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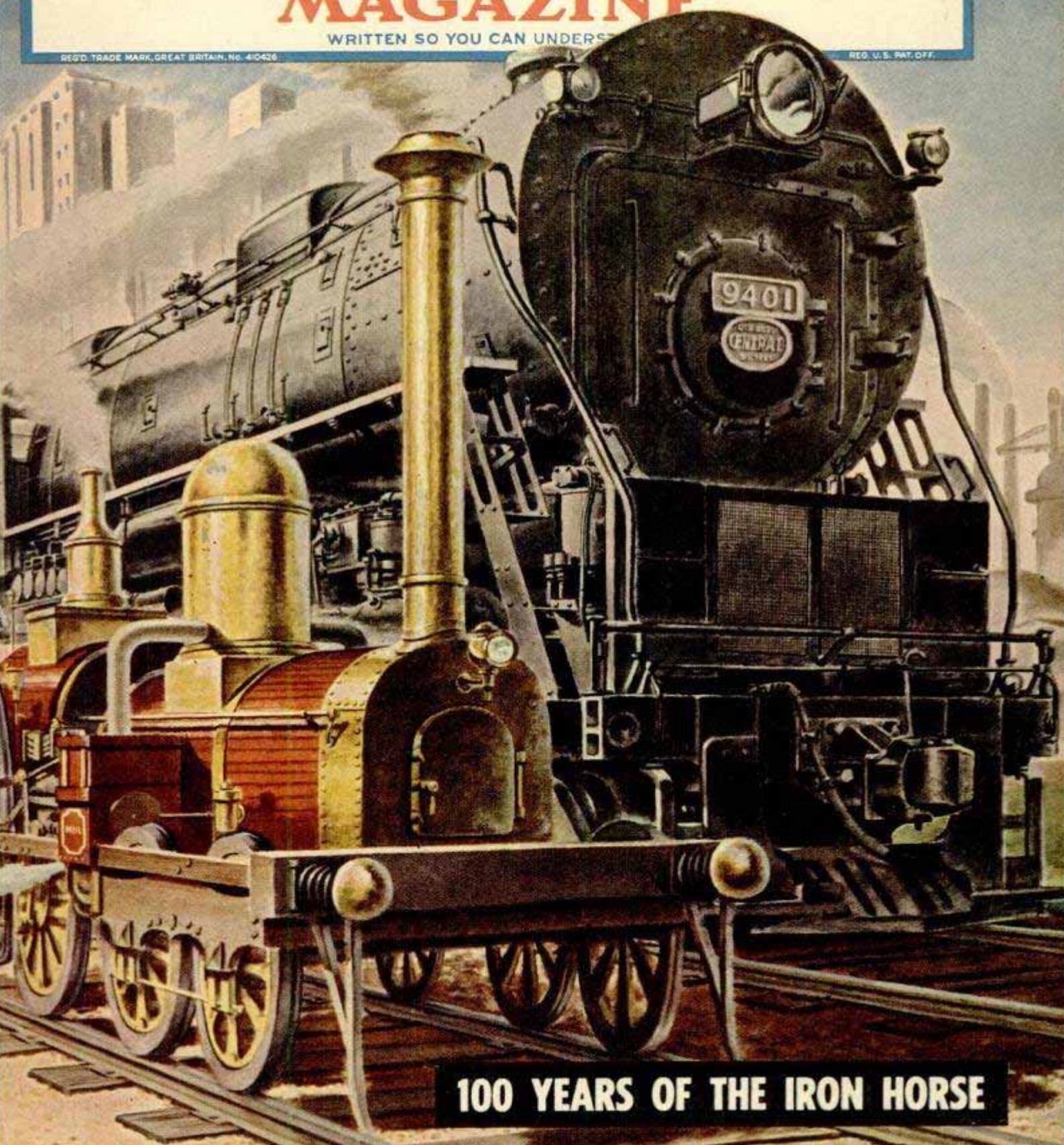
# POPULAR MECHANICS

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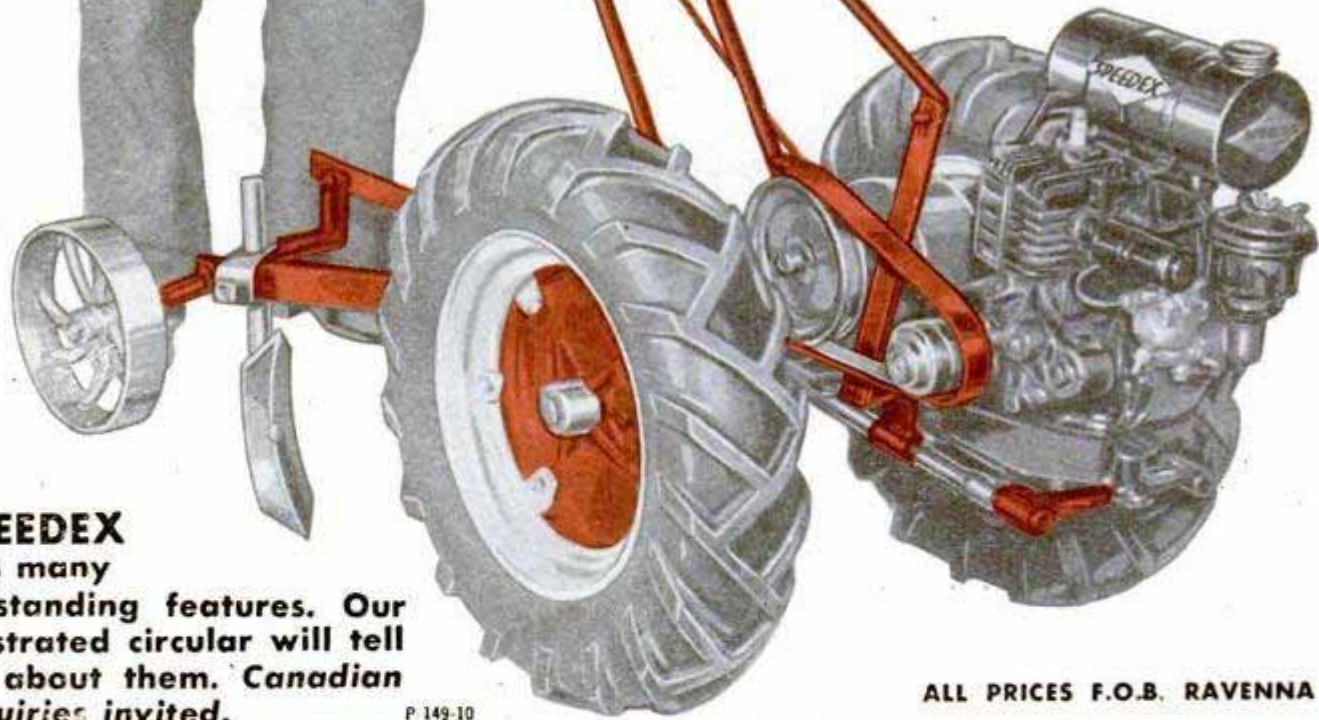
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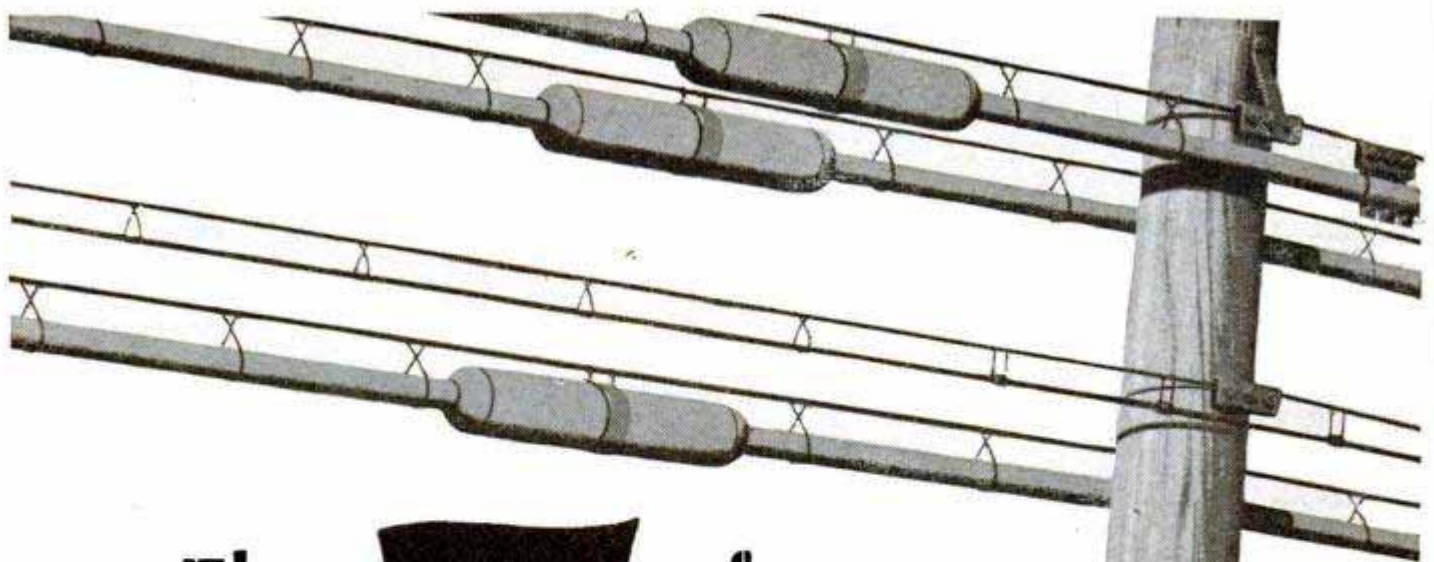


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# The **case** of the Creeping Sleeve

Lead sheathing on telephone cable meets many stresses—the tug of its own weight, wind pressure, contraction and expansion from cold and heat. Then, too, there's the pressure of nitrogen gas put in Long Distance cable to warn of sheath breaks and keep out moisture.

And, sometimes, lead is subject to "creep"—a permanent stretching—even when the stress is but a fraction of the normal tensile strength. Creep is especially likely at the lead sleeves used where two lengths of cable are joined. The sleeve may stretch and break open exposing telephone circuits to the elements.

So Bell Laboratories scientists have developed methods to test and control creep. In a special testing room, weights are applied to scores of samples of lead, under controlled conditions. Exact records of the amount of creep are obtained with a precision instrument.

Years of careful study have produced a lead composition which resists creep and yet has all the other properties required of sleeves. This means better telephone service for you and helps give that service at lowest possible cost. It is an example of the way Bell Telephone Laboratories scientists study and improve every part of the great telephone plant.

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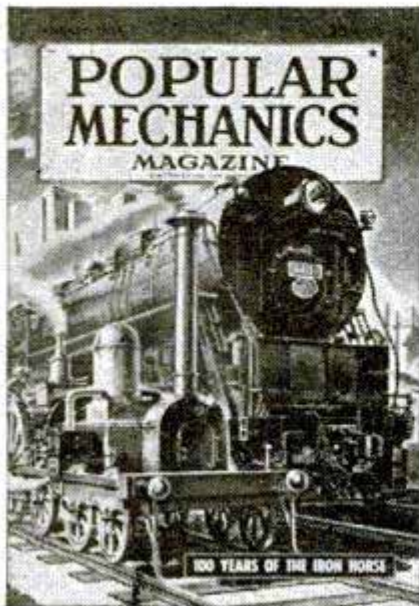


# Popular Mechanics Magazine

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



THE NEW YEAR will be brighter for *Popular Mechanics*' readers because there will be more full-color illustrations than have ever been used in the history of the magazine. All of the color photos, drawings or paintings will be the products of our new five-color sheet-fed rotary press built for *Popular Mechanics* by C. B. Cottrell & Sons. The big rotary, which is the pride of our press-room, can turn out 88,000 pages an hour. Look at the picture above—a black-and-white reproduction of the cover painting by Lou Nulsen—and then turn to the cover of the magazine for a full appreciation of what color can add to an illustration.

The use of full color—the reproduction of every color in the rainbow—opens new vistas in layout possibilities for both the News and Craftsman sections of the magazine. Turn to pages 97 and 98 for the color feature on the outboard cabin cruiser. Then turn to pages 179 and 180 in the Craftsman section. These color photos with the novel toys were made in our own studio. Next month a full-color layout will illustrate the really colorful story of "Hell's Canyon Mailman."

Volume 91                      JANUARY 1949                      Number 1

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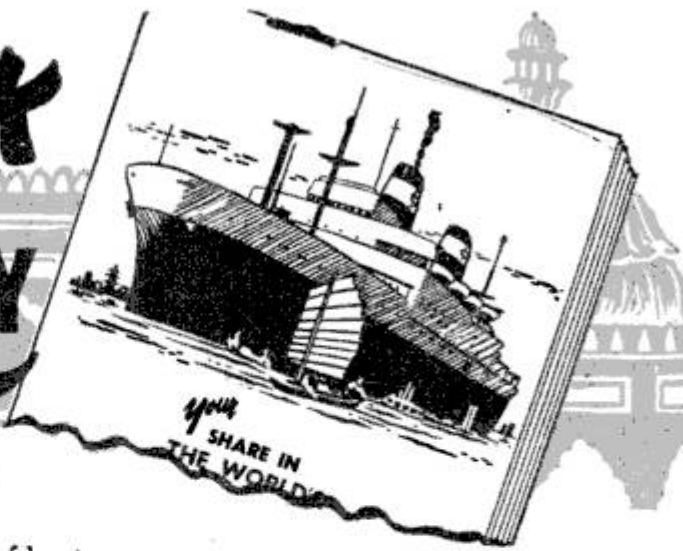
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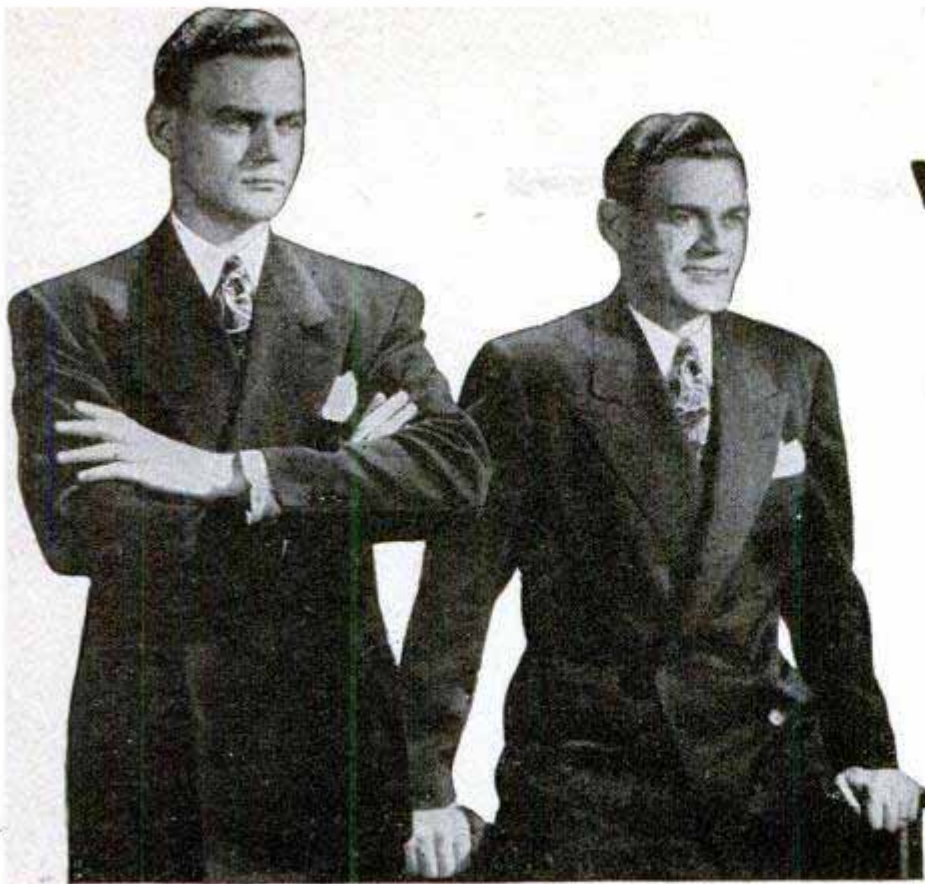
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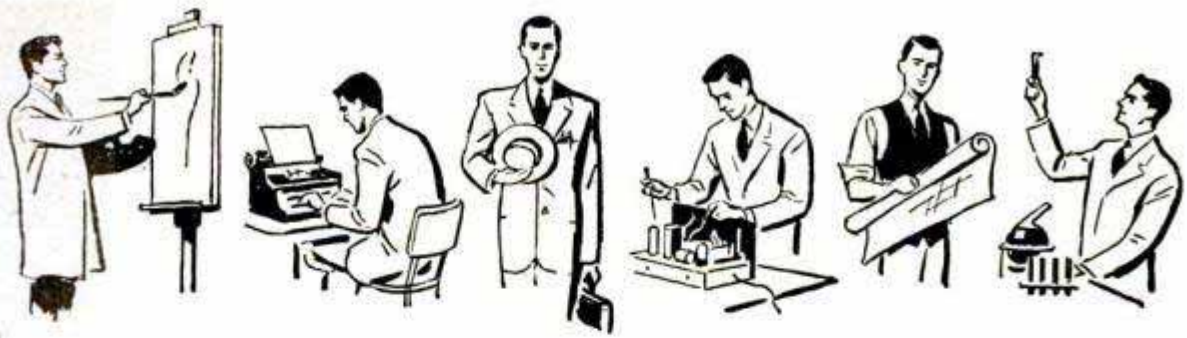
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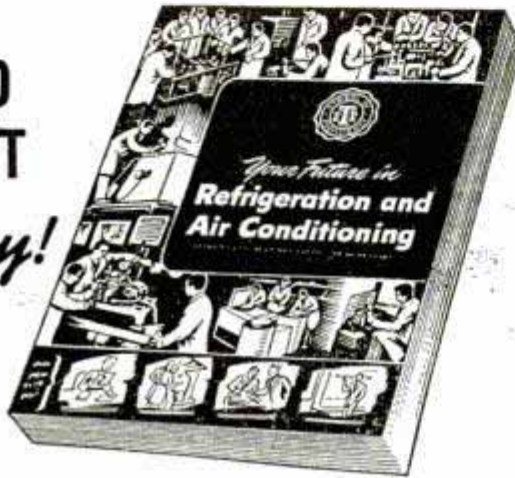
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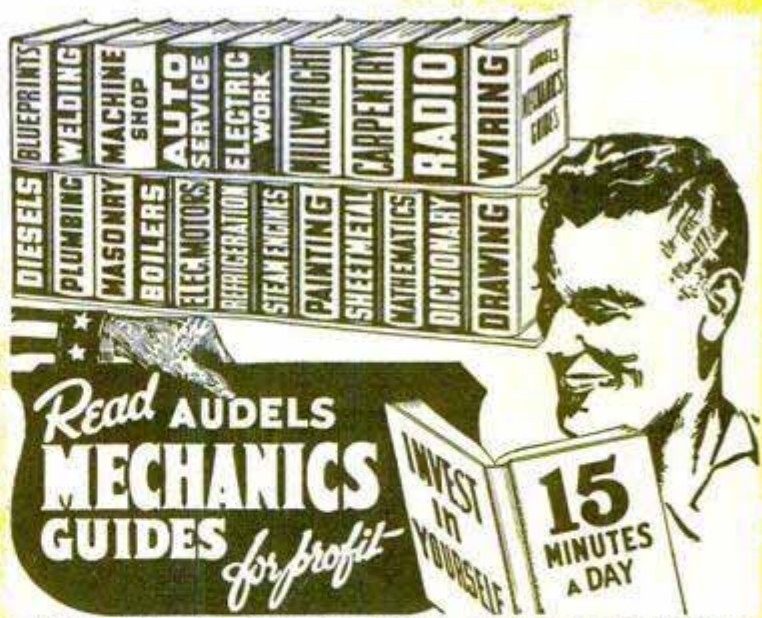
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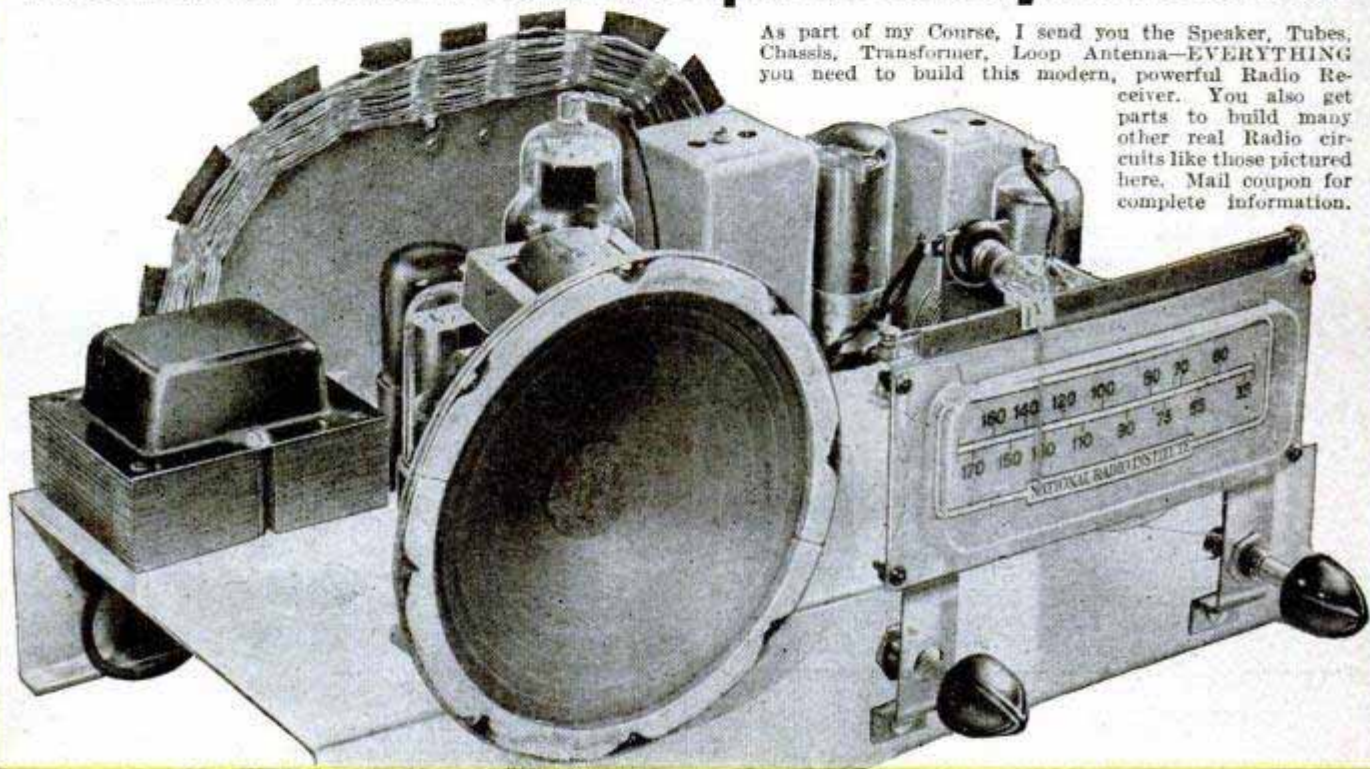
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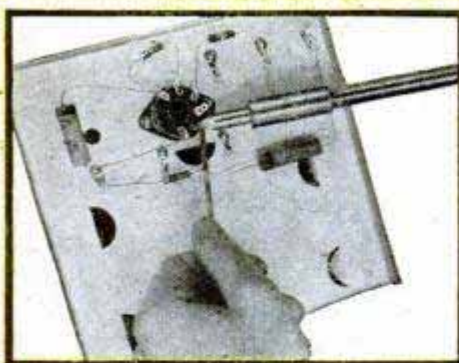
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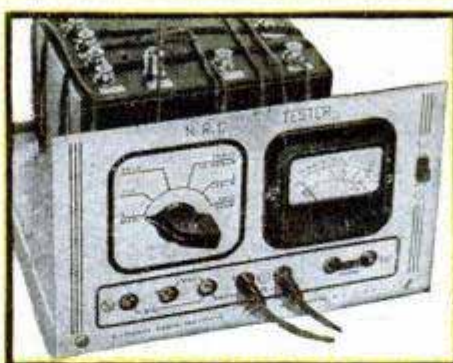
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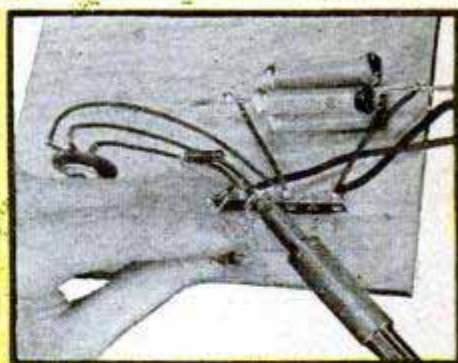
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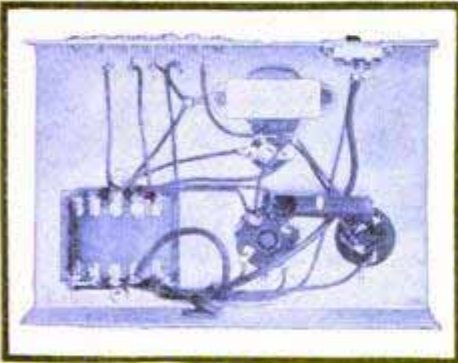


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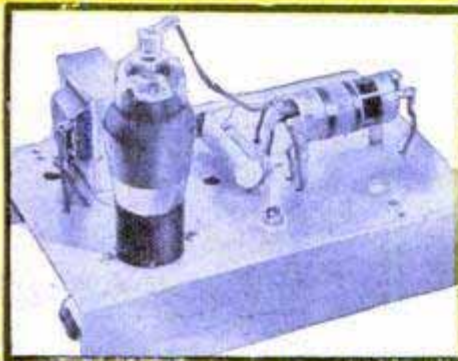
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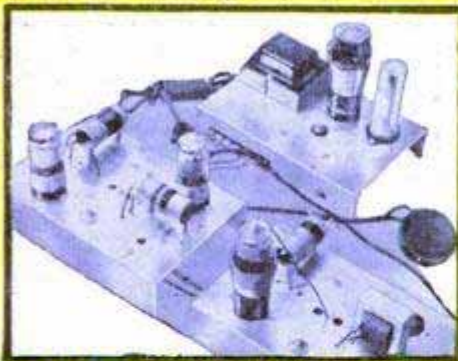
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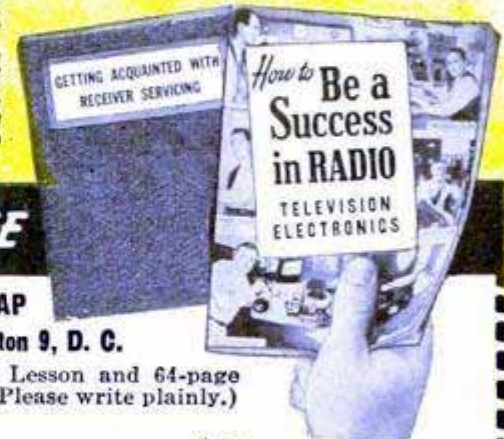
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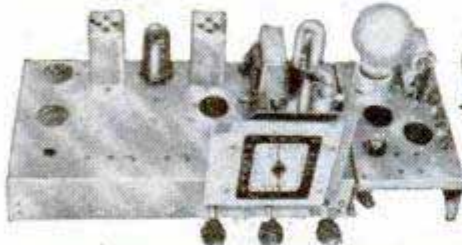
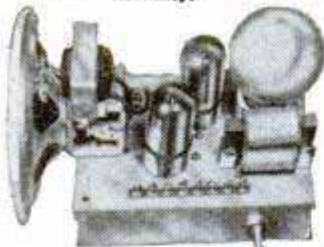
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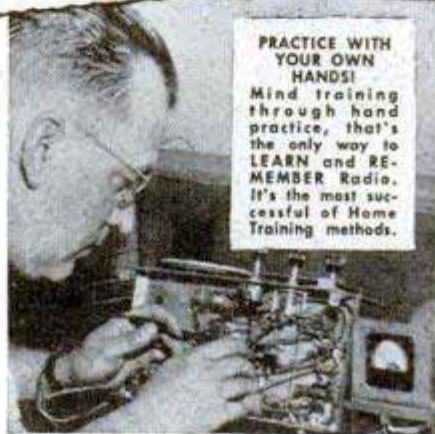
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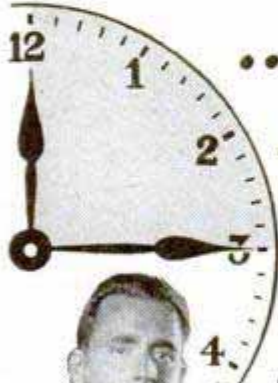
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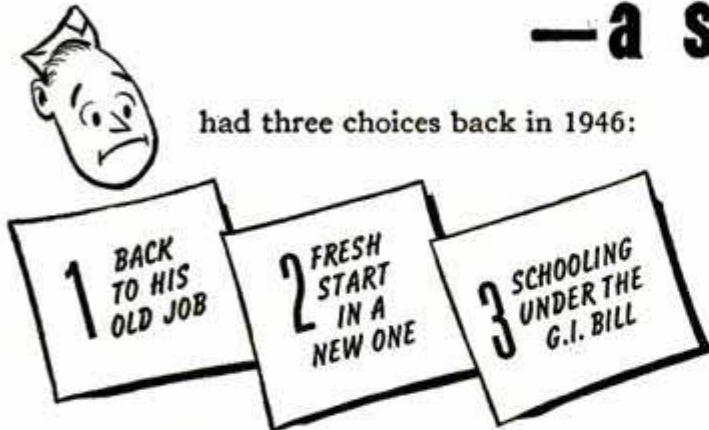
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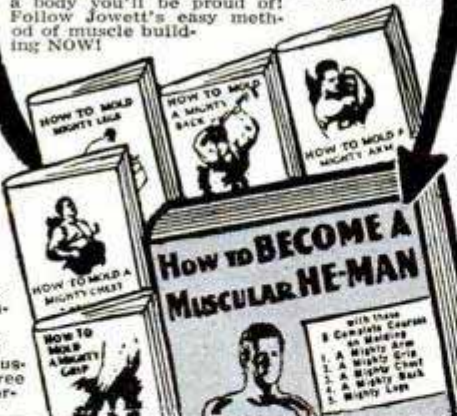
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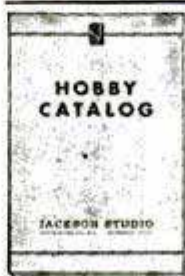
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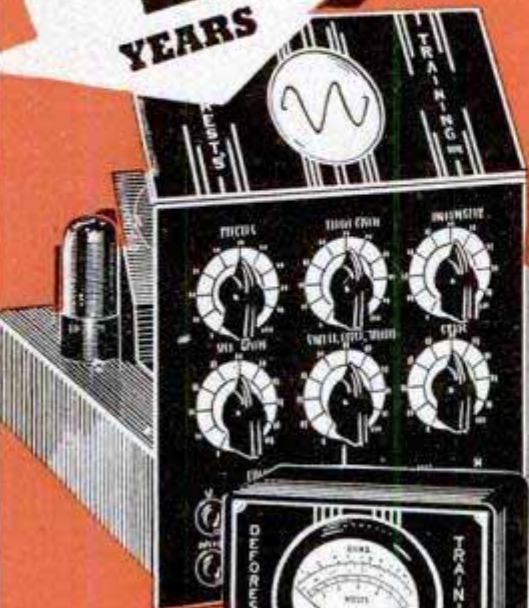
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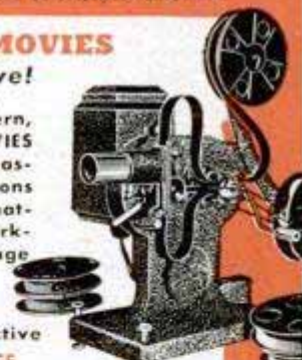
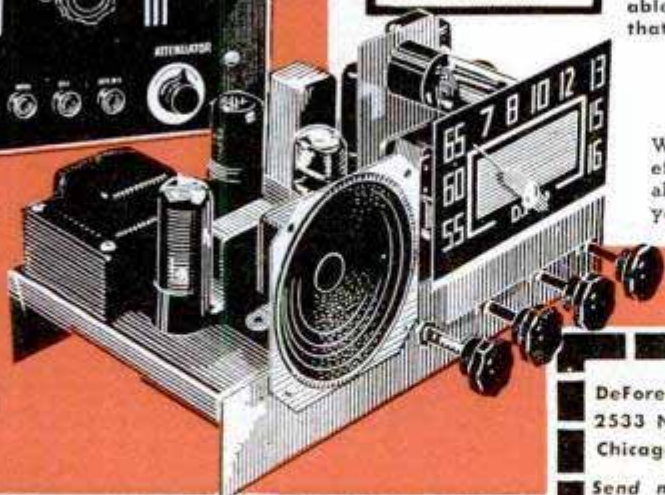
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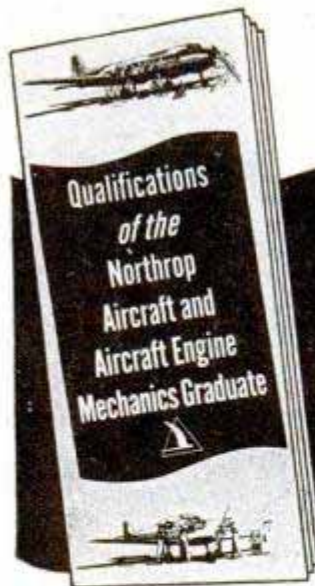
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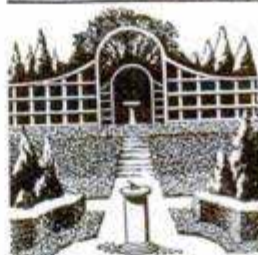
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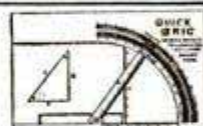
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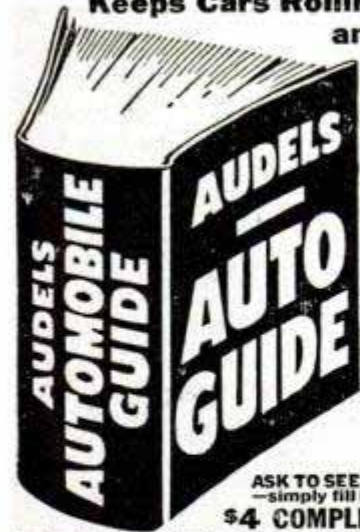
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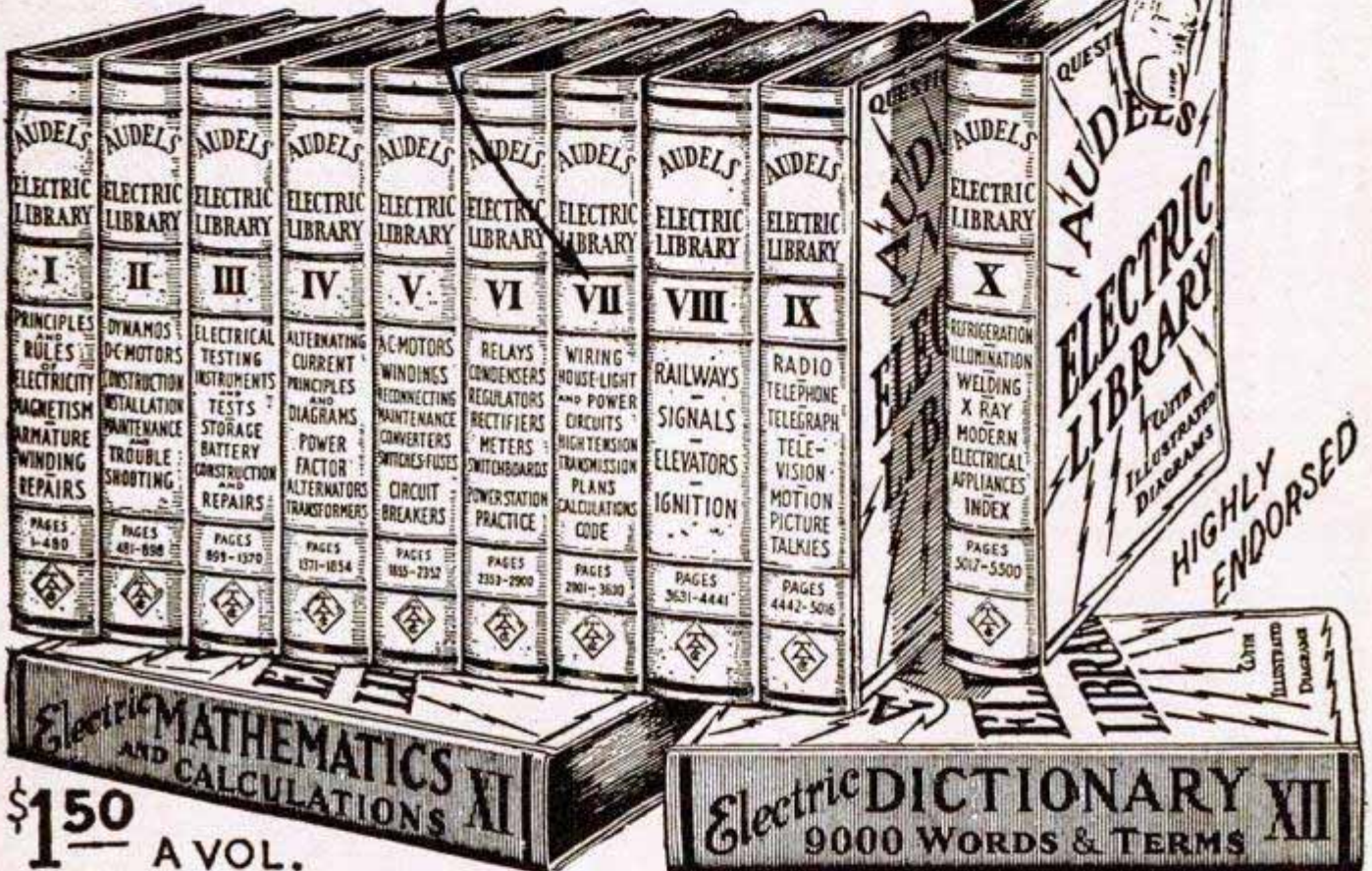
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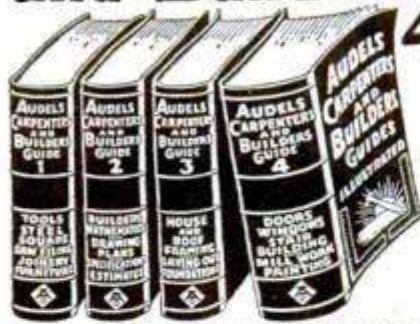
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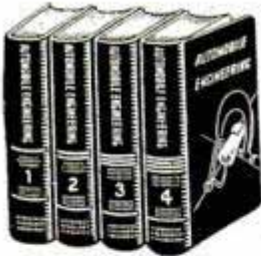
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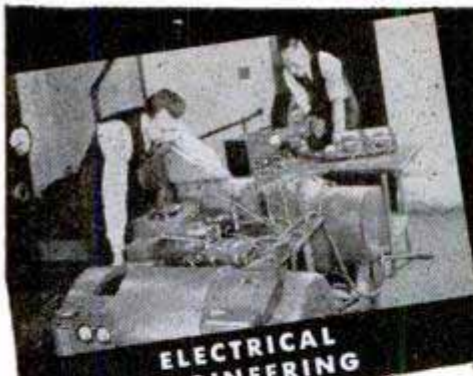
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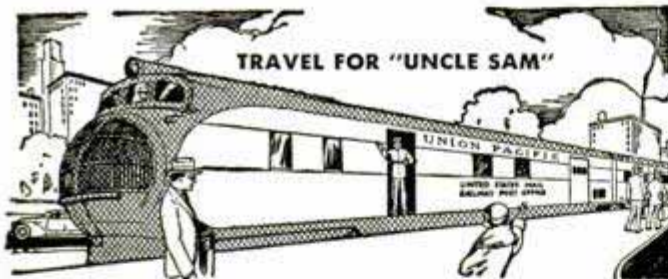
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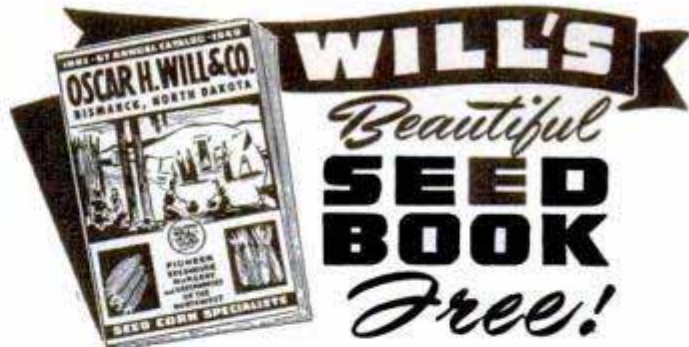
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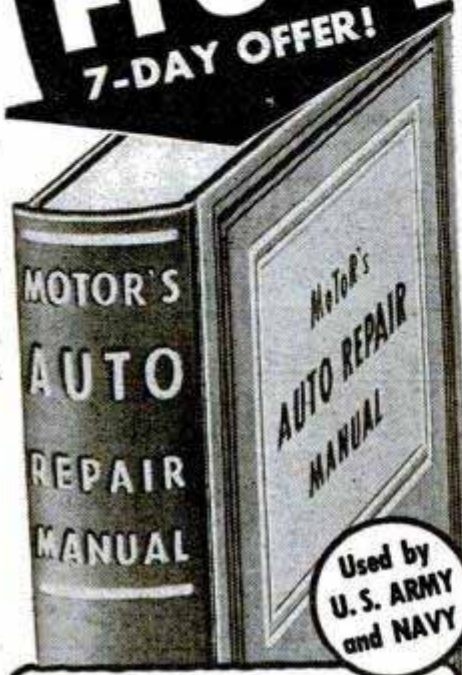
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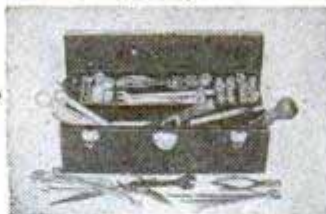
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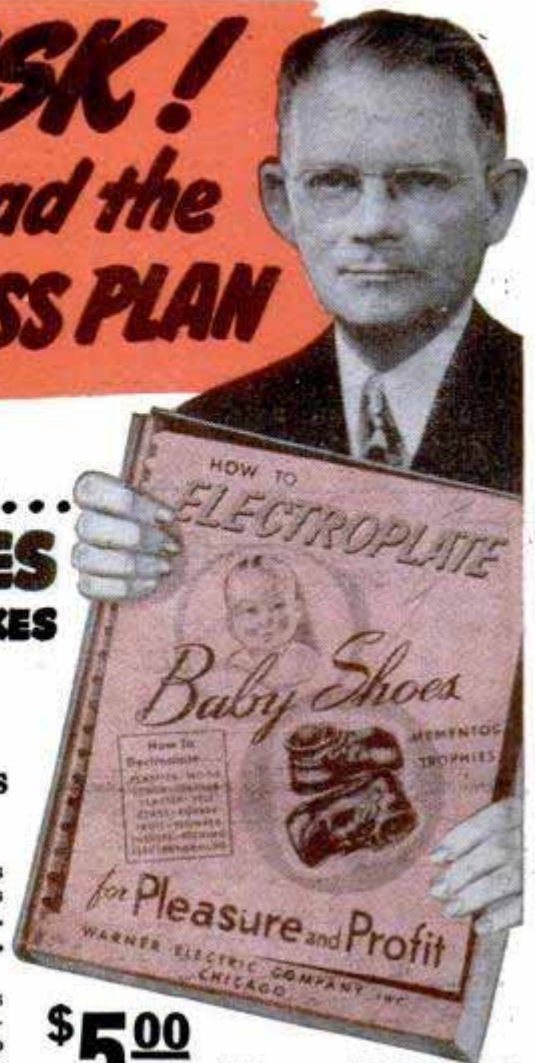
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MAKE Crystal radio "boosters." Ten times volume. Designs, instructions, catalog. 25c. Radio Leader, La Verne, Calif.

PLASTIC Boxes—Molded, 3 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x  $\frac{5}{8}$ ". Small parts containers. Opaque, transparent colors. Eight assorted \$1. Stampade, 1219 Huron, Cleveland 15, Ohio.

FREE Lists. Radios, television, records, appliances. Bargain prices. Mail post card today. JMAD Company, 122 Clinton St., Buffalo 3, N. Y.

RADIO Tubes, surplus radio equipment, bargains. Ask for list. Kay Electronics, Box 25, Hollis, New York.

MAKE Simple, tubeless, batteryless, distance-getting crystal radios. Crystal and illustrated instructions 25c postpaid. Allen, 427-P, Clinton, Missouri.

### BUSINESS OPPORTUNITIES

IMMEDIATE Cash profits by mail. I'll show you how. Write me today. B. C. Fryer, Department A-1, Box 1895, Atlanta, Georgia.

BIG Money. Spare or full time in your home. No selling! Spray new miracle finishes, plush and suede, on signs, radios, automobiles, figurines, lamps, toys, etc. Our business is booming—new easy Flock-Kraft methods. Material costs few pennies, you get dollars. Free samples, complete powerful money making plan free. Write now: Coast, 1505A West Manchester, Los Angeles 44, California.

AMAZING Screw holding drivers! Remove, hold, insert screws inaccessible places. Factories, mechanics, stores big buyers. Exclusive territory. Millicco, 701 Miller Bldg., Boston, Mass.

MAKE Money in your own spare or full-time business, casting new 1949 metal toys and novelties. Latest scale model autos, original ashtrays, savings banks, water pistols, etc. Enormous wholesale and chain store demand keeps manufacturers busy. No experience or special place necessary. Write for details and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

"COLLECT And grow rich" is a free booklet that's yours for the asking. Learn of this opportunity for a lifetime, spare or full-time office business of your own, where you can make a profit on the work of hundreds of others. T. J. Surface, Pres., Dept. 230A, Roanoke 4, Virginia.

COLLECT Your old bills. Easy, inexpensive. Free folder. 613 Commonwealth Annex, Pittsburgh 22, Penna.

TRADE Magazines help you get ahead. Latest single copies. Over 1000 covering every trade, business and interest. List of publications with prices free. Commercial Engraving Publishing Co., 34C North Ritter, Indianapolis 19, Indiana.

START Candy kitchen. Make extra money. Literature free. Center Products, 211-C Church Street, Mt. Auburn, Illinois.

MAIL Order opportunities galore. Literature 10c. Sanchez, Box 66, Chelsea Station, New York 11.

BUILD A profitable real estate business, spare time. Particulars free. Roseman Agency, 55 Clifford St., Boston 19, Mass.

MAKE Money from own home by mail selling office supplies. Tremendous demand. Snyder, 5-B Spring, Beachwood, New Jersey.

MAKE Perfume. Learn how free. Write "International," 6347 Parnell P.M., Chicago 21.

INTERESTED In mail order work? Progressive Mail Trade Magazine, twelve issues, one year, one dollar. Information in each issue worth more. Houston Mail Order House, 5306 Pease Avenue, Houston 3, Texas.

FREE Sample! Weekly "Surplus Reporter," Tipp City 14, Ohio. Rush name.

EARN At home casting novelties. Make your molds with our liquid rubber. Dry sample and instructions. Major Chemical Co., 131 Inman St., Cambridge 39, Mass.

SMALL Business advisory service. Expert advice in selecting and starting businesses; obtaining supplies; marketing products; capital needs, etc. Nominal fee. Save time, money, costly mistakes. 9804 Brunett, Silver Spring, Md.

OPERATE Profitable mail-order business. Write Fred Smith, Box 8, Austell, Ga.

\$250.00 MONTHLY. Raise Angora rabbits backyard easy way. Wool \$9.00 pound. Details free. White's Rabbitry, Newark, Ohio.

MAKE Music boxes—Big demand. We supply Swiss musical units, \$2.25 each. Scott Mfg. Co., Wallingford, Connecticut.

MAKE Rubber stamps, metalize baby shoes, repair dolls, silver mirrors, make plaster novelties. Catalogue of "30 ideas" free! Universal, Box 1076-A, Peoria, Ill.

SCIENCE Of memory simplified. Free booklet "Memory Development." Memorology Club, 2016 Sunnyside Ave., Chicago 25, Ill.

AMAZING Opportunity. Start oriental art shop selling rare imported oriental art, curios, and silks. Free information. A. Andrade, Importer, 5932 Foothill Blvd., Oakland 5, California.

**SAWDUST.** Turn it into cash. Six methods. Instructions 25c. Charles, 12-BR, Norwood, Ohio.

**MAKE Flexible molds!** Cast plaques, novelties, bookends! Free sample! H. Tooker, Hamilton 44, Ohio.

**SELL** By mail! Ideas galore! Join Mail Selling Opportunities Club! Details free! G. Wehner, Box 142-A, Roxbury 19, Mass.

**NEW Industrial hand cleaner.** Free manufacturing-distributing plans. Unusual money-making proposition. "Acro-Sol-Ex," 623 West 14th Ave., Denver 4, Colorado.

**FREE Electroplating booklet.** Money making plans. Send postcard for your copy. Highly paid, interesting, uncrowded field. D. Hyde, Box 2099—Station V, Los Angeles 3, California.

**GET Ahead faster in any business, profession or job.** Learn to publicize yourself. Tested methods. Details free. Publicity Systems, Box 322-A, Jacksonville, Ill.

**LEARN Designing, modeling, molding, plastics, plasters, compositions.** Simplified, inexpensive methods. Immense profits. Literature free. Plastics Digest, 2917-B Michigan, Kansas City 3, Mo.

**GLASSY-CAST:** New and finest liquid plastic on the market. Cold set. 15 to 30 minutes for finished product. Free instructions. Easy to make novelties, toys, jewelry, machinery parts, etc. \$2.50 per quart. Elasto-Mold: Flexible, transparent, permanent production molds made in 20 minutes. Free details and samples on request. Also quality rubber latex. Wholesale prices. Plastic Service, 294 Washington St., Room 813, Boston 5, Mass.

**START Home manufacturing business** making Cleaning Compounds, Soaps, Insecticides, Cosmetics, Polishes, Food Flavors. No machinery. Literature free. Kemix, Park Ridge, Ill.

**COMPLETE Courses in flocking, copper tooling.** Free details. Home Industries, 1655 West 80th St., Los Angeles 44, Calif.

**YOU** may have exclusive advertising service franchise. Proven money maker—complete detailed program furnished. Small investment. Write Thomas, 115 Northside Branch, Atlanta, Ga.

**NOW Available!** 1949 edition of Official Concessionaire's Guidebook. Jam-packed with money-making ideas, games, formulas, equipment for concessions, roadside stands, carnivals, medicine business, etc. Buyers guide. Send \$1.00 today for copy. Concessionaire's Guidebook, Box 133B Sta. B., Toledo 6, Ohio.

**EARN Money** by mail, like I do. Literature free. Satterfield, 521-K North Pine, Little Rock, Ark.

**SEALTEC** Collection money making plans. Local—mail order. Sixth edition. Particulars free. Flasco Sales, 2505VJ 150 St., Flushing, New York.

**BECOME A** finance man. Particulars free. George Lenhoff, Lincoln 8, Nebr.

**BUY 800,000** Articles direct from manufacturers. Details free! Schibani, Box 1576-A, Birmingham 1, Alabama.

**YOUR Own profitable home business.** Preserve live flowers to last forever. New simple discovery. Enormous demand all year round. Tremendous profits! Light fascinating work. Send \$2.00 for working equipment, instructions, and valuable sales plans. Satisfaction guaranteed or money promptly refunded. Alfred Hermansen, 210 Fifth Ave., Suite 1102A, New York 10, N. Y.

**RESURFACE** Butcher blocks with portable machine. Butchers pay well for this service. You can easily make \$50 to \$100 per week for part time work. Write for details. Hill Machine Co., Box 677, Rockford, Illinois.

**GET It** for them wholesale. Be community buyer nationally-known merchandise; radios, refrigerators, washers, sweepers, typewriters, appliances. Savings up to 40%. This pleasant easy work can earn up to \$5000 year. Write, Giard, Aurora, Mo.

**HALF Million** articles wholesale. Directory 25c. Publishers, Box 1302-P1, Detroit 31.

**DOUBLE** Your money back if not more than pleased with "Opportunities Preferred"—the big 32 page 8 1/2 x 11, slick paper magazine jam packed with ideas for operating a profitable "mail order" business. Latest issue 25c. Griffin & Company, 756 Broadway, Everett 49, Mass.

**BUY** Nationally advertised merchandise for others: radios, appliances, etc. Low wholesale prices. Make commission each purchase. Up to \$5,000 year possible. Easy, fascinating new business. Free information. Cox, Saugus 10, Massachusetts.

**BE Independent**—Operate America's lowest price penny vending machine. Big profits. Immediate shipments. Write for bulletin and prices. Fielding Mfg. Co., Desk 19, Jackson, Mich.

**AUTO** Body mechanic's tools that sell on sight. No demonstrating. Big profit. Douglass, 3615A South Grand, St. Louis 18, Missouri.

**USE** Your home as magazine subscription station. Represent all magazines. Liberal commissions. No experience—no capital needed. Catalog, full details, free. Write McGregor Magazine Agency, Dept. 22, Mount Morris, Ill.

**METALLIZE** Baby shoes. Excellent profits. New system assures success. Free details. Treasures Forever, 89 Henry Ave., Lynn, Mass.

**GET The facts!** Splendid year-round profits your own business. Manufacture Insulite and cement building blocks. Small investment. Lotz Mfg. Company, Dept. K, Escondido, Calif.

**POPCORN** Equipment, potato chip outfits. Long Eakins Company, 4960 Hi Street, Springfield 99, Ohio.

**PROFITABLE** Mail order plans. Details free. Alfred Haseman, Beecher, Ill.

**YOUR** Home or garage has space needed for mfg. new mechanics hand cleaner. \$500-\$750 monthly. No machinery needed. Exclusive territory. Trade-mark and formulae free. Tiffany Products, 289 E. 6th, St. Paul, Minn.

**SAVE** Money. Get all bronze baby shoe supplies from one source. Prompt deliveries. Low costs. All types of mountings—book ends, ash trays, pen sets; plating compounds, equipment. Also complete course in electroplating baby shoes that shows easy way to start profitable business in spare time at home. Read details page 52 this magazine. Send name for free facts. Warner Electric Company, 1512 Jarvis Ave., Dept. C-31, Chicago 26, Ill.

**STRING** Pearls, beads of all kinds, at home or open your own shop. Free information. Poynter's, 310 13th Street, Richmond, Calif.

**MAIL** Order opportunities. Read "Dollars and Sense." Copy 10c. Brown, Gracie Station, New York 28.

**FOR** More business, whether you have merchandise, service, or patent to sell, rent New York individual office. Rates, only \$12.00-\$24.00 yearly. Established 1926. Co-operative Office Service, 126 Lexington Avenue, New York 16.

**PROFITABLE** Home business. Start in spare time. Experience unnecessary. Complete information. Useful Products Co., 166-29 88th Ave., Jamaica 3, N. Y.

**SOAPS, Cleaners, etc.** made without machinery. Easy instruction booklet. Formulas, \$1.00. Brown, 9111-M Hoyne, Chicago 20.

**OPERATE** Profitable mail-order business. Splendid opportunity. Write S.A.K. Supply, 1421 St. Vincent St., Philadelphia 11, Penna.

**OWN** Your mail order business. Sell envelopes, bags, boxes. Big profits. No investment. Omaha Envelope Service, 4721-E California, Omaha 3, Nebr.

**FREE** Colorful book "372 Unusual Worldwide Business Adventures!" Photos! Pictures! True; successful. Australia, Africa, South America, New Zealand, Mexico! Not hokum. Work home. Refreshingly "different" plans. Publishers-F. Carlsbad, Calif.

**BIG** Money in antiques—Sell by mail or start profitable business at home. Old Antiquer, 11652-A Collins St., North Hollywood, Calif.

**BABY** Shoe metallizing. Secrets never before revealed. Amazing offer. Schoettle, Friendship, Ohio.

**RED** Hot home-mail manufacturing business opportunity. Everything furnished. 300% profit. Facts free. Bridges, 286-G Third Ave., New York 10, N. Y.

**FREE** Literature—How to have profitable home mail business supplying popular self-help books to millions. Big demand, good earnings, everything furnished. Rush name: National, Box 88-G, Dorchester, Mass.

**MAIL** Business opportunities. New plans, proven propositions. "What to sell" service. Different, profitable. Write: Smith, Box 2592-G, Hines, Ill.

**OWN** Growing business. Clean, moth-proof rugs and upholstery "in the home." Profits up to \$20 day on each service man. See DuraClean advertisement, page 246.

**WAX-O-GLASS;** Cleans glass; polishes metals amazingly quick. Make it yourself. Formula \$1.00. Ideal Service, Park Ridge 3, Ill.

**MAKE \$50.00 Weekly,** home, spare time, handling our mail business your territory. Lynn, 5710 Bankfield, Culver City, Calif.

**OWN** And operate a profitable venetian blind laundry. Complete details and instructions \$10.00. Proven money maker. A. J. Gebhart, 1434 10th, Seattle, Wash.

**THINKING** Of South America? Send \$2.00 for up-to-date list of 240 varied, important businesses in Mexico, Central and South America, Foreign, U. S. addresses given. Pan American Information Bureau, Box 3483, Shreveport, Louisiana.

**RUBBER**—Molds, models, casting, finishing, metallizing materials; wholesale catalog, sample free. Plastic Products, 3151-3 Southport, Chicago.

**MAKE** Money—Easier! \$3-\$10 hourly operating your own dignified money making service business. Big demand everywhere. Instructions, supplies furnished. Little capital. Lifetime opportunity. Pura-clean, 17-A East 42nd, New York 17.

**START** Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. A-U-PPM, Freeport, Ill.

**\$3.41 PROFIT** Per hour interest you? Easy, amazing process velvetizes interiors, signs, novelties, radios, lamps at low cost. Free sample. Sparks, 1145 Queen Ann, Los Angeles 6.

**HOME** Business making statuettes, plaques, artificial marble, rubber molds. Metallizing baby shoes. Silvering mirrors. Formulas. Folder free. Creative, 236-L, Winnetka, Illinois.

**IT'S** Easy to convert hand mowers to power mowers with Handy-Dandy Lawn Mower Conversion Kits. Installed on any mower in 3 hours. Used with any small gasoline or electric motor. (Lauson engines and Pennsylvania mowers in stock. Immediate delivery.) Kits can be purchased with or without engines. Fits 16 to 20 inch mower. Dealers wanted. LeClaire Manufacturing Co., LeClaire, Iowa, Dept. PM.

**NO** Selling, operate vendors, amazing profits, details free. Silver-King, Suite B, 622 Diversey, Chicago 14, Ill.

**FIREPROOF** Mattresses, curtains, homes, almost anything. Earn big. Save big. Be independent. Eldorado Fireproofers, Lotus, California.

**OPERATE** Profitable home mail order business on small capital. Details free. Jordan, 743 Dorrence Street, Philadelphia 46, Penna.

**MAIL** Order success even for beginners. Details free. Condello, 39 McArthur Dr., Fords, N. J.

**START** Profitable air conditioning business. Don Nelson, Warner Robins 2, Georgia.

**RUBBER** Molds! Genuine latex! Low cost! Catalog free! Castcraft Studios, 2027-P Fulton St., Brooklyn 33, N. Y.

**MAIL** Order system of successful operators now revealed. Smallest capital. Different, dynamic. Quick action. Details free. Schroder, 221 Bush, Covington 5, Ky.

**LEARN** Roofing and siding business! Pays amazing profits. Our simple instructions course covers everything. Very easy to master. No tedious study. Act now! Free details. Roy J. Peytons Sr., 415 Southeast First Street, Evansville 9, Indiana.

**RAISE** Ginseng. Roots bring \$10.00 pound. Circular free. Fezler Seed Co., Patchogue, N. Y.

**INCOME** From local information. Interesting. Sparetime. Neher Company, La Verne, Calif.

**"ELECTROPLATING Know-How"**—Get the professional know-how of modern electroplating, fascinating money making field, simply and quickly! Write for free illustrated booklet. Joseph B. Kushner, Electroplating Engineer, Stroudsburg 23, Penna.

**"STOCK"** Molded plastic boxes. 3 1/2" x 2 1/2" x 3/8". Opaque, transparent colors. Modern packaging new products. Sample eight \$1. Stampade, 1218 Huron, Cleveland 15, Ohio.

**MAKE** Money making new greasless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

**GET** Hundreds money making deals, business ideas, plans and manufacturing. Amazing folio free. Austin Mail Service, 5538 Lexington, Chicago, Illinois.

**ANNOUNCING** Home study course in commercial baking. Practical basic training. Good field for those with aptitude. Nearly depression proof. Send for free booklet, "Opportunities in Baking Industry." National Baking School, 1315 Michigan Ave., Dept. 3438, Chicago 5, Ill.

**ENORMOUS** Opportunity developing inventive ideas. List of eleven ideas free. Jack Kester, Deckerville, Michigan.

**MAKE** Tough, hard plastic 1c pound. Makes durable floors, walls, mantels, roofs, 101 uses. Build attractive home yourself. Material cost \$150 room. Bays Laboratory, Oklahoma City 9.

**LIQUID** Rubber. Make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

**MECHANICALLY** Inclined? Resurface butcher blocks. Lifetime business. Roy Crawford, Keyport, New Jersey.

**MAKE** Money addressing envelopes. Our instructions reveal how. Glen Glenway, 5713 Euclid, Cleveland 3, Ohio.

**I MAKE** Big money in the mail-order business. You can do the same at home with copyrighted system. Write me. I'll tell you how. F. Little, R.D. #1, Glenshaw, Penna.

**ENVELOPES** Addressed accurately, reasonably. Fast service. We have capable addressers in your city. Glenway System, 5713-Y Euclid, Cleveland 3, Ohio.

**EXCELLENT** Manufacturing propositions. Request circular. Richards, 44 North Albany, Chicago.

**READ "Advance"**—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

**A BUSINESS** In your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Chemica Division, 1269 S. Norton, Los Angeles 6.

**A FACTORY** In your home garage! Mfg. and sales rights, mechanics' waterless hand cleaner, \$500-\$800 monthly. No special equipment necessary. Formula free. Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.

**HOME** Workers wanted to hand-spin Angora wool. Either sex. House of Angora, Springfield, Ill.

**BUY** The new Concession popcorn machine. Biggest low priced popper on market. \$100 puts you in business, complete. Also caramel corn, candy floss, candy pullers, kettles, heating equipment. Write for new catalog. Concession, Dept. A, Toledo 6, Ohio.

**WHOLESALE** Supply sources and money making plans offer security, success, in your own business. Details free. Reynard Publications, Smithfield 3, Ohio.

**MAKE** Money by mail. Howard, 1778A Hamburg St., Schenectady 4, N. Y.

**START** Bottled natural gas business. New, amazing opportunity. Demand enormous. Pays big profits. Literature free. Enso, Pasadena 16, California.

**LEARN** Piano tuning, repairing, at home. Tremendous field! Piano parts, tools furnished. Established 1935. Empire School of Piano Tuning, 606-B East University Ave., Champaign, Ill.

**UNPAINTED** Bookends, plaques, statues, figurines. List. Haverty Products, 1219 8th Ave., Altoona, Penna.

**NATURAL** Molding Latex. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

**MAKE** Money sharpening saws at home on electric machine. No experience necessary. Hardware dealers act as your agents to secure work. Send for free book "Independence After 40" shows complete plan for starting in spare time. Foley Mfg. Co., 47 Foley Bldg., Minneapolis 18, Minn.

**RUBBER!** White liquid rubber! America's finest flexible moulding rubber! New! Extra heavy viscosity! Quick drying! Ideal for home, classroom, or industry. Only \$7.95 per gallon, \$2.95 per quart, and \$1.00 per half-pint sample. Parcel post prepaid! Plastercraft Supply Company, 3051 St. Clair Avenue, Cleveland 14, Ohio.

**CASH** For your idea, 280 manufacturers need inventions, patented or unpatented. List free. Invention Bureau, 208M Clinton, Oak Park, Illinois.

**YOUR** Own mail order business at home. New, illustrated course. Free booklet. Registrar, 7219 South Broadway, Los Angeles 3.

**VENDING** Machines earn big money! An investment as low as \$10.50 will start you in this fascinating, profitable business that can lead you to the road of success and independence. Routes can be established and operated in either full or spare time with no experience needed. Write for full details and our free catalog illustrating our nut, candy, gum and stamp vendors; also slot machines, amusement games, etc. Parkway Machine Corporation, 623 W. North Avenue, Dept. 7, Baltimore 17, Maryland.

**SPECIAL** Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

**HOW** And where to obtain capital. Small and large loans. Free particulars. Star Service, Wapakoneta, Ohio.

**OWN** Mirror shop. Resilver mirrors. Glass sign making. Electroplating. Supply prices. John Sprinkle, V60, Marion, Indiana.

**BRONZED** Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution, 30-amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation \$20.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

**QUICK** Money. "Repairing car batteries." At home! Easy too! Batteryman, Grand Junction, Colorado.

**346** FROM Square foot plywood. Jigsaw necessary. Write, Woodarts, X-38, Bridgewater, Mass.

**OPERATE** Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

**RECAST** Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

**RE-NEW** Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723A Troost, Kansas City, Missouri.

**COLORGLAZED** Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

**SPECIALTY** Manufacturing, the big money business that can be operated anywhere, start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Money-making Opportunities in Specialty Manufacturing." Howard Robinson, Ph.G., 1300-A South Ohio Street, Sedalia, Mo.

**START** Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

**\$25** WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

**137** WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

**BRUSH** Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

**WOULD** You pay 3%—first \$350 made? Color-illustrated book "505 Odd, Successful Enterprises" free! Some offer occasional "day off." Work home. Expect something odd! Pacific, Oceanside, Calif.

**MAILING** Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordaa Publishers, Box 23, Pawtucket, R. I.

**RUBBER** Molds, natural liquid rubber, flock filler (for making sectional molds), statuary plasters, felt finishes for novelties. Catalog and "Plastercraft" course free. Blue Rapids Supply, Blue Rapids, Kansas.

**CO-PUBLISH** And advertise in The Central Mail Advertiser. Sample copy for stamp. Low rates. Large circulation. Bagby Printing Co., Georgetown, Ohio.

**MAIL** Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. Blackstone Press, Somerville, New Jersey.

**START** Home plaster novelty business. Amazing course tells how. Literature free. Kemo-Courses, Dept. A, 4862 Catalpa, Chicago 30, Ill.

**EARN** \$200 Weekly installing new amazing "Styron" plastic wall tile in homes, offices. Easily applied. Tile your own kitchen, bathroom, top. Instructions, everything furnished. Literature free. U. S. Tile Co., 30 W. Washington St., Chicago 2, Ill.

**COPUBLISH** Leading m.o. paper. Latest copy Mail Sale Advertiser and proposition, dime. Vanroy W. Shirk, Lebanon, Penna.

**LIQUID** Marble—Colorful, glossy! Molded, brushed, sprayed! Cast novelties, statuary, colored tiles. Flexible molds. Composition floors. Particulars free. Marbleizing Service, Edwardsville, Illinois.

## MONEYMAKING OPPORTUNITIES

**WIN** Cash, cars in prize contests! Write for copy filled with current contests, winning hints and tips. Send only 25c. Wright Contest Digest, Dept. 17-A, P.O. Box 2266, St. Louis 9, Missouri.

**NOTARY** Public. Be one. Largest legal supply house, 22 cities, guarantees your appointment by governor if you qualify, equips you for \$16.97. Respected public office. You certify legal papers, use official seal made with your name, collect fees. Easy. Notaries needed everywhere. Write Stationers Exchange, Boerne 15, Texas.

**EARN** \$25 Distributing 50 boxes of greeting cards. Over 20 different top quality assortments for Xmas, birthday plus deluxe boxed stationery. Also make extra money taking magazine subscriptions. Details free! Cassell Co., 11D Elm St., Westfield, N. J.

**SEWING** Machine—Millions need repair, modernized, electrified, etc. This is it! Write Taylor Service Co., Hamilton, 2A, Ohio.

**METALIZE** Baby shoes for fun and profit. We show you all trade secrets and furnish supplies to start you in big profit business or spare time hobby. Write for details. Shuplate, Dept. A, Lawton, Okla.

**FOWL**, Muncie, Indiana. Money at home with imprints. Samples free.

**LEARN** To have your own mail order business. Read my successful way proved since war. \$1.00. R. S. Kennedy, 419 Dime Bldg., Detroit 26, Michigan.

**\$12.00** PROFIT On 25c investment. Write immediately. Suproco, Ogema 5, Wisconsin.

**FOR** Sound, sensible, proven successful mail order methods, send 10c for details to C. A. Griffith, 132 Water St., Fredonia, N. Y.

**I MADE** \$1000.00 On 1000 tomato plants. Instructions, \$1.00 (refundable). Alfred Dinsmore, Marlborough, Mass.

**"WATERLESS** Hand Cleaner." Make, sell. No machinery. Build profitable business. Complete formula \$1.00. Ideal Service, Park Ridge 2, Illinois.

**"HOW** To Make Money with Hamsters." Latest information. \$1 postpaid. Free details. Englewood Publishers, 4015 So. Lincoln, Englewood 3, Colorado.

**READ** Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

**FREE** Offer. Cash income for life. Succeed, 317 American Bank Building, Portland 5, Oregon.

**PROFIT** With Larson Leathercraft. Belts, purses, 100 other ideas. Largest supply in U. S. Catalog 10c. Larson, Dept. C, 824 S. Tripp, Chicago 24.

**EARN** Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

**FREE** Literature on money making ideas. Write: Lighthouse, 1023-J Hamilton Street, Lockport, Illinois.

**LEARN** To sell by mail. Pound of literature 25c. W. E. Martin, Bassett, Va.

**CANDY** Manufacturing and marketing, complete course \$6.00. Literature 10c. Philip Pate, Kissimmee 1, Florida.

**WORRIED** About a job? Learn how to make \$5000 a year, depression or no depression. Yes, anyone can operate this plan successfully, no matter where they live, no matter how old they are—man or woman. Anyone can put this plan to work and make good money! Free information. M. H. DeSpain, Box 473, Port Huron, Mich.



**INCREASE** Your earnings: Local business opportunities; mail order information; wholesale supply sources; valuable money-making tips; information, free details, rush name. Wilkin Company, Hillsboro, Ohio.

**METALLIZE** Baby shoes. Further information 3c stamp. Metal Crafts, Box 125-R5, Tampa 4, Florida.

**15 M'NOTES** Masters advertising and sign lettering; complete system \$1; free circular. Abenteprizes, Box 875-M, Peoria, Illinois.

**THOUSANDS** Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 40, Illinois.

**WIN** Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 1/2 East 5th, Duluth, Minn.

**ANALYZE** Handwriting for profit! Complete outfit \$1.00. Graphologists, POB-971, Philadelphia.

**UNPAINTED** Figurines. Illustrated list free. Oman, 642 Broadway, St. Paul 1, Minn.

**UNPAINTED** Plaster ornaments. Beautiful designs, easily decorated with water colors or oil paints. Profit or hobby. Free illustrated list. Firestone product dealers wanted. Distributors: Lexite Natural Latex for molds. Midwest Novelty Mfrs., 524 E. Park, Anaconda, Montana.

**EARN** Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

**MAKE \$100** Per week or more in a full or spare time baby shoe metalizing business of your own. Write now for free literature on this easy to learn highly profitable business. Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 23, Penna.

**MEN, Women**—"Most everybody likes candy." Learn to make in a professional manner. (Our 38th year). Ragsdale Candies, D4, East Orange, New Jersey.

**RESILVER** Mirrors at home. Formula 25c. Ideal Service, Park Ridge 6, Illinois.

**PRIZE** Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

**WOULD** You pay 3%—first \$350 made? Color-illustrated book "505 Odd Successful Enterprises" free! Proven! Work at home, office. Expect something odd! Pacific, Oceanside, Calif.

**PUBLISH** Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord. Nebr.

## FORMULAS, PLANS, ETC.

**DAZZLING** White mineral paint. \$2. Paints six room masonry house. Formula 50c. Thos. Wolverton, Blacklick, Ohio.

**PLANS**—New patent sewage disposal system. Requires less drainage, build it yourself. Specifications and drawings by registered professional engineer. \$2.00. De Haviland, Mundelein, Illinois.

**CHEMICAL** Analysis, formulas, research. Central Laboratories, David Whitney Bldg., Detroit 26, Mich.

**FORMULAS** For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

**ANY** Formula \$1.00. Satisfaction or refund. Brown, 9111-J Hoyne, Chicago 20.

**PRODUCTS** Analyzed. Duplicated. Improved. Formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

**10,000** FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

**MAKE**—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

**\$1.00** GETS You 21 money-making popcorn, candy apple formulas. We supply equipment. Concession Supply Company, Dept. A, Station "B," Toledo, Ohio.

**TESTED** Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

**REAL** Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

## PLASTICS

**CELLULOSE** Acetate—Clear, matte, colors. Generous assortment \$1.00. Gift wrappings. Major's, 3510 Palmer, Chicago 47.

**NEW** Low prices on Plexiglas, jewelry findings, initials, sequins, tools, etc. Free catalog. G. Baker Company, River Edge, New Jersey.

**PERMANENT** Carved roses, orchids, swans, goldfish, butterflies, etc. Jewelry and gifts. Crystal Floral Novelty Co., Bound Brook, New Jersey.

**PLASTICS**—Supplies, findings, shells. Illustrated fabricating manual, bargain catalog, 10c. Gem-O'-Lite, Box 686F, North Hollywood, Calif.

**PLEXIGLAS**—12" x 12" Masked sheets. 1/16"-\$1.00, 1/8"-\$1.25, 3/16"-\$1.55, 1/4"-\$1.85. Include 10% postage. Dyes, rods, tubes, luminous powders, carving blanks, drills, jewelry findings. Free catalogue. Craft Plastics, Somerville, New Jersey.

**RENEW** Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723B Troost, Kansas City, Missouri.

**BARGAINS** In plastics. Lucite, Plexiglas, Catalin. Many colors and sizes. Details free. George Plastics, 6938A George St., Chicago 34, Ill.

**PLASTIC** Materials and supplies for your hobby or business. Catalog and internal carving instructions free. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

## CHEMISTRY

**FREE** Catalog: Chemistry, mineralogy, physics, biology. Special—39 chemicals in 2-oz. bottles \$3.90. Tracey Laboratories, Evanston, Illinois.

**UNIVERSITY** Professor teaches chemistry by mail. Details free. Box 1295, Toledo, Ohio.

**NEW** Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Ill.

**NEW** Used equipment, chemicals. Catalog. At-la-s, 21 Wenham, Boston, Mass.

**CHEMICALS** For chemistry set renewals at low prices. Large general catalogue 15c. National Scientific Company, 2204 North Ave., Chicago 47, Ill.

**CHEMICALS** And apparatus for industrial, analytical, and private laboratories. Catalog 10c. Dept. M-26. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, N. Y.

**HANDBOOK** For chemical experiments. Illustrated. Hundreds of experiments. 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

**LABORATORY** Chemicals, apparatus, books. Catalog 10c. Fleischer's Laboratories, Everett 49, Mass.

## HELP WANTED

**BOYS** Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 44. National Engravers, 214 Summer, Boston, Mass.

**FREE** Details. Action novelties, airplanes. Kolinski, 759 South 25th, Milwaukee 4, Wisconsin.

## AGENTS WANTED

**FREE** Samples. Big profits showing amazing glow-in-the-dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer, Madison Mills, 303 Fourth Ave., New York, N. Y.

**NEW** "Sponge" wall cleaner. Erases dirt like magic. Wallpaper, painted walls, ceilings. Saves redecorating. Lightning seller. Samples sent on trial. Kristee, 112, Akron, Ohio.

**AT** Last! Something new and sensational in everyday cards. Gorgeous satin and velour designs. Get orders fast. Big profits. Imprinted stationery. Floral charmettes, napkins. 25 assortments for all occasions, retail 60c to \$1. Samples on approval. Puro Co., 2801 Locust, Dept. 940-A, St. Louis 3, Mo.

**NEWEST** Money making sensation. Sell hand painted ties with personal initial. 100% profit. Experience unnecessary. Special offers. Write for free 20 page catalog complete line ties, mufflers. Philip's Neckwear, 20 West 22nd St., Dept. K-31, New York 10.

**PROFITS.** Big demand and repeat orders selling rubber mats for home or auto. Free sales plan. Mitchell, 2140A San Fernando Road, Los Angeles 41.

**400% PROFITS** Selling genuine, guaranteed. "Nu Silver Polish and Plating Liquid." Apply with cloth. Stores, offices, homes. NuProcess Products, Aurora, Illinois.

**BIG** Money career. Sell guaranteed Nylon uniforms; white, colors. No investment. Highest commissions. Easy, quick sales to waitresses, beauty shops, hotels, nurses, etc. Complete variety fabrics. Exclusive styles. Free catalog sales kit. Up-land Uniform, 255 West 28th Street, Dept. G-1, New York.

**SCHOOL** Seniors! Your postal will bring our wonder, Kwick-Sell cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235L, Pittsburgh 30, Pennsylvania.

**STRANGE** "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee, 113, Akron, Ohio.

**SELL** Personalized napkins, stationery, matches. Samples free. Dunbar, Sanford, Florida.

**I'LL** Put a "shoe store business" in your pocket! Nation's leader trains you to make big money! Fit men, women. Free sample outfit. Write today! Consolidated Shoe System, Dept. S-210, Chippewa Falls, Wis.

**A DRESS** For you with every 3 you order for yourself and family. Amazing new plan. Everything free. Harford Frocks, Dept. W-9128, Cincinnati, Ohio.

**PLASTIC** Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write L & M Co., Dept. 58-A, 510 St. Charles, St. Louis, Mo.

**ABSOLUTELY** Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 4774, Cincinnati, Ohio.

**EARN** Big money. 21 Sunshine everyday cards with six lined envelopes \$1. 48 Sunshine notes for \$1. Sensational values. Costs 50c. Sells \$1. Also 1949 21 card Easter asst. Birthday, get well, napkins, gift wraps, stationery. Write today. Samples on approval. Sunshine Art Studios, 115 Fulton St., Dept. PM-1, New York 8, N.Y.

**SELL** Refrigerator motor oil. Good profit. No competition. Free details. Warco, 2689-E Coolidge, Oakland 1, Calif.

**MAKE** Money calling on friends. Show greeting card assortments—Birthday, get-well, others. Floral stationery. Gift wrappings. Experience unnecessary. Samples on approval. Wallace Brown, 225 Fifth Ave., Dept. D-4, New York 10.

**POCKET** Pal: Replaces pocket knives. New safe, beautiful. Always razor sharp. 50c seller. 321% profit. \$15.00 or more daily. Agents, salesmen, distributors. Sample 10c. Nelson Mfg. Co., 222 W. Kellogg, St. Paul 2, Minn.

**HOTTEST** Seller of all time. Details free. C & C Sales, Box 1046P, Chicago 90, Ill.

**INFORMATION**—Wholesale supply sources. Money-making plans. Increase your income! Write Reynard Service, Smithfield 3, Ohio.

**GREETING** Card money-makers. Birthday, everyday, Valentine. Catalog free. Greenport Art Company, Dept. 918P, Brooklyn 15, New York.

**SELL** Easter, Mother's, Father's day Bible text mottoes and signs. 6 samples \$1.00. Made in beautiful colors. Special Kut Signs, Dept. J, Sidney, Ohio.

**MAKE** Sensational profits! New, sell-on-sight plastic line: Tablecloths, aprons; many other splendid fast-selling items, novelties. Postal brings free details, special deals. Hurry! Royalty, Box 748-H, Passaic, New Jersey.

**MAKE** Big money with the wonderful new, "Pink Satin" cream shampoo! Sells fast! Sales repeat! Splendid money-maker for you! Rush name for interesting free details, today. Demo Laboratories, Bogota, New Jersey.

**BUY** Thousands of nationally advertised products direct from manufacturers. Write for "Buy Direct and Save." Consumers Assn., 287-A Lebanon Ave., Mt. Lebanon, Penna.

**MAKE \$100** A week selling subscriptions for "Jr." The Modern Magazine for boys and girls. Every parent a prospect. See the possibilities? Write "Jr." Dept. G., 812 North Dearborn, Chicago 10, Illinois.

**FREE Nylons** given if Kendex hosiery runs or snags! World's only women's hosiery sold with written guarantee amazing everybody. Mere words could not express unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkins sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Complete line from sheerest to service (15-20-30-40-60 denier) all lengths 28 to 35 inches—latest colors—seamed full fashioned and seamless. No competition because Kendex guaranteed nylons not sold in stores. Also complete line men's hosiery actually guaranteed for one full year! Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures, etc. All styles, patterns, colors, prices to please everybody. Thousands shipped daily. 100,000 pairs constantly in stock for fast delivery. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Show free outfits. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Complete money-making outfits including salesbooks in color, samples of hosiery materials, etc. furnished free and prepaid. Simply mail name and address to: Kendex Company, Babylon 13, N. Y.

**SELL \$2 Fire extinguishers.** Locally, mailorder. Lorrac Products, Albany 1, N. Y.

**SELL Ultra-blue stock signs to stores.** 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 438, New York City 70.

**EARN Big money year 'round.** Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, household linens, etc. For information, Corporate Merchandisers, Dept. PM-10, 110 West 34 Street, New York City 1.

**BIG Bargains for big profits.** Over 100 sensational wholesale values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

**AMAZING Offer—\$50 is yours for selling** only 100 boxes entirely different, new deluxe all-occasion cards. Patented feature television card included. Each box sells for \$1.00, your profit 50c. Surprise items. It costs nothing to try. Write today for samples. Cheerful Card Co., 499, White Plains, N. Y.

**WANT Pleasant outdoor work in a business** of your own? Good profits selling over 200 widely advertised Rawleigh home/farm necessities. Pays better than most occupations. Hundreds in business 5 to 20 years or more! Products—equipment on credit. No experience needed to start—we help you. Write today for full particulars. Rawleigh's, Dept. A-145-PPM, Freeport, Ill.

**SELL The famous \$3 "Fire-Killer" extinguisher** with bracket, wholesale or direct; big profits; exclusive territory. "Fire-Killer," Syracuse 1, N. Y.

**FAST Money!** Take orders for new sensationally different picture enlargements. No competition. Everybody buys. Gotham Products, Box 5427 M, Philadelphia 43, Penna.

**LOOK Here! Wanted—Men and women** to start in business on credit. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. A-192-PPM, Freeport, Ill.

**HOUSE To house salesmen for the best** in brushes. Write Argon Brush Co., 511 8th Ave. N.E., Minneapolis 13, Minnesota.

**QUALITY Plastics at new low prices!** Tablecloths, aprons, garment bags, utility covers. Free illustrated pricelist M91. Acclaim Products, 25 Hillside Ave., New York 34, N. Y.

**SELL Books by mail.** Mammoth sales and huge profits. Everything furnished. Send 3c stamp for complete details. Business Plans Foundation, Box 56, Madison Square Station, New York 10, N. Y.

**SELL By mail books, novelties, bargains!** Ready made circular service! Large profits! Catalog free! Elfco, 432 North Wells, Chicago 10.

**SCHOOL Seniors—Earn 40% commission** selling classmates America's most beautiful graduation name cards. Largest selection. Outsells all others. Free sample kit. Printercraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

**BIG Money selling cast iron and aluminum** cooking utensils direct to consumer, exclusive designs. Free illustrations. Jones Machine & Foundry Co., Chattanooga 2, Tenn.

**GUARANTEED Product in protected** territory, if you are now selling or intend to sell house-to-house. For full 1 qt. sample amazing High Shine Windsor No Rubbing Wax, send only 25c covering handling and postage. (Sells for \$1.25.) Windsor Wax Co., Inc., Dept. P.M.-2, Hoboken, N. J.

**MAGIC Cleaner—Laundry soap deal.** Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

**MAKE More money selling personal** initialed individualized belts, buckles, cap badges, tie holders, name plates. 2,000 emblems to choose. Big profits, whole or part time. Write today; special outfit offer. Hookfast Specialties, Box 1425, Dept. 6, Providence, Rhode Island.

**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.

**GOLD Lacquered window sign letters.** Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

**EXCELLENT Sideline for printing and** advertising salesmen. Decalomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

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

#### AGENCIES WANTED

**IF You manufacture counter hardware** items or novelties and are looking for a sales outlet contact us. Ingle & Company, Murray Theatre Bldg., Richmond, Indiana.

#### HIGH-GRADE SALESMEN

**IN '49 Sell the "big" line—"The** world's latest" Sinco calendars and advertising specialties. Write today. H. W. Singleton Company, Dept. PM, Salt Lake City, Utah.

**ADVERTISING Book matches—Cash** in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-19, 7530 Greenwood, Chicago.

**BIG Profit opportunity for salesmen.** Decalomania nameplate, sells to all businesses. Repeats often. Sensational manufacturing methods beat competition with low prices, immediate delivery, small quantities. Make money without investment. Sideline or full time. Free samples and complete information will convince you. International Industries, Culver City 1, California.

**BABY Shoes metalized and mounted.** Big profits. We do work. Ellisons, 2419 Wylie Ave., Pittsburgh, Penna.

**QUICK Earnings selling dealers.** Complete line. Power units. Farmco, M-2001, Excelsior Springs, Mo.

**FANS—Fans—Salesmen making \$50 to** \$100 per day selling our electric fans and sump pumps. Write—Universal Fan Co., Inc., Peru, Indiana.

**SALESMEN—Put yourself in line for** big money and real future. Keep stores supplied with 5c-10c counter goods. Nationally advertised merchandise. Top profits for you and merchants. Liberal deals boost sales. Sideline or full time. World's Products, Dept. 10-M, Spencer, Ind.

**UP To \$50.00 in a week and tailored suit** for yourself without paying one cent. Write for plan. Progress Tailoring Co., Dept. N-217, Congress and Throop, Chicago 7, Ill.

**OVER 100 "Automatic fire extinguisher"** experienced dealers have changed to Red Ball Inc. since Oct. 25. There is a reason. Make us prove it. Write Box 1655, Salt Lake City, Utah.

**POPCORN Machines, all electric un-**peanut roasters, carameltcorn, heating appliances. No inside Sales, Indianapolis, Iowa.

**NEW Jobs open in selling! Send name,** address for free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

**AMAZING Discovery.** Master Glaze puts brilliant glass-like surface on cars. Free sample, information. Big commissions. Master Glaze, Dept. 665, 7720 Harwood, Milwaukee, Wisc.

**SALESMAN! Make over \$30.00 a day.** Sell nationally advertised adding machine for only \$22.95 complete. A desk model portable precision built, fully guaranteed, every inch a business machine. Easy to operate, easy to sell, easy for you to make big money at 49% profit! For life-size color photo and full details, write today to Lightning Adding Machine Co., Inc., Dept. ZD-6, 543 So. Spring Street, Los Angeles 13, Calif.

**BALLOONS, Toys, novelties, etc.,** wholesale. For full information write Dutz Enterprises, 109-A Sangamon, Lincoln, Illinois.

**QUICK Sure money. Selling Annie Blain** flavors. Highland Park 1, New Jersey.

**SELL 7 x 11 Signs, no trespassing, etc.,** 25 different. 100-\$2.50. Postpaid. Retail \$10.00. Information write, Feld, 813 Ellison, Cincinnati, Ohio.

**BIG Money selling tooth powder.** Write today. James Walker, 633 Plymouth Ct., Chicago, Ill., Dept. 3.

**BIG Money taking orders. Shirts, ties,** socks, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-AN Lincoln, Chicago.

#### EDUCATIONAL AND INSTRUCTION

**"HOW To Break and Train Horses"—A** book every farmer and horseman should have. It is free, no obligation. Simply address, Beery School of Horsemanship, Dept. 1101C, Pleasant Hill, Ohio.

**IF You'd like a profitable office busi-**ness, operate a collection agency. Our inexpensive short course quickly qualifies you. Write Cole & Associates, Syracuse 2, New York.

**GOOD Jobs and a sound substantial fu-**ture await you in hotel and institutional field. Men and women, all ages, needed for well-paid positions that offer color, excitement, ever-new and fascinating duties. Record breaking travel means even greater opportunities for trained men and women in hotels, clubs and institutions. Lewis School receiving calls for managers, assistant managers, stewards, hostesses, purchasing agents and 55 other types of important positions! From coast to coast there are important positions that offer splendid opportunities for advancement in a business where you are not dropped because you are over 40. Previous experience proved unnecessary! No need to leave your job to qualify. A good grade school education, plus Lewis Training qualifies you at home, in spare time. Our National Placement Bureau helps to place you; and our amazing Certified Job Plan actually certifies you will "make good" when placed. Write today for free book! Veterans: Course approved for Veteran's training. Lewis Hotel Training School, Room PA-368, Washington 7, D.C. (First and only school of its kind—now in its 33rd year.)

**INVESTIGATOR Training.** Phillips Secret Service. 1917B North Kenneth, Chicago 39, Illinois.

**BOOKKEEPERS! Increase your earnings.** Operate your own simplified "Dollar-A-Week" bookkeeping and tax service. Full or spare time. Details free. No obligation. Ellis, Box 200, Cedar Grove, North Carolina.

**NOW You can have an office. Learn** credit-collection business by new home study course. Many earn up to \$5,000-\$15,000 annually. Free bulletin. Franklin Credit School, Dept. 202A, Roanoke 7, Virginia.

**NOW You can learn professional lock-**smithing at home. The same professional course taught in our famous resident school now available as extension course. All locks mailed your home for study. Young, old, disabled, become independent. Operate your own business. Only approved school in nation. The professional course you've always wanted. If you cannot attend our resident school, we'll bring our Government approved school to you. National Locksmithing School, 1074 Valencia St., San Francisco.

1949 GOV'T. Jobs! Many new openings. Start high as \$3,351. Secure positions. Men-women. Qualify now. Free 40-page book, sample coaching. Write Franklin Institute, Dept. K24, Rochester, N. Y.

MAKE Up to \$30-\$40 week as a trained practical nurse! Learn quickly at home. Booklet free. Chicago School of Nursing, Dept. M-1, Chicago.

SCIENCE Of memory simplified. Free booklet "Memory Development." Memory Club, 2016 Sunnyside Ave., Chicago 25, Ill.

HOME Study courses. Over 500 subjects. Courses include text, lessons, examinations, etc. Complete, only \$9.95. Write DeVoto Schools, 35 Vicente, San Francisco 16 Calif.

NEW Style home study course in advertising art now ready. Free portfolio "Your Career in Art." Applied Art Studio, 1662 Lincoln Avenue, Cleveland 7, Ohio.

WANTED. Watch repairing. International and other good used correspondence courses. Bought. Sold. Rented. Baker, 5509-B Winthrop, Chicago 40.

BECOME A Doctor of Psychology or Metaphysics. Teach secret of contentment, happiness. Win degree of Ps.D. or MsD. Solve mental worries. Free book. College of Universal Truth, 5153-C North Clark, Chicago.

SPECIAL Offer radio instruction publication. Radio Maintenance. How to service. install, profit in radio, television, sound. Six editions, 200 pages \$1 postpaid. Radio Maintenance, Montclair, N. J.

BOOKKEEPING Easily learned! Rapid, simplified instruction. Introductory lesson 35c—15 lesson course, \$5.00. B. Buchalter, 1280 Ocean Ave., Brooklyn 30, N. Y.

OIL Painting—Economic, home study course. Write Carlos Art Academy, Correspondence Division, Watertown, N. Y.

INVESTIGATOR Courses. Free literature. Criminology Institute, 1324 West Broadway, Dept. P-3, Spokane, Wash.

WELDING—Learn a profitable trade quickly at best equipped school in U. S. G. I. approved. Free catalog. Write Hobart Welding School, Box M-197, Troy, Ohio.

EARN More quicker; amaze with Super-memory, established 1938. Facts, figures, names, stick like burrs. Write Thor Books, CMI, Box 1210, Chicago.

EXPORT! Learn at home from established world trader. Big paying positions. Your own profitable world-wide business by mail order without capital; or travel abroad. Experience unnecessary. Free booklet. Mellinger, 101W, Los Angeles 24, Calif.

LEARN Air conditioning, refrigeration, and heating. Write today for free booklet. Detroit Air Conditioning Institute, 4125 Grand River, Detroit, Michigan.

SPANISH—Learn fast—with Speed-O-Way phonograph records and textbook, \$7.95 complete. Write for free folder. Speed-O-Way Publications, Box 2301, Houston 1, Texas.

DENTAL Technician's practice kit. Artificial teeth, plastic, etc. Free instructions with kit. Grant Laboratory, S-219 W. 7th, Los Angeles, Calif.

BE A real estate broker through home study or classroom instruction. Write for free book. Approved for veterans. Weaver School of Real Estate, 15 E. Pershing Rd., Box CP-1, Kansas City 8, Mo.

MEDICAL Laboratory technicians in great demand. We train you in your own home, in your spare time. Also home study course in general chemistry. Free catalog. Imperial Technical Institute, Box 973-J, Austin, Texas.

USED Correspondence courses and books bought, sold, rented and exchanged. Catalog free. Lee Mountain, Pisgah, Alabama.

LEARN Photo-engraving at home or in oldest, largest school in America. Work for newspaper or establish own profitable business. New Tasope! Photo-Engraving equipment available soon. Write for information. Veterans ask about G.I. training. The Aurora School of Photo-Engraving, Tasope! Bldg., Aurora, Mo.

LINGUAPHONE Makes languages easy. At home learn to speak Spanish, Portuguese, Italian, French, German, Russian, by quick, easy Linguaphone Conversational Method. Save time, work, money. Linguaphone correspondence courses are available to veterans under G.I. bill of rights. Send for free book. State if G.I. Linguaphone Institute, 83 RCA Bldg., New York, 20, N. Y.

SECRET Investigation. Experience unnecessary. Investigators particulars free. George Wagner, M 125 West 86th, New York.

### PLAYS, STORIES, MANUSCRIPTS

I WANT New writers to cash hundreds of checks for \$1 to \$100, offered each month. The easiest way to write for pay. No previous experience necessary. Send for free details. No obligation. Saunders M. Cummings, 468-M Independence Bldg., Colorado Springs, Colo.

### BUSINESS SERVICE

HOLLYWOOD Remail service, or what? Everson, Box 133, West Los Angeles 25, Calif.

WE Receive, reforward letters; \$3.00 monthly or 25c each. "Hawkins," 1300 Tailor, Washington 11, D. C.

### SPECIAL SERVICES

POSTMARK Your letters Lisbon, or Estoril, the Portuguese Riviera, 50c, air-mailed \$1.00. Inquiries about Portugal, \$1.50. Only bank money order accepted. A. Feio, Apartado 202, Lisbon, Portugal.

PHOTOSTATIC Copies. Write for prices. Hamy, 214 Robinson, Hudson, N. Y.

### INFORMATION

3,670 MISSING Relatives located. Heirs traced. Many pointers! Bulletin 25c. Chaffee, 308 Washington, Chicago 6.

### CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

"HOW To Make Money With Simple Cartoons"—a book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 91-C, Pleasant Hill, Ohio.

LEARN Showcard writing at home in spare time. Fascinating, profitable. Free information. Sherwood Publishing Co., Irvington 11-6, N. J.

FAMOUS 875 Lockwood art course now only \$6 postpaid. Other smashing art bargains. Catalog 10c. Art Book Shop, Arnold 5-B, Missouri.

SIGN Letters; ready made, just paste them on easily; all colors, sample free. "Artistic," 74 Edmund Pl., Detroit.

CARTOONIST'S Magazine, 25c. Lessons, hints. Cartoonist Hartman, 2776 California Ct., Lincoln 8, Nebraska.

BECOME Professional lettering artist. Make money. Design stationery. New, amazing device. Major-Art System, 3510 Palmer, Chicago 47.

FIGURE Drawings by French artist Lalire. Over hundred female poses, body details, \$1.00. Art Headquarters, 1160 25th Avenue North, St. Petersburg, Florida.

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

### ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

FREE! 1948 Advertisers Rate and Data Directory, 52 pages! E. H. Brown Advertising Agency, 20 N. Wacker, Chicago 6.

ADVERTISING Sensation! Reach 2,100,000 families, \$32.90 inch. Display, classified, ratebook (newspapers, magazines, mailing lists), advertising assistance, free. Chicago Advertising Agency, 20-PM West Jackson, Chicago 4.

ADVERTISE: 24 Words, 40 newspapers \$3.50. Lists free. Advertising Bureau, 10511-C Springfield, Chicago 43.

MAILORDER Advertising! Complete planning, writing, placing service. Quarter-century reputation. Les Finkle-Advertising, 257 South Spring, Los Angeles 12, California.

COPY-Writing—Forceful sales messages! Letter for little as \$3.00. Prospectus. Fred Schmaus, 895P East 241st Street, New York 66, N. Y.

COMPLETE Service for mail advertisers, planning, preparation, printing, placing. Write: National, Box 88-A, Dorchester, Mass.

SALES Letter writing our specialty! Production facilities. Particulars on request. Commercial Record, Saugatuck, Michigan.

CHOICE Mailing lists. E. J. Eller, Broker, 1000 Sutter Street, San Francisco 9, Calif.

EXPENSIVE But sure. Selected retail customers eager for sporting, trapping, miscellaneous goods. \$15 list of 1000. Check with order or c.o.d. Mer-Kel Mdse. Mart, Box 99b, Station A, Brooklyn 16, N. Y.

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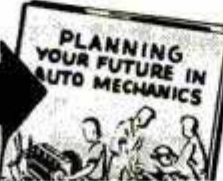
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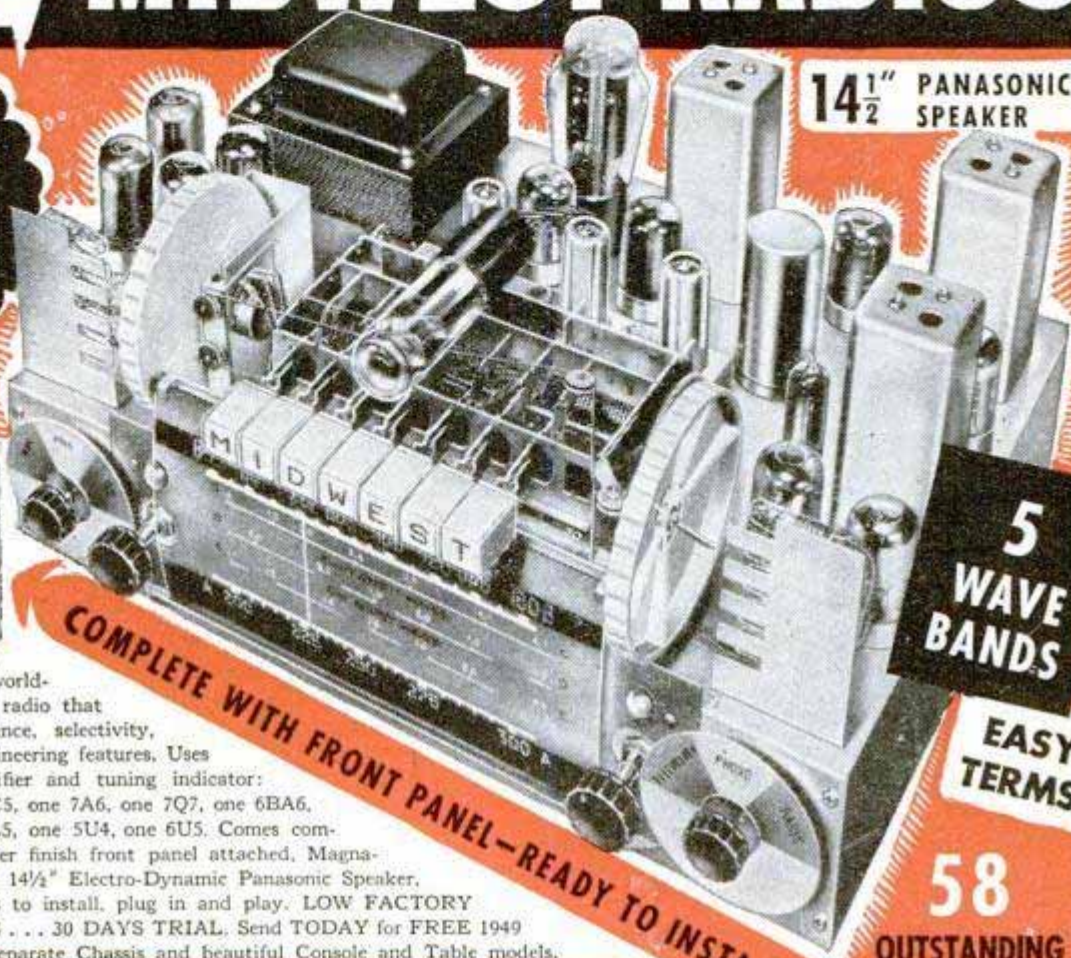


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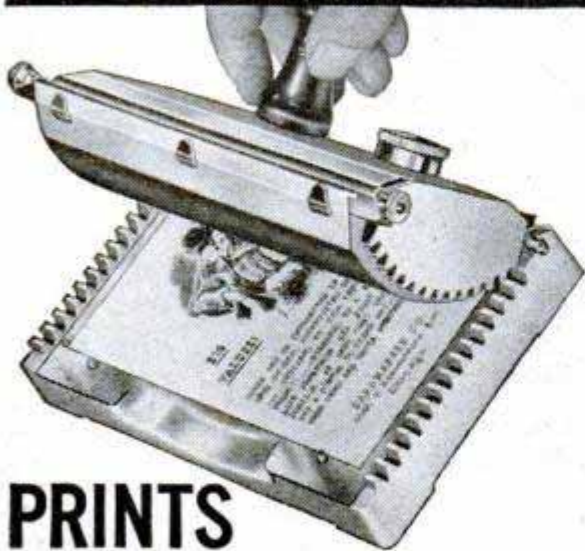
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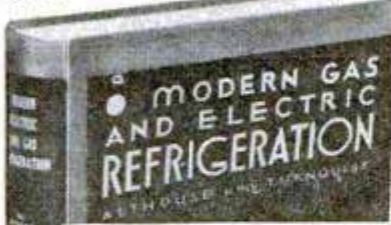
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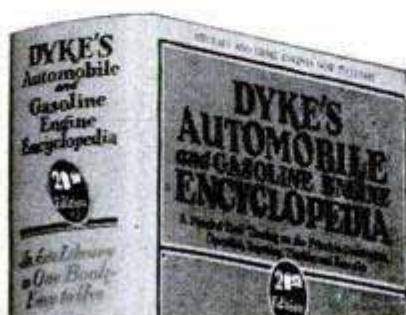
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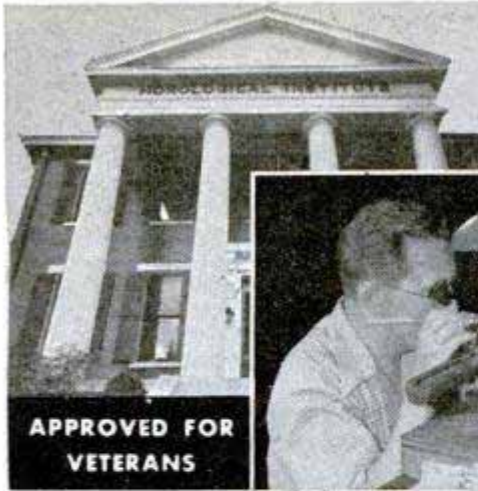
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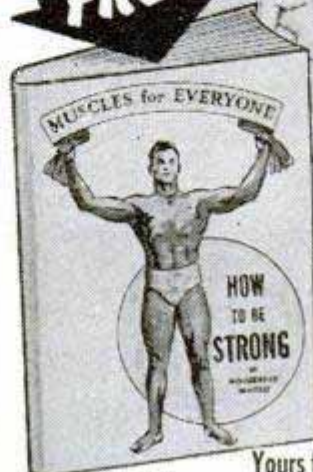
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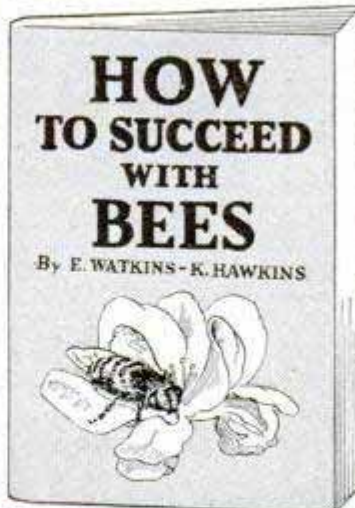
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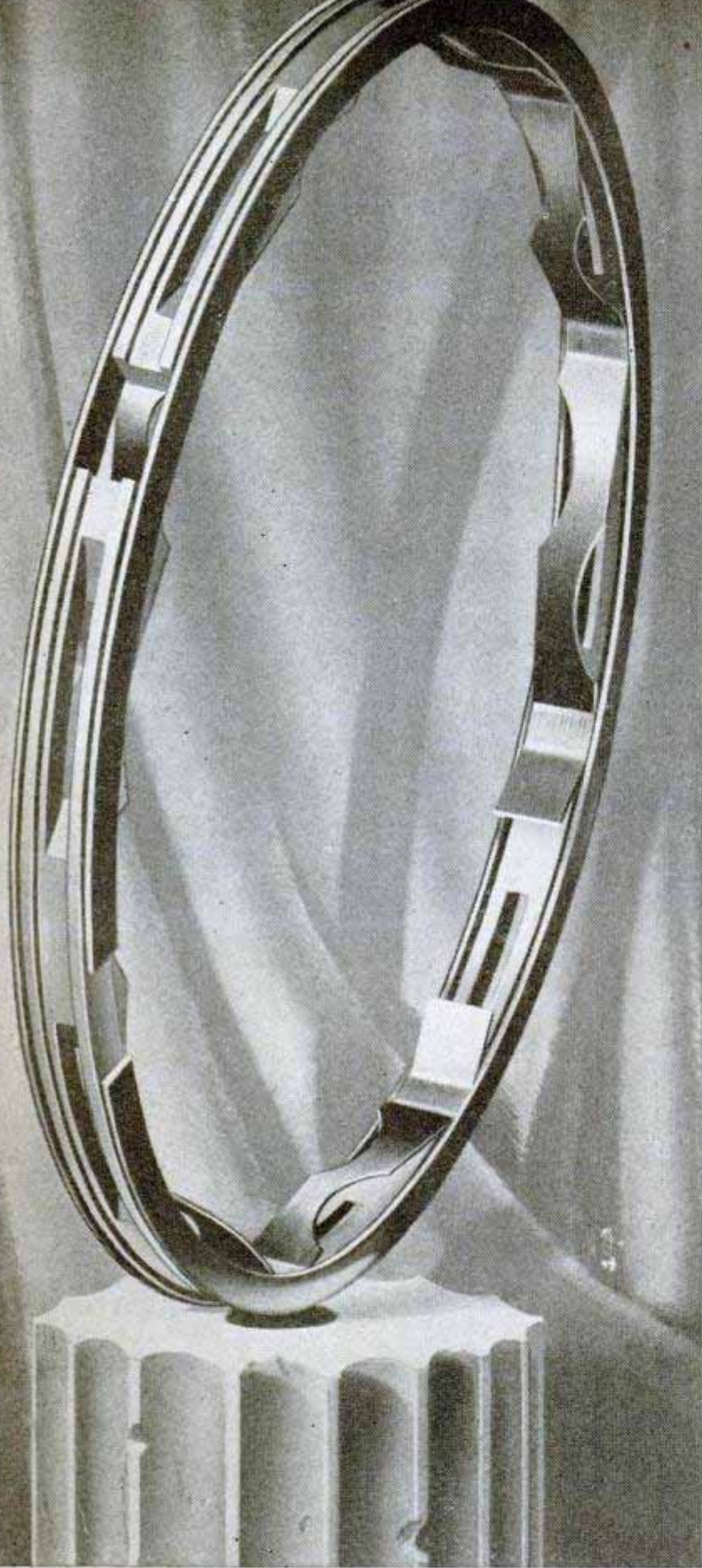
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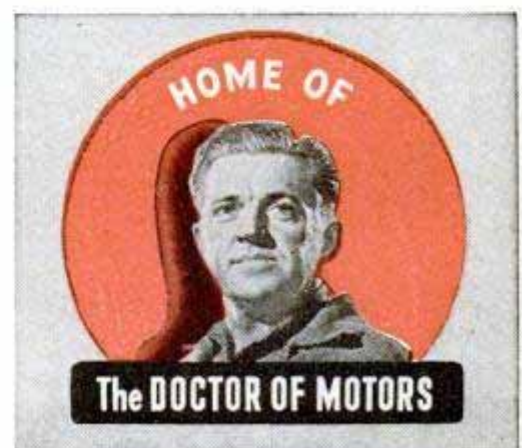
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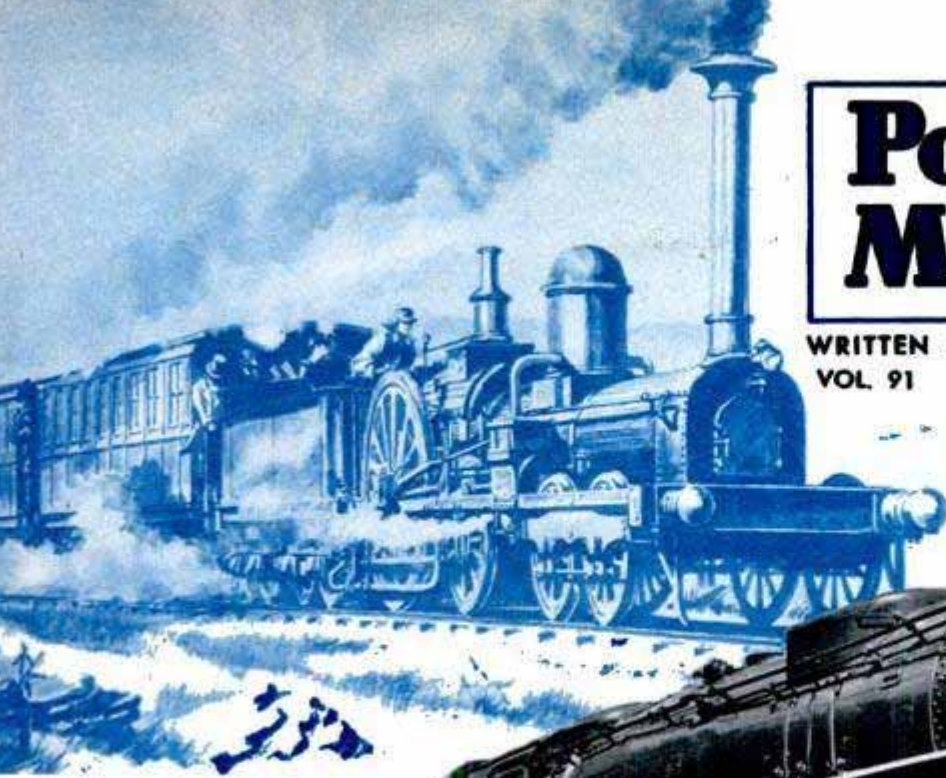
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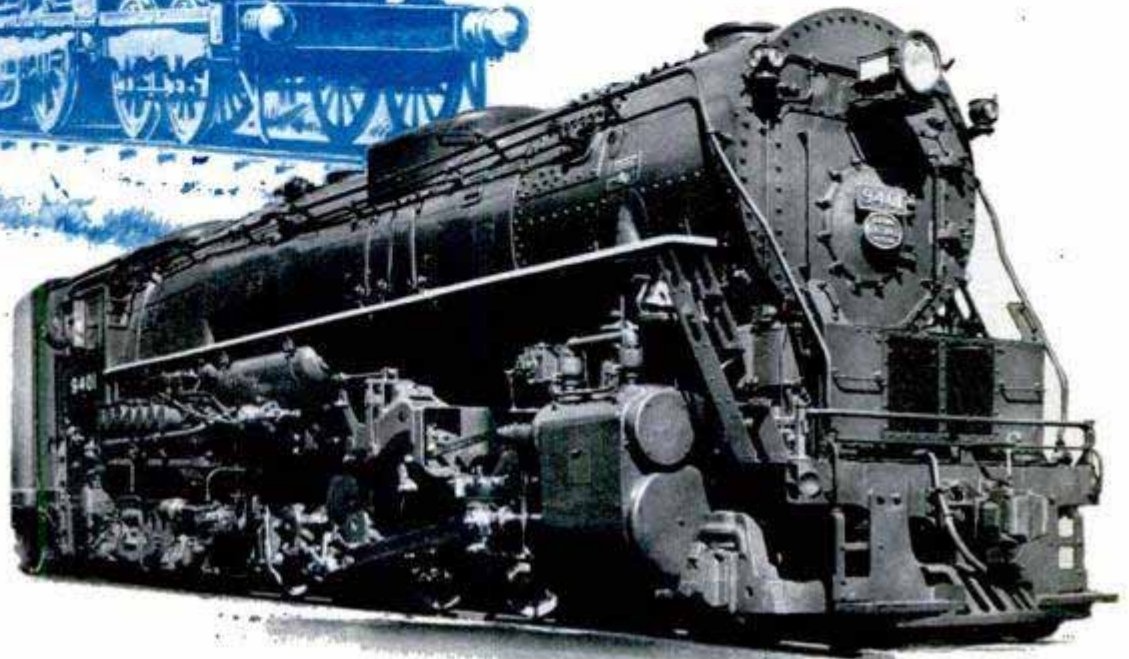
POPULAR MECHANICS

# POPULAR JANUARY 1949 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 91 NO. 1



The Lightning, above, was the first steam locomotive built at the Schenectady works in 1848. Just 100 years and 75,000 locomotives later came the last one, shown at right



## END OF AN ERA



By Wayne Whittaker

**N**OBODY blew a whistle or rang a bell as the big steam locomotive was eased out of the erection building and pulled into the running shed. The pulling was done—prophetically enough—by a purring diesel-electric switcher.

Workmen from the far corners of the cavernous old erection building gathered around. They were strangely silent and appeared to be only half believing what they saw. To the casual observer there was nothing unusual about the looks of this locomotive—a conventional 2-8-4 type. It was built under contract by the American Locomotive Company in Schenectady for the Pittsburgh and Lake Erie Railroad.

"If anybody had ever told me—" said one of the workmen to Frank J. Close, superintendent of the steam shop. The man didn't finish his sentence, but Close and his assistant, F. L. McMahan, nodded their heads in perfect understanding.

The boiler of the new locomotive was

filled with water and she was coaled up. Still nobody budged. After a time the steam-pressure gauge registered full-boiler pressure. Then followed the familiar sequence of blowing out the boiler tubes and setting the safety valves. The injectors were tested. The water pumps. The air brakes. The stoker.

P. T. Egbert, vice-president in charge of the locomotive division, and several other top executives joined the waiting group. A photographer's flash bulb exploded. A foreman waved a "go ahead" signal to the test engineer and under its own steam the locomotive chugged out of the running shed to mark the end of an era in the shops of the American Locomotive Company.

This particular locomotive happened to be the last steam engine off the regular production line of the plant which has been building locomotives for 100 years. From now on, unless something unforeseen occurs, all of their production will be

4-4-0 Gov. Marcy, 1851



4-4-0 American type, 1860



4-4-0 American type, 1898 81





Stanton Mason, "junior engineer" of Scotia, N. Y., eyes 4500-hp. diesel

Back in 1848—the year before the California gold rush—an infant company known as the Schenectady Locomotive Engine Manufactory produced its first product. This was a spritely little engine with a high smokestack, lots of polished brass, red paint and gold trim. It must have been something of a curiosity to the boatmen and passengers traveling on the Erie Canal, which passed the doors of the plant. The rivermen, with their hundreds of miles of navigable waterways, laughed at the locomotive named *Lightning* and probably joked about it being all dressed up with no place to go. There weren't many miles of railroad track in the country at that time.

streamlined diesel-electric locomotives.

"We didn't plan it this way," says Mr. Egbert. "It's simply a matter of demand. All the railroads want diesels. The handwriting has been on the wall for a number of years and we've been preparing for this day since the early 1920s. That's when we built our first diesel."

Despite any handwriting on the wall, the decision of Alco (contraction for American Locomotive Company) to discontinue steam production comes as a blow to railroading fans throughout the world. There are volumes of statistics proving the economy of diesel operation as compared to steam. But statistics are a poor substitute for the thrill a railroad fan gets in watching an old iron horse under full steam flinging back its plume of smoke and splitting the air with its warning whistle. The sounds and the smells of a hurtling diesel in all its gleaming efficiency can never replace the colorful iron horse in the heart of a true steam-locomotive fan.

Time out for a backward glance over 100 years of locomotive building. This production record is a study in mechanical evolution during Alco's building of more than 75,000 locomotives. The record bridges three wars and several depressions; it embraces advancements in mechanics that have revolutionized our way of life.

The *Lightning* was a good engine; in fact, it was away ahead of its time. It weighed about 15 tons, had 84-inch drivers and, although it was built to haul nine cars at 9 to 15 m.p.h., it once pulled an eight-car train at 80 m.p.h. The little locomotive was sold to the Utica and Schenectady Railroad and was doomed to only one year of service. It was just too powerful for the roadbeds of that day.

Local railroad magnates were not impressed with the *Lightning's* performance and further orders were not forthcoming. After three years of struggle, the "manufactory" quietly folded up. The *Lightning* was its only product and if anybody had told the company directors that this locomotive would be famous a hundred years later they would have been dumfounded.

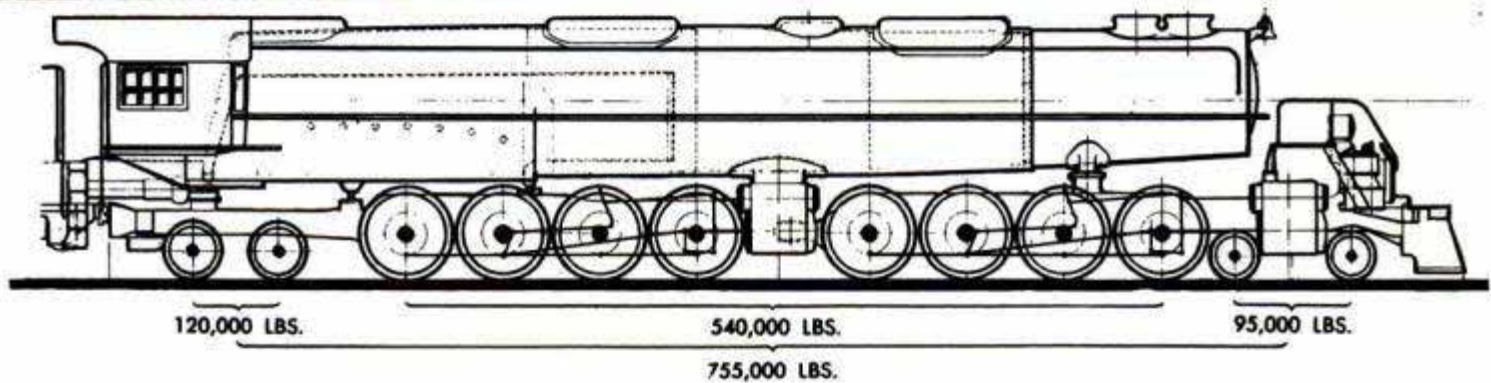
The company was quickly reorganized in 1851 by John Ellis, one of the early stockholders. Ellis and his four sons guided the company, now known as the Schenectady Locomotive Works, for more than half a century. In its first year they built five locomotives and one of these, the *Governor Marcy*, was destined for fame. Pictures of the *Marcy* have been widely reproduced as one of the first 4-4-0 types of locomotive. (To the uninitiated, the numerals from left to right tell the number of wheels composing the leading truck, the number of driving wheels and the number of wheels on

4-4-2 Atlantic type, 1905



2-6-0 Mogul type, 1906





**Big Boy, the world's largest steam locomotive, weighs 755,000 pounds. Sketch shows the weight distribution**

the rear truck. The 4-4-0 is also known as the 8-wheel or American type.)

Walter McQueen, ingenious master mechanic and one of the greatest steam-locomotive builders of all time, served as superintendent and later as vice-president of the company. McQueen made things hum and by 1855 the plant was turning out one \$7500 locomotive every eight days. By this time, coal-burning locomotives were being generally accepted. The speedy Schenectady locomotives made record-keepers dizzy by breaking one record after another. One of the favorite speed runs of the day was to Niagara Falls. Jokesters of the era quipped that at breakneck speeds of 35 m.p.h. a passenger no more than opened his lunch basket than he was at the Falls.

In 1857 there was a general business panic and the plant with its 440 workers suffered a severe slump. The next year

only two locomotives were built and the company was reorganized. Three years later came the Civil War with high prices and government orders for as many locomotives as could be built. The plant delivered 84 locomotives to the government between 1861 and 1863. Historians agree that these locomotives played a vital part in the course of the war. The McQueen engine became nationally famous.

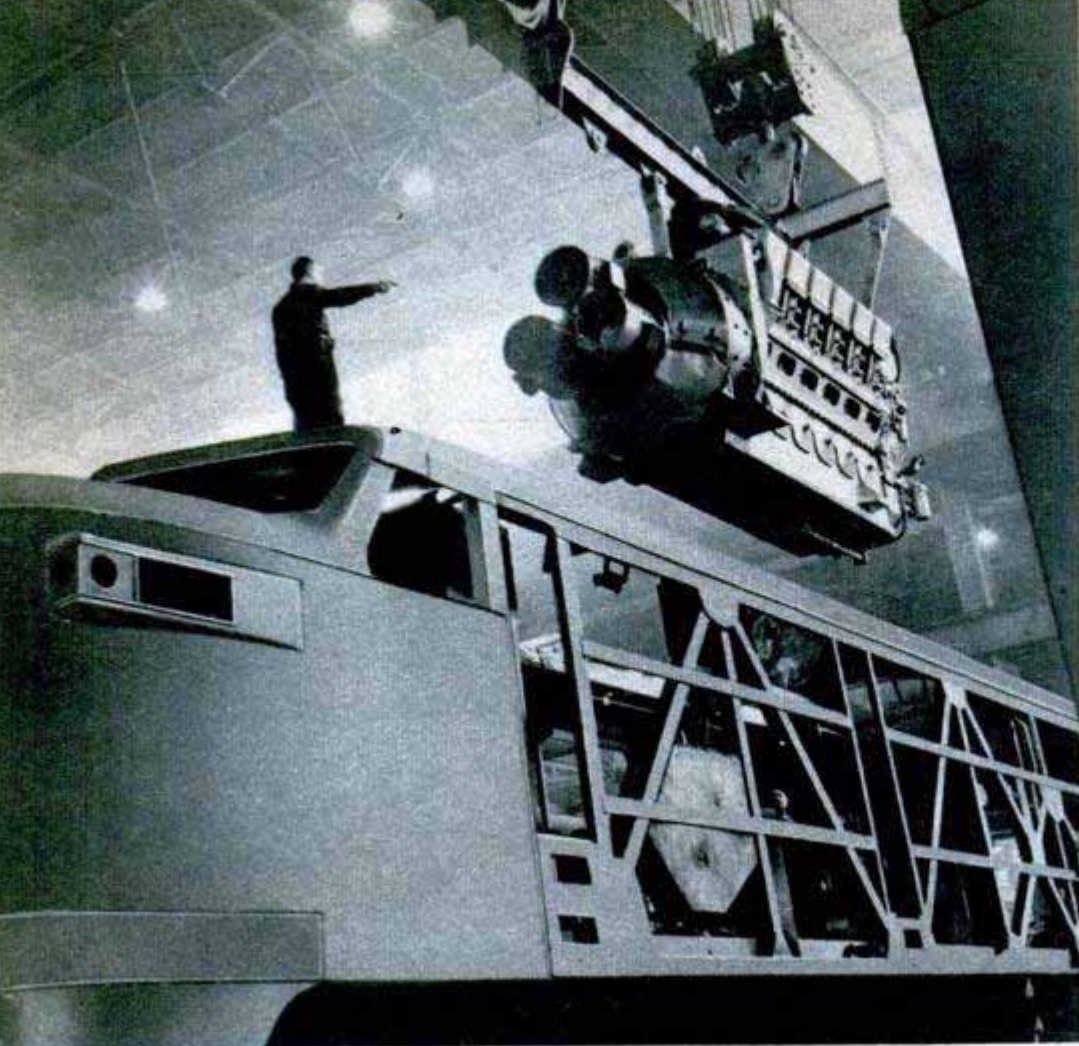
The proof of the quality of the engines built by McQueen may be seen today on a fruit-belt run between Stockton and Linden, Calif. The locomotive on this run was built in 1867, originally for the Central Pacific, and is now the property of the Stockton Terminal and Eastern Railroad.

During these early years the plant became known as the "Big Shop" and, although it was to change its official name many years later, the east side of the plant

4-6-0 10-Wheeler, 1906

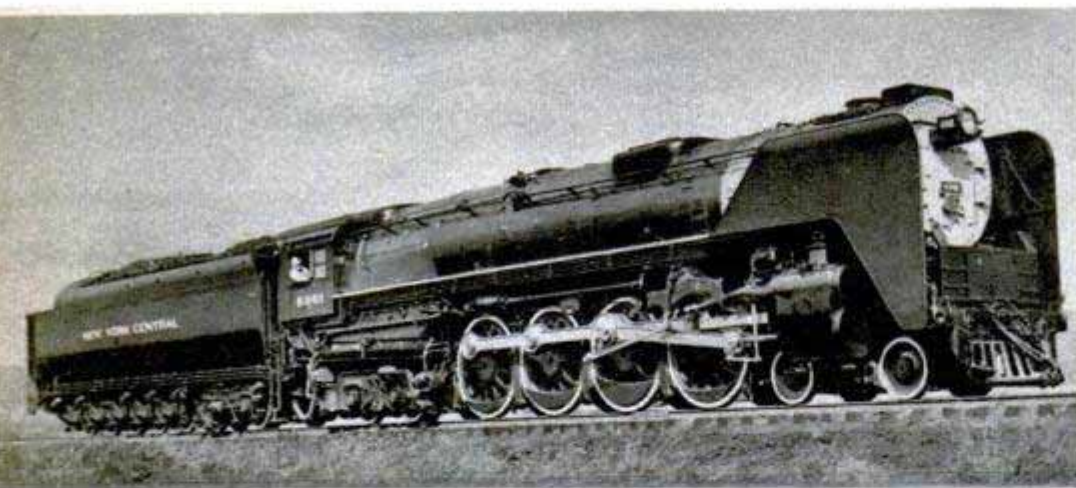
4-6-4 Hudson type, 1937





The scene has shifted at Alco to the building of diesel-electric locomotives; here a 1500-hp. diesel engine is being lowered into framework

Below, 4-8-4 Niagara-type locomotive is one of the most popular in U. S.



is still known as the Big Shop in Schenectady. In 1869, the company celebrated its coming-of-age 21st birthday with an appropriate occasion. The Schenectady-built locomotive, Jupiter, transported Governor Stanford and his party from Sacramento, Calif., to Ogden, Utah, for the golden-spike ceremony connecting the Central Pacific and Union Pacific Railroads. The Jupiter

aging four times as much in weight as those produced back in 1851. During the 80s and 90s, heavy American-type (4-4-0) locomotives set some remarkable records and led the way in the race for powerful express engines.

On June 24, 1901, the Schenectady Locomotive Works became the American Locomotive Company through a merger with

is said to have been the first locomotive to pass over these connecting rails which linked the East and West to inaugurate a great step in transportation which was to unite the nation.

Up until this time, the Ellises, McQueen and his top assistants had concentrated on the 4-4-0 type of locomotive. Their basic problem concerned boiler capacity because the bigger the boiler the faster the McQueen engines would run. In the two decades after 1870 other types were added to the line—the 2-6-0, 4-6-2, 4-8-0 and the 4-4-2. Albert J. Pitkin, noted for his work at the Baldwin Locomotive Works in Philadelphia, joined the company in 1882 as chief draftsman.

Pitkin was an exponent of heavy and powerful locomotives which were a boon to a rapidly growing freight and passenger business. He designed the first cross-compound locomotive which uses one high-pressure and one low-pressure cylinder. In this engine the steam is used twice, which saves coal and water. The compound locomotive was developed in various designs and not widely used until about 1910 when superheating became general.

After Pitkin joined the Big Shop the locomotives soon were aver-

2-8-0 Consolidation, 1937

2-8-2 Mikado, 1937





Painted by Alco artist Howard Fogg, a diesel-electric is shown on mountain run of Southern Pacific

seven other companies. These were boom days in transportation and in 1907 Alco set a production record by building 930 locomotives. Technical development of the steam locomotive was moving toward an all-time peak. Superheating had been proved a success. A locomotive superheater raises the temperature of the steam by passing it through loops of pipes which are exposed to the hot gases from the furnace. The superheater made it possible to raise the temperature of steam above that of saturation.

Another important locomotive development just after the turn of the century was that of the "articulated" locomotive. This type has two sets of driving wheels connected by a joint and providing great tractive force. The wheels in each group are driven by a separate pair of cylinders. Articulated locomotives are known as the Mallet type, named for the inventor of the most popular design used in the United States. Advantages of the Mallet for pulling heavy trains can readily be seen as compared with the conventional rigid wheelbase with a single group of driving wheels.

Mallet types built by Alco include the 0-6-6-0, 2-6-6-2, 4-6-6-4, 2-8-8-2 and the top

(Continued to page 246)

4-8-8-4 Big Boy, 1941



4-6-6-4 Challenger, 1944



2-6-6-2 Early Mallet type



0-6-6-0 First Mallet, 1904



4-8-2 Mountain, 1946



4-8-4 Niagara, 1945





### Black Light Shows Up Bad Eggs

Eggs that are too old to be good can be detected by the ultraviolet rays of black light, according to recent experiments. Westinghouse scientists have found that a fresh egg glows scarlet under the invisible rays, while an older egg shows up with a purple color. The outer shell and its protein covering are fluorescent, which makes the egg glow under the light. Presumably the color switch occurs when oxidation of an older egg causes a chemical change in the shell.



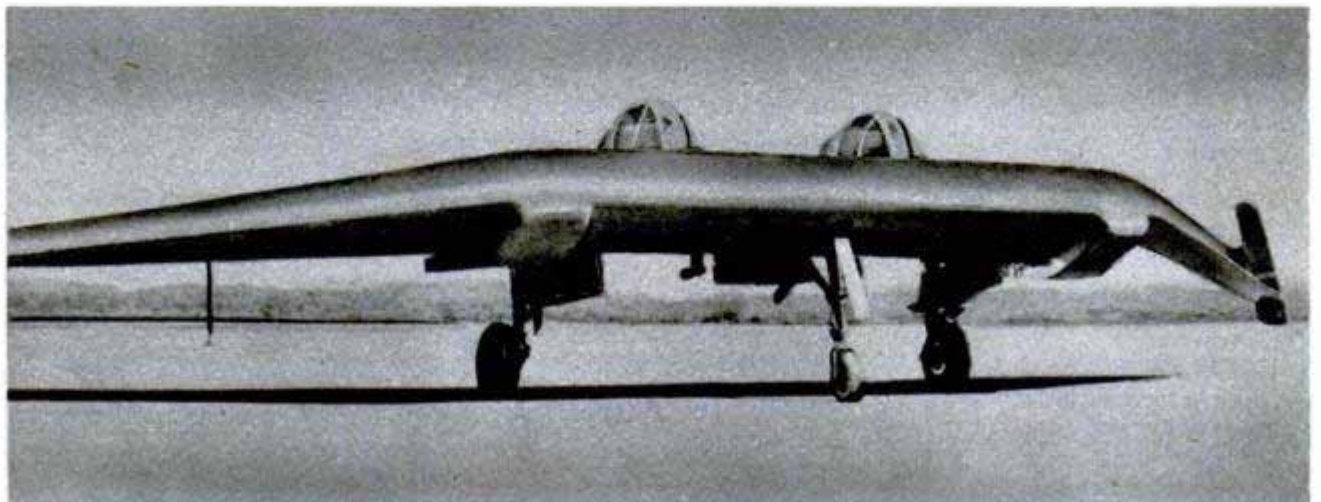
### Twin-Jet Flying Wing

Twin jet engines power a flying-wing aircraft developed for the British Royal Air Force. The plane consists of a wing with a nose section and two jet engines. It was shown recently at an aircraft constructor's exhibition in England. Of 60 aircraft at the show, 20 were powered either by turbojet or turboprop engines, and some attained speeds of 600 miles an hour.

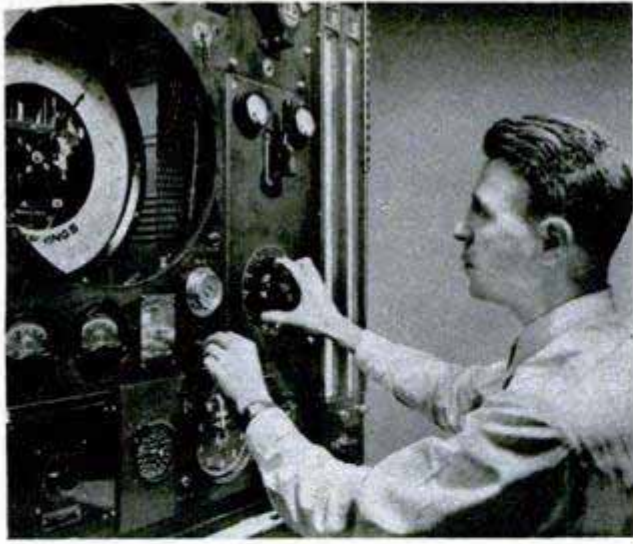
### Tailless Glider Seating Two Completes 2400-Mile Trip

Similar in size and design to the U. S. Air Force's flying wing, a giant glider developed in Canada has no tail section. The

motorless craft, which carries two men, has a tricycle landing gear that is retractable. It recently completed a 2400-mile trip.



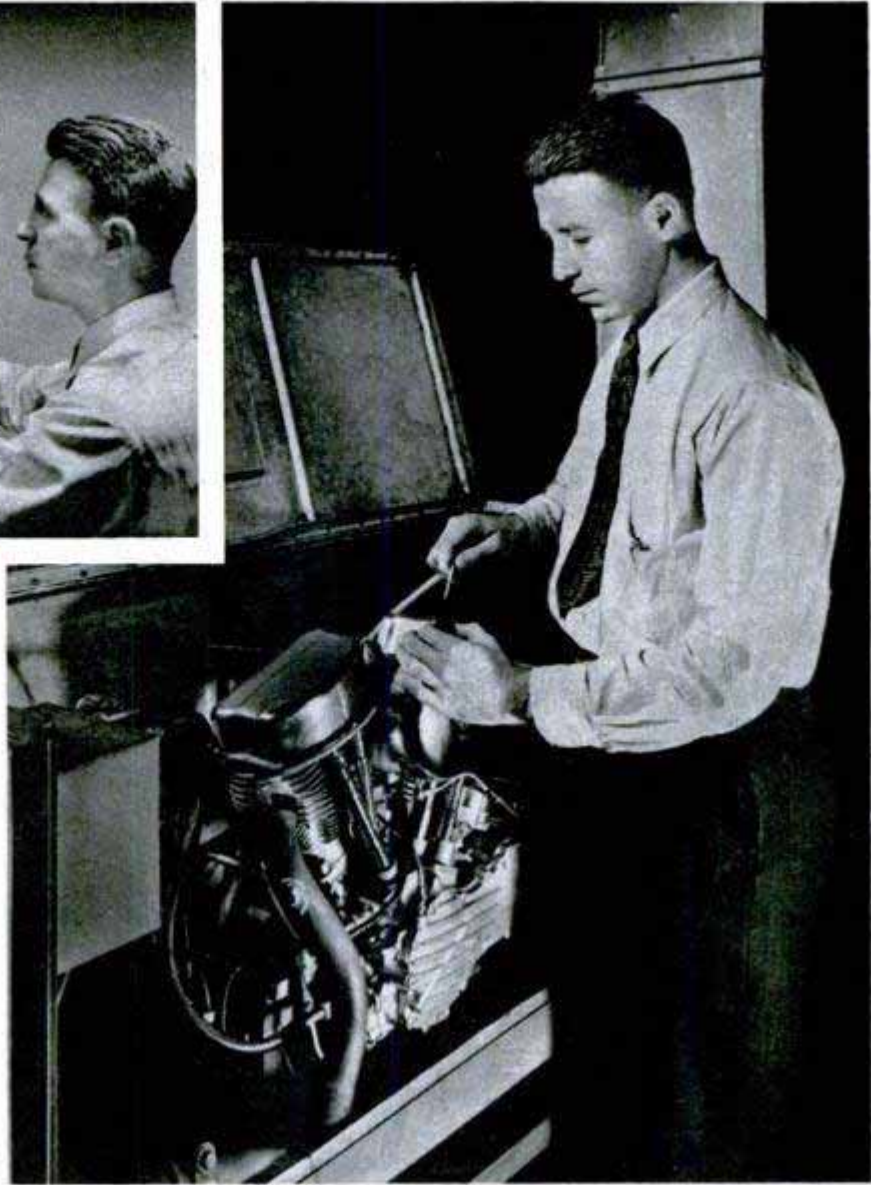




By moving dials and throttle, an engineer can "load" a dynamo to simulate any motorcycle speed

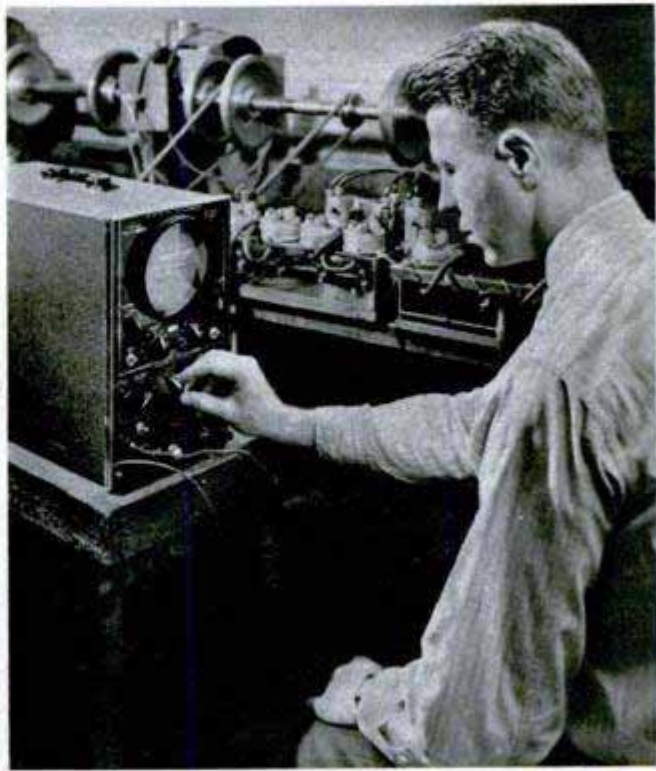
## MOTORCYCLE TEST ROOM

Motorcycle engines must pass rigid examinations before they can graduate from testing laboratory. Harley-Davidson engineers connect a score of instruments to the engines while they roar at full power. Right, an engineer inserts a thermocouple into the air cleaner to check the temperature. Cylinder head, crankcase, oil-in and oil-out heat also are checked



Water and mercury gauges show the pressure and vacuum measurements of the engine while running

Wave shapes on the screen of the oscilloscope are analyzed to determine whether contacts are correct

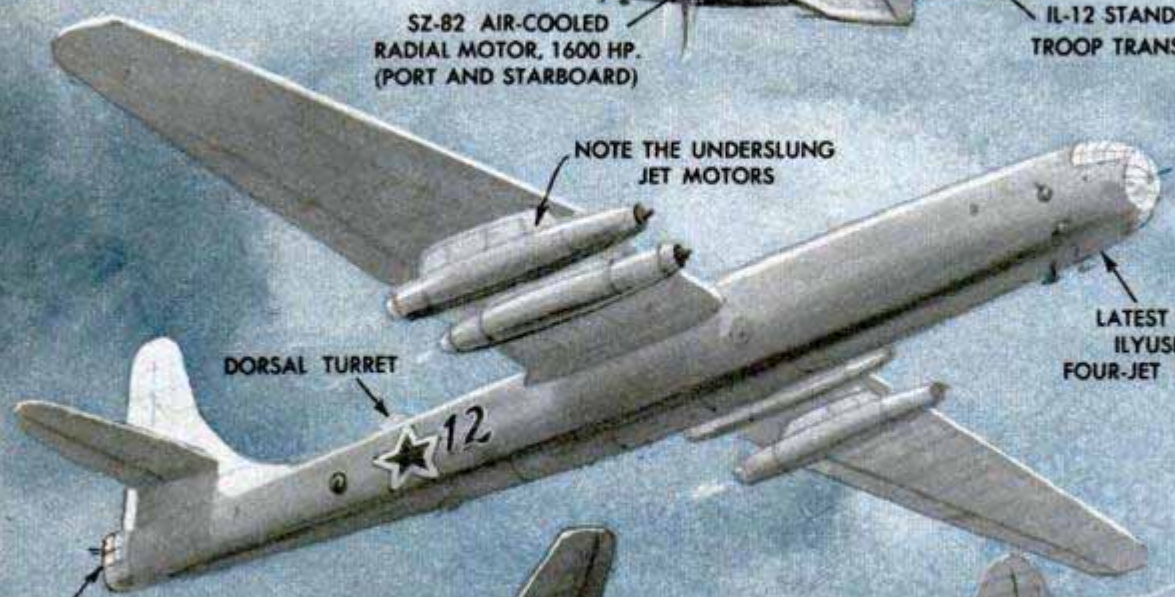


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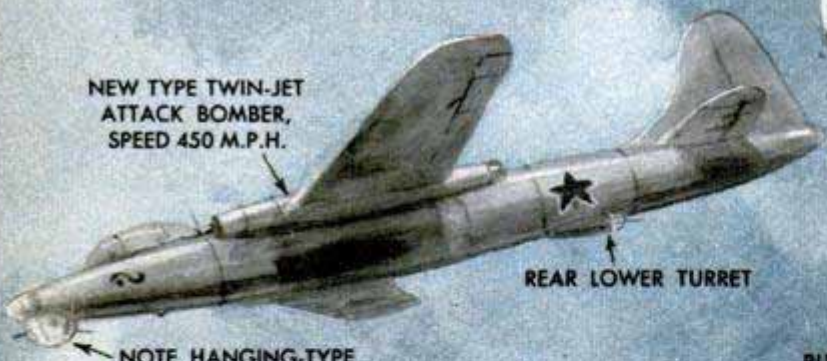
DORSAL TURRET

LATEST TYPE ILYUSHIN FOUR-JET BOMBER

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TUPOLEV TWIN-JET BOMBER, ALL-METAL CONSTRUCTION. SPEED (APPROX.) 472 M.P.H.



NEW TYPE TWIN-JET ATTACK BOMBER, SPEED 450 M.P.H.

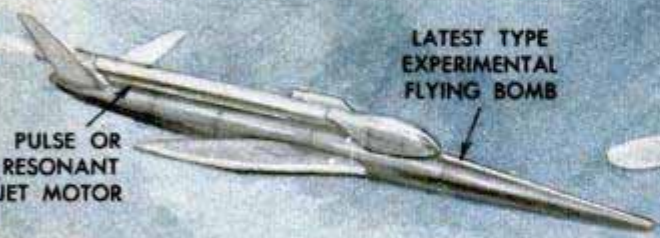
REAR LOWER TURRET

NOTE HANGING-TYPE NOSE TURRET



TU-2 FIGHTER-BOMBER EARLY TYPE STILL IN USE IN CONSIDERABLE NUMBERS

1850-HP. ASH-82 RADIAL ENGINES



LATEST TYPE EXPERIMENTAL FLYING BOMB

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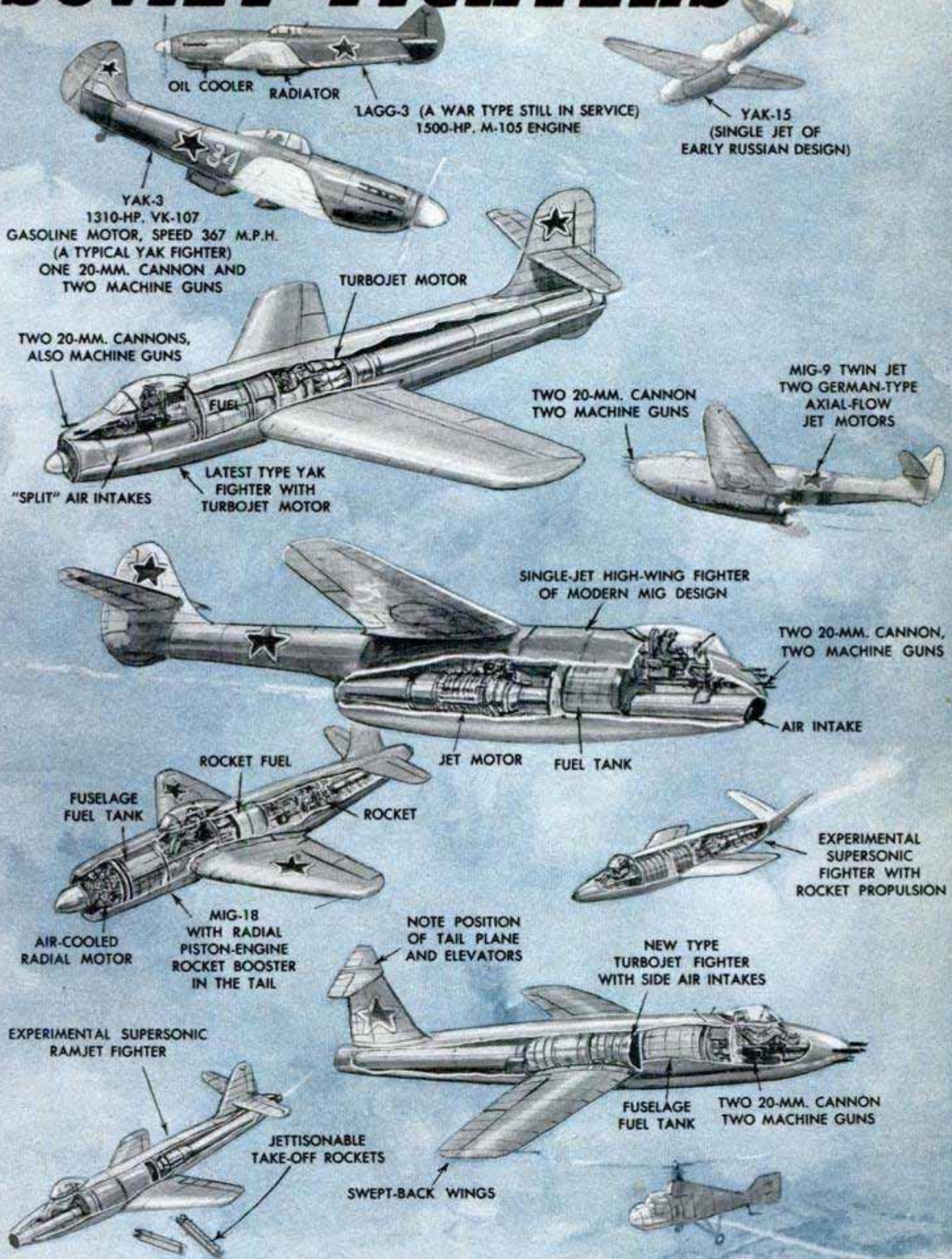
MIG-UTKA TAIL-FIRST PUSHER MONOPLANE FOR USE AS ARTILLERY OBSERVATION AIRCRAFT



PIECING together scraps of information from many sources, the famed British illustrator, G. H. Davis, presents for *Popular Mechanics* readers his impressions of Russia's front-line fighters and bombers. Most of the details were culled from photos and data in Swedish, Polish, French and British

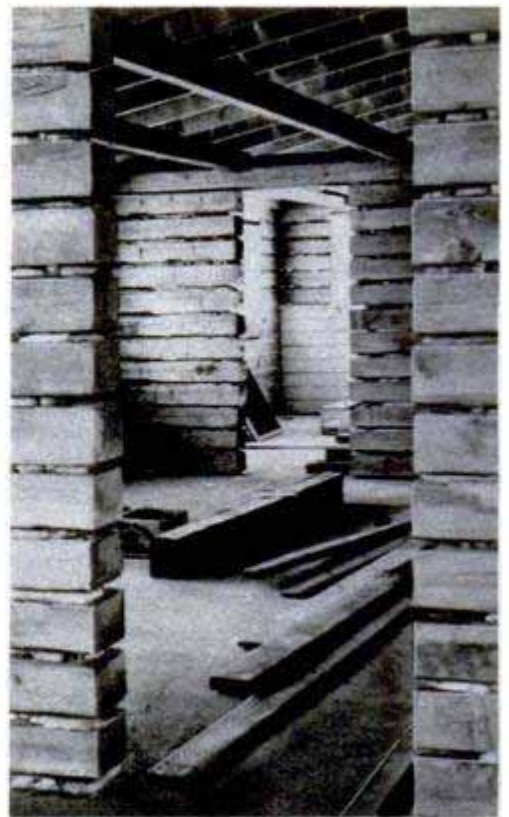
technical papers and from direct observation at air displays over Moscow. Virtually no information has been released by Russia on new war equipment. Foremost among Soviet designers are Yakolev, Ilyushin, Migoyan, Gurevich, Lavochkin, Tupolev and Sukhoi, aided by German research

# SOVIET FIGHTERS



centers and technicians now under Russian control. Other than British Rolls-Royce turbojet engines, most of the power plants have a distinct German touch and Nazi-type rocket motors are used in their latest experimental supersonic craft. Some fuselages strongly resemble American planes,

like the new Yak fighter and Republic's F-84 and, earlier, the TU-70 and the Boeing B-29. The Yak's top speed is believed to be near 650 miles an hour. The main armament of Russian aircraft is apparently centered in the 20-mm. Sk-Yak cannon and the 12.7-mm. Beresin machine gun.



Top, a ranch-style home of railroad ties. Below, another home under construction. Right, the interior walls

## Railroad Ties Form "Log" Cabins

Secondhand railway ties are providing one solution to the building-material shortage on the Mojave Desert. Used for building homes, garages, markets and other structures, the ties are stacked up like logs in a log cabin and produce walls three times as strong as frame-stucco. The ties are power-planed on four sides and held securely in place by wooden dowels, three

feet long, running through them. About 400 ties are needed for an average six-room house. Exterior walls are laid with close fits between ties, but inside walls are laid more openly with mortar filling the spaces between the wood. The ties used in one living room were left uncovered and stained to resemble mahogany. The new vogue in building material was started when an abandoned railway put 750,000 ties on sale at 10 cents each.

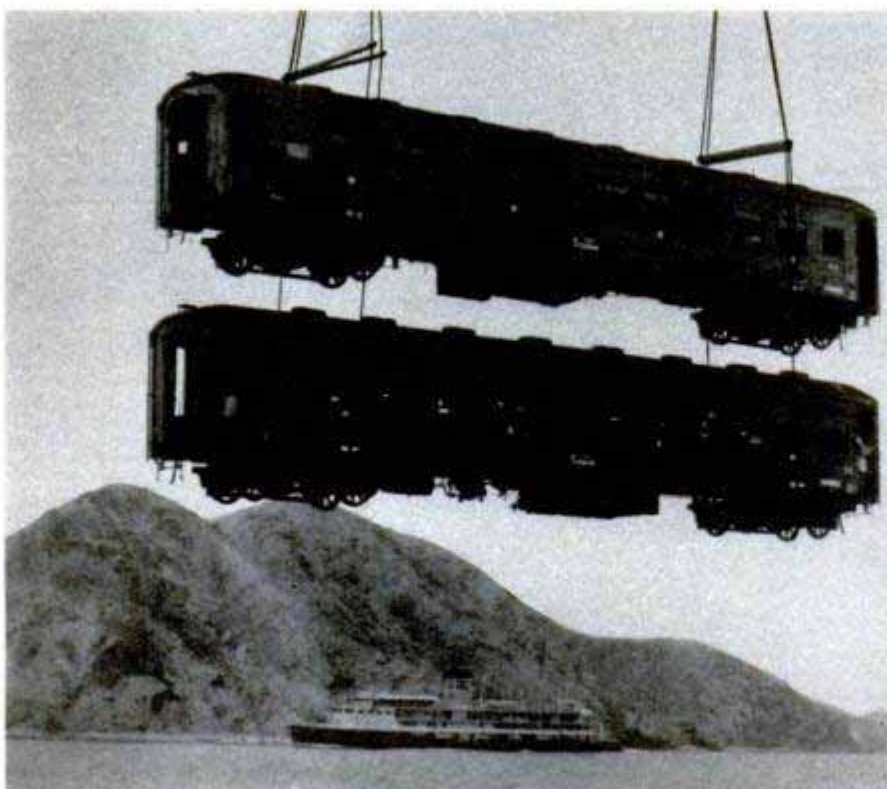
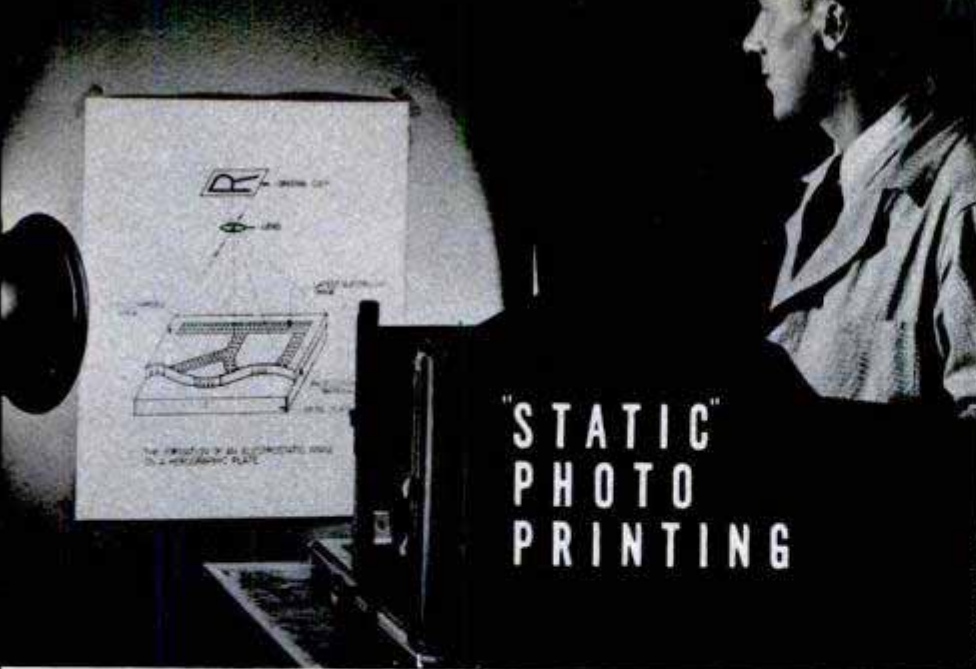


Photo courtesy Osaka Asahi

## Japan's War Crane Ferries Rail Cars

Once a valuable tool in Japan's wartime ship-building program, a large floating crane is now used to haul new railway cars over a short stretch of water. Overwater delivery saves expense by reducing the travel distance from the factory to the point of delivery. Suspended one above the other, the cars are lowered directly on the tracks at the end of the trip.

California leads in private-car ownership with 2,992,060; New York comes second with 2,481,478, and Pennsylvania is third with 1,985,275.



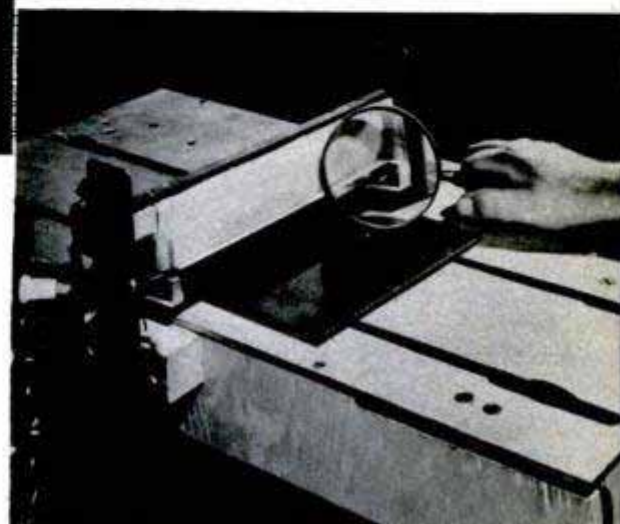
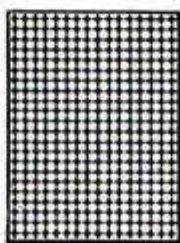
Printing without ink and photography without chemicals may seem impossible, but new technique, called xerography, performs these impossibilities and, what is more, can do them in a hurry. Prints are completed only 45 seconds after the shutter is clicked. Instead of silver crystals, as in photography, or ink, as in printing, the new process uses negatively charged powder which clings electrostatically to the positively charged paper. Diagram below explains how

Plate being exposed in camera, above, is first sensitized, right, by passage under fine wires that are visible through the reading glass

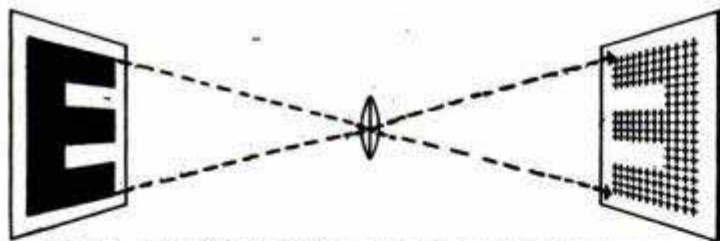
HERE'S HOW THE PROCESS WORKS



Left, surface of the coated plate is given an electrical charge as it passes beneath the wires. Right, the plate coating is now charged with positive electricity and it is all set for exposure



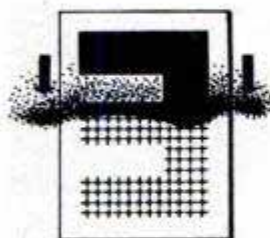
Below, stripping printed sheet from plate after electrostatic transfer



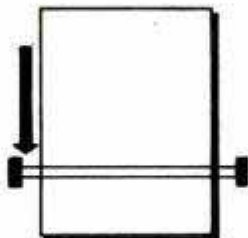
Above, copy (E) is projected on the plate by camera lens. Positive charges disappear in areas exposed to light. Area of image retains its positive charge



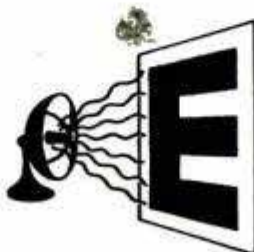
Dry printing press, below, uses no ink. Instead, a powder forms image



Left, powder of negative charge sprinkled on plate adheres only to positive image. At right, paper is placed over plate and is given a positive charge



Left, positive charge on paper attracts the powder from plate, reproducing original image. Right, powder fuses when heated to form permanent print



***Your feet  
go fishing  
too***

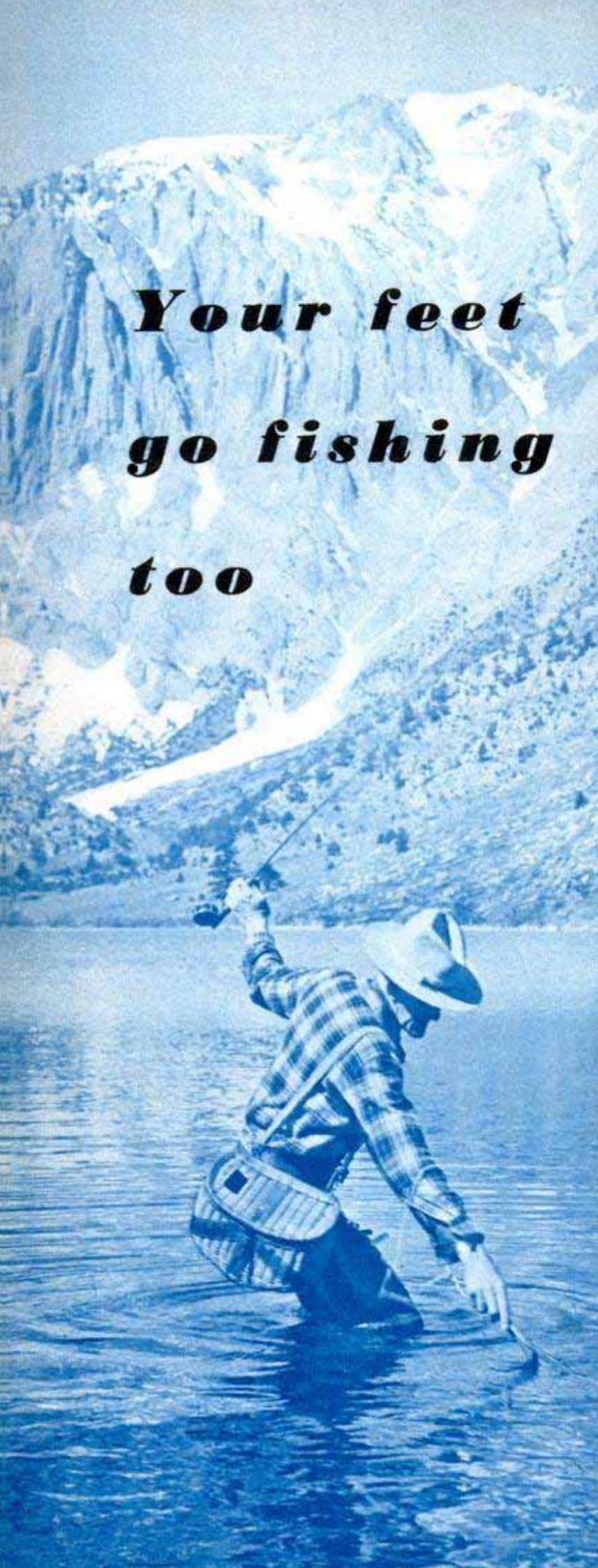


Best for nonskid grip on almost any surface except smooth bedrock, these husky, steel-calked loggers' boots have soft uppers that lace above the ankles

by Claude M. Kreider

photos by Ray Chapin

Below, the hip boot buckles comfortably around the legs. Left, this lake angler is wearing hip boots, but for real protection he should have long waders



**T**HE OLD-TIME outdoorsman knows that proper care of the feet is imperative. The woods guide is as careful of his foot comfort as a movie star is of her complexion. And you, when planning that fishing vacation, should consider your feet and the proper footgear just as seriously. One bad blister on a toe can mean a wasted day in camp and can lead to a serious infection. A slip on a boulder or a mossy log can cause a serious—even fatal—fall.

First of all, to guard against blisters, wear wool socks. The soft yarn is a kind pad for delicate toes and it absorbs perspiration. Wool is warm, even when wet, so may prevent colds and more serious complications. With light footgear, used for camp and moderate walking, medium-weight wool is about right. For more strenuous trail work, particularly with a back pack, and for wear in hip boots or waders, buy the best grade of hand-knit, heavy-weight wool socks it is possible to find. These should be of knee length to provide warmth when wading and to permit tucking the trousers inside them when wearing low hiking shoes, such as basketball shoes or moccasin pacs.

Remember that in strenuous walking the feet spread, necessitating ample toe space, which is an additional reason, aside from the space needed for the thick socks, for purchasing footgear a size larger than the shoes worn at home. The one cardinal rule for outdoorsmen is to wear roomy shoes.

Always, there is the proper footgear for every use and this requires careful selection, with the view of just what demands you will make upon those feet of yours, each with its delicate bone structure.

#### FOR HIKING

In these days of heavily fished waters, many anglers "hike in," often carrying back packs. For woods travel and dry going, nothing is better than the moccasin boot or pac with an eight-inch top. It is light and very comfortable, with its full moccasin bottom, and high enough to tuck the trousers into the top to exclude dust and forest duff. The leather is usually oil treated, rendering it reasonably water resistant for walking in swampy ground.

If the hike promises to be a wet one, the rubber-bottom moccasin is best. It also is comfortable and weighs only four pounds to the pair. The soft, oil-treated leather uppers will exclude water for a considerable period. Both these and the pacs have corrugated nonskid soles, excellent except on mossy rocks and logs and ideal for rock work as well as forest travel. Both of these moccasins are useful for ordinary shore fishing too and, being soft and flexible, are suitable for canoe work as well.



Even though you're carrying a heavy pack, your feet won't complain when you wear roomy moccasin boots and thick wool socks. Below, chest-high waders have nonskid felt soles for safe travel in rocky streams





Getting close to that good spot may mean a wetting unless you're wearing a pair of armpit waders such as those shown above. With the uppers drawn tightly around the body, you are virtually waterproof. Below, a variety of footwear for fishing and hiking. Shown are: 1. felt-soled canvas shoes; 2. basketball shoes with rubber soles; 3. rubber half-boots; 4. rubber-soled moccasins; 5. high-top waders with attached suspenders; 6. hip boots; 7. moccasin boots or pacs with 8-inch uppers; and 8. leather walking shoes with 6-inch tops



In dry country, where there is a great deal of rock work, there is nothing better than the heavy basketball shoe. It is lightweight, easy on the feet, and with the corrugated rubber sole is absolutely nonskid so long as the ground is dry. This inexpensive shoe is worn by many mountain climbers as well as anglers along our Western trout streams.

Finally, the experienced hiking angler has found that the knee-length lace boot is an abomination. It is heavy, usually comes with a sole too thick and stiff to permit easy foot action, and its tightly laced top severely restricts the working muscles of the calf. This type of boot is good only for rough going in heavy brush and rocks and for rattlesnake protection in bad snake country.

#### FOR STREAMSIDE FISHING

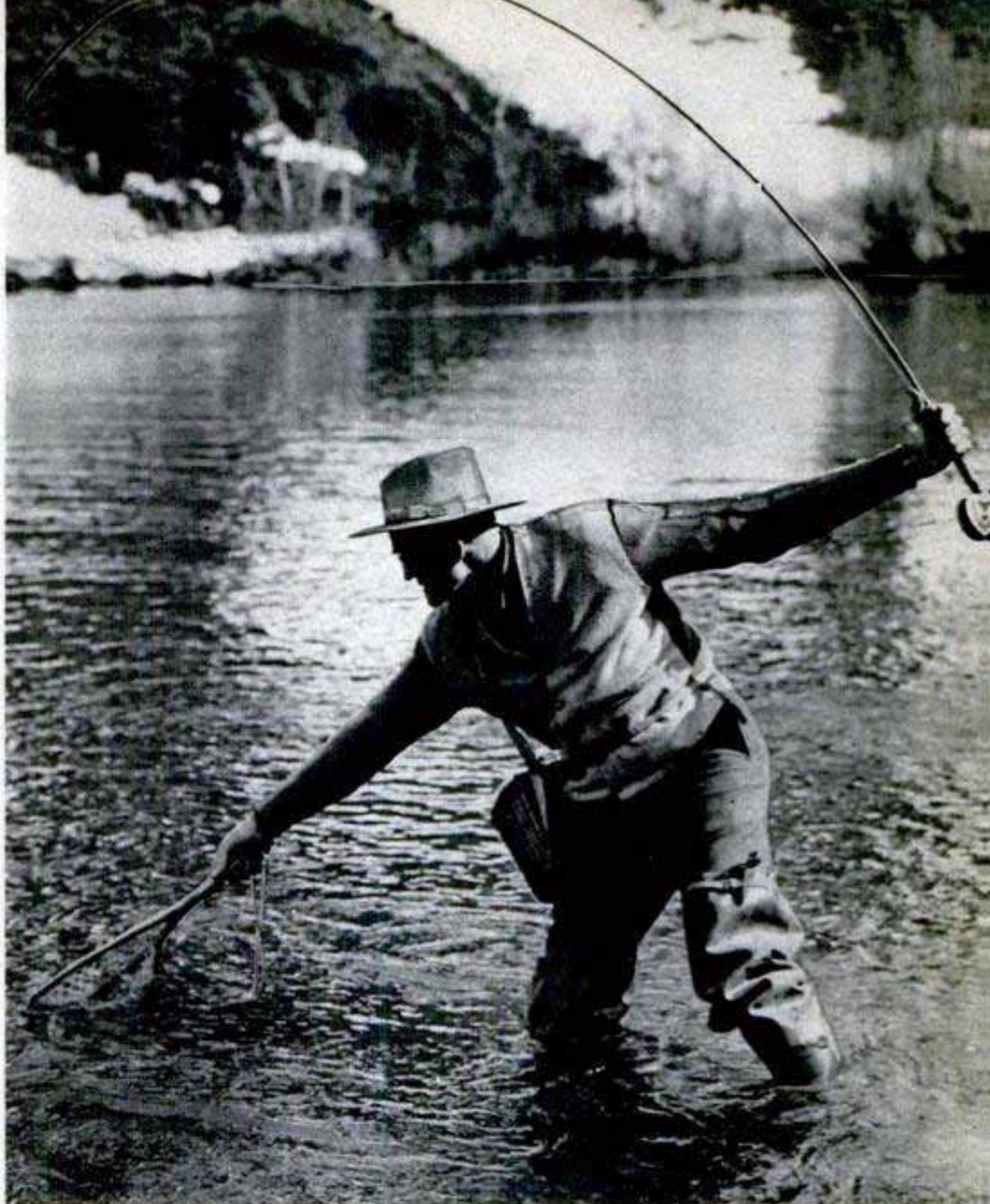
Regardless of his good intentions, the shore angler who refuses to be bothered with rubber boots will sooner or later wet his feet, so he has only to consider foot comfort and a nonslip sole. Thus the basketball shoe is ideal, for it grips on rocks and, when



If you don't intend to wade in deep water, hip boots are satisfactory, but be wary of holes

wet, is quickly dried without harm. The pac and rubber-bottom moccasin are also good and will stand a limited amount of shallow wading before the water comes through.

Rubber half-boots are also good, especially along the lake shore, on gravel and swampy ground. But perhaps the best footgear for the stream angler is the hip boot with corrugated sole. Worn turned down below the knee and strapped to the leg, it is very easy to walk in and, of course, it insures dry feet. But the rubber sole will slip on rocks and logs that are wet or mossy. Under these conditions felt-soled boots are best, unless strap-on chains are carried to be put on the rubber soles. These are positively nonslip but uncomfortable to walk on and should be removed and carried in the knapsack when much walking is to be done.



#### FOR WADING

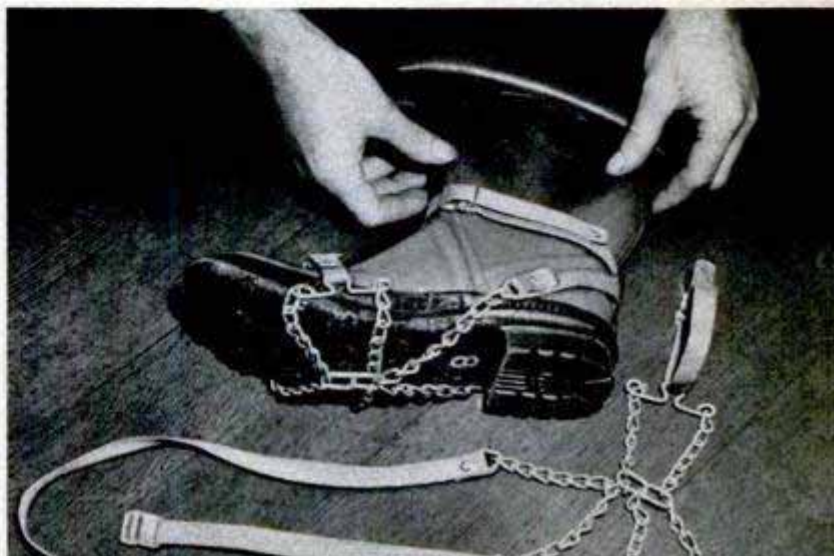
More and more these days, the experienced angler wades and wades deep. In large streams he can cover a great deal more water than from shore and fish it better. In lake fishing he is able to wade out on the sloping gravel bar or rocky shelf and get his fly or bait into the deeper

waters that are denied the shore fisherman.

Again, the hip boot is useful, but will surely ship water over the top sooner or later. Chest-high waders are the real answer for the serious wader. They often come equipped with heavy suspenders and

(Continued to page 234)

Below left, for rock climbing and canoeing, basketball shoes are good. Low-cut moccasins are fine for camp wear and pacs for hiking. Right, these metal chains make your rubber-soled hip boots nonskid on wet rocks



# Outboard cabin boat

for week ends afloat



There's plenty of room in the Cub for day cruising. The cabin will seat eight comfortably. For overnight fishing trips, two can sleep inside and two more in the cockpit

Below, stowage space was not forgotten in the small cruiser. Large lockers under each berth and this one forward in the cabin provide plenty of room. Berths are over six feet long



**YOU DON'T** have to be a millionaire to own your own yacht today. There's an economy-size cruiser being produced that promises to make the dreams of the week-end sailor come true.

Small enough to haul around behind the family car, the Cub cruiser has no expensive power plant. It's powered by an outboard motor and you can cruise all day on the gas one of its big brothers uses pulling away from a dock.

Nor do you have to live near deep water to get plenty of pleasure boating out of the lightweight craft. It has a scull-type hull that floats on less than six inches of water, which means you can launch it in just about any river or lake. With a two-wheel boat trailer, you can hitch the 750-pound craft behind your car and select your own lake for that week end on the water.

The enclosed cabin has two berths, each more than six feet long, and the open cockpit is roomy enough to take two air mattresses for additional sleeping facilities. If the weather turns bad, a canvas cover keeps the cockpit dry. Roomy stowage lockers under the berths and in the forward end of the cabin provide ample space for a small gasoline stove, bedding and other equipment. Its wide Lucite windows all open to let in the lake breezes.

The Cub sells for less than \$1000 complete with running lights, cabin light, cushions and cockpit





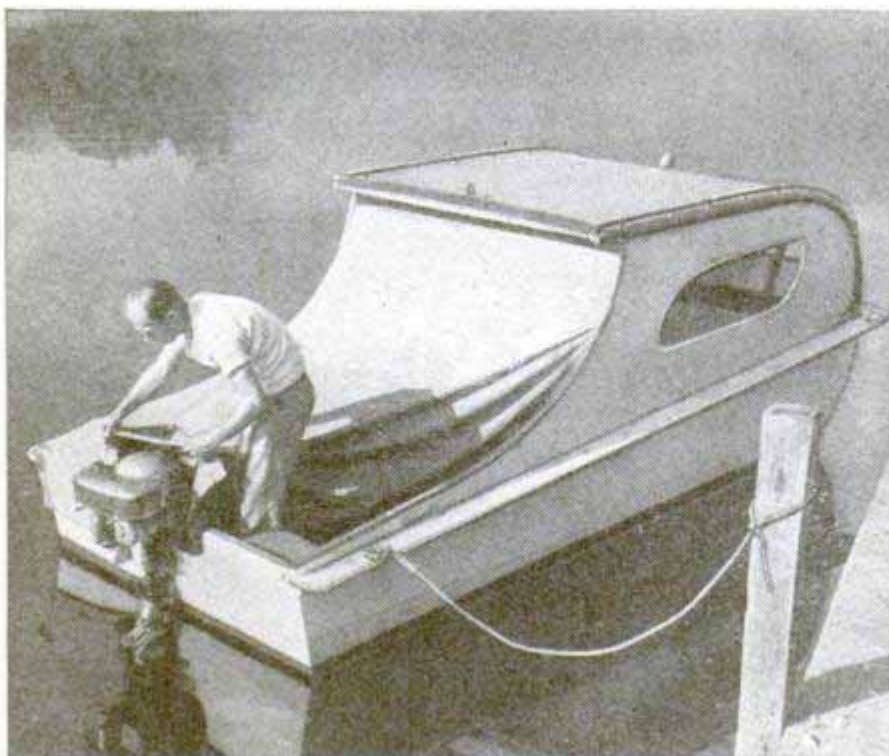
To launch the Cub, you back it into the water on its two-wheel trailer. It floats in six inches of water

cover. These are enough for day cruising, but if you plan on spending the week end aboard you'll probably want a folding table, ice chest and portable stove. These are extras, not included in the list price.

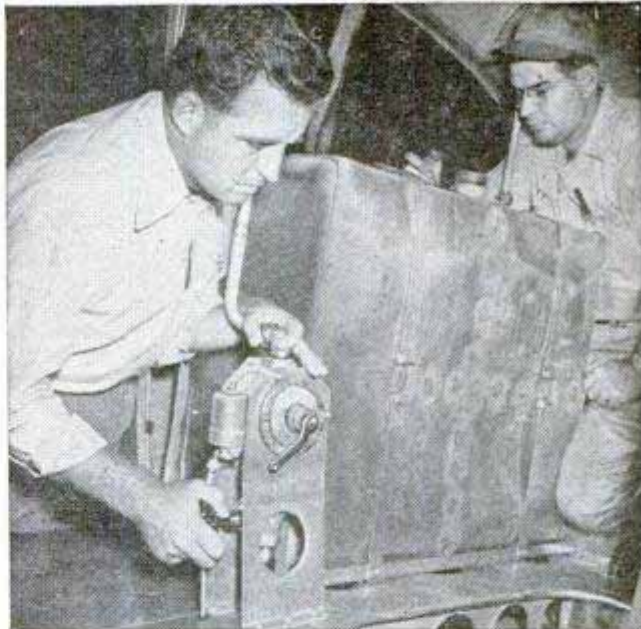
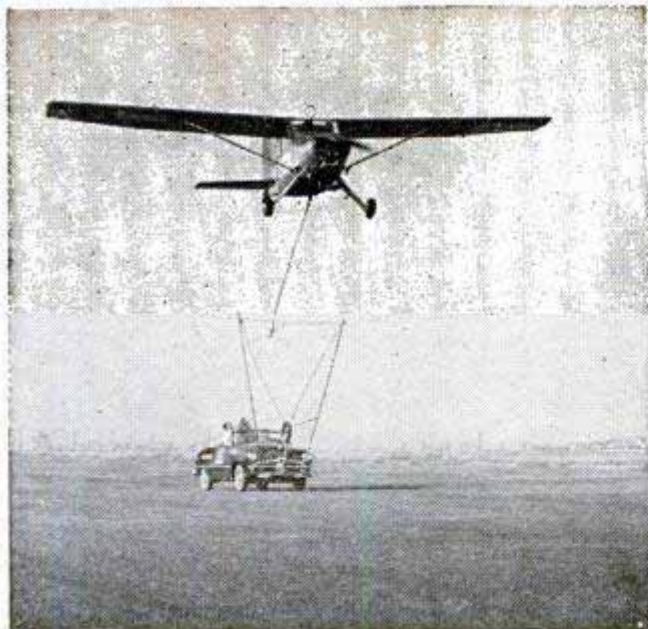
You won't need a dinghy, or a dock for that matter, because the Cub draws so little water it can be run right up on the beach. Launching is simple. You merely back the trailer into the water and the cruiser floats free.

About 15 feet long, the cruiser has a beam of 5½ feet. Three keels protect the marine-plywood bottom from damage during beaching. The top is insulated to keep out the heat.

The manufacturer, the Liberty Coach Co., is planning a new model with wheels that retract into the hull like airplane landing gear. This will make the Cub even more convenient for the weekend yachtsman. Also in the planning stage is a slightly larger model fitted with an inboard marine engine.



Canvas cover protects the open cockpit and motor when traveling or when tied up at the dock



With the refueling auto speeding along at 70 miles an hour, above, hook from plane picks up the gas can. Upper right, pilot inspects pump that forces fuel to wing tanks. Lower right, close-up of can-holding rig

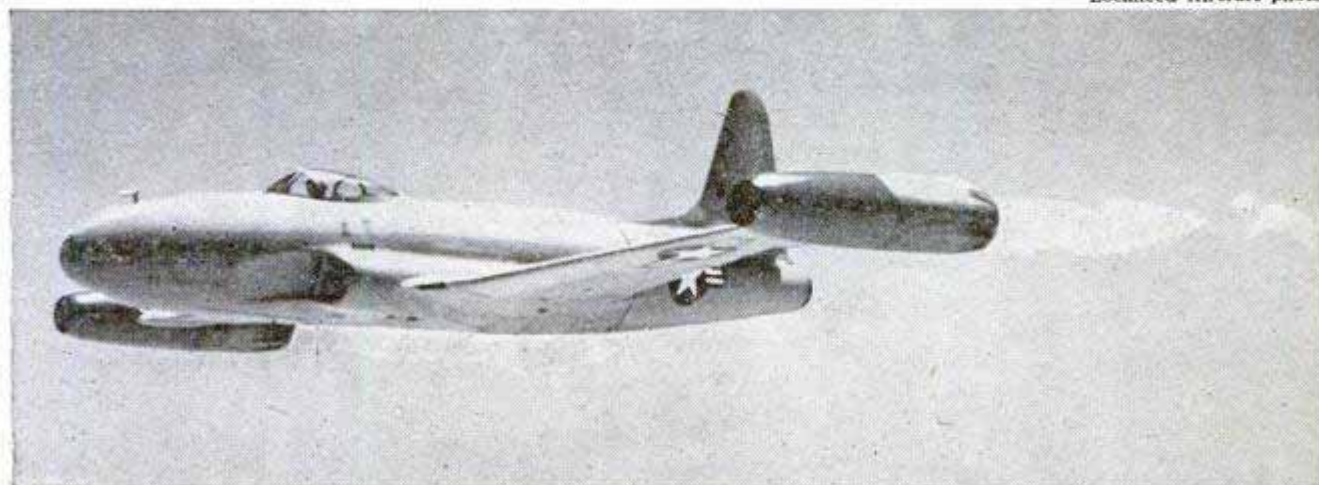
### Gas Lifted From Speeding Car Keeps Endurance Fliers Aloft

Auto-to-air pickups of five-gallon cans of fuel helped a pair of Dallas, Tex., fliers in their bid to break the 721-hour airplane endurance record. A grappling hook lowered through the plane floor lifts the cans from a specially built rig on the front of a convertible speeding along at 70 miles an hour. After being pulled manually into the plane, the gasoline is poured into an auxiliary tank and then forced out to the wing tanks. The 165-horsepower Luscombe used for the test holds 93 gallons of gasoline fully loaded. The pilots were forced down after 530 hours in the air, but plan a second attempt with the same equipment within a few months.



**FIRST RAMJET PLANE** to fly, a standard Lockheed F-80 with ramjet units at wing tips streaks through sky over Muroc Air Force Base, Calif. Tubes of stainless steel, ramjets used for flight were seven feet long and 20 inches in diameter. After the plane reached speed of about 400 m.p.h. through use of its regular turbojet engine, it flew solely on forward thrust provided by air rammed into tubes mixing with liquid fuel and burning

Lockheed Aircraft photo



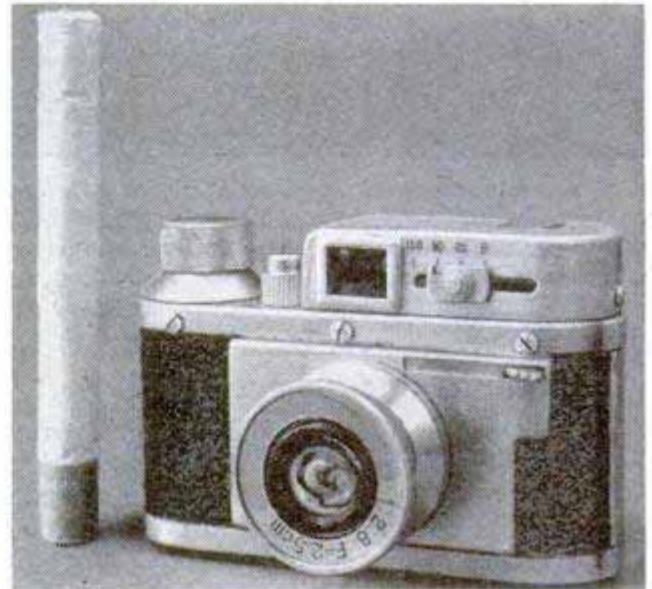


## Office Machine Makes Plates For Offset Printing Plates

Printing plates for offset and multilith presses can be made by an untrained office worker with a machine that requires only three square feet of floor space. The unit uses the new plastic duplicating plates. Because it eliminates the need of costly arc lights, vacuum frames and whirlers, it costs less than conventional plate-making units. The machine reproduces line or half-tone copy and is designed for the small office that uses direct-mail advertising.

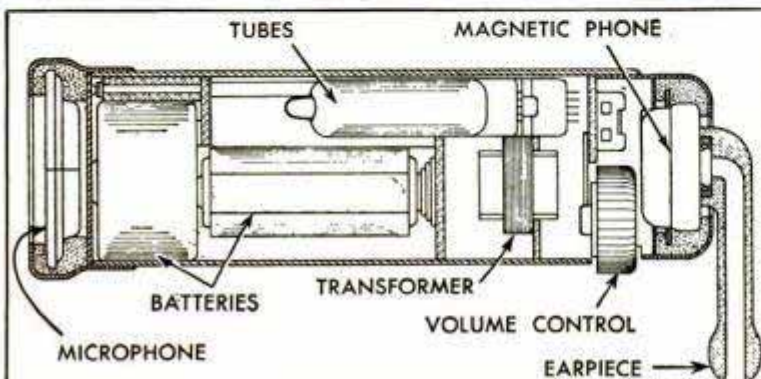
## Camera Fits in Watch Pocket →

About as long as a standard-size cigarette and half as high, a tiny camera, produced in Japan, is small enough to fit in your watch pocket. It takes a special 10-exposure roll of panchromatic film; however, double 8-mm. film has been used successfully. The fixed-focus miniature has an all-metal focal-plane shutter with speeds of  $\frac{1}{25}$ ,  $\frac{1}{50}$  and  $\frac{1}{150}$ . Lenses are interchangeable, but the standard is an f:2.8 anastigmat. The tiny camera is popularly referred to as a "spy camera" in Japan.



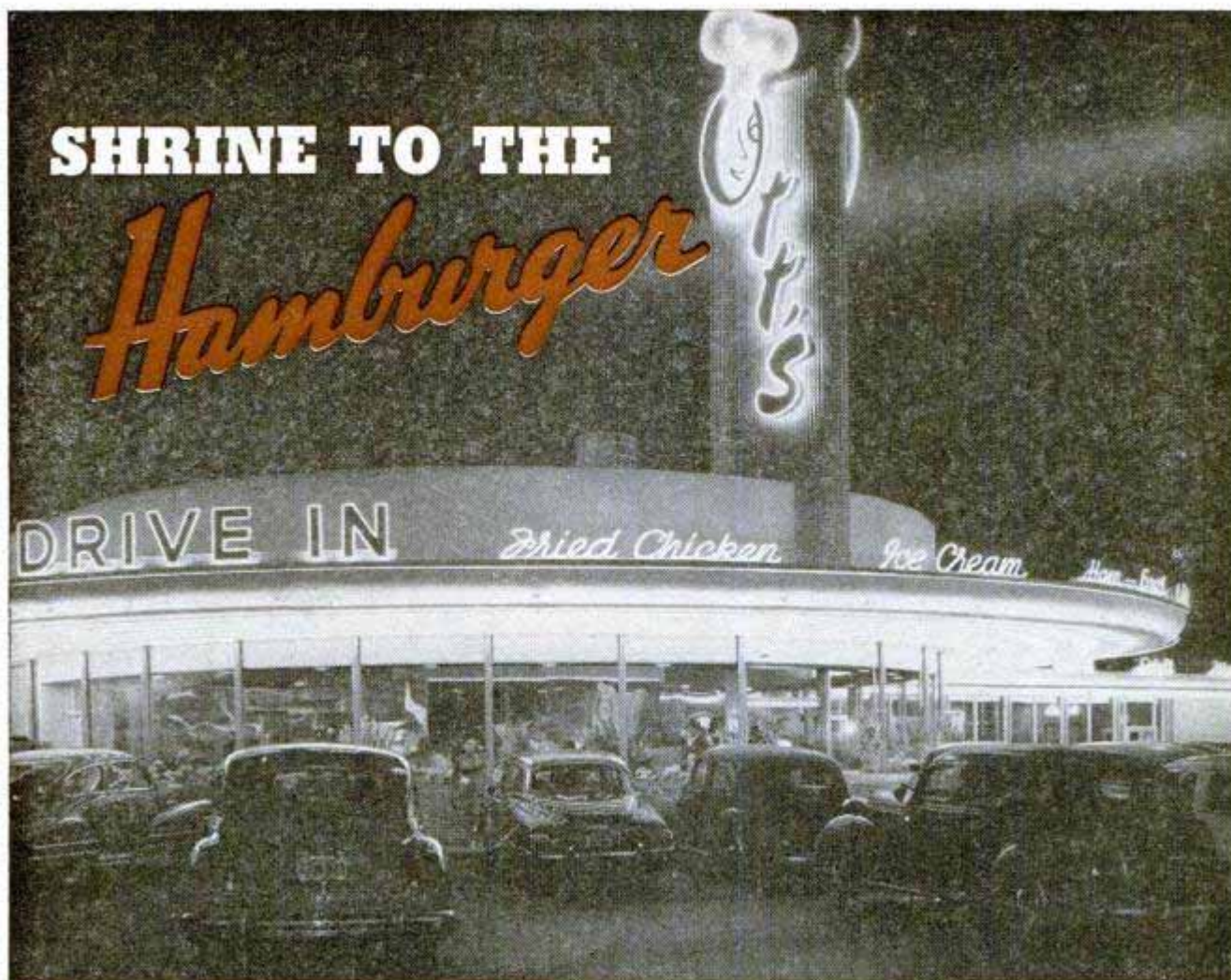
## Acoustical "Opera Glass" Aids Hearing in Theater

Even persons with normal hearing are helped by a hearing aid that is held in the hand. The aid is designed for use in theaters and other assemblies where speech sometimes is difficult to hear. Small enough to fit in the palm of the hand, the aid consists of a microphone, vacuum-tube amplifier, midget phone receiver and an earpiece. To pick up voices, the user inserts the projection into his ear and turns up the volume.



## Lighter Motor Oil

Available to motorists is a lighter oil, designated 5-W, for use in subzero temperatures. In some cases in the past the automotive industry has recommended the use of 10-W oil and an additional 10 percent kerosene in order to provide good lubrication in cold climates. The new oil has additives which resist oxidation, bearing corrosion and scoring.



Open night and day, this super-eatery has its own traffic police. It serves about 7000 meals every 24 hours

**M**ORE THAN 7000 meals a day, each piping hot and cooked to order, pour out of the two gleaming kitchens of the world's biggest drive-in restaurant. Located near downtown San Francisco, the colossal eatery covers  $1\frac{1}{8}$  acres of land and employs 176 people including four traffic policemen who flag the customers into the correct spot in the 250-car parking area.

Six minutes after the average meal is ordered at the drive-in it's delivered to the patron, and some specialties are whipped out in 60 seconds. Order fried chicken and the drumstick and assorted parts will journey from the refrigerator to your car window in 14 minutes, cooked to your individual specifications. All written orders that pour into the kitchen are time-stamped, then stamped again when the victuals are delivered—an efficient check on kitchen speed. If a customer complains of slow service the management can tell at a glance who's to blame.

O. E. (Ott) Straub pored over

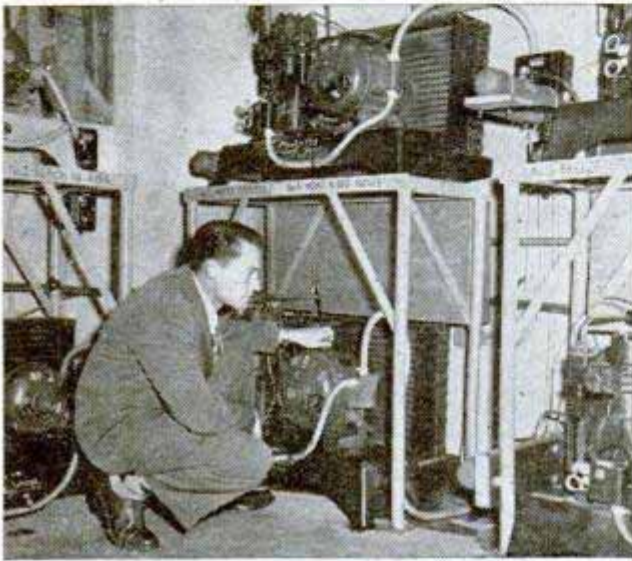
Orders are time-stamped and clipped on a plastic wheel. Infrared lamps keep food hot

the records of other drive-ins for eight years before he built his own super-eatery at a cost that approached \$750,000. Patrons can dine in their cars, enter the restaurant for booth or counter service, or linger over their meals in an enclosed patio. There's also a cocktail bar. For the staff there are a private dining room and two dressing rooms complete with showers.

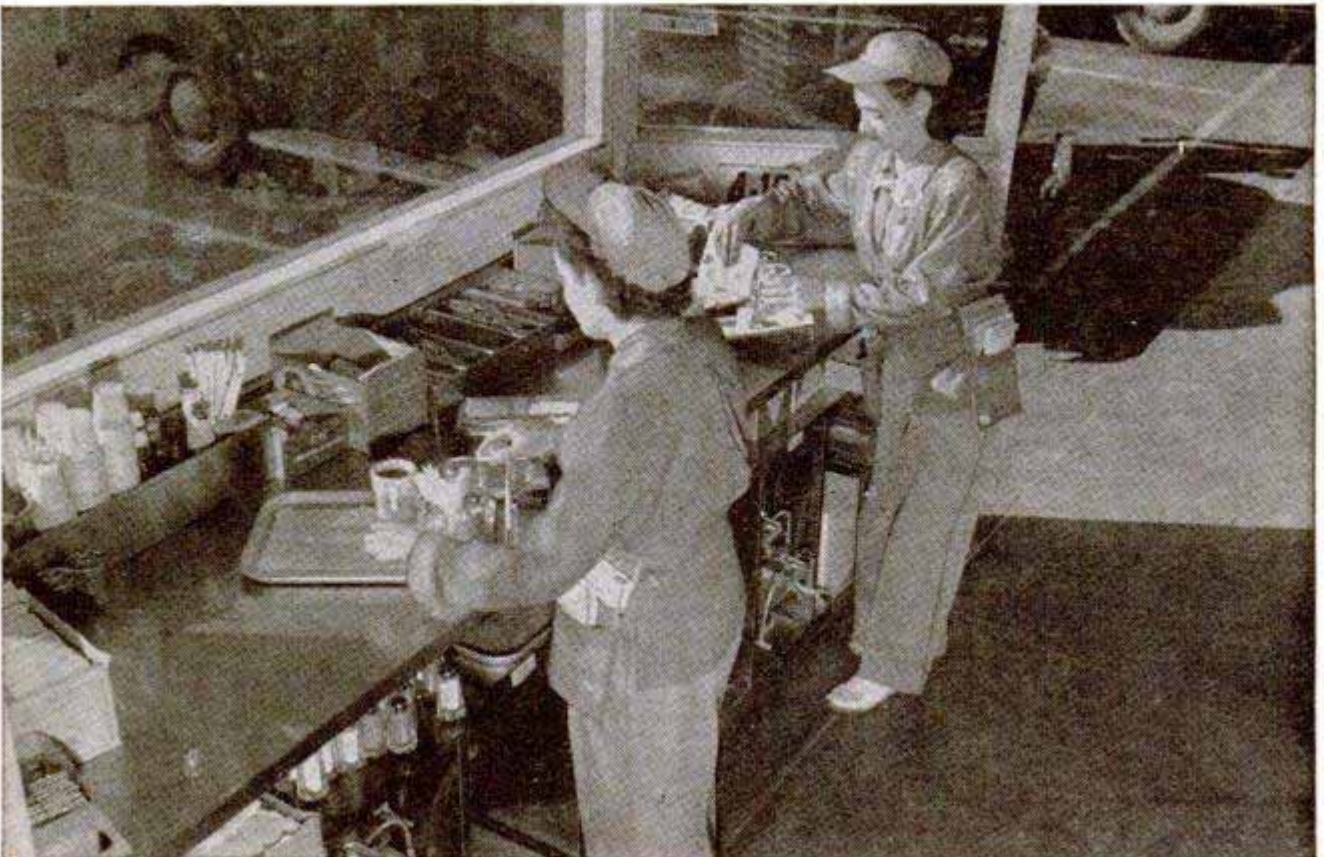




More than 60 orders of fried chicken can be cooked simultaneously in the two identical kitchens. Below, the central cooling plant is a maze of refrigeration units. All the glasses are chilled before using



Girl carhops prepare trays inside glass-enclosed pantries, then pick up food orders from cashier's counter



Enjoy music with your dinner? Just hand the carhop a nickel and tell her what number you want on the master juke box. Then tune in the music on your own car radio—it's broadcast from the drive-in's short-range transmitter.

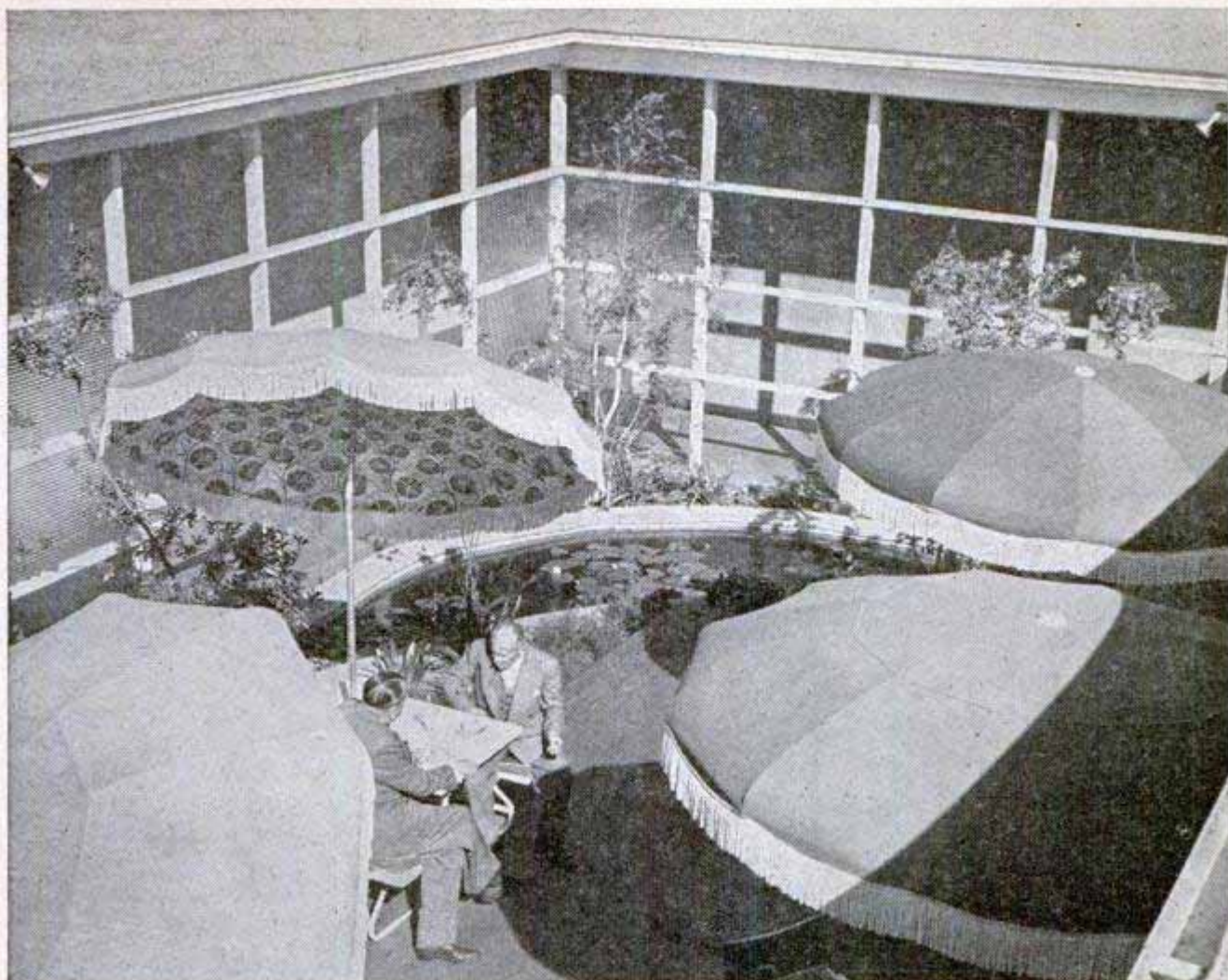
The two kitchens double the capacity of the establishment. Air pumped into the kitchens is filtered, all dishes are kept warm by hot air and glasses are chilled by refrigeration. When the cook slides an order across the delivery counter to be picked up by a waitress, it's kept warm by a battery of overhead infrared lamps.

Inside the kitchens are all sorts of new wrinkles for speeding service to the eat-and-run patrons. One machine molds hamburger patties at a rate of 800 per hour, while another automatically slices buns at a rate of 1000 per hour. Automatic dishwashers and sterilizing equipment help keep the kitchens spic and span.

An intercommunication system with eight stations scattered over the restaurant keeps the owner in touch with all his departments. The coin-operated music system has 21 outlets spaced to avoid excessive blaring or dead spots.

Ott's also caters to the businessman who wants to tote home a dinner to the wife and children. He can call the restaurant from the office and place his order for the evening meal. By the time he arrives at the drive-in, the food will be waiting in a box, piping hot and ready to go.





Patio has umbrella-shaded tables and a lily pond. Plastic roller-roof soon will cover patio when it rains

Owner Straub watches as a carhop steps on foot pedal to open the window which gobbles up the dirty dishes. Below right, molding machine stamps out hamburger patties at a rate of more than 800 portions an hour



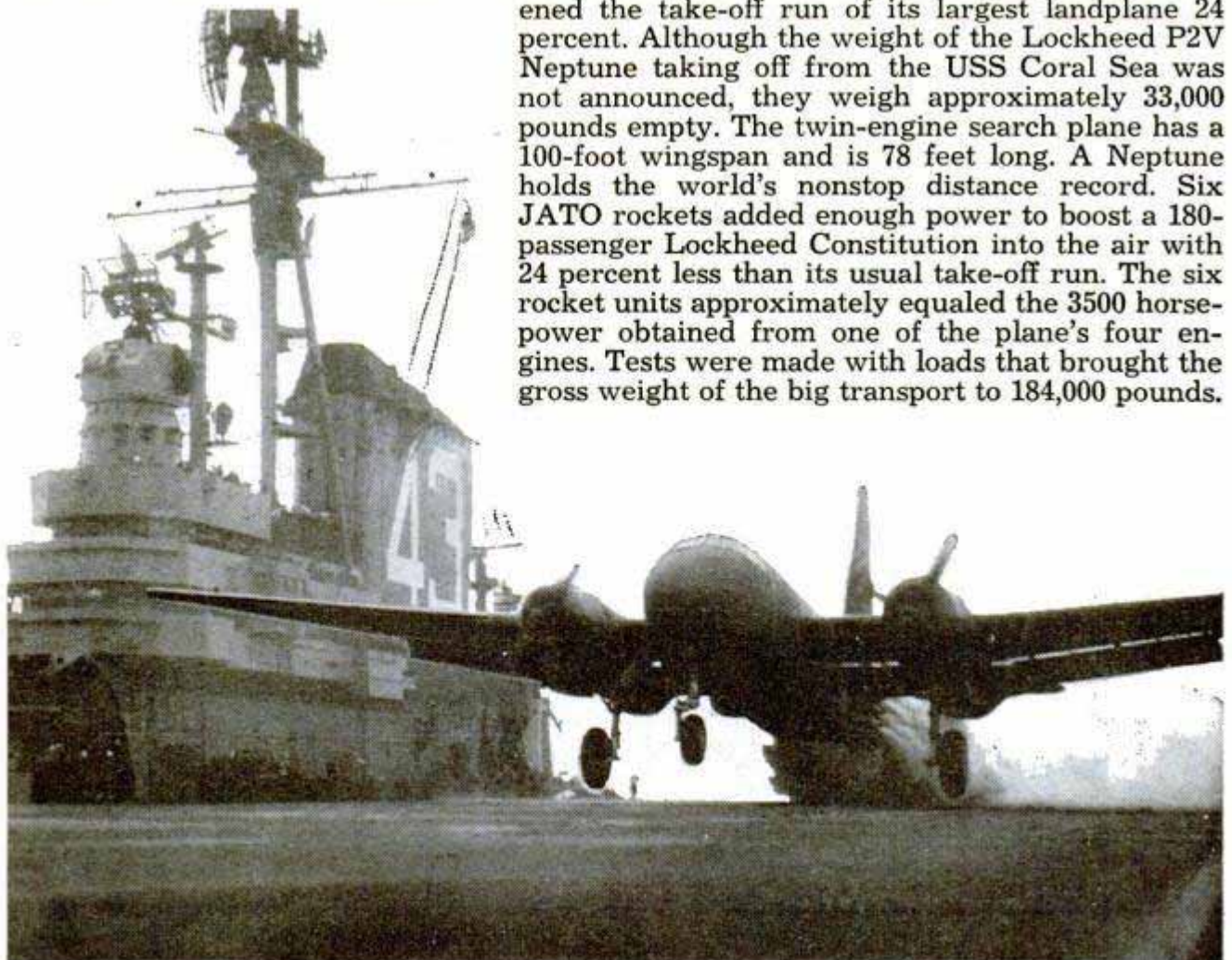


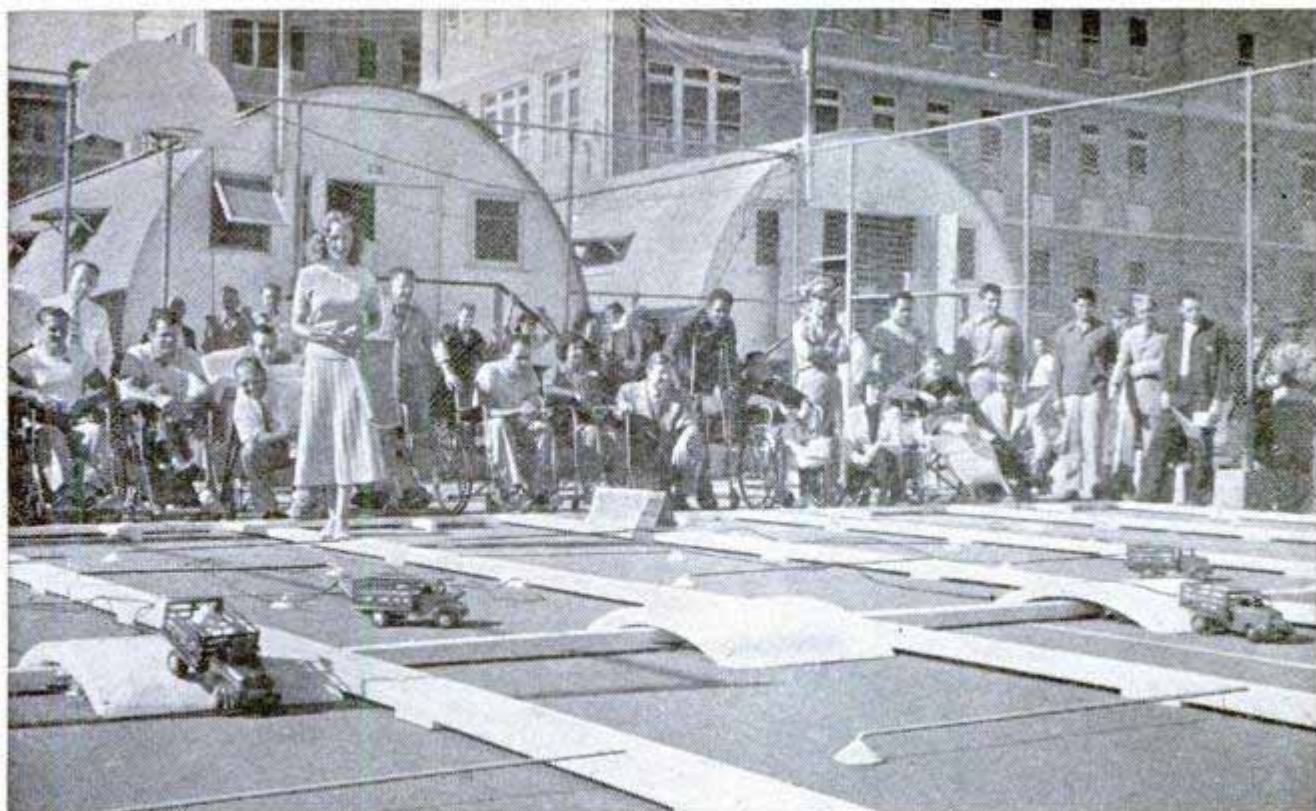
Official U. S. Navy photos

With six JATO units boosting it, 184,000-pound Constitution, above, uses 24 percent less run on take-off. With aid from jets, a twin-engine Navy Neptune, below, becomes heaviest plane to fly off a carrier

## JETS BOOST NAVY HEAVYWEIGHTS

Using jet assistance, the Navy put into the air the heaviest plane ever to fly off a carrier and shortened the take-off run of its largest landplane 24 percent. Although the weight of the Lockheed P2V Neptune taking off from the USS Coral Sea was not announced, they weigh approximately 33,000 pounds empty. The twin-engine search plane has a 100-foot wingspan and is 78 feet long. A Neptune holds the world's nonstop distance record. Six JATO rockets added enough power to boost a 180-passenger Lockheed Constitution into the air with 24 percent less than its usual take-off run. The six rocket units approximately equaled the 3500 horsepower obtained from one of the plane's four engines. Tests were made with loads that brought the gross weight of the big transport to 184,000 pounds.

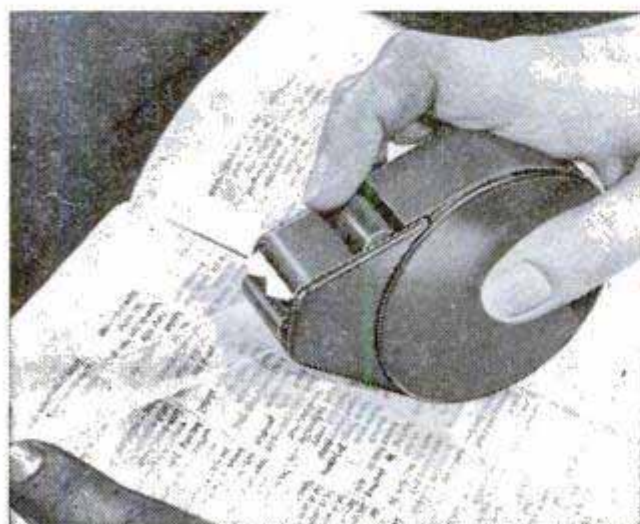
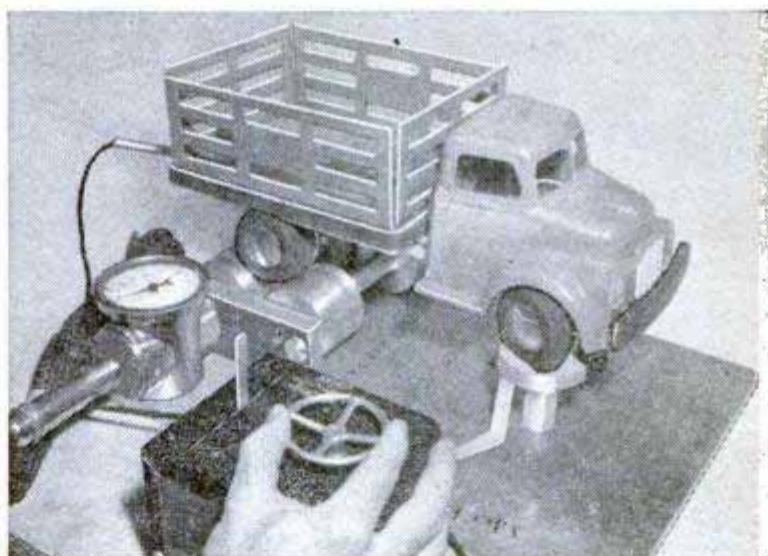




## Electric Toy Trucks Controlled Remotely

Everybody can be a truck driver and in the safety of his living room with a new electric toy truck that goes forward or backward and is steered by remote control. A small transformer, connected to the truck by a 35-foot wire, controls two electric motors that propel and steer the vehicle. A lever on the transformer shifts the truck through five speeds, forward and reverse. A small wheel on the transformer controls the steering motor. The trucks are operated from 110-volt current and were introduced at a Los Angeles veterans hospital.

Above, paraplegic veterans at a Los Angeles hospital race the toy trucks over a specially designed obstacle course. Below, testing one of the trucks. The control unit is in foreground



## Dispenser Clips Cellulose Tape At Any Desired Length

Cellulose tape can be rolled smoothly onto a surface with a dispenser that also cuts the strip at any desired length. The dispenser applies a strip of tape along a straight line or around corners. Pushing a lever on the side of the case against the working surface ejects a knife blade which clips the tape and leaves a short length in position for the next application.

☐ To be built near Des Moines, Iowa, an FM radio tower 1530 feet high will be the world's tallest man-made structure, topping the Empire State Building by 280 feet.

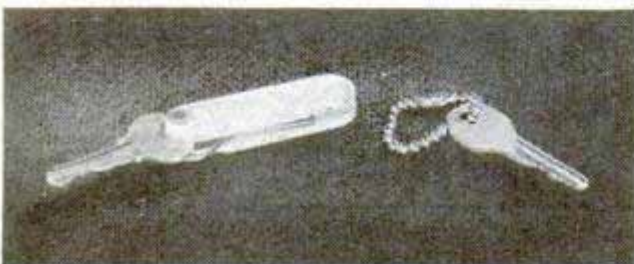
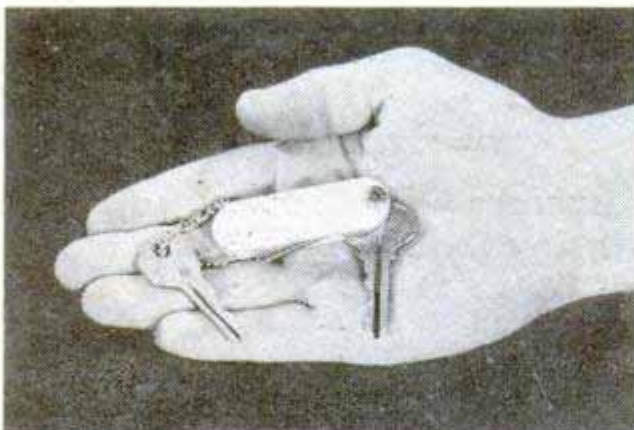
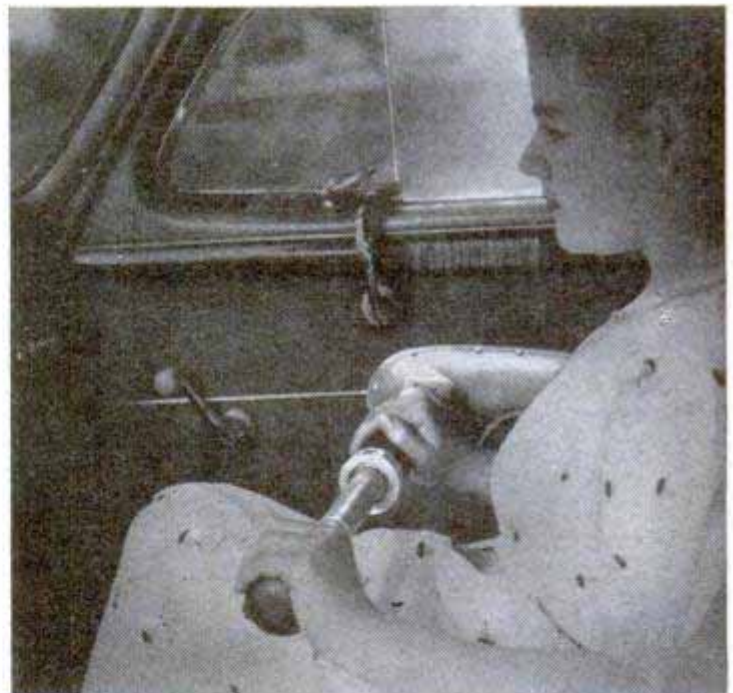
# SHOPPING



**Upholstery protectors** for the lower half of your car doors will keep scuff marks from destroying that new-car look. Made of transparent plastic, the kick-resistant sheets are quickly installed. Mud, grease and other soil are easily wiped away with a soft cloth.

**Emergency lighting system** for your car (not illustrated) assures you of safe driving lights should your headlights go out while you are speeding along the highway. A relay turns on auxiliary lights, such as fog lamps, the instant the headlight circuit is broken. It is simple to install in any car and no extra dash switch is required.

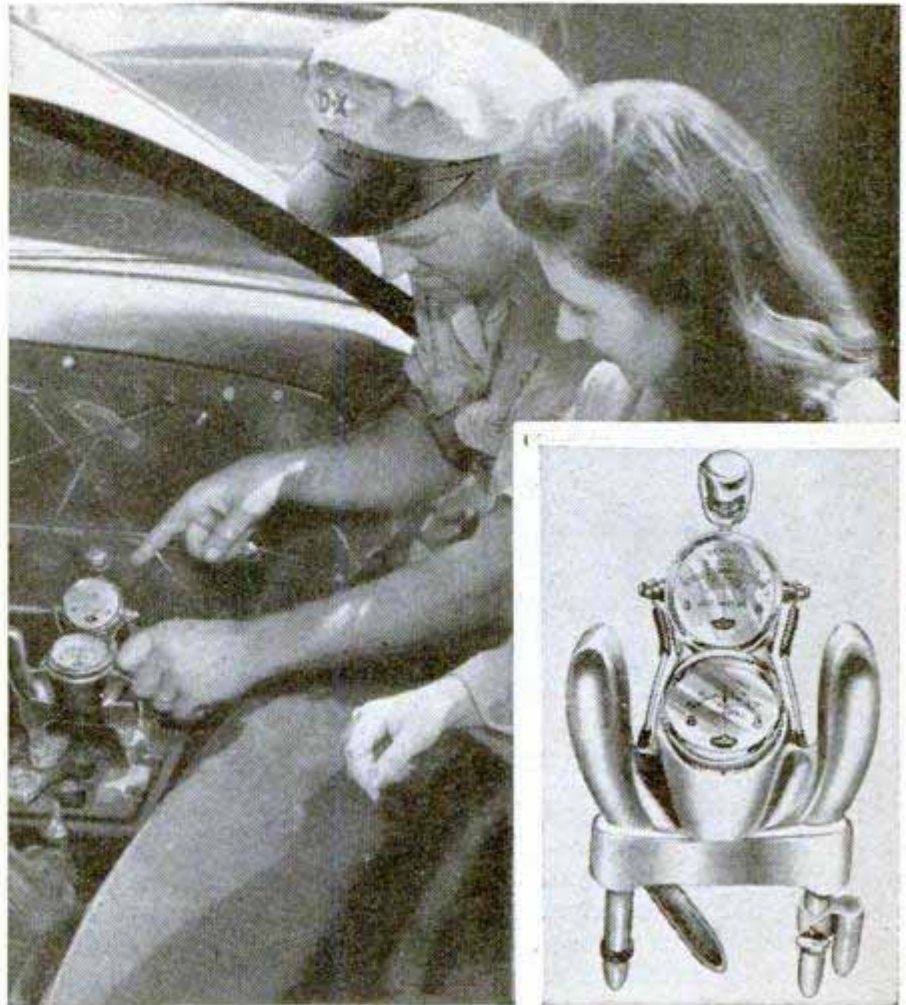
**Safety Bar** that doubles as an armrest protects passengers in the right front seat during crashes and sudden stops by keeping them from being thrown against the windshield or dashboard. When not in use, the bar swings back against the door where it makes a convenient armrest. In an emergency, the passenger pulls the bar in front of him and braces himself against the impact. It also keeps children from falling.



**Two-way key container** lets you slip one key out while leaving the others still on the key chain. With it, you can leave your ignition key in the car for the parking-lot attendant and take the other keys with you. The ignition key is fastened in one end of the plastic case while the additional keys go on the key chain. Spring action of the slotted plastic case enables you to pull the chain from the case when desired, but is strong enough to hold it for normal use.

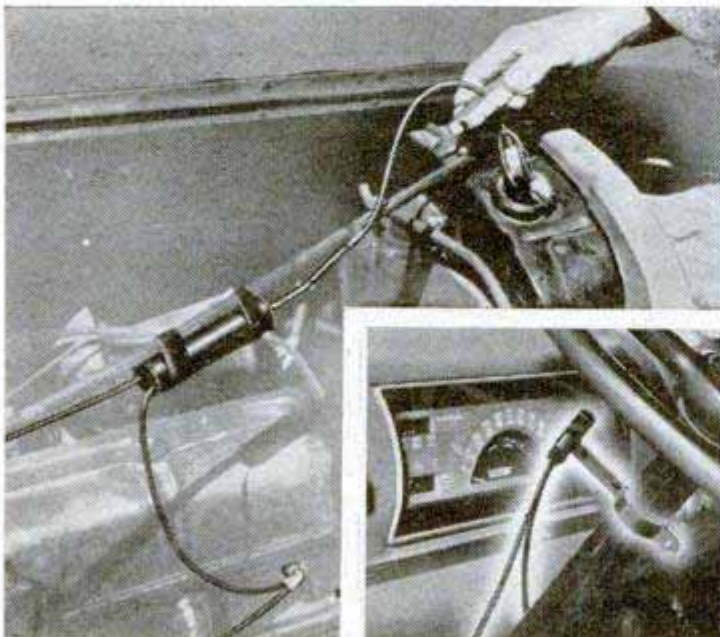
# LIST for MOTORISTS

**Universal tester** for car batteries can also be used for checking cables, voltage regulators, generators and starter motors. It is a prod-type instrument and it is not necessary to disconnect the battery cables to make the tests. Made of solid copper, the instrument contains a voltmeter and ammeter. For testing voltage capacities under a load, a resistor is built into the unit. Cables and starter motors are tested without disconnecting by induction. The meters are illuminated for easy reading. An adjustment on the tester permits its use on large truck batteries.



**Water-level indicator** signals you when the water in your radiator is too low for efficient cooling. A neon lamp mounted on the steering column flashes the warning. Current to flash the bulb comes from one of the spark-plug cables. The attachment can be installed on your car in 15 minutes.

**Shaving while traveling** is no problem with an electric shaver that operates on either 6 or 110 volts. The shaver has two cords, one for use in the automobile, the other for use at home on either a.c. or d.c.





Air Materiel Command photo

## Suits Made of Aluminum Foil Protect Fire Fighters

Fire fighters dressed in suits made of aluminum foil can work in intense heat without being burned. The shiny suits, developed by the Air Materiel Command for fighting fires in crashed planes, reflect the heat to keep the wearer comfortable even when exposed to high temperatures. The aluminum foil is laminated to a cotton backing. The entire suit weighs less than eight pounds and consists of a helmet,

trousers, zippered jacket, gauntlets and spats which are worn over rubber overshoes. The helmet has an eyepiece made of heat-resistant glass which will withstand 2000 degrees of heat. During a test, three men dressed in fire-fighting suits walked toward a gasoline fire. The conventional suits had to be wet down, while the aluminum-foil suit was the most comfortable and suffered the least damage.

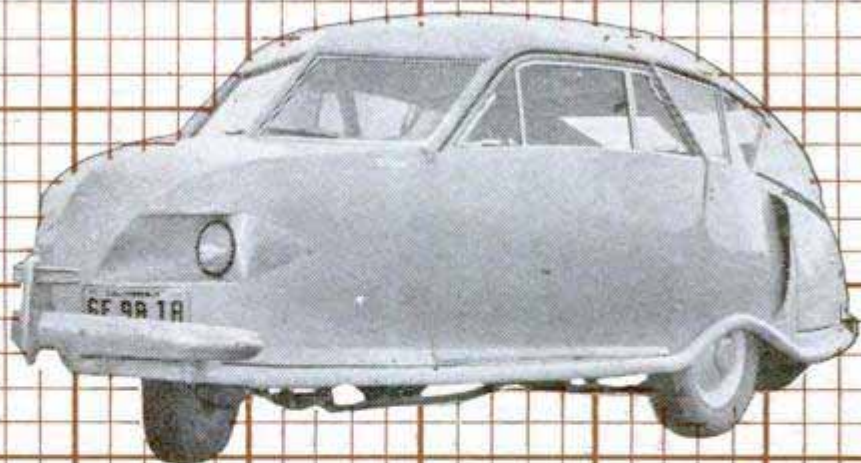


## Whittled Cathedrals

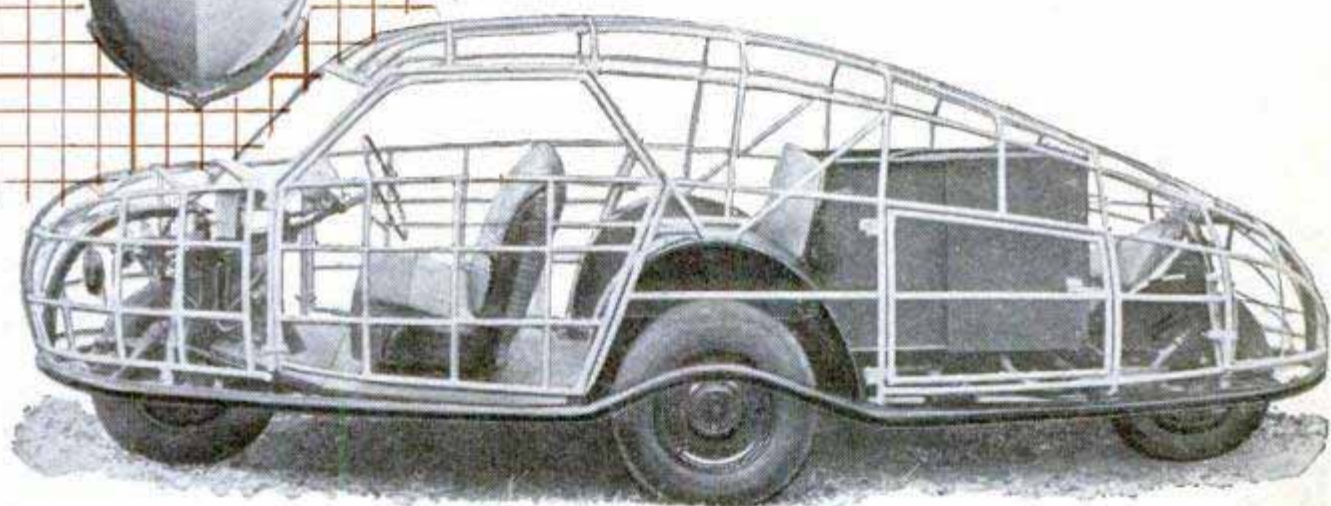
With a dime-store knife, discarded crates and wood scraps, and a supply of glue, a whittler has fashioned two model cathedrals. Marshall M. Smith of Kannapolis, N. C., built the models in 17 months. Both models contain storage compartments and one has an electric clock in the tower.

## Asphalt "Coat" for Rockets

Reducing heat flow to the walls of rocket-motor nozzles, an asphalt-composition coating prevents the extreme heat of the discharge gases from melting the metal. The composition is a thermoplastic which coats the conical passage leading to the nozzle throat. Vaporizing in the presence of heated gases, it absorbs the heat and protects the metal.

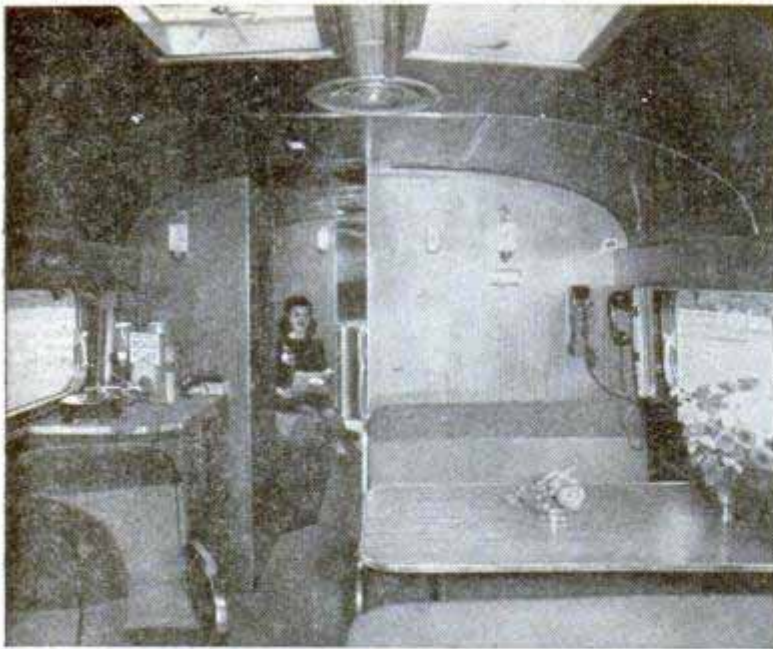


**DIAMOND-PATTERN WHEEL** placement is featured on the Gordon, an experimental car which has been driven 10,000 miles by its inventor, H. Gordon Hansen of San Lorenzo, Calif. The two driving wheels are in the center and single wheels under nose and tail are used for steering as well as balance. Although the Gordon's wheelbase is 156 inches, the car has a turning radius a third less than average cars. In photo at left, rear of car is at top of page. A V-8 engine is mounted in rear



Above, steel-tubing framework protects all wheels of fenderless car. Engine is just aft two center wheels. Below left, instruments are grouped on single panel. Right, the model shows how car pivots on driving wheels





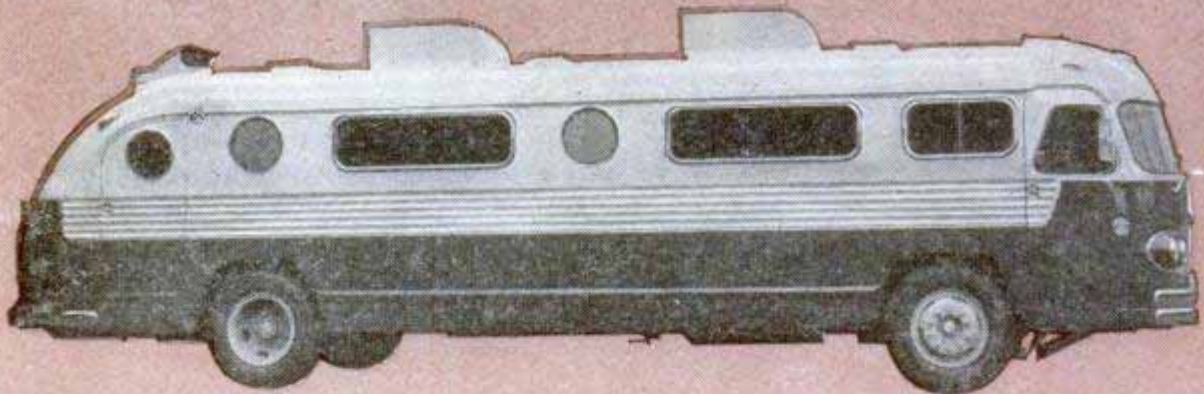
Comfortable lounges of luxury land cruiser gleam with shining mahogany. Note radio-telephone, indirect lighting cove over picture window, and the air-conditioning ports in the ceiling

## ***Cruiser on Wheels***

**Z**OOMING along U. S. highways are a number of custom-built "land cruisers" which from the outside look deceptively like ordinary busses. They are actually luxurious yachts on wheels with Honduras-mahogany-paneled walls, picture windows, "ship to shore" radio-telephones and comfortable accommodations for eight persons including the driver. One of these private land cruisers carries a "dinghy" in the form of a motor scooter. The owner reports that the scooter is one of his handiest accessories and is useful for exploring by-paths over which the heavy bus could not travel.

These rear-engine cruisers are the product of a Loudonville, Ohio, company and are built on a standard 29-passenger bus chassis. They contain kitchen, bathroom, sleeping quarters, daytime lounging and workroom and other home conveniences. The cruisers are air-conditioned and prospective buyers are urged to dream up special features which can be installed.

Aside from private use for



The custom-built Flexible land cruiser looks like an ordinary 29-passenger bus but it accommodates only eight persons. The humps on top are for air-conditioning equipment; air scoop at rear is for engine. Cutaway below shows general plan with kitchen at rear, center lounge with studio couch, bathroom, dinette-lounge and driver's compartment. Driver can speak by "intercom" to any section

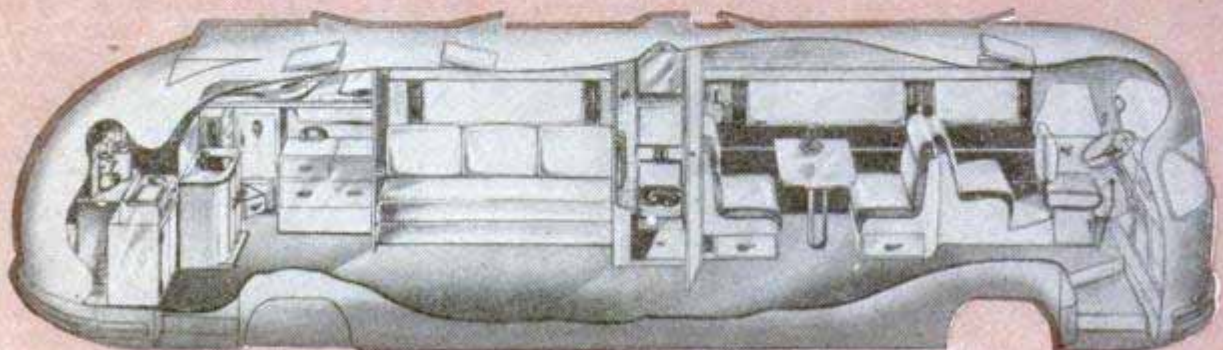






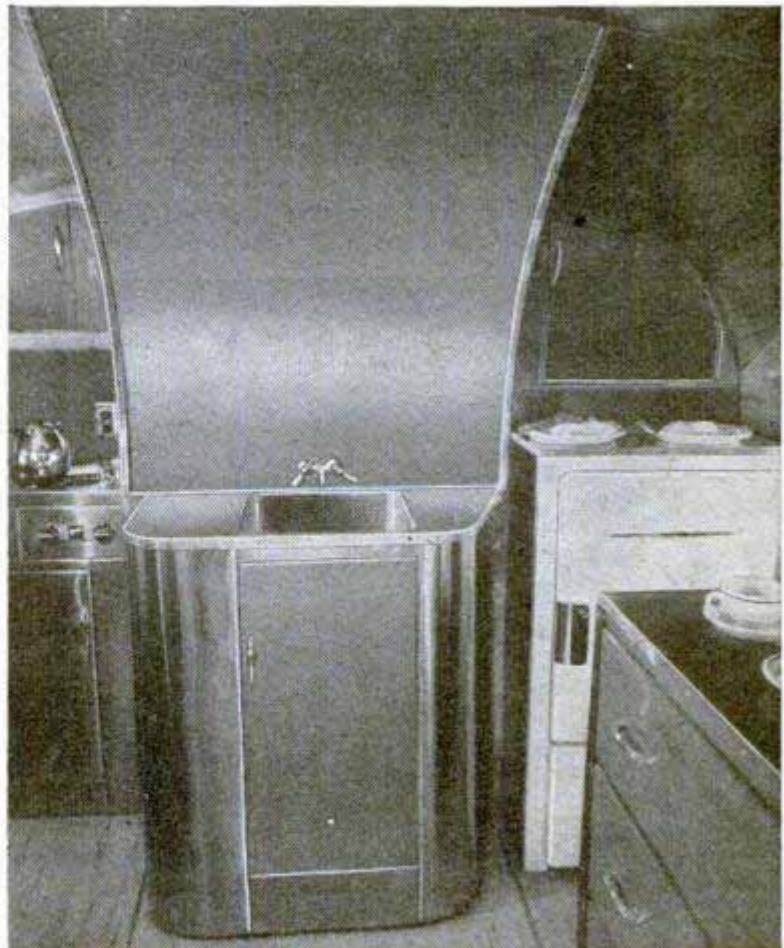
Table in dinette-lounge is removable so seats can be pushed together to form a comfortable double bed

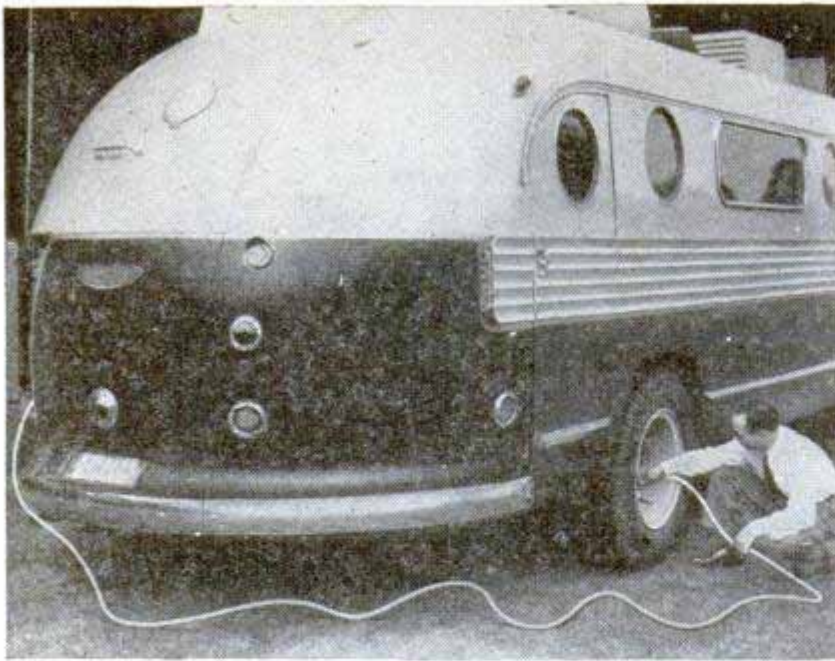
touring, for hunting and fishing trips, the cruisers are used as mobile offices for construction companies, as traveling television broadcasting stations and portable rooms for processing photographs. During the 1948 National Air Races at Cleveland, one cruiser was used as headquarters by the Goodyear Company, sponsors of one race. An executive of the Flxible Company, which builds the land cruisers, recently completed a 30,000-mile six-month trip in one of them.

On first inspection a cruiser built for private touring appears to be a three-room yacht. Aside from the driver's cubicle in the front, there are a dinette-lounge, center lounge and kitchen in the rear.

By pushing a few buttons,

Modern kitchen features stainless-steel sink, electric stove, refrigerator and an ample storage space for food





Tires are filled from the air-brake compressor reservoir on this land cruiser. The engine and radio-telephone equipment are in rear

the dinette-lounge (compartment just behind the driver) and the center lounge become bedrooms at night. Accordion-type doors close the center lounge off from the other rooms. The dinette-lounge, which also serves as office or cardroom, has dark-red-leather panels to set off the mahogany walls and chrome moldings. Along one sidewall is a cushioned alcove with a removable table. At night the table is taken out and the cushions pushed together to form a large double bed. Two deep-cushioned chairs in this section also form a single bed and just aft of the driver's seat is another reclining seat.

The dinette-lounge also boasts a snack

The two studio couches in the center lounge form two double-bunk beds. The sections are moved by concealed electric lift units



bar concealed in a chest of drawers containing space for storing refreshments and a built-in Thermos ice-cube container. A telephone hangs in one corner of the room. It can be used for incoming or outgoing calls.

Through a hallway a door opens to a compact bathroom, or shower room, with two-tone walls of tile and a stainless-steel floor with drain. This room has a fold-away railroad type of lavatory operated by a push button. Appointments range from a mirrored medicine cabinet to a slot for discarding old razor blades. A double-door arrangement permits the room to be made an auxiliary to either the front or center lounge.

The center lounge has two studio couches which convert to double-deck bunks at night. All you do is push a button which starts an electric mechanism to elevate the seat and back sections to form four bunks.

The kitchen at the rear is a sparkling stainless-steel and electric wonder. There are an electric range, an electric hot-water heater, a refrigerator and a thermostatically controlled automatic coffeemaker. There are adequate storage facilities for food and linens. All electricity on the cruiser is provided by a 110-volt generator operated by a four-cylinder gasoline engine. In addition, there is a 12-volt emergency lighting system. The gasoline engine which

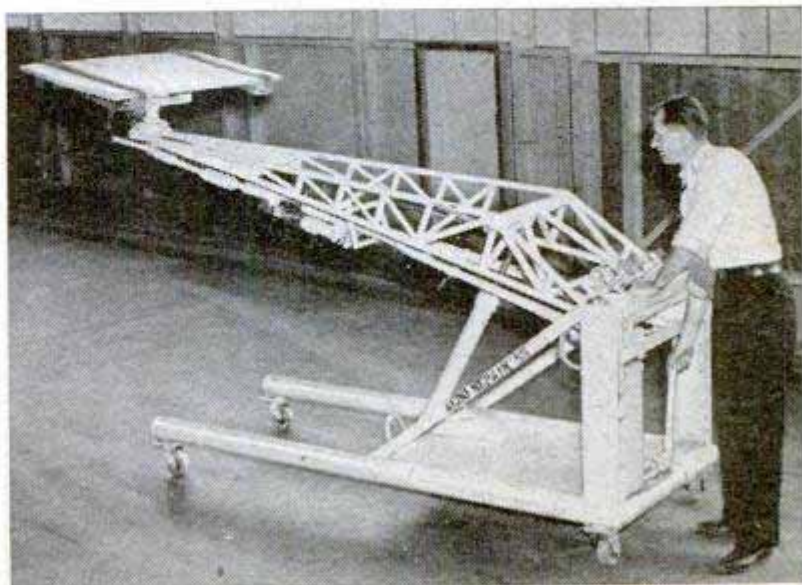
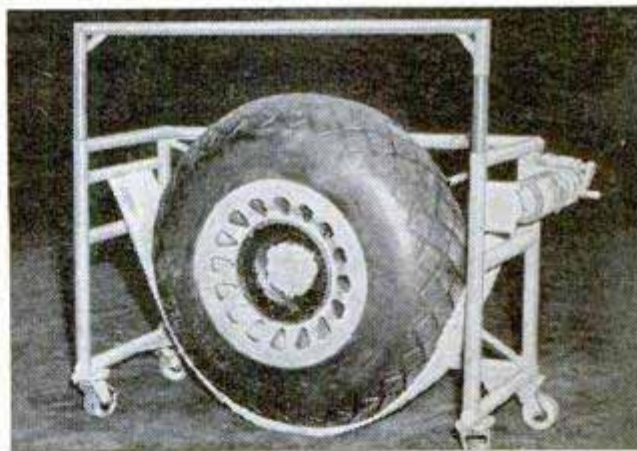
operates the generator also provides heat for the cruiser. Wall thermostat controls regulate the heat. The cruiser's 80-gallon fresh-water system operates at 40 pounds pressure derived through a pressure-reduction unit from the cruiser's brake supply. Land cruisers normally carry a supply of air at 110 pounds pressure for operating brakes and other equipment. A hose connected to the air tank is useful for inflating tires and blowing out dust. The air hose is stored in a rear compartment that contains the radio-telephone equipment and such assorted items as fishing tackle, outboard motors and—at least in one instance—a cut-down motor scooter.

## Safety Aids for Air Force Ground Crews

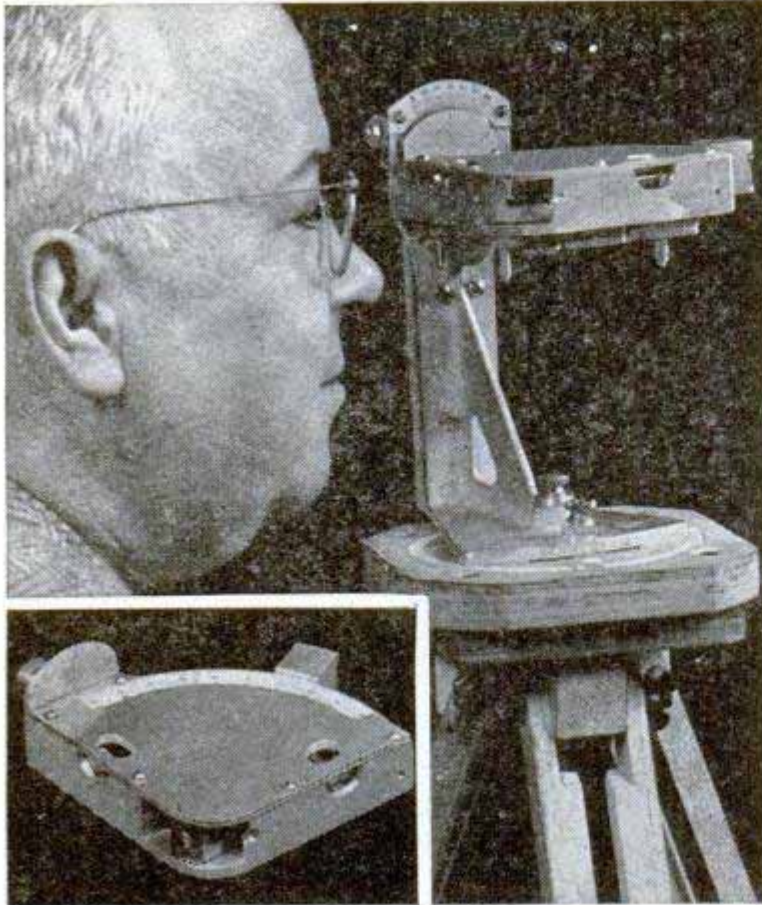
Nine men can work at the same time on this portable stand in safety. Its steps always remain horizontal, no matter how high it is elevated. Railings prevent accidental falls



Safety first is more than a catch phrase to flyers and in the U. S. 15th Air Force it is taken just as seriously by ground crews as it is by airmen. Keeping giant planes in perfect flying condition can be a hazardous occupation, but safety engineers of the 15th Air Force designed these mechanical devices to cut down the number of strained muscles and broken toes. Right, two men had to tug and strain to lift airplane wheels into place. Now this wheeled rack, built entirely of scrap parts, does the heavy work for them. Below right, with this hydraulic lift, a mechanic can put huge wing tanks or other parts into position without straining his back. Below left, a retractable third wheel for crew stand supports its front end when it is moved around by mechanics



## Pocket-Size Surveying Instrument Also Useful As Two-Way Level



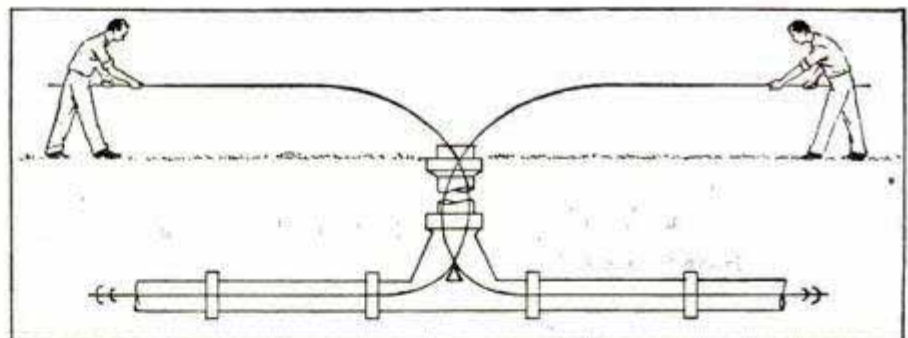
Accurate lines can be run for fences, building lots and foundations with a quadrant transit weighing only five pounds with tripod. It covers a full 360 degrees horizontally in arcs adjustable up to 60 degrees, with a similar vertical range up or down grade. Any angle or compound angle may be included between the adjustable sights. The aluminum head is pocket size and also can be used as a two-way level.

## Dye Detects Wheat Weevils

Weevil infestation in wheat, previously difficult to detect, can now be shown up easily by soaking grain samples in a dye containing acid fuchsin, a coal-tar product. During infestation, the female weevil gnaws a hole in the grain, deposits an egg in it and seals it with a jellylike material. This material is virtually invisible to the eye. When the grain is dyed, however, the sealing material shows up as a cherry-red dot.

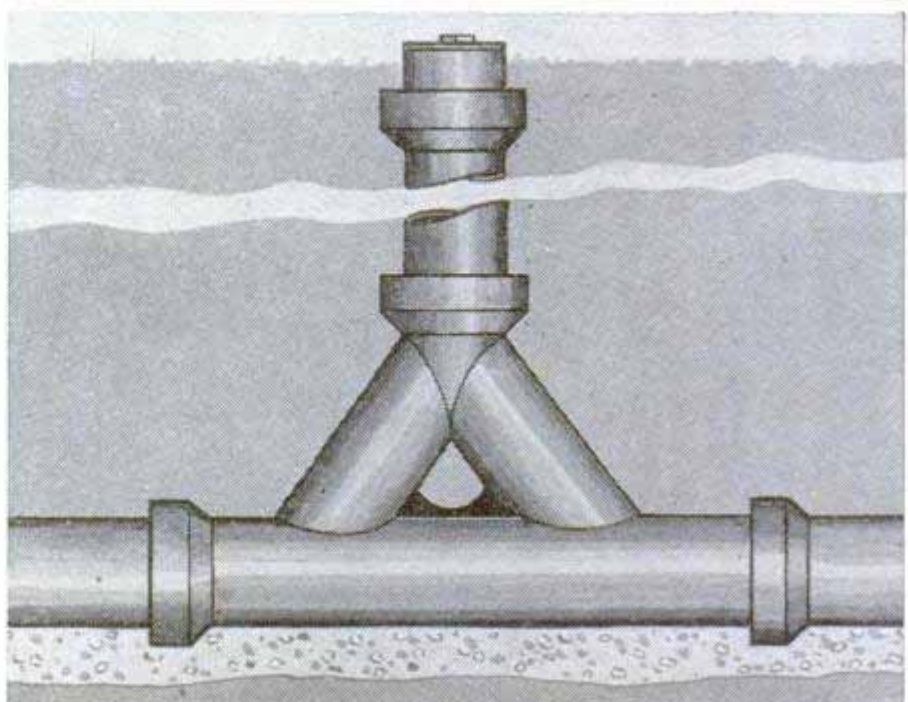
## Inverted "Y" Fitting Aids Sewer Cleaning

Clogged sewer-pipe sections are located and cleaned more easily when an inverted "Y" fitting devised by Harry L. Fulton of Pueblo, Colo., is used. It permits two-way cleanout and visual inspection of the flow. The base of the Y-pipe, at ground level, is covered and the lower ends join the horizontal pipe.



## Anti-Dust Spray For Allergy Relief

If you suffer with an allergic condition that is aggravated by house dust, you can reduce your suffering with a spray emulsion that literally "seals" dust at its source. An odorless white paste is mixed with water and sprayed on carpets, furniture and bedding. It prevents dust from becoming airborne.



**Virdie Price solves ceramic problem of applying clay lace by dipping cotton lace in clay. Cotton burns away in kiln, leaving lace on figure**



## ceramics is a family affair . . . .

**W**HEN RAY MAXWELL left the Army three years ago he wanted to escape the commotion of city life—to shake loose from his former investment-banking business and live in peace beside his favorite fishing stream in Colorado.

With his wife and two daughters he moved to Aspen in the Rockies and built a home from native materials. Now all he had to do was find a way to earn a living.

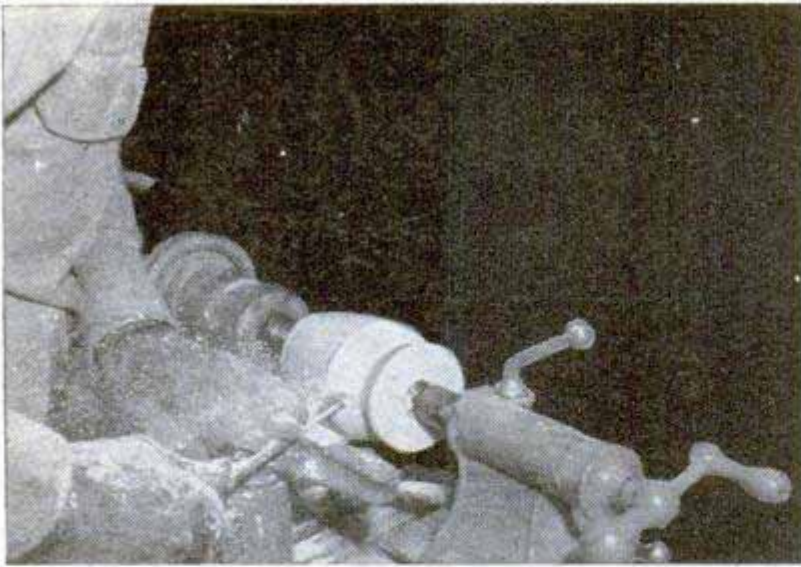
One day Maxwell watched as his younger daughter, Joy, decorated some clay figurines preparatory to firing them. Why not learn something about pottery and open a ceramic studio, he wondered. His wife and daughter were both competent artists and could decorate the pieces. He could learn the technical end.

After surveying the field, he decided it was tailor-made to his needs, and his family was enthusiastic. So the family converted one daughter's hobby into a business. Today they are turning out personal ceramic pieces of such fine quality that they are in demand all over the country.

The Maxwells are among the scores of

**Ceramist slices mold marks from "green" piece before firing. Projections become needle-sharp in the kiln**





Maxwell turns his casting molds on an ordinary wood lathe. Right, clay body is poured into the final mold

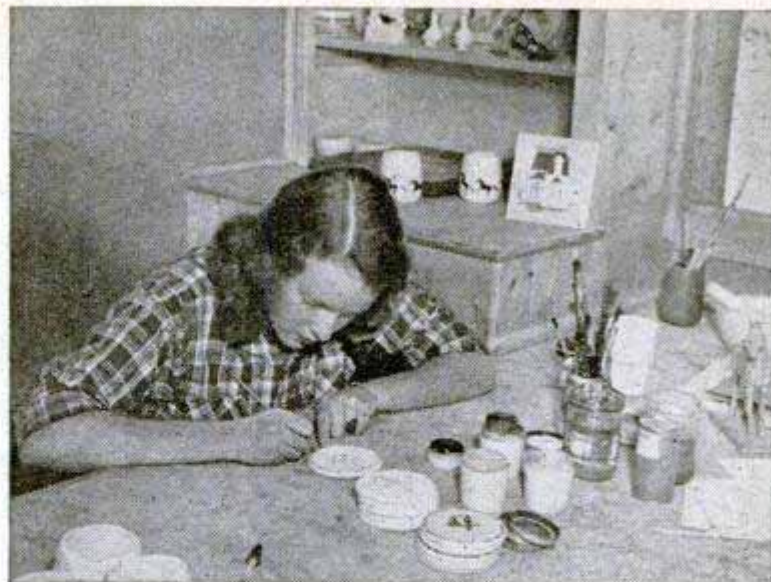
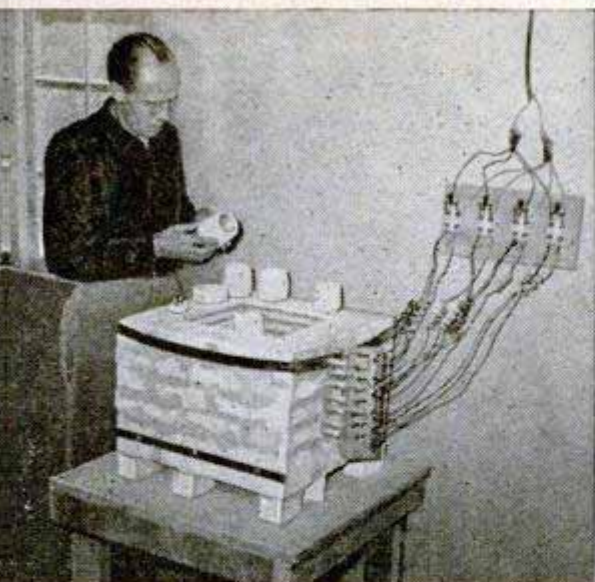
persons who have learned ceramics from scratch to weld ingenuity and knowledge into a lucrative business. Ceramics demands both craftsmanship and artistic ability. It's an ideal hobby that can grow into a garage or spare-room business.

Clay is one of the most versatile materials existent. It goes into common bricks and fine dinnerware, sewer pipe and priceless porcelains. As a utility material, it is strong; as an art medium, it can be shaped into striking contours and decorated with beautiful colors. A common brick costs only a few cents, yet the same amount of clay (of a different kind) plus a cup of glaze and color materials can be shaped by an artist into a vase or figurine worth hundreds of dollars.

Ceramics is principally a handcraft and has been difficult to mechanize. But one of the ingredients that the Maxwells mix into their successful formula is ingenuity. One of Ray's former hobbies was woodworking so he hitched up several of his power tools to provide short cuts that have saved labor and in some cases increased volume. For example, the average potter builds up a model for a new clay mug or bowl by turning it on his potter's wheel. To do the same job, Maxwell casts a cylinder of plaster of paris in a tin mold. When the plaster has hardened, he clamps it in his wood lathe and turns out a new shape with ordinary woodworking tools. A final polishing with steel wool gives the model a smooth, perfect contour.

Hand-decorated mugs show Popular Mechanics covers. Most items turned out by the Maxwells carry messages





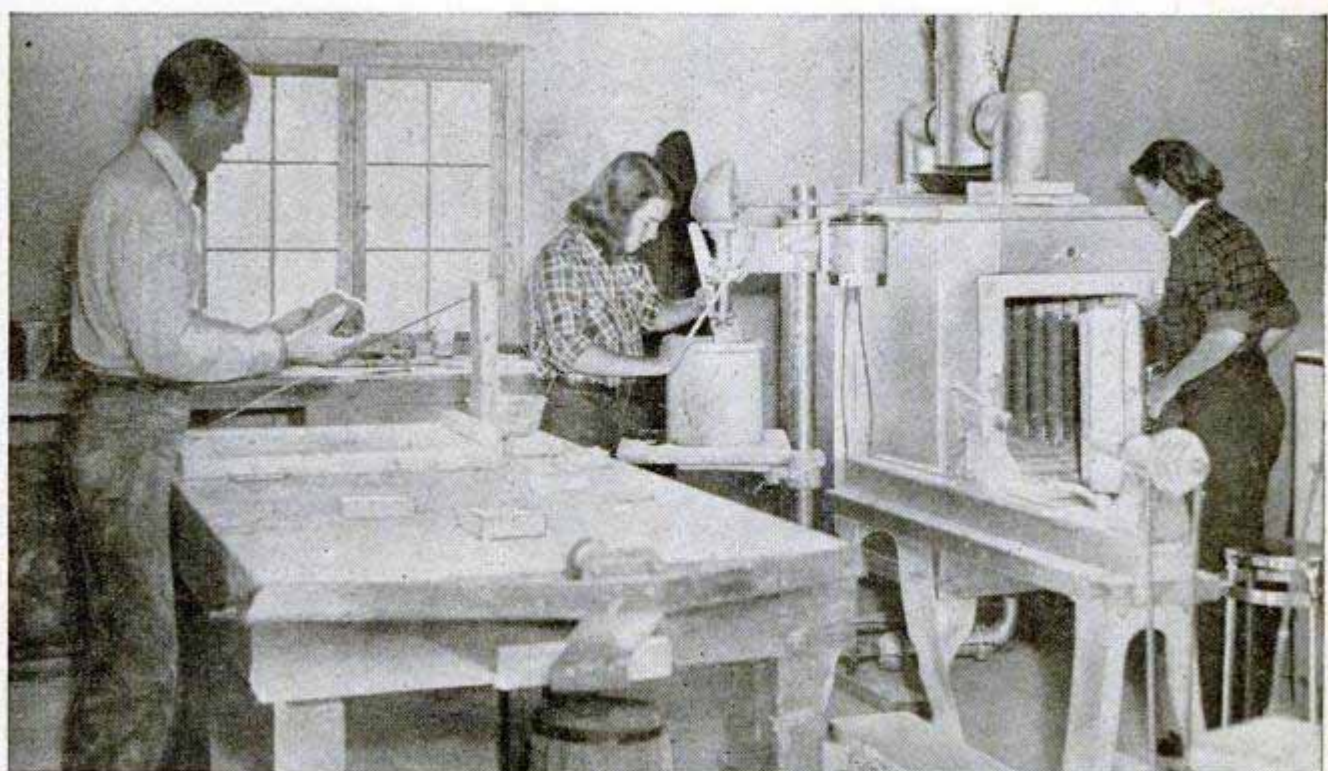
To aid in glazing clay objects, Maxwell built a spray booth above an old phonograph turntable. As the piece to be glazed spins on the turntable, he applies the glaze with a spray gun. An old vacuum cleaner behind the booth draws excess spray out of the air.

Maxwell built his own electric kiln out of refractory insulating brick and cement. He cut the grooves for the wires in the brick with his power saw. Hard on the blade, he admits, but much less expensive than buying a ready-made kiln. His kiln cost him about \$35, while one of comparable size would require an outlay of \$200 to \$400. Today, because of the family's increased output, the Maxwells also have a larger, gas-fired

Above left, Maxwell inspects pieces after their first firing in homemade electric kiln. They should ring when tapped. Above, daughter Joy decorates coasters with colorful birds of the West



Old phonograph provides turntable in the Maxwells' spray booth where glaze is applied with a spray gun. Below, Joy uses drill press to mix clay body while her parents prepare to fire pieces





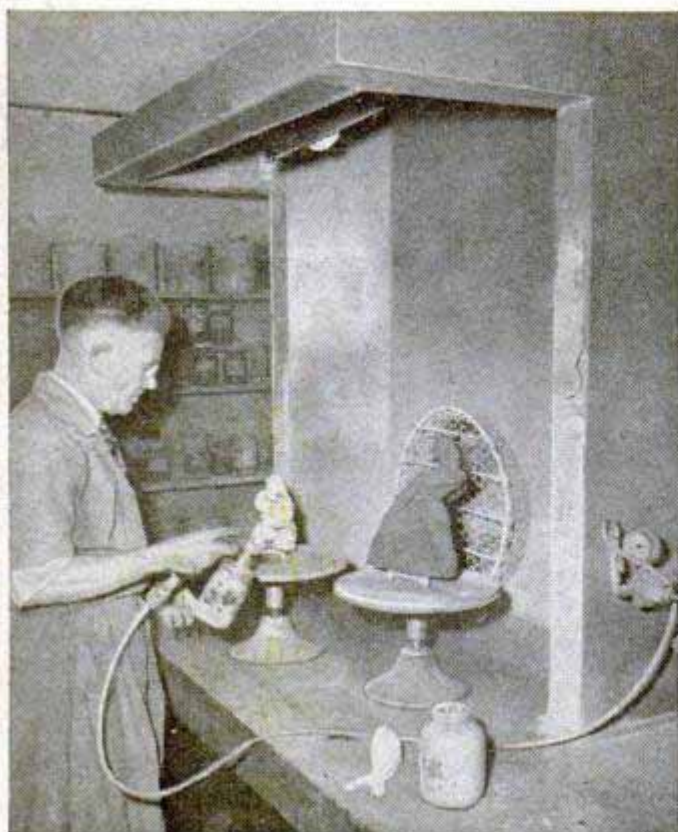
Products from Virdie Price's kilns range from salt and pepper shakers to miniature tea sets and decorative figures. All of them are handmade

Glen Lukens, artist-instructor, sprays glaze on one of his distinctive figurines. Right, sewing-machine treadle operates his potter's wheel

kiln. For mixing their clay formula, which must be perfectly smooth, they use a paddle attached to a drill press.

When they started learning the business, the Maxwells discovered that most small ceramic shops specialize in some kind of artware. They buy their clays, colors, glazes and other materials from supply houses and then develop an individual line of products. One man may produce large decorative plates and wall plaques; another may devote full time to turning out a menagerie of small animals. Depending on the workmanship, prices of individual pieces range from less than a dollar to five or ten dollars or more.

The Maxwells wanted to turn out pieces that not only were beautiful, but had unique decorations. Today their ceramic items are divided roughly into two classes: pieces which are decorated with wildlife native to the area or which reflect the lore of the old





West, and pieces, specially ordered by each customer, that exhibit a personal message.

One man ordered a set of mugs each bearing the name of a member of his family. Another wanted several plates decorated with cartoon scenes depicting his wife and himself tumbling down a mountain on skis. A dude ranch ordered sets of mugs carrying scenes of life on the ranch. Mottos, bits of poetry, pictures of homes, all of these have been created on pottery for customers.

Each order is different, and they are piling up in the Maxwells' mountain home. Business became so good that Ray, his wife Ruth, and Joy were tempted to let the enterprise grow beyond the family stage, but finally decided they would lose the personal touch if it grew much larger. Ray is beginning to wonder when he'll do all that fishing he'd planned.

The Maxwells' shop is just one of scores of such family enterprises. Ceramics is an attractive hobby because it enables a man to create just what he wants and decorate his pieces in any way that appeals to him. One coffee drinker, for example, was dissatisfied with the small size of an ordinary cup; as soon as he became proficient at shaping and firing his pieces he turned out giant-size cups and saucers. Some hobbyists have made complete sets of dinnerware for their tables. Tilelike squares decorated with names and dates or with favorite scenes make unique pieces that may be set into the walls of a kitchen or bathroom. In fact, when a good ceramist builds a new home he may turn out all his own tile in the designs and colors he wants.

Some hobbyists haven't the time or space for installing their own kilns and other equipment. If they live near a commercial pottery they can buy cups, saucers and other objects from the pottery in bis-



Homemade kiln was shaped in two parts by mixing clay and sawdust in a cheese carton. When it was fired, the sawdust burned out, leaving air spaces in clay. Below, adjustable rests steady hands over potter's wheel



cuit form, ready for glazing. After decorating and glazing the pieces, they return them to the pottery for a final firing. This can be profitable for a small pottery.

Such is the case at the ceramic studio operated by Virdee Price in West Los Angeles. The Price studio creates a wide variety of art objects that range from miniature cups and saucers and odd salt and pepper shakers to large candy bowls, porcelain clocks and figurines decorated with ceramic lace. How to mold clay into an intricate, lacy weave is a puzzle that stumped many

(Continued to page 262)



### Paint Roller for Picket Fence

Individual pickets in a fence can be painted quickly with a roller small enough to fit between the boards. The applicator's roller is made of lamb's wool and holds enough paint to cover the average picket without a second dip in the paint pan. One stroke of the roller completely covers the surface with paint.



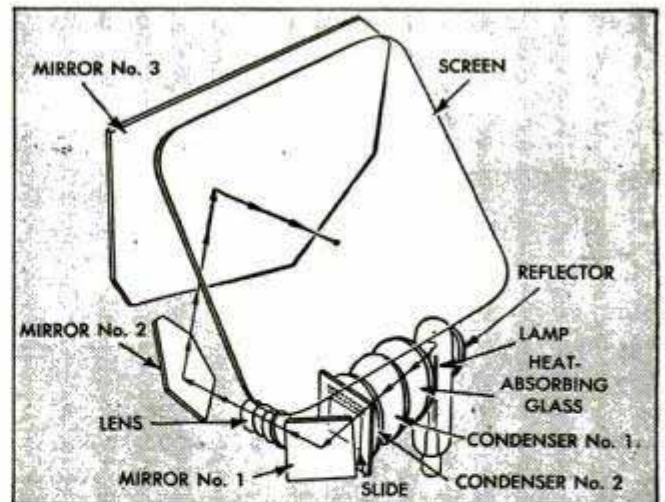
### Screen Shows Slides in Bright Room

Enlarged images of two by two-inch slides are projected so brilliantly on the screen of a new viewer that the unit can be used in a fully lighted room. The viewer consists of a slide projector, slide changer and screen built into one instrument which occupies less than 10 by 12 inches of desk



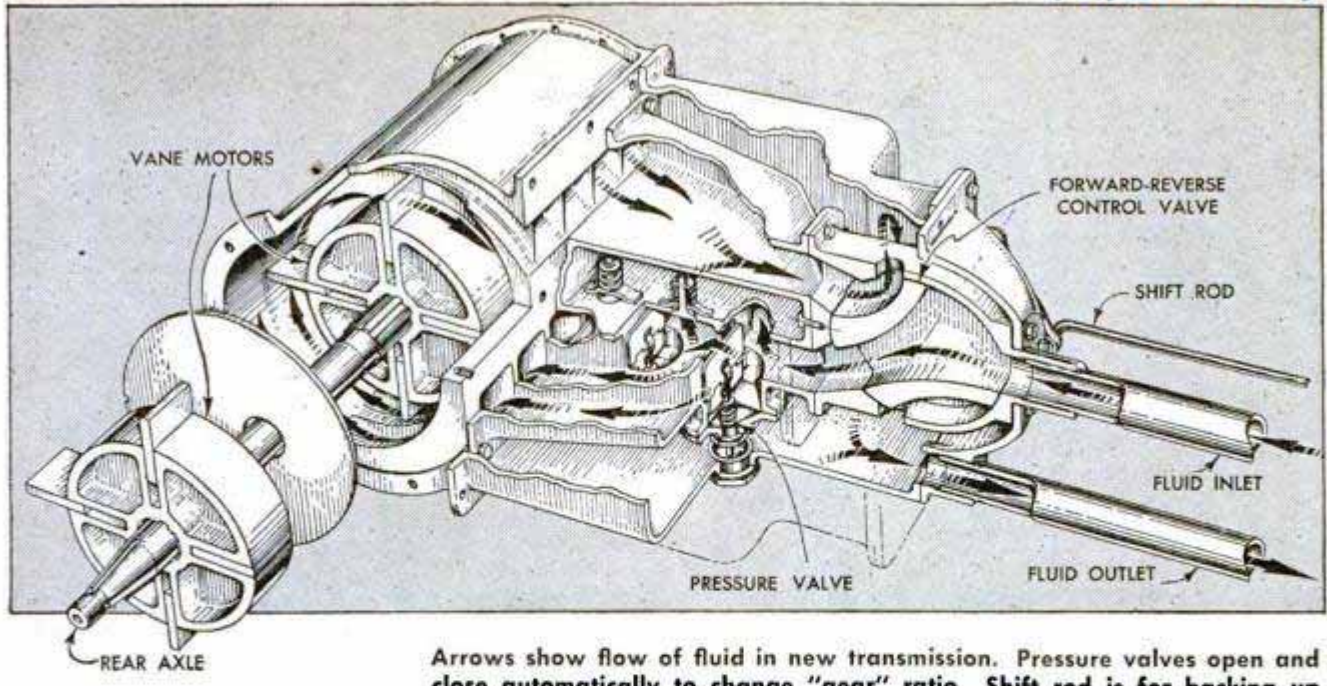
### Hearing-Aid Attachment Clarifies Phone Talk

Persons who use hearing aids can carry on a normal telephone conversation with a simple attachment for the handset. In most cases, those who are hard of hearing have difficulty in using a phone because sounds are induced which are uncomfortable when heard through a hearing aid. The attachment is merely a rubber tube which slips over the receiving end of the phone. In use, the phone is turned upside down and the rubber attachment held against the microphone of the hearing aid. The tube forms an air cell which prevents other sounds from reaching the microphone.



space. It holds 75 cardboard slides or 30 double-glass slides. Light from a 75-watt lamp is reflected through a heat-absorbing glass, two condensers and the slide. The image then is reflected by a mirror, passes through a lens and is reflected by two more mirrors to the rear-projection screen. The screen is made of dark-colored glass and measures 7½ by 7½ inches.

BUT PAUL THOMPSON,  
FOREST GUARD, OREGON,  
BUILT CAR



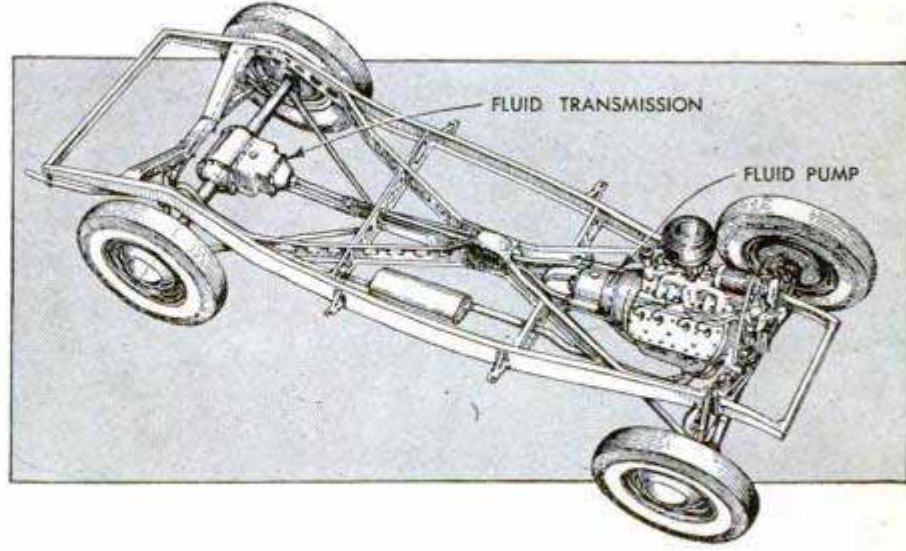
Arrows show flow of fluid in new transmission. Pressure valves open and close automatically to change "gear" ratio. Shift rod is for backing up

## FLUID TRANSMISSION USES NO DRIVE SHAFT

Completely hydraulic, a new fluid transmission, designed by an Oregon inventor, eliminates the clutch, geared transmission, drive shaft and differential gears. Called a hydraulic manifold, the unit replaces the differential in the rear-axle housing. Two tubes carry fluid under pressure from a pump at the motor to the manifold unit between the rear wheels. Six vane motors, three for each rear wheel, drive the car in low or reverse. The unit automatically cuts out two vane motors as speed increases to a point equivalent to second gear. As speed further increases, another pair of motors is cut out, and the car moves in high with one vane motor driving each wheel, providing a ratio equal to high gear in ordinary transmissions. No gears are used and the only control necessary is for shifting into reverse. Automatic "gear" changes are accomplished by spring-loaded pressure valves. As back pressure is built up by increased load at the wheels, these valves open and fluid is pumped into



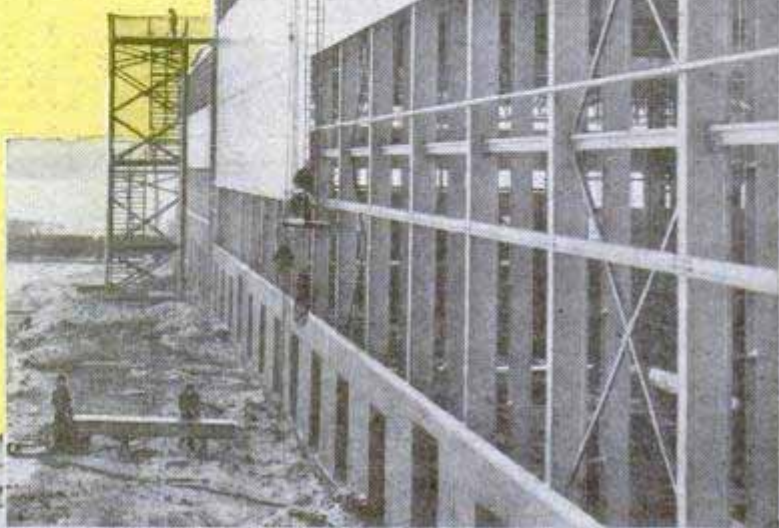
Using parts from a junk yard, inventor Victor Jewel built this car to test his fluid drive. Total cost of parts: \$300. Below, no drive shaft is used. Fluid is carried by tubing from pump at motor to transmission



additional vane motors to provide more pulling power. The inventor plans to adapt the unit for powering rear axles of trailers and semitrailers by pumping fluid from the tractor through two hydraulic hoses.

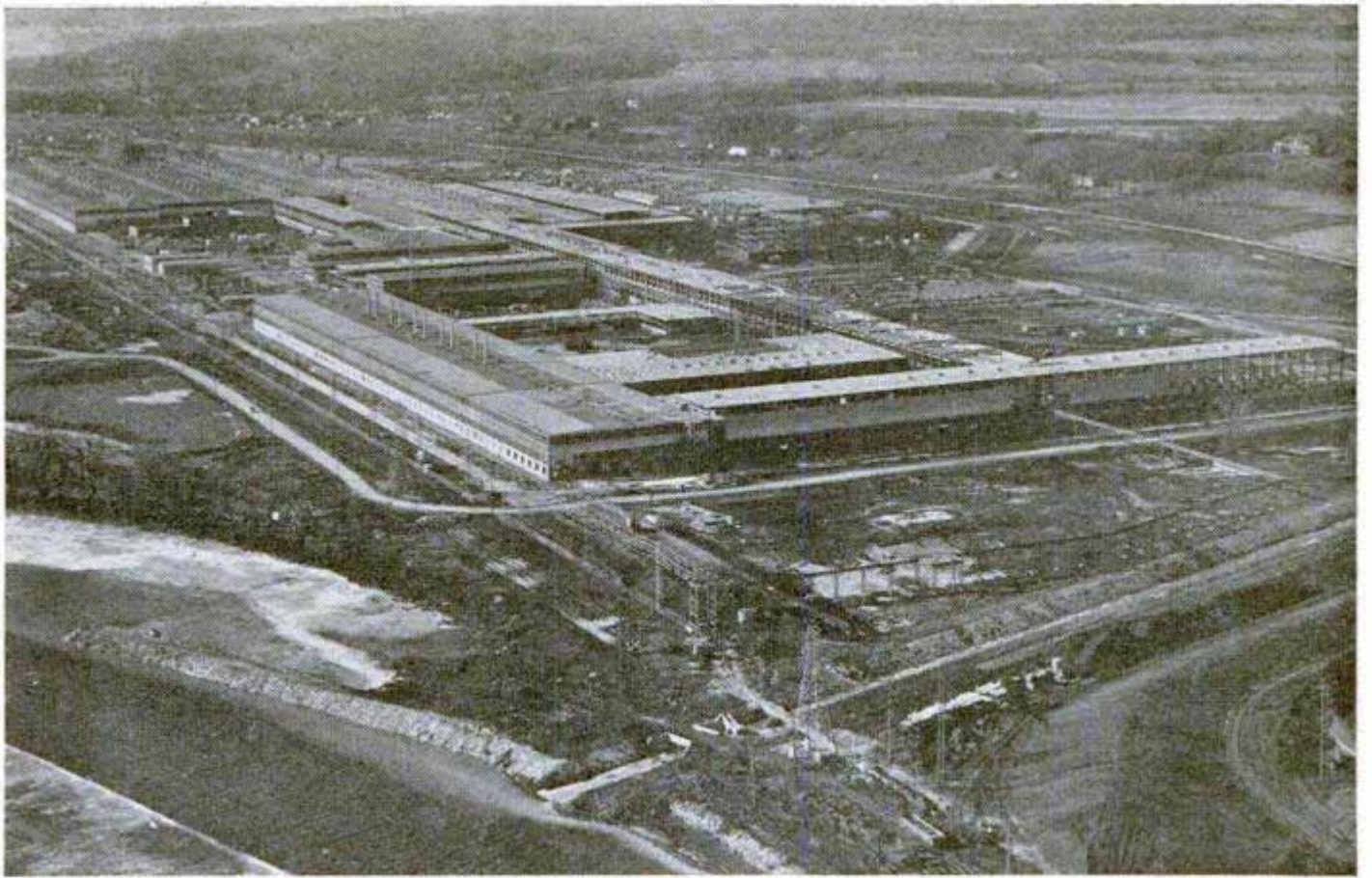
# ACRES OF ALUMINUM

Right, the plant's three miles of exterior walls go up fast as workmen install panels consisting of two aluminum sheets separated by a thick layer of glass-fiber insulation. Panels interlock with a shiplap joint and are calked with aluminum-colored material



Below, boring holes in horizontal strip to mount the narrow trim over windows. Left, two men easily raise the aluminum sash. Later it is glazed from the inside





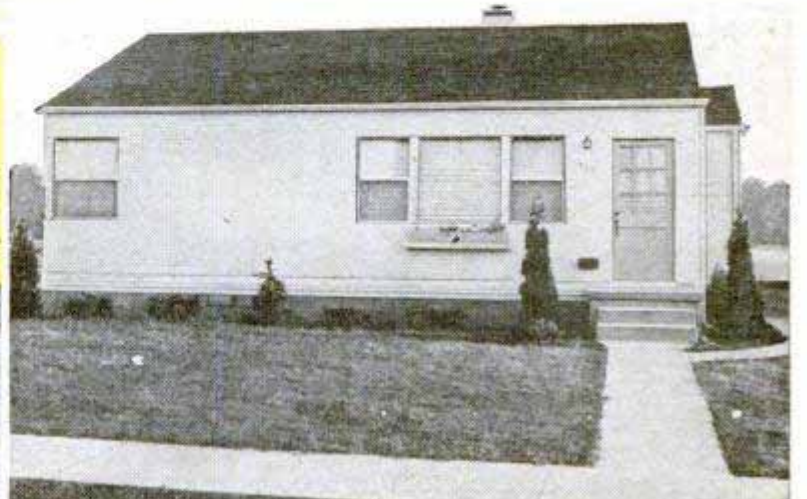
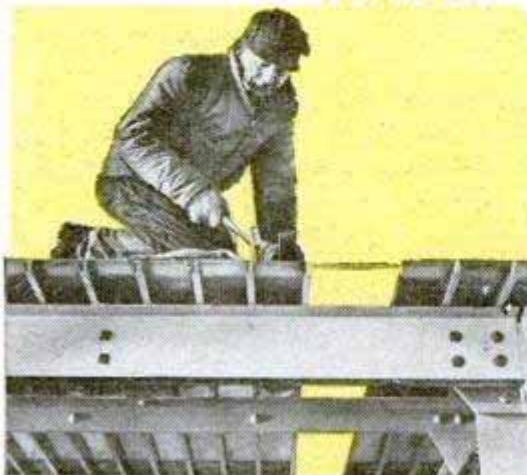
**Air view of the new Davenport rolling mill during construction. It will turn out aluminum sheet and plate**

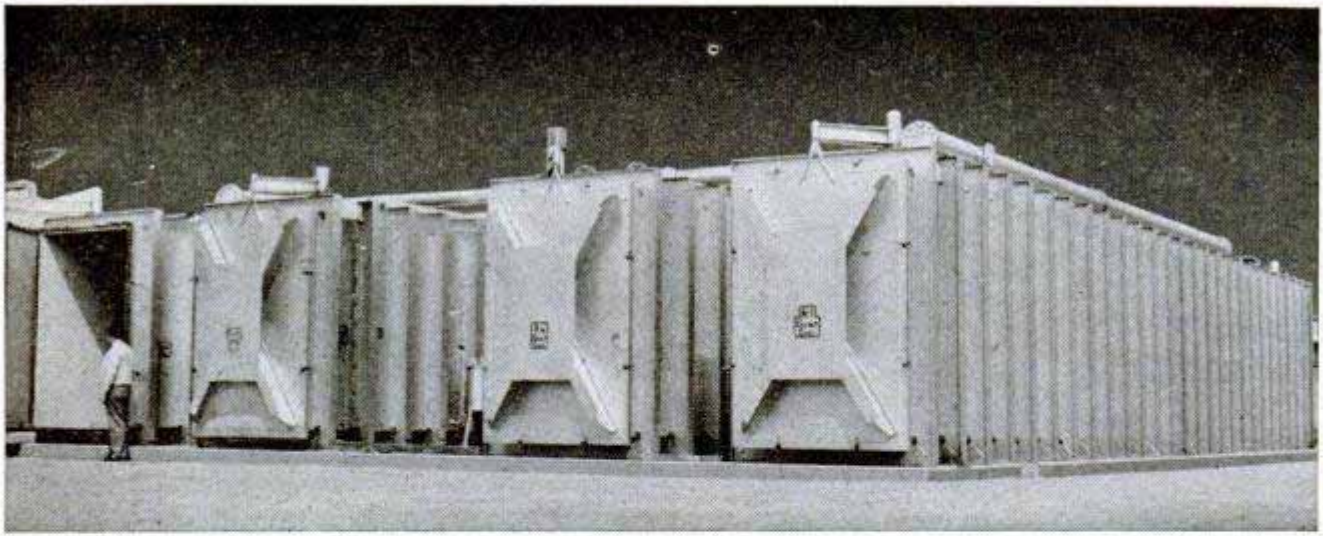
**G**LISTENING in the sunlight like a shiny new dime, the giant new rolling mill of Aluminum Company of America at Davenport, Iowa, provides the nation with a preview of aluminum's future in factory construction. This sprawling plant, extending over 52 acres of flat land on the bank of the Mississippi River, is a practical demonstration of aluminum's versatility. Except for 25,000 tons of structural-steel framework, which, incidentally, is coated with more than three carloads of aluminum paint, the plant is basically an all-aluminum project.

It is not a wild experiment in aluminum usage, however. The lightweight metal was

used only where it has advantages over other metals. Adding up to a total of more than 6¼ million pounds of aluminum are exterior wall panels, window sash, roof deck, conduit for light and power circuits, roof drains, ventilators, movable office partitions and 1340 miles of light and power cables. Surrounding the mill is a shiny fence four miles long, the longest aluminum-mesh fence ever made. More than 100 workers and their families will learn the advantages of aluminum at first hand—they will live in neat, three-bedroom homes constructed almost entirely of the lightweight metal, located on the river bluff only a few miles from the plant.

**Below left, installing the aluminum battens on the 52-acre roof deck. Right, worker's home is aluminum, too**

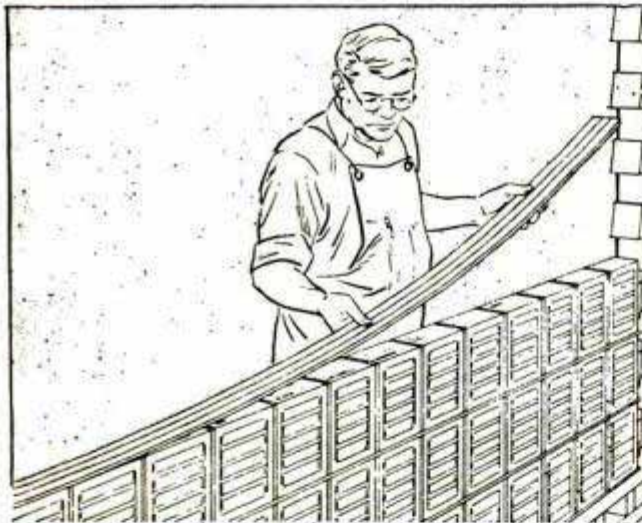




## Gas Chambers Fumigate Entire Ship's Cargo at Once

Four huge fumigating chambers at Norfolk, Va., are used to rid imported cotton and vegetable products of disease-bearing insects. The four 4000-cubic-foot chambers will hold the complete cargo of an average ship. Bales of cotton or other products are wheeled into the chambers and the gas-

keted doors sealed. Inside air is exhausted by a huge compressing motor and a deadly insecticide is introduced as a vapor. The vapor is pumped out and the chambers ventilated before workers, wearing gas masks, remove the material. Each treatment requires about two hours.



← Blocks set in tiers are separated by wood strips. Above, vertical strips are inserted between blocks. Right, glass wall is anchored in place with wedges

## Glass Blocks for Walls Set in Wood Instead of Mortar

Walls made of glass blocks can be built in openings of any size or shape by setting the blocks in wood instead of mortar. Only four basic parts are needed to build the wall: the Owens-Illinois glass blocks, vertical wood strips, horizontal wood strips and wedges. All the wooden parts are beaded to fit grooves in the blocks. After

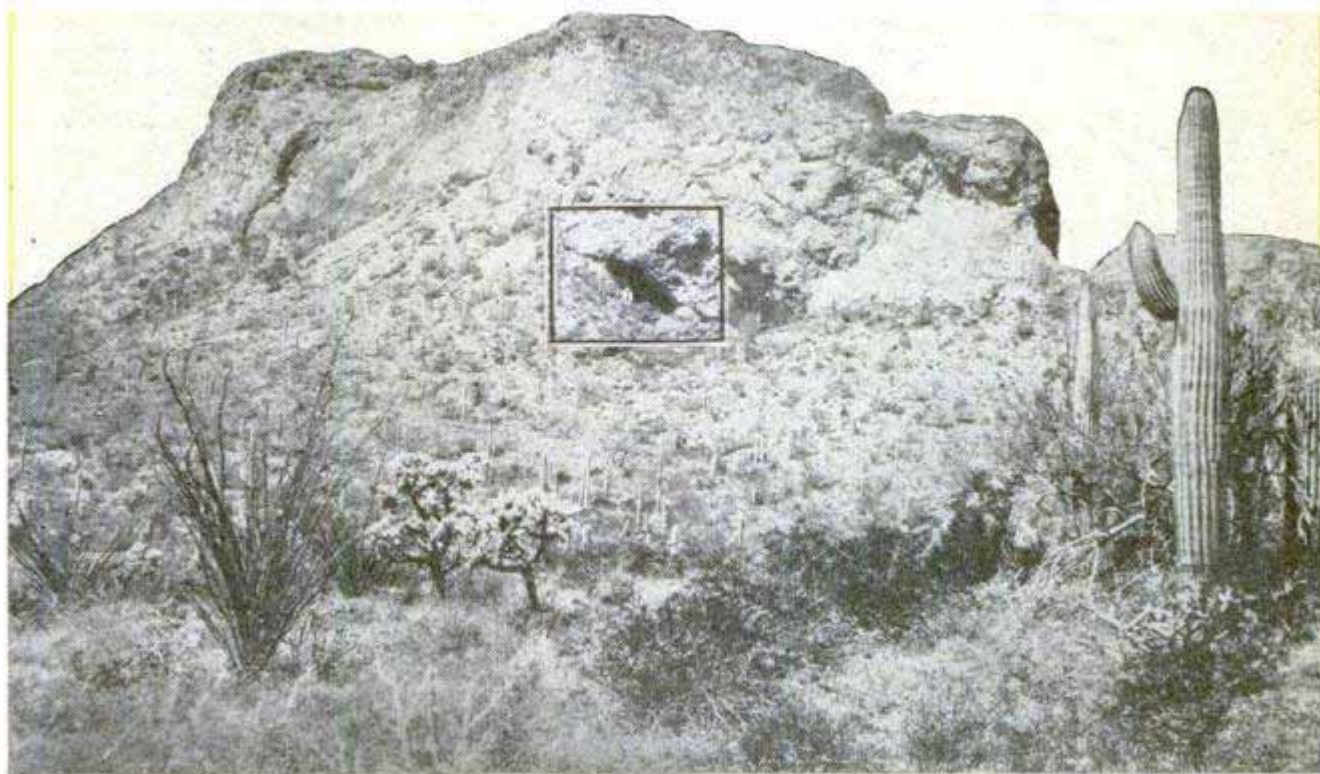
the wall has been framed by two by fours, one of the horizontal wood strips is nailed in place. A course of glass blocks is laid on this base, with the blocks separated by vertical strips. Each course is anchored tightly in place by driving a wood wedge at each end to apply pressure to the blocks. Trim is nailed on to complete the wall.

## Sealed-In Vapor Makes Packaged Steel Rustproof in Storage

Rusting of bare steel during plant storage or shipment is prevented by a corrosion inhibitor known as CS-CI-501. This liquid is sprayed on the wrapping paper used to package the steel. As it evaporates, its vapor encloses the steel in a corrosion-

proof atmosphere. Even when moisture condenses on the steel surface, corrosion is prevented because the vapor dissolves in the water film, making it noncorrosive to steel. The vapor is odorless, nontoxic and will protect steel for as long as two years.

# A CAVE GIVES UP ITS SECRETS



By Oren Arnold

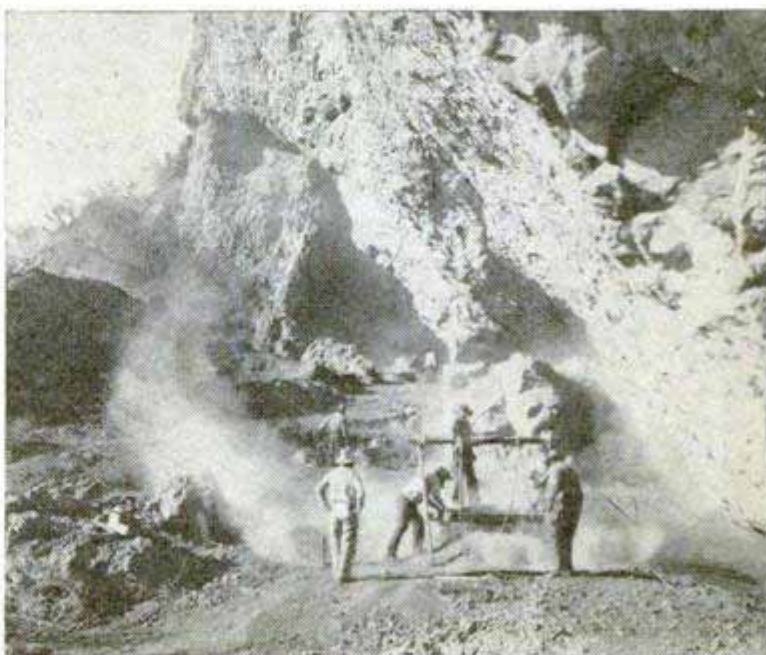
Just a gash in the face of an Arizona mountain, Ventana Cave, center, is a veritable storehouse of history to archeologists

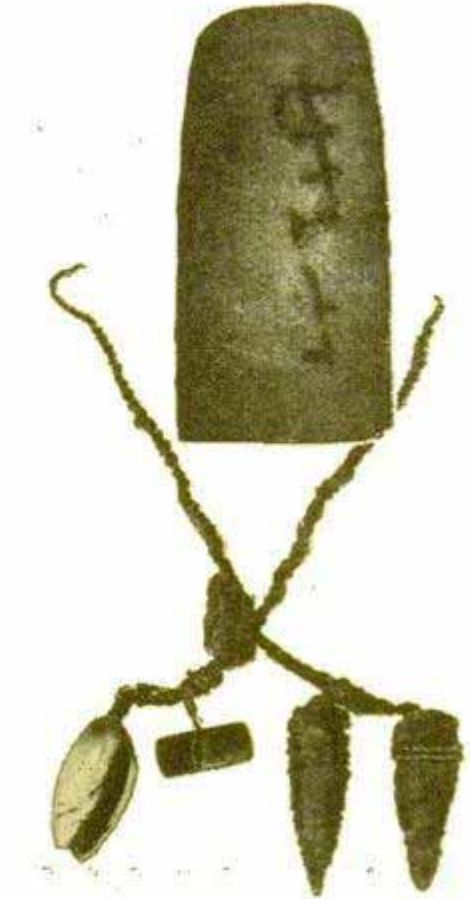
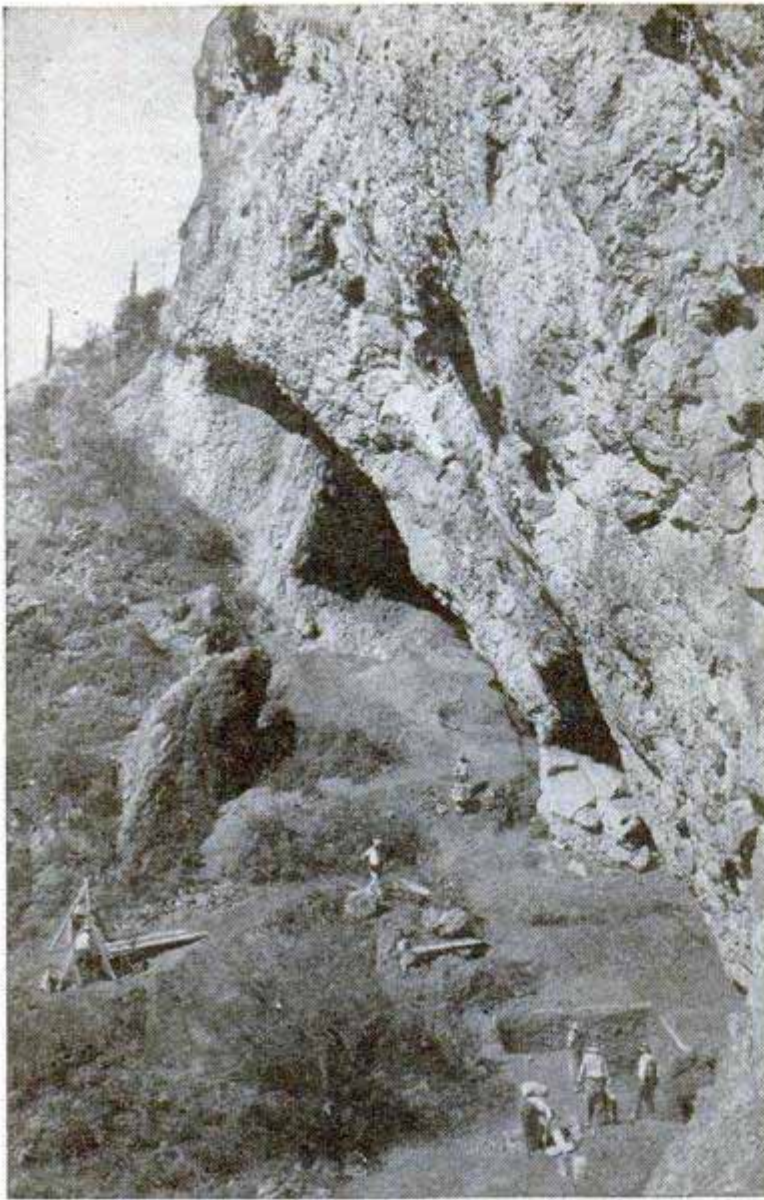
**D**ISPIRITED because an archeological project had just failed, Emil Haury, professor of anthropology at the University of Arizona, stopped his car one afternoon near a lone rock mountain on the wild desert of Arizona. Late sun had turned the near-by rock to crimson. Suddenly a black shadow caught his attention. He got out of his car and ambled toward it. This shadow seemed to open, revealing itself as a cave. Here was a chance to explore the legend that Spanish *conquistadores* once hid fortunes in silver in this region. Doctor Haury decided to peer into the cave.

Instead of silver bars, he found what has turned out to be one of the most important records of prehistoric Americans yet unearthed in North America. Whereas up to this time we had been able to go back about 15 centuries in the prehistory of our southwestern United States—through studies of cliff dwellings, pueblo mounds, pit houses and tools—this cave has enabled us to peer back an estimated 250 centuries. Each layer of deposit on its floor held an abundance of

**Modern archeologists, searching for secrets hidden in antiquity, discovered a gold mine of ancient history in this deserted cave in the side of an Arizona hill**

Hundreds of cubic yards of powder-dry soil had to be hauled outside the cave for screening because of the resultant dust





Left, view of cave entrance. Worker hauls soil in wheelbarrow from cave to screens. Above, an amulet string found with mummy contains sea shells, wooden nose plug and arrowheads. Top, the bowl of a stone pipe used for ritual smoking about 1100 A.D.

information, as if filed there for reference in drawers already labeled:

1948	to 1400	A.D.
1400	to 1	A.D.
1 A.D.	to 3000	B.C.
3000	to 8000	B.C.
8000	to 10,000	B.C.
10,000	to 25,000	(?) B.C.

These so-called drawers contained utensils, weapons, tools, clothing and ornaments, as well as bones and mummies.

As Doctor Haury entered the cave, the walls immediately caught his eye: starting about 10 feet up, mud daubs had been thrown all over them. He stood on a rock to chip one off, then grunted in surprise as a piece of ancient cloth tumbled out of the mud. Then with his archeologist's pick he began to dig in the dirt floor. After a few strokes he had gathered an arrow point and a piece of decorated pottery. Now he went at it hard; the floor was pay dirt at almost every stroke!

Twilight drove him back to his car, and in the vastness of the desert he cast about for a landmark. A few miles away he saw

a spot of turquoise sky through another cliff. "That's Ventana," he murmured; an Indian had told him of it. It was truly a "window" (Spanish *ventana*) high up. It would locate the cave, and serve also to name it—Ventana Cave. He hurried back to Tucson, 110 miles away.

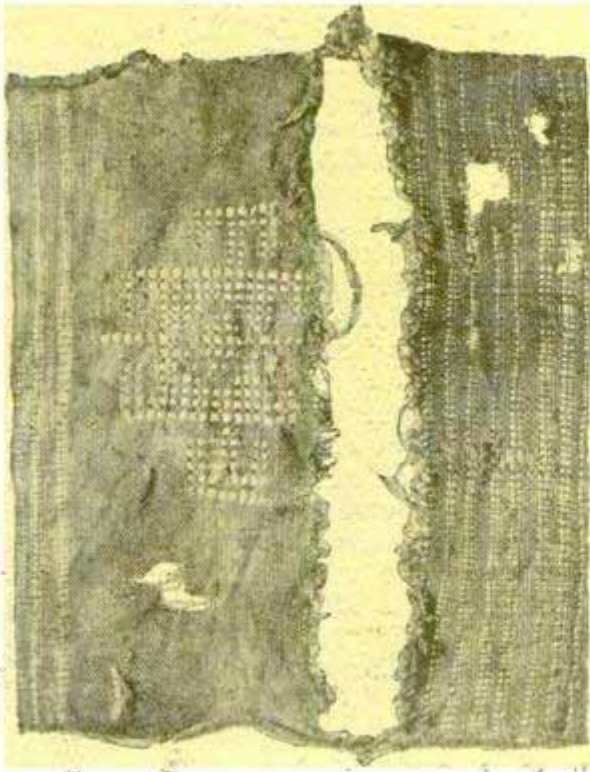
Doctor Haury quietly rounded up his digging crew and returned to the desert. From Ventana Cave they could see blue smoke rising ominously from Papago Indian villages not many miles away. The Papagos had thwarted him once, withdrawing their permission for digging on another site for fear of evil spirits. So he left his camp on a diplomatic mission.

"I am working now in an old cave," he said to the Papagos, "and I need help. May I hire some of your strongest boys to do shoveling and push wheelbarrows? I will pay them well."

The Doctor carefully chose his boys from influential families. This vested interest in the project, he hoped, would give the Indians a sense of proprietorship.

For a while his trained university stu-





**This ragged piece of loosely woven cotton cloth was once used by the inhabitants of Ventana Cave. It was unearthed in the 1200 A.D. stratum and is still in fairly good condition, thanks to the dry Arizona atmosphere. Notice the intricate design which was woven into the primitive garment**

dents concentrated on screening the soil that the Indians removed. Haury himself had to commute to teach classes, but he left a competent foreman in charge. One day he had a long-distance call.

"Everything is fine," his foreman began cagily. "The Papago boys are good workers, and there's a very efficient Papago girl now serving as switchboard operator for this district."

"Excellent!" Doctor Haury was alert.

"I merely called to report that we found five objects today."

"Objects? I'll come at once."

Haury drove the 110 miles at breakneck speed. There, a few feet under the cave's topsoil, were five human mummies. Bones of men are common; well-preserved mummies are rare. These showed hints of antedating any others ever found in the Southwest. But the Papagos might claim them as sacred ancestors. The Indian workers would surely convey news of the discovery to rugged old Pia Machita, the Papago chieftain, who had the power to stop all work. In anticipation of just such

a moment, Doctor Haury had been doing some quiet investigation.

He had learned that Pia Machita had "acted up" and been sent to prison a while back, but that whites had helped salvage his dignity by getting the sentence shortened. A reciprocal courtesy to the whites would be in order now.

Haury went to the village and tactfully laid those facts before the native councilors. They nodded agreement, yet they had to save face. "The Thunder God," they informed the scientist, "lives in that cave. If you dig there you will release him."

But the professor was ready for this one. "Let him be released," said he. "Are you more cowardly than white men? The thunder, my friends, is only the noise of the storm. You have seen the Lightning God strike with great damage. But the Thunder God is merely a comical old man pounding a huge tom-tom."

Such logic convinced the red folk. Excavation at Ventana could proceed.

When first hint of the mummies had been revealed, the diggers put picks and shovels aside and began work with trowels, paintbrushes, nutpicks and tiny hand syringes, removing the soil almost grain by grain. Around the mummies were found exquisite pieces of pottery, stone implements, arrow points, pieces of clothing and even remains of food.

No spoon of sand was left unscreened from this point on; 700 cubic yards of earth were put through quarter-inch mesh so that no revealing item might escape notice. Indian guests came now, to look on. Haury tried, through interpreters, to explain each step to them, and also to convey some idea of a scientist's ideals.

Strange bones were uncovered from time to time. One set turned out to be a dog about 6000 years old, the oldest evidence of a domesticated dog in America. Technical studies showed it to be a true dog, not derived from any local wild strain. Teeth, for instance, showed details of crushing surfaces, cusps and cingula differing from those of coyotes and wolves.

One noon the students announced to Doctor Haury, "We have found a horse."

"Well, there's a meat shortage," said he, dryly. He knew they were down far beyond the days of the Spaniards, who brought the first horses to this continent. He also knew that students eternally try to pull a professor's leg; he had gotten even with them once by molding and firing a "prehistoric mustache cup" and burying it for them to unearth.

But they did have the teeth of a horse as large as an Indian pony. Students of our antiquity have long told us that our only native horse was a diminutive species, the

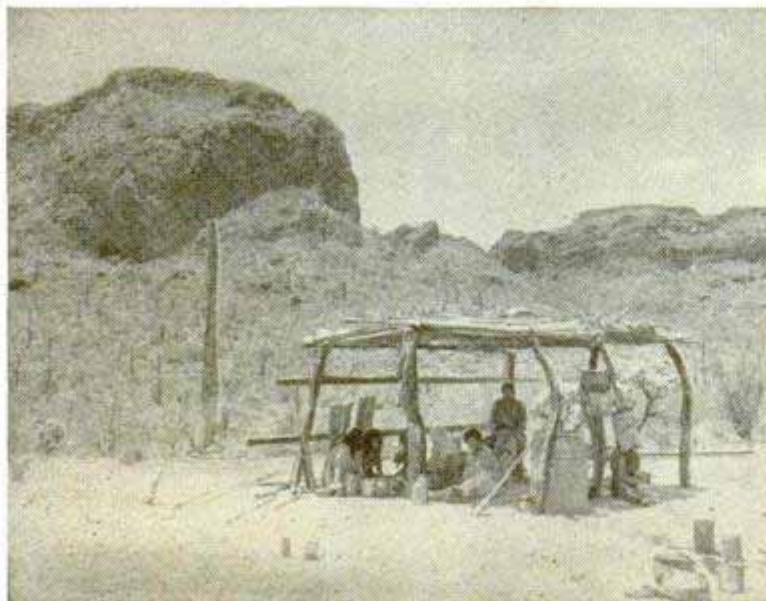


Inside the cave, workmen shovel away the accumulation of the centuries and haul it outside where it is carefully screened



Above, removing the deepest consolidated layer which produced the fossil fauna and the oldest cultural evidence in the cave

Descendants of the Papago Indians who used the cave for many centuries now live under this primitive shelter in the vicinity



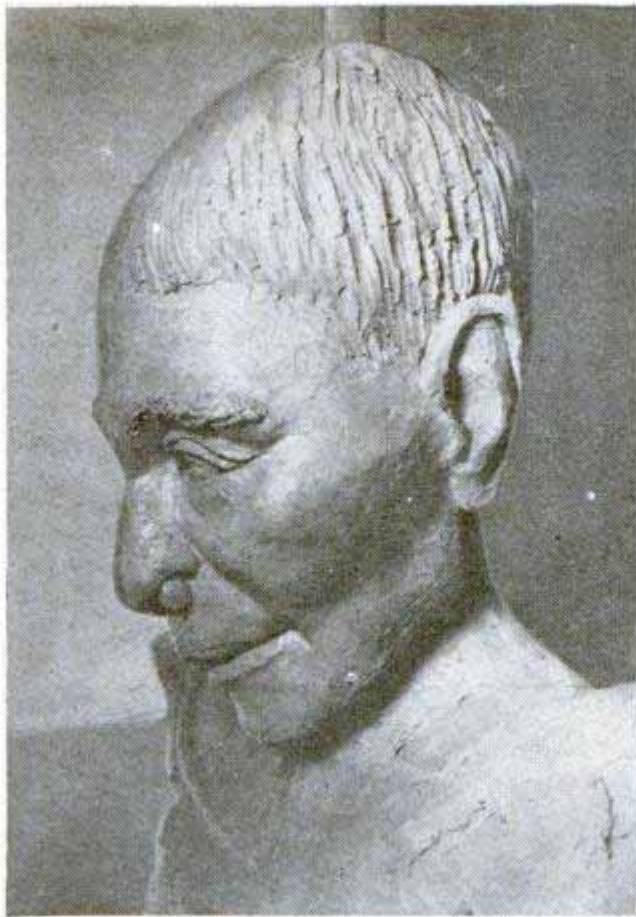
size of a lamb. This Ventana specimen, says Haury, definitely establishes the fact that a full-sized species had evolved in America long before the time of Christ. It had marked technical differences from the horses of Asia and why the species disappeared is anybody's guess.

One university student came upon the strong, sharp teeth of a jaguar, long extinct. They were in the stratum or "file drawer" labeled 8000 to 10,000 B.C. The creature may have made his lair in Ventana during some brief period when men did not live there.

In that oldest stratum, stretching back to a hazy 25,000 B.C., were found proofs that climate in the Southwest was very different from the arid environment today. Students found skeletal parts of a bison now extinct and much larger than our modern "buffalo" (which is actually a bison). There, too, were parts of a tapir, of a four-horned antelope, and of a sloth, all strangers to our Southwest. "These were succulent eaters which could never have survived in a desert. Unquestionably the region had much more moisture then than now," says Haury.

Full exploration of Ventana and correlation of findings has taken years. Time was needed for other scientists to lend their specialized knowledge before official announcement of the project could be made. The human skeletons and mummies had to be cleaned for X-ray studies. Plates were sent to Dr. Joseph Aronson at the University of Pennsylvania for skilled analysis. He found that our ancients suffered from arthritis as much as we do. Mummy tissue was sent to the Arizona State Department of Health where experts typed the blood that had flowed through the ancient veins. Of ten tests run, nine showed the blood to be Type O, one Type AB. This is almost exactly the same proportion of the two types as found in Papago Indians today.

In time, Haury made further study of those mud daubs that he had discovered when first entering the cave. Nearly 30,000 had been thrown on walls and ceiling. They ranged from walnuts to baseballs in size. Each had a



Right, Ventana mummy poses while sculptor works on clay bust of the ancient Indian. Left, the finished bust

piece of cloth inside it and some had a feather stuck on the outside. Many obviously had hardened there for centuries, and the cloth in them was ancient, but cloth in others was modern, indicating that the Papagos had added to the collection. Haury tried without success to learn the meaning of the daubs from the Papagos. The daubs are still a mystery.

Sheer abundance of findings, extending over so many centuries, makes Ventana Cave the most important single archeological ruin ever excavated in America, Doctor Haury feels.

"Heretofore we have had piecemeal facts from many different ruins," says he. "Ventana offers us a registration of the people in a cave open for century after century. We know that our Ventanans had lives similar to the so-called Folsom man, a few of whose artifacts were found near Folsom, N. Mex., in 1925. Our findings can vastly expand the conjectural possibilities there.

"From our 'file drawer' of that stone-age period prior to 10,000 B.C. we obtained not only an abundance of animal remains but many weapons and tools. From the very oldest stratum our students brought stone choppers. These were chipped into blades like hatchets or knives, and were useful for hunting game and skinning it. They were held in the fingers, without handles. We found large sea shells, five to

six inches across. These doubtless came by barter or raiding from the Gulf of California, and would have been prized as drinking cups."

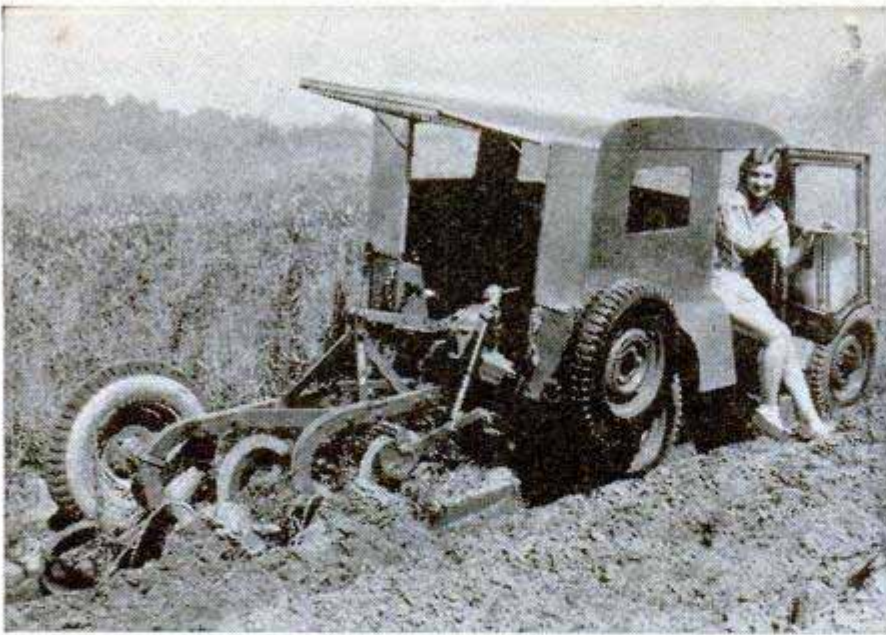
Here were unearthed the first clues of the transition period when man on our continent changed from a culture without pottery to one with it, an epochal advance which occurred about the time Christ was on earth. At Ventana, as elsewhere, pottery became the mark of a sedentary, farming people. It is from such folk that most wisdom has sprung—perhaps because they, not the fierce raiders, found time for meditation.

This storybook cave revealed an exciting stacking—the remains of one culture found on those of earlier cultures. Scientists had thought this occurred in America only during the past few centuries, judging from remains elsewhere. At Ventana, stacks began centuries before Moses' time.

Here, too, was a partial fill-in of the "missing link" renowned in recent southwestern archeology. Ruins in the Mexican-border region already had turned up important facts about our desert folk just prior to the year 1400 A.D. and after 1700. But the period between had been barren. Ventana supplied many tools, pottery, weapons, even human remains, on which technical study of that period could start.

Most fascinating pursuit of the scientists

(Continued to page 264)

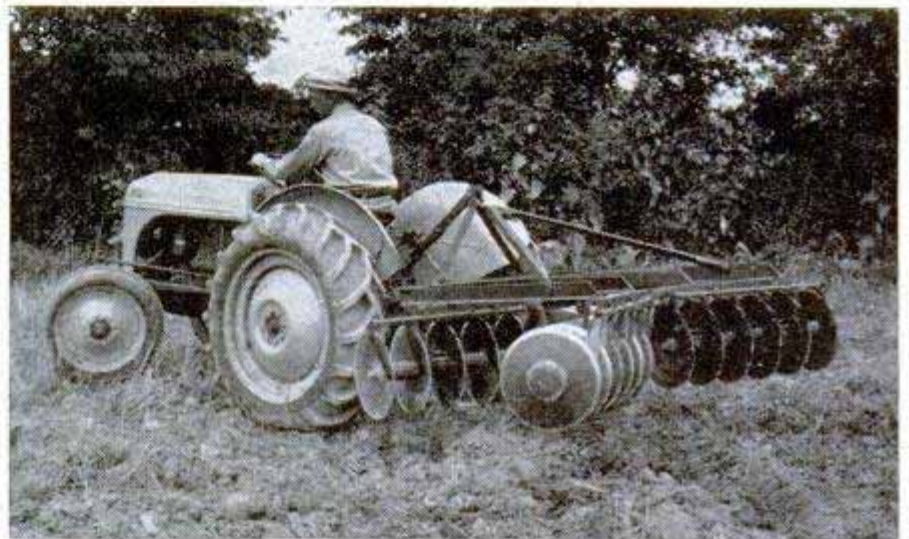


## Cab of Aluminum Fits on Jeep

Installed on a jeep, an aluminum cab protects the driver from the sun in summer and provides a warm cab in the winter. The aluminum shell, which forms a roof and sides for the vehicle, has an insulated lining and is sealed to the jeep body with rubber. The doors can be locked and the door windows raised. A large door at the rear can be swung up for easy access to the rear section of the vehicle.

## Lift-Type Disk

Hydraulic power has solved two farm problems—how to transport a disk harrow and control the depth of its cut. A lift-type tandem disk harrow is attached to the tractor and carried to the field. The depth of the cut is regulated hydraulically or the tractor can lift the harrow completely off the ground. The frame is rigid and the gangs are set at a 20-degree angle.



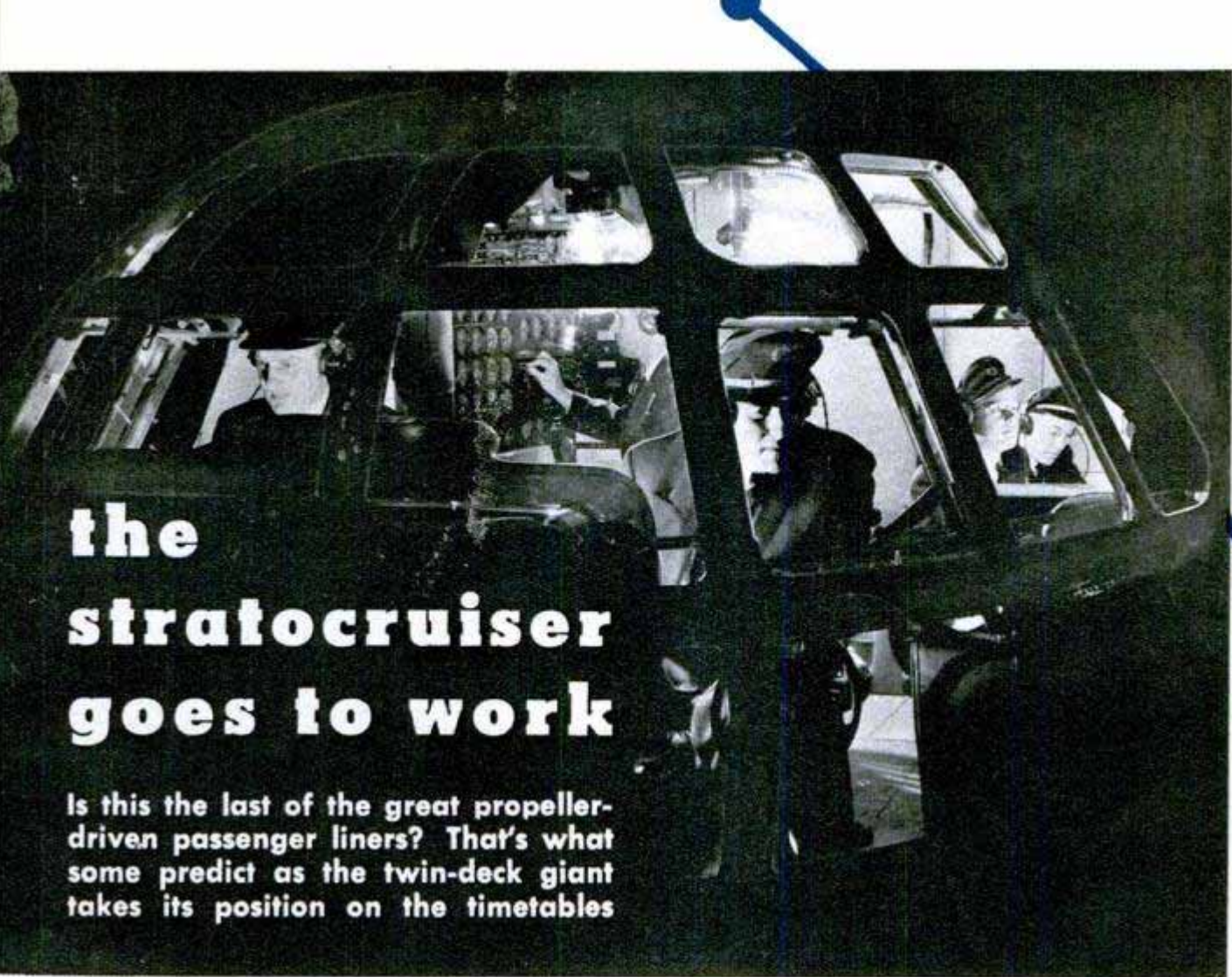
## Radio Operates in Liquid During Tests for Cooling



Engineers of the Air Materiel Command have developed a cooling system for a radio set by immersing it in liquid. They are seeking a way to reduce the size of electronic equipment used in aircraft. Engineers mounted one set in a watertight case and filled the case with Freon refrigerant. The liquid, through its cooling effect, permits components of the radio to be placed closer together without danger of burn-outs or explosions. It also protects the set from atmospheric damage.

## Sound Waves Test Paint By Causing It to Peel

Silent sound seems to be a jack-of-all-trades and its latest job is testing the wearing qualities of paint. A metal sheet, coated with the paint, is vibrated by sound waves too high to be heard. In less than one second, the life expectancy of the paint can be determined from the force of vibration necessary to make it peel.



# the stratocruiser goes to work

Is this the last of the great propeller-driven passenger liners? That's what some predict as the twin-deck giant takes its position on the timetables

**N**EWEST and biggest of the de luxe airliners—the Boeing Stratocruiser that costs 1½ million dollars a copy—goes into regular service this year.

The great 114-passenger double-deckers will cut solid hours from existing schedules. New timetables will read: "New York to London, 11½ hours instead of 14½ hours," and "San Francisco to Honolulu, 8½ hours instead of 12 hours."

Not only is the Stratocruiser the latest conventional airliner, it probably is the last of them. Most engineers agree that the next big passenger planes will be powered by gas turbines and will be either jet propelled or will use the turbines to turn conventional propellers. The Stratocruiser, they think, is the last of the big passenger-carrying planes that will use reciprocating engines.

Lined up in front of a Boeing Stratocruiser is part of the 30 tons it carries into the air. It will accommodate 114 passengers on daytime runs or 27 in "Pullman" berths and 39 in chairs when used as combination sleeper-and-day plane





Berths are seven inches wider than those in standard rail sleeper cars



Spiral stairs, above, join two decks of the giant air carrier. For large families or groups of friends there are spacious staterooms, right, that are made up with divans or couches

Since the plane represents the end of an era from the design standpoint (not from the point of view of the flying public, because the big ships will be the best available for years to come), let's compare it with one of the first planes ever built for airline service.

Twenty years ago a popular airliner was the tri-motored all-metal Ford, whose three engines produced a total of 660 horsepower. Any one of the Stratocruiser's four engines develops more than five times as much.

The Ford carried 12 passengers in a compartment that measured 350 cubic feet. The same number of passengers can sit, with room to spare, in the big Boeing's cocktail lounge alone. The baggage and express compartments of the new plane are twice the volume of the Ford's passenger compartment.

The Ford cruised at 95 miles per hour, two miles an hour slower than the Stratocruiser's landing speed.

The Ford's fuel tanks held 235 gallons of gasoline. The Stratocruiser carries 32 times as much fuel and its drinking-water tanks alone are equal to one third the total fuel capacity of the Ford. The Stratocruiser can fly 4200 miles nonstop, a distance that would require seven intermediate landings for fuel by the earlier airliner.

A passenger on the Ford was deafened by noise, subjected to cold drafts and made uncomfortable by changes in altitude. Stratocruiser passengers never need to raise their voices and they breathe a manufactured atmosphere adjusted to a pleasant summer temperature and humidity. The cabin retains sea-level pressure up to 15,000 feet and is reduced to an apparent altitude of 6000 feet at the 25,000-foot ceiling.

Briefly, the Stratocruiser has a span of 141 feet, is 110 feet long and has a tail that stands 38 feet high. Four Pratt & Whitney Wasp Majors, each with 28 cylinders, individually develop 3500 horsepower for take-off. The loaded plane has a take-off weight of 71 tons and cruises at 340 miles per hour at air levels of up to 25,000 feet. One reached a speed of 498 miles an hour in a dive.

A fleet of 55 Stratocruisers is under construction in Seattle for Pan American World Airways, American Overseas Airlines, United Air Lines, Northwest Airlines, British Overseas Airways and others. When all deliveries are made, it will be possible for a passenger to fly around the world in less than 70 hours by transfer-





Looking toward rear of main passenger cabin on the upper deck of the 340-mile-an-hour luxury airliner

ring from one Stratocruiser to another.

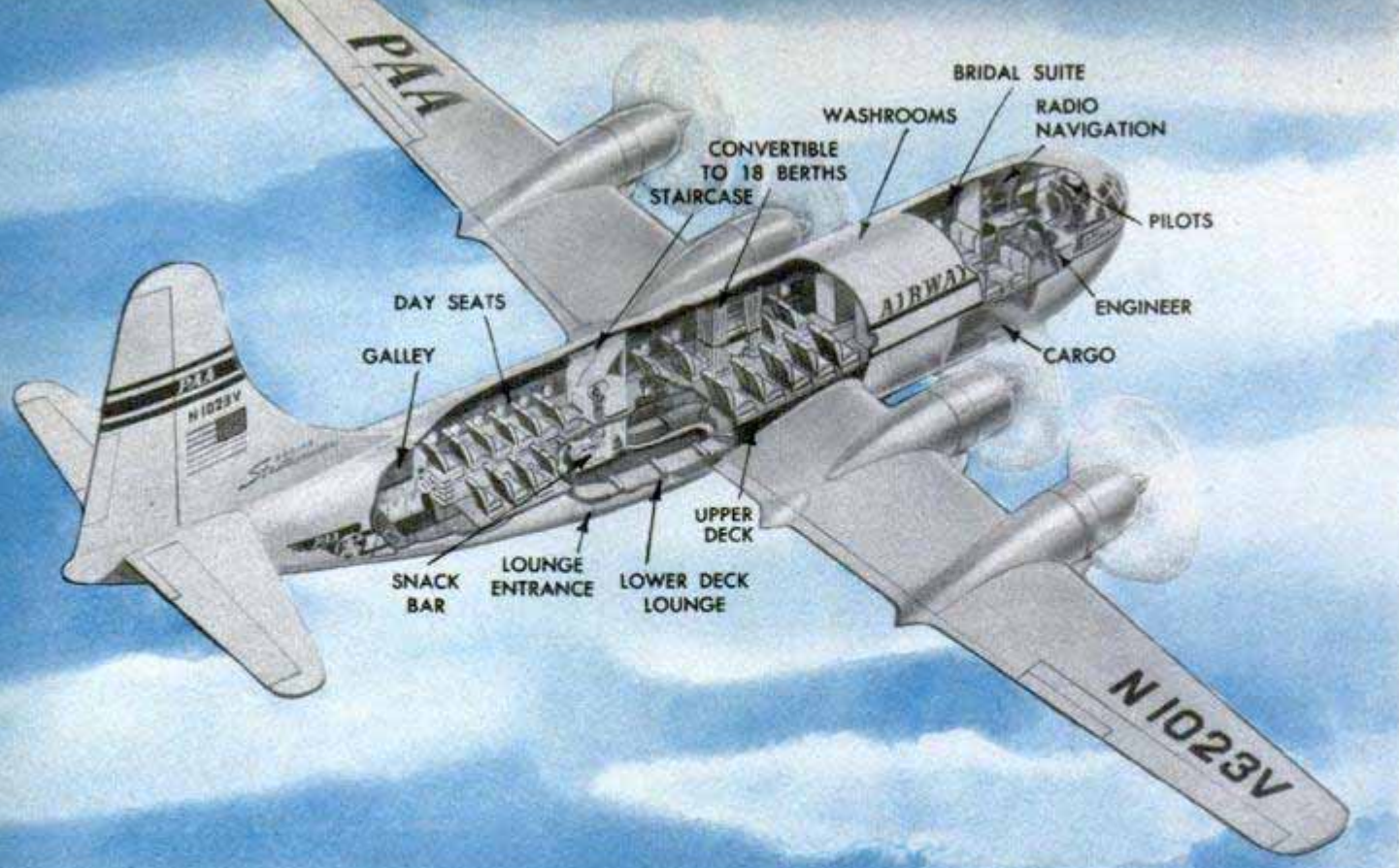
As a day plane, the big carrier seats up to 114 passengers; as a combination day-and-sleeper plane it carries 25 chair passengers and 27 "Pullman" passengers on the upper deck plus 14 chair passengers in the lower-deck lounge. A spiral stairway

connects the two decks. A stewardess can change a berth-type seat into a bed in one minute. Upper berths fold out from the cabin walls.

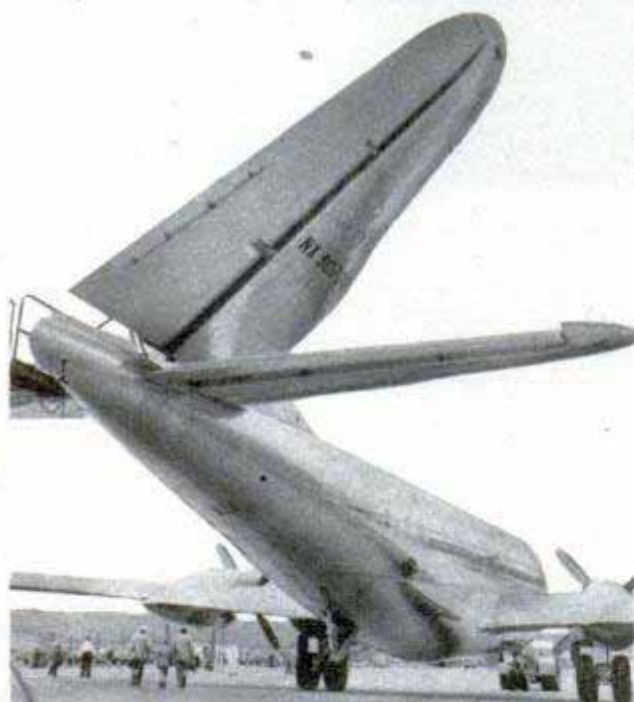
Each seat has an armrest "control panel" that contains a call bell and a switch for the prefocused reading light, ash tray,

Upper and lower berths are curtained off for complete privacy. Right, food is loaded through special door





Cutaway view showing how Pan American World Airways will use two-deck space of the \$1,500,000 transport



Hinged tail, above, allows big Boeing ship clearance getting through hangar doors. Upright, the rudder tip is 38 feet high. Below, large metal containers at left in galley hold fruit juices and hot soups



an "occupied" sign, seat number, reclining-back adjustment and a receptacle into which may be fitted the dining-tray leg.

The plane has an extra-large galley with its own side hatch so that food and supplies may be loaded or unloaded from the galley without being hauled through the passenger compartment. Commodious dressing rooms for men and women are provided. The crew, which may number up to eight, has its own toilet facilities in the control compartment.

Interior decoration was given considerable attention because a passenger's surroundings can contribute to travel sickness and fatigue or actually reduce them, depending on the colors and patterns used. Clashing colors and "busy" designs were ruled out. The basic color system employs dark colors at floor and seat level with light "high value" colors on the walls and ceiling. This treatment adds to the illusion of spaciousness and prevents eye fatigue when shifting the gaze from inside the plane to the outside. This is important because the Stratocruisers will normally fly above the clouds in constant sunshine during daytime hours.

Stratocruisers destined for different routes are given individualistic cabin color schemes. Planes for the bleak North Pacific run to the Orient are being finished inside with rough-textured fabrics of beige and reddish-brown to help create a feeling of comfortable warmth. Aircraft on the Honolulu run will have tropical interiors featuring bamboo trim. Conservative oak





Fourteen passengers can be seated comfortably in the air-conditioned lounge, situated on the lower deck

Flexwood paneling goes into ships ordered by British Overseas Airways. After testing several color mock-ups, however, it was decided that all control compartments will be the same. They will be finished in medium gray and dark maroon, with black nonreflective paint for instrument panels.

The control compartment has so little resemblance to the cramped cockpits of older transports that pilots are calling it the "pilot's parlor." Normal crew consists of pilot, copilot, flight engineer, radio operator and navigator. Each has a comfortable, roomy chair. Among other innovations are the paneled windows that give exceptional visibility.

The seven windows at eye level are of a new nonicing type and consist of two layers of plate glass separated by a plastic core and by a transparent three-molecule-thick layer of electrically conductive material. Electricity flowing through this layer keeps the window at a frost-and-ice-free temperature. Hot air prevents icing of the other windows.

Even severe icing conditions are no handicap at all to the plane. Leading edges are kept warm by hot air from eight combustion heaters flowing through special wing and tail passages. Even when it is 20 degrees below zero outside it is possible to keep all leading edges at 80 degrees above zero. The four-bladed reverse-pitch electric propellers are protected from ice by resistance heating elements running lengthwise in each blade.

With the exception of the hydraulic rudder-control system, the Stratocruiser is

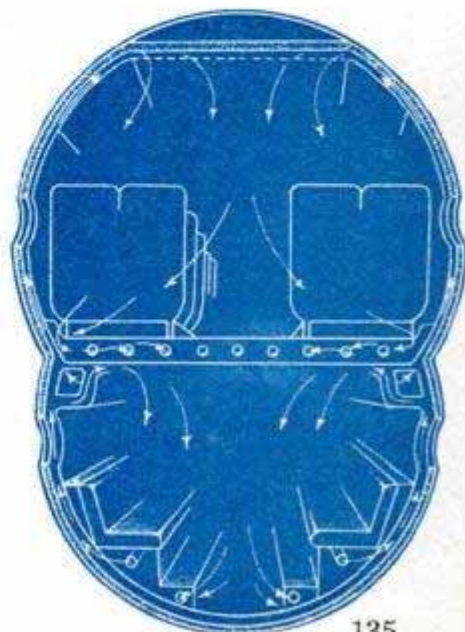
virtually an electric airplane. Its six 28-volt d.c. generators create enough power to serve the domestic needs of a 114-home community.

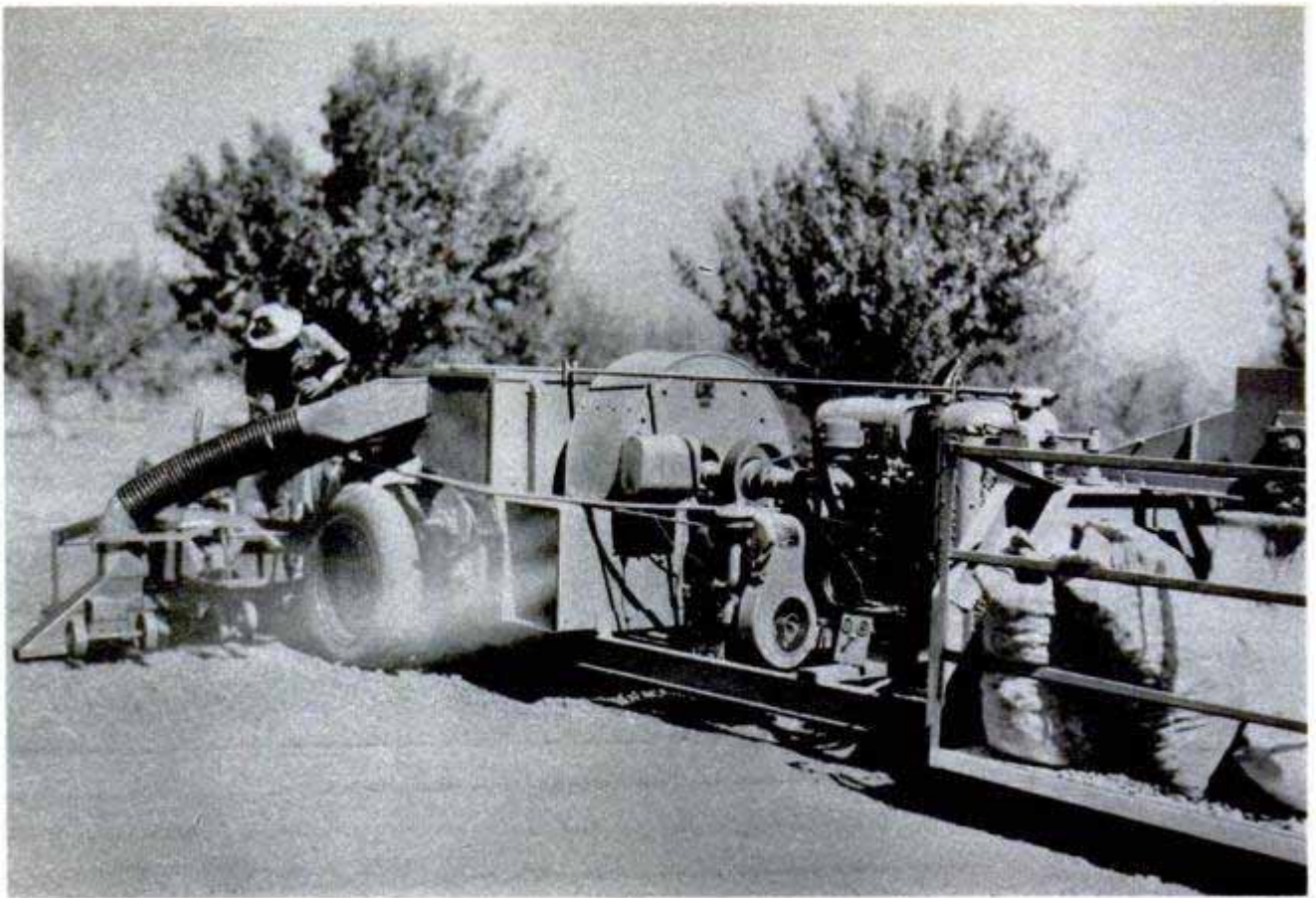
There are 119 motors and 411 lights on the plane, 482 switches and 10 miles of wiring. Power demands range from the 616 amperes required for raising or lowering the landing gear to  $\frac{1}{100}$  ampere for burning a tiny compass light located in the control compartment. Two alternators and five inverters are used to supply current of the types needed, including 110-volt a.c. for electric shavers.

The multitude of lights on the plane includes a 50-watt spotlight in the nose-wheel

(Continued to page 244)

Cross-section view of a Stratocruiser showing paths of air flow inside two decks. At 15,000-foot altitude, the passenger cabins still maintain their pressure at sea level





## Almond Harvester

Latest method of harvesting almonds is to sweep them up with a vacuum cleaner. The idea first was applied to a clover-seed harvester and then was adapted to a filbert

picker and an almond harvester. The heart of the machine is a reverse fan which sucks the almonds up a tube. The big vacuum cleaner has worked so well that ranchers say almost all almonds will be harvested by this method within a year.



## "Scarecrows" Frighten Coyotes

Sheep ranchers on the western plains are erecting coyote "scarecrows" to protect their flocks. They are made of sacking or other old cloth fastened to a wooden cross-bar. The flutter of the cloth frightens the coyotes. As many as a dozen of these scarecrows have been erected within a quarter-mile square.

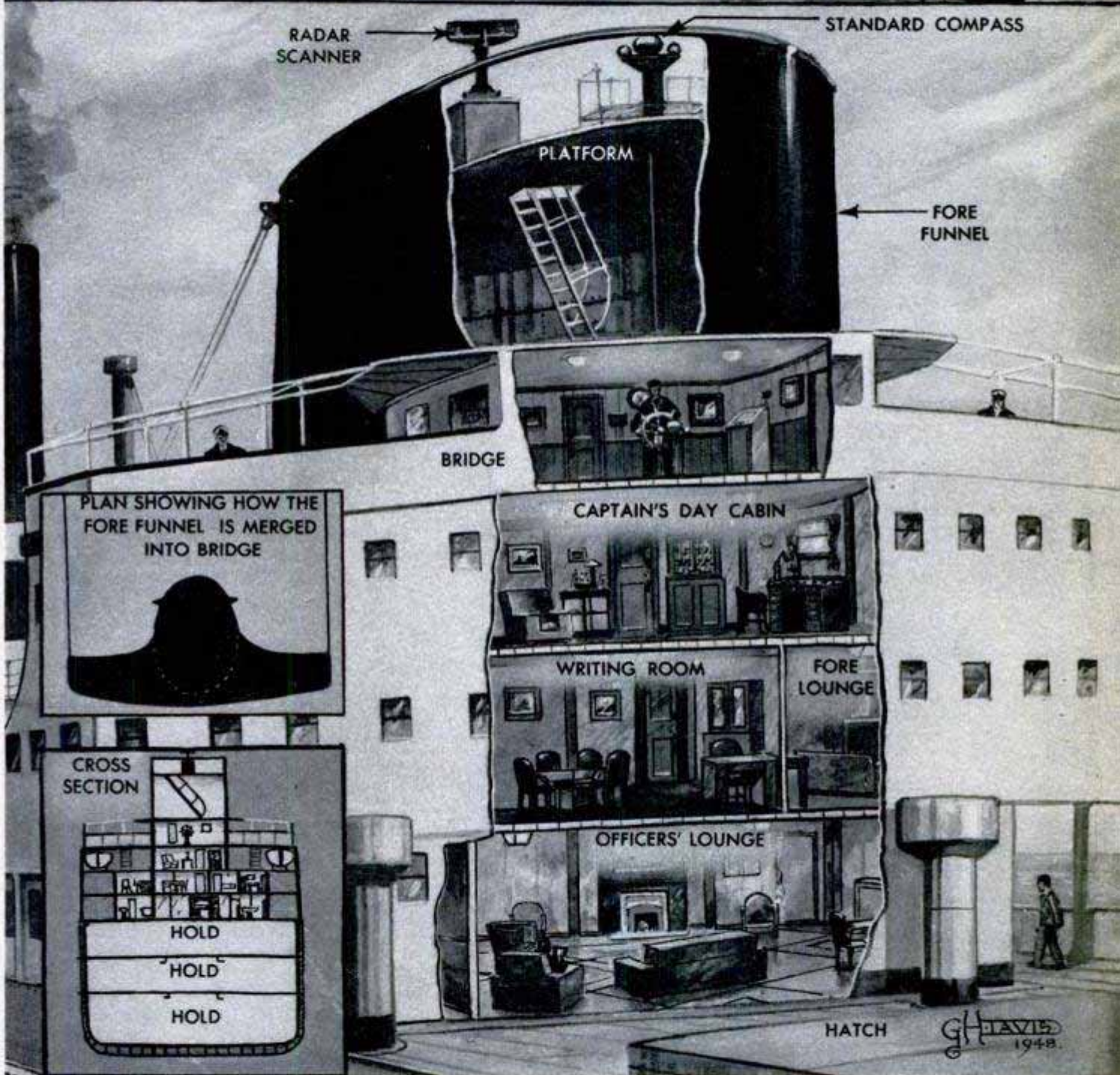


## Crankcase-Oil Tester Shows Up Dirt

Filling-station attendants can show motorists when their oil is dirty enough to need changing by means of an illuminated disk that compares clean oil samples with oil from the crankcase. The disk contains two samples of clean oil. Oil from the dipstick is dropped into a third cavity. A flashlight behind the plastic disk illuminates the oil to disclose any harmful sludge or gritty particles.



FORWARD FUNNEL OF THE SILVERBRIAR CONTAINS WHEELHOUSE, PASSENGER AND OFFICERS' QUARTERS



## SHIPS HAVE CABINS IN FUNNEL

No smoke rolls out of the forward funnel of two cargo liners built in England, the Silverbriar and the Silverplane. The stack is unnecessary but has been preserved for appearance. Inside the funnel are the wheelhouse, captain's cabin and a luxuri-

ous officers' lounge. Other features of the "new look" ships are well-fitted cabins and recreation rooms for the crews, and passenger rooms paneled in leather. Each of the ships is 10,700 tons, dead weight, and has geared turbines for propulsion.



Off Point Barrow, the starting point of the 300-mile trip to Barter, the two LSTs stand by as the icebreaker in distance breaks up the 12-foot ice

# OPERATION ICICLE

Bulldozer at Barter Island forms this gravel approach to the open bow doors of the LST to speed unloading of cargo during the brief period of open water



**O**NCE A YEAR the 62 officers and men of the U. S. Air Force outpost on Barter Island in the Arctic Ocean, only 1100 miles from the North Pole, anxiously watch the horizon for the first sign of the yearly supply boats. The island is isolated by solid ice 11½ months of the year, but in August the ice breaks up enough for supply ships to get through.

Last summer two LSTs proved their ruggedness by making the 600-mile round trip from Point Barrow behind the thick-skinned icebreaker Burton Island. Since Barter Island is open to shipping only a few days each year, speed in unloading cargo is essential. The gaping bow opening of the LST makes this craft an ideal ship for the run.

However, the LST was designed as an expendable, thin-skinned vessel. Steel reinforcements were added for the Arctic trip. Despite this precaution the ships came back looking like battle casualties. Propellers were bent, holes were gouged in the bow doors and side plates were buckled. The voyage proved that LSTs could make the run, unload and get away before the ice closed in.

Two helicopters, stationed on the icebreaker, maintained reconnaissance 20 miles ahead of the slow-moving procession. After six days of sliding between ice floes, the ships arrived at Barter and unloaded 40,000 tons of supplies—enough to maintain the communications detachment until the ice breaks again.



Loaded with supplies for the Air Force detachment, an amtrack goes ashore at Barter after a six-day trip through ice floes



As ships near land, the helicopter comes down on the deckload of lumber on one of the LSTs. Helicopters maintained reconnaissance 20 miles ahead of ships during trip. Below, heavily loaded LST, foreground, waits for icebreaker to clear channel





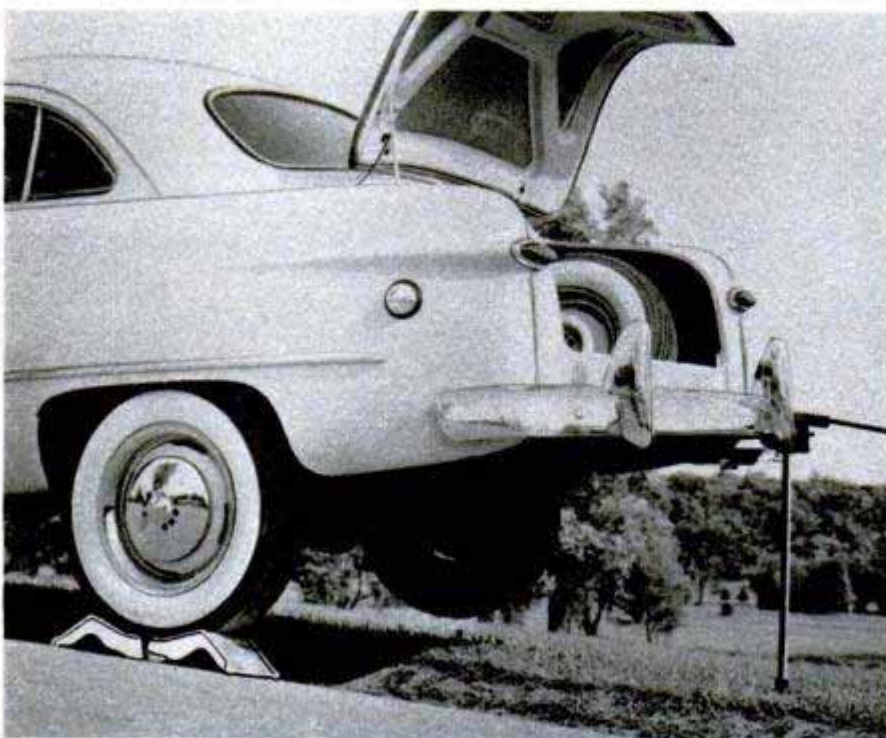
### Full-View Golf Bag

All the clubs are in full view in a new golf bag made of aluminum and plastic instead of leather. The bag holds 12 clubs with each shaft locked in place. A trigger mechanism releases the individual club. The bag prevents clubs from being damaged by striking against each other. One compartment in the plastic base holds balls and tees and another has room for a sweater, shirt or light raincoat.



### Drinking Fountain for Children

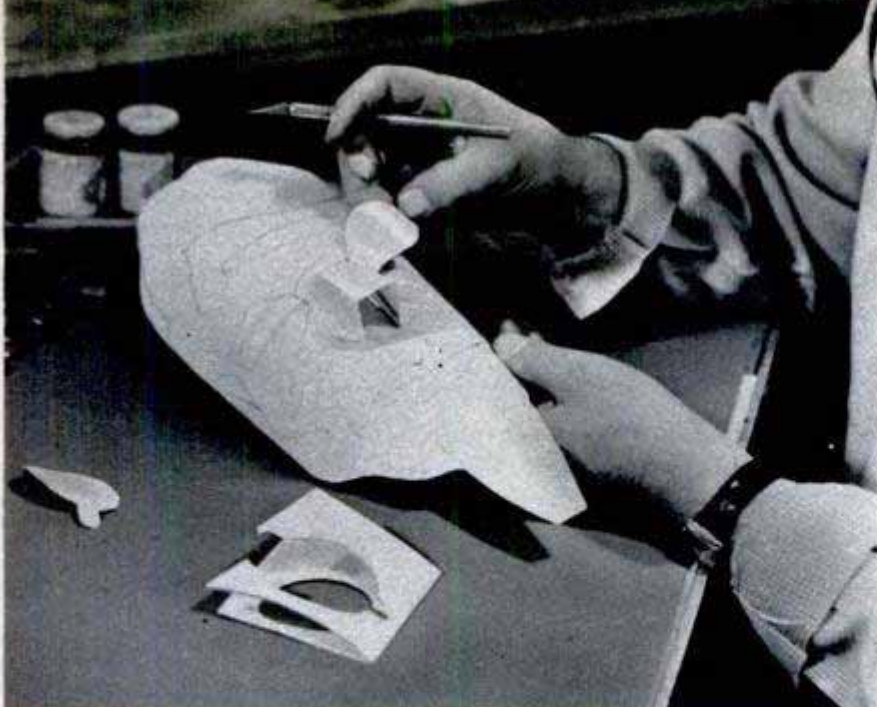
You won't have to lift your youngster up when he wants a drink of cold water if the fountain has a children's bubbler mounted at a lower level. The extra bubbler can be mounted on either side of the fountain or, if desired, in a separate location up to 20 feet away. The recommended height is 30 inches. The combined units will provide enough cold water to quench the thirst of more than 70 people an hour.



### Wheel-Block "Cradle" Folds for Storage

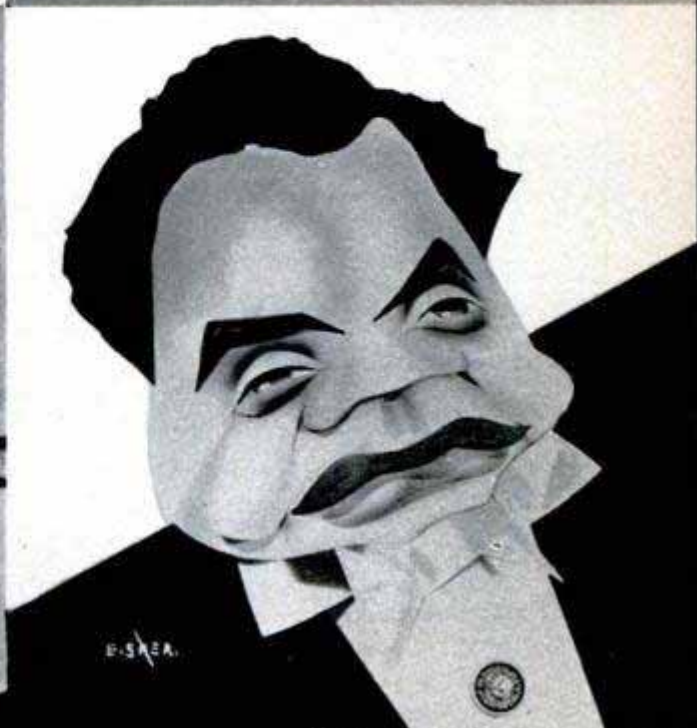
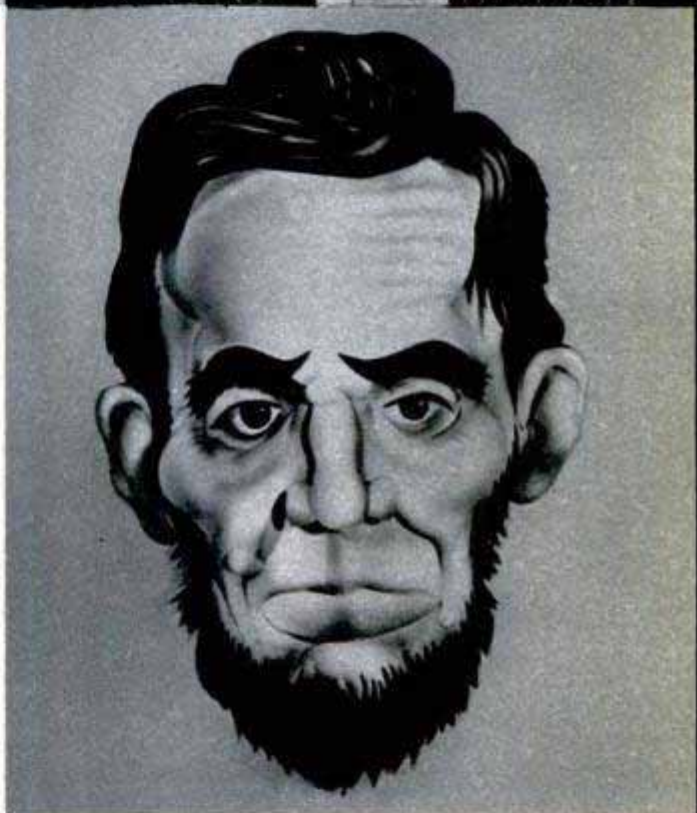
Your car won't roll off the jack right in the middle of a tire-changing operation when it's held immobile by a folding block that prevents movement in either direction. With one wheel rolled into the cast-aluminum "cradle," the car can't move even when a bumper jack is used. Hinged in the middle, the block folds for storage in the trunk.

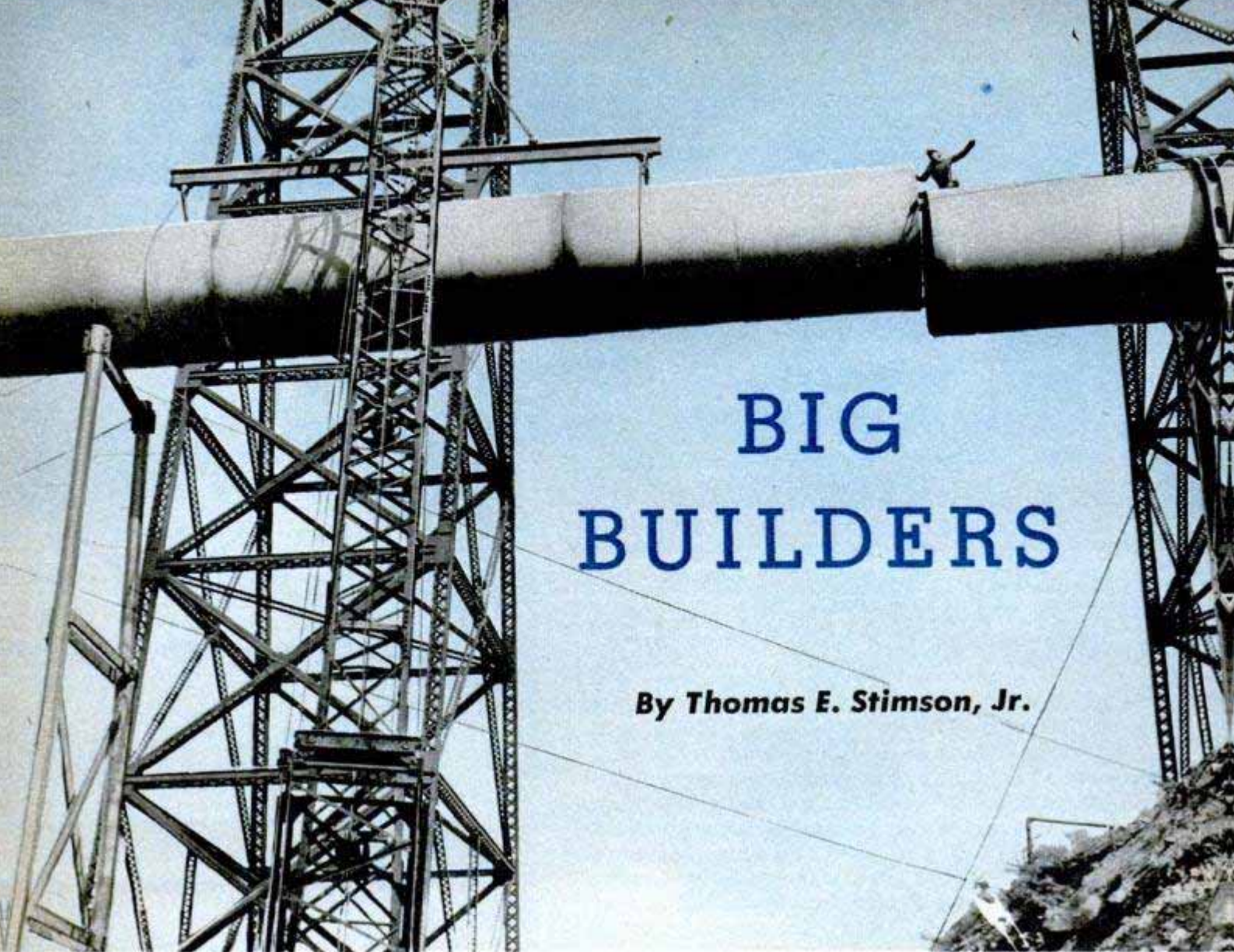
☐ Chiggerproof cloth, developed by the Department of Agriculture, has remained deadly to chiggers after seven washings.



## PAPER PERSONALITIES

JACK EISNER, New York toy and game designer, makes caricatures of famous persons out of twisted pieces of paper and such odd accessories as ping-pong balls for muscles, pearls for eyes, pipe cleaners for mustaches, small wood balls for noses (such as is worn in the Thomas E. Dewey caricature, top right), bits of wire and scraps of wood. His working tools are shears, sharp knives, cellulose cement and an airbrush for coloring. Lincoln's dark hair and beard (right) are products of the airbrush. Eisner is shown using the airbrush below to bring color to the eyes of his caricature of Uncle Sam. The airbrush also made Uncle Sam's wrinkles. Eisner first sketches an outline of his subject, then cuts out separate features and pastes them (top left) in position. Sometimes he mixes the materials. The hair of Edward G. Robinson, movie tough guy (lower right) was made of part paper, part cord. The "ruby" stickpin is a red reflector button.





# BIG BUILDERS

By Thomas E. Stimson, Jr.

Two sections of eight-foot pipe slip into place. Giant pipe line will carry irrigation water across a canyon

**H**ELP WANTED — *Young engineers, draftsmen, welders, mechanics, to work in Afghanistan, Alaska, Brazil, China. Top wages, room and board. Transportation furnished.*

That's a composite of the advertisements recently carried in some newspapers. American contracting companies are busy around the globe, putting up dams and bridges and laying out roads and pipe lines

that will help raise foreign standards of living to the levels we know. Yankee construction engineers are the great builders of the century.

Today thousands of young Americans, living in temporary construction towns in the Middle East, are erecting big oil refineries and digging in pipe lines. In Afghanistan they are creating reservoirs and irrigation systems that will make that country blossom. Recently in Brazil, while relocating a railroad that will tap a mountain of metallic iron, they fought "phantom swamps" that seemed to have no bottom, swamps that swallowed entire trainloads of roadbed material. They are building or preparing to build great concrete dams in India and China and they are erecting modern steel bridges across rivers that never were tamed before.

Up in Alaska they are reconstructing the world's most northerly railroad that runs from Seward to Fairbanks, and in Mexico they are draining swamps and

No eight-hour shift for an M-K pavement roller. Fitted with two giant floodlights, it works around the clock



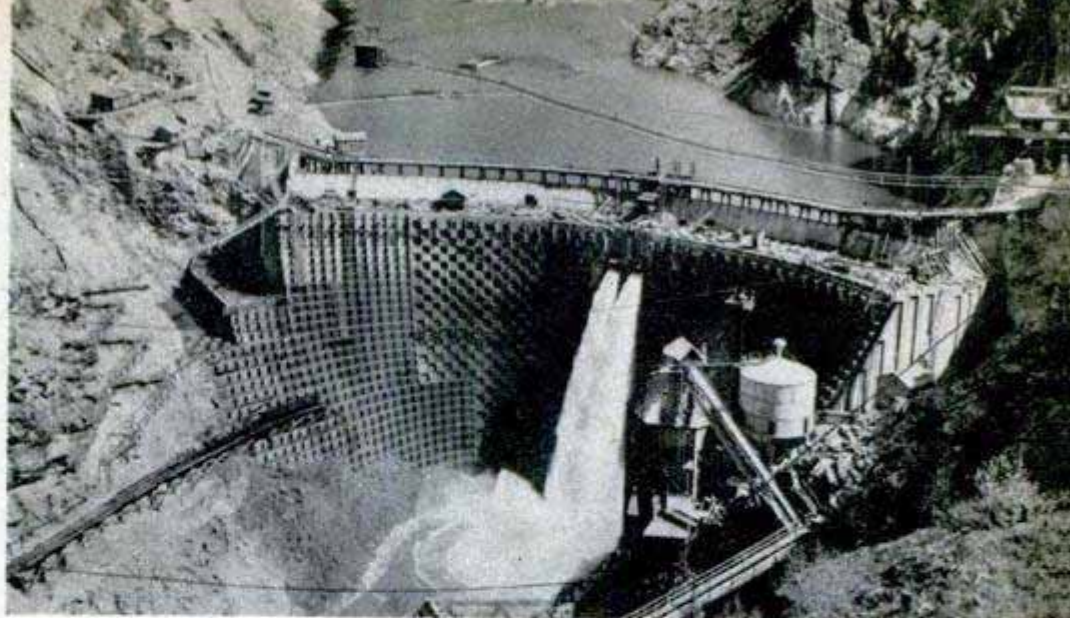


building high schools. In the Philippines, in Iran, in Venezuela, they are on the job.

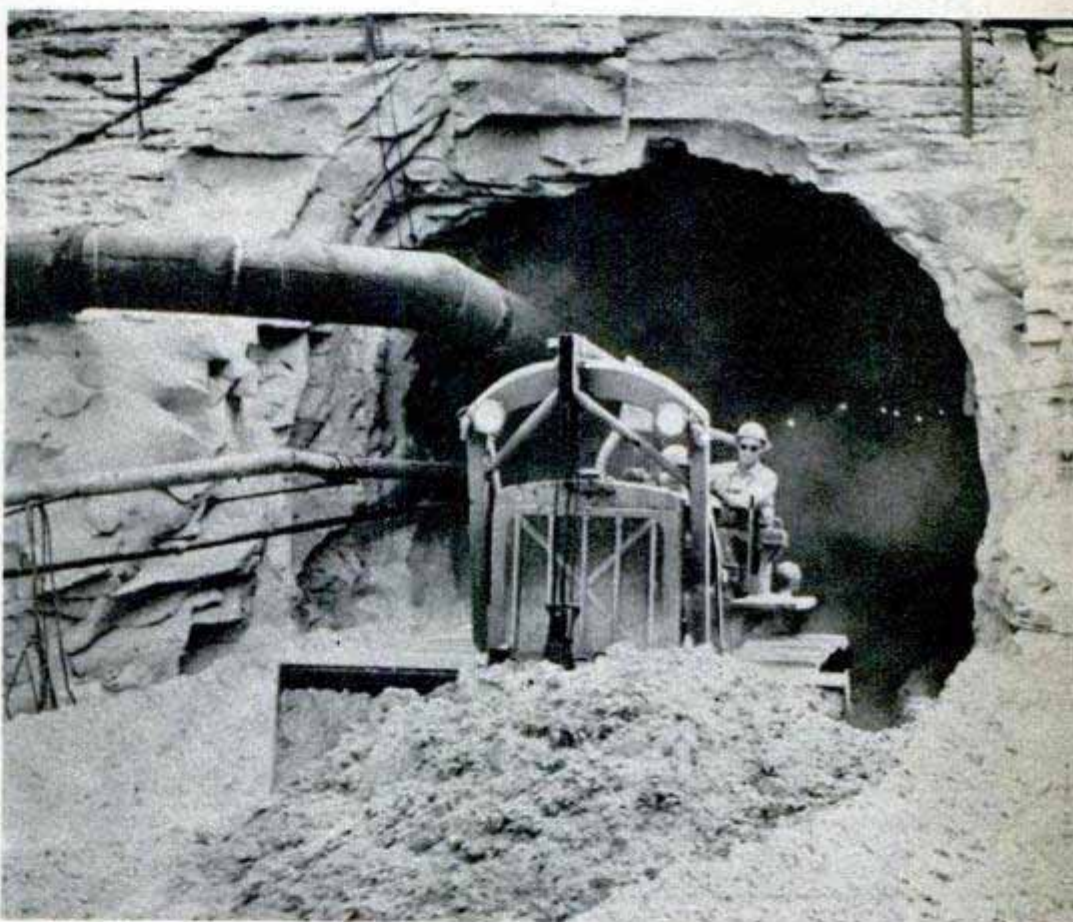
It's no trick to build anything if there's no limit on time or money. That's the way the pyramids were built. The American specialty is to guarantee that a project—no matter how big—will be completed according to plans and specifications on a certain date for a certain amount of money. Often the American invents big machines to do much of the work, or devises unique construction methods to fit the job. Then he enters a bid that is so low his competitors are amazed.

Modern king-sized construction methods really got their start in 1931 when Harry W. Morrison, an Idaho contractor who specialized in railroad construction, realized that no one man or organization had the know-how or money to handle some of the stupendous projects that were being planned.

The Bureau of Reclamation was asking for bids on Hoover Dam and Morrison, like a lot of other contractors, wanted a crack at it. The job was too big for any one company he knew so he brought together a group including Henry Kaiser,

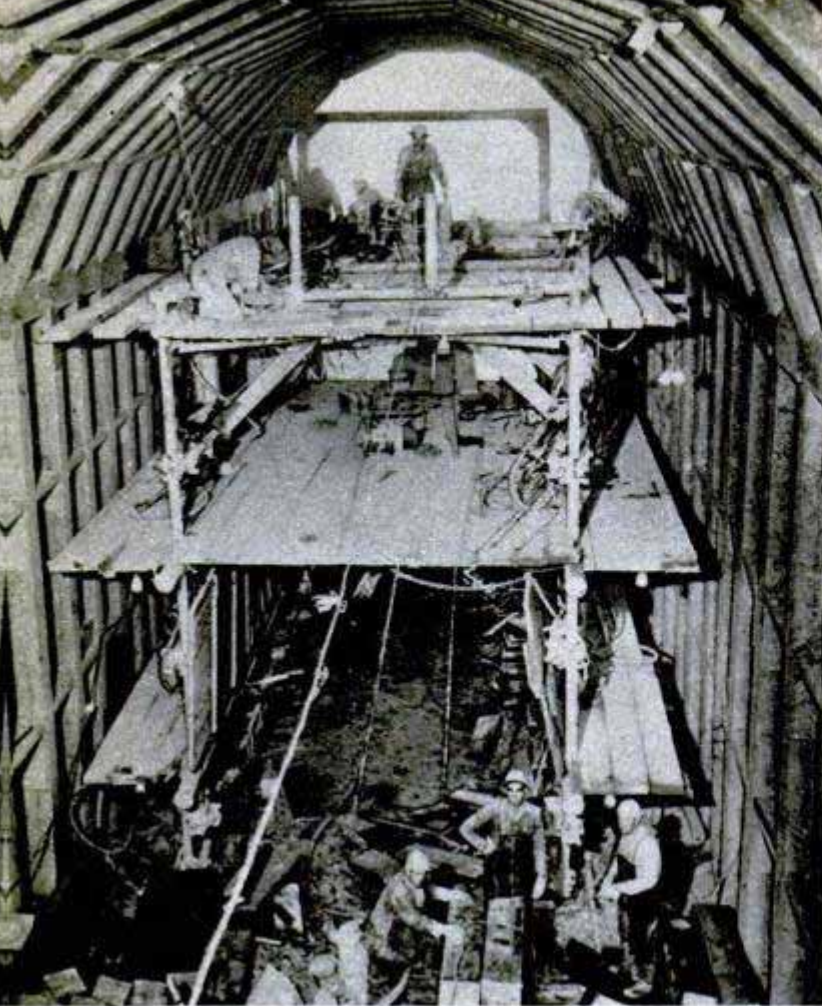


Designers must look into future. Waffled face of 540-foot Ross Dam, built by M-K Company in Washington, will be concrete bond if dam is enlarged



† Bulldozer pushes earth from a long tunnel which will hold fortifications designed to test the Army's experimental bombs and guided missiles

↓ Stretching beyond the horizon is the Southern Pacific's 12-mile trestle across Great Salt Lake. M-K Company rebuilt it with new piles 140 feet long



M-K "molemen" work from a three-story scaffold in setting timbers for a tunnel through a mountain. Below, five-mile freeway under construction along ocean near 'Frisco will cost a million dollars a mile

W. A. Bechtel, McDonald & Kahn, The Utah Construction Company and the Morrison-Knudsen Company. Calling itself Six Companies, Inc., the group made a successful bid on Hoover and built it in record time, then went on to handle Bonneville Dam, part of Grand Coulee Dam, and a portion of the San Francisco Bay bridge. The four construction contracts totaled 118 million dollars.

The Six Companies created the modern formula for successful large-scale construction: assemble a group of concerns, each of which is skilled in a particular branch of construction, and then let each use its talents on a particular part of the job. The group is temporary, united possibly for the one big job. Often some of its members participate in other alliances at the same time and compete against each other for other contracts.

Morrison's knack in dovetailing just the right companies into construction groups has helped make the Morrison-Knudsen Company one of the greatest, if not actually the greatest, construction outfits in history. Today the company's headquarters in Boise, Idaho, supervises construction on a worldwide basis. Instead of performing one job at a time, it often has scores under way simultaneously. To keep track of all these projects, the company publishes a



new "directory of operations" every 30 days. On some projects it acts as prime contractor, on others it engages on a joint-venture basis with other contractors, on still others it may operate as part owner of the company that is to do the work.

This complicated setup helps the company maintain a large volume of work, which in turn allows it to send experts in tunneling or hard-rock blasting, for example, to the particular jobs that need their special talents. Too, it helps keep large, expensive units of equipment busy all the time.

In all, Morrison-Knudsen's record of performance approaches two billion dollars. Aside from a dozen or so power lines, canals, tunnels and railroad contracts that look like small change by comparison, the company today is engaged on a joint-venture basis in about a dozen major projects.

One of these is the 43-million-dollar Hungry Horse Dam in Montana; another is the 22-million-dollar Bull Shoals Dam on the White River in Arkansas; a third consists of miscellaneous Pacific Ocean operations that include huge military construction on Guam, a project that by itself has employed as many as 6500 men at one time. It was an M-K construction crew of 1254 men, incidentally, that was marooned at Wake Island at the start of the

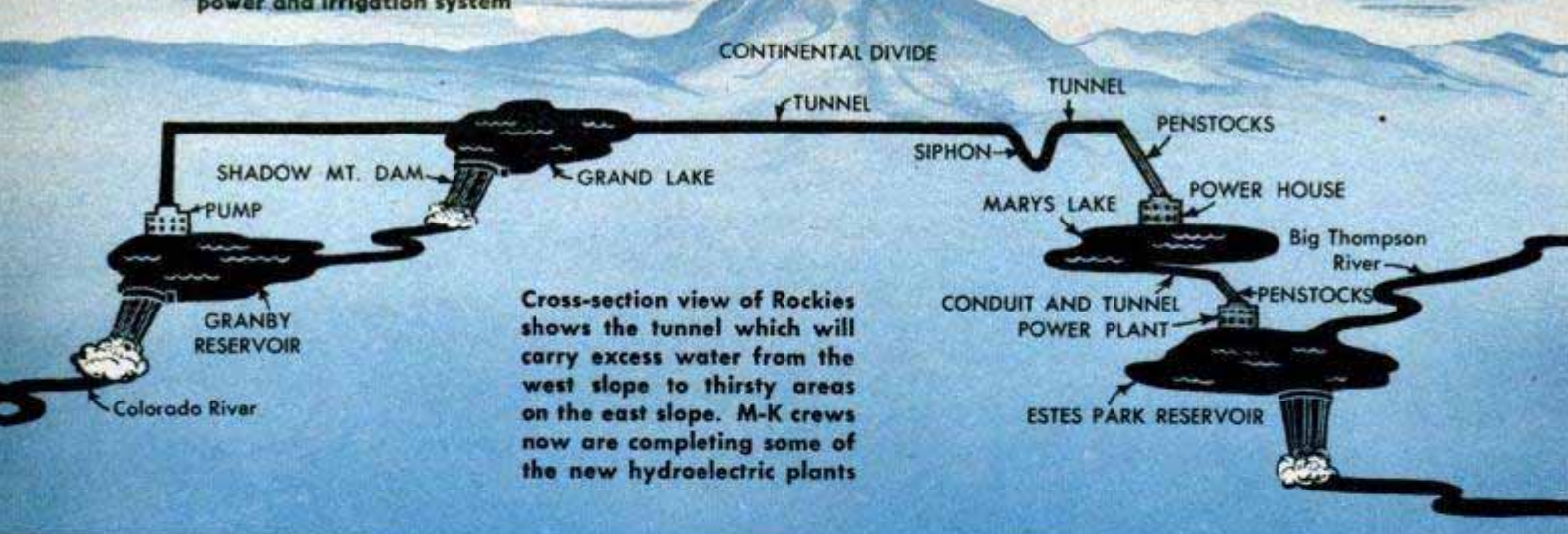


M-K plane at Seattle, part of a private "airlift," takes on equipment parts urgently needed in Alaska



Sketch of Hungry Horse Dam, being built in Montana. It will contain three million cubic yards of concrete. Below, earthmovers peeled back the earth's surface in digging this 200-foot pit which exposes vein of coal





Cross-section view of Rockies shows the tunnel which will carry excess water from the west slope to thirsty areas on the east slope. M-K crews now are completing some of the new hydroelectric plants



Rail cars are shipped to China to rebuild railway



Anchorage, Alaska, needed additional power so M-K engineers moved section of broken tanker into place and used ship's engine to generate electricity. Below, this 1500-bed hospital was built in Honolulu



war and captured there by the Japanese.

In Colorado and Utah the company is building underground blockhouses and similar fortlike structures, some buried under mountains, that will be used by the Army to determine penetration characteristics of some of its new experimental bombs and guided missiles.

Opposite St. Louis the company has a hand in building the huge Locks No. 27 that will permit safe navigation of the Mississippi all the way from New Orleans to Minneapolis and St. Paul, a river distance of some 1100 miles. The 1200-foot locks plus eight miles of canal will cost nearly 17 million and will allow water traffic to detour around the treacherous Chain of Rocks Reach, the last big obstacle to upper-river navigation.

M-K forces and others are completing a series of hydroelectric plants in Colorado as part of the government's 130-million-dollar Colorado-Big Thompson project. This ingenious scheme will take water from the upper Colorado on the west slope of the Rockies and bring it east under the Continental Divide by means of a tunnel so that the water can irrigate parched areas east of the mountains.

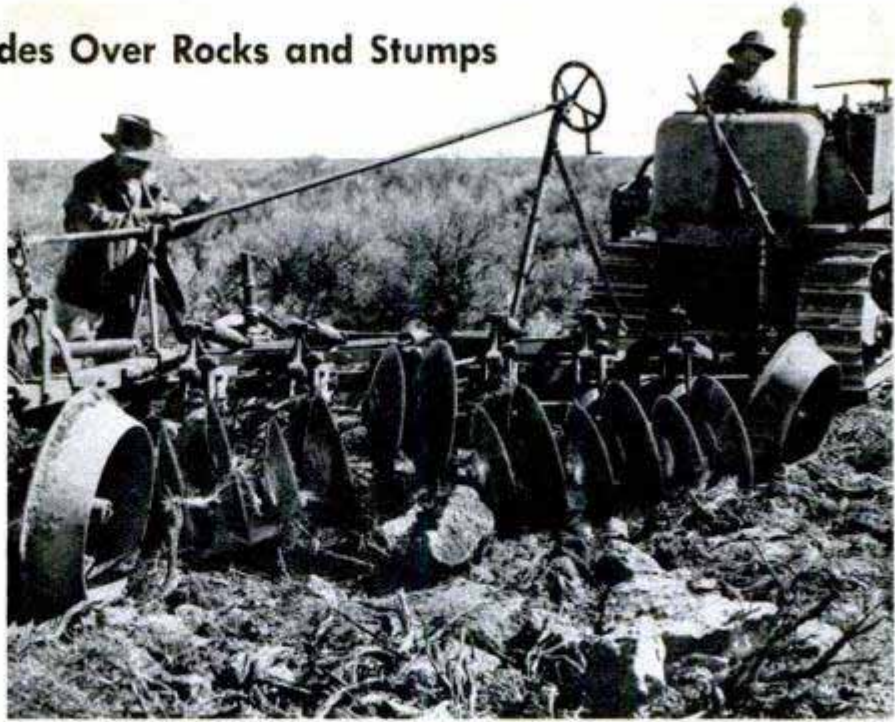
In North Dakota, Morrison-Knudsen and Peter Kiewit Son's Company of Omaha are building a brand-new seven-million-dollar city to be known as Riverdale. Complete from brick office buildings and frame residences to paved streets and public utilities, the city will require two years to build and will serve as headquarters for workers who will build Garrison Dam.

M-K has a hand in the construction of Davis Dam, 67 miles downstream from Hoover Dam on the lower Colorado. Davis is a vast earth-and-rock embankment, 140 feet tall, containing 3,500,000 cubic yards of selected materials. The concrete that is going into the facings, spillway and other special portions of the structure is mixed with chilled water. River water that goes

(Continued to page 242)

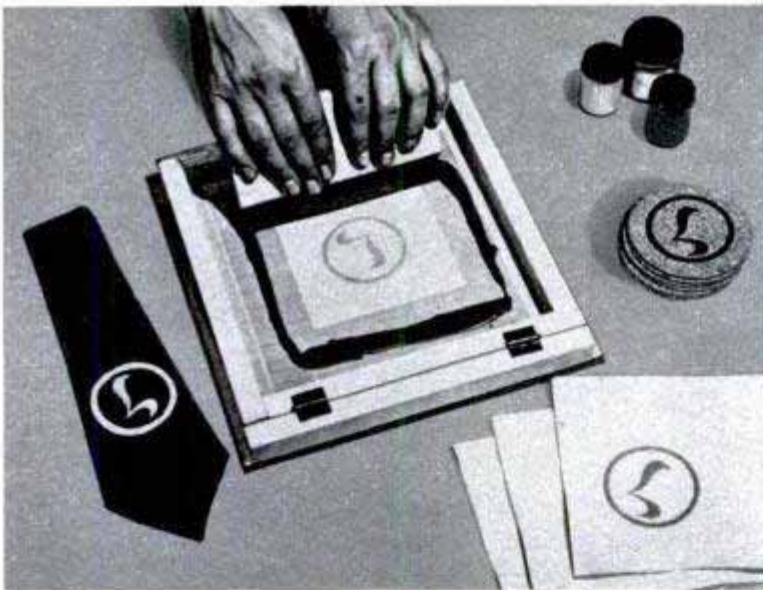
## "Knee Action" Plow Rides Over Rocks and Stumps

Stumps and rocks can't damage a disk plow imported from Australia by the U. S. Forest Service. The implement is under test for killing sagebrush on great stretches of western land to be cleared for range or farming. Conventional plows have not been satisfactory for this work because they are rigid and therefore easily damaged by stumps and rocks. The Australian plow has disks mounted in pairs on spring-controlled arms. When the disks strike a rock or stump they ride up and over the obstacle to enter the ground again on the other side. Each pair of disks can be raised 12 inches without affecting the other disks. The depth of



Bureau of Reclamation photo

cut can be adjusted up to seven inches and the width of cut from six feet four inches to seven feet six inches.



## Silk-Screen Printing Outfit

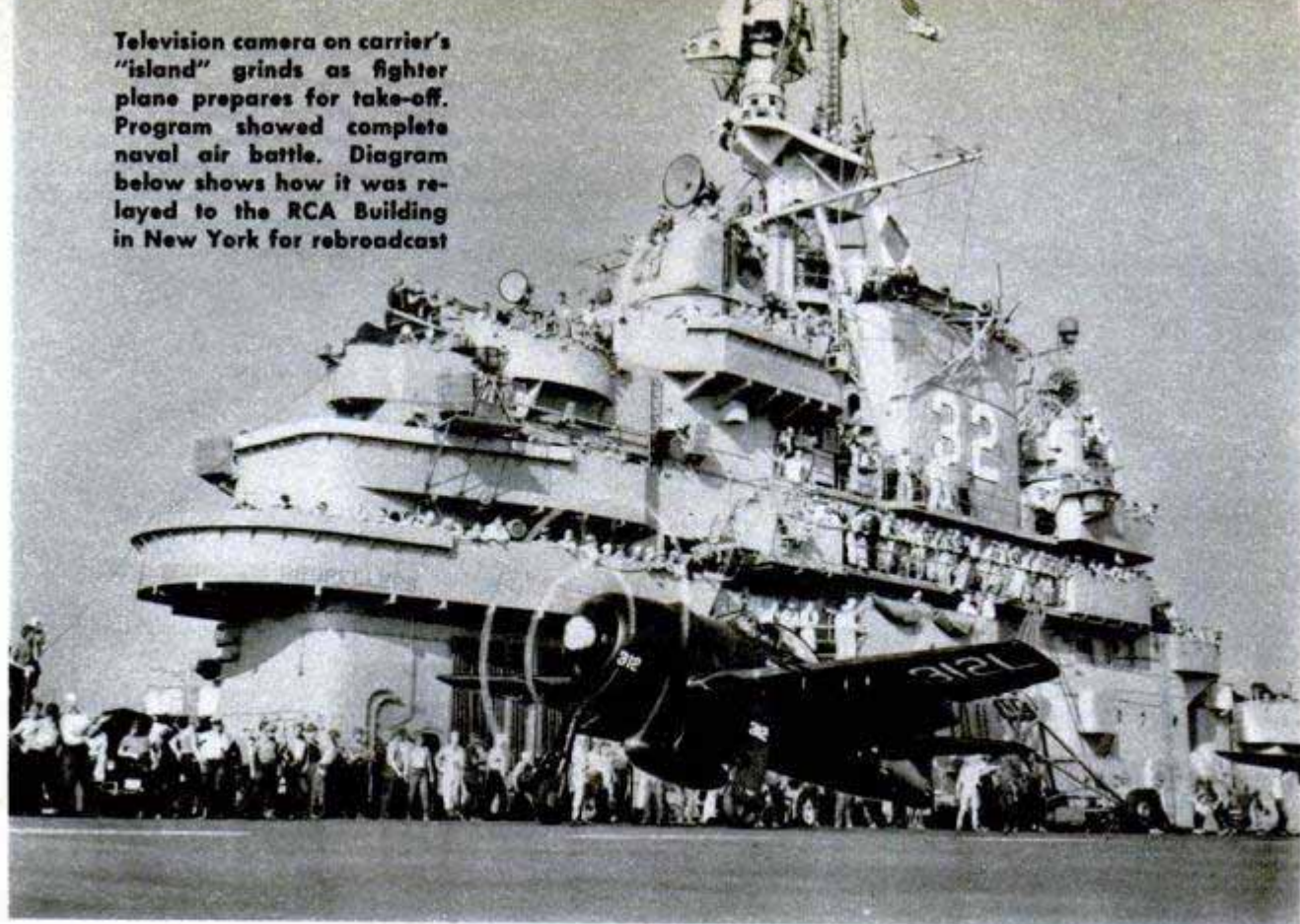
Personal monograms and designs can be stenciled on stationery, drapes, neckties and other articles with a silk-screen painting set. Included in the set are a stencil sheet, four jars of coloring, a stencil knife, paint paddle, silk-screen frame, squeegee and alphabet guide. After the stencil has been mounted on the screen, the paint is applied and the squeegee drawn across the surface to transfer the design to the object that is being decorated. The same stencil can be used thousands of times for making smooth and neat impressions.

## Wire-Fence Stretcher Has Tension Indicator

Wire fences go up faster and with the proper tension when a wire stretcher that attaches to a tractor, truck or automobile is used. The stretcher has a calibrated scale that shows the amount of pull, enabling the operator to put the same tension on each wire. Two models are available. One handles single strands of smooth or barbed wire and the other is a combination stretcher for use on both field fencing and single strands. The evener is adjustable for standard widths of field fence.



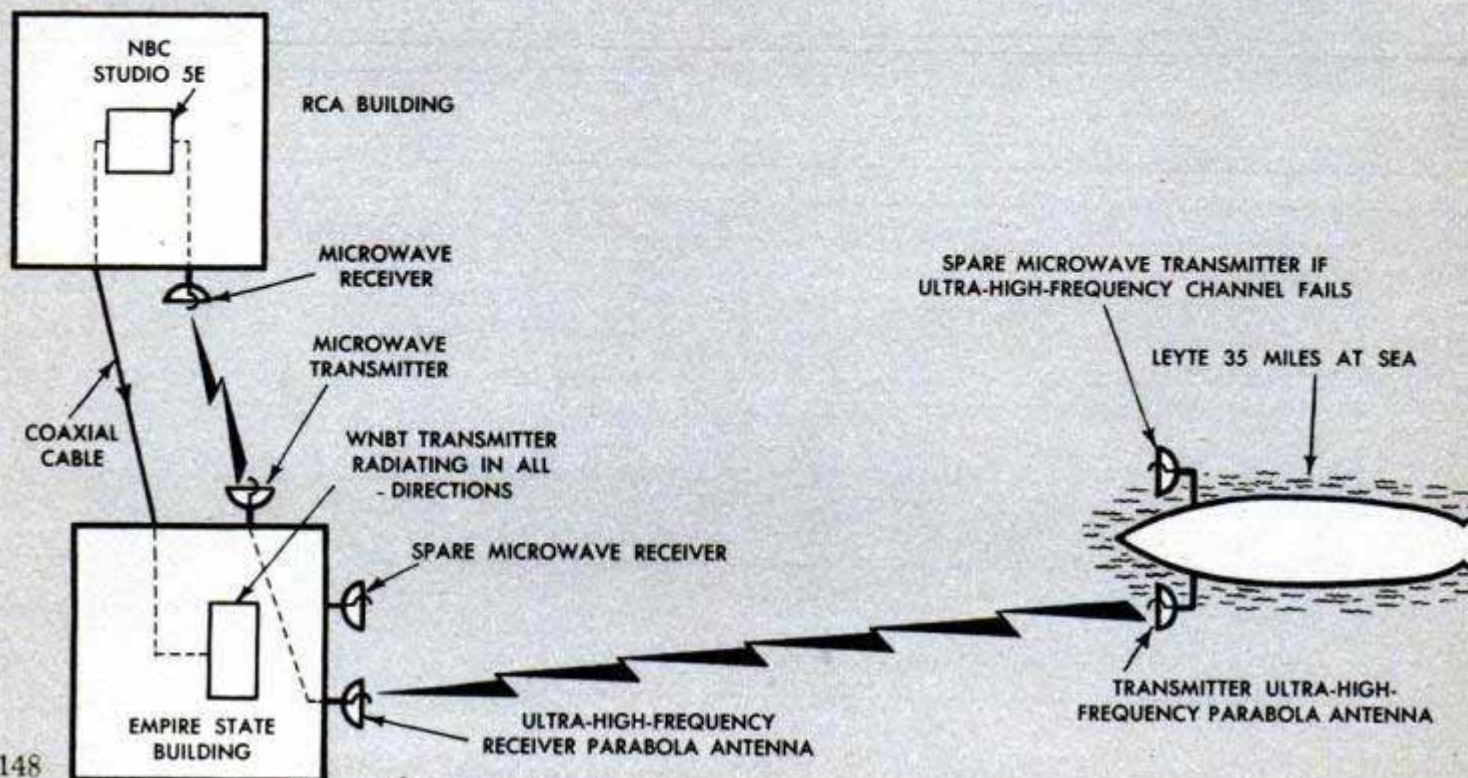
Television camera on carrier's "island" grinds as fighter plane prepares for take-off. Program showed complete naval air battle. Diagram below shows how it was relayed to the RCA Building in New York for rebroadcast



## ship-to-shore

# TELEVISION

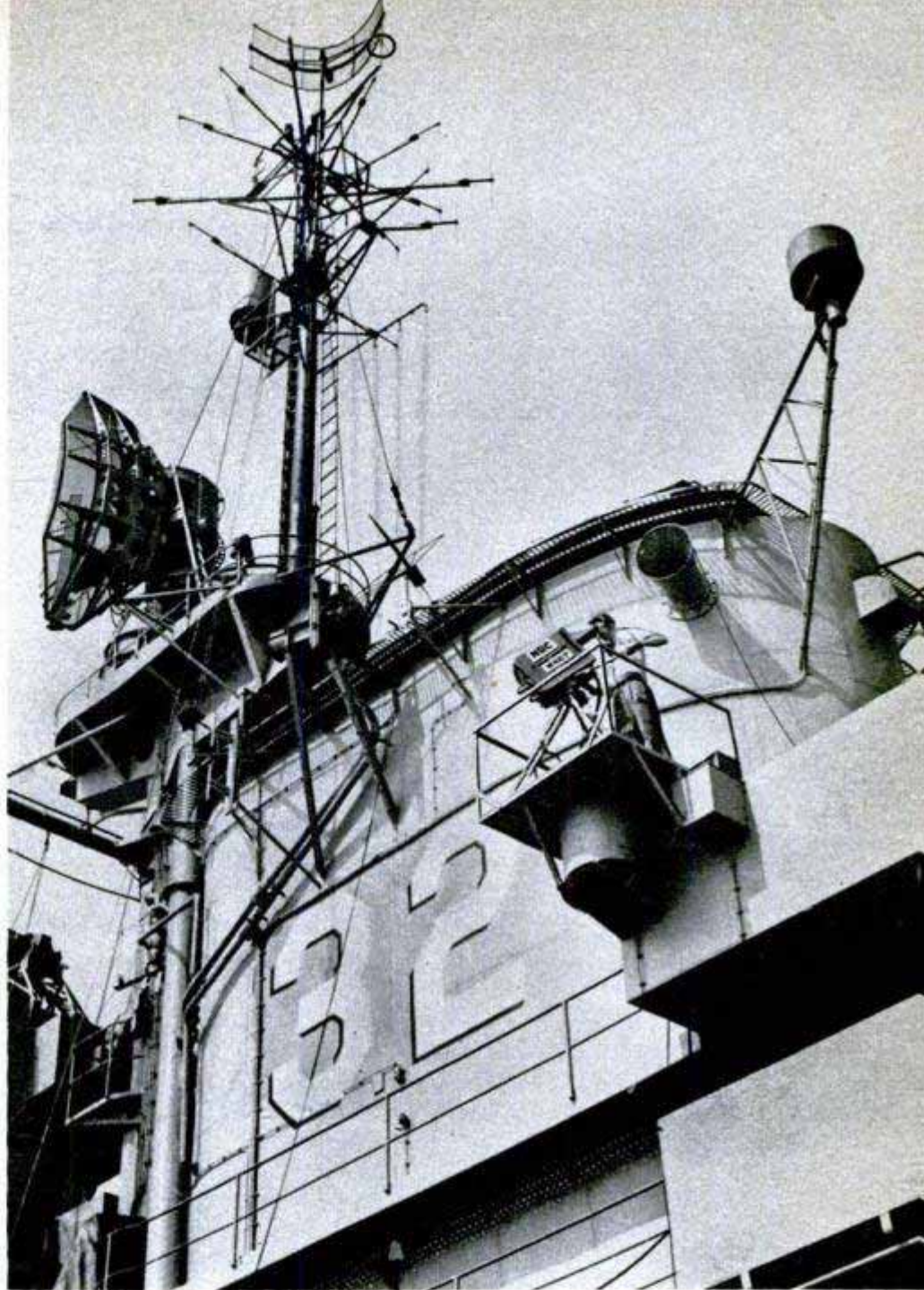
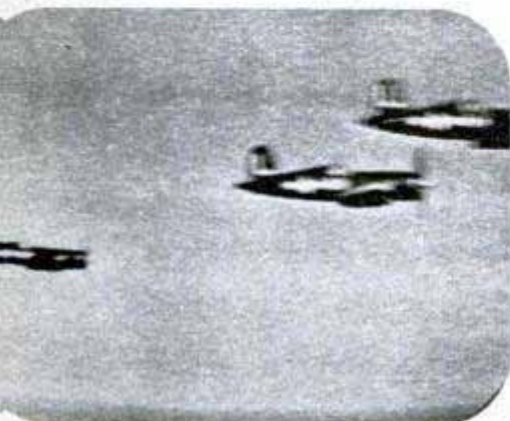
Video fans, seated comfortably at home, are witnesses of a distant naval battle. It's a dramatic experiment that may foreshadow the use of TV in odd jobs from tracing guided missiles to docking giant ships



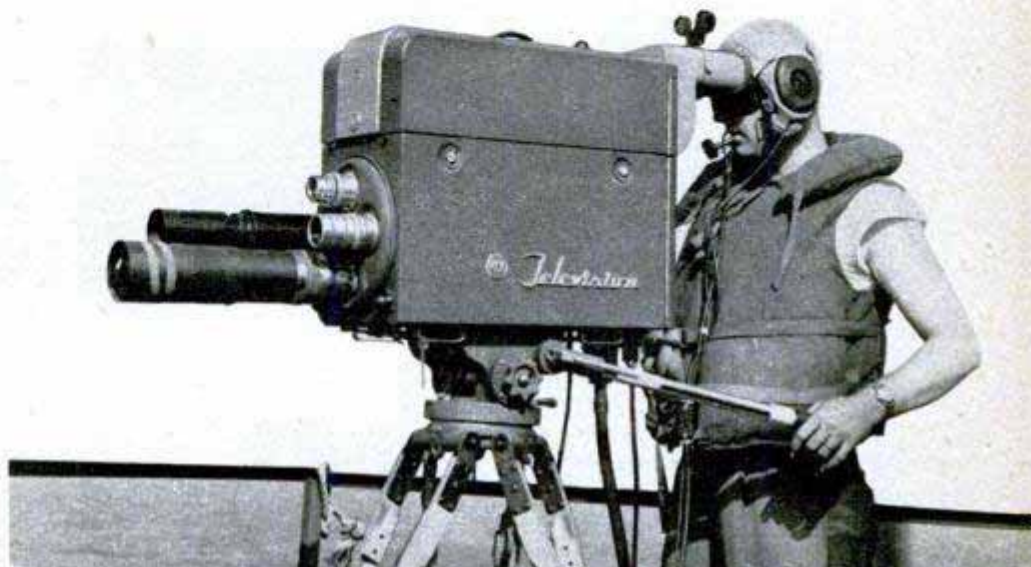
**T**ELEVISION, already land-based and airborne, now has gone to sea and is under consideration as an ally in naval combat and intelligence.

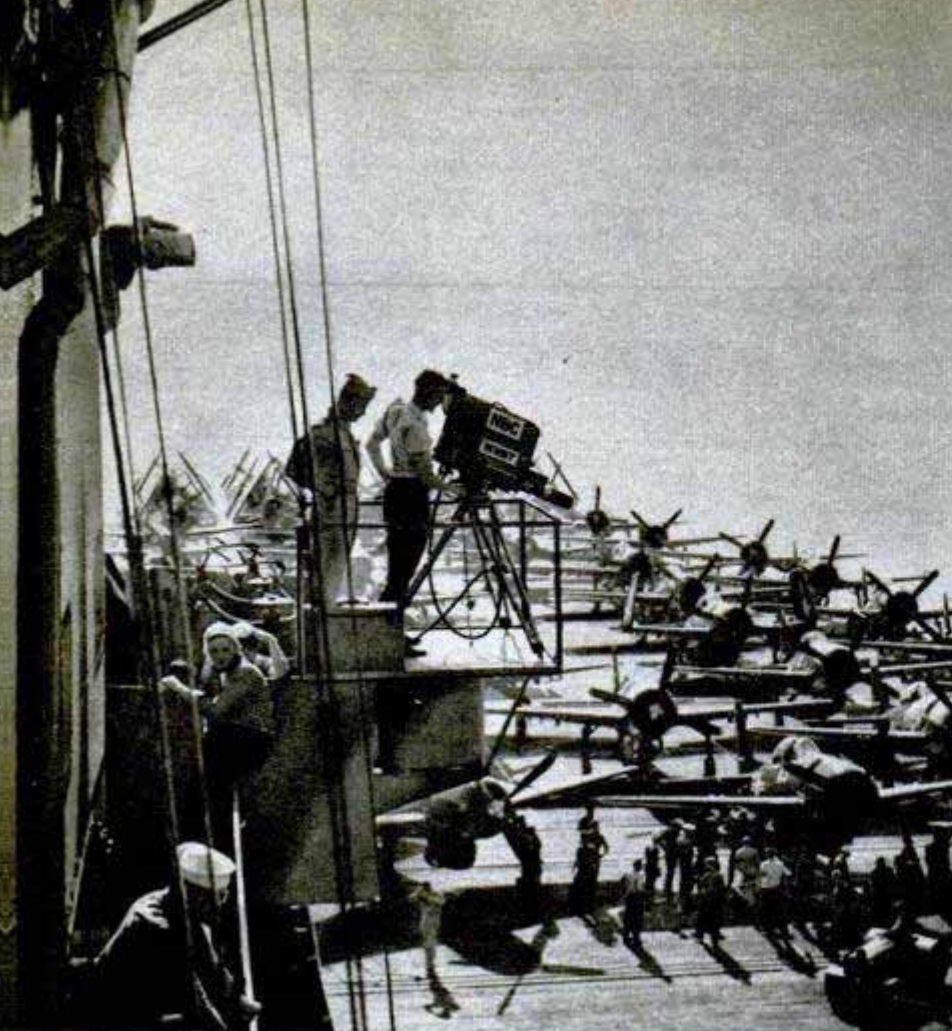
From the carrier *Leyte*, cruising in the Atlantic off Long Island, the National Broadcasting Company, in cooperation with the Navy, has brought into thousands of video-equipped Eastern homes an eye-witness drama of landings, take-offs and "attack" from the sky.

The broadcast has been described as the most difficult telecast ever accomplished. The major problem was to hit a parabolic antenna atop the Empire State Building with the narrow ultra-high-frequency video beam from a

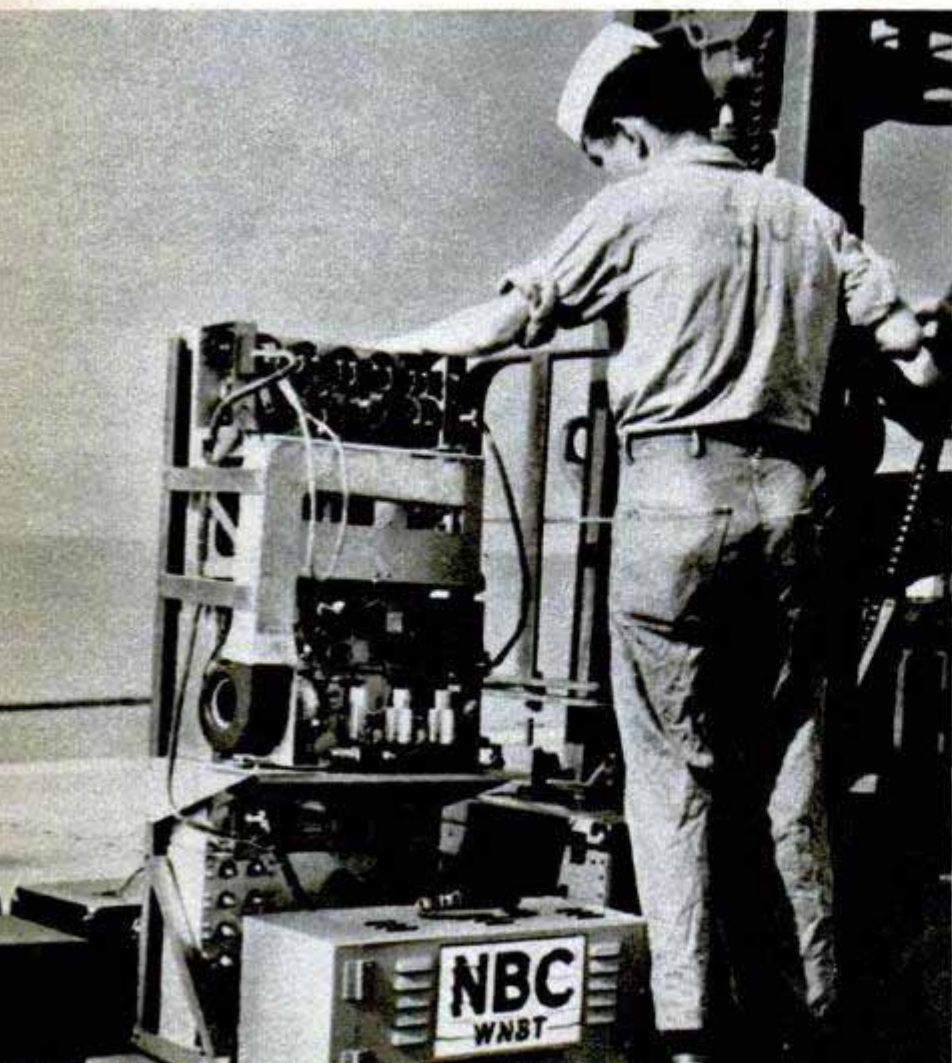


↑ Perched high on the superstructure, a cameraman catches the action on the flight deck. Below, most dangerous spot for the camera was on the edge of the flight deck. Cameraman wears life jacket in case he has to go over the side to escape a careening plane. Left, these photographs show that the program was relatively free from distortion as it was picked up by video receiver in New York





Cameraman focuses on the action below as planes are towed into position for the take-off during the telecast of the air battle. Portable transmitter, used in sending the pictures, is taken aboard carrier. Recently designed, it weighs only 130 pounds.



zigzagging ship 26 miles away. This was accomplished by installing the transmitter on the Leyte's search radar tower, which can be mechanically "homed" on a target by an electronic device which adjusts for such factors as the ship's speed, position and the wind.

The video signal was beamed via microwave transmitter from the Empire State Building to the NBC studios, where it was "mixed" with the audio signal. The latter had been sent via short-wave radio from the ship to receivers at Riverhead, Long Island, relayed by wire almost 100 miles to lower Manhattan and then to the RCA Building. The program was piped to the Empire State Building for transmission.

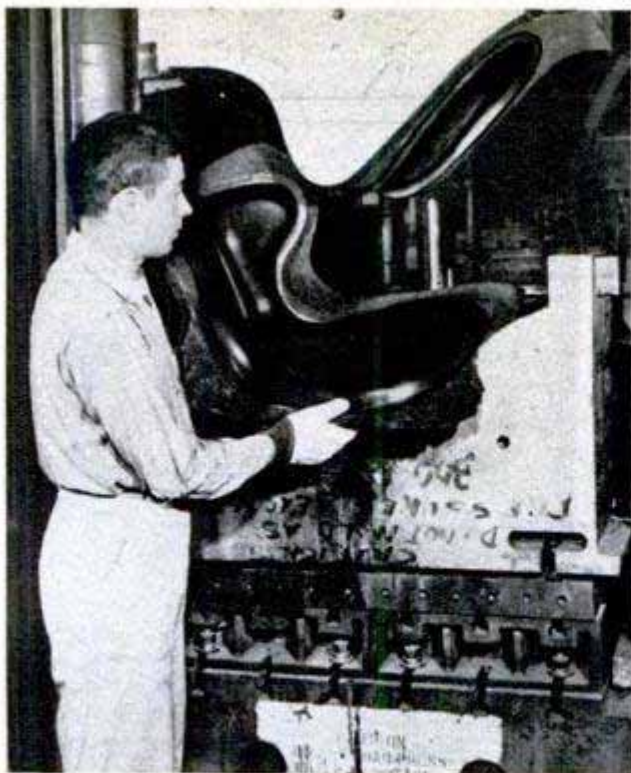
Two cameras on the carrier's "island" and one extending precariously over the water from the edge of the flight deck covered the 100 planes in the "battle" from warm-up, through take-off and maneuvers, to landing. A fourth camera, in the briefing room, showed the pilots receiving final instructions.

Navy spokesmen foresaw a number of possible uses for TV, both in combat and intelligence work. A video-equipped guided missile could send back a continuous picture of the terrain over which it was passing and, in its final seconds, show the target. Pilotless planes on reconnaissance could send back graphic information even when they failed to return. Television might also serve to reproduce instantaneously in various parts of a ship the chart board, and could be of help in docking large vessels.

It is conceivable that at some future time sea battles might be telecast for the benefit of high-ranking officers not at the scene or even for the general public. In the event any great distance was involved a scheme of airborne relay links, such as stratovision, might be employed. In any use of TV it is possible to make a permanent record on film via the kinescope recorder.

A succinct reaction to television was expressed by Rear Admiral Ralph Jennings, commander of Carrier Division 4, who said, "Radar shows where it is; television will show what it is."





## Plastic Chair Can Be Given Any Kind of Undercarriage

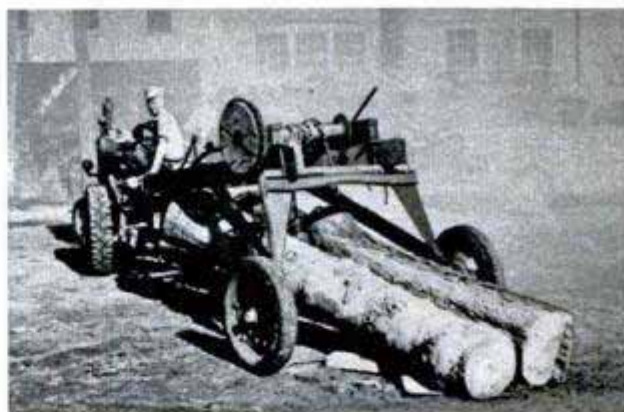
Chairs with the seat and back molded from a single sheet of plastic can be mounted on any type of undercarriage from a swivel to a standard four-legged construction. The one-piece chair was designed after an analysis of the sitting postures of

hundreds of persons. A sheet of plastic-impregnated sisal is placed in a 500-ton compression mold to form the chair, which weighs about seven pounds. The plastic is impervious to moisture and some chemicals and is not scarred by cigarette burns.



## New Spindle Holes for Records

Enlarged holes in phonograph records are repaired with a kit that cuts out the center of the record and replaces it with a washerlike insert containing a new spindle hole. The kit includes a cutting tool that, when heated, burns through the center of the record leaving a clean hole into which the replacement insert is pressed. New label blanks are provided to be pasted on the record after the center insert has been installed.



## Ancient Log Carrier Goes Modern

More than 75 years old, a log-lifting mechanism is back in service with a new chassis that is pulled by a tractor instead of a team of oxen or horses. John Moeke of Zeeland, Mich., rebuilt the log carrier, replacing the six-foot wheels and their wooden axle with auto wheels and an arched steel axle. The lifting mechanism was in operating condition and was retained. Now he uses the vehicle to haul logs from the Michigan forests.

☐ Average car speed on main rural roads was 46.8 miles an hour in 1947, according to a U. S. Public Roads Administration report.



# two- hour house

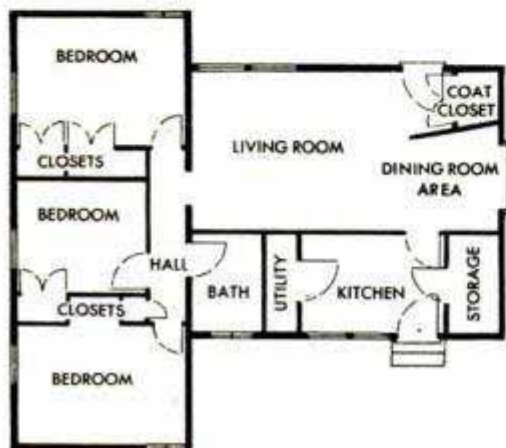
While members of a family take in a movie—even a single feature—a crew of workmen can erect a complete house on their vacant lot. Factory-built in seven sections, the house is erected merely by fastening the sections together. Above, one of the sections is lifted with a crane from a truck to the foundation

Right, a second section is moved into place. It will be anchored to the foundation and welded to the other factory-made room units



← Completed house, ready for occupancy two hours after trucks rolled up with the sections, has three bedrooms, a living-dining room, kitchen, bath, utility room and closets. Made of steel sheathed with aluminum on the outside, it is listed at \$8950

↓ Interior is roomy and has floor-to-ceiling windows. The house has been given a Class-A report by the Federal Housing Administration. Below left, plan shows room arrangement for maximum utility



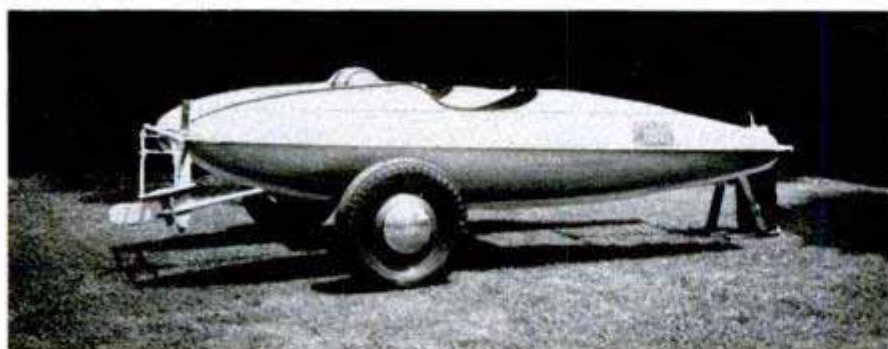


## Pygmy Cadillac Has Scooter Engine

Proudest boy in Montevideo, Uruguay, is six-year-old James N. Miller, Jr., who owns a convertible identical to his father's Cadillac except in size. The car, half the size of the real Cadillac, was built by Jose Latouskas, who works in the garage owned by James' father. A motor scooter and its engine serve as the chassis. Shock absorbers from a 1942 Chevrolet provide front-wheel suspension and coil springs were made for all four wheels. The sheet metal for the body was formed by hand, and white fog lamps serve as headlights. The steering-gear mechanism is from a Crosley car. The seat is adjustable for either a child or an adult and is upholstered in red leather. The midget car has a top speed of 45 miles an hour and cost about \$1500, including labor.



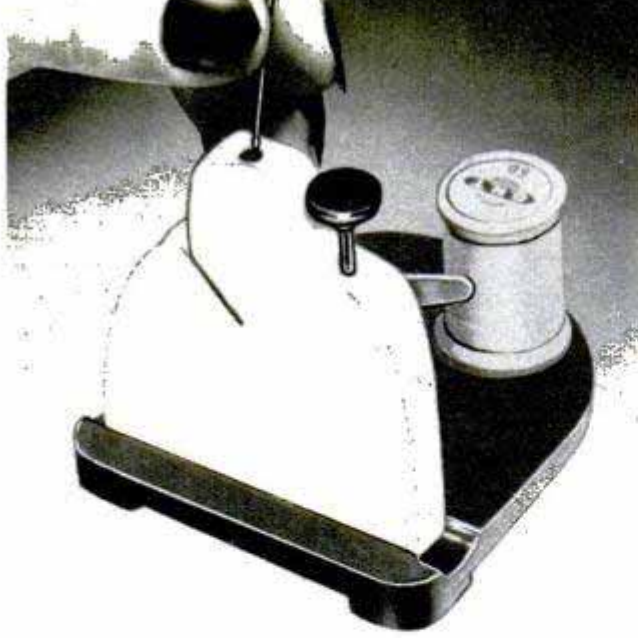
Top left, the engine and chassis are from a motor scooter. The miniature Cadillac has a chain drive. Top, the car is identical to the hub caps with a real Cadillac. Above, seat is adjustable for either child or adult



## Gas-Tank Boat Travels 10 M.P.H.

Constructed from two surplus aircraft belly tanks, a boat built by Bunny V. Ronco of Allentown, Pa., travels 10 miles an hour and draws only three inches of water. The boat seats two and is driven by a seven-horsepower, two-cylinder engine mounted between the two tanks. Bulkheads have been placed fore and aft of the passenger compartments, making the craft virtually unsinkable. Out of the water, the boat is easily transported on a two-wheel trailer.

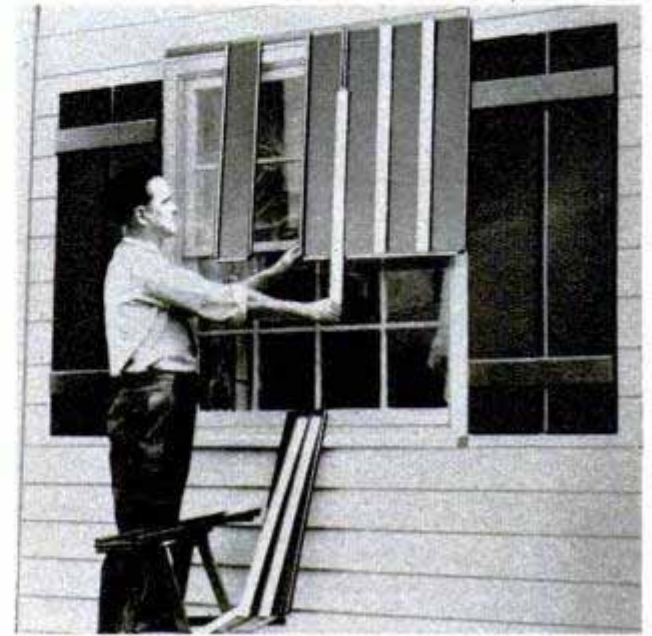
☐ Directly or indirectly, it takes between 15 and 30 tons of water to produce a pound of beef.



**NEEDLE THREADER** never misses! Push the button and the job's done. It even has a built-in scissors



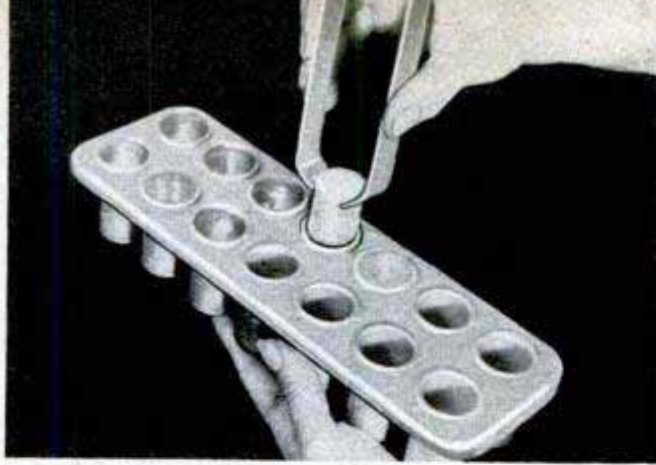
**ALUMINUM AWNING** can be made to fit any width. You assemble six-inch sections on the job (below)



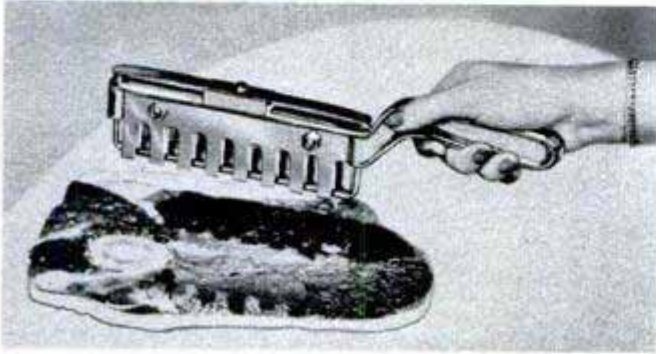
# WHAT'S NEW *For Your Home*

**HEATED SERVING TABLE** eliminates repeated trips to the kitchen. Food is kept hot during meal by electrically heated glass top. A thermostat keeps glass at 200 degrees when the cord is plugged into any outlet

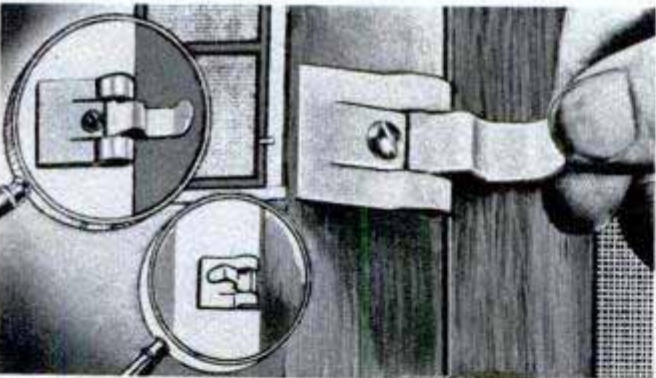




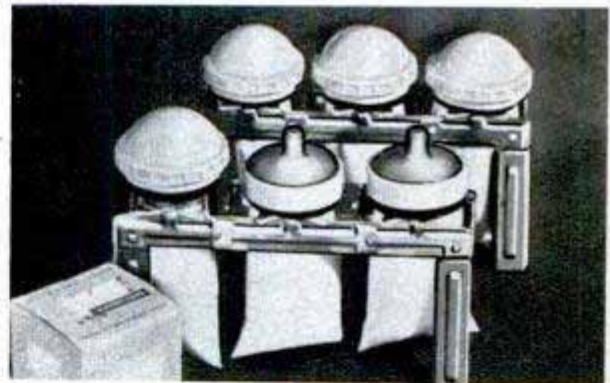
**ROUND ICE "CUBES"** for picnickers slip inside a Thermos bottle intact. The tray fits any refrigerator



**STEAK TENDERIZER** has 16 blades that cut sinews without splatter of juices. Guard limits depth of cut



**DISPOSABLE BOTTLE** for baby is made of soft plastic. Below, covers keep the nipples germ-free

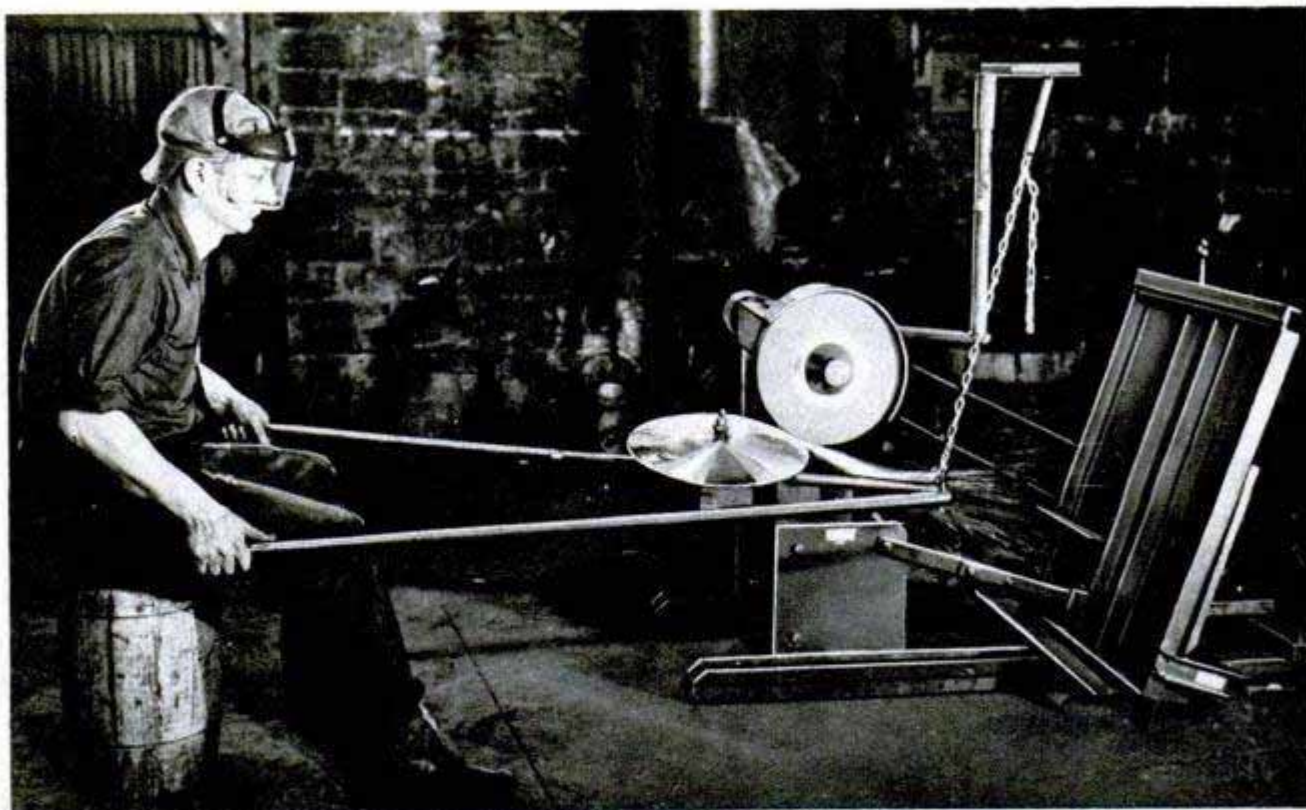


**FASTENER**, above left, holds screens and storm windows in place by the spring action of snap lever. Four of the fasteners are used per window

**IRONING BOARD** at right adjusts to any of 18 heights so the housewife can do her ironing standing or sitting. The sleeve board is movable too

**SMOKERS' AID** at left has an electric lighter that goes on automatically when it is lifted. The stand has an onyx base for use as a night light





## Versatile Tool for Farm Use Sharpens Plow or Saws Wood

Several attachments can be fitted to a versatile power tool to make it an entire farm workshop. The primary part of the tool is an arbor powered by a two-horsepower electric motor, a five-horsepower gasoline engine or a tractor pulley. With a grinding attachment, sickles, scythes, plow points and hay-chopper blades can be sharpened at any bevel. Another attachment enables the farmer to grind and polish disk blades with uniform sharpeners around the circumference. Still another includes a saw table, which swings backward when not in use, and a circular saw. A 30-inch saw and table handles 12-inch material for cordwood sawing.

Top, grinding a disk blade on versatile farm tool. The blade revolves as it is ground. Right, ripping lumber. Saw table swings out of way when not in use



## Standardized Spot-Welding Guns Use Interchangeable Parts

With a single basic spot-welding gun chassis, 57,600 variations for specialized uses are made possible by the use of interchangeable jaw extensions and standard electrodes. According to the manufacturer, this standardization of basic parts permits the user to take care of 95 percent of all welding requirements with seven basic gun types. It also cuts maintenance time and cost by permitting the operator to replace worn or broken parts with standardized units. Any standardized gun can be con-

verted for a different job simply by changing one or two parts. Previously, gun designs were "tailor made" to fit the job. This meant high production costs. The new line will not only reduce costs, but also speed production, the manufacturer claims.

ⒾNinety percent of all cities and towns having local passenger transportation systems are served by busses only, according to a recent report of the Automobile Manufacturers Association.

**FIRST HELICOPTER** designed → specifically for agricultural and industrial work carries a pilot and two persons or equivalent load 235 miles at 75 miles an hour. All nonessential parts are eliminated to boost the pay load. It is engineered for use in aerial spraying, oil exploration and timber survey

**PROPELLERS** with square tips, below right, are wider and absorb more power than narrow blades. Installed on Western Airlines Convairs, they are reversible. "Orange peel" cowling exposes the entire engine within few seconds

↓ **STAIRWAY** on same plane is self-contained, saving passengers time and the airlines money. It operates hydraulically but pilot can also pivot it down manually



↓ **FIRST JET-PROPELLED AIRLINER** has been tested in England. The plane made a 200-mile flight from London to Paris in 37 minutes, hitting a top speed of 415 miles an hour. The two jets develop 20,000 horsepower



# Pets in Predicaments



Animal-rescue worker and puppy emerge from an eight-foot hole which almost became a deathtrap for the dog. The boy, playing in vicinity, called rescue agency when he heard the faint barks of the trapped puppy

**C**HASING a kitten for 10 blocks inside a sewer pipe or inching along the eaves of a tall building toward a trapped pigeon may be high on your list of undesirable occupations, but to some men and women these chores are part of a job they wouldn't swap for the softest berth in the world!

These hard-working people are the rescue experts of animal-welfare agencies who frequently risk their lives getting pets out of predicaments. Every large city has

By Arthur R. Railton

at least one such organization and its staff members are as devoted to their work as any doctor or social worker. They are called upon to climb trees like lumberjacks, crawl into smoke-filled rooms like firemen and to treat injured animals like veterinarians. At times they have to be as patient as the cats they rescue or as surefooted and nimble as mountain goats.

To the animal-rescue worker there's one cardinal rule: Don't let the animal suffer

Coastguardsmen come to the rescue of a dog that struggled for 45 minutes in icy water of the Chicago River



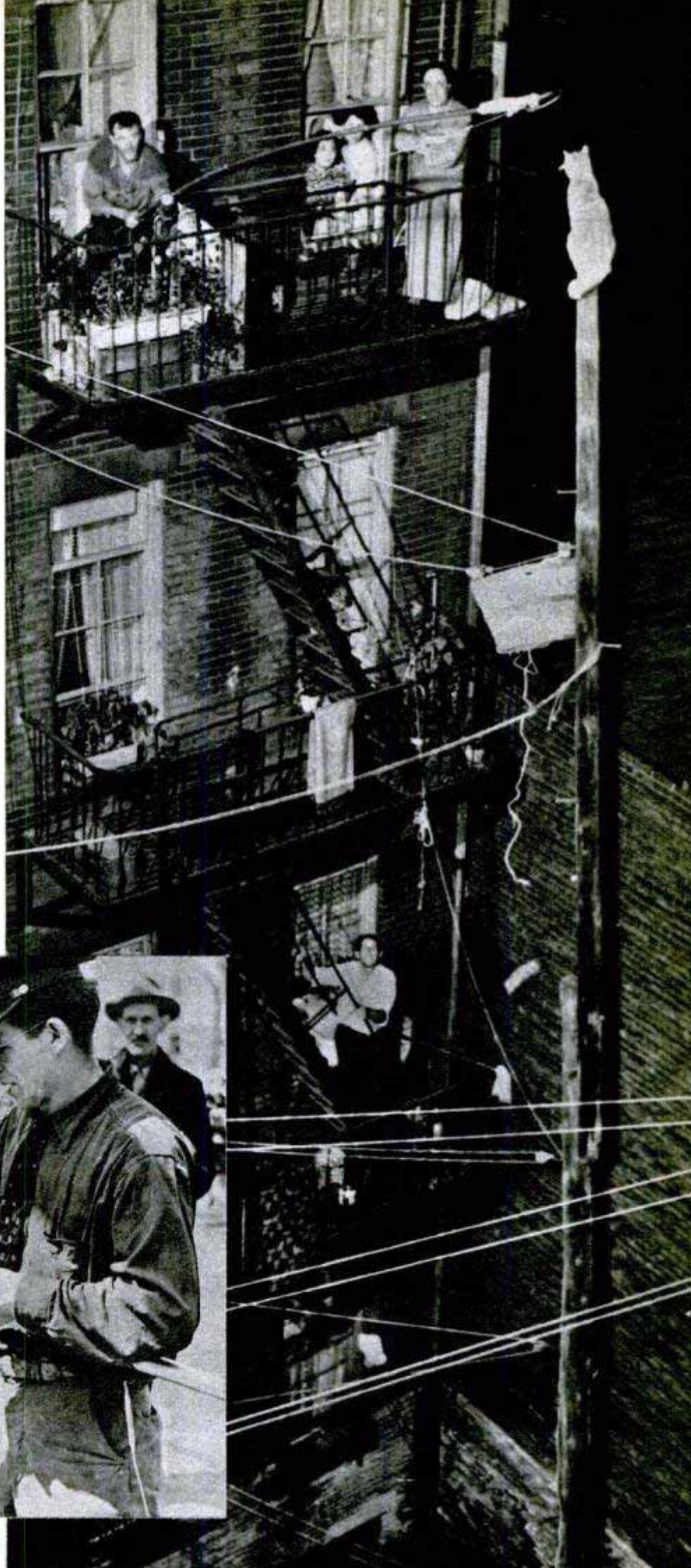


unnecessarily. With this rule as their guide, they are, like the firemen, always ready to go when a call comes.

Take, for example, the case of the lovesick peacock. A Chicago man kept a pair of peacocks as pets and things were as smooth as a peacock's tail until one day one of the birds died. The surviving peacock brooded for days, finally decided to find her himself and left through an open window.

It was midwinter and his owner, fearing he might freeze during the night, notified the animal-rescue workers. Answering the call in their rescue truck equipped with everything from hypodermic needles to long-handled nets, they soon spotted the bird roosting on a chimney atop a nearby apartment house. They rushed up the stairs and out on the snow-covered roof with nets ready for the capture, but it wasn't that simple. The peacock, probably sensing some plot to thwart his search for his mate, took off for another roof every time the would-be rescuers came within net's range.

Right, feline clothes-pole sitter got up but couldn't get down! With a noose and basket, rescuers brought cat down safely. Below, close-up of rescue noose





**This miss is unhappy about her puppy, trapped between walls of house, until rescuer fishes him out with rope**

After hours of flying from chimney to chimney, the peacock settled down for a nap. The rescuers, weary from climbing up and down stairs, crept up quietly and netted him just as he awakened and spread his wings for flight. By this time it was morning and the welfare people chalked up another sleepless night under the heading, "Peacock Rescue."

Most calls for help, though, don't involve such exotic creatures as peacocks. Cats

and dogs make up the vast majority of rescue cases. These pets seem to be continually getting themselves in dilemmas.

A common problem is how to get a puppy out of a partition without tearing a hole in the wall. Scampering around the open floor of an attic, puppies often fall between the walls and, of course, there's no way out for them. Rescue workers have two choices: Either tear open the wall or get the animal out the hard way. The hard

**Chained without food or water by thoughtless owner, dog becomes vicious and tries to fight off his rescuers. Woman holds leather thong for dog to bite on as the man waits for a chance to grab the animal from behind**



way consists of dropping a lasso between the walls and dangling it in front of the animal until he gets curious enough to step inside the loop. Then, with a gentle jerk, the rescuer tightens the loop around the dog's midsection and pulls him to safety. Sometimes, however, the animals fail to cooperate and then there's nothing to do but break open the wall.

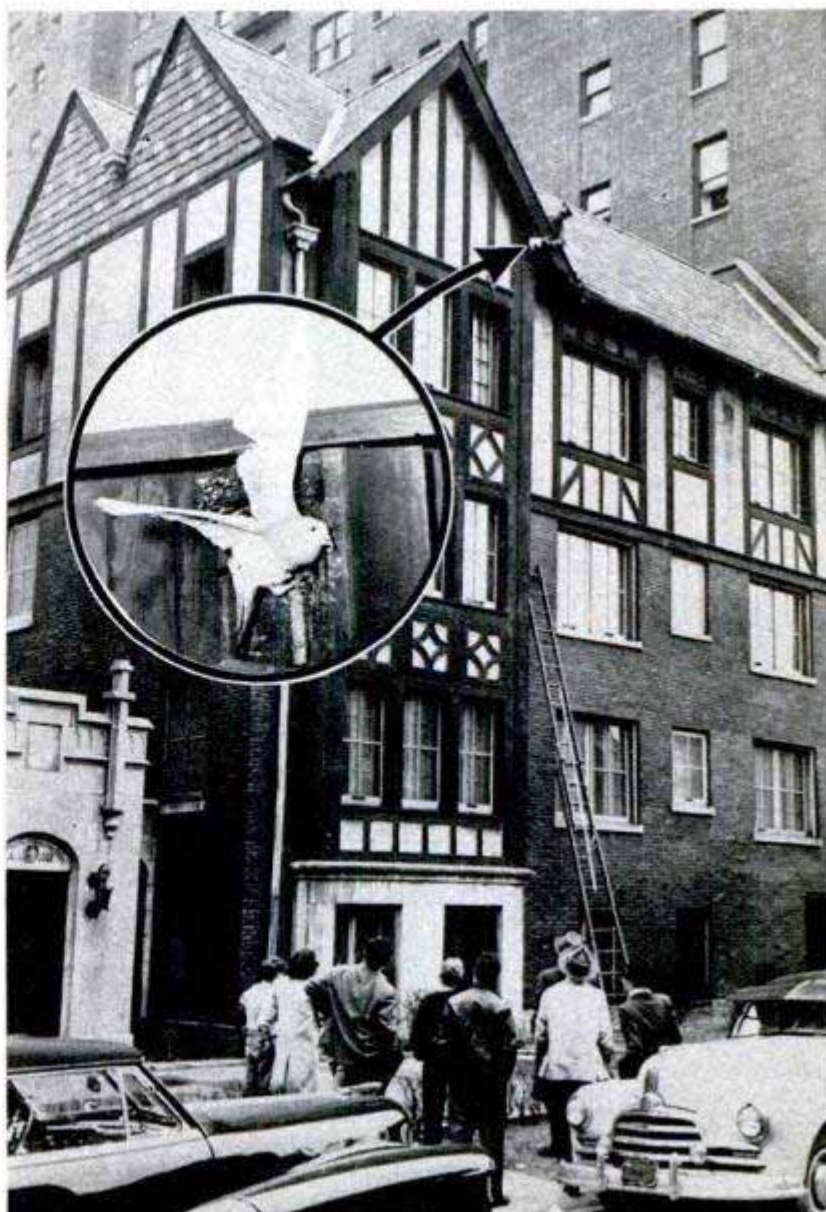
Cats have a fondness for climbing high up trees and poles. But on occasion, they're afraid to climb down. After a few hours of listening to the cat's cries for help, the neighbors call the animal-rescue team. Standard equipment for this type of rescue is another noose, but this one is attached to the end of a long pole. Usually a basket or net is kept handy. The rescue worker gets as close to the cat as he can and then tries to work the noose around its body. Sometimes the cat acts hard-to-get and the resulting struggle dislodges it from its perch and it falls. That's when the net comes in handy. An assistant stationed on the ground scoops the cat into the net and another of its nine lives has been saved.

Rescuing horses and other large animals is a different problem. One day a tired work horse decided it was too hot to work and he dived from one of New York City's docks into the inviting river. The cool water was fine and apparently he enjoyed it for a while, but when he decided he'd had enough water for one day he couldn't find a landing. There were no sloping banks for miles—just high sea walls and dock pilings. The rescuers managed to get close enough to wrap a wide canvas belt around his midsection. Heavy ropes and cables were attached to the belt and, with the help of a powerful dock winch, the animal was hauled back to dry land. Horses sometimes break through old well covers or fall into excavations. Again a winch is required and the rescuers usually call on some auto-wrecking service. With or without the winch, it's a tough job and there's lots of grunting and heaving before Dobbin comes up safely.

Most rescue workers carry a pistol just in case, but they rarely use it. Occasionally an animal



Black cat is rescued after a 10-day imprisonment in San Francisco pipe line. Rescuer traveled 10 blocks on tiny "scooter" bringing cat to safety. Below, "grounded" when leg is caught in an eave board, pigeon is given freedom by nimble rescuer

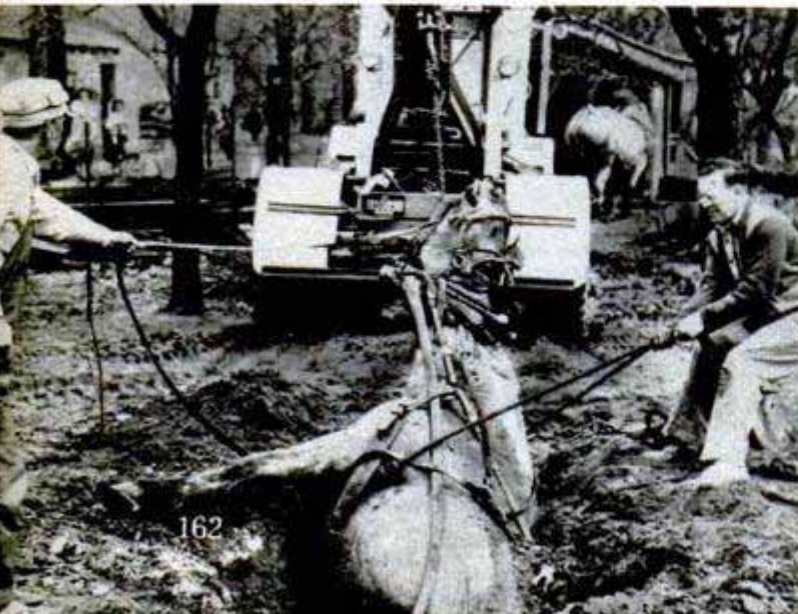




Chasing a rat got this dog into trouble. He rammed his head into wheel and had to have help to get out



Peacocks get into trouble, too. This one was netted after a cold chase from roof to roof. Below, not all rescue operations are small. When heavy work horse falls into well, it takes a derrick to get him out



grows vicious during his hours of imprisonment or suffering and they are forced to shoot him, but this is rare. Usually the gun is used only when animals have become critically injured or diseased.

There are many tricks of the trade and most of them are learned only by experience. Treed cats are often dangerous and you have to know how to grab them. A few quick swipes of their sharp claws will make anybody more careful next time. Dogs that have been injured or have never become accustomed to gentle treatment may attack the rescuer. Animal workers know how to grab them safely. They tempt the dog with a heavy leather thong and when he sinks his teeth into it they grab him from behind. Cats are held by their legs or backs until they calm down.

Some animals are just too elusive to be caught without traps. For this a humane trap is used. It consists of a wire cage with a door that drops when the trap is sprung. Uninjured, the animal is caught inside.

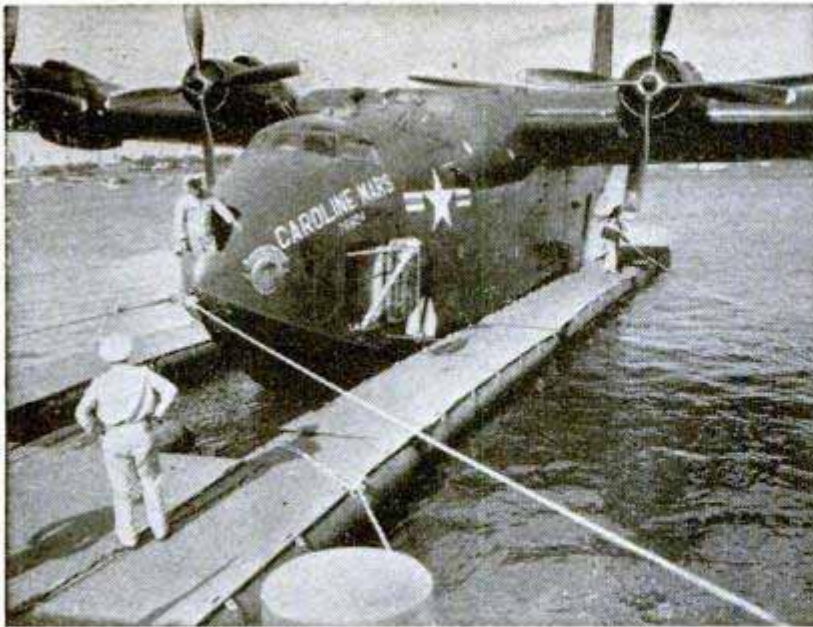
Usually foolproof, the trap was almost fooled by a pet monkey that decided to "go native" in a wooded area. After chasing the elusive creature through the woods without success, the animal workers decided to use the trap. They baited it with an ear of corn and a banana. Then they retired to await results. The monkey scampered up to the trap, looked it over and succumbed to the temptation of food. But he was a cautious animal and, instead of going in after the corn, he just reached in and picked it up. The trap didn't spring and the monkey chewed away at the corn, still uncaught. After finishing the corn he decided he'd like the banana for dessert. Fortunately for the anxious rescue workers, the banana was out of his reach. This time he went in and the trap door closed.

Many animals of unknown ownership are rescued and if unclaimed are put up for adoption. The rescue organizations investigate the applicants and require the new owner to sign a contract stating he will provide proper food and shelter and will agree to periodic inspection by the agency.

Whatever the animal is and whatever its plight, the rescue crews never give up. One worker was called to rescue a small puppy that had fallen into a sewer. The dog was huddled far inside the pipe and if he weren't recovered a sudden rain might wash him off his perch and into the main. An onlooker asked the rescue worker, "What'll you do if you can't get him out?"

There was no hesitation in the answer. "What do you mean, can't get him out? We've got to get him out, that's all."

There's no "can't" in the rescue worker's dictionary. He's proud of the fact that he always "gets his animal."



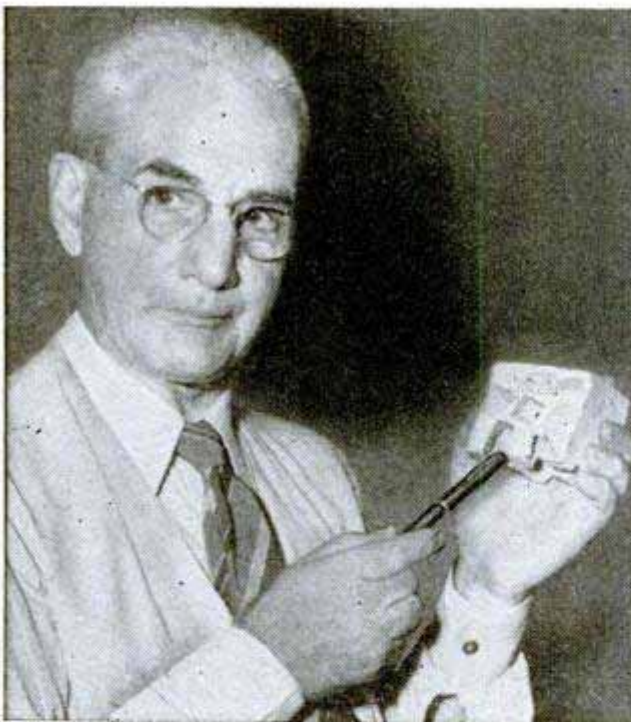
Goodyear photos

Rubber pontoon dock at left can be completely disassembled and stowed in plane, right, in a matter of hours

## Navy's Largest Seaplanes Tote Own Floating Docks

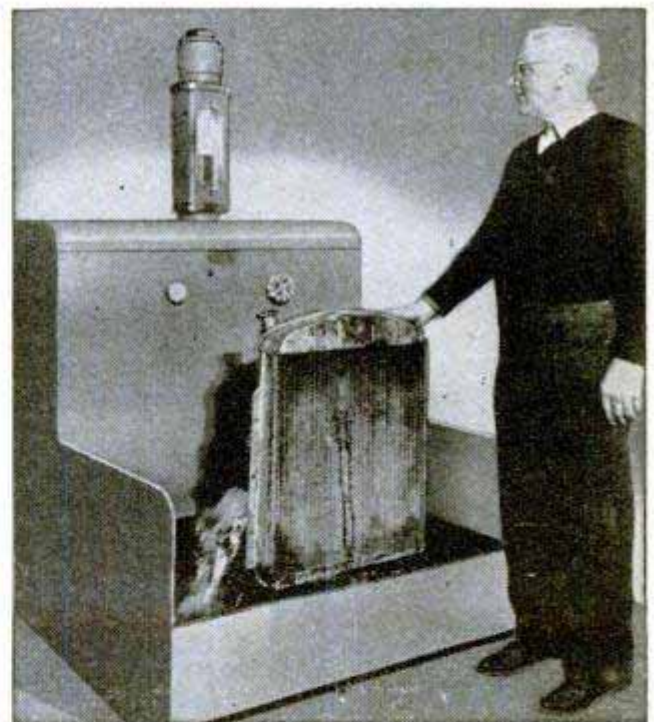
Nine inflatable rubber pontoons decked over with plywood provide a lightweight, portable dock for the Navy's largest seaplanes. The pontoons are arranged in an elongated "U." Deck panels are hinged to make them sufficiently rigid for unity, yet

flexible enough to undulate with water movement. The dock provides tie-up facilities for refueling and loading where there are no permanent installations. The 103-foot unit can be towed short distances or disassembled and flown in one plane.



### Ice Cubes in Concrete Make Lighter Blocks

Ice cubes are one of the ingredients of a building block invented by W. R. Twiford of Miami, Fla. Twiford mixes the ice with concrete, then pours the mixture into a mold. When the concrete hardens, the ice melts, leaving cavities in the block. The result is a building material much lighter than conventional blocks.



### Radiator-Flow Tester

Auto radiators that may be partially plugged are checked by a machine that indicates the gallons-per-minute flow. While the machine circulates water through the radiator, the operator compares the reading with the flow specifications of the auto manufacturer to determine whether plugging is present. No drain is required as a pump continuously circulates the water.

# STEEL

By Clifford B. Hicks



Feiree Wire Recorder Corporation photo

**Major drug firm speeds inventory with wire recorders. The information is typed from spools by stenographers**



Wire Recording Corporation of America photo

**"Sound diary" of the development of children is the most popular use. Note portability of this recorder. In college speech classes, below, students find out how they sound to each other, criticize their own work**

Feiree Wire Recorder Corporation photo



A CHICAGO apartment dweller, dazed from lack of sleep, finally lodged a complaint against his noisy neighbors. When the case came up for a hearing, the man walked into the courtroom carrying a portable wire recorder, turned it on and sat back triumphantly while the judge listened with growing amazement to the squawkings of the blatant tenants.

Ingenious owners of magnetic recorders are putting the instruments to work on jobs that couldn't be foreseen even by the manufacturers. An explorer totes a portable wire recorder into French Guiana to record native dances and jungle sounds for a motion picture. A doctor making his daily calls merely phones the office after each stop and a magnetic recorder automatically transcribes case histories, notes and recommended treatment for the patients. In Wichita, Kans., the head of the Detective Division records every question and reply when a suspect is being grilled—inflections often tell more than words.

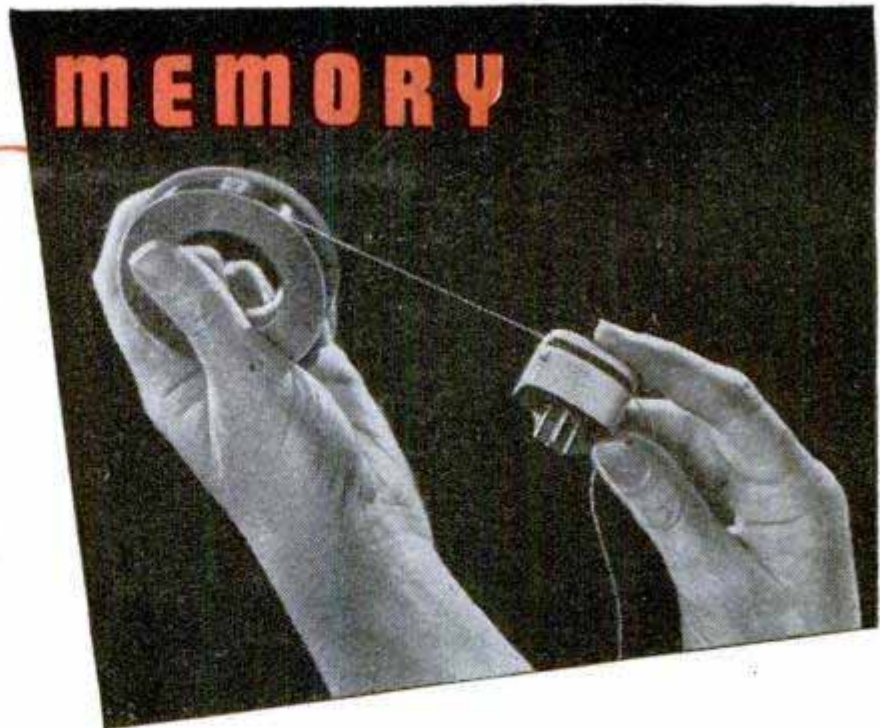
Engineers have barely skimmed the surface in finding applications for this new recording system. To date, the most popu-

# with a MEMORY

lar use has been in the home—the owner keeps a “sound diary” of the development of his children, records favorite melodies from the radio or pirates the neighbor’s new disk records for copying. But other applications affect millions. If you lived west of the Eastern Standard Time zone last summer, you heard tape recording over the American Broadcasting Company stations 15 to 18 hours each day.

Magnetic recording also has become a tool of the scientist. Tape recorders are zooming through the ionosphere in V-2s. In the surgery room of a Chicago hospital, the patient, wide awake under a spinal anesthetic, listens as a wire recorder plays his favorite melodies during the operation. Records prove that he is more relaxed and recovers more quickly, as worry during an operation can put the brakes on the patient’s recovery.

A recorder plays an important role in UNIVAC, the mechanical brain that can answer almost any complicated problem. Problems fall into types, and a method for solving each type must be worked out in advance. Such patterns are recorded on



Heart of recorder is electromagnet called the “head.” More than a mile of fine wire can be wound on spool

reels of magnetic tape. Then, when the equations of a particular problem are fed into the machine, the corresponding spool is slipped into place and UNIVAC pops up with the answer.

Stereophonic or “three dimension” sound, soon to reach the market, will seat the listener in the middle of a symphony orchestra—at least that’s the impression he’ll get. And amateur movie makers soon will have that long-sought goal, inexpensive sound films, through a new application of magnetic recording.

Tape and wire recorders didn’t hit the market until after the war, but they are based on a principle discovered by Valdemar Poulsen in 1898. He shouted into a peculiar machine and the noise was recorded magnetically on a length of heavy wire. When the wire was played back, an echo of the shout could be heard. The method was of little use until the invention of the vacuum tube and other electronic devices in the ’30s, and until metallurgy could provide suitable recording mediums—the stainless-steel wire and iron oxides of today.

In the late ’30s Marvin Camras, a young scientist at Armour Research Foundation in Chicago, wanted to record the songs of a friend. Using the Poulsen principle as a point of departure, he came up with two vital developments: placing the magnetic patterns longitudinally on the wire instead of across it, and using a.c. instead of d.c., which gave him a better signal-to-noise



Magnetic Corporation of America photo

Stenographer wearing earphone takes dictation from recorder; foot pedal starts, stops and rewinds wire



Experimental recorder is said to have higher fidelity than any other because of faster wire speed, constant drive

If the equipment is the finest, the quality of reproduction is as good or better than the best disk recorder. Big 30-inch-a-second broadcasting models give tone variations from 30 to 15,000 cycles per second, whereas the phonograph-disk range is only from about 50 to 5000. A master recorder built at Armour (a commercial model will be on the market soon) reproduces any audible sound as well as some that are inaudible, and is said to have higher fidelity than any recorder in existence.

Ordinary disk records play for about six minutes, and even the new long-playing records are limited by the size of the platter, but a magnetic recorder will play more than an hour, on a wire a mile and a third in length, wound on a

ratio. The recorder looked so promising that the Navy ordered 1000 models for use aboard ship and the Marine Corps put portable instruments in the hands of its combat correspondents.

The Armour Research Foundation owns most of the patents on magnetic recording, and at present has licensed about 55 manufacturers to turn out a bewildering number of home recording and office dictation machines.

The person who sees a magnetic recorder in operation for the first time may be surprised that no "shavings" are taken from the wire or tape. In simplified theory, here's the way magnetic recording works: Audible sounds are picked up by a microphone and piped into an amplifier, where they are converted into electrical signals that vary in direction, length and intensity. These signals activate an electromagnet (the recording head) which magnetizes the wire or metal-surfaced tape in a corresponding pattern. If you can put such magnetic patterns on a wire you should be able to work the system in reverse to play back a recording. As the wire runs across the head, the magnetic patterns induce corresponding electrical signals which are boosted in the amplifier and converted into audible sounds in the speaker. Stainless-steel wire only .0036 or .004 inch in diameter, and paper tape with a coating of iron oxides less than .001 inch thick serve as the recording mediums.

pool smaller than a nickel doughnut. Furthermore, a disk usually starts getting noisy after 20 to 40 playings, but a wire or tape recording can be played indefinitely

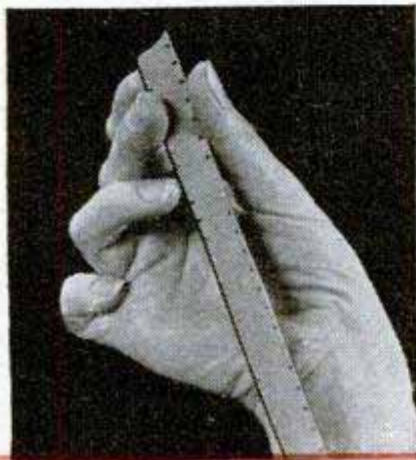
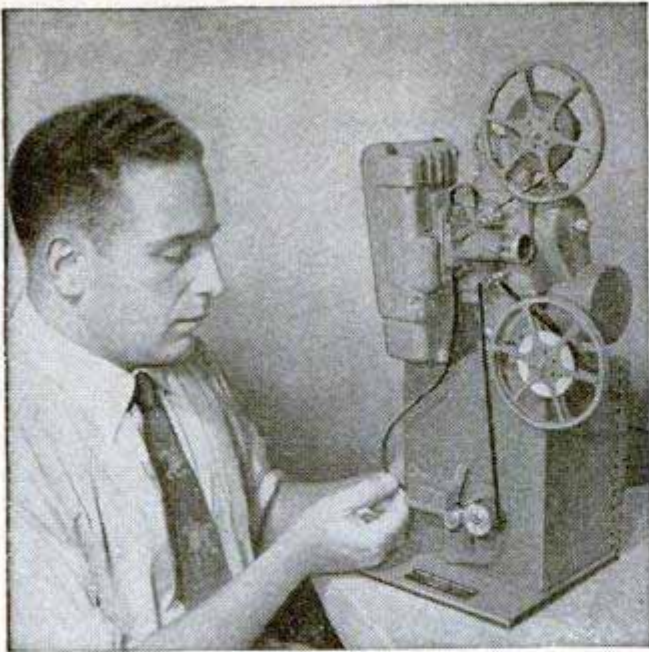
## RECORDING

Diagram shows how the sound is picked up by microphone and converted in amplifier into varying electrical signals. Signals then pass through electromagnet which magnetizes wire or tape in similar pattern

Drawing adapted from "School Sound Recording and Playback Equipment" published by Radio Manufacturers Association





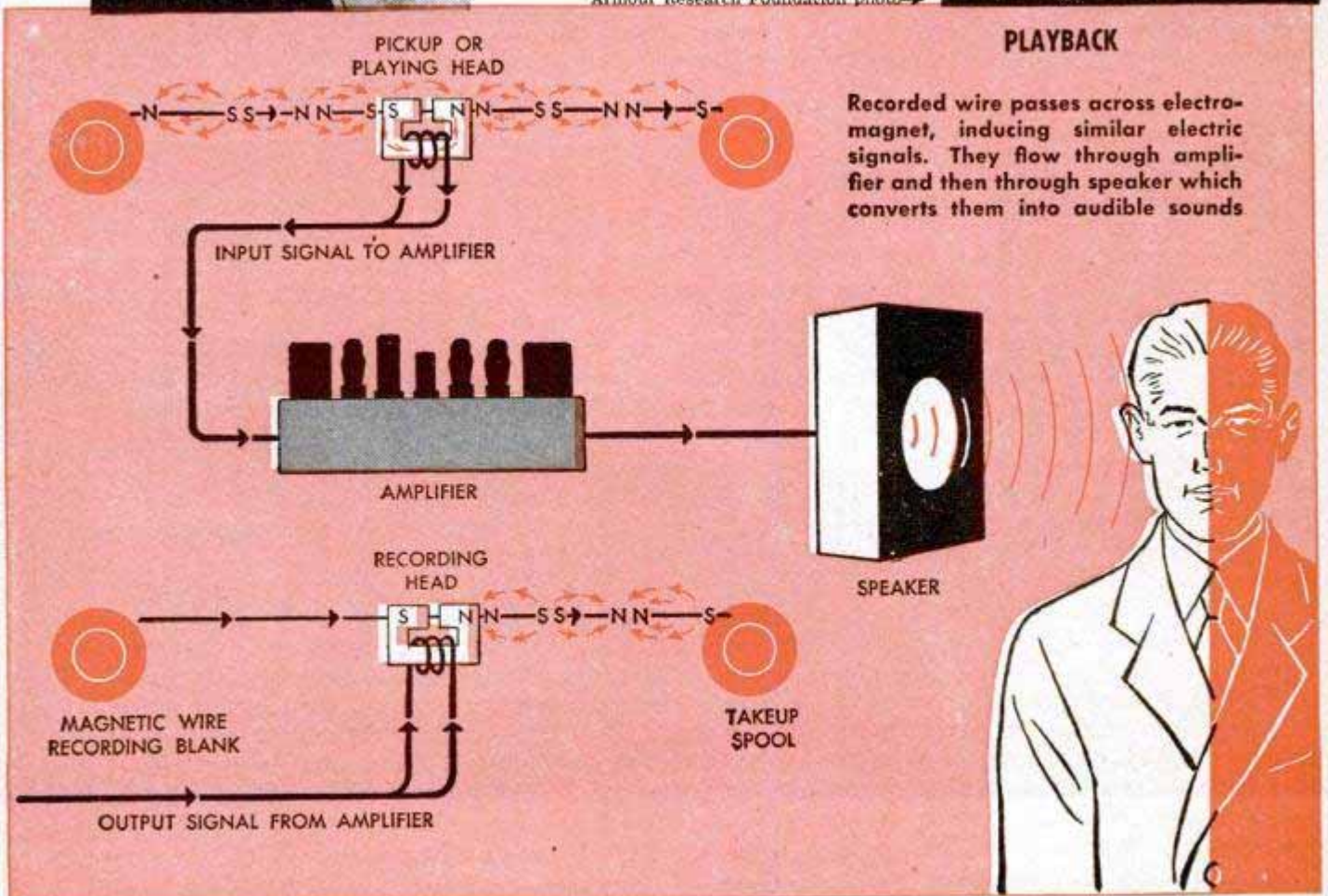


Top left, inventor Camras shows his latest laboratory development — magnetic sound on film. Film passes through recording head below projector. Left, magnetic track is placed on one side between sprocket holes and edge of film. Amateur movie fans soon will have this development

Above right, a miniature recorder built by Camras fits in coat pocket. Right, it is powered by two flashlight batteries. Recordings are played back on another machine



Armour Research Foundation photo





Smiley Burnette, Western film star, records important phone conversations on magnetic tape by placing telephone on top of an induction pad

without loss of quality. A recording at Armour has been played 19 million times, and the change in quality is so slight it can be measured only by instruments.

Disk records can't be altered, but it's no trick to "erase" a magnetic recording by demagnetizing the wire; and it's equally simple to edit a recording by snipping out the undesired section and tying the remaining ends in a square knot, which passes through the head without a pause. In the case of tape, the portion is clipped out with scissors and the ends secured with cellulose tape.

One of the principal advantages of the magnetic system is that many channels can be recorded simultaneously on a single strip of tape. For example, tape recorders are installed in the nose of V-2 rockets for experimental tests. Each instrument flashes electrical signals to its own track on the tape. When the tape is recovered and played back, it gives a complete picture of the flight at any instant, as all tracks are on one strip and all are replayed simultaneously. As many as 150 tracks have been recorded on one strip.

One recorder produced in Camras' laboratory is an experimental pocket model that operates from the power stored in two flashlight batteries. It is a recorder only—the wire spool is placed on another machine for the playback. The instrument is small enough to fit into a coat pocket or purse and is designed for news commentators, lawyers, doctors and insurance adjusters who want to record a witness' replies. Another recorder soon to hit the market can be attached to any car radio. And still another records on a paper belt that can be folded and slipped into a small envelope for mailing.

For the office or home machines there is a bewildering assortment of attachments and improvements. On one model, the stenographer stops the machine with a foot pedal and the recorder automatically rewinds a few inches of wire—when the wire moves forward again she hears the last couple of syllables and can pick up her place. A voice-

actuated microphone soon will be available for the executive. Whenever he speaks in the direction of the mike, his voice automatically will turn on the recorder and start the recording. Most manufacturers put out induction pads which automatically transcribe phone conversations without being connected to the phone.

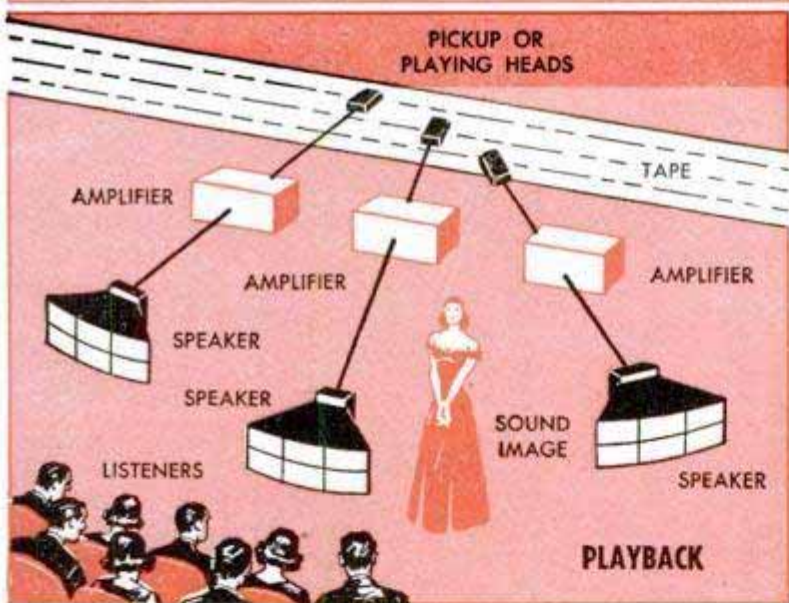
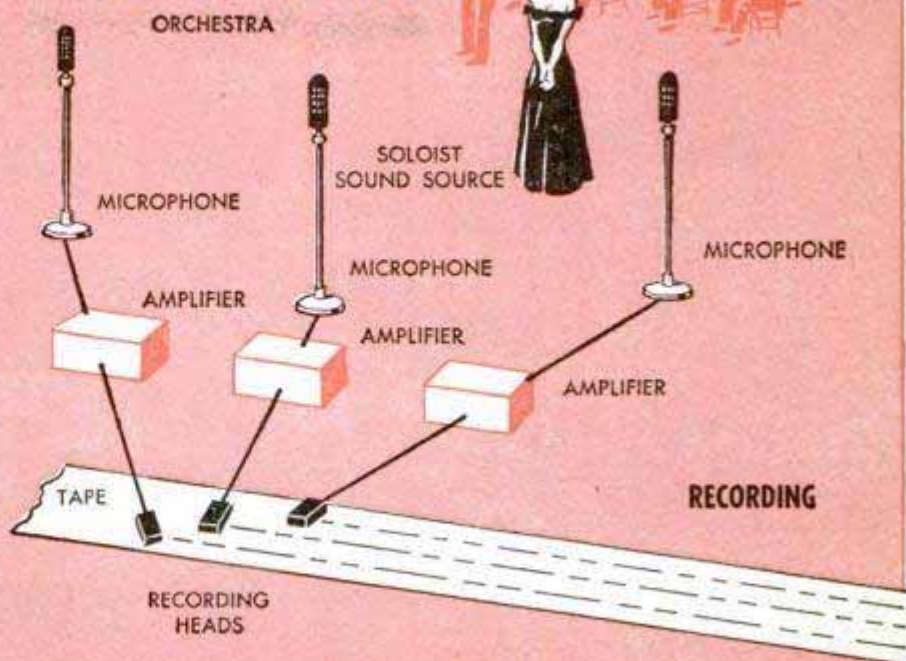
Another development is half-inch tape with two parallel sound tracks. The machine records for a half hour on the upper track, reverses itself, and records another half hour on the lower track. Thus, whenever you play the recording for an hour, the tape automatically is rewound and ready for another play.

A drawback of magnetic recording is that it's difficult to find a desired section on an hour's spool. One answer is the automatic timer. As the operator watches the timer, he runs the spool through at super-speed until he comes to the desired portion. Another snag is that wire is difficult to handle. Cartridge-type spools that plug into the recorder eliminate any handling of wire on some machines.

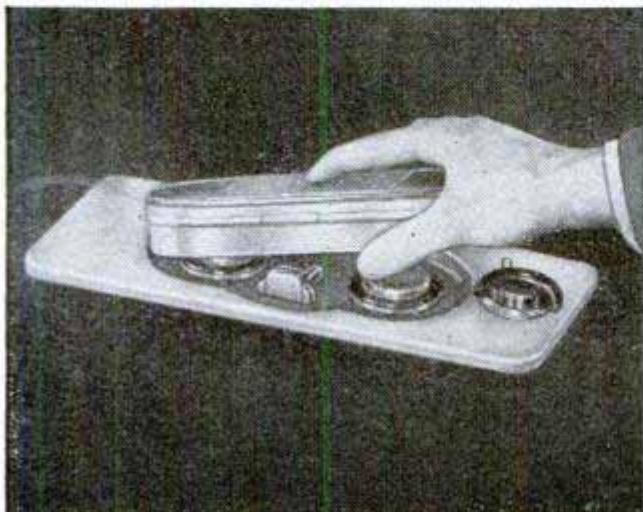
(Continued to page 240)

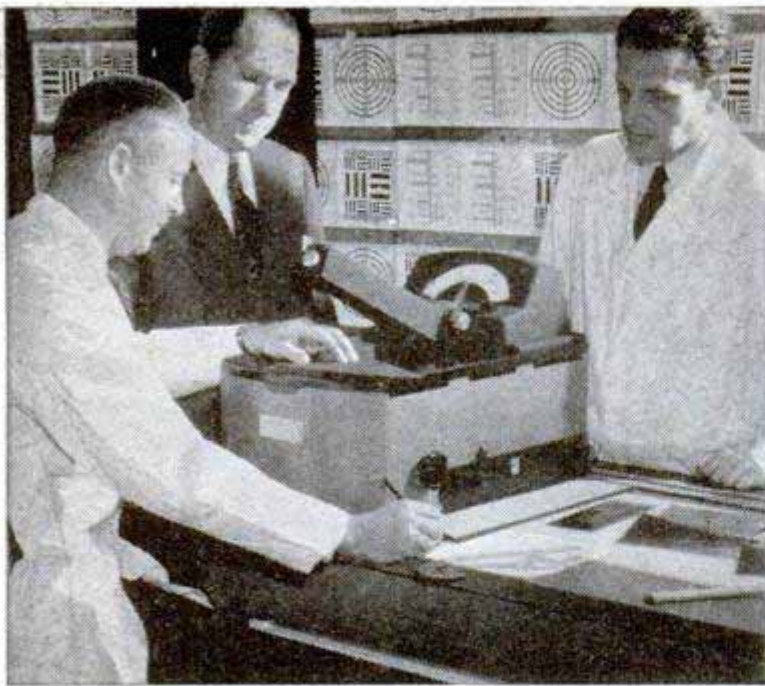
# STEREOPHONIC SOUND

Three microphones pick up the sound and record it on three sound tracks on the same tape. When recording is played back, three heads pick up the tracks simultaneously and sound comes out of three speakers, giving listeners a sound image of depth and direction. Below right, this equipment plus microphones and speakers give stereophonic tone



Experimental magazine eliminates wire handling. Right, radio network uses these high-fidelity tape recorders  
 Santay Corporation photo American Broadcasting Company photo



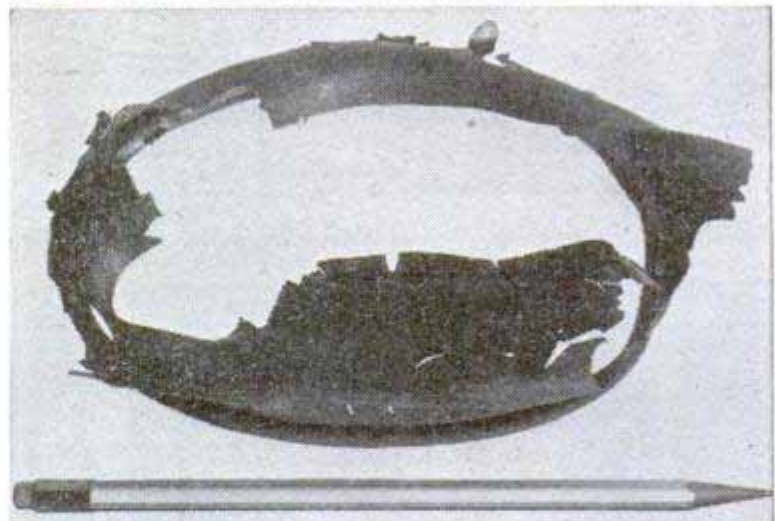


## Instrument Analyzes Color For Film Emulsions

Color density is determined by an electronic analyzer so sensitive that it can measure 1/100,000,000 of the amount of light from a car headlight. The analyzer is designed for use in color photography, but can also be used to measure or match colors in textiles, paints and dyes. The device, developed by Ansco, looks like an oversize record player. Inside the arm is an electron-multiplier phototube which gives the instrument its sensitivity. The measuring arm may be detached and used at distances up to six feet. The analyzer is used for making accurate emulsions for films.

## Seals With Mystery Collars Picked Up War Food Bags

Officials of the Fish and Wildlife Service believe they have the answer to the mystery of the rubber collars found on the necks of fur seals during the past five summers. The collars have baffled biologists since the first one was discovered on a seal in July, 1944. Officials now believe they are fragments of rubber bags used by the Japanese for aerial delivery of food to their besieged troops in the Aleutian Islands. Many of the bags missed their mark and parachuted into the water where they floated on the surface. Officials say the food attracted small pup seals which plunged through the narrow openings of the bags. The rubber containers then could not be dislodged and eventually crumbled away. All that remained when the seals were killed during sealing operations were the rubber collars.

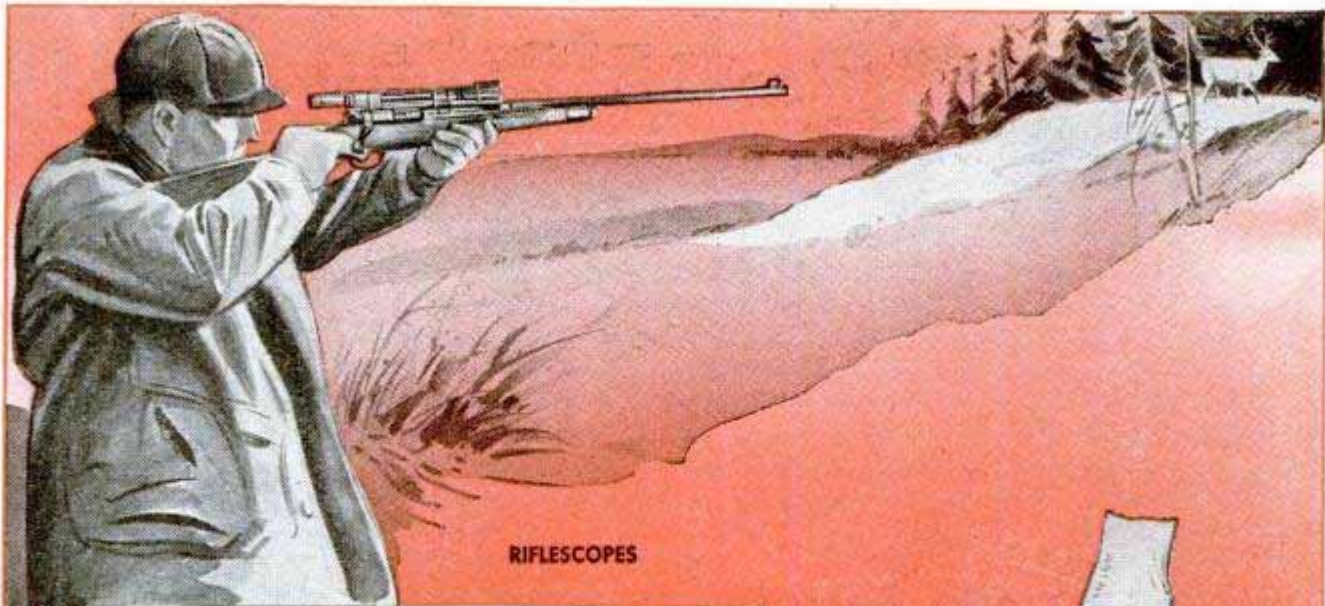


U. S. Fish and Wildlife Service photos

## Inspectors Use Magnetism To Spot Flaws in Boring

So minute that they are invisible to the naked eye, tiny flaws on the inside surfaces of borings 35 feet long are detected by a General Electric inspection technique. Used to inspect holes bored in long metal castings, the technique uses fluorescent lights, a mirror and a surveyor's telescope. The forging is magnetized and iron-oxide particles are blown into the hole. These particles align

themselves with the magnetic poles of any crack or flaw. A small cylinder containing three fluorescent tubes and a mirror is then drawn through the hole. The boring surfaces are reflected in the mirror and are examined from one end of the boring by an inspector aided by the telescope.



RIFLESCOPES

## The CRAFTSMAN

★ Why not assure yourself a prized big-game trophy next fall by fitting your favorite rifle with a good riflescope—one you made in your own shop? The article on page 198 gives complete instructions for building several hunting-type scopes. Some have both internal windage and elevation adjustments and are optically designed to give sharp definition and a brilliant field of view, features that are essential in a hunting scope.

★ For downright practical usefulness and lasting decorative value you can't beat a gate-leg table, especially a large one like that detailed on page 172. Opened, it makes a full-sized dining table, seating 12 people; closed, it makes an individual decorative piece that fits in anywhere.

★ It's easy to make needle-and-thread repairs on rugs having small warp breaks, holes due to burns or other causes, or worn fringes and spots. An article on page 188 shows the procedure in detail.

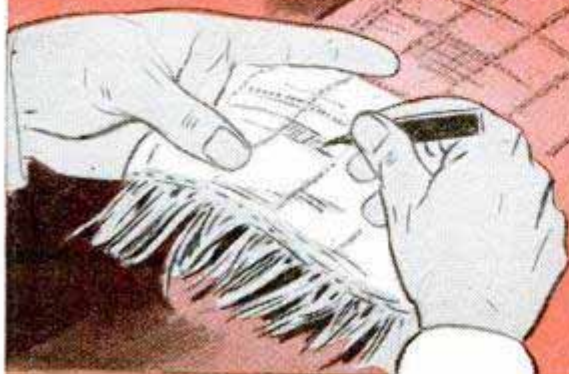
★ Our shop feature, page 214, explains approved methods of attaching pulleys, gears and other power-transmitting units to shafts.

FASTENING WHEELS AND PULLEYS



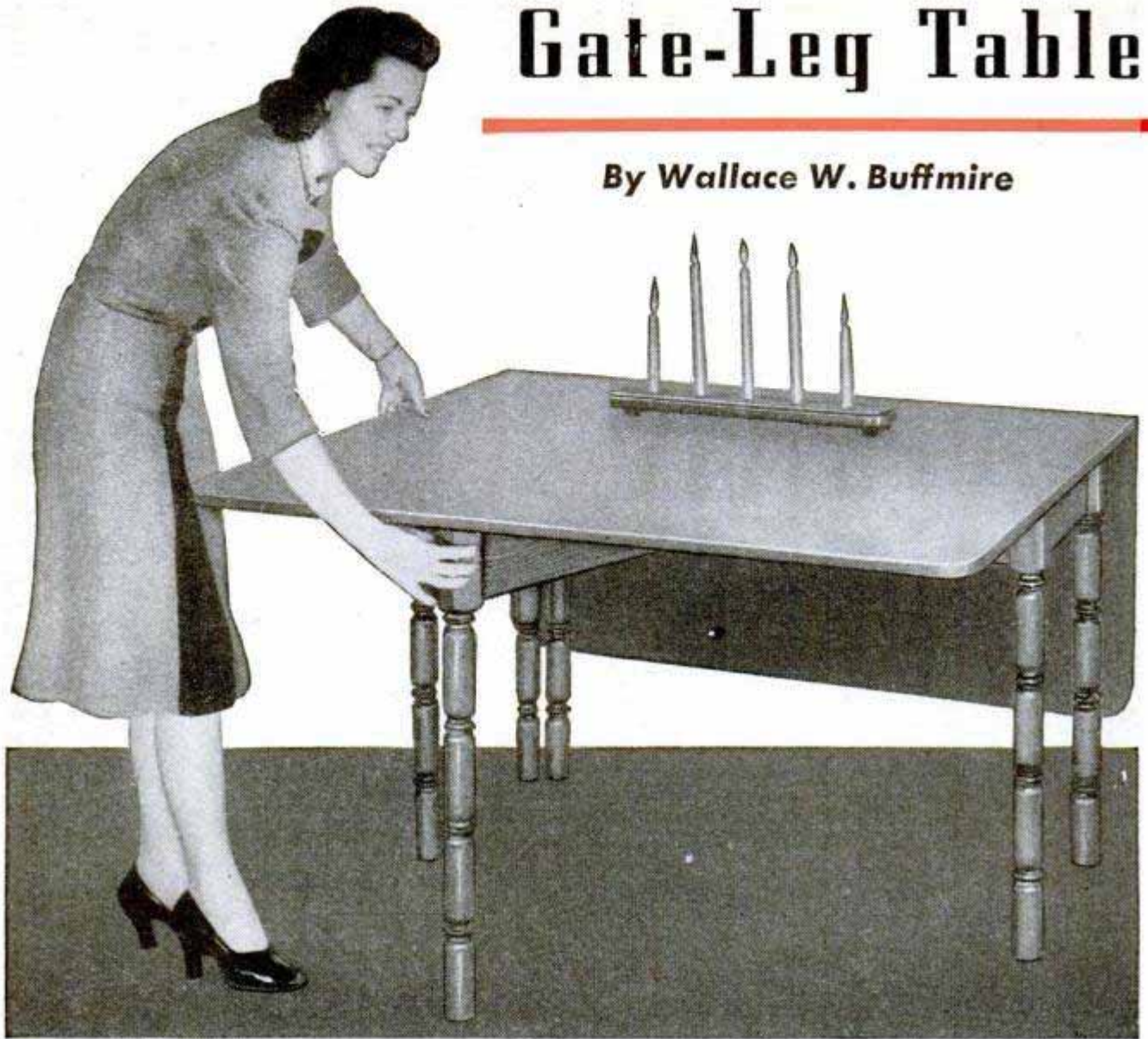
GATE-LEG TABLE

RUG REPAIRING



# Gate-Leg Table

By Wallace W. Buffmire



**H**ERE'S a dining table that really makes use of limited space. Folded and tucked away against a wall, Fig. 7, it requires only 20 in. of space, but when brought out into the open and fitted with two extra leaves its large top (40 x 84 in.) will accommodate a family gathering of 12 or more. It's a practical answer to the problem of space in the small home or apartment.

The original table was made of American black walnut, the top being walnut burl veneered to a core of poplar. This was done to cut cost, but the whole table, with the exception of the extension-slide assembly, can be made of solid stock. Turn the legs first. These are made from 2-in. turning squares, dressed on four sides. Note that each leg is left square for a distance at the top and the rest is turned to the largest diameter possible. This calls for accurate centering of the turning square in the lathe to assure that all legs have very nearly the

**Popular item for the combination living-dining room and small apartment. Takes little space when folded, yet opens to big-table size, seating twelve**

same diameter. After the leg is in the round, so to speak, spot the beads with dividers and finish with a roundnose chisel. Al-

though 1-in. stock was used for the rails,  $\frac{3}{4}$ -in. material will do. The rails are mortised into the legs as in Fig. 4, the tenons being glued and crosspinned to lock them in place. If you do not have a mortising attachment for the drill press, the leg mortises can be cut by drilling a series of overlapping holes and then cleaning and squaring up the mortise by hand with a chisel. Locate the mortises so that the rails set in about  $\frac{3}{16}$  in. from the face of the legs. Draw up each assembly with a bar clamp before nailing through the tenons.

The extension slides for the top are made from  $1\frac{1}{4}$ -in. hardwood as in Fig. 3. The members slide on a dovetail. Note that the female part of the dovetail has a  $\frac{1}{8}$ -in. groove cut in the bottom. This groove, which is stopped about 1 in. from the end of the slide, is for a stop pin which prevents

# for the Small Dining Room

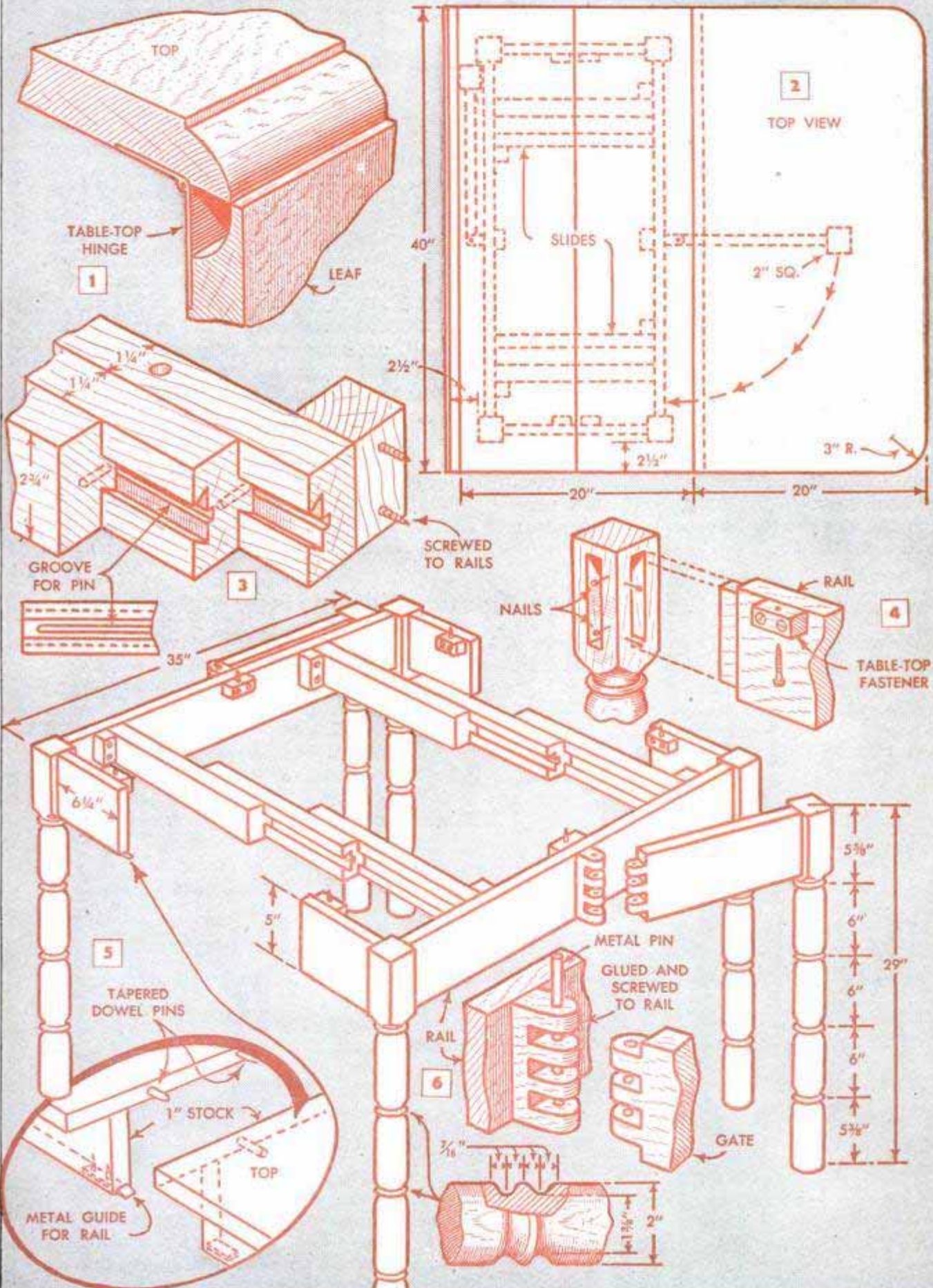




Fig. 2 shows how the gate legs nest against the side rails of the table. The wooden hinge detailed in Fig. 6 was used on the original table, although a regular butt hinge can be used if desired. If a butt hinge is used, glue a stop block to the underside of the leaf so that the gate leg can swing only at a right angle. Stock for the drop leaves must be edge-glued to build up the required width. The leaves are fitted to the top section by what is known as a rule joint, Fig. 1, and are hinged with special table-top hinges. Note that the hinges are mortised flush with the surface and that the pin of the hinge must be located directly below the shoulder cut of the rule joint. This is important, as otherwise both surfaces will

not be level when the leaves are raised or the joint will bind. To allow clearance for a varnish finish, the concave cut in each leaf must be of a slightly greater radius than that of the convex cut. Ladder-back or other colonial-style chairs will go well with this table, or matching chairs can be built. The legs should have the same spool design and seats woven with fiber or rush.

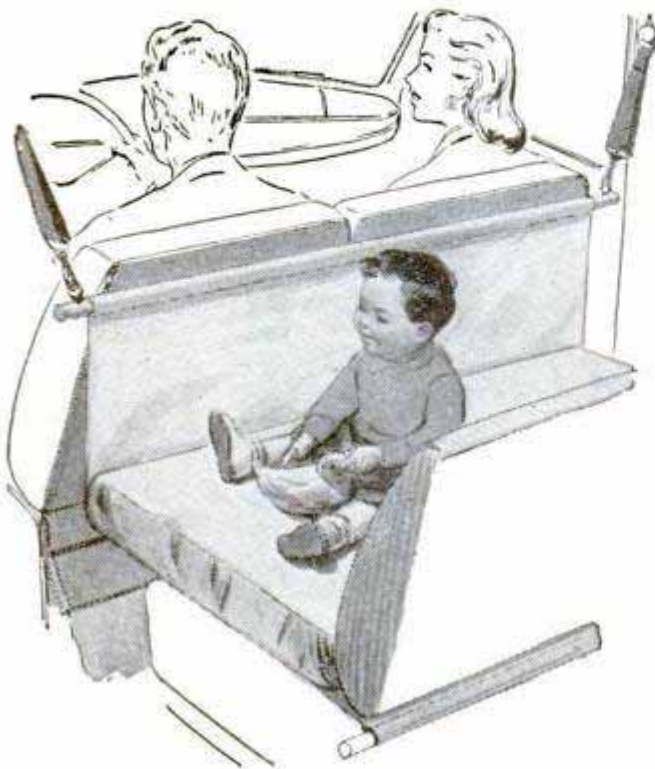
the extension from being pulled completely out. Both slide assemblies are fastened to the side rails of the table with screw blocks, as shown in Figs. 3 and 5. Finally, the outer members of each assembly are counterbored on the underside for short screws, which are used later to attach the two center panels of the top. Screw blocks also are used to fasten the top.

## Back Seat of Car Converted to Playpen Eliminates Safety Hazard

There'll be no need to worry about baby's being thrown from the back seat onto the floor of the car if the seat is converted to a padded playpen. It's easy to do as it only requires suspending a piece of canvas between the two seats. The canvas should be

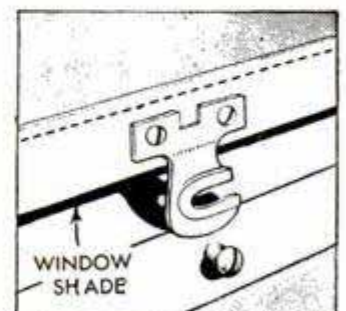
slightly narrower than the width of the car and hemmed at each end to take a wooden pole. The rear pole is held between the seat back and the cushion, while the front one, equipped with a screw eye near each end, is attached to the hand straps of the car by means of snaps. Then, the mattress from baby's bed is placed on the seat. When this arrangement is not being used, the canvas can be rolled and stored on the car floor where it is out of the way.

Harold R. Willis, Chula Vista, Calif.



## Roller Bracket Anchors Shade

To keep a window shade from flapping when drawn over an open window, one man anchors it with a flattened shade-roller bracket. The bracket is attached with short screws

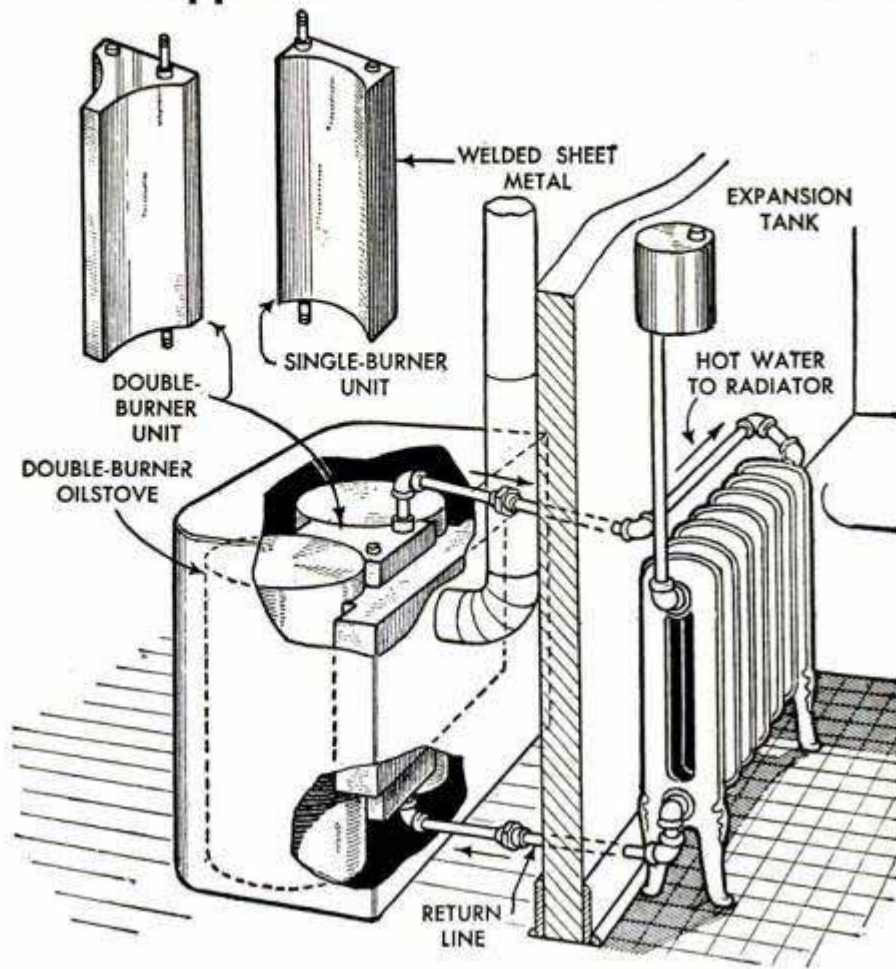


to the wooden slat at the bottom of the shade. The other end of the bracket is hooked over a roundheaded screw driven into the edge of the window sill.



As the oilstove used to heat his home is in a front room and therefore does not adequately heat the adjoining bathroom, one man devised a way to pipe hot water from the stove to a radiator in the bathroom. Having a double-burner oilstove, he made a water jacket of welded sheet metal to fit between the two burner chambers and welded a pipe fitting to the top and bottom of the jacket. He welded sheet-metal baffles to the inside walls of the jacket at an angle to cause the water to swirl as it ascends, and thus become evenly heated. Then, he ran pipe from the jacket to the radiator. Note that the radiator is equipped with an expansion tank for the water. He found that this arrangement provides more than enough heat to keep the bathroom comfortable even in the coldest weather and also that it does not noticeably affect the efficiency of the oilstove, which is operated at the same setting as before the installation. A similar unit for a single-burner stove is made, as

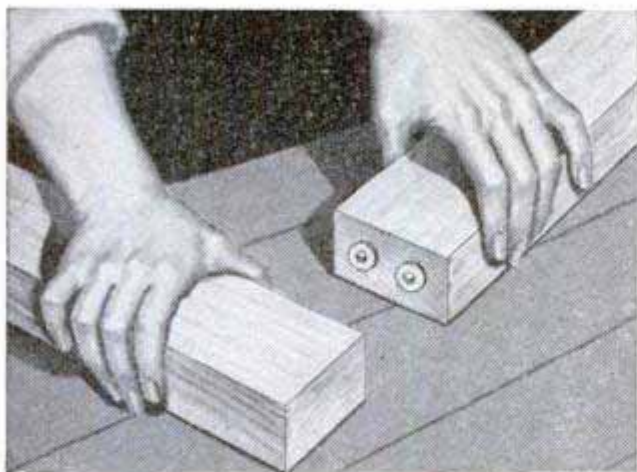
## Oilstove Fitted With Sheet-Metal Jacket Supplies Hot-Water Heat to Bathroom



shown, to fit partially around the outside of the burner chamber.

Roland Diehl, Madison, Wis.

## Pointed Dowel Centers for Cabinet Makers Are Turned From Metal Rod



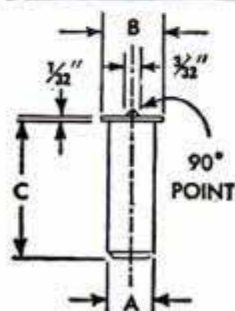
Should you need dowel centers for a cabinet-making job and find it difficult to buy them in your town, just turn a pair of the size required from a length of metal rod. Chuck the rod in the lathe and turn the shank and flange to the dimensions given in the chart. Then finish the center with a 90-deg. point on the flanged end. The length of the shank, dimension C, is not critical and depends largely on the length of dowel to be used.

John L. Alden, Maplewood, N. J.

## Wallpaper Provides Decorations

Attractive doilies and covers for matchboxes or cardboard coasters are made from waterproofed scraps of wallpaper. Waterproof the paper with either thinned cellulose cement or paraffin dissolved in cleaning fluid. Clear lacquer also may be used for this purpose.

☞ To remove crumbs from an electric toaster, use a new, small paintbrush.



DOWEL	A	B	C
1/4"	.255	3/8"	3/4"
5/16"	.317	7/16"	13/16"
3/8"	.380	1/2"	1 1/8"
7/16"	.442	1/2"	1 3/8"
1/2"	.505	5/8"	1 1/2"

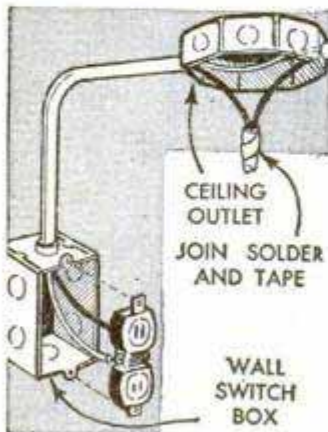
## Inclined Planks Support Plywood To Simplify Sawing Large Sheets



Handsawing a large sheet of plywood or hard-pressed board near the center usually is an awkward job, even with the sheet supported adequately in a horizontal position. However, if the work is rested on two planks placed parallel with the saw cut and leaned at an angle against a wall or bench, it can be sawed easily from a standing position as this brings the top center portion of the sheet within easy reach. A cleat nailed across the planks near the bottom prevents the sheet from sliding and keeps it off the floor to complete the cut.

John E. Reeves, East Aurora, N. Y.

## Unused Ceiling-Fixture Circuit Adapted for Wall Receptacle



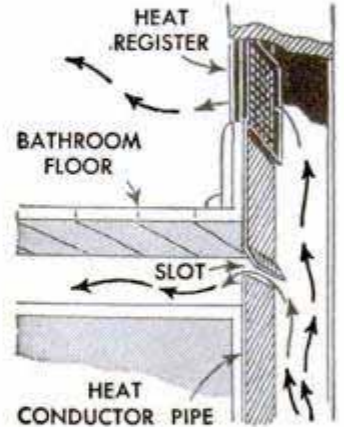
When the ceiling fixture has been removed from a living room, the unused wall switch usually is left intact. If this is the case in your home, you'll find it a simple matter to replace the switch with a convenience outlet. First, remove the decorative cover from the ceiling-outlet box and join, solder and tape together the ends of the two live wires inside the box. Then, disconnect the wall switch and wire a du-

plex receptacle in its place. This extra outlet will come in handy for a night light and numerous electrical appliances.

Roy C. Loughary, Portland, Ore.

## Hot Air Warms Bathroom Floor

Are you planning a new home with hot-air heat? Then, consider the added comfort of a warm floor in front of the bathtub. This is done by slotting the hot-air duct at a point between the bathroom floor joists and forming a baffle to deflect part of the warm air through the opening.



Of course, the bathroom will have to be laid out so the floor joists run parallel with the tub and the duct located in the wall between joists and immediately in front of the tub.—E. S. Norton, Pittsburgh, Pa.

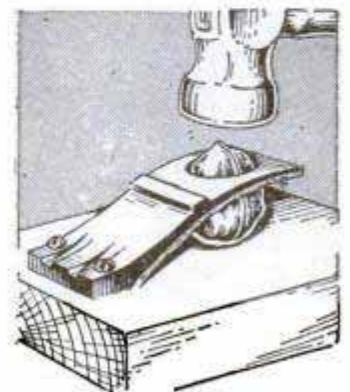
## Bamboo Ski Poles Strengthened



Even though they are unusually strong and pliable, bamboo ski poles occasionally break under severe strain. However, if they are wrapped with friction tape the full length of the shaft, they will not splinter. Laminated-cane ski poles also may be reinforced in this manner.

## Cracking Hard-Shelled Nuts

If a large number of hard-shelled nuts are to be cracked with a hammer, the job is done faster and without danger of injury to the fingers when the nut is held by a clamp. The clamp consists of a section of tire casing having one end cut out to hold the nut and the other end nailed or screwed to a wooden block.

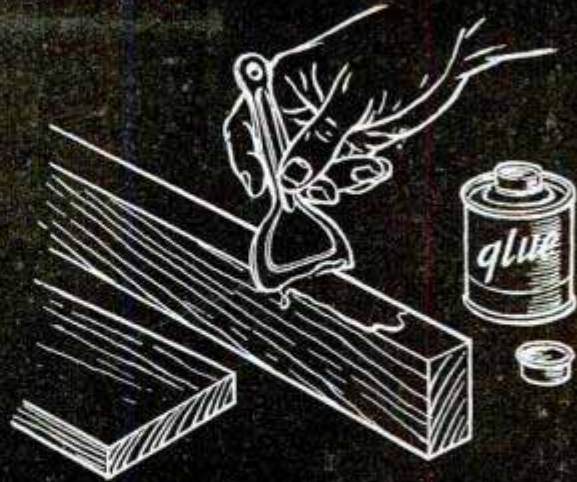


G. E. Hendrickson, Argyle, Wis.

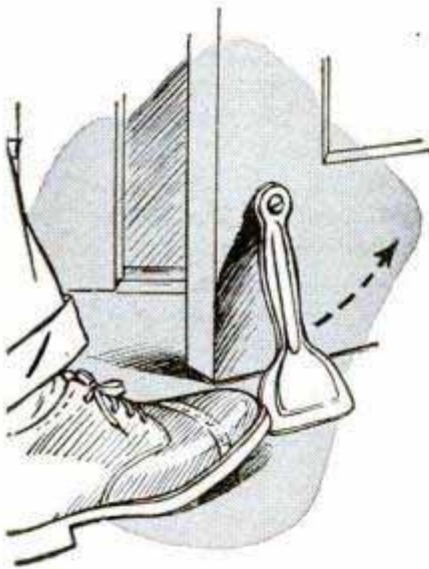
# Use a plate scraper for—

By Kenneth Murray

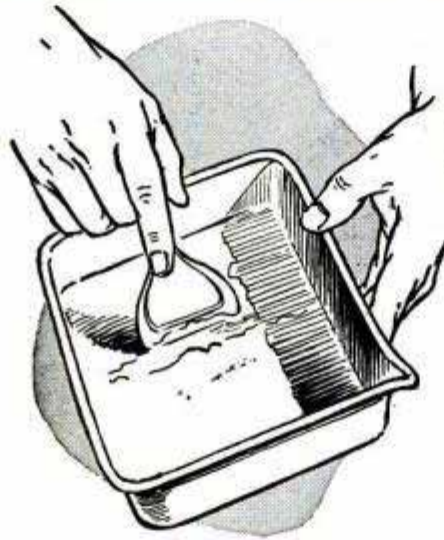
Usefulness of ordinary rubber plate scrapers is by no means confined to dishwashing alone. Actually they have dozens of uses throughout the home, including the darkroom and workshop, and are also handy when cleaning car windows. A few of the applications for which they are especially suited are shown in the drawings. However, if the scrapers are kept in mind, many other practical uses will present themselves.



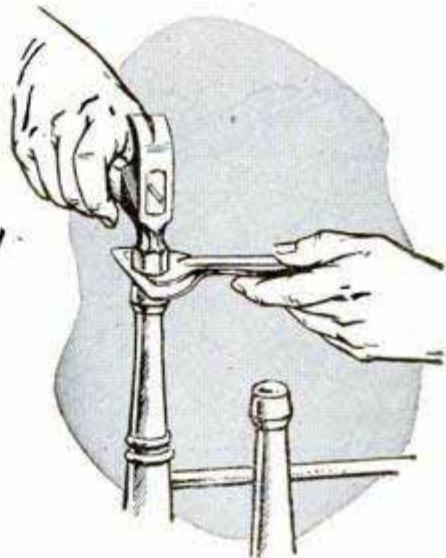
a glue spreader



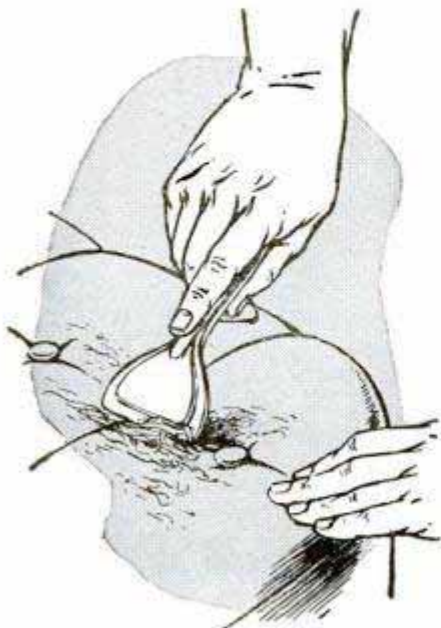
a doorstop



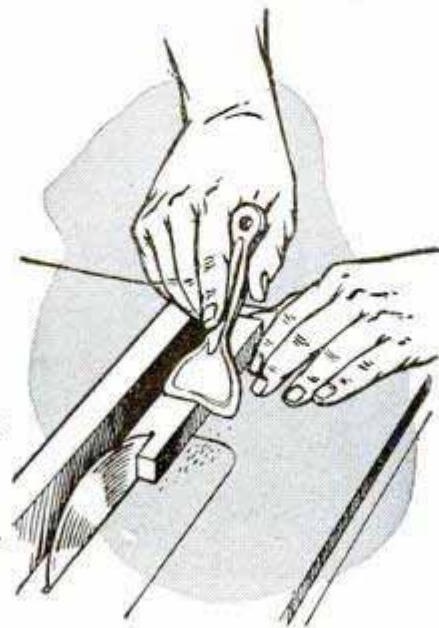
cleaning photo trays



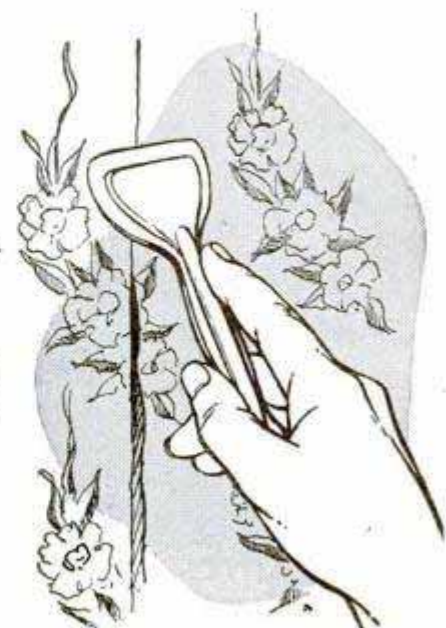
a hammer "cushion"



picking up lint



a hold-down

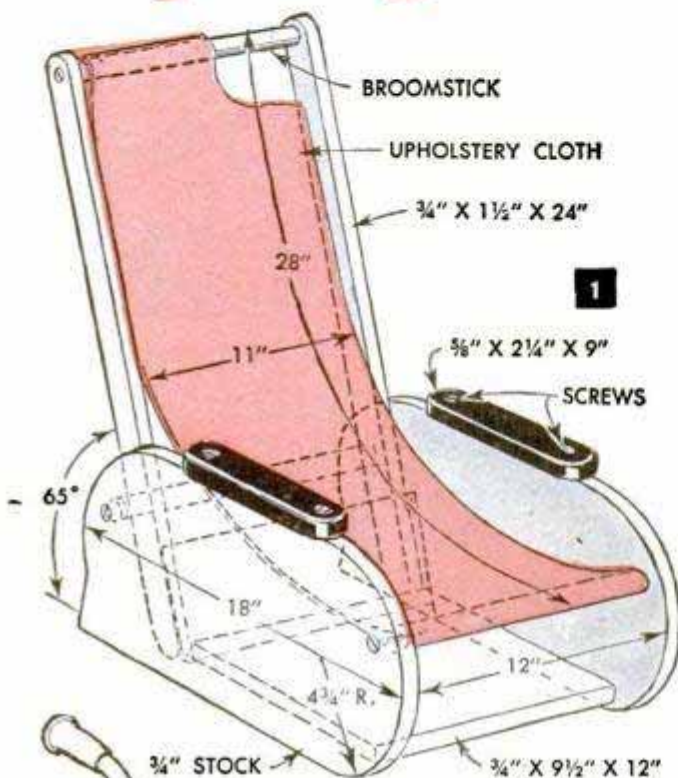


smoothing wallpaper

# Toys

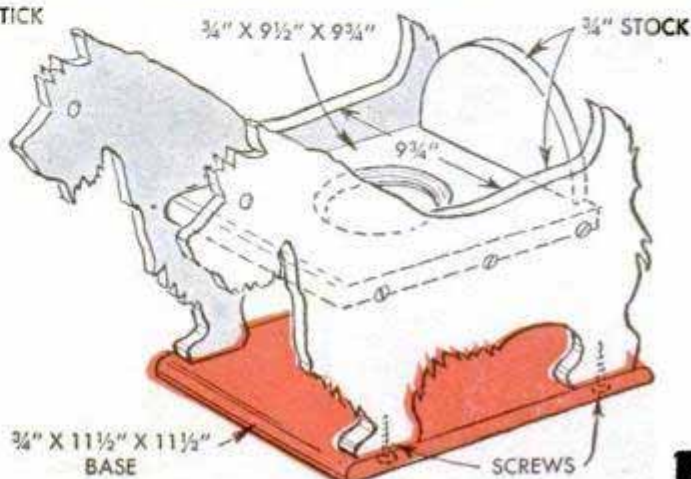
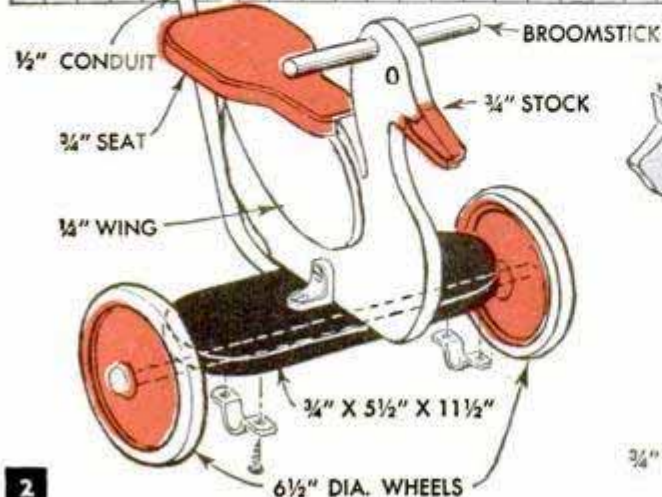
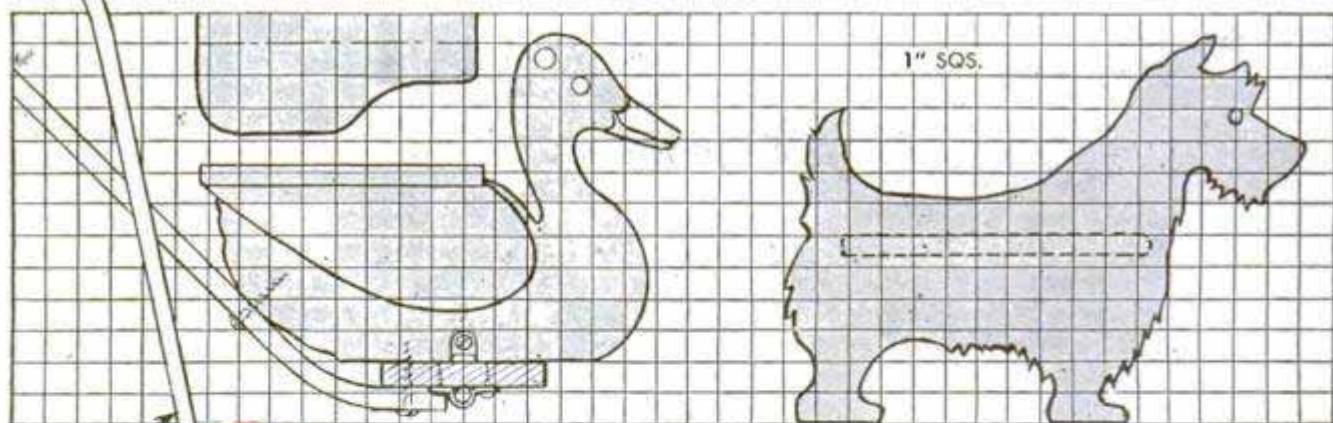
Seven novel and exciting toys for playroom and outdoor use. All can be made inexpensively from stock lumber. Some require roller skates; others, wheels from discarded toys

By Marvin Hartley



BY USING STOCK LUMBER, which is already cut for width and thickness, a jigsaw is the only power tool needed to make these novel toys. However, several of them can be made entirely with a few common hand tools. Pieces of broomstick, a pair of old roller skates and wheels from a discarded doll buggy or other toy, all of which usually are readily available, help to keep material cost at a minimum.

**Hammock chair:** Patterned somewhat after a steamer chair, this one, detailed in Fig. 1, features a compartment for picture books under the seat. Both sidepieces are cut from 1 x 10-in. stock, which actually measures about  $\frac{3}{4}$  x  $9\frac{1}{2}$  in. The sides are screwed to a third piece of the same stock placed  $\frac{1}{2}$  in. up from the bottom. The uprights for the back are 1 x 2s ( $\frac{3}{4}$  x  $1\frac{1}{2}$  in.), rounded at both ends and attached to the sidepieces at a 65-deg. angle with short screws from the inside. Note that a length of broomstick is screwed between the





When rainy days keep lively youngsters penned indoors, they'll have a circus in the basement playroom with this rollicking merry-go-round. Propelled by the feet of the riders or pushed by a third person, the toy rotates in a five-foot circle. The colorful fish coaster shown below gives two riders a fast and merry trip downhill. The toy is steered by the feet of the driver, and the fish's fin provides a handhold for the rear rider





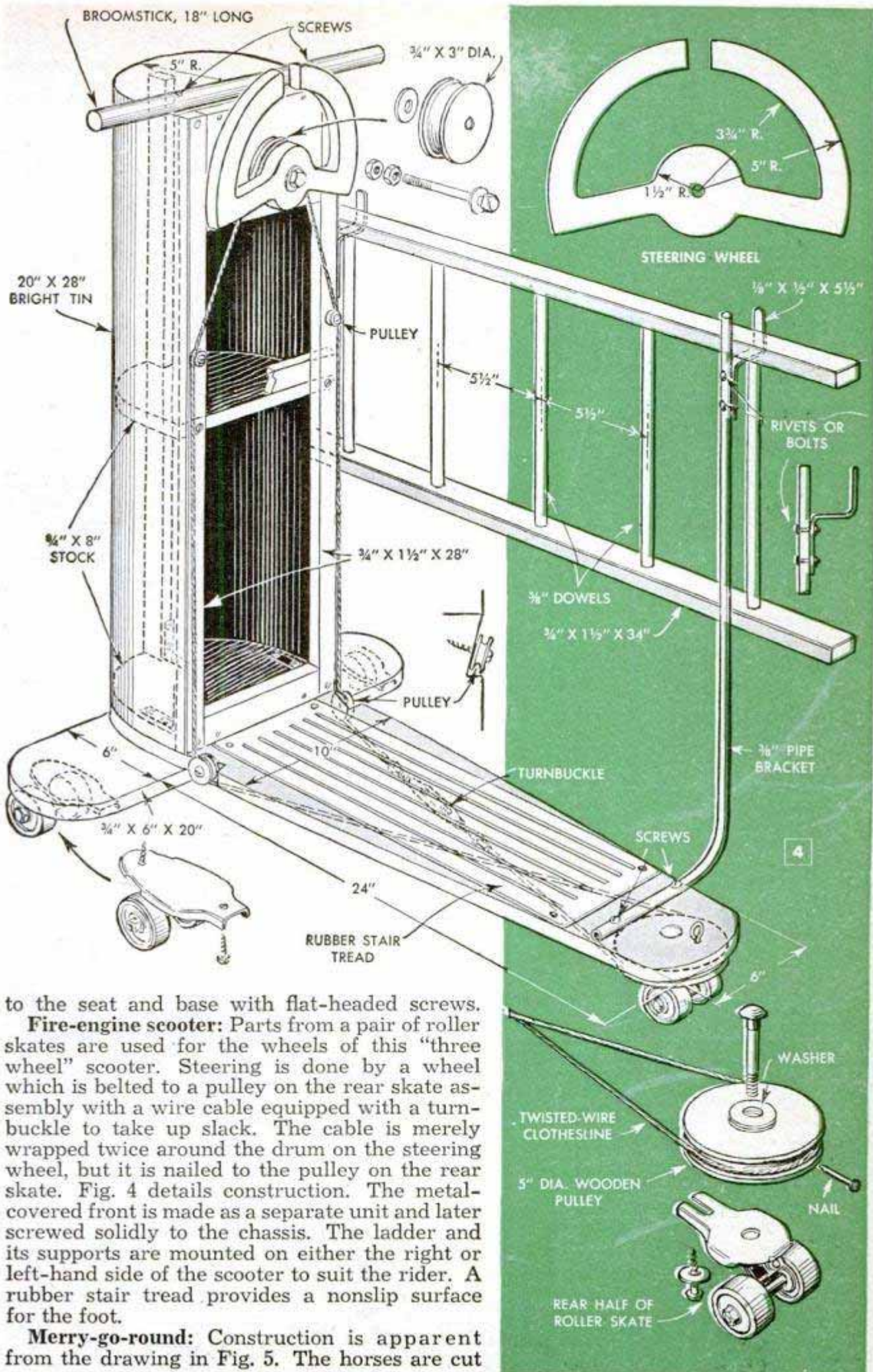
No toy is more appealing to a boy than a fire engine. This one has roller-skate wheels, a removable ladder and space for groceries when Mom sends Billy on an errand. Small tots will rock by the hour in the novel seesaw boat pictured below, which is a safe and sturdy toy. The scottie chair at the right can be used as a play chair or put to practical use as a training seat

sidepieces of the chair to support the back. A piece of 1 x 4, cut to fit between the sides, is screwed to the edges of the upright pieces at the bottom. Strong upholstery cloth is used for the seat and the ends are hemmed to slip over two lengths of broomstick, one being screwed between the sides and the other between the ends of the uprights. Finally, short blocks, rounded at both ends, are screwed to the edges of the sidepieces to provide armrests.

**Duck stroller:** Make a paper pattern of the duck first, following the squared drawing, Fig. 2. The duck is cut from a piece of 1 x 12 ( $\frac{3}{4}$  x 11 $\frac{1}{2}$  in.), the wings are  $\frac{1}{4}$ -in. stock and the seat and footrest are sawed from a 1 x 6 ( $\frac{3}{4}$  x 5 $\frac{1}{2}$  in.). The duck is attached to the center of the footrest with angle brackets. Then a handle, bent from  $\frac{1}{2}$ -in. conduit, is drilled for screws and fastened securely to the underside of the footrest and to the edge of the duck. The axle is fastened with small pipe straps.

**Scottie chair:** Designed for use either as a play chair or a training seat, the scottie chair, Fig. 3, consists of five pieces. As 1 x 12-in. material is too narrow for the scotties, extra blocks must be added to the edge of the board for the feet. The seat is a piece of 1 x 10 ( $\frac{3}{4}$  x 9 $\frac{1}{2}$  in.) with a semi-circular back screwed to the rear edge from below. The base is cut square from a piece of 1 x 12 ( $\frac{3}{4}$  x 11 $\frac{1}{2}$  in.). The scotties are fastened





to the seat and base with flat-headed screws.

**Fire-engine scooter:** Parts from a pair of roller skates are used for the wheels of this "three wheel" scooter. Steering is done by a wheel which is belted to a pulley on the rear skate assembly with a wire cable equipped with a turnbuckle to take up slack. The cable is merely wrapped twice around the drum on the steering wheel, but it is nailed to the pulley on the rear skate. Fig. 4 details construction. The metal-covered front is made as a separate unit and later screwed solidly to the chassis. The ladder and its supports are mounted on either the right or left-hand side of the scooter to suit the rider. A rubber stair tread provides a nonslip surface for the foot.

**Merry-go-round:** Construction is apparent from the drawing in Fig. 5. The horses are cut

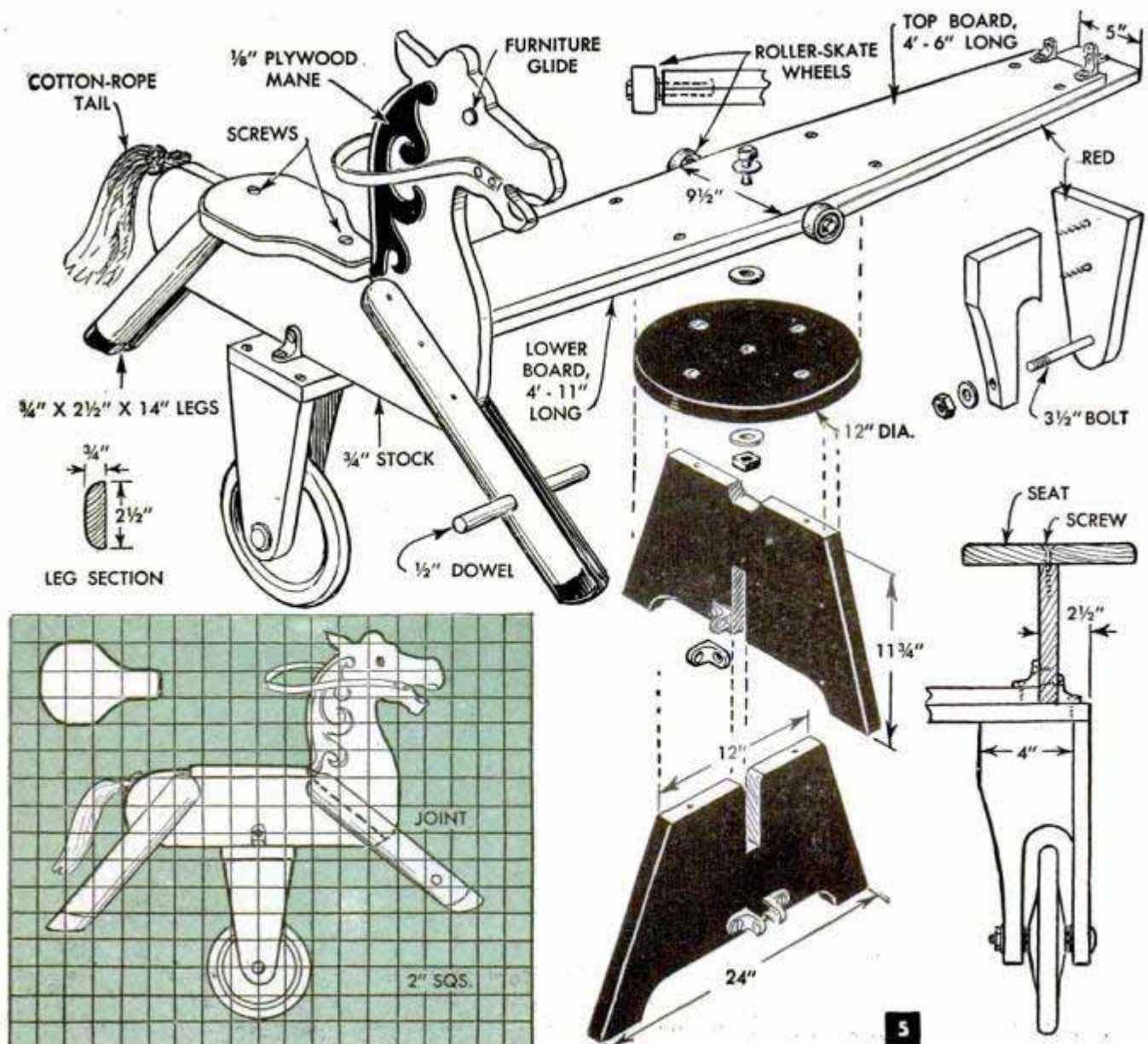


from two pieces joined together at a 45-deg. angle at the point indicated by the dotted line in the squared drawing. The base of the toy around which the horses rotate is of half-lap construction, bottom edges being covered with rubber to reduce slippage.

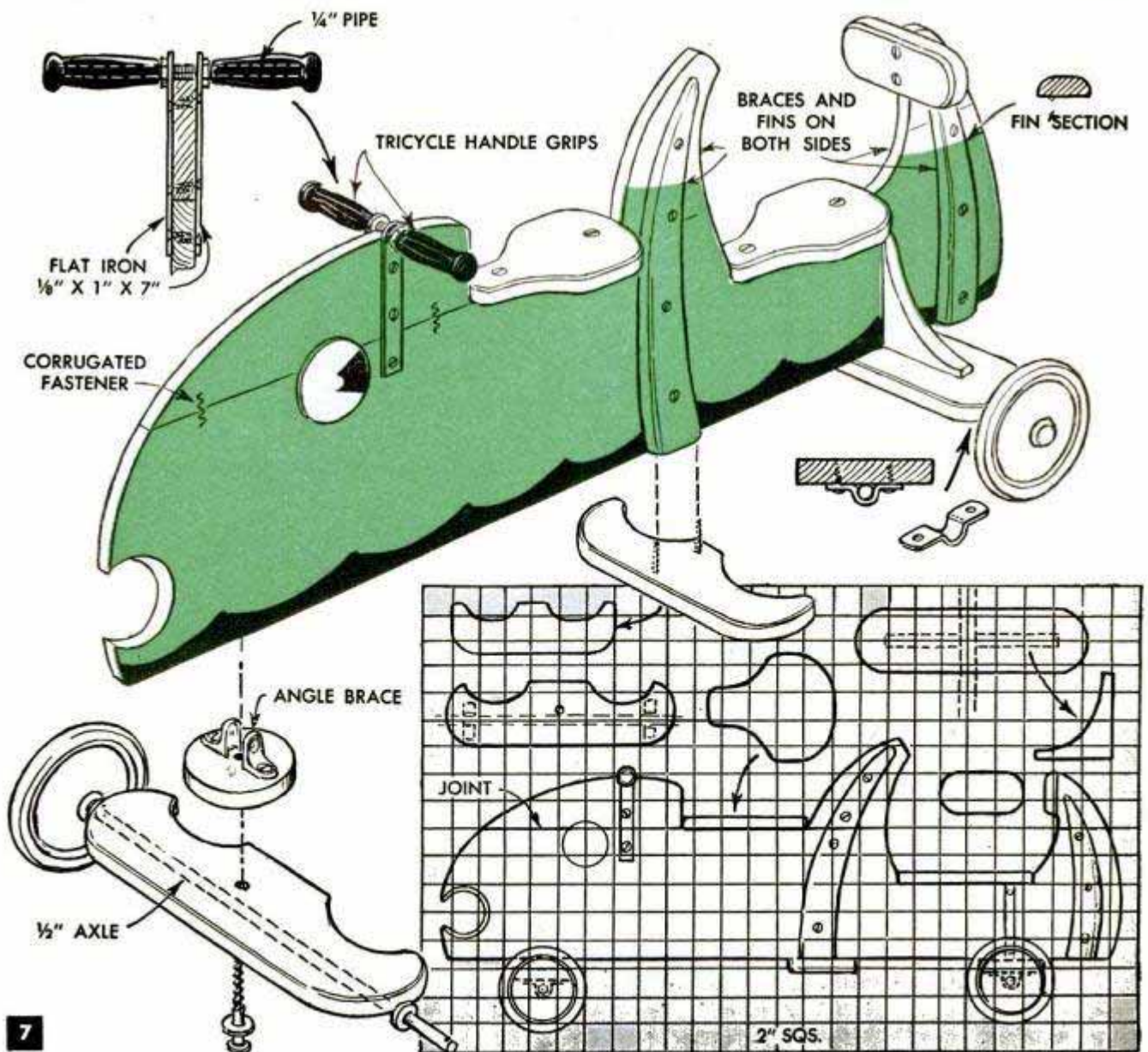
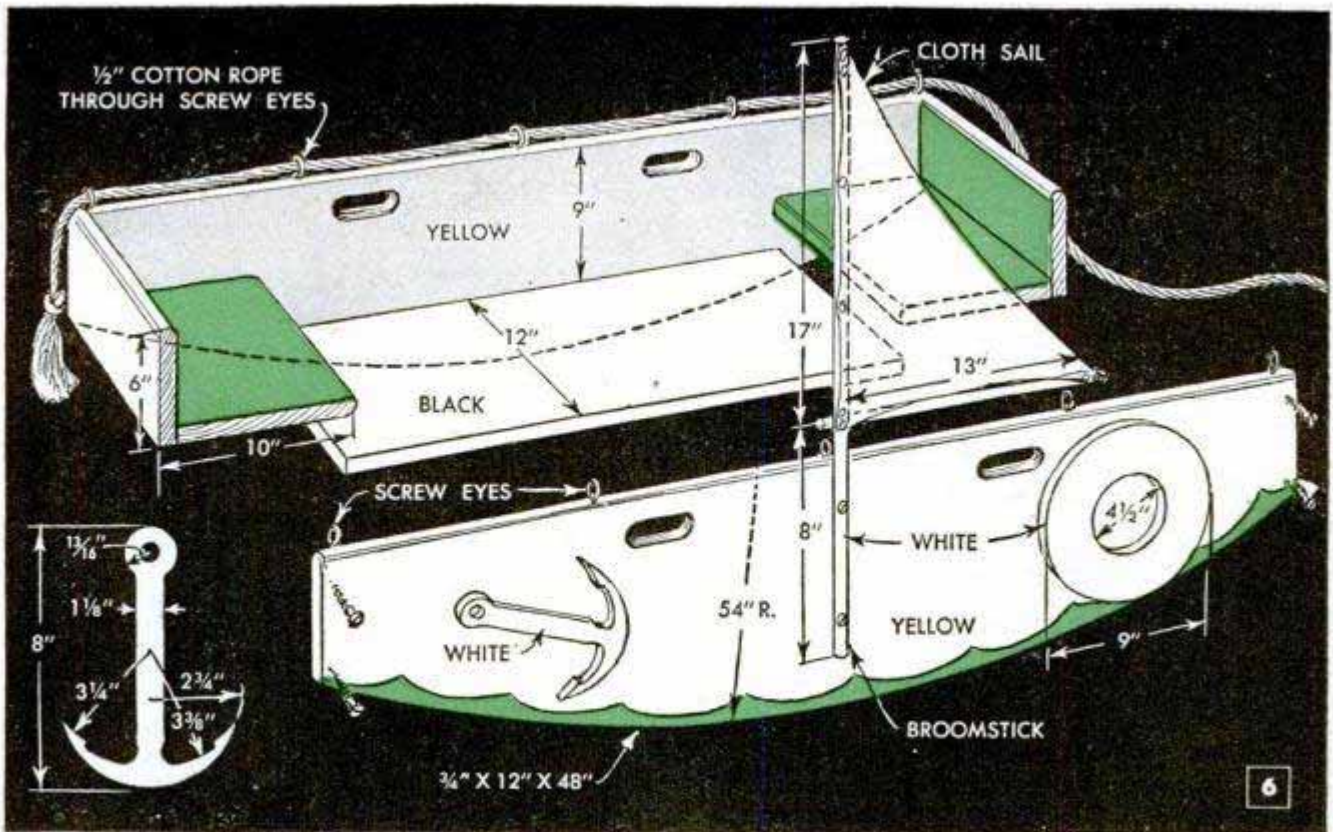
**Seesaw boat:** The entire boat is made from 1 x 12-in. stock and assembled with screws in the manner shown in Fig. 6. Screw eyes turned into the top edges are threaded with rope, the ends of which are knotted and frayed to form tassels. Anchor and life-belt motifs are jigsawed separately and nailed to both sides of the boat.

**Fish on wheels:** The body of the fish is built up of two stock pieces joined together with corrugated fasteners. Fins are braced with cleats screwed to each side. The squared drawing, Fig. 7, details the size and shape of all parts. The front-wheel assembly is lag-screwed to the fish.

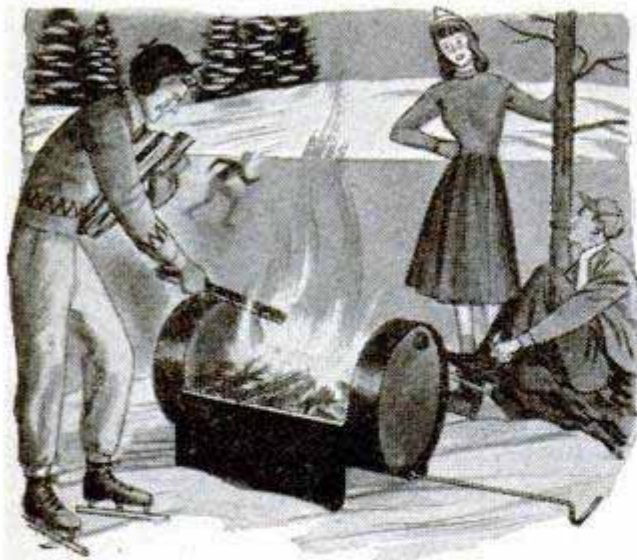
Left, a beach or garden umbrella used as a canopy will add to the realism of the merry-go-round. A pipe flange and nipple will provide a socket for it







## Skaters' Portable Fireplace Is Made From Oil Drum



Just the thing for ice-skating parties in extremely cold weather, a sled-type fireplace made from an oil drum is easily towed on the ice. If the party decides to move to another location, the fireplace can be taken along. The side of the oil drum is cut and bent to form two runners, and a towing handle is made from a length of steel rod or stiff wire. A bed of sand or dirt insulates the bottom of the fireplace and permits it to be used offshore.

## Asphalt Base Molding Simulated With Hardboard Strips

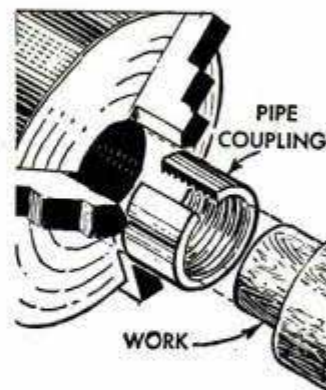
If you would like an asphalt base molding in your kitchen and bathroom but feel that it is too expensive, you can imitate it by installing  $\frac{1}{4}$ -in. hardboard. Cut the board into strips of the desired width, chamfer the upper edges and cement or nail them in place. If you nail them, use



small finishing nails and countersink the heads. Use a narrow molding at the lower edge, such as quarter round. Or, if you like something different, try a narrow cove molding. Enamel the base to suit.

## Chucking Wood for Internal Boring

To chuck wood stock securely in a lathe for internal boring, use a piece of pipe coupling to increase the gripping surface of the chuck jaws. Hacksaw a section from the side of the coupling to permit clamping action and turn down the end of the work to fit in the coupling. Make this shouldered end the same length as the coupling clamp to give a positive grip.—L. D. Barner, Waco, Tex.



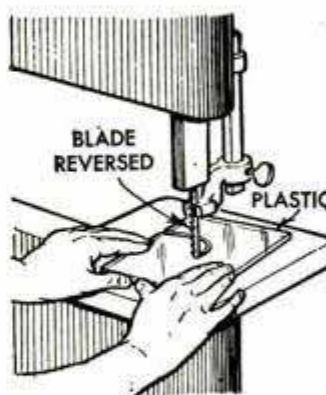
## Handle to Carry Chopping Block



It's not difficult to carry a chopping block if it is fitted with a handle. A good one that will not damage the cutting edge if it is accidentally struck with the ax is made by nailing a strip of old auto casing to the side of the block.

## Cutting Plastic on Bandsaw

Before cutting plastic with an ordinary bandsaw blade, turn the blade so that the teeth point upward as they pass through the table. This gives the necessary backward angle to the teeth and will prevent chipping of the plastic. Best results are obtained if the blade is lubricated with paraffin or wax.



S. S. Palestrant, Bronx, N. Y.

☛ A handful of salt thrown at the base of a flame caused by burning grease will extinguish it quickly.



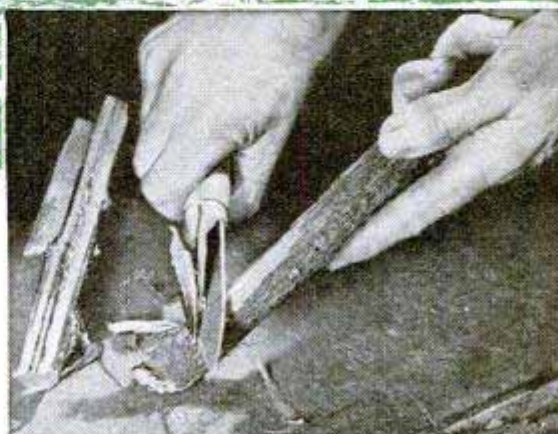
## FANCY WOODS from your back yard

By Walter E. Burton

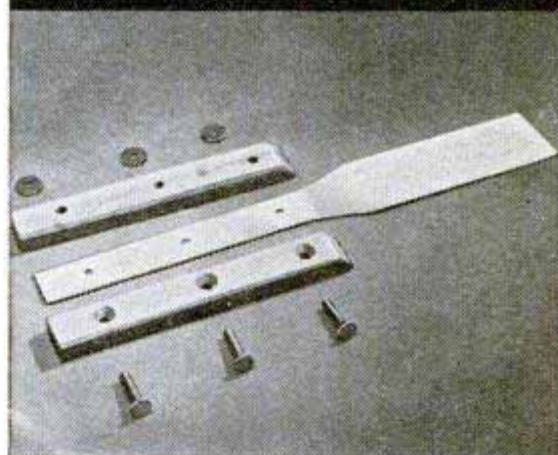
**C**HOICE pieces of fancy woods that are ideal for small turnings, such as tool handles and similar projects, are available right in your own back yard. Wood from an apple or cherry tree finishes beautifully and is well suited to turnings and the carving of small novelties. Large stems of some rose bushes, being of tough and close-grain wood, are excellent for tool handles. Catalpa wood, while relatively soft, has an interesting grain.

Often, the dead branches of a bush or tree will be dry enough to use right away but in other cases the wood will have to be seasoned before working it to shape. This is done by stripping the bark from the branches and then storing them overhead in a garage or dry basement. Paint both ends of each piece with asphaltum to prevent checking. After a few months of air-drying, the pieces will be ready for use.

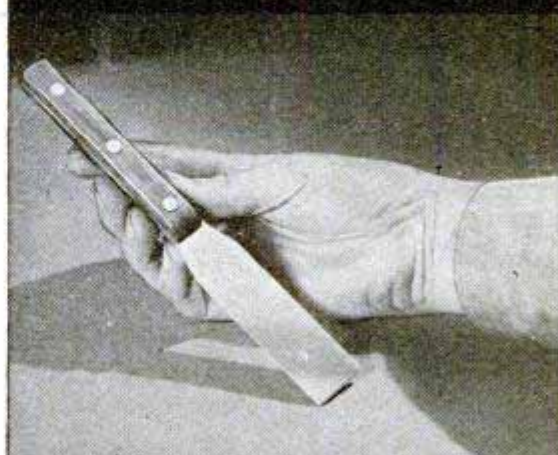
The spatula pictured in the photos at the right is an example of what can be done with home-grown wood. Here, wood from the stem of a rose bush was used to form the handle. First the wooden parts are planed flat on one side and cut roughly to size. Then they are clamped to each side of the spatula tang and all three parts drilled at one time for three flat-headed rivets. Holes in the wooden parts are countersunk slightly to take the rivetheads and the burrs on the peened ends. A file is used to dress the rivets flush with the wood and, finally, the handle is worked down to the desired shape with sandpaper. A coat of stain followed by two coats of clear lacquer and rubbed to a high polish brings out the beauty of the wood.



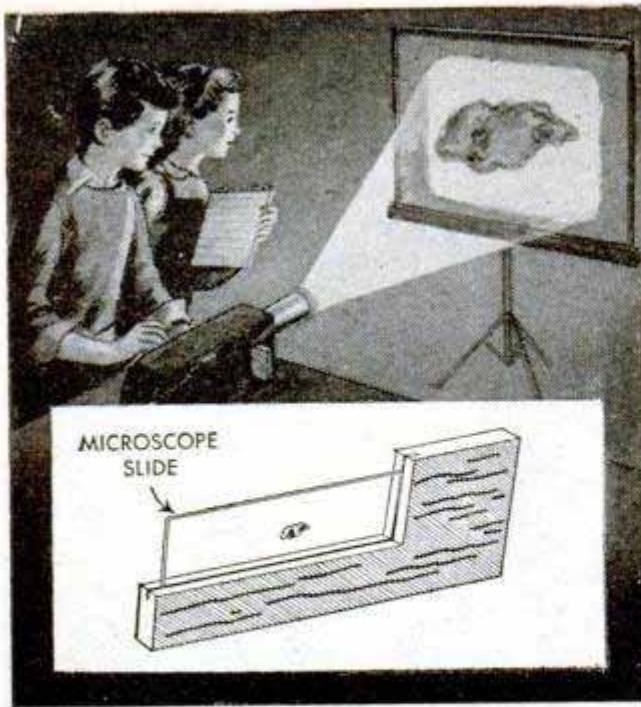
Removing bark of dead rose-bush cane. Wood is then allowed to dry thoroughly



A length of rose-bush cane, split down the middle, is used for spatula handle



Assembled to spatula with brass rivets, handle is sanded, stained, lacquered



### Microscope Slides Are Projected For Study and Entertainment

In addition to being a study aid for high-school science courses, an ordinary transparency projector adapted for showing microscope slides provides hours of entertainment for the child hobbyist. The regular transparency carrier is replaced with a wooden slide carrier, the dimensions of which are determined by the particular projector. The wooden carrier is made L-shape from two separate blocks. Before the blocks are glued together, the adjacent edges are grooved to hold a microscope slide, as shown. The projector is operated in the same way as when used to show transparencies.

Leo J. Freiermuth, Moscow, Idaho.

### Fitting Plywood Panels



It is easy to fit a plywood panel into the grooved stiles and rails of a paneled cabinet or door frame if the edges of the panel which are to fit in the grooves are chamfered 45 deg. along each corner. The cham-

fers readily permit the edges of the panel to be aligned with the grooves. This is especially helpful when the panel is of a fairly large size.

Whitney K. Towers, Los Angeles, Calif.

☐ If you wrap silverware in flannel, use the unbleached type. The sulphur used in bleached flannel tarnishes silver.

### Cold Chisel Has Shockproof Grip

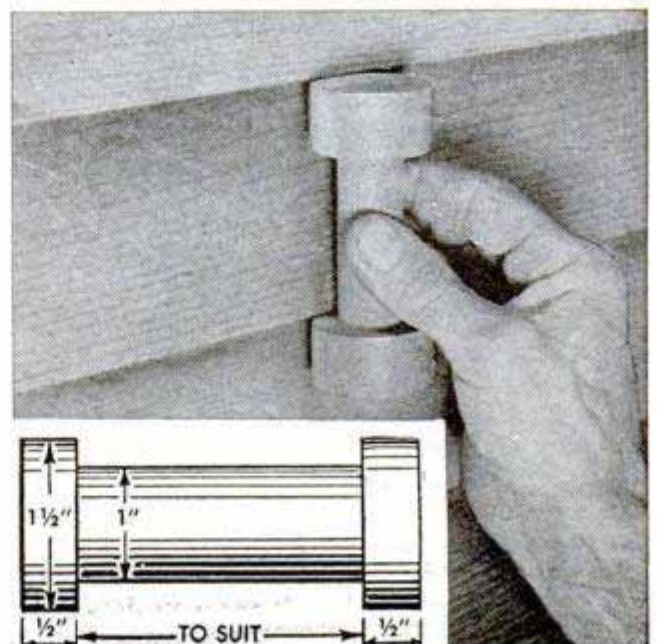
Using a cold chisel will be easier on your hand if a piece of rubber tubing or garden hose is slipped over the shank of the chisel. Soft, thick-walled tubing is best. If it is difficult to force over the chisel, lubricate the shank with a few drops of glycerin.

Jo Ro Jung, New Orleans, La.



### Siding Is Spaced Quickly With Spool Gauge

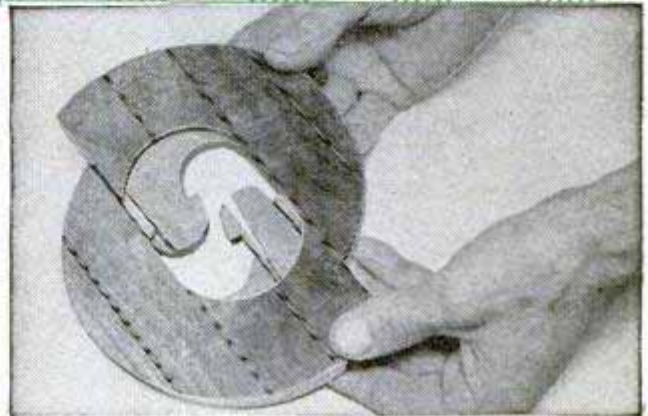
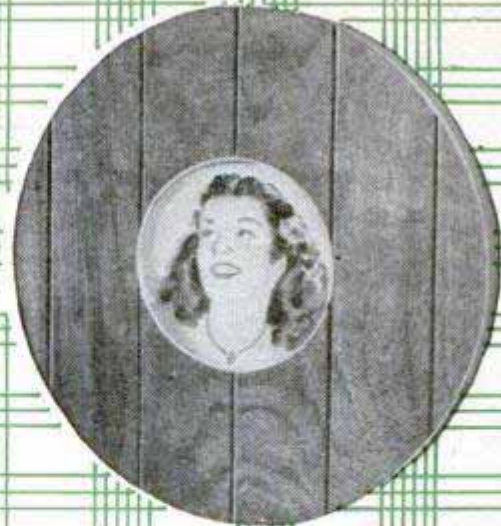
Once the starting strip of beveled siding is leveled and nailed in place, it's a simple matter to space and level each succeeding board with this spool-shaped wooden gauge. The gauge, turned to the dimensions indicated in the detail, is employed at intervals along the length of each piece of siding as in the photo. The length of the gauge shank is not given, as this depends upon the width of the siding and the height of the wall. Consideration of the latter is important if you would avoid having the last piece of siding considerably narrower than the others. Thus, if the siding is to be laid 6 or 8 in. to the weather, you should determine if the total height of the wall is a multiple of the desired spacing. You may find it necessary to vary the 6 or 8-in. spacing one way or the other. The figure for the correct spacing is also the dimension for length of the gauge, measuring from the outside edge of one flange to the shoulder of the other. As long as both flanges are 1/2 in. wide, the gauge can be used end-for-end.



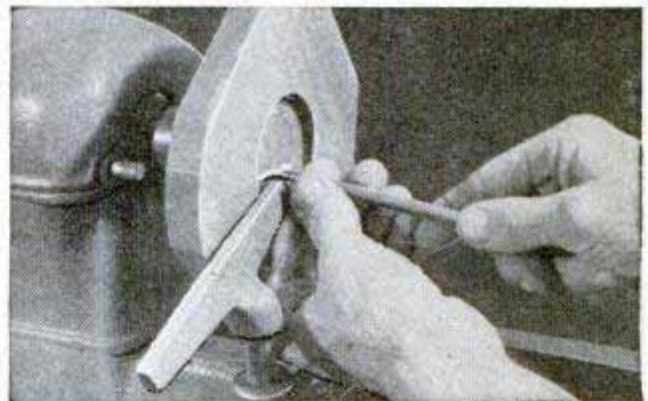
# SLIP-JOINT PICTURE FRAME

By Benj. Nielsen

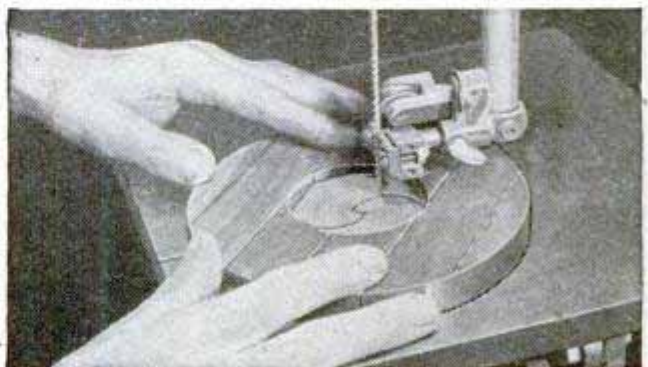
ONE WOULD never guess that this unusual picture frame slides apart on hidden dovetail splines to release the photo. While the one shown is circular, only minor changes in dimensions are necessary to make the frame square, with a square picture recess. To make a circular frame, bandsaw the corners from a piece of stock  $\frac{3}{4}$  in. thick and 7 in. square, and make the five decorative saw cuts, indicated in the detail, parallel with the grain. Mount on a lathe faceplate and cut the picture recess, undercutting the edge as in section A-A. Then, turn to a 7-in. dia. and sand smooth. Bandsaw the disk to form the automatic ratchet-type catch which holds the two sections of the frame securely when they are slid together. Next, make the dovetail spline of hardwood and run a groove and dovetail in the two parts of the frame as in section B-B. Some hand-fitting probably will be necessary to assure that the parts operate properly. If a square frame is made, the work is somewhat simplified as no turning will be necessary. If desired, the shallow saw cuts can be respaced on the square frame. Use a fine cabinet wood of a uniform color and attractive grain, finishing the frame in the natural color of the wood.



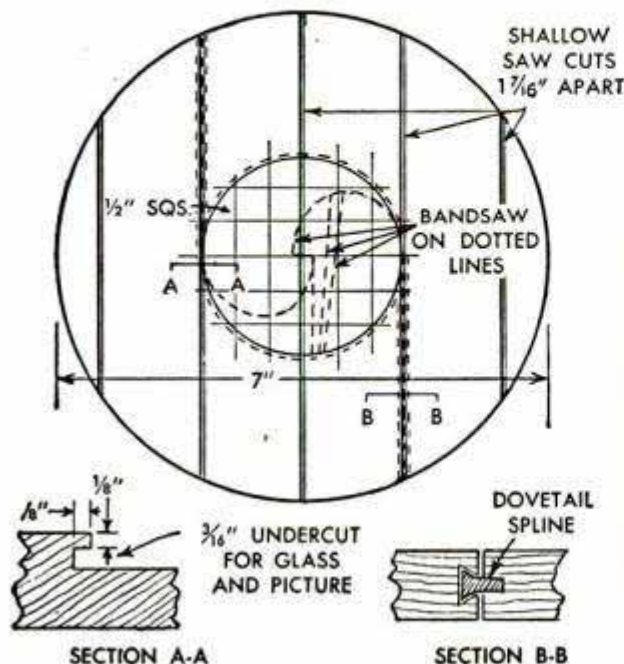
Unusual catch operating on ratchet principle holds sections of frame together and is quickly released



With rough frame mounted on lathe faceplate, edge of picture recess is undercut for glass and photo



Bandsaw frame into two sections, forming ratchet-type catch. Then cut grooves and add dovetail splines



# REPAIR DAMAGED RUGS

**N**EW LIFE is added to torn, frayed and spotted rugs by simple needle-and-thread repairs that can be made right at home. Warp breaks, or tears, worn fringes and split selvages are the most common types of damage caused by prolonged heavy wear. Large throw rugs placed before doors and between rooms, and also room rugs unprotected by pads on uneven floors get the greatest amount of wear and become damaged quicker than rugs in the less-traveled areas of the house.

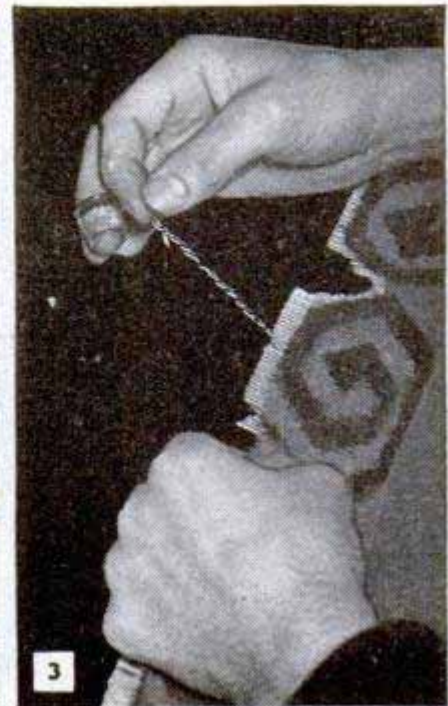
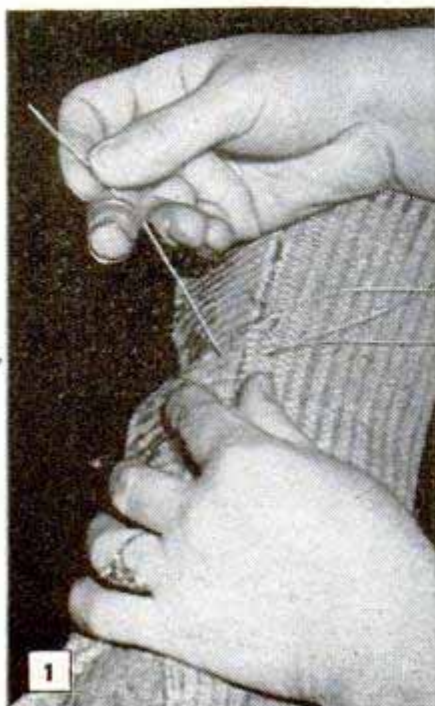
Rugs are of two common types: those that are woven, and those made by knotting or hooking threads through a loosely woven foundation, or web, through which the threads pass to form loops. These loops usually are sheared to a uniform height in the course of manufacture and form what is called the pile. In the woven type of rug, the warp and weft threads are woven flat, thus exposing the side of the thread to wear instead of the ends of the sheared loops as in the pile type of rug. Figs. 7, 8 and 9 show variations of weave. Special terms are used by manufacturers and dealers to identify the various types of rugs and certain designations determine the twist of the yarn and the finish or quality of the fiber. The type of floor covering woven in strips on narrow looms is commonly called carpeting. It is made in various widths and is generally woven in solid colors. Other types of rugs are usually woven in colored patterns. Rugs in colored patterns should always be cleaned before any repair is attempted, otherwise

By **Simon S. Palestrant**

the repair may not match the pattern. This is especially true when the rug is somewhat threadbare and the colors have been dulled by long wear, or have faded due to exposure to sunlight. Vacuum cleaning a rug thoroughly will remove the loose dirt and also some embedded dirt, but only washing or shampooing will restore the color in a worn pattern rug. If the repair, even though it is small, involves matching a part of an intricate pattern, Fig. 2, a thorough cleaning beforehand is doubly important.

Tears occur when a rug is scuffed while on the floor or when sudden pressure twists and breaks the warp threads of the web. Ordinarily a warp break of this type is easy to repair as no part of the rug is torn away or missing. The edges of the torn parts are matched carefully and sewed together either with an overcast stitch, Figs. 1 and 5, or, in some cases, with a cross-stitch as in Fig. 6. To make it easier to join the parts, the torn area of the rug is laid over a rounded piece of wood—a rolling pin is just the thing. After the repair is finished, wrinkles are flattened by spreading and stretching the threads with tweezers as in Fig. 18. Small sections of rugs or carpeting can be sewed together to form a larger piece in the same manner.

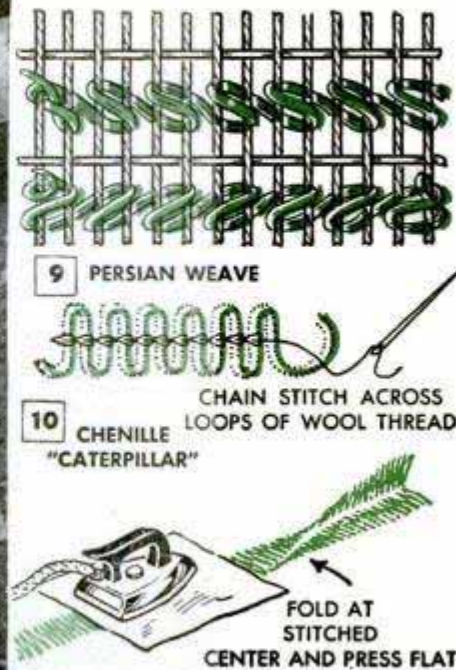
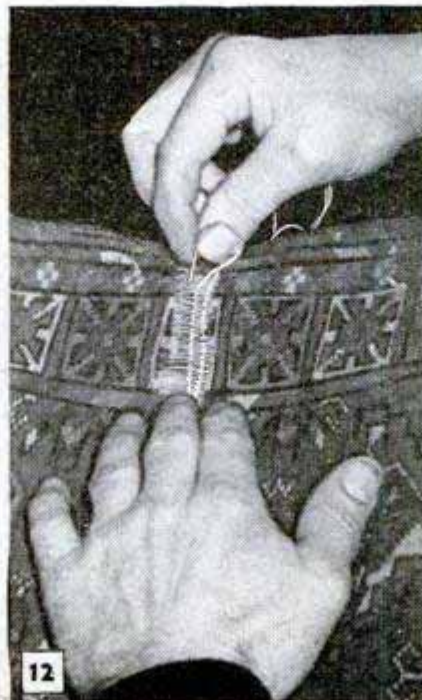
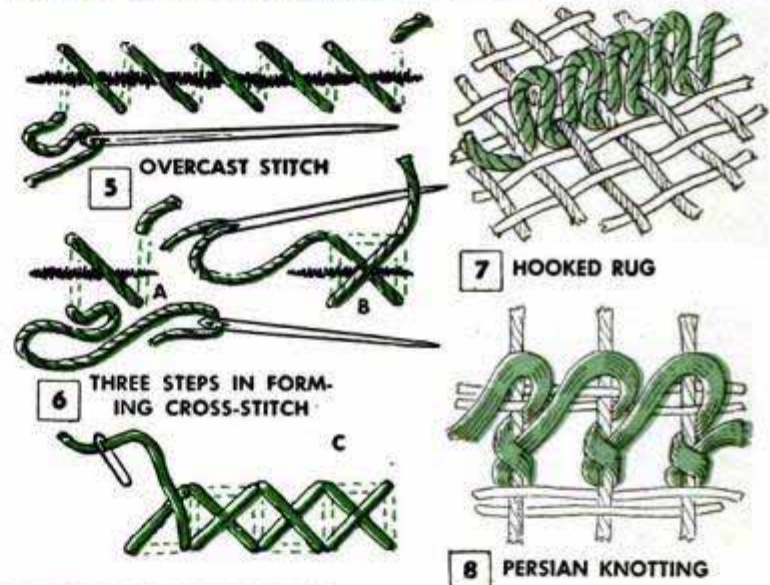
Repairing a threadbare rug where the pile is worn down to the web in spots calls for a more detailed procedure. The pile must be replaced with a wool yarn colored to match the pattern closely. The method of looping the repair yarn varies with the type of rug from the simple hooked loop,

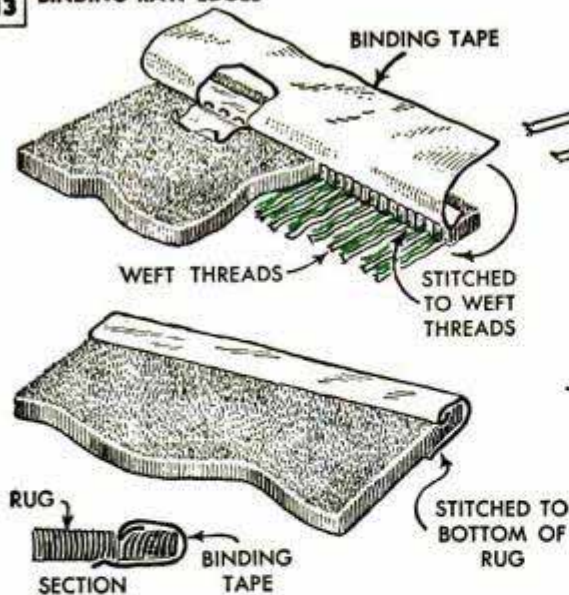
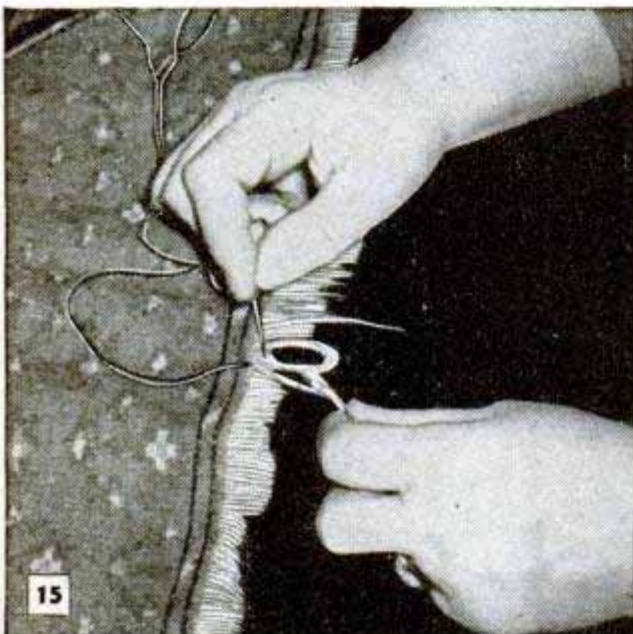
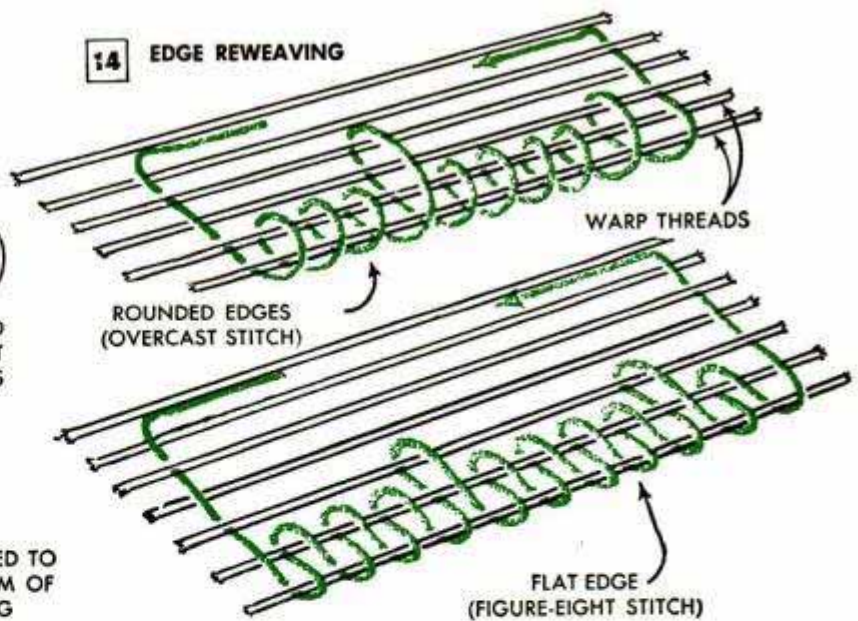


# YOURSELF

Fig. 7, to the intricate Persian weave in Figs. 8 and 9. In some cases, it is possible to match a design with yarn unraveled from an old rug as in Fig. 3. Remove the old pile knots in the threadbare portion to expose the web. Then tack this area over a wooden frame made from 1 x 3-in. stock. The frame serves the same purpose as embroidery rings, as it holds the rug flat and helps retain the flatness after the repair is made. Next, loop the wool threads into the web with the colors arranged according to the original pattern, Fig. 4. Knot the yarns and, when the area is covered, clip the tops of the loops to the same height as surrounding pile.

A small hole due to a burn or other cause makes it necessary to replace the web as well as the pile. Select a thread of the same size as the warp threads and start as in Fig. 11. After the opening is covered with the warp, cross-weave the weft threads as in Fig. 12 by threading the needle under one and over the next warp thread until the weft thread is carried across the hole. In taking the next weft thread across, the under-and-over weave must alternate with the first. Proceed alternately in this manner until all the weft is woven in. Then weave in the pile loops and shear to



**13 BINDING RAW EDGES****14 EDGE REWEAVING**

**15** Above, in making a fringe, loops of wool yarn are sewed to the selvage. Below, uneven ends of the cut loops are trimmed straight to make a uniform edge

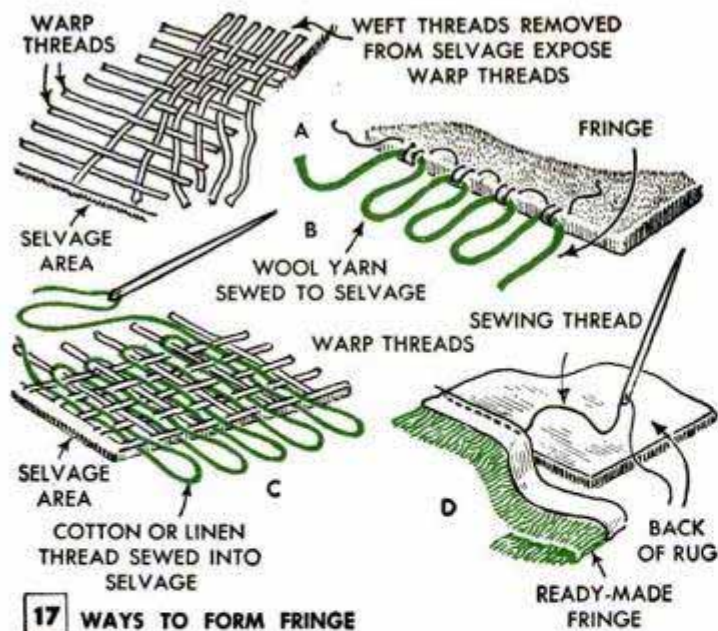


match the surrounding pile. In filling in a missing area of a chenille rug, a specially made fringe, or "caterpillar," is used as in Fig. 10. This is folded and pressed as shown before inserting in the opening in the rug.

When a piece of floor covering is cut to a narrower width or to an odd shape, the cut edge must be reworked to prevent it from raveling, Fig. 19. The last few rows of threads bordering the cut are sewed together with an overcast stitch, and the sewed edge is protected with binding tape as in Fig. 13. Where the edges of a rug are not cut but are frayed by long wear, they can be rewoven as in Fig. 14, using either an overcast stitch or a figure-eight stitch, depending on whether a rounded or flat edge is desired.

To replace torn or worn fringes, first cut off the old fringe and overcast the last two warp threads with ordinary sewing thread to keep the end of the rug from fraying. Some fringes on very old rugs are made of linen, but on most rugs the fringes are either wool or cotton. Linen and cotton fringes are sewed into the rug as they are made, detail A in Fig. 17, by simply drawing the cotton or linen threads into the selvage. Note that the thread is continuous, as in detail C in Fig. 17. When completed, the loops are laid flat and cut, Fig. 16. Then they are dampened, brushed flat and allowed to dry. If the fringe is to be made of wool yarn, alternate loops are made and the crest of each loop is sewed directly to a warp thread in the selvage with a separate cotton thread, detail B, Fig. 17, also Fig. 15. After sewing in place, using as many series of loops as are desired to form a light or heavy fringe, the loops are cut, dampened and flattened as before. Ready-made fringes, detail D, Fig. 17, are commonly used on small occasional rugs. These are stitched to the underside of





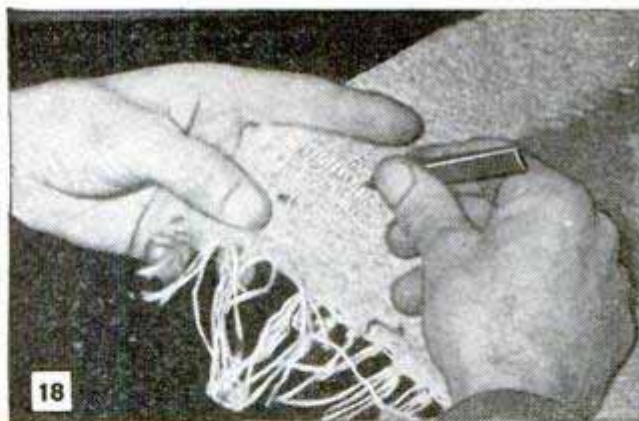
17 WAYS TO FORM FRINGE

the rug, Fig. 20, and may be attached all the way around the rug or only to the ends.

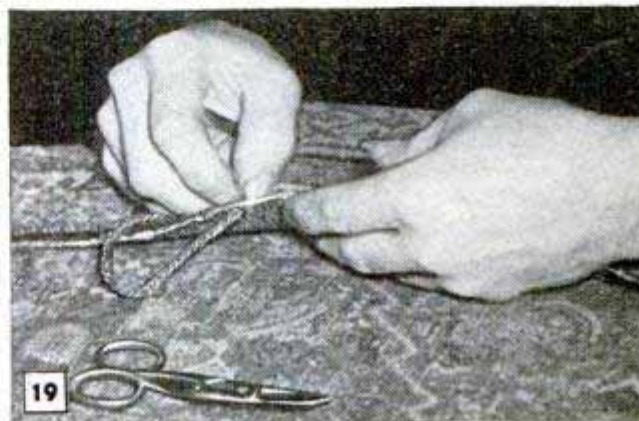
Older rugs may show small white spots, either singly or in groups, and sometimes they will appear widely scattered over the whole surface of the rug. Usually, this is due to small tufts or knots of the pile being pulled or torn out of the web. When these appear singly or widely scattered over the whole surface of the rug, they can be hidden effectively by touching up with aniline dyes, or waterproof inks will give the same result. Usually, the dyes must be mixed to match the adjacent colors. Unless the area is large, the new color need not match the old one exactly, but it should be close as otherwise the spot will show at some distance. The dyes are applied with a small brush as in Fig. 21 or with a pointed stick. In some cases a stick is better as the color can be worked down to the full depth of the pile. It should be noted that this repair is only a temporary one. If the rug is badly spotted over its whole surface, it can only mean that the warp is rapidly disintegrating to the point where the rug is no longer worth repairing.

Rugs that get exceptionally hard wear on an uneven floor are sometimes protected with a heavy lining sewed to the bottom. This can be applied only to those areas that get the hardest wear, or the lining may be attached to the whole underside of the rug. Use a heavy 6-oz. ticking or a lightweight awning cloth. When a lining is used it probably will be necessary to remove it before the rug can be cleaned properly. It should be remembered that a lined rug slides easily on a waxed hardwood floor. On a smooth floor the felt pad is usually more effective in minimizing wear.

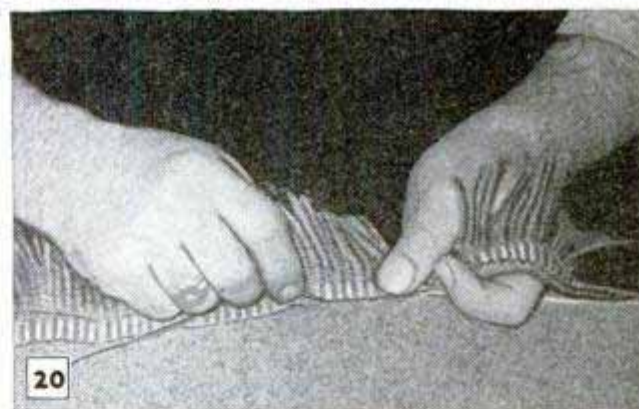
☛ New inner soles for house slippers can be cut from an old felt hat.



18 Wrinkles are flattened by spreading and stretching threads with tweezers. Threads then are respaced



19 Reweaving the edge after cutting. New threads are pulled into the warp threads with an overcast stitch

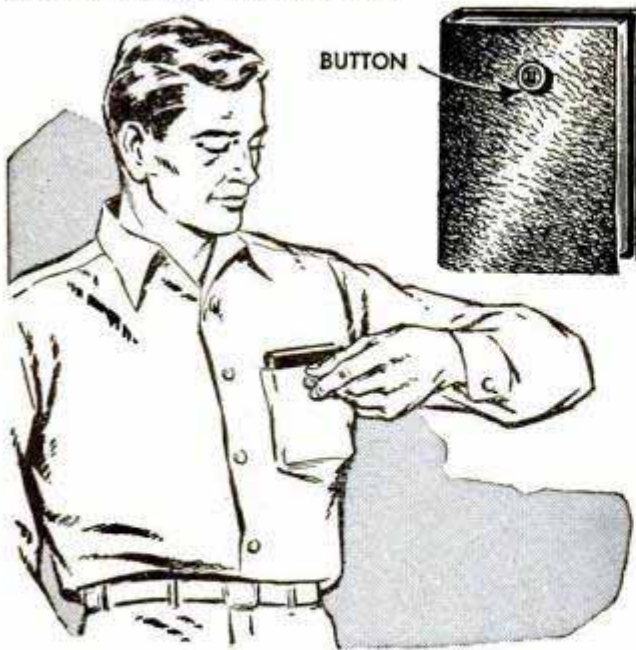


20 Ready-made fringe being sewed to a bound edge. Fringe should be sewed to the underside of the edge



21 Aniline dyes or waterproof inks are used to tint small light spots that show up where worn pile is pulled out of the web. This repair is considered temporary

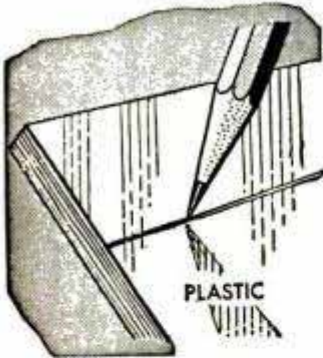
## Notebook Buttoned to Pocket Is Protected From Loss



If you carry a notebook in a shirt pocket while on the job, it can be kept from dropping out when you bend over by buttoning it to the pocket. Simply sew a button to the cover of the notebook and make a corresponding buttonhole in the pocket. This idea is useful also when carrying an over-size notebook or wallet in the hip pocket.

Andrew Vena, Philadelphia, Pa.

## Coloring Scribed Lines on Plastic Aids Following Pattern



Guidelines scribed directly on plastic prior to cutting it are easier to follow if colored with a soft pencil. After filling the lines, wipe away excess color. —Frank Shore, New York City.

## Motor-Switch Guard and Lock

A piece of sheet metal cut and bent approximately as shown provides an excellent motor-switch guard and locking device for home-workshop equipment. It is particularly useful when the position of the switch is such that it is likely to be accidentally turned on while the machine is being adjusted.

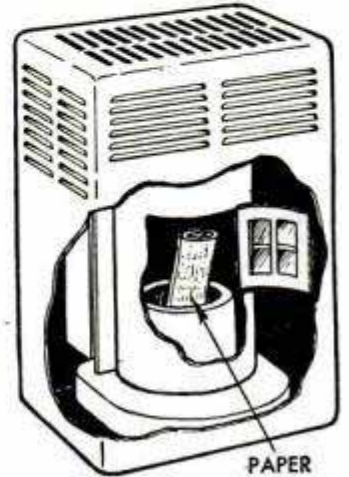


The guard is held in place by the switch locknut. Holes drilled through the curved sides of the guard permit locking the switch in the off position with a padlock. This prevents unauthorized use of the equipment and is a necessary precaution when children have access to the shop.

Richard Hanscom, Elmhurst, Ill.

## Newspaper in Pot-Type Burner Absorbs Excess Fuel Oil

When a pot-type oil burner is turned on and forgotten without being lighted, a quantity of fuel will collect in the bottom of the pot. If ignited, this will generate extreme heat. Therefore, the excess fuel must first be removed before the burner can be used. An easy way to do this is to

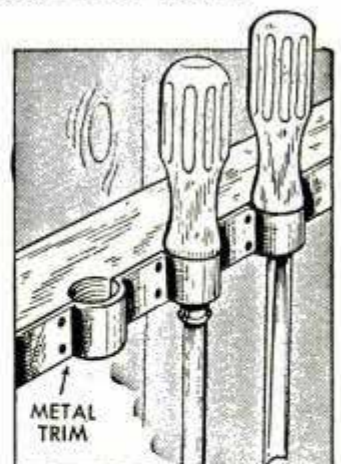


make a tight roll of newspapers and stand the roll upright in the pot. Turn off the valve, of course, before inserting the paper roll. After about an hour, the paper will have absorbed the oil and it then can be removed, leaving the burner in usable condition. As the oil-soaked paper is a dangerous fire hazard, do not allow it to remain in the house. Discard or burn it outdoors. —Hi Sibley, Nuevo, Calif.

## Metal Trim Provides Tool Rack

Metal trim or upholsterer's steel webbing nailed to a wooden backing rail makes a neat-appearing rack for small tools. Half-round bends are made in the trim at regular intervals and the rail is notched opposite the bends to form holes for inserting the tools. If hammers, tin snips or similar tools are to be hung from the rack, enlarge the holes to suit the sizes and shapes of the tools.

Arthur Trauffer, Council Bluffs, Iowa.

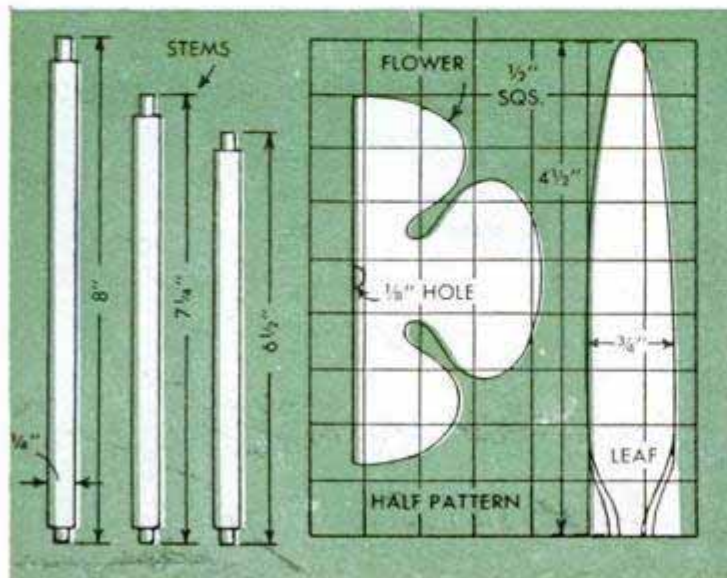
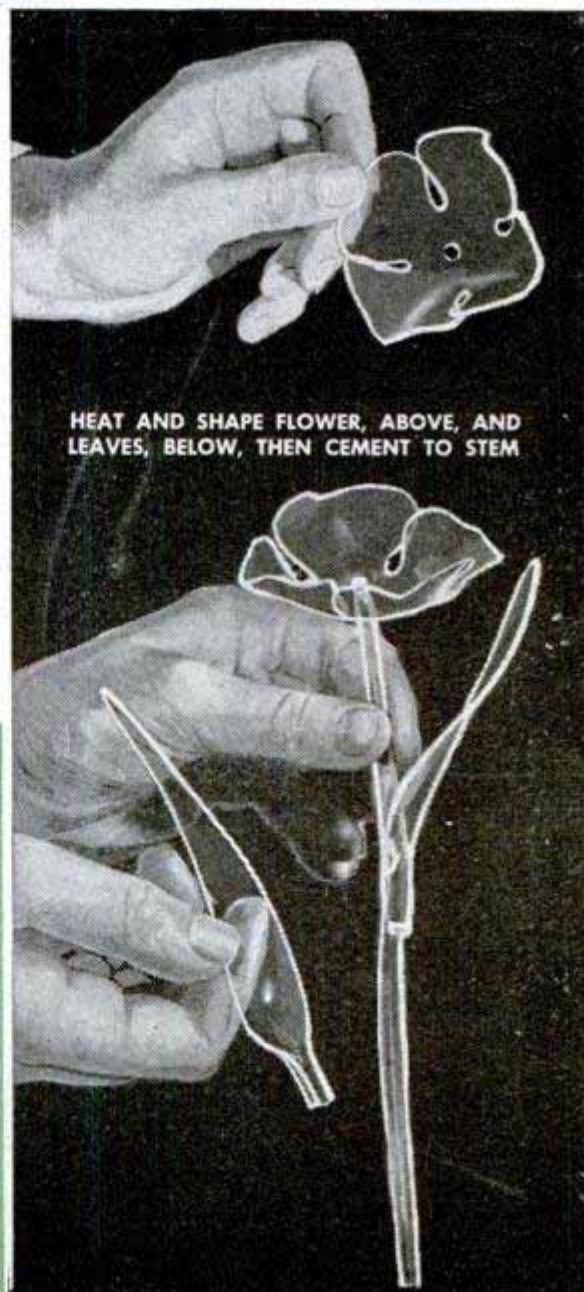


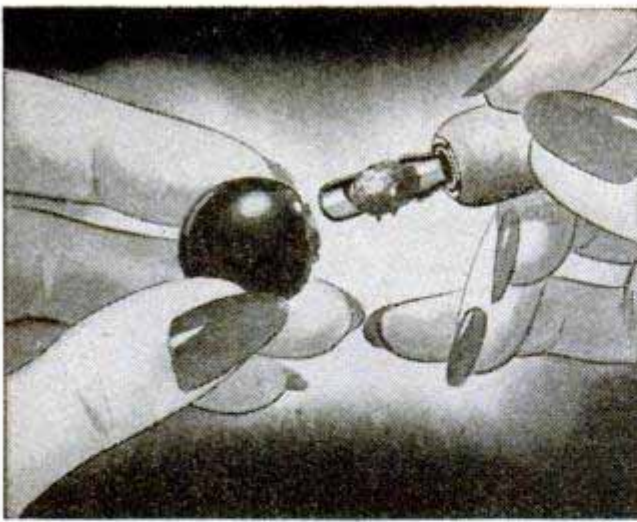
Wash the inside of your refrigerator with lukewarm water and borax to keep it sweet and clean. To absorb the odors, put a piece of charcoal on one of the shelves.

# Plastic Poppies

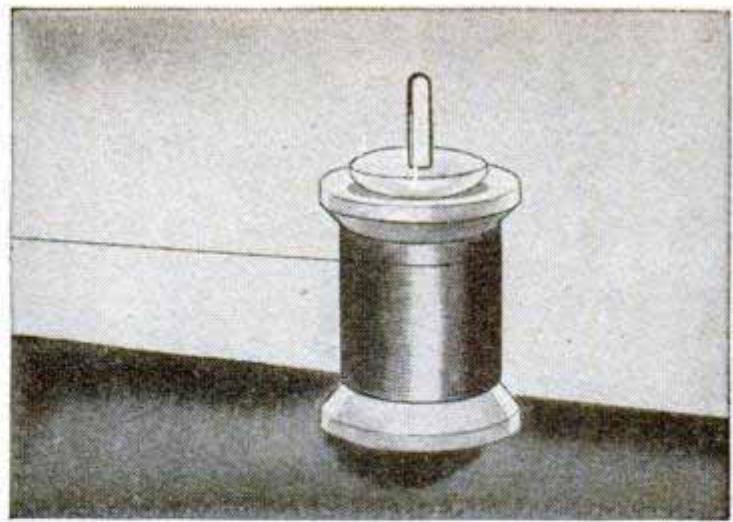
**P**OPPIES of crystal-clear plastic "planted" in a wooden bowl form an attractive centerpiece for the dining table. Arrange the flowers in a small salad bowl or in a bowl turned from hardwood. Use a bowl that is plain so it will not detract from the flowers. Cement the stems of the finished flowers in  $\frac{1}{8}$ -in. holes drilled in the bottom of the bowl or support them with a frog. The stems are cut from  $\frac{1}{8}$ -in. sheet plastic and their edges are rounded by scraping with a knife. Use a fine file or a knife to make round tenons,  $\frac{1}{8}$  in. in dia. and  $\frac{1}{4}$  in. long, on both ends of each stem. Then cut blanks for the flowers and leaves from  $\frac{1}{16}$ -in. crystal plastic and drill a  $\frac{1}{8}$ -in. hole through the center of each flower blank.

Each stem, leaf and flower is shaped individually by first heating it until pliable in an oven set at 250 deg. and then bending to suit. Handle the heated plastic with clean cotton gloves or a piece of cloth as, when pliable, it is too hot to handle comfortably with the bare hands. Bend the stems to a slight curve and cup the flower petals. Next, form the base of each leaf around one of the stems, holding it with the thumb and forefinger until it cools enough to retain its shape. Finally, attach the leaves and flowers to the stems with fast-setting plastic cement, holding the parts in place with the fingers.





**PITTING CHERRIES** is easy if you use a clean pen point. Just insert it point first into a penholder, then insert the rounded portion into the stem end of the cherry and rotate it to remove the pit



**RAPID SEWING** by machine will not cause the spool to spin and unwind the thread too rapidly if a rubber faucet washer is placed over the spindle and on top of the spool to serve as a friction brake

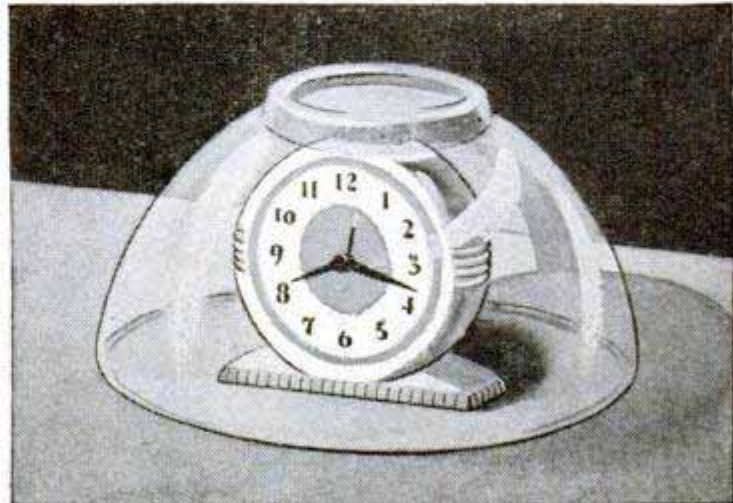
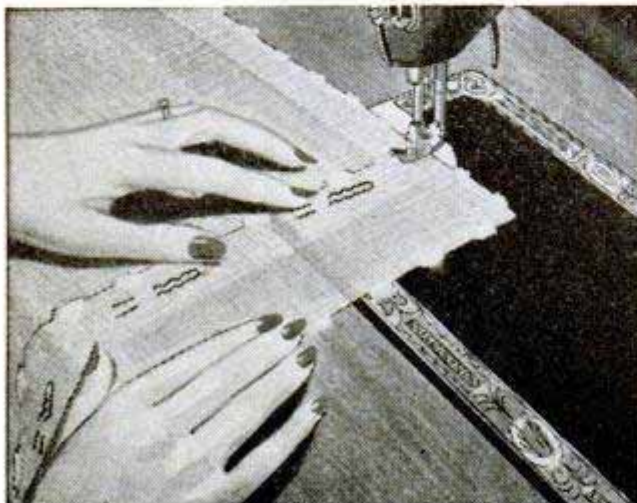
## SOLVING

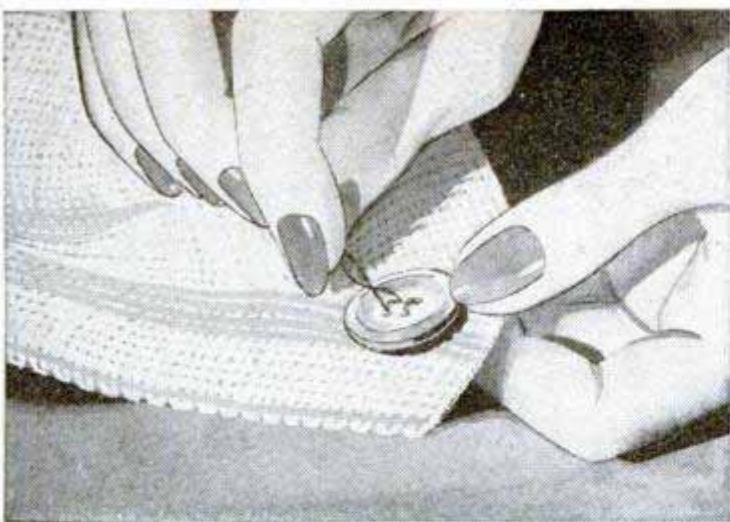


**A DRINKING GLASS** is less likely to slip from the hand of a child if several wide rubber bands are placed over the glass. In addition to giving a nonslip grip, colored bands add decoration

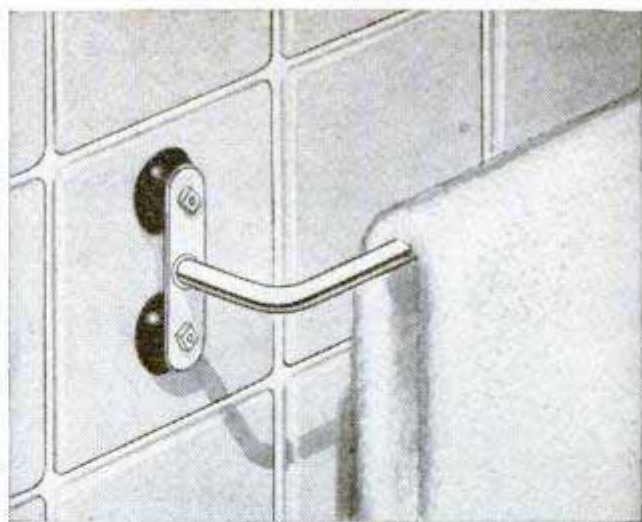
**HAIRPINS FASTEN HEMS** of marquisette curtains for machine stitching, lower left. Using hairpins saves much time spent basting and removing threads and does not damage the curtains

**IF LOUD TICKING** of an alarm clock disturbs your sleep, you can muffle it and still read the time if a glass bowl is inverted over the clock as shown below. Use a bowl made of clear glass





**A LARGE BUTTON** sewed to the corner of a dishcloth comes in handy to scrape hard-to-remove food from dishes and pans. This eliminates using a knife or scraper when cleaning burned or hardened food



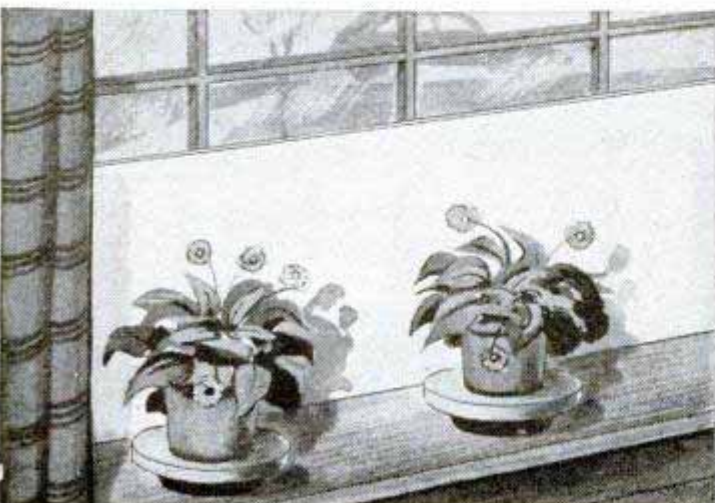
**MOUNTING TOWEL RACKS** on tile walls with suction cups makes it unnecessary to drill any holes through the tile and allows the racks to be readily rearranged. Moisten the cups before mounting

## HOME PROBLEMS

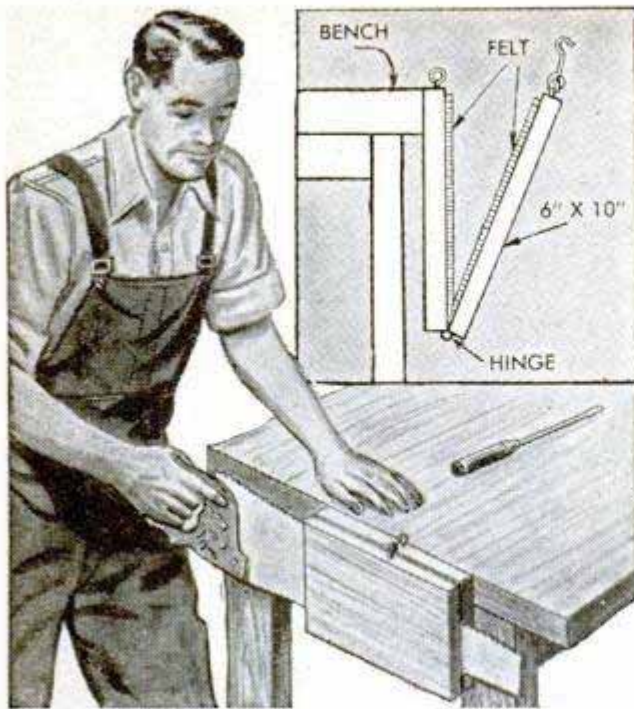
**BROOMSTICK HANDLE** on stepladder, right, helps keep your balance when standing on upper steps. Drill hole in top step and a block fastened to its underside and whittle broomstick end for tight fit in hole

**SOILED STOCKINGS** caused by rubbing against the tops of galoshes, lower right, are prevented by placing strips of adhesive tape around inside of galoshes at this point. Tape is replaced when soiled or worn

**PROTECTING PLANTS** kept on window sill from injury on cold nights, below, is done by standing a piece of cardboard between plants and window. The cardboard should be higher than tops of the plants



## Oiler Fastened to Workbench Keeps Handsaws Rustfree

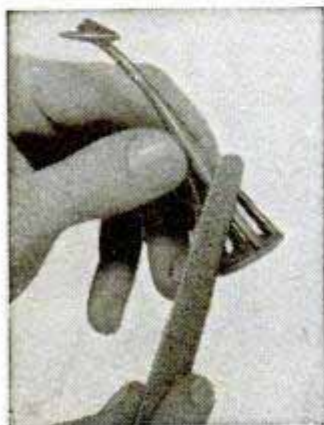


Handsaws that are stored in the basement are given a protective coating of oil by running them through this handy oiler before putting them away. Make the oiler by hinging together two 6 x 10-in. boards and fastening them to the end of a workbench top as shown. Felt or sponge rubber is glued to the inner faces of the boards to retain a light machine oil, and the oiler is held in the closed position with a screen-door hook and eye. The boards should close tight enough to exert a slight pressure on the saw.—C. C. Alleman, Santa Rosa, Calif.

## Stimulating Growth of Indoor Plants

Use an electric heater with a bowl-type reflector to stimulate the growth of house plants, substituting a lamp bulb of low wattage for the heating element. This will concentrate both heat and light on the plants.—Ken Murray, Colon, Mich.

## Emery Boards Sand Small Work



Emery boards used for fingernail manicuring are just the thing for sanding small carvings, model-airplane parts, etc. They are narrow, thin and easy to handle which makes them especially suited to this type of work. Or-

dinarily, one side of the board is coarse and the other fine, thus permitting both rough and finish sanding to be done quickly with the same emery board.

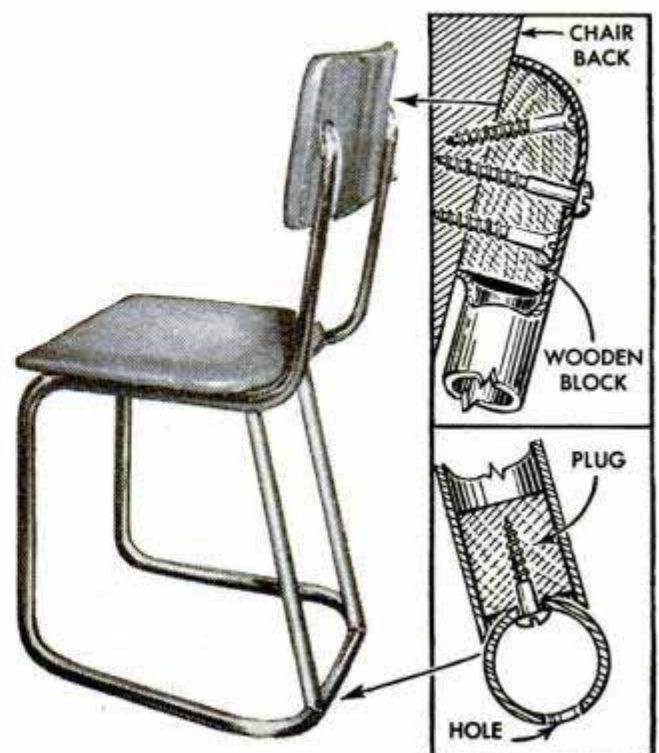
## Hint for Applying Oak Stain

To obtain an even color over the entire surface when applying a medium oak stain to softwood floors, first seal the surface with a filler of thinned, hot glue. Allow the glue to dry and rub it down with sandpaper before applying the stain to the floor.

A. E. Fenn, Chicago.

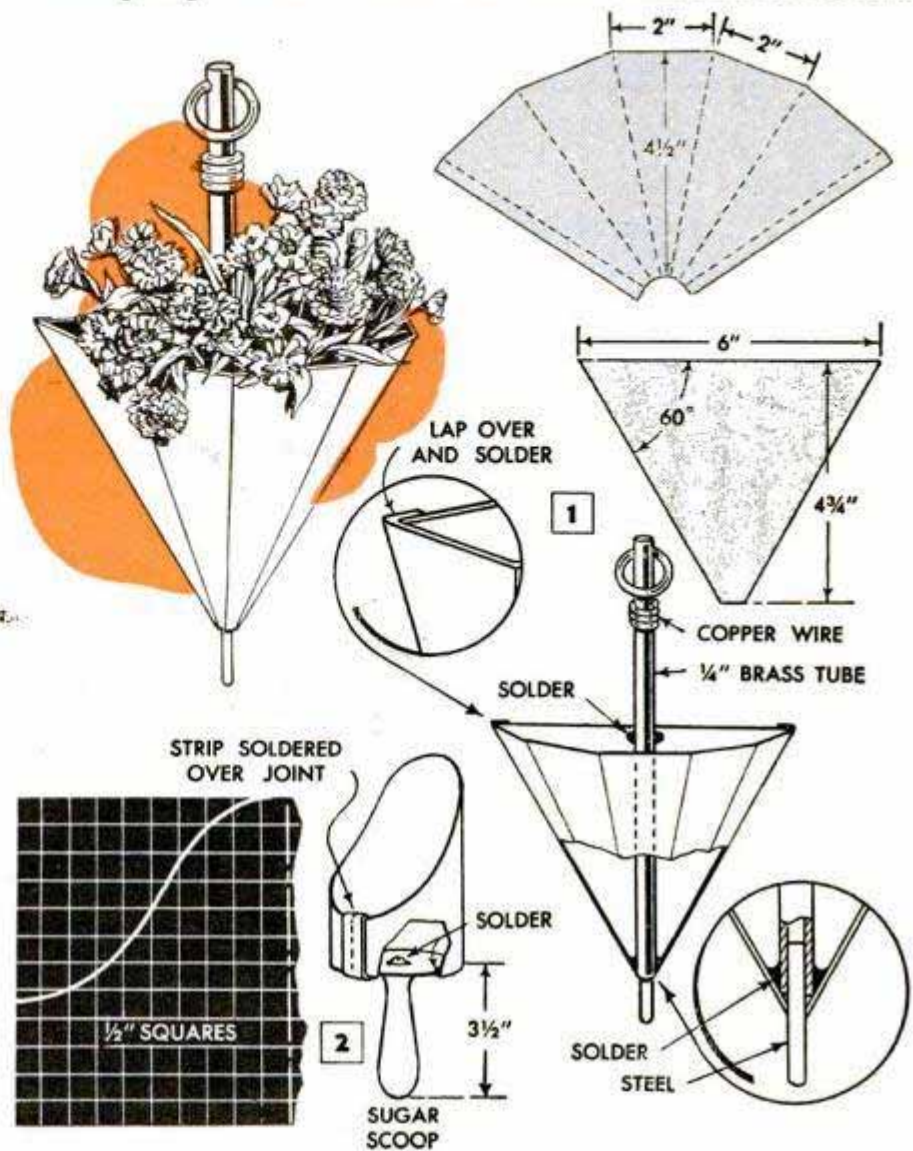
## Reinforcing Tubular-Steel Chairs

Tubular-steel chairs can be reinforced to withstand exceptionally hard use by strengthening the backs with wooden blocks and adding legs made from adjustable metal closet poles. To reinforce the back, shape a wooden block to fit snugly inside the formed upper end of each tubular frame member, as in the upper detail. Then screw and glue the blocks to the chair back, countersinking the screws. Fasten the frame members over the blocks with longer roundheaded screws driven in from the outside. The base of the chair is strengthened by means of two legs cut from the closet-pole sections. The flange of each section is screwed through a wedge-shaped block to the chair seat, and the lower ends of the legs, rounded to fit over the frame, are held by screws driven into wooden plugs. The plugs, of course, must fit tightly in the legs. Drill holes through the underside of the frame, as shown in the lower detail, to provide access for the screwdriver.—Harold E. Benson, Denver, Colo.



Made of sheet copper, these attractive vases are watertight for displaying freshly cut as well as artificial flowers. The partially opened umbrella design is suitable for almost any room, while the sugar-scoop design is ideal for the kitchen. The front of the umbrella is cut and bent, as shown, and soldered to a triangular-shaped back. The handle is a length of  $\frac{1}{4}$ -in. brass tubing and a piece of steel rod forms the tip. A brass ring at the top of the handle and copper wire wrapped around the tubing just below the ring complete the unit. The sugar scoop is cut from sheet copper, following the shape given in the half pattern, and bent round over a 2-lb. coffee can. The bottom of the vase is a copper disk fastened to a wooden handle with a roundheaded screw, the head of which is coated with solder. After the sides of the scoop are soldered to the disk, a copper strip is soldered on the joint to make the vase watertight.

## Novel Pin-Up Vases Made of Sheet Copper Display Either Natural or Artificial Flowers



## Graduated Level Determines Joist Variation Before Installing Tile Ceiling

To cover the ceiling of a basement recreation room with tile, it probably will be necessary to shim the edges of some of the

joists before fastening the furring strips. The thickness of the shims required to level each joist can be determined quickly by using a carpenter's level graduated in inches at one end. Take a level and mark graduations in eighths of an inch from both edges inward toward the center. After using a straightedge to find the lowest joist, work from this point and place the level between the joists, as shown, noting the variation on the scale.



## Protecting Electric-Iron Cord

Insulation on an electric-iron cord will not become worn at the point where the cord emerges from the coil spring of the appliance plug if the cord is wrapped with a plastic spiral of the type used to prevent kinking of telephone cords. The spiral should extend from the end of the plug for several inches beyond the coil.

John F. Ewing, North Hollywood, Calif.

**3 TYPICAL SCOPES**

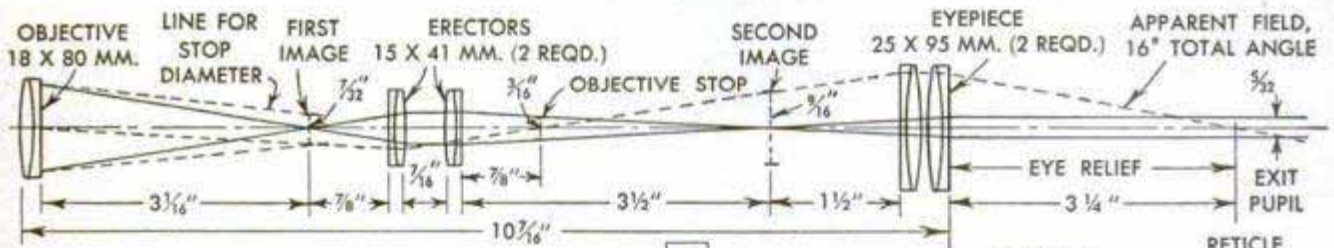
BUILT AT AN AVERAGE COST OF \$6.00 EACH, THESE SCOPES ARE EXCELLENT IN OPTICAL DESIGN AND MECHANICAL CONSTRUCTION. PHOTO TAKEN PREVIOUS TO BLUING



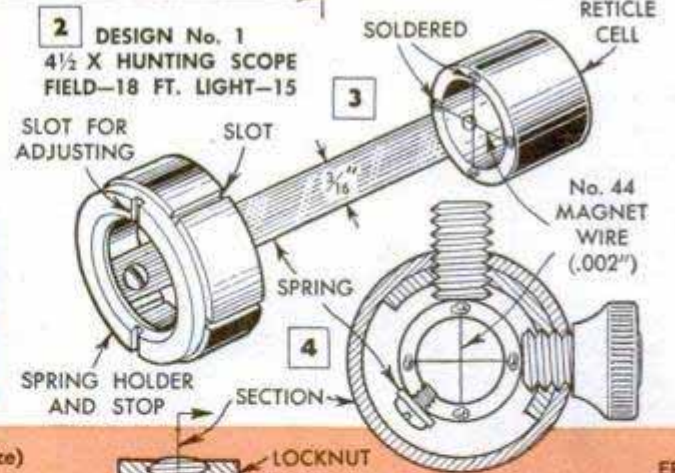
**1**

ALL MAIN TUBES ARE 18 GA., 7/8 IN. DIA.

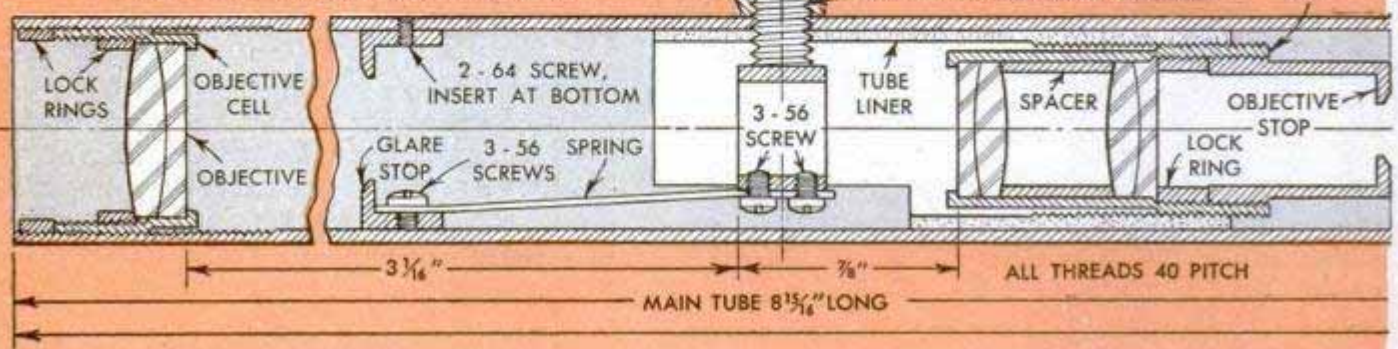
# BUILD YOUR



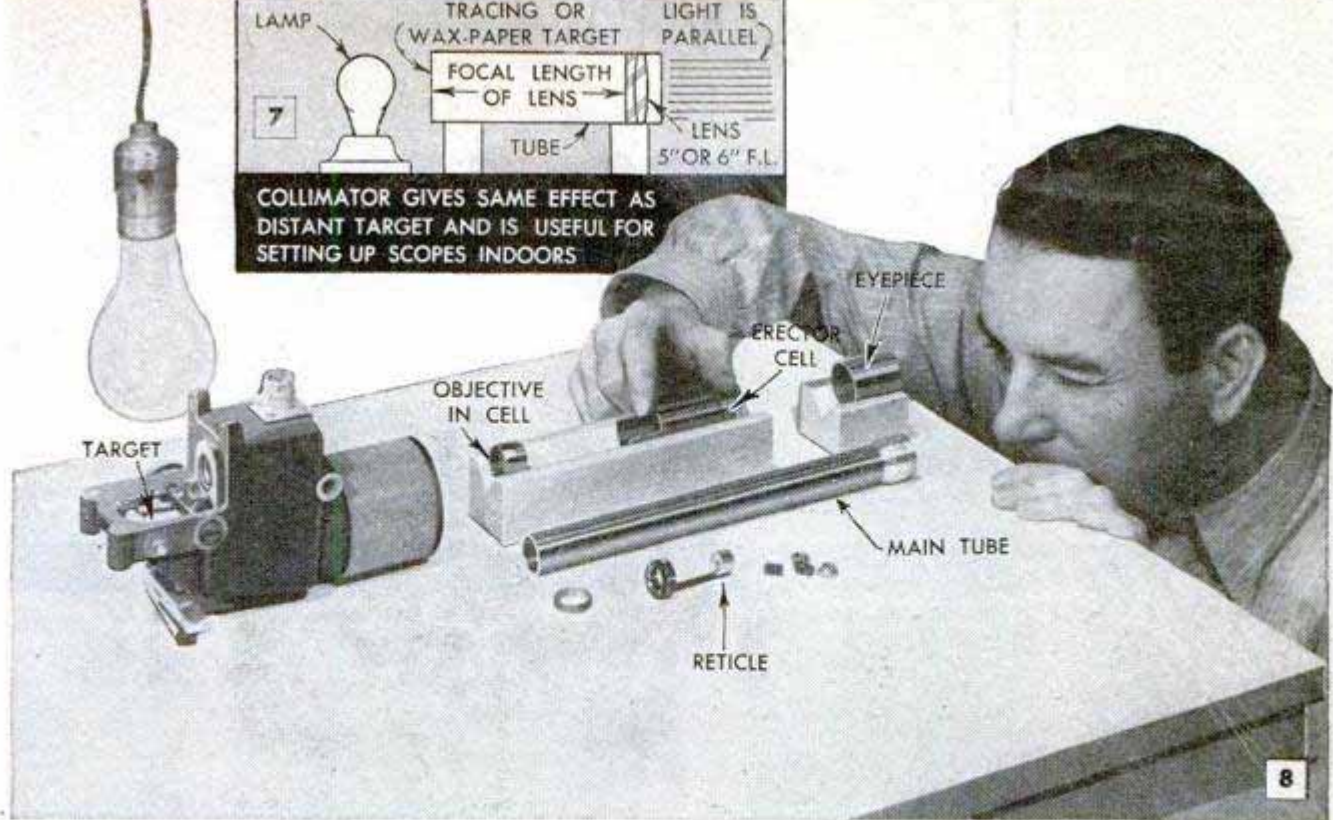
.005 SKIN CUT CLEANS OUTSIDE OF TUBING



**6** CONSTRUCTION OF 4 1/2 X HUNTING SCOPE (Full Size)  
18-GA. STEEL TUBING, 7/8\"/>







# OWN RIFLESCOPES *By Sam Brown*

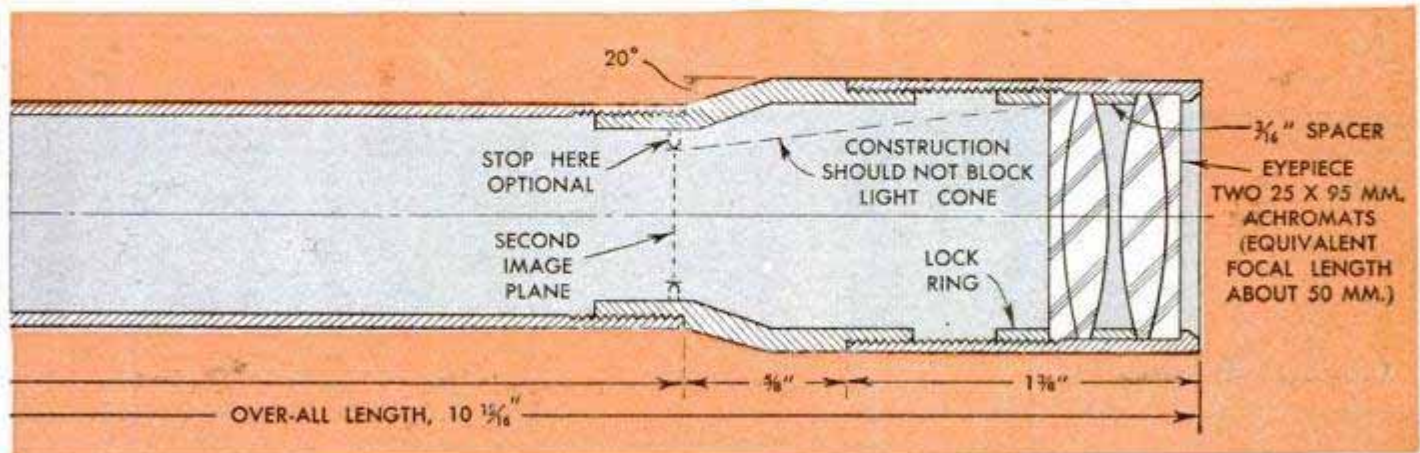
**I**F YOU ARE a hunter and also like to run a lathe, you will enjoy both the work and the results of building one or more of these riflescopes. Three typical scopes shown in Fig. 1 were built at an exceptionally low cost. The eight designs cover about everything required in a hunting scope, and all of them are bench-tested, representing the best of 40 jobs set up and tested by the author.

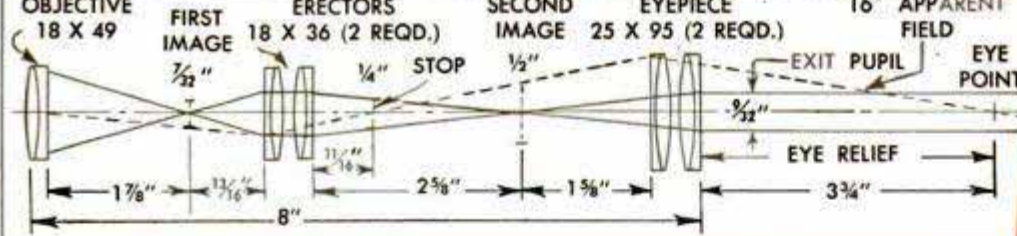
**Selection of design:** The first thing to do is to go over the spacing layouts and select the power of scope you prefer. If you want a big-game scope, the power should not be over 3X, as the important things here are good illumination and a field of not less than 28 ft. at a 100-yd. distance. A scope for small game should be 3X to 5X, a good all-round choice being 4X or 4½X. Varmint

scopes can run to a little higher power, and designs Nos. 7 and 8 are excellent for this type of shooting. Order the lenses needed from any dealer handling stock lenses, as the ones used have been selected for availability as well as optical quality.

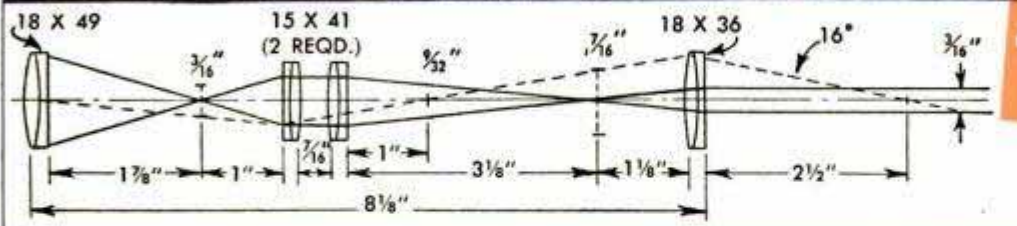
**Tubing:** Inside and outside diameters of various gauges of tubing are given in Fig. 11. The main tube of the scope should be 18 or 20-ga. seamless steel tubing, 7/8-in. o.d. (outside diameter). A .005-in. skin cut, Fig. 5, is used to clean up the outside of the tubing. Other sizes of tubing come in handy for the various individual parts, although most of these can be made from solid stock. Bar aluminum is recommended for the inside parts, as it is lightweight and easy to turn on the lathe.

**4½X hunting scope:** Fig. 2 shows the

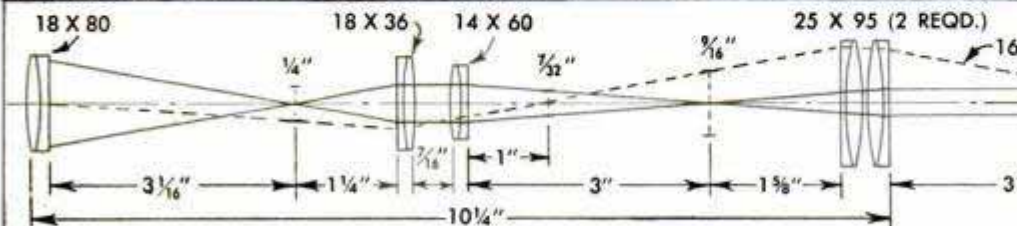




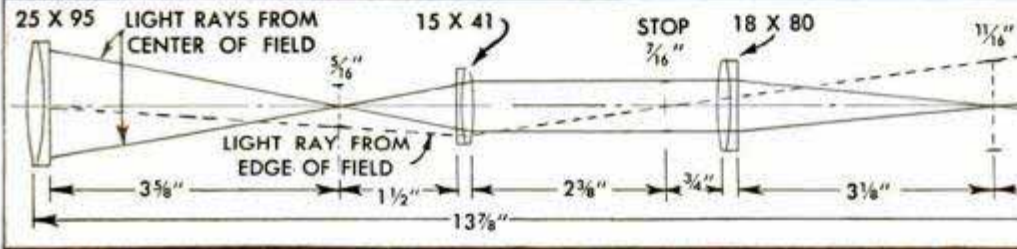
**DESIGN No. 2** 2 1/2 X FIELD - 33 FT. LIGHT - 40 (UNIVERSAL FOCUS)



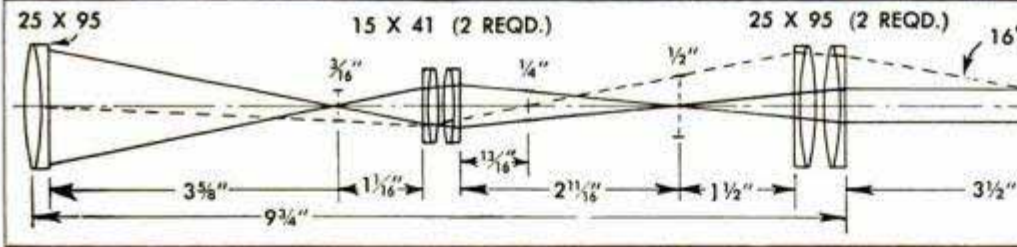
**DESIGN No. 3** 3 X FIELD - 28 FT. LIGHT - 25 (UNIVERSAL FOCUS BEYOND 10 YDS.)



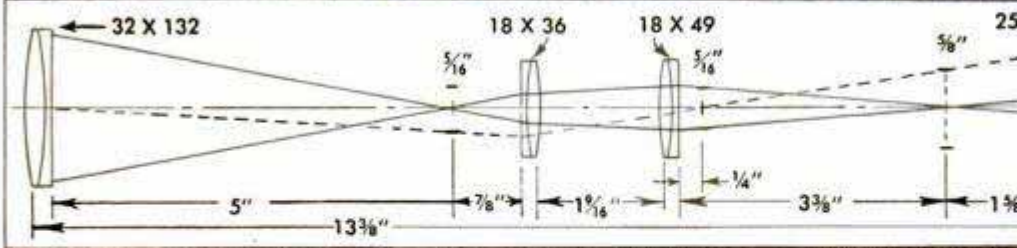
**DESIGN No. 4** 3 1/2 X FIELD - 24 FT. LIGHT - 21 (UNIVERSAL FOCUS)



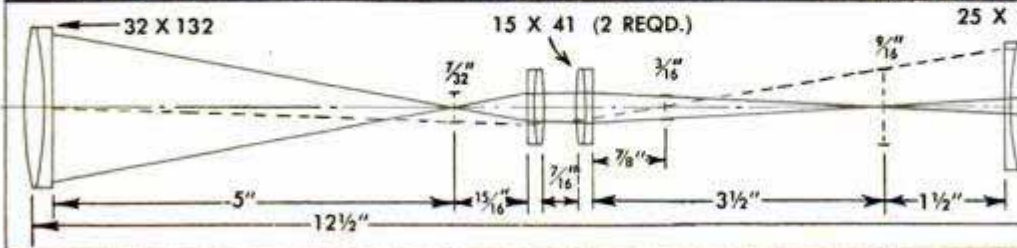
**DESIGN No. 5** 4 X FIELD - 26 FT. LIGHT - 36 (WIDE-SPACED ERECTORS DECREASE EYE RELIEF)



**DESIGN No. 6** 5 X FIELD - 18 FT. LIGHT - 21 (UNIVERSAL FOCUS BEYOND 20 YDS.)



**DESIGN No. 7** 5 1/2 X FIELD - 18 FT. LIGHT - 30 (132 MM. FOCAL-LENGTH OBJECTIVE IS THE LONGEST THAT CAN BE USED FOR UNIVERSAL FOCUS)



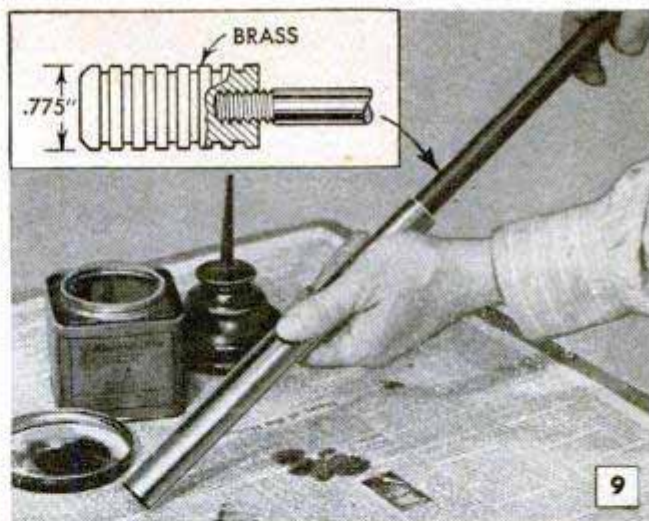
**DESIGN No. 8** 7 1/2 X FIELD - 12 FT. LIGHT - 16 (UNIVERSAL FOCUS BEYOND 30 YDS.)

**SPACING LAYOUTS**

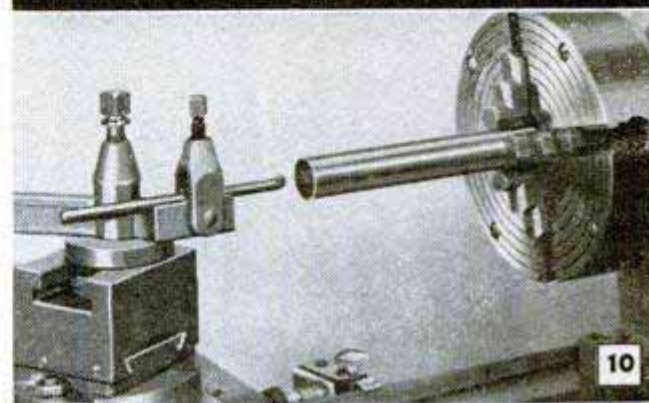
- ALL DESIGNS ARE TO SAME SCALE
- ALL DIMENSIONS ARE GIVEN IN INCHES
- DIA. OF LENSES AND FOCAL LENGTH ARE SHOWN IN MM.
- FIELD OF VIEW IS EXPRESSED IN FT. AT 100 YDS. DISTANCE
- LIGHT VALUE IS THE DIA. OF THE EXIT PUPIL IN MM., SQUARED

optical layout for design No. 1 which is a good 4½X hunting scope. Like the other diagrams, this one shows how the lenses should be spaced, and also indicates the diameter of the stops. Every scope should have one glare stop between the objective and the first image plane. The diameter of this stop at any location is determined by drawing lines, Fig. 2, from the first image plane to the edge of the objective. The objective stop behind the erector-lens cell screens unwanted light from the second image. Fig. 6 details typical construction of the 4½X scope in full size, but this can be varied to suit particular requirements. The feature of this type of construction is that the objective and erector lenses are mounted in separate cells and thus are adjustable. The objective can be turned in or out and the erector lenses moved over a considerable distance in the threaded tube liner. With these two adjustments, it is perfectly safe to cut the main tube to net length before testing assembly. Take time to lap the inside of the tube with a brass plug, using fine abrasive and oil, Fig. 9, to assure easy fitting of the tube liner and glare stop. The main tube is short enough to permit threading in a four-jaw chuck, as shown in Fig. 10. Work all threads to full depth and make them somewhat loose for easy hand-turning, as tight threads are a nuisance. A 40 or 48 pitch is recommended for all the threads. The table, Fig. 12, lists double depth of threads which is subtracted from the major, or outside, diameter of the mating part to give the bore, or inside diameter, of the larger tube. Also listed is the amount of infeed needed to cut a full thread with the compound set at the usual 29-deg. angle. Turning the various lens cells and retaining rings is ordinary lathe work and should present no appreciable difficulty. The spring for the reticle cell, Fig. 3, can be made from a ¼-in. metal-cutting jigsaw blade with the teeth ground off.

**Assembly of riflescope:** After the main tube and various other units have been made, the scope should be given a bench test as in Fig. 8. The target should be a distant object. As one is not always available, it is convenient to make a simple collimator, Fig. 7, which will serve the purpose. Using a lens of 5 or 6-in. focal length, locate a tracing or wax-paper target at the focal-length distance and place a lamp directly in front of the target. The setup can be checked by holding a small mirror in the parallel emergent beam, Fig. 7, and redirecting the light back to the target. When the target is properly spaced, the mirror will refocus the target image on the target itself. If available, reflector sights or similar optical devices can be used as collima-



9 SIZING THE INSIDE OF MAIN TUBE



10 TUBE MOUNTED IN 4-JAW CHUCK FOR THREADING

11 TUBING SIZES				12 THREAD DATA		
Outside Dia.	Inside Dia.			Threads per in.	*Double Depth	*Compound Feed
	22 ga.	20 ga.	18 ga.			
¾"	.694	.680	.652	40	.038	.021
⅞"	.819	.805	.777			
1"	.944	.930	.902	48	.032	.018
1 ⅛"	1.069	1.055	1.027			

\*Using standard V-point threading tool

tors. As pictured in Fig. 8, the test setup is arranged alongside the main tube, placing the objective and eyepiece at the positions they will occupy when mounted. Then the target is brought into sharp focus by moving the erector cell back and forth. After this is done, the reticle cell is fitted in place and moved as needed to bring the cross hairs into sharp focus. When proper spacing of the parts has been attained, begin actual assembly of the scope by mounting the reticle cell and glare stop in the main tube. The tube liner also is inserted at this time. Note that the glare stop is turned so the spring holds the reticle cell against both adjusting screws, Figs. 4 and 6. The erector cell is approximately positioned in the same operation. When this much of the assembly has been completed, test the scope as shown in Fig. 18. Note that the eyepiece is reversed end-for-end to permit the lenses to be located the same distance from the end of the main tube as they will be when the eyepiece is actually screwed in place. The objective is not

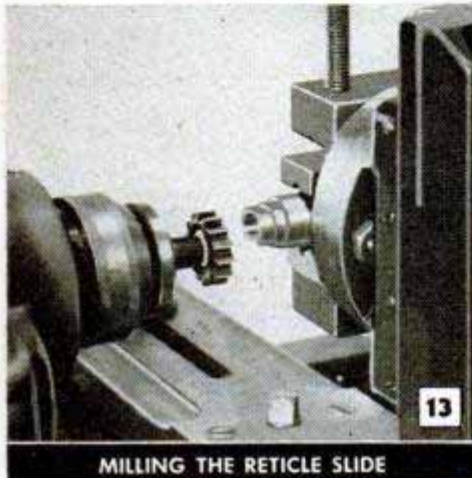
mounted for the test. All that is done at this point is to focus sharply on the cross hairs, turning the erector cell in or out as required. A final check is made with the eyepiece screwed in place, and the objective is mounted and turned in until any distant object or the target of the collimator is in sharp focus. Move your head from side to side when looking through the scope and note if the cross hairs move over the target. If they do, continue adjusting the objective until the cross hairs stand still on the target regardless of your eye position or movement. After perfect focus is obtained, secure the erector cell with a few drops of shellac.

**Construction of design No. 3:** This scope,

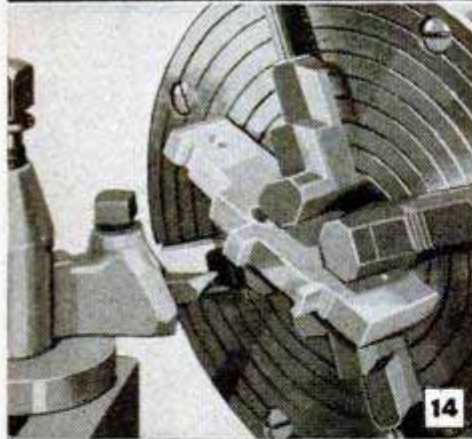
shown in Fig. 17, features a screw-actuated elevation adjustment and, as it does not have a windage adjustment, the scope mount must incorporate this movement. When constructing an elevation adjustment of this type, all work must be done to hairline accuracy in order to make the device practical. Using a 3-56 adjusting screw in connection with a 16-division scale, Fig. 15, a turn equal to one division moves the reticle about .001 in. which, in this particular scope, moves the cross hairs (changes the point of impact) 2 in. on a target at a 100-yd. distance. Operations for milling the reticle slide and turning the elevation-adjustment base are shown in Figs. 13 and 14. The reticle slide is held in the slot of

the adjustment base with two screws as in Fig. 16. The other parts of the scope are similar to those in design No. 1 and, if desired, it also is practical to use the simpler spring-type reticle. This design, as well as any of the scopes shown, can be reworked to higher power by using an objective of longer focal length. To do this, use the spacing layout as is from the first image plane back and substitute the new objective, locating the objective a distance from the first image plane equal to the focal length of the objective. Compare the 4½X scope (design No. 1) with design No. 8, and you will note that the two systems are almost identical except for the objective.

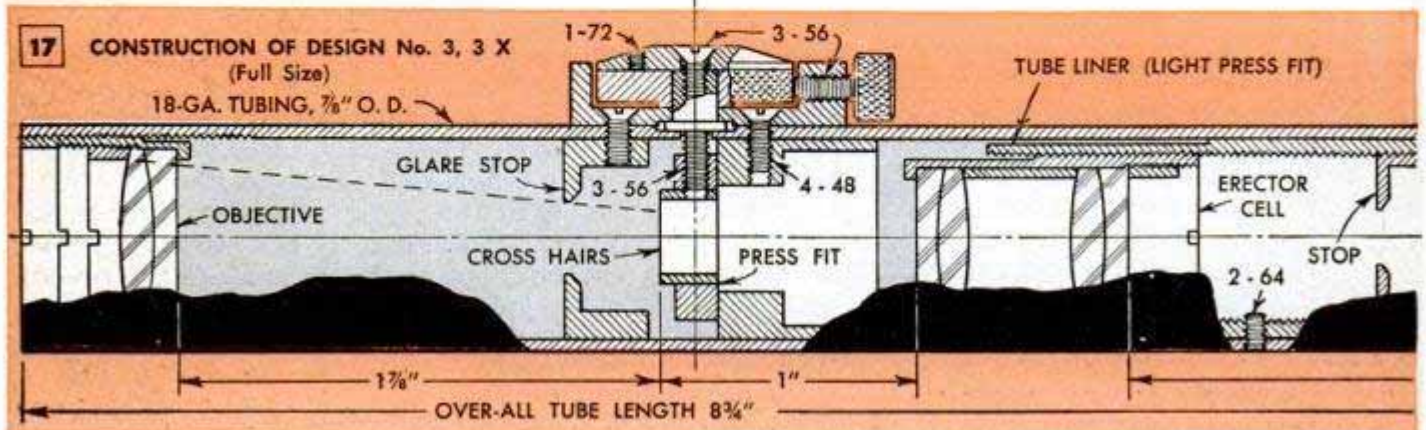
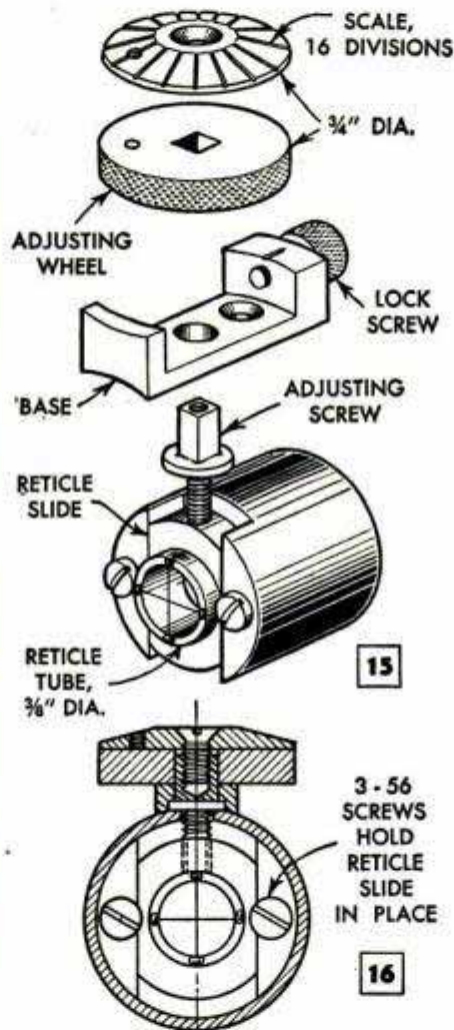
**Building the 7½X:** As this scope, design No. 8, uses a large ob-

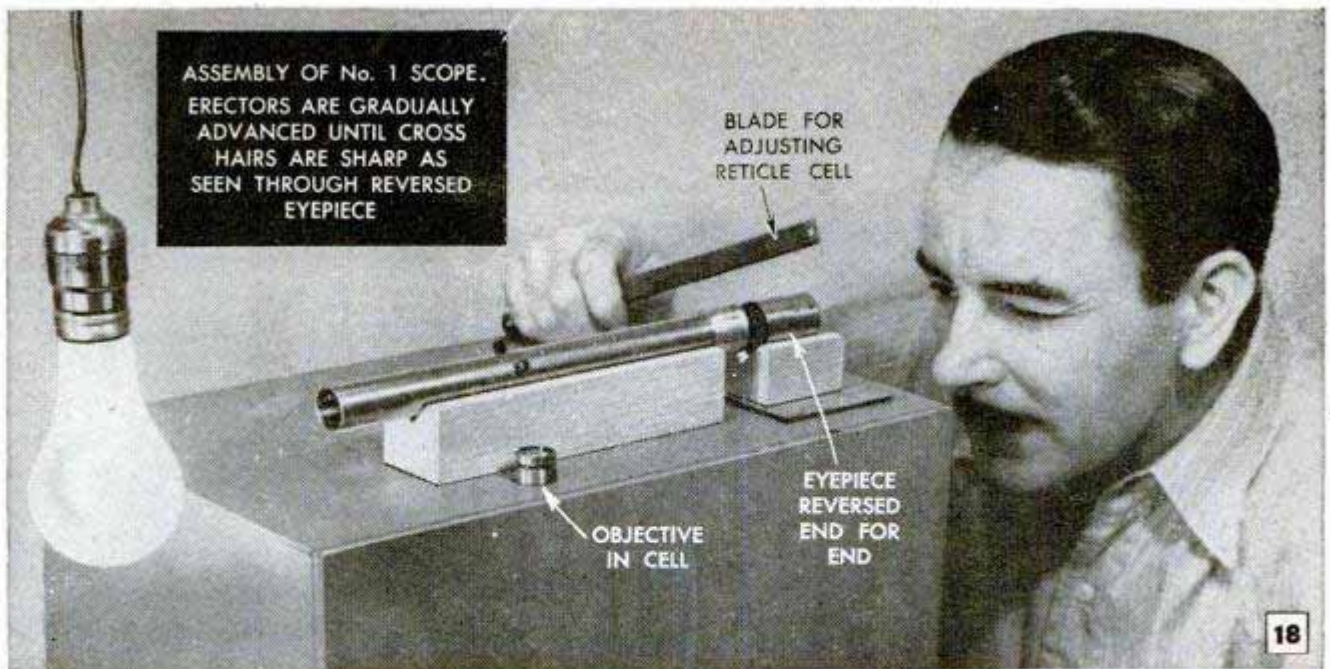


MILLING THE RETICLE SLIDE



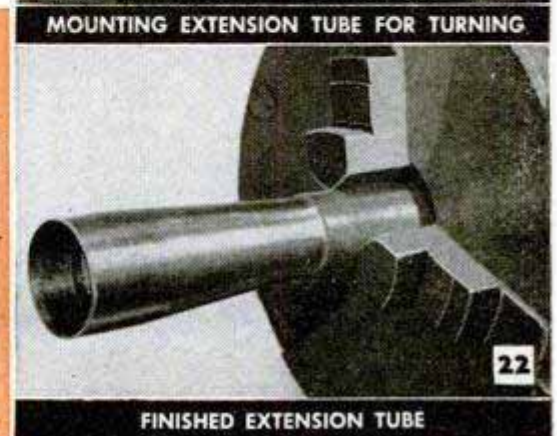
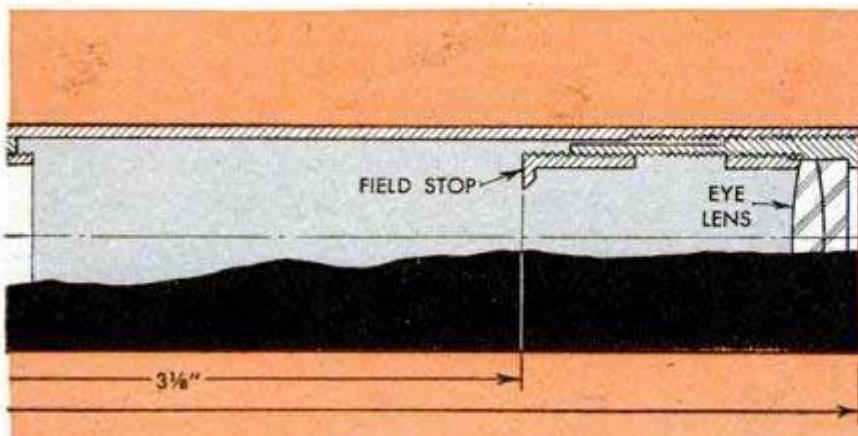
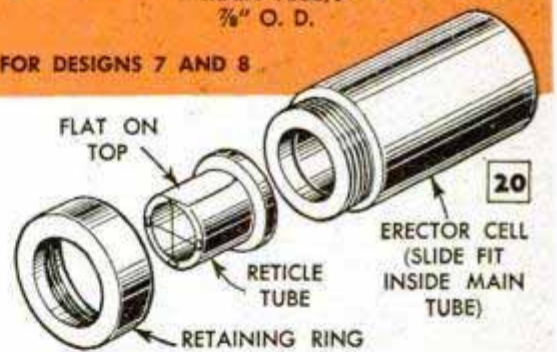
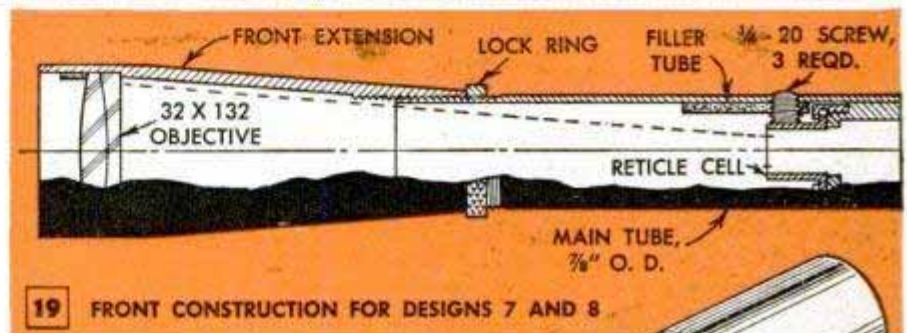
TURNING ELEVATION ADJUSTMENT BASE





jective, it is necessary to make a front extension tube. This is done by internally threading a piece of solid or tube stock and then turning the work on to a threaded stub spindle as in Fig. 21. The free end is then bored and threaded as required to finish the piece, Fig. 22. The front end and reticle of the  $7\frac{1}{2}X$  scope are shown in Figs. 19 and 20. This reticle mounting is a simple type positioned by three screws and is intended for zeroing only. After it is set, the screws are affixed with a few drops of shellac.

**Other designs:** The construction details given for designs Nos. 1, 3 and 8 can be applied equally well to any other design, using the features you like best. Once it is begun, the construction automatically works itself out because each cell or mounting must thread into the tube and one part determines the size of the next part. For an all-round scope, design No. 1 is recommended. However, every design shown is a good scope and the optical quality, with the lenses specified, is excellent. In damp climates, the lenses should be protected from possible clouding by storing the scopes in a moistureproof container.



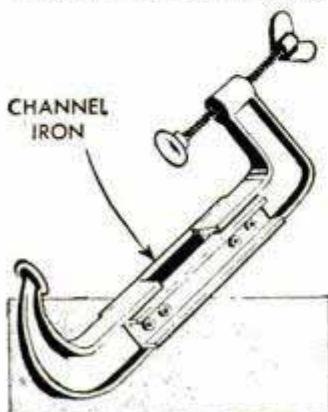
## Tile Patterns Scored in Hardboard With Power Handsaw



Desiring a special pattern that could not be had in standard tileboards created the problem of how to score the material. The size of the sheets made it impossible to score them on a bench saw, so the answer to the problem was a power handsaw. In my case, the job called for scored lines across the width of the sheets and, to assure even spacing, I used a straightedge and two blocks as shown. Planks on saw-horses were used to support the work and the blocks were nailed to the planks, one on each side of the sheet to allow it to be pushed between them. Thus, as each score was made, I simply advanced the sheet through the blocks until the score was even with a mark representing the desired spacing. An abrasive cutoff wheel is preferred to a saw blade as it produces a neat rounded groove that simulates closely the mortar joint of tile. It may be necessary to use a small blade as you may not be able to retract a standard one sufficiently.

Michael Ligocki, Gary, Ind.

## Channel Iron Extends C-Clamp



Cutting a C-clamp in two parts and fitting it with a channel-iron extension adapts the clamp to handle work of almost any desired size. The extension consists of two pieces of channel iron fastened with two bolts to each sec-

tion of the clamp. Of course, registering holes must be drilled through both the clamp and channel-iron sections. Keeping on hand several C-clamps altered in this way, along with a number of pairs of channel-iron strips cut to different lengths, will make available a wide variety of clamp sizes.—A. H. Waychoff, Phoenix, Ariz.

## Brass Screws Improve Boots

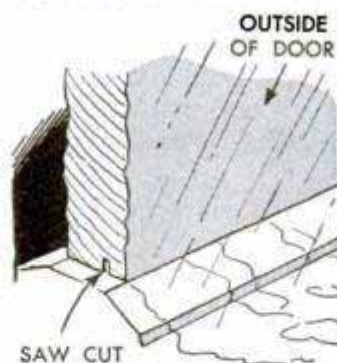
Many hikers recommend the use of roundheaded brass screws instead of hobnails on the soles and heels of hiking boots. The screws not only improve the gripping quality of the boots but can be replaced as they become worn. Use  $\frac{3}{8}$ -in. screws in the largest wire size obtainable.



Screws are driven in the usual manner after holes have been started with an awl. If the screws are arranged in the pattern shown, which has proved satisfactory, 20 of them will be required for each boot.

Will Stoll, Elmhurst, Ill.

## Lower Edge of Door Grooved To Prevent Leaks

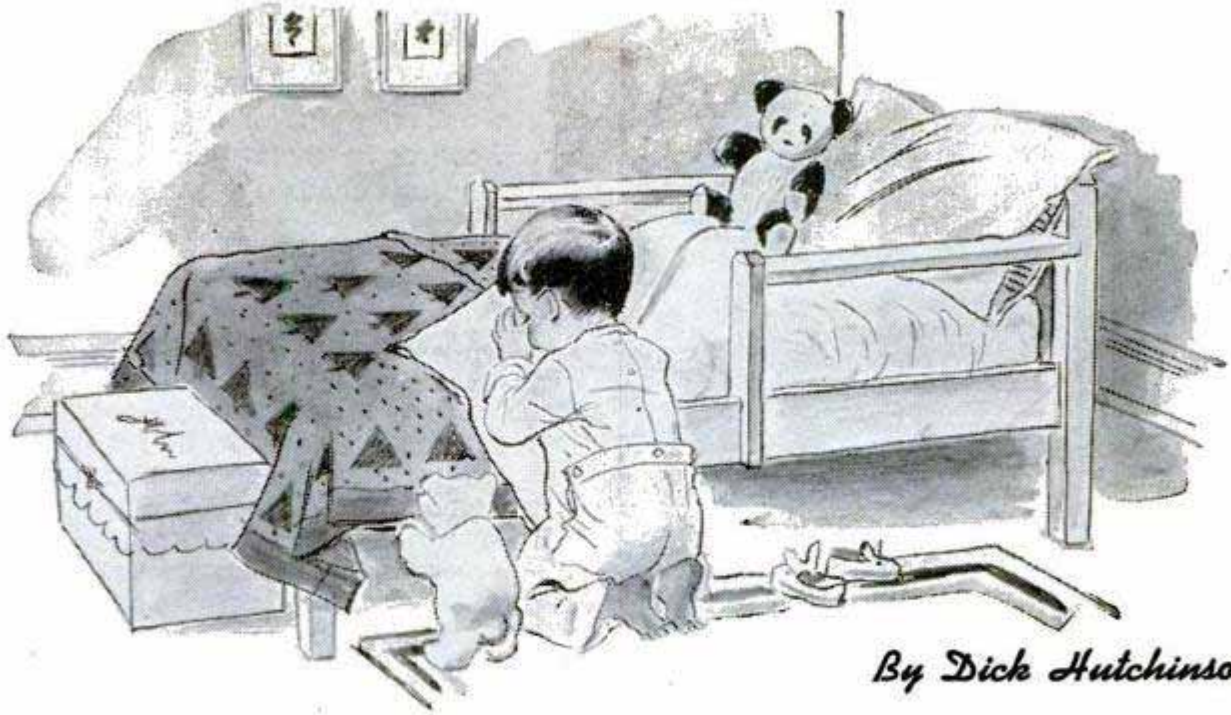


If water from a driving rain seeps under an outside door, this trouble can be corrected in most cases by merely making a shallow saw cut in the lower edge of the door as indicated. Drops of water passing under the door will, when they reach the groove, fall to the threshold and drain back outside. To cut the groove, remove the door from its hinges and nail two guide strips to the lower edge in the position you desire for the groove, spacing them just far enough apart to take the saw blade. A groove about  $\frac{1}{4}$  in. deep is sufficient.

E. T. Gunderson, Jr., Humboldt, Iowa.

Window screens are converted to temporary storm windows by coating them with thinned cellulose cement or clear lacquer. This fills the wire mesh but still admits light. In spring, the screens are restored to original condition with thinner.

# CHILD'S BED HAS ROPE SPRINGS

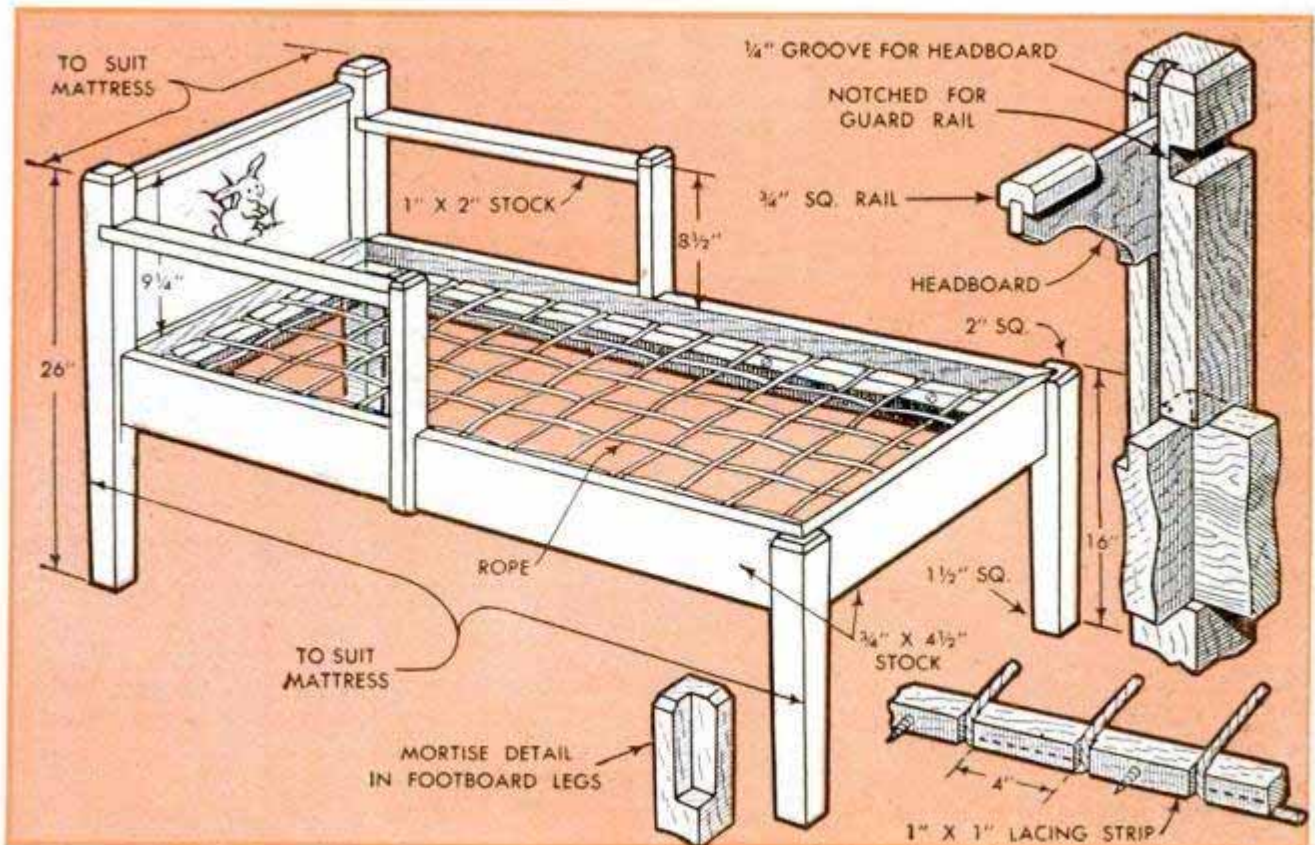


By Dick Hutchinson

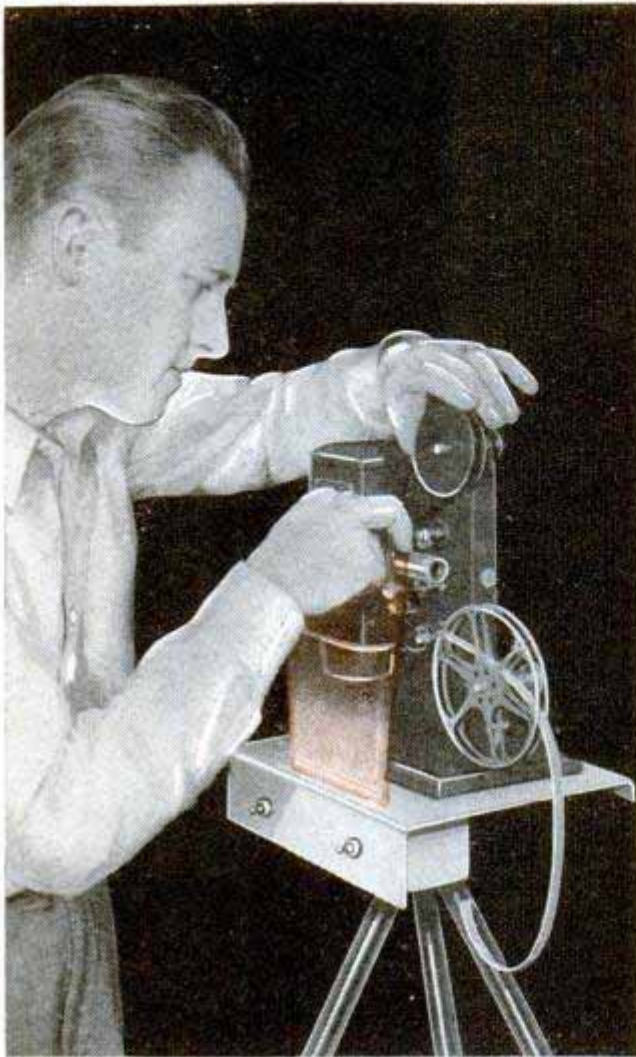
Inexpensive and easy to build, this Hollywood-type youth bed is just the thing for baby when he begins to outgrow his crib. Except for a headboard panel of  $\frac{1}{4}$ -in. plywood, the bed is made entirely of solid stock. Over-all dimensions of the bed and the length of the guard rails are not given in the detail as these are determined by the size of the mattress, the guard rails being approximately half the length of the bed. Note that the bed rails are fastened perma-

nently to the headboard and the footboard by mitering the ends and gluing and nailing them into mortises in the tapered legs. After the bed is assembled, a rope spring (clothesline will do) is laced through notched strips of  $1 \times 1$ -in. stock screwed to the sides of the bed rails as well as to the headboard and the footboard. After all nails are set and puttied over, the bed is enameled, using either a two-tone effect or a color to harmonize with the bedroom.

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# TRIPOD PROJECTOR BASE



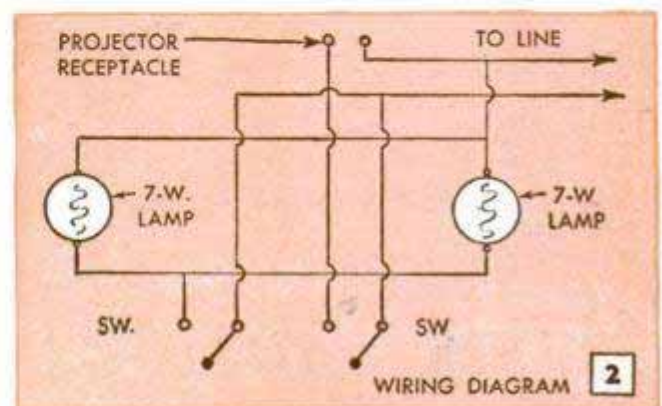
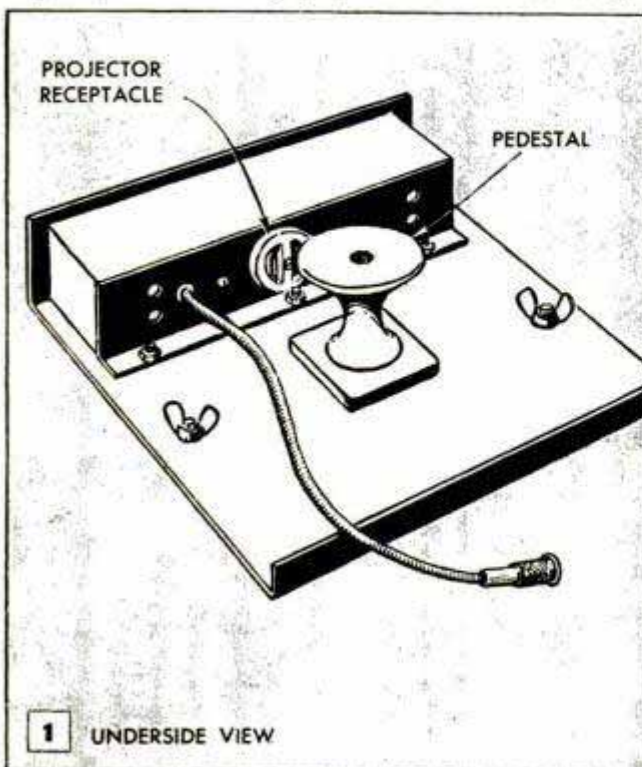
Projector base has two toggle switches. One controls light which illuminates the film gate and tracking mechanism. The other controls projector operation. Tripod permits setting projector at suitable height

If home movies are your hobby, a sturdy tripod projector base is practically indispensable when it comes to presenting a smooth-running show to your friends

By L. H. Georger

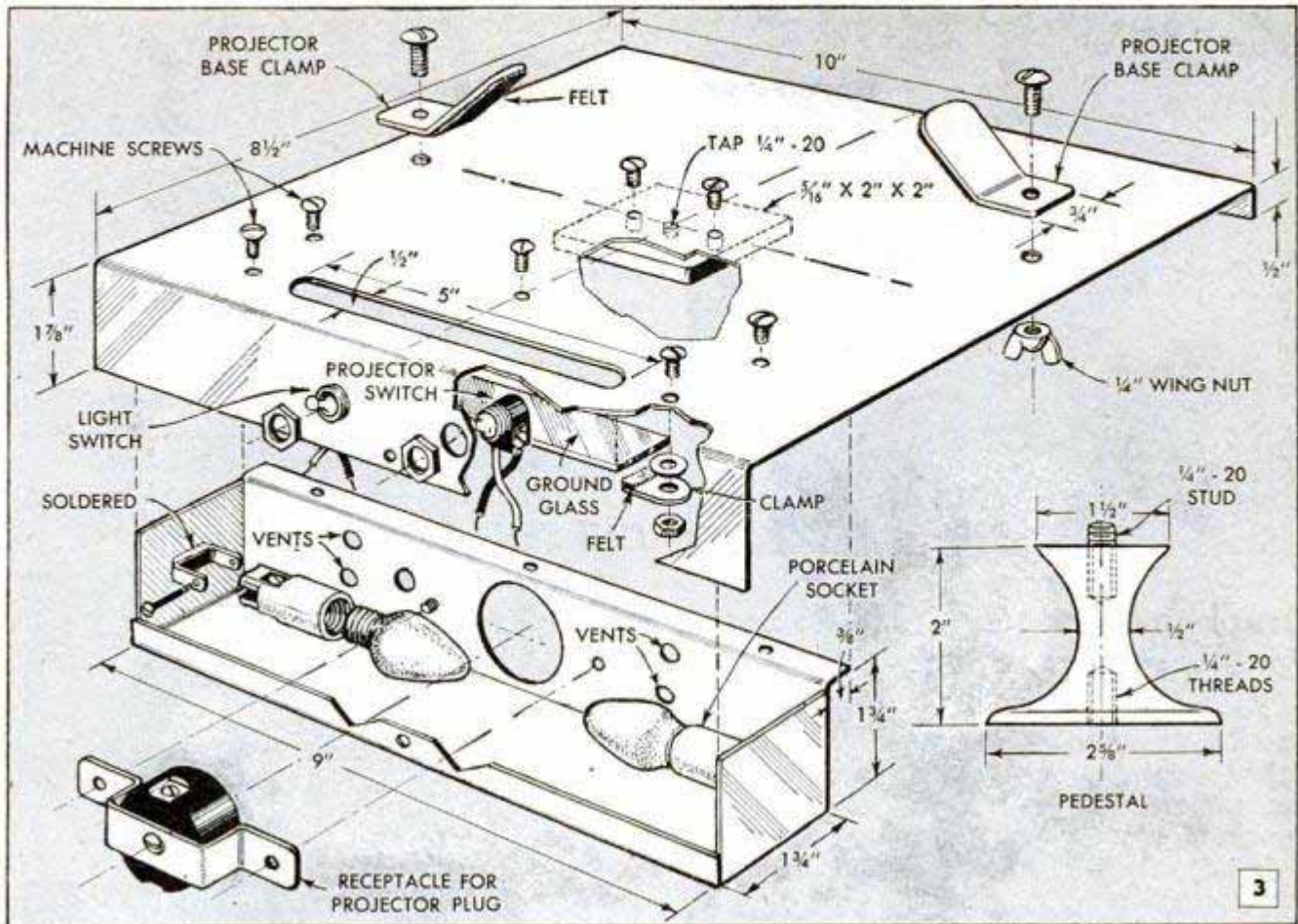
**A**N INVALUABLE accessory for your home-movie equipment, this projector base has two outstanding features. One permits the projector to be set up on any camera tripod, either wooden or metal, thus eliminating the bothersome job of setting up a table each time you wish to show movies. The other feature is a built-in utility light which provides sufficient indirect illumination for threading the projector and examining the film without turning on the room lights. Two switches, conveniently located on the side of the base, allow both the projector and the utility light to be turned on and off independently. The unit is compact and can even be stored in the back of some projector cases.

The base detailed in Fig. 3 was built for a specific projector and, of course, the dimensions may be varied to suit the particular requirements of your outfit. For rigidity, make the base from 16-ga. sheet metal, using 24-ga. metal for the lamp housing. The projector clamps are of sheet metal and are fastened to the base with wing nuts. These clamps are faced with felt so they will not mar the finish of the projector. Cut a  $\frac{1}{2}$  x 5-in. slot in the base directly over the lamp housing, making sure it will clear the edge of the projector when the latter is clamped in place. The slot can be made by first marking its length and width on the base and then drilling a hole at each end. The waste is removed with a hacksaw blade or a pair of duckbill tinner's snips. To diffuse the light, cover the underside of the slot with a piece of ground glass held





# HAS BUILT-IN UTILITY LIGHT



in place with felt-edged metal clamps fastened to the top of the base. If a piece of ground glass is not available, you can roughen the surface of a piece of ordinary window glass by rubbing an abrasive and oil over the surface with another piece of glass. Note that ventholes, as well as holes for the switches, are drilled through the side of the lamp housing. Two 7-watt lamps, two toggle switches and a receptacle for the projector plug are wired in the lamp housing as in the diagram, Fig. 2. Standard miniature porcelain sockets and U-shaped clamps are used to hold the lamps. The center of the base is reinforced with a piece of 5/16-in. steel, 2 in. square, and this is drilled and tapped to take either the tripod screw or the pedestal stud shown in Figs. 1 and 3.

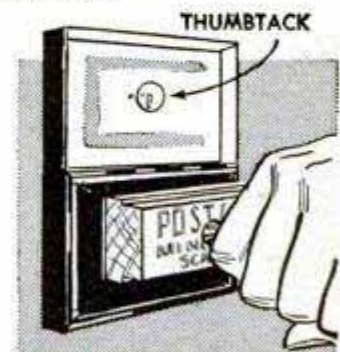
The pedestal, which raises the base 2 in., is required only if the base is to be mounted on a wooden tripod, as the head of this type of tripod usually is too large to provide clearance for the lamp housing. The pedestal is merely a turned metal extension fitted with a threaded stud in one end and tapped for the tripod screw in the other. Although the over-all dimensions of the original pedestal are given in Fig. 3, they are not critical. In addition to its intended use, the pedestal also will come in

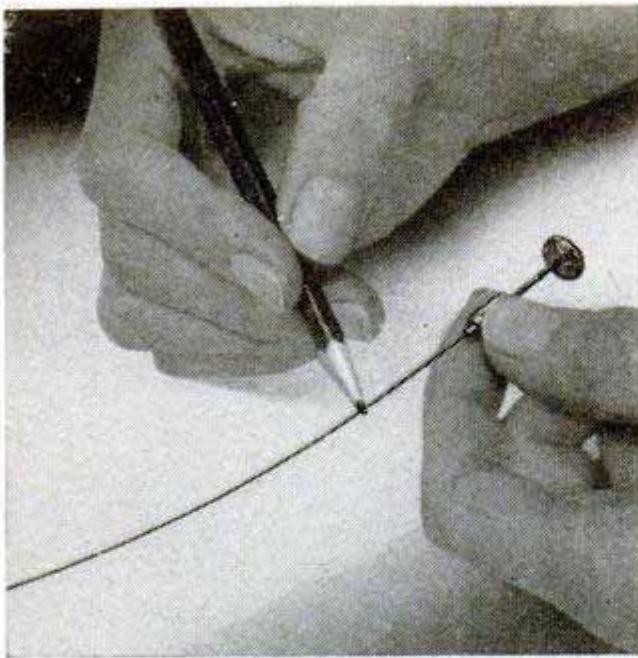
handy when taking high-angle movies using a pan head on a wooden tripod. It will raise the pan head sufficiently to keep the handle from striking the tripod top.

The extension cord, which connects the lamp housing to the 110-volt line, is connected by means of a plug and jack to a short cord which runs from the housing. This arrangement allows the longer cord to be rolled separately for carrying. For a neat appearance, the base can be chrome-plated or given a wrinkle finish.

## Thumbtack Fastens Ink Pad In Convenient Position

Inspectors and shipping clerks will find that a thumbtack soldered to the cover of a rubber-stamp pad often will come in handy for attaching the pad to a convenient wall, packing box or other vertical surface. The thumbtack is inserted through a hole punched in the pad cover and the top of the tack is soldered to the cover.





### Graphite Lubricates Cable Release For Smooth Operation

To keep a cable release operating smoothly and with a minimum of pressure, lubricate it frequently with graphite. Unscrew the button end from the sheath, remove the cable, and rub it with a pencil lead or powdered graphite. Never use oil to lubricate the cable.

### Film-Holder Slide Cuts Box Seal



When the tear string provided on a box of film fails to break the seal, it can be cut easily with a film-holder slide. The film holders are always at hand and using the slide may prevent a broken thumbnail.

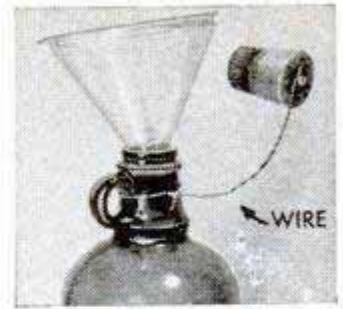
### Substitute Photoflood Reflector



If an extra photoflood reflector is needed in an emergency, a radiant-type electric heater will serve the purpose. The heater is lined with tin foil and the heating element is replaced with a photoflood lamp. The tin foil is fastened with cellulose tape.

### Cork Tied to Photo-Solution Bottle Cannot Be Mislaid

Corks hinged to the neck of a photo-solution bottle with stiff wire cannot be mislaid or contaminated. A small, round-headed screw is driven into the top of the cork. Then one end of the wire is wound around the screw and the other end around the bottle. The wire should be stiff enough to hold the cork out of the way when pouring the solution.



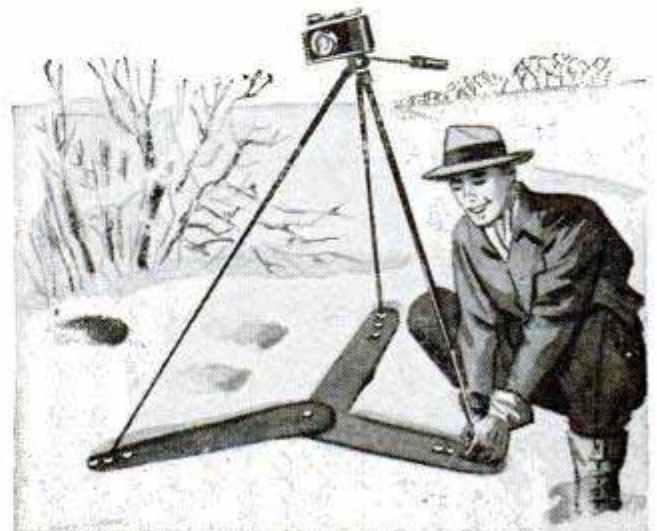
### Coil Spring Supports Funnel

A large coil spring of the type used in furniture upholstery is a handy item to keep in the dark-room as an excellent funnel support. It is especially helpful when using both hands to pour from large trays.



### Tripod Supported in Sand or Snow By Compact Wooden Platform

Sand or snow will not prevent setting up a tripod if it is supported by this folding platform. It consists of three pieces of  $\frac{1}{2} \times 3 \times 14$ -in. wood bolted together at one end. Several holes drilled partially through the outer ends of the arms permit adjusting the tripod legs and keep them from slipping. A few coats of shellac or varnish protect the platform from moisture. If desired, the platform can be made from sheet metal.





## DRILL-PRESS ROUTING

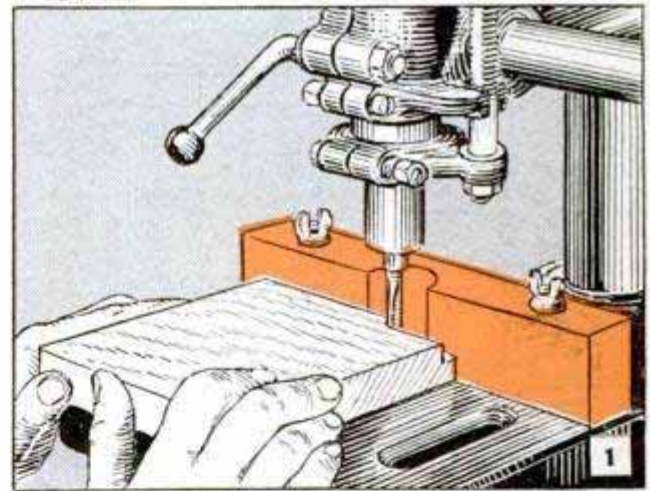
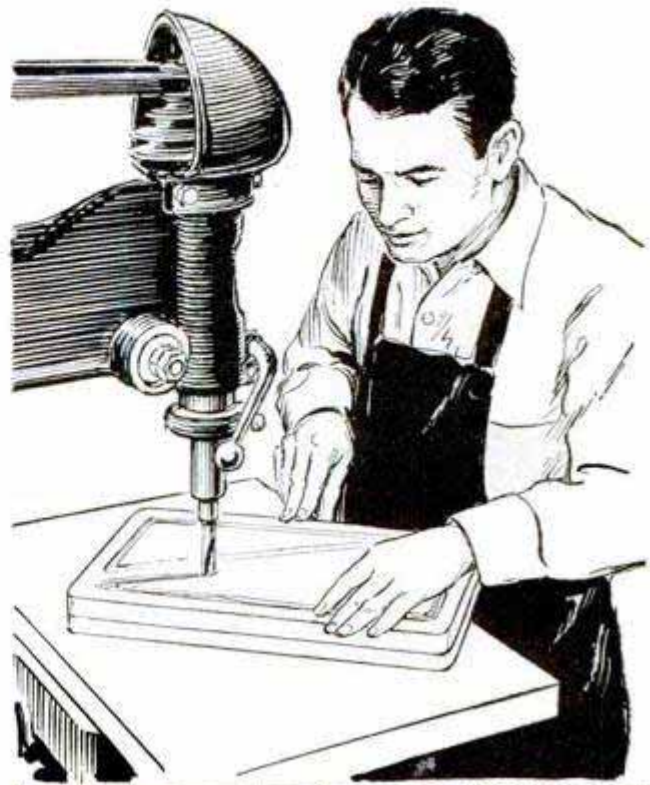
Easy-to-make jigs that clamp to the drill-press table guide the work for accurate uniform routing

By E. Waltner

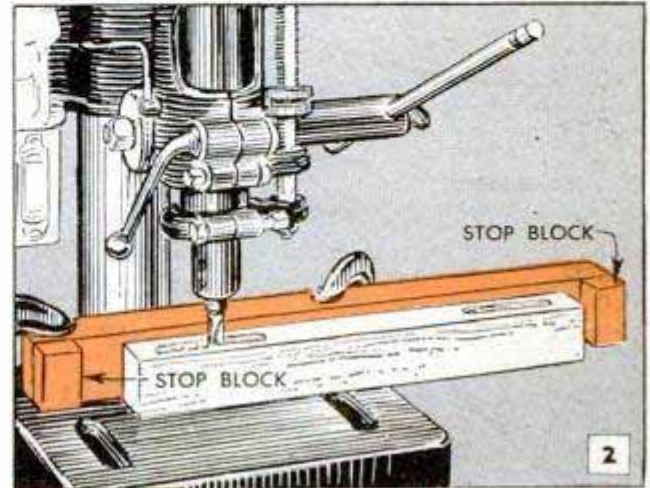
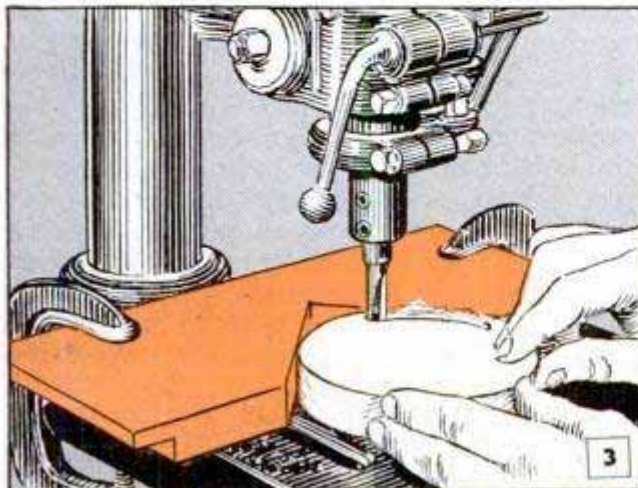
A FEW SIMPLE JIGS plus an assortment of router bits are all that is needed to convert a drill press into a router. A spindle speed of about 5000 r.p.m. is satisfactory for most routing. However, when using small-diameter router bits or when production-routing, 8000 to 10,000 r.p.m. is recommended. In most cases, the jig or guide fence, shown in color on the illustrations, should be clamped to the drill-press table back of the work. The work is fed from left to right, or against the cutting rotation of the router bit. If it is necessary to clamp the fence in front of the work, the work must be fed from right to left. To avoid heating the router bit and thus drawing the temper, the work is fed slowly and uniformly.

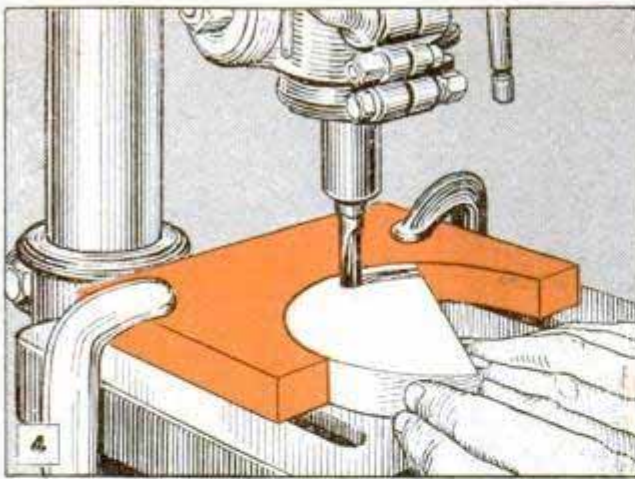
Rabbeting is done by guiding the work against a straight fence having a semicircular cutout for the router bit, as in Fig. 1. The size of the rabbet is controlled by locking the spindle sleeve at the desired depth of cut and adjusting the fence forward or away from the router bit as required. Fig.

Varying distance of V-block jig from router permits accurate routing of wide range of circle sizes

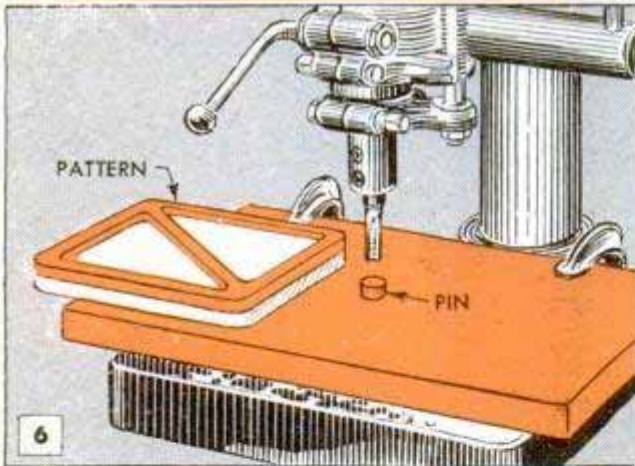
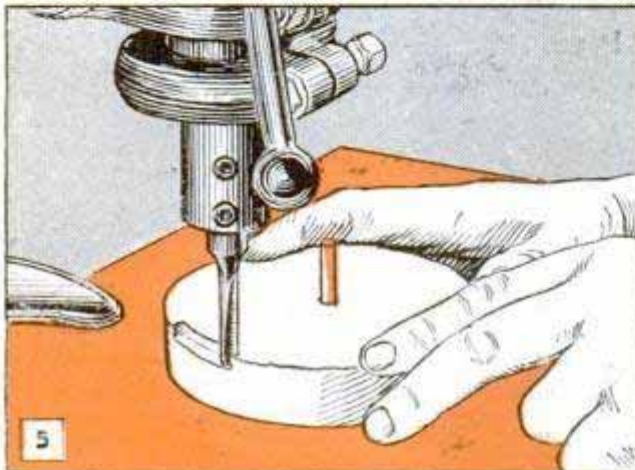


↑ Fence clamped to table guides work being routed.  
↓ Routing mortise with aid of fence and stop blocks

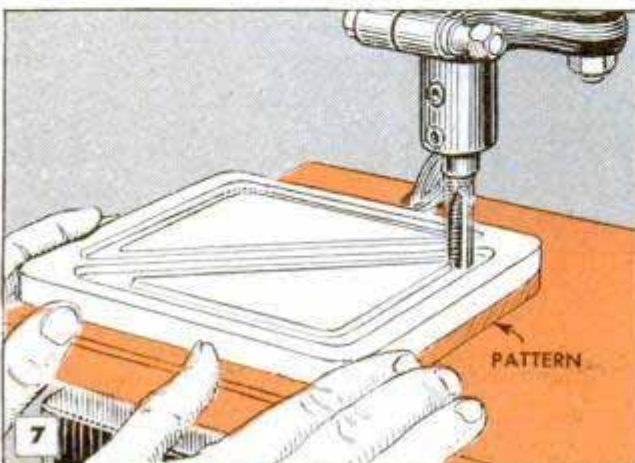




4 Routing semicircular piece using waste part as jig. Pin aligns work for routing rim of circular piece



6 Pin-and-pattern jig for routing duplicate parts. Pattern is placed over pin and guided around it



2 shows how to cut mortises. Note that stop blocks are fastened to the guide fence at each end to limit the length of the mortise. This method is particularly useful when making duplicate parts. Drill a hole at the start of the cut, using the router bit as a drill bit. Then with the bit in the hole, lock the spindle sleeve for depth and advance the work to the right-hand stop block. If the mortise is more than  $\frac{1}{2}$  in. deep, drill a series of overlapping holes along the length of the mortise and then rout out the remaining wood.

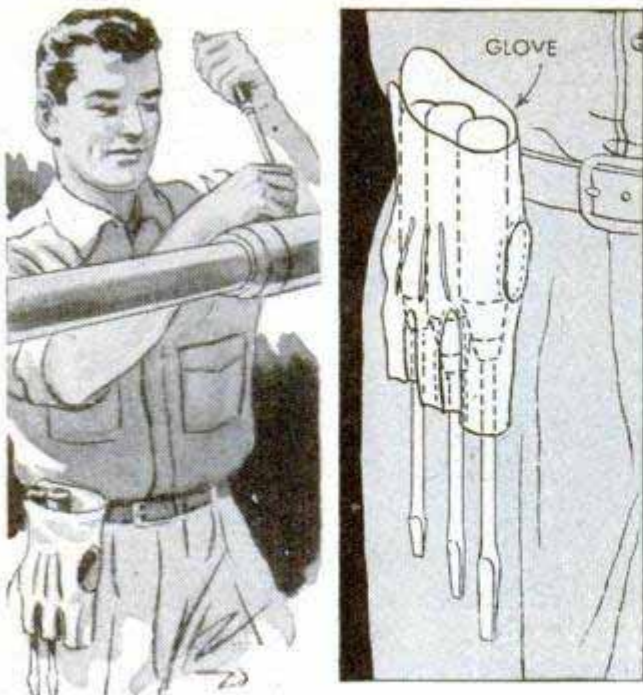
When routing circular work, use a V-block jig as in Fig. 3. The work is held against the two sides of the vee and slowly rotated. One jig of this type may be used for a wide range of circle sizes by simply clamping it to the table at the required distance from the router bit. When the work is only a portion of a circle, a jig cut to the same radius as the work is used as in Fig. 4. If the circle has been carefully band-sawed, the waste portion of the wood will serve as a jig. In addition to the V-block method, routing around the rim of a circular piece of work is done with a pivot pin as in Fig. 5. The pin is set in a board clamped to the drill-press table. With this method, the work must have a hole through its center. However, if this is objectionable, a shallow hole can be bored in the underside of the work, and the disk pivoted on a very short pin.

When routing special shapes covering an area too large to be removed with a single pass of the router bit, a pin-and-pattern jig, Fig. 6, is used. A full-size pattern is cut from  $\frac{1}{4}$ -in. plywood and tacked to the underside of the work. The pin, which can be either metal or wood, must be the same diameter as the router bit. It is set in a base-board so its projection above the surface of the board is slightly less than the thickness of the pattern. Then the base is clamped to the table with the pin directly below the router bit. If the pin is not the same diameter as the router bit or is not aligned exactly with the bit, the work will not be an identical copy of the pattern. In use, the work and pattern are placed over the pin, as in Fig. 7. The bit is locked for depth by clamping the quill, and the outline of the pattern is routed in the work by guiding the cutout edges of the pattern against the pin. The remaining stock is removed by guiding the work freehand against the router bit until the entire space has been cleaned out. In some cases, it will be found helpful in keeping the pattern against the pin if the design is sketched on top of the work to serve as a guide.

Electric push buttons can be seen in the dark if coated with luminous paint.



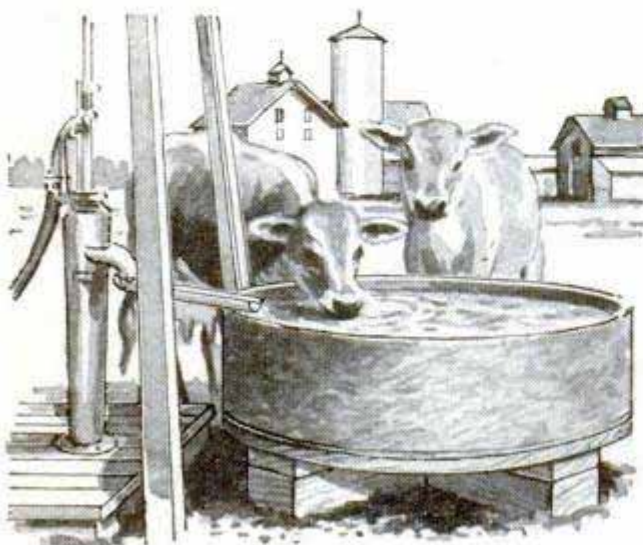
## Glove Provides Small-Tool Holder



Several screwdrivers or other small tools can be carried conveniently in a holder made from a discarded glove. Slits are cut in one side of the glove to permit fastening it to a belt, and the thumb and finger tips are removed.—W. B. Eagan, Louisville, Ky.

## Prolong Life of Metal Stock Tank By Proper Mounting and Care

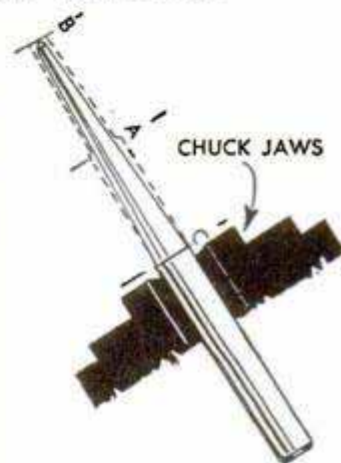
Proper mounting is important in prolonging the usefulness of a metal stock tank, particularly where special conditions, such as changing the herd from one pasture to another, make it necessary to move the tank. In any case, the tank should not be placed directly on the ground, especially in cinders, as the latter cause corrosion which is harmful to the zinc coating. It is better to support the tank 8 or 10 in. above the ground on a wooden platform made to conform to the shape of the bottom. Elevating the tank not only promotes sani-



tation by preventing stock from stepping in the water, but also permits air to circulate under the tank and thereby keeps it dry. An excellent base for supporting the wooden platform is made by half-lapping 2 or more timbers and assembling them in the form of a cross as shown. Occasional cleaning and sterilizing of the tank is important. Use an old broom to clean the tank rather than a shovel or hoe, as scraping may injure the protective zinc coating. Let the tank dry in the sun to sterilize it. Draining and drying the tank periodically induces formation of protective zinc salts on the metal that prolong the life of the tank appreciably. If straw has been piled around a tank to insulate it during the winter, be sure to remove it when freezing weather is over.

## Turning Tapers on Bar Stock

Turning short tapers on small-diameter stock is done faster if the end of the stock is not supported by a center and the turning is done in 2 steps, feeding away from the chuck. With the taper attachment set, a cut is taken from points A to B, roughing out the taper to within  $\frac{1}{32}$  in. Next, a cut is taken from points C to A, and then a finish cut is made the entire length of the taper. For tapers on very small diameter stock, it is best to chuck the work almost to point A for turning the A-B portion. Rechuck it to turn the other section.

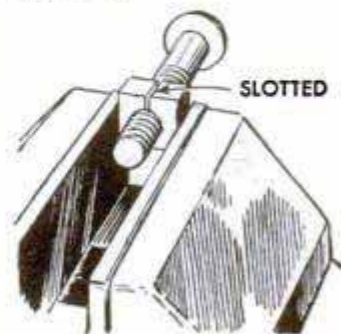


Earl R. Goddard, Denver, Colo.

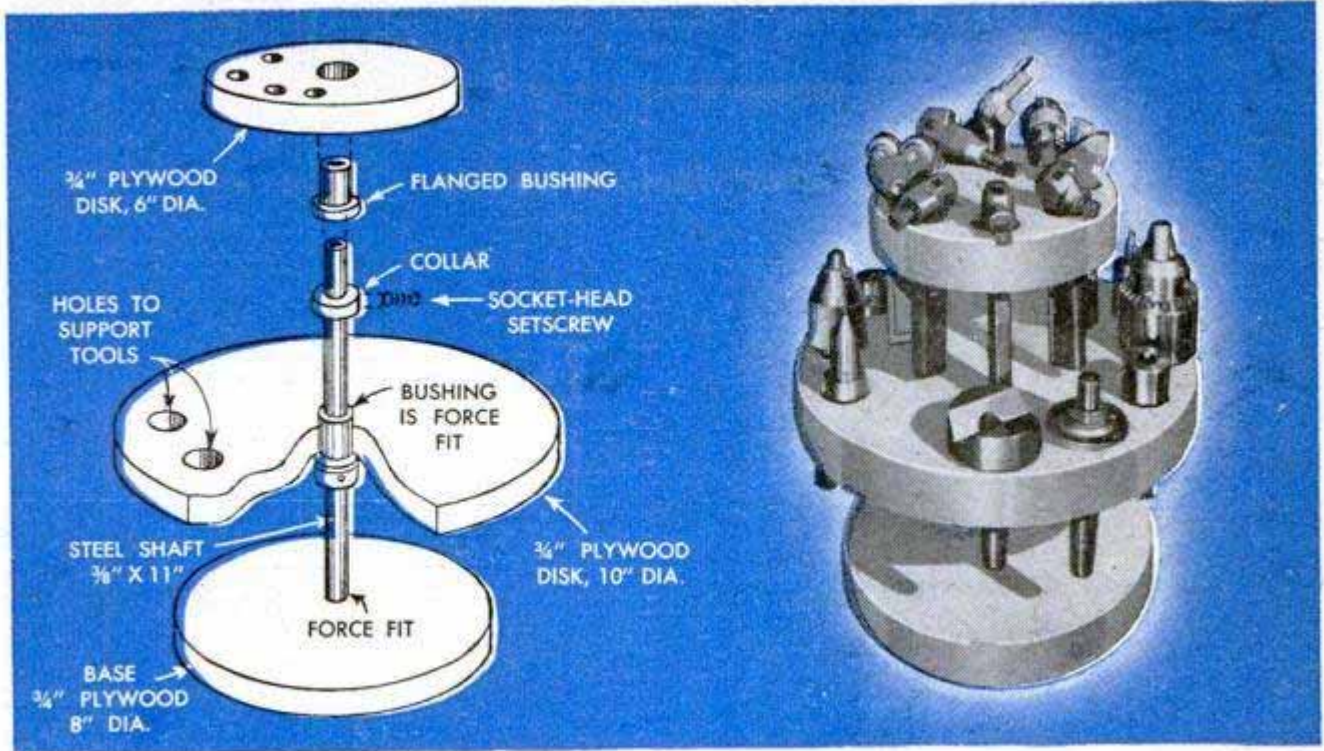
## Split Nut Protects Bolt Threads When Clamped in Vise

Here is a simple way to protect the threads of a bolt which must be held in a vise for slotting or cutting. Just saw through one side of a nut having the same threads as the bolt. Then, turn the nut

on the bolt and clamp the nut in the vise. The slot in the nut will allow it to close tightly on the threads and hold the bolt securely, although the threads will be protected from damage.



# Rotating Tool Stand Holds Lathe Accessories



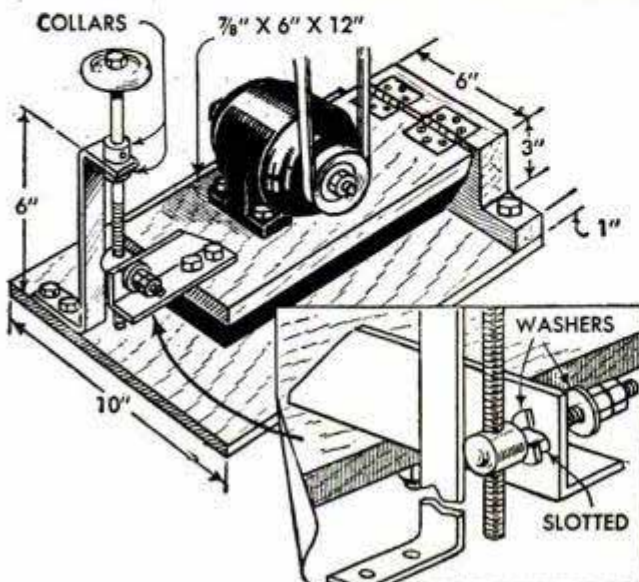
When work at a metal-turning lathe requires the use of a number of accessories on the same job, a rotating tool stand like this one is a timesaver. It also keeps the tools in order when they are not in use, preventing them from getting nicked or otherwise damaged by handling or storing in a drawer. Three plywood disks, a couple of flanged bushings and a short length of steel shafting are the principal parts of the stand and it takes only a few minutes to assemble them. Tools fit into holes drilled through the wooden shelves, a special hole

being drilled to accommodate each tool. Note that tools in the lower shelf can be removed and replaced without disturbing those in the upper shelf. Arrangement and size of the holes must be worked out by measurement of the tools. Each shelf is center-drilled to take a flanged bronze bushing in a force fit. The bushings bear on collars fastened to the shaft with set-screws. The hole in the base for the shaft should be drilled slightly undersize so that the shaft will be a tight, force fit.

W. S. Kals, Vancouver, Can.

## Hinged Motor Mount Has Handwheel for Belt-Tension Adjustment

Designed for use where a power tool is driven from below, this hinged motor mount provides for uniform belt tension



without imposing the weight of the motor directly on the bearings. Slack in the belt is taken up by turning a handwheel. This raises or lowers a hinged shelf to which the motor is fastened. The drawing shows how the device is made. The adjusting mechanism consists of a threaded shaft supported vertically by a flat-iron bracket and two collars. The shaft passes through a tapped hole in the head of a specially turned bolt and the end of the shaft rests on the bottom board. The turned bolt is supported by a piece of angle iron which is bolted to the end of the motor shelf. Two nuts on the bolt permit it to be tightened sufficiently to provide a sliding fit in the slot in the angle-iron support. Note that the rear edge of the motor shelf is cut at an angle to allow it to be lowered.

☞ To prevent unraveling of rope ends, dip them in varnish or shellac before using.

# Fastening WHEELS TO SHAFTS

Pulleys, gears and clutches transmit power from one machine part to another, but only the fasteners prevent the wheels from spinning idly

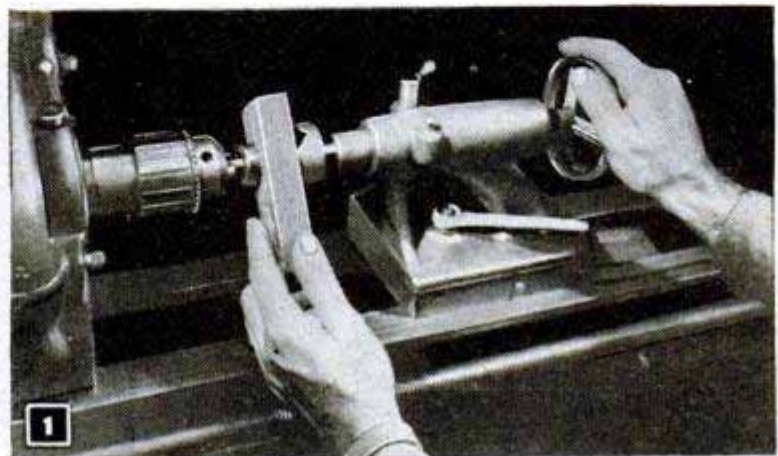
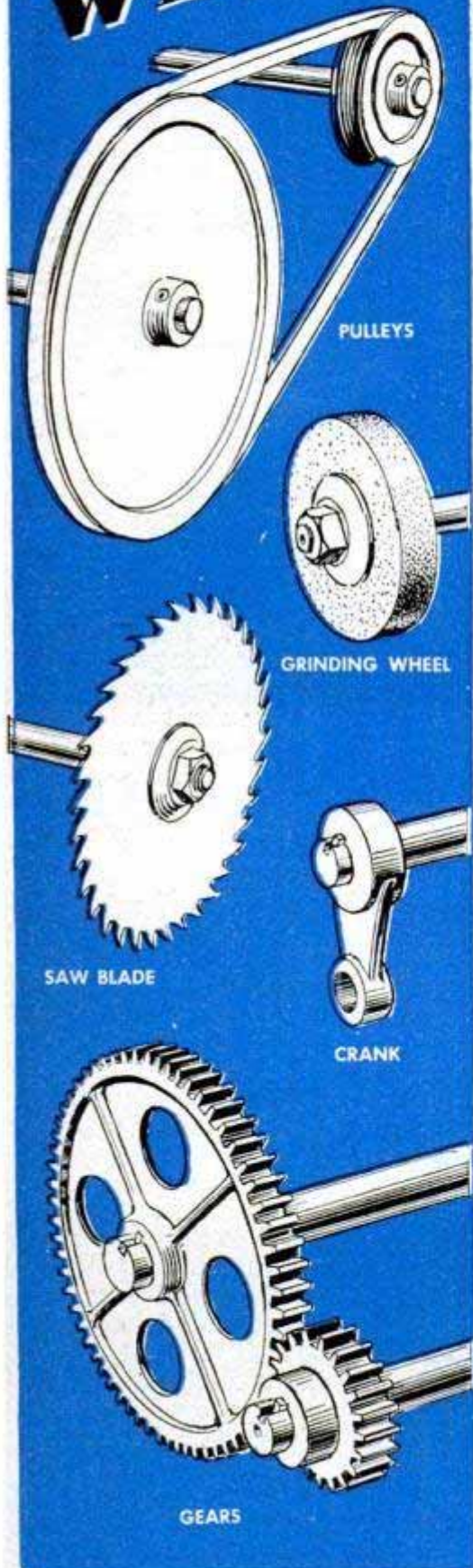
By W. S. Kals

**I**N DESIGNING or building homemade power-driven equipment and in attaching new gears, pulleys, wheels or clutches to machine units, methods of fastening these parts are governed by the size of the parts and the force, or torque, to be transmitted. The fastener must withstand pressures developed by the sustained load, or turning force, plus shock loads originating within the mechanism, and also must resist any lateral forces that may act on the rotating parts.

Some fasteners take care of these requirements in one application, but others require separate provisions for transmitting torque and for taking up lateral thrusts. Separate fasteners are of several types. These range from a simple nail or cotter pin to straight and taper transverse pins, which pass through the wheel hub. They also include setscrews, Figs. 9 and 11, and keys of various shapes and applications. In addition, there are the force-fit, shrink-fit and expansion-fit types of fastening in which the parts are simply forced together cold, or one or the other of the parts is cooled or heated.

**Force fit:** This is a common method of fastening where a smooth hub contour with no projecting keys or pins is required and where the sustained load is uniform with no possibility of shock. On very light work where turning forces are small and accuracy is of secondary importance, such as the gear in Fig. 2, dimpling the shaft or hub of the gear with light blows from a ball-peen hammer will provide sufficient friction between the hub and the shaft to carry the load and prevent any lateral movement of

Any lathe can be used as a light arbor press suitable for pressing small parts onto shafts. The shaft is held in drill chuck







Force fits for small gears and other parts attached to standard shafting are achieved by simply knurling the shaft. The knurl has the effect of increasing the diameter of standard shafting as much as .003 in.

the gear. An arbor press is commonly used to force the gear on the shaft. When installing gears, pulleys or other parts carrying heavier loads, the shaft is made slightly larger than the diameter of the hole in the wheel hub. A common rule of thumb is to allow .001 in. for each inch of shaft diameter. Fig. 3 shows one method of achieving a force fit by simply knurling the end of the shaft in a lathe. The effective diameter of the shaft for purposes of a force fit may be increased as much as .003 in. in this manner. However, if the shaft or the wheel hub is of soft metal, the tips of the knurl either will flatten to some degree or bite into the hub. In this case, the effective diameter will be reduced. This method often is used where it is necessary to force-fit a wheel onto a shaft of exactly the same diameter as the hole in the hub. It is employed also in fitting parts onto cold-rolled-steel shafting which may run slightly undersize. Usually the knurl will provide the extra .002 in. needed for a force fit. A lathe can be made to serve as an arbor press for small parts by setting it up as in Fig. 1. Here the shaft is chucked and the fitting, in this case a small ball bearing, is started on the shaft by hand. Then the tailstock is brought up and a block of hardwood is placed between a crotch center and the bearing. It is possible to force-fit small parts in this manner with practically no distortion.

**Shrink fit:** Where the parts are fairly large and carry much heavier loads, some form of shrink fit is used. In some cases, a part can be heated sufficiently by immersing it in boiling water. Oil, which has a higher boiling point than water, gives a slightly greater expansion. Where the wheel is large and it is impractical to heat in this manner, the shaft can be shrunk by cooling. In ordinary work, the result will be the same.

**5** **TABLE**

Shrink-Fit: obtained by heating outer member  
 Expansion-Fit: obtained by cooling inner member  
 Compound-Fit: obtained by heating outer member and cooling inner member

Rule of thumb:  
 Interference needed, .001" per in. dia. of shaft.  
 Table gives the change per in. dia.

Material	Dry Ice	Boiling Water
Aluminum	-.0020	+.0017
Brass	-.0017	+.0015
Copper	-.0015	+.0012
Cast Iron	-.0010	+.0008
Steel	-.0011	+.0009

**6** BENT NAIL

**7** COTTER PIN

**8** SCREW SET OFF CENTER

**10** SCREW THROUGH HUB AND SHAFT

**11** SETSCREW

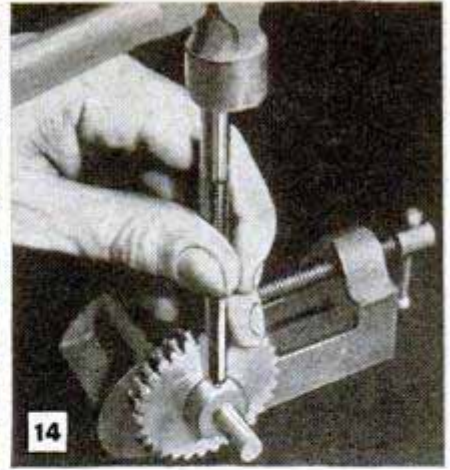
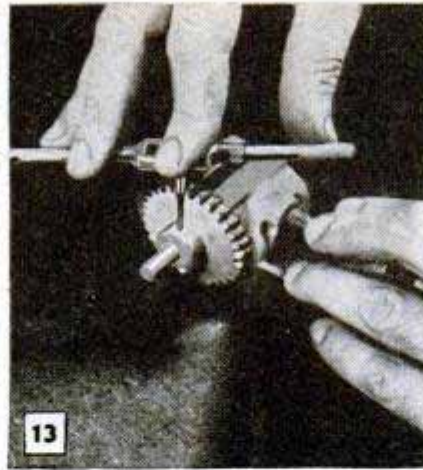
D=DIA. OF SHAFT

FLAT ON SHAFT EQUALS DIA. OF SCREW

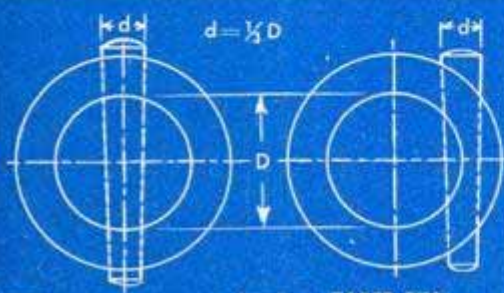
  

**9** **TABLE**

Shaft Dia. (Inches)	Setscrew To Use
Up to 1/4	No. 8 - 32
5/16 - 3/8	No. 10 - 24
1/2 - 11/16	1/4 - 20
3/4 - 15/16	5/16 - 18
1 - 1 1/4	3/8 - 16



Small gear wheels to be fitted with setscrews are drilled and tapped as in Figs. 12 and 13. When seating a taper pin in the hub of a wheel, use a pin punch and tap it lightly, otherwise the pin may "freeze"



15 TAPER PIN

16 TAPER PIN SET OFF CENTER

17 TABLE

Shaft Dia. (Inches)	Pin Number	Large End Dia.	Approx. Fraction of In.
3/16	7/0	.062	1/16
1/4	5/0	.092	3/32
3/8	3/0	.125	1/8
1/2	0	.156	3/16
5/8	2	.193	1/4
3/4	4	.250	1/2
1	6	.341	11/32
1 1/2	8	.492	1 1/2
2 1/2	10	.706	2 3/32



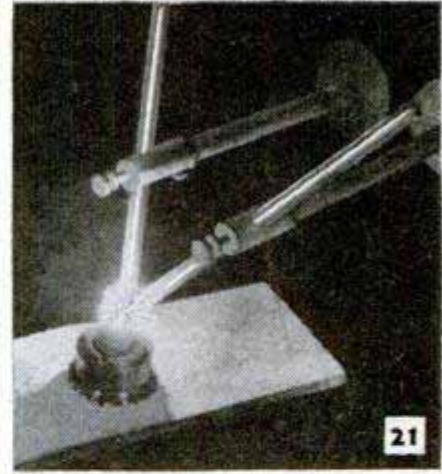
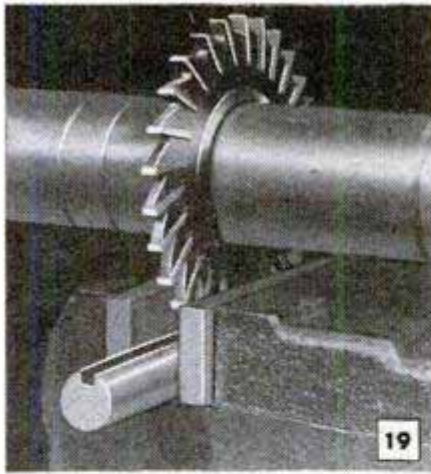
TAPER REAMER

18 TABLE

Code Number	Small Dia.	Large Dia.	Smallest Drill
7/0	.045	.067	56
6/0	.061	.081	52
5/0	.072	.097	49
4/0	.087	.114	43
3/0	.103	.130	37
2/0	.114	.146	32
0	.129	.164	29
1	.145	.180	26
2	.161	.201	20
3	.181	.229	14
4	.207	.260	4
5	.241	.299	C
6	.278	.354	K
7	.330	.422	R
8	.397	.505	X
9	.481	.607	31/64
10	.580	.721	37/64

**Expansion fit:** In expansion fitting, the shaft is cooled so that it will fit into the hole in the hub. Solidified carbon dioxide (Dry Ice) provides a cheap and practical way of cooling a shaft for an expansion fit. (Caution: do not touch carbon dioxide with the bare hands.) As a rule, allowing work to remain packed in carbon dioxide for 10 to 15 min. will give sufficient shrinkage. The table in Fig. 5 shows the expansion and shrinkage values for several common metals. As an example in calculating the necessary shrinkage or expansion required, take a brass gear wheel with a bore of 2 in., the wheel to be shrink-fitted to a steel shaft. By the common rule, the required diameter of the shaft would be 2.002 in. By heating the gear in boiling water it would normally expand  $2 \times .0015$ , or .003 in. When heated, the bore of the gear wheel would measure 2.003 in. and should slip over the end of the shaft quite easily. By chilling the shaft in carbon dioxide, it is reduced  $2 \times .0011$ , or .0022. The diameter of the shaft then would be 1.9998. In cases where expansion or shrinkage of one of the parts is insufficient, the compound fit is used. The compound fit is accomplished as stated in Fig. 5, by heating the outer, or female member, and cooling the inner, or male member. This method also is used frequently in high-grade work.

**Pin fastenings:** The simplest of these are the bent nail and the cotter pin or key, Figs. 6 and 7. For slow driving speeds and light loads, these fasteners serve the purpose as they will transmit power on slow drives and also prevent the wheel moving laterally on the shaft. They do not, however, withstand shock loads or heavy thrust. Elaborations of the pin fastening are the off-center screw, Fig. 8, and the threaded key, which is turned into a hole tapped half in the shaft and half in the wheel hub as in Fig. 10. Socket-headed setscrews with flat and cup points are used to fasten machine pulleys, particularly pulleys on small motors. Small gear wheels on experimental equipment often are provided with this type of fastening as the wheels are removed easily when gear ratios must be changed. The wheel hubs are drilled and tapped for the screws as in Figs. 12 and 13. On small-diameter shafts, such as



Keyways for both flat and square keys are milled in the shaft. By boring the hub of the wheel oversize and silver-soldering a slotted sleeve in the bore as in Fig. 21, the internal keyway is formed without milling

those on most motors of less than  $\frac{1}{2}$  hp., the setscrew seats on a flat milled on the shaft. A flat also can be ground on a shaft as in Fig. 4. Pulleys and other driving and driven wheels attached to the shaft with a square key or a flat key, Figs. 22 and 23, usually are provided with a setscrew, which is tightened on the key to hold it in place and also to prevent the wheel from moving laterally on the shaft. Figs. 15 and 16 and the table in Fig. 17 show two applications of the taper-pin fastener. This method of attachment gives the rigidity of the shrink and expansion fit but permits removal of the wheel by simply driving out the pin. Holes for taper-pin fastenings first are drilled with an ordinary twist drill of the required size and then reamed with a taper reamer. Fig. 18 lists the common sizes of small taper reamers and gives the drill sizes to use. Where the parts are not subjected to severe vibrations the taper pin is set lightly in the wheel hub with a pin punch as in Fig. 14.

**Key fasteners:** On drives which are subjected to variations in load and where the parts are too large to make pinning practical, wheels are keyed to the shafts. The driving and driven members of various types of clutches on stationary equipment often are fastened to the shafts in this manner. The square and flat keys, Figs. 22 and 23 and the Woodruff, or half-moon key, Fig. 25, are commonly used. Sizes of these keys have been standardized and the tables in Figs. 24 and 25 list common sizes. The position of the key with relation to the wheel hub and shaft has been more or less standardized also, as indicated by the key letters "a" and "b" in Figs. 22 and 23, and the letters "h" and "w" in Fig. 29. When installing either the flat or square keys, Fig. 20, a keyway is milled in the shaft as in Fig. 19. Standard gears, pulleys and other manufactured parts have the keyway formed in the hub. If these parts are being made in the home shop, hub keyways can be formed on a small bench shaper, or even with a hand file. Another way is to bore the wheel hub oversize, then turn a slotted sleeve to fit in the wheel hub. The sleeve is reamed to fit the shaft. It is then silver-soldered in the wheel hub as in Fig. 21. The slot in

$a = \frac{1}{4}D$ 
 $b = \frac{1}{4}D$

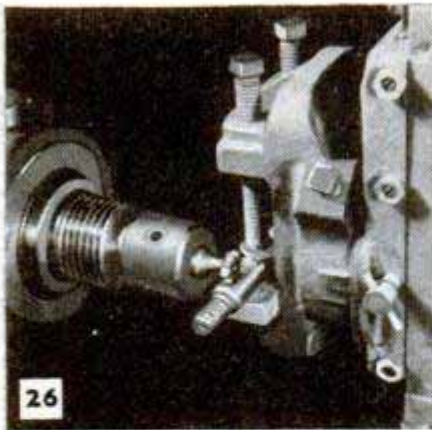
**22 SQUARE KEY**

**23 FLAT KEY**

Shaft Dia. (Inches)	Square Key	Flat Key	
		Width	Height
$\frac{1}{2}$ to $\frac{9}{16}$	$\frac{1}{8} \times \frac{3}{8}$	$\frac{1}{8} \times$	$\frac{3}{32}$
$\frac{5}{8}$ to $\frac{7}{8}$	$\frac{3}{16} \times \frac{3}{16}$	$\frac{3}{16} \times$	$\frac{1}{8}$
$\frac{1}{2}$ to $1\frac{1}{4}$	$\frac{1}{4} \times \frac{1}{4}$	$\frac{1}{4} \times$	$\frac{3}{16}$
$1\frac{1}{8}$ to $1\frac{3}{8}$	$\frac{5}{16} \times \frac{5}{16}$	$\frac{5}{16} \times$	$\frac{1}{4}$
$1\frac{1}{2}$ to $1\frac{3}{4}$	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{8} \times$	$\frac{1}{4}$
$1\frac{13}{16}$ to $2\frac{1}{4}$	$\frac{1}{2} \times \frac{1}{2}$	$\frac{1}{2} \times$	$\frac{3}{8}$

**WOODRUFF KEY**

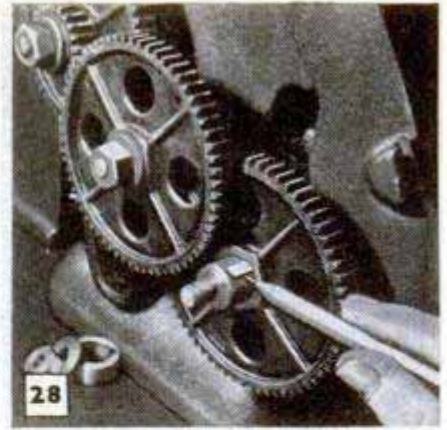
Length	Width					
	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{1}{4}$
$\frac{1}{2}$	204	304	404			
$\frac{3}{8}$		305	405	505		
$\frac{3}{4}$			406	506	606	
$\frac{7}{8}$				507	607	807
1					608	808
$1\frac{1}{4}$					609	809
$1\frac{3}{4}$						810



26

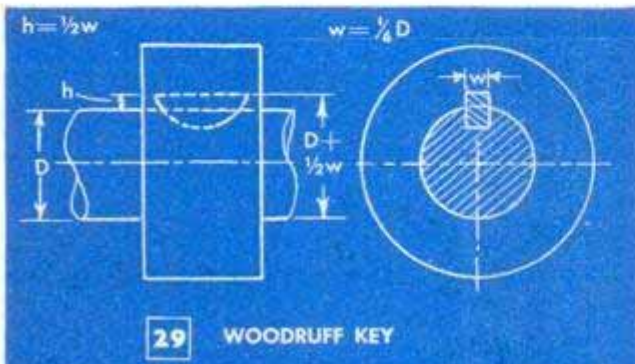


27



28

Slots for Woodruff keys are cut easily in the lathe with a milling attachment. Before removing the work, place a key in the slot and check depth with a micrometer. Right-hand photo shows application of the key



29 WOODRUFF KEY

30 TABLE		
Shaft Dia. (Inches)	Woodruff Key Width	Code Number
$\frac{5}{16}$ to $\frac{7}{16}$	$\frac{3}{16}$	204
$\frac{7}{16}$ to $\frac{1}{2}$	$\frac{3}{32}$	304 etc.
$\frac{9}{16}$ to $\frac{5}{8}$	$\frac{1}{8}$	404 etc.
$\frac{11}{16}$ to $\frac{15}{16}$	$\frac{5}{32}$	505 etc.
1 to $1\frac{1}{16}$	$\frac{3}{16}$	606 etc.
$1\frac{1}{4}$ to $1\frac{3}{4}$	$\frac{1}{4}$	807 etc.

Note: The Woodruff Key Code Number is derived as follows: First digit, width of key in 32nds. Second and third digits, length in 8ths. Thus 405 indicates a key  $\frac{1}{8}$  wide)  $\frac{5}{8}$  long.



31 MACHINED SHOULDER

32 GRINDING-WHEEL COLLAR



33 WELDED COLLAR

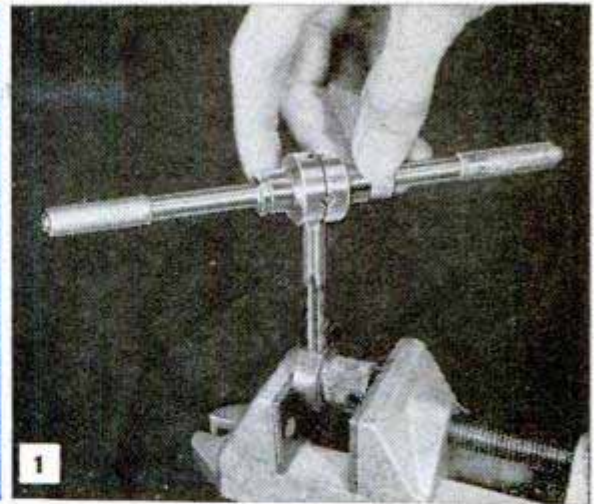
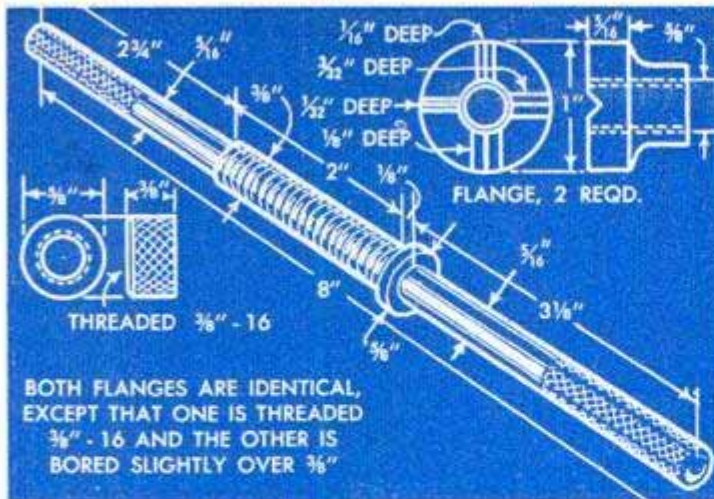
34 COLLAR AND SETSCREW

the sleeve allows the key to slip into place.

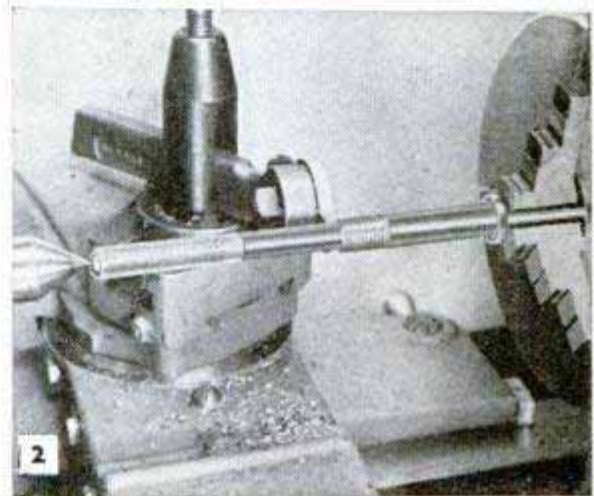
The lathe setup for cutting a Woodruff keyway with a milling attachment is shown in Fig. 26. After locating the position of the keyway, work is fed upward into the cutter by means of the vertical slide of the milling attachment. Before the shaft is removed from the milling-attachment vise, a key is inserted in the slot and the depth checked with a micrometer as in Fig. 27. A typical application of the Woodruff key is shown in Fig. 28. The table in Fig. 30 gives the recommended sizes of the Woodruff key to be used with a shaft of a given diameter. The special note directly below the table describes the meaning of the code numbers listed in the right-hand column.

**Threaded arbors:** Grinding wheels, circular-saw blades and circular-saw attachments, buffing wheels and wire scratch wheels are attached to the driving shaft or arbor by a compression-type fastening. Similar grinding and polishing accessories are attached to a flexible shaft in the same manner. The arbor is shouldered and threaded for a distance from one end, or both ends in the case of a motor-driven grinder, and is fitted with a nut and either one washer as in Fig. 31, or two loose washers, or flanges, as in Fig. 32. The latter is the common type of fastening used on saw arbors, although some are fitted with a welded inner collar or flange as in Fig. 33. Threads on the arbor are cut either right or left hand, depending on the direction of rotation of the shaft. In some applications where slight adjustments are necessary, the inner collar is attached to the shaft with a setscrew as in Fig. 34. Note that the grinding-wheel collars in Fig. 32 are recessed and that the outer flange is turned with a hub. Grinding wheels are fitted with lead sleeves and paper flanges on both sides to protect the arbor and the ground surfaces of the metal arbor flanges from abrasive action when attaching and removing the wheel. Paper flanges also help to prevent the wheel from loosening.

# Flanged Tap Wrench Takes Four Shank Sizes



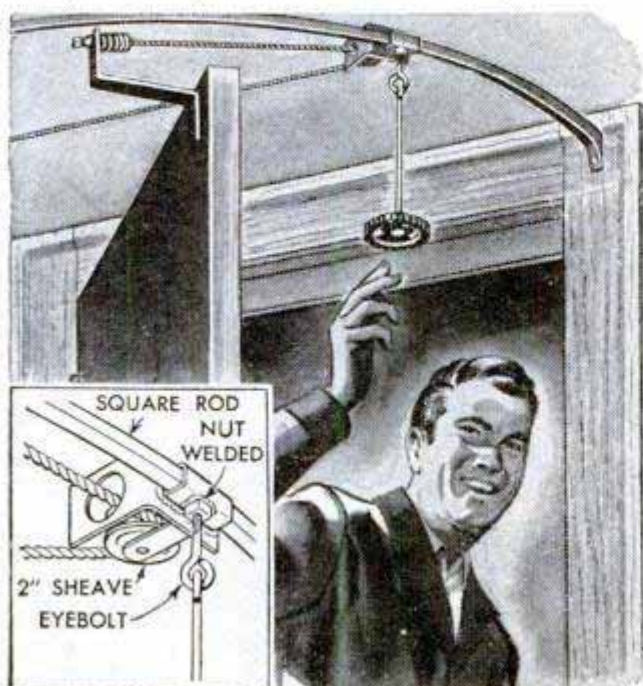
This versatile tap wrench, Fig. 1, makes an interesting and instructive project for either the home craftsman or the school shop. The handle unit is turned from  $\frac{5}{8}$ -in. cold-rolled steel to the dimensions given in the detail. After knurling the ends, the center section is threaded in the lathe, as in Fig. 2, or with a  $\frac{3}{8}$ -16 die. The flanges are turned from cold-rolled steel and then notched to take four sizes of tap shanks. The notches can be milled in each flange or they can be filed in the flanges by hand. If the notches are hand-filed, care must be taken to space them equidistantly. File the notches to exactly the same depth in both flanges so taps are gripped securely.



## Counterweight on Door Automatically Returns It to Preset Stop

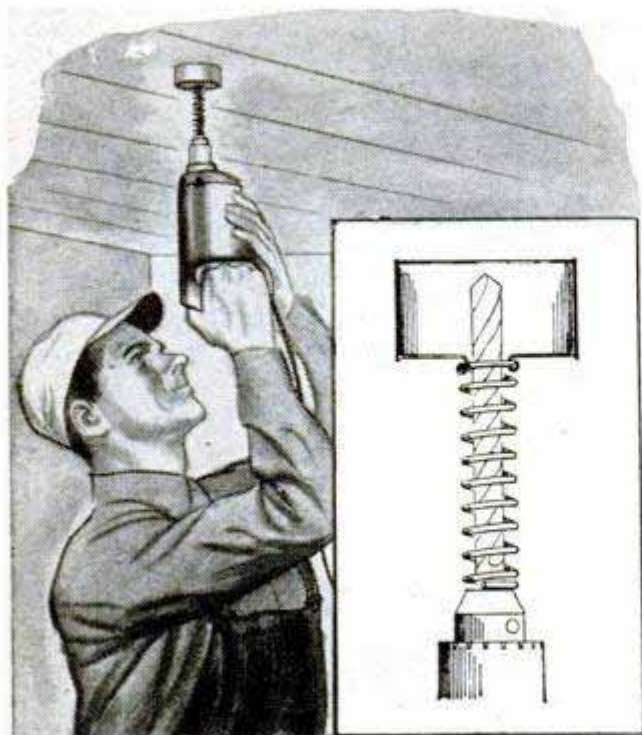
Because it was necessary to keep an entrance door partially open for proper ventilation, the workers in one powerhouse made an adjustable doorstop that runs on a circular overhead track. A counterweight brings the door back against the

stop after someone passes through. The track is a length of square rod bent to a radius about 1 in. greater than the width of the door. The stop itself is made by bending a piece of flat iron to fit loosely around the track. A hole is drilled in the underside of this flat-iron sleeve and a nut is centered over the hole and welded in place. Then one side of the sleeve is welded to a piece of angle iron fitted with a 2-in. sheave as shown. An eyebolt, which serves as a setscrew to lock the stop in place, is turned in the nut by means of a steel-rod extension to which a valve handwheel is attached. A bracket bent from flat iron is fastened to the upper part of the door to take one end of the counterweight rope. This bracket may have to be offset slightly so the rope aligns with the doorstop sheave. Note that a short coil spring is brazed over the rope hole in the bracket to provide a shock absorber. Another sheave is attached to the wall at the same height as the stop and pivoted so it is always in line with the stop. A sash balance serves as a counterweight. This should slide in a wooden channel to protect the wall.



J. C. Montgomery, Bowness, Alta., Can.

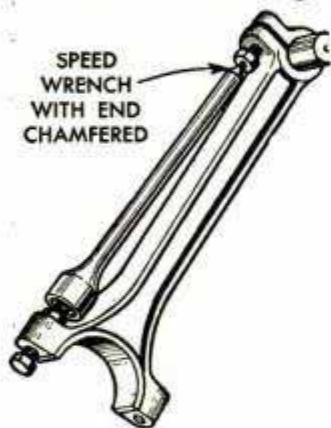
## Tin-Can Guard Catches Shavings When Drilling Overhead



To protect his eyes from falling particles when drilling through ceilings, one electrician placed a small tin can over the end of the drill bit. A coil spring holds the can flush with the ceiling, as shown. Both the spring and the hole in the bottom of the can must, of course, be slightly larger than the bit. The hole is punched from the inside of the can and the metal is bent around the end coil of the spring to hold the can in place.

Stratis Simon, Long Island City, N. Y.

## Releasing Tight Wrist Pins From Connecting Rods



Here is a device used by one mechanic to release exceptionally tight wrist pins from connecting rods of the type shown. A shallow hole is drilled in the center of the head of the bolt which clamps the wrist pin and the bolt is loosened slightly.

Next, a bolt is inserted through the hole in the lower end of the connecting rod. This bolt, having a smaller diameter than the hole, is turned into a nut. One side of this nut is filed down to bear against the connecting rod so that it will not turn. Then, a speed-wrench fitting is pointed and placed

between the two bolts, as indicated. In this way, tightening the lower bolt exerts pressure on the wrist-pin bolt forcing the clamp open.

Arthur W. Carpenter, Blackbird, Del.

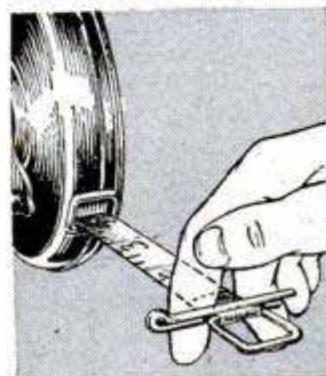
## Apron Carries Stenciled Reminder

Because he often forgot to lock up his apparatus when leaving the laboratory for the day, one chemist stenciled a reminder on the inside of his apron. Then, as he hung the apron on the wall, he would see the note to check the equipment.

Merle A. Stewart, Jr., Mars Hill, N. C.

## Finger Grip for Measuring Tape

When using a measuring tape, a better grip is had if a cotter pin is slipped over the end of the tape next to the metal ring. This is especially useful when wearing gloves to work outdoors in cold weather.

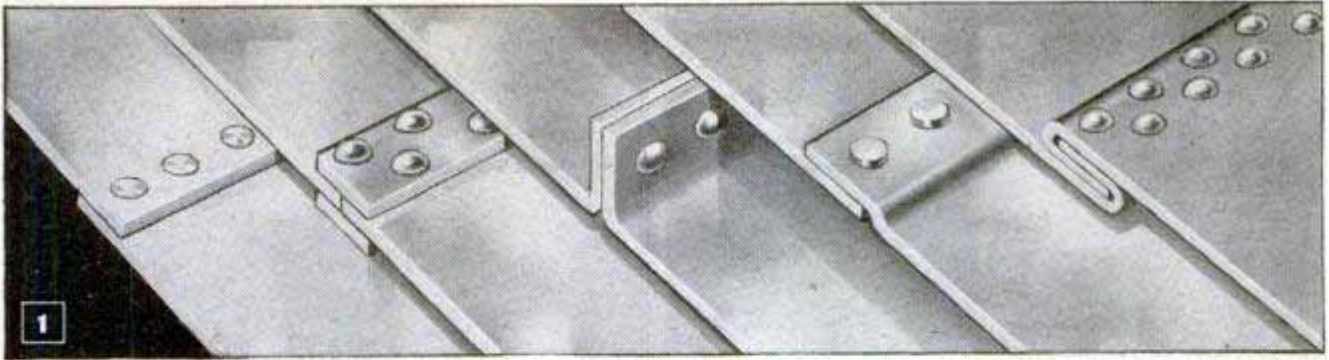


## Grease Fitting on Hand Gun Permits Pressure Filling

Hydraulic hand guns used to grease hard-to-reach places on a car are refilled in a jiffy with a compressed-air gun. Of course, before this can be done the casing of the hand gun must be drilled and tapped to take a  $\frac{3}{8}$ -in. hydraulic grease fitting.

Jerome Ford, Lancaster, Ohio.





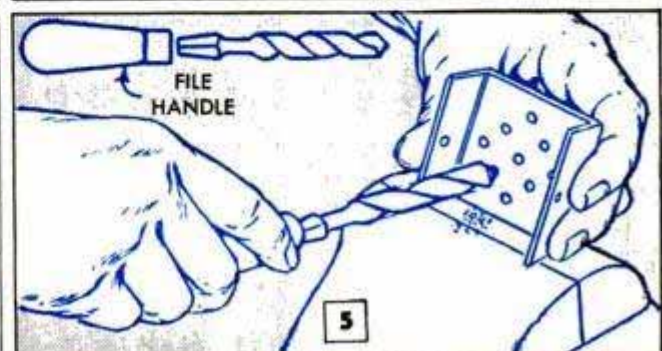
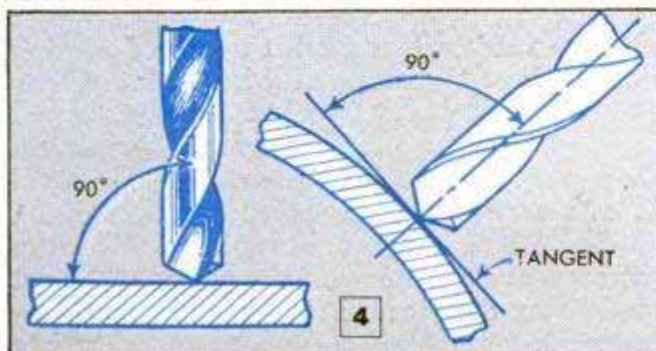
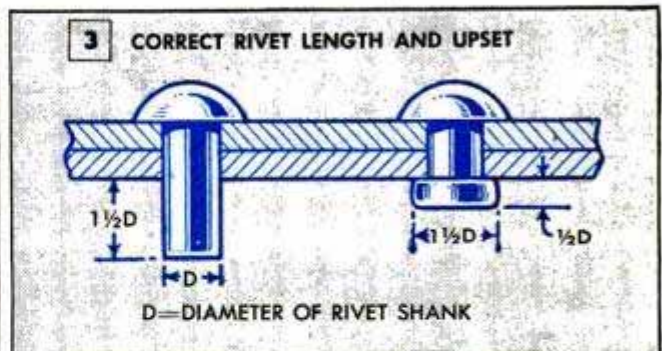
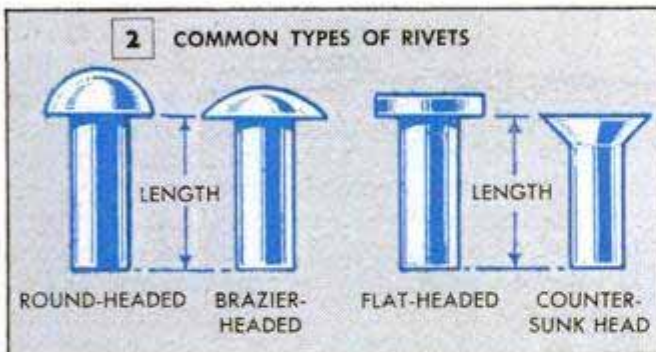
# HOW TO RIVET ALUMINUM

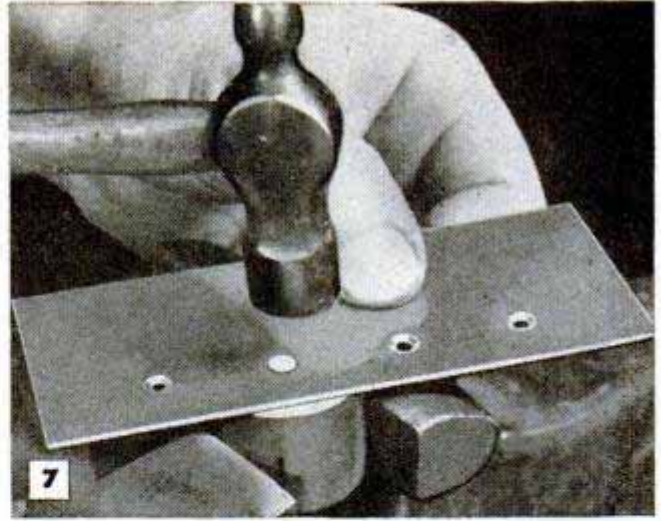
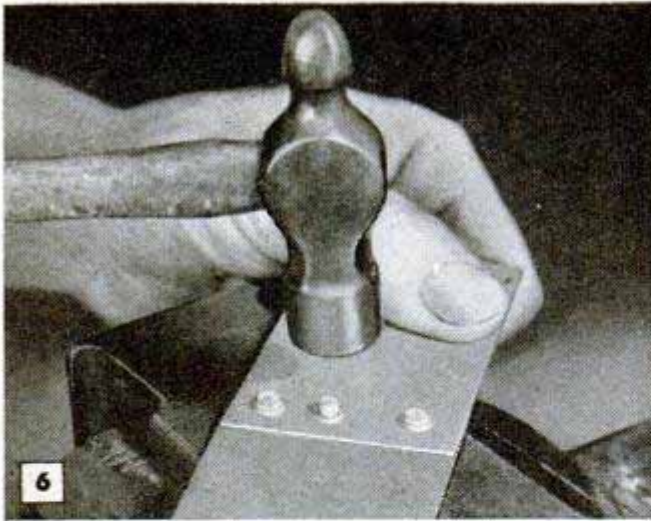
**R**IVETING aluminum sheets, either in factory production or in the home workshop, requires a specific procedure to produce maximum strength in the joint without any distortion of the material. In nearly all types of work the rivet pattern, Fig. 1, is important not only for decorative effect but for resistance to shearing or buckling of the joint. The type of rivet to be used is selected according to the nature of the work and the type of joint which is most suitable to the project in hand. The four rivet types shown in Fig. 2 will meet all ordinary requirements. If decorative value is a factor in the selection, then the round-headed and also the brazier-headed rivets usually are best. Use the round-headed type to join the heavier sheets where greater strength is required. The size and thickness of metal in the head is designed to strengthen the area around the rivet hole. When thin sheets are to be joined, a brazier-headed rivet is the one to use as its broad head gives a maximum grip on the

By R. J. De Cristoforo

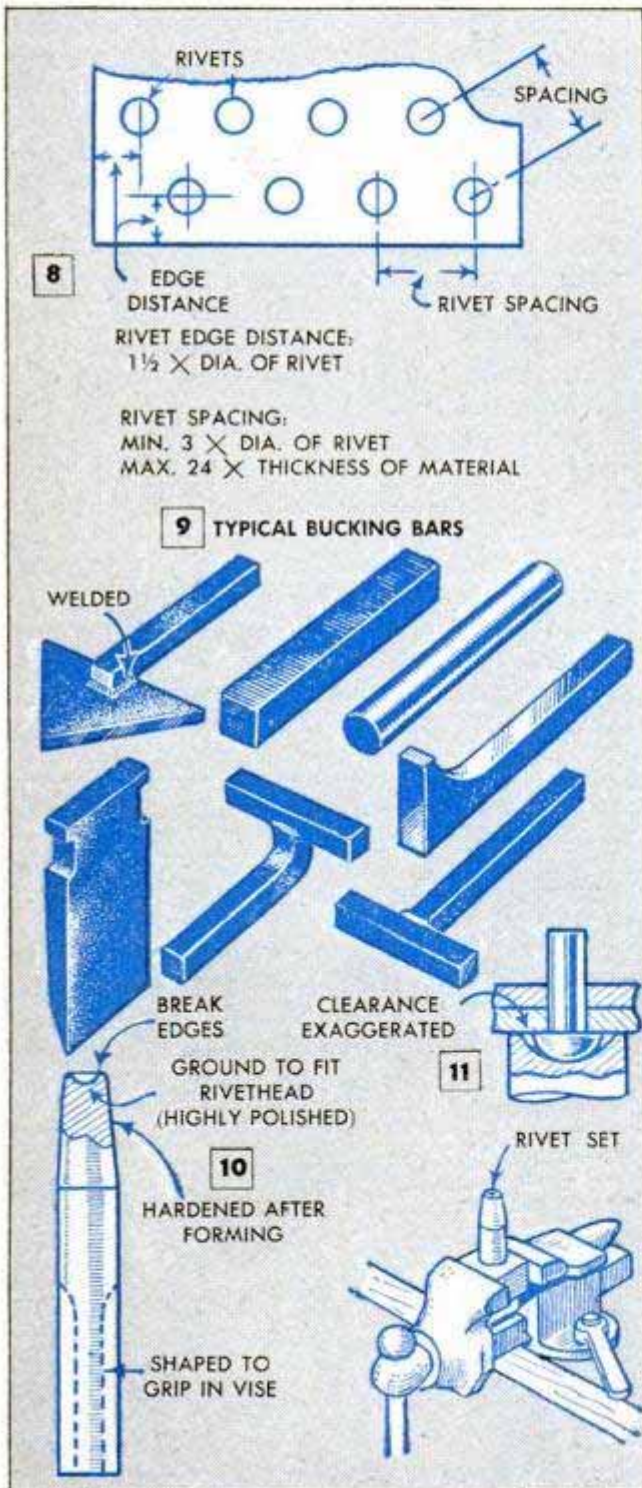
area surrounding the rivet hole. In places where the structural members are a close fit, the flat-headed rivet provides that extra clearance so often needed for bucking with a flat bar. Rivets with countersunk heads are used when the surface of the riveted joint must be flush. It is important to remember that the length of the countersunk-head rivet is measured from the top of the head while in all the others the rivet length is the length of the shank and not the over-all length.

The length of the rivet in relation to the thickness of the work is illustrated in Fig. 3. Approved practice requires that when the head of the rivet is seated, the projection of the shank below the lower, or inside, surface of the metal should be  $1\frac{1}{2}$  times the diameter of the shank before upsetting, as in the right-hand detail, Fig. 3. In ordinary practice the rivet hole is made the same diameter as the rivet shank to give a very light press fit, but in production fabrication some specifications call for





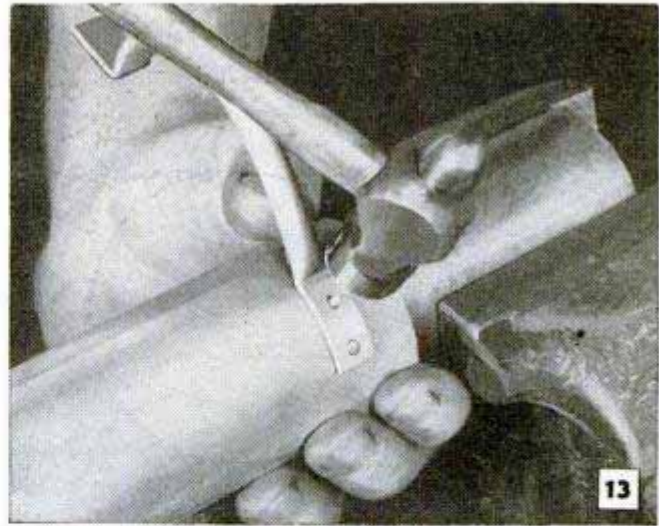
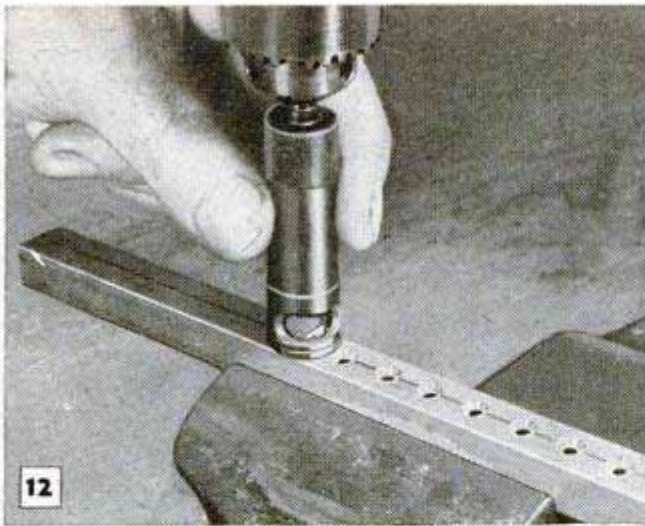
Rivets on dimples are upset in the usual manner. A rivet of the same size can be used as a dimpling die



slight variations. In any case, the hole should be drilled with care to avoid undue burring. Be sure that the drill bit is properly sharpened for drilling aluminum. In breaking the hole through, care should be taken that the drill chuck does not spin against the metal surface and score it. After drilling, all holes are burred. In the small shop, this can be done with a burring tool made from an old square-shanked drill bit fitted into a file handle, Fig. 5. Be especially careful when burring thin metal to avoid depressing the metal around the hole. Good practice demands that, where the joints require a line of rivets, the holes be drilled in a precise pattern as in Fig. 8. Angle of the drill with the work, Fig. 4, should be uniform when drilling a series of holes. Both the lengthwise spacing and the edge spacing should be laid out to exact dimensions. If there are two lines of rivets, the holes are staggered and the lines are accurately spaced.

When riveting guns are used, the shank of the rivet is upset with a bucking bar, or dolly, Fig. 9. In some kinds of work, the bar also is used to bear on the head of the rivet while the shank is upset with a hammer. Bucking bars usually are made up in the shape required. In handwork, using round-headed rivets, the rivet set, or anvil, is used when upsetting. One end of the set is tapered as in Fig. 10 and the end is recessed to a radius slightly greater than that of the rivethead. This is done to give a clearance as in Fig. 11. Break the edges at the recessed end with a light beveling cut while the work is still in the lathe. The straight end of the rivet set can be shaped as in Fig. 10 so that it can be gripped in a vise or fitted in a hole drilled in a steel block as in the right-hand detail, Fig. 10. When using the set, be sure to hold the work square, otherwise the edges of the set may mar the work. Flat-headed and countersunk rivets can be upset neatly on any



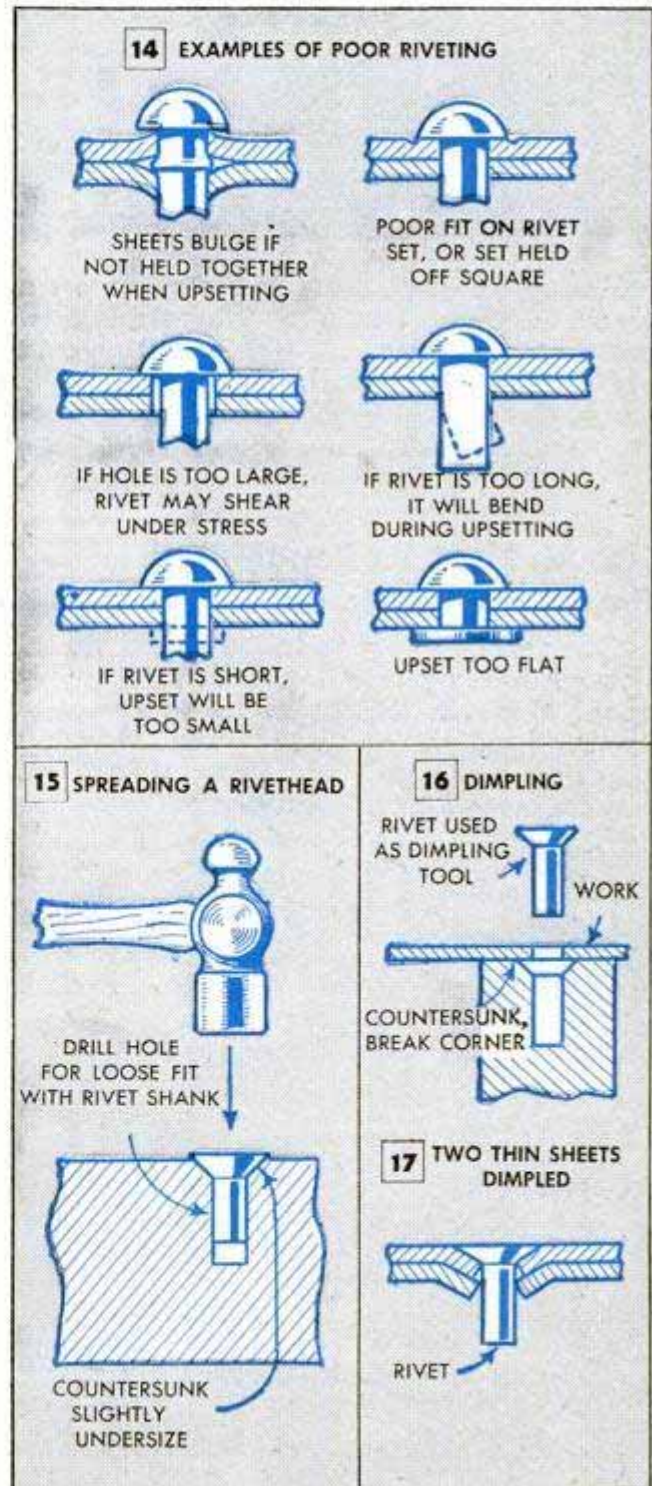


Automatic countersink assures uniform work. Tubing is riveted over a round bucking bar held in the vise

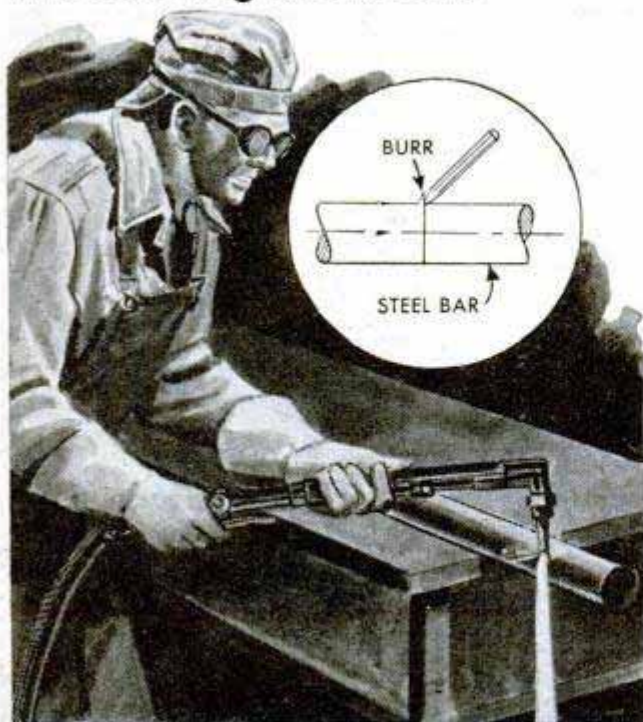
flat metal surface, but to assure that the rivethead will be flush after upsetting, it is necessary that the parts of the work be held tightly together. In order that countersunk rivets shall be perfectly flush when upset, it is necessary that the holes be countersunk to a uniform depth. Fig. 12 shows an automatic countersink in use. It is held in a drill chuck and can be set to countersink with exact uniformity at any average depth. Countersinking by hand will be less uniform of course, but with care it can be done with sufficient accuracy. In handwork, the tendency is to run the countersink too deep. When this happens, drill a hole in a small piece of steel and countersink it slightly undersize. Then spread the rivethead as shown in Fig. 15 so that it will fill the countersink flush when the shank is upset. When using rivets with countersunk heads on thin material where the depth of the head will not permit countersinking the metal, the rivet holes are drilled and then the two thicknesses of metal are dimpled as in Figs. 16 and 17. Make a dimpling bar by drilling a rivet-sized hole in a piece of round steel. Countersink the hole and break the edge, as indicated in Fig. 16, by simply beveling the edge slightly with a large drill bit held in the hand. Then use a rivet as a dimpling die as in Fig. 7. Burr the dimples lightly on one sheet only and when joining the work upset the rivets on the dimples as in Fig. 6.

Fig. 14 pictures the most common faults in riveting thin material. Although any one of these will produce a poor and unsightly job, the most frequent errors are in drilling holes oversize, using too short or too long a rivet and, on round work, Fig. 13, tending to upset the rivet too flat. For better results some riveters round the upset slightly on this type of work.

☞ To loosen a rusted screw, press a hot soldering iron against it for a few minutes.



## Burr Aids Concentrating Heat When Cutting Round Bars

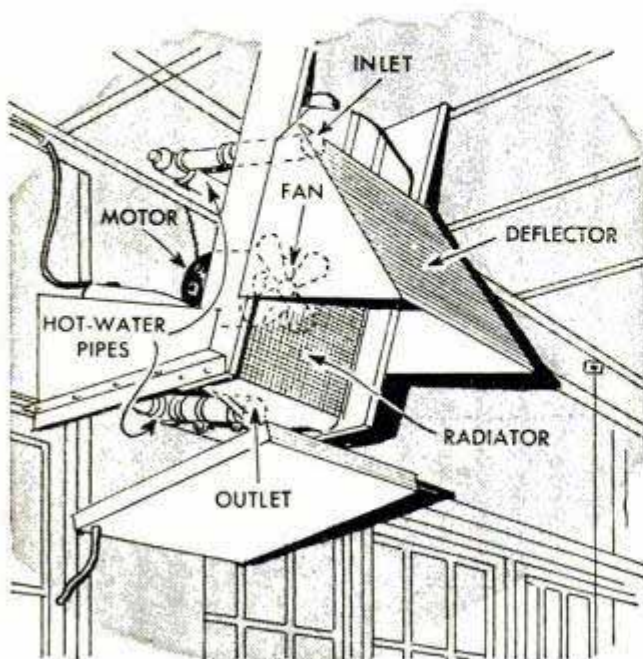


Before cutting round bar stock with a torch, one man speeds the job by raising a small burr at the starting point with a cold chisel. The burr absorbs the heat from the torch, thus reaching the kindling temperature more rapidly than a smooth surface.

Emil Wittmann, Philadelphia, Pa.

## Hot-Air Heat for Repair Stall Provided by Auto Radiator

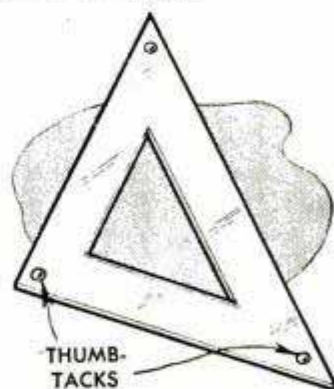
One garage owner installed an individual hot-air heating unit for each stall in his shop. This was done by connecting an auto or truck radiator to the hot-water heating pipes near the stall and using an electric fan to blow air through the radiator. A



sheet-metal deflector directs the warmed air into the repair stall. The filler neck of the radiator is sealed and the unit is connected to the pipes with ordinary hose and clamps.—L. H. Houck, Jefferson City, Mo.

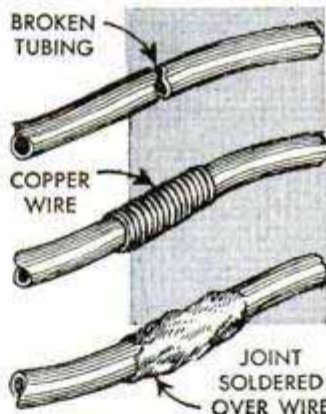
## Thumbtack Feet on Triangle Prevent Smudged Drawings

If you sometimes smudge a pencil drawing when sliding a triangle over it, fit the triangle with thumbtack feet which will raise it above the paper to prevent smudging. The tacks are pushed through the triangle near each corner and the projecting points cut off and filed flush with the surface.



Bill Crowell, Raleigh, N. C.

## Repairing Hydraulic Brake Lines



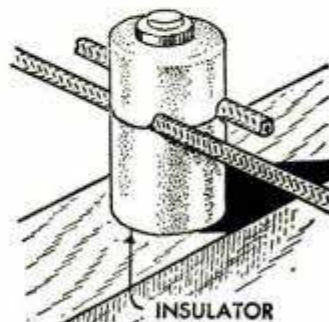
With the nearest garage miles away from my home, I was faced with the problem of a broken hydraulic line in the brake system of my car. I repaired the metal tubing simply by wrapping copper wire around the broken portion and covering

the wire with solder. This mend proved to be more than a temporary repair, as it is still holding after months of use.

Alfred G. Larson, Idaho City, Idaho.

## Using Split-Knob Insulators To Hold One Wire

When split-type insulators are used to carry single electrical wires in a barn or other outbuilding, put a short piece of the same wire in the unused slot of each insulator. The insulator will grip the wire better and there will be less chance of the insulator shattering when nailed in place.—W. H. McClay, Pasadena, Calif.



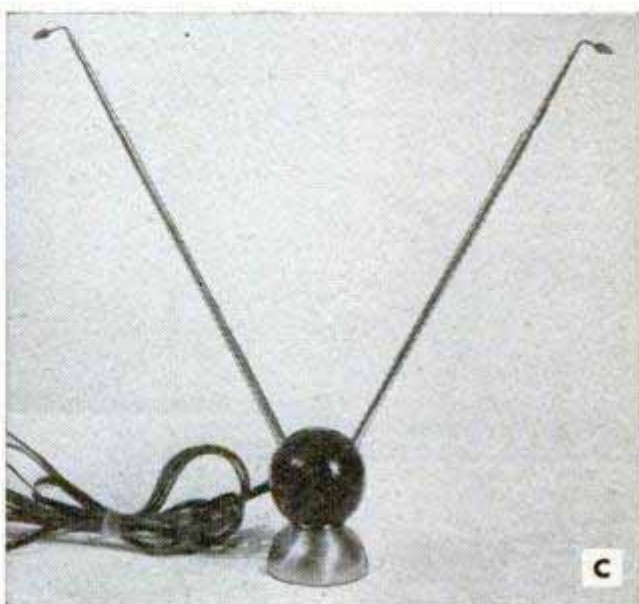
# Radio Television Electronics

## Television Set Is Portable

**T**AKE WITH YOU the very sound and sight of events you want to hear and see. Easy to carry as indicated in sketch B, this portable TV receiver employs a 7-in. electrostatic kinescope tube and the picture area is 26 square inches. It may be used wherever current is available.

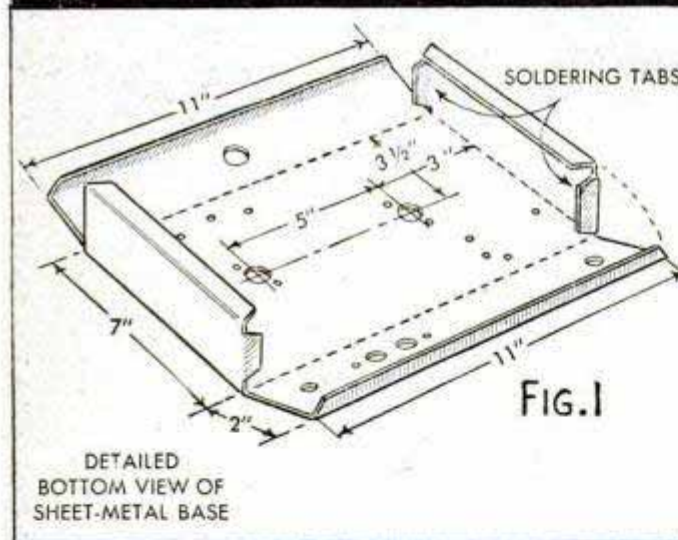
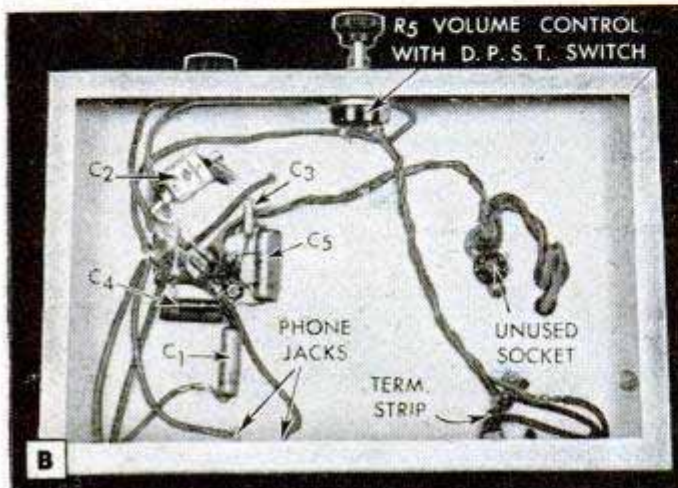
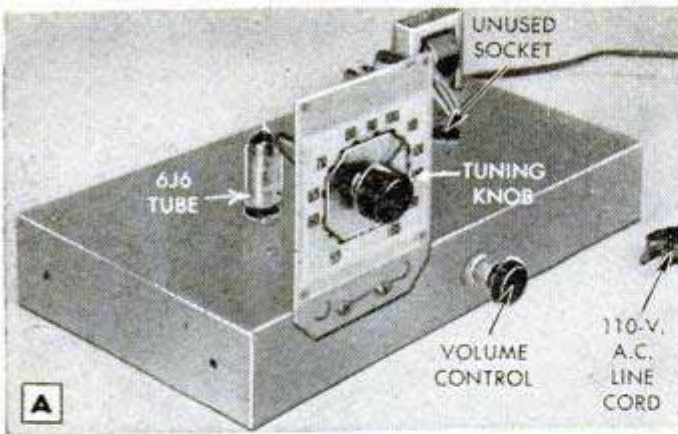
Housed in a luggage-style leather-grain case  $11\frac{1}{2} \times 15\frac{1}{2} \times 17\frac{1}{2}$  in., the set may be placed on any standard-size end table, desk or other convenient spot where the picture will appear at eye level. The off-on-volume, brightness, channel-selector switch and contrast control are on the front of the cabinet as shown in photo A. Focusing, horizontal and vertical controls, used for adjustment at time of installation, are at the rear. Other features include a special safety interlock switch which guards all dangerous shock points.

Covering 12 TV channels, it may be used in any city. The portable antenna shown in photo C is optional equipment to be used wherever a regular TV antenna is not available. It works indoor or outdoors and is adjustable to proper station direction. Two telescoping extensions are employed for tuning to various TV channels.



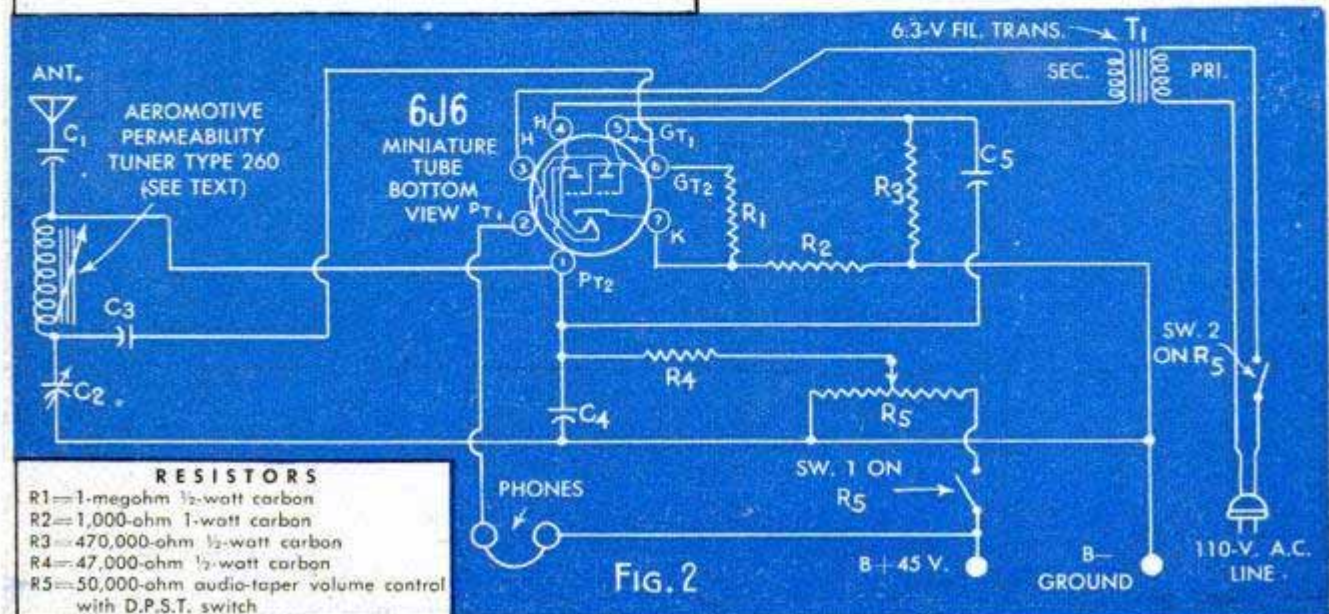
# 1949 Low-Cost Progressive

By S. A. Johnson



ONE MINIATURE dual-purpose tube does the work of two in this new progressive broadcast-band receiver which is especially designed for beginners and experimenters. All parts have been carefully selected for economy and simplicity of construction without sacrificing performance and with a view to adding another tube and a few extra parts at a later date to make an excellent 2-tube loudspeaker set that will operate on any 110-volt a.c. power line without using a B-battery. The same 6.3-volt 3-amp. filament-supply transformer and all other original parts will be employed except the switch on volume control, R5, which will be changed to a single-pole, single-throw type. Therefore, when buying the volume control, R5, select one that can be used with an attachable switch. Like its predecessors in the student progressive series, this set is complete in itself and should be carefully built and used by the beginner for some time until he is thoroughly familiar with its operation before starting unit No. 2 which will appear in the April issue.

Designed around an Aeromotive type-260 regenerative permeability tuner which provides an effective tuning arrangement that has few parts, it covers a tuning range from 540 to 1600 kc. This tuner is listed in the 1949 radio-parts house catalogs for \$1.44 and is complete with dial, coil and tuning knob. No single-gang, variable-tuning condenser is required. Before starting construction, study the diagrams carefully and note how the various parts are



- RESISTORS**
- R1=1-megohm 1/2-watt carbon
  - R2=1,000-ohm 1-watt carbon
  - R3=470,000-ohm 1/2-watt carbon
  - R4=47,000-ohm 1/2-watt carbon
  - R5=50,000-ohm audio-taper volume control with D.P.S.T. switch

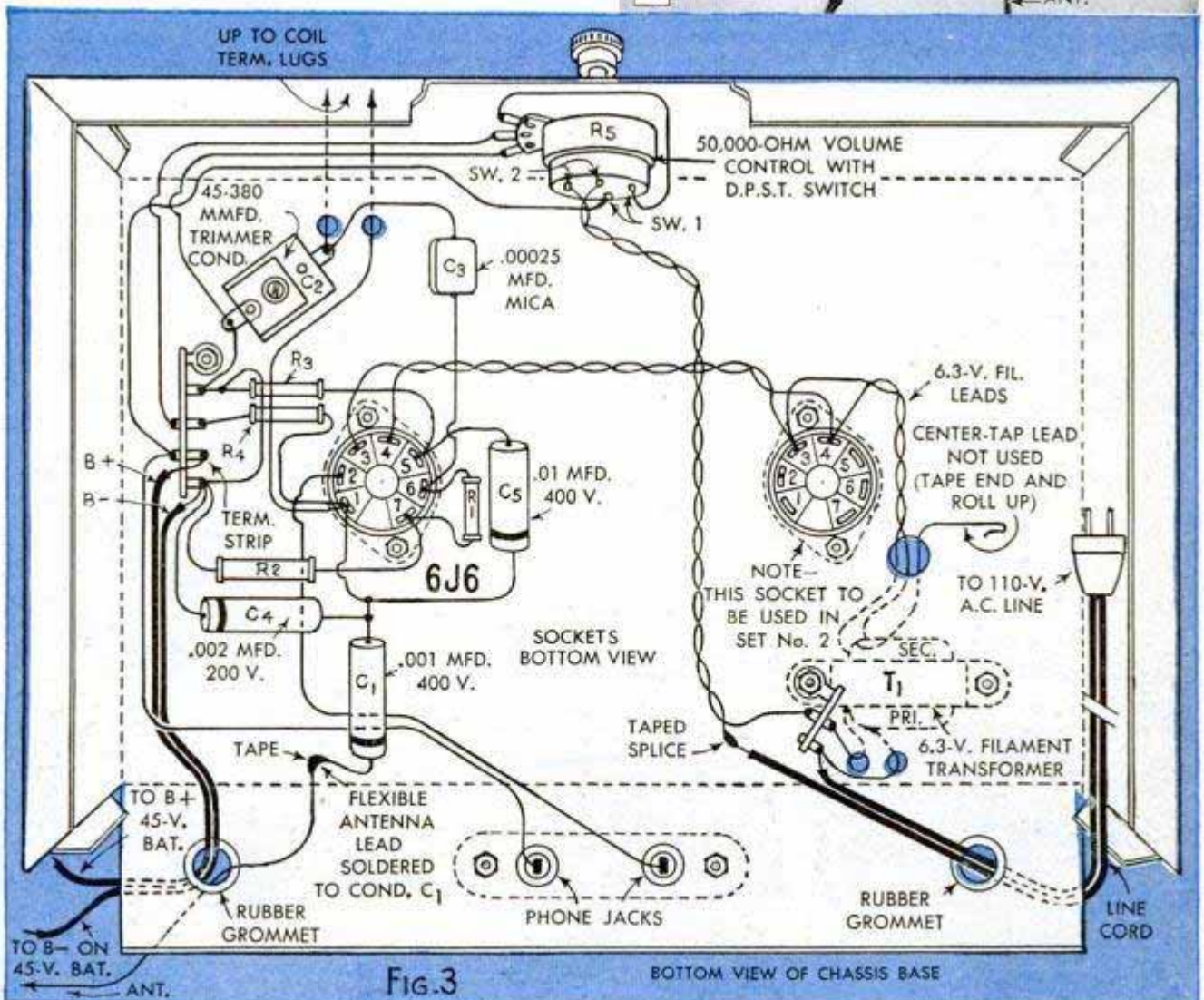
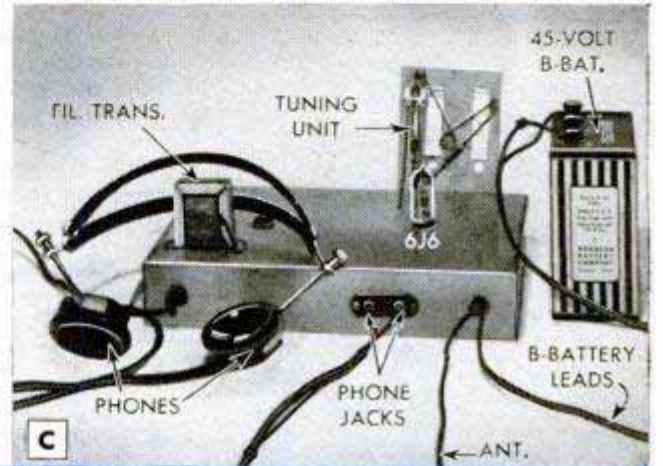
FIG. 2

# Broadcast Set . . . Unit No. 1

mounted in photos A, B, C and D. The sheet-metal chassis base detailed in Fig. 1 is a standard type and size available from most radio-parts supply houses; the builder may omit the tabs and turned-over edges if he forms his own. Drill the necessary holes in the positions indicated in the diagram, Fig. 1; the holes for the miniature tube sockets have  $\frac{5}{8}$ -in. diameters. These holes may be made with a smaller drill and enlarged to size with a tapered reamer.

Mount the various parts using short machine screws and nuts; there is plenty of room on the chassis and you will note that this set includes the socket for a second tube which is to be added in unit No. 2 of this series at a later date. Having the socket already mounted simplifies wiring the second set. Wiring is easy providing you are careful to make good soldered joints and are sure that every connection is exactly as shown in the diagrams, Figs. 2 and 3. It is good practice for the beginner to mark off each lead on the pictorial wiring diagram, Fig. 3, as the wiring progresses. This is usually done with a colored pencil.

(Continued to page 230)



# RADIO AND ELECTRONICS TODAY



(A) Custom-built television receiver designed for decorators' in-the-wall use, shows a 520-square-inch picture claimed to be about 10 times the size of the most common television sets on the market today

(B) Front panel removed from the in-the-wall TV-set installation (A) shows the projection-type receiver, power-supply unit and speaker on separate shelves

(C) Portable, indoor, television-receiver antenna consists of a tubular-metal dipole with adjustable disks. It is claimed to be effective for local TV stations

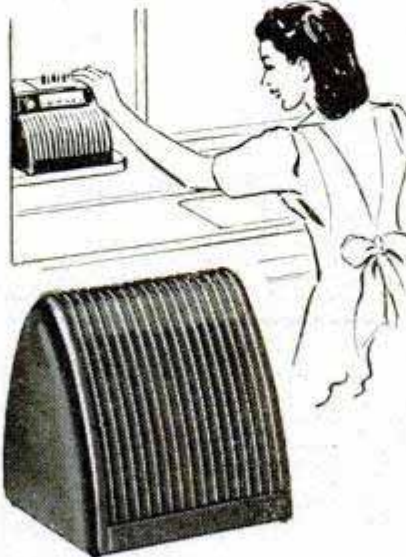
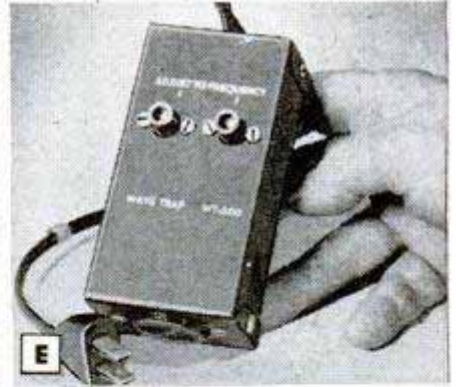
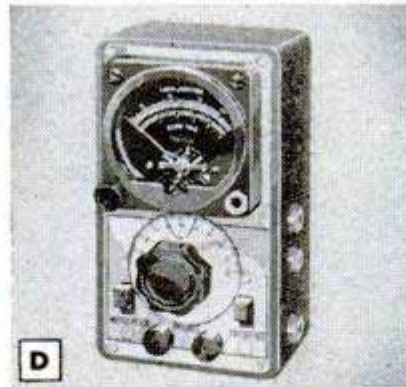
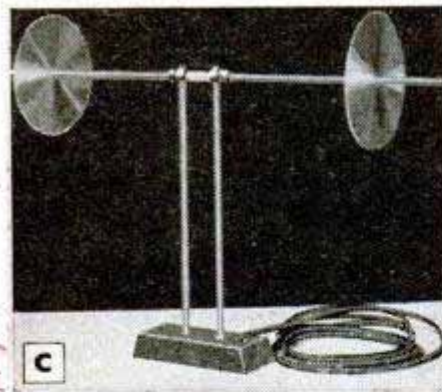


(D) Pocket-size wavemeter and modulation indicator enables amateur, ship and police radio operators to monitor quality of transmission, plot field patterns, and keep a constant check on modulation limits

(E) Wave trap designed to eliminate interference when caused by amateur radio transmissions received through a.c. power line. It can be used in connection with any standard TV, AM or FM receiver

(F) Combination radio receiver and inter-call system for the home or office. It may be employed as a regular broadcast receiver and the same program may be channeled to the extension unit in another room. Can also be used for instant two-way communication between rooms by merely pushing a button. Employs four quick-heating tubes

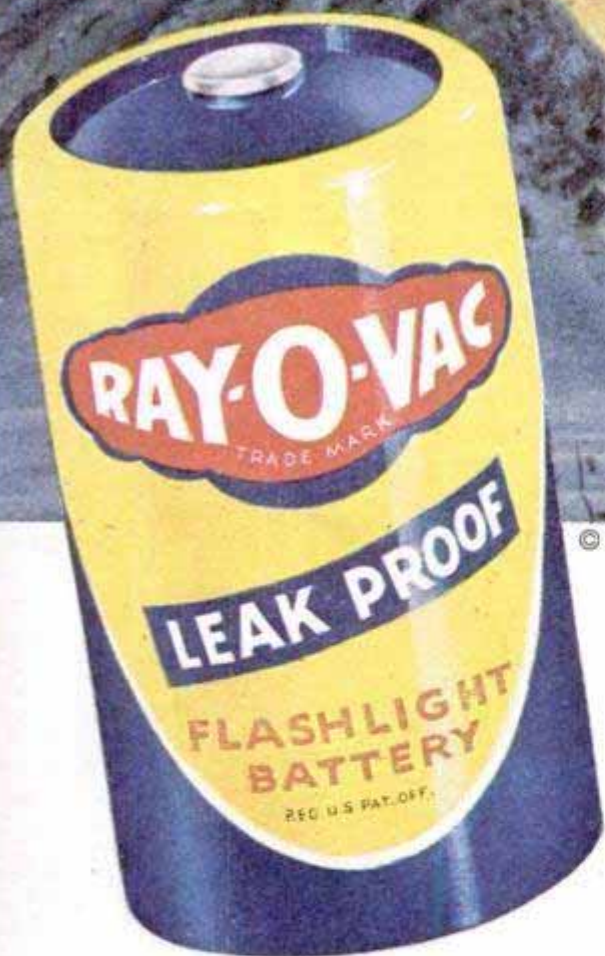
(G) Hand-type hearing aid developed for persons whose hearing loss is slight and who will benefit by an improvement in hearing ability under certain conditions where the sound level is below the ordinary conversation level. Very compact, it has finger-tip control and includes microphone, receiver and power pack. It weighs 8½ oz.



NOW... LIGHT  
WHEN YOU NEED IT!

Ray-O-Vac leak proof batteries  
stay fresh for years!

(because they're sealed in steel)



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blown up nearly 5 times**

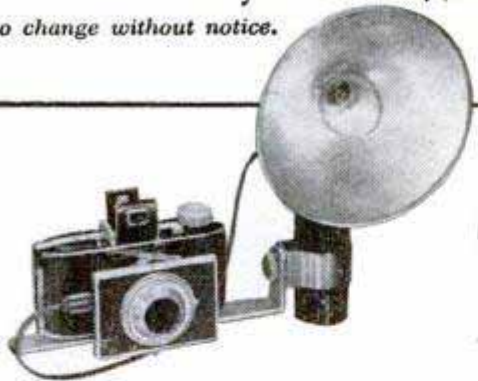


Introducing  
the

## **Kodaslide Table Viewer**

Good news for 35mm. and Bantam slide fans: For quick shows with 2 x 2-inch slides, small-group viewing, initial review and editing, it's the new Kodaslide Table Viewer. Ask your Kodak dealer for a demonstration and see for yourself. Price, \$95.

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**FAST**—*f/4.5 Lumenized lens makes sparkling color pictures . . . salon black-and-whites.*

**TRIM**—Fits pocket or handbag . . . weighs only 13 ounces.

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**EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.**

## **ENTIRELY NEW TYPE rear-projection screen shows brilliant image even in fully lighted room**

The 7½ x 7½-inch rear-projection screen, backed by the Kodak Ektalite Field Lens, both radically new, gives you even, over-all brilliance, detail, and freedom from distortion never before approached with a viewer.

Fine optical system includes *Lumenized* Kodak Projection Ektanon Lens *f/3.5*; 75-watt lamp; heat-absorbing glass; two *Lumenized* condensers; three front-surfaced projection mirrors.

Built-in slide changer takes up to 75 cardboard slides; also takes glass slides. Changer automatically switches on lamp when each slide is inserted, turns it off as slide is withdrawn.

Efficient cooling system (by convection) protects slides in Viewer.

The body is of die-cast aluminum, finished in buff and brown. Viewer uses AC or DC current; has eight-foot cord.

## **MIGHTY MIDGET—Kodak Flash Bantam f/4.5 Camera**

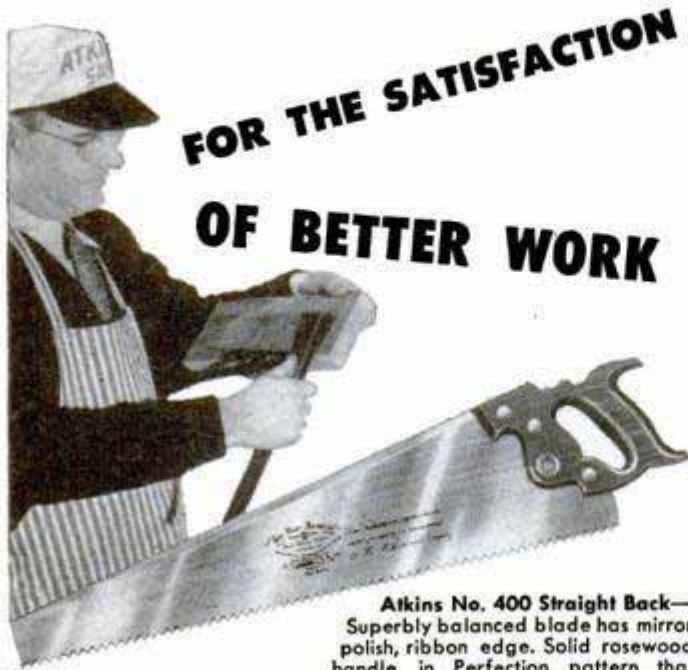
**ECONOMICAL**—8 exposures on black-and-white Kodak Films or full-color Kodachrome Film.

**SYNCHRONIZED**—Makes flash exposures up to 1/100 . . . straight shots up to 1/200.

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**FOR THE SATISFACTION  
OF BETTER WORK**

**Atkins No. 400 Straight Back**—Superbly balanced blade has mirror polish, ribbon edge. Solid rosewood handle in Perfection pattern that prevents wrist strain. Segment ground 5 gauges for easy clearance. Carefully hardened and tempered. Filed and set ready for use. Ship point pattern.

It's easier to achieve the fine workmanship that doubles the pleasure you get from your home workshop if you use Atkins Saws. Atkins have the balance and design that make them handle better—the extra keenness that means faster, cleaner cutting. Because they are made of "Silver Steel"—Atkins' special saw steel that takes a keener edge and holds it longer—it takes fewer sharpenings to keep an Atkins cutting smoothly for longer periods. There's an Atkins for every workshop need. To get the most in sawing satisfaction, get Atkins.

## 4 FAVORITES FROM THE COMPLETE ATKINS LINE

**No. 65 Straight Back**—Fine quality suited to general carpentry. Segment ground, Damascus polish blade, filed and set for use. Carved apple handle. Ship pattern.



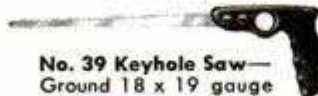
**No. 2000 Straight Back**—Light but stiff tempered blade, segment ground, polished and etched. New "Perfect-Grip" apple handle is close to blade for easy handling. Ship pattern.



**No. 37 Compass Saw**—17 x 18 gauge hardened, tempered and polished. 8 points per in. Filed and set. Plastic handle.



**No. 39 Keyhole Saw**—Ground 18 x 19 gauge for easy clearance with minimum set. 10 points per inch. Uniform temper. Filed and set. Plastic handle.

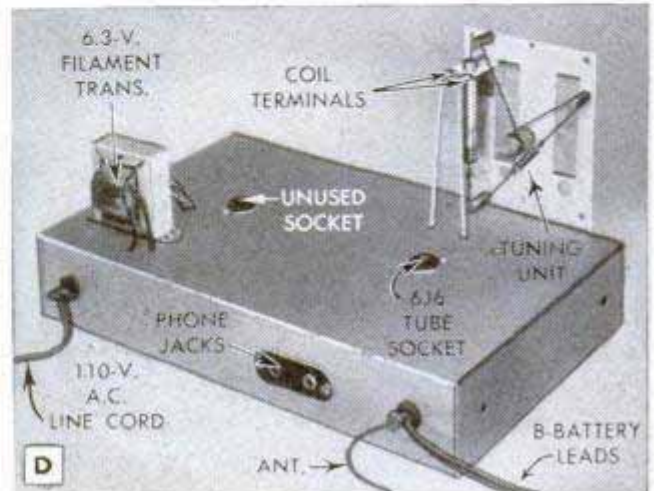


Buy at your Local Hardware Retailer  
**E. C. ATKINS AND COMPANY**  
INDIANAPOLIS 9, INDIANA

## 1949 Low-Cost Progressive Broadcast Set Unit No. 1

(Continued from page 227)

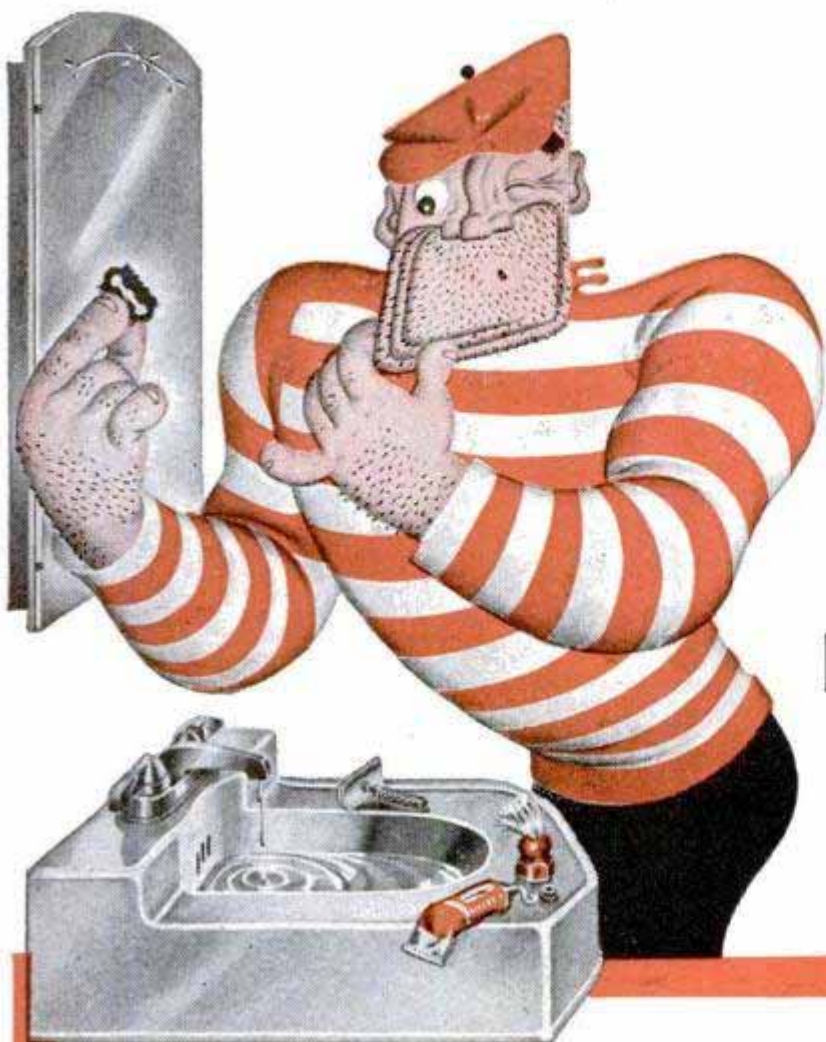
In this way, the builder does not miss any connection. Also check each lead with the schematic circuit diagram, Fig. 2. After the wiring has been completed, plug the power cord into an a.c. wall outlet and turn the set on; the tube should now light up. Next, connect the 45-volt B-battery and plug in the headphones. As the headphones are



plugged in, you should hear a loud "click" in the phones. Now connect the antenna to the wire leading from condenser C1 at the point indicated in the pictorial wiring diagram, Fig. 3. The type of antenna will depend upon the location. In the city, where there are several powerful broadcasting stations, a short indoor antenna is recommended as it will give the best selectivity. For more distant stations, a longer outdoor antenna will give better pickup. The ideal antenna is the one which gives greatest signal strength without causing the stations to overlap on the dial.

If the set is operating correctly, you will hear a high-pitched whistle as the station is tuned in. "Backing off" on the volume control stops the whistle. Once you have tuned in a station which you can identify and for which you know the frequency, set the dial pointer to that frequency. Then adjust trimmer condenser C2, under base, with a small screwdriver so that the pointer will always indicate that station. Do not turn pointer past scale limits. For example: If the station has a frequency of 900 kilocycles, it should come in at approximately 900 on the dial. Detailed student material list R-373 for this one-tube progressive set unit No. 1 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

(See page 232 for Television Antenna Booster)



## Piston Rings need replacing, too!

**OIL-PUMPING** in your car warns that you need new piston rings. It's the *first* sign of worn-out rings and the danger signal of undue engine wear.

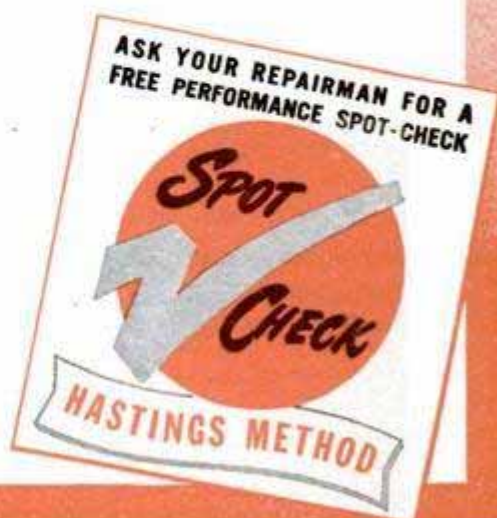
Fortunately, rings are *replacement* parts. And when you replace with Hastings Steel-Vent piston rings, you *stop* oil pumping, *check* cylinder wear and *restore* performance. It's the best money you can spend on your car. Hastings Manufacturing Company, Hastings, Michigan, Hastings Ltd., Toronto.

# HASTINGS

**STEEL-VENT PISTON RINGS**

**"TOUGH... BUT OH SO GENTLE"**

**TOUGH** on Oil-Pumping  
**GENTLE** on Cylinder Walls



# Speed Sweep

**+ Arbitrin**



Speed Sweep, the brush with the steel back, is designed to sweep cleaner, faster, easier, and to outlast ordinary brushes 3 to 1. Arbitrin sweeping fluid, sprayed on the floor before sweeping, disinfects, deodorizes, and removes stains in the process of sweeping. These, plus many more advantages (16 in all) have proved to be the perfect answer to effective, low cost floor sanitation in over 60,000 factories, offices, schools, and stores. Mail coupon for complete facts. *Milwaukee Dustless Brush Co., 530 N. 22nd St., Milwaukee 3, Wis.*

**Milwaukee Dustless Brush Co.**  
530 North 22nd St • Milwaukee 3, Wis.

We are interested in complete information about Speed Sweep brushes and Arbitrin sweeping fluid.

Name .....

Address .....

City ..... Zone ..... State .....

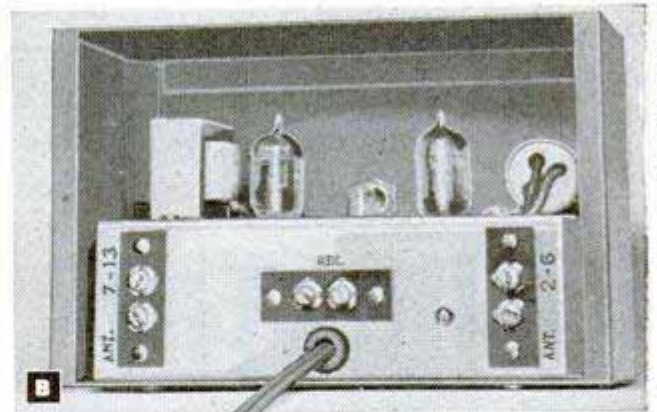
## Television Antenna Booster

Increasing antenna gain to give a steadier and clearer picture, this antenna booster may be used with any television receiver. The unit is merely placed near the TV receiver and is connected in series with the antenna lead. It is claimed to make possible the use of indoor antennas in



many installations and to reduce inter-channel interference and interference from short-wave, FM and AM stations.

Among other features, it provides a means for using several television receivers on one antenna system. It has a self-contained power supply and is simple to connect and easy to use. The brown-finished cabinet is made of aluminum and the unit is available in two types; one operates on channels 2 to 6 inclusive and sells for \$24.95 and the other is a slightly larger unit which sells for \$29.95. This



number TAB-98 unit employs two tubes, operates on all channels and has two antenna inputs. This feature eliminates the necessity of disconnecting the antenna when changing from low to high channels. Back and front views of this model are shown in photos A and B. Booster devices of this description are a valuable aid to good TV reception in fringe areas remote from broadcasting stations.

**Steady  
work . . .**

**big money  
with  
American**

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Now's the time to step out of the "hourly wage class"—and make **BIG PAY EVERY DAY** in a business all your own! Here's how—start a floor surfacing business with an American! Hundreds of men are doing this and making \$35 to \$50 a day—you, too, can make big money!

There's plenty of floor surfacing work all the year 'round in today's booming building industry. Pleasant, indoor work . . . sand both new and old floors. Easy to operate an American Sander—no big overhead—no large investment—no special schooling. Decide now that you want to get ahead and be your own boss!

Send for "money-making" booklet entitled "Opportunities in Floor Surfacing"—use coupon and enclose 25c in coin or stamps to cover handling.



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FLOOR MACHINES

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## Your Feet Go Fishing Too

(Continued from page 95)

a drawstring which closes the top tightly under the armpits. These are now being made of lightweight, thoroughly waterproof fabric and with comfortable boot feet, replacing the older type "stocking foot" wader with which a heavy brogue was worn.

The soles of these waders should be of heavy felt, sewn and cemented to the boot feet. This material provides a good grip on boulders and logs, but may slip on those covered with mud or moss. The experienced wader carries a pair of strap-on chains for use when needed. In very slippery going, such as over log jams and windfalls along heavily wooded streams, the steel-calked logger's boot is safest of all and, under these conditions, the angler who is determined to wade will wear them and choose wet feet rather than risk a serious fall.

### FOOTGEAR WHEN AFLOAT

For canoe work, where soft and flexible soles are required, nothing excels the low moccasin. The modern type with rubber sole is perhaps best, insuring dry feet when stepping ashore on sand bars. Almost as suitable are the all-purpose pacs or rubber moccasins, although these, with their thicker soles, are not so comfortable when one kneels at the paddle. Their advantage, of course, is that they are also suitable for walking and portaging.

For lake and ocean fishing boats, you have the choice of the basketball shoe, ideal on a wet deck because it will not slip, and the rubber half-boot with its nonskid, corrugated sole. It is especially good in rough weather when the waves sweep across the deck, perhaps up to your ankles.

### CAMP WEAR

The moccasin seems to come first when camp comfort is desired. Again, the modern type with rubber sole is best, for usually, somewhere close by, the ground will be damp. The rubber half-boot is also good and it is comfortable. It, like the leather half-boot, protects the ankles when the mosquitoes and other biting insects are abroad if the trousers are tucked inside.

There is always the correct footgear for your purpose and its choice is a matter for serious consideration. So choose it carefully. Buy those shoes or boots plenty large and try them out at home, with the proper socks, before you start out on that long-planned trip.

# Here At Last

## A Complete Electrode Service for Better, Easier, Faster Welding

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8 types of electrodes—fill every  
shop welding need**



These industrial and commercial arc-welding jobs are easier to do and cost less when you use P & H Welding Electrodes:

- All types of industrial welding
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- Automotive repairs { blocks fenders frames
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- Contractors' welding
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- Construction equipment repairs { excavators tractors graders ditches, etc.
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- Fabricated housing
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**Eight famous P & H industrial electrodes now conveniently packaged for automotive, general repair, job welding, and machine shops; foundries; schools; etc.**

You save welding time and do better work, when you always have the right electrode for the job.

P & H Shop Packs consist of eight different packages of electrodes. Detailed instructions are printed on each individual package so that you can use the right electrode for every job.

Guesswork is eliminated. Welds are stronger, better looking. Welding time is greatly reduced.

And you can weld anything made of steel, alloy or stainless steel, sheet metal, cast iron. You can also put hard, protective, long-life surfaces on new parts, or build up worn parts better than new. P & H Shop Pack electrodes let you do a wider variety of work — at lower cost.

#### Attractive Price

The cost of all 8 Shop Packs, individually packaged and labeled for your convenience, is only \$11.75.

#### Simplifies Inventory

The use of individual packages means that you only have to reorder the types you need — at little cost. Maintaining a complete range is easy. You can always handle any job that comes up.

#### Can be used on any type of welder

It pays to use P & H packaged electrodes. No matter what make of welder you have, no matter whether you use AC or DC current, order P & H Shop Packs today from your nearby P & H distributor.

#### Reduces Welding Costs

Purchase P & H Shop Pack electrodes (\$11.75). Check their speed, quality, easy manipulation, and wide variety of uses. This small investment paves the way to lower

welding costs. You will want to standardize on these efficient weld rods.

As a further aid to reducing costs, we suggest that you investigate the new P & H AC Arc Welder. This is the only welder with easy-to-use Dial-lectric control. It has no moving parts and needs no maintenance.

Connectible to 220 or 440 volt current, the P & H Dial-lectric machine requires only 2 1/4 feet of floor space. Built-in remote control; easy, quick-start arc; high-low welding range; elimination of arc blow; and the simple radio-like knob that provides complete welding range from 20 to 275 amps with a 3/4 turn — all these features make for better, faster welding.

Contact your nearby P & H distributor for complete details about America's most complete welding service, or mail the coupon below, clipped to your business letterhead.



Manufacturers of  
America's Most Complete Welding Service

**TEAR OUT COUPON, ATTACH TO YOUR BUSINESS LETTERHEAD, AND MAIL TODAY**

**HARNISCHFEGER CORPORATION**

4673 W. National Avenue, Milwaukee 14, Wisconsin

Yes, I'm interested in Shop Packs, P & H's complete electrode service, and the new P & H AC Arc Welder with revolutionary Dial-lectric control. I would like information on the items that I have checked below:

- P & H AC Welders
- Send address of distributor
- P & H Shop Pack Electrodes
- Send representative
- Send Free Book, "Simplified Welding."

Name.....

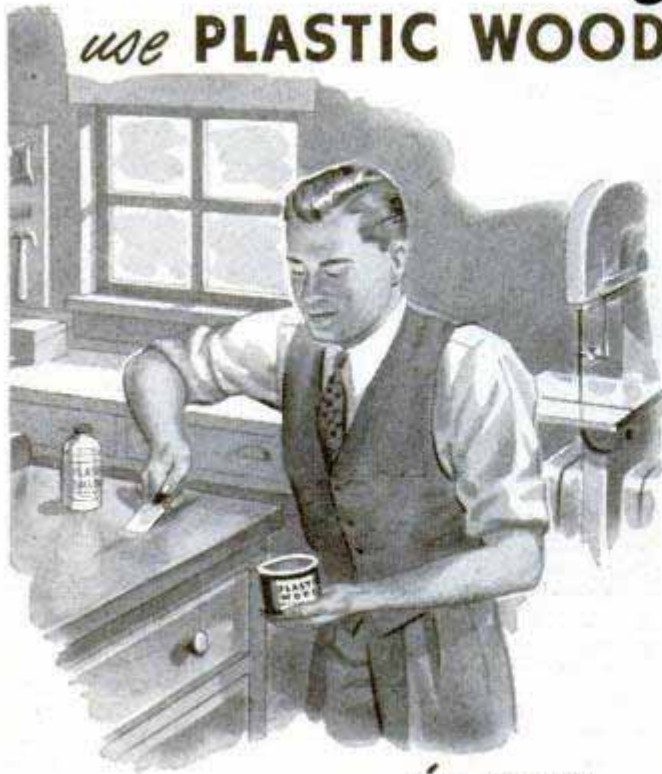
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If you'd like a satiny smooth, professional finish on your next cabinet job—use Plastic Wood! It's an ideal filler for cracks or rough grains, dries tight and hard, sands to a swell finish and takes paint, lacquer or varnish perfectly. Here's an extra hint—knot holes or gouges just disappear when this handiest filler is used! *Handles like putty—hardens into wood!*

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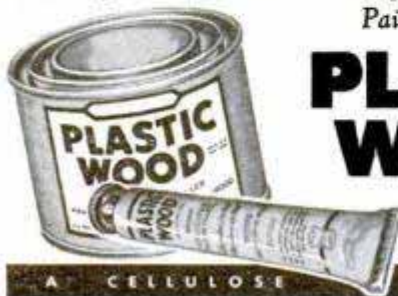
**FOR REPAIRING . . .**

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- You'll want Plastic Wood SOLVENT, too. Get both at one time. It is made especially to control the consistency of Plastic Wood . . . useful also in removing dried Plastic Wood from tools and fingers.

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**Paint Peels From Porch Steps**

*Q—My front-porch steps are of the older type with wooden treads, risers and stringers. The space under the steps is enclosed. Paint simply will not stay on the treads or risers. It blisters and then peels back to the bare wood repeatedly. Why won't the paint stick to the wood?*

*P.T.—Oklahoma City, Okla.*

A—Perhaps the most common cause of paint blistering and then peeling as you describe is due to moisture penetrating the wood from the back, or unpainted side, and loosening the bond of the paint film. Due to the probable lack of ventilation under your porch steps, the unprotected side of the treads and risers absorbs an undue amount of moisture which works through the wood to the paint. One remedy which has been successfully used is to remove the treads and risers, dry them thoroughly and then prime and paint the back sides and edges. On your particular type of steps it also might help to cut an opening in both enclosed ends so that air can circulate more freely.



**Removal of Overroofing**

*Q—My house has been reroofed twice over an original roof of wooden shingles. The wooden shingles are badly rotted at the eaves. The slate surfacing is worn off in places. Should I reroof the top roof, or put on a new roof?*

*H.A.—Baltimore, Md.*

A—It would seem from your description that the whole roof is in rather bad condition. Just what you can best do depends to some extent on whether the roof boards are spaced or are laid edge to edge. If the boards are laid edge to edge, then probably the best recommendation is to remove everything down to the boards and lay a new roof. On the other hand, if the boards are spaced (a regular practice some years ago when wood-shingle roofs were more common), you have the choice of laying a new roof of wooden shingles or of filling the spaces between the original roof boards with narrow strips and then laying a roof of composition shingles.

**Possible Danger From Chimney Fire**

*Q—The chimney in my home is about 30 ft. high and is built in the center of the house. The chimney is quite old, unlined of course, and must be*

(Continued to page 238)





When your Ford needs a new part, make sure it's a Genuine Ford Part, an identical twin to the part built into your Ford at the factory. That saves you time and money and adds many extra years to your Ford's life.

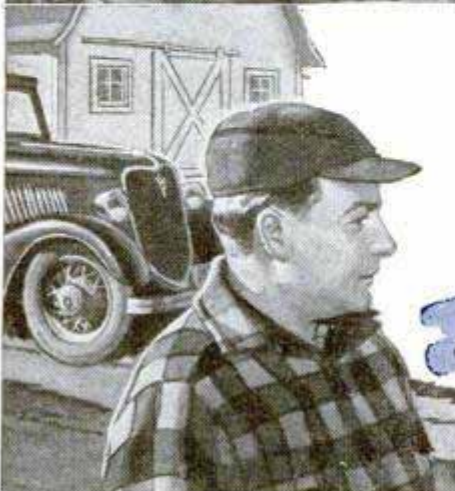


*Made right*

Ford engineers know the vibration of an "off balance" clutch can cause serious engine trouble. That's why the clutch disc being made (at left) is carefully designed for perfect balance.

*Fit right*

When clutch discs are completed, some go to the production line, some to Genuine Ford Parts stocks as replacement parts. They're identical twins to the parts built into your Ford.



*Last longer!*

"I've driven Fords for 21 years now," says Mr. Ed Robinson of Wilton, Conn., "and there's no substitute for *real* Ford parts. I've found it pays to look for that Genuine Ford Parts sign." (At all Ford Dealers and selected independent garages.)

# BUILD IT, FIX IT

WITH

## AMBROID

"IT STAYS STUCK!"



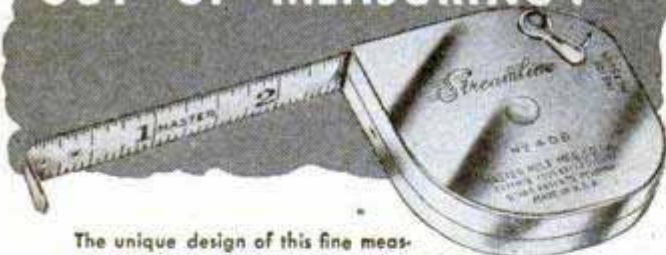
For a quick job with permanent results use multi purpose, fast drying Ambroid liquid cement. For home workshop, household or factory. A quality leader for 39 years. Ready-to-use Ambroid is waterproof, transparent, quick drying, extra strong, flexible, heat and corrosion resistant. For assembling, repairing or mending jobs, keep Ambroid handy. At your dealer's or send 25c for a big 2 oz. tube postpaid. Money back guarantee.

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Engrave my name (75c extra). Please print clearly.

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CITY..... STATE.....

rather badly clogged with soot. As the house is in the country I am afraid of a chimney fire during the winter months. I once had an experience with such a fire and want no more of it. How can I clean this tall chimney so as to minimize the danger or eliminate it entirely? G.H.—Minot, N.D.

A—If the house is in the open, exposed to high winds, the draft in the flue probably is very strong and if the chimney is straight it seems unlikely that it would be badly coated with soot. Recently, there was described in this column a method of cleaning a chimney by means of a length of chain lowered into the flue from the top. The method is quite effective in loosening excess soot which will drop to the bottom of the flue where it can be removed through the cleanout. In addition, a small shovelful of ordinary granulated rock salt thrown on a hot fire at intervals will help to remove ordinary accumulations of soot from the furnace and flue. Regular use of the salt in this manner will prevent the formation of heavy soot deposits. Prepared soot removers are even more effective. In tall chimneys having a strong draft it is important that the fire door, ash door and the lower damper and cleanout door on the stove or furnace seat tightly when closed. If the doors are loose or close improperly, the fire will be difficult to control with the regular check draft or turn damper, especially on days or nights when high winds are blowing.

### Leaf Disposal

Q—My home is in a wooded subdivision and disposal of the leaves is a problem. Due to the variety of trees on and near my property the work of raking and burning lasts well into the winter months. Isn't there some simpler and quicker way to get rid of leaves?

B.S.—Louisville, Ky.



A—The ashes from burned leaves of the common kinds of deciduous trees have some value as a fertilizer for certain plants and shrubs. Instead of burning the leaves each season, many owners of large wooded grounds either compost the leaves or dispose of them with leaf-shredding attachments available for some types of the larger power lawn mowers. These machines pick up the leaves, shred or pulverize them and drop the particles back on the ground in a thin, uniform covering. Those homeowners who prefer to compost leaves use the residues thus produced as a mulch for evergreens and certain shrubs, or as a top dressing for flower beds used for growing flowering plants which thrive in acid soils.

### Fence to Drift Snow Over Garden

Q—I'm told that a low fence erected on the side of the garden plot from which winter winds blow will cause snow to drift over the plot, which will be beneficial. Is this true? And can I build a fence near a strawberry bed?

M.B.—Madison, Wis.

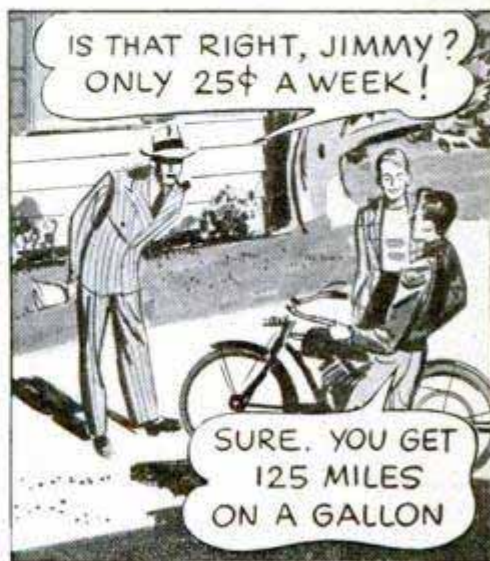


A—It's true that a board or picket fence placed as you suggest will cause snow to drift over the garden plot if the plot is in the open where the prevailing winds sweep across it. The only direct benefit from the drifted snow is derived from the moisture which seeps slowly into the soil when the drift melts away in the spring. Also, under certain conditions, this additional moisture may tend to stimulate the activity of nitrifying bacteria and thus increase the available nitrates in the topsoil. The drift also will prevent the blowing of dry soil during the winter months. Drifting snow over a strawberry bed by means of a fence could, perhaps, be recommended for the same reasons, but it is advisable to mulch the bed after the ground freezes with coarse straw or other material. The mulch should be removed from the plants in the spring.

LOOK, DAD. IT ONLY COSTS JIMMY \$10 A YEAR TO RUN HIS WHIZZER!



IS THAT RIGHT, JIMMY? ONLY 25¢ A WEEK!



SURE. YOU GET 125 MILES ON A GALLON

SAY, THAT'S A GOOD IDEA FOR RUNNING ERRANDS AND TRAVELING TO SCHOOL



A BIKE'S MORE FUN, TOO, WITH WHIZZER DOING THE WORK. YOU REALLY GO PLACES

YOU DON'T HAVE TO BUY ME A NEW BIKE EITHER, DAD



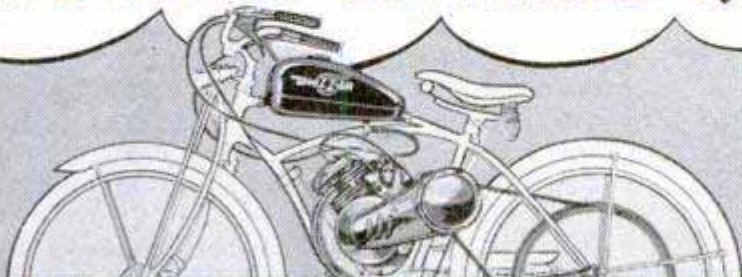
THAT'S RIGHT, MR HOLMES. A WHIZZER CAN BE PUT RIGHT ON BILL'S BALLOON TIRE BIKE

FOR FUN!

FOR THRIFT!

FOR WORK!

IT'S WISE TO GO WHIZZER!



COMPLETE WITH ALL NECESSARY ATTACHMENTS

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Federal Tax Included. F. O. B. Pontiac, Mich.

Twist-Grip Controls

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2½ h.p. up to 35 m.p.h.

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**Act Now!**

Amazingly simple to install and operate. Just hook up terminals of two or more phones to any two-strand wire and you are ready to talk! Powered by standard flashlight batteries. **HUNDREDS OF USES** for quick, low-cost, dependable 2-way communication around **HOME, SHOP, FARM, INDUSTRY**. Each phone complete with self-contained hand-operated ringer. Every phone checked for perfect operation and fully guaranteed.

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USED—good, serviceable condition .....	\$ 7.45	Special <b>\$13.40</b>
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RECONDITIONED—(By U. S. Signal Corps).....	10.75	Special <b>20.00</b>
LIKE NEW, Slightly used .....	12.95	Special <b>24.40</b>

### ARMY FIELD TELEPHONE WIRE

Weatherproof, Durable. 2-conductor, twisted, 3 copper and 4 steel strands, tinned, insulated. **On Original Steel Reels.**



**W-110B.** Unused, new, but stored in open. Half-mile reels (2500 to 2750 feet). Wt. 85 lbs. Each. .... **\$14.25**  
**500-foot coil (14 lbs.)**..... **\$3.50**  
**1000-foot coil (28 lbs.)**..... **\$6.50**

**W-130 LIGHTWEIGHT ASSAULT WIRE.** Weights only 10 lbs. New, half-mile reels (2600 feet) each..... **\$15.00**

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**Stage Coach Kit \$150**  
Plus 15c postage



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**ALL 3 for Only \$375**  
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Pleasant leisure hours spent in building these realistic miniature replicas pay off in satisfaction and the pride of displaying your craftsmanship. Wells Fargo Stage Coach revives memories of the Old West; Conestoga Covered Wagon just like the Pioneers'; 2 1/2 ton Army Cargo Truck is backbone of U. S. Army combat supply service. Covered Wagon and Stage Coach 1/2" scale; Army Truck 1/2" scale. You'll enjoy working with precision parts, die-cut from white pine and plywood, for simple, accurate assembly: free-rolling wheels, real metal fittings, formed ribs, leather springs, etc., full size plans.

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## Steel With a Memory

(Continued from page 168)

Sound-on-film is one of the latest developments and destined to be one of the most popular. Camras has coated the films with a strip of magnetic material. In most cases, this coating is applied between the sprocket holes and the edge of the film. All the amateur must do is install a recording head on his projector, attach it to an amplifier and speaker (even a radio) and he has sound films. He can dub in the sound immediately after taking the film, and in the future he will be able to record on the film as it is exposed. The fidelity is excellent. Processing has no effect on the track.

Warner Brothers has developed a similar sound system for Hollywood films which promises to be a money saver. The ordinary method of recording is to develop the film, then dub in the sound track. This often requires a good many recording "takes" before synchronization is perfect, and each take must be processed, which requires several hours. Furthermore, the films that are not synchronized are worthless. With the new system, the recording can be played immediately after it is made. If it is imperfect, it can be "wiped off" and others made immediately until synchronization is flawless.

The latest magic from Camras' laboratory is the application of magnetic recording to stereophonic sound, which definitely creates an illusion of depth and direction that is impossible with other systems. Stereophonic sound is based on the fact that a human being obtains a sense of depth and direction because he hears through two ears. Thus, a blindfolded man can, within limits, guess the direction and distance from which a sound originates. When a person in a concert hall listens to an orchestra, each of his ears picks up the sound of each instrument, even though the sounds are blended. Yet when a person listens to a radio, the sound comes from only one source—the speaker of the instrument.

In the new system, two or more microphones are placed in different positions. A battery of three microphones might be placed in a line in front of an orchestra. Each microphone is connected to a recording head so that three tracks are made simultaneously on a single roll of magnetic tape. For the playback, three speakers replace the three mikes and each speaker is connected to the pickup head corresponding to its track. When the recording is played, the music from three sources seems to flood the listener with sound so deep and rich that, once he's heard it, he'll forever be dissatisfied with other types of recording.



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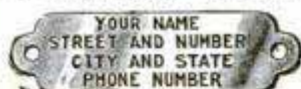
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## Big Builders

(Continued from page 146)

into the mixers is first refrigerated and then is further cooled on hot days by the addition of 60 tons of crushed ice a day to bring it down to the low temperature that makes the strongest concrete.

Morrison-Knudsen, in fact, has participated in building each of the four big dams on the lower Colorado. Each job was vastly different. Hoover Dam is 726 feet tall and at the other extreme is Imperial Dam near Yuma, only 45 feet tall. Imperial is 3475 feet long and is called a "floating" dam because its weight rests partly on buried piles.

Other noteworthy dam projects include Anderson Ranch Dam in Idaho, the tallest earthen structure in the world, and Ross Dam in Washington, a 540-foot-tall concrete dam that has a unique "waffled" face which will serve as bonding if the dam is ever enlarged. Two M-K dams are under construction on the Feather River in California, and two others are being built in Wyoming, one on the Big Horn River and one on the North Platte.

Morrison-Knudsen's greatest construction efforts were performed during the war and included the building of steel plants and training camps. For the Navy it built a number of complete air stations in scattered parts of the Pacific. One unusual wartime project was the secret Red Hill operation near Pearl Harbor. This consisted of burrowing into a mountain to build 20 huge underground fuel-oil tanks, concrete lined, each so large that it could contain a 30-story building. This long-secret project was described in the November (1948) *Popular Mechanics*.

The company was one of the first to utilize mass "airlift" transportation when it acquired 17 aircraft and chartered other planes to haul thousands of tons of materials, including 30,000 barrels of asphalt, to build and pave isolated Alaskan airports during the war. More recently M-K completed its portion of the new 25-million-dollar Fairfield-Suisun Air Force Base in California, principal military trans-Pacific air terminal. Some of the runways at this field are almost two miles long and parts of them consist of 18-inch-thick solid concrete pavement laid on top of 58 inches of crushed rock.

Last year the M-K engineers finished five miles of million-dollar-a-mile freeway across marshy ground south of San Francisco. To avoid damage to the six lanes of pavement by the fluctuating tidal

(Continued to page 244)

# Crosley

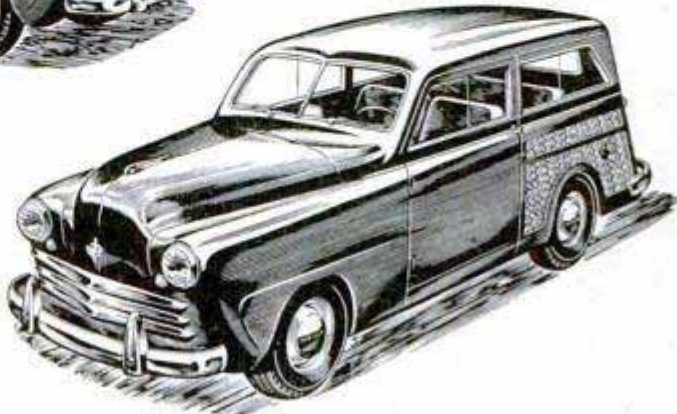
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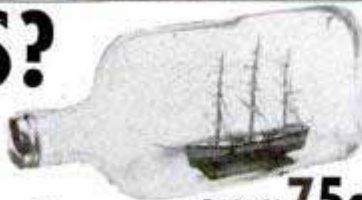
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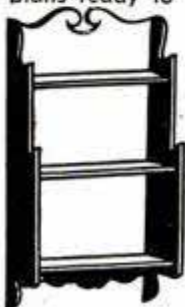
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ground waters it was necessary to provide some 7000 sand piles under the roadbed. These piles consist of 18-inch holes drilled to depths as great as 60 feet and filled with sand. Across the tops of the piles and under the roadbed itself a thick layer of sand was tamped into place. The combination of the piles and the drainage layer allows the water to move up and down without affecting the solid pavement above.

Some of the smaller but interesting jobs that M-K men have performed recently include the digging and concreting of a 1500-foot shaft in Wyoming to tap a rich deposit of sodium carbonate, the rebuilding of the 12-mile trestle that Southern Pacific uses as its main line across part of the Great Salt Lake, and constructing a 3000-foot ski lift at Sun Valley.

The company's heavy earth-moving equipment, normally used for making cuts and fills in highway construction, is being put to a new use between highway jobs these days. Once a vein of coal had to be mined by means of tunnels and shafts; now, with heavy equipment available, it is often most practical to remove the overburden and expose the coal so that it can be excavated with power machinery. Some of the M-K crews are moving millions of yards of dirt and rocks that blanket coal deposits in Arkansas and some other coal regions.

This is only a partial record of the accomplishments of one construction company. Morrison-Knudsen, its affiliates and hundreds of its competitors are changing the face of the earth, at home and abroad.

## The Stratocruiser Goes to Work

(Continued from page 135)

well to facilitate ground servicing, 36-inch fluorescent tubes for indirect lighting in the lounge, and "red and white" lighting in the control compartment. White lighting illuminates the instruments and controls at sunset to provide strong visibility and the white light gradually changes to red as the sky grows dark. The red illumination prevents night blindness and at the same time allows good vision. With the approach of dawn the red lighting gives way again to white.

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(Continued to page 246)



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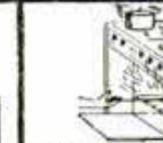
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Partly because of its size and complexity the Stratocruiser is believed to have been tested more thoroughly than has any other aircraft. Tests actually began in 1944 when the plane's military prototype, the C-97 Stratofreighter, was first flown. This cargo plane can carry as much as 20 tons of freight and has a ramp that permits the loading of four regular field ambulances into the fuselage.

Both cargo and passenger versions of the design use a new wing that is 16 percent stronger, 26 percent more efficient, and 650 pounds lighter than the wing of the B-29. This improvement comes in part from the use of the new 75-ST alloy of zinc, magnesium, copper and aluminum for the skin and some extrusions. Spot welding is used extensively.

Flight tests of the Stratocruiser itself resulted in two tall filing cabinets full of test reports, two miles of 16-mm. movie film and two miles of instrument tape. For parts of its flight test the first plane carried three tons of precision test instruments. It is estimated that the 700 hours of flying time involved in the tests cost nearly three million dollars. The test flights were equal to eight trips around the world at the equator.

Twenty years ago an airplane like the Stratocruiser hadn't even been dreamed of by serious engineers. The strides that air transport has made in two short decades makes one wonder what flying will be like in 1969, just 20 short years from now.

### End of an Era

(Continued from page 85)

development of this type—the giant 4-8-8-4. The latter, better known as Big Boy, was built during the last decade for mountain hauls. The Big-Boy type is the world's largest steam locomotive and weighs 604 tons. It has sixteen 68-inch drive wheels, can produce 7000 horsepower and hauls a mile-long freight train at 60 m.p.h. When Big Boy takes a drink he fills his boiler to capacity with 24,000 gallons of water.

Among the locomotive improvements from 1900 to World War I were the automatic stoker, the Walschaert valve gear, power-operated reverse gears, multiple throttle, booster engine on the trailing truck, cross-compound air pumps and many others. During this period the boiler pressure remained standard at about 200 pounds. (This was to be increased to 300 in the 1930s). The Walschaert gear is an improved system for opening and closing valves to extract full work from steam.

(Continued to page 248)

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Over the years two general classifications of steam locomotives had been developed—passenger and freight. The most popular types in recent years have been the 4-6-2 (Pacific), 4-6-4, 4-8-4, and 4-8-2 (Mountain). Earlier types were the 4-4-0 (American), 4-4-2 (Atlantic) and the 4-6-0 (Ten-Wheeled). All of these types are still in service, many on branch lines. The principal freight types have either four or five pairs of coupled driving wheels with the lead and trailing trucks equipped with either one or two pairs of wheels. They include the 2-8-2 (Mikado), 2-8-4, 4-8-2, 4-8-4, 2-10-2, 4-10-2 and the 2-10-4. During recent years the freight requirements have been speeded up to such an extent that many passenger and freight locomotives of similar types are used interchangeably. This is particularly true of the Mallets ranging from two sets of four driving wheels to two sets of 10.

Also distinguished itself during World War I by promptly filling government contracts. After the war came the first rumblings of diesel talk throughout the locomotive industry. Was this an innovation or the possible harbinger of a new era in railroad transportation? Whatever it was, Alco wanted a part of it and in 1924 the plant turned out its first diesel-powered locomotive—the first commercially successful diesel built in the U. S. It is still in service as a switcher.

But while diesels were in their infancy Alco continued to build and improve on steam locomotives. A streamlined locomotive named Hiawatha was built for the Chicago, Milwaukee, St. Paul & Pacific Railroad. It was the 4-4-2 type and has a sustained speed of 100 m.p.h. with a top speed of 120 m.p.h.

When the U. S. entered World War II Alco was ready to do its part. The plant covered 112 busy acres and was ready to gear production to an all-time high. The peak in steam production was reached in 1944 when 1354 locomotives were built. In addition to more than 2000 steam and diesel-electrics, the plant's war production included 150 boilers for Liberty ships, hundreds of M-3 and M-4 tanks, tank destroyers, big guns and scores of other items ranging from turret rollers for battleships to diaphragm forgings for Navy torpedoes. Alco also built the big M-36 tanks called Sluggers which knocked out German Tiger tanks and helped turn the tide in the Battle of the Bulge. The Navy and War departments honored the company by awarding the Navy E with star and the joint Army and Navy E with two stars.

(Continued to page 250)

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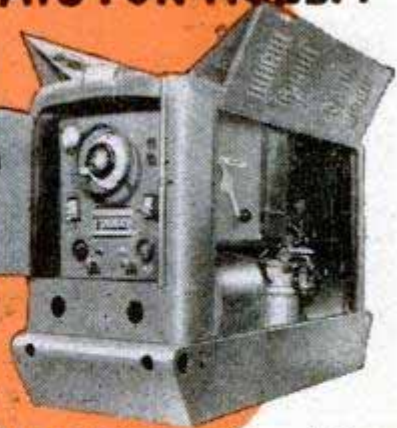
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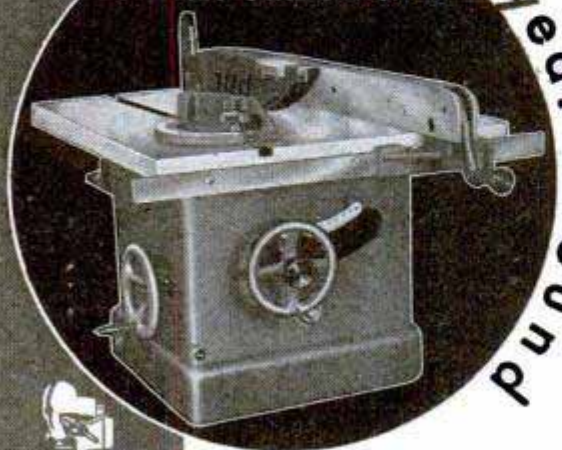
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However, steam-locomotive fans will not be deprived of seeing their favorite iron horses in action overnight. At present in the U. S. there exists a total of 110,000,000 locomotive horsepower. This horsepower is composed of only 7,000,000 diesel, 3,000,000 electric and 100,000,000 steam. It is estimated that by 1955 this picture will be changed to the extent of 30,000,000 diesel-electric locomotive horsepower.

Despite this upsurge of diesel popularity the chances are that 50 years from now a few steam locomotives will still be chugging along somewhere in the U.S.A. The steam fans will see to that!

## Farmer "Fiddles" as He Sows



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British farmers sow their fields with a seed broadcaster that is rotated by a "bowing" action similar to that used by a bass-viol player. The bow is strung with heavy thong that wraps around the shaft of the broadcasting blades. As the operator works the bow back and forth, it spins the blades, broadcasting the seed.

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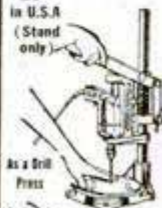


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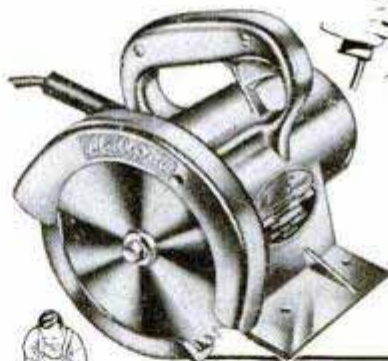


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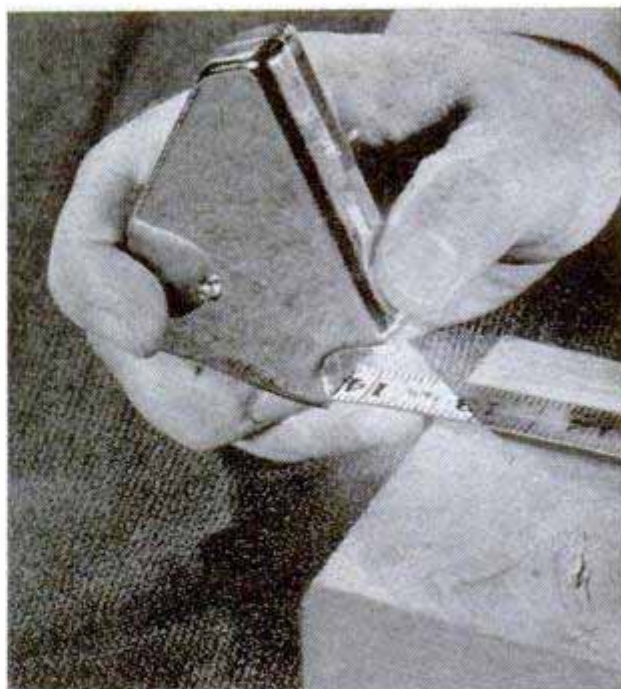
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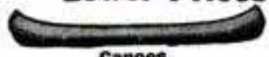
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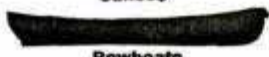
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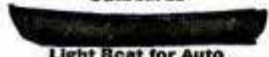
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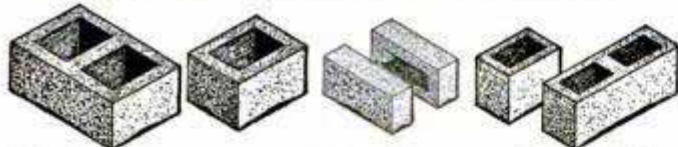


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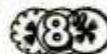
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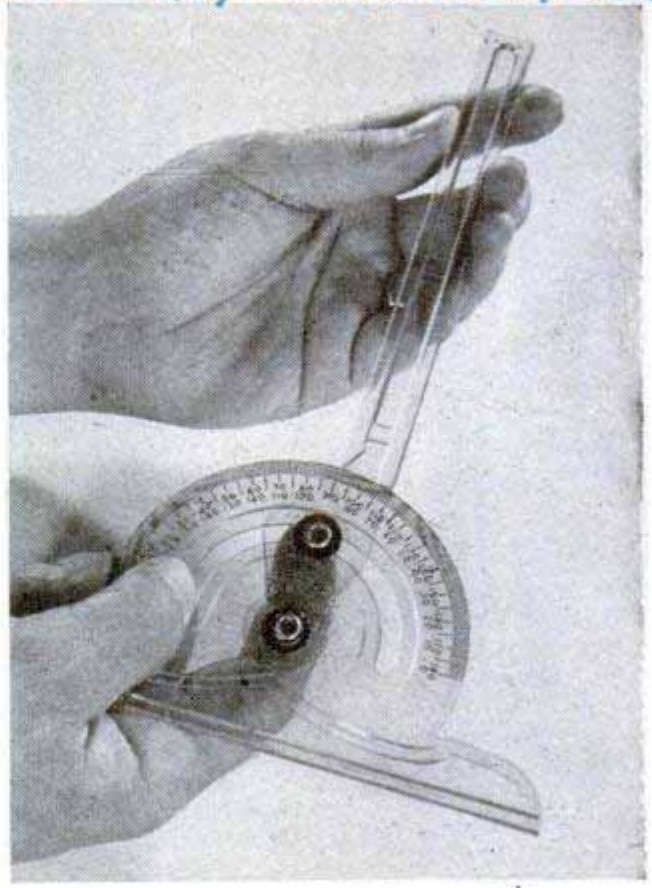
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Although it may not be discovered for years, a new subnuclear particle bearing a magnetic charge instead of the plus or minus charge of the proton or electron has been predicted by a British physicist, Dr. P. A. M. Dirac. He estimates that the new particle could be created in the laboratory by an artificial collision having an energy of 500 million electron volts. This is beyond the range of even the 184-inch cyclotron at Berkeley, Calif., with its 400-million-electron-volt particles, which artificially created mesons. Until a more powerful atom smasher is built, the search for the new particle will be carried out in studies of cosmic rays.

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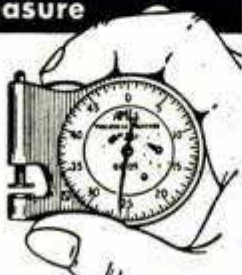
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**THE NELSON COMPANY**  
IRON MOUNTAIN - MICHIGAN

## NEW Pocket Thickness Measure

A pocket-watch size precision dial indicator weighing only 1½ oz. for accurately measuring the thickness of sheets, strips or tubing, round, square, or hexagonal stock, tissues, fibres or filaments of materials such as rubber, metal, paper, plastics, leather, glass or cloth.

4 MODELS .0005", .001", and .01 mm graduations. Range of all models 5/16" (8mm).



PRICE \$15.10 Post-paid complete with leather case and full instructions.

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MFR. OF MICROMETER DIAL GAUGES & INDICATORS

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HIGH SPEED ROTARY FILES

Set of 5 Assorted . . . . .	\$ 2.00
" " 10 " . . . . .	3.75
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1/4" shank



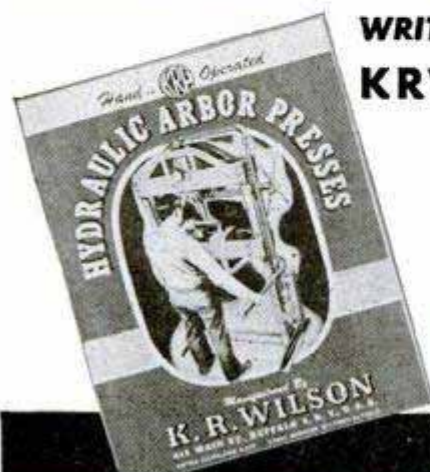
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—A purely vegetable laxative to relieve constipation without the usual griping, sickening, perturbing sensations, and does not cause a rash. Try NR—you will see the difference. Uncoated or candy coated—their action is dependable, thorough, yet gentle as millions of NR's have proved. Get a 25c box and use as directed.



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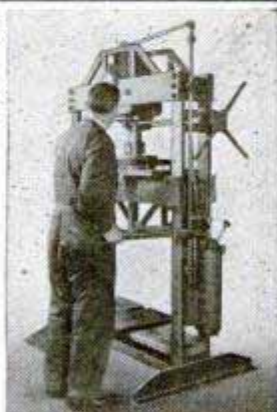


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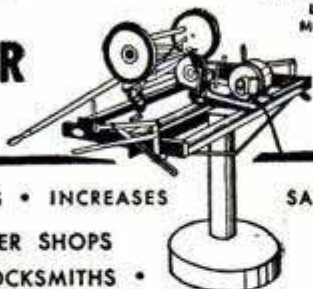
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INCREASES PROFITS • INCREASES SALES  
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*Sharpens All Reel Type Mowers • Hand, Power or  
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All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist reel blades. Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets that hold mower in grinding position. No extra attachments required. One lever puts mower or bed knife in grinding position. 100% steel construction. Grinding head rides on five ball bearing races. Small, compact, easy to operate. Sharpens wood chisels, joiner knives and planer blades without extra attachments.

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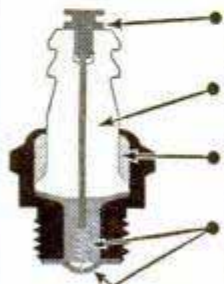
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Speed up production! Increase your profits! BELSAW power self-feeds at 24 feet per minute... The lowest-priced surfacer that will handle 12 x 6 in. stock. Planes green or dry sawed lumber into smooth, worked forms. Three high-speed steel knives make 42 cuts per inch. Multi-duty BELSAW takes inexpensive attachments for all planing mill operations—Jointing, Rabbeting, Grooving, Matching. BELSAW is the **only** 12 in. planer providing **attachments for jointing and grinding its own knives**. Start planning NOW for BIGGER VALUE and BETTER PERFORMANCE, with BELSAW. Write for FREE specifications, illustrations and low prices.

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**CHAMPION TERMINAL**—assures better center electrode seal and provides sturdier electrical connection.  
**CHAMPION-CERAMIC INSULATORS**—proved dependable in millions of Champion Spark Plugs.  
**CHAMPION SILLMENT SEAL**—prevents excessive compression leakage between insulator and shell.  
**CHAMPION "THERM-O-FLEX" CONSTRUCTION**—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

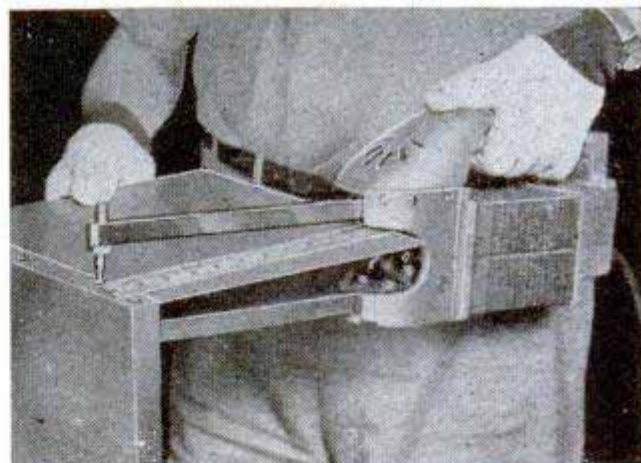
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Quickly adjusted to fit any standard doorway, a portable nursery gate does not have to be permanently fastened to the doorframe. V-shaped metal forks on each end of the gate fit around the door casing and hold the gate securely when it is adjusted to the proper width by means of two bolts. The forks are rubber-covered to prevent damage to woodwork.

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One-hand welding is possible with a portable unit that handles metals up to 1/8 inch thick. Because of its design—the top tong rests at the point of pressure—the unit cuts operator fatigue. A squeeze of one hand plus the 22-pound weight of the welder furnishes all the pressure needed. The other hand can be used to hold the work. The machine's portability makes it useful for off-location work. It welds mild stainless steel, terneplate, galvanized iron, magnesium and, when a special alloy tip is used, handles aluminum sheets. The welder is designed for use with 110 or 220-volt alternating current.

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No. K1. An Ideal Beginners Radio Kit covers 550 to 6000 KC including Broadcast, police, aircraft, amateur marine, and foreign broadcasts. All parts including 3 tubes supplied. 110V 60 cy AC. Transformer operated, calibrated dial complete instructions for assembly. Operates loud speaker (not included). Excellent boy's gift. Ship. wt. 3 lbs. Loud speaker 2½" PM (extra).....\$1.95 Headphones (extra).....\$1.00



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## BC 645 GENERAL ELECTRIC TRANSCEIVER



No. 201. Complete 15 tube transmitter receiver. Ideal for new citizens band 460 Mc for communication between office and car, home, boat, etc. Conversion

article in August ELECTRONICS Magazine. Brand new in original G.E. cartons with tubes. Add postage for 25 lbs.

**\$19.50 . . . . 2 FOR \$35.00**

### ACCESSORIES FOR BC 645

PE 101C Dynamo motor 110V 60 cycle power supply for car use. . . \$3.95  
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No. 230. Easily assembled 110V AC or DC ball bearing fully enclosed motor from Army surplus dynamotor. Purchaser to make simple changes and shaft extensions, detailed instructions and all parts supplied. Motor approximately 5,000 R.P.M. Ideal for tool-post grinder, flexible shaft tool, model drill press, saw. Shipping weight 6 lbs.



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**\$34.50**

No. 200. Brand new 14 tube army transmitter receiver radar unit with indication in feet. Many applications such as electronic burglar alarm, radar set, etc. Complete with 14 tubes, controls, plugs, antennas and instruction manual. Shipping wt. 87 lbs.

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No. 223. Army PE125 power supply provides 500 volts at 160 MA from 12 or 24 Volt storage battery. Heavy duty unit with filters starting relays, fuses, tubes, and diagram. Shipping wt. 73 lbs.



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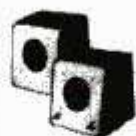
## T 32 TABLE MICROPHONE



No. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs. . . . . \$2.95

## INTERPHONE 2 WAY CALL SYSTEM KIT

No. 1P1. Saves many steps between house and barn, tenant house, workshops, etc.; can be used to watch baby from neighbors. Uses 2 wires and will operate up to 1-5 mile. More than one remote can be used. Kit is complete with tubes, one master, one remote speaker and detailed instructions. Shipping weight 5 lbs.



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## ASTROGRAPHS WITH CASE



**Only \$3.95**

No. 259. New B29 navigation instrument which can easily be used to make a good contact printer, strip map holder, etc. The plywood case 14½" x 11" x 10" high is perfect as a tool kit, camera, projector case or for building a portable phonograph picnic kit, make up case, etc., has leather handle reinforced covers, 8 covered compartments in bottom. Cost Gov't \$125.00, Add postage for 20 lbs.

### GN 58

## GENERATOR

No. 275. Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed, supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs.



**\$7.95**

## BC 746 TUNING UNIT

No. 257. Transmitter Receiver Tuning Unit from Army Walkie Talkie. Containing coils tuning condenser, transmitter crystal sockets, etc., excellent for building amateur station. Shipping wt. 1 lb.



**\$1.00**

## METER SPECIAL

No. 237. Beautiful Dejur 3" Square Precision Milliampmeter 0-800 MA range. 0-10 MA basic movement. Probably the best buy ever offered in a war surplus meter. Shipping wt. 1 lb.



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**\$9.95**

## BENDIX DIRECTION FINDER LOOP

No. 219. Brand new loop excellent for aircraft or boat direction finder. Also useful as radio aerial to eliminate local interference. Rugged army construction. Shipping wt. 8 lbs.

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No. 204. New General Electric 50 Amp. 220 Volt AC circuit breakers. 100 Amp. when used on 110V. Add postage for 4 lbs. \$2.95, 3 for \$7.50



**\$2.95**

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No. 211. Tiny Delco motor only 1" x 1¼" x 2" 10,000 RPM. Operates from 6 to 24V. Excellent for models. Add postage for 1 lb.

## HEATHKIT HIGH FIDELITY AMPLIFIER KIT

No. A2. A truly fine 110V 60 cy transformer operated High Fidelity Amplifier Kit. Ideal for reproducing quality music at home, churches, mortuaries, outdoor gatherings etc. Output over 10 Watts. Complete with all tubes (push pull circuit) transformers, punched chassis and detailed assembly instructions. Shipping weight 20 lbs. High Fidelity 12" P.M. Speaker for above \$6.95 Mahogany speaker cabinet size 14½" x 14½" x 8" for above speaker. . . . . \$8.75



**\$14.95**

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**\$2.49**

No. 203. A beautiful Army Tuner containing 3 precision variable condensers, tank coils, switches, vernier dials, worth over \$30.00. The best buy in surplus. Shipping wt. over 20 lbs.

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No. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs.



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## G.E. 1000 VOLT 350 MA DYNAMOTOR



**\$5.95**

No. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs.

## DM-36 DYNAMOTOR

No. 215. Western Electric 24 Volt input, 220V at 60 MA out. With filter assembly. Ship. weight, 6 lbs.



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## POWER TRANSFORMER - SPECIAL



**\$3.95**

3 FOR \$9.95 Weight 11 lbs. each.

No. 226. Primary 117V. 60 cycle. Secondaries supply 746 V.C.T at 220 MA, 6.3V. at 4.5A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping

## HEARING AID HEADPHONES

No. 216. Hearing aid type, comfortable, keeps out outside noise, one of the Army's best types. Add postage for 2 lbs. . . . . \$1.00



## THE NEW 1948 HEATHKIT 5" KIT OSCILLOSCOPE



**\$39.50**

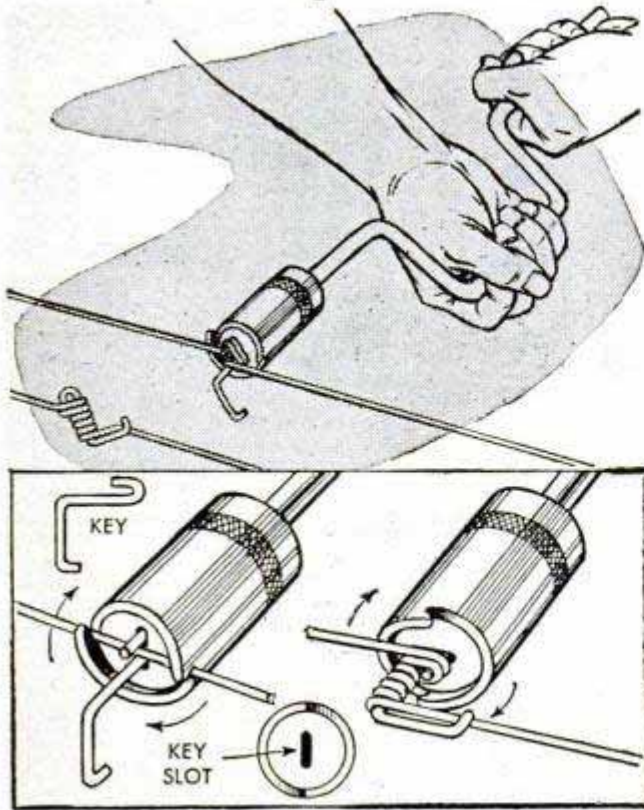
No. 03. Complete kit to build a beautiful 5" oscilloscope. Ideal for studying and servicing television and FM radio. 6 tubes including 5BP1 cathode ray tube. 1500-Volt power supply operates from 110-V 60 cy A.C. Has compensated vertical and horizontal amplifiers and 15 cy to 30 KC sweep generator. Detailed instructions make assembly easy. Shipping weight 35 lbs. Nothing else to buy.

## HOW TO ORDER

Give part number and description. Add postage for weight shown. No orders under \$2.00. We will ship C.O.D.

**HEATH COMPANY BENTON HARBOR 17, MICHIGAN**

## Turn of Crank Tightens Fence



Fences are tightened permanently by a crank-type handle that reels up the surplus wire. The tightener works on plain, barbed or woven wire and can be used in

erecting new fences as well as taking the sag out of old ones. A hooked wire twister is installed in the crank, a strand of the fence inserted and the crank turned until the strand is tight. The twister then is hooked over the wire to keep it permanently taut. About nine inches of wire can be reeled up in this way, depending upon the gauge of the wire. Because each strand can be tightened individually, the tightener eliminates cutting the fence to compensate for unevenness.

## Turkish Water Pipe—Modern Style

Beneath the bowl of a new pipe is a glass jar which can be filled with water to provide a cooler smoke. The smoke passes through a tube to the bottom of the jar, then up through the water and stem. The jar can be filled with menthol to relieve head congestion.



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# WESTINGHOUSE AIR COMPRESSOR

BRAND NEW  
WAR SURPLUS SPECIAL

2-Cylinder Piston Type  
Ideal for:

- Paint Spraying
- Industrial Uses
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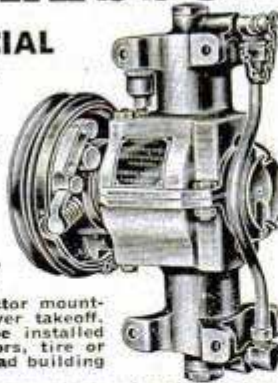
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**HOME... FARM... FACTORY**

Designed for automotive truck or tractor mounting. Can be run off fan belt or power takeoff. Comes with automatic clutch. Can be installed for use on: farm trucks, jeeps, tractors, tire or garage service trucks, contractor or road building machinery, pneumatic devices, etc.

Can be operated with  $\frac{1}{2}$  H.P. or more electric motor or equivalent portable gas engine.

Light weight, compact and versatile unit... delivers "oil free air"... simple in operation; requires minimum of maintenance; operates under all climatic conditions; suggested operating pressure 75 P.S.I.; equally efficient operation in either direction of rotation; approx. displacement 3.27 CFM at 600 RPM, 6.54 CFM displacement at 1200 RPM. Has 2 inch bore— $1\frac{1}{2}$  inch stroke. Overall dimensions: width 9", height  $11\frac{1}{8}$ ", depth  $6\frac{5}{8}$ "; approx. wt. 23 lbs.

A REAL BUY...  
worth many times  
this price



**\$26.95**

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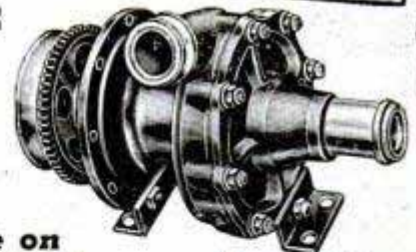
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Ready for use on  
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## Belt Driven — Centrifugal Pump

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An extraordinary value for all types of intermittent or continuous pumping in the home... farm... factory. Built to exact specifications of Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft Engines. May be run with electric motor, gas engine or power take-off on tractor. Delivers up to 25 gallons a minute with  $\frac{1}{4}$  H.P. motor; 80 gal. a min. with one H.P. motor. Will deliver up to 44 ft. head or 25 ft. suction. Use 1" outlet hose; 1" or  $1\frac{1}{2}$ " inlet hose (recommended).

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Has cast aluminum housing, accurately machined 5" bronze impeller;  $3\frac{1}{2}$ " V belt pulley and mounting brackets. Shaft rotates on ball bearing; has grease gun fitting.

Original cost approx. \$88.00. Shipping weight 10 lbs. A REAL BUY.

**\$21.50**

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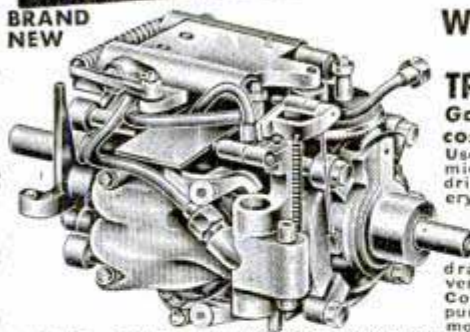
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## WESTINGHOUSE HYDRAULIC TRANSMISSION

Gov't. Acquisition cost . . . . . \$300.00

Use it on chain saws, midget autos, lathes, drills, power machinery, chucking machines, farm machinery, potters' wheels, tractors, trucks, etc. Ideal as hydraulic torque converter. Contains hydraulic pump and hydraulic motor; has reversing

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Compact, powerful, rated 1,000 P.S.I., .507 cu. in. per revolution, 8 gal. per min. at 3750 r.p.m. Change rotation by reversing flow. Delivers up to 6 H.P. BRAND NEW. Requires 1 1/2 to 6 H.P. Wt. 4 1/2 lbs., \$60.00 value for . . . . .

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Brand New CHECK and RELIEF VALVE. Adjustable for any pressure. . . . . **\$2.95** postpaid

FREE: New, 20-page illustrated Hydraulic Manual featuring diagrams, photographs and instructions — FREE with each hydraulic order.

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For fire protection, irrigation, de-watering, industrial uses, farm uses, etc. Pumps rated 500 gallons per minute at 275 ft. head; equipped with 1 1/2" diameter straight splined shaft for direct coupling drive; 4 1/2" threaded suction intake; two—2 1/2" threaded discharge outlets; Hale Pump Co. Model CF volute type; requires 37 H.P.; dimensions: 21" x 24" x 28". Complete with full accessory kit including suction and pressure gauges, priming equipment, and instruction book. Ship. wt. 415 lbs.

Gov't. acquisition cost \$425.00

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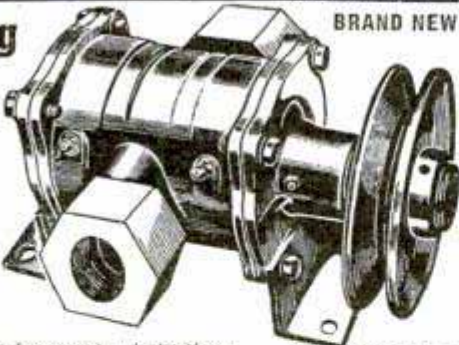
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Positive Displacement

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Perfect for draining basements, irrigation, fire fighting, sprinkling, pressure booster, insecticide and other spraying, fuel transfer, stock watering, industrial pumping, deep well jet pumping and home water systems. Rated 2 1/2 ft. suction and 150 ft. head pressure at 80 gallons. Use from 1/3 to 5 H.P. motor.

Mfd. by the Pump Division Eaton Mfg. Co.

Complete engineering report and instructions FREE with pump

Supplied with mounting brackets and 5" V belt pulley, ready for instant use. Standard 1 1/2" inlet and outlet pipe thread. Dimensions: 9 1/2" x 7 1/4" x 4 1/4". Ship. wt. 18 lbs. A \$142.00 value. . . . .

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1. Double action, 1 1/2" bore, 5" stroke, will lift 1760 lbs. in one second with Vickers MF9 Pump. Wt. 3 lbs. A \$35.00 value. . . . . **\$8.95** postpaid

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6. Double action, 3 1/2" bore, 11" stroke. (Will lift 9600 lbs. in 7 seconds using Vickers MF9 Pump.) Complete with fittings. Wt. 15 lbs. A \$92.00 value . . . . . **\$22.50** postpaid

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1. Four-way control valve with built-in relief valve, for use with double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders.

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2. Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand New. Ship. Wt. 6 lbs. A \$60.00 value. . . . . **\$10.95** postpaid

3. A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Ship. Wt. 8 lbs. A \$75.00 value. . . . . **\$14.95** postpaid

BRAND NEW

## Vickers Heavy Duty HYDRAULIC PUMP



For tractors, bull-dozers, construction machinery, lift trucks, industrial applications, etc. Used on Ross carriers. Delivers 18 gal. per minute at 1000 P.S.I. at 1200 R.P.M. using 10 H.P. Has 1 1/2" intake; 1 1/4" outlet; threaded and keyed 3/4" shaft for direct or pulley drive. Wt. 40 lbs. Dimensions: 5 3/4" diameter, 7 1/2" high. Original value \$148.00. NOW . . . . . **\$39.50**

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## Brand New Vickers Heavy Duty HYDRAULIC CONTROL VALVE

This Vickers heavy duty 4-way control valve, Part C-2330, is ideal for use with the Vickers Heavy Duty Pump for double action cylinders. Has built-in relief valve with 50 to 1000 lbs. per sq. in. overload adjustment; max. capacity 24 GPM; pressure inlet connection from pump 3/4" pipe thread; cylinder connections 3/4" pipe thread; discharge connection to tank 1 1/4" pipe thread; Over. dimen.: 8 3/4" W. x 10 7/8" L. x 7 5/8" H. Ship. wt. 54 lbs. ORIGINAL COST MANY TIMES MORE. . . . . NOW **\$24.95**

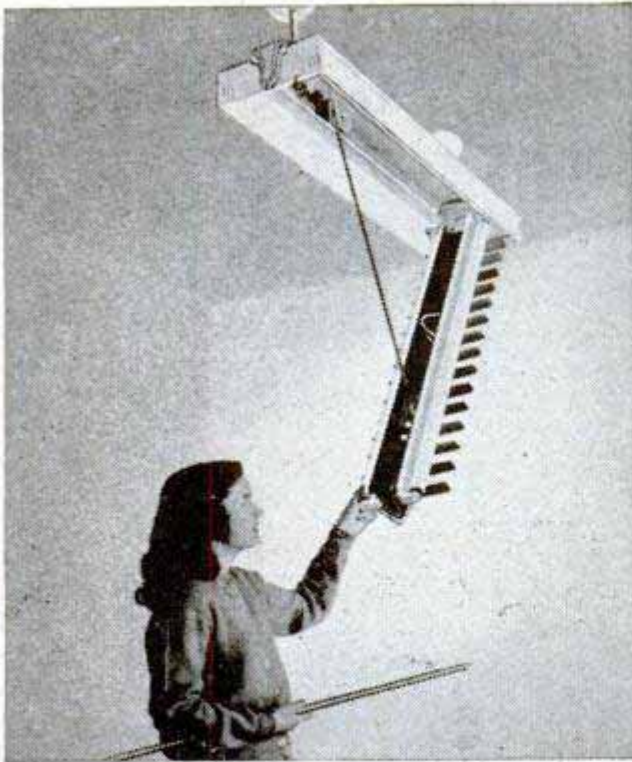
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Stepladders are unnecessary for maintenance work on a ceiling fluorescent light that is hinged at one end, permitting the reflector assembly to be pulled down with-

in easy reach. A lightweight maintenance rod is used to raise and lower the assembly. Tubes and starters can be changed quickly and the entire reflector unit can be removed and washed at floor level.

### Paint-Plaster Substitute

Surfaces need not be plastered or painted when finished with a new wall coating made of soybean oil, styrene, silica sand and pigment. The heavy coating has a sandy texture and will adhere to porous materials such as wallboard, concrete block and brick as well as polished surfaces such as glass and aluminum. No prime coat is required and the liquid can be applied to interior or exterior surfaces with a paintbrush or sprayer.

### Wallpaper Border for the Nursery

Produced by a new process that permits printing a 100-foot roll without repetition of design, two novelty wallpaper borders contain pictures and rhymes of interest to children. Designed for children's rooms, the borders come complete with paste and instructions. They are said to be of interest to children from 18 months to 10 years and are long enough to go around a room without any design being repeated.

# GLOWS IN THE DARK

## AN EASY WAY TO MAKE BIG MONEY

Be the first to sell sensational luminous house numbers, light switch plates, wall protectors, cord pulls, etc. Also luminous pictures, statues, decals, and a host of religious, nursery and other objects THAT GLOW IN THE DARK. Sell on sight. GET INTO THIS NEW AND GROWING INDUSTRY. ENORMOUS DEMAND... NO COMPETITION... BIG PROFITS. Represent a large manufacturer, established over 34 years. WRITE AT ONCE for liberal MONEY-MAKING offer and FREE SAMPLE to show you how they GLOW IN THE DARK. MADISON MILLS, 303 Fourth Ave., Dept. N-4, New York 10, N. Y.

Write for Free Sample!

## GIVE YOUR CAR THE "WOLF CALL"

### of Deep Tone DUAL MUFFLERS

The rich, low, mellow sound of "straight thru" ADVANCE mufflers is something all your friends will admire.

Also greater power, speed, and economy result from the reduced back pressure of this scientific design. Rugged steel tube throughout (no aluminum); blowout-proof.

**SIMPLE TO INSTALL.** No welding, cutting, or holes to drill. Complete with rubber mounted clamps (no rattle) and all necessary fittings.

**ADVANCE MUFFLERS, 6800 S. Vermont Ave., Dept. PM-19, Los Angeles 44, Calif.**  
 Send Check, Money Order, or we will mail C.O.D.  
 You pay postage upon receipt.

Dual Muffler Set (Ford, Mercury only)	\$20.00 <input type="checkbox"/>	Single Muffler (other makes)	\$5.50 <input type="checkbox"/>
Single Muffler (Ford, Chev., Plym.)	4.86 <input type="checkbox"/>	2 1/2" Chrome tail pipe tips	1.75 <input type="checkbox"/>

Car make \_\_\_\_\_ Year \_\_\_\_\_ Model \_\_\_\_\_  
 Name \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

ADVANCE MUFFLERS

6800 S. Vermont Ave., Los Angeles 44, Cal.





Many a business saves time and cuts costs, by using a Delta-Milwaukee Scroll Saw.



A Delta-Milwaukee Scroll Saw is first choice of hobbyists who know the deep satisfaction that comes from using quality tools.



**\$94.00\***  
without motor or switch

Get *any* speed you need . . . from 650 to 1750 cutting strokes per minute . . . with a **DELTA-MILWAUKEE®** Variable-Speed 24" Scroll Saw

**Cuts wood, light metals, plastics, hard rubber, asbestos, bone, hard leather, etc.**

Preferred by those who know fine tools:

- Airports
- Cabinet Makers
- Carpenters
- Department Stores
- Display Shops
- Hobbyists
- Hotels
- Model Builders
- Pattern Makers
- Schools
- Sign Shops
- and others!

Convenient ball crank helps you pick the exact speed you require: High speed for fine work. Low speed for heavy work. Any speed in between.

That's an advantage the Delta-Milwaukee Variable-Speed Scroll Saw provides—one that is missing in machines with a limited speed range that is too slow for some materials and too fast for others.

There are other reasons why this quality scroll saw is so well known for accuracy, speed, and long life. These are just a few:

- Timken tapered-roller bearings are automatically lubricated from splash system in crankcase.
- Table tilts to right and left — and to front, for side-wise cutting as well as straight cutting.
- Spring hold-down tilts with table. It is effective on bevel cuts as well as on straight cuts.
- Continuous-flow air pump drives directly from crankshaft independent of blade, thus eliminates a source of blade breakage.

Ask your nearby Delta distributor for the whole story on the Delta-Milwaukee Variable Speed-Scroll Saw. And have him show you the complete line of dependable, low-cost Delta-Milwaukee tools that he has on display.

\*Prices subject to change without notice

**\$235.75\***

without motor or switch rod



You can cut work up to 1 3/4" thick. Distance to the overarm is 24" — big capacity for all kinds of jobs.



Universal chuck will take jeweler's blades, pin blades, saber blades, sanding drums, and round-shank files up to 3/4" dia. shank, without extra attachments.



You can adjust tension spring over saw blade to suit type of blade used. Graduations on tube permit accurate settings.

Two machines mounted together — to save space, time, and money  
**DELTA-MILWAUKEE SAW-JOINTER COMBINATION**

Circular saw and jointer mounted on one steel stand and driven by same motor. Both may be operated singly or together. 10" saw blade cuts 3 1/4" stock. Rips to center of 50" panel. Jointer surfaces boards 6" wide; cuts rabbets 1/2" deep. Both tools have lubricated-for-life ball bearings. See this machine at your Delta distributor.

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.



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HM-64

# Sockurls

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You'll never be "out on a limb" for the right nut turner if you standardize on speedy Proto socket wrenches. They're accurate, thin-walled and extra strong. And they're available in all common sizes. Be as thrifty as a squirrel and buy these sockets, along with their handles and attachments — or complete sets — from your Proto dealer. Remember —

**Tools you need...  
we make!**

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4888



**Mfd. by PLUMB TOOL CO.**

2255-Z Santa Fe Ave., Los Angeles 54, Calif.

## Ceramics Is a Family Affair . . .

(Continued from page 119)

ceramists until Virdie Price came up with an answer. She dips cotton lace into a mixture of clay and water, sometimes rolling it in with a rolling pin to get complete impregnation. Then the lace is attached to the vase or figure and placed in the kiln. The heat burns out the cotton, leaving the clay design in place.

In spite of her commercial ceramic business, Miss Price finds time to hold morning classes in ceramics. Her students buy clays and other supplies from her at retail, purchase numerous objects in biscuit form and pay standard fees to have their work fired in her kilns. It's a profitable side line that she recommends to others.

Some potteries regard the formulas for their clays and glazes as trade secrets. Most supply houses sell standard formulas. Individuals then can experiment with variations to find materials that can be cast with especially thin walls or superior strength and resonance. One essential is that the clay body and the glaze both have the same coefficient of expansion; otherwise, the glaze develops many fine hairline cracks, or "crazes," after firing.

Original clay models can be fired provided they have thin wall sections or have been hollowed out so they won't crack in the kiln. For production of dozens or hundreds of duplicates, the ceramist usually uses the "slip casting" method, which is the Maxwells' technique.

After Maxwell has turned a solid plaster model of a mug on his lathe he makes a plaster mold of this model. The mold can be taken apart in three or more pieces. Its inner walls form the outer walls of the completed mug. "Slip" is the trade name for a gravylike mixture of clays, water and other ingredients. It requires a great deal of study and experimentation to develop the clay body that is ideal for a particular piece. To make a casting, the Maxwells pour slip into the mold. The plaster walls of the mold absorb the water in the slip, gradually forming a crust. When this crust is as thick as the walls of a mug, they merely pour the rest of the slip out of the mold and they have both inner and outer walls formed. The thickness of the piece depends on the length of time the slip is left in the mold. This process requires a great deal of patient experimentation before the results are satisfactory.

After the fragile casting is dry, it is carefully surfaced and fired in the kiln. The resulting "biscuit" of burned clay now is

(Continued to page 264)

# BALL BEARING STEEL WHEELS

Complete With Wheels, Tires & Bearings Made To Outwear Other Type Wheels

SIZE	TIRE	BEARINGS	LOAD Lbs.	ONE	TWO	FOUR
6" x 2"	Solid	Ball 1/2", 5/8"	300	\$ 3.25	\$ 6.25	\$12.00
8" x 2"	Solid	Ball 1/2", 5/8"	250	\$ 4.25	\$ 8.00	\$15.50
10" x 1 3/4"	Semi-Pneu.	Ball 1/2", 5/8"	125	\$ 3.00	\$ 5.50	\$10.50
10" x 2 1/2"	Semi-Pneu.	Ball 5/8"	250	\$ 5.50	\$10.00	\$19.00
12" x 2 1/2"	Semi-Pneu.	Ball 1/2", 5/8"	150	\$ 5.50	\$10.50	\$20.00
12" x 2 1/2"	Semi-Pneu.	Ball 1/2", 5/8"	225	\$ 5.75	\$11.00	\$21.00
12" x 3"	Semi-Pneu.	Ball 1/2", 5/8"	340	\$ 8.50	\$16.00	\$31.00
16" (4.00x8)	Pneumatic	Roller 3/4"	520	\$12.50	\$24.50	\$48.00
16" (5.00x8)	Pneumatic	Ball 3/4"	375	\$13.00	\$25.50	\$50.00

NOTE: Other wheels from 3" dia. to 23" with loads from 100 lbs to 1700 lbs. in fibre, solid rubber, semi-pneu., pneumatic 2 to 8 ply, axles to match.

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36" Wide x 76" Long

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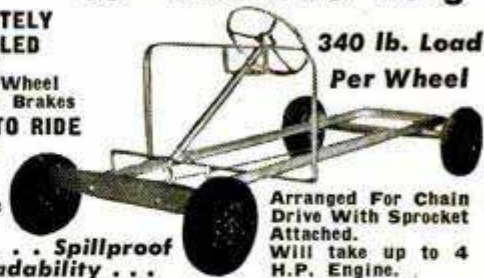
12" x 3" Wheels  
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FOR ADULTS or CHILDREN . . . A Splendid Father and Son Project. Can be purchased with Pneumatic High Speed Wheels. Also complete Model "D" 40" x 90" with 7.7 H.P. Engine.



340 lb. Load Per Wheel

Arranged For Chain Drive With Sprocket Attached. Will take up to 4 H.P. Engine.

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TRADE MARK  
**STEEL MEASURING TAPES**



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### A SURE CURE for Cold Weather Starting... the new SHUR-HETE Motor Water Heater

Install a Shur-Hete unit on your engine—plug it into a 110 volt A.C. outlet and your car will start easily and quickly, even on the coldest mornings. Why? Because the water around the sealed electric element is heated, causing automatic circulation which keeps the entire engine block warm; therefore the oil in the crankcase and around the cylinder walls is always free-flowing.

Easy to install—Any garage mechanic can install a Shur-Hete in a short time. 1/4" connections into head block and into drain plug opening are all that are necessary. Fittings included—nothing else to buy.

Dealerships Open!

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### Save Time and Money with Shur-Hete!

Eliminate run-down batteries . . . towing charges . . . needless engine wear . . . and wasted gas.

Uses only 1/3 to 1/2c electric power per hour.

Safe to use with any standard anti-freeze.

Will not overheat engine or burn out.

#### GUARANTEED!

Shur-Hete Outfits for Autos only \$12.50

Truck and Tractor Outfits—\$13.50

Important: Give make and year of auto, truck or tractor. Shipped parcel post prepaid if remittance is enclosed; otherwise COD with postage added.

## Sensational New Electric ① WELDER ② CUTTER!

**BOTH only \$15**

USES 110-115 AC or DC • WELD-BRAZE-CUT-SOLDER-HEAT TREAT

The WELDRITE combination—tested and proven by countless commercial and amateur users, is now offered direct to you at the amazingly low price of only \$15.00. No Gas—No Gauges—No Spark Lighter needed. Always ready for immediate use—Just plug WELDRITE into 110-115 AC or DC outlet.

Uses standard welding and brazing materials available at all welding supply stores. WELDRITE furnished complete with Converter Unit #1 Single Holder with attached Alligator clip, for welding metal up to 3/8" thickness, using up to 3/8" rod, and #2 Double Holder with Copper Coated Dual Carbon Electrodes for Cutting, Brazing, Heat Treating, Soldering, etc. Starting welding materials and instructions included.

Ideal for home workshop. Invaluable for body and fender shops, garages, repair and machine shops, manufacturers, etc.

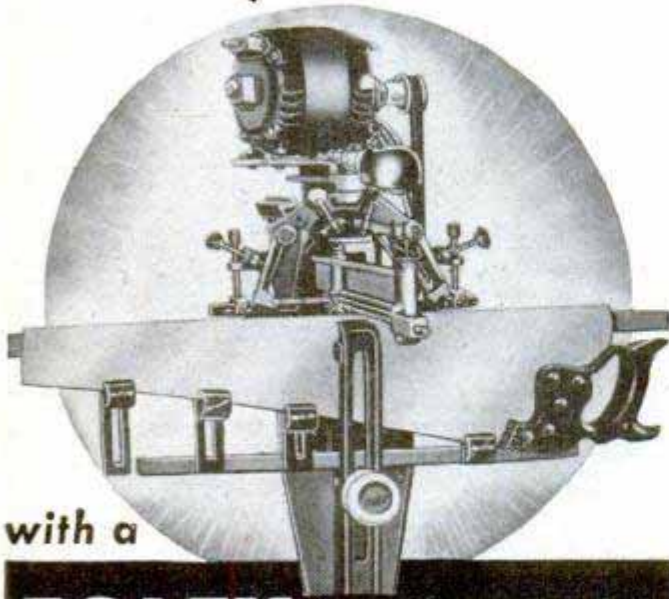
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# Last Year's Profit \$3,000!



with a

## FOLEY automatic SAW FILER

"Last year's profit amounted to \$3000. Not so bad for a one-man outfit"—from C. C. H., Penn. From Ohio J. B. W. wrote us—"I made \$765 last year filing saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make up to \$2 or \$3 an hour with the Foley Saw Filer working full time or part time. That extra money comes in mighty handy in these days of rising prices.

It's no trick to take care of the saw filing for your neighborhood hardware or lumber dealer—plus looking after the saws for farmers, townspeople, manual training departments and factories. The Foley files all hands saws, also band and cross-cut circular saws. It's a cash business, no canvassing, no eyestrain and no experience needed.

### FREE BOOK Shows How to Start

INDEPENDENCE AFTER 40 shows just how you can start at home in your spare time work—in your basement or garage. It's an immediate cash business that can develop into a full-time repair shop.



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decorated with mineral-oxide pigments. All of the Maxwells' work is hand decorated, but commercial stock transfers can be purchased at supply houses. After a coating of glaze has been applied, the piece goes back into the kiln again for a final firing. This turns the dull colors of the pigments into bright shades and converts the glaze into a glasslike surface.

Ceramics is a popular subject at night-school classes and at high schools and universities. The University of Southern California has a complete ceramics department under the direction of Glen Lukens, famous ceramic artist. Students come from every state to study under him. They learn that clays must be mixed thoroughly and then screened through a fine mesh to avoid lumpiness. They learn that clay always shrinks in drying and that no ceramic object is as large as the model from which it was cast. They learn never to leave a sharp edge on a clay piece because it will become needle-sharp when glazed and fired.

Finally, they learn that each step in ceramics is the most important. A mistake anywhere along the line can spoil a piece; perfect control can produce a gleaming piece that would be the pride of any professional ceramist.

## A Cave Gives Up Its Secrets

(Continued from page 129)

at Ventana was the piecing together of facts to reconstruct life as the ancients lived it.

"We can be sure they were gentle folk," Haury says. "Plainly they enjoyed a good family life, loved their mates, loved their children, worshipped in the simple ways they knew.

"They lived and let live, without greed, for their relics show many tools for grinding food and making household goods but relatively few weapons. Most of the weapons, moreover, were such as might have been needed for hunting, not defense.

"Of food, there was abundance. They enjoyed squash, corn, beans, cactus fruits, the meat from deer, sheep, gophers, rabbits and desert tortoises.

"We know they dressed well but did not overdress. Men wore only breechcloths and sandals. Women wore exquisite materials loomed in a complicated, open design. In winter, the ancients added blankets; we found well-preserved ones of woven yucca fibre with rabbit fur twisted around it, soft and warm.

"Burial pillows were found intact under the mummies' heads. We found bone awls

(Continued to page 266)

# Here are Real **WAR SURPLUS BARGAINS!**



**BALL BEARING ARBORS**

(A) Grinding and saw arbor. Has 1/2" double end shaft, 10" long with 2" center pulley. New Departure double roll precision ball bearings. Right and left hand thread. Self-aligning Dodge pillow block. 10,000 RPM Bearings alone list at \$10. Complete arbor new. Stock #305. . . . . only **\$495**

(B) DELUXE version of above arbor—has 2 and 3 inch center step pulley and 2 1/2" heavy cast aluminum pillow block. Brand new. Stock #306. . . . . only **\$595**

(C) HI-SPEED GRINDER. Heavy duty, ball bearing with heavy aluminum casting. 2 step pulley driven thru the rear or base. Precision spindle. 17" long by 3/4" or 5/8" shaft (specify size desired). 6" from base to center of spindle. Ship. wt. 12 lbs. Stock #328. NEW. . . . . only **\$1095**

**Electric Rubber Cable (ALL NEW) CORD SETS**

Extension cords, 100 ft. heavy duty. Plug, socket and guard. Number 18 wire. Worth at least \$10. OUR PRICE. . . . . **\$535** (Stock #310)

Same as above—50 ft. length. (Stock #311). . . . . **\$385**

**HEAVY DUTY ELECTRIC CABLE**

3 wire #10 rubber Tyrex cable—with lugs. 65 ft. lengths. Stock #365. NEW. . . . . **\$1300**

3 wire #10 submarine cable and lugs—can be placed underwater, underground or overhead. Also for portable tools. Will carry 40 amps. Stock #312

50 ft.	100 ft.	250 ft.	500 ft.
\$12.00	\$20.00	\$45.00	\$85.00

4 conductor neoprene covered #18 stranded tinned copper wire (two blacks & two whites). Run in parallel gives you #16 gauge. Lugs furnished for parallel run. Water & oil resistant. (Stock #346).

100 ft.	250 ft.	500 ft.	1320 ft. reel
\$4.25	\$10.00	\$19.00	\$36.00

150 ft. reels, 3 wire #8 with 4. 60 amp Crouse & Hines connectors—2 male & 2 female. Perfect for welders, hay loaders, saws, electric ranges, etc. List price \$285.00. Used—like new. OUR PRICE. . . . . **\$6500** (Stock #313)

**JARVIS GRINDERS**

2 HP, 60 cycle, 220-440 volt, 3450 RPM. Totally enclosed G.E. motor with 6 ft. flexible shaft. List price \$285.00. Used—like new. (Stock #326). . . . . **\$8500**

AS ABOVE with 1 1/2 HP motor (Stock #330). . . . . **\$7500**

AS ABOVE with 1 HP motor (Stock #331). . . . . **\$6500**

**HORNS and HOWLERS**

Motor driven (not a vibrator). Heavy duty with great power and long life. Adjustable for high, medium or low tone. 110 volt AC current. Weather proof. For alarm or signal horn on boats, school yards, factories, etc. List price \$47.00. OUR PRICE. . . . . **\$945** new. (Stock #302)



**AC ARMY LIGHT PLANTS**

New 750 watt 110 volt 60 cy. light plant with Briggs-Stratton model AP gas engine. (Stock #315). . . . . **\$14500**

New 1000 watt 110 volt 60 cy. light plant with Briggs-Stratton model BP gas engine. (Stock #316). . . . . **\$17500**

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Add \$10 for spare parts and tools.

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AC—750 watt 110 volt 60 cycle with voltmeter, rheostat, 3/4" shaft. Dimensions: 9" H x 12" W x 13" L. Wt. 52 lbs. Shielded to prevent radio interference. Mfg. by Elcor. \$125.00 value. **\$4950** OUR PRICE, new (Stock #322)

DC—300 watt, 12 volt, 2900 RPM. Heavy duty, with current cut-out relay, high and low switch, 30 amp meter, charge and discharge, Mfg. by Marathon Electric Co. 3/4 HP gas or 1/2 HP electric motor will drive it. Can be bought less shaft and base to be used direct mounted to Briggs-Stratton 1 HP engine. (Stock #323). NEW. . . . . **\$700**

Complete with base, shaft and bearing. (Stock #324). NEW. . . . . **\$1595**



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Heavy duty utility wagon with plate aluminum body 24" x 42". Sides 5 1/2" H. 3/8" steel axle with ball bearing wheels and Goodrich puncture proof balloon tires, 23 1/2" W x 10" dia. Has heavy steel under frame. Will carry 1,000 lb. load. Wide tread tires for mud, snow, gravel, etc. Will not mar floors. Ideal for newsboys, farms, grocers, factories, etc. Approx. wt. 80 lbs. Nothing like it now on the market. Sold complete or in 5 different kits: wheels only; wheels & frame; wheels, frame & platform or body. WRITE FOR FREE CIRCULAR. (Stock #332)



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Complete. Piston type with 10 gal. tank, 1/2 HP capacitor type, AC, 110-220 volt 60 cycle motor—approx. 2 cu. ft. Brand new. **\$7950** (Stock #340). . . . . only

**Assemble yourself and save \$10.**

ABOVE tank with legs and saddle. . . . . **\$1195**

AS ABOVE—1/2 HP motor, 2 cyl. Westinghouse compressor. 3 CFM at 75 lbs. . . . . **\$10950**

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Electric motor driven, portable spray painting unit for jobs requiring a larger quantity of material. Piston type, single cyl. air compressor has 2" bore by 1 3/4" stroke. 2.86 CFM. Max. working pressure 40 lbs. Mounted on base. Equipped with safety valve & drain cock. 1/2 HP capacitor type motor, 110 volt AC, with cord and plug. 20 ft. air hose and fittings. Ship. wt. 45 lbs. Brand new. (Stock #348). . . . . only **\$4250**

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Brand new piston type, 2 cyl. compressor with automatic clutch. Westinghouse model T-1. Can be run off power take-off or 1/2 HP motor. Delivers oil free air. Suggested operating pressure, 75 P.S.I. Approx. displacement 3.27 CFM at 600 RPM. Ideal for spraying, industrial work, tire inflation, painting, etc. Approx. wt. 23 lbs. (Stock #345). . . . . only **\$2250**

**KELLOG AIR COMPRESSOR**

Kellog Model 241 air compressor. Piston type with 2" x 1 3/4" bore. Capacity of 2.8 CFM at 100 lbs. V-belt drive, 3/4" shaft. Can be run with 1/4 or 1/2 HP motor. Delivers oil free air. Max. recommended working pressure 150 lbs. (Stock #349). NEW. . . . . only **\$1495**

**PORTABLE BUZ SAW**

Powered by 6 1/2 HP Briggs & Stratton air cooled gas engine. Adjustable hinge, requires no clutch. 28" blade, will take up to 12" hardwood. 1 3/4" ball bearing mandrel. Has power take-off. Complete unit mounted on two wheels with 400 x 8 pneumatic tires. Has tow bar for trailing. Wt. approx. 400 lbs. Sold complete or less blade, engine or wheels. Make \$25 to \$50 a day sawing wood with this sturdy unit. WRITE FOR FREE CIRCULAR. (Stock #350)

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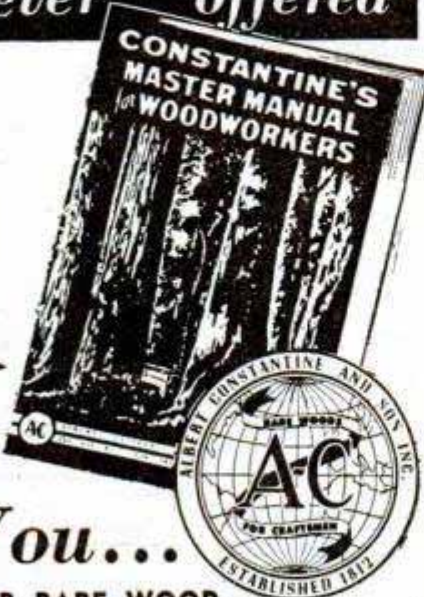
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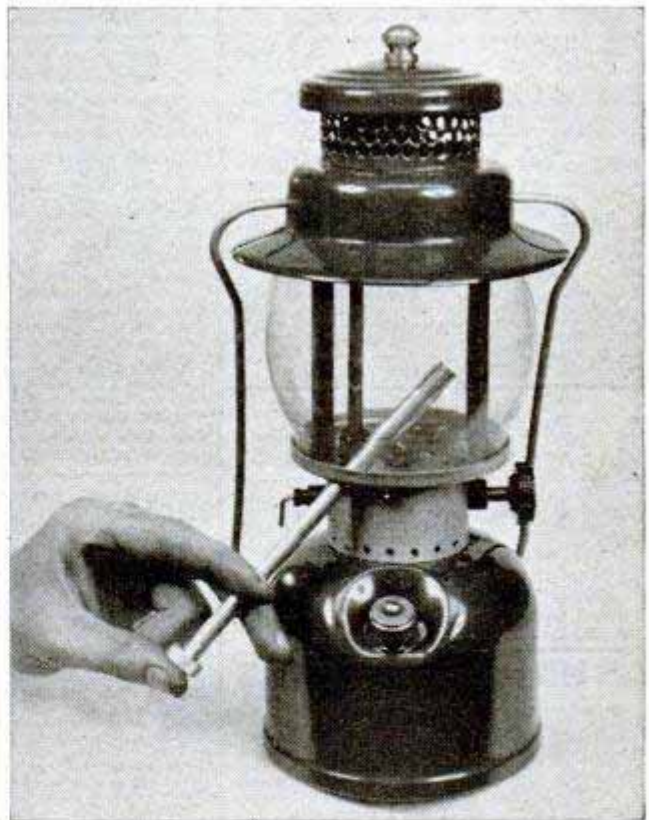
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and cactus needles with cord still threaded. Such items had not decayed over the centuries because of the moisture-free soil and air of Ventana."

For the first time, we have learned accurately what the ancients actually looked like. At Ventana were found 40 skeletons and mummies, some in excellent preservation, dating from at least 6000 B.C. to 1400 A.D. Those of 6000 B.C. and prior had long heads, in contrast to the intermediate-long heads and the round heads of men in later centuries. In the university museum at Tucson is a bust of a man, carefully restored. This citizen of Ventana, of about 1000 A.D., was a dark gentleman of medium build with long, coarse hair and a refined face, obviously far removed from savage life.

"His tribe was so much like our Papago Indians of today," says Haury, "that I am sure they were Papago ancestors. The earlier roundheads are a linkage with the Pueblo Indians of northern Arizona and New Mexico. The variations undoubtedly mean that Ventana saw a changing population, a mixing of races, and an extension of Folsom people there in some period."

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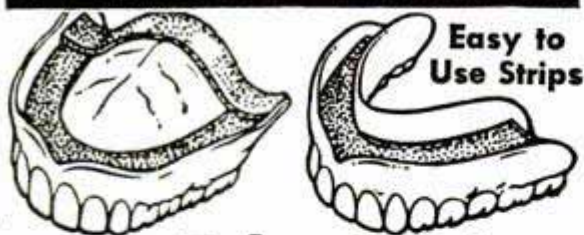
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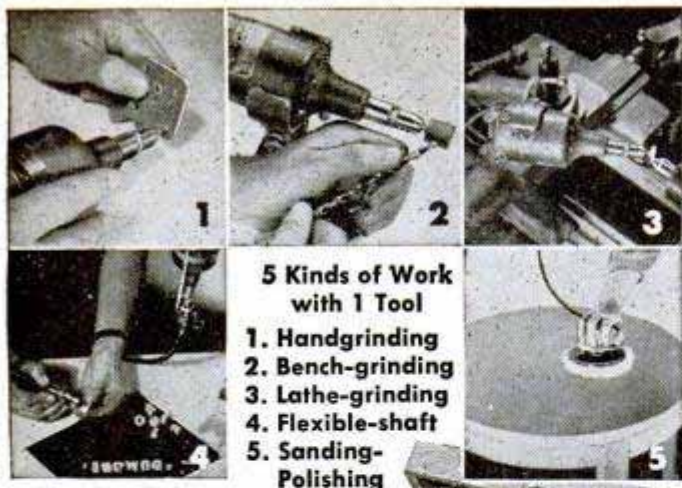
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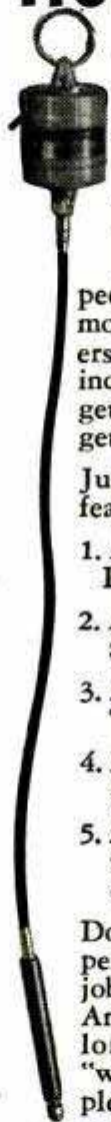
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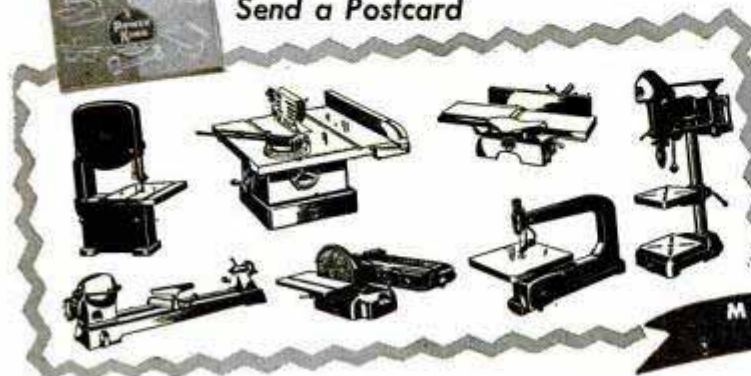
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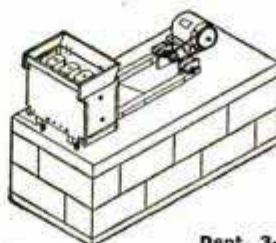
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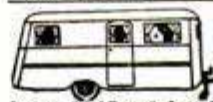
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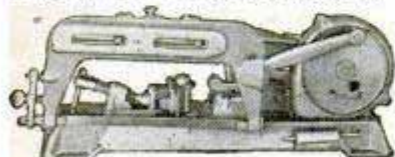
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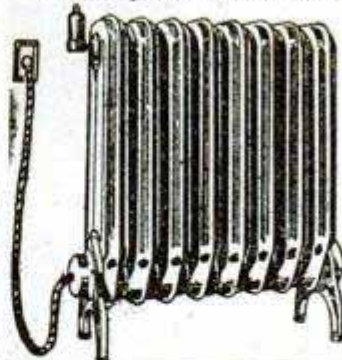
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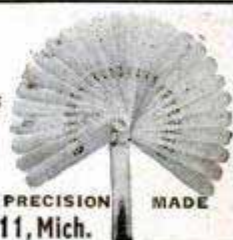
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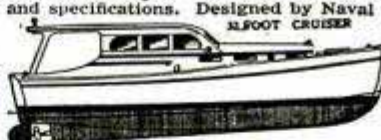
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Car owners who are wasting money and not getting proper gas mileage due to over-rich mixtures will be pleased to learn how to save gasoline by VACU-MATING over-rich mixtures. VACU-MATIC fits all cars, trucks and tractors. It is automatic and operates on the supercharge principle. Easily installed in a few minutes.

**SALEMEN WANTED!** Big Profits! Send name, address on penny postcard for free particulars and how to get yours for introducing.

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AMAZINGLY POWERFUL!!

4 oz. Alnico Magnet, lifts 10 lbs. \$1.00. Our Leader, 15 oz. Magnet, lifts 40 lbs. \$2.50. New alloy—will not weaken! Useful for lifting valuables from tanks, lakes, or rivers easily! 7 small magnets \$1.00 with list of many shop and home uses. Satisfaction guaranteed.

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## It's EASY! ECONOMICAL!



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Beat the housing shortage with a full-size house on wheels or add new pleasure to your vacations and week-ends with a sleek sport trailer. Step-by-step instructions and complete bill of materials with every plan. *Three different models.*

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**ORDER ALL THREE—AND GET ONE FREE**  
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JANUARY, 1949

## Outstanding Surplus Value!

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HUNDREDS OF ASSORTED ITEMS—A \$50 VALUE

**\$8.95** Per Complete Kit

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**SET INCLUDES OVER 300 ITEMS**

**Here is the list.**

35 Grinding and cut-off wheels, sizes 1 to 5 inches, 1/8 to 3/4 hole

10 Mounted stones—3/32", 1/4", 3/8"

3 Steel cutters 1/8"

5 Steel cutters 3/32"

1 Steel circular saw mounted on mandrel

1 Drum sander 1/2" mounted on 3/32" mandrel

6 Cut-off Wheels on 1/8" mandrel

1 One inch buff on 1/8" mandrel

1 One inch felt wheel on 1/8" mandrel

1 7/8" rubber wheel on 1/8" mandrel

2 High speed rotary files 1/4" shank

100 3/4" cloth butterfly abrasive discs

1 One inch wire wheel 5/8" hole, brass center

10 Cloth abrasive discs

3 Sheets crocus cloth 9 x 11

1 Box paper discs—100

2 Leather wheels

1 Roughing stone

1 Bristle brush 3", 5/8"

10 Sanding rolls

3 Honing stones

1 hole, brass center

6 Sanding sieves

2 Felt bobs

1 Rag wheel—4 inch

In sturdy compact container 13 1/4 x 9 1/4 x 2 1/2", weight 8 1/2 pounds; with installed rack for all drills.

**Satisfaction Guaranteed**

**8 HIGH SPEED ROTARY FILES**

1/4" Shank .. **\$3.95**



**20 MOUNTED STONES**

Assorted 1/8" and 1/4" Shank .. **\$3.95**



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**\$8.95** Complete with Motor Chuck

I enclose \$ \_\_\_\_\_  Check  M.O.  Send C.O.D.

(Encircle items wanted)—WHEEL KIT, ROTARY FILES, MOUNTED STONES, DRILL GRINDERS.

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# NOW YOU CAN SHAVE IN YOUR CAR!

Just plug this conversion Unit into your dash cigarette lighter receptacle—and connect your AC-DC electric shaver to unit! Prestol You're all set to shave right in your car anytime. Fast—simple—compact—durable—very low current drain. 6 Volt DC input. Unit is also ideal for operating 3-way portable radios in car. Unit is complete with cord and plugs. Order **\$7.95** post MF 102. Price: Only..... paid

## ELECTRIC MOTORS

Pictured at right: 110 Volt AC approx. 1/30th HP Motor. Heavy-duty construction, ball bearings, 3500 RPM, size: 6 1/2" long by 4" high, shaft size: 3/8"x3/16". Ideal for power tools, fans, models, blowers, etc. Order MH 102. **\$3.95** Post-Price..... paid



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—Homelite Engine: Consists of a 30 Volt DC, 50 ampere (1500 watt) generator driven by a single-cylinder, two cycle air-cooled gasoline engine, approx. 3 HP. Rope or electric starting. Illustrated at left. Shipped freight collect. Order MG 105.

Prices: As is... **\$39.50** Tested... **\$49.50**



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lawn mower sharpening at low cost!

**\$4250**

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turn spare time into dollars

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Installed in a few minutes with ordinary tools. Complete, simple instructions. Just replace regular gas-cock with **ERIE TIME-O-GAS**. Set knob to burn from 2 to 55 minutes. Device shuts off automatically! Works on manufactured, natural, mixed gas. Use with or without pilot. Pilot lighter included free with each unit. Described in October Popular Mechanics, page 121. Send **\$8.95** for postpaid **ERIE TIME-O-GAS**; or C.O.D. plus postage, or write for free information. Models for incinerators and other gas appliances also available.

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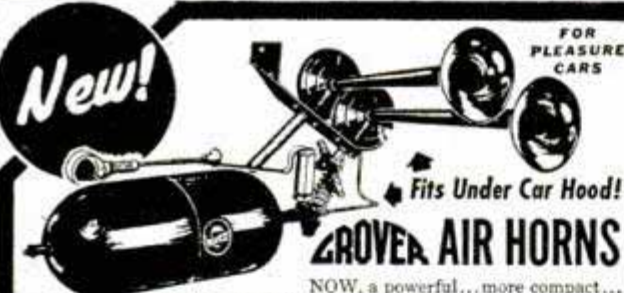
**\$3** With Instructions



Operates from 4 or 6 volt Accumulator or A. C. Transformer. Print your name and address and order with international money order only. Post Free.

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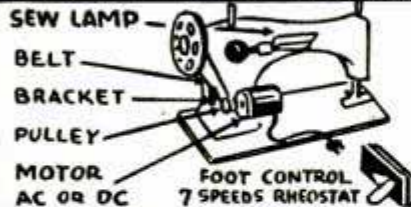
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NOW, a powerful... more compact... easily installed high pressure air horn and air tank assembly that fits on firewall or side splash pan under car hood! **FACTS NOW!** Spun brass bells, true-tone harmony, heard for miles! Complete assembly features two matched GROVER air horns, self-filling air pressure reserve tank, bronze diaphragms, brass valve, control handle and all necessary copper tubing, rubber hose and fittings. Instructions furnished. Satisfaction guaranteed. If your dealer cannot supply you, write for facts NOW with make, model and year of your car to **GROVER PRODUCTS CO., 1217 S. Hope St., Los Angeles 15, Calif.**

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I am enclosing \$15.95  check  money order or  send C. O. D. and I pay postman \$15.95 plus a few cents postage.



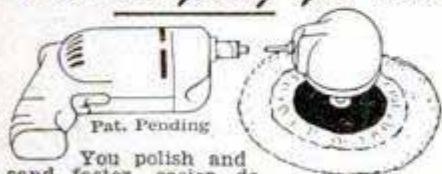
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The only attachment for angle-head electric drilling.

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Why Pay More and Get Less? Only the BULL BUFFER

Has everything you want in a polisher-sander!



You polish and sand faster, easier—do beautiful, professional work—with this amazing attachment for your electric drill. (You can also drill up to 1/2" with your 1/4" drill and at right angles never before possible!) Bull Buffer more than pays for itself the very first time you make your car, floors, woodwork, furniture gleam like new. It's built of lifetime materials and guaranteed. Thousands and thousands of satisfied users. At your dealer or send cash, check or money order for your Bull Buffer, complete as pictured. Only

**\$9.95**

**BERTRAM K. ENGINEERING CO.**  
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1. Fits any chuck on an electric drill or flexible shaft—no extra power unit to buy!
2. Only Bull Buffer has gear reduction—the power to do any job without injury to your electric drill!
3. Only Bull Buffer has swivel action—turns in complete circle when drill is stationary!
4. Only Bull Buffer has angle head for electric drill—gets to all hard-to-reach surfaces, curved or flat!
5. Only Bull Buffer has 3 speeds\* — "same as," 1/2-speed, or twice speed of your drill!

\*See description under photo of Bull Buffer kit.



Bull Buffer comes complete with sheepskin bonnet and two sanding discs, only \$9.95. Bull Buffer alone cuts drill speed 1/2; for direct drive (or "same as") drill speed, order Adapter A with Bull Buffer; for twice drill speed, order Adapter B.

**ORDER THESE ACCESSORIES FOR YOUR BULL BUFFER**

1 1/2" Jacobs No. 6425 key chuck; with Bull Buffer, increases 1/4" drill to 1/2" capacity — reduces speed, increases power	\$5.00
Extra sanding discs (000-00-0-1-2 1/2-3-4) each	.10
2 1/2" cup wire brush for removing paint, rust, scale, etc.	1.75
Extra sheepskin bonnet	1.25
Adapter A—for direct drive at "same as" drill speed	1.00
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**RUSH NAME for FREE** Selling Outfit



One of many fast selling combinations of straight and half circle tubes.

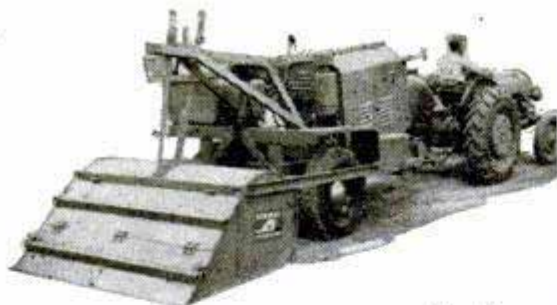
**BRAND** new — Cash in quick and big on tremendous demand for Fluorescent Fixtures with the sensational new WESTINGHOUSE Circl-Arc Lamp. Half circles of brilliant, economical, beautiful Fluorescent Light. Nothing like them ever shown before. Old-style straight tube fluorescents can be bought anywhere, but you'll be **FIRST** with WESTINGHOUSE Circl-Arc—the biggest lighting scoop in history. New buyers—new profits waiting everywhere!

**FREE** Send Name on Penny Post Card for Complete Selling Outfit showing more than 100 Different Fixtures. Rush name today —have profits next week.

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SCORES OF NEW MODERN DESIGNS SELL ON SIGHT





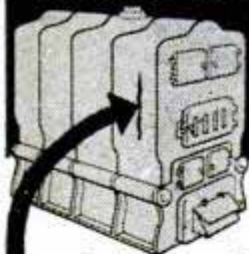
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**SEAMAN ROTARY TILLER**  
*Can do ALL THIS for You . . .*

- Prepare land for planting, generally in ONE PASS. Many Seaman owners till and plant at same time.
- Handle entire job of Seedbed Preparation with ONE MACHINE . . . at lower Horsepower Hours cost.
- Make Seedbed best suited to your soil and crop conditions . . . pulverize fine or coarse, as desired.
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Also, latest motorized Seaman Tillers can be adapted to heavy-duty belt work or to operate our high-capacity portable irrigation unit. **ORDER YOUR SEAMAN TILLER NOW!** 20 models, 3 ft. to 7 ft. tillage widths, power take-off and gas- or diesel-powered. See your Seaman dealer and write for Bulletin NST.

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*Save*  
**Fuel Costs**

Seal up every heat-wasting crack, opened seam and other leak in your furnace, boiler, tank, radiators and piping *tight*—as professional repair men do—with Smooth-On No. 1 Iron Cement. Do it yourself—now—and cut this winter's fuel bills. You apply Smooth-On like putty, it hardens like metal, and *stays tight*, because it expands slightly as it sets. Buy Smooth-On No. 1 in 1 3/4-oz., 7-oz. or 1-lb. size at your hardware store. If they haven't it, write us.

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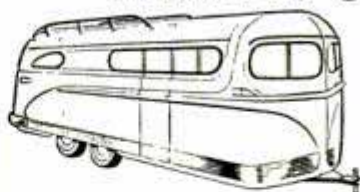
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THE IRON CEMENT OF 1000 USES



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supplies all parts to size for quick, easy assembly of complete metal trailer body—Roof Caps, Roof Bows, Doors, Complete Chassis, Roof Corners, Roof Ends. Build this modern

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*Write* for complete working plans showing detailed construction, location of parts for 12 ft., 16 ft., 20 ft., 24 ft., 28 ft. and 32 ft. lengths. Only **\$100**

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*Fits all cars — chrome plated*  
**DEEP TONE**

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Kit contains carved hull and complete set of fittings. Send today for kit #1225 which will be sent postpaid for \$15.00. Our 40 page illustrated catalog mailed on receipt of 25c.

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Operates spray guns, rock drills, tampers, paving breakers, sandblasting . . . Uses only 1 gallon of gas an hour!



Save Money—build your own Smith Air Compressor! Famous the world over! Capacity 60 cu. ft.; pressure up to 100 lbs. per sq. inch. Just order the Smith Compressor Head and Accessories with complete instructions for assembling. All you need is a Ford Motor and shop facilities. Head equipped with high speed compressor valves; automatic unloading and idling.

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Compare Your Present Rear Window with the Improved "FULL VIEW."



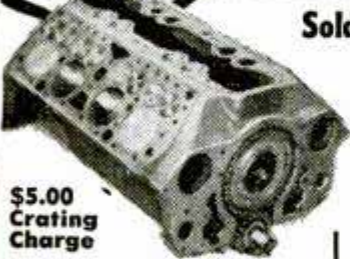
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Made to Fit these Cars:  
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 Shipped PREPAID anywhere in U.S.A., only. Each..... **\$25.00**

Carries the Same 90 DAY GUARANTEE As a New Motor Assy.

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Rebuilt by skilled mechanics. Assembly has Rebornd Block with New Pistons, Pins, Rings, Reground Crankshaft, all New Bearings. Guaranteed 90 Days. Allowance on Old Motor We ship at outright price. Send your motor prepaid, must be suitable for rebuilding. Send in notarized bill of sale showing title number if any. We refund difference when we receive your motor.

\$5.00 Crating Charge

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34-47 8 cyl.	\$219.00	\$175.00
<b>CHEVROLET</b>	Outr.	Exch.
29-47 6 cyl.	135.00	105.00
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34-47 6 cyl.	174.50	142.00
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35-36 6 cyl.	\$191.00	\$147.00
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<b>LINCOLN-ZEPHYR</b>		
36-37 also	Out'r.	Exch.
fits 38-39	252.00	202.00
39-40	394.00	244.00
<b>MERCURY</b>	Outright	Exch.
39-47 V8	169.00	119.00
Oldsmobile	Outright	Exch.
37-47 6 cyl.	187.50	147.50
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<b>PLYMOUTH</b>	Outr.	Exch.
1932 4 cyl.	149.00	124.00
33-47 6 cyl.	160.00	130.00
<b>PONTIAC</b>	Outright	Exch.
37-47 6 cyl.	187.50	147.50
35-47 8 cyl.	219.00	175.00
Studebaker	Outright	Exch.
35-47 Comm.	191.50	147.50
39-46 Cham.	169.50	136.50
35-47 8 cyl.	219.00	175.00

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As Low as **\$24.95**

### "ZIPPER TYPE" REAR CURTAIN

Each top packed complete and consists of main top proper, rear curtain and all needed binding and fittings. (Glass is not supplied—use glass from top being replaced). Best quality, laboratory tested—equal to or better than the original. All metal parts are of heavy bright chrome plated rust resistant. Tops are heavily stitched with treated thread and sewed for durability and appearance.



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CADILLAC	1936-48	41.75	Terra to '38	1936-40	\$39.95
CHEVROLET	1936-48	39.50	HUDSON	1941-47	46.95
CHRYSLER	1935-38	33.00	LASALLE	1936-40	41.75
CHRYSLER	1940-48	39.50	MERCURY	1939-42	37.95
DE SOTO	1935-38	33.00	MERCURY	1946-49	39.95
DE SOTO	1940-48	39.50	NASH & LAFAYETTE	1937-41	39.95
DODGE	1935-38	33.00	OLDSMOBILE	1936-48	41.75
DODGE	1940-48	39.50	PACKARD	1936-48	45.95
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NOTE: Specify color wanted also Model or Series. Body Style, Year & Make when ordering.



## 60 HP. JEEP Engines

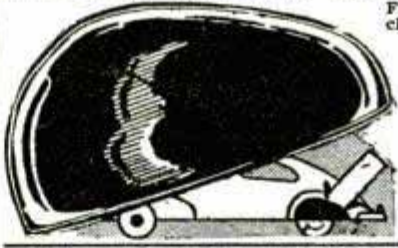
Reconditioned, Tested and Guaranteed in perfect running order and ready to run. Every part is checked to be perfect and carries a 90 Day Guarantee same as a new engine.

COMPLETE with . . . Generator, Starter, Distributor, Coll, Fan and Fan Belt, Water Pump, Fuel Pump, Intake and Exhaust Manifolds, Carburetor, Oil Filter, Spark Plugs, Flywheel, Clutch and Pressure Plate, Wiring.

Outright, **\$179.50**  
 PG58R-003, Ea.

\$5.00 Crating Charge

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For most makes of cars including '49 Ford & Mercury. Made of all metal, prime finish, with Rubber beading to prevent rattle. Easy to install.

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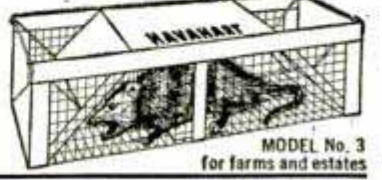
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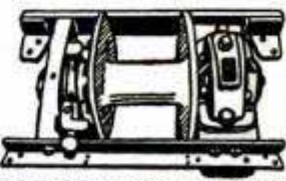
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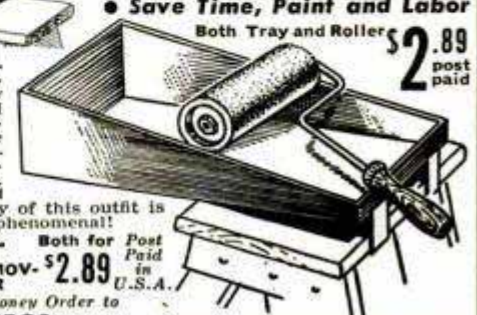
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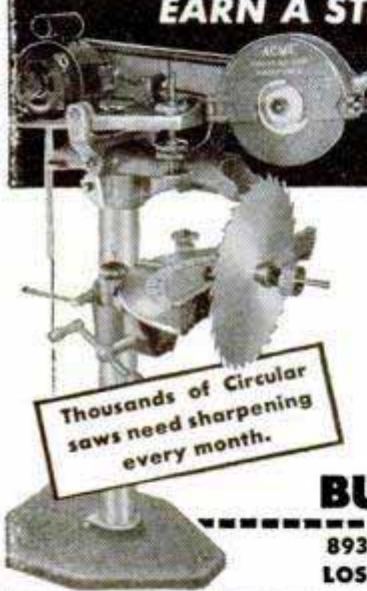
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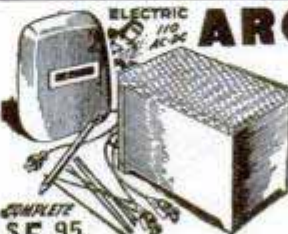
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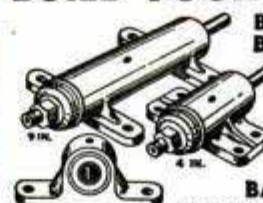


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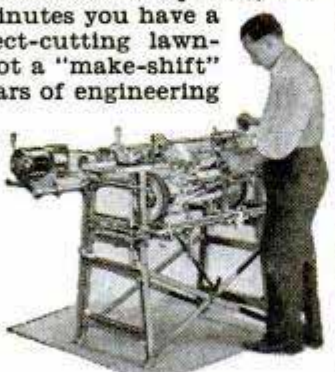
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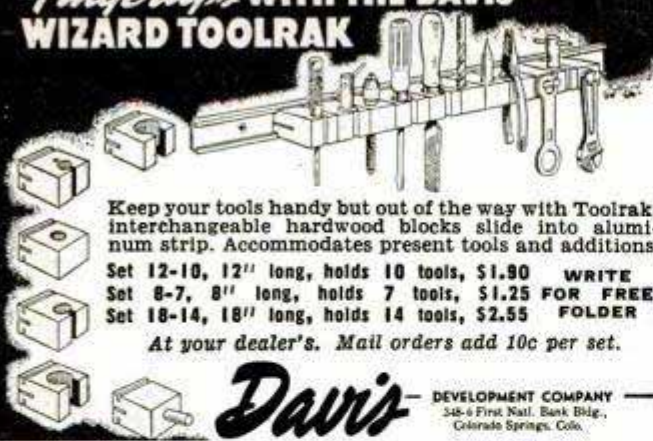
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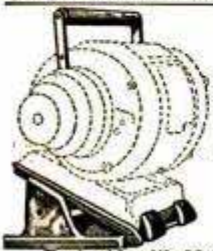
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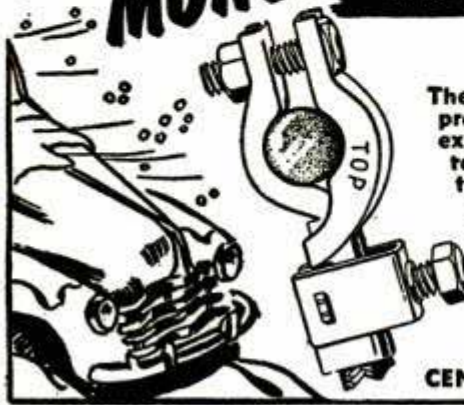
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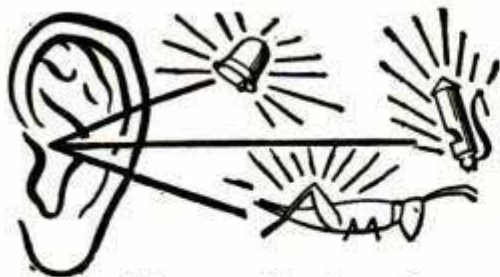
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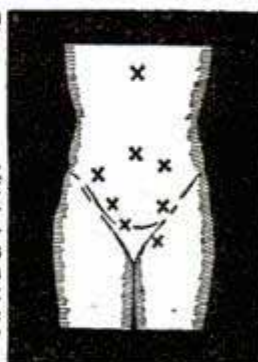
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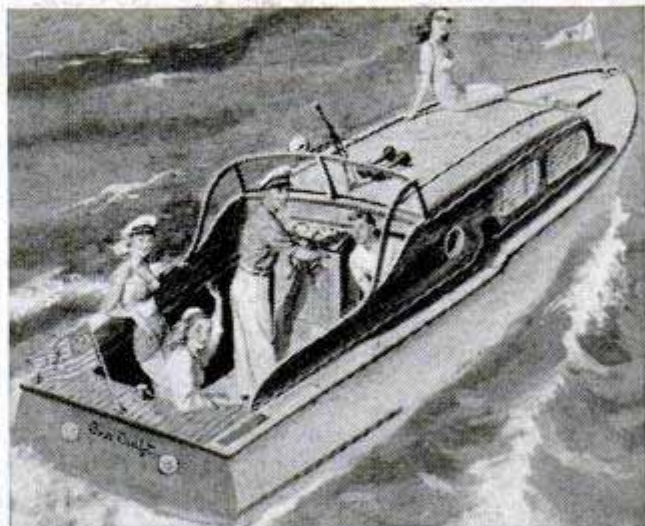
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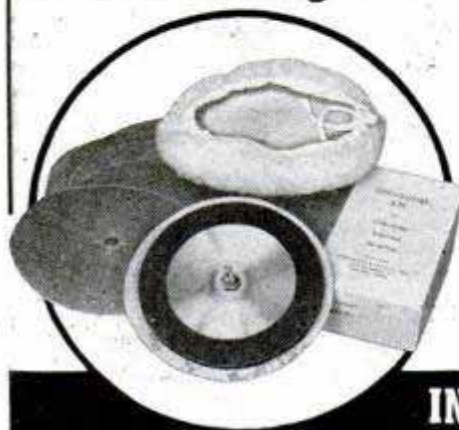
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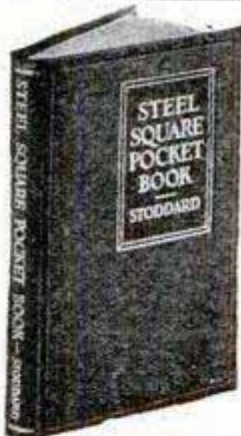
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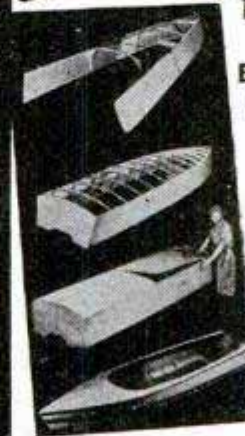
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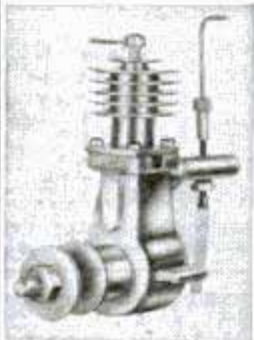
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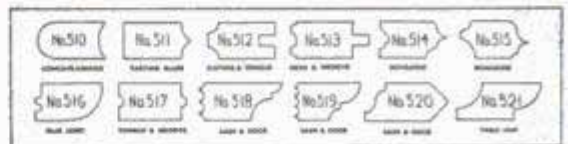
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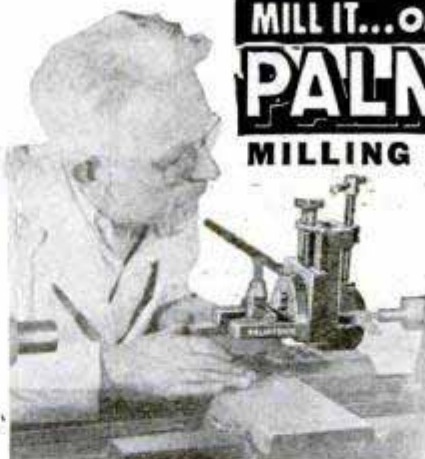
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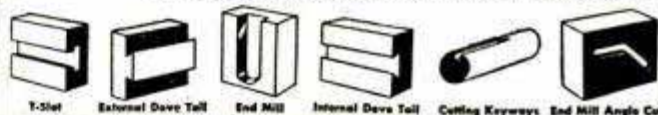
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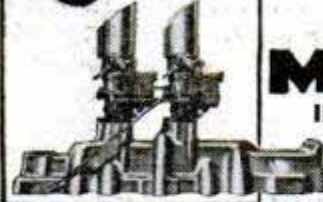
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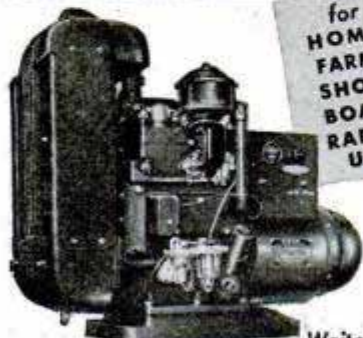
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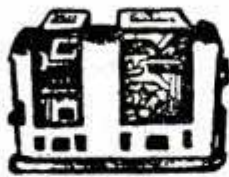
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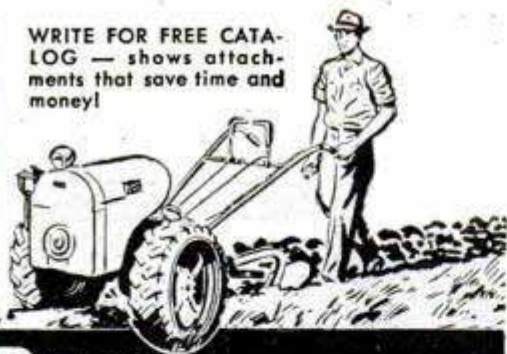
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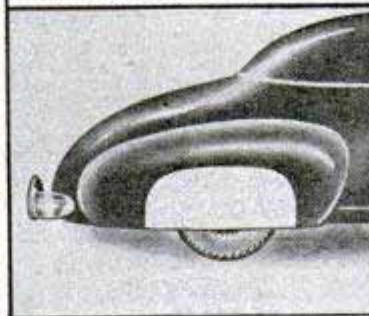
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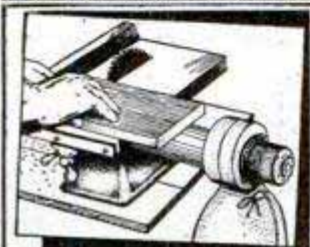
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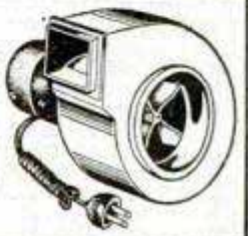


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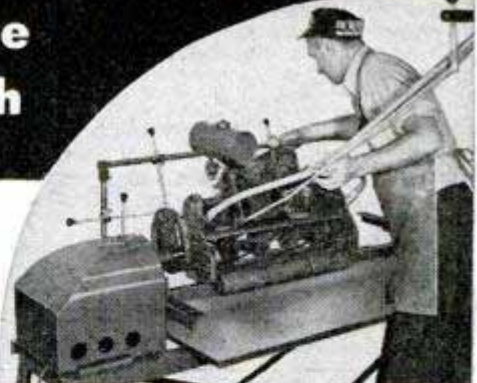
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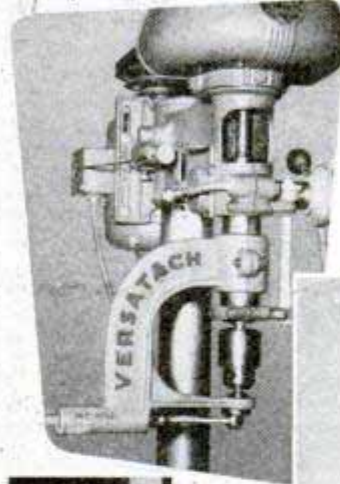
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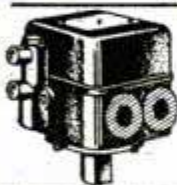
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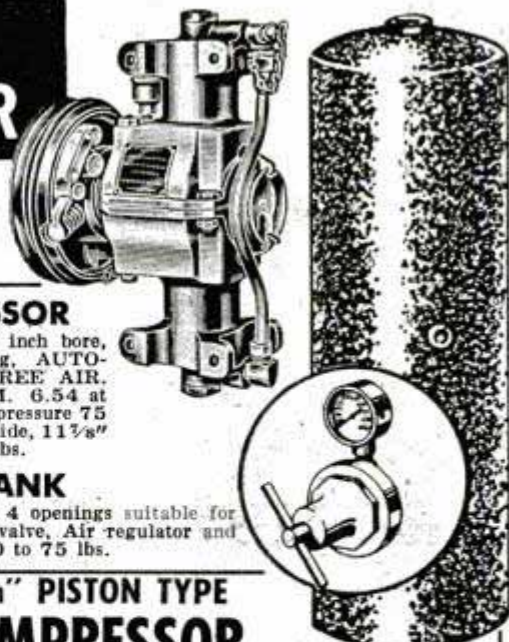
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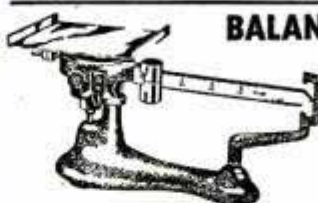


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## POLAROID GOGGLES

Rubber frame with head strap. Has interchangeable clear and tinted lens.



**69c**

## RUBBER BALLOONS

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9x12x3 1/2". Shoulder strap. Canvas bag, 4 compartments. 6 pencil holders plus slots for rulers, etc. Perfect campers bag, for hikers, for school. Used in perfect condition.

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Uses 2 dry cell batteries. Excellent for mechanics who need to get into close quarters etc. O.D. color. Has rheostat to control brightness. Sold without batteries. Shpg. wt. 2 lbs.

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This power plant consists of a gasoline engine that is coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run any of the surplus items that require 24-32V-DC for operation. The price of this power plant tested and in good condition is only \$79.95 F.O.B. Buffalo, or we can supply in strictly "as is" condition for \$58.95 F.O.B. New York City. These latter are exactly as received, in heavy steel strapped govt cases, and we are unable to determine if the individual units are new, or what the condition is if used, while the \$79.95 are some of the same that we have brought to Buffalo for testing and repair if necessary. We do not recommend gambling on the "as is" condition, except for quantity purchasers. We can also supply a converter that will supply 110V AC from the above unit or from any 32V DC source for \$12.95.

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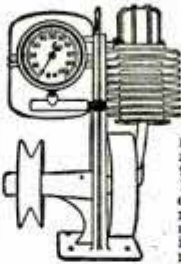
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Swell for hunting, water, sports, skiing or "bundling". As coveralls for cold outdoor, or farm work. Made of 100% woven wool with extra flannel inner lining giving double warmth & utility. Wiring so fine, Beriberi it does not interfere with movement. Can be used with or without heating. Sizes 36 thru 46. Only \$3.49

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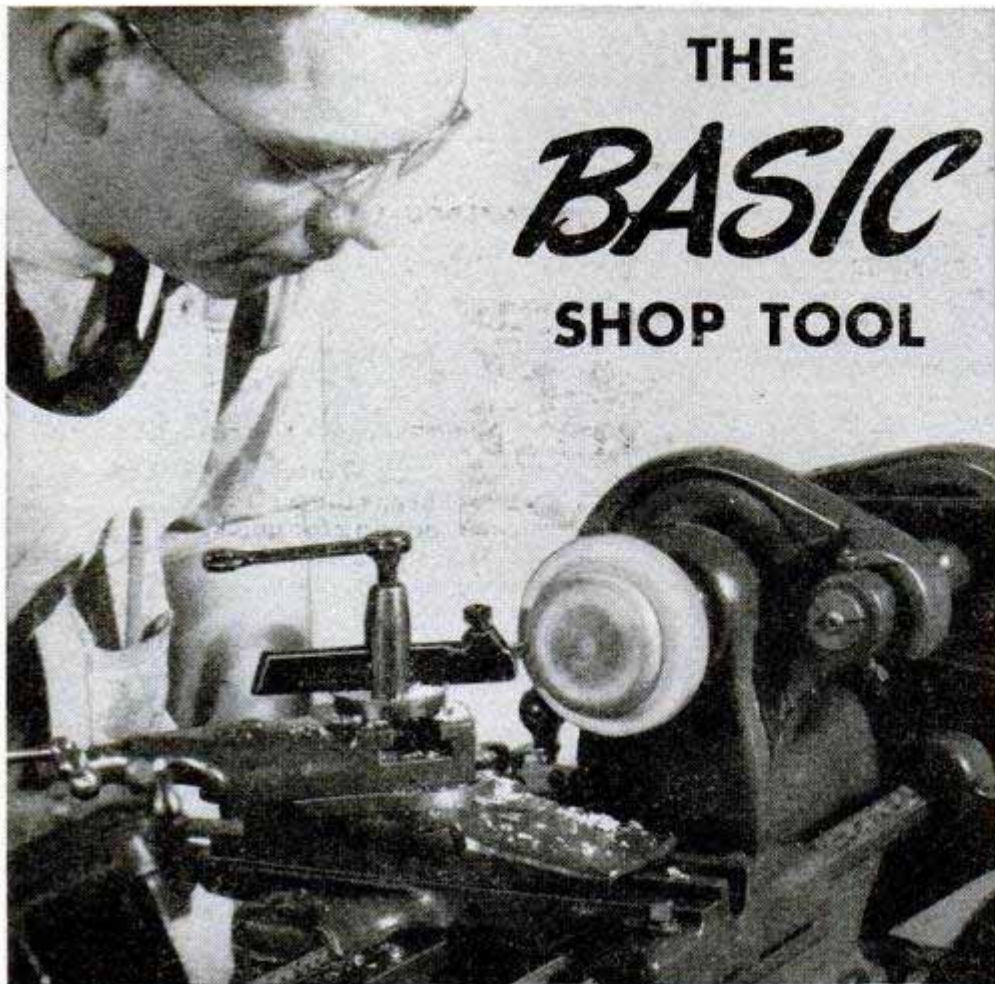
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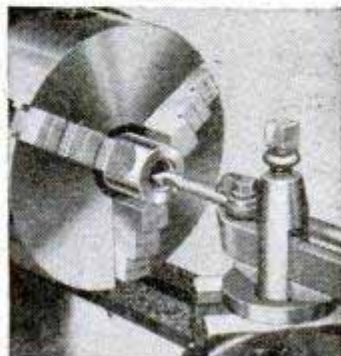
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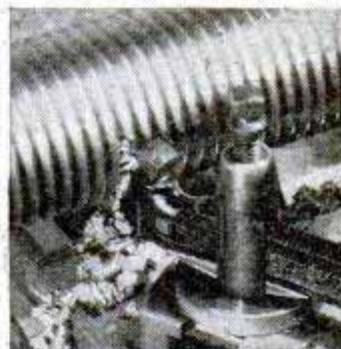
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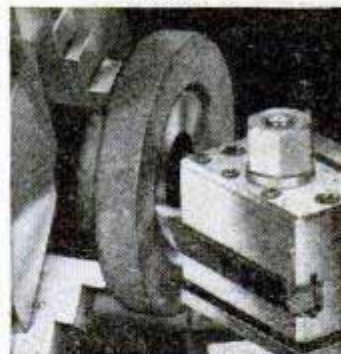
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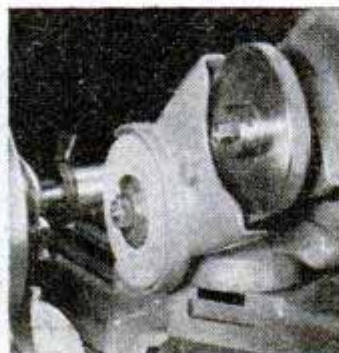
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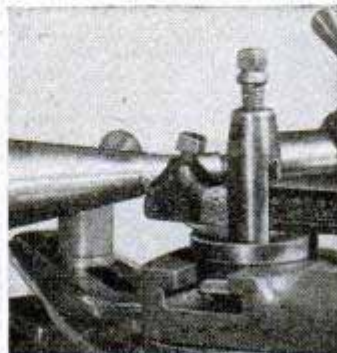
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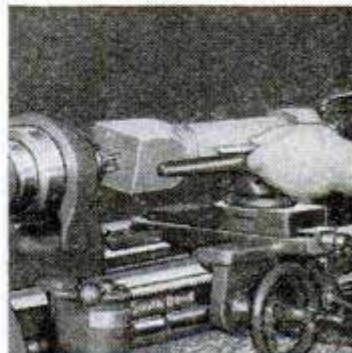
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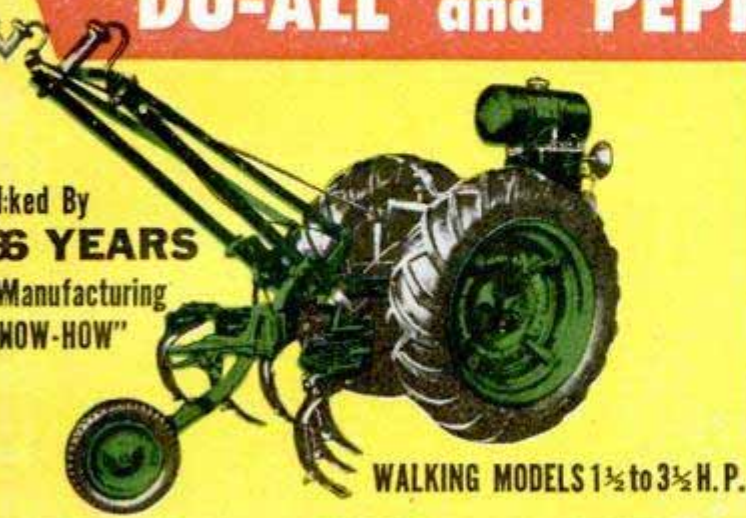
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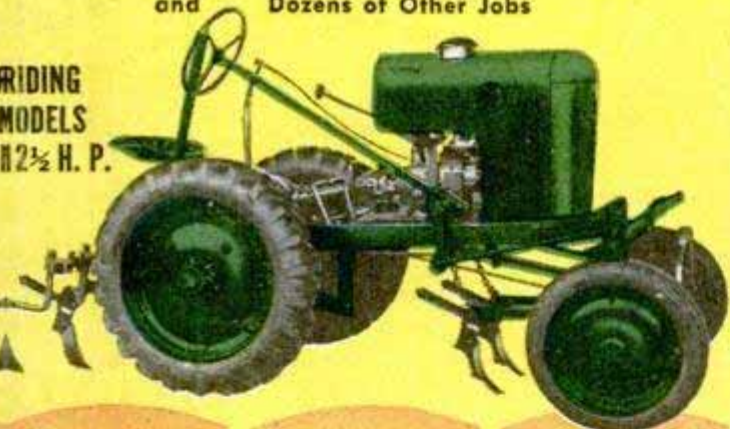


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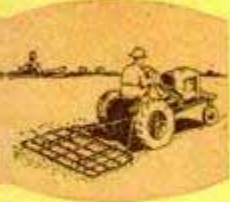


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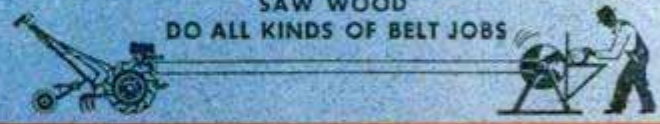
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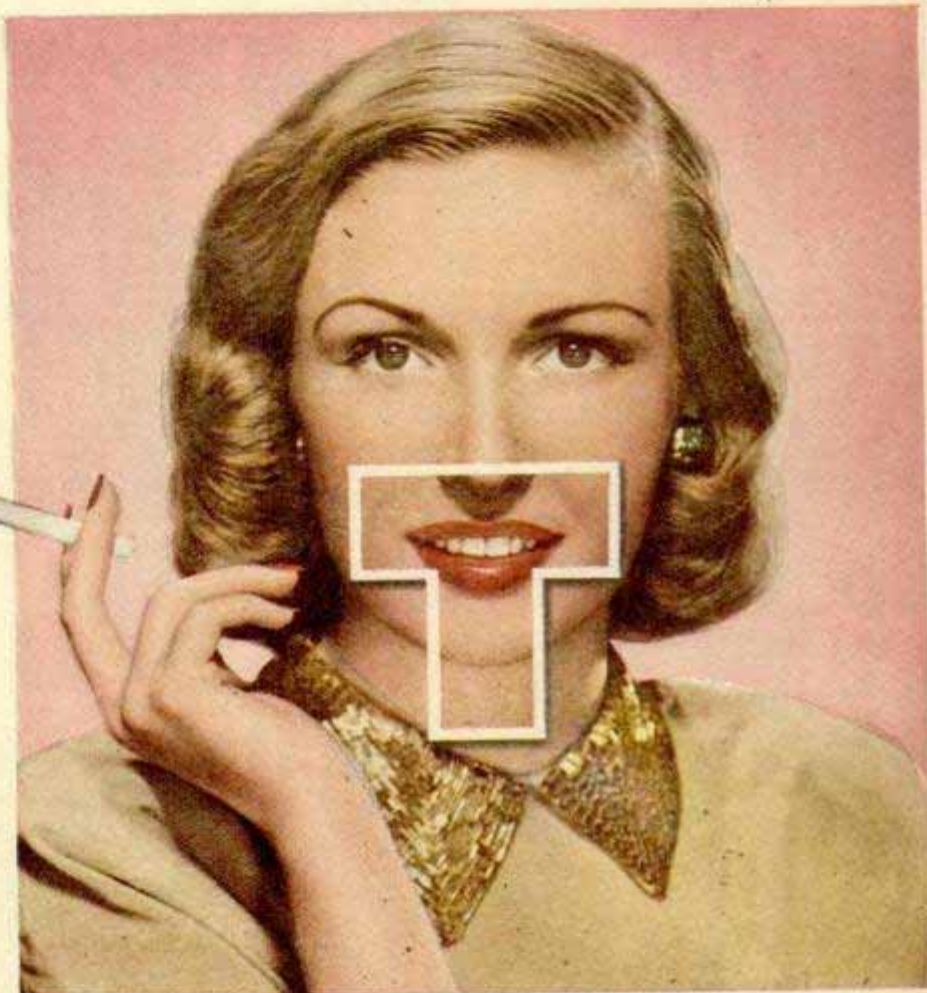
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