

ANC

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK, GREAT BRITAIN, No. 410428

U.S. PAT. OFF.

JULY 1947
25 CENTS



BUBBLE BOAT
PAGE 88

"De LUXE" YOUR TIRES IN 5 MINUTES!

...Snap on metal

Lyon
WHITEWALLS*

*TRADE MARK



...and add the **final touch** of smartness!

The easiest way to make your car look a hundred per cent smarter is also the most inexpensive and practical. Snapping on metal Lyon Whitewalls takes less than five minutes. They cost less than half what you used to pay for white sidewall tires . . . are *easy* to clean . . . *can't* scuff on curbs . . . have *no* upkeep expense . . . and they achieve the car-appearance

designers have always sought—even *smarter* wheels to give your car a *longer, lower* look than ever before! Ask your dealer to show you Lyon Whitewalls next time you stop for gas.

★ ★ ★

PRICES: Standard Steel Model (16" Wheels) \$6.95 Set of Four. De Luxe Steel Model (15" and 16" Wheels) \$9.95 Per Set of Four. Sets of Five Priced Higher. A Lyon Trade Product Sold Under Applicable Fair Trade Laws.

WHITEWALLS* ARE THE EXCLUSIVE TRIM RING PRODUCT OF LYON, INCORPORATED, 13881 WEST CHICAGO BLVD., DETROIT 27, MICHIGAN



Typical example: the B. F. Goodrich tire that outwears prewar tires

THERE'S always a chance that any tire, of any make, will roll an impressive mileage if all factors are just right. But it's more than chance when *all four* of the tires on a car used for hauling on gravel roads deliver over 30,000 miles each—and are still going strong.

Let Bill Hamilton, who drives for the Pacific Guano Company, Berkeley, California, tell the story in his own words:

"My territory was in a farming area. Many of my miles were over gravel and dirt roads. My four B. F. Goodrich Silvertown tires took an awful beating, for I traveled better than 1,000 miles a week, hauling a sack loader be-

hind the car. Despite these conditions, my B. F. Goodrich tires have covered over 30,000 miles each. There still remains enough tread for several thousand miles more, but since the weather is wet, I will take no chances and will recap them now."

Pipe in hand, Mr. Hamilton appears above, pointing to one of these 30,000-mile tires. He concludes, "I have received nearly half again as much mileage from these tires as I did from prewar tires."

One reason B. F. Goodrich tires outwear prewar tires is that the tread is *wider* and *flatter*. This improved tread supports the weight more evenly, spreads the wear,

absorbs the pounding of rough roads. Today we are receiving letter after letter from pleased B. F. Goodrich owners telling us that this wider tread works out as well in practice as it does in theory—gives more miles of service than any prewar tire they ever owned.

If you need tires, it's probably good news to you to know that your B. F. Goodrich dealer now has most sizes right in stock. You can probably get tires right off his rack without waiting. *Talk to your B. F. Goodrich Company, Akron, O.*

B.F. Goodrich
FIRST IN RUBBER



Big boat . . .



Little boat . . .



There's an



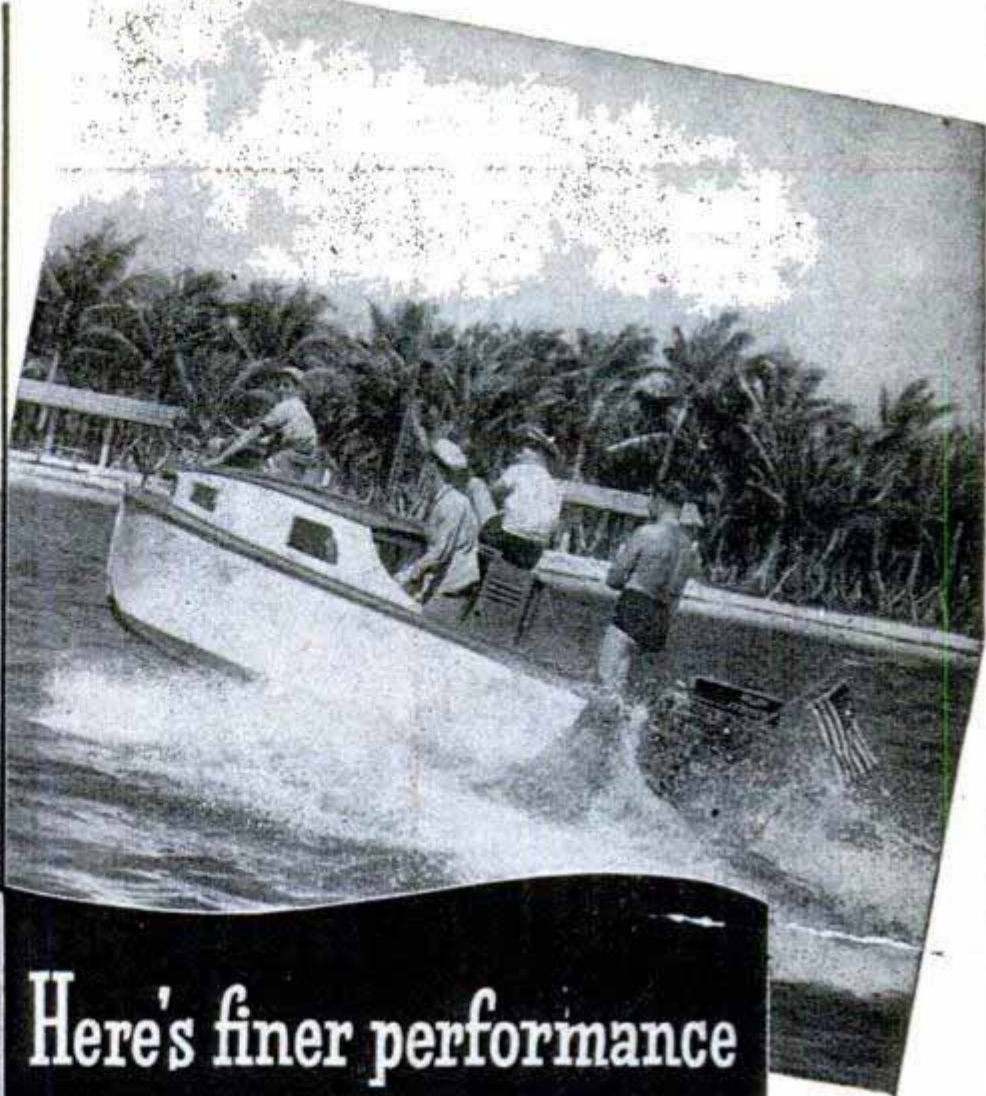
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Popular Mechanics Magazine

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



GETTING intimate with lions is all in a day's work for our editors and photographers. When Frank Fritz, PM cameraman, wanted a lion closeup for "School for the Big Cats" (page 80) the trainer handed him a whip and invited Frank into the cage. Cliff Hicks, assistant editor, stepped in with him and shot this picture while Frank was trying to convince his ferocious models it was all in fun. The lions weren't impressed.

NEXT MONTH Stanley Hiller, Jr., young inventor of the first practical co-axial helicopter, answers the question you've been asking—How soon will helicopters be ready for you? Other August features include a story of the speed runs on the Utah salt flats and an article by J. A. Krug, Secretary of the Interior, "Teaching Old Rivers New Tricks."

HOW to row, row, row your boat and really get some place is the theme of a practical article in next month's Craftsman section. Also, you'll appreciate the bending brake described in another story if you've ever tried to make right-angle bends in sheet metal. Photography fans will be intrigued with a "workable darkroom" where articles are never mislaid.

RADIO ham beginners will find an excellent 5-band phone and CW transmitter featured next month in the Radio and Electronics section.

Volume 88

JULY 1947

Number 1

Managing Editor.....	Roderick M. Grant
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For the Craftsman

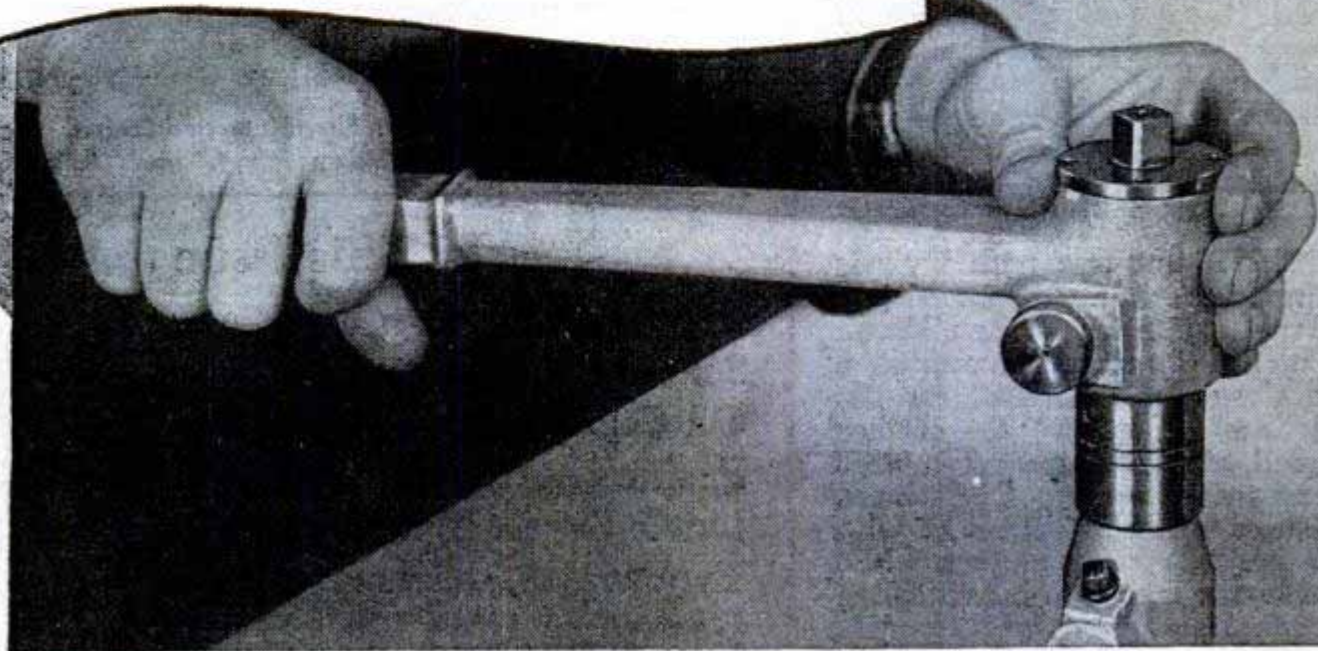
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Published monthly by POPULAR MECHANICS COMPANY, 200 East Ontario Street, Chicago 11, Ill. H. H. Windsor, Jr., president; Paul H. Dunakin, vice president and general manager; D. F. Windsor, vice president and secretary-treasurer; William Harrison Fetridge, vice president and assistant to the publisher; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 25 cents; subscription rates in United States and possessions, Canada, and countries of the Pan-American Postal Union, 1 year, \$2.50; 2 years, \$4.50; 3 years, \$6.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 60 days in advance so you will not miss an issue. Give both old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Copyright 1947, by Popular Mechanics Company, Copyright under International Copyright Union. Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

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To Help You
Simplify Production



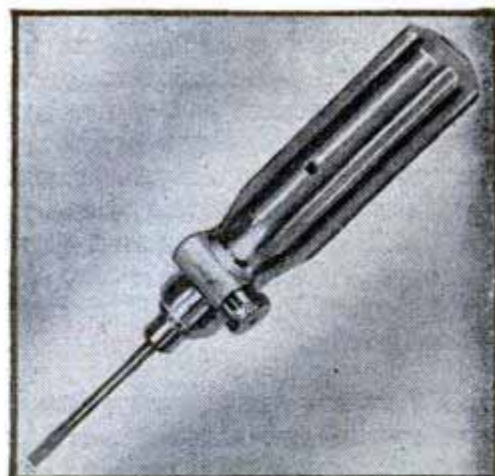
New Type of Torque Tools Incorporate Spring Clutch!... Are 98% Accurate!

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The Wrench offers right and left-hand drive, ratchet action and withdrawal. Spring clutch may be set from 0 to 500 inch pounds. Standard sockets are interchangeable. The Screw Driver may be set for any value of torque from 0 to 35 inch pounds. A ratchet action is incorporated. The same tool will also withdraw screws. Standard bits, including socket types, may be easily inserted. The tool is made of pressure cast aluminum.

Another Time-Saver on the job, is chewing gum. The act of chewing aids the workers' concentration—seems to make the work go easier. Chewing gum may be used even when workers' hands are busy; reducing interruptions from the job. For these reasons many plant owners have made Wrigley's Spearmint Gum available to everyone.

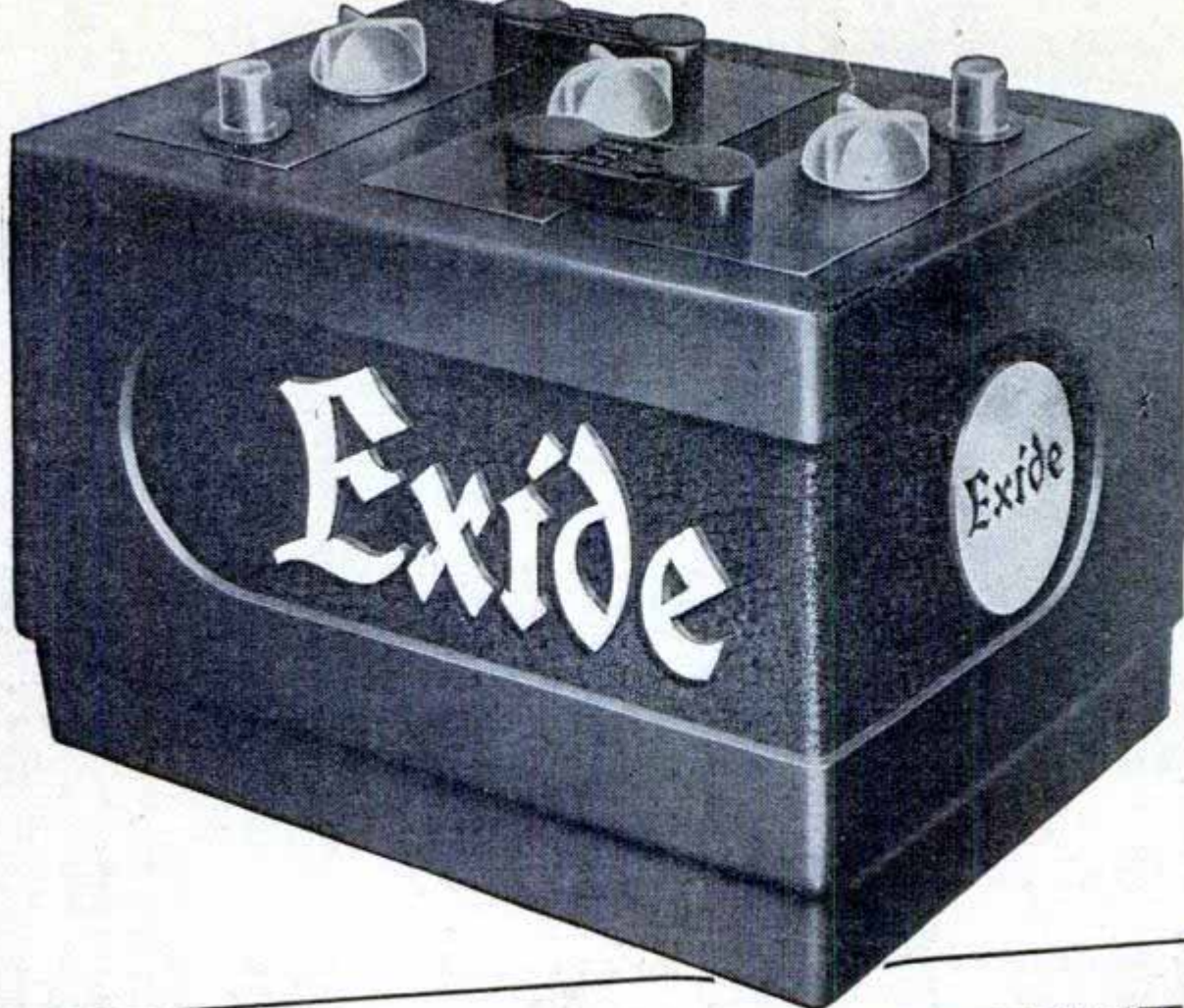
*You can get complete information from
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Torque Screw Driver



AB-68



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WHEN IT'S AN EXIDE : : . YOU START

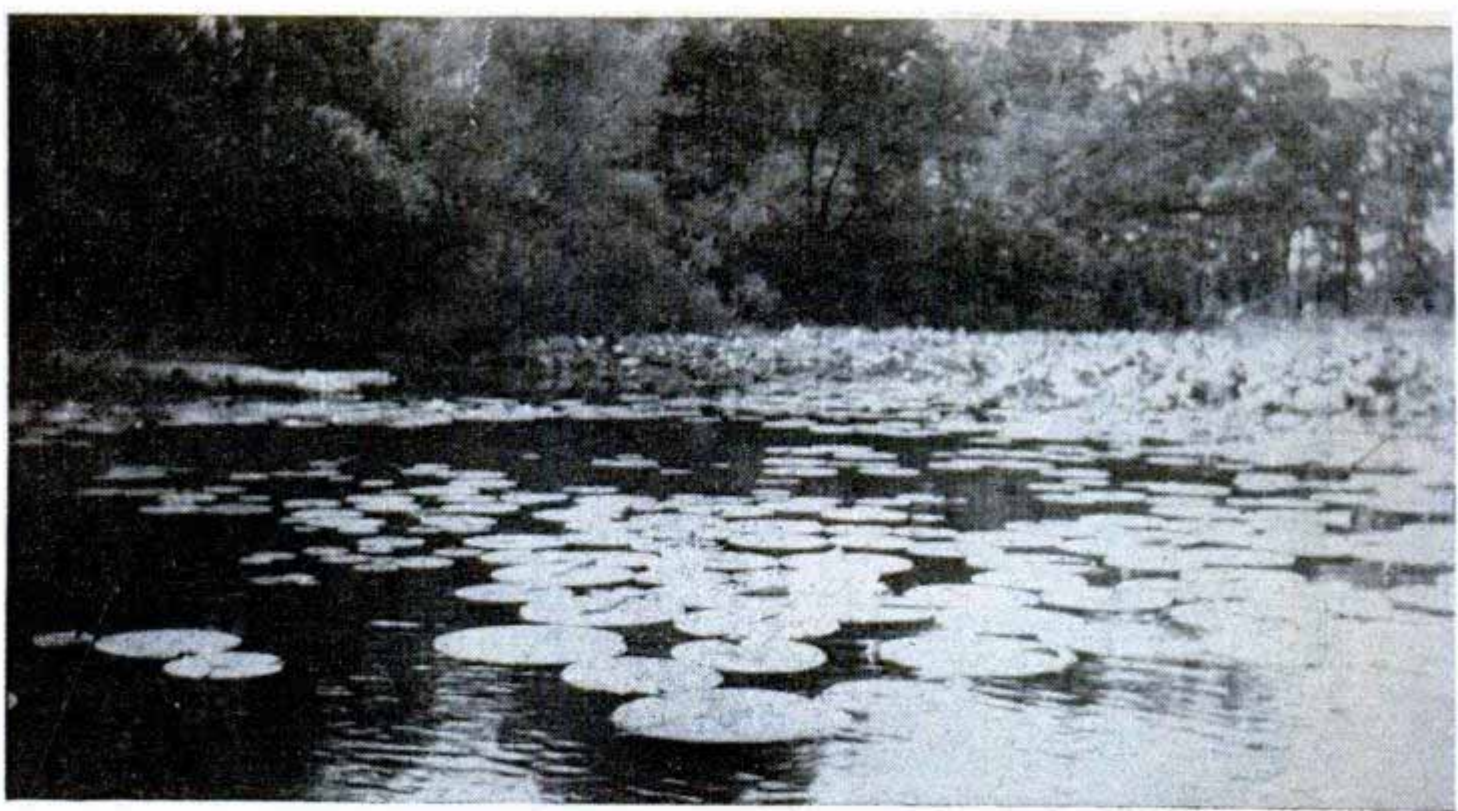
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

Exide Batteries of Canada, Ltd.

This One



EU2H-EKS-J79U



No. 3 Hawaiian Wiggler Gets Bass in Lily Pads



Henry White, veteran guide at Chaffey's Locks, Ontario, with string of bass taken out of lily pads with No. 3 Hawaiian Wiggler.

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Position.....

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City and State.....

Be honest now—

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If you were boss, would you select "YOU" for that better job?

Consider before you answer.

First of all, could you *fill* the job? Has your experience fitted you for the step forward—have you been preparing for promotion apart from experience gained on the job?

Or have you just been filling a niche, doing daily tasks well but making no real and intelligent effort to learn and qualify for the job ahead so that if an opening should occur you would be ready to fill it?

The man who gets real promotion makes his own breaks—the man who slaves in the ordinary job at low pay just wishes and dreams of promotion and more money. Which are you?

Business is always willing to pay the man who knows—and pay him well. The man who is ready and willing to take responsibilities—and capable of directing the efforts of other men is a

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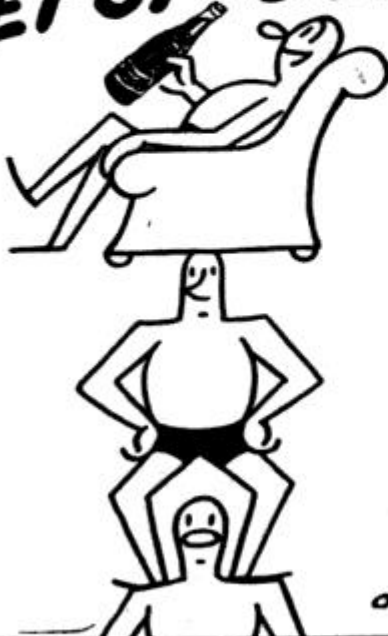
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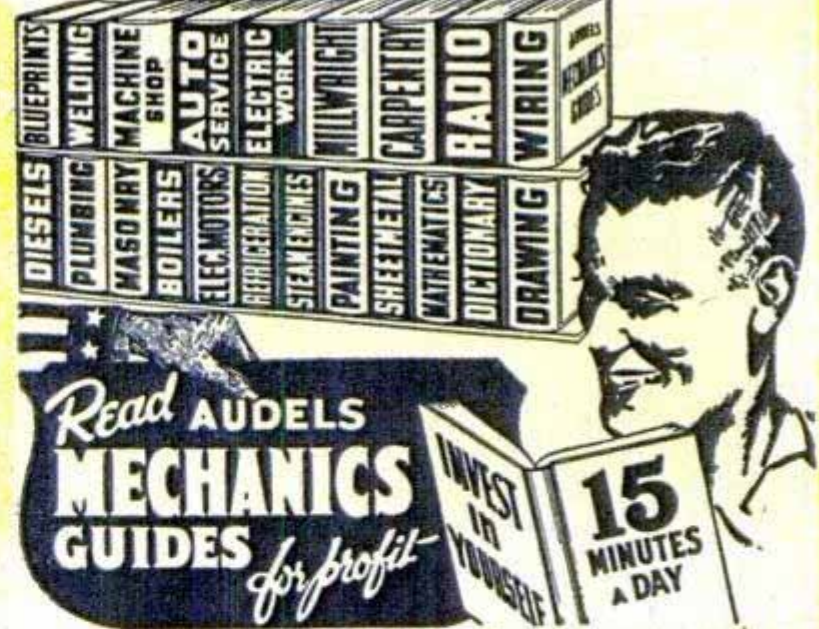
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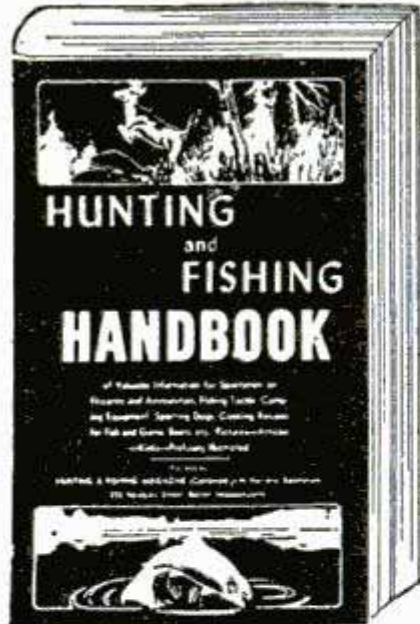
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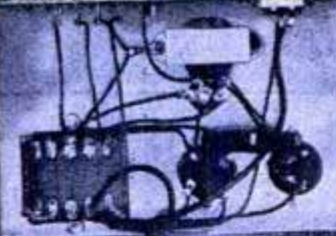
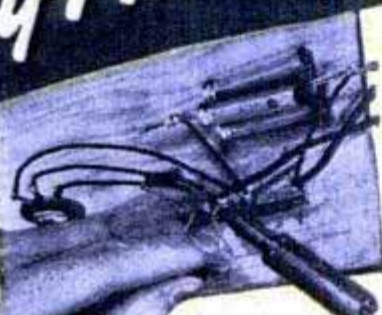


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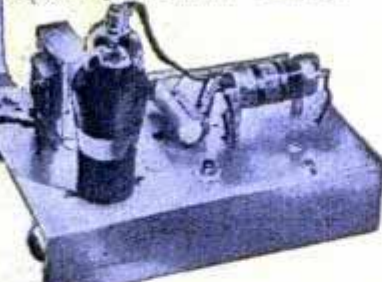
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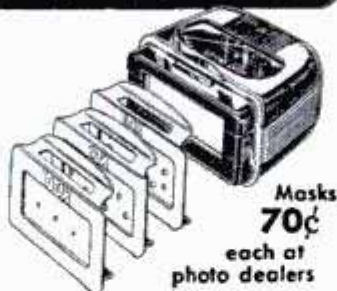
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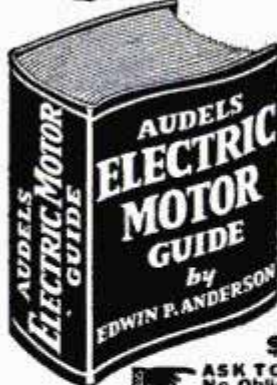
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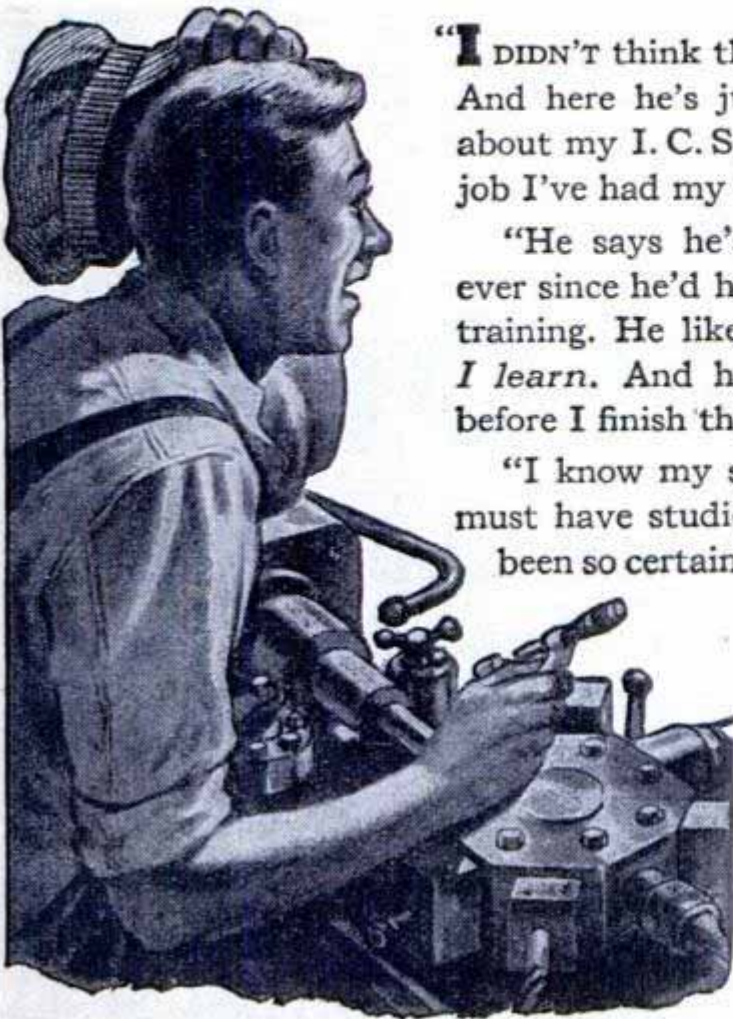
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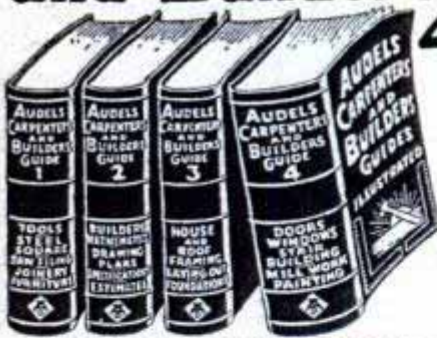
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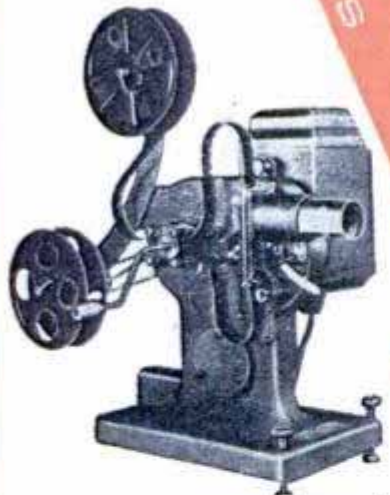
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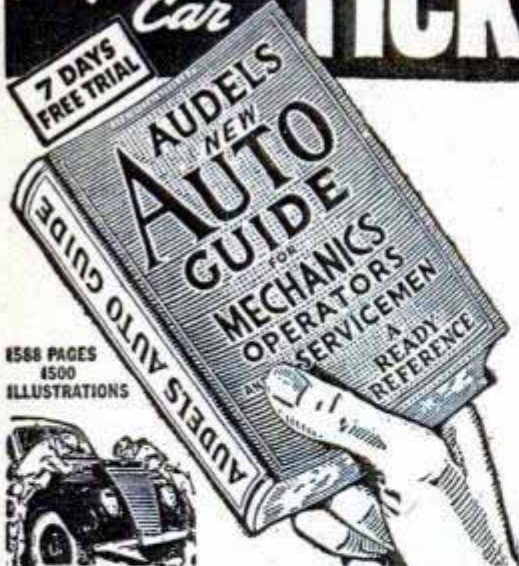
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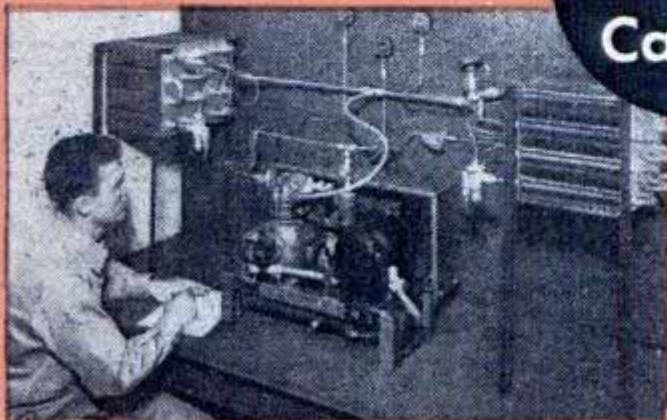
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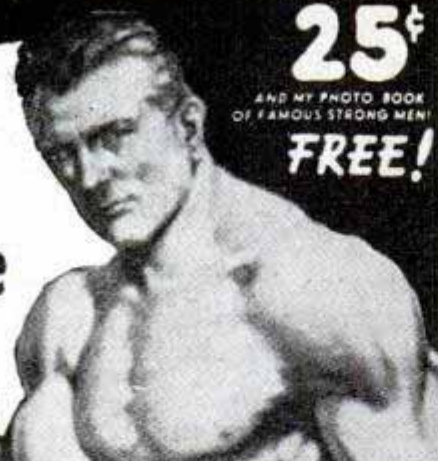
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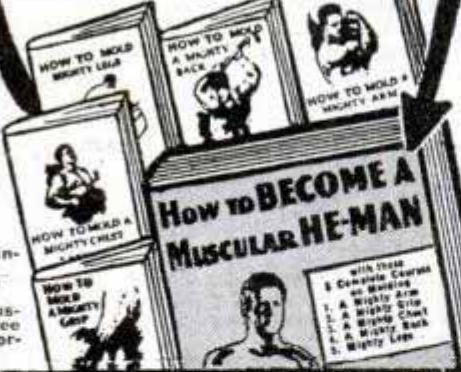
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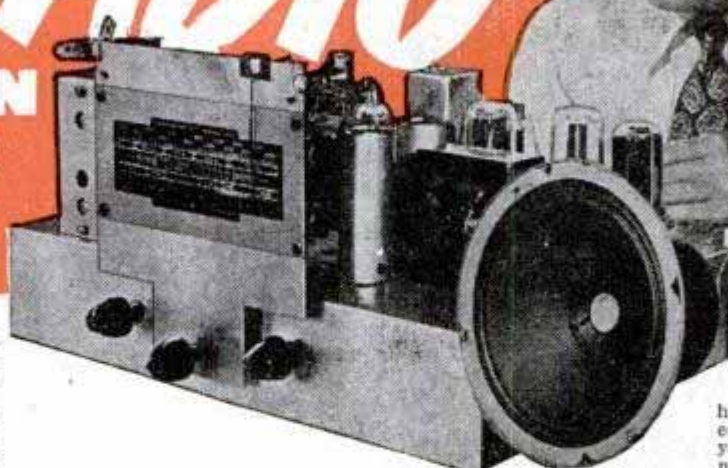
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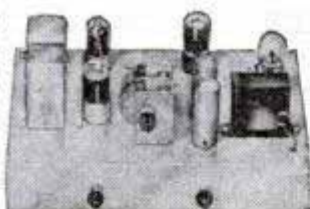
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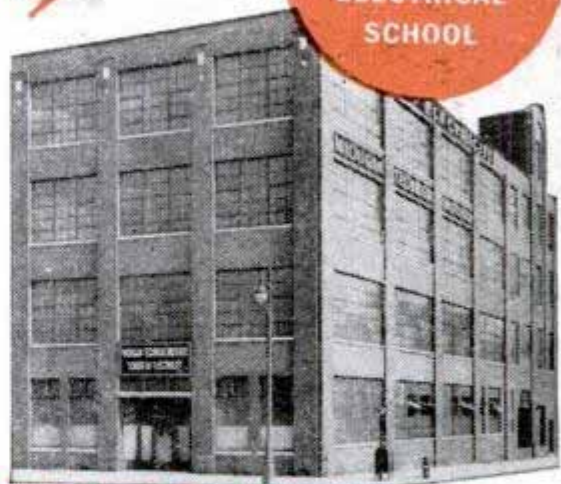
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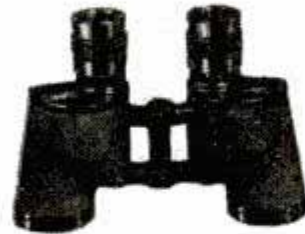


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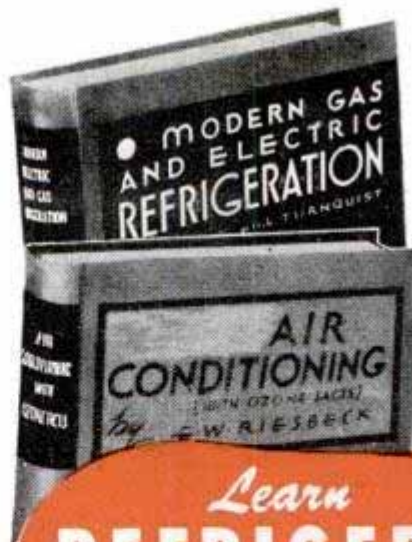
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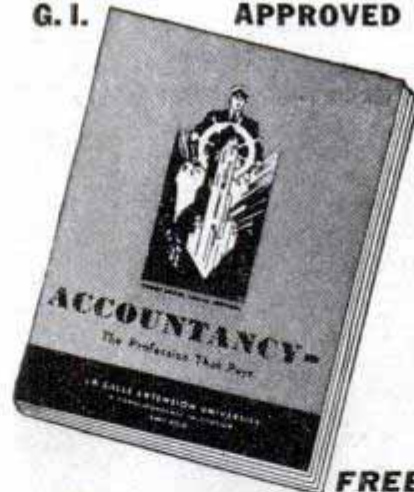
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MAKE \$3000 Yearly. Mail order business. Claude Bolton, 710½ West 7th Street, Sioux City 17, Iowa.

\$5 COMMISSION On booked distant moving jobs you recommend. United, 243 West 60th Street, New York, N. Y.

OPPORTUNITIES Galore. "Mail from everywhere" everyday. Name listed, 10c. Arthur Sibley, Mendon, Mass.

COMPOSITION Flooring—made in most colors. Lifelong, soundproof, resilient. Flexible molds. Cast novelties, plaques, statuary. Big money—your own business. Catalog free. Write, Bing Products, 88-A3C Broad Street, Boston 10, Mass.

"RUBBERCOAT": Aircure mold making liquid. Make your own, overnight. Manufacture plaques, statuettes. 22 ounces \$2.00. Directions, free model. Rubbercoat, 3873-A California Street, San Diego 1, California.

10,000 WORD Book tells, "How To Build Your Own Mail Order Business" at home! Plans, instruction, ideas galore! 25c postpaid. J. Scott, 282 West 117th St., New York 26.

MAIL Order magazine. Sample free. Schultheis, Box 449, Irwin, Penna.

\$100.00 A Week possible. Your own mail order business. Newest mail-order and agency proposition. Write today. Norman S.P.M. Rorick, 3514 Columbia Parkway, Cincinnati 26, Ohio.

OPERATE Profitable home mail order business on \$5 capital. Details free. Darwin, Box 631, Grand Junction, Colo.

INFORMATION Locating articles and products (wholesale), etc. Literature free. 3537C South Hoyne, Chicago 9.

FOR Greater opportunity write, Leaf Service, Box 998, Ingleside, Texas.

OWN Your business. Tell me how I can build a good service business. Employ others. Year around. Small investment for equipment and merchandise. Protected territory. Write Hinson & Company, Inc., Richmond, Indiana.

OVER 300 Ways to make money by mail. \$1 information free. Write, Clements, P.O. Box 1064, Orlando, Florida.

HEADLINES Pay big money. We furnish press, type, 4-page newspapers for your own "Sensational Headlines." Complete outfit only \$9.95 postpaid. Big profits: fairs, schools, weddings, births, etc. Sample headline 52 letters 25c. KFC Co., P.O. Box #16, Lisbon, Ohio.

UNPAINTED Bookends, plaques, statuettes, figurines. List. Haverly Products, 1219 8th Ave., Altoona, Penna.

METALIZE Baby shoes. Correct modern method. Information free. Universal, Box 1076-A, Peoria, Ill.

DRAIN Tile and block machinery. Flower pot, love seat, block and brick molds. Aluminum lawn furniture. Data free. Concrete Machinery Company, Hickory 6, N. C.

ACCOUNTANTS, Bookkeepers—Operate on **SRFS** accounting and tax system. Full or part time. No franchise fee. Barnhart & Kennedy, Public Accountants, Chambersburg, Penna.

EARN Extra money taking subscriptions for leading magazines. Write, American Readers' Service, Lansdale, Penna.

OPERATE Own wholesale candy business. Sell stores. Free list. Information. Sally Dee Candies, 142-Sims, Newport, R.I.

BARGAINS, Wholesale items, business plans and opportunities. 10c. Holm Sales, Box 12A, Oakland, Indiana.

MAKE Money—Silvering mirrors \$1.00, earthworm culture 50c, brush plating \$1.00. Universal, Box 1076-A, Peoria, Ill.

EXCELLENT Mail order business. Free literature. Postoffice Box 40, New York 18.

RUBBER Molds, liquid rubber, statuary plaster, kits for beginners. Complete "Plastercraft" course free on request. Blue Rapids Supply, Blue Rapids, Kansas.

SURE Fire mail order book 25c prepaid. Box 63E Station H, Buffalo 14, N. Y.

MANUFACTURE Modern overhead garage doors. Big demand. You can start with little capital; few tools. We furnish hardware; plans. Gardo Engineering, Dept. 2A, 3819 Riviera Drive, San Diego 9, Calif.

200 MONEY Making deals, Plans. Rare formulas. Schemes, Folio free. Formico Mart, Box 572, Dayton, Ohio.

OPERATE Profitable mail order business. Splendid opportunity. For details write Eastern Sales Service, 46 Violet Ave., Floral Park, N. Y.

"IDEAS For Additional Income." copy 25c. MacLaughlan, 415 So. Fourth Ave., Puente, Calif.

TERMITE Exterminator. Inexpensive. Easy to mix. Formula 25c. Charles, 12 AK, Norwood, Ohio.

FREE Booklet—"Key to Greater Earnings." James Williams, Box 2215, Hollywood, Calif.

START Mail order business, free 10,000 word how booklet. Details. Whittier Service Bureau, 17½ No. Lewis, Tulsa 4, Oklahoma.

MAKE Money building-selling boats new easy way with readymade hulls. Brochure 10c. Plastic Boats, Box 844, Grand Central Station, New York 17.

"HOW To Make Money With Hobbies." Big profits! Send 3c stamp for free details. Business Service, 1101 Kings Highway, Shreveport 49, Louisiana.

BIG Money selling Bobby-Jo baby shoes by mail; everything furnished; tested; successful plan free. No-Co-Ro, Oakland 6, Calif.

BABY Shoes metalized the durable method. Complete instructions \$1.00. St. Albans Plating Industries, 135-17 135 Ave., So. Ozone, L. I., New York.

A Rare offer! Start a spare time business of your own! Practical, easy and highly profitable. We carry a complete line of vending machines. Write for details! Cameo Vending Distributing Co., 432 West 42nd Street, N. Y. Medallion 3-1334.

WANT Security? Vending machines have provided me dependable income past 20 years; depression proof. Start route now while locations plentiful, or buy several for your own store or factory. Stock shipment nut venders, ball gum venders, best quality ball gum. Free literature. Hawkins, 906 M Howard, Palestine, Texas.

"SUPER" Profits manufacturing plaques, statuary, stoneware. "No guesswork" complete instructions, from start to finish. \$2.00 postpaid. (Mail 50c with order) balance c.o.d. Jay Tee Products, Inc., 1223 Franklin Ave., Columbus 5, Ohio.

WANT Money by mail? New course tells how. Write McKittrick, Box 58, Mt. Vernon, Ill.

EARN Money by mail, spare time. Definite instructions. Literature free. Robotti Service, Rm. 422-PM 1133 Broadway, New York City.

WHY Labor? Wonderful money maker. Domestic fire alarm. Essential. Inexpensive. Free details. Regent, 70 Rockland St., Boston 19, Mass.

BE Our full time representative in your community for taking subscriptions to leading magazines. Liberal commissions. Write for details. National Literary League, Inc., 981 The Arcade, Cleveland, Ohio.

INVESTIGATE Mail selling! What's the one best thing to sell, happily, honestly, profitably? We know! Get free particulars, exciting proof. What-To-Do Shop, Box 1082, Tacoma, Washington.

BRONZED Baby shoe mountings. Beautiful all-metal bookends, onyx plaques, etc. Wholesale only. Write for list. Hollywood Bronze Supply, 1770 No. Vermont, Hollywood 27, Calif.

FISHWORMS—Easy raise hundreds or millions. Instructions 25c. Charles, 12 AK, Norwood, Ohio.

WILL You give your permission to let us send you free, complete mail order information immediately? Versatile Enterprises, Westfield, New York.

UP To \$1500 yearly selling by mail in spare time interest you? New ideas and plans every month. Details free. Idea of Month Club, 3023-A Greenmount, Baltimore 18, Md.

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UNPAINTED Plaques, bookends, ash trays. List. Bava, 3655 E. Canfield, Detroit 7, Michigan.

HOW To build your own mail order business. Beginners Idea Book tells how. Quarter postpaid. Satisfaction guaranteed. J. P. Seery, North Conway 3, N. H.

CANDEE-SMITH Governor business. Factory, name, mailing and agency files \$25,000. Advertised in Popular Mechanics for 27 years. See March 1947 ad, page 294. Owner 75 years old. Business needs younger blood.

94c PROFIT From every \$1.00 received. No selling, manufacturing, \$1.00. Pamata, Woodbine, Brooklyn 21, N. Y.

EARN Money at home. Raise and sell orchid seeds by mail. Complete details 25c. Lyle, Box 1231, Santa Barbara, California.

START Profitable mail order business. Write, Tesco, Box 189-MR, Wilkes Barre, Penna.

UNPAINTED Plaster ornaments 2½c up. Oman, 642 Broadway, St. Paul 1, Minn.

WHOLESALE Directory \$1.00. Business opportunities \$1.00. Reimer, E-1119 Chestnut, Saginaw, Michigan.

\$20.00 PER Day possible with new plan, no personal selling, no manufacturing, spare, full time, details free. W. Williams, 5514 Speedway Drive, Speedway 24, Ind.

COIN Machines earn big money! Machines are now available at \$11.75 that can earn as high as \$7 weekly profit. Place machines in stores, hotels, filling stations, etc., and your income starts immediately. Routes can be operated in spare or full time with no experience needed. We'll tell you how and send you a catalogue describing our nut, candy, gum, and postage venders, also scales, amusement games, etc. Write immediately to Parkway Machine Corp., Dept. P, 623 W. North Ave., Baltimore 17, Md.

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FOR More business, establish office address, requiring no room, or box number. Rates, \$7.30 and \$14.60 yearly. Co-operative Service, 126 Lexington Avenue, New York 16.

YOUR Name as publisher, 80 page mail order magazine. Free ad. Only \$4.50 needed. Sample copy 25c. "RBCO", 542x Fifth Ave., New York 19.

OPERATE Dependable mail order business, supplied by us. Progress Mail Order, Box 1374, Indianapolis 6, Indiana.

OPERATE America's most popular low priced precision penny vending machine. Big profits. Be independent. Write for bulletin and prices. Stock shipments. Fielding Mfg. Co., Desk 547PM, Jackson, Michigan.

OWN A mail-order paper products business. Sell envelopes, tags, bags, boxes, by mail, wholesale. Tremendous demand. Steady profits. No capital necessary. Write Omaha Envelope Service, Dept. 212, 4721 California, Omaha 3, Nebraska.

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

METALLIZING Baby shoes makes you money! Learn this simple, profitable business from nationally recognized authority. Get professional results with professional "know-how"! Free particulars. Joseph B. Kushner, Metal Finishing Consultant, Stroudsburg 3, Pennsylvania.

"PROFITS From Plastics" pamphlet, samples, 25c. Technicraft, 1156 Commonwealth, Boston 34, Mass.

BRONZED Baby shoe supplies. Hardening solution, mountings, etc. Send stamp for list. Limited number of kits, complete with materials and equipment to bronze 10 shoes plus a free, easy to understand instruction course at the amazingly low price of \$6.95 prepaid. Send check or money order to Western Bronze Supply, Dept. P, 5419-21-23 Melrose Ave., Hollywood 38, Calif.

PACKAGE. Sell products under your name. Dade Products, Box 1720A, Cleveland 5, Ohio.

MAILORDER Beginners! Save money by getting started right! Our new booklet may save you dollars. Only 10c, postpaid. Mail Order Mecca, 30 West Washington Street, Chicago 2, Illinois.

BIG Profits in carded merchandise, combs, blades, etc. Write for wholesale prices. Buford's, Box 54, Dallas, Texas.

HOW To set up and run a mirror shop! Resilver mirrors. For price write—John Sprinkle V60, Marion, Indiana.

WHY Job worry? Learn electroplating. Highly paid, uncrowded, interesting business. Gold, silver, nickel, chromium, etc. Send postcard for free booklet and proof. Plater Hyde, Dept. MC, P.O. Box 176, National City, Calif.

SUPER X liquid molding rubber. Sample jar 25c, quart \$3.00, gallon \$10.00. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

OPERATE Profitable mail order business. Write Gallagher Publications, Box 691C, Kingsport, Tenn.

BABY Shoes preserved. Formulas, instructions \$1.00. Novelty Bronzing, Box 56, Hyde Park 36, Mass.

EARN Easy money, spare time. No experience. Lane, 548-B 61st Street, West New York, New Jersey.

SYNTHETIC Latex with Neoprene base for making flexible molds! Quick drying! Safe! For home, classroom, or industry! Quart \$2.00. Gallon \$5.95. Full instructions. Beginners' booklet on molding and plaster casting, 25c. Plastercraft Supply Company, 1406 East 43rd Street, Cleveland 3, Ohio.

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GOT \$24,500 Using "schemes" from "Schemer" magazine. Alliance, Ohio. 49th year, \$1.00. Three samples 25c.

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RAISING Canaries pays good profits. Valuable bird book—"Its Care, Breeding and Training." Price \$1.00. American Canary, 2839 N. Halsted, Chicago.

CURRENT Names homeworkers, 200-\$1.00. Johnson, Box 203-P, Brookport, Ill.

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

JUST Out. New. Tops them all. "Queen of queens" plan and product mail order business. It's old and beginner's grand opportunity. Saccani, Box 3825-M, Cleveland 10, Ohio.

1947 GIGANTIC Directory of opportunities, advertisers, supplies sources, trade information, mail order ideas, products, wholesalers, valuable tips. Just published. Descriptive literature free. Wilkin & Co., Hillsboro 3, Ohio.

MEN—Women be your own boss start a home business with our collection of 137 plans. Send for particulars. Simon Waldman, Dept. P-1, 4444 Richmond St., Philadelphia 37, Penna.

IF You'd like to make \$5,000-\$10,000 yearly in the collection-credit agency business, write us at once. Outstanding opportunity. Cole Associates, Syracuse 2, N. Y.

MAKE Money making shell jewelry and novelties. Instruction book 75c. Kit \$5.00. Catalogue free. Palm Shellercraft Co., 220 W. 9th St., Sarasota, Fla.

METALLIZE Baby shoes. Excellent profits. New system insures success. Free details. "Treasures Forever," Metallizers, 89 Henry Ave., Lynn, Mass.

THE Mail Order News (54th year) shows you money making opportunities in every issue. Sample copy 25c. Veterans Business Publications, Charleston 1, Ill.

46 FROM Square foot plywood. Jigsaw necessary. Write, Woodarts, X-36, Bridgewater, Mass.

EXTRA Dollars, or a good living, with your typewriter. New, exclusive opportunity. Never before offered. Get details now. Schroder, 221 E. Bush, Covington, Ky.

MAIL Order Beginners! "Business Development Plan." "Profitable Mail Selling Idea." "Pointers Along the Mail Order Trail." Noted mail sales specialist's, three-in-one, 10,000-word treatise shows "how" at home, spare time, small capital. From idea to mailbag. 25c postpaid. Satisfaction guaranteed. Maupin & Maupin, Lafayette 3, Indiana.

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LIQUID Marble—Colorful, glazed! Molded, brushed, sprayed! Composition floors. Rubberlastic molds. Particulars free. Marbleizing Service, Edwardsville, Ill.

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

BIG Mail income. Free particulars. Murray's, 196 Circle, Forestville, Conn.

PLASTIC Homes—Build yourself! Resurface old buildings! Wonderful building material. Particulars free. Marbleizing Service, Edwardsville, Illinois.

PARATOL—Amazing new rubber latex moulding compound for perfect detail castings of all kinds tested and approved in long service. No worries—easy to apply, quick drying, maximum strength and long life. Why pay more—buy direct! Quarts—\$1.60, 1 gal.—\$4.90, 5 gals. \$4.45 gal. 4 oz. samples on request. Send 25c to cover mailing and handling charges. Full instructions sent with each order. Testworth Laboratories, Inc., Manufacturers of coating and adhesive products of all kinds, 407 S. Dearborn Street, Chicago 5, Illinois.

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SELL Pin earring sets, novelty jewelry, \$2.50, \$5 sellers. Order assortment \$15 dozen. Manufacturers, 264 5th Ave., New York.

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GREAT Opportunities and profits in mail order business at home. Free literature. F. Webster, Box 1972C, Hollywood, Calif.

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MAIL Order business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-snatching schemes. Fascinating 100-page illustrated success-catalog free! Write, Nelson Company, Dept. 4-02, Chicago 5.

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ELITE Collection contains 137 practical money-making plans; local and mail order. New edition. Particulars free. Elite Co., 220 Grand St., New York 13.

OPERATE Profitable home business. Levine's, Box 15-X, Boulevard Station, New York 59, N. Y.

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QUICK Money! "Repairing car batteries." At home! Easy too! Write, Batterymen, Grand Junction 5, Colorado.

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COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser and proposition, commemorative stamp. Vanroy Shirk, Lebanon, Penna.

START Profitable mail order business. PMT lists new propositions available; products, sources, accurate methods. Covers ad writing, letter logic, trade information. Send 10c for copy and get free instruction folio offer. Progressive Magazine, Sheboygan, Wisconsin.

HOW And where to obtain capital. Fully explained. Particulars free. Star Service, Wapakoneta, Ohio.

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START Mailorder bookshop—Everything furnished; publisher cooperation. 25c brings booklet, exclusive setup, samples, exciting ideas. General Publications, Ossining, N. Y.

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START Your own business! Big money manufacturing novelties, plaques, statuary. Free catalog. Write Bing Products, 88-AJE Broad Street, Boston 10, Mass.

SELL By mail. Unique dealership open. Business basis. No plans or schemes. Schulte, Box 2983, Houston 1, Texas.

EARN Up to \$480 month part or full time keeping books for small firms. Simplified System. Write Tax-Saver System, Dept. Q, Fort Worth, Texas.

\$1 STARTS You in business. Sell by mail, or direct. California deluxe ties sell for \$2.50, costs you \$1.25. Send \$1 for complete plan and sample \$2.50 tie. Creamer of Hollywood, 832 North Edinburg, Dept. 7-P, Hollywood, California.

MONEYMAKING At home. 80 page magazine 25c. "RBCO," 542P Fifth Ave., New York 19.

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

EARN Good money spare time entertaining with musical glasses. Information free. MacDermid, 1013B Quarrier St., Charleston 25, West Virginia.

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AMAZING Profits in home operated distinctive, exclusive art-gifts specialty business. Write for starting ideas. Valvick, Warba, Minnesota.

OPERATE Profitable home mail order business on \$5 capital. Details free. M. F. Eberst, 216 Crawford Ave., Altoona, Penna.

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INFORMATION Locating articles and products (wholesale), etc. Literature free. 3537C South Hoyne, Chicago 9.

HAVE Your own paying business. "Plastic Trade Secrets & Formulas" tells how. \$2. Details free. Little, 1020-Towson, Fort Smith, Ark.

BIG Money making shellcraft kits! Violet spray \$1. Chatelaine \$1. Cameo \$1. Instruction book 35c. Shelart, 3027 6th Street, South St. Petersburg, Fla.

HOW To set up and run a mirror shop! Resilver mirrors. For price write, John Sprinkle V55, Marion, Indiana.

START Your own business metalizing baby shoes. Complete instructions \$1.00. Technical Aid & Supply, P.O. Box 668-P, Los Angeles 53, Calif.

TRAVEL, Make money; 20 ideas \$1.00. No personal checks. George Clark, 129 North Rose, Kalamazoo 12, Michigan.

SAWDUST—Turn it into cash. Spare time. Instructions 25c. Charles, 12 AN, Norwood, Ohio.

WHY Earn profits for somebody else? Build your own business, spare or full time. Small capital start, grow big! Be your own boss! Start today! Details free! Elliott, 177 Columbia, Edgewood 5, R. I.

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EARN Money at home! Thousands do! Free details. Sizemore, Box 7, 4917 Kostner, Chicago 30.

CONCRETE Fence posts—Full blueprints and information for making forms and posts. \$1.00. W. R. Hale, New Iberia, La.

WIN Money on contests advertised in magazines and on radio. General Contest Bulletin, published monthly, gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

MEN—Women! Sell "Aroma of Flowers" sachets! In demand everywhere! Over 200% profit! Details free. Mountain Specialties, Box 72, Westcliffe, Colo.

MAKE Big money. Build your own lamps and sell. Write for free factory photos. Buddy Products Mfg. Co., 1123 West Belmont, Chicago, Ill.

LEARN Mail order, dime magazine. Diehl's, 168 Clinton, Buffalo, New York.

THE Knack of making money in any job, business or profession. Postal brings details. L. R. Schulz, 216 W. Jackson, Chicago 6.

EMBOSS, Beautifully, stationery, cards. New, amazing inks, gold, silver, easily applied. Free literature. Crawford, 174P Nichols, Bridgeport 8, Conn.

MAIL Order magazine, dime. Acme, Fifty Bristol, Buffalo, New York.

MAGAZINE Of ideas, schemes, plans—25c. "The Circuit," Woodbine, Maryland.

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FORMULAS, PLANS, ETC.

ROOFING, 100% Fireproof, low cost, lasts indefinitely; make yourself; formula with instructions. \$1.00. Rav Roofing Co., P.O. Box 265 Petersburg, N. Y.

21 POPCORN, Candy apple, etc. formulas. All money-makers. \$1.00. We can supply equipment. Concession Supply Co., Dept. "A," Box 133 Sta. "B," Toledo, O.

MAKE Cosmetics, perfumes, flavors, etc. 100 formulas \$1. M. Elsbury, 717 N. Dearborn, Chicago 10.

100 SINGLE Ingredient formulas 25c. co., Box 189-MS, Wilkes Barre, Penna.

MANUFACTURE Cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

ANY Formula \$1.00 each. All tested and workable. Williams Co., Box 385, Galesburg, Ill.

NEED Chemists? Products duplicated? Formulas? Analyzes? Consulting Scientific Company, Swarthmore, Pennsylvania.

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

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

FORMULAS—Latest, best. Analysis. Giant formula catalog and chemical instruction sheet 10c. Refunded first order. Belfort, Engineering Building, Chicago 6.

"LUMINOUS Paint," Resilvering Mirror formulas 25c each. Ideal Service, 300, Park Ridge, Ill.

PLASTICS

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. 704 Land Bank, Kansas City, Missouri.

NEW Plastic! Plastell! Gorgeous colors! Available now for big profits. Information, 1947 illustrated catalog, details cash prize contest—10c. Write today! Beilco Plastics, Inc., Dept. 06, 98 Gramatan Ave., Mt. Vernon, N. Y.

PLASTICS—8 Colors sheets and rods, stamp brings price list. Hanson Plastics, 7625 South Parkway, Dept. 44, Chicago 19.

PLASTICS—Best materials, lowest prices. Send for free price list. Plastex Products, Curtis and Filbert, Baltimore, Maryland.

PLASTICS, Sheets, rods, tubes. Free list. Swiss music units \$3.50. Plastic Supply Co., Dept. PM70, 2618 St. Louis Ave., St. Louis 6, Mo.

NEW Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins, saw, drill, carve. Manual tells how. Send \$3.35 for complete 20 project kit including one pound liquid Castolite. Castolite, Dept. H-21, Box 211, Kenilworth, Ill.

SPECIAL Sale. Catalin plastics. Sheets, rods, tubes, scrap. Less than factory price. Hurry. Price list free. Plastics, Scottsville, N. Y.

PLASTIC Injection machines; toy, industrial, commercial. Jewelry findings, Plexiglas, dyes, Polystyrene rods; tenite; kits, etc. Low prices. Free list. G. Baker Company, River Edge, New Jersey.

2 LB. Plexiglas first grade \$2.50. 2 lb. clear scrap 70c. 5/32", 3/16", 1/4", 5/16", 3/8", 1/2" inch. Schick Mfg. Co., 257 William St., New York City.

EDUCATIONAL Offer! Sample kit containing odorless resin, accelerator, rubber mold, lubricant, dye; plus all equipment necessary to make quick castings in lustrous Formalin! Complete with instructions and price list, \$3.00 f.o.b. Formalin, Romeo, Michigan.

"WORKING With Plexiglas," the latest and best book on plastics. Full of illustrations and instructions. Only \$1.50 postpaid. Craftsman Supply House, Scottsville, N. Y.

PLEXIGLAS—Colors 1/4", \$1.90; 3/16", \$1.65; 1/8", \$1.35 sq. ft. Clear scrap 25c lb. Four lbs. minimum. Prices f.o.b. Rain-bow Plastic Company, Arlington, Texas.

PLEXIGLAS—Masked, 12"x12"—1/16", 95c plus 10% postage. Free listings. Craft Plastics, Box 129P, Somerville, New Jersey.

LUCITE—Sample 25c; catalog, dime, refunded. Mid-west Plastic, 1717 No. 66, Omaha 4, Nebr.

PLEXIGLAS Kits: Special offer: 18" tie-rack and coaster holder, \$2.50 value, now \$1.75. Free gift with each order. Free price list. Heah Mfg. Co., 5115 N. Neenah, Chicago 31, Ill.

NEW, Self-adhering, transparent plastic film. Lifetime protection for maps, charts, sketches, drawings, blueprints, valuable papers, sheet music, book covers, index cards and hundreds of other uses. Easy to use. Waterproof, dirtproof, germ-proof, washable. One dollar for 5 foot by 12 inch roll. R. E. Heyman, 123 Center Terrace, Newark, New Jersey.

AMAZING New book "Light and Plastics," tells in simple language how to use light in plastics (Lucite and Plexiglas). Covers fabrication and includes 5 project plans for making edge-lighted mural, bench spotlight, lighted wall shelf, decorative flower pot, lighted clock. All for \$1.00. Plastic Press, 1108 S. Albany, Chicago.

METALLIZE Plastics for profit! Free particulars. Joseph B. Kushner, Metal Finishing Consultant, Stroudsburg 3, Pennsylvania.

MAKE Money assembling our pre-fabricated plastic kits. Sample kit 50c. Catalog free. Fabros, Box 156, Station F-1, Buffalo 12, N. Y.

LEARN Internal carving in plastics for pleasure and profit. No special skills or long training required. It's easy, exciting. Complete instruction folder shows how to carve flowers, animals, landscapes of colorful, thrilling beauty in solid Plexiglas plaques and cubes. Explains dyeing, filling. Illustrates power tool, drills, materials needed. Complete information plus price list, catalog of metal findings and jewels, only 10c. Plastic Parts & Sales, 1157 S. Kingshighway, Dept. H-26, St. Louis 10, Mo.

LUCITE Sheets, rods, dyes, cements, cheap. Free price list. Thomas Cavaliere, 2141 So. Beechwood St., Philadelphia 45, Penna.

PLEXIGLAS Sheets. 1/10"x12"x16" \$1.05; 1/8"x11 1/2"x12" 98c; 13"x16 3/4" \$1.60; 1/4"x8 1/2"x12" 90c. Ten colors in 12" rod assortment, one Fluorescent \$4.00. Plexiglas cylinders 6" o.d. x 1/4" wall x 12" length \$1.60. Julian Rhodes Muench Co., 1527 W. Alabama, Houston 6, Texas.

CHEMISTRY

THE House of Winn, home of supplies for amateur chemists. See Winn's New Idea chemical kits and apparatus outfits for home experimenting. Send 10c for retail catalog. Established 1931. John H. Winn, Dept. 507, 124 West 23rd St., New York 11, N. Y.

SPECTROSCOPE For quick chemical analysis \$3.00. Cutting Co., Box 457, Campbell 1, Calif.

FREE Scientific catalog. Fourteen hundred exceptional items. Tracey Laboratories, 1907 Harrison Street, Evanston, Ill.

LABORATORY Supplies at wholesale prices. Chemistry, biology, physics, geology. Catalogue 10c. National Scientific Company, Established 1908. 2204 W. North Ave., Chicago 47, Ill.

SOMETHING New! Student chemists send 5c for catalog and free copy of N-1 "Know Your Chemicals" series. Met & Co., Dept. 10, 160 Hillside Avenue, Nutley, New Jersey.

NEW Laboratory supply catalog of chemicals and apparatus, contains over 5000 items with illustrations, 212 pages. Send 50c. Standard Science Supply Co., 1232 No. Paulina Street, Chicago 22, Ill.

CHEMICALS-LAB. Supplies. New catalog 10c. Mel-Glo Chemical Co., 258 Fourth Avenue, Brooklyn 15, N. Y.

HANDBOOK For chemical experimenters, illustrated, hundreds of experiments, 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Complete supply service for correspondence school students. Send 3c for catalog. Dept. M-43, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

APPARATUS, Chemicals, ounce quantities, catalog 5c. Fleischer's Laboratories, Everett 49, Mass.

HELP WANTED

A FEW Seasoned executives to help merchandise telephone electronic equipment and other electrical products. Correspondence held confidential. Mac Call Telephone Electronic Equipment, Box 8186, Norfolk 3, Va.

MAKE More money selling individualized buckles, belts, tie holders, cap badges. Choice of 2000 emblems. Quick profits—repeats. Special outfit offer, write Hook-Fast Products, Dept. A, Columbus 6, Ohio.

REPAIRMEN And installers for Mac Call Dictagraph Teletalk, Stromberg Carlson Amplicall and Bogan wanted by United Intercommunications, Post Office Box 8128, Norfolk 3, Virginia.

AGENTS WANTED

AGENTS. Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sale plans make sales easy. Permanent repeat business. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. P.M., Chicago.

NEW Miracle heavy wire cutter! Pocket size. Big money maker! One ton cutting pressure in one hand, cuts anything: heavy gauge spring wire, nuts, bolts, etc.; replaces bulky cutters many times its size, weight and cost. Every mechanic, factory, farm and home owner needs it. Specially low priced at \$7.50. Sells on sight! Make up to 125% profit selling direct or dealers. Demonstrating sample \$3.75 post-paid, remittance with order or write for free selling plans. Security Mfg. Co., 144 West 27th St., New York City.

SALES Agents wanted to sell Fireaire fireplaces and furnaces in your localities. Every home owner is a prospect. Low in price. Variety of designs. See display advertisement elsewhere in this issue. Liberal commissions. Write for proposition. The Edwards Manufacturing Co., 235 Eggleston Ave., Cincinnati 2, Ohio.

\$1 STARTS You in business. Sell DeLuxe ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two DeLuxe ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-13, New York 10.

SILVER Plating liquid. Simply rub on with cloth. Cleans, silverplates, polishes, one rubbing. Genuine silverplate. Renew silverplated ware. Also silverplates brass and copper. Male and female sellers wanted. Part or full time. NuProcess Products, Aurora, Illinois.

EXTRA Money quick. Sell personalized stationery, matches, napkins, coasters, playing cards, greeting cards, gift wrappings. Up to 100% profit. Sample all-occasion assortment on approval. Large portfolio personalized stationery showing over 40 different styles. Senrab Co., 212-N West Washington St., Syracuse, N. Y.

MAGIC Cleaner and laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 5007 Irving Park, Chicago.

AMAZING Spare time earnings, sell name imprinted Christmas cards 50 for \$1.00. Leader box pays to 50c profit. 25 big moneymakers. Stationery. No money or experience needed. Approval samples. Empire Card, 155 Fox, Elmira, N. Y.

AT Last! Something new and sensational in Christmas cards. Amazing "Oilette" cards. Like costly oil paintings. Designs never before offered. Quick orders. Beautiful 50 for \$1 cards, name imprinted. Big profits. 20 other assortments 60c to \$1. Samples on approval. Puro Co., 2801 Locust, Dept. 740J, St. Louis, Mo.

CHRISTMAS Cards: Easy money, quick. Free literature tells all! Evers, Elmhurst, N. Y.

PROFIT Selling genuine imported briar pipes direct to consumer. Terrific values. Samples, \$1.00 each. Details. Abbott Pipes, 62-B East 87th St., New York, N. Y.

EARN Big money selling complete new line 1947 greeting and Christmas cards. Big profits. Liberal bonus. Sample on approval. Write today. Forest W. Kimball, New London, N. H.

EASY Money making opportunity showing friends famous Wear Wright brand nylon hosiery, lingerie, blouses, sportswear, greeting cards. Tremendous demand, steady repeats, big profits. Four special outfit offers. Free lingerie sample display card. Wear Wright Company, 1709 Arch St., Dept. B, Philadelphia, Penna.

TREMENDOUS Profits selling new scientific soil acidity tester for lawns, farms, gardens. Sells \$2.00. Your profit \$1.00. Sample and full information \$1.00 post-paid. Willard Laboratory Supply, 2030-T Sunnyside, Chicago 25.

CHRISTMAS Cards. Earn big money. Take orders galore from friends. 25 exquisite folders with name, \$1.25. Free samples 10 designs. America's fastest selling 21 Christmas folder box, costs 50c. Sells \$1. Request samples today. Sunshine Art, Dept. E-7, 115 Fulton St., New York 8, N. Y.

HOUSE Numbers that glow in the dark. Luminous pictures, etc. Large mfr. wants factory representative. Wonderful new product. Fast seller. Free samples. Madison Mills, 303 4th Ave., New York City.

EXCLUSIVE Franchise for first class agent, permanent, no competition. A. Thompson, Marysville 68, Calif.

COSTS 20c. Sells \$1.00. Millions prospects. \$20 daily. Samples free. Burns Company, Johnstown, Penna.

AGENTS—Sell white shirts direct from manufacturer. Liberal commission. Jarod Mfg. Corp., Rockville Centre, N. Y.

TO 100% Profit selling greeting card box assortments. Details and assortment sent on approval. Glorian, 515 East 45th Street, Brooklyn, New York.

STATE Agency open for Lightmaster cigarette lighters. Macgregor, Tahoe Valley 16, California.

\$50 CASH For selling 100 assortments of 21 Christmas cards at \$1.00. Complete line. Free samples 50 for \$1.00 cards. Special offers. Write today. Hedenkamp, 343 Broadway, Dept. Y-21, New York 13.

SHIRTS \$1 Each for resale. Box 18, 93 Fourth Ave., New York.

CASH In quick on tremendous demand for new low priced burglar alarm for cars, homes and farm buildings. Nothing like it. Everybody wants one. Big profits. Unique sample offer. Northwest Electric Co., Dept. E-42, Pukwana, S. Dak.

MAKE Money the easy way, be an agent. List of 100 large companies looking for agents \$1.00. Roy Kramer, 329 Cates St., Maryville, Tenn.

AGENTS—Excellent, repeating profits. Opportunity establish own business with exclusive territory. Additive lubricant. Automotive, marine, aeronautical, industrial fields wide open. Write Kidder Oil Co., LaCrosse 5, Wis.

INFORMATION Locating articles and products (wholesale), etc. Literature free. 3537C South Hoyne, Chicago 9.

MEN And women—Large daily profits selling guaranteed household products to friends and neighbors, all or spare time. We start you. Write Crest Tested Products, 2118 East 15th, Kansas City 1, Mo.

WE Buy old type Singer sewing machines, your profit up to \$25.00 on each. Write for literature. Essex Shop, 172 Washington St., Newark 2, N. J.

CHRISTMAS Card agents! New, exclusive, patented children's linenette books. Four books in attractive packet. Retail 50c. Sample on approval. Also cut-out valentine assortment. Elmcraft Card Co., 5928 South Western, Chicago 36, Illinois.

SELL Christmas cards! New, different, exclusive, 50 with name imprinted, \$1. Make extra dollars with new bonus plan that earns you up to and over 100% profit. Compare our 21-folder "Champion" assortment, sells for \$1. Sent on approval, no investment. Etching, panoramas, florals, religious, gift wraps, birthdays, also stationery and personal de luxe album. Free samples of many extra-profit imprint lines. Work with a leader! Write today. Pen-N-Brush Studios, Dept. PM7, 154 Nassau Street, New York 7, N. Y.

GUARANTEED Money making sales offer. Free details. Men, women write today. Popular Products, 1472 Broadway, New York.

24-KARAT Gold-plated ball point pens. Sample pen \$1.00, sells for \$1.98. Edison Ball Point Pen Co., 126 Lexington Ave., New York 16, N. Y.

MYSTERY Drinking bird. Drinks constantly. \$1.98 prepaid. H. Hayes, Blue Earth, Minnesota.

AMBITIOUS. Sell Xmas cards, stationery, big profits, colored catalog free. Beacon Hill Greetings, 115 Chauncey M. Boston, Mass.

"TWINPHONE" Sensational new telephone device, two people listen at once, every home, business, are customers. Sells for \$3.75. Send \$2.35 for sample, particulars. Soroka, 131 Rockaway Parkway, Brooklyn, N. Y.

POCKET \$1.25 On each sale. Hand-colored 8x10 enlargement in gorgeous new metal photo frame—sells on sight for \$2.98. Write for sales plan. Monogram Studios, Box 233, Department A, Forest Hills, N. Y.

NEW Spee-Dee hose coupling for standard garden hose. Easy on, easy off. Sample 50c. White Specialty Manufacturing Company, 4628 W. Auer Ave., Milwaukee 10, Wis.

ROTACUT Power mower—\$66.00 net. Express prepaid. Farm Products, M-2006, Excelsior Springs, Mo.

BALLOONS \$2.00 Gross; rubber toys; balls. Kids cowboy metal spurs \$2.00 dozen. Complete \$10 retail value assortment for \$5.00. Start own route. Buy wholesale—sell merchants everywhere. Newest specialty line. Big profits. Ellswood Distributors, La Junta, Colorado.

AMAZING Leather or plastic buckleless expanding watch bracelets fit all watches. Retail \$1.50. \$25.00 daily easy. Particulars free. 2 samples \$1.00. Safety Watch, 309 E. 105th, New York City.

HOW To start your own business. Send for big free catalog full of electrical appliances, lamps, housewares and giftwares. Big profits. Quality merchandise. No investment required. Bilmar Brothers, Dept. 7-C, 711 W. Lake Street, Chicago 6, Ill.

CHRISTMAS Cards. Earn \$5.00 with each ten \$1.00 21 card assortments you sell. Also wrappings, note paper and imprint cards. Write for samples today. Howard P. Ellis, Dept. PM-8, Pitman, N. J.

REFLECTING House numbers \$1.00, name-plates \$2.50. Mail box signs \$5.00. Carl Sign Co., Wooster, Ohio.

KEROSENE Cook stove, 2 burner \$8.75; fluorescent 2 light kitchen fixture (less bulbs) \$4.50; oil burner, 3 controls \$125.00. Prices f.o.b. Essex Shop, 172 Washington St., Newark 2, N. J.

A Natural! Make good money with fast-selling, new line of plastic tablecloths and women's aprons! Also novel, embroidered cotton pillow cases! Write for "interesting" details. Royalty Sales, Box 748-C, Passaic, N. J.

FREE! Big 32 page 8 1/2 x 11 magazine, that tells how to make money in local or mail order selling! "Opportunities Preferred," 33-P Vassar, Dorchester, Mass.

AGENTS: See display ad, page 250 this issue. Heel-Eez, top selling auto accessory; volume to dealers.

FOOT-MASTER Tablets. Amazing seller to those afflicted with foot trouble. Proven seller 45 years. Good profit. Repeats fast. Write Master Products Co., 6 East Oak Avenue, Moorestown, New Jersey.

MEXICAN Feather pictures. Unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 762, Mexico City.

WHOLESALE—New item for women. Free particulars. Renee, 8 Cumberland St., Boston, Mass.

FINGER Nail clips. Tool steel cutting edges stay sharp. Bright nickel. Retail 50c, sample 15c. Twelve on display card, \$1.80 dozen plus postage. Fast seller. Kearney, 180 Seventh Avenue, New York 11, New York.

AGENTS, Dealers, distributors. We have the fastest-selling item on the market today. 100% profit. Steady repeater. No competition. Rush \$2.98 for complete set-up, or write for details now! Morrison, Box 9312, Station S, Dept. 12, Los Angeles 5, Calif.

WHY Need money! Our product offers excellent profits with thousands of prospects. Free information. Atlas Products Company, Dept. 17, Box 388, Oklahoma City, Oklahoma.

AGENTS: All ages, earn \$30 to \$50 weekly selling for yourself, fibre brooms, mops, and floor dusters, start now. Write Burtz Fibre Broom Co., Columbia, Penna., Dept. A.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania 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.

EARNING Less than \$200 weekly? Boost income quickly. Fast selling celluloid price tags, metal molding, menu covers. Every store, restaurant buys. Pricing Press, Dept. PX, 124 White Street, New York.

SELL Personal Initialed individualized belts, buckles, cap badges, tie holders. 2,000 emblems to choose. Fast profits. Repeats. Write today special outfit offer. Hookfast Specialties, Box 1425, PM, Providence, Rhode Island.

AMAZING Discovery. Miracle glaze puts brilliant glass-like surface on cars. Free sample, information. Big profits. Miracle Glaze Company, 9714 S. Austin Ave., Oaklawn, Illinois.

AGENTS—Distributors \$28.00—\$140.00 daily. Flo-Glo plastic linoleum finish. Write, Acme, Box 404, Mount Vernon, N. Y.

JUST Out! History of World War II. Huge volume. Popular price. Authentic text. Official photographs. Big profits. Riverside Book Company, Iowa Falls, Iowa.

MAKE Money in your spare time! Helps furnished. Easy sales. Voluntary repeat orders. Liberal commissions. Write for free wholesale price list today! McGregor Magazine Agency, Dept. P.M.-7, Mount Morris, Illinois.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2.00, pants 35c, topcoats \$1.25, overcoats \$2.00, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-B Jefferson, Chicago 7.

90c PROFIT Each \$1 sale. Sell positive mothproofing solution to housewives, stores, agents. Experience unnecessary. Postal brings details. Kinford, Wayne 3, Penna.

GREETING Card agents, "line up" with "Pines" for bigger, better, quicker profits. Rush name, address on postcard today. Box 32, Flushing 5, New York.

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.

137 COMPLETE Plans for starting own business: local—mail order. Particulars free. Elite Co., 220 Grand St., New York 13.

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

200 MONEY Making deals, Plans, rare formulas. Schemes. Polio free. Formico Service, Box 572, Dayton, Ohio.

\$3 FIRE Extinguisher; quick sales, wholesale or direct; liberal profits. "Fire-Killer," 109 N. Franklin, Syracuse 1, N. Y.

PLATING Outfits for autoparts, reflectors. Connect to a battery. No tanks necessary. Free booklet and particulars. Gunmetal Co., Ave. N, Decatur, Ill.

FREE Water and our concentrates, makes flavors, lotions, shampoos, 72 products, labels, bottles furnished. Qualco, E-20030 Russell, Detroit.

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

SELL Personalized soap. Name on every cake. Ideal for gifts. Get sample offer. Dunbar Soap, New Brunswick, N. J.

AGENCIES WANTED

SURE Success! Appoint William Finau Store, Nukualofa, Friendly Island, Oceania, your distributor, annual sales: \$20,000. Bankers: Bank of New Zealand, Auckland. Interesting lists gratis.

HIGH-GRADE SALESMEN

ADVERTISING Book matches—World's largest direct selling manufacturer of advertising book matches offers opportunity for profitable year 'round selling; every business a prospect. No experience needed to start; full or part time. Factory service. Low prices for high quality; repeats; sales kit furnished. Match Corp. of America, 3433-43 West 48th Place, Dept. E-9, Chicago 32, Illinois.

SALESMEN—1948 Calendar and novelty line ready. Buyers everywhere. Low prices. Big commissions advanced. Samples free. Consolidated-Modern Press, Inc., 329P South Wood, Chicago 12.

POCKET Pal: All-purpose cutting tool. Sell dealers nickel plated model. 50c seller. Sell advertisers imprinted colored Pocket Pal. State preference. Either sample 25c. Nelson Mfg. Co., Box 525, St. Paul, Minn.

ADVERTISING Book matches—Cash in on political campaigns. 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. M77, 7530 Greenwood, Chicago.

BRAND Spanking new. Business and professional men need it the year 'round. Repeat orders and exclusive territory. Write or wire for details. Continental Service, 907 Birch, Eau Claire 2, Wisconsin.

TAKE Orders for solid brass nameplates. Immediate commissions. We deliver. Metro Engraving Co., 362 Cross Street, Malden, Mass.

DISTRIBUTORS, Salesmen—Patented cigarette case holder for automobiles, trucks. Fine seller. New. 200% profit. Sample 25c. Literature free. Little Giant Holder Company, 919 South Vermont, Los Angeles 6, California.

1000 CONTRACT Bookkeepers needed. Start your own business. Part or full time. Free course of instructions. Write H. T. Bedford, 222 W. Maple Grove Ave., Fort Wayne, Indiana.

START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales. 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. G-U-PPM, Freeport, Ill.

SELL Delicious candies, nuts, gum. Immediate delivery. Write Casterline, 2031-C Sunnyside, Chicago 25, Illinois.

RESTAURANT Sanitation course complete. Good commission. Institute, 2385 Edgewater, Los Angeles 26, Calif.

SELL Plastic and wooden cocktail specialties, coldrink spoons, spir-its, stir-stics; gold stamped imprint. Free samples. 25% commission. Kay-Gordon Company, 210 Fifth Ave., New York City 10.

DOUBLE Your money by distributing California's golden Veronica Health Water. Millions of bottles used. First to reply will receive enough territory and "know-how" for financial independence. Write Hardy Hoover, 40 North Hemlock, Ventura, California.

BONUS Commissions selling photographic creations. Samples. Creative photography, Box 315, Cooper Station, New York 3, N. Y.

DISTRIBUTORS Calling on mill supply jobbers with processed oil specialties for New York, New Jersey, Pennsylvania. F. W. Boyde & Co., 731 N. 24 St., Philadelphia 30, Penna.

DISTRIBUTORS, Salesmen, bigger commissions with lowest priced home and auto extinguisher. Exclusive contracts. Carbo-gas, Box 2141-A, Portland 14, Oregon.

PLASTIC Imprinted cocktail spoons. Big comm. Timesaver, Box 2495, New Orleans.

NATIONALLY Known manufacturer of industrial stapling machines, tackers, stitchers and staples—now reopening territories. First year salesmen earn \$5,000 to \$7,000. Large repeat business will double your income. Excellent opportunity to advance in large expanding organization. Write The Heller Co., 2139 Superior Ave., Cleveland 14, Ohio.

SELL Scheall's \$1.25 guaranteed fire extinguishers. Sold, used throughout America. Astounding profits. Scheall, Box 263-P, Duluth, Minnesota.

ATTENTION Salesmen! Tremendous profits, sensational new specialties for all types trade. Industries, 919 Brooklyn, St. Louis 6, Missouri.

\$13.50 PROFIT On every sale and prospects galore! Drug stores, gas stations, sporting goods, post exchanges, jewelry, variety, cigar stores, etc. "snap-up" this attractive \$46.40 sunglasses and cabinet deal. Fast sellers. Full commission on restocking assures you regular, automatic income. No samples to buy or carry. Write for free full information and free selling equipment. Midwest Scientific Co., 1148 Chicago Ave., Dept. 500, Chicago 22, Ill.

SENSATIONAL Window wizard cleans glass surfaces in 10 seconds. Long profits, big bonus. Sample \$1.25. Wizard Mfg. Co., Box 63, Downey, California.

SALESMEN Here is an opportunity for you selling Telephone Electronic Equipment and other electrical products. Mac Call Telephone Electronic Equipment, Norfolk, Virginia.

YOU Can make \$40 to \$50 weekly selling guaranteed children's shoes. Big opportunity, tremendous field. Big advance commissions. Get special free offer! See Home Service Shoe Corporation advertisement on page 250. Act now.

12 FANCY Boxes pure Vermont maple sugar postpaid \$6.60. Retail \$1 each! Eulalia Turner, Poultney, Vermont.

PRESSURE Cookers. Now available. Selling like wildfire. Amazing profits. Write quickly. Morris Mandell, Inc., 131-P W. 14th St., New York 11, N. Y.

SELL Filling stations, sales tested specialties. Good profits. General Sales Co., 915 Brooklyn, St. Louis 6, Mo.

SELL Calendars full or part time—every business house a prospect—also wholesale to printers—calendars, novelties, sheet pictures. Fleming Calendar Company, 6535 Cottage Grove Avenue, Chicago 37, Ill.

ORANGE Concentrate direct from our Florida groves. One quart bottle makes six quarts delicious natural orange drink simply by mixing with five parts cold water. Groceries, foodmarts, hotels, restaurants, taverns, roadstands, sodafountains, hospitals, resorts, camps, farmers, big buyers. Money-back guarantee. No investment. Protected territory. Salesmen earn \$100.00 to \$200.00 repeat commission weekly. Sunset Valley, 3357 N. Clifton, Chicago 13, Ill.

QUICK Profits selling full or part time, individualized buckles, belts, cap badges, tie holders, uniform shirts, caps, ties. Choice of thousand emblems. Sure repeat orders. Easy-selling outfit offer. Write Hook-Fast Company, Dept. 12, Roanoke, Virginia.

FREE! Latest issue Opportunity Magazine. Salesman's Guide. Inspiring, constructive. Shows how to earn money selling for others or in your own business. Hundreds postwar opportunities. Send name and describe what you have sold or are selling. Illustrated copy sent free. Opportunity Magazine, 620 N. Michigan, Dept. 17, Chicago 11, Ill.

EDUCATIONAL & INSTRUCTION

WIN A well-paid job in travel—step into a new world of glamorous opportunity! Today more Americans are "going places" than ever before in history. As a result—the hotel and institutional field is surging ahead to new prosperity. Successful Lewis graduates "making good" everywhere in luxurious hotels, fashionable resorts, smart restaurants, and clubs. Free book explains how to qualify at home for a well-paid position in this ever-growing business where you are not dropped because you are over 40—shows how you are registered free of extra cost in the Lewis National Placement Service. Veterans: Course approved for Veterans' Training. Write today. Room LO-395, Lewis Hotel Training School, Washington 7, D. C. (Now in its 31st year.)

VOICE Builder for speaker or singer at less than the cost of a lesson. Free voice advice booklet. Victor Voice Institute, Studio 127, 6515 Wilshire, Los Angeles 36.

LEARN Auctioneering by mail. Sample lesson free. Write Nelson School, Renville, Minn.

WANT A government job? Start \$1756-\$3021 year. Men—women. Prepare now for next examinations. Veterans get preference. 32-page booklet free. Write. Franklin Institute, Dept. K24, Rochester, N. Y.

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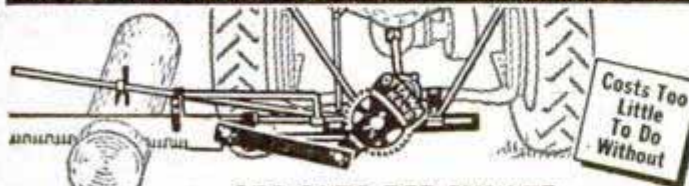
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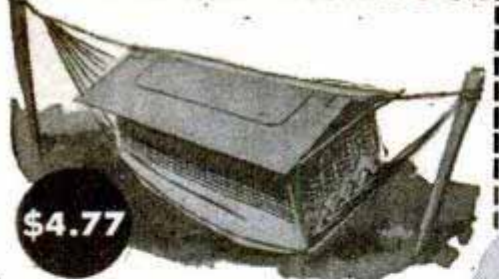
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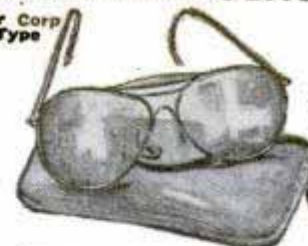
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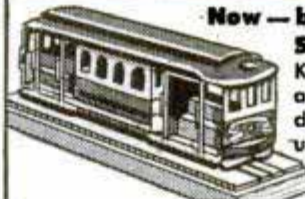
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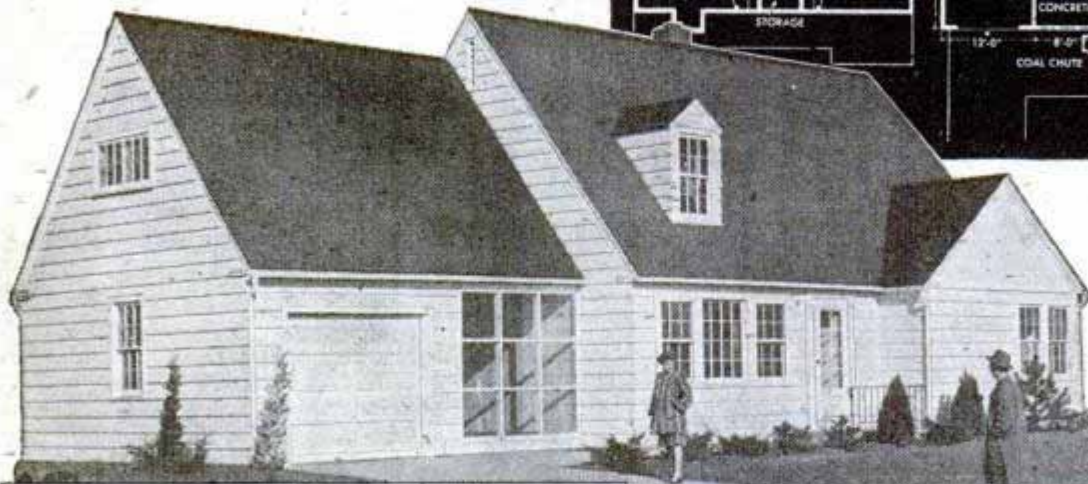
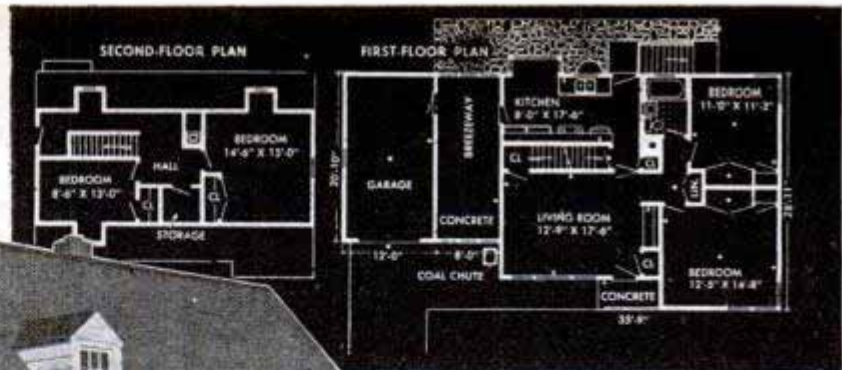
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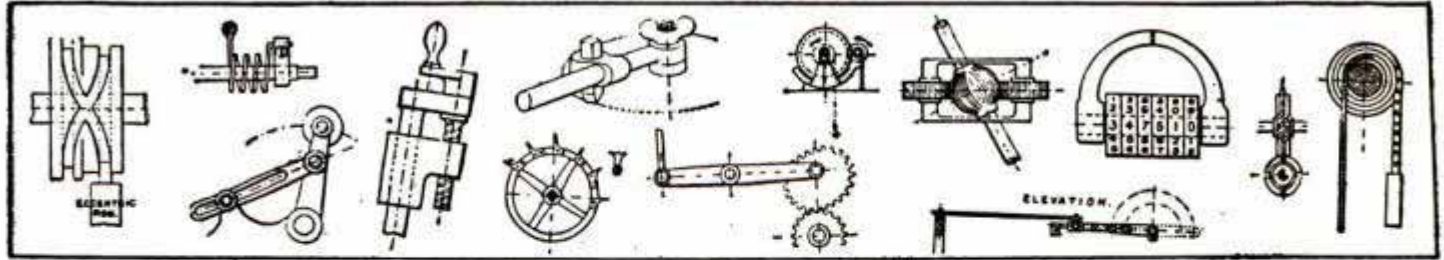
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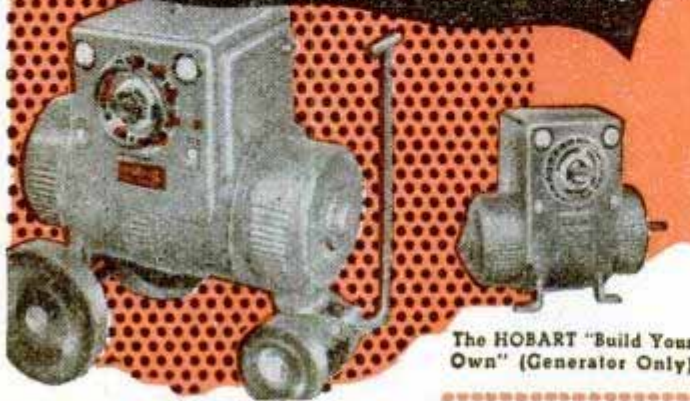
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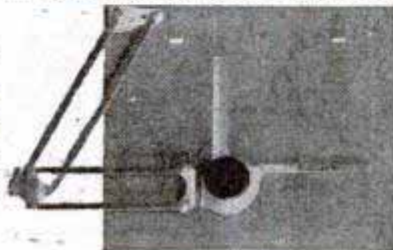
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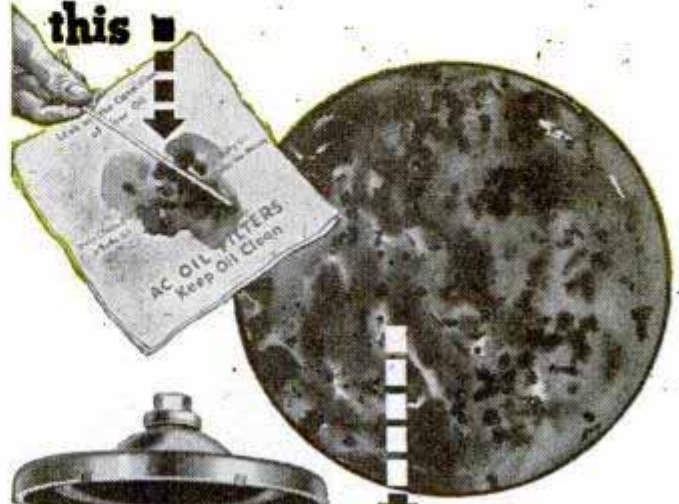
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ED'S MY DRUGGIST... a good one, too! And since I've been his Doctor of Motors for years, I could talk to him like a Dutch uncle.

"Look, Ed," I said, "you're happy with the way your car runs now, but you have only had part of my prescription."

Then I told him what I'd done. Ground the valves, replaced the gaskets, installed a set of Perfect Circle Piston Rings to stop her oil pumping—and a lot of other things she'd needed for a long time.

"If you want to *keep* your car in tip-top shape," I said, "Here's the rest of my prescription—just bring it in regularly for periodic checkups. Then I can correct little troubles before they become big ones—and save you a lot of worry and money."

Ed said he would follow that suggestion and that it sounded like a good prescription for every car owner. He's right, too!

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THEY FISH FOR TROUBLE

By Richard H. Parke

TO A LANDLUBBER'S EYE they look like millionaires' yachts. They're sleek with clipper bows and cruiser sterns, slender masts and white superstructures. But the Lord Kelvin and Cyrus Field are not bucking North Atlantic gales for pleasure.

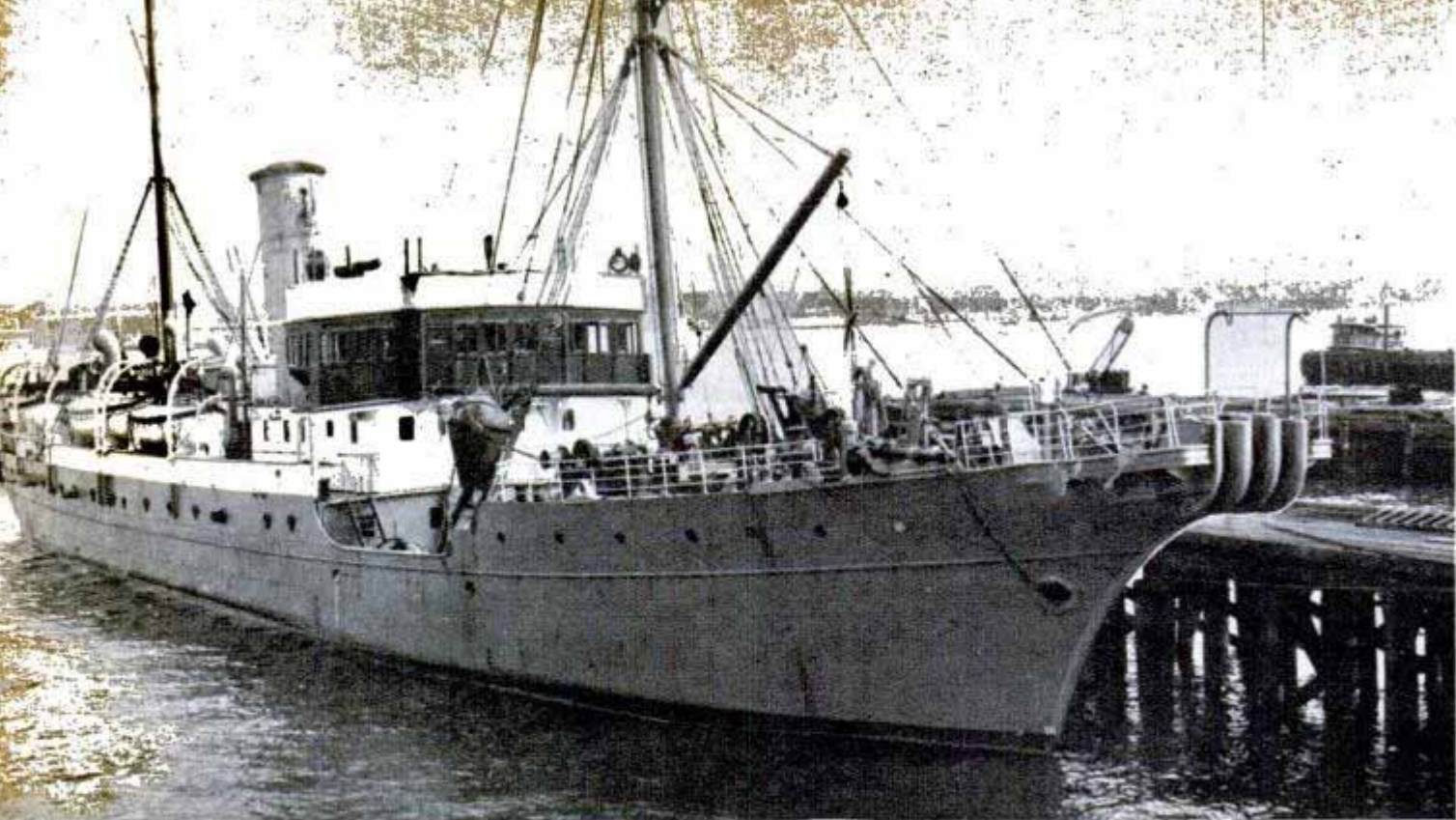
Mariners know the ships' peculiar trade by the two red balls and diamond-shaped cones swinging lazily from the foretrucks. The signals, displayed only when the ships are at work, spell out in international code "Cable ship, all others stand clear."

The 2641-ton Kelvin and the 1288-ton Field roam the sea lanes repairing breaks in Western Union's 10 transatlantic cables. Their highly trained crews, using instruments of miraculous precision, plumb the depths to locate the armor-plated strands of wire, no bigger 'round than a man's thumb, that tie the two continents together. They haul the damaged cables up, splice broken parts with a surgeon's skill and return them to their watery homes.

The Kelvin and Field are responsible for the maintenance of the largest single cable system between this country and Europe. They fish for trouble in all kinds of weather, at all seasons of the year, in waters from the Gulf to the arctic currents.



Lucas grapnel, used in deep water, cuts the cable in two. When the grapnel strikes the strand, huge jaws automatically bite the cable and hold one of the free ends so it can be lifted to the surface

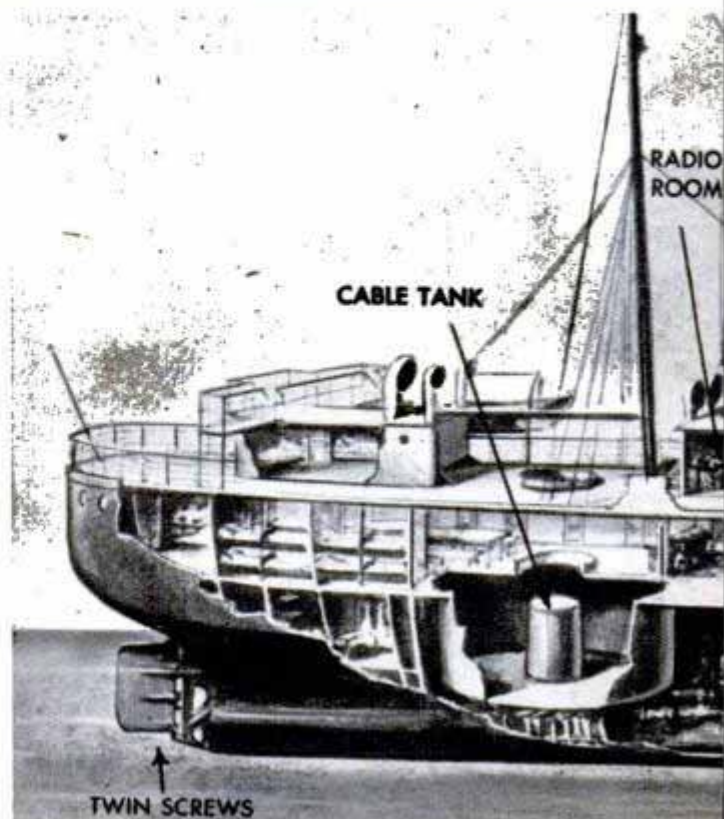


Cable ship *Cyrus Field* ties up at dock between calls. She's always ready for a quick trip to the scene of a break. Right, bo'sun coils the strand into one of the four storage tanks which hold 600 miles of cable

Not long ago the *Kelvin* and *Field* finished their biggest job—keeping the under-sea cables in service throughout the war. Virtually all top-secret messages affecting Allied war strategy were transmitted by cable. The two ships dodged enemy subs, planes and mine fields to keep the vital threads of communication open. They were guarded by the American, British and Canadian Navies and Air Forces on their repair missions.

Each ship narrowly escaped torpedoing. The *Kelvin*, traveling in a convoy off St. John's, Newfoundland, saw the wake of the torpedo that sank the ship directly abeam of her. The *Field* stopped short of danger off Port Judith, R.I. She anchored in a fog while a collier that was accompanying her continued on. Minutes later the collier was sunk by a U-boat that had been waiting, dead ahead, for both vessels to pass the periscope sights.

The 332-foot *Kelvin* and the smaller 238-foot *Field* often were sent far out to sea accompanied only by small escort vessels. On one such mission in 1943 the *Kelvin* was at work on one of the main cables, nearer Europe than America. Her escort ran dangerously low on fuel before the repairs could be finished. Work was abandoned while both vessels high-tailed it for the nearest port—Londonderry, Ireland. It was a hazardous trip through submarine-infested waters and Allied mine fields but the ships arrived safely. The Naval ship refueled and returned with the *Kelvin* to com-



plete the cable job without further trouble.

Fortunately the Germans, so far as authorities know, never attempted to cut an Atlantic cable. The breaks that occurred were all results of normal wear and tear. But the two vessels often were delayed in reaching the scene of a break because of the scarcity of escort vessels. Days and sometimes weeks would pass before the Navy was able to put escorts at their disposal or assign them to coastwise convoys going in the direction of a break.

Convoys, incidentally, were always a headache to cable maintenance men because of the danger that the ships' anchors would become fouled in the undersea lines while in port. New York Harbor boasts an intricate cable system but it is continually menaced by anchors.

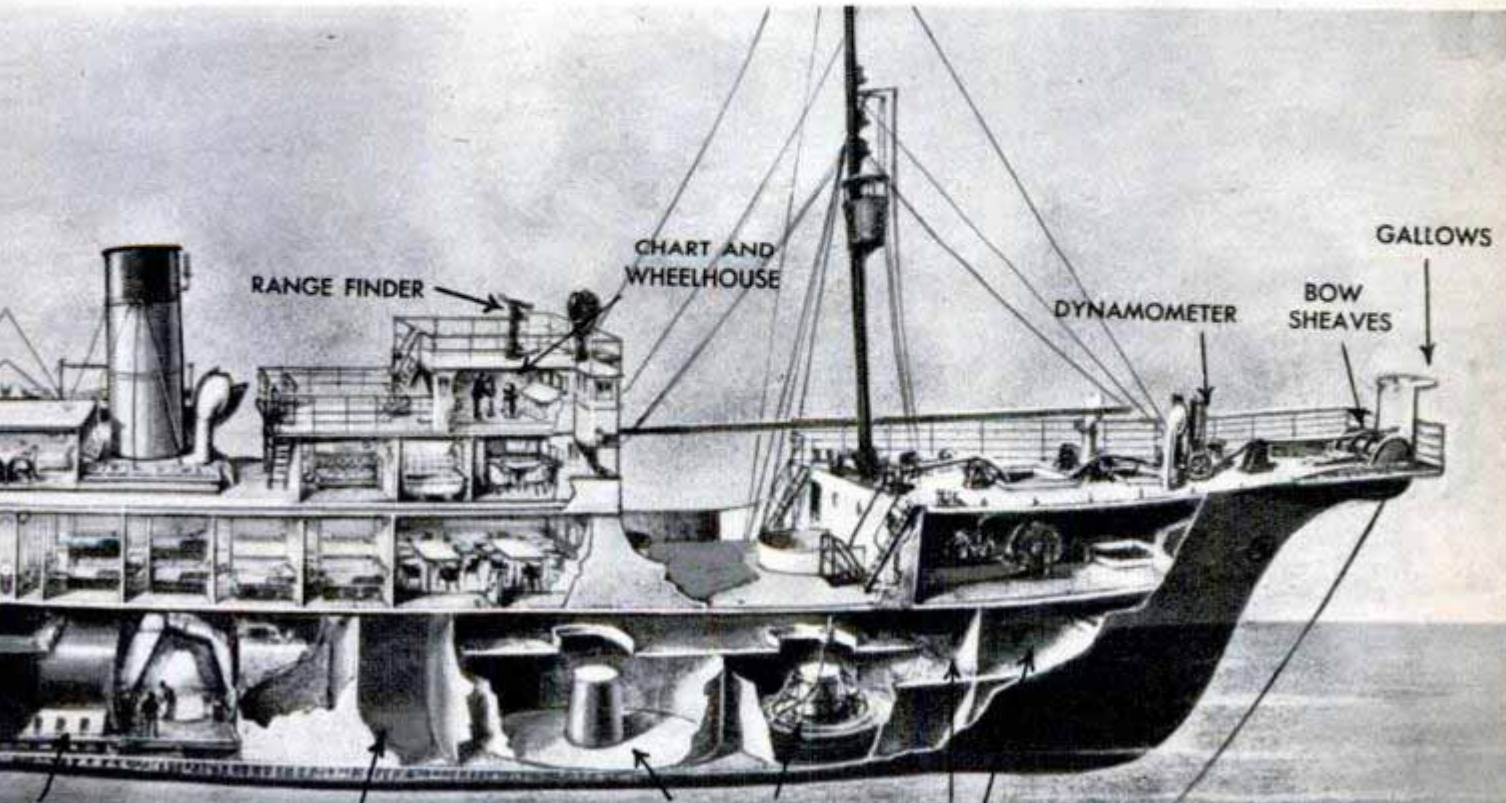
One night an inbound convoy, caught in winds of gale force, arrived outside the harbor and was unable to proceed in through The Narrows. The vessels anchored and a few of the big hooks became hopelessly entangled in a section of cable. The cable snapped. By coincidence the Field was in the vicinity and in response to an urgent radio from Western Union engineers was able to reach the area and begin repair work within a matter of hours.

The dragging anchor always has been a cause of cable damage. In the Firth of Forth in Scotland, 13 ships' anchors once were found ensnared in a four-mile length of cable. High on the nuisance list, too, are the iron-studded trawls which fishing vessels drag along the ocean's bottom. Corrosion eats the wires and they are constantly chafed against sharp rocks and bits of

Cutaway drawing of Cyrus Field shows how cable runs through dynamometer and down to storage tanks



Tension on the grapnel rope is determined by the dynamometer to show when grapnel strikes cable. Below, all grapnel ropes are run through the bow sheaves



wreckage. Ice has been known to crush cables in the northern latitudes and there is at least one authenticated case of a cable being damaged by an inquisitive whale.

Eight of the 10 Western Union cables, which the Kelvin and Field nurse, run from Trinity Bay in Newfoundland to Valentia, Eire, and from Conception Bay, Newfoundland, to Penzance on the westernmost tip of England. The other two lines tie New York City and Newfoundland to Horta in the Azores, where feeder lines connect them with the European continent.

Since the steamship Great Eastern laid the first successful Atlantic cable in July, 1866, the cables themselves and the ships that lay and repair them have undergone

layers of jute yarn impregnated with tar and pitch cover the entire cable.

Stout as they are, cables deteriorate with time and exposure. The two oldest cables operated by Western Union were laid in 1873 and 1874. By now repair ships have replaced with new cable all but about 14 percent of the 1873 line and all but two percent of the 1874. The newer cables have undergone less replacement because of improvements in protective sheathing.

New cable is drawn from a reserve stock worth \$800,000 which Western Union stores at Halifax, Nova Scotia. Halifax is the base for the Kelvin and Field, chosen because it is centrally located for coastwise cable repairs and has a year-round ice-free harbor. The crews of both ships—Canadians, British and a few Newfoundlanders—have settled there and regard it as home.

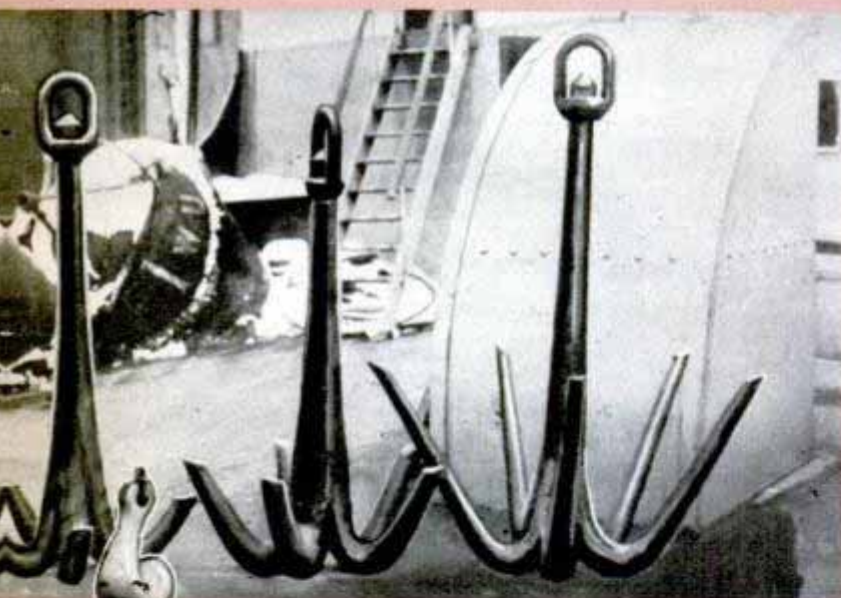
Both ships are under British registry, carrying on a custom inaugurated many years ago when it became apparent that more men could be recruited for this type of work under the Union Jack than the Stars and Stripes. Their crews—85 and 60 men—are mostly old-timers, some having served on cable ships of the Anglo-American Telegraph Company which Western Union took over in 1911.

Esprit de corps runs high among them. It is compounded partly of pride in their calling and partly of a feeling of security because they have a permanent home. But if their life is fairly routine it does have the glamour of unexpectedness—like firemen they never know when they will be called out or what they will find.

The ships are not dispatched on a job until shore-based engineers have plotted accurately the area involved. As soon as a break is reported the cable stations conduct a series of tests. These involve applying a current of electricity through the damaged cable and calculating the distance, measured in terms of electrical resistance, between the testing point and the point of failure. Once this is determined engineers consult charts showing the known course of the particular line and the depths at which the cable is located along its path.

Given the geographical position of the break, the repair ship steams to within grappling range. On arrival she drops a "mark buoy," the nautical equivalent of a land surveyor's stake, but doesn't begin grappling until she has checked and rechecked her position in relation to the damaged cable. In bad weather or heavy overcast this may require considerable jockeying, for like all other vessels the repair ship must "shoot" the stars and sun to obtain an accurate "fix" for position.

If the cable lies in deep water the repair ship stands off a mile or so from the point



↑ Common grapnel resembles boat anchor with five prongs welded or forged to a common shank
← Gifford grapnel has a series of hooks facing in four directions and forming links in a long chain

many changes for more efficient service.

A typical submarine cable today has five layers. The current-carrying section usually is composed of a central copper wire over which are laid copper tapes or more copper wires to form a completed conductor. It measures about $\frac{1}{8}$ inch in diameter. This core is wrapped with a thin tape or wire made of magnetic nickel and iron alloy. Over this goes an insulation of gutta percha which, in turn, is wrapped in several layers of tanned jute yarn. Next comes an armored sheath, composed of as many as 19 galvanized-steel wires. Finally two



at which she believes the faulty cable is located. She pays out the grapnel and slowly tows it at right angles to the cable, searching with huge jaws for the strand.

The grapnel is attached to a line that passes through a shipboard dynamometer, a device that measures the tensile stress which the line is undergoing. The skipper watches the dynamometer, signalling the engine room promptly if it appears that the grapnel has become fouled in some underwater obstruction.

Old-time cable ship skippers have another and more picturesque means of checking stress and one that they swear is as infallible as the "dyna." They climb up on the ship's forecastle head, where the line is being payed out slowly over the vessel's stern. Over the line goes a mat and on top of the mat sits the skipper. He'll tell you he can feel vibrations that indicate when the grapnel's jaws make contact with the cable.

Locating the cable by grapnel is the trickiest part of the job. In shallow water it's made a lot easier by a "leader gear"—two bared copper electrodes which are submerged and towed across the suspected course of the cable at the smallest angle practicable.

While the ship uses the leader gear the shore station nearest the break sends through the cable a dot-dash message which identifies the station. Men on the ship can hear these signals through ear-phones. The strength increases as the vessel approaches the break and reaches a climax when the ship is directly over the broken ends. This position is plotted on a

Wire in core of cable is made of → copper and carries electric current

If wire breaks, these flexible cop- → per tapes carry current around gap

Alloy tape has magnetic qualities → which keep messages from jumbling

Thick protective covering of gutta → percha holds messages to their paths

Jute wrapping cushions pressure → of three miles of water above cable

Nineteen steel armor wires pro- → tect the cable from abrasion by rocks

Final wrapping of tarred jute → yarns seals out ooze of ocean floor

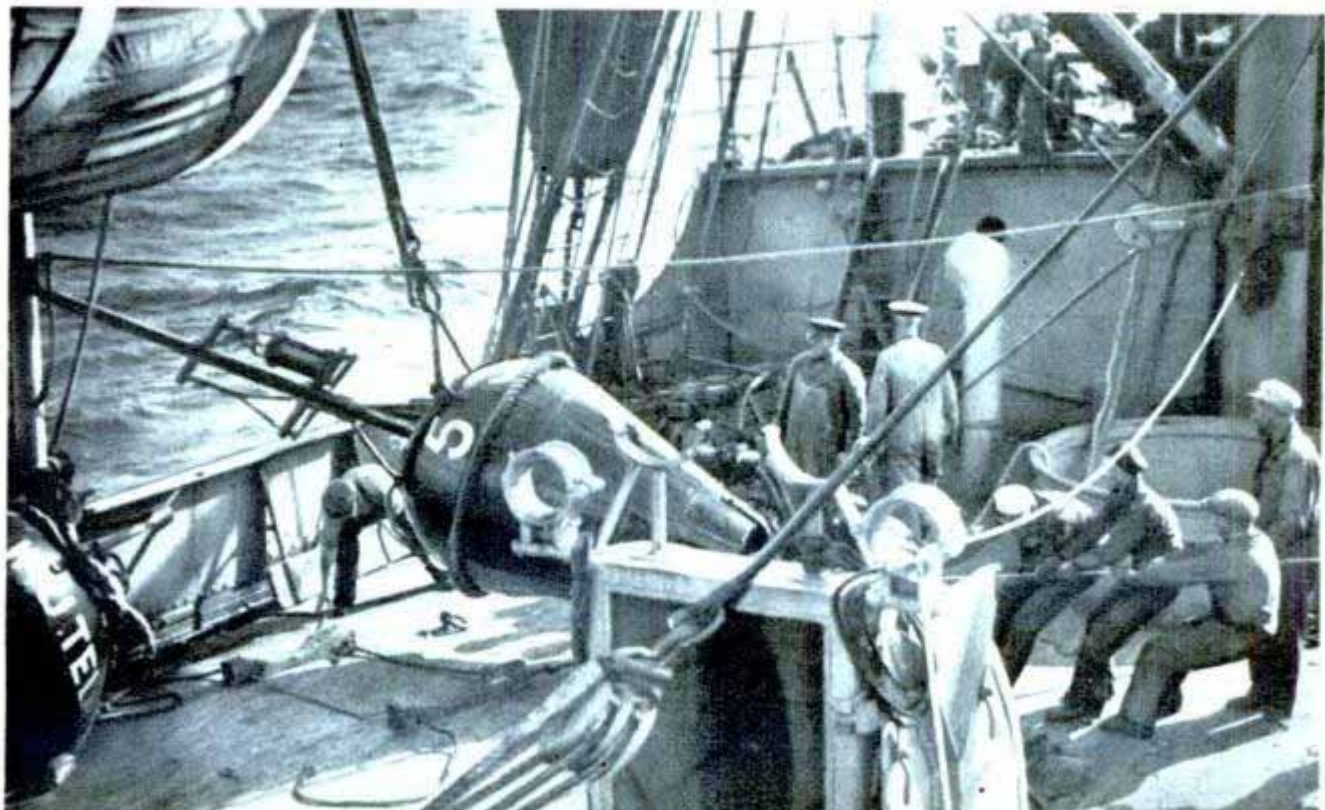


"grappling sheet." The ship then stands off to begin grappling.

There are several types of grapnel. The simplest is an oversize boat anchor with five prongs welded or forged to a common shank. The Gifford is a series of short hooks oriented 90 degrees apart. A patented grapnel known as the Lucas is used in deep water to raise cable that must be cut before it can be surfaced. It grips the cable and cuts one end free in a single operation.

(Continued to page 252)

Crew recovers a "mark buoy" upon completion of job. Lamp on the buoy burns three weeks without attention



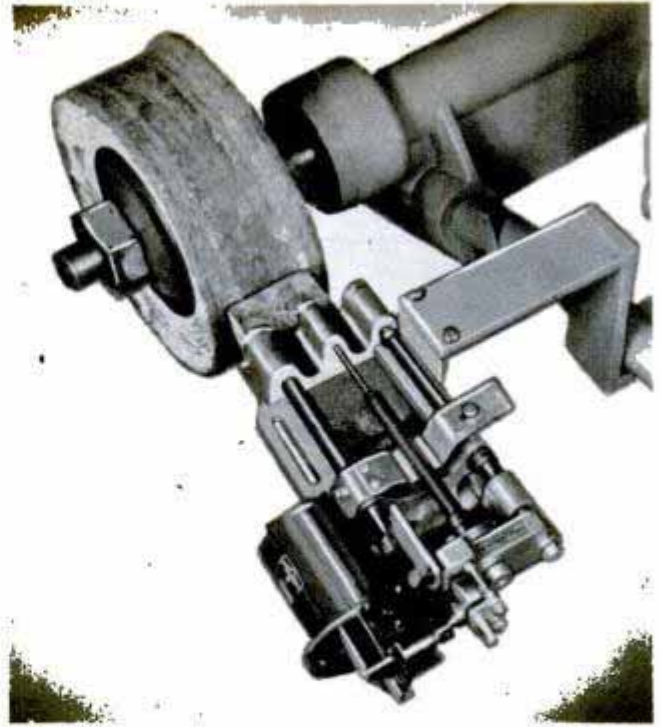


Drill Converted to Saw

Electric and pneumatic drills are converted into power saws by a cutting tool that knifes through plastic, sheet metal, rods, bars and tubing. When used with $\frac{1}{4}$ -inch drills, the circular saw will cut 10-gauge mild steel and $\frac{3}{16}$ -inch aluminum. No starting hole is required and the cuts are made with milled-edge saws that eliminate burring or filing. An adjustable guide shoe regulates the cutting depth.

Mileage Dial for Nautical Charts

Nautical chart distances are translated quickly into miles with a rolling dial which is handy for boatmen. The dial is placed on the chart and rolled along from the point of departure to the destination. No matter how intricate the course, the instrument automatically records the distance in miles. Four separate mileage scales match the charts most commonly used.



Buffing Compound Applicator

Buffing compound is applied automatically by a motor-driven applicator that can be mounted on any buffing machine, either right or left-hand. The applicator has an intermittent control that feeds the stick of compound against the wheel. Sticks of compound any length up to four inches are held in the applicator clamp, with special carriers available for wide sticks. Power is supplied by an enclosed motor available for 110, 220 or 440 volts.

Phone Number Index

Telephone numbers are easy to find in a card-index box that snaps directly to the telephone. The record file is made of plastic in several colors and has a swing-back top that keeps dust off the alphabetical cards. An individual snap attachment is made for each style of telephone. The index box also holds a pencil.





Photo-Negative Analyzer

Density and contrast range of any photo negative—necessary information for selecting the proper grade of paper for a print—can be determined accurately with a photographic analyzer. A concentrated beam of light inside the instrument penetrates a tiny aperture in the viewing plate. The negative is placed over this plate and an arm above the plate is lowered. The light passes through the negative to a photocell inside the arm and a built-in meter shows the density of that part of the negative. By measuring maximum and minimum densities of a negative the photographer determines the contrast range and selects the correct paper. The instrument can also be used as an illumination meter.

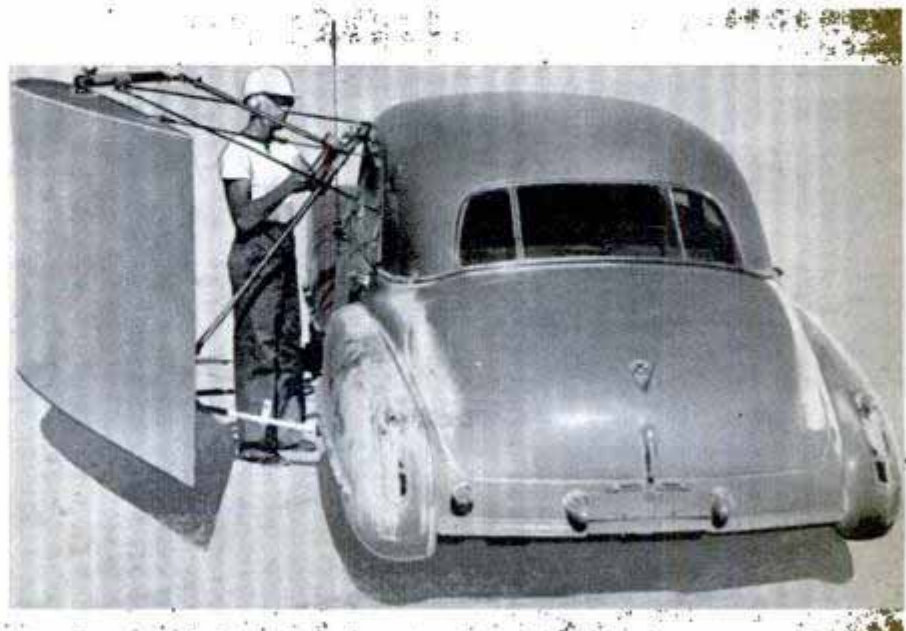


Nut Gatherer Eliminates Stooping

Bending and stooping are eliminated from the job of picking up pecans and other nuts when a spring-headed gatherer is used. Attached to a long wooden handle, the steel spring picks up nuts by wedging them between its coils. The worker then taps the spring on the edge of a basket and the nuts fall in. The design of the spring prevents it from picking up leaves or trash.

Wings Aid Tire Testing

Tires now get 90-mile-an-hour proving tests on autos with airplane wings. Attached vertically, the wing section deflects sufficient air to offset 300 pounds of side thrust that would otherwise pull a circling car off course and cause tire sides to "scrub." In earlier tests this produced abnormal wear on tire treads and made it impossible to obtain accurate results. The testing was shifted from highways to an oval desert track when a 30-mile-an-hour speed increase made the former method unsafe. The idea of adding a balance wing was developed by United States Rubber Company engineers.





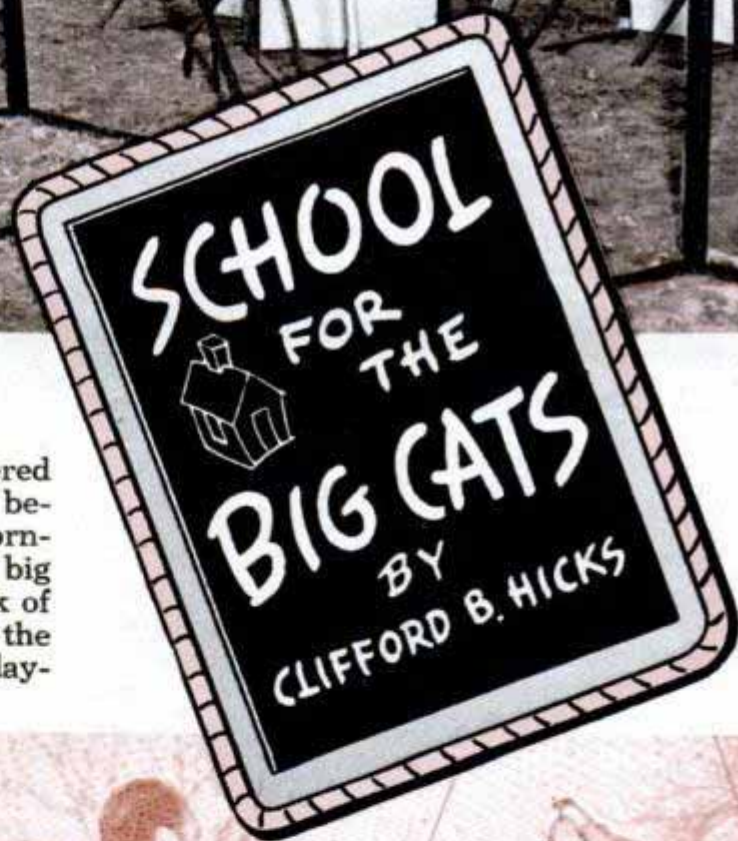
"Kindergarten" lessons are learned quickly by Prince, a 15-month-old cub. Here Clemens teaches the lion to follow tip of whip through a hoop

DICK CLEMENS is as mild-mannered as any school teacher. His scars betray the ferocity of his pupils. Every morning he slips through the door of the big cage in his back yard and puts his pack of full-grown lions and tigers through the ABCs of jumping through fire hoops, playing leapfrog and carrying him piggyback. Four hours later he slips out, relieved that he has proved he is still the boss.

Clemens is one of the country's four leading wild-animal trainers. He plays in Shrine circuses and benefit shows on an independent circuit.

Every day that he's not on the road the 47-year-old trainer holds school for the big cats at his home in Creve Coeur, a small town near Peoria, Ill. The scars that cover his body are proof that spending four

"Crutch" aids trainer in teaching a cat to sit up. Lion leans against the support until he can balance himself. Then the back rest is lowered by rope





Even Clemens is nervous when he works with the tigers, who are moody and treacherous. Note the talons on the striped cat pictured above. One false step and the trainer will be maimed or killed by those razor-sharp claws

hours daily in prepping the lions and tigers for their circus act isn't exactly a healthy way to make a living.

Take his famous "door bounce," in which he plays a dangerous game of tag with an angry lion. Clemens taunts the snarling cat until it leaps from its pedestal. Then he drops his whip and races across the cage

for the door. The cat crosses the arena in a couple of bounds. Just as it makes a final lunge for the trainer's back, Clemens slips through the door and the 500-pound lion crashes into the bars.

The "door bounce" is a good reason why Clemens can't get a life insurance policy. To make sure that our photographer got a

Tyrone and Patsy, two full-grown lions, snarl at Clemens' whip. Right, here's how the trainer looks to the cats





Early in the schooling Clemens opens his fist whenever lions snarl. Later, during the act, the cats snarl whenever he spreads his fingers



↑ Teaching a tiger to roll over on command is a ticklish stunt

↓ In the "door bounce" Clemens is chased by a 500-pound lion, slips through the door by a whisker. The lion isn't fooling, either!



good shot, he made his dangerous dash for safety five times. Each time he was a little slower, and the fifth time the lion missed him by a whisker.

"Some people think it's all an act—that Duke wouldn't hurt me if he should catch me," says Clemens. "They're wrong. Duke's instinct tells him to kill me if he has a chance, and he couldn't stop suddenly even if he wanted to. Once when I was putting on my show in Chicago an attendant failed to open the door fast enough. Duke's inch-long talons ripped through my left shoulder. I was lucky to get out before he did any more damage."

It took a doctor four hours to repair the wound in Clemens' shoulder. At two o'clock in the morning he returned and put his animals through the complete act—with two watchmen the only spectators.

"A trainer who leaves the act because of an injury is no good," declares Clemens. "The animals may think they can get away with it again, but more important, the trainer will lose his nerve."

A lion trainer continually changes his act as a safety measure, he explains. If he did the same thing every day he'd get careless, and a careless man hasn't a chance in the big cage.

School for the big cats starts early each morning when they're turned into the exercising cage. Promptly at 10 o'clock Clemens slips through the door, armed with a pole, whip, two pistols loaded with blanks, and sometimes a chair.

Clemens won't say exactly how he teaches his cats some of their tricks, for a good reason. It may take him years to discover a method to teach a lion a particular trick, but once the method is known other trainers could teach their cats the same stunt in half an hour.

Only a lion that has confidence in himself makes a good animal for training. The big cat usually acquires this self-reliance when he's about 1½ to 2 years old. Clemens' basic training is aimed at developing an understanding between himself and the lion. He never mistreats his cats and has

nothing but contempt for anyone who deliberately harms any animal.

If the lion is vicious or tough when he starts to school, Clemens puts him in a "squeeze cage" where he can't move. Then a collar and chain are fastened around the cat's neck and a "V" chain fastened to the collar from the rear. When the animal is released from the cage Clemens hangs onto the forward chain while his assistants keep the animal under control with the rear chain. This theoretically teaches the lion "respect of distance" from the trainer.

It's only theoretical, though. For example, Nerc, a high-strung animal, forgot all his training in Minneapolis three years ago. Clemens was in the middle of his act when a helper pulled the wrong door and Nero went to the wrong pedestal.

A lion act must have stop-watch precision and Clemens was faced with the task of getting Nero to the right seat. He brought the cat down in a leap from the pedestal but as he was backing across the cage he



Above right, Clemens rides piggyback on his most trustworthy animal, always a crowd-thrilling stunt. Note the look of pain on his face. This photo was taken the day after he was clawed from shoulder to hip, a wound that required 118 stitches. Below, tigers sulk on their pedestals while he polishes a lion act in his back-yard arena





Split-second footwork! In one stunt he provokes lioness into leaping at him, stepping aside as she hits the sand

stumbled over a prop. Nero leaped for his stomach. Clemens put up his legs to protect himself and the cat crunched down on his left thigh.

Clemens gets a faraway look in his eyes when he describes what happened then. The big animal flipped him into the air and

Many tricks are possible after the cats learn to follow the whip. Here one bounds across another's back in pursuit of the stick



carried him clear around the arena. Clemens says he had no sensation of fear or pain—just dizziness. The trainer's wife, standing just outside the cage, fired a blank in the lion's face. The loud report startled Nero momentarily and he dropped the man. Instantly Clemens was on his feet, whip in hand, forcing Nero to his pedestal. Then he calmly backed out of the cage and went to the hospital for five weeks. He says, a little bitterly, that a lot of the audience thought it was part of the act that night.

After the lion has been taught to keep his distance from the trainer, Clemens teaches him to move in the right direction. This is done by tapping him gently on the nose with the whip. He'll lean for it, then follow it as the trainer moves it in the proper direction.

"Seat-breaking"—an animal—training him to go to the proper
(Continued to page 236)

Electric Wheel Chair Has Radio and Lights

Tilting or turning the steering post operates all the controls of a unique motor-driven wheel chair for invalids. The chair, invented by Kenneth Ginsterblum of Osage, Iowa, has a reversing switch in the center of the steering column to permit backing up. All the controls are conveniently located and can be operated by one hand. Two special batteries furnish power to the 12-volt $\frac{1}{2}$ -horsepower motor, allowing seven hours' traveling time without recharging. The chair moves at speeds up to six miles an hour and has enough power to pull double its own weight up an 11-percent grade. The two front wheels have balloon



tires, and the rear wheel, which steers the chair, has a shock-absorbing fork. Other features include a portable radio, a removable steering post, built-in head and tail-lights, and upholstered armrests that open up to reveal aluminum storage boxes.



Belly-Tank Boat

Made from the spare belly tank of a bomber, a tiny racing boat is driven by a one-horsepower in-board motor. Fay Elrod of Jonesboro, Ark., built the compact little craft in his basement. Six feet long by three feet wide, it weighs only 85 pounds. The carved wooden keel is protected by a metal strip and the propeller shaft and bearings were fashioned on a lathe. The steering wheel is a band of scrap steel with a half dozen screwdriver handles for spokes. The fuel tank holds only two gallons, enough to operate the boat most of the day.

Tin-Can Plane Model

"Hedge hopping" over the front yard of Herbert E. Fey at New Braunfels, Texas, is a DC-3 transport complete to the last detail in $\frac{1}{8}$ -inch scale. While the model doesn't fly, Fey has it mounted in flying position. He built it in 3 $\frac{1}{2}$ months at a total cost of only \$5.50. Its riveted "aluminum" skin is formed of 1044 tin sheets which Fey salvaged from 600 discarded tin cans. It is 9 feet 3 inches long with a wing span of 13 feet 1 inch. Contributing to its weight of 150 pounds



are 3275 nails, 1108 rivets, 262 wood screws and five machine bolts. It has a retractable landing gear.



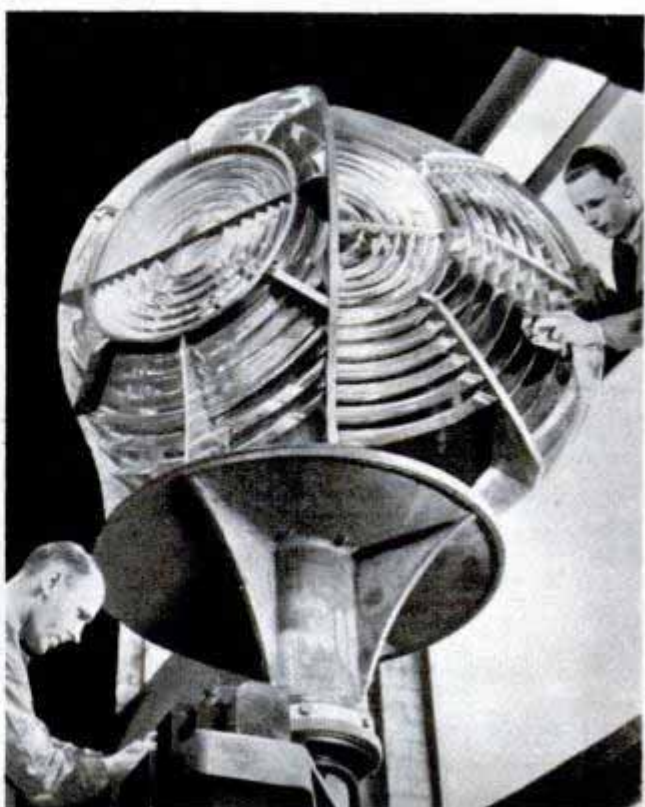
"ON A BICYCLE BUILT FOR TWO"—without a back-seat driver. Built like an overgrown tricycle, two rear wheels insure greater stability and fewer spills

ERRORS, their nature and location are signaled by a machine that solves supersonic flight problems. It is 16 times faster than a trained mathematician
National Advisory Committee for Aeronautics photo



HELD BY a safety harness, a navigator takes a "fix" over the mid-Atlantic. The belt was rigged up after a pressurized transoceanic air liner blew its astrodome

SEA AND AIRMEN 40 miles away will see light from two-ton optics being installed along the Norwegian coast. They'll flash nearly 40 million candlepower



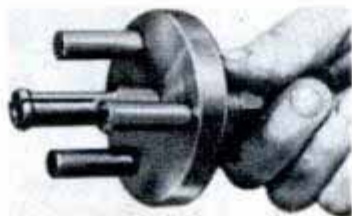
Auto Bottle Warmer

Baby bottles are heated en route during an automobile trip by a bottle warmer that clamps on the steering post. The warmer, made of metal with a baked enamel finish, is connected to any live wire beneath the dashboard and grounded against the steering post. A heating element in the bottom of the cup operates automatically under the weight of the bottle and goes off when the bottle is removed. Small cans of baby food also can be heated in the unit.



Tool Removes Auto Bearings

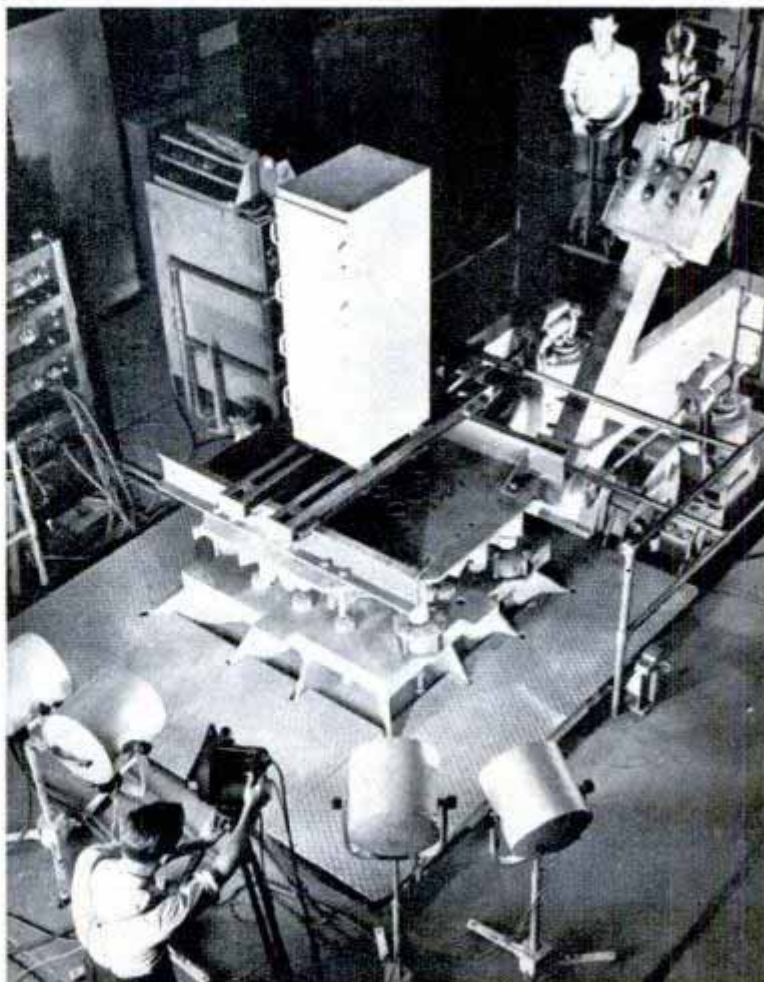
Without marring or damaging the bearing, a new tool for the automobile mechanic is said to remove any clutch pilot bearing in 60 seconds. It is furnished with six collets and two pins—all that is necessary to remove any automotive clutch pilot. With the tool inserted, a wrench is used to remove the bearing assembly. The bearing remover exerts a straight, square pull which insures removal without scoring. The tool also will remove bushings.



Shock Tester

Anchored firmly in 40 tons of concrete, a dry-land "battleship" tests shock resistance from simulated direct hits by big guns or exploding mines. Developed by Westinghouse, the battleship set-up is used for radar tests and to try out other complex instruments. Equipment to be tested is fastened to a gigantic anvil which is struck from below by a 3000-pound hammer. The hammer, suspended from a heavy shaft, is pulled above the horizontal and then released. Swinging like a pendulum, it moves down and then up to strike the anvil a 3,600,000-pound blow. The shock produced lasts only $\frac{1}{1000}$ second.

Information, including manufacturers' names and addresses, concerning products described in this issue may be obtained by writing to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Illinois





Rudder lines from motor are guided by pulleys for "remote-control" steering. Below, boat is carried upside-down atop car. Lower right, Hageman starting the motor

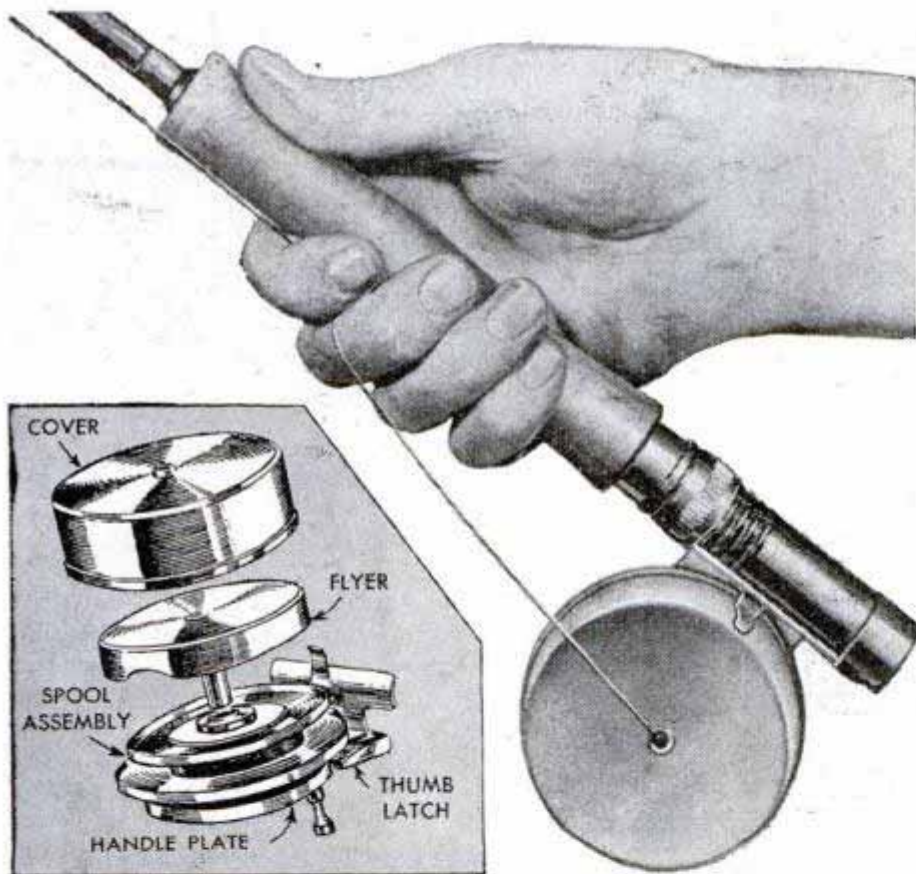
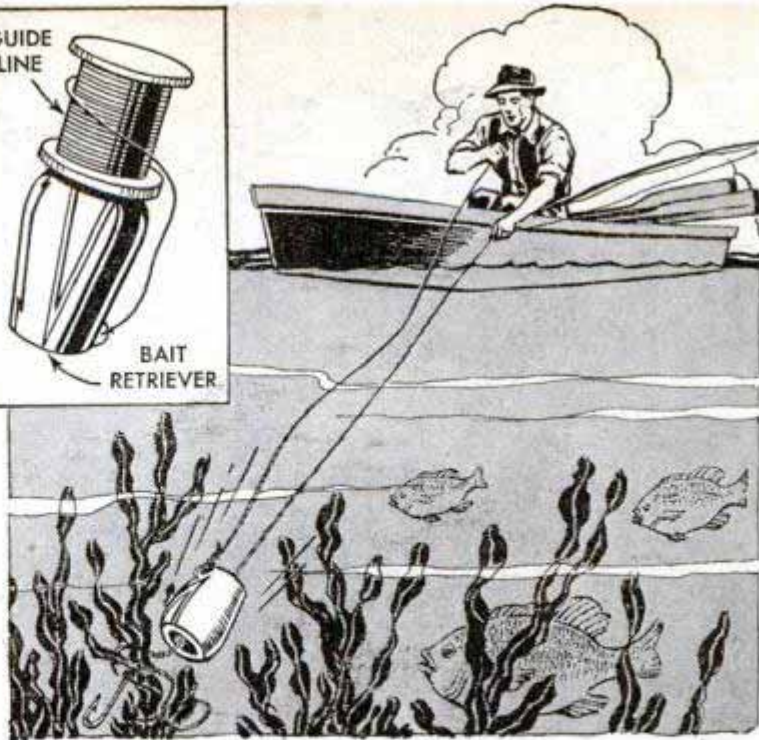
"Bubble" Boat

Because his Plexiglas boat is practically invisible a short distance away, James R. Hageman of Glendale, Calif., appears to be sitting on top of the waves when he goes for a ride. He built the "bubble" boat by bolting together two upper nose sections of a Douglas A-26 bomber and filling the seam with plastic cement. An aluminum crossbar stiffens the craft amidships and a Plexiglas keel gives her more stability. With a small outboard motor on the stern Hageman can travel six to eight miles an hour. A system of rudder lines and pulleys gives him "remote-control" steering when he sits in the bow. Two sections of canvas fire hose pad the hull when the boat is carried on top of his car.



Plunger Frees Snagged Hook

Fishing plugs and hooks that are snagged on underwater weeds or branches are jolted free by a retriever, or plunger, that operates like a miniature pile driver. The retriever consists of a weight fastened to a guide line which is wrapped on a spool. The snagged line is slipped through a zigzag slot in the side of the retriever. When the weight is released it speeds down the line, delivering a solid blow to the plug to jolt it loose from the snag. If the plug is not disentangled by the first impact the guide line can be pulled and released again to deliver repeated blows against the snag. The retriever, made of a high-strength alloy, is small enough to fit into a tackle box.



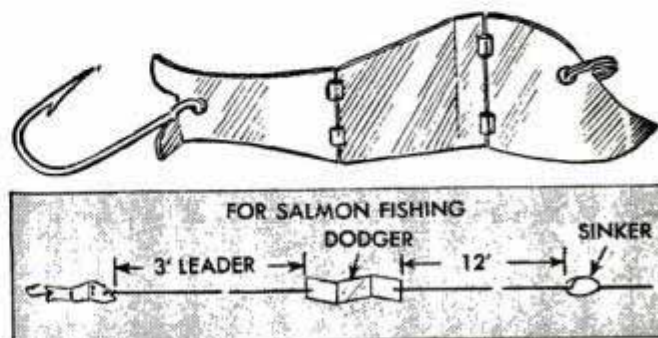
Fishing Spool Reel Eliminates Backlash


Backlash is eliminated by a new type stationary spool reel which enables a fisherman to cast his lure a great distance. The spool remains stationary during the cast but the line feeds out freely. A thumb latch sets it for retrieving the line. No special pole is required and the reel can be used with fly or bait rod to cast 1/8-ounce to one-ounce lures.

☐ American duck and geese populations have declined drastically for the last three years with a drop this year of 26,000,000, leaving only an estimated 54,000,000 waterfowl in the country.

Fishermen's Spoon "Swims"

Hinged in two places, a fishing spoon simulates the action of a crippled herring darting around and turning over in the water. The spoon is available in two lengths, 4-inch for salmon and bass and 2 1/2-inch for trout. The spoons, finished in nickel and brass, and painted to resemble a herring, are strong enough to support a 100-pound weight.





**ON GUARD...IT'S
FOREST FIRE TIME**

American Forest Products Industries photos
Flames leap through timber near Puget Sound. Biggest problem is to keep small fires under control.
↓ Forest patrolman "localizes" a blaze by working on fringes. Charred logs might spring to life again



POOILING MEN, machines and materials, the "tree farmers" of Oregon's Douglas fir country are standing by for fire weather in the big timber. It's tourist and camper season in the forests and the radio at North Fork Guard Station is crackling its fire messages.

"Humidity 19, visibility four miles, wind east-northeast."

When the men at the fire-guard station receive such a transmission they move fast, for the message means that the woods are dry, the visibility poor, and a strong wind is coming up—the ideal situation for the kind of fire which will sweep thousands of acres unless the tree farmers are on their toes.

Fire-conscious private forest owners—the tree farmers—have

Right, first signs of a blaze are detected from modern lookout towers
↓ Guard sights through his alidade to "fix" a distant column of smoke



organized this group to battle the red demon that continually threatens the nation's last great stands of timber. In their short history the tree farmers have chopped annual fire loss on protected land to .12 of one percent, considerably below the .20 of one percent which the United States Forest Service considers an acceptable annual blaze loss.

George Bunke, chief fire warden for the tree farmers at North Fork, Ore., has under his direction some 50 "smoke eaters," the service's lookouts and forest guards. Now that the summer dry season is here his outfit has been increased by a squad of high school boys who form a fire suppression crew.

The observers, guards and suppression crew are clamping a tight





Crewman reports progress of a battle against flames over a shortwave radio mounted on a high-speed truck. Right, more than 170 miles of telephone wire thread the forest and patrolmen can tap in anywhere for reports

watch over 500,000 acres this season—nearly 100 square miles of fine timber that could go up in smoke. It takes vigilance plus the service's modern equipment to patrol an area that size.

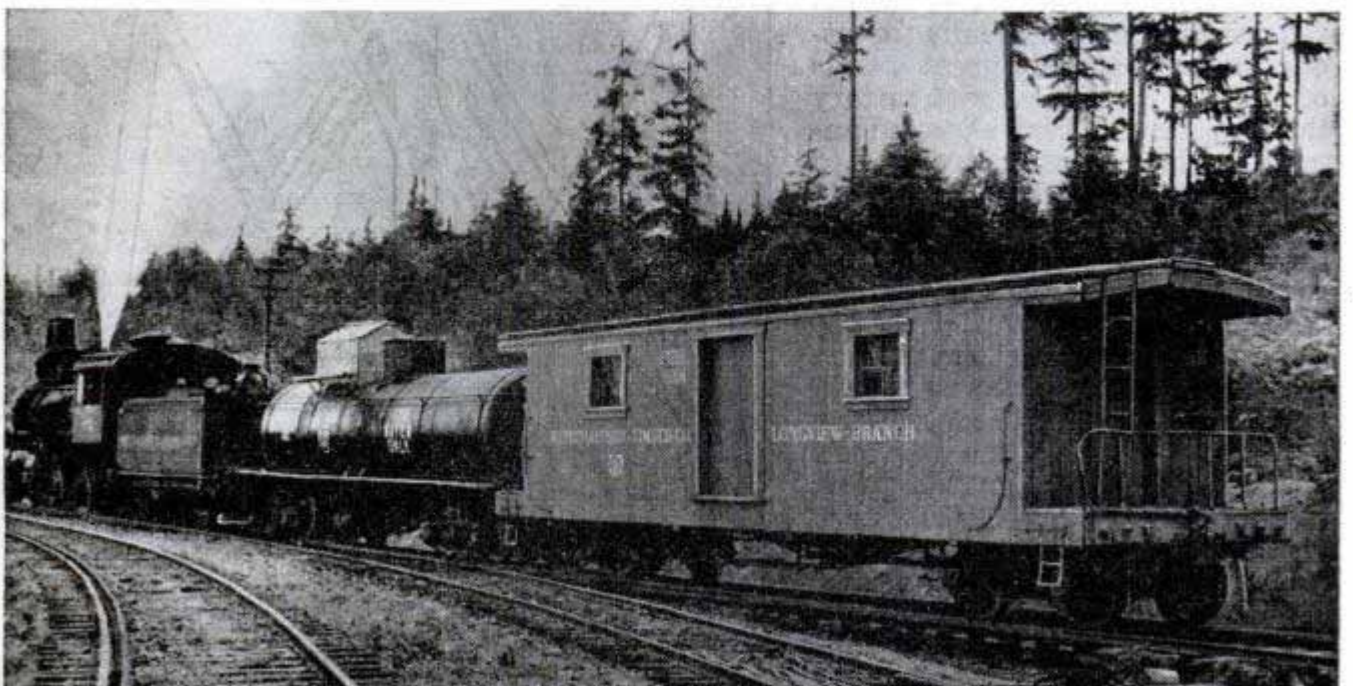
The chief warden's fire control headquarters is a rustic log-sided station. But you won't find him at his desk for long during the dry season. You'll find Vic Johnson, his assistant, manning special equipment designed to receive fire reports and plot the location of smoke signals. With "cross-shot" reports from several lookout stations perched atop mountains scattered

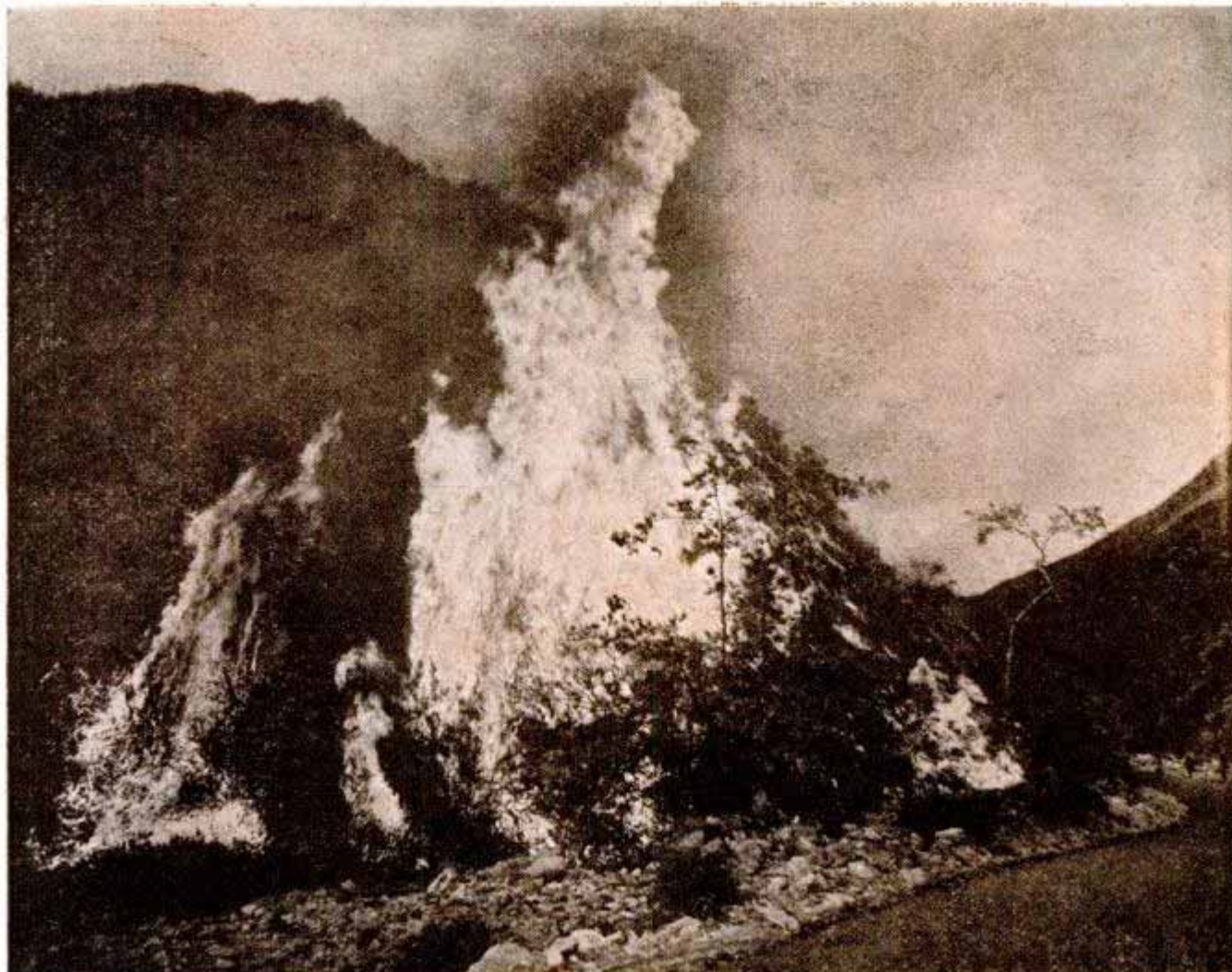
over tree-farmer territory, Johnson can quickly pin-point on the central map in the North Fork station any sign of smoke.

These mechanized forest rangers use radio for fast communication. Just behind Johnson is a big stand-by set, tuned to the wave band assigned the Oregon State Forester's office for statewide use.

A flip of the radio switch at either the lookout station or dispatcher's office provides two-way communication between units of the ground forces. Patrolmen are equipped with walkie-talkies to extend facilities into the dense forest areas where

Locomotives pull tank cars filled with water and cabooses carrying crews to fires along lumberers' railroad





U. S. Forest Service photo

Flames, probably started by a cigarette tossed out along the highway, leap through brush in a western canyon

a wisp of smoke may become a sheet of flame within a few minutes.

The founders of the tree-farmers' organization, the Clackamas-Marian Counties Fire Patrol Association, started their fire fighting with nine men, a few hand tools, a team of horses and a buggy. To fight this summer's battles along the forest trails they have a 500-gallon fire truck equipped with power take-off, a pickup truck with a 150-gallon tank, five additional pickups, a passenger car, seven portable fire pumps with hose and nozzles and enough hand tools such as brush hooks and axes to keep 400 men busy.

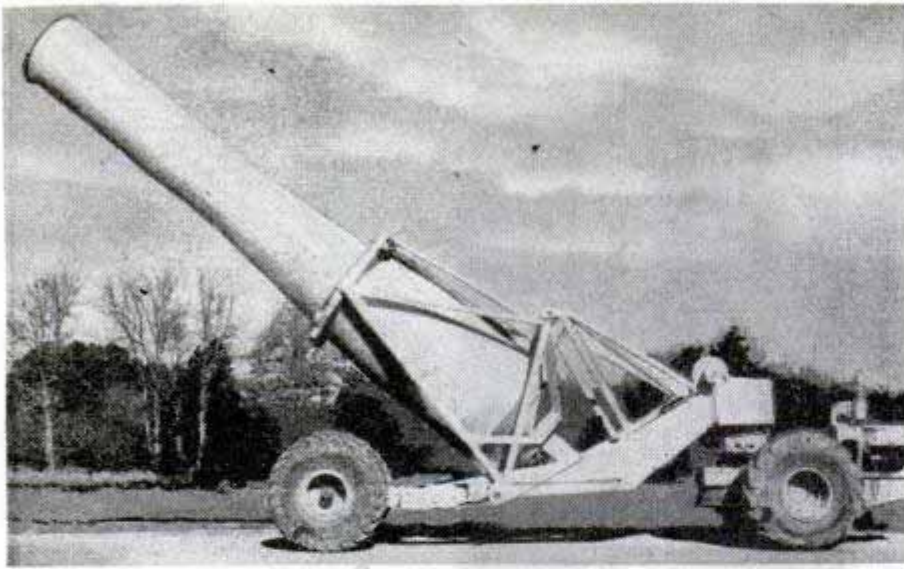
This equipment is strategically placed so that it can reach any point in the forest in a few minutes. The tree farmers boast 104 miles of road and truck trails supplemented by 171 miles of telephone

line, which the fire fighters can tap to call headquarters. Seven primary lookouts are the "eyes" of the network. The lookout

(Continued to page 256)

When blaze breaks out in scrub area a pumper is rushed into action, fed by a nearby stream. All of the tree-farmer equipment is highly mobile



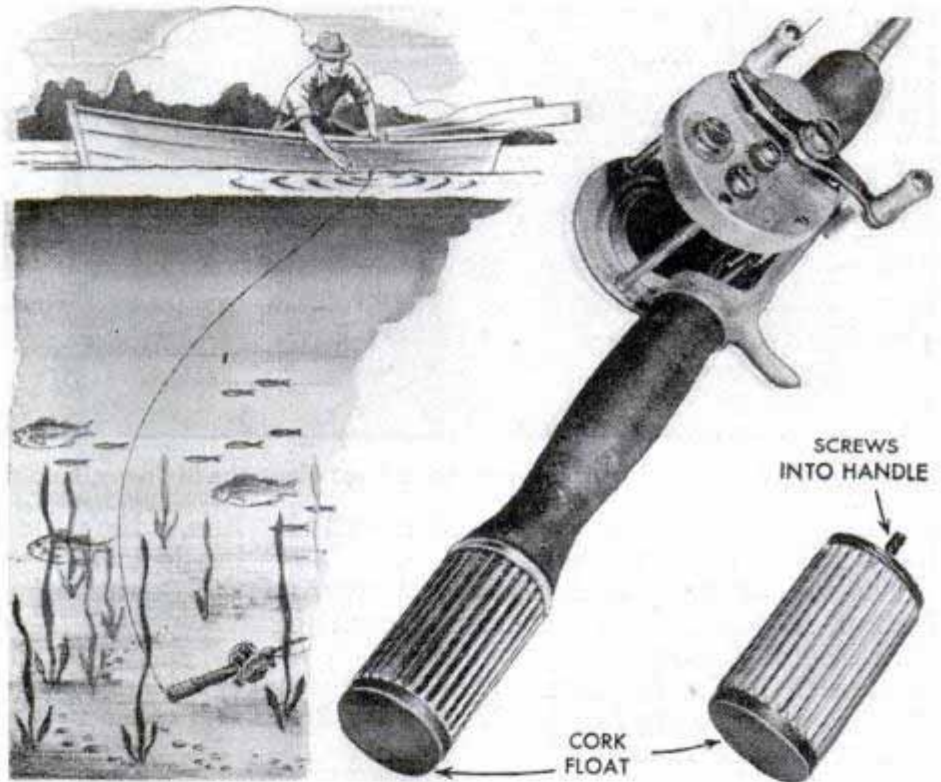


Giant Concrete Mixer

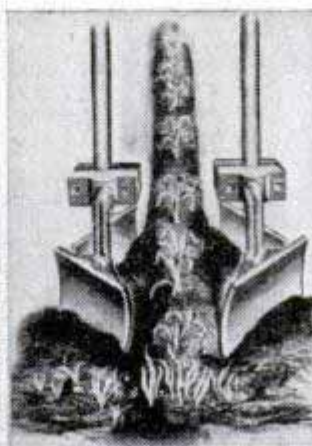
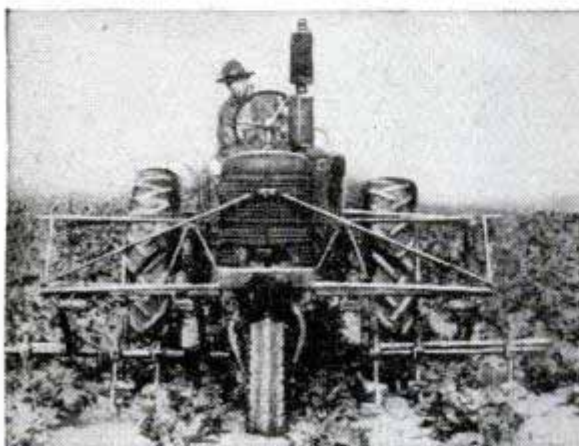
Mass production of concrete houses is speeded by a giant mixer which churns seven cubic yards of concrete en route to the pouring site and lifts the mixture to forms 20 feet or higher. The machine weighs 30,000 pounds and is nine feet wide and 45 feet long. It was designed by R. G. LeTourneau, Inc., to work with the Tournalayer, an enormous machine which "lays" concrete houses.

"Shooting" Buoy Recovers Tackle

Safety floats that can be attached to fishing rods, tackle boxes and other items of value permit the fisherman to recover his equipment if it is dropped overboard accidentally. The float is two inches long and can be screwed to the handle of a fishing rod or snapped on other equipment. If the article disappears over the side, water penetrates the little cylinder and in three to seven minutes causes a chemical reaction which breaks open a cartridge. One end of the cartridge remains attached to the article and the other end forms a buoy which is thrust upward by water-generated carbon dioxide with sufficient force to penetrate weeds. As the buoy ascends, a reel of 30-pound tensile strength Nylon line unwinds, one end of which is attached to the article



and the other to the buoy. When the buoy reaches the surface a dye is discharged to mark its location. The article is recovered by hauling in the line. A larger model for outboard motors releases two 65-pound-test Nylon lines.



Weed Snatcher

Twin pairs of "shoes" attached to any cultivator kill the weeds between rows. The four shoes are attached in place of two cultivator teeth working next to the crop row. The front shoes push crusted soil and weeds away from the row and the deep-set rear shoes deposit moist soil along the rows.



U. S. Navy photos

BANSHEE IS NAVY'S "MOST POWERFUL" FIGHTER

World's most powerful carrier-based fighter is the Navy's description of the new turbo-jet Banshee. Top speed is still a secret, but they admit it exceeds 600 miles an hour fully armed and climbs more than 9000 feet a minute.

The Banshee lands at 70 miles an hour, close to the lowest speed of wartime ship-board fighters, and takes off in a short run with virtually no warm-up. It demonstrated exceptional "wave off" qualities, vital to carrier operation, almost touching down with flaps and landing gear fully extended before taking the signal to gun the engines and fly away.

Though slightly heavier and larger, it closely resembles the Phantom, also built for the Navy by McDonnell Aircraft. Principal difference and key to its high performance are two Westinghouse 24-C Yankee engines. They are axial-flow type, with the air never changing direction of flow from the time it enters at the front until it streams out with a powerful push at the rear.

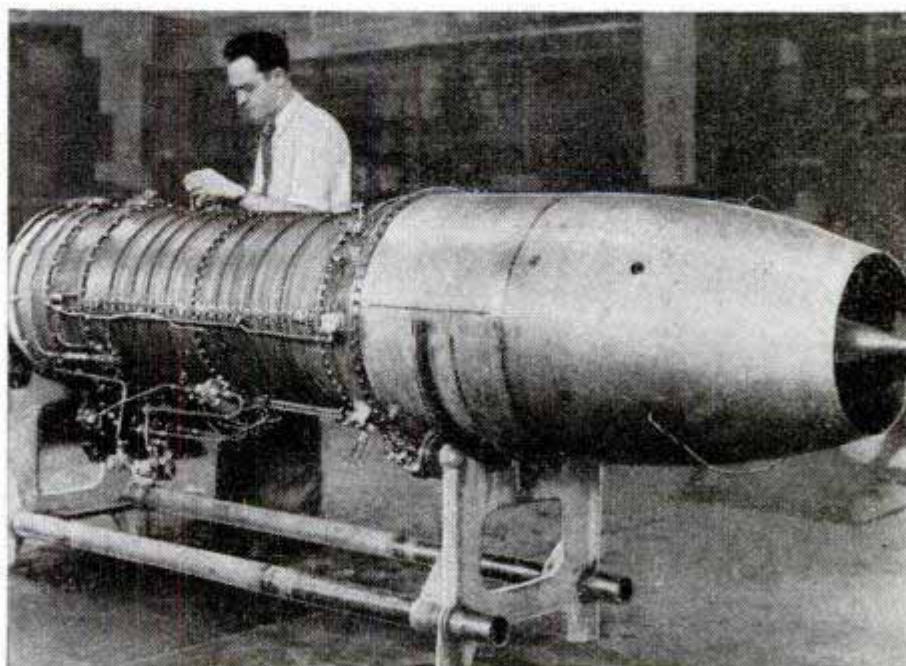
The two engines turn up the equivalent of more than 5500 horsepower, where 2000 horsepower was about tops for fighters two years ago. Lindbergh eked 200 "horses" out of his then remarkable power plant, in flying to Paris 20 years ago.

Another carrier asset of

the new twin jet is "kneeling," which makes room for about 50 percent more planes on deck. In kneeling, the nose wheel is electrically retracted, as it is in flight, until the bowing plane rests on a caster attached to the underside of the nose tip. The tail is then so high that adjacent aircraft can be moved up beneath it for stowage.

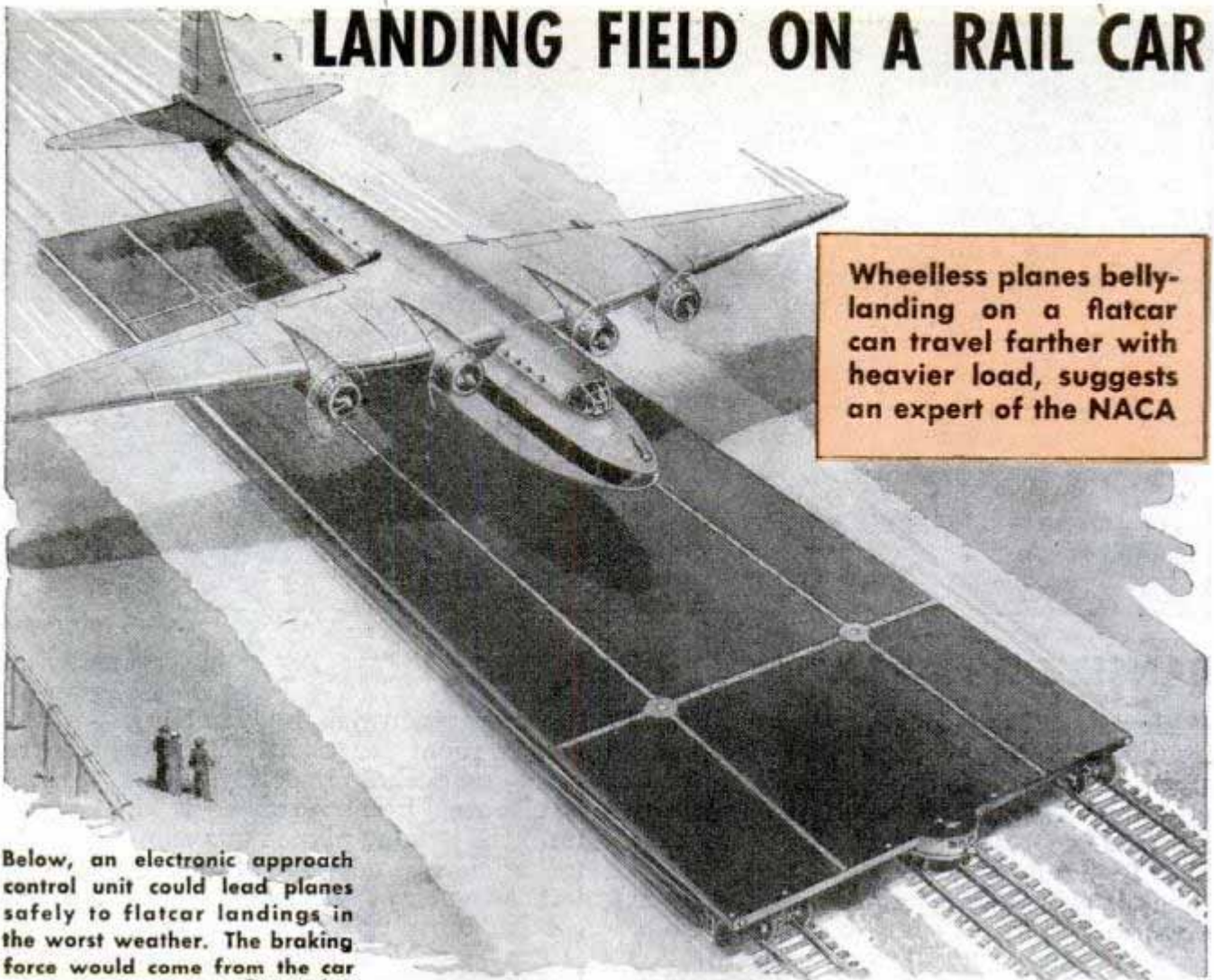
The Banshee's service designation will be XF2D-1. Its stub-end wings spread 41 feet opened and 18 feet folded for deck storage. The plane is 39 feet long. The pilot sits forward of the wings and his head is above the fuselage, giving good visibility.

Since jets are efficient only at or above 85 percent of full power, a single unit is recommended for cruising, rather than using both at reduced power. The engines are close together at the wing roots, so there is little yaw when only one operates.



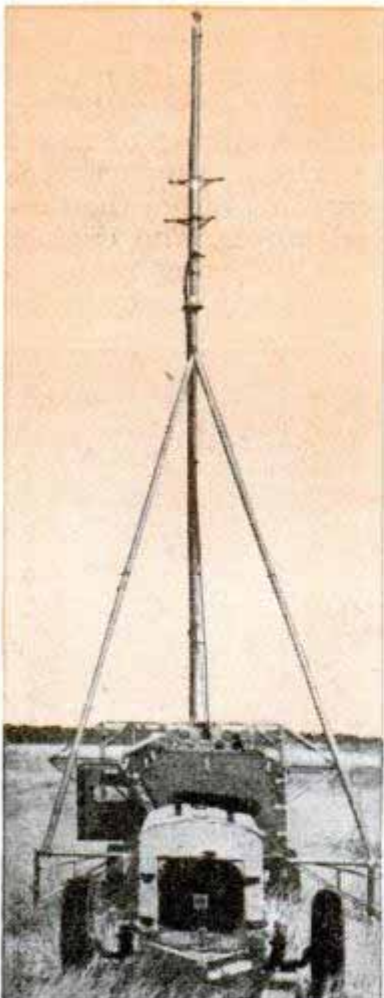
From two of these Westinghouse 24-C jets comes the Banshee's over 600-mile-an-hour speed

LANDING FIELD ON A RAIL CAR



Wheelless planes belly-landing on a flatcar can travel farther with heavier load, suggests an expert of the NACA

Below, an electronic approach control unit could lead planes safely to flatcar landings in the worst weather. The braking force would come from the car
Sperry photo



Air liners can carry an extra 5000 pounds or more, in the same size plane, if designers produce a substitute for landing gear. Many believe landings on railway flatcars or moving belts are the best, and safest, answer.

Engineers like Lewis A. Rodert of the National Advisory Committee for Aeronautics say it's the only way the industry can keep up with the trend to faster and longer flights. On present planes the gear is about a tenth of the gross weight—a stiff penalty in pay-load dollars and cents for equipment used only a few minutes during each trip. Other than those few useful moments, the gear is operational dead weight.

Rail launchings aren't new. Along with declined runways, catapults and a cable attached to a falling weight, they were used during the Wright brothers' era. Glider pickups, the Electropult and jato, of course, are comparatively recent developments.

Rodert suggests substitution of high-wing monoplanes, with strong, flat fuselage bottoms, suitable not only for belly landings but for protecting passengers and cargo in emergencies. The high-wing design would keep the power plants, jet or piston, safely clear of the landing surface.

In landings the plane would follow the radio range and glide path control equipment to "home" on the fast-moving car, started automatically by the plane passing over a range beacon. The engines would be manually or automatically adjusted to hold a constant air speed until the plane was arrested by the landing platform. All the braking effort, shock absorption and arresting gear would be contained in the car.

The single-direction railway, in contrast to the multidirec-



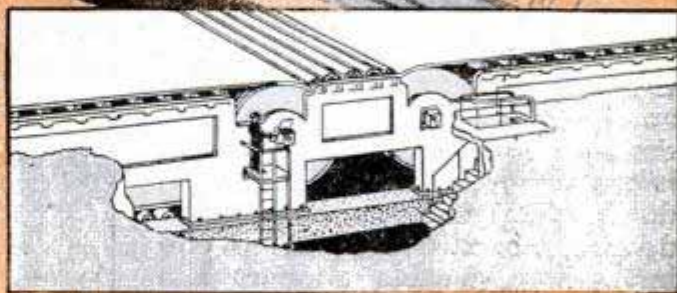
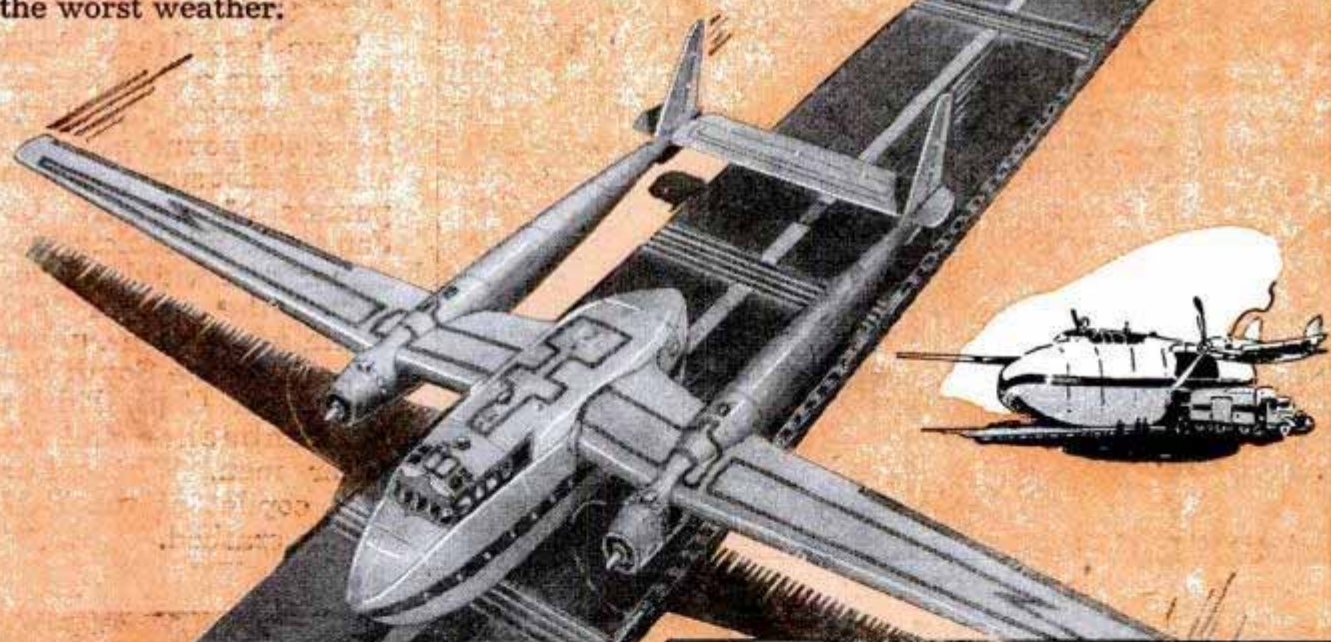
tional runways now required, would operate from either end. A large enough yaw angle would be furnished by the arresting gear between the plane's longitudinal axis and the car's direction to compensate for the wind. Launching would be accomplished by accelerating the car and releasing the plane at climbing speed.

Use of flat-bottomed planes would also eliminate the hazards and problems of failures in the complicated landing gear system. Today's planes, not built for emergency belly landings, are generally badly damaged when forced to resort to one.

Another solution suggested would utilize a series of high-speed moving belts, running at ground level and separated by rollers. The belts would operate in sections to make repair and maintenance simpler. Constant movement would keep them free of snow and ice in even the worst weather.

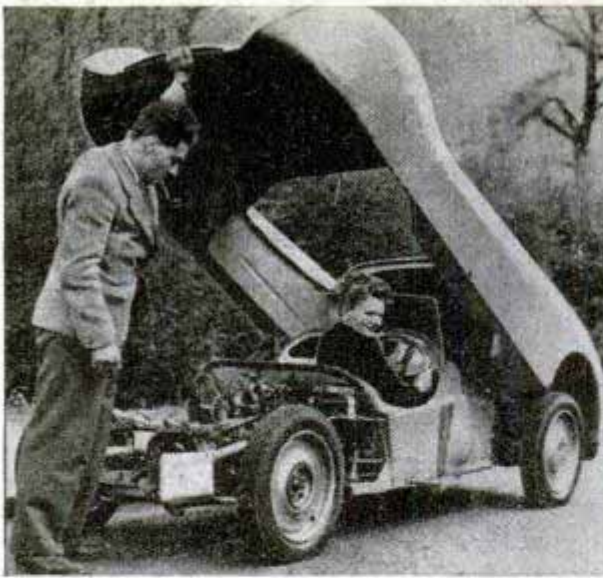


Landing gear is about tenth of plane's weight. On a B-35 it amounts to 12,000 pounds



For ease of maintenance and repair, the speeding belts would be in sections. The surface would always be free of snow and ice in bad weather





MIDGET CAR HAS LIGHTWEIGHT ONE-PIECE BODY

Hinged at the front, the lightweight one-piece body of a small streamlined English car is lifted easily by Charles Cooper, the designer, who built the auto during his spare time. With a five-horsepower engine

mounted at the rear, the car can go 70 miles an hour and travel 65 miles on a gallon of gas at moderate speeds. Cooper, who lives at Surbiton, England, believes the car could be marketed for less than \$1000.



Fuel-Tank Sea Raft

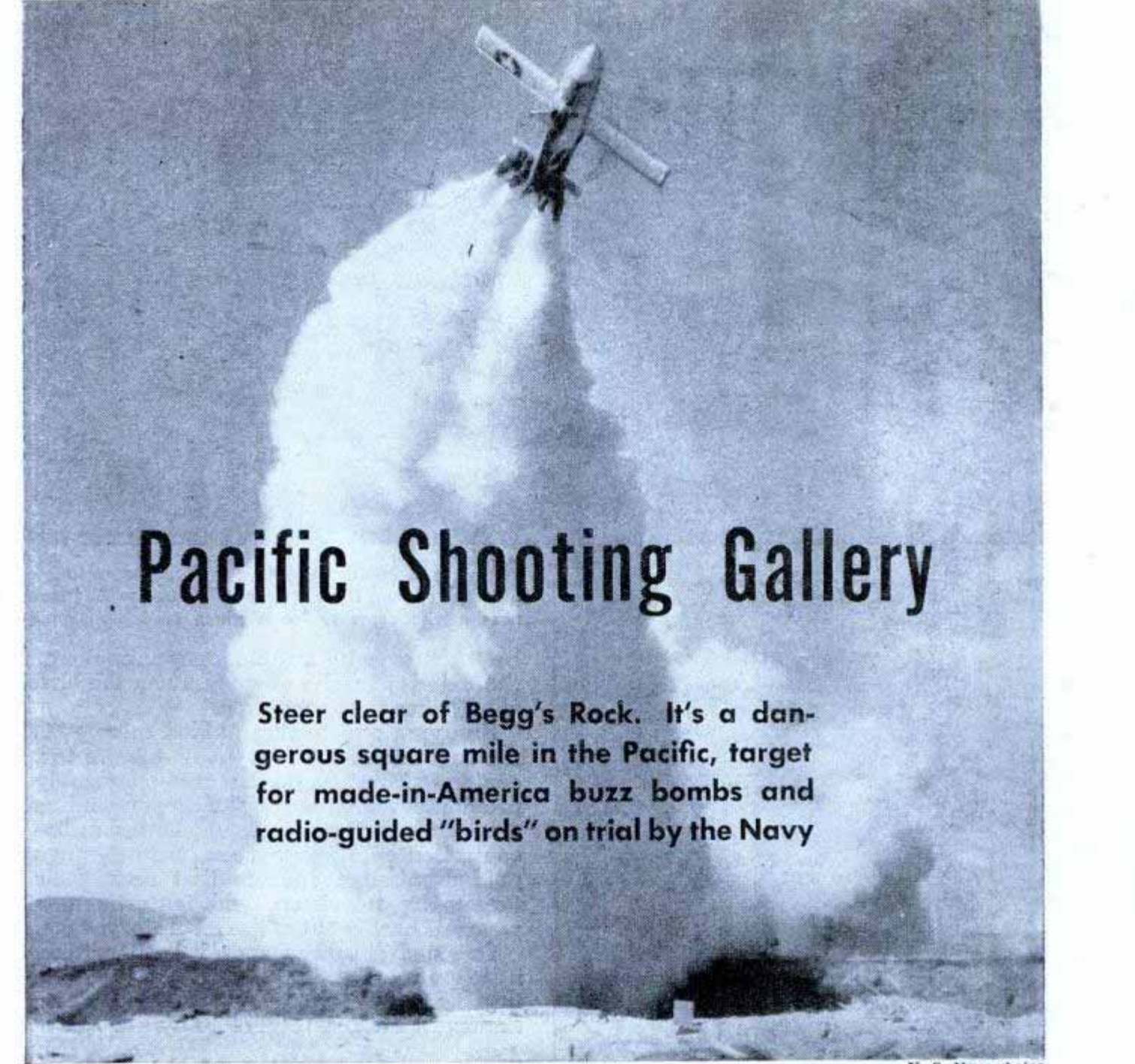
Two auxiliary fuel tanks from a P-38 fighter plane provide the floats for a 400-pound pleasure sea raft that supports 2600 pounds of weight. Lt. James C. Whittaker, designer and builder, conceived the raft in 1942 while adrift in a rubber life raft in the South Pacific with Capt. Eddie Rickenbacker and six other men. Whittaker was copilot of the B-17 which crashed.

'Bachelor' Home on Wheels

Complete housekeeping facilities for one person are provided by an eight-foot trailer weighing under 800 pounds. It has a full-length bed, galley, ice chest, sliding windows with screens, and a Dutch door. The headroom is six feet one inch. Two wheels support the trailer, which is easily maneuvered behind a car.

☐ Removal of paint from spray booths is made easier by applying a special coating to booth walls before painting, the entire coat being readily peeled off afterward.





Pacific Shooting Gallery

Steer clear of Begg's Rock. It's a dangerous square mile in the Pacific, target for made-in-America buzz bombs and radio-guided "birds" on trial by the Navy

U. S. Navy photos

Blast of the four rockets, lasting less than two seconds, carries Loon 50 miles out over the ocean

INSIDE THE COMBAT information center at

By Thomas E. Stimson, Jr.

Point Mugu, Calif., you focus your attention on a green pip of light traveling slowly back and forth across the translucent radar screen before you.

"That's the P-80," the Navy commander at your elbow explains. "The pilot is waiting for the Loon to be fired, then he will chase it. He has orders to shoot it down if it runs wild."

A steady roaring noise commences outside the building and is quickly lost in a giant swish of sound.

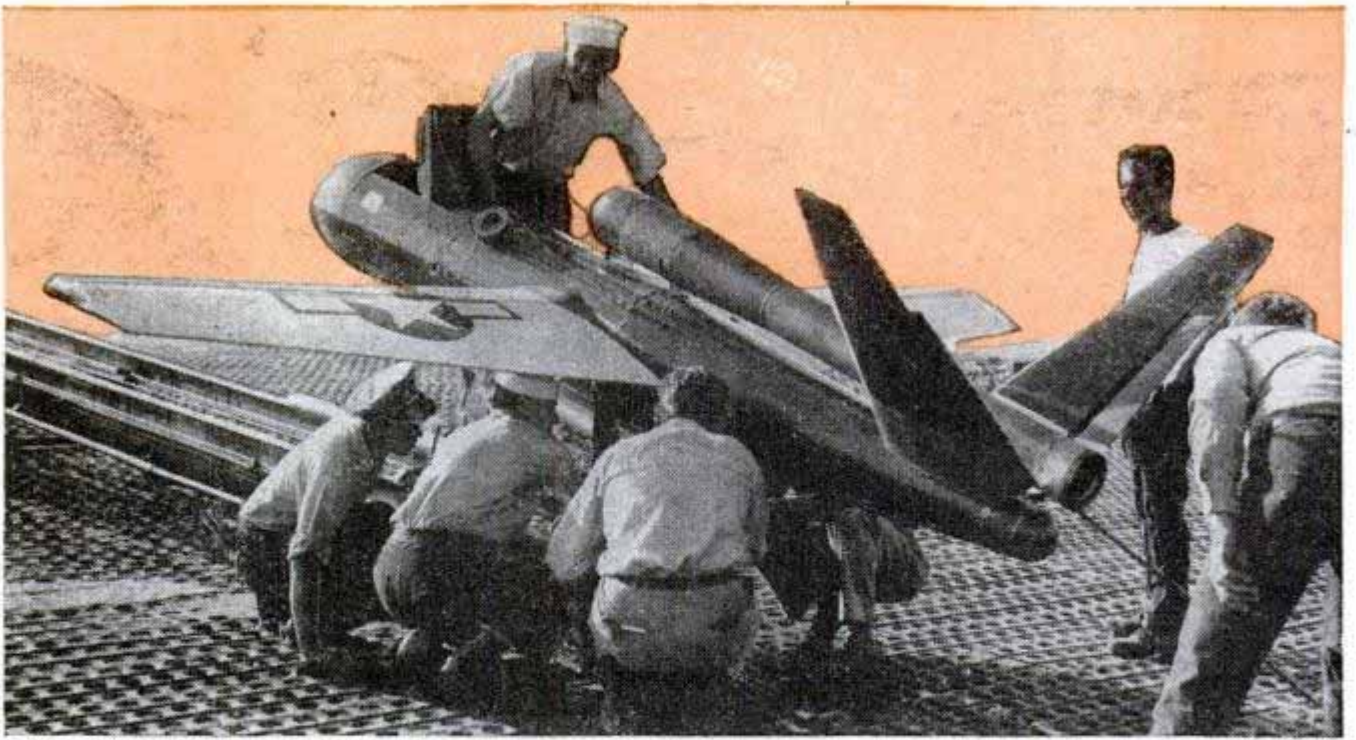
"The bird is on its way," reports a technician with earphones sitting at a charting table. On the radar screen are two pips of light, the bird and the P-80, moving steadily toward the southwest. As you watch,

the leading pip begins to veer off to the south.

Hastily the commander reaches for his radio control box, dials a number, and holds down a switch for a moment. The pip moves back on course.

"Could have been a strong gust of wind that threw the bird off," he says. "To bring it back on course I dial the amount of turn required and then press the 'left' or 'right' switch to indicate the direction of turn. All the commands go by radio to an automatic pilot on the bird.

"Its altitude is preset and is controlled by a gyro. This other switch on the control box is the dive switch, for diving the missile into its target. We won't use it on this flight because the target is beyond the range of this particular radar. Control will



Preparing to launch small target plane, powered by pulse jet engine, from a gunpowder catapult. Open nose carries chute to lower plane on radio signal

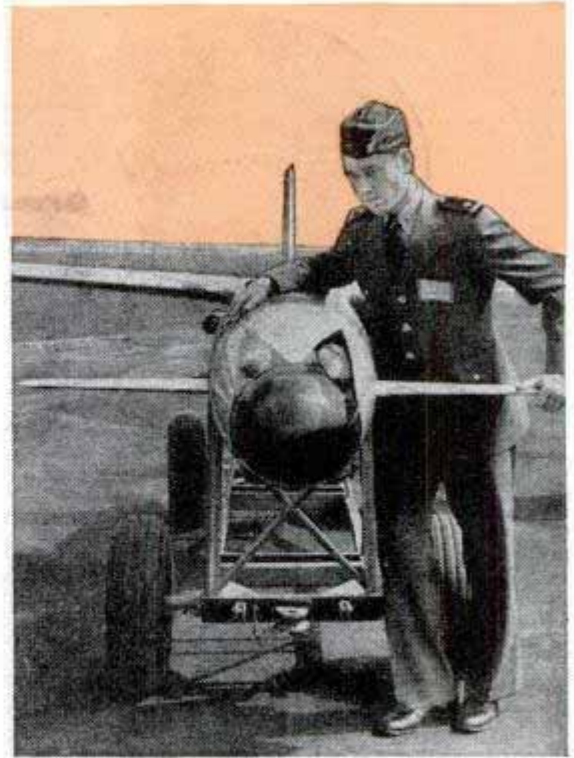
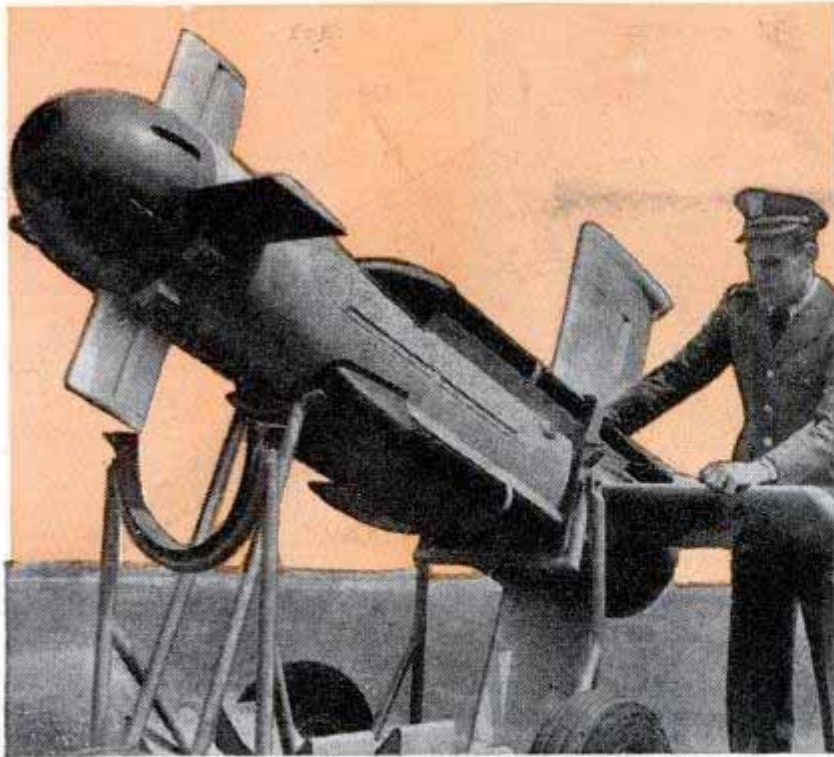
be taken over by a radio station on one of the islands 50 miles offshore when the bird approaches the target area."

Studying and testing guided missiles is the function of the Navy's air-missile test center at Point Mugu. Located on a sandy promontory 50 miles up the coast from Los Angeles, the test center evaluates radio-controlled pilotless aircraft, long-range guided missiles, rockets that seek their targets by television, and fantastic new weapons hardly out of the laboratory stage.

One such future weapon is the Neptune, a 235-mile rocket that is expected to get its first tests next June here and at White Sands, N. Mex. A total of 10 will be deliv-

Missile's path is observed on round radar screen and corrections made by means of control panel at left. Lower left, radar feeds data on the flight of the "bird" to a plotting table. Below, interior of a concrete blockhouse from which firing is controlled





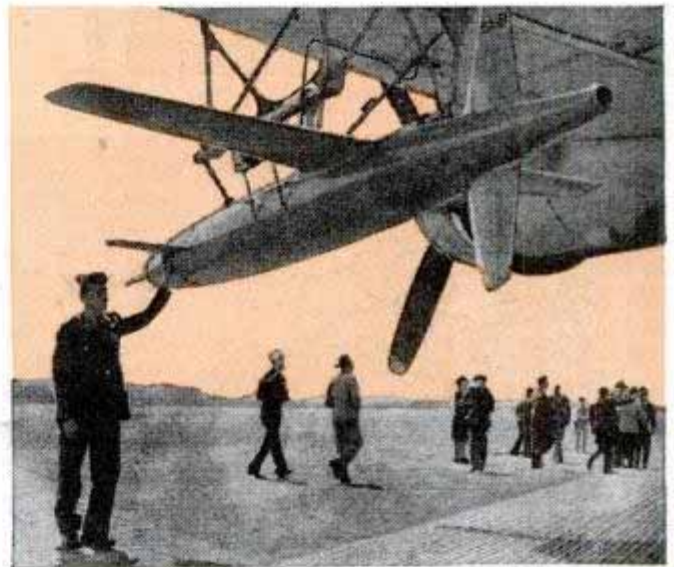
Checking antenna attached to tail of Little Joe, a radio-controlled rocket missile. Oblong window in the nose of Gorgon, upper right and below, allows it to "home" on target after being launched from plane

ered by 1951. The largest rocket which could conveniently be fired from a ship, it will be 45 feet long and carry up to 2000 pounds of measuring instruments. Span across the fins will be 98 inches. Much slenderer than the German V-2 and about a third its weight, the Neptune will be launched from a vertical position.

The stabilization problem is handled by mounting the engine in gimbals, with a gyro guiding changes in direction of thrust. This saves weight, increases thrust for the fuel used and is expected to lengthen the rocket's burning time to 75 seconds, eight seconds longer than the V-2. The engine, fueled with oxygen and alcohol, is being built by Reaction Motors to produce approximately 200,000 pounds thrust for its brief flight.

The program is intended to provide basic knowledge and techniques that will be needed if and when the world ever engages in push-button warfare. More specifically, Navy technicians are studying air-to-air, air-to-ship, ship-to-air, and other special purpose missiles. They are seeking for each type the best kind of launching system, air frame, propulsion unit, and guidance system. Propulsion motors in the sonic, trans-sonic, and supersonic ranges are or will be studied.

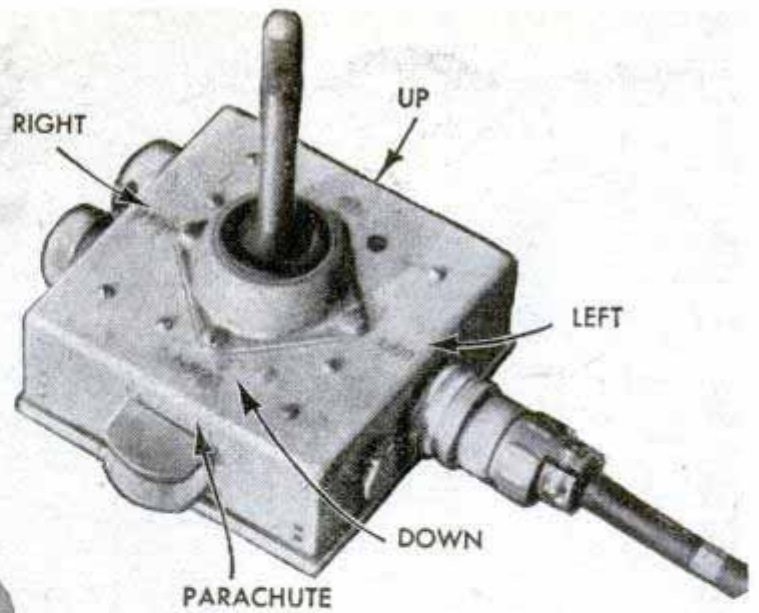
Guidance is a big problem all by itself. Among the various systems are the preset mechanisms such as steered the German V-1 and V-2 missiles, target-seeking devices such as direct the Bat glide bomb on a collision course with its target, the com-



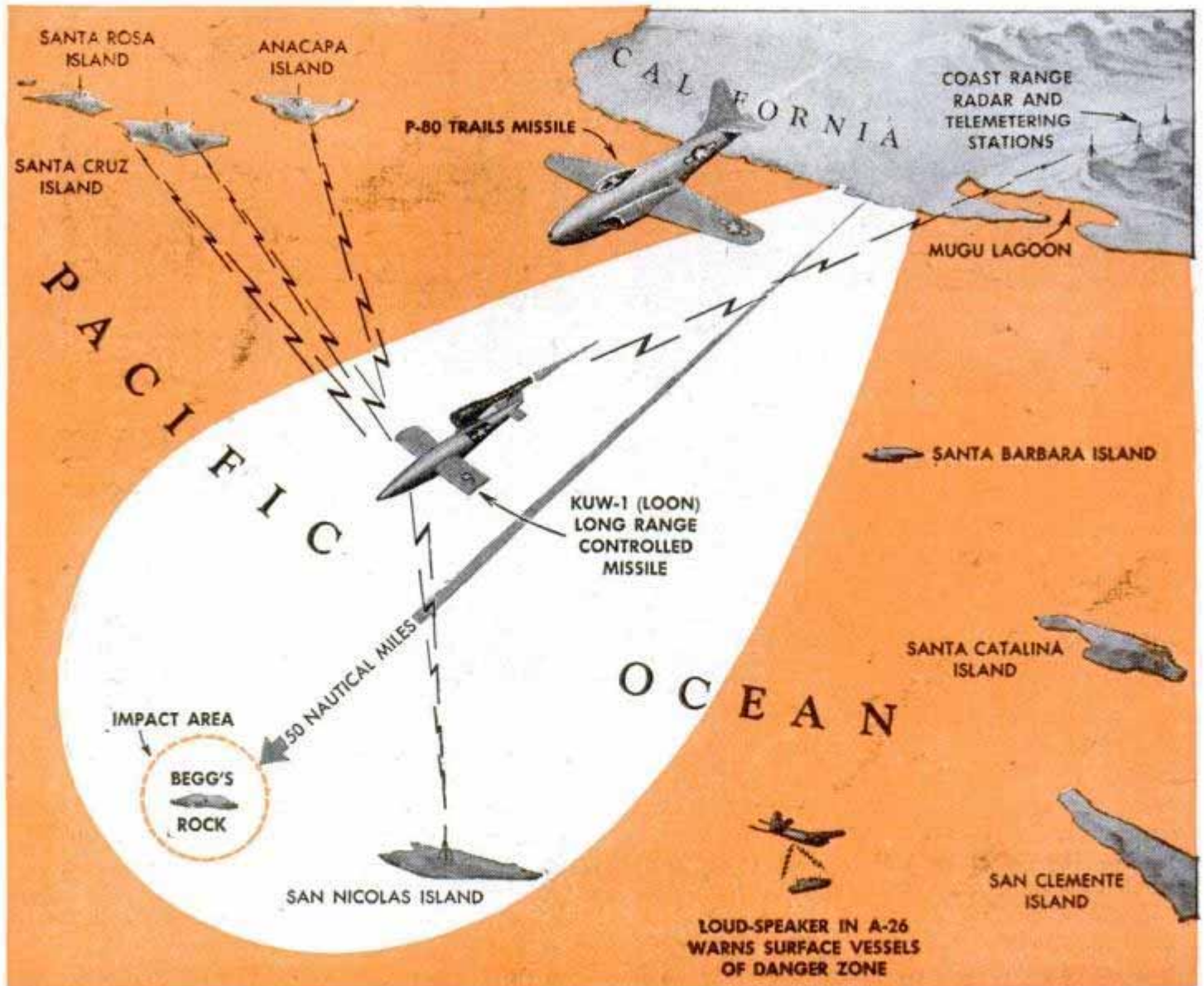
mand system by which radio impulses or other signals are used to control the missile during flight, and the course-seeking system by which a beam of light or radio energy is pointed at the target and along which the missile flies until it hits the target. More than one of these guidance systems can be used with the same missile.

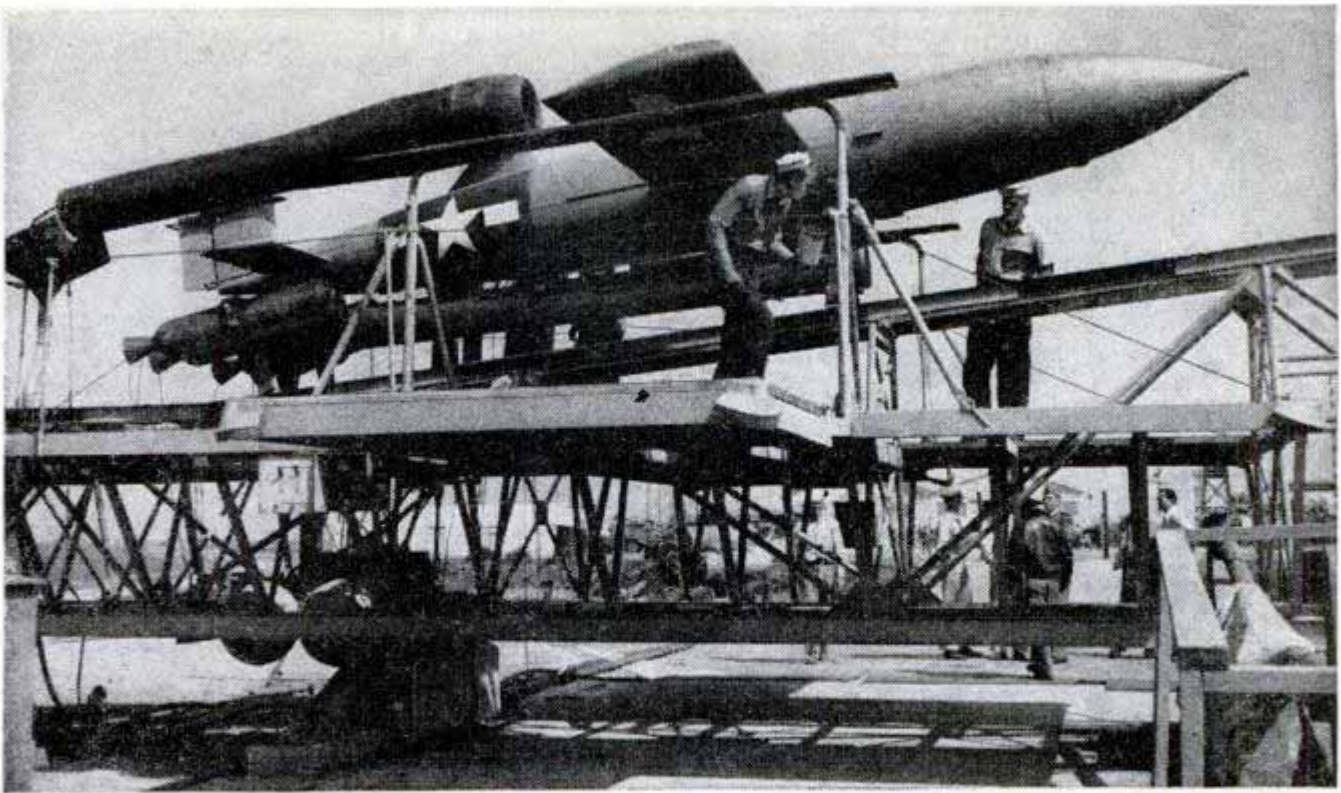
As an "impact area" for this research the Navy uses an area of water, roughly fan-shaped, that extends 80 miles out into the Pacific from Point Mugu. No suitable test range of the desired length could be found ashore. The specific target for most of the long-range missiles is the square mile of ocean that surrounds Begg's Rock, a tiny pinnacle that rises out of the water more than 50 miles offshore. Radar stations on the mountain peaks behind Point Mugu and on several offshore islands are used for watching the missiles while in the air.

When a "bird" is scheduled to be fired,



"Pilot" on ground maneuvers target plane by means of radio impulses from control box in his hand to receiver in plane, which in turn operates automatic pilot. Below, the Pacific shooting gallery and the Begg's Rock target





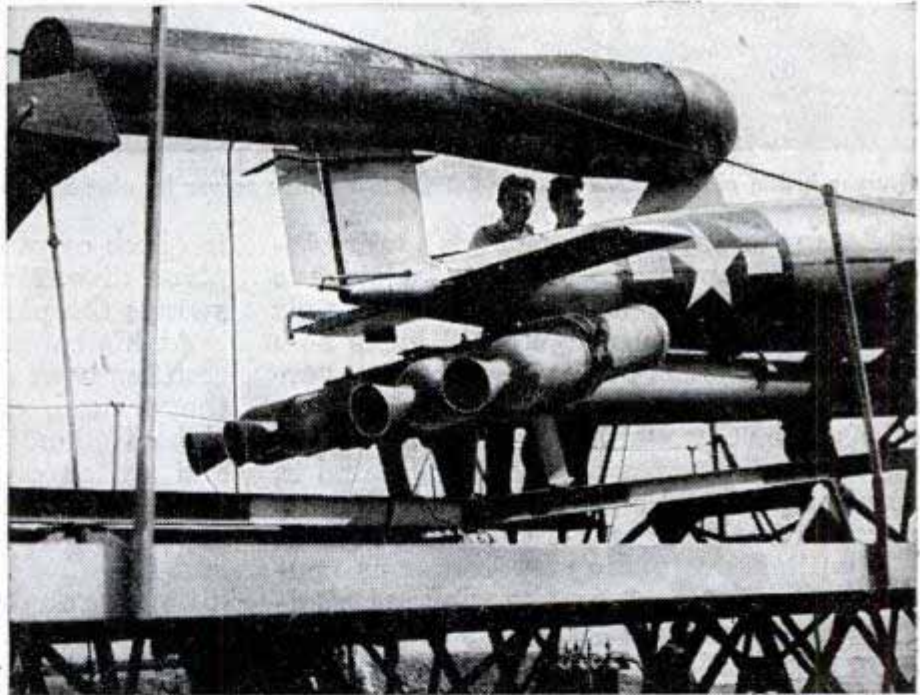
From rocket take-off, above, the Loon gets an impetus of only seven Gs, against 18 from gun-powder catapult. Right, view of four rocket motors below tail

radio warnings are first broadcast to ships and fishing vessels that might be in the area, then radar searches for any vessels that might not have heard the warnings. A patrol plane with a loud-speaker pointing down from its tail is sent to any such ship to warn it to get clear.

Each long-range missile is observed all through its flight by the pilot of the P-80 chaser plane and in addition is tracked by the chain of radar stations. At the same time, instruments inside the missile continuously measure its roll, yaw, pitch, the performance of its various parts, and other data, and transmit this information by telemeter radio to the ground stations.

One of the most useful long-range birds for carrying on some kinds of research is the stub-winged V-1 buzz bomb that is powered by a pulse jet engine. An American version of this German weapon was built in large numbers in the United States during the latter part of the war and some of these are now used as research vehicles.

Designated by the Navy as the KUV-1 and nicknamed the Loon, the improved V-1 missiles have a range of more than 150



miles and a speed in excess of 425 miles per hour. Some are launched from the rails of a 150-foot catapult, the powder charges of which impose an acceleration of 18 Gs on the Loon and build up its speed to 260 miles per hour by the time it leaves the rails.

Other Loons are fired by means of a launching carriage or sled to which are attached four large rocket motors. The rockets drive the sled and Loon up into the air with a force of 7 Gs, then when the motors burn out the sled falls free and the Loon continues on its way.

Smaller missiles that are being studied at Point Mugu include Little Joe, a ship-launched radio-controlled rocket of 2-mile



Gauges inside plane record results of flight test under power by nine-inch pulse jet engine below the fuselage

range for use against suicide planes or other missiles, the radio-controlled Gargoyle for air-to-ground use, and the air-to-air Gorgon that has a range of 12 miles at a speed of 500 miles per hour. Improved versions of the Bat glide bomb are being tested, as is the German X-4 anti-aircraft rocket that trails $3\frac{1}{2}$ miles of fine wire behind it, receiving control signals over the wire as a way of avoiding jamming of radio signals.

Simultaneously the test center is conducting research on a wide range of pilotless target aircraft. These small drones have a wing span of around 10 feet. All are controlled by radio from the ground. They are used as targets by anti-aircraft gunners and also for the testing of new radio control systems for pilotless aircraft or missiles. Some are powered by conventional gasoline engines, some by pulse jets. Some can fly at the rate of 240 miles per hour, climb 25,000 feet, and remain aloft for more than an hour.

Radio control of the drones has been perfected to the point where the "pilot," standing on the ground, maneuvers one of the craft with as much dexterity as if he actually had his hands on the plane's controls. Holding a small control box from which protrudes a switch handle similar to the control stick of an airplane, the pilot pulls back on the stick to cause the drone

to climb or pushes it forward to make the plane dive. Moving the stick left or right swings the plane in the desired direction.

At his command the plane loops, spins, shuttles back and forth only a few feet off the ground, or climbs practically out of sight. He lands the plane by tripping a special switch on the side of the box. This switch sends out the radio impulse that pops open a hatch in the plane's fuselage and frees its parachute, at the same time killing its engine. The plane floats down to a slow landing.

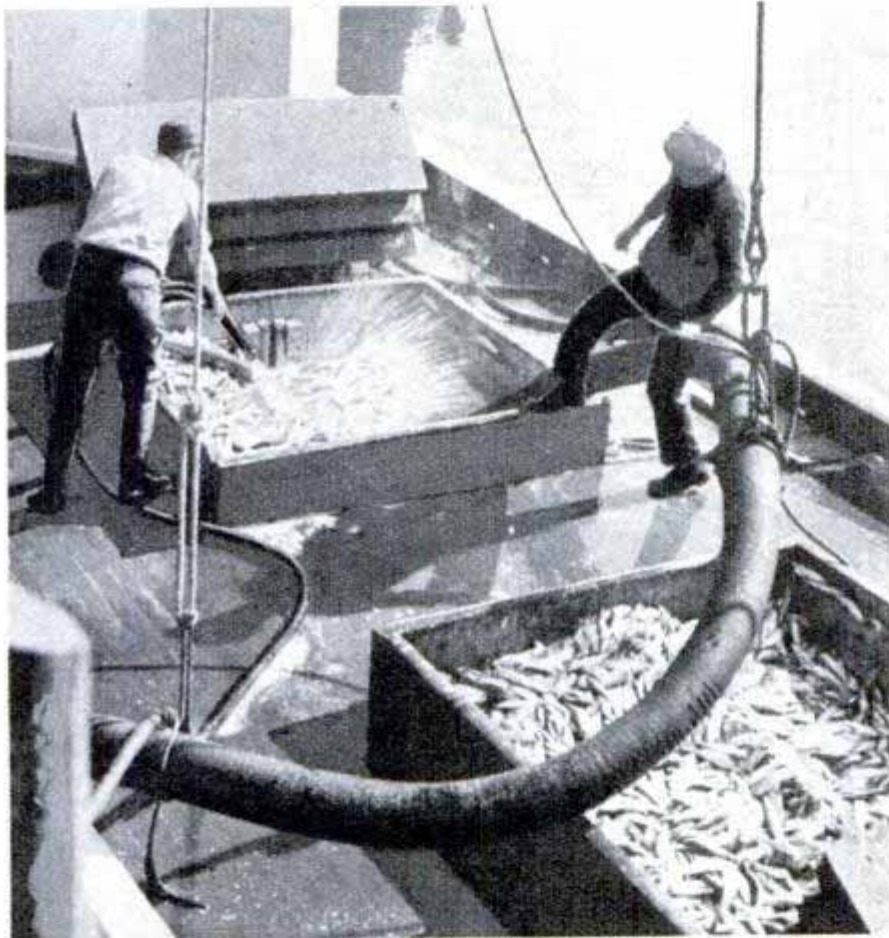
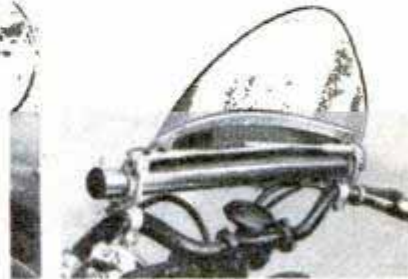
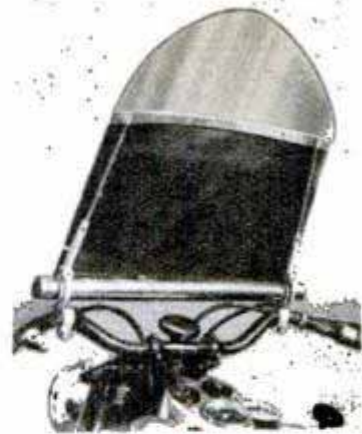
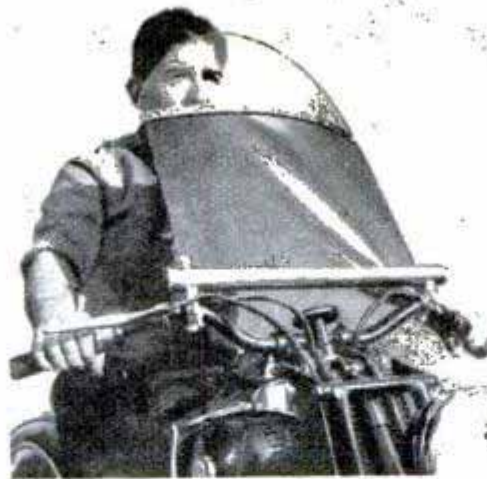
Push-button warfare is still in the future. "We are not yet ready to push the button," remarks Captain A. B. Scoles, director of tests at Point Mugu, "but we are doing everything possible to wire up the button so that if the occasion arises, our buzz will be just as loud and just as effective as the other fellow's."

Chemical Coating Insulates Exhaust Pipes

Fire danger from hot exhaust pipes is lessened by a chemical coating which kills 90 percent of the visible red glow and invisible infrared radiation. The coating, made from oxides of calcium, titanium and antimony, is the outgrowth of wartime research to develop a material to black out the red glow created by bomber exhaust pipes.

Shield for Motorcycle Rolls Into Cylinder

Lowered or raised like a window shade, a new motorcycle windshield gives a rider protection in any kind of weather. When raised for rain or cold weather the shield is rigidly reinforced by two steel uprights. The waterproof curtain rolls into a small chromium-plated container which fits on the handle bars.

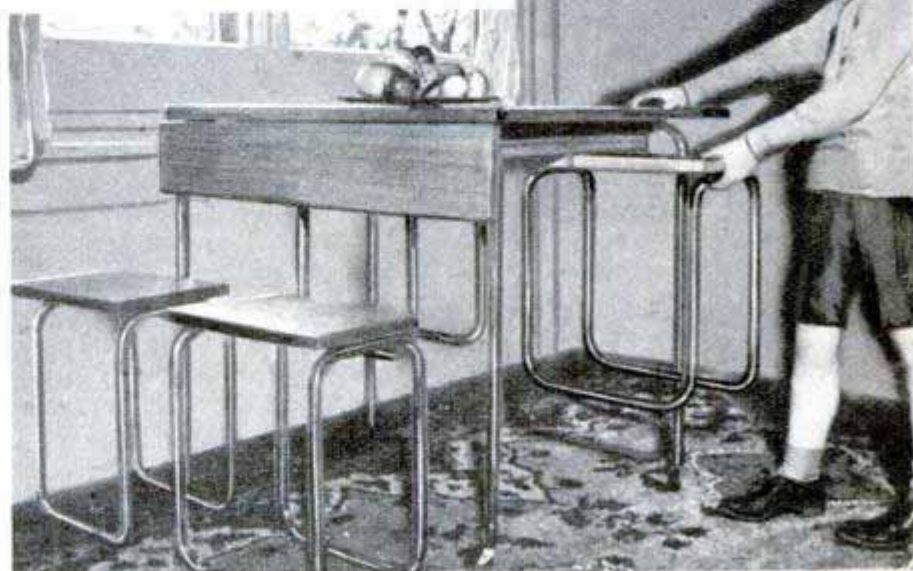


Hose Transfers Fish From Boats to Tanks

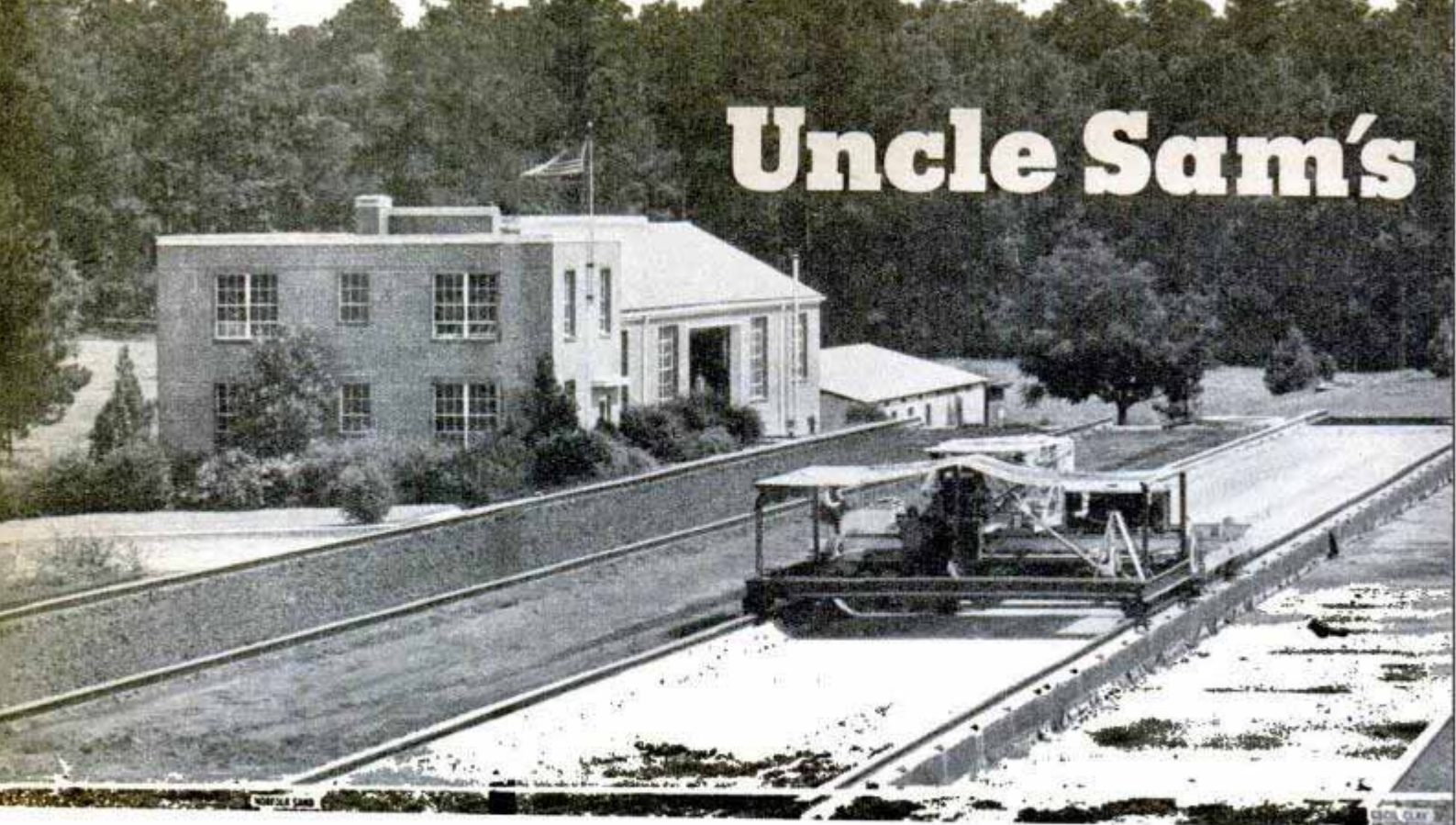
Fish are transferred from boats to a Maine cannery through a six-inch rubber hose. To prevent injury, the fish are floated in water pumped through the hose into a 12-inch pipe that discharges them into storage tanks. By this method, fish can be handled at the rate of 2500 pounds per minute, six times as fast as by conventional methods of unloading.

Stools of Dinette Set Slide Beneath Table

To economize on space in her kitchen, an Australian woman designed a dinette set with stools that can be stored beneath the table when not in use. The stools, which are made with tubular legs and wooden seats, slide into slots under the table top. The table is equipped with casters so it can be shoved into a corner to save even more space in the kitchen.



Uncle Sam's



On homemade plots of soil at Auburn, Ala., government scientists put to trial tillage implements for U. S. farms

By Wayne Whittaker



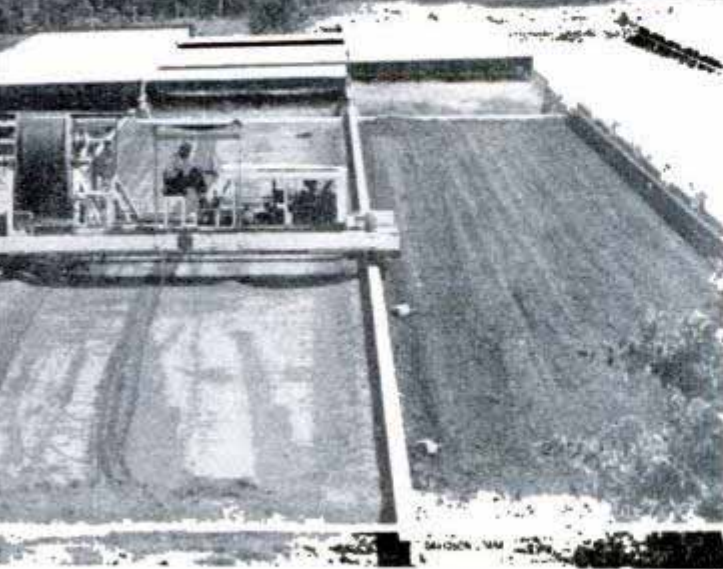
DOWN in Auburn, Ala., people come from miles around to see the U. S. government's \$20,000 "mule." This mechanized mule, the only one of its kind in existence, performs its wonders—naturally enough—on a proving ground for farm machinery which is the only one of its kind in the world.

Before the war Germany had a similar laboratory on a small scale which worked with models. The Auburn Tillage Machinery Laboratory operated by the Department of Agriculture is believed to be the only full-size institution of its kind ever built, according to I. F. Reed, senior engineer and director of operations at Auburn.

The high-priced mule, nicknamed Twenty Grand, is used for testing equipment over specially prepared beds of soil. It is a power car driven by a 135-horsepower engine and has a speed variation from .2 to 10 miles an hour with a drawbar load of 5000 pounds. A dynamometer on the car measures and records pull. The vertical and side loads of plow bottoms,

I. F. Reed, chief of Auburn lab, watches results of plow test on recorder as the \$20,000 "mule" pulls rail-mounted car

Plow Boys



disks and other tillage implements are also recorded.

One Alabama native who had observed the constant activity at the lab for many months expressed concern over results.

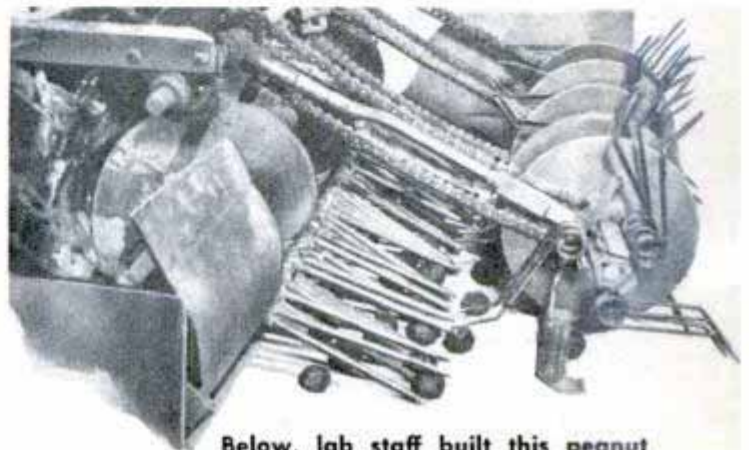
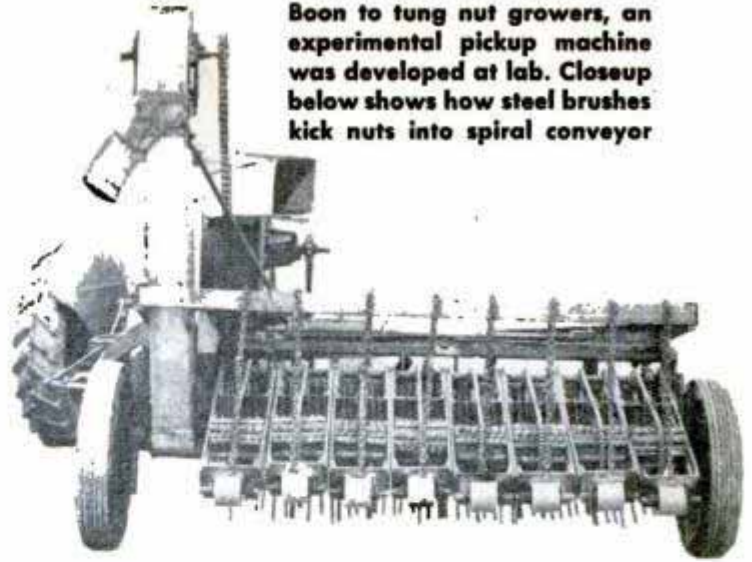
"Seems like them gov'ment engineers just can't make up their minds," he said. "First they plow, then they disk, then they roll, then they sprinkle and roll once more. Then just like as not they plow the whole place up again and start from scratch. Nothing ever has a chance to come up!"

That's where the observer is all wrong. The things that "come up" in those harassed soil beds are helping find the answers to such pertinent questions as: How do different plow designs affect different types of soil? How do the various tilling methods affect the soil? What effects do tool design, speed of operation and soil conditions have on tractor requirements? What new tillage tools will help the farmer do a better job?

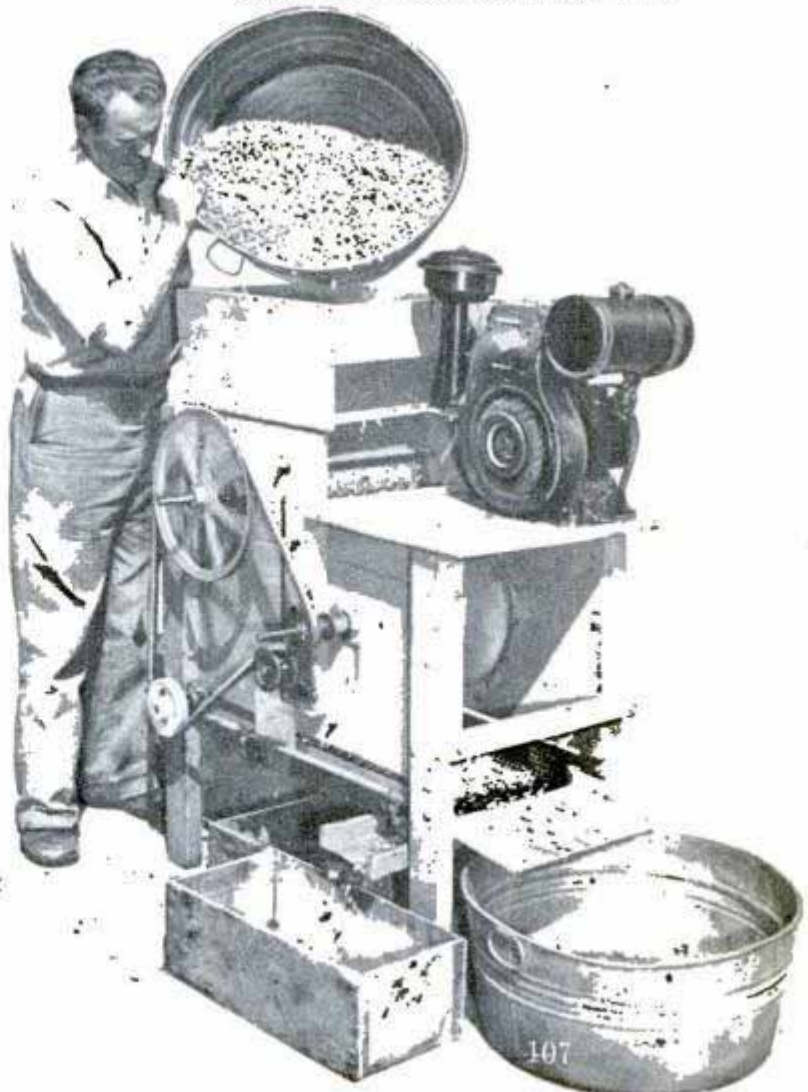
The experts have tried for years to find the answers with field tests. The results have been unsatisfactory because of varying soils—even in the same field—and moisture conditions beyond control. For the first time, tests under rigidly controlled conditions of both the soil and the tools are being made at Auburn. Nine soil beds, each 20 by 250 feet and two feet in depth, are used in the tests. Two of the plots are divided to make four beds 20 by 125 feet, thus making room for 11 types of soil. Soils vary from heavy clay to light sand.

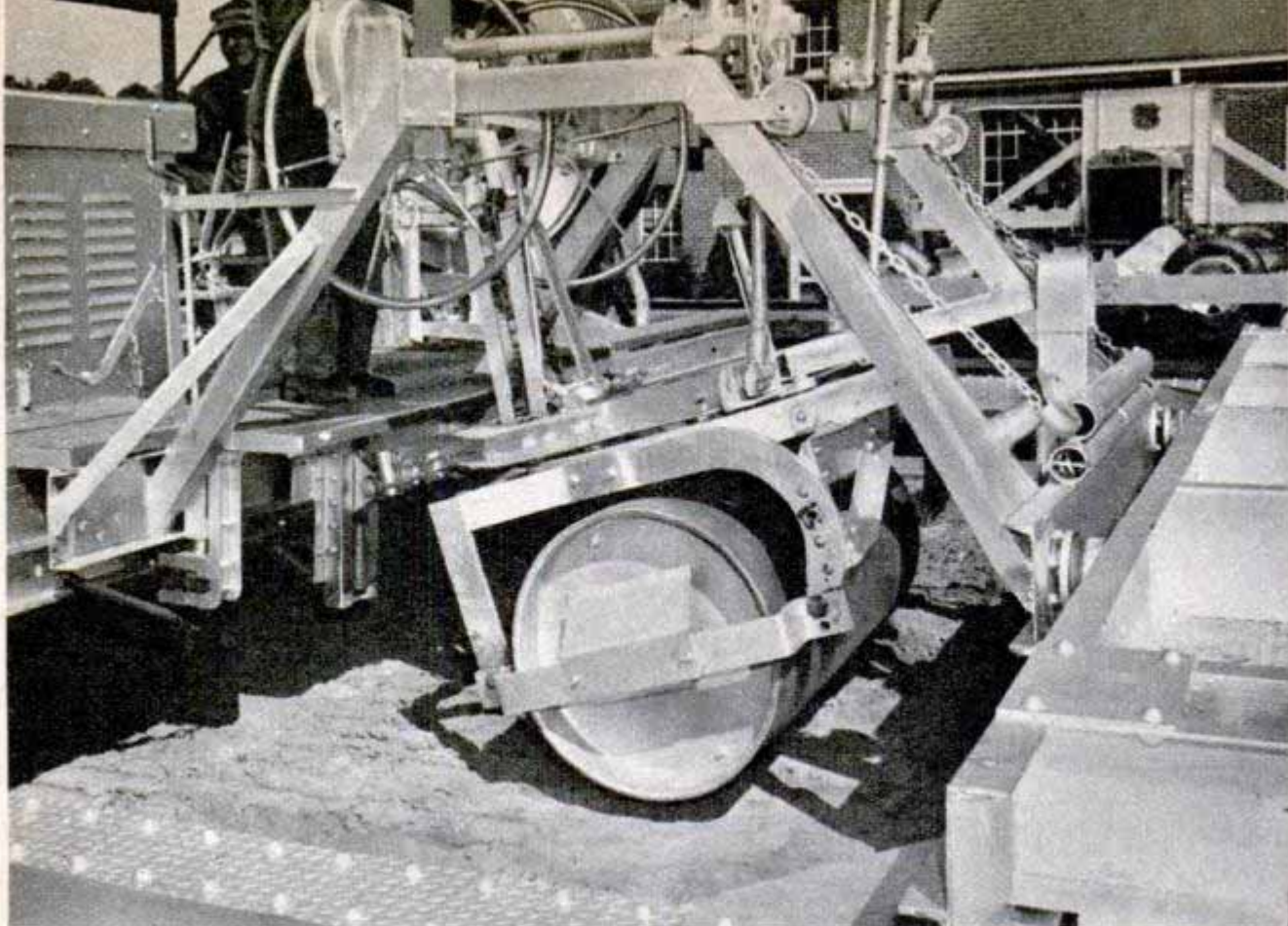
Rails are mounted on low walls between

Boon to tung nut growers, an experimental pickup machine was developed at lab. Closeup below shows how steel brushes kick nuts into spiral conveyor



Below, lab staff built this peanut sheller—300 times faster than man





Soil-fitting car rolls soil bed before test; it also has grader, disk and subsurface packer attachments

the soil beds and over these rails ride the power car and a unit known as a soil-fitting car. The latter, powered by a truck motor, prepares the plots for the tests. Grader blade, disk unit and subsurface packer or roller are attached to this utility car. A sprinkling unit is mounted on top. The rails also support sheet metal "cover" cars which can be placed over any plot to protect it from the weather.

After the fitting car has done its prepara-

tory work, soil samples are taken to determine moisture content and soil texture. Then the car is rolled back out of the way with an ingenious switching arrangement and test equipment advanced over the plot. This equipment consists of two major units, the power car with dynamometer and the test unit car itself. During a test, only the tool being studied contacts the soil. While the power car measures pull, the test unit records the forces necessary to hold the tool being tested in working position. Loads are measured on six hydraulic cells strategically located to give complete support to the tool.

Mr. Reed and his staff have probably spent more time testing the plow—one of the earliest farm implements known to man—than any other tool. The major problem was to learn the effect on each type of soil of every plow design. Careful study of the breaking up of a fur-



Portable tung nut huller operated in orchard saves trucking to distant hulling plant. This machine is a laboratory "baby"

row slice has pointed the way to better designs to help a farmer bring a particular soil to its best planting condition.

Extensive tests have been conducted with tractors to compare the packing effect of rubber tires with that of steel lugs or track equipment. These tests indicate that rubber tires form a more compact layer of soil. Another tractor-plow test was concerned with determining the proper speed for best results. This was important to the designers of tractors and plowing equipment because the recent trend has been away from heavy, low-speed tractors to light, high-speed machines. Tests show that speeds should not advance much beyond four or five miles an hour to obtain the most economical results.

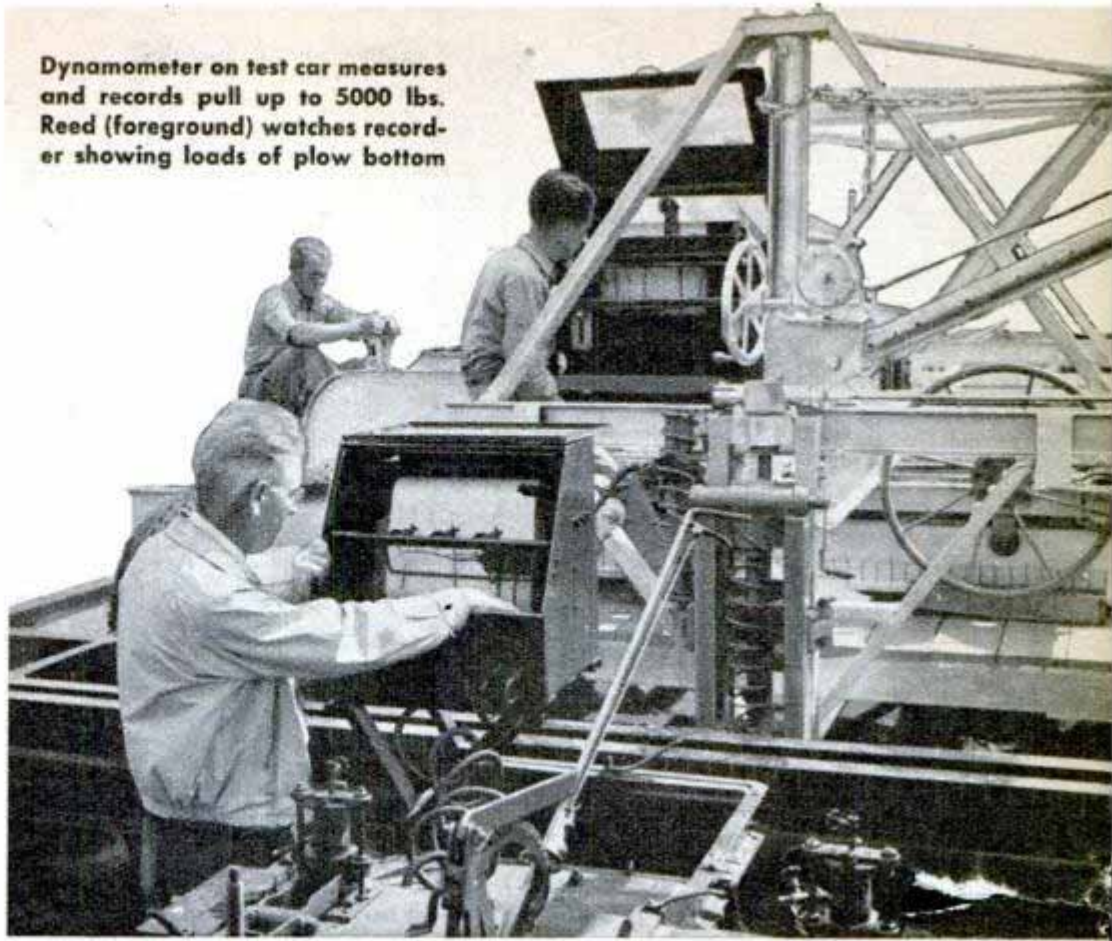
Leading farm machinery manufacturers bring newly designed tools to the laboratory for testing. One company saved a full year of field tests on an improved type of plow bottom using a simplified low-cost share by making use of laboratory facilities.

The laboratory staff not only tests tools designed by manufacturers but develops many implements which may be patented. These patents immediately become public property and the tools may be manufactured by any company. During the war, tillage operations were reduced in order that the staff might specialize on equipment for the production and harvest of oil-bearing crops. This has resulted in successful experimental models of a portable tung nut huller, castor bean huller, tung nut pickup machine, variable depth cotton seed planter, improved peanut sheller, and a peanut digger and shaker which leaves the plants in windrows.

All of these machines were built in the well-equipped laboratory ma-

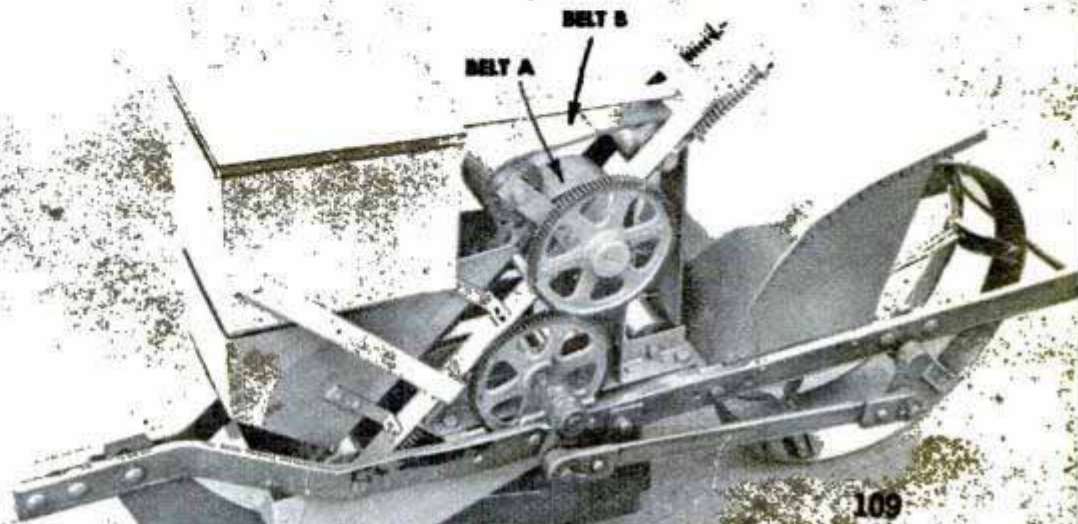
Rubber belts on lab's peanut planter drop seeds evenly and close to the ground. Holes in Belt A catch nuts as they drop from hopper and Belt B made of soft rubber holds nuts in place until they

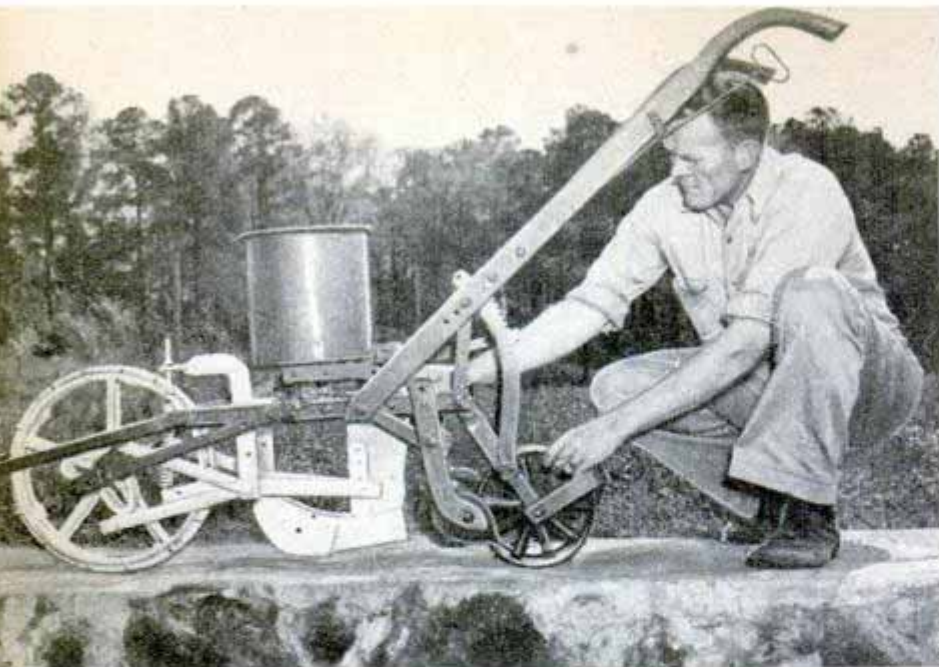
Dynamometer on test car measures and records pull up to 5000 lbs. Reed (foreground) watches recorder showing loads of plow bottom



chine shop. Two of them — the tung nut huller and pickup—may prove a tremendous boon to one of America's newest industries. The production of tung oil, once imported from China in excess of 100,000,000 pounds a year, is now a \$10,000,000 industry in this country. This year the region along the Gulf Coast from Florida to Texas will produce about 20,000,000 pounds of the valuable oil. It is one of the fastest drying oils known and is in great demand by the paint and varnish industry. Tung oil is also used as a waterproofing agent for linoleum, transformers, electrodes, brick, masonry, and in a variety of inks.

The tung industry in this country has been hampered by the high cost of gathering the nuts and by the shortage of labor. The tung nut pickup which is pulled behind a tractor was developed largely by R. E.





Experimental variable depth cotton seed planter assures good stand in a wet or dry season; planting depth varies 1½ inches

Jezek, associate engineer at the laboratory. Steel brushes kick the nuts into a spiral conveyor which carries them to an elevator from which they can be dropped into bags or other containers. The nuts are guided into the conveyor by long steel fingers which pass over the fallen fruit as the machine moves through an orchard. Considerable research has been expended on this machine. The original model, pushed before a tractor, was found to be unsatisfactory in field tests and had to be torn apart and redesigned.

Here are some of the important features of laboratory developments: The portable tung nut huller operates in the field and

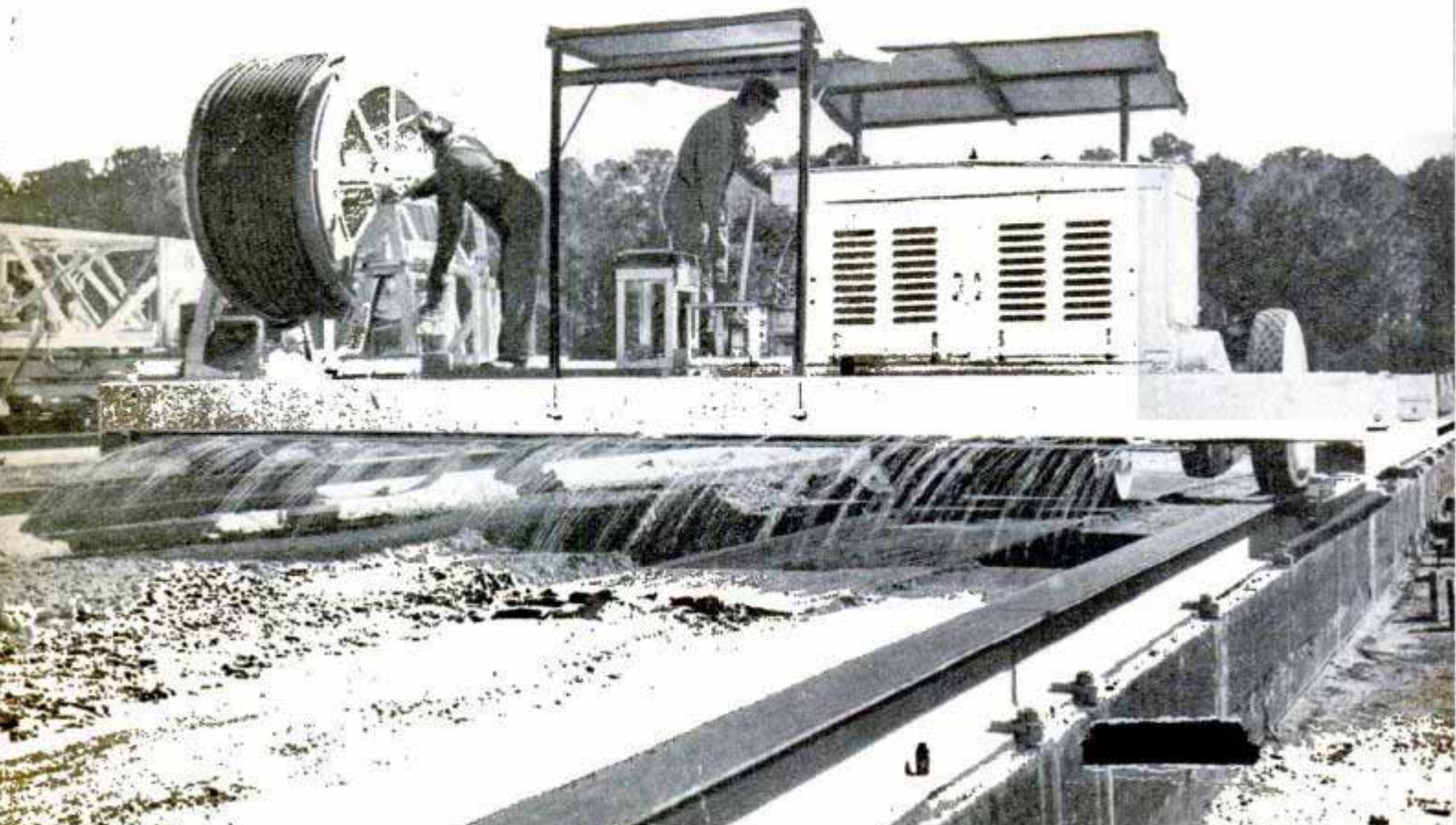
saves shipping or trucking the nuts to a big hulling plant. The castor bean huller can be operated by one man and turns out 35 to 40 bushels an hour. The cotton seed planter assures a good stand in wet or dry weather by varying the depth to which the seeds are planted by about 1½ inches. The peanut sheller is designed for shelling seed peanuts and does not crack as many of the tender nuts as commercial shellers; it shells 300 pounds an hour, as much as 30 men can shell in a 10-hour day. Another ingenious invention is a belt-type peanut planter. (See illustration.) One of the belts is perforated to catch the nuts as they drop from the hopper. Another belt, made of soft rubber, presses against the perforated belt to hold the nuts in place until they

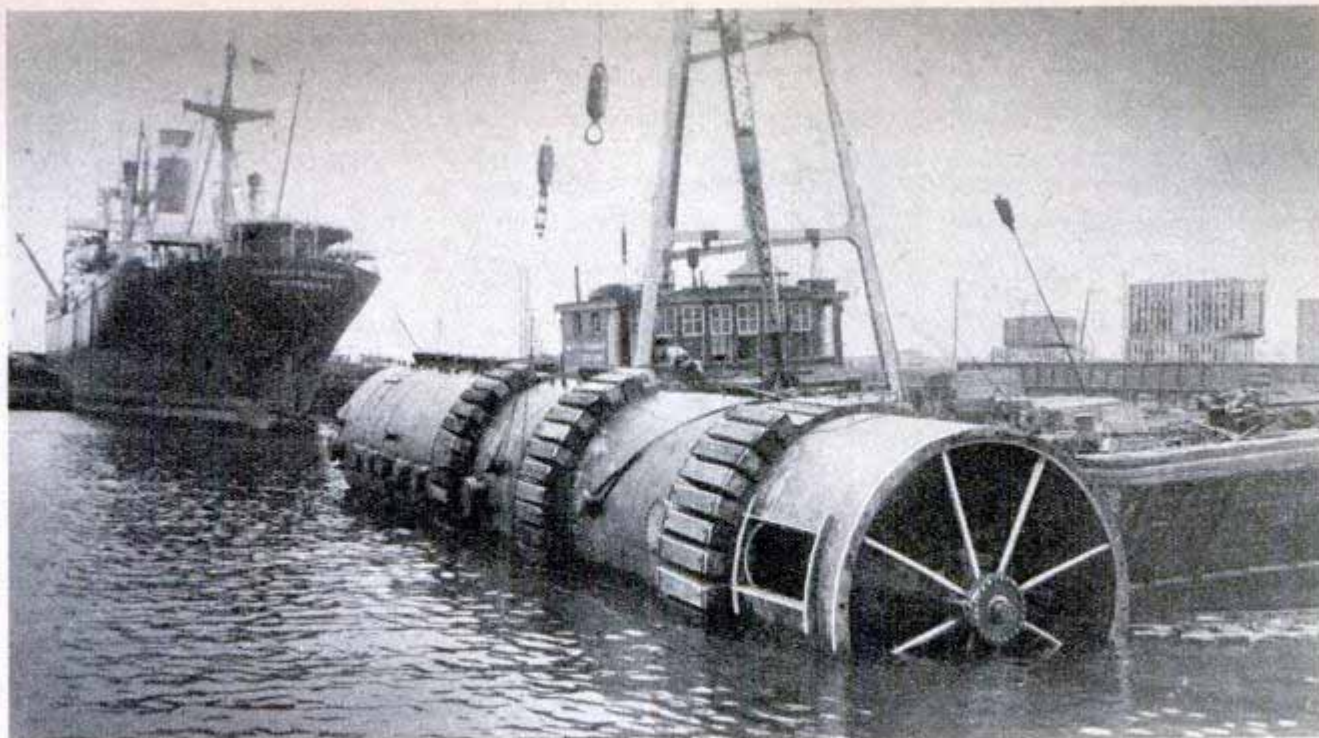
are close to the ground for proper spacing.

In addition to the work at the Tillage Machinery Laboratory, cooperative projects are carried on with other divisions of the Department of Agriculture and various state agencies.

"At present there is great need for some sort of 'Bureau of Standards' for farm machines," says Mr. Reed. "I look upon the unique facilities here at the laboratory and my staff of two engineers, three mechanics and two helpers as the possible nucleus for such an institution."

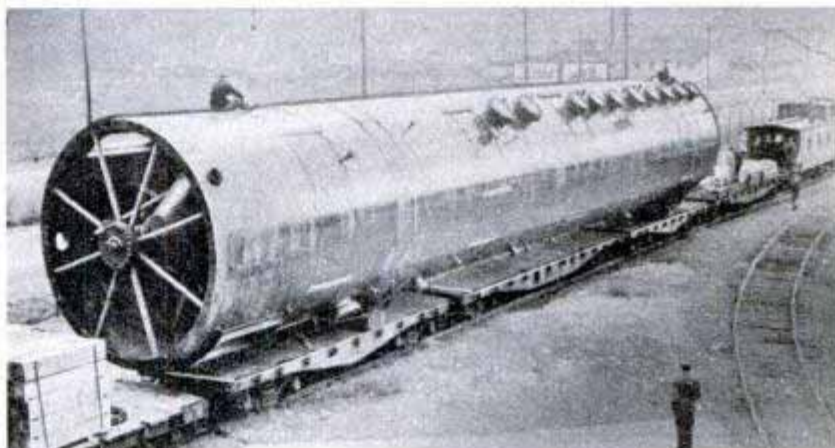
Rainfall by request helps prepare soil bed for controlled test; utility car is powered by truck engine





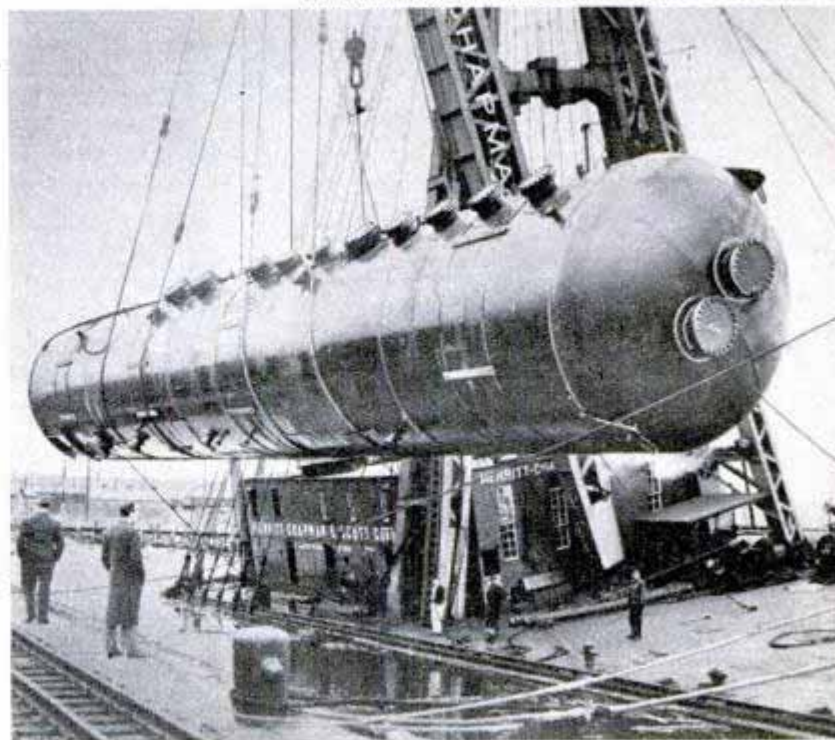
BIG TOWER—LONG TRIP

How would you go about moving a 117-foot steel drum weighing 165 tons halfway across the country? This transportation problem was solved recently by both rail and water over a distance of 2025 miles. The huge drum, a tower 16 feet in diameter, was built in Jersey City for a petroleum catalytic cracking plant in Sugar Creek, Mo. First the drum was loaded on three box cars and moved by rail to the Hudson River where it was dumped into the water and partially loaded with sandbags as ballast. It then was towed by tug up the Hudson, through the New York State barge canal and through another canal to Buffalo where the tug and tower entered Lake Erie. The trip across the Great Lakes to Chicago was made at an average speed of eight miles an hour. From Chicago, a river tug towed the drum through the Illinois waterway to Seneca, Ill., where it was loaded on a barge as there was insufficient water to handle the 7½-foot draft. The tug and barge then moved along the Illinois waterway to the Missouri River and up the Missouri to Sugar Creek. The 2025-mile trip to the refinery required 32 days.



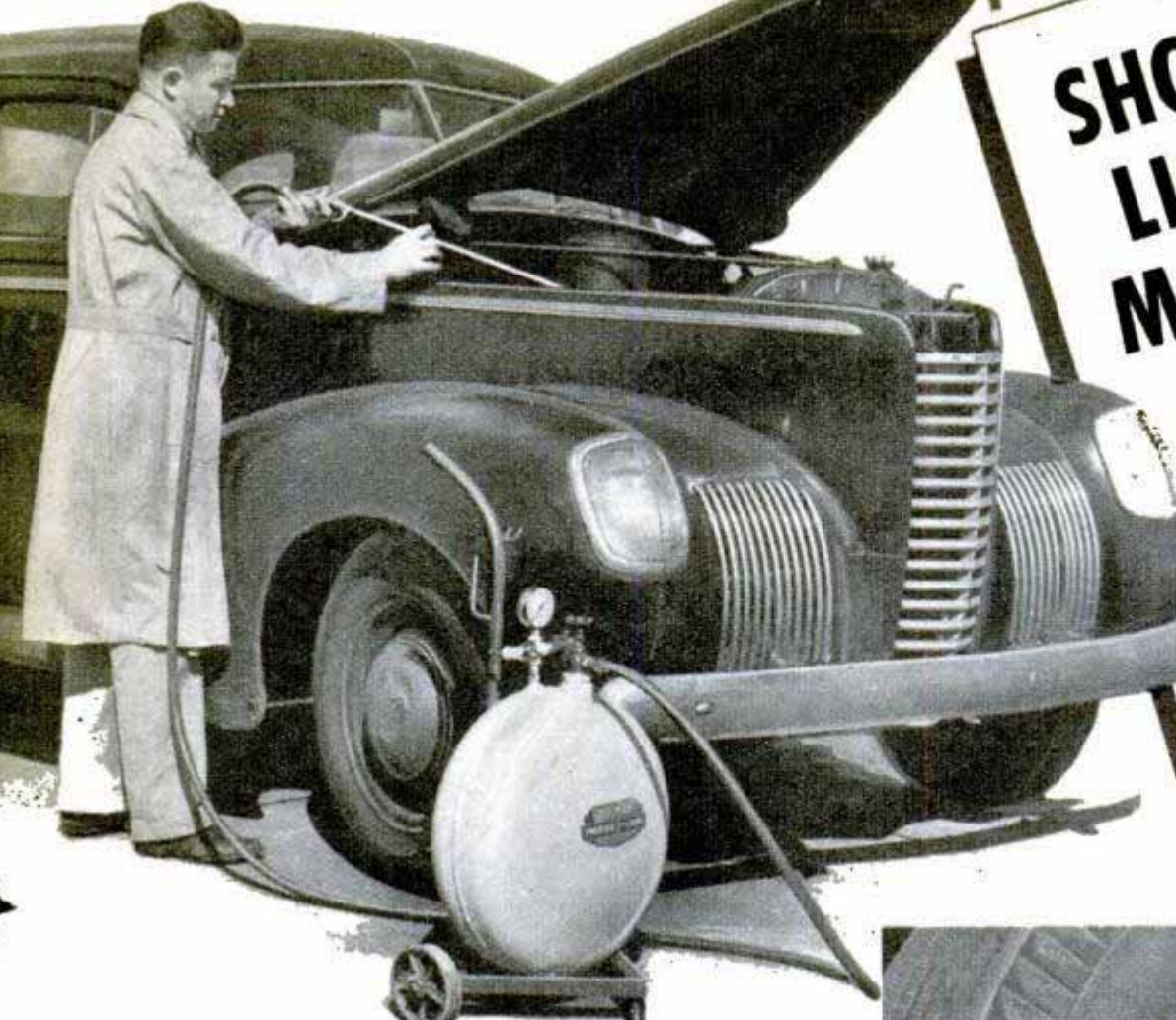
Top, reinforcing strips are fastened around the tower. Above, the 117-foot drum was moved to the harbor on three rail cars. Below, 165 tons of steel are lifted from the rails to be dropped into the water

General Motors Cleveland Diesel Engine Division photos



SHOPPING LIST FOR MOTORISTS

*Electric "Creeper"
Bumper Jack
Puncture Detector
Parts Cleaner
Paint Sprayer*



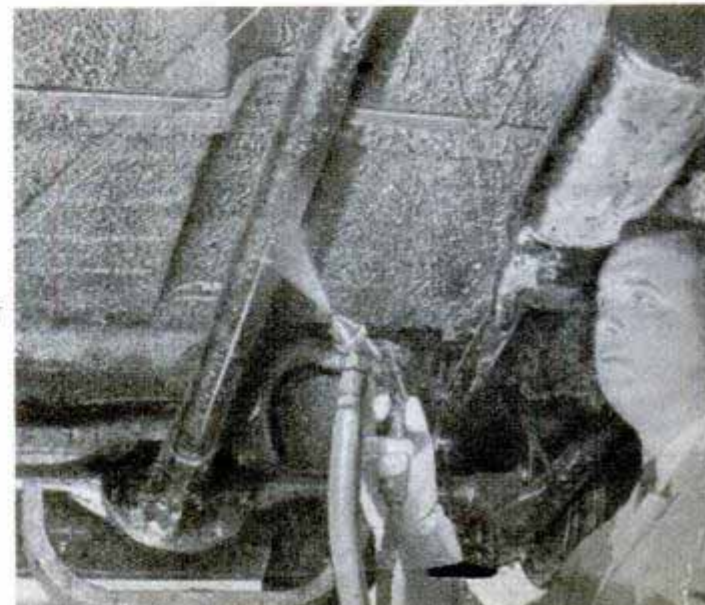
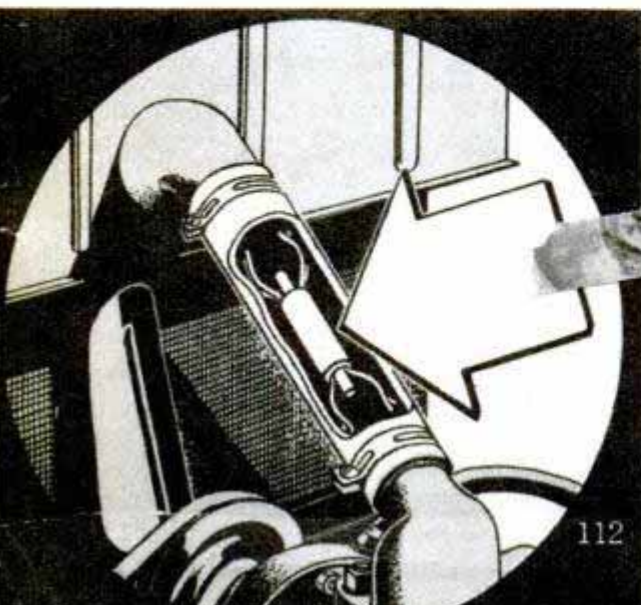
CLEANING SOLUTION sprayed from an air gun at 50 pounds pressure removes all grease and dirt from automobile engines, fenders and wheels. Liquid cleaner is placed in a six-gallon tank connected to air hose. The outfit is rolled right up to car for quick job

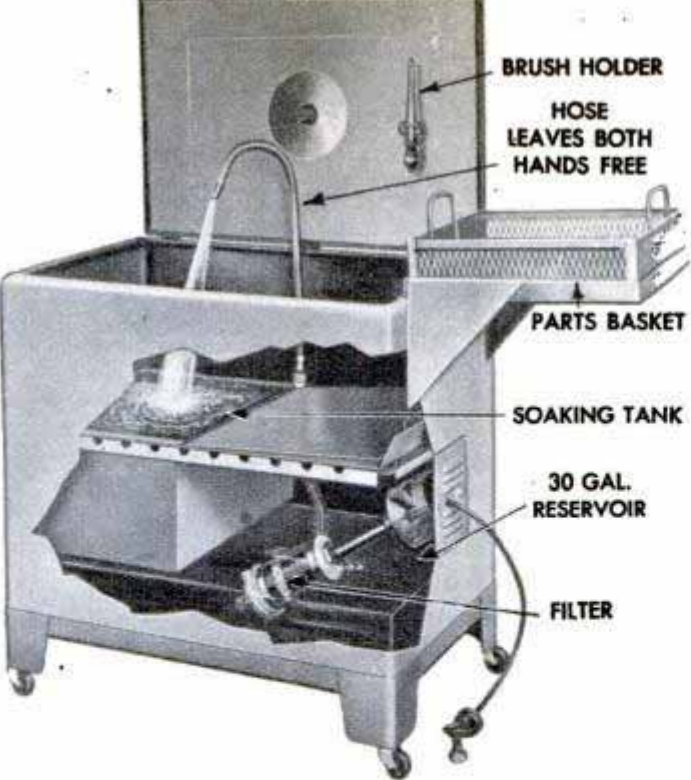
ANTI-STATIC POWDER injected by air hose into inner tube (right) gives better radio reception in auto and prevents shocks. One tablespoonful to each tube does the trick; only one injection is needed

RADIATOR-SCALE DISSOLVER below slips inside the top radiator hose and decomposes rust or scale by electrical and chemical action. The unit is easily inserted and held snugly by prongs on either end



PROTECTION for the underside of cars (below) is provided by spraying with a new rubberized sealing compound. It not only reduces damage from flying rocks but retards rust and discourages rattles





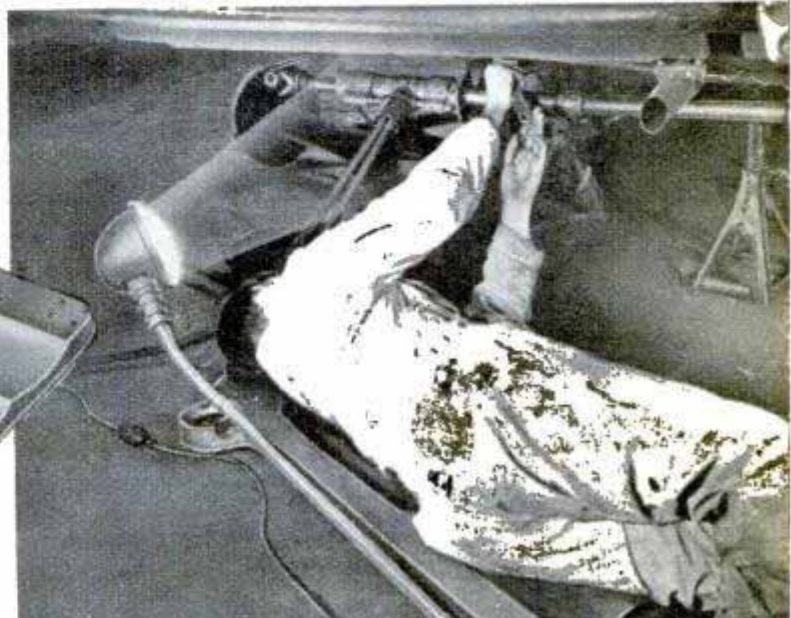
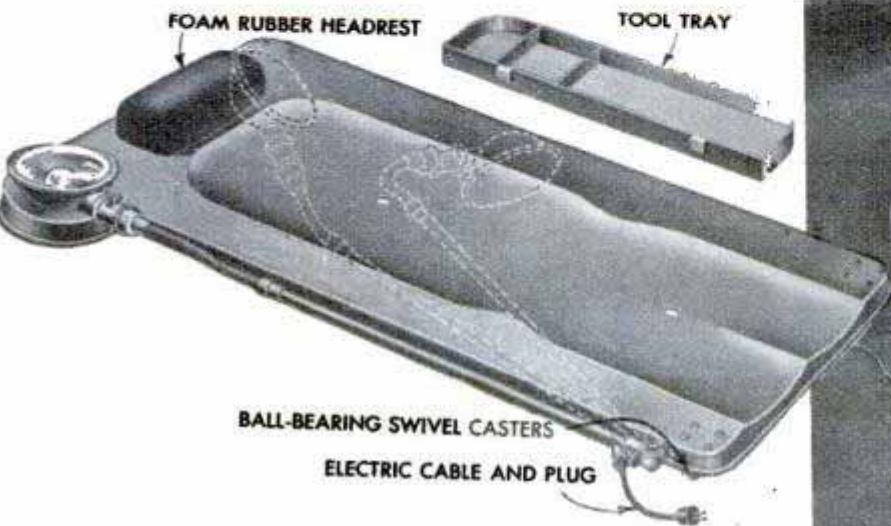
NAIL DETECTOR locates any metal object inside a tire casing that might work in and cause a puncture. A floating permanent magnet signals the presence of metal in the casing, yet its range is so limited it is not affected by metal rim or any wire reinforcement. A six-volt lamp provides signal flash

CABINET for washing auto parts has a filter for the cleaning fluid so it can be used over and over. Reservoir in bottom of cabinet holds 30 gallons and electric pump provides steady flow to soaking tank

SLOTS cut in the front and rear bumpers of Kaiser and Frazer cars (right) simplify the job of jacking up auto to change a tire. The slots are located in the exact spot for the best jacking efficiency



PRETTY SOFT—Sponge-rubber pillow and adjustable lamp attached to mechanic's "creeper" make the job of working beneath an auto a lot pleasanter than it used to be. The lamp can be cocked at any angle



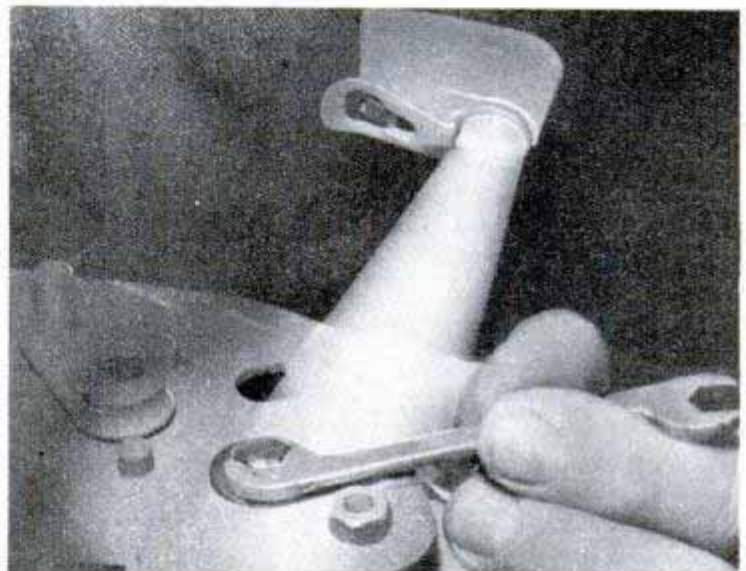
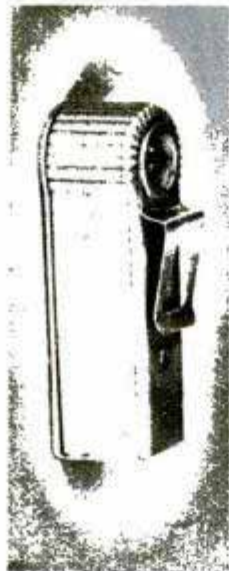


Power Lawn Mower From Scrap Parts

By cutting down an automobile rear axle and using the universal and transmission, J. F. Zornes of Nipomo, Calif., has made himself an efficient lawn mower that the operator can ride. The unique machine is powered by a five-horsepower, one-cylinder gasoline motor and guided by a single wheel in front as well as by applying individual brakes to the rear wheels. Three mowers pulled by a boom cut a 40-inch swath.

Clip Light

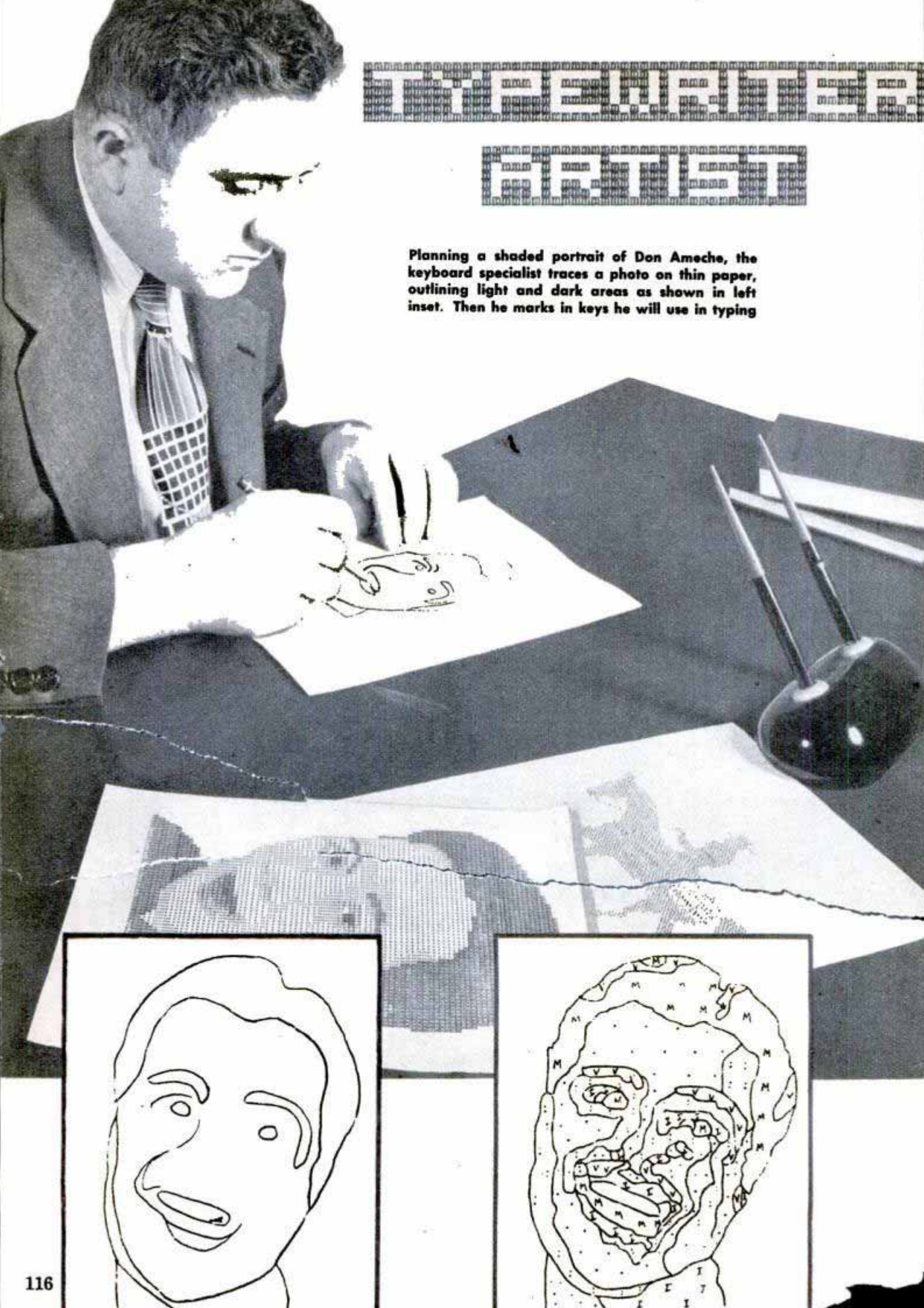
You can read a map in an auto with a small flashlight that turns on when clipped to a pocket. It can also be clamped to a purse mirror, or to the breast pocket of a coat or mechanic's jacket, leaving the hands free. With key chain attached, it is convenient when locating keyholes in the dark.



Air-Mail Helicopter

Side compartments on helicopters can hold over 500 pounds of air mail. A row of hooks at the top holds mail bags in place. The helicopters, designed for new helicopter air-mail routes, are being built with either an open or enclosed cockpit.

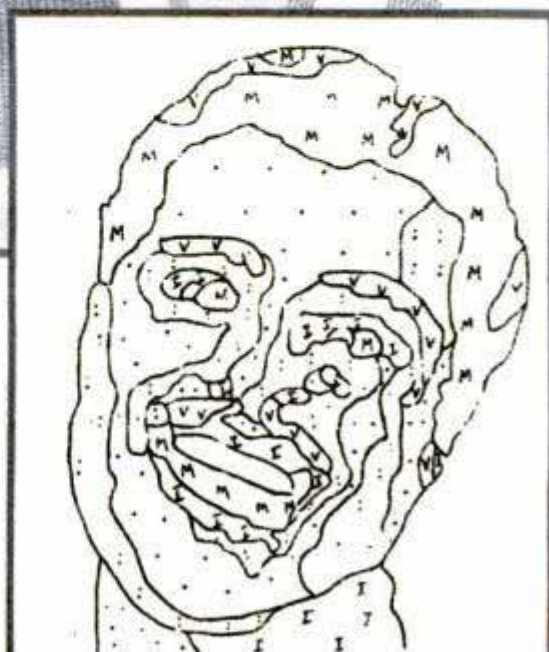
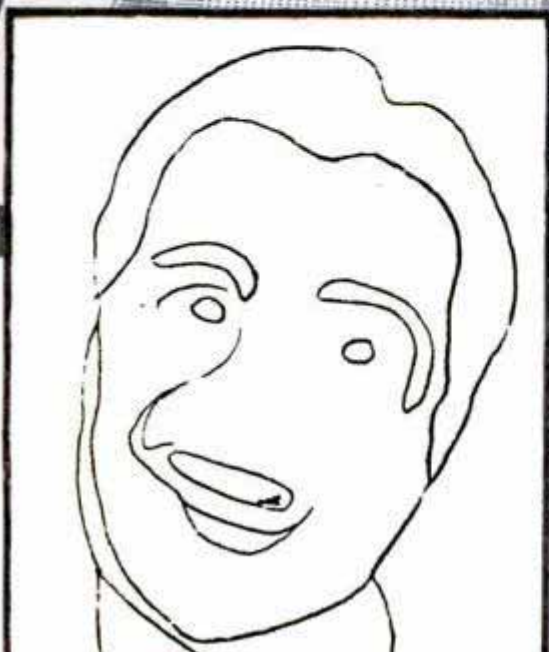
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THE NEW YORK TIMES

NEW YORK

Planning a shaded portrait of Don Ameche, the keyboard specialist traces a photo on thin paper, outlining light and dark areas as shown in left inset. Then he marks in keys he will use in typing

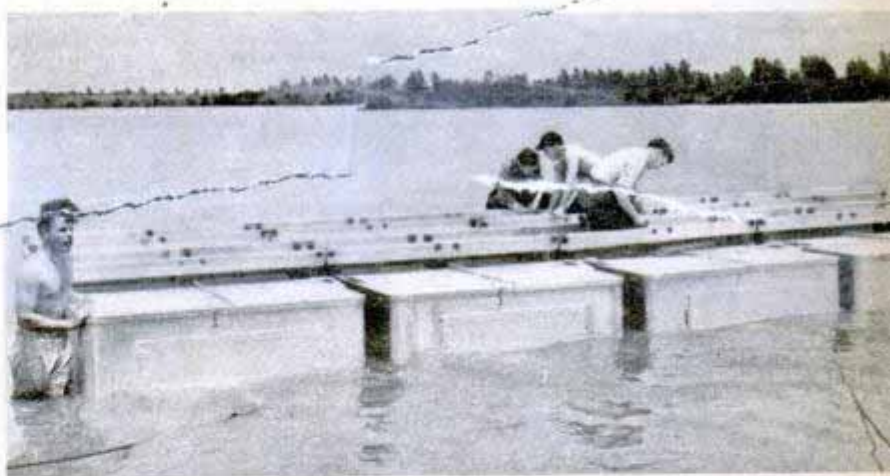
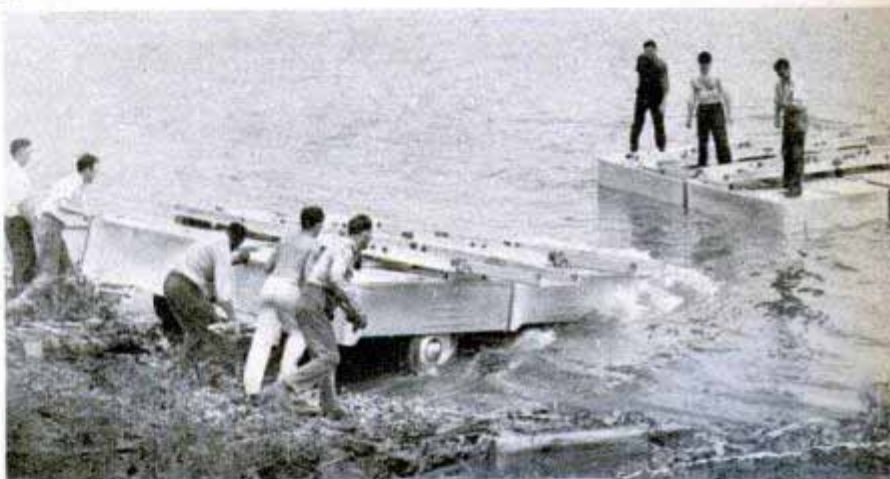




SWIMMING TRAILER

Two watertight trailers, each loaded with 12 men, are towed easily by a jeep. The three photos below show how trailers are fastened together with aluminum tracks to form a bridge

When a watertight trailer made of aluminum is pushed into the water it becomes a ferry or bridge to transport heavy vehicles. Weighing only 829 pounds, the trailer is as useful in the water as on land. An ordinary automobile can tow eight of the trailers on the highway. For water use, tracks made of aluminum are installed on the top deck to provide footing for the vehicles. Applicable to military as well as civilian operations, the trailers can be used as temporary piers, emergency bridges to replace washed-out structures and as a means of moving marooned cars and trucks.



Trailer ferries a jeep across a lake. Tracks are fastened to trailer before it is shoved into the water. The jeep is driven up additional tracks, an outboard motor fastened to trailer, and the ferry glides across the lake





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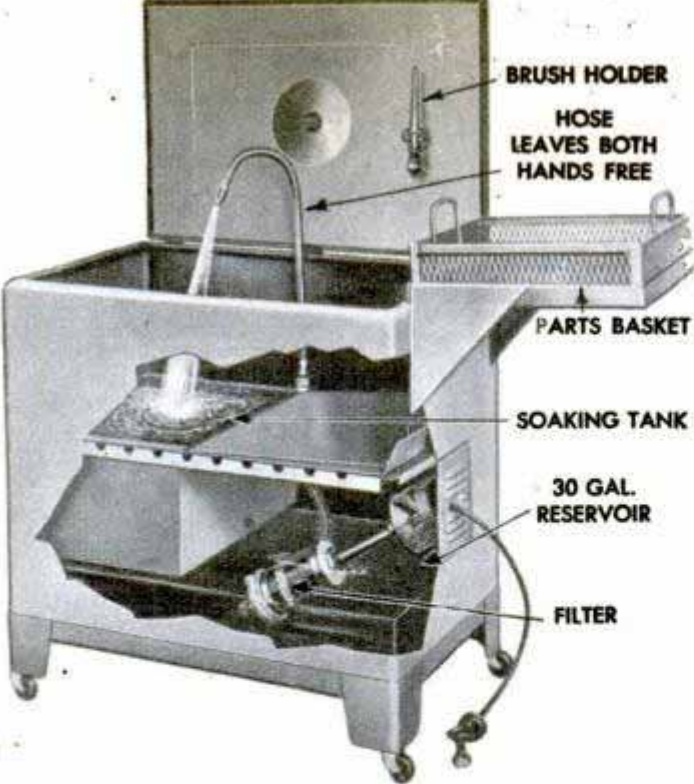
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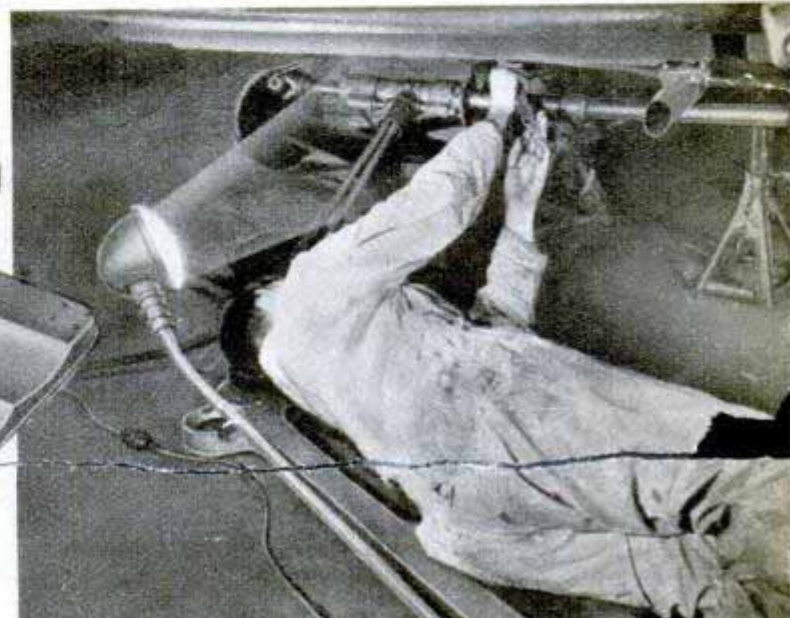
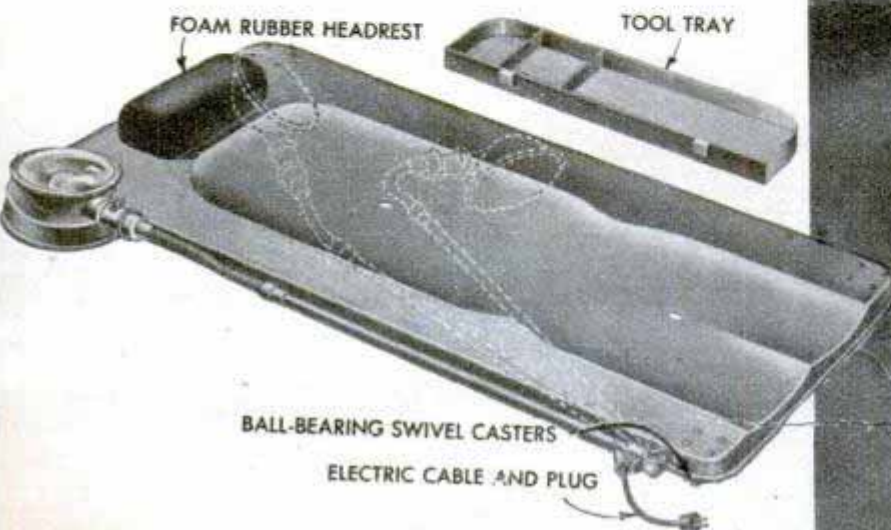
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Parts Cleaner
Paint Sprayer*



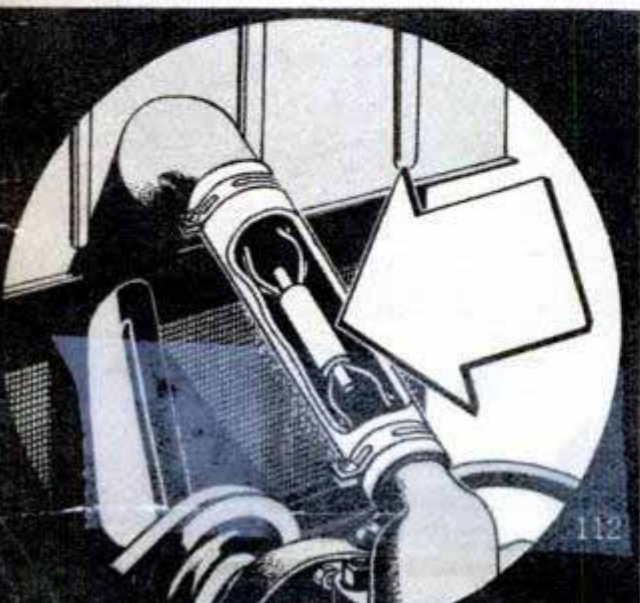
CLEANING SOLUTION sprayed from an air gun at 50 pounds pressure removes all grease and dirt from automobile engines, fenders and wheels. Liquid cleaner is placed in a six-gallon tank connected to air hose. The outfit is rolled right up to car for quick job

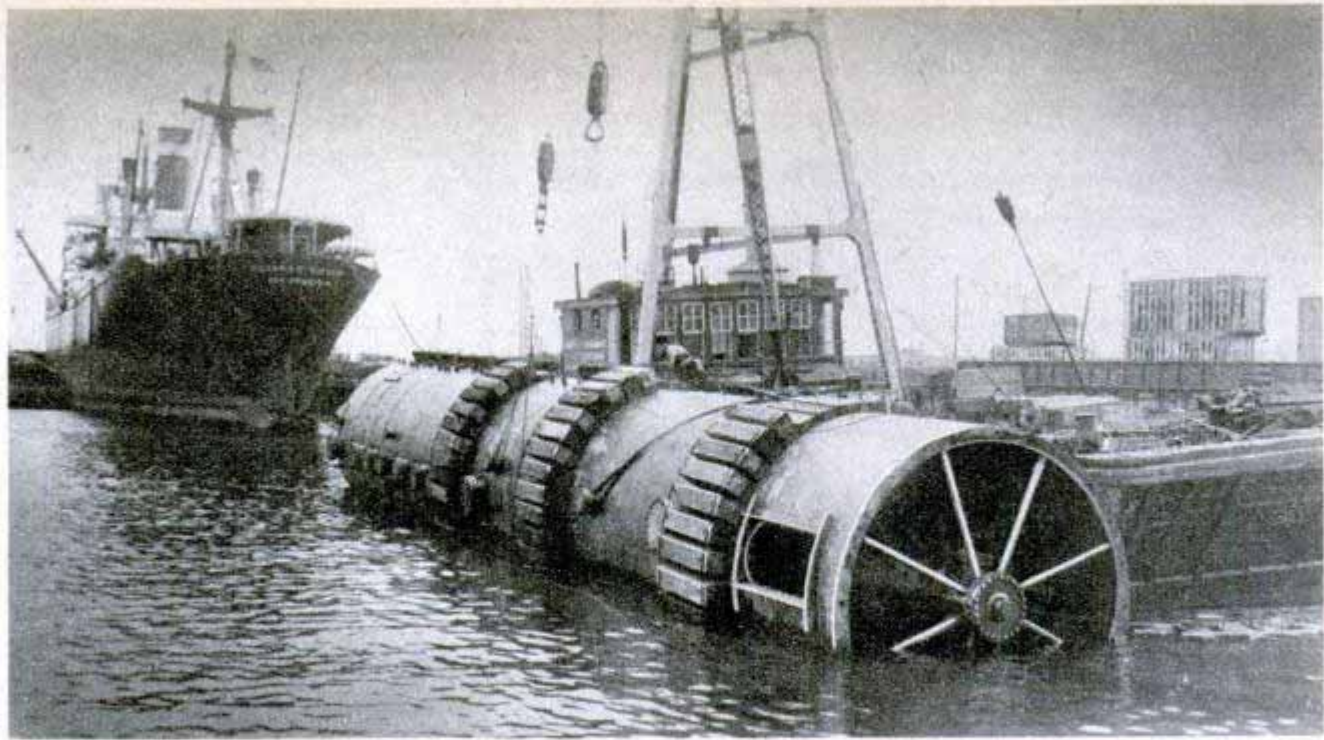
ANTI-STATIC POWDER injected by air hose into inner tube (right) gives better radio reception in auto and prevents shocks. One tablespoonful to each tube does the trick; only one injection is needed



RADIATOR-SCALE DISSOLVER below slips inside the top radiator hose and decomposes rust or scale by electrical and chemical action. The unit is easily inserted and held snugly by prongs on either end

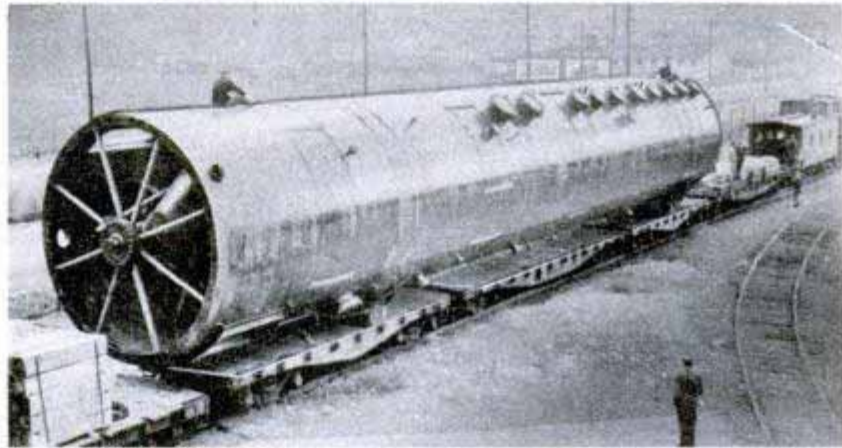
PROTECTION for the underside of cars (below) is provided by spraying with a new rubberized sealing compound. It not only reduces damage from flying rocks but retards rust and discourages rattles



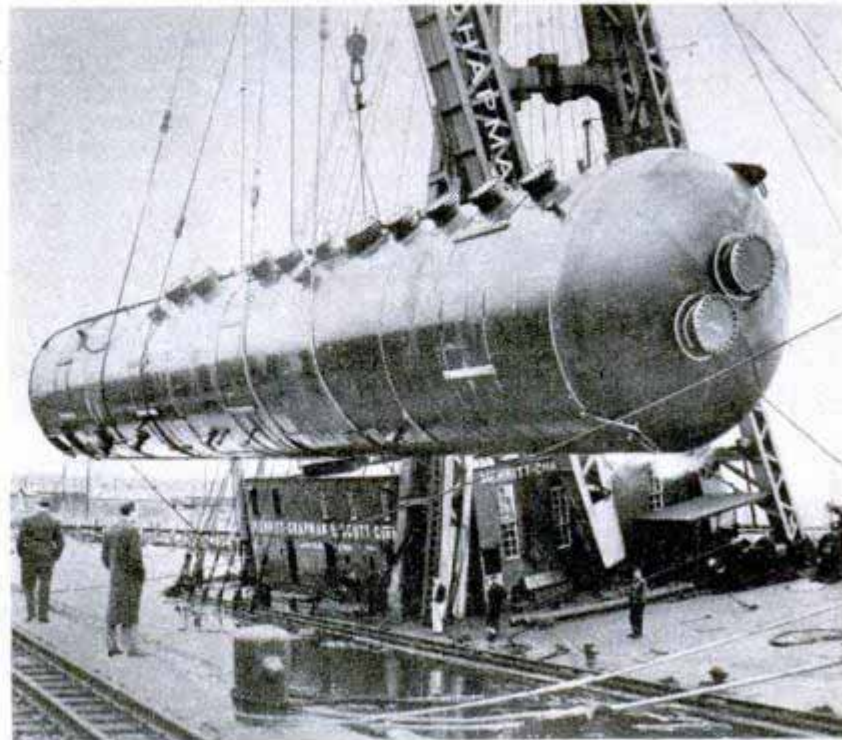


BIG TOWER—LONG TRIP

How would you go about moving a 117-foot steel drum weighing 165 tons halfway across the country? This transportation problem was solved recently by both rail and water over a distance of 2025 miles. The huge drum, a tower 16 feet in diameter, was built in Jersey City for a petroleum catalytic cracking plant in Sugar Creek, Mo. First the drum was loaded on three box cars and moved by rail to the Hudson River where it was dumped into the water and partially loaded with sandbags as ballast. It then was towed by tug up the Hudson, through the New York State barge canal and through another canal to Buffalo where the tug and tower entered Lake Erie. The trip across the Great Lakes to Chicago was made at an average speed of eight miles an hour. From Chicago, a river tug towed the drum through the Illinois waterway to Seneca, Ill., where it was loaded on a barge as there was insufficient water to handle the 7½-foot draft. The tug and barge then moved along the Illinois waterway to the Missouri River and up the Missouri to Sugar Creek. The 2025-mile trip to the refinery required 32 days.



Top, reinforcing strips are fastened around the tower. Above, the 117-foot drum was moved to the harbor on three rail cars. Below, 165 tons of steel are lifted from the rails to be dropped into the water
General Motors Cleveland Diesel Engine Division photos





Experimental variable depth cotton seed planter assures good stand in a wet or dry season; planting depth varies 1½ inches

Jezeq, associate engineer at the laboratory. Steel brushes kick the nuts into a spiral conveyor which carries them to an elevator from which they can be dropped into bags or other containers. The nuts are guided into the conveyor by long steel fingers which pass over the fallen fruit as the machine moves through an orchard. Considerable research has been expended on this machine. The original model, pushed before a tractor, was found to be unsatisfactory in field tests and had to be torn apart and redesigned.

Here are some of the important features of laboratory developments: The portable tung nut huller operates in the field and

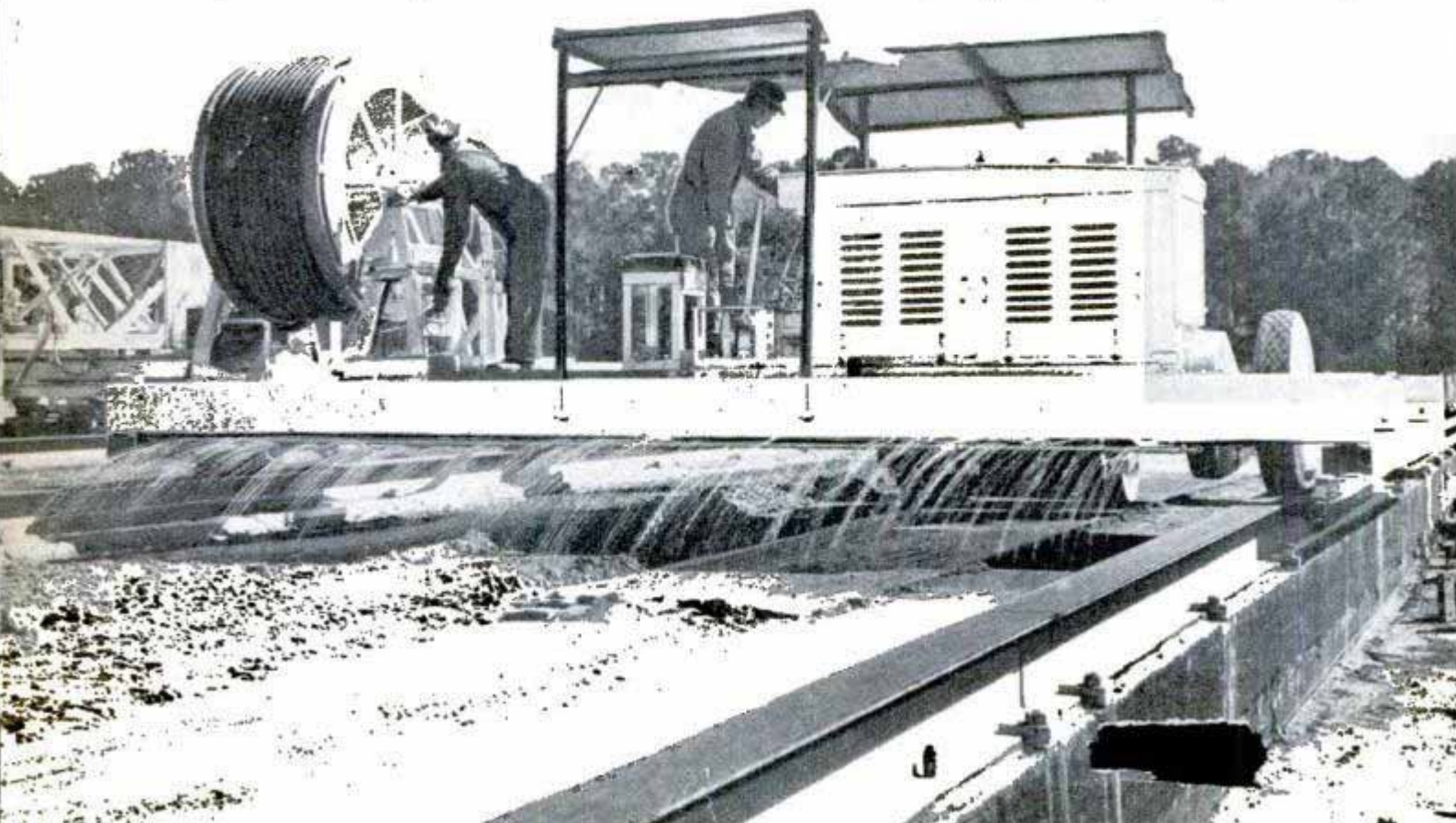
saves shipping or trucking the nuts to a big hulling plant. The castor bean huller can be operated by one man and turns out 35 to 40 bushels an hour. The cotton seed planter assures a good stand in wet or dry weather by varying the depth to which the seeds are planted by about 1½ inches. The peanut sheller is designed for shelling seed peanuts and does not crack as many of the tender nuts as commercial shellers; it shells 300 pounds an hour, as much as 30 men can shell in a 10-hour day. Another ingenious invention is a belt-type peanut planter. (See illustration.) One of the belts is perforated to catch the nuts as they drop from the hopper. Another belt, made of soft rubber, presses against the perforated belt to hold the nuts in place until they

are close to the ground for proper spacing.

In addition to the work at the Tillage Machinery Laboratory, cooperative projects are carried on with other divisions of the Department of Agriculture and various state agencies.

"At present there is great need for some sort of 'Bureau of Standards' for farm machines," says Mr. Reed. "I look upon the unique facilities here at the laboratory and my staff of two engineers, three mechanics and two helpers as the possible nucleus for such an institution."

Rainfall by request helps prepare soil bed for controlled test; utility car is powered by truck engine



row slice has pointed the way to better designs to help a farmer bring a particular soil to its best planting condition.

Extensive tests have been conducted with tractors to compare the packing effect of rubber tires with that of steel lugs or track equipment. These tests indicate that rubber tires form a more compact layer of soil. Another tractor-plow test was concerned with determining the proper speed for best results. This was important to the designers of tractors and plowing equipment because the recent trend has been away from heavy, low-speed tractors to light, high-speed machines. Tests show that speeds should not advance much beyond four or five miles an hour to obtain the most economical results.

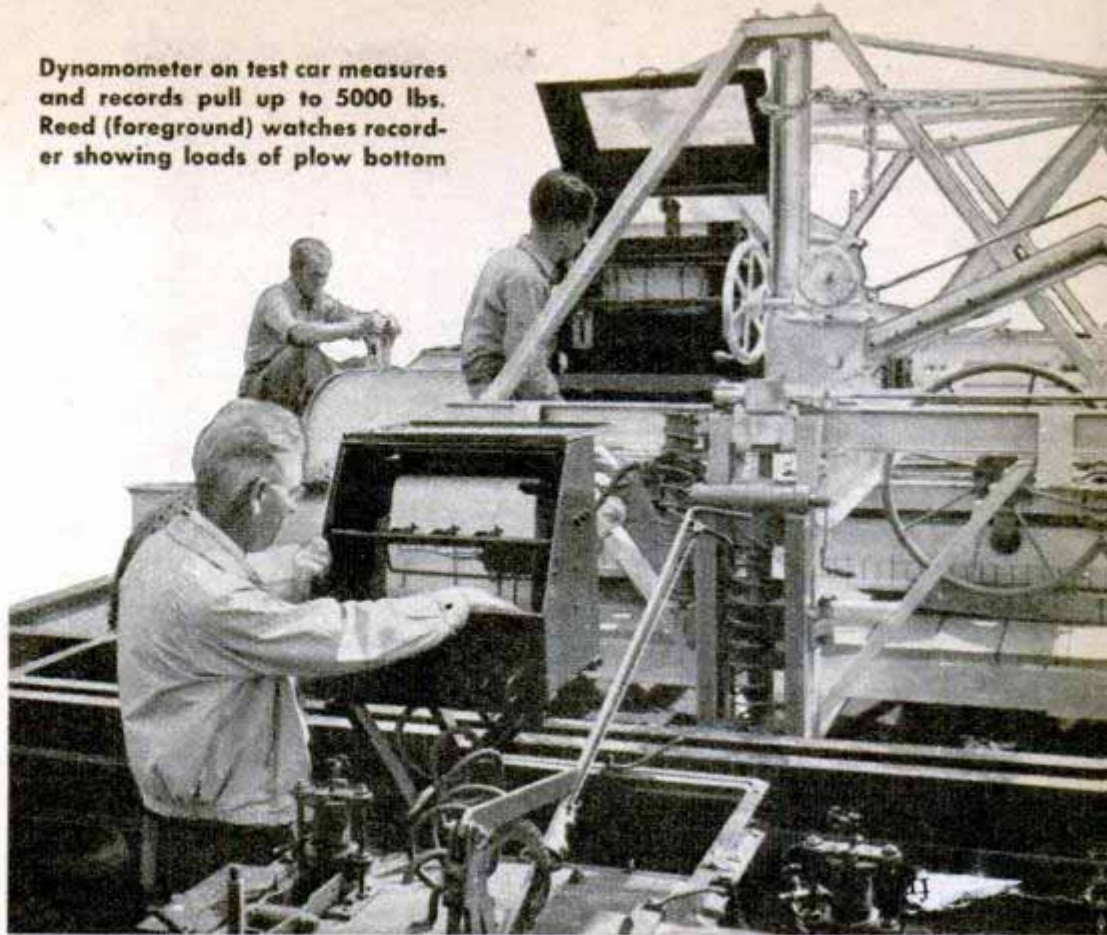
Leading farm machinery manufacturers bring newly designed tools to the laboratory for testing. One company saved a full year of field tests on an improved type of plow bottom using a simplified low-cost share by making use of laboratory facilities.

The laboratory staff not only tests tools designed by manufacturers but develops many implements which may be patented. These patents immediately become public property and the tools may be manufactured by any company. During the war, tillage operations were reduced in order that the staff might specialize on equipment for the production and harvest of oil-bearing crops. This has resulted in successful experimental models of a portable tung nut huller, castor bean huller, tung nut pickup machine, variable depth cotton seed planter, improved peanut sheller, and a peanut digger and shaker which leaves the plants in windrows.

All of these machines were built in the well-equipped laboratory ma-

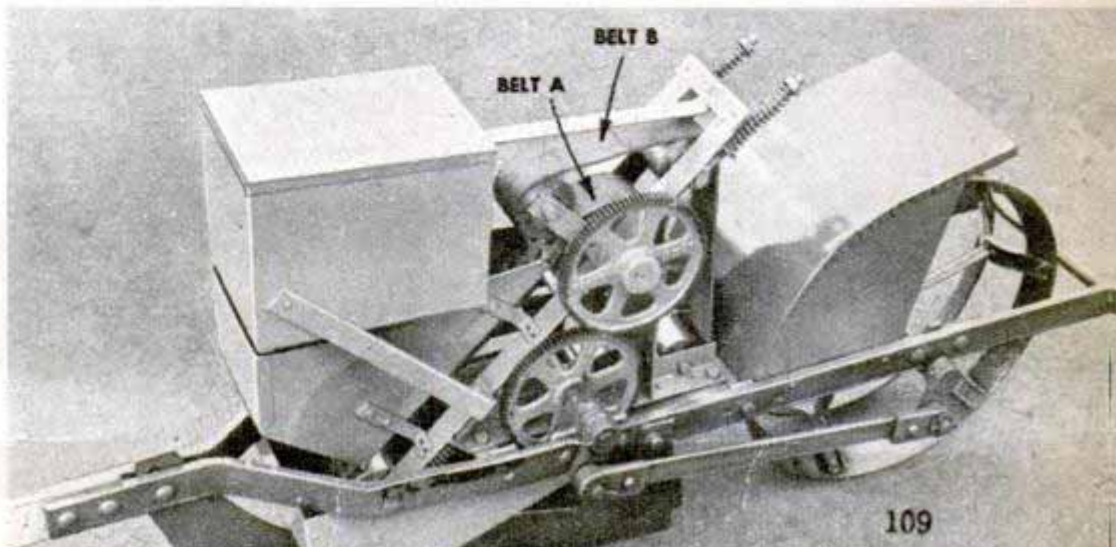
Rubber belts on lab's peanut planter drop seeds evenly and close to the ground. Holes in Belt A catch nuts as they drop from hopper and Belt B made of soft rubber holds nuts in place until they

Dynamometer on test car measures and records pull up to 5000 lbs. Reed (foreground) watches recorder showing loads of plow bottom



chine shop. Two of them — the tung nut huller and pickup—may prove a tremendous boon to one of America's newest industries. The production of tung oil, once imported from China in excess of 100,000,000 pounds a year, is now a \$10,000,000 industry in this country. This year the region along the Gulf Coast from Florida to Texas will produce about 20,000,000 pounds of the valuable oil. It is one of the fastest drying oils known and is in great demand by the paint and varnish industry. Tung oil is also used as a waterproofing agent for linoleum, transformers, electrodes, brick, masonry, and in a variety of inks.

The tung industry in this country has been hampered by the high cost of gathering the nuts and by the shortage of labor. The tung nut pickup which is pulled behind a tractor was developed largely by R. E.



MIND your p's and q's in drawing portraits" is the advice of Julius Nelson of Baltimore.

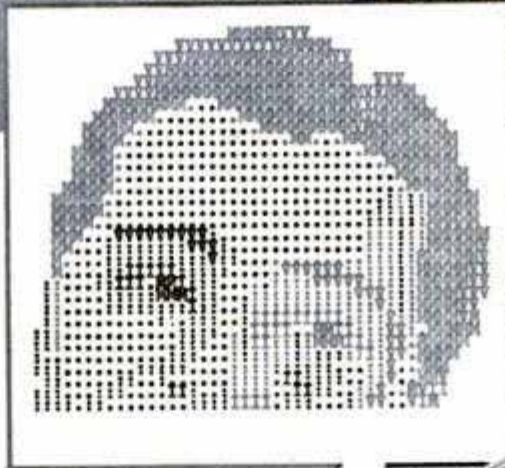
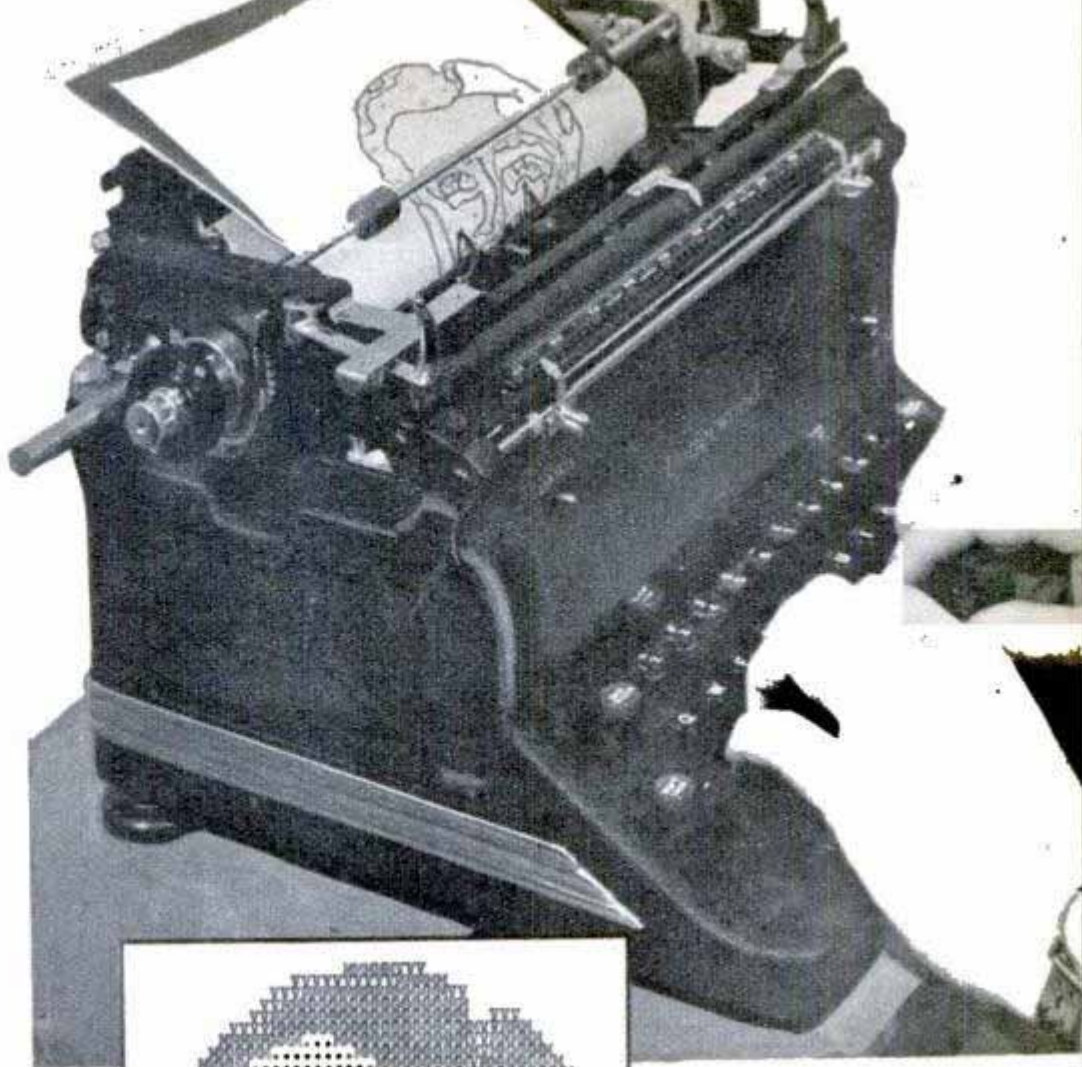
Nelson is an artist without paints or brushes. His easel is a typewriter carriage and he performs pictorial tricks with \$ and # signs.

Seat him in front of a typewriter and he'll beat a tattoo on the keys to draw a portrait, cartoon or landscape. "Artying" he calls it. He's written two books on the subject and "Who's Who" listed him as the man who developed this new art.

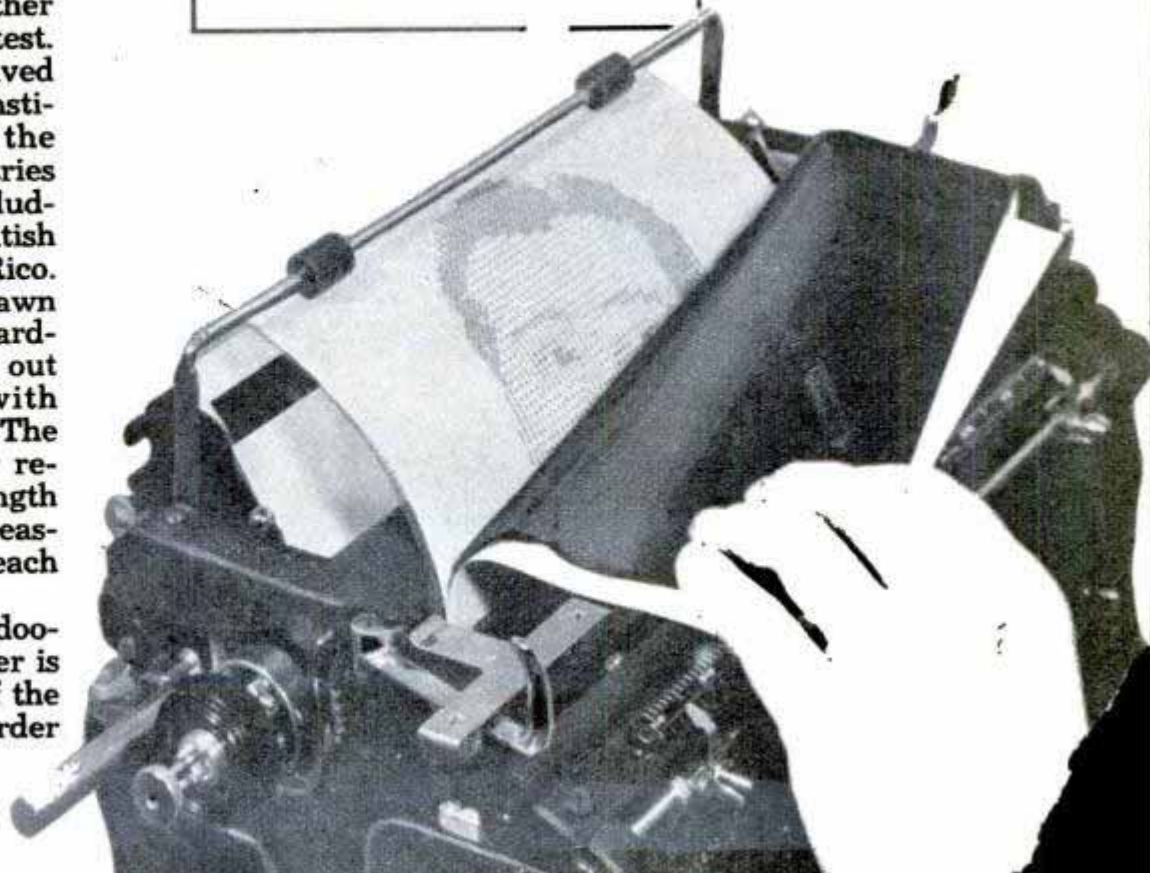
Several years ago Nelson broke his wrist and started doodling on a typewriter to strengthen the ligaments. Soon he was trading pictures with other artypists. Today he is acclaimed by professional artists as the leader in a new field of design and was voted the "originator of a new type of graphic art" by Canadian newspapers.

Every year Nelson, who is president of a business school, conducts a contest for artypists. He has accumulated more than 12,000 examples of their art and expects another 1500 in this year's contest. In the past he has received entries from penal institutions, schools for the blind and from countries all over the world including China, India, British Guiana and Puerto Rico. The pictures are drawn on paper, cloth, silk, cardboard—even worked out on special paper with Braille typewriters. The largest entry he ever received was a full length portrait of Lincoln measuring four feet in each direction.

Nelson's advice to doodlers on the typewriter is to begin with some of the simpler art forms—border



Traced pattern is placed over a carbon and a clean sheet of paper. By following his key marks Nelson draws the portrait. Inset at left shows how different characters produce different shades in finished drawing





designs and cutouts. To make a cutout, trace a silhouette or draw a picture such as the horse and rider on the following page, and cut it out of the paper. Use the sheet as a pattern, placing it over a sheet of ordinary paper and inserting both in a typewriter. By filling in the pattern with a typewritten letter or character you reproduce the design.

Cartoons are easy for anyone with a little imagination, according to Nelson. Favorite characters for these funmakers are parentheses, diagonal marks, periods and underscore marks.

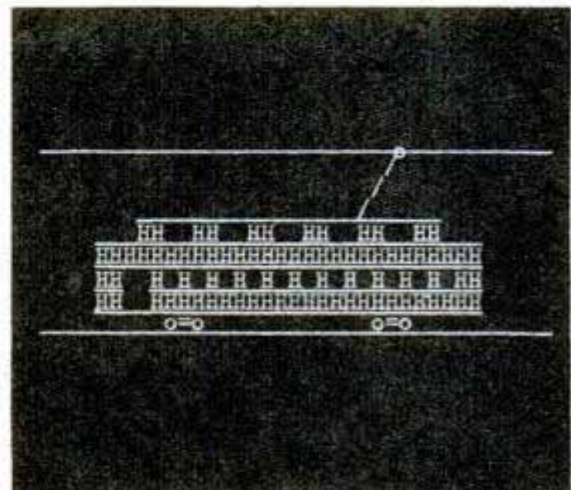
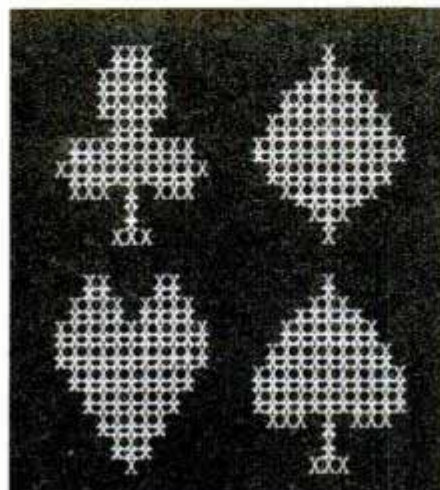
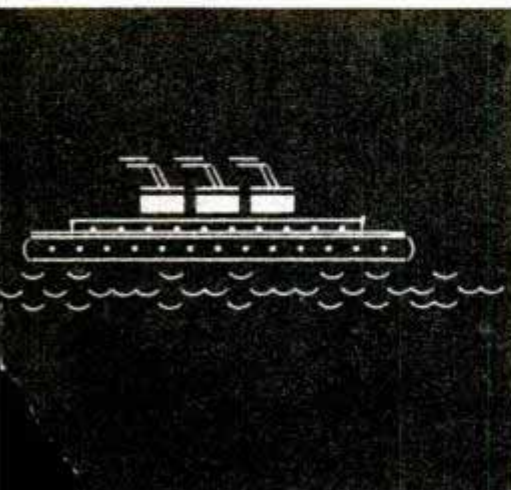
Portraits are the most difficult to draw and require the most patience. The portraits of General MacArthur, Madame Chiang Kai-shek and Edward G. Robinson shown on these pages required many hours of planning and typing. Nelson recommends a three-step procedure in making a shaded portrait.

First he chooses a good photograph of the

subject and traces it on a sheet of thin paper. Areas are outlined according to how light or dark they are.

In the second step he compares the tracing with the photograph and chooses the characters to be typed into each area. This requires good judgment of the shade each character will produce. For example, a period gives the lightest shade, a semicolon slightly darker, "I" an intermediate shade, "V" and "N" darker yet, and "m" the darkest single character. For black areas several characters may be typed over each other. Symbols of each character are marked in the proper area on the tracing.

Nelson then places a carbon over a clean sheet of paper, the tracing over the carbon, and inserts all three in the typewriter. The characters are typed into the proper area as marked. Some areas can be shaded even more by half-spacing, a trick that's done by holding down the space bar or back spacer every other time the key is struck.



One of Nelson's favorite pastimes is inventing "typewriter mysteries" which he sells for a few cents. By following a printed sheet of instructions the typist can draw a picture without knowing what he's producing until he's almost finished.

Nelson likes to slip messages into his landscapes which can be read when the pattern is discovered. You might find the Gettysburg Address or "Now is the time for all good men to come to the aid of their party" forming the beach of a palm-framed tropical scene.

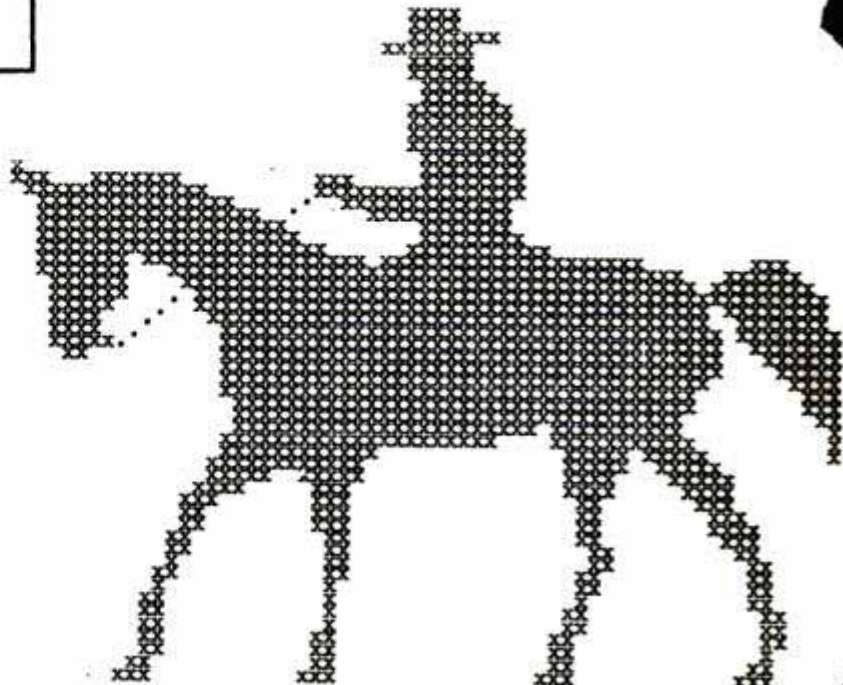
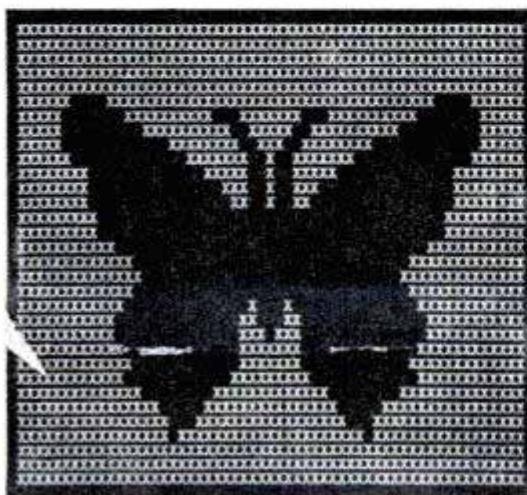
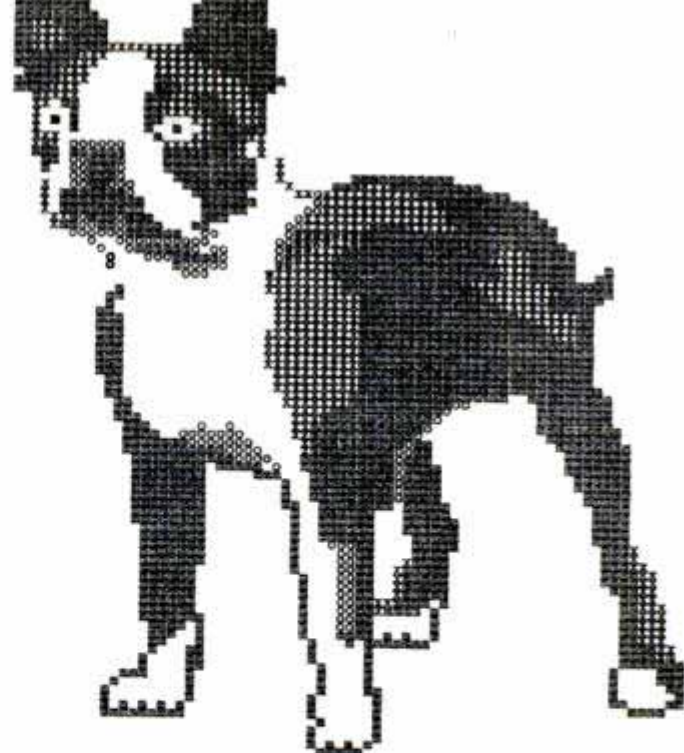
Artying is more than just doodling with typewriter keys or drawing the familiar "soldiers," says Nelson. It teaches students to manipulate the parts of the typewriter and relieves the monotony of class practice. Artying can be used in decorating school papers, programs, menus, Christmas cards, handbills and cover designs.

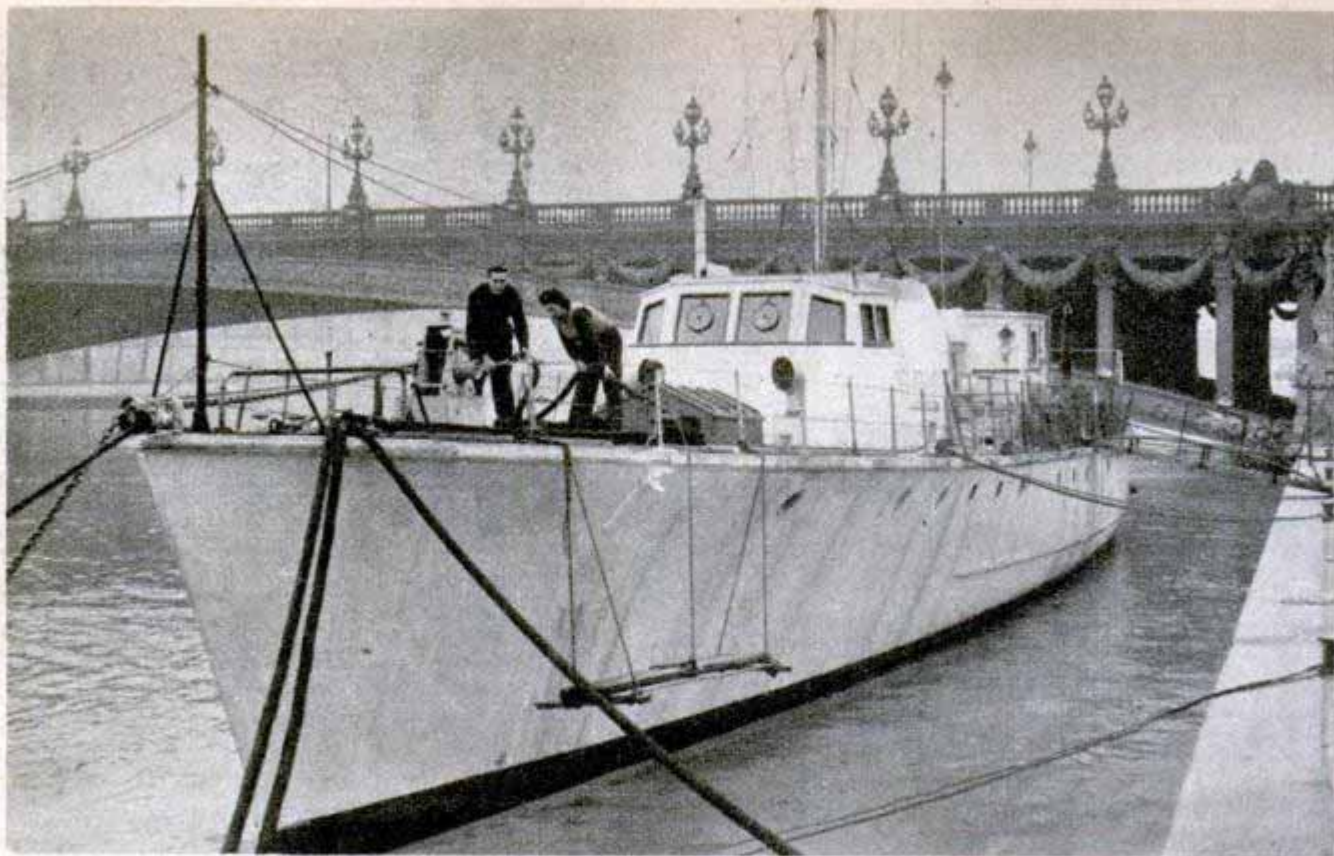
"Besides," says Nelson with a grin, "it's a lot of fun!"

TYPEWRITER MYSTERY

Follow these directions and you'll type your own cartoon. What is it? Try it yourself to find out. Instructions are given line by line. For example, in typing the first line set the carriage at the left margin, strike the space bar 39 times, then strike the capital X four times.

Line	Line
1. 39sp, 4X	16. 13sp, 26X
2. 35sp, 10X	17. 9sp, 30X
3. 34sp, 12X	18. 3sp, 36X
4. 33sp, 11X	19. 38X
5. 33sp, 9X, 1sp, 10X	20. 37X
6. 32sp, 21X	21. 1sp, 35X
7. 32sp, 11X	22. 3sp, 32X
8. 32sp, 8X	23. 5sp, 28X
9. 32sp, 8X	24. 7sp, 24X
10. 31sp, 9X	25. 9sp, 19X
11. 31sp, 9X	26. 12sp, 14X
12. 28sp, 12X	27. 16sp, 10X
13. 23sp, 17X	28. 19sp, 7X
14. 19sp, 21X	29. 20sp, 4X
15. 16sp, 24X	30. 19sp, 8X
	31. 17sp, 13X





They're at Home In a Patrol Boat

By remodeling a British war boat, Marcel Baudouy, French war veteran, now has a floating home for his English wife and four children. As a member of the Free French forces during the war he commanded a small torpedo boat. When he couldn't find a home because of the housing shortage he bought a British motor launch and fitted it for private use. Double-deck bunks were installed for the children. On his first civilian trip he berthed the boat in the Seine River while taking his family sight-seeing in Paris.



Lift Parks Autos in Tiers

Cars are parked in tiers by a lift that "files" them four high in a framework designed for garages. Each unit of the framework has four platforms, one on top of the other, which are just large enough to accommodate a car. Autos to be parked are driven onto the lift, which raises them to the correct height, then slides them into the proper storage bin. In a recent demonstration at Spokane, Wash., each car was parked in less than two minutes.

POPULAR MECHANICS

Air Liner Phone Calls Anywhere

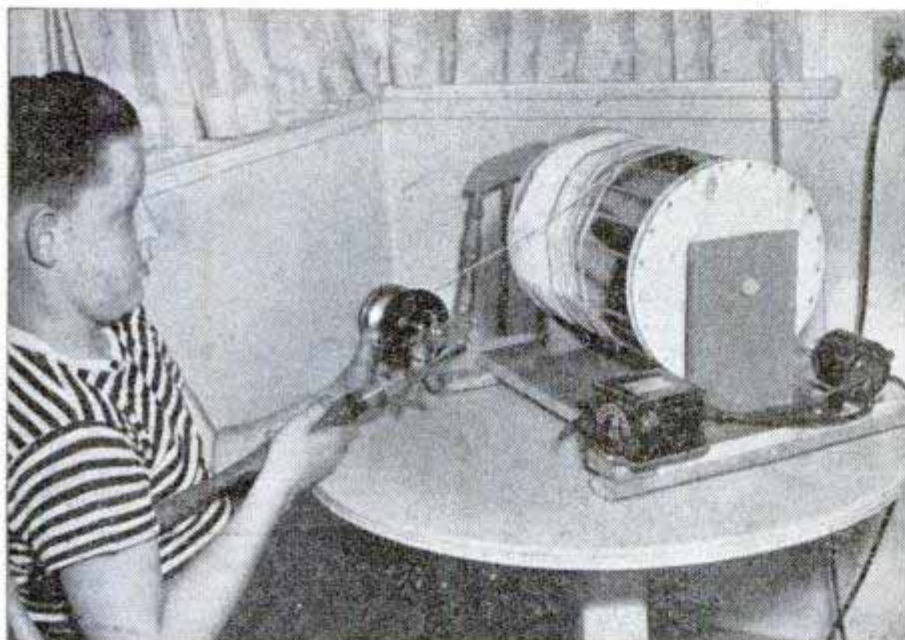
Telephone calls anywhere can be made to and from air liners equipped with air-to-ground sets. They are the conventional hand-type instruments and are used in the same manner. Direct contact can be made to land stations within 100 miles and from there the connection is completed over wires. At greater distances the closest mobile service station, also used to handle calls between motor vehicles and homes or offices, is contacted to act as a relay point. At 19,000 feet the plane can reach relay facilities within 150 miles. Calls to the craft are made through long distance and then a mobile service operator, who signals the plane over a specially assigned radio channel. The signal causes a bell to ring and a light to flash in the cabin of the plane.



United Air Lines photo

Motor-Powered Reel Dries Fishing Line

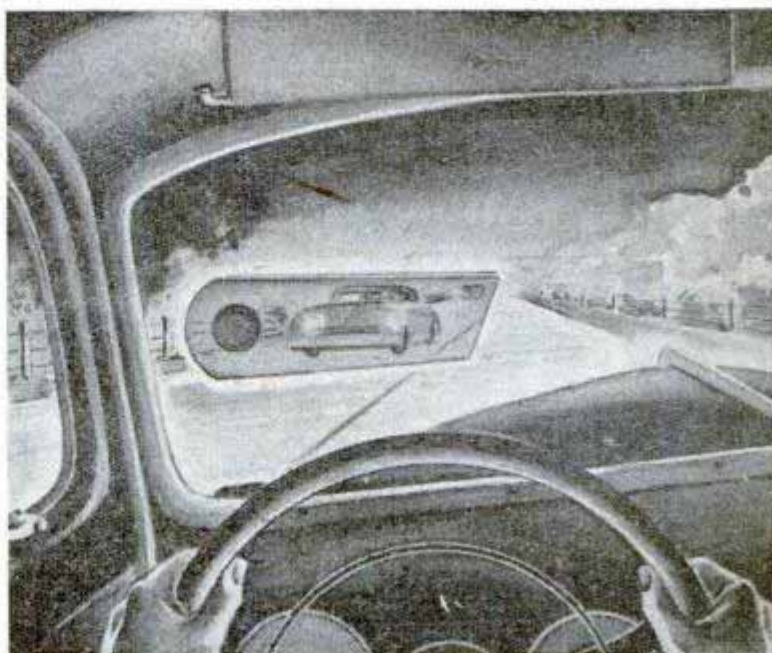
Fishing lines are dried on a motor-driven reel built from salvaged parts by a Los Angeles angler. The reel is fashioned from the ends of an apple box, a dozen dowels, the motor from a discarded auto heater and the rheostat transformer of an old electric train. The reel, 14 inches long and 10 inches in diameter, is connected with the motor by a cord belt and its winding speed is regulated by the rheostat.



Shade for Headlight Glare

Glare from the headlights of oncoming cars is reduced by a safety shade that fastens to the windshield and can be flicked quickly into position to shield the eyes. The shade is transparent although it is a dark color which transmits little light. A suction cup holds it to the windshield at eye level. When not in use the shade can be swung out of the way.

Discoveries of new oil reserves in the United States alone will equal or surpass the vast quantities already discovered, in the opinion of Standard Oil Company (New Jersey) geologists.



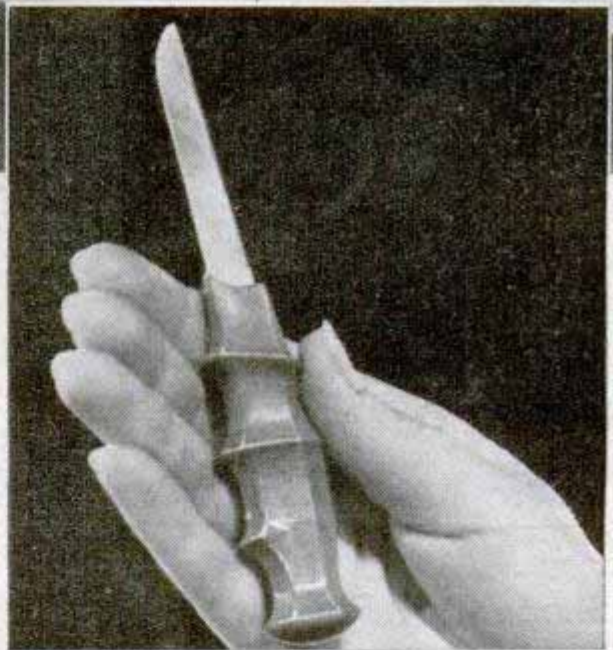
WHAT'S NEW *For Your Home*

A four-page "shopping section"
dedicated to modern homemakers



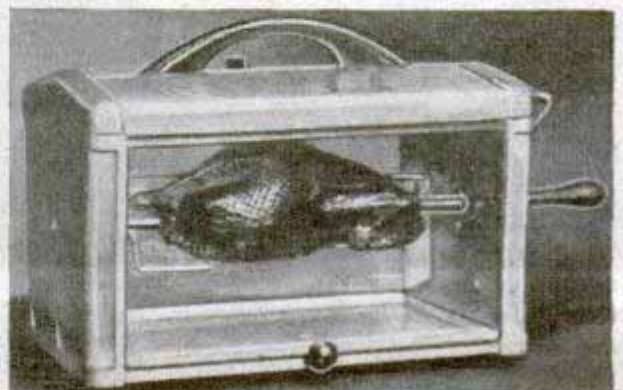
↑ **GAS PLUG** for stoves and other appliances can be plugged into wall socket, permitting use of flexible pipe

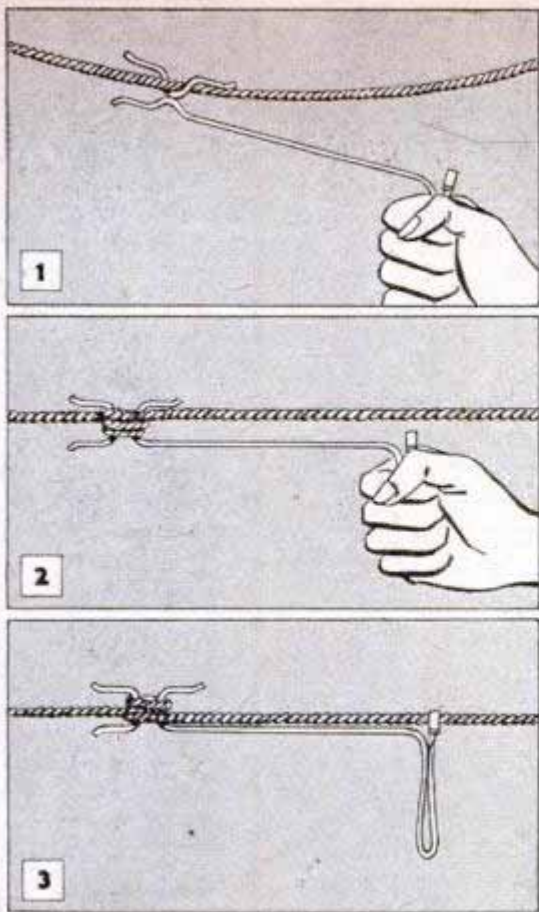
↓ **HOT WATER** flows instantly from faucet with this electric water heater. Slow stream gives the greatest heat



↑ **KNIFE HANDLE** assures safe grip with finger impressions molded in plastic. Knife floats in water

↓ **ELECTRIC BARBECUE** holds 10 pounds of meat or fowl on spit. Through glass sides you can watch meat cook, turned slowly by an electric motor

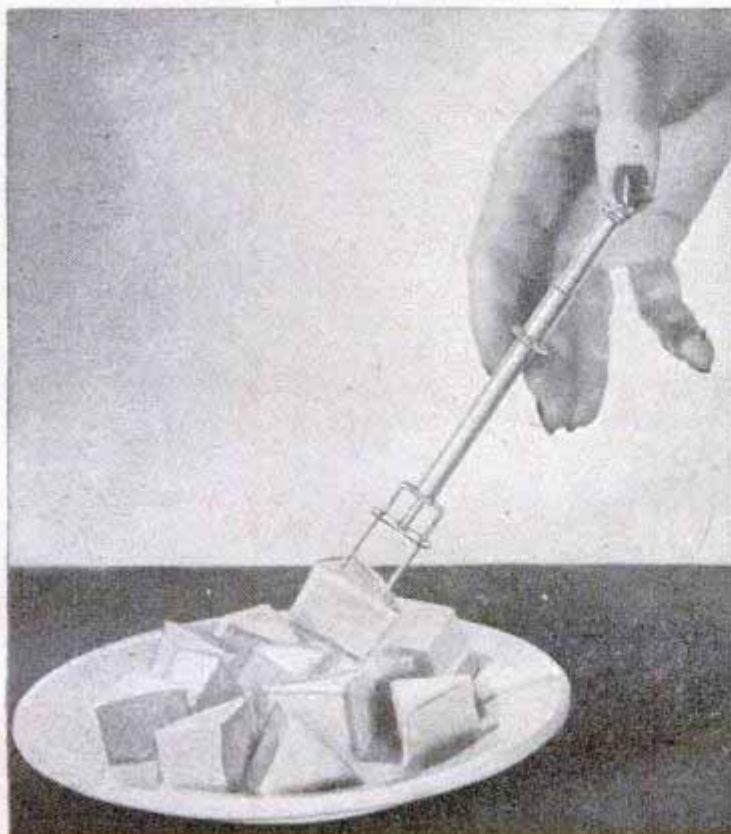




CLOTHESLINE TIGHTENER turns like a crank to give lift to sagging lines. When line is taut, a hook on handle secures the crank

BARBECUE-BROILER at right has two gas burners. Meat is threaded on skewers and automatically rotated by an electric motor

! FORK FOR TIDBITS spears food, drops it neatly on plate when a button is pushed

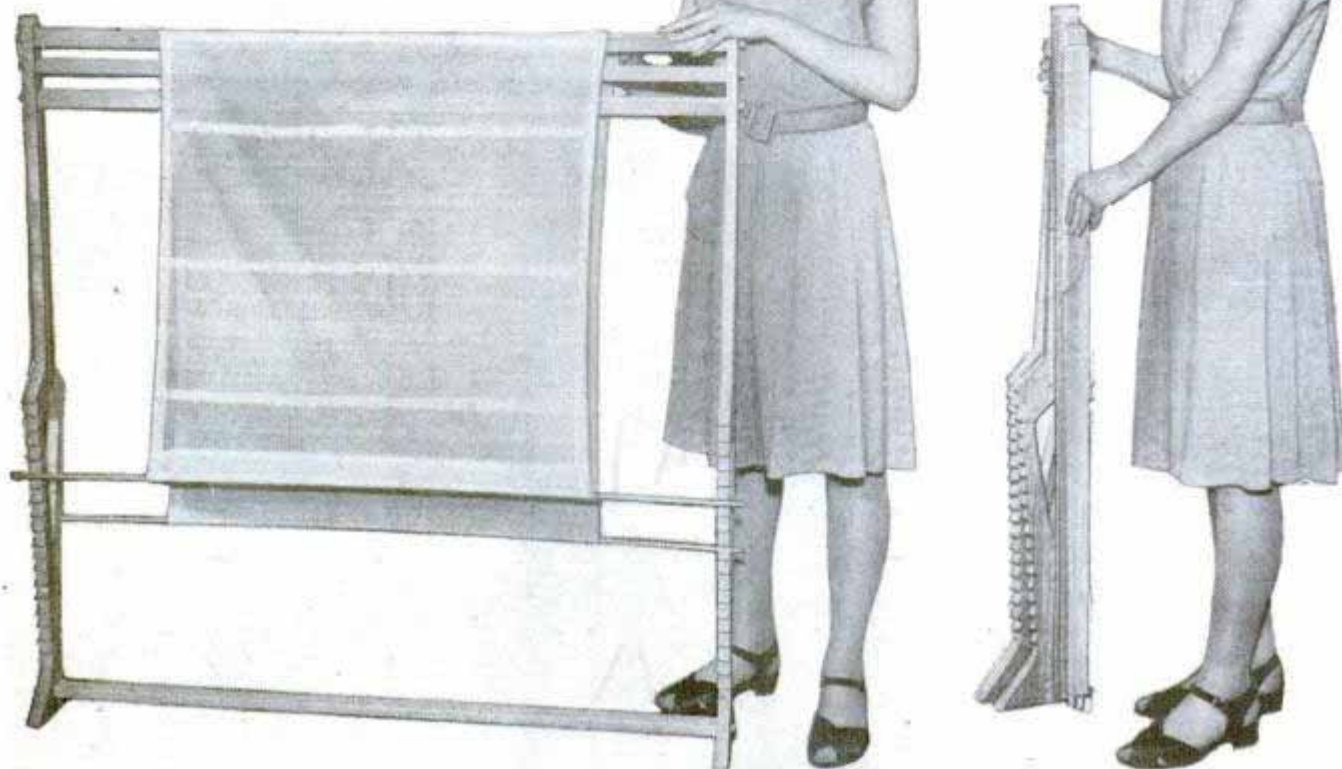


SOFA BY DAY, this space-saver unfolds at night into the comfortable full-size bed shown below. Innerspring mattress is folded inside back and seats



WHAT'S NEW *For Your Home*

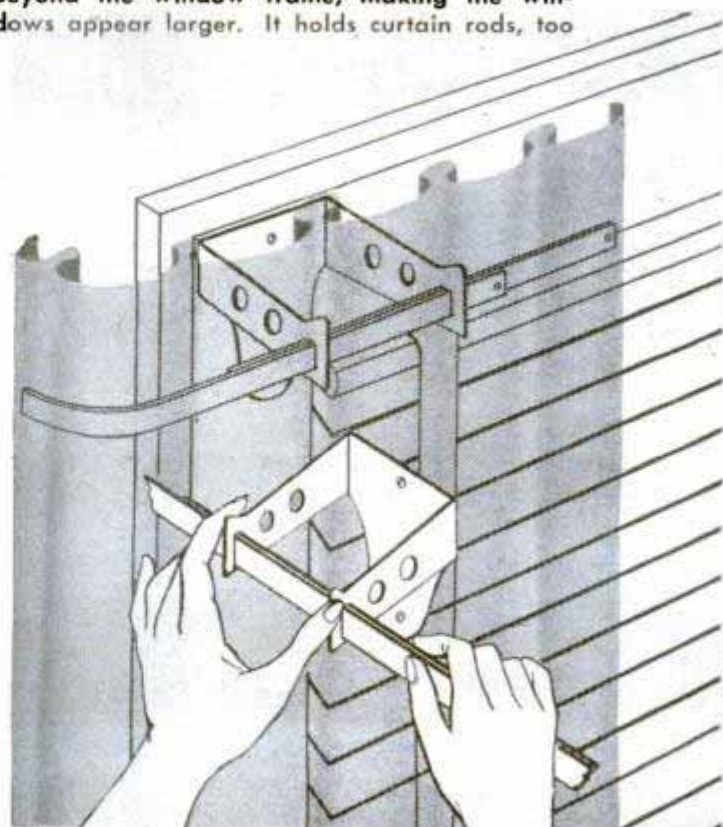
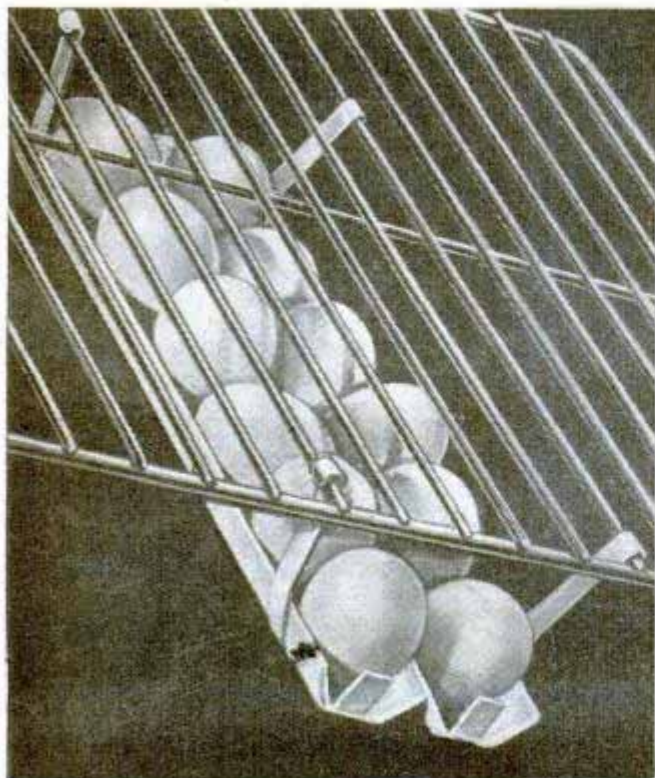
Continued from preceding page



CURTAIN STRETCHER has no pins that might damage fine curtains. The stretcher is a compact bundle when collapsed, can be assembled in less than three minutes. It holds three curtains at once, stretching them through bars inserted in the hems

SLIDING EGG TRAY that hooks beneath refrigerator shelves makes use of precious space that is ordinarily wasted and offers better protection for eggs

DRAPERY "CRANE" holds drapes several inches beyond the window frame, making the windows appear larger. It holds curtain rods, too

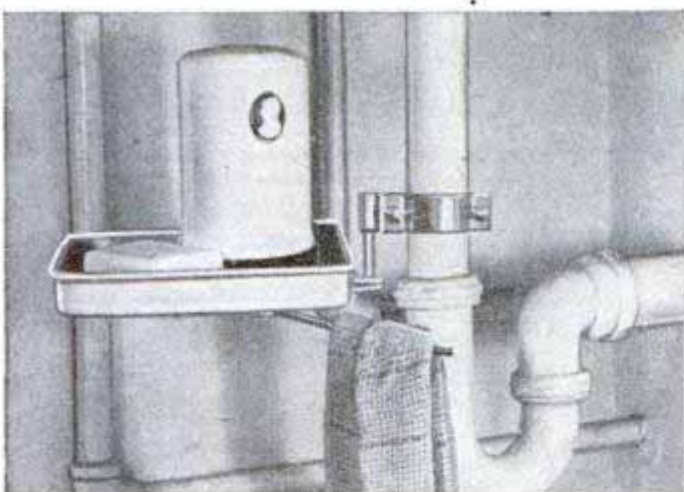




RIPPING KNIFE for home tailors slashes out unwanted seams quickly. Blunt end of the forward finger slides along beneath the material



DOUBLE DUTY BULB converts any lamp to indirect light. Frosted top shoots soft beam upward, bottom gives bright light



SWINGING TRAY clamps beneath sink to hold soap and other household needs out of sight

↓ **GREASE SHIELD** made of aluminum fits top of standard 10-inch skillets to trap flying grease



↓ **BUILT-IN PRESSURE COOKER** is the feature of a new electric range. Six-quart cooker can be removed and the heating element raised to the surface when desired



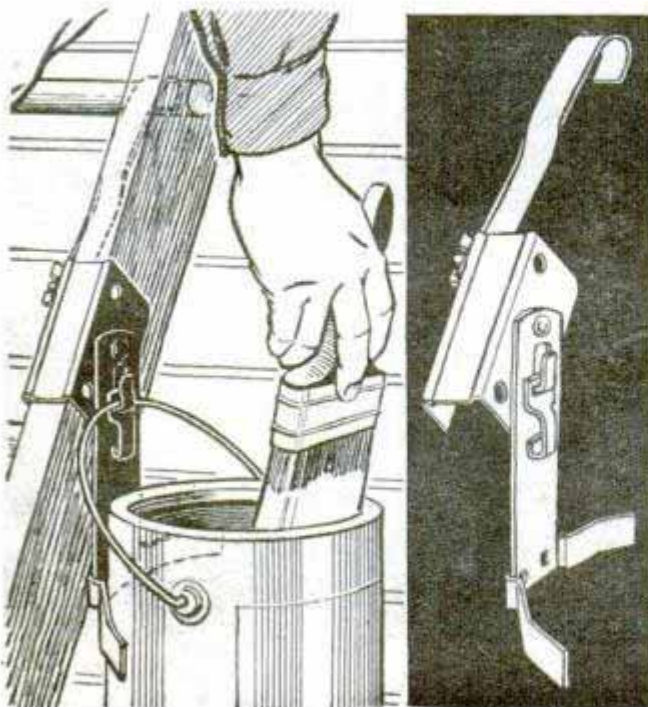


BASEMENT INVENTOR

Neighborhood "small fry" are eager to mow the lawn of William Lusk of Chicago because they are permitted to drive the powered mower he invented. Lusk bought a small motor, added a chassis and three wheels and now the scooter-type vehicle pulls a creeping-bent mower around the neighborhood lawns. By loosening a few bolts he can substitute a conventional lawn mower for the front wheel. The operator sits on a tractor seat and drives the mower with controls on the handle bars that are simple enough for a child to operate. A machine manufacturer by trade, Lusk has invented several other time-saving machines. Last winter he developed a power snow sweeper with a revolving brush and metal blades to clean his sidewalk. Among his other inventions are a device to prevent accidental discharge of shotguns, a powered crib for babies, and an air purifier.



Top left, snow sweeper with brushes cleans sidewalks. Top, "scooter" pulls creeping-bent mower. Above, the front wheel can be replaced with a manual lawn mower for a quick job on ordinary grass



Painter's Ladder Hook

Cans of paint are held in an upright position by an attachment that hooks onto the rung of a ladder. A self-adjusting swivel compensates for the angle of the ladder. The device accommodates pint, quart, and gallon cans.

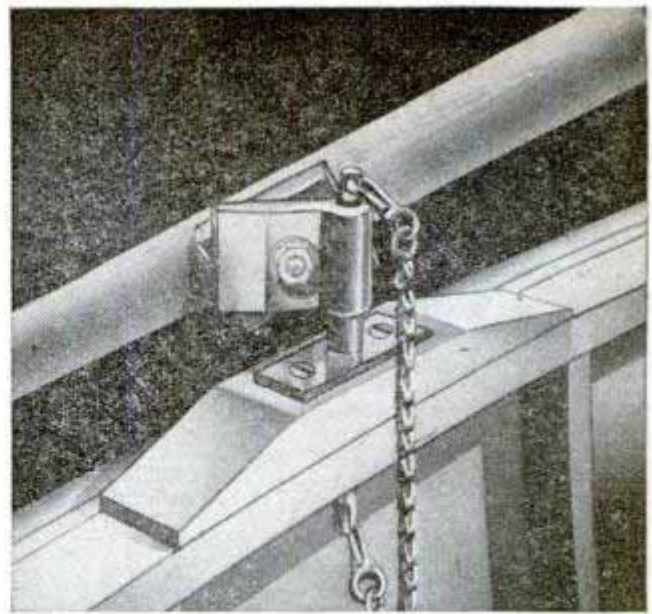
Chemical Elements Named

Three chemicals, previously known only by a number on the periodic table of elements, have been named. Element 43 is called technetium; 85, astatine, and 87, francium. Technetium was the first element artificially made by atomic bombardment of molybdenum. Astatine also was produced by atom smashing, with alpha particles used to break up bismuth. Francium, with the symbol Fr, was named in honor of France by its discoverer, Mlle. M. Perey.



Platform Elevates Piano Pedals

Small children are able to operate piano pedals by means of a platform and pedal attachments that can be adjusted to reach from five to seven inches above the floor. The platform is made of sheet metal, finished in dark mahogany and covered with corrugated rubber to prevent foot slipping.

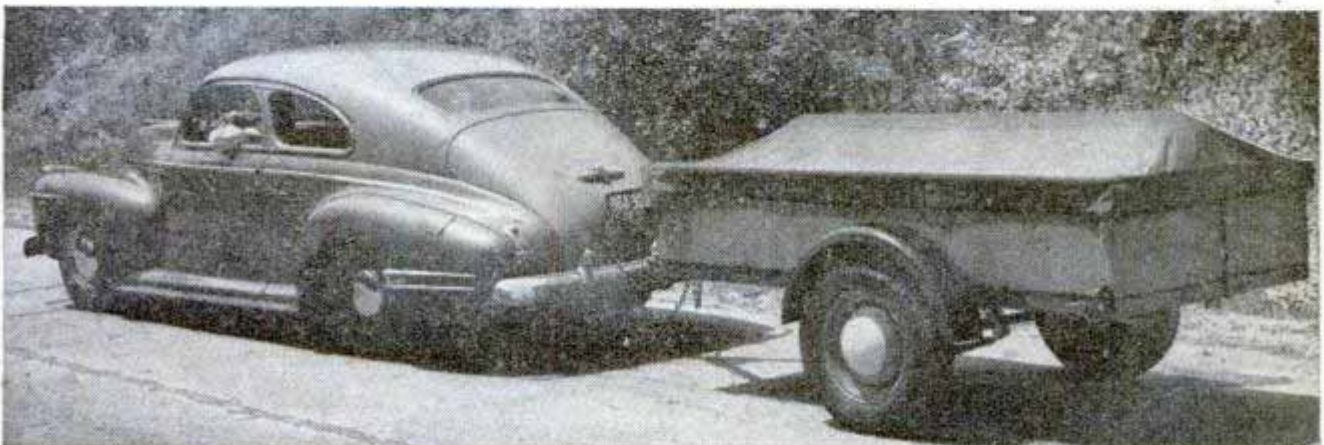


Silent Oarlocks for Hunters' Boats

Oarlocks designed for silent operation permit hunters to approach game quietly by boat. The lower half of the thole pin is tapered to fit snugly into the socket on the gunwale, reducing noise as the oar is pulled. The bolt through the oar passes through a smooth facing plate and then through the swinging plate on the lock. This gives two flat surfaces moving against each other. The locks are made of brass.

Camper's Tent on Wheels

Two beds, icebox, food compartment, gasoline stove and two folding chairs are carried with a folding tent on a two-wheel trailer. Campers and tourists uncouple the trailer from their car and put the tent up in 10 minutes. The trailer serves as the base for the tent which has screened windows and door. Total weight of the trailer and tent is 1000 pounds, but only 60 pounds rest on the car coupling. The tent, which resists water, fire, mildew and mosquitoes, is 8 by 10½ feet.



Three steps (top to bottom) produce a curved channel. In Step 1, material is sheared to correct size
 O'Neil-Irwin Mfg. Co. photos

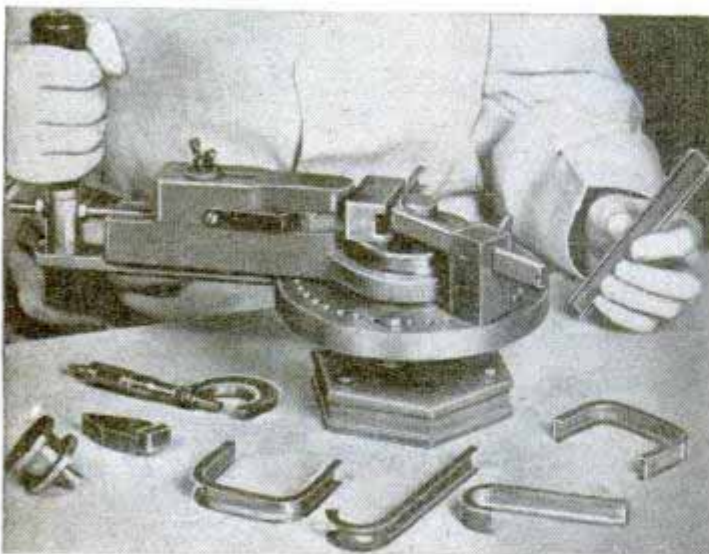
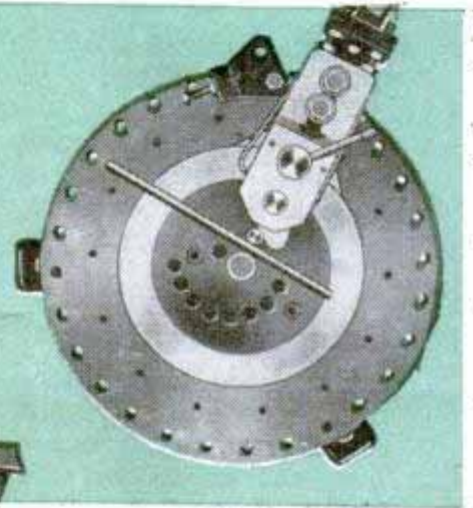


Metal

EVER WONDER how manufacturers make all those curved pieces of metal that go into thousands of products—from miniature hearing aids to heavy agricultural equipment, from model airplanes to automobiles? One method employs a variety of hand-operated machines which bend the pieces into the desired shapes. No dies are used and yet dimensional accuracy to a thousandth of an inch is



In the second operation, the piece of metal is transformed by a brake machine from a flat shape into the desired channel effect



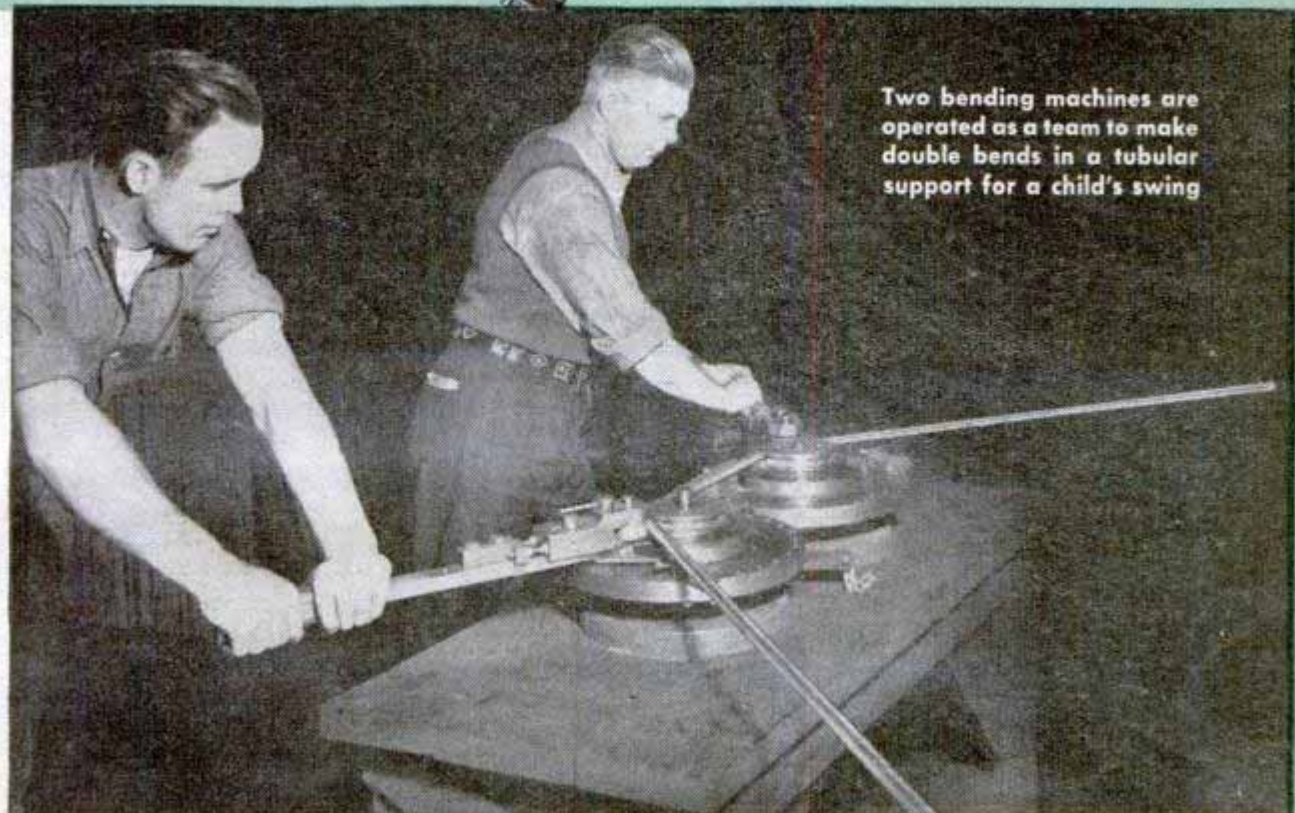
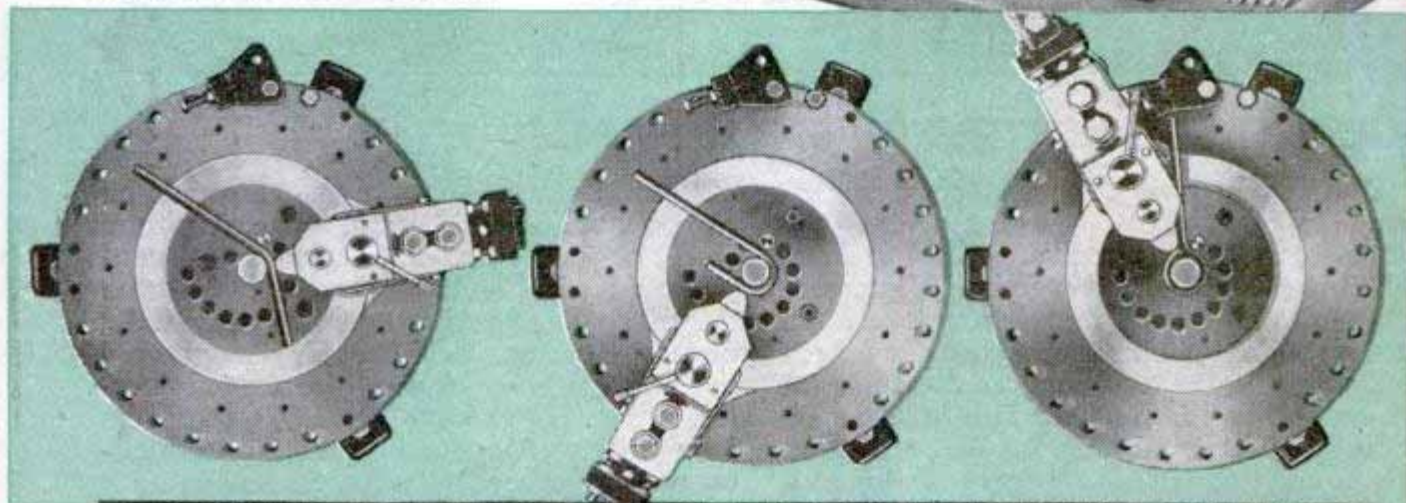
Step 3—bending the channel to the specified radii. At the right is a multitude of shapes that are mass-produced by similar bending machines



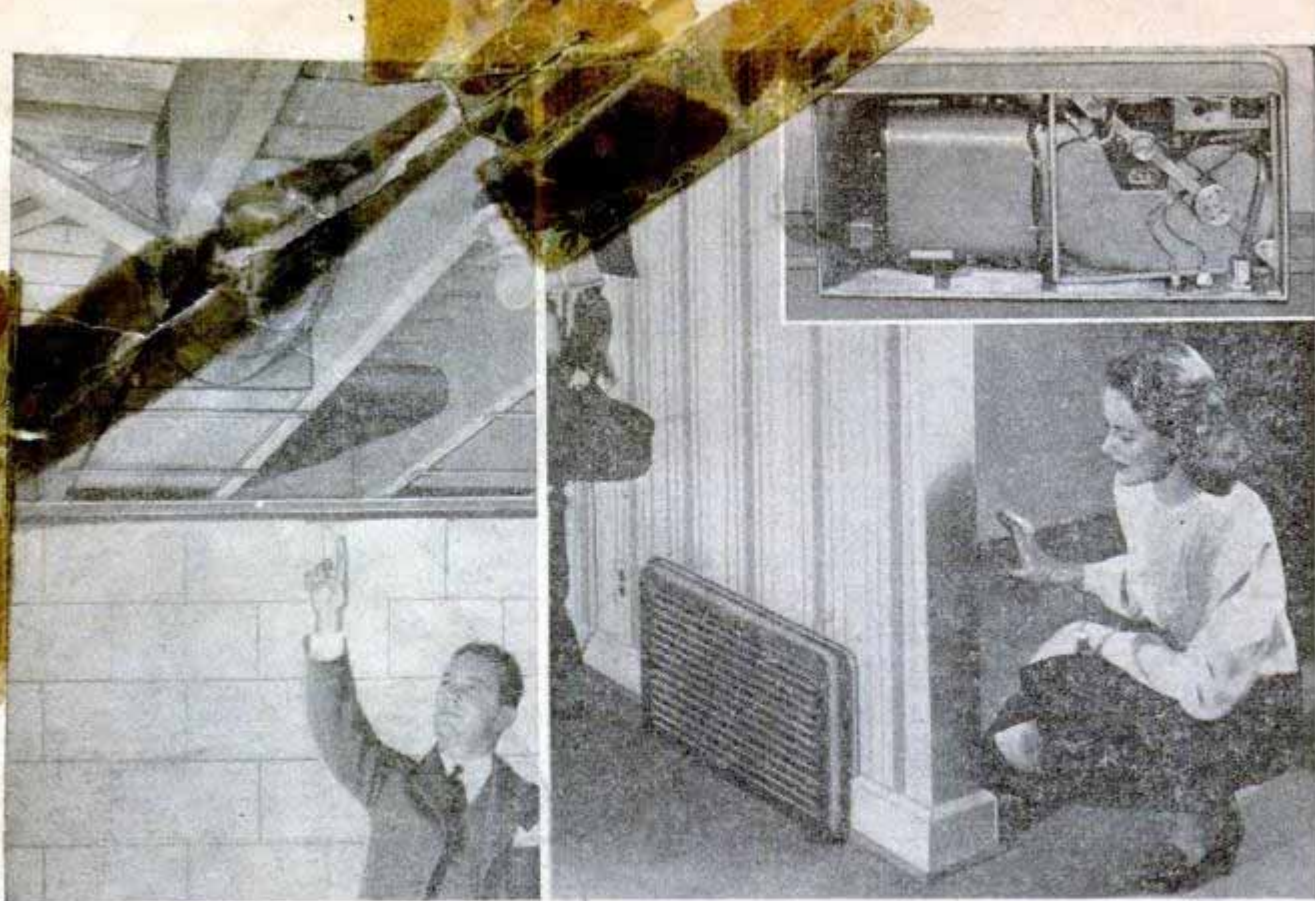
Benders

obtained. The machines are adjusted and set so that hundreds or thousands of curved pieces can be produced with virtually no variance in dimensions. Metal benders are often used to turn out a limited volume of parts when it would be uneconomical to buy blanking dies. These two pages show several machines and the pieces they produce.

Flat piece of metal is formed into corrugated shape (right). Below are shown four steps in forming an eye on end of a rod



Two bending machines are operated as a team to make double bends in a tubular support for a child's swing



SUITCASE-SIZE HEATER FOR SMALL HOMES

Taking the place of a furnace, two gas-burning heaters, each about the size of a suitcase, will keep the average house comfortably warm in cold weather. Patterned after gasoline heaters used in automobiles and airplanes, the house heater has a hermetically sealed combustion chamber in which the fuel is burned. The fuel can be natural, mixed, manufactured or bottled gas. Since the cabinet always remains at a

safe temperature, the midget heater can be placed in the wall, under the floor, in a closet or in the attic. It uses a small vent pipe instead of a chimney and requires no ducts in some installations and only short ducts in others. Each heater is operated independently by its own thermostat, making it possible to have 70-degree temperature in living room, dining room and kitchen, and 65 degrees in bedrooms and bath.

Matchbox Camera Used by Underground During War

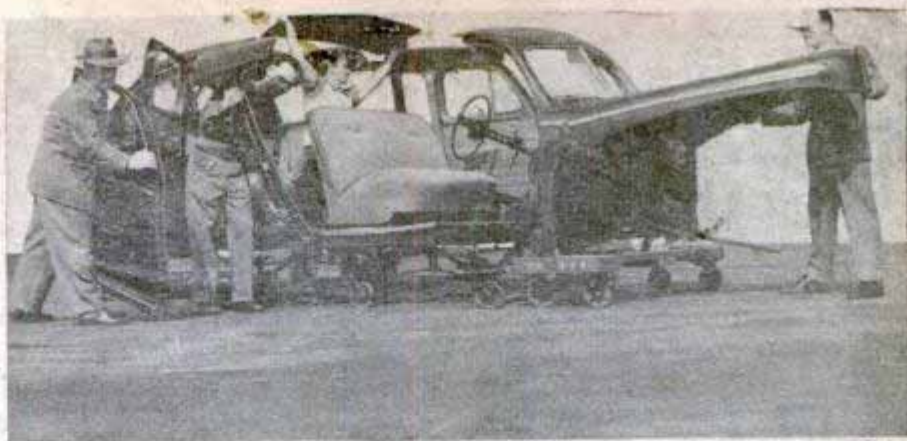
Cameras the size of a matchbox and "vestpocket" darkroom kits were developed during the war by Eastman Kodak Company for agents of the Office of Strategic Services and the underground forces

in Europe. Although the cameras were small enough to be concealed in an agent's hand, they snapped photographs about 1/2-inch square that could be enlarged many times and still be clear. Film for the camera was furnished in two-foot lengths wound on spools which provided 30 exposures. The camera had a shutter speed of 1/50 second. For copying photos or printed material the camera was set in a small stand equipped with a close-up lens. There was no view finder and the exposure was made simply by aiming at the subject and pushing a plunger. The tiny darkroom kit contained rolls of 16-mm. film, developing and fixing chemicals in pill form, a small chamois for wiping dry the developed film, a mixing spoon, film clips and a small stick for agitating solutions.

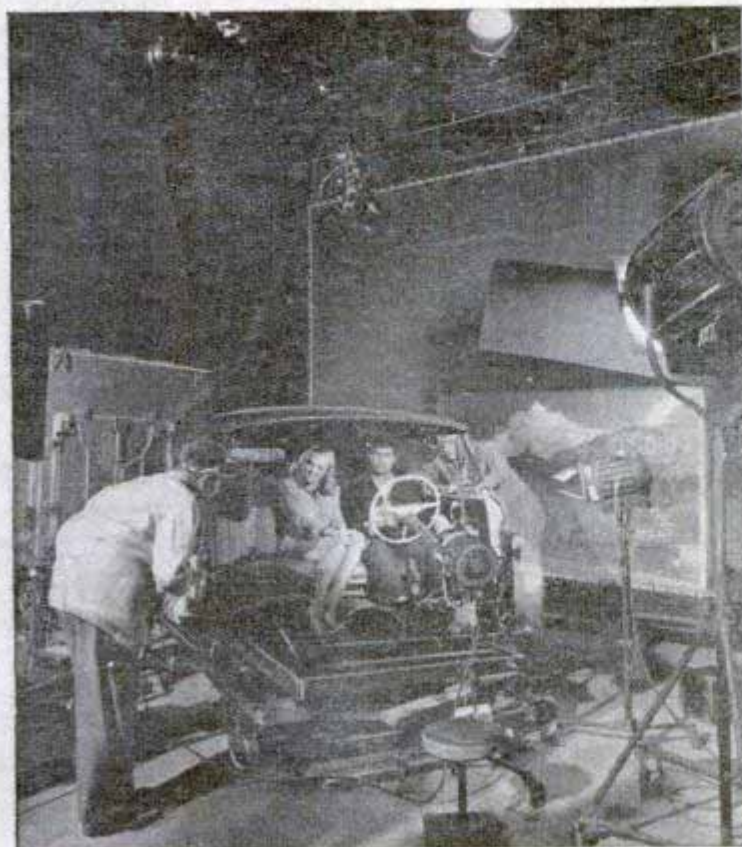
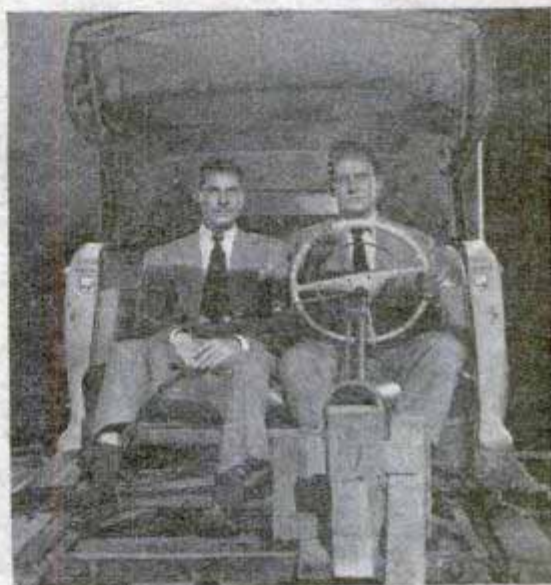
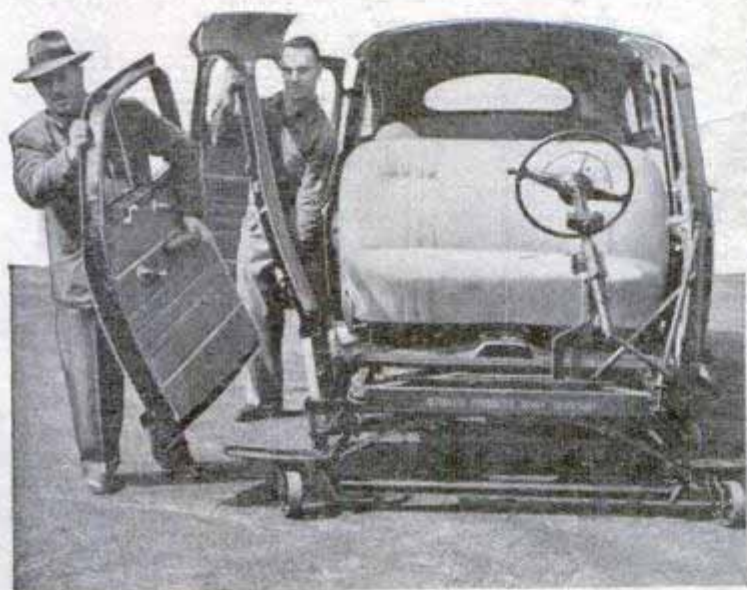


Knockdown Autos

Automobile bodies that may be taken apart in a few minutes enable motion picture studios to make close-up scenes of actors inside a car. Sections of a car body are removed to provide room for camera, sound microphone and studio lights. Mounted on cross-springs, the bodies are bounced up and down when the illusion of motion is desired. The breakaway bodies come apart in three sections. Doors or an entire side may be removed; the roof may



be taken away, and the front or rear sections may be wheeled off. Assembled, the body has a standard appearance. Stock bodies are rebuilt for come-apart action.



Come-apart automobile body (top photo) divides into three sections for movie close-ups. Front and doors and part of roof can be removed from a sedan body. Or the front and both sides can be taken away, as in the picture directly above. With the front and sides eliminated from a convertible body (left), the camera is moved in close to get the shot shown below. Note the realistic appearing background produced by screen visible at left



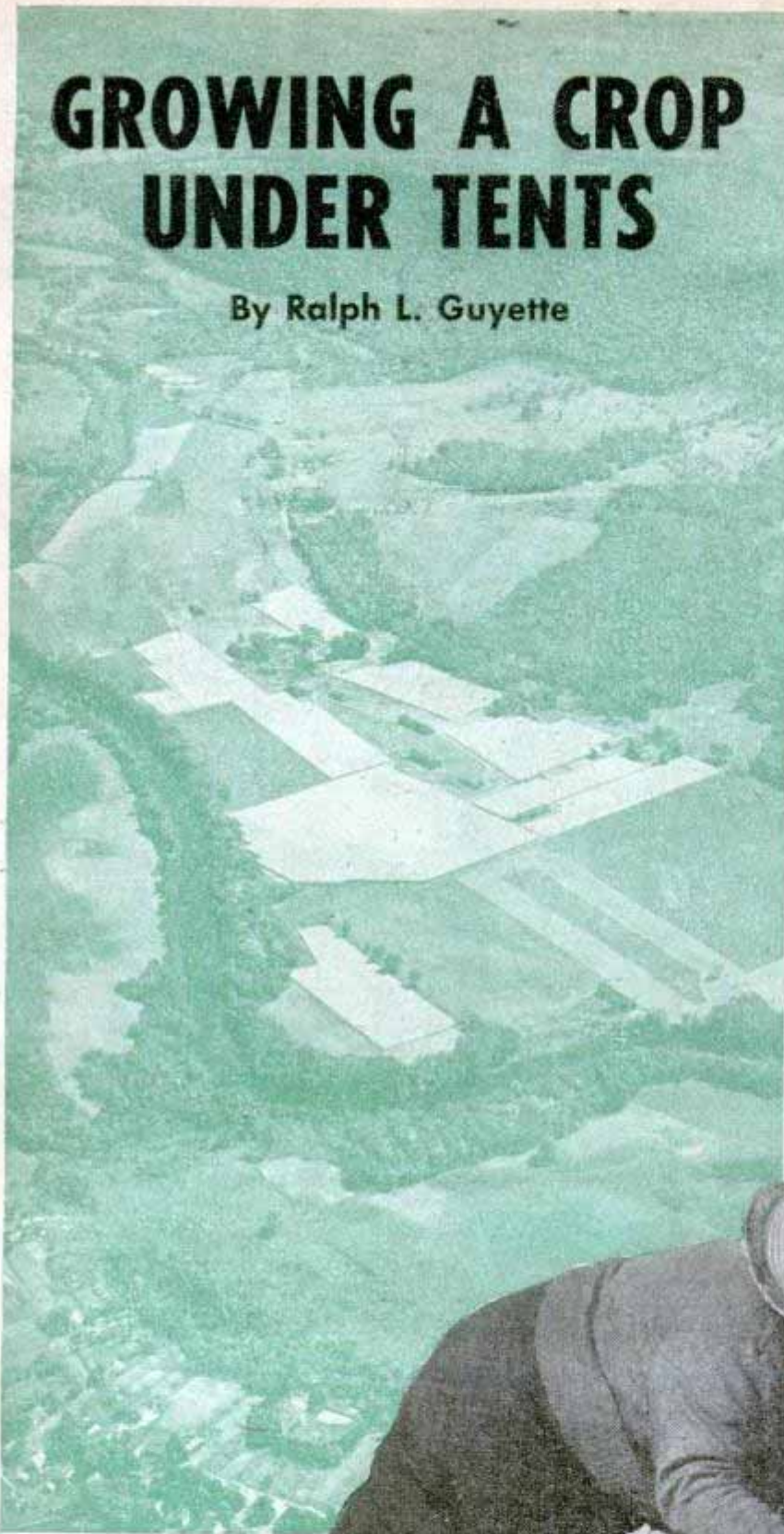
GROWING A CROP UNDER TENTS

By Ralph L. Guyette

IN THE rolling Connecticut Valley one of the most valuable crops in the world is harvested under tents that cover thousands of acres. It's shade-grown tobacco. The leaves are used for wrapping fine cigars and this tobacco can be grown in only a few spots on earth.

Years ago the finest type of shade tobacco was grown in Cuba and Sumatra, but high tariff duties put the squeeze on American cigar manufacturers. They solicited the aid of the Department of Agriculture in 1900. After much research the department discovered that a good shade tobacco could be grown in the Connecticut River Valley and in a small area along the Georgia-Florida border.

The Connecticut Valley is one of the most highly industrialized areas in the country and consequently has a high



↑ Air view of cheesecloth tents that protect crop. Right, workers choose sturdiest plants from seed beds





Hartford Courant photo

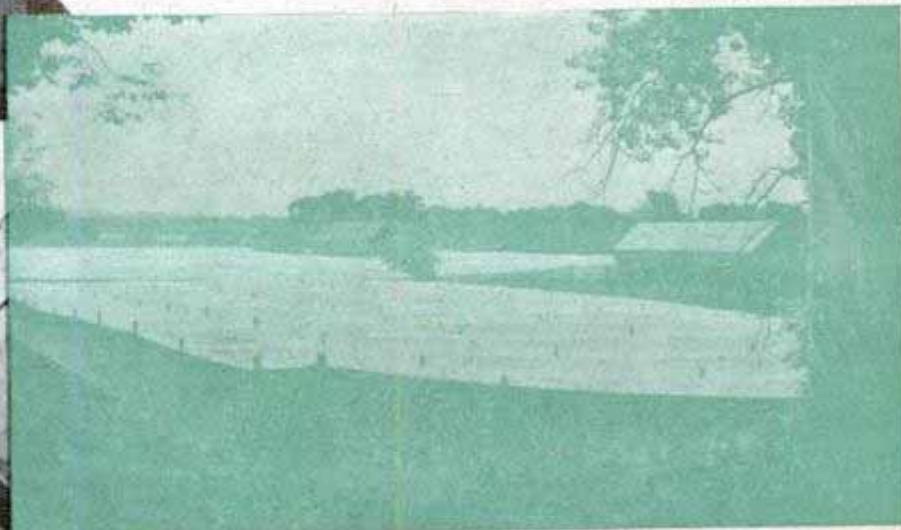
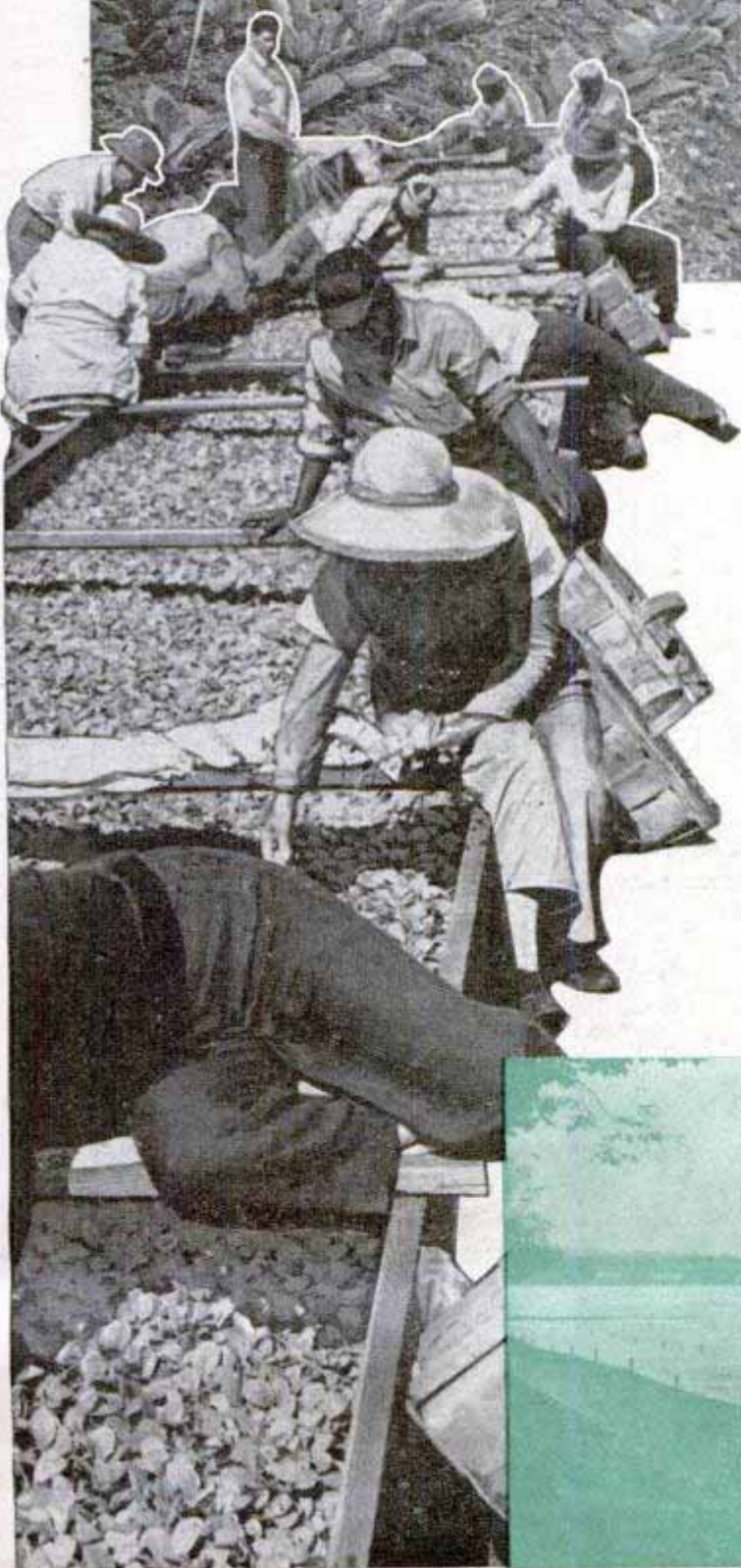
Girls hoe the tobacco beneath miles of tents. Cultivation of the crop requires much hand labor

wage scale. The growing of shade tobacco requires large amounts of hand labor and that is the reason wrapper tobacco is among the most high priced of all agricultural products.

In Cuba and Sumatra the high humidity, temperate climate and a prevailing overcast of low clouds create conditions favorable to the production of fine wrapper leaf. Because all these conditions do not exist in New England, the Department of Agriculture was stumped until it discovered that gigantic cheesecloth tents could be erected over the crop to bring tropical climates to New England. Tents become "clouds" to shield tender leaves from the rays of the sun and boost

Wires stretched on poles support the cheesecloth. Tents prevent the hot sun from burning the tobacco

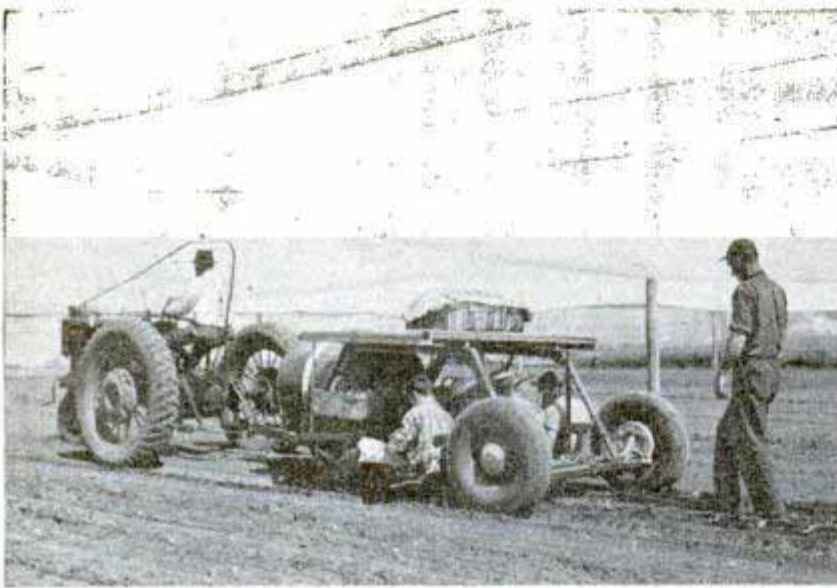
Library of Congress photo





Connecticut Development Commission photo

↑ Long bundles of tobacco leaves are strung to the peaks of air-ventilated curing sheds like those at right



Planting machine makes a trench and fills it with water. Workers set out the plants by hand. Below, the crop is harvested five or six times a season, as the leaves at the bottom mature most quickly

Shade Tobacco Growers Agricultural Association photo



the humidity some 20 degrees.

In the Connecticut Valley is the world's greatest humidifier—8700 acres of cheesecloth tents. Stretching along the river for about 75 miles through Connecticut and Massachusetts, these covers shelter millions of dollars worth of delicate wrappers.

Raising shade-grown tobacco is an art which has been studied and improved through decades. First step is the sterilization of the seed beds under glass. Years ago this was done by injecting live steam into the soil, but today a chemical is sprayed on the beds which penetrates deeply into the ground, minimizing fungus diseases and the growth of weeds. The seeds then are sown and allowed to sprout.

As the plants break through the loose loam they are thinned out and only the sturdiest plants survive. In about six to eight weeks these are transplanted to the fields. Meanwhile the huge tents have to be set up and the land fertilized.

The tents are supported by wooden poles 12 feet high and set at intervals of 33 feet in each direction. They are left in the ground from year to year and replaced only when necessary. Wires are stretched tightly between the poles and

(Continued to page 220)



SPEAR-TYPE STAND equipped with foot pedal holds golf bag upright on the fairway while a golfer takes a shot

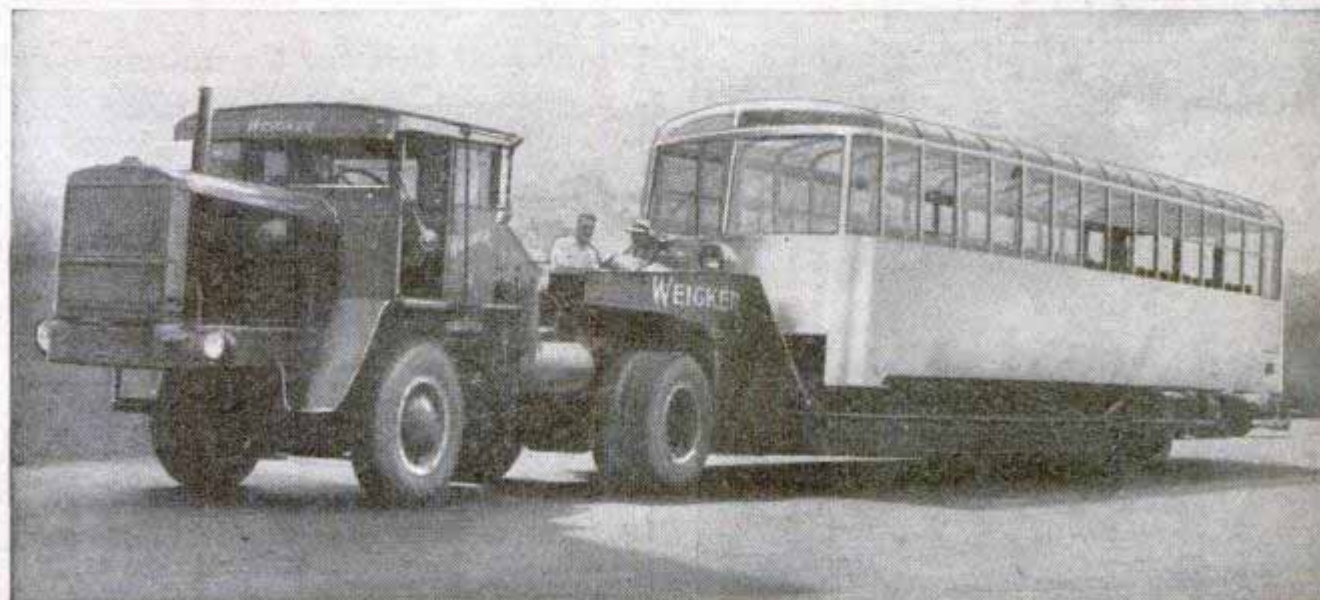
PLEXIGLAS ROOF on Pike's Peak sight-seeing railway coach increases vision



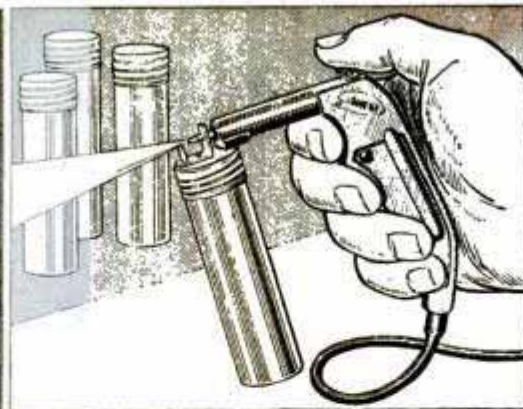
MOTOR SCOOTERS solve the transportation problem for Clarence White and his three children in Claremont, Calif. The scooters are economical and have automatic clutches and transmissions for easy operation



SWEDEN'S FIRST JET fighter plane, the J-21-R, has reached speeds in excess of 500 miles an hour at the air force base at Norrkoping. The plane is similar in appearance to the British De Havilland Vampire



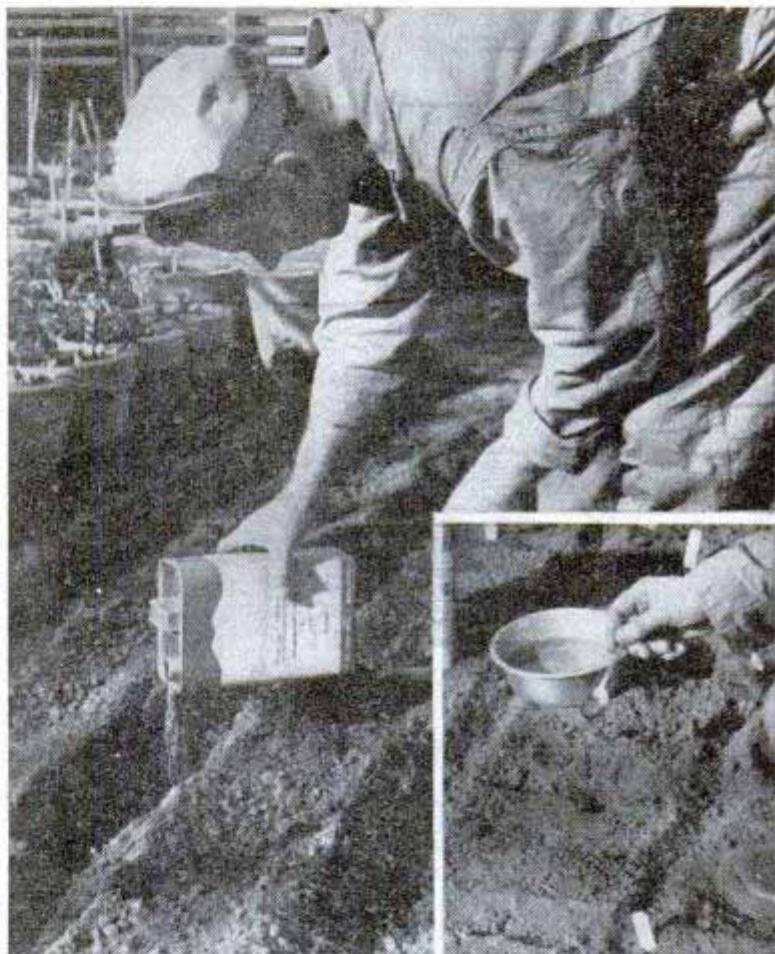
Disposable Spray Paint Containers Save Time in Changing Colors



Inexpensive paint containers supplied with a new spray gun outfit eliminate messiness and bother in changing colors. Used containers are thrown away instead of being cleaned and refilled. The air hose uses compressed air from bottled pressure, insecticide sprayer tank, tire pump or an auto spare tire.

Soil Fumigant Kills Insects →

Destructive garden insects are killed by a soil fumigant that can be used without special equipment by the home gardener. The liquid contains ethylene dibromide, a compound that gives off gases which kill many soil pests including wireworms and nematodes. The fumigant is poured into a system of trenches or holes, then covered and packed. It spreads as a gas 10 inches from the point of application and penetrates to a depth of 16 inches. Following treatment, the soil is left idle 14 days before planting.



Windowed Lids for Containers

Plastic windows in the lids of metal containers keep the contents in view and do away with the need for labels. In addition to storing small parts and odds and ends, waxes, pastes and ointment can be kept in the containers without deteriorating. They are made in deep and shallow styles in 10 sizes up to three inches in diameter.

You may wish to obtain additional information about the new products described each month in *Popular Mechanics*. If you want to know the name and address of the manufacturer or distributor, just write to Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11, Ill.

**STANDING
Room
ONLY**

**LOS ANGELES
CITY LIMITS**

THE ARRIVAL of a string of pack animals used to be quite an event in the sleepy little village of La Ciudad de Nuestra Senora La Reina de Los Angeles.

Today the same town is concerned with the building of 247 miles of superexpress highways to lighten its traffic load. The dusty hamlet of a century ago has grown into a sprawling industrial colossus.

Los Angeles leads the world in aircraft production, motion pictures, oil-field equipment and sports apparel. It is second only to Akron in tires and tubes, second to New York in the creation of all wearing apparel, third in petroleum refining and food processing, and fourth in furniture manufacturing. The county ranks first in farm production and was second as a war-production center.

Los Angeles' harbor leads all American ports as a fishing center. A quarter million tons of tuna, mackerel, sardines and other fish valued at \$17,000,000 pass through the port each year. Hollywood, an industry as much as a geographical place closely allied with Los Angeles, spends about \$125,000,000 a year to produce



Once upon a time Los Angeles produced movies and weather. Suddenly it is a colossus of industry

motion pictures that draw around \$270,-000,000 at the nation's box offices.

Now Los Angeles County is clinching its claim to second place in the automotive industry as well. Before the war, Ford and General Motors assembled up to 154,000 cars a year in the Los Angeles area. Today these concerns are expanding their facilities and other motor makers are moving in.

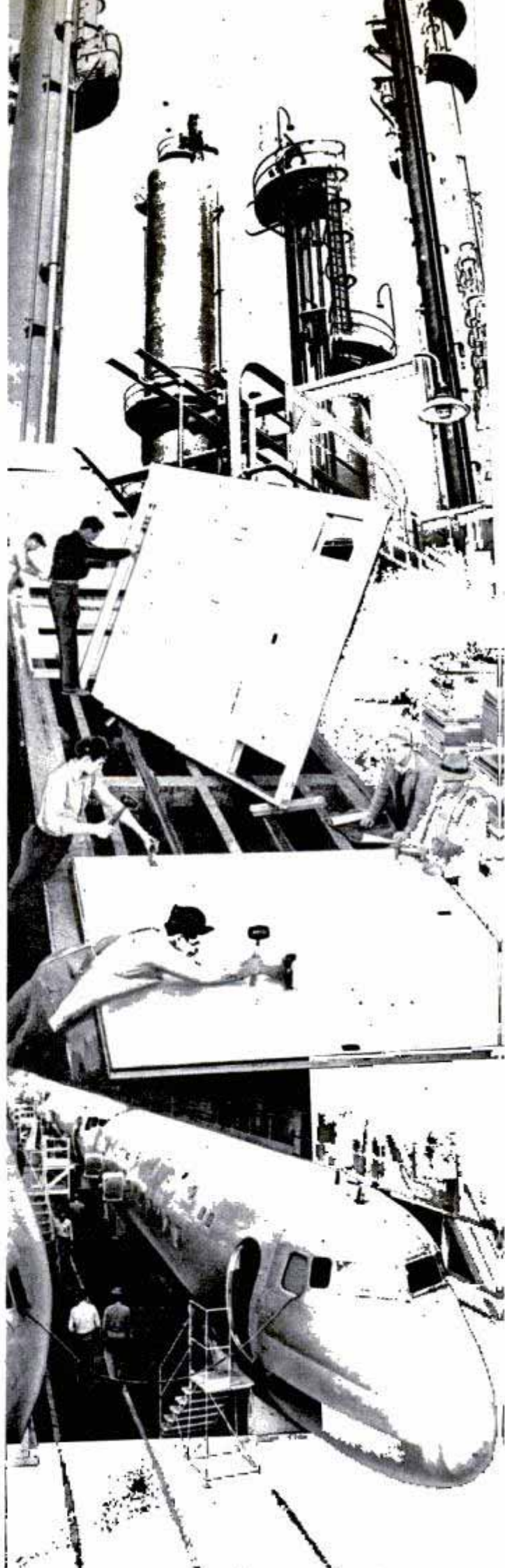
Assembly plants for Buick, Chevrolet, Chrysler, Dodge, Ford, Kaiser-Frazer, Lincoln, Mercury, Nash, Oldsmobile, Plymouth, Pontiac, Studebaker and Willys are to turn out 650,000 units or more per year for distribution in the 11 western states. Seventeen thousand workers not including those in the area's steel, rubber, battery, sub-assembly and accessory shops are to be employed in the assembly plants.

This industrialization in the West parallels the westward shift of population that is occurring today. The West was growing by leaps and bounds before the war, then this growth was stepped up by the recruiting of hundreds of thousands of workers in the East and Middle West to work in the war production centers along the Pacific Coast. It was supposed that most of the new population would return home after the emergency. Los Angeles in particular was bursting at the seams and sighed with relief when the war ended.

Then came a surprising aftermath. Tens of thousands of people left Los Angeles almost at once but most of them went home simply to wind up their affairs. They returned in a few weeks, often being followed west by their former neighbors. The influx of population continued and today it is estimated that the Los Angeles metropolitan area has a permanent population of about 3,500,000 people. Predictions that the area some day will support 10,000,000 people no longer seem fantastic.

Some war plants, especially in plastics and light metals, switched over to civilian production without a hitch when the war ended. Vast plants that were built solely to manufacture military aircraft were occupied by new concerns as rapidly as leases could be arranged. In 1946 alone 263 new industrial enterprises were established in Los Angeles County and 389 existing plants were expanded. This represented a one year's investment in excess of \$155,000,000. Current industrial employment is 85 percent greater than it was before the war and amounts to more than half the total industrial employment in the whole state.

All this created an acute housing shortage that still continues in spite of tremendous efforts to catch up with the demand. Vast tracts that before the war were cattle ranches or grain fields are now communities of modern homes complete to paved

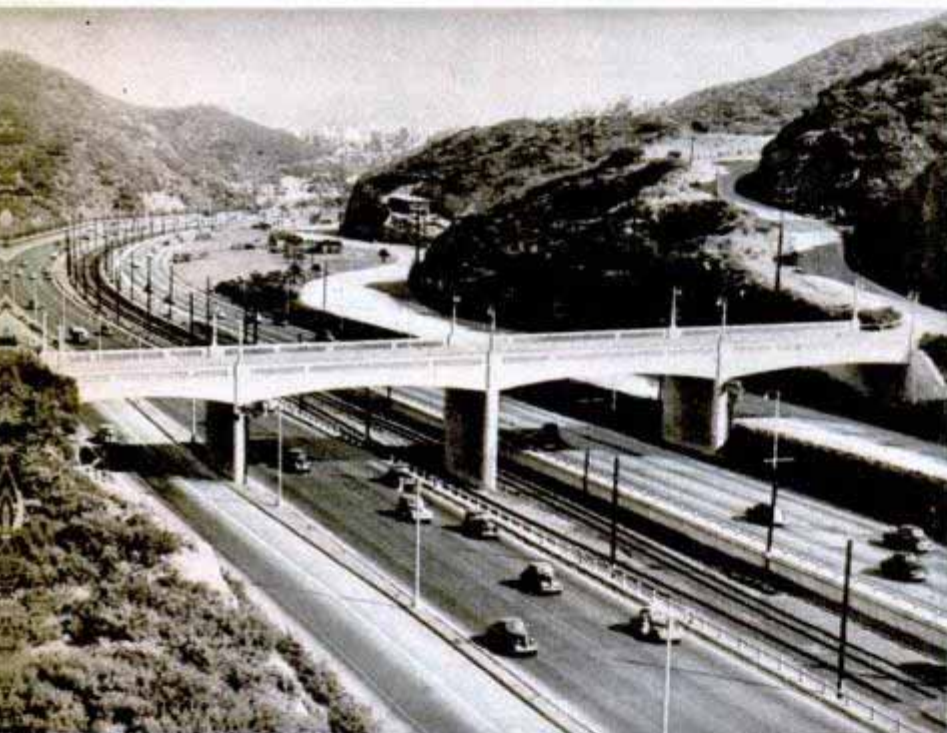




From movies to synthetic rubber (processing towers at top of opposite page) and from prefabricated houses and automobiles to vacuum cleaners, beach balls and sportswear—that's industrial L.A. in action



Engineer lifts model to show how future superhighways planned for city will pass through buildings; note ramps and parking levels. Below, multiple-lane highway from San Fernando Valley



Model of big trailer park under construction (below) and aerial view to the right tell the story of booming Los Angeles. All homes seen from air here were finished in last couple of years



streets, traffic signals and shopping centers. Kaiser Community Homes, as one example of mass building, is constructing thousands of houses on a factory production basis, virtually all of which are purchased while they are being assembled. The new owners move in the day after the painters and decorators finish their work. Vast tenementlike apartment houses are practically unknown in the West and the average family has its own backyard garden, often including a few orange, avocado or walnut trees.

Private residential and commercial construction in Los Angeles amounted to \$220,637,000 last year, far above the nongovernment building permits of any other American city. Even so, homes are still scarce. Apartments are practically impossible to find and hotel rooms are in such demand that the stay of each guest is limited.

The housing shortage will ease this year or next, it is expected, and meanwhile Los Angeles is fighting two other problems that have accompanied its expansion. Noted in the past for its clear skies, the area now is plagued by a "smog" condition of smoke and industrial gases during some parts of the year. A unique temperature inversion in the atmosphere plus the background of mountains literally converts the Los Angeles basin into a closed room during some seasons. Smoke and gases lie stagnant in the air instead of being dissipated by the wind. The large



synthetic rubber plants and other principal sources of irritating fumes now use filter traps in their stacks. "Smog detectives" are tracing the smog that still exists so that similar remedies may be applied where needed.

Metropolitan Los Angeles includes an area of about 1200 square miles that stretches from San Fernando to Long Beach and from Santa Monica to San Bernardino. The region grew up during the automobile age and never felt the need for mass rapid transit systems of the types required in densely settled portions of the East. Private cars plus good roads and a few interurban electric lines always were adequate.

Today the number of automobiles has increased to the point where streets and highways are clogged with traffic during rush hours. Some kind of rapid transit must be provided and the city is studying a number of ideas, including a proposed jet-propelled overhead monorail system that would serve all nearby communities.

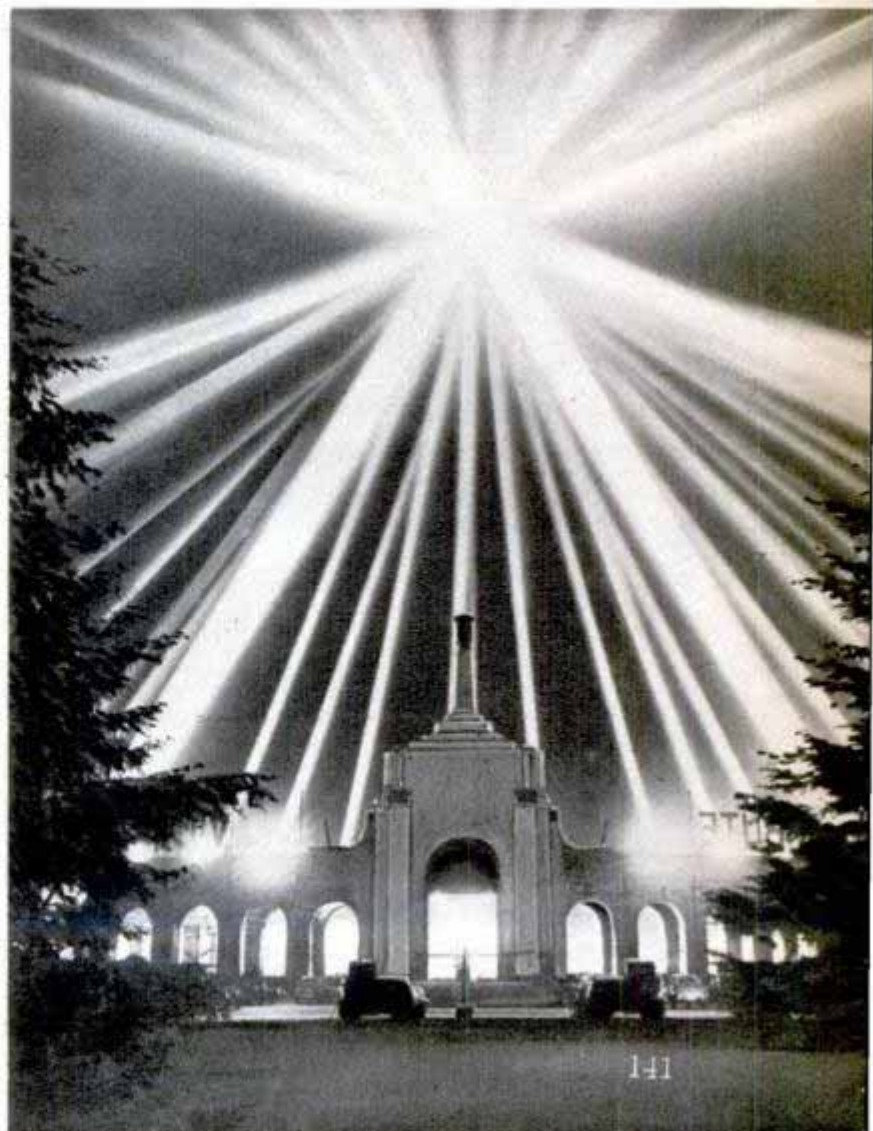
Most probable solution to the transportation problem appears to be large fleets of automotive buses that will operate over an expanded system of high-speed motorways. Construction of these has started. One freeway or parkway is being built from downtown Los Angeles through Hollywood and connecting to the San Fernando valley. The Santa Ana Freeway toward Orange County is under construction, as are portions of the Terminal Island Parkway.

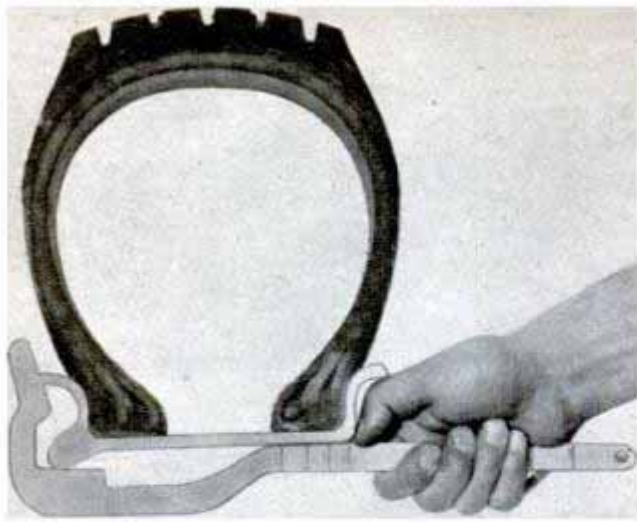
Within the next 12 years the city, county and state propose to build 247 miles of freeways within the area. This tremendous multibillion dollar project

(Continued to page 244)



Los Angeles' fishing port is America's greatest, and these giant sea bass prove there's sport here too. Below, searchlights at coliseum criss-cross the night sky





Rim Gauge "Sees Through" Tire

Rim size for most wheels can be measured with a gauge that makes it unnecessary to remove the tire and tube. The gauge is made of lightweight aluminum. Tires have to be removed only on dual wheels where the space band between rims doesn't permit insertion of the gauge.



Stepladder for Big Trucks

Mechanics are able to reach the engines in big trucks with ease by standing on a metal step which fits over either front wheel. The step clamps on tires of all sizes and can be adjusted to various heights.

Lightweight Unloading Platform

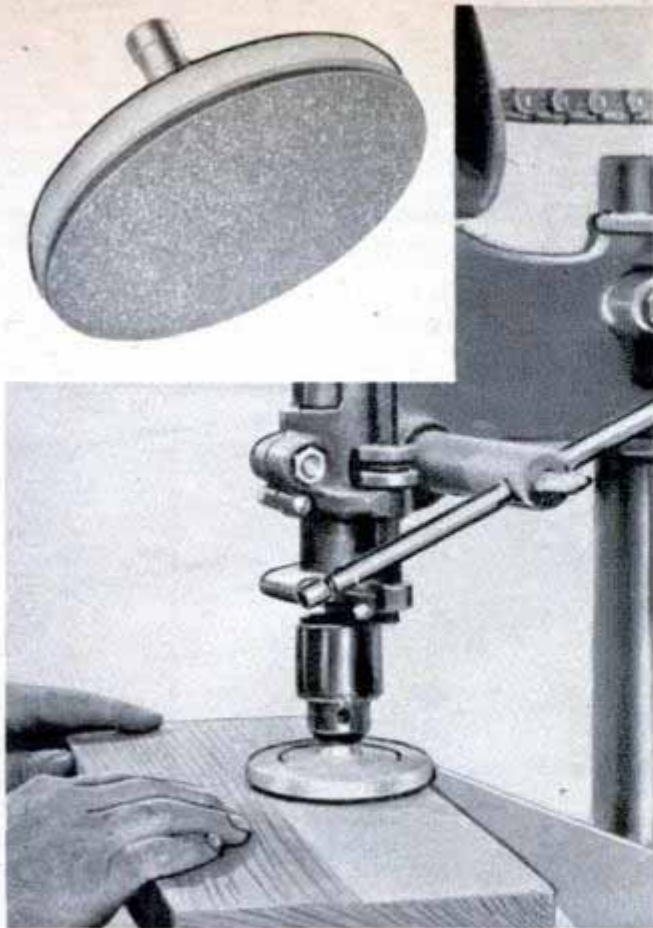
Magnesium-alloy dock boards, forming unloading "bridges" between freight cars and platforms, create no sparks and thus eliminate explosion and fire hazards. Lightweight and easy to handle, the magnesium dock boards are available in nonskid, raised pattern safety tread or smooth finish floor plate, in 527 sizes and shapes.



'Dual Control' on Dentist's Drill

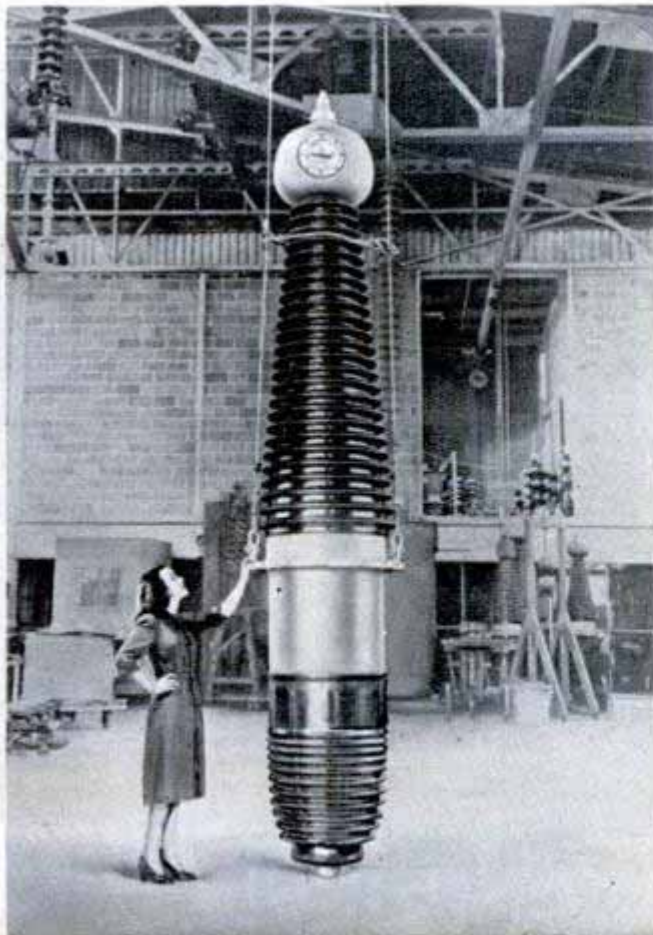
At last the patient with a dentist's drill in his mouth gets a break. A Pueblo, Colo., dentist has rigged up a control which the patient holds in his hand. If the going gets too rough he just presses the button and, regardless of the dentist, the drill stops. Its originator says just holding the control gives patients more assurance, though few actually use it.





ROTARY SANDER has a four-inch plate cushioned by a sponge-rubber pad $\frac{3}{8}$ inch thick. The steel arbor permits use in any chuck or collet of $\frac{1}{2}$ -inch capacity

GIANT "SPARK PLUG" installed in a power station which serves several communities insulates 230,000 volts of electricity. The insulator weighs more than 6000 pounds



EASY-TO-ERECT GARAGE designed in Sweden comes in six precut parts. The model shown here can be ready for the car 30 minutes after two men start to build it

TREE "MOWER" operates like a snowplow to cut 14-foot willow saplings off river land. With the machine one man can clear 20 acres of overgrown land in one day

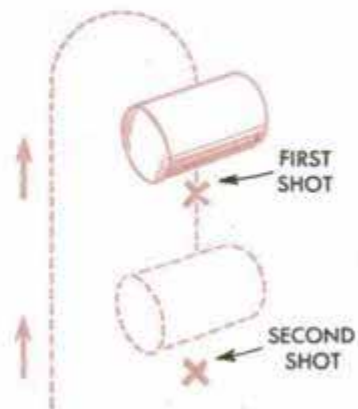
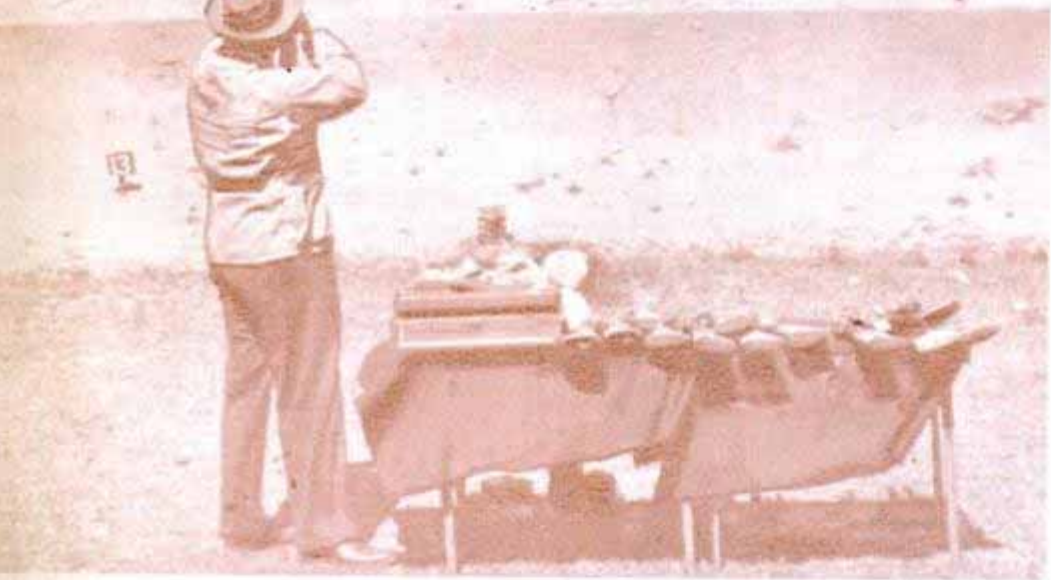


THEY CALL IT

Herb Parsons, who takes pot shots at flying targets, can "drill" the hole of a washer and shatter three eggs before they hit the ground. All it takes is plenty of practice, he says



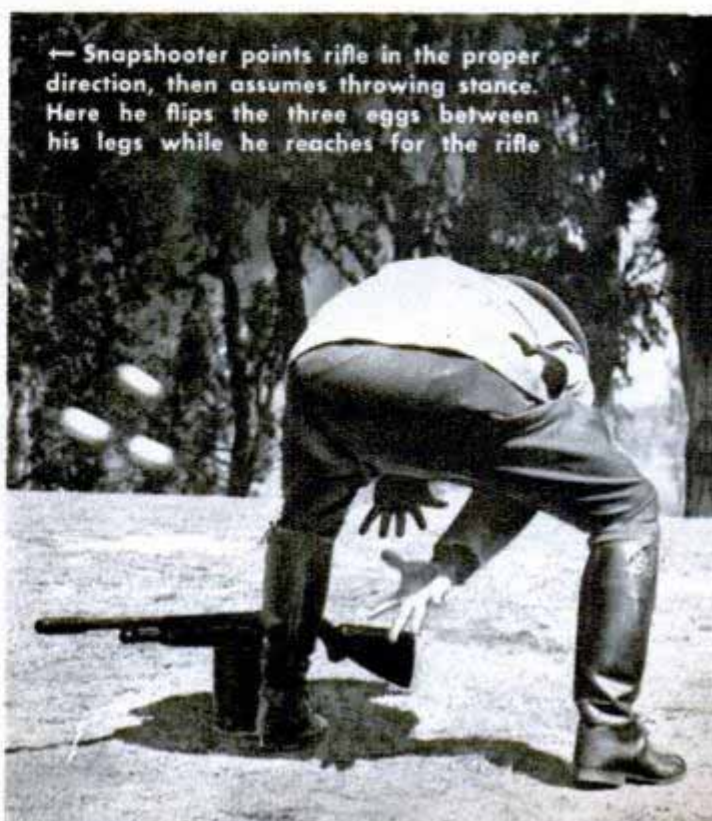
Hitting grapefruit with a high-velocity bullet is a spectacular stunt because target practically disintegrates in the air



TWO SHOTS AT A SINGLE TARGET



Two quick shots at bottom bottle, top one falls in line for second shot



← Snapshooter points rifle in the proper direction, then assumes throwing stance. Here he flips the three eggs between his legs while he reaches for the rifle

SNAPSHOOTING

MOST gun enthusiasts could perform spectacular shots at flying targets if they followed a few basic rules and put in lots of time practicing. That's the contention of Herb Parsons, ace exhibition shooter for Winchester-Western.

One of Parsons' stunts is to toss three marbles into the air and shatter them with three fast shots before they touch the ground. In another he pastes a stamp across the hole in a metal washer and shoots out the stamp after the washer is in the air. "Snapshooting" is what his split-second firing technique is called.

Years of practice are required for such shooting but Parsons says the rudiments are easy to master. A .22-caliber rifle is ideal for snapshooting. He warns that snapshooting never should be attempted in an inhabited area.

First, he says, the shooting must be done with both eyes open. Start with a quart tin can. Kick it out in front of you, then snap the rifle to your shoulder and squeeze the trigger instantly.

After you've mastered the ground firing, try hitting objects tossed into the air by someone else. The trick is to fire right under the target just after it has reached the peak of its trajectory, according to Parsons. Always hold low on falling targets, as most missed shots are too high.

Two shots can be put into the same target by shooting below it once and then dropping the sights for the second shot. In firing at two targets in the air, always fire



Parsons instructs one of his pupils where to aim—just below target after it passes the peak of its trajectory

at the lower one first. Small blocks of wood make good practice targets. Tomatoes, apples and oranges also are good for stunt shooting as they practically disintegrate when hit while they are in the air.

Speed in snapshooting comes with practice but accuracy is most important. Actually a tossed target stays in the air a long time, as Parsons frequently demonstrates. He throws an egg over his shoulder, stoops down to pick up an empty shotgun, loads one shell and hits the egg before it touches the ground. In another egg-and-shotgun trick he tosses three eggs into the air from between his legs, picks up a shotgun, whirls around and fires three shots, smashing all three eggs while they're still in the air.

← One second gone! He drops to knee and picks up shotgun. Below, he shatters egg nearest ground before hitting the other targets





300-FOOT CRANE

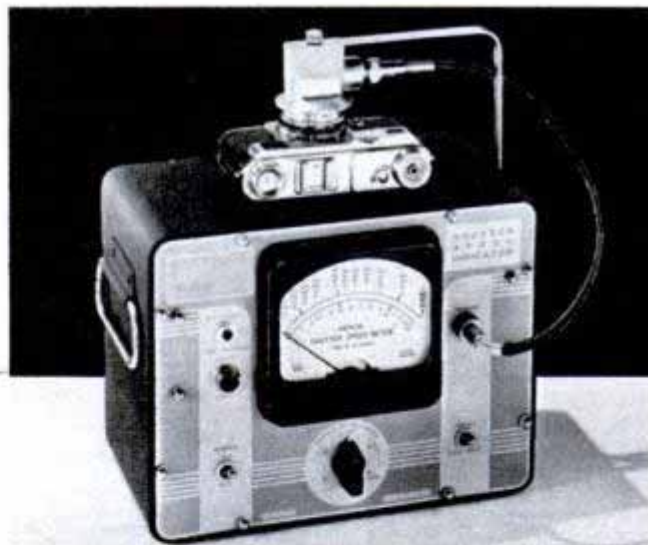
Thirty-ton loads of steel are removed from barges in one "bite" by a 300-foot crane shown reaching out from the Mississippi River shore near Vicksburg. The crane was built by R. G. LeTourneau, Inc.,

manufacturer of earth-moving machinery, to unload barges stranded in the river by low water. Thirty tons can be lifted to a height of 150 feet, as high as a fifteen-story building. The crane, which makes snappy work of unloading the barges, is mounted on four wheels eight feet in diameter.



Ventilated Lawn Umbrella

Sun rays are kept out but cool breezes circulate through the alternating aluminum layers of a colorful umbrella designed for lawn or beach use. Air spaces are provided in the eight-foot-wide umbrella between two layers of aluminum strips. It is easy to set up and adjust and is available in a variety of color combinations.



Shutter-Speed Tester

Camera shutter speeds from $\frac{1}{2500}$ second up to $1\frac{1}{2}$ seconds can be tested accurately with a photocell meter now available. The camera shutter is placed between the photocell and an adjustable light source in the meter. When the shutter is tripped, the meter indicates the length of time it remains open. The device is particularly useful to color photographers who must have accurately controlled exposures for good color definition.



Vacuum Still Vaporizes Glass

Solids and liquids never before vaporized are "distilled" in a powerful molecular still developed for petroleum research. By creating a near perfect vacuum, the still evaporates materials into hundreds of parts according to the size of their molecules. Oils, greases and waxes divide into several hundred parts which are analyzed for viscosity, stability and change with temperature. So powerful is the process that in time the glass walls of the still itself are evaporated. Distillation of solids less volatile than grease or wax takes so long, however, that study of their "distilled" parts is impractical. The complex still, built around a five-foot glass tower, was developed by the Gulf Oil Corporation.



Germ-Killing Lamp Creates Ozone

Room air is purified by a lamp which combines an ultraviolet-ray tube with an electric sanitizing unit to kill airborne germs and create ozone, free from harmful irritating substances. The lamp is used in offices, restaurants, factories and laboratories. In animal hospital tests, the lamp lowered mortality by keeping the air sterile.

Giant Tank Shipped by Flatcar

With a capacity of 50,000 gallons, a storage tank 52 feet long and 12½ feet in diameter recently was shipped by rail to the B. F. Goodrich Company. The giant tank was interlined with 1½ tons of rubber and will be used to store muriatic acid. It is near the maximum size that can be shipped on a flatcar.

¶Ninety-eight percent of all common plastic objects can be mended or joined with a welding compound that dissolves the surface material. It can be used with all thermoplastics, including Lucite, Plexiglas and Celluloid. The compound dries and disappears completely, leaving the pieces joined as a single unit.



FLYING FISH...

At Home Anywhere



Republic Aviation photo

YOU FIND the versatile seaplane every-

where now, from river bases a stone's throw from Wall Street to lakes and streams in the Canadian wilds. The float-equipped plane is fast proving it can do almost everything a landplane does, even to alighting on hard-surface runways—as well as a few things the more conventional landbound species can't do.

Take the case of the shiny all-metal Lus-

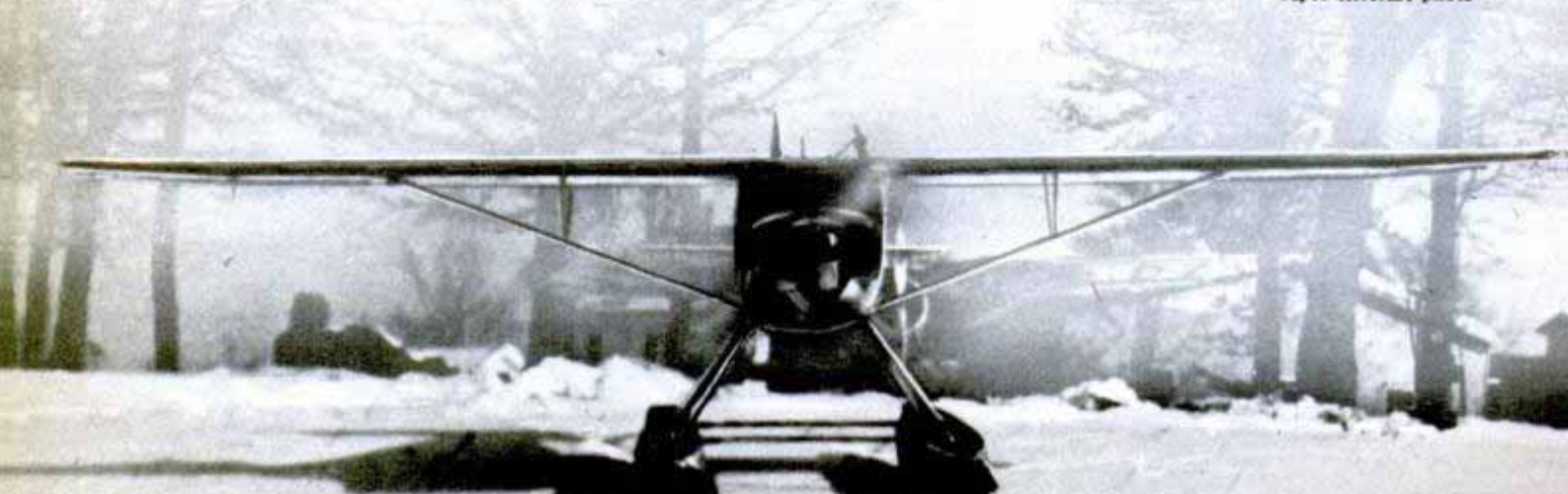
By William Winter

combe perched on the bait box of the tuna clipper, Liberator, operating off southern California. In the best naval air tradition, the "eye of the boat" is lowered over the side by the net boom and pilot George McKusick takes off to patrol for schools of fish.

This system works so well that the Liberator gets her full catch of fish in fewer days than formerly, and can make more trips than "old-fashioned" clippers without

When winter comes the light floatplane operates on snow or ice. Take-offs are even made from dampened grass

Piper Aircraft photo





Edo Aircraft photo

Big cities, with their convenient river-front seaplane bases, aren't unusual backdrops for floatplane travel

such a lofty crow's-nest. When McKusick comes in from his patrol, a boom whisks George, Luscombe and all back to the bait box, where the plane sits like a gigantic kingfisher.

Flying a seaplane, you find yourself surprised at the many possible landing places. The plane is by no means limited to seacoasts or big lakes and rivers. When hunters and fishermen staged an aerial blitz on the Maine lakes, the Inland Fisheries and Game Department was forced to fight fire with fire; now the game warden rides the range in a Piper plane. During one patrol, six trappers were apprehended in northern Maine. On skis in winter and floats in summer these ships have been ideal for "airportless" flying.

Besides regular patrol, the planes check game population and the condition of the deer herds. When deep snows prevent the deer from finding food, it is

dropped to them. In the spring, the planes stock streams and lakes with fish.

During Maine's hunting season you can take a train to Masardis and then drive 10 miles to Oxbow, Milton B. Hall's headquarters for the Bradford Recreation Camps.

Lack of airport facilities didn't stop these flying Nimrods from bagging birds a few hours from home





Hall operates a string of camps in the deep woods of the headwaters of the Aroostook. There you take your choice—either a two-day canoe trip to get started, or a 40-minute seaplane ride. Once at the outlying camps you are 36 miles from the nearest settlement. All necessary supplies are ferried in by plane.

Proof that some old airplanes never die is furnished by the Alaska Coastal Airlines. The company operates 12 sturdy floatplanes of nostalgic vintage. There are several Lockheed Vegas—a mighty slick airplane in the '20s—old Curtiss Kingbirds, Bellancas and

a Fairchild Pilgrim. In the maze of islands between Juneau and Ketchikan these rugged old seaplanes are the only dependable means of transportation. They even carry dog teams!

The famous Alaskan bush pilots land seaplanes on water, mud flats and even grass fields. There is a regular routine of change each season from wheels to skis to floats. One pilot landed at Nome after a trip on skis to Kotzebue in a 1926 Bellanca. The sea ice was covered with surface water so he flew over to a nearby strip of cleared land and put on wheels. However, quick changes like this are the exception rather than the rule.

The seaplane is as much at home in the heart of a city as it is in the Alaskan backwoods. Albert Buck started out with one seaplane in the center of Pittsburgh. His first customers were office workers who



A popular trail for float enthusiasts is the Inland Waterway, top, stretching down the coast to Florida. Above, "curb service" for guests arriving at island hotel. Below, fishing in luxury from the ship's nose

Republic Aviation photo



watched his take-offs and landings from their windows. Soon Buck was doing a yearly gross of \$80,000 and in five years of flying had no accidents. Even when snows stop all other flying for weeks at a time at western Pennsylvania airports, Buck's seaplanes buzz up and down the river.

So many seaplane bases are strung along the meandering Hackensack River, just across the Hudson from New York, that the place is called "Edo Meadow" after the manufacturer of virtually all the floats in the country. At the foot of Webster Street on the Oakland Estuary, Howard Norton, an ex-Navy pilot, recently started a service, and there is another on New York's East River. Such close-in bases are not a novelty. You can find them across the nation from the Wall Street Downtown Skyport in New York, where businessmen come and go in their expensive Grumman amphibians, to Gard Safley's base at Jantzen Beach, Portland, Ore.

A big reason for the popularity of seaplane flying is that Nature sup-



Edo Aircraft photo

Attaching small boat to the pontoons for a fishing week end. It is always a good idea to check the floats before take-off to be sure they are watertight



On this trip the Seabee carried four hunters, guns, ammunition, decoys, oars, a rubber boat and a portable shooting blind. Below, making a jet-assisted take-off from dry land in a float-equipped Cessna. The condition of the ground made it necessary to put an airplane dolly beneath the floats





En route to a town eight miles from water, an ingenious pilot buckled on a motorcycle to ride the last lap

plies the landing fields. Sometimes she even supplies magnificent airways, such as the Inland Waterway that runs down the coast to Florida.

Facilities may consist of a landing dock on empty fifty-gallon oil drums that rise and fall with the tide, or the elaborate Orlando Aviation Country Club in Florida, complete with restaurant, tourist's cabins and featuring speedboating, hunting, fishing, water skiing and dancing. Biggest item in an operator's overhead is the pontoons themselves, costing about \$1000 for the average lightplane.

The question of "how do we get to town" was well answered by the General Oglethorpe Hotel on Wilmington Island, Ga., where you can tie the plane to a dock in the front yard and have your bags carried in just as if you had come by car. Guests have been known to fly into the center of Savannah, landing on the river close to the city hall.

Recently, Minden, La., was set agog by a trim little seaplane that landed on Caney Lake six miles from town. It wasn't the seaplane that caused the excitement, but the motorcycle strapped to the port float. The pilot unstrapped his mechanical steed and sprinted into town for lunch, conducted his business and was away within two hours.

At a seaplane base at Ossining, on the Hudson, the operator makes a habit of taking off and landing on the ice. If anything, take-offs are quicker. Since floats lack shock absorbers, the tech-

nique is to use a power landing, which eases the plane down, rather than a three-pointer which can be jolting. Last winter a Cub was used several times as an ice-breaker. This operation must be done with care for thin ice cuts like a knife.

One of the best air show acts in the country is put on regularly by George Lambros and Walter Kulik. The "script" calls for Lambros to shut off the engine when the plane gets over the field. Then Kulik climbs out on the float and inches his way forward

(Continued to page 248)

Just behind the iceboat is a seaplane taking off at an Ossining, N. Y., base
Piper Aircraft photo



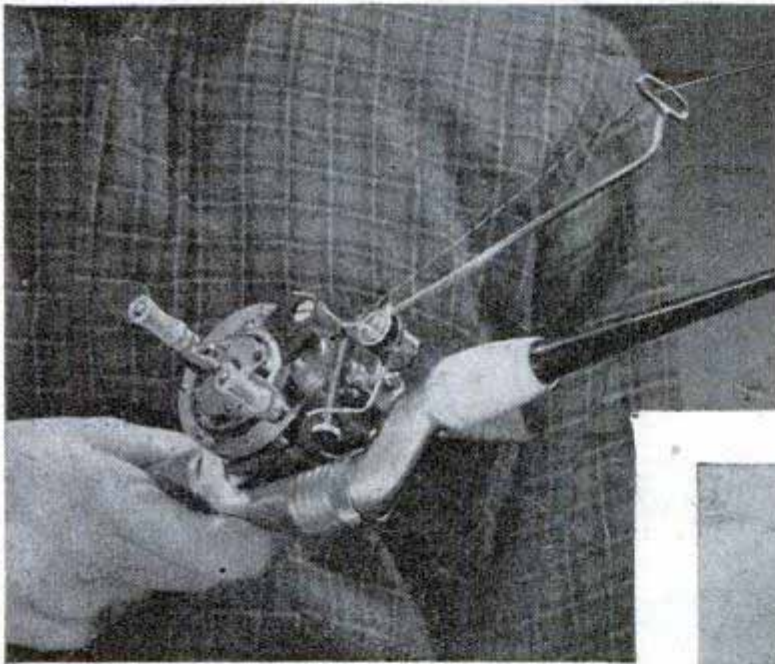
Fishing Rod Holder Leaves Hands Free

Either a rod and reel or a cane pole can be supported by a rustproof holder that leaves the angler's hands free to operate the boat. The upper half of the holder swivels in any direction to keep the line free when a fish strikes. To place the rod in the holder it merely is passed over one section of a heavy wire and under another. This leaves the handle free at all times. If the tip of the rod is too low the holder can be adjusted by bending it near the rod handle. The holder clamps to the seat of the boat.



Brake for Fishing Reels

Backlash and snarled fishing lines are prevented by a brake which fits detachable type reels. If the reel overruns and creates slack, the brake automatically sets with no thumb action necessary. The brake is a combination of a drum fastened to the reel handle and an attachment clamped to the rod. It has a line-guide arm and a brake shoe.



Rubber Boat Fender

Boat hulls are protected from bumping against docks by a synthetic rubber cushion filled with air at five pounds pressure. In addition to guarding the hull, the white float can be used as a buoy or emergency lifesaver. It is available in 12, 16 and 20-inch lengths.

Tire Powder Eliminates Static Electricity In Radios of Cars and Trucks

Automotive engineers have discovered how to prevent tires from generating static electricity which causes squeals and sputterings in car and truck radios. A black powder, injected into inner tubes, collects the static electricity and dissipates it.



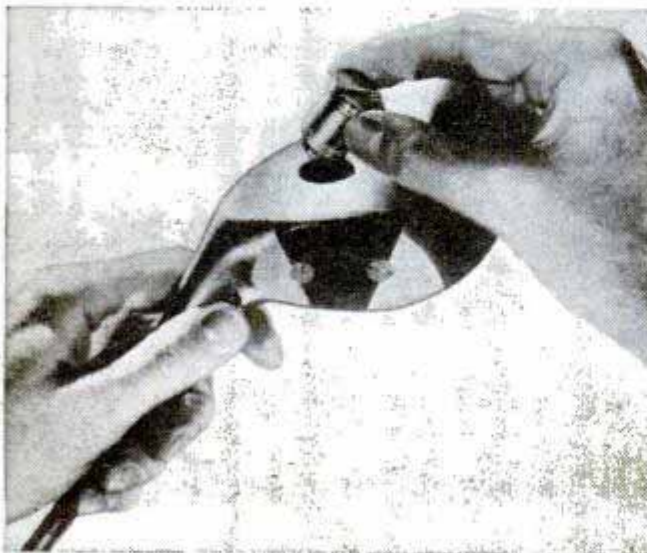


Rumble Seat on Basket Holds Child in Grocery

Rumble seats for babies have been added to wheel-mounted shopping baskets in a Pueblo, Colo., grocery store. The manager said he got tired of asking shoppers to keep their youngsters off the baskets, so he designed a safe, comfortable seat.

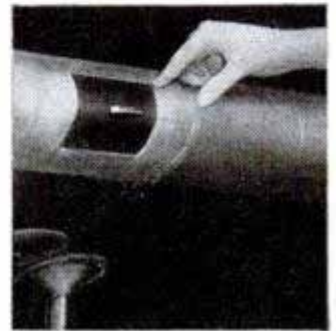
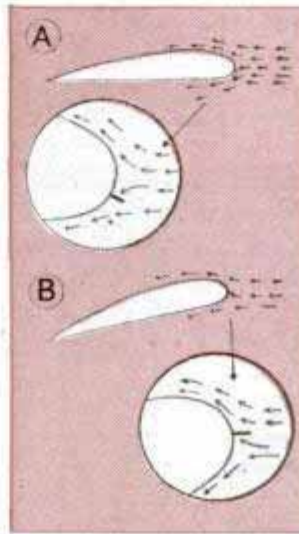
Plug Balances Aluminum "Wood"

Weight and balance of a new aluminum-headed golf club are regulated by a removable plug to suit the player. The plug is unscrewed and weights are added or taken away. Sets of four matching "woods" are made, with a fiber insert on the face to prevent any metallic sound when a ball is hit. Shafts are made of chrome molybdenum steel.

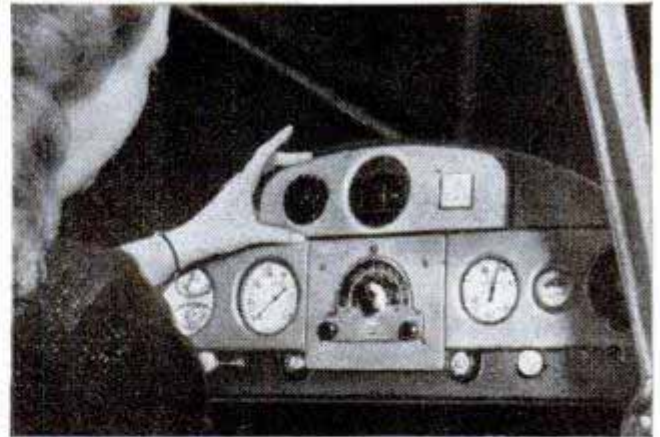


Stall Warning Indicator

Airplane stalls—the cause of most light-plane crashes—may be prevented with a warning indicator on the wings. When the plane speed drops to a critical point, the indicator flashes a red light and blows a horn to warn the pilot. It consists of a small metal tab mounted in the leading edge of a wing and an electric circuit to the cabin instrument panel. Its operation is based on the aerodynamic fact that part of the air passes above a wing and the rest below it. The indicator's metal tab is located so that in normal flight the air flow keeps the circuit open. But as the plane approaches a stall, the air flow moves down on the leading edge of the wing and causes the metal tab to flip up. This closes the circuit,



Drawing A shows wing in normal flight with vane held down by rush of air. In B, nearing a stall, air flow pushes vane up and actuates warning device



causing the horn to blow and the red light to flash. The indicator was developed by the CAA and Dr. Leonard M. Green of New York City.

Ethyl Alcohol From Whey

Ethyl alcohol is made from milk sugar in whey by a process developed by the U. S. Department of Agriculture. The alcohol can be made as a by-product of cheese or casein manufacture by using steam to concentrate the alcohol. The remaining whey protein serves as cattle feed.

AMMUNITION for the WAR ON DISEASE

By JOHN R. KINSEY

WAR AGAINST HUMANS is over. Now, war is directed against germs and disease to keep humans alive. The demand for such drugs as streptomycin and penicillin grows greater as new curative powers are discovered. Doctors, hospitals and patients cry for more and more medicine.

And they get it.

America's drug manufacturers are accustomed to going into action fast to produce tons of some newly discovered germ killer.

A year ago, streptomycin production was less than two pounds per day. Now, 1100 pounds of the white powdery stuff are produced every month. Penicillin output has climbed to 2500 billion units (nearly



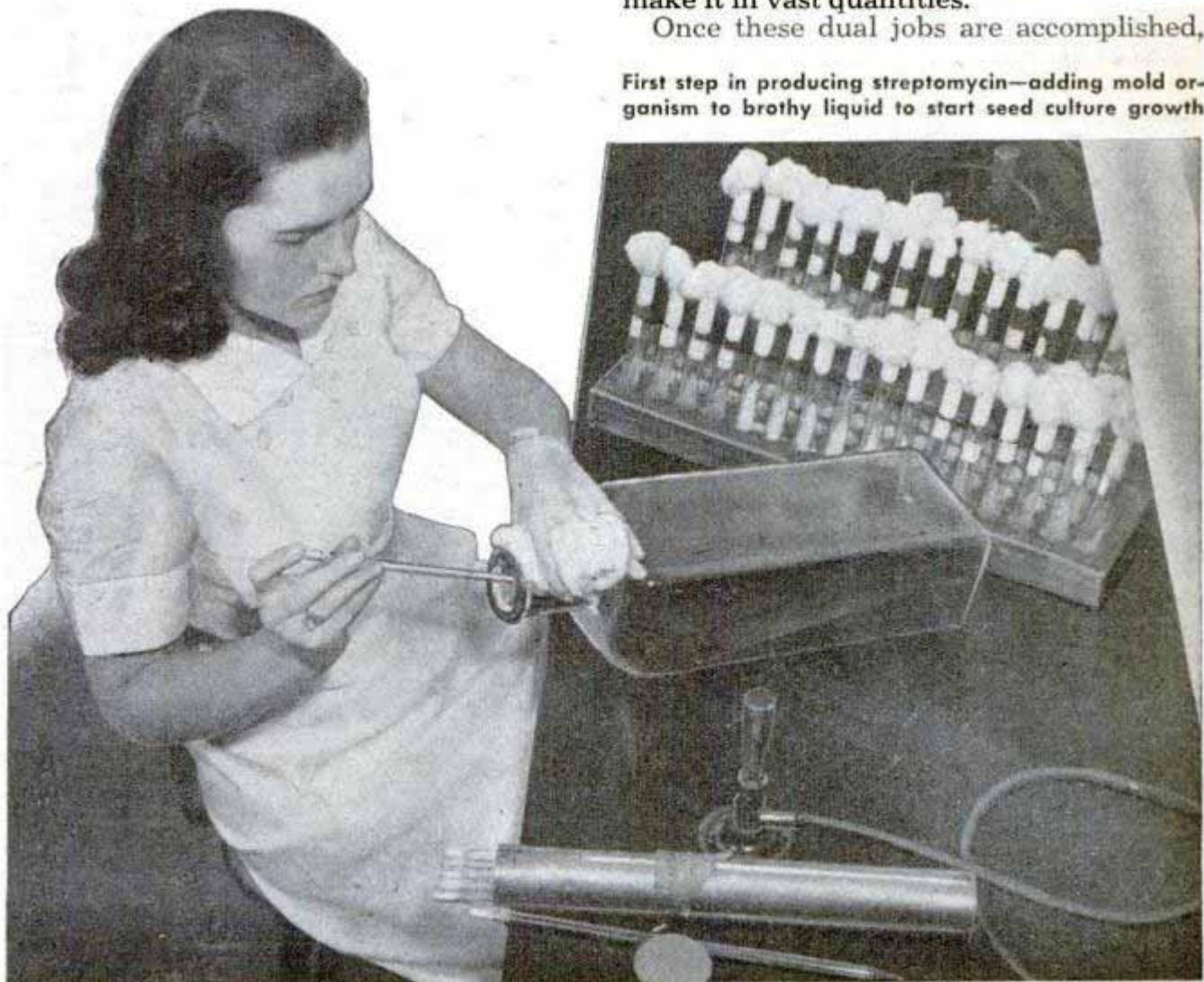
Medical "war map" is photomicrograph of organism that produces streptomycin. Note beadlike spores

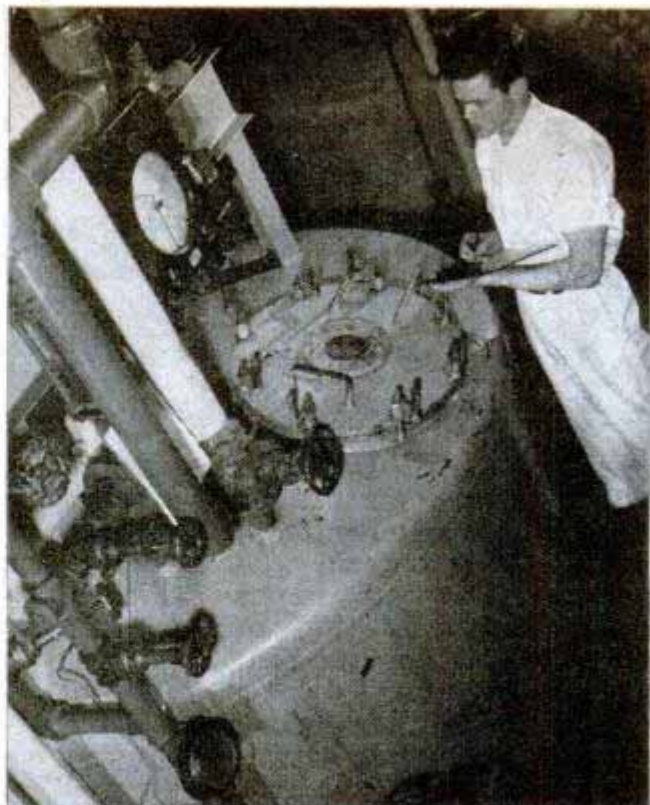
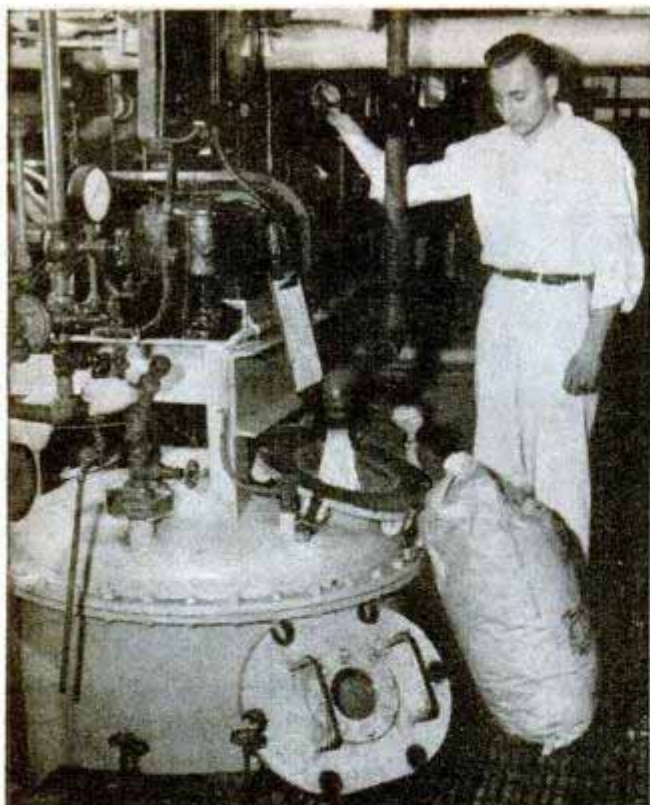
3300 pounds) per month, or enough to treat about 2,500,000 patients.

When a new drug is discovered, research men experiment in pharmaceutical laboratories until they learn how the medicine can be produced. Then engineers design and set up the machinery and equipment to make it in vast quantities.

Once these dual jobs are accomplished,

First step in producing streptomycin—adding mold organism to brothy liquid to start seed culture growth





Photos by John C. Michalek, Abbott Laboratories

Seed culture grown in bottles, poured into 300-gallon tanks, produces large quantities of streptomycin seed

the new medicine pours out—pure and powerful—from an assembly line which is almost entirely automatic. Machines make the medicine, bottle it, cap and label the bottles and put them in cartons. About the only nonautomatic jobs are constant tests by chemists to safeguard purity, proper mixtures and exact quantities going into bottles, capsules and tablets.

Testing streptomycin for toxicity, potency and purity



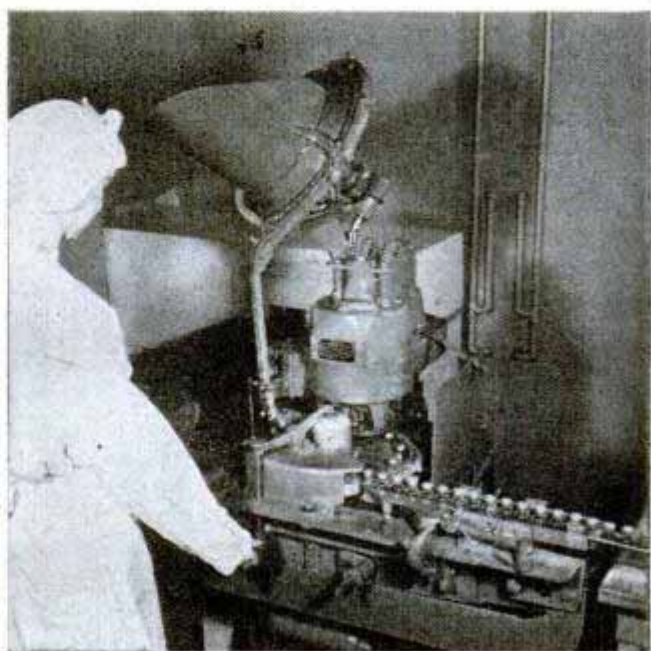
Fermentation is next step. From a 5000-gallon tank of broth three pounds of streptomycin are extracted

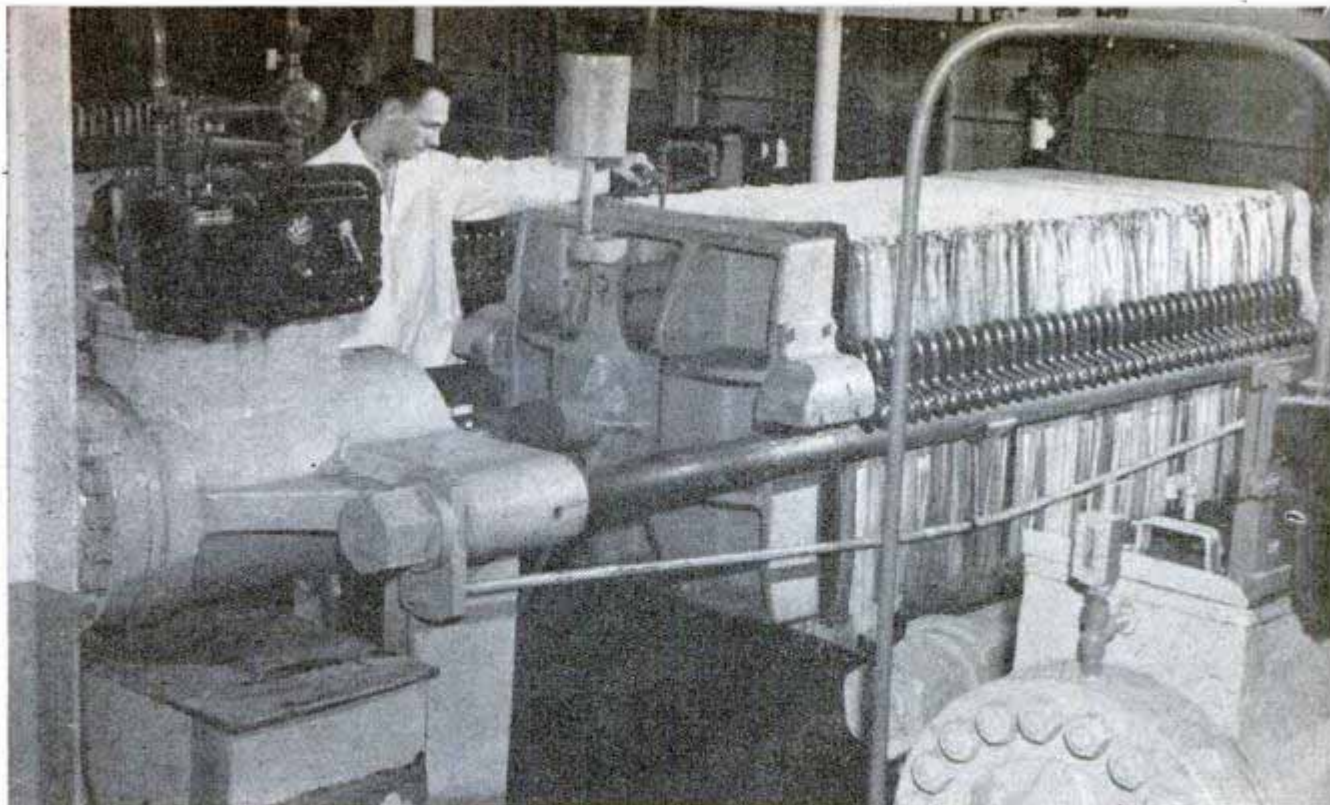
At Abbott Laboratories in North Chicago, Ill., production of streptomycin is mainly a matter of turning valves to send soupy liquids swishing through pipes and into fermentation tanks, then through filters and stills to drying machines.

They start with less than a thimbleful of mold organism taken from the soil, and end up with 5000 gallons of "soup" which is converted into about three pounds of pure streptomycin. Penicillin is produced in much the same manner.

The effectiveness of penicillin against numerous diseases has been widely pub-

Machine applies tamperproof seals to bottles of drug





Filter presses remove vegetative cells and concentrate liquid material which contains the drug, streptomycin

licized. Streptomycin, still being tested clinically, has proved effective against septicemia (a blood infection), tularemia (rabbit fever), influenzal meningitis, infections of the urinary tract, peritonitis and some types of tuberculosis.

Like streptomycin, vitamin capsules are made by robotlike machines, one turning out 700,000 capsules per day. Here's how it works: Gelatin material is formed into a continuous strip which is cut automatically into 10-inch squares. An operator places the lower half of a square on the lower plate of a capsule mold. Then vacuum is

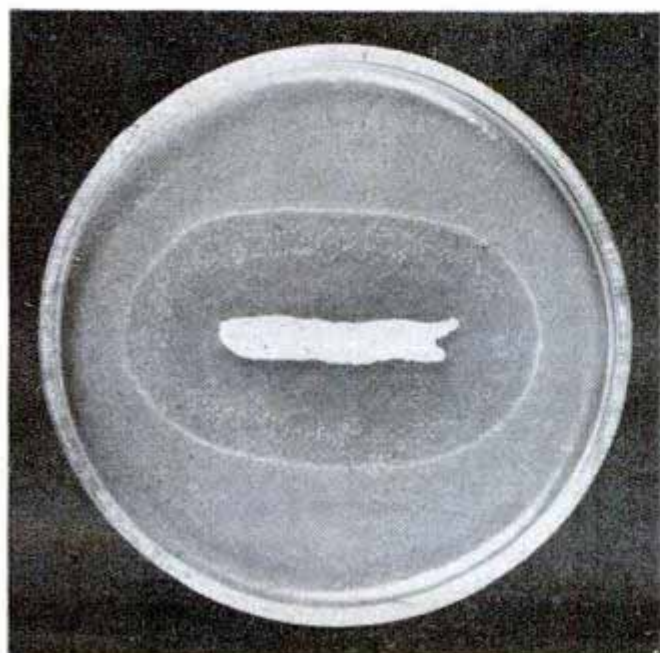
applied to pull the gelatin down into the cavities of the mold.

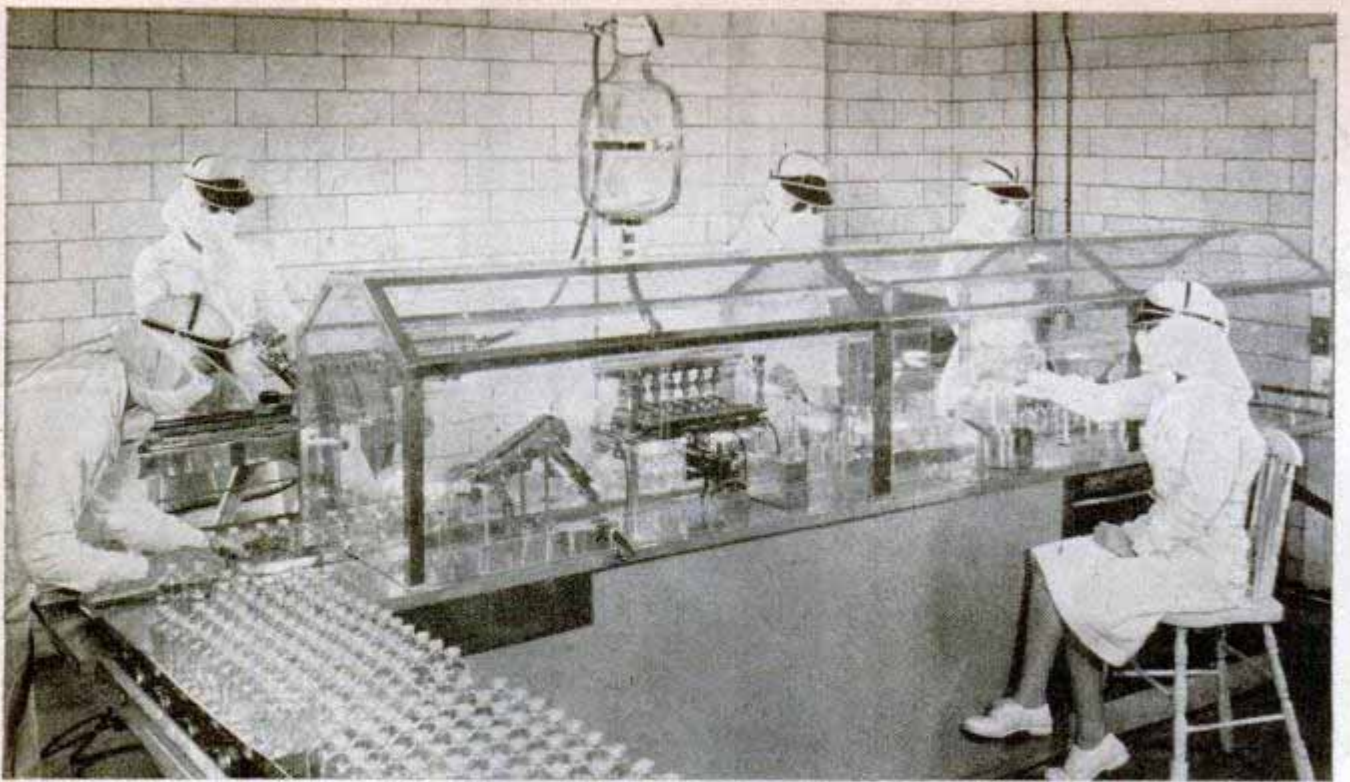
Next, a row of nozzles squirt the vitamin material into the gelatin-lined holes. The top half of the gelatin square then is folded over the vitamin-filled holes, followed by the top plate of the mold. Then the entire mold is put in a hydraulic press.

Pressure is applied and vitamin capsules

Streptomycin (white area) widens the circle of its attack against bacteria that cause urinary infections

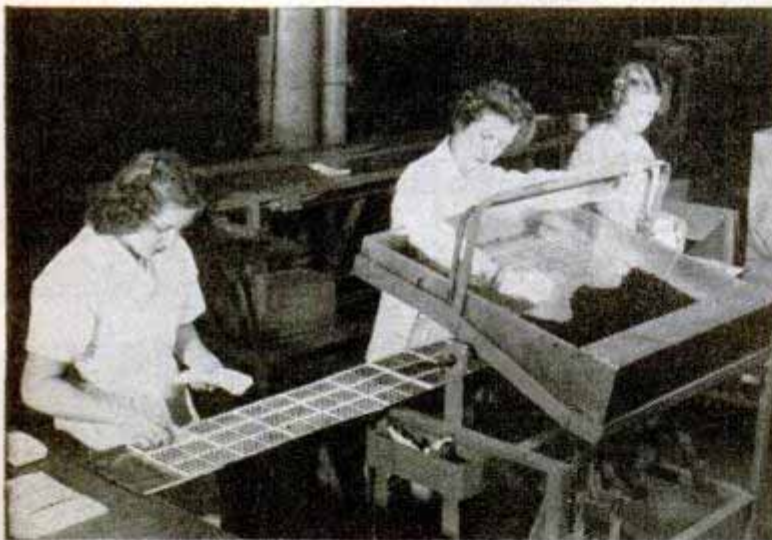
White, powdery streptomycin is dissolved in a special solution and injected into a patient's muscles or veins



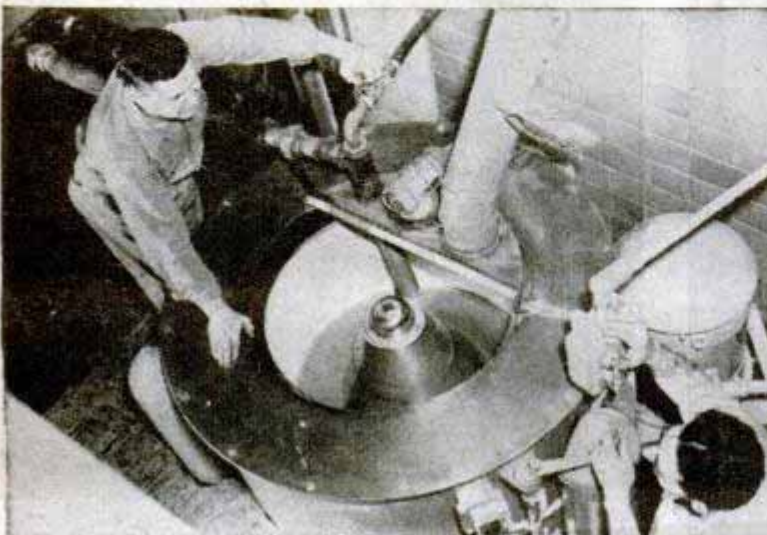


Courtesy of Frederick Stearns & Co.

Moving bottles are constantly subjected to germ-killing ultra-violet rays in a medicine filling machine shielded by Plexiglas



In filling vitamin capsule boxes, girl tilts frame toward her and capsules roll into place. Below, machine spins Tridione, a drug for treatment of epilepsy, to separate crystals from liquid

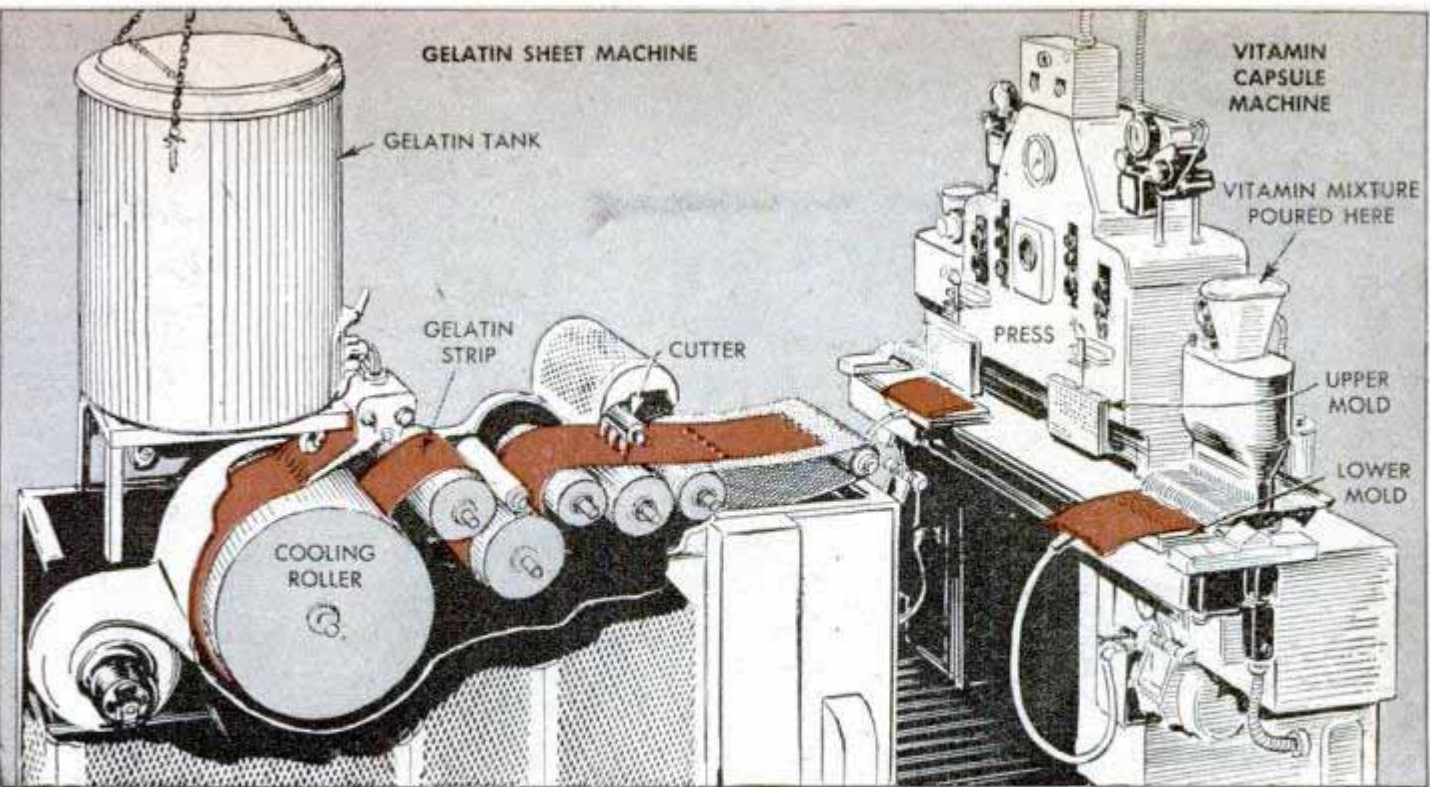


roll out. Still warm and pliable, they are placed on drying trays where they remain for two days to dry and harden. After being inspected for size and shape, they are washed in a liquid solvent, dried and packaged. Frequent tests are made for purity and vitamin content, and samples are set aside for periodic stability tests.

Packaging operations, likewise, are almost completely automatic. One box-filling machine operates something like a teeterboard. Vitamin capsules are deposited in one end of the frame. At the other end are placed open vitamin boxes containing small compartments for the capsules. When the operator tilts the frame, the capsules roll into the niches in the boxes.

Making tablets is another nearly automatic operation. The drug is mixed with the tablet "body," consisting of starch, sugar and other materials. After being moistened, the mixture goes into an extruding machine which produces future tablets in spaghetti-like form. These sprouts break into lumps which are dried until they become powdery.

The powder is shoveled into a tablet machine equipped with punches and dies. As the powder falls into holes in the dies, punches press down and compress the material into tablets. The tablets are whirled around in another machine to remove excess powder,



Gelatin sheet machine produces the coating for vitamin capsules. Machine at right forms the finished capsules

and then they're ready to be packaged, shipped—and taken with a glass of water.

These and other drug manufacturing and packaging processes are the result of years of experiments. Almost every day, an improvement is developed. Sometimes, two steps are combined by a new machine.

In the case of Tridione (medicine for treating epilepsy), five production steps were combined into two. Output of the white powdery medicine was boosted from 20 to 300 pounds per day. This means that more people suffering from petit mal (mild form) epilepsy are able to get relief.

While still in the development stage, Tridione had one objectionable characteristic. It smelled bad. Various substances were mixed with it, but the odor persisted.

One day a salesman for a flavor manufacturing firm called on Abbott Laboratories and left a sample of a new synthetic coconut flavor—a product he had been unable to sell to anyone. The chemist in charge of producing Tridione—having tried just about everything—poured a few drops of the coconut flavoring into a batch of the medicine. Immediately, the objectionable odor vanished.

The raw materials for pharmaceutical products come from near and far, from trees, from the ocean bottoms. Honey for cough syrup from middle western farms. Herbs from India for hay fever medicine. Sheep glands for hormone products. Ergot (from Russia and Spain) for obstetrical medicine. Fish oils and liver extracts for vitamins.

Even curare, the detective story poison,

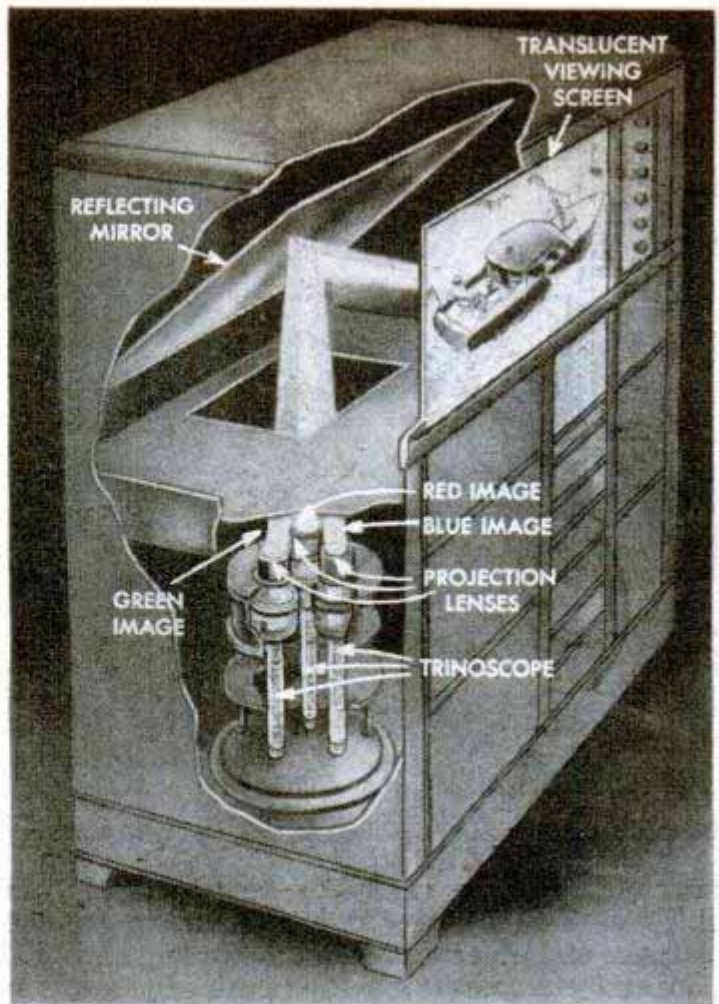
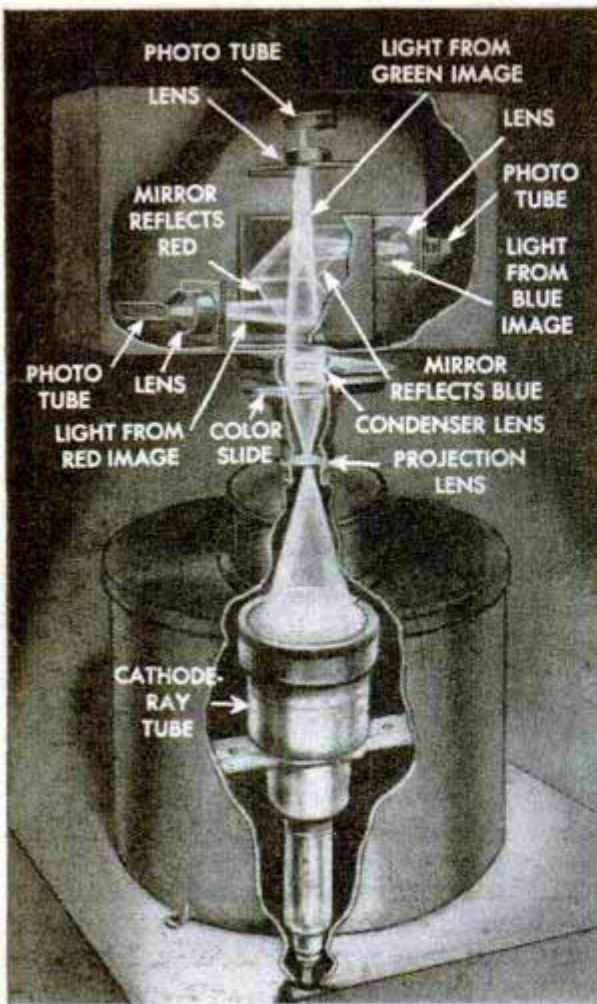
is used. Pure curare, administered in safely minute concentrations, relaxes a patient for surgery. Curare—a plant secretion—is obtained from South American Indians. However, they add other things which multiply the chemical processes required to extract pure curare.

As Dr. D. L. Tabern, Abbott chemist, explains: "The native is no expert botanist.

(Continued to page 224)

Pouring vitamin mixture into capsule machine. Nozzles deposit exact amount for each capsule in mold cavities





† Inside television camera a light beam from cathode-ray tube is projected through Kodachrome and split into three colors. Radio signals are sent for each color. Receiver at right projects three colors on screen at once

Color television developed by RCA uses electronic instruments instead of rotating disks to produce full colors on a viewing screen. A new color-television camera used in demonstrations photographs colored slides and transmits the pictures to the receiver. The camera splits the light image into three color components—red, blue and green—

Electronic Color Television

and transmits radio signals for each of the three images.

The receiver picks up the three transmissions, changes them back into three light images and projects them on the screen together to reproduce the full-color picture. The electronic system is said to produce pictures that are free from any flicker, color fringes or break-up of color.



Cross-Striped Tire Grips Road

Cross-stripe inserts of soft white rubber give better braking action to a new type automobile tire. The inserts are placed crosswise in the tread, creating hundreds of independently acting tread blocks which are exceptionally pliable and grip the road to bring the car to a quick stop.

Infrared Detects Painting Forgeries

Infrared photographs often aid in detecting forgeries or proving the authenticity of paintings. This is done in two ways: (1) By bringing to light the original signature, covered over in forgeries, or (2) by revealing paint layers beneath the visible surface. The first free strokes used by famous artists in starting a painting display characteristics which are known to expert critics.



LUGGAGE



FLUORESCENT LIGHTING

The CRAFTSMAN

★ Top feature this month, page 186, is a practical article on refrigerator maintenance: what you can do yourself and what you ought to have done either to keep the old box going a while longer or to maintain the new one at peak efficiency. It'll look a lot simpler after you go over this story.

★ Lighting up fluorescents will get a spark of interest from nearly every homeowner these days. And if it's building the fixtures that stumps you, you'll find this angle pretty well covered in an article beginning on page 170.

★ It's no trick at all to put in a good concrete walk from the house to the street or from the back door to the garage if you know how to go about it. The story giving the details begins on page 208. Figure the money you'll save on just a few feet of walk.

★ And, incidentally, did you ever think about building a suitcase for your own use? Well, it's been done, and a feature on page 162 tells how.



CONCRETE WALKS



REFRIGERATOR MAINTENANCE



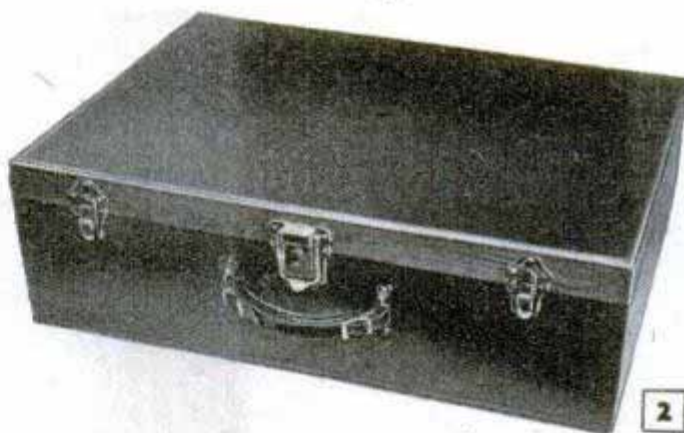
LUGGAGE

from your own shop

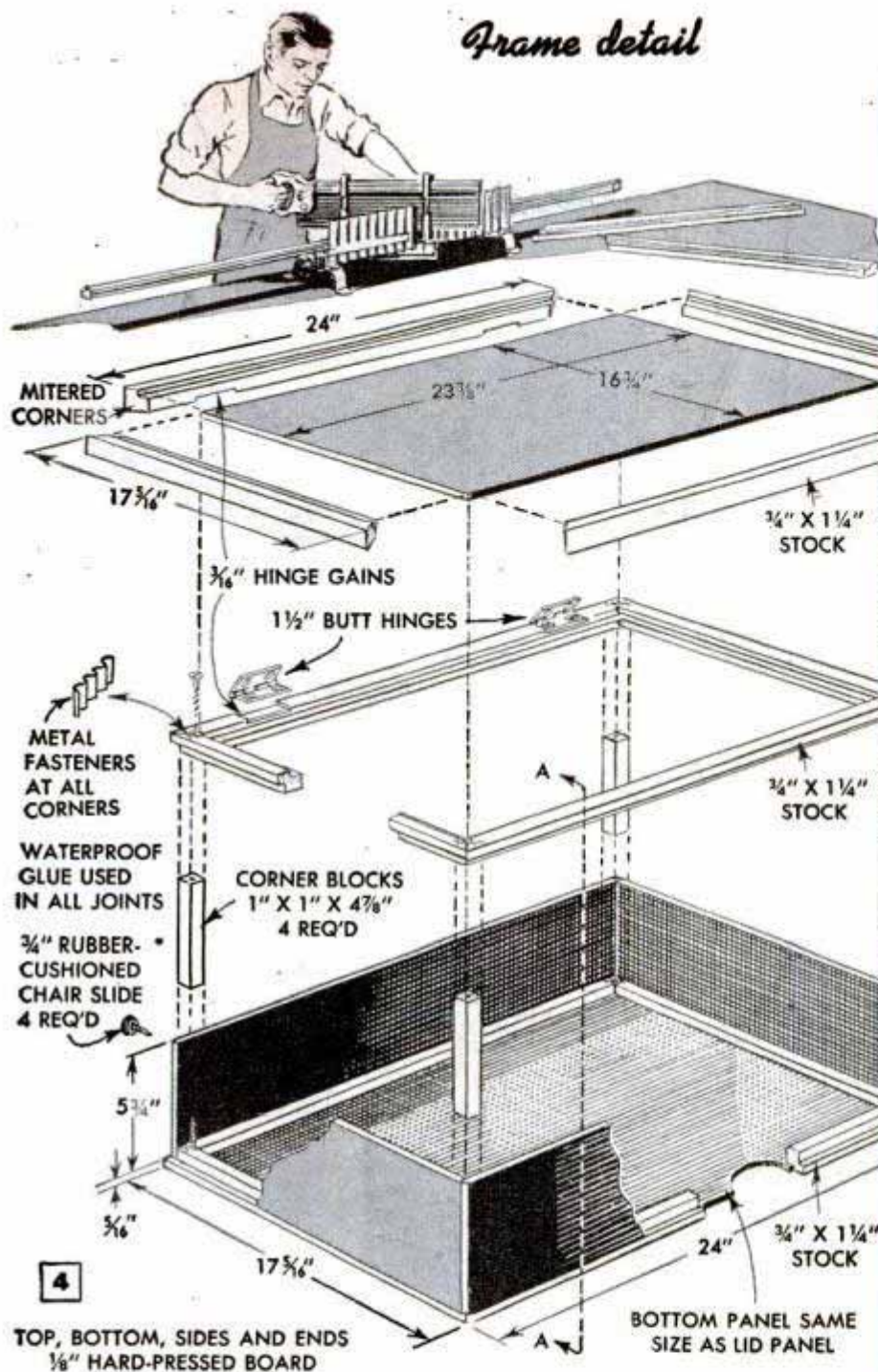
By C. C. White

NEAT and serviceable luggage made in your own home shop need not have a "homemade" appearance if you're careful about a few of the details. Overnight cases, a full-size suitcase or any size in between can be made with hand tools from materials which are readily available. Figs. 1 and 2 picture two cases of the same size and of exactly the same construction except that the case shown in Fig. 1 is partly cloth-covered and has a plastic handle. Fig. 3 shows the case open, the interiors of both styles being the same. The inside of the lid is fitted with a cloth pocket with shirred edge. An elastic band keeps the pocket from sagging open when empty.

Figs. 4 and 5 give the construction details. The frame is made of either soft or hardwood. Rabbits are cut in each frame piece so that the hard-pressed-board panels fit flush. Fig. 5 gives the joinery details. Ends of the top, bottom and center frame members are mitered, then joined with corrugated fasteners and waterproof glue. Frames are joined to the square corner posts with screws. Panels are attached with glue and small brads as in the sectional view, Fig. 5. With the frame and lid assembled, hinge the parts together, then put in the cloth lining. This is glued in as in Section AA, Fig. 5, being tacked only at the top edge



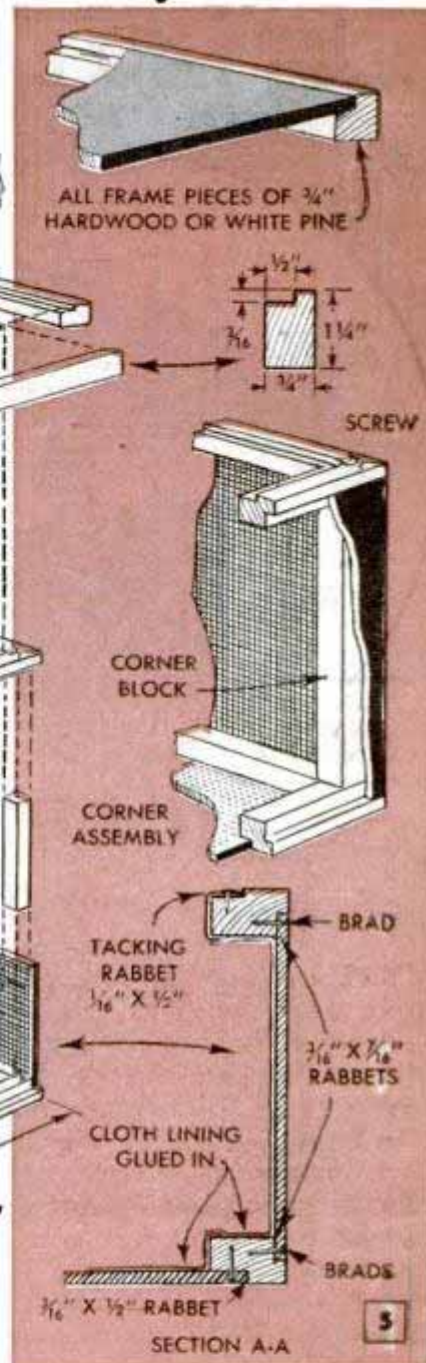
Frame detail



4
TOP, BOTTOM, SIDES AND ENDS
1/8" HARD-PRESSED BOARD

BOTTOM PANEL SAME
SIZE AS LID PANEL

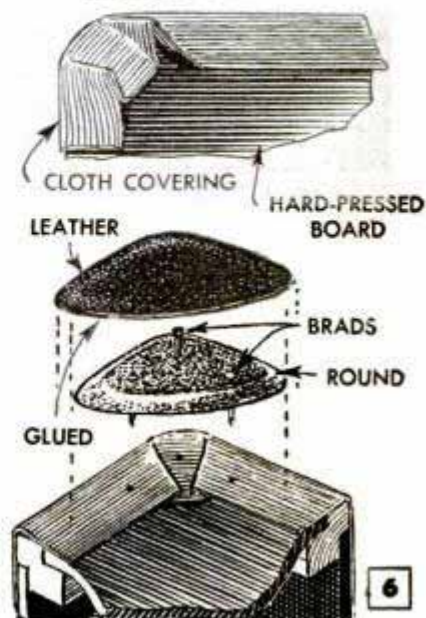
Joints



SECTION A-A

as indicated. Be sure there are no wrinkles in the cloth. Standard sample-case hardware is used. This includes a lock, two catches and leather carrying handle. Chair glides are attached at the corners of the back to prevent marring when the case is set on the floor. The catches are attached with short screws but the sample-case lock is riveted in place. Fig. 2 shows the plain case without cloth covering across the ends and narrow sides. In finishing this style the wood is simply stained to match the hard-pressed panels as nearly as possible, and then the whole thing is given two coats of spar varnish. The cloth-covered case takes another step. Oxford-gray twill is used to cover the top, bottom and ends. "Bottom" used here refers to what is ordinarily the back of the case. Measure the width of the case and then add 3/4 in. on each side for the hem. Round corners of the case and apply glue. Apply the cloth over the glue, allowing one edge to extend over the side panel 1 in. Fold the corners as in Fig. 6. Do the same with the edge of the lid. Then finish the corners as in Fig. 6, using a triangular piece of hard board, and cover this with a piece of leather.

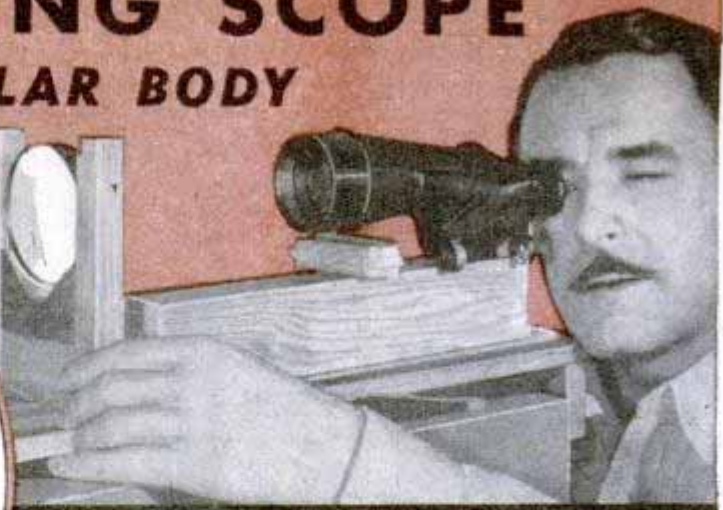
Cloth corners



6

Powerful SPOTTING SCOPE

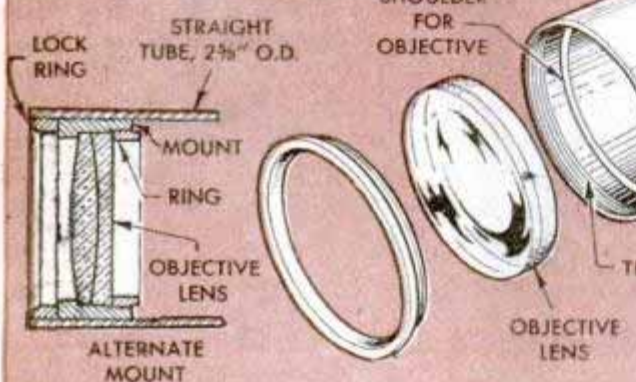
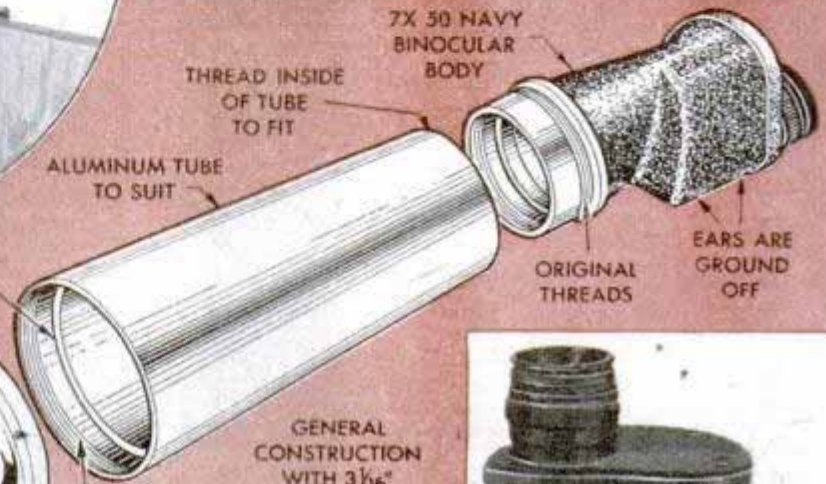
Made from BINOCULAR BODY



DETERMINING POSITION OF OBJECTIVE



FINISHED SCOPE MOUNTED ON CAR-DOOR STAND



GENERAL CONSTRUCTION WITH 3 1/16\"/>

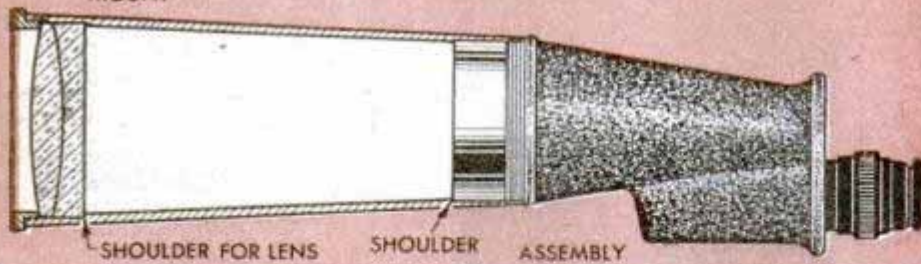


Photo courtesy Edmund Spalve Co.

Approximate Data on Various Lens Combinations

Objective		27.5-mm. Eyepiece			22-mm. Eyepiece			1 1/2" Eyepiece		
Diameter	Focal Length	Pwr.	Field	Illum.	Pwr.	Field	Illum.	Pwr.	Field	Illum.
1 3/4" (44 mm.)	20" (508 mm.)	18X	44	25%	23X	30	15%	40X	13	5%
2" (50 mm.)	16" (407 mm.)	15X	52	44%	18X	38	31%	32X	16	9%
2" (55 mm.)	18" (458 mm.)	16X	49	50%	21X	33	27%	36X	15	9%
2 1/4" (58 mm.)	12 1/4" (308 mm.)	11X	71	119%	14X	50	73%	24X	22	25%
2 1/2" (64 mm.)	19" (482 mm.)	17X	46	58%	22X	31	35%	38X	14	12%
2 5/8" (66 mm.)	18" (458 mm.)	16X	49	66%	21X	33	38%	36X	15	13%
2 3/4" (70 mm.)	18" (458 mm.)	16X	49	76%	21X	33	44%	36X	15	15%
*3" (78 mm.)	14 7/8" (378 mm.)	14X	56	122%	17X	41	83%	30X	17	26%
3 1/8" (80 mm.)	23 3/4" (600 mm.)	22X	35	53%	27X	26	35%	47X	11	12%

* Illustrated

Field is given in yards at 1000 yds. distance. Best field is obtained with Navy 27.5-mm. eyepiece. Illumination is percentage of light as seen by naked eye . . . should not fall below 15% for best results.

Only Requires Changing Lens

ONE of the simplest and best ways to make a high-power spotting scope or monocular is to use the body of a 7x 50 Navy binocular, adding a new objective lens. As shown in the center drawing, the rear portion of the scope is the body of the binocular, with the ears ground off. Either the right or the left side can be used. As stated, the original objective lens is not used, but the eyepiece and all the other optics and prisms, as well as the metal parts that are used to mount them, are retained. With the binocular body assembled and with the focusing eyepiece turned completely in, the position of the new objective can be determined by moving the lens forward and backward until the image is sharp. A setup similar to that shown in the upper right-hand photograph should be used when checking the lens. Measuring the distance from objective to binocular body threads will give you the length of additional main tube that is needed. Always be sure the eyepiece is turned in when making this test, and focus only on an object that is at least 100 yds. distant. The over-all length of the scope will be about the same as the focal length of the objective that is selected.

If an objective of over 2½ in. in dia. is used, construction of the main tube will not be easy because it will require both inside and outside taper turning from suitable casting stock. As far as being easy to make, the best objective is one having a diameter of about 2½ in. This can be fitted inside a straight tube 2⅝ in. in dia. and the tube will fit the end diameter of the binocular body also. Smaller objectives are practical and can be made as shown by the alternate mount, center left-hand detail, where the lens is fitted into a cell and the cell is screwed into the tube. This method is advantageous also for the final focusing adjustment. The table at the bottom of the preceding page shows various combinations that are possible, many of which are available from surplus Army-Navy stocks. A car-door stand mounting for the finished monocular is indicated in the upper left-hand detail.

When making a scope, don't try for too much power—14x is about the limit for a hand-held monocular and 18x is all that's needed for target spotting at 100 yds. Finish the inside of the main tube with a flat black paint that will minimize light reflection. For the outside, the best finish is a black or dark green crinkle varnish baked on at a very low heat in the kitchen oven (leave the oven door open). If you use this finish, make a test panel first to be sure that the right results will be obtained.

Blade Guard for Pointed Tools Preserves Sharp Edges



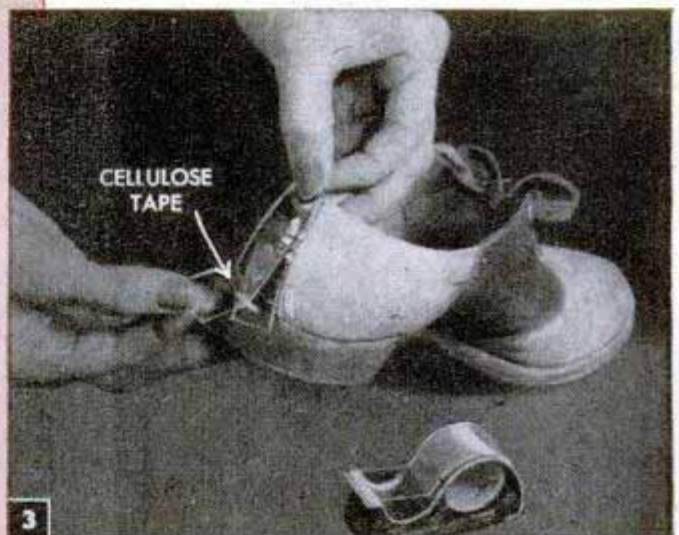
To protect the sharp edges on chisels and similar tools, one craftsman made holders with cloth sleeves and wooden-plug ends that proved satisfactory. Each plug is larger in diameter than the width of the tool and is slotted to fit the edge. A cloth sleeve, long enough to extend above the ferrule, is attached to each plug. Cloth tape is used to tie the holders shut.

Coat Hooks Used as Oar Rests

Instead of allowing the ends of oars to float free in the water or putting them inside the boat when not rowing, screw wire coat hangers to the sides of the boat to hold the oar blades out of the water. When the oars float free, the handles may be in the way of the people in the boat, and when the oars are inside the boat, water drips on the seats and bottom.



Solving



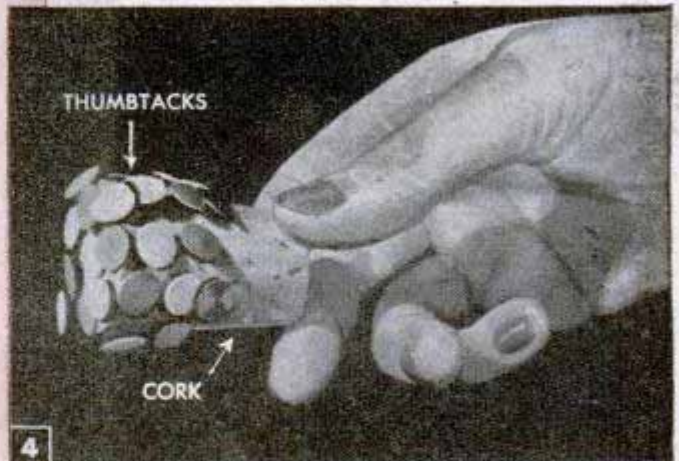
1 To prevent bending the lid on a jar of preserves when prying it off, insert half a spring-type clothespin between the lid and the can opener. Place the end of the pin flush with the edge of the lid

2 Tape a package of coffee filter pads to the lid of a coffee jar and both will always be at hand. Transfer the pads when you open a fresh jar of coffee

3 When cleaning and polishing two-tone shoes, apply cellulose tape to mask the portion that is not being cleaned. The tape can be stripped off easily

4 It's easy to find the thumbtacks when you want them if they're stuck in a large cork and kept in a drawer

5 Although a transparent plastic ruler is handy and easy to work with, when used on a dark surface or if dropped to the floor, it's hard to locate. However, a few spots of brightly colored nail polish spaced along the center make the ruler easy to see



HOME PROBLEMS

6 If a clothesline pole is too long to be stored conveniently, it can be made to pull apart into two sections. A metal tube couples the lengths together.

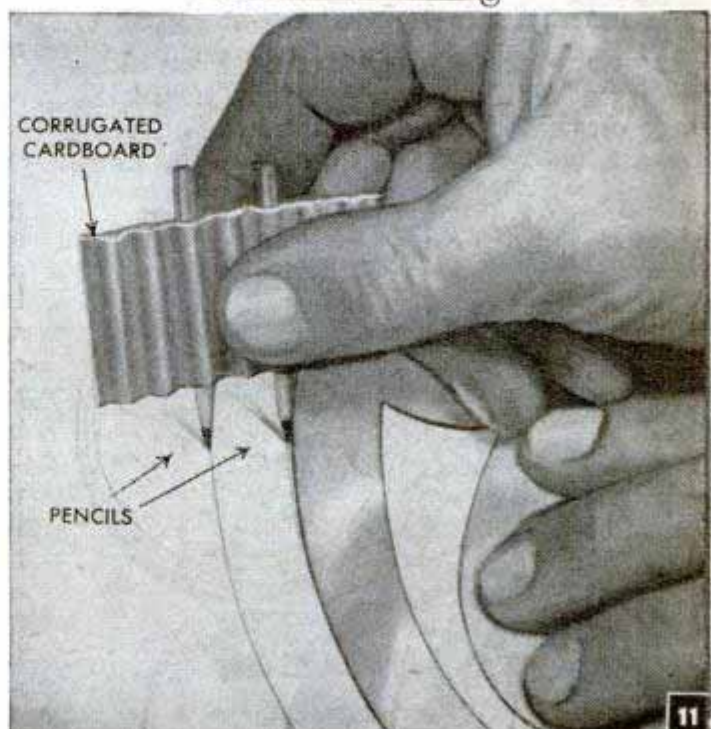
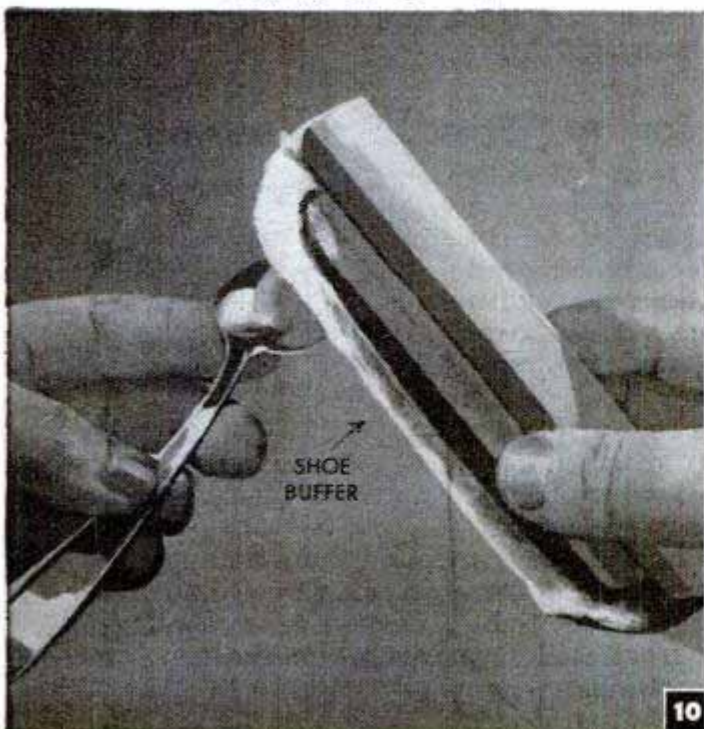
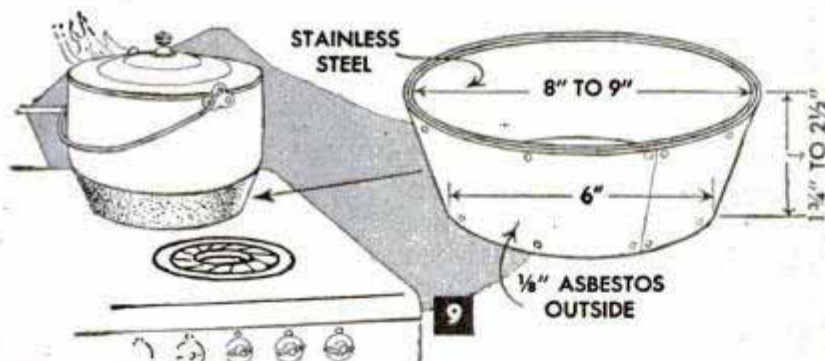
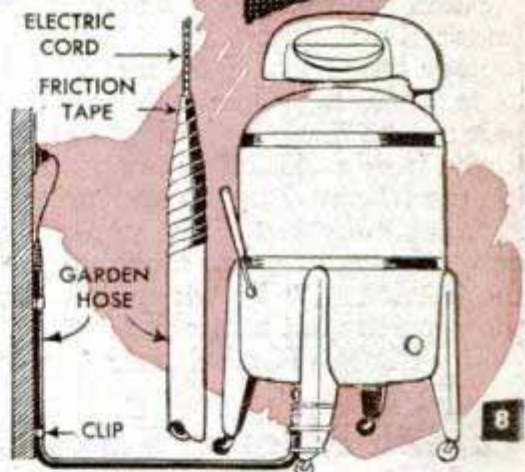
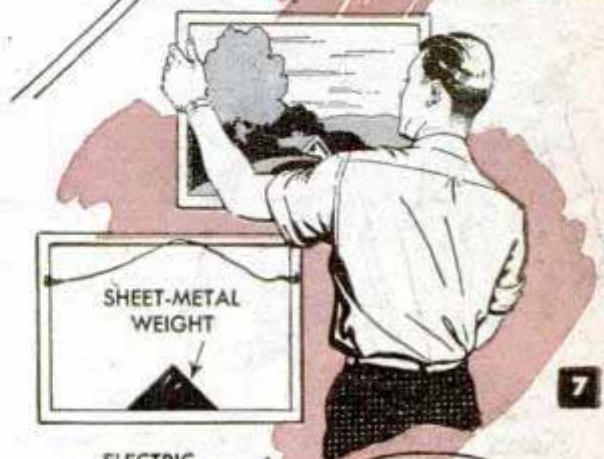
7 By gluing a triangular piece of metal to the cardboard back of a picture frame, sufficient weight is added to make the picture hang level on the wall.

8 Safety and a longer life are added to an electric washing-machine cord if the length that ordinarily lies on the floor is sheathed by a piece of garden hose. Close the two open ends with friction tape.

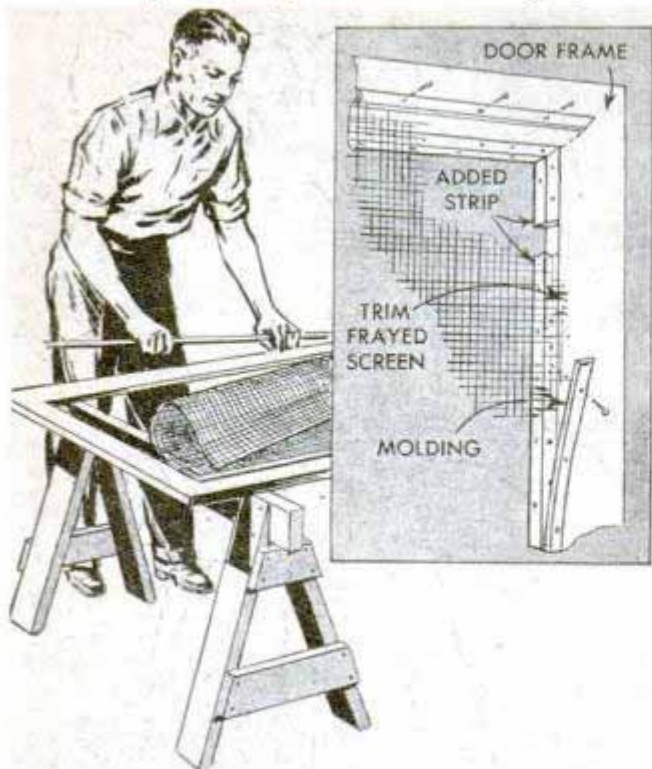
9 Since many small gas and electric stoves have cooking plates about 6 in. in diameter, larger pots and pans extend over this area and are unevenly heated. A metal collar covered on the outside with asbestos will distribute the heat evenly underneath the pan.

10 For a better and faster job when polishing silverware, try a new lambskin shoe buffer. Cover about half the surface of the buffer with polish before using and the treatment will serve you a long time.

11 One way to draw parallel lines is to insert pencils in a strip of corrugated cardboard and use as shown.



Damaged Screen Door Repaired By Using Wood Strip



Should the screen in a door be torn from under the molding, renailling is not satisfactory usually because many of the wires have been torn loose. A satisfactory repair can be made by nailing a strip of wood to the inside of the frame and then fastening the trimmed screen and molding to this strip, as indicated in the upper right-hand detail. Except for the fact that one side of the frame is a little wider than the others, the repair is not noticeable.

Charles Kimball, Los Angeles, Calif.

Growth Rings on Scales of Fish Indicate Approximate Age

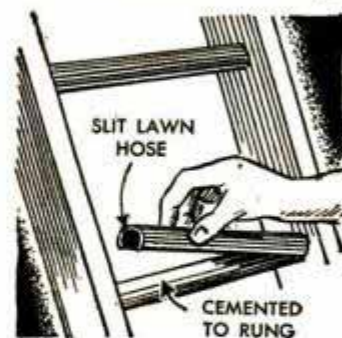
If you're more interested in how old a fish is rather than how big it is, count the rings on the scales. As in the case of trees, these rings indicate annual growth, there



being one ring for each year. It may be necessary to use a magnifying glass to see the rings clearly. It should be remembered, however, that this is not an exact index and does not apply equally well to all species of fish.

Nonslip Tread for Ladder Rungs

Instead of discarding ribbed lawn hose when it is badly worn, you can use it to make nonslip treads for a ladder. Cut the hose into lengths that will fit between the up-rights and slit each piece lengthwise. Fasten the hose around the rungs, using linoleum cement as a binder.—Kenneth Murray, Colon, Mich.



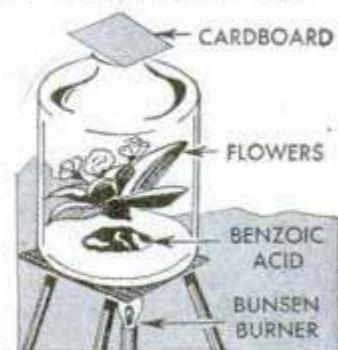
Eliminating Rattle in Shift Lever

In many makes of cars the gear-shift lever is attached to the steering column or post by means of a bracket and, at times, develops an annoying rattle. To eliminate this condition, one motorist wraps a piece of rubber tubing and wire around the shaft between the lever and bracket to serve as a bushing. Wire and tubing of the right size must be used to make a tight fit.



How to "Frost" Strawflowers

When a few grains of benzoic acid are placed in a loosely covered bottle, along with some strawflowers, and the container is carefully heated above a Bunsen burner, the acid will sublime and crystallize on the flowers, giving them an appearance of being covered with hoar frost. If the bottle is tightly corked after cooling, the frost will remain on the flowers for some time.



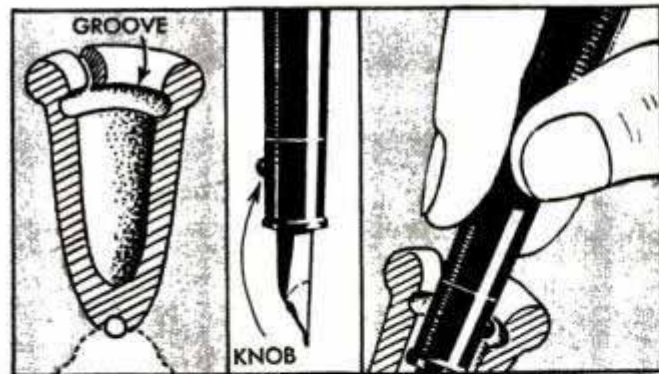
Nathan Bogoch, Winnipeg, Man., Can.

Swinging Grill Converts Fireplace Into Barbecue



Any outdoor open fireplace becomes a barbecue when you install this adjustable grill. The grill rack hangs from a swinging crane and is adjusted for height above the glowing coals by hooking into different links of the supporting chains. The crane hinges are anchored in the masonry while

the fireplace is being built, as shown in the detail. Otherwise holes are cut into mortar joints with a star drill and expansion bolts installed. All parts are of wrought iron, the grill rack being a built-up job consisting of flat-iron bars welded to lengthwise members.

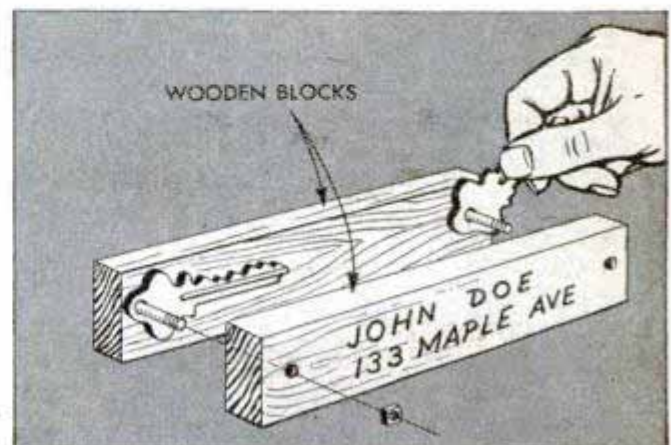


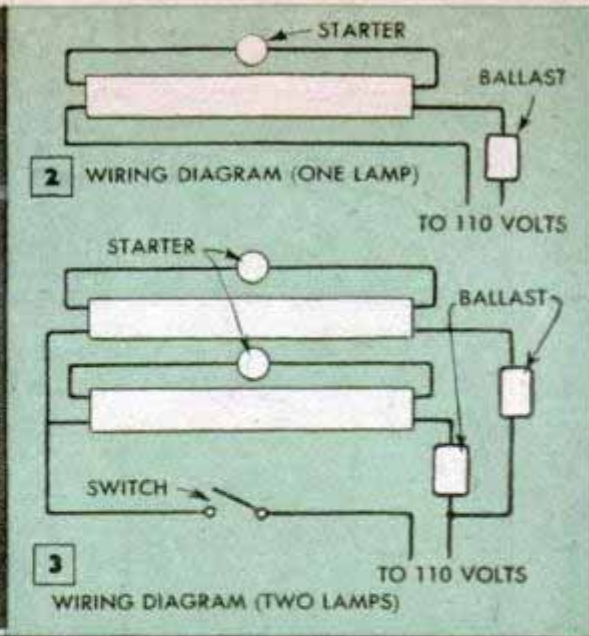
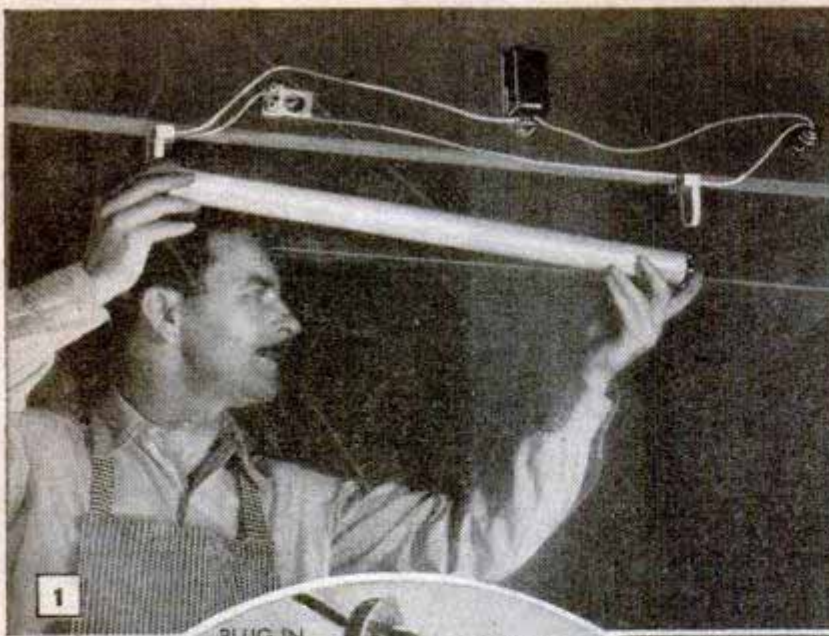
Desk Pen Is Locked in Holder

By adding a small knob to the tapered portion of a fountain pen and cutting vertical and circular grooves in the holder, the pen can be locked in position to prevent its easy removal and use by many different people. Too many writers using the same pen will often spoil the point. The left-hand detail shows how the grooves are cut and the center detail indicates the size and location of the knob.

Wooden Key Container Floats

Made of balsa wood, this container or holder is ideal for boat and tackle-box keys because it won't sink if accidentally dropped into the water. The two blocks that form the sides of the holder should be large enough to provide buoyancy and float the weight of the metal. Brass screws, which will not rust and are resistant to the action of salt water, are used to hold the keys in place. Your name and address can be burned, cut or stamped into the wood as a means of identification.

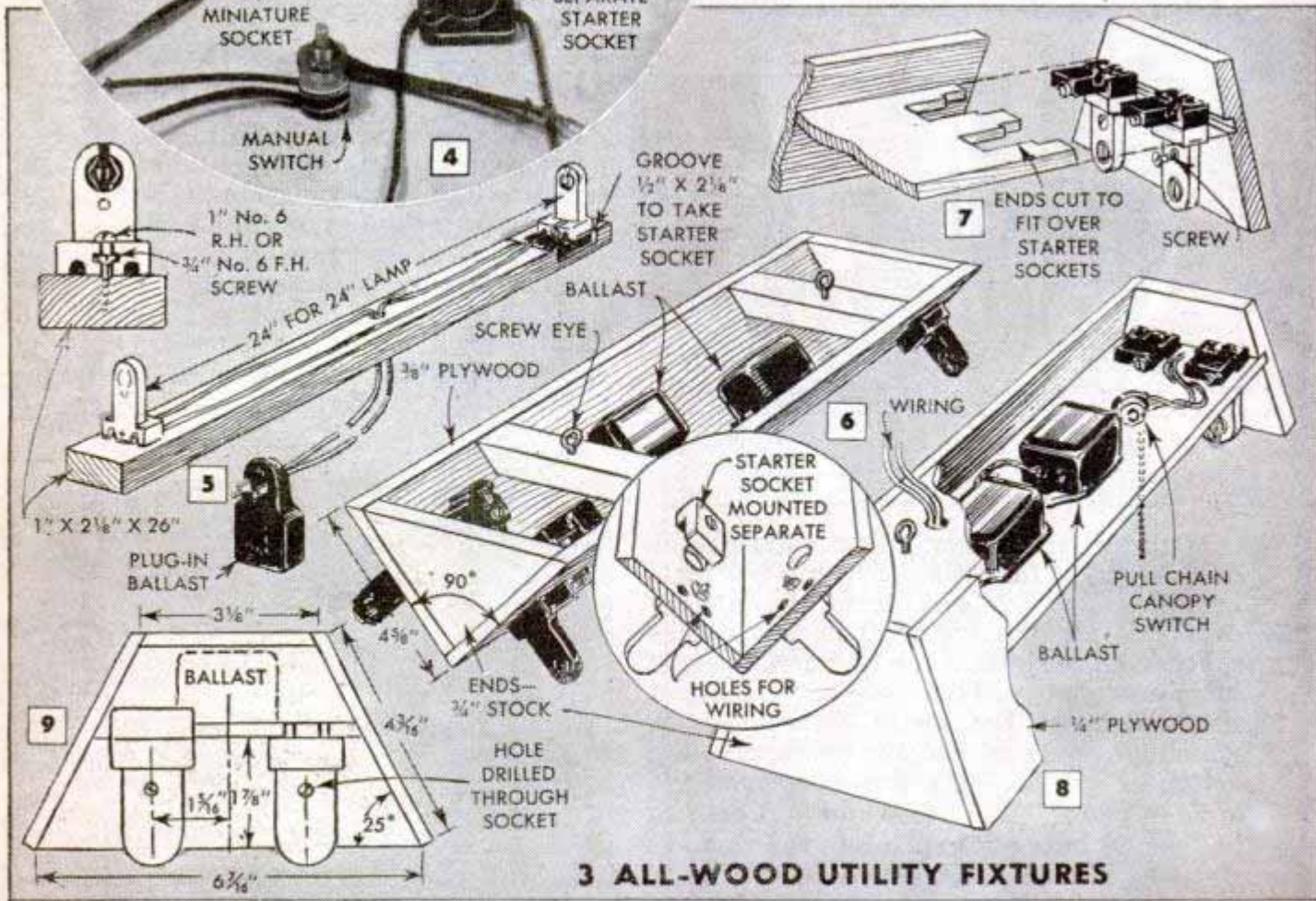
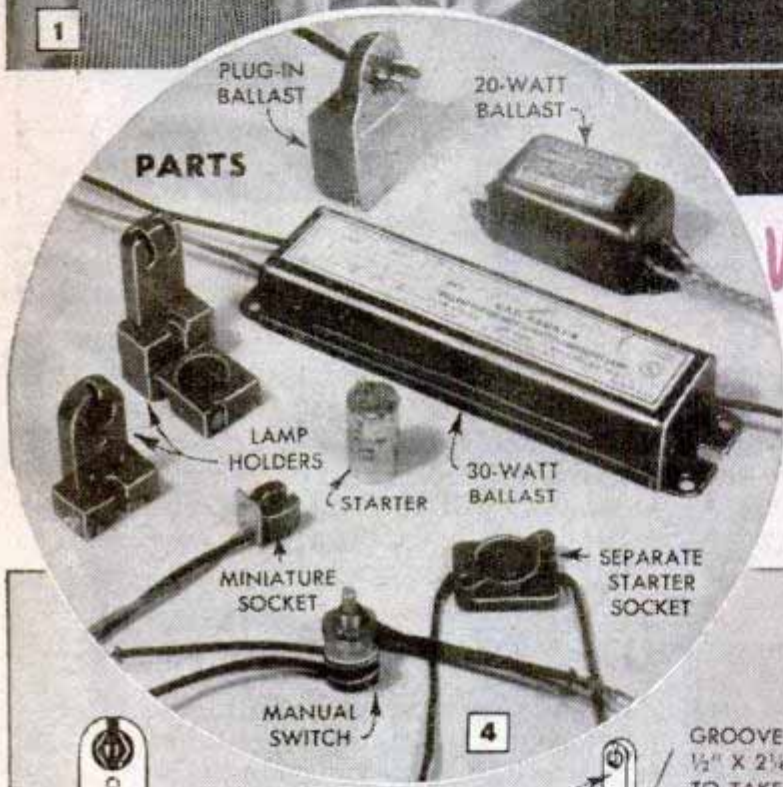




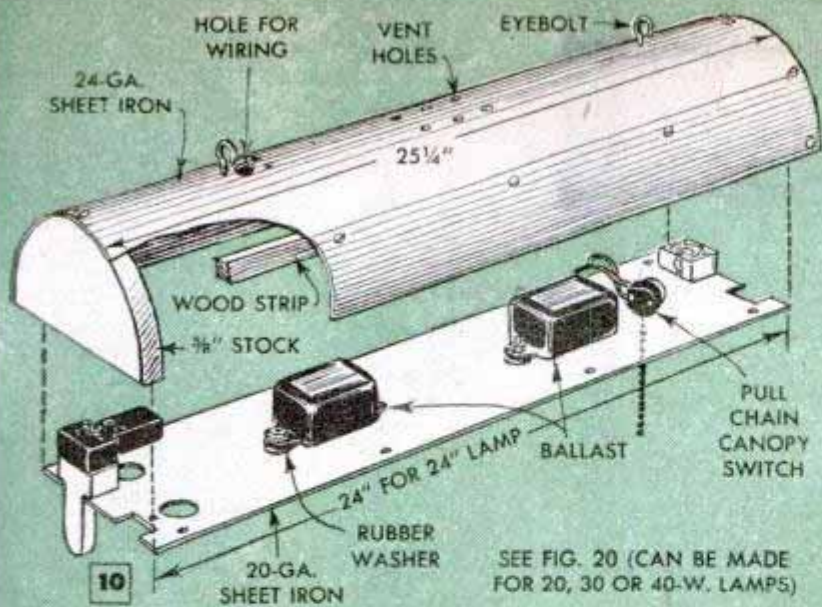
LIGHT UP

W T M 49 By Sam Brown

ALTHOUGH fluorescent lighting is not a new subject, it did not find widespread application until a few years ago, and then its uses were largely industrial and commercial. Today, however, this type of lighting is becoming increasingly pop-



3 ALL-WOOD UTILITY FIXTURES



FLUORESCENT

with Homemade FIXTURES

ular in the home and workshop as a source of superior, low-cost illumination. Assembled from standard parts, fluorescent fixtures are not difficult to build for almost any lighting condition. Like ordinary filament lamps, the simplest installation of the fluorescent tube is a surface mounting, such as shown in Fig. 1. Bare as this is, it does the trick in certain locations. The basic wiring diagram is shown in Fig. 2, consisting of two circuits, one of which supplies current to start the lamp or tube and then plays no further part in operation, while the second circuit supplies the operating current. This line must carry a suitable ballast to limit the current to the amount needed for any particular lamp. A two-or-more lamp circuit is shown in Fig. 3, and requires either a separate ballast for each lamp, or two ballasts mounted in one case.

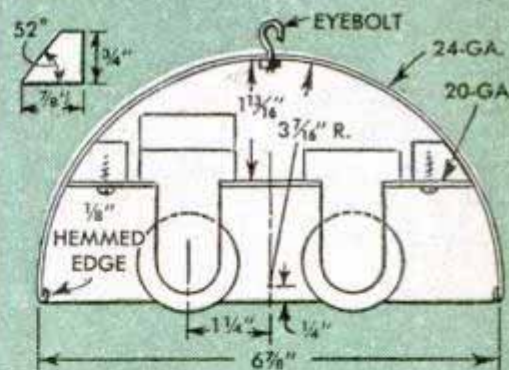
Parts: Parts are shown in Fig. 4. Included are ballasts having the proper capacity, and lamp holders, the latter consisting of one lamp holder and one combination lamp holder and starter socket. Also needed are either automatic starting switches, or one of the manual types which are for push, turn and pull operation and control one or two lamps. Always be sure the ballast is for the proper wattage, frequency and voltage range.

All-wood fixtures: Fluorescent lamps generally are considered to radiate less than one half the heat of filament lamps and can be mounted satisfactorily in all-wood fixtures, such as shown in Figs. 5 to 9. Fig. 5 is a simple light strip using a plug-in type of ballast, while the other two use standard ballasts mounted inside the fixture. These units can be made up to 40-watt size, the lamp length determining the length of fixture (see Fig. 20 for lamp sizes). The lamp-holder mounting for the fixture shown in Fig. 8 is not

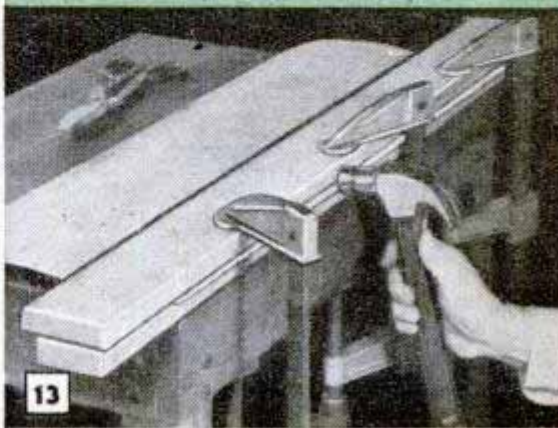


11

A TWO-LAMP SHOP LIGHT

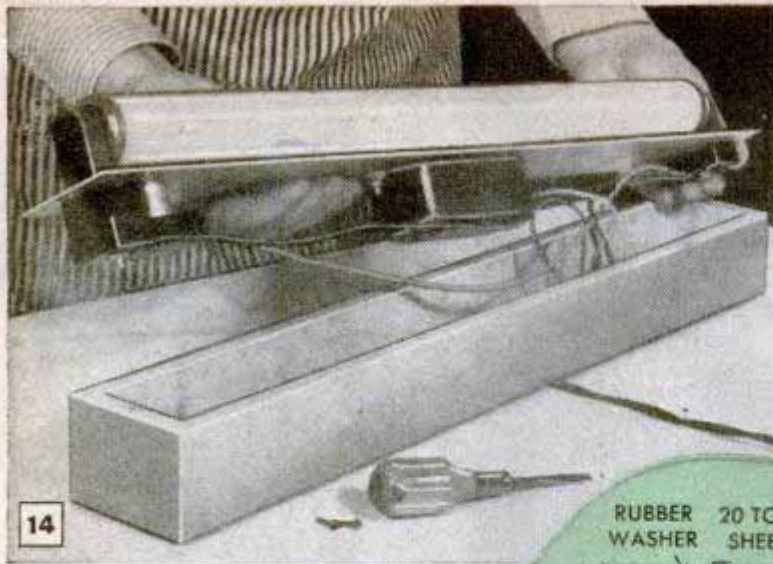


12 MINIMUM SECTION—CAN BE MADE SLIGHTLY LARGER AS DESIRED. FOR TWO 40-WATT LAMPS USE TULAMP THIN SECTION BALLAST (1 3/8" X 2 1/4" X 1 1/4").



13

METHOD OF HEMMING EDGE



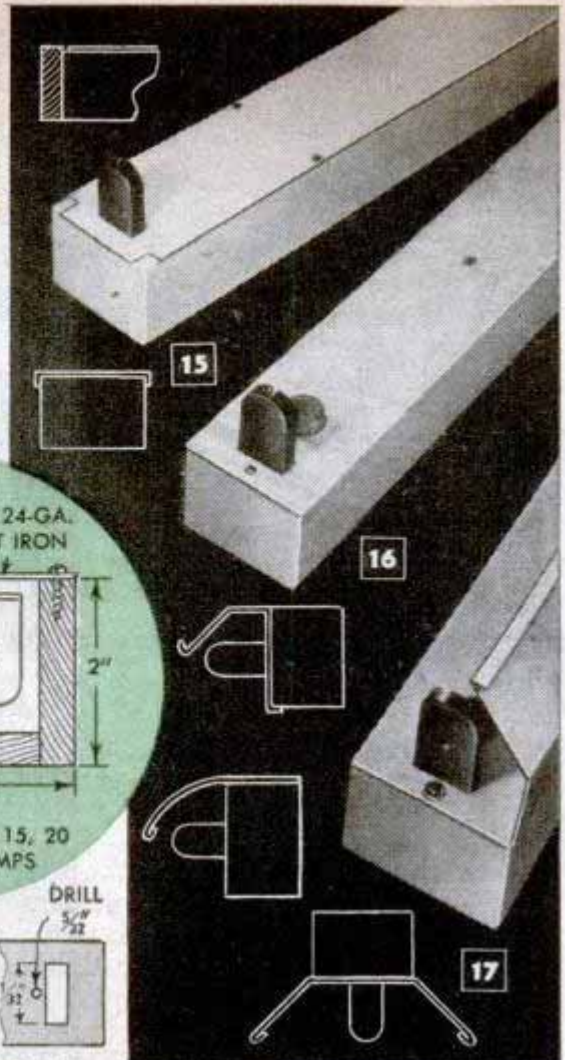
14

CHANNEL STRIPS IN WOOD BOXES

provided for in the original socket and requires drilling a screw hole through the socket, as can be seen in Fig. 7.

Two-lamp shop light: A better type of construction combines wood and sheet iron as shown in Figs. 10, 11 and 12. Fig. 13 indicates a method of hemming the edge of the metal housing. Two 20-watt lamps make an excellent bench light, while two 40s serve nicely for general illumination. It can be seen that this same general construction can be used for the fixtures shown in Figs. 6 and 8. All two-lamp fixtures can also be made up for only one lamp by narrowing the width of the base.

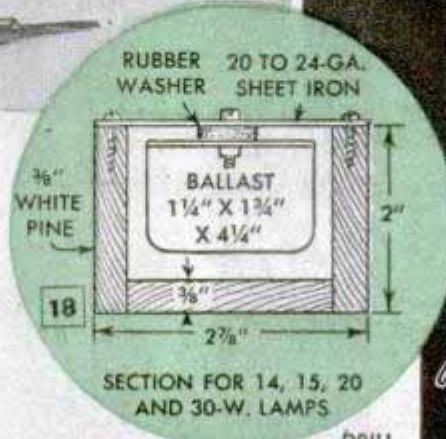
Channel strips: Channel



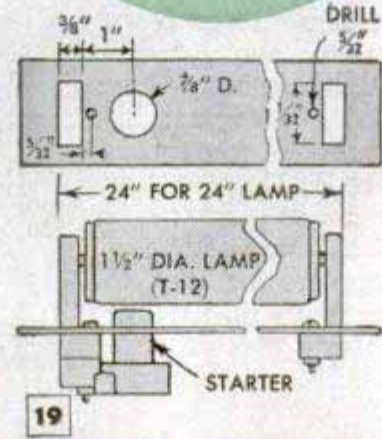
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16

17



SECTION FOR 14, 15, 20
AND 30-W. LAMPS



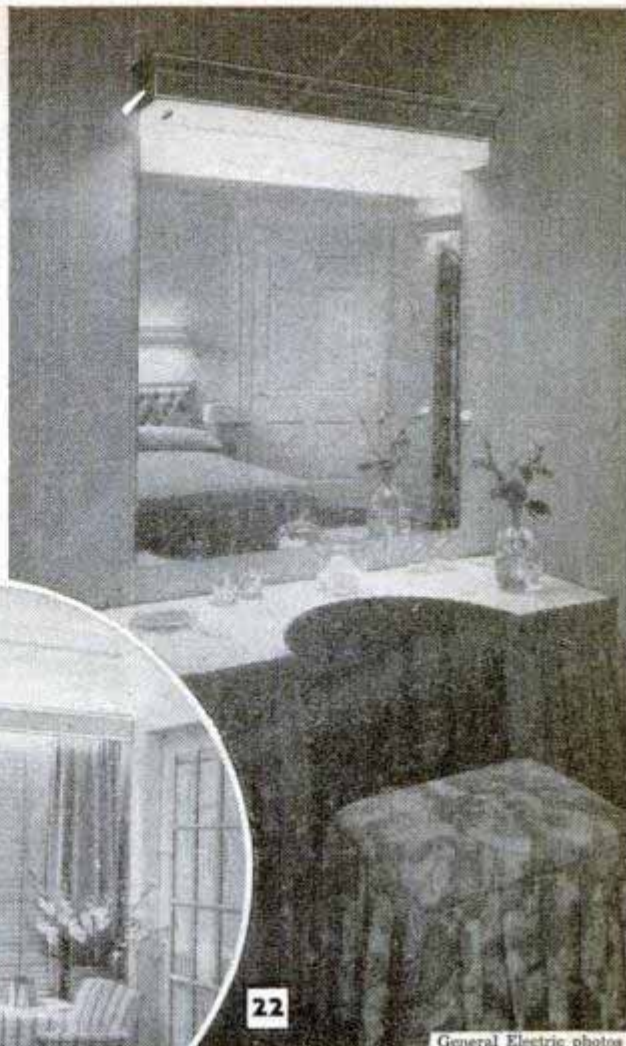
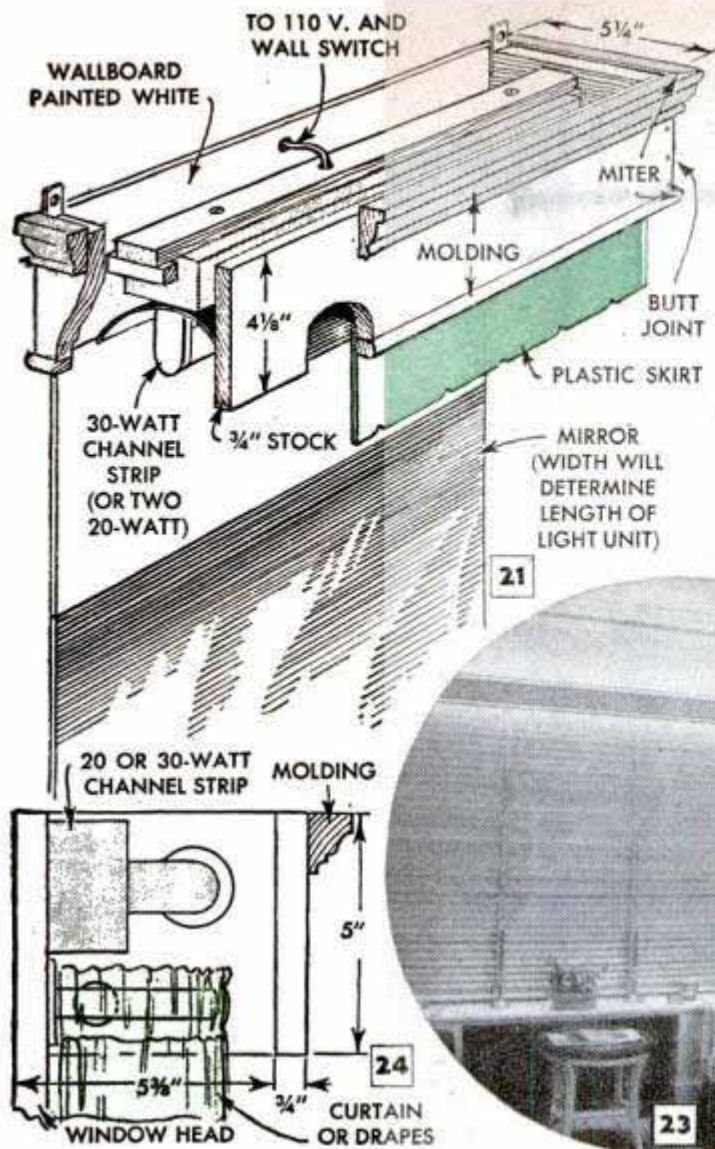
MOUNTING DIMENSIONS

strips, Figs. 14 through 17, are basic fluorescent-light units used extensively as fixture bases or for special built-in installations. The strips can be made up of wood boxes with sheet iron or metal mounting bases, as shown. Sectional

20 FLUORESCENT LAMP SIZES ^① AND ELECTRICAL DATA							
Lamp	Diameter	Length ^②	Lamp Holder	Total Watts ^③	Filament Lamp Equal ^④	Lamp Life (Hrs.)	Ballast Size ^⑤
6-Watt	5/8"	9"	Miniature Bipin	8	20-Watt	2500	1 1/4" X 1 3/4" X 4 1/4" (1 Lamp)
8-Watt	5/8"	12"	Miniature Bipin	11	25-Watt	2500	
13-Watt	5/8"	21"	Miniature Bipin	20	40-Watt	2500	
14-Watt	1 1/2"	15"	Medium Bipin	18	30-Watt	2000	1 1/4" X 1 3/4" X 4 1/4" (1 Lamp)
15-Watt	1"	18"	Medium Bipin	20	40-Watt	2500	
15-Watt	1 1/2"	18"	Medium Bipin	20	40-Watt	2500	1 1/4" X 1 3/4" X 6 1/2" (2 Lamps)
20-Watt	1 1/2"	24"	Medium Bipin	25	50-Watt	2500	
30-Watt	1"	36"	Medium Bipin	40	75-Watt	2500	1 1/4" X 1 3/4" X 6 1/2" (1 Lamp)
40-Watt	1 1/2"	48"	Medium Bipin	50	100-Watt	2500	1 3/8" X 2 1/4" X 8 3/4" (1 Lamp) 2 3/8" X 3 1/8" X 9 1/2" (2 Lamps)
100-Watt	2 1/2"	60"	Mogul Bipin	125	200-Watt	3000	2 3/8" X 3 1/8" X 14 3/8" (1 lamp)

① Lists all common sizes — some other sizes and styles also available.
 ② Over-all mounted length of one-lamp and two-lamp holders.

③ Lamp watts plus watts lost at ballast.
 ④ Filament lamp which gives same approximate light as fluorescent lamp listed.
 ⑤ Smallest size — some other sizes available.



General Electric photos

COVE LIGHTING
FOR WINDOW CORNICES
OR VANITY MIRROR

dimensions, Fig. 18, will accommodate lamps up to 30 watts. The 40-watt size will require a slightly larger box to suit the larger size ballast. Fig. 19 gives dimensions for socket mountings, and these dimensions apply to any style of fixture using 14, 15, 20, 30 or 40-watt lamps.

Cove lighting: The two examples of cove lighting, Figs. 21 through 24, are typical channel strip installations. General construction details, which can be altered to fit individual requirements, are given in Figs. 21 and 24. If possible, the power line should be concealed in the wall, with control from a wall switch. However, the simpler method of tacking the wiring along woodwork and then to a receptacle can be used.

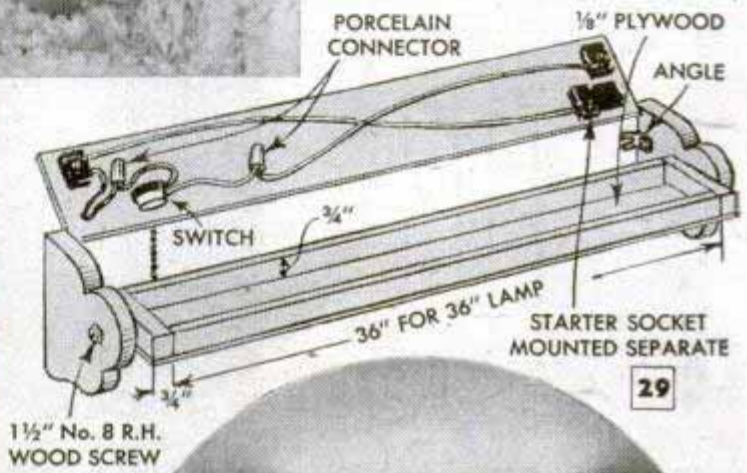
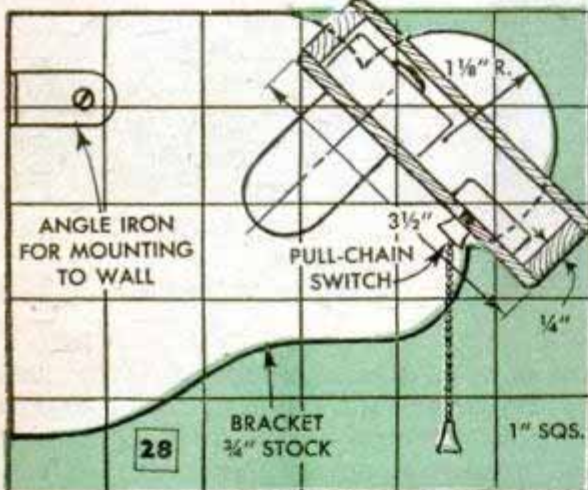
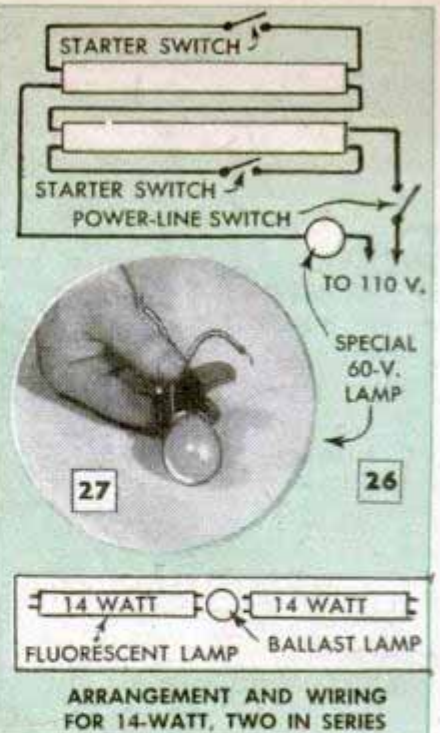
Bed lamps: Bed lamps, Fig. 25, introduce the problem of magnetic ballast hum. All fluorescent-lamp ballasts make a low humming sound, which is inaudible in most locations but like a bee in flight in the quiet of a bedroom. Fortunately, it is practical to cut the ballast in at some remote point in the power line, and the noisemaker thus can be shifted to a far corner of the room, or, even better, to some distant location like the basement or attic. However, for

successful operation, the voltage drop must not be too great, and this may occur when the ballast is located too far from the lamp. As a general rule, do not locate the ballast more than 50 ft. from the lamp and avoid locations where there is extreme moisture or where the surrounding air temperature is higher than 120 deg. F. Without the ballast, the basic light unit takes the form of a flat box housing the lamp holders and starting switch. All-wood construction can be used for the 1-in.-dia. tubes (15 and 30 watts) and the housing can be held to 1 in. thickness, as shown in Figs. 28 and 29. This tiltboard style makes a very practical bed lamp, allowing rotation of the light to any desired position. The fixed headboard style, as shown in Fig. 30, uses the lamp-housing box flat against the wall, with a combination wood and metal shade extending outward, as can be seen in Fig. 31.

Series hookup: Two 14-watt lamps (this one size only) can be connected in series and operated with a small 60-volt lamp as a resistance ballast, as shown in Fig. 27. Total wattage of lamps and ballast is about 45 watts. This circuit can be used on alternating or direct current. It has no ballast

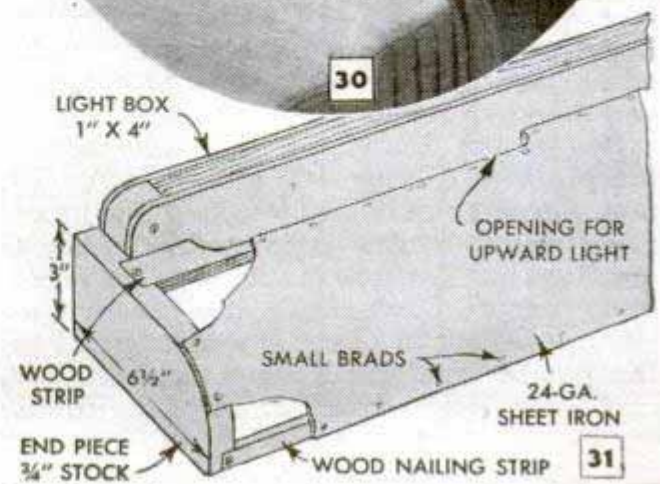


25 **BED LAMPS**
... SHOULD HAVE BALLAST
APART FROM FIXTURE

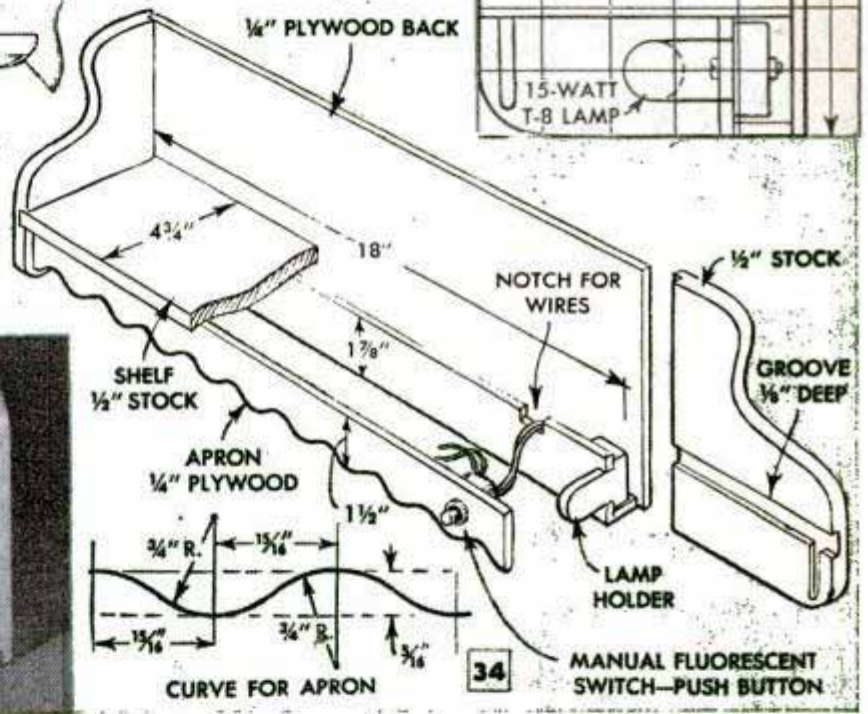
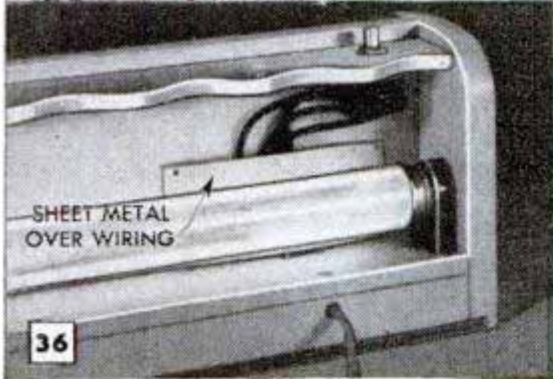


hum, making it ideal for bed lamp use. The wiring diagram, Fig. 26, shows three separate switches in order to prevent confusion, but actually the three switching operations (two starters and one power line) are combined in one manual fluorescent switch. The switch must be the type designed to operate two lamps; a manual fluorescent switch for one lamp will not work.

Wall shelves: Illuminated wall shelves are attractive and practical—one of the best applications of fluorescent lighting in the home. A typical unit is shown in Fig. 32 and is fully dimensioned in Figs. 33 and 34. The lamp is a 15-watt T-8 (T means tubular and the number gives the diameter of the tube in eighths of an inch, in this case 8/8 in.); such a size is easier to conceal than the larger T-12. The switch is a manual type, push button, for one lamp. This switch is operated by pushing it in, holding for a few seconds until the lamp lights, and



then releasing. It combines a starting switch and power-line switch in one unit, and has four lead wires. Power leads usually are black and are wired into the power circuit (see Fig. 2), while the second pair of wires is cut in on the starting circuit. The ballast is mounted apart from the shelf, using a plug-in type or running wiring to the regular ballast which can be mounted in the basement or on a wall. A modification of the shelf-type holder, a living-room installation, is illustrated in Fig. 35, and a method of



keeping wiring from coming in contact with the lamp for this and similar fixtures is shown in Fig. 36.

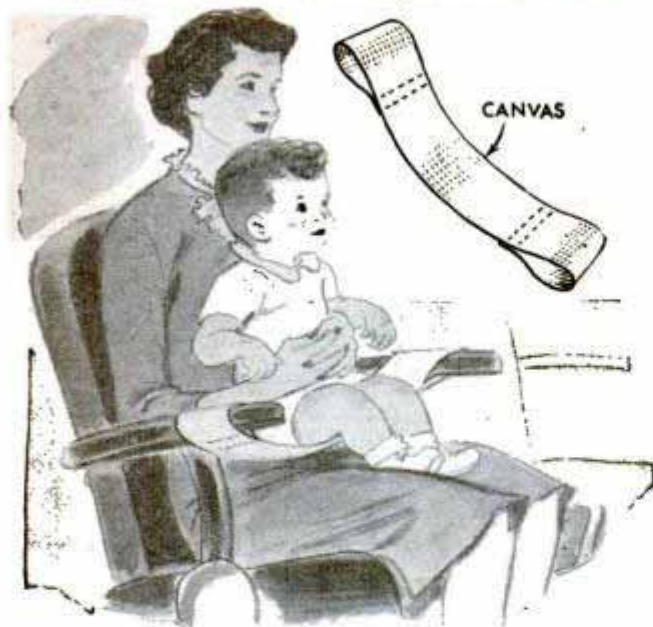
T-5 lamps: T-5 lamps are available in 6, 8 and 13 watts, as tabulated in Fig. 20. Although not shown in any of the plans, these lamps are excellent for shelves, picture lighting, portable trouble lamps, etc., where their small dimensions and low wattage are important considerations. Wiring is standard, and switching can be done with automatic starters or manually, the same as with the larger-diameter lamps. Whenever connecting starters, ballasts, etc., if wiring diagrams are included with the equipment, refer to these as a double check.

Installation applications: Don't use a

one-lamp fixture as a lathe light or for illuminating any revolving machinery; the best unit for such installations is a two-lamp unit and, further, ballasted with a two-lamp high power-factor ballast. Don't overrate the light value of fluorescent lamps; a sound conservative rating is twice the illumination of a similar wattage filament lamp. "Light Up Fluorescent" with one or two simple units, and then, as your appreciation of this new and better lighting grows, make other installations as dictated by your own experience.

Carriage lamps on an old surrey make excellent door lamps. After rubbing down, paint them black, wire for electricity and install on each side of the entrance door.

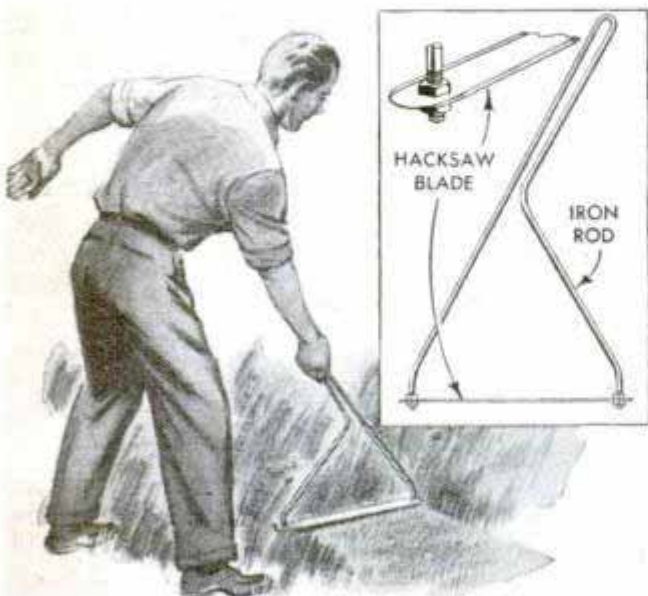
Strap Fits Over Arms of Seat And Holds Child at Movies



Making the burden of holding a child on her lap at the movies easier, one mother sewed together a supporting strap of heavy cloth that would slip over the arms of the seat and bear the weight of the youngster. A wide strip of canvas is ideal for the purpose. Loops about 6 in. in dia. will fit over the arms of most seats. Allowance must be made for slack in the strap so it will be comfortable.

Hacksaw Blade Fastened to Rod Used as Grass Cutter

Grass and weeds that are too tall to be cut with a lawn mower will fall before this cutter, which is made from a power hacksaw blade and a length of iron rod. The teeth of the blade are ground off and both edges are sharpened. Then the rod is bent as indicated in the upper right-hand detail and the blade is locked in place with two

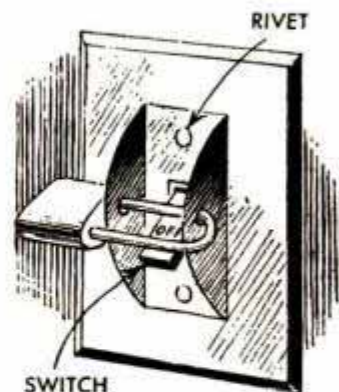


nuts on each end of the rod. The rod, of course, is threaded to fit the holes in the ends of the hacksaw blade. When cutting grass, a long, sweeping motion is used.

E. W. Moses, Jr., Blacksburg, Va.

Locked Guard for Snap Switch

To keep any unauthorized person from turning on a snap switch such as is used for power tools, or to prevent its being turned on accidentally, a sheet-metal guard and padlock will prove effective. The base of the guard slips



over the switch toggle and the semicircular sides are drilled to receive one leg of the lock. This latter feature prevents the switch from being thrown from the up to the down position or vice versa. Even with the lock removed, it's almost impossible to turn the switch on or off accidentally.

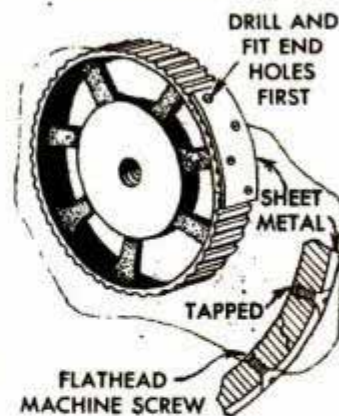
Garden-Hose "Snake" in Tree Keeps Robins Away

One orchardist has found an unusual way to keep robins out of his cherry trees. He arranged a length of old garden hose among the branches to resemble a snake, which is so realistic that the birds stay away as long as it remains in the tree.

Oren P. Tresslar, Vincennes, Ind.

Broken Mower Wheel Repaired

Because a cast-iron wheel on a lawn mower is broken doesn't mean that it must be discarded. A simple repair can be made with a piece of sheet metal and several flat-head machine screws. Fit the broken piece to the wheel and drill



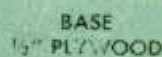
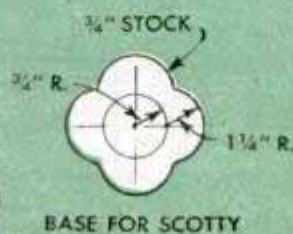
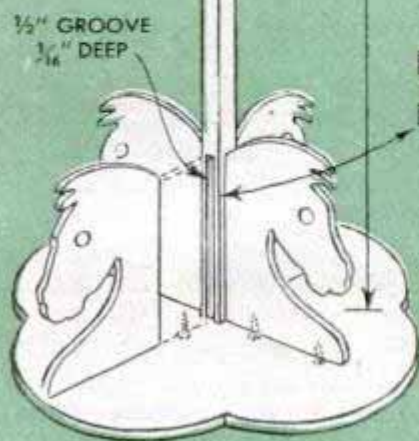
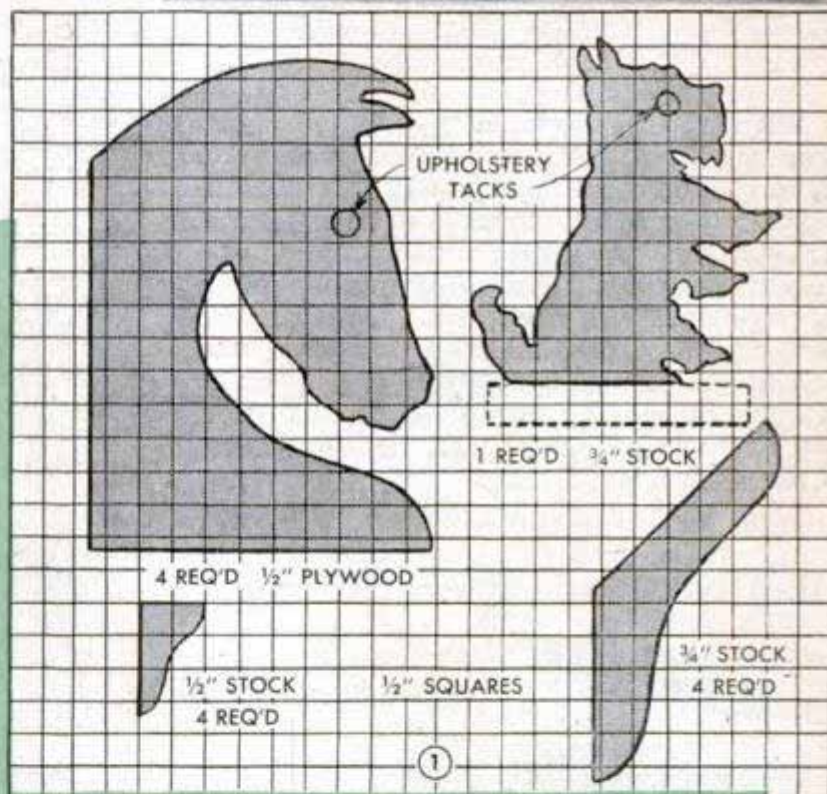
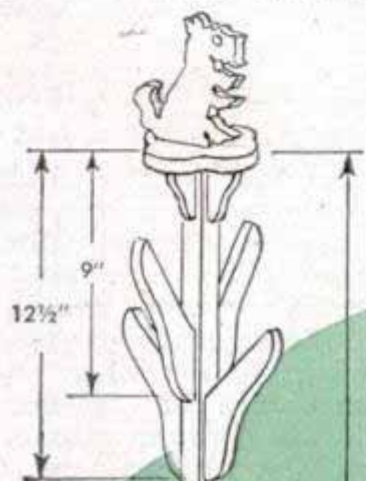
and tap several holes on each side of the cracks. Then bend a length of metal to cover the cracks and fit the curvature of the wheel. Holes are drilled in the metal to fit the holes in the wheel and the former is fastened in place with machine screws. Bevel the ends of the metal "patch."

W. H. McClay, Pasadena, Calif.

Hang'em up

THIS child's-room costumer makes it easier for youngsters to hang hats and coats neatly on a rack. Pony heads in cut-out design, which serve as braces for the column, and a pint-sized Scotty sitting at attention on the top effectively match the usual decorations of a child's room. The whole thing's easy to make, too. All you need are hand tools and a few pieces of suitable hardwood. Birch is especially recommended because it is so easy to finish with either colored enamels or varnish to match the other furnishings. Parts are joined with screws and all edges are sanded smooth before finishing.

Chas. E. Pilon, Newport, R. I.



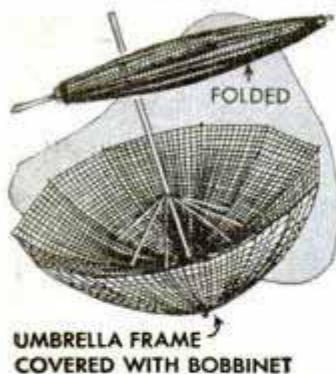
Colored Picture Is Transferred Onto Other Surfaces



Without any special paper, you can transfer colored designs and pictures found in magazines and newspapers to embroidery cloth or other surfaces in many cases. Take a sheet of white writing paper and rub the surface thoroughly with a piece of paraffin. Then press the waxed surface against the design to be transferred and rub the back with the bottom of a spoon or similar object. To complete the transfer, lay the waxed surface on the cloth and press with a hot iron.

Paul Hadley, Philadelphia, Pa.

Bait Net Made From Umbrella



An easily carried minnow net that will fit into a small space can be made from a discarded umbrella frame. Cut fine-meshed bobbinet to fit the ribs of the frame, using linen fish line as thread to sew the net to the frame. The handle is removed and a fairly heavy cord is tied to the shaft of the umbrella when seining for minnows.

Way to Repair Cigarette Burns

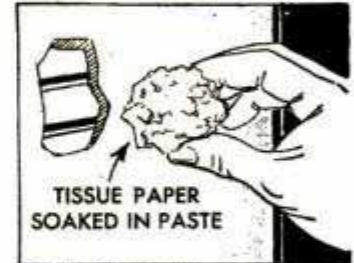
Because it is difficult to find a matching piece of cloth to repair a cigarette burn in upholstered furniture, yarn can be used

with fairly good results. Select one whose color matches, or is close to, the material that has been burned. Darn the hole so that it is well covered and iron the patch level, using a damp pressing cloth.

Francis W. Henry, Pottsville, Pa.

Paste and Tissue Paper Mixture Fills Hole in Wall

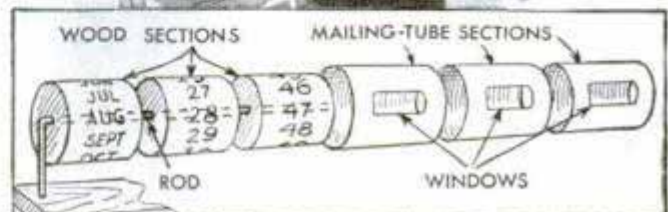
As an emergency expedient, use white tissue paper that has been soaked in paste to plug a hole in a plastered wall. You can mold it into a solid mass and, after it is applied, smooth it down until even with the plaster. The patch can be finished to match the wall.



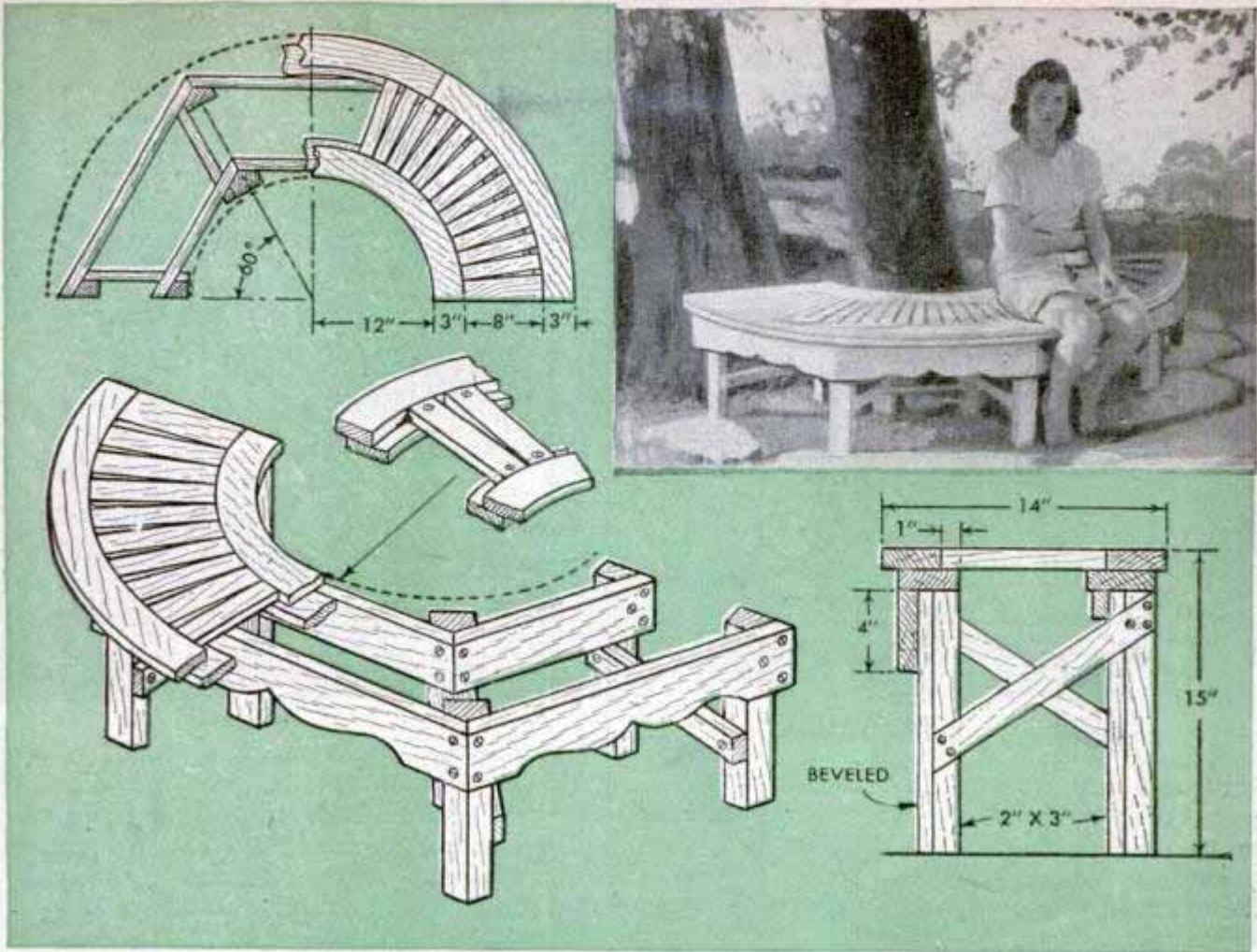
Opie Read, Jr., Chicago.

Perpetual Calendar for Children Duplicates Cylinder Type

A perpetual calendar for the children's room, similar to the cylinder type, can be made with a few pieces of mailing tube and some scraps of wood. The tube is cut into three sections with a window in each one for the month, day and year. Three wooden dowels or other round wooden pieces, which rotate on a wire shaft, fit into the tubes and are marked for months of the year, days of the month and a series of years. The ends of the shaft are bent and fastened to a wooden base.



Novel Tree Seat for the Outdoor Living Room



This seat can be made semicircular as shown or in duplicate sections to encircle a tree trunk completely. Either way the construction is the same except that when two semicircular sections are made you duplicate all the parts. Notice that the legs are beveled to take the aprons front and back and that cross braces stiffen the structure when assembled. Use screws to join the parts. Driving screws takes more time, of course, but the job will be much more

lasting as a result. Also, it's a good idea to paint all joining surfaces before assembly. This will prevent absorption of moisture. Circular members are built up from two layers of segments, the lower layer being offset 1 in. to form a ledge for the radial pieces. This method substitutes for the cutting of a rabbet on thicker stock, which would be a difficult operation without special equipment. Finish with two coats of white outside paint.

Ball Is Dipped in Colored Chalk to Leave Mark on Target

Here's a game that's safe for children because it does not require the use of pointed darts to determine the score on the target. Instead of darts, soft rubber balls are used and each player dips them in a box of powdered chalk, there being a different color for each player. After each round, the score is figured from the colored spots left on the target by the balls.

When sewing buttons on trousers, overalls or other garments where there is a good deal of strain, try sewing a button on each side of the material back to back. It prevents the cloth from tearing out.





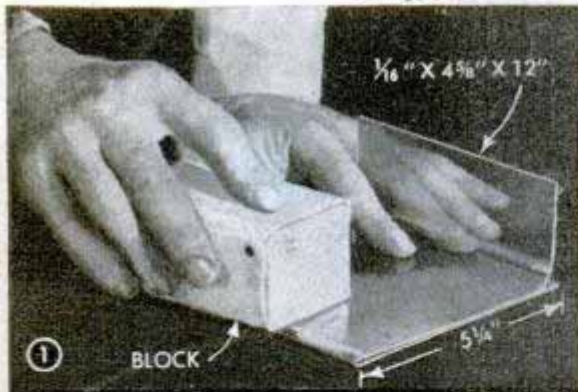
Pictures are Pretty

9 Attractive Designs You Can Make



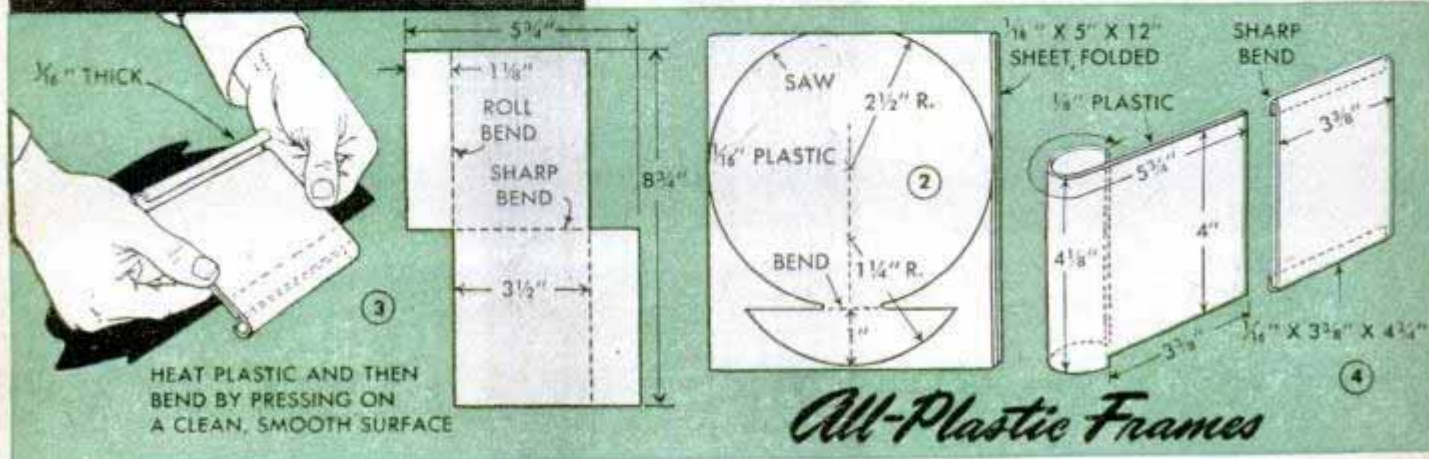
Frame No. 1
Courtesy Vargish & Co.

SIMPLE in design, these plastic picture frames depend largely on the beauty and crystal clarity of the material for their effectiveness. Some of the frames, such as Photos 1, 2, 3 and 4 at the tops of these pages, use plastic for both frame and glass. Construction details are shown in the correspondingly numbered photo and line drawings at the side and bottom of this page. These frames are best worked on a strip heater, which confines the bending heat to the area required. Sharp bends are worked by heating the plastic along the bending line and then rubbing the joint gently with a cloth-covered block as the plastic cools. Large-radius bends are made by heating the required area and pressing the free end against any smooth, clean surface until the desired curvature is obtained. If the correct curve is not made on the first attempt, it's a simple matter to reheat the piece and repeat the bending process as often as is necessary.



FOR A CLEAN, SHARP BEND, RUB THE HEATED PLASTIC WITH A CLOTH-COVERED BLOCK

Bent frames are illustrated by two simple designs, Photos 5 and 6. This type of construction always requires a form. The form for No. 6, illustrated by Fig. 6, is a simple arrangement of



All-Plastic Frames



in Plastic

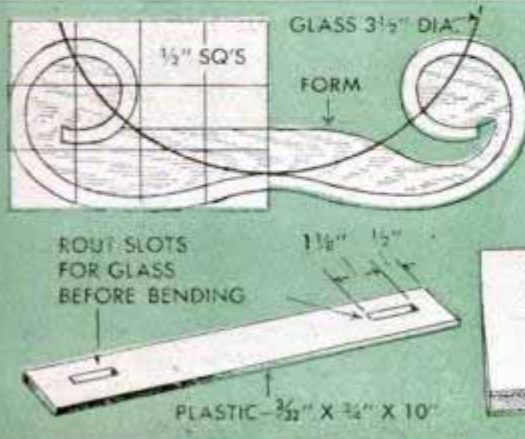
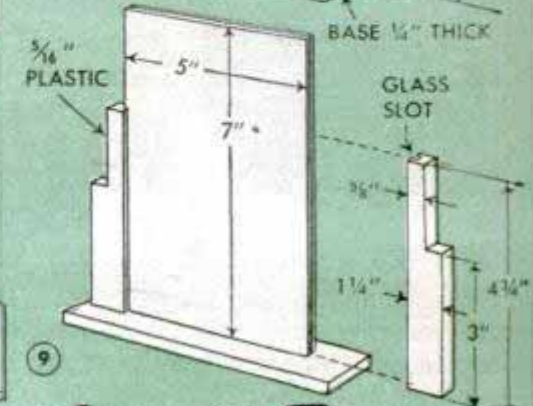
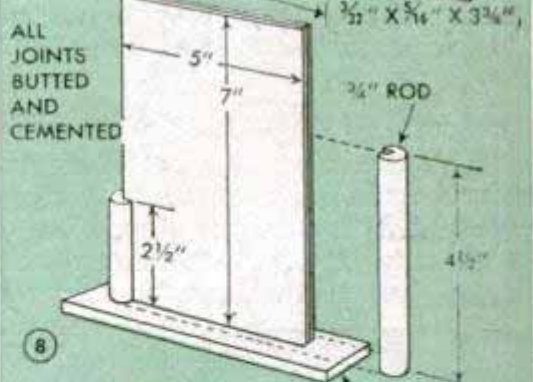
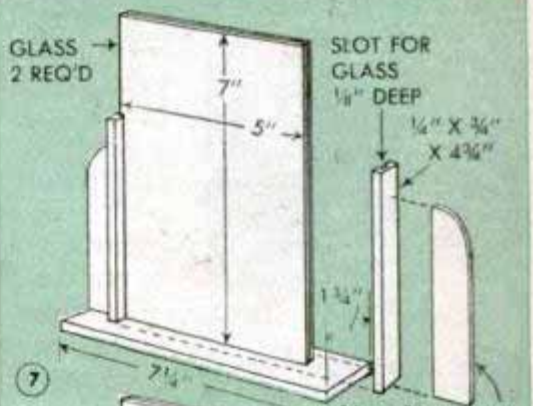


6 $\frac{3}{32}$ " X $\frac{3}{4}$ " PLASTIC

$\frac{3}{8}$ " DOWELS ON $\frac{1}{8}$ " CENTERS

pegs; the form for No. 5 is bandsawed to the shape shown in Fig. 5. The wood should be sanded until it is very smooth to prevent mark-off. Slots for the picture glass in design No. 5 are cut previous to bending. An over-all heat, commonly obtained by placing the strip in an oven, is used for all bent frames when smooth-flowing curves are required.

Straight frames, such as shown in Photo 7 and Fig. 7, are made from straight sections of plastic assembled with cemented butt joints. A solvent-type cement, such as methylene dichloride or vinyl trichloride, gives firm, clear joints on work of this kind and is easily and quickly applied. This type of frame has the edges sanded with 100-grit wet-or-dry paper used with water, which gives a frosty effect that combines nicely with the crystal plastic. Alternate designs for straight frames are suggested by Figs. 8 and 9. The same type of assembly and construction is used.



Straight Frames

Outboard Motor Locked in Place



By inserting eyebolts through the heads of wing-nut mounting bolts, after the wings have been removed, it's possible to lock an outboard motor to the transom of a boat so the motor will be difficult to remove. The manner in which the eyebolts are inserted will vary with the different makes of motors, but one method is suggested in the photograph. When the eyes of the bolts are in the position shown, a padlock is slipped through them to prevent removal of the motor.

Walter A. Dewey, Oakland, Calif.

Removing a Broken Light Bulb



Should an electric light bulb break off in the socket, it can be removed with a cork without danger of cutting your hand on the jagged edges. Press the cork into the base of the bulb and unscrew it. A large cork is best.

Repairing Battery Hydrometer

Don't throw away a battery hydrometer if the nozzle has been broken off. It can be repaired with a rubber stopper and a length of glass tubing. Select a stopper that will fit snugly into the hydrometer and drill it



to receive the tubing. Press the assembly into position and the hydrometer is again ready for use. — Julius R. Jung, Jr., New Orleans, La.

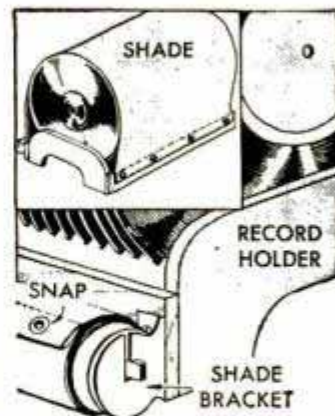
Plaques Finished With Varnish

When making clay plaques and figurines, you can dispense with the more or less complicated business of firing by covering the work with two thin coats of clear varnish. It's better to do the front of a plaque before it's quite dry to prevent cracks.

Moisture will evaporate through the back. In the case of a figurine, a small area could be left in the back or base for the evaporation of moisture.

Dust Cover Fits Record Holder

Most phonograph record holders can be equipped with this cover to keep dust off favorite selections. A shade and roller are cut down to fit the width of the holder and the shade also should be shortened and fitted with snaps on the free end.



Mounting brackets for the shade are nailed to one side of the base of the holder and matching parts for the snaps on the shade are attached to the other. When the records are not being played, the cover is pulled over them and held in place with the snaps of the button or turnbutton type.

Substitute for Wire Paper Clip

If regular wire paper clips aren't available, heavy paper cut in narrow strips will serve as a substitute to hold a number of papers together. Cut two slits in the papers to be fastened together and slip the strips between these, as shown in the illustration. This will not disfigure the paper in any way.



Beatrice E. Reese, St. Petersburg, Fla.

Name Printed on Auto Hub Cap

The large hub caps on present-day automobiles sometimes are scraped off when rubbing against curbstones, lost in traffic or forgotten when changing a tire. However, if your name and address are stenciled, scratched or printed on the inside of the cap, you have a chance of having it returned if it becomes lost and is picked up by another motorist.

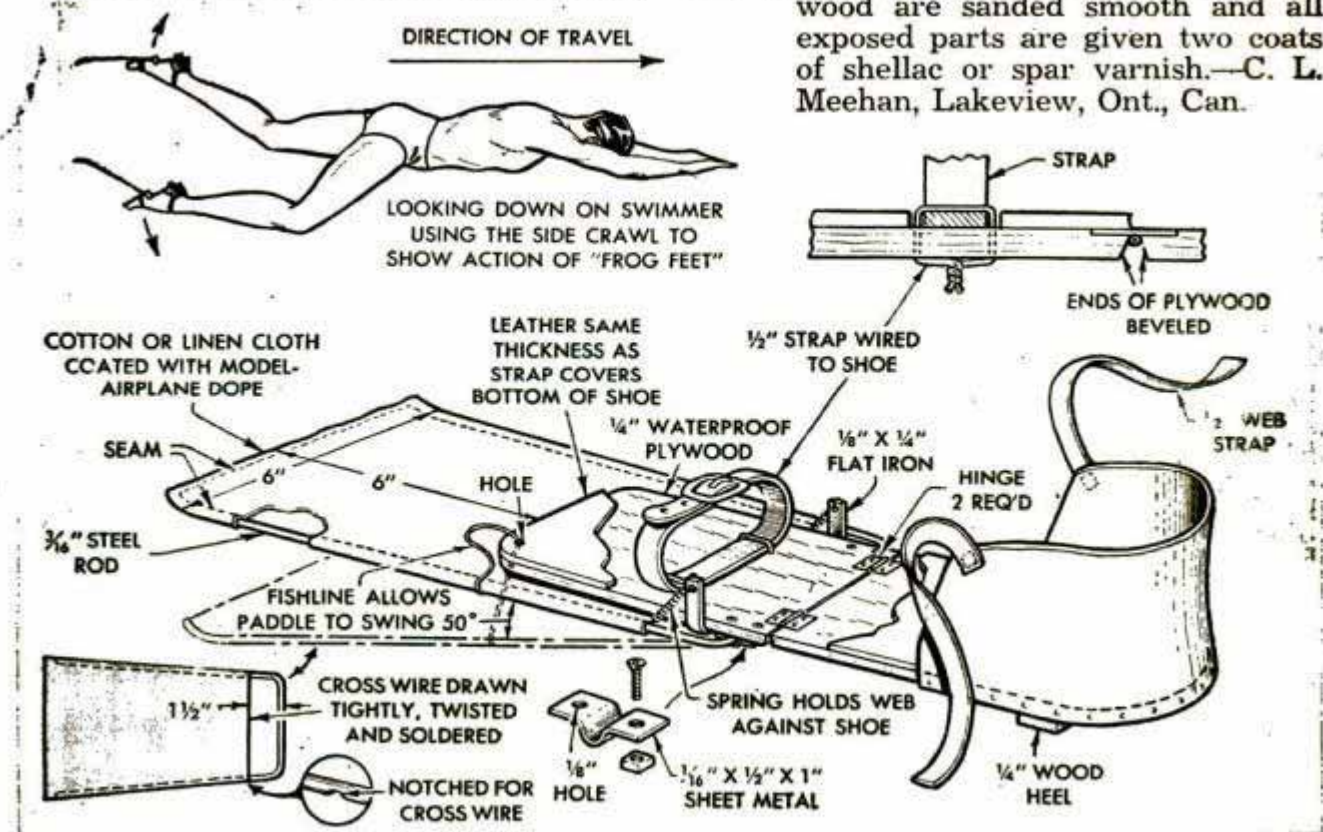


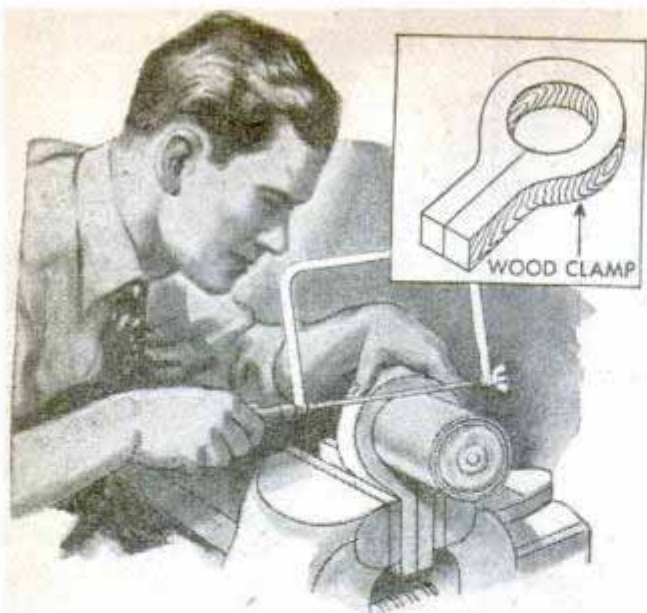


"FROG MEN" SWIMMING PADDLES

ONCE you get used to wearing them, these "frog feet" will enable you to swim greater distances at speeds you couldn't achieve otherwise. Although good swimmers will be able to use them to advantage in a number of swimming strokes, many users probably will find the side crawl the least tiring for long-distance work. Details below show how to make the paddles, each of which consists of two parts: a shoe, or sandal, and a hinged flap, or wing, which is cloth-covered. The wing is hinged in such a way that it can swing in an arc of only about 50 deg. However,

this is sufficient to allow it to "feather" properly on the return stroke when swimming. The cloth covering or web of lightweight canvas is stretched over a wire frame, sewed as indicated, then treated with airplane dope, which waterproofs and shrinks the cloth tight on the wire frame. The sandal is cut from waterproof plywood and is fitted with a "counter" cut from an old inner tube. Web straps attached to the counter tie over the ankle. Notice that the sandal is covered with leather or rubber of about the same thickness as the toe strap. This prevents chafing. Edges of the plywood are sanded smooth and all exposed parts are given two coats of shellac or spar varnish.—C. L. Meehan, Lakeview, Ont., Can.



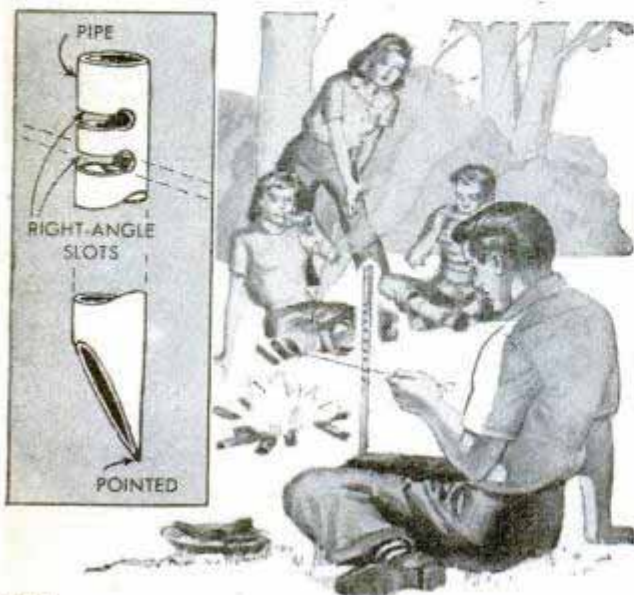


Wooden Clamp Around Tin Can Makes Sawing It Easy

The edge of a tin can will not buckle or bend out of shape if it is held in this clamp while being sawed. The inside diameter is a little larger than the can and the slot between the two legs that are held by the vise should be wide enough to make the clamp a tight fit around the can when in position. Use a fine-tooth blade and make the cut as close to the clamp as possible.

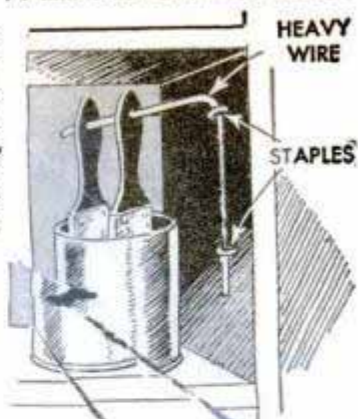
Slots Are Cut in Length of Pipe To Support Wiener Forks

This simple holder for wiener forks is made by sawing a number of slots in a length of pipe. Before the slots are cut, however, small holes are drilled through the pipe, at a point where the cuts are to end, to keep the forks from slipping out. The end of the pipe is pointed so it can be driven into the ground easily. Use galvanized or wrought-iron pipe to make the holder.



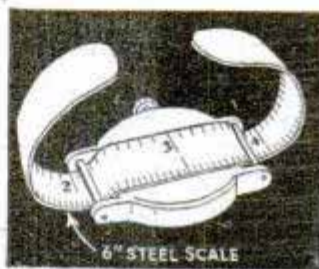
Wire Bracket Will Hold Brushes

Made from a piece of heavy wire bent at a right angle, this holder will keep several brushes suspended in a can of cleaning solution and not allow the bristles to rest on the bottom so they will be bent. The bracket is fastened to the wall or side of a shelf and, because of this method of mounting, can be slid up and down to remove brushes without moving the can and spilling liquid. Of course, it's necessary to drill holes in the handles of the brushes to slide them on the bracket.



R. Hoppough, Waukegan, Ill.

Watch Strap Formed From Scale



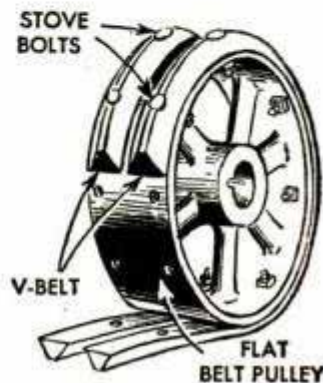
By taking a regular 6-in. stainless-steel scale and bending it to the desired shape, an unusual wristwatch band can be made for very little expense. One

advantage of using the scale is that the markings can be used to gauge the symmetry of the bends, starting with the 3 in. mark as the center. The square corners of the scale should be filed round and the edges should be beveled slightly.

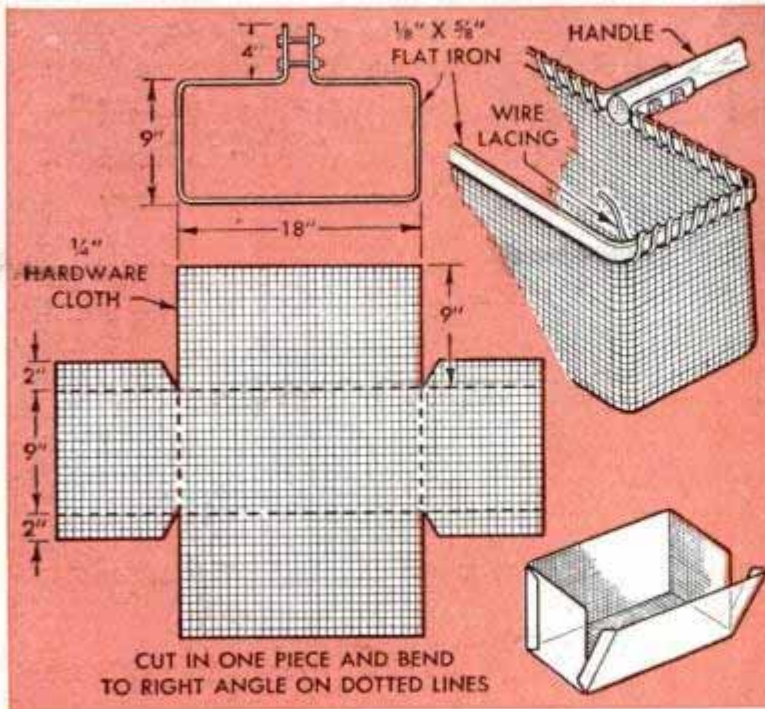
Donald S. Henningfeld, Ft. Belvoir, Va.

Flat Pulley Used as V-Belt Drive

Flat-belt pulleys can be converted to V-belt drives by using a length of discarded V-belt. Two strips of the latter are reversed and bolted to the pulley in such a manner that the wide side of the belt is against the face of the pulley. The space between the belts is just wide enough for the drive. This conversion will not work as well on smaller pulleys because of the difficulty in reversing and bolting V-belts to a surface having a small radius.—Albert A. Mihalovich, Rathbun, Iowa.



"Weedless" Dip Net Made From Hardware Cloth



For netting fingerlings under grassy banks, around tree roots or aquatic plants, or just dipping up minnows from open water, this rigid net has several advantages over other types. It will withstand a lot of rough usage because it's made of metal and attached to a sturdy wood handle. The frame is bent from flat iron and fastened to the handle with small bolts as shown in

the details. Then, from hardware cloth, cut a single piece of the shape and size indicated. Bend this to a rectangular, boxlike shape, solder the overlapping corners and lace it to the iron frame with wire, using a simple over-and-under lacing and pulling each loop tight. A coat of green enamel will make the net less visible in the water. The handle should be about 6 ft. long.

Live-Bait Minnows Can Be Carried in Glass Fruit Jar

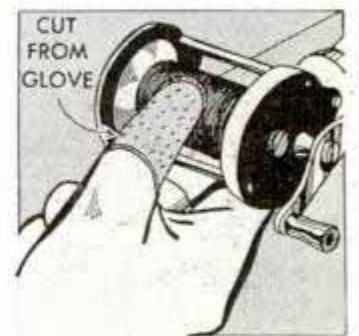
When fishing in midstream and using live minnows for bait, the necessity of making a trip to shore every time bait is needed can be eliminated by using a glass-

jar container that will carry five to six minnows. Fill a pint jar half full of fresh water and screw on the lid to make it airtight. A cord, which slips over the shoulder, is fastened around the neck of the jar. Bait kept this way will remain alive for an hour or more.—R. A. Jenkins, St. Louis, Mo.



Leather Thumb Gives Protection

One fisherman wears the thumb cut from a leather glove when casting. This serves as protection when "thumbing" the reel. The material should be leather, since cotton or any similar fabric material would not overcome the heat generated by friction of the line, and rubber would have too much braking action.



☞ Picnic salads can be served cold if packed in a double boiler with ice in the outer container.

Checking V V V for Refrigerator Ills

Much of the repair work done on domestic refrigerators requires special tools and equipment, but if you know how a refrigerator works—and why—there are simple maintenance routines that you can follow to keep the unit in condition and make frequent calls for a serviceman unnecessary

✓ Like any fairly complex mechanical refrigerator must be serviced properly and maintained if it is to deliver the peak performance for which it was designed. Some repairs, which do not require “opening” or “pumping down” the system, are fairly easy to make and can be done with ordinary tools. (Opening or pumping down a system refers to the removal, or partial removal, of all refrigerant to get at some particular part. To do this, special equipment is needed and generally it is better to have a serviceman do the work. Also, when a system is opened, you may be handling gases that are toxic and, therefore, dangerous.) Only repair and maintenance that do not require opening the system are discussed here.

✓ Fig. 1 shows schematically how a refrigeration system works. Warm, low-pressure refrigerant vapor is admitted to the compressor where its temperature and

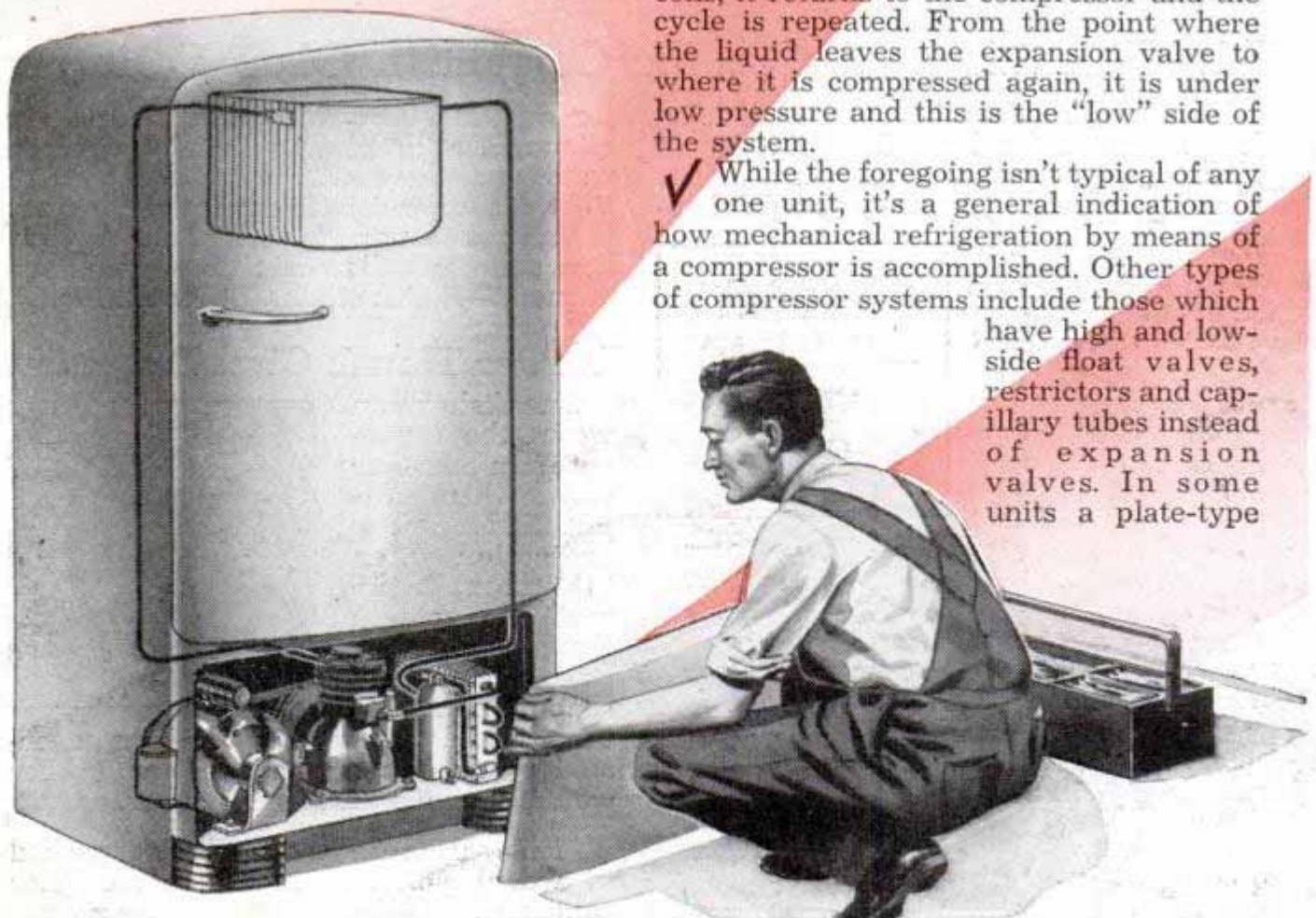
By John F. Shrock

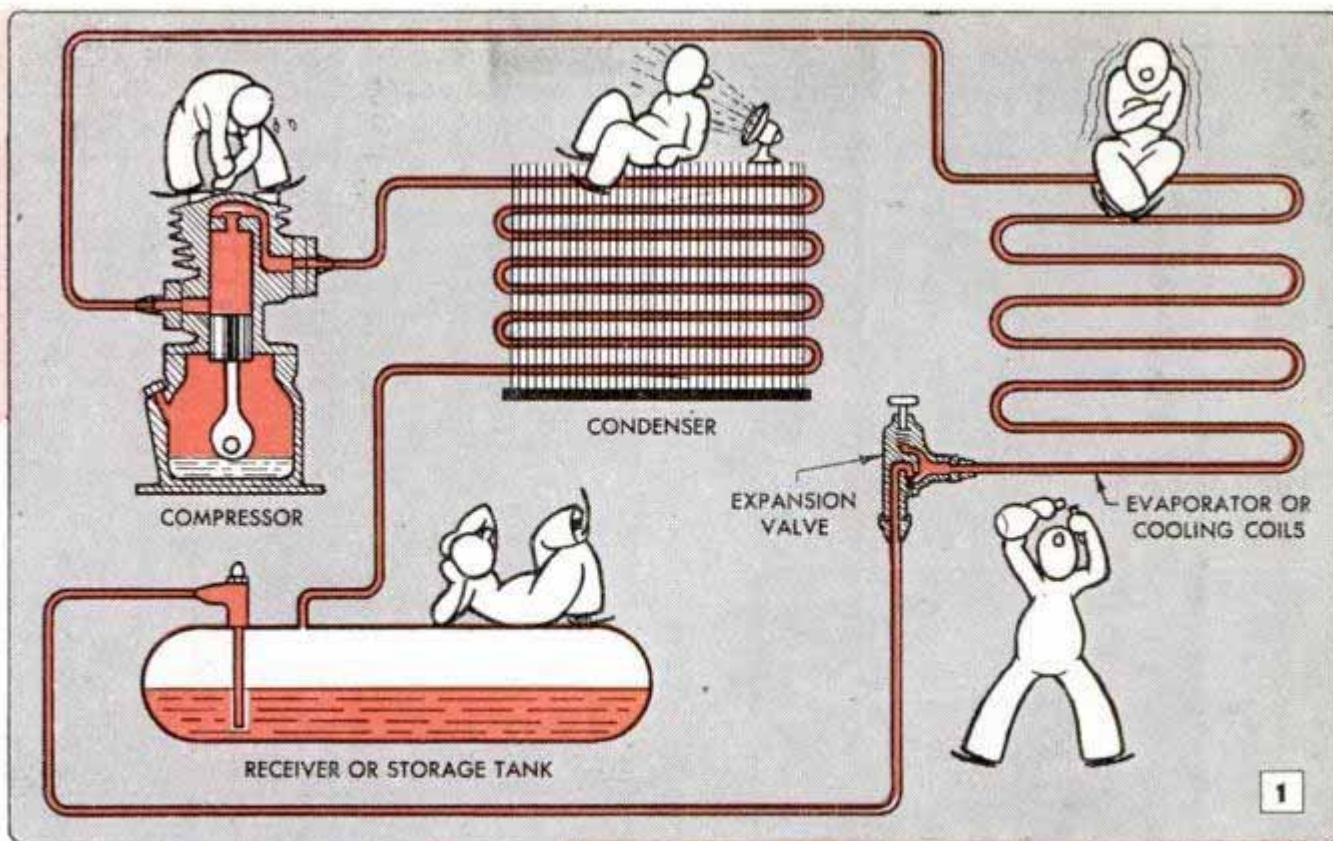
pressure are raised and then it passes to the condenser

where the vapor is liquefied and partially cooled. From here the liquid goes to the receiver, which functions as a storage tank to supply refrigerant according to the fluctuating demands of the system. At the expansion valve the liquid is metered and admitted into the evaporator or cooling coils; these are the coils that generally encase the ice-cube trays and also refrigerate the interior of the cabinet.

✓ From the point where the refrigerant is compressed to where it passes through the expansion valve or a similar metering device, it is under high pressure and this generally is referred to as the “high” side of the system. At the expansion valve the pressure and temperature are reduced so that the liquid will absorb heat and “boil,” thereby evaporating and cooling the interior of the refrigerator. After the refrigerant passes through the cooling coils, it returns to the compressor and the cycle is repeated. From the point where the liquid leaves the expansion valve to where it is compressed again, it is under low pressure and this is the “low” side of the system.

✓ While the foregoing isn't typical of any one unit, it's a general indication of how mechanical refrigeration by means of a compressor is accomplished. Other types of compressor systems include those which have high and low-side float valves, restrictors and capillary tubes instead of expansion valves. In some units a plate-type





In brief, here's what happens during a compression refrigeration cycle: Refrigerant is raised to a high-pressure gas in the compressor, liquefied in the condenser, stored in the receiver, metered at the expansion valve, "boiled" in the evaporator to cool the interior of the cabinet, and returned to the compressor to complete the cycle

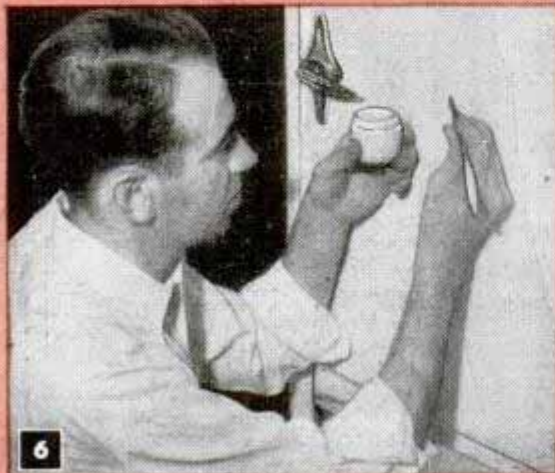
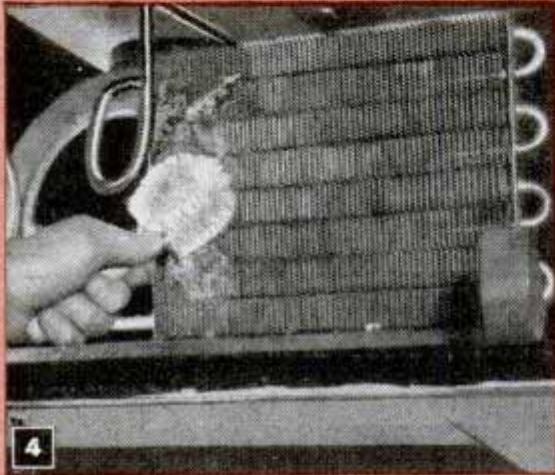
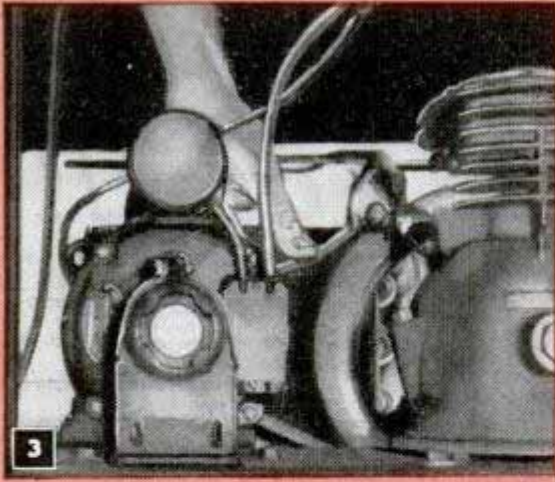
condenser is combined with the receiver and is air-cooled instead of being the fin-and-tube type, Fig. 4, that is cooled by a fan.

✓ To start and stop the unit when refrigeration is needed, there is a system of automatic controls. Usually these are switches or relays that are operated by temperature or pressure, and if they do not function properly, they should be adjusted or replaced by a serviceman. Sometimes adjustments can be made by referring to instruction sheets pasted inside the cover of the switch box. However, first check the electrical current to be sure that it is supplying power and test the motor for proper operation. When possible, also check the wiring for shorts, grounds and continuity. If the unit is of the "hermetic" type, the motor and compressor are sealed in a housing and require replacement as a unit if defective in operation. The "open" unit has the motor connected to the compressor by a V-belt drive. "Semihhermetics" are a combination of the open and hermetic types, having a sealed compressor that is direct-connected to the motor. Any of these types can have either a reciprocating compressor, which has pistons that function like those in an automobile engine, or a rotary compressor that is like a positive-action pump.

✓ An efficient machine is one that's clean, and a condensing unit (compressor, condenser, receiver, metering device and evaporator) is no exception. Ac-

cumulations of dust, dirt and oil act as insulation and prevent proper air circulation and removal of heat from the unit. This is especially true of the condenser. Both the fin-and-tube type and the plate condenser should be cleaned with a brush to remove any accumulated dirt, Fig. 4. With the fin-type condenser, be sure that the passages between the fins are free of obstructions





and check to see that the fan blades are not bent or otherwise operating improperly. When working around an open condensing unit, always disconnect the refrigerator from the power supply as operation of the unit is automatic and it may start or stop at any time, catching a tie or loose clothing.

✓ In connection with air circulation, another point to check is the location of the refrigerator. For most makes there should be at least 3 in. between the back of the cabinet and the wall, Fig. 2, and as much or more space above and at the sides. Any pockets which restrict the free flow of air cause inefficient operation. This may be indicated when the refrigerator operates in short cycles; that is, starts and stops frequently.

✓ When going over an open condensing unit, always check the V-belt drive for tension and alignment. Tension can be tested by pressing the belt with the thumb, Fig. 3. There should be about $\frac{1}{2}$ in. deflection. If the belt is too loose, there will be slippage and loss of power. One of the simplest ways to check alignment is to place a straight-edge against the face of the compressor pulley and see that it is parallel with the face of the motor pulley. When a belt becomes loose or frayed it should be replaced. This is done by loosening the motor-mounting bolts and sliding the motor toward the compressor. After the belt has been replaced, check the new one for tension and alignment, but remember that it will stretch somewhat.

✓ Although most motors do not require frequent oiling, if they run dry they will overheat and burn out bearings. Lubricate the motor according to instructions for the particular type that you have, but do not use too much oil or grease, as this, too, will cause overheating. Be careful not to drop oil on the V-belt as this causes deterioration of the rubber. When testing the drive, tighten all mounting bolts to eliminate a possible cause of excessive vibration.

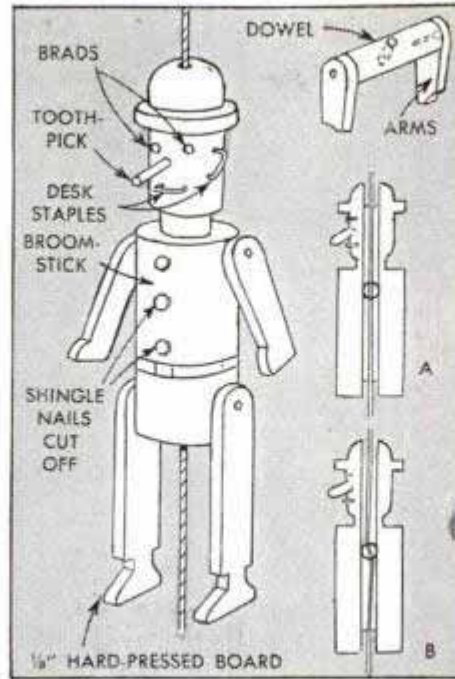
✓ Sometimes a compressor runs continuously or too long. Some causes for this are an excessive refrigeration load, or food placed in such a way as to obstruct the circulation of air inside the cabinet so that only the space around the evaporator coils is cooled. When placing food in the refrigerator, do not have it above room temperature.

✓ It may be necessary to replace the gasket around the refrigerator door if it becomes loose and allows cold air from inside the cabinet to leak and cause frequent operation of the condensing unit. The gasket can be replaced by removing the screws or loosening the metal flanges that hold it in place, Fig. 5, and inserting new strips. To keep the unit neat appearing, repair chips or scratches with porcelain enamel or glaze, Fig. 6, or use a lacquer. Clean the damaged area before patching.

When you know the secret command, this little man will slide down the string or stop when you tell him to, but for anyone else he'll only slide and refuse to stop until he reaches the bottom of the string. The real secret lies in the position of the dowel that fastens the two arms. There is a hole drilled in it through which the string passes, and if this hole is aligned as shown in detail A, it will be impossible to stop the toy. However, if the hole is out of alignment, as shown in detail B, the man will slide when there is little tension on the string and stop when it is pulled tight. Care must be taken to be sure that

the dowel is a tight fit in the body for the toy to work properly. The man is carved from a broomstick and he has hard-pressed-board arms and legs. Shingle nails, staples, brads and a toothpick serve as features and decoration. Gaily colored enamels will give the toy an attractive appearance.—Peter B. Horsley, Calgary, Alta., Can.

Toy Will Stop or Slide on String At Secret Command of Operator

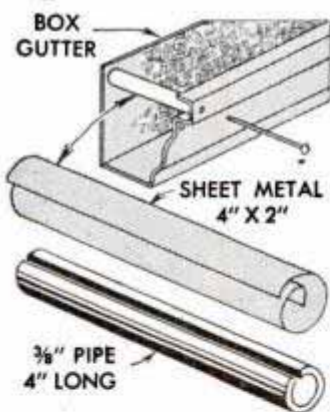


Key Concealed in Screen Door Is Readily Accessible

Here's a place to keep the door key where it will be readily accessible to all members of the family without having to bend over to pick it up from underneath the door mat. On the hinged edge of the screen door, mortise an opening into which the key will fit. This should be at a convenient height. A similar mortise is cut into the storm door where the key can be concealed during the winter.

Joseph St. Laurent, Bremerton, Wash.

Spacers Are Bent Around Pipe

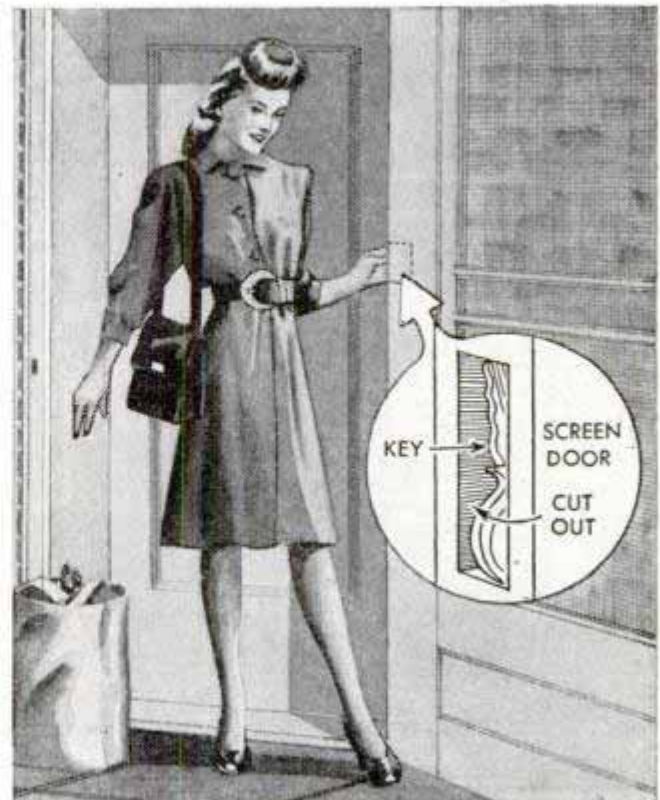


Spacers for box gutters are formed quickly and easily with a piece of $\frac{3}{8}$ -in. pipe 4 in. long. If longer or shorter spacers are required, the length of the pipe is varied accordingly. Cut a slit in the pipe to hold one side of the sheet

metal. After the metal is inserted, it is rolled around the pipe and then slipped off. This insures spacers that are uniform in length and diameter.—Richard Verbrughe, Grosse Pointe Park, Mich.

How to Waterproof Minnow Nets

If a minnow net or seine is to be waterproofed, it should be thoroughly dry before it is treated. The net is soaked for half an hour in raw linseed oil and spread over bushes or hung on a line to dry. Nets given this treatment will not absorb water and after use they can be shaken to throw off moisture and immediately packed in a car.



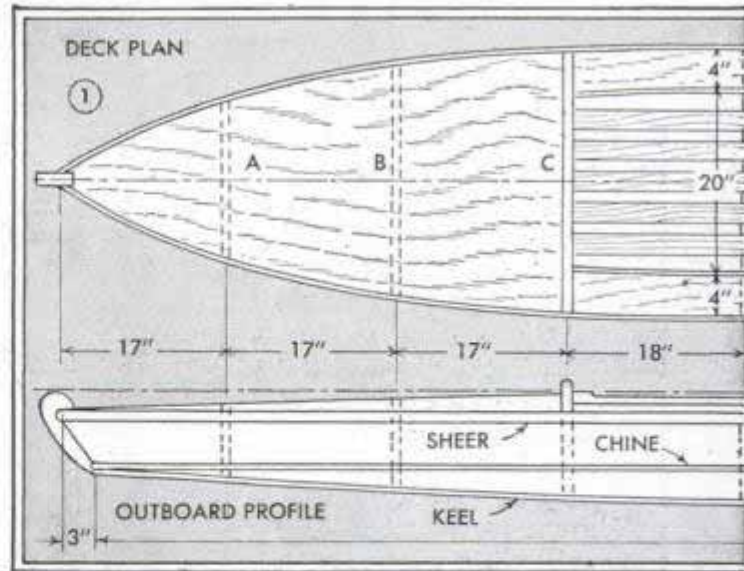


"Skimmer" A STURDY

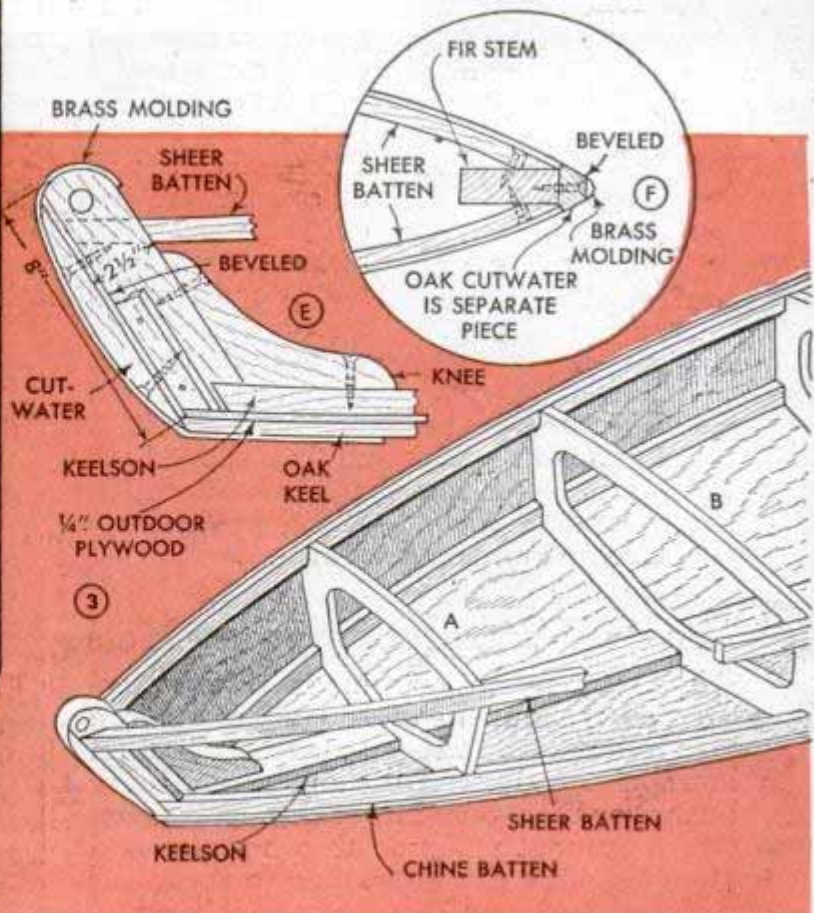
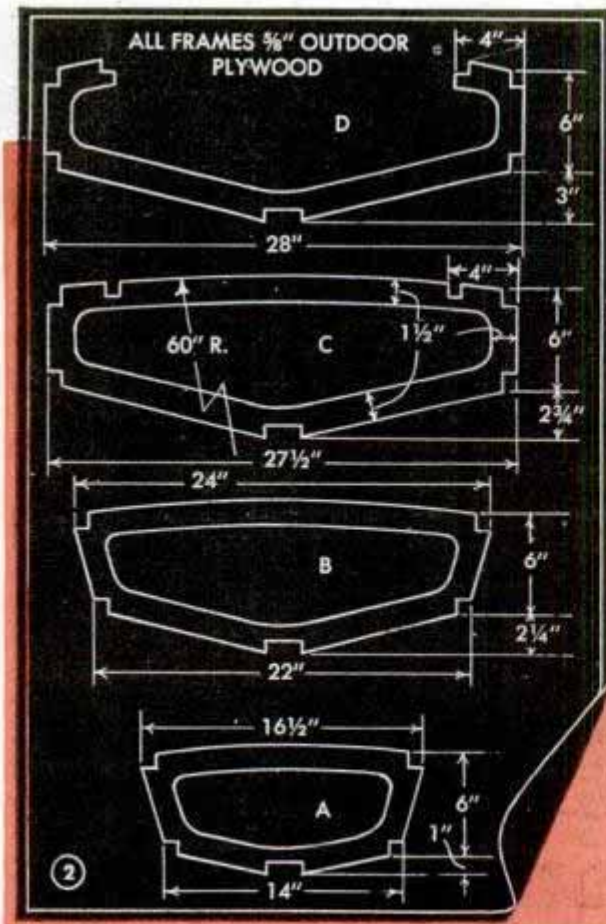
You can put a kayak together in no time — it's not a lengthy all-season boat building project

By Hi Sibley

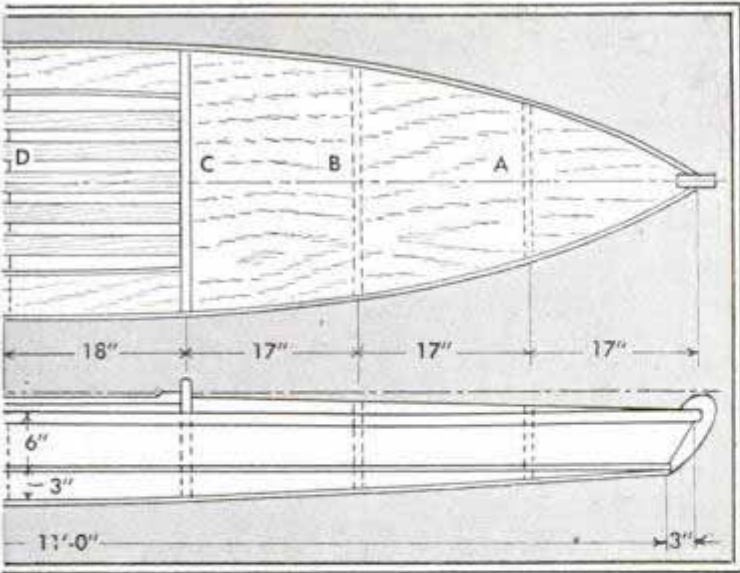
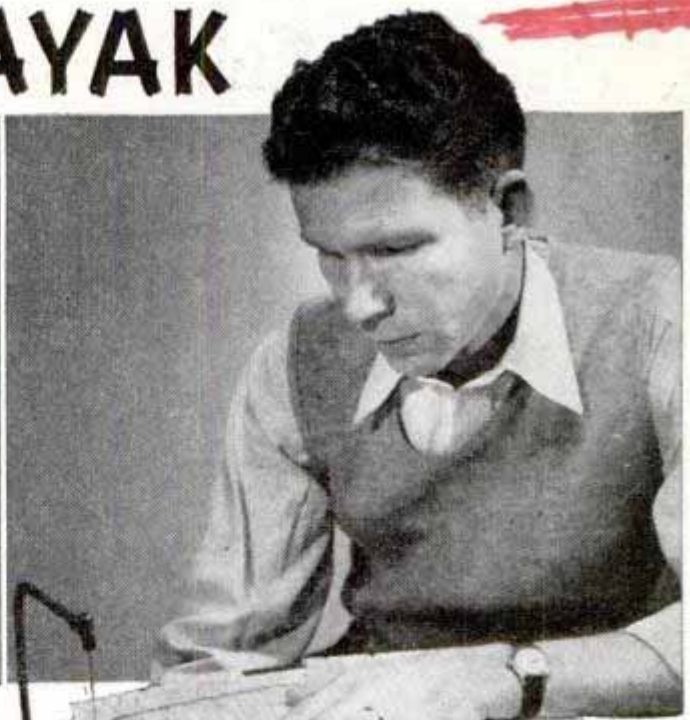
THIS KAYAK is staunch and seaworthy because it's built of waterproof plywood over a conventional frame. Sides are vertical and only 6 in. high from the bottom edge of the chine to the top edge of the sheer batten, but this gives enough free-board to keep off moderately rough water. Fig. 1 gives the deck and profile plans. Start building by laying out the frames full size on heavy brown paper, following the dimensions in Fig. 2. Then transfer the outlines to $\frac{5}{8}$ -in. waterproof plywood, making duplicates of frames A, B and C. Saw to the outlines with a jigsaw. Where plywood is not used make frames as in Fig. 4. Cut $\frac{3}{4}$ by 1-in. notches for the chine and sheer battens and a $\frac{3}{4}$ by 2-in. notch for the keelson in each frame. Make a rough frame or "building board" on which you can assemble the frame of the kayak upside down. Cut out the stem and stern parts, the cutwater, filler blocks and knees as duplicates, detail G of Fig. 3. Then



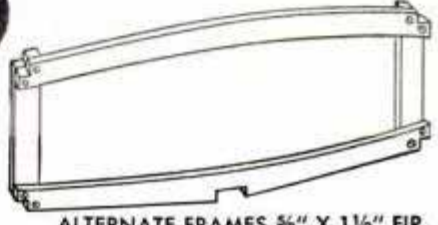
assemble on the building board with frames, stem and stern parts, keelson and the chine and sheer battens fastened with glued and screwed joints. Use galvanized screws for joining the frame. Before the glue dries make sure the frames are square and that the assembly is level. Note also from detail A in Fig. 2 the fairing on the chine, sheer batten and keelson. This must be done carefully with a plane so that the deck, sides and bottom will lay properly. Fit the plywood sides first, then coat the chine with marine glue and lay on $\frac{1}{2}$ -in.



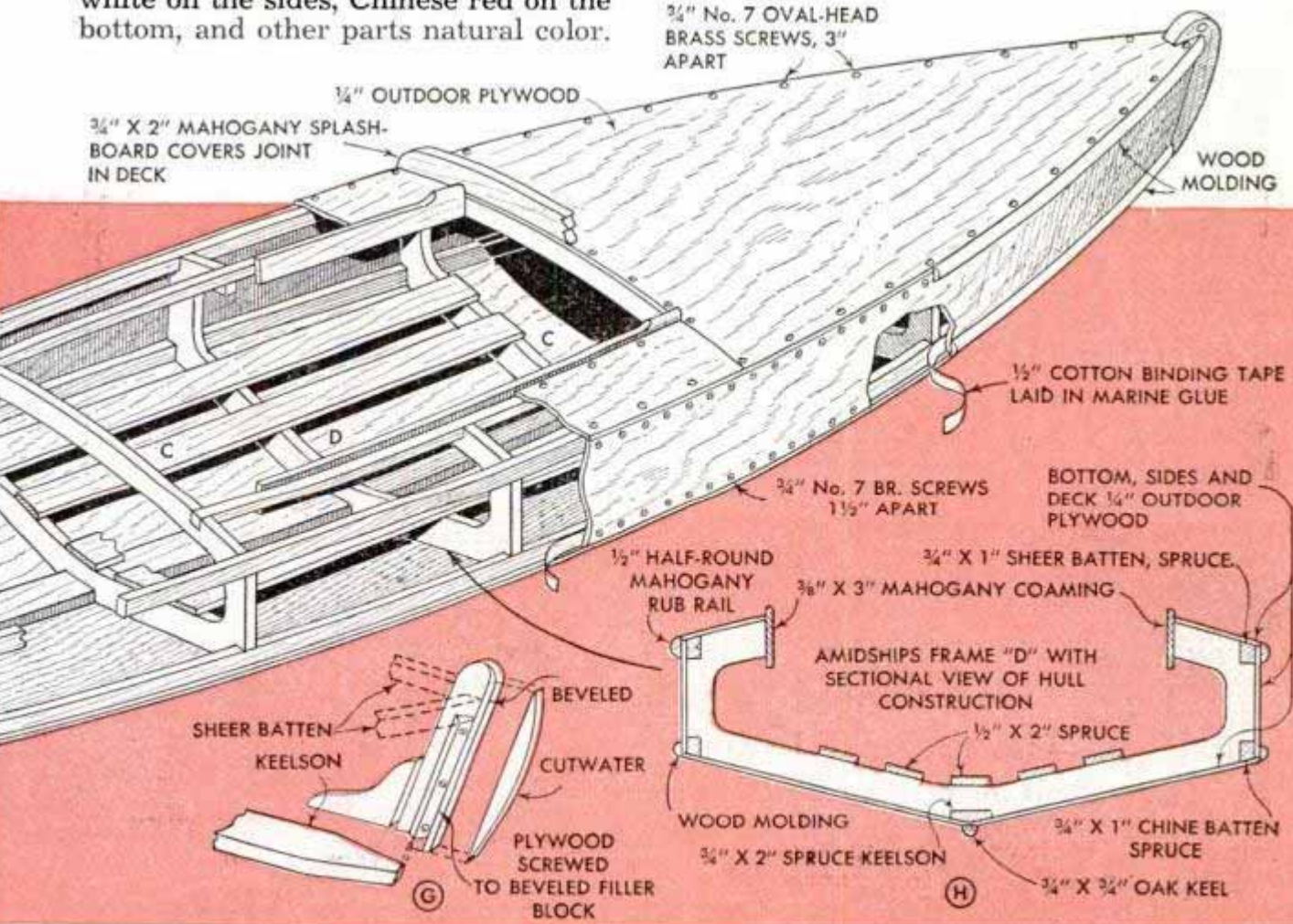
PLYWOOD KAYAK



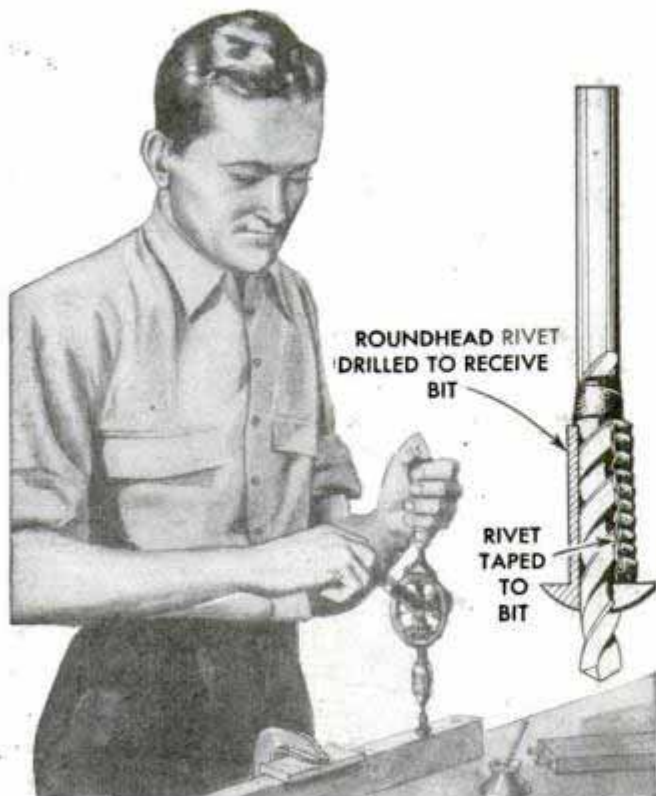
binding tape as indicated. Apply marine glue to the sheer batten also. Then screw the sides in place. Many builders make the same joint at the chine and keelson. Either way, apply marine glue liberally and uniformly. Space the screws the same as on the sides. This leaves only the deck, coaming and false bottom to be fitted. The splashboards, Fig. 3, should be bandsawed to the exact curvature of the deck. One effective color combination is cream or white on the sides, Chinese red on the bottom, and other parts natural color.



ALTERNATE FRAMES $\frac{5}{8}$ " X $1\frac{1}{2}$ " FIR, SCREWED TOGETHER



Roundhead Rivet Serves as Stop For Small Hand Drill

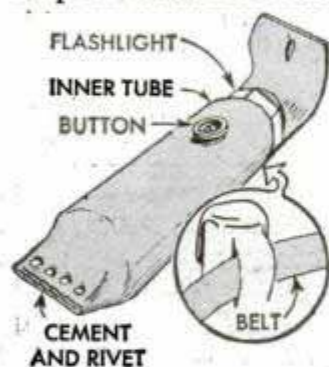


With a roundheaded rivet and a short length of friction tape, a very serviceable drill stop can be made. The rivet is drilled to be a close fit over the bit and is slipped on with the head down. The "stop" is held at the desired position with the tape.

Robert A. Horacek, Burbank, Calif.

Flashlight Case Is Dampproof

Proof against damp air, this flashlight case will slip over a belt where it is readily accessible when needed. Cut a piece from a motorcycle inner tube long enough to fit over the flashlight and allow for a flap at the top. The two slits at the back form a loop for attachment to the belt and another slit is cut in the flap to serve as a button hole for the button on the front of the case. The bottom is cemented and riveted. All slits should be reinforced at the ends to prevent them from tearing.



The bottom is cemented and riveted. All slits should be reinforced at the ends to prevent them from tearing.

Dental Tools Used in Small Lathe

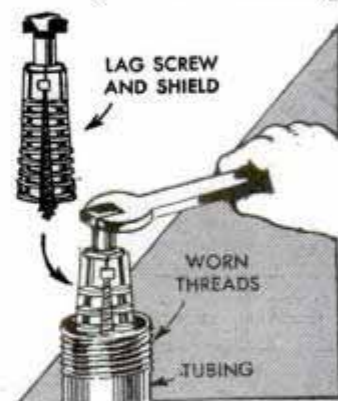
Small lathe tools for boring and inside threading on fine work can be made from broken dental tools which are usually easy to obtain. To prepare the tools, anneal the metal and bend it to the desired shape,

using a file to make the cutting edge. Then harden it by heating and quenching in oil or water. Touching up the edge with an oilstone completes the process.

Grover G. Strother, Belington, W. Va.

Screw and Shield Expand Tubing

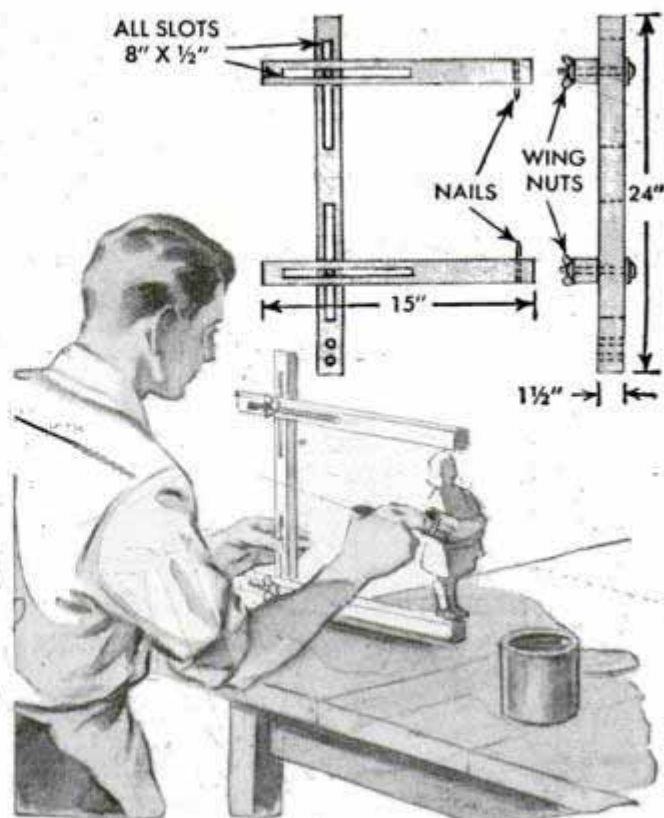
Thin-wall tubing that has been dented at the ends so the threaded portion will not take a fitting can be straightened by using a lag screw and expansion shield. The screw and shield are slipped inside the tube and the former is turned until the dents are removed. Be careful not to stretch the tube beyond its original diameter.



A. H. Waychoff, Phoenix, Ariz.

Simple Clamp Holds Small Parts While Painting Them

Tired of getting paint on his hands and smearing the work, one craftsman made an adjustable clamp to hold small objects that were to be finished. Both the wooden upright and the two arms are slotted for wing nuts so adjustment can be made for pieces of various sizes. A nail is driven through the end of each arm to hold the work in place. The upright is bolted to the work table.—E. J. Wiczorek, Chicago.



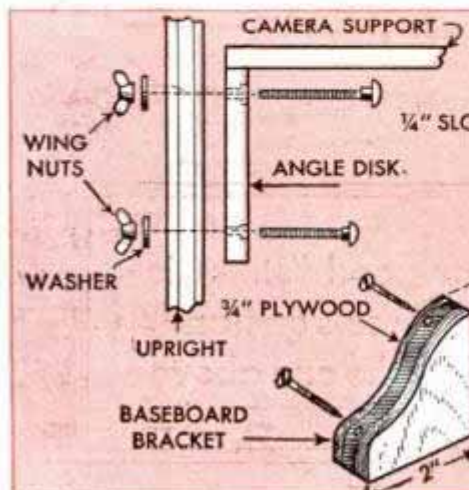
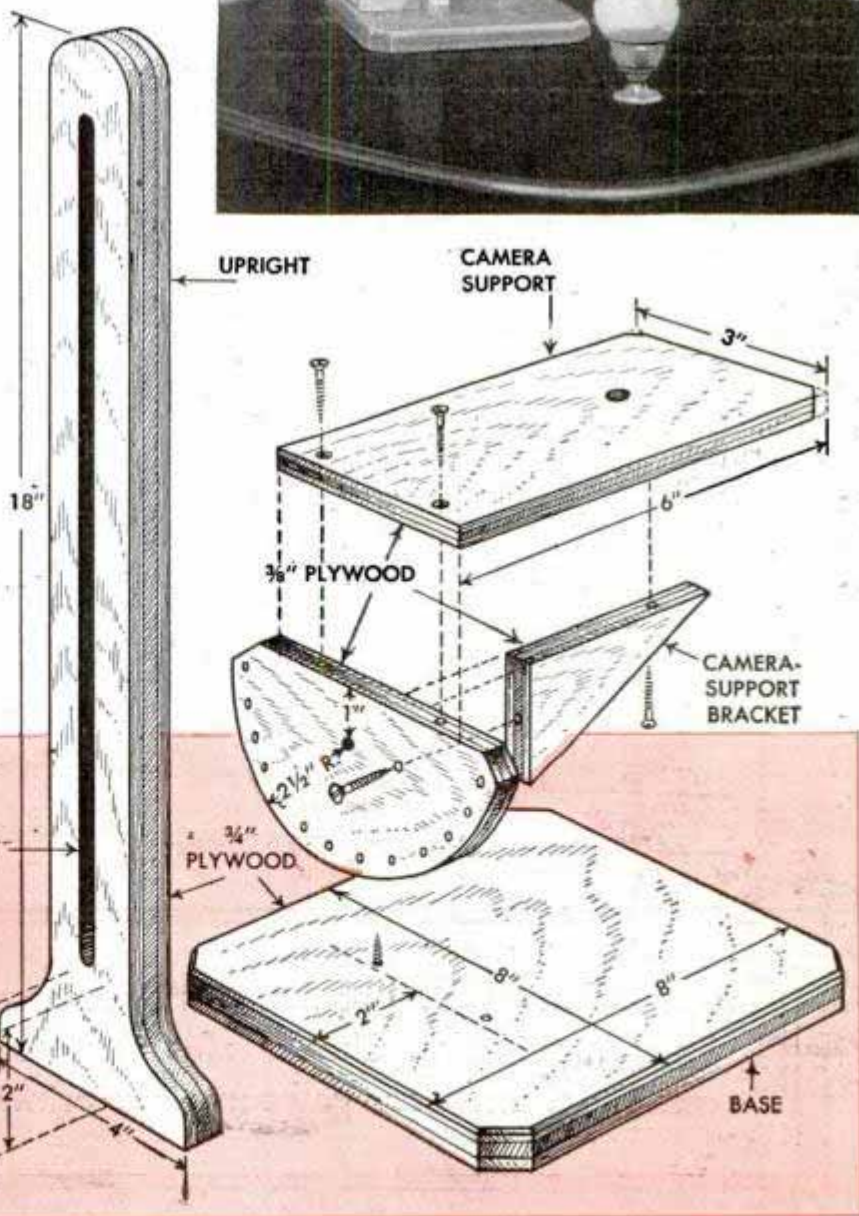
MIDGET TRIPOD

for table-top shots

By E. Peter Smith

IT'S A MUST for any photographer who wants to take close-up shots with a small camera. With this stand, natural-history close-ups, caricatures or any other type of table-top photography are made just about as easy as the simplest outdoor snapshot.

Construction details below show how to put the stand together. Plywood is indicated as the material to use but of course you can substitute any solid hardwood. The important detail to notice is the half-circle quadrant which is laid out in 15-deg. angles. Holes are drilled at these points and small bolts and wing nuts allow the camera to be shifted and locked at any angle. A camera support is screwed to the straight edge of the quadrant, reinforced by an off-center brace located to permit easy access to the center bolt. A $\frac{1}{4}$ -in. stove bolt of the proper length usually fits the threaded tripod bushing of American-made cameras. Foreign-made cameras require a special bushing. Drilling the proper-size hole in the camera support and inserting the tripod screw completes the stand. As you can see, it is possible to adjust both the height and angle of the camera as desired. By shifting the camera and stand alternately you get practically a universal adjustment. This makes it easy to use the camera and support directly on the table top or on an adjacent stand.

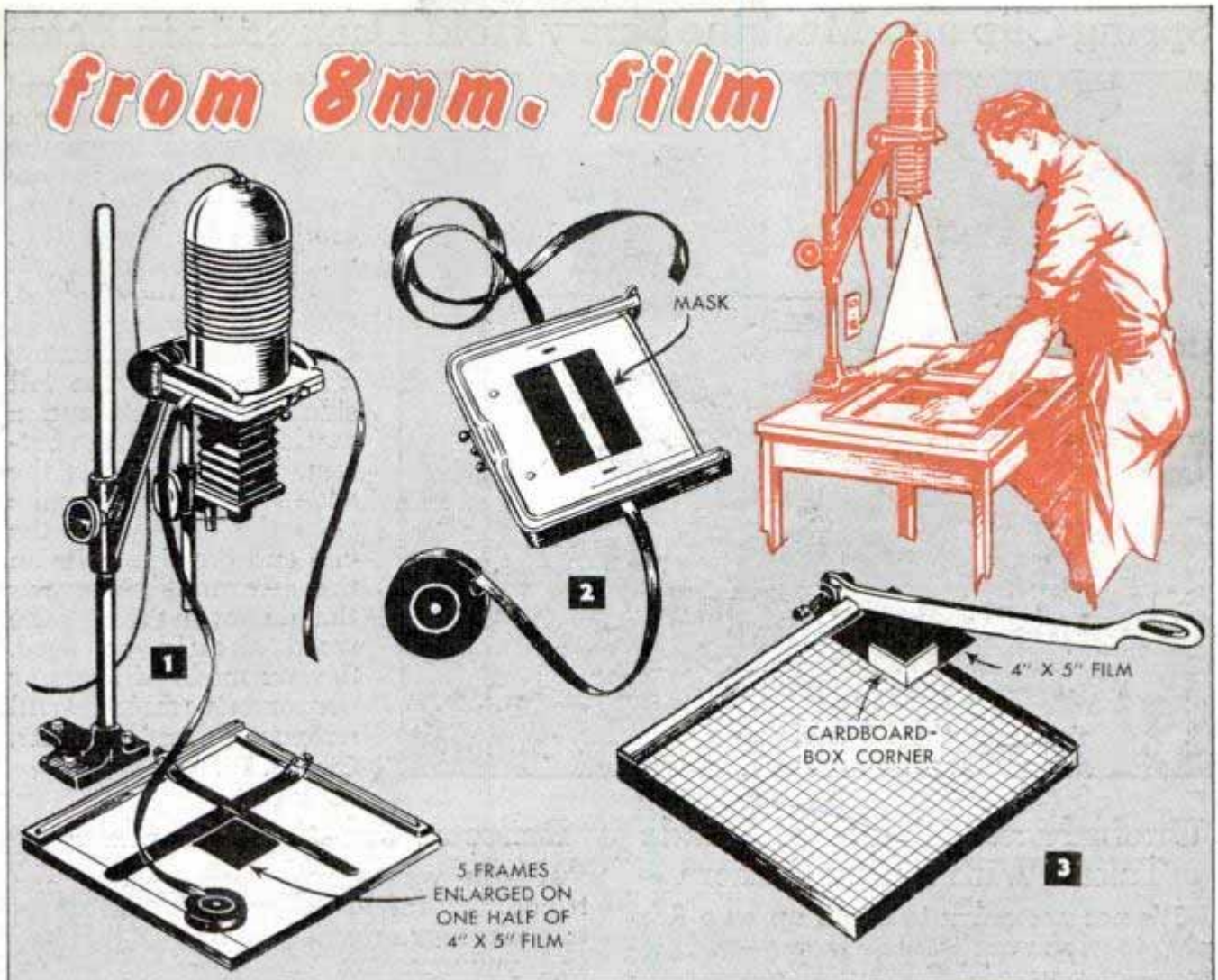


MAKING ENLARGEMENTS



A much-neglected source of negatives for good "stills" is 8mm. movie film. Choose a few frames from reels on hand, and the chances are you can make prints like the one above

From 8mm. film



All that's needed to make enlargements from 8mm. movie film is an enlarger, some 4 by 5-in. cut film and a fine-grain developer. The procedure is much the same as when making any enlargement except that the movie-film positive is projected on regular film first to produce the negative from which the final print is made. The film for the negative should be a fine-grained panchromatic type.

First step, of course, is selection of the scenes from the movies that you wish to enlarge. Because the picture will be magnified many times, the frames should be those which are in sharpest focus. Place the film strip in the negative carrier of the enlarger so that at least five frames of the scene can be projected at the same time, and be sure to mask the strip carefully, Fig. 2. If the enlarger has a glassless carrier, place one edge of the strip so that its entire length is held between the carrier plates to prevent possible buckling. Then, as before, mask off the rest of the opening. Let the loose ends of the film hang down out of the way, Fig. 1.

In the darkroom, cut the 4 by 5-in. film lengthwise so there are two strips, each 2 by 5 in. If a cardboard-box corner is used to position the film on the trimmer, Fig. 3,

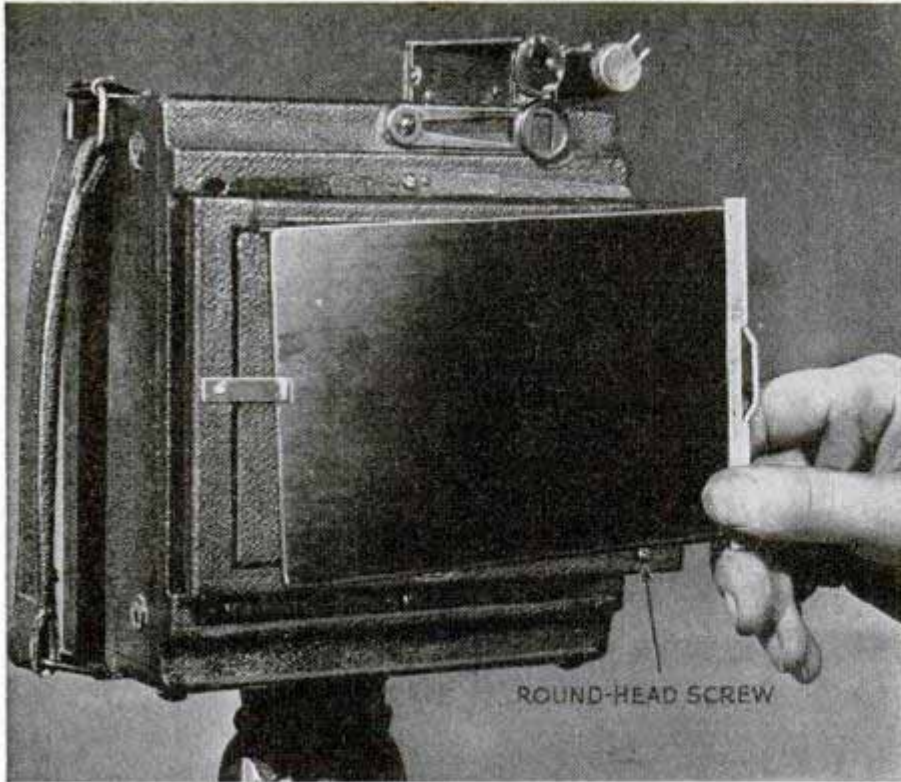
By Marion Schwerman

the task will be much easier and the results will be accurate. To project the movie film, place the carrier in the enlarger and focus on the easel so that each frame is about 1 in. wide. Then place the cut film on the easel and project the 8mm. frames on it. Five frames should about cover the length of the strip.

With five frames on the same film, it's possible to give each one a different exposure, much in the same way that a test strip is made on enlarging paper. At first it will be necessary to do a little experimenting; for example, try exposures of 1 sec., 2 sec., 4 sec., 8 sec. and 16 sec. with the lens set at f:11. However, the exposure will depend somewhat upon the light source in the enlarger and the speed of the film being exposed. Once the approximate exposure range necessary for the materials and equipment you have has been determined, the 5-test strip should cover scenes from most films.

The negatives that are made will be about the same size as 35mm. film. As mentioned, use fine-grain developer and avoid too much contrast. Then select the best frame and enlarge it as you would any other negative, using a matte-finish or similar paper to avoid grain.

Spring Clip and Machine Screw Hold Dark Slide in Place



After you've focused and are all set to take a picture, where to put the dark slide of a press-type camera is a problem. Generally it's too big to fit in a pocket, and if you lay it anywhere, it may be lost. One photographer solved this problem by attaching a spring clip to the left side of the back and a machine screw at the bottom. When he pulls the slide to take a picture, he slips the end under the clip and the side rests on the screw. Short screws that do not go through the wood should be used. Screws made of brass or noncorrosive material will not rust.—Frank P. Fritz, Cicero, Ill.

Unobstructed Picture of Parade Taken With Reflex Camera

It's not necessary to climb up on a fire-plug to get an unobstructed view—and picture—of a parade. Owners of reflex cameras will find that they can be held upside down, above the heads of the crowd, and the picture taken from this position. The ground glass is used to frame and focus the picture, just as is done when the camera is held in the normal manner at waist level.

Bob Hurst, Chicago.



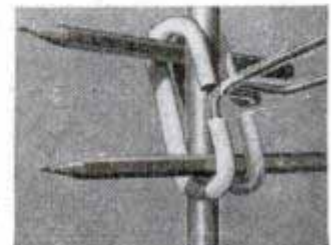
Reflector Substitutes as Tripod

If you want a tripod for tabletop photography and your camera is small, you can use a photoflood reflector and clamp to advantage. The camera is held by the rubber-covered jaws. Be sure the ball-and-socket joint is tight enough to hold the camera.

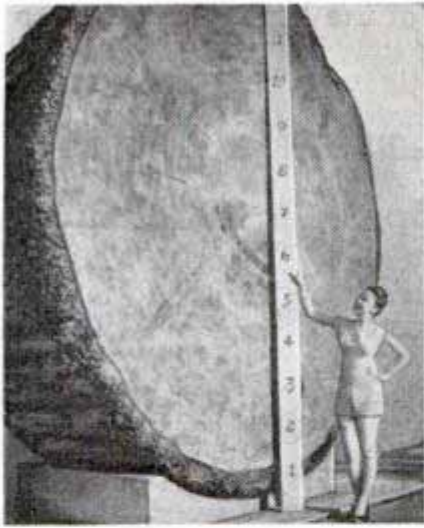


Pencils Help Secure Reflector To Photoflood Standard

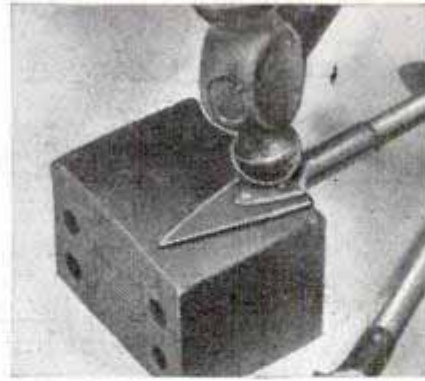
When working with photoflood clamp-on reflectors, sometimes it is necessary that one or more be fastened in a low position on the stand to obtain the desired lighting effect. However, usually the clamp will not grip the shaft of the stand tightly and the reflector tends to tilt downward, throwing the light on the floor. If two pencils are slipped through the loops of the clamp as indicated, the reflector will be held firmly in position.—R. F. Donovan, Jersey City, N. J.



CRAFT QUIZ



1. Largest in United States is—
 (a) 26-ft. diameter (c) 32-ft. diameter
 (b) 19-ft. diameter (d) 47-ft. diameter



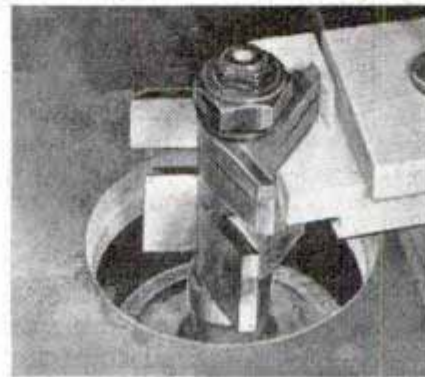
2. Hammer used for riveting is—
 (a) Planishing (c) Ball pein
 (b) Cross pein (d) Blocking



3. Most plastic articles are—
 (a) Phenolics (c) Acetates
 (b) Acrylics (d) Ureas



4. Tool used here is a—
 (a) Harpoon (c) Bolas
 (b) Sky hook (d) Peavey



5. Wood being shaped is—
 (a) Pine (c) Mahogany
 (b) Walnut (d) Rosewood



6. This cart is sometimes called—
 (a) An Escalator (c) A dolly
 (b) A wanigan (d) A dado



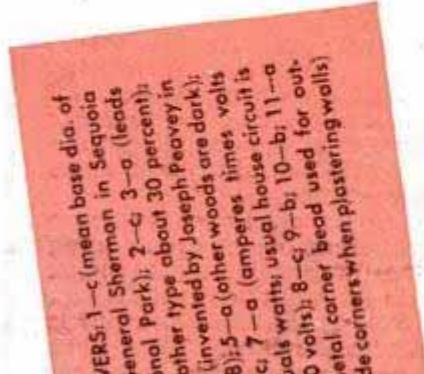
7. A 9-amp. iron pulls about—
 (a) 1000 watts (c) 750 watts
 (b) 500 watts (d) 400 watts



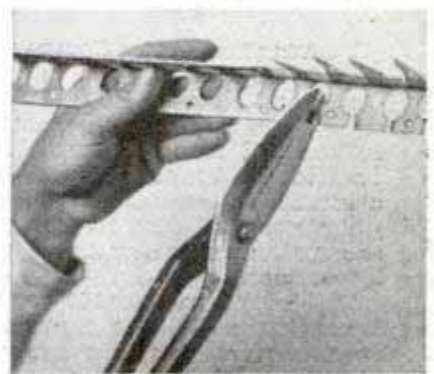
8. Wall treatment here is—
 (a) Ship lap (c) Batten seam
 (b) Drop siding (d) Square sticking



9. You'll find the most trees in—
 (a) United States (c) Brazil
 (b) Russia (d) China



10. An oak table like this is—
 (a) Sheraton (c) Old world
 (b) Mission (d) Adam



11. This goes with—
 (a) Plaster (c) Flagstones
 (b) Plastics (d) Shingles

ANSWERS: 1—c (mean base dia. of the General Sherman in Sequoia National Park); 2—c (leads any other type about 30 percent); 3—d (invented by Joseph Peavey in 1858); 4—d (other woods are dark); 5—c (amperes times volts equals watts; usual house circuit is 110 volts); 6—c; 7—c; 8—b; 9—b; 10—b; 11—d (metal corner bead used for outside corners when plastering walls)

Red Ribbon Tied to Fishing Fly Will Attract Frogs



TROUT FLY AND RED RIBBON

Many fishermen use a long, limber cane pole and a light line to reach over into the lily pads and moss when fishing for frogs. With this setup, a trout fly makes an ideal lure, and if a short piece of red ribbon or wool yarn is tied to the bait so the ends hang down over the fly, it will prove more attractive. Some fishermen use just the ribbon or yarn tied to an ordinary hook.

Nail Keeps Bolt From Turning



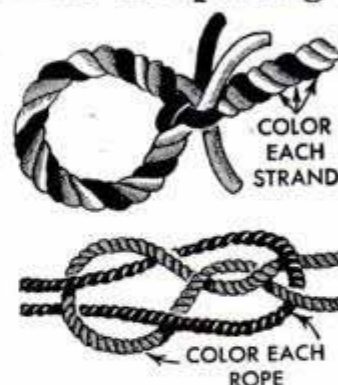
One way to keep a carriage bolt from turning or working loose is to drill a hole at an angle through the

projecting part of the head. Then drive a nail through the hole into the wood. If the nut is pulled up tight and held in place with a lock washer, there is little likelihood that the bolt or nut will become loose.

Colored Rope Aids in Splicing

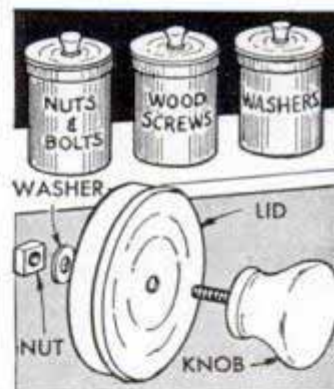
For the novice in rope tying, it's hard to see just how a splice or knot is made because the various strands, being the same color, are difficult to trace. When making splices, color each strand a different color, and when tying knots, color the ropes differently. This will eliminate confusion and make learning an easier process. Inks, very thin paint or dye may be used.

Andrew Vena, Philadelphia, Pa.



Handy Knobs for Tin Containers

Tin cans that are used around the workshop for nuts, bolts and other small parts will look neater and be much handier if the lids are fitted with knobs. Regular household pot-cover knobs will do. Holes are punched in the top of the lids and the knobs are attached with nuts and washers. Painting and labeling the cans will improve their appearance. —Ivan J. Stretten, Detroit, Mich.



BUILD YOUR HOME YOURSELF

Popular Mechanics Company is pleased to announce the publication of both a book, *Your Home and How To Build It Yourself*, and a set of ten working-size blueprints for our "Build-It-Yourself House." These are our contribution to the crucial housing shortage, and, as a service to our many readers who have been unable to find comfortable living quarters, we are making these available through our Book Department.

The book contains 100 pages—three-fifths of it consisting of photographs and working drawings. Several sections are printed in colors showing just how your own house will look. Every construction detail is given step by step and board by board, so that even the most

inexperienced person can understand it easily.

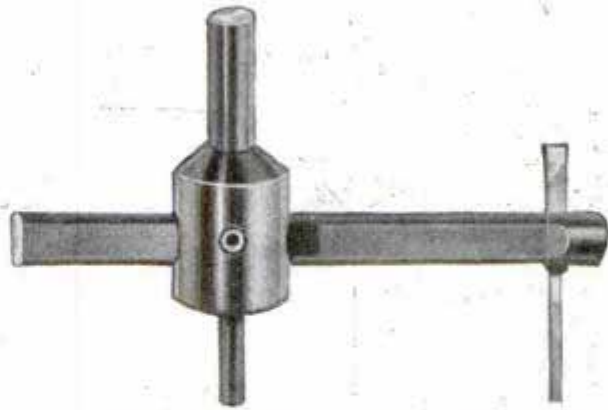
The blueprints give floor plans, elevations, framing, plumbing, wiring diagrams, etc. Of course, the house is easily adaptable to other types of architecture, such as modified Dutch Colonial, modified Cape Cod, and plain gable roof without dormer windows.

Should you plan on building another house or remodeling your present one or even adding on another room the information in this book will enable you to do the work yourself.

Your Home and How To Build It Yourself is \$3.00—complete set of plans \$12.50. When both the book and plans are purchased together there is a special reduced price of \$14.00. Duplicate sets of plans are \$5.00 each.



DRILL-PRESS

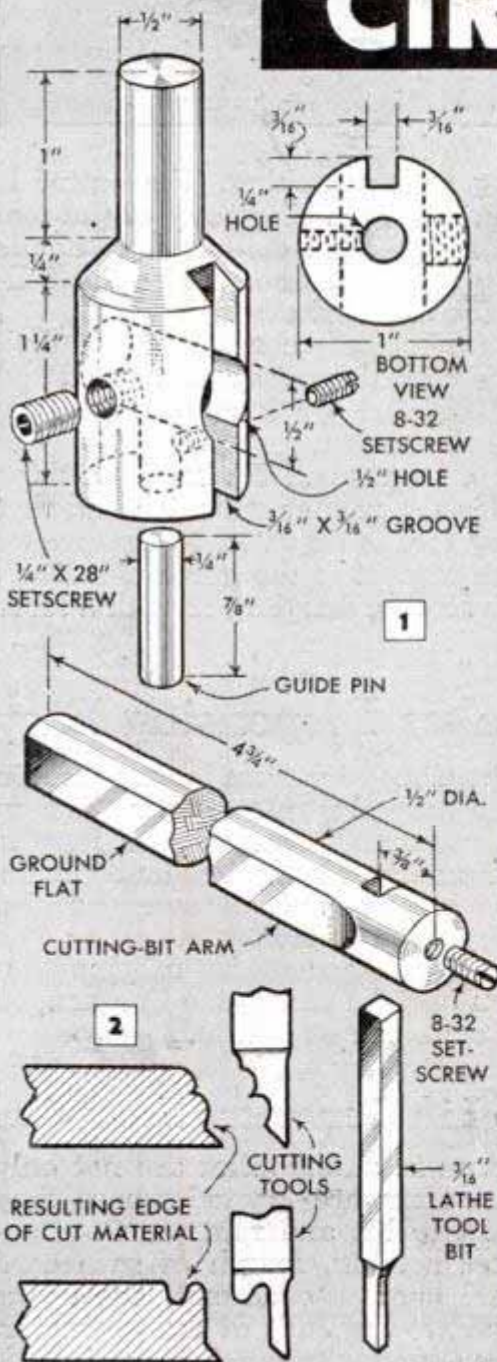


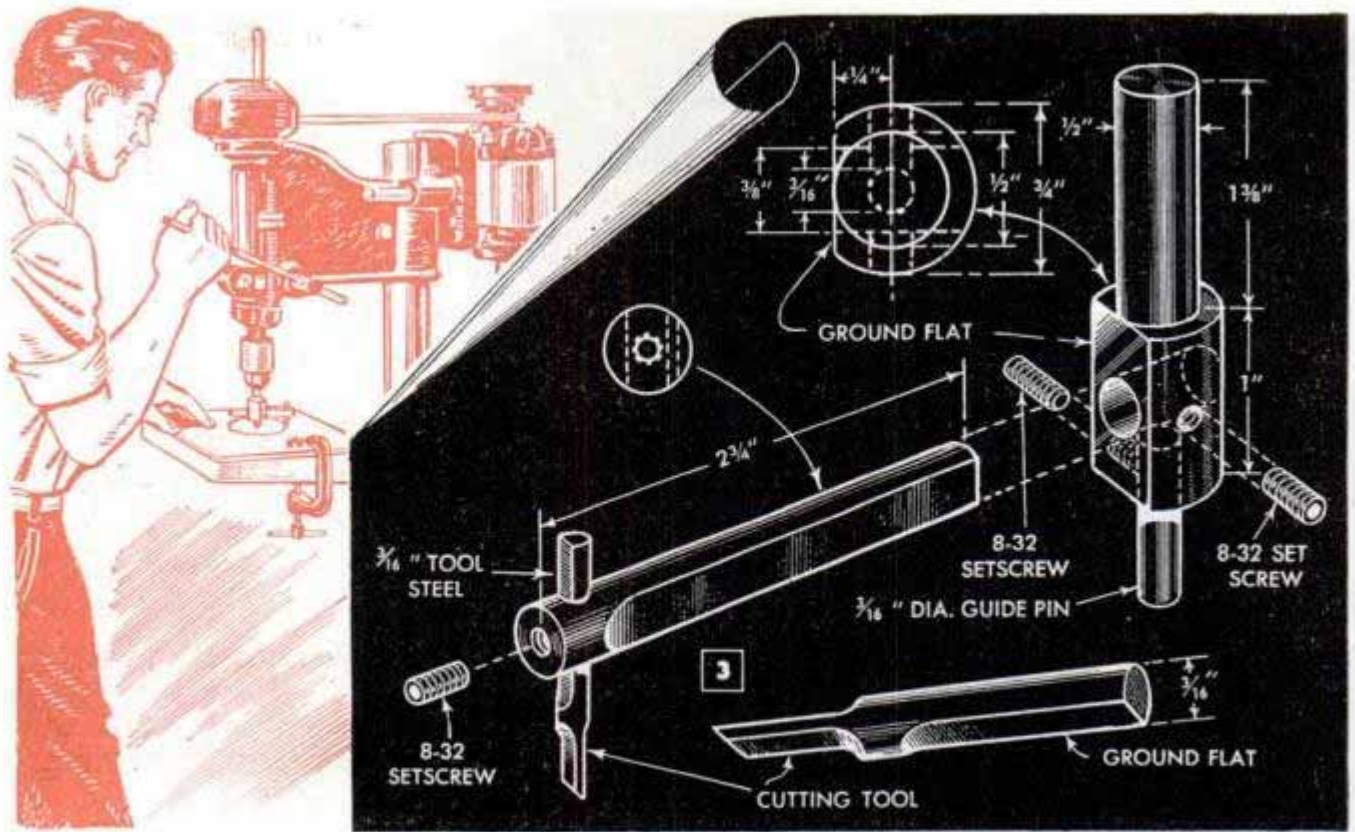
CIRCLE CUTTERS

By Wm. E. Danneman

IN THE AVERAGE JOB SHOP there's only occasional need for a circle cutter, but when you do need one you generally need it badly. It does work which is impractical to do by any other means except in a lathe or perhaps with a hole saw, that is, if you happen to have one just the right size for the work at hand. Within its limits the circle cutter is adjusted quickly to cut different sizes of circular disks or holes in any ordinary material such as wood, fiber, plastic, aluminum, brass or mild steel. Not only that, but by grinding shapes on the cutters you can cut disks with molded edges as in Fig. 2. Or by grinding a shape on the outside edge of the cutter you can cut holes with molded edges. The swinging arm, made from drill rod, carries the cutting bit and must be hardened and drawn on both sizes of the circle cutters detailed. All turning, milling, tapping and broaching must be done first, of course. Broaching required is merely the squaring of the hole taking the larger cutter bit and this can be done with a small file if necessary. The flat on one side of the arm can be milled or ground to size according to the facilities available. Hardening procedure is quite simple. First you heat the part to a cherry red and quench in No. 20 lubricating oil. Clean with fine emery cloth to remove the scale completely. Again heat slowly and uniformly until the metal comes to a light straw color. This temperature is quite critical and the process must be closely watched. At the instant the metal turns uniformly straw color, and before it turns blue, quench in cold water. This process hardens the part sufficiently to prevent the locking setscrew from cutting into the milled surface.

The holder, Fig. 1, is a simple machining job





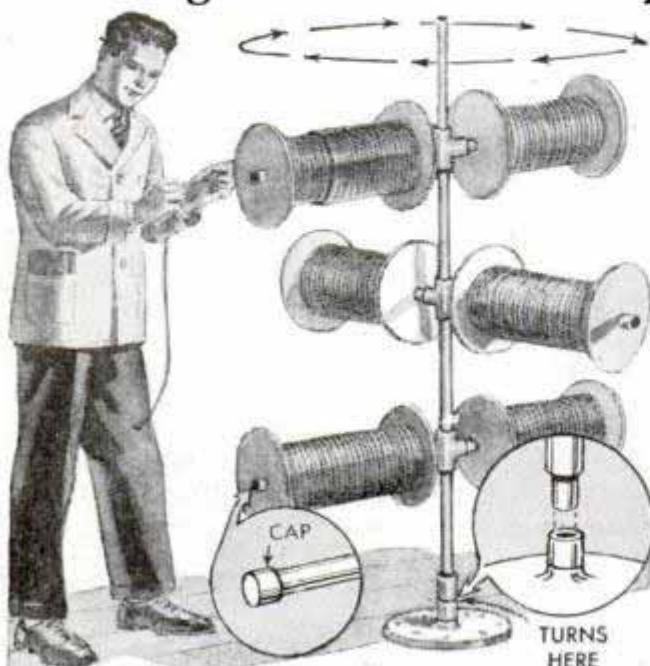
in mild steel. If desired, the guide pin can be hardened by the process already described. It will last much longer if hardened. Holes drilled in the holder for the guide pin and the arm carrying the cutting bit are reamed to final size. The groove milled in the body of the holder allows the cutting arm and the bit to slide to within $\frac{5}{16}$ in. of the center of the pilot hole. This brings the minimum hole size that the tool will cut down to $\frac{5}{8}$ in.

The small cutter detailed in Fig. 3 is made up in essentially the same way as the larger size already described. The cutting tool is made from $\frac{3}{16}$ -in. drill rod, hardened

by heating and quenching. The cutter is not drawn, however. The body of the tool is turned from $\frac{3}{4}$ -in. drill rod. A flat is milled or ground on one side of the full-diameter section as shown.

When using circle cutters in the drill press drive with slowest spindle speed and always clamp the work securely to the table, using bolts, fixtures or C-clamps. Use a cutting oil on steel. Be sure that the pilot hole is the proper diameter and that the cutting tool is adjusted to the proper depth with respect to the guide pin. Don't work with sleeves dangling or with a loose necktie.

Rotating Stand for Wire Spools Makes Dispensing Easy



For dispensing wire from large spools in a hardware store, this rotating stand is easy to use and requires little space. The lengths of pipe that serve as spindles or arms for the spools are capped on one end and screwed into pipe crosses at the other. The crosses fit into other pieces of pipe that serve as an upright and rotate in a flanged base. The arms are staggered.

Sling to Lift Generator From Car

Generators in automobiles are not only heavy, but often are located where they are difficult to lift and remove. One mechanic uses a 36-in. length of sash cord with a wire hook at each end. The hooks are attached to the ends of the generator, which is removed with much less effort.

W. V. Athanas, Ashland, Ore.

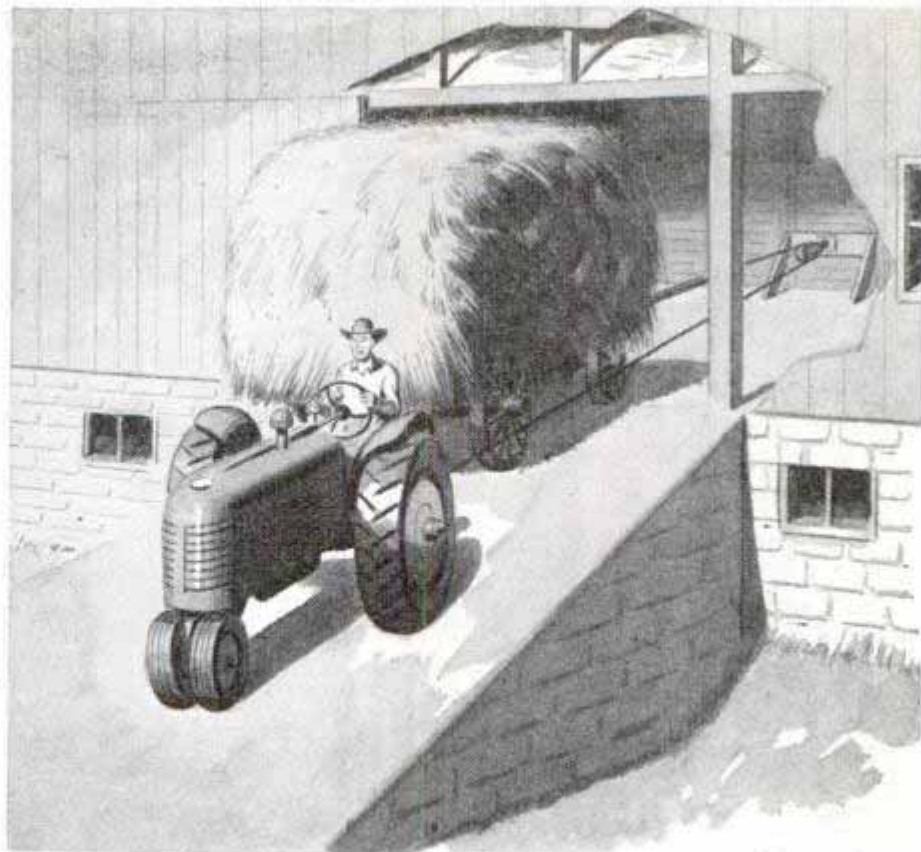
Tractor Hookup Prevents Fire

Instead of pulling a load of hay into a barn with the tractor coupled directly to the wagon, one farmer uses a rope and pulley as shown. This keeps the tractor out of the barn so that there is no possibility of a spark from the tractor exhaust igniting dry hay already in the barn. One end of the rope is tied to the wagon tongue, run over a pulley at the back of the barn and then out to the tractor. The rope should be long enough to permit keeping the tractor well away from the hay load on the wagon. If this should be fired, possibilities of losing the barn by fire would be almost as great as if the hay inside the barn were ignited.

Henry Droege, Pottstown, Pa.

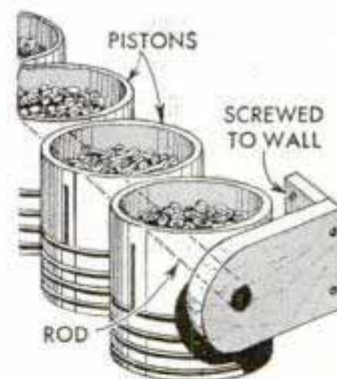
Angle "Break" in Wire Fence

Here's a simple way to build a fence that will permit people to pass through the opening but will stop most large animals. Two arms are built, as shown, and the other side of the fence extends almost to the bottom of the Y. Because it requires no special hardware or fittings, this opening is constructed quickly and easily. When it can be used, it costs less than a gate.



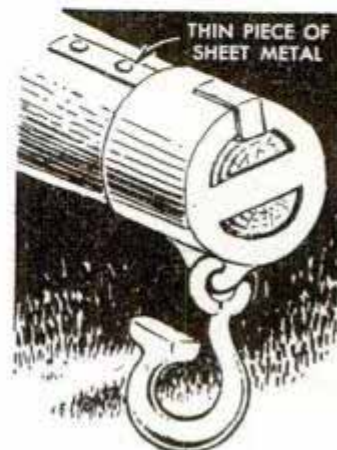
Small-Parts Holders From Pistons

Discarded automobile pistons, pivoted on a length of pipe or rod, make convenient holders for small parts. Wood brackets support the ends of the pipe. To use, tilt the piston so the parts fall into your hand. After it is released, the container will then swing back into the normal position.—T. H. Johnston, Ottawa, Ont., Can.



How to Secure Singletree Irons

Singletree irons will not slip off easily when they are secured with thin strips of sheet metal. Tack a strip to the singletree, letting it extend out beyond the end for a short distance. Then slip the iron in place and bend the metal back over it as shown in the illustration. This will make a firm fit and prevent the iron from working loose.—Paul Criton, Jr., Kayville, Sask., Can.



MODERNIZE THAT OLD LATHE

By
Jack
Mellinger



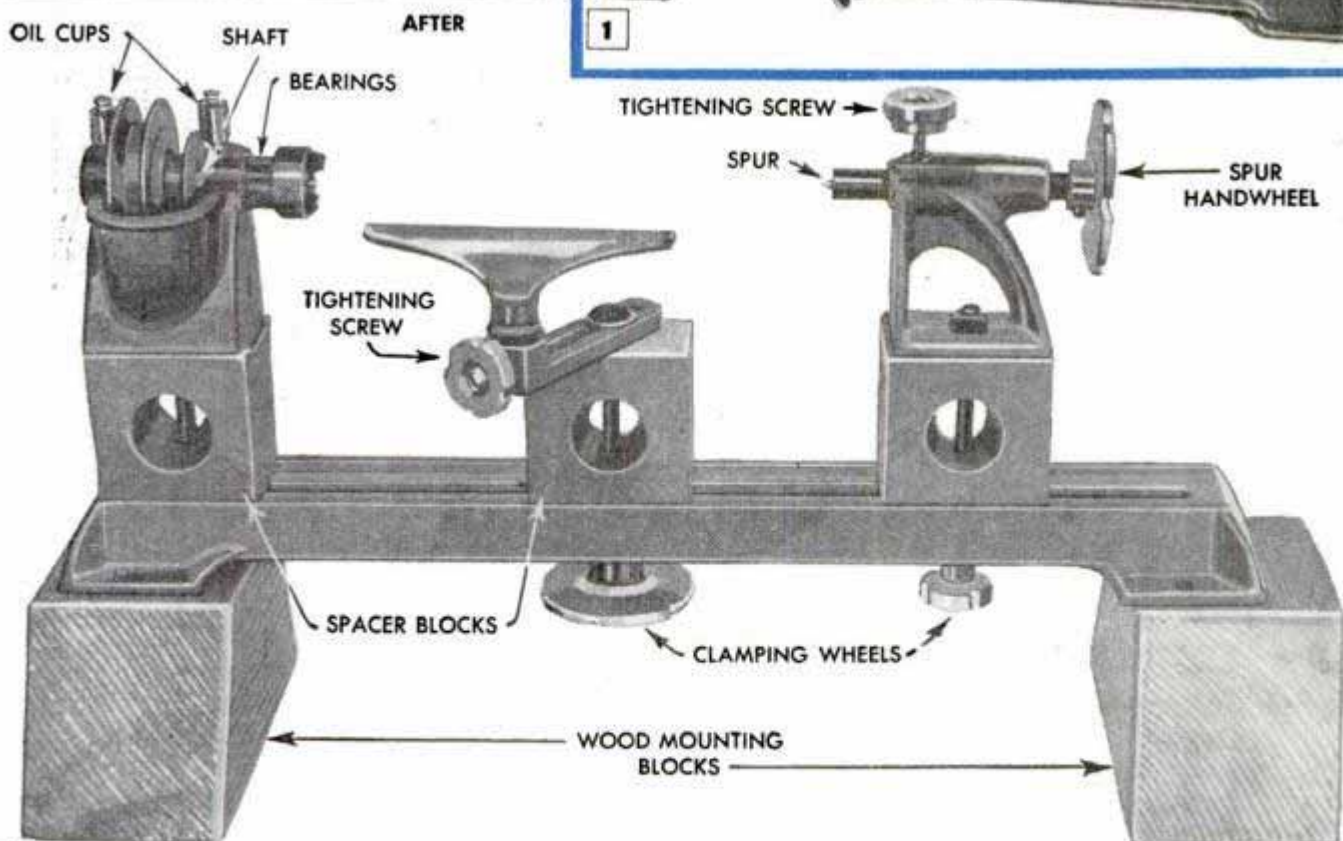
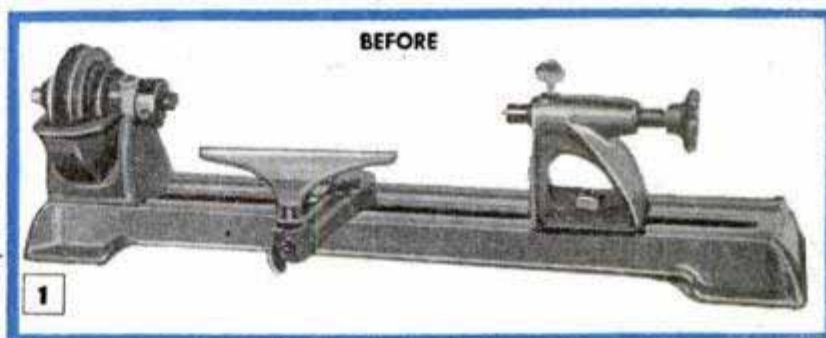
Blocking up the head and tailstock of a small wood-turning lathe will practically double its usefulness, especially in the home shop where the work varies greatly in size

MANY older lathes of the interchangeable-parts type—you bought a piece at a time and then assembled—may be getting rather loose and wobbly by this time, particularly where the machine has had hard service. Remarkably good for the price asked, these small tools filled the needs of many a home-shop owner. But now after years of service they may need a little fixing.

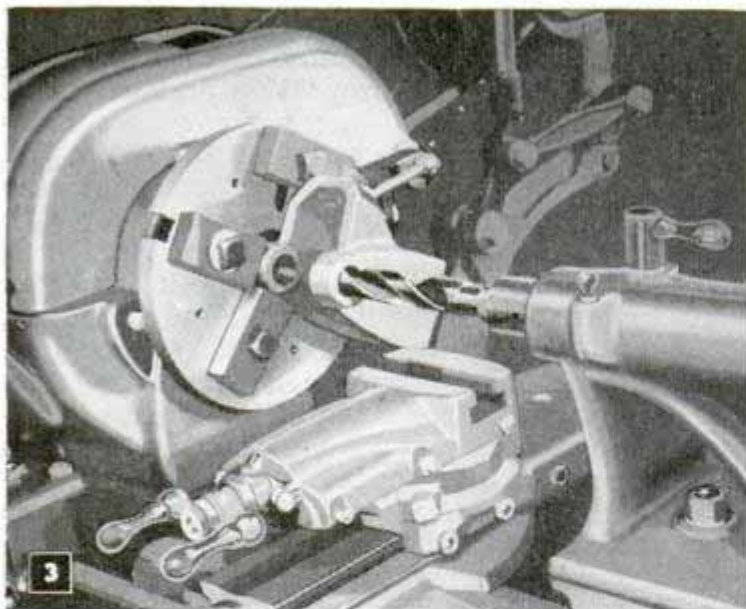
Usually the swing of lathes of the type shown in Fig. 1 ranges from 6 to 8 in., which definitely limits the diameter of faceplate or screw-center work that can be done without using the outer end of the headstock spindle. A lot of work in the home shop requires a larger swing. Increasing the swing, that is, increasing the diameter of work the lathe will swing, is simply a matter of blocking up headstock, tailstock and tool-rest holder to equal heights as in Fig. 2. Just how much machining and fitting this will require depends on the type of lathe bed. If the bed ways are raised like those shown, then the raising blocks will require the milling of a narrow rabbet on each lower corner, Fig. 5. If the ways are flat the same rabbet cut must be made, only somewhat wider so as to leave a projection on the lower face of each of the raising blocks. The projection will slide between the ways and act as a guide to keep the three parts—headstock, tailstock and tool

rest—in proper alignment. Any metal that will machine well can be used for the raising blocks. The proportion and height of the blocks should be given careful consideration before you begin cutting any metal. Original swing of the lathe determines the height, and width of the bed fixes the width of the blocks within pretty close limits. If the original swing was, say, 6 in. and you want to increase it to 8, or maybe 10 in., then the blocks should be either 2 or 4 in. high as the case may be. Swing of the lathe, of course, is reckoned as the largest diameter of work that can be turned on the faceplate. An allowance for clearance of the bed is always made, that is, if the lathe is rated as 6-in. swing the distance from the spur center, measured from its axis, to the bed will be slightly over 3 in.

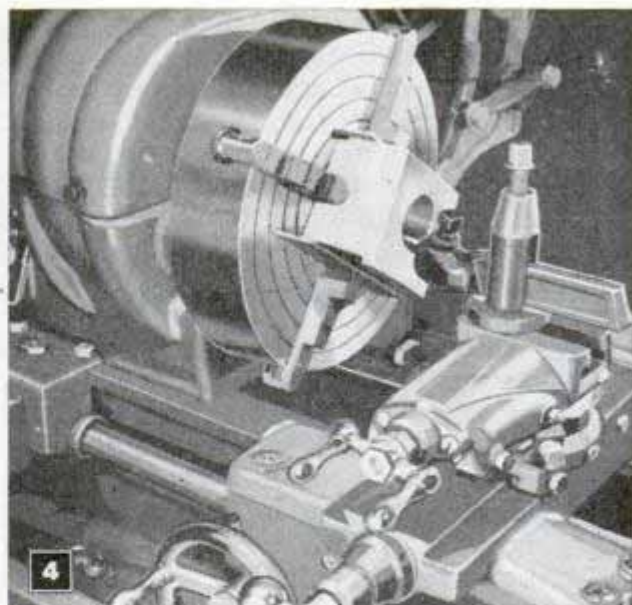
If you use blocks cut from solid stock it will be necessary to machine them all over. This can be done in a metal-turning lathe as in Fig. 4. If you use castings, only the top and bottom will need to be machined. Usually this will call for milling to fit the lathe ways and the bottom of the head and tailstock castings. Have this done at a machine shop unless you have facilities for



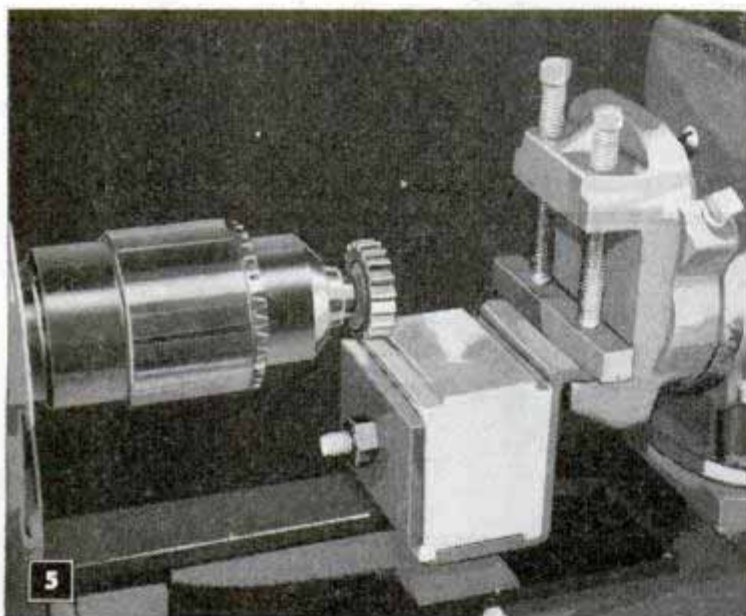
ADDED IMPROVEMENTS TO THE OLD WOOD-TURNING LATHE



Above, bore out headstock-bearing seats for larger bushings. Ream holes so that bushings are a snug drive fit. Below, mill raising blocks in a special fixture to fit the lathe bed



If raising blocks are made from solid stock they should be machined all over. The center hole is not necessary; it's only ornamental



this work. That's about all there is to the raising process except drilling the blocks and substituting larger bolts holding the three raised parts. If you want to go farther and replace the small handwheels, or palm wheels, with larger parts, these are quite easily made by turning disks from sheet steel and then filing or grinding fingerholds in the edges. Finally, if the headstock bearings are badly worn it's a good idea to replace them and also the headstock spindle. Dismantle the headstock and bore out the bearing seats as in Fig. 3. Drive in larger bushings and turn a new spindle to fit. Provide oil cups for frequent lubrication.

Etching Designs in Sheet Metal by Using Acid Solutions

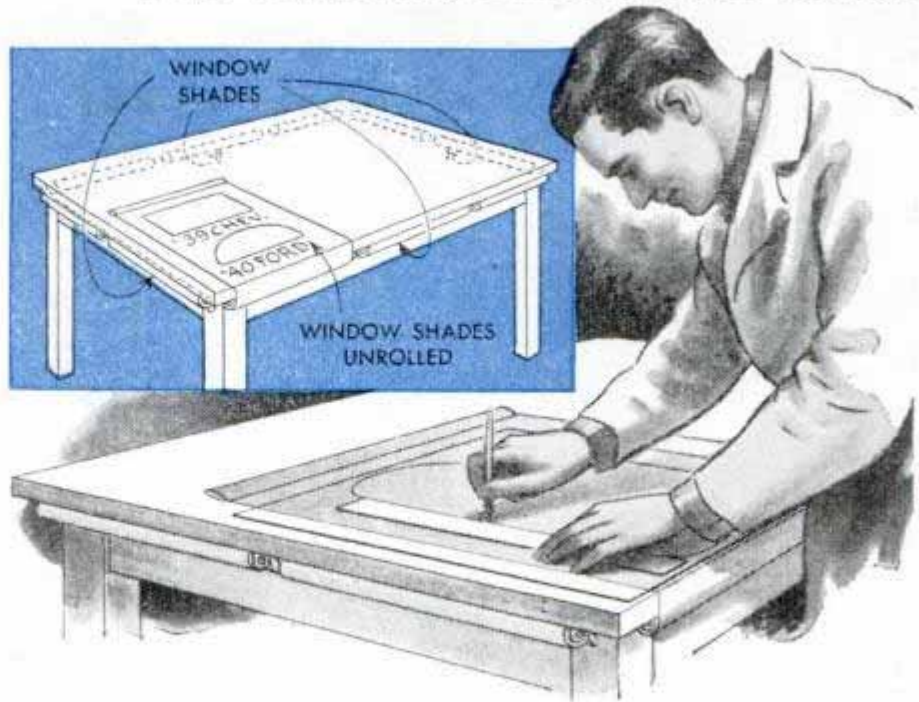
Before etching any kind of metal, the material must be well cleaned. Aluminum and nickel silver are prepared by going over the surface with steel wool or some fine abrasive such as slaked lime or plaster of paris. Copper and brass are cleaned with a 40 percent solution of nitric acid by rubbing with a swab dipped in the liquid. Then the metal is plunged into cold water, dried and rubbed with a dry abrasive. When annealing copper and brass, if the heated metal is immediately plunged into cold water most of the scale will be removed. All parts that are to be protected from the acid are covered with asphaltum varnish. If a design is to be etched, the entire surface is coated. When the varnish is dry, trace the design with a pencil and then cut in sharply with a scratch awl. To etch copper or brass, lower it into full-strength commercial ni-

tric acid. This will cut to a depth of about .002 in. in one minute. Around five minutes are required to etch nickel silver to the same depth. Although a 50 percent solution takes longer, it should be used where a deep etch is desired. Aluminum is etched in the same manner as copper except that full-strength muriatic acid, which will cut to a depth of .003 in. per minute, is used. Here again, it is sometimes better to use dilute solutions to obtain better control. Etching solutions should always be mixed and kept in glass containers. Acids should be mixed slowly and carefully, and, when working with weak solutions, the tray should be rocked to prevent bubbles and scale from interfering with the action of the solution. If acid burns occur, use standard first-aid treatment.

Dick Hutchinson, Alhambra, Calif.

Instead of having separate cutout patterns for windshields and car windows stacked on the table or kept elsewhere, one glazier draws them on window shades and rollers that are attached underneath the table by means of roller brackets. When a particular pattern is wanted, the blind on which it is drawn is unrolled so that it lies flat on the table top. Then the glass is laid over the pattern and the glazier cuts it to shape by following the outline with a glass cutter. In this way, a number of patterns are always at hand when needed.—Edgar Barnhart, Whittier, Calif.

Patterns for Automobile Windows Are Fastened Underneath Table



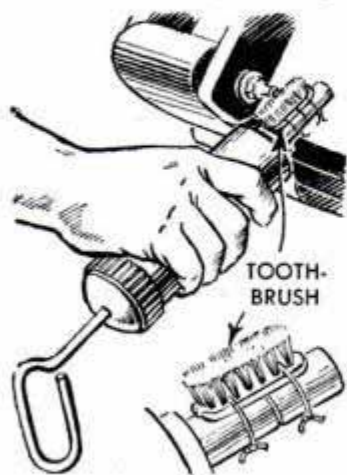
How to Secure Foundry Type

Frequently the compositor in a print shop will find it necessary to place a line of foundry type in such a position in a form that there is danger of the line becoming pried if not carefully handled. However, if the line is wrapped with cellulose tape it will be held firmly and may be handled as easily as a slug line. The tape is peeled off the metal easily when the type is ready for distribution.

Keith B. Wiley, Earlysville, Va.

Toothbrush Wired on Grease Gun Handy When Cleaning Fittings

To prevent dirt from getting into pressure fittings when greasing, one mechanic found that by wiring a toothbrush to the



nipple of the gun it was easy to wipe the fitting before applying the grease. The handle is cut off the brush before it is fastened in place with wire. Fittings in inaccessible places are easy to get at with this arrangement.—Fred W. Schneider, Towaco, N. J.

Price and Number of Eggs Shown By Crate "Blackboard"

In many stores where farmers bring eggs in small crates holding 12 doz. or less, mistakes sometimes occur when the report slip is lost and the dealer does not know the quantity or condition of the eggs. To avoid such errors, one merchant uses blackboard paint to cover half of the top of each crate. Then the necessary information can be written on this surface with chalk and will not become lost. Also, the owner's name or initials are stenciled on the crate as a means of identification.



Ⓢ Attaching more than one electrical tool to any given outlet for use at the same time causes an excessive drain on the current.



Display Sign Is Part of Bumper

Additional protection for the front end of delivery trucks is provided by this display sign which also serves as a bumper. The letters are formed of 1-in. extra-heavy pipe and are assembled by welding. Then the top and bottom strips of flat steel are welded to the letters to complete the sign. This provides protection for the radiator grille without interfering with the circulation of air. Bolts and braces are used to attach the sign to the bumper. Aluminum paint provides a protective finish.

Elton Sterrett, Houston, Tex.

Fresh Water for Minnow Tank Keeps Them Alive Longer

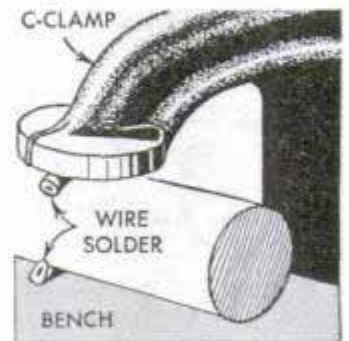
Those who sell minnows for bait often find it difficult to keep them alive and in good condition when the water becomes stale. In other words, stale water eats the profit before the fish get a chance to eat the minnows. One dealer solved the problem



by securing a large tank which was provided with two inlets and two outlets at each end, the latter being screened. Water is circulated through the tank constantly. To lessen the possibility of any chemical reaction between the metal of the tank and the water, the interior was finished with several coats of aluminum paint. The water should be pure and the correct temperature.

Wire Solder Clamps Small Work

When setting up small rods for a machine operation, often it will be found that a standard V-block is too large to be used conveniently. In such a case, wrap wire solder around the work



where it will come in contact with a C-clamp and the work table. As the clamp is tightened, the solder will adjust to the shape of the rod and hold it firmly in place.

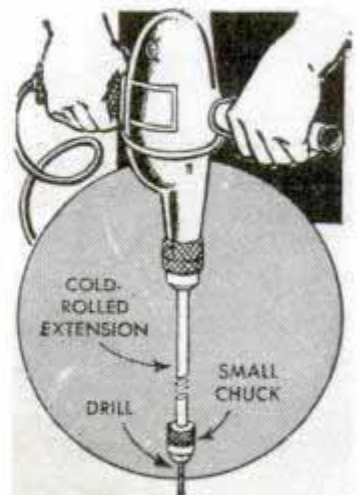
F. E. Averill, Santa Ysabel, Calif.

Young Trees Are Set in Sand To Prevent Disease

By setting young fruit and shade trees in a bed of sand, one grower found that damage caused by insects and disease was prevented. An excavation for the tree about 3 ft. in diameter and 8 in. deep is made, and just enough soil is placed around the roots to keep the tree standing. Then the hole is filled with sand. After the tree starts, it is watered until it has a firm foothold.—Ralph Underhill, Beebe, Ark.

Extension Rod on Power Drill

With this extension for a hand power drill, hard-to-get-at places are reached easily. A piece of cold-rolled rod is threaded at one end to fit a small drill chuck, the other end fitting into the chuck on the power drill. To use, fit the extension in place and insert the drill in the chuck on the end of the rod. Use a large rod so the extension will be rigid.



Frank E. Wilson, Palo Alto, Calif.

DRIVE YOUR WELL

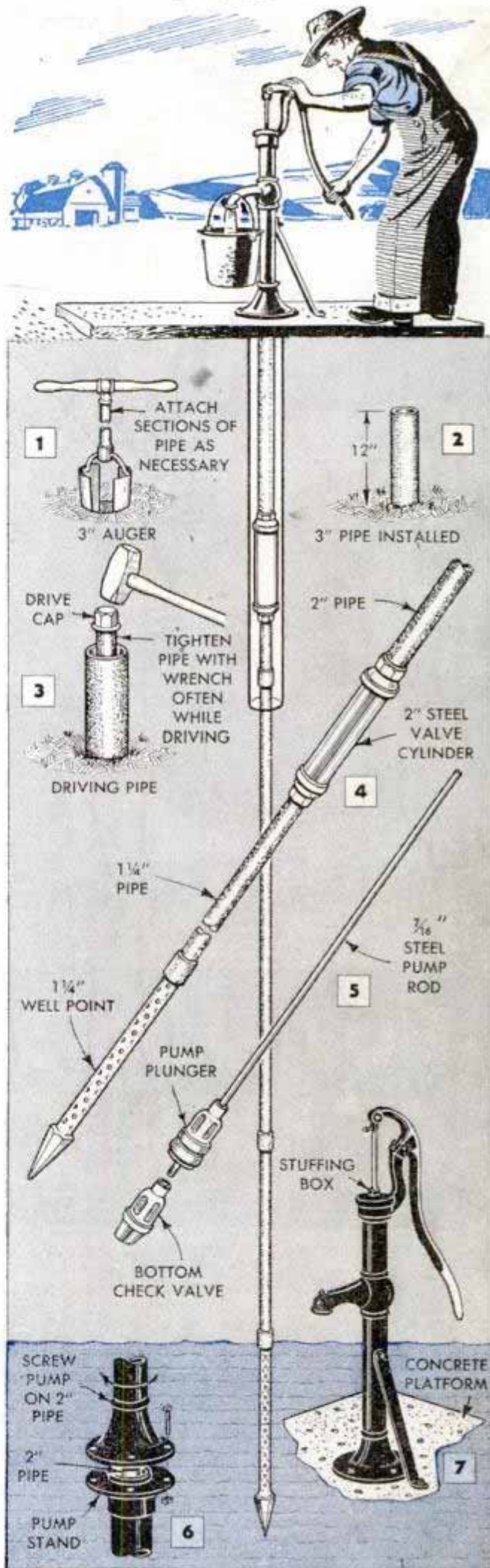
Where water-bearing strata are quite near the surface it's easy to put down a well

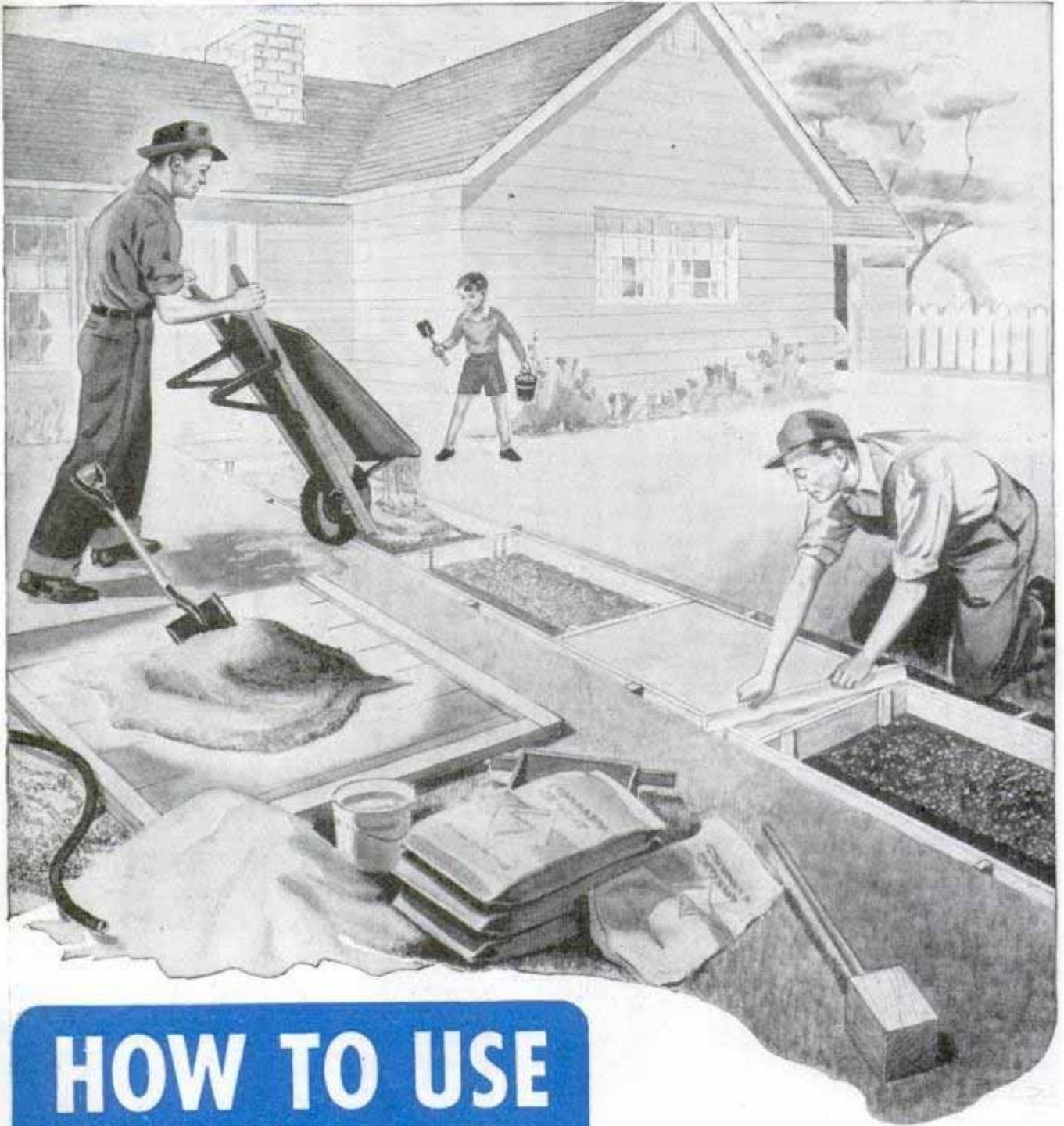
By Raymond J. Karpen

IN MANY LOCALITIES where the ground is fairly level over comparatively large areas you can generally tap a good water supply by merely driving down a pipe fitted with a well point. If you plan to drive a well you may save time by making inquiry about the depth of wells in the vicinity. Experienced well drillers often can tell with remarkable accuracy, just by the look of things, where you will be most apt to strike water with a well point and at approximately what depth. Once you have good advice on these points the rest is quite easy to accomplish.

Begin as in Fig. 1 with a 3-in. posthole auger of the type having a handle of pipe. Have at hand several 3-ft. lengths of pipe threaded to fit the handle, together with couplings. Run the auger down as far as it will go easily, then unscrew the handle, turn on another section of pipe and proceed, lengthening the auger handle in the same way until you reach a depth of 8 to 12 ft. Here the auger with its long handle becomes unwieldy and, besides, in most localities, a depth of 8 ft. will put the pump cylinder below the maximum frost depth. Now drive a length of 3-in. pipe into the auger hole to serve as a casing, Fig. 2. Next, assemble the well point and one or more lengths of pipe of sufficient combined length to reach above ground when the well point touches the earth at the lower end of the casing. Draw these joints tight. Screw on the drive cap, Fig. 3, and you're ready to go. Take it easy with the sledge, as heavy blows may buckle the pipe or have the effect of deflecting the point. As a rule the pipe drives quite easily. From there on it's merely a matter of adding pipe in short lengths until the driven point reaches water. Usually you can tell quite accurately when the point enters water-bearing strata. Check with a weighted cord lowered inside the pipe. If the point strikes a rock on the way down, it's usually best to pull it and start over again. Any attempt to force the point past a stone by heavy sledging may cause buckling.

When you're sure of water, assemble the pump cylinder, Figs. 4 and 5, and drive this down until the top end of the pipe reaches to a point an inch or so above the casing. Then install the pump as in Fig. 6 and pour a concrete platform as in Fig. 7. Slope the platform so water runs off on all sides.





HOW TO USE CONCRETE

By Thomas Trail

YOU DON'T have to be a concrete craftsman or a professional mason to do some of the ordinary concrete jobs that require a minimum of special equipment. Laying a sidewalk is a good example. All you really need in the way of equipment are a few form boards and stakes, hammer, handsaw and shovel, a mixing platform and the necessary amounts of sand, gravel and cement. A rubber-tired wheelbarrow and a measuring box and tamper, Fig. 2, are helpful accessories. And, of course, anyone contemplat-



First add together measured amounts of cement, sand and gravel as at A above. Each bag of cement contains 1 cu. ft.

ing laying a sidewalk or doing any other similar concrete job about the home must have a willingness to bend his back, for it's going to take some work. However, no homeowner will have trouble with this part if he takes time to figure the money that can be saved by doing the job himself.

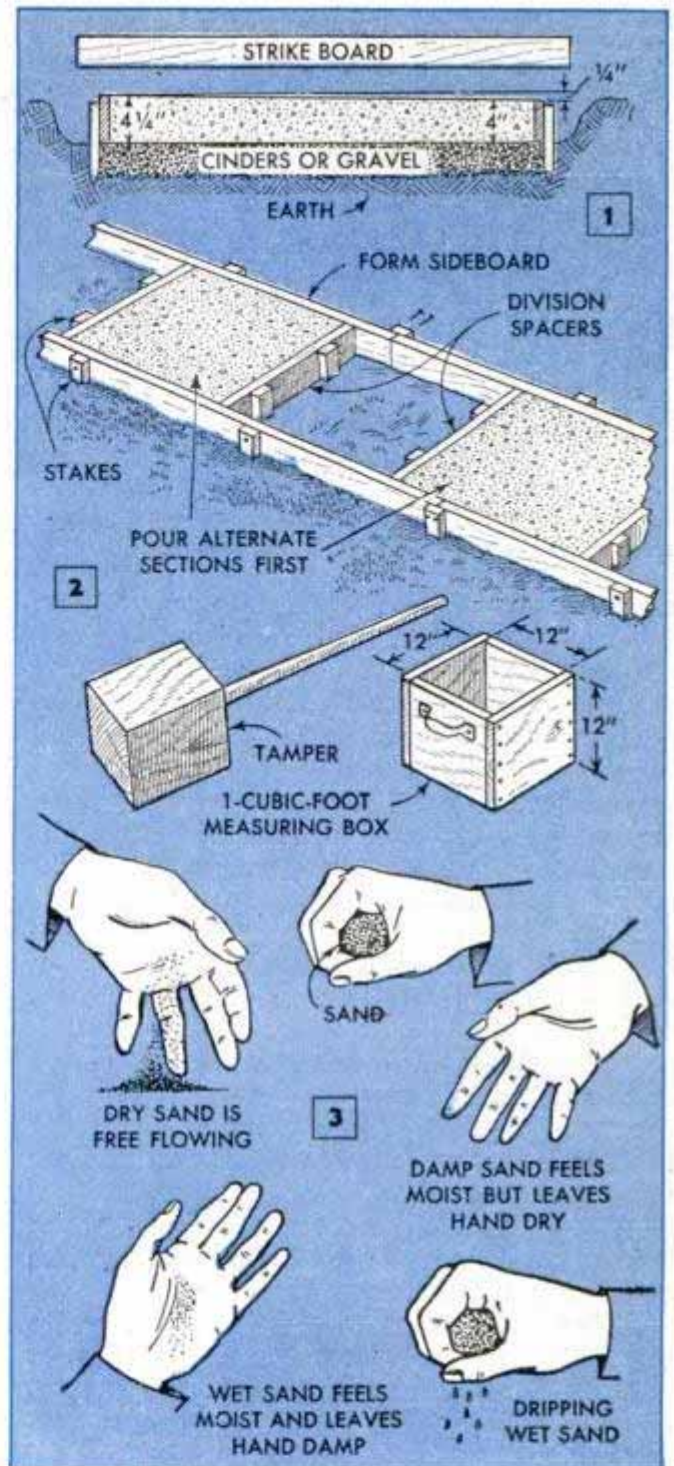
Main sidewalks such as those leading from the street to the house should be between 3 and 4 ft. wide. Secondary walks, Fig. 7, need not be more than 2 to 2½ ft. wide. An average thickness is 4 in. Locate and align the walk and then drive stakes along what will be the sides, allowing 2 in. on each side for the thickness of the wood form. Tack a string to the posts on each side to serve as a guideline in making the excavation.

If the soil is well drained, remove it to a depth of 2 in. and pack the ground with the wooden tamper. If the soil is wet and poorly drained, excavate to a depth of 8 in. and lay a subbase of clean cinders or coarse gravel 6 in. thick. Pack with the tamper.

Next build the form as in Fig. 1. Use 1 by 4-in. lumber set on edge for the sides of the form. Drive stakes into the ground alongside the form boards and nail them to the form lightly. Level one side of the form ¼ in. higher than the other. Expansion joints should be spaced apart about the width of the walk. Place a 1 by 4-in. divider board with stakes to hold it in place at each end of alternate sections as shown.

Construct a watertight mixing platform of tongue-and-groove lumber. The best mix proportions for sidewalks are 1 sack portland cement, 2¼ cu. ft. of sand, 3 cu. ft. of gravel or crushed stone and 5 gal. of water. This amount of water applies when the sand is average in moisture content. See Fig. 3. If the sand is very wet use only 4¼ gal. of water per sack of cement; if damp or dry, use 5½ gal. per sack.

The sand should contain particles of



In mixing, measure the sand and gravel in a 1-cu.-ft. measuring box as at B above. Then mix the material dry by shoveling the mass over several times as at C. Finally, make a depression at the center of the pile and add a measured quantity of water in small amounts, detail D. Mix thoroughly by shoveling as before



After pouring the section as at E, settle the mixture all around the edges with a trowel or shovel. Level with the strike board as at F and finish with a float. Don't edge the work until mixture stiffens slightly

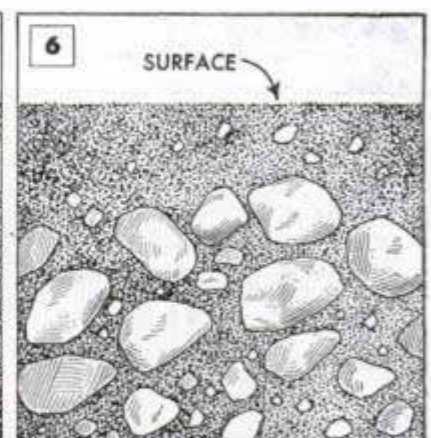
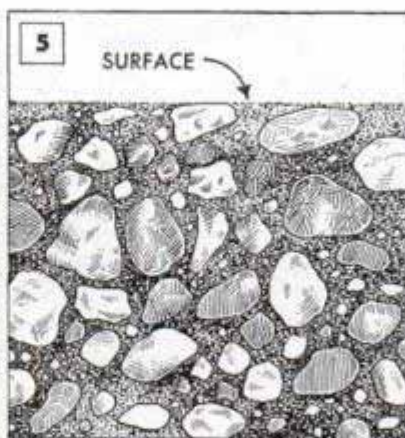
assorted sizes from very fine to about $\frac{1}{4}$ in. in diameter. The gravel or crushed stone should range from about $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. in diameter. Mix together the dry cement and sand until no brown or gray streaks remain, then add the measured amount of gravel or crushed stone and continue mixing until the pebbles are well distributed throughout the mixture. Cement requires no measuring since each sack holds 1 cu. ft.

When the dry materials are mixed thoroughly scoop out a depression in the heap and pour in part of the measured amount of water. Continue mixing and adding water until all the water has been used and each pebble is completely coated with cement, Fig. 4. Pour the concrete into the alternate section forms within 30 min. after mixing and level off with a strike board as in Fig. 1. As the concrete is poured, work it into the corners of the form with a spade or the edge of a trowel, Figs. 5 and 6.

After the concrete has become quite stiff but is still workable, use a wood float to level the surface and smooth out uneven spots. This will also leave an even, gritty,

nonslip surface. Finish the edges of the sides and ends of each section of the walk with an edging tool to provide a rounded surface. After removing the divider boards pour a freshly mixed batch of concrete into the alternate empty sections of the form. Finish these sections in the manner already described, giving special attention to finishing the edges. When hardened sufficiently, cure the concrete by covering with several thicknesses of burlap or canvas, or a 2-in. layer of sand, and keep this covering moist for a week or more. Details A to H show the step-by-step process of laying the walk.

Although it's a more detailed undertaking, an attractive and convenient concrete driveway can be constructed in much the same manner as a walk. Usually it's better to rent a power-driven mixer for a driveway job. Driveways are built 8 to 10 ft. wide and should be at least 6 in. thick. Practically the same methods of excavation and cinder fill are used, except that 6 in. of earth should be removed from the driveway site. The excavation should be 5 in.



Cross sections cut through concrete walks clearly show the difference between well troweled concrete (left) and improperly troweled concrete (right). The layer of weak material at the right is the result of over troweling, which brings an excess of the fine material to the surface of the walk



Cure concrete by covering with burlap. Keep the covering moist

deep at the center and should slope evenly to 6 in. deep at each side.

The form boards are 1 by 6-in. lumber, as are also the division boards. These are placed across the form every 20 ft. to provide expansion joints between the sections. The driveway is poured in alternate sections and each section leveled off with a curved-edge strike board to produce a crowned surface, Fig. 8. The same procedure is followed in smoothing, edging and grooving, and in pouring the second set of alternate sections. The same curing procedure also is followed.

Curbs are not necessary where the driveway surface is poured to grade level, but if the driveway is built below grade level, curbs should be provided. These should be about 4 in. high. They are formed by means of a template on the end of the strike board as in Fig. 9. Use 2 by 10-in. form boards. Unless there is severe freezing and thawing the cinder fill can be omitted except in poorly drained areas.

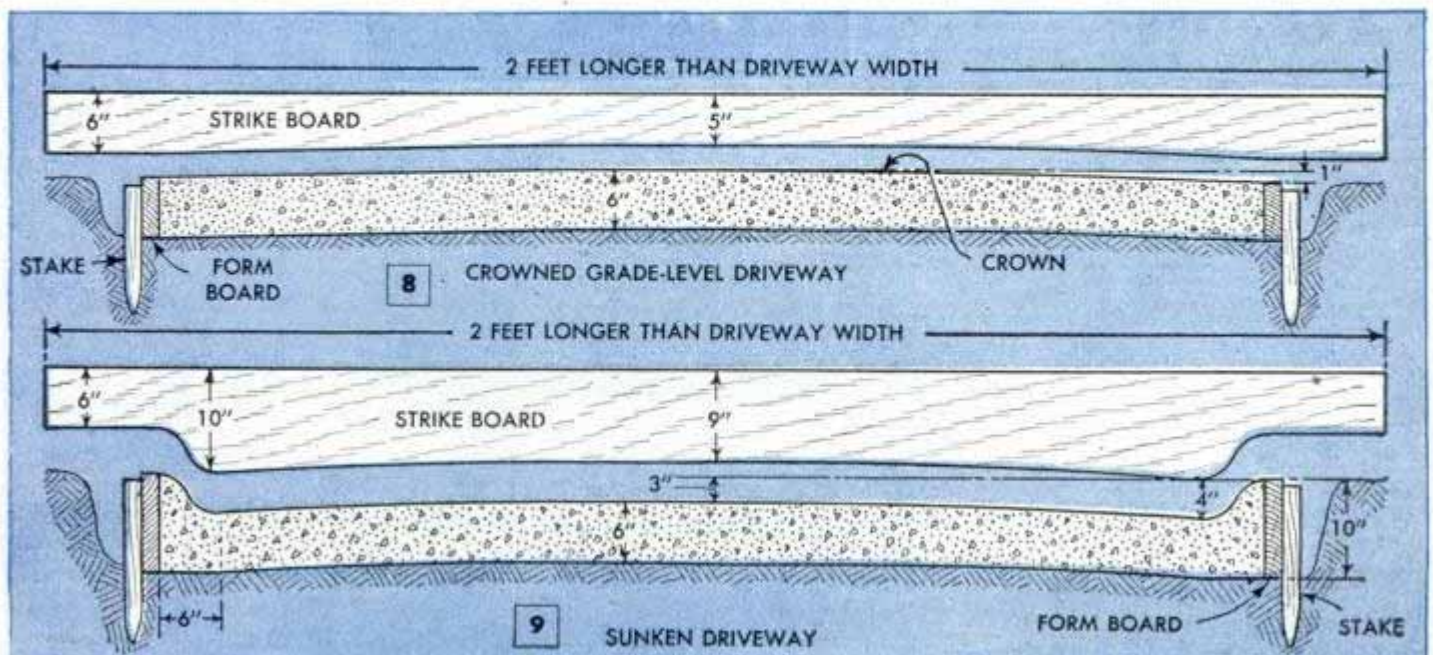
The following amounts of various mate-



rials required for constructing sidewalks and driveways include 10 percent allowance for waste and the particular type of sand and gravel used.

For each 10 sq. ft. of 4-in.-thick sidewalk $\frac{7}{8}$ sack of portland cement, 2 cu. ft. of sand and $2\frac{1}{2}$ cu. ft. of gravel will be required. For every 10 sq. ft. of 6-in. driveway, $1\frac{1}{4}$ sacks of cement, $2\frac{7}{8}$ cu. ft. of sand and $3\frac{3}{8}$ cu. ft. of gravel will be needed. In calculating materials required for sunken driveways, measure the overall width and add 6 in. extra width to take care of curb thickness. This figure multiplied by the driveway length gives the total square feet.

Where a 6-in. subbase of gravel or cinders is required, 5 cu. ft. of either of these materials will be needed for each 10 sq. ft. of sidewalk. If greater than 6-in. thicknesses of subbase are necessary, $\frac{1}{12}$ cu. ft. of gravel or cinders will be required for each inch of subbase thickness per sq. ft. of sidewalk or driveway.



Duplicate Work Turned in Lathe By Using Full-Scale Pattern



Having a number of duplicate pieces to turn in a short time, one machinist hit upon the idea of making a full-scale drawing and using it as a tool guide on the lathe, the latter serving as a modified version of a profile machine. The drawing was thumb-tacked to a board which was attached to the base, flush with the cross-feed. Then a pointer that extended over the board was screwed to the cross-feed apron. The tool bit was set against the work at its widest point and the drawing was adjusted so the pointer was against the corresponding line on the drawing. Following, the longitudinal feed of the lathe was engaged, and by using hand control on the cross-feed, the pointer was made to follow the lines on the drawing. This work is not too accurate, but it proves satisfactory where close tolerances are not required. The pointer is used to make rough cuts as well as the final cut.

R. G. Eaneman, Berkeley, Calif.

Razor Blade Holds Window Glass



When it's necessary to install a large pane of glass in a sash without removing it from the frame, one glazier uses a number of discarded razor blades to hold the glass while fitting

it and preparing to drive the points. Single-edge blades are used to lessen the chance of cutting fingers.

G. E. Hendrickson, Argyle, Wis.

Keeping Chickens From Roosting On Poultry Feeders

By mounting a rod horizontally above a poultry feeder and stringing tin cans along it, chickens can be prevented from roosting there. If they attempt to perch on this "roost," the cans will rotate and throw them off.



Sack Covering Protects Ensilage

To keep ensilage from spoiling, one farmer tramps the surface down once a day for two or three days after the silo has been filled. Then a covering of several layers of heavy fertilizer sacks is laid on top of it. This provides an almost airtight cover.

Auto Wheel Makes Rotary Table For Paint Spraying

If part of the front-wheel assembly of an automobile is available, a rotary table for small paint-spray work can be made with little effort. Mount the wheel spindle on a pedestal that has footings of the type illustrated. Height of the wheel can be a little below the waist. Provision should be made for the removal of paint-spray "fog."

Walter R. Bridgforth, Houston, Tex.





Tuning a Television Receiver

Anyone can soon learn to tune a television receiver correctly. Reception of a picture with the accompanying sound from a television station that is broadcasting in your area is a simple tuning process. Check to see that the television station is on the air and note the channel number of the station. At the present time program schedules are published in the newspapers or may be obtained from the local station upon request.

Typical controls are illustrated in the sketch of the RCA Victor model. Their purpose is as follows: (brightness) sets picture brilliance; (horizontal) stops picture moving from side to side; (vertical) stops picture moving up or down. On the right side of the picture tube, the picture control varies picture contrast, light or dark; off-on sound turns set on and off and adjusts sound volume; station selector selects and indicates the station channel and the number appears in a window. The fine tuning control tunes the receiver for best sound reception.

A test pattern and music are usually broadcast for about 15 minutes preceding each program. In this pattern, when the receiver is correctly adjusted as indicated in Fig. 5, the design is clear and steady, and five distinct shades are discernible on the central circles. When sound is distorted, or if bars flicker across the picture in step with speech or music as shown in Fig. 1, adjustment of fine tuning is indicated. Fig. 2 identifies auto-ignition interference. Figs. 3 and 4 show conditions corrected easily with the contrast control and horizontal control.

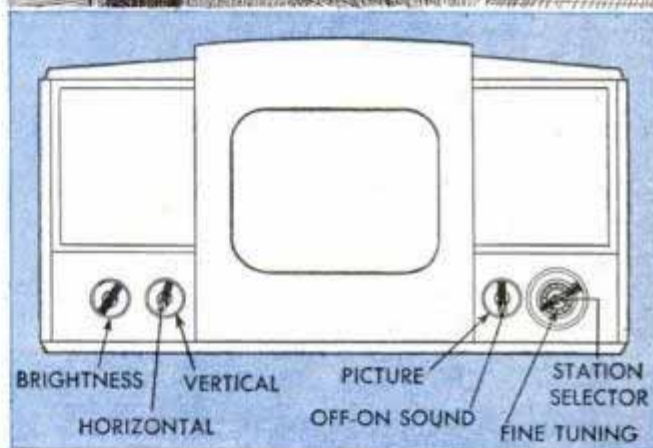
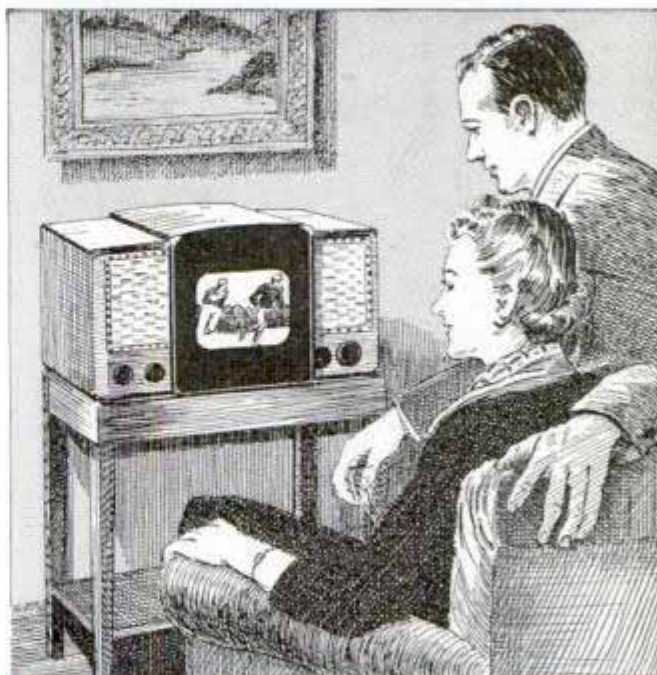


Fig. 1—Sound Bars



Fig. 2—Automobile Interference



Fig. 3—Too Much Contrast

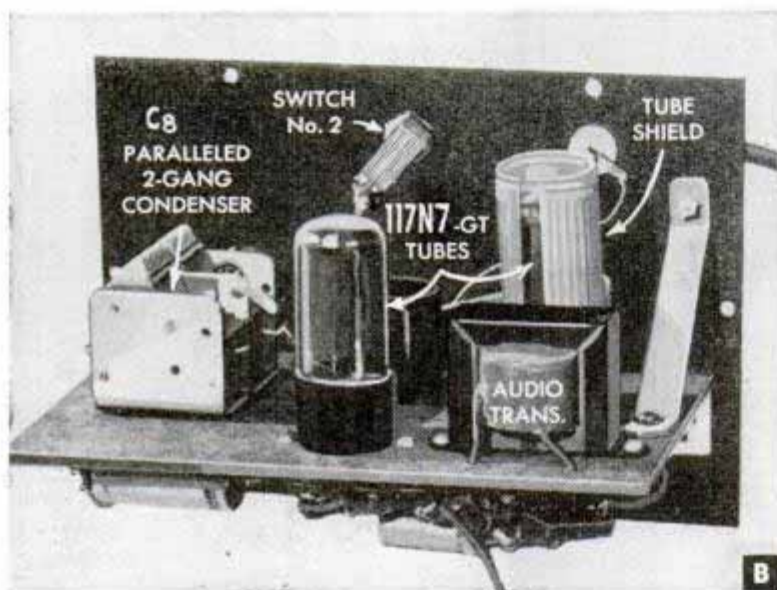
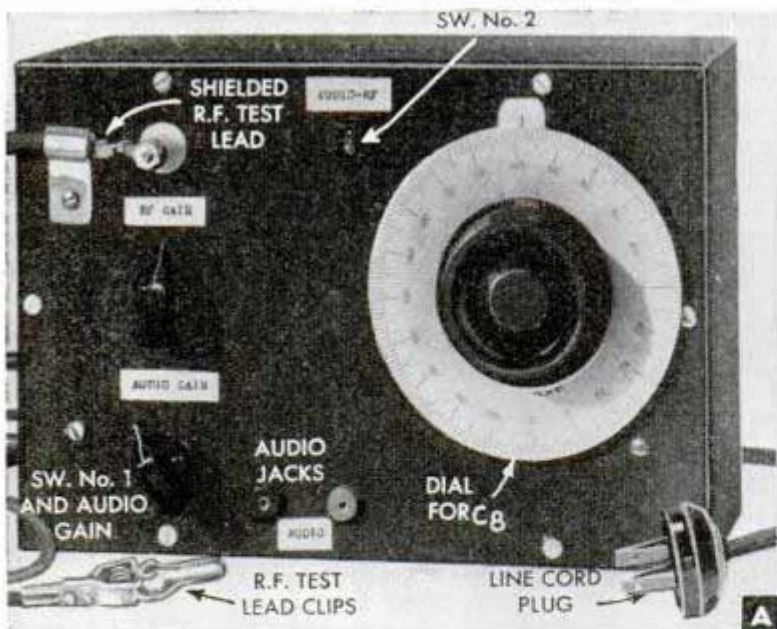


Fig. 4—Off Center



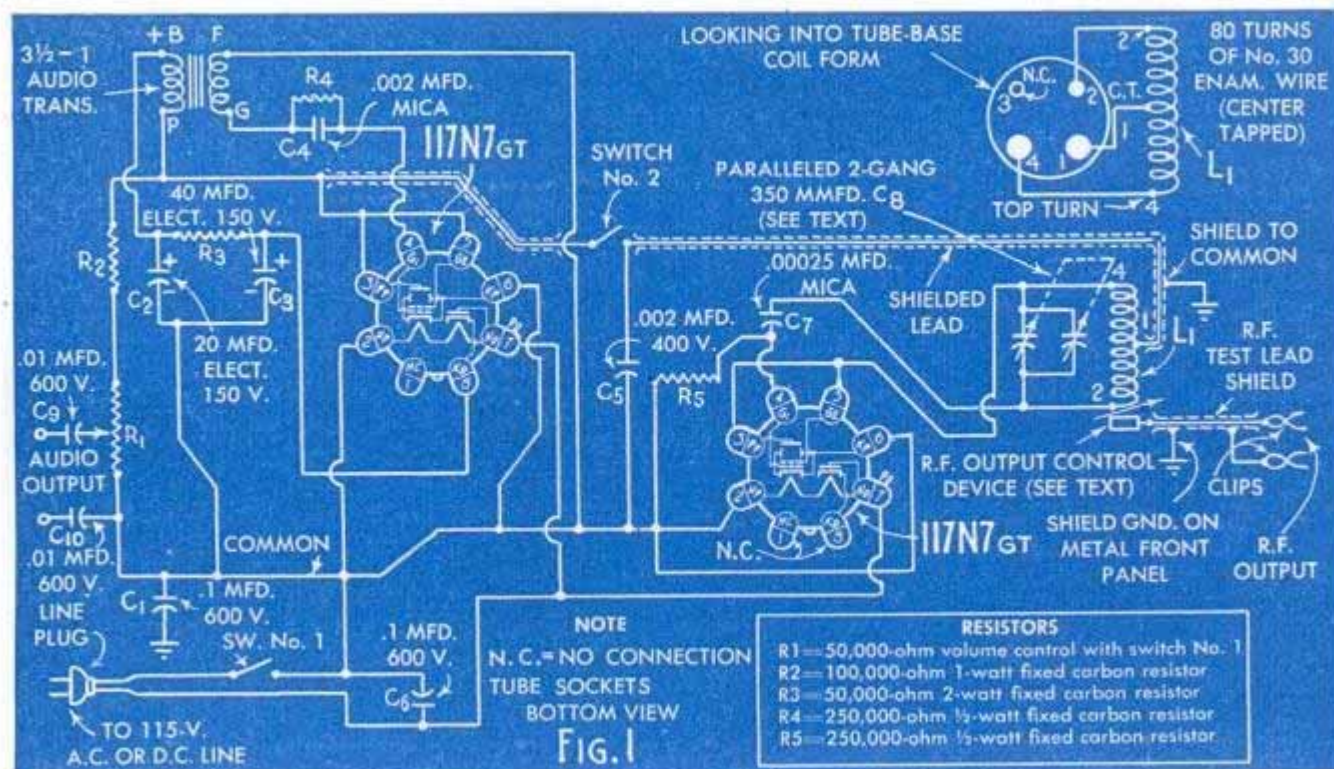
Fig. 5—Correctly Adjusted

HOW TO BUILD A DUAL-PURPOSE



CAPABLE of producing both a modulated radio-frequency signal and an audio signal for lining up broadcast receivers, or for isolating trouble by the popular "signal substitution" method commonly used by radio servicemen, this useful homemade signal generator is well within the pocket-book range of the average radio experimenter who does not require an expensive precision laboratory instrument.

Although definitely not intended for beginners, it is a highly satisfactory unit for students and experimenters as it is inexpensive to build and operate. Standard parts are employed with the exception of the coil, which is hand-wound on a 4-prong tube base, and the control device which governs the r.f. frequency output of the generator. This unorthodox but effective control device consists of a standard insulated panel bearing and a short shaft to which is cemented a piece of $\frac{1}{8}$ by $\frac{5}{8}$ by $2\frac{3}{4}$ -in. hard-pressed wood carrying a $\frac{5}{8}$ -in. square of sheet aluminum. This aluminum square, which is fastened to the end of the pressed-wood strip with a short machine screw and nut, is connected by means of a piece of very flexible wire to the feed-through



SIGNAL GENERATOR FOR SET TESTING

insulator which serves as the r.f. output terminal. Rotating the bearing shaft varies the position of the aluminum square in relation to the r.f. coil, and thus controls the amount of radio-frequency output which is picked up from it at a distance of about $\frac{1}{2}$ in., with a minimum effect upon the tuning of the oscillator.

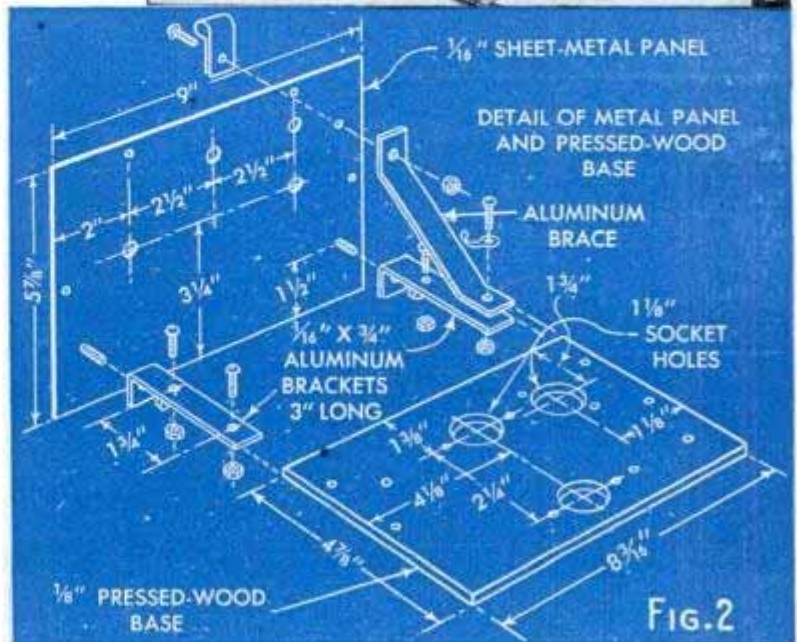
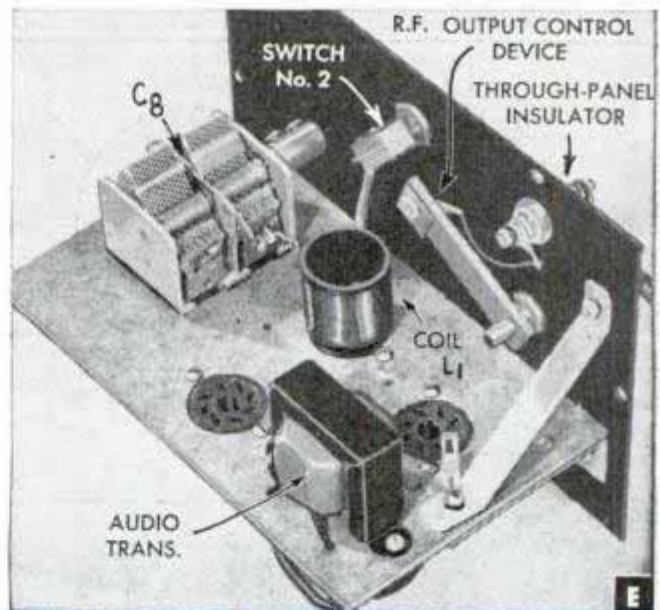
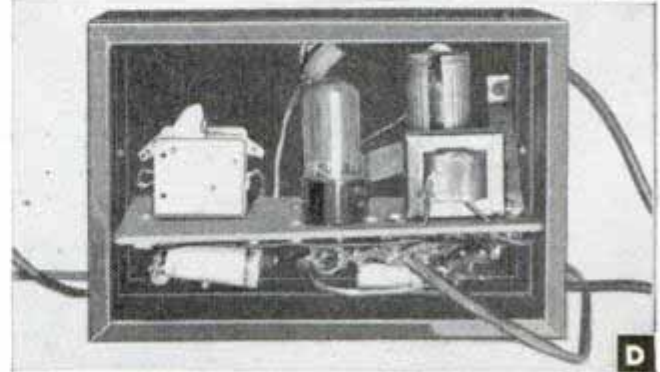
With a single coil, this signal generator provides a radio frequency of approximately 400 kilocycles to 1600 kilocycles, covering the most popular intermediate-frequency band, plus the entire broadcast band. The radio-frequency signal is modulated by a 400-cycle audio tone. This 400-cycle tone is also available for use in the audio portions of the circuits. One 117N7-GT tube serves as a radio-frequency oscillator, and the other as a combination audio-oscillator and rectifier for the a.c.-d.c. power-pack section.

The unit is built up on a $\frac{1}{8}$ -in. hard-pressed-wood base and is housed in a standard metal cabinet 9 in. long, 5 in. wide and 6 in. high. Its front and back plates are removable and one serves for the front panel. This metal case provides the necessary shielding. The insulated base is made necessary by the fact that the unit employs an a.c.-d.c. circuit which cannot be directly grounded to the metal cabinet in the usual manner, as a line short might occur when the shielded r.f. output cable from the signal generator is connected to the set under test. Therefore, please note that the only ground connection to the metal case is made through fixed condenser C1 to the panel bracket as shown in underside photo F (see page 232); all other grounds indicated are made to the common floating ground.

Photos A, B, C, D and E show various views of the completed unit; the schematic circuit diagram is given in Fig. 1. The metal panel and pressed-wood base details appear in Fig. 2; the base is supported on the panel by means of aluminum, or sheet-metal, brackets. When wiring the circuit it is important to keep the leads, especially those in the r.f. portion of the unit, as short as possible.

When completed, the audio-frequency output should be tested first. This is done by merely plugging a pair of headphones in the audio jacks. If everything is working properly, you should hear an audio signal of approximately 400 cycles. The frequency of the tone

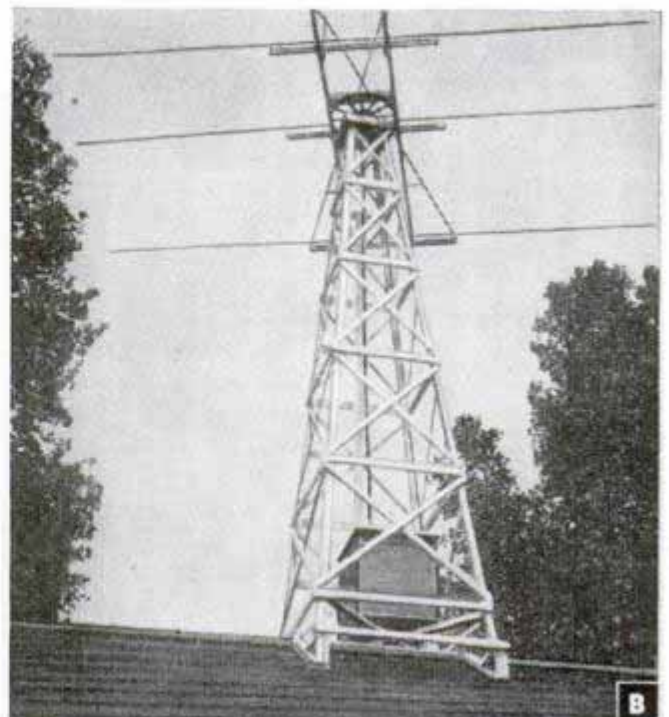
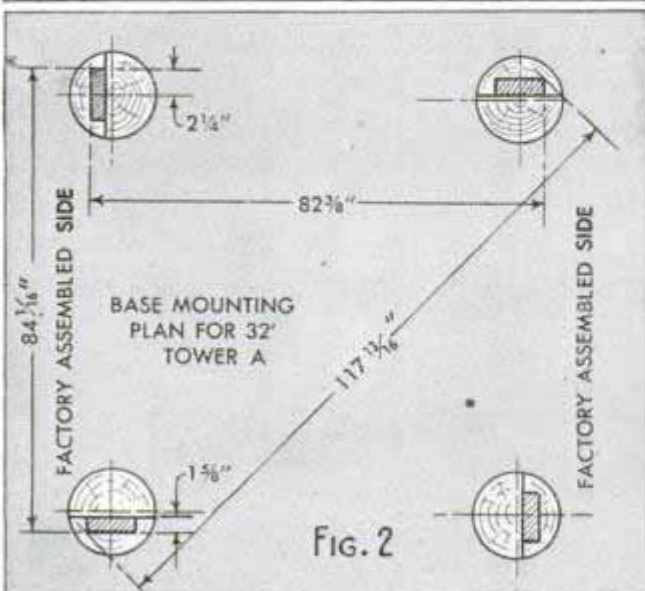
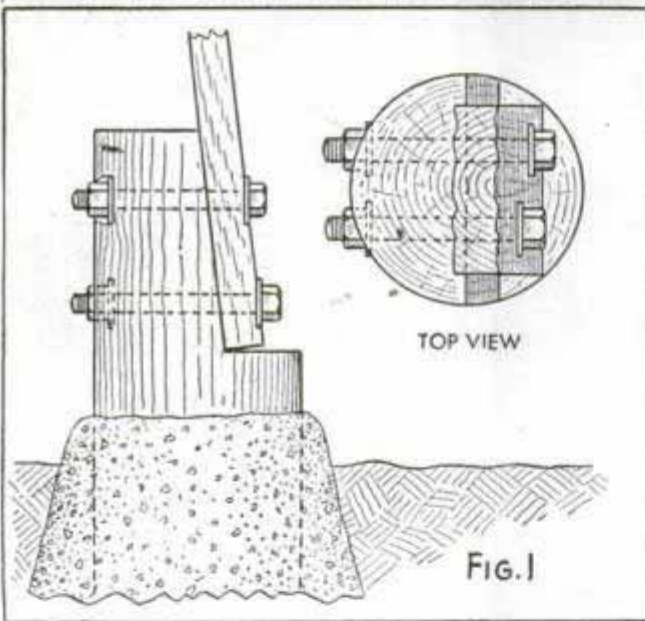
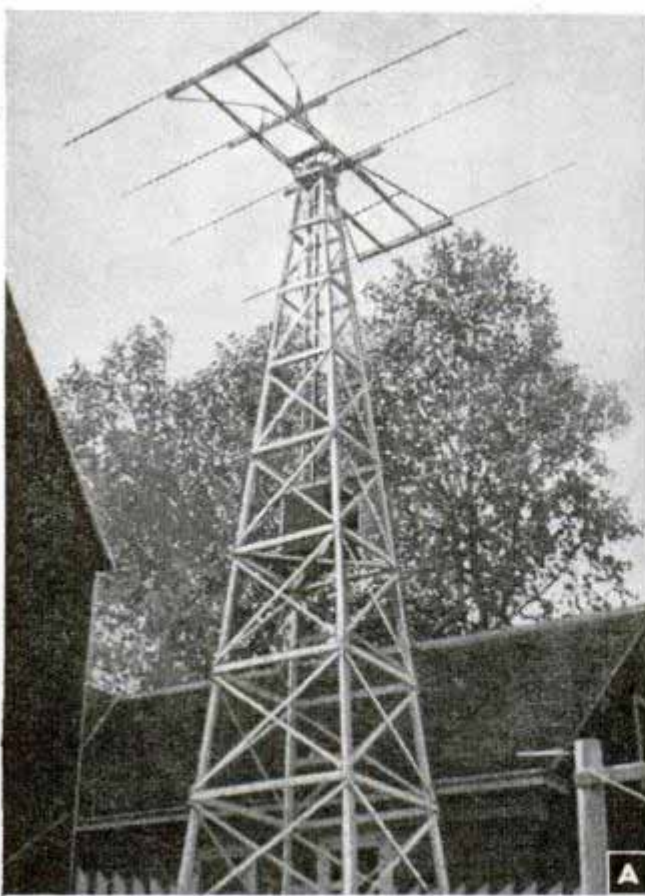
(Continued to page 228)



Wooden Towers for Amateur Radio Rotary Beam Antenna Arrays

Solving a common problem for those amateur radio operators who wish to take advantage of the possibilities of a good directive beam array that can be rotated by means of one of the new motor-operated rotating devices, these "Sky-Lane" wooden self-supporting towers are now available in kit form, with two sides assembled. All necessary hardware and instructions for completing the assembly are included.

To be effective the beam array should be in the clear and above surrounding buildings. Those lucky "hams" who have a back yard or vacant lot prefer the 32-ft. tower illustrated in photo A. This comes in two 16-ft. sections which are connected by a butt joint which is secured by steel plates and bolts. Two pairs of inner horizontal cross braces and full truss construction are claimed to prevent deformation and distribute any strain over a large portion of the tower. An additional 16-foot section can be added later if desired. This tower is mounted on four tapered 6-ft. cedar posts as detailed in Figs. 1 and 2. As this is an important operation the most accurate way of setting the posts in position is to first assemble the tower and then make a light framework jig, using as a pattern the bottom legs of the tower. When the posts are finally set in concrete, the tower is raised and bolted in position as indicated in Fig. 1. The 16-ft. roof assembly, photo B, is ideal where ground space is not available; one man can raise or lower it by merely walking it up or down as you would raise a ladder. This Sky-Lane "Topper" model is 47 in. square at the base, and 11 in. at the top.



Carries better... Looks better...

and, of course, it's safer...
...in a **KODAK
CARRYING CASE**

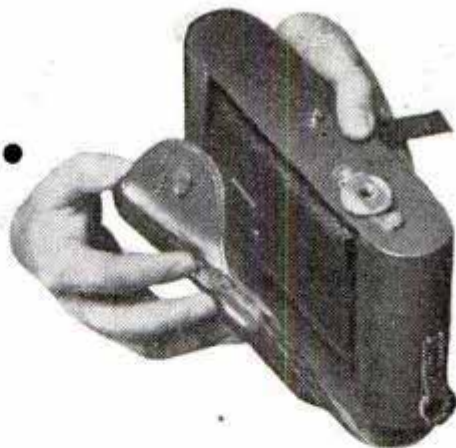
FOR KODAK 35 with Range Finder...

Handsome Field Case of top-grain sole leather, with shoulder strap. Built-in ruggedness... quick accessibility for instant, easy shooting.

(Below)

FOR KODAK VIGILANT SIX-20...

Kodak Snapsack... russet sole leather with hand strap... illustrative of pouch-type case so popular for folding cameras. Also takes Kodak Monitor Six-20.



FOR KODAK MONITOR...

De Luxe Field Case... top-grain cowhide, special stitching, skived leather straps, metal-reinforced inner section make it a truly de luxe case.



FOR YOUR BANTAM...

Handsome leather Field Case with neck strap... permits manipulation of all camera controls without removing from case... tripod socket in base. At your Kodak dealer's... Eastman Kodak Company, Rochester 4, N. Y.



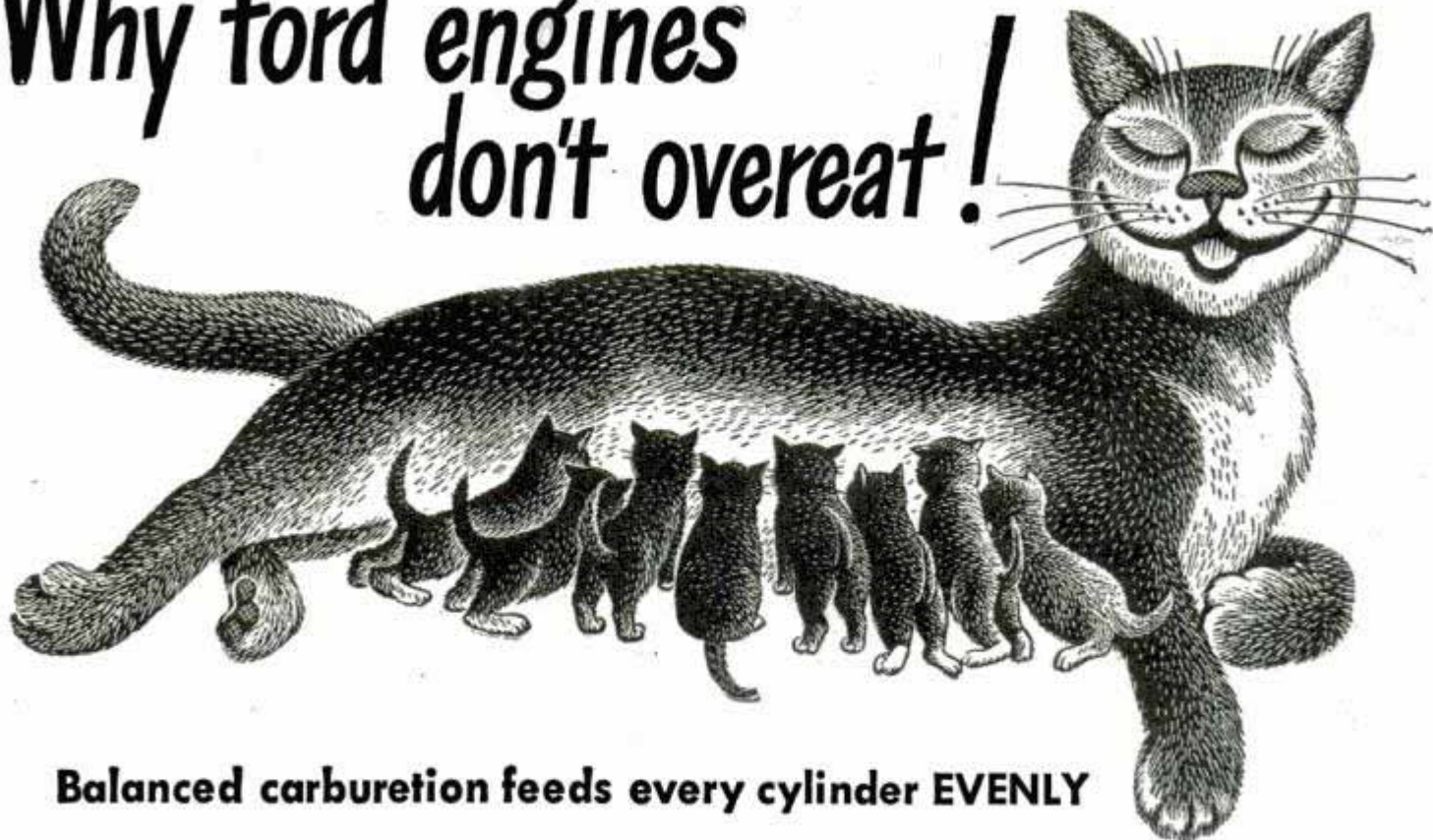
FOR ANY CAMERA WITH TRIPOD SOCKET...

Ounces of prevention... Kodak Hand Straps... Kodak Neck Straps... light, strong, woven leather... make it practically impossible to drop your camera.



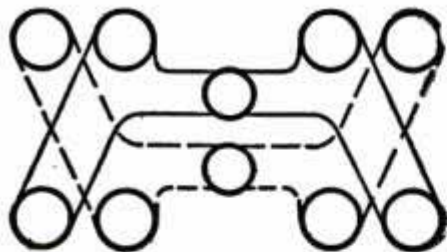
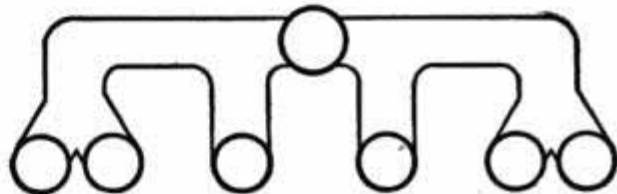
Kodak

Why Ford engines don't overeat!



Balanced carburetion feeds every cylinder EVENLY

● Whether you own the Ford Six or the V-8, you're sure to get balanced down-draft carburetion. You're sure that every cylinder is properly fed . . . and economically, too!



In the Ford V-8 engine, the dual carburetor feeds the cylinders through a duplex manifold. Each manifold serves four cylinders whose place in the firing sequence prevents simultaneous suction by any two cylinders.

In the SIX the downdraft carburetor serves the cylinders through a unique four-port manifold with dual leads. Two leads serve the two center cylinders, the others serve the end pairs. As in the V-8, this results in even feeding.

In both SIX and V-8, you get greater economy from Ford's accelerating pump which sends extra fuel into the carburetor when the engine needs extra power, but saves this fuel in normal driving. And in cold weather Ford's new Automatic Manifold Heat Control routes warm exhaust heat past the carburetor for quick warm-up, then back through normal channels.

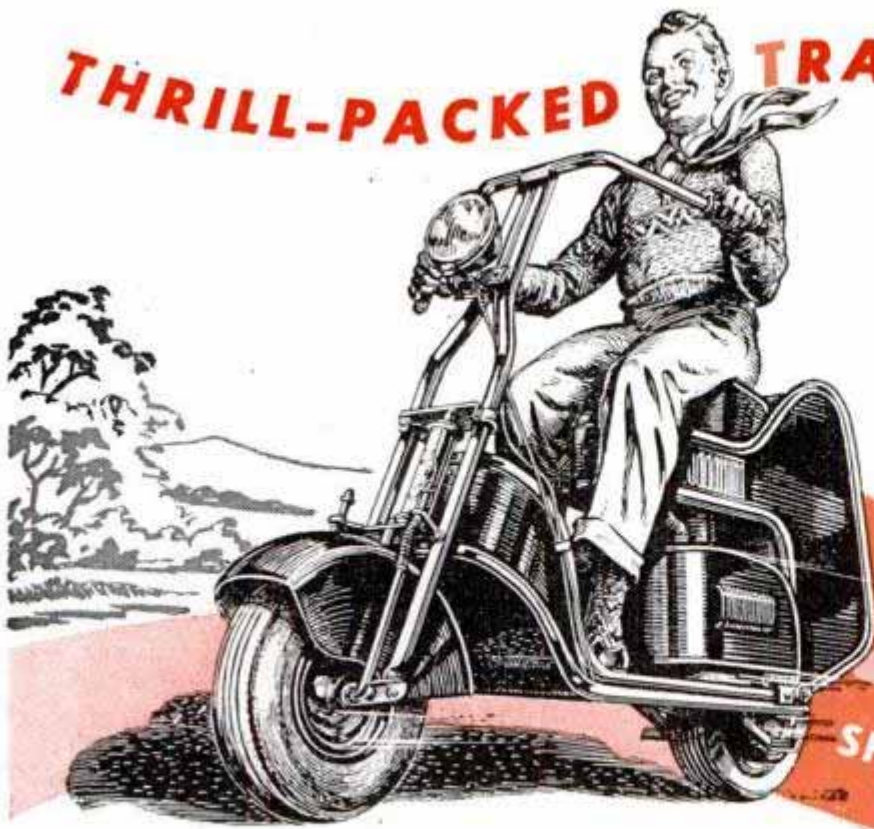
These and many other features put FORD OUT FRONT for fuel efficiency.



There's a **Ford** in your future

THRILL-PACKED TRAVEL!

THE
AMERICAN
Moto-Scoot
WAY



80 MILES TO THE GALLON!
SPEEDS UP TO 40 M.P.H.!

GOES EVERYWHERE
PARKS ANYWHERE

Ride with the pride of knowing that a single penny buys miles of power. Functional design, precision-engineering and scientific construction give you AMERICAN Moto-Scoot—to suit *your* work and pleasure needs. See AMERICAN Moto-Scoot . . . try it today. You'll agree it's America's **BIGGEST** power travel value.



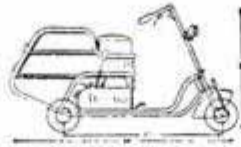
ECONOMY

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POWER

Power to *spare* . . . wherever you're headed you get there quickly, easily, smoothly!



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TOOLS

Growing a Crop Under Tents

(Continued from page 134)

stapled. Cheesecloth in sheets 400 inches wide is then pulled by hand over the wires, stretched to its full width and sewn. Each acre requires 5000 square yards and new cloth must be used every year for all but the sidewalls.

Fertilizing the fields amounts virtually to dietetics, for the continuous use of the same soil for tobacco robs the land of calcium, magnesium, aluminum and sulphur.

The seedlings are planted by machine except around the poles where it is necessary to plant by hand. The planting machine is operated by a driver and four men. As it moves slowly over the land it digs shallow trenches and fills them with water. The men set the plants firmly into the ground at regular intervals, planting from two to three acres a day.


After planting, the grower must maintain a constant guard against insects. Some 20 different species of bugs, ranging in size from tiny thrips, that barely can be seen, to common grasshoppers, continually threaten the tobacco and are fought off with powder repellent.

Harvesting or "priming" is done by hand in from four to six steps. Since the leaves ripen most quickly on the bottom of the plant, the first priming consists of picking three or four leaves from a spot on the plant nearest the ground. Three more primings are necessary at intervals later.

As the pickers go from stalk to stalk they remove the leaves from the plants and lay them on the ground between rows. Other workers gather them in canvas baskets and drag their loads to the edge of the field for delivery to curing sheds.

The leaves are strung on wooden laths and hung from waist height to the roofs of the curing sheds. Within eight weeks the rich green color changes to the pale brown.

(Continued to page 224)



Model Builders Attention!

	V	V-2	V-3
Hex	1/2"	3/8"	5/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

Champion spark plugs for model gas engines give the same dependable performance as regular Champions. Silliment sealed. Sillimanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

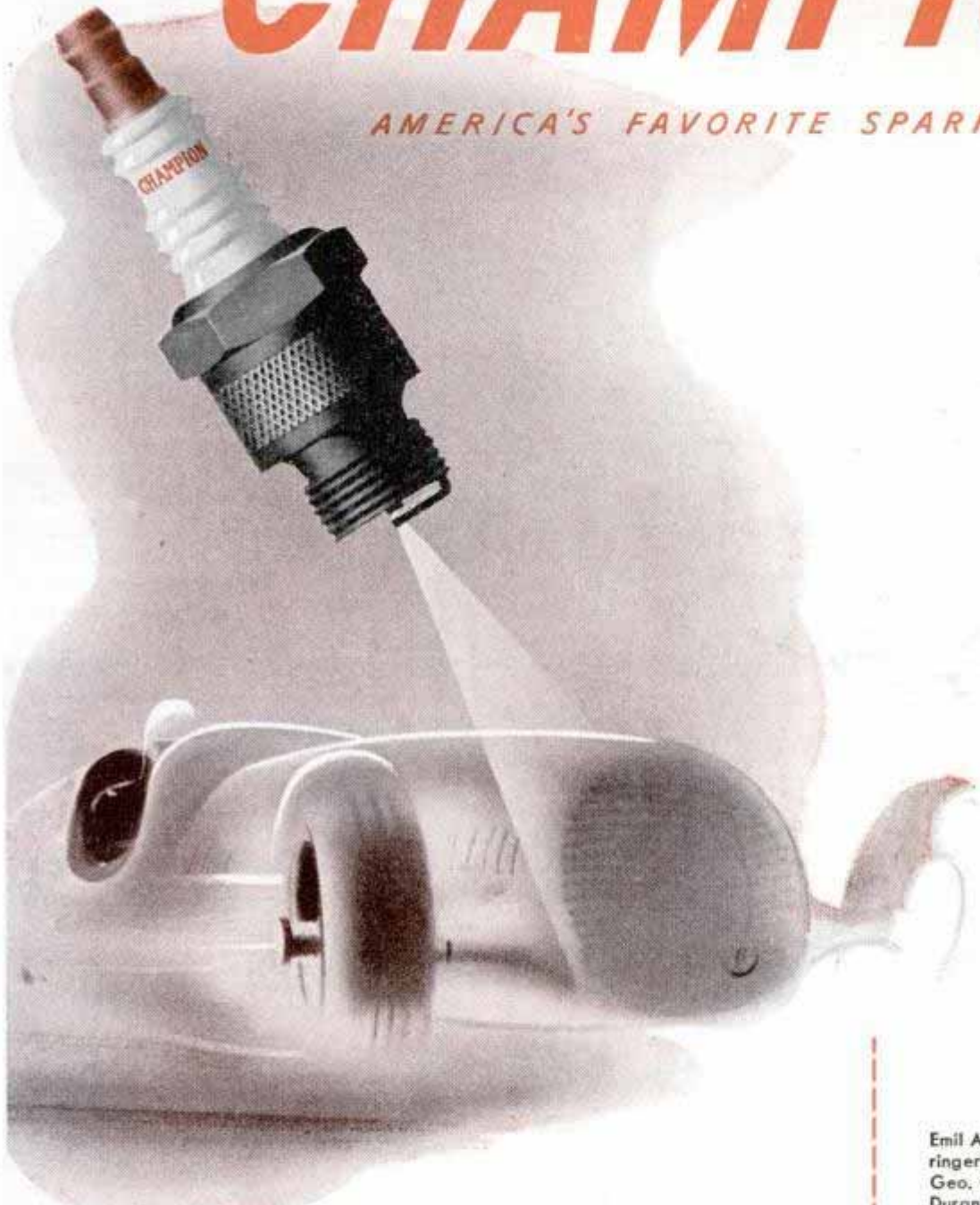
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SPARK PLUG COMPANY • TOLEDO 1, OHIO

Dependable

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AMERICA'S FAVORITE SPARK PLUG



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*Deceased

The Champion 100-Mile-an-Hour Club, the "world's most exclusive club," is composed of those race drivers who have driven the full 500 miles in the Indianapolis Race, at an average speed of 100 m.p.h., *without* relief. Of all the race drivers who have competed in this international speed classic, only 35 have achieved the distinction of becoming members and are entitled to wear the club emblem. 32 of these 35 qualified for membership using dependable Champion Spark Plugs.

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No. 89
1/2" ELECTRIC DRILL
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No. 209
Drill Stand
 (less drill)
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Light in weight, convenient and handy, this improved drill has a special aligning grip that makes straight drilling natural. Backed by 35 years of electric drill manufacturing, produced in great quantities by modern methods, this is today's best drill buy.

For every day farm, garage, construction and maintenance use, you can't get a better drill at any price. Specially wound, long life, high torque, fan-cooled motor. Cut steel gears, self-lubricating bearings, sturdy die cast case and a full sized snap action chuck (no key to lose).

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 We'll fix it in a jiffy
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and most other construction materials.

- DRILLS 4 TIMES FASTER!
- STAYS SHARP 50 TIMES LONGER!
- CUTS CLEAN, TRUE-SIZE HOLES!

Tipped with Carbide Cemented Carbide—harder than the hardest steel.

Goodbye to back-breaking masonry drilling! Cut clean, true-size holes in masonry jiffy-quick! Use your rotary drill, hand brace, or drill press. Drill holes 1/8" apart without break-through. Ask about Handy 6-drill set, 3/16", 1/4", 5/16", 3/8", 1/2" and 5/8". In free canvas kit, \$13.70 postpaid, or C.O.D. See your dealer, or write.

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PULVEX "DDT" FLEA POWDER



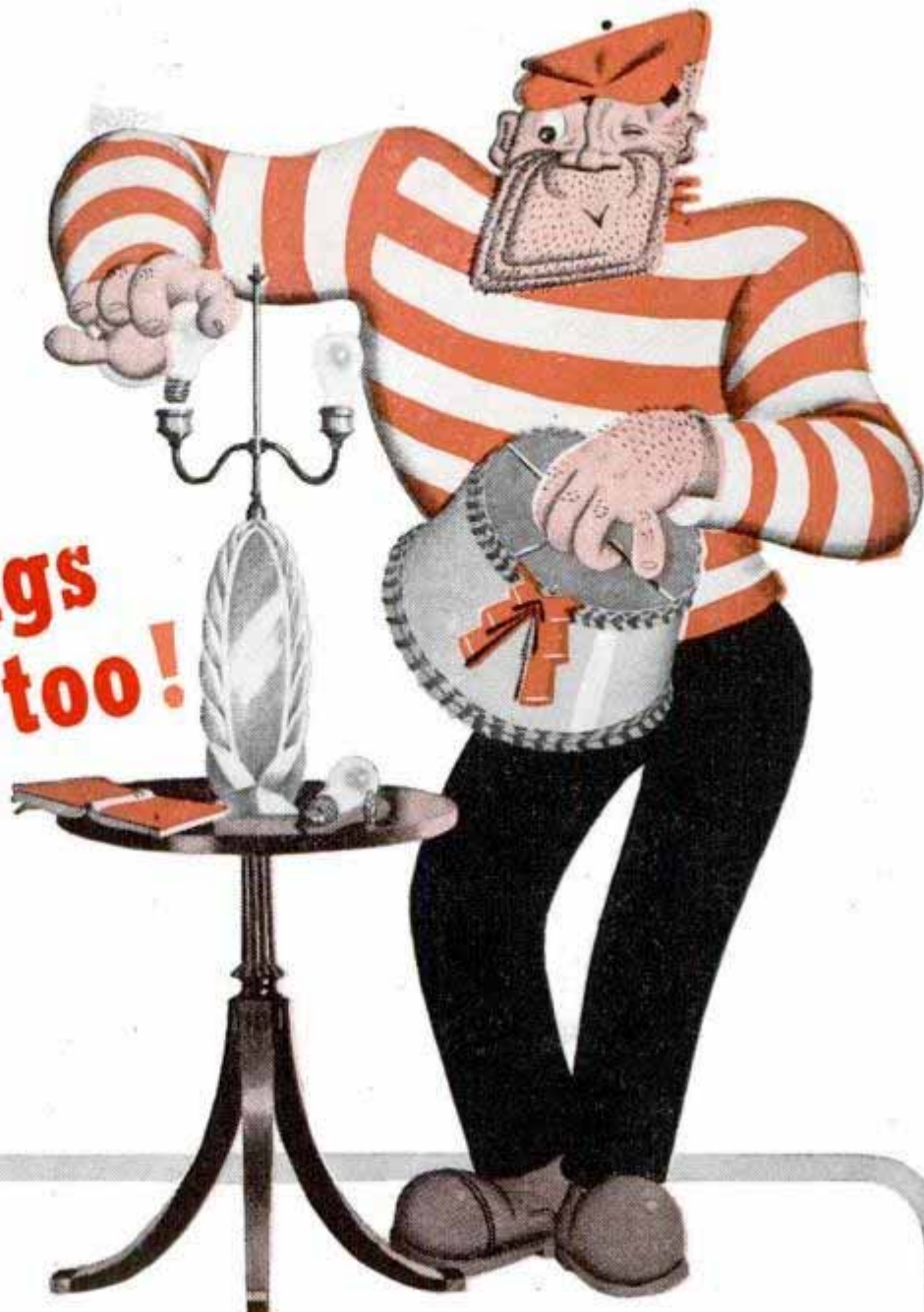
Kills the fleas **Quickly!**
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Either Kind **25¢ & 50¢**

**Piston rings
wear out, too!**



Engine wear is mostly *parts* wear. Certain parts, like piston rings, are designed to "take" the wear and be replaced again and again.

When your car begins to smoke, waste oil or lose power,

it will pay you to install Hastings Piston Rings *at once*. They *stop* oil-pumping, *check* cylinder wear, *restore* performance. It's the best money you can spend on your car.

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HASTINGS

STEEL-VENT PISTON RINGS

TOUGH on Oil-pumping **GENTLE** on Cylinder Walls

FOR THE FINEST VACATION EVER



Go "Exploring" on a HARLEY-DAVIDSON

For fun and thrills, there's nothing to equal a vacation tour the Harley-Davidson way! Just pick the historic places and natural beauty spots you want to see most — and your dependable Harley-Davidson will take you there *fast and economically*. Go where and when you please — stop over any time — no set timetables to follow. You can do more and see more — even visit out-of-the-way places not reached by other methods. And all season long your Harley-Davidson turns evenings, holidays, and week ends into *extra pleasure time* — as you join other riders on trips and gypsy tours, or take in race meets, hillclimbs, and other thrilling motorcycle events. See your Harley-Davidson dealer NOW — and mail coupon today!



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Please send at once free copy of 24-page "ENTHUSIAST" Magazine, filled with thrilling motorcycle action pictures and stories.

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which characterizes fine wrapper tobacco.

Before the leaves are ready for fermentation they must be restored to their moist and flexible state so they will not break when handled. This can be done by steaming, but usually Nature helps with an evening mist or rain.

The damp leaves are bundled, tied into "hands" and shipped to the processing warehouse. Here the tobacco is packed into "bulks" weighing from 4000 to 5500 pounds.

Thermometers are placed in the center of the bulks to measure the rise in temperature as the tobacco ferments. Workers turn the bulks every eight days, replacing the inside hands with tobacco that has been on the outside. The process is repeated until the moisture evaporates from the tobacco and the temperature falls to around 75 degrees. The tobacco then is dampened again, sorted, sized and tied.

For baling the leaves modern hydraulic or electric presses have replaced old-fashioned presses in some cases, but many growers insist that the hand press still produces the best results. Finally the bales are sewn into paper covers that are porous enough to permit air circulation around the still fermenting tobacco.

Connecticut Valley shade is ready at last for shipment to manufacturers and eventually to the glass cases of cigar counters.

Ammunition for the War on Disease

(Continued from page 159)

Into his curare 'poison arrow stew' he tosses various plants and a few small animals, perhaps to increase the potency. This means that our chemists have quite a job extracting pure curare from the mixture."

While the ultimate goal of a plant like Abbott Laboratories is to produce medicines and other pharmaceutical products in huge quantities, there are many steps that come before mass production.

One of these is chemical analysis of tiny samples—possibly one drop of liquid or a speck of powder. Midget-size utensils, weighing machines, filters and other equipment are used.

The weighing machine, or microbalance, is accurate to 1/30,000 ounce. It is so delicate that a downy feather would be a staggering load. A dot made by a pencil can be weighed; in fact, it has, and it weighs about .008 milligram. The balance is operated in a room in which temperature and humidity are rigidly controlled.

The tiny bottles, beakers, crucibles and casseroles employed in this fine work are

(Continued to page 228)

IT'S A
GRAND FEELING.
TO BUILD A
MINIATURE HOUSE



IT'S A GRAND FEELING, TOO,
WHEN YOUR CAR IS
CUSHIONED WITH MARFAK
CHASSIS LUBRICATION

THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

It's a grand feeling to work at your hobby . . . the same grand feeling you get from your smooth riding, *Marfak* lubricated car.

A smooth riding car means *Marfak* is doing its job . . . and it sticks to the job for a thousand miles and more. *Marfak* is scientifically designed to cling to bearing surfaces, to resist wash-out, jar-out and squeeze-out. Now is the time to see your Texaco Man and say: "*Marfak*, Please!"



THE TEXAS COMPANY

TEXACO DEALERS IN ALL 48 STATES



Tune in: TEXACO STAR THEATER presents the TONY MARTIN show every Sunday night. See newspaper for time and station



Let's get this show on the road!

• I'm unwilling host to some underfed fugitives from a flea circus—and I'm the only one who's fed up!

What I need is a bath with Sergeant's SKIP-FLEA Soap, followed by regular dustings with SKIP-FLEA Powder. The SKIP-FLEA combination knocks 'em dead . . . and it's safe for me. Ask for the new 50c economy size of the powder.

SKIP-FLEA Soap and Powder are only two of the 19 dog care products developed by Sergeant's in over 73 years of thorough clinical research and testing.

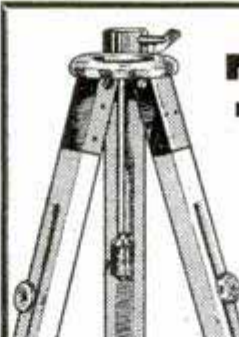
Each one helps to keep your dog healthy and happy.



• Learn more about how to give your dog the care he deserves with Sergeant's new FREE Dog Book. It contains a lot of interesting, useful advice on dog care and training. Ask for it at your drug or pet store, or write to Sergeant's, Richmond 20, Va.

Sergeant's DOG CARE PRODUCTS

SAY YOU SAW IT IN POPULAR MECHANICS



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Strong Wooden Tripods with adjustable metal legs. 5½ foot extension. Used by Government for engineers levels and transits. Can be used for holding Telescopes, Cameras, etc.

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Used, in excellent condition. Mfg. by Thompson Lever Mfg. Co., Philadelphia. Value \$150.00 **SPECIAL \$49.50**

Engineers All Metal Army Type Hand-Sighting

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ASK YOUR GAS PUMP MAN TO PUT ON FOR YOU

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New American Portable Electric Saw saves time, labor and money in production work. Not a hobby tool. One hand operation. Cuts any angle. 8" blade. Write . . . give occupation.

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save oil, save gas, restore original power

Send postal for free booklet on oil-saving.

SEALED POWER CORP., DEPT. 65, MUSKEGON, MICH.

SELL ULTRA-BLUE STOCK SIGNS

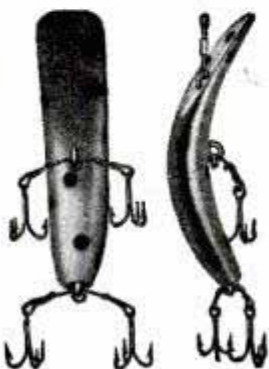


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Once the Flatfish gets its hooks into a fish, the fish is as good as in your creel. This is because Flatfish hooks are not the conventional kind of hooks. They're smaller and sharper. They penetrate more easily and more quickly. Then, too, the Flatfish has a hooking arrangement that hooks the easy striker. With the hooks offset from the body of the lure, the fish cannot obtain sufficient purchase on the body of the bait to enable it to throw the hook. World's largest selling plug. Over 3,000 sold every day! Lures in 21 colors. Underwater, surface and trolling models, \$1.20 each. Musky, \$1.35. Flyrod size, 95c. Write for FREE 32-page Color Catalog, including 4,000 word treatise on plug fishing.



Flyrod Model

Two fly-rod sizes — 1/12 or 1/16 oz. for casting or trolling. 95c each.

HELIN TACKLE CO.

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DETROIT 7, MICH.

Free CATALOG

"Hope this won't make
you mad, Jerry..."



JERRY: What's on your mind, Uncle Pat? I can take it.

UNCLE PAT: Well, you'd better return that saw and get your money back—if you still *can*.

JERRY: What do you mean? What's the matter with this saw?

UNCLE PAT: It's one of those bargain counter orphans, Jerry. No brand name. No reputation. Nothing behind it to back it up. It'll let you down just as sure as you're born.

JERRY: Brand names aren't *that* important, are they?

UNCLE PAT: They are to *me*. I want *quality* when I buy tools. That's why I always do my buying at the hardware store, where they carry the best in every line. And believe me, I never put my money down till I see a brand name I can trust.

Your **HARDWARE DEALER** sells **QUALITY** tools
and hardware... Buy from HIM



POPULAR MECHANICS



**THE
NEW**

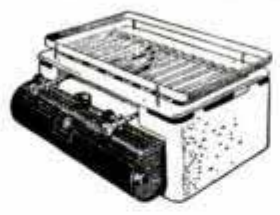
KABINKOOK

A new streamlined two burner gasoline stove for cabins, trailers, boats—or for any small kitchen.

Lights instantly. Approved for safety and efficiency. Removable tank for safe filling. Automatic pressure gauge. Wide burner spread—10¾ inches—permits use of standard utensils. With satin-smooth stainless steel top, light grey body, maroon tank, the AGM Kabinkook is attractive as well as convenient.

GALLEY RAIL

Galley rail available as a slip-on accessory for use in boats. Kabinkook's compactness makes it the ideal galley stove—19¾ x 12½ x 7¼ inches.



... READY-LITE Backed by fifty years of AGM lamp building experience. One and two mantle models. 8 to 10 hours of brilliant steady white light on one filling.

PRODUCTS OF
AMERICAN GAS MACHINE COMPANY
Albert Lea, Minnesota



"Equipment Most Sportsmen Like Best"

much smaller than doll dishes. One bottle holds only a single drop of liquid.

While the men in the microlaboratory are dealing with thumbnail quantities, workers in the nearby liquid and ointment department are busy with carload lots. In one big room are 30 big 1000-gallon tanks and 50 smaller tanks—all glass-lined. Then there are pumps, filters, mills, homogenizers and electrically operated mixers.

In another room, goggle-protected workers concentrate on making a synthetic vitamin D called viosterol. They dissolve ergosterol (extracted from yeast) in ether and suspend the solution in quartz flasks over banks of ultraviolet lamps. The ether evaporates and the vitamin product is purified and dissolved in an edible oil.

Constant tests assure that all products are pure and effective. From the standpoint of visitors going through a drug plant, the tests are perhaps the most interesting part. Rats, mice, guinea pigs, monkeys and humans are used. Fifty Abbott employes formed the "Human Guinea Pig Club" and volunteered to submit to various tests. They give blood, taste new tablets and hold still while hypodermic needles are stuck into their arms.

Partly because of their spirit, it was possible to find new methods to produce better penicillin, streptomycin and other lifesaving drugs.

Dual-Purpose Signal Generator

(Continued from page 215)

is controlled by the capacity of condenser C5, and it may be raised or lowered by using a different value of condenser. A smaller condenser will give higher tone, and a larger condenser a lower-frequency tone. If the audio portion of the generator is working properly the next step is to connect the unit to a radio receiver by means of the 4-ft. shielded lead. This is a single-conductor shielded rubber-covered lead connected to the through-panel insulator; its woven metal shield is grounded on the metal panel under the clamp. This r.f. test lead terminates in two spring clips, one attached to the conductor and the other to a short lead soldered to the woven-wire shield. The clip on the center wire is attached to the antenna post of the receiver and the shield clip to the ground post. With the receiver tuned to the middle of the broadcast band, the dial C8 of the signal generator is rotated. Somewhere near the 50-degree mark on the dial you will hear the signal from the generator. Paralleled 2-gang condenser C8 can be 360 or 365

(Continued to page 232)

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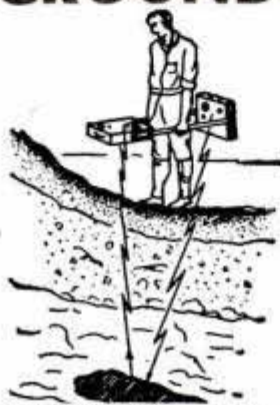


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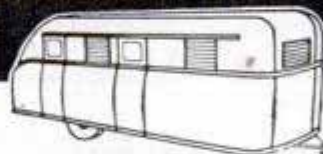


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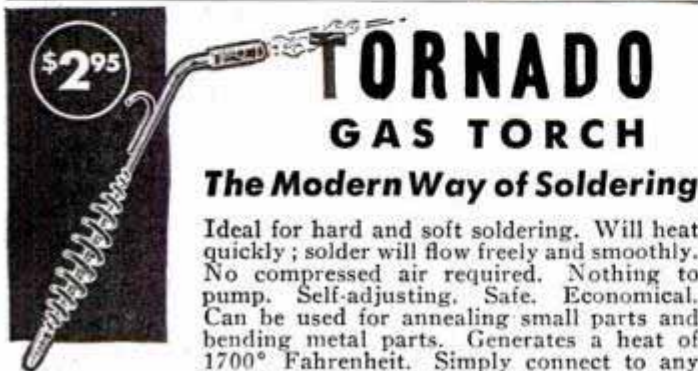
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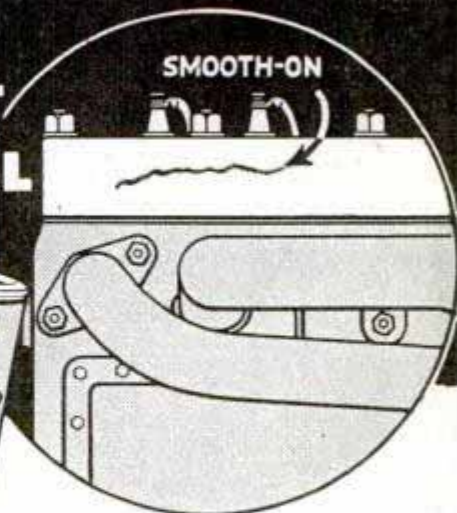


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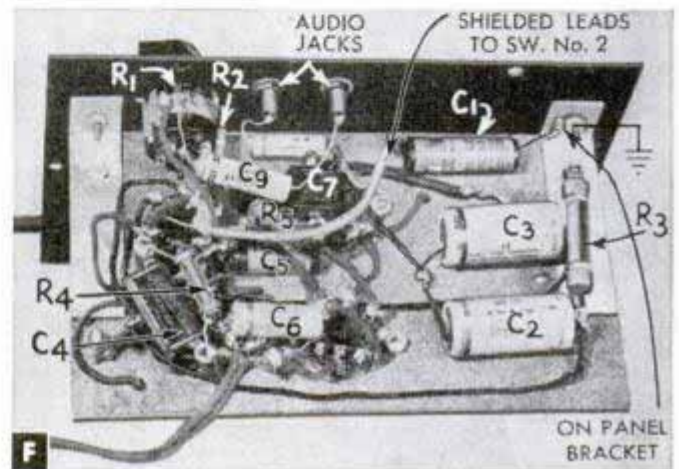
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mmfd. The generator can now be calibrated by using known broadcast band signals.

The "signal substitution" method of trouble shooting is briefly as follows: As the generator provides both audio and radio-frequency signals it can be used to trace both of these circuits in the receiver. Starting with the audio end, plug standard test leads in the audio jacks; ground one lead on the chassis of the receiver under test and apply the other lead to the grid prong of the final audio output tube in the set. If this stage is working properly, the 400-cycle tone will be heard in the loud-speaker. Reverse the unit line plug in the wall socket if hum is present. Next, the signal is applied to the audio driver stage; again the signal should be heard, louder this time because of the extra gain provided by the



additional tube. The next step is to throw the audio-r.f. switch No. 2 to r.f. and use the shielded r.f. output lead. The center test-lead clip is then applied to the plate of the detector tube (assuming it is a diode detector of a superheterodyne set) and the signal generator is tuned to the i.f. frequency. If the detector is working properly the signal will again be heard in the speaker. In sequence, the generator r.f. signal is applied to the plate and the grid of the i.f. tube and then to the plate of the mixer tube. Finally the generator is retuned to the frequency to which the mixer stage of the receiver is tuned in its grid circuit, and then r.f. signal is applied to the grid of this stage. Again the signal should be heard in the loud-speaker. In any of the above steps if it is impossible to get the signal through the stage under test the chances are good that the trouble is in that stage. A voltmeter is then used to check all voltages and resistors in this stage. The signal generator isolates the trouble to one tube. Detailed student material list R-357 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

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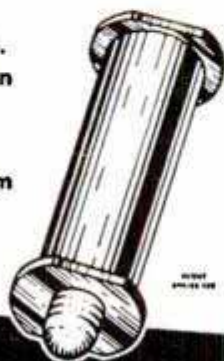
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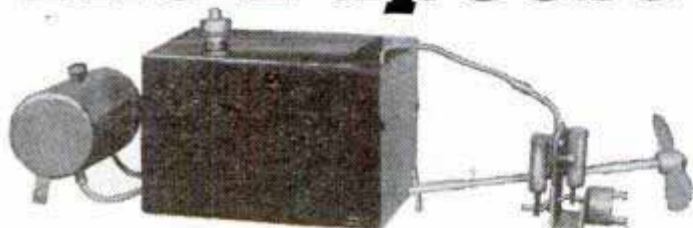
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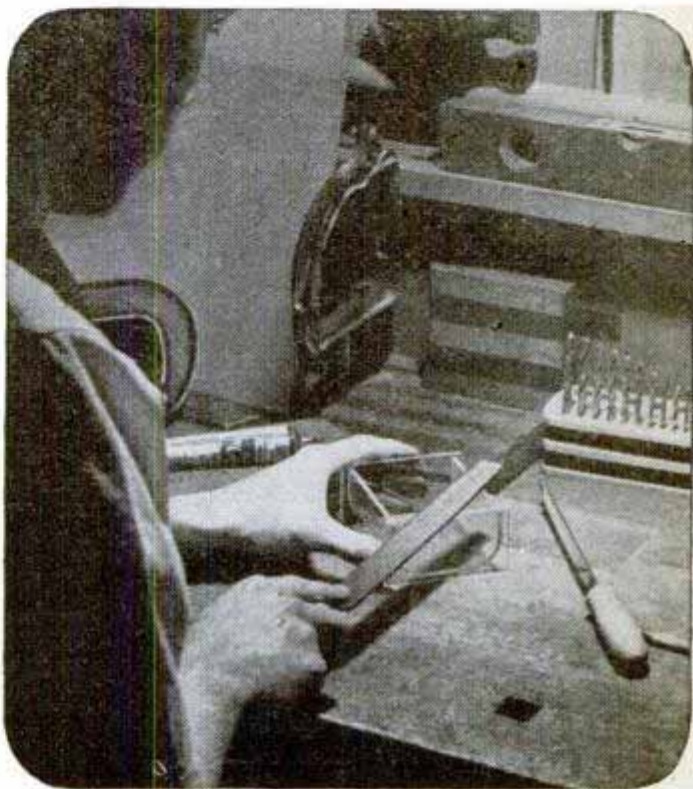
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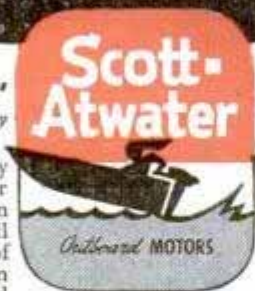
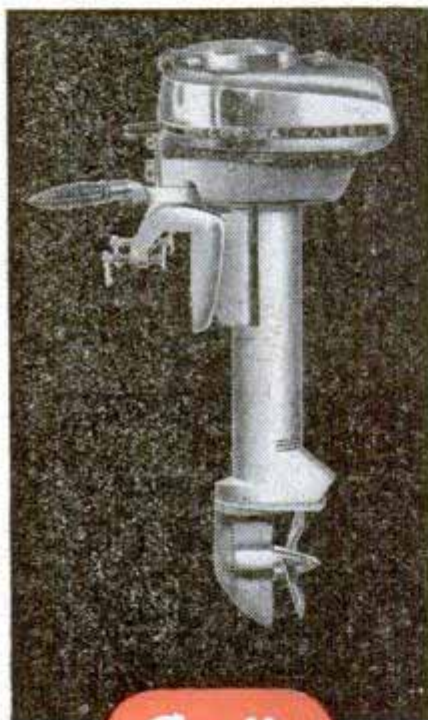
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School for the Big Cats

(Continued from page 84)

pedestal and sit down—may take a half hour or two years. But this and the more intricate tricks are based on the trainer's ability to make the animal follow the tip of a whip or stick.

Roars, snarls and spits from the animals dress up any lion show. Clemens has a neat little trick he uses to make his cats bellow on cue. During the first stages of training they instinctively snarl and roar at the whip that dangles above their noses. Clemens holds his right fist toward their faces. Whenever a lion roars, the trainer spreads his fingers. Eventually the process is reversed in the lion's mind. Whenever Clemens opens his hand the lion roars. It's what a psychologist would call a conditioned reflex but to Clemens it's just a training trick.

During Clemens' act there are 10 lions, two tigers and one man in the cage. The animals build pyramids, walk planks, roll over, jump through fire hoops, sit up and play leapfrog.

Clemens' more spectacular stunts include riding a lion's back like a horse, taunting one of the cats until it leaps at him from a high pedestal, and holding his head inside the mouth of his most trustworthy animal.

To teach an animal to balance himself on his hind legs the trainer uses a mechanical "crutch"—an ordinary pedestal fitted with a hinged support along one side. A rope runs from the support through a pulley in the top of the cage to an assistant outside. Clemens lifts the cat off his front feet by dangling the whip above his nose. The lion finds himself sitting straight up, leaning against the hinged support for balance. The assistant gradually drops the support until the lion is sitting by himself.

Meat often is used as a bait in teaching tricks to the tigers. According to Clemens, these striped cats are sneaky as a snake, treacherous as a mule, and a lot more dangerous than either. He frankly admits he's nervous whenever they're in the cage. After a two-hour warm-up with the lions, he switches to the tigers for an hour. It isn't a very pleasant change. Clemens considers lions reasonably safe as long as they're on their pedestals—it's when they're on the ground that they become dangerous. Tigers are dangerous all the time.

After a nerve-racking hour with the tigers he polishes the entire act for 12 minutes, then drives the animals back to their cages. Then he may train his "punks," the 1½-year-old cubs, for a while, which he considers a more or less pleasant pastime.

(Continued to page 240)



**Snap-on's BLUE-POINT BOXOCKETS
combine socket wrench grip
with direct leverage!**

Straight handle Boxocket wrenches are designed with heads set at a 15° angle so that they can be used in many corners where an offset wrench might prove cumbersome.

The 15° angle provides ample clearance from obstructions . . . avoids skinned knuckles . . . and gives you long, direct, pulling leverage. Add to this the many advantages of Boxocket construction, including the fact that they need only half the space required by an end wrench when handle movement is limited, and you have a husky, "no-slip, no-spread" Boxocket wrench to speed your work. Sizes range from 3/16" to 1 1/4" with different size openings in each end for double duty service. Other Boxocket styles, 3/16" to 3 1/8". Available through Snap-on's nationwide, direct-to-user tool service.

SNAP-ON TOOLS CORPORATION
8062-G 28th AVENUE • KENOSHA, WISCONSIN
International Division: Kenosha, Wisconsin, U.S.A.



XD-6K BOXOCKET SET
12 popular wrench sizes ranging from 7/16" to 1" without duplication, offset at 15° angle on 6 long-leverage handles. Complete in sturdy leatherette kit for **\$1100** only

MAIL YOUR ORDER . . . Our local representative will deliver the set to you. Give business address if possible.

Snap-on Tools
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PRESIDENT, CROSLY MOTORS, INC.

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For information and literature write: Crosley Motors, 2532-HB Spring Grove Ave., Cin'ti 14, O.



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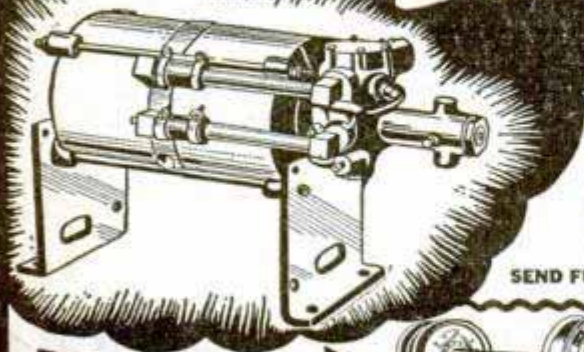
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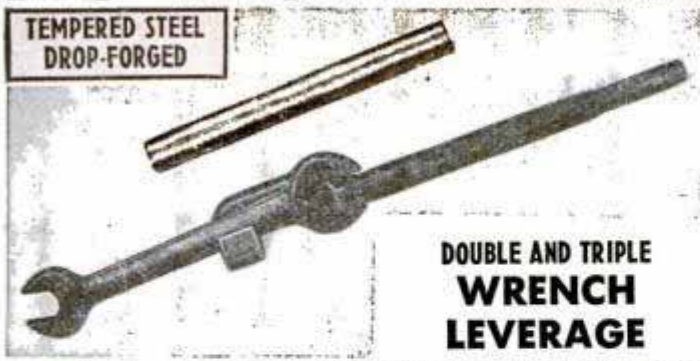
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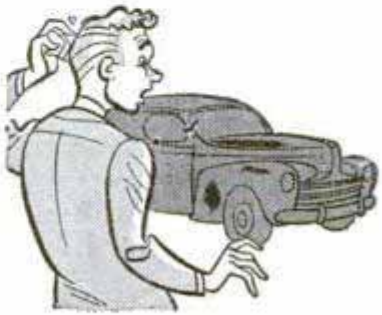
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Car's a sight!



Here's the stuff



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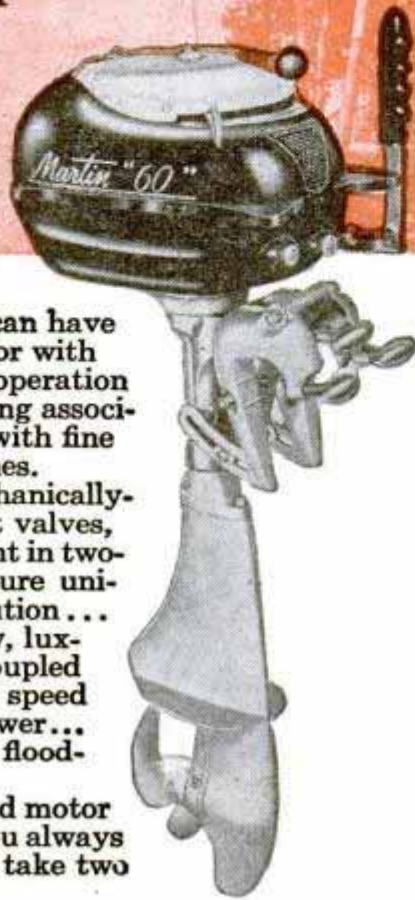


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He may also require "jugheads" to stay after school if they've acted up during the regular training period. "Jugheads" are animals that aren't quite as bright as Clemens would like them to be.

The "weapons" that he carries into the cage aren't really weapons at all. Clemens says there's nothing short of steel bars or a rifle shot that can prevent a big cat from killing him. His safety depends upon how well he can bluff the cats into thinking they can't reach him. He does it by jabbing a pole or chair toward them. There are half a dozen old chairs around the cage at his home. With legs battered off, they're good evidence that a lion or tiger can reach the trainer any time he wants to—he just doesn't know it.

Whips are seldom used directly on the animals, as a cat that can be whipped into submission doesn't belong in his act. He uses the whip to break up fights, dress up the act and give emphasis to his spoken commands.

Blanks are fired whenever an animal has made up his mind to do something he shouldn't. The loud report makes him forget his plan momentarily and gives the trainer a chance to change the cat's mind.

Clemens points out the discomforting fact that if one lion jumps the trainer the other cats likely will pile in. But there's bad blood between lions and tigers and the striped cats rarely will help any animal except another tiger.

This bad blood leads to frequent scraps inside the cage. One day last year Clemens decided to work four "punks" into the act. It was the first appearance of the cubs and it upset the older animals. Instantly the cage was a melee of fighting cats with Clemens in the middle. When he'd driven the animals back through the chutes one of the cats lay dead and another was so badly wounded it had to be shot. An expensive day.

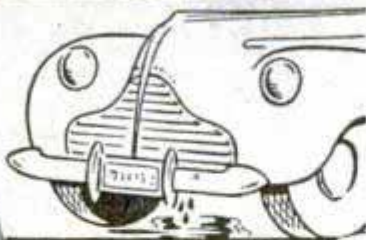
One of the first questions a stranger asks the trainer is how he got into the dangerous business. Clemens has a wanderlust and dangerous occupations have a magnetic attraction for him. He ran away from home to join a circus when he was 14 and fell naturally into the job of cage boy for the lion trainer. After drifting around for five years he landed a job at the Minneapolis Zoo, a job that lasted only three weeks. The director discovered him training the zoo's lions at night.

He drifted from circus to circus for a while, then wandered around the world from Siberia to Samoa. Returning to the States, he became a deep-sea diver, dredge-

(Continued to page 244)



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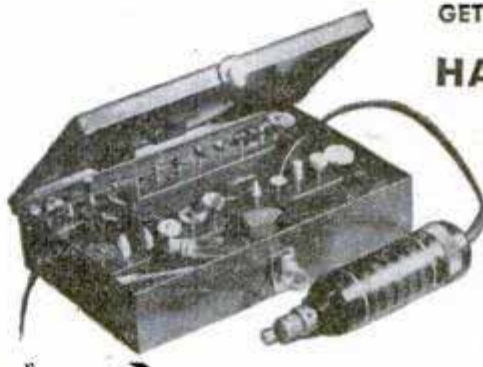
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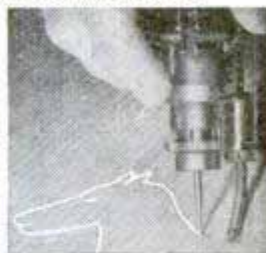
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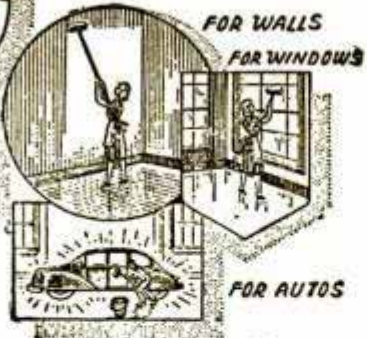
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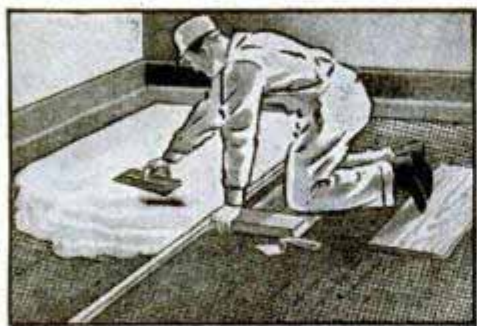
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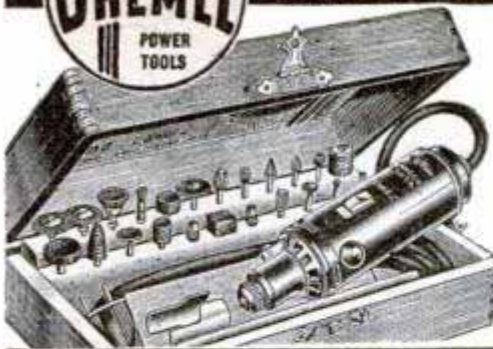
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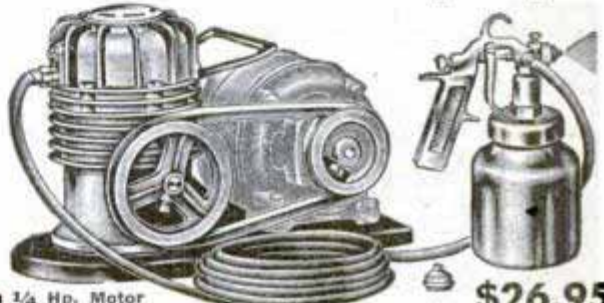
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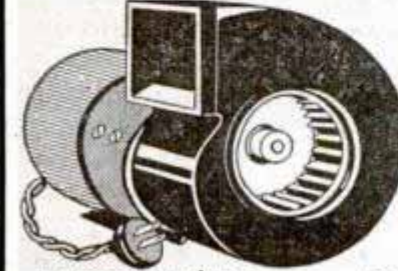
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This RUGGED BLOWER & EXHAUST DELIVERS 100 CU. FT. AIR PER MINUTE. Quick and simple to install. Anyone can do it with ordinary household tools.

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man and steel-mill hand. After his marriage he and his wife moved to a small piece of land near Peoria and set up a cage in the back yard, where he developed his highly successful act. Incidentally, his wife is his top assistant.

Clemens has trained more than 100 big cats during his life and his body shows it. One of his popular tricks is holding a lion's food between his lips until the cat crunches down on it. There's a recent scar on his mouth from a cat that was a bit too hungry.

He can also show you a scar on his back that slants down from one shoulder to the opposite hip, a reminder of an Oakland, Calif., incident. Clemens was "working" one lion when an assistant tripped over a guy wire that held up the cage. The shaking framework nudged another cat off its pedestal behind Clemens. The animal immediately jumped for the trainer's back, raking him from shoulder to hip. After Clemens finished the act he was rushed to the hospital. The seam in his back required 118 stitches. He gave a scheduled performance the next afternoon.

Clemens hasn't lost his appetite for danger but he's getting philosophic now that he has a big-time act. "Most people who have sense enough to pick out a goal early in life, work until they die to attain it. Ever since I was a kid I've had one ambition—to hit the big time with my own lion act. Maybe it wasn't much but I've done it. Now there's still half a life for me to live. What's a guy supposed to do from here on in?"

Standing Room Only

(Continued from page 141)

already has been mapped. The motorways will travel across country toward their destinations above or below the existing networks of streets. Most will have four lanes in each direction and all will be served by converging collector roads so as to eliminate all cross traffic. The complete system will be part of a total of 613 miles of super-highways that are to be built in the five southern counties of the state during the next decade or two.

Private capital is expected to take care of the demand for adequate parking in downtown Los Angeles by constructing so-called "motorway buildings" around and above portions of the freeways. The streets, in other words, will run right through the buildings. Each of the buildings will have three or four levels of parking space reached by ramps that lead from the street.

One of the reasons why Los Angeles is experiencing its fabulous growth, of

(Continued to page 248)

Govt. Surplus Guaranteed PHOTOGRAPHIC SUPPLY BARGAINS

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16MM 50 ft. magazine film, super X or XX processing not inc.	\$1.75
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over the highways, just like the big cars. A real thrill for anyone who likes to "tinker." Every red blooded boy will want to build one. Cause with this kind of auto, he'll be the "big shot" in his town. This is a real powered auto, not a toy. Rush postcard or letter and let us tell you all about it.

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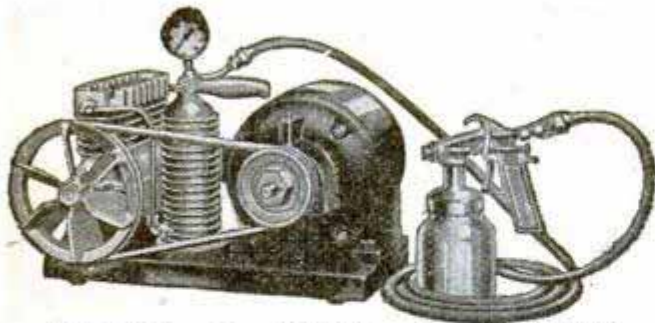
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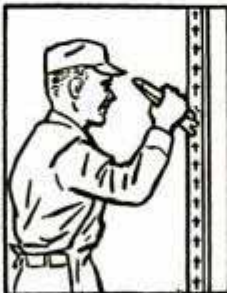
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**BUILD YOUR OWN
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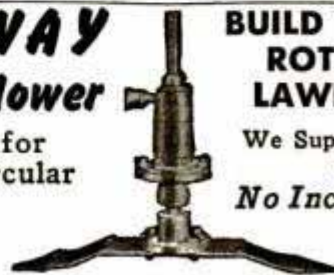
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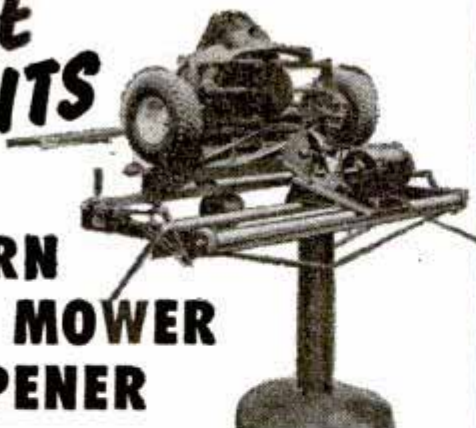
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course, is that many people always have desired to move west but were hindered in the past because of the lack of jobs. Now that more jobs than ever before are available, the Pacific Coast is filling up all the way from San Diego to Seattle.

The most equable portion of southern California is a narrow and semiarid belt constricted between the ocean to the west and the mountains and desert to the east. The region appeared good for little more than cattle ranching at the beginning of the century and the only thing that Los Angeles had was its climate. On the face of it the area never would amount to much.

Then Yankee ingenuity created Los Angeles Harbor by dredging out some tidal mud flats. Next the city went hundreds of miles away, up into the Sierra Nevada mountains, for water and electricity. Today it taps the Colorado River as well. Now it is getting ready to augment the fuel oil and natural gas that it gets from California fields by means of a pipe line that will extend to Texas, bringing in natural gas from the midcontinent fields. Ideas like these are building up the whole West.

Flying Fish... At Home Anywhere

(Continued from page 152)

to flip the prop from behind. At Bendix, N. J., the engine was balky. All you could hear as the seaplane neared terra firma was the sound of the wind in the struts as Lambros came in for a forced landing. It was a three-pointer smack on the hard runway! Neither Kulik nor float was injured.

From the pilot's point of view seaplanes have many advantages. The student can shoot landings one after another in a straight line for mile after mile. At a busy land port he would have to taxi back to the head of the runway after each landing and wait his turn for take-off, thus wasting valuable flying time.

Experienced pilots claim they can keep going in weather that would ground land planes. Flying close to the water, they know they can "sit down" when things get too bad. This, they argue, is far better than being caught out on wheels and worrying where to put them down.

Seaplane pilots probably get more surprises than any other private flyers. Once Bob Fogg, a skilled water pilot, was flying toward the Gulf of Mexico when he found himself pinched between two weather fronts. With visibility dwindling he managed to make a landing on what appeared to be a lake. He climbed out of the plane to discover he had landed in an oil field with derricks sticking up on all sides!

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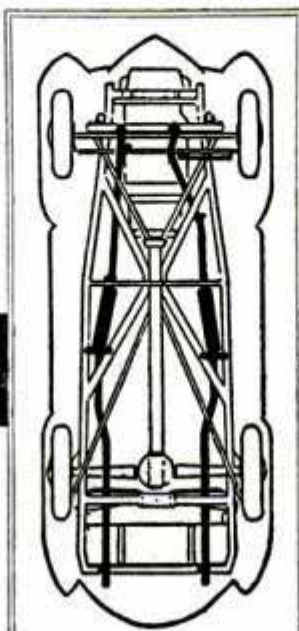
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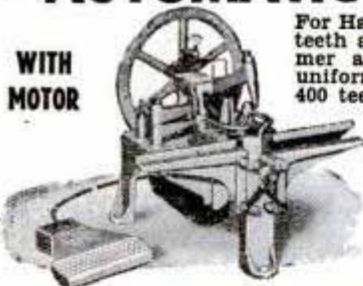
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For Hand and Band Saws. Set saw teeth automatically. Perfect hammer and anvil action sets teeth uniformly. Easy to operate. Sets 400 teeth a minute.

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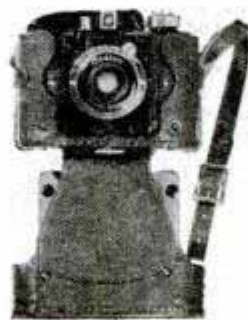
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\$40 to \$50
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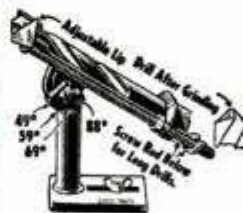
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1", \$3.75; 1 1/4", \$5.25; 1 1/2", \$6.50; 1 3/4", \$7.50; We can supply up to 2 1/2", V8, \$8.00. Note difference between A and B types. Mailing weight, 3 lbs. If remitting, enclose for postage.

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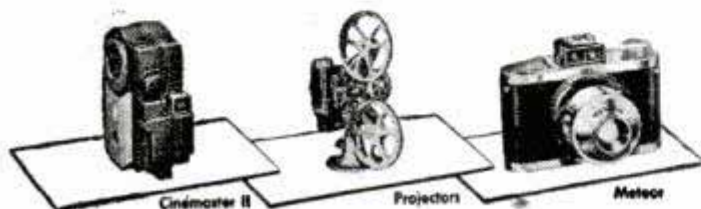
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3. LENS CORRECTION. Universal's experience in the grinding and polishing of lens and prisms for precision optical instruments resulted in the color corrected anastigmat Mercury II lens.

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MERCURY II—It's a Universal

UNIVERSAL CAMERA CORPORATION
NEW YORK CHICAGO HOLLYWOOD



They Fish for Trouble

(Continued from page 77)

When the cable is hauled up, the ends are lashed to buoys. Tests are made to determine whether there is electrical continuity through it to the shore station. Repairs don't start until this continuity is established for a cable ship must keep in constant communication with the shore station through the cable it is working on. Progress reports on repairs are transmitted to the plant engineer in New York and the ship also receives orders through the cable.

The extent of the break and the condition of the cable determine the length of time required for repairs. A few years ago, for example, a break in one of the older Western Union cables necessitated splicing in 270-odd miles of new cable, a task requiring many days. Frequently bad weather forces a repair ship to suspend work temporarily.

Just before the last splice is made on every job the cable ship signals to the home station the traditional message "now finaling." This means the job has been completed and that the ship, after dropping the cable into position and picking up buoys, is ready for a new assignment.

The various cable companies frequently use one another's ships for repair work. When not engaged on Western Union work, the Kelvin can be chartered for \$2000 a day, the Field for \$1500. The contracts state that the ship, while working on a competitor's lines, shall be under the management and control of the parent company.

The cable still is regarded as the workhorse of the communications system. Virtually unaffected by atmospheric disturbances that plague the air waves, it carries messages with speed, precision and dependability. When a break is reported the Kelvin and Field drop a hook over the side—fishing for trouble.

Electrical Ceilings Heat a House

Heat for an experimental house in Knoxville, Tenn., is supplied by electrified ceilings controlled by thermostats. The heating element, developed by United States Rubber Company, is conductive rubber sandwiched between two thin layers of plastic. It costs only \$72 a year to heat the one-story bungalow which consists of living room, bedroom, hall, combination dining room-kitchen, and glass-enclosed porch and bath, all equipped with ceiling heat. Power rates in Knoxville are lower than in most sections of the country, but the builders believe electrified ceilings are practical anywhere if the house is properly designed and insulated.

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10 x 1.75".....\$2.75
8 x 2".....\$2.00

Industrial wheels for
heavy loads

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6 x 2".....\$2.80

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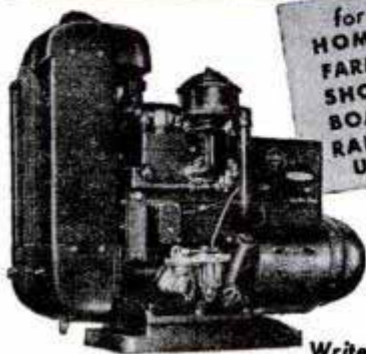
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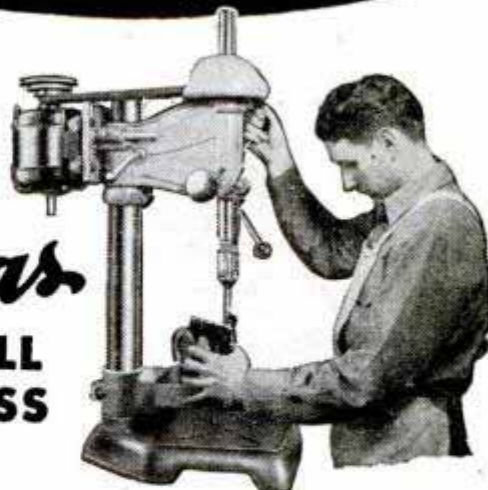
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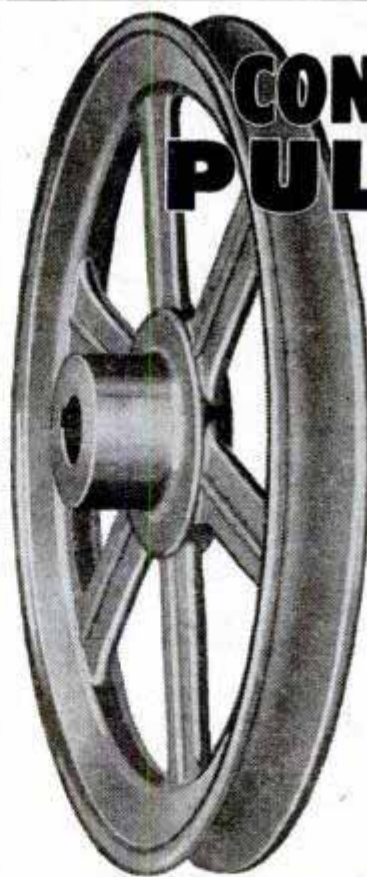
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A worthy companion for the all-purpose compressor. Simple and efficient design, easy to operate. Its versatility and low cost make this syphon type spray gun a valuable asset in the home, shop and farm.



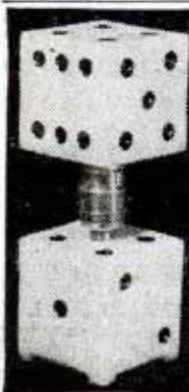
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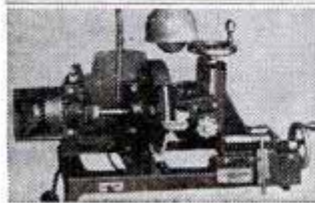
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"Like my new hat, Joe?" she asks. "The boy friend says it gives me that angel look."

"Humph," I snort.

"Why the gloom, sour-puss?" she asks. "Indigestion?"

"No," I shoot back. "It's just I'm thinkin' if you don't reline those brakes, you may *really* look like an angel."

"Oh," she says casually, "I can still stop can't I?"

"Not quick enough or easy enough," I reply.

"Well, it does take a lot of pressure to stop this old bus," she admits grudgingly. "Will new lining make it easier to stop?"

"My Grizzly Brake Lining will," I tell her. "Plus giving you greater stopping safety, Grizzly also permits you to slow down and stop with a 'soft' pedal. That's why Grizzly is the perfect lining for both men and women drivers and—"

"Whoa," she laughs, "that's enough. Reline 'er with Grizzly, Joe, and I'll drive relaxed!"



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Grizzly Brake Lining is designed to give sure, smooth stops to both. Demand Grizzly—a leading brand of brake lining for over 30 years! Grizzly Manufacturing Company, Paulding, Ohio.

"Bear in Mind" . . . ask for

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BRAKE LINING

WHEREVER BRAKES ARE SERVICED

On Guard . . . It's Forest Fire Time

(Continued from page 93)

stations are modern towers equipped with radios and fire-finders.

Headquarters for fire-fighting crews are three guard stations where crewmen are ready to go into action as fast as any city fire department. Local farmers and residents serve as voluntary patrolmen to blanket the area further.

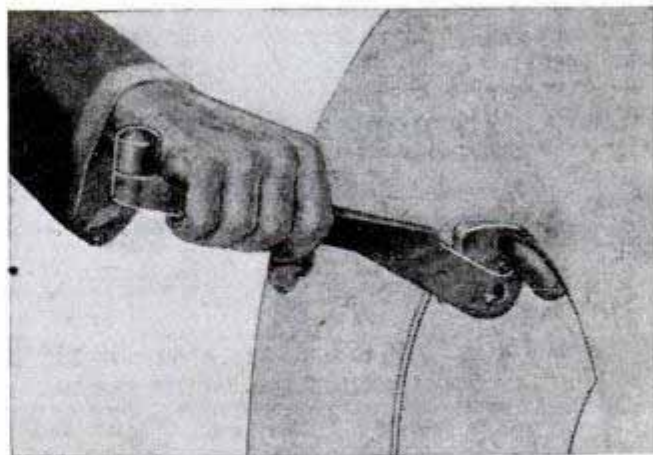
House Mountain Lookout Station is one of the key spots in the network. The 3925-foot elevation is capped with a 110-foot tower. Several times a week the lookout "shoots" fires or suspected fires with his fire-finder, reporting by telephone to Vic Johnson at North Fork. Johnson immediately contacts other stations, the blaze is "lined up" and within minutes the rigs are on their way.

Some fires, known as "permit fires," are welcomed. Bunke issues over 1000 slash-burning permits every year to tree farmers on semi-agricultural lands within the area. Every precaution is taken. Some fires require three field trips—one for preliminary inspection, one for burning supervision and a third for a safety check.

But these are the only fires that are tolerated. Oregon's tree farmers are on sentinel duty in their war against the forest's ruthless enemy.

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Weight balances are attached or removed from automobile wheels by a leverage tool equipped with fixed and movable jaws. All types of balances for passenger cars, trucks and buses can be handled by the tool. It removes weights without breaking them, permitting their re-use.



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TELEVISION IN YOUR HOME NOW FOR \$159.50 ONLY Complete



This easy-to-assemble kit plus a few hours time gives you a highest quality television set . . . at only half the price you'd pay for the lowest priced set on the market!

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instructions are non-technical and simple to follow. All complex units are pre-assembled at Transvision factory.

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I'm interested in your easy-to-assemble Transvision Television Kit. Please send me more information.

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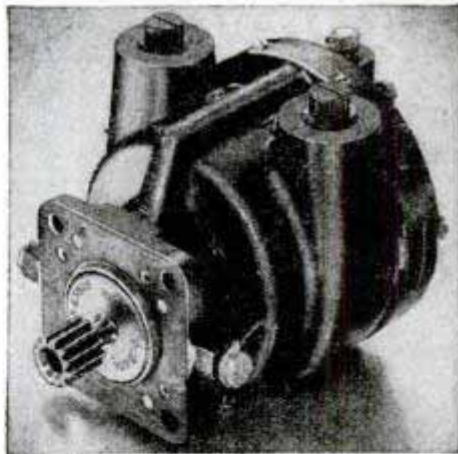
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"STATION
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DOUBLES YOUR
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SPECIFICATIONS—Rated over 200 pounds capacity. Strong steel undercarriage, natural finish wood "station wagon" sides. Semi-pneumatic 10-in. tires. 24" long, 18" wide, 20" deep.

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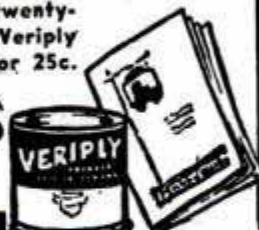
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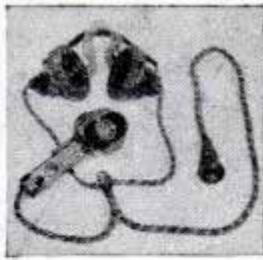
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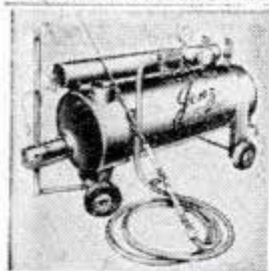
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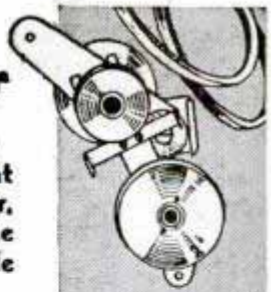
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Push tubular shaft in reduction unit onto motor shaft. Tighten pulley screw. Secure either end of transmission stationary and you are ready to take-off to any machine.

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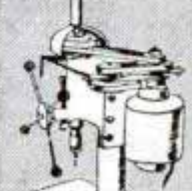
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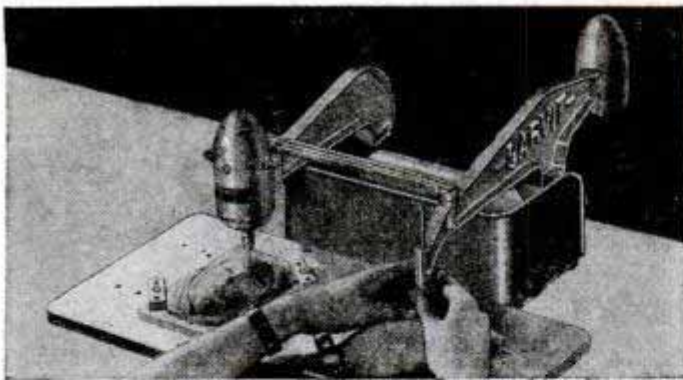
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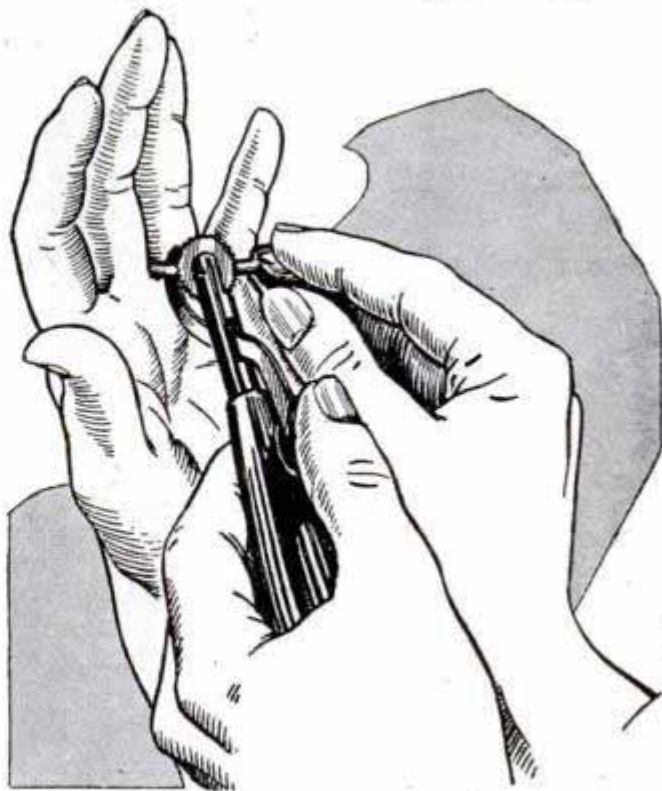
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 Please send one Carvit. \$48.50 enclosed. Shipping charges C.O.D.

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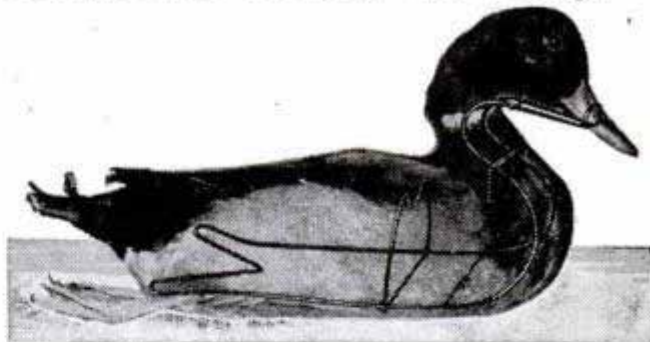
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Rings are removed quickly and easily from injured fingers by a cutting tool specially designed for such emergencies. To remove a bent ring from a swollen finger, a smooth-edged, curved arbor is slipped between finger and ring. Then a lever is pressed and a knob turned to gently apply a small circular saw to the ring.

Dead Ducks 'Framed' for Decoys



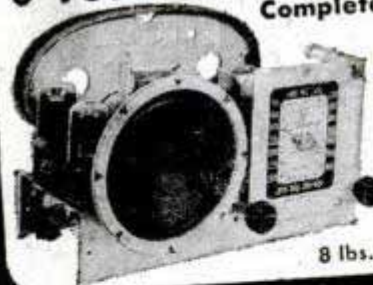
Dead ducks held in lifelike position by a wire frame are used by hunters as decoys. The rustproof steel wire frame, weighing about two ounces, conforms to the shape of the duck and holds its head up. The wire frame is concealed by roughing up the duck's feathers so that they lap over it.

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Gets Full Broadcast and Short Wave Bands



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Machine Measures 11x4x 3 1/2" High. Throat 7" ONLY \$4.50 Deep. PATTERN FREE. Postpaid

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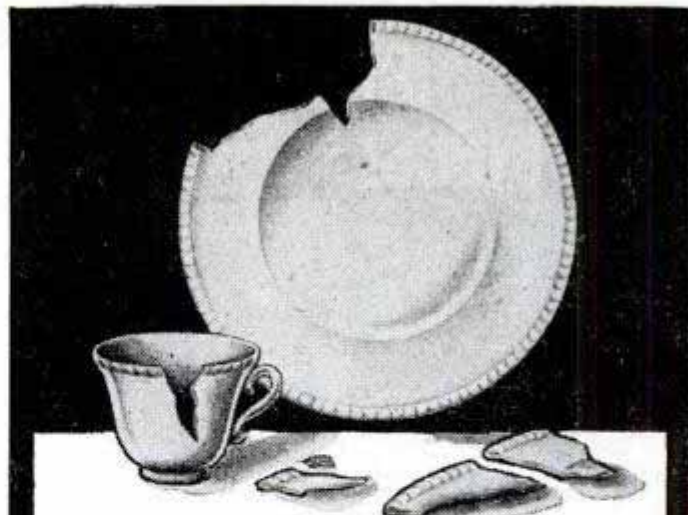
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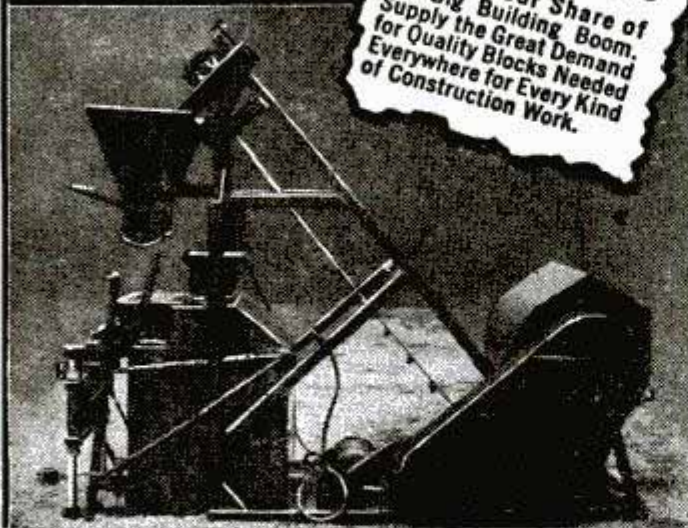
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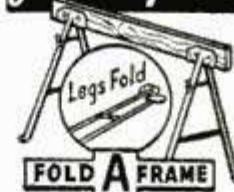
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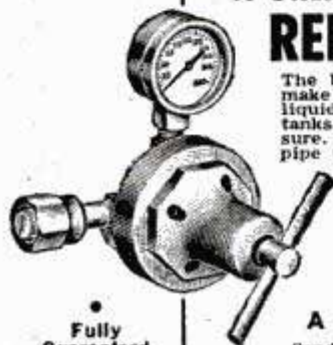
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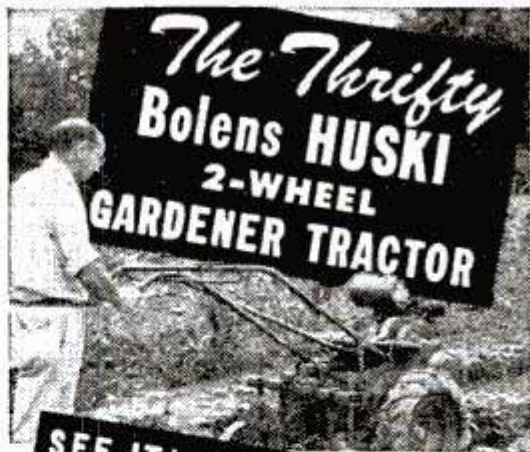


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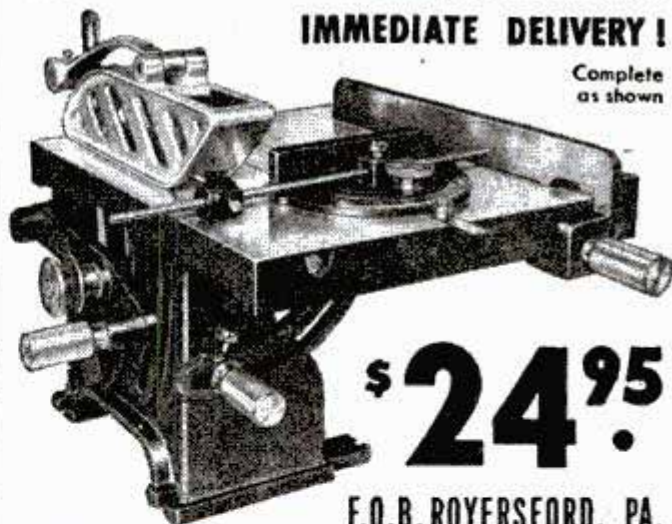
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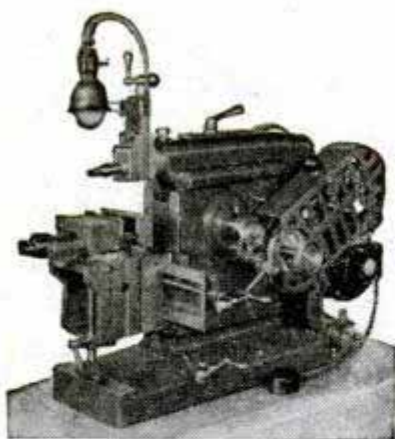
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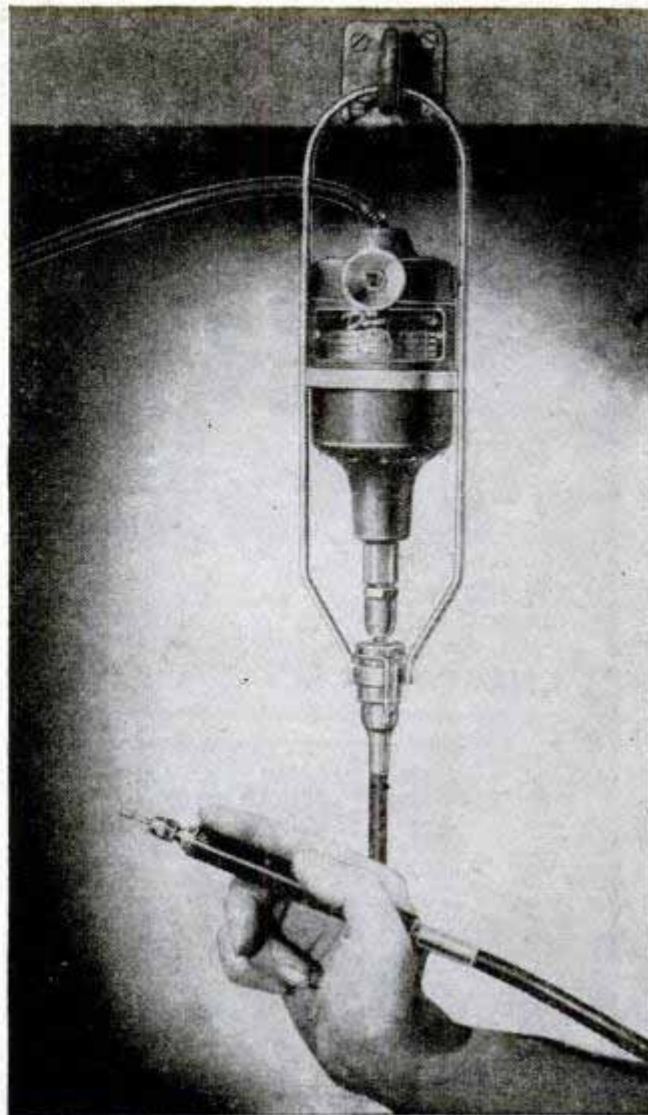
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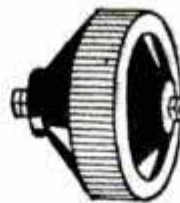


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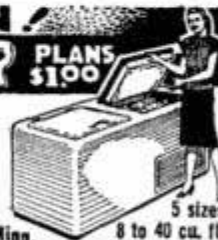
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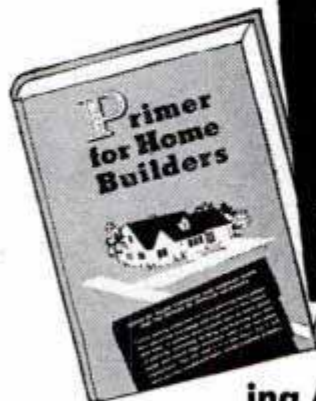
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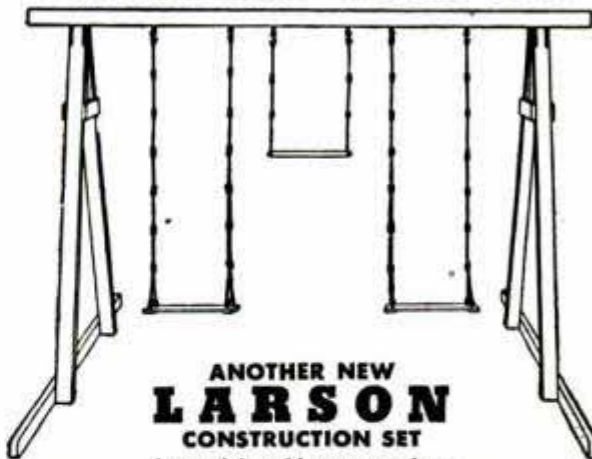
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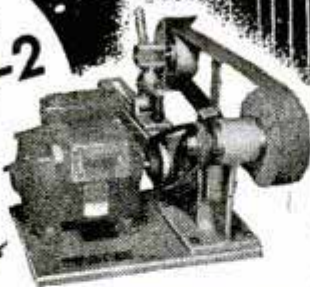
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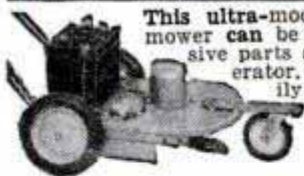
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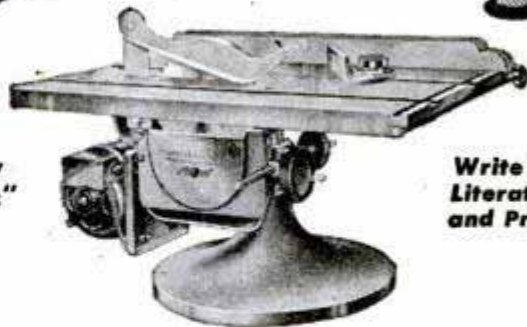
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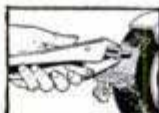
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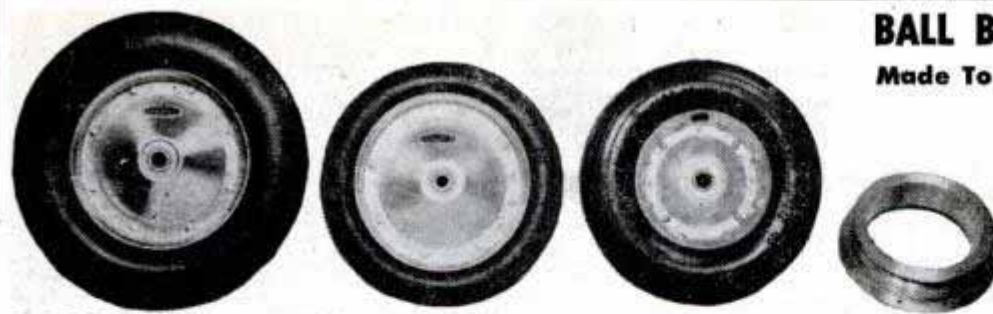
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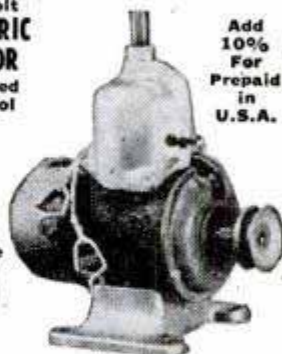
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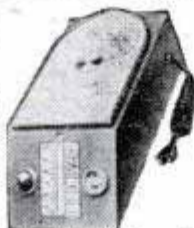
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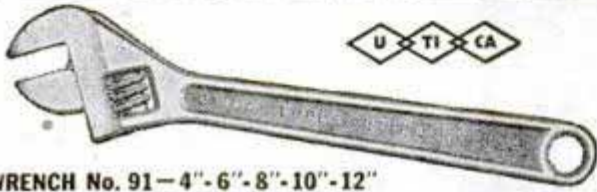
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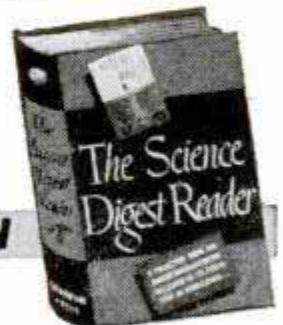
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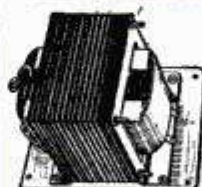
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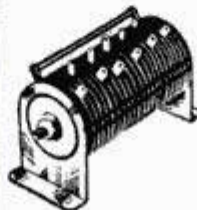


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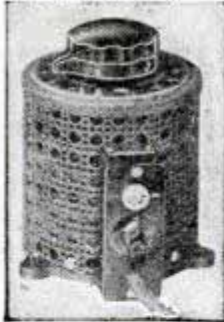


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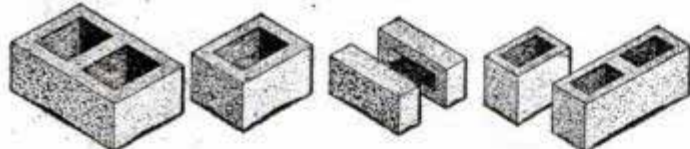
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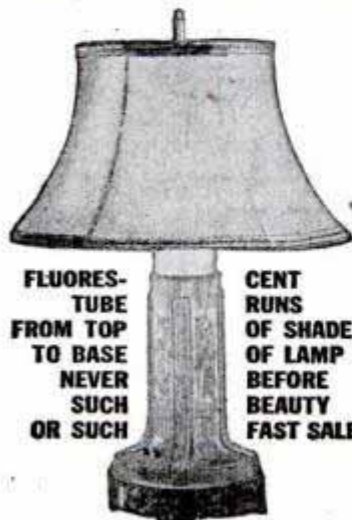


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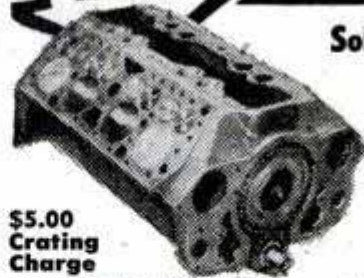
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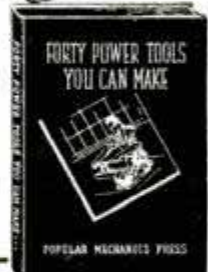
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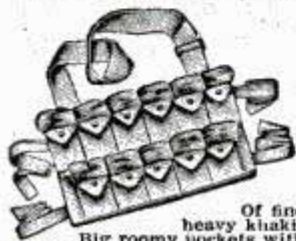
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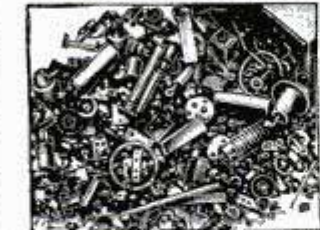
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SKIMMING THE
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WAY!

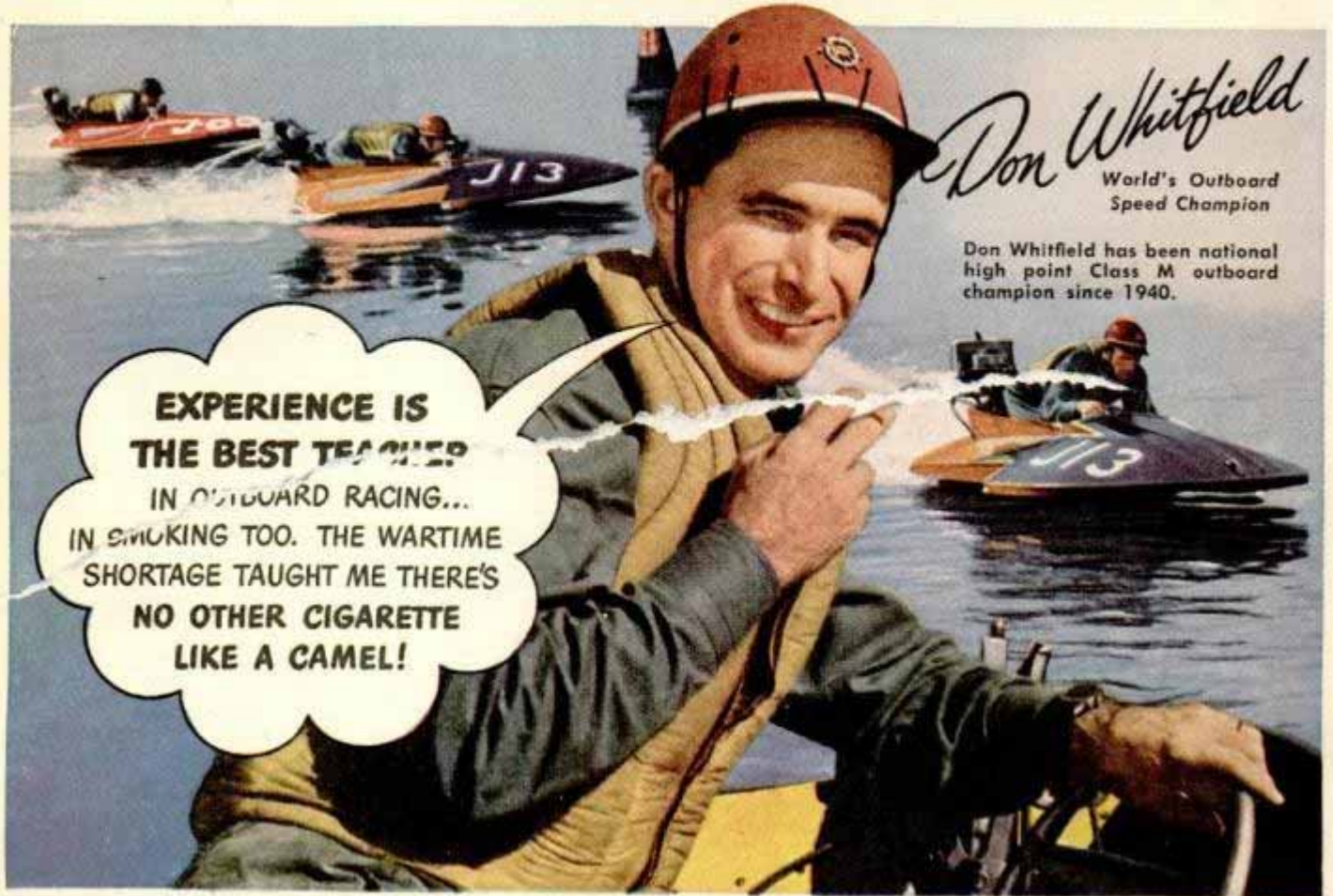


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