corp.

Cats are masters at making "four-point" landings. To demonstrate their technique in alighting on four feet, a fast camera lens was trained on a Persian kitten while it dropped to the ground from a height of about four feet. The rapid-fire shutter clicked six times, caught the kitten in six positions for exposures each one six-hundredth of a second in duration. The pictures tell the story. Before the kitten had fallen twelve inches it had made the lightning twist of the body that brought all four feet around into landing position.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

*Miracle eye camera - speed
Louis S. Hubler 1509 Park St.*

1151 S. Broadway
Los Angeles, Calif.

MOVIE COSTUMES

Los Angeles, Calif.



tions of state, swords, shoes and hats.

Often contemporary uniforms are less known in the city of celluloid than others worn a hundred years ago. The Follies Bergere doorman, for instance. A producer asked the Western Costume company, on whose racks hang enough garments to outfit a half-million movie stars and extras, for a duplicate of that ornate uniform. Nowhere in magazines or



WHAT medals did the Duke of Wellington wear at the battle of Waterloo? What kind of shoes did a Kentucky farm boy wear in 1835 and what do Siamese navy officers' buttons look like? What kind of blunderbuss did the Puritans use, and how did pirates of a century ago dress?

These are everyday questions in Hollywood. No costume is too ancient, no decoration or weapon too rare, for the wizardry of the costume makers to reproduce it on short notice. The movies are just now entering a new era of costume pictures. More than ever the resources of research people and designers will be taxed to guarantee authentic reproductions of dress uniforms, peasants' ragged garments, guns, pistols, badges, decora-

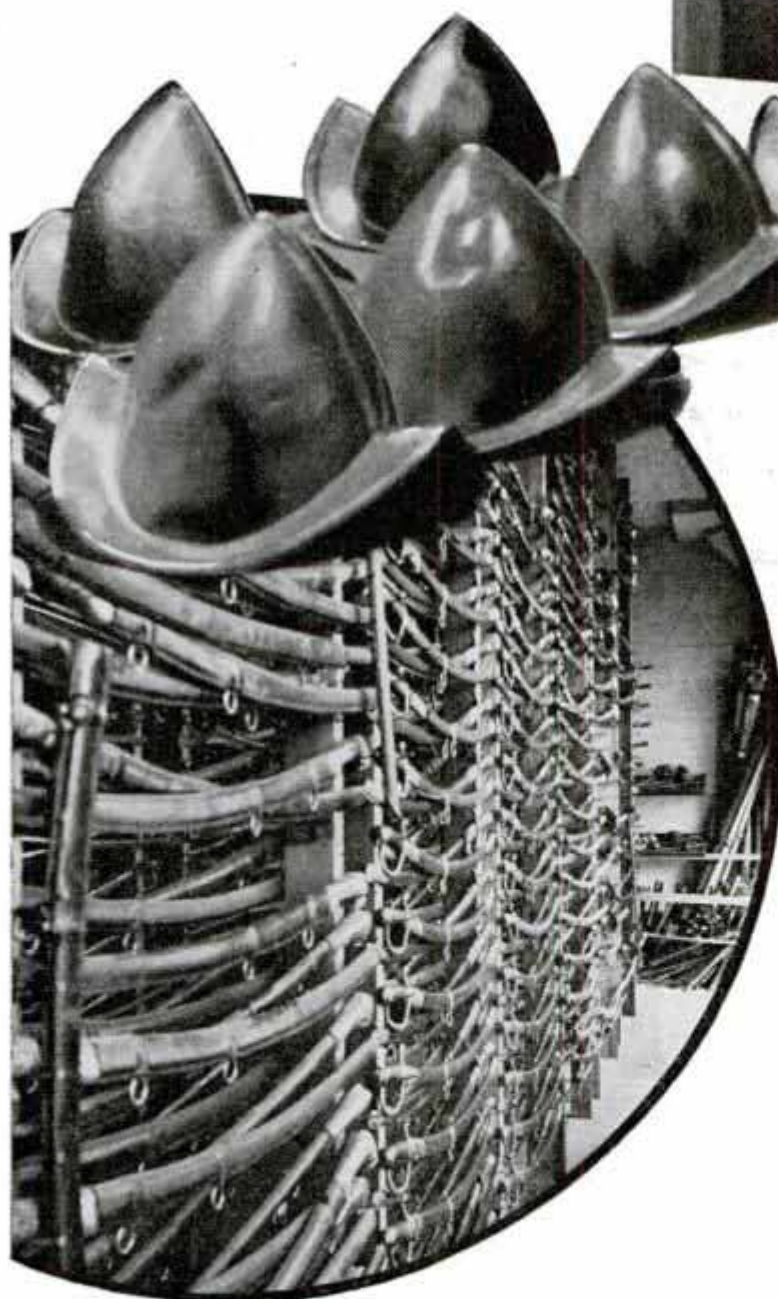
Shoes, Shoes and More Shoes Line the Racks of Studio Wardrobe Departments and Costume Companies

4 1116

WORTH MILLIONS

newspapers could be found his picture, so a cable was sent to a Parisian artist. Twelve days later a colored sketch, showing both front and back, was delivered in Hollywood, and three days after that a counterpart of the doorman walked before the cameras.

To a former German naval officer, Lieutenant Commander C. F. Cook, once attached to the famous raider, "Emden," falls the lot of guaranteeing the authenticity of most costumes you see on the screen. In his files are 75,000 pictures of



all sorts of people of all lands since the invention of photography four decades ago and numerous sketches printed prior to 1850. In his cabinets are 700 authentic pieces of military, naval, diplomatic and lodge uniforms, together with 2,000 authentic pieces of equipment—buttons worn by Turkish soldiers, Mexican generals' badges, Brazilian belt buttons, cockades of Netherlands' soldiers, uniforms of the Spanish civil guard, war decorations, from which he can quickly reproduce the uniform of a soldier, sailor, guard or officer of any country.

One costumer alone can put 60,000 uniformed troops in the field of make-believe on a week's notice, complete with pants, tunics, hats and belts. Of these, 2,000 would bear arms, for rifles are needed only in close-ups. Should a director want the opposing armies followed by hangers-on, the same shelves can outfit 50,000 peasants of various nationalities. The same collection of costumes,

Top, Spraying Helmets to Kill the Reflection; Below, Swords of All Nations Ready for the Movies



gathered from the four corners of the globe during the quarter-century history of the movies and manufactured in Hollywood to meet picture needs of the past, will dress the astounding total of 500,000 actors, actresses and extras.

Every military change of uniform in the history of the United States from the buckskin shirt and flat felt hat of the Virginia infantry of 1774 to the open-neck tunic of Uncle Sam's 1935 soldiers is represented among these half-million costumes. Not long ago a company called for fifty each of these nineteen different types, and a few days later 950 movie soldiers stood at attention, representing in person the history of America's military uniforms.

Movie Indians are known to the costumers by types, not tribes. Type-B Indians, for instance, wear jackets, leggings, moccasins, G-strings and headbands with feathers, while Type-C wear only leg-

gings, G-strings and moccasins. Whatever an actor wears, whatever he may use, such as sword, badge or gun, is part of his costume. In the files of one Hollywood studio are 500 authentic badges and decorations denoting heroism or high honor accorded their former owners in a hundred nations. Of course, costumers do not permit originals to be carried away from their files, but in a half-day an expert workman will reproduce any badge in existence, even making it larger or smaller to fit particular needs. Five hundred assorted officers and diplomats have been costumed in only two days

Working from a

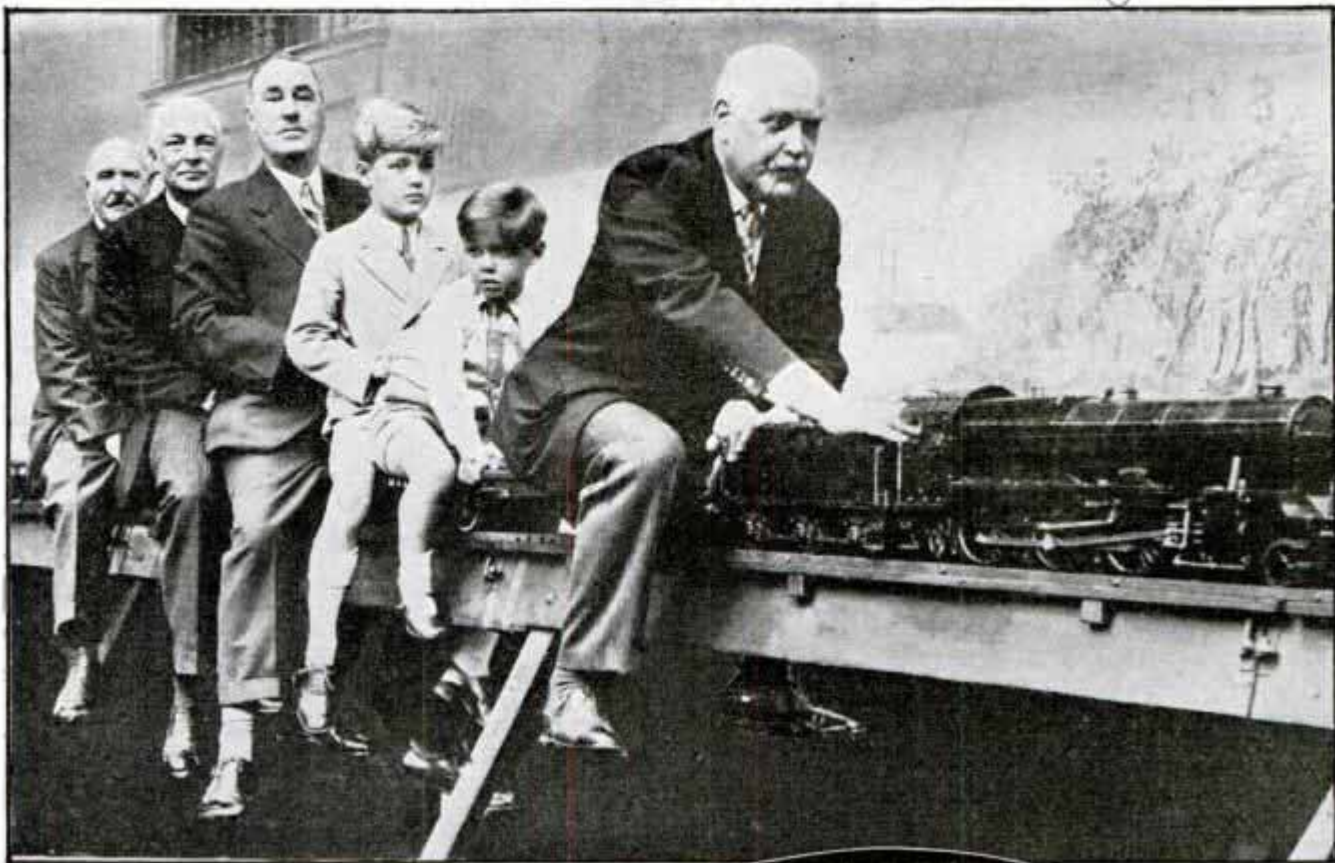
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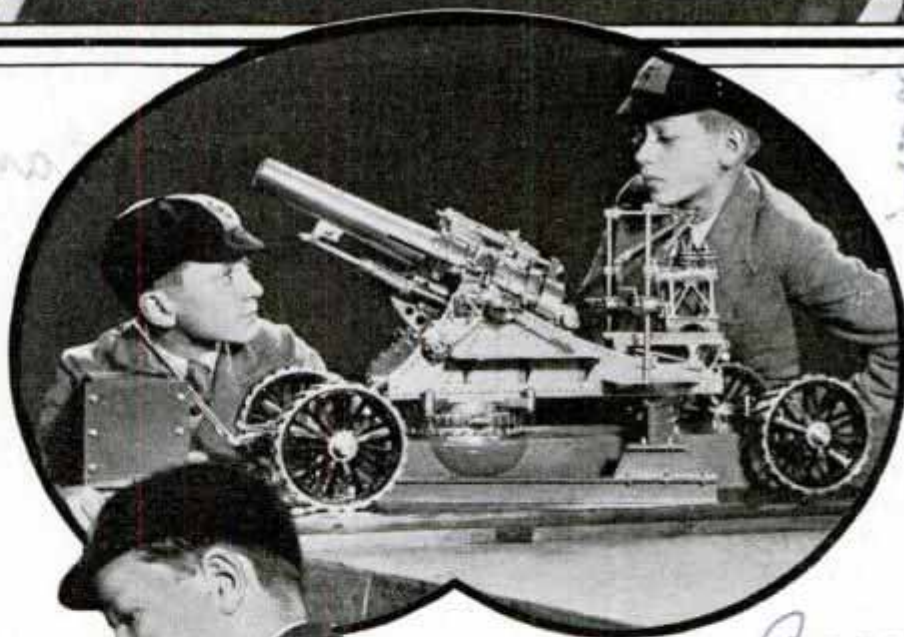
Top Photo © Paramount Productions, Inc.
Top, Making Ornaments and Jewels for Costume Picture; Center, Pirates Ready to Face Camera; Bottom, Military and Lodge Hats

London, England

Models of Big Things Work Like Originals

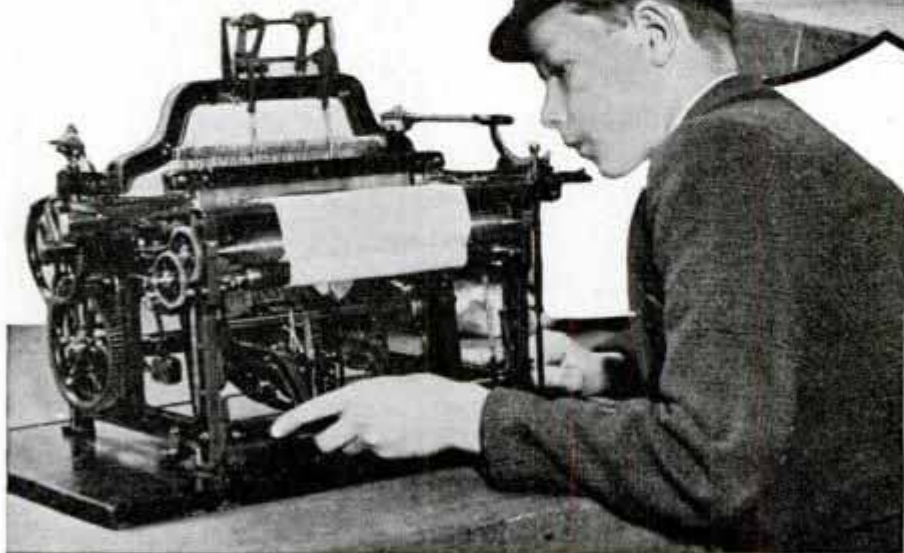


Growing Interest in Things Mechanical Was Revealed Recently at the Model Engineering Exhibition in London; Top, Sir Jostah Stamp, Chairman of the London, Midland and Scottish Railway, Drives a Miniature Locomotive with Five Friends as Passengers; This Engine Runs Like the Original from Which It Was Copied



© Planet News

Acme



Above, Two Schoolboys Inspect Working Model of Twelve-Inch Siege Gun at Exhibition of Models; This Miniature Gun Is Complete in Every Detail, a Marvel in This Type of Craftsmanship; Left, Fine Model of Lancashire Loom Catches Eye of This Boy; the Exhibition Demonstrated the Appeal That Models Have for the Adult

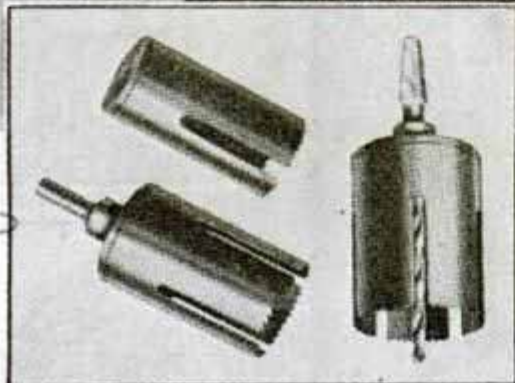
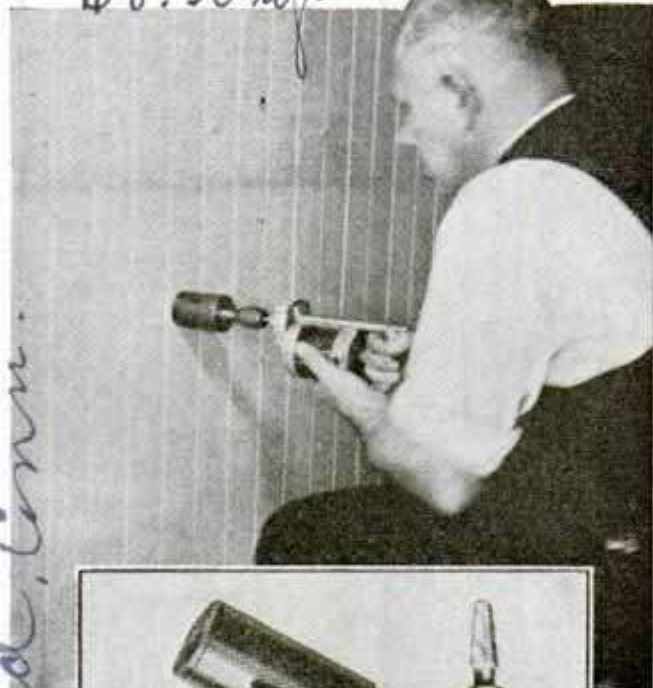
London, England

10/4/35

1172

Rotary Saw Cuts Pipe Hole Through Wall

\$8.50 up



Drilling Pipe Hole with Rotary Saw; Observe Slots for Escape of Sawdust in Cutting Heads Below

Designed especially for the job of cutting pipe holes through walls and floors, a rotary saw now being manufactured is so rugged that it will cut through nails and metal ceilings without being injured. Narrow slots in the saw provide an escape for the sawdust, which otherwise would jam the teeth of the cutting head and stall the tool. Used either with a hand brace and bit or an electric drill, saws ranging in diameter from three-fourths inch to two inches will bore pipe holes through three thicknesses of flooring.

1120

DIESEL AIR BOATS PLANNED TO FLY ATLANTIC IN DAY

Long-range flying boats that can carry a useful load of twenty-six tons from New York to London in a day's non-stop flight are planned by Glenn L. Martin, airplane

Baltimore

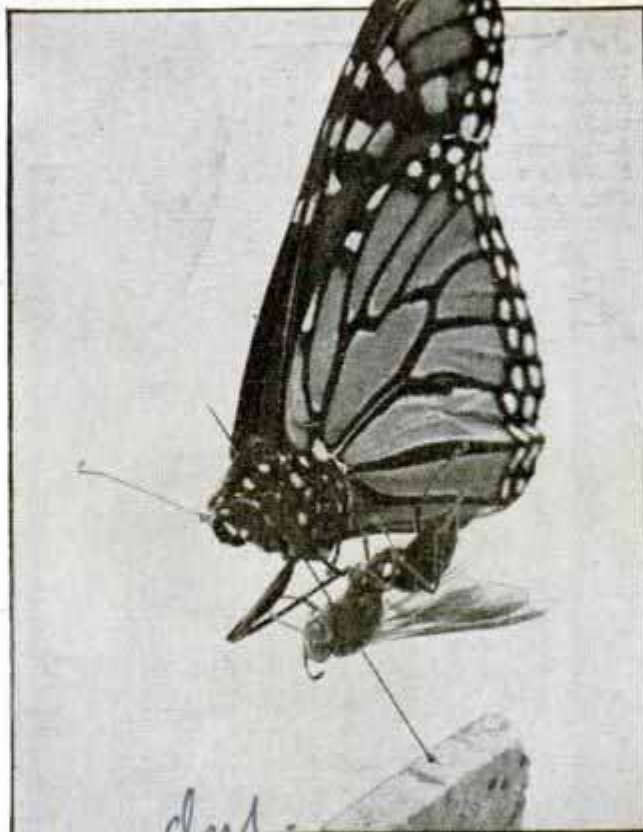
builder, who predicts daily schedules between the continents for the near future. Although more expensive per ton-mile, he believes the non-stop trip over the 3,465-mile "great circle" route will be preferred, saving a business day over the Bermuda-Azores route with its refueling delays. The Martin plans call for a 180-foot ship powered by four Diesel motors developing 6,000 horsepower. The ship would weigh 48,000 pounds empty and 100,000 pounds loaded, with top speed of 170 miles an hour, 18,000-foot ceiling and range of 5,090 miles with a 10,000-pound pay load.

1173

Butterfly Branded as Killer of Wasps and Small Birds

Mild enough in appearance, the New England buckeye butterfly is in reality a bold fighter, as Harvard University entomologists demonstrated in photographing one in deadly combat with a wasp. The buckeye's normal diet consists of milkweed blossoms and nectar. When on the warpath it is capable of killing wasps and other insects and even small birds.

Cambridge Mass

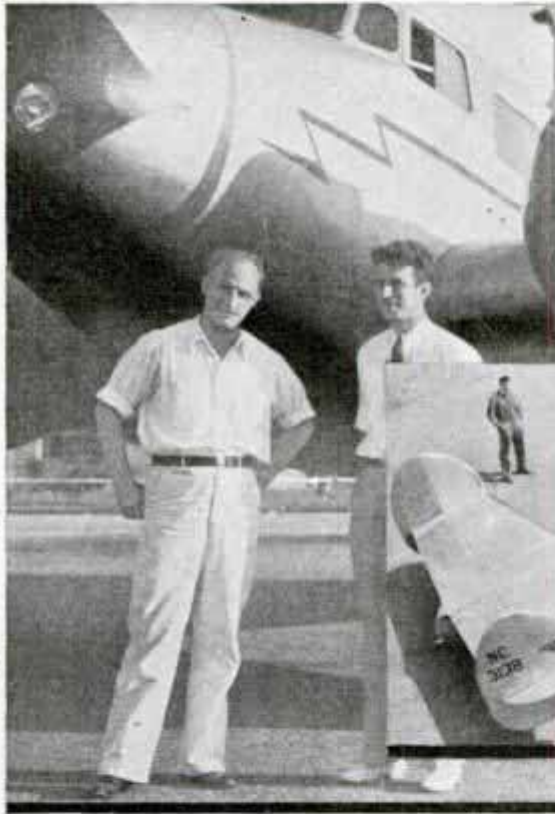


Fighting Member of the Butterfly Clan Mounted as if in Act of Killing a Wasp

*Lockheed Aircraft Corp.
Burbank Calif.*

Luxurious Air Yacht Is a Home with Wings

Most of the luxuries of a modern home are provided in a \$75,000 air yacht delivered recently to a Texas oil operator. The ship, named the "Sky Lark," is a twin-motor Lockheed Electra painted an opalescent green. Fittings in the passenger compartment include four adjustable chairs, a couch, an end table, card table, lavatory, electric fans, buffet and an electric refrigerator. The radio equipment includes two-way voice communication from the cabin as well as the cockpit, radio



Interior and Exterior Views of Luxurious Air Liner Which Contains Many of Comforts of Home

beam receiver and a telegraph key for code communication in foreign countries. The interior is finished in soundproofed fabric and leather. The ship has a top speed of more than 200 miles an hour, retractable landing gear, adjustable pitch propellers and wing flaps for slow landings. Several long trips are planned.

Fire-resistant and verminproof bed mattresses are being produced by treating all combustible materials in a chemical bath.

Liquid for Waterproofing Sprays or Brushes On

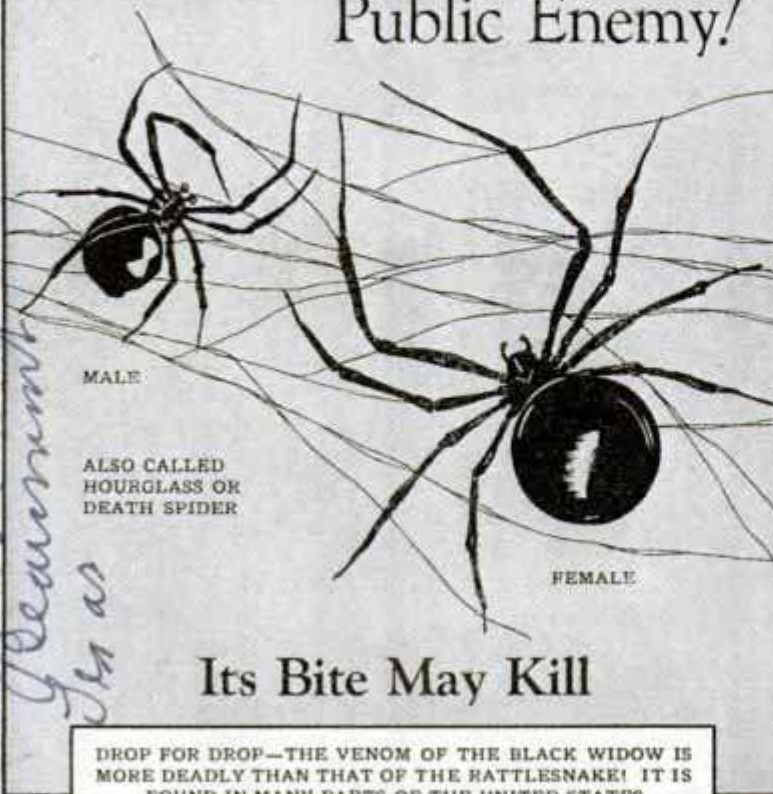
Colorless and prepared for interior or exterior use, a waterproofing liquid that is acid resistant is on the market. It can be applied to wood, brick, stucco, cement, concrete, stone or iron by spraying or brushing on. It is an excellent sizing for plaster and can be used as an undercoat for paint or as a protective coating over paint. The liquid quickly penetrates any porous substance. It will not crack or crumble and is weather resistant, making it useful as a rust preventive.

National Safety News Oct 9 1935

Sleepsafe Industries The Protosol Co.

*Cent. Thomas & Stinson Jr. Los Angeles, Calif.
Camp 10555*

The Black Widow Spider - Public Enemy!



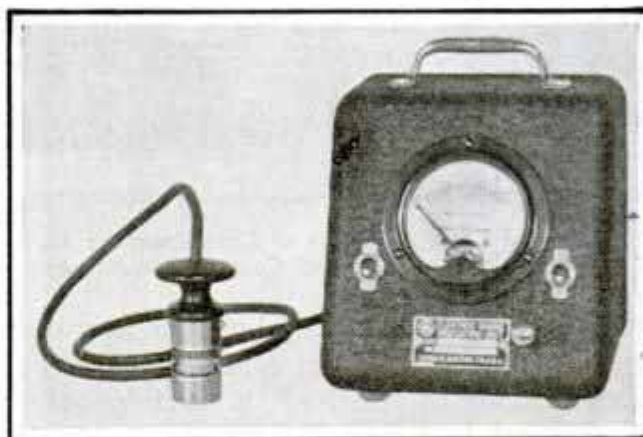
if his life is to be saved. One man, sturdy and in excellent health, was bitten just under his armpit. At first there was only a small red lump like a mosquito bite, but the pain spread quickly throughout his body and in fifteen minutes he suffered convulsions, with severe abdominal pain and rigidity, nausea and blinding headache. It was two hours before he received medical aid and he was then semi-conscious and in a state of profound shock. He recovered after two months in a hospital, but carries a scar a half inch deep as large as a silver dollar. To stop spread of the poison, the wound should be tied off within five minutes after the bite; an "X" shaped incision should be made through the center of the bite and the poison sucked out. This treatment would be useless twelve minutes after the bite. Hot baths and soaking in Epsom salts help relieve pain. Stimulants should

If a black widow spider bites you, don't worry unless it was the female of the species. Deadlier than the male, its bite is fatal to one in every twenty victims. The male may sting, but it cannot kill. This is probably the reason why entomologists could not agree until recently that the black widow carries a deadly weapon; but it is now recognized that, drop for drop, the venom of the female "Lactrodectus mactans" is far deadlier than that of the diamond-back rattlesnake. Three hundred years ago Indians along the Pacific coast poisoned their arrows with a paste made from the bodies of black widow spiders. Such an arrow would kill a deer within five minutes, even if the wound was superficial. Fatalities from the bite of this eight-legged killer have been reported in seventeen states, five persons having died in Texas last summer. The black widow is easily recognized by its gleaming, round black body, a half inch long, with a characteristic scarlet hourglass marking on the under side and usually two red dots near the spinnerets. The male is only half as large and sometimes lacks the hourglass marking. The victim of a spider bite must have immediate attention

be avoided, since they speed the distribution of venom. The black widow may be eradicated by sweeping and whitewashing cobwebbed buildings and burning trash.

81193

THICKNESS OF PAINT MEASURED BY ELECTRIC GAUGE



Electric Gauge Which Measures Thickness of Coat of Paint or Enamel Applied to Metal Surface

How thick is a coat of paint? An electric gauge has been developed by the General Electric company to supply the answer. It measures the thickness of porcelain enamel, paint or other nonmagnetic materials like glass, celluloid or mica,

Schenectady, N.Y.

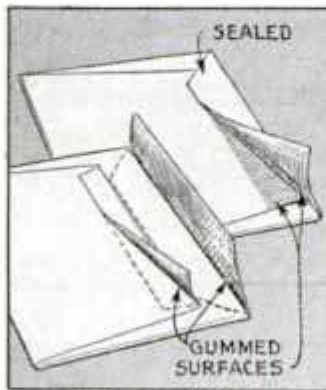
natural
 comb. Will m. Smith 5 29 Pearl St.
 Gleaming

which have been applied to or laid on flat sheets or plates of steel or iron. It permits quick measurement of the thickness of the material not only at the edges but in the middle or any other place where a flat surface a little more than an inch in diameter can be found. Weighing only seven and one-half pounds, the gauge can be used wherever a 110-volt, sixty-cycle power supply is available. The instrument consists of an indicating unit in an aluminum cabinet and a one-half pound gauge head connected to the unit by cable. When the face of the gauge head is placed in contact with the surface of the material to be measured, the thickness can be read directly on a dial. Operation of the gauge is based upon the reluctance of a magnetic circuit passing through a coil in the gauge head and through the steel directly under the portion of the material being tested.

81179

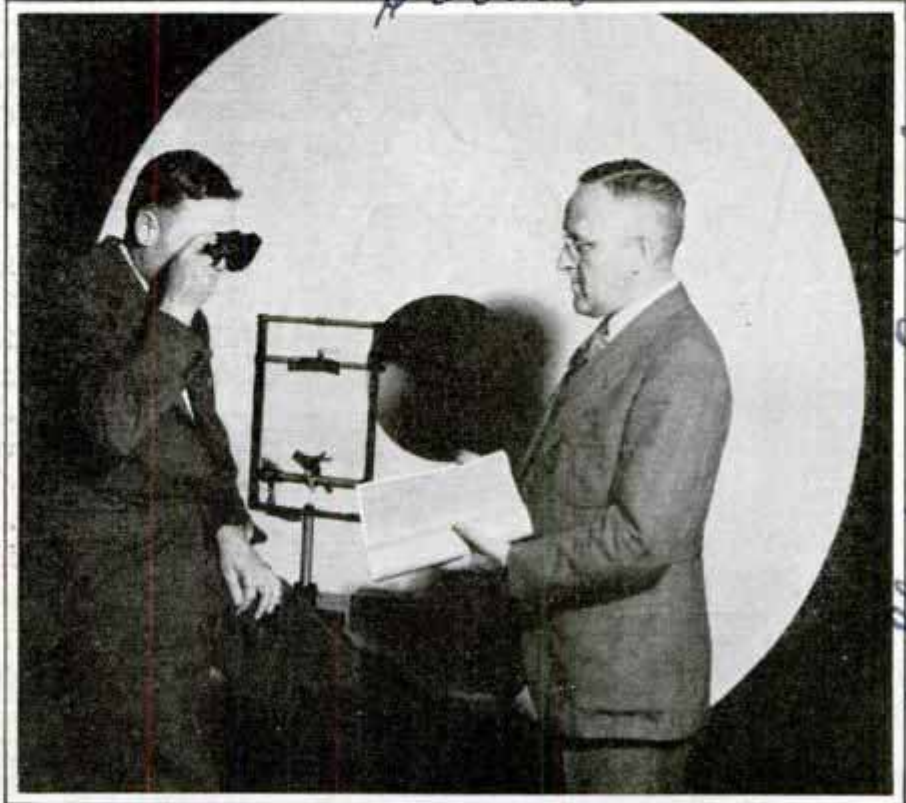
ENVELOPE THAT SEALS ITSELF REQUIRES NO MOISTURE

Self-sealing envelopes that are unaffected by moisture and cannot be steamed open are on the market. There are two adhesive flaps which stick to each other but to nothing else. After the letter is inserted, the lower flap is turned up and the upper one folded down, bringing their gummed surfaces together. They stick instantly. A letter opener can be inserted to slit the envelope without damaging the inclosures.



Visibility Meter Tells Reader How Much Light He Needs

\$ 35.00



Finger Turns Wheel on "Goggles" to Adjust Revolving Filters While Eye Focuses on Book; Dial on Wheel Tells Best Light for Reading

Measuring the amount of light you need to read a book and determining the visibility of highway signs and printing have been reduced to an exact science by a visibility meter. Really two instruments in one, it resembles somewhat a pair of goggles with two eye-windows containing colorless filters. Peering through the "windows" at a book, you twirl a wheel at the top of the instrument until the book is barely discernible through the movable filters. Then, reading from one scale on the wheel, you can tell the number of foot-candles best suited for your own eyes. By using another scale you can determine the relative visibility of various fonts of printing type on different papers, or appraise the attention-getting power of signs.

☐ Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

M. Vogel, A. es. Frankford à main

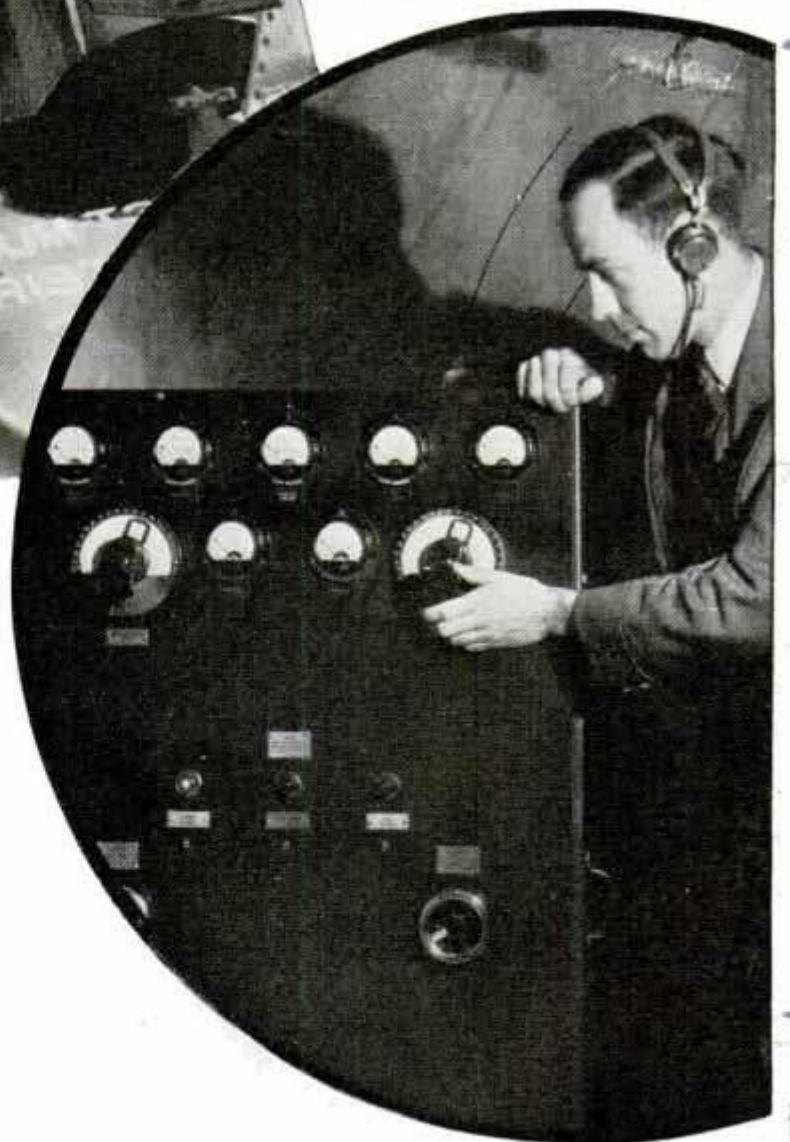
U. S. Envelope Co.

General Electric Co. Helsinki Park

8-11-25
22 & 69th, New York

PIRATES

O. V. Hanson, chief engineer of the National Broadcasting Company. "Science can trace the station doing the jamming very quickly by using a radio directional finder. Bearings may be taken from two points and the direction found by discovering at which point of the compass the loudest volume occurs. When this is done at two different points and the 'lines' of the bearings projected, the outlaw or

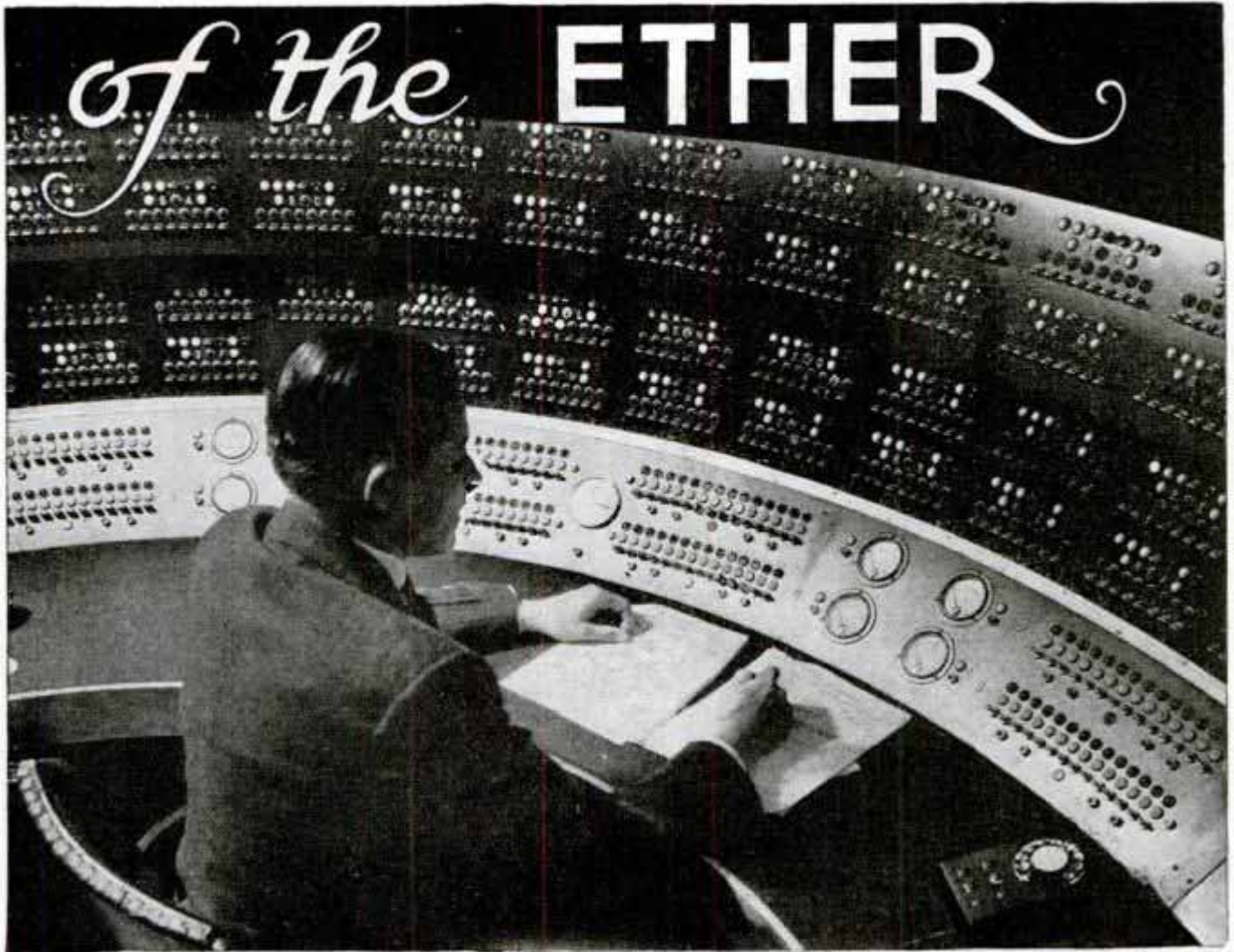


WITHOUT knowing it, you probably have encountered the invisible "pirates" of the air waves—those racketeers of space who today constitute a threat to national and international broadcasting of news and information.

The buzzing sound which you occasionally hear during an important broadcast and which you believe is static may be intentional interference. And the occasional loud music which interferes may be "jamming" caused by pirates of the ether at work preventing you from listening to the broadcast for one reason or another.

"Jamming, or intentional interference with a broadcast is a difficult thing to contend with," says

Above, National Broadcasting Company Announcers at War Maneuvers at Pine Camp, N. Y.; They Slipped by 268 Hypothetical Air Pirates; Below, Experimental Short-Wave Set

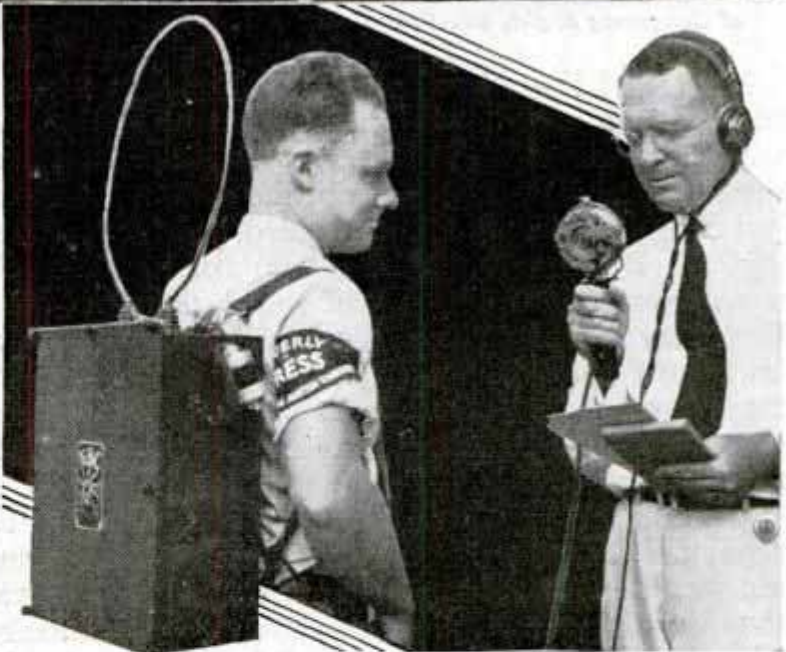


of the ETHER

interfering station will be found where they cross. While science can trace the interfering station, no mechanical means have been discovered to prevent interference. The best the engineer can do is to slip his wave length a bit, hoping his audience will again tune in and pick up the broadcast.

"Jamming may be accidental or deliberate. When accidental, it may be due to poor equipment. This is unusual in the United States where radio technicians have developed the latest in crystal controls with the maximum of variation. As for international broadcasting, a number of nations in a radio treaty agreed to stay on certain wave lengths. Some nations did not enter into or abide by this agreement. This may account for some jamming. In case of war, of course, a nation may not abide by the agreement and interfere with propaganda sent out by the enemy.

"The only way to hear a broadcast from



Above, Main Control Desk at N.B.C. Headquarters in Radio City; Below, Portable Short-Wave Transmitter

Abyssinia, for example, in case of war with Italy, would be to agree secretly upon several wave lengths. When the interfering station found the first and started to jam, the broadcasting station would shift to the second and so on, staging a radio game of hide-and-seek."



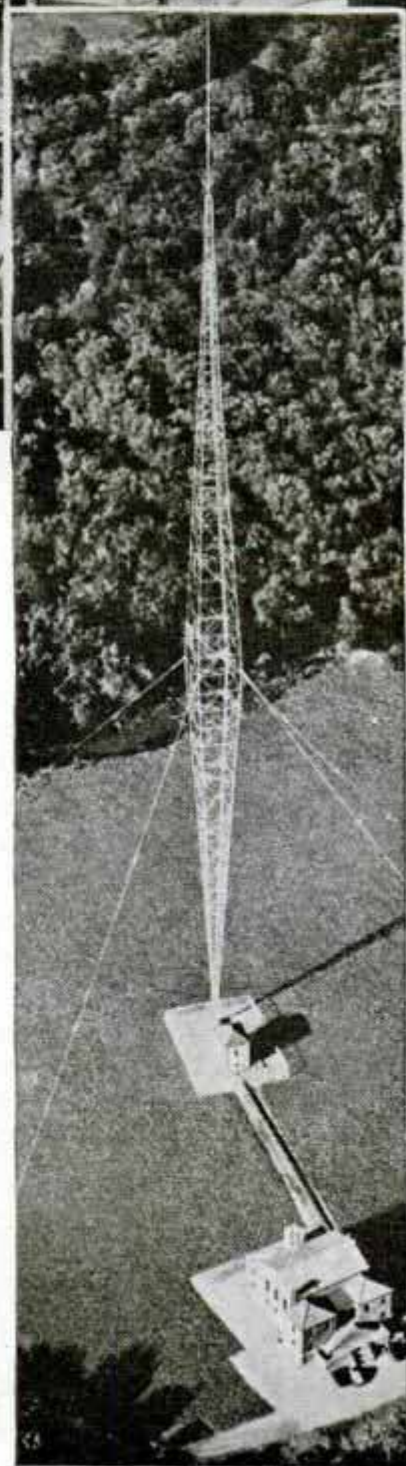
Above, Broadcasting Address of French Ambassador at Joint Session of Congress; Right, 550-Foot Tower of WABC at Wayne, N. J.

Pirates of the ether during the past few years have utilized two methods of interference—a buzzer circuit which drowns out a broadcast with a constant buzzing drone, or music which accomplishes the same objective, but they have lately added a third and more ingenious method. By broadcasting the sounds of certain machines which move at a high rate of speed, they can simulate the noise of static. The “static” which drowns out an important political speech to which you are listening may be created by a pirate in the employ of the opposition who thus nullifies thousands of dollars worth of radio time.

While radio engineers have not as yet been able to cope entirely with the pirates in mechanically preventing jamming, they have been making headway through the development of ultra-short wave transmission, wherein the broadcast may be definitely directed like a beam of light. Like a beam of light, however, the ultra-short wave cannot be “bent” over the horizon and so it is limited to short distances.

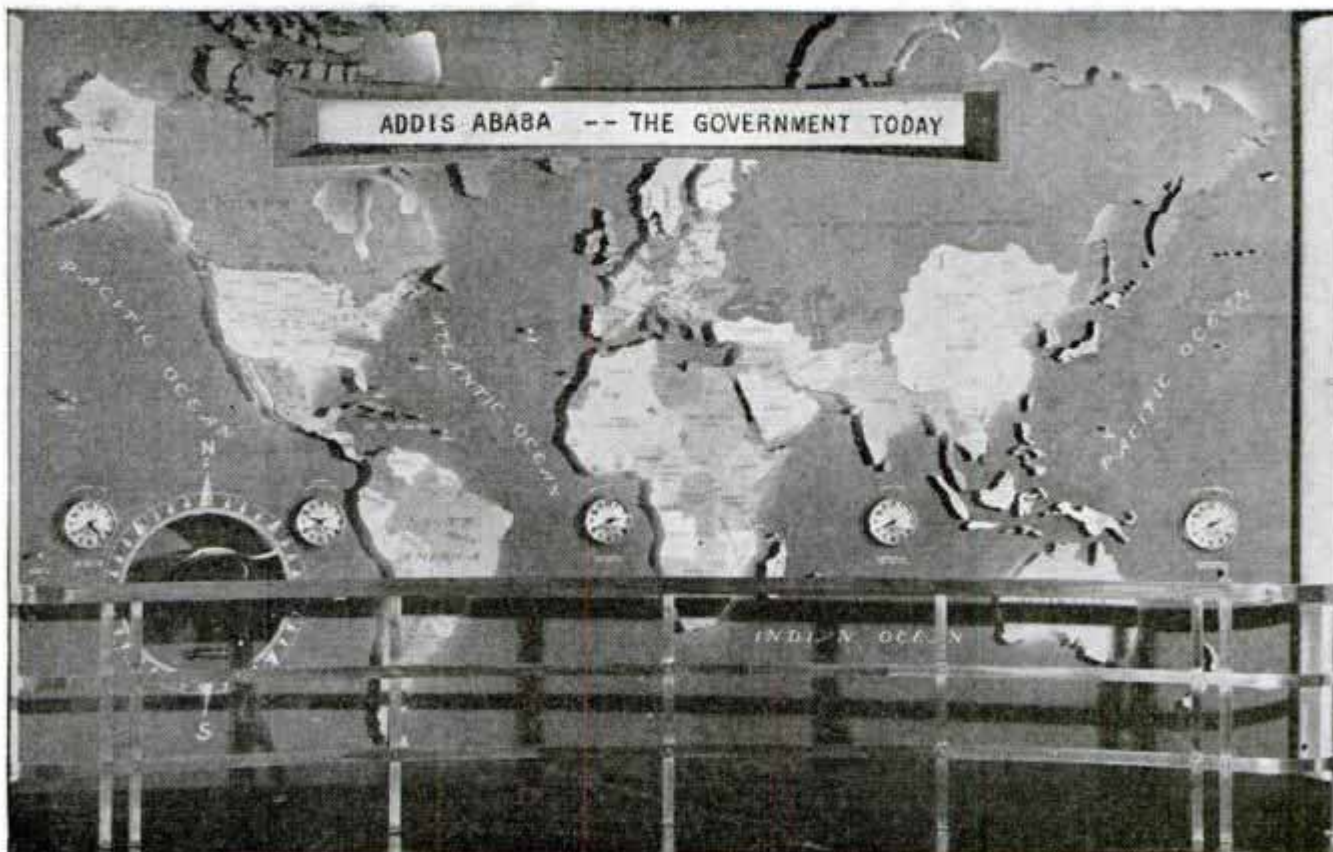
Marconi, inventor of the wireless, believes it may be possible to “bend” ultra-short waves and if he succeeds in accomplishing this, they can be used to broadcast in a given direction over a considerable distance and thus foil the pirates. In the meantime, experiments have been

(Continued to page 120A)



26 Broadway, New York

News Map Flashes at Source of Latest Story



As Illuminated News Bulletin Moves in Ticker-Tape Fashion across Space Where "Addis Ababa" Appears, the Map Lights at Point Where the Story Originated; Clocks Show Time for Every Zone

When news bulletins are flashed on a translucent screen above a large map in New York's industrial and travel exposition, a light indicates the city from whence came the news. More than fifteen miles of

wire and 370 switches are used in operating the big map, which is eighteen feet long and ten feet high. The exposition, which opened recently, is held in Radio City at Rockefeller Center.

Police Car to Fight Gangsters Is Protected by Steel Armor

Armored at vulnerable points and equipped with gun ports, a sedan developed for combating gangsters is being

used by police. The car has an all-steel body and its dash, cowl, headboard, toe-board and both front-door panels are lined with lightweight armor steel that will stop bullets from forty-five caliber sub-machine guns. Windshield and side wings are fitted with bullet-resisting glass. Radiator and tires are protected by special guards. In gun fights, the police may open both front doors and use them as bulletproof shields while they fire at all the angles afforded by swinging the door. This gives them more freedom of movement than when firing only from the front seat. There is also a gun port in the windshield.



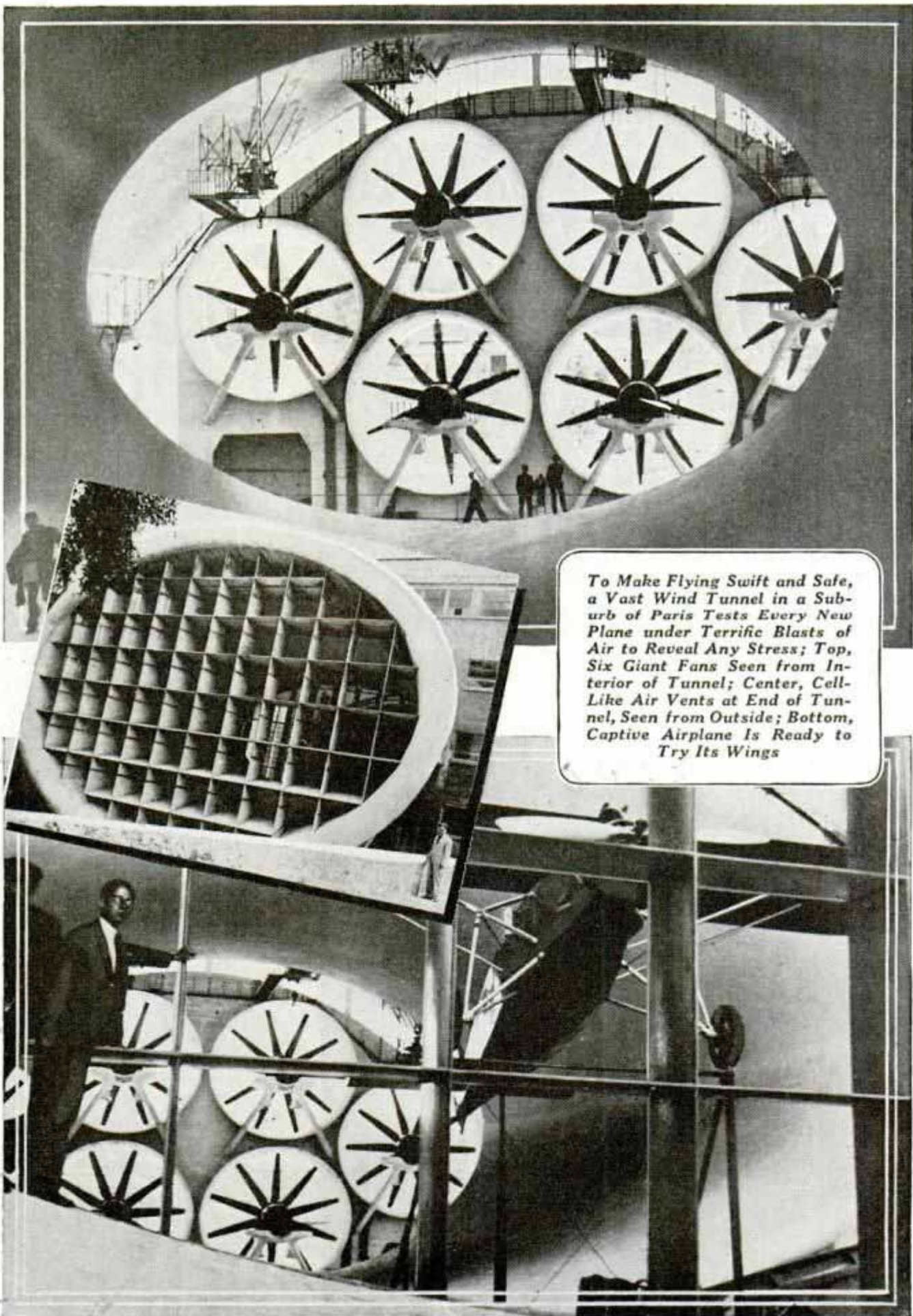
Firing from Armored Plymouth; Note Tire Guards and Radiator Shield; This Car Is Built Especially for Use of Police against Criminals

at Watertown Mass

Windshield - Co. 2.5 G. A. H. Perfect

81142

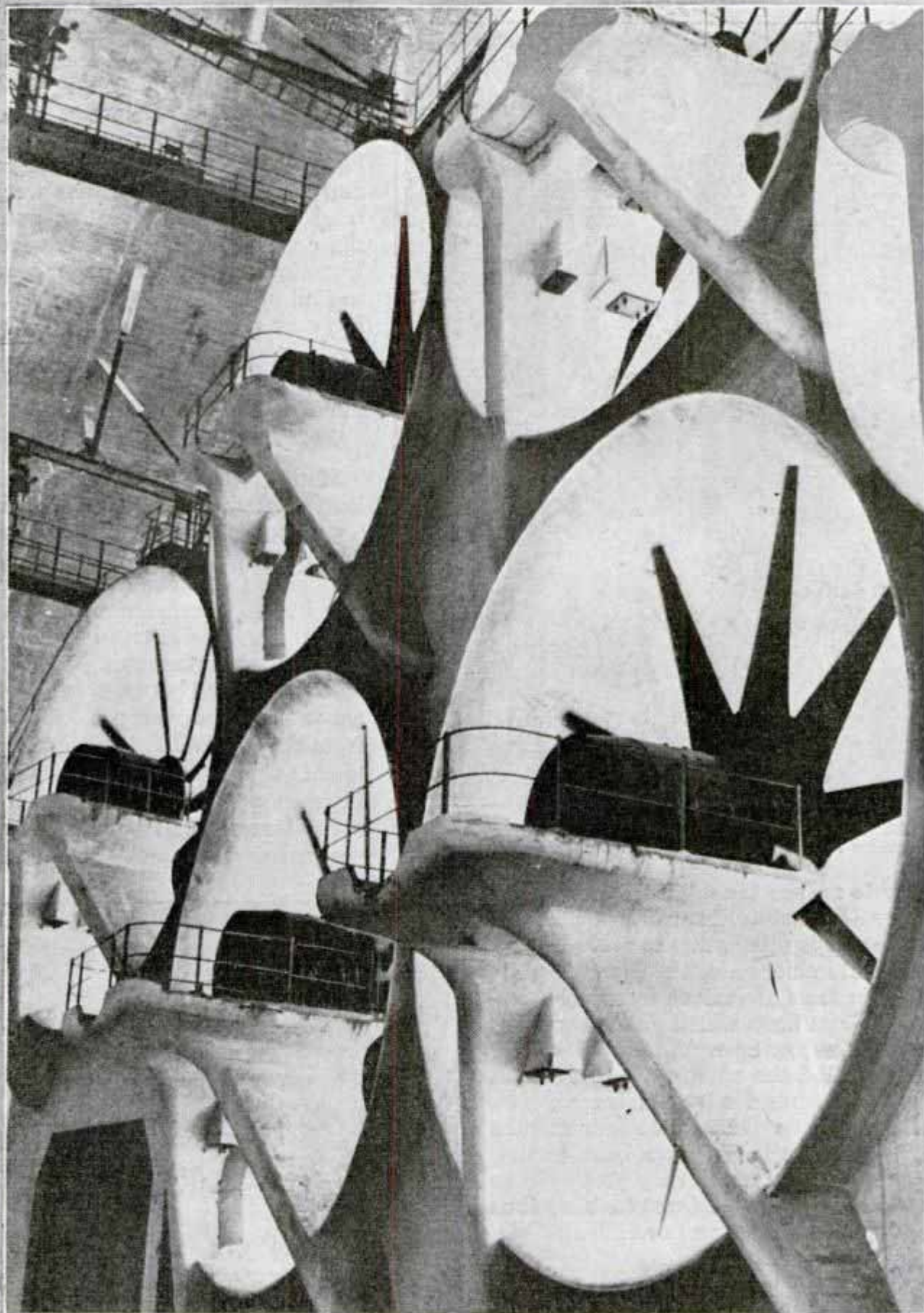
Man-Made Hurricane Tests Full-Size Planes



To Make Flying Swift and Safe, a Vast Wind Tunnel in a Suburb of Paris Tests Every New Plane under Terrific Blasts of Air to Reveal Any Stress; Top, Six Giant Fans Seen from Interior of Tunnel; Center, Cell-Like Air Vents at End of Tunnel, Seen from Outside; Bottom, Captive Airplane Is Ready to Try Its Wings

78
 How many of the...
 ...

... ..

*near Paris, France***Giant Battery of Fans Helps Make Flying Safe**

This Battery of Six Gigantic Fans Stirs Up a Tempest in the Tunnel Where France Tries Out the Stability, Speed and Sturdiness of Its Planes Before Letting Them Take the Air; the Fans, Driven by Powerful Electric Motors, Thrust Strong Air Streams against the Ship from Every Angle

B.C.

14615 Mattetal St. Detroit Mich. 48224

Better Safety-Island Lighting Reduces Automobile Accidents



This Illuminated Safety-Island Guard Is Visible for Long Distances; It Is Equipped with Non-Glare Sodium Lamp

How to reduce the number of collisions at street-car safety islands is a problem that Detroit is attempting to solve by improving illumination of the concrete platforms. In tests of various forms of lighting, a sodium lamp which gives a brilliant yellow glow has been found effective. It does not blind the automobile driver, but its light is visible for long distances, even on foggy nights. During the four months that two of the lamps have been in use, the safety islands which they protect have not been struck by an automobile, thus resulting in a reduction in accidents.

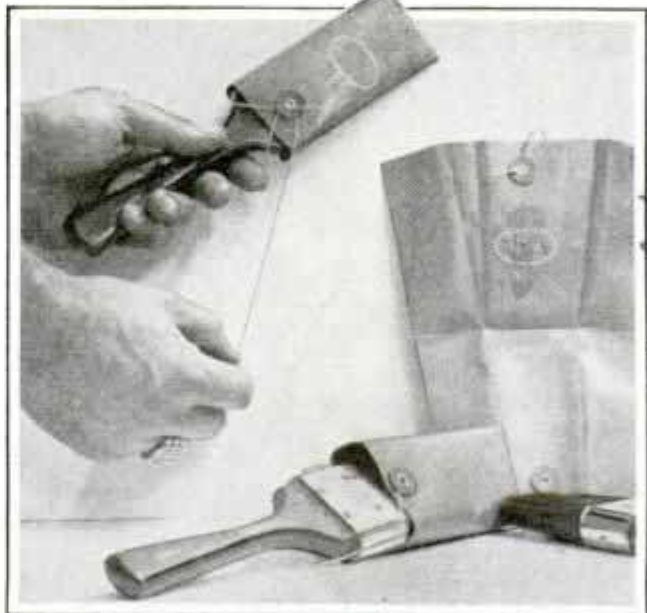
SICK APPLE TREES ARE REVIVED WITH DOSE OF BORACIC ACID

Boracic acid has been used successfully to tone up sick apple trees in experiments

in Canada. Trees whose fruit showed skin blemishes, brown core areas or very small sparse leaves have been treated with the acid after holes were drilled in the trunks with brace and bit. Trees thus treated bore a normal, healthy crop the following year. The poor and diseased apple crop has been blamed on the drought and a number of remedies were tried with negative results until the common antiseptic was used. Experiments now are under way to find out why the boracic acid has such a favorable effect on the apple trees.

PAINTBRUSH WRAPPERS PRESERVE THEIR SHAPE

Made from a single piece of heavy, oil and water proof paper, a wrapper for paintbrushes makes an attractive sales package and also serves as a conditioner after the brush has been used. The brush can be cleaned and re-wrapped, thus preserving its original shape, or if it is to be used again soon, the wrapper keeps it from drying out. It is chemically treated against moths, and brushes can be preserved for several months in the wrappers without damage.



Paper Wrappers for Paintbrushes Which Preserve Their Original Shape and Prevent Drying Out

Canadian

W.P. Fuller Co

Write Dept. Long Beach, California
W.P. Fuller Co.

Harbour
of Toronto & Club, Canada

Emb. James Montagnes 517
Commissioner Field

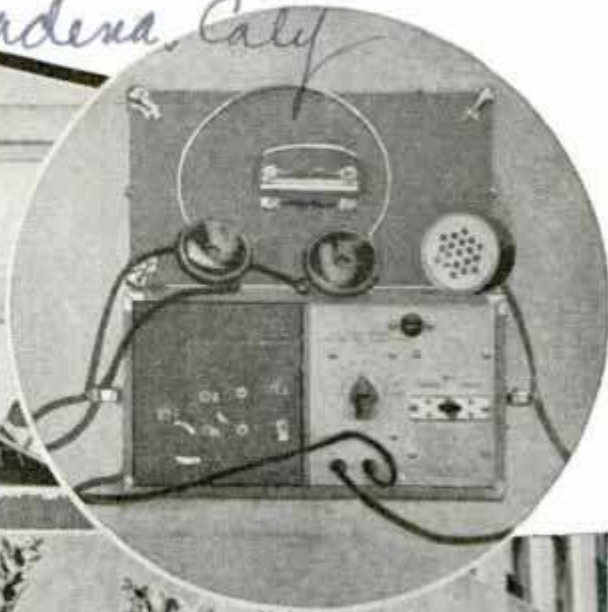
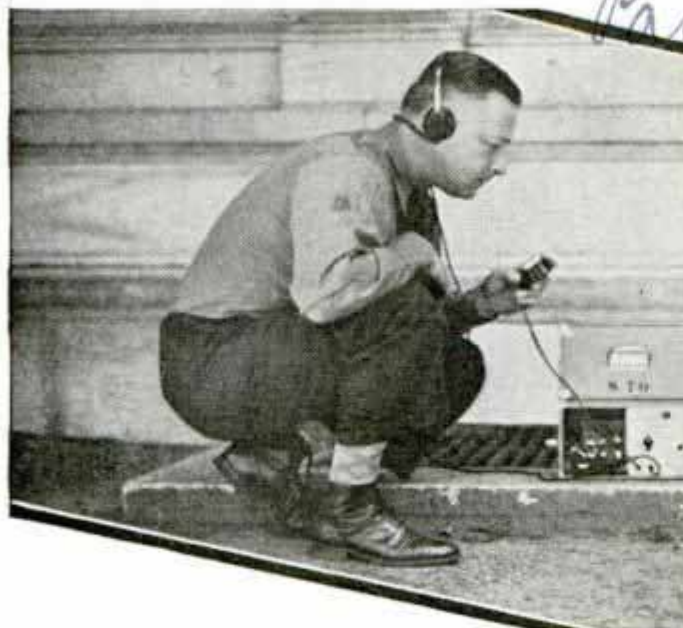
Francisco, Calif.

Foresters Pack Eight-Pound Radio on Patrol

21137

of Pasadena Star News

Pasadena, Calif



Top, Field Radio in Use and Close-Up of Set; Bottom, Ranger Carrying Radio in Compact Case

Scarcely bigger than a ranger's hat, a compact two-way radio set has been developed by the Forest Service for use of its patrols in the wooded wilderness of California, Oregon and Washington. Batteries included, it weighs only eight pounds and is carried by hand in a case six by seven by ten inches. Rangers guide each other by radio to forest fires, and recently the short waves helped find a lost deer hunter in the Angeles National Forest. The broadcasting range is sixty miles, but there must be no solid barrier between sending and receiving point. In case of fire, radios are posted at strategic spots along the fire line, with relay sets on mountain peaks to establish contact between all stations.



not on market.

Su arm & form

81169

Haying Is Speeded Up by Automobile Carrying Buck Rake

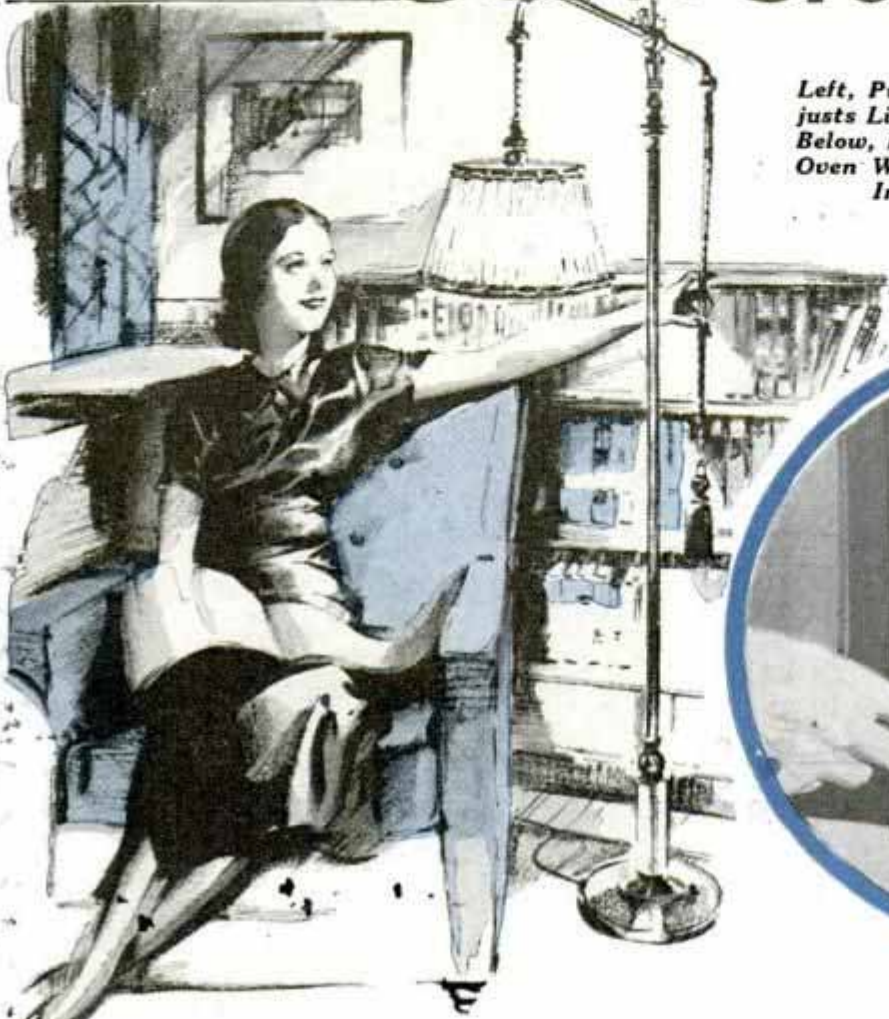


Hay is carried to the stack or baler at twenty miles per hour by a motorized buck rake patented by a Kansas farmer. The rake, which is twelve feet wide, is bolted to the front of an automobile or truck, replacing the bumpers. Six hundred pounds of hay can be transported at one load. Speed of the vehicle when empty is about twenty-five miles per hour. It will do the work of five teams. Since a woman or boy can operate the rake, it leaves the men on the farm free for other work.

Chas. A. J. Stockwell and

and Ward Sheen, Pawnee Rock, Ark

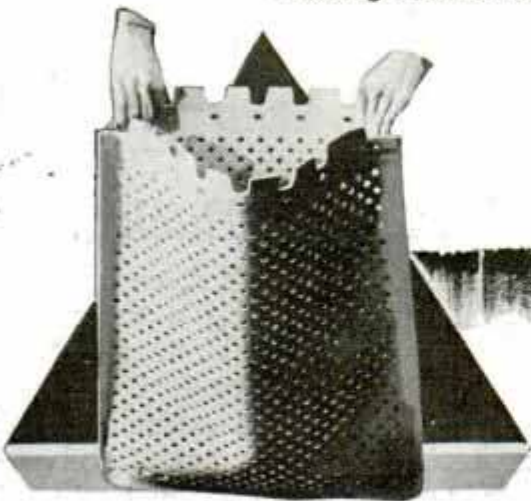
New Conveniences



Left, Pulling Cord on Floor Lamp Adjusts Light Level for Reading or Bridge; Below, Battery Light Shoots Beam into Oven When Door Operates Switch; It Installs in Any Stock Oven



Right, Stand with Adjustable Mirror Enables Milady to See Back and Sides of Her Head When Seated at Dressing Table or Vanity



Above, Perforated Rubber Bag, Designed to Replace the Nets Used in Laundries to Prevent Bundles of Clothes from Mixing; This Bag Will Not Burst and Danger of Tearing Clothes While Washing Is Reduced

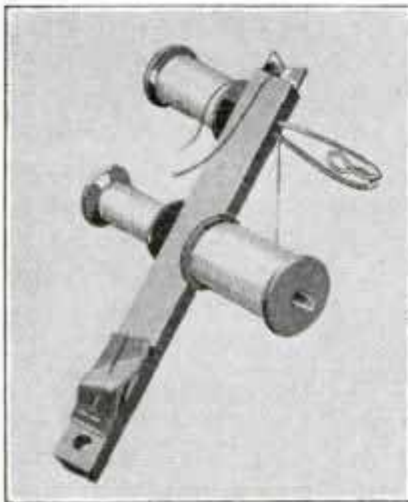




Left, Bookends with Pockets for Small Living Plants or Artificial Fruit Clusters Add a Decorative Touch to the Home; Right, Makeup Box with Mirror Plugs into Nearest Socket



for YOUR HOME



Above, Spool Holder Also Has a Cutting Device That Snips the Thread at Just the Right Place; Hole at One End Permits Hanging Holder on Wall



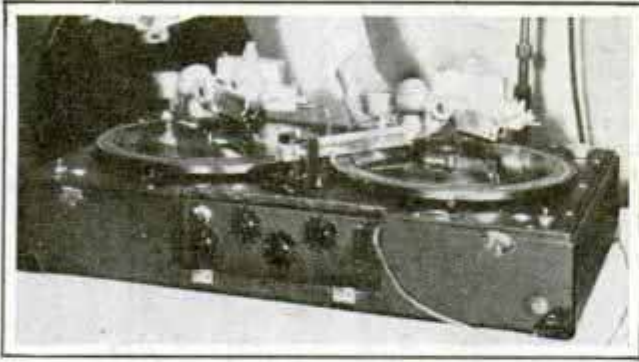
Left, Grater Attachment for Meat Grinder Makes Preparation of Raw Foods Easier; Above, Midget Electric Stove Is Handy for One-Room Apartment

8 1191

7 11

corp. - 5th Ave New York

"LIBRARY" OF SOUND EFFECTS IS PRODUCED ON RECORD



Mechanical Selector Drops Needle on Record at Correct Point to Pick Up Desired Sound Effect

Anything from a horse's neigh to the roar of a hurricane can be reproduced in the radio broadcasting studio by merely twirling a dial and pressing a button that selects the desired sound effect from a phonograph record instantly. On wax disks a "library" of sound has been recorded to furnish realistic effects for any broadcast. The records are played on a dual turntable electric phonograph with two mechanical pick-ups which, pre-set by dials, engage the needle with the record at the exact point to produce the sound specified in the script. Between each effect on the record is a blank channel, dividing the disk into sections. Each section is numbered; Section 1 may be a train whistle, Section 12 the bark of a dog, Section 37 a clock striking. To play Section 37, the operator turns the dial to "37," which moves the selector arm over the record to the proper position, then presses a button which engages the needle until pressure is released. With two turntables the operator is able to make dial adjustments in advance for the next sound.

damper baffle. During the warming-up period, the device remains closed, but as the heat rises, a spring bimetal element relaxes pressure on the damper and checks the flow of heat up the chimney. Another result is that the boiler retains its heat longer. As the heat goes down, the damper closes gradually thus allowing more draft for the next warm-up period.

8 1117

ORIGIN OF MEASUREMENT UNITS THE HUMAN BODY

The cubit.—The royal Egyptian cubit was based upon the measurement of an arm from the point of the elbow to the end of the middle finger. The Egyptian cubit averaged 20.62 inches. The Olympic cubit averaged 18.24 inches. The Olympic cubit was divided into two spans, or six palms or twenty-four digits. At a later date two-thirds of a cubit became one foot.

A palm.—The palm was the distance across the hand at the base of the fingers. The average was about three inches.

Digit.—The digit was originally the breadth of the forefinger. This with the Greeks became the thumb-nail breadths. When it was received into Rome it became the "uncia" or inch.

The foot.—This was the length of a foot on an average man. Twelve "unciae" made one foot.

The rod.—Sixteen good men were lined up as they came from church. Left toes were placed against the heel of the left foot of the man ahead. Sixteen of these feet made one rod.

The inch.—To standardize the inch King Edward II, in 1324 decreed that three barley corns taken from the center of the ear, placed end to end, should measure one inch. This was not a satisfactory solution as the size of the corns varied.

The yard.—Henry I decreed that the distance from the end of the nose to the end of the thumb was one yard. This seemed to be the natural way of measuring cloth.

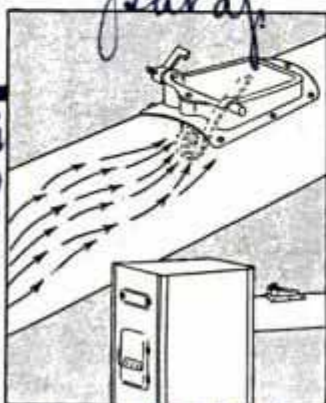
The fathom.—This was the length across two arms outstretched. A yard was one-half of a fathom.

It was not until the middle of the nineteenth century that standards of measurement were established so that modern machining is possible.

Em. Andrus Halberstam 3741-83rd St. Jackson Heights, N.Y.

Prudence 11/6 A.T. Atlas Athletic Corp

DRAFT CONTROL TO SAVE HEAT USED ON GAS OR OIL PLANT



Designed to save heat by reducing losses through the chimney, an automatic draft control is available for gas or oil-fired boilers. It is installed on the pipe and acts as a draft control and semi-

William H. Leach



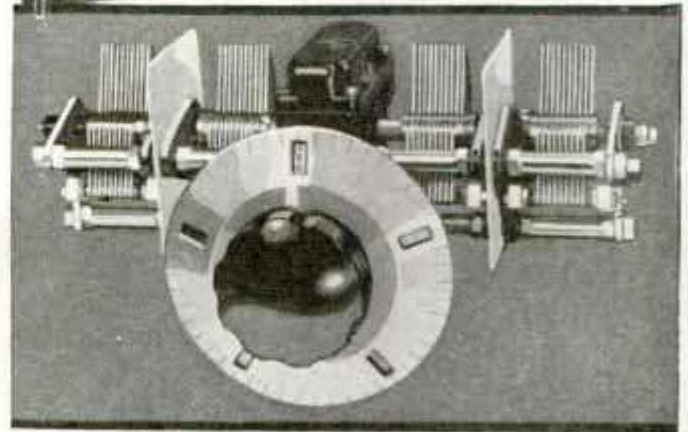
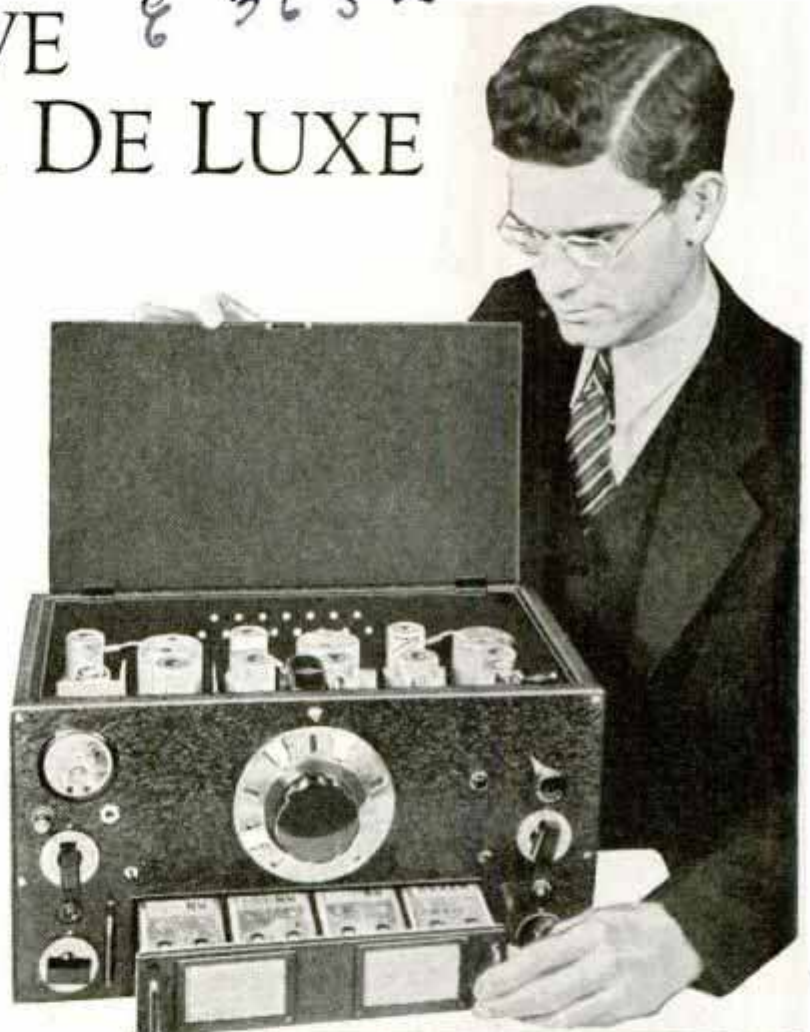
Radio

SHORT-WAVE RECEIVER DE LUXE

8 3652

PERHAPS the most interesting part of this exceptionally fine short-wave receiver is the tuning dial. Although it is read exactly like an ordinary dial, it has a total scale length of approximately 12 feet. Fifty division lines are engraved on the dial shell as shown in the center photo, and each tenth division is numbered in the usual way. However, the dial revolves ten times in covering the tuning range. With each complete revolution the numbers change automatically, giving continuous readings to 500. The numbers turn with the division lines, and change rapidly at the bottom of the dial when they are out of the operator's line of sight.

Tested in Popular Mechanics radio laboratory, and other locations in the Chicago area where receiving conditions place a handicap on the performance of any short-wave receiver, this set



showed remarkable selectivity and sensitivity. Foreign stations were received with full loud-speaker volume without the usual background noises and the busy

(Continued to page 142A)

National Company, Inc.

Two SELECTIVE CRYSTAL

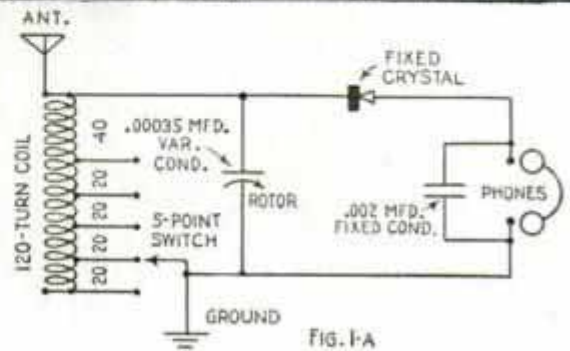
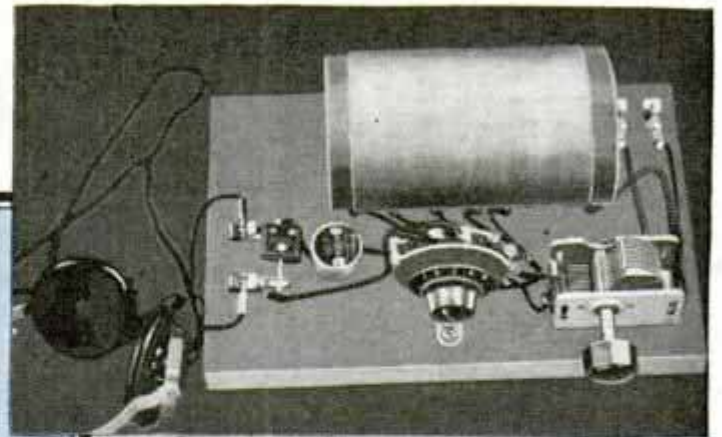
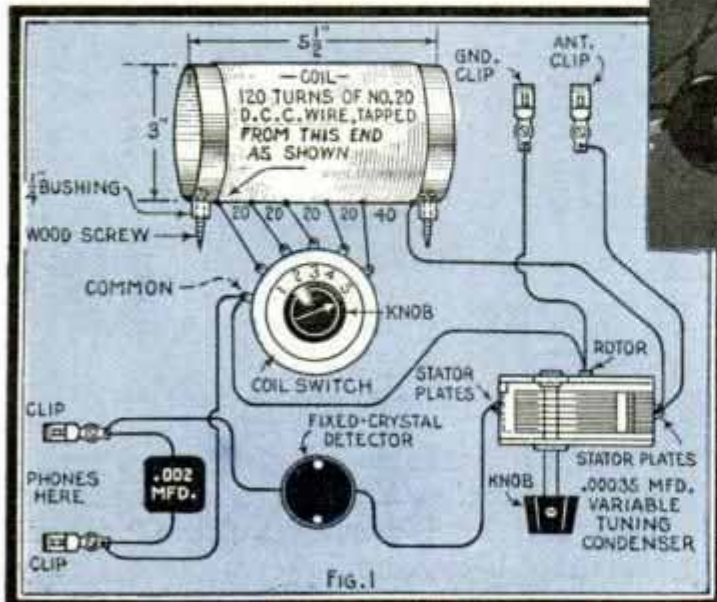


ANYONE can build a selective crystal receiver, for a few cents, that will bring in local programs with surprisingly good tone quality. The lowly crystal has never been surpassed as a detector of radio signals as far as tone is concerned. Of course, it is necessary to use a pair of 2,000-ohm headphones, but these can be obtained from catalogue houses and radio parts dealers for as little as 98 cents.

A good fixed crystal of the type shown in Fig. 1, and the photo at the right, sells for 45 cents; the glass-inclosed ad-

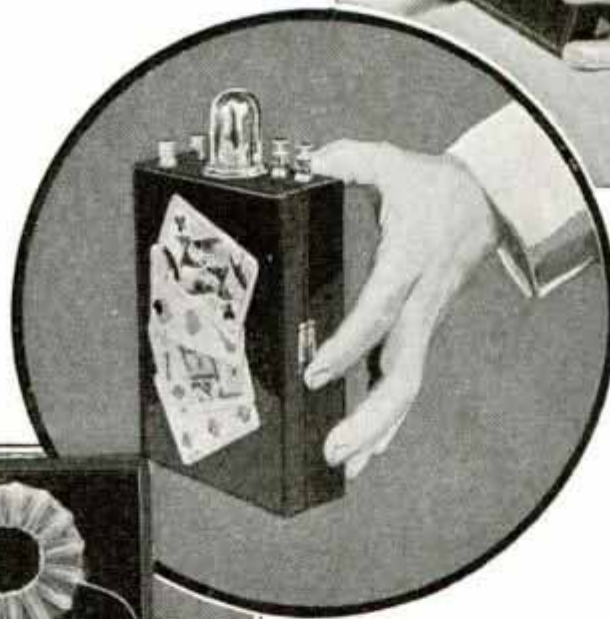
justable variety, illustrated on the opposite page, costs 22 cents. The remaining parts used in the sets to be described can be salvaged from old receivers or purchased for a very small sum.

The simplified wiring diagram for the most selective of these receivers appears in Fig. 1 and the schematic circuit diagram is given in Fig. 1-A. This simple receiver is assembled on a board 6 in. wide and 10 in. long. The coil is wound on a fiber or



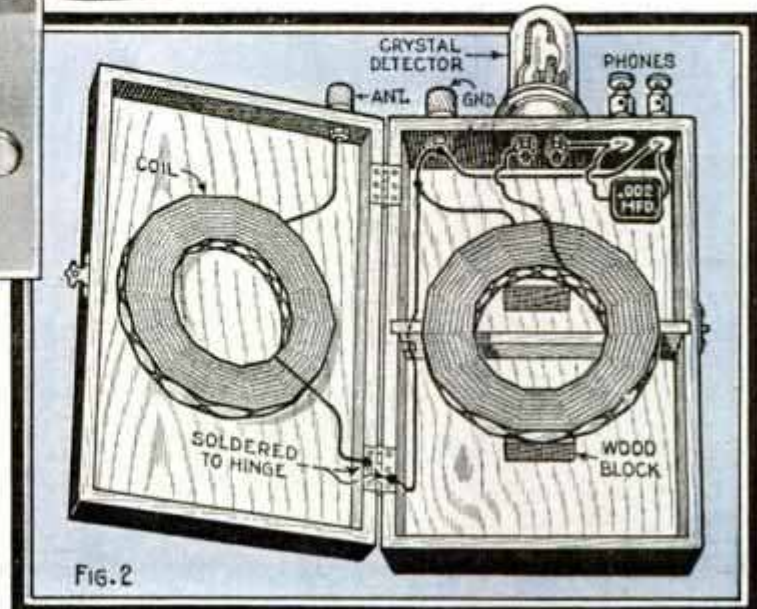
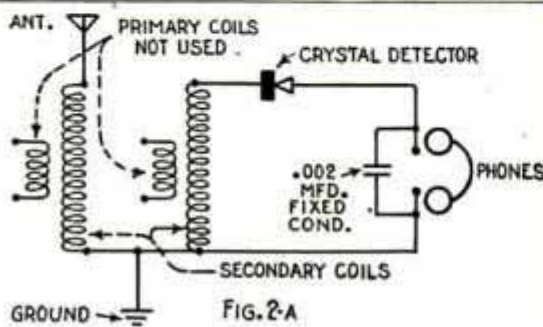
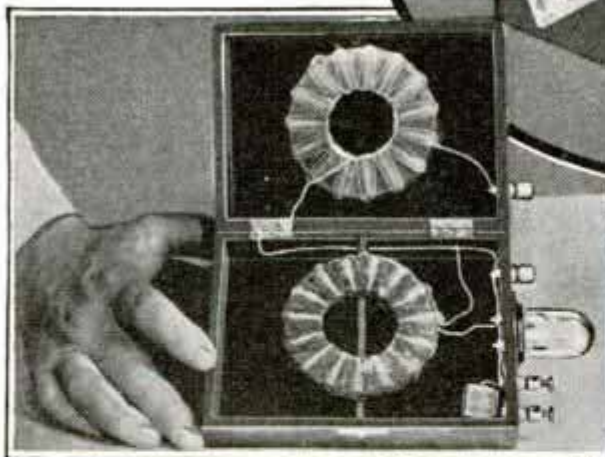
RECEIVERS *at low cost*

cardboard tube, 5½ in. long and 3 in. in diameter. A large mailing tube of the same size can be used if fiber tubing is not available. If cardboard tubing is used, it should be given a coat of shellac and thoroughly dried before the coil is wound. The close-wound winding consists of 120 turns of No. 20 double-cotton covered copper magnet wire. Anchor the starting and finishing ends by passing the wire in and out through two small holes drilled, or punched, through the ends of the form. About 6 or 8 in. of wire should be left at each end. This coil is tapped every 20 turns for 4 taps, leaving 40 turns at the right end; these may be made by counting the turns and lifting the turn to be tapped. A short piece of matchstick inserted under

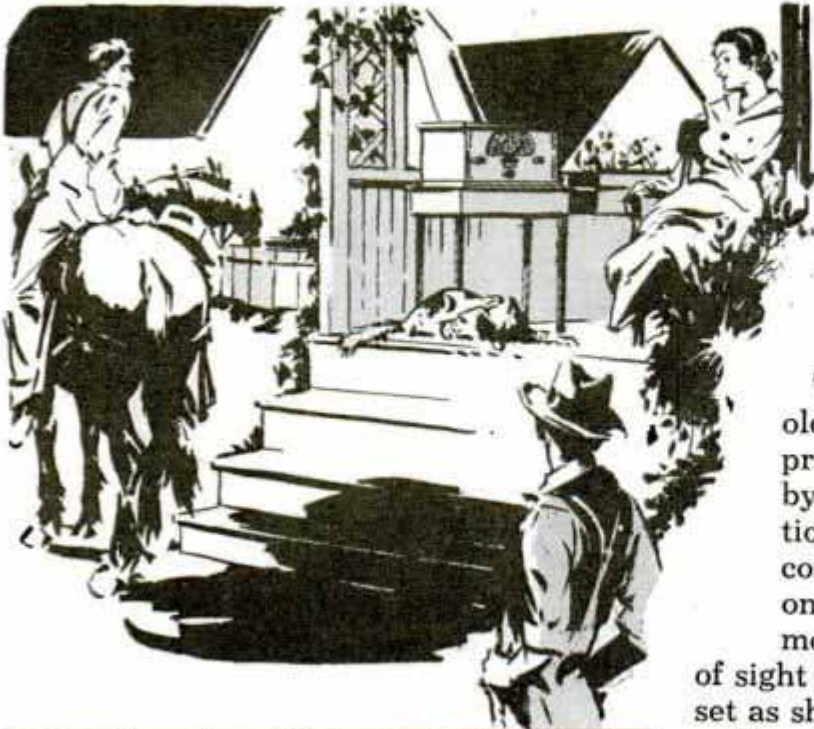


the wire will hold it up so that the cotton insulation may be scraped from the wire at these points. Short leads of the same wire are soldered to each tap for the 5-point switch.

(Continued to page 146A)



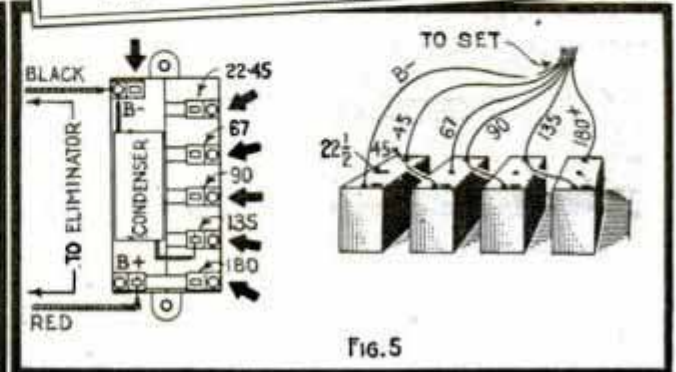
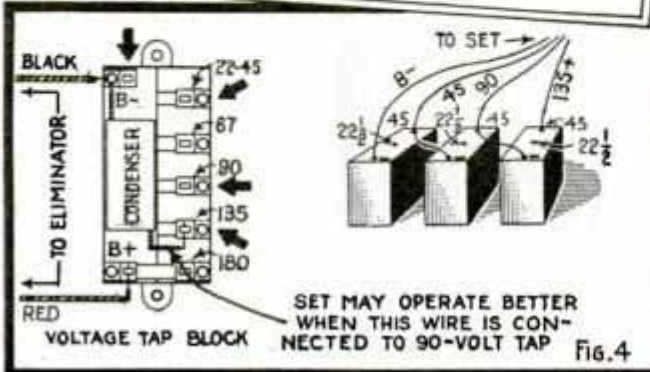
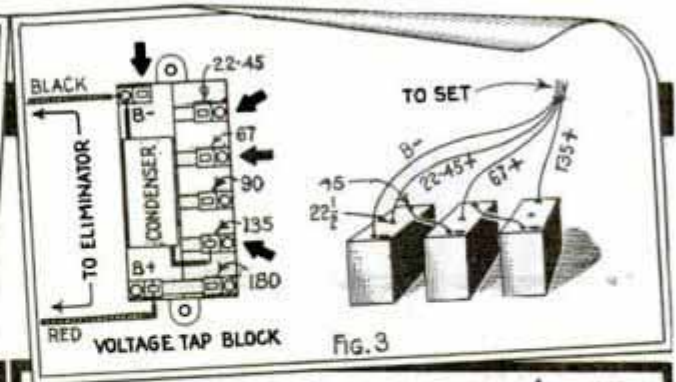
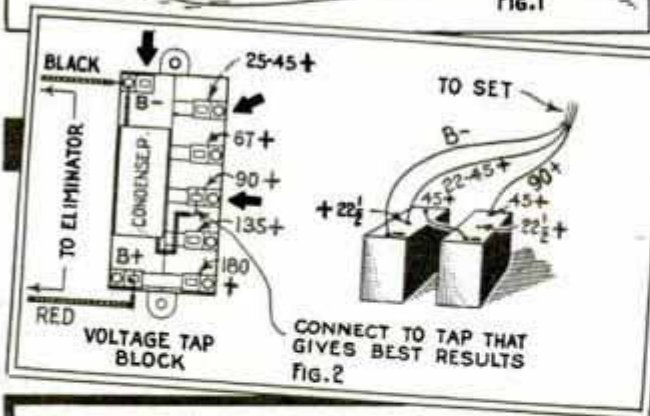
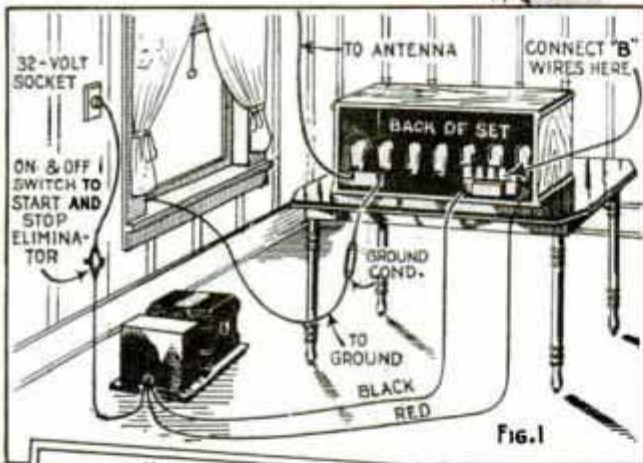
E 36 45 361 W. Superior Chicago
B-Eliminator for Battery Set on Farm Plant



IF YOU live on a farm equipped with a 32-volt lighting plant, it is a simple matter to make your battery receiver all-electric. Anyone can shift the connections necessary to change from B-batteries to one of the B-power units designed to operate directly from the 32-volt supply line.

These B-eliminators employ the old reliable generator principle of producing current, the same as used by every automobile without exception. No rectifier tubes or vibrating contacts are required. Combined in one unit, this small quiet-running motor generator may be placed out of sight in a closet or on the floor near the set as shown in Fig. 1.

The regular 30-ma. type will operate any ordinary battery receiver of 5 or 6 tubes with more B-power than is required. On sets having more than 6 tubes it is advisable to use a unit having greater capacity, depending on the mill drain of your receiver. Figs. 2, 3, 4 and 5 show how to change the wires from standard B-battery combinations to the B-eliminator. Arrows indicate where each wire from your set connects to the voltage-terminal block on the unit.



HINTS FOR RADIO EXPERIMENTERS

Right, Adjustable Support from Music Stand Makes Good 5-Meter Antenna for Car; Wooden Tool Handle Is Drilled Lengthwise to Take Antenna and Iron-Rod Bracket Bolted to Bumper; a Wood or Fiber Plug Separates the Metal Rods in the Handle; Below, Handy Miter Made with Angle Iron



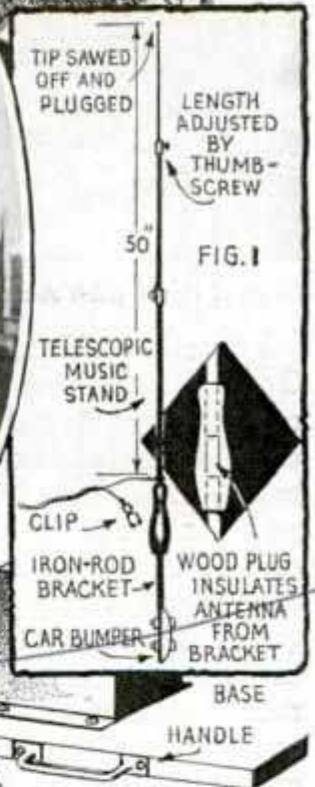
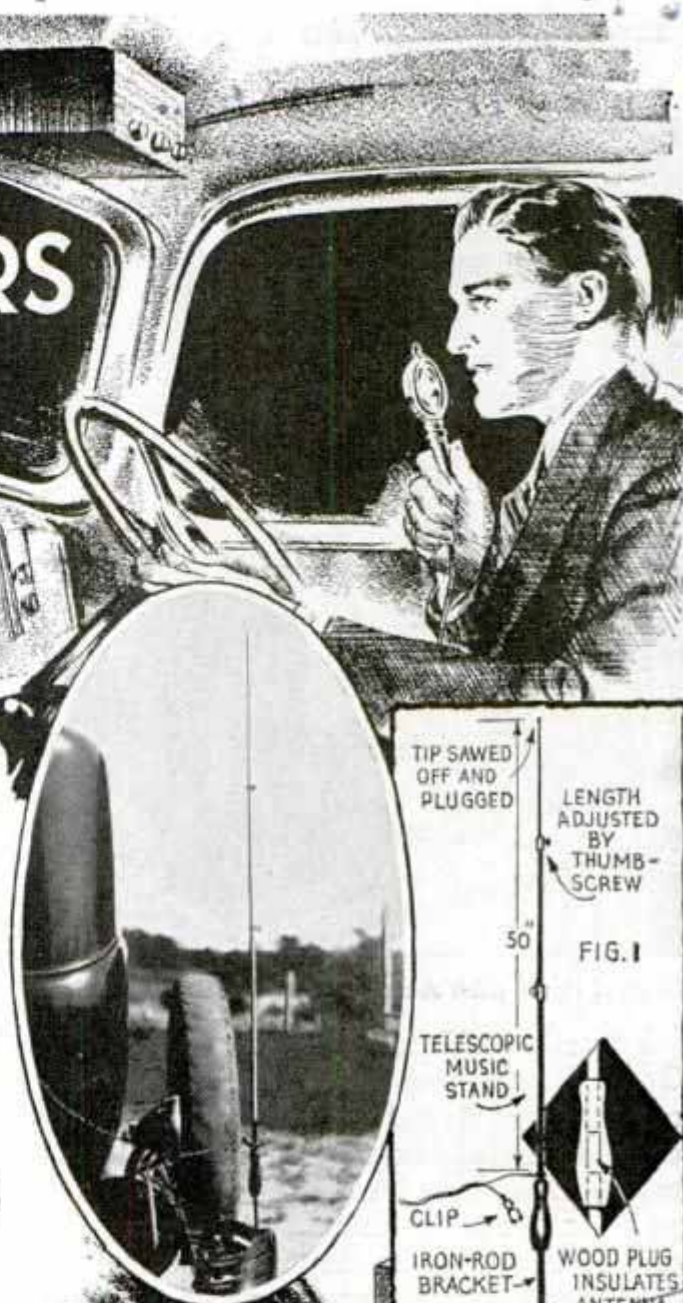
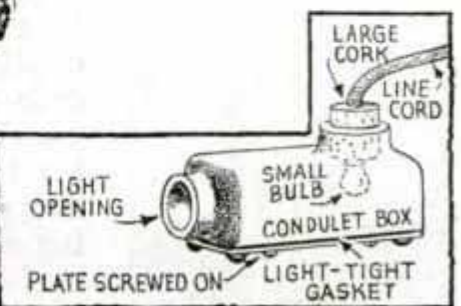
Above, Interference Filters for Use between Interfering Apparatus and Line, or Line and Receiver; Unit at Right Inserts in Extension Leads, the Other Plugs in Outlet



Small Low-Priced $\frac{1}{8}$ -In. Electric Drill, for Radio Experimenters and Service Men, Does Away with Tiresome Hand Drilling in Metal Receiver Bases and Transmitter Racks

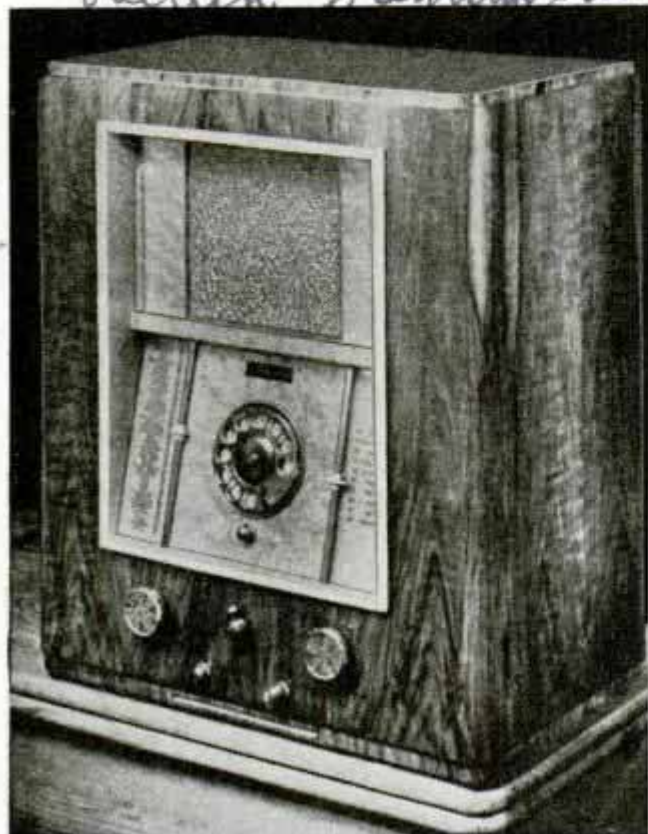


Above, Handles Aid in Carrying Heavy Power Packs; Below, Ordinary Conduit Fitting Used as Light-Source Box for Operating Photocell Relay



3642
 Wash. D.C. 70 Washington Ave.

Broadcast Receiver Has Automatic Dial for Locating Stations



Control Panel with Automatic Dial and Station List

Favorite stations may be dialed on this German radio receiver in the same manner that you would dial phone calls on an ordinary automatic telephone. The number combinations for a selected group appear on the front panel. When properly dialed, the desired station is accurately tuned and the program comes in with good clarity and volume. It is claimed that the tuning system differs widely from former methods where a number of fixed condensers were cut in and out by means of a multi-point switch.



Beat Oscillator Aids in Tuning

With this instrument attached to any short-wave or broadcast receiver of the superheterodyne type, anyone can listen to the many continuous-wave code signals that would otherwise be inaudible. Helpful in learning code, it is also useful for tuning in weak signals by

the sensitive "birdie" method. It may be operated with receivers using either 2.5 or 6.3-volt tubes.

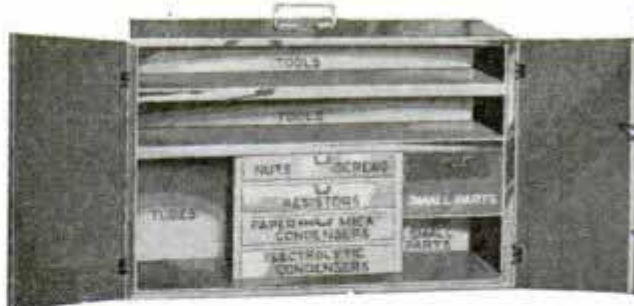
Transformer Regulates Line Voltage

The highest performance of electric appliances can be maintained and their life greatly increased by keeping the voltage supply as near as possible to the normal rating specified. This is particularly true of radio receivers operated in localities where there is wide line-voltage fluctuation. The voltage-regulating transformer illustrated, is provided with a multi-tap primary switch and a sensitive voltmeter mounted for convenient reading.



Steel Cabinet for Shop or Portable Use

This portable steel cabinet is arranged to take the necessary tools and parts commonly used by radio experimenters and service men. A place for everything and everything in its place saves time, money and patience. Three of the four center



Portable Cabinet for Tools and Radio Parts

drawers are divided into "pigeonholes," and there is ample space on either side for tubes and replacement parts. The two upper shelves are of sufficient length to accommodate a soldering iron, hand drill and smaller tools.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

Handwritten notes and signatures: 'Moltherrstrabe 2, Chicago', '500. S. Throop Chicago', 'E 36 46', 'E 36 31', 'E 36 18', 'E 36 44', 'RCA Mfg Co.', 'Mfg Co. 599', 'Solar'.



The Latest in METAL FURNITURE

By W. T. WARDE

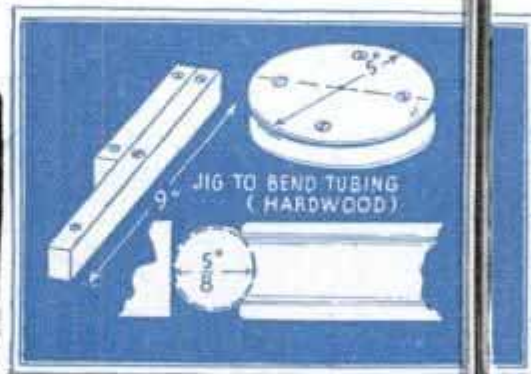
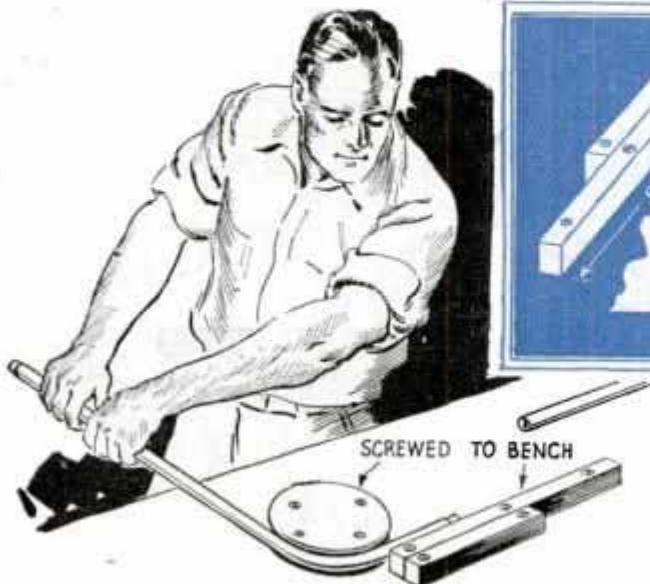
PART I

SMART SMOKING STAND OF ALUMINUM

FOR making smoking stands, small tables, candlesticks, lamps and many other items in modified modern design, the use of sheet and tube aluminum offers interesting and practical possibilities, depending largely on the ingenuity of the maker. Aluminum can be had in many shapes and sizes. The tubing is available in $\frac{1}{8}$ -in. diameter, and the sizes increase by sixteenths and eighths of an inch, up to 2 in. in diameter, and then by larger jumps up to 6 in. in diameter. Each size will fit snugly inside the next larger size, which is an advantage in many forms of construction. The new resin plastics, obtainable in sheet, tube and rod form, also lend themselves to the making of modern furniture and fit in well with aluminum construction. In this smoking stand, the disk into which the ash receiver fits could well be cut from sheet plastic, either black or colored. Similarly, this material could be used

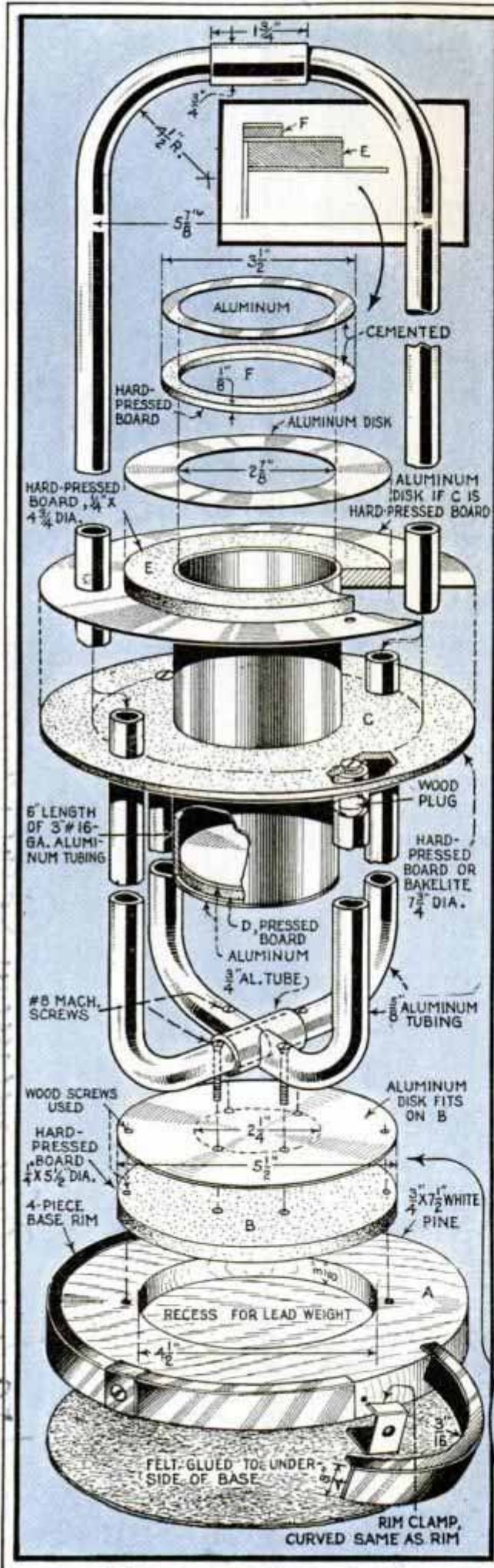


Stubs Aluminum Company New York
60 Walker



Homemade Jig That Will Bend the Tubing without Kinking It

Aluminum - Steel Sales

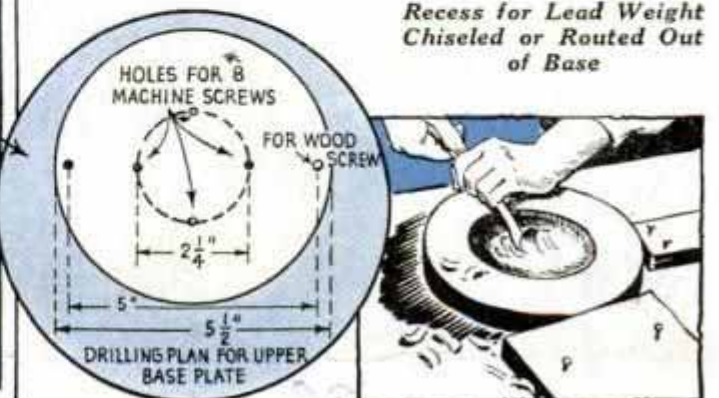


Right, Pouring Sand into Plugged Tubing before Bending; Left, Filing Ends to Fit in Joining Sleeve

in making up the base, although in the original these members were cut from wood and from hard-pressed board.

To make the smoking stand, you start with the base, cutting it out of a piece of white pine. If this is done on a scroll saw, accurate disks can be cut with the aid of the jig illustrated on the last page of the article. The base is next routed or chiseled out to form a recess for holding a lead weight of about 3 lbs. The other disks to be used may also be cut at this time. One is slightly larger than the recess in the base and fits over it; another serves as the holder for the ash receiver, and two smaller ones are used on the ash receiver, one as a flange around the open end, and the other to form the bottom. On disks from which the center is also cut out, forming a ring, center the piece on the pin of the circle-cutting jig, then cut out the inner circle, and, keeping this in place, cut the outer circle last. A strip of paper, the thickness of the saw blade, should be inserted between the inner cutout and the outer piece, before making the second circle. With the exception of the wood base, all of these disks are cut from hard-pressed board and are used only to serve as a backing to stiffen aluminum disks of exactly the same size to which they are cemented with "liquid solder." In case sheet plastic is used, it is not covered with

Recess for Lead Weight Chiseled or Routed Out of Base



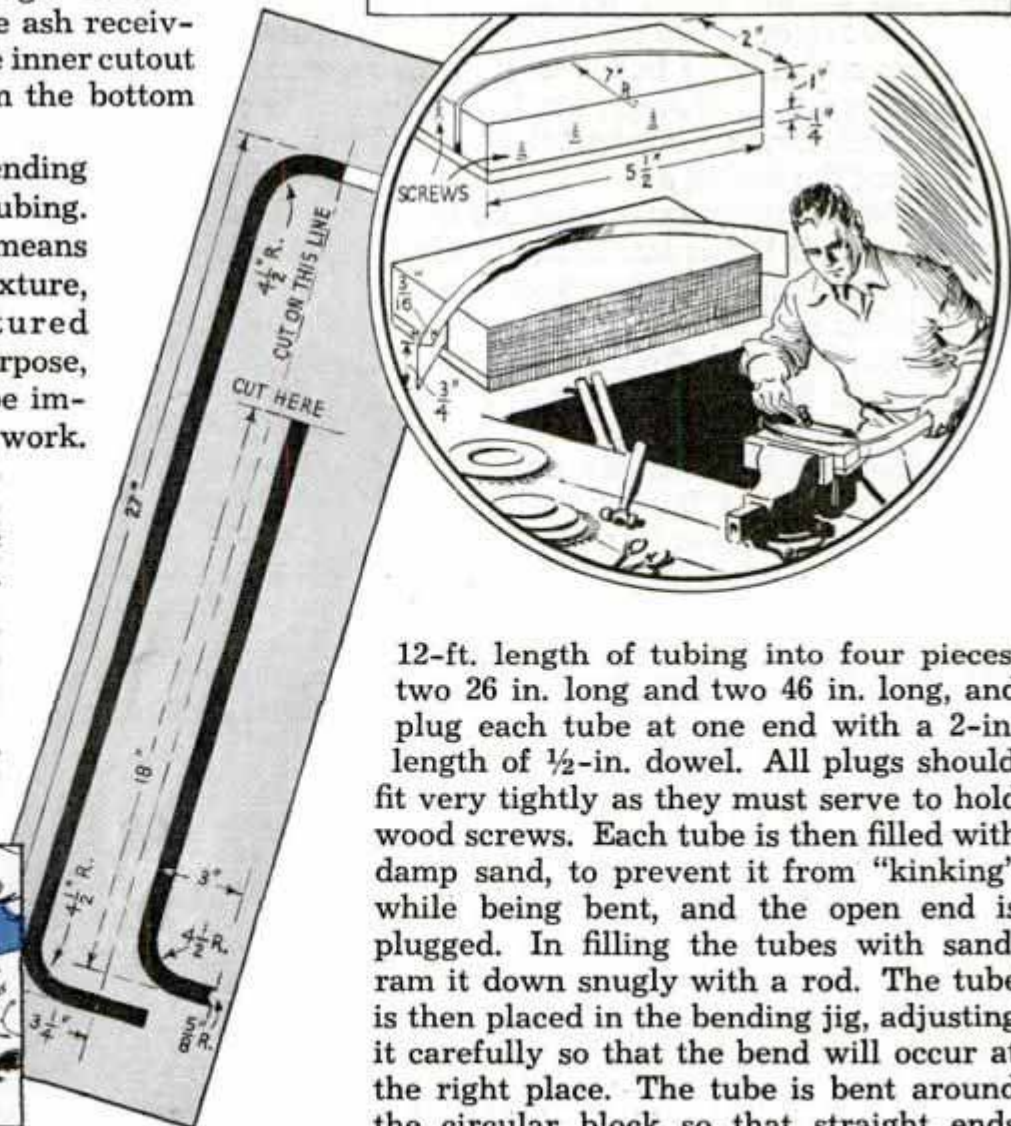
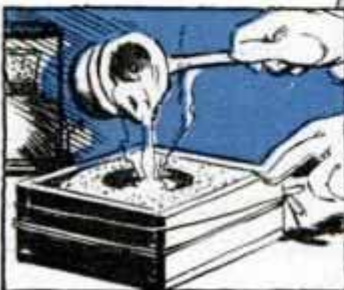


Tubing Must Be Cut Off Squarely to Size; Right, Cementing Aluminum to Wood with "Liquid Solder"

aluminum disks. The cutting of aluminum can also be done on the scroll saw, in which case a metal-cutting blade is used. Another method is to cut the disks out after the aluminum has already been cemented to the hard-pressed board. This method will eliminate slight variation in size and fit, which sometimes happens when the disks are all cut separately. If you have a lathe, you can mount the disks, previously cut a trifle oversize with a saw, on a faceplate, and then turn them down to the finished diameter, which will assure you of a very neat edge. In cutting the flange on the ash receiver, remember that the inner cutout is to be used to form the bottom of the container.

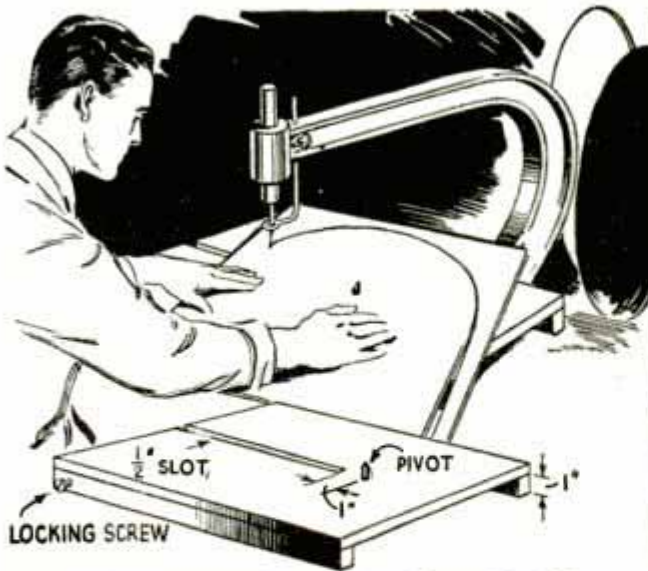
Next comes the bending and cutting of the tubing. This can be done by means of a tube-bending fixture, which is manufactured especially for the purpose, or a simple jig can be improvised to do the work. Details and measurements of such a jig are given in one of the drawings. After it has been screwed to the top of the workbench, cut the

Molten Lead Poured into Sand Mold to Form Base Weight



After Cutting and Bending the Parts, Assembly Is a Simple Matter; Below, Edging for Base Is Bent to Right Curvature and Hammered over at Right Angles in Form

12-ft. length of tubing into four pieces, two 26 in. long and two 46 in. long, and plug each tube at one end with a 2-in. length of $\frac{1}{2}$ -in. dowel. All plugs should fit very tightly as they must serve to hold wood screws. Each tube is then filled with damp sand, to prevent it from "kinking" while being bent, and the open end is plugged. In filling the tubes with sand, ram it down snugly with a rod. The tube is then placed in the bending jig, adjusting it carefully so that the bend will occur at the right place. The tube is bent around the circular block so that straight ends



Circle-Cutting Jig Fits on Scroll or Band-Saw Table; the Pivot Pin Is Always in Line with the Saw Blade and the Distance between Them Is the Radius of the Circle

1	12 ft. length of $\frac{3}{8}$ " aluminum tubing	16 gauge
1	$6\frac{1}{2}$ in. " " " "	16 "
1	6 in. " " $\frac{3}{4}$ " " "	16 "
1	9 in. square of sheet aluminum	20 "
2	6 in. " " " "	20 "
1	4 in. " " " "	20 "
2	$3\frac{1}{2}$ in. " " " "	20 "
1	36 in. strip " " "	1 inch wide
4	$1\frac{1}{2}$ in. machine screws and nuts	No. 8 duralumin
4	$\frac{1}{2}$ in. wood screws	round head
4	$\frac{3}{4}$ in. " " "	flat head
3	$\frac{5}{8}$ in. steel wood screws	flat head
1	piece white pine	$\frac{3}{4}$ " x $8\frac{1}{2}$ " x $8\frac{1}{2}$ "
1	" " "	$\frac{1}{4}$ " x $6\frac{1}{2}$ " x $6\frac{1}{2}$ "
1	" " "	$\frac{1}{4}$ " x $5\frac{1}{2}$ " x $5\frac{1}{2}$ "
1	" Hard-Pressed Board	$\frac{1}{8}$ " x 9" x 9"
1	" " "	$\frac{1}{8}$ " x $4\frac{1}{2}$ " x $4\frac{1}{2}$ "
1	12 in. length $\frac{1}{2}$ " dowel	
3	pounds pig lead	

will be at right angles. It is necessary to pull the long end a little past right angles so it will be just right when it springs back. The disadvantage of using a manufactured bending fixture is that marks are often left on the work, which are very difficult to remove. The sand method does not leave such marks but it may involve some waste due to spoilage, for, like many other operations, you must get the "knack" of bending the tubing at exactly the right place. Considerable care must be exercised to get all bends identical, especially in the case of the two longer pieces.

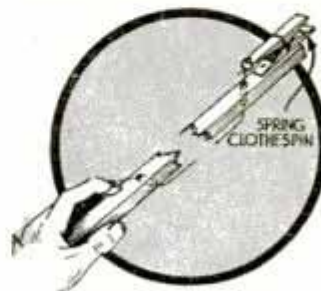
The tubes should then be cut to the exact lengths required. To do this, mark off two parallel lines on the workbench $3\frac{1}{4}$ in. apart and about 30 in. long. Lay one of the longer tubes, with the outside edge lined up with one line and the curved ends extending toward the second line. The ends are marked carefully where they cross the second line, and are cut off at these marks. The same method is followed with the shorter pieces. Two $1\frac{3}{4}$ -in. lengths of $\frac{3}{4}$ -in. tubing are used to join the ends of the longer pieces. If the curvature of the bent ends prevents them from butting together, use a file judiciously until a good fit is obtained. Two small holes are drilled and tapped through both the sleeves and joining ends, for screws, of which the heads are filed flush after final assembly.

The rest of the work is simply a matter of careful assembly according to the details furnished in the drawings. The base

has an edging consisting of four strips of aluminum. These are bent to the curvature of the base in a special made jig, the edge of the strips being hammered down at right angles to overlap the top surface of the base $\frac{3}{16}$ in. Four edging strips are used and small U-shaped pieces are screwed over the ends to conceal them. The edges of the hard-pressed board are filled with shellac and then given a couple coats of black enamel or aluminum bronze. The exposed part of the base may be finished in black or some other color.

"Long Fingers" to Retrieve Articles Lost under Gratings

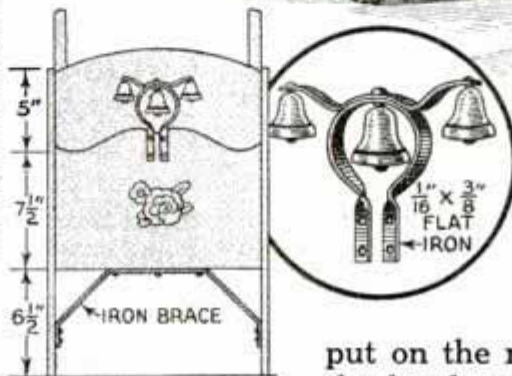
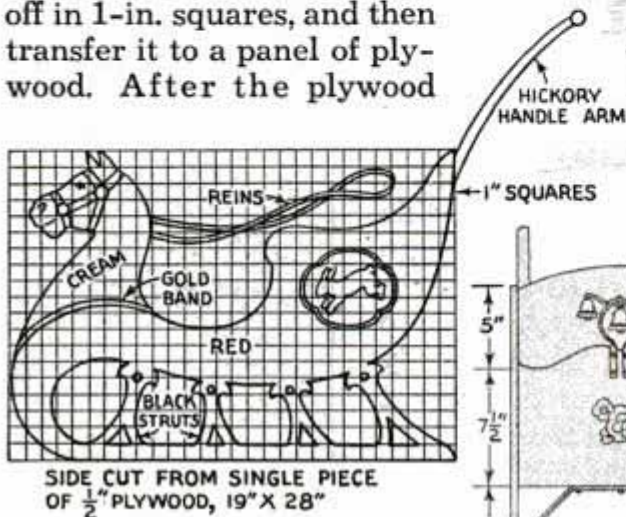
Besides being useful for retrieving small articles dropped in gratings and furnace registers, this improvised tool is handy for hanging or taking down light pictures, charts, etc. Also, it can be used to remove small articles from high shelves. The tool is made by screwing a spring clothespin to a light stick, the jaws of the clothespin being opened by pulling a wire,



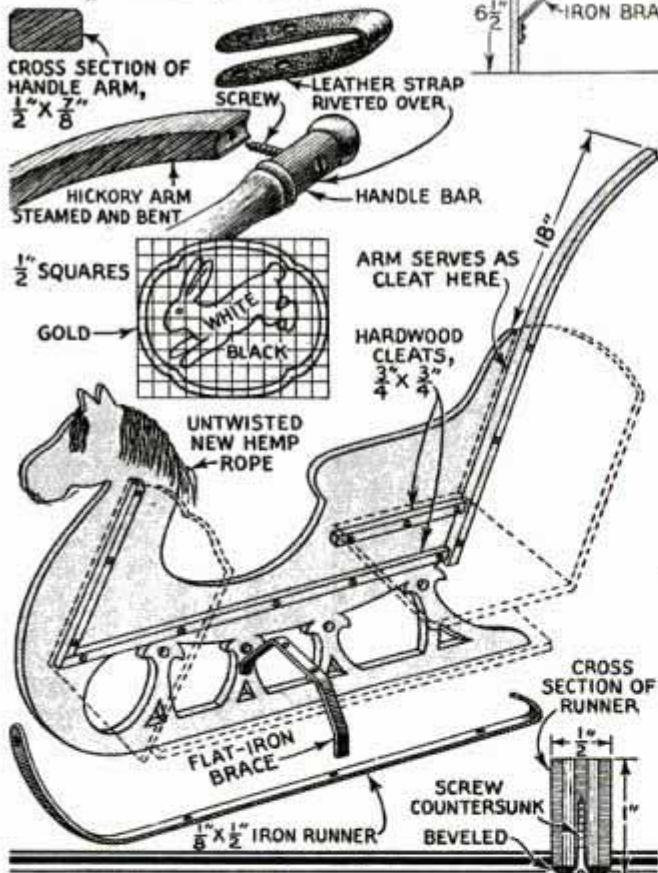
which is tied to the movable jaw of the clothespin, and is passed through holes in the stick as shown in the illustration. The holes should be drilled sufficiently large and at an angle so that the wire will work freely.

"Horse Sleigh" Gives Baby Thrill of Driving

Reminiscent of the days of bobsleds and cutters, this child's sleigh is made entirely of 1/2-in. plywood with the exception of the handle, runners and brace. It is a fine scroll-saw job and, when painted in bright colors, will have great appeal to the prospective passenger. First lay out the design on a piece of paper marked off in 1-in. squares, and then transfer it to a panel of plywood. After the plywood



This Red Sleigh, with Its Team of Dapple-Gray "Horses" and Jingling Bells, Makes a Big Hit with Any Youngster



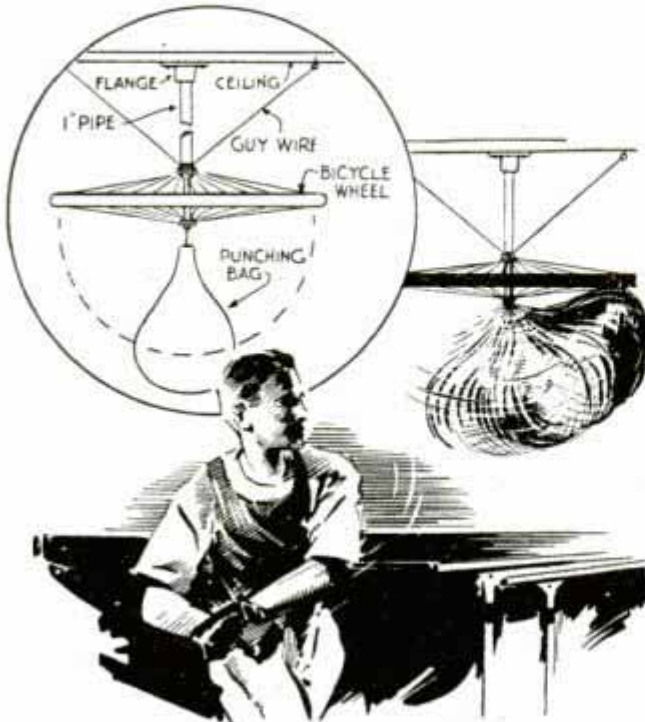
put on the runners and follow with the hardwood cleats, which support the bottom seat, back and dashboard.

Use casein glue and brass screws at the joints. The flat-iron brace between the runners can be attached to the bottom with small bolts. For the handle, use two pieces of 1/2 by 7/8-in. hickory steamed and bent in a form to the curve required. These handles serve as cleats for the back, and thus reinforce the entire structure. Note that the handle bar is held to the arms by long screws, with leather straps drawn tightly over the joint. A bracket for three sleigh bells can be made and screwed to the dash. Take care when using screws in plywood, especially in the runners, to drill holes equal to two-thirds the diameter of the screws so that the laminations will not be forced apart. In painting, the horses' heads may be done in a light color such as cream or white with iron-gray dappling stippled on. Use bright Chinese red for the body and black for the struts. A panel design of a rabbit or other familiar animal will greatly add to the juvenile appeal.

parts have been sawed out, sand the edges smooth and give them two or three coats of shellac, allowing each coat to dry before applying the next. This is necessary to keep moisture from entering and causing the wood layers to separate. Next,

Disks of tire-patching rubber cemented to the feet of your portable typewriter will help keep it from "creeping" on a table.

Noise of Punching Bag Is Absorbed by Bicycle Wheel



Suspended from the Ceiling with a Pipe Hanger, a Bicycle Wheel Makes a Noise-Absorbing Platform for a Punching Bag

If you have a punching bag in your basement and the noise disturbs people above, suspend it from a bicycle wheel as shown. The wheel will absorb vibration and eliminate most of the noise. A floor flange and a length of pipe, braced with guy wires, serve as a hanger, which is attached to the wheel with an eyebolt through the hub. The eye of this bolt extends into the lower end of the hanger where it is held with a small bolt inserted horizontally through the pipe. Washers are used on both sides of the hub, which is pulled up tightly with a nut. A second nut, having a ring soldered to it, serves as a lock nut and a hanger for the bag.—William Heeley, Lancaster, Mass.

Putty on Window Anchored Firmly by Scoring Sash



To provide a good anchorage for putty when glazing windows, take a steel tracing wheel and score the sash as shown. Score two or three lines along each side of

the sash. Then, when the putty is pressed into place it will sink into the small depressions made by the tracing wheel.—G. E. Hendrickson, Argyle, Wis.

Holes "Drilled" in Hack-Saw Blade with Electricity

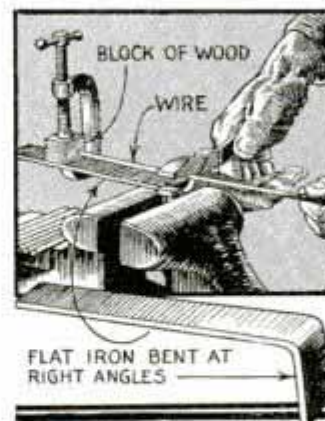
When a hack-saw blade breaks near the end, a new hole for clamping it in the frame may be made quickly without annealing or tedious drilling. Get a small carbon rod, such

as from a flashlight battery, and point one end. Then connect this with a wire to one post of a storage battery. Clamp the blade firmly to the other post and touch the pointed carbon



where the hole in the blade is desired, pressing firmly for a moment. The sharp point will become so hot it will melt a small hole in the metal, at the same time drawing the temper for $\frac{1}{2}$ in. or so around the hole, thus annealing the blade so it will not break out when clamped in the frame.—Floyd Meek, Rockbridge, Ill.

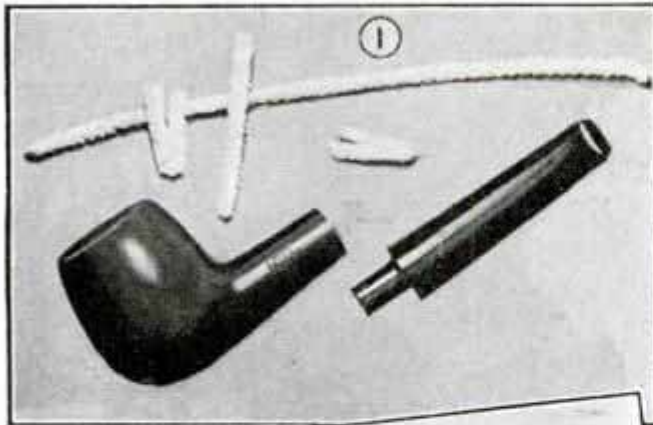
Wire Cut to Equal Lengths with Adjustable Jig



This setup will enable you to combine speed and accuracy in cutting wires or small metal rods to specified lengths. The work is done with a pair of side-cutting pliers, the lower jaw of

which is clamped in a vise. A piece of flat iron is bent at right angles and held between the stationary vise jaw and the pliers. A wood or metal block is then clamped to the horizontal portion of the iron strip at a distance from the pliers equal to the desired length of the pieces which are to be cut.

Three Pipe-Smoking Tips from Old Timers

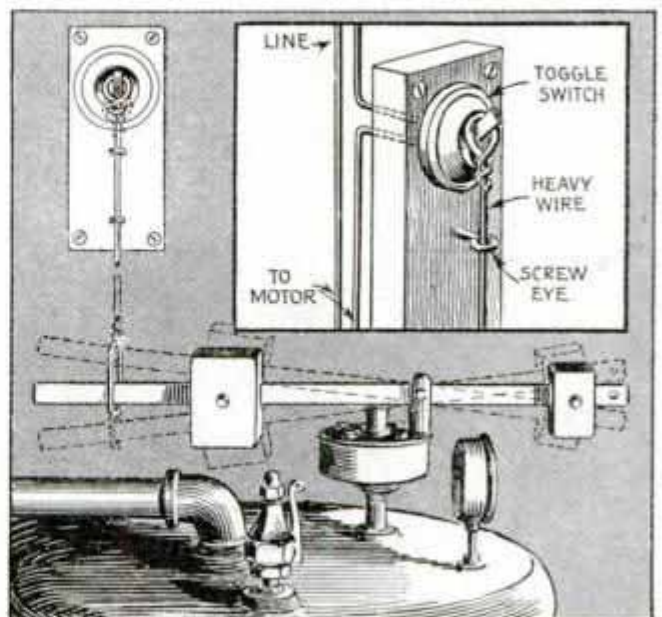


Bent double and inserted into the shank of a pipe bowl, ends first, as shown in Fig. 1, a short piece of pipe-stem cleaner will catch moisture and filter the smoke. A quick shake of the wrist will dislodge the cleaner to insert a new one. To prevent dust from getting into the stem, one smok-

er slips a pencil eraser of the kind shown in Fig. 2, over the end. Another smoker suggests the simple humidifier shown in Fig. 3, to keep tobacco moist. It is a piece of plaster of paris, which he keeps dampened with water. One dampening keeps a pouch of tobacco moist for several days.

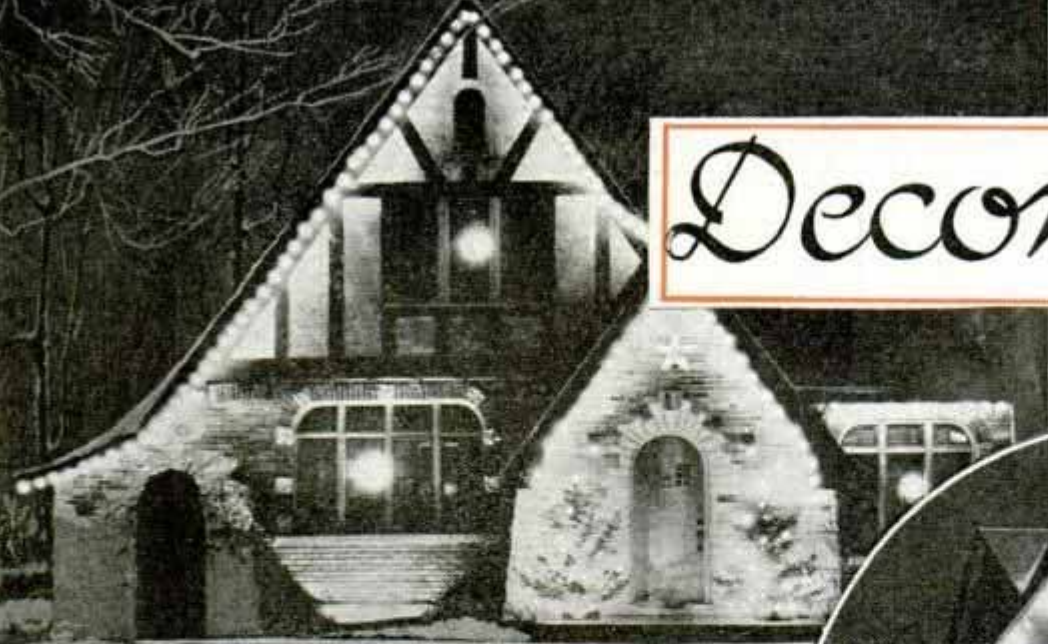
Boiler Thermostat Switches On the Forced-Draft Blower

Of the many methods improvised to automatically control a forced-draft blower on a boiler, this is one of the simplest. It is merely a toggle switch, installed in the line of the blower motor, and is operated by the boiler thermostat, which previously controlled the drafts. Thus, when pressure in the boiler drops, the counterweighted arm opens the switch, starting the blower motor. When the pressure is again built up, the arm rises and closes the switch. A stiff wire, guided by screw eyes in the base on which the switch is mounted, connects it to the arm. A long loop on the lower end of the wire allows the arm to move through a predetermined range before opening or closing the switch. A little experimenting may be necessary to determine the size of loop required.

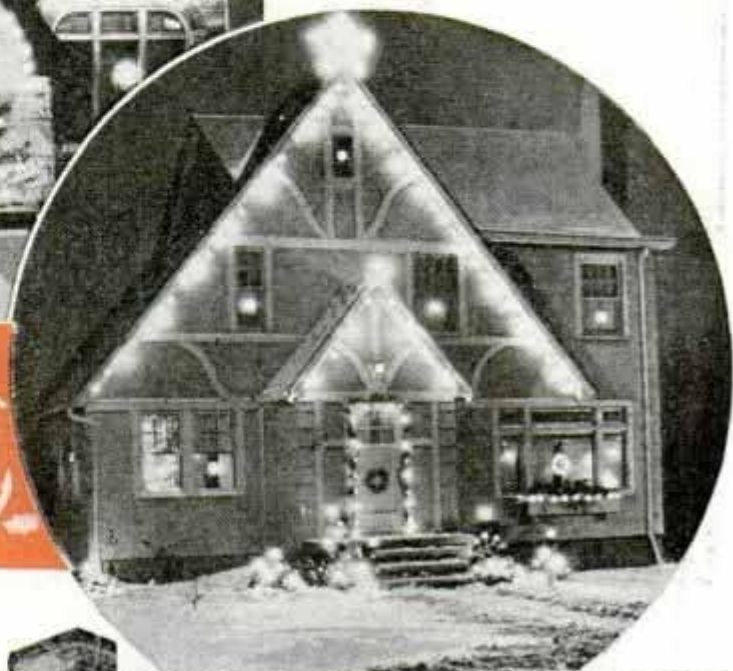


Toggle Switch Automatically Operated by Boiler Thermostat Controls Forced-Draft Blower

Decorations



Strings of Colored Lights under Eaves, Lighted Wreaths in Windows, Harmonizing Effects at the Ground Level—All at Small Expense—Will Dress Up the Home in Gaiety and Brilliance



There Are Many Possibilities for Realistic Outdoor Displays Such as This Typical Christmas Scene; the Insert Shows Another Unusual Effect—a Stuffed Deer Head on a Fabricated Body, with Antlers Lighted

That Say

"Merry Christmas"



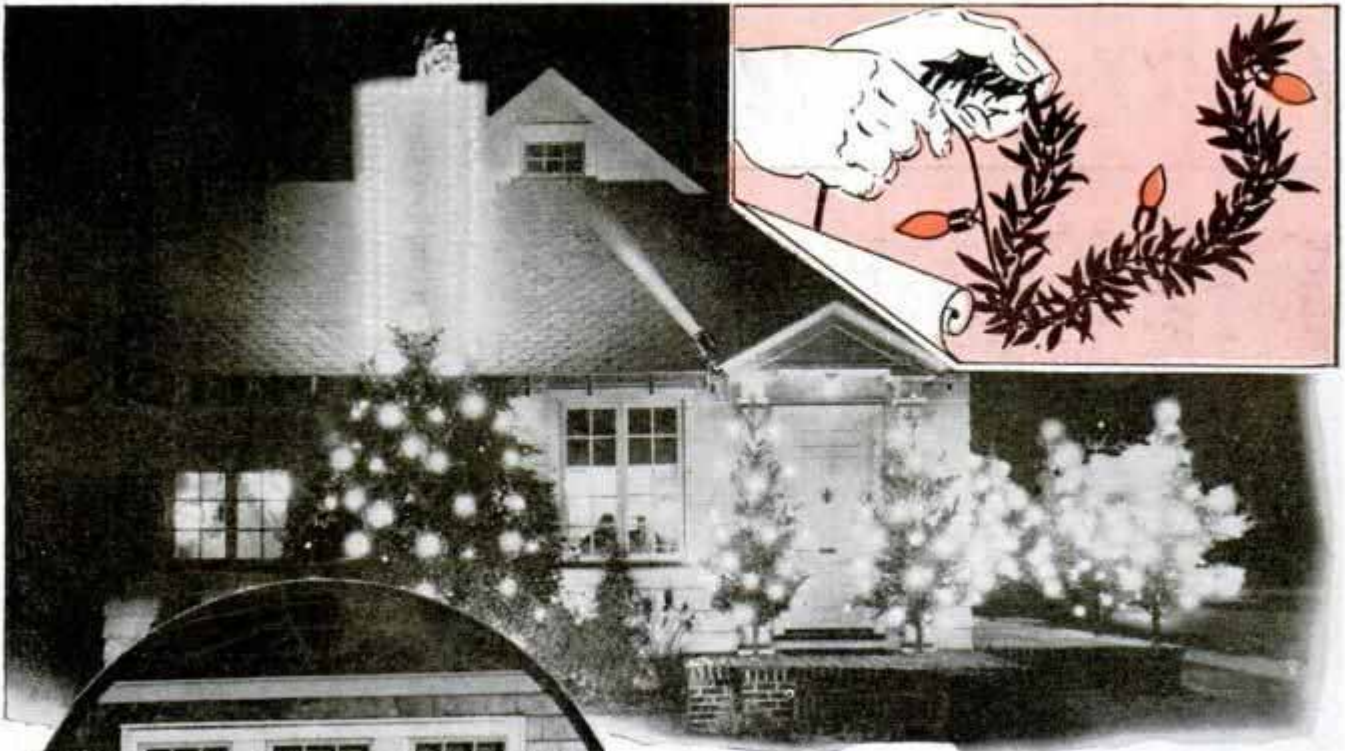
And Here He Comes, Right through the Sky, Sleighting along on a Carpet of Snow—a Picturesque Cutout Lighted at Night by a Spotlight

THERE are many ways of saying "Merry Christmas" with lights. Strings of lamps may be tacked under the eaves, windows may be adorned with electric candles, and small Christmas trees may be placed on either side of the front door, setting off the door with an illuminated star hung overhead. Spotlights directed against the walls are placed in inconspicuous positions. Electric light extension wires may be brought through basement windows or from porch outlets. In many cases strings of Christmas lights may be attractively entwined around the porch pillars, run along the edges of prominent chimneys, or they may be strung to advantage on evergreens.

To enhance the day as well as the night appearance of exterior hangings, you can wrap them with evergreen branches or with artificial roping. Yellow, orange, blue and green lamps produce the most pleasing lighting on green wrapping, but red lamps should be avoided as they tend to give the green material a brownish appearance. A Santa-Claus figure at the



Many Lively Figures of Santa, Like the Two Shown on This Page, Can Be Cut Out of Hard-Pressed Board, Touched Up to Realism with Paint, Fastened to a Suitable Framework, and Placed at a Dormer or Chimney; in the Absence of a Spotlight, the Figure May Be Vividly Outlined at Night by Strings of Colored Lights on Correspondingly Painted Portions



A Row of "Blazing" Trees and Strings of Lights Running up the Prominent Chimney, with Santa Peeping Out, Give This Small Home the Needed Touch; Above, How Wires Are Wrapped with Evergreen Sprigs or Artificial Foliage

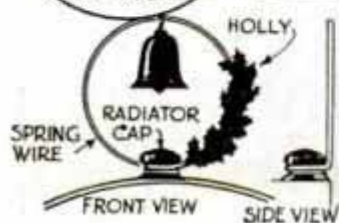
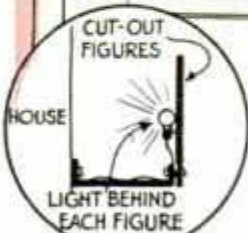


Banks of Electric Candles Placed at the Windows Give a Pleasing Change from the Usual Wreaths; Below, Doorway Silhouettes Brought in Sharp Relief from the Background by Means of Lights Concealed behind the Figures

chimney or dormer, makes a colorful picture. In setting up such figures, the strength of reinforcing frame members must be considered. Guy wires may be needed to provide support from various angles, and the figure should be fastened to the chimney or dormer with wire, or by other means. The figures can be painted in the usual red, white and green. If a spotlight is not available for night lighting, you can outline the figures with strings of lights of the same color as the part to which they are applied.



Why Neglect the Car? This Jingling Wreath, Clipped to the Radiator Cap, Takes the Place of Sleigh Bells



For those who desire novelty presentations for the front yard or for a portion of the house, decorative silhouettes are pleasing, such as the one of the "Three Wise Men." This may be cut out of sheet metal or hard-pressed board and mounted neatly over the front doorway, if the latter lends itself to such treatment. U-shaped brackets are used to hold the cutout a few inches from the wall, the details being shown in one of the illustrations. Two or three miniature lamp sockets are fastened behind the figures so that the lights cannot be seen from the front, but their illumination on the background will show the cutout in striking silhouette form. For daytime attractiveness, you can have a black silhouette against a white or other

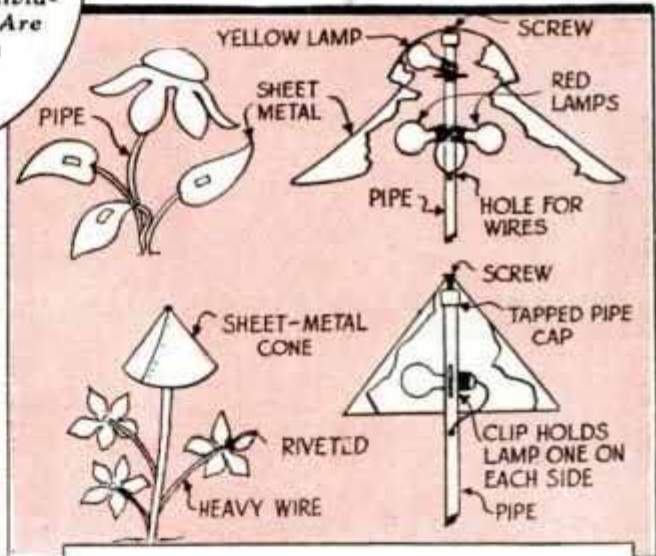
light-colored background, or the cutout may be painted in realistic colors.

Window silhouettes also make pleasing pictures. Perhaps the simplest method of making one is to cover the inside of the window pane with a sheet of tissue paper. The cutout is then pinned or glued to it, after which a desk or other lamp is arranged behind the scene. A more elaborate idea is a "shadow box." This calls for a sheet-metal reflector, which may be a length of common roof gutter. One or more lights are mounted on a strip, which is attached to the center of the reflector as shown. Ventilating holes on the top and bottom sides of the box may be necessary. Next comes the picture, or, if you wish, a lettered sign. The picture or letters are cut out of opaque paper, preferably black, and are pasted to a sheet of translucent paper, parchment, or Cellophane, which is large enough to overlap the edges of the box, and is stuck to it with strips of adhesive tape.

The family car shouldn't be overlooked in the decorating program. Small wreaths are built



For the Christmas Dinner Table, This Appropriate Centerpiece, Lighted Inside, Gives a Ruddy Glow; Even the Individual Nut Cups Are Lighted with Tiny Bulbs



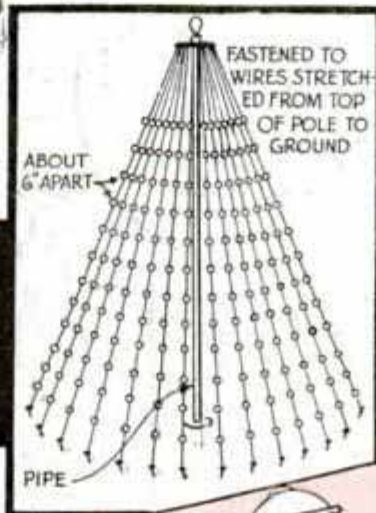
Small "Mushroom" Lamps to Stud the Snow-Covered Lawn with Spots of Color, Conceal the Lights under the Top Cone or Cap; They Can Be Made from Sheet Metal and Wire in a Variety of Designs



"Shadow Boxes" for Window Displays of Silhouetted Picture Effects or for Lettering Can Be Made by Anyone in a Few Hours' Time



This Imitation Christmas Tree Is Made with Strings of Lights Fastened to a Center Support Pole and Staked to the Ground in a Circle



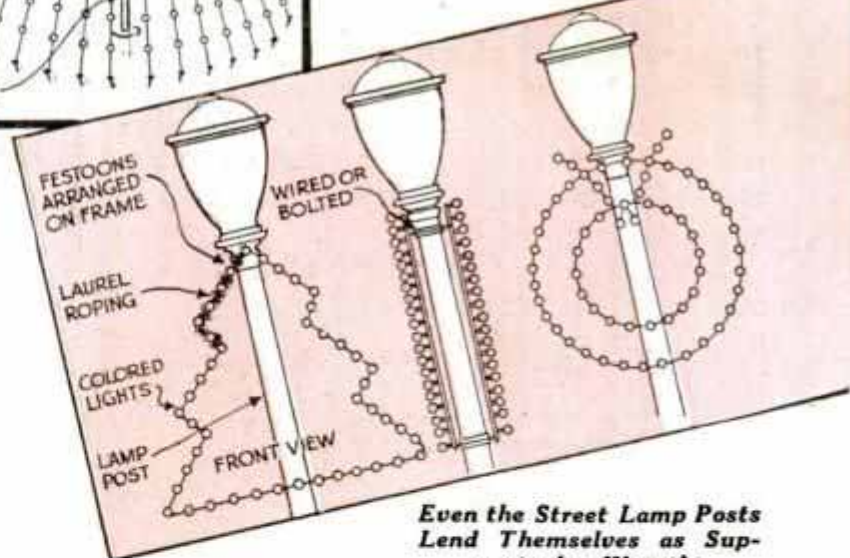
by coiling spring wire so that it will clamp on the radiator neck. A large bell or three small ones are then fastened to the top of the framework. The wire circle is wrapped with holly or other evergreen foliage to give it the appearance of a wreath.

The progressiveness of a merchants' association or civic group is reflected in an attractively lighted shopping district. A huge, lighted Christmas tree placed in the village square, where it can be viewed from many sides, is a prominent display which may be built for the cost of a wooden framework and a number of cut evergreens, which are attached to the outside of the framework, completely covering it. The big, imitation tree looks real and offers wonderful possibilities in effective lighting. Trees of this kind have been built 25 and 30 ft. high.

In trimming your inside Christmas tree, try brushing the branches with a thin

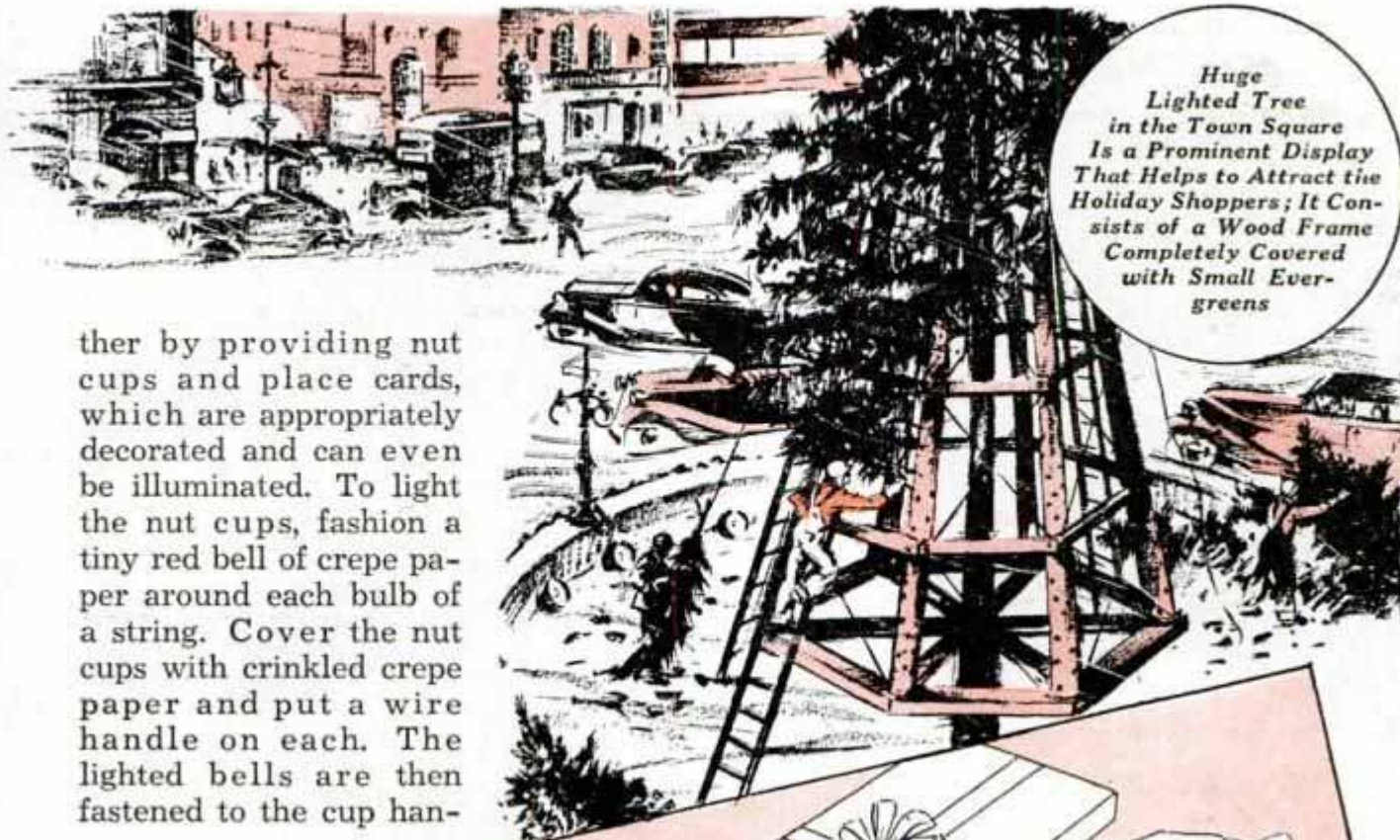
paste of flour and water, and then sprinkling them with artificial snow and icicles. Or, for a frosted effect, whitewash the branches with a spray gun. Doing the same with silver and gold bronzing powders means a little more work, but also surprising rich effects. When the tree branches and needles have been so prepared, unique results can be obtained by using lights and ornaments of similar colors. With yellow lights, use gold ornaments and gold tinsel. With blue lights, silver tinsel and ornaments blend well, and with white lights, silver, white and crystal ornaments show up to advantage.

Even the Christmas dinner table may be dressed up with the aid of a few lights, some crepe paper and cotton. The Santa-Claus centerpiece shown in one of the drawings is not difficult to make. The chimney from which Santa is emerging is a square cardboard box with sides cut away so



Even the Street Lamp Posts Lend Themselves as Supports for Wreaths

only the corners and edges are left for support. This framework is covered with red paper having a brick-work design. Cotton, sprinkled with snow, is put around the base, and to throw a ruddy glow on the table, a small lamp is placed inside the chimney. If laid on a saucer, the lamp will not scorch the tablecloth. The Santa Claus is then arranged in the opening, and his Cellophane bag can be filled with small favors for guests. You can go a step fur-



Huge Lighted Tree in the Town Square Is a Prominent Display That Helps to Attract the Holiday Shoppers; It Consists of a Wood Frame Completely Covered with Small Evergreens

ther by providing nut cups and place cards, which are appropriately decorated and can even be illuminated. To light the nut cups, fashion a tiny red bell of crepe paper around each bulb of a string. Cover the nut cups with crinkled crepe paper and put a wire handle on each. The lighted bells are then fastened to the cup han-



The Expression of Esteem and Thoughtfulness Goes with Gifts That Are Artfully Wrapped and Tied

dles with bows of red ribbon.

Wrapping of your Christmas parcels usually involves tedious work and effort to get them "just so." With the variety of new Christmas wrapping papers and striking ribbons, the wide selection of colored Cellophane in sheet and ribbon form, this year's wrapped parcels should excel those of last year. A number of tasteful touches in tying are shown here, which, when carefully followed, will give your parcels a truly



distinctive appearance. And, just because you have gone to such extra time and trouble, your gifts will be more expressive of esteem and thoughtfulness.

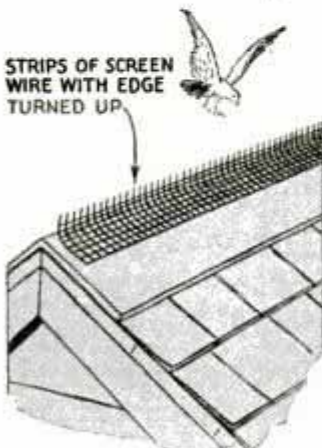
Toy Balloons Used as Ornamental Balls on Christmas Trees



Rubber Balloons Dipped in Paraffin and Sprinkled with Salt Make Ornaments for Christmas Trees

Glistening balls for ornaments on Christmas trees may be made by coating toy rubber balloons with melted paraffin and salt. Inflate the balloons to a diameter of not more than 4 in. and dip them, one at a time, into the melted paraffin. Several dippings may be necessary for each ball to make the shell thick enough. As soon as the wax has set, hold it under a stream of cold water at the sink to harden it thoroughly. The balloon may be deflated and removed if necessary to use it for further molds. If coarse salt is sprinkled over the wax before it hardens on the balloon, it will sparkle and glisten. When they are attached to the tree keep them away from the lamps as the heat will melt the paraffin.

Pigeons Kept from Roosting on Roof with Strip of Screen Wire



If you are troubled by pigeons roosting on the ridge of your buildings, fray one side of a strip of screen wire and tack it to the ridge as shown. This idea is also good on farms where fowls have

a habit of roosting on barns and other out-buildings. In this case $\frac{1}{4}$ or $\frac{1}{2}$ -in. wire mesh will be found to be more satisfactory than the screen wire.

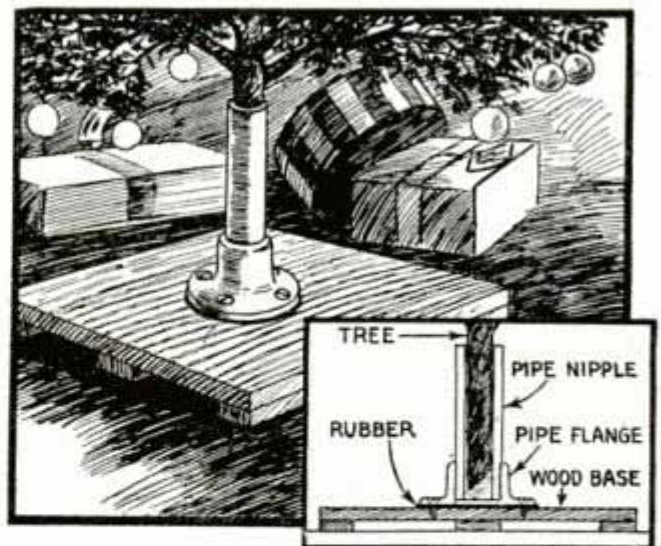
Thumbtacks Stored in Drawing Board with Folded Cardboard

Instead of sticking extra thumbtacks into the edge of a drawing board, where they are difficult to remove, and are often in the way of the T square, insert them into a folded strip of heavy cardboard. Then glue the ends of this strip to halves of a split cork. The assembly can now be slipped into a hole drilled in the edge of the board.



Christmas Tree Stays Fresh and Green in Water-Filled Holder

Supported by a holder in which you can keep water, your Christmas tree will remain fresh much longer than usual. To



Floor Flange and Nipple on Wood Base Make Sturdy Stand Which Holds Water to Keep Tree "Alive"

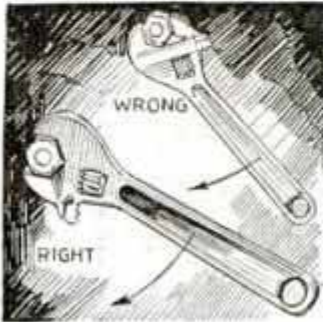
make such a holder, screw a floor flange to a wood base, using a piece of inner tube as a gasket between them to make a watertight joint. Then run a pipe nipple into the flange and set the tree in it. As your

trees may vary in size from year to year, it is best to use a large flange and nipple. Then you can insert wood wedges around a tree that fits loosely in the holder to keep it in an upright position.

Preventing Breakage of Wrench

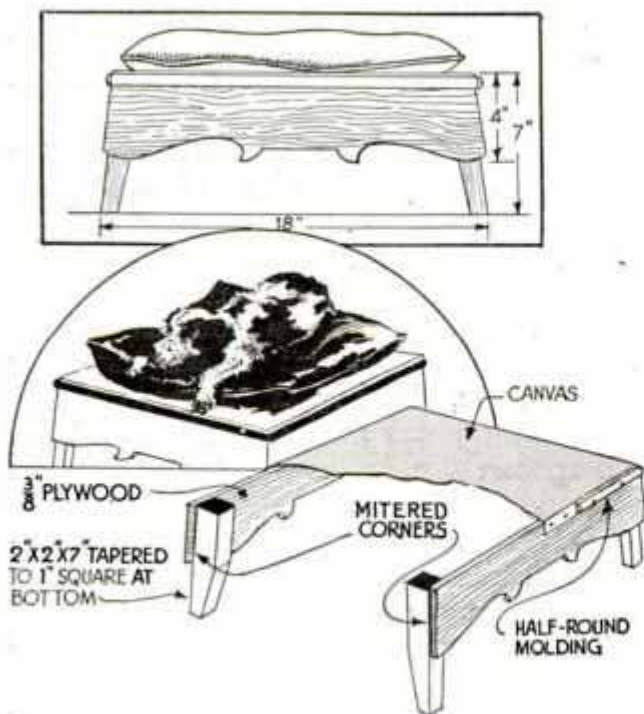
Wrenches of the type shown will stand considerable abuse if the adjustable jaw is kept facing the direction a nut is to be turned. When loosening or tightening a

nut, the greatest strain is on the jaw opposite the direction in which the wrench is moved and for this reason the stationary jaw should always be placed to take this strain.



Private Sleeping Couch for Your Dog Keeps It Off the Chairs

Your dog likes to get up off the floor to keep out of drafts when taking his nap, and it will prefer this low couch to chairs or other furniture. The couch can be made any suitable size, the dimensions given being suitable for a small dog. Glue and brads are used in assembling. The top is covered with a piece of canvas.



Comfortable Couch Your Dog Will Like to Sleep on to Keep Off Drafty Floors

Developing Tank Housed under Table Saves Space in Darkroom

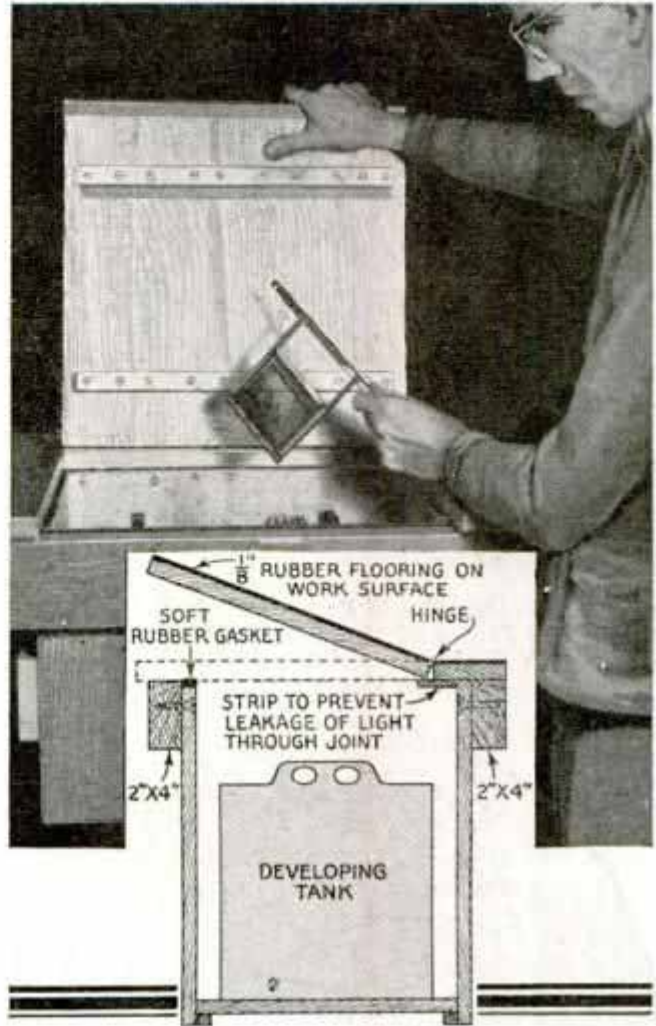


Photo-Developing Tank Kept under Table and Reached through Lid in Table Top Saves Space

By housing your developing equipment in a compartment under the worktable, considerable space can be saved in a darkroom. A section is cut from the table top and is hinged to swing upward. Redwood or cypress is excellent material for building the box. Paint the interior with a chemical-resistant preparation, such as asphaltum paint. The color should be black or dark green. If the edges of the lid are sealed with soft-rubber gasket, and the remainder of the box made light-tight, the darkroom lights can be turned on when the lid is down without fogging film that has been placed in the developer. It is a good idea to provide a latch for the lid to reduce possibility of opening it accidentally.—Walter E. Burton, Akron, O.

Hookless fasteners on luggage and clothing will work easily if the metal segments are rubbed with a piece of paraffin.



Radiator Valves Should Be Well Packed to Prevent Escape of Steam or Hot Water, Which Necessitates Adding "Raw" Water to Boiler

Little Things that

DO YOU KNOW

- That* Different paints on radiators will vary their heating capacity as much as 12 to 15 per cent
- That* "Stale" water is better than fresh water in your steam or hot-water heating plant
- That* A gas water heater should have a separate chimney outlet above your furnace smokestack
- That* Excessive clinker formation and burned grates in a furnace can be avoided
- That* Tight-fitting storm sash on all windows and doors may mean a fuel saving of about 20 per cent



"Overcoat" on the Furnace or Boiler and "Jackets" on Pipes Bring Excess Basement Heat Upstairs

THINGS that count in cutting your heating costs are not only those that minimize actual losses of heat, but also those that make a heating plant operate more efficiently, and those that avoid expensive replacements.

Corrosion in Hot-Water Systems: Many people change the water in hot-water systems every year or oftener, thinking that fresh water is better than "stale" water. But they overlook the fact that all water contains air and that air contains oxygen, which is the chief cause of rust in the inside of the boiler, piping and ra-

diators. After water in the system has given up its content of oxygen, further corrosive action stops until fresh water is added. Continuing to change water in the system will cause more and more rust, and will eventually necessitate the renewal of pipes. Therefore, the right procedure is to drain off only the sludge—particles of corrosion that accumulate at the lower part of the system when the plant is inoperative. Then, only a small quantity of water need be added to replace that removed. If your hot-water system has no leaks, and you do not allow the water to boil over through the expansion tank, the water can be used for many seasons. However, when you are absent during cold weather and the heating plant is not in use, there is, of course, the risk of freezing pipes and radiators, and for this reason the entire system should be drained completely.

Corrosion Faster in Steam Plants: Owing to higher temperatures, corrosion in a steam-heating plant is faster than it is in a hot-water system. Besides, the violent churning of the steam has a tendency to loosen the iron-oxide scale already formed, and to expose a fresh iron surface

Cut HEATING COSTS



Heat Losses by Filtration Reduced by Calking All Door and Window Frames, Both Inside and Out, and by Applying Good Weather Stripping

to further corrosion. Care should be taken that valves do not allow the escape of steam, necessitating frequent addition of water to the boiler.

"Hard" Water Another Factor: In most localities water contains lime, and when the percentage of lime is excessive, the water is "hard." The lime is deposited on the inside surfaces of the pipes, radiators and boiler. In the process of time this causes a hard coating and eventually results in pipes that are "limed up." Generally in a hot-water system where such trouble is acute, the water, restricted in flow, becomes overheated, forming steam, which ruptures a pipe or coil. This warning of such a bad condition is really fortunate, because piping coated with even a moderate layer of scale should be renewed as it acts as insulation, preventing the maximum heat transfer through the pipe. To make up for this, the fire is increased and an excessive amount of fuel is burned. Obviously, it is much cheaper to avoid lime deposits by using the water as long as possible, because after being used for a short time, the hardness is "boiled out" and the water becomes "soft."

Radiators and Radiator Covers: In order to transfer heat from a radiator to the



Proper Care of the Heating System Would Have Doubled the Life of These "Limed-Up" Pipes

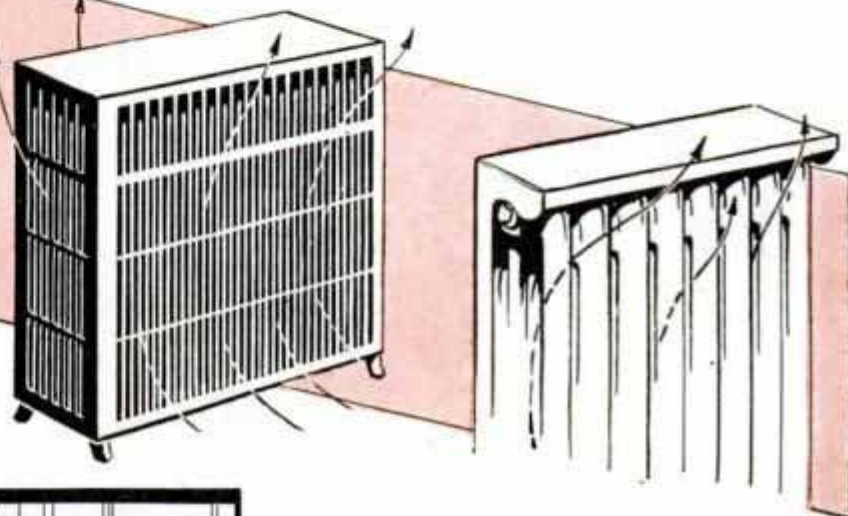


Storm Sash Serve Their Purpose Better if They Are Sealed in Place with Felt Strips, and if the "Weep Holes" Are Kept Closed



The Heat Transfer of Radiators Coated with Linseed-Oil Paint Is 12 to 15 Per Cent Greater Than if Coated with Gold or Aluminum Bronze

Some Radiator Covers That Retard Free Circulation of Air May Cause a Fuel Waste of 20 to 30 Per Cent by "Firing Up" to Maintain the Desired Room Temperatures



Radiator Not Shut Off in Cold Room May Cool Entire Heating System; Box of Insulating Board Prevents Heat Loss or Frozen Radiator; Rug against Door Keeps Cold Air Out of Adjacent Rooms

air of a room to be heated, good circulation of air is necessary. The comparatively cool air near the floor is slowly attracted toward a warm radiator because the air in contact with its hot surface moves upward. In rising, the heated air tends to create a vacuum, but instead of forming a vacuum, cool air near the floor is drawn in to fill this space, is heated, rises, and so the cycle continues. Any radiator cover that retards the air movement, tends to defeat the purpose of heating. When radiator covers retard the air flow, the tendency is to "fire up" in order to get the

desired room temperature, with the result that fuel costs will rise. It has been estimated that poorly designed radiator covers often cause a 30 per cent fuel waste. Therefore, only covers that will allow free movement of air should be used. A solid shield behind a radiator against an outside wall will save fuel as it prevents unnecessary dissipation of heat through the wall. Also, radiator shields that direct the air out into the room minimize the deposit of dirt on curtains, drapes and walls, reducing laundry and cleaning bills. Such a shield should be spaced about 2 in. from the top and back of the radiator.

Paint on Radiators: Only a few years ago it was common practice to paint all radiators with bronze paint, especially aluminum. Now the trend is to use ordinary oil paint that matches the walls and woodwork. The change meant an increase in heat transfer from the radiator to the room air, of 12 to 15 per cent. The explanation is that bronze paint really

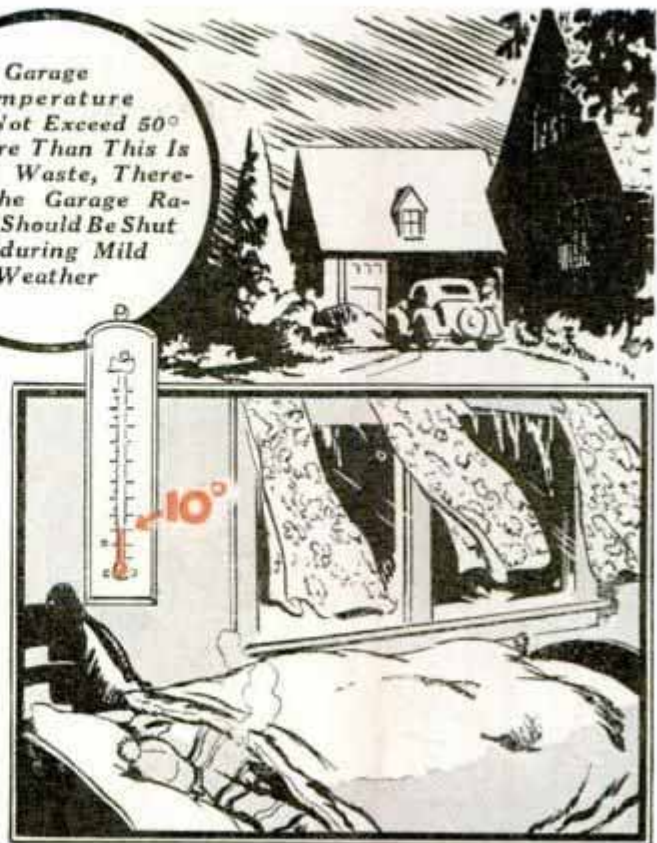
acts like a mirror and reflects some of the heat back into the radiator, in the same way as the reflector of an electric heater.

Storm Sash and Calking: In the average home, much more heat is lost through windows than through walls. For this reason, the provision of tight-fitting storm sash, preferably sealed at the edges with felt strips, on all doors and windows, means a great saving in your heating bills. According to actual measurements, it was found that heat radiation losses through windows and doors, can be reduced as much as 20 per cent by using storm sash.

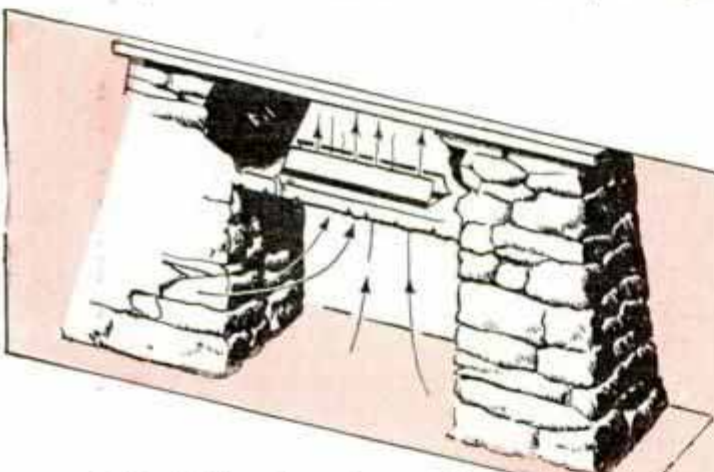
The "weep holes" at the bottom should be kept closed except occasionally to clear up condensation of moisture on the outer glass. Another source of heat loss is filtration through walls, on account of their porosity, through crevices around door and window frames, through cracks between foundation and walls, etc. Therefore, before doing a decorating job, be sure to have the workmen carefully caulk every crack at doors, windows and baseboard, using patching plaster. Oakum or other calking material, stuffed in cracks from the outside, is equally important. Weather-stripped doors and windows will also help to cut down losses due to filtration at these points.

Furnace "Overcoat" and Pipe Jackets: If your basement is overheated, and you

Garage Temperature Need Not Exceed 50° F.; More Than This Is a Heat Waste, Therefore, the Garage Radiator Should Be Shut Off during Mild Weather



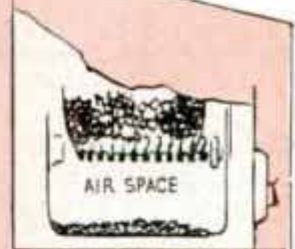
The Amount of Fresh Air Needed Is Often Over-Estimated and Extreme Changes in Temperature from Warm Living Rooms to Very Cold Bedrooms Are Often Detrimental to Health and May Be Costly



It Is Rather Expensive to Forget Closing the Fireplace Draft as a Great Volume of Warm Air Can Escape Up an Open Chimney



Insufficient Air Space in Choked Ashpit Often Results in Burned Grates, Excessive Clinker Formation and Poor Fuel Combustion

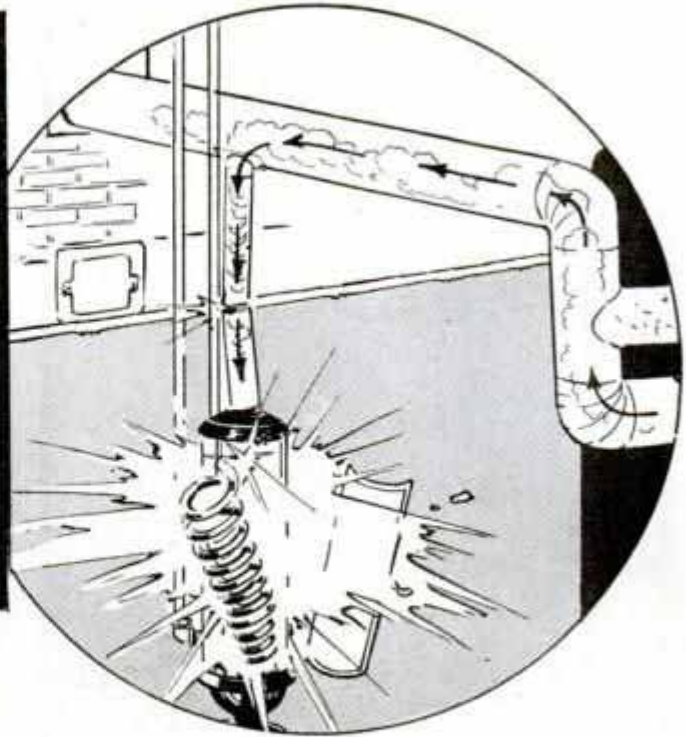
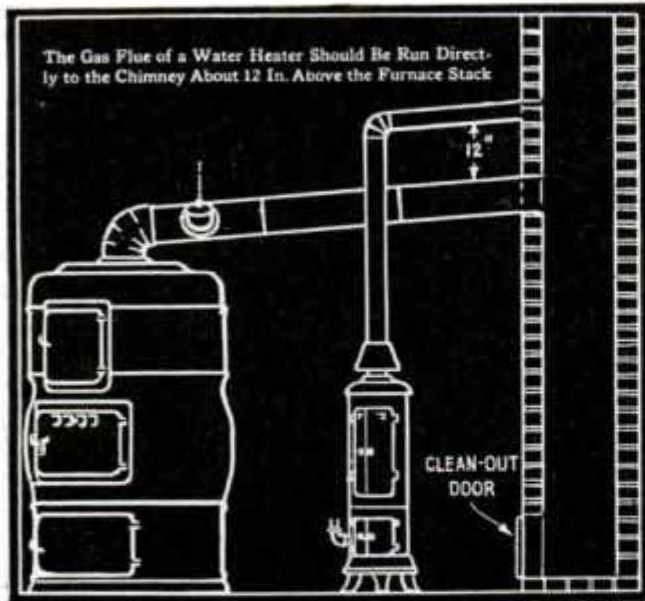


have a steam or hot-water system, much of the heat not needed in the basement can be transferred upstairs, which results in a fuel saving. To prevent such heat losses in the basement first put an insulating "overcoat" on the furnace, using shredded asbestos and water, mixed to a stiff paste. Apply to a thickness of about 2 in. and cover the coating with sheets of muslin. Next, use asbestos "jackets" or other insulating material on the outgoing heating pipes, leaving the return pipes bare. If there is still too much heat in the basement, cover the return pipes also.

Fresh-Air Bedrooms: When bedrooms are opened for the night to obtain fresh air, turn off the heat in these rooms. Water circulating through the radiator in a cold room drops in temperature enough to



For a Slow-Burning Night Fire See That the Fuel Bed Has a "Bright" Spot Near the Front and Adjust Draft Accordingly



There May Be Disastrous Results if Vent of Gas Water Heater Is Connected to Furnace Stack



Insulate the Tank to Keep Water Hot as Long as Possible; Non-Corrosive Vent Pipe on Water Heater Will Outlast Many Common Ones

cool the entire system perceptibly with a resulting fuel waste. If a closed hot-water radiator is likely to be frozen, cover it with a close-fitting box made of substantial insulating material, and then leave the radiator turned on. Cold air from an open bedroom will circulate into adjoining warm rooms, through the space under the doors. To prevent this close the opening with a rug or folded blanket. It should also be remembered that a change from the all-day house temperature of 70° F. or above, to an exceedingly low bedroom temperature is not as beneficial as often supposed. People are most comfortable and their bodies function best within temperatures ranging from 60 to 75° F. Sufficient fresh air can be obtained by opening the windows only a few inches. The lowering of bedroom temperature to that of outdoors, means that considerable heat must be used the next morning to raise the temperature again.

How Warm to Keep Your Garage: You can also waste considerable heat by keeping the garage warmer than necessary. The main object in heating a garage is to prevent oil and grease from getting thick and sluggish, so that the car can be started easily and will receive proper lubrication at once. A garage need not be warmer than 50° F. The number of days when heat is required for garages is one-third less than the number of days required for heating homes.

And, Don't Overlook the Fireplace! Another heat loss, which many people overlook, is the fireplace. Chimney suction will draw out a great volume of warm air through the fireplace, when the damper is left open. Therefore, always close the draft control or damper when the fireplace is not in use. If the damper is warped so that it will not close tightly, have it repaired. Even then, the small crevices will allow the escape of warm air, but this can be overcome by stuffing a pillow, filled with shredded asbestos, in the opening, below the closed damper. Newspapers stuffed in the opening will help temporarily.

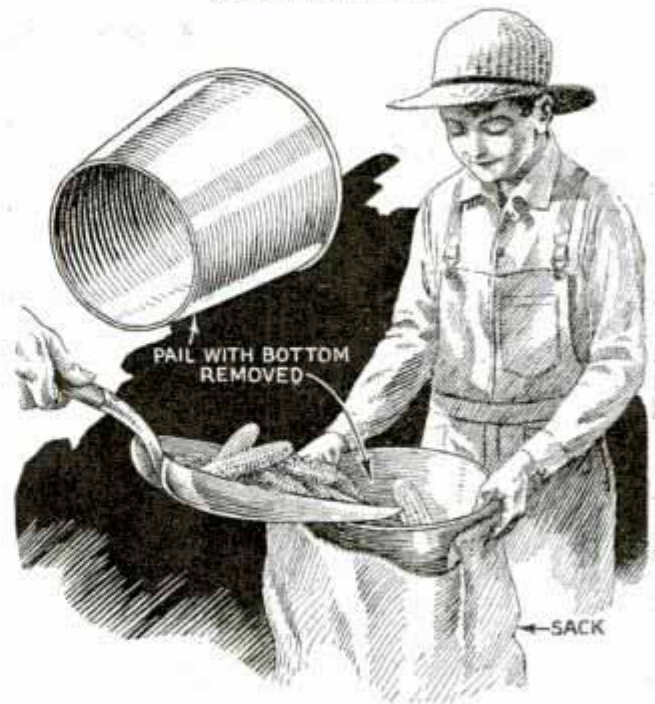
Hot-Water Heaters: A saving of fuel cost may be effected by thoroughly covering the tank with an asbestos coating to retain the heat in the water as long as possible. When the vent pipe of a gas water heater must be replaced, use one of cop-

per, monel metal, or other non-corrosive metal. An ordinary sheet-metal pipe lasts only a short time due to the action of sulphuric acid formed by the combination of moisture with sulphur, present in some gas. The vent pipe should enter the chimney not less than 12 in. above the furnace or boiler vent pipe. Many people run the gas-heater vent pipe directly into the furnace vent pipe, not realizing the possible disastrous results of such an arrangement. To illustrate the danger involved in a faulty vent connection, suppose a fresh supply of fuel had been shoveled in the furnace and the draft conditions, owing to the weather, happened to be bad. The smoke and other products of combustion from the furnace would be quite cool and "lazy." Some of these gases might travel down the vent of the gas water heater, and form an insulating blanket over the gas flames. This would not only cause the gas flame to burn inefficiently but might even extinguish it. Later, when the fire in the furnace would burn brightly, sparks could ignite the raw gas in the vent pipe and cause an explosion.

Choked Ashpits Are Costly: People often wonder why their furnace grates warp and must be renewed. The reason is that an ashpit choked with ashes up to the grates does not allow sufficient air circulation to keep the grates, as well as the layer of ashes below them, cool. As a result, the grates burn and sometimes melt.

"Banking" the Fire: "Banking" the fire or pushing down the thermostat at night is a great habit as it supposedly saves fuel. But after the house cools off perceptibly during the night, it takes a long time to bring it back to the desired temperature the next morning, and to do this a good, hot fire is needed. It is claimed that the amount of fuel burned in this way is just as much as would have been burned if the fire had been kept going throughout the night in order to maintain a uniform temperature. The fire should be kept burning moderately during the night. To do this, first add the necessary fuel to last until morning and then see that there is a "bright or hot spot" in the fuel bed, preferably in the front near the charging door. Also see that the dampers are adjusted to provide enough draft for a continuous but not a rapid-burning fire.

Grain Sacks Filled with Funnel Made from Pail



Pail with Bottom Removed Holds Mouth of Large Sack Rigidly When Filling It

Inserted into the mouth of a grain sack that is being filled, a bottomless pail provides a good funnel. The pail is held in the sack by a helper and makes a rigid opening into which the material can be scooped without any possibility of the mouth of the sack sagging, which often happens when the sack is held without a rigid support. By rigging up a post to hold the sack and pail, one man can fill it.

Roaches Are Kept Out of Bathroom by Steel Wool around Pipes

Stuffed around pipes where they enter a wall or floor, steel wool effectively prevents roaches and other insects from entering the home through these small openings. Steel wool is better for this purpose than putty, which is often used, as it is flexible and will not fall out. However, if you wish to use putty around the pipes for the sake of appearance, first fill the openings with steel wool and then apply the putty over this.



Loose Papers Held on Desk Top with Rubber Strip

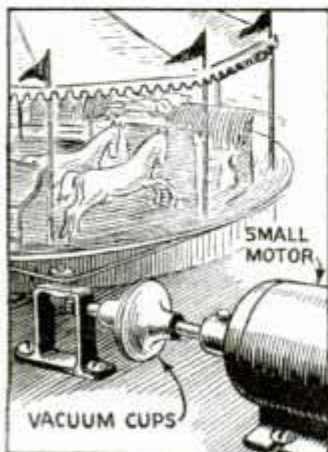


Rubber Strip Stretched over Desk to Hold Papers Takes No Room and Is Easier to Use Than Weights

Stretched across a desk and tacked to the underside of the top, a narrow strip of inner tube makes a good holder to keep loose papers from blowing off. The strip is just as effective as paperweights, takes up no room, and is easier to handle as the papers can be inserted or removed easily by simply lifting the rubber.—A. H. Waychoff, Tempe, Ariz.

Suction-Cup Universal Joint Connects Toy Drive Shafts

Rubber suction cups make cheap and quickly detachable universal joints for connecting drive shafts of toys to small motors, or to each other. They are slipped over the ends of the shafts and are cemented in place with shellac or rubber cement. Usually the cups are merely pressed together to make the coupling, but if the load is fairly



heavy, or if the connection is to be more or less permanent, a little moisture applied on the contacting surfaces of the rubber before pressing them together will cause them to stick more tightly.

Rolled Roofing Is Measured Easily When Laid on Roller Skates

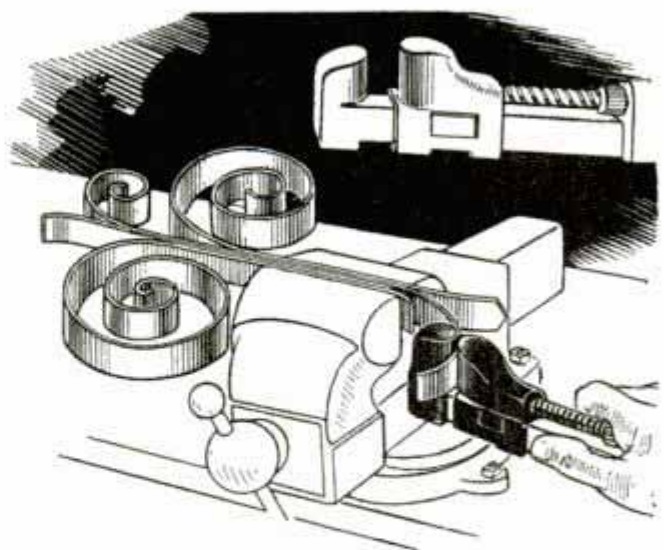
When measuring and cutting lengths from a roll of roofing, lay it on a pair of inverted roller skates screwed to a board, floor or table top, which will make it easy for you to turn the roll.



For cutting the roofing, use a pair of tinner's shears, which you will find much more efficient than a knife.—Ray J. Marran, Kansas City, Mo.

Scrolls on Ornamental Iron Work Formed with Monkey Wrench

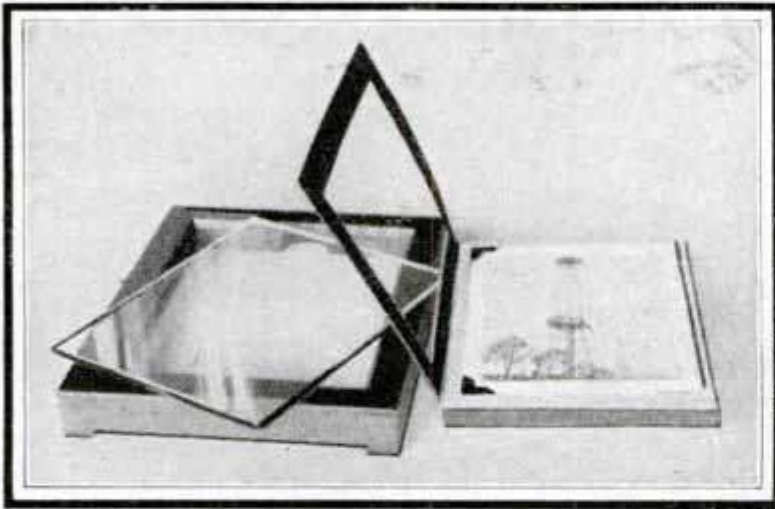
An old monkey wrench having the inner sides of the jaws rounded on a grinding wheel, makes a good tool for forming scrolls on ornamental iron work. This tool is not only easy to clamp to the work, but its jaws are adjustable for making tight



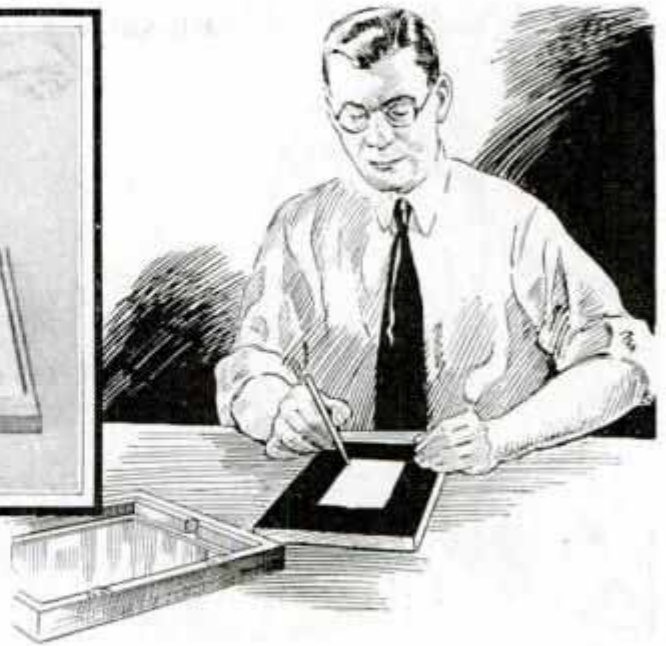
By Rounding the Jaws of a Monkey Wrench, You Have a Tool for Forming Ornamental Iron Work

and open scrolls, or for sharp, right-angle, and wide bends. If wrenches of different sizes are altered, you can handle almost any kind of ornamental iron work.

Printing Photos to Assure Uniform Borders



When a Number of Photo Prints Are to Have White Borders, Use This Positive Method of Getting the Border Mask Located Centrally over the Prints

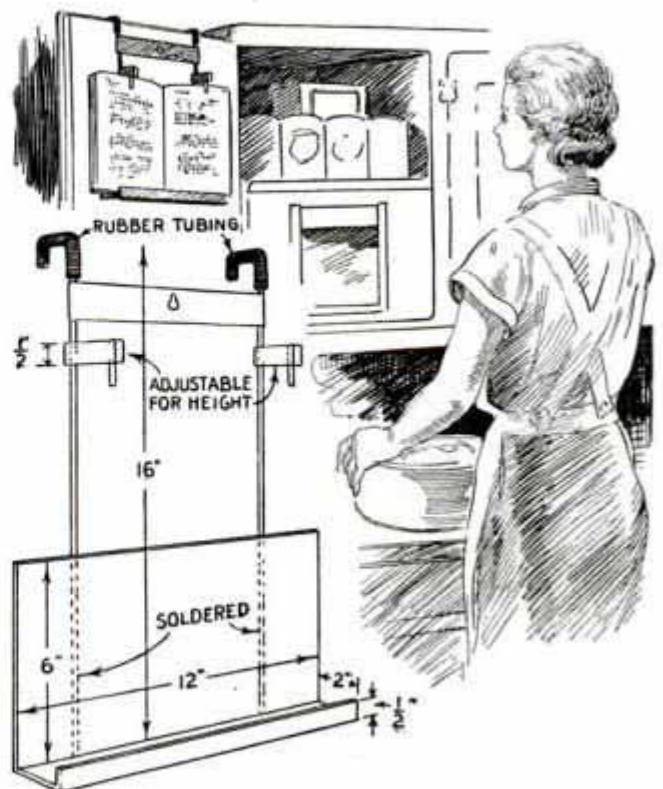


With this method of making photo borders, trimming is unnecessary as all of them will be equal in width. A piece of heavy paper the same size as the back of the printing frame is applied to the latter with a spot of glue at each corner. Lay the border mask in position and hinge it along one edge with adhesive tape. Trace the inside of the border on the paper surface. With this marking, and a sheet of

sensitized paper, it will be easy to locate two art corners for holding the paper, using the kind that has a fully formed pocket on one side and a glued surface on the other. In making prints, insert the sensitized paper in the two art corners and lay the negative on top. Then lower the border mask, adjust the negative, assemble the frame and proceed to print in the usual way.—Walter N. Purdy, Chicago.

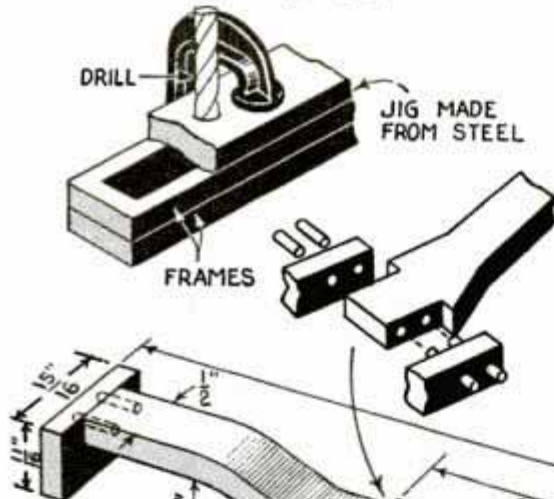
Cookbook Kept Open by Holder on Wall or Cabinet Door

Instead of propping up a cookbook with pans and taking a chance on soiling the pages, use this holder and hang it on one of your cabinet doors or on a wall above your worktable. The holder is made of sheet metal and two lengths of wire as shown, the upper ends of the latter being bent to hook over the top edge of a door. If you want to hang the holder on a wall, a narrow strip of sheet metal is soldered between the wires near the upper ends, and a hole is drilled in it to slip over a nail. Small blocks of brass or hardwood, which are drilled to slide over the wires, have vertical pins at their outer ends to slip down over the pages of the book and hold it open while in use.—Frank Jablecnik, Berwyn, Ill.

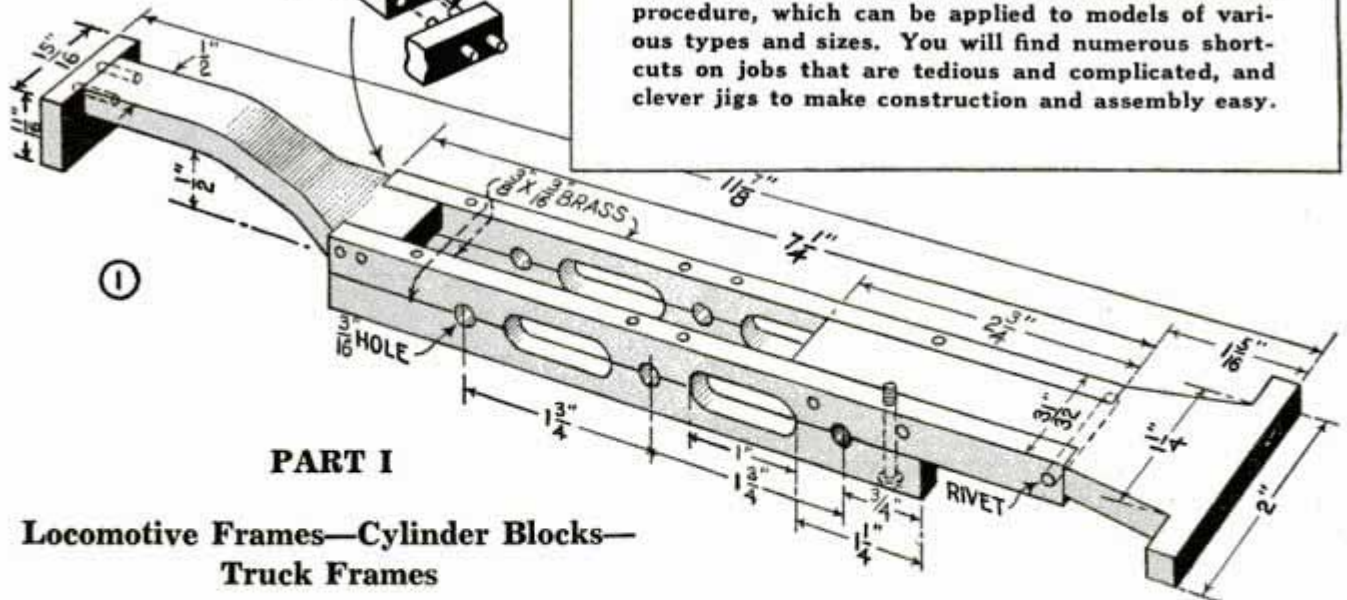


☐ A drop of mercury-nitrate solution touched to imitation gold will leave a white spot, but has no effect on real gold.

Shortcuts *for the* MODEL



Would you like to build a model railway, or, are you already following this growing and fascinating hobby? In either case you will find valuable information in this series of articles. It includes reference data of lasting value, showing how you can make many parts from stock material, without the need of castings, how many jobs can be simplified for those who do not have a complete set-up of machine tools. Emphasis is laid on step-by-step procedure, which can be applied to models of various types and sizes. You will find numerous shortcuts on jobs that are tedious and complicated, and clever jigs to make construction and assembly easy.

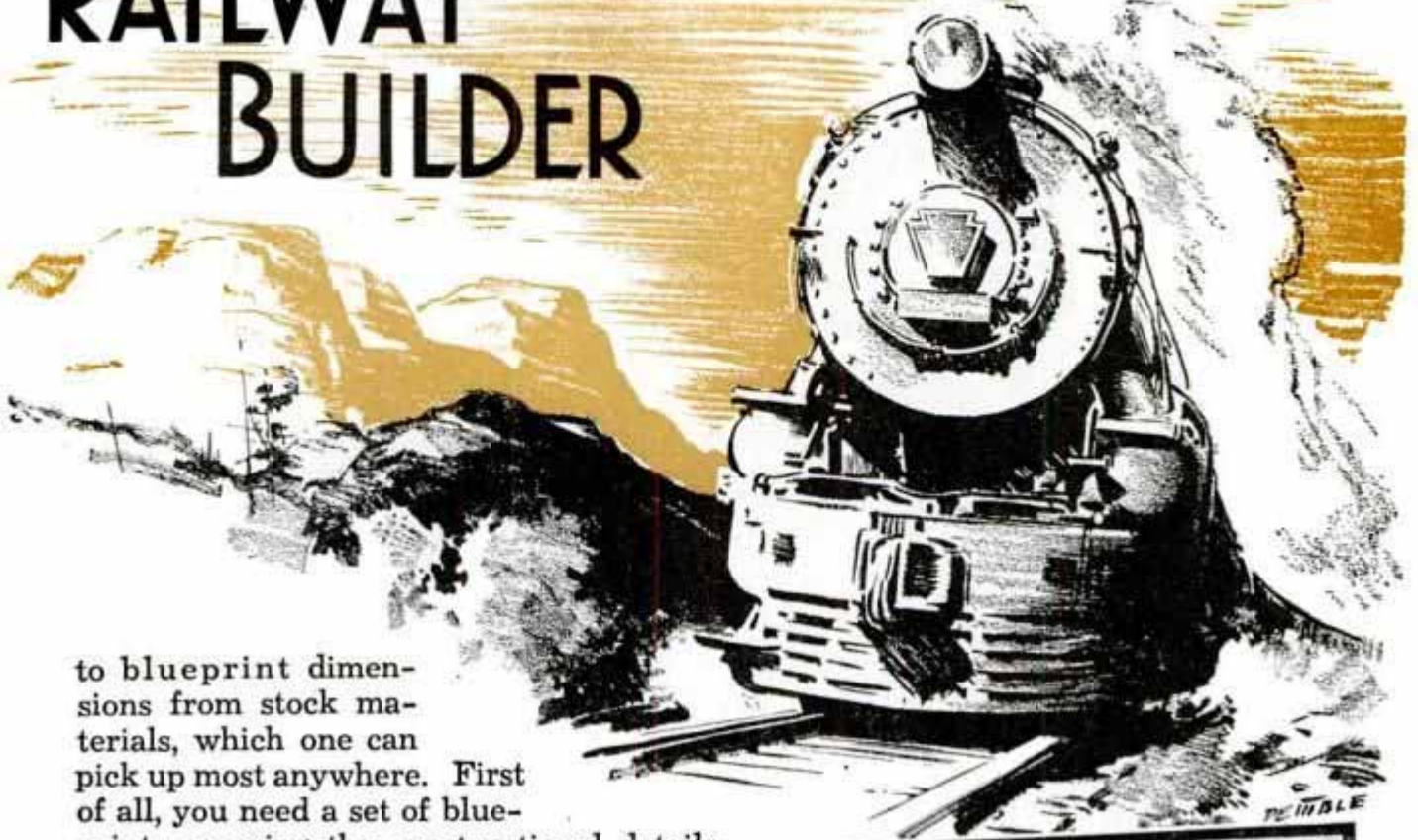


SOME of the finest museum-type models have been built with hand tools. Of course, machine tools greatly facilitate some steps of the work, and their use is advisable in many instances, especially where great accuracy is involved. But, if you have not yet acquired a complete ma-

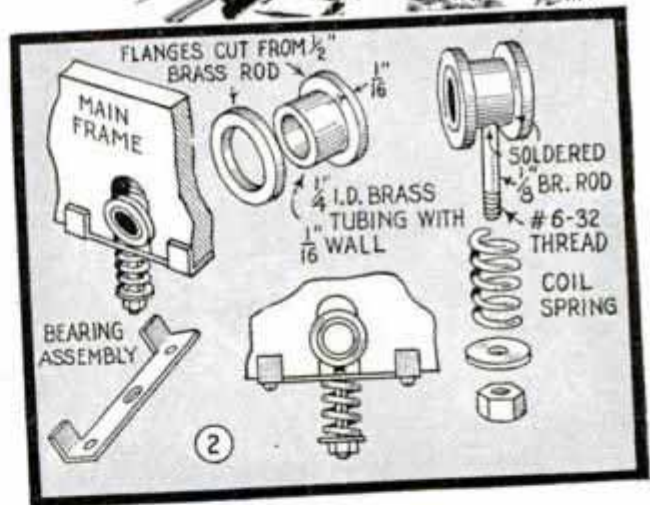
chine set-up, there are numerous tricks of construction and judicious use of stock materials which will enable you to use hand tools in producing work of exceptional merit, although the methods vary from the usual orthodox procedure.

The problem is one of building up parts

RAILWAY BUILDER



to blueprint dimensions from stock materials, which one can pick up most anywhere. First of all, you need a set of blueprints covering the constructional details of the type and size model you wish to build. The size and amount of materials needed can be determined as you go along. It is not necessary to bother about figuring scales, as practically all blueprints show either $\frac{1}{4}$ or $\frac{1}{2}$ -in. scale parts, the former scale of $\frac{1}{4}$ in. to 1 ft. being the most popular. Simplicity of a locomotive frame is evident from Fig. 1, which details a frame in $\frac{1}{4}$ -in. scale. The dimensions merely give you an idea of the size, and with minor alterations you can adapt this kind of frame to several types of model locomotives. A glance will show that the whole thing consists of six pieces of flat brass joined with four pins and small machine screws. Rough sawing from the solid stock and a bit of careful work with a file, will easily bring the front and back members to the required blueprint size. The side pieces will require squaring up to length. Then you drill and tap for the machine screws that hold the two halves together, join the two halves of each side and clamp together with the drilling jig on top. Drill the axle holes through both sides. When you assemble ready for the pins, coat all joining surfaces with a soldering flux and draw the parts together with small C-clamps. Then drill holes for

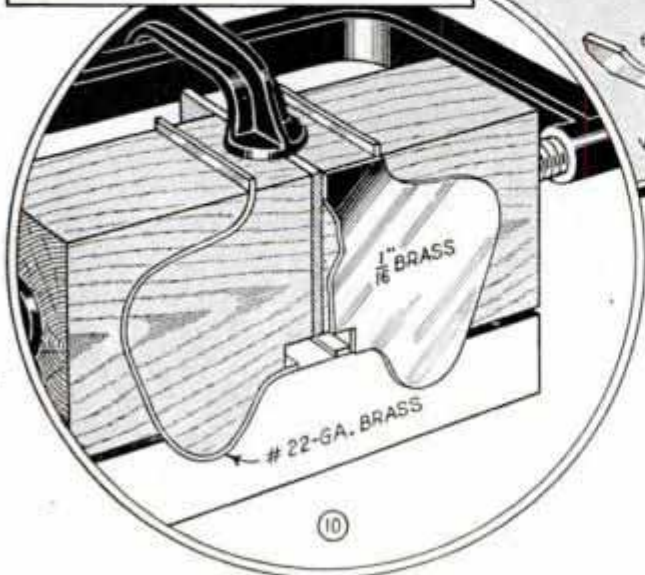
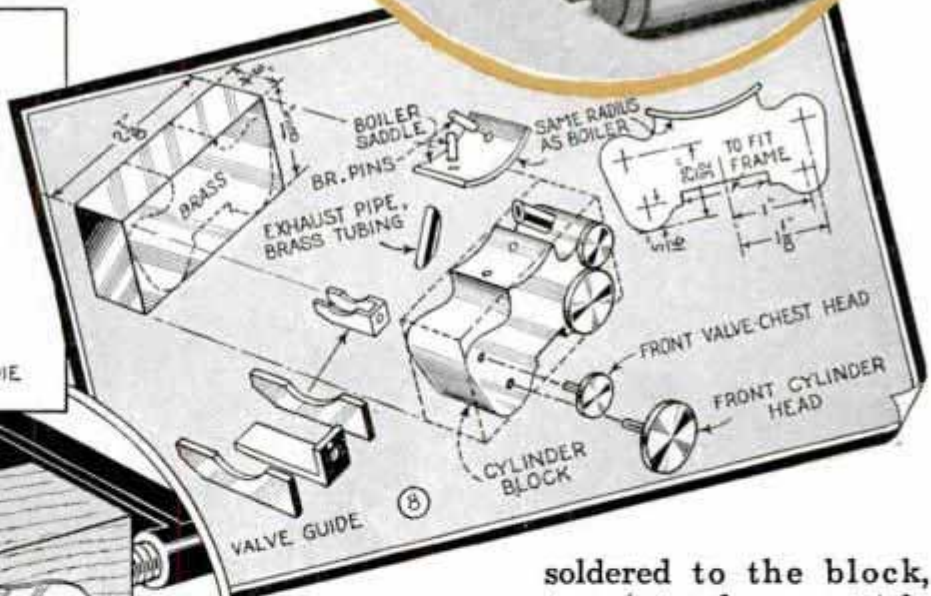
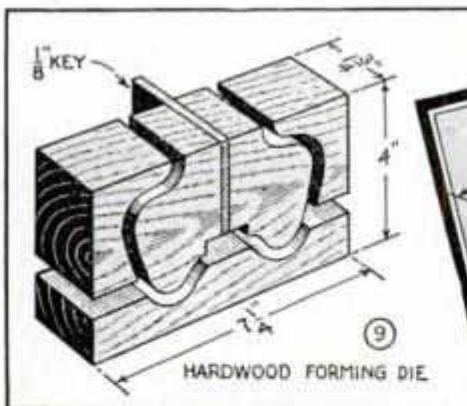
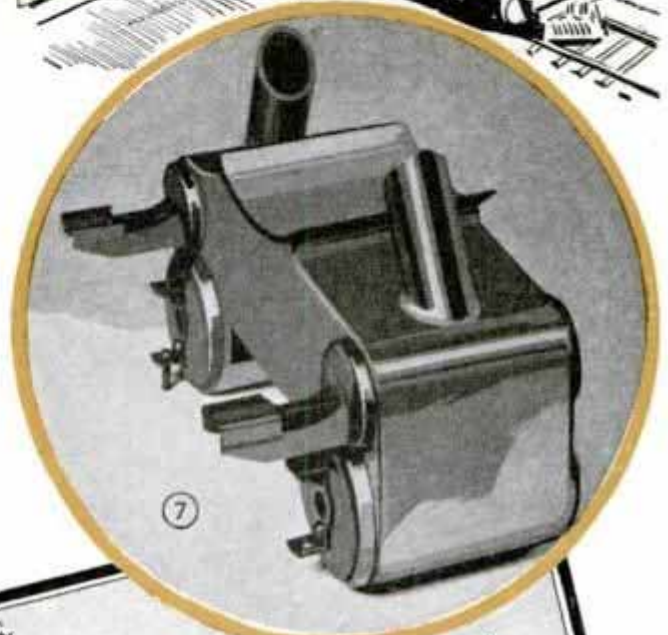


the pins, drive these in and file the ends flush. The job is finished by flowing solder into the pinned joints.

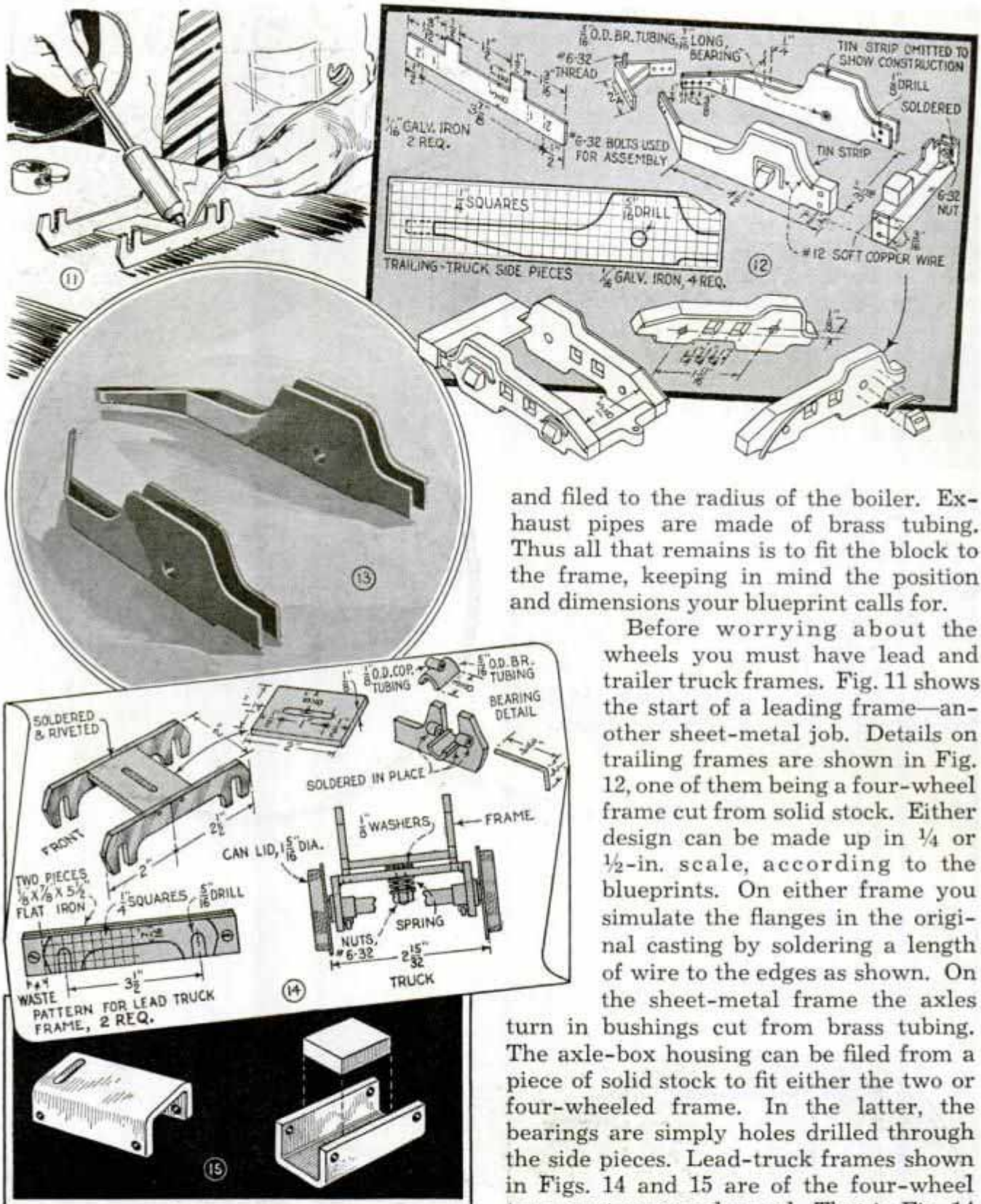
A glance at Figs. 4 and 5 turns up a different proposition, in that the side members are in one piece, slotted for separate bearings. In assembling, the whole thing is clamped to a wooden jig for soldering in the cross members. The general dimensions given are in the $\frac{1}{2}$ -in. scale but the frame design will admit all manner of variation. If the type of model you are building calls for eight drive wheels, four on a side, it is necessary that each wheel be sprung individually to the frame. This is often rather tricky, but Fig. 2 shows a

tached permanently to the frame until you have the wheels and cylinder block made and fitted.

Fig. 7 shows what you can do in making up a cylinder block entirely of sheet metal. The hardwood forming die shown in Fig. 9 is the secret. When you make up the die remember that No. 22-gauge soft brass is the best weight metal to use in forming the block and the trick in sawing out the die is to select a saw blade that will give, as near as possible, a width of cut equal to the thickness of the metal. Outside of this, Fig. 9 is self-explanatory. Fig. 10 shows the outer sheets pressed to form in the die. The ends of the block are sawed to the rough form and one is soldered in place. Then the die is removed by collapsing the inner sections. Soldering on the other end completes the block ready for the heads and boiler saddle. On the larger scale models, a friction can lid will solve the cylinder-head problem nicely. The blueprints will usually give the diameter of the cylinder head as $1\frac{1}{2}$ in. when the model is $\frac{1}{2}$ -in. scale, while the valve heads are generally 1 in. in diameter. Can lids of these diameters,



soldered to the block, turn out a clean, neat job. However, if the can lids are not available, there's still another way. Cut rings from a length of brass tubing of the proper size, solder to the heads and then over the ring solder a disk of sheet brass. Round the joint with a file and you have it. Now, on the other hand, if you are building a small-scale model, you can save the time of making up a die by simply sawing the block to the required contour from a solid



and filed to the radius of the boiler. Exhaust pipes are made of brass tubing. Thus all that remains is to fit the block to the frame, keeping in mind the position and dimensions your blueprint calls for.

Before worrying about the wheels you must have lead and trailer truck frames. Fig. 11 shows the start of a leading frame—another sheet-metal job. Details on trailing frames are shown in Fig. 12, one of them being a four-wheel frame cut from solid stock. Either design can be made up in $\frac{1}{4}$ or $\frac{1}{2}$ -in. scale, according to the blueprints. On either frame you simulate the flanges in the original casting by soldering a length of wire to the edges as shown. On the sheet-metal frame the axles

turn in bushings cut from brass tubing. The axle-box housing can be filed from a piece of solid stock to fit either the two or four-wheeled frame. In the latter, the bearings are simply holes drilled through the side pieces. Lead-truck frames shown in Figs. 14 and 15 are of the four-wheel type most commonly used. That in Fig. 14 consists of three pieces cut from the solid stock and soldered as in Fig. 13. A feature of this frame is the split axle bearings, which permit easy removal of the wheels. The lower frame is simply a short length of channel drilled for the axles, slotted for a kingbolt and weighted with a piece cut from solid stock. Washers between wheels and frame give necessary clearance.

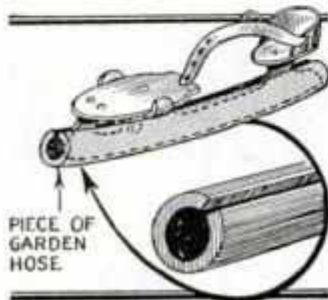
(To be continued)

piece of brass as in Fig. 8. Judicious use of a file and emery cloth will dispose of the saw marks on the block. Round disks cut from brass rod, flattened with a file, then pinned and soldered to the block, serve as cylinder and valve heads. The boiler saddle is a separate piece of sheet metal soldered to the block, care being taken to see that both the saddle and the upper ends of the exhaust pipes are cut

Poisoned Rats Die Outside Building

Here is a poison that causes rodents to develop a ravenous thirst so that they go outside in search of water and usually die immediately after drinking it. The poison consists of barium carbonate, 1 part, mixed with bait, 4 parts. Fresh meat, cereal or cooked eggs are good baits, which should be mixed with enough water to make a mash. Of course, the poison should always be placed where it is accessible to the rats only.

Skate Runners Shielded from Nicks with Rubber-Hose Guards

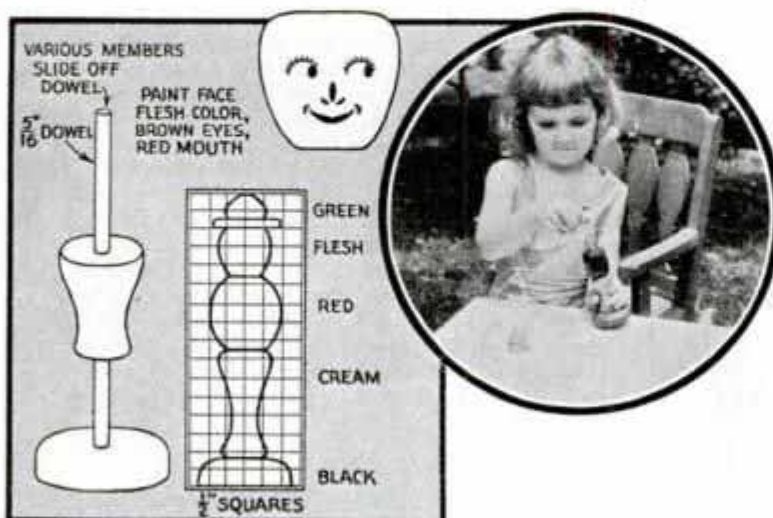


Slit along one side and slipped over a skate as shown, a piece of garden hose will protect the blade against nicking. It takes but a moment to remove

the guard, which, if made of lightweight hose, can be folded and carried in the pocket when not in use.

Take-Apart Doll Amuses Children for Hours at a Time

Little tots will have lots of fun with this doll, as it can be taken apart and put together by them. Painted in bright colors, the doll consists of three "body" pieces drilled to fit over a dowel "backbone," which is mounted on a round base.



Four-Piece Doll Is a Real "Puzzler" to Children, Who Take It Apart and Try to Assemble It



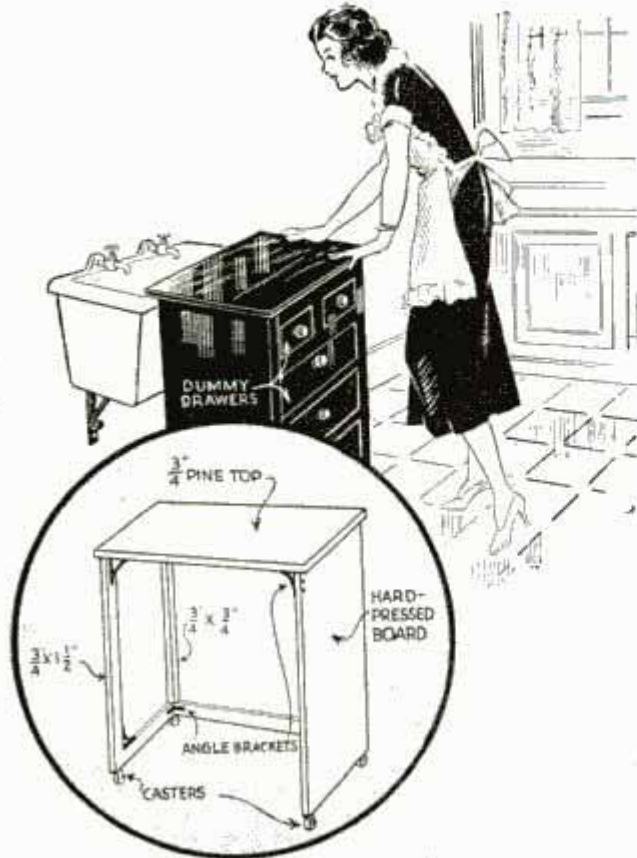
Gas Torch Used for Burning Exterior of Cabin to Antique It and Preserve the Wood

Exterior Walls of Cabin Burned to Get Weathered Effect

By slightly burning the exterior surface of a cabin with a gas torch, and then brushing it with a steel brush, you not only give it a weathered effect that would take nature many years to duplicate, but also preserve the wood. This process gives the wood a rich, brown color and makes the grain stand out. Shades from a deep brown to a light tan can be produced by varying the amount of brushing. Whenever possible, the lumber should be burned before it is applied to the structure. A blowtorch will do for small surfaces, but a torch using a tank of rock gas or ordinary illuminating gas can be used to greater advantage on large surfaces. An effect of great age can be given to a shingled roof by burning the edges of the shingles while they are still bundled, after which they are applied.—Stratford Enright, Hollywood, Calif.

☐ A good preservative for camera bellows consists of a mixture of carnauba wax, 1 part, dissolved in warm turpentine, 10 parts.

Dummy Cabinet Conceals Laundry Tub When Not in Use

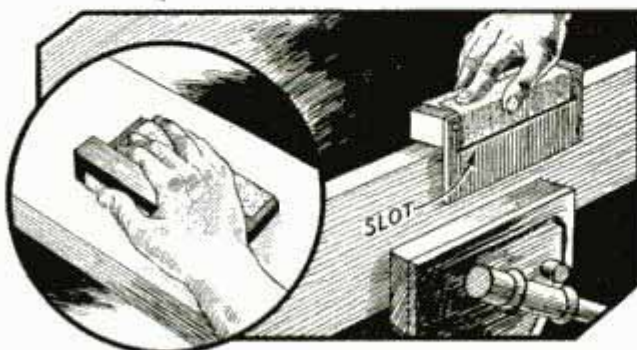


Laundry Tubs Do Not Mar the Appearance of a Basement Room When Hidden with This Cabinet

When a laundry tub is located in neat surroundings, such as inside a kitchen or a basement recreation room, a dummy cabinet, which straddles the tub and effectively hides it, will improve the appearance of the room. The frame is braced with angle brackets. The three sides of the cabinet are made of hard-pressed board and the top is $\frac{3}{4}$ -in. wood.

Edges of Squared Boards Sanded without Rounding Them

Made to take one quarter of a sheet of standard-size sandpaper, this block



This Block for Edge Sanding Is Made to Take a Quarter Sheet of Standard-Size Sandpaper

smooths the edges of squared work without any tendency to round them and can also be used as a regular sanding block on wide surfaces. It is made by screwing a thin piece of stock, such as hard-pressed board, at right angles to a wood block about $\frac{7}{8}$ in. wide. The thin stock is slotted flush with the underside of the block to take the paper, which is wrapped around the latter for sanding narrow work. When sanding large surfaces, the paper is held as shown in the circular detail.—H. Foster Griswold, Long Island City, N. Y.

Rain Spots on Felt Hat Bleached with Peroxide Spray

The trick in cleaning a white felt hat lies in removing rain spots, which are not affected by naphtha. First, brush the hat thoroughly with the naphtha, and then hang it on a line, changing its position every 10 min. or so to dry it evenly. If any rain spots show after this treatment, they can be bleached by lightly spraying them with peroxide of hydrogen. Two or three sprayings are usually sufficient. Allow the hat to dry between each application.—Walter Meinke, Santa Ana, Calif.



Passing It On to Others

Although the solution of many minor everyday problems around the home, in the workshop, concerning the car, or pertaining to your daily work, may seem rather insignificant to you, there are perhaps thousands of others who have the same problems. If your solution was unusual, but simple and practical, why not pass it along to others to help them? These pages are a "clearing house" for such ideas and if you have any new ones that are exceptionally outstanding, don't hesitate to tell us about them. We are always looking for such short cuts that will save time, work and money. And, of course, we will send a check in payment for anything that we use.

Write to Shop Notes Editor

POPULAR MECHANICS MAGAZINE

200 E. Ontario St.

Chicago

National Marketing Machine Co., 4026 Cherry

"Metallic" Plant Is Made from Waste of Machine Shop



Metal Shavings of Various Sizes Arranged in Pot Filled with Plastic, Resemble Growing Plants

Set in modeling clay or any plastic "earth" in a miniature flowerpot, spiral shavings turned from steel, brass and other metals can be pleasingly grouped to resemble a growing plant, as shown in the circular detail. Age furthers this resemblance, as exposure to air will tone down the luster of the metal. Shavings, turned from different metals and in a variety of sizes, can be had for the asking from almost any machine shop.

Milk Kept Out of Animals' Reach with Metal Holder



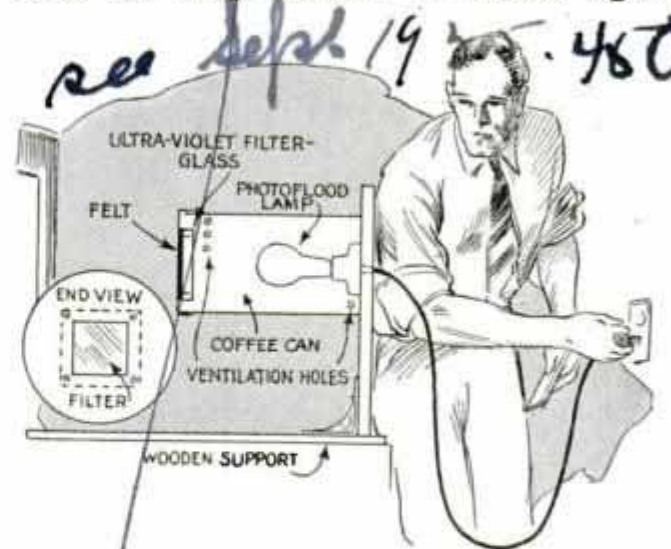
Screwed to the wall near a door, where it can be reached by the milkman, this holder will keep milk bottles away from cats and dogs. It is made of sheet metal, and has one or more

openings cut in the front edge to receive the bottles, the edge being turned upward slightly to keep them from slipping out. A bottle is inserted or removed by tipping up the bottom.

Black Light Produced with Filter and Photoflood Lamp

An inexpensive source of ultraviolet rays for fluorescent experiments can be made from a coffee can, photoflood lamp and an ultraviolet filter. A strip of felt should surround the window in the end of the can to prevent leakage of visible light and to avoid breaking the filter when it is fastened in place with metal or wood strips. A few common substances which fluoresce are fabrics dyed with some coal-tar dyes such as fluorescein, solutions of quinine or aspirin, the skin, teeth and nails, most lubricating oils, many paints used for indoor surfaces, and some varieties of paper. A good paint that is invisible under ordinary light, but which fluoresces strongly under ultra-

violet rays is made by dissolving a little anthracene in xylol. This preparation is especially suitable for treating large surfaces for stage effects. If visible light



Light of Photoflood Lamp Shining through Ultra-violet-Ray Filter Produces Black Light

shines through the ventilators, the front of the can may be pushed through a tight-fitting hole in a cardboard screen mounted on the worktable.

Fish-Scherman Corp.

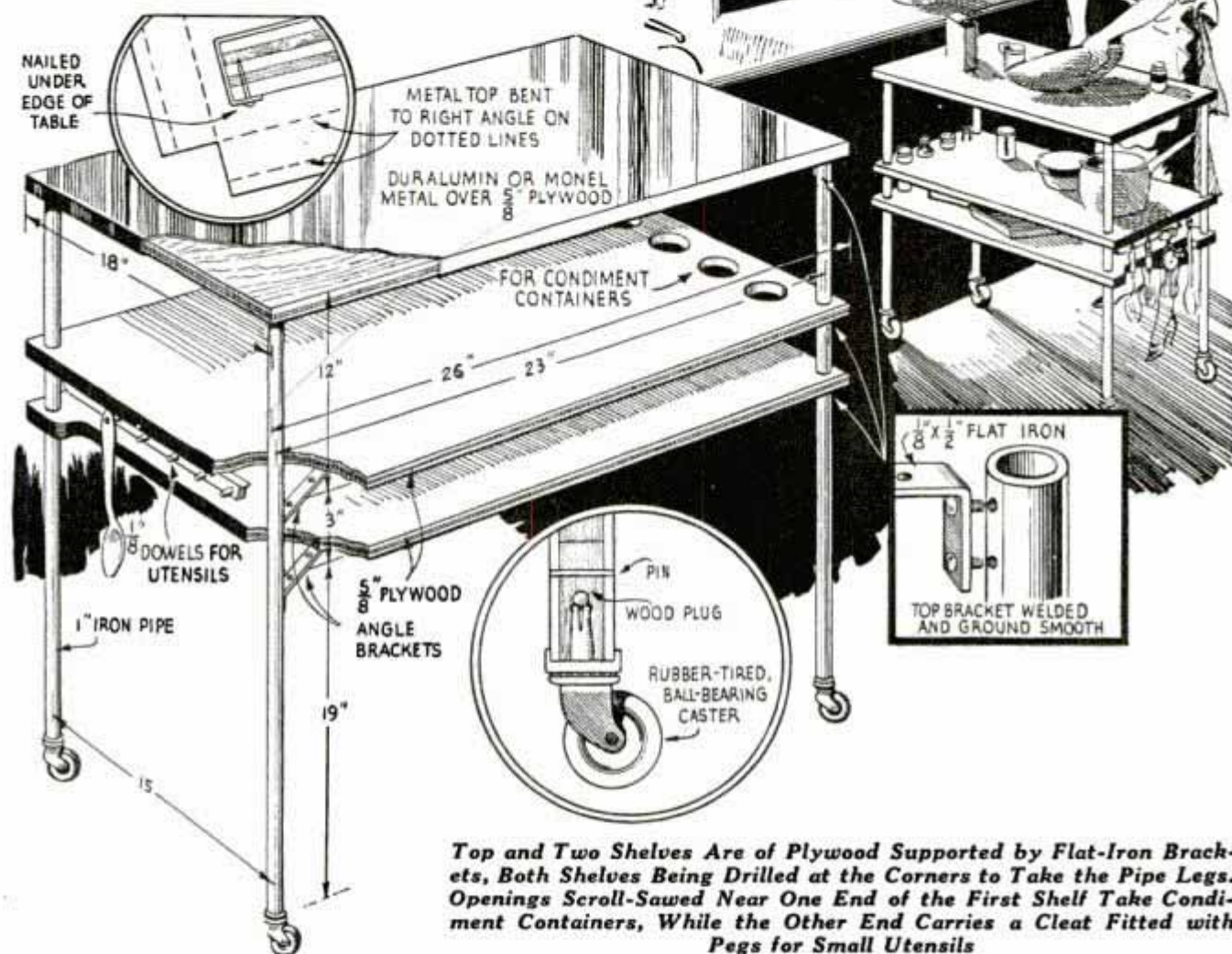
Holders made by Parker Wire Woods Co. Worcester, Mass. Plants made by Hamblin & Russell of Worcester, Mass.

Photoflood lamp

see Sept. 19 1940
W. M. Fish-Scherman Corp., 1700 Broadway, Calif.

Attractive "Ferry" Saves Steps in the Kitchen

Covered with duralumin or monel metal, and fitted with rubber-tired casters, this kitchen "ferry" serves as a wheeled worktable on which to transport food in preparation, together with all necessary



Top and Two Shelves Are of Plywood Supported by Flat-Iron Brackets, Both Shelves Being Drilled at the Corners to Take the Pipe Legs. Openings Scroll-Sawed Near One End of the First Shelf Take Condiment Containers, While the Other End Carries a Cleat Fitted with Pegs for Small Utensils

equipment, from cupboard to sink or stove, and eventually to the dining table. If duralumin or monel metal is not available, galvanized sheet iron or linoleum can be used. In the latter case, a molding, mitered at the corners, will give the job

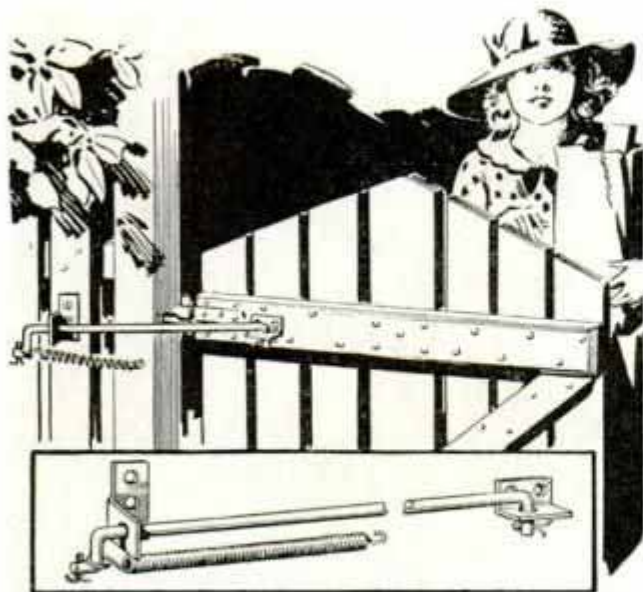
a neater appearance. The circular detail shows how the casters are mounted in the legs by plugging the ends of the latter with hardwood, which is pinned in place. The plugs are then drilled vertically to take the casters.

Extra Uses for Soap in the Home

Soap has many uses besides cleaning. Insoluble in gasoline and kerosene, it is ideal for sealing threaded connections of oil stoves, gasoline and oil lamps, automobiles and the like. It also lubricates squeaky hinges on car doors. If windows are difficult to raise or if drawers are hard to open, rub a little soap on the slides. When working with oils or paints, soap applied

liberally under the fingernails and around the cuticle, will prevent staining of these parts. One-quarter of a bar of laundry soap, melted and stirred into a solution of water, 1 gal., and kerosene, 1 pt., results in an emulsion which is one of the best insecticides for poultry houses and dog kennels. Soap added to water used for removing wallpaper prevents rapid evaporation, and the paper may be removed in half the time usually required.

Spring in Gate Closer Lasts Longer When Pulled in Straight Line



Hooks and Latches Are Not Needed When This Automatic Closer Is Used

Instead of fastening a gate spring so that it bends around the post and is soon stretched out of shape, why not apply this improved method, which stretches the spring in a straight line? The idea is only applicable to gates that open on one side. The spring is attached to the gate post and to one end of an iron rod, which slides through a bracket. The hole in the bracket should be oversize to allow for the slight pivoting action of the rod. The other end of the rod is pivoted to the gate by means of a second bracket as shown.

Water Line Shut Off with "Dry Ice"

Dry Ice packed around a damaged water pipe will freeze the water and stop the flow so that repairs can be made. This is helpful where there is no convenient method of shutting off the pressure.

Christmas Gifts that are Distinctive



Doll House
507 and 508

"I made it," always conveys a touch of personal value which makes any gift a prized possession. Our blueprint service includes plans of numerous attractive items. Here are a few popular projects for your immediate selection.

BIG 5-ROOM DOLL HOUSE—507 and 508: Just the thing for youngsters. 41 in. long, 18½ in. wide, 24¾ in. high. Two prints—50c.

SMOKING STAND—521: 26 in. high; top is 12½ in. square. Has four turned legs. Ashes fall into concealed pan at bottom—25c.

PRISCILLA SEWING CABINET—617: Early American design. 26½ in. high, 12 in. wide and 14 in. long. Very useful—25c.

IMITATION WOOD INLAY LAMPS—773: Wood is pre-glued and turned on lathe. Finished job looks like real inlay—25c.

ATTRACTIVE CORNER SHELVES—593: Scroll-sawed from plywood. Fine for knick-knacks—25c.

HANGING SHELVES—594: Practical shelves for clocks, books and plates. Big value for 25c.

INLAID CHESS AND BACKGAMMON BOARD—505: Backgammon on one side, chess or checkers on other—25c.

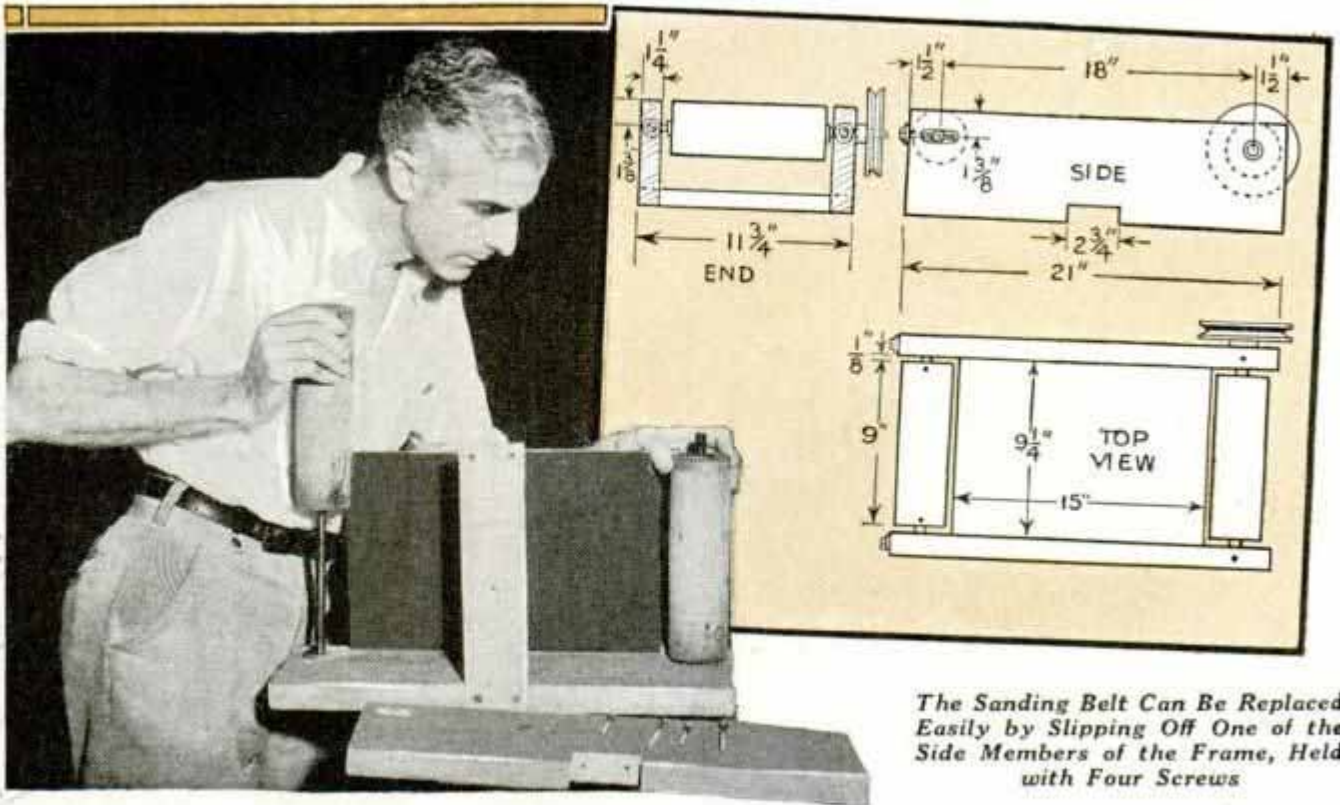
28-IN. MODEL RACING YACHT—664: Planked hull. Automatic controls. A model any boy will be proud to own—25c.

THREE SIMPLE FOOTSTOOLS—685: Tops padded and upholstered. Bandsawed legs of attractive design—25c.

OAK-LEAF MAGAZINE BASKET—849: 16 in. high. Intricate oak-leaf design. Full-size pattern for scroll-sawing—25c.

Any six of these blueprints will be sent postpaid upon receipt of \$1.00. For an additional 12c we will include a copy of our 80 pp. booklet, "What to Make," which completely describes Popular Mechanics plans, besides giving valuable information on where to obtain hard-to-get materials, how to read blueprints, saw filing, etc.

POPULAR MECHANICS MAGAZINE, Dept. B.P.F., 200 E. Ontario St., Chicago



The Sanding Belt Can Be Replaced Easily by Slipping Off One of the Side Members of the Frame, Held with Four Screws

these points. The cylinders are of hardwood. Before turning them down, carefully drill them lengthwise in the center to fit the shafts; the driving cylinder fits snugly on the shaft, while the other cylinder is a loose fit. The shaft of the driving cylinder is drilled and tapped for a screw with which the shaft is keyed to the cylinder. This screw should be countersunk deep enough in the wood to permit the cylinder to be turned down without any risk of the tool striking the screw. Then the shaft is chucked in a lathe and the cylinder is carefully turned down to a uniform diameter throughout its entire length. The diameter must also be such that when the cylinder is mounted in the frame its upper surface will be in line with the top of the frame. If desired, the cylinders can be turned first and the bearing holes in the frames drilled later. The bearing holes of the drive shaft must be bushed, preferably with bronze bushings, although the writer has used brass tubing which can be renewed when necessary. Oil holes, breaking through the bushings, are drilled as shown. When turning the loose cylinder, which is similarly done by chucking the shaft in the lathe in order to get the cylinder concentric with the shaft, some means of keying the two together securely must be employed. The shaft of the driving cylinder

must be longer than that of the loose cylinder, to permit attachment of a V-pulley. Also, the holes drilled in the sides of the sander to take the shaft must be in corresponding positions, otherwise the abrasive belt will not run true.

Soft Crayons Pointed in Screen Cone

Rolled into the shape shown and tacked to a wall, a strip of screen wire provides a sharpener for quickly pointing soft crayons. The idea is especially handy in shipping rooms and on

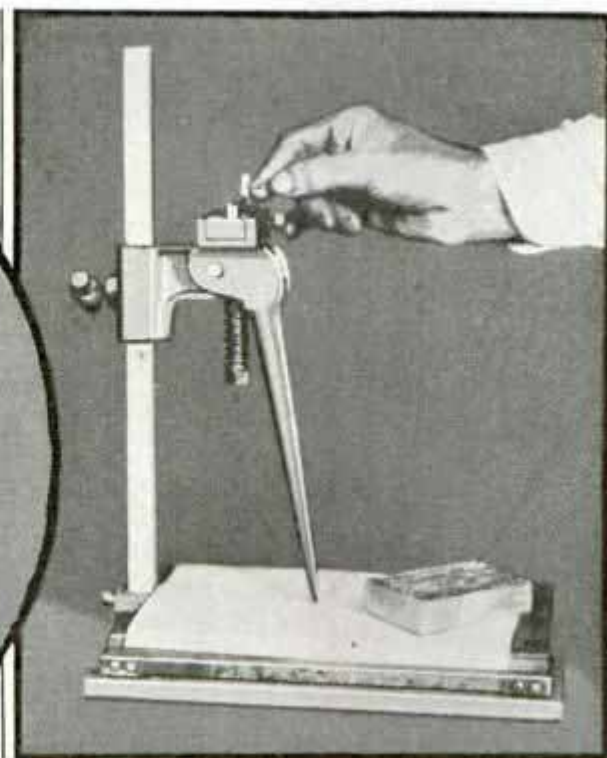
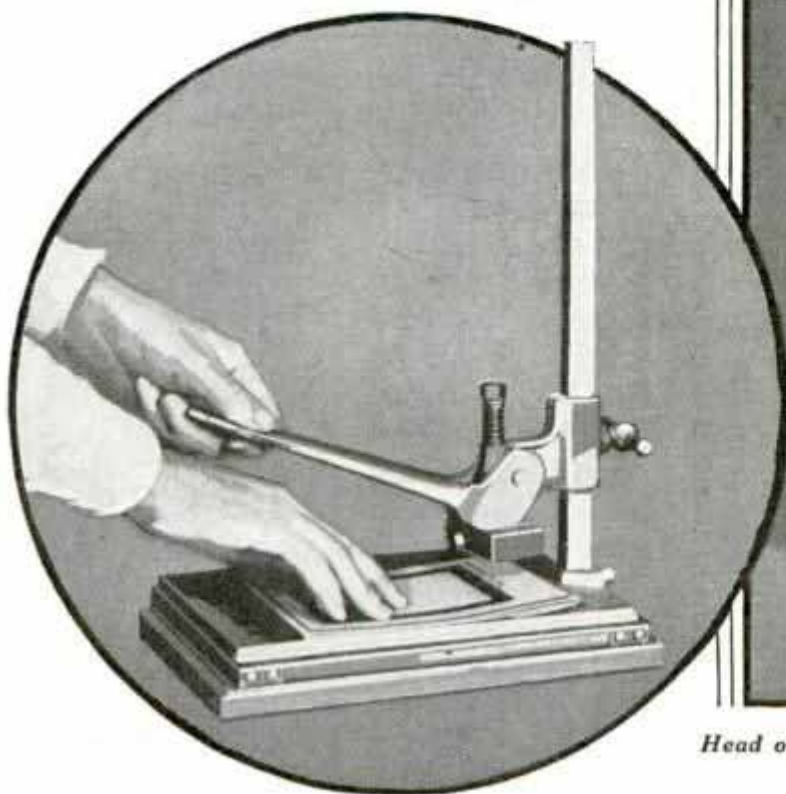


loading platforms where several of the sharpeners can be tacked up at convenient locations. Also, the sharpener is useful in the home or in a schoolroom where it can be tacked to a wall near the blackboard with a small box underneath to

receive the waste scraped from the crayon.

Celluloid handles from toothbrushes make good stirring rods and pestles for mixing and crushing chemicals.

Hand Embosser Has Interchangeable Type



Head of the Capper Is Inverted and Clamped to the Standard While Inserting the Type

For embossed cards, letterheads, envelopes, photo mountings, prints, etc., where it is desirable to make a change in the words occasionally, you will find this converted bottle capper just the thing. A small piece of channel iron of sufficient width and depth to hold linotype slugs, bearing the type characters, is permanently attached to the plunger. A hole in

the side of the type holder is drilled and tapped for a screw, which is driven against the slugs to keep them in place. The lever and plunger unit are then adjusted slightly above the bed or table and a sheet of blotting paper or other resilient material is placed under the cards to be embossed. If desired, you can ink the type also by pressing it against a rubber-stamp pad.

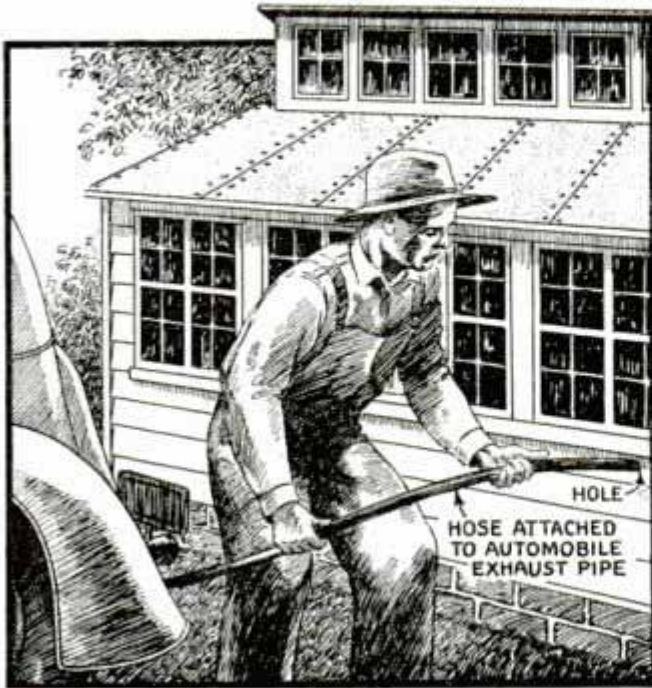
Paint Sprayer on Wheelbarrow Uses Tire for Air Tank

Resembling a wheelbarrow in appearance, this paint-spraying outfit uses an auto tire as an air tank. The tire is fitted with an extra stem and valve, for connection to the compressor, while the regular stem, with the valve removed, has a shut-off cock for attachment of the spray-gun hose. The compressor is of the type for light work around the home. To move the outfit from one location to another, disconnect the hose from the tire.

Wet photographic negatives will dry quickly in a draft of warm air if they are first soaked for 30 seconds in a solution consisting of denatured alcohol, 9 oz., and formaldehyde, 1 oz.



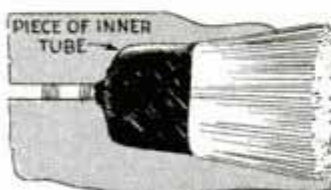
Vermin in Poultry House Exterminated with Exhaust Gas



Lice, Mites and Other Parasites Killed by Filling Poultry House with Carbon-Monoxide Gas

Directed into a poultry house through a pipe or hose, carbon-monoxide gas from the exhaust of an auto or tractor will kill lice and mites as well as spiders, bugs, flies, etc. Remove all poultry from the house and then seal the doors, windows and cracks as tightly as possible to retain the gas. Then set the carburetor to produce a rich fuel mixture and let the motor run for several minutes. The gas will impregnate all parts of the building and kill every living thing inside. As carbon monoxide is very poisonous when inhaled, open all doors and windows and leave them open wide for at least a half hour or so to thoroughly air out the building before entering it.

Rubber Sleeve Protects Broom



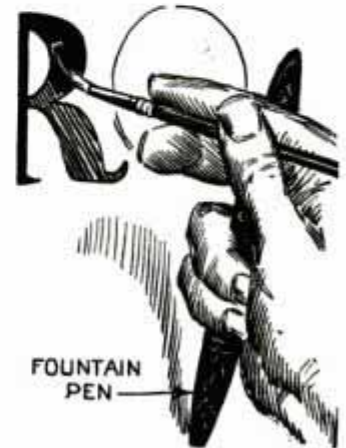
Janitors of schools, theaters, and other buildings where there are seats to sweep around, will find that a piece of old inner tube stretched over the upper end of the broom will protect the straws against bolts and other projections on the seats. The rubber should be wide enough to cover the sewed por-

tion of the broom and extend up over the top where the edges are sewed or cemented together around the handle.—C. R. Crane, Barnsdall, Okla.

tion of the broom and extend up over the top where the edges are sewed or cemented together around the handle.—C. R. Crane, Barnsdall, Okla.

Fountain Pen Aids in Lettering Cards or Show Windows

As a rest for the hand, when filling in lettering on show cards or window signs, one artist uses a fountain pen which he grasps between the second and third fingers of the brush hand as shown. The smooth end of the pen allows the hand to glide easily as the work progresses. The same method can be used by draftsmen when lettering drawings that might be soiled easily.



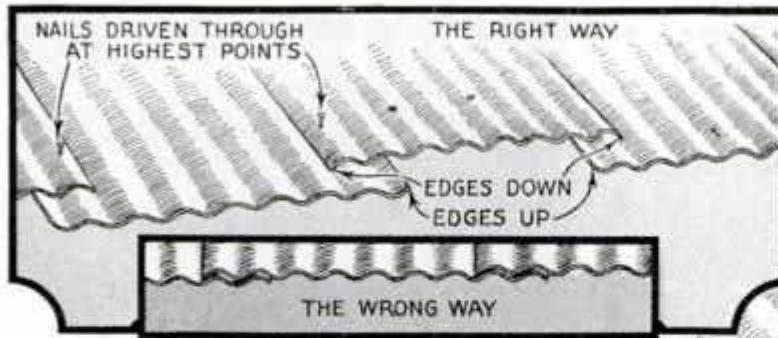
Hooks Hold Supply Boxes on Bins When Invoicing Stock

Invoicing the contents of stock bins was a slow, tedious job in a wholesale hardware store until the foreman had a pair of steel hooks attached to one side of each supply box. The hooks fit over the retaining board of each bin so that the box can be supported in the most convenient position for receiving the pieces as they are invoiced.



Invoicing Contents of Stock Bin Is Done Quickly by Hooking Supply Boxes on Sides of Bin

Laying Corrugated Roofing to Avoid Leaks



Do you know the way corrugated metal roofing is applied determines just how effective it will be during all kinds of weather? Sheets laid in the customary edge-down, overlapping style often develop hard-to-find leaks, especially during a driving rain. To lay the material properly, place the first sheet with the edges down, and fasten it with lead-head nails. The second sheet underlaps the first and its edges should extend up. The third is laid with edges down, while the fourth is like the second and so on. The pieces should overlap the distance shown. Never drive nails in valleys, nor into the edge of a sheet that is to be overlapped,



as the nail heads will then prevent a tight fit. The overlapping edges are nailed down tightly, the nails being spaced about 1 ft. apart. They should be driven into the first ridge and slightly at an angle toward the exposed edge. This tends to draw the edge tightly against the piece underneath and thus prevent water from entering. Also, avoid driving the nails too deeply as this causes cupping.

Stock Food Mixed in Barrel with Old Lawnmower Blades

Welded to the end of a shaft, the blade assembly of an old lawnmower makes a good mixer for mashes and stock foods. The shaft may be an iron rod with a crank formed on one end, or it can be assembled from pipe and fittings. A U-shaped assembly of flat iron, bolted to the lid of the mixing barrel, carries the shaft, which is held in place with collars and set screws.

Static Electricity in Mimeograph Paper Is Removed by Grounding Machine

If static electricity causes paper to stick to the printing cylinder of a mimeograph machine, ground it to a near-by radiator or water pipe. This is done by soldering the bared ends of an insulated wire to the pipe and machine, first scraping any paint or corrosion from the places of attachment to get a good electrical contact. If this does not eliminate the trouble entirely, suspend a strand of tinsel from the frame of the machine so that the end brushes each sheet as it is printed.



Suspended Vertically from the Lid of a Mash Barrel, the Mixer Is Turned with a Crank Made of Pipe



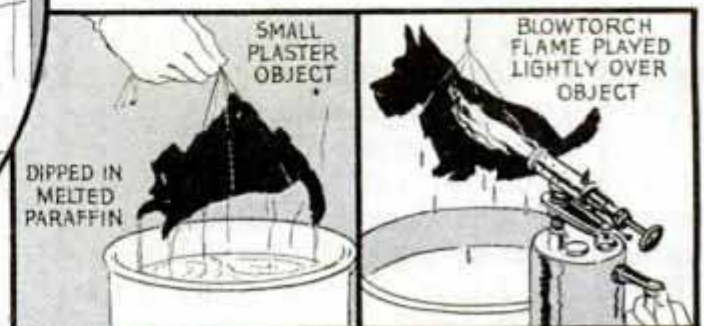
Leather, Plastics and Other Close-Grained Materials, Are Washed in Alcohol, Coated with Lacquer, Then Dusted with Graphite or Copper Powder, After Which Electroplating Is a Simple Process

ELECTROPLATING of wood, plaster casts, leather, porcelain, pottery, textiles, plastic materials and other non-conductors is a simple matter when the methods explained in this article are used. Flowers, insects, leaves and the like can also be metalized. Objects of the latter type, when plated with gold, silver or another suitable metal, are easily fashioned into novelties and pieces of jewelry of rare natural design.

Preparing Objects for Electroplating: Materials that are porous and therefore would absorb electroplating solution, must be sealed before their surfaces will conduct electricity, which is necessary for electroplating. For open-grained or po-

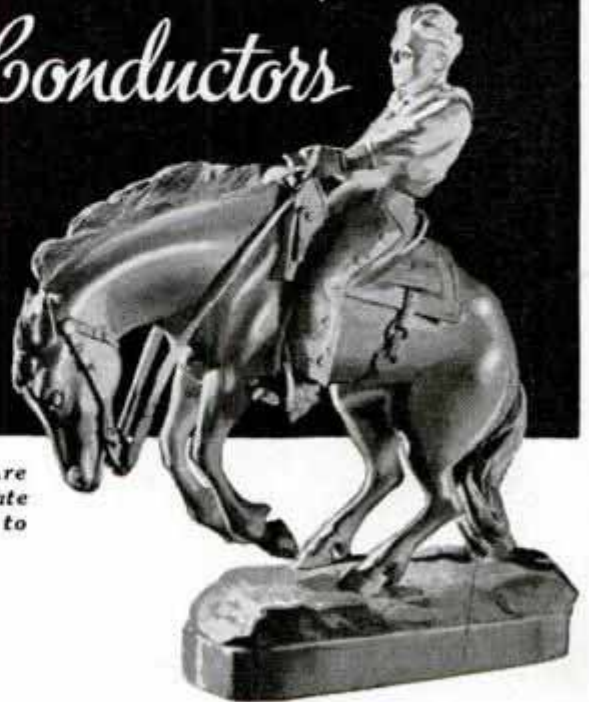
rous materials, the cleaned object is first treated with melted paraffin, heated to 250° F., preferably by complete immersion, until all trace of bubbles from the pores has ceased. Large objects, which cannot be completely immersed, are painted with the melted paraffin and if possible the object should be heated to 250° F. In either case excess paraffin should be removed after sealing has been completed. Sometimes this can be done by playing a blowtorch flame lightly over the object, starting at the top and gradually working down. The flame must be kept moving. While the object is still hot, surplus paraffin is wiped off with a piece of lintless cloth. This is particularly important when the work contains fine lines which might be obliterated by a film of paraffin. When the blowtorch method is not advisable, excess paraffin must be scraped off very carefully.

Graphiting the Waxed Surface: The surface is next brushed with graphite of the variety used by electrotypers. After covering the surface the surplus



WOOD, PLASTER...

and other Non-Conductors



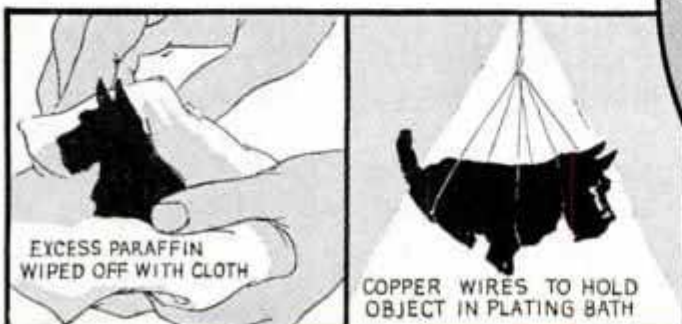
Leaves, Flowers, Insects and Similar Delicate Articles, Are First Dipped in Diluted Silver Lacquer, Then in Silver-Nitrate Solution, Followed by Exposure to Hydrogen-Sulphide Gas, to Produce Conducting Surface for Electroplating

graphite is wiped off, the work is either immersed for a few seconds in, or brushed with, a well-stirred solution made by adding the same grade of graphite, 2 lbs., to water, 1 gal., and the work is washed in running water to remove the excess graphite. The graphite-solution treatment greatly aids plating and has been found to give far better results than the dry-dusting method alone.

A good grade of fine, copper bronze powder may be used in place of the graphite. It should be shaken up with lacquer thinner and allowed to settle and dry, after pouring off the solvent in order to remove the grease, which invariably coats each particle of the metal powder. If this is overlooked, bronze powders will not give results as good as graphite. With clean bronze powder, plating will be speeded greatly because metal powder is a far better conductor of electricity than graphite. If either the graphite solution or a bronze solution is kept on hand for use as needed,

water must be added to replace that which is lost by evaporation. After a few weeks of use, the solutions should be allowed to settle, and the water poured off and replaced with fresh water in order to remove impurities which will collect during the dipping process.

Plating with Copper: Regardless of the final metal which is to be plated onto the job, it must first be copperplated. Any other metal may then be plated over the



EXCESS PARAFFIN WIPED OFF WITH CLOTH

COPPER WIRES TO HOLD OBJECT IN PLATING BATH



TO GET SOLUTIONS OF THE CORRECT CONCENTRATION THE CHEMICALS MUST BE WEIGHED ACCURATELY

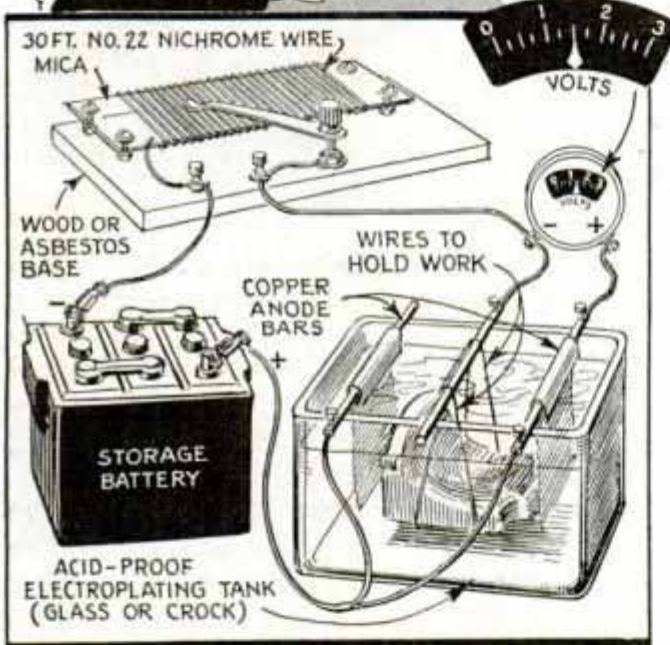


Copperplating Solution Is Made by Mixing Copper Sulphate in Water and Then Adding Sulphuric Acid

wires, in which it can be shifted about easily to eliminate marks that would be left if the wires were kept in the same location. Three copper rods are laid across a glass plating tank. The center rod, connected to the negative terminal of the battery, is used to suspend the work in the solution. Large sheets of copper are suspended from the outside rods. For copperplating, the solution is made by dissolving copper sulphate, 27 oz., in water, 1 gal. To this is added cautiously, while stirring, concentrated sulphuric acid, 6½ oz. All connections are made before the work is suspended in the solution. If the work is suspended in the solution while the current is off, the results may be unsatisfactory. The rheostat is adjusted so that the voltmeter reads 5 volts. This adjustment is maintained for about 5 min., after which the rheostat is again adjusted until the meter reads about 1½ volts.

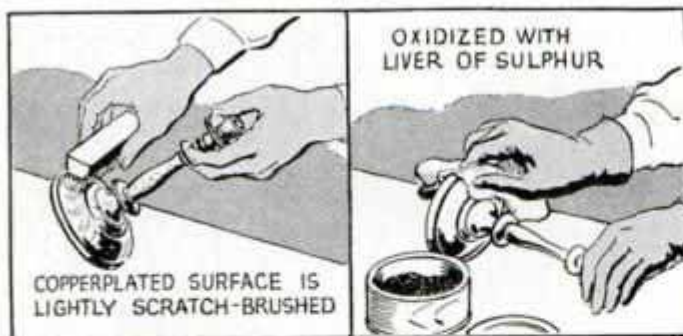
The work should be inspected from time to time. Too high a voltage will cause the plate to be dark in color, while too low a voltage will not only slow down the work but make the plate crystalline rather than smooth. The ideal voltage to use is the highest value which will give a bright, reddish plate. When lifting the work from the tank, do not turn the current off. The copper plate will not appear all over the job at the same time, but will start at one or more spots and spread until eventually the entire surface is plated. Changing the position of the work in the sling will speed coverage. From 30 to 90 min. will be required for the plate to cover the entire surface if graphite is used as the conducting material. If copper bronze powder is used, the time will be reduced to somewhere between 10 and 30 minutes.

Jobs which are particularly difficult to plate may be speeded by giving them the



After Covering an Article with Graphite or Copper Bronze Powder, It Is Immersed in the Copperplating Bath, Connected as Shown in the Above Diagram

copper. It is very important to avoid touching the work with the bare hands, or getting it even slightly dirty or oily, before or during the process of plating. The job is wired up, that is, connected to pieces of clean copper wire for the dual purpose of suspending the job in the plating tank and to conduct electricity to the prepared surface. If possible, a small piece of brass, to which a long wire is soldered, is clamped to the work so that it makes good electrical contact. The brass piece may be adjusted from place to place during the plating operation so the plate will form all over the work. A better method is to suspend the work in a sling of fine copper



so-called oxidizing treatment before immersing them in the plating bath. In this process the graphited surface is wetted with a dilute copperplating solution made by adding an equal volume of water to a small portion of the copperplating solution above described. Fine, clean, grease-free iron filings are then sprinkled over the wet surface and gently brushed until the entire surface is completely covered with red copper plate.

Oxidized Copper Finish: After plating with copper, the work should be lightly touched with a soft-wire scratch brush. This must be done cautiously as the plate is thin. If an oxidized-copper finish is wanted, the work is next lightly buffed with a cloth buff and rouge. It should then be cleaned in a hot lye solution, rinsed, and brushed with a hot solution of liver of sulphur and distilled water, until the desired tone of brown has been developed. The work is finally washed, dried, and lightly scratch-brushed to bring out high lights, and given a final coat of clear metal lacquer to preserve the finish.

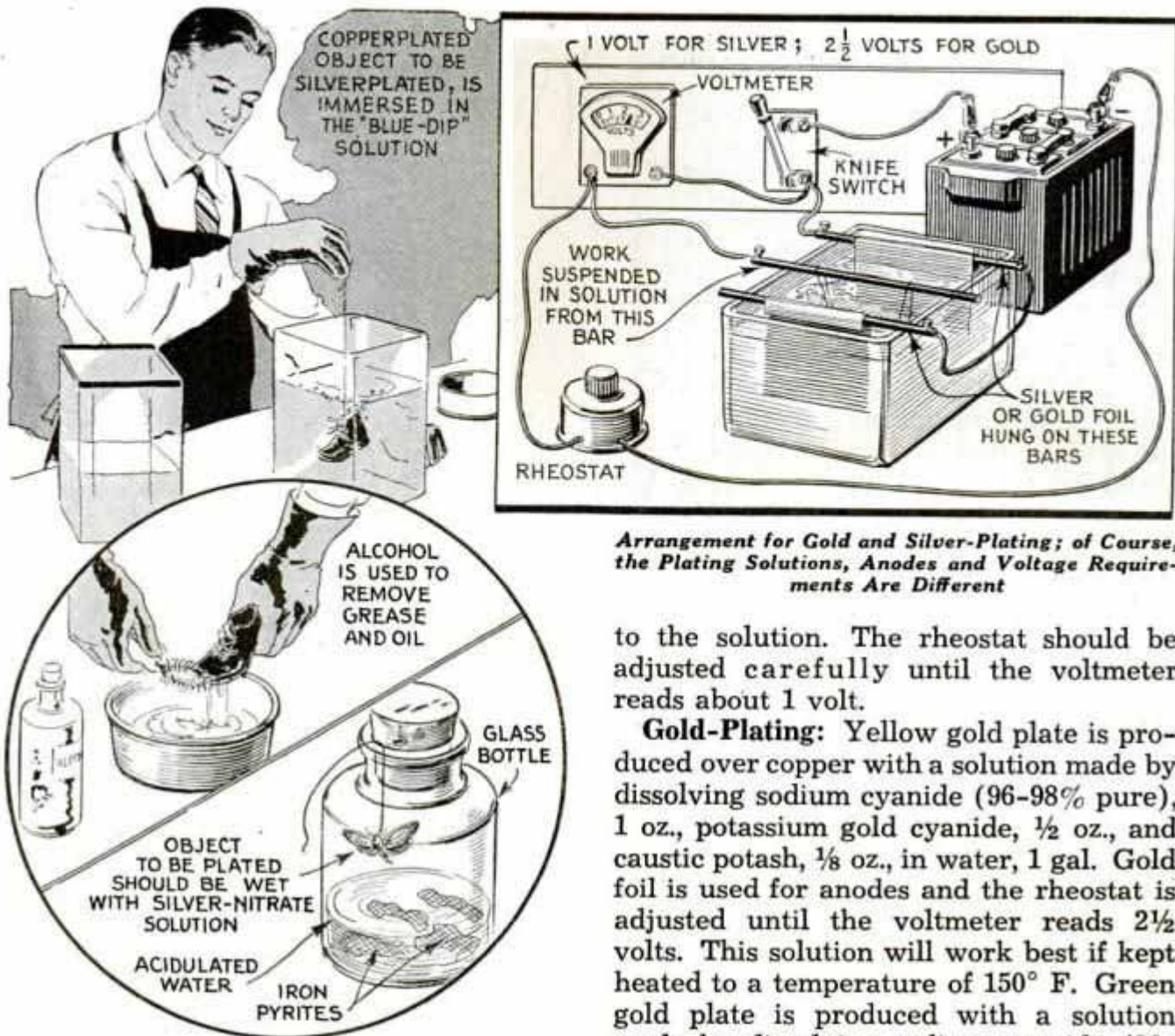
Silver-Plating: If silver or any other metal is to be plated over the copper, the work is thoroughly washed after removal from the copperplating solution and left suspended under clean water until the other plating solution is ready for use. If the copper plate is left exposed to the air it will become slightly corroded and this will make it difficult to plate with another metal. The silver-cyanide plating solution described here is particularly effective for this kind of work. Three solutions are required. The first or blue-dip solution is made by dissolving sodium cyanide, 6 oz., and bichloride of mercury, $\frac{1}{2}$ oz., in water, 1 gal. The work is transferred to this solution for a second to coat the surface with



Above, While Gold-Plating, the Solutions Are Kept at Uniform Temperatures in a Water Bath; Below, After Work to Be Silver-Plated Is "Blue-Dipped," It Is Placed in This Silver "Strike" Solution

mercury and then it is immediately suspended in the second or so-called "strike" solution made by dissolving sodium cyanide, 8 oz. (96 to 98% pure), silver cyanide, $\frac{1}{2}$ oz., and caustic soda, $\frac{1}{4}$ oz., in water, 1 gal.

This solution as well as others containing cyanides are extremely poisonous and must be handled with great care. They should be used in a well ventilated room and near an open window. Under no conditions must acid or copper-sulphate plating solution be spilled into cyanide solutions, as this would cause their decomposition and the generation of deadly poisonous hydrocyanic-acid fumes. When working with cyanide solutions, wear rub-



Arrangement for Gold and Silver-Plating; of Course, the Plating Solutions, Anodes and Voltage Requirements Are Different

to the solution. The rheostat should be adjusted carefully until the voltmeter reads about 1 volt.

Gold-Plating: Yellow gold plate is produced over copper with a solution made by dissolving sodium cyanide (96-98% pure), 1 oz., potassium gold cyanide, $\frac{1}{2}$ oz., and caustic potash, $\frac{1}{8}$ oz., in water, 1 gal. Gold foil is used for anodes and the rheostat is adjusted until the voltmeter reads $2\frac{1}{2}$ volts. This solution will work best if kept heated to a temperature of 150° F. Green gold plate is produced with a solution made by dissolving sodium cyanide (96-98% pure), $1\frac{1}{2}$ oz., caustic potash, $\frac{1}{4}$ oz., and green gold cyanide, 1 oz., in water, 1 gal. It is used as explained for yellow gold except, that the temperature should be 90° F. and the voltage should be adjusted to 3 volts. Other metals such as nickel and chromium may be plated over the copper by using standard plating solutions such as have been explained in past issues of Popular Mechanics Magazine.

Plating Leather, Textiles and Plastics: Leather, textiles, plastics, as well as close-grained materials which do not absorb moisture readily, can be sealed with a good grade of spar varnish or with water-resistant clear lacquer. Rigid articles, after being thoroughly washed with alcohol to remove all traces of grease, are dipped into, or painted with, varnish or lacquer. Fragile items should be sprayed with varnish or lacquer thinned with alcohol. After thoroughly drying, a second coat of commercial electrotypers' varnish

Leather Articles Are Washed in Alcohol before Proceeding; Below, Insects and Delicate Objects Being Exposed to Hydrogen Sulphide before Electroplating

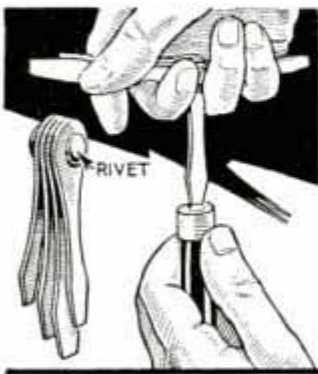
ber gloves to protect yourself against entrance of the poison through cuts or skin abrasions. These solutions are used daily without mishap, and if the rules given here are followed, they are perfectly safe. The strike solution is used in a clean plating tank and connected as shown in one of the drawings. Sheets of steel are suspended from the positive rods. The job is wired to the center or negative rod and immersed in the solution with the current on without a rheostat. In a few seconds a silver coating will completely cover it. It is then removed and immediately transferred to the silver-plating solution made by dissolving sodium cyanide (96-98% pure), $4\frac{1}{2}$ oz., silver cyanide, 3 oz., and ammonium chloride, $\frac{1}{8}$ oz., in water, 1 gal. If a bright plate is wanted, carbon bisulphide, 1 oz. (inflammable), may be added

Frank S. Lewis

is applied uniformly. When the varnish has dried tacky finely ground graphite is dusted on every part to be plated. Copper powder may be used in place of graphite. After this treatment, you can proceed with plating as already described.

Leaves, Flowers and Insects: Leaves, flowers, insects and other delicate objects whose markings must be preserved in the final plate with more accuracy than is possible with the graphite or metal-powder methods should be chemically treated to render them conducting. This is done by first dipping the object in a dilute solution of silver lacquer and allowing the thin film to dry thoroughly. When dry, the job is next dipped into a solution made by dissolving silver nitrate, $\frac{1}{2}$ oz., in water, 1 pint. The object should be left in this solution until its surface is thoroughly wetted. The wet job is then suspended in a bottle in the bottom of which there should be a few lumps of iron pyrites. These should be covered with water, to which is added a few drops of hydrochloric acid just before the object is suspended inside the bottle, but above the water. Hydrogen sulphide will be generated in the bottle and this reacts chemically with silver nitrate to form silver sulphide, an insoluble substance which is a fairly good conductor of electricity. When the coating of sulphide is complete, the object may be copperplated and then finished with any other desired plate. When using the sulphide process it is well to work outdoors as the gas is evil smelling and is somewhat poisonous if too much is inhaled.

Nest of Assorted Screwdrivers Folds Flat



Electricians and others will find many uses for this nest of screwdrivers, which folds flat to carry easily in the pocket. After the steel bits have been ground to shape and drilled for the pivot screw, they are hardened by heating to a cherry red and then plunging them into cold water. The tool is gripped as shown, which gives strong leverage.

Rolls of Wrapping Paper "Filed" on Ends to Prevent Tearing



Wrapping Paper Will Not Tear Ragged along the Edges if Ends of Roll Are Roughened with File

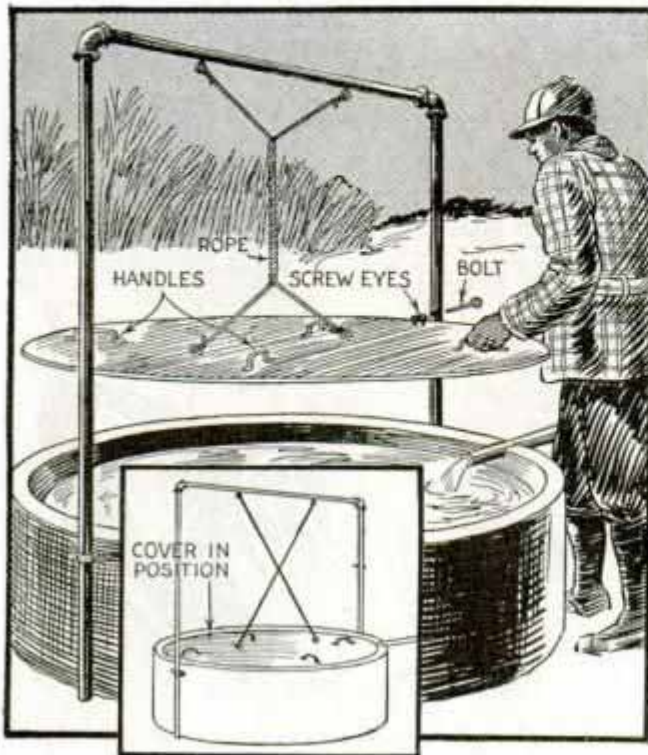
When wrapping paper is stored, dampness often causes the layers to stick together at the ends so that the paper tears when unrolled and ragged edges result. To avoid this, one merchant roughens the ends of each roll with a rasp or coarse file to separate the layers before placing the paper in a rack.

Pencil Holder of Corrugated Cardboard Shields Shirt and Saves Pocket

To carry a number of pencils and pens in his shirt pocket, a shipping clerk uses this holder, which is a piece of corrugated cardboard cut and folded to the shape shown. It not only saves wear on the pocket, but as the back of the holder extends above the pocket, it acts as a shield against soiling the shirt when pencils are removed or replaced hurriedly.



One-Piece Cover on Water Tank Raised by Twisting Ropes



This One-Piece Cover Allows Stock to Drink from All Sides of the Tank

Instead of protecting your stock-watering tank in winter with a cover hinged in several sections for easy removal, make it in one piece and suspend it with two ropes from a pipe frame over the tank, crossing them as shown. To raise the cover, it is rotated by means of handles provided, causing the ropes to shorten in twisting. At the proper height, a bolt is inserted through one of the pipe standards and through screw eyes in the cover to hold it in place when it is raised.

Painter's Putty Carried in Watchcase

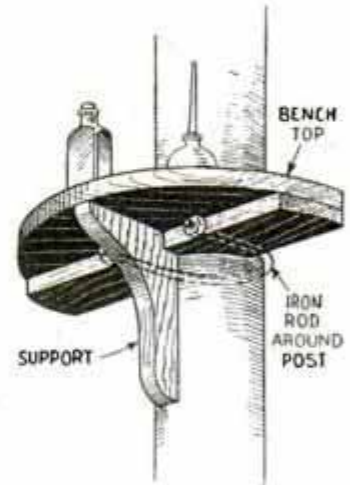


To keep a little putty handy for filling cracks and nail holes, a western painter carries it in an old dollar watchcase, which he clips to a pocket or the front of his overalls. He claims that this is a much better method than carrying a ball of putty in

his pocket, where it dries out quickly. The crystal of the watchcase is removed and a spring clip is soldered to the ring.

Utilizing Pillars in the Shop

Large pillars supporting overhead beams provide ideal locations for tool shelves and light workbenches. These may be either circular or semicircular, and are fastened to the pillars by means of wood brackets and U-bolts as shown, the bolts straddling the pillars and fitting through holes drilled in the cleats on the undersides of the shelves.



Directed in front of his face by an assembly of pipe and fittings, air from the blower of a blacksmith's forge serves as a screen to protect his face. The pipe as-

Worker's Face Shielded from Forge Heat by Thin Sheet of Air

sembly is tapped into the blower pipe, and is provided with a valve by which the flow of air can be controlled. Although not shown in the drawing, a short nipple, flattened at one end and screwed horizontally into an elbow on top of the assembly, will spread the air into a wide sheet or screen between the forge and the worker.



Thin Sheet of Air Forced between Forge and Worker Protects His Face against Intense Heat

sembly is tapped into the blower pipe, and is provided with a valve by which the flow of air can be controlled. Although not shown in the drawing, a short nipple, flattened at one end and screwed horizontally into an elbow on top of the assembly, will spread the air into a wide sheet or screen between the forge and the worker.

Sliding Shelf under Bench Saves Work for Packing Clerk



Stooping or Lifting of Heavy Boxes Is Unnecessary When Packer Uses Shelf on His Work Table

When a shipping clerk or packer fills a box with miscellaneous items, he must either stoop to fill it on the floor or else set it on a bench and lift the heavy, filled box to the floor. To save this work, one packer built sliding shelves under his bench on which to rest the packing boxes. The shelves are placed about halfway between the top of the bench and the floor. They are made with 2 by 4-in. frames and slide under the bench when not in use.

Writing Added to Half Tone with Pencil



Printers, who sometimes find it desirable to write or print on a half-tone engraving, will find that a good method of doing this is to first make a regu-

lar paper mat of the engraving, and then write on it with a medium-hard lead pencil. The pressure should be no greater than in writing on any other paper. When the mat is cast, the stereotype will retain the writing so that it will show up as legibly when printed as if the writing had been made on the original copy.

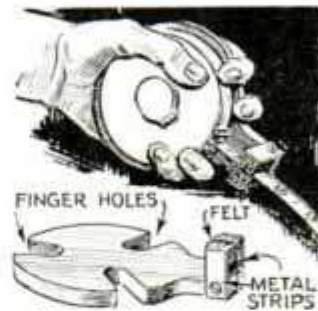
Broody Hen Discouraged with Leg Clamp

Unable to settle down comfortably on a nest, a broody hen wearing this leg clamp is soon discouraged and returns to profitable egg laying. The clamp is a strip of sheet metal $1\frac{1}{2}$ in. wide and 5 in. long drilled and bent to the shape shown. A piece of felt or rubber is used as a cushion between the clamp and the leg to prevent injury. The clamp will not interfere in any way with the regular habits of the fowl.



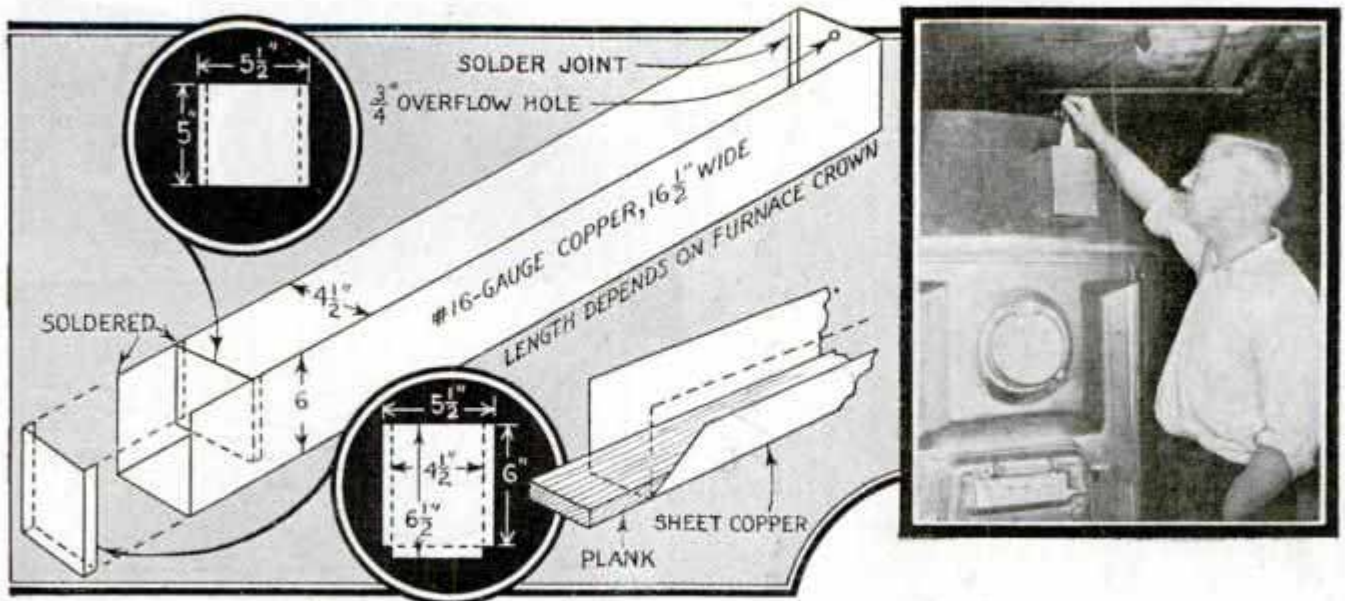
Steel Tape Oiled While Winding to Prevent Rust

Applying oil to a steel tape as it is wound will go far toward preventing rust. A simple oiler for this purpose consists of a wood disk with an extension on one side. It has three slots spaced to fit the fingers so that it can be held comfortably between the tape case and the palm of the hand. The extension on the end has two brass or iron strips fastened at right angles to it. Felt pads are glued to these pieces as indicated and are kept moistened with oil.



☞ For delicate measurement of chemical solutions, use a medicine dropper that has had the end drawn out to a fine point over a bunsen burner.

Efficient Humidifier Placed in Furnace Crown

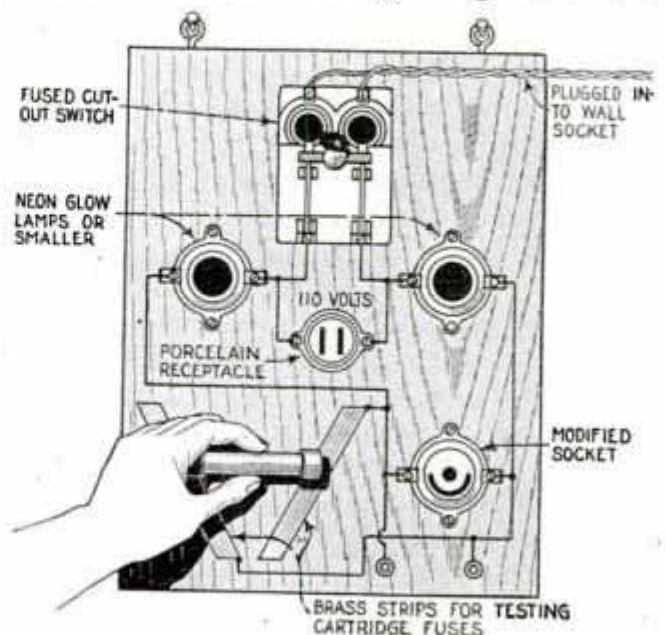


Inserted through the crown of your hot-air furnace, this humidifier will be found much more effective than the usual water pan in maintaining the correct humidity in your home. There is no danger of cracking the hot furnace castings by water leaking on them as there are no joints within the furnace jacket. The humidifier is a copper trough, which should be long enough to reach from one side of the furnace to the other with the ends projecting outside the crown. It is mounted about 3 in. above the furnace dome, one end extending about 6 in. to permit filling,

which can be done with a pail. Better still, a faucet can be arranged above the opening of the trough as shown in the photo. An overflow hole is provided at the end of the trough extending from the rear side of the furnace, while a baffle at the front, where the trough enters the crown, serves the double purpose of keeping dust from entering the furnace jacket, and of preventing water from overflowing if poured too fast. If 16-gauge copper is used, the trough will support its weight when filled, but if a lighter gauge is used, it should be supported by two rods.

Electrical Test Board That Will Handle Many Light Jobs

Plugged into a wall outlet, this test board is handy for testing fuses, lamps, etc. Two brass strips take care of cartridge fuses, while a modified socket, which has one-half of its inner shell removed, takes care of plug fuses and lamps. A blown fuse or burned-out lamp will not light the neon lamps on the test board. Bulbs that are in good condition will not light, but they will flash the neon lamps. The board also contains a receptacle from which a 110-volt current can be taken for operating tests. Feeler wires may be connected to the posts below the modified socket to test for grounds, or short and open circuits.

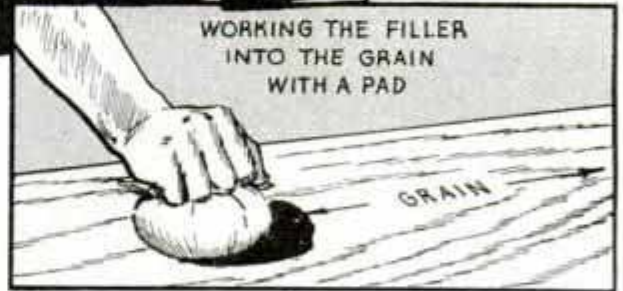


You Can Make This Test Board at Practically No Cost and Use It to Test Fuses, Lamps, Etc.

☐ If rubbed with a soft-lead pencil, a seal will make a clear impression on hot wax, and the fine lines will not be clogged.



Practical



produce an exceptionally fine finish it is advisable to repeat this process. Before filling the grain, you mix a half-and-half solution of raw linseed oil and turpentine and apply this with a soft cloth, rubbing the surface briskly with the saturated cloth until the oil is absorbed. Allow to dry at least 36 hrs. When dry, you again smooth up with fine steel wool, No. 00 or finer, taking particular care to work exactly with the grain. This is important, as the object in using the steel wool is to clean out the surplus oil that collects in the open grain of the wood.

UNEXCELLED for beauty and durability, the oil finish is extensively used on the highest grade of work. For example, the finest gunstocks made at the present time are invariably finished in oil. Prized antiques are often renewed by oil finishing. No special equipment or materials are required and anyone can do the work.

While practically any of the hardwoods can be oil-finished, it is perhaps most commonly done on walnut, of which there are many grades and kinds both foreign and domestic. The first essential is a glass-smooth surface on the wood. Sand new wood smooth with progressively finer grades of paper, using grits from No. 1 to No. 6-0. Then dampen the work with a sponge. In this you merely dampen the surface uniformly; you do not get it sloppily wet. The purpose of this is to raise the grain by causing a surface swelling. After the surface is dry it is sanded thoroughly with No. 6-0 paper. If you must



In filling you use walnut-colored paste wood filler, pouring off the liquid contents of the can and to this adding only half the solid material in the bottom of the can. To this solution, thoroughly stirred, add sufficient ebony oil stain to give a deep, chocolate color. Mix in whiting until you get a fairly stiff paste. Cut two 12-in. squares from muslin, lay one over the other, place a half teacupful or so of the filler at the center and fold the cloth from the four corners. Squeeze the pad until some of the filler is forced through the cloth, then rub it briskly on a piece of smooth wood until the bottom of the pad is glazed over. Fill the surface by rubbing the pad across the grain, using sufficient pressure to keep the filler coming through in very small

659 Washington Blvd. Chicago. Made up usually
Hooker Glass and
Co.

FINISHING



amounts. On curved work, use a circular motion which crosses the grain going and coming. Keep up the hard rubbing until the filler begins to set causing the pad to stick. Then instead of wiping off the excess, allow the work to dry as it is for 36 hours. Now, tack a piece of $\frac{1}{4}$ -in. felt to a block of wood and over this fasten a strip of No. 6-0 wet or dry sandpaper. Pour linseed oil on the filled surface and sand until you remove all traces of excess filler. It is important to sand across the grain. Continue the sanding with fine paper until examination of the surface discloses no open grain at any point.

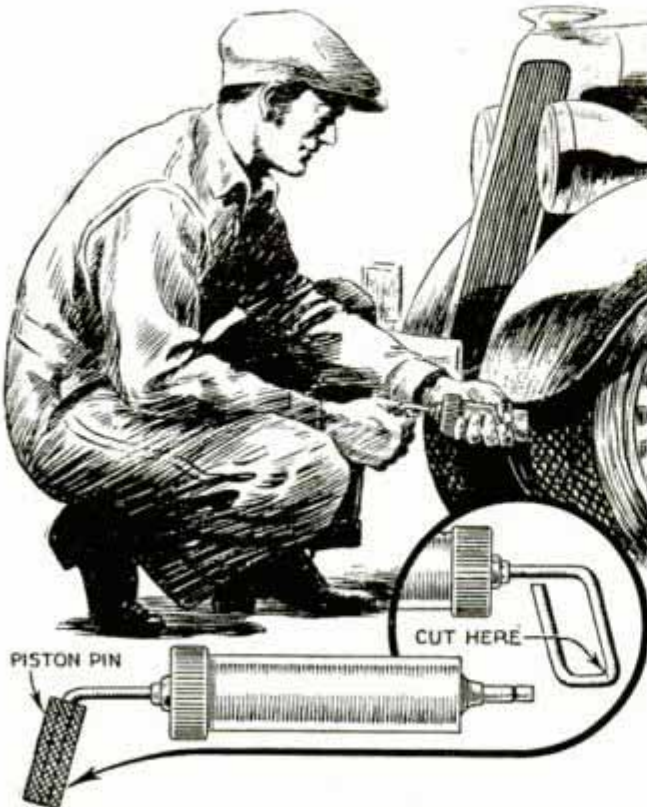
The final process consists of continued applications of a half-and-half solution of raw oil and turpentine at 36-hr. intervals until the wood will absorb no more oil. The length of time it takes to accomplish this depends on the texture and density of the wood. As a rule three or four applications will be sufficient. When the wood will no longer absorb oil it is ready for the final polishing. The boiled oil alone is used in polishing. It should be the best quality you can obtain. Apply the oil in a thin coating, allow it to dry at least 48 hrs. and then polish. On a flat surface you can make a good polisher by tacking a piece of leather to a small block of wood. On irregular-shaped work, such as a gunstock, polish with the palm of your hand. Continue the rubbing until the surface is dry and smooth. Then apply a fresh coating of the oil and again



allow to dry. The degree of the polish depends directly on how far you carry the polishing and re-oiling process. The outstanding quality of the oil finish at any stage is its resistance to heat, cold and moisture and it always retains sufficient elasticity to prevent checking and peeling even under the most adverse conditions.

☐ Spread thick lacquer over the end of a bolt, after tightening the nut and after the lacquer dries it will serve as a satisfactory substitute for a lock nut.

Grease-Gun Handle Made Comfortable with Old Piston Pin

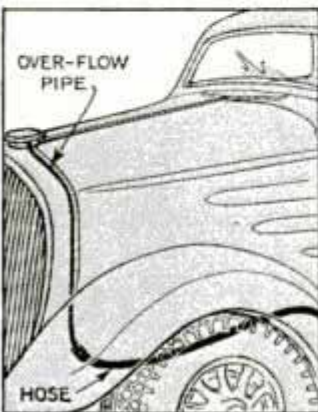


"Zerk" Grease Gun Will Open Clogged Grease Fittings Easier When Fitted with This Hand Grip

When using a small Zerk grease gun, and a clogged fitting is encountered that requires considerable pressure to open it, the small handle of the gun is hard on the hand. To improve the handle I sawed it off as indicated and slipped a piston pin over the remaining part. The space between the handle and pin was filled with molten lead to hold it in place, first filing several notches in the handle to give the lead a "grip."—W. C. Wilhite, Edelstein, Ill.

Alcohol Fumes from Car Radiator Carried Away with Hose

To keep the fumes of alcohol in my radiator from entering the car, I slipped a length of rubber hose over the overflow pipe and run it back to the rear of the car. The hose can be fastened with clips or wire to the frame or splash aprons to hold it in place. Care should be taken



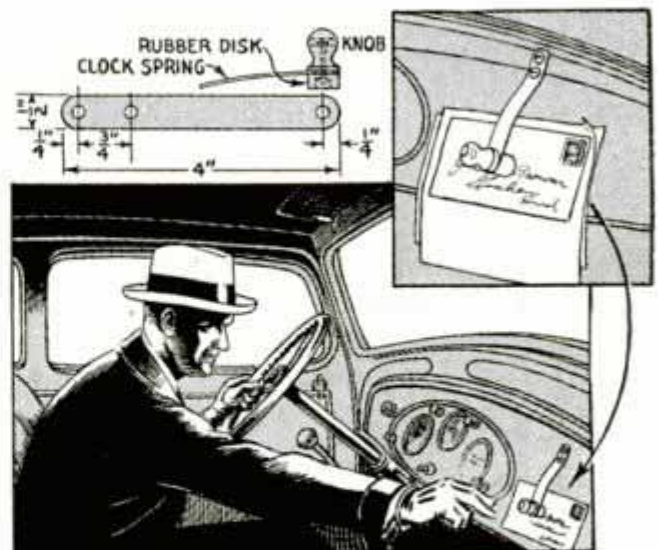
to see that the hose is kept well away from the exhaust pipe. It is still better to use copper tubing as a substitute for the rubber, and in this case only a rubber connector is used to attach it to the overflow line.—John Cosgrave, East Moline, Ill.

Installing New Piston Rings to Prevent "Freezing"

Serious trouble due to the seizing of newly fitted piston rings at the bottom of the cylinders sometimes occurs when the rings have been fitted only to the worn part of the cylinder walls. When the new rings pass into the unworn part of the cylinder, at the bottom of the stroke, a lack of sufficient end clearance causes them to stick, and either break or "freeze" to the cylinder walls. This freezing usually occurs soon after the motor stops and while it is still hot. It is due in part to the fact that the cylinder cools somewhat faster than the piston and to the removal of lubrication, thus allowing a metal-to-metal contact. The trouble may be effectually prevented by fitting the rings at the bottom of the cylinder allowing .001 in. end clearance per inch of cylinder diameter.

Letters and Papers Kept Handy on Auto Instrument Board

Salesmen, drivers of delivery cars, etc., will find that clips bolted to the instru-



Clip on Instrument Board of Car Keeps Papers at Hand for Quick Reference

ment boards of their cars are handy for holding letters, papers, memo pads, order slips, etc. The clip is a piece of clock

spring, which is drilled at one end for stove bolts and at the other for a wood knob. If the spring is annealed at the ends by heating it to a cherry red, it can be drilled easily, after which it should be heated again and then cooled in water to harden.

Fogging of Windshield Prevented by Rubbing Solution on Glass

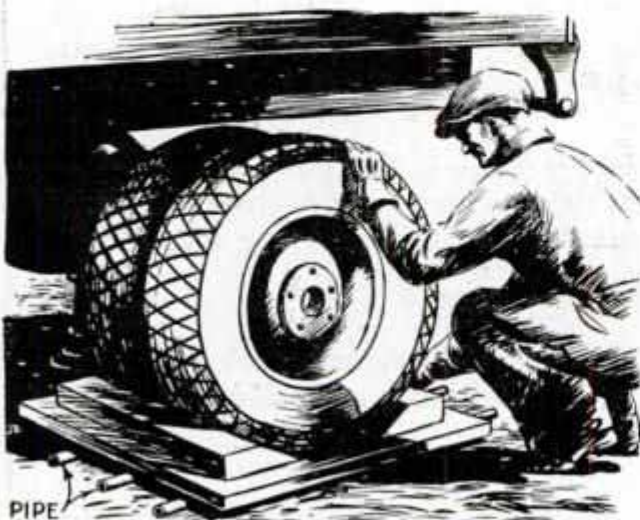
Applied to your windshield with a cloth, the following solution will effectively keep it from fogging: Potassium oxalate, 16 oz., dissolved in glycerin, 8½ oz., with the aid of heat. A hot-water bath furnishes the most satisfactory heat for this purpose.



Then add camphor, ⅛ oz., and continue heating until this has dissolved. The heat is now turned off and turpentine, 1 oz., is added while stirring.

Double Truck Wheels Removed Single-Handed

Removing heavy truck wheels is made quite easy by using a strong platform which rests on lengths of pipe or iron rods. Drive the wheels to be removed on the platform, and then take the weight off the axle with a jack. Loosen the axle nut and pull the wheel and platform toward you. If the platform is to be used frequently, put dolly rollers under it.



Removing Heavy Truck Wheels Becomes a One-Man Job When This Platform Is Used

Valve-Grinding Compound Kept Handy on Motor with Wire Holder

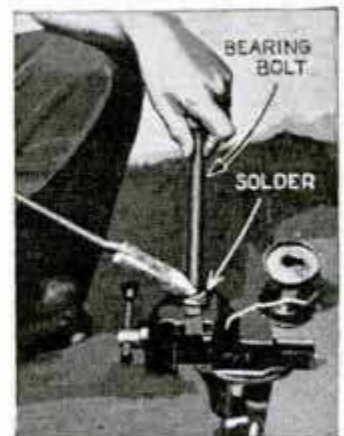


Ends of Wire Holder Hook into Holes in Block Next to Workman When Grinding Valves

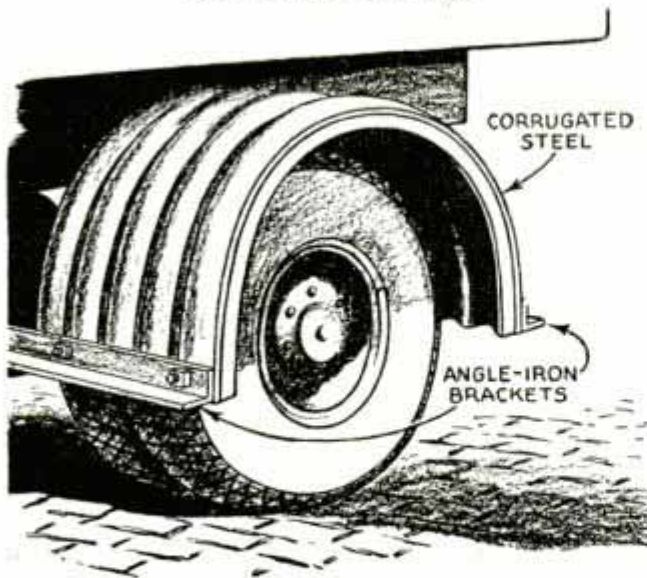
To avoid possibility of delay or of spilling materials, when grinding auto valves, bend a length of heavy wire to the shape shown and insert the ends into the stud holes in the motor block. Then you can put the pans containing gasoline and valve-grinding compound in the holder and keep them conveniently at hand.

Oil Leaks around Bearing Bolts Stopped with Solder

In cars having the upper ends of the rear main-bearing bolts outside the crankcase, mysterious oil leaks sometimes occur. Often, it will be found that the fit between the lower half of the bearing and the motor block is not tight which permits oil, under pressure, to leak into the bolt holes. To stop this, the bolts are removed and solder is run under the head as shown. When the bolts are pulled down tightly, the soft solder effectively seals the opening.



Strong Fenders for Trucks Are Made from Steel Culvert



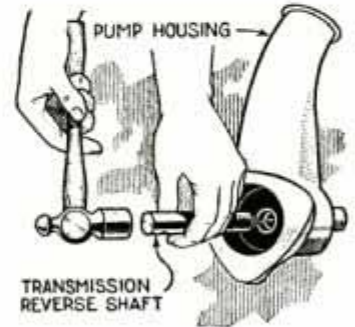
Section from Corrugated Steel Culvert Used as Fender on Large Truck or Trailer

Sections cut from large, corrugated steel culverts make good fenders for trailers and the rear wheels of trucks. The section is cut in half and opened up to the right curvature, after which it is attached

in place with strips of angle iron. If more than one section is required for each wheel, they are joined easily by overlapping the ends and bolting them together. If a material lighter than culvert steel is needed, corrugated roofing will do nicely. —E. T. Gunderson, Jr., Humboldt, Ia.

Pump Bushing in Ford Removed Quickly

If you have trouble in removing the bushing from the water-pump housing of a V-8 Ford, try using the reverse shaft from the transmission of a model-A Ford as a driver. This shaft is the same diameter as the bushing on the water pump.



☛Leather gloves can be cleaned by rubbing them with wallpaper cleaning dough.

The Next Issue

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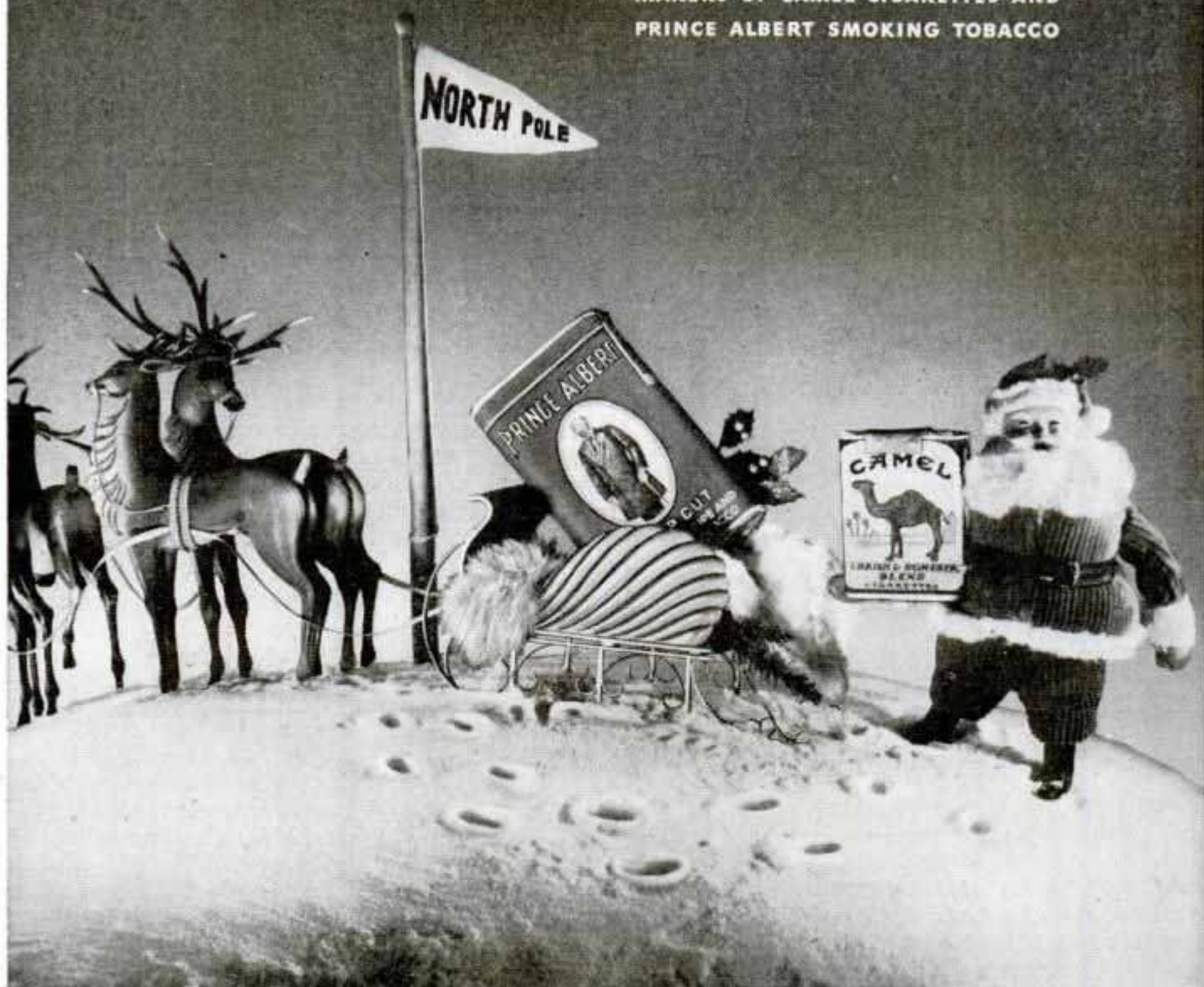
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FROM

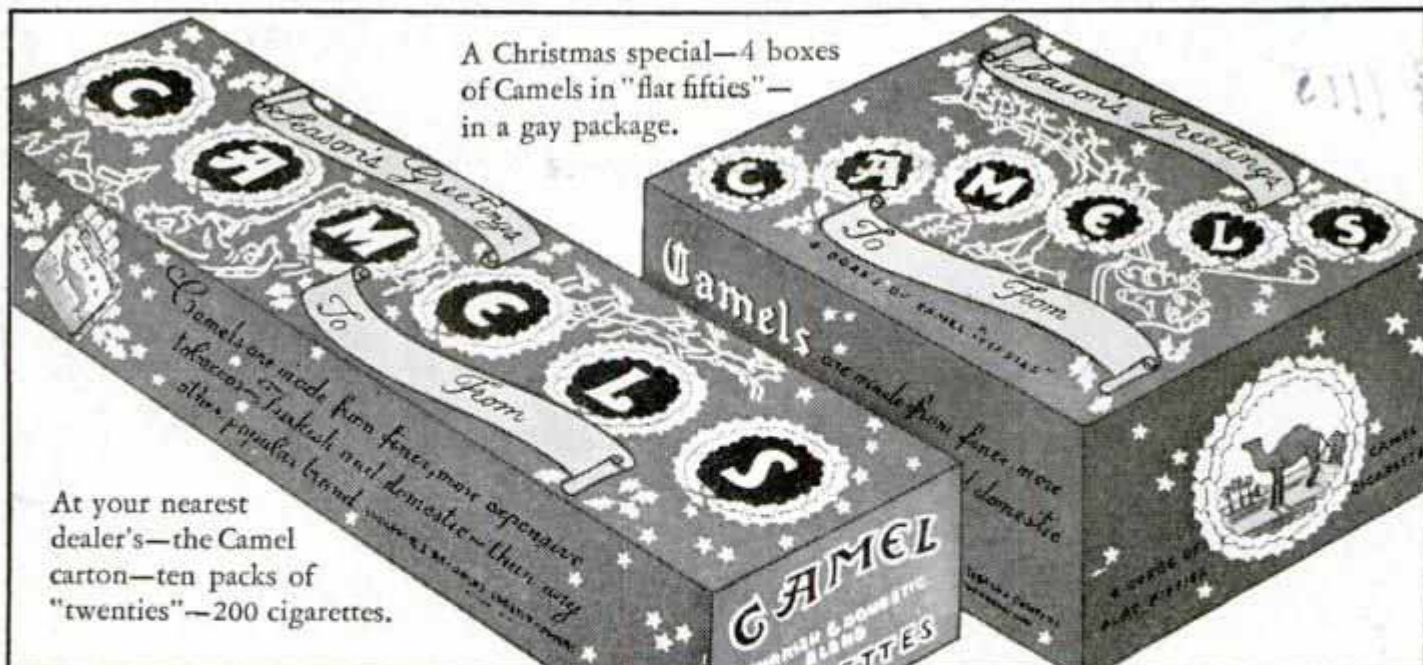
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Movie Costumes Worth Millions

(Continued from page 84)

8 1115

photograph, an expert badge maker can turn out a replica of any badge in gold or silver plated white metal in two hours. First, he models the outline in clay on glass, casts hot metal on the model, finally quick-plating the badge. Although tens of thousands of badges of all kinds are stored in Hollywood wardrobe departments, one studio recently found it had none from the Los Angeles police department.

Hollywood costumers often perform feats of wizardry overnight. One morning a director called for two French court costumes of 1750. At noon he amended the order to include swords, "one to break in a duel, and I want 'em tomorrow morning." Laboring all night, the costumer severed the steel blade, mitered it, provided a rod and ring on one side and a trigger which the actor could pull to drop the blade when the duel commenced. So finely did he balance the blade that, when the defeated swordsman pulled the trigger, the steel foil flashed through the air and fell quivering on its point directly in front of the camera.

Many similar tricks are employed to provide authentic appurtenances to costumes. Springfield rifles used during the Spanish-American war become blunderbusses when the barrels are cut off, cast brass funnels screwed on and flint holders added. Firing modern shells equipped with powder-filled cartridges which burn on leaving the barrels, they provide atmosphere and noise so necessary to "action."

Within the mothproof gas room of one costuming concern are 100 diplomatic uniforms. With minor changes, these can serve to represent any nation in the world. Each diplomatic tail coat contains gold decorations costing \$325. This is nontarnishable gold bullion in the form of tiny tubes cut to fit the pattern and fastened by thread to first-class broadcloth.

Costumes pour into Hollywood for every country on the globe. Ex-generals, retired diplomats and peasants all sell their gold-braided coats, striped trousers and tattered garments to old-clothes men. These, in turn, pass them on to brokers, and those considered of value to pictures are shipped to the film capital. Oddly,

movie producers prefer locally made duplicates because to look well on the screen, costumes either must have the appearance of newness or be properly aged.

Not long ago 2,500 European peasants jammed a large movie set, and every suit and dress had been scientifically aged. They were ground under emery wheels, sandpapered, made ragged with files and rubbed with olive oil and grease, beeswax and fuller's earth. Though strong and sturdy, each looked as though it were ready to fall apart. After the picture was finished, the dirty costumes were returned to the costumer who steam-cleaned them and returned them to stock. These torn dresses and coats are even more valuable than new garments, for they are ready to be fitted on actors and extras with no more ado than restoring their dirt and grime.

Pictures whose scenes are laid in ancient times obviously require new uniforms and costumes. Chain mail is not made today but if it were, it would be so heavy no actor could stagger through a day's work. In its place knitted cord takes on the appearance of metal when graphite is rolled into its strands. After such a garment has been knitted, it is painted with aluminum paint to make it look bright and shiny.

Research workers examine many books to learn exactly how each part of a costume should be made, and from what materials. Although these may be considered "substitutes" in that they are not original costumes, movie producers demand that actors wear the type of material called for by the part. A "swell" appears in the best broadcloth evening suit a tailor can produce, while street urchins or orphans are dressed in cheap cottons. Not only does each type of cloth register on celluloid its quality, but also the more costly pieces last longer.

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THE TRUTH ABOUT "DEATH RAYS"

(Continued from page 78)

Short sound waves have been rendered accessible to the eye.

A fine light ray is made to fall into a trough filled with a non-conducting liquid and is then projected on a screen in the form of a small sharply defined point. If now an ultra-sound "ray" emanating from a quartz crystal is passed through the trough perpendicularly to the light ray there appear on the screen, curiously enough, a number of other luminous points, equally spaced left and right from the original point of light. The appearance of these extra points is due to the fact that alternate rarefactions and condensations in the medium through which the ultra-short sound waves pass act as a grating for the light ray and diffract it. The same phenomena of diffraction would indeed be produced by mechanical gratings if their spacing was of exactly the same dimension as the length of the ultra-sound waves, which at a frequency of ten million oscillations per second are approximately one-tenth of a millimeter long. The line connecting the "diffraction images" indicates the direction of the ultra-short sound waves. With enough light rays you can survey at one glance the course of the ultra-sound waves throughout the volume of liquid under observation.

Ultra-short sound waves are in part reflected by metal plates, in part will penetrate them, even though weakened, up to a thickness of ten centimeters. If metal or glass prisms are interposed they are refracted. It is possible even to make ultra-sound lenses.

METAL SHIPPED IN TANK CARS

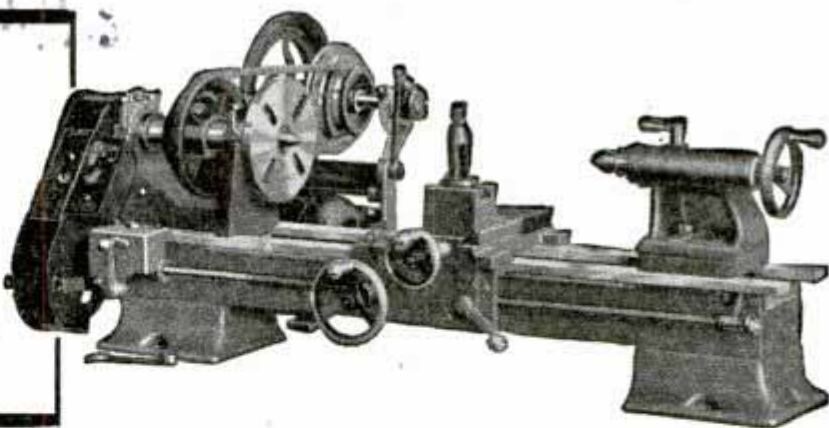
Sodium, a metal so light it floats on water and with a melting point at about the boiling point of water, is used to make lead-ethyl for treating gasoline but shipping it is a problem because in the presence of moisture it burns and it must be kept away from air. The metal now is shipped in tank cars having an inner tank, holding 80,000 to 100,000 pounds, and an outer jacket containing oil. The metal is poured into the tank and at its destination the oil jacket is heated and the metal is blown out with nitrogen gas.

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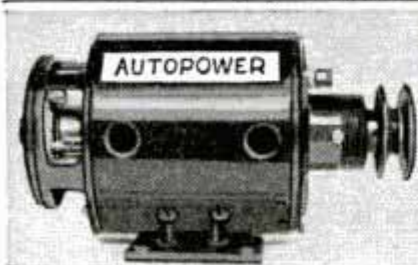
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THE NIGHT!



FOR SKIN-LINE SHAVES THAT
LAST HOURS LONGER



25¢ LARGE TUBE
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61125 **PIRATES OF THE ETHER**

(Continued from page 92)

conducted by the National Broadcasting Company which, utilizing the latest in short-wave and ultra-high frequency equipment, demonstrated at the army's Pine Camp maneuvers that it would be possible to broadcast to the world a description and sounds of an actual engagement on the battle front.

The experiments proved it possible to deliver an intelligent signal through the use of an intricate system of short and ultra-high frequency relays despite interference from more than 268 short-wave transmitters being utilized by the army signal corps in the same sector. In foiling these 268 hypothetical pirates who, in preliminary tests, managed to prevent any broadcast signals from being heard, the engineers made use of ultra-short waves which, while not actually bent over the horizon, were directed to strategic positions where they could be picked up and rebroadcast.

The announcer, equipped with a one-watt pack set, operating on 37.6 megacycles was supposed to broadcast infantry movements despite the interference of the pirates. His signals were received by an automobile mobile unit equipped with a fifteen-watt set operating on 31.1 megacycles, and retransmitted to a seven and one-half watt transmitting set operating on 31.1 megacycles, then sent to a transmitter operating on 2,020 kilocycles on a seventy-foot tower several miles away.

The signal was then picked up at the receiving location at Pine Camp and transmitted by signal corps circuits to the N.B.C. master control circuit at general headquarters from where it was put on a special telephone circuit to New York and thence on the network. Thus through the use of ultra-high frequency and short-wave bands it was possible to eliminate much of the interference which otherwise might have made a network broadcast impossible.

It was an extremely complicated process to foil the mythical pirates—a process which science is much interested in simplifying. Experiments also showed that where ultra-short waves were used and the broadcast "beam" directed to a point behind the lines, the broadcast information could be kept from the "enemy."

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All New

16 complete plans

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Stanley announces sixteen new plans, all in one attractive book. Among the items featured are: Work Bench, Combination Table and Cupboard, Folding Breakfast Unit, Circus Toy, Lazy Chair, Wall Bookcase, Cape Cod Cottage for Birds, End Table, Model Airplane and others.

The directions are clear and concise, and the drawings are easy to follow.

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105 Elm Street

New Britain, Connecticut

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PROTECT YOUR TOOLS FROM THEFT

Makes lumber, shingles, lath, ties, crates, boxes, cases, all forms lumber.

Three capacities: 10, 14 and 20 feet. Accurate set works, positive dogs. Full or one-way type power feed runs on low power—many owners use old auto engine.

Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment.

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TURN TREES INTO MONEY WITH A BELSAW!

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The 1936 Clausing "DeLuxe" Lathe

TIMKEN BEARING equipped. V bed ways. Hooded V belt drives. Convertible to back geared screw cutting. .001" accurate.

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13 in. over bed \$69.50

36 in. between centers



MAN. LOOK AT THESE PRICES ON GENUINE BLACK & DECKER ELECTRIC DRILLS

1 1/2" JUNIOR DRILL \$3.35



THE NEW 1/2" JUNIOR (above): Drives twist drills for drilling up to 1/2" holes in steel; augers for drilling up to 1 1/4" holes in wood. Also drives hole saws for cutting clean, round holes, from 3/4" to 3 1/2" diameter in wood, metal or composition. A husky, he-man tool that will make quick work of so many tough jobs you'll wonder how you ever got along without it. Universal motor. Real Black & Decker quality. A really great drill at a really small price.

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THE NEW 1/4" JUNIOR: Drives twist drills for drilling up to 1/4" holes in metal; augers for drilling up to 1/2" holes in wood. Also drives wheels for light grinding, buffing, wire brushing, polishing, etc. A practical, handy tool that will make short work of a thousand-and-one odd jobs around the shop, home or garage. Universal motor. Dependable Black & Decker construction throughout. A great buy at its sensationally low price.

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Please send me Free Literature describing new low-priced Black & Decker Tools and the address of my nearest B. & D. dealer.

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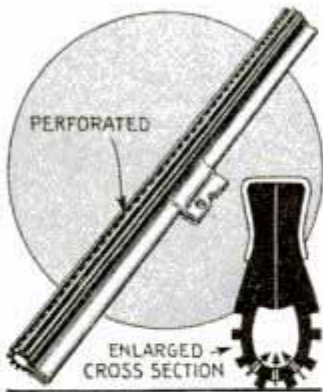
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WIPES
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And in much less time.

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Balloon
PERFORATED
WINDSHIELD
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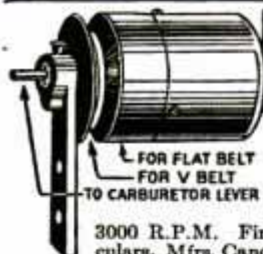
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If your dealer cannot supply you, order direct.

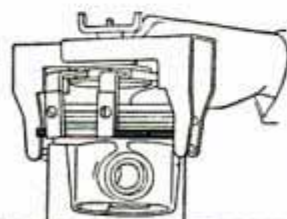
HULL MFG. CO., Box 246-D, WARREN, OHIO

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SUNNEN PRODUCTS CO.
7990 Manchester Ave., St. Louis, Mo.

SUNNEN RINGMASTER

QUICK STARTING IN WINTER

(Continued from page 46)

from developing sufficiently high internal temperature to aid combustion. Low compression, furthermore, reduces intake suction which, in turn, is a handicap in breaking up the fuel as it is sucked through the carburetor jets.

Trying to raise the temperature of the ingoing air is a poor substitute for keeping compression at summer levels. Sensible only is the plan of raising the temperature of the oil or thinning the oil so that compression can be kept normal. Increasing the temperature of the ingoing air fifty degrees isn't of any account when internal temperature is so low because compression, in turn, is at a minimum.

Note again that when compression is low intake suction suffers. Because the fuel is not drawn up into a fine enough spray the vapor, if any, is extremely incomplete. This prevents the spark from the plugs from igniting the charge.

When the service man comes to your rescue he gives the engine a compression boost with the aid of a freshly charged battery. This spins the crankshaft fast enough to build up higher compression and to increase intake suction. The combination of these two is often sufficient to overcome the effect of the congealed oil, the gummed piston rings and the inefficient fueling. But it is just a crutch. The engine should start with a normal battery.

To do this we must watch compression. This, in turn, means watching oil viscosity. For winter operation, lubrication experts recommend an oil designated as 20-W for weather above freezing and 10-W for temperatures between thirty-two degrees (freezing) and fifteen below zero. In colder weather, 10-W should be diluted with ten per cent kerosene.

Almost everything that happens during the starting process in winter is blamed on the cold, yet the fallacy of this should be evident from the fact that the same things happen in summer. Dampness, for instance, will cause shorting of high-tension current across the tops of the spark plugs and across the head of the distributor. No engine will start below a certain cranking speed, and it is apparent that this minimum can be reached through a weak battery or an inefficient starter-motor wheth-

(Continued to page 123A)

QUICK STARTING IN WINTER

(Continued from page 122A)

er it is winter or summer.

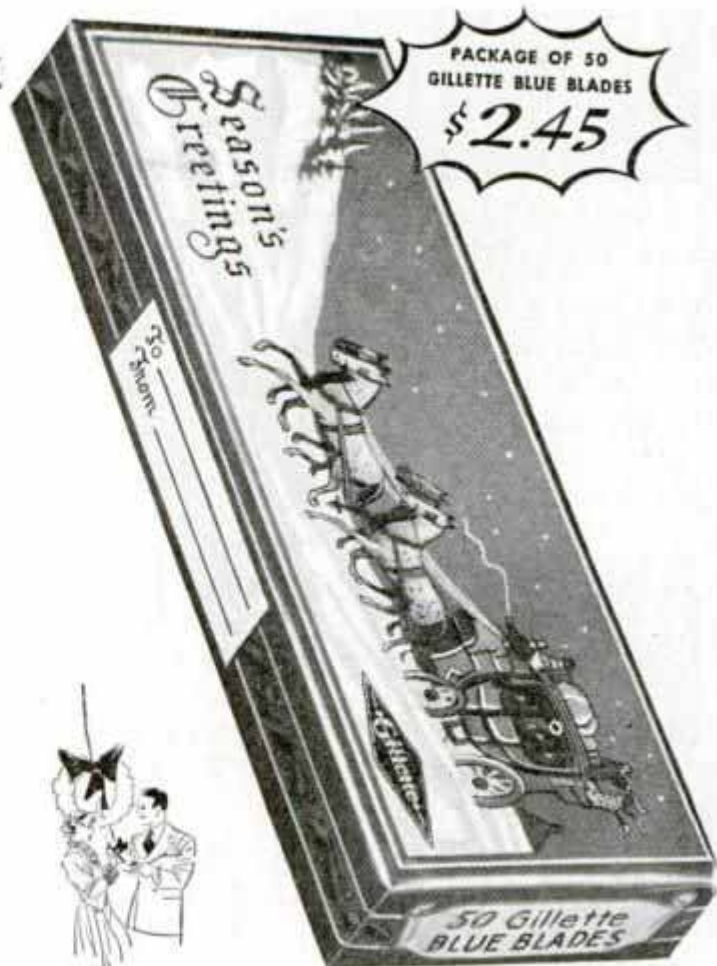
Low compression will bring on a number of other ailments such as a run-down battery, sticky valves, diluted lubricant and fouled spark plugs, to mention a few. The tendency too often is to consider this by-product of poor compression as the cause of the starting trouble rather than to recognize poor compression itself as the seat of the trouble. Compression, unfortunately, is an intangible thing. Without suitable instruments you cannot accurately observe its action. Yet it exists, and in engine operation it ranks with ignition, fueling and lubrication. It is adversely affected through poor lubrication more than through mechanical conditions.

This latter point can be demonstrated easily. Install extra tight rings but do not use winter oil, and then note what happens. The engine won't start, although its mechanical condition should have raised compression, theoretically. It is because so many owners have had difficulty starting their reconditioned engines in winter that compression can be thought of as a hindrance rather than a help. The real difficulty was excessive friction.

What we want in the normal engine is higher compression through permitting the rings to expand freely and by using oil that will flow to the cylinder walls and offer no resistance to the turning of the crankshaft, camshaft, timing gears and other moving parts. Winter lubricants will provide this.

An engine with "sloppy" fitting rings and pistons will start easily in warm weather. There is no reason, therefore, why just as good a start can't be had in cold weather if the engine is kept just as limber through using oil that isn't congealed by the cold.

Preheating the fuel vapor aids combustion, of course, but this can be a detriment. It may cause the engine to start and to run temptingly well before the lubricating system is warmed enough adequately to protect the cylinder walls. Priming has always carried this objection. Using the right kind of winter oil not only improves compression, eases starting and saves fuel but also saves "scuffing" the cylinder walls. It keeps the engine starting through a much longer and more useful life.



THE GIFT TO CHEER HIS MORNINGS FOR MONTHS TO COME

SEARCH the gift counters—hunt for hours in the jostling Christmas shopping crowds and you couldn't find a more thoroughly acceptable gift at anything like the price of this attractive package of 50 Gillette "Blue Blades." Here's a gift that will cheer a man's mornings for months to come—assure him hundreds of clean, easy shaves.

The Gillette "Blue Blade," especially made for tender skin, is first choice of most men everywhere. It is the blade in demand—the most logical, practical gift you can imagine. Make up your list now. Just write Gillette "Blue Blades" on your shopping list for men who "have everything" or are hard to please.

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LePAGE'S LIQUID GLUE—This handy can is ready to use—*always*. Is a standard "tool" in thousands of woodworking shops. Slow setting. Makes joints secure and exact.

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Liquid Glue



2 Waterproof!



LePAGE'S WATERPROOF GLUE—A special glue for use on jobs exposed to the elements or moisture. Takes but a few minutes to add cold water and mix. Several sizes.

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man has so many jobs for a drop or two of liquid solder that he'll find it a real help in his shop. It works almost like magic.

3 Works almost
like magic



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We also have a complete list of film subjects for any projector. Write now for BIG, FREE Catalogue of Movie Supplies.

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BIG
VALUE



Motor Driven

THE NEXT WAR IN THE AIR

(Continued from page 73)

tion, has recorded temperatures at various points on Mars and can measure the heat from a candle flame 100 miles away.

It has been reported that a five-foot searchlight reflector was set up on the Atlantic seaboard, and generators of infrared heat radiations set up at known directions and distances from it. On a pitch-black night beams of infrared radiations were sent out, and made to slowly sweep the horizon. When a ship fifty miles distant intercepted one of these beams, the infrared radiation was reflected back to the large reflector. The latter focused the radiations on a thermocouple, and a galvanometer is said to have indicated the presence of the ship and its exact location.

The great transatlantic liner "S. S. Normandie," is equipped with a radiation emitter and receiver which sweep the horizon through forty-five degrees of angle. In fog these radiations penetrate and reflect back from any large object, such as a ship. An average size vessel four miles distant can be "seen" and small channel buoys two miles distant have been located.

In the next war the phenomenon of irradiation will be used. Extremely short waves, far shorter than the shortest radio waves, when played upon many materials cause the latter to become radioactive and emit their own radiations for several hours. Ordinary table salt, irradiated by X-rays, will glow in the dark for several hours. Thus, many objects which normally are inert, may be made to announce their location to a sensitive receiver.

Ordinary high-frequency radio waves have been found to possess curious reflection characteristics. They have been used to detect the presence of airplanes flying at great heights above the clouds. A radio pulse is sent out from the ground, and the exact time of its departure recorded by an instrument. The exact time of the receipt back of the reflected pulse is also recorded, and the instrument thereby not only gives the elevation of the plane, but also an idea as to its location.

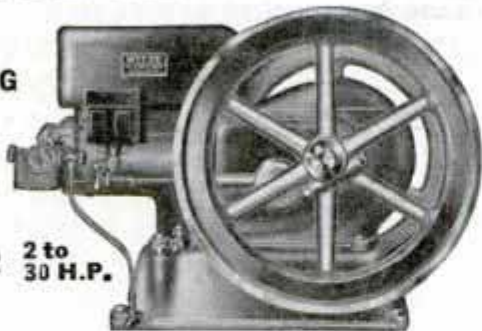
Recent reports say that Marconi, the inventor of radio, has developed an ultra-high power, ultra-high frequency beam of radiation, which will short circuit the electrical ignition system in gasoline engines.

(Continued to page 126A)

WITTE ENGINES

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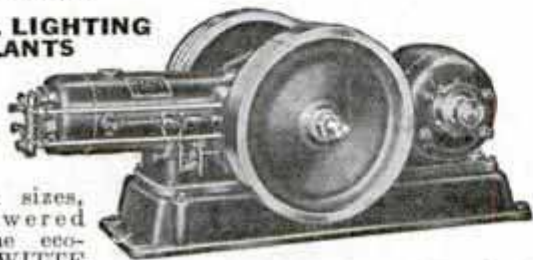


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TERMS** 2 to
30 H.P.

Complete line of engines on wood skids or iron base. Produces economical and dependable power for farm or factory. Saves time and labor. 27 different sizes. Put one to work, you will be surprised how quickly it pays for itself.

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Seven sizes, all powered with the economical WITTE Diesel Engine. Stationary Diesel Engines of 5 and 10 H.P. for other power purposes.

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DOUBLE A

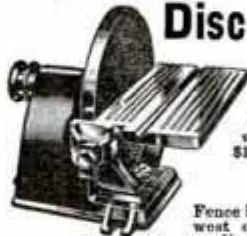
Power TOOLS

**Motor-Driven
Drill** \$2.25



Sensitive, precision-type, light-duty drill press. Maximum distance, chuck to base, 7 1/2"; spindle travel, 1 1/2"; speed, 800 R. P. M. Equipped with chuck and 3 1-8" adjustable swaging table. Overall height, 30"; width, 3 1/2"; depth, 9". Shipping weight, 6 lb. Price, prepaid, \$2.25; west of Rocky Mountains, \$2.55.

Disc Sander \$1.49



Absolutely unique! Nothing like it at so low a price! Has 7" by 3 1/4" table and 6" sanding plate. Overall height, 7"; depth, 8"; length, 8". Shipping weight, 8 lb. Price prepaid, \$1.49; west of Rockies, \$1.79. 6 Assorted sanding discs, 29c extra.

BELT SANDER \$1.95

Fence included. Shipping weight, 12 lb. Price, prepaid, \$1.95; west of Rockies, \$2.39. Sanding belts, 32" x 4", coarse, medium or fine, 30c each.

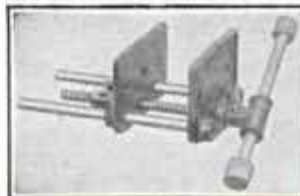
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LATHE \$3.95**

Heavy-duty, for small, accurate turning. Swings 5" stock, 12" long. Hollow spindle. Oilite bronze-bearing headstock. Heavy, accurately fitted tail stock. No. 0 Morse taper spur and cup centers. 2" ice rest and holder. 20" bed, accurately machined. Shipping weight, app. 15 lb. Price, prepaid, \$3.95; west of Rockies, \$4.95. 1/4" V-Type 2-Step Cone Pulley, for motor or lineshaft, 35c extra. (Ask about our full line of wood and metal lathes.)



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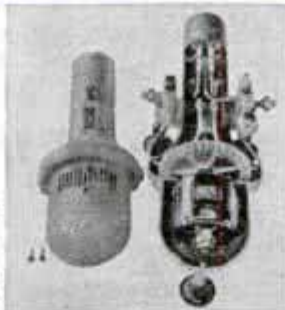
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425-POWER \$18.50

Produced by Lens Specialists

No use owning a cheap, imitation microscope. For true scientific work, you need a precision instrument. And here it is, magnifying 100 to 425 diameters for only \$18.50.



You can explore hidden mysteries of science—learn microscopy and photography with a Wollensak. Made by lens specialists famous since 1899 in optical manufacture.

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Wollensak TELESCOPES
MICROSCOPES
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LITTLE JACK HORNER
SAT IN A CORNER
AFTER EATING A LARGE PIE . . .
HE STUCK IN HIS THUMB,
AND PULLED OUT A TUM,
(WHICH HE ALWAYS KEPT IN HIS VEST)
(POCKET FOR JUST SUCH EMERGENCIES)

WHY MILLIONS CARRY TUMS!

MILLIONS now know the smart thing is to carry a roll of Tums, always. Heartburn, gas, and other symptoms of acid indigestion have a habit of occurring at unexpected times. You don't have to drench your stomach with harsh alkalies which physicians have long warned may make the tendency toward acid indigestion worse. Tums, a real scientific advancement, contain no soda or other alkalies, instead a wonderful antacid that simply neutralizes stomach acidity, the balance passing out of the body inert. Pleasant to eat as candy, only 10c a roll. Put a roll in your pocket now.

TUMS FOR THE TUMMY

TUMS ARE
ANTACID . . .
NOT A LAXATIVE

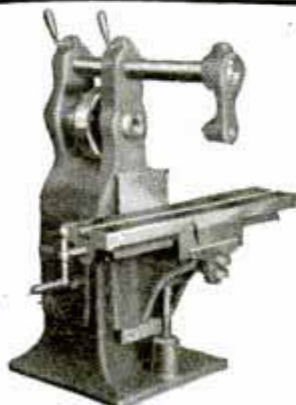
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4 in. vise
Floor size drill press
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Small emery wheel (2 wheel)

Hundreds are taking advantage of this new, economical method of adding to their shop. The price of the mill illustrated includes all parts and machining specifications.

THE NEXT WAR IN THE AIR

(Continued from page 124A)

Such a beam, directed at a squadron of enemy planes, so it was said, would bring them all down in helpless confusion.

These claims are seriously questioned. Science knows no means by which man can generate such a beam. It is true that certain radiations will break down electrical insulation in the laboratory; but to break down the insulation in a distant airplane engine, shielded by a metal hood, would require radiation intensities beyond anything man knows how to generate.

Such radiations exist in the center of the sun, as well as in all stars. They seem to be generated by the profoundly high temperatures. The highest temperature we know how to generate continuously is in the electric arc, which is approximately 6,000 degrees Fahrenheit. The center of the sun, however, is millions of degrees hot. The pressure of the radiations from a ton of matter at such a temperature would knock down the strongest fortifications that man has ever built. Set down in the center of North America it would set fire to everything on the continent.

Until we can do what the sun does, annihilate matter, we shall not be able to sweep airplanes from the sky by playing a beam of radiations upon them. The sun annihilates 240,000,000 tons of matter per minute in order to produce the radiations which it emits. It has been able to destroy this amount of itself for millions of years, and still have left what we see today!

But it is a foregone conclusion that the next war is going to be enormously more deadly and destructive than the last one. While the struggle for command of the air is going on, the giant bomber will percolate through on both sides and deal terrible deaths to thousands miles back of the fronts. One side eventually will win control of the air. Land and water forces will then be disposed to take advantage of this, and the victor will unloose his maximum effort, making full use of the latest devices that science has developed. The effect will be the virtual extermination of the vanquished and the prostration of the victor. A century must pass after the next great war ere civilization shall have gathered itself together and brought a return of human happiness, comfort and security.

(To be continued)

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GREATEST OFFER EVER MADE
PUTS THIS OTTAWA TO WORK FOR YOU
Make Money! Wood is valuable. Saw 15 to 20 cords a day. Does more than 10 men. Ottawa easily operated by man or boy. Falls trees—saws limbs. Use 4-hp. engine for other work. **30 DAYS' TRIAL.** Write today for FREE book.
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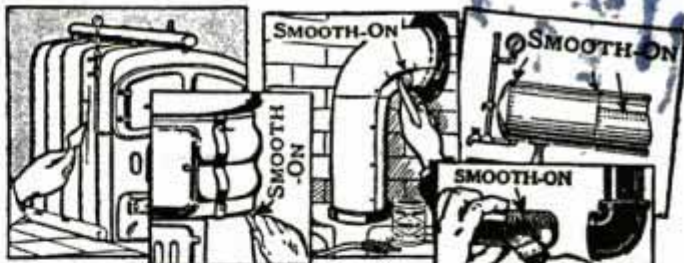


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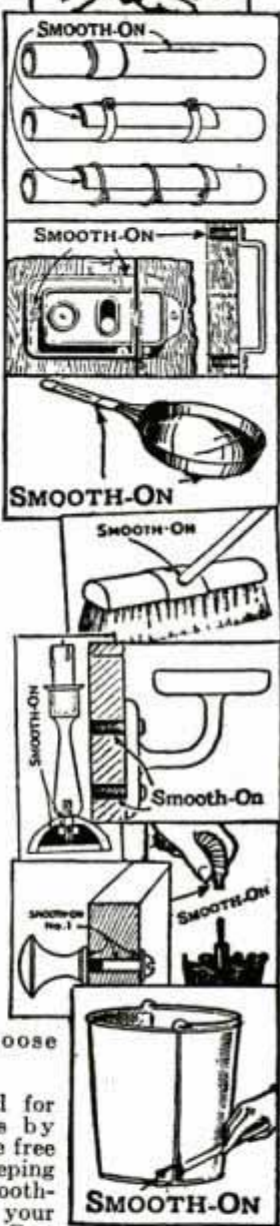


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Money in Magic

(Continued from page 60)

matches stand up without slitting them in any way. It looks simple until it is attempted. It is effected by laying three matches on the table as shown in the diagram and lifting up with the bottom match.

Putting a match inside a glass is a sure-fire hit at a small party. The glass is inverted on a board. A kitchen match is placed against its side and the idea is to get the match inside the glass before it falls. The average person seldom, if ever, can do it without practice. Explain you will do the impossible by picking up the glass and walking around the room with it, and then place it over the match before the latter falls. The secret lies in placing the tip downward. Then by lighting it and blowing it out gently the substance in the match head will hold it against the table long enough for you to walk around the room with the glass before covering the suspended match.

A simple prop that will serve you well is a double handkerchief with a pocket arrangement. The hems of two handkerchiefs are sewn together on three sides. One corner is left open to form a pocket as illustrated. The corners should be gathered together to form a bag. Money, lucky pieces and watches can be made to disappear and reappear in other persons' pockets by the use of this.

By using a dollar bill in this routine, another trick is suggested. Have the audience note the serial number on the bill. As soon as the bill has vanished, hand the handkerchief to your assistant and ask him to go into another room and bring in a plate of lemons and a knife. The audience is allowed to select one lemon from the plate. You cut it open and find the dollar in its center. While absent from the room, your assistant lays the groundwork for the trick by fastening the dollar bill to the knife blade with a spot of candle wax. Fold the bill tightly and in cutting the lemon, work at such an angle that the audience cannot see the back side of the knife.

While idly thumbing a deck of cards, make note of the fifth from the top. Divide the bulk of the deck into four stacks without disturbing the top of the pile. Now from the top deal off the four top cards

placing one on each of the stacks. Hand the fifth card to a spectator with instructions to look at it, then reinsert it in any pile while your back is turned.

Gather up the cards and make a hurried search through the deck. When the card is discovered, work it to the last position in the deck. Then announce you are going to give yourself two guesses to name the card. For the first one, push up the second from the last card. When you are told this is incorrect, push it back in the pack and at the same time place the last card, the one selected, face down on the table, as if it were the one just rejected. In your next try, take one from the middle of the deck and ask if it is the one. When answered in the negative, announce someone has made a mistake as you are certain about the card on the table. When turned up, it will be the one forced on your spectator at the outset.

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

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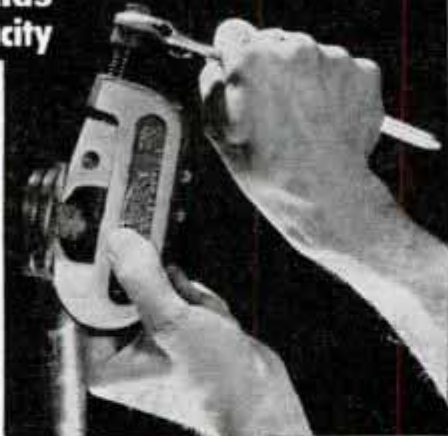
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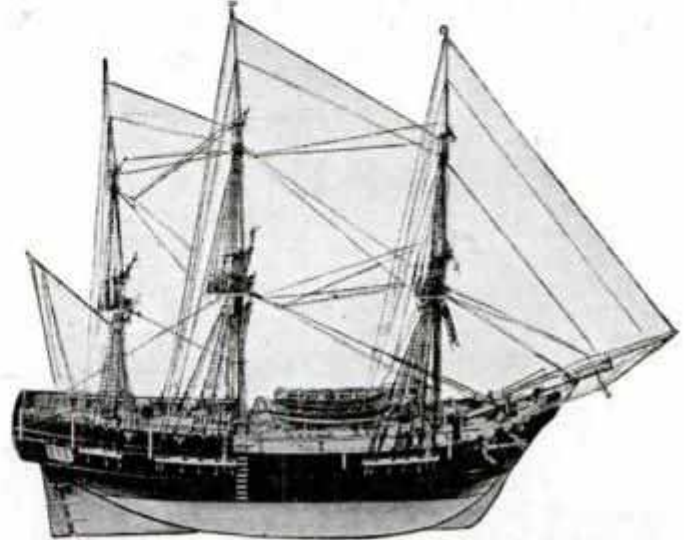
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BEHIND THE SCENES IN THE COMICS

(Continued from page 37)

renders his position as soon as he loses favor. Percy Crosby has kept his boy figure "Skippy," alive by his knowledge of youth and its moods and Barney Google, Major Amos Hoople, Harold Teen, and Caspar Milquetoast are as well known as many movie stars.

George McManus discredits the popular idea that cartoonists lead a life of ease. His business routine is no different from the average business man's. He works on his famous characters from nine to five o'clock five days a week. Although he has remained impervious to Maggie's cultural inclinations since 1912, Jiggs is an accomplished linguist and a citizen of the world. He appears in more than twenty-five foreign papers and both the dialogue and the drawings are fitted to the language and customs of the country.

Fontaine Fox has been drawing the "Toonerville Folks" since the business was in its infancy and when an idea doesn't come easily, he simply sits down and "figures it out in cold blood." Gene Byrnes follows the same plan with his "Reg'lar Fellers" and so does J. Jerome Williams who draws "Bound to Win" under the name of Edwin Alger.

The comic artist faces terrific competition. There are more than 250 comic strips running in the daily newspapers, and the half dozen large syndicates that control the output are constantly on the lookout for new ideas to replace those that have become outmoded. What do cartoonists make? There are as many answers as there are cartoonists. The salaries range from \$1,200 to \$250,000 a year. According to one syndicate official, there are probably a dozen stars in the business who receive more than \$1,000 a week. Some work on a straight salary but the majority get a percentage of the gross income.

But the weekly salary check is only one source of income. Many artists receive a share of the movie and radio rights of their comic strips, royalties from manufacturers who use the names of characters, commissions to draw the illustrations for national advertising campaigns, and many other side issues. Cartooning is a field of overnight successes and quick fade-outs and yet withal, it has a high percentage of

(Continued to page 132A)

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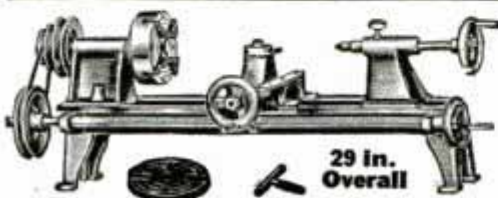


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BEHIND THE SCENES IN THE COMICS

(Continued from page 130A)

topnotchers who continue to entertain their millions of followers year in and year out. Carl Anderson spent more than fifty years in the business before he struck pay dirt in the impish youngster, "Henry." The success of twenty-four-year-old Alex Raymond reflects the other extreme. He went to work for a syndicate at a small salary because he wanted to draw. In less than a year he was given the assignment for the daily "Secret Agent X-9" thriller and in his spare moments he draws two full-page features, "Jungle Jim" and "Flash Gordon."

Martha Orr, a Chicago girl, made the rounds of advertising agencies and radio stations with art samples and continuities without success until her heart-throbby "Apple Mary" cartoon serial was launched. It made a big hit almost at once. On the other hand, Rube Goldberg was making more than \$1,000 a week when his arch simpleton, "Boob McNutt" and his equally famous "nutty inventions" slipped from public favor and drifted out of sight.

Keeping a plot going is a common worry of all cartoonists but the creators of the "girl-type" strips have an added problem. They must keep up to the minute in women's fashions! The clothes that "Tillie," "Dora," "Diana," and "Winnie Winkle" wear are as important as their jokes and stories. Carl Ed doesn't follow young men's fads and fashions—he sets them! For several years, his "Harold Teen" has had a profound influence on the dress and slang of high-school students.

A cartoonist must observe a long list of "don'ts" and guard against injuring anyone's feelings. No mention must be made of religious or social matters of a controversial nature. One artist once showed a small child pulling the tail of a cat and was deluged with letters of protest.

As a rule, a cartoonist works three weeks ahead of his daily series and eight weeks in advance on his Sunday page, and as some newspapers carry either one or the other, the artist must plan his strip to run smoothly so those who read only the Sunday paper can follow the series the same as those who read the daily episodes. And, of course, there must be no break between daily and Sunday for those who run the strip continuously.

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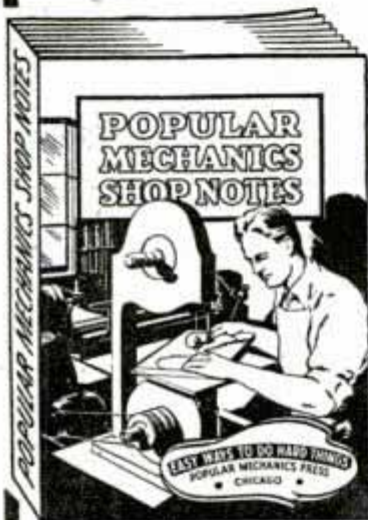
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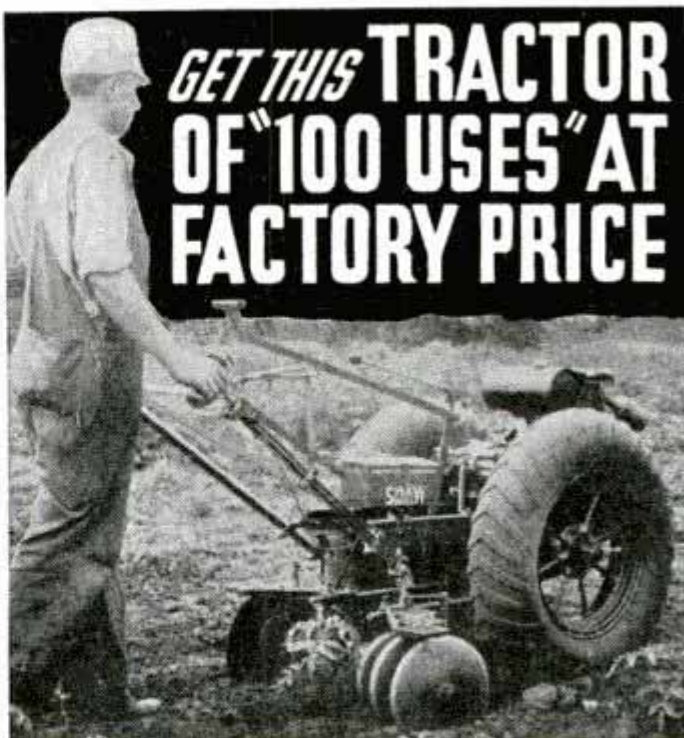
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YOU CAN BECOME A GOOD SKATER

(Continued from page 42)

likely to find your muscles sore and in a short time you won't be in shape to do much racing. For distance events, don't set any more pace than necessary.

There are two recognized ways of getting around turns indoors. One is to employ the chop stroke and the other is to slide. The first probably is faster but it uses up more energy. Although requiring more ability and strength, sliding saves stamina. The smart speed skater learns to take his turns wide. Sweep wide before coming to the first, then cut inside to be on the inside at the middle of the corner, and stay there until ready to sweep out for another. An eight or ten-lap track is best skated egg-shape.

The start of a straightaway sprint is of paramount importance. Most sprint starts consist simply of chopping eight or ten strokes to get into stride. The arms should be kept close to the body like a track sprinter. Above all, use a short stroke.

To be a top-notch skater, you need the wind and heart of a track star. Consequently the same sort of training should be observed. Skating equipment is important. The shoe should fit snugly and for indoors the blade must not exceed fifteen inches in length. The skate for outdoors is virtually the same except that the blade may be one-half inch or an inch longer. When the skates are set to the inside of the shoes the ankles are braced and greater speed is possible. Always work with someone a little better than you are. Then your style is bound to improve.

PILOT'S "BLIND SPOTS" CHARTED FOR SAFER FLYING

Plotting of the "blind spots" in a pilot's line of vision is accomplished by using an instrument called the visiometer. When placed in the cockpit of the plane at the spot where the pilot's head comes in actual flight, the device measures accurately the exact parts of the plane which obstruct vision. In military craft the problem is important because enemy planes could attack at one of the blind spots before the victim knew what was happening. Some of the world war pilots cut away parts of the fabric of their planes to enlarge their field of vision.

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TINYTONE RADIO CO., Dept. P-1, KEARNEY, NEBRASKA

SKY HIGH—WHY NOT?

(Continued from page 27)

gins to be lost. The sun here does not shine so warmly upon the bag and the temperature of the atmosphere outside the bag is higher, the result of coming closer to the earth again. Ballast, therefore, must be dropped quickly and expertly to keep the balloon from getting out of control. For this purpose reserve ballast is carried. For, should the balloon come under a cloud bank in its descent, its speed would be greatly increased, the result of losing its heat more quickly than otherwise. Conservation of ballast, therefore, and a reserve supply are two imperative things in ballooning.

To ascend 73,000 feet, bureau of standards figures call for a balloon and equipment weighing 4,900 pounds and ballast weighing 1,900 pounds. Beyond these figures the experts have not gone as no balloon has been contemplated for a greater height than 75,000 feet. Theoretically, however, on the basis of present ratios a 90,000-foot altitude would call for a balloon weighing approximately 12,000 pounds and carrying 4,200 pounds of ballast; for 100,000 feet, 22,300 pounds weight and 7,600 pounds ballast. To double the present altitude height, 2,500 tons weight, at least, it is estimated, would be needed.

The interesting fact is the tremendous increase in balloon weight as altitude increase is sought. This almost insures 75,000 feet as the practical limit of altitude for man with present equipment.

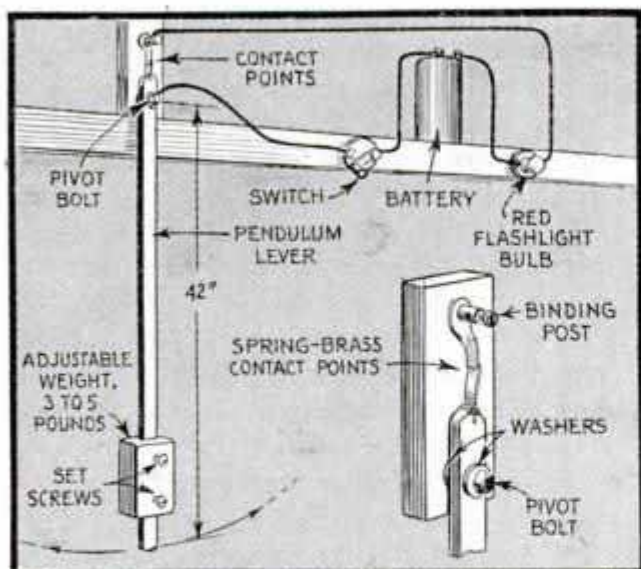
Silk offers a lighter balloon fabric but does it guarantee the safety that present fabric does? Again, free balloons equipped with automatic instruments can attain greater heights than those human-manned. These, however, are very much limited in performance as compared to the gondola-attached bag.

To avoid danger of explosion, helium has been tried instead of hydrogen, but helium does not have as great lifting power. Despite all the difficulties, however, many of the hazards of life in the stratosphere have been mastered by applying the laboratory methods of the chemical engineer, according to Dr. Jean Piccard.

By eliminating carbon dioxide from the air in the gondola and adding oxygen, regulating the temperature and the humidity,

(Continued to page 138A)

Pendulum in Darkroom Helps Determine Correct Exposure Time



Swinging Pendulum That Flashes Light at Intervals of One Second Aids in Making Enlargements

As it is important that exposure time for photographic enlargements and similar work be made by regular second intervals, a pendulum that swings once each second, and flashes a light with each swing, will enable you to do the work accurately. The pendulum is suspended from a shelf or wood block and has spring-brass contact points at the upper end. These are wired to a dry cell through a switch and a red bulb. A weight on the pendulum is adjusted so that the latter makes one swing each second, using a watch to get the adjustment accurate.—L. B. Robbins, Harwich, Mass.

Two Methods of Detecting Water Leaks in Auto Motors

If you are suspicious that water is leaking into cylinders of your motor, try one of the following methods: When the motor is cold, the radiator should be filled to the top with water, after which the motor is started. Bubbling and hissing in the water can be heard by listening at the radiator filler hole if leaks are present. Another method consists of running the motor until it is hot, after which the spark plugs are removed in quick succession. If the leak is of any magnitude, steam will escape from the offending cylinders in a considerable quantity. Escaping gasoline vapors may sometimes tend to confuse, but the odor of steam is quite distinctive and cannot be mistaken for other vapors.



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P. O. Box 6022

Kansas City, Mo.

SKY HIGH—WHY NOT?

(Continued from page 136A)

and even keeping the air fresh, science has made living in the rarefied space many miles above the earth possible.

"Weighing off" the balloon by blasting the ropes with T.N.T., it was discovered, keeps the delicate cosmic-ray telescopes intact. The use of rubber tubing to make an air-tight introduction of the valve rope into the gondola results in a valve and cord continuously free and usable. The selection of metals for gondola construction is a continuing chemical experiment.

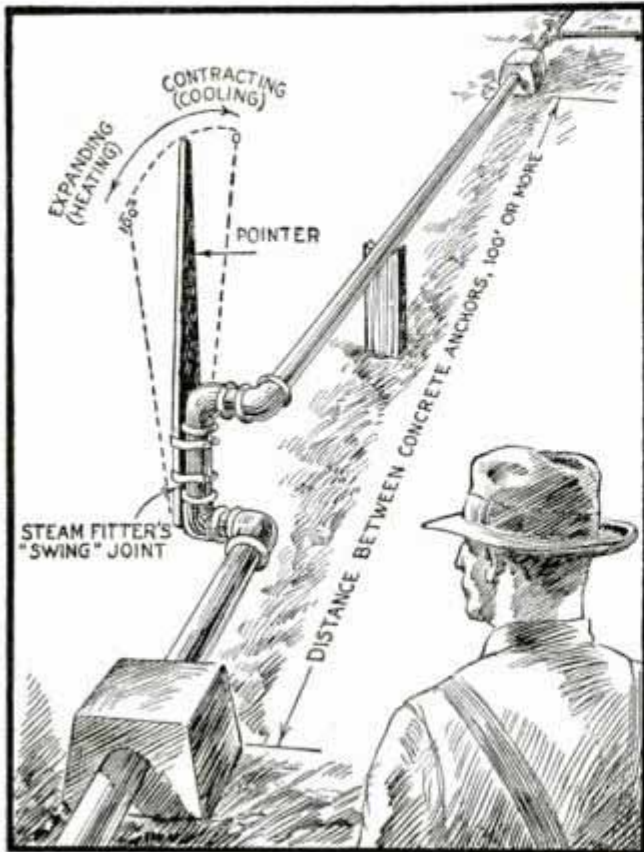
"The oxygen problem, contrary to popular belief, is far less important than the carbon-dioxide problem," says Dr. Piccard. "A crew of two absorbs per minute about 1,500 to 2,000 cubic centimeters of oxygen and replaces it by a similar volume of carbon dioxide. The air breathed in the open contains about .03 per cent carbon dioxide, but fortunately this is not the limit of human tolerance. Four per cent carbon dioxide produces rapid breathing but is not very harmful. Two per cent causes no bad effect, and it was considered the upper limit to be allowed in the gondola of the balloon.

"Several methods of air-conditioning have been proposed and used in the stratosphere gondola. The simplest method would be to evaporate liquid air and to release a corresponding amount of air from the gondola into the near vacuum of the stratosphere. But this method is highly uneconomical. A more economical method consists in replacing only the two liters of spent oxygen and in extracting chemically the two liters of carbon dioxide produced per minute. This method requires only one and seven-tenths kilograms of oxygen in ten hours, while the other takes about seventy-five kilograms.

"Two methods are feasible for the removal of carbon dioxide: pads filled with alkali and the Draeger apparatus for producing fresh air, which may need repairs and may cause the atmosphere to be charged with alkali dust. We decided to use the alkali bags, which always work automatically. Little mattresses of gauze were filled with alkali. They were one or two inches thick and about eighteen inches square. Potassium hydroxide on asbestos was the alkali chosen first.

(Continued to page 140A)

**Temperature-Warning Device
for Water Systems**



Pointer and Steam-Fitters' Swing Joint Installed in Pipe Line to Indicate Temperature Changes

Taking advantage of expansion and contraction of pipe under varying temperatures, a reliable temperature-warning device is readily incorporated in the water system of a greenhouse or other place where temperature changes are critical. As the expansion of iron pipe for a small rise in temperature is quite small, it is necessary to measure it carefully. This can be done by anchoring the ends of a 100-ft. length of pipe in concrete firmly and providing a steam-fitters' swing joint, which carries a long pointer as shown. The end of the pointer can be made to connect with an electric alarm when certain temperatures have been reached. Due to the fact that various pipes are expanded at different rates, no definite expansion rule can be given, but once the danger point is found and the warning made to sound at this point no trouble will be experienced, as the expansion or contraction rate of any given line of pipe is always the same.

(Soiled dust mops may be cleaned by immersing them in hot water to which washing soda and household ammonia have been added.

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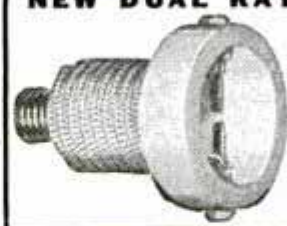
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SKY HIGH—WHY NOT?

(Continued from page 138A)

"It was not certain, however, that this compound, which in the laboratory is used for the absorption of carbon dioxide from dry air, would be 100 per cent effective under the conditions of the flight, where it was not known how dry the air would be. Therefore, a second set of bags was filled with sodium hydroxide. Both chemicals worked very well.

"In previous stratosphere ascents the observers have suffered from high humidity. In one case they were soaked to the skin by water dripping from the upper part of the gondola. Therefore, we filled another set of bags with anhydrous magnesium perchlorate. These pads kept the humidity within very low limits. Granulated silica gel, easily disposed of as ballast, was carried to absorb those organic chemicals which cause the difference between fresh and stale air.

"The activity of the chemicals was much improved by the fact that the lower part of our gondola is painted black and the upper part white. Therefore, the lower half of the gondola absorbs more of the sun's heat, and this produces a natural air circulation inside. The chemical composition of the white pigment is of the utmost importance because some white paints absorb infrared rays and become just as hot in the sun as black paints."

Since the gondola used for a stratosphere flight must not be shaken because of its delicate cosmic-ray instruments, and the slightest wind will push the balloon sidewise, "weighing off" proved to be the most delicate part of the whole enterprise. Dr. Piccard solved the problem by introducing four cardinal ropes to hold the load centered and then severing the ropes by blasting them with T.N.T. As the cutting had to be rapid and close to the load ring, eighteen feet from the ground, it could not have been done with an ax.

Until some revolutionary development occurs in ballast or fabric, fifteen miles will about remain the altitude record. There has been talk of "hydrogen ballast," lighter than the fine shot used, if effective otherwise. And it is not impossible that a lighter balloon fabric than that used at present can be developed. But to make it as strong as the present fabric, is something else again.

THE LAND OF GOLD AND MYSTERY

(Continued from page 17)

dition to gold and silver, are lead, copper, zinc, graphite, arsenic, mercury, antimony, tungsten, tin, molybdenum and iron.

In the last few years, many changes have been made in the Mexican mining and labor laws. Anyone contemplating a mining or business venture in Mexico should first obtain information from the Pan American Union, Washington, D. C.

The mountains of Mexico also offer a varied and in some places, a delightful climate. The central plateau on which Mexico City lies has a particularly enjoyable climate. Tourists from the United States familiar with the climate at the border are usually agreeably surprised when they arrive in Mexico City and find that it is not too hot or too cool for comfort. It is very much like the late springtime in the northern United States with very little variation between winter and summer except in rainfall. The central plateau is about 7,500 feet above sea level and is completely hemmed in with mountains which shield the valley from winter winds.

The climate in the lowlands along both coasts is tropical and extremely hot in some places. A chance to experience the many variations in climate between that of the central plateau and the tropical lowlands is offered in the rail trip over the Mexican railway to Vera Cruz, Mexico's most important Atlantic seaport.

Visitors to Mexico will be impressed not so much by its cultivated crops as by its wild vegetation. In the humid lowlands hundreds of species of trees, palms and ferns are garlanded with countless smaller plants. In the arid regions there are many species of cacti, and a rain may bring a profusion of color. Indian corn is one of the most important agricultural products. Others are cotton, beans, sugar cane, sisal hemp, coffee, bananas, oranges, cacao and rice. The proportion of Mexican land that can be cultivated is relatively small although important irrigation works are being built in many sections.

For years the Mexican government has been constructing an automobile highway from Laredo, Tex., to Mexico City. The completion of this highway will enable more Americans, seeking new touring thrills, to visit this charming country that rivals Europe as a tourist paradise.

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SHORT-WAVE RECEIVER DE LUXE

(Continued from page 101)

amateur bands could no longer be referred to "as crowded."

The selectivity of the HRO receiver is controllable directly from the front panel and may be varied from knife-edge performance to a broad degree which will respond to the full musical range of short-wave broadcasting stations. A set of four coil units is supplied as standard equipment for continuous frequency coverage from 4 to 30 megacycles; a megacycle is 1,000 kilocycles. The four coils in each set include two stages of preselection, detector and oscillator. They are ganged together for swift, easy handling and plug in as a unit.

A switching device on each coil permits change from general coverage ranges to amateur band spread over the entire dial. Individually calibrated tuning curves are mounted on the front of each coil unit as will be noted in the upper photo and the case of coils shown at lower left.

Outstanding features of this receiver other than those previously mentioned are: crystal filter, automatic or manual volume control, beat-frequency oscillator for c.w. tuning and a vacuum-tube voltmeter with the instrument calibrated in the "S" scale of carrier intensity. This meter records the strength of an incoming signal, according to the new R-S-T system, by merely pushing a button. Nine tubes are used, not including the rectifier. The circuit employs two stages of tuned radio frequency ahead of the first detector; these high-gain stages account for the unusual sensitivity of the set on weak foreign stations, and the noticeable absence of troublesome image-frequency effects. These tubes are followed by the first detector, high-frequency oscillator and two stages of intermediate-frequency amplification. The seventh tube is the diode detector and first audio amplifier, which works into a pentode output power tube operating a good loud speaker to full capacity. The ninth tube is the beat-frequency oscillator that may be switched on and off as required for code signals, or for locating the carriers of weak distant phone stations. A separate power unit is used with this de luxe short-wave receiver which is specially designed for amateurs and short-wave listeners.

CHARTING STORMS BY RADIO

(Continued from page 3)

some distance from a storm the resulting graph was an extreme ellipse, with several bumps denoting minor disturbances. As we came closer to the hurricane the ellipse broadened out, and when in the middle of it, the reading was almost circular.

We deliberately went into the path of the storm and took fifty pictures of cloud formations, made sketches and measurements of value for future work, and charted the path, height and speed of the clouds. The first rain squall was encountered in the Dismal Swamp in North Carolina. Fortunately the storm had already wrought its havoc farther south and had swung out over the ocean. The most peculiar feature of the hurricane was the cloud formation. There were long streamers like the spokes of a wheel, slowly revolving about the storm center. As we drove along, a bank of clouds would loom over the horizon. As it met us, there would be a deluge, lasting for ten or fifteen minutes. Then the sky would brighten and often the sun would shine.

In South Carolina there was a lull, but in Georgia we saw a tornado coming straight toward us and paused only long enough to photograph it. Two minutes later we saw the twisting column of cloud about a mile away and directly alongside of us. A tornado roars like a waterfall. In Florida there was plenty of evidence of a storm having visited, but it had departed.

With our crude homemade apparatus we had located and encountered the hurricane, starting from a point over 2,000 miles distant. Under the present system of weather forecasting, reports are obtainable only twice a day. This is not enough for high-speed aerial transportation. Most hurricanes are high-altitude affairs, not even registering on the ground. High-altitude storms are heralded by static, the same as others. This can be heard and located. Due to the extreme carrying power of atmospheric electricity, three or four stations would be sufficient to chart all the air lines of America and furnish hourly reports, greatly simplifying the present complex system of interconnecting phones and observers. Such a system would also be of great value to shipping. Perhaps at last a real use has been found for the much-abused static.

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There's Safety in Height

(Continued from page 54)

though the pilot is continually pulling back the throttles as the plane drops to denser air. If he has been flying at a high level the pilot may begin his power glide as far as 100 miles away.

Aeronautical engineers are looking to the time when airplanes will fly at even greater heights than at present. For flights of more than 1,000 miles faster speeds could be made by flying as high as 35,000 feet in "pressure" cabins in which comfortable atmospheric pressures could be maintained.

"The main problems of flying higher are those of safety and comfort," one engineer states. "Most of the problems of power and construction have already been solved. Most important of all will be the development of a control system that will always maintain the same air pressure in the cabin. A change in air pressure of two pounds per square inch doesn't seem much but to a passenger it would represent an abrupt vertical climb or dive of about 3,000 feet. Such a change in pressure might rupture the eardrums. It may be five years before practical passenger flying at such altitudes will be realized.

"Before that time we may be flying as high as 20,000 feet without special equipment merely to get over storm areas. At 20,000 feet the gain in speed is not enough to warrant steady cruising. At that altitude pressure cabins would not be needed and passengers and crew would be kept comfortable by spraying oxygen into the cabin.

"At 20,000 feet you can be certain your cigarette lighter won't work. At that altitude there is not enough oxygen to support combustion and that is one of the reasons why engines must have superchargers. By supplying the oxygen deficiency the passengers and crew could be kept comfortable at quite high altitudes, below the heights where pressure cabins are necessary."

Captain-pilots today are studying celestial navigation. Navigating by the sun and stars may become a necessity because at high altitudes haze and clouds often hide the earth and navigation by dead reckoning is apt to be inaccurate on long flights. Pilots would still be able to use the radio

beacons but the chief purpose of the beams is to keep a pilot on a definite course instead of telling him how much distance he has covered.

In the future when a pilot flies half way across the continent non-stop he will check his position every now and then by shoving back the navigation hatch and getting a "fix" accurate to within five miles. During the day he will "shoot" the sun with a special marine-type sextant equipped with an artificial horizon, and after dark he will point his sextant at one of the best known stars.

The art of "shooting the sun" has been speeded up and improved so a pilot can determine his position at any time without waiting for a noon observation. Instead of working out his position by tedious marine methods he can find out where he is within a minute's time by consulting the latest navigation tables and charts.

Although the pilots are having new duties piled on them almost daily new instruments are being developed to eliminate some of their routine work. One of these is a device that automatically adjusts the carburetor mixtures for every change in altitude and temperature. Another is a constant-speed propeller that automatically adjusts the pitch of its blades according to the power output of the engines so that regardless of the throttle setting the propeller speed remains the same. They are also expected to do away with the constant task of keeping the engines of a multi-motored airplane in synchronization.

8126

INSECTS GIVE NAMES TO TOWNS

Insects are responsible for the names of some American towns. Deadwood and Whitewood in the Black Hills owe their names to stands of dead yellow pine killed by beetles about 1860. Hoquiam in the state of Washington is an Indian name meaning dead timber. At various times the hemlock looper has killed most of the hemlock and tideland spruce on large areas in the Hoquiam region.

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SELECTIVE CRYSTAL RECEIVERS

(Continued from page 103)

The coil form is mounted on the board by means of two short bushings and wood screws. The variable condenser may be any standard 17-plate, .00035-mfd. variety. Inexpensive fahnestock clips are used for the antenna, ground and phone connections; the .002-mfd. fixed condenser is connected directly across the phones.

All circuit connections are made with the same No. 20 wire and should be carefully soldered at each point indicated. The common tap, or lever, of the coil switch is connected to one side of the phones, the rotor of the variable condenser and ground clip. A ground lead should be run to a cold-water pipe; file the pipe bright at the connecting point and use a ground clamp to insure a good connection.

Our second receiver, although not as selective as the first, is cheaper to build and may be carried in the pocket. The outside dimensions of the hinged wooden box are as follows: 4½ in. wide, 6¼ in. long and 1¾ in. deep including the lid. The black-lacquered souvenir box shown in the photo was obtained from a 5 and 10-cent store and is about evenly divided at the center. Two old honeycomb, or lattice-wound, coils are employed; these are glued on small wood blocks and so arranged that when the box is closed they will almost touch. A complete list of materials and further tuning data for both sets may be obtained upon application without charge. The wiring details for the pocket set are given in Figs. 2 and 2A. To tune this set for various stations, open and close the cover with the box standing on end, until the desired station is obtained. An enlarged blueprint of all layout and wiring diagrams is available; those who wish it should specify blueprint R-218.

Crystal receivers are useful in many locations where larger sets are not practical. They cost nothing to operate and are handy for use in sickrooms and dormitories where headphone reception is necessary. Although the range of any crystal receiver is limited to about 50 miles for the large broadcasting stations, greater distances are possible with these sets under favorable conditions. For maximum results, it is necessary to have a good pair of headphones, an efficient ground and a long, high, well insulated antenna.

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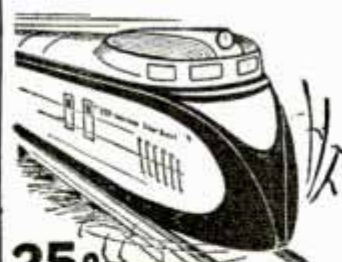
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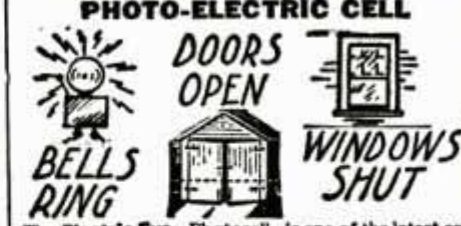


HOW TO TAP DANCE



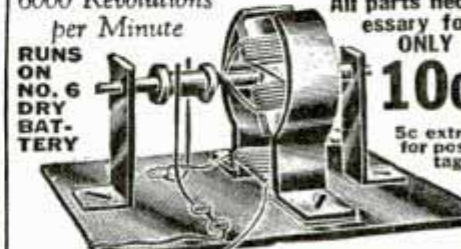
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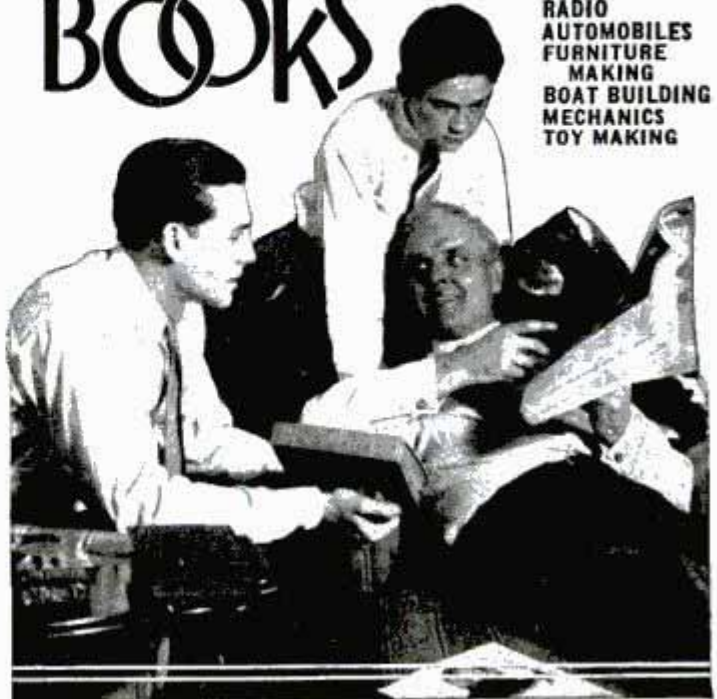
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