

POPULAR MECHANICS

MAGAZINE

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"SPEEDWAY IN A SAUCER"
PAGE 134

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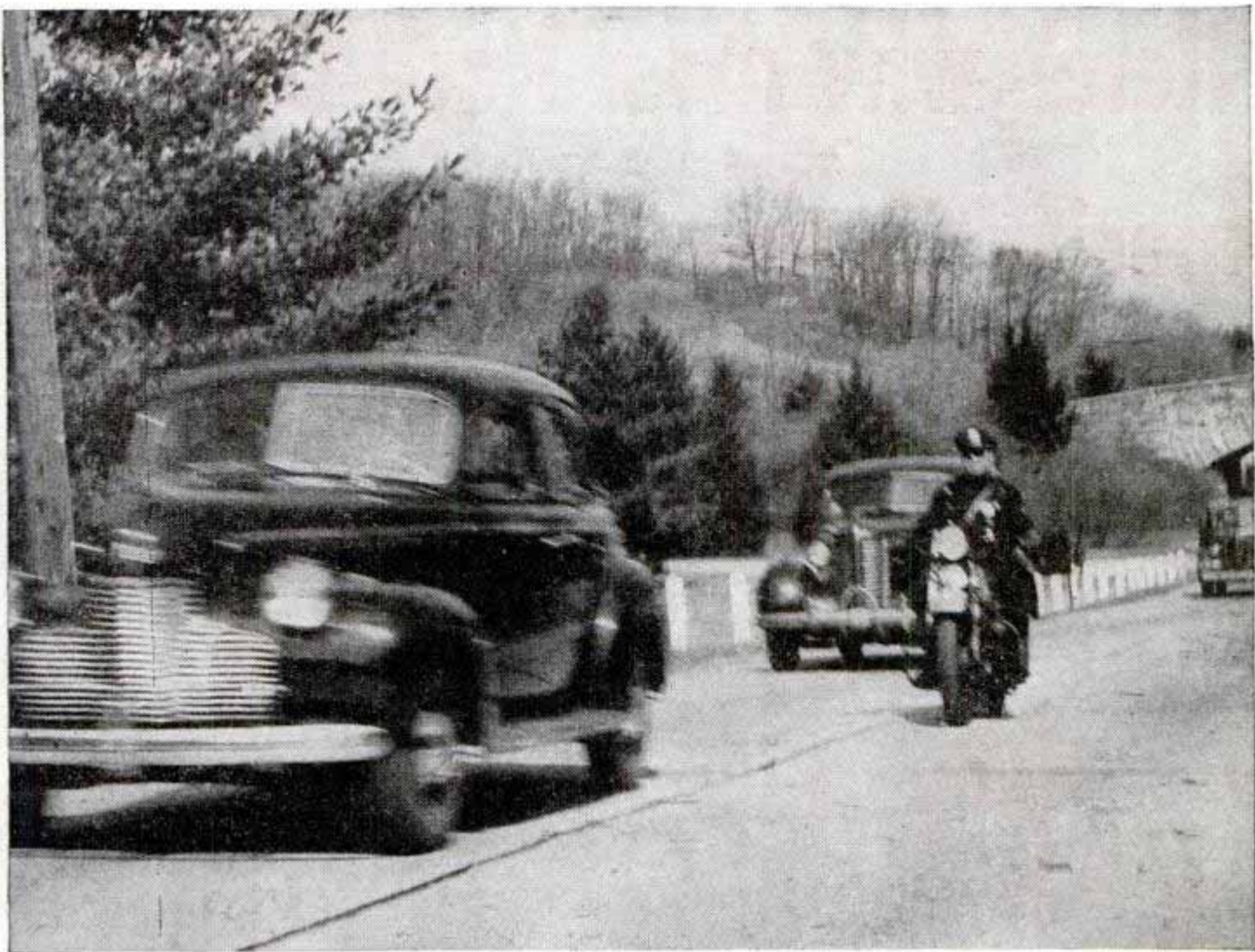
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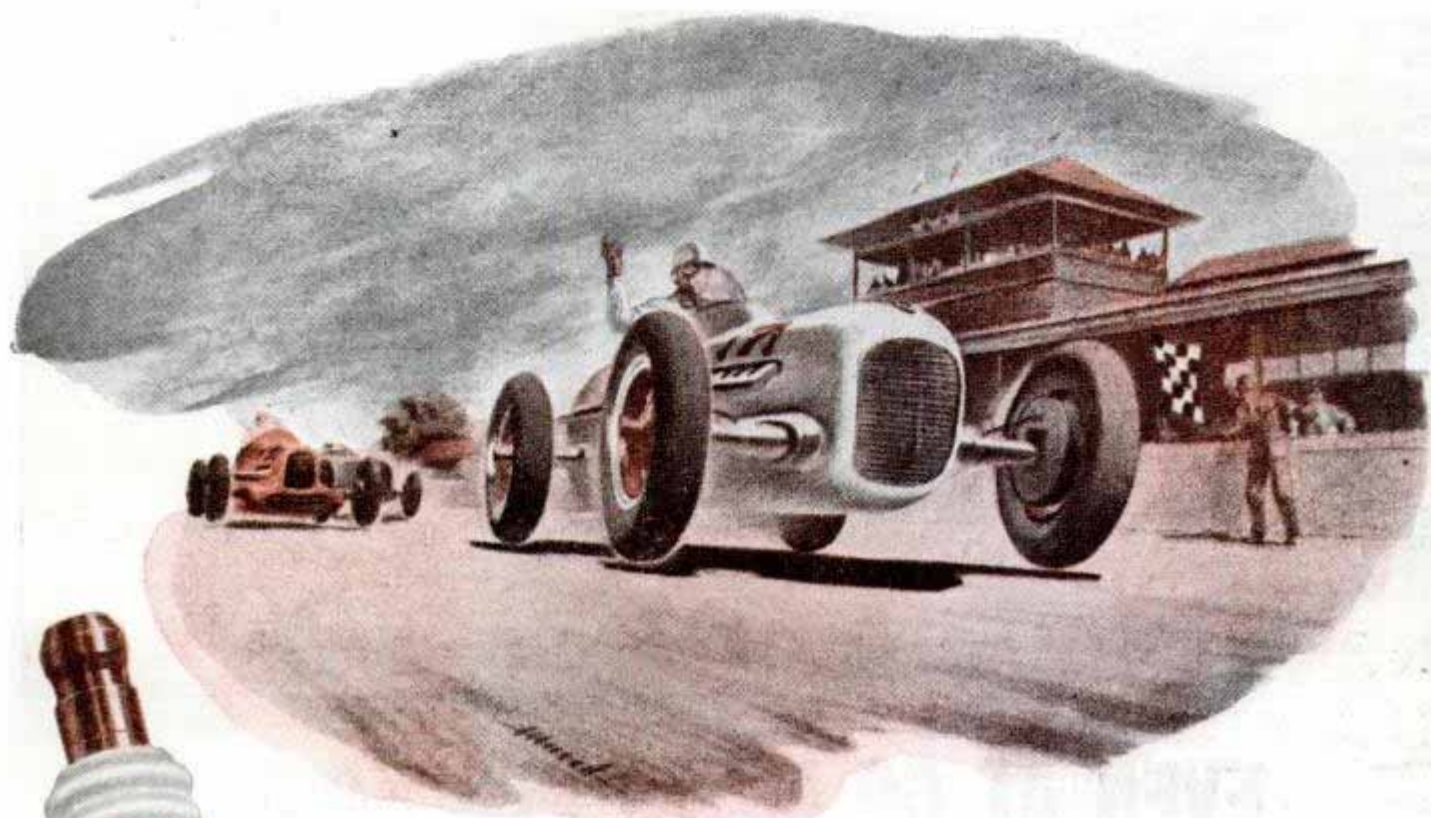
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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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

This Month and Next

THERE'S a thick slice of meat in your Popular Mechanics "sandwich" this month. Packed between covers is the story of the gigantic new flying wing that can tour 10,000 miles on a tankful of gasoline . . . Part II of Byron Nelson's series of golf lessons . . . and on page 88 we present the 1947 Studebaker cars—first of the "old line" to put on a new dress and new engineering. In the opening article by Aubrey Cookman, Aviation Editor, the coming system of landing airplanes "blind" by radar is described in pictures and text . . . and a full-color section starting on page 113 introduces Eastman's process of color photo printing for amateurs.

NEXT MONTH we offer a full ration in features, starting off with sonar—the magic "ears" of the sub-chasers. Then there's "Rough Riders on Water Skis," which will win many converts to a sport famed for plain and fancy thrills. Another headliner tells the story of ocean currents from a ripple to a tidal wave.

MADE to order for vacationers is a feature on our 27 national parks, and many a GI will grow thoughtful over "Garden in the Desert," the story of a vast irrigation project in the Northwest.

THE CRAFTSMAN section will present the ABCs of log-cabin construction . . . also a dust-and-pollen filter for homes that knocks the sneeze out of hay fever. An article for camera fans tells how the fellows who crash the roto pages frame a picture before they shoot. Another timely feature for the Craftsman tells how to build a portable barbecue.

"MEAT" for radio fans will be served up in the form of a built-in set that serves various rooms with extension speakers.

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Managing Editor.....Roderick M. Grant
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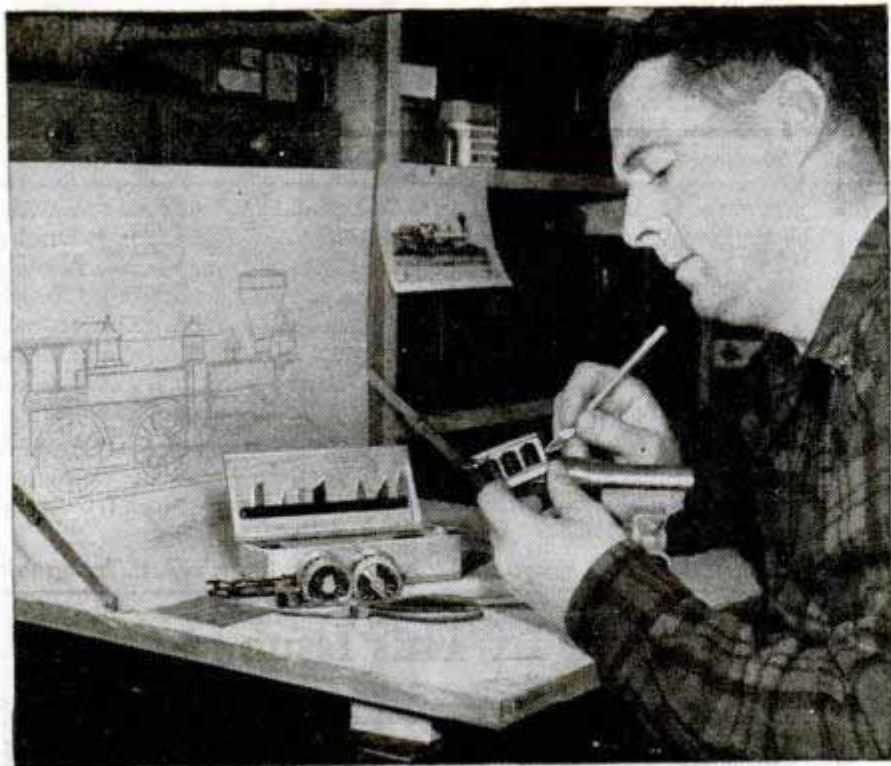
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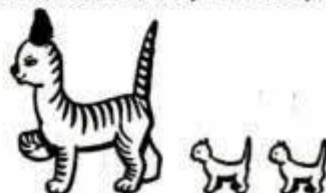
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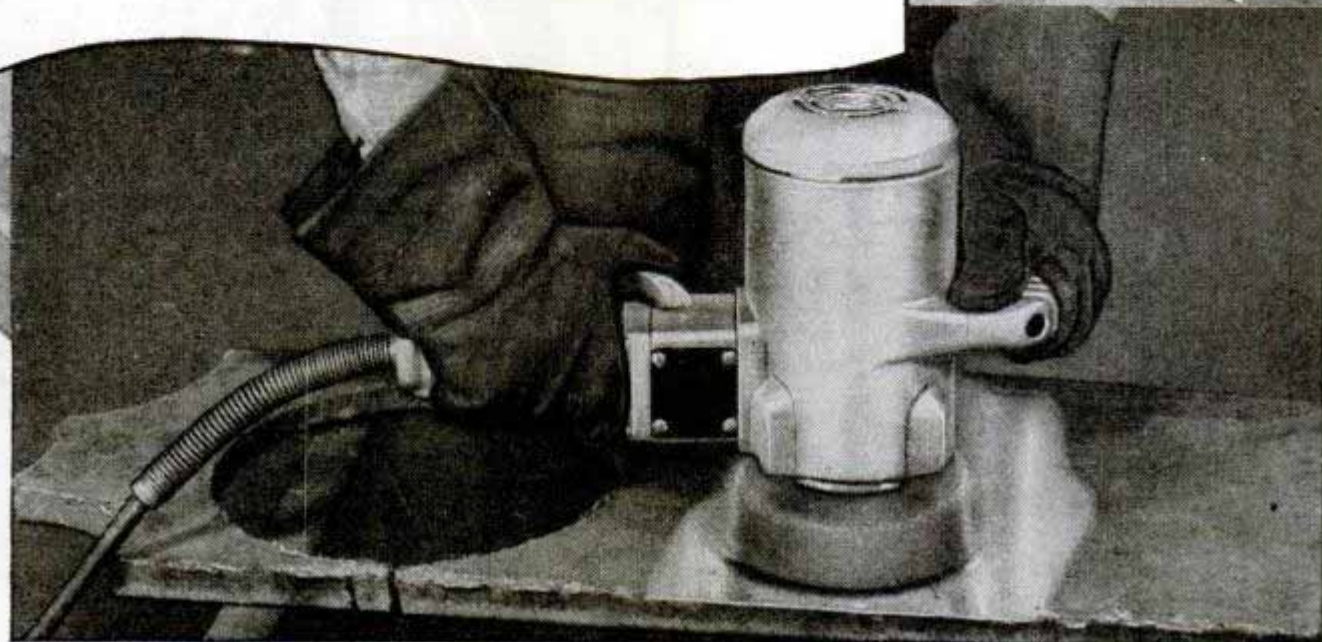
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AA-72

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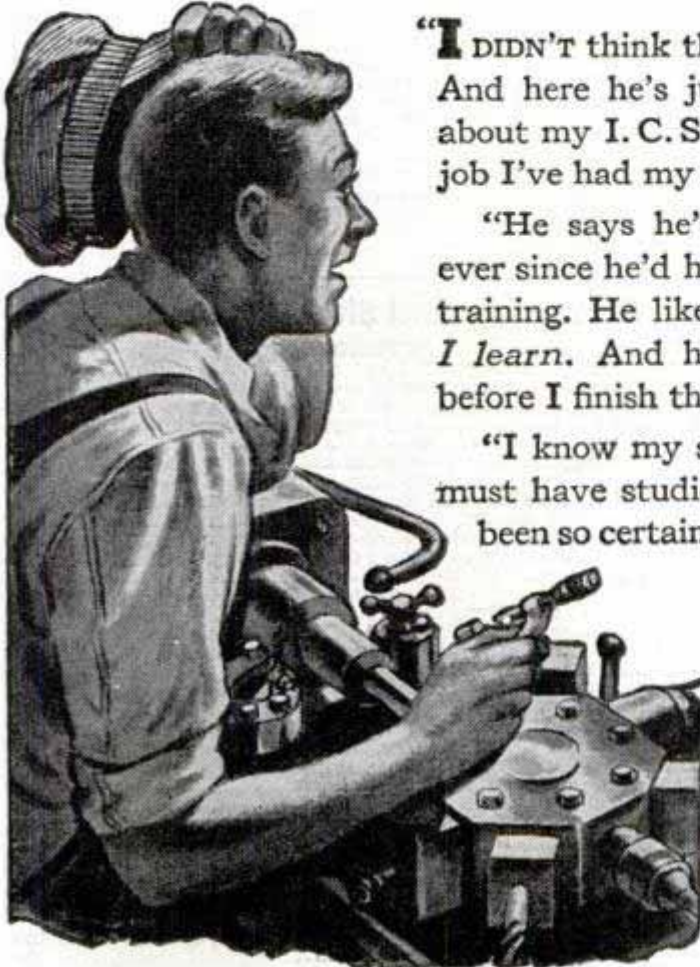
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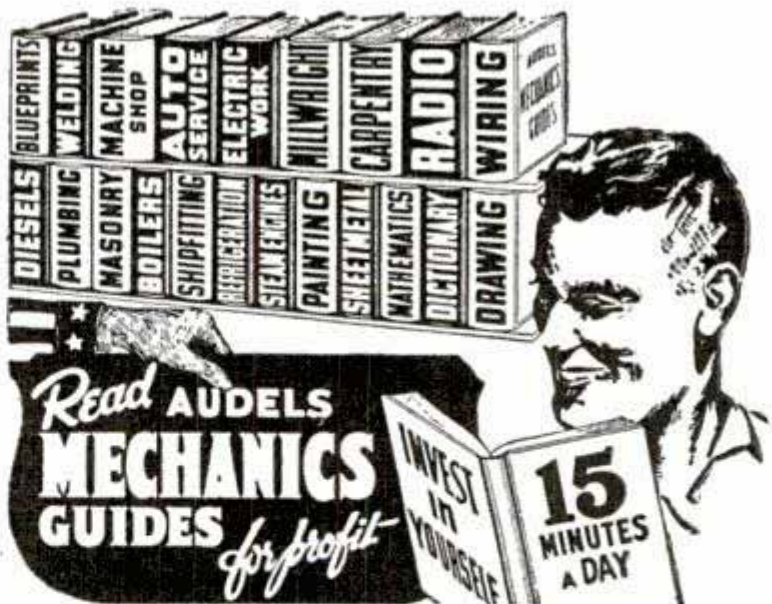
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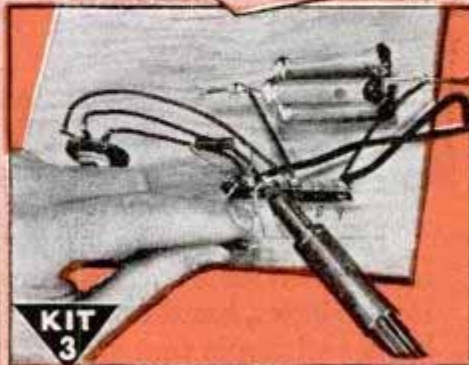
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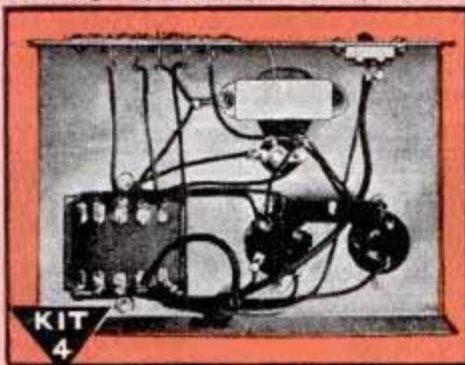
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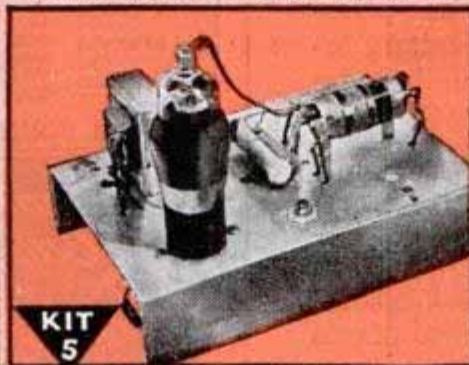
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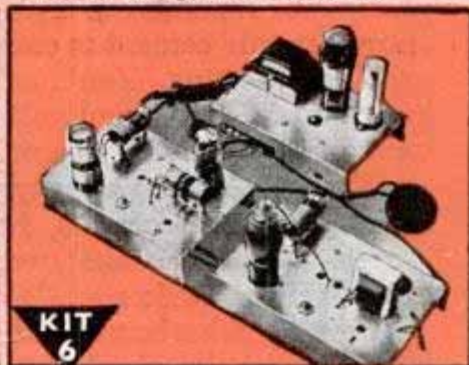
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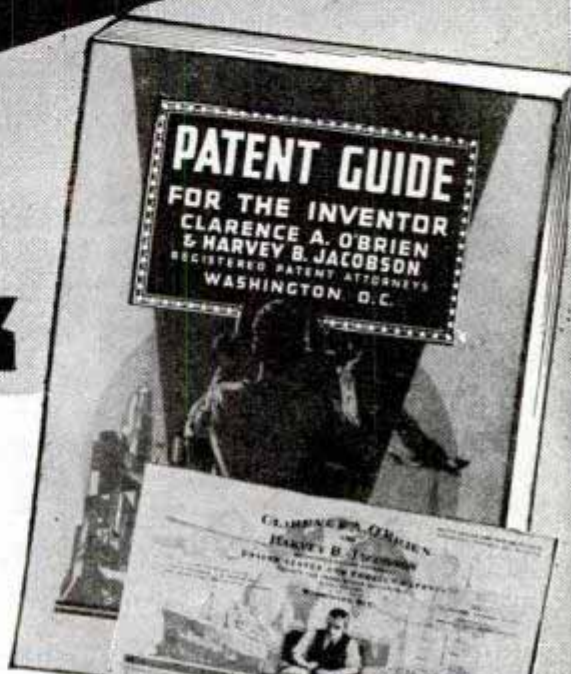
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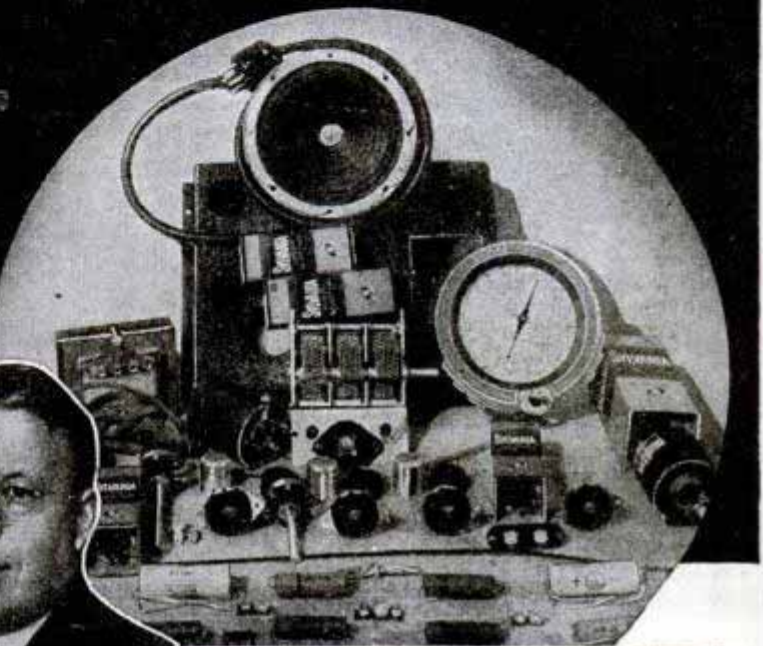
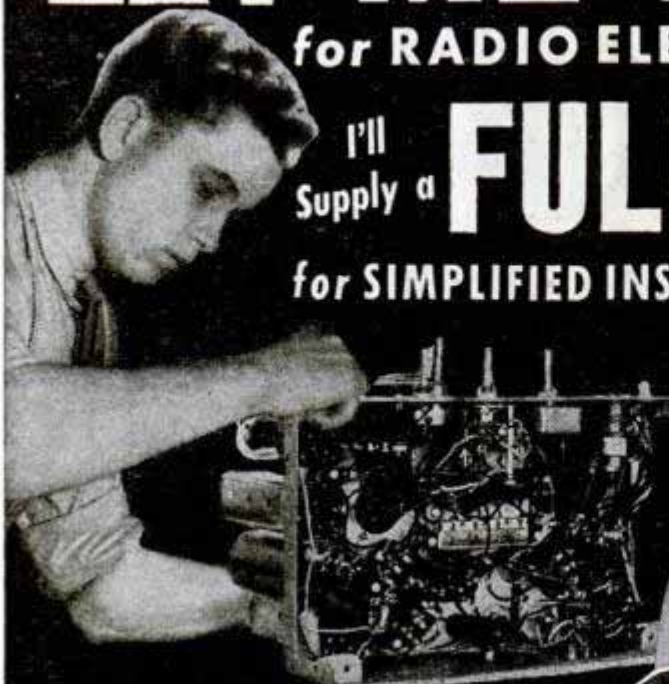
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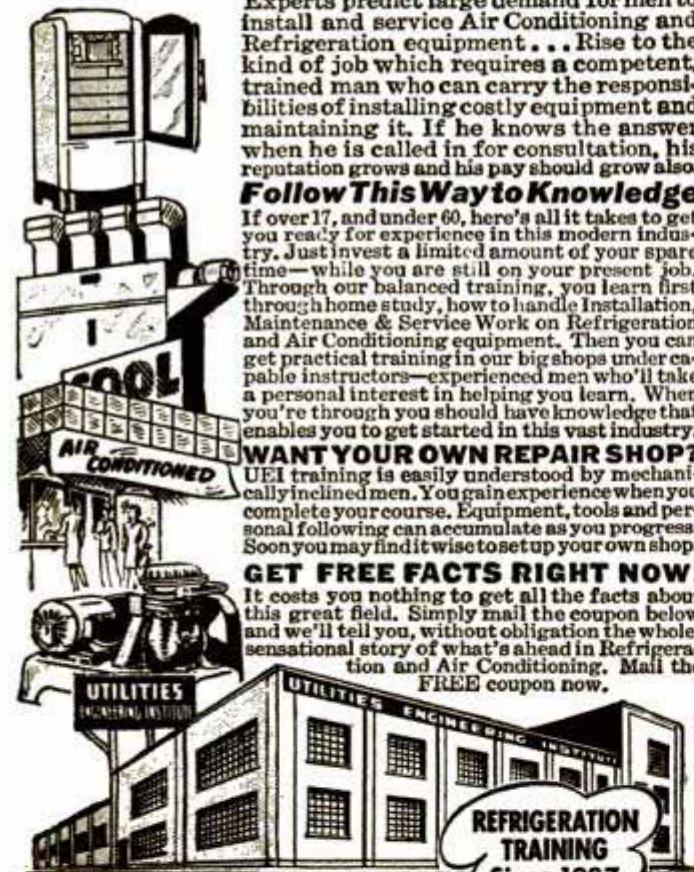
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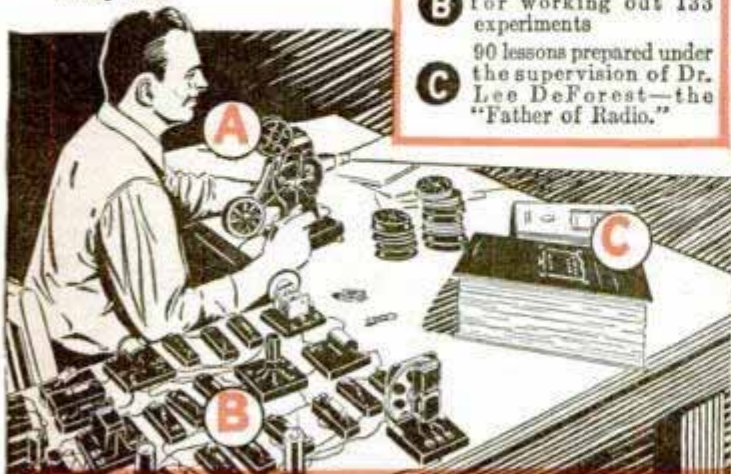
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By S. T. CHRISTENSEN
the "Fix-it Man"

WELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add, has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

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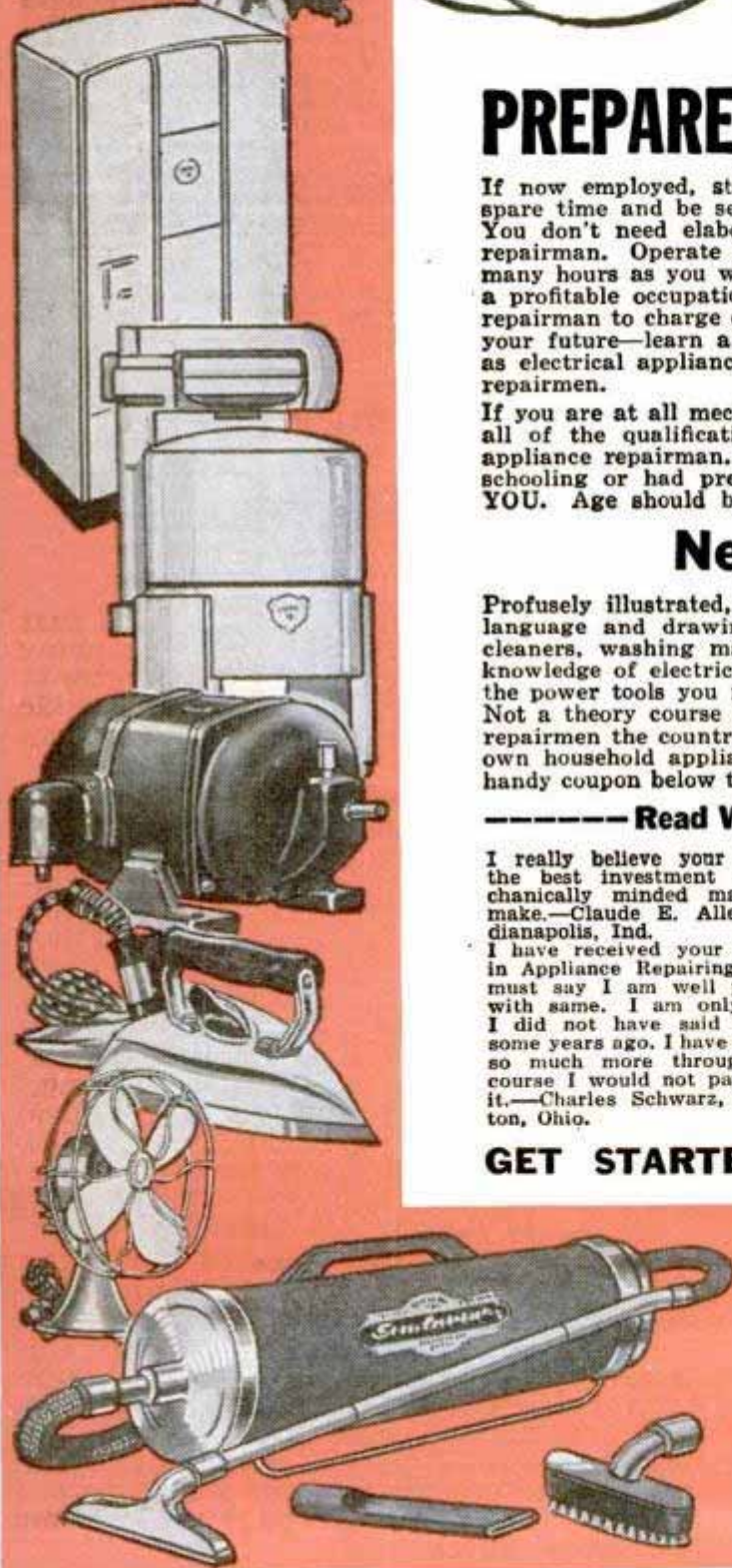
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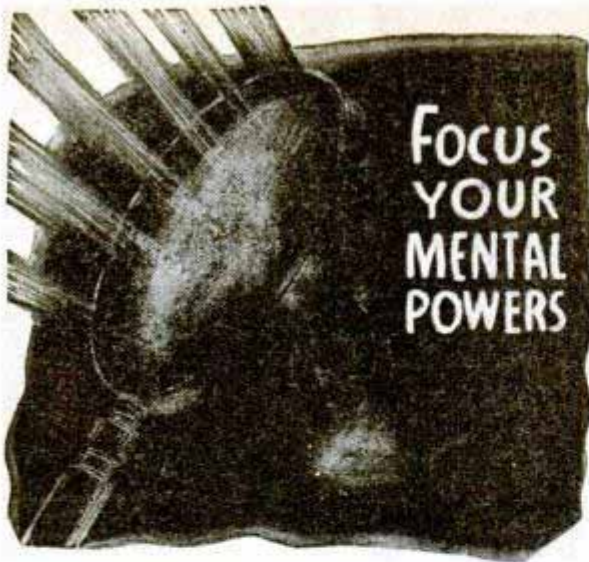
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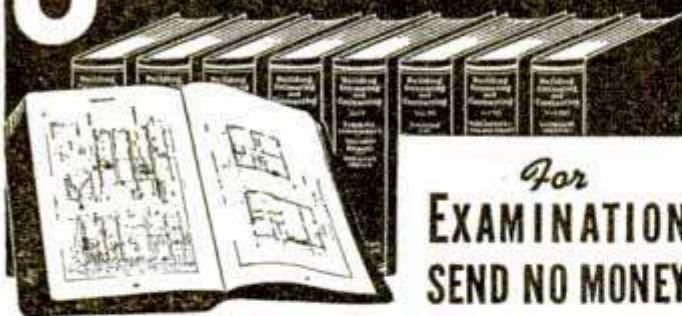
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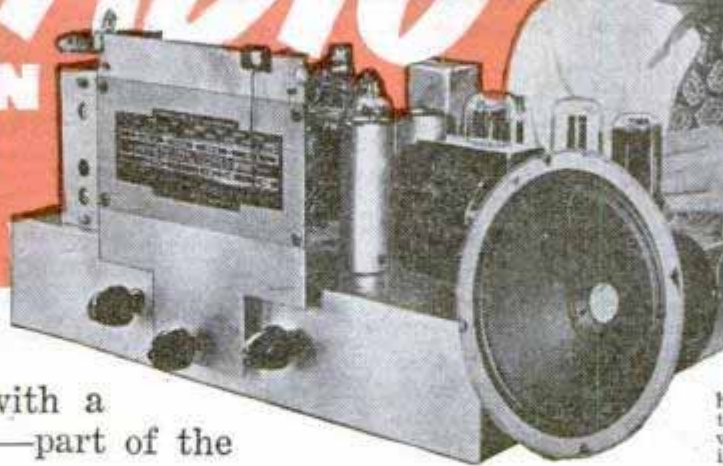
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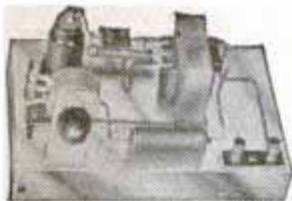
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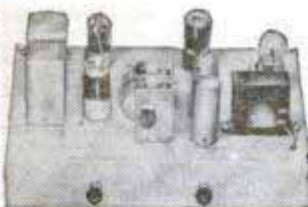
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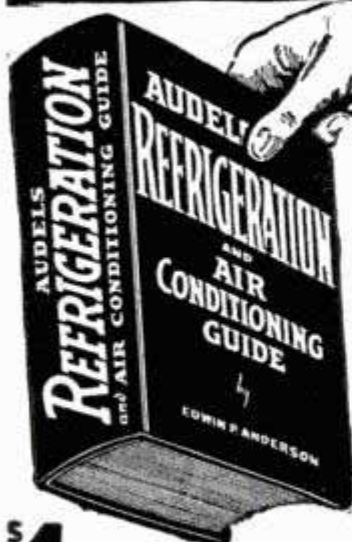
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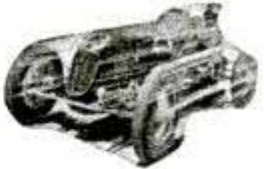
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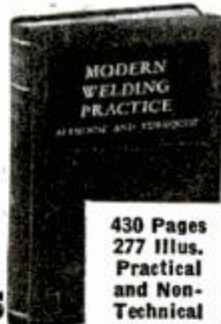


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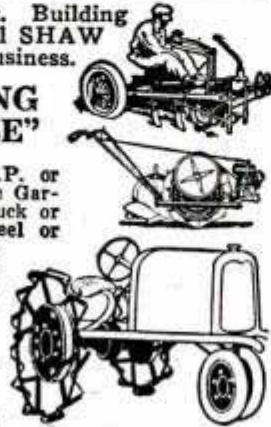
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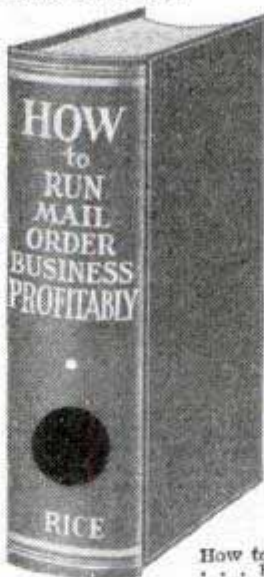
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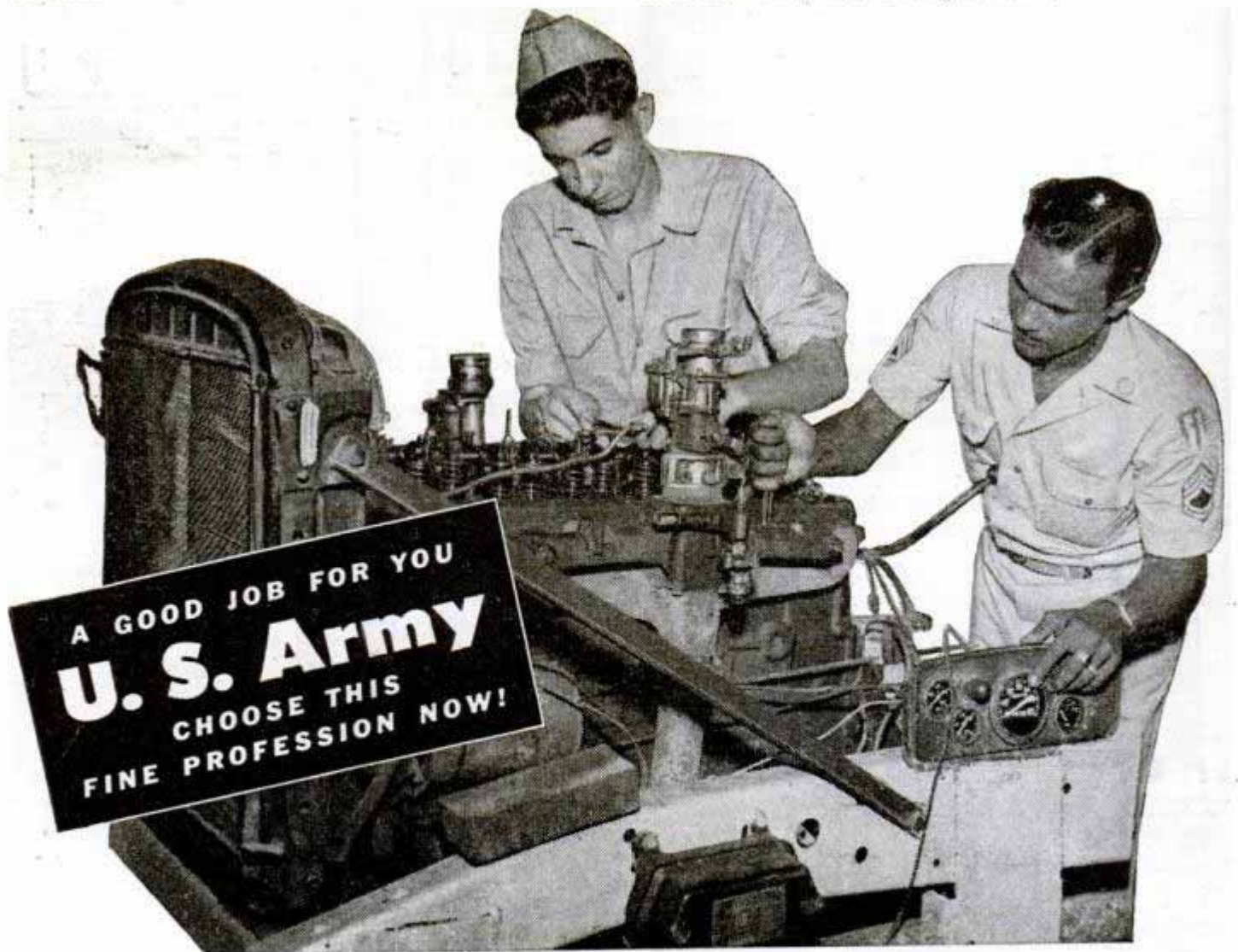
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125 DIFFERENT U. S. Stamps, 30c. Frank Stroskey, Box 55, Perth Amboy, New Jersey.

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FREE U. S. price list. Postage 3c. Mark Hanna, 335 - 5th Avenue, Pittsburgh 22, Penna.

FREE—Pick 25c worth of stamps from our first U. S. approval selection. Approximately 100 stamps to choose from. Excellent value. No obligation to buy. Lists illustrating the most popular U. S. stamps—at prices you can afford—will be included. Don't miss this opportunity! Write today. S. C. Engel Co., 38 Park Row, New York City.

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MILITARY Insignia: 22 different for \$1.00. (Value \$4.60). Introductory offer, never before equalled. Prices and Insignia Guide 10c. Sample 5c. Hobbyguild, P35 West 32nd St., New York.

RAISED Metal designs, figures, emblems made easier, faster on shell casings, bowls, plaques. Complete detailed, illustrated instructions and photos one dollar bill or M.O. to Perma-Craft, Box 608, Mt. Kisco, N. Y.

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LOOK! Hobby collectors! Genuine over-sea helmets clearing sale, 50c. With liners, \$1.00, 20% extra for postage. Escondido Salvage Depot, P.O. Box 474, Escondido, Calif.

READ "Hobby Life Magazine" copy 25c. P. O. Box 1296P, Detroit.

GEM Cutters, 1/2 lb. gem agate and jade, \$1.00 postpaid. Gem House, Box 1003, Casper, Wyo.

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INVENTING Can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 40-E, 1926-Eye St. N. W., Washington 6, D. C.

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COINS, Minerals, glass, Indian relics. Catalogue 5c. Cowboy Lemley, Las Cruces, New Mexico.

DECORATE And sell unpainted plaques, statuary, etc. Pioneer, Austin 6, Minn.

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SWORDS, Rapiers, daggers, pistols, armor. Illustrated catalog 50c. Robert Abels, 860-A Lexington Ave., New York.

4 FINE Ancient arrowheads, \$1.00. Stone Tomahawk, \$1.00. Flint knife, 50c. List free. Lear's, Box 569, Galveston, Texas.

MUSEUM Specimens. Indian relics, curios, den decorations. Illustrated catalogue, identification chart 25c. We also buy. Museum Supplies, 6601 Oshkosh, Chicago 31, Illinois.

50,000 INDIAN Arrows, tools, rainbow variations. Don McKillop, Regina Sask

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"GENUINE" Arizona rubies (garnets). Send quarter for packet. Mineral Specimens Company, Box 2651, Phoenix, Ariz.

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FOR Immediate delivery, cameras and equipment: movie cameras, projectors, still cameras, enlargers, lenses, screens, printers, trays, film, paper, chemicals, reflectors, dryers. Complete stock of dark-room equipment and hundreds of other photographic items. We pay highest prices for used cameras and equipment. Send for free new big catalog. Flash Photo Sales, 6612 N. Sheridan Rd., Dept. E-1, Chicago 26, Ill.

FILM! High speed. Five rolls, eight exposures, postpaid: No. 127, \$1.45; 120, \$1.75; 620, \$1.75; 116, \$2.00; G16, \$2.00. Artex, Union, New Jersey.

FREE—Set of filters for names and addresses of four camera owners. Photo-Craft, Canton 1, Ohio.

KENT Dark room kit; a complete printing and developing kit for beginner or advanced amateur. Contains the necessary equipment and materials for processing and printing photo negatives. \$10.00 set; special sale \$8.92. Conway Camera Company, 34 N. Clark, Chicago 2, Illinois.

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ROLL Film, factory fresh popular brands, 6 rolls 127, \$1.65; 120-620, \$1.98; 116-616, \$2.30; 36 exposure 35mm. 85c each, postpaid. Imperial Foto, 122 Sharon, Glendale, Ohio.

STARTLING! Ansco color developing outfit for Ansco color film and Printon. Easy, beautiful, one-half gal. size, \$2.25; one gal. \$3.20. Printon set outfits, 1/4 size \$2.20. One gal. \$4.90. Pamphlets upon request. Conway Camera Co., 34 North Clark, Chicago 2, Illinois.

PAPER, Chemicals, roll film, repairs. Catalogue 3c. Photoking Supply Shop, 6803 N. Clark, Chicago 26, Ill.

PROJECTORS, New 16mm. "Excel," a.c. motor driven. Automatic rewinding. Ready to operate. \$15.50 postpaid. Photo-Craft, Box 470-Z, Jamaica 1, New York.

PHOTO Finishers. \$15 per thousand cash paid for empty spools 127, 120, 620, 116 and 616. Write stating quantities available. Howard West, 3 W. 42nd St., New York 18, N. Y.

FILMS, Fresh, dated 1948, outdoor type. 127—\$4.09 dozen. 120 or 620—\$4.81 dozen. 116 or 616—\$5.41 dozen, postpaid. "Cameraman," 542-5th Ave., New York 19.

PICTURES From everywhere. Build priceless collection of worthwhile prints. Exchange with camera enthusiasts everywhere. Beginners or advanced workers. All sizes—subjects. Bi-monthly bulletin. Year's registration \$1.00. Information free. Photographic Exchange Club, 1206-B New York Ave. N.W., Washington 5, D. C.

REPAIR Leaky camera bellows with Belloseal formula \$1.00. Henry A. Berg, 124 No. 19 W., Duluth, Minn.

ENLARGERS—Build your own. Kit of parts, \$6.00. Free particulars. Crescent Engineering, Box 586, North Hollywood, Calif.

BASS Says: Trade cameras? For 36 years Bass has satisfied thousands everywhere! Finest equipment available. Always satisfaction guaranteed or your money back! Bass buys 'em, sells 'em, trades 'em. Bass Camera Company, Dept. AG, 179 W. Madison St., Chicago 2.

CASH! Spot cash for cameras, lenses, binoculars, movie and still equipment. Send full description for prompt cash offer. Over 36 years of dependability. Bass Camera Company, Dept. AG, 179 W. Madison St. Chicago 2.

SURPLUS Cameras. Scarce items, new, used. Bargains. Camera Guide, 126-M Lexington Avenue, New York. Latest edition well worth 25c (coin, stamps).

PHOTOGRAPHY For pleasure or profit. Learn at home. Practical basic training. Long established school. Write for booklet. American School of Photography, 1315 Michigan, Dept. 3432, Chicago 5.

USED Camera Directory. Box 1031-M, Canton, Ohio—lists hundreds of war-bargain used cameras—35mm., Speed Graphics, Kodaks, Rolleiflex—many others. Send 25c for latest issue.

HAVE You a camera? Improve your hobby of photography and learn how to make better pictures. Write today for our latest book catalog and sample copy of American Photography, containing articles and pictures by the world's foremost writers and photographers. Camera House, 601, 353 Newbury St., Boston 15, Mass.

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DON'T Be in doubt! Try Smith's fine quality service! Any 8 exposure film developed, 8 prints and 2 enlargements, only 25c. 8 double-size, 25c. 35mm. fine grain developed, 36-3x4 enlargements, only 90c; 18, 55c. Cartridge reloaded, 36 exposures 35c; 18, 20c. Enlargements: 4x6, 10c; 5x7, 20c; 8x10, 35c. Write for mailers, sample print and price list. Smith Studios, 8 Saint John Street, Plains, Pennsylvania.

ROLLS Developed with 8 enlarged prints—3½x5 inches 25c. Enlargement coupon free. Skrudland, 6444 23 Diversey, Chicago 35.

GENUINE Moen-tone finishing approved by thousands since 1898. 8 exposure roll developed with 16 prints or 8 enlargements 25c. Moen Photo Service, 452, La Crosse, Wisconsin.

8 HOUR Service—Your 8 exposure roll developed and printed jumbo size 25c; deckled edge if requested. 12 exposure roll 35c. 16 exposure roll 50c. 36 exposures \$1.00. Reprints jumbo or regular size 3c each. All film developed fine grain. Workmanship, materials and 8 hour service guaranteed throughout. Quality Photo Service, Box 468, San Francisco 1, Calif.

ADVANCED Amateurs anticipating opening business, amazing details. Photographer, Midland Park, N. J.

ROLL Developed, 8 prints, 25c. Reprints 3c. Jumbo size 30c per roll. Jumbo reprints 4c. Prompt service, high quality Velox prints. Church Studio, Desk 2A, Enterprise, Ore.

2 BEAUTIFUL Hi-Gloss prints each good negative and enlarging coupon with each 6 or 8 exposure roll developed 28c. Owlphoto Co., Weatherford, Oklahoma.

ENLARGING, Printing, developing easily learned. Simplified instructions \$1.00. Fred Carpenter, Box 264, Hamlin, Texas.

ROLL Developed, eight sparkling 4x6 glossy enlargements, 35c. MacDonald's Photos, Box 28-A, Congress Park, Illinois.

MONEY Back guarantee—All this for 25c: Roll developed, 8 bigger deluxe prints, also 8 regular prints, plus two beautiful enlargements and tasteful Leathertone frame. Lifetone Photo Company, Dept. 639, Des Moines, Iowa.

FINE Grain 35mm.—36 exposures roll developed, with 36 beautiful 3x4 fade-proof prints, \$1.50. Immediate service. Veteran owned. Kershaw Photo Labs., Box 3687, Kensington Sta., Philadelphia 25 Penna.

QUALITY Enlargements on DW paper, 8x10, 50c; 5x7, 25c; 4x5, 15c. Roll developed, 2 prints each negative plus enlargement coupon 30c. Clover Photos, Box 28, Gravesend Station, Brooklyn 23, N. Y.

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FREE Book "How To Take Better Snapshots" given with each roll of film developed. 8 exposures 25c. 12 exposures 40c. 127, 35mm. enlarged to 3"x4½" 5c per print. Studio, P. O. Box 217, Kansas City, Kansas.

FILM 6 Or 8 exposure roll developed & printed plus 5x7 enlargement free—complete 25c. Mail film to Joy-Photos, G.P.O. Box 606, New York 1, N. Y.

EXCLUSIVE Introductory offer! 4 beautiful enlargements for 10c. Send any 4 negatives of the same size (up to 2½"x4½") and we will return to you immediately 4 valuable enlargements—deckled and dated on Velox. Negatives returned with order. Send negatives, this ad and 10c coin today. This ad must accompany order. Mail-N-Save, Box 310-8 Quincy, Mass.

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FAST Delivery. Satisfaction guaranteed. Eight exposure rolls with two prints of each exposure, 30c; or eight jumbo size prints, 35c, completely finished. Write for special reprint prices. Pioneer Photo Print Service, Box 123, Wichita, Kansas.

AT Last we have films: 116 and 616, 38c ea.; 120 and 620, 33c ea.; 127, 27c ea. Roll developed, all your snapshots hand-colored as beautiful as most actual colored photography 35c. Hand colored reprints 4c each, 12 for 45c. Midwest Photo, Janesville 26, Wisconsin.

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FILM Developed, 8 album size enlargements or 16 sparkling prints, 25c; 8 snappy 4x6 enlargements, 30c. Reprints each: contact prints, 2c; album enlargements, 3c; 4x6 enlargements 4c. Crystal Studios, 159-F, Rushford, Minn.

ROLLS Developed and printed, 25c. Reprints, 2c; 5x7 enlargements, 15c; 8x10, 25c. Davis Studio, Guthrie, Oklahoma.

FREE Snapshots! Free album! Mail this ad and two negatives for free snapshots complete in album! When you see these free samples you'll want more. Artist. Dept. 131, Drawer 220, Regina, Sask.

BIGGEST \$1.00 Value in 35mm. finishing today. 36 exposure fine grain 3¼x4½ enlargements; deckled, embossed margin and date. Eighteen exposures 75c; 16 exposure splits 55c; 36 exposure reloads 50c. Special: return this ad with \$2.00 and we will send five 36 exposure reloads. Free mailers. 8 exposure rolls in beautiful, deckled contact finish with embossed wide margin, 25c. Mailbag Film Service, Box 5440A, Chicago 80, Ill.

8 VELOX Prints and two professional enlargements 25c. Send roll or negatives for trial offer. Young Photo Service, 405-C, Albany 2, N. Y.

50 REPRINTS \$1.00. No limit. Studio, 1408-M Bond, Rockford, Ill.

GLOSS Finish enlargements, 4 5x7 from negative 50c. 3 5x7 from photo 50c. Robert Renshaw, Jr., P.O. Box 478, Chester, Penna.

PHOTOGRAPHY For pleasure or profit. Learn at home. Practical basic training. Long established school. Write for booklet. American School of Photography, 1315 Michigan, Dept. 3451, Chicago 5.

8 EXPOSURE Rolls 25c, over 8 exposure 40c, for one Velox print each and free enlargement coupon. Reprints 3c, minimum 25c. Fred D. Eastman, Bode, Iowa.

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EVERY Picture an enlargement! 8 sparkling deckle-edge enlargements and roll developed 25c coin; 116 size or smaller; enlarge reprints 3c. Enlarge Photo, Box 791D, Boston, Mass.

BEAUTIFUL Double-size pictures 3¼c each, from 116 and 120 negatives. 3¼x4½ from all other sizes. All work guaranteed. Overnight service. Roll developed and 8 pictures 30c. Roll 12 pictures 45c. Roll 16 pictures 60c. Enlargements on double weight portrait paper 5x7—30c. 8x10—50c. Copies made from any picture 75c. Pacific Photo Service, Box 666, San Francisco, Calif.

SENSATIONAL Introductory offer! Send snapshot or negative, this ad, and 3c. We'll send you a beautiful 7"x5" enlargement! Or, Kodak roll developed with 16 guaranteed deckled-edge velox fade-proof prints or 8 double-size prints, 25c! Special! From your negatives, 16 regular-size or 8 double-size reprints, 25c! Candid rolls—36 exp. 35mm. developed, vaporated, enlarged to 3x4, \$1.00! 18 exp. 50c. Reprints, 3x4, 3c each. We have new, perfect 35mm. film. Low prices. Free mailers, details on request. American Studios, Dept. 279, LaCrosse, Wis.

CENTURY Delivers work and service that can't be beat. 8 exp. roll 25c with two professional enlargements free. Century Photo Service, LaCrosse, Wis.

8 PRINTS, All enlarged to nearly postcard size, from your roll or negative. 25c. Willard Studios, Box 3535A, Cleveland 18, Ohio.

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FILM-Processing not included, 100 ft. lengths. Double 8, Weston 6 \$1.65; Weston 64, \$3.95; Single 8, Weston 6, \$1.15; Weston 64, \$2.40; 16mm. Weston 6, \$1.55; Weston 24, \$3.80; Weston 64, \$3.90. Promader Genera, Davenport 7, Iowa.

HOME Movies—Lists 3c. Sample Kodachrome scene "Allure" \$1.00. Kodachrome slides—sample 35c. Galloway Films, 3008 Fifth St., S.E., Washington 20, D. C.

PROJECT-O-COLOR, The new sensational accessory for movie projectors, available now! Information free. Write Project-O-Color, Palatine 2, Ill.

HOME Movies. Rent, buy, swap 8mm.-16mm. silent and sound at money-saving rates. Details for a dime. Midland, Box 429, Oak Park 4, Ill.

35MM. And 16mm. sound film and equipment. Will trade for 16mm. film and equipment. Send stamps. Mertz Films, Springfield, Illinois.

BRAND New 8mm. motor driven projectors \$36.25 postpaid. Sterling's, 679 Northampton, Easton, Pennsylvania.

MOVIE Projectors and binoculars bought and sold. List 10c. United, 2309-A Lawrence, Toledo, Ohio.

FAMOUS Films. Projection sample 35c. Excel projector \$14.50. Others, silent and sound. We change silent projectors to sound. Catalog 3c. Richardson Cinema, Wyoming, Penna.

FINEST Movie screens, inexpensive, make them yourself. Free literature. Snow White Screen Company, Danville, Illinois.

16MM. Motor driven projector \$16.00 postpaid. Selco Products, Danvers, Mass.

COLOR! 8mm. Movie film for Univex and double 8mm. cameras! Full color film processed free our laboratory! \$3.70 spool double 8mm. \$2.25 roll single 8mm. Limit, three rolls each type. C.O.D.'s accepted. ESO-S, 828 W. 39th, Kansas City 2, Missouri.

RENT 8MM.—16mm. and sound films by week. New catalogs. Lowest rates. Dayton Film, 2227 Hepburn, Dayton 6, Ohio.

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HOME Movies. All kinds. Lists free. Box 337-A, Valley Stream, N. Y.

BASS Says: 36 years of leadership in the motion picture equipment field. Sound projectors, 8 and 16mm. equipment, finest accessories. Bass buys 'em, sells 'em, trades 'em. Always satisfaction guaranteed or money refunded! Bass Camera Company, Dept. A, 179 W. Madison St., Chicago 2.

BEAUTIFUL Kodachrome film subjects, 8mm., 16mm. Low prices. Big catalog, 25c. Projection length sample from "Waikiki Hula," \$1.00. World in Color, Box 392-F, Elmira, N. Y.

COMPLETE Stocks always of castle, official, pictorial films, 8mm., 16mm., sound. Musicals, soundies, free catalogs. We exchange your films and equipment, or buy them for cash. Frank Lane, 5 Little Bldg., Boston, Mass.

35MM. Sound westerns, features, shorts. C. Rogers, Box 26, East Atlanta, Ga.

UNUSUAL 8-16 mm. Film subjects. Big catalog with sample film, 10c. National Film Exchange, Broadway, Sta. E, Toledo 9, Ohio.

I BUY, Sell, swap, rent s.o.f., 8 and 16mm. films. List free. Harvey Iris, Box 539, Brockton, Mass.

MAKE \$8 To \$10 net profit daily with your 8mm. or 16mm. projector. Details free. Metcalf, 10806 Glenroy Ave., Chicago 43, Ill.

MOVIE Films, 100' outdoor 16mm. \$2.25; three rolls \$6.00; 100' indoor film \$4.25. Ambassador, 479-A, Quincy Street, Brooklyn, N. Y.

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UNUSUAL Home movies—travel, adventure, sports, news, war films. Many film bargains. Big 1946 catalog and sample, dime. Audet, Box 6520-BQ, Philadelphia 38, Penna.

8MM, 16mm., 35mm. films. Samples 10c. Lists free. Paramount Films, Monmouth, Illinois.

35MM. Sound features, projectors. A Savarese, Woodcliff Lake, New Jersey.

"THE World's Greatest Passion Play," all sizes sound and silent. Write Hemenway Film, 33-F Melrose St., Boston 16, Mass.

LEARN Movie projection, management. Free catalog. Theatre Institute, Elmira, N. Y.

SPECIAL Movie film, 8mm., 25 feet double-Weston 8, \$2.00. Super double X, Pan indoor 60, outdoor 100, 16 mm.—\$6.50. Super X Pan indoor 24, outdoor 50, \$5.75. Pan Weston 12, \$5.00. 16 mm. 100 feet Weston 6, \$4.00. Free developing. Exhibitors Film Exchange, 630 9th Ave., New York 19, N. Y.

BEAUTIFUL Kodachrome slide and list, 25c. Art Slide Co., M-1, Canton, Ohio.

MOVIE Camera films, 100' 16mm. \$2.50. 25' double 8mm. \$1.25. Free developing. Better Films, 742 NewLots, Brooklyn 7, N. Y.

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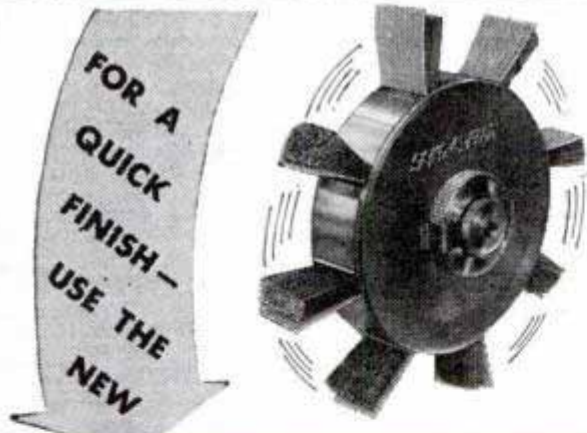
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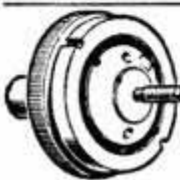
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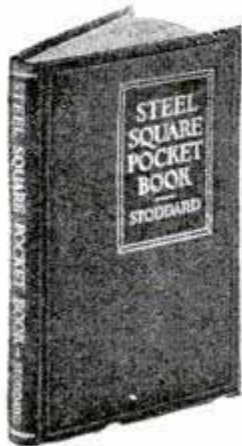
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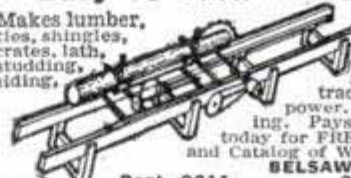
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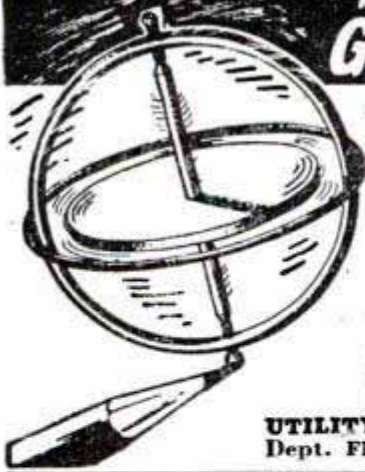
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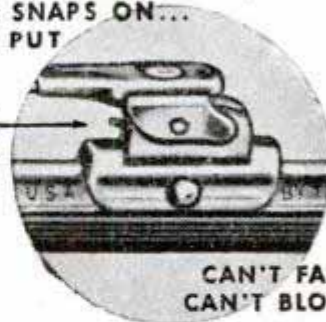
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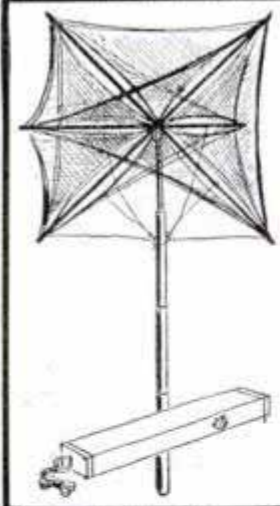
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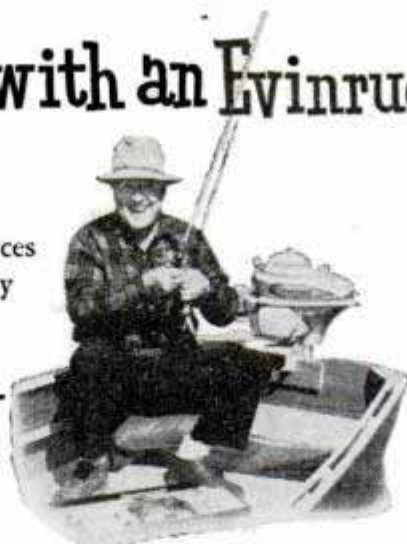
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OUTBOARD MOTORS

By Aubrey O. Cookman

FOR MANY weeks countless planes of all descriptions have been sweeping low over the Indianapolis Municipal Airport. A plane drops so close it almost touches down, only to roar away in a burst of power. In a short while another follows and repeats the performance.

Baffling to the casual onlooker, perhaps, but not to Civil Aeronautics Administration experts working hard to whip a major aviation problem—bad weather landings.

You didn't know it, of course, but the pilots in those planes were "blindfolded," to all intents and purposes, and the technique that brought them almost to touch-down was an important wartime radar development called GCA, or Ground Controlled Approach. It was born of a necessity to fly against the enemy in all kinds of weather and yet give our airmen every conceivable chance to operate safely. Now the CAA is testing to determine how many of its benefits are operationally practical enough to be passed along to civil aviation.

The Army has set down planes on dual runways at 30-second intervals, using the system, while the best that can be done

Search antenna atop radar landing control tower. Below, closeup of an indicator panel

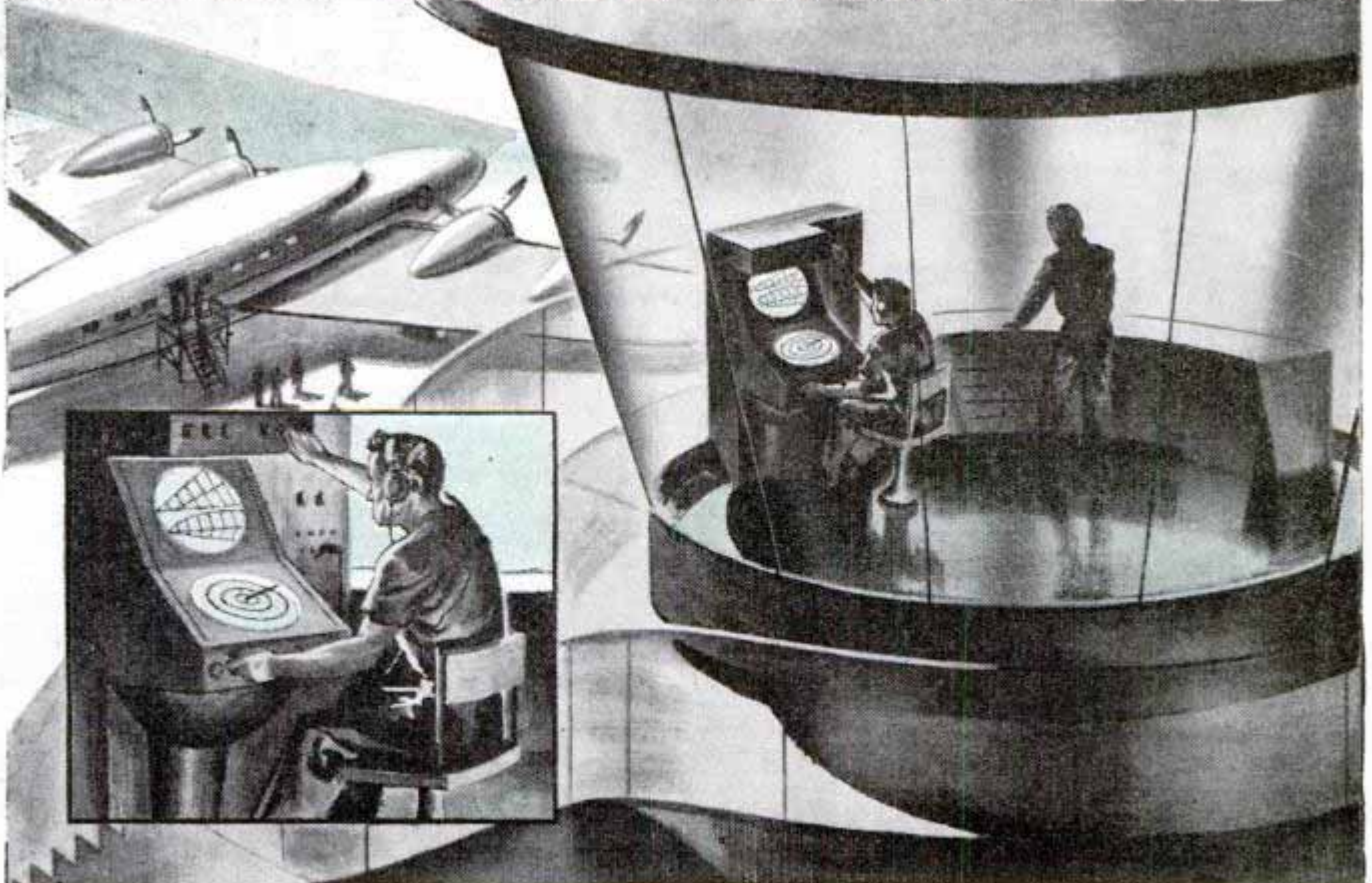
POPULAR MECHANICS

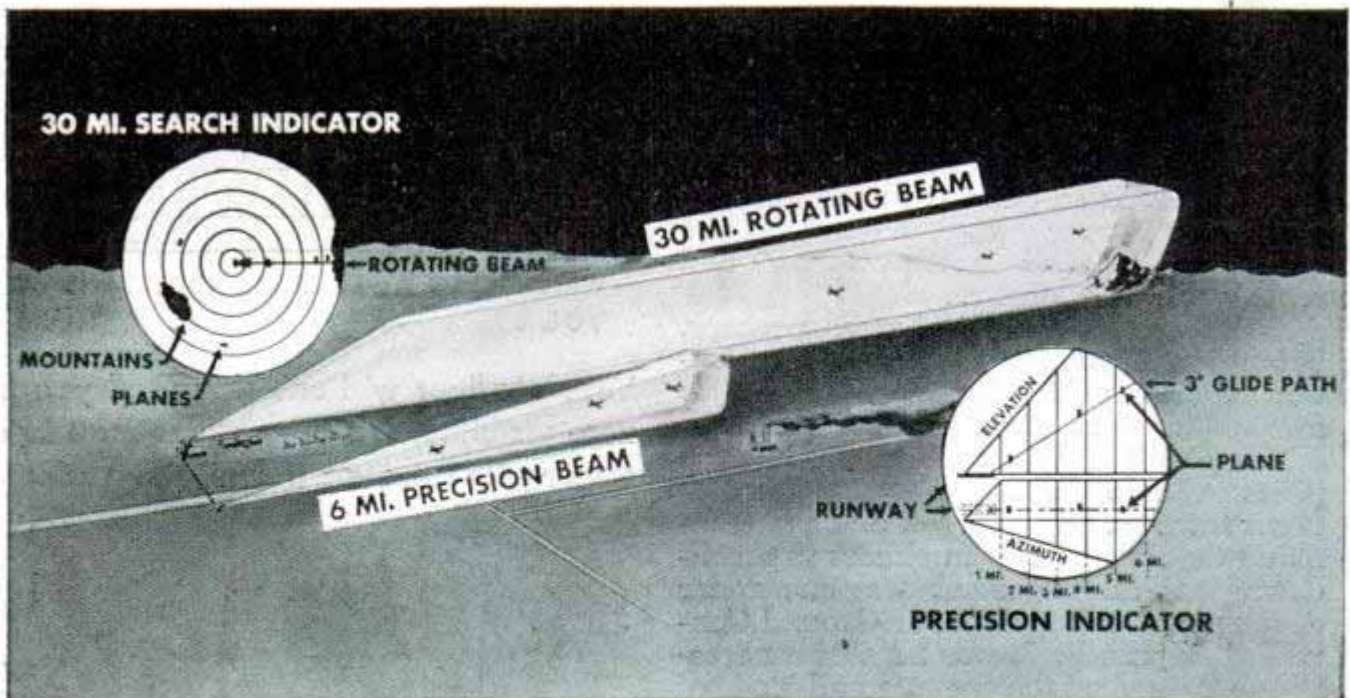
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WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 85 NO. 6

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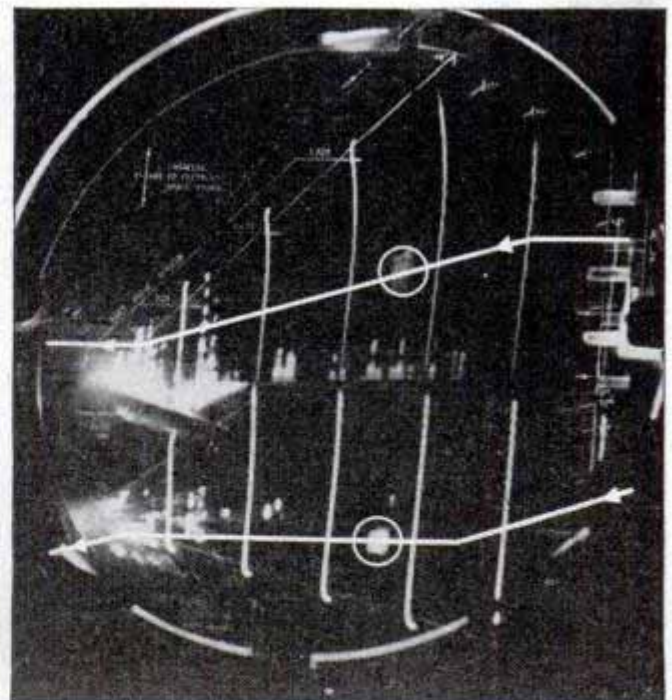
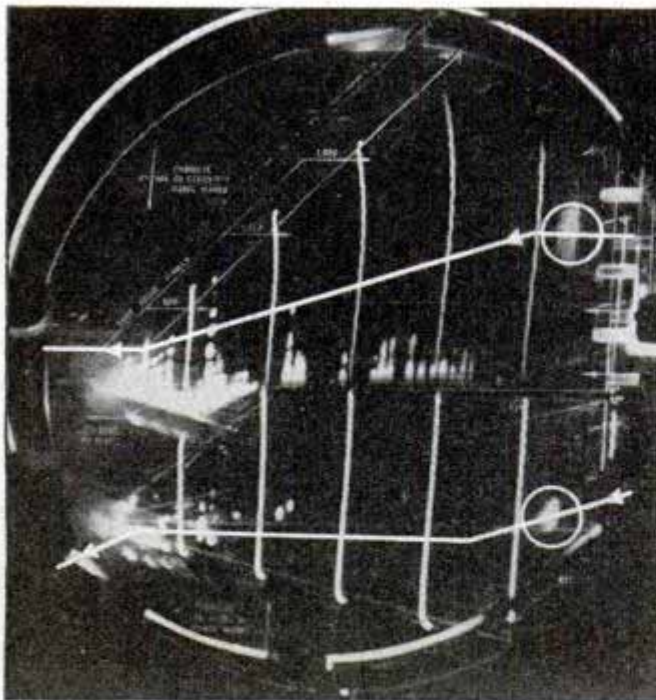
Plane first appears as a new and moving "blip" on search scope, with the precision system assuming control for the final stages of approach and the actual landing. Search beam swings completely around every two seconds

with a 500-foot ceiling and present instrument landing procedures, minus radar, is four or five an hour. Advocates say that within 18 months radar will handle landings as fast as an airport can accommodate them. And, further, that it will eliminate the time-consuming practice of "stacking" planes in layers overhead while they wait to land. One major air line recently stated that its actual revenue loss due to weather cancellations was \$2,000,000 a year. Noting that this represented a 45-plane fleet, mul-

tiple by an industry of 500 aircraft and you have an astronomical annual loss.

Another GCA advantage is that the only requirement for its use, whether by small personal plane or giant air liner, is standard aircraft radio equipment.

GCA uses five trained operators, in its present form, and consists of two microwave radar systems housed together in a specially designed trailer. One is a search system, with a radar beam rotating over a 30-mile radius once every two seconds.



Photos by Gilfillan Bros., Inc.

First photos of an actual radar landing test. Elevation is shown in upper half and azimuth, or plane's horizontal path in relation to runway, in lower portion of this commercial version of the precision indicator, combining both factors on one scope. Reading from left to right, plane appears in first frame as circled blob of light in both upper and lower halves, nearing five-mile range mark electronically superimposed on the scope. Also shown in upper half are degrees of glide, with the $2\frac{1}{4}$ degrees required for this plane drawn on the scope by the operator. Also indicated, on the 45-degree-angle line at top left, are the elevations and around the perimeter



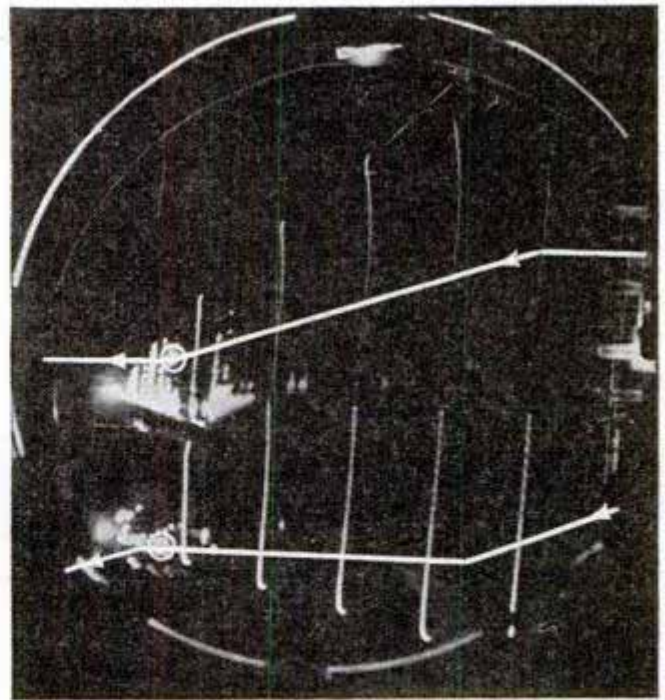
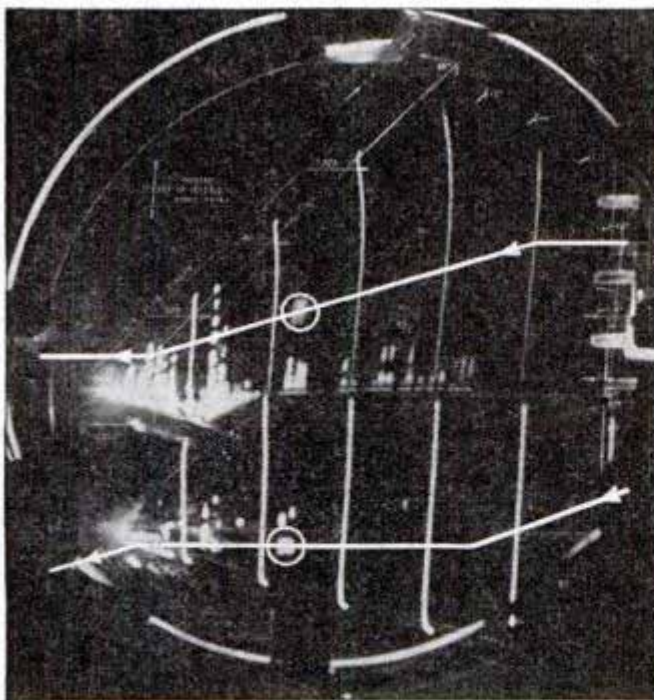
Interior of a GCA trailer, showing positions of five operators. Elevation indicator station is in foreground, final controller next, then the azimuth indicator post, with the two search scope watchers farthest from the camera

On its televisionlike 12-inch scopes the two operators can actually see every obstacle and aircraft in the entire 2800 square miles surrounding the airport. With them the bearing, distance and identity of planes can be determined with uncanny exactness.

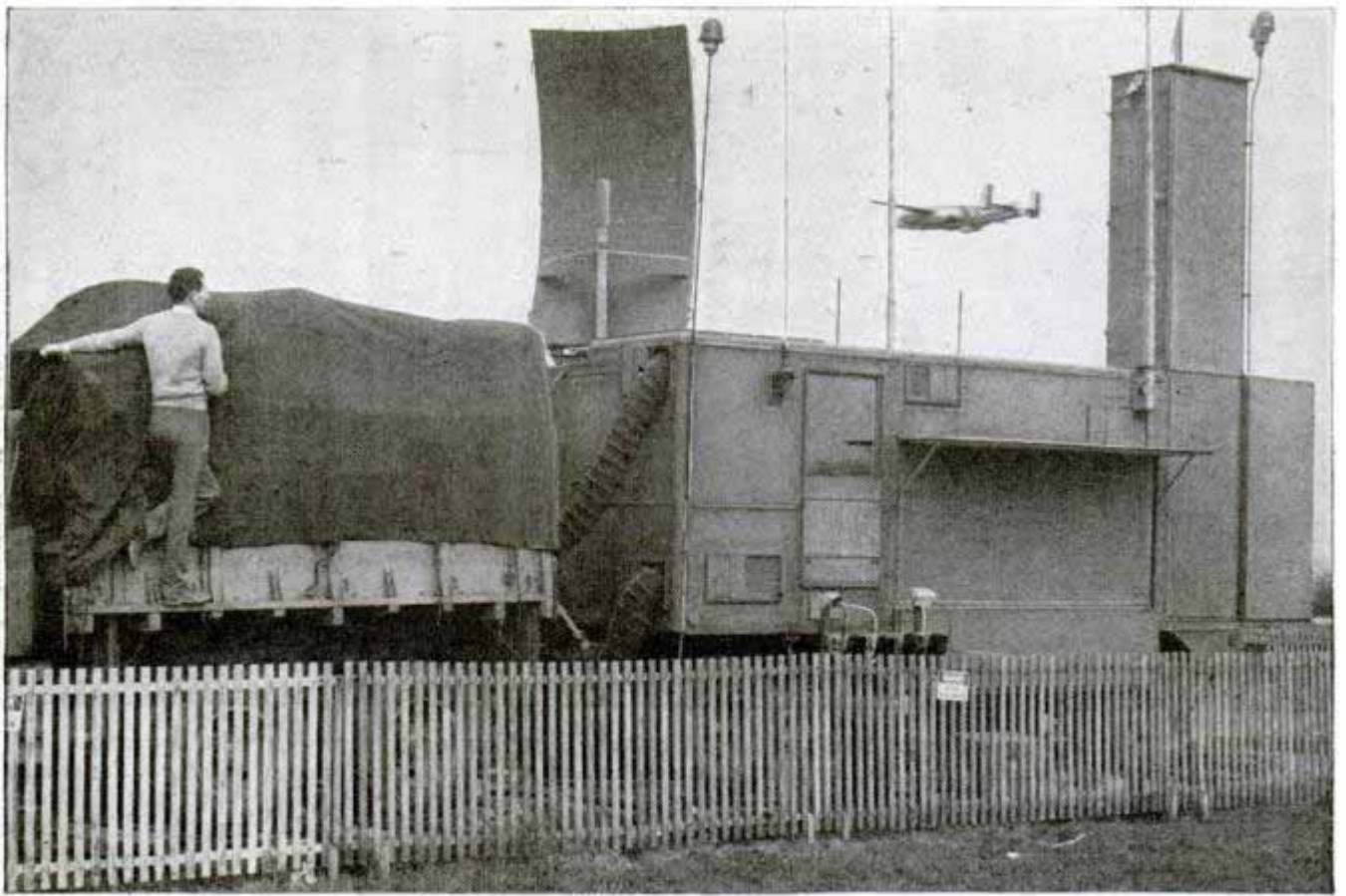
Both search system operators are "talkers," with earphones and microphones; a push-button arrangement permits them to tune in on the radio channel the pilot is using. The No. 1 operator acts as general policeman for all air traffic within a 25 to

30-mile radius and has responsibility for initial pickup, identification and first directions to all aircraft landing on GCA.

Seated next to him is a second search system operator, watching a similar scope but concentrating his attention on the "blips" or blobs of light, as the planes appear on the scope, in the area immediately surrounding the field. He selects the plane to be landed and "talks" the pilot along to the final glide-path stage, where the precision system goes to work.



of the scope are the 360 degrees to facilitate heading instructions. Actual touchdown point is where the lines converge on each of the halves. In test the plane was purposely brought to within only 125 feet of touchdown and the approach path drawn in on the lower portion is actually to the left of true center and the elevation path is above that of actual touchdown. In frame two the plane is 3½ miles out and in frame three it has moved to slightly more than two miles from touchdown. In the final frame it comes to within a hundred yards of what would normally be the point of touchdown before pulling up and flying away, its test mission completed



Truck and trailer, with search antenna assembly in upper center and elevation antenna housing at upper right

The precision system, heart of GCA, is run by three men. One follows the plane's rate of descent on an elevation indicator and the second checks direction on an azimuth indicator, showing the plane's heading in relation to the runway. Both manipulate metering devices that constantly relay to a panel before the third man, the final controller, information on the plane's course in relation to the prescribed landing path. Only the controller talks to the pilot.

Watching this data (from his aids) registering on the dials before him, the controller instructs the pilot to alter his course laterally or vertically, distances as small as feet, in order to place him safely on the approved path. Normally the pilot is able to take over control on a visual basis 100 or so feet off the runway, but in numerous instances controllers have brought aircraft down to actual and smooth contact with the runway. In the Indianapolis tests pilots are being guided only to the height at which they can normally see the runway, even in the worst weather, in order to speed up the number of experimental passes accomplished.

Primarily a mobile system when used by the Services, the GCA trailer is moved

about by a four-ton truck that also houses the auxiliary power equipment. The trailer is located 200 to 300 feet from the center line (to the pilot's left on an approach), and about 1000 yards from the downwind end of the runway being used. A large revolving search radar antenna mounted atop easily identifies the trailer.

One of the original manufacturers of GCA equipment, Gilfillan Brothers, Inc., of Los Angeles, has gone on to design a simplified system for possible commercial application. It weighs approximately 5 tons, in contrast to GCA's nearly 22 tons, and uses only two radar scopes, both of which are on the same panel and can be manned

by a single "talker." It is referred to as RLS, or Radar Landing System, rather than GCA. Wartime GCA radar equipment can be utilized merely by installing a coaxial cable to transfer control from the trailer to the operator in the control tower.

Though fully aware of the system's capabilities, the CAA is proceeding cautiously in the testing program, conscious of the many considerations to be met before adoption.

"We cannot immediately apply the newest things in radar to actual operations of



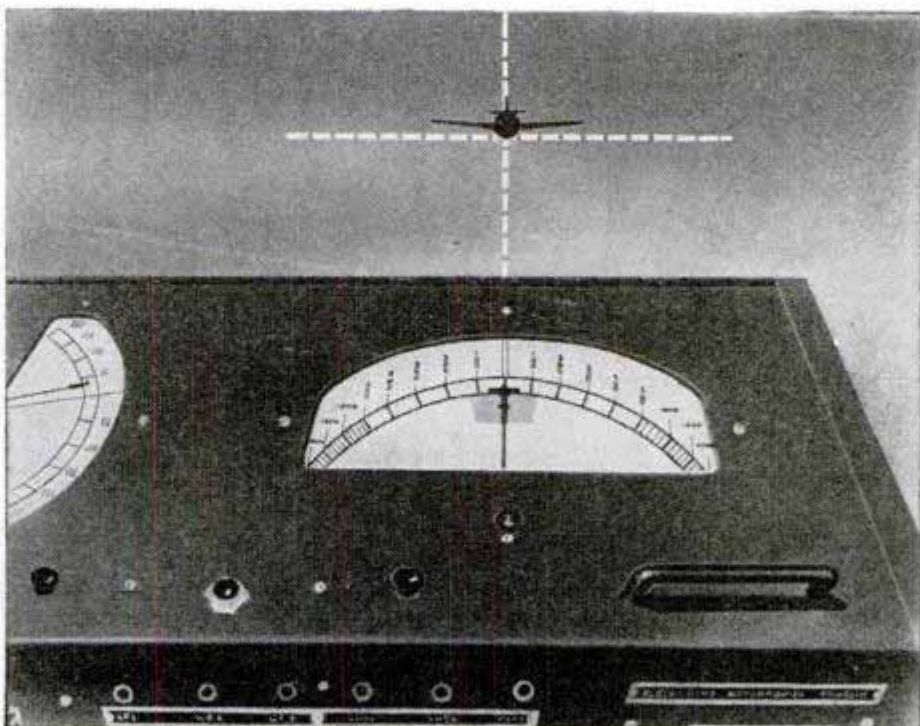
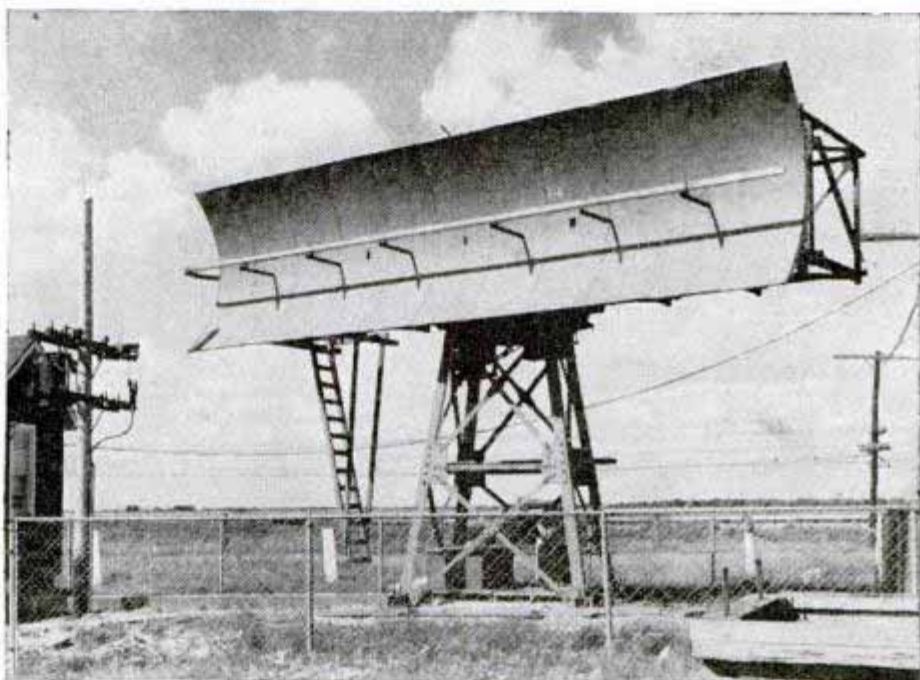
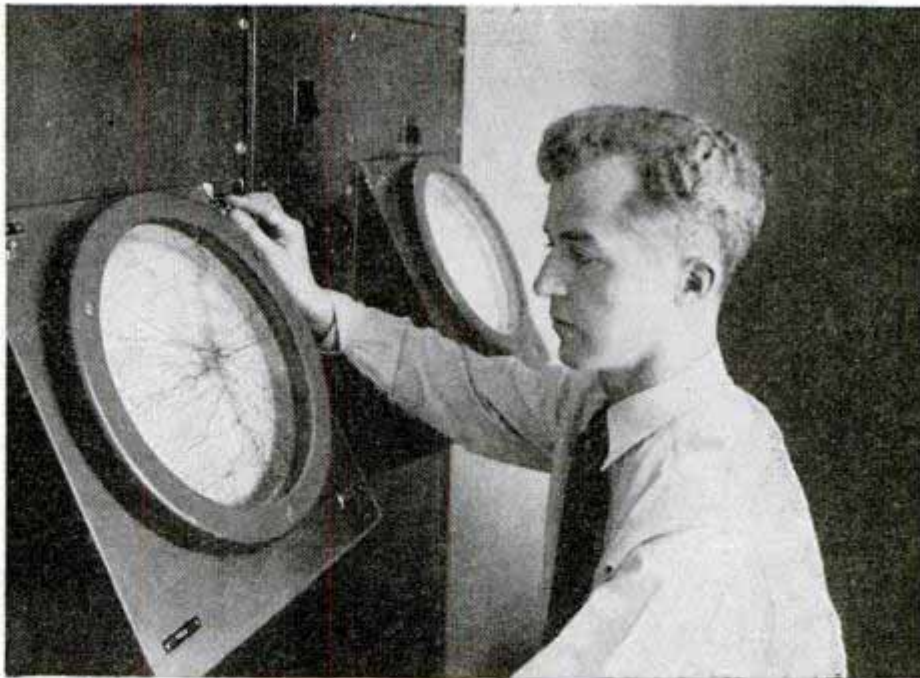
the air lines," Donald M. Stuart, chief of CAA's Technical Development Service, said. "With all radar's promise it must undergo further development before its use is acceptable to the air lines, to the air-line pilots and to the safety regulation officials of the CAA, all of whom are directly concerned with the safety of the flying public.

"Radar might be said to be in the third stage in our development of instrument approach and landing. Today, we are using low-frequency equipment which has definite drawbacks. We are now changing over to a Very High Frequency band where static and interference have less effect. This is stage two and we are also working to apply radar, which will be stage three."

Henry I. Metz, chief of CAA's experimental station at Indianapolis, additionally pointed out that "the cost of equipment, the skilled manpower required to operate it 24 hours each day and, above all, the responsibility held by the ground crew in landing an airplane are important factors against universal use of GCA as the basic system at this time."

But the most important fact is that GCA's war record has earned it the right to a thorough three-month testing program, and it may finally emerge as the answer to one of flying's few remaining hazards, landing planes safely in bad weather.

Position indicator at Winnipeg airport, top, on which all planes within 80 miles can be spotted. Equipment's broad rotating beam antenna is at center. The GCA controller's panel, bottom, with its dials calibrated in feet showing airplane's deviation from glide path. Elevation is at left and azimuth is at right



Midget French Automobile Accommodates Four People



(about 62 miles) on a gallon of gas. The model was built of wood and light metals. Production will begin as soon as coal, mineral ores and electric energy again are available in France. Factories already have the necessary tools and machinery. A twin-cylinder four-horsepower engine gives the automobile a speed of 53 miles an hour. The traditional chassis has been replaced by a framework made of light alloy castings. The car has doors on both sides and a convertible top. The engine is air-cooled, using an efficient ventilator that

French engineers have completed tests of a small but efficient touring car that weighs only 1100 pounds, accommodates four passengers and travels 100 kilometers

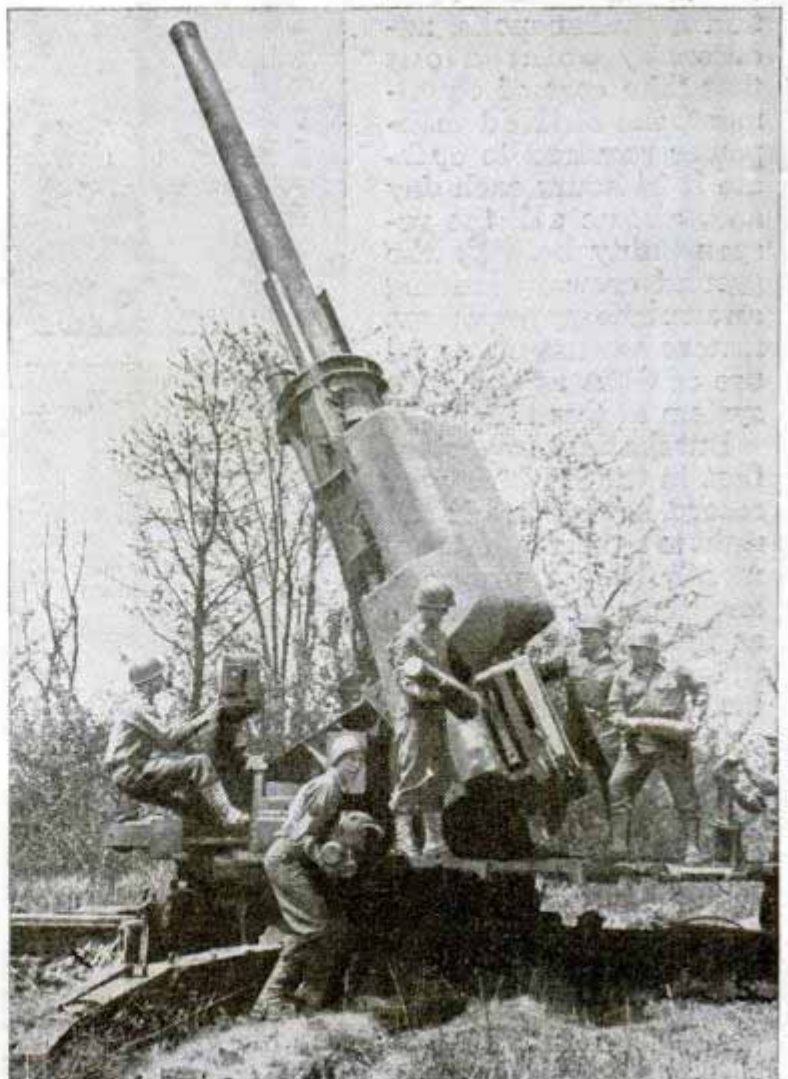
passes air over cooling flanges. Push-rod-operated valves and a floating motor unit are other advantages claimed for the midjet European model.

"Strato" Gun Shoots 12 Miles Up and Has Radar Director

Radar-directed "stratosphere" guns fire a 50-pound projectile more than 12 miles into the air. The 120-millimeter antiaircraft guns were used extensively toward the end of the war to shoot down enemy planes and buzz bombs. The gun is loaded with a "divided round"—the projectile is placed in the breech and followed by the cartridge case. Each weighs 50 pounds. The divided round is used because the combined weight of the projectile and cartridge case is too heavy to allow rapid loading by one man. The gun, transported on a four-wheel bogie, may be fired while in traveling position. The unit weighs about 20 tons.

Photos Printed in Daylight

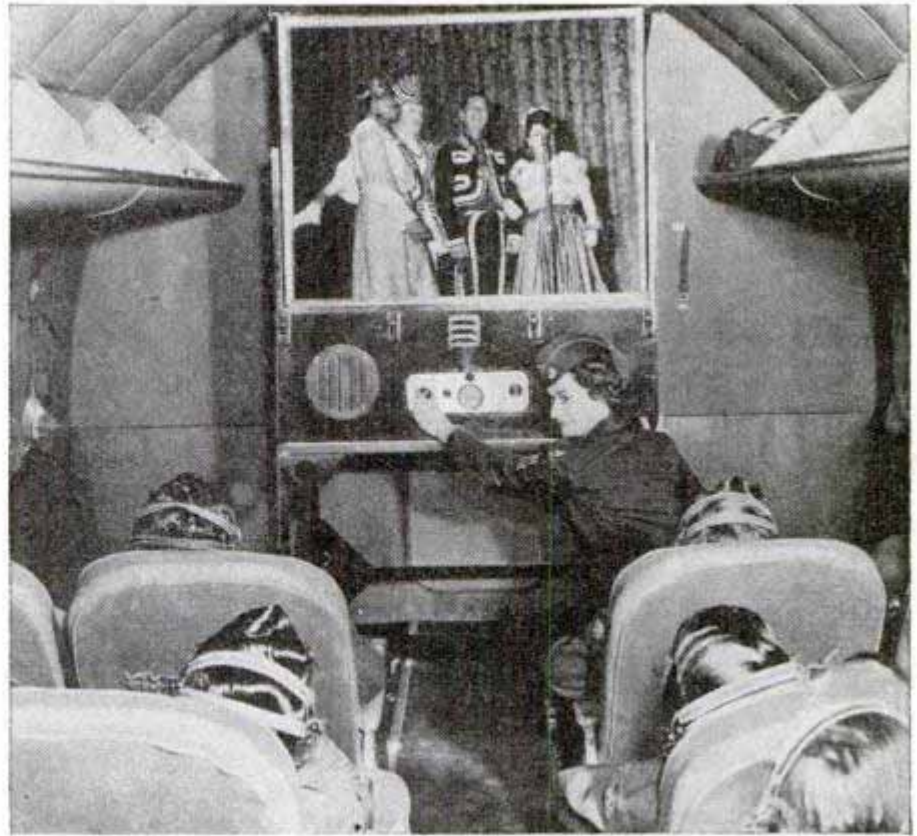
Requiring no darkroom because it employs a green fluorescent light as a source of illumination, a new photographic reproducing unit can be used in daylight. The photographic paper is sensitive only to the green light and is unaffected by ordinary light. The unit can be used to reproduce anything written, drawn, typed or printed. No camera is required.



Signal Corps photo

Patients See Airborne Movies on ATC Hospital Planes

Soldier and sailor patients evacuated by air from overseas stations to hospitals in the United States are seeing movies as they fly. The Air Transport Command, which operates the hospital planes, introduced the motion pictures to relieve the monotony of long air evacuation flights. The flight nurse in attendance can dial desired programs on the self-contained 16-millimeter projection and reproduction unit which is placed forward in the plane cabin. The 38½ by 29-inch screen can be seen by patients from any location in the cabin. Sound is reproduced by a cabin loud-speaker or individual headsets.



Official photo, U. S. Army Air Force

Canvas Cover on Framework Makes One-Room Cottage



Housing planners have come up with a "blanket" answer to the problem of providing temporary homes for veterans. A portable one-room cottage built by stretching a special canvas blanket over a wooden frame soon will be on sale to "homesick" veterans for \$1000. The blanket contains spun glass insulation for protection against heat and cold. It is stretched over a half-round framework that is similar in shape to the famed Quonset hut. The Army used structures similar to the "blanket home" to house soldiers in both the arctic and the tropics.

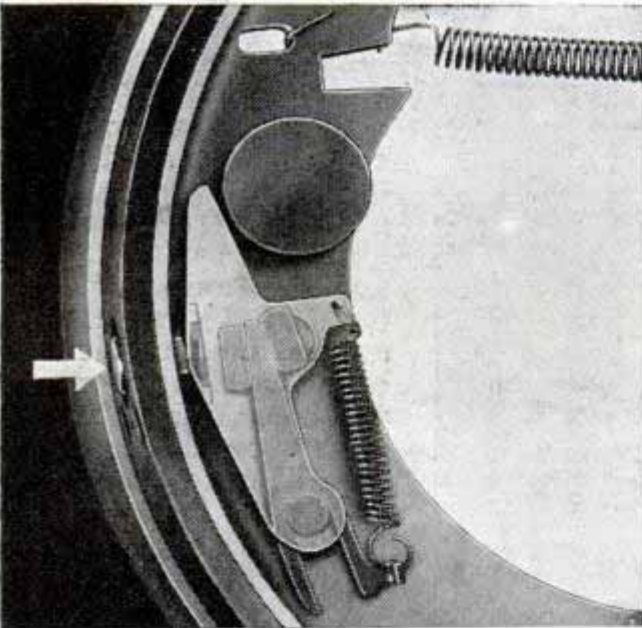


Information, including names and addresses of manufacturers, concerning products described in this issue may be obtained by writing to Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois.

Step on the Gas—



Nonglare black light illuminates jumbo-sized dials on dash of new Studebaker. Below, arrow points to plug on self-adjusting brake shoe described in text



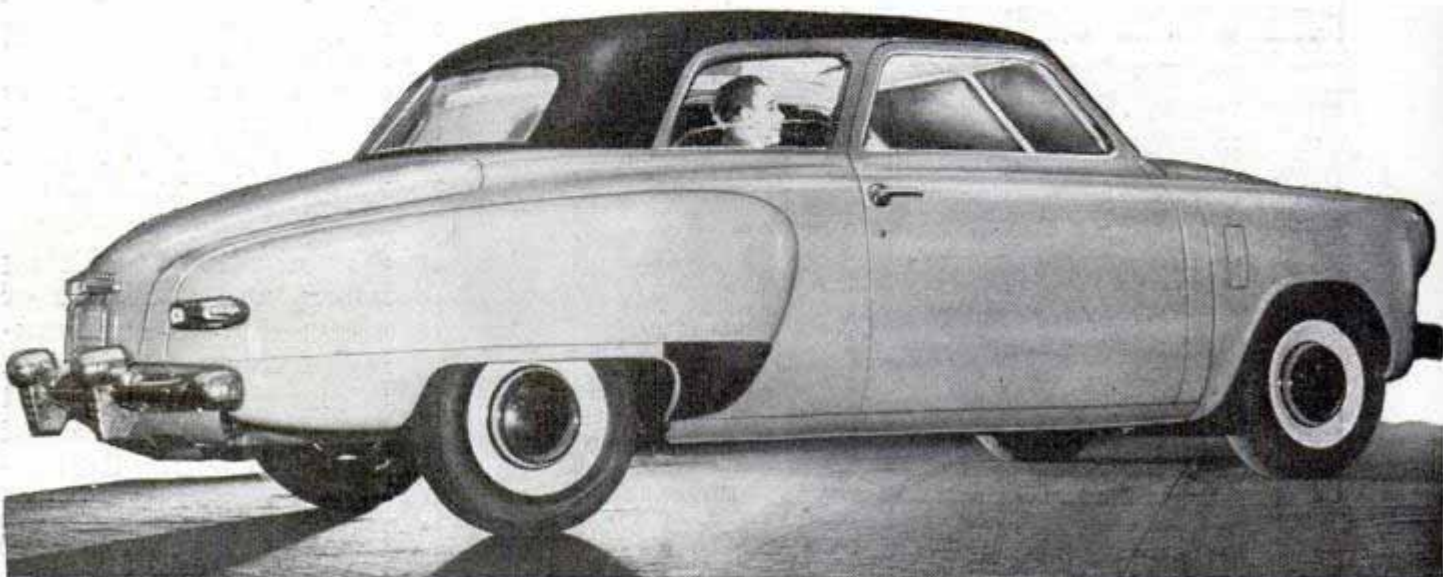
FROM one of the oldest automobile plants in America—Studebaker at South Bend, Ind.—are rolling new 1947 models that may hold a prophecy for the entire automobile industry.

If the '47 Studebakers are pacesetters, here are the features that car-hungry Americans can look forward to in the truly postwar cars: much lower bodies, wider and more comfortable seats, fenders absorbed into the bodies, a doubling of the glass area for windows, and such innovations as self-adjusting brakes and instrument panels illuminated with nonglare black light.

Most striking of the Studebaker models (as shown on the opposite page) is the five-passenger Commander coupe with a semi-circle of rear-view windows. Before its first showing in Chicago this car created such a sensation when being moved into a hotel that a police guard had to be called. The fenderless body design, while distinctly postwar, retains enough conventional styling for mass appeal. The windshield and rear windows offer double the vision of earlier models.

An ingenious braking system on the new Studebaker makes its own adjustments. The brake shoe is mounted on an eccentric in the center instead of being held rigidly by a fixed anchor pin at the bottom of the backing plate. A graphite bronze plug on the surface of the lining area of the front shoe maintains contact with the brake drum. As the brake lining wears, the plug moves inward and pulls up a spring-

Fenders streamline into body of '47 Champion sedan



the '47s are Rolling!

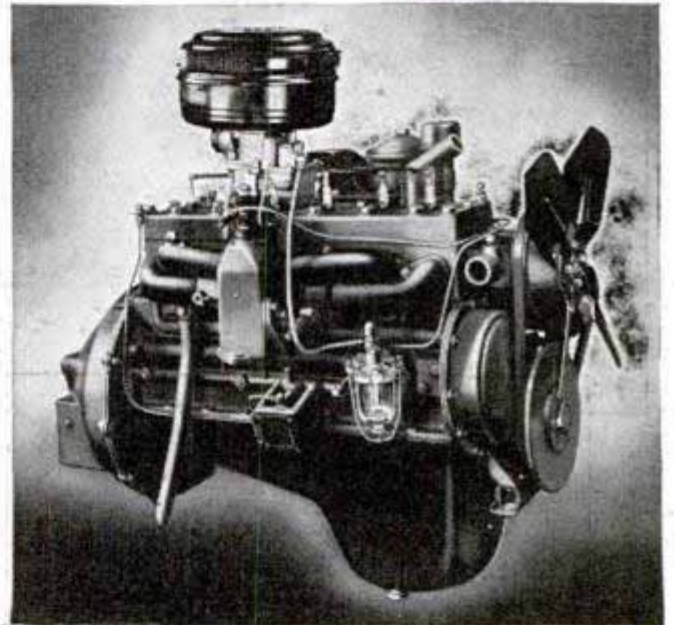


Studebaker Commander coupe has that "postwar" look

mounted wedge-shaped arm that presses against the eccentric. This causes the shoe to move outward in steps of .004 of an inch.

Although height of the '47 Studebakers is only a fraction over five feet, head room has not been reduced. A lower center of gravity, vital factor in driving safety, has resulted from dropping the midsection of the frame. The passenger compartment has been moved 13 inches forward to a position $19\frac{1}{2}$ inches ahead of the rear axle, placing it close to the center of longitudinal balance. The engine also has been moved for-

Continued to page 256



Studebaker power plant shows the "packaged" influence of Weasel; oil filler pipe is at front. Below, this view of Commander coupe shows semicircular rear windows





Nelson smacks an iron shot before an admiring crowd

The **Mechanics of GOLF**

Part 2

by
Byron Nelson

**Irons Are the "Payoff" Clubs
and Here the Game's Greatest
Master Tells How to Use Them**

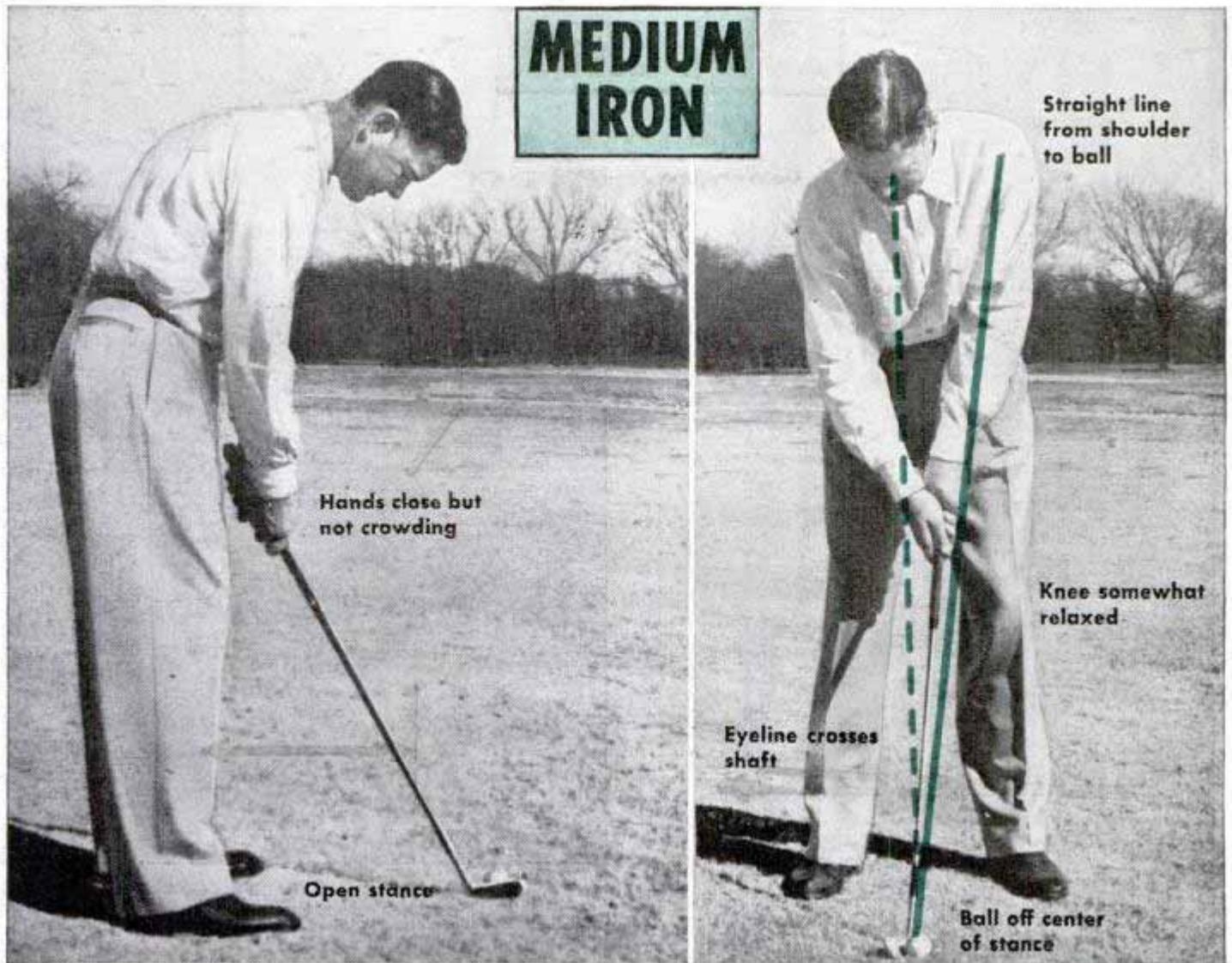
LAST MONTH we studied the details of gripping a golf club and effective technique for playing the woods. In this second article we will delve into the mechanics of hitting shots with long and medium irons.

I think of the iron shots as somewhat of a refinement over the wood shots. While both accuracy and distance are desirable objectives in playing a wood shot, the importance of accuracy increases and emphasis on distance decreases as we progress into the shorter irons.

For example, most golfers try to hit the ball as far off the tee as they can, hoping it will stay in the fairway. Even some of the best stray off into the rough at times. But, each top-notch golfer actually is trying to sink every shot he hits to the green with a medium or short (Nos. 7, 8, 9) iron. Just "close" isn't good enough.

If you have been interested in golf for any length of time, no doubt you have heard the expression, "He hits his tee shots a mile and then scrambles the rest of the way around the course."

I must confess that at one time long ago this might have been a reference to my game—and that of hundreds of other as-



"Mr. Golf" illustrates with front and side views the stance he uses for playing the medium irons (Nos. 4, 5 and 6)

piring young pros. The earliest tendency in learning to play golf is to try to "crown" the ball with the woods and sort of let the irons take care of themselves.

The irons are the "payoff" clubs. It's rarely the one who is the longest off the tee who wins the tournaments. In fact, there are thousands of golfers who can hit out wood shots with the best of the amateurs and professionals. But when you come to checking the prize lists, it's the golfers who are most accurate with their irons who are consistently at the top.

Johnny Revolta, Harry Cooper, Ben Hogan, Henry Picard, Walter Hagen, Bobby Jones, Tommy Armour and Chick Evans rarely won driving contests, but their names are synonymous with winning golf. These men all developed deadly accuracy with their irons.

The greatest satisfaction and the most profitable results in my own golfing experiences have arisen from memorable iron shots.

After I had won the Red Cross Open at New Rochelle in 1944 with a 72-hole total of 275, which was 13 under par, most of the newspaper comment centered on my

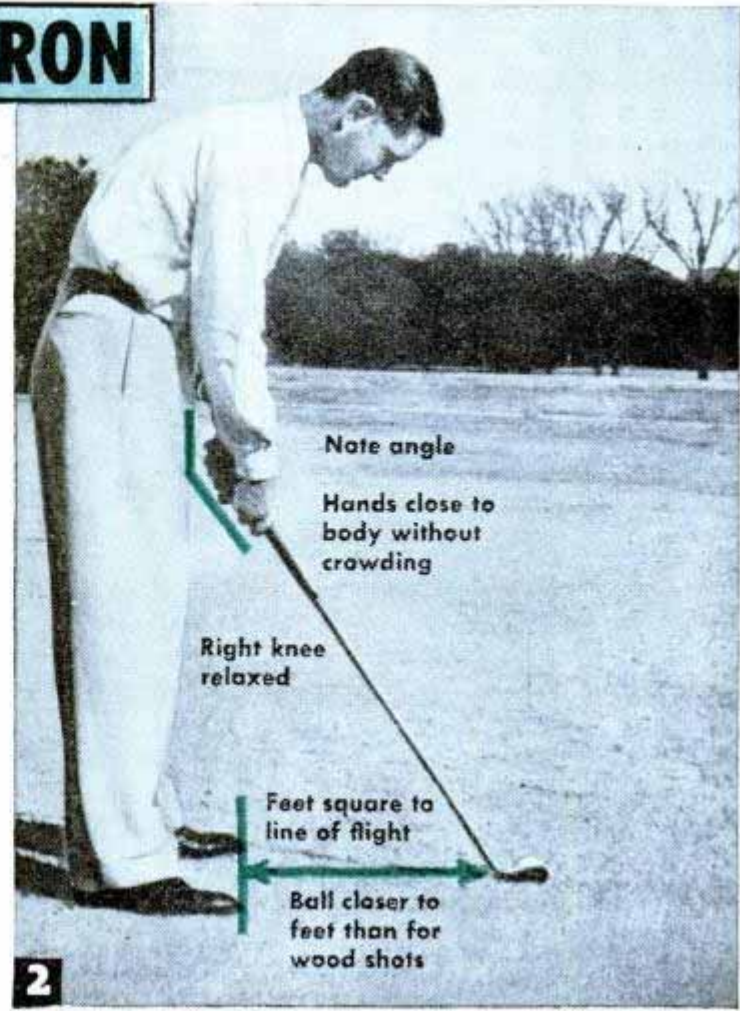
"dead" iron shots. As a matter of fact, I was hitting my drives well, but no one placed any emphasis on this.

I also can thank my irons for pulling me through the most thrilling episode of my entire competitive career. It occurred in the 1945 Professional Golfers Association of America annual championship tournament at the Moraine Country Club, Dayton, Ohio.

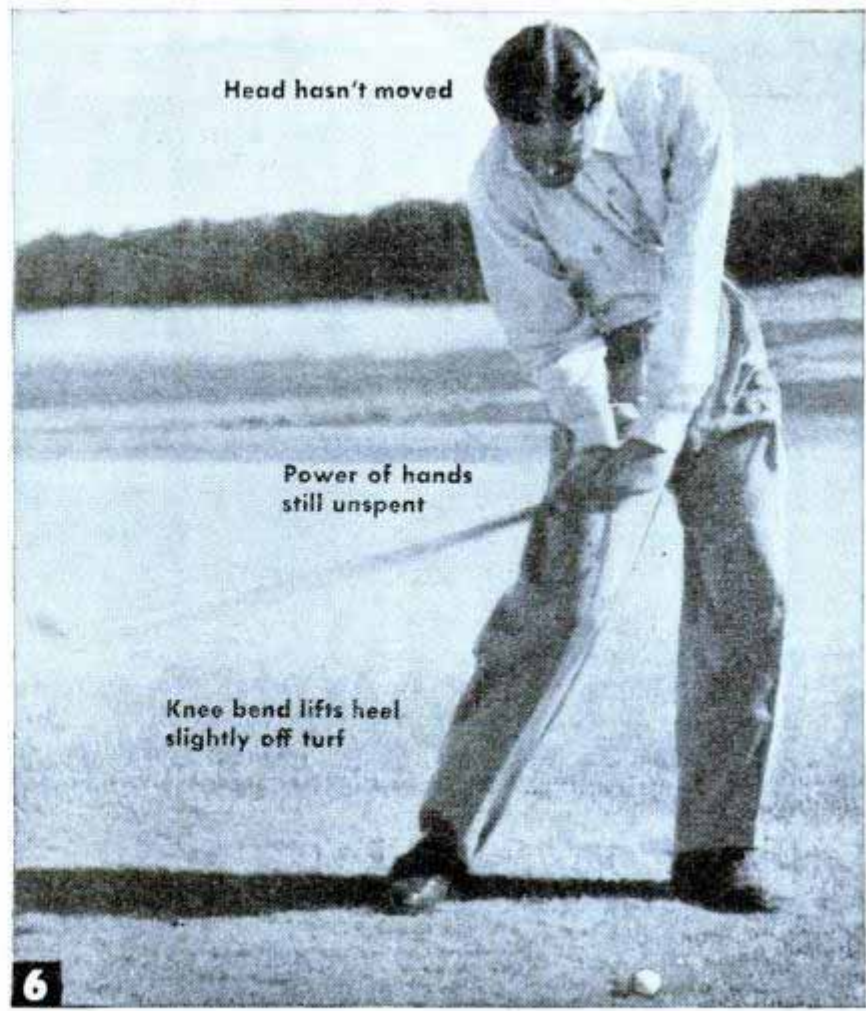
Mike of the famed Turnesa golfing family had me two down with four holes to play in the second round of the tournament. He drove first on the par three 175-yard 15th hole and his ball rolled up to within nine feet of the pin. That meant a sure par three and a possible birdie two for Mike. My only hope for survival lay in hitting my iron shot from the tee for one putt and a birdie two. My iron came through for me. The ball stopped three feet from the cup. Turnesa missed, I stroked my short putt in and was only one down with three to go. This took off much of the pressure.

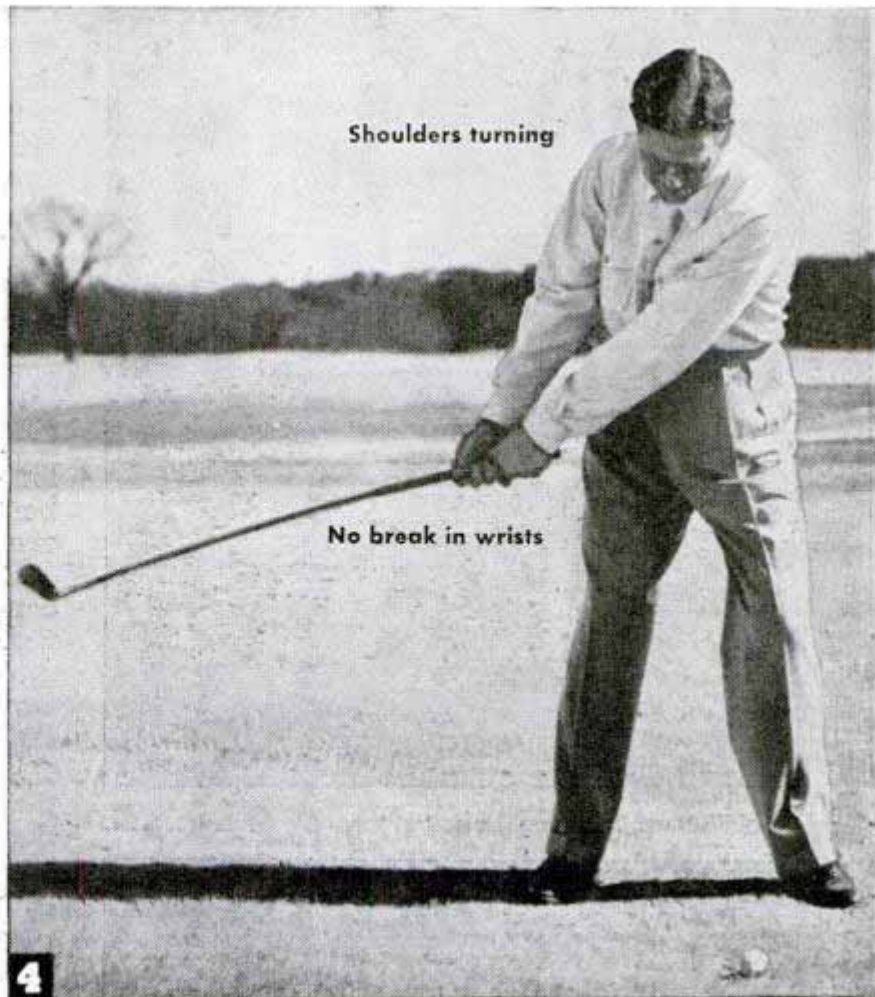
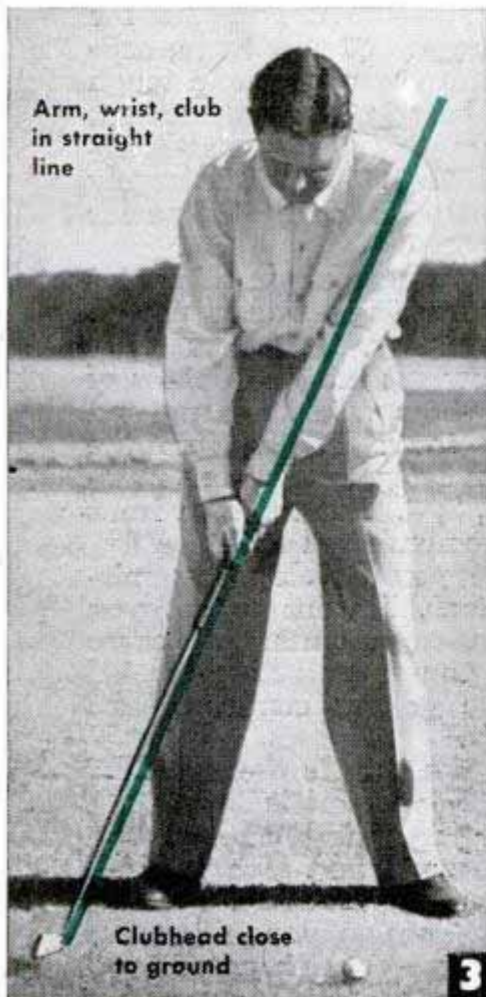
A short iron shot dead to the pin set me up for a birdie three on the next hole. Mike took four, and our match was even. On the 17th hole, the 35th of our match, my second

LONG IRON

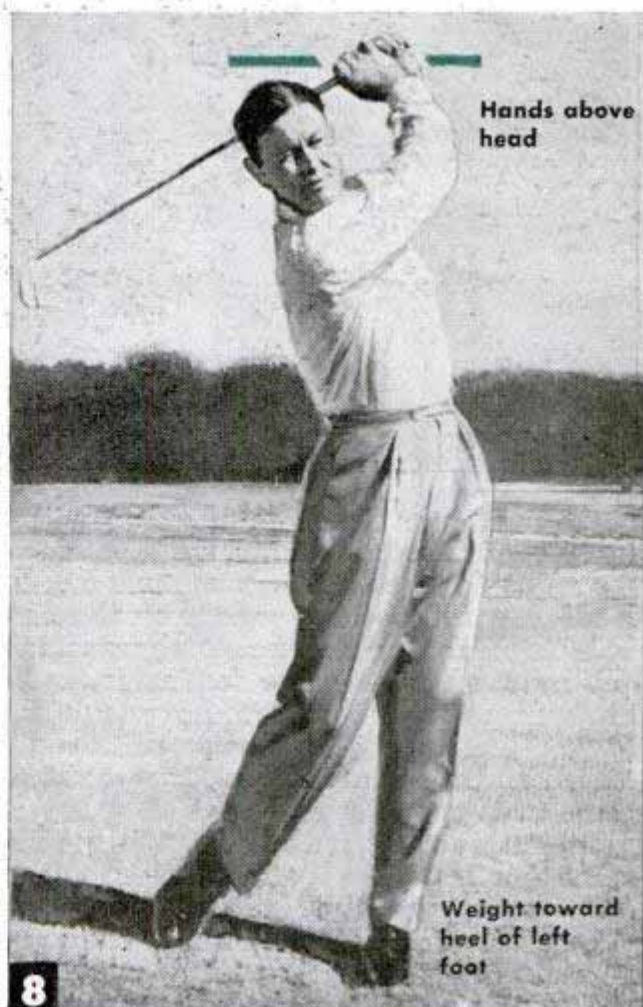
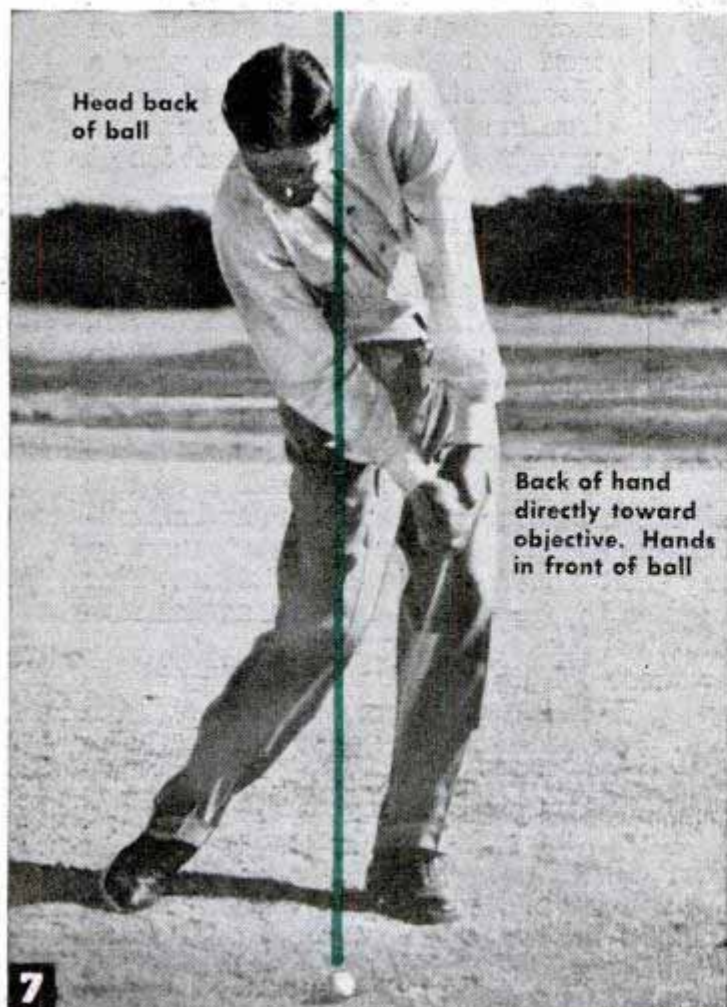


Follow the Nelson swing from





the address to the follow-through on these pages





"Lord Byron" proves that even the best of them can get into trouble



shot on the par five hole edged to within five feet of the cup, enabling me to get down for an eagle three. This gave me a one-up lead. A conservative par four on the final hole tied Turnesa, and the match was mine.

I went on to win the tournament. I'll always remember that iron shot on the 15th at Moraine. It was the turning point of the match and the tournament for me. While the direct monetary returns are not so great in this event, it's one we professionals want to win above all others, with the possible exception of the National Open.

Bud Ward of Spokane, one of the great amateurs of recent years, isn't particularly straight with his drives, but right up to the

time he put aside his golf clubs for duty in the armed services his brilliant iron play made him a tough man to beat in any tournament. He won both the National Amateur and Western Amateur largely through the accuracy and power of his irons.

I hope to have made this point in the foregoing—it does pay to stress iron play.

We now get into the details of playing shots with the long and medium irons. Falling into the long iron category are irons numbered 1, 2, 3. The medium irons are those numbered 4, 5, 6.

Before you develop any misconceptions, I want to set you right on two points that cause most beginners and self-instructed would-be golfers confusion and difficulty.

First, the grip is the same for playing irons as it is for woods. Second, the swing employed in playing wood and iron shots is fundamentally the same. You will observe as we go along that there are some minor variations as you change clubs, but you should not make a deliberate attempt to swing differently.

As a general rule, you stand more closely to the ball to play an iron shot than you do to play a wood shot, for the clubhead on an iron is set on the shaft at a more upright angle and the shaft is not as long. The same holds true of the irons as the numbers increase. A No. 8 iron, for instance, has a shorter shaft and more upright clubhead angle than a No. 3 iron, so you stand closer to the ball to play the former. This means you also swing in a more upright arc and take a shorter swing.

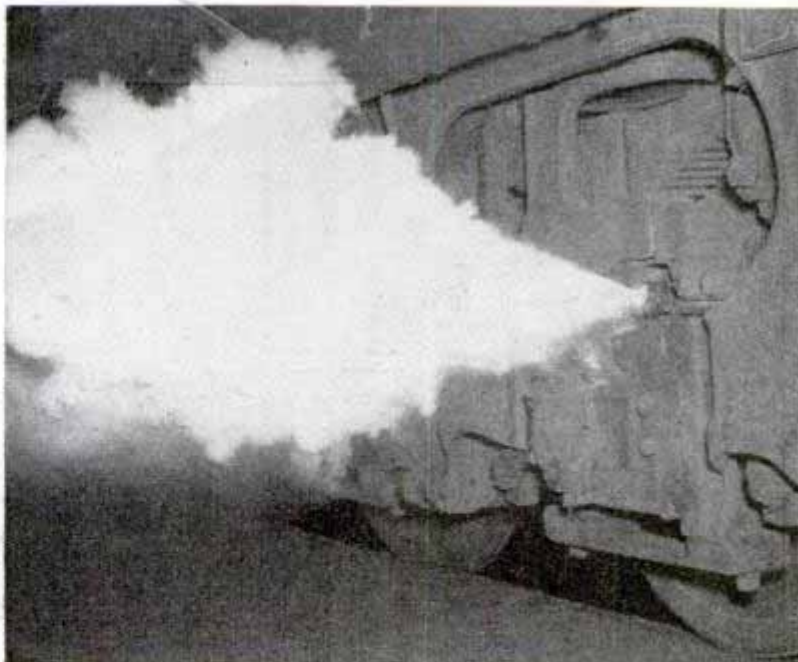
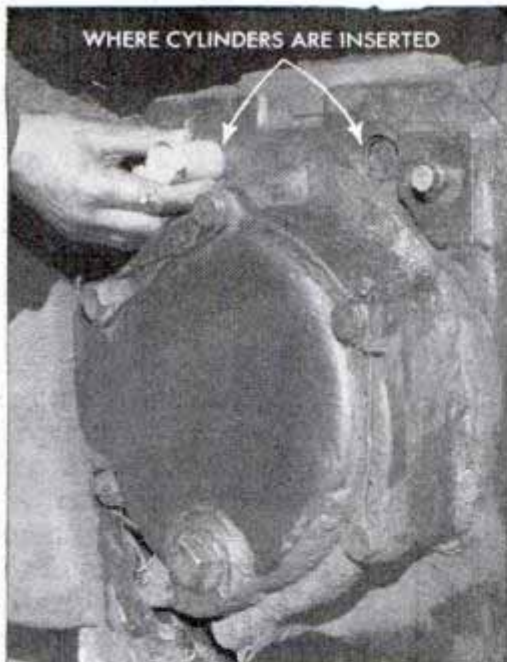
I told you in Article I of this series that I found streamlining and simplification a real boon to my efforts to develop my golf swing to maximum efficiency. This applies to the mental as well as the mechanical (physical) processes.

Those golfers who go along trying to develop a different swing to go with each club and each varying shot are unnecessarily complicating the game.

There is a single general difference between a shot played with a wood and one played with an iron.

With a wood, you attempt to sweep the ball off the tee (with a driver) or the turf (with a brassie or spoon). In playing an iron

(Continued to page 244)



Smoke clouds and penetrating odor released by a hot-box alarm warn trainmen of overheated axle journals on New York Central trains. When heat in a journal reaches 220 degrees Fahrenheit, two cylinders go into action

Hot-Box Alarm for Train Emits Smoke and Odor

before real trouble develops. The smoke is produced by one cylinder and the odor by the other. The gases are released through small holes which are opened by extreme heat melting a fusible metal stopper.



"Mountain Dodger" Is Fast Climber

Requiring less than 800 feet for takeoff at a 6000 foot altitude, the new Callair A-2 is designed especially for operation in mountainous regions. Driven by a 125-horsepower Lycoming engine, the plane climbs 1000 feet a minute fully loaded and has a range of 500 miles.

"Stereo" Camera Range Finder Focuses Both Lenses

Both lenses of a new stereoscopic camera are coupled with the range finder to provide easier focusing and assure the same focus for both objectives. The view finder, located between the matched lenses, prevents parallax because the scene viewed is actually recorded on the film. The camera has built-in synchronization and its shutter has 10 speeds, from one second to $\frac{1}{200}$ second, with time and bulb exposures. It takes 15 double, or stereo, pictures on an 18-exposure 35-millimeter film in black-and-white or color. A folding cap covers both lenses and the view finder. A binocular type viewer to magnify the stereoscopic transparencies is available.



Nonsinkable Aluminum Boat Rides Over Rocky Beach



Rain or sun or a rocky beach has little effect on a weather-resistant one-piece nonsinkable aluminum boat designed for general use. The bow of the 12-foot, 150-

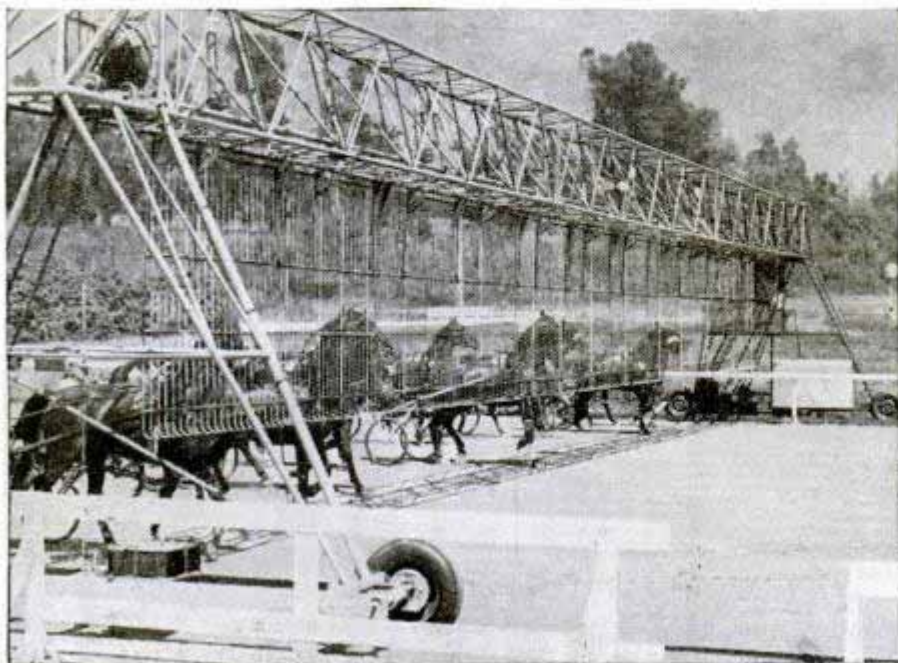
be used and oarlocks are provided. Oak runners and redwood seats muffle noise. Tests included runs over logs and beaching along rocky shores without damage.

Giant Self-Propelled Howitzer Fires 350-Pound Shell

"King Kong" of American field artillery weapons is a 63-ton self-propelled 240-millimeter howitzer which will fire a 350-pound shell 26,400 yards—nearly 16 miles. A crew of 18 men is assigned to the weapon which can travel on its tanklike chassis at 20 miles per hour. It can be put into firing service three minutes after it is pulled into position.



U. S. Army photo



Harness Race Gate Moves With Horses

As horses and sulky drivers move toward the starting barricade on a harness racing track a mobile starting gate moves with the entries to assure an even start. The barrier is powered by automobile engines. As it reaches the starting point the gate is lifted and horses and sulky drivers get under way.

☐ Atom-smashing one pound of U-235 creates energy equal to 10,000,000 electrical kilowatt hours.

Mr. Watt *farm hand*

A billion dollars will be spent in five years to bring electricity to three million additional farms within the United States

FOR years, many Americans have had the erroneous impression that few European farmers enjoy the conveniences of electricity. But before we shed another tear for the "backward countries of Europe," think of this: In 1935 when less than 11 percent of American farms had electric high-line service, farm electrification had

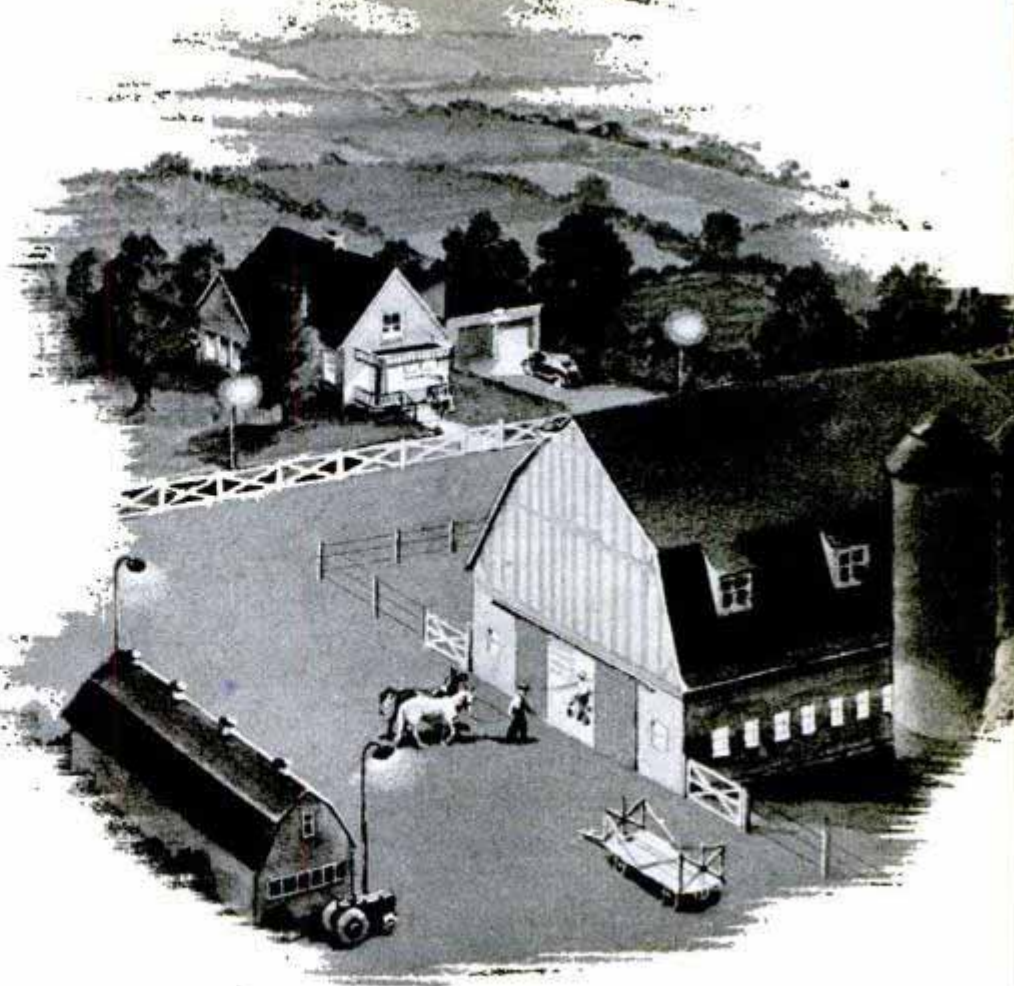
reached 85 percent in Denmark, 90 percent in Germany, 95 percent in France and practically 100 percent in Holland. Even today, with slightly more than 40 percent of our farms electrified, we are still far behind these and other countries in that respect.

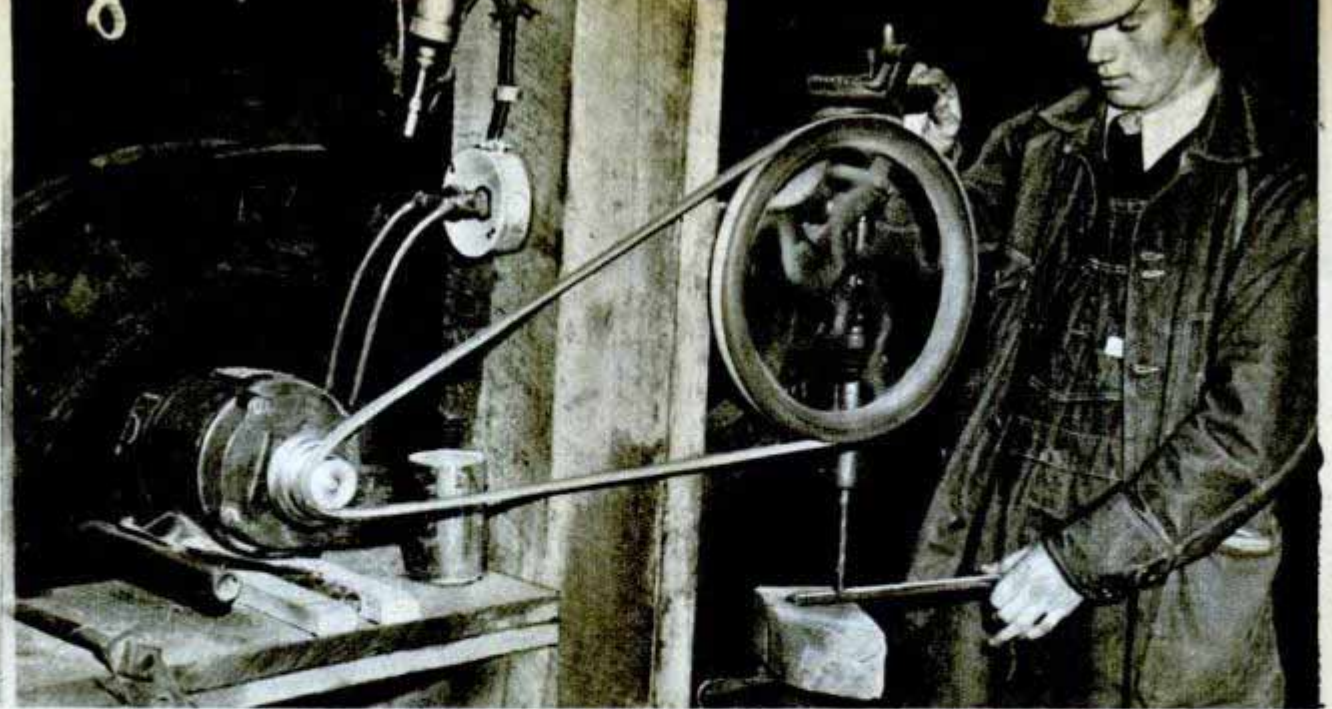
The war stopped much of the electric line construction which was planned to take up the backlog accumulated during the depression in the '30s. Now, with the war over and copper and other construction material again available, a giant five-year plan of rural electrification has been proposed. It is to be undertaken by private utilities, farm cooperatives and public agencies, and, based on prewar costs, will require the expenditure of about a billion dollars. The aim is to bring electricity to 3,655,000 additional rural consumers.

In addition to bringing the United States on a par with other countries, it is expected that this new construction will result in the sale of some three billion dollars worth of electric appliances. Since 25 percent of the modern farms use electricity for pumping water, an estimated 700 million dollars will go for additional plumbing installations. It will be a tremendous stimulus to continued

Lincoln Electric Co. photo

Arc welding outfit repairs loose braces on harrow





Workshops equipped with electricity aid farmers in doing their own repair work. Portable motor (below) comes in handy for many jobs, particularly hoisting



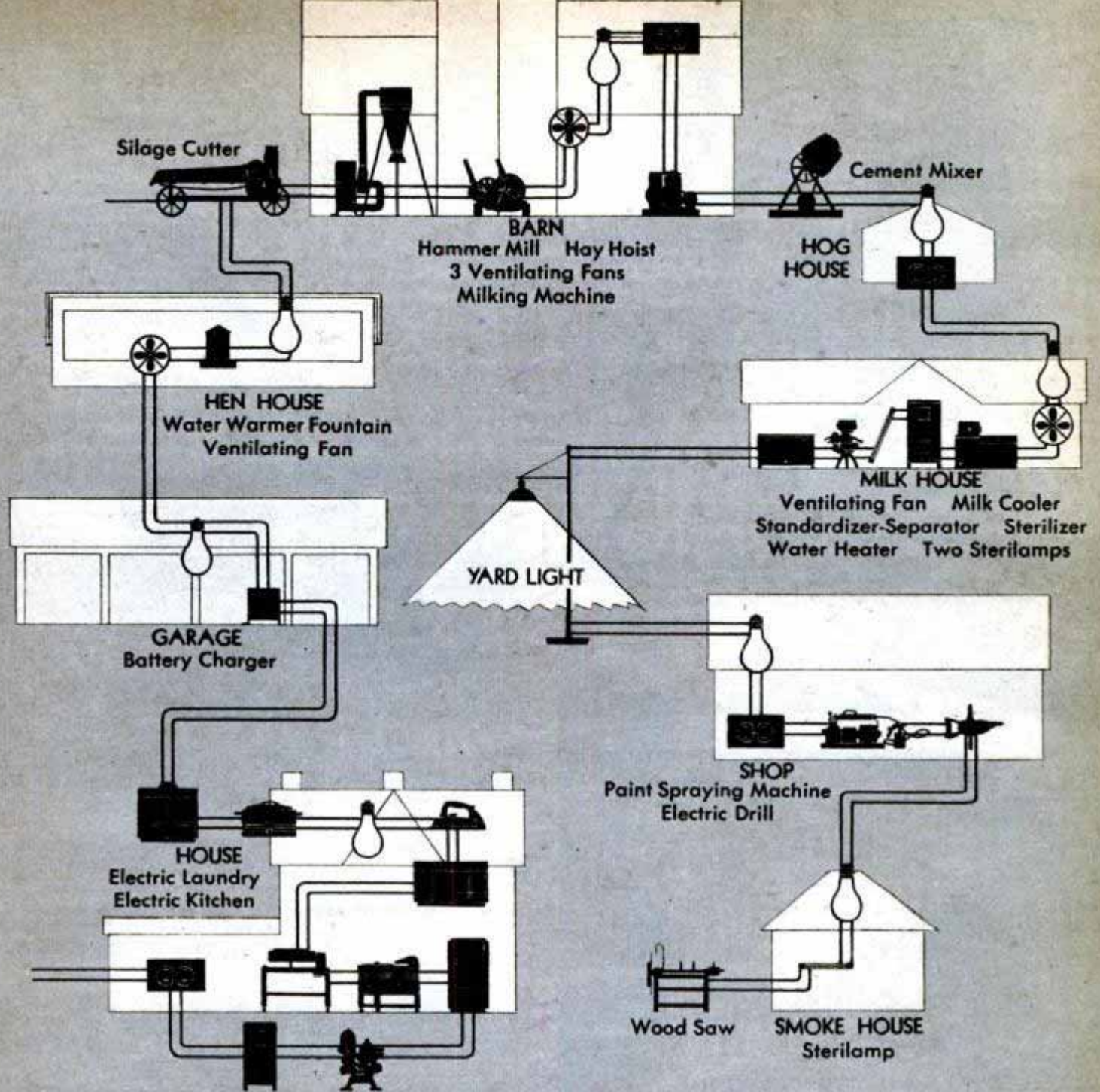
Light bulbs and a reflector installed behind a few boards create heat for brooder to protect little pigs

prosperity and provide employment for some of the millions of ex-servicemen. Best of all, it may help stop the exodus from the farms to the cities by making farm life pleasanter and more attractive, creating a better social, economic and cultural environment for our rural population.

The American farmer who, with less help, managed to feed the home population, our armed forces and a substantial part of the world, is a handy man. In places where electricity was brought to the farms, the farmers have found it a wonder-working tool. A homemade device—a few boards nailed in a corner of a hoghouse with a reflector and lamp dropped behind them—has saved an average of at least one pig per litter for many hog producers, both in protection from cold and crushing by the sows.

In poultry production, running water, pumped and heated electrically, controlled automatically and available at all times, not only saves thousands of steps for the poultryman but increases egg and poultry production. Other electrical aids to the poultry industry are safe, reliable electric brooders, night lighting of hen houses, egg





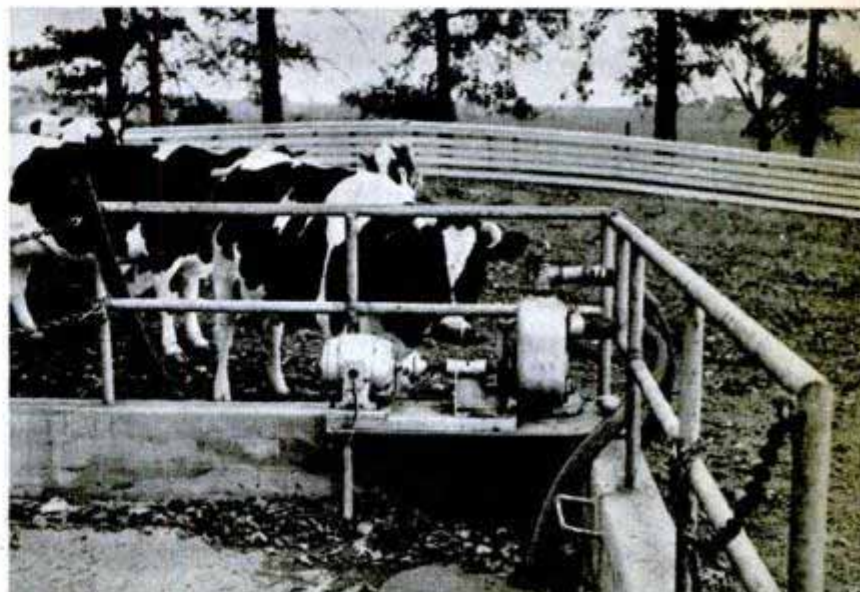
Westinghouse chart

Diagram of dairy farm that runs 25 machines by electricity. Below, pump draws liquid manure for fertilizer

candlers and graders, poultry house fans and egg coolers.

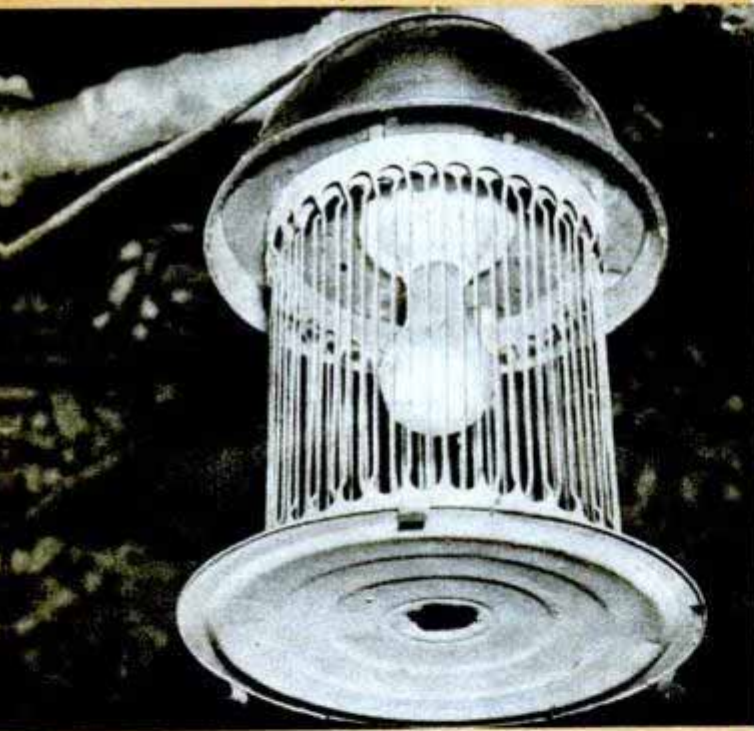
Having a tool ready to do a repair job at the right time often saves hours in the farmer's day. Electrically operated repair shops have become more numerous on farms. They prevent many trips to town. Where more specialized work is needed, many small communities have repair shops. Many of them also make electrically driven equipment for the farmers, such as elevators, hoists and other machinery for field work.

Irrigation during dry spells has frequently made the difference between poor yields and satisfactory ones for vegetable producers on both commercial and

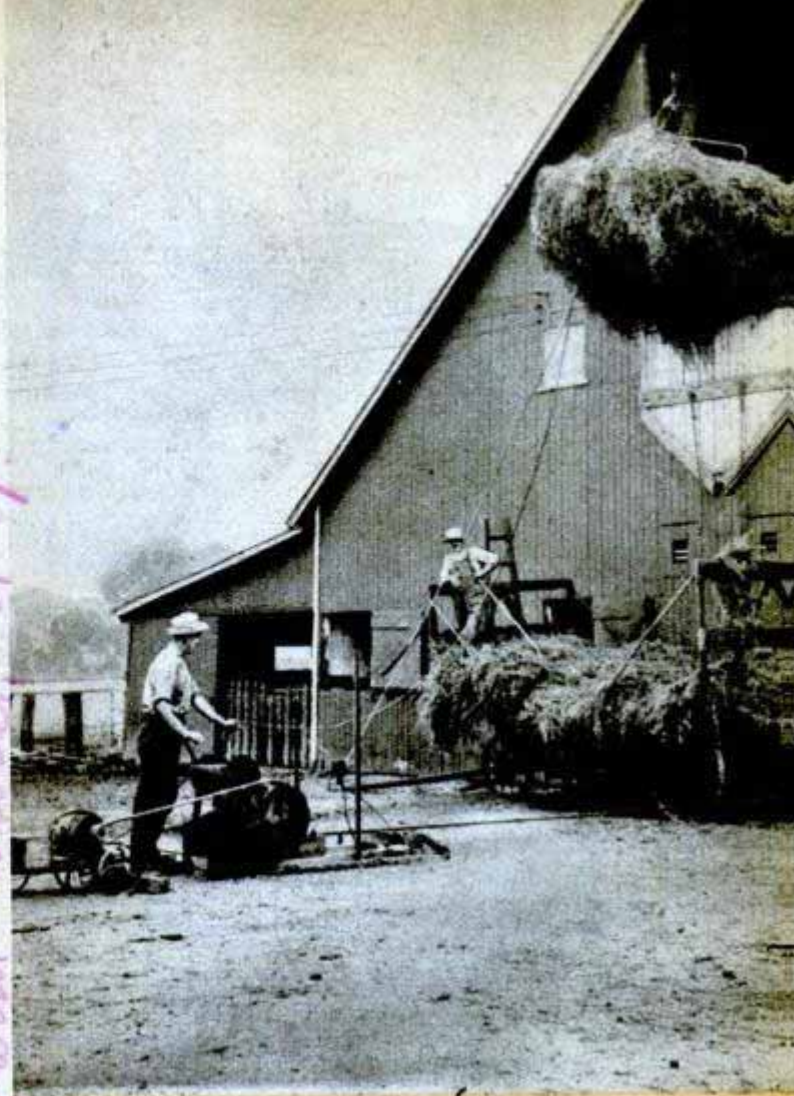




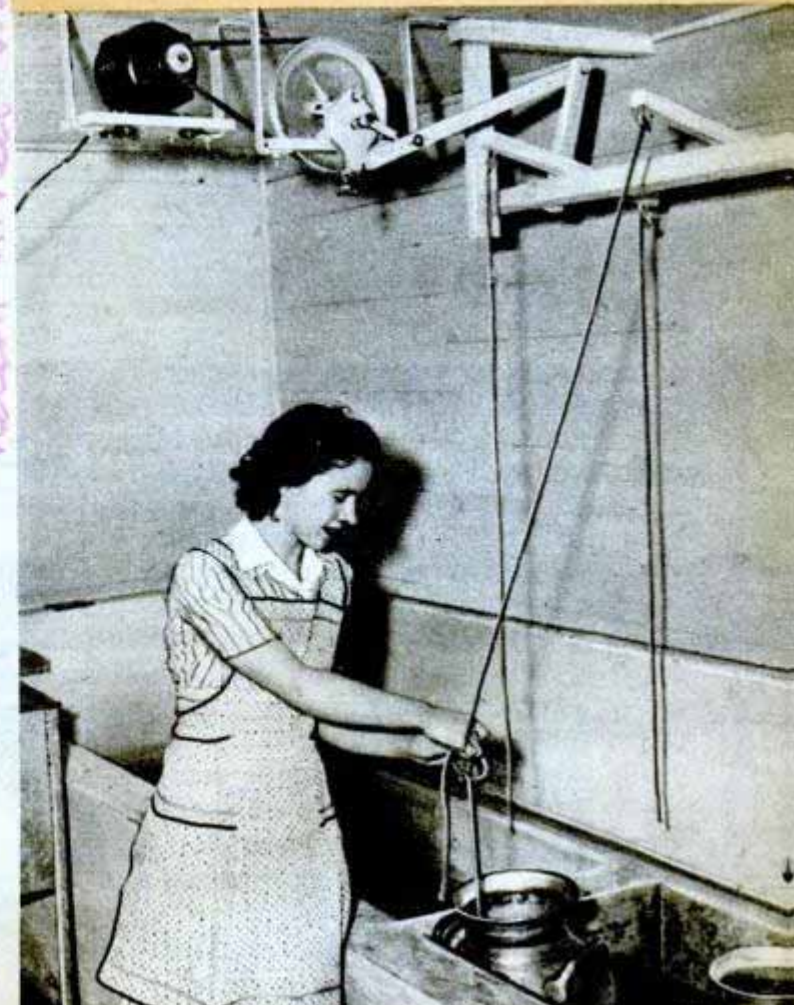
Public Service Co. of Northern Illinois photo
Unlike a windmill which works only when the wind is blowing, electric motor pumps water at any time



Light trap electrocutes insects with 4000-volt current wired to metal grille. Electric washer, ironer and dishwasher (below) cut hours from work on farm



Storing hay becomes a one-man job with portable electric motor, releasing a tractor for field work. Below, homemade milk stirrers run by electric motor



Helena R. Peet, Pruning Farm, Webster, Mo.



Eight cases of eggs per hour are graded by machine

self-supplying levels. Electrically pumped sprays, consisting of portable piping and easily moved from field to field, are being used by many farmers to stimulate growth and save crops.

Rural electrification has already brought one far-reaching benefit. It is making possible the development of rural industries and helping to decentralize industry. This is still an almost untouched field which holds promise of important public values. Industry, on a smaller scale than in most cities but adapted to the special needs of rural people, is reaching into rural areas which have electric service. Rural producers are seeing the economy of processing locally the raw materials produced locally—and the benefits in terms of greater community and individual income.

The combination farming-manufacturing life is now enjoyed by thousands in many industry-sponsored farm-factories. Probably the best examples are the village-in-

Quick-freeze unit preserves foods for future use

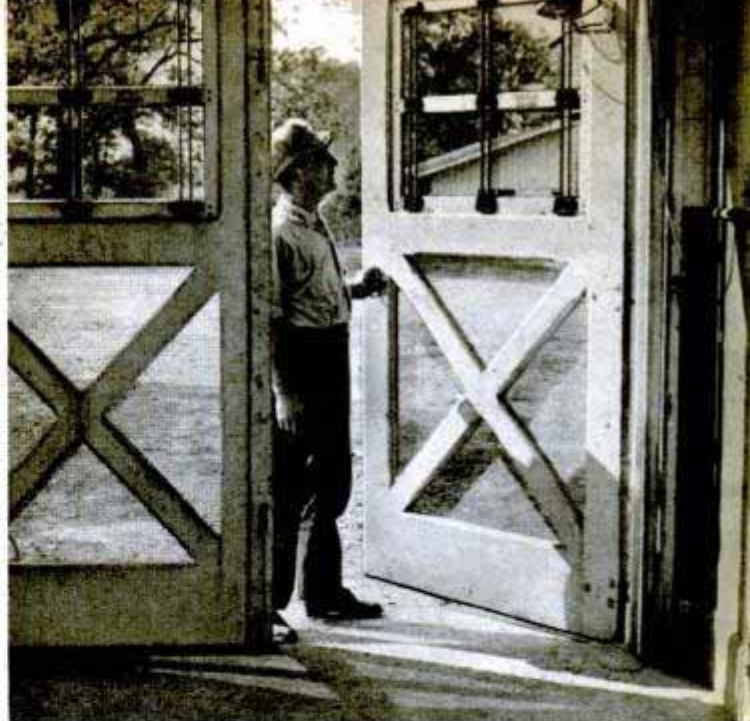


Electrically powered milk coolers are used widely by dairy farms to keep milk fresh which otherwise would spoil during the wait for shipment to market



Electric blower forces air through ducts to cure hay in mow. Below, electric clippers shear sheep





Fanning mill (at left) is driven by a small portable electric motor. Right, electric screens instantly kill flies

dustry projects of Henry Ford, where, during the slack farm season, farmers produce precision parts for automobiles. The worker, in addition to being provided year-round employment, has the dual advantage of healthy farm environment and high factory wages. This part-time farm-rural industrial employment holds promise of contributing to stability of income, maintenance of high standards of living and promotion of rural security.

Increased savings and income made possible by efficient application of electric power to farm tasks has encouraged many farmers to electrify their homes. Electric ranges not only save many hours of hard labor for the farm homemaker who stokes wood into a stove, but also permit her to do other tasks while her meal is cooking.

Electric refrigerators are often production tools, as farm families frequently store eggs and other small marketable items in the large-size family refrigerator.

Electric lights in the home mean almost unbelievable change in the lives of farm families who have struggled for years with inadequate, smoky oil lamps. Radios, washers, irons, vacuum cleaners—all the modern conveniences of the city home—soon will be available for more farm homemakers. These time-saving devices actually are more important to the farm housewife than to her city sister who seldom has "chores" outside the home.

Large-scale rural electrification is just beginning. Although the first central generation system went into service in 1882, until recent years farm electrification advanced very slowly. A few farms were connected to central-station power prior to World War I, and the early '20s saw a short-

lived spurt in which progress made in electrical engineering was reflected. But as late as 1939 only 20 percent of all farms in the United States had received central-station electric service.

In the period 1935-1945, due in part to the stimulating effect of the federal Rural Electrification Act of 1936, electric service was extended to an additional 30 percent of American farms. The act provides for loans to qualified organizations, preferably non-profit and cooperative enterprises, for the construction of power facilities for inhabitants of rural areas without central-station service.

To make the government-appropriated money go farther, Rural Electrification Administration engineers worked out a simple type of construction, using poles without cross-arms and stretching the wire in long spans. Previous rural electrification attempts had used heavy, expensive urban type construction which often made costs prohibitive.

As a further saving, almost all members and consumers of REA-financed cooperatives read their own electric meters and many figure their monthly bills, sending payments "on their own" to the cooperative office.

About half of rural America has been receiving central-station service since the first of January 1946. Congress appropriated \$200,000,000 for the fiscal year 1946 for the Rural Electrification Administration to be used as loans. An additional \$100,000,000 is available to finance REA systems. Scores of private and public utilities, too, have dusted off their blueprints and resumed bringing mankind's greatest servant to the American farmer.



PARIS *on a* TABLE TOP



Although George Alexander fled Europe before the war, he lives among the picturesque streets of Paris. The Los Angeles artist resided for 15 years in the French capital before the heavy curtain of war dropped over Europe. Anticipating the nostalgia that would depress him if he ever left the beautiful city, he spent many hours of his time re-creating characteristic sections of the capital in clay. He completed his ambitious project in 1936, but when he fled he had to leave it behind. At last he has it housed in his own studio. Alexander's Paris is complete with tawdry streets, curio shops, sidewalk cafes and wash hanging from apartment windows. On the shelves of corner newspaper kiosks are miniature periodicals. A typical mongrel dog sniffs hungrily in an alley. Alexander has even put miniature tomatoes, beans and other garden produce in the vegetable stores. An old street gate hangs awry on its hinges, and cracked plaster on the walls of the buildings adds a realistic touch



AN ARTIST

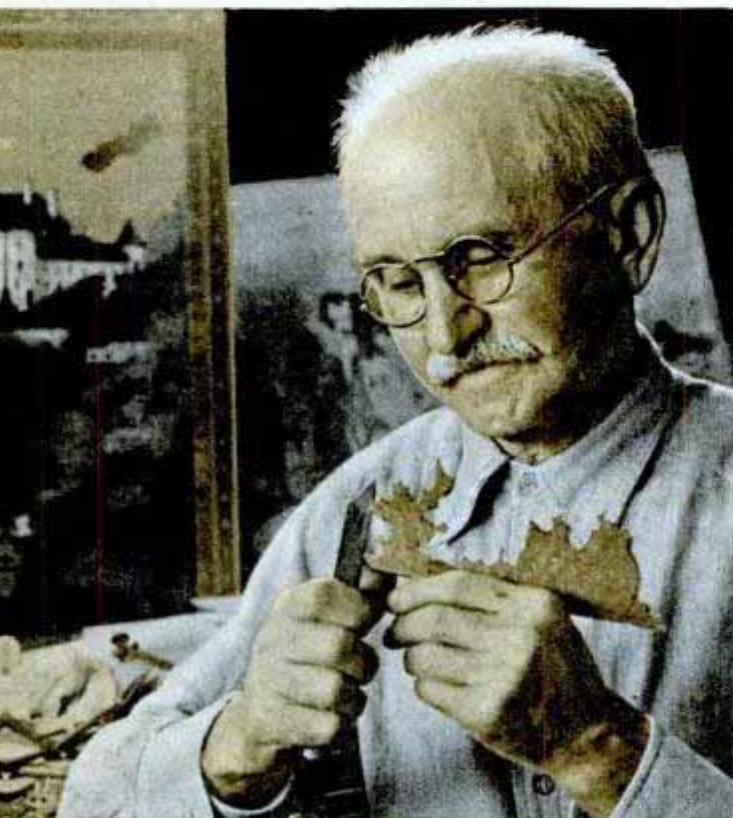
"Paints" With Wood

BEAUTIFUL PICTURES are created from thousands of tiny pieces of colored wood by 72-year-old John Wacha of Providence, R. I. Using more than 70 types of wood—some in natural color and others colored by impregnation—Mr. Wacha fashions lifelike flowers, trees, castles and anything that strikes his fancy. Buying his wood already sliced to minute thickness, he uses a fine-edged knife or saw to cut out the desired shapes which he fits together

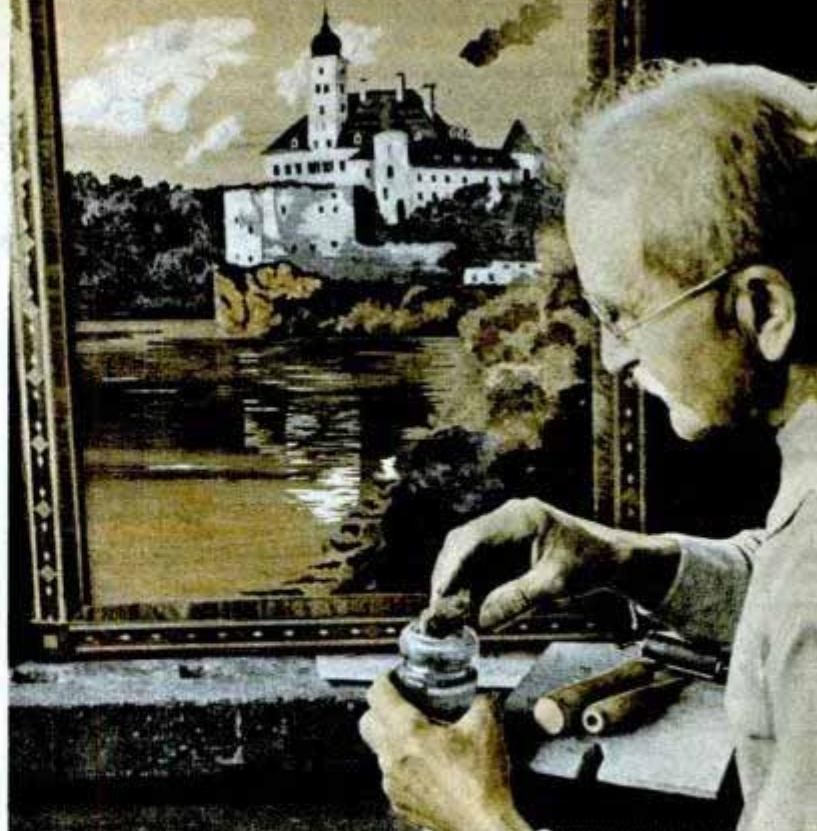
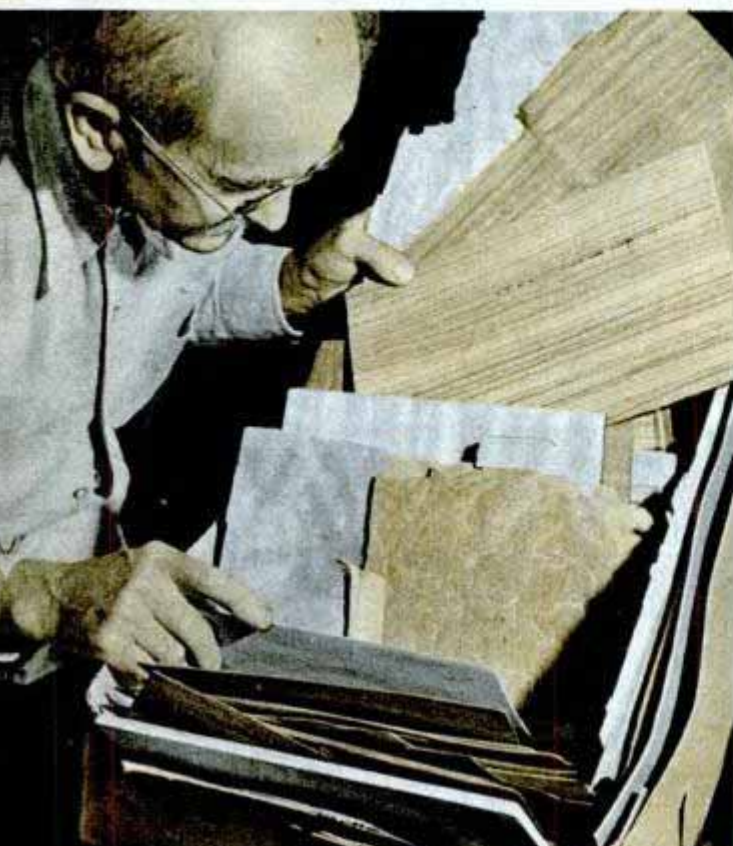


Craftsman Wacha's grandson watches him polish a picture made from many tiny colored wood slivers

to form the picture. Some of the cutouts are so tiny that the artist employs jeweler's tweezers to handle them. For example, small flowers less than a half inch in diameter are made up of 20 pieces of colored wood. Each piece of wood is held in place by gummed paper. When the picture is completed, it is covered with binder paper, mounted on plywood and pressed for 36 hours. Then the binder is removed and the picture is sanded, shellacked and waxed.



Intricate shapes are cut out with sharp knife. Wood from almost every corner of the globe is selected by the artist (below) to get the proper color for pictures



Preparing to apply an oil rub to an English castle scene. Light-colored wood created water reflections



A fine scroll saw is used to cut out the figure of Mother Eve. Below, a tiny sliver of wood is handled with tweezers for insertion in a palm leaf design



Gyro Keeps Its "Head" in Spins



Resistance to spins and dives is the feature of a lighter, smaller directional gyroscope developed by General Electric engineers. They have also built a climb-and-bank gyroscope approximately one third the weight of the present GE nine-pound instrument. The directional gyro has mechanical features designed to correct the tendency of conventional indicators to go awry when the plane goes into violent acrobatics, necessitating recaging and resetting when normal flight is resumed. It will take one third the instrument panel space of its predecessor and be more than a pound lighter. The climb-and-bank indicator likewise will occupy only one third the previous space on the instrument board.

Jap Copy of Jeep Lacks Power

America's versatile little jeep has a Japanese counterpart in a car of similar size built for military use. The Jap "jeep" has



power in its rear wheels only, while the American vehicle can be shifted to four-wheel drive whenever necessary. To compensate for this reduction in power, the car has larger wheels that give it slightly more clearance. Only the rear wheels are equipped with brakes. Most unusual feature of the little car is its front wheel suspension, consisting of coil springs and an elaborate hydraulic stabilizer. The vehicle holds three people, two in the front seats and one in the rear, with storage space on each side of the rear seat. A two-cylinder air-cooled, V-type engine provides the power. The vehicle can be shifted into three forward speeds and one reverse. It has one advantage over America's rugged jeeps—side curtains can be buttoned on during bad weather.

Phone Talks, Records Messages

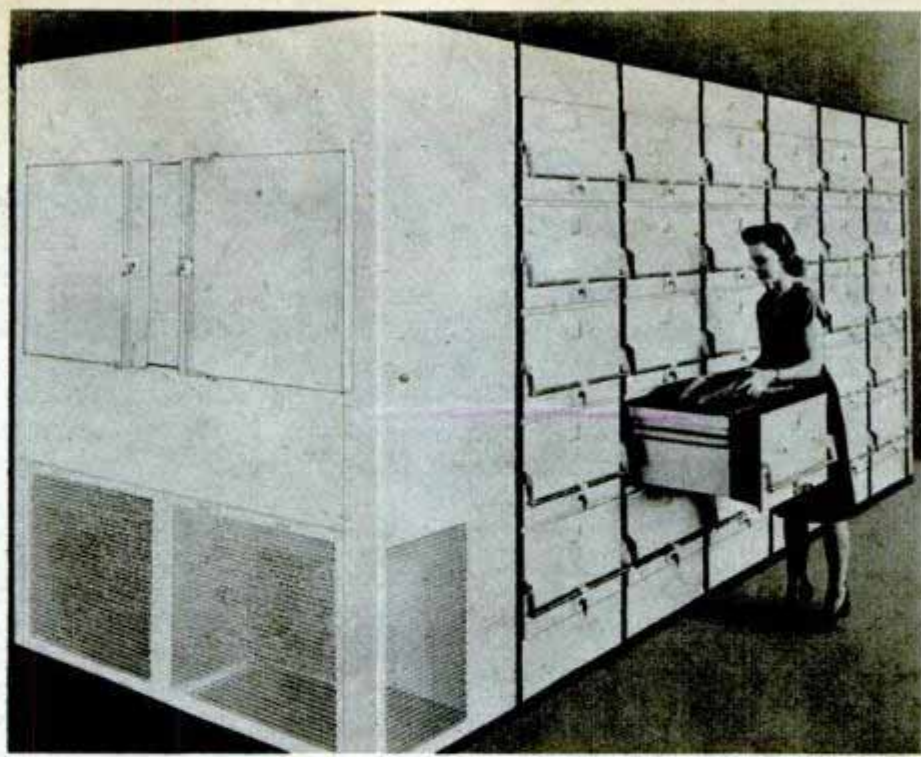
Telephone calls are answered and recorded by an "electrical secretary" which goes into action when a physician or businessman leaves his office. Connected to



the telephone system, the reproducing apparatus has two turntables. One plays a record telling the caller that no one is in the office and giving instructions to leave the message. The message then is taken on another record. The entire operation of the unit is automatic, starting with the vibration of the ringing bell which actuates a detector to connect the telephone to the apparatus. The reproducing pickup is lowered to the record which informs the caller that his message is to be recorded during a 30-second period that begins at a gong signal. When the phone call is completed, the apparatus "hangs up" the receiver.

Cold Food Locker Has 60 Drawers

Latest development in frozen food lockers is a 60-drawer cabinet that can operate in a comfortably heated room, eliminating the need for customers to enter sub-zero chambers. Only the interior of the six-cubic-foot storage drawers is kept at zero temperature. To prevent meat or food spoiling, the drawers are so designed that they cannot be closed unless properly sealed. Each drawer lists the contents and the name of the user.



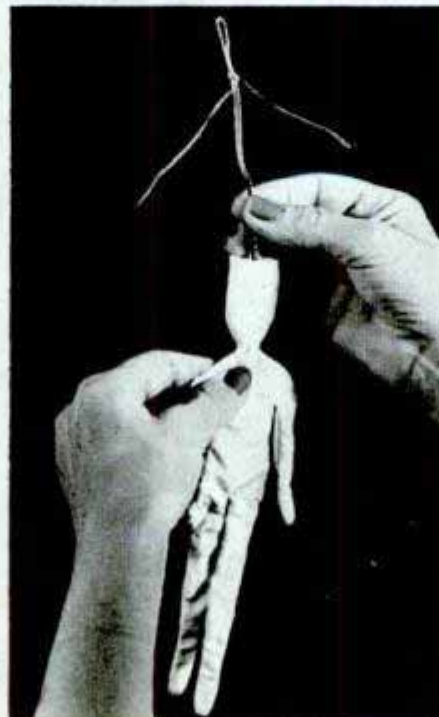
Wire Skeletons Brace Dolls Modeled After World Famous People



Using ordinary copper radio wire for the skeletons, Ruth Hope Leon of Jacksonville, Fla., fashions exquisite dolls modeled after famous people and fictional characters. After she inserts the wire skeleton in a cotton "skin" resembling a tiny diver's suit, Miss Leon adds cotton stuffing to fill out the legs, arms, torso and head. Eyebrows, eyes, eyelashes, nose, mouth and ears are applied by a few deft touches of water colors. Painstaking care produces authentic clothes for the dolls. Miss Leon's life-like figures, never taller than eight inches, have won many prizes.

Huck Finn, Marie Antoinette and Whistler's Mother dolls have framework made of wire

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois.



*100 National Women of Am. Penmanship
Jacksonville, Fla.*

1828
some features to my
car (any other, etc.)

Aladdin was

INSTEAD of simply waiting for the "bright new world" that everyone is talking about, Carl Mac Brainard, 23, is doing things to make that world come true.

Thanks to one of Brainard's inventions it soon may be practical to illuminate your home with cold light, using no more current than it takes to operate a console radio. The light sources will never wear out, the wiring eliminates fire hazards, and only a trickle of current is used. Instead of snap switches you may use circular controls, changing the intensity of the illumination to suit your needs.

That's just one of the Hollywood youngster's devices. For a peek at some of the others, let's imagine he is driving you home

from the theater. En route he reaches down to a toggle switch on the instrument board and clicks it four times.

"That," he explains carelessly, "turns on the furnace at home by short-wave. The house will be warm when we get there. And this—" clicking the switch five times—"turns on the lights in the garage. Two clicks open the garage doors."

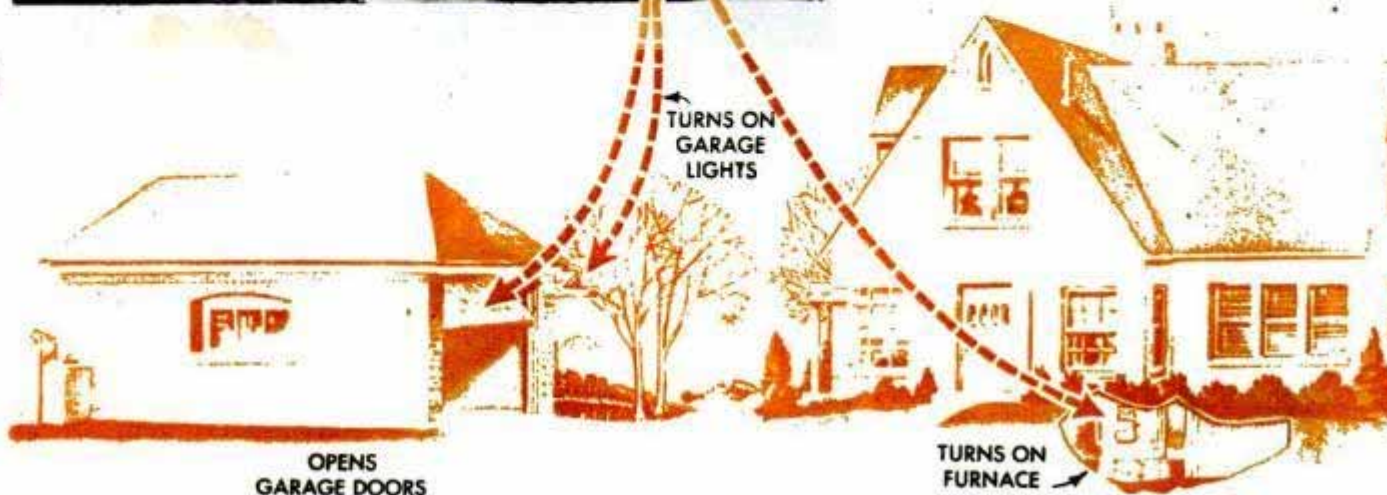
Just then a bell rings in the glove compartment of the car. Brainard reaches in and nonchalantly hauls out a standard telephone set. "Yep," he says into the receiver, "this is Mac. I'm on my way home from the show."

By now you can't believe your eyes but Brainard still has a trick or two up his sleeve. Handing you the phone, he suggests that you call your home. You dial your number, listen to the ringing signal, and presently you are explaining patiently that you're tied up with business.

Brainard tells you that the car phone is hooked up by short-wave radio to his telephone at home. In effect it's a wireless extension of his regular telephone.

It works this way: a one-tube detector "listening circuit" at his house turns on a relay whenever a call comes in over the wires or whenever

By flicking the toggle switch in car Mac Brainard can start furnace, turn on lights and open garage doors by radio while he is miles from home



a fiker



Brainard picks up the phone in his car. The relay turns on a two-way short-wave radio set which is connected with the telephone wires. A converter system that permits you to dial numbers by radio is a special hookup, patent applied for.

With this outfit Brainard can dial any local number from his car or he can call the long distance operator to make out-of-town calls. Tolls are charged against his home phone number. The radio extension has a range up to 30 miles from his home set. There is no interference and very little static. Hills have little effect on transmission or reception, although tunnels or a channel of tall buildings will block off conversation.

Brainard's brain now is evolving a "remote remote" radio phone so that a golfer, for example, can call from a small phone in his caddy cart, leaving his car radio turned on at the clubhouse to act as an automatic two-way relay.

The young idea-man invented the fundamentals of his radio phone while in high school four years ago. Ultimately, he thinks, most cars will have built-in phone circuits with the handset cradled on the instrument board.

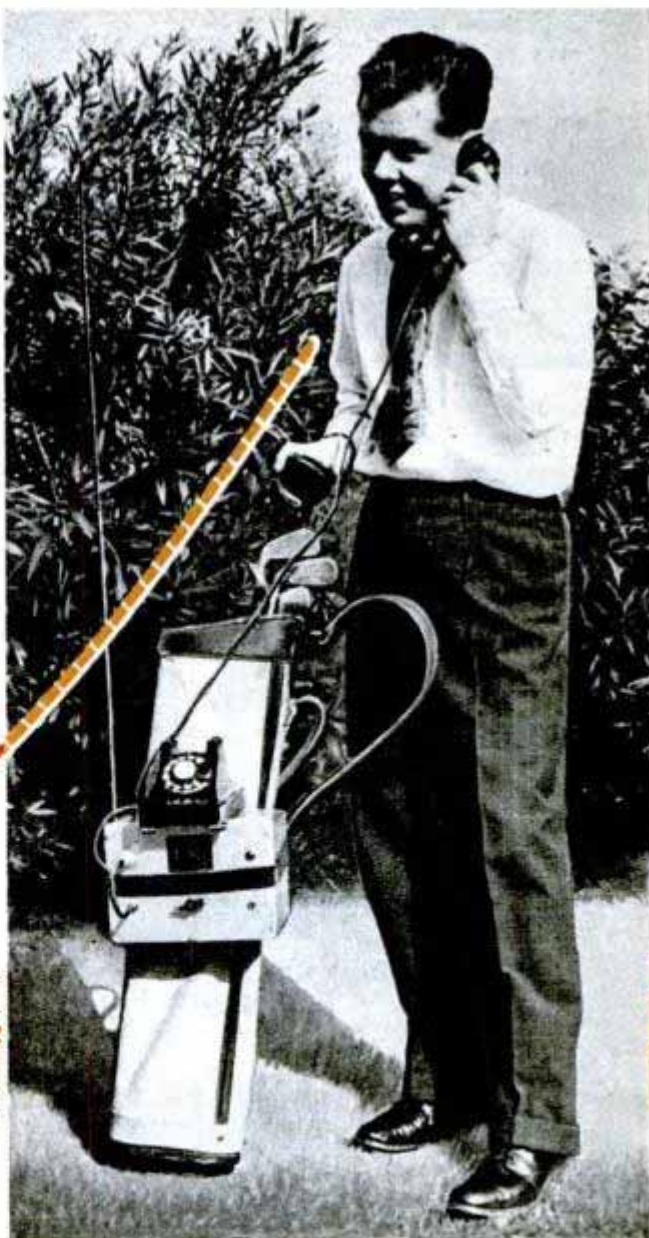
His radio circuits, which turn on the lights and perform other miracles at home while he is riding in his car, are somewhat simpler than the phone hookup.

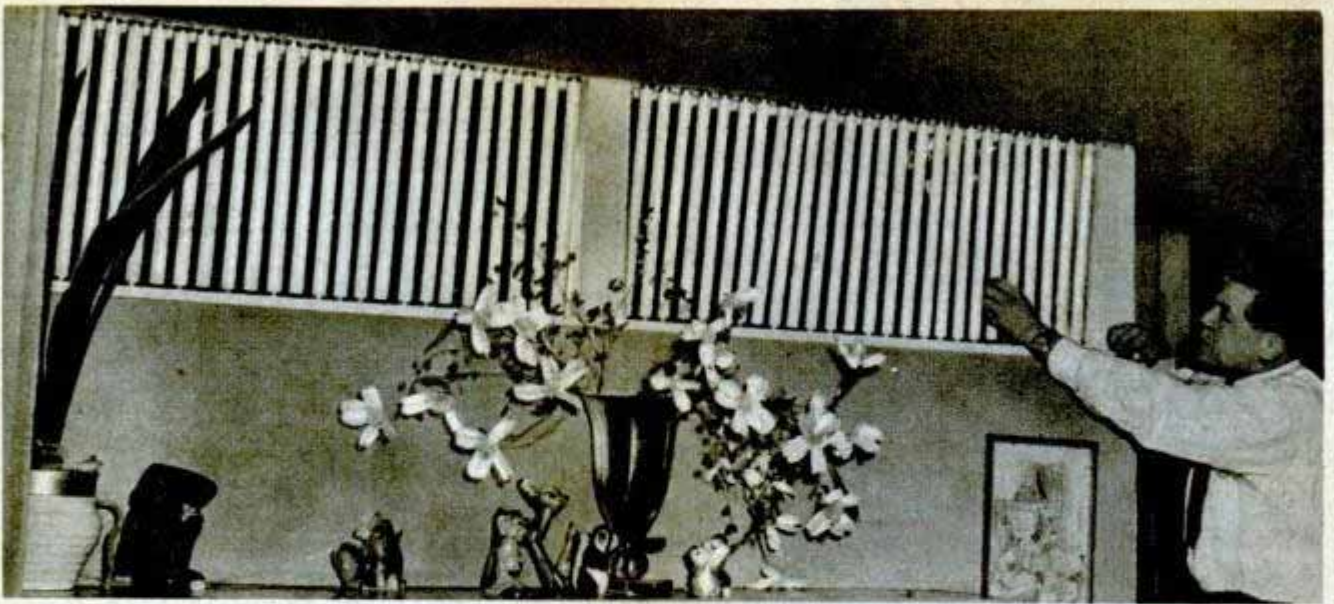
A small transmitter in the car sends out an impulse every time he clicks the toggle switch. These signals are picked up at

Want to phone home from the golf course? Brainard's golf bag contains a telephone. He uses the radio in his car, parked nearby, as an automatic two-way relay

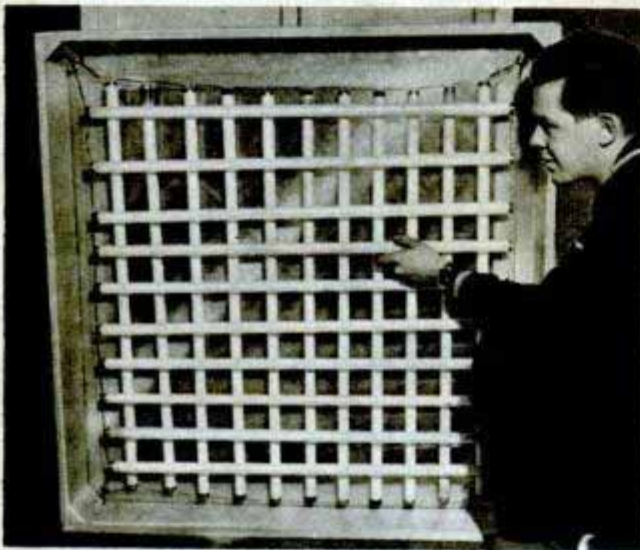
home by a three-tube impulse receiver in continuous operation. It consumes very little current. Amplified, the impulses operate a selector switch that completes the proper electrical circuit in the house. Instead of a toggle switch, a standard phone-type dial can be placed on the instrument board so that the number of impulses corresponding to the number you dial are transmitted automatically.

But still other surprises await you at Brainard's miracle home. As you step up on the porch an overhead light flashes on

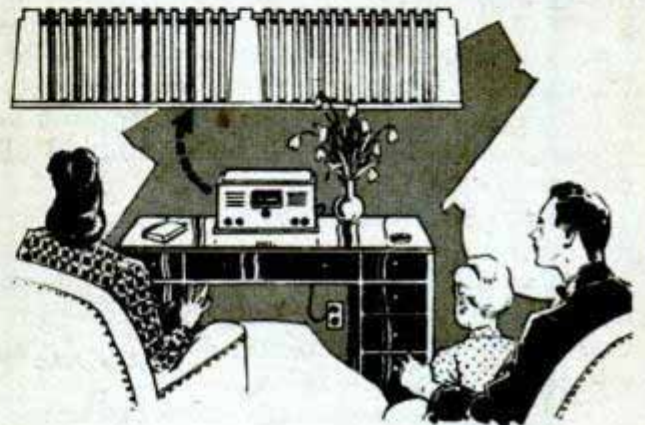




"Color organ" uses worn fluorescent tubes, flashes many hues in response to the radio's musical tones



Rear view shows color organ's fluorescent grid. Below, movies glow brilliantly on screen of cathode-ray tube



and, inside the house, chimes ring softly.

An electric-eye circuit could do this job, but Mac prefers a different system. On the wall just inside the entrance is an antenna that leads to a four-tube radio receiver perched on a convenient closet shelf. A metal mail box built into the wall is part of the antenna system.

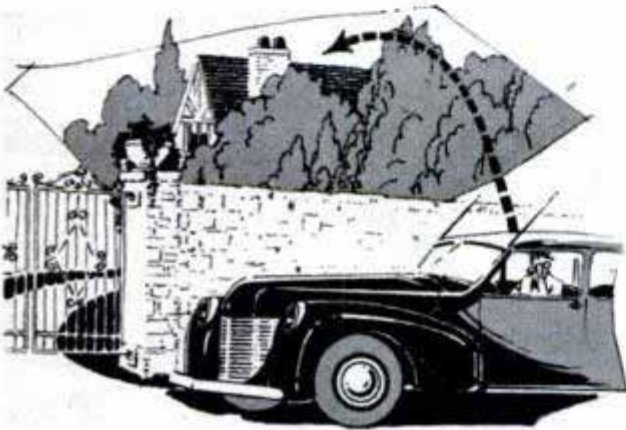
When you stepped on the porch you changed the capacity of the system, unbalancing the receiver and causing it to close solenoid relays that turn on the porch light and ring the doorbell for you.

Mac finished high school, worked in a defense plant and then did a hitch in the Navy. He's studied radio since he was 12, building some new kind of circuit every time he got an idea. One novelty was a midget pocket broadcast receiver in a plastic cigarette case, complete with a hearing aid receiver that fits into your ear.

A couple of years ago Brainard was wondering how he could use burned-out fluorescent tubes. He hooked up a high-frequency power source to one of them and found that the tube glowed, as good as new. Then, partly by accident, he found a circuit that energizes the tubes by means of audio-frequency impulses, the same kind that operates your radio's loud-speaker. The



Brainard installs radio equipment in his car. Below, communication circuit uses standard telephone handset



gas pressure inside the tube determined the necessary strength of the impulse. Brainard had a number of fluorescent tubes refilled with different gases, each producing a different color of light, and connected the tubes to the loud-speaker circuit of an ordinary broadcast receiver.

The result was a "color organ" with tubes lighting up in different hues at the same time that different notes of music are heard from the loud-speaker.

He built a magic-light color organ for himself, then a number of them for his friends. In the meantime he obtained a patent on the linking circuit that causes the tubes to respond to audio-frequency impulses. Now a huge organ is being built with a bank of 250 four-foot tubes that will stretch across the stage of a new auditorium at the North Island Naval Air Station, San Diego. The tubes will produce glowing colors to the music of an orchestra on the stage or to radio and phonograph music.

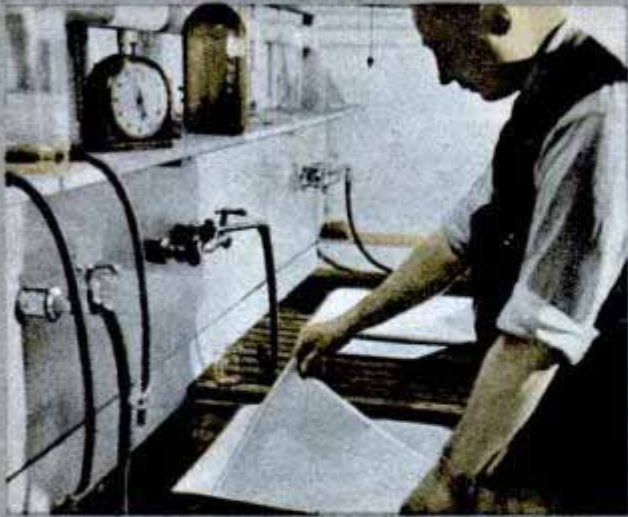
His "music with eye appeal" is to be marketed through Ideas, Unlimited, an organization that has given him a contract with a minimum guarantee of \$130,000 for the invention during the life of the patent. The lights will first be introduced as attachments to juke boxes.

Brainard now is expanding his original circuit so that such tubes can be used for illumination, the energy to be supplied by a one-tube radio tone generator. The current for operating that tube and a few others in a linking unit would be enough to illuminate an entire house.

By combining simple circuits with electrical equipment Brainard has installed trick hookups at the homes of some of his friends. Lou Costello, the movie star, has a bookcase in his home that swings open to reveal a secret room—if you know the secret. All you need to do is punch the nose of a certain character in a particular photograph on the wall. Mysteriously the bookcase swings open. The operation is the same as the circuit that turns on Brainard's porch light. The presence of your finger on the photograph disturbs the balance of a concealed radio-type circuit—that oper-

(Continued to page 240)

Print Your Own



1—The three matrix films are developed after exposure



2—The matrices are registered in position, then trimmed



3—Inherent colors are added to the films in pans of dye

5—Dyes are transferred to the paper with a special roller



4—"Buttons" on the blanket re-register films for printing

6—Repetitive prints are made quickly, look exactly alike



Six of the major steps in printing color photographs are illustrated above. On the following pages the process is outlined in full detail

PPRINTING color photos is a magic trick that has baffled amateur photographers since the dawn of color film. After an eight or 10-hour bout with color materials in the darkroom most amateurs have been content to leave the tedious job of color printing to the professionals.

Color Photos



The news that you can successfully print your own Kodachromes at home is headline stuff to camera fans. It's as if some Houdini of photography had opened his choicest bag of tricks and announced: "Here, boys, is what you've been waiting for! Step right up and help yourselves."

Word is now being passed along the line of camera addicts from coast to coast that color prints are within the reach of any advanced amateur who can read and follow simple directions. All that is required is a couple of hours in the darkroom and the outlay of a surprisingly small pile of cash.



Top photos by Ray Chapin



The new Kodak Dye Transfer Process is basically similar to most other color printing processes. But there the likeness ends, according to both amateurs and professionals who have given it a tryout. They sing their praise of the new method in terms of superior prints, ease of control and a saving of time and labor.

Six hours were needed to make an original print with the most widely used of the former methods—the wash-off relief process. The dye transfer process requires only two hours in the



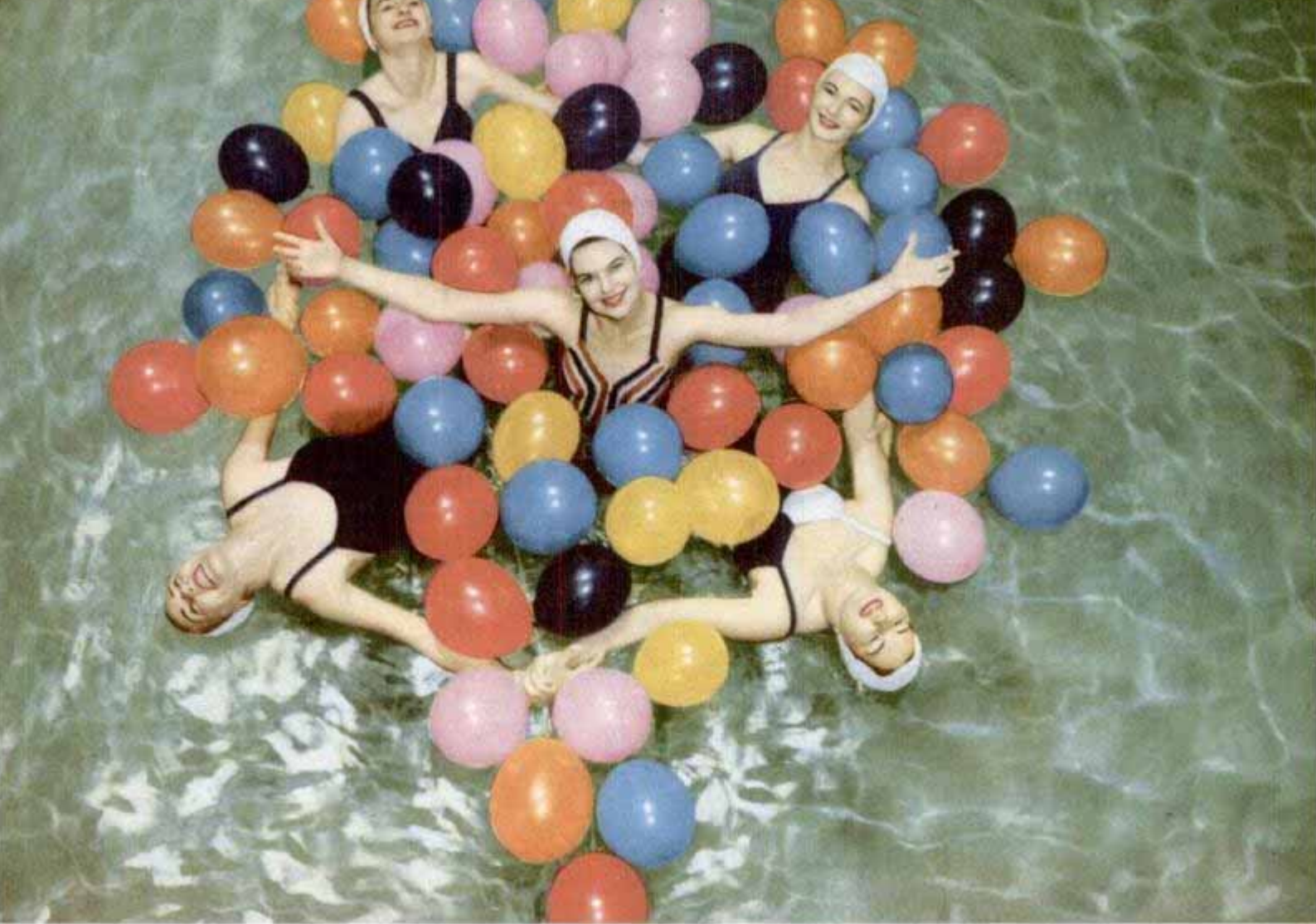


Photo by Ray Chapin

Now the amateur can translate his prized color transparencies into salon prints for framing. All the richness of natural color captured in these Kodachromes by amateur and professional photographers is brought to life in prints to adorn the walls of living room and game room

home darkroom. Repetitive prints can be made in one eighth the former time.

All necessary materials are included in a moderately priced kit. One of the most important items is a step-by-step "cook-book" instruction manual. Prints as fine as a professional's will result if directions are followed with care.

The process, developed by Louis Condax and Robert Speck of the Kodak Research Laboratory, passed its first practical test during the war. One apparently insignifi-

cant problem hampered production of sorely needed planes. Wire assemblies of the planes were so complicated that workers could not assemble them correctly without patterns.

Tracing each wire on a blueprint with a pencil of a particular color was too slow and subject to human error. One such pattern could be painstakingly drawn and colored. But how could this original be reproduced quickly in accurate colors?

This stumbling block was overcome with





the introduction of the new process. It was so simple and accurate that one drawing of the wire assembly was photographed, then reproduced hundreds of times—with the desired speed and accuracy. Upon distribution of the photographs among workers, production of the assemblies shot up 80 percent.

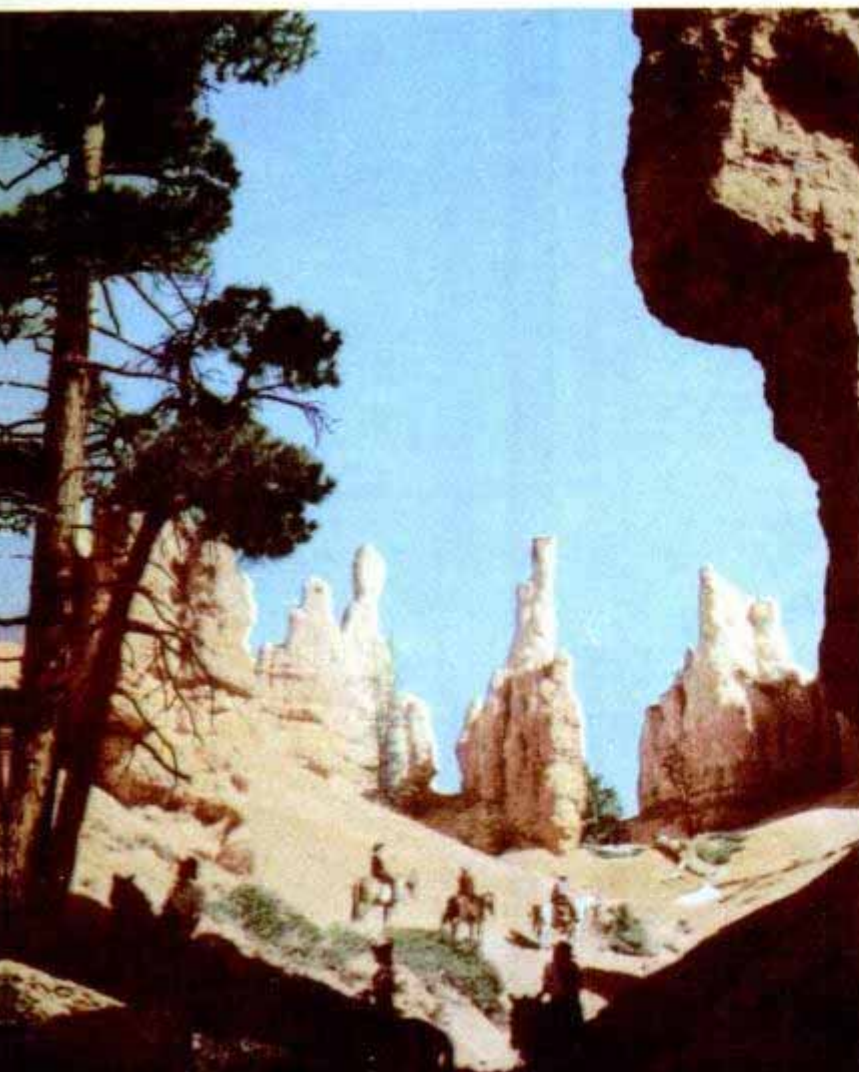
Most advanced amateurs have the minimum equipment needed for the dye transfer process. Any camera is suitable which will take ordinary color transparencies—films which show the object photographed in full color when held to the light. The required equipment also includes an enlarger with printing frame and a set of tricolor filters (F, N, and C4 plus 2A), an illuminator or contact printing box (easily improvised), at least eight standard developing trays, a thermometer, a squeegee, a trimming board or a sharp knife and straightedge and three graduates—10 c.c., 50 c.c. and quart size.

In addition to this minimum, the photographer must purchase a transfer board complete with a "dye transfer blanket" and a roller, machined especially for the new process.

Kits containing chemicals for the process are available at present in a "gallon" size. Each kit produces 12 sets of matrices and approximately 80 eight-by-ten prints, allowing for a few mistakes. Items contained in the kit also are available individually. A "quart" size kit may be marketed later.

Exclusive of the compact kit, the only materials required are Kodak matrix film and dye transfer paper.

In the new process the photographer makes three separate negatives in the usual manner. He filters the primary colors from the transparency one at a time. All colors of the spectrum are obtained from the three photographic pri-



Vacation photographs, always the specialty of the amateur, can capture favorite playgrounds—in color



maries—red, green and blue. By placing a red filter in his enlarger beneath the transparency, he allows only red light to pass through. Unexposed portions of the negative material represent the two remaining colors—green and blue. This combination of green and blue is called “cyan.” Eventually he will dye the matrix of this negative cyan, then print the dye on paper to give part of the final combination of colors.

Similarly he filters green out of the picture for the second negative. This leaves blue-red, or “magenta,” on the negative material. With blue filtered out, he has red-green, or yellow, on the third negative.

His remaining problem is to transform these negatives into matrices—relief “maps” of the photograph—dye the matrices, and then transfer the dye to the final printing paper. The dye transfer process simplifies and speeds the methods formerly used in solving this problem.

After developing these separation negatives, the photographer has seven more steps to convert them into a color print.

First he must make the matrices. He places the red-filtered negative in his enlarger with a sheet of matrix film, emulsion side down, in the printing frame beneath it. When he passes light through the negative to the film, the image penetrates the base of the film and affects the emulsion. This image represents two colors, green and blue, in varying degrees. Matrices of the other negatives are made in the same way.

In the second step the photographer develops these films in a tray containing “matrix film developer,” a solution from the kit. The image becomes clearly visible on each film. The films, after developing, are rinsed in a stop bath to prevent further chemical action of the developing solution. Washing them in hot water melts away all unaffected parts of the emulsion. He then rinses them in cold water and suspends them for drying.

These films have become matrices. Each of them is a relief map of the image. Tiny hills occur on portions of the image where the particular colors of that matrix are shadowed, valleys where they are brighter.

Third, he must register these matrices, that is, place them together until they are in perfect position. To do this he places them one at a time on the illuminator (or contact printing box) and tapes them to the glass as each is properly positioned. The result is a complete picture.

Two edges of this “complete picture” then are trimmed. This is another advantage in the new process. For whenever the photographer again lines up these common edges of all three matrices, they automatically will be in perfect register.

(Continued to page 232)

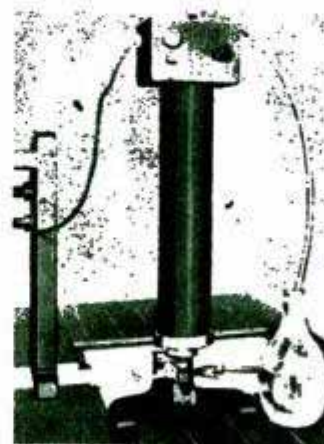
Pouch for Baby Frees Mother's Arms



Junior becomes airborne when riding the “Cuddleseat,” a canvas pouch slung over his mother's shoulder. It frees her hands for carrying packages. The contraption, probably inspired by the kangaroo's most familiar feature, has a padded seat to make the baby comfortable. Promoters say that more than 100,000 of the seats have been sold in Australia.

“Demineralizer” Purifies Water

Salts and other minerals are removed from hydrant water by a purifier that functions without aid of heat or electricity. Suit-



able for laboratories and industries which do mirror-silvering, radio and electronic work, the unit employs a cartridge filled with special resins to remove minerals from water. The resins convert dissolved salts into acids and then absorb these acids. One

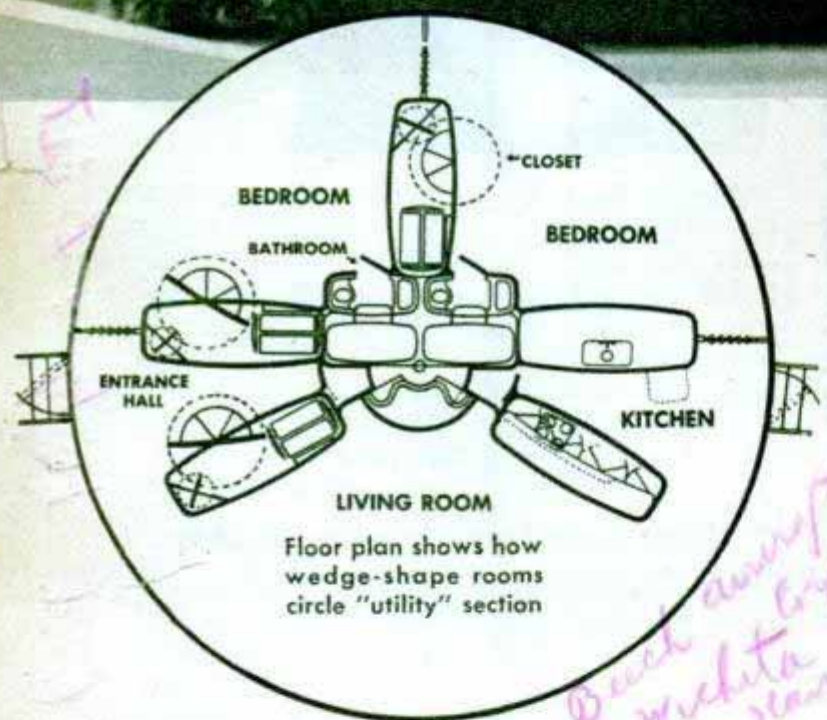
cartridge filling provides as much as 300 gallons of purified water required for such operations as storage battery maintenance.

*Carnstead Still Sterilizer Co.
2 Hanesville Terrace*

T. G. 175 N. W. 11th
 PORTLAND, OREGON
 THE (BY) ...



At home in a "Round House"



Side walls and partitions of this circular aluminum house are suspended by cables from a central steel mast. The house, designed by R. Buckminster Fuller, contains two bedrooms, kitchen, combination living-dining room and two complete bathrooms. Central axis holds the heating and air-conditioning equipment, refrigerator, washing machine and drier, dishwasher, range and sink. Beech Aircraft Corporation, Wichita, Kans., plans to build 50,000 Fuller houses in 1947. They will be shipped in parts, eight to a railroad boxcar, and can be erected by a 10-man crew in two days. The aluminum-stainless steel-plastic house will sell for \$6500. It has 1017 square feet of floor space

Closet door swings out to reveal revolving rack; immense living room window takes one third house perimeter



Single-Valve Mask Aids Firemen



Masks using compressed air at 1800 pounds' pressure are replacing the hitherto standard oxygen-type protector for firemen who must work in dangerous concentrations of smoke or gas. Complicated valves, by-passes and pipes, necessary in the use of oxygen, are replaced by a single reduction valve in the later device. A gauge with a luminous dial and worn on the wearer's chest tells him at a glance what his air supply is. The closely-fitted mask, of rubber, has contoured, laminated shatterproof lenses which permit full vision. Close-range conversation is permitted by a diaphragm-type inhalation valve and the entering air does not fog the lenses, a difficulty encountered with oxygen and other types of masks. Two sizes of air bottles are available; one worn on the back, with an hour's supply, and a smaller model for the chest, with 16 minutes' supply.

"Incendiary" Soap for the Army

Napalm, the incendiary ingredient that shot out of wartime flame throwers as a searing jet of flame, soon will be used by the Army as a harmless liquid soap. The War Department has announced that within a few months 50,000 gallons of a new quick-suds soap made of napalm will be issued to GIs for use in scrubbing everything from barracks floors to fingernails. The new soap can be made in the same plants that turned out the flame-thrower fuel. Napalm also is reported to have limited applications in hospital use.

"Spinning" Wrench Turns Bolts



Spinning a wrench with a single twist gives the tool enough motion to tighten or loosen bolts and nuts with little further aid. The wrench has a heavy crossbar that continues to rotate until the nut is tightened to almost the desired tension. Only an additional twist is needed for complete tightening. The manufacturer claims the tool speeds work 30 to 40 percent over ordinary wrenches. With attachments it can be used on bolts, nuts or stud screws.

Crossbar Holds Brush in Liquid

Made of heavy aluminum, a handy cup for holding paint or heating glue is equipped with a carrying handle and a removable crossbar inside the can. The crossbar can be used to wipe off surplus paint or to suspend the brush in the paint. A cone-shaped top fits over the handle and keeps the liquid from thickening. The container comes in one and two-quart sizes.





Have We

By John L. Kent

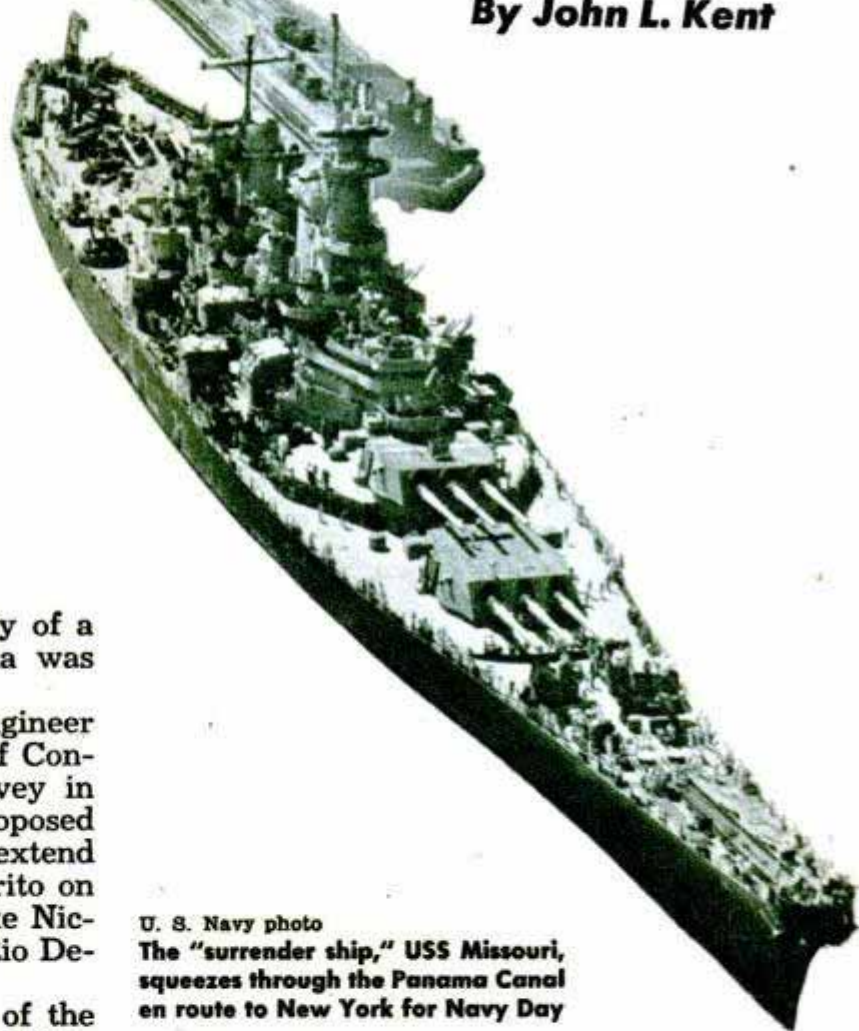
A SINGLE PLANE, dropping one bomb, could destroy it. What we'll do about protecting it I don't know—but we'll do something."

These were the recent words of Major General Leslie R. Groves, the Army's atom bomb chief, when speaking of the power of the atom bomb and what it could do to America's lifeline—the Panama Canal.

The vulnerability of the canal has long been recognized by our military leaders, and when Hitler's armies started their rampage of devastation, additional troops were rushed to the already large defense garrison in the Canal Zone. The war also brought up once more the necessity of a second canal in the event Panama was damaged by enemy action.

As far back as 1930 an Army engineer battalion, carrying out the orders of Congress, conducted a large-scale survey in Nicaragua over the route of a proposed second canal. This new canal would extend 173 miles across Nicaragua from Brito on the Pacific via the Rio Grande, Lake Nicaragua, the Rio San Juan and the Rio De-seado to Greytown on the Atlantic.

At the same time the Governor of the Panama Canal investigated the possibility of increasing the facilities at Panama. In 1939, based on the survey in Nicaragua and the findings of the Governor of the Panama Canal, Congress shelved the idea of a second canal and authorized instead a third set of locks at Panama. The cost of the project was not to exceed \$277,000,000. Actual work was begun on July 1, 1940, but the outbreak of the war caused the project to be greatly modified. Work was continued,



U. S. Navy photo
The "surrender ship," USS Missouri, squeezes through the Panama Canal en route to New York for Navy Day

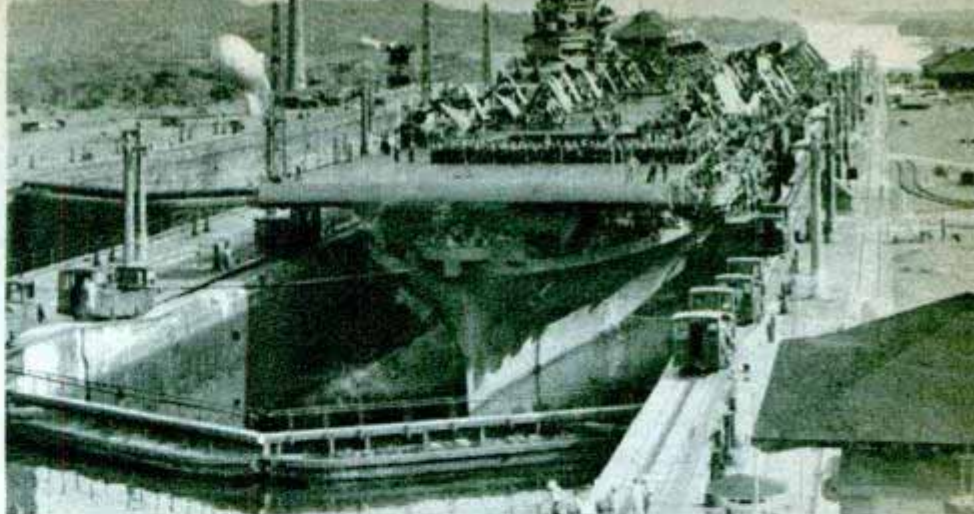
however, throughout the war, and a large part of the dredging and excavating operations has been completed.

But the atom bomb may force the United States to build the second canal through Nicaragua. In building it our engineers would face an even greater task than the Panama project. The French tried—and failed—to build the Panama Canal.

The story of the French failure is well

USS Bunker Hill clears the last lock of the big ditch with inches to spare
U. S. Navy photo

known. In 1879 Ferdinand de Lesseps, builder of the Suez Canal, formed a company to dig a sea-level canal in 12 years at a cost of \$240,000,000. But disease, greed and graft prevented completion of the undertaking. After nine years' work, de Lesseps had spent over \$260,000,000—twice the cost of the



Outgrown the Panama Canal?

Suez Canal—yet less than a quarter of the canal was built. The French gave up.

In May 1904, having paid \$40,000,000 to the French company, the United States took possession of the unfinished canal. After some delay in getting started, Army engineers were ordered to continue the canal. An Isthmian Canal Commission, headed by Lieutenant Colonel George W. Goethals as chairman and chief engineer, set up headquarters in Panama. The commission performed what is recognized as one of the greatest feats of modern engineering.

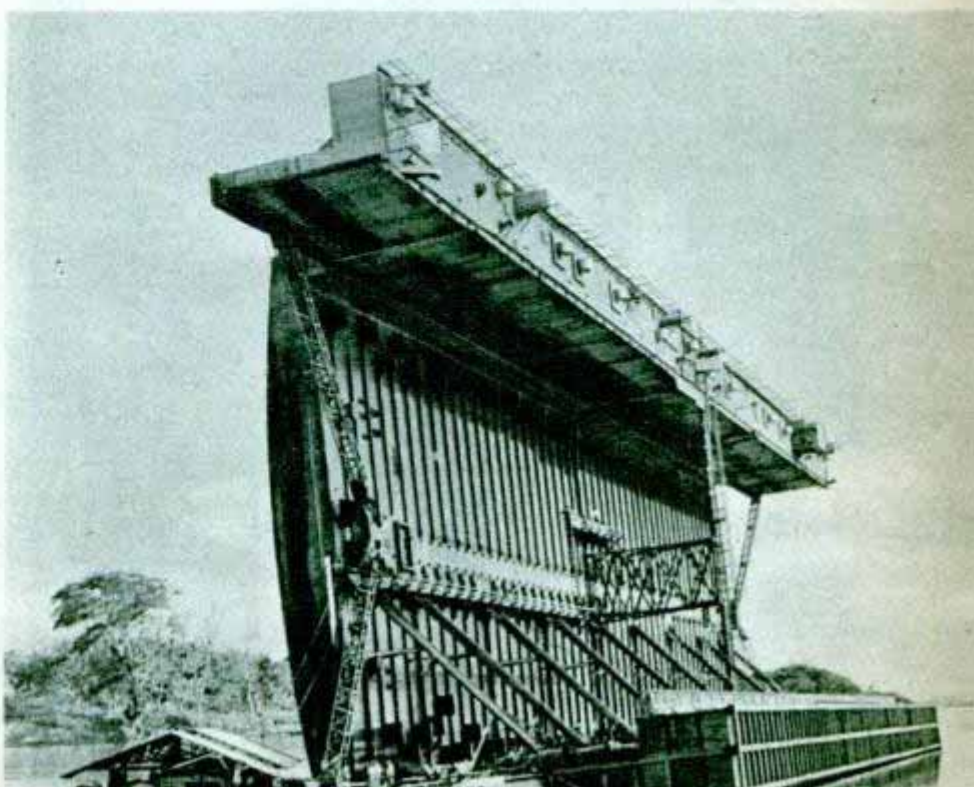
Here, without construction equipment as we know it today, man struggled against Nature in many of her worst moods. Floods and giant earth slides slowed the progress of work. There were no bulldozers, dump trucks or self-loading earth scrapers. Thirty-six years ago steam still was king and excavation was by cumbersome steam shovel. Material was removed by railroad flatcars pulled behind puffing steam locomotives.

Then, too, it must be remembered that the high mountain divide of the Cordilleras runs through Panama much as the Rockies cross North America. Thus, a ship passing from ocean to ocean



U. S. Navy photos

It looks like a tight fit for Pacific-bound carrier facing the three sets of locks that will lift it 85 feet. Floating dry dock (below) was so wide it had to be tipped on its side and welded to pontoons to pass through canal





Map shows line of proposed Nicaraguan Canal. Below, U. S. Army engineers engaged in Nicaragua survey move diamond drill parts
Signal Corps photo



Below, building the \$20,000,000 Panama fuel pipe line with a daily capacity of 265,000 barrels of fuel oil—a wartime project
U. S. Navy photo



has to be lifted over the Continental Divide. On the Atlantic side is the Chagres River; on the Pacific side, Panama's Rio Grande. By building a huge dam across the Chagres, a lake 164 square miles in area and 85 feet above sea level was created.

To get a ship up the 85 feet to the lake, it was necessary to build a set of locks at Gatun. A tremendous amount of concrete was used to build these durable water gates. The side walls of the locks are more than 45 feet thick at the bottom and up to a point 24 feet above the floor. From there on they taper to 10 feet in width.

Having reached the lake, a ship then sails along the lake 24 miles to Culebra Cut. This giant slice through the Continental Divide was carved through six miles of solid rock. The cut, today called Gaillard Cut in honor of Lieutenant Colonel David du Bose Gaillard, an assistant of Goethals, is seven miles long. Its deepest part lies between two hills, one 660 and the other 400 feet high.

After passing through the divide, a ship has to descend 85 feet to the Pacific. To accomplish this, locks were built at both Pedro Miguel and Miraflores.

The canal was opened to navigation on August 15, 1914, 10 years after the actual digging of the "ditch" started. In the course of its construction, two hundred million cubic yards of earth were excavated. The total cost, exclusive of outlays for defense, was \$380,000,000. Additions and alterations and the clean-up of large earth slides in Gaillard Cut

(Continued to page 236)

Glass Fertilizer Feeds Soil Over Five-Year Period

Farmers eventually may fertilize their fields with a layer of glass beads or glass wool. Housewives' plants some day may eat the glass containers in which they're planted. Experiments during the past year indicate that a glass fertilizer which dissolves in the soil is practicable. Soils coated with the glass "digest" plant foods from it at a controlled rate. The process was developed by Dr. Roger H. Bray and Dr. Alfred E. Badger in experiments at the University of Illinois.

Impressed by the curious coincidence that glass contains all the needed plant foods except nitrogen, water and organic material, the two men developed a glass fertilizer that delivers plant foods to soils over a long period. Highly important potash and phosphates as well as minor foods are fused with silica to make glass which may be ground or blown into glass wool.

By controlling the ingredients of the glass the two men have been able to control the rate at which it dissolves in the soil. A reasonably accurate prediction can be made as to when the soil will need more fertilizer. One application may feed five years' crops.

Three advantages of the new fertilizer may encourage its development. It is less expensive because it need not be spread as often. Food is available at a "controlled rate," benefiting more than just one or two crops. And the farmer can estimate the time when his fields will need another application, a factor in farm management.

Experiments with the new glass have not yet been completed. Years may be needed to develop it. So don't plan to sow glass with your grass next spring.

"Ditched" Ocean Fliers Form Club



By "ditching" a plane in the ocean and crawling into a bobbing life raft, 1200 American men and women have unintentionally qualified for membership in the Sea Squatters Club. The lapel emblem worn by members is a tiny gold sea gull. Among the distinguished members are Eddie Rickenbacker and his crew, Gregory "Pappy" Boyington, and Harold Dixon and his two companions who sailed 1000 miles in 34 days to a tiny atoll in the South Pacific. Headquarters of the club is at 140 Cedar Street, New York City.



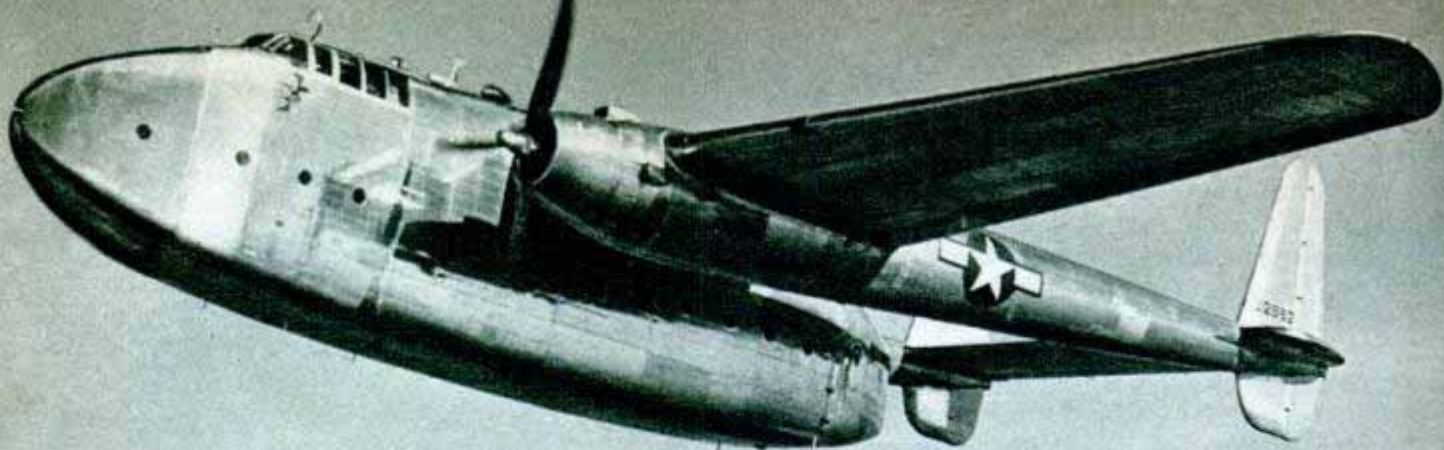
Anti-Foam Makes Oil Bubble-Free

Danger of air causing lubricating oil to bubble and foam out of high-speed motors is eliminated by an anti-foam agent developed by Gulf Oil Company. The glass cylinder at left, above, shows how air makes froth out of untreated oil.

Combination Sun Dial and Compass

Sun dial and direction finding compass are combined in a compact, waterproof instrument designed for campers, hunters and other sportsmen. The compass has an unbreakable crystal and luminous jeweled needle, housed in a solid brass case.

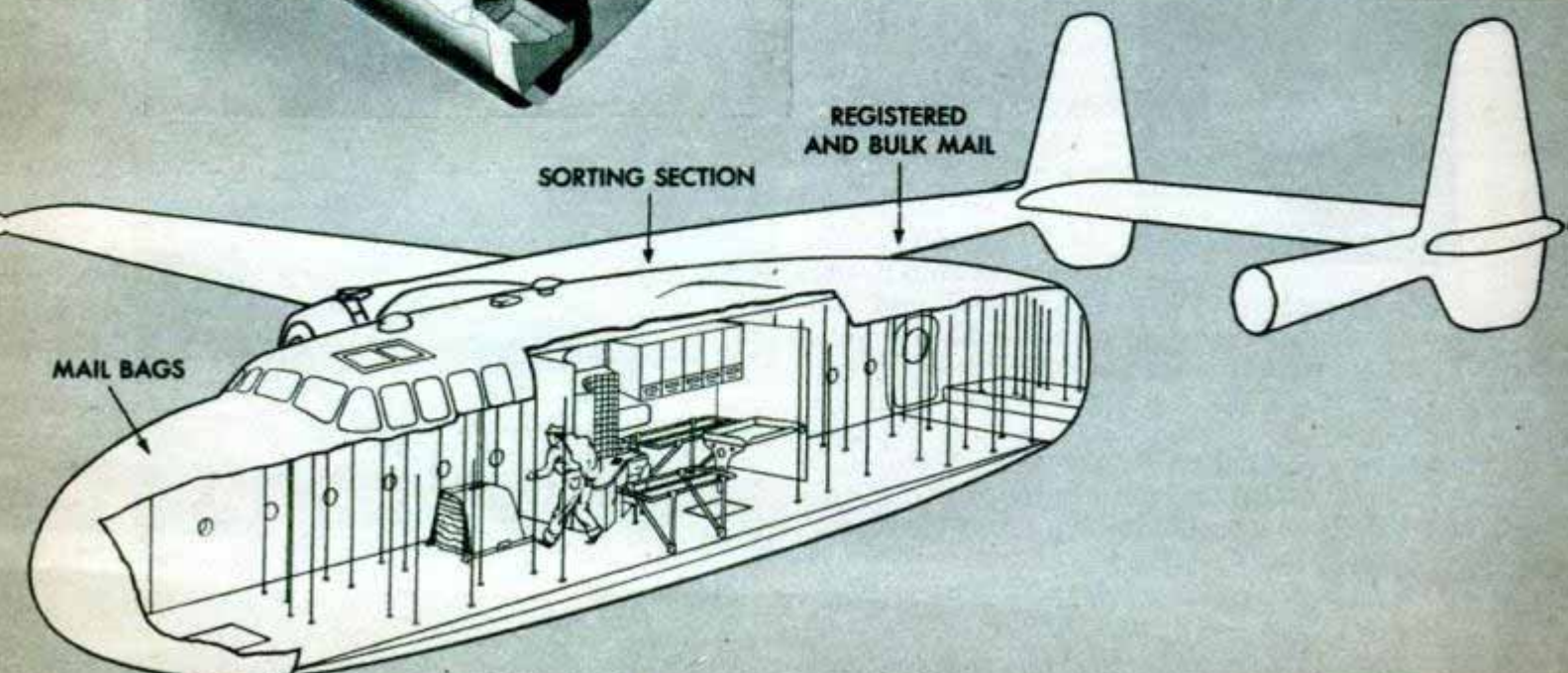
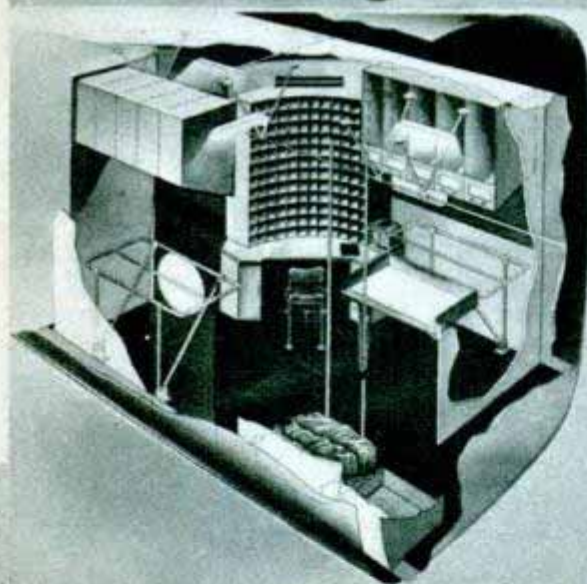
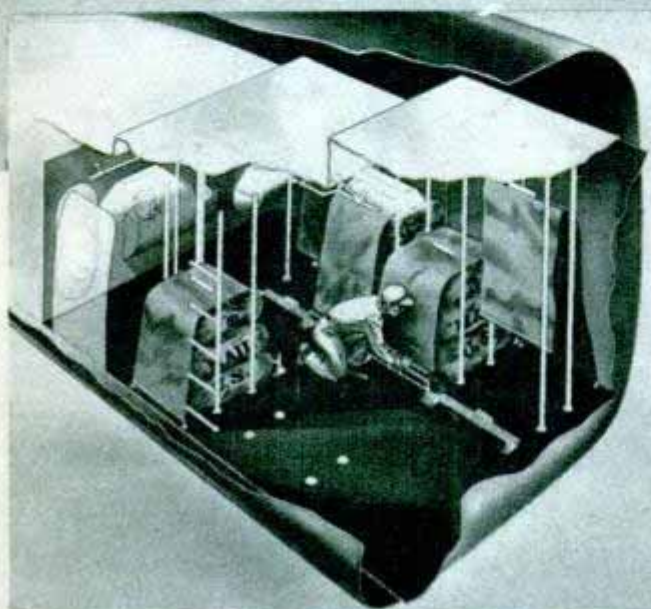




Flying Mailcar

AIRPLANE builders prophesy that special cargo planes carrying only air mail and parcel post soon will be in operation over the nation's transport routes. They point out that volume of air mail has increased so much that loads now must be divided among several passenger planes, often causing many hours' delay in delivery. One cargo plane, the Fairchild Packet, originally built for the Army, already has been redesigned for use as a flying mailcar in which up to seven tons of mail may be carried and sorted by airborne postal clerks who will work in flight. Capacity of the 38-foot-long hold is 93 percent that of a railroad car. Lightweight metal and plywood sorting tables, letter racks, chutes and bag racks are provided for the three clerks. Mail would be loaded at both ends of the hold simultaneously through a forward door and a huge clamshell-like rear door which opens at truck-bed height.

Two 2100-hp. engines power the Fairchild Packet, top. Cutaway drawings show: upper left, mail bags stored forward; left, lightweight mail sorting equipment; below, three "working" sections of the flying mailcar





Fresh in the Air

Dual control of Sikorsky's S-51 is provided for at the center of the three-passenger-wide rear seat. It carries 1250 pounds and cruises at 80 miles an hour

Baby kits complete from diapers to canned foods are now provided on TWA trips and United has a special you can't ride unless accompanied by a small child



Seating five, Bell's Model 42 helicopter cruises 100 miles an hour and has a range estimated at 300 miles

Actual operating conditions are simulated in testing plane heaters and mufflers outdoors on a portable stand

Largest piece of Plexiglas ever formed, this "bubble" covers the crew of a Northrop F-15 photographic plane

British-built, the Miles Gemini is adaptable to use as a freighter, ambulance, personal plane, trainer or taxi



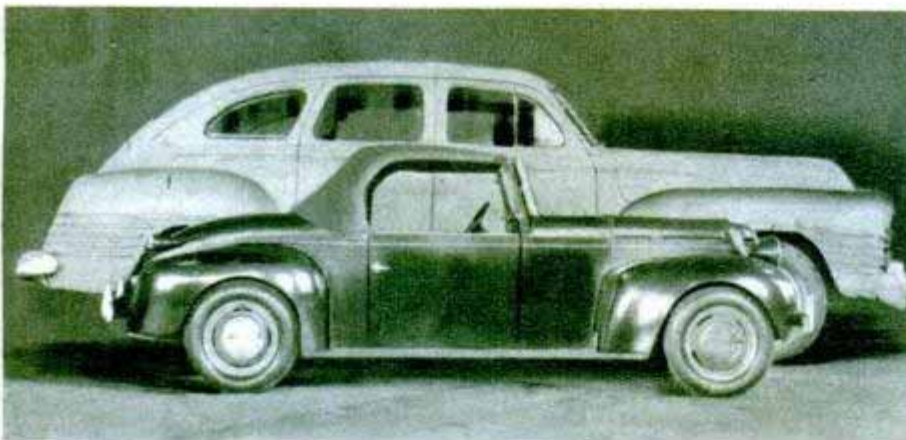
XP-81 Combines Turbine-Driven Prop With Jet Thrust at Rear

First plane ever to fly with a gas turbine providing the propeller drive, the AAF's new long range XP-81 has a jet engine in the rear developing a maximum thrust of 4200 pounds. When both engines are operating it is the fastest conventional fighter in the world. The design is based on the principle that a propeller loses its thrust efficiency at high speed while the pure jet becomes more efficient. The plane was built by Consolidated-Vultee with a General Electric Propjet engine in

the nose and a GE 1-40 in the rear. It can operate on either engine or both. Jet power in the forward unit is converted into rotational energy to drive a four-blade propeller, with added push coming from an exhaust jet almost directly below the cabin. The engine behind the pilot turns a centrifugal compressor and the remaining power of the blazing hot air and gases

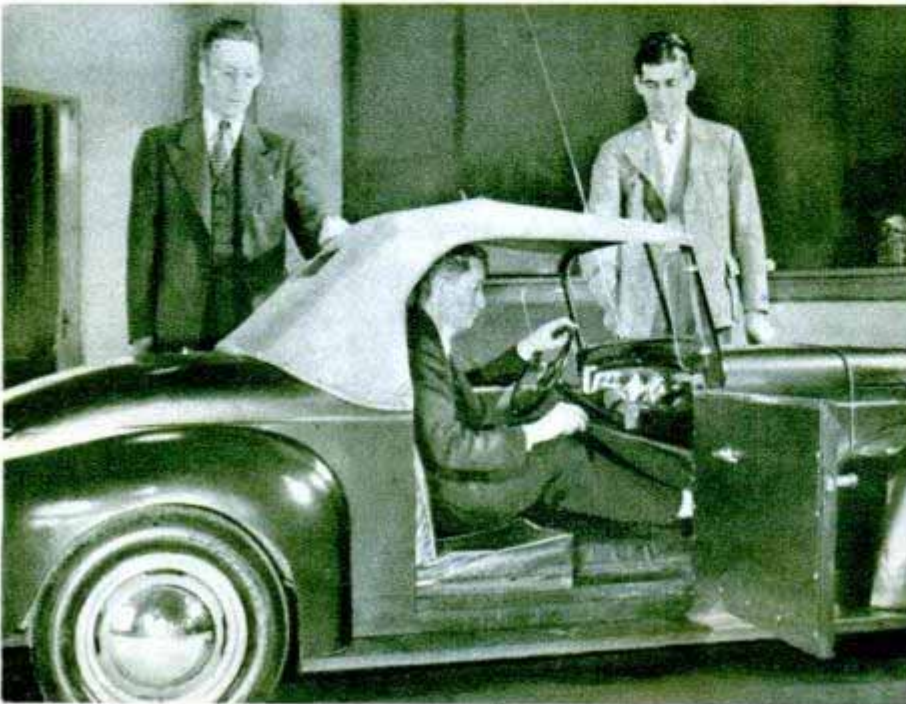


passes out a large exhaust through the tail. Both engines burn the same fuel, usually kerosene, with the Propjet the more economical and the most used. Wing span of the 22,000-pound XP-81 is 50 feet six inches and the fuselage length is 44 feet eight inches. It has a tricycle landing gear. The Propjet pressurizes the cabin and heats it at high altitudes.

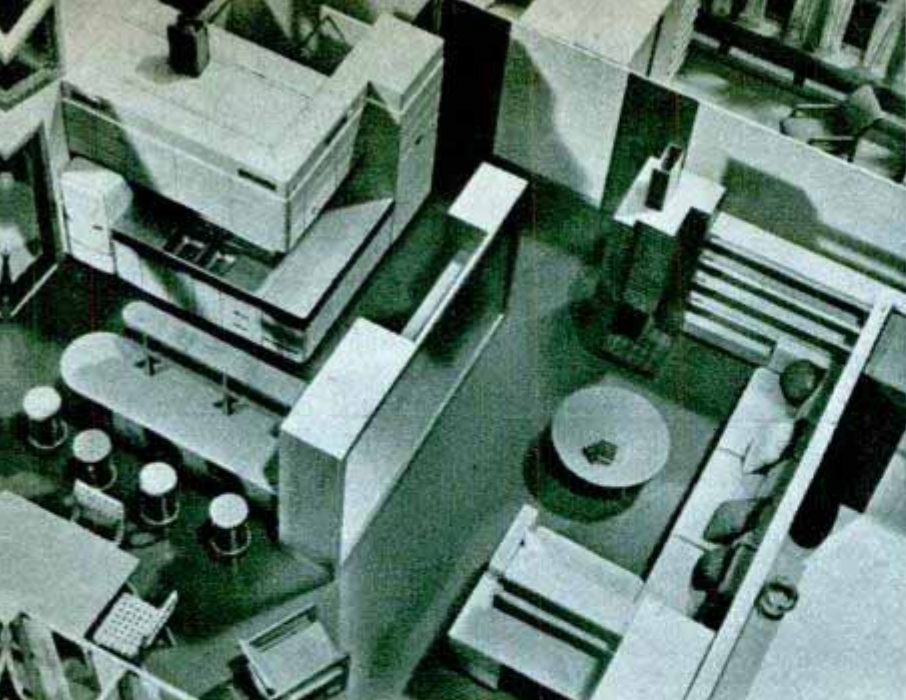


Midget Convertible Holds Gasoline for Trips of 500 Miles

Only 85 inches long and weighing but 1350 pounds; a "pocket size" convertible coupe designed and built by Talmadge Judd of Kingsport, Tenn., attains a speed of 70 miles an hour. Powered by a four-cylinder 20-horsepower engine, the "Humming Bird" carries 10 gallons of gasoline and averages 50 miles per gallon. Eight-gauge sheet metal instead of the standard 22-gauge was used in the construction. Tires are a special industrial make, 12 by 4.00. The car accommodates two passengers and is completely equipped with radio, heater and other accessories. Judd, an inventor and locksmith, reports he is negotiating with a manufacturer to mass-produce the little car.



22-8-17



Unit occupies small space beneath chimney in model at left. Right, core is wheeled through standard doorway

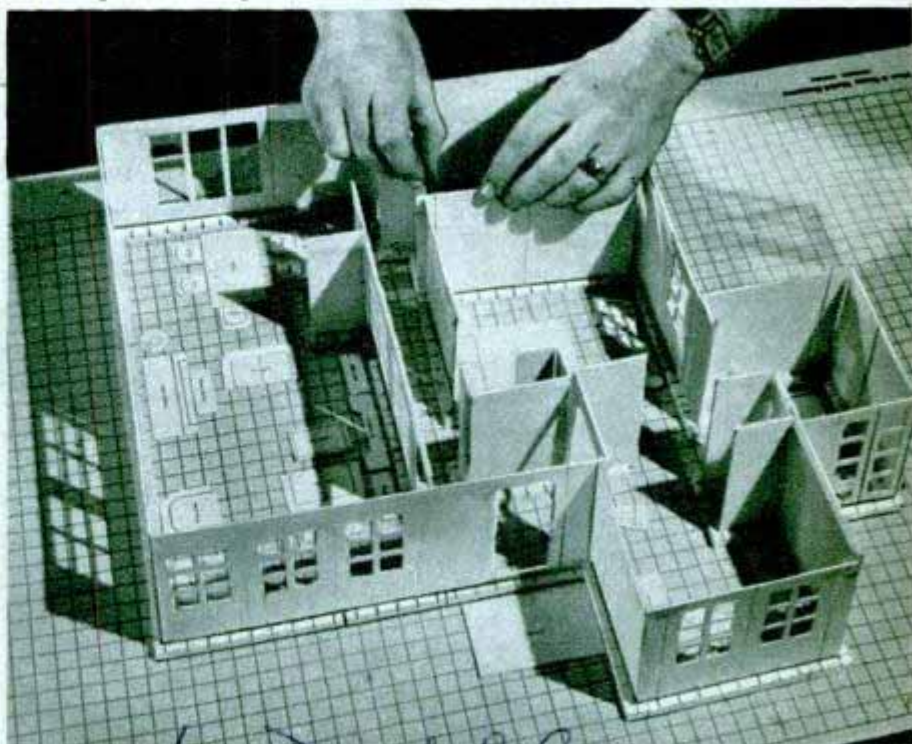
Utility Unit Cuts Building Cost By Eliminating Basement

Heart of many a post-war home will be a central utility core, small enough to pass through any standard door aperture, which will comprise a furnace, electrical connections for the entire house and plumbing connections for bath, kitchen and laundry. The core, 30 inches wide, 90 inches long and 77 inches high, eliminates the necessity for a basement and thereby cuts construction costs substantially. It can be shipped from factory to home at any stage of construction and placed in a predetermined location at which the sewer stack and oil, gas and water risers have been stubbed in. After these

connections are made the electricity is connected to the core's multibreaker box from outside supply lines. The furnace chamber, locally supplied, is installed and connections are made to main heat distribution ducts; the chimney is joined to a base inside the core. Major bathroom and kitchen-laundry units are connected to prepared fittings, kitchen and laundry cabinets are hung on the core; addition of decorative finishing completes the installation. Seven noted architects have designed nine small houses, ranging from Cape Cod through ranch house to advanced modern designs, around these units.

Build-Your-Own-Home Kit Helps Prospective Builders Plan Houses

Planning a house becomes a game for prospective home builders with a kit containing materials for erecting model houses of their own design. The kit enables the planner to see his proposed home in three dimensions. It contains three paper layout sheets divided into one-half-inch squares, each representing a square foot of space. Slotted wooden blocks are placed on the sheets in accordance with the house plan. Into the blocks are fitted heavy cardboard cutouts that build up the walls, doors and windows. The size of the cutouts varies, so the builder can experiment with any combination he desires. Cutouts of 94 pieces of furniture scaled to fit the model are included.



*Plan-a-Home Model Co.,
Elkhart, Indiana*

587 G
Wash.

Infrared Sighting Device on U. S. Army Carbine Spots Enemy in Dark



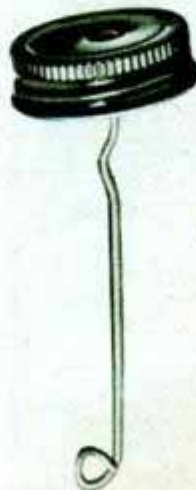
alties during the first seven days at Okinawa, according to the U. S. Army. Both the sniper-scope, mounted on a .30-caliber carbine, and the snooperscope, a hand model for observation and signaling, use the infrared ray principle, which additionally rendered camouflage almost ineffective. The sniper-scope has what appears to be a fog light with its face painted black attached below the carbine. A telescope is mounted above the rear sight, and the entire unit is connected through a cable to a small power pack on the soldier's back. On hearing a sound the soldier points the muzzle in its general direction, peers into the telescope and presses the power button. Moving the weapon back and forth like an invisible searchlight until he sights the enemy, he then adjusts the telescope sight and fires. All objects appear as various shades of green in the telescope regardless of their color in daylight. The snooperscope is a telescopic device on a hand grip with a similar

Two night-sighting devices, casting a beam of light invisible to the enemy, were responsible for 30 percent of the Jap casu-

fog light and power supply. The equipment was found highly effective in running locomotives and other vehicles at night.

Chemical Preservative for Fishing Line Permits Storage While Wet

Fishing lines will last longer and can be stored wet without damage when treated with a new preservative. The chemical solution stops rot without discoloring the line or making it sticky. Silk, cotton and cuttyhunk lines can be treated with the liquid, which is furnished in a two-ounce bottle—enough to treat 200 yards of 12-thread line. Inside the cap of the bottle is a rod with a loop at the end which extends down into the solution. The line is threaded through the loop, the rod is inserted in the bottle and the line pulled through the liquid.



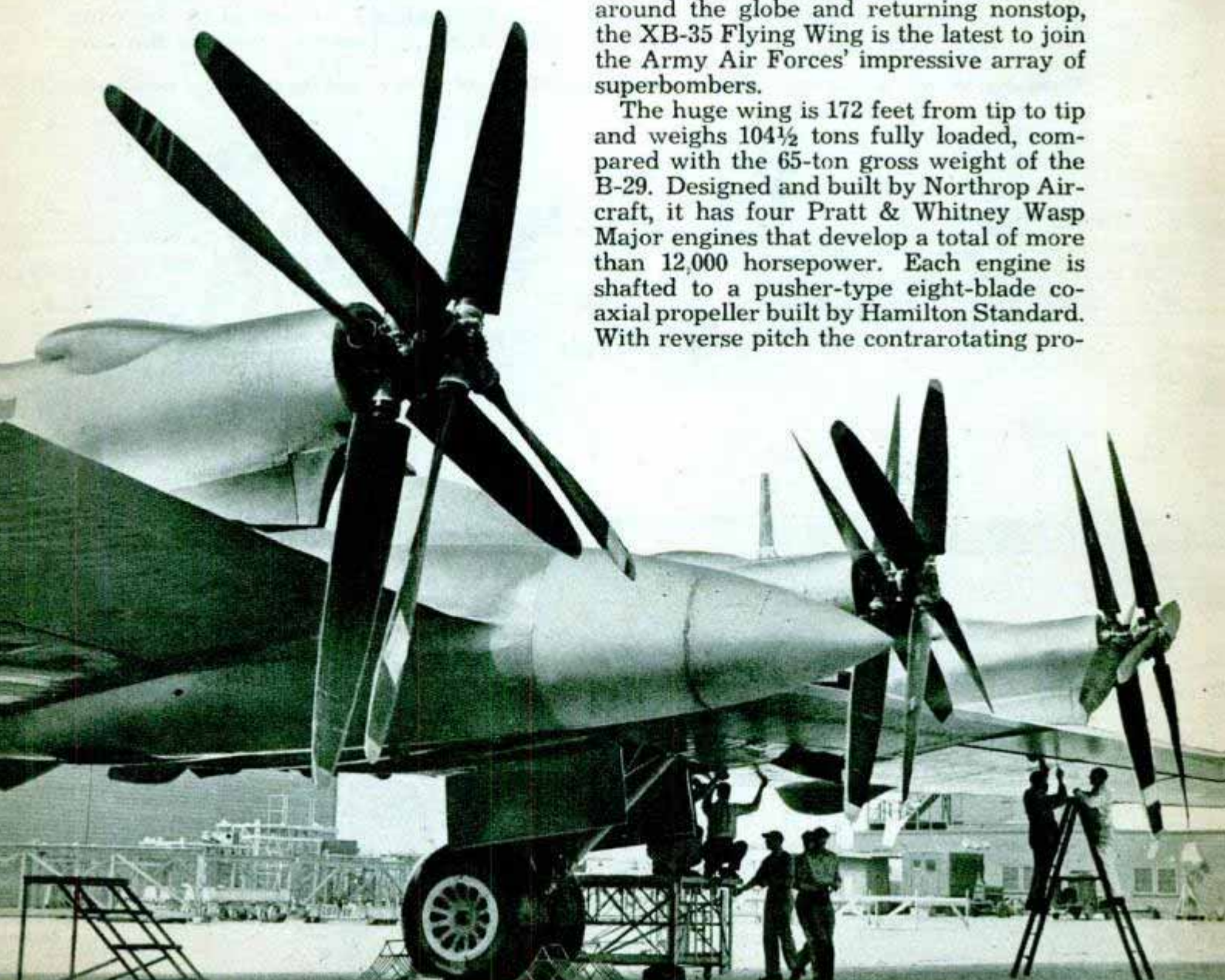
10,000-MILE FLYING WING

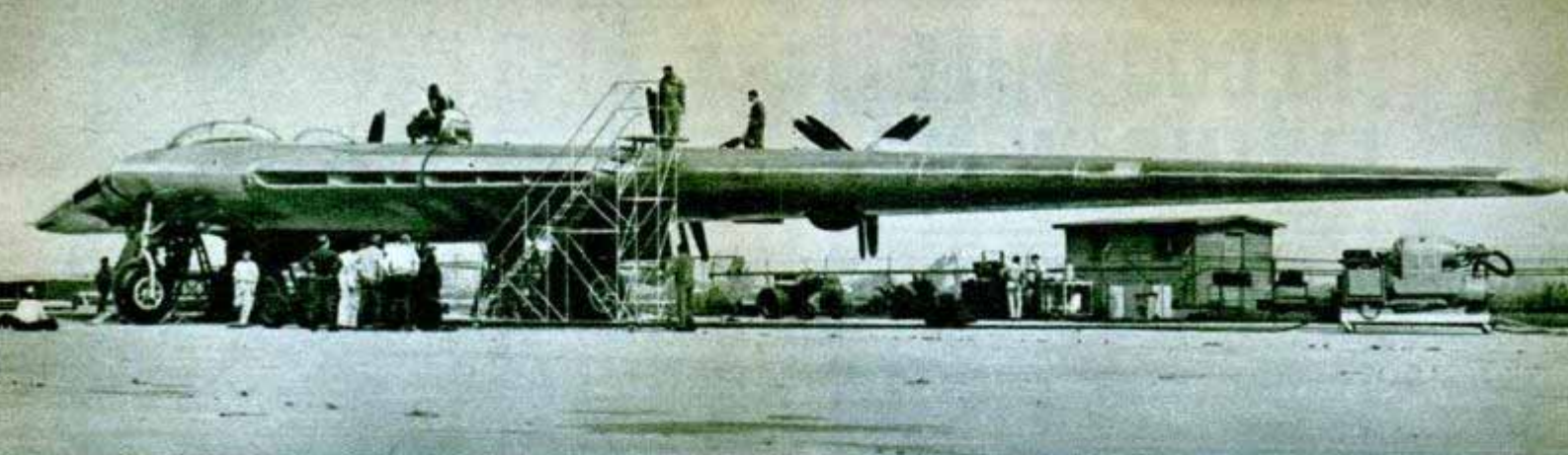


Side and rear views of 104½-ton XB-35. Diameter of the contrarotating propeller is 15 feet four inches

CAPABLE of carrying a tremendous bomb load one quarter of the way around the globe and returning nonstop, the XB-35 Flying Wing is the latest to join the Army Air Forces' impressive array of superbombers.

The huge wing is 172 feet from tip to tip and weighs 104½ tons fully loaded, compared with the 65-ton gross weight of the B-29. Designed and built by Northrop Aircraft, it has four Pratt & Whitney Wasp Major engines that develop a total of more than 12,000 horsepower. Each engine is shafted to a pusher-type eight-blade coaxial propeller built by Hamilton Standard. With reverse pitch the contrarotating pro-





Pending delivery of the last eight-blade propeller the plane had one six-blader, seen in middle of photo

PELLERS can be used for braking to reduce the landing run.

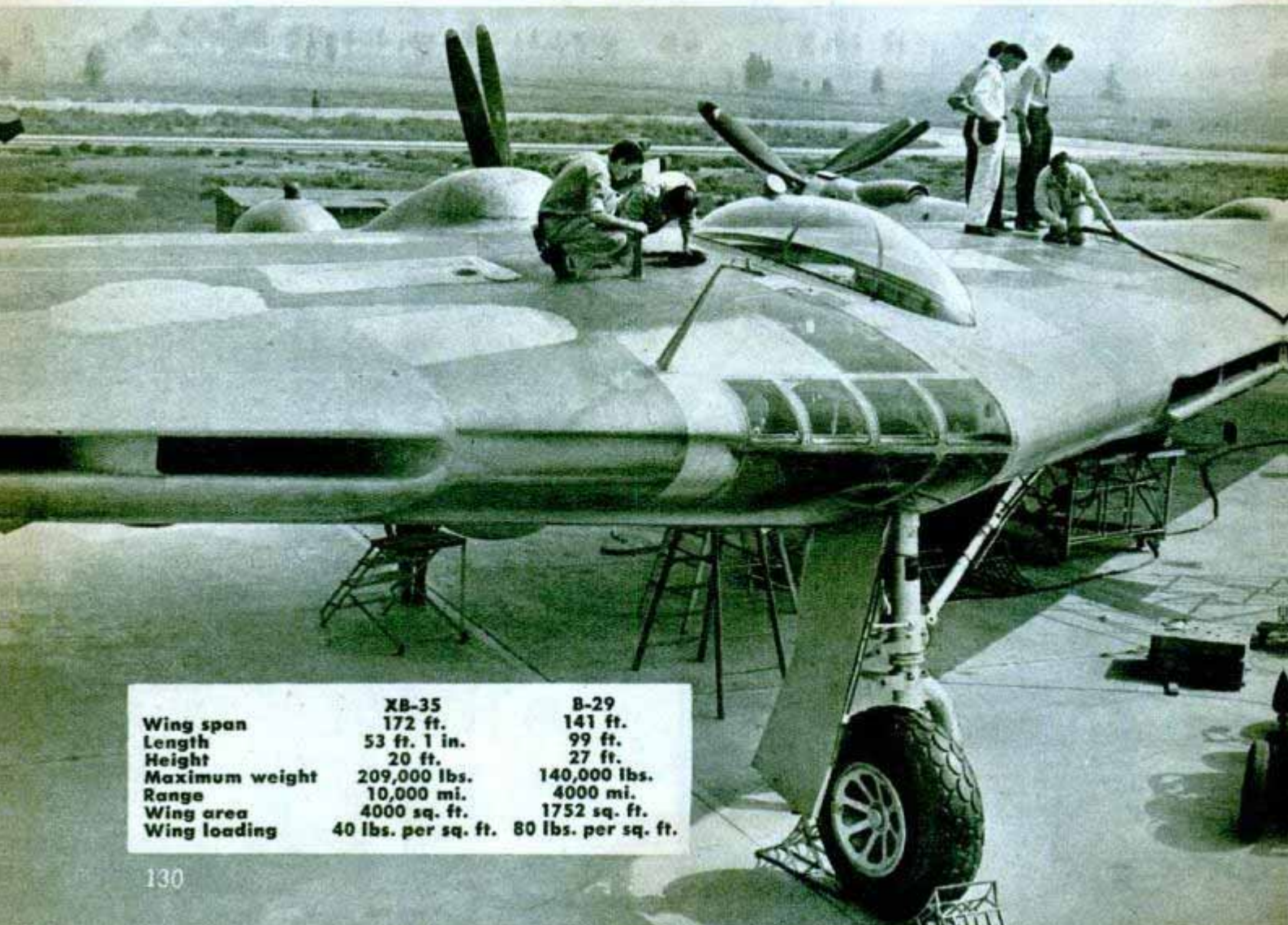
Pressurized quarters inside the central section of the wing accommodate up to 15 men, although the normal operating crew consists of nine, including three gunners. Cabin space, with folding bunks, is provided for the six additional men to alternate with crew members on long flights. No official performance figures for the plane have been announced, other than the range indication.

Radical as the big wing looks, it is far from an untried innovation. Twenty-three years of research and millions of hours of wind tunnel tests, flights and engineering

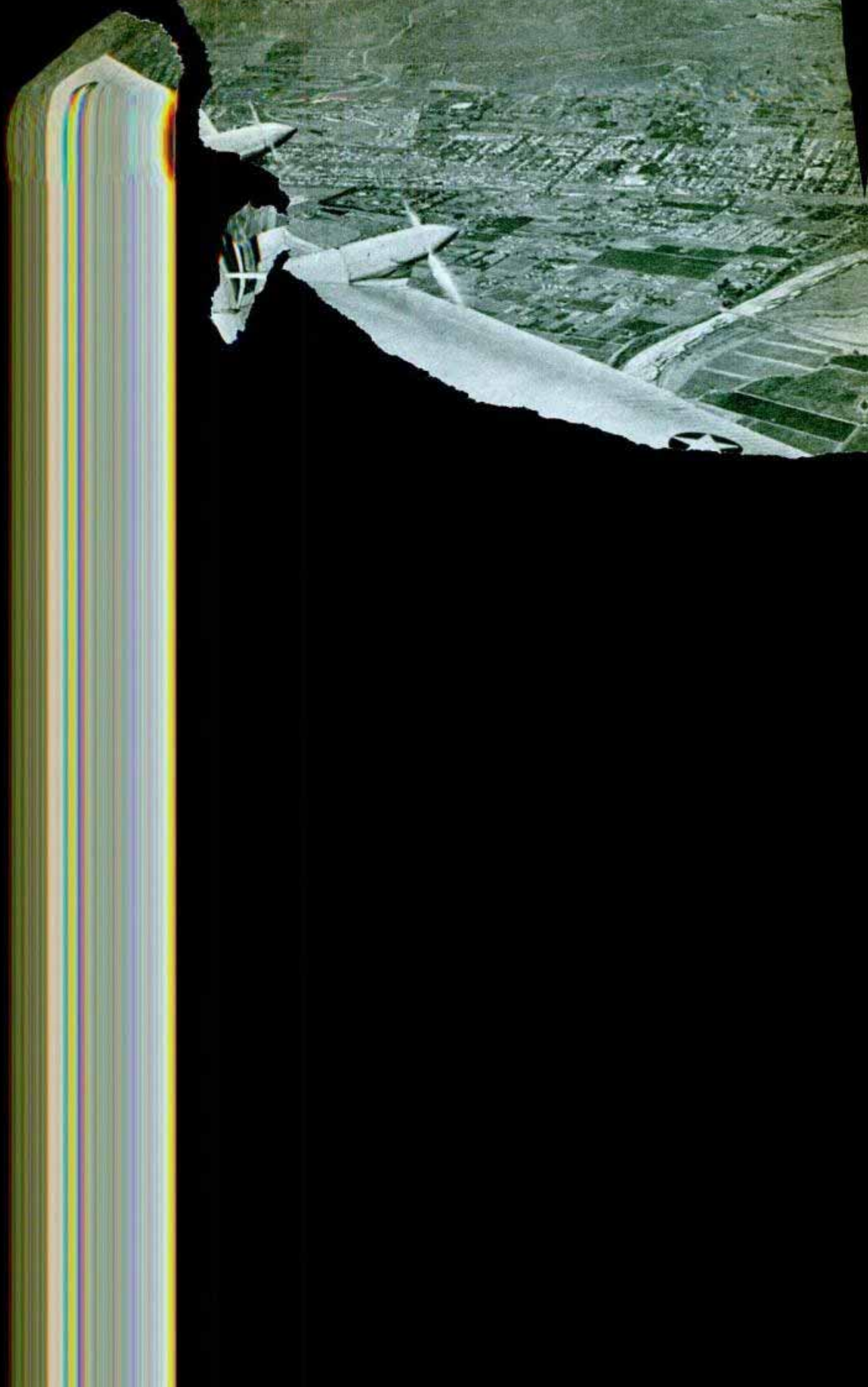
studies are behind it. John K. Northrop first began experiments with flying wings in 1923. He built and tested a number before the war ("Flying Wings Are Coming," Popular Mechanics, March 1942), with the first, the N1M, now at the Wright Field Aviation Museum after 200 flights.

Northrop solved the problem of controlling the wing, with the normal tail surfaces absent, by inventing an "elevon" that combines the functions of both elevators and ailerons. These, each 34 feet six inches long, are located on the trailing edge of the wing, beyond the landing flaps. Trim tabs and split-flap rudders are placed at the wing tips. Additional control aids are the long

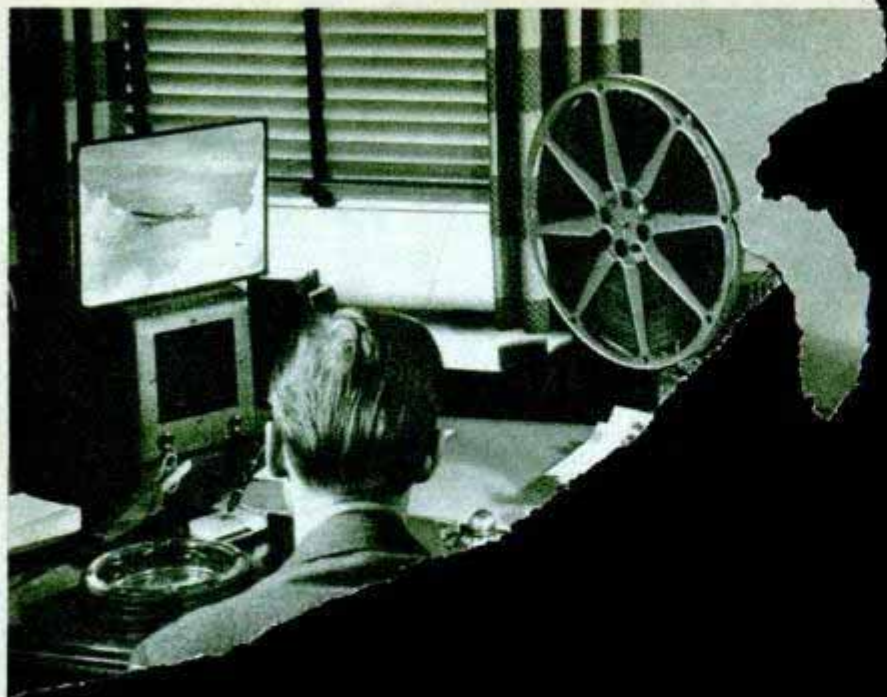
Close-up of the nose shows long blister used by pilot and the broad window area for copilot and bombardier

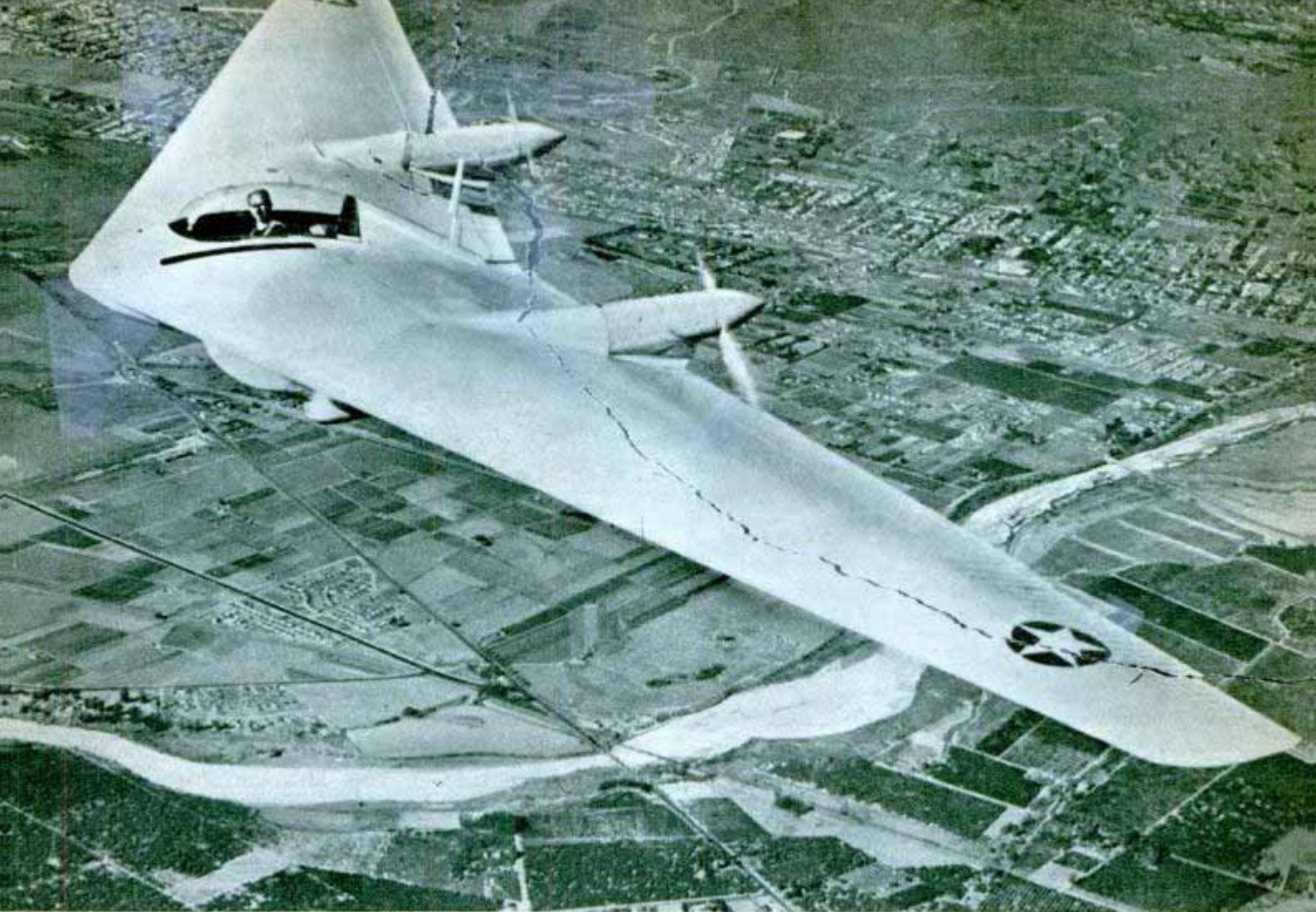


	XB-35	B-29
Wing span	172 ft.	141 ft.
Length	53 ft. 1 in.	99 ft.
Height	20 ft.	27 ft.
Maximum weight	209,000 lbs.	140,000 lbs.
Range	10,000 mi.	4000 mi.
Wing area	4000 sq. ft.	1752 sq. ft.
Wing loading	40 lbs. per sq. ft.	80 lbs. per sq. ft.



Sound-Film Movie Projector for Desk Is Set





One of the 60-foot scale models of the XB-35, the N9M, flying as a guinea pig to test the wing's design

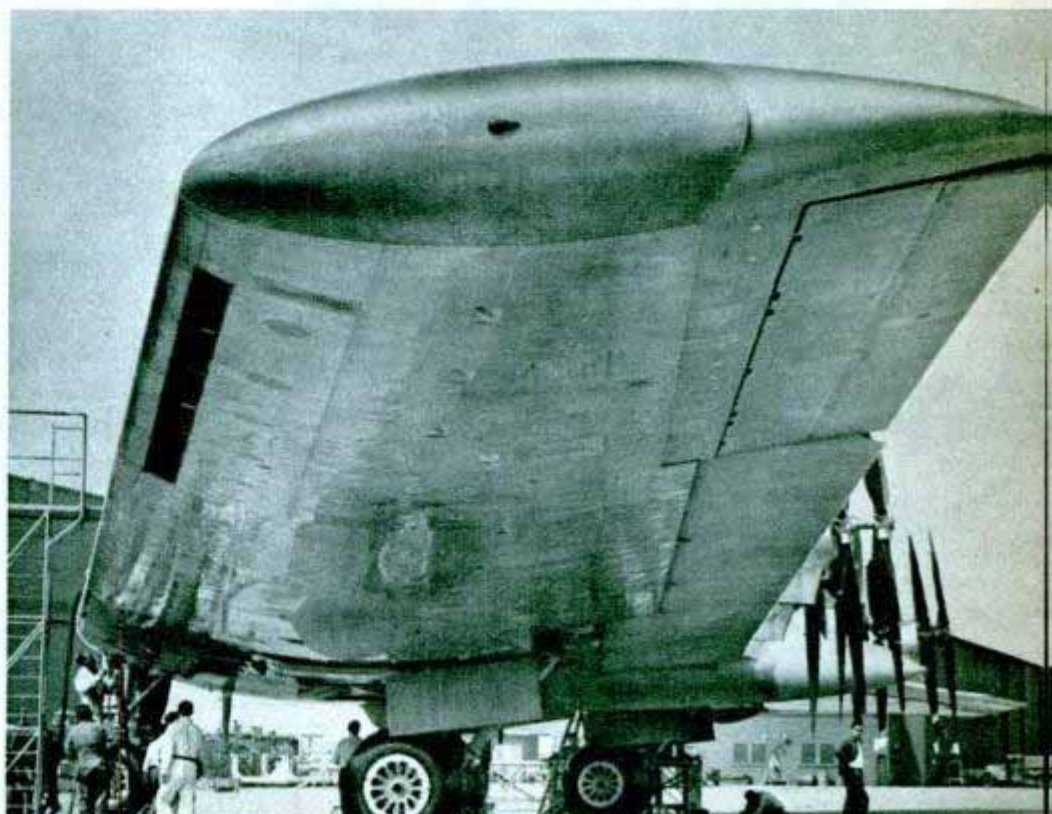
antistall slots just behind the leading edge, near the wing tips. At slow speeds they prevent interruption of the smooth flow of air, permitting positive control to be maintained. At high speeds the slots close automatically so that aerodynamic efficiency of the giant bomber is not impaired.

The XB-35 is 20 feet high when it rests on the five wheels of its retractable tricycle landing gear. The main gear has five-foot six-inch dual wheels and there is a four-foot eight-inch wheel at the nose. The center section of the wing is 37½ feet long, tapering to slightly more than nine feet at its tip. Sweep-back gives it the appearance of a giant boomerang.

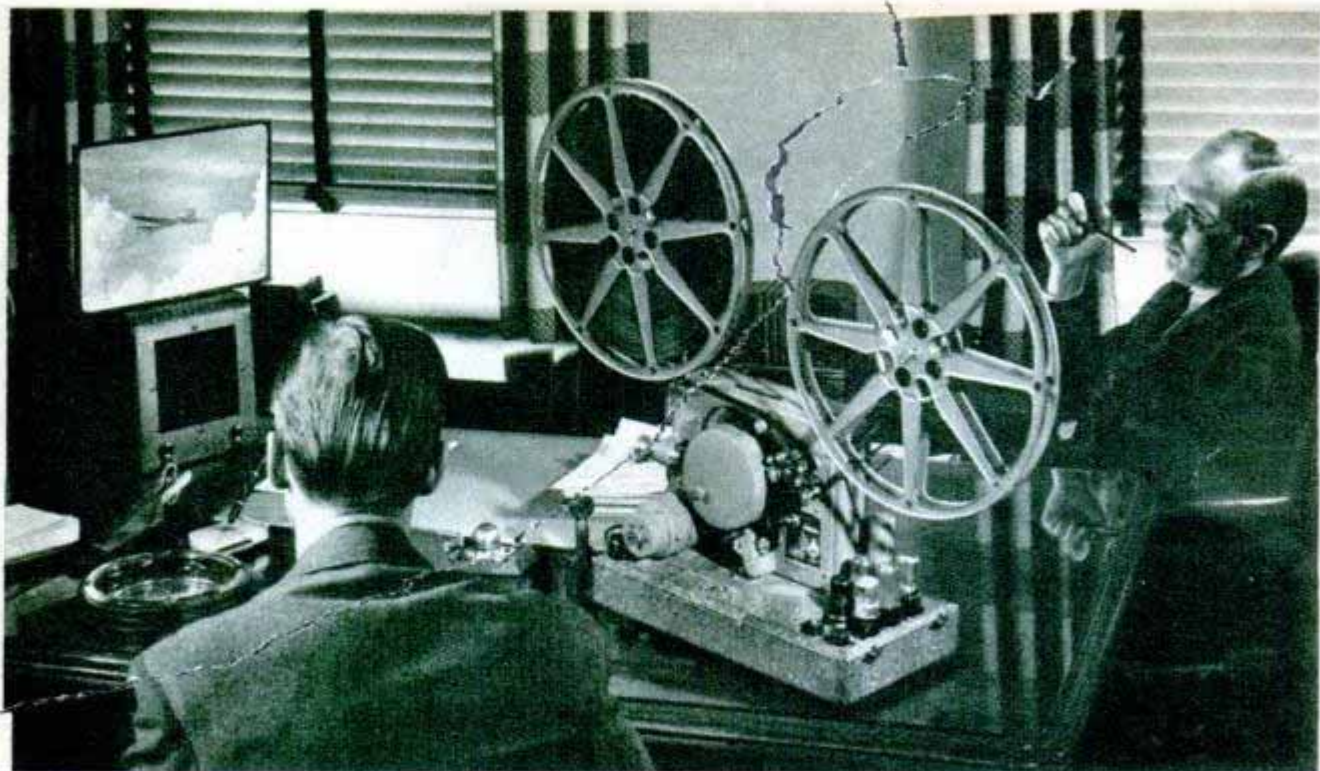
The aircraft is completely clean except for the pilot's streamlined Plexiglas hump just to

the left of the nose, an adjacent astrodome for the navigator and three defensive armament blisters. A vestigial "stinger" tail projects between the second and third propellers to provide a defensive field of fire at the rear. The engines are in submerged housings in the wing.

Underside of left wing, showing elevon surface and landing



Sound-Film Movie Projector for Desk Is Set Up in Three Minutes



Weighing only 28 pounds and assembled in a case slightly larger than a portable typewriter, a 16-mm. sound-on-film movie projector is now available which can be set up and put into operation in less than three minutes. It is especially useful for salesmen or students. Designed to be used with both screen and projector on a single

desk or table, the Movie-Mite includes an 800-foot take-up reel and cords and reel arms for 2000-foot reels. The unit operates on a.c. or d.c. and a single lamp, cooled by a centrifugal blower, is used for both picture and sound. The projector is mounted on gum-rubber cushions to reduce noise of operation.

Rubber Straps and Pulleys Guide Swimmer on 'Ironing Board' Trainer



Water isn't needed for practice swims with the training machine invented by an Australian. Resembling an ironing board, the machine has a wide strap which circles the waist and holds the student's trunk rigid. While his ankles are laced in canvas jackets and held in place by strong rubber straps, the trainee alternately pulls downward on hand grips to "swim."

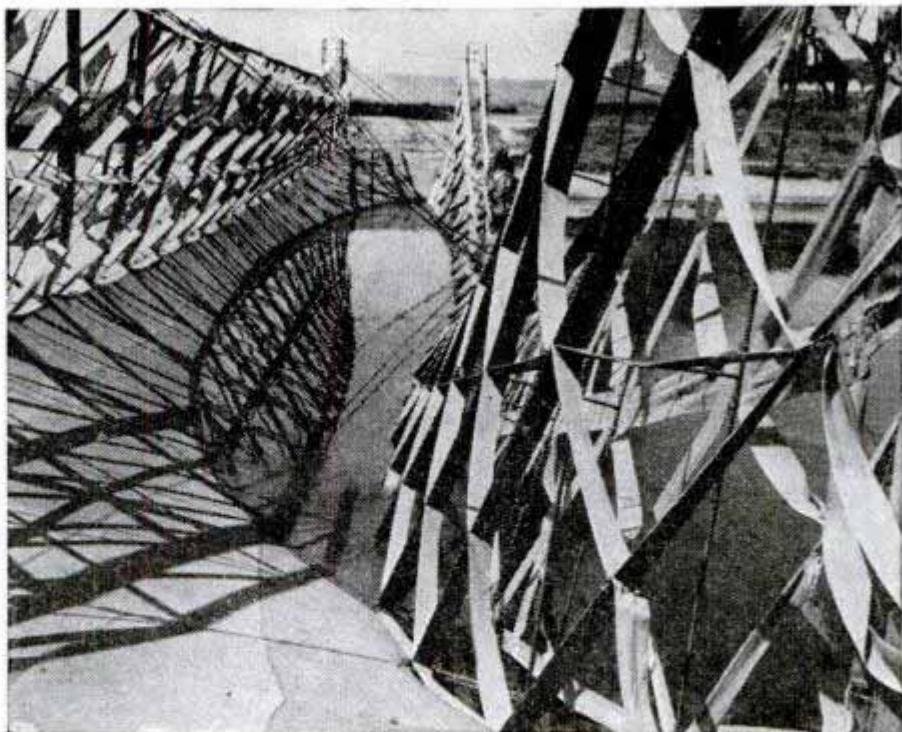
Alloy "Takes Its Own Temperature"

One chrome-cobalt metal alloy reveals its temperature by changing color under varying conditions. For example, at 500 degrees Centigrade it takes on a light straw color; at 550, bronze; 575, purple; 600, dark blue, and so on. A marked color change occurs with every 25-degree temperature change between 500 and 900 degrees Centigrade. After completing a scale of colors between 500 and 700 degrees, the metal repeats the colors from 700 to 900 degrees.

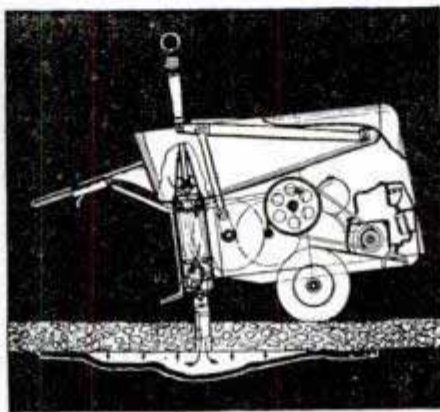
Information, including manufacturers' names and addresses, concerning products described in this issue may be obtained by writing to Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

Needle and Thread Mend Bridge

Fake bridges made of canvas, burlap and cloth tape were used by Allied forces to fool German artillery spotters and attack bombers. The flimsy structures were near-perfect replicas of the rigid-truss Bailey bridge. At a distance of several hundred feet it was virtually impossible to distinguish between the dummy bridge and the genuine article. When the fake bridges were bombed or shelled, camouflage engineers "sewed" them up and put them back in use.



U. S. Army Signal Corps photo

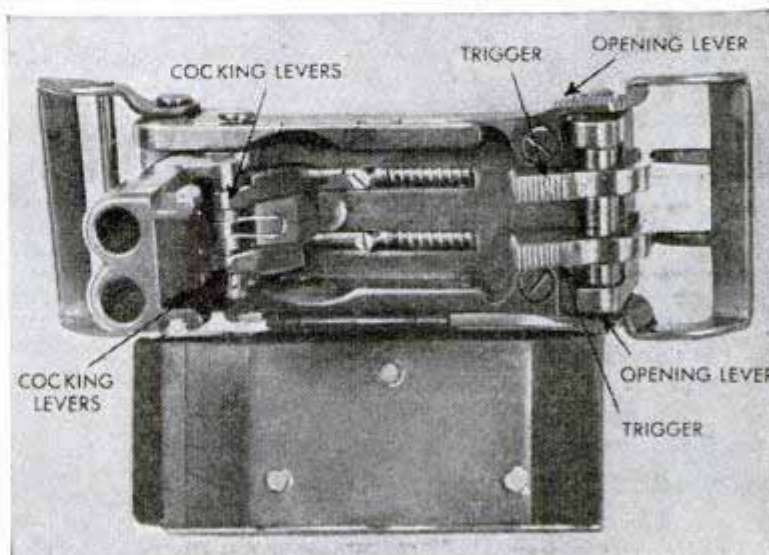


Mud Lifts Walk

Concrete slabs that have settled beneath the surface of sidewalks or pavements are raised to their original position with a mud jack. Small holes are drilled in the concrete through which mud mixed with cement is pumped to push the slab upward.

Belt Buckle Hides Gun

Nazis converted even the innocent gesture of looping one's thumbs over his belt into a potentially murderous motion with use of a deadly belt-buckle gun. Closed, the weapon resembles an ordinary belt buckle. Pressure on one end of the buckle causes the hinged front to open downward, exposing a stubby double-barrel gun. Individual triggers fire each two-inch barrel separately. The gun was brought into this country by an American soldier as a war souvenir.

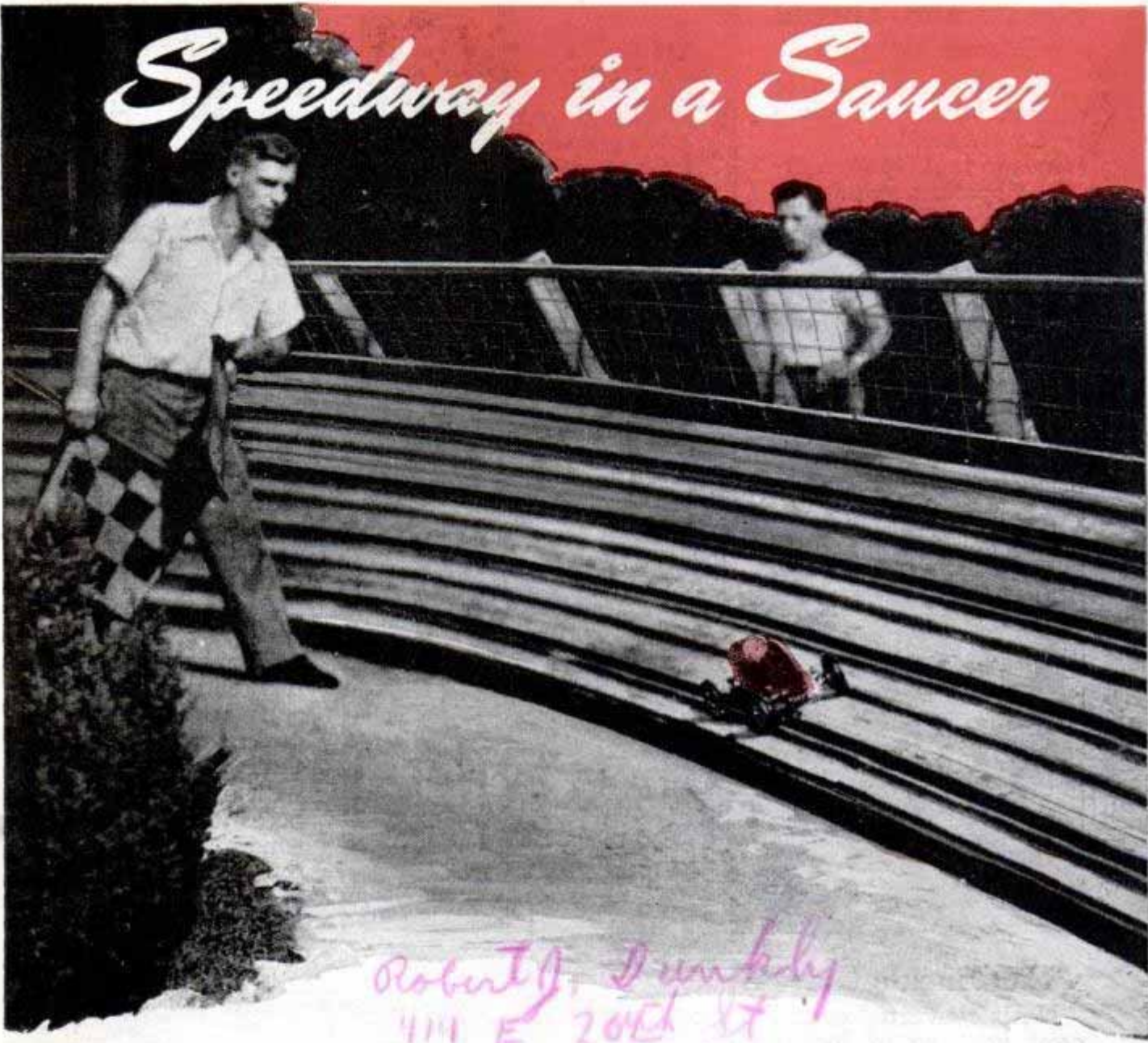


Transplant Teeth of Cat

Teeth of one kitten have been successfully transplanted to the jaw of another by Dr. Harry H. Shapiro of Columbia University and Dr. Bernice L. Maclean of Hunter College. Further experiments, if successful, may indicate that similar transfers could be made on human beings.

see also p 117 November 1970

Speedway in a Saucer



Robert J. Dunkley
4111 E 20th St
N Y 67, N Y.

By Clifford B. Hicks

WITH all the furor of major speedway events, races conducted at saucer-size tracks are attracting thousands of fans. Excited crowds whoop it up while six-pound model racing cars zip around a board track on a thimbleful of gasoline.

Motors roar and tires smoke on the turns, just as in the big-time races. Traveling at 75 to 80 miles an hour, the pilotless midgets circle a 264-foot course in slightly over two seconds.

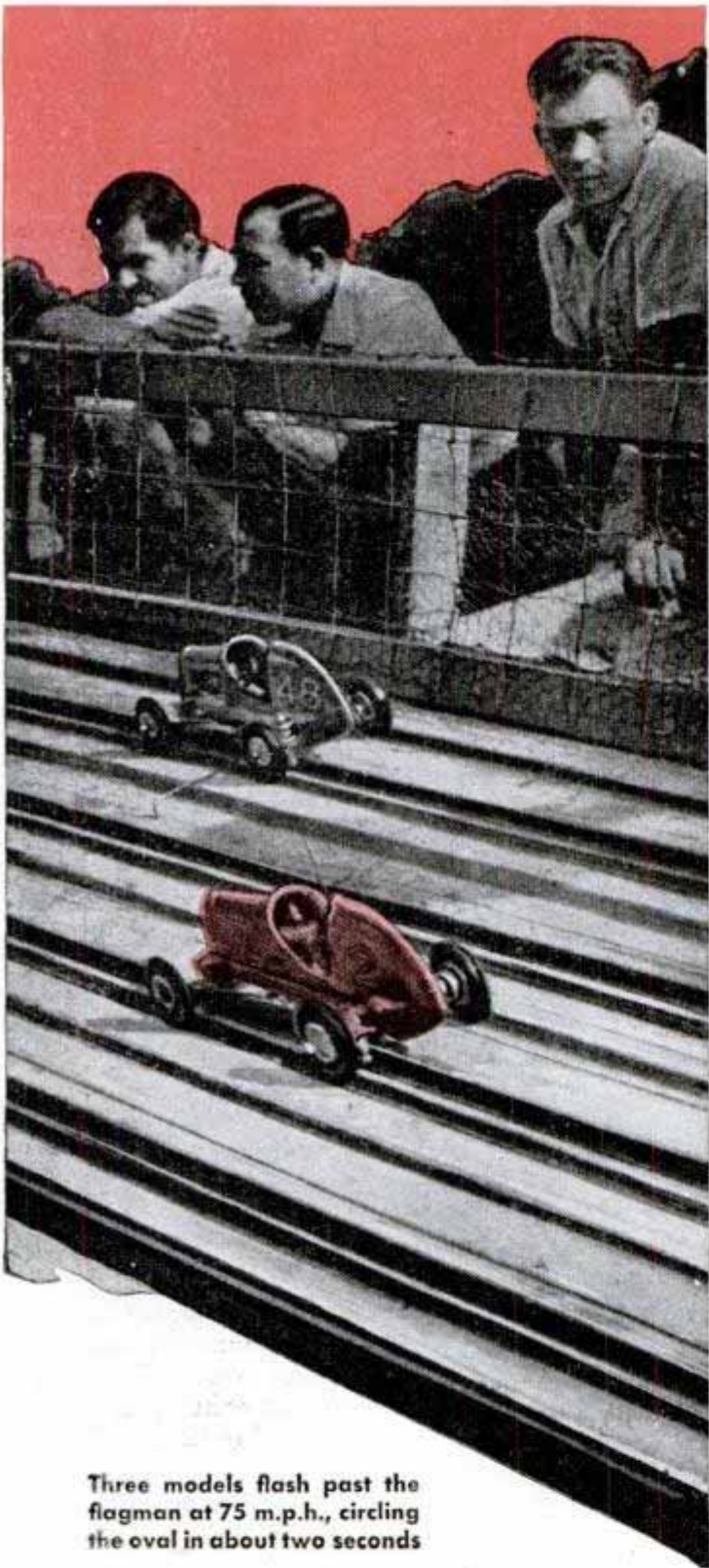
Model racing car meets are held each summer on tracks spotted throughout the country. Thousands of enthusiasts, members of the American Miniature Racing Car Association, compete. Crack-ups, motor and tire troubles occur. Owners claim the sport gives all the thrills and chills of regular speedway meets without injury or death to drivers.

The A.M.R.C.A. is the group's national

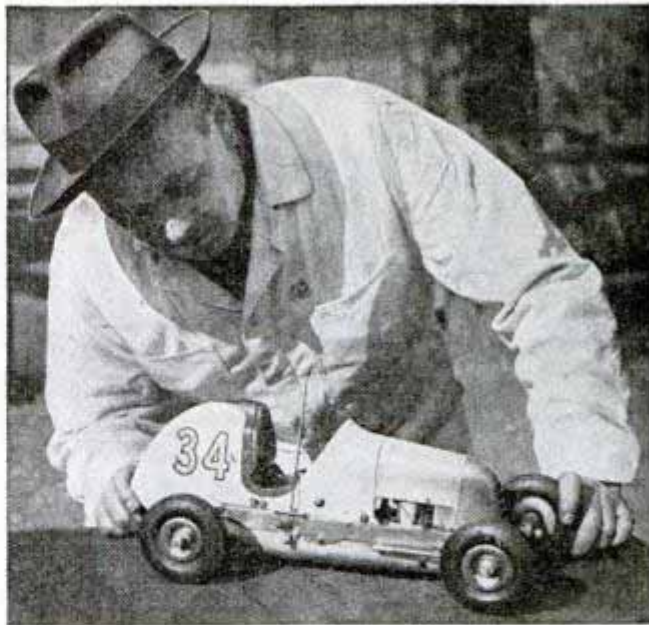
organization. It was formed in 1939 and is subdivided geographically into six leagues of some 300 clubs. The members enter their 10,000 cars in local meets, interclub competitions, regional meets and the National Races.

This year's regional meets are being held at New York City, in Illinois and in San Francisco in late June and early July. The National Races will be run July 31 to August 3 on two 1/16-mile tracks built by the city of Detroit.

Two different kinds of competition are held, one for "cable" cars, the other for the "rail" type. A cable car is fastened to the end of a cable which is anchored to a socket in the middle of the track. Once the car is started, centrifugal force keeps the cable taut as the model circles the track. Much faster speeds are attained by cable cars than by rail racers because of less friction on the track. The champion cable model traveled 114.64 miles per hour in setting its



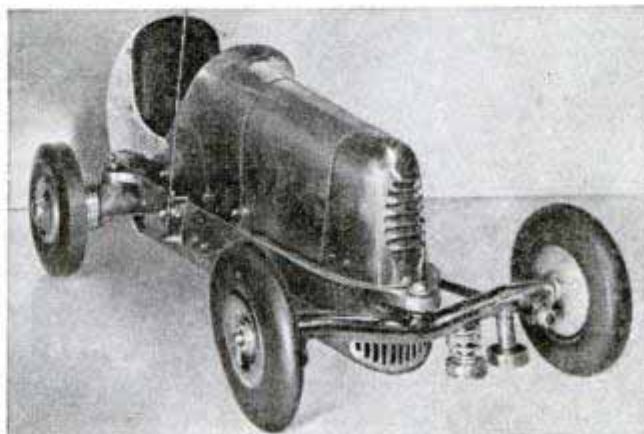
Three models flash past the flagman at 75 m.p.h., circling the oval in about two seconds



Owner gives his model final tune-up before the race



↑ An impatient car is fastened securely to the rail
↓ Note ball bearing locking studs on the front axle

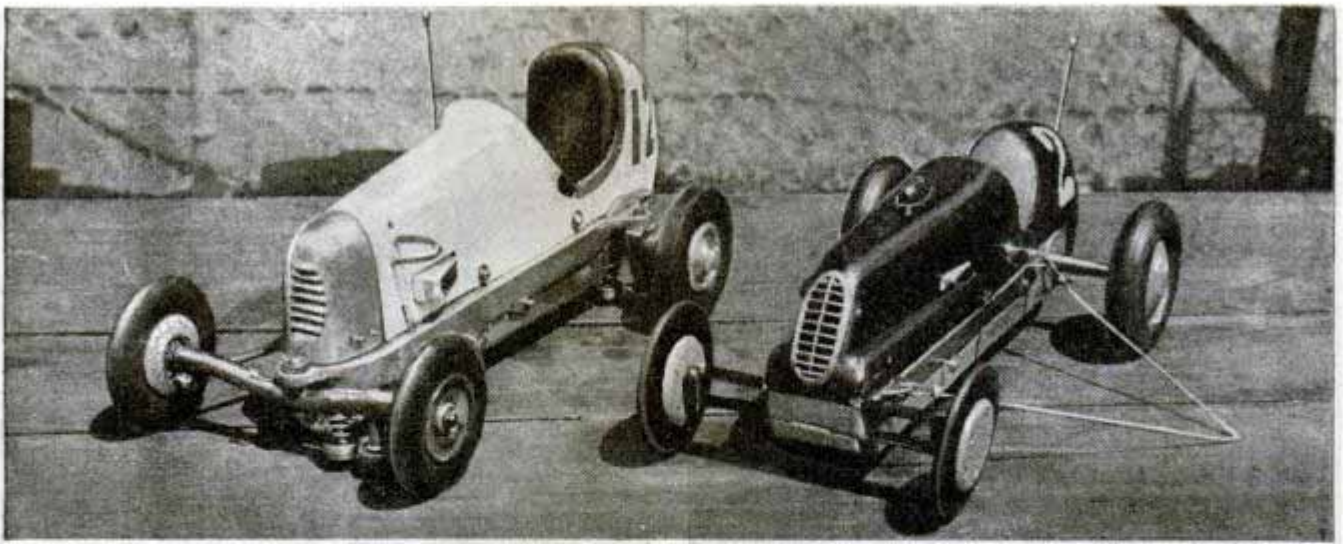


record. But the cable allows only one car to circle the track at a time. Instead of racing, it's car vs. stop watch.

For that reason enthusiasts are acclaiming rail racing as a better sport. "The future of the hobby definitely lies with the rail track," says Robert Mulhall, director-at-large of the national association.

Rail cars race on an elliptical track that is divided into four lanes. A flanged steel rail flanks each lane. Ball-bearing studs on front and rear axles lock the pygmies to these flanges. Friction against the rails reduces speeds to around 75 miles per hour.

Model Crafters
134 to 135
Bill Ryan



Racer at left rides a flanged steel rail around the miniature track. Steel wire on model at right fastens to a cable for faster cable-track racing. World's record cable car zoomed the course at more than 114 miles an hour

But in a recent race one car traveled so fast that its locking devices failed to hold. The six-pound model left the track at waist height to hurtle 40 feet through the air like a chunk of shrapnel before it struck the ground.

Engineers claim that turns in the track should be banked about 86 degrees—almost vertical—for cars traveling at present speeds. A good track costs \$1000 to \$2000 to build. But owners and spectators have the thrill of watching the Tom Thumb cars compete against each other.

Rules of the association limit the maximum weight of the models to 1½ pounds for every 1/10 cubic inch displacement, minimum one pound for each 1/10 cubic inch. Most of the cars weigh from 6 to 7½ pounds, with a 12½-inch wheelbase and 7½-inch tread. They cost about \$200 apiece, counting materials, motor and labor, and require two or three months of spare-time work to build from start to finish.

Frames made of magnesium are favored because they weigh about one third less than those of aluminum. A sheet aluminum skin covers this frame.

Two different styles are made, the "conventional," which is modeled after real racing cars, and the "streamliners," designed for speed rather than appearance. Streamliners average five miles per hour faster than conventional models, not because their lines are softer but because the design allows the power plant to be built lower to the track. Complete kits are manufactured for assembling the bodies.

Most of the engines are of a standard type called the "Hornet." The owner's ability to coax the most from his engine, coupled with the body style of his car, determines whether it is a winner. Engines cost about \$35, although prices on second-hand power plants skyrocketed to \$50 during the war. Like their big brothers, the en-

gines and frames are rebuilt for each race.

Parts are machined to 1/10,000-inch tolerances. A tiny spark plug is mounted on top of the engine. The piston has more clearance than those in family cars, because the engine's heat quickly expands it. The engine develops an estimated ¾ horsepower turning at 15,000 revolutions per minute. Anchored securely to the frame, it packs terrific energy into the models.

Fuel mixture is 70 percent alcohol and 30 percent castor oil, with a small amount of amyl acetate added, depending upon the temperature. The cars carry about 100 c.c. of fuel, enough to run a one-mile race plus a few additional laps.

Wheels of the little racers turn at 7000 to 8000 revolutions per minute. Tires would fly off or disintegrate at this speed if not held against a surface before the cars are released. Wheels are touched lightly to the track to cut down their speed until the race starts. One owner was knocked unconscious for 15 minutes by a small fragment of tire that broke loose and struck him behind the ear.

Tires are made of soft rubber. Like those on big racing cars, they last only a short time, usually not more than three or four races. During the war they were not manufactured. Prices of used tires soared, with a virtual black market developing.

Eight cells from pencil-type flashlights are soldered together to furnish a three-volt battery of high amperage. One basic problem is to stop the car after it is in motion. A wire switch extending like an antenna an inch or more above the top of the model is the solution. When the car is to be stopped, a handkerchief is held above the track. As the pygmy roars past, the handkerchief trips the extended switch, disconnecting the battery. One owner tried to trip the switch with his hand. The wire almost severed a finger.

Official races are sponsored by the national association. Qualification and elimination races are run before the feature event, which is a one-mile race for the four fastest cars of the preliminaries. The car with the best qualifying time is given the outside lane in the preliminaries, the inside in the feature.

Ben Meskowski of Chicago holds the official world's record at 79.92 miles per hour. Unofficial record, made at a meet without national sanction, belongs to William Weller at 80.09 miles per hour. T. J. Thompson, president of the Chicago association, built one of the most consistent winners. It placed first in 19 of 24 races during 1945.

At the starting line the "starting roller," a revolving cylinder flush with the surface of the track, starts the cars by rotating their wheels. Each growling model is then held forcibly in position until the others entered in that race are ready. Down comes the flag, owners release the cars, and away they roar, trailing a cloud of exhaust.

Photographs of the screaming models are difficult to obtain because of their high speeds. Films exposed for 1/1000 second are blurred. For the same reason no one can observe all the models in a race. A judge is appointed for each car. He follows that car until the race is over. Then judges and flagman compare observations to determine the winner.

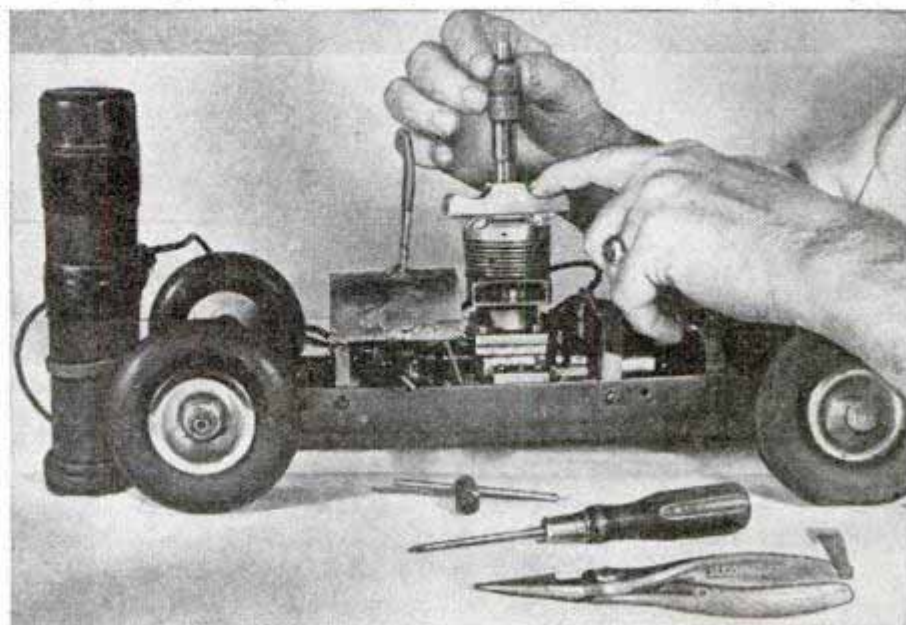
If you see an excited crowd around a miniature track this summer, don't stop to watch the races. Keep moving unless you want to spend most of your spare time pursuing an exciting hobby. Owners say the sport is highly contagious.



Pit repairs hold all of the anxiety of big-time races. Below, streamliner sacrifices style for high speed



Tiny power plant requires frequent checking to develop highest speed





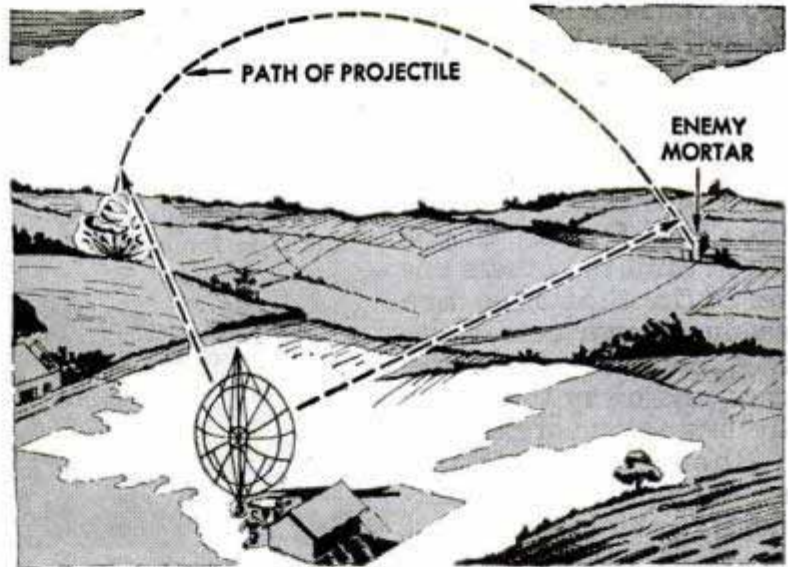
With the assistance of a walkie-talkie radio, a baseball team manager can instruct his players from the dugout and correct instantly any mistakes they may make dur-

Walkie-Talkie for Baseball

ing drill. Ben Chapman, manager of the Philadelphia Phillies of the National League, tried out a walkie-talkie to instruct his infield coaches during training.

Radar Tracks Course of Mortar Shell to Spot Gun Position of Enemy

Radar detection of artillery and mortar shells in flight has made it possible to locate hidden enemy gun positions within five miles of the radar screen. Army Signal Corps technicians developed the counter-mortar radar which tracks the upward and downward paths of an enemy projectile. The trajectory of the shells can be plotted from the radar bearings and this knowledge makes it possible to locate hidden gun positions five miles distant with less than 60 yards' error. Similar radar devices have detected moving vehicles 16 miles away.

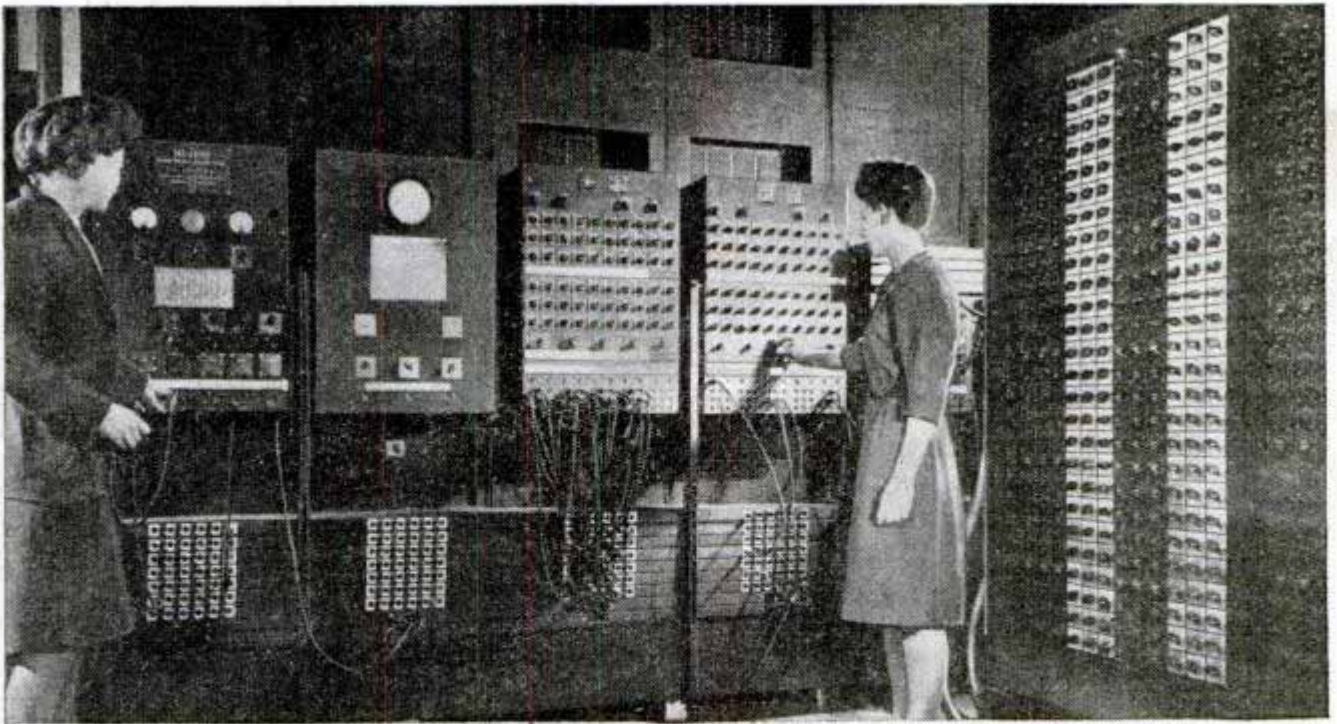


Twin-Tube Float for Swimmer Folds Into Small, Lightweight Package



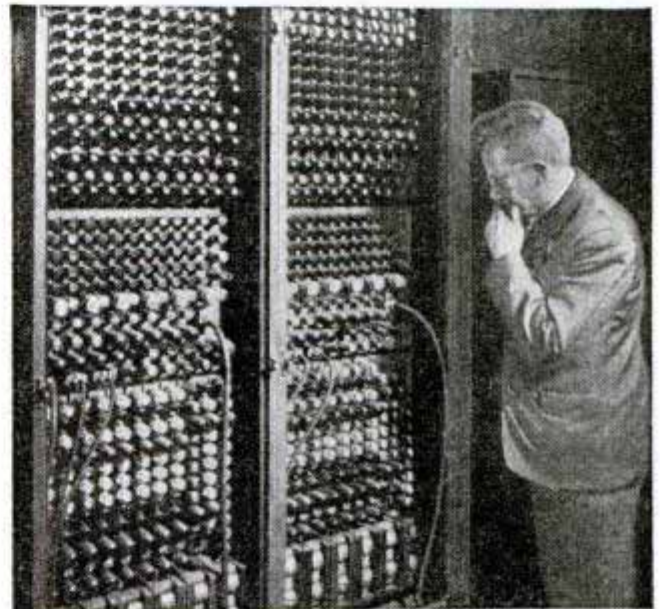
Buoyant enough to support an adult are the twin tubes of a swimming float which, when deflated, folds into a package 10 inches square and weighing less than two pounds. The tubes are inflated from the mouth and are fitted inside a colorful fabric cover. Hand grips and a pull-up strap assist the swimmer in getting on the float. A front eyelet permits it to be towed.

❏ Iowa farmers bought 75 carloads of surplus bulletproof rubber fuel tanks for airplanes and used them as water troughs, sand boxes, brooder houses and pontoons for supporting pipe lines.

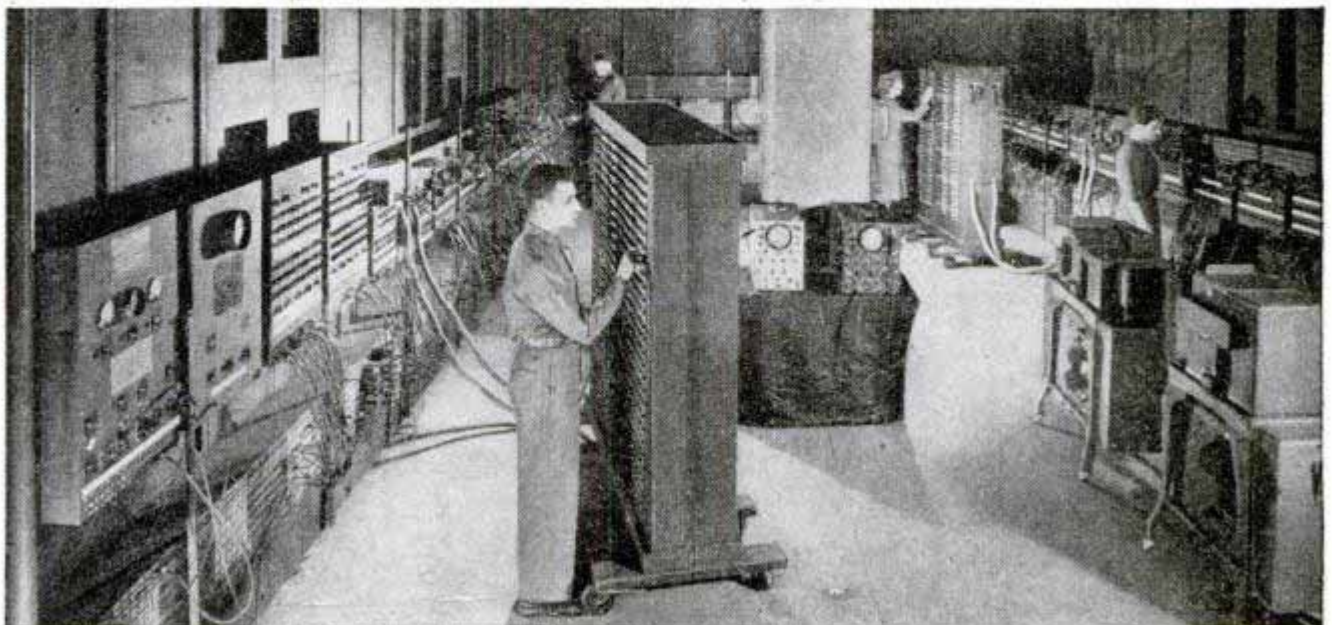


It Thinks With Electrons

Extremely complicated calculations in nuclear physics, aerodynamics and scientific weather prediction are among the peacetime jobs of the ENIAC. The machine, the first ever developed, gets its name from the first letters of the words describing its function as an Electronic Numerical Integrator and Computer. Built in 2½ years at the Moore School of Electrical Engineering at the University of Pennsylvania for the Army Ordnance Ballistic Research Laboratory, it was originally developed to solve ballistics problems. It is said to be the most intricate electronic device in the world, requiring for its operations 18,000 electronic tubes as compared with 400 tubes in the largest radar set. At maximum capacity, the ENIAC will carry out in five minutes more than 10,000,000 additions or subtractions of 10-figure numbers. In its first test the machine solved in two weeks calculations which would have required 100 man-years of trained computer's work. The ENIAC performs a single addition in 1/500 second, a single multiplication by a 10-digit multiplier in 1/360 second or a nine-digit result in division or square root extraction in 1/38 second



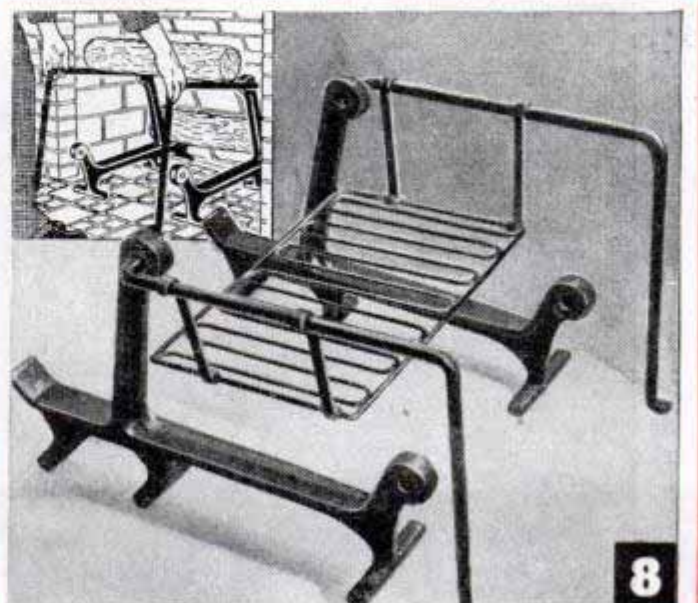
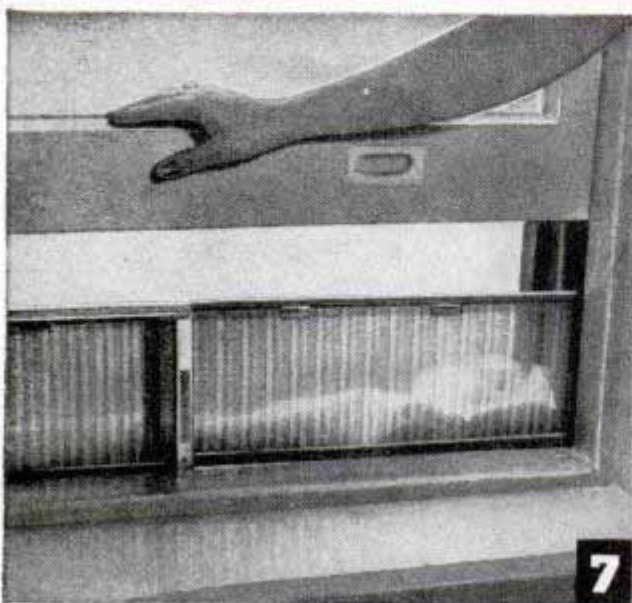
Getting ENIAC ready for operation, top. Above, rear view of section of machine showing tubes, plug-in chassis and transformers. Below, overall view of ENIAC being prepared to solve mathematical problem

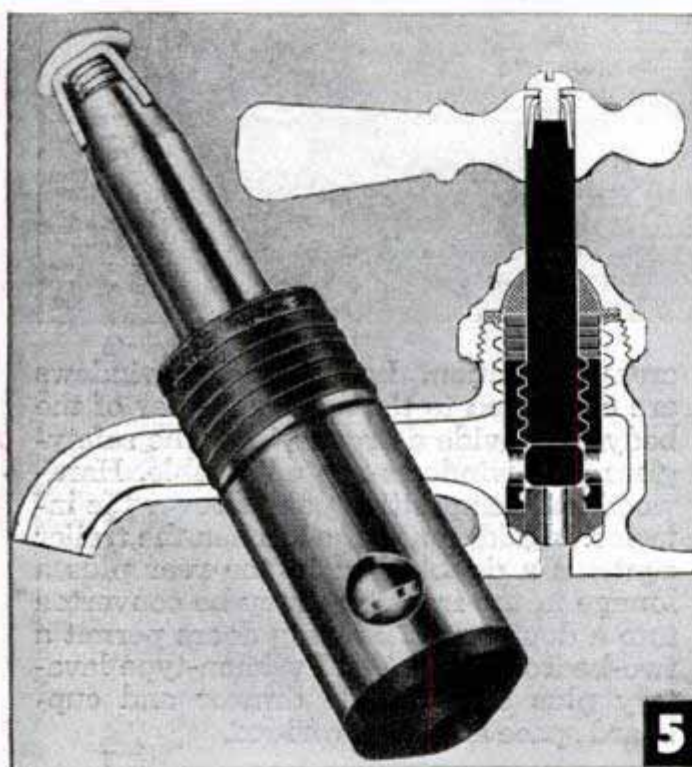


"Inside Stubb" for Your Home



- 1** Yarn is wound on a plastic "top" which permits it to unwind evenly
- 2** Portable washer cleans and dries three-pound load in 10 minutes
- 3** Inflated raft for baby prevents rolling off the rear seat of auto
- 4** Detachable twin-roller unit for wringing mops fits any size pail
- 5** Faucet insert fits most faucets, replaces worn washers, ends leaks
- 6** Lightweight electric polisher for floor shines wood, linoleum, tile
- 7** Plastic-covered wire-mesh window ventilator filters dust from air
- 8** Fireplace grill fits over andirons for home barbecue or corn popping
- 9** Nonslip holder keeps clothesline taut when tightened by quick tug
- 10** Soap rests on prongs in plastic dish to prevent "jelly" formation





Light Metal House Trailer Contains a Complete Kitchen

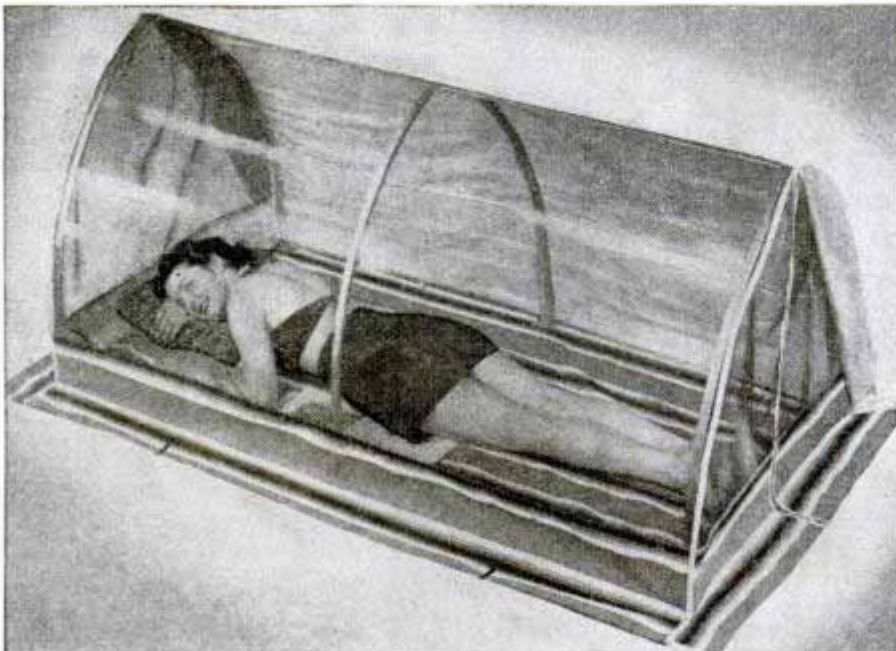


Roomy kitchen in this shining new house trailer weighs only 150 pounds but it contains an aluminum range, oven, icebox, broiler and convenient drawer space



Light metals replace conventional materials in a new, lightweight trailer that is being built in accordance with techniques used in manufacturing aircraft. All parts except the axle and running gear are made of aluminum or magnesium. The total weight of the 20-foot trailer is 1860 pounds. It contains an all-aluminum 150-pound kitchen unit that includes a range, oven, broiler, icebox and several drawers. Ventilation louvers at the front of the trailer plus air vents in the roof permit controlled

cross-ventilation. Large Lucite windows are contoured to the front and rear of the body to provide a broad view. The safety-glass side windows are adjustable. Hardwood and composition panels cover the interior. In addition to the kitchen the trailer contains a double bed in the rear plus a lounge in the front that may be converted into a double bed. Folding doors permit a two-bedroom effect. A Pullman-type lavatory plus considerable drawer and cupboard space are also provided.

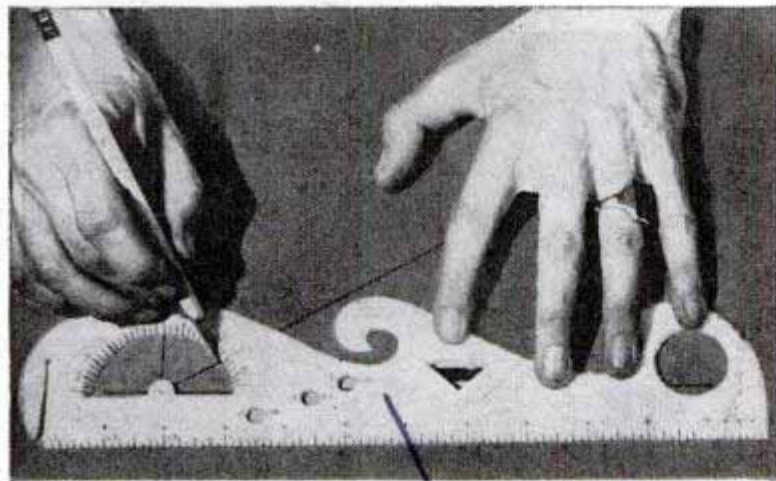


Sun Bathing Shelter Keeps Insects Out

When its outer cover is thrown back, a nylon screen prevents insects from entering a dual purpose shelter which serves as a beach accessory or play pen. When its brightly colored, weatherproof outer cover is in place the shelter can be used as a dressing room or overnight sleeper. The shelter can be put up or taken down easily in a few minutes and folds into a compact bundle weighing only 20 pounds.

Power Unit for Bicycle Replaces Rear Wheel

Any standard boy's or girl's bicycle can be converted into a power-driven bicycle with a 1½-horsepower engine-driven unit which replaces the rear wheel. No changes need be made in the bicycle frame and the bicycle can be converted back to "pedal power" simply by removing the power unit and reinstalling the rear wheel. The power unit is equipped with gas tank, kick starter and automatic clutch. A conventional bicycle coaster brake which is operated by the foot pedals gives added safety of operation. It attains speeds up to 32 miles per hour and gets 80 to 100 miles per gallon of gasoline.



Eight-in-One Plastic Ruler

Combining eight instruments in one, a plastic ruler is an aid to artists, architects, draftsmen, engineers and craftsmen. It serves as a letter weigher, ruler, magnifier, French curve, compass, protractor, level and miter. To weigh a letter, it is inserted in a slot at one end. Then a pencil is placed in one of three holes marked ½, 1 or 2 ounces. If the letter tilts the ruler it is heavier than the weight marked at that hole.

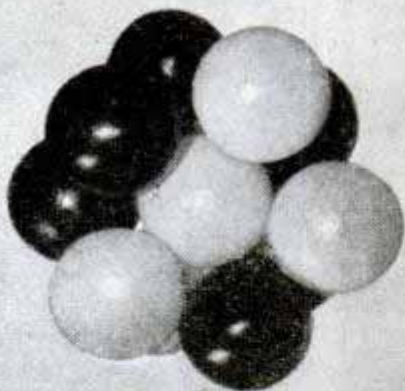
Parva Products Co - West Haven 16, Conn.

Pusher-Prop Glider Skims Over Swamp

Driven by a pusher-type airplane propeller, a swamp glider built for the Coast Guard draws only four inches of water. The 18-foot boat will be used in the swamps of Florida and Mississippi for rescue and revenue missions.

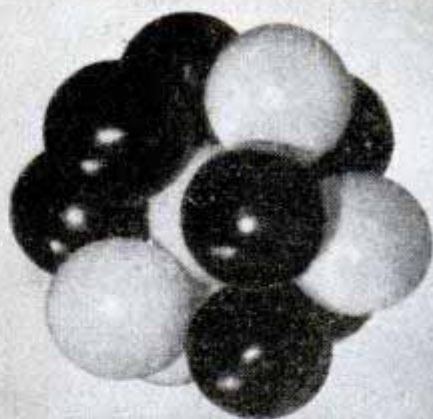
Houseflies have been put to work to cross-pollinate celery plants raised by plant breeders at Cornell University. The breeders, seeking to develop a blight-resistant celery, use flies rather than bees because they are more easily handled.





ORDINARY CARBON ATOM (C 12) NUCLEUS

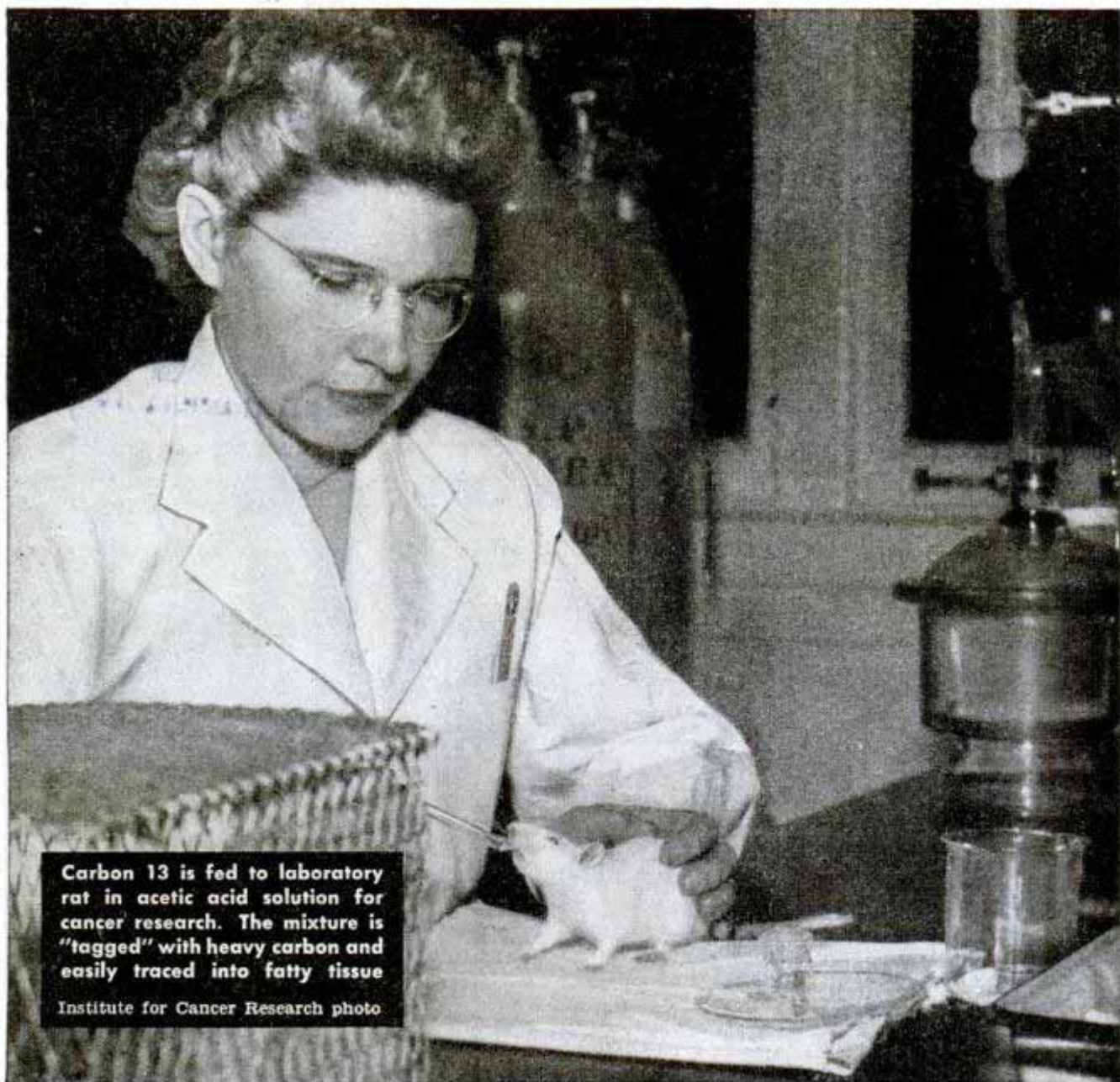
Houdry Process Corp., Sun Oil Co. photo



CARBON 13 ATOM NUCLEUS

White balls represent protons and black balls neutrons in atomic structure of ordinary carbon (C 12) at left and C 13, right. C 12 has six protons and six neutrons; C 13 has an extra neutron giving atom mass of 13

"TRACER BULLETS" on the



Carbon 13 is fed to laboratory rat in acetic acid solution for cancer research. The mixture is "tagged" with heavy carbon and easily traced into fatty tissue

Institute for Cancer Research photo

TELLTALE atoms may soon strip the mystery from some of man's deadliest enemies—cancer, hardening of the arteries, diabetes, heart disease.

A new key that researchers will use to gain knowledge of these ailments is a tiny particle of energy—Carbon 13, an isotope of ordinary carbon atoms. Some scientists believe it will prove to be as important a tool of medical research as the X-ray.

"Possibilities of research with Carbon 13 are almost beyond imagination," state two scientists, Dr. C. H. Werkman of Iowa State College and Dr. E. A. Evans of the University of Chicago, after experiments with the isotope.

Carbon 13 is invaluable in the study of metabolism, the chemical reaction by which

one unit more than ordinary carbon. Another isotope, Carbon 14, is two units heavier and when irradiated by a cyclotron retains a radioactive nature for a long time. Carbon 11, still another isotope, has a very short radioactive life.

Isotopes are merely chemical twins of various elements. Carbon 12 has six protons and six neutrons in its nucleus, giving a total atomic weight of 12 units. Suppose we add an extra neutron—an inactive particle—to the nucleus. This produces Carbon 13. Add another neutron and it becomes Carbon 14. Carbon 11, 13 and 14 cannot be distinguished either physically or

Trail of Cancer

By Nathaniel Nitkin

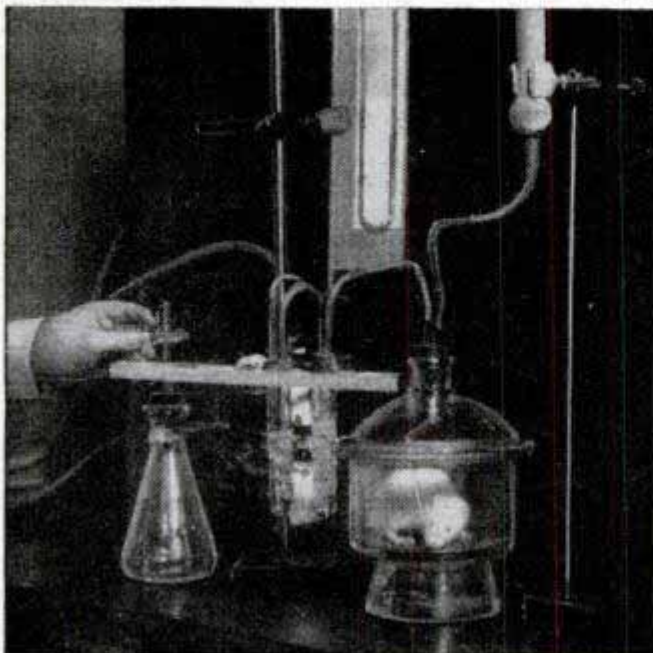
the body transforms foodstuffs into complex tissue. Metabolism, a basic process of life, has stubbornly resisted many experiments in the past because there was no laboratory method for following the process. Now Carbon 13 can be "tagged" or traced through the pathways it follows in the human body. Scientists say that experiments with the "tracer" may unlock many basic secrets of life.

This isotope can be traced because it differs in weight from the ordinary carbon atom, Carbon 12, so labeled because of its atomic weight. A Carbon 13 atom weighs

chemically from ordinary carbon. All react similarly when absorbed by living tissue. Fed to plants, Carbon 13 is processed exactly the same as ordinary carbon. If an animal eats this special food, the isotope becomes a part of the animal's living tissues.

But the factor that makes Carbon 13 of invaluable importance is that it can be traced through the daily functions of the body—biological metabolism—by a precision electrical instrument called the mass spectrometer, which is a refinement of the mass spectrograph.

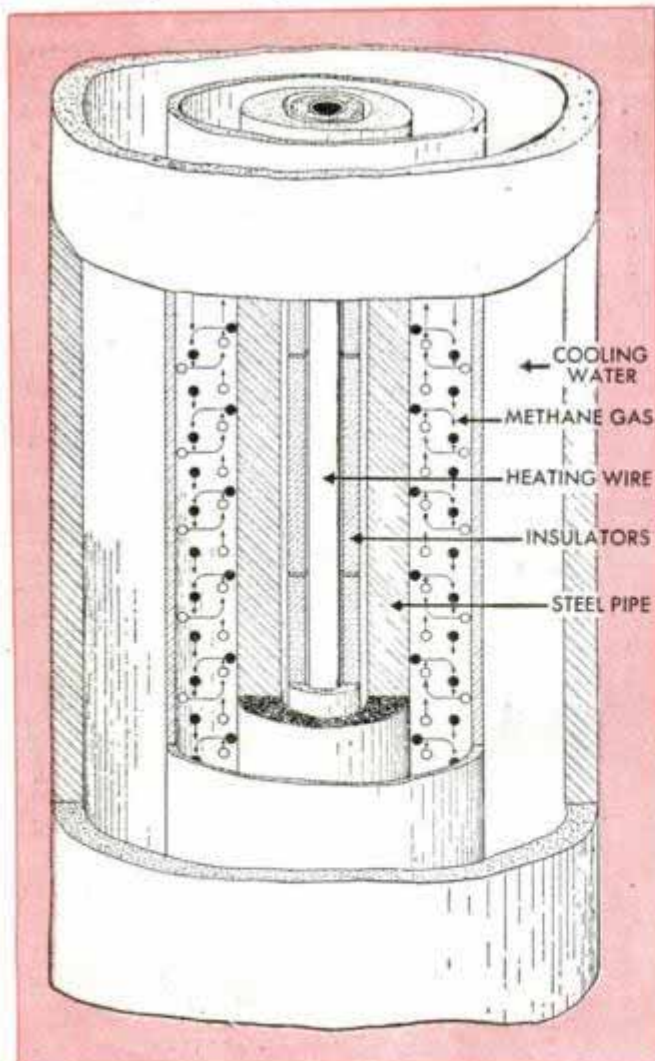
Left, carbon dioxide from rat's breath is picked up in glass jar for analysis to discover Carbon 13 content. Right, plants containing Carbon 13 are particularly valuable in studying abnormal growths such as cancer





Houdry Process Corp., Sun Oil Co. photo and diagram

Scientists use the mass spectrometer as a "chemical microscope" in experiments to follow Carbon 13 "tracers" by measuring the masses of individual atoms



The mass spectrograph does to elements what a prism does to rays of white light. When light is passed through a prism, it is broken into colors of different wave lengths. Similarly the mass spectrograph separates the various isotopes of a single element.

It is a U-shaped device. In one arm are two slits separated by an electrical field. In the other arm is a powerful electromagnet. The curved body between is a vacuum chamber.

Before carbon is placed in a mass spectrograph it is changed to a gas and given an electrical charge. Then the atoms are passed through the first slit and are boosted in speed by the electrical field. They race through the second slit into the vacuum chamber. The electromagnet in the other arm immediately attracts them as they rush through the U-shaped body.

Now Carbon 13, being heavier than Carbon 12, travels more slowly. Thus its path has a longer curve than that of the ordinary element. Carbon 14, heaviest of the three, has the longest curved path. As the atoms collect through slits on the magnetic screen, Carbon 12 bunches on one side, Carbon 13 in the middle, and Carbon 14 on the other end.

This ability of the mass spectrograph to isolate Carbon 13 from its sisters in the carbon family, together with further refinements in the mass spectrograph, make it possible to trace the path of the isotope through an organic body and to analyze the processes of metabolism.

Using a single element such as Carbon 13 to study metabolism and cancer is not a new procedure. Scientists have already utilized radioactive Carbon 14 and Hydrogen 3 to study cancer. The purpose of these experiments was to "tag" the organic compounds—to trace radioactive carbon and hydrogen through the body and ultimately to identify the fragments when metabolism breaks down the compounds.

This, in effect, is also the goal of laboratory technicians using Carbon 13 as a "tracer bullet."

But radioactive elements are dangerous. Radium and thorium could not be used in the experiments. Temporary radioactive elements were used to some extent—common elements such as sodium, potassium and phosphorus, made radioactive artificially. Carbon 11 also has been used experimentally. The gamma rays given off by these elements are electro-magnetic and

Diagram of the thermal process for concentration of C13. Methane gas is introduced at top of 40-foot tubes and passes downward in space between heated inside tube and water-cooled wall. Gas molecules containing C13 flow downward along the cooled wall while C12 molecules travel upward along heated tube

can be traced through living organs. But such elements have a half-life—a radioactive period—of only a few minutes, allowing research technicians but a short time to study their trails through the body.

Carbon is the most common constituent of all living things. Its omnipresence proves its potential value in unlocking the mysteries of life. It is readily absorbed into tissues. But until Carbon 13 could be forged in large enough quantities for research, the element could not be used effectively for studies that were to cover a long period of time.

In 1943 Dr. Harold C. Urey of the University of Chicago isolated half a gram of the traceable carbon. The Houdry Process Laboratories built a small plant to manufacture it for research, but the factory could make only one fourth gram per month. This isotope was too expensive for large scale experiments.

Dr. Allen Reid discovered a catalyst that aided in building Carbon 13. A catalyst is simply a substance that speeds up chemical and atomic change. The catalyst remains the same throughout, merely boosting the process like a supercharger.

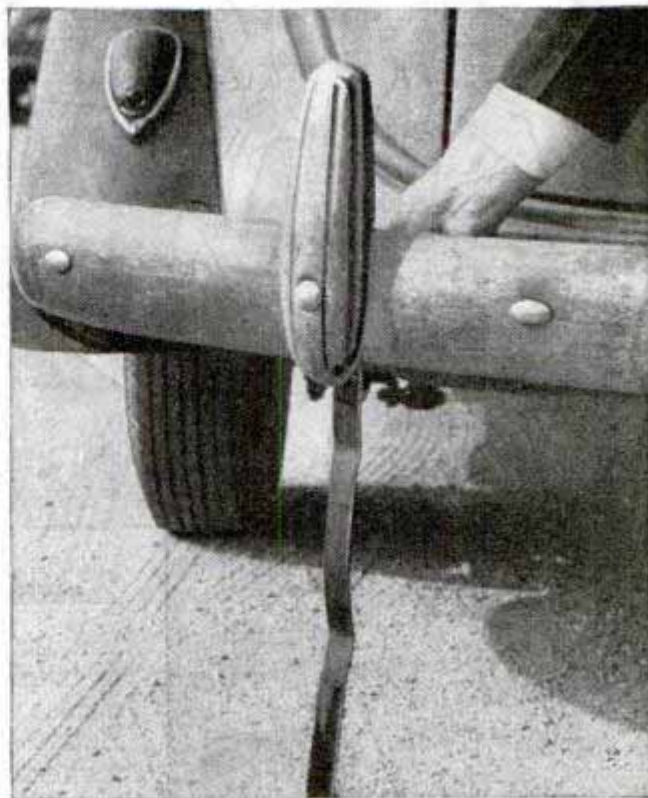
Using Dr. Reid's catalyst, Dr. Urey developed the principle that now makes possible large scale production of Carbon 13. Both physicists were among the foremost scientists in atom bomb research.

Now the Houdry Process Laboratories is building two large plants for the Sun Oil Company. They will produce 500 to 1000 times the amount of Carbon 13 that previously was produced each year, giving medical science an adequate supply for experiments that may uncover the cause and cure of man's baffling diseases.

Electric "Bath" for Metals Speeds Polishing Job

Electrolytic polishing for metals is rapidly replacing hand polishing in many industries because of savings in time and labor and improvement in the finish. Dr. A. E. Hostetter, associate professor of metallurgy at Kansas State College, reports that recent developments make it possible to electropolish metal in 30 seconds to four minutes, compared with 45 minutes to an hour by the hand process. With the electrolytic system the metal to be polished is attached to metal clips wired to a 40-volt d.c. generator or electrolytic rectifier. Then the piece is lowered into a container filled with acid which removes a thin surface layer of metal. This method is used to polish metal mirrors, light reflectors and costume jewelry, to remove burrs from fabricated parts and to smooth the internal cavities of molding equipment.

Rubber Strip Dangled From Car Saves Motorists From Shocks



Unique in its ability to conduct electricity instead of insulating against it, a strip of rubber dangled from the undercarriage of a car eliminates shocks from door handles or other metal fittings. The strip is produced by the United States Rubber Company and despite its rubberlike qualities grounds electrical charges in the same way as drag chains on fuel trucks. Tail wheel tires on military airplanes were made of the same material to discharge static.

1230 6th AVE. N.Y. 10, N.Y.

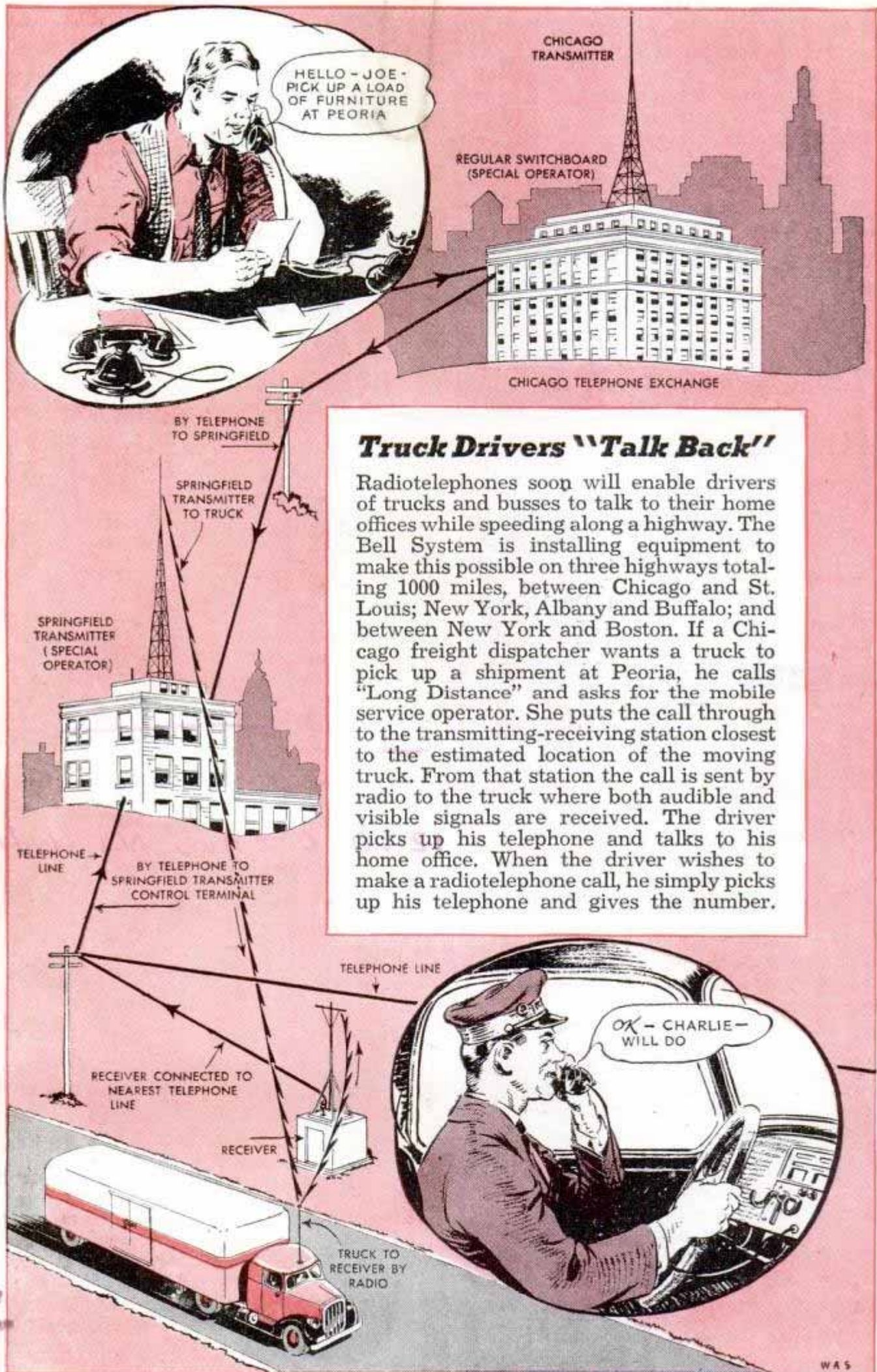
Fins on Pipe Carry Off Heat To Give Cooler Smoke



Stainless steel bowl, dural body and rubber mouthpiece are combined in a new one-ounce pipe which requires no breaking in because of the construction of the bowl, according to the maker. Fins on the pipe serve to dissipate heat and provide a cooler smoke. The stainless steel bowl is cooled so that tobacco cake is not formed under normal smoking conditions.

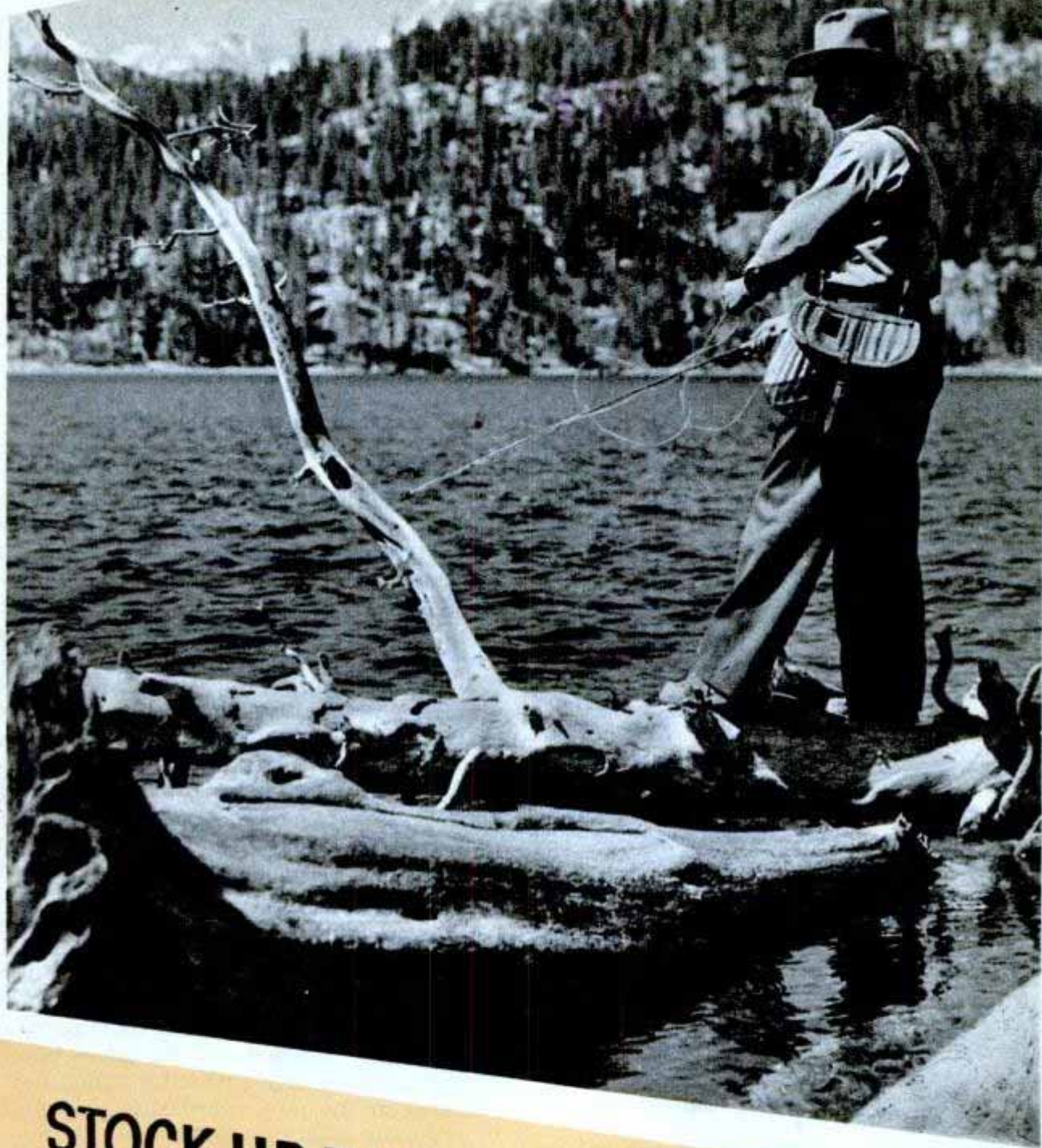
By Benny McLoone and
40990 Melrose ave
Los Angeles 27, Calif.

M.A. R.R. LASHBROOK
NEWS PAPER



Truck Drivers "Talk Back"

Radiotelephones soon will enable drivers of trucks and busses to talk to their home offices while speeding along a highway. The Bell System is installing equipment to make this possible on three highways totaling 1000 miles, between Chicago and St. Louis; New York, Albany and Buffalo; and between New York and Boston. If a Chicago freight dispatcher wants a truck to pick up a shipment at Peoria, he calls "Long Distance" and asks for the mobile service operator. She puts the call through to the transmitting-receiving station closest to the estimated location of the moving truck. From that station the call is sent by radio to the truck where both audible and visible signals are received. The driver picks up his telephone and talks to his home office. When the driver wishes to make a radiotelephone call, he simply picks up his telephone and gives the number.



STOCK UP FOR THE *Outdoors*

There's a happy hunting ground
in bulging Army surplus stores

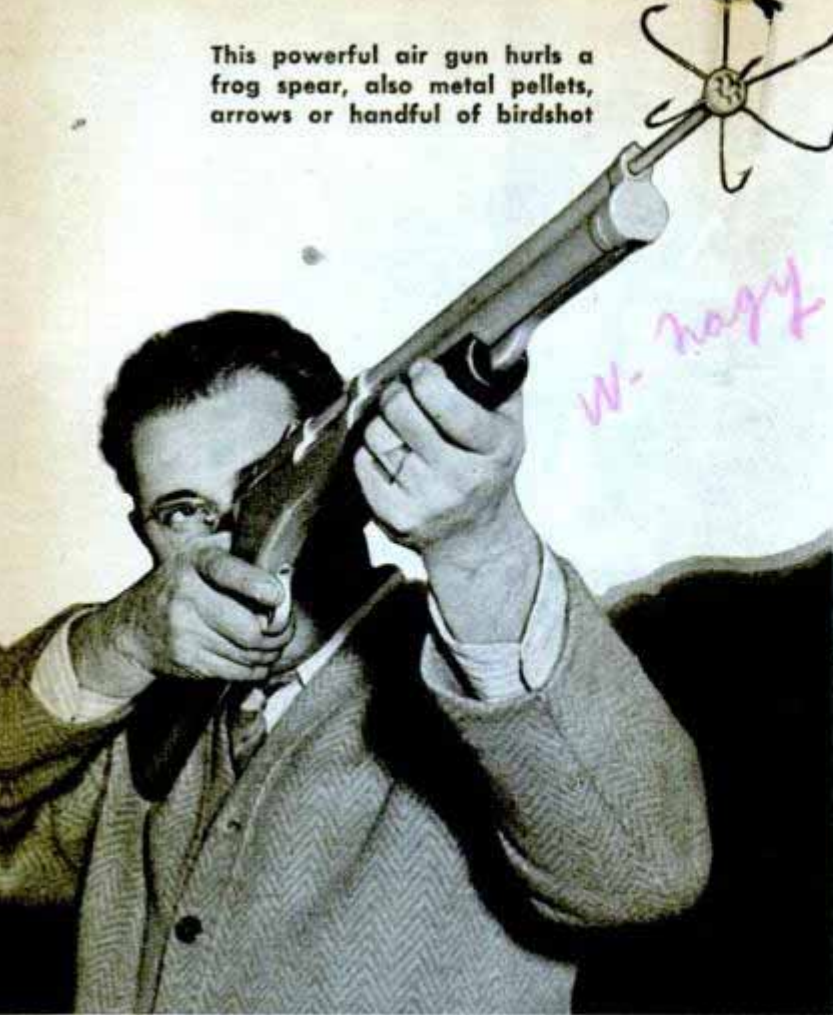
ELECTRIC gunsights, "pocket" cook-stoves, lightweight nylon tents and sleeping bags, and a hundred and one other new pieces of equipment will be available this year for your hunting, fishing and camping trips.

Lightness and compactness, based on military experience in the field, will be

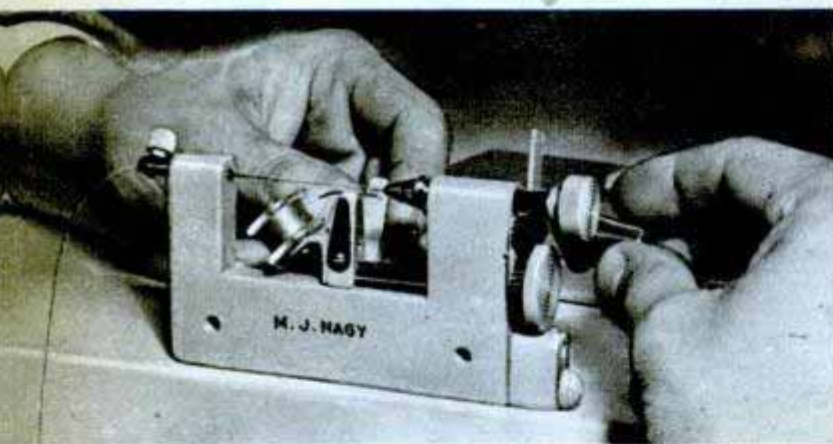
featured in nearly all of the equipment.

Surplus Army material that is ideal for the out-of-doors also is coming on the market. Some sportsmen have outfitted themselves almost entirely from surplus material and use a four-wheel-drive jeep to carry them over rough trails to a distant lake where they inflate a two-man rubber

This powerful air gun hurls a frog spear, also metal pellets, arrows or handful of birdshot



Resembling a specially built lathe, tiny apparatus below is for attaching gut leaders to trout hooks



Flexible plug-casting rod was made of radio antenna from naval craft; other parts are also war surplus



life raft for fishing trips. Wearing paratrooper boots and other GI clothing, they cook and eat with ex-Army utensils that include an Army Coleman stove almost small enough to put in your pocket. It makes a hot flame from any kind of gasoline. Surplus insecticide bombs dispel mosquitoes and walkie-talkies provide communication facilities.

Two new gunsights that are based on the electric gunsights used by fighter pilots are taking much of the guesswork out of aiming a gun. With such a device there is no need to line up the front and rear sights; you simply point at the target and pull the trigger.

The Giese electric gunsight consists of a small optical case, with self-contained batteries, that mounts over the breach of the gun. When you aim through the sight you observe a small central illuminated dot, surrounded by an illuminated ring. The dot represents the exact spot at which the gun is pointed. Provided that you have made the proper range and windage corrections, your bullet will hit that part of the target covered by the dot. The alignment is such that the dot and ring are invisible unless your head is in proper position behind the gun.

A shotgun model operates similarly except that the central illuminated dot is replaced by an inner illuminated ring. The inner ring represents your shot pattern at 40 yards and the outer illuminated circle represents a five-yard lead against ducks at normal ranges. Both models have a built-in adjustable Polaroid filter that permits aiming into the sun without squinting.

Another sight, the Nydar shotgun sight, uses the reflection of sky light to illuminate its optical aiming dot and ring.

Based on research that was performed during the war, most kinds of sporting rifles now can be "hopped up" for more power and muzzle velocity without making major changes in the gun, increasing its weight or reducing safety factors.

The process is called "controlled combustion chambrage" and consists of reshaping the cartridges to provide sharper angles at the neck and reshaping the cartridge chamber of the gun to fit the changed shells. The purpose is to convert the neck of the shell into a true venturi orifice, allowing the hot powder gases to escape with less resistance and deliver a stronger and more sustained push to the bullet. Standard factory powder loads may be used or the cartridges may be overloaded with safety for even greater power. Increases in energy up to 92 percent at 300 yards are obtained. Average cost of converting a gun is \$25.

A new air gun, designed primarily for

public shooting gallery use, is "powered" by dry ice or carbon dioxide gas, the pressure being supplied by means of a rubber hose attached to the gun. The gun discharges a .24-caliber round lead pellet that has a range and penetration comparable to that of a .22 short.

Newly designed rowboats made of various plastic compounds are being readied for distribution. One aircraft manufacturer is producing an aluminum canoe that weighs only 38 pounds while another aircraft concern is building molded plastic canoes that come apart into six pieces for storing in a car.

Salt and freshwater fishermen will have their choice of a wide variety of new lures and baits. One novel fishing attachment that is said to be worth its weight in gold is a small polished brass or chrome streamline "attractor" that is bent to fit over the curved portion of a hook. Available in various sizes, the attractors are for hooks used with plugs or spoons or for any other hook to which bait is not attached. Simple and inexpensive, the bit of bright metal attracts the attention of a fish and causes it to strike directly at the hook itself instead of at the lure.

One manufacturer is turning out a plug-casting rod made from a small surplus Navy radio antenna, with a natural-grip handle cast from secondary

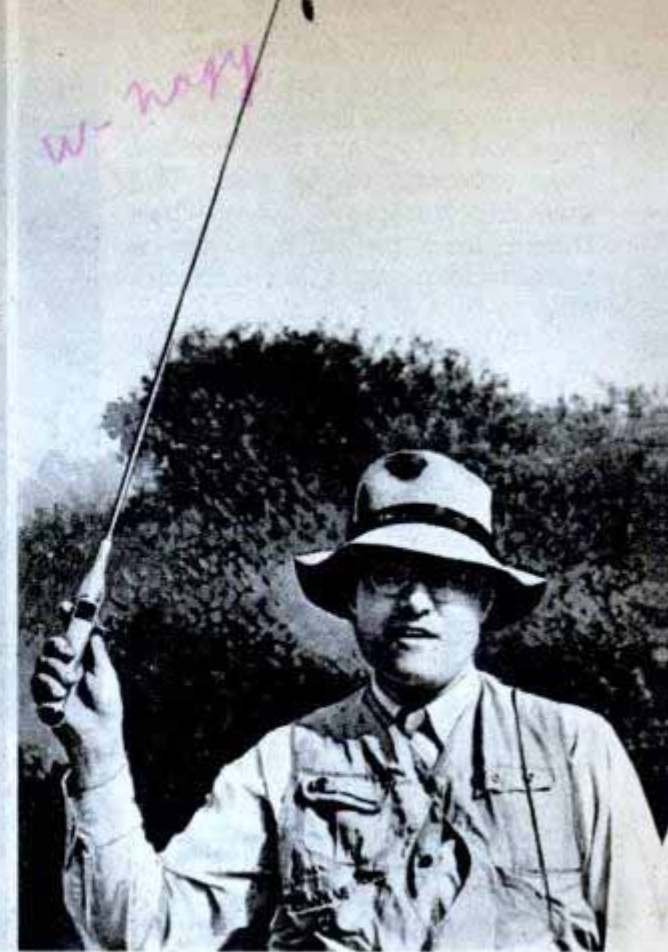
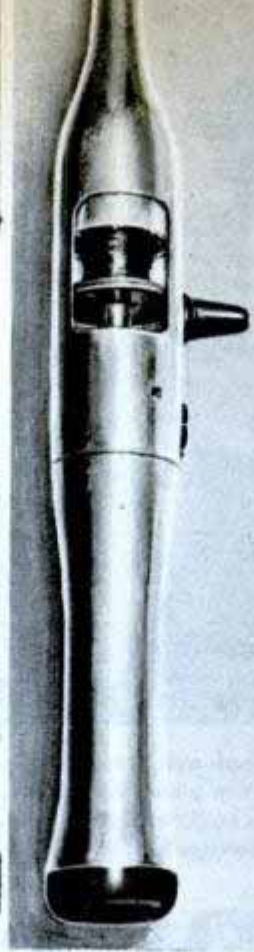


Waterproof nylon tent designed for Quartermaster Corps has air vents at top which keep out rain and snow. Ideal for sportsmen, the complete outfit including poles and stakes weighs only seven pounds. Below, collapsible barbecue grill folds to convenient size for trail



"Pocket" cookstove made for GIs is handy for camping; at right, pickaback creel has trap doors on top





Grids on portable grill can be adjusted for broiling. Close-up (center) is of "spinning" reel inside handle of unique rod; reel does not turn and in casting (shown at right) the line pulls away from it with a minimum of drag

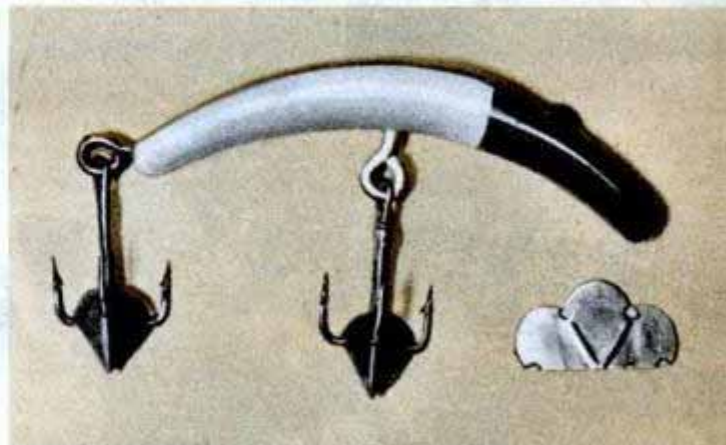
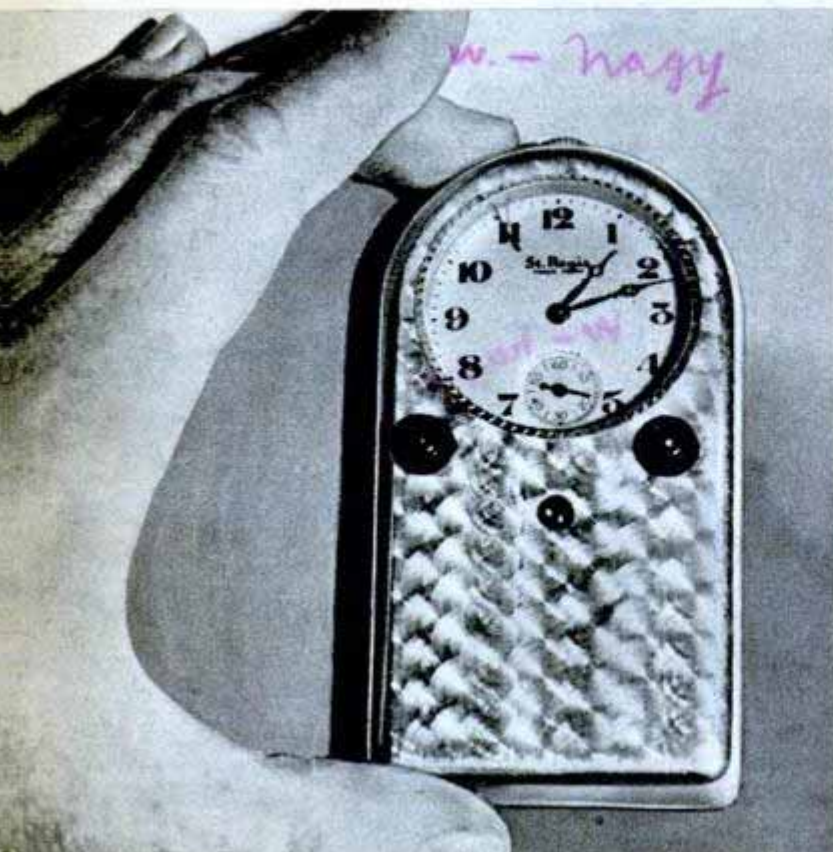
aircraft aluminum, and fitted with a reel stamped from leftover sheet metal. Some manufacturers, too, are experimenting with hollow plastic fishing rods that are light in weight and seem to have very good action.

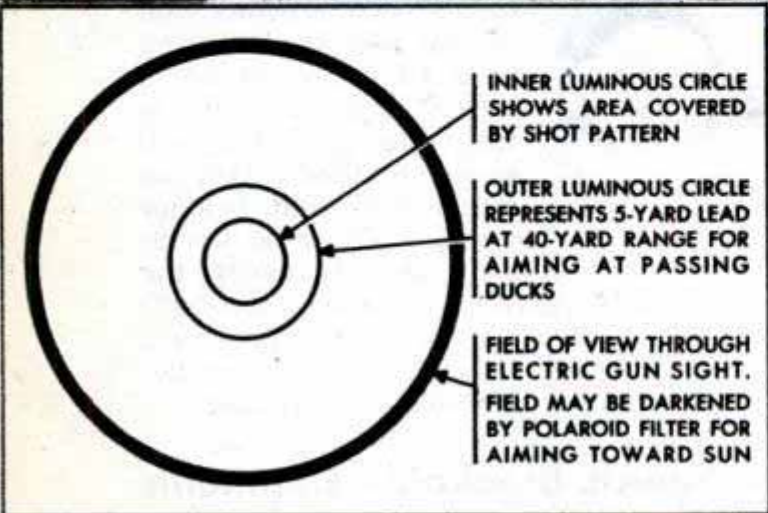
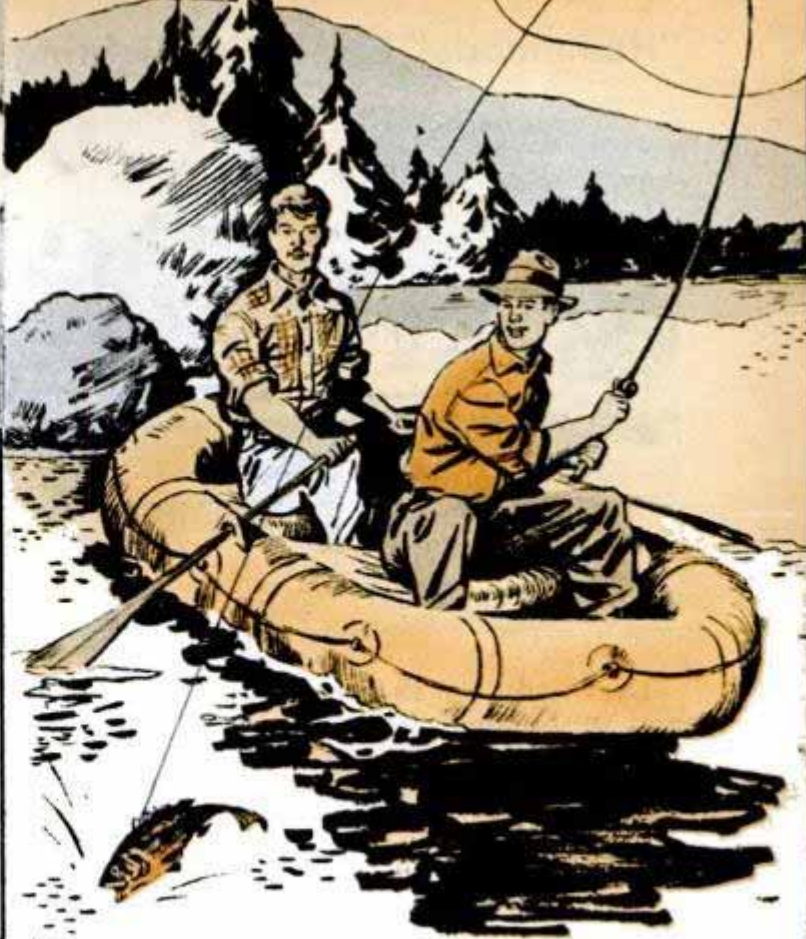
Not yet in production but possibly available soon are a number of special pieces of equipment invented by Mike Nagy and Tom Willoughby, two Northrop Aircraft engineers. In their spare time during the

war the two men built numerous camping and fishing gadgets for their own use, then found that all their friends wanted samples for themselves. Now they have applied for patent protection on the devices and are getting ready to manufacture them.

Of their various fishing reels, one bantam is made of duralumin and weighs only two ounces although it carries enough line for ordinary fly casting. Another lightweight fly reel has an adjustable drag in addition to the usual click drag. A third, designed for a soldier friend who lost all but one finger of his right hand, employs an indented cup in place of the usual handle for reeling in line. The reel may be turned by the motion of one fingertip. Other fish-

Combination watch, alarm clock and flashlight fits pocket. Below, metal attractors cause strike at hook





Electric gunsight mounted on hunting rifle is adaptable to shotguns. Right, fishing from inflatable life raft

ermen also like the reel because there is no projecting handle to catch in the clothes or rap the knuckles.

Still another reel is of the stationary spinning type which is entirely housed inside the handle of a lightweight plug-casting rod. The line is threaded through the hollow rod to the tip, eliminating the usual outside guides. Advantages of the spinning reel are that it does not rotate and that its axis is the same as that of the rod. Line slips off the reel with a minimum of drag and all chance of backlash is avoided. Line is recovered and replaced on the spool by means of a winding device operated by a small handle on the side of the rod. Basically an old English idea, the new design represents several improvements over past models.

Irritated by the conventional fishing creel that bangs against your side and snags in the brush, the two engineers devised a 15-ounce creel that you carry on your back between your shoulders. The creel has cloth sides and a ventilated duralumin top with a double spring-loaded trap door through which fish are dropped. The cloth that rests against your back is waterproofed and the whole creel collapses into a package four inches thick for storage. The top is quickly detachable for removing fish.

The creel is held in place by two thermo-setting plastic straps that hook over your shoulders. Soft and pliable when he re-

ceives them, the fisherman molds these straps to the contours of his shoulders and then places the straps in the sun for an hour or so. Heat of the sun hardens the straps, providing a permanent individual fit.

After experiencing the usual difficulties of cooking food in the thin air of high altitudes and not desiring to carry a large pressure cooker on his camping trips, Nagy built his own, a tube-shaped one-quart capacity cooker of stainless steel with a new type of positive safety valve. Small enough to be carried in a pocket, it may be used on a cabin stove or even placed upright in the coals of a campfire. It cuts the cooking time of food at high altitude to a fraction of the usual time. Packed in a thermal case, it can serve as a vacuum jug for carrying hot or cold liquids on trips.

Another device that the two engineers built for themselves is a combination watch, alarm clock and flashlight. They soon were swamped with orders for this item. The glass face of the watch contains an inside trigger and this face may be rotated so that the trigger will engage the hour hand at the time the alarm is desired. The alarm itself is a penetrating whine that is audible to a person who sleeps with the watch under his pillow and yet does not disturb people a few feet away. Two batteries inside the case illuminate the watch dial and also supply light for odd jobs in the

(Continued to page 260)

"Homemade" Forest-Fire Fighting Plow Does Work of 20-30 Men

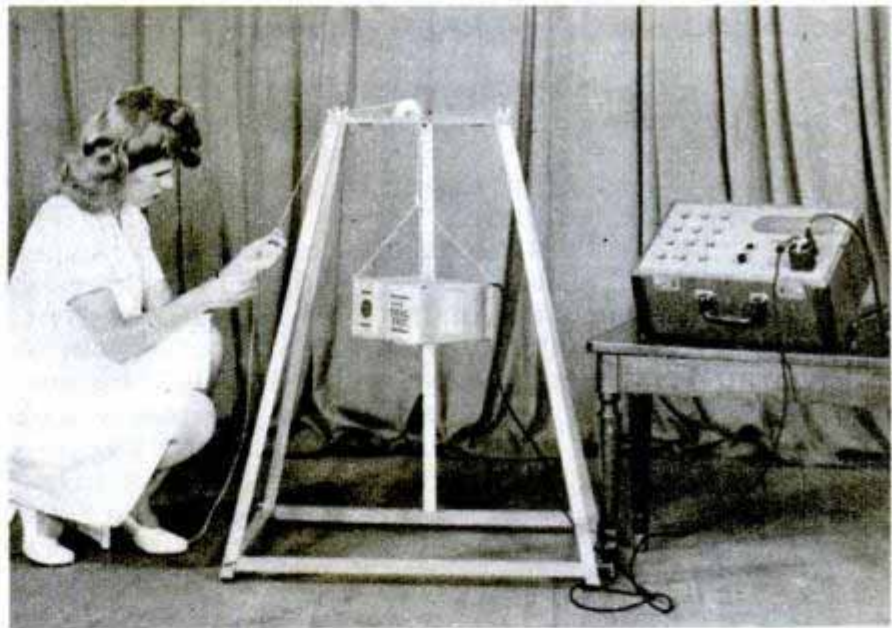


Drawn by an 18-horsepower tractor, a new firefighting plow is doing the work of 20 to 30 men with hand tools in clearing fire lines in southeastern forests. The device, "homemade" by Forest Service me-

chanics and drawn by a light caterpillar-type tractor, includes a stout beam with a heavy rolling coulter and a plow of the middle-buster or two-way type that turns a clear furrow 28 inches wide. Disks and wings spread the loosened soil to cover forest litter on either side of the furrow, resulting in a fire line 48 to 54 inches wide. Plowing a wide furrow is a well known method of fighting forest fires and heavier units, of 35 or 50 horsepower, have been in use. However, the lighter unit, carried on a one-and-a-half-ton truck with a crew of three or four men, often can reach and subdue the blaze before heavier equipment can get rolling.

"Cushion-Meter" Test for Packages Protects Breakable Shipments

How much cushioning will a breakable article packed for shipment need? That's a question answered by a handy meter that eliminates the need of shipping test packages. A detector head, weighing half a pound, is packed into a package with cushioning. This head is connected with an indicator instrument. When the mockup package is dropped, neon lamps indicate the amount of shock sustained by the package. They continue to glow until a reset button is pressed, allowing the operator to concentrate on the package instead of the light panel. The unit fits into a case 16½ by 11 by 19 inches and weighs only 17 pounds.



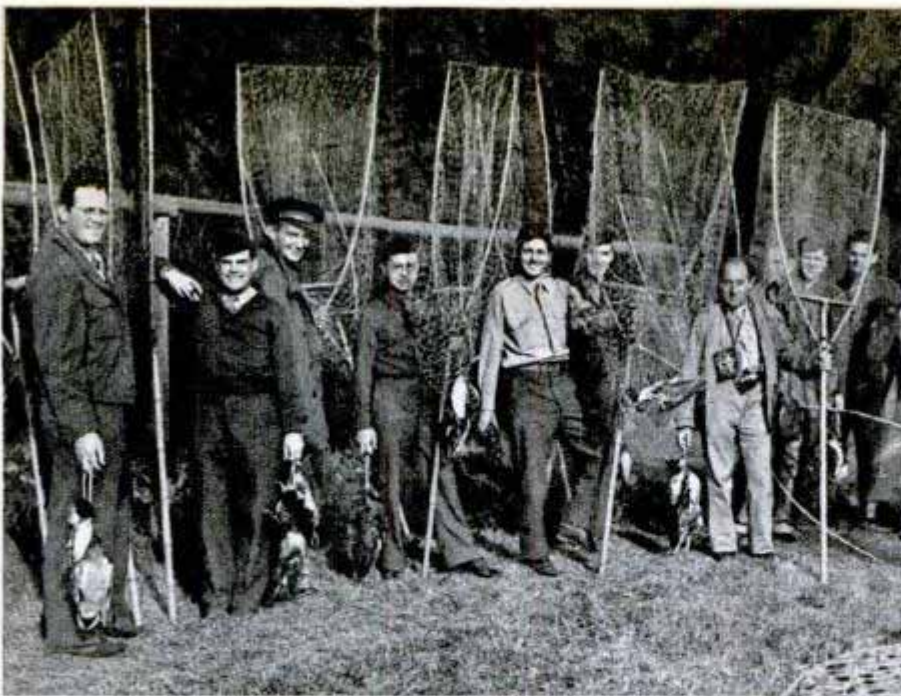
base and stem and a spiral steel needle which goes through small openings. Rubber cement applied to the stem and casing hole serves as a lubricant. A pull from a pair of pliers thins out the rubber stem to the desired diameter and enables it to slip through. The stem, released when the wire pulls off, shortens and spreads against the walls of the hole. Finally, the protruding rubber is snipped off an eighth of an inch from the casing tread or sidewall.

Blowout-Proof Rubber Rivet for Tires



Nail holes in tire casings can be plugged by rubber rivets, available in three sizes, which prevent water and slush from entering. The blowout-proof rivet consists of a rubber

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois



**"Butterfly" Nets Capture Ducks
At Japanese-Style Hunt**



Duck hunters in Japan must be dextrous because the Japanese way of taking the fowl is to capture them in long "butterfly" nets rather than shoot them. Assistance of

beaters is required also. The hunters hide behind screens on either side of narrow canals running from the central duck pond. As beaters flush the birds from the canal the hunters leap from behind the screens and attempt to snare the fast-flying ducks in their nets. Recently American newspaper and radio correspondents stationed in Japan tried Japanese-style duck hunting at the Imperial preserve near Tokyo and caught 50. The ducks were cooked for them by servants of the Imperial household.

Chemically Lined Tube Absorbs Oxygen From Air as Human Does

Imitating the human body's method, a new process obtains oxygen from the air for industrial use where regular supplies are not available. Air is blown through a tube lined with a specially compounded chemical which absorbs oxygen. When the absorption reaches its maximum, the air flow is halted. Oxygen is released when the tube is heated. The oxygen then is pumped into storage tanks and the pro-

cedure repeated. The chemical belongs to a group of compounds called chelates, organic substances having atoms of metal attached to them. In this case the metal is cobalt while in the blood it is iron. The metals greatly increase the oxygen-attracting power of blood and other organic compounds. The process was conceived while researchers were looking for something to indicate oxygen changes in submarines.

Mudslingers

By Richard W. Emery

Photos by Ray Chapin

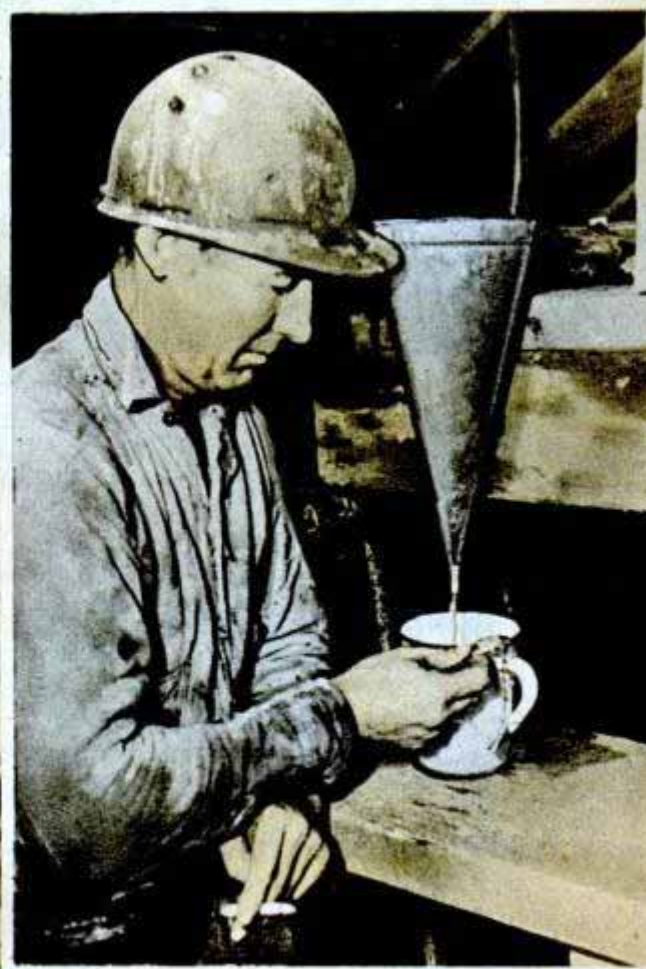
IF it weren't for mud, you very likely wouldn't be driving an automobile. Gasoline would cost too much.

Mud makes rotary drilling possible. And rotary drilling reaches the deep oil pools, which produce petroleum in such abundance that gasoline costs you little.

When a rotary drilling rig thrusts a spinning steel tube down through thousands of feet of the earth's crust, mud serves as a circulating fluid. It is the life blood of the drilling well.

Only within the past few years, America's oil industry has worked out methods of chemically controlling

Left, mud from well flows through open sluiceways where it drops its sand. Below, derrickman funnels a sample of mud to test its viscosity



Bring Up Oil

certain physical properties of drilling mud.

In the early years of rotary drilling, any old gumbo would do. Cave-ins, blow-outs, gassers, fires and explosions were looked upon as part of the business. Rotary drills dug faster and reached deeper than the century-old cable-tool devices. Drillers found their problems multiplied with depth of hole. They found also that all mud was not alike; that mud was subject to mysterious sudden transformations. For no apparent reason, it would change from thick to thin, from thin to thick, or suddenly give up its water content, flooding the walls of the bore and causing cave-ins.

Here and there inquisitive men went to work to find out why mud behaved so strangely and what could be done about it.

Researchers, however, found that many a field man would have none of their puttering with his mud system.

Heckled and handicapped, the researchers at times "went underground" to try laboratory-proved theories on actual drilling operations. One chemical engineer

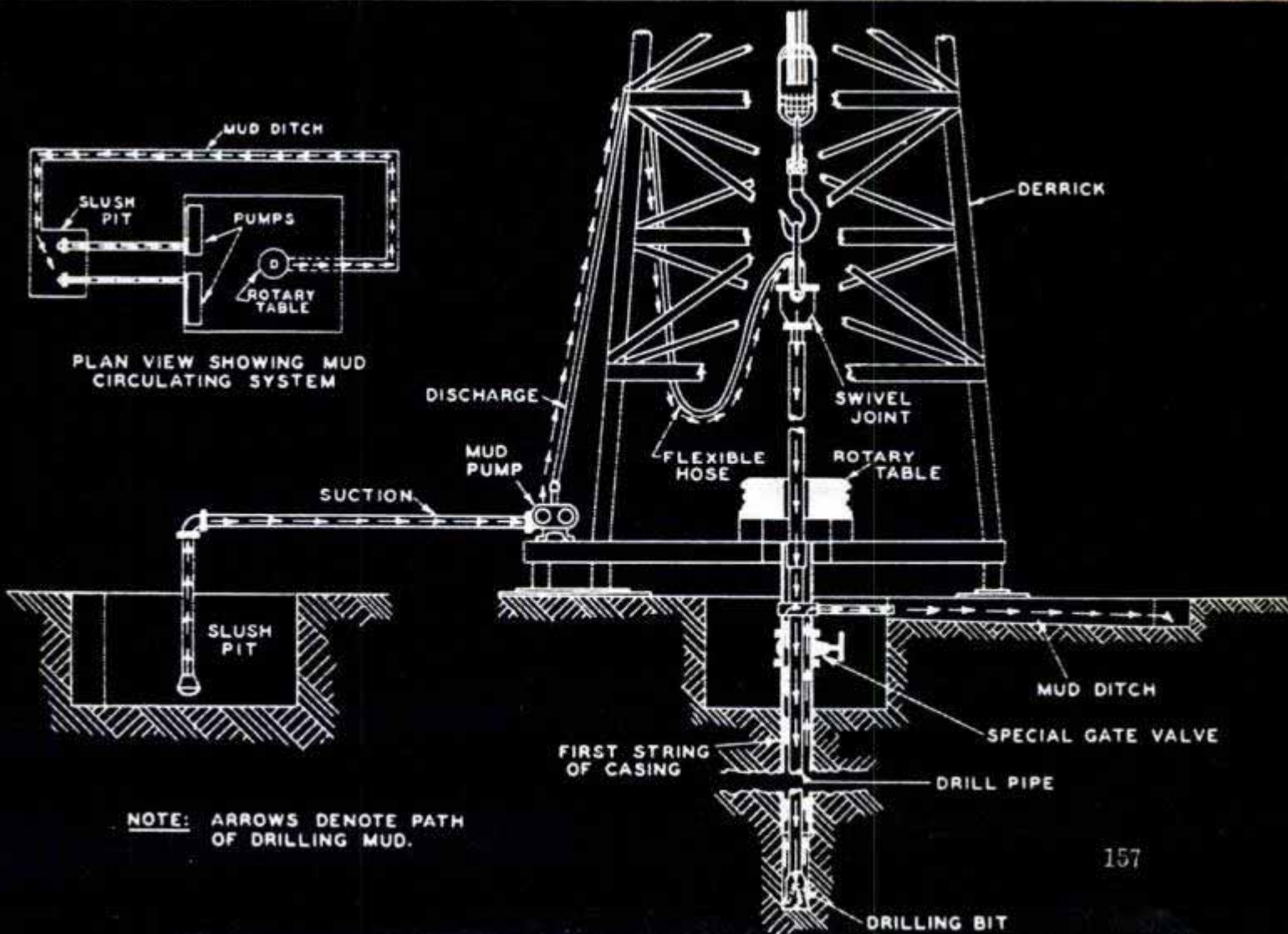
gave the field test to a laboratory process—now accepted as standard—by sneaking up to a drilling well near Ventura on California's coast line one night and pouring a bucketful of chemical into the mud pit.

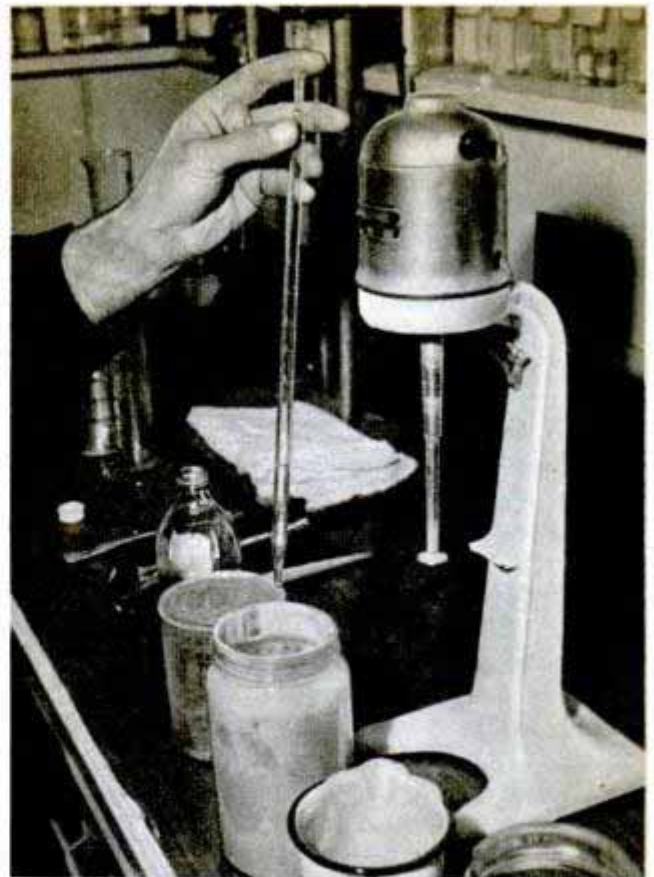
Drilling an oil well through thousands of feet of the earth's crust is an engineering project where man's wits and labor are pitted against high-pressure gas pockets, underground rivers of hot water and thirsty layers of shale that swell when wet and "heave" like tidal waves.

After a geologist has "located" the drilling site, rig builders erect a tall derrick of timbers or steel. Machinery for pumping mud and for rotating and handling drill pipe is installed. The crew "spuds in" the new well. The rotating drill pipe, armed with a cutting tool or bit, sinks rapidly into the ground. When the drill has bored to a depth somewhat less than the height of the derrick, "roughnecks" attach another length or "stand" of pipe to the upper end of the drill pipe and drilling resumes.

In an oversized mayonnaise mixing basin

Diagram shows circulation of the mud around a rotary drill. Note the mud channel around the two pumps. Diagram from Pure Oil Co.





Colloidal material picked up in the underground bore has thickened this mud (left). The mud engineer can reduce its viscosity by adding a few drops of complex or poly phosphates to the sample as shown at right

called the mud pit, dry commercial rotary clays are jetted with water, a process called mud-gunning. When the resulting soupy mud is approved by the well's mud man, it is pumped into the drill pipe through a flexible high-pressure hose. If the well drills to great depth—say 14,000 feet—it will have 1500 barrels of mud in circulation. That's around 125 tons.

Under high pressure, the mud descends inside the drill pipe to the bit. There the liquid spurts out through holes close to the cutters, cooling and cleaning the blades or teeth. Scooping up cuttings as it goes, the mud then starts its climb between the outside of the pipe and the walls of the hole.

On reaching the surface the mud spills into a sluiceway, passes through a shaker screen which removes the cuttings, flows along a settling ditch where it drops its fine sand, and empties into a mud pit, soon to be picked up by the pumps for another round trip. The same mud is used over and over, and the supply is kept up by adding dry clay and water.

Primarily, the job of the drilling fluid is to cool the bit and wash cuttings from the hole. But it has many additional jobs.

Every few hours, the crew must remove the bit, which becomes worn from grinding against rock and sand. Stand by stand, the drill pipe is hoisted and racked in the derrick. A new bit is put on. Then, stand by stand, the drill pipe goes back into the hole.

The delay runs into several hours. A vital function of the mud is to support walls of the hole during this interval and keep in suspension the cuttings it has lifted.

To be able to suspend heavy particles, mud must have the colloidal characteristic of "setting" or gelatinizing when motionless. But it must not "gel" to the point where the pumps can't re-establish circulation. Laboratory tests determine a mud's "gel" rate. By chemical treatment, the rate can be regulated. Concentrated colloidal material such as bentonite, an aluminum silicate, increases the rate. Complex or poly phosphates thin the mud.

While drilling is going on, mud must lubricate the bore but must not plaster the walls of the bore too thickly with clay.

Mud must seal off porous sands but must not soak into the sand and cause a cave-in. It must wall off loose layers of rock or gravel but not plug formations which might produce oil. By its weight it must hold down gas or water or oil which may try to push into the hole and "blow out" the well, but the mud must not push out into loose strata of shale and start them "heaving."

Without chemistry, making rotary mud do all those things is a hit-or-miss effort.

Engineers who specialize in drilling fluids are called mud engineers. A typical member of that relatively new profession is Fred L. Walker, Monrovia, Calif., who demonstrated the laboratory tests shown.



Left, testing for acidity or alkalinity of the fluid. Right, tank drips chemicals into the mud circulation system

Each test reveals some characteristic of a sample of mud—its density, sand content, viscosity, rate of “setting” or gelatinizing, its degree of acidity or alkalinity, its salt content, its water-retaining properties and its degree of wall-building.

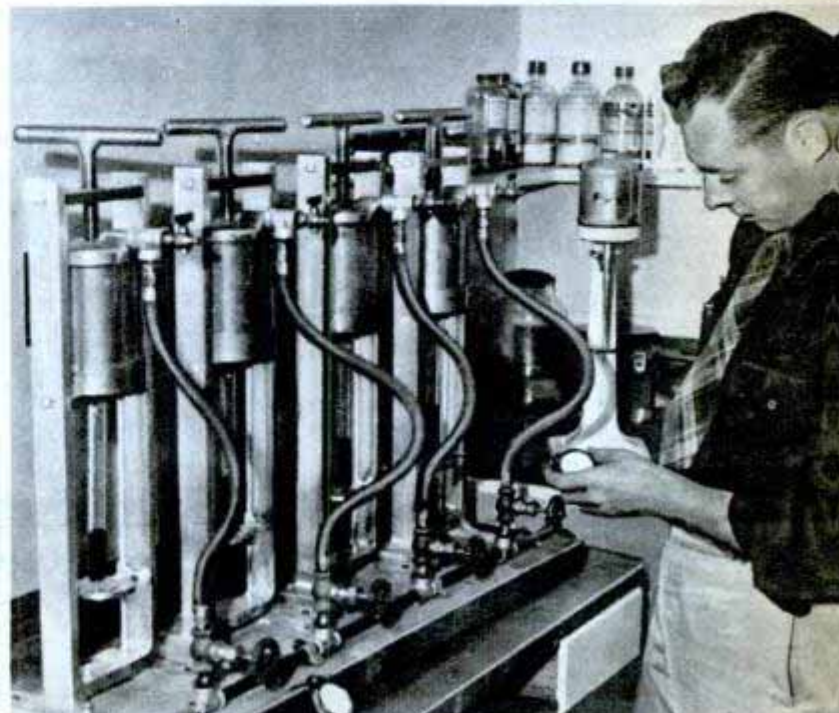
Hourly tests of viscosity and weight are made at the well. Once every shift or “tower,” there is a test for sand content and water-retaining property. Sudden changes in the mud are the first symptoms of trouble brewing deep in the earth.

For example, the toolpusher—drilling

superintendent—gets word from the mud man that mud returning from the hole is frothy and smells of natural gas. Somewhere in the deep bore, gas under tremendous pressure is forcing its way into the hole and cutting the mud, causing it to lose weight. Only the weight of the mud restrains the gas. So, as the mud gets lighter because of the bubbles, the gas gains headway and may blow out the whole column of mud. The blow-out may destroy the derrick, ruin the hole and set the gas on fire.

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Left, mud's “gel” strength is checked by timing the sinking of an aluminum tube in a sample. Right, mud engineer tests under pressure the water-retaining property and cake-building rate of four samples of fluid



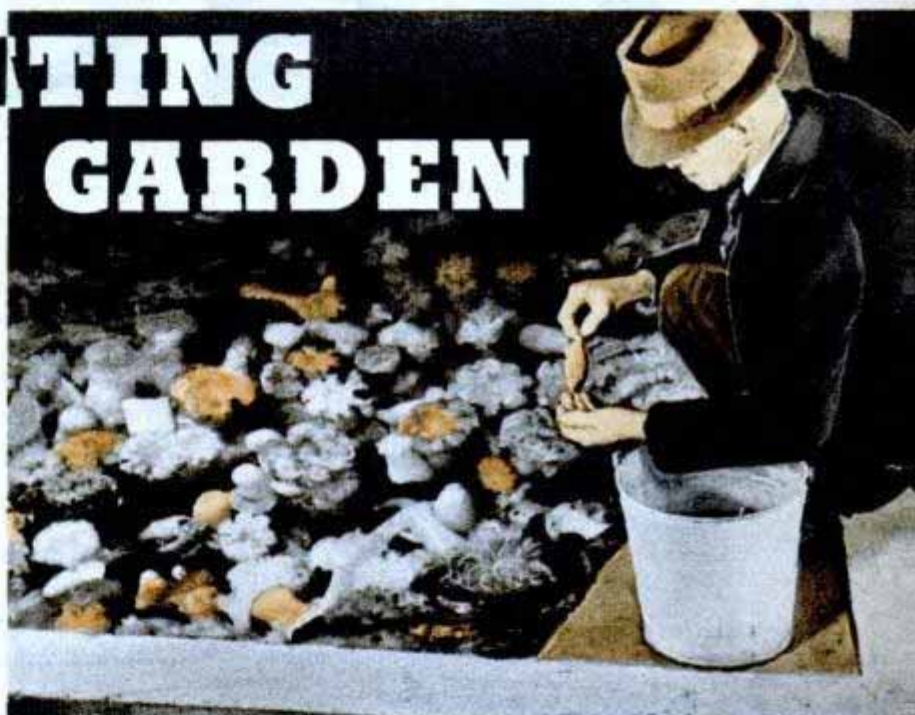


FISH-EATING

In marine garden above, delicate, flowerlike sea anemones look lovely. Their tentacles are death-trap for fish

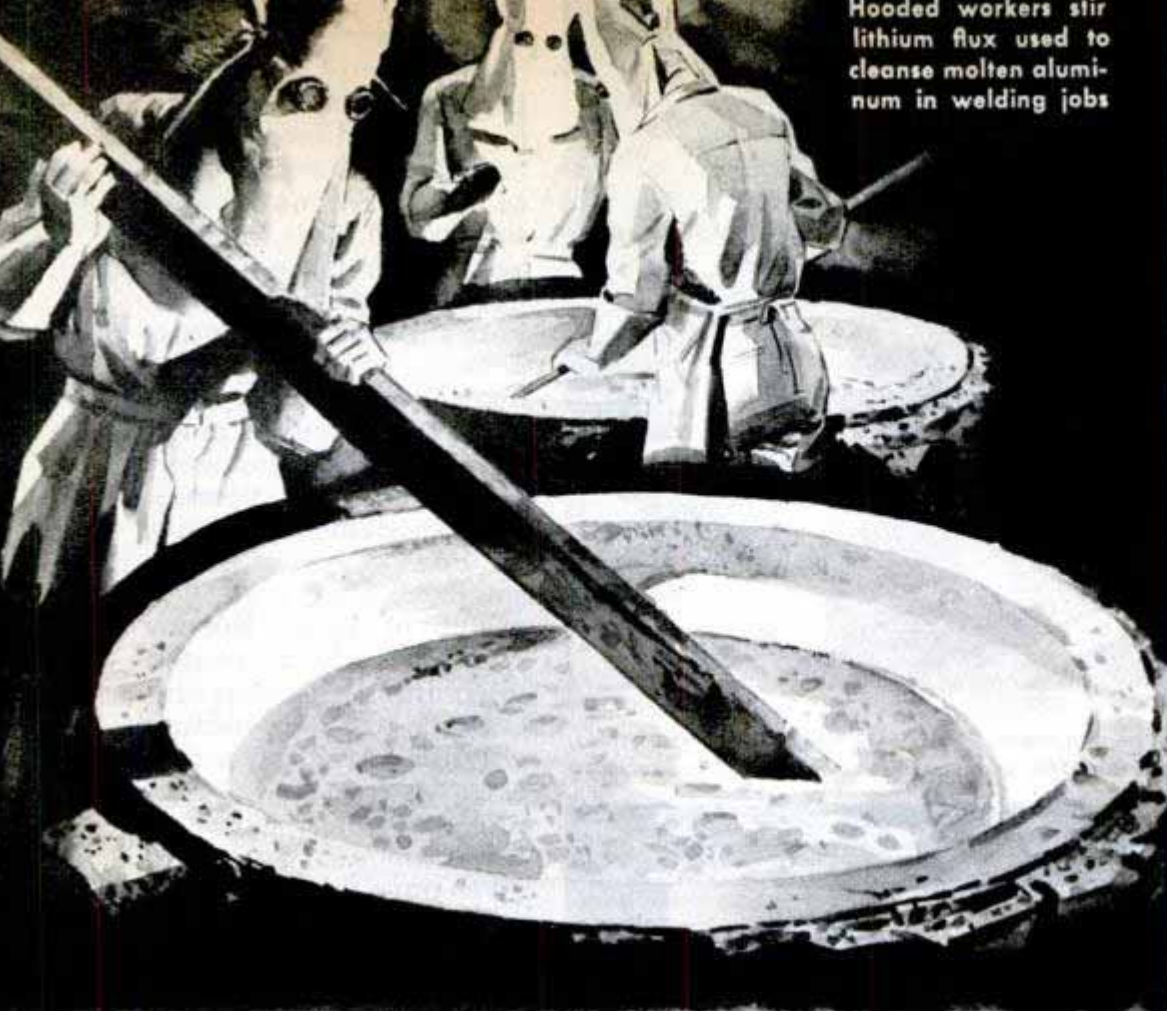
In tanks of ocean water, sea anemones live on all-fish diet. Right, feeding time for "flowers" of marine garden

Tentacles fold inward and maneuver a small fish, below, into head-down position. Soon it disappears completely



B RILLIANTLY colored in red, gold, blue and orange are the strange "flowers" in a fish-eating garden transplanted from the ocean depths to salt water tanks at Seaside, Oregon. There, George Smith grows sea anemones, ocean animals which look like flowers but which eat fish. The flowerlike appearance of the animal results from the gaily colored, feathery tentacles surrounding its mouth to belie its marine appearance. Fishermen bring Smith the sea anemones, which become ensnared in fishing nets many fathoms below the ocean surface. In "cultivating" his garden with a sea-food diet, Smith drops small fish into the center of the anemone, which quickly throws its tentacles around the food and folds it inward. Soon it disappears from view as it is drawn inside. Some time later the animal emits the fish bones. Occasionally, Smith will place 40 or 50 fish in the tank at one time. All of them are eaten in a few hours.





Hooded workers stir lithium flux used to cleanse molten aluminum in welding jobs

LITHIUM IS AT WORK



IN AERIAL BALLOONS

LITHIUM...the Hungry Metal

SOME metals, like gold, silver and platinum, have won fame as "noble" metals because they can't be touched by acids. Others, like iron, copper, aluminum and magnesium, are known as "use" metals since they are used in such huge quantities for building.

There is another classification of metals, just as important—the "servant" metals. They work just as hard as the "noble" and the "use" metals, only we seldom see them.

One of these metallic servants is lithium, the bantamweight. Pure lithium—you'll probably never see it outside of a laboratory—is the lightest of all metals. This soft metal, somewhat resembling silvery cheese, floats on gasoline, weighs 33 pounds a cubic foot. The same volume of magnesium weighs 108 pounds; aluminum, 176 pounds; iron, 490 pounds.

In spite of its lightness, you'll never split the breeze in a streamlined lithium plane. Lithium is weak and unstable. It can be cut with a knife; it tarnishes as soon as air strikes a freshly cut surface, and it decomposes in water almost instantly. Nevertheless, many uses have been found for compounds of lithium which depend on its chemical alacrity and the speed with which it grabs other elements such as oxygen and clings to them.

Lithium was discovered in 1817 by the Swedish chemist, August Arfvedson, but he was never able to isolate it in metallic form. This honor remained for Sir Humphrey Davy in 1818. Using an electric current, Davy decomposed lithium carbonate, obtaining small amounts of oxygen and lithium. Not until after the first World War were the difficulties involved in the separation processes overcome.

The United States has a world superiority in lithium supplies. One of our best sources is Searles Lake in California, a dry lake where evaporation has left huge deposits of chemical salts which are processed by the heavy chemical industries. One by-product of a

IN LUBRICANTS

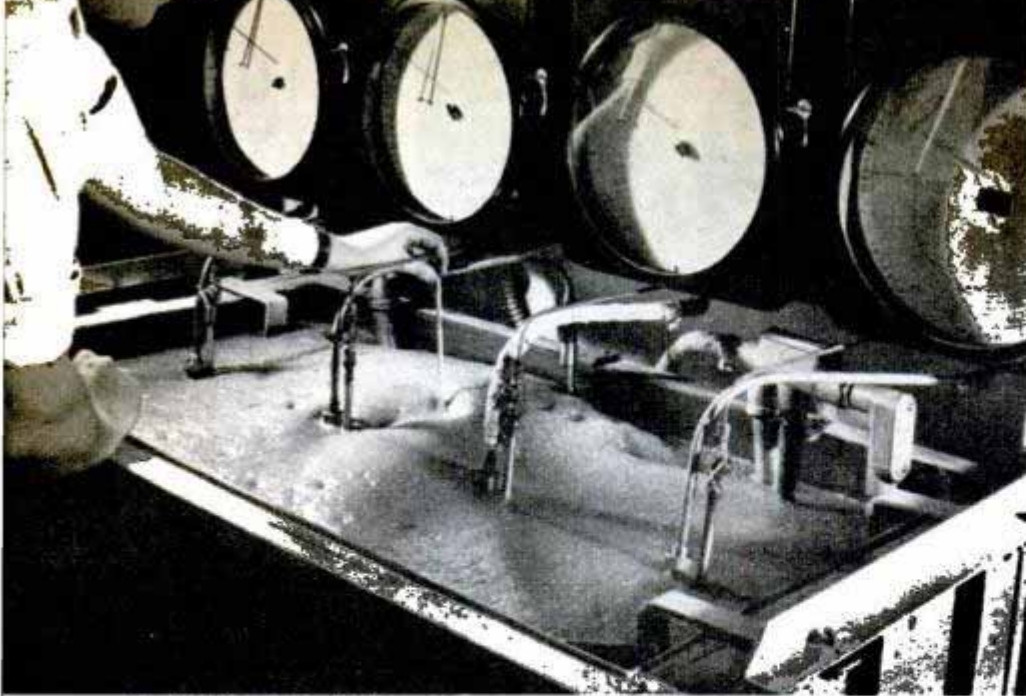


IN POTTERY MAKING



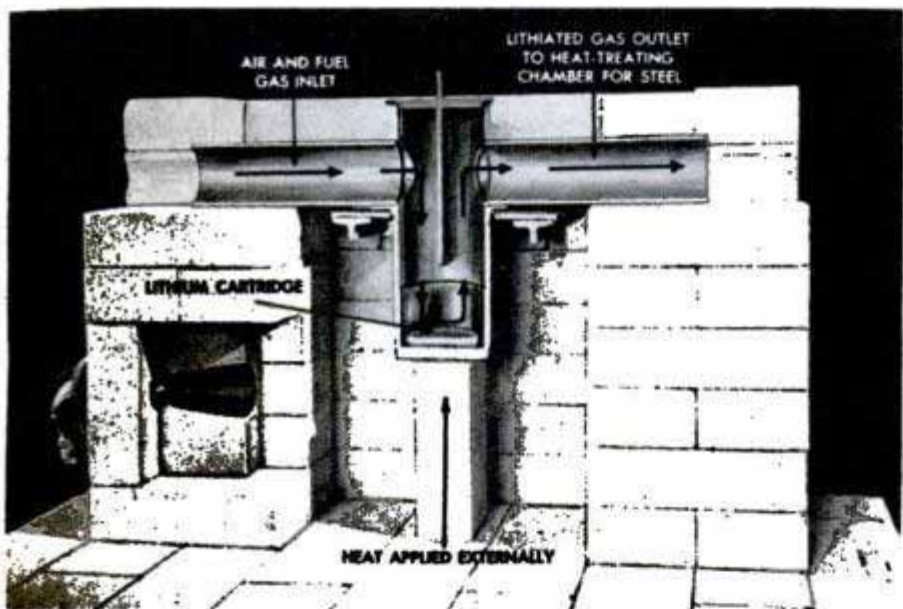
IN WELDING FLUX





Foot Mineral Co. photo

Soapy mixture in vat is lithium grease under test; widely used in aircraft, lubricant withstands heat from 140 degrees Fahrenheit to 67 below zero



Protective blanket of gas from lithium generator shown in cross-section guards heated steel parts from ravages of oxygen and water vapor. Below, pound of lithium hydride makes 40 cubic feet of gas to lift the aerial
Photo below by Lithalloys Corp.



certain processing operation contains 10 percent lithium. Spodumene, the most abundant lithium ore, contains a maximum of 3.89 percent of this light metal. It is found in South Dakota and North Carolina. In South Dakota's Black Hills, prospectors have uncovered huge spodumene crystals 47 feet long and as much as four feet in diameter, weighing 50,000 pounds. Most spodumene crystals, of course, are much smaller. Many are like grains of sand. Spodumene usually is heated with lime and calcium chloride to obtain lithium chloride. An electric current, passing through lithium chloride, separates the component parts and gives pure lithium.

This sounds much more simple and inexpensive than it really is. The price of lithium metal fluctuates between \$12.50 and \$20.00 a pound, but manufacturers are confident the not-distant future will see lithium selling at only \$5.00 a pound. Increasing demand for lithium has caused its production to jump seven-fold since 1930. Last year some 14,000 tons of lithium minerals and concentrates were used.

Here's one example of how a little lithium does a vast amount of work. One compound—lithium hydride—gives off hydrogen gas when brought in contact with water; a pound of lithium hydride liberates 45 cubic feet of gas—and that's how lithium helped in rescue work during the war. When a plane was downed at sea, a message from the portable radio set—the famous "Gibson Girl"—gave the crew a chance of being rescued. But the radio's aerial had to be held high aloft so that the signals could be heard.

The downed flier, on his raft, opened a can containing a pound of lithium hydride. He immersed this in sea water. Hydrogen, liberated from the hydride, poured into the balloon. A balloon filled with some 40 cubic feet of hydrogen easily lifted the 300 feet of copper aerial.

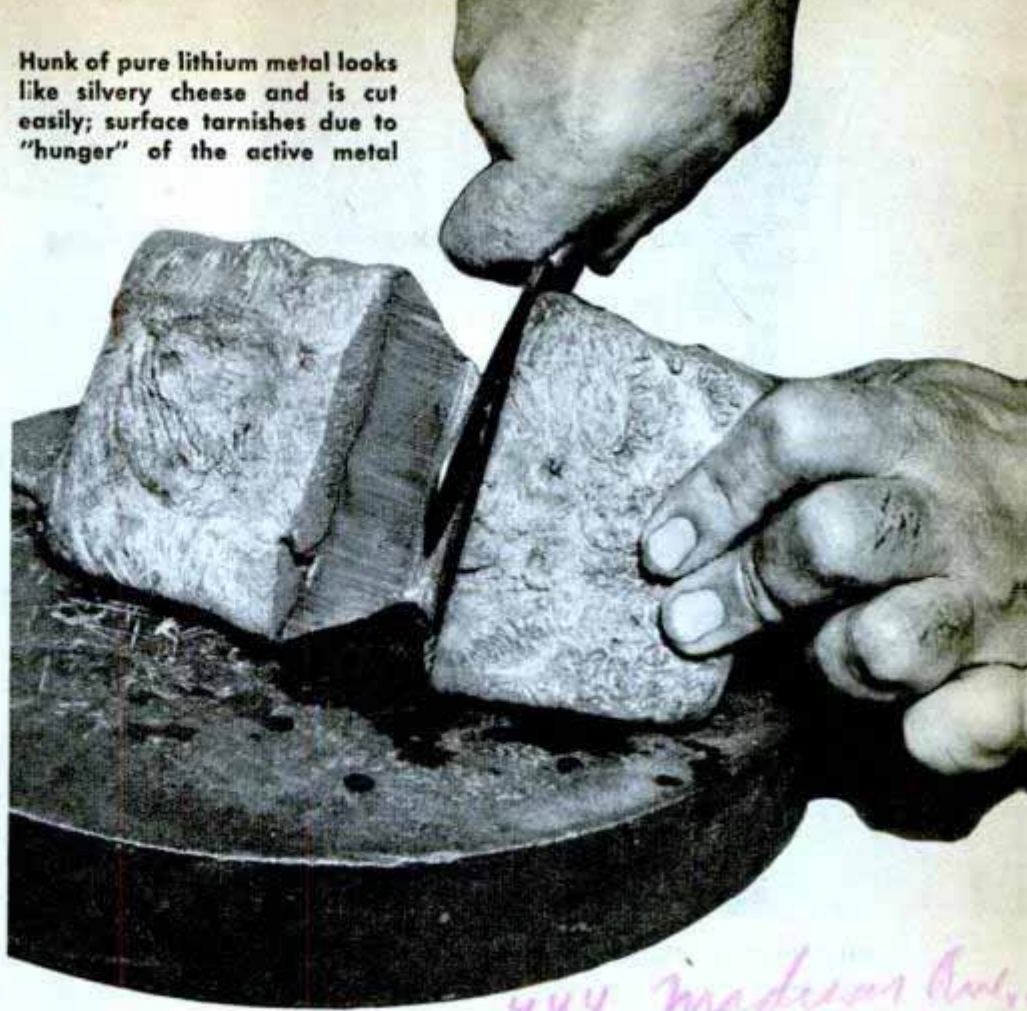
In metallurgy, one major use of lithium is as a super-refining agent that makes nonferrous alloy castings tougher and stronger. About one half ounce of the pure metal is enough to clean all gases, oxides, sulphides and other nonmetallic impurities out of a 200-pound melt of copper or bronze. The chunk of the "master alloy"—made up of two to 10 percent pure lithium and the remainder of metal to match the melt—is added to the molten metal a few moments before it is poured.

During those few moments, plenty happens. Lithium is so chemically active that it combines with almost any gas, taking that unwanted gas away from the melted metal. Then, because lithium is so light, the lithium compounds formed in the crucible or ladle of molten metal rise quickly to the surface where they are skimmed off. Thus lithium sweeps all impurities out of melted metal, making the metal cleaner and the grain finer.

One maker of metal parts for the Navy was getting an average tensile strength of 42,000 pounds per square inch in his castings. In an effort to turn out better work, he tried lithium and raised the tensile strength to 52,000 pounds per square inch. Another foundry man was averaging 25 percent "weepers" (rejected castings) because his castings were porous

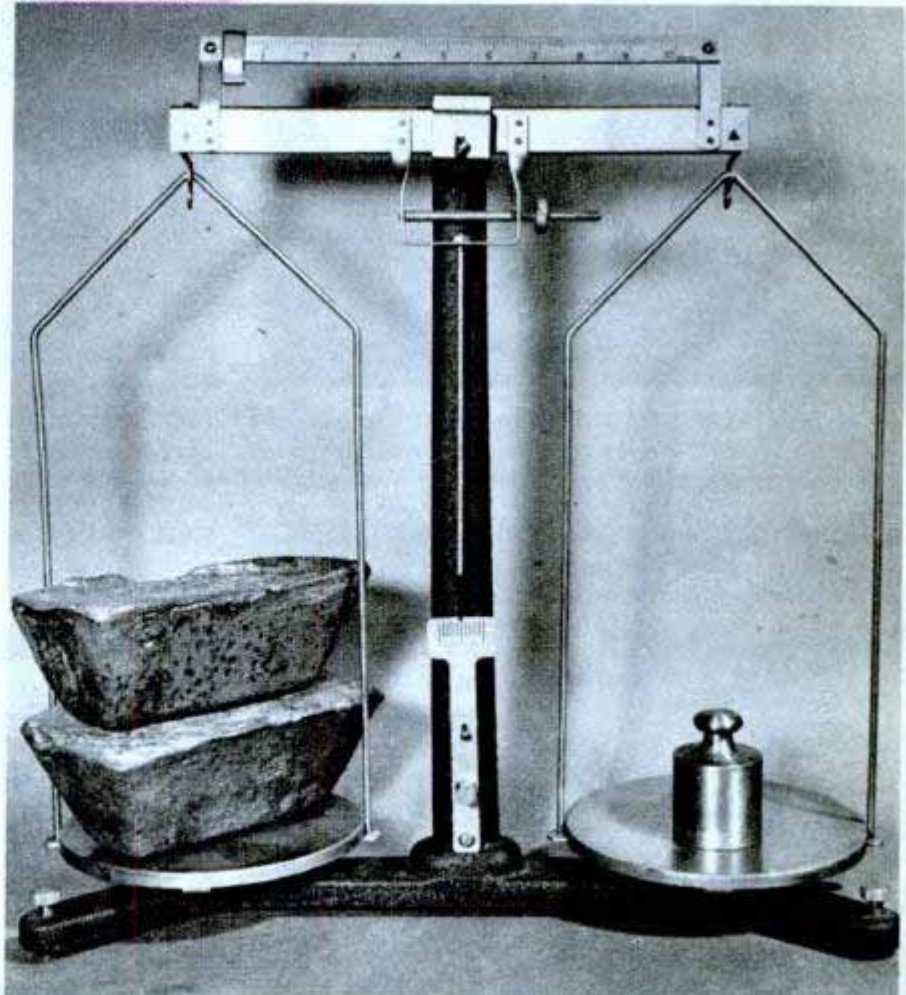
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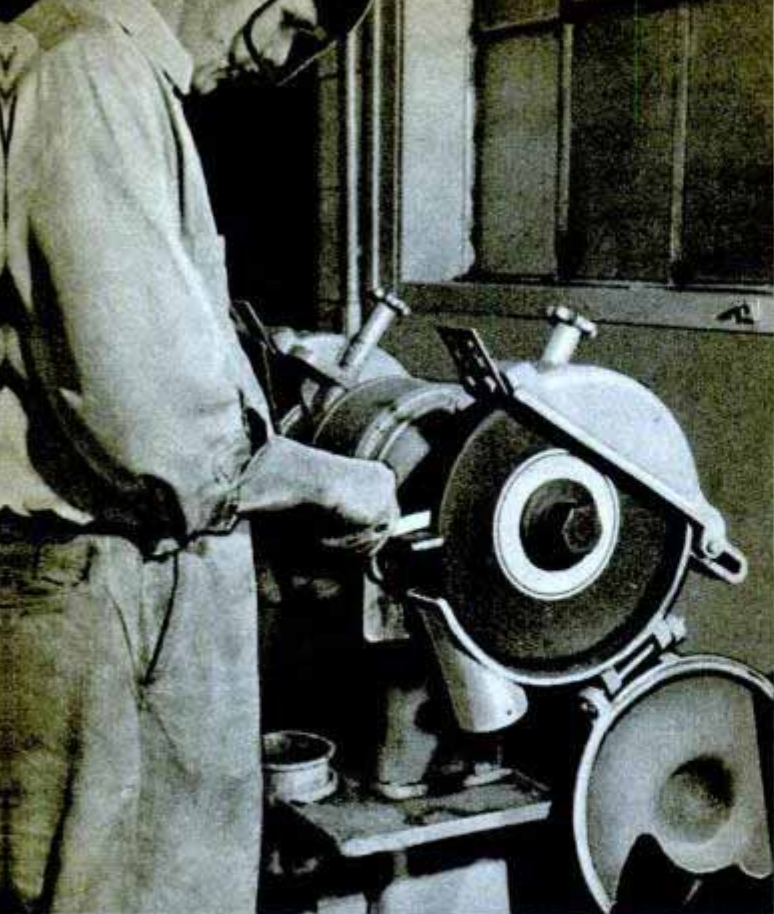
Hunk of pure lithium metal looks like silvery cheese and is cut easily; surface tarnishes due to "hunger" of the active metal



444 Madison Ave.
N.Y. 22, N.Y.

Super-lightweight lithium is 18 times lighter than brass; it floats on gasoline and is only one third as heavy as magnesium—the former light "champ"
Lithalloys Corp. photos





MULTIPURPOSE GRINDING WHEEL will cut cast iron, steel, brass, bronze and aluminum. The new wheel is made of grains of aluminum oxide and silicon carbide which are sealed together by a bond that is designed to produce a much cooler cutting surface

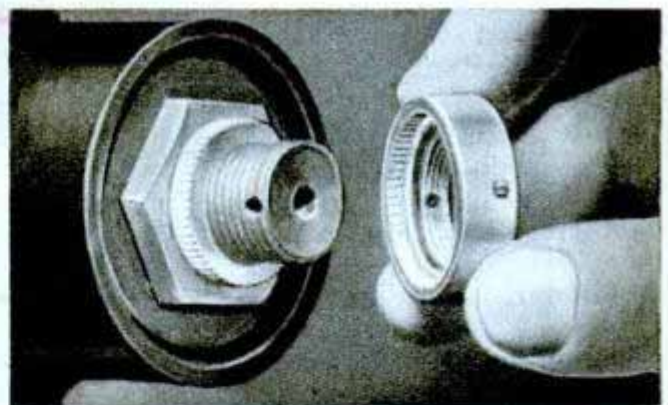
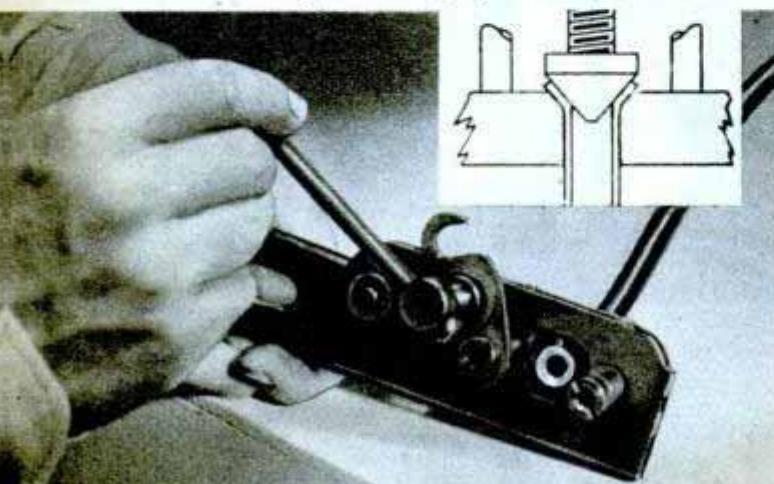


HERE'S A KNIFE with a hundred uses. The blades fan out to show saws, toothpicks, needles, tweezers, pliers, chisels, punches, pins, screwdrivers and surgical blades. Joe Gray, a Los Angeles veteran, purchased the knife at Heidelberg, Germany, for 50 cents



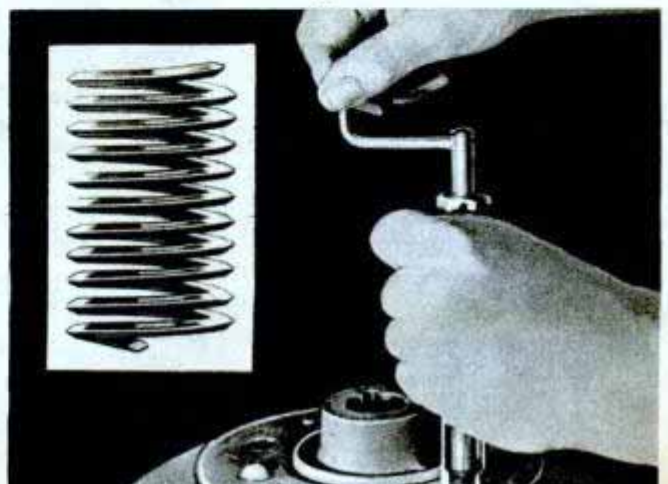
SPLIT BALL BEARINGS that permit easy installation in "impossible" locations are now available. The two races are held together by special taper-head screws

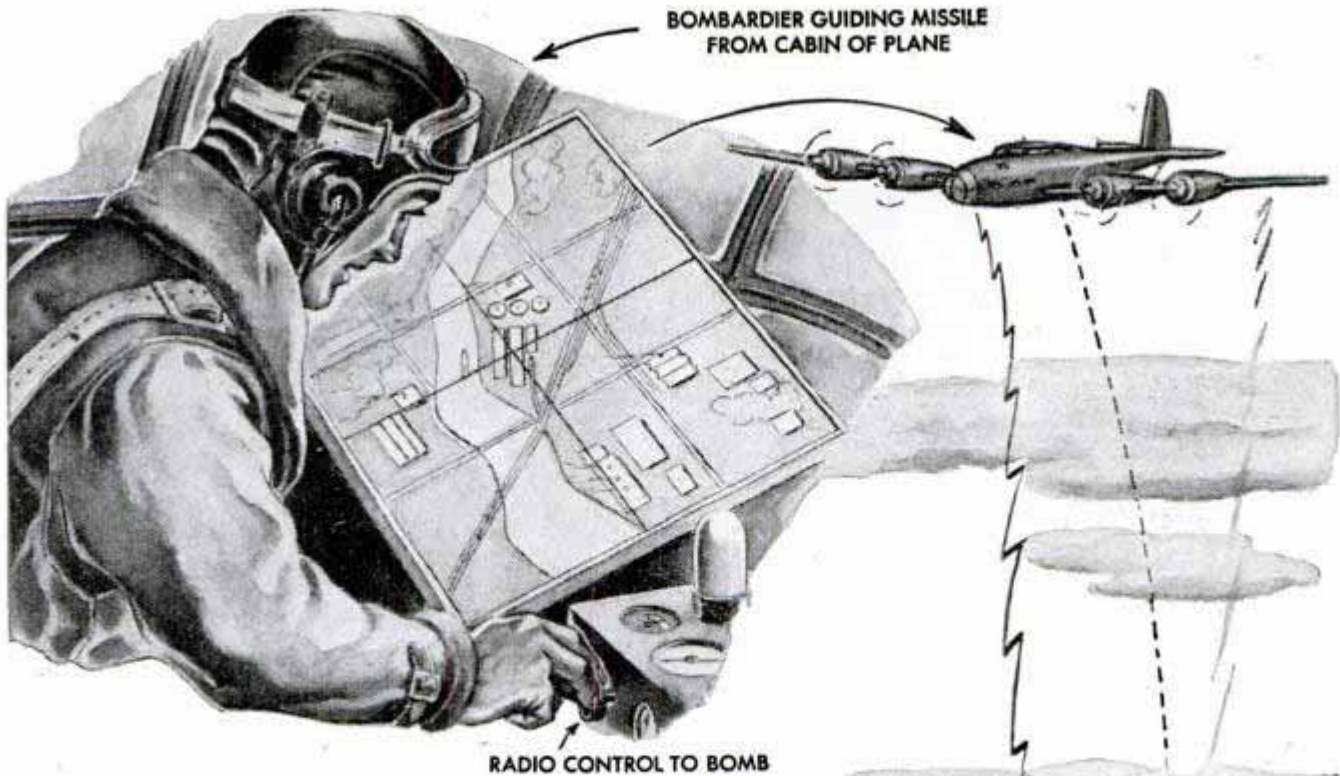
UNIQUE TOOL that operates like a pair of pliers flares tubing material. Single or double flares can be made in tubing measuring $3/16''$ to $5/8''$ in diameter



PRECISION ADJUSTMENT NUT with notches that mate permits pinpoint settings. When the nut has been set at the desired tension it is locked with a cotten-key

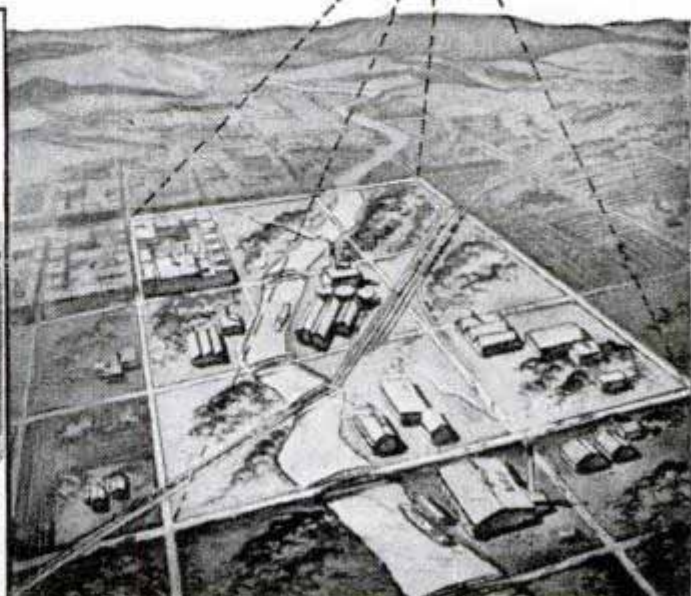
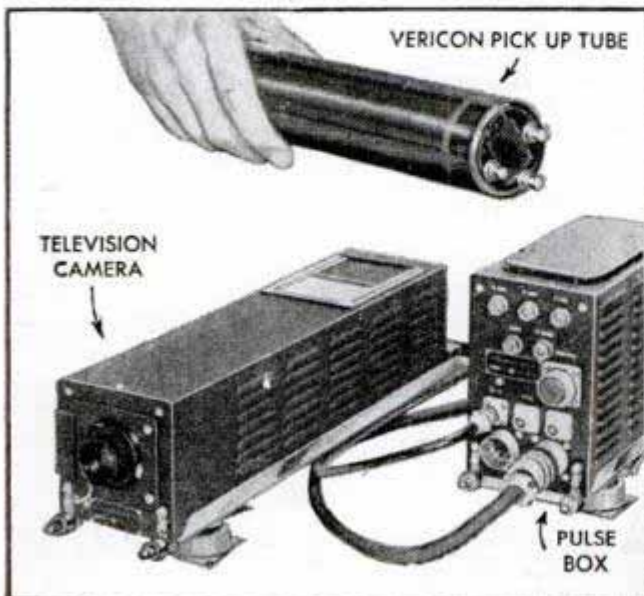
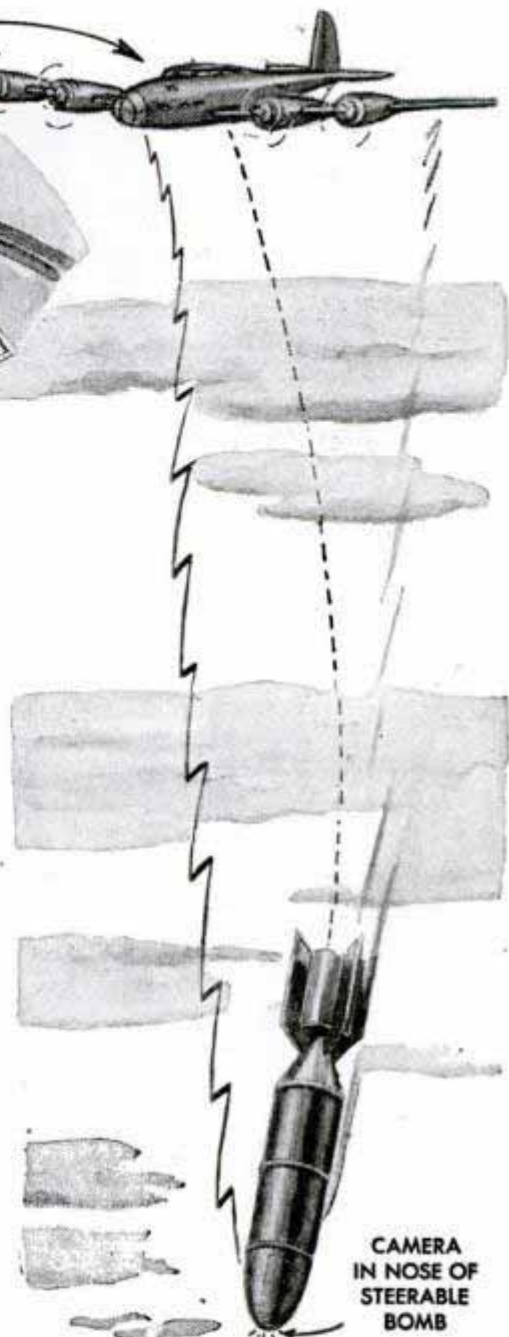
STEEL COIL INSERTS replace stripped or worn threads in either metals or plastics. The old thread is drilled out, then the hole is tapped and the coil inserted





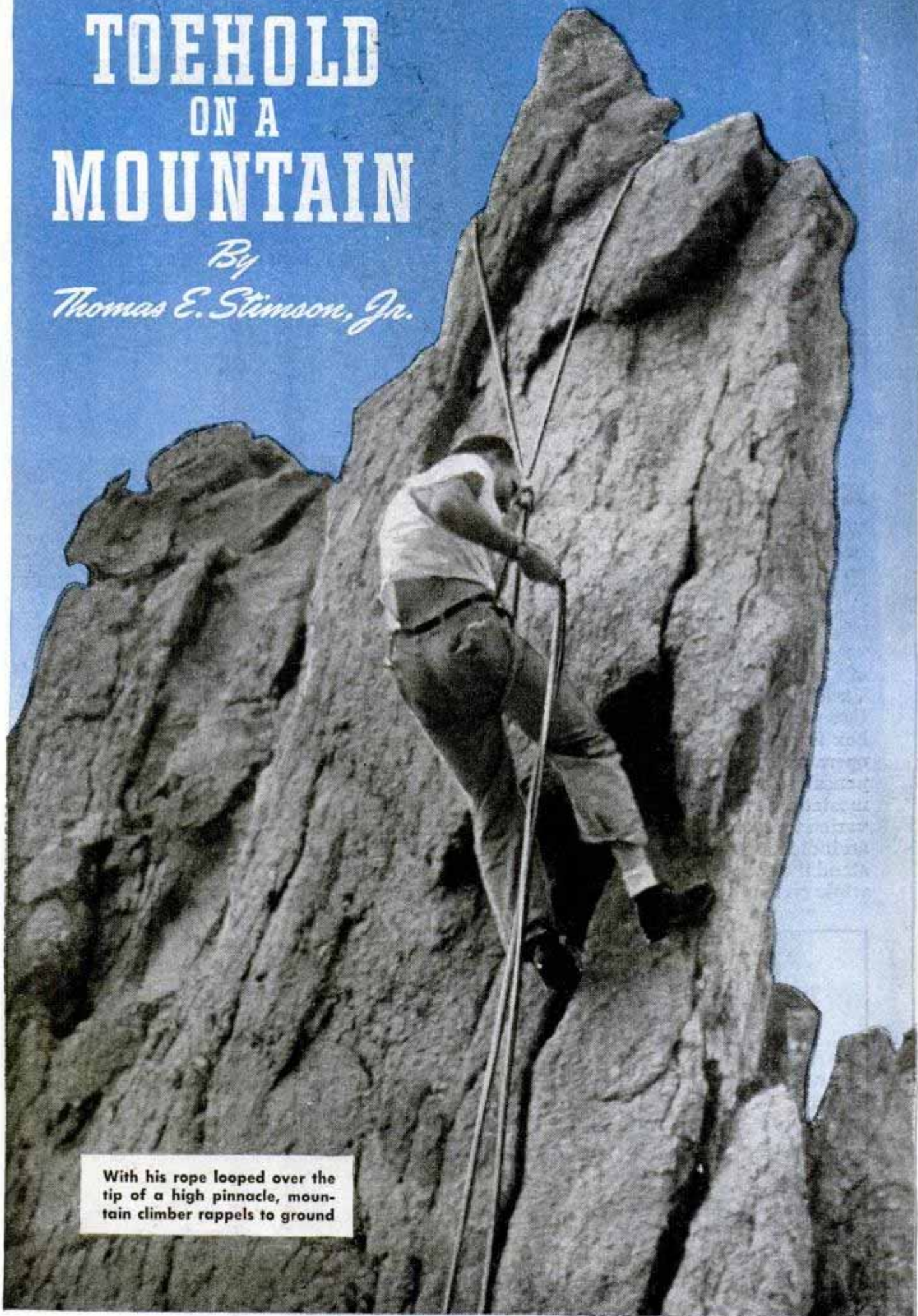
Radio Steers "Seeing Bomb"

With an automatic camera "eye" in the nose of a bomb, a bombardier can follow the missile's course on a television screen while directing its fall by radio. Crossed hairs on the screen itself help him steer the bomb's radio-controlled fins to the instant of impact. The camera, made by Remington Rand, weighs only 30 pounds and is 850 cubic inches in size. It consists of a standard lens with an automatic iris, a foot-long Vericon 212 vacuum tube and small parts similar to those in a radio receiver. A small companion pulse box is installed in the plane. The camera shutter is operated by a small motor that automatically compensates for changes in light conditions and a thermostatic device keeps the lens from fogging in the varied temperature zones through which it passes. As an indication of its ruggedness the camera can withstand the shock of acceleration up to 320 feet a second while en route to destruction when it hits the target.



TOEHOLD ON A MOUNTAIN

By
Thomas E. Stimson, Jr.



With his rope looped over the tip of a high pinnacle, mountain climber rappels to ground



YOUR left foot is resting on a projection of rock no larger than a baseball and your right foot is reaching cautiously for a crack into which you can dig your toe. You are clinging like a fly to the flat cliff.

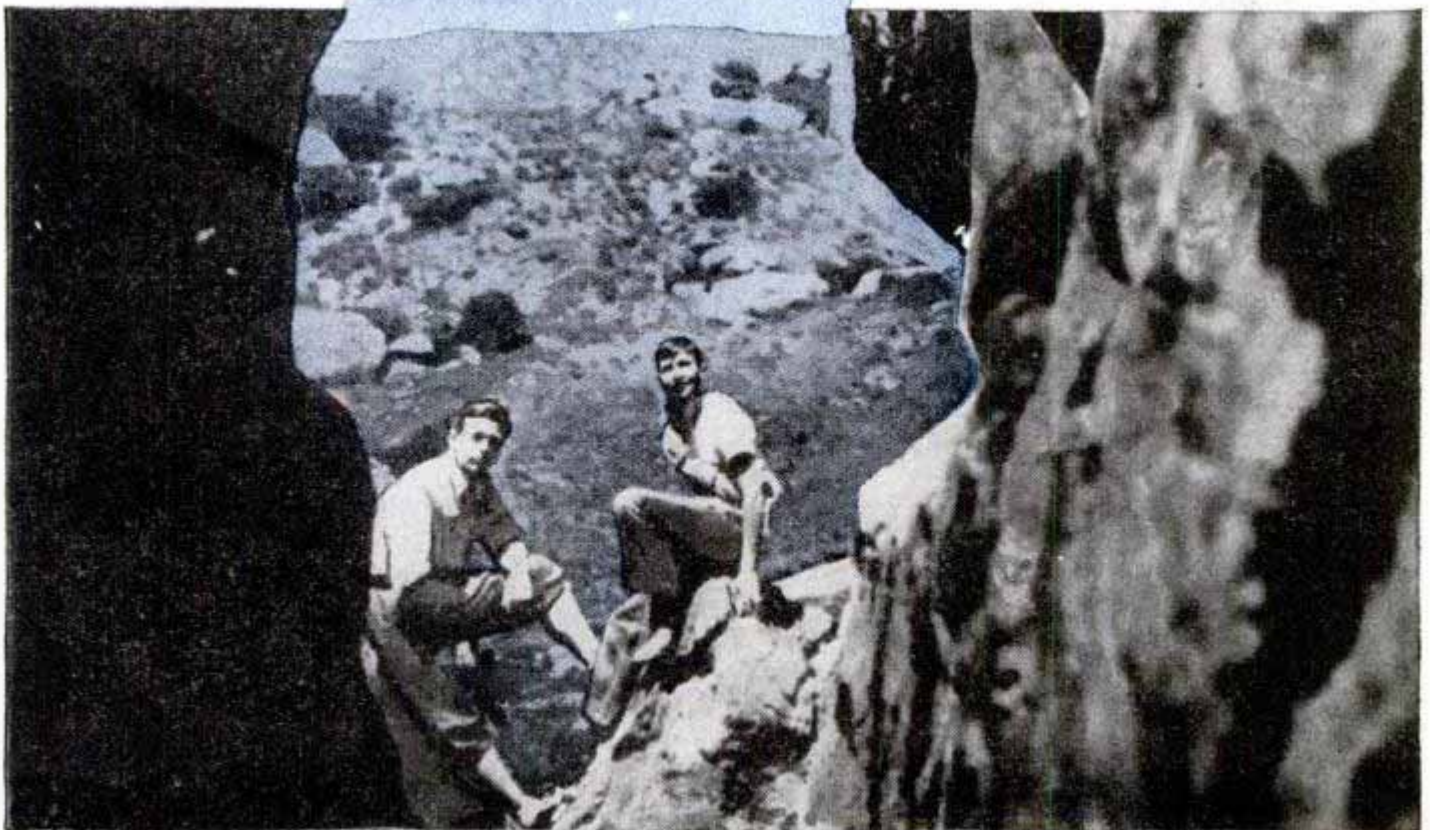
It's 500 feet straight down to the tops of the pine trees you see between your knees.

Brave men have grown weak in situations not half as tough as this and yet, barring an unlikely accident, you are perfectly safe. You and your two companions are linked together by a stout rope and the rope will save you in case of a slip.

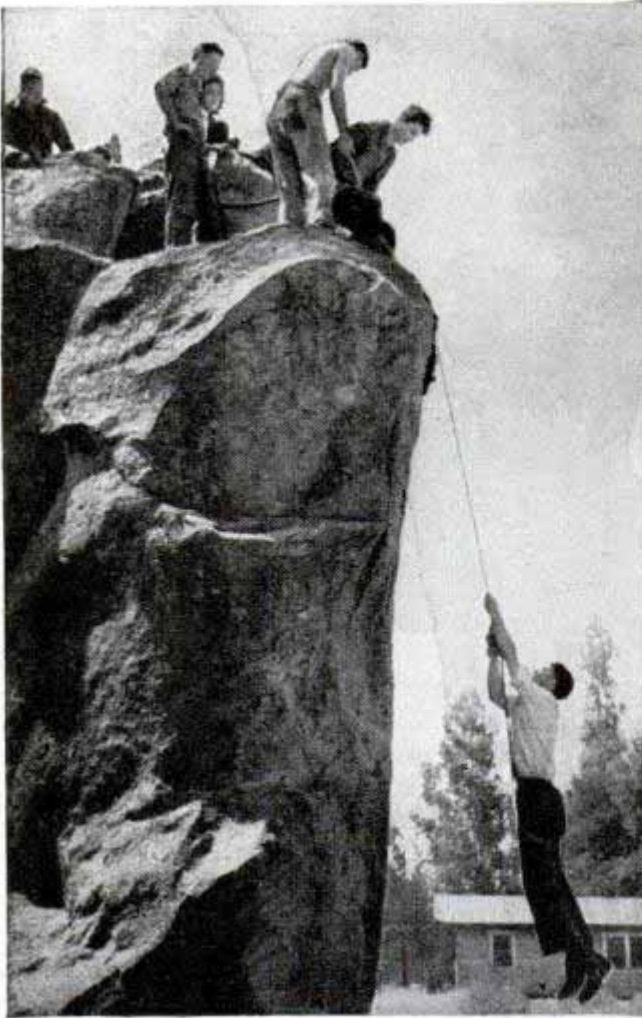
Rock climbing, once the exclusive sport of a few daredevil mountaineers, has become a standard outdoor sport in which

nearly anyone can participate. Girls make good climbers. Jim Gorin, president of the rock climbing section of the Sierra Club's southern chapter, has only one leg yet is an accomplished mountaineer. His crutch gives him firm footing in ascending or descending steep mountain trails. Roped up for a high angle climb over bare rock, he suspends his crutch from a sling around his neck and swings his leg and body from one hold to another by means of his arms.

Gorin's group holds week-end practice climbs to instruct novice climbers in the technique of making their way safely up the sheer faces of mountains. New members acquire skill and confidence by first



If you're tired of living, this sort of thing is recommended. Otherwise, don't try to jump across deep chasms



Practice-climbing on a "back-yard" rock. Below, a belayed rope safeguards leader against a long fall



climbing to the tops of rocks that are no taller than a one-story house. The rock wall may be just as steep as any mountain and the climbing problems may be just as difficult, but the novice has the psychological advantage of being only a few feet above soft ground. He can't possibly fall even those few feet because he is belayed from above by means of a rope tended by a fellow student.

Gradually the student members advance to more serious climbing. The club makes practice ascents on three mountains near Los Angeles, selected because of the different kinds of exposures and problems that each presents. The students are roped up with an experienced climber as leader for assaults on these peaks.

Student mountaineers learn that a flat tiny ledge hardly wide enough to receive the fingers of one hand can be trusted with your weight if you use your fingers to pull down on the ledge instead of out from it. The student learns to ascend a steep rock slope by inching himself along with his hands and feet, using the friction of his clothes to avoid sliding downhill. He learns how to wedge his hands in a crack and pull

For summer climbing the mountaineer wears rubber-soled shoes and carries pitons, a rope and a hammer



against them to partially support his weight while reaching for a new foothold. He learns never to trust any hold until he has tested it and even then to be chary of all holds on scaly rock.

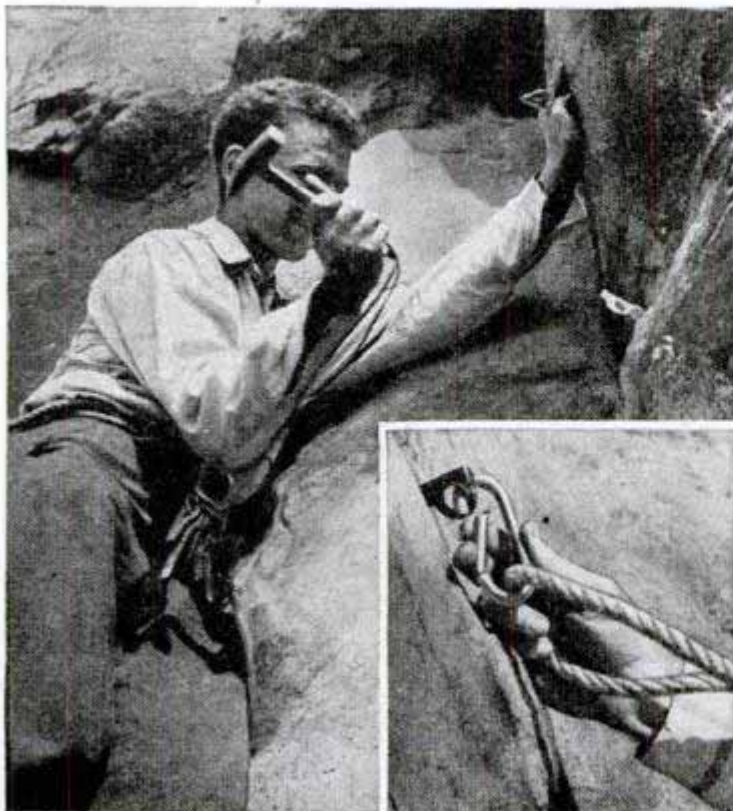
The students are taught that spectacular climbing over bare rock can be safer than ascending by means of an adjacent gully that looks easier but in which a rock slide could easily start. They are taught that they must climb by means of their own individual strength and skill and that the safety rope is rarely used as a direct aid.

Acting as safety man, each student learns how to snub the safety rope around a protruding rock or how to sit and snub the rope around his own body so as to hold the others if one of them should slip and fall. A lightweight climber who correctly uses his weight can easily hold a much heavier companion by means of the rope.

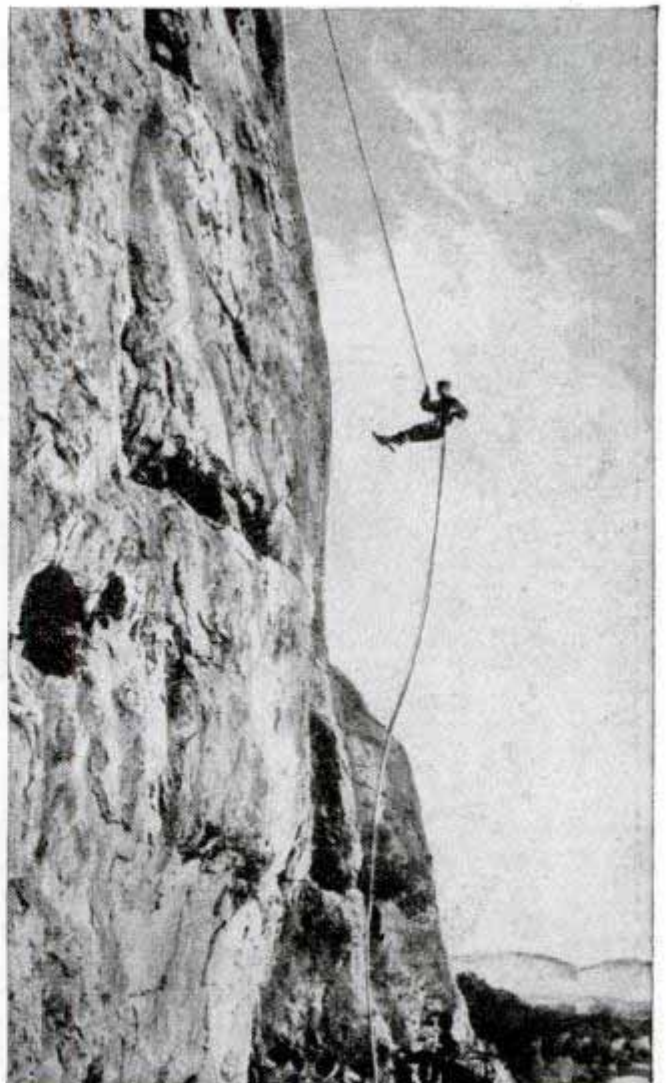
The result of this training is that, although the Sierra Club members have scaled dozens of precipitous peaks in the West, no serious injury has ever occurred to a member on a scheduled club climb. Some climbers have been hurt and a few have been killed in the mountains on personal expeditions and all such accidents are traceable to violation of one of the basic safety rules.

Climbers wear ordinary outing clothes in good weather with long-sleeved shirts to prevent scratching their arms on the rock. Most of them prefer rubber-soled tennis shoes if the rock is dry. A leather patch on the seat of the pants and one on the right

Climber hammers a piton into crack in rock. Inset shows how rope is attached to ring hooked into piton



One-legged Jim Gorin scales a California mountain. Below, climber lowers himself with the aid of a rope





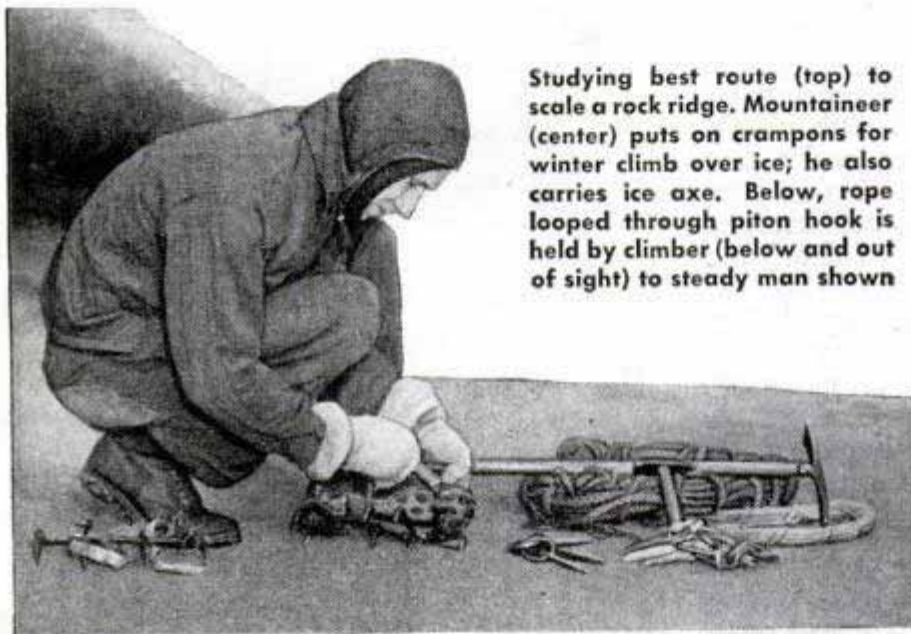
shoulder give protection against rope burns when sliding down a rope that is used for rappelling or descending a cliff rapidly.

The leader at the end of the rope carries a number of steel pitons, special rock spikes with an eye in the outer end, and a piton hammer for hammering them into cracks in the rock. Pitons are sometimes used as steps and handholds when no other means of ascent is possible but their ordinary purpose is to reduce the distance that a climber might fall in case of a slip.

After a leader has climbed 10 or 15 feet away from the man who is belaying him he hammers a piton into a convenient crack and then attaches the safety rope to the piton by means of a snap ring known as a carabiner. The rope slides through the carabiner without resistance, allowing him to continue to climb. At the same time it reduces the length of the rope that is free and this protects him against a long fall if he slips.

For climbing in ice and snow, mountaineers use lightweight winter clothing and heavy boots that are shod with sharp cleats and to which long-spiked crampons may be attached. Ice axes are carried for cutting steps and holds in ice walls, in addition to the rest of the equipment.

Actually, high angle rock work is a minor and not always necessary part of the sport of mountain climbing. Most of the tallest peaks in the United States can be ascended without roping up. Mount Whitney has a horse trail leading to its 14,501-foot summit. Many of the 300 mountains in Colorado above 13,000 feet may be climbed with no more effort than walking uphill.



Studying best route (top) to scale a rock ridge. Mountaineer (center) puts on crampons for winter climb over ice; he also carries ice axe. Below, rope looped through piton hook is held by climber (below and out of sight) to steady man shown



The Appalachian Trail that extends from the summit of Mount Katahdin in Maine to the summit of Mount Oglethorpe in Georgia, the John Muir Trail in California that runs north to beyond Yosemite from the top of Mount Whitney, and the extensive trails of the Colorado Rockies are three mountain trail systems that are used by hikers and climbers during the summer. From these trails hundreds of adjacent peaks may be ascended. Many have never been climbed principally because they offer no challenge to an experienced climber.

The country's main trails are traversed by thousands of vacationists every summer, carrying sleeping bags and food in shoulder packs and camping equipment on pack animals. Supervised jaunts are conducted, such as "high trips" by the Sierra Mountain Club in California. Climbers range from knapsack groups who spend two weeks reaching an 11,000-foot level to parties of 275 persons on horseback accompanied by 80 mules carrying equipment.

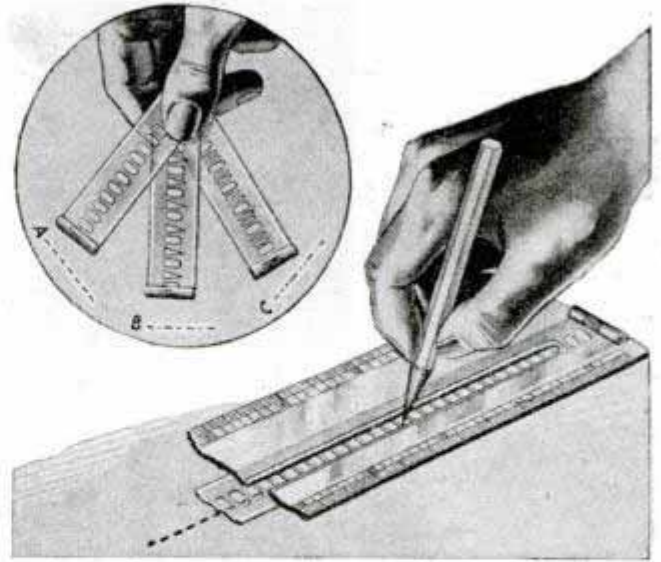
The sheer rock faces of the Palisades along the Hudson River offer more difficult climbing problems than do most mountains. A few isolated rocks, such as Shiprock in the desert of New Mexico and the Devil's Tower on the Wyoming prairie, are far more difficult to ascend than some of the country's most tremendous mountains.

One of the most concentrated rock climbing regions in the United States is found in the Yosemite valley, where towerlike spires that stand out from the valley walls present climbing problems so difficult that until recent years most of them were regarded as unclimbable. Now all except one have been climbed and plans for surmounting that one have been made.

Cathedral Chimney in Yosemite withstood five attempts to ascend it before it was finally climbed. Mount Starr King is climbed by use of a two-inch crack that extends up its side, and Lower Cathedral Rock, climbed only once, was scaled after the lead man on the rope stood on the shoulders of a companion, part way up, to reach some difficult handholds. The companion, meanwhile, had his feet on a half-inch-wide ledge on the high angle cliff.

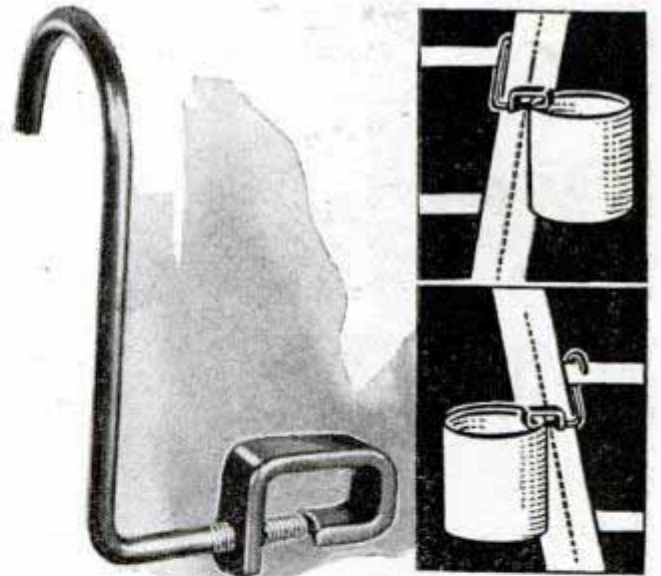
The famous Lost Arrow, a 2800-foot pinnacle that stands out from the north wall of the valley, so far has been just as unclimbable as 29,141-foot Mount Everest in the Himalayas. All attempts to reach the top of the Lost Arrow have failed hundreds of feet below the top, part way up the last 1400 feet of vertical rock. Mountaineers figure that the team of men who finally ascend to its top will need two days for the climb and that the men will have to tie themselves to the vertical cliff halfway up so they can sleep in safety overnight.

Dot-Dash Rule Helps Draftsmen



Dotted lines can be drawn as fast as straight lines with a transparent, slotted rule in which interchangeable inserts may be fitted to produce lines with even dots, a dot and dash or a dash and two dots. The pen or pencil is drawn over the insert and the dotted line automatically produced. Outside edges of the rule are graduated like an ordinary rule.

Hook and Clamp Hold Paint Can



Additional safety and convenience for the painter working from a ladder are provided by a hook and clamp device which holds paint cans in an upright position. The firm hold on the can prevents overturning or spilling. The paint can may be hung on either the right or left side of the ladder at a height most convenient for the painter. The steel hook fits over the ladder rung and hangs vertically. At right angles to the hook and running parallel with the ladder rung is a clamp which holds the paint can on the outside of the ladder upright. The clamp is attached to the can so that the opening is left free for dipping and stirring.



Cork-shaped lump of pure uranium, left, was rejected by Westinghouse as possible lamp filament in 1922 but knowledge then gained helped American scientists develop atomic bomb. Right, quantity of liquid within container is visible in transparent plastic barrel of hand-operated oiler or sprayer made for home use



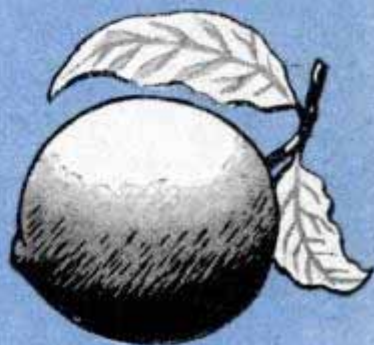
Double-deck streets, left, for pedestrians and bicycle traffic are city planners' answer to traffic problems in new housing development in Rotterdam. Giant "catcher's mask," right, covers sponge-boat propeller and assures divers who bring up sponges from Gulf of Mexico that their lifelines will not be fouled by propeller

The Craftsman

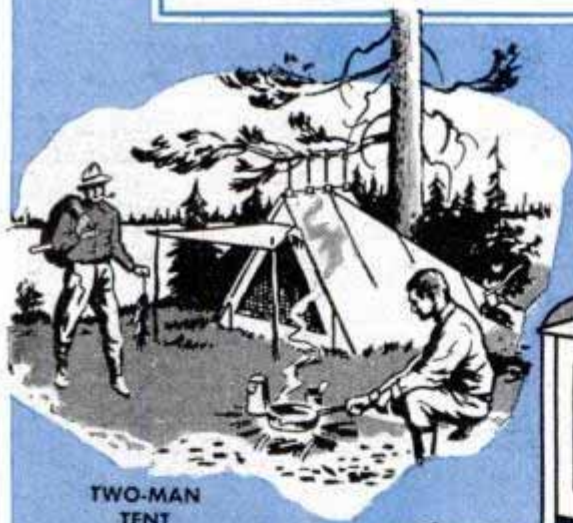
Here it is June again, and even the most confirmed craftsman comes out of hibernation in the basement shop to apply his talents to outdoor sports and gardening and picture-taking and backyard grills. So the Craftsman Section goes outdoors, too. On page 192 we offer you the best advice we have on the use of plant hormones. Try growing vegetables and flowers instead of weeds this year! Or you're planning a camping excursion: that tent on page 187 is light and easy to carry. There's a piece on page 214 about luminous paints. June brides and bridegrooms will get right down to the practical things of life and make costume jewelry from decorative buttons, as shown on page 182. Some hot June day the woodworker will go down in the cool basement shop and start that Dutch cupboard seen on page 174. And among the other 100-odd features and practical ideas are a story on page 207 telling how the blade guides of a bandsaw can be altered to permit crosscutting of long stock, and, on page 201, how to build a fluorescent-lamp unit for the advanced photographer's studio



BUTTON JEWELRY



"HORMONIZED" GARDEN CROPS



TWO-MAN TENT



DUTCH CUPBOARD



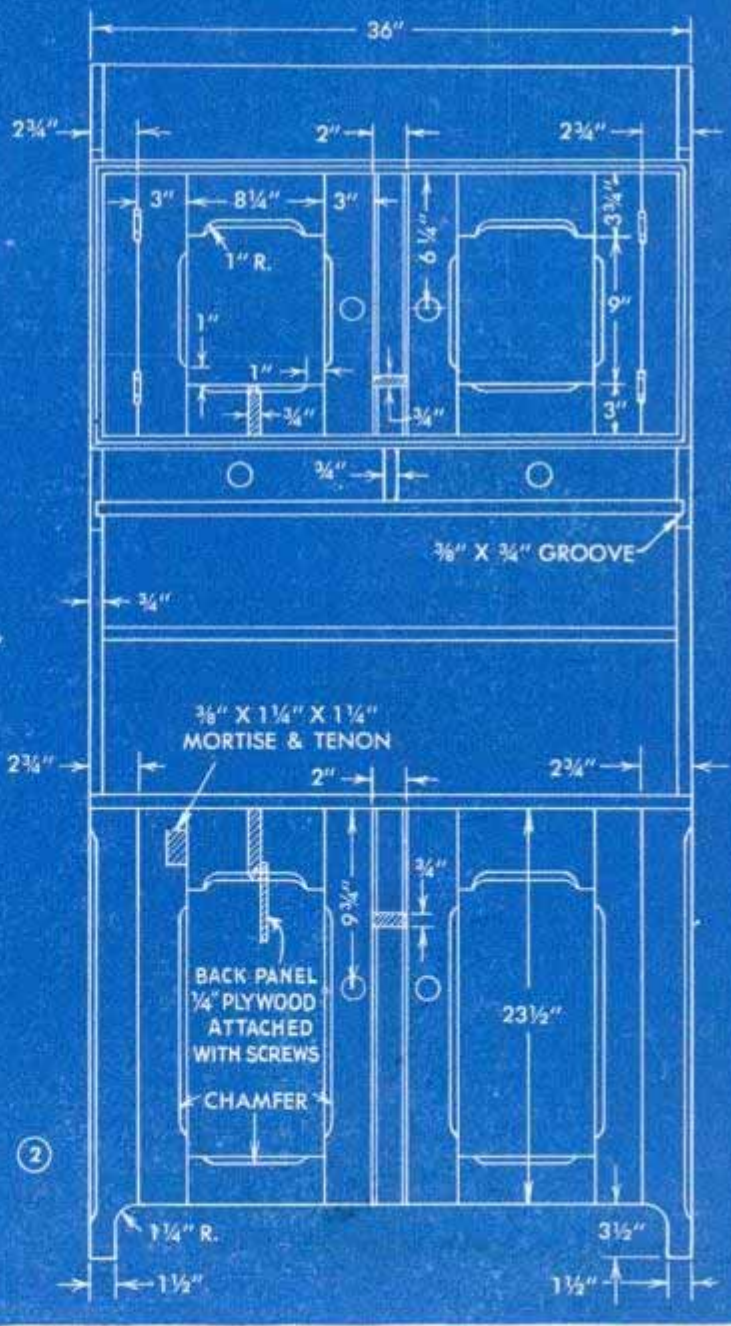
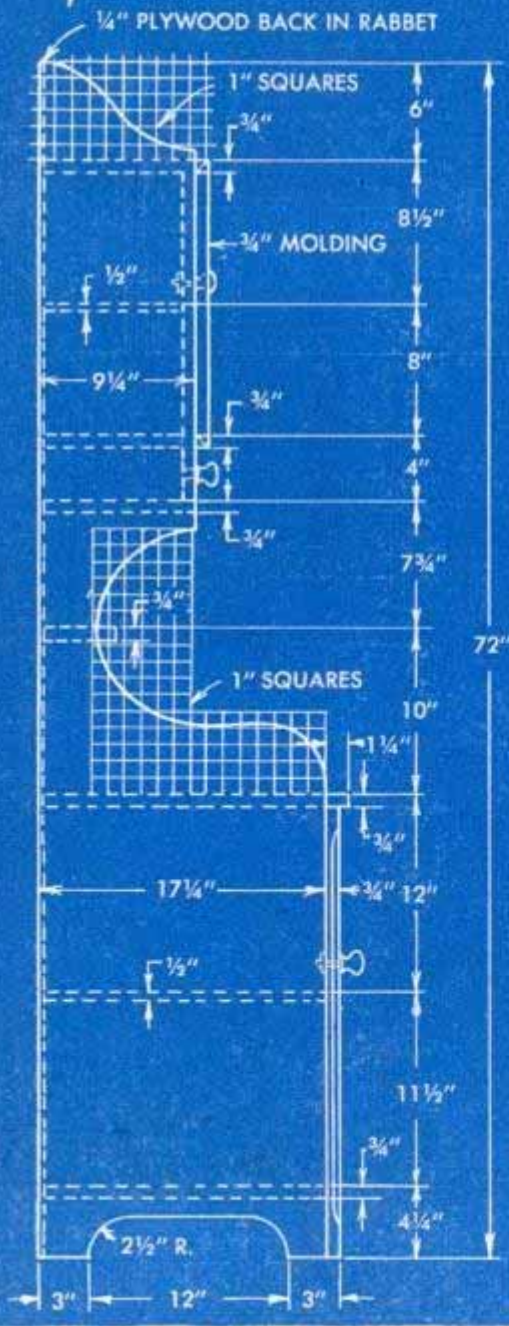
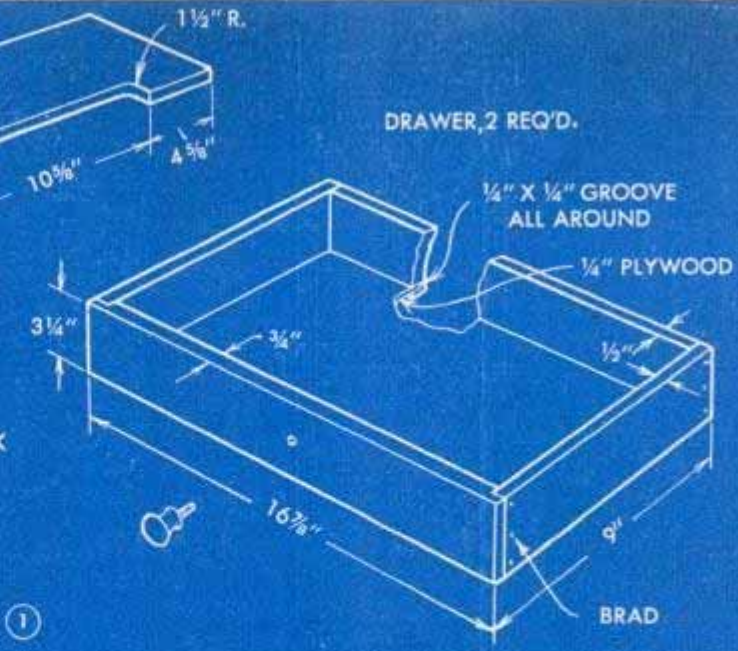
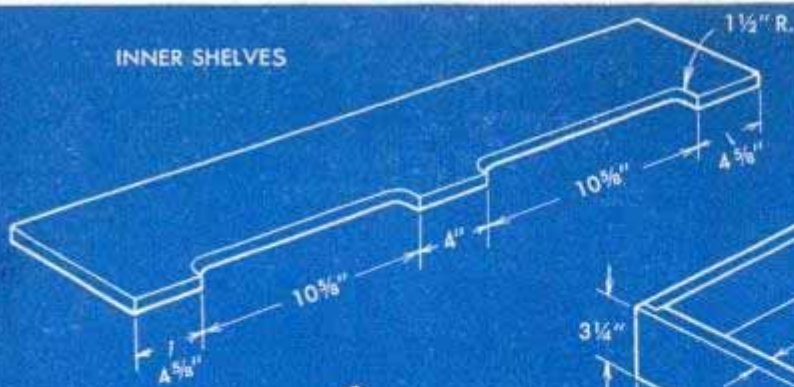
BLACK-LIGHT MAGIC



FLUORESCENT PHOTO LIGHT



ANGLE SAWING



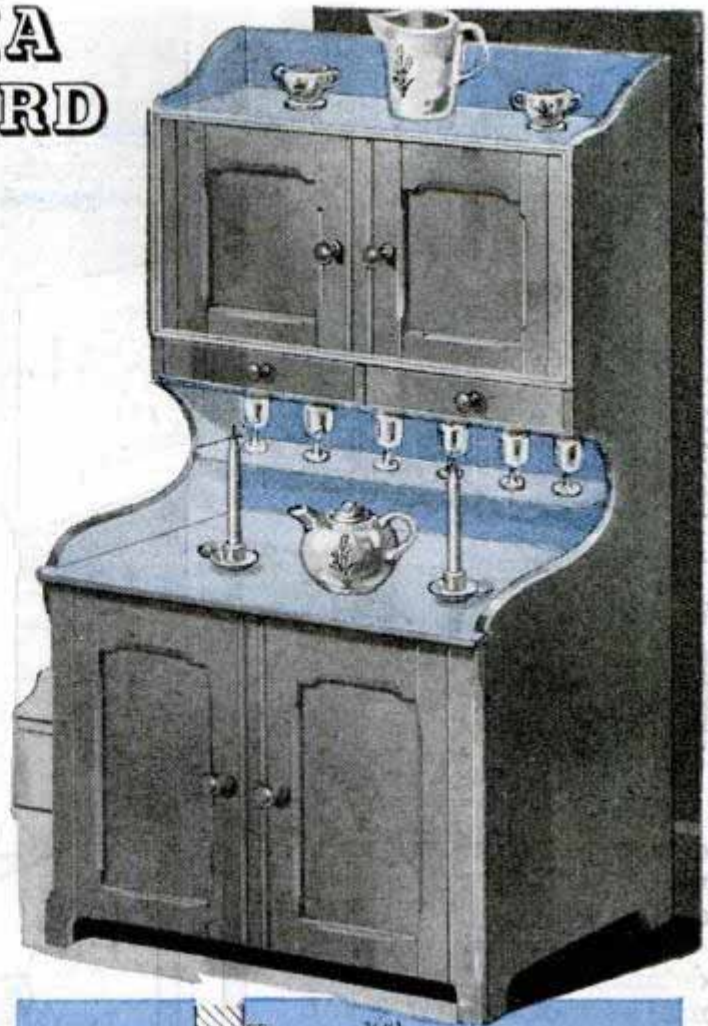
PENNSYLVANIA DUTCH CUPBOARD

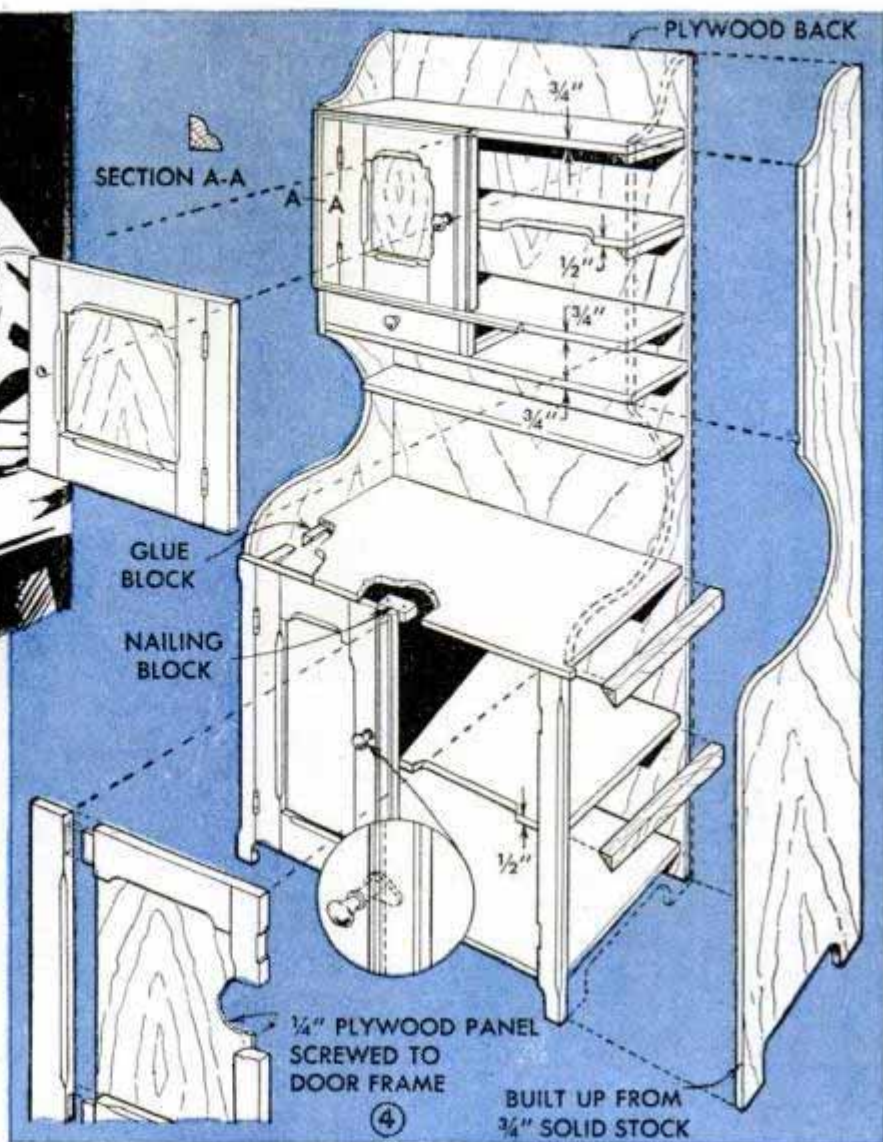
By NORBERT ENGELS

If your taste in furniture leans toward the plain and simple lines of colonial days, here's a charming old cupboard that typifies the simplicity of early American craftsmanship. It's the type of furniture that challenges the skill of the craftsman who works with hand tools mainly and who takes special pride in producing an expert job of finishing.

Begin by building up two panels of solid stock for the sides of the cupboard. This is done by jointing four or five narrow boards, using either tongue-and-groove joints or plain butt joints doweled and glued. A saving in stock may be had by running only two of the boards the full length and using shorter lengths for the lower half. In arranging the pieces keep in mind that right and left-hand side members are required. You may find it more convenient to cut the rabbet for the plywood back if it is done before the boards are glued together. The scroll cuts likewise may be roughed out beforehand and later dressed down with a spokeshave or file, although they can be done afterward with a keyhole saw. Except for one shelf, which is set in a dado as shown in Fig. 2, the eight shelves simply are butted against the side members and glue-blocked. Note that the $\frac{1}{2}$ -in. shelves, Fig. 1, are cut out along the front edge, and that the desk shelf, Fig. 4, is notched at the front corners to project $1\frac{1}{4}$ in. and fit flush with the surface of the sides. The plywood back will add rigidity to the whole assembly, and it's a good idea when attaching it to do so while the framework is still clamped.

Next, the facing strips to which the lower doors are hinged are fitted to the front corners of the assembly. These are chamfered on the outer edge and are cut out at the bottom to form a part of the leg. Finally, the opening is divided equally with a beaded upright, which is fastened at the top to a nailing block and at the bottom by driving nails up through the lower shelf. The upper compartment is fitted the same way except that the pieces are set in flush with the sides and the shelves. A small molding like the one shown in the sectional detail A-A in Fig. 4 is mitered at the corners and glued and bradded to the facing edges of the opening. The two-drawer



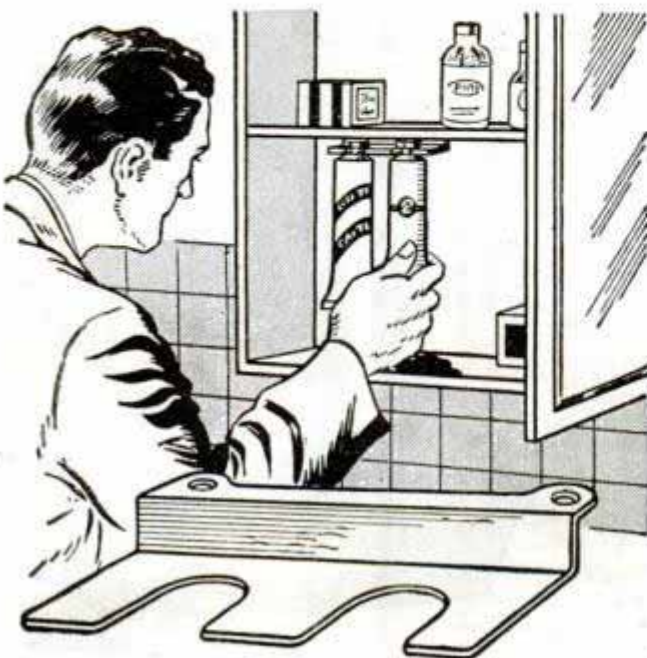


compartment below it is divided with a centerpiece and a runner.

Drawer construction is detailed in Fig. 1, while the method of making the doors is given in Fig. 4. Mortise-and-tenon joints are specified for the door frames but dowels may be used. Inner edges of the frames are chamfered to relieve plainness and plywood is screwed to the back of the frames. Fig. 3 shows how to make the wooden turnbuttons that are fitted to the doors. They should be installed to work

freely and latch against the back of the beaded uprights. A natural or a varnish finish is applied to the exterior of the cupboard, but the interior may be painted a pastel shade of bluish-green.

Rack for Tubes of Tooth Paste Attached to Cabinet Shelf



If you wish to keep tooth-paste tubes and other similar containers out of sight, a simple holder like the one shown may be screwed to the underside of one of the shelves in the bathroom cabinet. Any piece of nonrusting sheet metal will do for the holder and it can be made any size desired, depending on the number of tubes to be kept in the rack.

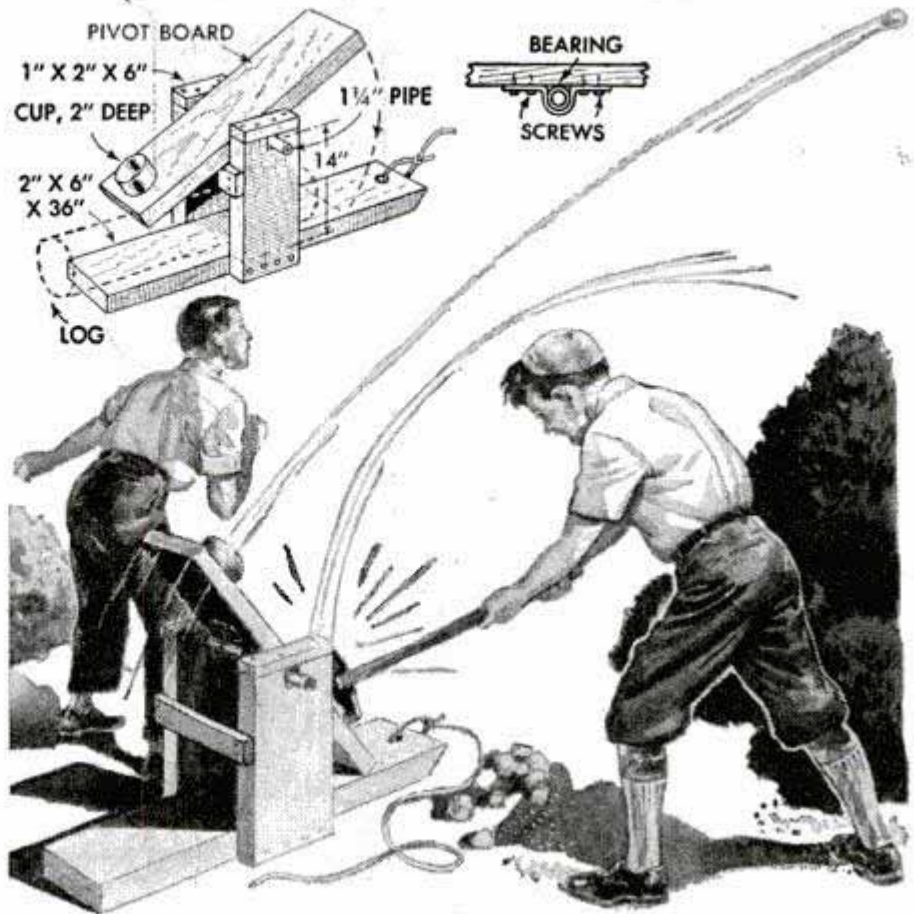
Repairs for Desk Drawers

If the joints of a drawer have become loose, it will be difficult to open and close it. In such a case, the remedy is to renail and glue the drawer so that it will slide easily. If swelling or warping is the cause of the trouble, the high spots should be sanded and waxed. It may be necessary to plane high spots.

Michael Ligocki, Gary, Ind.

Play Catapult Throws Projectiles High in Air

All small boys are attracted by any device that will throw a projectile high and far, and this catapult will do that very thing. If two or more boys use the catapult, different colored stones for each boy will help determine whose stone has traveled the farthest. As the upper left-hand detail indicates, fairly heavy lumber must be used in the construction of the device in order to provide sufficient strength to withstand hard use. Because of the size of the catapult, a tow rope is attached so that it can be moved about easily. Height or distance a stone is to fly is controlled by placing a log between the uprights, as indicated by the dotted line in the detail.

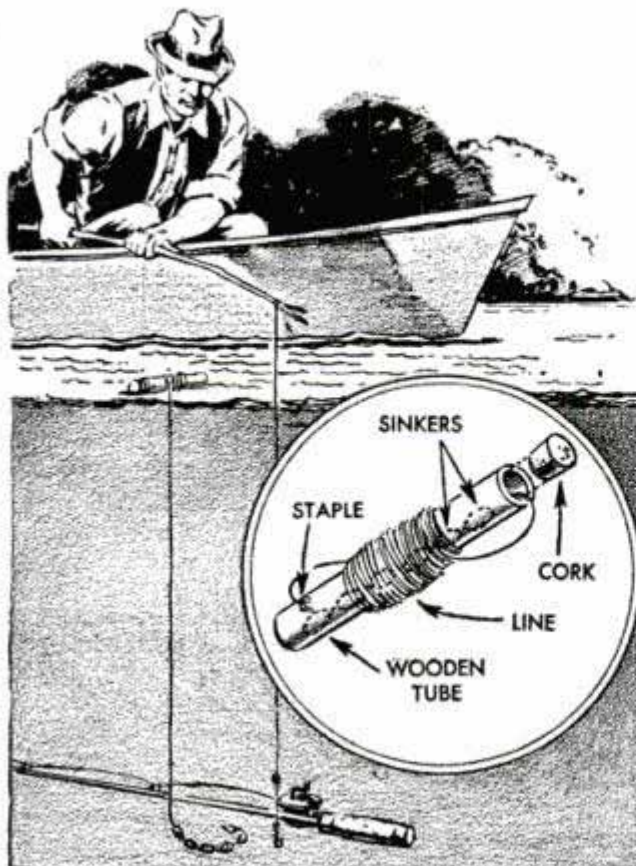


Fishing Rod Dropped in the Water Is Located by a "Buoy"

When a fishing rod is accidentally dropped in the water, chances are it will never be recovered unless a marker or buoy is floated over the place where it disappeared. A marker can be made from a

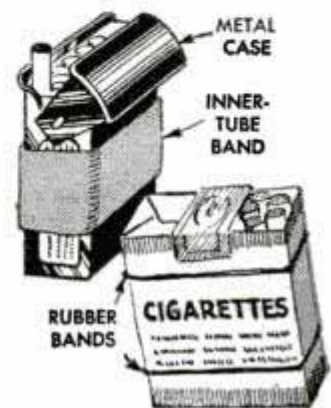
wooden tube such as a piece of bamboo or alder. One end of the tube is plugged and sealed and a cork is fitted in the other end. A length of fishing line, stapled to the tube, is weighted at one end with sinkers, which can be kept in the tube when not in use. When a rod is dropped, the weighted line is lowered to mark the place, and the tube will float on the water while preparations are made for retrieving the rod.

Addison Bain, Marion, Ohio.



Cigarettes Will Stay in Pocket When Held by Rubber Bands

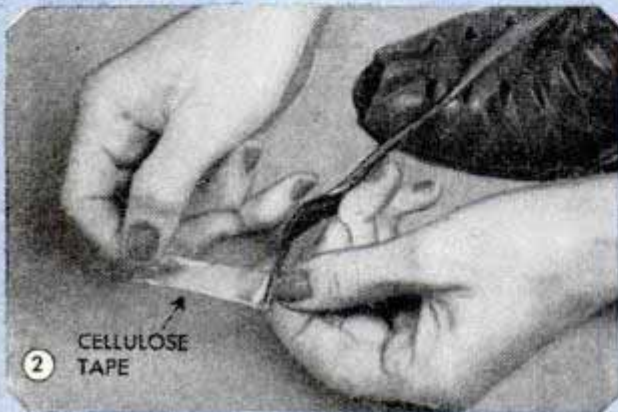
If you carry cigarettes in your shirt pocket, you can prevent the package from falling out when you bend over by wrapping rubber bands around the container. Those who have a metal case can cut a wide band from an inner tube, while those who carry a loose pack will find that a small rubber band at the top and bottom of the package will suffice.—C.D. Bassett, Ypsilanti, Mich.





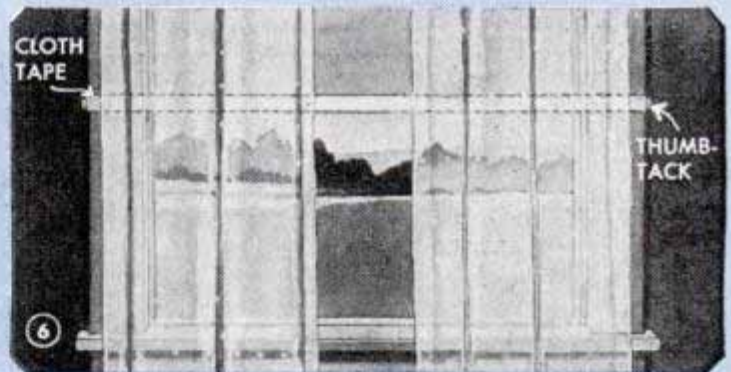
Solving Home Problems

1 Make it easier to clean your dust-pan brush by fitting an ordinary comb and a bracket to the pan, as indicated. Then, to clean the brush, merely draw the bristles through the teeth of the comb



2 Should the tip of a shoelace be lost or damaged, a few turns of cellulose tape make a satisfactory repair. Wrap the end securely and you will have a tip that will last as long as the lace

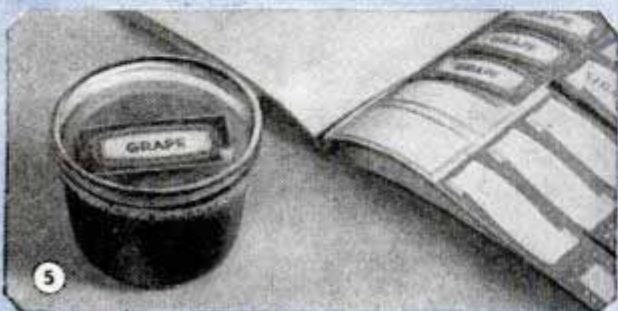
3 The next time you bandage an injured finger, seal the end of the bandage with clear nail polish and also brush the polish over any ravelings. This produces a neat-looking wrapping that will stay on



4 Sifter disks in larger compacts release so much powder that a considerable portion usually is wasted. This annoyance is eliminated by placing a stiff paper ring under the disk so that just the right amount of powder is released at a time



5 When sealing glasses of jelly, place the label on top of the seal before the paraffin hardens and when the wax is set the label will be firmly embedded. This eliminates pasting the label on the side of glass where it might be rubbed off



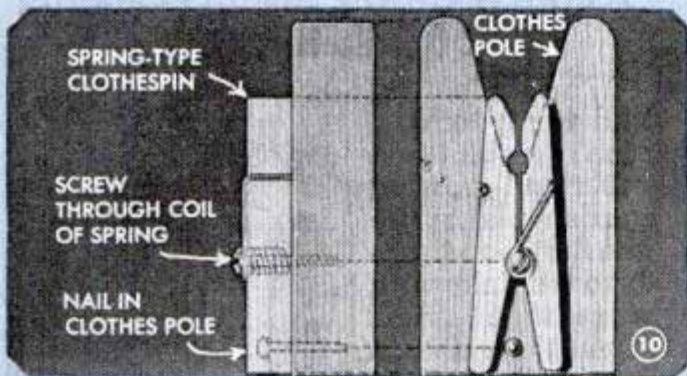
6 During the summer, when windows are open most of the time, curtains and drapes become soiled by brushing against the screens. One housewife prevents this by tacking a strip of tape halfway up the frame, using white tape and thumbtacks



7 Here is a neat and easily made tie holder that is particularly useful when traveling. Small windows are cut through heavy cardboard in the pattern shown and a similar slot is cut in the top of the holder for a hook

8 Don't throw away your old garden hose when you get a new one; you can make a yard sprinkler out of it. Plug one end of a 5-ft. length and couple the other to the hose. Two rows of holes provide good coverage

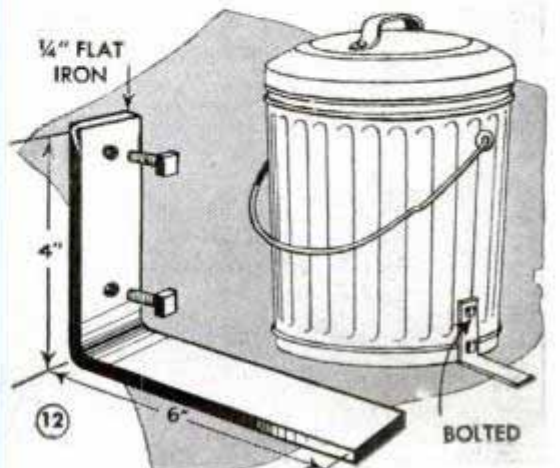
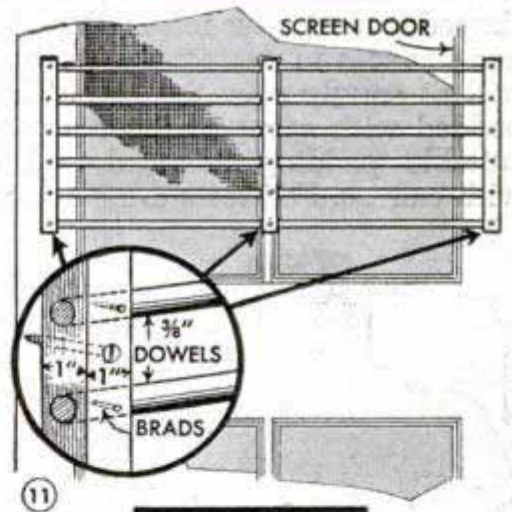
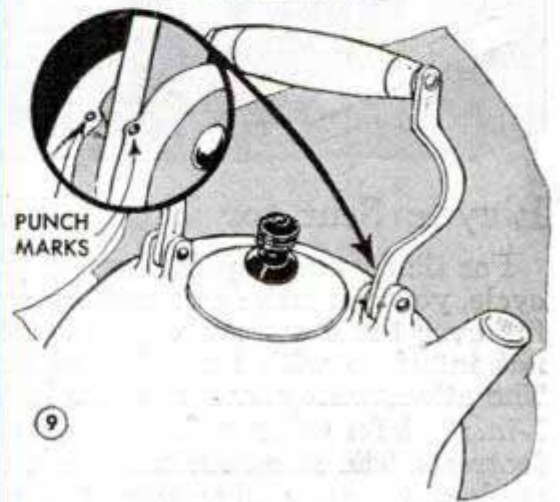
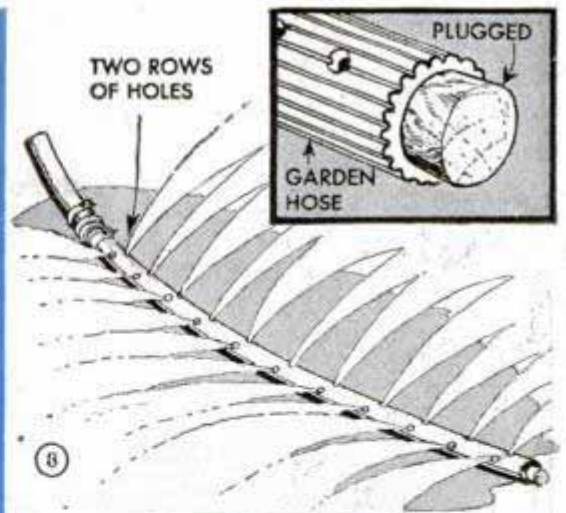
9 To keep the handle of a teakettle upright so it will remain cool when over the fire, make punch marks on both sides of the handle near the hinges. It is still possible to fold the handle down when necessary



10 A spring-type clothespin on a clothes pole will prevent its sliding sideways when the wind whips the line. A screw through the coil spring on the pin fastens it to the pole, and the nail in the pole is to center the pin when opened to attach the line

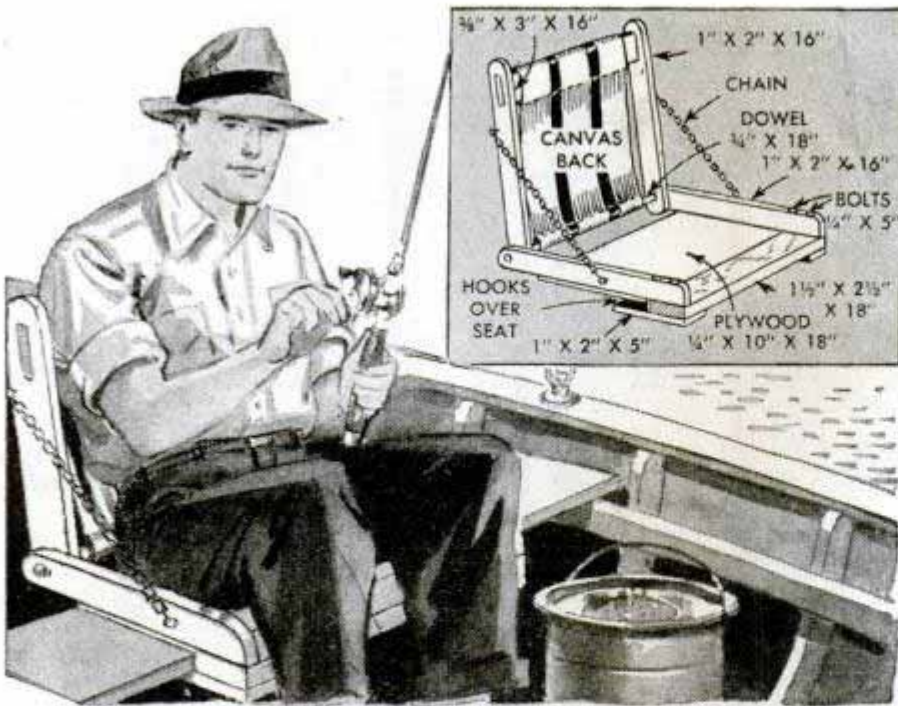
11 This wooden grille will protect the upper portion of the screen on a door from being pushed out. A similar grille on the lower portion will protect the screen from the kicking to which it is often subjected. The grille should be painted to match the color of the door

12 Small garbage cans with tight-fitting lids are a nuisance because it takes two hands to remove the lid. One solution to this problem is to fasten a flat-iron strip, bent as shown, to the can so the extending leg of the angle is held down by the foot



Back Rest Fits Rowboat Seat

A rowboat seat is more comfortable with a folding back rest like the one shown here which clamps to the regular seat on the boat. A standard-size life preserver cushion may be used for the back and for the seat. Or a cushion may be made for the seat and canvas may be stretched over the back, as was done in this case. The rest is removed easily yet it will remain firmly in place when clamped to the seat.—Ralph S. Wilkes, Elbridge, N. Y.



Bicycle Seat for Younger Passenger Slips Over Double Crossbars

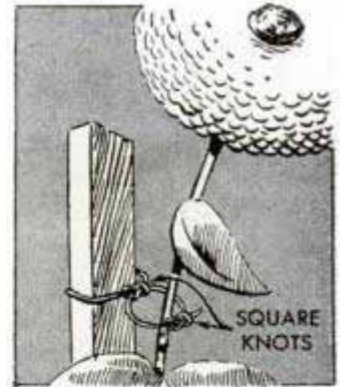
For that younger passenger on your bicycle, you can make an auxiliary seat that fits over the crossbars where weight will not interfere with balancing or steering. The attachment consists of two lengths of 1-in. stock for side members, a seat and two footrests. The side members are cut at an angle at the top and screwed to a piece of wood which forms the seat. They should be shaped so that after felt is glued to the inner surfaces to protect the crossbars they will fit snugly over the bars. The seat is padded with sponge rubber or any other suitable padding material and covered with canvas. Footrests are screwed to the

lower edge of the side members and reinforced with angle brackets. Heel guides are attached as indicated.

Dr. Bernard Matzen, Napa, Calif.

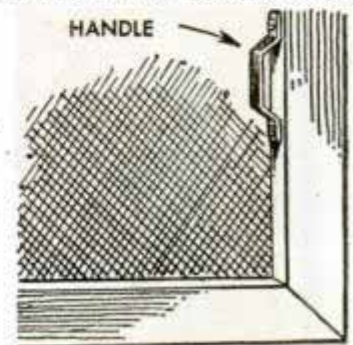
Knotted Cord Prevents Chafing Of Staked Plants

When staking and tying tomato, zinnia, dahlia and other tall-growing garden plants, tie the first loop tightly to the stake with a square knot. Then tie a second loop loosely about the stem of the plant. In this way, the plant can swing freely without danger of chafing or breaking and the cord cannot slip down on the stake.



Handles Simplify Installing Screen

If installing window screens from inside your home, you can hold the screen firmly by using metal handles screwed on the inside of the screen frames at the sides. These handles are of the type which generally can be obtained from hardware and dime stores.—Roger M. Woodbury, Haverhill, Mass.



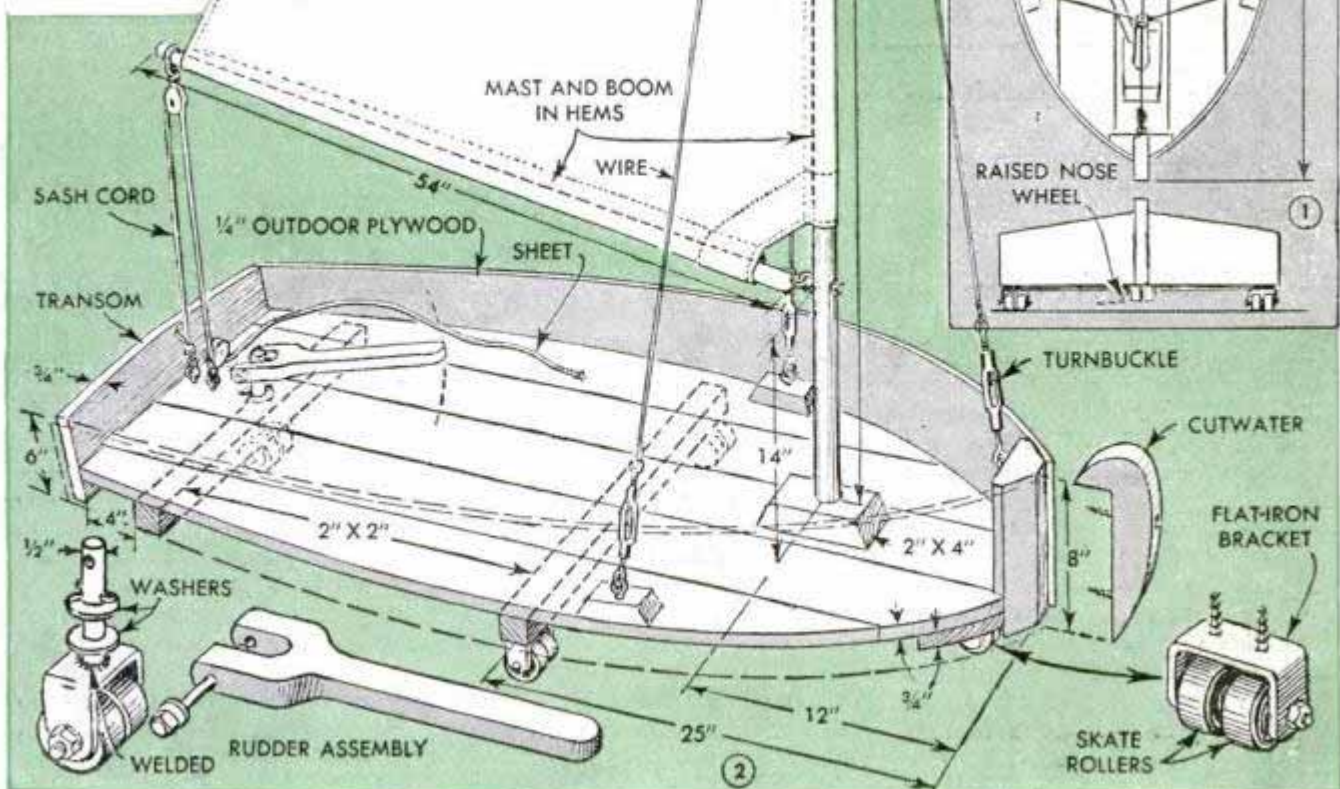
SIDEWALK SAILBOAT

for "Dryland Shippers"

Singly or in fleets, boys will find real sport in tacking and maneuvering these land-going sailboats. Since the rudder and sails are handled exactly like those on a real boat, youngsters can learn the art of sailing on dry land. And one of the fundamental rules of sailing is "don't get hit by the boom when tacking." To make the boat light so it will handle easily, $\frac{1}{4}$ -in. waterproof plywood is used for the sides and $\frac{3}{4}$ -in. wood for the transom and bottom. For ornamentation, a cutwater is screwed to the bow.

Three pairs of skate rollers mounted in heavy sheet-metal brackets support the hull. The original skate parts may be used, but this is not as neat a method of mounting. A nose wheel, Fig. 1, which clears the pavement by about an inch, is provided also to support the bow when sailing in "choppy waters." A king pin is welded on the rear roller unit for the tiller, Fig. 2, and a washer put on above and below the deck.

Unbleached muslin will make a good sail, with wide hems to slip over the mast and boom and a gusset for reinforcement where the two join. Shrouds and forestay are of galvanized wire and have turnbuckles for adjustment. There is no way to raise or lower the sail, but when not in use the boom is folded up; the sail is wrapped around it and held with light rope.

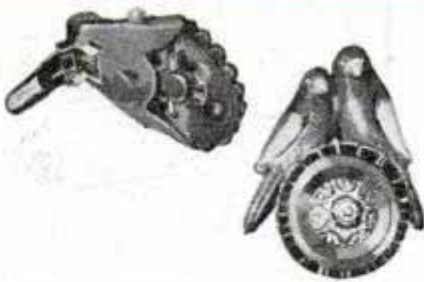


Costume Jewelry

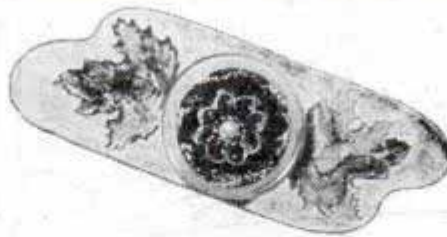
By Simon S. Palestrant

Of course you could pick up fancy costume jewelry for a fancy price — plus tax—at a store. But you can make stunning ornaments of your own exclusive design from colorful buttons, old toothbrushes and plastic bottle caps

YOU'LL be setting the pace among your friends when you sport smart costume jewelry of your own design—and it's inexpensive, too, when made from practically nothing but buttons. The stunning effects to be had by combining buttons with dime-store lapel ornaments and similar charm trinkets are limitless. With these and some toothbrush handles, plastic bottle caps and a little ingenuity, you can produce unusual accessories. Much depends upon the choice of buttons as well



Dress Clip



Barrette



Head Flower

Chic dress clips like the pair above can be made quickly by cementing novel buttons to metal clasps. Such clasps usually can be had from a jeweler's supply house or they can be removed from a discarded set. Clear nail polish will keep metal buttons looking bright, while buffing with rouge will give a high luster to plastic or bone buttons

There's no limit to the variety of barrettes that can be made. In this example, a piece of colored plastic or celluloid was shaped as shown and a large button was cemented to the center. Metal oak leaves from discarded earrings were cemented on either side. The fastening clamp was removed from another barrette and then cemented to the back

Clusters of small glass buttons encircling a large center one and bordered by bright ribbon "petals" make up this colorful head flower. The buttons are glued to a felt base having a scalloped edge, then pleated or gathered ribbon is sewed around the edge. Two rows of contrasting grosgrain ribbon were used on the attractive flower shown

From Decorative Buttons

as arrangement. The dime stores offer an excellent source for buttons—or you may find what you need right in the family button box. Don't overlook discarded dresses or uniforms for suitable and unusual buttons. Whether of plastic, glass, metal or wood, they'll all work up into attractive costume jewelry to reflect the personality and charm of the wearer. The tools required are practically nil—two small files, one round and one flat, a few tiny twist drills, also a coping saw and a tube of quick-

setting household or airplane cement will do for the most part. A few spring-type clothespins will be found handy for clamping the parts together while the cement is hardening. Solder can be used for fastening a clip or clasp to a metal button, although cement may be used for this purpose if a soldering iron is not available.

Plastic bottle caps are excellent for forming bands for button rings. A cap near finger size is selected and a hole is drilled through the top so a round file can be in-



Corsage



Necklace



Neck Decor

Artificial leaves are bound together to form a pleasing spray and the buttons are sewed onto the edges of the leaves in graceful groupings. Loops made of harmonizing ribbon are tacked securely underneath and to the spray. A plastic or metal pin back may be sewed to the ribbon as the means of fastening it to a dress or other garment

Careful selection of the right buttons is the making of this beautiful necklace or pendant. The foundation of the one shown is a disk of thin plastic or metal. The center consists of a medium-size glass button inset on one of metal. Slightly smaller buttons border the center and tiny square buttons then are glued around the perimeter of the disk

Simple yet smart looking is this decor or choker which is nothing more than a length of satin, velvet or other fine-grade ribbon studded with decorative buttons. The ribbon should be of a length to fit snugly around the neck, and is fashioned either by dress snaps sewed to the ends or by a tie cord. Space about 12 small buttons each way from the center



Hatpin



Ring



Earring

Heads of hatpins built up of several pretty buttons add a splash of color to a plain hat. A base to which the buttons can be cemented is shaped from thin plastic or metal and the pin is cemented to the back of the button-covered base. Or the hatpin can be soldered directly to a large metal button and then given a coat of clear nail polish

A common plastic bottle cap was used to form the band for this attractive button ring. A hole is made in the top of the cap and then it is enlarged with a round file, working it down until it slips over the finger. The button "setting" is cemented to a flat spot filed on the band after the latter has been sanded and buffed to a high polish

A single novelty button makes an attractive earring. Ear clips can be purchased or taken from an old set. If clip and button are metal, they may be soldered together. If clip is metal and button is plastic, fasten them with household or airplane cement. Hold the two parts together until the cement is well set, then lay them aside while it hardens



Worn shoes can be dressed up considerably with colorful button-studded bows whether complete new bows are added or just clusters of buttons are applied to original bows. Small buttons look the neatest for this, although just a large metal button sometimes looks chic when attached to the center of the bow

serted. After that it's merely a job of enlarging the hole to fit the finger. Finally a flat spot is made on the outside of the band for cementing a decorative button. Excess cement may be dissolved with nail polish remover, and you'll find various shades of nail polish ideal for touching up or accenting a desired effect.

A common item such as a toothbrush handle can be utilized to form a snap-on type bracelet by cutting off the bristle end and rounding it. The handle is made pliable for shaping by immersing it in boiling water for a few minutes. Decorative buttons



Bobby Comb



Bracelet



Slip-on Tiara

Bright buttons transform a plain bobby comb into a colorful hair ornament. Tiny holes are made through the top of the comb for attaching decorative buttons with thread or fine wire. Spacing of holes must match that of the buttons. In the case of large buttons where it is not desirable to sew them, you may fasten them with glue or cement

The handle of a discarded toothbrush studded with novelty buttons forms this attractive bracelet. The bristle end is cut off; then the handle is immersed in hot water to make it pliable for bending to fit the wrist. Buttons are attached by drilling holes and fastening with thread or fine wire, or they may be cemented to the outer surface

Another attractive hair ornament is this tiara. First a corset stay is shaped to clamp over the head by drawing it back and forth over a broomstick; then the stay is wrapped with ribbon. Buttons can be sewed or cemented to the ribbon, or they can be wired directly to the stay through holes made before the ribbon covering is wound around stay

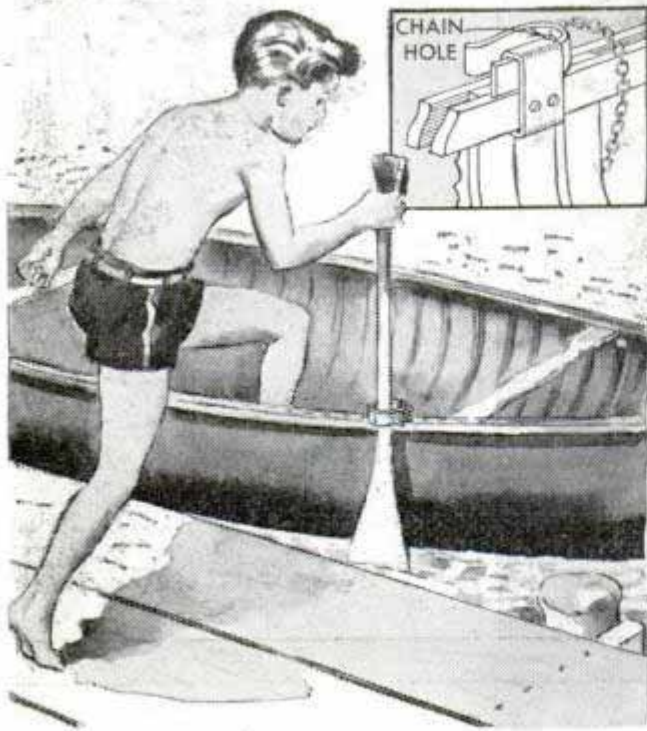
are then cemented to the outer surface.

Metal buttons and ornaments can be kept looking bright with a coat of clear nail polish or lacquer. Parts of jewelry made of toothbrush handles and bottle caps can be buffed to a high luster by using rouge on a buffing wheel or simply by brisk rubbing with a rouge-coated cloth. Of course, any file marks should be removed beforehand by sanding with a fine sandpaper or crocus cloth of 6-0 grade, working with it either wet or dry. This will produce a dull finish which buffing will restore to a sparkling luster.



Here's another example of what can be done with buttons. Using a belt you already have, the buckle is discarded and the ends are fitted with snap fasteners. Then in place of the buckle a disk of felt or leather is covered or outlined with buttons and fitted to the belt in the front to conceal the snaps

Paddle Holder Stabilizes Canoe To Prevent Capsizing



Many an unpleasant "dunking in the drink" can be avoided if you use a paddle and this holder to stabilize the rocking motion of your canoe when climbing in or out. The paddle is kept against the side of the canoe by the holder so that the tip of the blade rests firmly on the bottom, thereby preventing any rolling. A feature of the holder is that the clip can be removed so that it is out of the way, yet it is not easily lost because of the chain that fastens it to the canoe.

Small Silhouette Pictures Framed With Phonograph Records

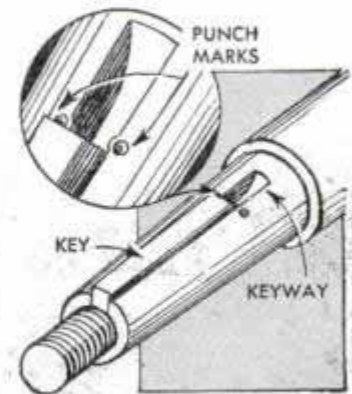
Outdated and unused phonograph records provide attractive and novel backgrounds for small pictures. Silhouettes and flower prints are especially adaptable to



this type of treatment. Simply glue the picture over the printing in the center of the disk and, with adhesive or cellulose tape, attach a short loop of cord to the back of the record. The loop should be slightly below the edge of the disk.

Punch Marks Position Shaft Key

When reassembling the wheel on an automobile, it happens sometimes that the key slides up too far in the keyway so that the wheel does not seat properly on the axle. To prevent this from occurring, make a center-punch mark on both sides of the keyway to keep the key in its proper position.



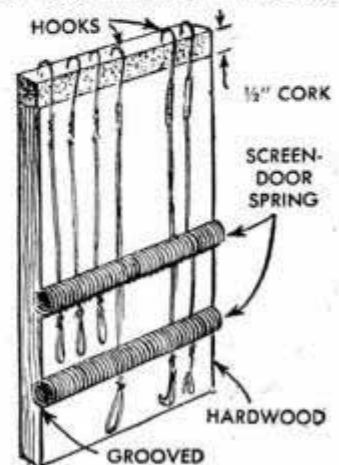
E. T. Gunderson, Jr., Humboldt, Iowa.

Wash Metal Boat Before Painting

The paint on many metal boats, soon after they have been finished, will start to peel and flake off because the surface was not properly cleaned before painting. To prevent this, remove all paint and go over the surface with a strong solution of cider vinegar. Then wash with soapsuds and rinse with clear water. When dry the boat is ready for painting. The same treatment may be applied to unpainted metal boats before the primer coat is applied.

Protective Holder for Fishhooks Prevents Damage to Tackle

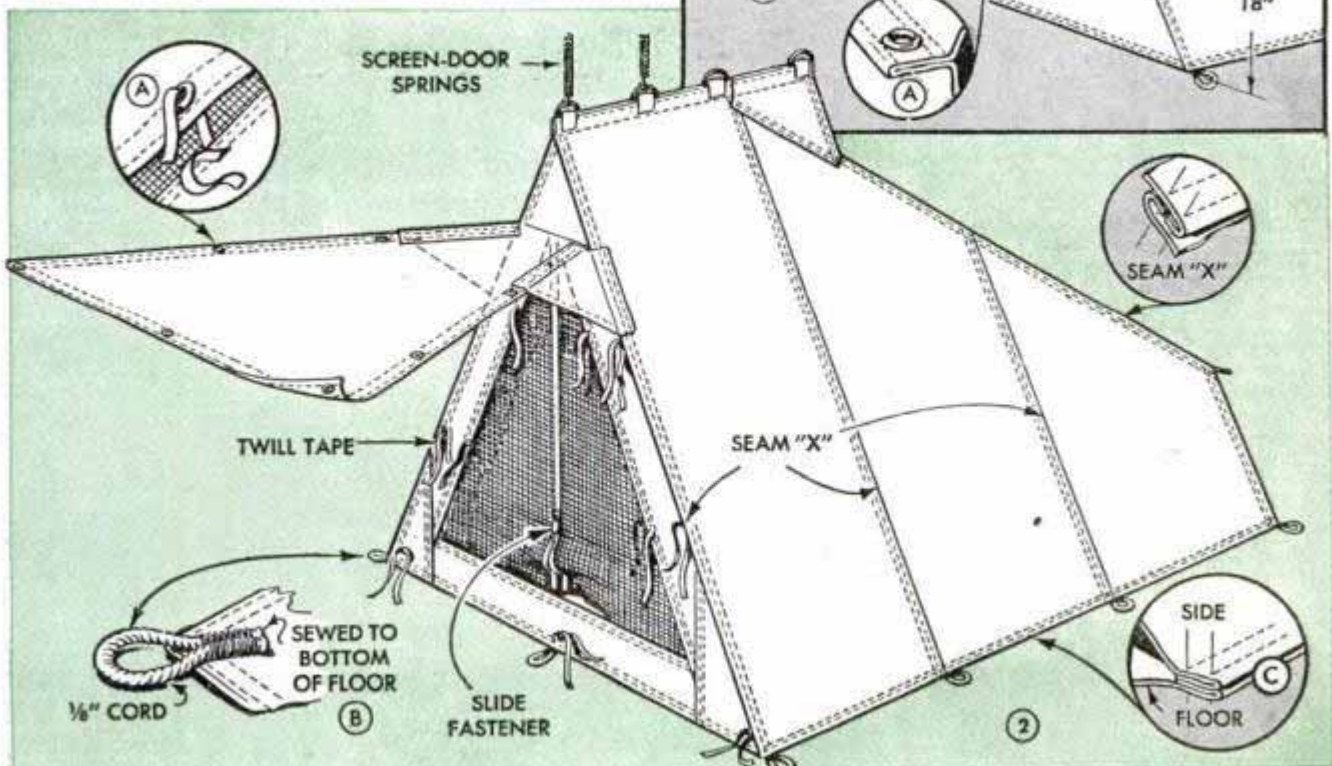
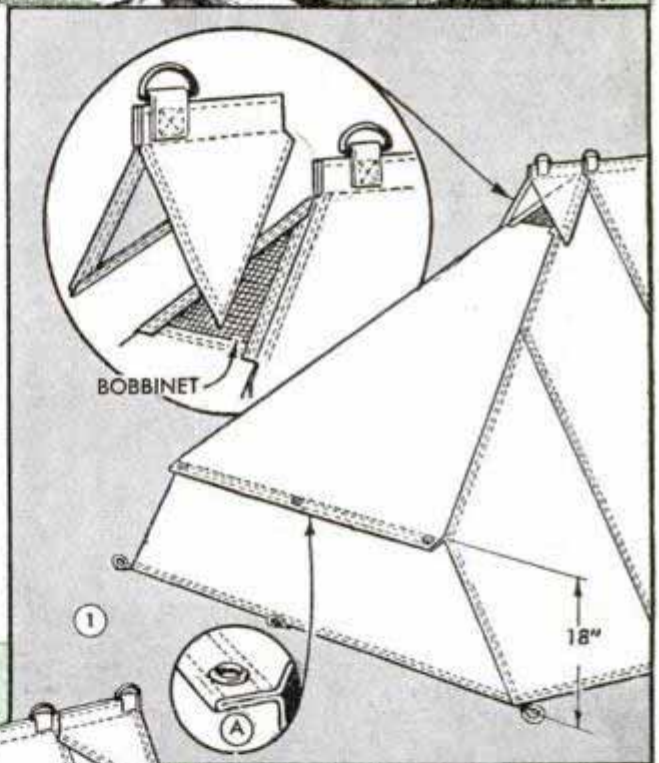
Snelled fishhooks can be kept in this holder and they will not become tangled or damaged, as often occurs when they are kept loose in the tackle box. The panel is a piece of $\frac{1}{2}$ -in. or $\frac{3}{4}$ -in. hardwood 4 in. wide by 10 in. long. To hold the hooks, a $\frac{1}{2}$ -in. strip of cork is glued to the top of the panel. Two flutes are cut in the wood to hold screen-door springs. Hooks with shorter snells fit into the top spring and the longer ones fit into the bottom. The exact position of the springs is determined by the length of snells you use.—Harold Gluck, New York, N. Y.

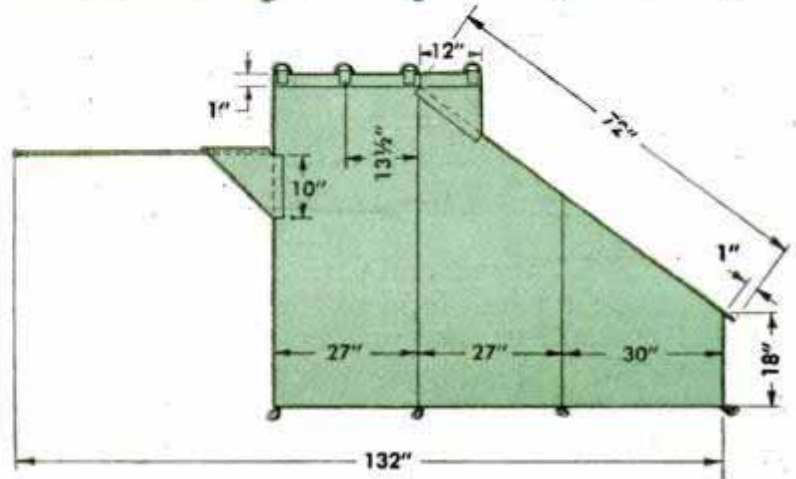
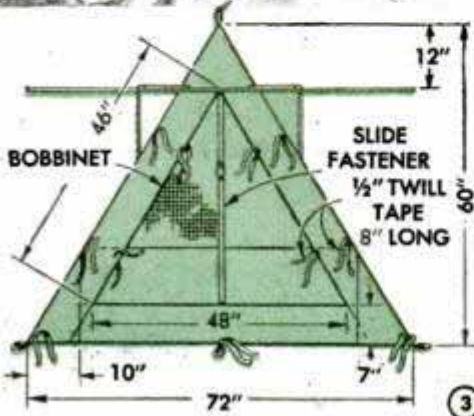
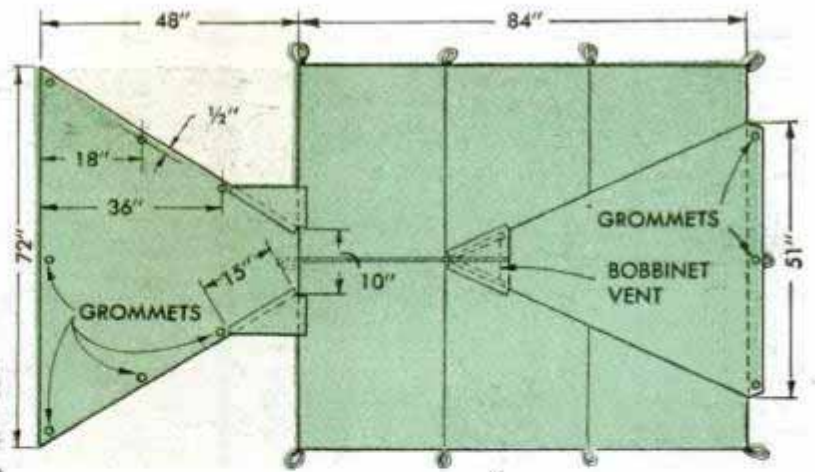


ALL-WEATHER TENT FOR TWO



COMPLETELY insect and vermin proof, this two-man tent is ideal for hikers, canoeists and others who require a lightweight outfit. It is made of waterproofed unbleached muslin and has a sewed-in floor. A bobbinet ventilator, protected by a hooded canopy as shown in Fig. 1, assures ample air circulation under all weather conditions. The door, also covered with bobbinet, closes tightly with a hookless slide fastener. An outside door flap that may be drawn down in case of rain can be tied in place from the inside with the tapes shown in Fig. 2, A. The tent can be set up with inside poles or suspended from a branch of a tree. If the latter method is used, screen-door springs or strips of inner



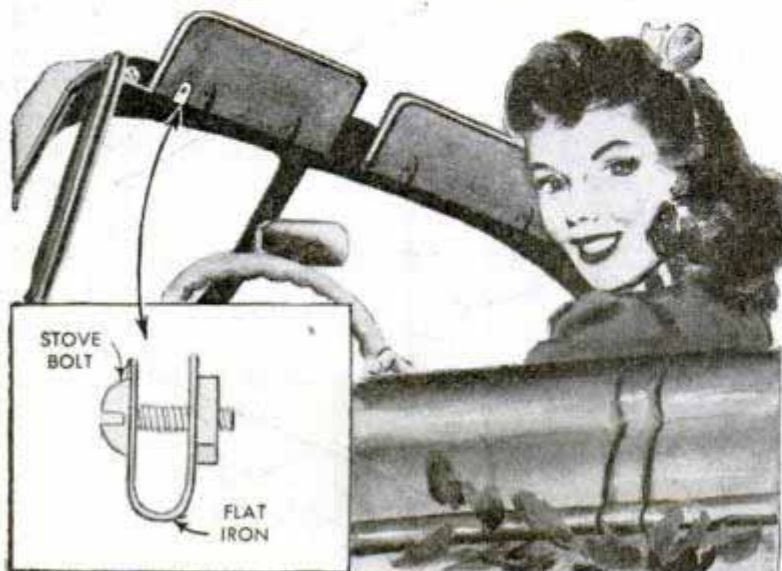


tube should be fastened between the tent and supporting ropes to allow for the swaying of the tree. Guy ropes are attached to the grommets, Fig. 1, A, to hold the rear wall vertical.

To make the tent, 20 yards of 80 by 80 unbleached muslin will be required. This is laid out and cut according to the dimensions given in Fig. 3. Care should be taken to allow enough material to make the various types of seams shown in the enlarged details of Fig. 1, A, Fig. 2 and Fig. 2, C. Loops of $\frac{1}{8}$ -in. cord then are sewed to the

bottom of the floor as indicated in Fig. 2, B, for the tent stakes. Other materials required are two spools of $\frac{1}{2}$ -in. twill tape, $1\frac{1}{4}$ yards of bobbinet or mosquito netting, one hookless slide fastener 40 in. long, 10 grommets, 20 ft. of $\frac{1}{8}$ -in. rope, four "D" rings, approximately 450 yards of thread and 2 gallons of tent waterproofing solution. A prepared waterproofing purchasable at most sporting goods stores can be used, or a good waterproofing compound can be made by mixing 1 pound of paraffin and 4 oz. of beeswax in a gallon of naphtha.

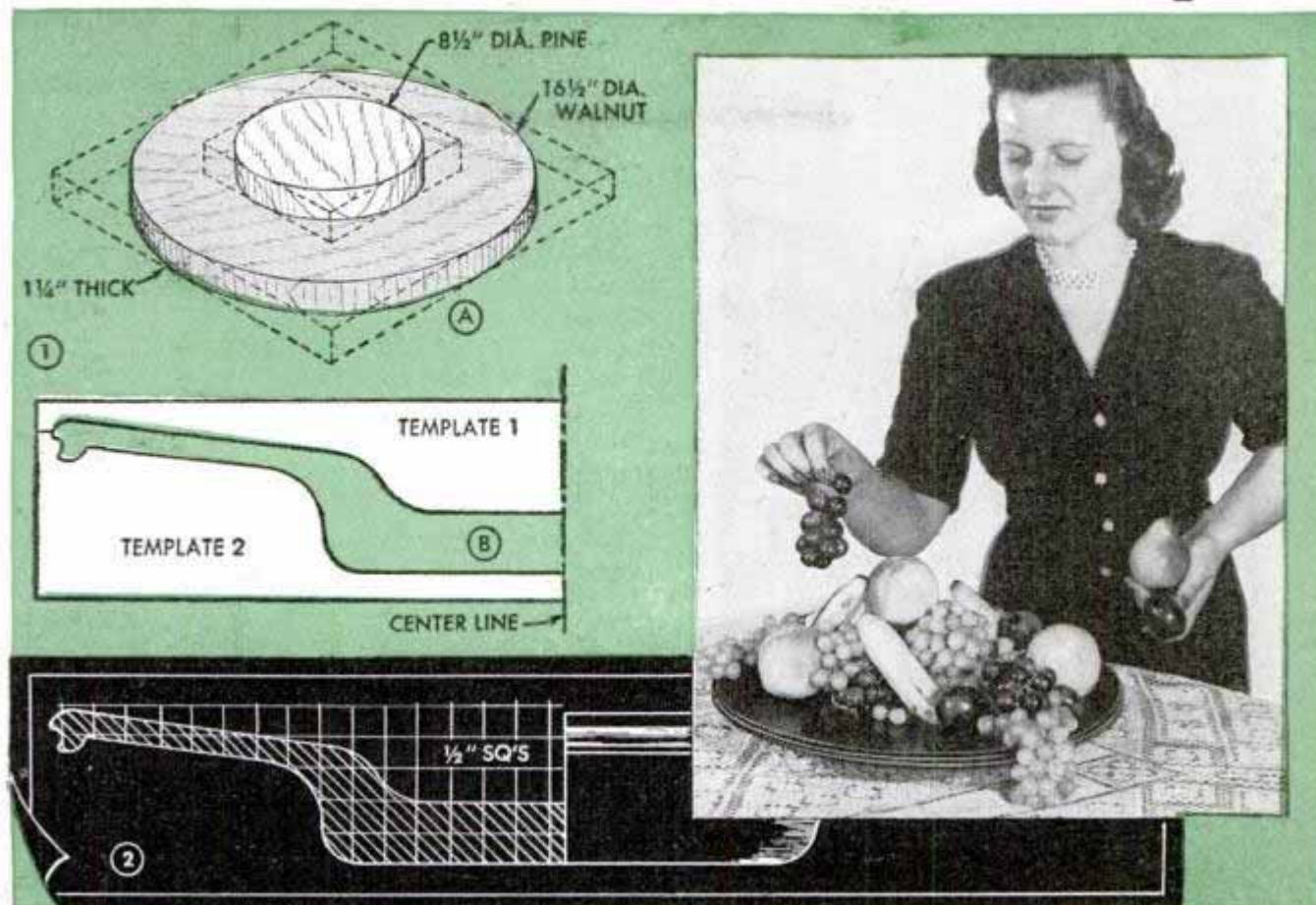
Small Clip Aids in Holding Sun Visor in Proper Position



If the sun visor on your car will not stay in the position in which it is set, the clip shown here will be an aid. It is formed from light-weight flat iron and is fastened over the rod that holds the visor. Tightening the stove bolt holds the sun visor in place securely.—Lionel Louis, Johannesburg, South Africa.

When serving food on paper plates to children at a picnic, one housewife found that the youngsters were less apt to spill the food if the plates were thumbtacked to the table. The food is served after the plates are in place.

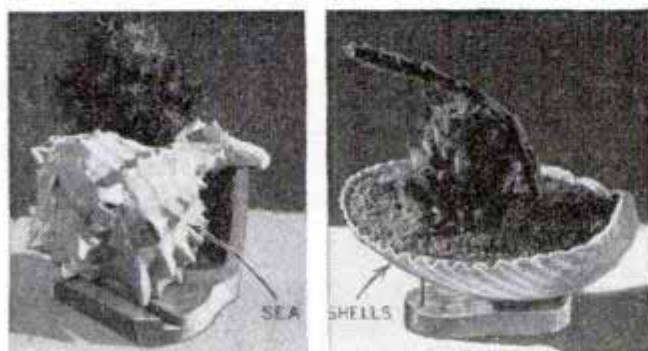
Turned Fruit Bowl Makes Beautiful Centerpiece



The beauty of this lovely fruit bowl reflects nicety of grain and a flawless finish. The drawing suggests a two-tone job, using a light wood for the bottom half and a darker wood for the top, although it can be made entirely of the same stock if you wish. Building up the turning of two separate disks as in A, Fig. 1, saves work and permits it to be made up of 1 1/4-in. stock. The top disk, detail A, Fig. 1, is made by gluing several pieces together edgewise, while the lower one can be of one piece. The small disk is centered on the larger, with the grain at right angles, and glued and clamped. Owing to its large diameter, the bowl in most cases must be turned on the outer end of the lathe headstock. Center the work on the faceplate and turn the bottom of the bowl first, using template No. 2, B, to check the contour as you go. Use heavy cardboard or light sheet metal in lay-

ing out the templates from the sectional drawing in Fig. 2. Next the work is reversed on the faceplate and the top is turned to match template No. 1. By carefully centering and gluing a scrap disk to the bottom of the work before turning the top, you can avoid screw holes in the finished job. Paper or thin cardboard should be placed between the glue joint so that the disk can be pried off later without marring the turned surface.

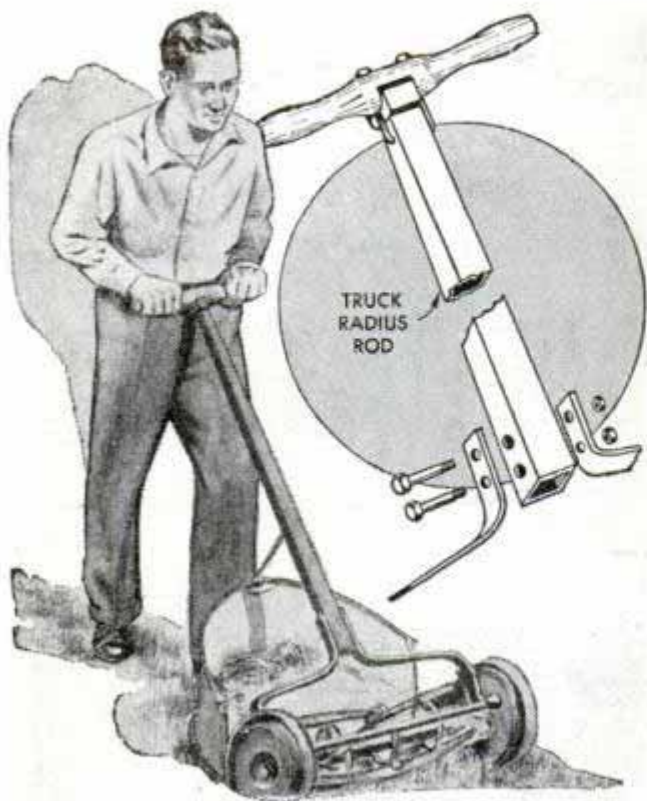
A beautiful shellac-spun finish can be applied to the bowl while it is on the faceplate. A mixture of equal parts of shellac and sweet oil is applied to the revolving work with a lintless cloth. Friction of the cloth against the work produces a rich-looking glazed surface which is built up with succeeding applications of shellac and oil. A final coat of wax may be applied if you wish.—Isadore M. Fenn, Chicago.



Novel Pots for Cactus Plants Made From Sea Shells

Sea shells can be made into artistic pots for small cacti and similar plants. The shells are mounted on bases of wood, as shown, and fastened securely in place. For a finish, the base can be painted with enamel, or for an unusual effect, it can be covered with a coat of plastic-type putty, roughly applied, and then painted.

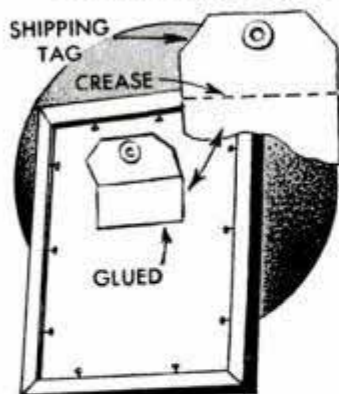
Substitute Handle on Lawn Mower Made With Radius Rod



A piece of radius rod from a truck chassis will serve as a substitute lawn mower handle. Both ends of the rod may have to be cut to obtain a handle of the proper length. Holes are drilled in the ends to fit the hand grip and the mower. If the rod is the split-seam type, it is best to tack weld the seam at several spots to prevent possible spreading. Given a coat of paint, this sturdy handle will last a long time.

Benj. Nielsen, Aurora, Nebr.

Tags Used as Picture Hangers



Shipping tags may be used to hang small pictures. The tag is cut and creased as shown and glued to the back of the frame. Care must be taken to fasten the tag so the picture will hang straight.

Emergency Repair for Canoes

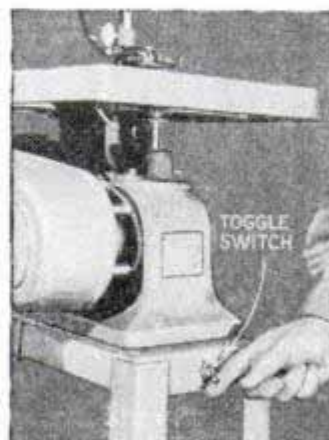
When spruce gum is available, a leaking canoe can be repaired even though you do not have a repair kit with you. After the leak has been located, clean the area and allow it to dry thoroughly. Then fasten a piece of spruce gum the size of a hickory nut on the end of a stick. Heat the gum with

a match and allow the drippings to fall on the leak. Spread the gum around the area with a heated knife. When the patch has dried the canoe is ready for the water.

R. A. Jenkins, St. Louis, Mo.

Scrollsaw Switch Is Mounted On Front of Stand

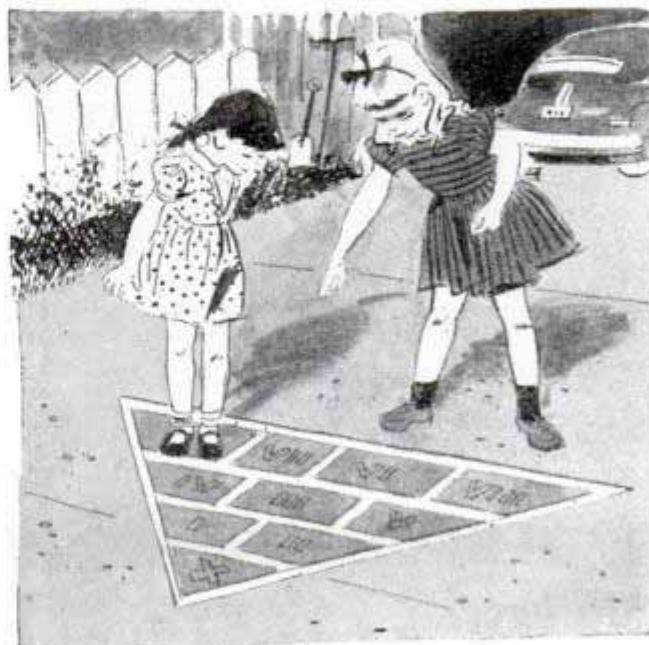
If the motor switch on your scrollsaw is located at the back where it is hard to get at, you can mount an s.p.s.t. toggle switch on the front of the unit for convenience in operation. The switch should be connected in parallel with the one on the back of the saw. Be sure to solder and tape the joints well. The switch should be mounted to go "on" with an upward movement of the handle.



D. J. Bachner, Jackson Heights, N. Y.

Game Board Inlaid in Driveway If Yard Lacks Space

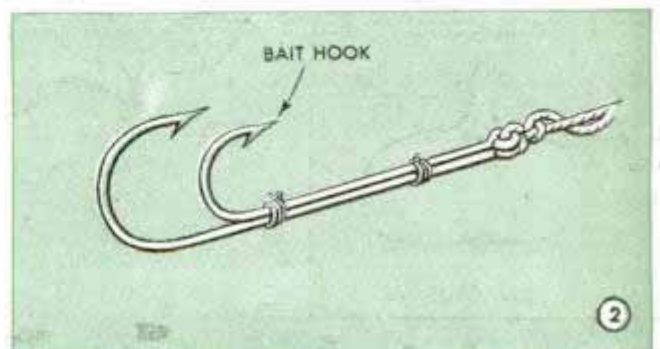
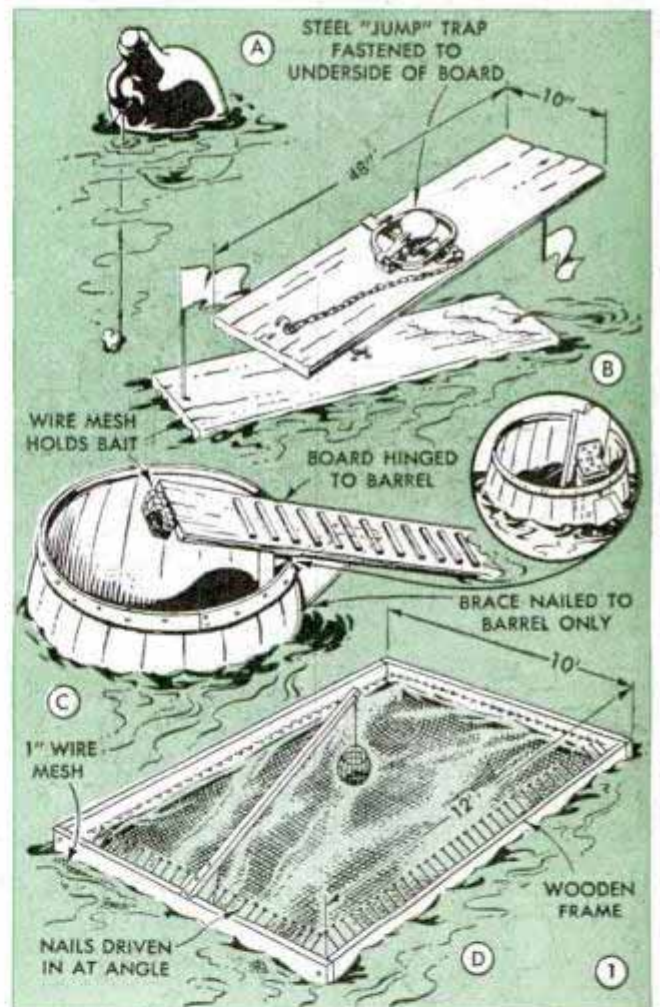
One city home owner solved the problem of providing play space for his small children by utilizing the concrete driveway that he was having laid for his garage. Tiles were cut to the proper shape and set in the concrete while it was wet. Then the numbers were painted on the tiles with white paint. Although in this case the tiles were set in cement, the entire game could be painted on a drive that had been laid previously.—Paul Hadley, Philadelphia, Pa.





Turtle Traps That Catch 'Em

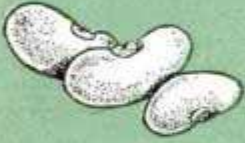
Turtles take a heavy seasonal toll of the spawn and fry of game fish and the young of waterfowl and small furbearing animals. The big soft-shelled "snappers" generally are the worst offenders and usually are the most numerous. Frequently it is necessary to control them or reduce their numbers as a measure in wild-life conservation. Fig. 1, A to D inclusive, details four traps that are easy to make and operate without constant attention. They are especially effective in ponds and the still backwaters of rivers and creeks. As turtles do not frequent swift water, anchoring the traps is a simple matter. The first, Fig. 1, A, is merely a half-gallon jug, tightly corked, and carrying about 30 to 36 in. of line, a heavy wire leader and a stout barbed hook baited with raw beef or flesh of the carp. Scaled fish are not attracted to either of these baits. Several such traps in a pond or still backwater will reduce the turtle population in a short time if regularly attended. Ordinarily this trap does not require anchoring in a small pond. Fig. 1, B, shows another type, the detail being self-explanatory. Bait is attached to the trap pan and the board is turned upside down. This trap can be anchored in a slow current. Detail C shows a more elaborate affair in which the design takes advantage of the turtle's habit of clambering onto partly submerged logs along the water's edge. Once adjusted and set afloat this trap is fully automatic. The hinged board tips so the turtle slides into the barrel, then the board returns to the original position, ready for the next customer. The trap shown in detail D is fully as effective in large ponds and there are no moving parts. And finally, by using two hooks tied together in the manner shown in Fig. 2, you can catch turtles with ordinary fishing tackle.



"Applied Chemistry"



POTATO



BEANS



LAWN GRASS



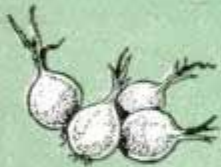
CORN



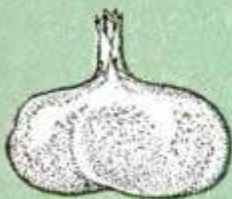
GARDEN PEAS



BEETS



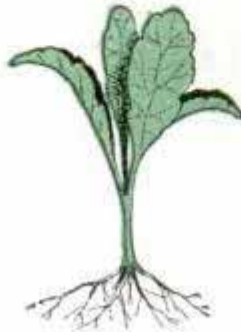
ONION SETS



GLADIOLUS



TOMATO



CABBAGE



CELERY



PEPPER



STRAWBERRY



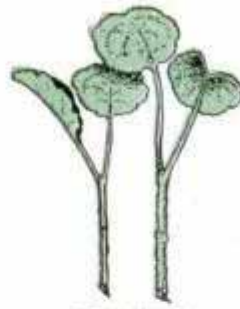
CHINESE JUNIPER



POINSETTIA



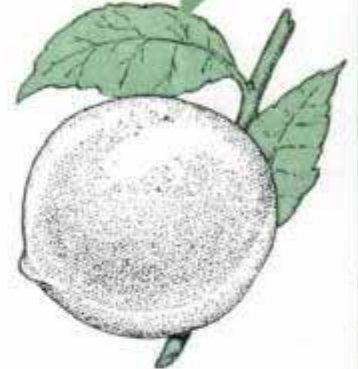
GARDENIA



GERANIUM



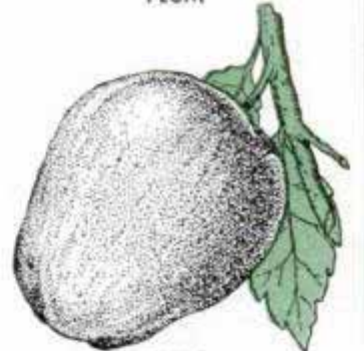
YEW



PEACH



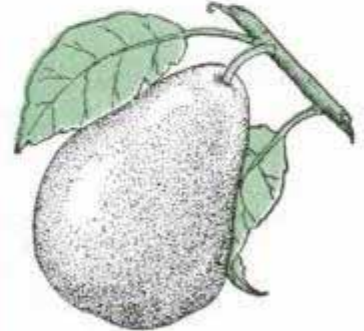
PLUM



APPLE



TOMATO



PEAR

① SEEDS AND BULBS

② TRANSPLANTS

③ CUTTINGS

④ FRUIT SET

Improves Garden Crops

A new day in home gardening is no longer just coming—it's already here. Plant hormones applied as sprays and dusts are proving a great aid in producing finer fruits and vegetables and a more vigorous growth of grasses and ornamentals

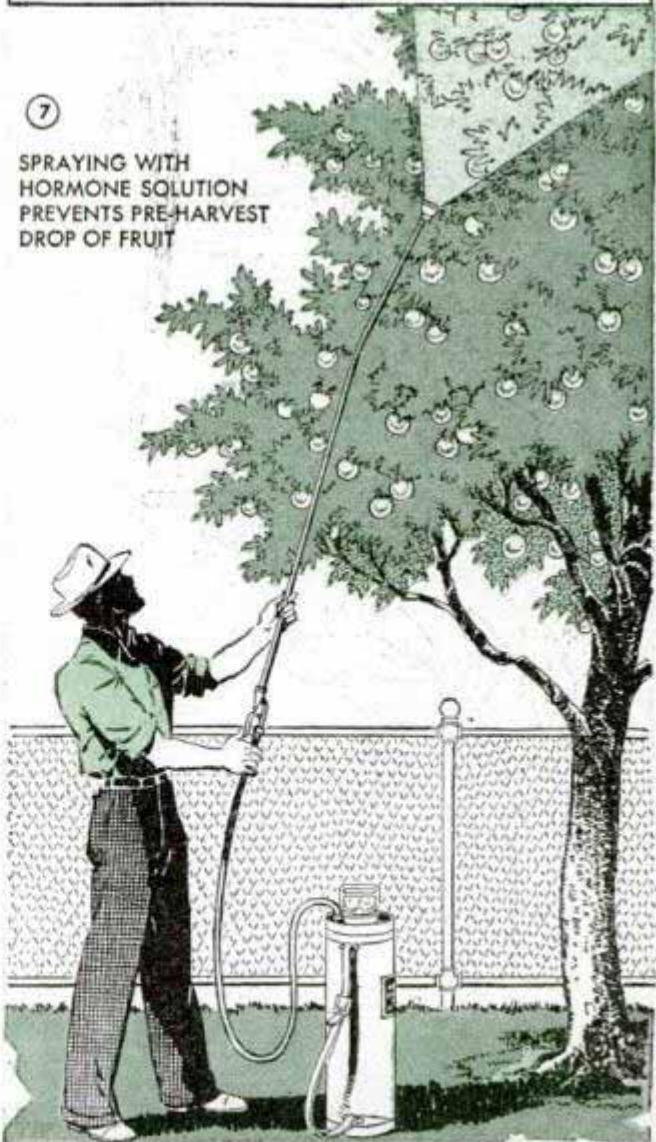
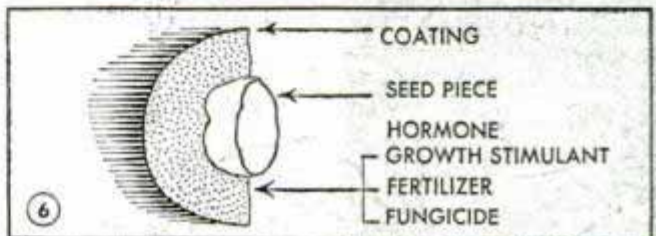
By W. Clyde Lammey

IN most cases you can handle the new chemical growth regulators—the so-called plant “hormones”—as easily as any of the old stand-by sprays and dusts which act as fungicides or insecticides or combinations of both. Most of these new chemical substances are applied in mixtures or solutions of very low concentration.

Application of newly developed chemicals to promote or alter plant growth and to protect plants from disease and insect attack is on the way to becoming a regular horticultural practice. Although many synthetic growth-promoting substances are still of only theoretical value to the average user, others have immediate practical applications of special interest to home gardeners, flower fanciers, farmers and orchardists. Usually the chemicals are applied to the roots, stems and buds of plants by dipping, dusting or spraying. In many instances you can use the ordinary hand or power sprayers and dusters. Although in certain cases the formula for a specific plant is quite critical, the recommended methods of application are very simple.

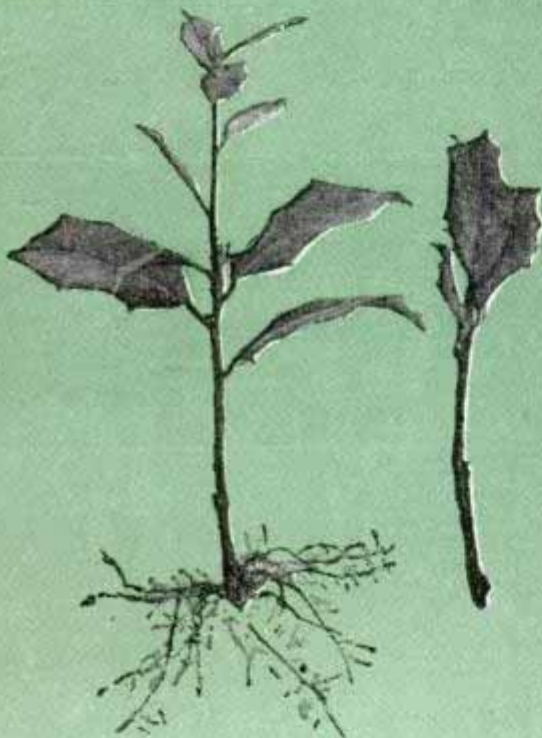
Since protection of the seed and seedling is closely related to the use of growth chemicals, one promising new method, Figs. 5 and 6, consists of coating individual seeds with a mixture combining a chemical growth regulator, a fertilizer and a fungicide, all of these preparations providing for the growth and protection of the seedling during and after emergence. Coated seeds of many of the common vegetables likely will be available to gardeners in the near future, but as yet the process is more or less in the experimental stage.

One important thing to keep in mind is that none of the new chemical growth substances, as now developed, is a plant food or fertilizer in the ordinary sense since the amounts of plant food that would normally produce an average healthy growth must always be present in the soil. Perhaps the best known of the synthetic plant-hormone treatments is the simple dusting of powdered, root-forming stimulants on





8



9 TREATED UNTREATED
AMERICAN HOLLY



10 UNTREATED TREATED
KENTUCKY BLUEGRASS

cuttings, seeds and bulbs, Figs. 1, 3 and 9. By this means the normal process of root formation is speeded up, resulting in stronger, healthier plants, faster growth and earlier flowering.

The various steps in rooting cuttings in this manner are quite simple and sure. The base or stem of the cutting first is moistened and then dipped into the hormone powder to a depth averaging about 1 in. It's important that the excess powder be shaken off so that only a thin coating remains on the stem. Then the treated cutting is placed in the propagation bed of wet sand in the usual way, Fig. 8, except that care must be taken that none of the powder is removed when planting. It's quite important that the sand be packed firmly around the stem. In taking cuttings, it's well to consult with your local experiment station for full information on the time and methods of propagating cuttings in your locality. Although in most cases cuttings should be treated and then planted in the propagating beds immediately, there are some exceptions to this practice. For example, it has been found that geraniums and the various cacti and succulents should be allowed to dry or "wilt" for 12 hours or more before treating and setting in the bed. Treated cuttings of some varieties "take hold" quickly, showing a vigorous, bunchy set of roots within two or three weeks. Others take from two to three months and perhaps longer, depending on local conditions. Manufacturers of hormone preparations suitable for use in rooting cuttings often recommend compounds of double strength for the slower-rooting varieties. A bottom heat in the cutting bed of 70 to 75 degrees also has been found a helpful supplement to the hormone treatment when rooting the species more difficult to start.

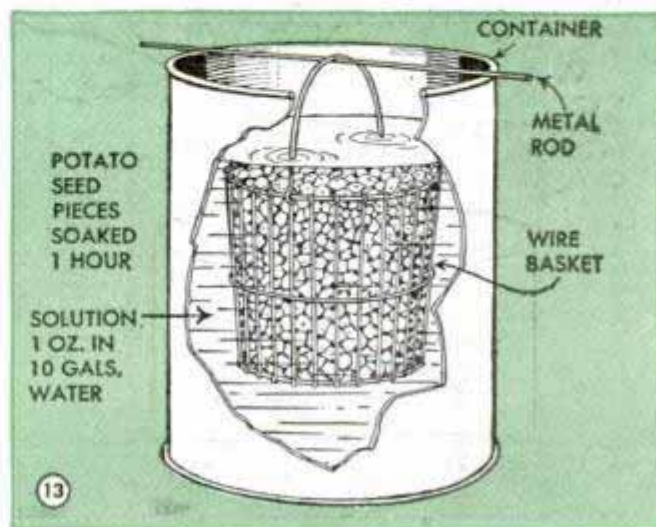
Ordinarily, when plants are moved, as in transplanting from beds to the row, Fig. 2, many of the delicate feeder roots are broken and growth stops until the damage has been repaired by natural processes. Loss of water due to the damaged root systems causes the familiar wilting. Many of the weaker plants, and those which have suffered the greatest root loss in handling, wither and die. As the secret of successful transplanting is the maintenance of root strength and the production of new root growth to replace that broken from the plant, another hormone treatment has been developed especially for use when transplanting. Comparisons of treated and untreated specimens of common transplants and cuttings invariably show the heavier root system of the treated specimen. Fig. 9 shows an example of two cuttings from American holly, a variety which ordinarily is difficult to root. Both treated and un-

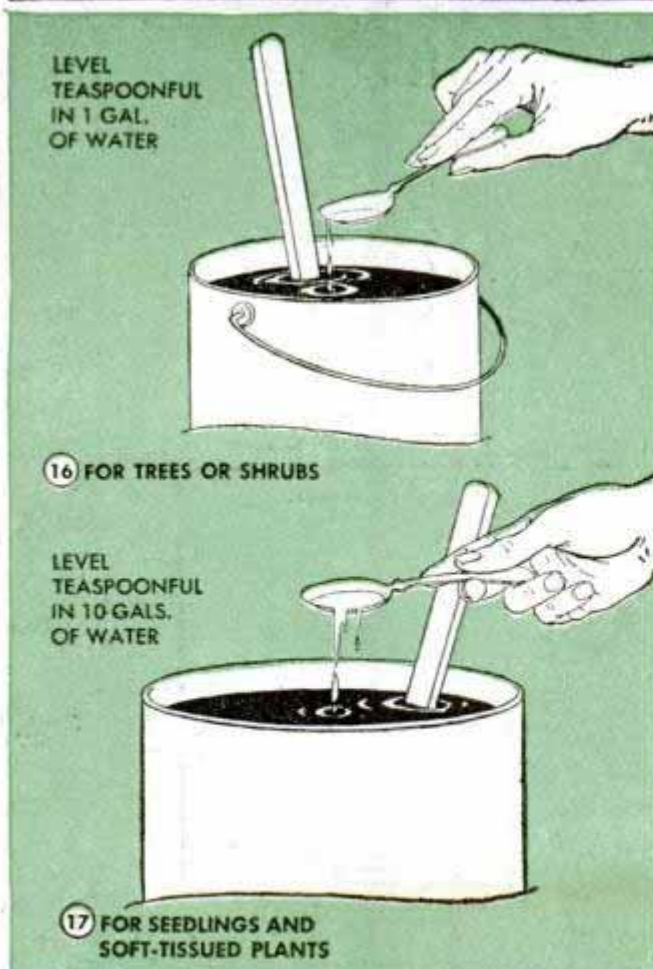
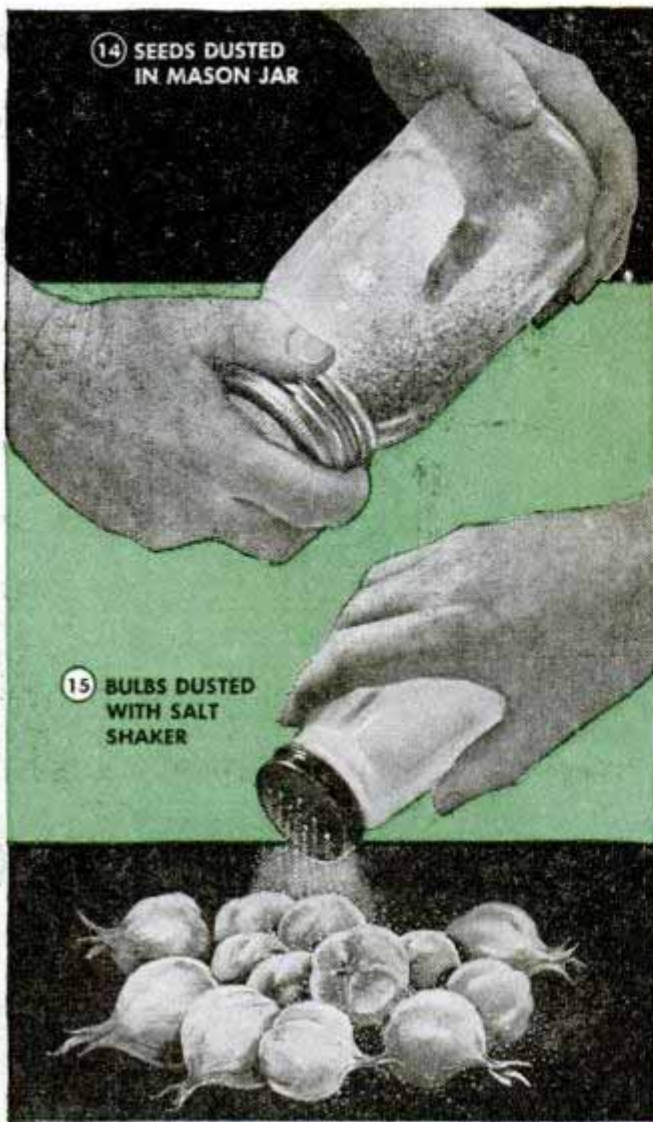
treated cuttings were left in the propagating beds for the same length of time. Note the developing root system and the vigorous top growth of the treated specimen. There are several methods of applying this root-forming aid and all of them are very nearly as simple as merely watering the plants in the ordinary way. Fig. 16 gives a recommended formula for small trees and shrubs and Fig. 17 indicates the solution for soft-tissued plants and seedlings.

These solutions can be applied in several ways. One method especially effective on tender seedlings as a protection against wilting is "watering" with the solution a day or so before transplanting. Bare-rooted plants such as rose bushes, peonies and others should be soaked an hour or so before planting, all the roots being immersed in the solution. Still another method is transplanting as usual and then soaking the soil around the roots with the solution.

In addition to being an effective aid in re-rooting of transplants and cuttings, similar solutions of these same chemicals can be used in various ways in treating such widely diversified plant growth as seed potatoes, newly planted lawns, old established sods and balled specimens of evergreens and deciduous trees. Fig. 13 shows an easy method of treating seed potatoes. The seed pieces should remain in the solution for at least one hour, and after removing and drying they may be further treated with any of the mercurial or formaldehyde preparations without lessening the effectiveness of either treatment. Lawns may be watered with hormone solutions during the spring and fall months, using a siphon attachment on the garden hose as in Fig. 11. To assure uniform results by this method it is necessary to apply a given amount of the solution per 1000 square feet. Measure the lawn and locate the areas with markers. Then sprinkle uniformly, taking care not to soak or flood the areas. When working on a steep, sodded slope or terrace, keep the bulk of the water on the higher levels as it will seep down the slope. Use a light, spreading spray under low pressure and work on a still day. The two sample sods in Fig. 10, from treated and untreated experimental plots, show the superior root system of the treated specimen. The time interval was the same for both specimens.

Flower beds, rock gardens and the vegetable-growing plot can be given the same treatment. Hormone stimulant in the powder form also can be dusted on practically all common vegetable and flower seeds and bulbs, such as onion sets and gladioli, with beneficial results. Use a glass jar for dusting small seeds as in Fig. 14. The jar should be filled to one third of its depth. Bulbs can be dusted with a salt or pepper shaker





as in Fig. 15. Be sure that the dust covers all the bulbs. If necessary dampen them slightly so the dust will stick to the surfaces. Bulbs and seeds so treated should be planted immediately.

Still another hormone treatment can be applied as a spray to fruits, blossoms and foliage to delay drop of apples, Fig. 7, to pears, plums and peaches, Fig. 4, and to produce seedless tomatoes, Fig. 12; also to flowers to induce fruit set and hasten seed formation without pollenization, and to holly and evergreen holiday decorations to cause the foliage to remain on the twigs from two to three weeks longer than normally. The cell layer at the point where most fruits, foliage and flowers are attached to the plant is known as the abscission layer. As the individual cells wither and die, the fruit, leaf or flower drops from the stem or twig. A specially developed hormone spray solution applied with a knapsack sprayer, Fig. 7, slows this natural process, keeping the fruit or foliage-bearing stem in an active state of growth and checking premature drop. As examples of time and variety, most kinds of apples are sprayed with the solution about 10 days to two weeks before picking time. The McIntosh apple requires two sprays 10 days apart. On this particular variety the effect of the spray lasts a week or more while on others a single spray is effective for a period of three weeks to a month. Other fruits, such as pears and plums, can be sprayed with a hormone preparation two weeks or more before picking time to prevent premature drop. To be effective, the spray must hit the stem or adjacent tissue.

Among the diversified applications of this same hormone preparation is its use in the production of seedless tomatoes, Fig. 12. The process is simple. Spray the blossoms immediately after opening and then once a week for four weeks. Use a double-strength solution. If this procedure is followed most of the individual fruits will be seedless. Likewise, spraying the blooms of lima and string beans results in a heavier set of pods, increases in yields up to 30 percent having been recorded in tests. Most of the common varieties of sweet corn will respond to treatment. Spray the silks just as the pollen begins to fly and be sure that the spray hits all the silks of each individual ear. As a result the ears will be larger, better filled and more uniform in size. Of course, it should be remembered that there are other conditions which naturally affect yields. An adverse growing season, such as unusually wet or dry weather during the early or latter part of the growing period, will tend to reduce the yield of the crop.

Photos and certain information by courtesy of Dow Chemical Co. and American Chemical Paint Co.

SCREENED Baby Crib

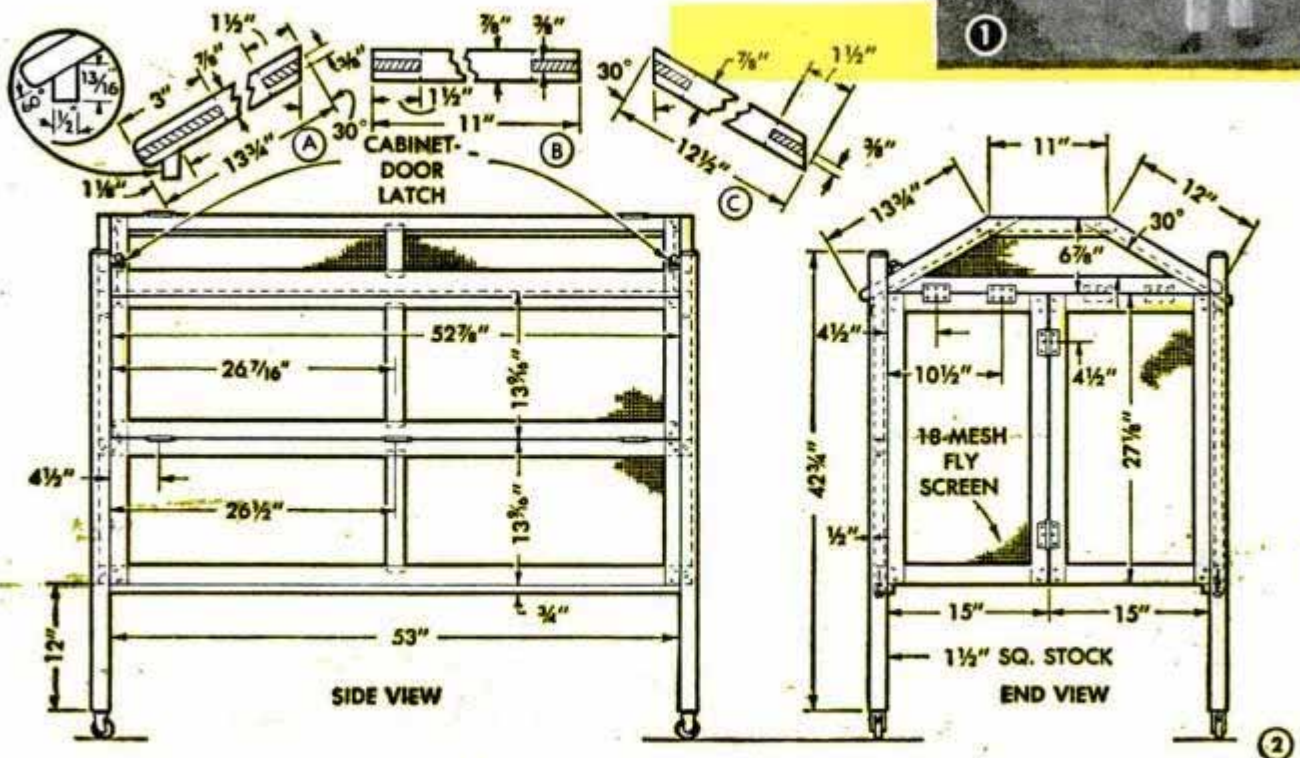
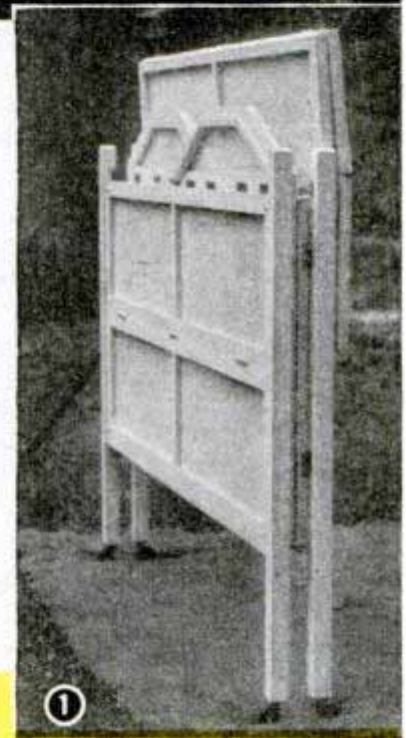
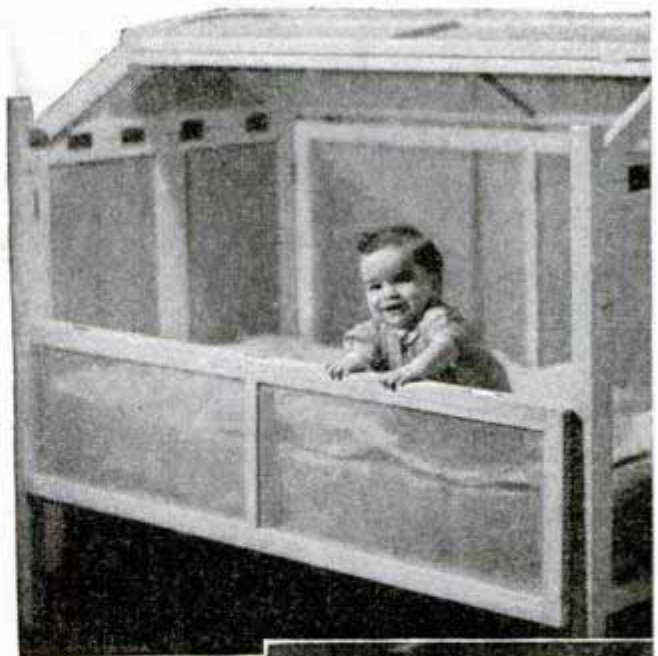
When baby naps outdoors or on the porch, screen wire keeps insects out and the baby in. Crib is collapsible

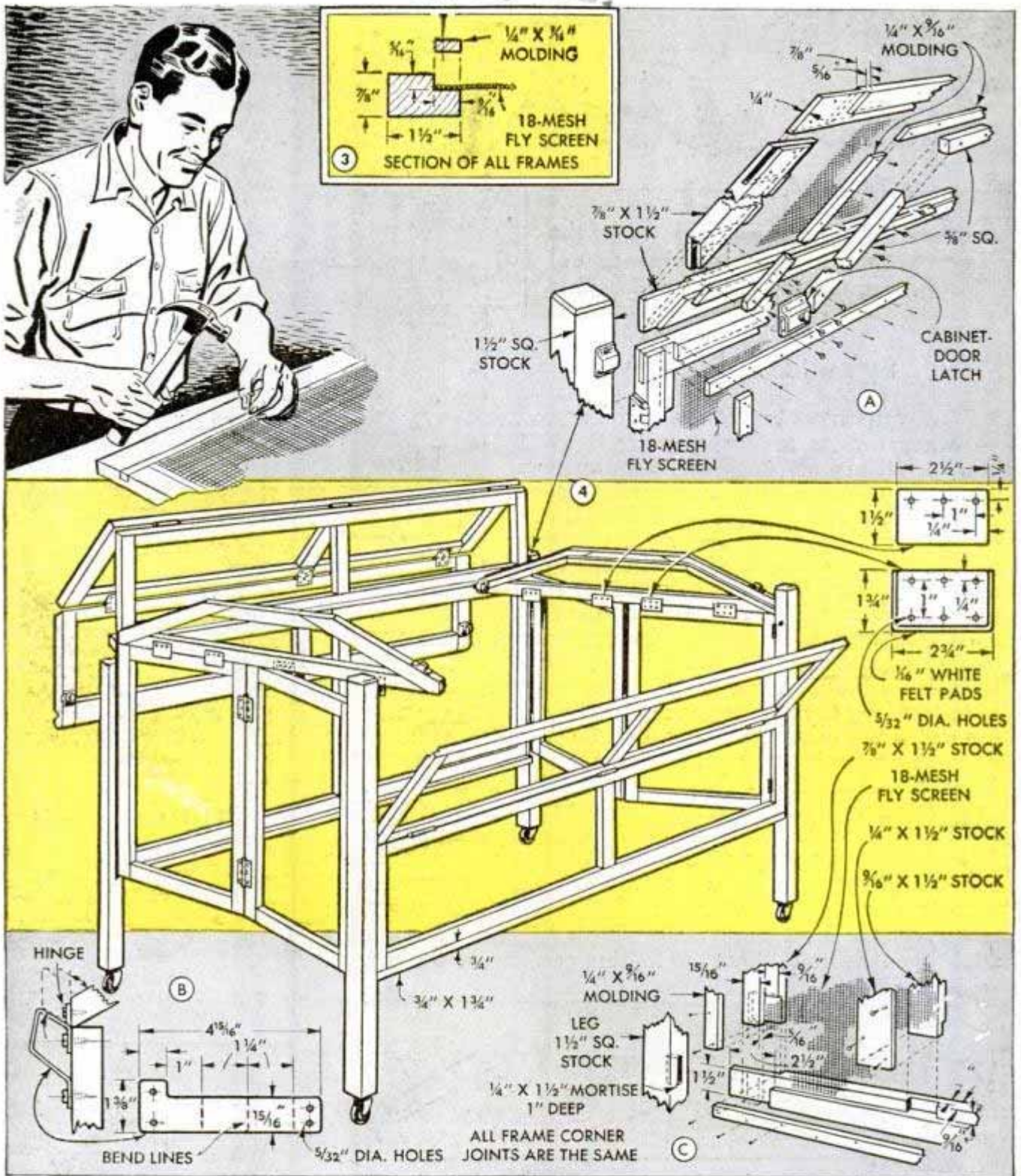
By Milton L. Bobeng

YOU won't have to worry about flies and other insects bothering your baby if you keep it in a screened crib like this one, which is covered with fine-mesh screen wire. Since it can be folded as in Fig. 1, you can move the crib to the most pleasant spot in the yard or pack it in the car for picnics. An added advantage of the bed is that there are no sliding parts or bars to catch and pinch small fingers and toes.

Overall dimensions of the crib are given in Fig. 2, and the dimensions for the three hinged top pieces are shown in details A, B and C. Tongue-and-groove construction is used in assembling the various panels, and most of the panels are hinged to the other members. Fig. 3 shows in cross section how the screen is fitted in all frames, and details A and C of Fig. 4 illustrate the method of joining frame members. As each frame is cut, the pieces should be fitted for a trial assembly to check and determine that they are square.

Hinges which are countersunk should be fitted next. Those connecting the front stationary and drop frames, as well as those connecting the rear top folding frame to the back frame, are the loose-pin type. Solid-pin hinges, also countersunk, are used to connect the folding end frames to the legs.





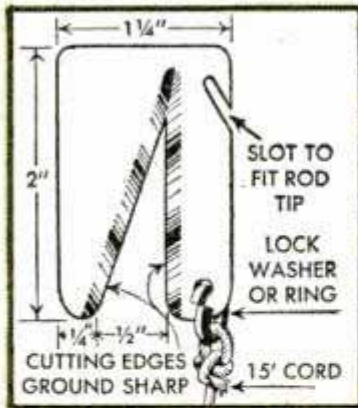
All other hinges are screwed on the surface of the frame pieces and are the loose-pin type. The manner in which the bed folds is indicated in Fig. 4, and the location of the hinges can be determined by reference to this illustration. Before final assembly, the frames should be painted, applying first an undercoat followed by two coats of enamel. Sand lightly after each coat has dried. Then a coat of wax should be applied to protect the surface during assembly.

The bumper and mending plates, Fig. 4, and the top rest bumper, detail B, should be made next. If desired, white felt pads are fitted beneath the plates where they

may strike and mar the wood. Note in Fig. 4 that some of the plates attach to the top and bottom members of the end frames, and some are fastened to the top members only. Small cupboard catches are installed as shown in Fig. 4 and detail A which serve to lock the crib in the open position and keep the child from pushing up the top.

To protect the parts of the crib where the members are not hinged, felt strips can be glued to the edges, and as a protection for the top when it is folded back, rubber bumpers can be installed. The casters, which should be installed last, are preferably a type that is relatively free wheeling so the crib can be moved easily.

Fly-Line Retriever Works Like a Tree Trimmer



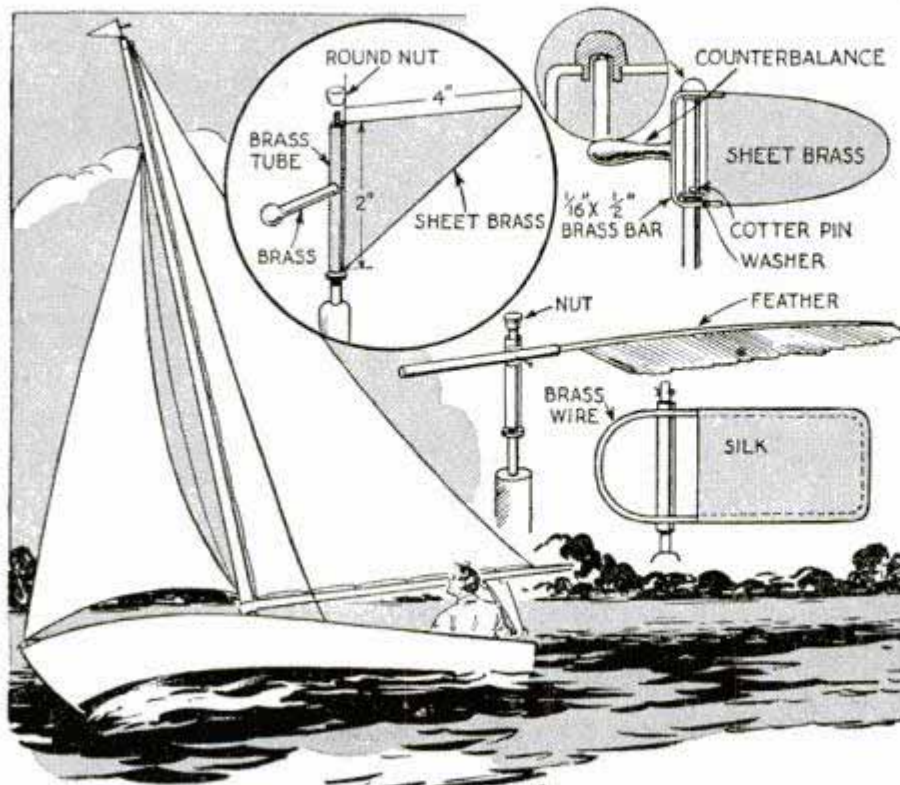
When you're whipping a trout stream and the speckled beauties are rising nicely to the fly—that's when it usually happens. A trifle too high on the back cast and fly and leader and maybe a yard or two of line are wound irretrievably around a small twig somewhere high out of reach. The problem of getting the line down is likely to be something of a poser unless you have the gadget detailed above. It's simply a piece of $\frac{1}{32}$ -in. tool steel with a V-shaped cutting edge ground razor sharp. One side of the cutter is slotted so that it can be hooked over the rod tip and raised to the offending twig as indicated. Then, after disengaging the rod, give the cord a strong pull and down come the twig and line.—M. J. McArthur, Beverly Hills, Calif.

Telltale Give Sailboat Skippers Exact Direction of Wind

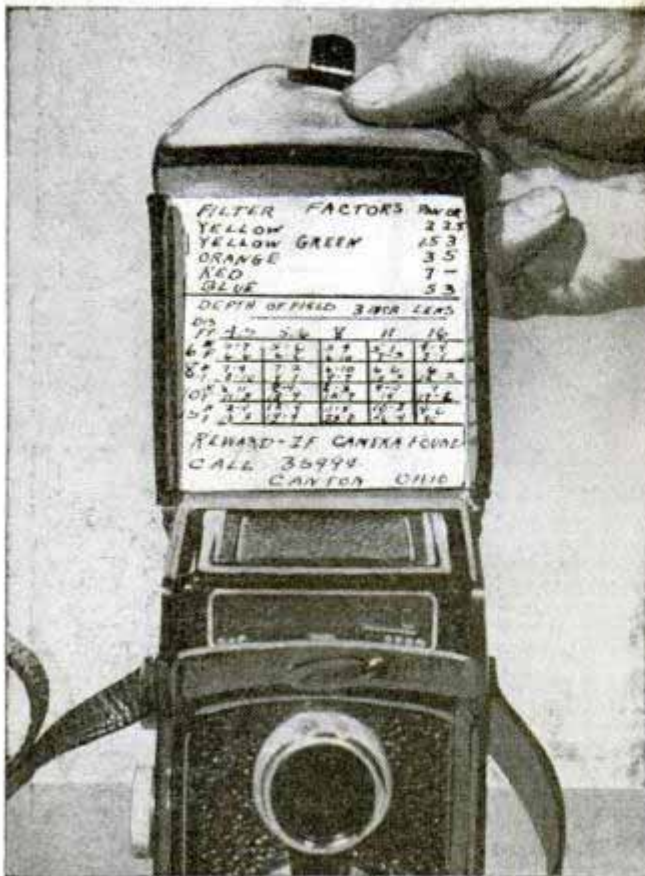
A telltale atop the mast comes in handy when you're maneuvering a small sailboat in close quarters and the wind is tricky. And even when it's smooth sailing in perfect weather a check on the wind direction can be made at any time by a

quick glance aloft. In wind vanes of any type the essential thing is perfect balance so that there is no binding at the pivot point. The details below show several styles ranging from the heavy-duty type made of metal to the light, sensitive turkey feather for small racing craft. The

metal vanes are fitted with counterbalancing weights and specially designed pivots. When constructing any one of these it's usually a good idea to make a trial assembly and carefully check the balance, reducing the weight of either the vane or the counterbalance as necessary. Bearing sleeves should be a true fit on the spindles. Metal parts can be polished and finished bright with clear lacquer. In fitting a fabric vane over a metal frame be careful that the fabric is not stretched too tightly as the coating of airplane dope has the effect of shrinking the cloth.



Data on Camera Carrying Case For Quick Reference

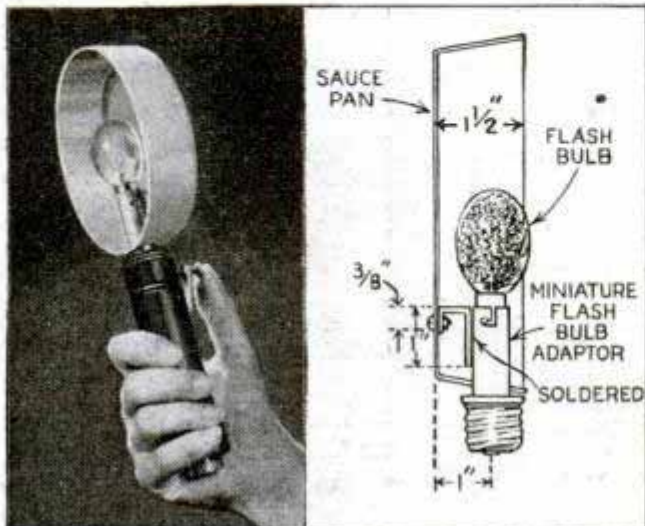


Camera information needed frequently may be printed on a card and pasted in the camera carrying case. Such information may consist of filter factors, depth-of-field tables and exposure charts. In addition, the owner's name and address should be on the card as a safeguard in case of loss.

H. Leeper, Canton, Ohio.

Flash Reflector Made From Pan

A compact and durable photoflash reflector may be made from a 1-qt. aluminum saucepan and a miniature flash bulb adapter. The pan is cut down so that it is about 1 1/2 in. deep and a 3/4-in. hole centered 1 in. from the bottom is drilled. Then a brass



bracket is bent as shown and attached to the bottom of the pan and to the adapter. The adapter should be positioned so the bulb will be in the center of the reflector. The reflector can be used with any flash unit case that takes a standard bulb or it can be used in a light socket.

D. E. Horn, River Forest, Ill.

Finishing Inside of Lens Shade

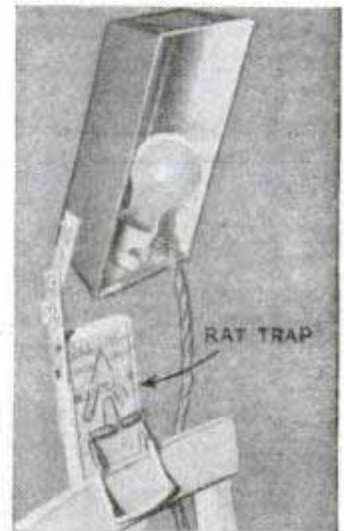
Sometimes lens shades are painted inside instead of being flocked. In time the paint may wear or chip off and expose the shiny metal surface of the shade.

To correct this, paste strips of adhesive tape inside the shade and cover the tape with a flat black paint, such as show card color.



Clamp-On Photoflood Reflector

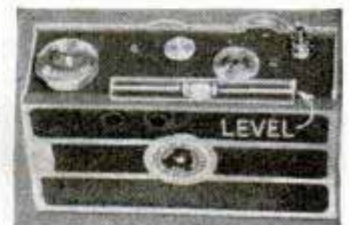
Using only a baking pan, a rat-trap and a few odds and ends, this reflector for No. 1 flood lights can be made in a short time. The light socket is screwed to a piece of wood which in turn is fastened to one end of the pan. One part of the pivoted support is bolted to the side of the pan and the other to the side of the trap. Adjustment is provided by a wing nut which fastens the two parts of the brace together. To protect the object to which it is clamped, the trap jaw should be wrapped with adhesive tape.



Herman Klein, Pittsburgh, Pa.

Line Level Helps "Set" Camera

When using a camera that has a view finder, often it is difficult to determine whether or not the camera is level. If a small line level such as the one shown is mounted on top of the camera it is a simple matter to frame the picture in the finder and then check the alignment with the level.—George T. Lundeen, Madison, Wis.





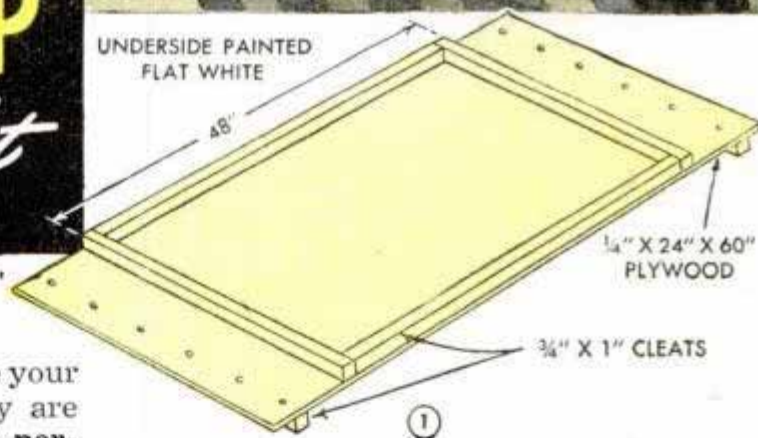
Fluorescent
PHOTO LAMP
gives soft light

By Tracy Diers

IF hot, bright photoflood lamps make your subjects uncomfortable while they are being photographed, this fluorescent portrait lighting unit will solve your problem. Its rays are intensely rich in actinic value and you should be able to click away at 1/10 second at f:16 on normal speed Panchromatic film. You will find that the negatives have a surprisingly long scale of tones and a welcome sparkle. The unit consists mainly of six 100-watt fluorescent tubes mounted on a piece of 1/4-in. plywood and wired as indicated in Fig. 7. The unit is suspended from the studio ceiling and can be tilted to almost any desired angle.

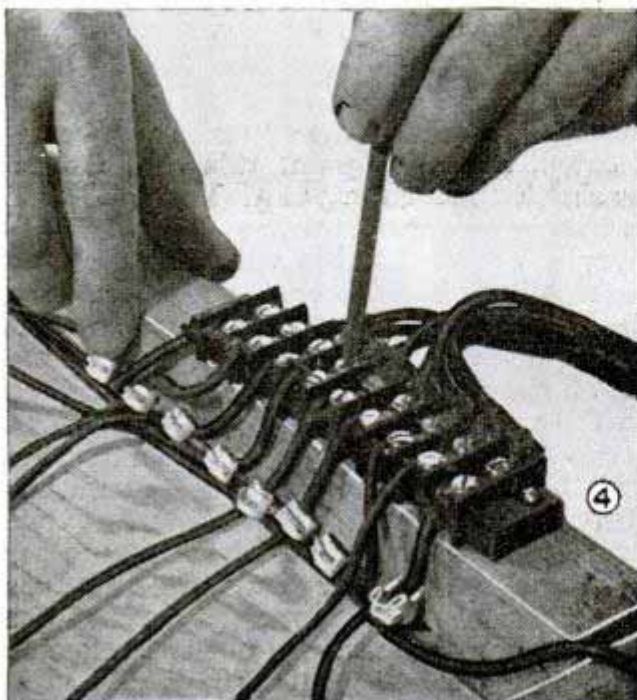
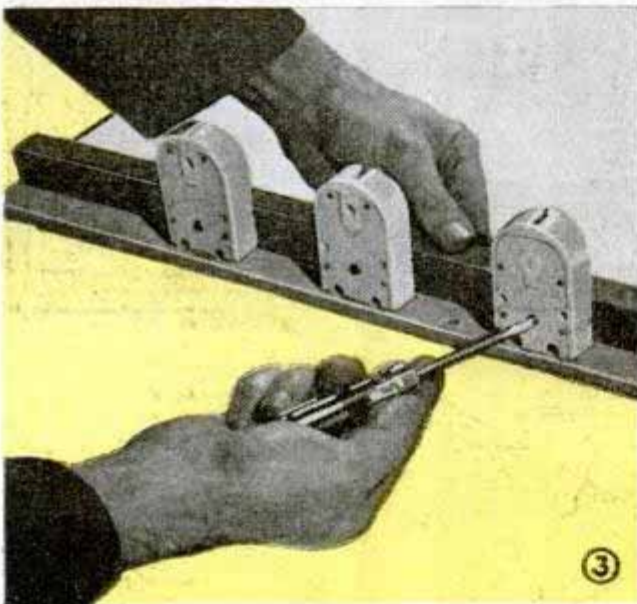
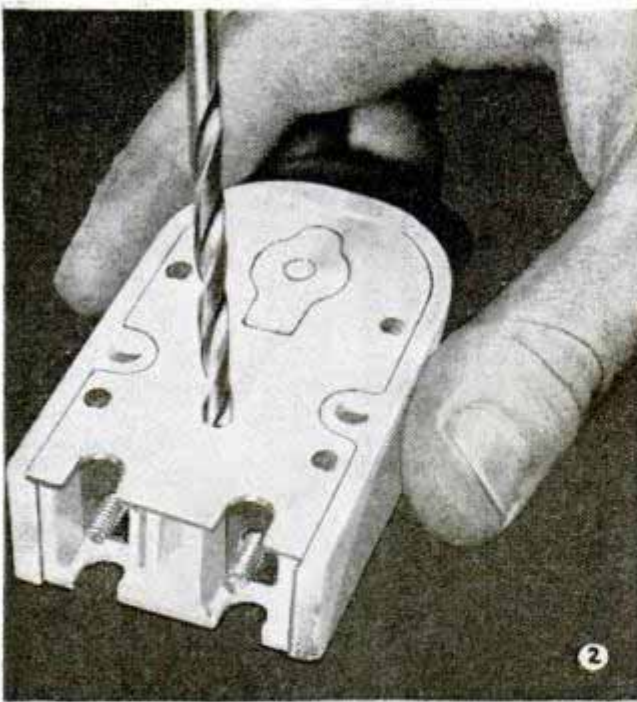
Start construction with the combination reflector and mounting board, which is reinforced at the edges on the back side with wood cleats as in Fig. 1. This reinforcement is necessary to stiffen the board when it is suspended. After the cleats have been screwed in place, attach the tube-socket

UNDERSIDE PAINTED
 FLAT WHITE



mounting cleats to the opposite side as indicated, and then paint this side with a washable, flat-white paint. You will need two sockets for each tube, or 12 in all. These usually are obtainable without mounting assemblies. Each socket should have a 3/16-in. hole drilled in it as in Fig. 2 so that it can be screwed to the mounting cleats. Fig. 3 shows how the sockets are attached to the mounting cleats with a long wood screw through each one. In order that the unit be self-starting when the current is turned on, automatic tube starters are used. You will need six of these, one for each tube, and their sockets. The starters should be of the two-prong type and are mounted on the back side of the reflector close to the tube sockets, Fig. 5.

The unit now is ready for wiring. This



may seem rather complicated at first glance, but upon closer examination of Fig. 7 you will see that the entire circuit is merely a repetition of the hookup of the first two tubes. At one corner on the back side of the reflector, attach a nine-contact terminal strip as in Fig. 4. All the wiring is done on the back of the reflector, as indicated in Fig. 7, and the wires connect at the terminal strip.

After completing the wiring on the reflector board to the terminal strip, you are ready to install the tube ballasts. Three of these are required, one for each pair of tubes. If there is any possibility that you may wish to transport the unit, it is best to mount the ballasts separately so that the unit can be taken apart. If all parts were installed on the reflector, the unit would be heavy to move about. Mount each ballast on a board about 1 by 7 by 21 in. in size, as indicated in Fig. 6, and wire the outlet end of each ballast to one 3-pole polarized receptacle and input end to one 2-pole polarized plug. Then connect the 110-volt line to three 2-pole receptacles, wiring the latter in parallel. There should be a switch in the line for turning the unit on and off.

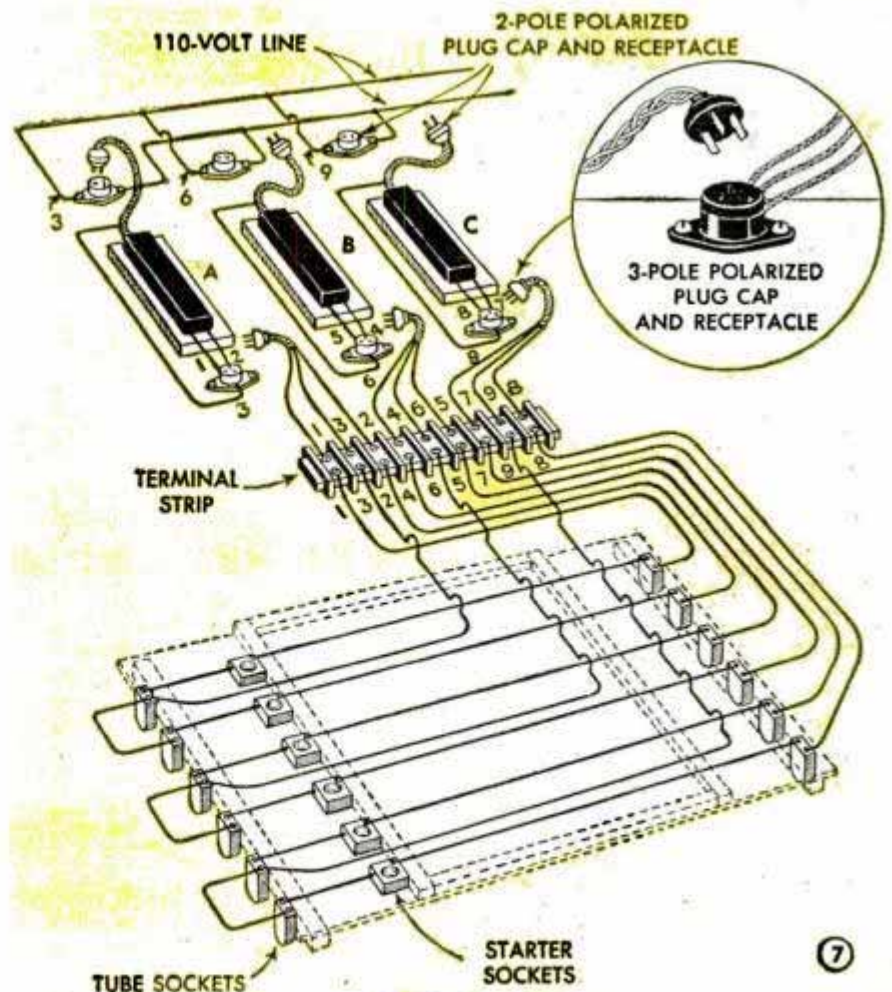
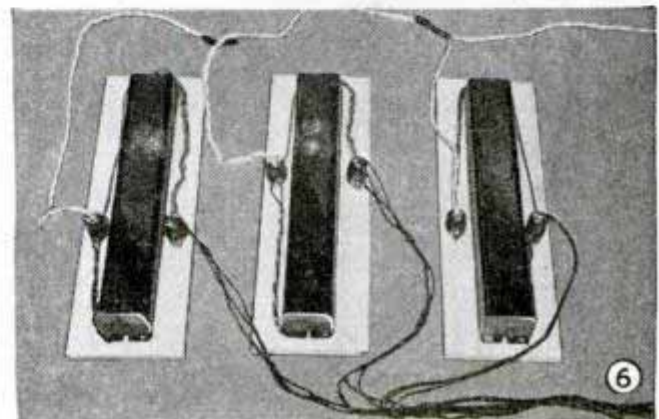
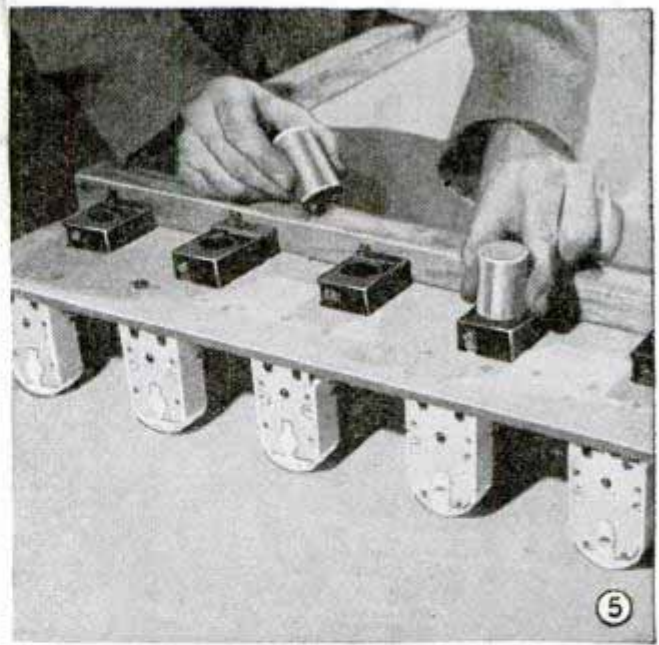
You will need a cable consisting of three 3-wire smaller cables. The cable can be made up from ordinary lamp cord or other flexible insulated wire, and can be of any length required to reach from the terminal strip on the reflector board to the ballasts, usually about 20 ft. Each of the small cables terminates in a 3-pole polarized plug and is connected to the terminal strip. In Fig. 7, each wire is numbered so that you can easily trace it through the terminal strip, cables, ballasts and on to the 110-volt line. By following these numbers you should experience no difficulty in wiring the unit. For example, wire No. 1 runs from a tube socket to the terminal strip, through one of the cables, then through the 3-pole plug and receptacle and into the outlet end of the ballast. Wire No. 2 is treated similarly. Wire No. 3 also is handled the same way except that it goes around the ballast directly to one side of the 2-pole plug, then to the 110-volt line. In Fig. No. 7 wire No. 3 is shown going into the cord leading from the current supply or input end of the ballast. Since there already are two wires coming out of this end of the ballast, wire No. 3 is merely connected to the one on the left-hand side as you face the ballast. Wires 6 and 9 are connected in a similar manner. In all cases, be sure that you connect the correct wires to the correct prongs in the plugs, and that the wires leading from the receptacle terminals correspond to those on the plug prongs.

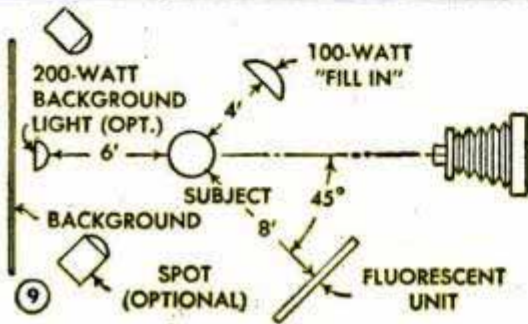
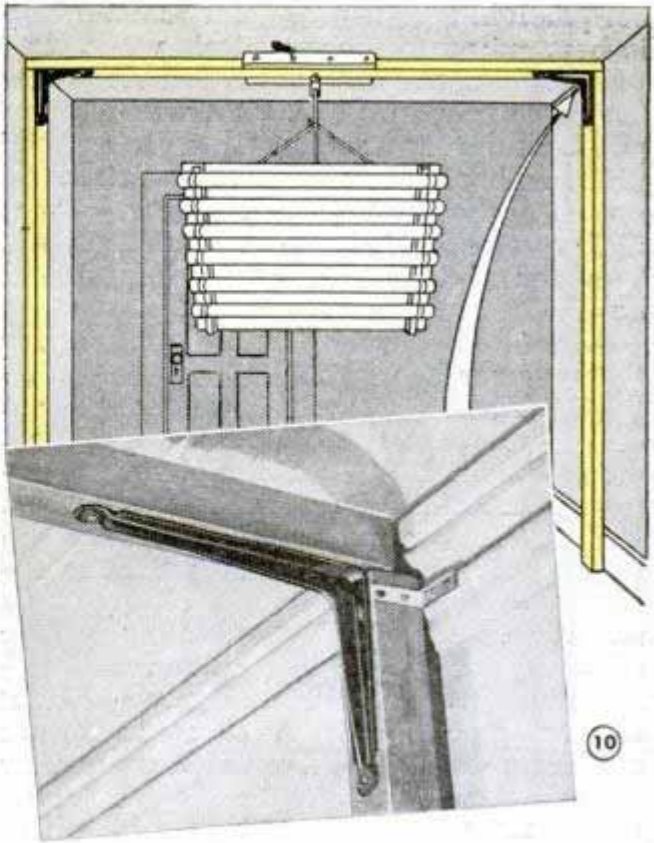
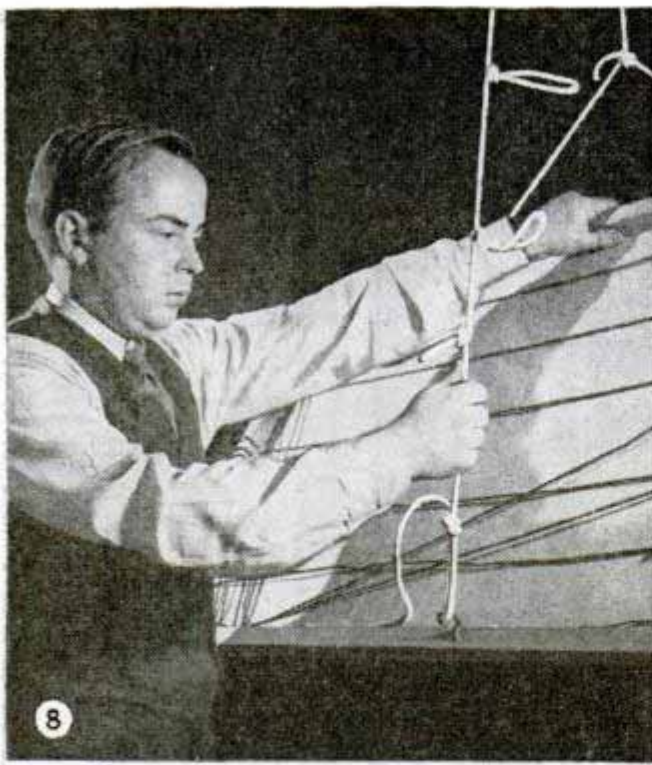
This completes the unit except for installing the tubes, which should be of the

3500 Kelvin type as this color temperature is best suited to most portrait work. Before hanging the unit it is advisable to test it. To do this, first check the wiring, then put the tubes and starters in their sockets, plug in all ballast connections and close the switch in the 110-volt line. The tubes will flicker once or twice and then light up. Tubes or starters that fail to operate should be checked in other sockets.

A simple but strong ceiling support for the reflector can be made as indicated in Fig. 10. The support consists of three pieces of 1 $\frac{3}{4}$ -in. square stock, the two vertical pieces being attached to the picture molding at the ceiling with small corner irons. Heavy angles are used at the joints between the horizontal and vertical members to reinforce them. A strong hook should be screwed into the bottom surface of the horizontal member and a small pulley hung from it for easily suspending the reflector board. A short length of clothesline rope is tied to two heavy screw eyes driven into the upper edge of the reflector near the ends. Another length of rope is tied to the center of the first, then run over the pulley in the support and down to a screw hook in the lower edge of the reflector at the center. The length of this latter rope will determine the height of the unit from the floor. Several loop knots are tied in this rope so that the reflector can be tilted by hooking one of the various loops into the screw hook as indicated in Fig. 8.

It is best not to hang the unit too high when photographing people with deep-set eyes. A portrait must show high lights in the eyes and if you raise the unit too high, the eyes will be in subdued light. Always have the model at least 8 ft. from the unit. Fluorescent light is rich in violet rays and if the model is too close, the skin tones will appear chalky in the print. Although the unit does not cast sharp, harsh shadows, you should balance its light with a 100-watt lamp in a reflector on the side of the face opposite the fluorescent unit and close to the floor at a distance of 6 ft. from the model. Small spotlights or 150-watt mushroom lamps can be used to provide pickup lights in the hair. These lights



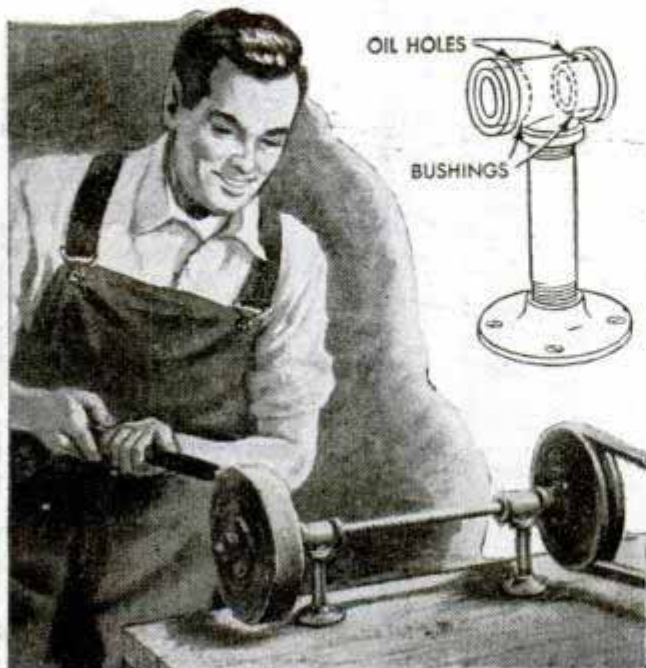


should be placed in back of the model. Fig. 9 shows the setup. Use a long focal length portrait lens so you can get in back of the unit and get a clearer image on the ground-glass screen.

Exposure is critical and you can over-

expose easily. When correctly exposed the negatives made with this unit have what is called luminosity and "roundness." Retouching will be minimized because of the large area of the light coming from the unit. If you use an inexpensive color correcting filter over the camera lens, the unit can be used with color film. Information on the correct filter to use should be obtained from the manufacturer of the film. Also, when using a light meter take the reflection reading from the face of the model at a distance of 2 ft. For enlargements, best results are obtained by using a slow paper.

Shaft Hangers From Pipe Fittings and Generator Bushings



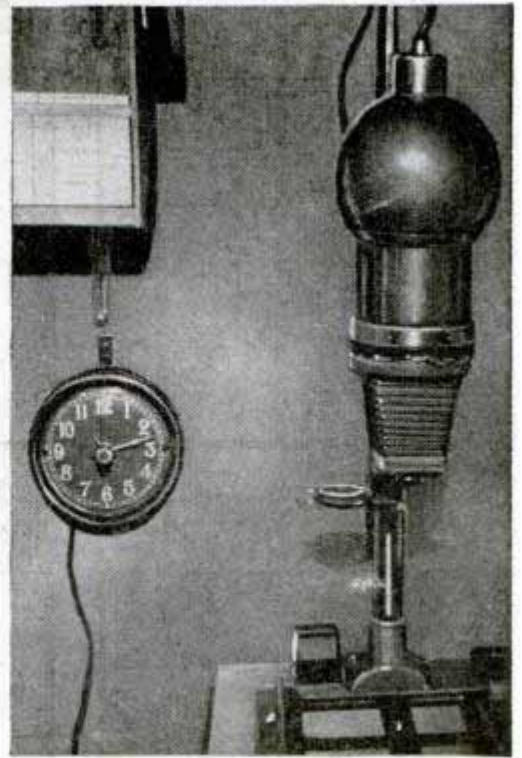
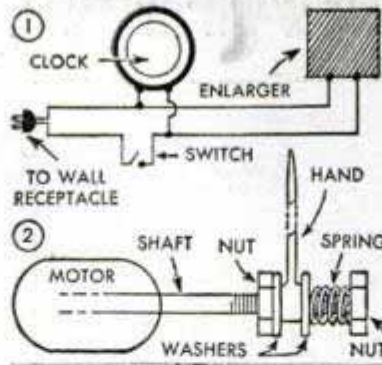
Shaft hangers for grinding wheels, buffers, etc., can be made with a few pipe fittings and some generator bushings. The outside diameter of the bushings should be such that they are a drive fit in the pipe tees after they have been reamed slightly. It may be necessary to ream the bushing also if the shaft is too tight a fit. The assembly is completed by fastening the tees to short lengths of pipe and floor flanges. Oil holes are drilled in the tees and oil cups can be screwed into these holes. A pulley is mounted on one end of the shaft and the grinding or buffing wheel on the other.

Raymond B. Stanfiel, Malvern, Ark.

ⓘ Mirrors never should be hung where the sun shines directly on them for any considerable length of time. A mirror exposed to direct sunlight may become cloudy.

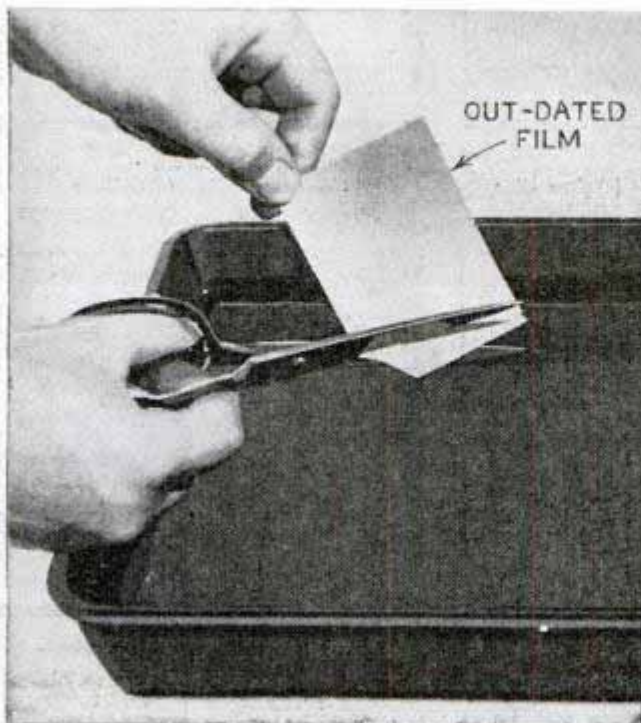
Photo Timer and Enlarger Operated Together

If a switch is connected in series with the enlarger and in parallel with the timer, detail 1, the two will operate simultaneously. Any self-starting electric clock is used for this setup. The minute and hour hand are removed, leaving only the second hand. With a little work a reset device can be installed. The motor is removed and the shaft is threaded. Then the hand is replaced and the two washers, nuts and spring shown in detail 2 are added. The knob and catch which are shown in the lower left-hand detail are for the purpose of returning the hand to the 12 o'clock position. In operation, the knob is pushed in against the spring so the catch will engage the hand, and when the hand is set and pressure is removed, the catch will spring back.



Acid Fixing Solution Is Tested With Outdated Film

Acid fixing solution can be tested by cutting a small piece of outdated film and placing it in the solution. Then the time required for the film to clear should be noted. If the hypo is exhausted, it will take more time for this to occur than is recommended by the maker of the fixing powder.



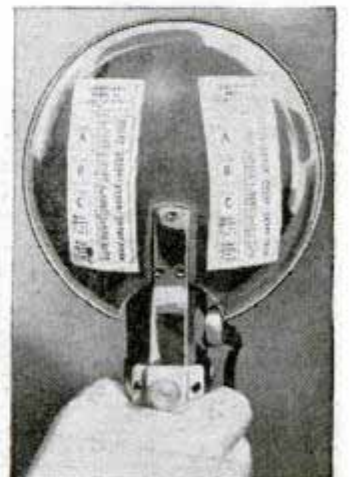
"Brushes" for Coloring Prints

In order to save time when tinting prints with water colors, try using medicine droppers as "fountain brushes." Procure a number of the droppers and wrap the tips with bits of cotton. Then insert a narrow clipping from the color book in each dropper and fill with water. The color will dissolve immediately and the "brush" is ready for use. This eliminates the use of separate dishes for each color, as well as continual cleansing of the brush.



Flash Data Given on Reflector

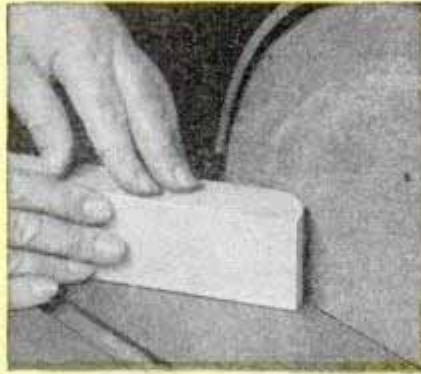
Printed tables are available giving data on shutter speeds and aperture openings for various types of flash bulbs now on the market. A convenient way to have such data at hand is to paste tables of the bulbs most often used on the back of the reflector.



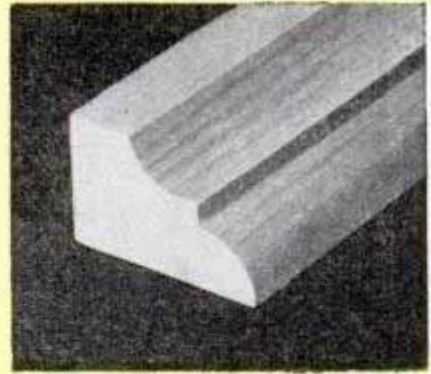
CRAFT QUIZ



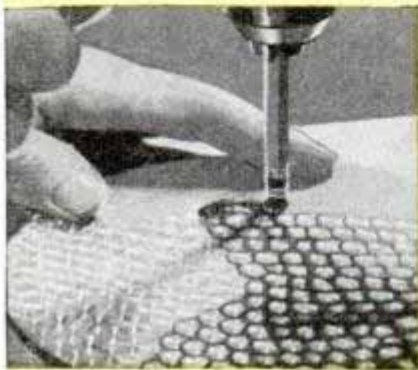
1. He is using a—
 (a) Crosscut saw (c) Guard
 (b) Stop rod (d) Rip fence



2. This red sanding disk is—
 (a) Flint (c) Open coated
 (b) Aluminum oxide (d) Garnet



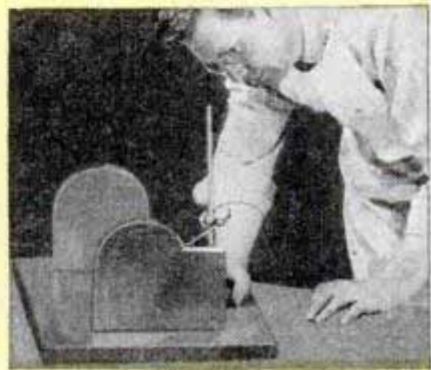
3. This molding is—
 (a) Double cove (c) Bead and cove
 (b) Cove and bead (d) Clover leaf



4. One name for this finish is—
 (a) Swiss (c) Engine
 (b) Round dot (d) Sparkle



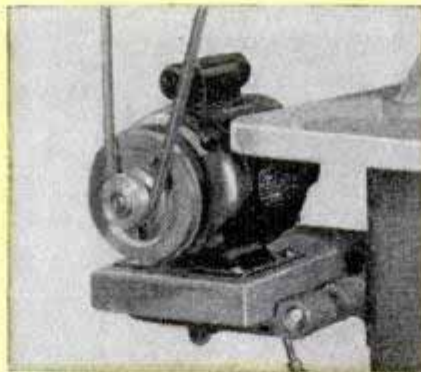
5. This drill-press operator is—
 (a) Drilling wood (c) Drilling metal
 (b) Routing (d) Boring



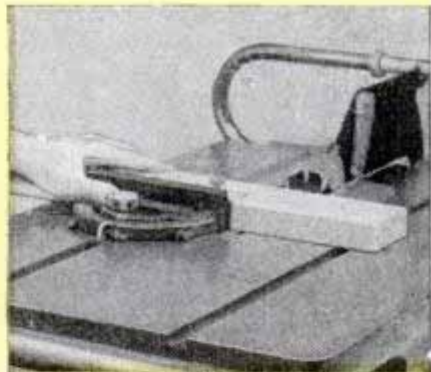
6. He is using a—
 (a) Combination square (c) Wiggler
 (b) Height indicator (d) Surface gauge



7. Spray painters don't like—
 (a) Lemon pie (c) Orange peel
 (b) Hash (d) Alligators



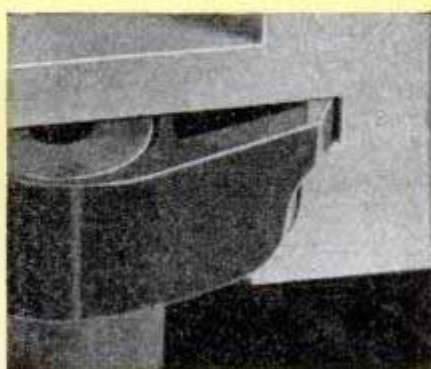
8. This motor is—
 (a) 1/2 hp. (c) Capacitor
 (b) Too big (d) Three phase



9. Wrong in this picture is—
 (a) Hand (c) Splitter
 (b) Saw blade (d) Miter gauge

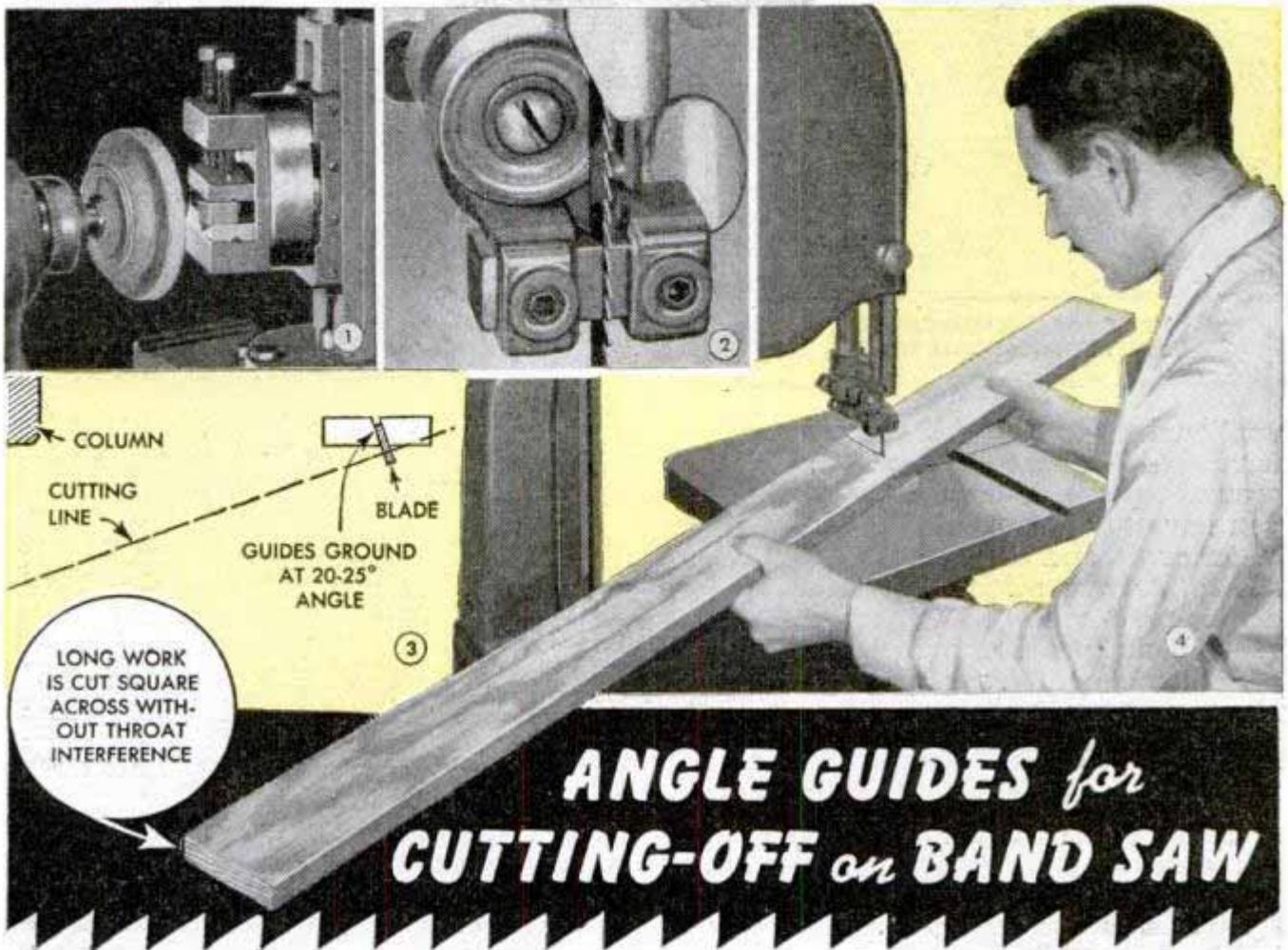


10. He is using—
 (a) Slow speed (c) Overdrive
 (b) Cross feed (d) Slotting table



11. This wood shaper cut is called—
 (a) Undercutting (c) Edging
 (b) Thumb mold (d) Coping

ANSWERS: 1—b; 2—d; 3—b; 4—c
 (also called spot finish); 5—c (note
 pulleys — slow speed would not be
 used for wood operation); 6—d; 7—c
 (a faulty finish resembling orange
 peeling); 8—c; 9—a (should be at
 center of miter gauge); 10—b; 11—d

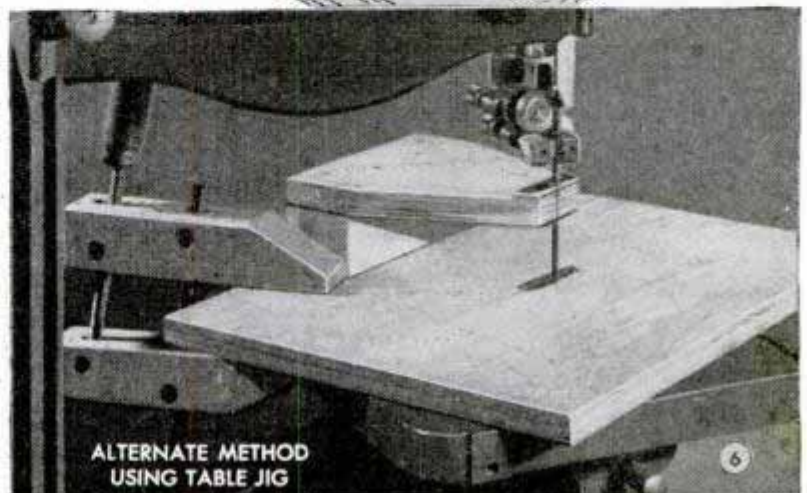
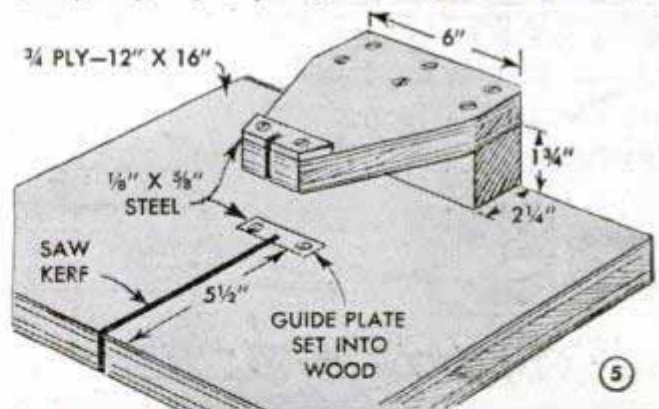


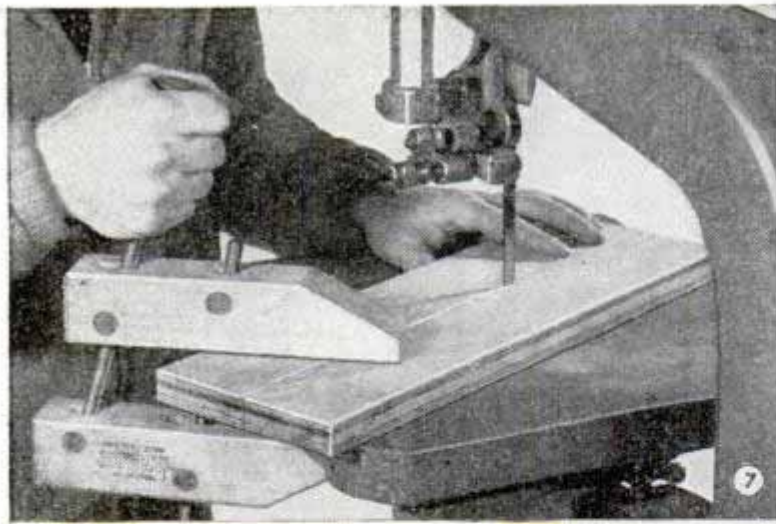
ANGLE GUIDES for CUTTING-OFF on BAND SAW

By Sam Brown

A simple twist of the blade and—presto!—your band saw can be used for square cutting-off on long work without throat interference. The best method of twisting the blade is to grind the guides at an angle of 20 to 25 deg. Fig. 3 shows the setup and Fig. 1 shows the grinding being done on a lathe with the use of a milling attachment. A close-up view showing the guides installed and ready for work is given in Fig. 2. With a 20-deg. twist to the blade, work of any length and up to 4 in. wide can be cut squarely across, as shown in Fig. 4. By backtracking and cutting from both sides an 8-in. board can be cut.

The angle guide blocks are needed only for the top guide, the bottom guide being backed off completely. Both blade supports or back-up guides are used in the same manner as for con-





SIMPLE ANGLE BOARD CAN BE USED FOR OCCASIONAL WORK

ventional sawing. Most band saws have 1/2-in.-square guide blocks ground square at both ends—all you have to do is grind two ends at an angle and then reverse, as shown. A twist angle of up to 30 deg. is practical with the average 14-in. band saw, but best results are obtained with a smaller angle. Narrow blades work better than wide ones, the best size being the popular 1/4-in. width. No adjustment of the tracking is needed. This unusual band saw setup does not harm either the blade or the saw, although prolonged friction may eventually lead to blade breakage.

An alternate method of working is shown in Figs. 5 and 6. This employs an auxiliary wood table fitted with steel guide plates, Fig. 5. In use, the table is fitted over the

regular band saw table and then is turned to the required angle and clamped, Fig. 6. The regular blade guides are backed off completely, but both upper and lower blade supports are used.

Even simpler is the method shown in Figs. 7 and 8. All you do here is kerf a board halfway across, and then use this board to angle the blade, Fig. 7. As before, the regular guides are backed off, but both blade supports are used.

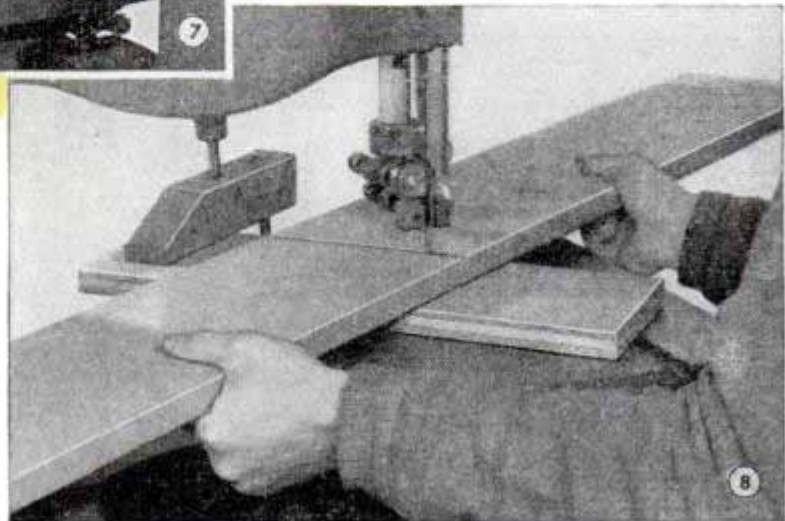
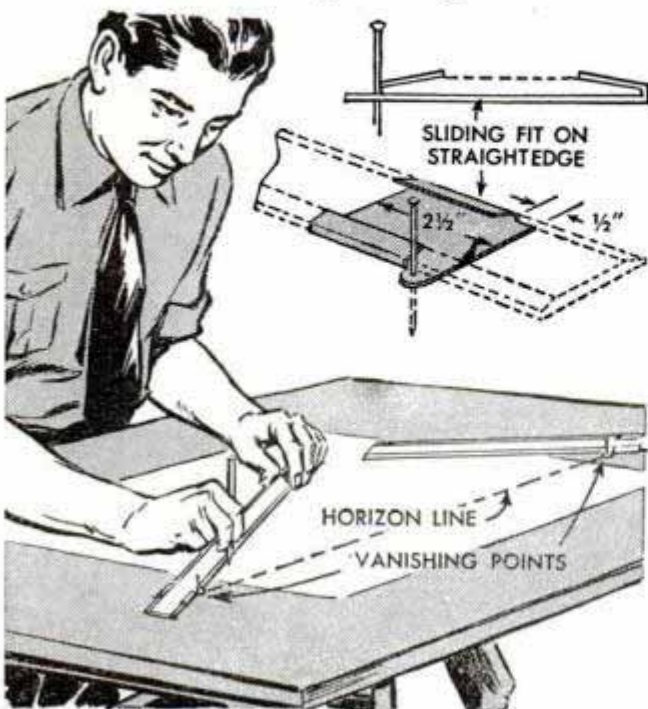


Fig. 8 shows this setup being used to cut a 6-in.-wide board in one pass.

For continuous working, such as cutting packing-box material, the blade should be 1/4 in. wide, with a good amount of set. The heavy set of the blade will permit lubrication of the guide pins with paraffin or wax, and the lubricant will not rub off quickly in the wide saw kerf.

Pivoted Straightedge Is Aid When Drawing in Perspective



To facilitate drawing when working in perspective, or when making exploded views, one draftsman uses this sliding guide in which the straightedge pivots. In the case of perspective drawings, the part of the guide that fastens to the board is pinned on at the vanishing point. By using two rules the drawing is made in a short time. The guide is cut from light metal to the dimensions given.

C. L. Meehan, Toronto, Ont., Can.

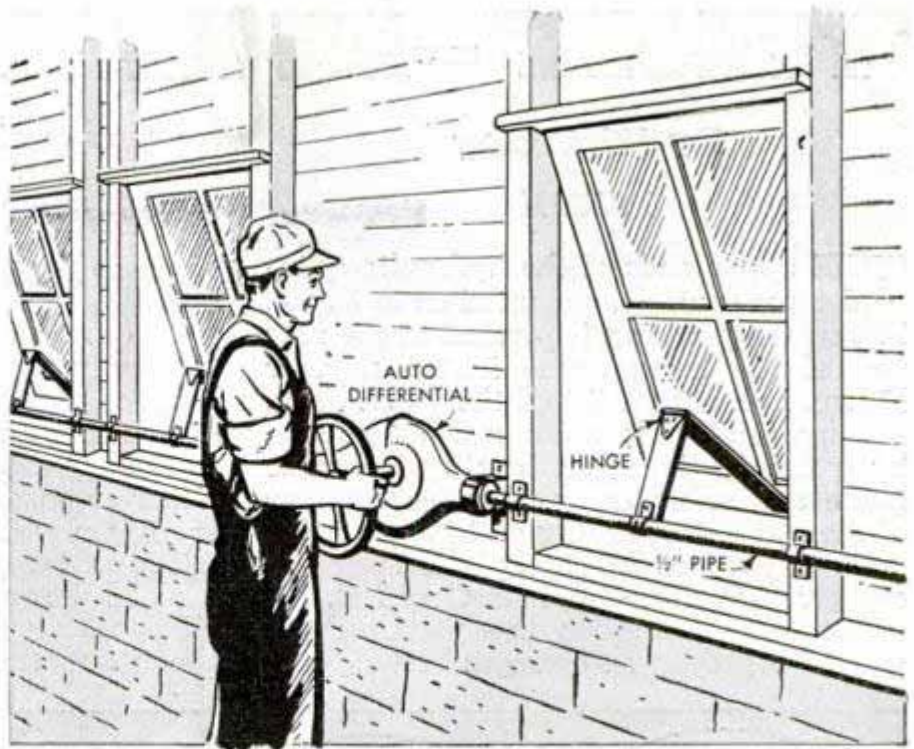
Welded Ends on Stranded Cable Will Not Unravel

The ends of stranded steel cable will not unravel if they are arc welded. First wrap light wire around each end and grind smooth. Then clamp the cable tightly in a grounded vise and run a light bead over the strands to weld them together.

Frederick Boch, Taylorville, Ill.

Barn Windows Are Controlled By Differential

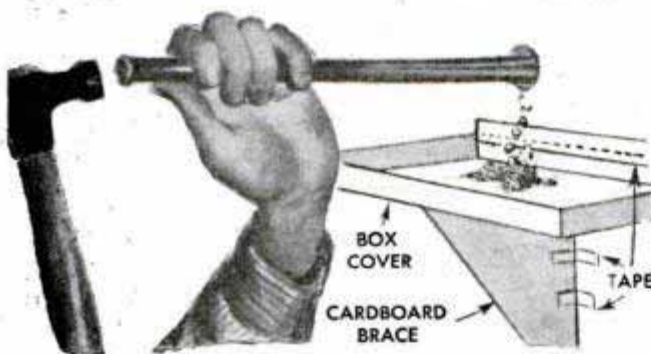
Dairy and other barn windows may be opened and closed, or opened and held in any position, by using an auto differential, some pipe, a few hinges, some flat iron and an old steering wheel. No overall dimensions for the linkages can be given as the size and location of the windows will be determining factors in every case. The axle housing should be cut at a point about 6 in. from each end of the gear case and 1/2-in. pipe should be welded to the ends of the axles. The drive shaft should be shortened and the steering wheel attached to it. A linkage arrangement such



as is shown for attaching the window to the pipe will complete the assembly.

Wm. P. Houser, Organ, N. M.

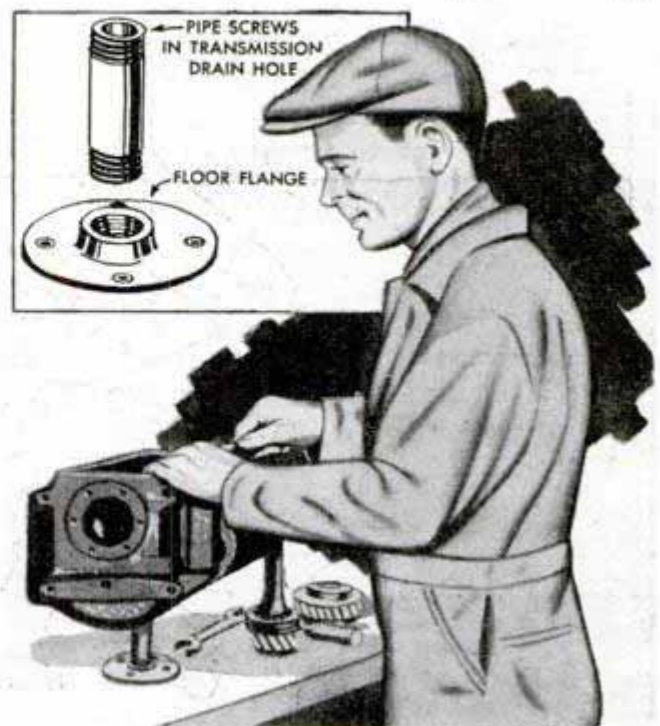
Cardboard "Shelf" Fastened to Wall Will Keep Drillings Off Floor



When drilling holes in a wall with a star drill, or when making a repair on a plastered surface, a cardboard "shelf" made from a shoe-box cover will keep plaster and other debris from falling on the floor. To support the shelf, cut a brace from stiff cardboard in the form of a bracket and tape it to the cover and to the wall. This will serve to support the shelf and its load safely.—Andrew Vena, Philadelphia, Pa.

Stand for Holding Transmission Case Can Be Made of Pipe Fittings

It's difficult to work effectively on an automobile transmission unless you have some means of holding it rigidly. One quick and easy way of assembling a stand is to turn a pipe nipple into the bottom drain hole in the transmission housing, then screw a matching floor flange to the bench top in a convenient position. Screw the nipple into the floor flange by turning the transmission slowly until the nipple tightens securely in the flange.



Water Lowers Tank Into Hole

If you have occasion to lower a large storage tank, oil drum or other bulky container into a hole, and have no helper to assist in lowering it, you can easily do the work yourself by filling the hole with water and sliding or rolling the tank in place. Then, when you pump out the water or let it drain away, the tank will settle gradually to the bottom.

"FEEJEE"—AN ALL-PURPOSE

By Hi Sibley

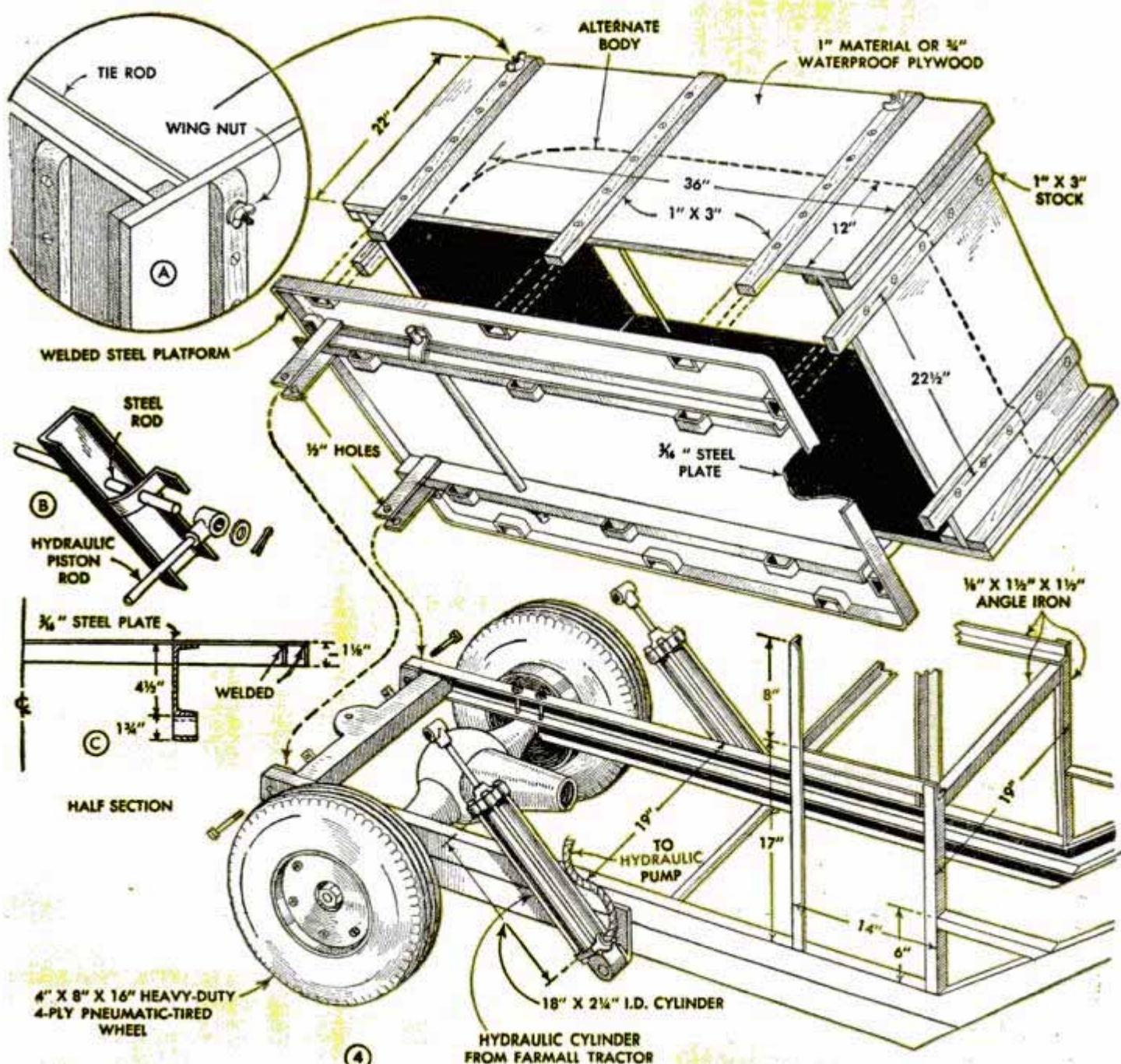
PART II

THE upper ends of the hydraulic-cylinder plungers are mounted as in Fig. 4, B, and the platform is pivoted at the rear end of the truck frame in the manner shown. For a high lift of the truck body, the hydraulic lift units are lengthened by removing the upper head and plunger guide and substituting a longer cylinder of seamless steel tubing and longer bolts.

Dimensions of the steel platform or bed are given in Fig. 4, details C and D. All parts which comprise the platform are welded together, as strength and rigidity

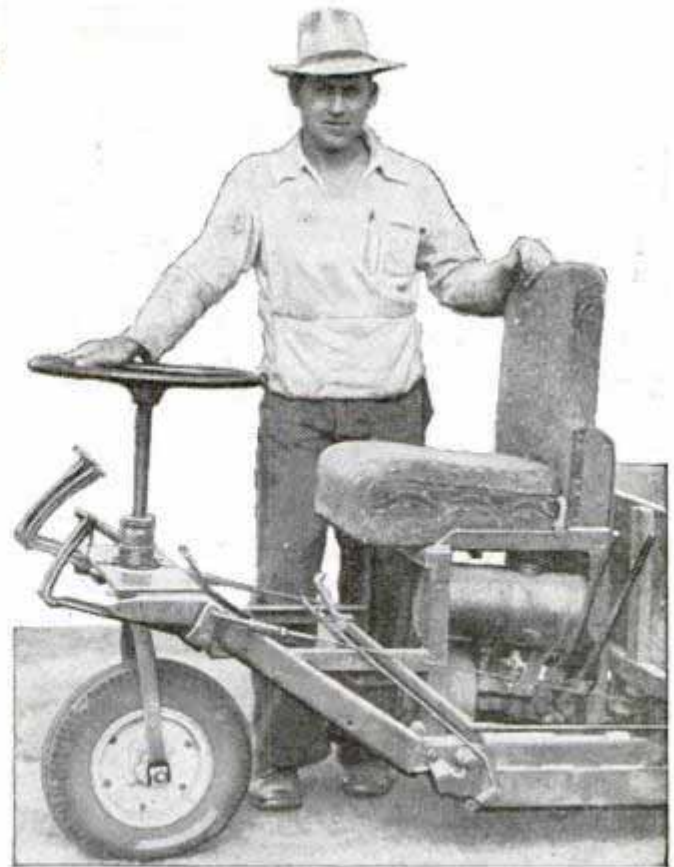
are necessary in this unit. The overall size as detailed was found to be the most practical for all ordinary purposes and, due to the low center of gravity, there is little danger of tipping even with comparatively high, bulky loads. When you have heavy parts or materials to load you'll appreciate the low platform. The full-box and half-box body were referred to in the first installment of this story, and dimensions were suggested for these parts. Of course, either or both of the boxes can be altered to suit any special requirements.

The next step is the mounting of the rear-wheel disks on the brake drums of the rear axle. Refer to Part I, Fig. 3, detail F, which shows how the wheel disks are welded to

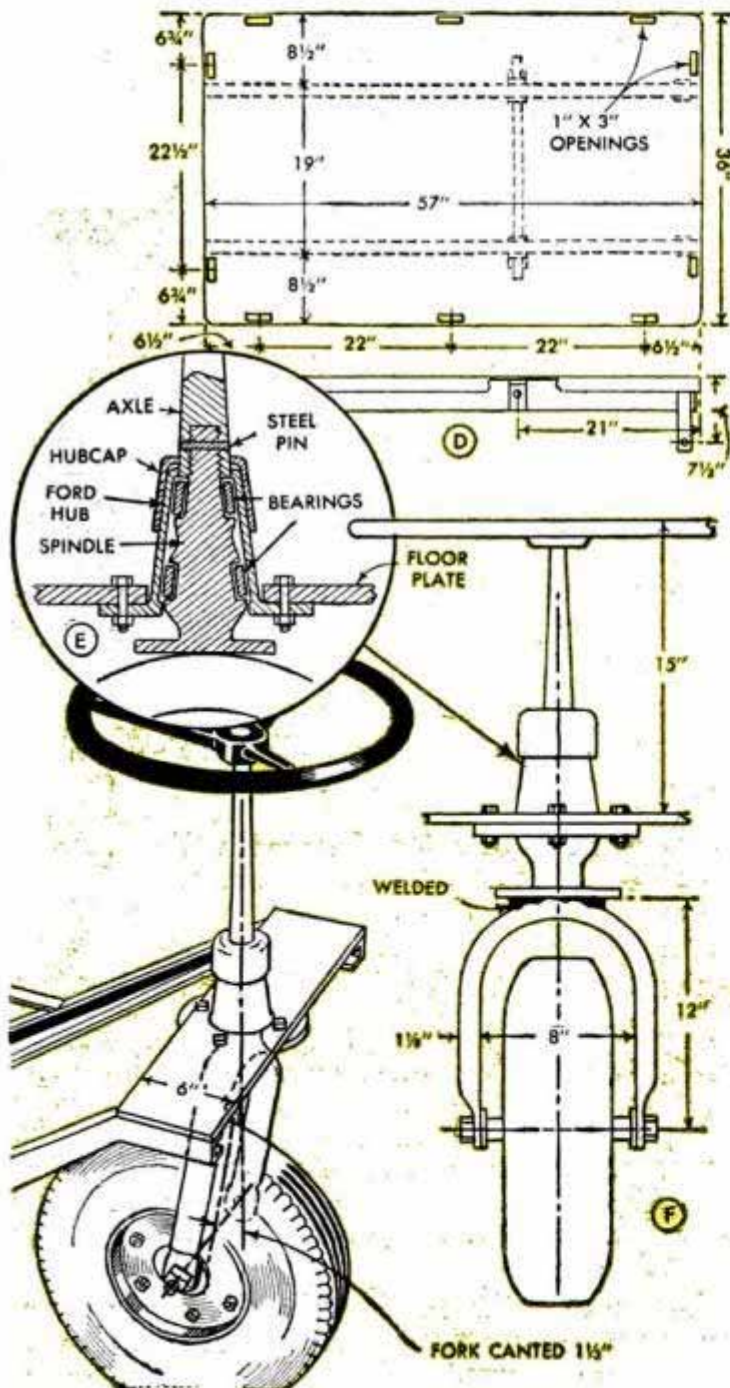


DUMP TRUCK

the brake drums. As you can see from Fig. 4, the wheels are 4 by 8 by 16 in. in size and are fitted with 4-ply pneumatic tires. Two-ply tires in the same size will not be satisfactory for the purpose except perhaps for very light loads. Although it is possible to bolt the 8-in. wheel disks to the original axle-wheel flanges by means of spacers, this method is not as satisfactory as welding the disks to the drums. As a rule, wheel disks of the type used consist of two halves held together with bolts and, as these will be inaccessible after the disks are welded to the drums, it's a good idea to weld the bolt heads beforehand to prevent them from loosening or turning. Care must be taken when welding the disks in place to

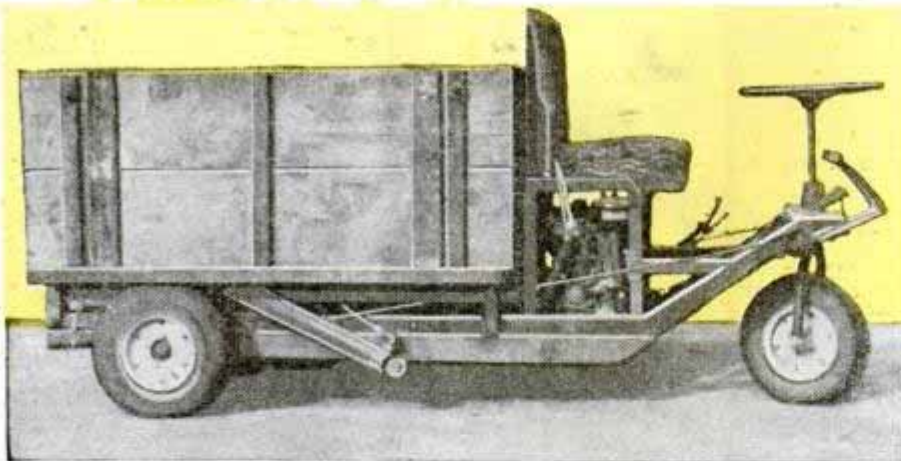


As you see here, the truck has a comfortable spring-cushioned seat mounted on an angle-iron frame

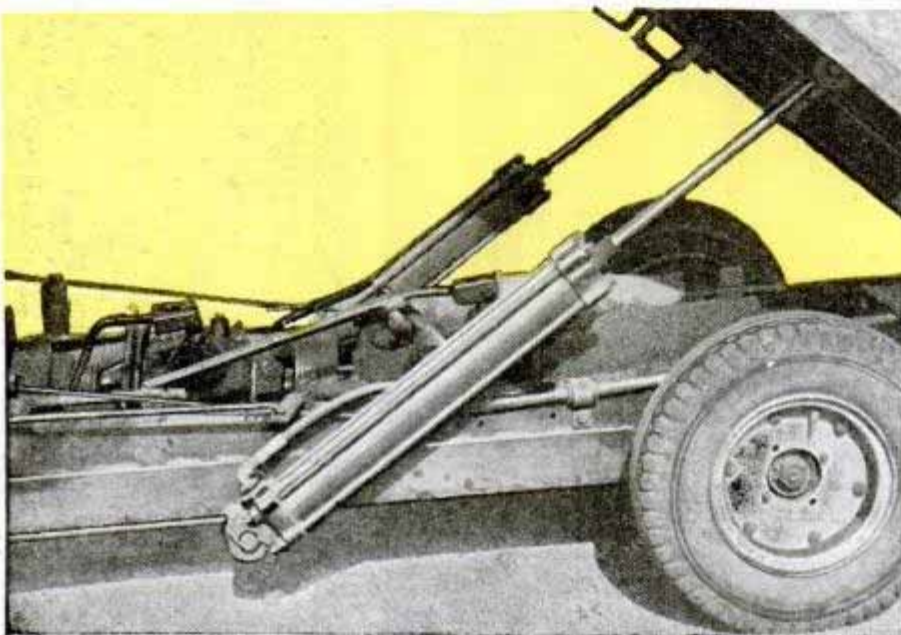


assure true-running wheels. Even a slight wobble will result in undue wear on the tires. The drums should be cleaned thoroughly before reassembling and, if necessary, the brake shoes should be relined.

Another welding job calling for the same care and precision is the assembly of the front-wheel fork, bearing and steering post. Details of this assembly are shown at E and F in Fig. 4. The front wheel is the same size as the rear wheels, but of course the hub and bearings are retained. The wheel fork is made from $1\frac{1}{8}$ -in. seamless steel tubing bent to the shape indicated. The ends are flattened before bending and are drilled to take a steel shaft having both ends shouldered and threaded for nuts and lock washers. This work can be done in a lathe. When mounting the wheel in the fork it may be necessary to use spacers at both ends of the hub. Short lengths cut from ordinary iron pipe will do, but the spacers must be a close fit on the shaft and the length must be such that the hub of the wheel has about $\frac{1}{16}$ in. end play when the assembly is complete. The hub should be provided with a pressure grease fitting. A steering-post bearing, Fig. 4, E, is adapted from a Ford front-wheel hub and the steering shaft is made up from a length of the live axle which was removed from the rear-axle assembly when cutting it down to a narrower tread. One end of this shaft is drilled and tapped to screw over the threaded end of the spindle, to which it is



When fitted with the full-box body the truck will handle loose grain, ensilage, ground feeds or any small, loose parts of either metal or wood



For a higher body lift the original hydraulic cylinders are easily lengthened with seamless steel tubing of the same diameter and longer stay bolts

making the assembly the wheel fork is welded to the end of the spindle and when making this weld care must be taken to cant the fork back $1\frac{1}{2}$ in. at the lower end. This arrangement gives the wheel the proper caster for stability and ease of steering. Before assembling the steering column completely, ream the outer end of the hub cap to a close fit over the steering shaft to keep out dirt and grit. Provide a pressure grease fitting for convenient lubrication of the bearing. When assembled in the truck frame it's important that the wheel, fork and steering column stand on a perpendicular center line as in detail F, Fig. 4. If the wheel is off-center or the column cants in relation to the frame the truck will not steer properly.

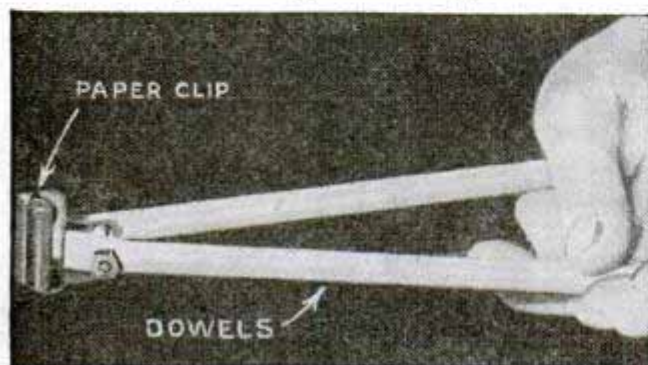
As the final step in the construction you have the seat frame, Fig. 4, and perhaps a few minor adjustments of pedals and control levers to assure that everything is in working order. The seat can be just about anything that suits you individually so long as it is safely constructed and serves the purpose. By fitting cushions from an ordinary auto seat in the angle-iron seat frame you finish up with something like that shown in several of the photos. And finally, although the truck will run just as well without painting, a coat of outdoor enamel will add to its appearance and keep off the rust.

(THE END)

pinned as indicated. The opposite end of the shaft is machined and threaded to take a 16 or 18-in.-dia. steering wheel. Usually a steering wheel of this type is keyed to the steering shaft with a semicircular or "half-moon" key. This work can be done in your local machine shop. The wheel-mounting flange is bolted to the floor plate of the truck frame when assembly is made. In

safely constructed and serves the purpose. By fitting cushions from an ordinary auto seat in the angle-iron seat frame you finish up with something like that shown in several of the photos. And finally, although the truck will run just as well without painting, a coat of outdoor enamel will add to its appearance and keep off the rust.

Sure-Grip Tongs for Light Work Improvised From Spring Paper Clip

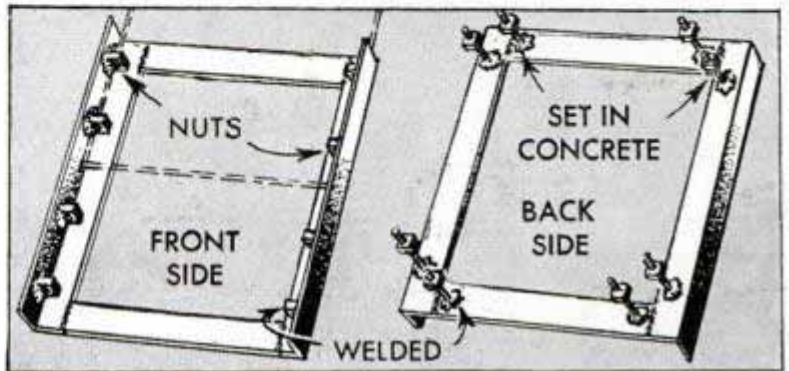
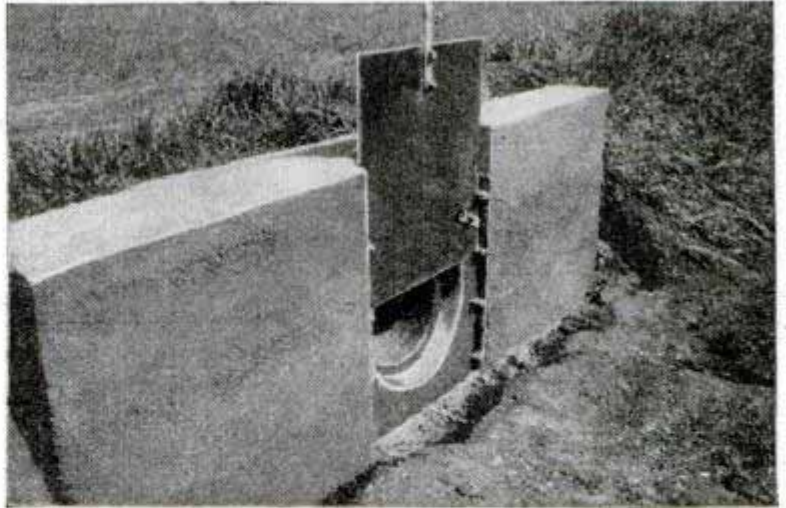


A pair of lightweight tongs to handle small pieces of hot metal or wire can be made from two lengths of dowel and a spring-type paper clip. Flats are cut on one end of each dowel to fit them to the handles of the clip and the dowels are fastened to the handles with small stove bolts.

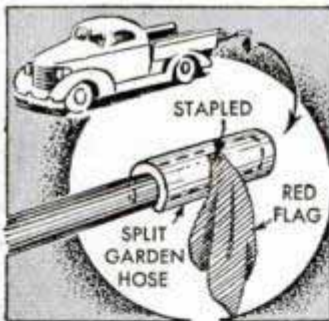
☞ To preserve the finish properly, a car should never be washed in the sun or when its surface is warm.

How to Build an Irrigation Head-Gate Frame

An irrigation head-gate frame to regulate the flow of water in irrigation ditches can be made at a very low cost and will conserve the water supply. The width and height of the frame should be such that it will fit outside the bell of the tile. Two lengths of flat iron are used for the horizontal members and two lengths of angle iron are used for the vertical members. The frame is welded and four nuts are tacked to the inside leg of each angle to serve as slides for the gate. Then two bolts with nuts screwed on are welded to each corner of the frame to serve as anchor bolts to hold the frame in a concrete wall. The head gate, with a handle made of flat iron, is cut from heavy sheet metal to fit between the slides. Some provision must be made to hold the gate at the desired height. The frame is set in concrete when the form is poured.—Don L. Helt, Fort Collins, Colo.



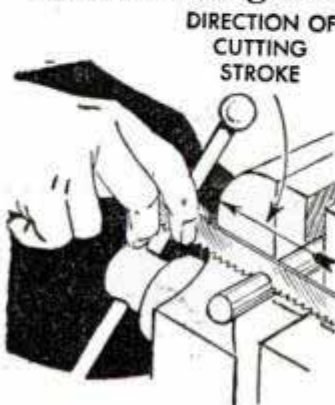
Split Garden Hose Fastens Flag On Projecting Truck Load



To attach a warning flag to pipe and similar loads projecting from the rear of a truck, staple one corner of a piece of red cloth to a short length of garden hose that has been split

lengthwise to slip over the pipe. When the load consists of lumber, use a short section of automobile tire casing in the same manner and slip it around the end of the longest board.—Kenneth Murray, Colon, Mich.

Hacksawing in Close Quarters



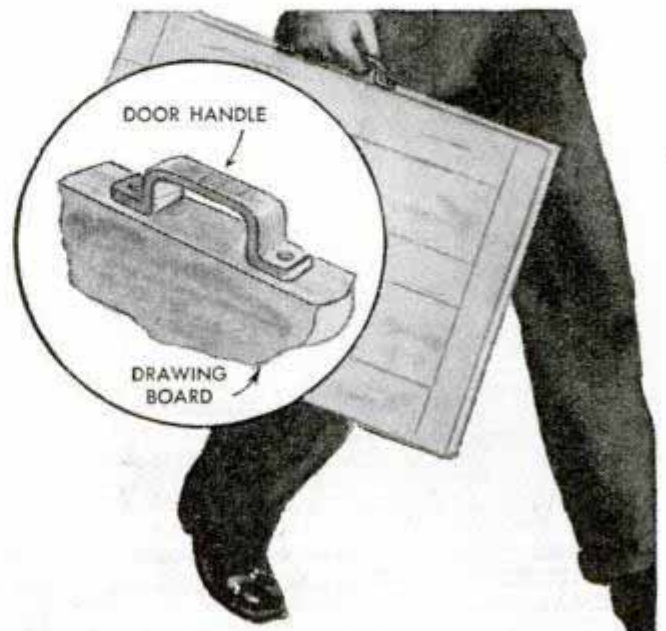
When it is necessary to use a hacksaw in close quarters where the frame cannot be inserted, remove the blade and use it with the teeth pointed toward you so the cutting is done when the blade is

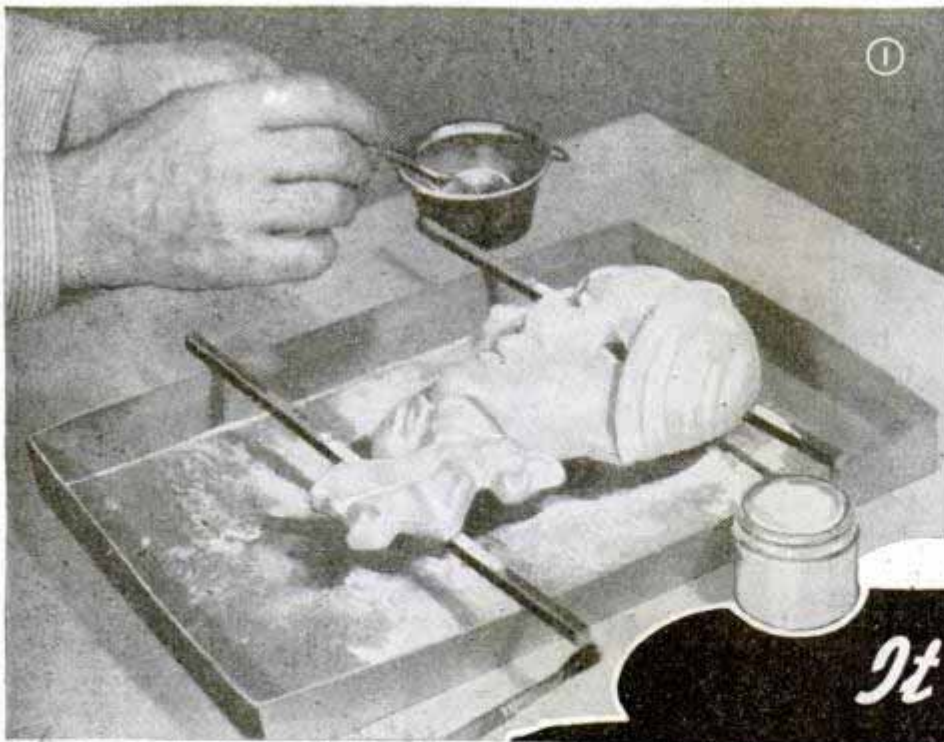
pulled forward. When done in this way, there is no tendency for the blade to buckle.—Cpl. Jack L. Masters, Aberdeen Proving Ground, Md.

Handle Used on Drawing Board

A screen-door handle fastened to one side of a drawing board with wood screws is convenient for the draftsman when making field sketches. The handle should be attached to the top edge of the board so that it will be out of the way when sketching.

T. C. Evans, Fort Wayne, Ind.

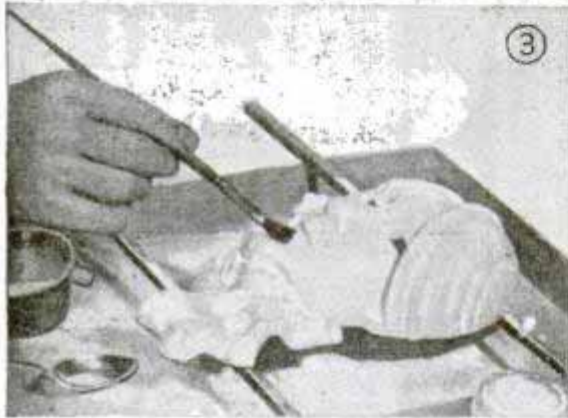




Photos courtesy Black Light Products

It GLOWS

By J. Cornell Richardson



Application by dusting
is done by sifting luminous powder over wet varnish coat to which the powder adheres

POPULARIZED by varied uses, luminous paints and allied products find a steady and increasing use in industry, the home and "just for fun." Luminous paint is available in several in-the-dark colors, as is luminous pigment, and has a usable glow life of 15 minutes to 10 hours, depending on the kind used. A few of many products available are shown in Fig. 4.

Application by dusting: One of the most direct and best methods of applying luminous pigment is by dusting it on paper, novelty figures or other items. Applied to a mask, this process is shown in Fig. 1. The mask is coated first with a white-varnish enamel. After this has set for about 5 min. and while still tacky, the luminous powder is dusted on by sifting through a tea strainer or other sieve of about 40 mesh. After standing another 20 min., the excess powder is brushed off, as in Fig. 3, and the surface gently burnished. The object, when thoroughly dry, is finished with a clear top coat of shellac. This method gives a uniform coating which glows when the object is placed in the dark, Fig. 2.

Shadows are fun: In a darkened room, take a sheet of luminous paper and hold it behind your head, as shown in Fig. 6. Have someone turn on a light (a 100-watt lamp) so that your head casts a shadow. Hold the pose for about 5 sec. Turn out the light. In the dark the protected part of the sheet will show your shadow, Fig. 5, while the rest of the sheet, after exposure to light, will glow. This makes an interesting "guess what" party stunt by lumi-photographing hands or small objects. The luminous paper should be treated just like photoprinting paper—keep it in the dark or face down until you are ready, then expose and, finally, view it only in the dark. The best paper is one with a brilliant initial glow,



(4)

PIGMENT ... IN POWDER FORM VARIOUS COLORS

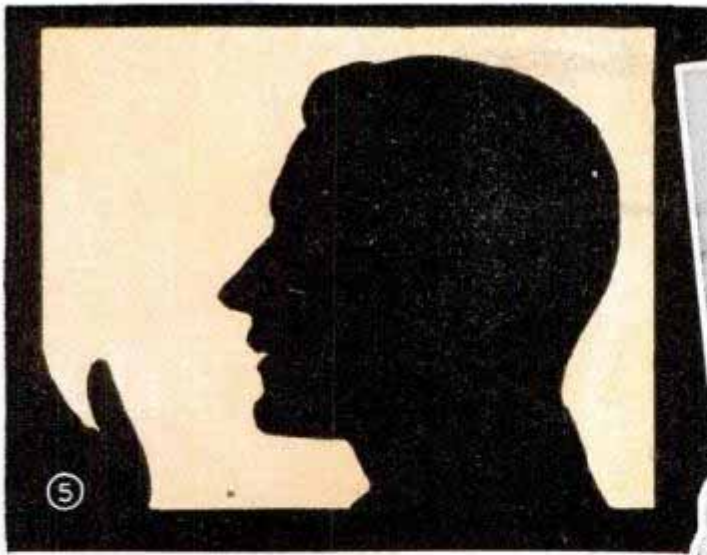
GUMMED TAPE ... WIDTHS TO 3"

COATED PAPER AND PLASTIC SHEETS

PREPARED PAINT

PLASTICS ... FLEXIBLE SHEETS AND PIGMENT-FILLED TUBES

Luminous products
... ARE VARIED AND INCLUDE A WIDE ASSORTMENT OF MATERIALS



LUMINOUS PAPER



in the **DARK**

but having a short life of about 15 min. This will permit repetition of the stunt after a short interval so that three or four sheets will keep the performance going indefinitely.

Luminous crayons: Wax-base luminous crayons are available in the same colors as the paint and pigment. These can be used in any way an ordinary crayon would be, and they also have the added advantage of being visible in the dark.

Ways to make signs: By one method, the lettering is blocked in with black or other color paint, as shown in Fig. 10. This kills the glow so only the non-painted area shines in the dark. Fig. 11 shows this sign by day, the coloring of the letters being an off-white. Fig. 12 shows the sign by night—it will glow blue, green, violet or yellow depending on the color of paper you choose. A second method calls for spraying the letters directly with luminous paint. Fig. 13 shows a sign being sprayed, and Figs. 14 and 15 are day and night representations. The ground color of the panel is nonluminous dark red. Since luminous paint has practically no covering power, it is necessary first to spray the letters with white paint and then apply luminous paint over the white coating. This double operation is made easy by masking. Both of these methods can be reversed; that is, make the background glow and have the lettering nonluminous. Signs also can be cut out of luminous paper and pasted on a stiff cardboard panel, as indicated by Figs. 7, 8 and 9.

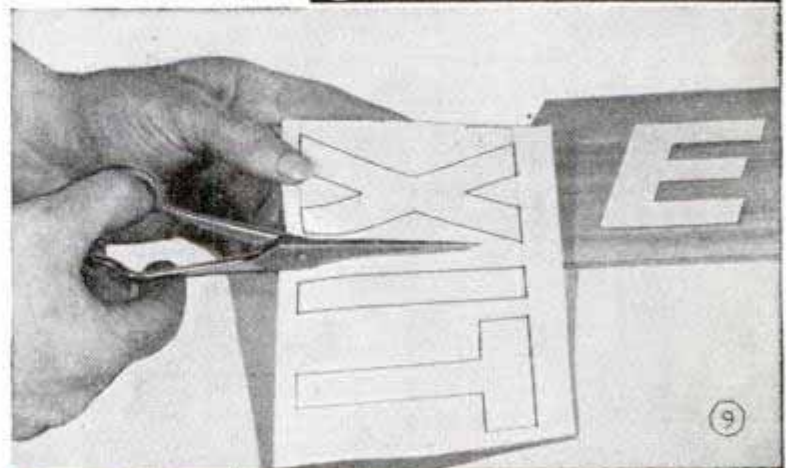
Shadows are fun
Here's one time you can walk away from your shadow if you cast it on luminous paper



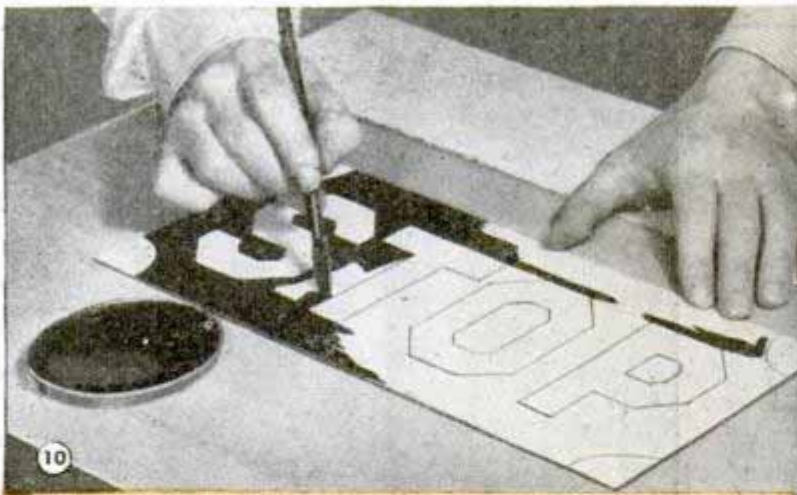
⑦ SIGN LOOKS LIKE THIS BY DAY



⑧ THE LETTERS GLOW IN THE DARK

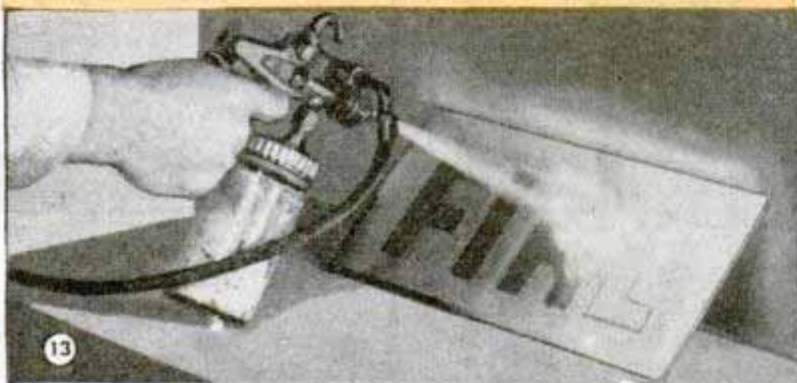


Cutout letters and figures of luminous paper provide a simple and inexpensive way of decorating rooms, making signs, etc. You can purchase plain or gummed-back paper for this purpose



Two methods of making signs

First method, above, uses luminous paper with letters cut in with ordinary paint. Second method employs luminous paint sprayed directly over letters which should be painted white



Making paint: Paint should be mixed 4½ lbs. of pigment for each gallon of vehicle. Use the chart, Fig. 30, for smaller quantities. Coverage is about 100 sq. ft. per gallon. The vehicle, Fig. 16, can be any clear neutral lacquer, any clear spirit varnish or most kinds of clear synthetic. Vehicles containing linseed oil, lead, manganese or cobalt, or having high moisture content or absorption, should not be used since these materials react chemically, causing reduction of glow. Homemade mixes may show a certain amount of jellying after standing several days and should be used immediately. Actual mixing is simply a job of stirring—no attempt should be made to grind the paint because breaking down the particles will kill the glow to some extent. Your homemade mix will settle quickly and should be stirred frequently. To retard settling and hardening, add either talc or titanium dioxide. Obtain twice the amount of vehicle required to make the paint. Keep one-half of this amount for an undercoat and overcoat. Whenever a white base is indicated, such as over metal, wood or glass, lithopone should be added to the undercoat until the required opacity is reached. The overcoat serves to protect the paint from moisture and cleaning operations.

Purchased paint: The vehicle commonly used is a synthetic—methyl methacrylate, vinyl acetate, alkyd resin and others. When you buy luminous paint, be sure to order thinner to match, Fig. 31. These paints are very heavy-bodied and usually require some reduction.

How to apply luminous paint: The surface must be white. Luminous paint has no great degree of opacity and will not cover dark or dirty marks on a white panel, Fig. 29. Further, the white panel must not be lead paint. The most satisfactory surface is the undercoat previously described. Smooth brushing is much more difficult with luminous than with ordinary paints, and the best practice is to apply three or four thin coats rather than one heavy one. For delicate work, such as the silk-screen process, a pigment especially formulated for fine texture should be used. Spraying is simple with light equipment if the paint is thinned to suit. All work must be coated heavily and uniformly in order to have an even glow. Be sure to apply the overcoat to all work.

Pigments: Pigment data is given in the table, "Characteristics of Phosphorescent Pigments." All pigments are sulphides, nontoxic and nonpoisonous, and should not

be confused with radium paints. Selection of pigment usually is made on the basis of intensity and life of glow. With the exception of zinc sulphide, all are sensitive to moisture so it is a good idea to treat all as moisture-sensitive. Any contact with water or moisture turns the pigment a dirty gray day color and practically kills all glow. The particle size of all pigments is relatively coarse, averaging 20 microns. While this is practically invisible to the eye, it is several times coarser than ordinary paint pigments. The glow color of the pigment is most pronounced immediately after activation but fades to white at about the halfway mark of full glow duration. Figs. 17, 18 and 19 show the relative life and intensity of strontium, zinc and calcium, respectively. As a general rule, pigments with the most intense initial glow will have the shortest life. All pigments can be reactivated indefinitely—they will last for years indoors and from 1 to 2 years outdoors.

Activation: The luminous coating must receive light before it will glow in the dark, Fig. 20. The period of activation need not be more than from several seconds to a



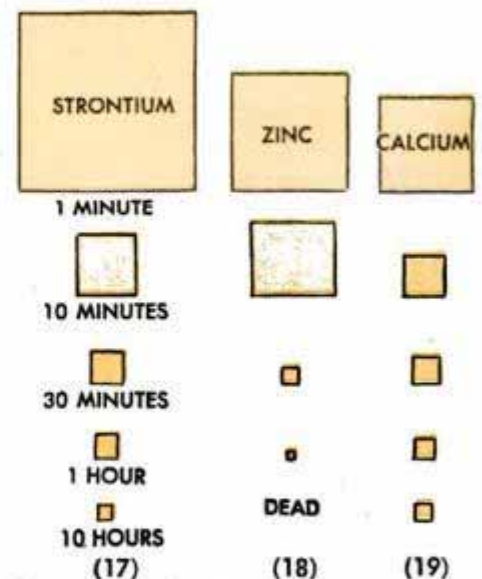
Making paint
is simply a job of stirring pigment into vehicle, such as lacquer or clear synthetic varnish.

minute and prolonged activation does not increase the glow. Any light source such as sunlight, electric light, flash light or even the light of a match will activate luminous material. It is well to remember, however, that the weaker the light, the longer is the required period of activation. Dip coating of light bulbs is practical and has little effect on regular lighting intensity, Fig. 21. An example of poor activation is shown in Fig. 22; basement stairs seldom get enough light of any kind to activate them strongly.

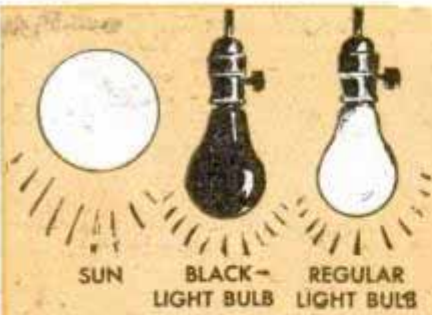
Intensity of glow: See Fig. 23. If you light an ordinary kitchen match and hold it about 2 ft. from a light-colored wall, you will get about the illumination possible with a

CHARACTERISTICS OF PHOSPHORESCENT PIGMENTS					
Pigment	Color 1 in Dark	Particle Size 2	Intensity of Glow	Period of Glow	Stability
Strontium	Blue	Coarse	High	8-10 Hrs.	4 Very Sensitive to Moisture
Zinc	Emerald	Medium	High	1 Hour	Stable
Calcium	Violet	Coarse	Medium	10-12 Hrs.	4 Very Stable Indoors
Zinc and Cadmium 3	Orange-Yellow	Coarse	High	15-30 Min.	Stable
Calcium and Strontium 3	Blue-Violet	Medium	Medium	10 Hrs.	4 Moisture Sensitive
Strontium and Zinc 3	Green	Coarse	High	8-10 Hrs.	4 Moisture Sensitive
Strontium 3 and Calcium	Green-Blue	Coarse	Medium-High	10 Hrs.	4 Very Sensitive to Moisture

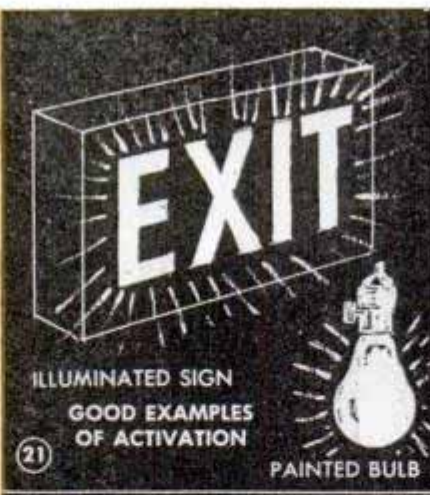
1. Fades gradually to white in all cases. Day color of all pigments is off-white.
2. Runs from 10 to 40 microns. Very much coarser than ordinary paint pigments.
3. In all mixtures, pigment named first predominates.
4. Must always be protected with clear top coat . . . loses glow when exposed to moisture.



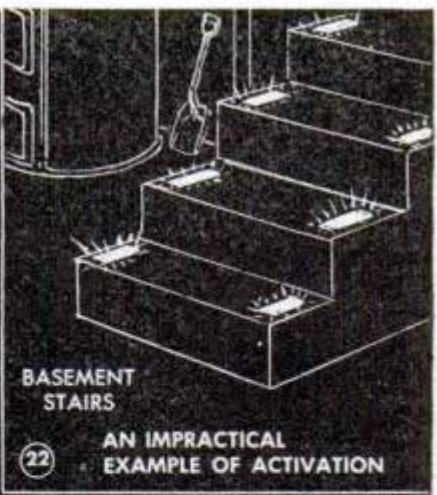
Brightness of various pigments represented by squares, shows intensity and life of luminous pigments



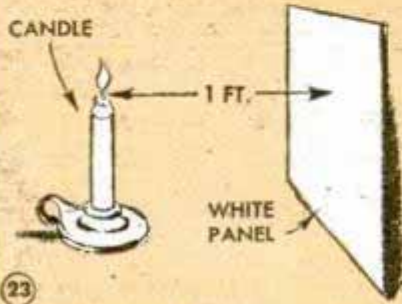
20 **ACTIVATION**
 All luminous pigments require activation before they will glow in dark. Source can be sun, black light or regular bulb



21 **ILLUMINATED SIGN**
GOOD EXAMPLES OF ACTIVATION
 PAINTED BULB



22 **BASEMENT STAIRS**
AN IMPRACTICAL EXAMPLE OF ACTIVATION



23 **INTENSITY OF GLOW**
 Brightest luminous pigments have illumination value of about 1/2 foot-candle. A foot-candle is illumination on white panel from candle 1 foot away



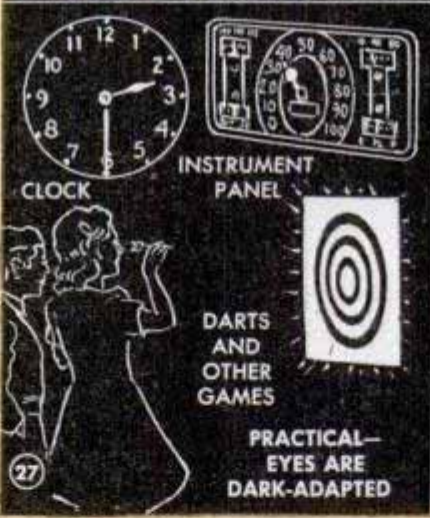
24 **BRIGHT GLOW SHORT LIFE PIGMENT NEEDED**



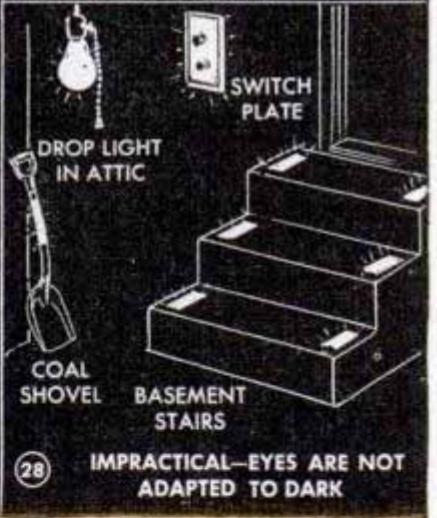
25 **LONG LIFE MORE IMPORTANT THAN BRIGHT GLOW**



26 **DARK-ADAPTED EYES**
 Walk outdoors on a dark night. Everything will at first look black, later become visible. Most luminous paints can be seen clearly only after eyes have become adapted to dark



27 **PRACTICAL—EYES ARE DARK-ADAPTED**



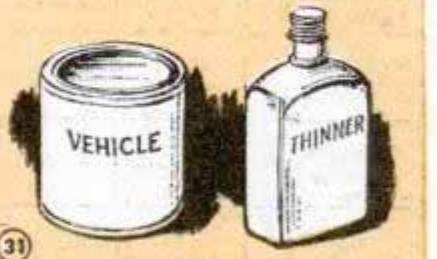
28 **IMPRACTICAL—EYES ARE NOT ADAPTED TO DARK**



29 **WORK SURFACE**
 Surfaces to be luminous painted should be white or receive a coat of white paint. Luminous paint will not cover dark colors or dirty marks on a white panel

VEHICLE (Liquid Measure)	PIGMENT (By Weight)
1 gallon	4 1/2 lbs.
1 quart	1 lb., 2 oz. (18 oz.)
1 pint	9 oz.
1/2 pint (8 oz.)	4 1/2 oz.
1/4 pint (4 oz.)	2 1/4 oz.
1 ounce	1/2 + oz.

30 **MIXING PROPORTIONS**
 All pigments take 4 1/2 lbs. pigment per gallon of vehicle



31 **VEHICLE and THINNER**
 Vehicle for homemade paints can be clear lacquer, spirit varnish or synthetic varnish. Factory mixtures use special vehicles—be sure that you use a compatible thinner



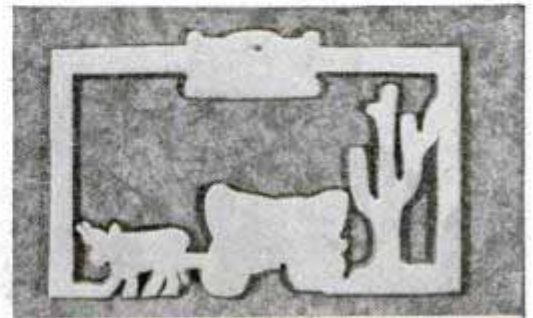
"IN-THE-DARK" VIEW OF BLACK SILHOUETTE BACKED WITH A SHEET OF LUMINOUS PAPER.



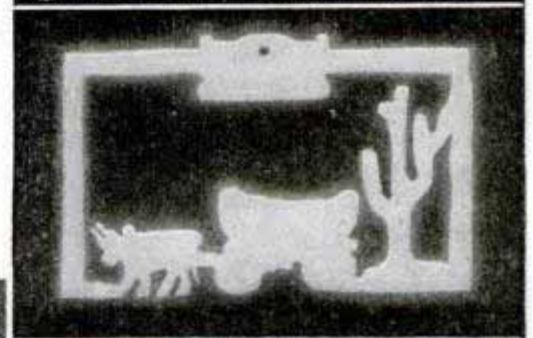
LUMINOUS PAPER

bright pigment immediately after exposure. Some applications require the brightest possible glow with duration of glow being secondary, Fig. 24. On the other hand, all outdoor and many indoor applications must glow all night, as indicated in Fig. 25, making duration more important than intensity.

Dark-adapted eyes: Dark-adaptation of the eyes is perhaps the most important factor to consider in luminous applications. The glow of the pigment is relatively weak when compared with white light, and in most instances is valueless unless the eyes are dark-adapted, Fig. 26. You are aware of how black the interior of a theater looks when you first enter, yet after your eyes become accustomed to the dark the illumination seems quite strong. Exactly the same thing applies to all luminous paints: a degree of glow which would be almost invisible to eyes not quite dark-adapted becomes quite strong when the eyesight is better adjusted to darkness. Perfect applications for dark-adapted eyes include instrument panels, clock hands, etc., as shown in Fig. 27. Impractical applications are shown in Fig. 28. In no instance can you walk from a well-



34 WOOD CUTOUT PAINTED LUMINOUS



35 . . . GLOWS LIKE THIS IN DARK



36 TAPE APPLIED TO TABLE EDGES . .



37 . . . OFFERS PROTECTION IN DARK



TABLE LAMP SHADE SPRAYED WITH LUMINOUS PAINT GLOWS AFTER LIGHT IS TURNED OUT



38

lighted room into a dark room and expect to see the glow of a luminous object immediately—it just can't be seen.

Carrying power: Under normal conditions of brilliance, luminous objects are nearly invisible at 100 feet. Even when visible, the glow has no character.

Signs, house numbers, etc., all appear only as blur of light when viewed from a distance, and the object takes on character and outline only when viewed at a comparatively close range.

Application ideas: Figs. 32 through 38 show a few application ideas. With a little ingenuity and experimentation you can work out many effects that are amusing and practical.

Spark-Plug Tester Can Be Made From a Lead Pencil

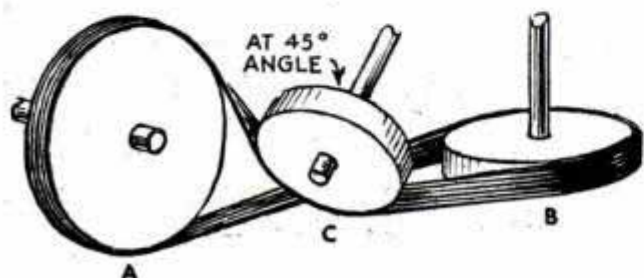


Being unable to determine which spark plug was missing because he had no tools at hand, one motorist used an ordinary lead pencil as a tester. Both ends of the pencil were sharpened and a hole was cut in the center to allow a $\frac{1}{8}$ -in. air gap between the ends of the lead. To use the tester, place one end of the pencil on top of the plug and ground the other end on the engine block. If the plug is good, a spark will jump the air gap in the pencil.

Hulda Alexander, Lemmon, S. Dak.

Belt on a "Quarter-Turn" Drive Kept in Place by Guide Pulley

Since the rule that applies to all belt drives is that "as the belt leaves any pulley its center must lie in the plane of the pulley it approaches," difficulty often is experienced in keeping a belt in place on a short quarter-turn drive. This trouble can be avoided, however, by use of a guide pulley C mounted at an angle between the two pulleys A and B. Locate the guide pulley in such a way that the mid-point of the belt, as it leaves either pulley A or B, is in the same plane as the guide pulley. With

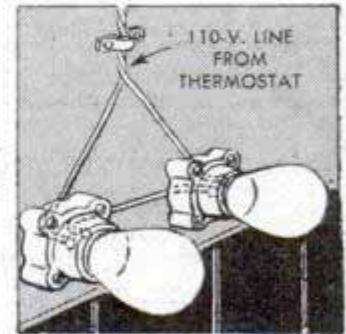


this arrangement, the center of the belt is in the plane of both pulleys and it can be run in either direction.

W. F. Schaphorst, Newark, N. J.

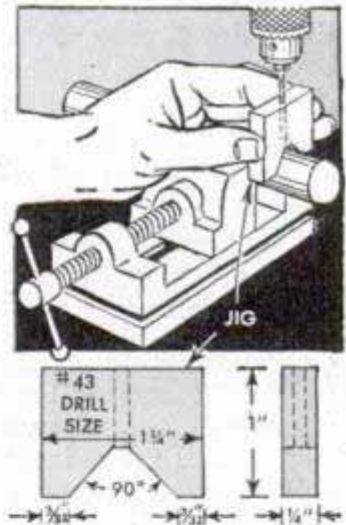
Brooder Lights Wired in Series Furnish Correct Intensity

When tinted bulbs of correct wattage for brooder heating cannot be obtained, ordinary bulbs may be used. An extra socket is wired in series with the one in the brooder. This will furnish the necessary heat and the light output will be subdued. Both bulbs should be of the same wattage. —C. W. Philpot, Laurens, S. C.



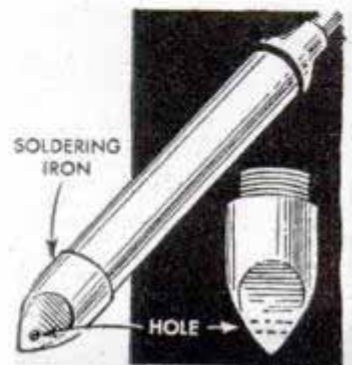
Drilling Jig Centers Round Stock

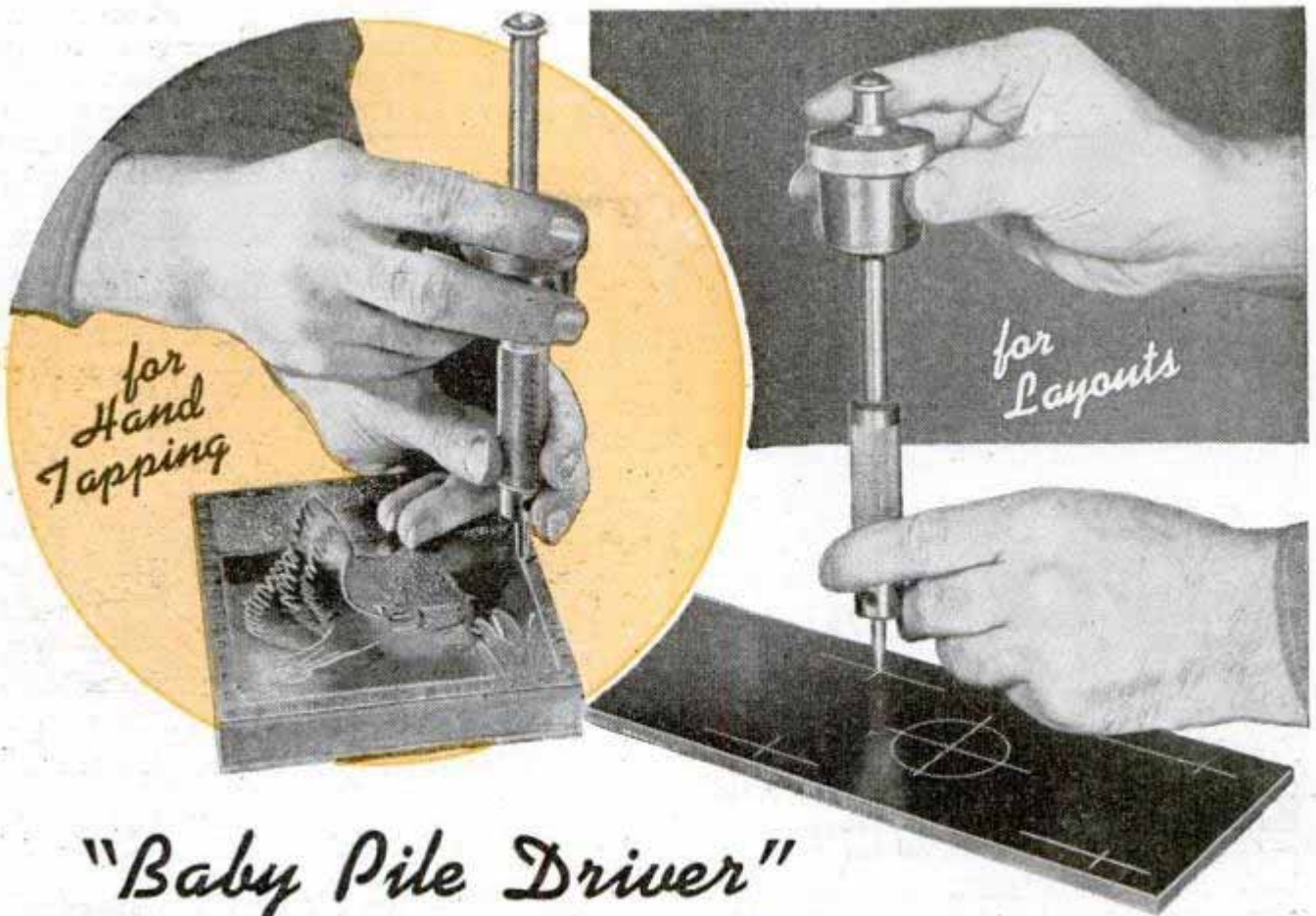
To center round stock in the drill press, try this jig. The dimensions given need not be followed as the design can be adapted to any size. However, the one shown is suitable for any diameter up to 1 in. Only one centering hole is drilled in the jig since the hole in the round can be spotted with the drill bit that fits the jig. The hole in the work then is finished with a drill of the desired size. The jig is made from flat steel, stamped with the drill size and then hardened. —J. Shest, New York, N. Y.



Improved Method of Soldering

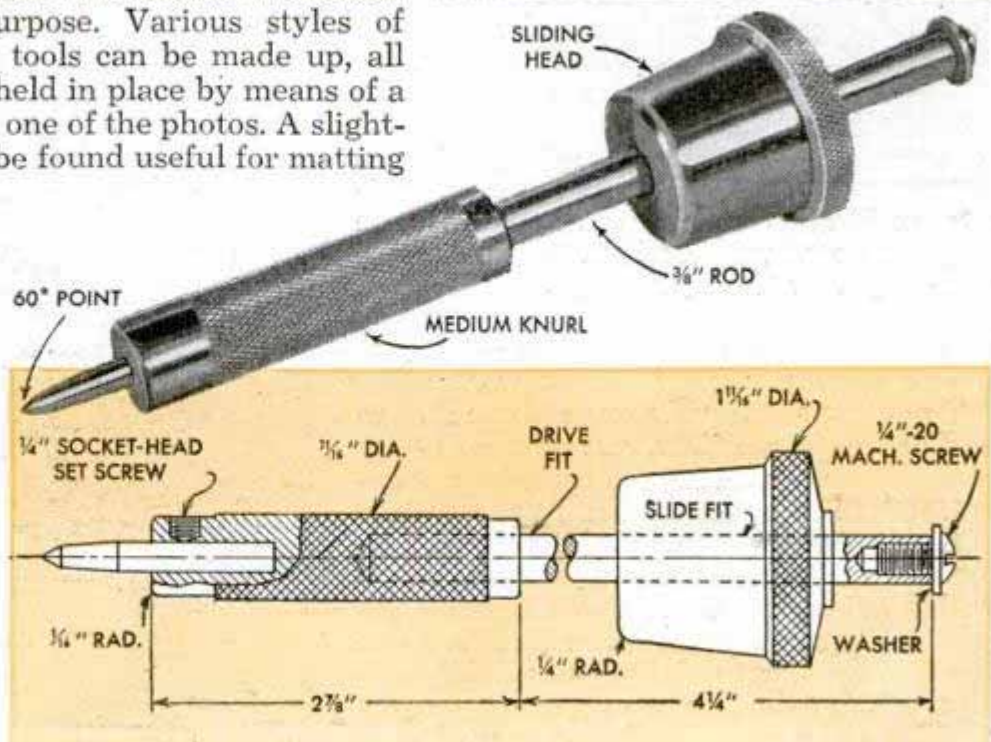
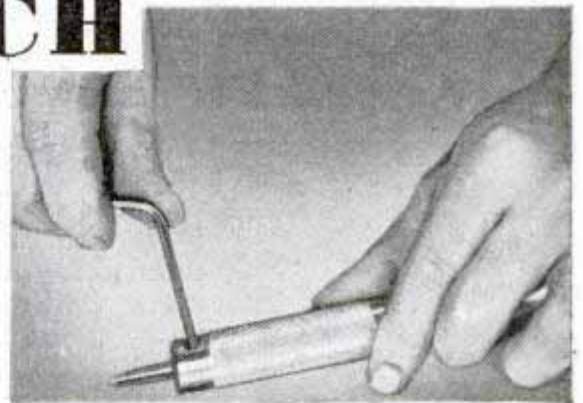
If a small hole $\frac{1}{8}$ in. in dia. is drilled through a soldering iron about $\frac{1}{4}$ to $\frac{1}{2}$ in. from the tip, depending upon the size of the iron, more solder can be held. This will permit feeding the solder directly to the work when soldering seams and joints. The hole as well as the tip must be tinned, of course. —W. Riederich, Flint, Mich.



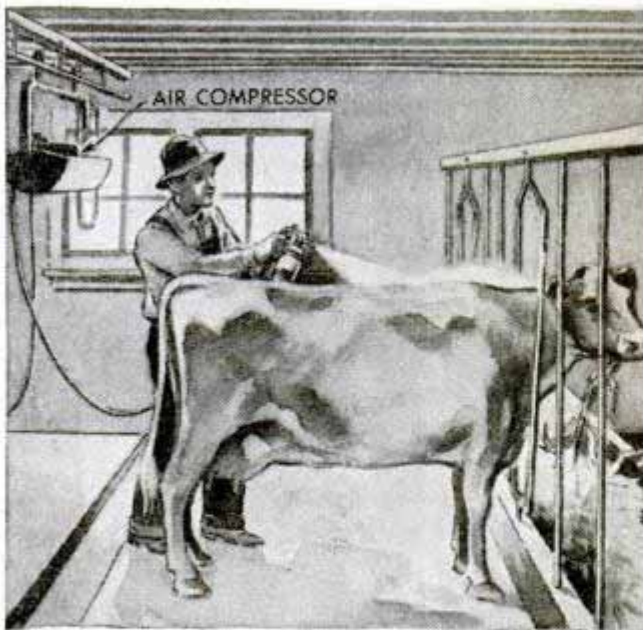


"Baby Pile Driver" CENTER PUNCH

YOU don't have to hunt for the hammer when you use this center punch because it's built right onto the punch. The tool does a good job, too, on precision layout work and is easy to handle for hand tapping or matting. Construction is simple and altogether a matter of lathe work. Mild steel is used for all parts except the punch, which should be made from hardened drill rod. The shank end of a broken drill also can be used for this purpose. Various styles of punches and tapping tools can be made up, all interchangeable and held in place by means of a setscrew, as shown in one of the photos. A slightly heavier head may be found useful for matting or hammering operations. How the tool is used will be apparent from the pictures. The sliding head simply is lifted and then dropped with a rapid movement. For roughing-in background areas in tapping, the tool can be used like an ice pick, letting the sliding head move up and down of its own accord.

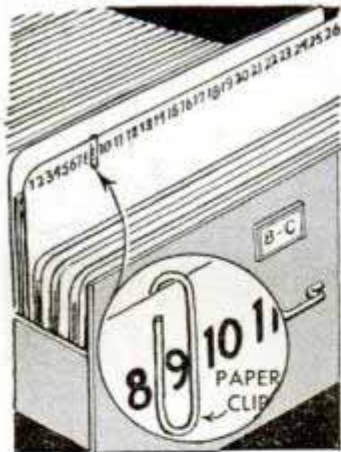


Spray Gun Applies Insect Killer In Liquid Form



Where electric power is available on farms, an electric paint-spray gun can be used to apply liquid fly killer to cows. The air compressor is mounted on a platform built into the litter carrier and braced with cleats to prevent slipping. With this arrangement, access to all stalls is easier.

Files Are Used for "Follow Ups"



A simple "follow up" file system may be set up by marking an ordinary file folder along the top edge with the numerals 1 to 31. Then slip a paper clip over the number that represents the day of the month when the file is to be brought to the proper person's attention. Months could be marked on the file also and noted with a clip in the same manner.—Opie Read, Jr., Chicago.

Months could be marked on the file also and noted with a clip in the same manner.—Opie Read, Jr., Chicago.

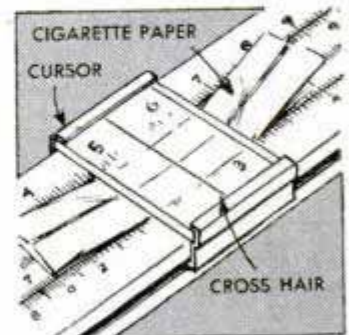
Tumbler Cleans Small Parts

Tumbling small parts or machine screws and nuts to clean them can be done easily with this unit. A 1-qt. paint can with a snap-on lid is used as the barrel. In the bottom of the can drill a 1/4-in. hole slightly off center to take a 1/4-in. bolt. Secure the bolt with a nut and washers on the outside and inside. Next solder a 1/2-in. strip of tin down the interior length of the can at right angles to the side. Mix a cup of dry emery powder and a cup of boxwood or pine saw-

dust to serve as a cleansing agent, and place this and the parts to be cleaned in the can. Then chuck the projecting end of the bolt in a lathe and turn at about 200 r.p.m. for approximately three hours. After this time the parts can be removed by screening or sifting.—Ray Allen, Chicago.

Cursor on Slide Rule Is Cleaned With a Cigarette Paper

Cleaning the underside of the cursor on a slide rule is done easily without removing the glass if a cigarette paper is used. Simply fold the paper as shown and slip it under the cursor.

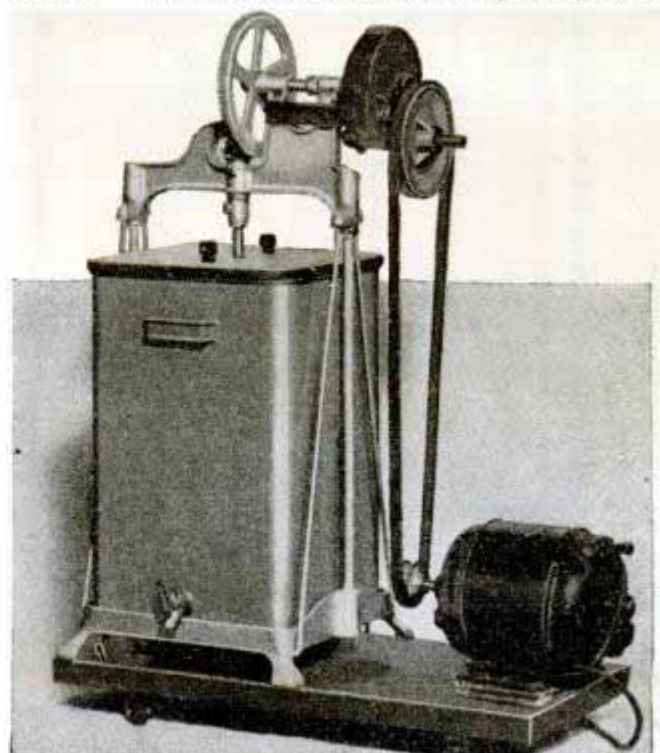


After grasping the projecting ends, the paper is worked back and forth until the undersurface is cleaned.

Edward S. Barnum, Detroit, Mich.

Hand-Driven Churn Converted To Electric-Motor Drive

This hand-driven churn was converted to power operation with the addition of an electric motor, reduction gears and reduction pulleys. In this particular case, the gears, which were taken from a hand grinder, had a ratio of 12 to 1. To further reduce the speed, a 2-in. pulley was used on the motor and a 5-in. drive on the gear-box. The same approximate ratios should be followed to secure satisfactory operation.—Wm. R. Jackson, Birmingham, Ala.

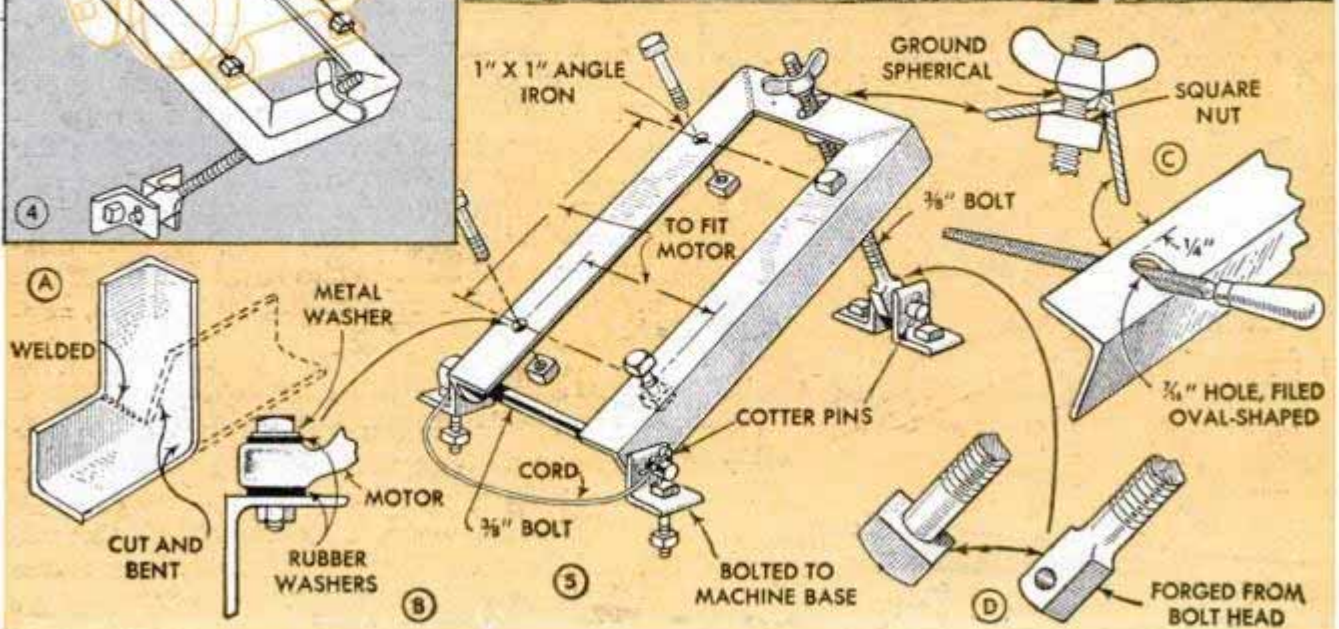
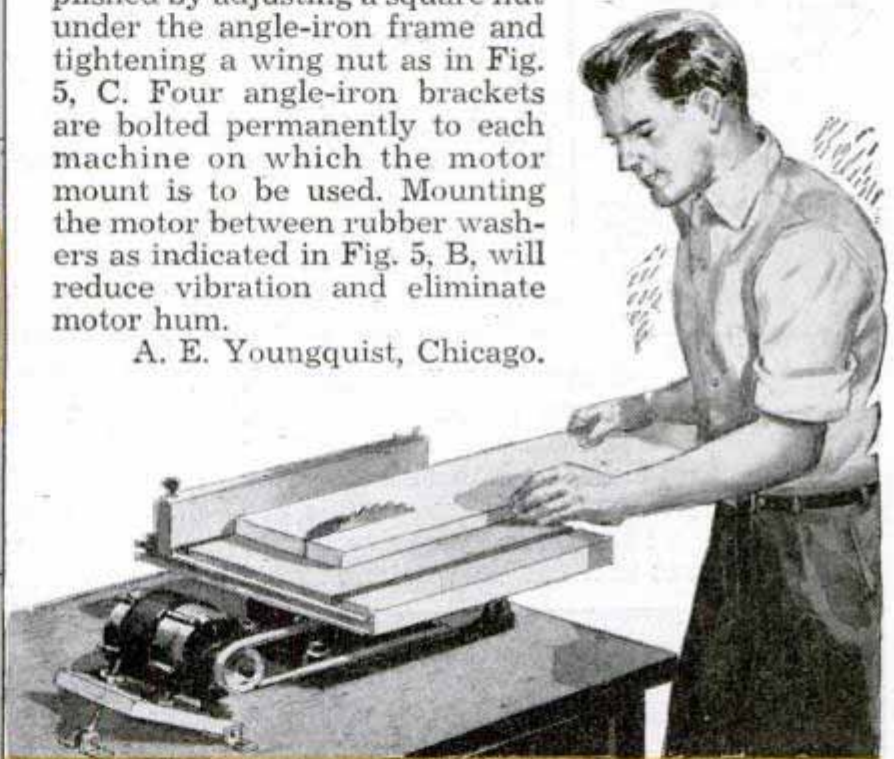
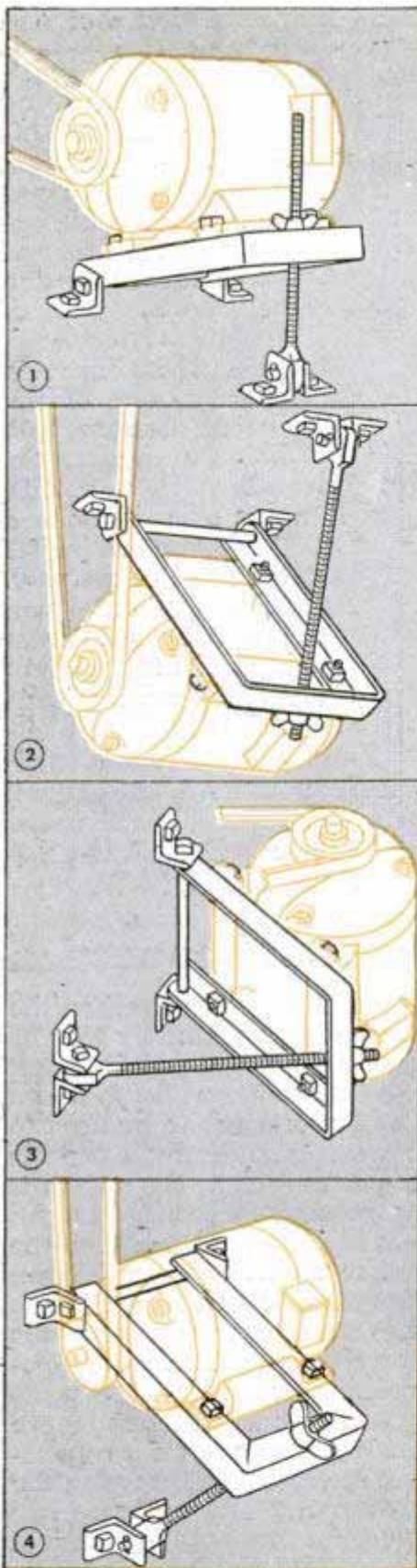


QUICK-CHANGE MOTOR MOUNT SERVES ALL MACHINES

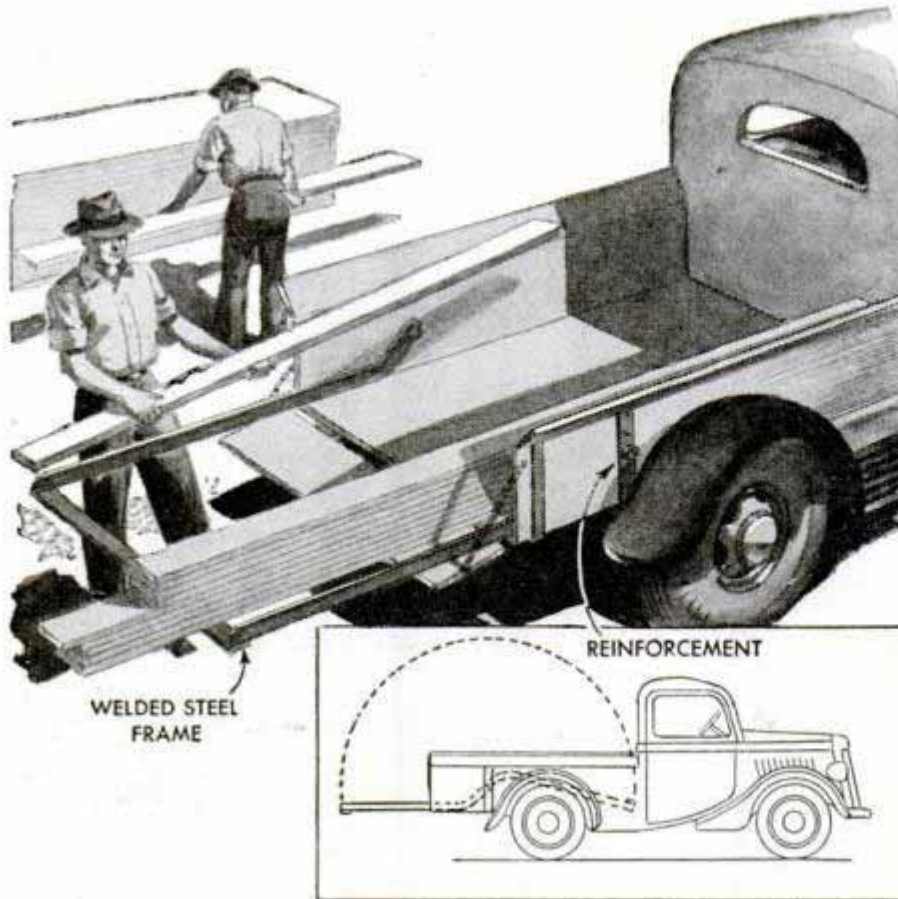
CHANGING a motor from one machine to another in the home can be done in less than a minute with this all-position motor mount. Some of the many different positions in which it can be used are shown in Figs. 1 to 4 inclusive. Only motors built for vertical as well as horizontal mounting should be used as illustrated in Fig. 3.

Dimensions for the angle-iron frame (Fig. 5) are not given as these will vary according to the type and size of motor used. The corners are cut, bent and welded as detailed in Fig. 5, A, and two holes are drilled to take a $\frac{3}{8}$ -in. bolt on which the frame hinges. A third hole is drilled and filed to an oval shape for an adjustment screw, which is a $\frac{3}{8}$ -in. square-head bolt forged and drilled as shown in Fig. 5, D. Belt tensioning is accomplished by adjusting a square nut under the angle-iron frame and tightening a wing nut as in Fig. 5, C. Four angle-iron brackets are bolted permanently to each machine on which the motor mount is to be used. Mounting the motor between rubber washers as indicated in Fig. 5, B, will reduce vibration and eliminate motor hum.

A. E. Youngquist, Chicago.



Extension on Bed of Truck Increases Capacity



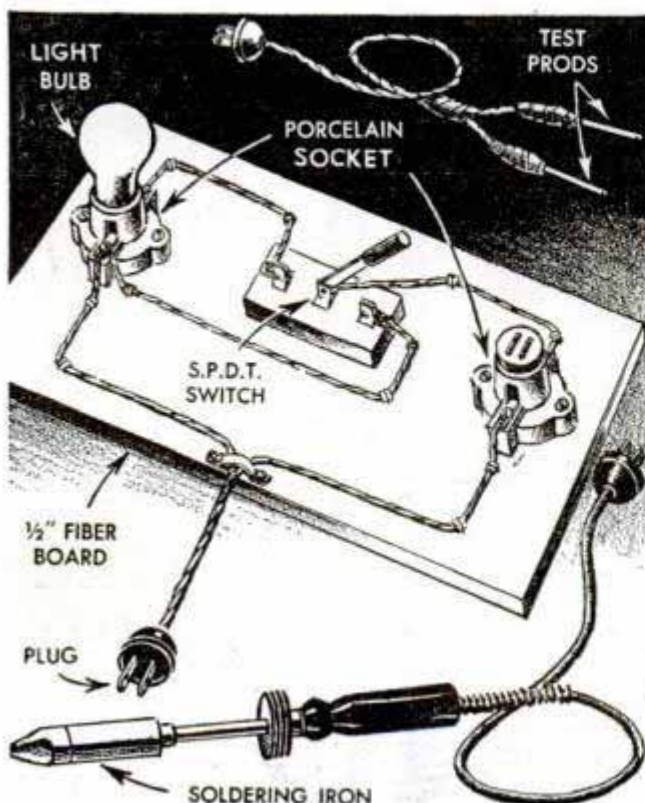
One contractor found that the capacity of his pickup truck for hauling bulky loads was increased greatly by adding the extension shown. It is of welded steel construction and bolts to the sides of the truck. A flat-iron reinforcement is fastened to the sides, one of the bolts being the same one that holds the extension. When not in use, the frame is folded back so that it rests on the bed of the truck out of the way. Although the extension will not bear any great weight, the arrangement is ideal for carrying loads such as lumber on a pickup truck. Since this, in effect, extends the truck body, warning flags may be necessary.—Paul Carlstedt, Edmonds, Wash.

Combination Circuit Tester and Soldering Iron Connection

With two porcelain sockets and an s.p.d.t. knife switch, you can combine a circuit tester with an electrical outlet suitable for plugging in a soldering iron or other tool used in electrical wiring. The sockets are mounted on a fiber-board panel with the switch wired to them as shown. The right-

hand socket receives full voltage when the switch is thrown to the right, and when the switch is thrown to the left the other socket is in series with that on the right so that a lamp bulb or other resistor can be used to reduce the voltage. In soldering, a bulb is used in the left-hand socket, the switch is thrown to the right and the iron is plugged into the right-hand outlet to heat; then the switch is thrown to the left to keep the iron hot with no danger of overheating. When the switch is thrown to connect the sockets in series, test prods can be used in connection with a small bulb, which will serve as a test lamp. A neon bulb will be found more sensitive to small leaks than an incandescent lamp. In order to avoid throwing the switch the wrong way and running full voltage through the prods, they should always be plugged into the left-hand outlet, with the bulb in the right-hand socket.

Walter R. Bufkin, Evansville, Ind.



Building Paper Decorates Walls

If you wish to decorate the walls of your summer cottage or playroom with an unusual paper, try decorative building paper. It can be applied with tacks and paste and, being heavier than wallpaper, has more insulating value.

Sadie G. Lasley, Queen City, Mo.



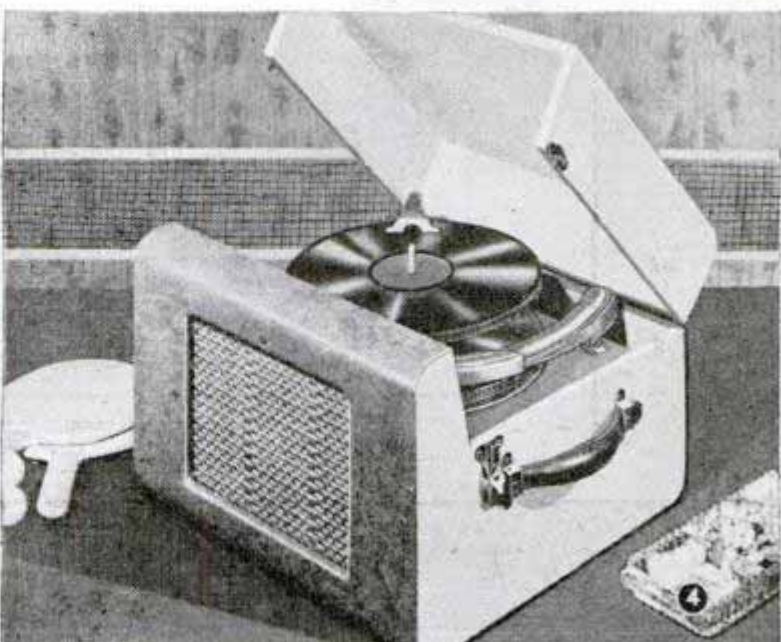
RECORD PLAYERS TODAY

Now you can spin your favorite "platters" on improved turntables in cabinets housing amplifiers of advanced design. Photo No. 1 shows a most unusual 5-tube table radio-phonograph of Philco design that features an automatic record player. The operator merely places a record in the slot and closes the door. Then automatically the motor starts, a tone arm positions itself and the music plays. Furthermore, it will adjust itself to either 10 or 12-in. records.

A streamlined plastic cabinet model is offered by Garod; this radio-phonograph combination, shown in photo 2, is available in either ivory or walnut plastic with contrasting pickup arm and control knobs. It employs five multi-purpose tubes.

The convenient 6-tube combination phonograph-radio in photo 3 features the Farnsworth three-point suspension record changer that handles both 10 and 12-in. records. Its lightweight tone arm is provided with a crystal pickup.

A portable automatic record changer with audio amplifier is shown in photo 4. It is 15 in. wide, 15 in. deep and 10 in. high. This handy carry-about model by Audio Industries employs a speaker of the heavy-duty PM type.



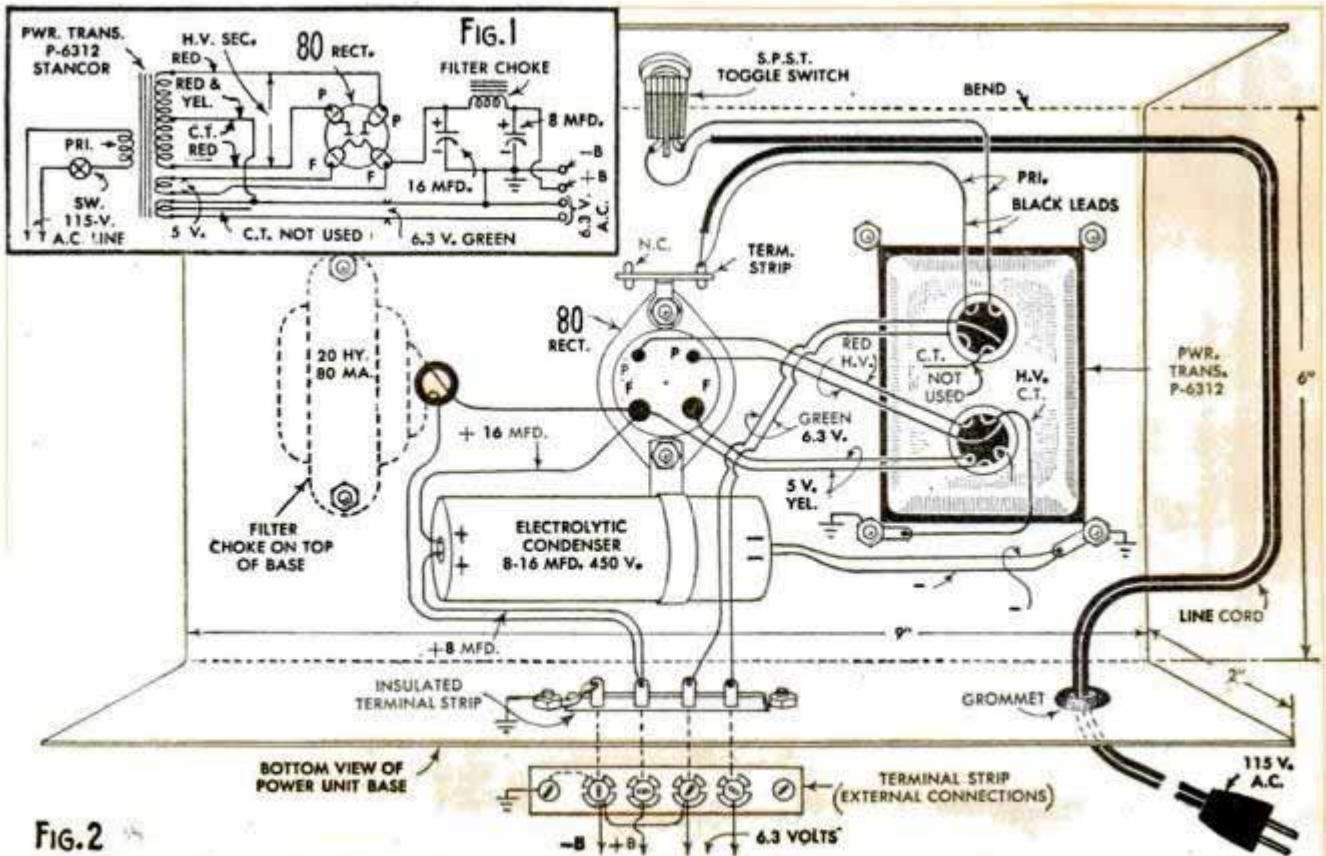
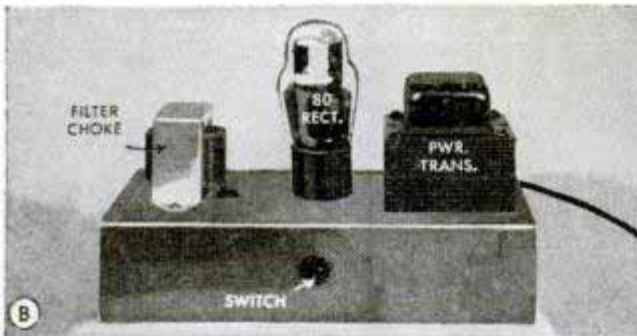
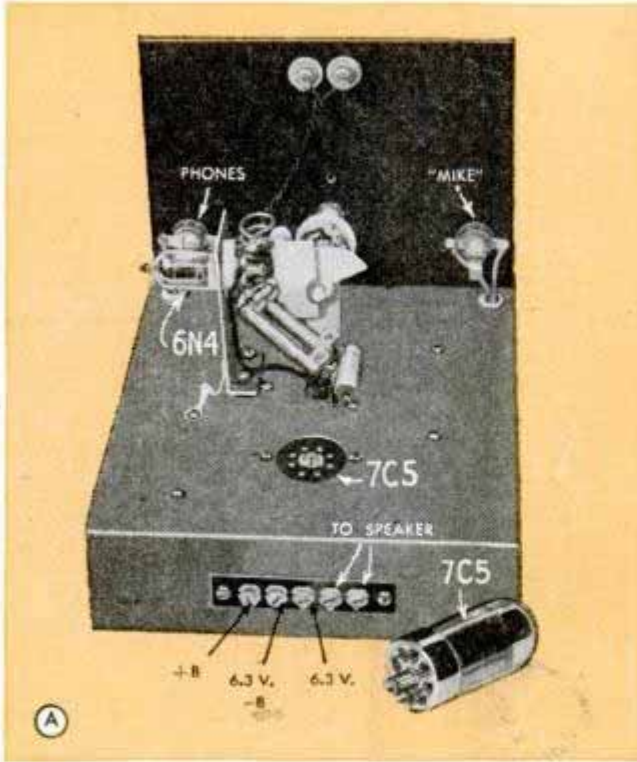
HI-EFFICIENCY TRANSCEIVER FOR THE

By L. M. Dezettel—W9SFW

DESIGNED around a high-frequency tube ideal for the new 2-meter "ham" band, this combination transmitter and receiver provides the newcomer as well as the pre-Pearl Harbor licensed amateur with an efficient means of getting on the air for local contacts while larger equipment is being built. It also may be used for mobile operation in a car with one of the new vibrator-type power supplies.

The 6N4 tube is a miniature triode self-controlled RF power oscillator and it is modulated with a type 7C5 loktal audio power tube in the "transmit" position. In the "receive" position the 6N4 is a super-regenerative detector and the 7C5 acts as an audio amplifier. All RF leads are extremely short; photos A and D show the compact construction.

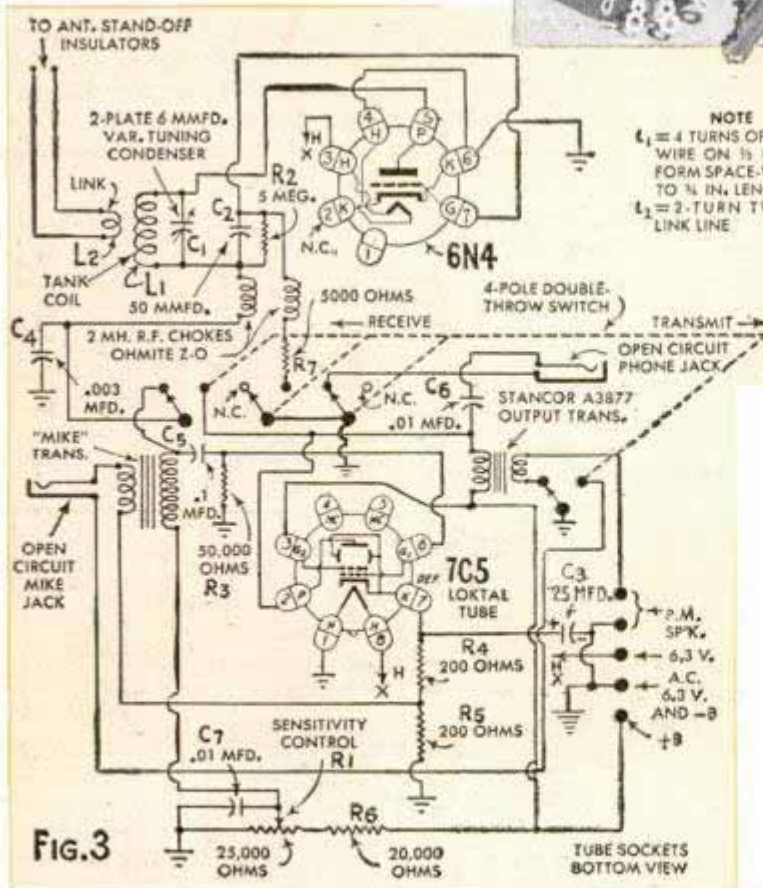
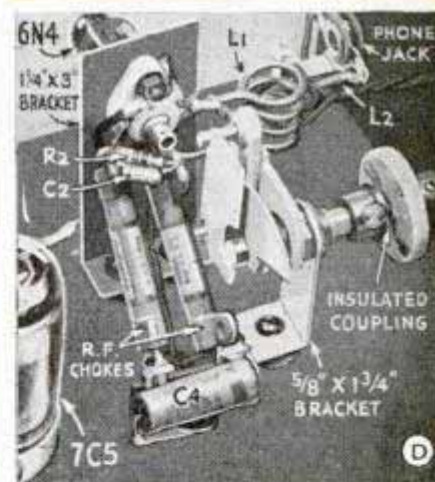
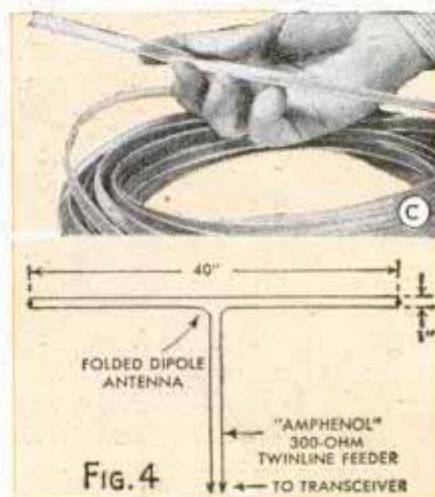
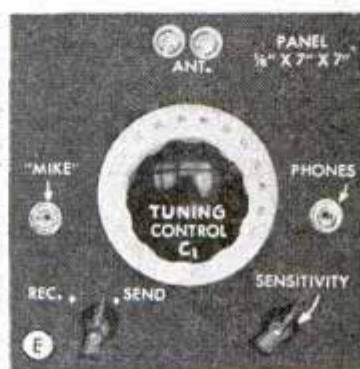
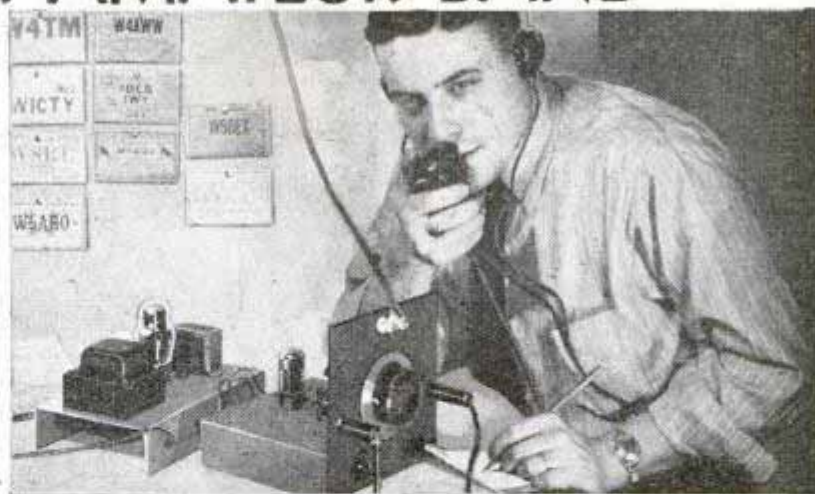
A separate 300-volt a.c. power supply unit is detailed in Figs. 1 and 2. All circuit details and specifications for the transceiver appear in Fig. 3 and the photos. The 6N4 tube socket is a ceramic miniature type, mounted with terminals 1 and 7 at the bottom; terminals 4 and 6 are connected and grounded on the bracket. A National XP-6 "button" insulator is used to mount the bracket for tuning condenser C1. Small rubber grommets act as shock absorbers for the tube and choke assembly bracket



NEW 2-METER AMATEUR BAND

which is grounded with a short piece of heavy braided wire. Coil L1 is soldered to the variable condenser terminals as closely as possible. Fixed condenser C2 is a tiny 50-mmfd. "Muter X50" tubular mica type. The headphones used are of high impedance type.

The folded dipole antenna is shown in Fig. 4. If heavy wire is used, the dipole spacing may be 1 in. as shown; the feeders are made with "Amphenol" 300-ohm twin-lead transmission line, photo C. The entire antenna may be made with the twin-line material by cutting it to length and connecting the dipole ends. To operate, listen for another amateur station and adjust the sensitivity control for loudest signal. The rushing sound disappears when the station is tuned in. Adjust the two-turn pickup link coil L2 in coil L1, at the same time readjusting the sensitivity control for best reception; this coupling adjustment also is correct for transmitting. Any single-button carbon "mike" may be



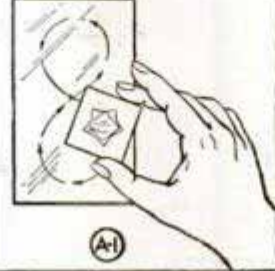
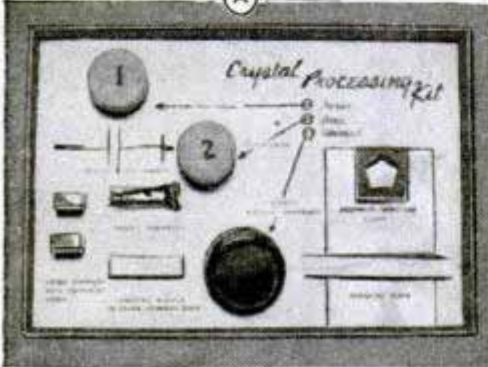
used; close talking is necessary for full modulation. The student reference number for this construction article is R-345.

Blueprints covering radio construction articles in this and past issues are available for 25 cents each; detailed student material lists and additional information can be obtained from our Radio and Electronics Department without charge on receipt of ordinary letter postage.

"Ham" Radio Suggestions



(A) Now you can regrind your own transmitting crystals or grind new blanks to any desired frequency in the recently reopened amateur bands. Everything that is required for grinding and finishing is contained in the kit shown in the photo. It includes coarse and fine abrasives; quartz etching fluid; four high quality quartz crystal blanks; one glass finishing plate; a carrier lapping plate with a pentagon well, and an instruction sheet. Two crystal holders with half-inch prong spacing that will fit into an ordinary octal tube socket also are included. The usual figure-8 crystal grinding stroke is clearly illustrated in sketch A-1



(B) Critical tuning adjustments are easily maintained with this fast acting dial-lock and tuning indicator. The lock is especially useful in mobile equipment where vibration and rough handling are encountered



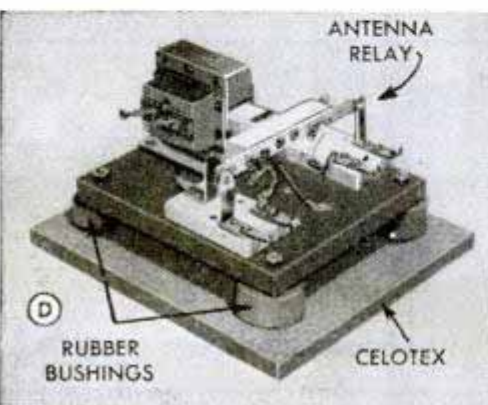
(C) R.M.A. fixed resistor color-code guide for identifying resistor values. As fixed carbon resistors are now subject to the new R.M.A. standard values rating, radio parts houses will supply the nearest R.M.A. standard. This value may be slightly above or below the original specification but will not affect the efficiency of any circuit

Black -0	Black -0	Black -	Tolerance
Brown -1	Brown -1	Brown -0	Gold -- ± 5%
Red -2	Red -2	Red -00	Silver -- ± 10%
Orange-3	Orange-3	Orange-000	No Band-- ± 20%
Yellow -4	Yellow -4	Yellow -0000	
Green -5	Green -5	Green -00000	
Blue -6	Blue -6	Blue -000000	
Violet -7	Violet -7	Gold -Multiply by .1	
Gray -8	Gray -8	Silver -Multiply by .01	
White -9	White -9		

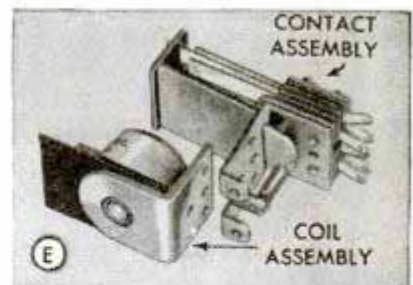
Tan -- Insulated

FIXED RESISTOR R.M.A. Color Code

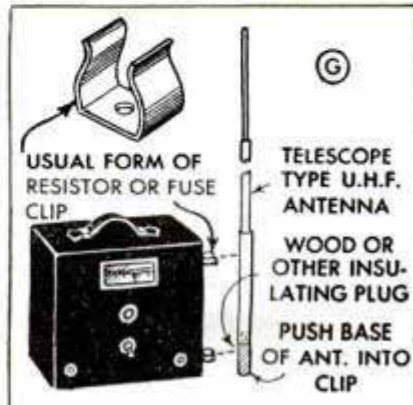
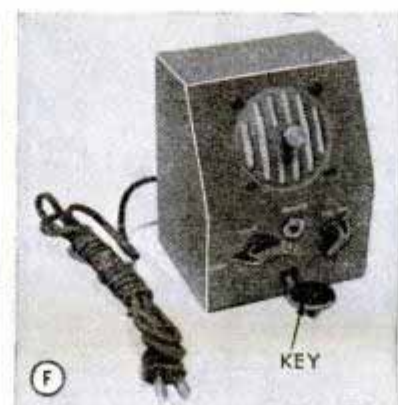
(D) For practically silent operation mount your antenna change-over relay as shown in the photo. This heavy-duty "Gordon" R.F. relay also is suitable for transmitter tank switching and 60-cycle power switching. Adaptable for many applications, the small "Guardian" universal relay (E) can be operated on nine different a.c. or d.c. voltages simply by switching coil assemblies. A contact parts kit permits building many switch assembly combinations



(F) One-tube code practice oscillator, complete with speaker, phone jack and built-in key, for classroom or individual use



(G) Fuse clips eliminate complicated socket attachments for mounting rod antenna on portable receivers or transceivers





KODAK ORTHO-X (sheets)—top-speed ortho film. Gives ruddy skin effects, hence popular for pictures of men.



KODAK PANATOMIC-X (sheets, miniature rolls)—extremely fine grain, first choice for big enlargements.



KODAK PORTRAIT PANCHROMATIC (sheets)—a favorite multi-purpose film, especially valuable for portraits.

First step to a finer picture ... the right Kodak Film



And it won't be long before these seven favorites, and the rest of the Kodak Film family, will be back on Kodak dealers' shelves. The supply is steadily improving.



KODAK PLUS-X (rolls, packs)—all-around "pan" film; combines high speed, fine grain.



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Rochester 4, N. Y.**



KODAK SUPER PANCHRO-PRESS, TYPE B (sheets)—high speed, good highlight separation. Outstanding for portraits.



KODAK VERICHROME (rolls, packs)—fast, orthochromatic. America's favorite snapshot film by a wide margin.

Kodak

"I Always Have Luck with the JITTERBUG"

— writes girl angler



Jitterbug and Tina Lure Bass!

Tina with bass and a couple of pickerel caught on the Jitterbug. Seems from her letter that Tina, like many male anglers, is quite sold on the wobbly, noisy Jitterbug as a fish-getter.

Choice of Six Colors
\$1.21



Dear Fred:

"I caught these seven good-sized bass and two pickerel within a few hours on your 'Old Faithful' Jitterbug at Burden Lake.

"I always have luck with the Jitterbug. We use them on all our fishing trips and wouldn't be without them. Some day I intend to try your other lures and I hope they are as good."—(Miss) Tina C. Boel, Red Mill Road, Rensselaer, New York.

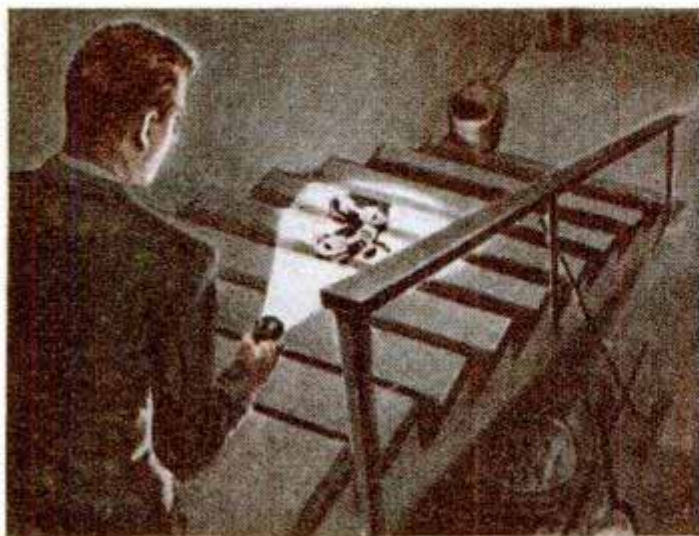
Write for New Catalog

Gives you complete information on where and how record catches are being made with Jitterbugs, my famous surface bait, and also my family of Hawaiian Wigglers. A copy is yours for the asking.

FRED ARBOGAST & CO., 1626 W. North St., Akron 3, Ohio

How to Avoid these "BOOBY TRAPS" in your home!

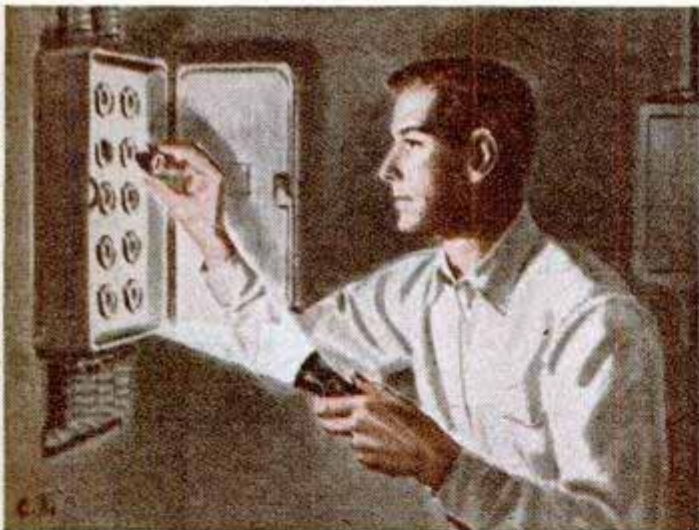
What you can't see CAN hurt you—says the National Safety Council



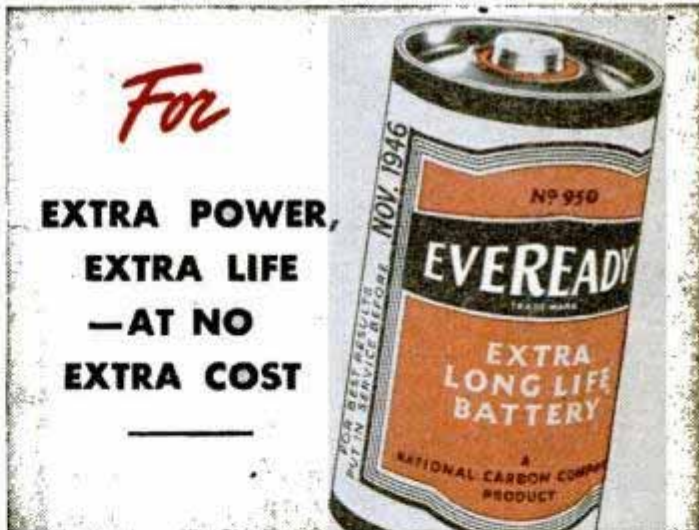
1 About 5,000,000 Americans are injured every year at home—33,500 fatally! Largest single cause: *falling*. A roller skate on a dark staircase; shin-catching obstructions; slippery objects: these can be lethal "booby traps." To avoid them, carry your "Eveready" flashlight in dark areas.



2 Be sure all obstacles are cleared away. Linoleum or carpeting should be tacked down firmly. In attic or basement, pack all loose objects in nonflammable boxes stored against the walls. Don't rely on *your* knowledge of where obstacles are located—the next person may not know.



3 Know *in advance* where your fuse box, main water and gas valves, etc., are located; be sure you have a clear path to them. Armed with your "Eveready" flashlight, you can approach without fumbling in an emergency. Be sure loose wires are so placed that you won't trip over them.



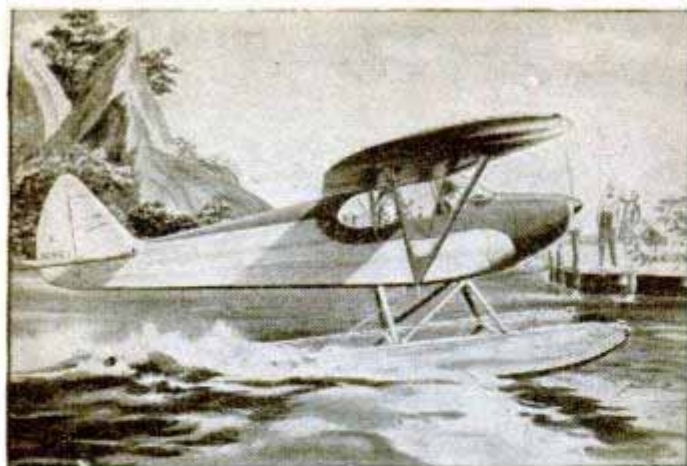
4 Keep your "Eveready" flashlight always in the same convenient place—so you won't be tempted to do without it because it can't be located. Keep it filled with "Eveready" batteries—they're again available at your dealer's. They are the *largest-selling* flashlight batteries in the world!

NATIONAL CARBON COMPANY, INC.
30 East 42nd Street, New York 17, N. Y.
Unit of Union Carbide and Carbon Corporation



EVEREADY
TRADE MARK

The registered trademark "Eveready" distinguishes products of National Carbon Company, Inc.



BUILDING MORE PLANES means building BETTER planes that cost LESS

THAT'S why Piper continues to lead in value, safety and economy. Ask your Piper Cub Dealer for a free flight demonstration in one of the new Piper Cubs. Get full information from him about the *free flying course* given with the purchase of every new Piper Cub.



Thousands of requests are pouring in for this latest Piper book on current models and for these new editions of two already famous books, off the press just a few weeks ago:

1. **Piper Cub Brochure.** Brand new! Beautiful full-color airplane illustrations, suitable for framing. Complete specifications of Piper Cubs.
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Get these books from your Piper Cub Dealer now. Or, if you prefer, send us 10c per book or 25c for all three. Use stamps or coins. Specify which books you desire. Write Dept. PM66.

PIPER AIRCRAFT CORPORATION
LOCK HAVEN, PENNA.

PIPER

Print Your Own Color Photos

(Continued from page 117)

Fourth, he dyes the matrices, first soaking them in hot water to prepare them for the dyes. Each matrix is placed in a pan of dye corresponding to its inherent color—cyan, magenta, or yellow. These dyes are prepared from concentrated solutions in the kit. Where the "hills" occur on the images, less dye will be absorbed, and eventually less dye of that color will be transferred to the finished print. "Valleys" absorb more dye and therefore relay a brighter color to the print.

Fifth, he prepares the dye transfer paper upon which the final print will be made. Former printing papers required a series of steps to prepare them for soaking up the dyes. The new paper is pre-mordanted—already treated—and needs to soak only 10 minutes in a single solution prepared from the kit. The photographer can soak it while he is dyeing the matrices. When it is ready, he places it on the transfer board, a flawless surface, and squeegees it taut.

Sixth, he places the matrices in acid baths that wash away all excess dye. In the first bath all changes in contrast and high lighting are made by adding more material from the kit. The second holds the dye rigid in preparation for transfer to the paper.

Seventh and last step is to print each matrix on the paper with the aid of the "dye transfer blanket." This blanket is a milk-white plastic sheet about the thickness and pliability of a magazine cover. It is fastened to one end of the transfer board so it can be folded back like the page of a book. On the under surface of the blanket are six "buttons" the size of a dime, two along the bottom and four along the side. These buttons are spaced at varying distances from the bottom and one edge, so that they are out of line with each other.

The photographer folds back the blanket to expose the buttons. He places the cyan-dyed matrix on the blanket so the two edges that were trimmed in registering fit snugly against any three of the buttons, two in length and one in width. When the other two matrices are placed against the same buttons, they will register perfectly.

He then folds the blanket and matrix down over the transfer board until the matrix is close to but not in contact with the paper. He transfers the dye by rolling the print roller over the back of the blanket to obtain perfect contact between the relief and the paper. After three minutes the cyan dye has been absorbed, and he folds back the blanket and removes the matrix.

(Continued to page 236)

Switch to -

AUTO-LITE

Money cannot
buy a better
spark plug



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RADIO SHOW STARRING
DICK HAYMES—SATURDAYS
8:00 P.M.—E.S.T. ON CBS



*The Spark Plug that's
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Auto-Lite spark plugs are designed by the same engineers who design complete electrical systems for leading cars and trucks. This specialized engineering experience is one reason why money cannot buy a better spark plug. A complete set of ignition engineered Auto-Lite spark plugs in your car, helps give you quick starts, and full mileage from every gallon of gas. So switch to Auto-Lite when faulty spark plugs need replacing. See your Auto-Lite Spark Plug Dealer today.



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Toronto 1, Ontario Toledo 1, Ohio



Continuing tests and scientific research, plus 35 years' experience designing complete ignition systems, enable Auto-Lite Ignition engineers to maintain one high standard of quality.

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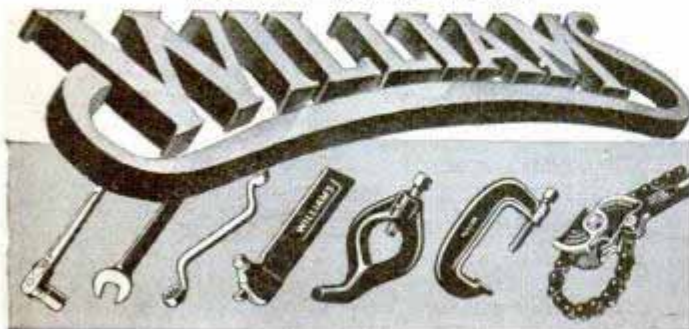


Home Craft Sets are supplied either in the steel case illustrated or mounted on a panel which can be hung beside the lathe.

WILLIAMS Home Craft TOOL HOLDERS

● This set of 8 tool holders provides for all regular lathe operations and is ideal for home work shop use on lathes from 7 to 10" swing. Drop-forged from tough steel, accurately machined and specially heat-treated, these holders represent the same fine quality as the Williams industrial line. The high-speed steel cutters furnished, are ground, ready for use except those for turning. The "diamond-point" turning cutters require only a minimum of grinding to desired form. Sold by Industrial Distributors everywhere. Write Dept. M-66 for literature.

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Destroys Ugly Weeds but Won't
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Made by THE SHERWIN-WILLIAMS Co. Cleveland, Ohio




What marks a box,
a can, a jar
So all may know
what contents are?

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The better construction of GERSTNER Chests assures better value at no greater cost. Free catalog for Tool, Die and pattern Makers.

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Smooth HORSEPOWER



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Casite carries oil quickly to the tight spots . . . protects new motors during break-in period . . . reduces engine wear . . . retards formation of sludge and gum . . . keeps motors clean and full of zip.

And everyone knows that a clean motor runs better and lasts longer.

Put a pint in the crankcase every oil change and a pint through the air intake every three months—for better and smoother performance all-year-round. Sold by service stations, car dealers and garages, everywhere.

GUARANTEE Add Casite to crankcase and run through air intake according to instructions, then drive your car 100 miles or for 60 days, whichever is first. If not convinced that Casite gives you better and smoother performance, you get double-your-money-back by filling out guarantee certificate and mailing it to The Casite Corporation, Hastings, Mich. Maximum refund is \$1.30 per pint, twice the advertised price of Casite.



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Recognized for over thirty years as authorities on preservation of fine finishes.

All parts of the image that are cyan (green-blue) now have been transferred to the paper. When he prints the magenta matrix he transfers all blue-red portions. In printing the yellow matrix, he completes all possible color combinations.

The result? A beautiful color print within two hours of the time the process started. He can make other prints quickly by redyeing the matrices and printing them in the same way.

Although beginners who use the dye transfer process may need practice before producing perfect prints, the advanced amateur will find it much easier and less expensive than the former wash-off relief process. And to the true darkroom fan there is a vast satisfaction in translating his own brilliant film transparencies into life on paper.

Have We Outgrown the Panama Canal?

(Continued from page 122)

brought the cost up to \$525,000,000 by 1921. The building of the canal, however, is one of the best bargains our country ever made. How many millions of man-hours and ship-hours were saved by the Panama Canal in World War II will never be calculated.

In money value, the canal is definitely a paying proposition. In the peak year of traffic in 1929, 6289 vessels paid more than \$27,000,000 in tolls.

Always well defended with giant coastal guns, the Canal Zone bristled during the war with anti-aircraft artillery. Barrage balloons were everywhere. A \$20,000,000 fuel pipe line from Cristobal on the Atlantic side of the Isthmus to Balboa on the Pacific side was completed just before the Japs threw in the towel. Conceived as a secret alternate supply artery from one ocean to the other in case the canal was knocked out by enemy action, the pipe line—originally a single 20-inch line 46 miles long—proved so valuable that a duplicate pipe line was begun even before the first was completed. The daily capacity of the dual artery is 265,000 barrels of fuel oil, 60,000 barrels of gasoline and 47,000 barrels of Diesel oil.

But while every precaution was taken to protect Panama, the possibility of the Nicaraguan Canal was not forgotten. Following the survey ordered by Congress in 1929, an Army officer and one noncommissioned officer remained behind to continue the collection of hydrological and meteorological data pertaining to the proposed canal. These men are in Nicaragua today, oper-

(Continued to page 240)

Presenting DELUXE



BURGESS

vibro-tool

Trade Mark Reg. U. S. Pat. Off.

In a convenient setting that appeals to every craft and shop worker . . . a gift to thrill anyone!

Note the convenient arrangement whereby all Vibro-Tool attachments are in plain view and may be withdrawn and replaced with a minimum of effort.

In designing the De Luxe Kit, Burgess has satisfied a long-felt need for a handsome package containing the Vibro-Tool, accessories, and a handy sharpening stone . . . all permanently boxed to give the best day-in and day-out service to the user.

The Vibro-Tool De Luxe combination is housed in a sturdily constructed, hinged wooden box with a natural polished finish . . . providing a case which is attractive in appearance and which offers a high degree of utilitarian value.

The De Luxe Kit contains not only the Vibro-Tool and newly-designed accessories conveniently placed in individual compartments, but a high quality sharpening stone as well, so that all of the attachments can be kept in finest condition.

The twenty-two attachments included are a new, longer-lived standard needle for most types of engraving; the sturdier Tantalum Carbide needle for hard metals and glass; new curved and straight-edged knives and foot gauge for regulating depth of cuts; six carving chisels for wood and linoleum; six leather working tools; an abrasive point for frosting glass and smoothing surfaces; and five ball points for leather working, peening, etc.

The Vibro-Tool Deluxe Kit V 150 Price \$16.50
SEE YOUR DEALER OR ORDER DIRECT

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BURGESS BATTERY COMPANY
166 N. Wabash Avenue Chicago 1, Ill.

WORKSHOP WISDOM

REWINDING FISH RODS



When rewinding your rod, add more guides to distribute strain of strike more evenly.

A coat of CASCAMITE, the highly water-resistant glue, will protect areas under windings from damp rot.

How to rewind your rod:

Remove old windings, guides, ferrules.

Next, rotten stone or pumice all surfaces free of old varnish and glue.

Spread a thin film of CASCAMITE on areas to be wound, and wind guides on tight with silk thread. Coat section ends and tip with CASCAMITE and cap with ferrules.

When dry, varnish both rod and windings.

CASCAMITE also mends cracks between bamboo splits.

Gives rod added resilience and "whip."

Why folks prefer CASCAMITE:

Easy to mix. Just add CASCAMITE to cold water and stir.

Strong. CASCAMITE glue joints are stronger than the wood itself.

Economical. Mix CASCAMITE as you need it. No waste.

Get CASCAMITE—and CASCO—the standard casein household repair glue, at your hardware store—in 10¢, 25¢, and larger sizes. For outdoor and boat work, use CASCOPHEN, the new, completely waterproof resorcinol-resin glue.

WRITE FOR FREE GLUING GUIDE: Contains complete gluing directions plus helpful hints for household repairs. Address a post card to: Casein Company of America, Dept. PM-66, 350 Madison Ave., New York 17, N. Y.



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Dry Powder Urea Resin Glue

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FAMED USS MISSOURI
Full-hull official scale model with replica of surrender plaque



Kit plaque is slab of a quarter ready for mounting.

A DREAM OF A MODEL . . . you'll have hours of fun building it! And you'll enjoy owning this fine model for years to come.

Authenticast assembly kit includes easy directions, diagram, tools, over 100 cast-metal precision-perfect parts. Scale: 1 inch to 500 inches, finished model is 21 inches long. Priced \$12.95 complete at hobby shops.



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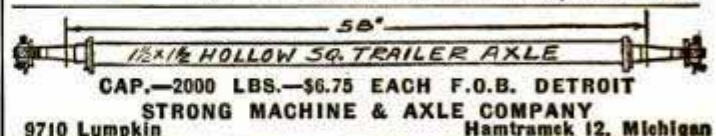


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It's easy to hone keen cutting edges on your chisels and plane blades. Precision adjustment for ANY ANGLE of bevel. Roller glide makes every stroke uniform across oil stone. Light, strong—ideal for home craftsmen, hobbyists, carpenters, cabinet makers.

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The first pipe smoke!



The best pipe smoke!



The famous ZEUS Filter Cigarette Holder is back in Aluminum, with handy ejector.

Write for "Pipes—for a World of Pleasure." It's FREE L & H STERN, INC., 56 Pearl St., Brooklyn 1, N.Y.



Sir Walter Raleigh, father of pipe smoking, never knew the pleasures of a Sterncrest pipe. Poor chap, he was born too soon to puff an LHS of genuine Imported Briar, vita-fused for sweetness from the first puff.

IMPORTED BRIAR
Model #14 \$5

Dozens of others—antique or smooth.

LHS STERNCREST 14K, with gold band, imported briar \$7.50

Other LHS Pipes: \$10.00, \$3.50, \$1.50. at all good dealers

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Warner LIQUID SOLDER
NON-METALLIC—DEPOSITS TINY FIBERS TO REPAIR LEAKS

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WARNER LIQUID SOLDER—Non-Metallic—Deposits Tiny Fibers to Repair Leaks Anywhere in Cooling Systems. Simply pour in! Finds and REPAIRS every crack or hole. Do it yourself—or see your service man.

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ONE MOTION LIGHTS IT

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THE only one-motion stainless steel lighter at \$1.00. New wheel and flint adjustment for velvet-smooth action.

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EARN BIG MONEY

MAKING DIES
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HOME SHOP WORKERS
Here's what you've been waiting for!

The **FIRST** Really Low Cost
Drill Press
FILING ATTACHMENT

**FOR FILING, JIG SAWING, SLOTTING
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This amazingly simple invention can be readily adjusted to fit all standard makes of home shop drill presses. Made of the finest materials by a precision manufacturer, it costs you only \$18.50 prepaid, a small fraction of the price asked for other more complicated types. But production is limited. Order direct today for immediate delivery. Satisfaction guaranteed or your money refunded. Please state type of drill press used in your shop.

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BURBANK
CALIFORNIA

ating rainfall stations, collecting evaporation data and recording lake levels, barometric pressure and wind velocity.

The information they have collected will prove of value, as once again an investigation into means of increasing the capacity and security of the Panama Canal is in progress. This time, the Nicaraguan Canal is bound to figure more prominently in the possibilities.

Since the locks are the most vulnerable part, it seems likely a proposal will be made to rebuild the Panama Canal as a sea-level waterway. There probably will be a recommendation that the canal be enlarged to allow aircraft carriers and larger ships of the future to pass. Even now the largest carriers can't make it and the battleship Missouri barely squeezes through.

In 1931 the Army's Interoceanic Canal Board said a new canal would lessen traffic demands on the Panama Canal and provide an alternate link between the oceans during emergency. By an ironic coincidence, one of the Army engineers who helped prepare the 1931 report on how to protect the canal, Major General Groves, also helped make the atom bomb—the weapon which can destroy it.

Aladdin Was a Piker

(Continued from page 111)

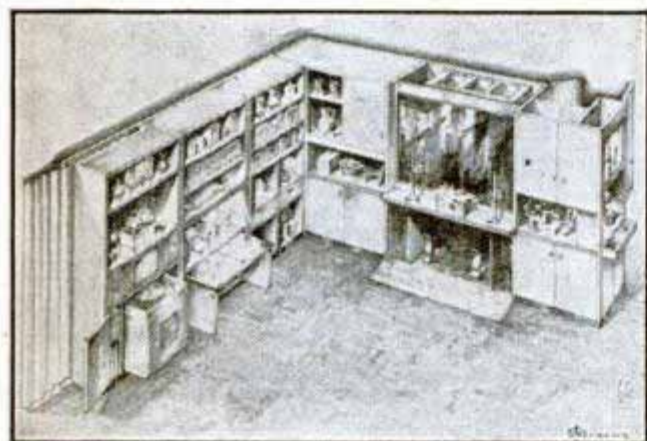
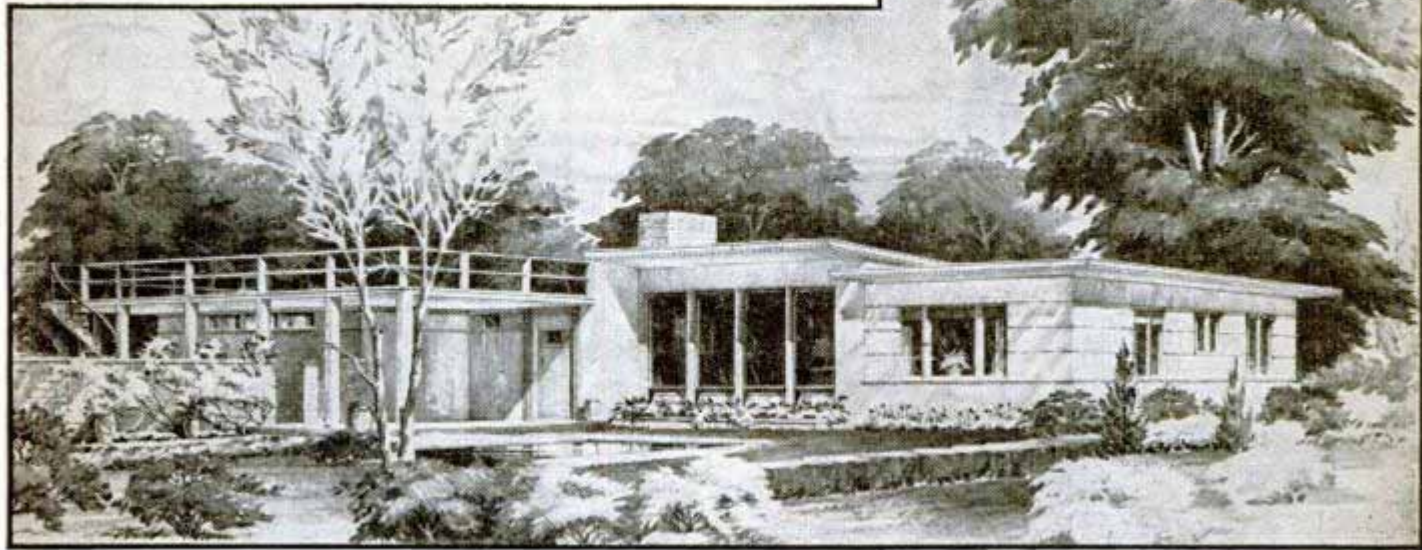
ates a relay—that furnishes current—that turns a motor—that swings the bookcase!

A similar circuit operates a burglar alarm that Brainard installed for Costello. The system is actuated when a prowler approaches the house—before he has had an opportunity to break in. Balanced circuits that are located at different places around the house all are connected with an indicator panel in Costello's bedroom. A buzzer sounds to attract attention when one of the circuits is disturbed, and a light indicates the location of the disturbance. The circuit may be hooked up to switch on lights when someone approaches the house.

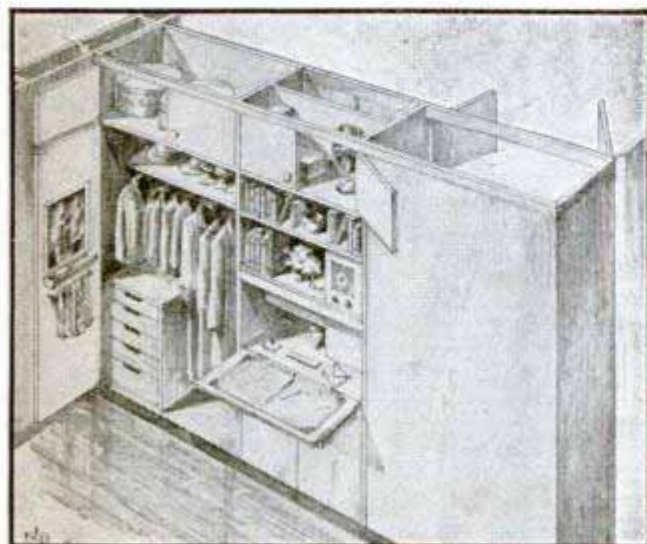
For another friend, whose house is 300 feet from its gates, Brainard invented a mechanical gateman. He concealed a microphone in one of the gate pillars and placed a loud-speaker in an adjacent tree.

When a visitor sounds his car horn at the entrance gates the sound is picked up by the microphone, goes through an amplifier and relay and operates a buzzer in the house. The owner uses the concealed tree speaker and the microphone to talk with the visitor. He can push a button that unlocks and opens the gates if the visitor gives the correct password.

Built For Your Future . . .
*with hands skilled
 by the past*



Defoe's "Working Walls" are distinctly a modern innovation. They put between-room wall space to work for the housewife and provide more storage while actually saving room space.*



IT TAKES a lot of time and work to transform thought into reality. Things like the new Defoe Homes don't just happen. Back of them are the skill and experience born of more than forty years of painstaking workmanship under the exacting traditions of the shipbuilder's art.

• • For more than four decades everything Defoe has produced has been built to perform perfectly—and built to last! What the Defoe organization has learned in all those years has now been translated into the comfort, the convenience, and the economies of the new Defoe Homes. They will be a definite contribution to the better things for better living in the good times which lie just ahead.

*TRADE NAME REGISTERED



HOUSING DIVISION
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 BAY CITY, MICHIGAN

Please send me the descriptive brochure on the new Defoe Homes. Enclosed is 10c for handling and mailing costs.

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**Cut your pipe faster
more easily
with this new
efficiency-balanced**

**RIGID
PIPE CUTTER**



*... with fast-action
thin-blade cutter wheel*

● Slap this new **RIGID** Cutter on a pipe, turn it tight and roll it right through your pipe in a few easy turns—thin wheel leaves practically no burr. You like the well-balanced feel of its new style malleable frame and the thin blade tool-steel wheel always cuts true—every cutter individually tested to assure it. Your choice of 5 sizes to 6" capacity. For easier pipe cutting buy **RIGID**, at your hardware or supply house.

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WORK-SAVER PIPE TOOLS

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Electrically Welded Endless

Paramount

**BAND
SAW
BLADES**



Made in widths from 1/8" to 1-3/4"

Make your band saw do more work for you. The proper width of blade will extend the scope of this important machine. Burrill's Paramount Blades are made from tough Nickel Alloy Steel properly tempered. Teeth accurately set and filed, and all saws carefully straightened. Send order and check today. Delivery will be made as promptly as conditions permit, from a few days to a week or two. You can obtain these saws at the following prices:

1/4"-3/16"-3/8"-3/4" wide, 5'6" long.....\$.90 each
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1/2"-3/16"-3/4"-3/4" wide, 7'6" long..... 1.10 each

Other sizes at proportional prices

ALSO METAL CUTTING BAND SAWS

Made in widths from 1/8" to 3/4"

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BURRILL SAW & TOOL WORKS

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Superior Quality
**ROTARY
FILES**

FOR HOME CRAFTSMEN

The nationally famous Ford Rotary Files, used for the past 25 years by leading precision manufacturers, are now available for the home craftsman in a handy dust proof case which contains six popular shaped tools.

The tools are made of the finest quality high-speed steel, hardened and tempered for maximum life. These ground cutters are efficient on steel, aluminum, brass, plastic or wood. The shapes will meet most home craftsman applications. These tools are made with standard 1/8-inch shank. Additional shapes and sizes are available.

Money with order prepaid
C.O.D. — postage extra

SIX TOOLS in
Dust Proof Case \$6.25

M. A. FORD MFG. CO.

400 WEST FIRST STREET
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SAY YOU SAW IT IN POPULAR MECHANICS

Thompson
**BEATS
the World
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**Better Built
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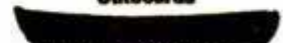
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**Safe Boats With
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Keep passengers perfectly dry—even at high speeds. Catalog also shows two new models of "Take-Along" Boats. Two big factories—save you freight.

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Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (181)
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(Write to
either place)

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CORTLAND, N.Y.



Piston rings cost less than smoke rings...

EVEN youngsters today know hot smoke from a car means burning oil, wasted power, cumulative damage to cylinder walls. All these can be cured by reconditioning the engine and installing new Sealed Power Piston Rings. They lengthen engine life, restore original power, save oil, save gas.

Whatever the make, model, or degree of cylinder wear in your engine, there's a Sealed Power Ring Set specifically engineered to do the best possible job. Sealed Power people are proud of their product and its 35-year record of preference by leading car, truck and engine builders. See your Sealed Power franchise dealer and ask him for the new booklet, "What Causes Excessive Oil Consumption." Or write direct to Sealed Power Corporation, Muskegon, Michigan and Stratford, Ontario.

KEEP YOUR WAR BONDS! GET \$4 FOR \$3!

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For better results 26 Basic Ring Designs

No one piston ring design can meet all replacement needs. Sealed Power Individually Engineered Ring Sets are made up from twenty-six (26) basic ring designs, which permit each set to be specifically engineered to do the best possible job in a particular make of engine.

These ring sets are engineered to save gas without sacrifice of oil economy, to save oil without inducing friction and cylinder wear. Each set gives balanced performance in a particular engine.

**Piston Rings
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BEST IN NEW CARS! ★ BEST IN OLD CARS!

NOW! DUSTLESS SWEEPING



The Dustless brush is the only brush ever perfected for "Dustless" sweeping. This brush has a reservoir in its back for Arbitrin sweeping fluid. In the process of sweeping, Arbitrin filters through the brush and makes the best kind of sweeping compound out of every particle of dust it contacts. Besides reducing dust 97%, the Dustless brush also eliminates sweeping compound, saves labor and outlasts ordinary brushes 3 to 1. Get complete facts about this better method of sweeping. Write today.



- Dustless
- Speed Sweep
- Speed Wash brushes

MILWAUKEE DUSTLESS BRUSH COMPANY

528 N. 22nd Street • Milwaukee 3, Wisconsin

The Mechanics of Golf

(Continued from page 94)

shot, you strike the ball a descending blow.

Don't labor under the same delusion as one onlooker I once overheard. Observing that one of the contestants in a \$10,000 open tournament took a substantial piece of turf in playing his shorter iron shots, this non-conversant individual commented disgustedly, "I should pay good money to watch that guy butcher this beautiful turf! He should be diggin' dandelions, not playin' for dough."

As a matter of fact, if you hit the ball properly with an iron, you are bound to slice off a bit of the turf. What actually happens is that the ball is squeezed between the clubhead and the turf at the instant of impact, for the clubhead is traveling downward and has not reached the bottom of its arc. In fact it has not even started to cut into the turf. This happens after impact, and the bottom of the arc is reached at a point slightly in front of the spot at which the ball rests.

Generally speaking, the shorter the club (the higher the number), the larger the piece of turf taken in playing a full shot. You little more than scuff the turf when using Nos. 1 and 2 irons.

A common difficulty encountered by many golfers is that their clubhead strikes the turf before striking the ball. This always means a spoiled shot.

In my opinion, the most important single consideration in playing iron shots well is a firm grip on the club with both hands all the way through your swing. This means you will have control. Control is vital to both distance and accuracy. If the club is permitted to turn, twist or slip even slightly in your hands, the shot will not bring the desired results.

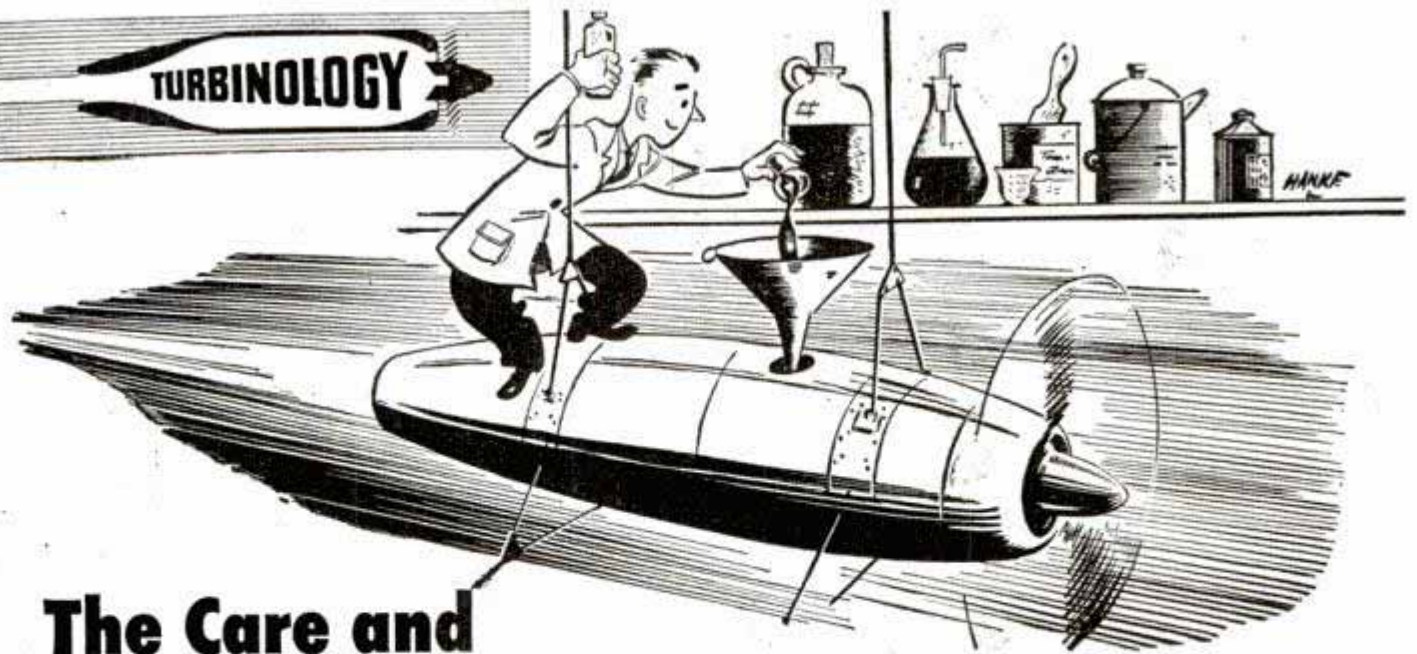
Photos 1 through 4 depict the stance, address and start of the backswing for the long iron shot. Together with the accompanying explanatory matter they cover all essential points in getting the clubhead started properly on the backswing.

Photo 5 is particularly important. It shows maximum distance a long iron or medium iron need travel on the backswing for full power and efficiency in the downswing.

The dangers in taking your clubhead back any more than this are (1) bending or "breaking" the firm left arm, (2) "breaking" the wrists, (3) loosening your grip on the club and (4) losing control of the club for the downswing.

Remember—the clubhead is started downward by the following simultaneous

(Continued to page 248)

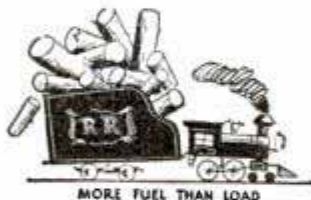


The Care and Feeding of a Turbine

The new propeller turbine of the Wright Aeronautical Corporation is no gourmet with a choosy appetite. It would be possible, though not very practical, to design it to run on either gasoline, kerosene, fuel oil, alcohol, cleaning fluid, or paint remover.

These liquids burn easily. And the main problem in "feeding" a turbine is to give it a free-burning fuel that produces intense heat to expand air and thus put enough pressure on the turbine blades to force them to turn.

If the turbine was for ground use, the cheapest fuel might be selected, fuel oil or crude oil. But in the air, every pound of fuel means one less pound of potential payload. So the fuel with the highest heat value for the lowest weight has to be selected.



Otherwise, planes would be like trains a century ago, when they carried so much firewood there was scant room for passengers.

Years ago, scientists measured the heat necessary to raise the temperature of a pound of water one degree Fahrenheit. They

called this a British thermal unit. It is a very critical measure of fuel value. This is the way three common fuels rate in B.t.u.'s per pound: Dry wood 5,000, Coal 14,000, Gasoline 19,000.



Kerosene and fuel oil have about the same number of B.t.u.'s per pound as gasoline. Uranium has millions per pound but no one knows yet how to pour it into a fuel tank.

Kerosene is a promising turbine fuel. In cold weather, it flows easily, and doesn't "boil" or vaporize at high altitude as gasoline will. Since there is no "knock" problem in a turbine, it doesn't matter that kerosene has an octane rating far below gasoline.

However, gasoline is being used in the experimental models for several reasons. It is plentiful. From long experience with Cyclones, Wright engineers are

skilled in metering gasoline and designing air intakes and combustion chambers to get just the right combination of air and fuel for best heat results. Finally, there is less carbon, a serious problem on the delicately balanced turbine blades.

Yet if you should visit the Wright Aeronautical test cells in the coming months, you might see turbines being tested with gasoline, kerosene, fuel oil, or maybe mixtures of the three.

Eventually, Wright engineers will select one fuel to burn in the production models of the turbines. In line with their long practice of building more power with less weight and less fuel consumption, that fuel will be the one which will permit giant airliners to get the utmost in turbine power and still carry a maximum load in passengers, mail and cargo.



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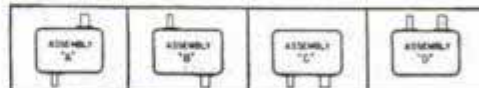
4-1	25-1	64-1	200-1
8-1	30-1	75-1	300-1
10-1	40-1	80-1	400-1
16-1	50-1	100-1	600-1
20-1	60-1	150-1	800-1

Torque capacity 100 inch pounds. Especially suited for bench work, home work shops, light production, animated displays, etc. When ordering be sure to specify assembly and ratio required. Shipping weight in carton, 8 lbs. Full money back guarantee. Prompt deliveries.



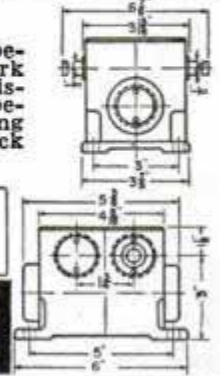
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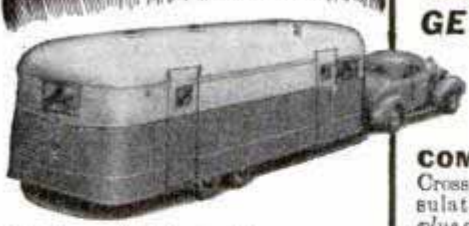
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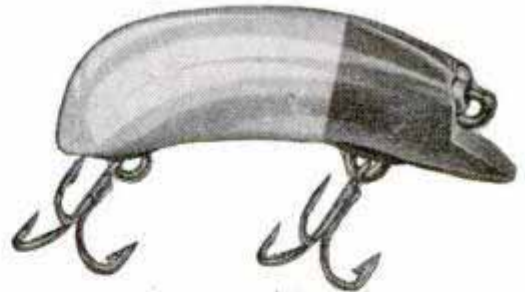
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motions: (1) Start of lateral shifting of weight from right to left side, (2) turn of left shoulder which pulls the arms with it.

I always have the feeling in the downswing that my left hand is pulling the club, and my right hand is doing its best to keep up with the left.

Photo 7 will bear close observation. With the clubhead within four inches of the ball, and all the power at my command flowing into the club, my head remains fixed in its original position. It has not moved an inch, forward, backward, up or down. It serves somewhat the function of a hub in a wheel, with my arms and shoulders the "spokes."

Just as important is the position of my hands. One of the most helpful discoveries I made in trying to perfect my iron play was the value of keeping the back of my left hand facing directly toward my objective from the time the clubhead enters the "hitting area" (last 20 inches before clubhead impact with the ball) until it has reached a point in the follow-through at which the club shaft is nearly parallel with the ground and pointing at my objective. By keeping the hands as shown in photo 5 you will avoid many difficulties resulting from uncontrolled wrist action.

At the finish of the follow-through as illustrated in photo 8 you should note particularly the following points: (1) Club is still gripped very firmly, (2) pull of the shoulders has turned my head so that my eyes may follow the ball, but my head has not moved from its original position. My weight is over to the left side.

The photos on page 91 illustrate the stance and address for the medium irons. Together with the accompanying captions they are fully explanatory.

As we come to the end of Article II, I again remind you that, under normal conditions, the swing for all clubs is fundamentally the same.

In the final article of this series next month we will study the technique of playing short irons, chip shots, shots out of traps and putting. We will wind it up by playing two holes of golf together.

(Concluded next month)

Mudslingers Bring Up Oil

(Continued from page 159)

To shut off the flow of gas into the hole, a restraining pressure must be built up by weighted mud. The toolpusher orders 40 tons of weight material—powdered barite or hematite. Barite is barium sulphate or "heavy spar" with a specific gravity of 4.3

(Continued to page 252)



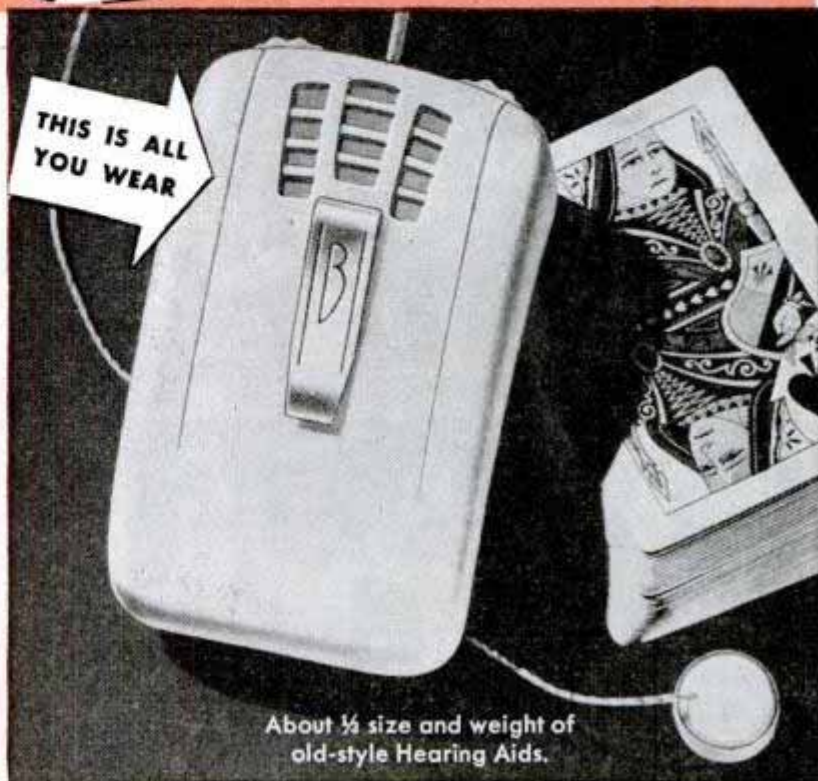
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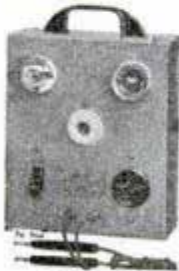
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to 4.6. Hematite is an iron oxide with a specific gravity of 5.2. The "gel" property of the mud is built up with bentonite material so that the fluid will not permit particles of barite or hematite to settle.

Pumps drive the weighted mud into the drill pipe and the heavy fluid by hydrostatic pressure and pump pressure forces gas-cut mud to rise. If the increased weight of the mud column is enough to hold down the gas, the catastrophe has been averted.

In general a good drilling mud carries about one third solids and two thirds water. Its weight may run from 70 to 80 pounds per square foot for ordinary drilling, but can be changed to meet special problems. In comparison, water weighs 62.4 pounds per cubic foot. With an especially light oil-base mud (mixed with oil instead of water), drilling fluid at 60 pounds per cubic foot can create hydrostatic pressure of 2083 pounds per square inch at 5000 feet, 4166 pounds at 10,000 feet and 6249 pounds at 15,000 feet. Weighted mud at 115 pounds per cubic foot can create hydrostatic pressures of 3992 pounds per square inch at 5000 feet, 7985 pounds at 10,000 feet and 11,978 pounds at 15,000 feet.

Gas pressures of 5000 to 6000 pounds per square inch may strike back at the driller. If not kept under control, such enormous pressure can destroy a well and terrorize a whole section of an oil field.

"Gel" rate is measured by timing the sinking of a thin-walled aluminum tube in a sample of mud. To test for water-retaining properties, the engineer puts a sample of mud in a cylinder under 100 pounds per square inch pressure. The rate of dripping from a filter in the bottom of the cylinder provides an index. Thickness of clay deposit on the filter indicates the mud's wall-building properties.

Testing and treating mud for oil drilling is a new science, but it's come a long way since the days of frequent blow-outs, gas-sers and fires. Properly controlled by a mud engineer, rotary mud performs feats of engineering three miles underground.

Lithium . . . the Hungry Metal

(Continued from page 163)

and weak. Adding lithium brought his percentage of weepers down to one percent!

As an alloying agent lithium has startling properties. Adding as little as .01 percent of this metal to lead—a couple of pinches per 1000 pounds of lead—gives a lead alloy which remains hard even at high temperatures. Alloyed with magnesium,

(Continued to page 256)

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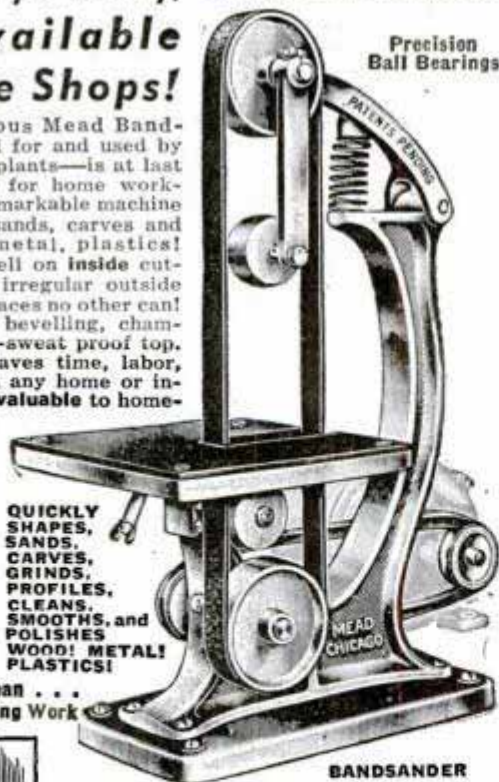


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The world-famous Mead Bandsander—invented for and used by hundreds of war plants—is at last available to you for home workshop use! This remarkable machine quickly shapes, sands, carves and polishes wood, metal, plastics! Works equally well on inside cut-out openings or irregular outside edges. Gets at places no other can! Tilting table for bevelling, chamfering. Rust-and-sweat proof top. Ball bearings. Saves time, labor, money on jobs in any home or industrial shop. Invaluable to home-craftsmen, makers of patterns, tools, dies, signs, costume jewelry, castings, forgings, ornaments, radio and electrical parts, stampings, etc. Nothing else like it. Sold on 5 Day Trial, money back guarantee. Circular Free!



Precision Ball Bearings

BANDSANDER

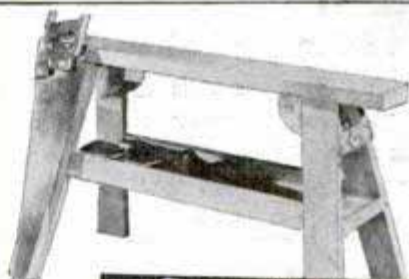
QUICKLY SHAPES, SANDS, CARVES, GRINDS, PROFILES, CLEANS, SMOOTHS, and POLISHES WOOD! METAL! PLASTICS!

Cuts Fast and Clean . . .
Saves Filing, Sanding Work



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Send for free details on "the machine that amazed the experts!" Rush a postcard today for Circular, surprisingly low price. Hurry!
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Saw-horse
that folds
away



FOLD-HORSE

(Patented)

The only folding saw-horse that offers complete stability, yet occupies only 1/6 of normal storage space. It is ideal for job, shop or home craftsman. Takes up only 8" x 9" x 42" when folded—a definite advantage in transporting. Requires less than a minute to set up to standard saw-horse size. The rugged, 14-gauge, cadmium plated hardware is recessed to prevent nicking your saw. Top is clear, white pine with a 2" x 6" x 42" working surface and 9" x 36" tool tray. Place your order immediately to assure prompt delivery. Lists.....\$9.95 each.

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Luggage light—carry it anywhere

Imagine! A portable steam heating "plant"—no larger than a suitcase—that pours out an abundance of clean, healthful steam heat in minutes . . . by just plugging into an electric outlet!

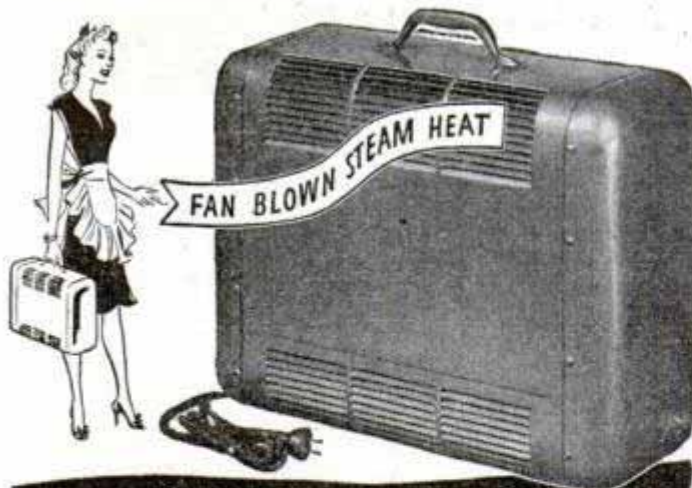
Fan-Circulated Steam Heat

Not a *spot* heater that "toasts" on one side. Efficient Wittie Steam Heater circulates 90 cubic feet of steam heat per minute . . . evenly and gently throughout the room. Real cozy warmth on those chilly days in the country . . . Winter-long comfort at home as well!

Safe and Economical

No glowing coils; heating element safe from prying fingers. Cabinet never gets hot. "Econo-miser" Control saves on current. Weighs only 32 lbs. 115 volts AC only. See new Wittie Heater at leading dealers now!

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ELECTRIC *Steam* HEATER

KEEP a CAN of BOTH ON HAND!

Heavy 3-IN-ONE

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Refrigerators, mixers, motors, power tools, lawn mowers, ironers.

Sweepers, sewing machines, hinges, guns, locks, metal drawers.



For over 50 years
America's accepted
household oil!

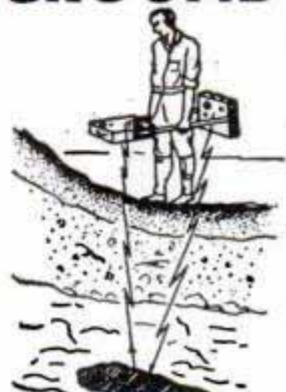
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3 - IN - ONE *Oil*

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is again available in limited quantity without priority. Orders filled in sequence as received. INVENTORS—SCHOOLS—CRAFTSMEN use FOUNDRYETTE for making castings quickly for new inventions, for instruction, and general purpose. Order now for early delivery. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc., \$17.50, \$24.00, \$34.50, f.o.b. Kansas City. Domestic gas supply and 110 volt AC or DC energy required for operation. Write for circular.

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You CAN'T WORM WRONG

for tape, hook, whip, round (ascariid) worms when you worm your dog as directed with Pulvex Worm Capsules, a combination treatment which insures your worming right. Used by leading breeders. Packaged 2 ways: for puppies, for dogs. Either, 50¢; double-size, 75¢
At pet, drug, department stores.



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★ COMBINATION TREATMENT
WORM CAPSULES

THE ONE AND ONLY PIPE OF ITS KIND

VanRoy
with the
Ajustomatic
STEM



FREE-TURNING—SELF-ALIGNING

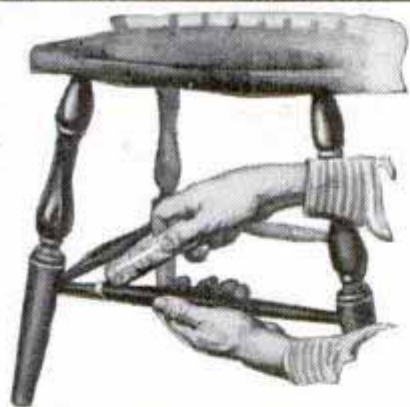


VanRoy Ajustomatic Bard \$5

VanRoy Ajustomatic holds a man's affection; it is the only screw stem pipe that maintains perfect alignment of stem and bowl throughout its long, happy life! The exclusive VanRoy patent, "float-mounting"—allows free turning of the stem but grips it snugly in any position. The stem can't lock at an off angle, always lines up as straight as a die. A remarkable innovation, worthy of the VanRoy tradition of eminently fine quality. VANROY COMPANY, INC., Empire State Building, N. Y. 1, N. Y.



SIGNET OF QUALITY IN PIPES



REPAIRS FURNITURE, TOYS

...also broken china, glassware, torn luggage and books. This handy adhesive is waterproof, transparent and flexible. Get a tube today!



DUCO CEMENT

REG. U. S. PAT. OFF.



Useful
TOOLS

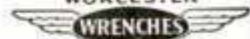
SET
T-52
**Deluxe
Electrical
Ignition
and
Radio Set**

All For \$13.00
List Price

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SPINTITE SET
A Positive Need in Every RADIO,
HOME and ELECTRICAL SHOP.

Contains Chuck Type Handle, Reamawl, 3 Screw Drivers,
2 Pliers, 7 SPINTITES and Insulated, **WALDEN**
WORCESTER
Neutralizing Alignment Wrench.

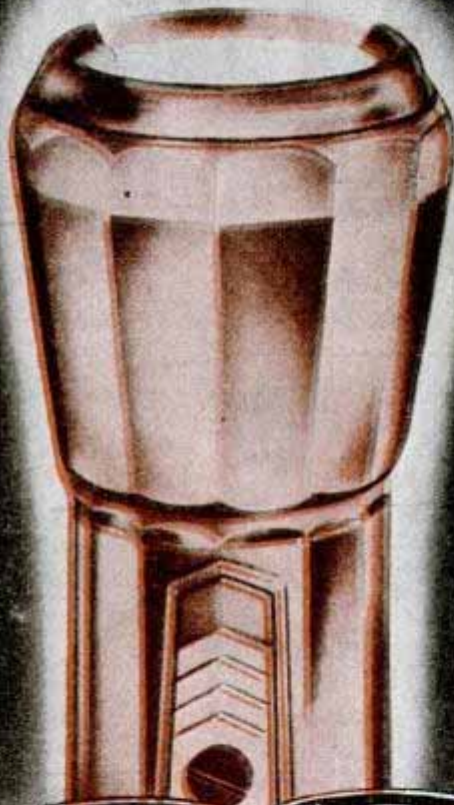


STEVENS WALDEN, INC.

WORCESTER 4, MASSACHUSETTS

NEXT TIME SAY BRIGHT STAR

and you will get a
FLASHLIGHT & BATTERIES
famous since 1909
for QUALITY,
STYLE and
SERVICE



BRIGHT STAR BATTERY CO. CLIFTON N. J.

lithium confers both strength and hardness.

In the heat treatment of steels, oxygen and water vapor are deadly foes of the metal. Ordinarily, when steel is heated to 1600 degrees Fahrenheit, the metal grabs up oxygen rapidly. This forms a scale which must be removed by abrasive cleaning or pickling in sulphuric acid. Instead, a small, renewable "cartridge" containing compounds of lithium is inserted in a generator attached to the heat treating furnace. A "carrier" gas is allowed to flow over this lithium generator, picking up lithium vapor. The vapor fills the furnace and forms a protective blanket over the hot steel, protecting it from oxygen and water vapor. As a result, steel pieces come out of a lithium vapor furnace bright and shiny, ready for assembly. Their precision measurements are not altered.

One compound, lithium chloride, picks up moisture so rapidly that the material is being used extensively in air conditioning equipment. In a typical lithium air conditioning system, air is drawn into a tank containing lithium chloride in solution. By varying the strength of the lithium salt, moisture in the air can be decreased to a relative humidity of 11 percent.

Lithium compounds, added to certain lubricants and greases, have made it possible to use the resulting lubricants over temperature ranges from 140 degrees Fahrenheit to 67 below zero. These lubricants are finding wide application in planes.

Vases, plates, tiles and other ceramic products become stronger and possess glossier finishes when lithium compounds are added to the basic materials. Both the fluoride and the chloride of lithium are used in fluxes for aluminum welding to keep the surface of the molten metal clean during welding. Tomorrow, lithium will be working in even more fields, pushing back limitations which have been hampering industry.

Step on the Gas—the '47s Are Rolling!

(Continued from page 89)

ward until its center of weight is over the front spring suspension. This vertical and horizontal redistribution of weight is said to offer better stability and riding quality. An improved mounting which locks body and chassis resists shocks and strains.

As might be expected, few of the changes in these '47 cars are in the power plants. Studebaker officials are well satisfied with the 80-horsepower L-head six-cylinder

(Continued to page 260)

Goodbye Putty

TREMCO

MASTIC-GLAZE IN COLORS

Successor to putty!

- NEVER CRACKS • NEVER FALLS OUT
- EASIER TO USE • NEEDS NO PAINTING

At dealers everywhere

MC 1231



TREMCO QUALITY PRODUCTS
FOR HOMES AND FARMS

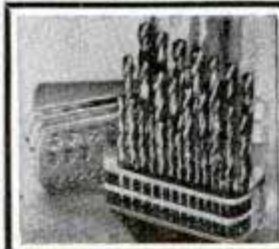
YOUR ELECTRIC DRILL

Has 100 Other Uses

when used with K-Jax attachments
METAL SAWING . . . SHEARING
RIVETING ATTACHMENTS

Write for illustrated circular

K-JAX, 2600 Canton St., Dallas, Texas

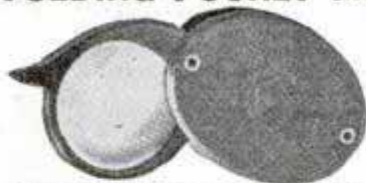


Why Hunt for Drills?

These Complete High Speed Drill Sets
Now Available at Low Prices
#1 to 60 Drills. . . . \$12.95 Per Set
1/16-1/2 by 64ths. . . \$16.95 Per Set
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(Drill Stands Free)

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MACHINE SHOP SUPPLIES
183 Grand St., New York 13, N. Y.

FOLDING POCKET MAGNIFYING GLASS



HIGH POWER

POST PAID **75c**

Double Lens \$1.35

CAPITOL SPECIALTIES, 100 Wall Street, Bridgeport 3, Conn.

SAY YOU SAW IT IN POPULAR MECHANICS

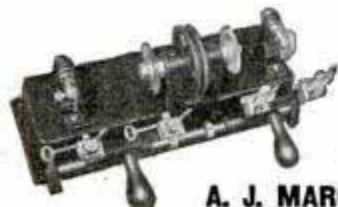


BUILD THESE PROJECTS

For garden or lawn. Easy to build. Easy to sell. Detailed Blueprints Model B-25 Dutch Windmill 50c; Model OM-60 Old Mill, 85c. Lawn Figure Patterns—Sunbonnet Girl, Dutch Boy, Tulip Girl, Holland Pair, 35c each, all 4—\$1. Catalog illustrating many models, send 10c, today.

CRAFTSMAN'S MODEL CO., Dept. P-92, 2030 N. 41st St., Milwaukee, Wis.

MARCOT KEY MACHINE



Marcot No. 8 Key Machine
Mounted on Cabinet. . . . \$ 75.00
Book on Modern Locksmithing 3.95
Auto Code Book and Depth Keys 12.50
2592 Assorted Key Blanks. 77.76
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A. J. MARCOTTE CO., 1200 N. Kedzie Ave., CHICAGO 51, ILL.

It's Good to See Good Tackle Again!

That's exactly what we overheard anglers say when they saw the first South Bend Quality Tackle made since the war!

Here are rods, reels, lines and baits now being made. Not enough for all, it's true, so see your dealer early.



Two Great Fly Rods—No. 47 and No. 59



Most Popular Automatic Fly Reel

When you try an Oren-O-Matic, you'll know why it's so highly prized by fly rod anglers. Two sizes: No. 1130, capacity 26 yards D line; No. 1140, capacity 34 yards D line.

The No. 47 Fly Rod, shown here, is the favorite of anglers who want the extra snap and fast action of flame-finished split bamboo. Exclusive South Bend Comficient Grip and end-locking reel seat. The popular No. 59, lower in price, is also in production now.



Dependable Black-Oreno—Now Braided of NYLON

World-famed Black-Oreno is now being made—of NYLON! Smooth, pliable, easier casting, longer lasting, new moderate prices. Made in 12, 15, 20, 25, and 30-pound tests.



A Really Great Bait—The No. 1991 FISH-OBITE

We wish we could make enough of these wonder baits to meet the demand! Made of indestructible plastic, in the famous South Bend red arrowhead, white body pattern.

Fishing Photo Book—FREE

A 48-page book filled with action photos—every one a winner in the South Bend Fishing Photo Contest. Send a card today. Ask for "Fishing Photo Book."

SOUTH BEND BAIT COMPANY, 891 HIGH ST., SOUTH BEND 23, IND.

SOUTH BEND

A Name Famous in Fishing

SWIVEL-HEAD

FLASHLIGHT

nothing else like it!

**HEAD TURNS
LIGHT AT
ANY ANGLE**

Greatest advance in flashlight design in a generation. Turn powerful pre-focused beam where you want it . . . stand it up . . . clip it on . . . both hands are free. A handsome, durable, all-purpose flashlight for everyone. Ask your dealer.



**\$2 LESS
BATTERIES**



No. SW-22
Patented

No. 75 Heavy-Duty Dated Cell. Fresh Lasts longer. 10c

Flashlights & Batteries

If dealer cannot supply, send \$2.00 to Dept. P UNITED STATES ELECTRIC MFG. CORP., New York 11, N. Y.

*USA LITE Red-Head Safety Flashlight - a "MUST" for the motorist.

Test-O-Lite the MODERN TROUBLE SHOOTER



THE NEON GLOW

. . . LOCATES TROUBLE INSTANTLY in electric circuits, fuses, cut-outs, motors, radios, appliances. Tests everything electrical from 100 to 550 volts. Indicates hot or grounded wires. Tells AC from DC. Engineers prefer it because it has patented safety features.

↑ PUTS "FINGER" ON THE TROUBLE SPOT - QUICKLY

Far superior to ordinary clumsy test bulb. Saves precious time. Indispensable in shop or home. Vest pocket size. Lifetime guarantee. List \$1.50 (Pat. No. 1,778,883) Purchase through regular electrical dealers.

L. S. BRACH MFG. CORP.

200 Central Ave. Newark, N. J.



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HUNTER'S COMPASS

Hunting Case, Watch Type, All Metal, Jeweled **\$3.50**

Engineers All Metal Army Type Hand-Sighting

LEVELS \$1.50



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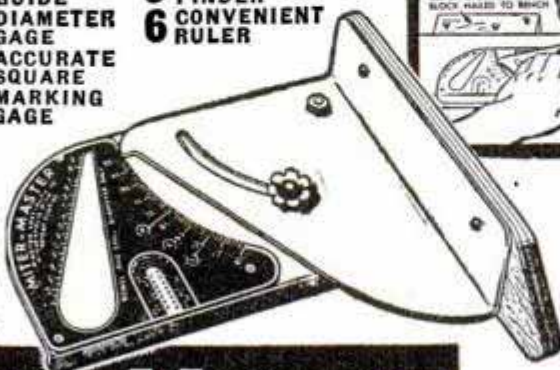
AMERICAN

FLOOR SURFACING MACHINE CO.
335 So. St. Clair Street • Toledo 3, Ohio

6 handy tools in ONE!

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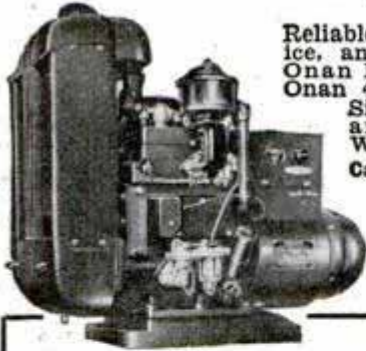
Miter Master takes the place of an expensive miter box accurately set to any angle. Scale marked for mitering 5, 6, and 8-sided frames. Steel construction. Built to last a lifetime. If your dealer can't supply you we will send it postpaid anywhere in the U. S. for \$1.50. (Foreign \$1.75.) Unconditional guarantee. If not satisfied within ten days for any reason whatsoever, your money will be refunded.

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MASTER SPECIALTY COMPANY

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ELECTRICITY FOR ANY JOB ANYWHERE



Reliable, economical electric service, anywhere, anytime, with an Onan Electric Plant. Driven by Onan 4-cycle, gasoline engines. Single-unit, compact design and sturdy construction. Water or air cooled.

Capacity range 350 to 35,000 watts
115 to 660 volts A.C.
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Combination A.C.-D.C. types
65 different models

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Give Dad a HULL AUTOMOBILE COMPASS

A Father's Day gift for his comfort and welfare when driving. He'll use the HULL STREAMLINE AUTOMOBILE COMPASS the year around, to stay on the right road, avoid lost directions, backtracking, delays. Circular free. At your dealer's. Price \$3.95.

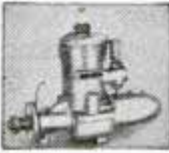


HULL MFG. CO.

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WARREN, OHIO

ENGINES IN STOCK: ONLY \$9.95



The "THOR" miniature gasoline engine that really operates is available. Over 10,000 sold to date. 1/8 H. P. Complete with coil and condenser and full illustrated instructions for only \$9.95. Fully bench tested and ready to run. Power for all models. Send only \$1.00—Shipped Collect C.O.D. same day. Send for FREE illustrated Catalog of hundreds of hobby items.

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BUILD YOUR OWN FAN with that old motor

One piece cast aluminum propellers used for cooling and ventilating. Also available to dealers at discount.

Size	Polished	Unpolished	Bore
In. 2 Bl. 3 Bl.	2 Bl. 3 Bl.	In.	
15 \$2.50 \$3.50	\$2.00 \$3.00	1/2, 5/8, 3/4,	
18 3.00 4.00	2.50 3.50	1/2, 5/8, 3/4,	
20 3.25 4.25	2.75 3.75	1/2, 5/8, 3/4,	
24 3.50 5.00	3.00 4.25	1/2, 5/8, 3/4,	
30 5.00	4.00	1/2, 5/8, 3/4, 1	

Let us give you our prices on your aluminum castings

KLOPPENBORG ALUMINUM FOUNDRY, Dept. SM2, Davenport, Iowa

LAWN ORNAMENT-NOVELTY PATTERNS

28 Lawn Ornament Patterns, 25c. Other patterns; 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 10c each. 25 Novelty Patterns, 30c. All 62 Full Size Patterns, \$1.00 Postpaid. Strother Pattern Service, Dept. G-8, Box 383, Belington, W. Va.

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GET THE BEST IN MUFFLERS V-8 DUALS & SINGLES



Finest Norman custom-built muffler sets - steel pack - torpedo type - heavy, perforated steel cores - chrome enamel finish - mellow, deep tone (improves with use) - designed to fit - all ways superior - double economy.

DUALS.....\$17.50 SINGLES.....\$7.00
V-8 Ford-Mercury Buick, Olds., Chrys.
SINGLES.....\$5.50 ORDER TODAY! Will outlast three ordinary mufflers.
Chev., Ford, Plym.

Distributors - Write for Full Details

NORMAN'S MUSICAL MUFFLERS

Dept. PM-5, 1216 W. Slouson Ave., Los Angeles 44, Calif.

AGENTS-SALESMEN Cash In On This Big Money Making Opportunity! Sell This Amazing Pen... Writes 2 Years Without Refilling

\$100 TO \$150 Per Week EASY

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\$5.00 profit per pen. Sales waiting in every home, office, factory, school. Prospects everywhere. Wonderful Gift for Fathers' Day, Graduation and other occasions.



Outfit includes: pen, safety clip, polished aluminum desk stand, transparent cover, 2-year Reynolds's guarantee.

Nationally Advertised \$12.50



\$7.50 each in lots of 4 or more F.O.B. Chicago Sample \$12.50 Postpaid

Reynolds Pen INTERNATIONAL

The most amazing, versatile pen ever created. Writes 2 years without refilling. Writes with satin smoothness, fine, medium or heavy. Writes on cloth, through 6 carbons, under water. Will not drip, leak, smudge or smear. Dries instantly. The Pinnacle of Pen Perfection. . . Reynolds Pens come in red, blue or black barrels, silver tops, matching jewel caps. Order your supply. Remit with order. No C.O.D.'s. Use coupon.

STARR PRODUCTS

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STARR PRODUCTS, DEPT. P. M.

Distributors, Reynolds International Pen 502 S. Wells Street, Chicago 7, Illinois

\$7.50 Each in lots of 4 or more. Sample \$12.50

I enclose \$..... Ship following order:

..... Reynolds Pens, \$7.50 each (f.o.b. Chicago)

..... Sample Pens each \$12.50 postpaid

Name.....

Street and No.....

City.....State.....



Simplify Your Work
with an
AUTOMATIC DRILL

You'll find it a lot easier and quicker to make clean, accurate holes with a Millers Falls automatic drill. These quality tools assure sturdy, smooth operation. They offer such advantages as:

Eight fluted drill points ($1/16''$ to $11/64''$ in diameter) recessed in the handle for easy accessibility. Each one in a numbered compartment.

Sure-tightening chuck holds drill points securely.

Durable, attractive buffed-nickel finish.

Millers Falls automatic drills are becoming increasingly available. Let one of them save you time and effort. See them at your local dealer today.

One Thing In Common — QUALITY!



**MILLERS FALLS
COMPANY**
Greenfield, Mass.

Champion engine and the 94-horsepower Commander engine. Experience in building the famed war-going Weasel helped Studebaker engineers concentrate engine units in a minimum of space.

The connecting rod bearings are new and of an interchangeable type and the conventional elongated drive shaft has been replaced with a shaft in two sections. These sections meet at an angle in a rubber-mounted bearing in the center of the frame, eliminating the floor tunnel in the rear compartment.

The 1947 Commander models consist of sedans, coupes, station wagon and a convertible on a 119-inch wheelbase. The four-door Land Cruiser has a 123-inch wheelbase. The Champion is mounted on a 112-inch wheelbase, two inches longer than formerly, and has an overall length of 192 inches. It will be available in two sedans, two closed coupes, a station wagon and a smart convertible coupe with an automatic self-raising top. Broader wheel rims are featured on all the cars with 15x5.50 tires on Champions, 15x6.50 on Commanders.

Body details include outside door handles of a new pull-to type, interior hardware designed for minimum protrudence, a pistol-grip parking brake located in the center just below the dash, a new angle in the steering column which is said to reduce fatigue on long trips, and spring ends that "float" on rubber cushions.

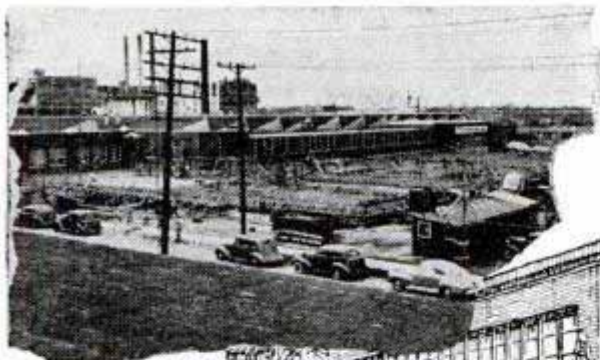
Stock Up for the Outdoors

(Continued from page 153)

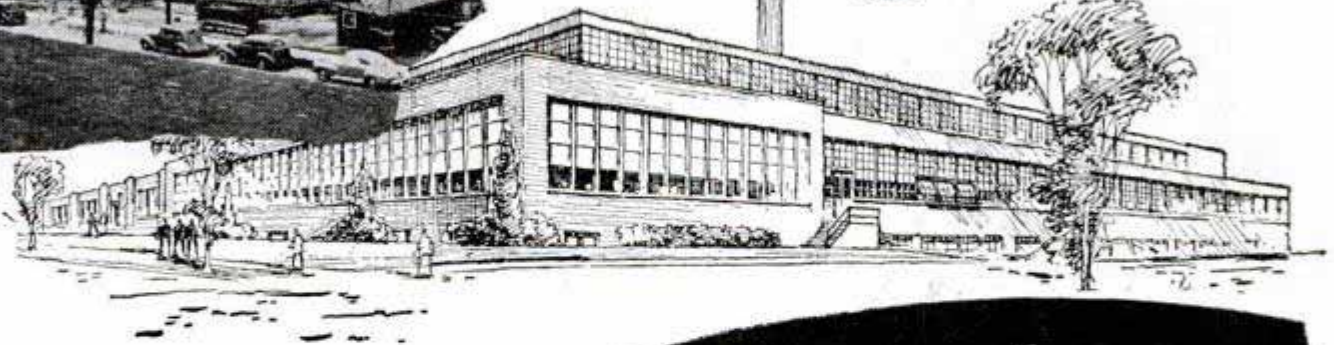
dark. The "sportsman's traveler" is four inches long and weighs six ounces.

One of the latest Nagy-Willoughby inventions is a powerful air gun made of aluminum alloy with a plastic stock and grip. The gun uses an air cylinder of new design that can be pumped up to a pressure of 8000 pounds per square inch and that holds its charge indefinitely. Interchangeable barrel liners in several diameters allow various loads, such as BB shot, steel balls up to $5/16$ -inch diameter, arrows or frog spears to be used. A frog spear is shot with accuracy up to 50-foot distances and the gun will put a heavy steel ball through a one-inch pine plank at moderate ranges. Loaded with a paper capsule that contains a small handful of birdshot, it throws a scattergun pattern comparable to that of a .410 shotgun at ranges up to 75 feet.

The fact that today's hunters and fishermen are getting the advantage of war-proved equipment means one thing: It's fine for the sportsmen but tough on their quarry.



At left is a recent photograph showing construction under way on Delta's new plant addition. The artist's sketch below shows how the completed building will look.



Building your Happiness

New plant addition now under construction speeds the day you can enjoy

DELTA HOMECRAFT* POWER TOOLS in your home shop . . .

We want you to enjoy the pleasure of using Delta Homecraft Power Tools. We want you to know the deep satisfaction that arises from working with *quality* tools like these.

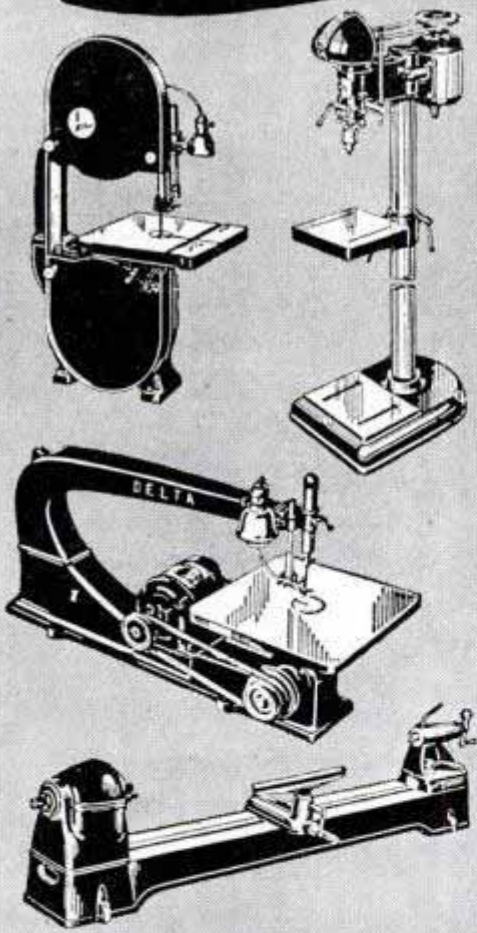
Right now, though, the widespread demand for these famous power tools far exceeds the number we can produce. But we are cutting down the time you must wait until you *can* become the proud owner of Delta Homecraft Power Tools.

Shown here is our new plant addition scheduled for completion this summer—considerably increasing our capacity for building these tools. This is one way in which we will hasten Delta tools onto the floor of your nearby store.

We sincerely appreciate your patience thus far. Thanks!

Keep in touch with the store in your neighborhood that carries Delta Homecraft Power Tools.

*Trade Mark Reg. U. S. Pat. Off. HM-37



Tear out coupon and mail today!

FREE!

"Happiness Herald" — a tabloid newspaper that gives interesting facts, in words and pictures, about the fascinating, woodworking hobby. Pictures typical shops and projects. Enjoy its inspiration and ideas. Send coupon for your free copy.

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MILWAUKEE POWER TOOLS

Subsidiary of Rockwell Manufacturing Co.

For Men who Really Know Pipes

Royalton CROWN

MOUTHPIECE TUBE
prevents backflow
of moisture

CONDENSING CHAMBER
traps and holds bitter
juices and sediment

BOWL GUARD
keeps shank
and bowl dry

REMOVABLE SECTION
eases thorough cleaning

CHAMBER GUARD
bars tobacco fragments
from bit

Patented

\$1.50

Selected
Briar



THIS REMARKABLE PIPE frees smokers from the annoyance of bitter juices and tobacco slugs. These nuisances are trapped by Royalton Crown's condensing well and other patented safeguards. For day-long, dry-cool smoking, no pipe can quite compare with a Royalton Crown.

HENRY LEONARD & THOMAS, INC. OZONE PARK 17, N. Y.

LORRAINE LIGHTER



Streamlined, smart, sure-fire. Precision-made of gleaming hi-polish dural-aluminum. Triple capacity gives three times longer use without re-filling. Lightweight: 1 1/4" x 2" x 7/16".

DISTRIBUTORS WANTED

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\$12 Doz.

Less than Gross Lots
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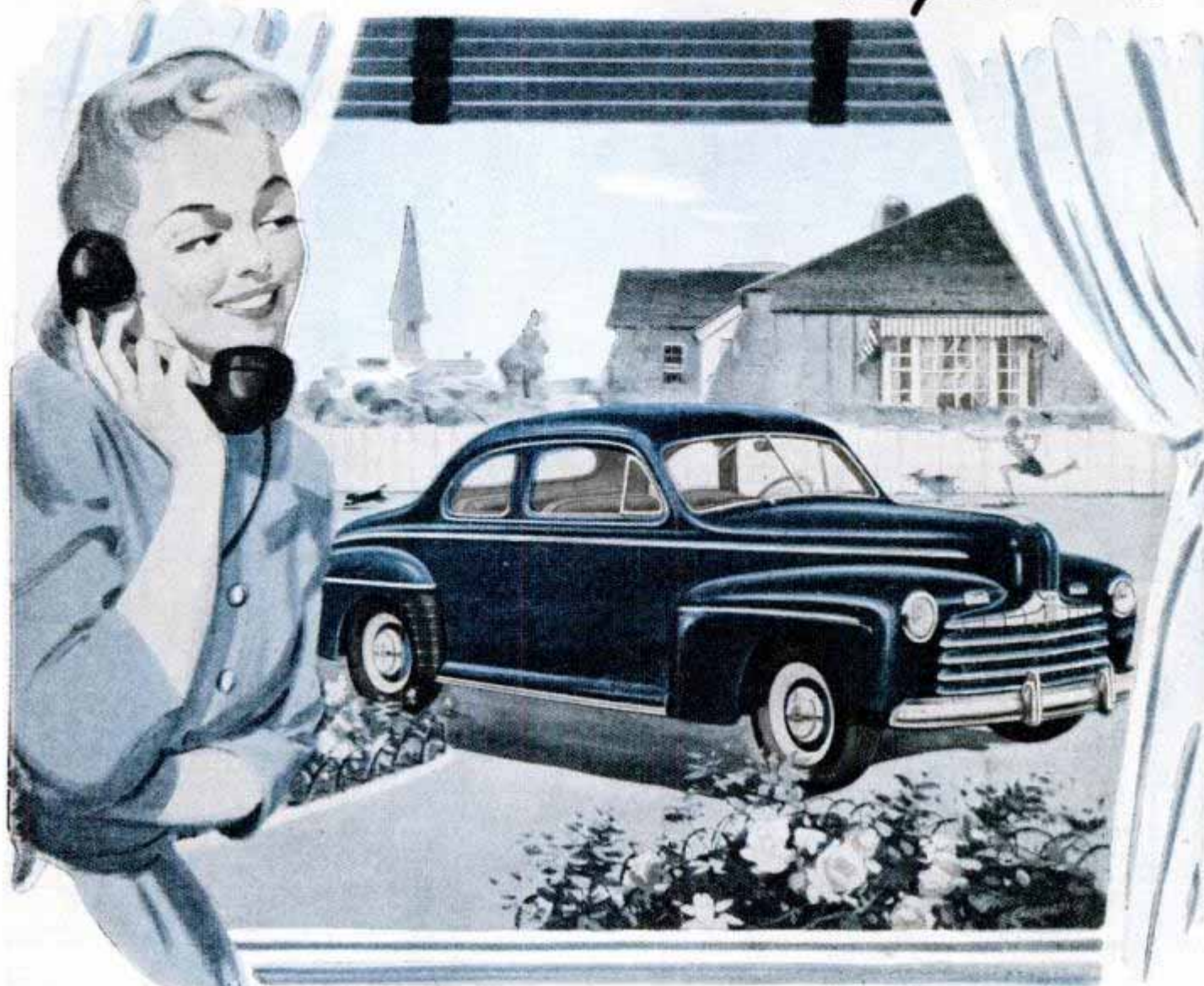
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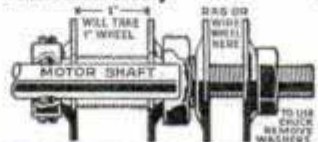
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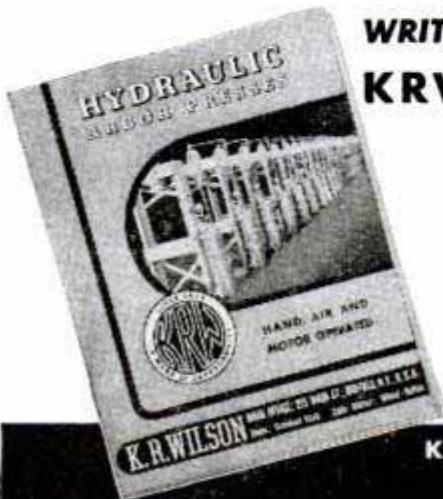
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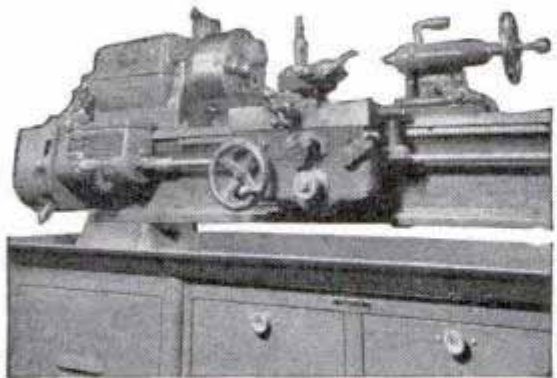
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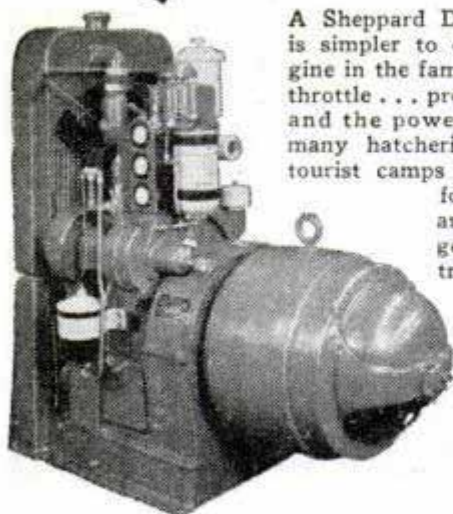
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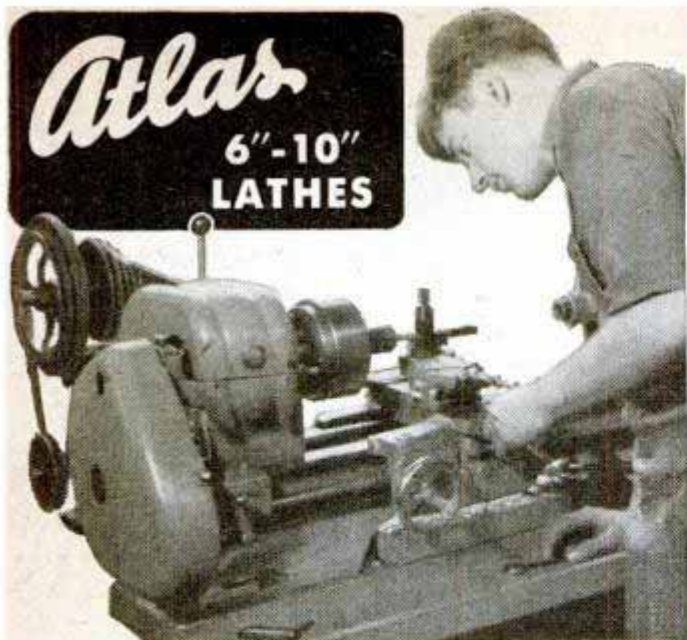


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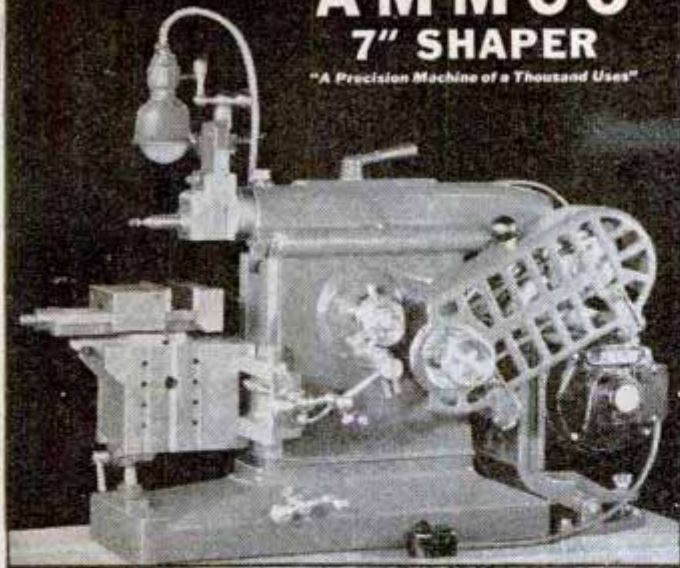
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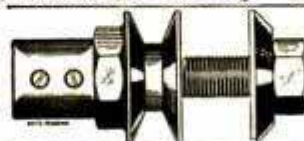
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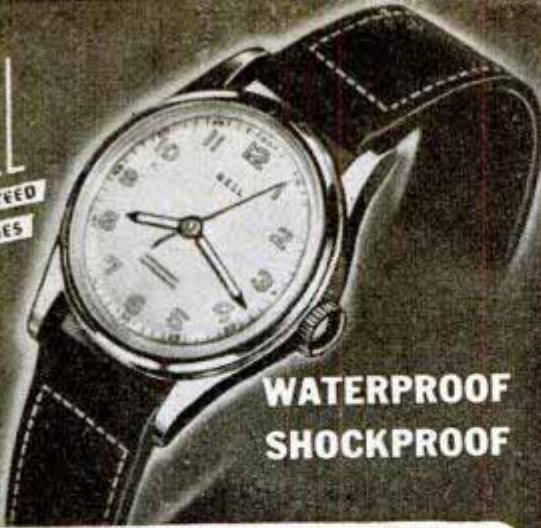


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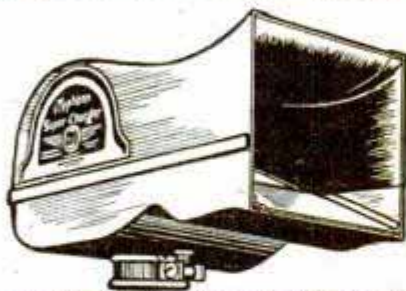
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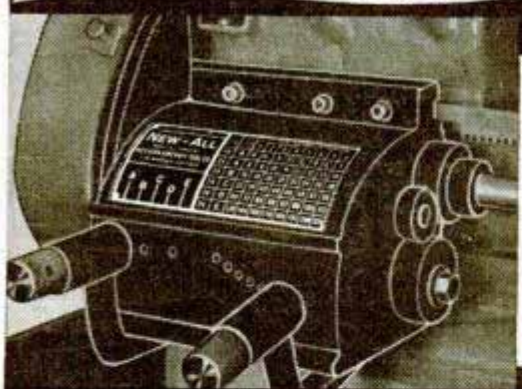
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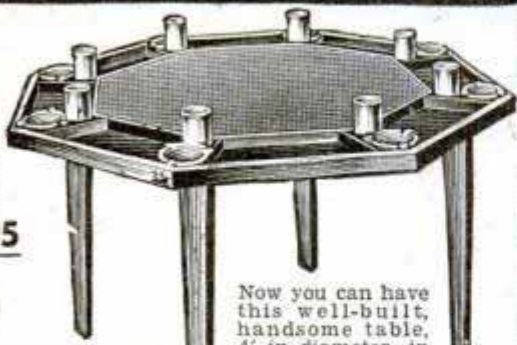
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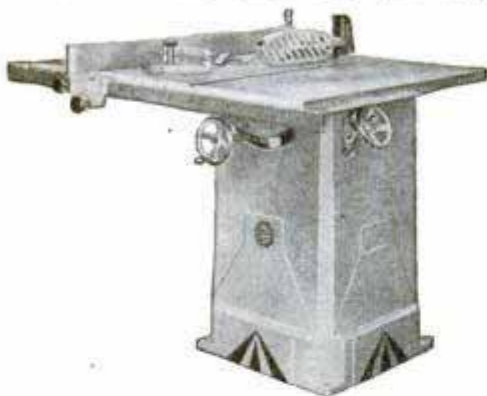
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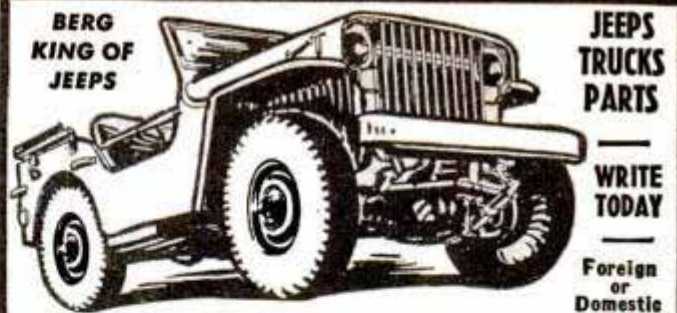
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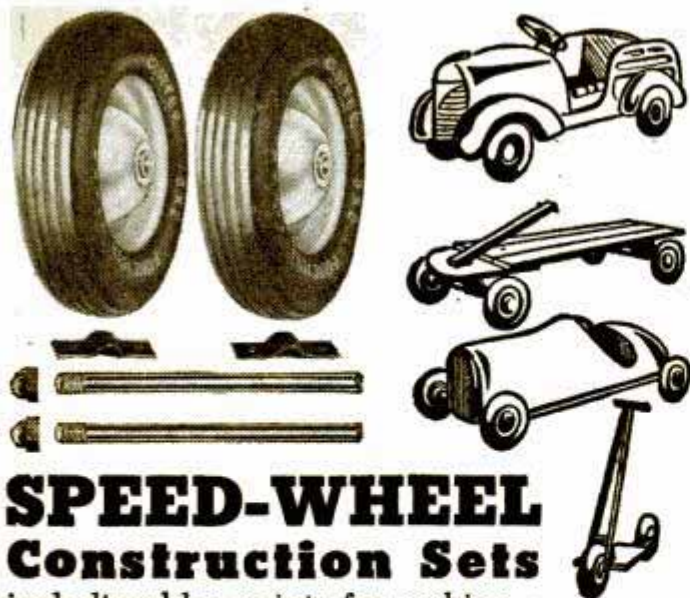
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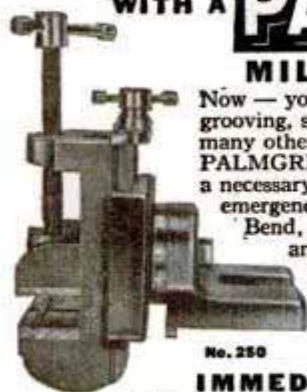
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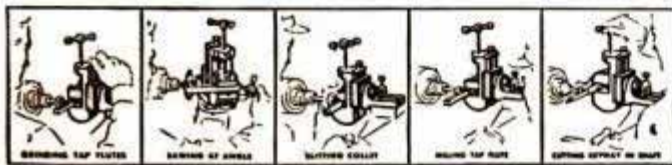
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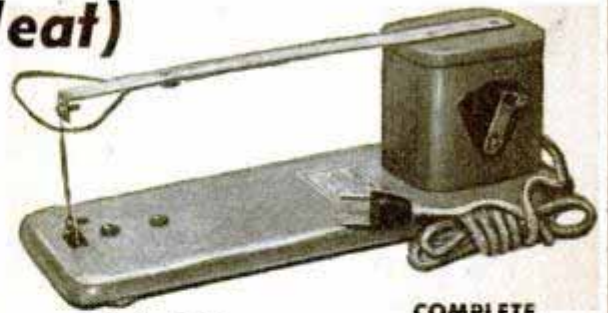
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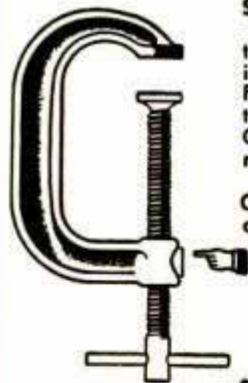
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Build your own periscope with a pair of these tank prisms—look over the heads of crowds, etc. Slightly soiled and scuffed but optically perfect. Measures 6 5/16 x 2 1/8 x 1 11/16 inches. Shipping weight 2 lbs. **98c**
R-234—Price each, . . .

CAVALRY SPURS



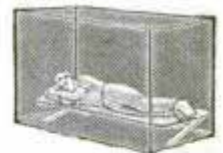
Genuine wish-bone type cavalry spurs. Nickered brass. **A102, Pair, .98c**
A103 Spur straps per set of four . . . **50c**

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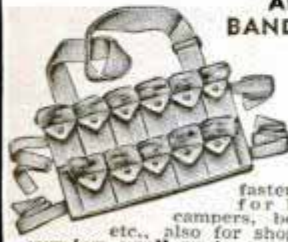


Of marquisette with taped seams. Metal rods and bars included. Covers cot or hammock. Brand new. **A104—EACH \$2.95**

U. S. ARMY COTS

Brand new Army cots. Hardwood frame with extra heavy canvas. Folds compactly—opens to 27x78 inches. Will support 1000 pounds. Fits in mosquito tent listed above. Wgt. 25 lbs. **\$5.95**
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ARMY BANDOLEERS



Of fine heavy khaki. Big roomy pockets with button fasteners. Fine for hunters, campers, boy scouts, etc., also for shop work in carrying small parts, etc. Material alone is worth this price.

11 Pocket Type No. 129 **49c** Each
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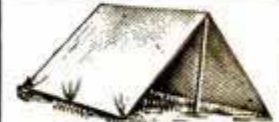
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Regular U. S. Government Issue Canteens. Plastic screw top chained to body. Slightly used.
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A118—Plastic Body 69c
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A119—Canteen Covers, Used, Ea. . . 35c
A120—Canteen Covers, Used, Each 25c



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A106—PAIR \$2.95
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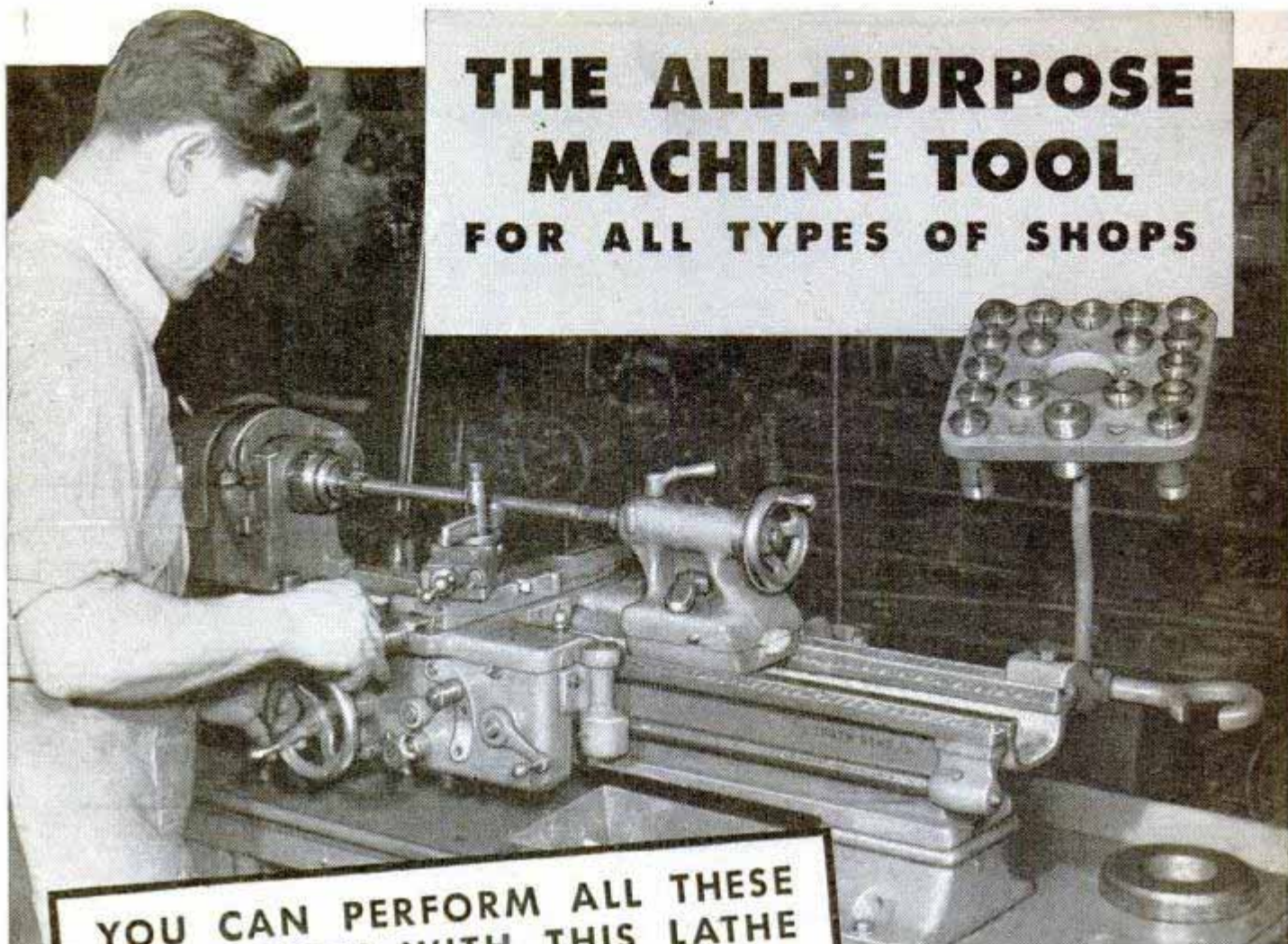
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