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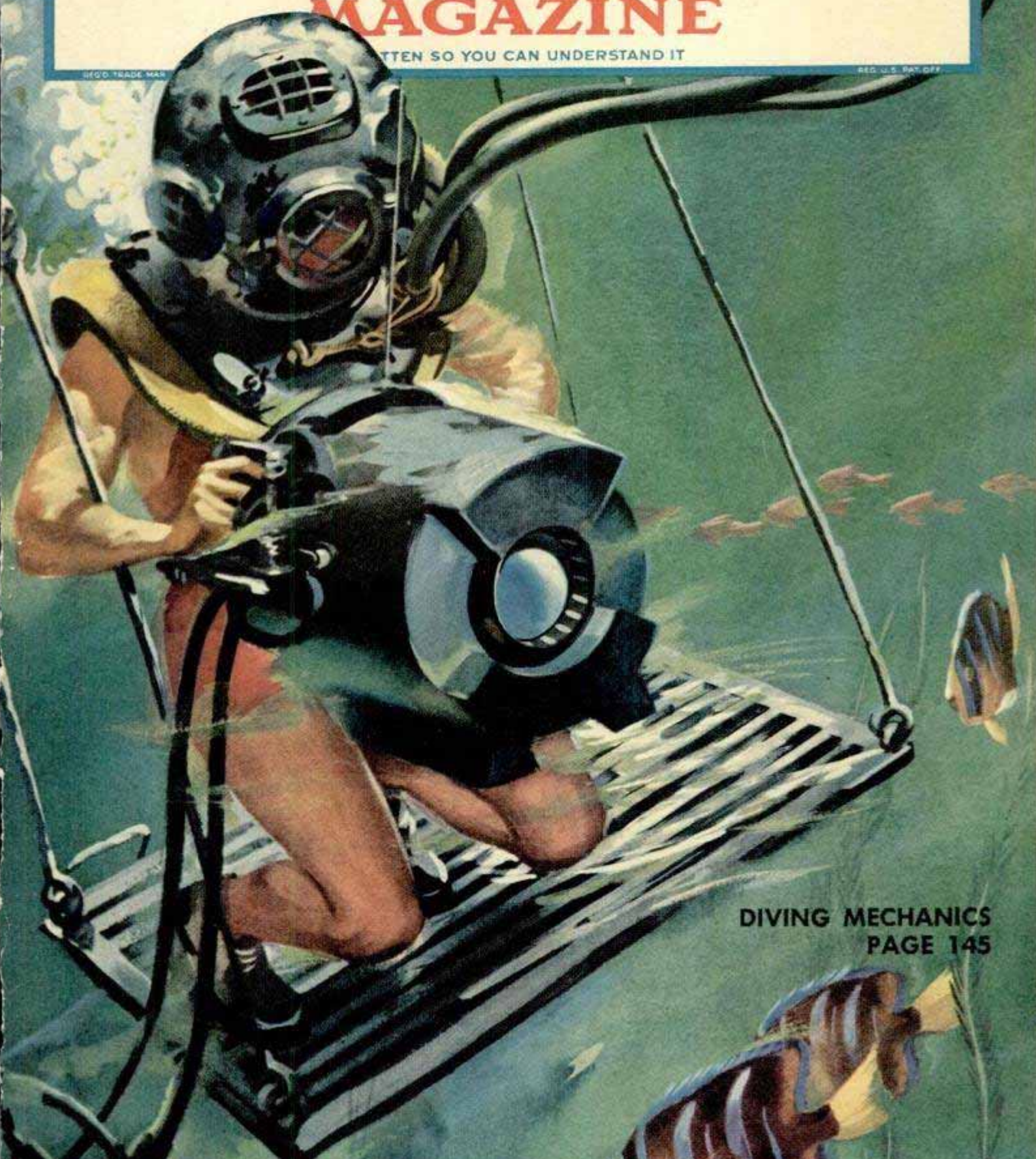
POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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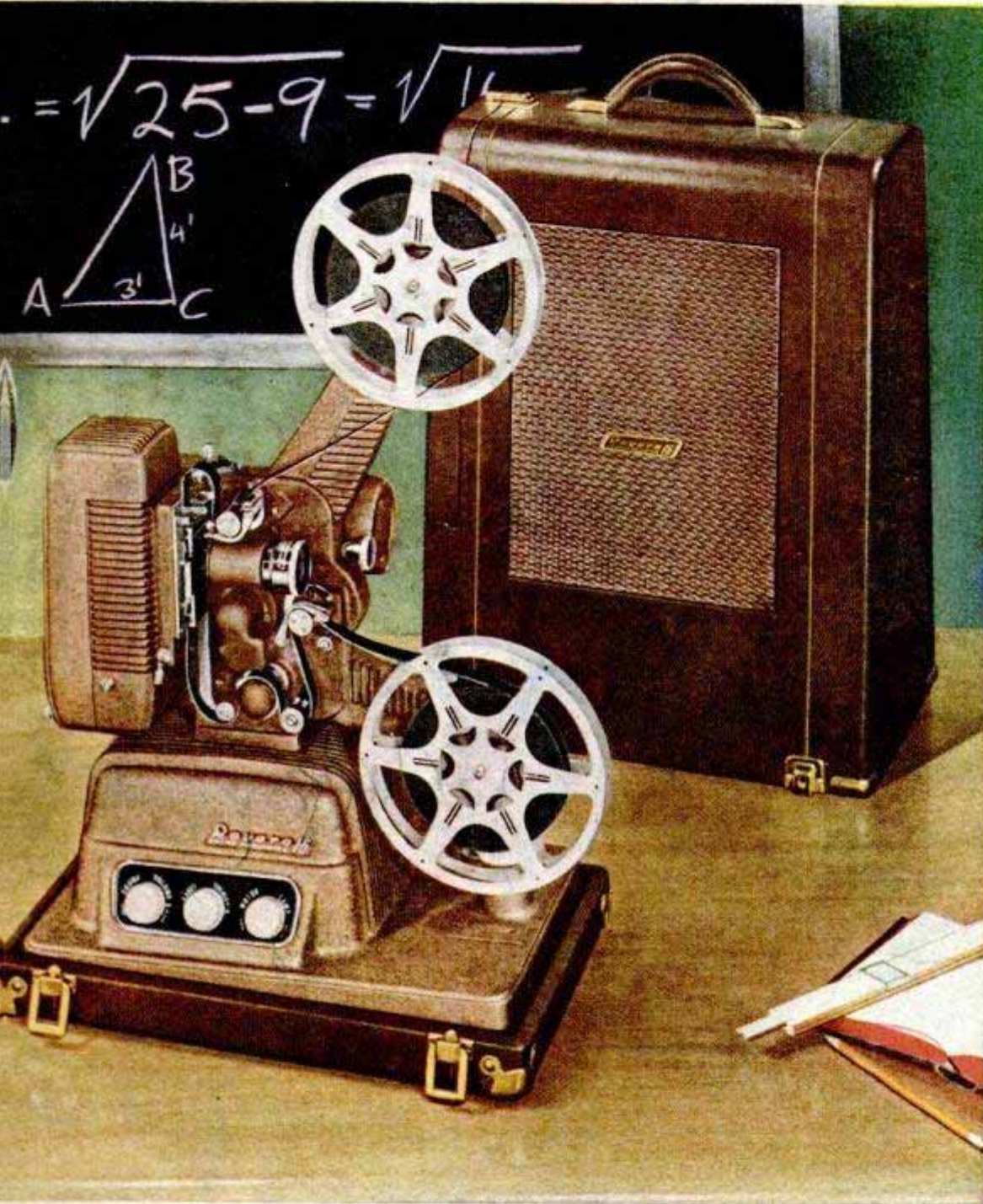
DIVING MECHANICS
PAGE 145

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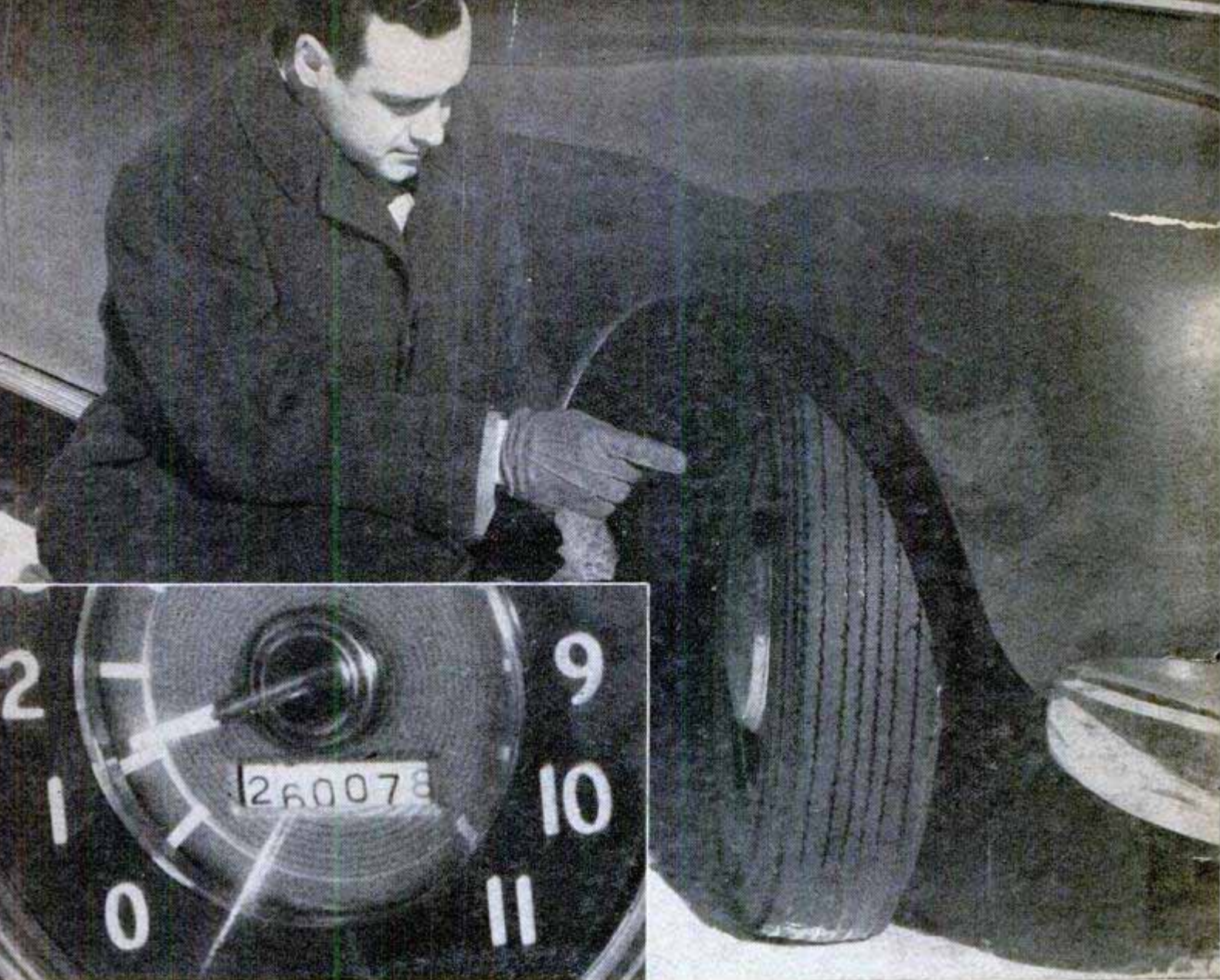
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Typical example: user's experience with B. F. Goodrich tires

DR. H. C. BAUMANN of Pottstown, Pennsylvania (above) thought we ought to know about his experience with B. F. Goodrich tires. He wrote:

"I have been noticing your advertisements . . . relative to the good use automobile owners are experiencing with your tires. I feel my tires have done as well as most in your advertisements . . . At the present time, my speedometer reads 24,380 miles, and my only care for the tires was regular pressure checks." (When this picture was taken his speedometer read 26,007.)

"The car has been used every-

day, in all kinds of weather", Dr. Baumann continued, "and a good deal of the time on highways at the faster speeds. Very much of my driving is done on rural macadam roads. The tires have not even been off the wheels! And they still have *plenty* of good tread left. In fact, my friends find it hard to believe they are the original tires."

Hundreds of enthusiastic B. F. Goodrich owners have written us, telling that their B. F. Goodrich Silvertowns outwear other tires, including prewar tires.

Because the tread is wider,

car weight is spread over more tread; wear is slower, more even. The tire body lasts longer because it has more and stronger cords to take road shocks.

If you need tires, visit your B. F. Goodrich dealer. He'll give you a good trade-in allowance on your present tires. Convenient terms can be arranged. If you don't know his address, look under *Tires* in the yellow pages of your phone book. *The B. F. Goodrich Company, Akron, Ohio.*

B.F. Goodrich
FIRST IN RUBBER

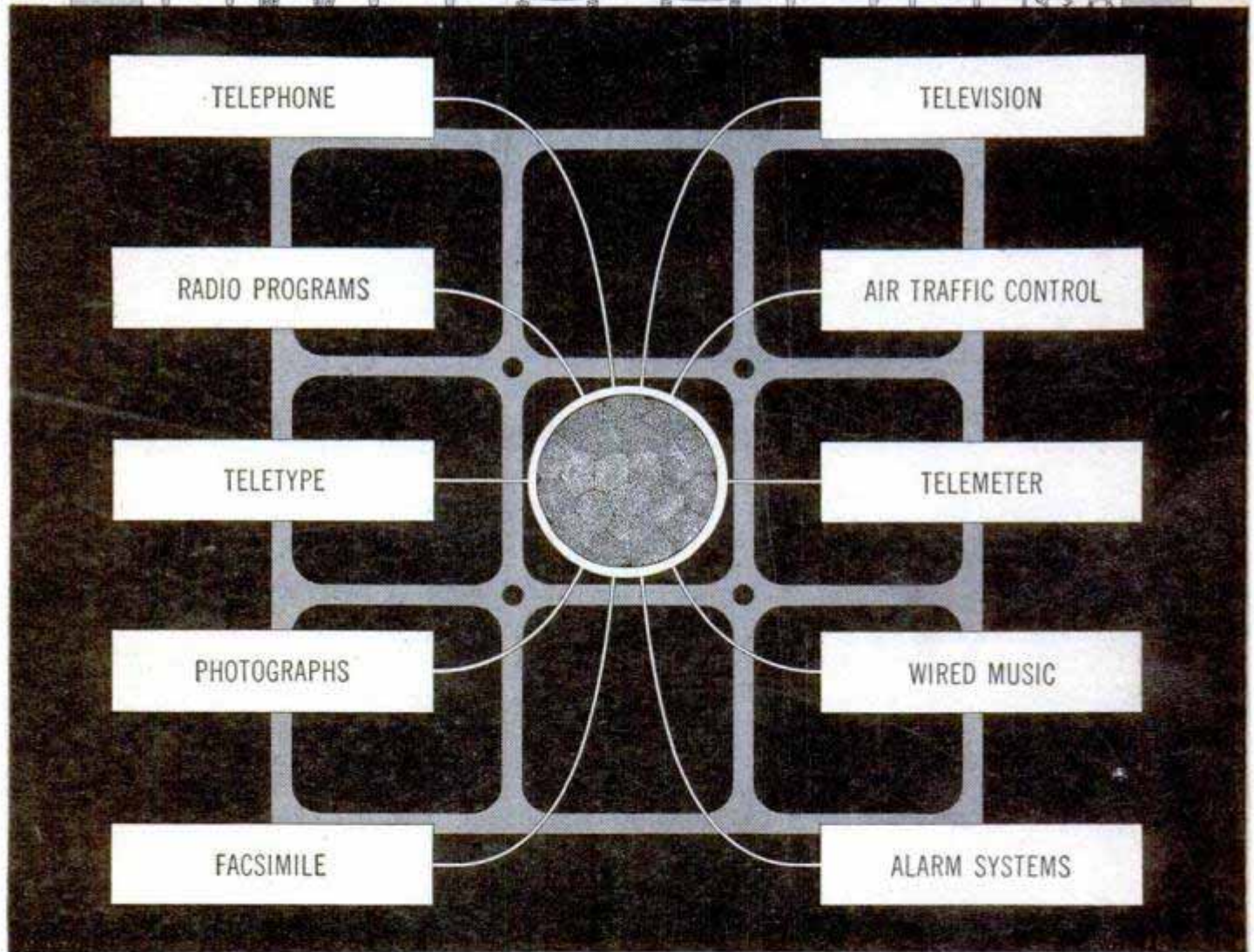
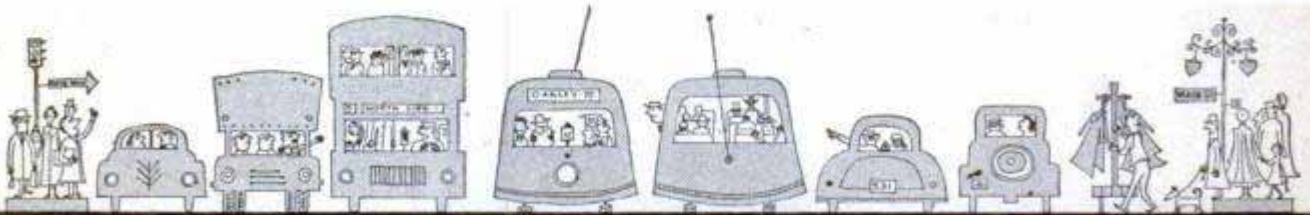
Traffic is heavy under the street, too

Surely the busiest thoroughfare in the world is a telephone cable. But it is more than "telephone"; for these thousand or more wires, carrying sound and pictures at lightning speed, are highways for many services.

Each one of these presents its own problems to Bell Laboratories scientists and engineers: for the telephone differs from television, and television differs from a radio program. And yet they have an essential unity: they involve

transmission of alternating currents, with frequencies from zero up to several million cycles. Each calls for new thinking, new ideas, new goals of accomplishment.

The diversity of the cable's many services speaks for the unity of Bell Laboratories' purpose. That is, to know the theory and practice of communication so thoroughly that any transmission of sight or sound can reach its destination clearly, quickly, economically.



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MOST talked about automotive feature today is the automatic transmission—and the least understood. For that reason we invited L. H. Nagler (above), member of the Society of Automotive Engineers and a nationally-known authority on transmissions, to explain in simple, unbiased language the various kinds of automatic transmissions now in use. This outstanding article begins on page 102.

NEXT MONTH you will be intrigued by six pages of drawings on "Judging the Olympics" by G. H. Davis, noted London artist. Also in the June issue, Tom Stimson, western editor, will take you on a mountain-lion hunt. The ingenious hunters use an electronic hearing aid to help track their prey. Another June feature—on the serious side—tells why the atom bomb was only a milestone in atomic research and how our leading scientists are "Attacking the Mysteries of the Atom."

HOME BUILDERS can construct three-dimensional models of their dream houses with realistic interior and exterior features by following a new planning system outlined in the June Craftsman section. Another timely feature tells how to build a golfer's caddy cart with racks for clubs and plenty of storage space.

RADIO experimenters will find a new compact three-way portable receiver in next month's Radio and Electronics section.

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BOMBS GO ON A BAT!



THIS big, bat-like flying wing is the YB-49. All by itself it could conduct a bombing raid undreamed of a few years ago.

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This is an all-metal hint of some of the great things coming in the future of aviation. It is a working model of the research being conducted for the U. S. Air Force for the security of the United States.

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What Strange Powers Did The Ancients Possess?

EVERY important discovery relating to mind power, sound thinking and cause and effect, as applied to self-advancement, was known centuries ago, before the masses could read and write.

Much has been written about the wise men of old. A popular fallacy has it that their secrets of personal power and successful living were lost to the world. Knowledge of nature's laws, accumulated through the ages, is never lost. At times the great truths possessed by the sages were hidden from unscrupulous men in high places, but never destroyed.

Why Were Their Secrets Closely Guarded?

Only recently, as time is measured; not more than twenty generations ago, less than 1/100th of 1% of the earth's people were thought capable of receiving basic knowledge about the laws of life, for it is an elementary truism that knowledge is power and that power cannot be entrusted to the ignorant and the unworthy. Wisdom is not readily attainable by the general public; nor recognized when right within reach. The average person absorbs a multitude of details about things, but goes through life without ever knowing where and how to acquire mastery of the fundamentals of the inner mind—that mysterious silent something which “whispers” to you from within.

Fundamental Laws of Nature

Your habits, accomplishments and weaknesses are the effects of causes. Your thoughts and actions are governed by fundamental laws. Example: The law of compensation is as funda-

mental as the laws of breathing, eating and sleeping. All fixed laws of nature are as fascinating to study as they are vital to understand for success in life.

You can learn to find and follow every basic law of life. You can begin at any time to discover a whole new world of interesting truths. You can start at once to awaken your inner powers of self-understanding and self-advancement. You can learn from one of the world's oldest institutions, first known in America in 1694. Enjoying the high regard of hundreds of leaders, thinkers and teachers, the order is known as the Rosicrucian Brotherhood. Its complete name is the “Ancient and Mystical Order Rosae Crucis,” abbreviated by the initials “AMORC.” The teachings of the Order are not sold, for it is not a commercial organization, nor is it a religious sect. It is a non-profit fraternity, a brotherhood in the true sense.

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The ROSICRUCIANS
[AMORC]

San Jose

California

**"What's he got
that I haven't got?"**

LOOK at the successful men you know. "What have they got" that you haven't?

Very little, probably. In most ways these men are no brighter or naturally more capable than average. Many of them probably have no more formal education or better natural aptitudes than you.

But that little extra they have is important. They have the special knowledge and ability for which business is glad to pay well—they know the what, why and how of business. They have also the confidence and aggressiveness which come from knowing that they know and can apply their knowledge.

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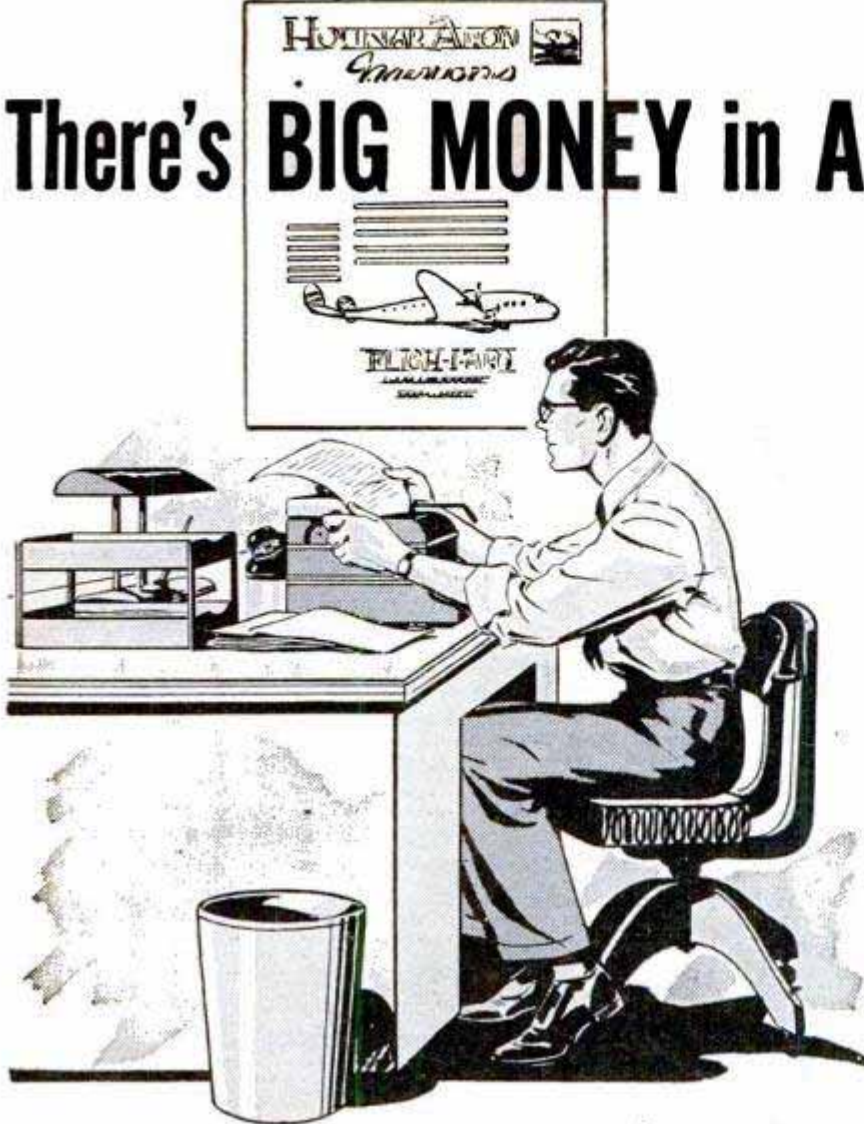
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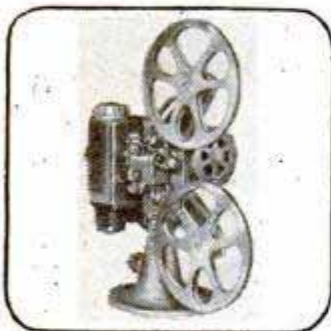
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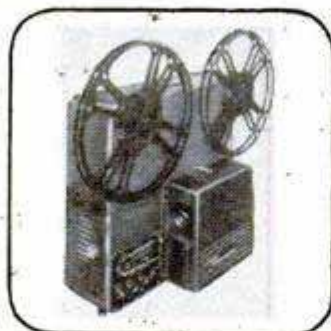
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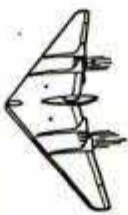


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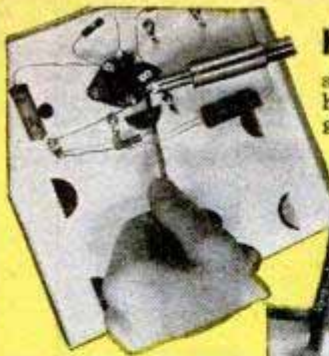
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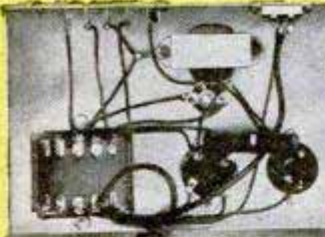
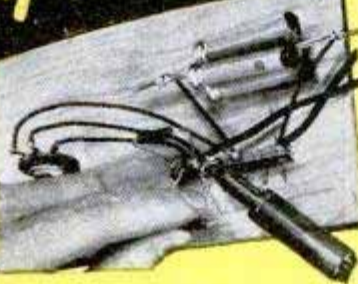
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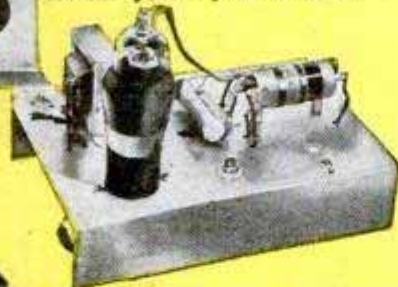
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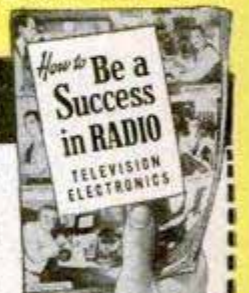
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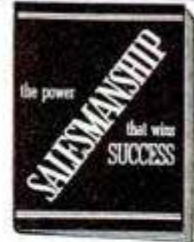
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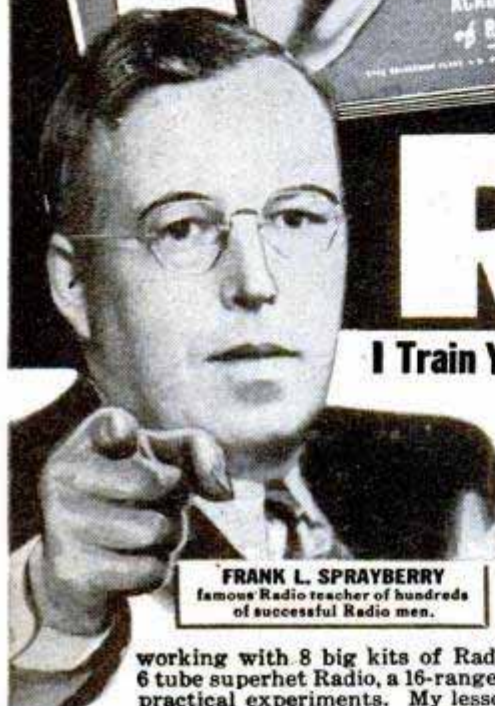
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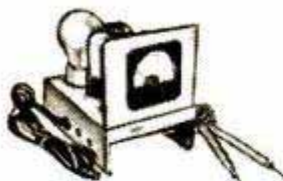
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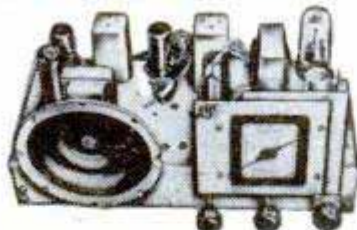


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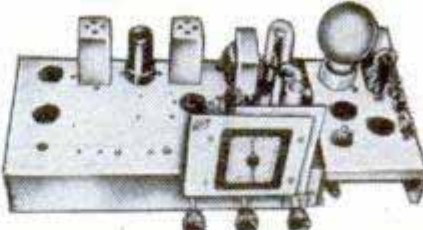
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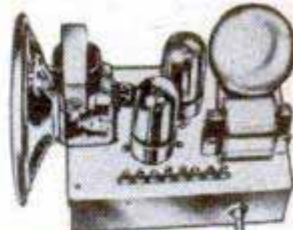
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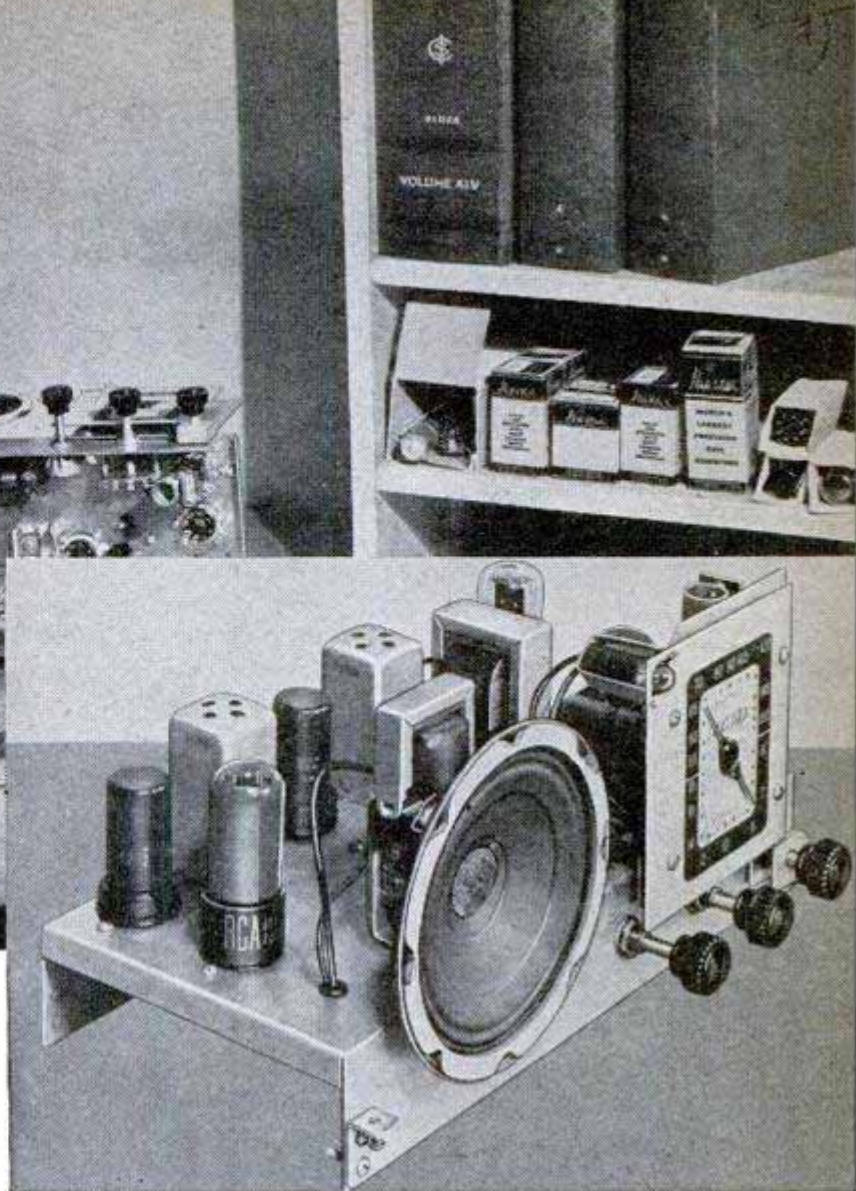
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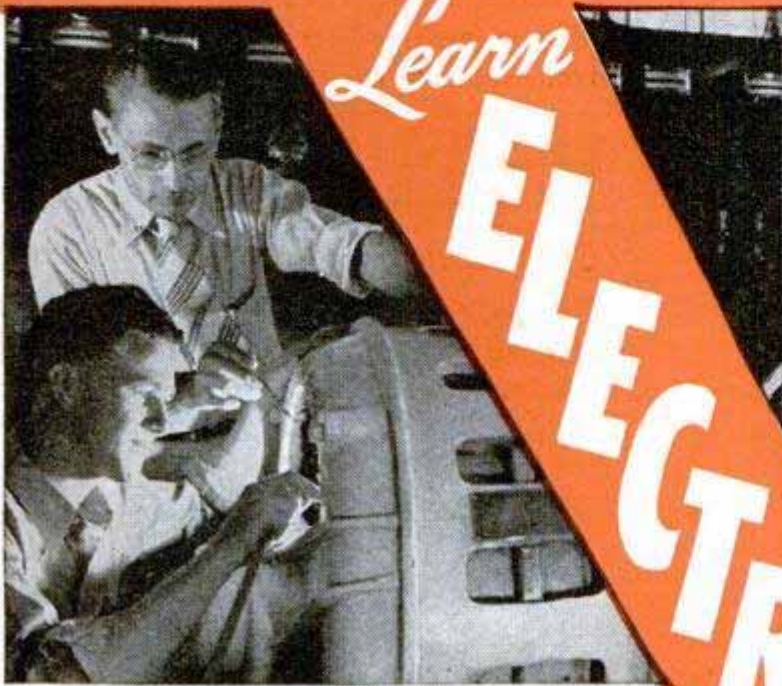
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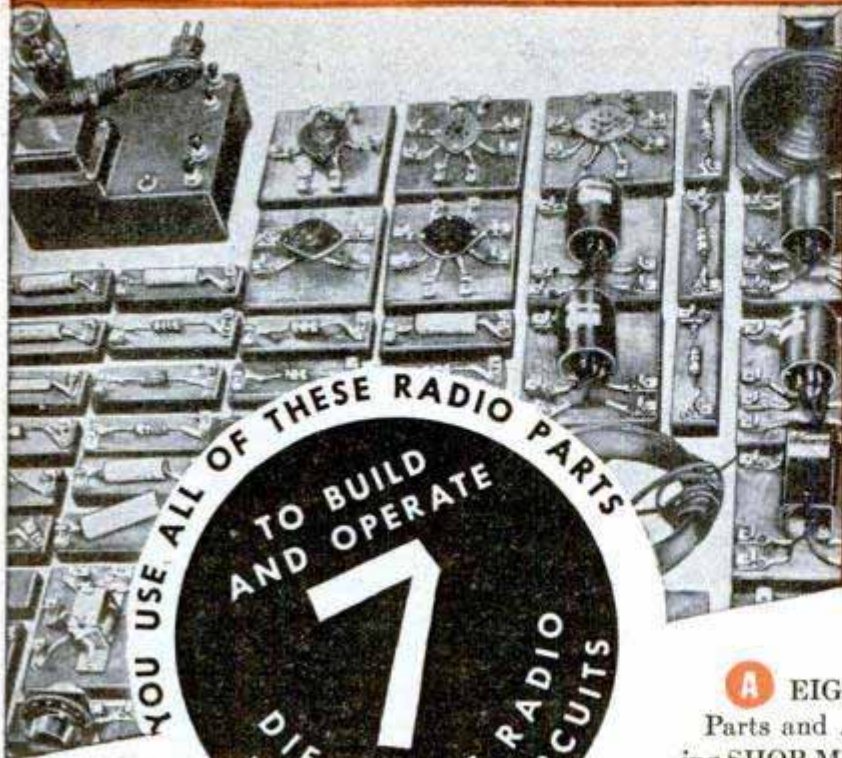
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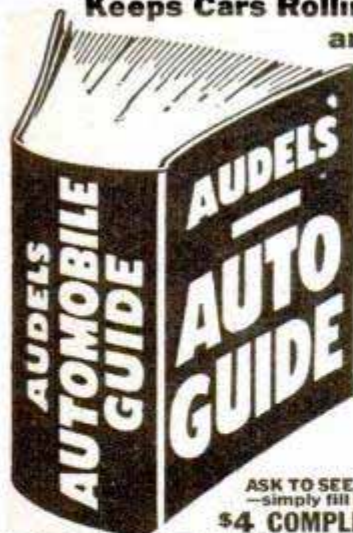
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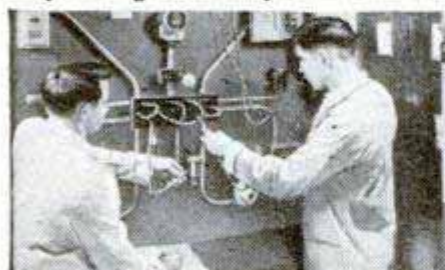
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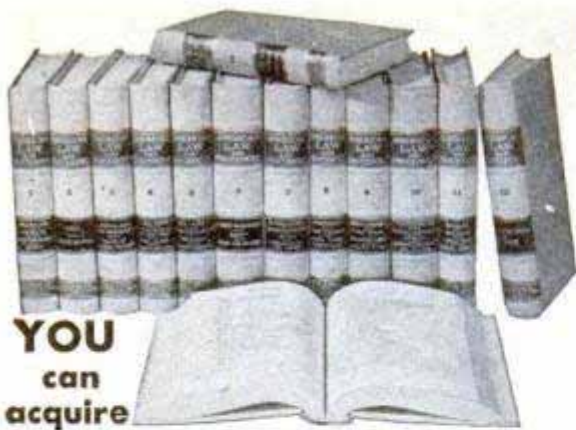
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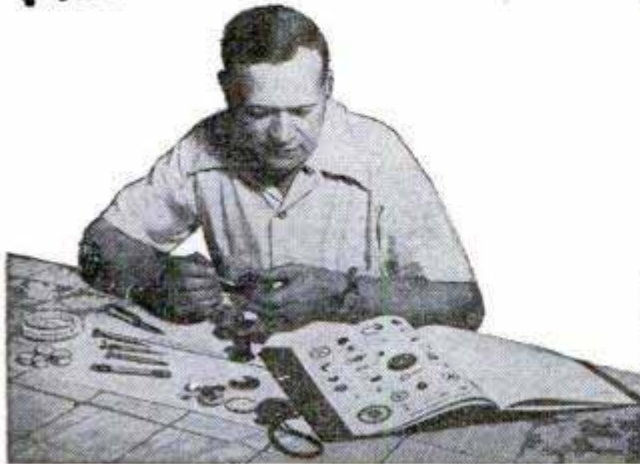
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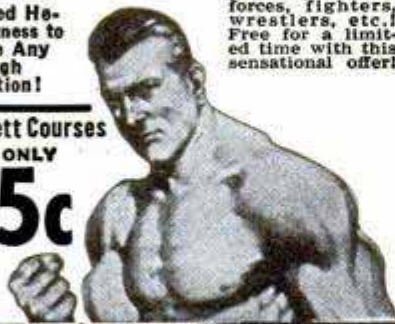
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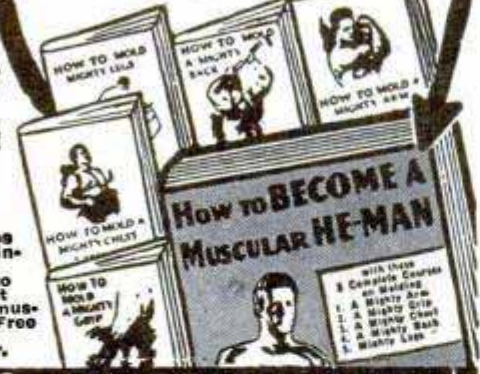
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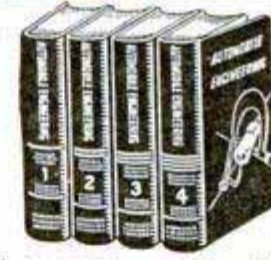
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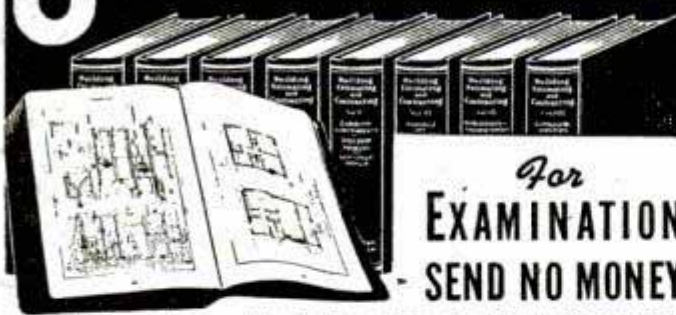
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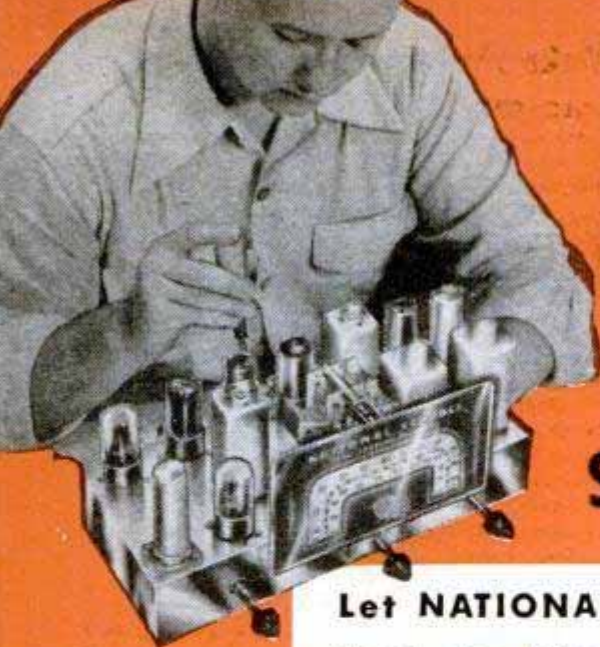
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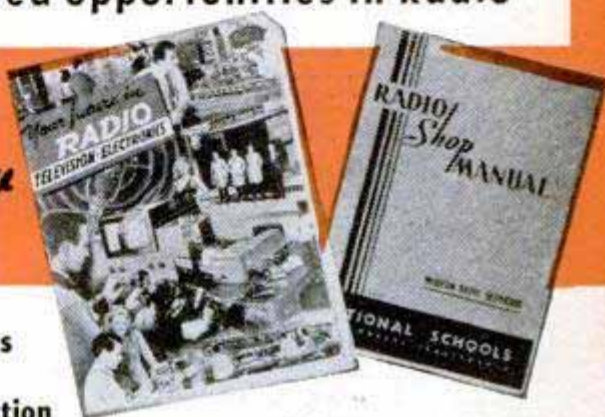
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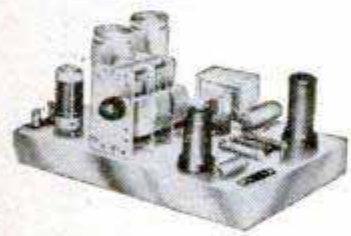


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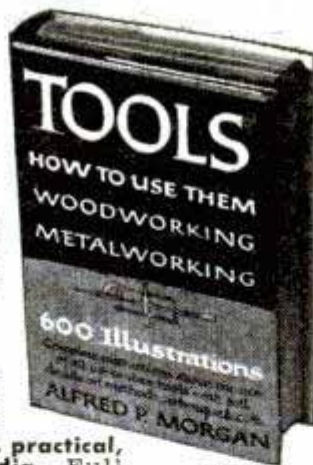
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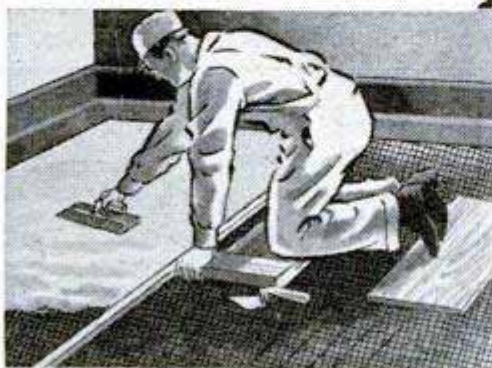
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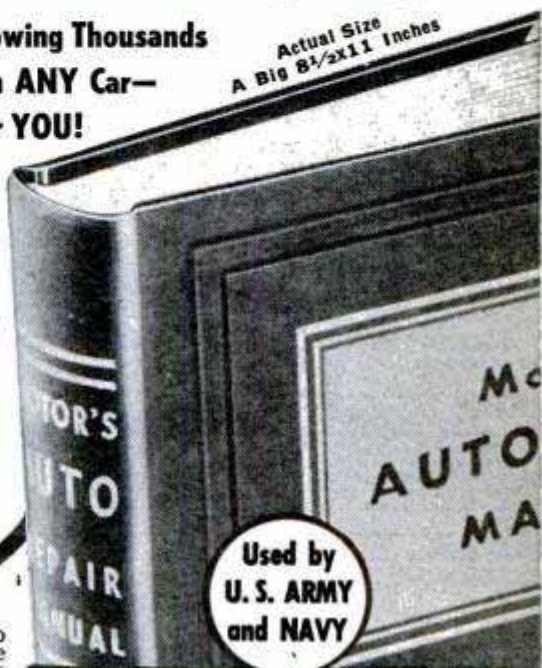
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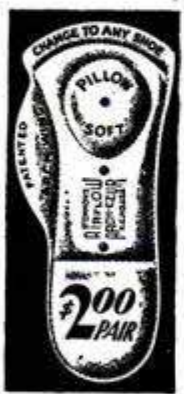
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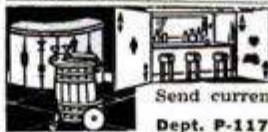
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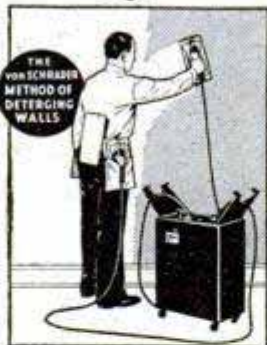
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SONGWRITERS—Protect your songs. Get the facts first. Free booklet, attractive offer. Song Service, 331-C West 46th, New York.

POEMS Wanted for musical setting. Send poems for free examination. Five Star Music Masters, 630 Beacon Bldg., Boston, Mass.

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LIQUID Rubber for making flexible molds. Cast novelties. Sample bottle 25c. Free literature. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

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TWO Amazing new typing opportunities. Earn up to several dollars hour, right at home. New, exclusive, different. Write Schroder, 221 E. Bush, Covington, Ky.

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution. 30 amp. plating rectifiers with powerstat control. \$85.00. Geared motors for agitation. \$15.00. Lead lined tanks. Write for list. Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.

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

OPERATE Profitable home business selling merchandise by mail. Fast sellers. Large profits. Powell Service, 5713 Euclid, Cleveland 3, Ohio.

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

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

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

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

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

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

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

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

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

WHITE Liquid rubber for making flexible molds! Quick drying! Safe! For home, classroom, or industry! Quart \$2.00. Gallon \$5.95. Full instructions! Beginner's booklet on molding and plaster casting 25c. Free with order! Plastercraft Supply Company, 1406 East 43rd Street, Cleveland 3, Ohio.

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

MACHINES Available for making new designs of interlocking concrete building blocks. Delaware Industries, Dept. 11, Muncie, Indiana.

LEARN Direct advertising, letter shop business. Free booklet. Armstrong, 7219 Broadway, Los Angeles 3.

MONEYMAKING OPPORTUNITIES

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

FLUORESCENT Lighting sensation. Make \$100 weekly cashing-in 16 different ways without capital. Make beautiful 20 and 40 watt lights (complete) from discarded materials. Amazing illustrations free. Willis Fluorescent, 101 York St., Brooklyn 1, N. Y., Dept. C.

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

NEW Original cooperative home manufacturing plan. Amazing details from actual manufacturers. Rolls Enterprises, 115 D West 16, New York 11, N. Y.

WIN Contest money. Send 25c complete instructions for writing winning answers. Winacontest, 22P Westlake Ave., Auburn, N. Y.

SEWING Machine repairmen make big money lifetime. Start neighborhood shop. Complete service manual, covering all makes, \$1.98 postpaid. Money back guarantee. Sewing Machine Serviceman, Hamilton 9-AA, Ohio.

WINDSHIELD Wiper rebuilding brings big profits. Free particulars. H & H Products, Box 430, East Akron 5, Ohio.

MAKE—Sell new amazing auto paint you simply wipe on. Complete formula \$1.00. Ideal Service, Park Ridge 8, Ill.

UNPAINTED Plaster ornaments: Beautiful designs, easily decorated with water colors or oil paints. Profit or hobby. Illustrated list free. Distributors of new Loxite, a Firestone product for molds. Midwest Novelty Mfgs., 108A Cedar, Anaconda, Montana.

FISHWORMS. Easy raise, sell hundreds, millions. Instructions 25c. Charles, 12-BF, Norwood, Ohio.

EARN Extra money. Publish, sell, your own self-help folios by mail. Free details. Seymour Service, 2236M So. 27th, Milwaukee 7, Wis.

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

FILLING Stations need long life "Skap" rubber toilet bowl brush. Sample 25c, refundable. Complete line available. Skasol, Webster Groves 19, Missouri.

BECOME Successful mailorder bookdealer! Particulars free. 25c brings booklet, cooperative starting setup. Graphic Publications, Box 867, Manchester, N. H.

SELL Watches and jewelry. Illustrated booklet free. The Jewelbox, 2-W Stone St., New York 4.

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

WIN Contest prizes, cash! "Here's how." Alfred Novak, 2601-M Division, Cleveland 13, Ohio.

START Your own business! Big money manufacturing novelties, plaques, statuary. Free catalog. Write Bing Products, 88-A5B Broad Street, Boston 10, Mass.

EARN Up to \$520 month part or full time keeping books for small firms. Simplified system. Write Tax-Saver System, Dept. N, Ft. Worth, Texas.

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

DOLLAR Brings pair seashell earrings and parts for three more. Beasley, 3218 Wisconsin Avenue, Washington, D.C.

MAIL Beginners! Free information guide. Leese, 4718 North Lavergne, Chicago 30.

SELLS Like mad! Show it once—smacko! It's grabbed! No sales talk. Costs \$2, Brings \$5. Just one of those inexplicable successes. Inquire Stampico, 8837 Quincy, Detroit 4, Mich.

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

INSTRUCTIONS: How to make rubber stamps, luminous paints, money from sawdust, resilver mirrors, raise earthworms. 25c each. All five \$1.00. Davies, Box 1087-PM, Kingston, Penna.

DOLLARS For spare time. Send postcard. Free details. Hasco, 119 Ravine, Matawan, New Jersey.

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

TECHNICAL Bulletin listing 24 opportunities. Free. Public Educational Service, 493 Irving, Bridgeton 2, N. J.

EXTRA Money? Free details. Trable, 1018½A Elm Street, Dallas, Texas.

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

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

WIN Contest money. General Contest Magazine gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

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

FORTIFY The future! Start own business; home, office. Booklet describing "Collection of 137 Tested Plans" free. Elite Co., 220-A Grand St., New York 13.

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

FORMULAS, PLANS, ETC.

TESTED Formulas—Genuine manufacturing processes. Literature free. Chemical Service, Edwardsville, Illinois.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

MAKE Your own cosmetics, stain remover, remedies, insecticides. Real manufacturing formulas. Tested approved. \$1.00. Afink Chemists, 4 Clark Place, New York 52, N. Y.

PAINT Baby's room, etc., without paint odor. Simple formula 50c. Veltman & Callahan, Box 906 Station A, St. Petersburg, Fla.

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

FORTUNES in formulas. Ten thousand trade secrets, recipes, processes. 900 pages. Only \$3.00 postpaid. Natco Supply, Dept. PM, 1090 West 43rd, Norfolk 8, Va.

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

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

PLASTICS

PLASTIC Materials. Cements, dyes, findings, internal carving drills. Send 10c for catalog and floral carving instructions. Locket with internally carved rose and bud 50c less findings. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

TABLE Tops, cupboards, heat resistive lifetime plastic sheet. Many colors. 15c brings you samples. Box 19, Eau Claire, Wis.

DYP-DYE Plexiglas, Lucite. Common ingredients, very inexpensive formula, instructions 25c. Hank's, D-1 Box 124, Bristol, Penna.

PLASTICS—Sheets, rods, tubing, coatings. Shells, findings, dyes, craft supplies. Lucite scrap 25c-65c pound. Illustrated fabricating manual, price list, 10c. Lucite sample, 35c. Courtesy to dealers. Gem-O-Lite, Box 686F, North Hollywood, Calif.

LUCITE, Plexiglas masked sheets. All sizes. Cost square foot (12"x12") 1/16" 90c; 1/8" \$1.16; 3/16" \$1.43; 1/4" \$1.68; 5/16" \$2.09. Include 10% postage. Almac Plastics Inc., 230 Fifth Ave., New York 1, N. Y.

PLASTICS—Eight colors. Stamp brings price list. Hanson Plastics, 7625 South Parkway, Dept. X, Chicago 19.

MOLDS, Highest quality, lowest prices. Plastic-Plaster. Large selection best sellers mailed monthly, 75c 1 year. Plastic supplies, coating resins. Literature 25c. Apex Art Plastics, 2126 Marconi, St. Louis, Missouri.

LUCITE And Plexiglas remnants, masked. Generous assortment \$1.00 postpaid. Industrial Engineering, Box 5989, Metropolitan Station, Los Angeles 55, Calif.

EMBED Keepsakes, charms, flowers, biological specimens. Amazing liquid plastic (clear, colors) produces beautiful castings within half hour. Complete kit \$2.90 (U.S.A.). D. B. Munson, Dept. A-5, Box 401, Evanston, Ill.

INTERNAL Carved swans, bluebirds, goldfish, butterflies, etc., pins, \$1.50. Rose or daisy costume jewelry sets, \$1.50 less findings. Also gifts and novelties. Crystal Floral Novelty Co., Somerville, New Jersey.

PLASTIC Injection machine, Plexiglas, jewelry findings, self designing paints, chrome initials, internal carving drills, kits. Catalog, G. Baker Company, River Edge, New Jersey.

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

PLASTICS Trade secrets. Write for free information. Enclose 25c if you would like plastics samples. Plastics Research, Box 346, Alhambra, Calif.

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

PLEXIGLAS—Masked sheets, 12"x12". 1/16"—\$1.00, 1/8"—\$1.25, 3/16"—\$1.55, 1/4"—\$1.85, include 10% postage. Internal carvings, Drills, dyes, Luminous powders, rods, tubes, cements, jewelry findings. Free catalogue. Craft Plastics, Somerville, N. J.

PLASTIC—Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

CHEMISTRY

LEARN Chemistry at home, from the house of Winn. Home of supplies for student chemists. New idea chemical and apparatus outfits for home experimenting. Photographic scales, semi-professional microscopes and accessories. Send 10c for retail catalogue. Established 1931. John H. Winn, 124A West 23 Street, New York 11, N. Y.

LABORATORY Supplies: Chemicals, glassware, etc. low prices. Large catalog 15c. Microscopic stain catalogue 20c. Both for 25c. National Scientific Company, Established 1908, 2204 W. North Ave., Chicago 47, Ill.

CHEMICALS And apparatus for industrial, analytical and private laboratories. Complete supply service for correspondence school students. Send 10c for catalog. Dept. M-43, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

FREE Catalog: Chemistry, mineralogy, physics, biology. Tracey Laboratories, Evanston, Illinois.

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

APPARATUS, Chemicals, ounce quantities, catalog 10c. Fleischer's Laboratories, Everett 49, Mass.

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

HELP WANTED

INSTALLATION And service men wanted now by authorized Iron Fireman dealers. Stokers, oil and gas burners, automatic coal, oil, gas furnaces, boilers, electric controls. Steady work. Good wages. Advancement opportunities. Write, stating experience and locality preferred. Address Engineering Service Department, Iron Fireman Mfg. Co., 3186 West 106 St., Cleveland, Ohio.

RELIABLE Man with car wanted to call on farmers. Wonderful opportunity now. \$15-\$20 in a day. No experience or capital required. Permanent. Write today. McNess Co., Dept. 78, Freeport, Ill.

BOYS Wanted. Over \$50 week! Sell name plates for front doors. Write National, 214-U Summer, Boston, Mass.

AGENTS WANTED

WHERE To buy 800,000 articles (household appliances, clothing, etc.) wholesale! Write for your free club membership. Glass Pub. Co., Dept. 102, Ellwood City, Penna.

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

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

AGENTS, 400% Profit on every sale. Latex products. 24 samples and wholesale list sent for \$3. Sample gross \$6. Vassarco, Box 1734, Cleveland 5, Ohio.

MEN'S Shirts, ladies' nylon slips, pinafores. Earn liberal commission. Free selling outfit. Jarod Manufacturing Corporation, Rockville Centre 8, N. Y.

AMAZING Discovery. Miracle glaze permanent brilliant glass-like surface for cars. Free sample; information; big profits. Miracle Glaze Company, 9714 S. Austin Ave., Oaklawn, Illinois.

DENTAL-STERO—The new toothbrush holder and sterilizer for money-making salesmen. Used in every home! Big profits. Write Dental-Stero Company, 3906 Secor Road, Toledo 6, Ohio.

EARN \$25 A day and more selling nationally advertised aluminumware, silverware, pressure cookers and jewelry. It is simple, let us show you how to make big profits with no investment. Write Continental Products, Dept. B5, 30 Ormsbee Avenue, Providence, R. I.

GET In the magazine subscription-renewal business. Pays liberal commissions. No capital needed. Helps furnished. Repeat sales come automatically. Wholesale catalog free. Write McGregor Magazine Agency, Dept. 12, Mount Morris, Illinois.

SELL Ultra blue stock signs to stores, 1000 slogans, comedy, general, religious, 7x11, cost 6c, sells 35c. Make money. Sample free. Lowy, 8 West Broadway, Dept. 379, New York City 7.

SENSATIONAL Household item sells on sight under \$1.00. Palmer Co., 2305 Monroe, Detroit, Mich.

SILVERWARE Cleaning, plating, polishing, liquid (NuSilver). Apply with cloth. Contains genuine silver. Renews silverplated ware, articles, pieces. Silver-plates brass, copper, bronze. Part. full-time agents wanted. NuProcess Products, Aurora, Illinois.

SELL Gold embossed monogram stationery. Sample free. Dunbars, Sanford, Florida.

\$1 STARTS You in business. Sell deluxe ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two deluxe ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-23, New York 10.

SELL Alarm to freezer owners. Details. Box 577, Freeport, Illinois.

EARN Big money year 'round. Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, Household linens, etc. For information, Corporate Merchandisers, Dept. PM 3, 110 West 34 Street, New York City 1.

DOUBLE Duty shopping bag. Zips open. Instantly changes from small to large size. Lightning seller. Samples sent on trial. Kristee, 122, Akron, Ohio.

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

A Dress yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. M-9128, Cincinnati, Ohio.

POWER Lawn mowers, electric refrigerators, deep freeze, washers, oil furnaces. O. C. Harris, Summitville, Ind.

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

AMAZING Daily profits, big repeat business selling top-quality, lowest priced men's guaranteed hosiery: full, part-time. Experience, investment unnecessary. Free selling outfit. Coltsos, 242-J5 Purchase, Boston 10, Mass.

EARN \$5.00 With every ten \$1.00 boxes of everyday cards you sell. Also personalized stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-6, Pitman, N. J.

\$25 PROFIT On 50 \$1 boxes. Show beautiful greeting cards, stationery, gift wrappings, to friends, neighbors, coworkers. Free literature shows easy way making money. Approval samples. Torres Company, 8B St. Francis Place, Brooklyn 16, N. Y.

COSMETICS. Your label. Eight cents jar, up. Thompson, 1566 East 18th St., Cleveland 14, Ohio.

AMAZING New scientific invention uses powerful infra-red heat plus massage to bring quick relief from aches and pains. Excellent for facial massage, too. Big profits. Details free. Neubauer Company, 4815 "A," Philadelphia 20, Penna.

FAST Selling new idea! Women rave about glamorous scent given lingerie, accessories by new method. Liquid sachet, 50c. Gorgeous sample card of twelve bottles, \$3.00. Moneyback guarantee. Low wholesale. Parfums Varre, Inc., 381 Fourth Avenue, New York 16, N. Y.

PERTO-POTS: DDT; 2.4-D; BHC; Antu; Rotenone. Write, Allen Co., Pitts-town, N. J.

NEW Items, novelties, salesboards, coin machines, opportunities featured big spring special magazine. Four big issues only \$1. Billboard, 4161 Patterson, Cincinnati 21, Ohio.

MPGR'S. Agents wanted for new type automotive and industrial lighting units. Write for details. Pho-Tel Products, 621 So. Lebanon St., Los Angeles 14, Calif.

BIG Profits fast! Sell beautiful plastic table covers, curtain drapes, garment bags. Twenty other terrific sellers. Free swatches. Star, 261 Fifth Avenue, New York, Dept. M.

\$1 STARTS You in business. Sell rings, earrings, chains, pearls. Costs you only \$7 per dozen, you make \$12 dozen. Send \$1 for special introductory offer two items. Silver Screen Fashions, 833 Columbus Ave., New York City.

DIRECT From factory. Start in business. Swiss watches; samples supplied. No money required. Big profits for ambitious salesmen; territories open. Ergim Swiss Watch Co., 833 Columbus Ave., New York City.

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

MAKE Money at home like I do! Write immediately. Duffy, Covington, Ky.

AMAZING Invention needed by thousands. 500% profit; send quarter for samples. Full details. Refundable. Krueger, Box 812P, Oakland 4, Calif.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with a written guarantee that amazes everybody. Mere words could not possibly express the almost unbelievable opportunity you now have to make money. Fantastic and "impossible" earnings now become a reality. Can you imagine a guarantee that replaces hosiery regardless if damage is due to use or abuse and regardless whether it is the fault of the hose or the wearer? Here is sales dynamite that will blast your earnings to the sky! Even if you never sold a thing in your life, three magic words: "guaranteed against everything" will open doors for you—will make women listen and will pour money in your pocket. Kendex stockings are not sold in stores, so you have no competition. Complete line includes beautiful sheer nylons; long wearing, durable service nylons; three different lengths; genuine outsize nylons; latest shades; choice of full fashioned with seams or seamless; lowest priced rays. Also separate complete line of men's hosiery including nylon, lisle, rayon, cotton, mixtures etc.; plain and fancy; long and short. Thousands of pairs shipped daily. No money or experience needed. Nothing to invest or risk. No samples to buy. Nothing to pay, now or later! Simply write orders. We deliver and collect. Liberal advance cash plus huge cash bonus. Write orders spare or full time; exclusively or as a side line. Become a manager and appoint others to sell for you with steady income on their sales! Complete money-making outfit, including salesbooks in color, samples cut from actual hose, instructions, order blanks etc. furnished free and prepaid. Rush name and address on postcard and start making money next week. Kendex Co., Babylon 137, New York.

90c PROFIT Each \$1 sale! Sell real mothproofing solution. Employ agents. Experience unnecessary; we tell you how. Kinford, Wayne 3, Penna.

SELLS At sight. Stainless steel carving sets \$21 doz. Samples available. 125 other fast sellers. Manufacturers, 264-5th Ave., New York.

WHOLESALE! Balloons, novelties, watches, jewelry, premium goods. Collins Co., Forsyth, Georgia.

POCKET Pal: Replaces pocket knives. New, safe, beautiful. Always razor sharp. 50c seller. 231% profit. \$15.00 or more daily. Agents, salesmen, distributors. Sample 10c. Nelson Mfg. Co., 222 W. Kellogg, St. Paul 2, Minn.

PROFITS To 100% selling everyday greeting card box assortments. Birthday, convalescent, wrappings, stationery, etc. Details and assortment on approval. Glorian, Dept. 22, 515 East 45th Street, Brooklyn 3, N. Y.

BIG Profits selling beautiful imprinted stationery, greeting cards, etc. Free samples. The Ed-Brite Co., 435 North Terrace Ave., Mount Vernon, New York, Dept. 15.

AGENTS Make big profits selling sensational new diapers which require no folding. Every new mother a prospect. Rush name for free sample. Fred Dexter and Staff, 234 West 17th, Houston 8, Texas.

UP To 122% profit! "Mad-Nets," \$1.00 novelty magnets. Free bulletin. Frederick, 4 South, Stamford, Conn.

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

BIG Money selling tooth powder. Write today. James Walker, 633 Plymouth Ct., Chicago, Ill., Dept. 1.

FREE Sample! Big profit opportunity with amazing glow-in-the-dark house numbers, switch plates, pictures, decals, religious articles. Represent large manufacturer. Madison Mills, 303 Fourth Avenue, New York, N. Y.

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

INFORMATION — Wholesale supply sources. Moneymaking plans. Increase your income! Write Reynard Service, Smithfield 3, Ohio.

100% PROFIT With new electric gas lighter, eliminates matches, pilot. Write Optical Research Products, Fairview, N. J.

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

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

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

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

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

BIG Profits. Sell photo enlargements. Richphoto, 215 W. 98th, New York City.

HIGH-GRADE SALESMEN

UNBELIEVABLE Earnings, salesmen, crew managers, taking orders for bronzing baby shoes. Every mother definite prospect. \$1.00 deposit (refundable) brings complete selling outfit, including sample "Metalsealed" baby shoe. Photograph shows how men make \$50.00 a day. Metalsealed, Box 2095, Wichita, Kansas.

SELL Nationally known brands furniture and appliances for large retail store. Box 21, Fairfield, Penna.

YOU Can earn 49%! Salesman wanted to sell nationally advertised desk model portable adding machine. Priced \$12.95, fully guaranteed. Not a toy. Easy to operate and in demand everywhere. You can make 49%! For complete details and full size color illustration, write today to: Lightning Adding Machine Co., Inc., Dept. ZD1, 543 So. Spring Street, Los Angeles 13, Calif.

START Your own business on our capital. Always your own boss. Hundreds average \$5,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. E-U1-PPM, Freeport, Ill.

SELL To stores—Stationery, advertising tape, restaurant items, tags, labels, and hundreds of other fast-selling business necessities. Big cash profits. Free sales outfit. Willens & Co., 2130-AK Gladys Ave., Chicago 12, Ill.

BIG Money quickly and easily taking orders for complete line personalized initialed buckles, belts, cap badges, 2,000 emblems. Fast repeats. Write today. Hook-Fast Company, Box 480-PM, Roanoke, Virginia.

SALESMEN: Big money showing building owners sensational product; cuts essential repair cost up to 75%. Six average orders weekly pay you over \$190.00. Age: 30 or over. Get money-making facts. Write, Zone Co., Dept. E-6, Box 789, Ft. Worth 1, Texas.

ADVERTISING Book matches—Cash in on political campaigns; sell union label matches. Cuts for all businesses, political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M58, 7530 Greenwood, Chicago.

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

AMAZING Daily profits, steady repeat business selling famous Colt shoes direct. Exclusive features make selling easy. Experience unnecessary. Patented Footograph assures accurate fitting. Free selling outfit. Colt Shoes, 601-J5 Atlantic, Boston 10, Mass.

MAKE \$500.00 A week! Be first with "Neo-Fluorescent." Revolutionary invention! New type fluorescent sign replacing neon. Fantastic virgin market with dealers. Mfgs. distrib. nets fabulous profits. Free sample offer. H. Rose Co., 539-B So. Franklin, Chicago.

POWER Mower (Maytag)—\$99.50. Sensation. Display kit, free. Rotacut, M-2005, Excelsior Springs, Mo.

SALESMEN: Excellent openings now with authorized Iron Fireman dealers. Attractive salary and commission. Make good money selling top quality, nationally advertised Iron Fireman coal stokers, oil and gas burners, automatic coal, oil, gas boilers and furnaces. Excellent individual sales training course and selling equipment. Write for information, stating locality preferred. Iron Fireman Mfg. Co., 3188 West 106 St., Cleveland 11, Ohio.

SALESMEN—Distributors. Sensational new fluorescent changeable letter sign. Change message in a minute. Priced very low. 40% comm.; easily earn \$200 per week. Territory going fast. Write or wire Signcraft Co., P.O. Box 8341, Los Angeles 21, Calif.

FANS—Fans. Salesmen making \$50 to \$100 per day selling our electric fans, sump pumps, and portable water softeners. Have also, all kinds of fan parts; build your own. Write Universal Fan Co., Peru, Ind.

\$240.49 IN One week—Unusual? Not at all! Just look at one week's earnings of these representatives. WWS \$290.99, JMH \$229.75, RJR \$262.47, VJM \$275.95, JEA \$240.49, RWF \$231.21. Direct mail campaign brings hot leads right into your home. Remarkable product does part of 10 men's work; a "natural" during these labor problem days. Has perfect sales story; sells year round. As modern as radar! Special demonstrator offer. We extend credit, deliver and collect. No capital required; no experience necessary. You make big profit on first sale and full credit on repeat business. Every business, store, factory, etc. are prospects. Write John Porter, 2433 Indiana, Dept. 307, Chicago 16.

DISTRIBUTORS Only. Sensational dwelling unit for automatic fire protection. Top and complete line. 65% possible. Freight free. Red Ball Co., Box 1552, Salt Lake City.

PHOTO-SALESMEN—Agents. Sell beautiful hand colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait, 3343 North Ave., Chicago, Illinois.

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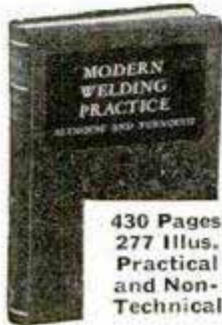


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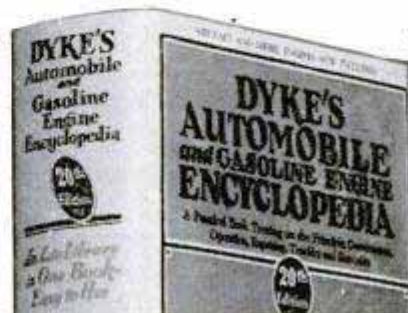
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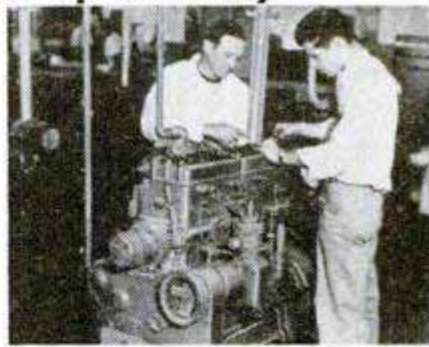
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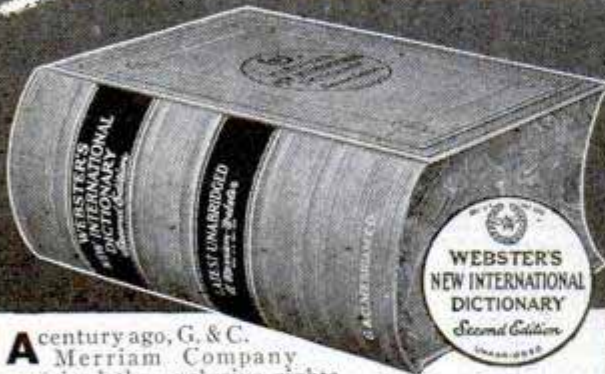
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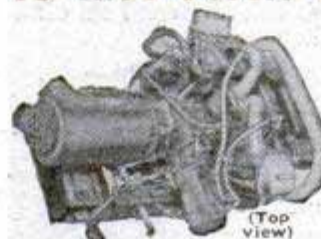
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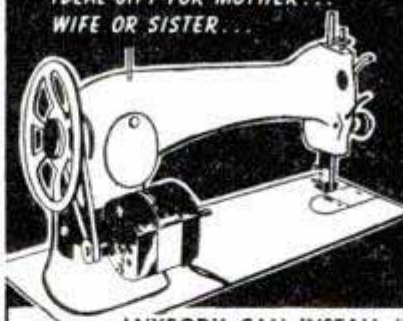
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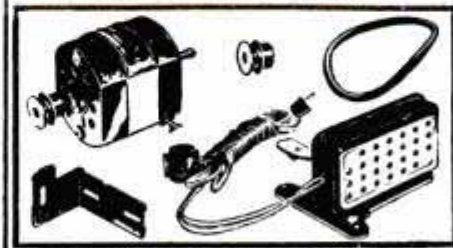


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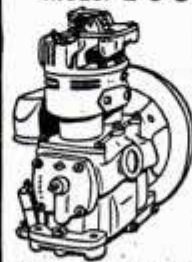
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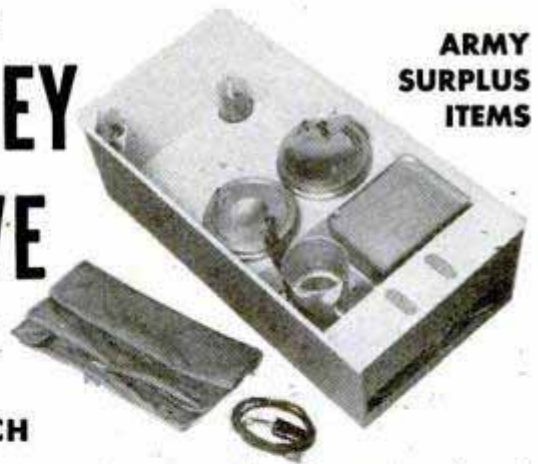
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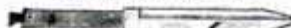
For experimental work in optics. Consists of 27 precision ground and polished prisms and lens elements in assorted diameters and focal lengths. Big variety—positive, negatives, etc. Actual value over \$100.00. **A519—27 PIECES... \$7.95**



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TYPE F1
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Heavy canvas pouch. Ideal for taking lunches, shopping, books, etc. Has 11x12 inch pocket. Brand new, guaranteed perfect. Has oversize flap with single strap fastener. **A113—EACH \$1.69**



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Brand new gov't. surplus. Army-Navy model. Single jewel mounted needle. Silver colored dial. A splendid value. **Shp. wgt. 1 lb. A174—Each... 98c**



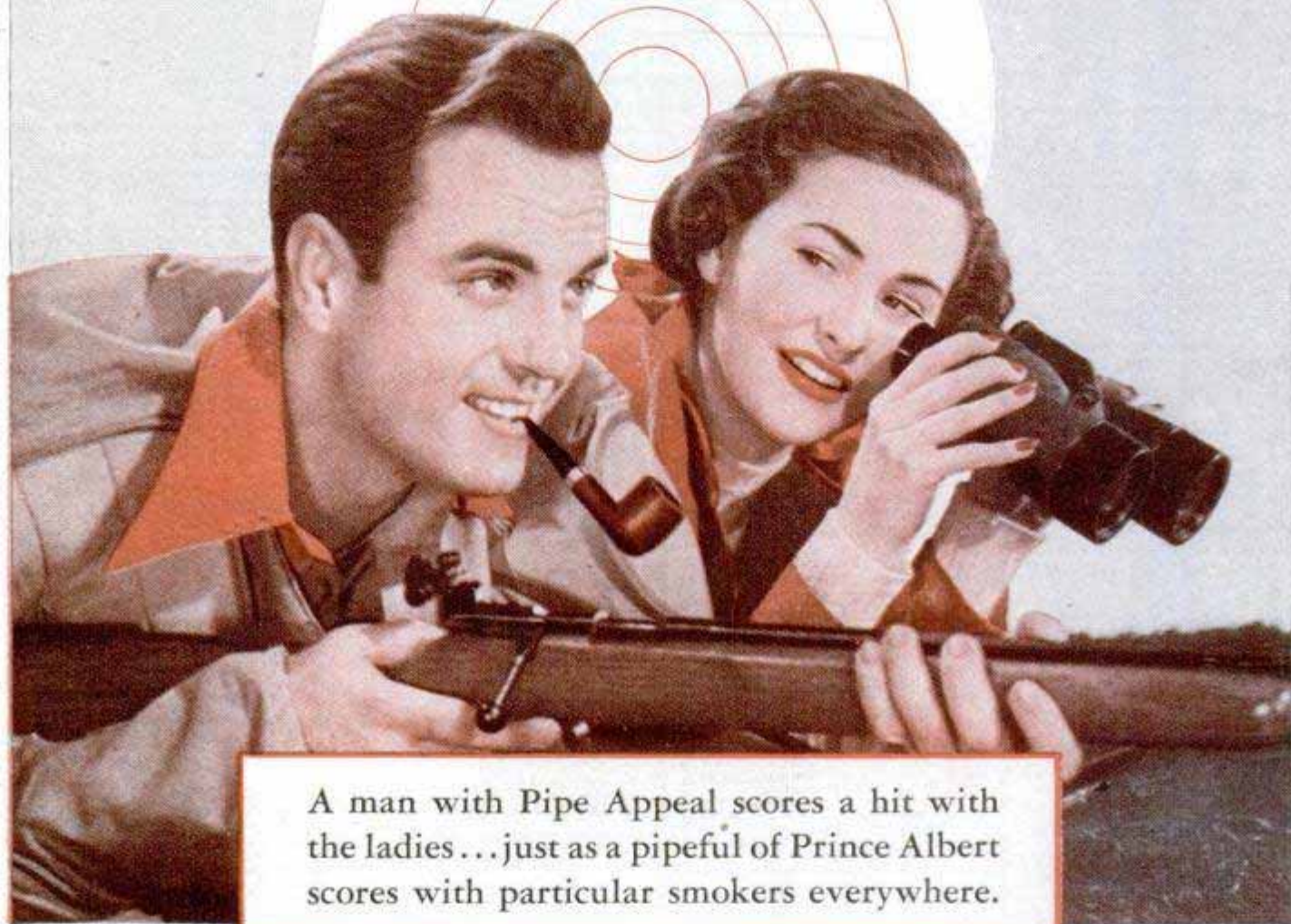
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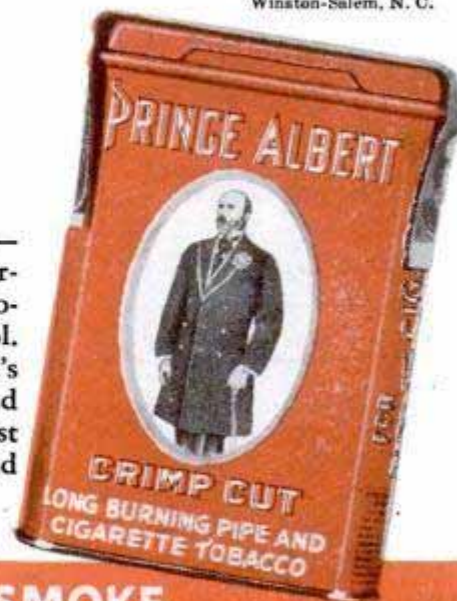
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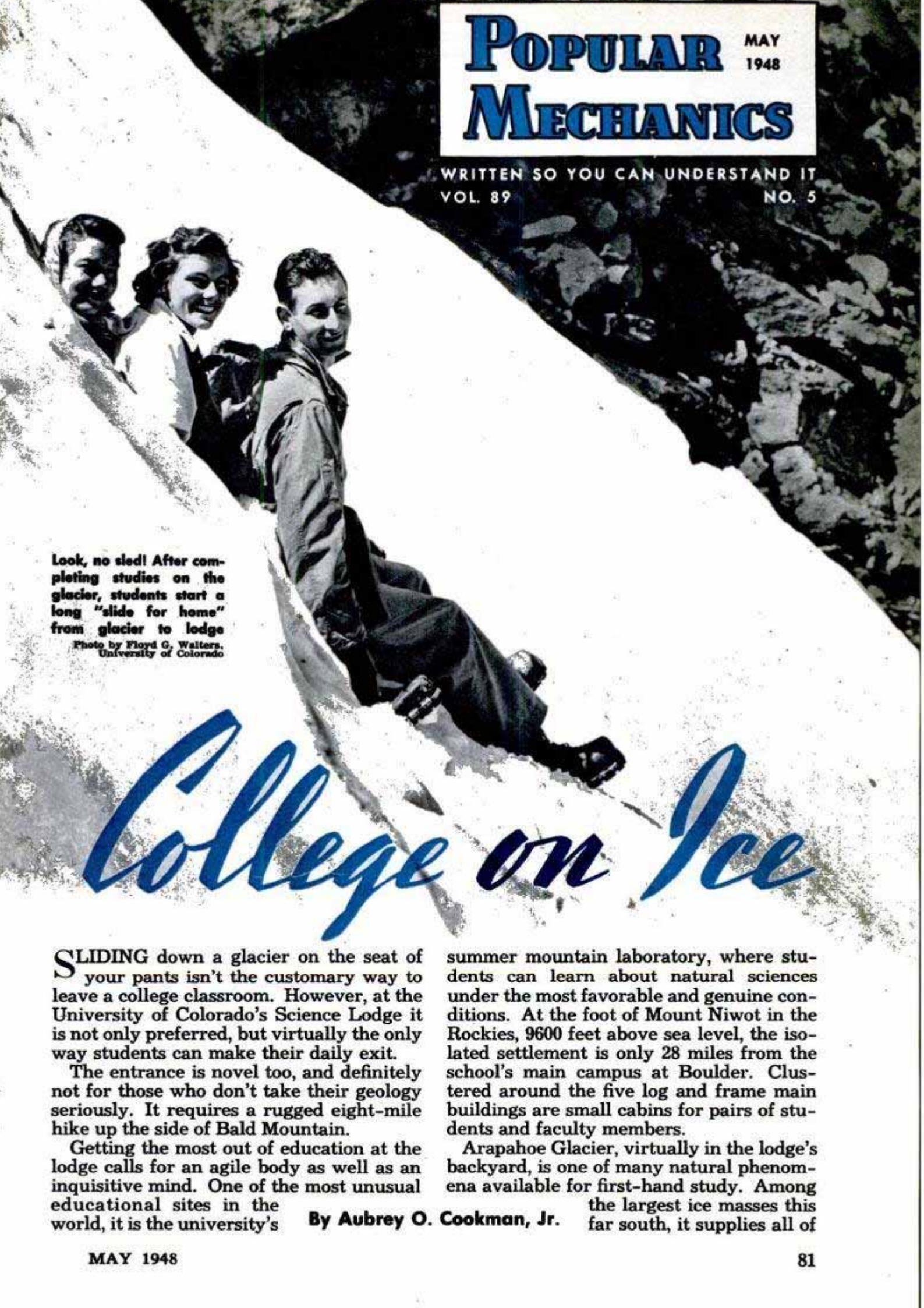
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THE NATIONAL JOY SMOKE

A black and white photograph showing three people sliding down a steep, snow-covered glacier. They are dressed in heavy outdoor gear. The person in the foreground is a man in a dark jacket and pants, sliding on his back. Behind him are a woman and another man, also sliding. The glacier is a mix of white snow and dark rocks. The background shows a rocky mountain slope.

Look, no sled! After completing studies on the glacier, students start a long "slide for home" from glacier to lodge

Photo by Floyd G. Walters,
University of Colorado

College on Ice

SLIDING down a glacier on the seat of your pants isn't the customary way to leave a college classroom. However, at the University of Colorado's Science Lodge it is not only preferred, but virtually the only way students can make their daily exit.

The entrance is novel too, and definitely not for those who don't take their geology seriously. It requires a rugged eight-mile hike up the side of Bald Mountain.

Getting the most out of education at the lodge calls for an agile body as well as an inquisitive mind. One of the most unusual educational sites in the world, it is the university's

summer mountain laboratory, where students can learn about natural sciences under the most favorable and genuine conditions. At the foot of Mount Niwot in the Rockies, 9600 feet above sea level, the isolated settlement is only 28 miles from the school's main campus at Boulder. Clustered around the five log and frame main buildings are small cabins for pairs of students and faculty members.

Arapahoe Glacier, virtually in the lodge's backyard, is one of many natural phenomena available for first-hand study. Among the largest ice masses this far south, it supplies all of

By **Aubrey O. Cookman, Jr.**



University of Colorado photos

Young scientist checks dew at 10,000-foot elevation with instrument of his own design. Inset at right, a student weighs a young seedling to measure the amount of moisture cold winds have sucked from it

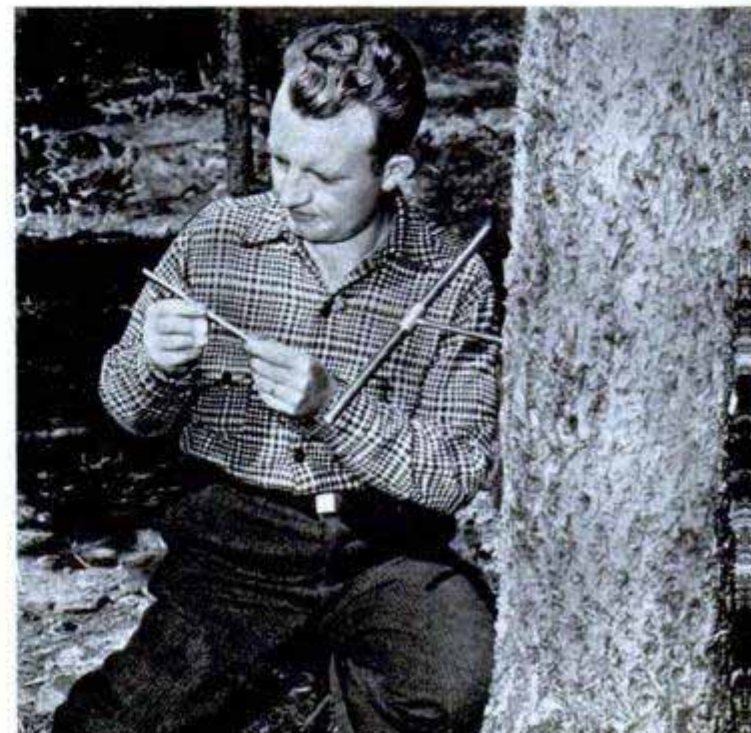
Boulder's water. Those who've spent hours trudging around it say they have a better appreciation of how these giant frozen bodies reshaped the earth's surface than those whose glacier study has been confined to steam-heated classrooms.

Variety is probably the laboratory's most important asset. Within hiking or short bus distance, geology students can examine varying rock formations present in over a mile of the earth's thickness. Bare, rugged

Using a micro-measurement instrument, a girl works out her thesis on tree measurements in the mountains



↓ Student bores a tree for study of its growth rings. Borer brings out the "core" without harming the tree





There's nothing like the outdoors for a study of nature. Here a university instructor lectures a field class assembled on a mountainside. Inset shows girl students using a plane table for mapping the area

peaks along the Continental Divide go to heights above 14,000 feet and then, eastward, gradually give way to the foothills and hogbacks bordering the western edge of the high plains.

In this area that is often described as a geologist's paradise can be seen exposed metamorphic rocks at the Divide, evidence of volcanic action at Specimen Mountain, intrusive igneous rocks in the foothills and the stratified sedimentary formations of the plains. Classes visit tungsten, coal and silver mines, oil and gas fields, and many kinds of quarries.

The front range of the Rockies unfolds a tale tens of thousands of years long about drainage, glaciation, lake sedimentation and the constant movement of the earth's "skin." Some collect as many as 200 speci-

mens of rocks, ores, minerals and fossils in a single summer.

Biology students explore plant life and fauna found over a vertical span of elevation of 8000 feet. In a single day they can visit places with climates varying as sharply as those of Denver and northernmost Canada. Field trips take them to the tundra above timber line, through the lakes, ponds and streams of the mountains, and finally down to the short grass plains, where cactus and sagebrush divide attention with prairie dogs, jackrabbits, snakes and extensive bird life.

Special stress is laid in learning a new and different technique in biology research methods. A weather station has been set up at Ward, and hourly readings are taken over a large area to map the distribution



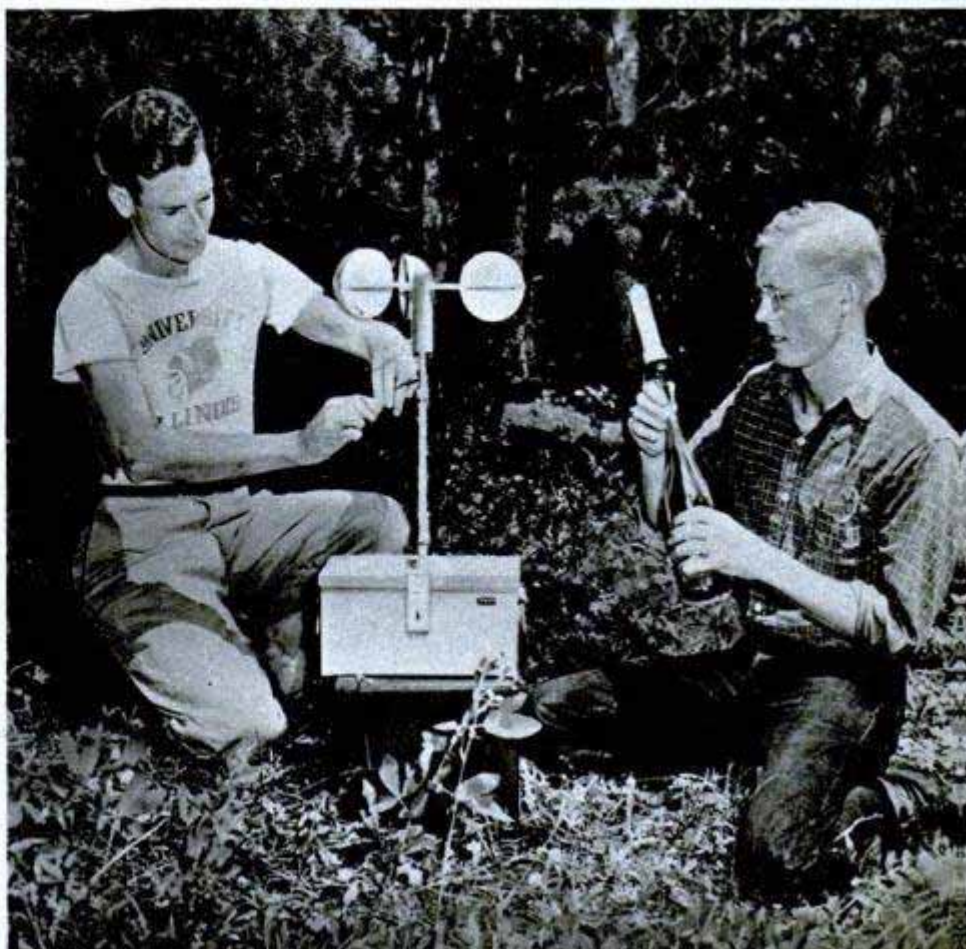
of plants, and to help check the abundance of different growths, their frequency and conformation. When field work is finished, the research continues in fully equipped labs at the lodge.

Class sizes have to be kept down because accommodations at the lodge are limited. This year's session, from June 21 to August 27, will include only 60 students, 40 in geology and 20 in biology. A ratio of four men to each woman in the former is exactly reversed in the latter. The work in each section follows entirely different lines, but both emphasize field problems.

In keeping with the outdoor setting, dress is thoroughly informal. There, nearly two miles above sea level, the usual campus attire gives way to thick boots and socks, blue jeans, heavy coats and jackets, and hats that will shield from the frequent rains and the sun's glare. For those in biology, who probe into aquatic life, bathing suits are recommended additions.

With a permanent camp staff handling all the chores, practically the entire time of students is free for research projects. All the meals are served at a central

Students hike back down the mountain after a study of the glacier. Below left, a professor checks the temperature of a drift from top to bottom. Right, students measure speed of wind and rate of water loss in plants



dining hall, where pack lunches are doled out in the mornings for those leaving on all-day field jaunts. Trips by bus and on foot are taken three days a week, alternating with three days in camp.

One class for graduate students roves constantly. Its 10 or 12 members are away for six weeks with full camping equipment, often ranging as far as 200 miles.

Science Lodge came into being in a completely unacademic way, as a week-end and vacation retreat for men who wanted to get away momentarily from the rigors of college teaching. A half dozen Colorado faculty members started it about 30 years ago as a place to relax and from which they could start their fishing, hunting and hiking trips.

Word spread and the university became interested too, finally using a \$1000 grant in 1921 for the first purchase of ground for the present laboratory site. Later, when the area's potential usefulness as an outdoor research center became apparent, the university traded other land it held to the government for 80 acres around the lodge. Now it owns 1100 acres of forest land in which to carry on the research work.

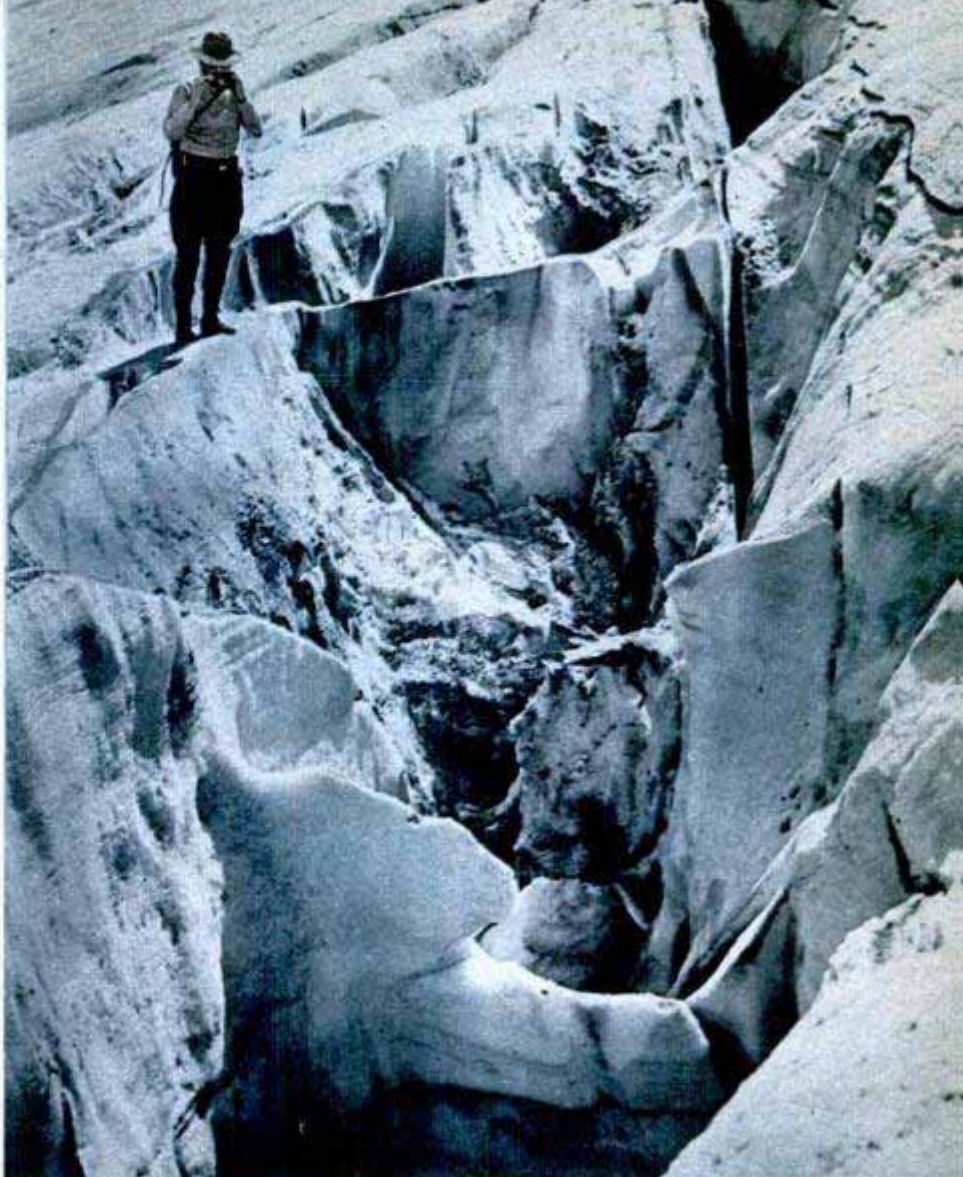


Photo by Bruce R Snow, Boulder, Colo.

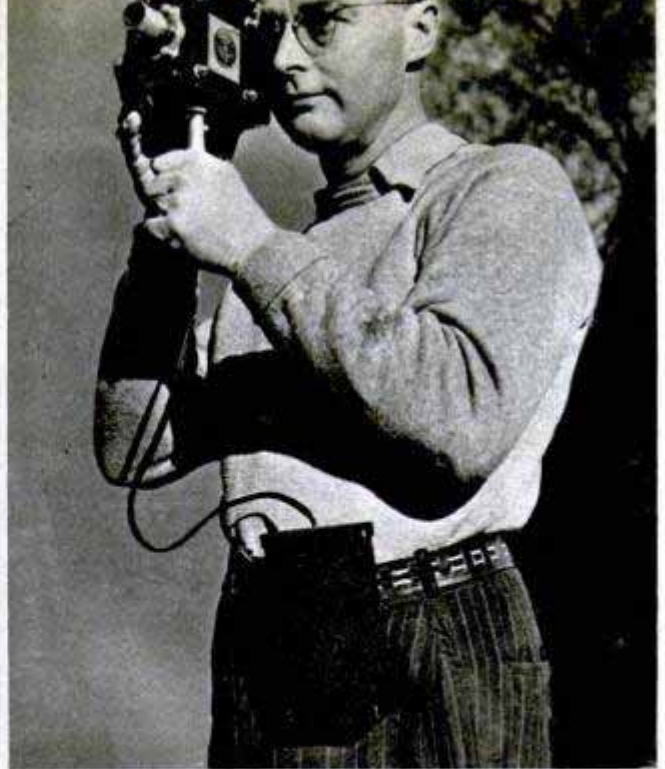
Above right, during a field trip to Arapahoe Glacier a scientist studies one of the crevasses. Below, student pulls a rubber raft through Red Rock Lake, high in Rockies, while his companion takes notes on marine growth





He Can Blow Back at Autos

When Hilton Tupman noticed that motorists frequently sound their horns at pedestrians without excuse, he decided to give the man on foot a chance to strike back. The Los Angeles auto dealer came up with a pedestrian horn which blasts right back at inconsiderate drivers. The tooter is built of war-surplus materials and a pair of bus horns. When a trigger is pulled, air under 500 pounds pressure rushes through the horns, which can be heard for a mile.



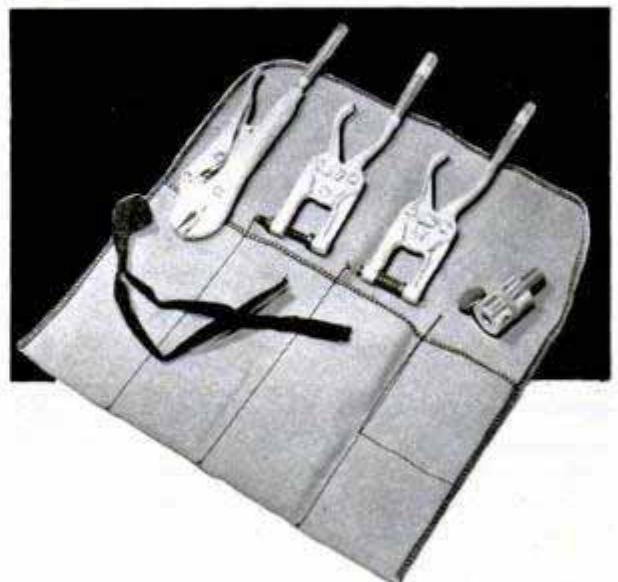
Airplane Gun Camera Converted for Peace

Airplane gun cameras, used during the war on fighter planes, are converted to practical 16-mm. motor-driven movie cameras by a kit now on the market. The kit includes a battery case, view finder, handle and tripod bracket, lens shade and a focusing element for the lens. A few simple changes inside the camera are necessary to convert it for amateur use. The battery case is carried on the belt.

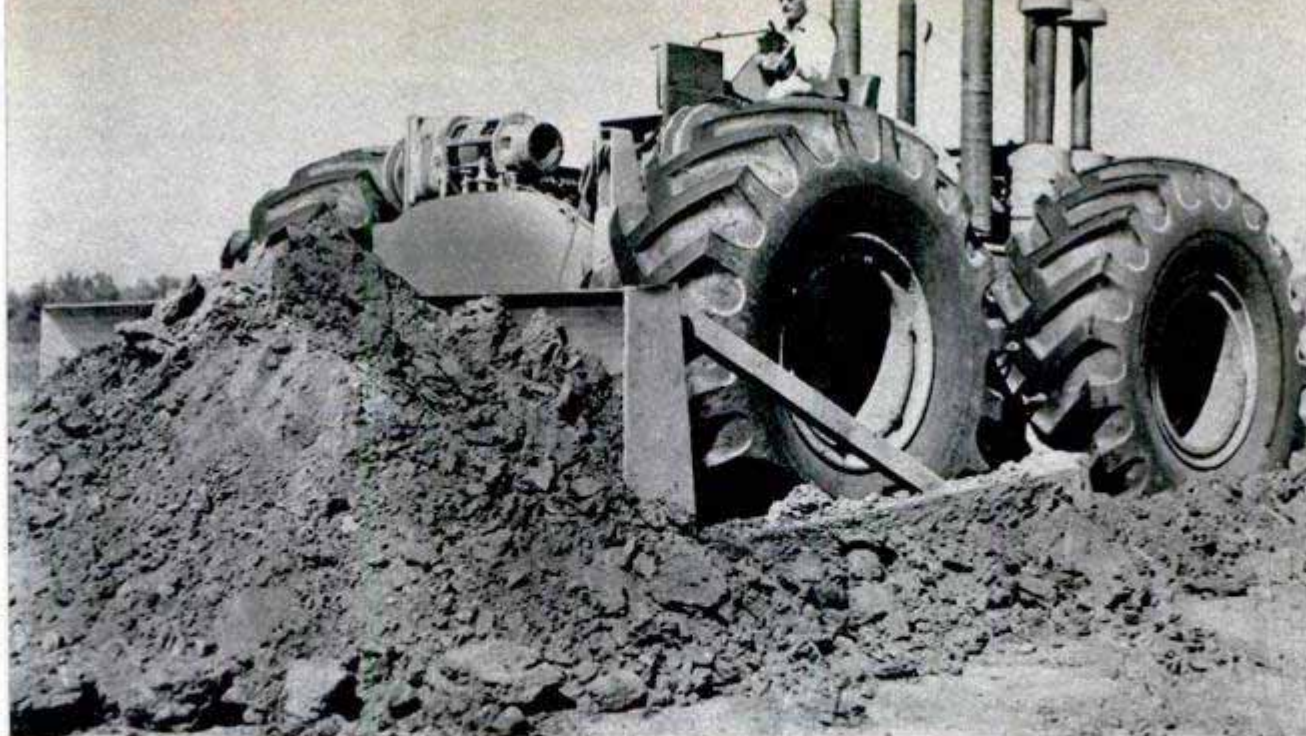
Amputees Grip Hand Tools Securely With Holding Devices

With a set of holding devices designed for use with any standard artificial arm, handicapped persons can grip hand tools securely. Gripping pressure is adjustable and a lever instantly releases the tool. In

the kit are three holding devices: a vise wrench, pliers with a screw adjustment for clearance, and spring-pressured pliers requiring no adjustment. An adapter that fits into the artificial arm is also provided.



By attaching holders (above) to his artificial arm, amputee (left) uses hand tool efficiently



Complementing 16-foot blade at front end of dozer, one at the rear the same width chops off roots 18 inches below surface. Four 30 by 33 tires support the huge pusher, which has about 700 horsepower and is easily maneuvered forward or backward.

700-Horsepower "Dozer" Chops Roots Below Ground

Even the roots are chopped off by a giant butane-powered pusher called a Tornadoizer. The "dozer" blade pushes over trees and brush, and a 16-foot cutter, hanging at the rear, lifts the earth slightly as it slices to a depth of 8 to 18 inches and lays it back down in its wake. It has about 700 horsepower and moves either forward or backward. The 50-ton-capacity vehicle rides on 30 by 33 tires, has a maximum speed of 16 miles an hour and is easily maneuvered.

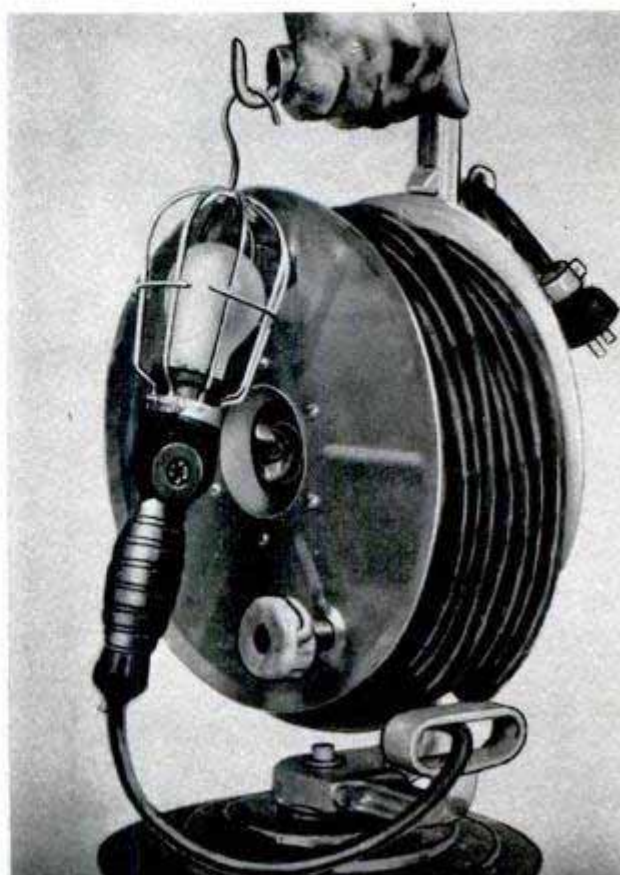


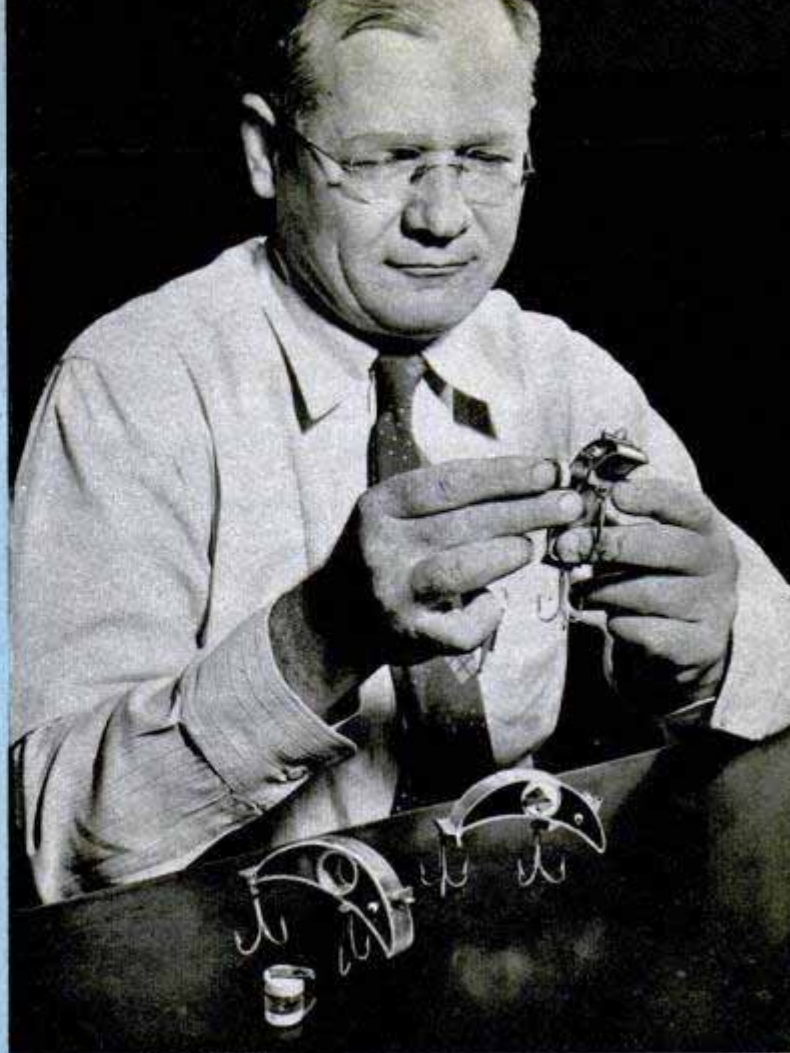
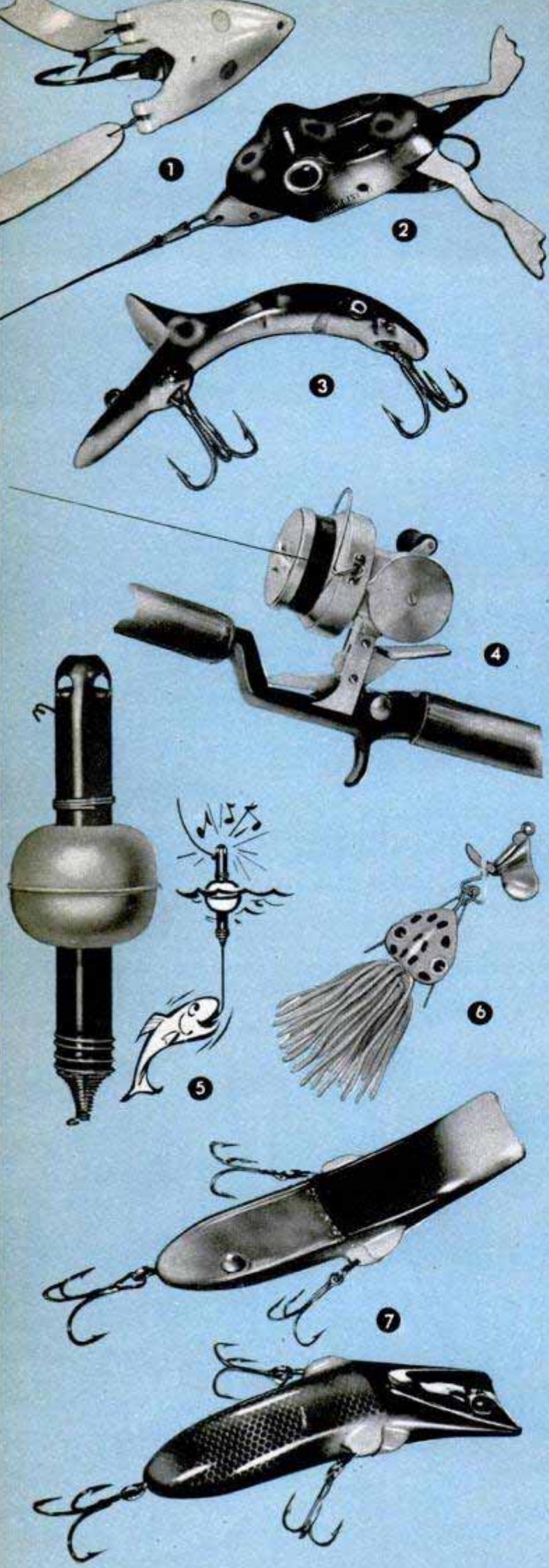
Reel for Long Extension Cords

Long extension cords remain untangled and easy to handle when kept on a reel that takes lengths up to 400 feet. A constant-contact conductor feeds current to the cord continuously. The reel swivels on its base to align with the direction of unreeling. Weighing less than 15 pounds without cord, the unit is easily carried from job to job. The cord is rewound by a handle on the drum.

Orders for Diesel locomotives by American railways in 1947 reached 2075, nearly double the highest previous year (1104 in 1941) and comparing with 79 new steam engines ordered.

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





↑ Even the smartest fish will have trouble recognizing this lure. It contains a chemical capsule that reacts with water, producing a stream of bubbles to make it look just as inviting as a real live minnow

1. Made of a lightweight, buoyant plastic painted in lifelike colors, this skate lure can't snag in thick weeds because of an unusual toggle mechanism

2. Like the skate lure above, this lifelike frog is designed to prevent tangling in weeds. Its plastic body takes rough usage without cracking or breaking

3. Scientifically balanced for trolling, this lure, called the Shedevel, also has a molded plastic body. For use in deep-water fishing, sinkers can be added

4. Because the spool doesn't revolve there is no backlash with this slip-cast reel. Line slips off end of spool and is controlled by trigger-operated wire bale that rotates to rewind the line on spool

5. Fishermen who like to nap between bites will welcome this bobber that whistles when the fish grabs the hook. It also solves the night-fishing problem

6. Sound effects are provided by this lure. Spinner rotates to make a noisy sputter as it is retrieved

7. Containing a globule of mercury, these lures of Tenite plastic wriggle and dart like a frightened minnow as the mercury rolls around inside the body



Hook, Line and Sinker

SUMMER is almost here and, as usual, fishermen all over the country are making plans to outsmart the crafty finned creatures. This year manufacturers have produced the largest assortment of tackle in history to help anglers tempt the big ones to grab a hook.

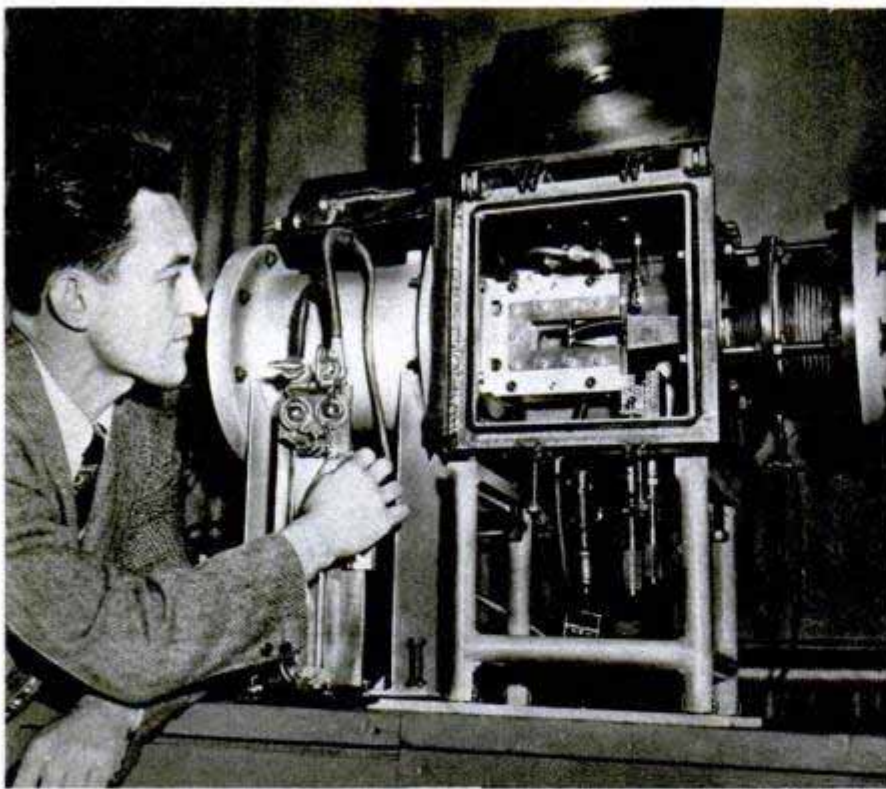
More than 18,000,000 fishermen are getting their tackle in shape for the all-out campaign. Among them will be some 3,000,000 new anglers who will discover for the first time the thrill of a strike. For the first season since 1941, the sportsman, veteran or novice, will be able to pick and choose from a wide variety of items. The old-line companies have expanded their production to help satisfy what is expected to be the greatest demand of all time. Nearly 100 new companies have entered the field since the war.

Some of the latest items that will tempt the fisherman in the sporting-goods shop and the fish in the water are shown here. With these, the Izaak Waltons hope to increase their chance of bringing home that "big one" that always seems to get away.

Above, rough life in the woods is made comfortable by an enclosed body for pickup trucks. Its waterproof top is supported by an aluminum frame. There are two bunks and lots of luggage space in the unit

Below, with this fly-fishing reel, the angler can retrieve his line manually or by a finger-operated trigger that rotates the spool. The trigger swings out of the way when take-up is being done manually. When a change of line is desired, a new spool is inserted in the reel after one screw has been removed



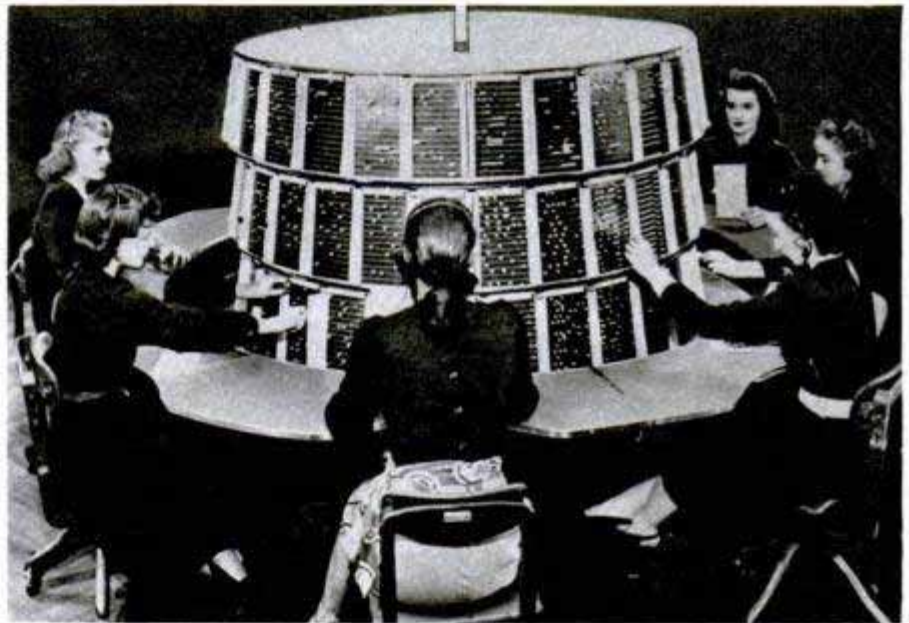


Rocket Test Tunnel "Climbs" to 50 Miles

Duplicating pressure conditions at altitudes up to 250,000 feet, a pilot model of a low-pressure, supersonic wind tunnel is being tested at the University of California. In the pilot model the test section is only an inch square, but a 10-inch model is now under construction. Scientists will use the larger tunnel to study design features of rockets, airplanes and other missiles traveling faster than sound at the extremely low pressures and temperatures found from 50,000 to 300,000 feet above the earth.

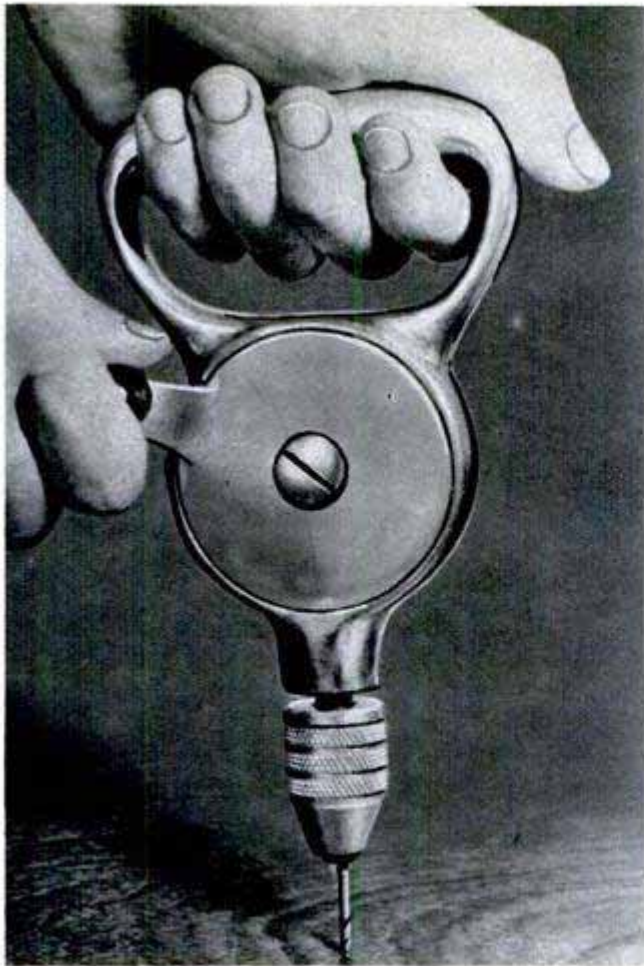
Train "Space" Board Spots Empty Seats

Train reservations are made quickly by operators seated in front of revolving "space" boards at the Chesapeake and Ohio Railroad's reservation bureau, Huntington, W. Va. A person in any city along the line who desires a reservation can dial a number and be connected with a Huntington operator who can tell from the board what space is available.



"Striking" Paint For Match Covers

Photo covers for paper matches are given a professional appearance with a paint that forms the striker surface. Double-weight matte paper, cut to proper size, is used and folded while still damp to avoid cracking the paper. Matches, removed from an ordinary book, are stapled to the cover. The striker surface can be applied with brush or spray.



"Fist Grip" Drill

Firm control of a small hand drill is assured by a "fist grip" that permits steady pressure on top of the tool without wobble or shimmy. The drill's gears are enclosed to prevent snagging of fingers or clothing. The drill has an aluminum body with a 1/4-inch capacity steel chuck.



Trolley Fire Ladder

Two thousand pounds is supported by a continuous, flexible fire ladder with a governor that lowers users at a safe speed. When weight pulls one side down the other side goes up. It hangs from a track 18 inches from the wall and is pushed from window to window.

"WALKING BARGE" developed by the Navy can haul 60 tons through surf, soft mud and quagmires. It humps itself forward like a frog over unfirm ground and is propeller-driven in water. In leapfrogging, the center pontoon rises 17 inches, moves forward 10 feet. The outer two pontoons, decked over to carry load, follow

U. S. Navy photo



Mercy Jumpers

Dramatic rescue of Canon Turner, dangerously wounded at isolated Moffet Inlet, turns spotlight on heroic work of Canada's expertly trained search-and-rescue squads



OPERATION CANON" is completed, and modern air-rescue technique measured up to a real-life emergency as tough as any which the fertile minds at search-and-rescue schools could devise.

Canon John H. Turner went seal hunting. Returning to his tiny Church of England mission at Moffet Inlet, he met an Eskimo girl carrying a bucket of ice to be melted for drinking water. The kindly churchman stopped to relieve her of the burden. Entering the doorway of his home thus encumbered, the trigger of his rifle apparently caught in a fold of his native-style fur clothing. The slug pierced his nose and lodged in an almost inaccessible part of the brain.

This happened not in the well-traveled western Arctic, where chains of war-built airports and other modern developments have practically banished isolation. Moffet Inlet lies far to the east, in Baffin Land, where an annual supply ship may or may not reach the scattered settlements. The Eskimos, except for rifles, live much as their ancestors did. The mission is one of the most northerly, inaccessible outposts of the Arctic Archipelago.

Mrs. Joan Turner found her husband lying unconscious in a pool of blood. With the aid of frightened natives, she fashioned a stretcher of blankets and carried the 230-pound man indoors. Except for her two small daughters, there wasn't another white

For protection on jumps over rugged country, para-rescue airmen wear rugby-type helmets with a steel wire mask

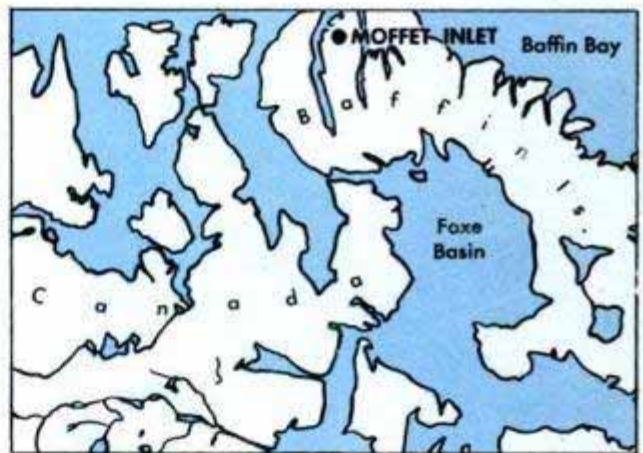
Royal Canadian Air Force photo



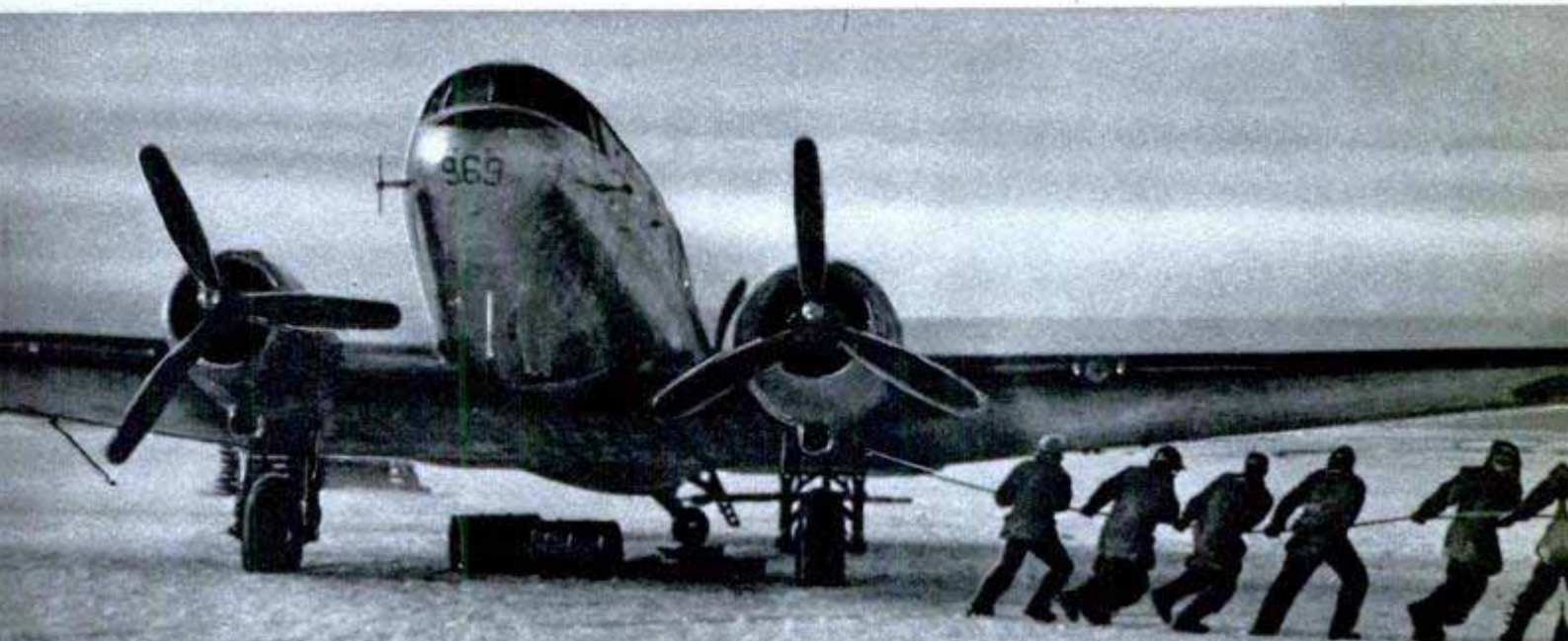
person within 70 miles. Fortunately, Joan Turner had been trained as a nurse before her girlhood sweetheart returned to Suffolk, England to marry her four years ago.

Mrs. Turner sent an Eskimo to her nearest white neighbor, Hudson Bay post manager John Cormack at Arctic Bay. The native did well to make the 70-mile journey, over treacherous new ice, in two days. Cormack radioed for help and returned to Moffet with the messenger.

Rescue preparations immediately got under way at Winnipeg and Rivers, Manitoba, nearly 2000 miles from Moffet Inlet, where the Canadian army and the RCAF have a joint search-and-rescue school. Mrs. Turner anxiously awaited further word.



Top, loading Canon Turner into plane at Moffet Inlet. His wife and one small daughter are the fur-bundled figures in foreground. Below, getting set for take-off





Lowering to ground after landing in a tree. Colored cloth on tree at left signals plane that he landed safely. Below, trainee pulls himself up glacier ice



Her husband lay paralyzed on the left side; he could not speak; he developed spasms, and had greater difficulty in breathing. On her radio set she was now receiving medical advice, though the outside world knew only that the Canon was wounded in the head. Mrs. Turner administered morphine and sulfathiazole.

On the tenth day after the accident, a plane circled overhead. It was an RCAF Dakota DC-3 transport. Mrs. Turner signaled with colored streamers as instructed, that her husband was still alive. This was the fall of the year; jagged, treacherous ice made a pontoon landing impossible, but there was as yet no ice strong enough to support a ski plane. The nearest practicable landing place was at Coral Harbor on Southampton Island, 600 miles south, where the plane had taken off.

On the frozen surface of a small lake near the mission the Dakota dropped medical supplies. Next came a heavy gasoline tin to test the strength of the ice for parachutists, and a smoke bomb to indicate wind speed.

Four men then made the perilous jump. In command was Capt. Guy D'Artois, a French-Canadian who, with his English wife, had made pre-invasion parachute landings in France to work with the underground. With him were Capt. Ross Willoughby, an army doctor, and two radio-men, Sergeants Judd and Cook. The doctor, less experienced in parachuting than his companions, missed by only a few feet death or injury on the jagged rocks at the edge of the tiny, frozen lake some miles from the mission, which was their target. Radio equipment, including a 400-pound battery and a 390-pound transmitter, floated down with them.

The plane circled back to Coral Harbor. For four days there was no word from Moffet, the radio equipment having been damaged. Authorities, fearing serious mishap, prepared to send another party to rescue the rescuers. Then the Dakota, returning at the first break in the weather, circled the mission once again. Faint signals were picked up from a small set devised by the two sergeants. One of their first requests was for tobacco and knives to reward Eskimos for cheerful aid.

At first, Dr. Willoughby thought that his patient had little chance for recovery. Then Canon Turner slowly began to show signs of improvement. He regained the will to live, his speech improved, the paralysis left his arm. For weeks, day and night, he was given penicillin every three hours.

Meanwhile the other paratroopers searched the district for a possible landing strip. Weeks passed before the ice was safe for a landing. Then the Baffin region's

notorious weather set in to prolong the delay. When a take-off from Coral Harbor was possible, a blizzard raged at Moffet; when the Inlet, where the sergeants worked incessantly to correlate weather reports from surrounding areas, was able to report "all clear," visibility fell to zero at the base.

An attempt had been made during the lull to evacuate the party by motorboat to Arctic Bay, where a landing might have been possible much earlier. Driven back by shifting ice and storms after a night in the open, that expedition alone was a grim experience even for the healthy members of the party. That the wounded man survived seems almost like a miracle.

The vigil of the paratroopers kept up for seven weeks. It was real winter now in the Arctic; temperatures hovered around 25 below zero and a glass of water at the bedside froze solid in the night. Flying Officer Bob Race and his six-man crew meanwhile flew the Dakota Snowbird 11,000 air miles on reconnoitering or supply-dropping missions to Moffet, or back south for supplies and consultations. Time was running out; the arctic night would make rescue before spring all but impossible.

Paratroopers finally reported the completion and marking of a crude landing strip on a lake 26 miles from the mission. A break in the weather came at last and once again the Dakota winged northward, squeezed between lowering clouds and the rocky hills, and landed perfectly.

By dog sled the party sped from the mission in record time while the crew manhandled the big plane into position for a tricky take-off. After a night of rest at Coral Harbor came the final 1200-mile hop to Winnipeg, where the patient continued his stubborn fight for life in a hospital. Thousands who had anxiously followed the story of "Operation Canon" breathed a prayer of thanksgiving.

"I want to go back north," says John Turner. "He has a chance to do it," says Captain Willoughby—"on crutches."

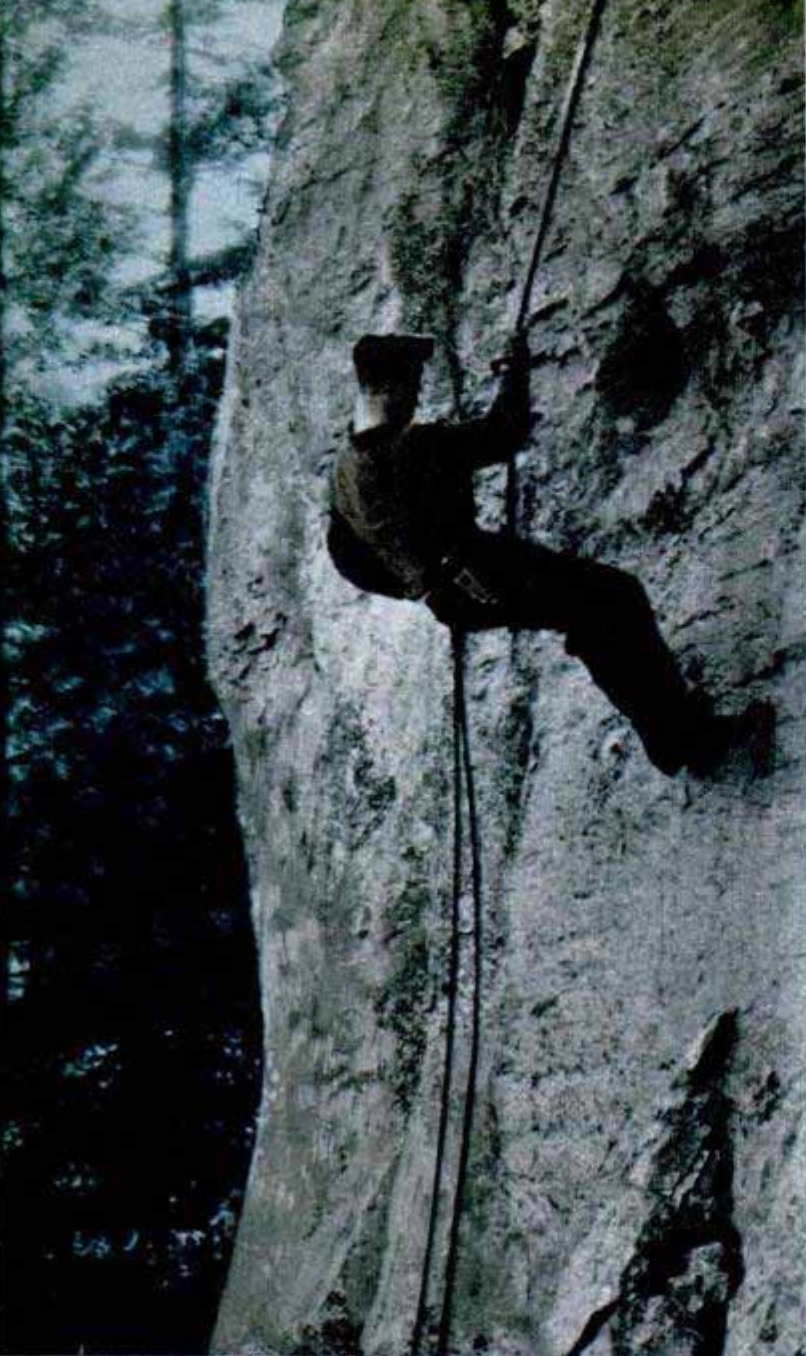
Episodes like this, while rarely as dramatic as Canon Turner's, are occurring regularly in the north country. To make them possible Canada has carefully built up one of its proudest services, the hand-picked search-and-rescue organization, coordinated by the Royal Canadian Air Force. One of its most "exclusive" courses is given at the para-rescue school near Jasper, Alberta, to students chosen for their brush experience, physical ruggedness and ability to cope with situations that may range from succoring victims of plane crashes on mountain tops to delivering babies in sections quickly accessible only by parachute.

The school operates from a small natural



"Patient" bridging narrow gorge on litter made from two small spruces and a Nylon sheet. Para-rescuers, below, have over 100 hours of first-aid instruction





Above, steel-cleated student making way up a sheer rock face. Logs on floor of tepee, below, keep beds of spruce boughs from falling into small fire built in center. Bush shelter, right, is kept warm by heat reflected back from fire by log barricade at right

airfield in a valley surrounded by towering mountains. There the men are tutored in controlled parachute jumping until they can make nearly perfect spot landings. Ten passing jumps, four into heavily timbered country and the rest over mountains, have to be made before they earn badges.

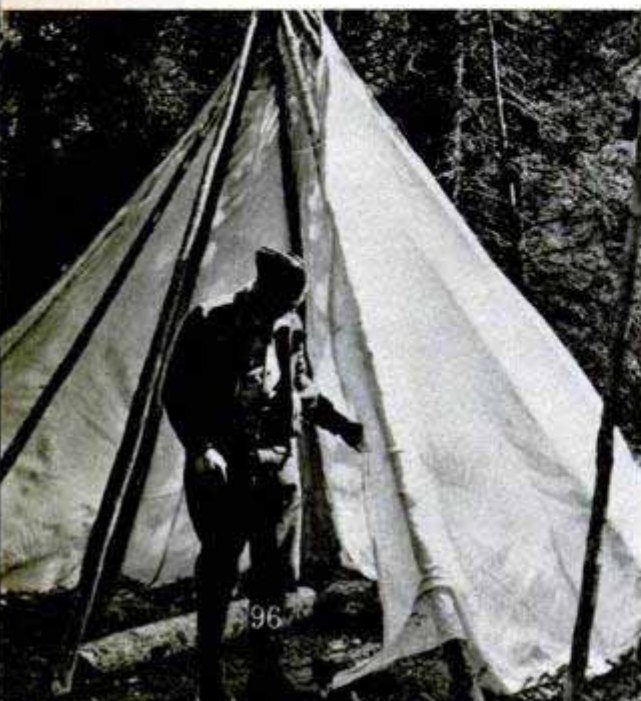
Landing close to targets is important. In addition to the possible danger to jumpers, who might land in water or on a steep mountain slope, a miss of a mile from crashed aircraft might entail precious hours of searching on the ground before locating it, especially in heavily timbered, rugged country. Fully equipped rescuers are loaded down with 60 pounds of gear and clothing, further complicating their movement.

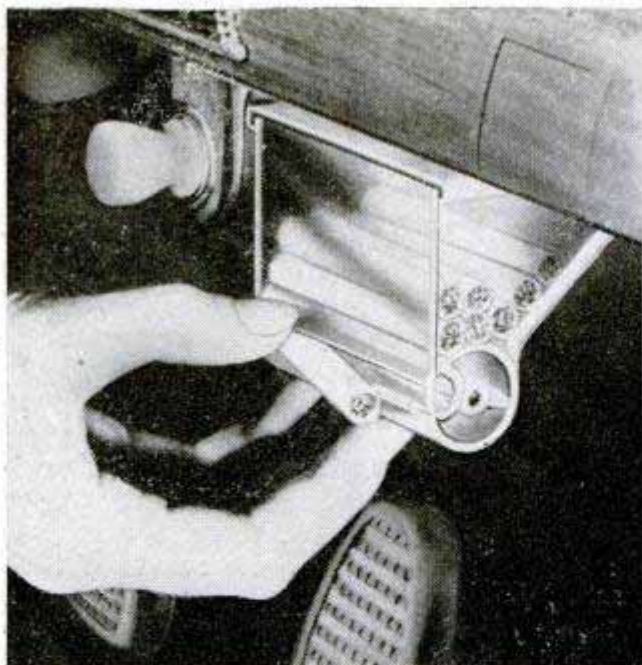
Mountain climbing means more to trainees than just scrambling up steep slopes. They are intensively schooled in techniques of snow, ice and rock work, and in evacuating injured from mountains and cliffs, through bush and heavily wooded country, and across streams and rivers. They are taught to improvise stretchers from materials at hand, and the 100 feet of Nylon rope they carry comes in for some surprising uses.

A master woodsman shows students how to make an ax serve in lieu of a score of tools. Under him they learn to erect bush shelters, build tents from parachutes and make a 14-foot log raft, capable of carrying four men and all their equipment, without benefit of rope or nails.

Their equipment is custom-made for the job. Special tinted glasses that protect against glare and snow blindness can be hammered against rock without even being blemished. The heavy duck jump suits are doubly reinforced by straps. Head and face are shielded by a helmet, similar to those worn by rugby players, with a steel wire-grid mask that balks injuries from snags and tree tops.

Canada is training her "Mercy Jumpers" to do their work well, and come back intact.





Dispenser Ends Fumbling For Cigarette by Driver

Motorists don't have to fumble for a cigarette when they have a convenient cigarette dispenser mounted on the dashboard. Made of transparent plastic, either plain or colored, the dispenser rolls out cigarettes singly at the touch of a finger. Only one bolt is used for installation.

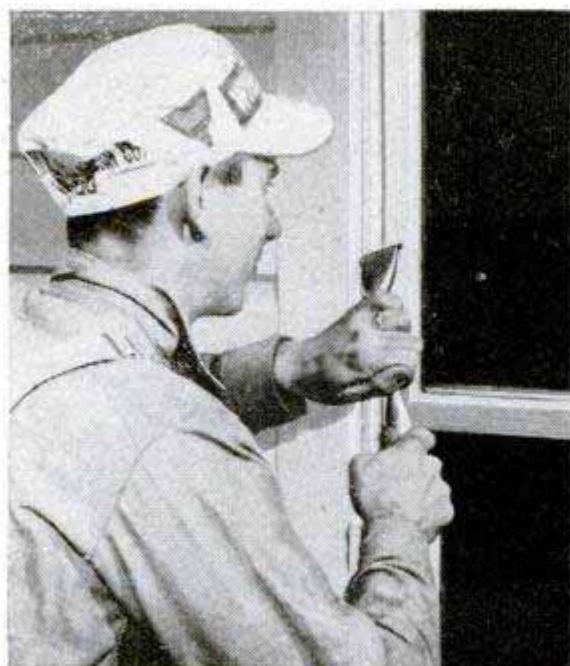
Antidote for Lewisite Gas Becomes Lead-Poisoning Cure

Lead poisoning, the painters' disease, is cured by British anti-lewisite, a chemical developed during the war to combat poison gas. The chemical, known as BAL, forces the lead out of the bones and tissues of the body. Prior to this discovery, lead poisoning was considered a hopeless disease.



Flexible Aluminum Shoes

As a result of the leather shortage, Germans are walking the streets of Berlin on shoes made of aluminum. Three enterprising residents invented the metal shoes, which they say will last 10 years and are much less expensive than leather shoes bought at black-market prices. The soles and heels are made of aluminum and the uppers of synthetic leather. The connecting parts are spaced far enough apart to permit flexibility.

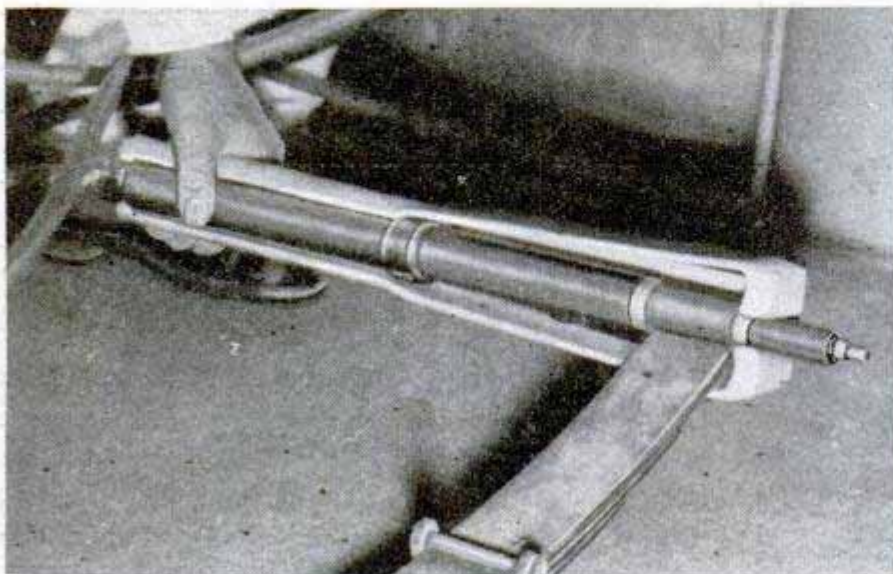
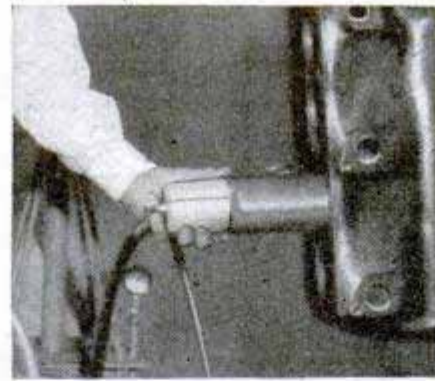
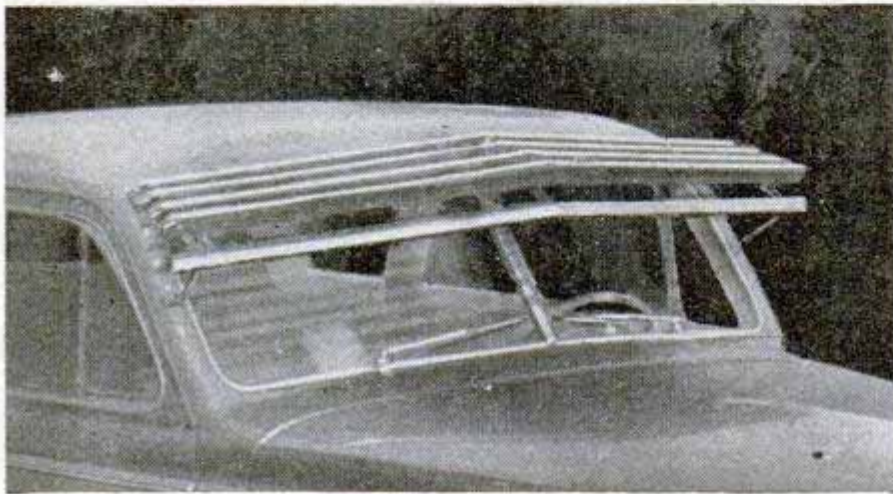
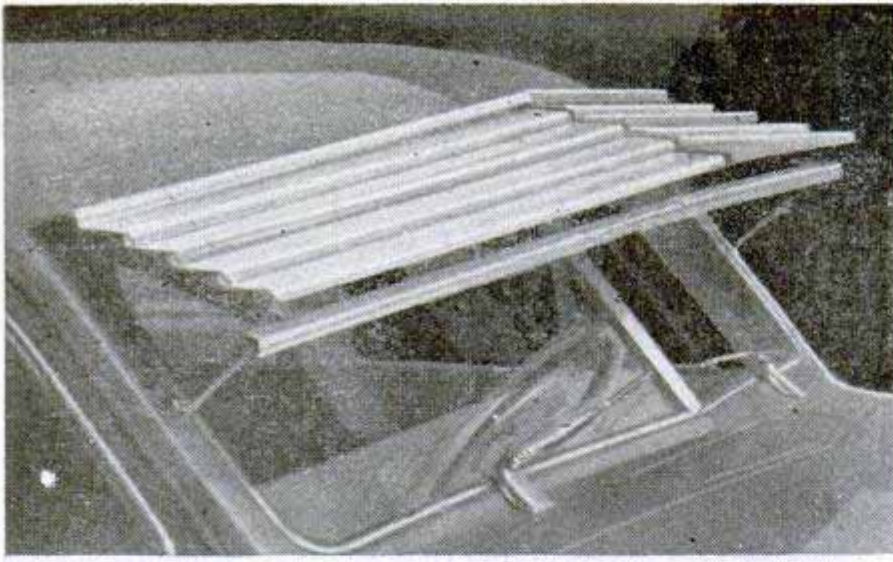


Paint Scraper Blade Won't Dig Into Wood

Scraping paint is made easier by a new tool that has an adjustable and removable blade of Carboloy cemented carbide, the hardest of man-made metals. The blade's shape prevents it from cutting into the surface beneath the paint. Because of its extreme hardness, the scraper can be used to remove dried plaster or cement.

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

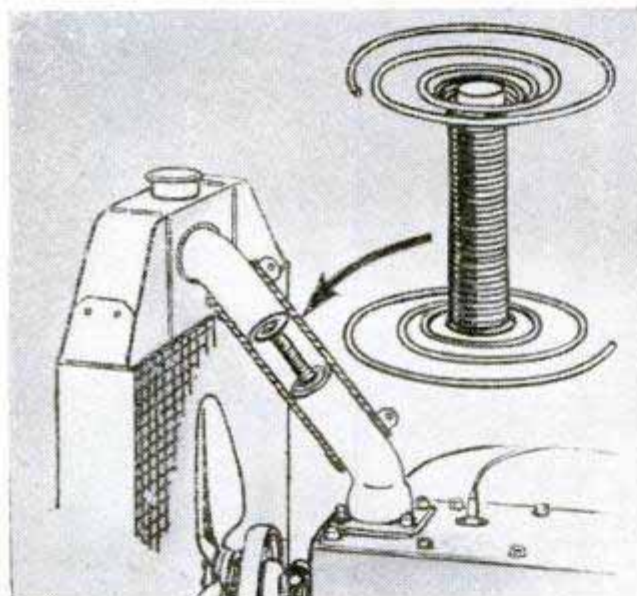
SHOPPING



Adjustable sun visor for automobiles can be opened and closed like Venetian blinds. A knurled control knob just below the rear-vision mirror extends or retracts the all-aluminum shade. The upper side of the visor is polished to match the chrome trim on the car. To reduce glare, the underside has a dull finish. While retracted, the visor does not interfere with the driver's vision, but it can be opened to provide relief from the bright rays of the sun. According to the manufacturer, the sunshade will not rattle or vibrate in any of its many positions.

Hydraulic ram exerting up to eight tons of pressure can be used to remove or insert cylinder sleeves in three minutes. The ram is operated by a standard air compressor and each pound of air pressure develops 115 pounds of hydraulic pressure. It is lightweight and easily operated by any mechanic. Adapters can be obtained to convert the power ram for use in removing worn and broken shackle bolts. The manufacturer also plans to market an assortment of adapters that will be used for removing valve guides, wheel hubs and gears. It is also planned to develop an adapter to permit the use of the ram in arbor presses.

LIST for MOTORISTS

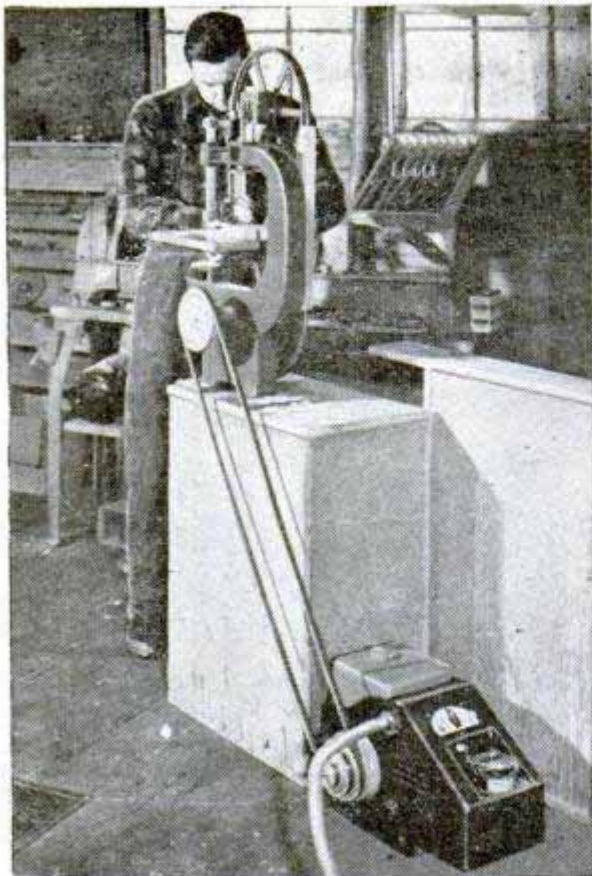


Emergency wheel eliminates the need for a jack or spare tire when you have a flat. Made in two sections, the rubber-tired aluminum wheel attaches to the rim and you drive safely to the first service station. One wheel section slips over the rim and the car is driven forward until it rests upon it. Then the second half is attached securely by means of two bolts.

Cooling-system de-scaler keeps car circulation channels in condition by dissolving any accumulated scale and preventing formation of new deposits. A silver-plated wire coil holds an alloy cartridge and together they eliminate scale-forming chemical reactions. The de-scaler is placed in the upper hose or inside the radiator shell above the tubes.

Motorcycle trailer is large enough when opened to provide sleeping space for two people. Built by two motorbike enthusiasts who are using it on a trip from Florida to California, it is 3½ feet wide and 4½ feet long when folded. Two side flaps swing outward to provide enough room for two full-length beds. The waterproof tarpaulin provides privacy and protection from the weather for the sleepers.

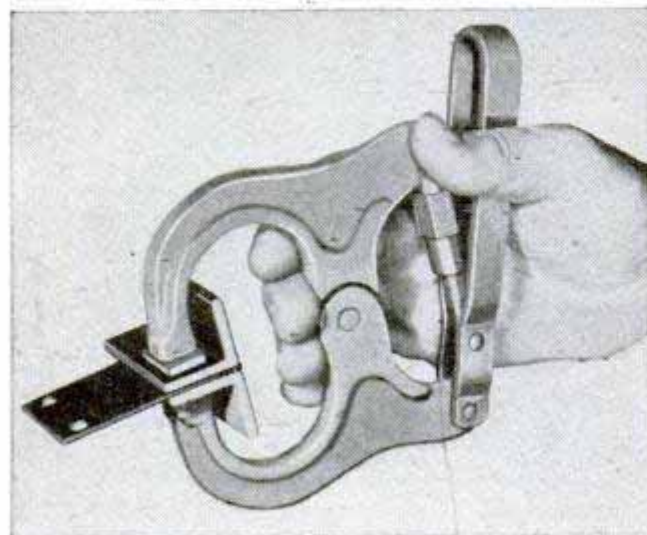




↑ Unit transmits power through a belt to workshop tools. Above, right, with a flexible shaft it grinds and buffs. Right, dial on case regulates unit's speed

Gas Unit for Powering Tools Can Be Moved Between Jobs

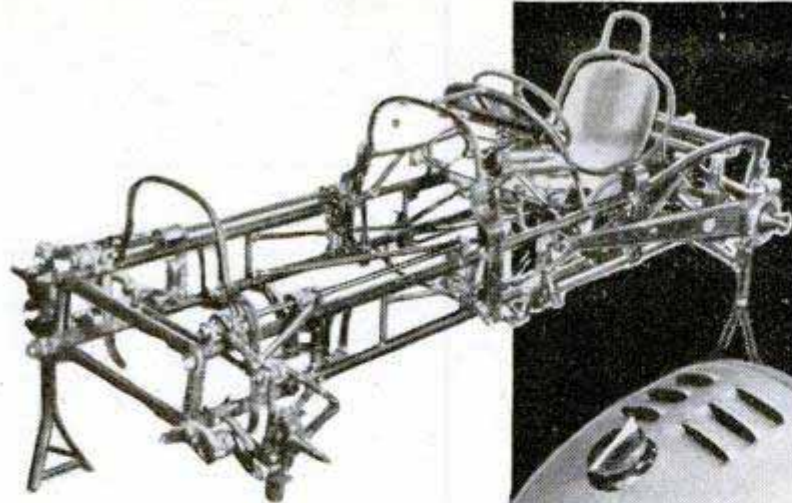
Designed for farm and workshop, a portable gasoline power unit can be carried from job to job and serves as stand-by power when electricity sags or fails. The 1½-horsepower unit weighs 50 pounds in its compact case. A speed-control dial regulates driving speeds from 1600 to 2600 revolutions per minute. Power is transmitted direct or through an optional transmission. With a utility shaft the unit will bore holes, sand, grind and operate shears. It can be belted to most power tools.



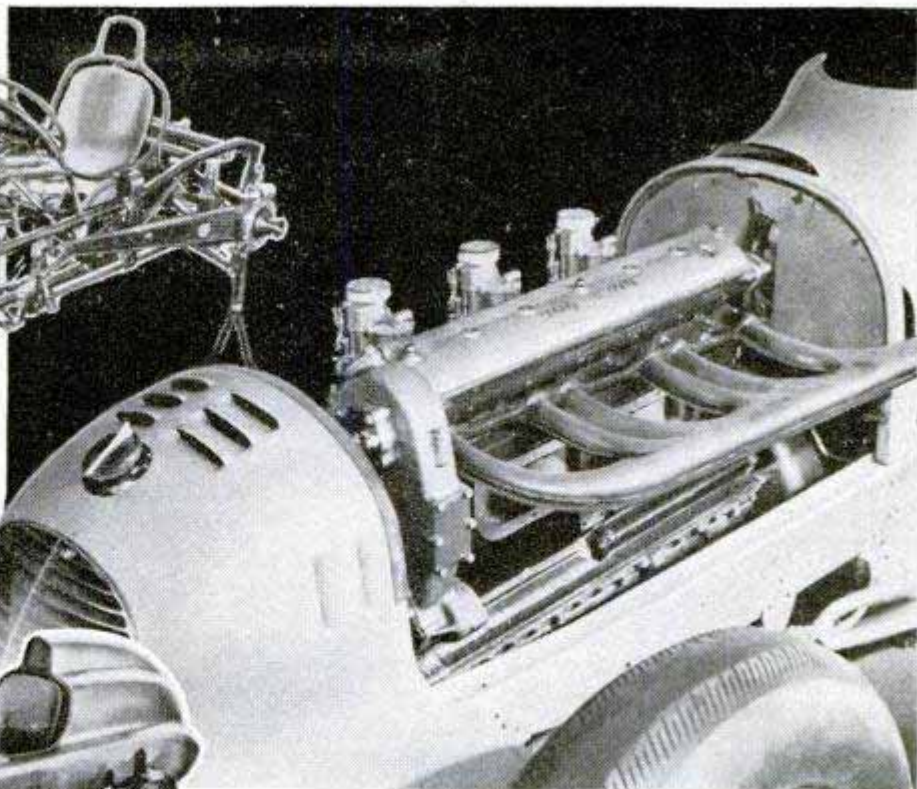
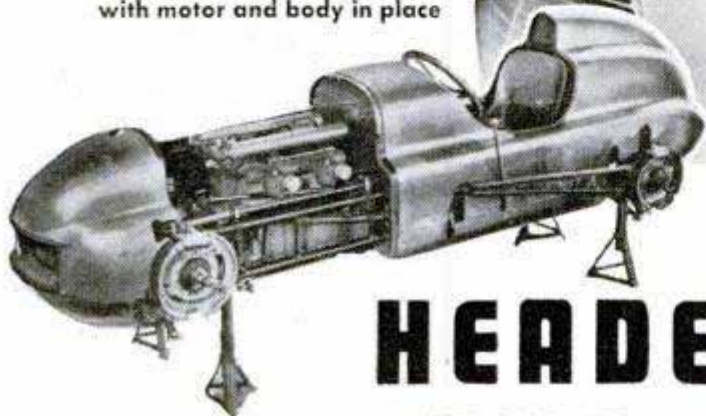
Quick-Action Clamps

C-clamps are now available that can be snapped into place with one hand, leaving the other hand free to hold the material in the proper position. The jaws can be opened to 2½ inches for clearance over angles and flanges before they are set. Material up to one inch in thickness can be held in the jaws. An adjustable toggle handle is squeezed to tighten the clamp.

☐ In the year 1932 only 12 locomotives were ordered by American railroads—lowest number in modern railway history; it was the first year in which orders for Diesel engines (7) exceeded steam (5).

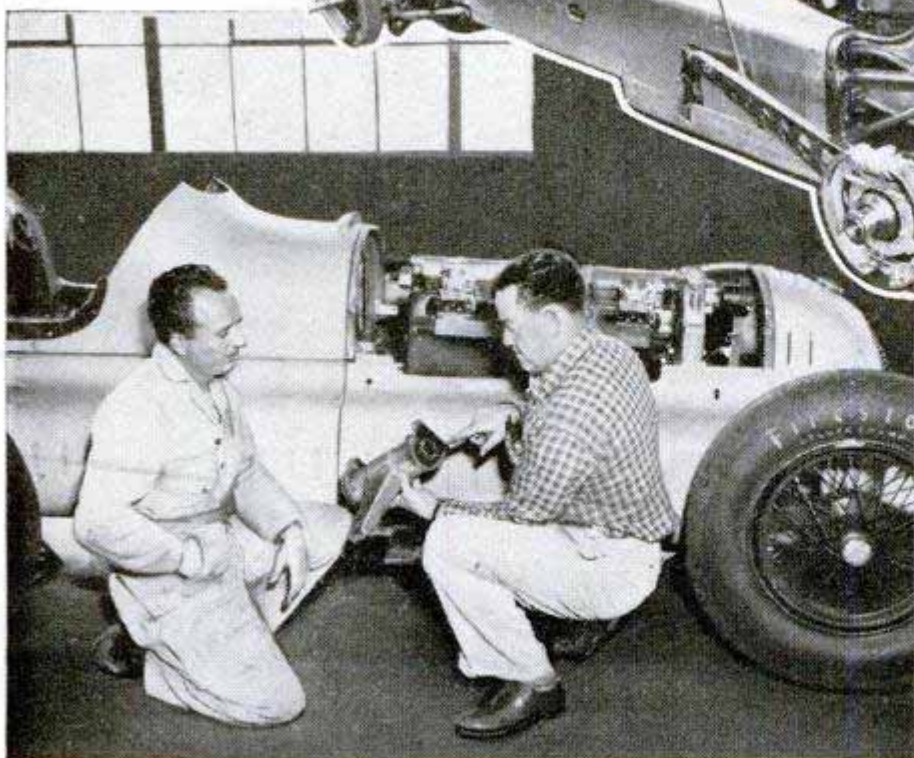
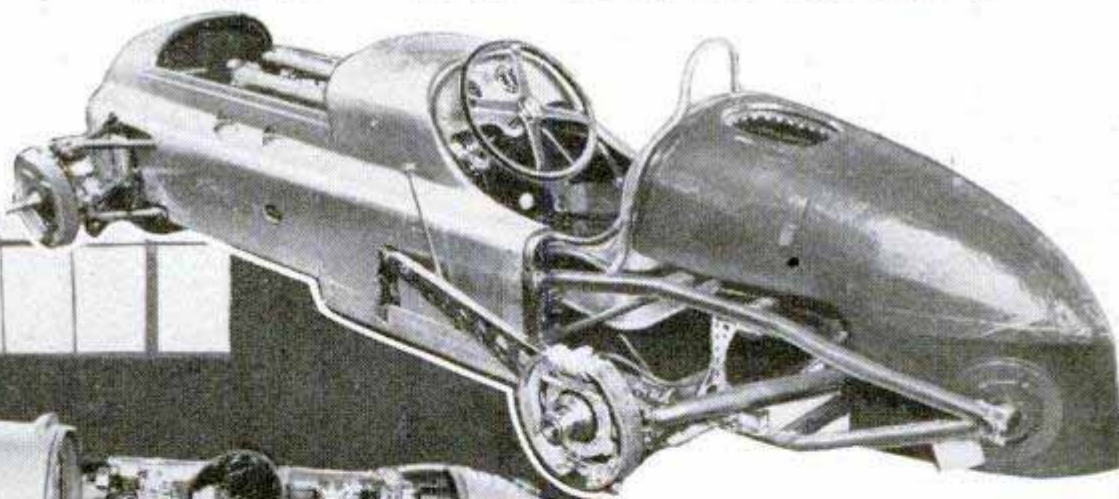


↑ Tubular-steel frame of the Kurtis car is a single welded unit. Below, the same car with motor and body in place

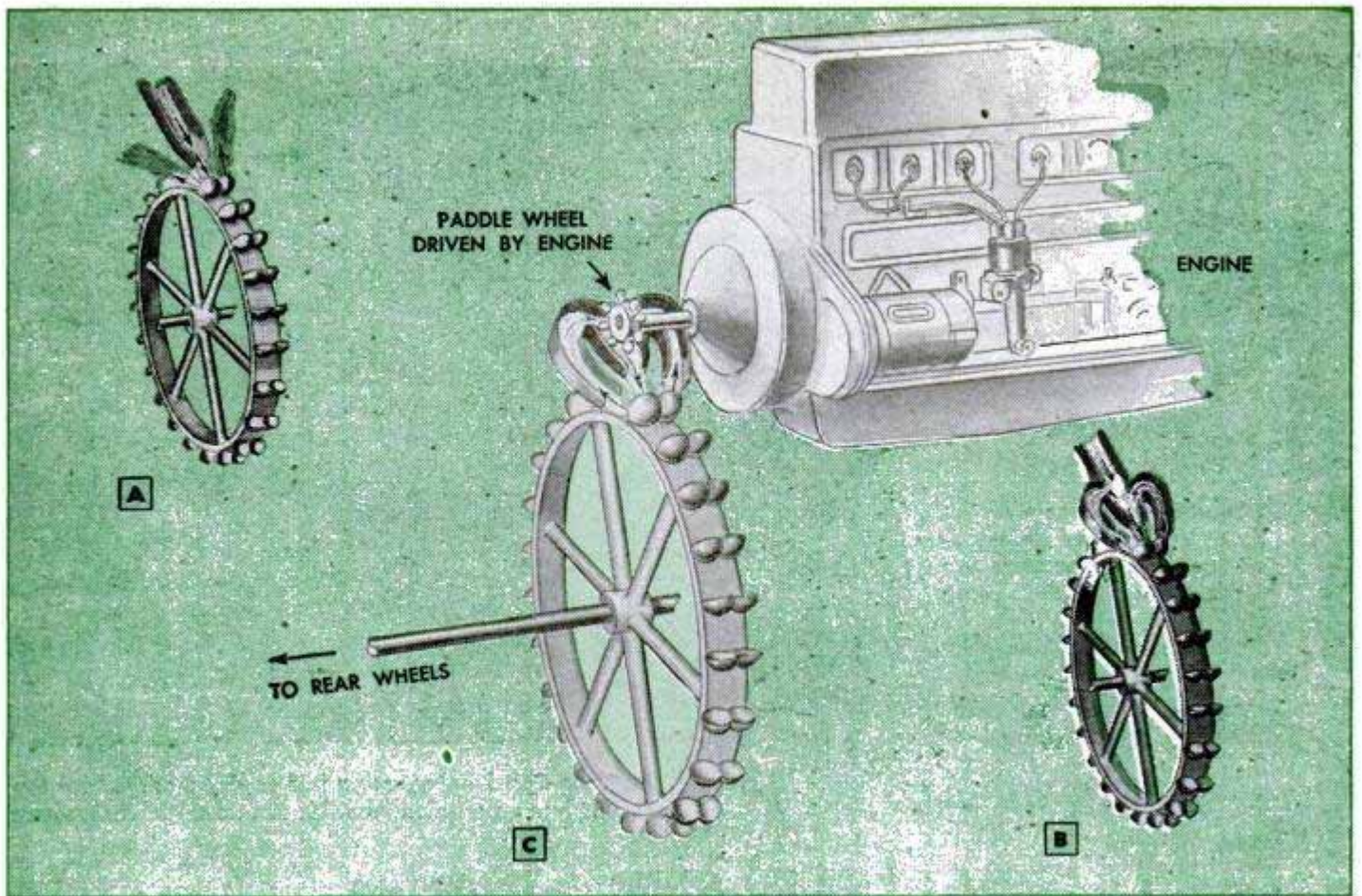


↑ The Twin-Coach entry uses a bus engine modified for top speed. It has an all-aluminum block and three carburetors

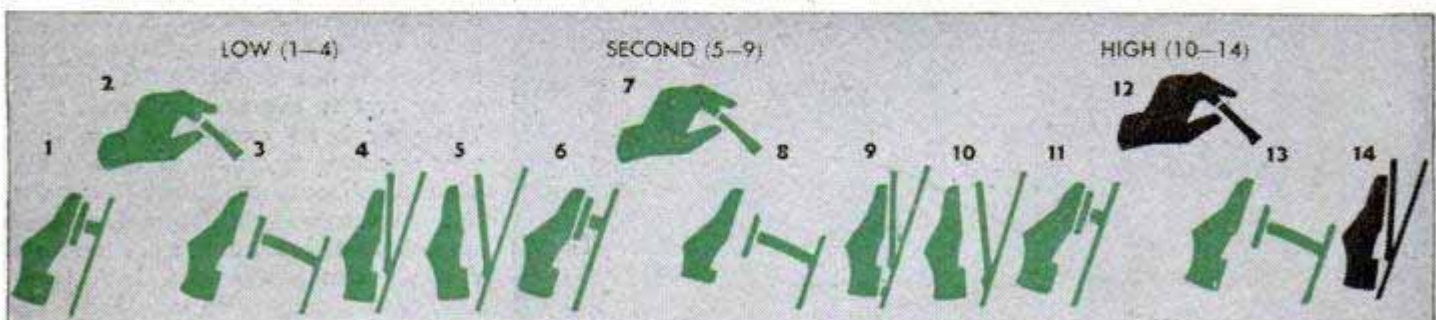
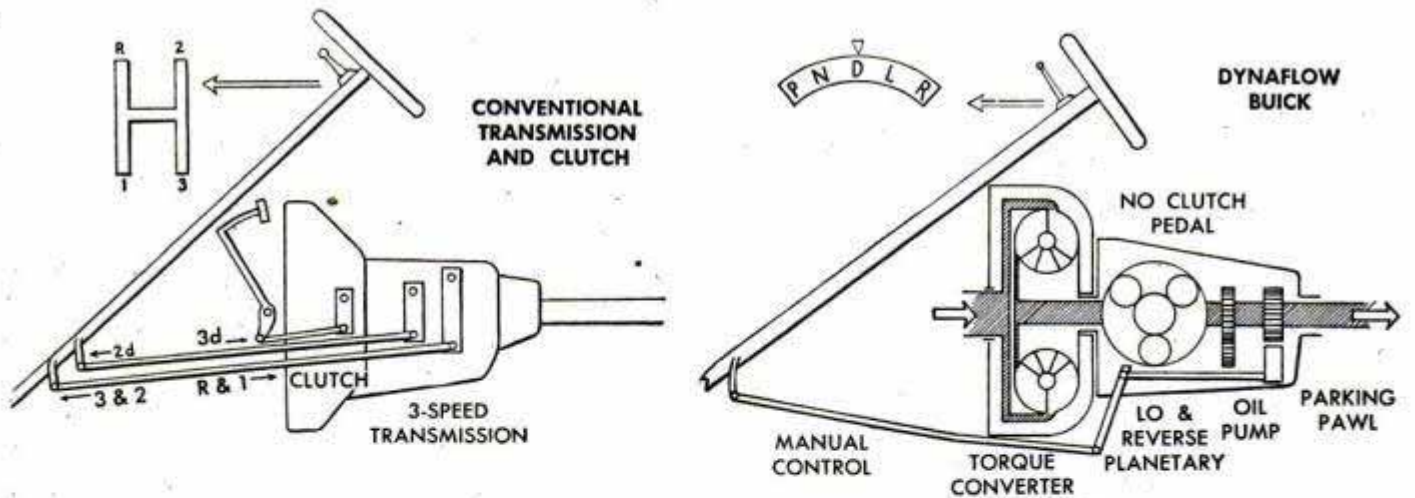
HEADED FOR THE SPEEDWAY



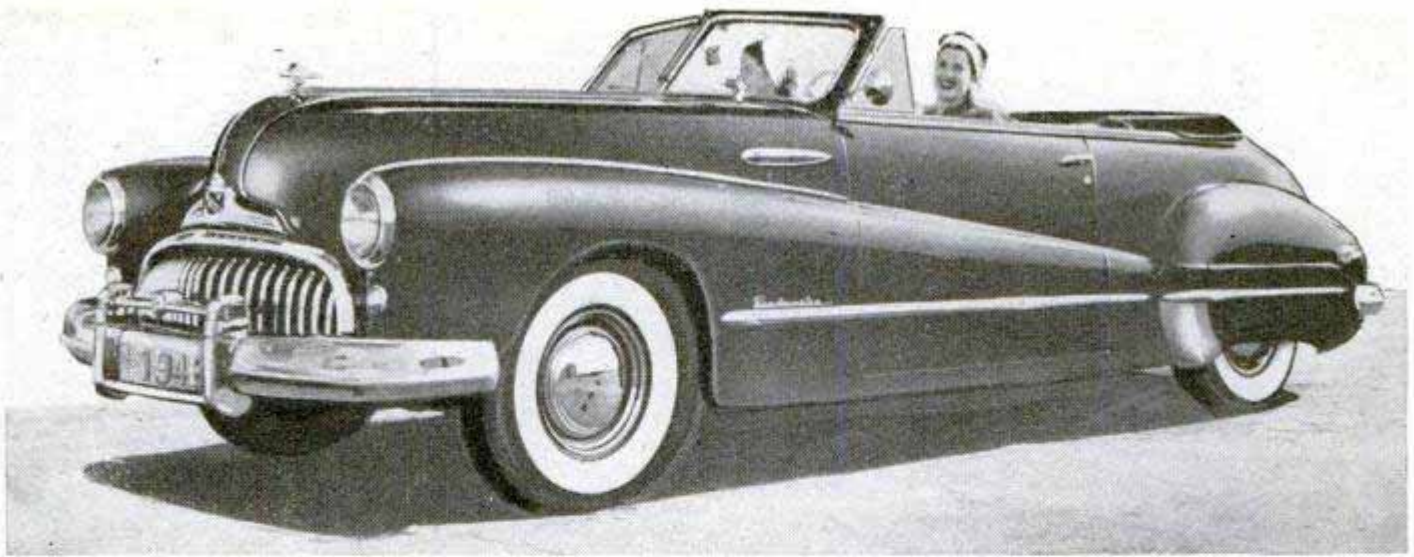
For 500 brutal miles, men and machines roar around Indianapolis Speedway in a test of stamina and speed. Each year brings new designs in engines and bodies to help the driver in his struggle to be first to see the checkered flag. This year is no exception. Here is a pair of racers that may be among the winners. Above, the Kurtis-Kraft car has a vulcanized-plastic gas tank that may eliminate breakdowns due to seams opening during the race. Left, torsionless wheel suspension may bring the Fageol Twin-Coach car down the home stretch leading the pack of speedsters



These drawings present a simple hydraulic explanation of torque-converter action of Buick's Dynaflow transmission. "A" shows water striking curved buckets of water wheel which redirects flow in a backward direction. This reverse flow exerts double pressure on water wheel; thus its torque or turning effect is double that produced by water striking a flat blade. "B" shows how the flow of water is redirected back to buckets to build up added force, and "C" explains how the hydraulic torque converter multiplies turning effort in a similar manner. Fluid is re-used and is enclosed to prevent waste. An engine-driven pump maintains circulation; the driven member (turbine) corresponds to the water wheel, and the stator to the redirecting chutes



Fourteen operations are required to get conventional car shift into high compared with two for automatic



How Your Car Shifts for Itself

By L. H. Nagler

Member of the Society of Automotive Engineers

SELF-SHIFTER transmissions are now in about the same stage of development as the self starter in 1920. Starters, now well standardized and fundamentally alike, differ only in construction of actuating mechanism and location of controls. Many years will elapse before any similar situation will be possible in automatic transmissions. Eventually a few standard types may predominate.

Automotive engineering frequently is described as a continuous series of compromises. Engineers must balance one feature against another—performance against economy, styling against accessibility, strength and durability against weight and cost. The all-important cost factor seriously limits full use of technical advances.

Automatic transmissions have taxed the ingenuity of engineers in selecting acceptable compromises. The same weeding-out processes will continue for many years, at least until the public, and the engineers, decide what features should be emphasized and which can safely be sacrificed.

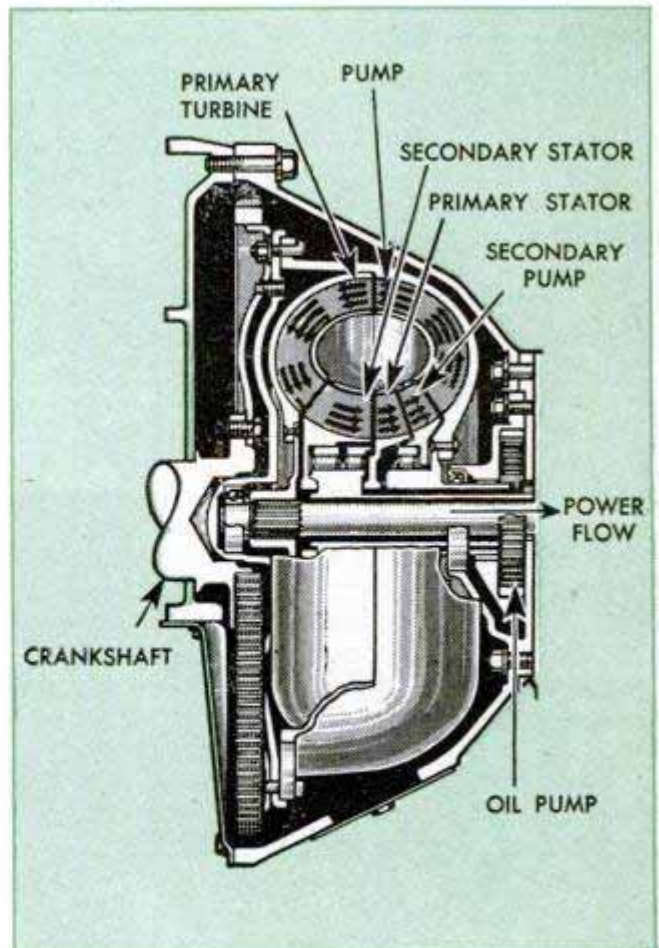
In recent months, attention has been focused on an entirely new type of automatic transmission. The hydraulic torque converter, now available on the Buick Roadmaster, is claimed by its promoters to represent **THE** automatic transmission of the future. If the concentration of engineering effort and expense on the converter is any indication, its backer's claims may be justified. Several other automotive manufacturers are expected to start production of torque converters in the next 12 months.

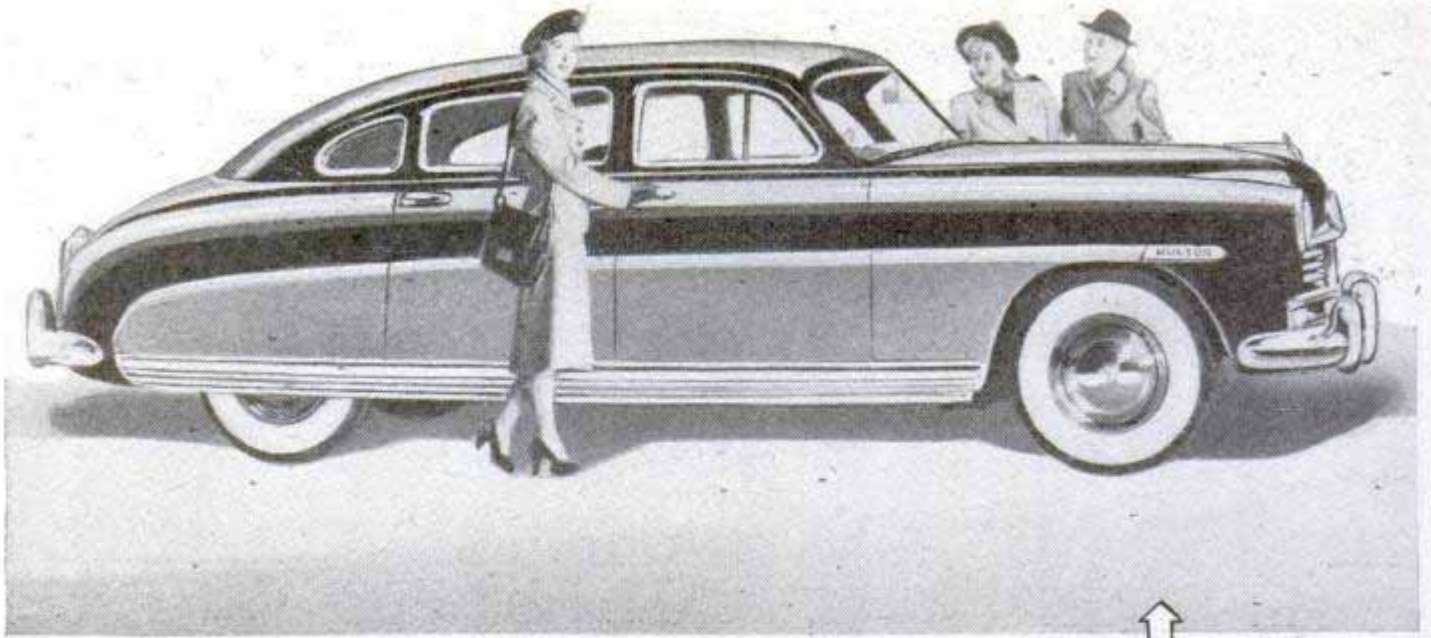
Advocates for the hydraulic torque converter in automobiles claim: (1) Absolu-

tely smooth acceleration, without interruption while the gears shift. (2) Simplicity—both of power flow mechanism and control devices. (3) "Packaged" construction, with sealed-in adjustments and built-in operating characteristics.

Although the hydraulic torque converter, as typified by the Buick Dynaflow, seems to be a leading candidate for **THE** future automatic transmission, other types

Buick Roadmaster above is first passenger car with the torque converter automatic transmission (below)





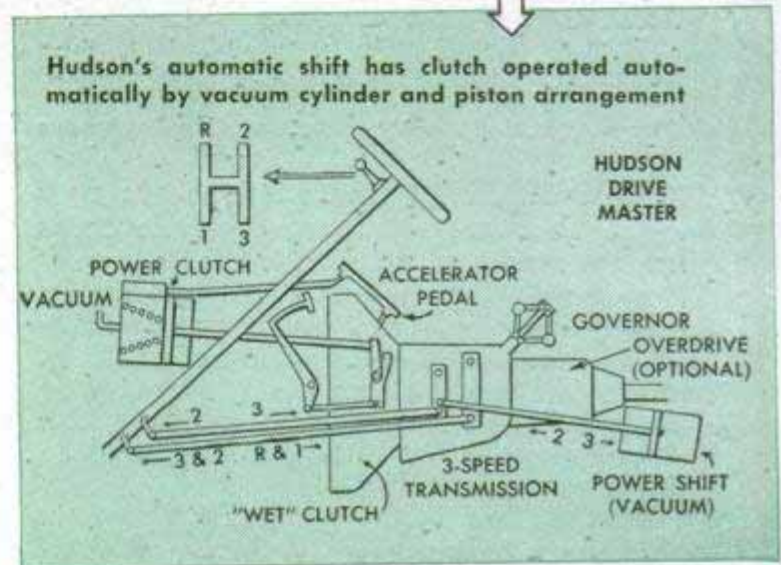
are by no means obsolete. Competing designs still claim many points of superiority. The torque converter has several inherent disadvantages, particularly relatively low efficiency under certain driving conditions. Incidentally, all automatic transmissions now in production are reliable and relatively trouble-free in service. This has not always been true of automatic shifters.

Until the announcement of the Dynaflow, all production automatic transmissions operated by use of added machinery to shift gears and engage clutches. In some designs the added machinery was applied to conventional three or four-speed transmissions. In others the basic construction was changed extensively to accommodate the needs of automatic shifting.

The simplest automatic shifter, and one still popular, consists of an overdrive gear unit mounted back of a regular transmission. This construction is available on several car makes (Nash, Studebaker, Packard, Hudson, Frazer and Mercury) at less than half the cost of more completely automatic jobs.

The overdrive provides automatic shifts between the two top "gears" (direct and overdrive) and thereby relieves the driver of considerable clutch operation and gear shifting. The foot clutch still is needed for starting from a standstill. With car in motion, however, many of the shifts can be made without declutching. The overdrive unit itself is shifted by accelerator-pedal operation.

Another automatic shifter built around a regular transmission is the Hudson Drive Master. In this design the clutch is operated automatically by a vacuum cylinder and piston arrange-



ment. Another vacuum cylinder shifts the second and third-speed gears.

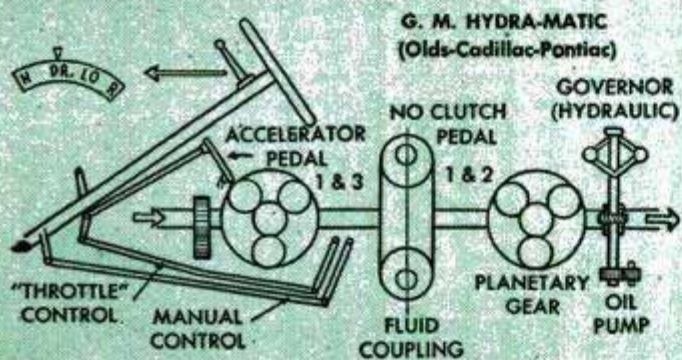
With this installation, normal starts are made in second. The transmission shifts to third (high) above a minimum speed, about 13 miles per hour, whenever the accelerator pedal is momentarily released. Downshift to second is possible for increased acceleration by flipping the manual lever to the second-speed position.

The Drive Master retains the usual clutch and gearshift lever. A selector switch is provided to give the driver the option of (1) full automatic drive, (2) vacuum clutch only (automatically disengages whenever the accelerator pedal is released at low speeds), and (3) conventional operation (using both clutch and gearshift in the regular way). In addition an automatic overdrive frequently is installed back of the Drive Master. This arrangement provides in effect a three-speed automatic transmission, with reduced engine speed for economy when in top "gear."

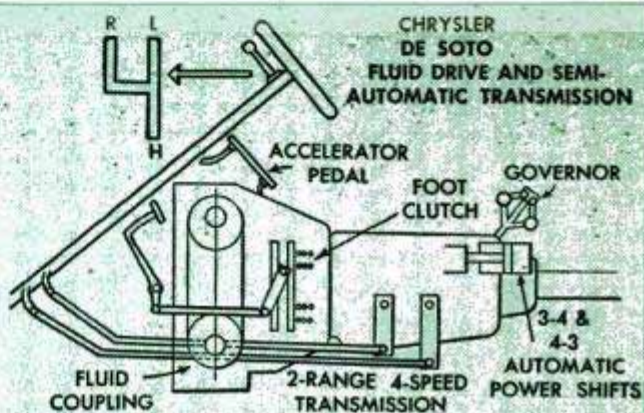
The Chrysler Fluid Drive consists of a special four-speed, two-range gearbox,



The 1948 Pontiac above has G. M. Hydra-Matic shift diagramed below. Clutch is eliminated and fluid coupling permits smooth operation

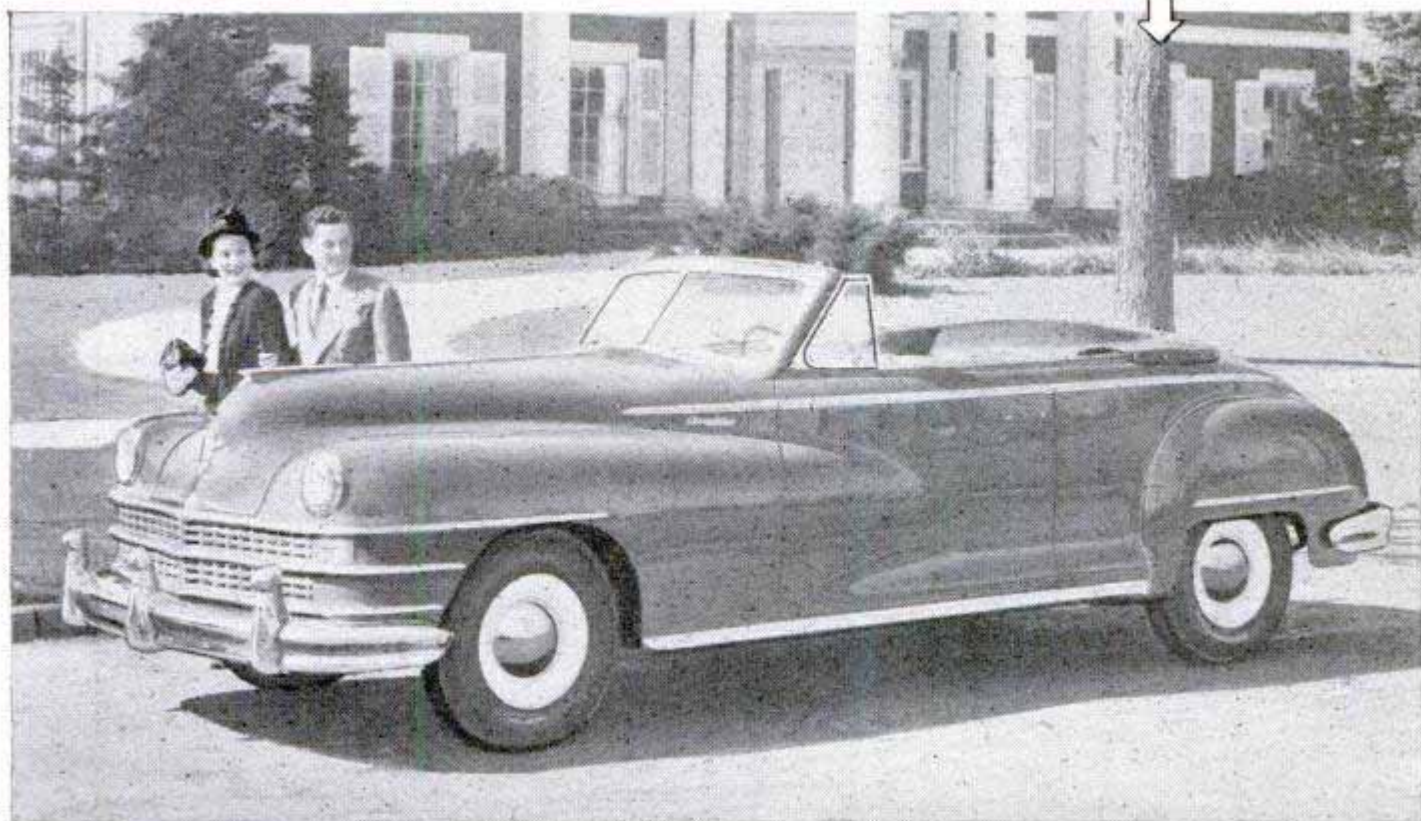


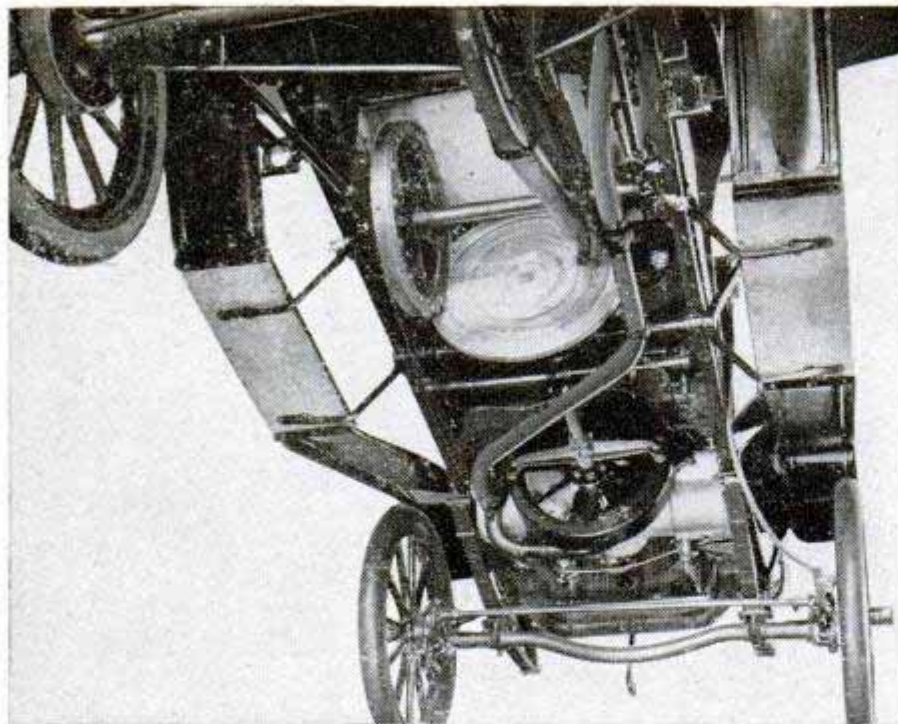
G. M. HYDRA-MATIC
(Olds-Cadillac-Pontiac)



CHRYSLER
DE SOTO
FLUID DRIVE AND SEMI-AUTOMATIC TRANSMISSION

Chrysler below uses Fluid Drive automatic transmission diagramed above and provides four speeds





Carter (1909) used friction transmission. Large disk driven by engine contacted friction-faced wheel connected by chain to rear axle of car. Wheel moved across face of disk to get variable ratio and even reverse!

mounted behind a fluid coupling and a conventional foot clutch. Introduced in 1940, this design is also available on the DeSoto. A variety of names has been applied—Vacamatic, Simplimatic and Tip-Toe Shift. This automatic transmission is different from the fluid coupling arrangement used on the Dodge, also termed a "Fluid Drive."

The foot clutch is needed for the initial shift from neutral to high range, but thereafter all normal driving is done with-

out touching either gear-shift lever or clutch.

With selector lever in high range, starts are made in third, which is next-to-top gear. The shift to fourth, above a certain fixed minimum speed, is made merely by releasing the accelerator pedal. Then a free-wheeling device in the transmission releases the drive in third, and a hydraulic piston actuates the shift to fourth speed.

When in fourth, a "kick down" shift to third is made by depressing the accelerator pedal all the way. A special switch disconnects the ignition circuit for a few explosions, thereby causing a momentary "break" in the power flow. During this interval the shift to free-wheeling third is completed by the hydraulic piston.

The fluid coupling permits gradual application of engine power when starting from a standstill. It also cushions the power flow. The fluid coupling acts like a slipping clutch, with diminishing slip as car speed increases. Unlike a mechanical clutch, the fluid coupling does not wear out by slipping, as slip takes place in a body of circulating oil.

(Continued to page 264)

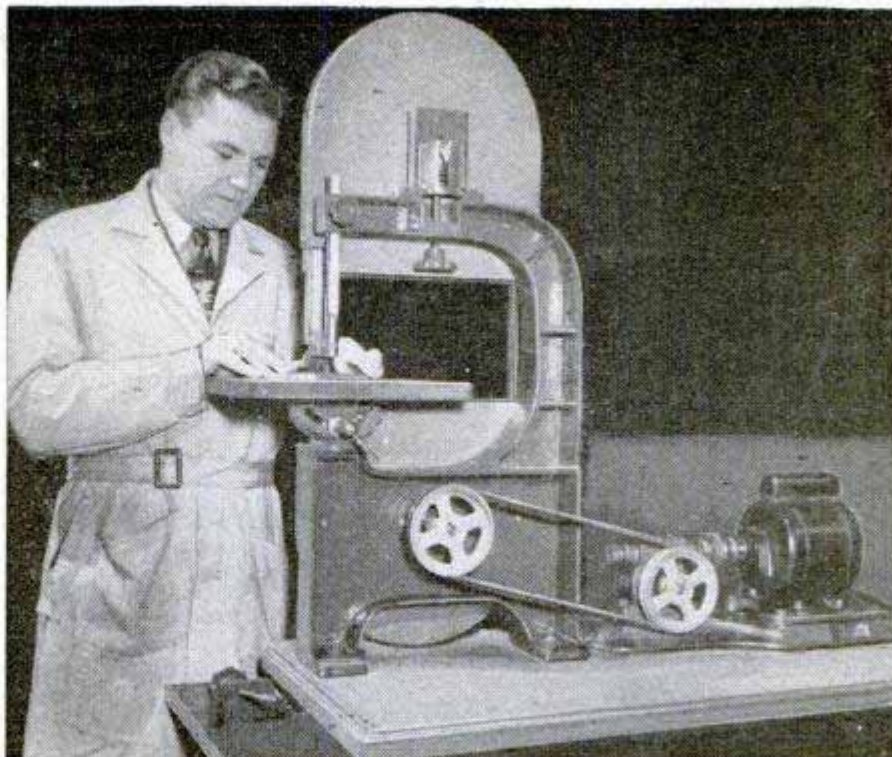
COMPARATIVE CHART OF AUTOMATIC TRANSMISSIONS

| | FLUID DRIVE (Chrysler, DeSoto) | DRIVE MASTER (Hudson) | HYDRA-MATIC (Cadillac, Oldsmobile, Pontiac) | DYNAFLOW (Buick Roadmaster) |
|----------------------------------|--------------------------------------|---------------------------|--|-----------------------------------|
| Foot Clutch | Yes | Yes (automatic) | No | No |
| Hand Control | Modified "H" | Standard | N D L R* | P N D L R* |
| Acc. Pedal— Lift to Shift | Yes | Yes | No | No |
| Automatic Shift | Hydraulic | Vac. clutch Vac. shift | Hydraulic | Torque converter |
| Up-Shift Speeds— Automatic | 3-4 | 2-3 | 1-2-3-4 | Infinite |
| Forward Speeds— Manual Shifts | Lo-Hi | 1-2-3 | Lo-Dr | Lo-Dr |
| Park in Gear | No | Yes | Yes (Rev.) | Special position |

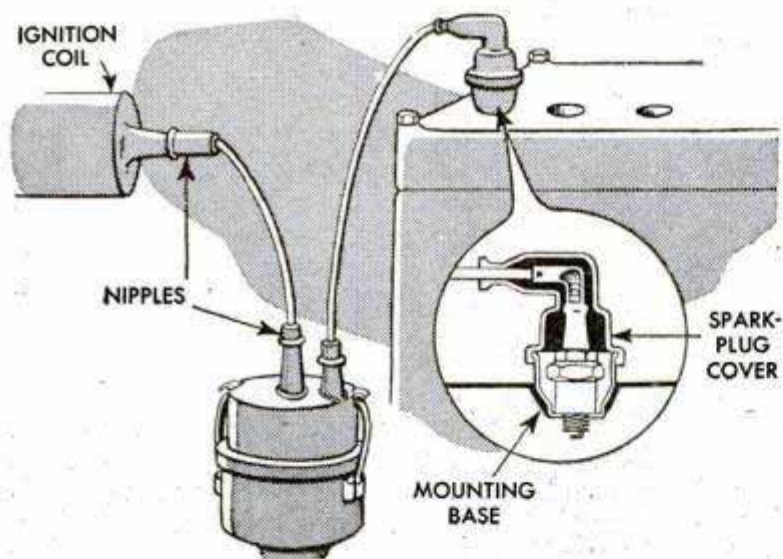
* N—neutral, D—drive, L—low, R—reverse, P—parking.

Bandsaw "Brake" Permits Metal Cuts

Wood-cutting bandsaws can be converted to metal cutting with a speed reducer that gives a reduction ratio of 30 to 1. The $\frac{1}{4}$ or $\frac{1}{3}$ -horsepower motor is mounted permanently on a base which also supports the reducer. When the saw is used for normal wood cutting, the base is set with the motor shaft at right angles to the saw, and the belt is installed in the usual manner. To convert the saw to metal cutting, the entire base and motor are turned 90 degrees and the speed reducer is connected to the shaft with a flexible coupling. Worm gears inside the reducer then cut the blade speed to approximately 180 feet per minute. With the correct cutting blade this is the proper



speed for cutting soft and low-carbon steel, copper, brass, bronze and aluminum. Variations in speed are possible by using other pulleys on the reducer and the saw.

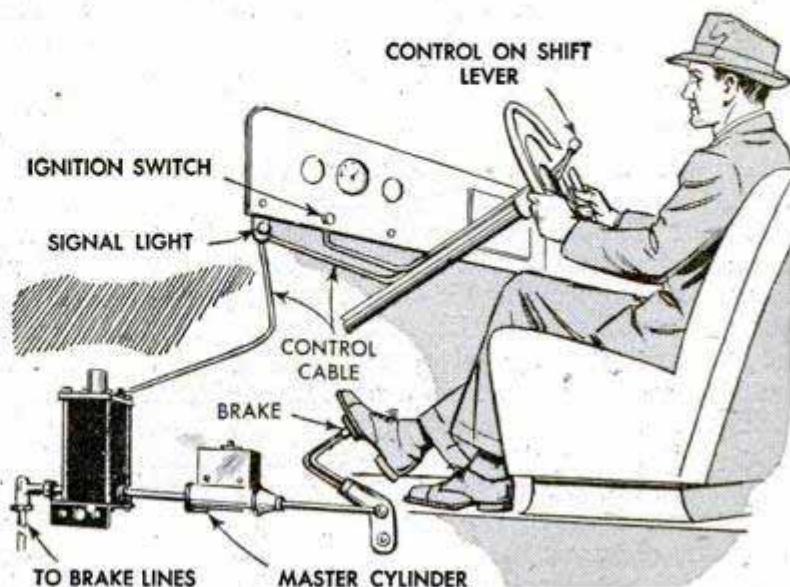


Raincoats for Spark Plugs Keep Ignition System Dry

Miniature shields for spark plugs protect ignition systems from water during rainy weather. A kit for installation includes mounting bases of cadmium-plated steel serving as spark-plug gaskets, right-angle covers made of synthetic rubber which fit like raincoats over the plugs, and flexible plastic ignition coil and distributor-cap nipples. The parts are made for cars built by the Chrysler Corporation.

Fingertip Brake Control Ends Stop-Light "Creep"

Your car won't roll on grades while you wait for the stop light to change if it is equipped with a fingertip-control braking device. Operated electromagnetically, the device holds hydraulic brakes on until released by a control on the shift lever. A red light on the dash glows when the brake is on. The unit is installed in the hydraulic system near the master cylinder and is wired through the ignition switch so that it cannot be left on unintentionally when the automobile is parked.





At this speed a boat doesn't draw much water! With fins out of water, the Li'l Injun is almost airborne

Stepping Up the

MOTORBOAT pilots are revving up their water-borne power plants these days, determined to exceed in 1948 the pace set on a western racing course last October. When the two-day meet ended, 14 new world records were on the books. In three classes that set new marks on the mile straightaway, the powerful boats rode their struts and little else three quarters of the distance.

For the men who live largely just to get more miles per hour out of limited displacement boats, those were jubilant days. But there was plenty of need for reflection.

They realized then that if hydroplanes were to go any faster without flying or becoming sheer suicide buggies, some changes had to be made. They also realized that runabouts (fun boats rather than race boats) were still terrific speedboats.

When Tommy Caldwell's rakish Blue Blazes streaked 88.782 miles per hour to a new world mark for 135-cubic-inch hydroplanes, and Tommy Hill in California Kid, a 225-cubic-inch hydro, reached 90.114, racing experts learned one important thing: the thin, aircraft-plywood hulls of step-bottom, lightweight hydroplanes had taken all the punishment they could from the power load of motors not yet peaked, without changes in design.

Then when Lorin Pennington's Copper-

By Bob Ruskauff

head, a Class-E racing runabout, raced to a world record of 70.245 miles per hour, a theory that had been accepted as revolutionary a few years back had to be discarded. When "three point" hydroplanes first entered the field it was generally predicted that the runabout hull, for speed competition, was doomed. But Copperhead and a half dozen other boats in her class that went almost as fast, proved otherwise. The Copperhead, although trimmed for racing, was actually a boat of basic hull plan identical with many built and used strictly for utility, ski-towing and other pleasure purposes!

So what does the speedboat future hold?

Four Californians whose achievements with marine speed have become internationally known were asked this question. They are Clay Smith, motor expert, and Joe Guess, hull designer, of the 225-cubic-inch series of Guess Who hydroplanes; Bill Campbell, runabout designer, and Harold J. (Hi) Johnson, propeller wizard.

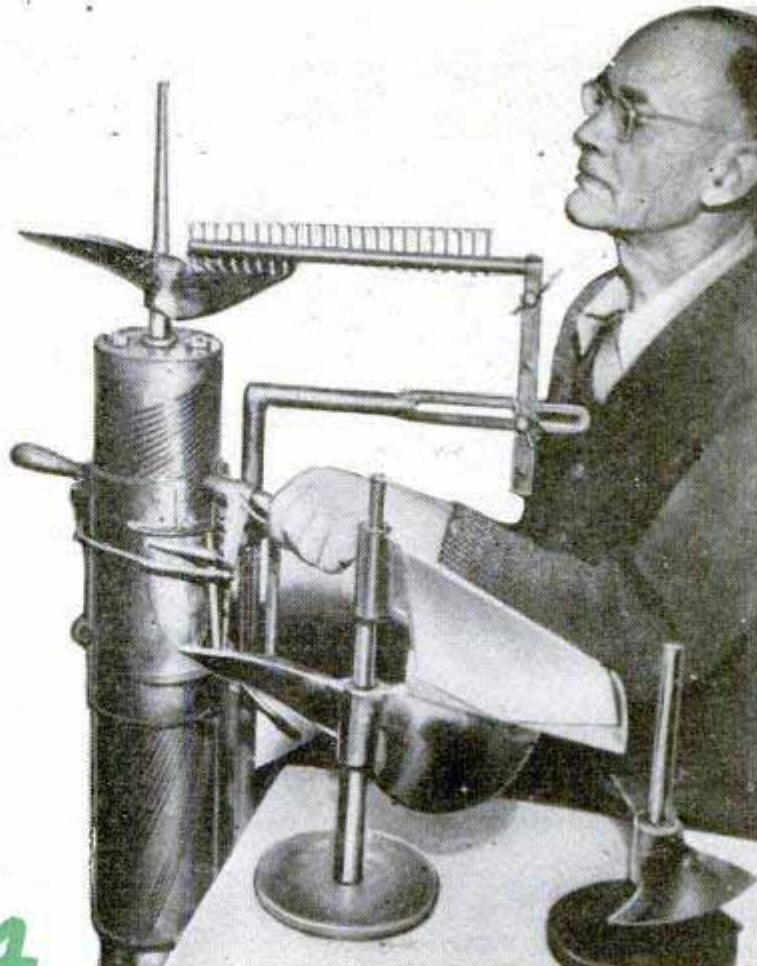
Like most top men of the motorboat world, all are now in the midst of long-range experimental work.

They concurred in several general beliefs: (1) Limited displacement racing boats within this year or the next will reach speeds possibly 10 percent greater than the records of 1947. This applies both

to the three-point step-hydroplanes and the racing runabouts. (2) Development of propellers, which must drive whatever load the engine and hull designers bring out, is vital. (3) Success will come because, more than ever in the past, designers of motors, hulls and propellers are working together to solve the problem. (4) Lighter, stronger materials both in hulls and power plants will play a big role. (5) Strangely enough, numerous ideas, such as the transfer drive, discarded a few years ago as impractical, will be resurrected because engineers have learned how to apply them.

What about the runabout? This class has most interest for the fast-boat owner who wants high speed

Right, Harold Johnson, propeller designer, checks blade pitch with gauge he invented. Below, racers put their boats in the water



Speedboats





This record-setting racer skims along at 73 miles an hour. Note that one propeller blade is out of water.

with safety in a sport boat but doesn't care for an outfit designed only for racing.

Campbell, who evolved the Class-E racing runabout hull plan after five years experimentation, says that any basic hull change can await developments in motors and props. The hull has yet to be strained to its limit or peaked, as designers say.

The veteran designer and builder says: "When Copperhead and Duz broke world records, with at least five boats in the E-racing-runabout class hard on their transoms, the speeds and consistency in the class indicated that the runabout hull has not been peaked.

"The whole design of the E fares from the bottom lines and in all the plans the lines were allowed to build the boat. With the conventional direct drive, runabouts

will reach within five miles of what Copperhead did and still remain fast, maneuverable play boats. You can carry three people, haul water skiers and control the boat at trolling speeds.

"On the other hand, we've only begun to realize the high-speed potentials of the V-drive. For an extra cost of \$350, the driver can shift his motor forward or back of the driving cockpit to achieve perfect balance and maneuverability at high speed, while maintaining a correct shaft angle necessary to get that speed.

"To achieve the type of E-racing runabout which hit 70, the boat in plan was reduced from several fairly successful runabouts. It was diminished in all sizes. We lowered the freeboard. We shortened the hull, lightened it and added relief

chines to increase stability. While making it lighter we also made it stronger by using laminated woods.

"The runabout which will go 10 or 15 percent faster than Copperhead can retain the basic plan, but will have some changes. These include lower freeboard, increased lamination and less weight and a lighter, more compact gear box to handle the transfer drive. It will house a more powerful motor within the displacement restrictions. It will pos-

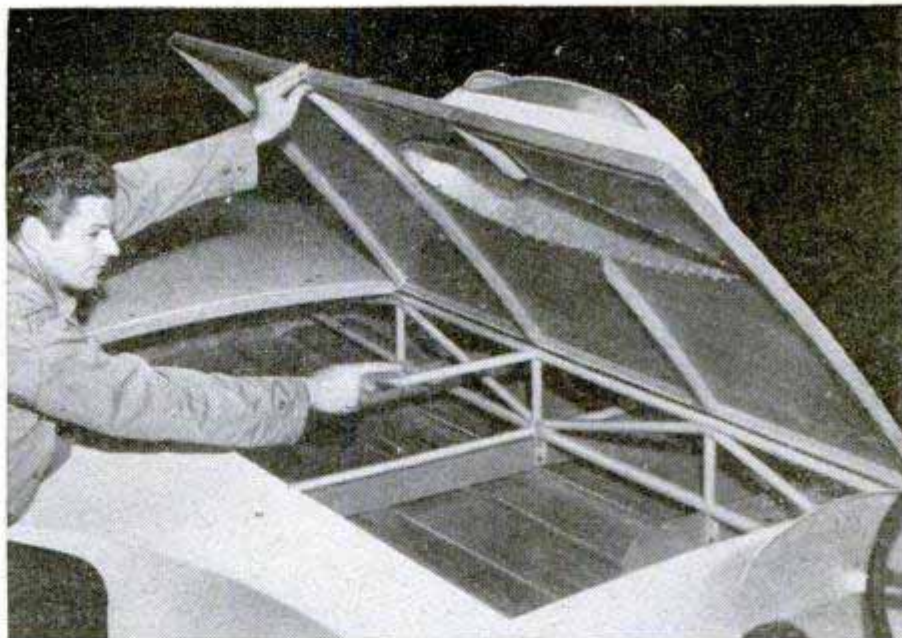
"Cleaver" propeller of new design (top) compared with conventional blade



sibly have a more perfect propeller setup. Beyond that, I wouldn't predict!"

Another new development is the wafer-thin hull that Clay Smith and Joe Guess use in Guess Who III. This 225-cubic-inch hydroplane might be the first in the small displacement field to hit 100 miles per hour (10 miles faster than the California Kid traveled). She is a successor to the famed 225, Guess Who II, that Smith drove through two undefeated seasons of racing and once held (at 79.840 m.p.h.) the world record that California Kid later lifted to over 90.

The new boat is a radical departure. Smith and Guess are installing a Ford-6 power plant, but not conventionally. The motor will be mounted on its side! This will reduce frontal resistance by decreasing the size of the metal cowling or "blister." Only the manifold will be above deck. Lowering of gravity weight center will decrease tipping and rocking. Rigidity is gained by resting the motor on a metal truss of lightweight chrome molybdenum tubing of high tensile strength, rather than on wooden stringers. From topside, the new boat resembles the half-section of a Bartlett pear.



Engine will rest on its side in shallow compartment of racer shown below

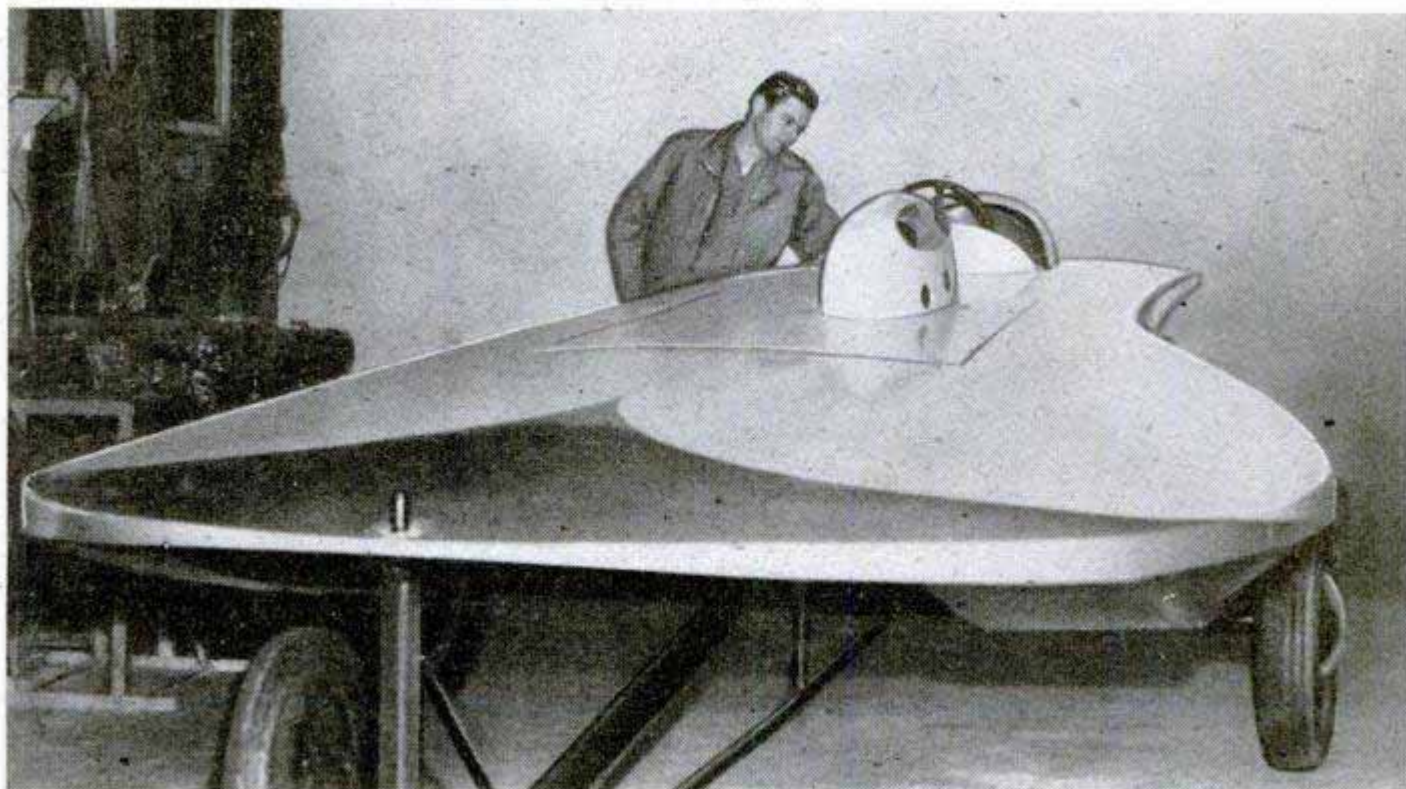
"She's deceiving," Guess said. "There's much closed-in area and a lot of hardwood (vertical-grain fir, with a $\frac{5}{16}$ -inch bottom), but she's light—about 375 pounds." Yet the hull is 15 feet 6 inches long, 30 inches longer than Guess Who II. From extreme width of 103 inches she tapers to only 54 inches at the stern.

Propeller design is vital in high-speed racing boats. Without a propeller the best racing boat in the world is as useless as a rowboat without oars. In this field one of the outstanding developments is a new propeller developed by Hi Johnson.

Johnson's propeller has a thick trailing

(Continued to page 260)

Guess Who III, potential 100-m.p.h. hydroplane, is wafer-thin. Blister on engine hatch covers manifold





1949 LINCOLN

First of the 1949 luxury cars to make their bow are the Lincoln and Lincoln Cosmopolitan models styled in the modern trend—low and wide with long sweeping lines and “picture window” visibility. Both models are powered by a new 152-horse-

The 1949 Lincoln Cosmopolitan town sedan is one of eight new models with new engine, chassis and body

power V8 L-head engine. The Cosmopolitan model, which has a wheelbase of 125 inches, is four inches longer than the Lincoln. All Lincoln Cosmopolitan models have automatic overdrive which is optional equipment on the Lincolns.



1949 MERCURY

Second product of the Ford Motor Company's 100-million-dollar new-car program is the 1949 Mercury presented in four body styles: four-door sport sedan, six-passenger coupe, six-passenger convertible, and station wagon. The new Mercury has a

The 1949 Mercury six-passenger coupe is wider and lower with big windows for all-around view of road

110-horsepower V8 engine, 118-inch wheelbase and is only five feet two inches high. The front seat is eight inches wider than in previous models. An overdrive unit, installed as optional equipment, becomes operative at speeds over 25 m.p.h.



Spring-Powered Gig Reels in Fish

Fish and frogs are "shot" with a miniature harpoon invented by 13-year-old Billy Taylor of Brookhaven, Ga. When the fisherman hits his target he merely reels in the fish or frog with a conventional fishing reel. The gig is "loaded" by inserting it in the rod, which compresses a strong spring. The line from the reel is then attached to the harpoon. When a trigger is pulled, the harpoon shoots into the water toward the target. Young Taylor has offers from fishing-equipment manufacturers, suppliers, sportsmen and even the Coast Guard. He says he will send the first gig to "the country's number one fisherman, President Truman."



Bundled Newspapers Counted

William Barnwell of the Pueblo (Colo.) Star-Journal and Chieftain has invented a way to check the number of newspapers in a bundle. Presses automatically count them but errors are sometimes made in bundling odd numbers. With Barnwell's system, the stack is put under a measuring rod and weight forced down on it by a lever. The indicated figure is then checked against a table that shows the sizes of all editions from eight to 56 pages.



Quarter in Slot Operates Recorder, Out Drops "Voice Letter"

Two-minute phonograph records in the form of "voice letters" and holiday greetings are cut by a coin-operated machine that is completely automatic. Upon insertion of a quarter, a fiber disk drops on the turntable and an illuminated panel gives instructions to the operator. "Mike fright" is eliminated by a conventional hand telephone instead of a microphone. A voice adapter automatically adjusts the machine to compensate for too strong or too weak voices. After the record is cut the machine replays it either through the telephone for private listening or through a loudspeaker before delivering it to the customer. The record can be replayed on any phonograph.

The Workshop Rolls to School

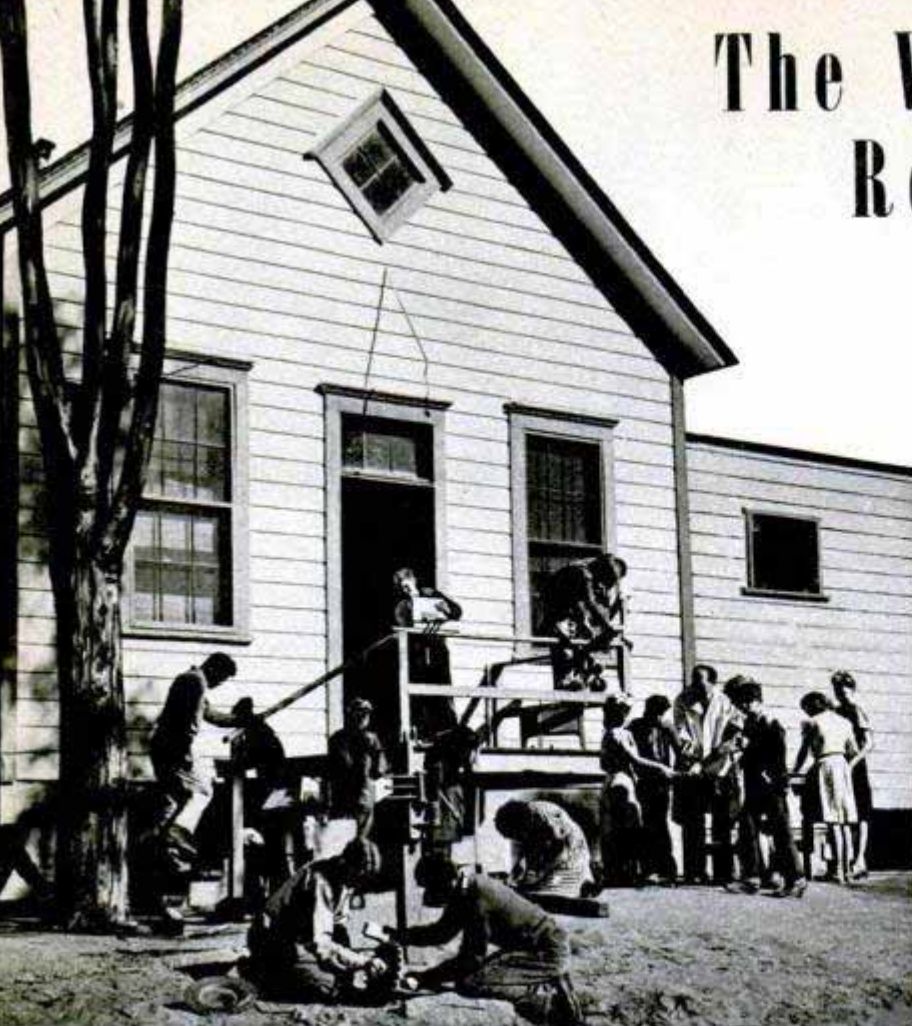
By Joseph S. Baer

FOR THE NATION'S three million kids attending one-teacher schools—among whom might be another Edison or Ford—the “shopmobile” means better instruction coupled with a holiday from classes.

The shopmobile brings children in under-equipped, country schools the opportunity to work with tools.

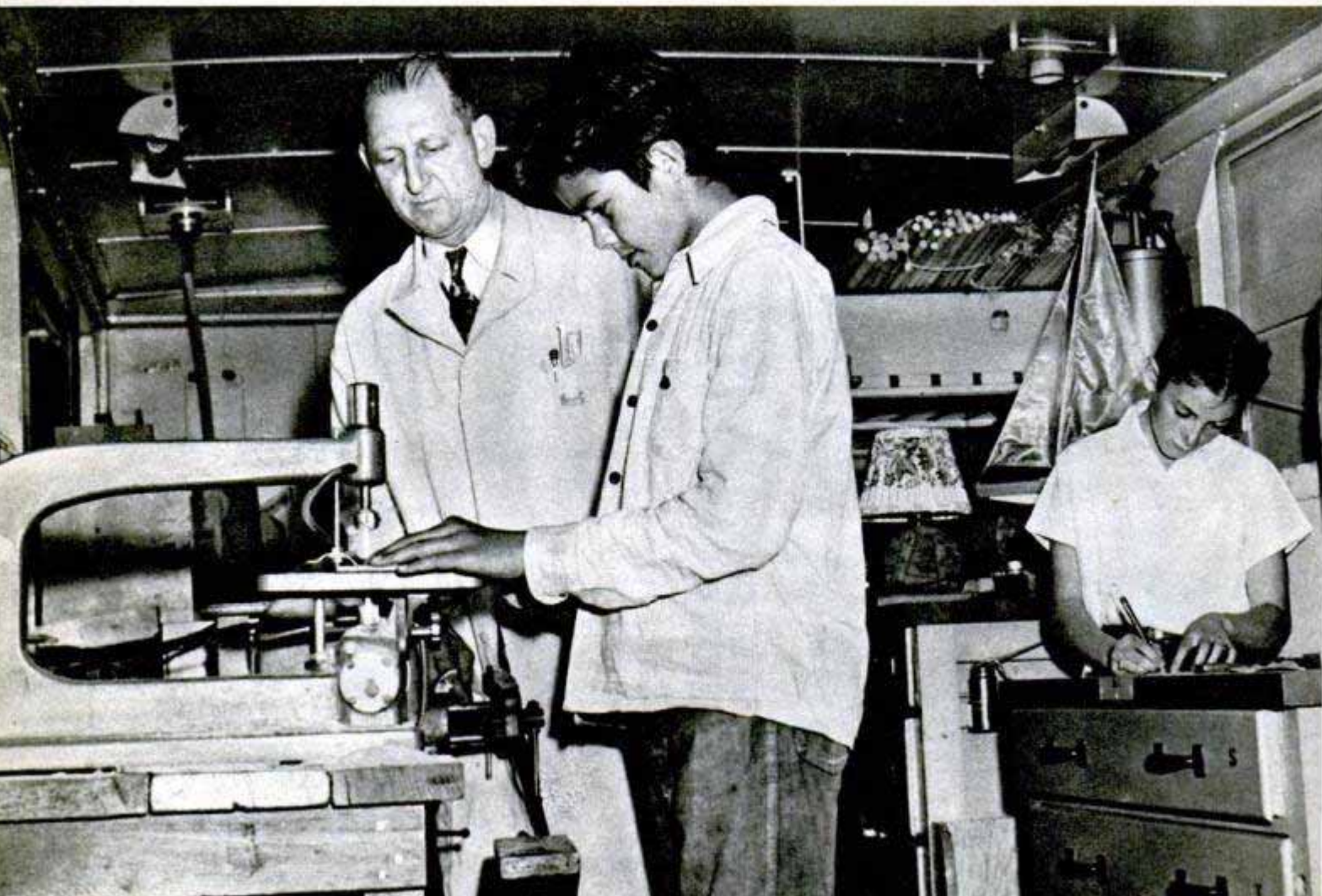
Here's the birth of the idea: When the War Assets Administration recently offered complete mobile shops for sale, 18 small school districts under the leadership of Dr. John S. Carroll, superintendent of San Diego County schools, jumped at the chance.

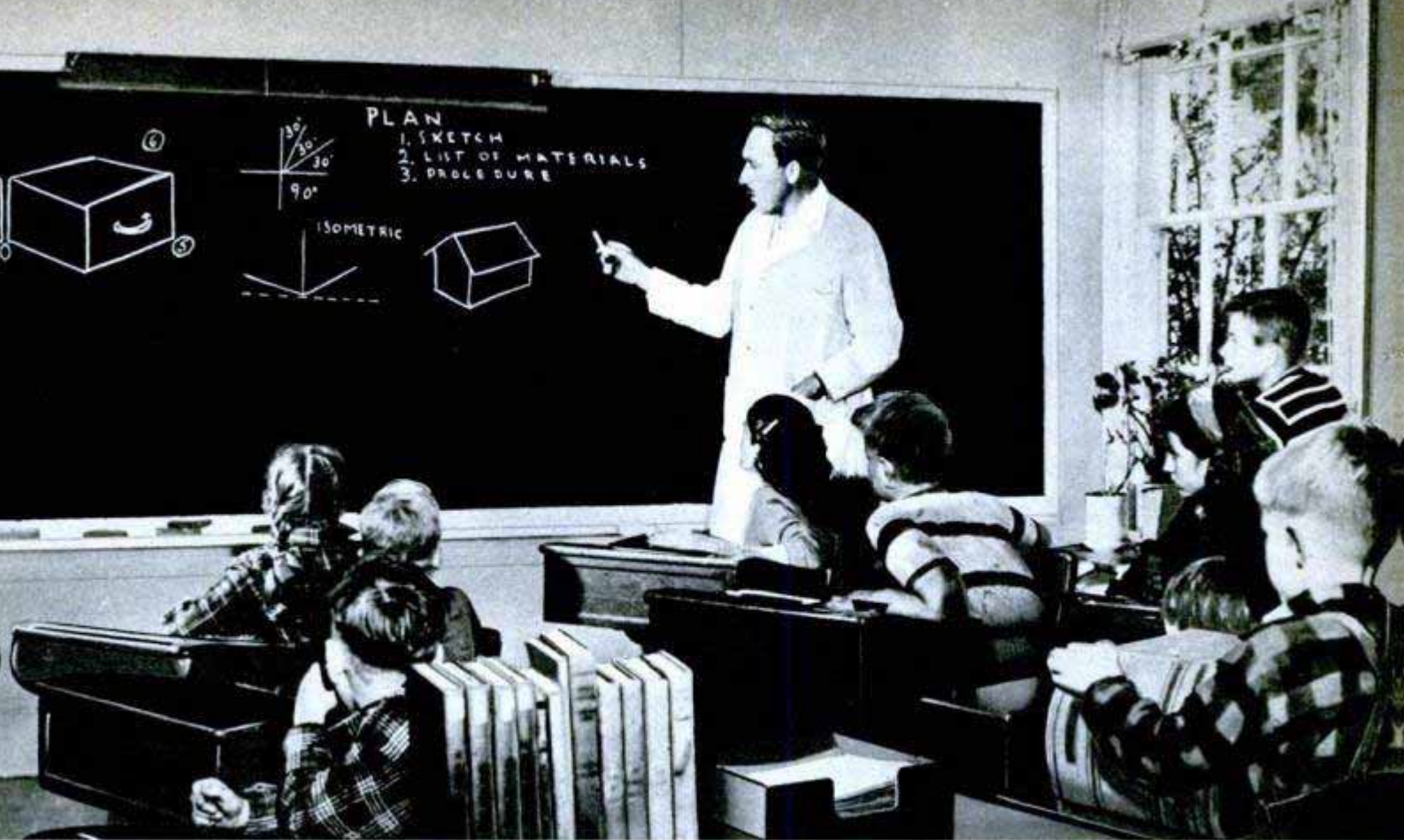
For years educators have realized that the one-teacher school doesn't give children a fair shake in equipment. Limited finances in smaller districts prohibit purchase and installation of expen-



Photos by Jack House and Bob Montague

Give the youngsters tools and even a school porch will serve as a workshop. Tools in the shopmobile are distributed for outdoor work. Below, individual instruction can be given inside the truck. Here the instructor checks student's first efforts with a jigsaw





On a weekly visit to a rural school a driver-instructor shows pupils how to prepare plans for their projects

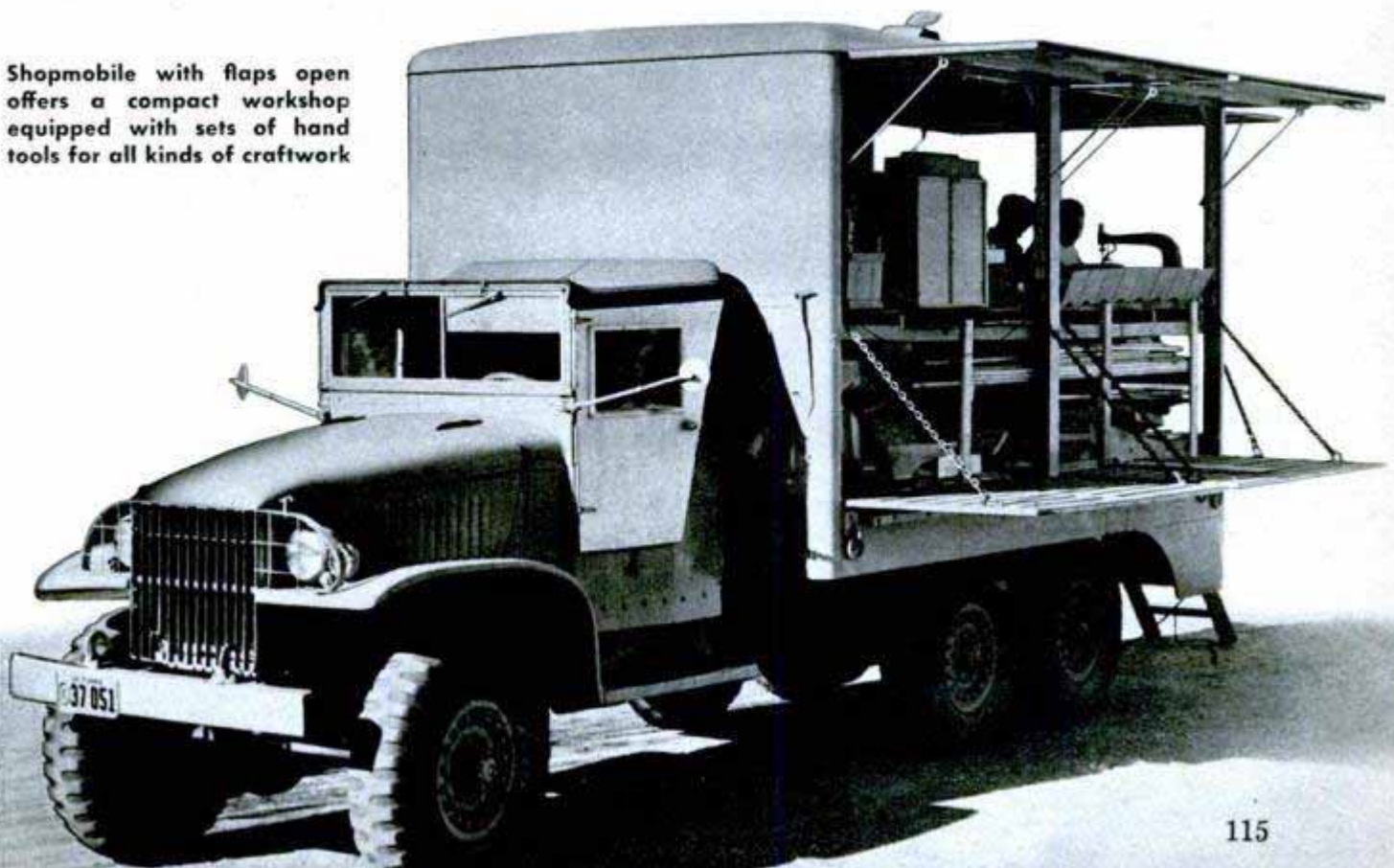
sive equipment that the city pupil takes for granted. And the one-room teacher can't be expected to teach the three R's and also be a specialist in industrial arts.

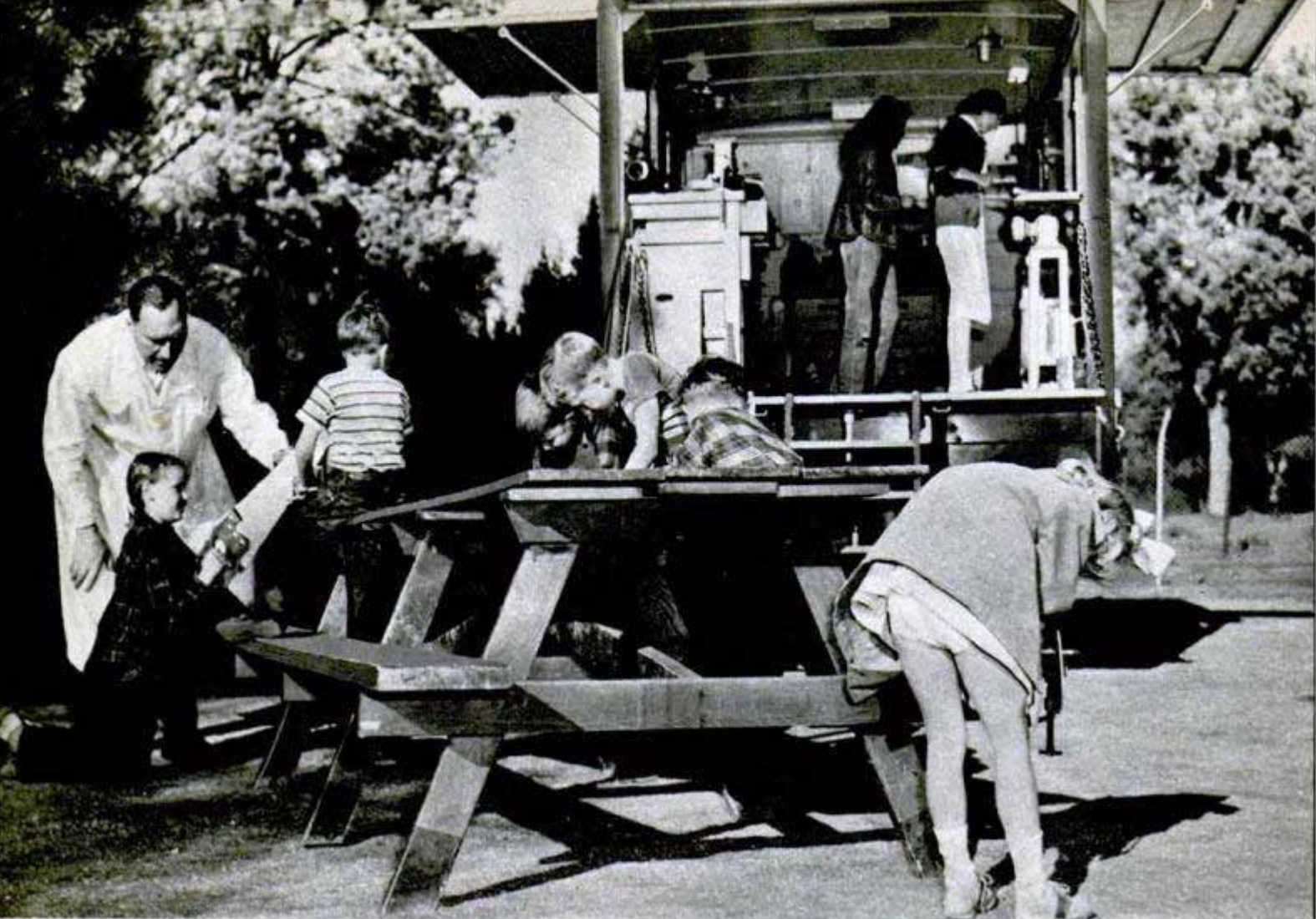
So the 18 school districts bought four of the war-surplus trucks at an average cost of \$450 apiece. But these aren't ordinary trucks—they are rolling machine shops equipped with all essential tools. And they

are sturdy trucks that absorb the impact of several hundred enthusiastic students each week. They are the 2½-ton, six-wheel van-type vehicles, bought at less than five percent of their original cost.

School crews remodeled the trucks, painted them bright aluminum and replaced some of the heavy tools used by amphibious forces with complete sets of hand

Shopmobile with flaps open offers a compact workshop equipped with sets of hand tools for all kinds of craftwork





Even a rough picnic table makes a good workbench for the pupils. Girls as well as boys take the shop course

tools. Among these are tools for working with plastic, wood, pottery, leather and metal. One power jigsaw was left in each truck. The shopmobiles, already wired, can be plugged into any electric system.

Two trucks were placed in service. Each is driven by a circuit-rider who is a specialist in teaching industrial arts. The instructors work out of a central point in the county and usually spend a half day at each school on the circuit per week.

When the shopmobile rolls up to a school the driver-teacher lets down the truck flaps and opens shop. At small schools where attendance is light, youngsters leave the classroom and work right in the shopmobile, weather offering few obstacles in mild southern California.

Occasionally, classwork is done inside where the teacher can draw simple plans on the blackboard. After a short period of instruction the students go to work building birdhouses, cabinets and shelves.

The mobile shop's visit ties in construction work with book "larnin'." For example, if the class is studying early California history, children use the tools to construct models of covered wagons, adobe houses or ox carts. Children enjoy this method of

dramatizing their studies because it translates a textbook fact into a reality.

Driver-teachers also give the regular teachers pointers on carrying on the construction work after the shopmobile rolls away until the following week. And teachers may be given instruction too. The instructor shows them how to build simple teaching aids that demonstrate visually, for example, how a unit can be broken into fractions.

Enthusiasm for the shopmobiles is high among children, teachers and school administrators. Plans are afoot to use the trucks for adult classes and for Boy and Girl Scouts interested in craftwork. And the other two trucks probably will be equipped and rolling the roads soon.

At present the cost of operating one truck is estimated at almost \$5000 a year, which includes the instructor's salary. By pooling resources with other schools, each school can have the shop service a half day each week for only \$500 a year.

As children become more skillful in handling the tools, more power tools can be added—lathes, drill presses and joiners—which were removed from the trucks and stored for future use.



Plane's Wheels Slide Back To Lessen Shock of Landing

For added safety, all Constellations are being modified so that the landing-gear wheels can move back about six inches when the big planes touch down at 100 miles an hour. The hydraulic damping device, replacing a rigid brace, cuts down the momentary initial load peak nearly a third. It also reduces the lurching sensation on landing about one fourth. Massive 40-foot towers that look like modern guillotines were used in tests for the new device. The wheels were spun 100 miles an hour in reverse and weighted above with lead to simulate landings.



Lockheed Aircraft photos

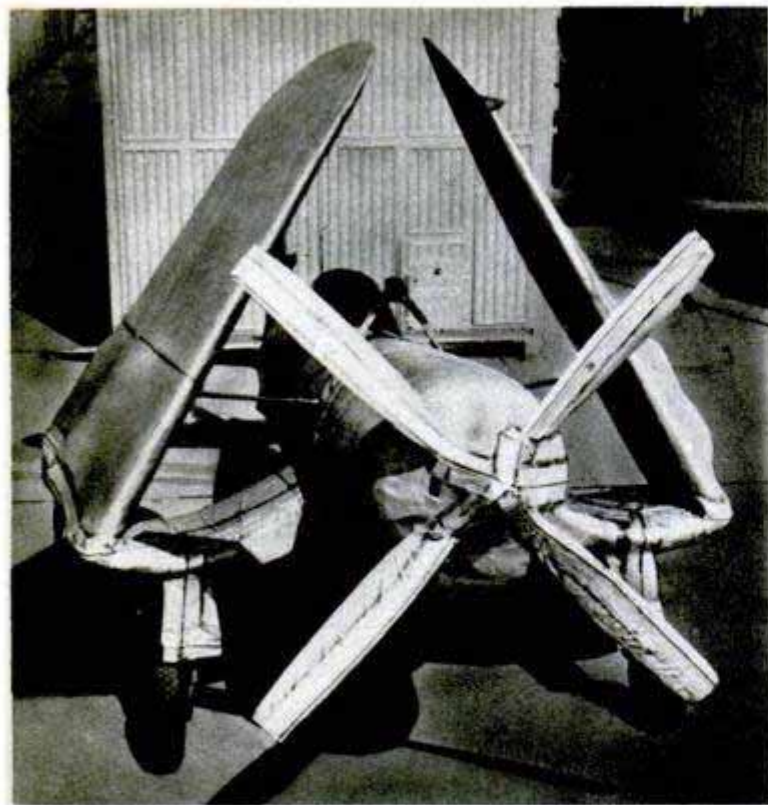
Above, on "guillotine" used in perfecting new landing aid, wing lift was duplicated by metal straps from top of tower to gear absorbing some of shock



Packaging Machine

To speed the packaging of screws, bolts, nuts and washers that are packed with heat-control instruments, the Minneapolis-Honeywell Regulator Company has devised a machine that is 18 times faster than a worker operating by hand. The machine, operated by one person, is adjusted to drop the required number of pieces into an envelope. It then closes the flap and staples the envelope. The output of six girls who formerly packed the parts has been tripled by the machine.

☐ Milk cans may eventually be coated with an enamel made from milk itself, according to the U. S. Bureau of Dairy Industry.

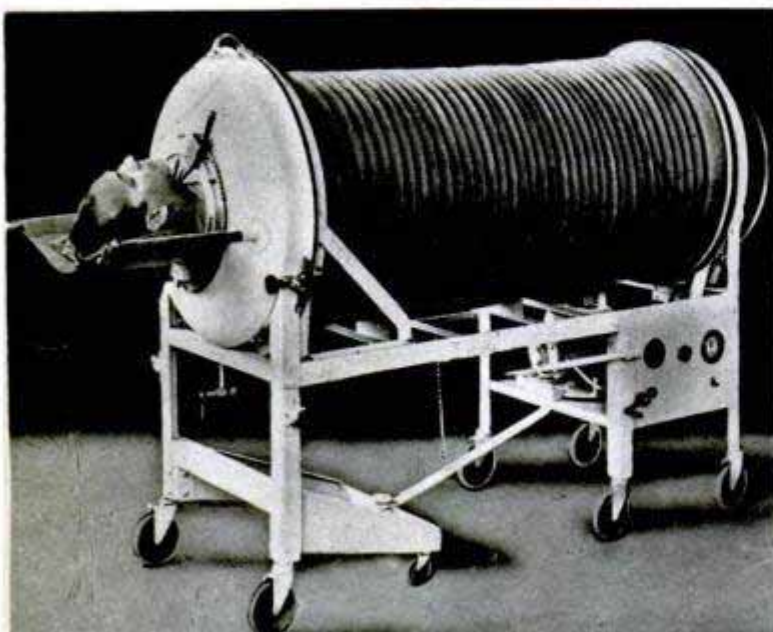


U. S. Navy photo

Zipper Bags Protect Aircraft To Be Stored for Short Time

Form-fitting zipper bags made of plastic-coated Fiberglas fabric will protect Navy planes in short-term storage. Inside the waterproof covers, chemicals will absorb moisture. They can be put on and taken off in one fourth the time required for present preservative measures. The tailored bags cover the entire plane, whereas present methods protect only the critical parts through applications of oil, grease and preservative compounds.

RUBBER LUNG equipped with a rubber bellows can be used instead of the iron lung in producing artificial breathing for victims of infantile paralysis



Dispenser Packs Wheel Bearings

Wheel bearings are lubricated thoroughly but without waste by a manual dispenser that forces grease between the races. Pressure is provided by turning a screw at the end of the dispenser. It services roller or ball bearings on all makes of passenger cars and light trucks. Quickly filled by suction, the dispenser holds enough grease to pack 40 average bearings.



Safety "Valve" on Fire Hose

Firemen are protected from the danger of bursting hose by a sealed air chamber that reduces the pressure wave of water when it is shut off at the nozzle. The chamber, developed at Northwestern University, also eliminates vibrations and knocks heard in home plumbing systems when faucets are turned off. It is a metal cylinder a foot in diameter and from 9 to 18 inches high connected to the fire-truck pump or in plumbing systems to the pipe near the faucet. Inside the chamber is a bellows sealed into a pocket of compressed air. When the nozzle or valve is closed the pressure wave rushes into the bellows and is absorbed by the compressed air. In the past, many firemen have lost their lives when water pressure burst a hose.

FISH-BOWL INCUBATOR has a transparent cover through which entire hatching operation can be seen. The incubator is heated and controlled electrically



Two-Wheeled Sulky For Small Tractor

Garden tractor users can sit down and ride if they have a sulky chassis that gives the small tractor two additional wheels and a spring seat. A dump-cart body that fits over the chassis converts the tractor into a small truck. The cart body takes loads up to seven cubic feet. Equipped with pneumatic tires and a foot brake, the chassis is also designed for use with a five-foot hayrake, or a mower can be attached for cutting the lawn.



Drill Blade Cuts Putty

Hardened putty is cut from window sash by a rotating blade attached to a standard electric drill. The cutter, designed for glass shops, contractors and remodelers, has a movable head which guides the carbide steel blade around the edge of the sash to cut away the putty. A fixed guide on the head is placed against the glass and an adjustable table is set to expose the cutter. The machine is held in this position as it is guided around the pane. The blade is adjustable from $\frac{3}{8}$ to 1-inch rabbet depth.

Global Sphere Charts

Distortions that characterize maps in attempting to project a curve onto a flat surface are overcome by a sphere chart. Designed by an Air Force officer for global navigation, they are actually plastic sections of a large globe. Two of the sections, 24 inches long and 12 inches wide, can cover a flight from San Francisco to Hawaii. They are lightweight, fit conveniently on a navigator's desk and can be made to any scale.



WHAT'S NEW *For Your Home*

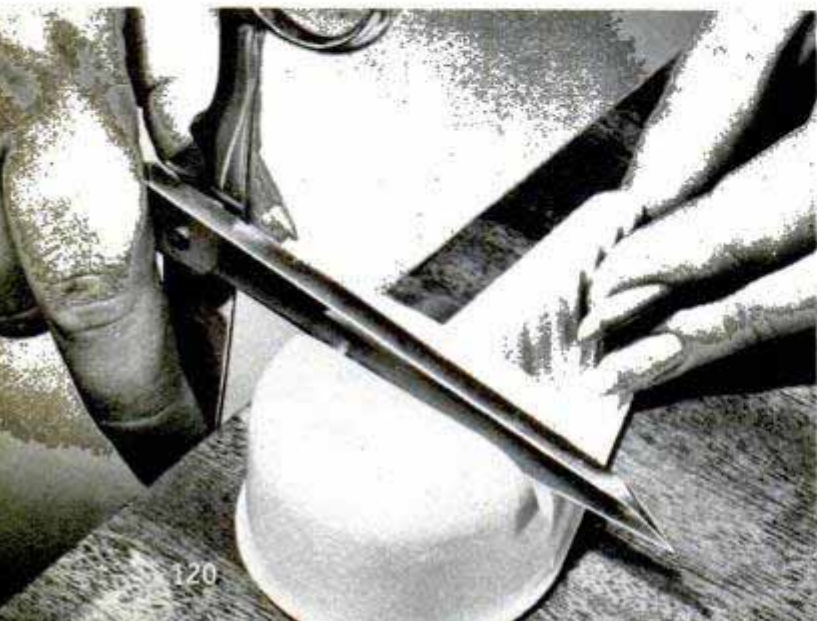
Sources of supply for these products may be obtained from Bureau of Information, Popular Mechanics Magazine



POTATO BAKER needs no oven. Designed for baking a single potato, aluminum holder bakes over an open flame. The potato is held by a perforated spit that speeds cooking of center

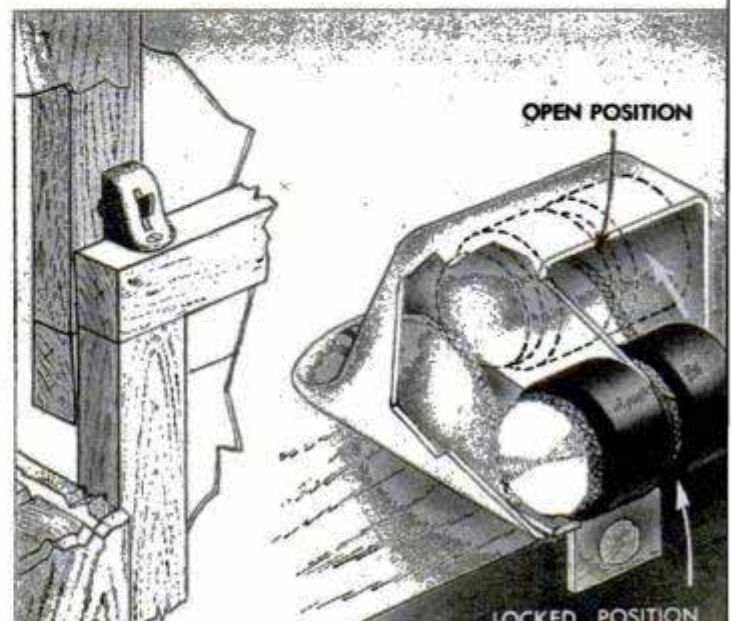
← **FOOD SHREDDER** is also a slicer and grater. The Tenite plastic unit won't chip and comes in several colors. Cutting blades are interchangeable to permit three different operations

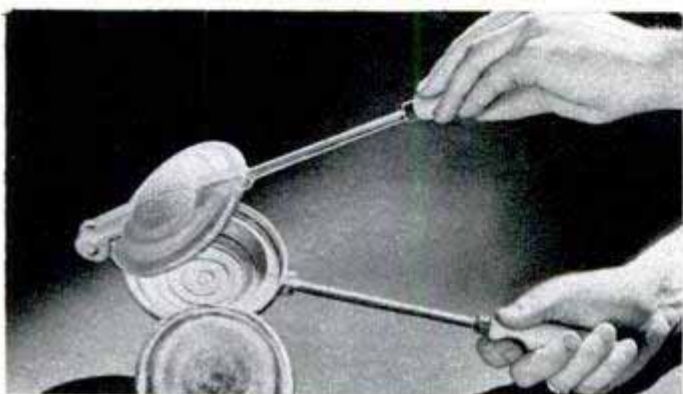
• **SHARPENER** for shears has no moving parts. Its carbide element sharpens scissors when the blades are drawn through a slot in the plastic case. Two quick strokes are enough



NURSING BOTTLE HOLDER makes pillow propping and other makeshift arrangements unnecessary. Made of Celanese plastic, the holder clamps the bottle firmly. During feeding, the bottle tilts forward so the milk flows easily, thus eliminating air sucking

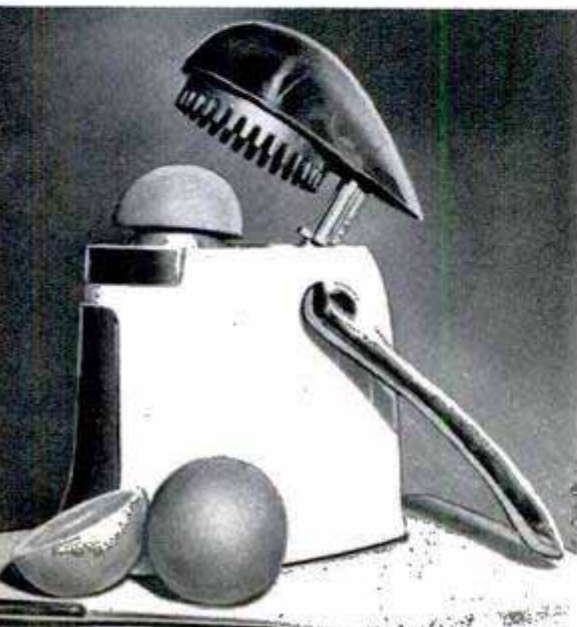
OPEN-WINDOW LOCK prevents further opening of a window from the outside. A rubber roller within the lock runs against the frame. When the window is moved, the metal core of the roller locks against a serrated track until the unlocking lever is moved



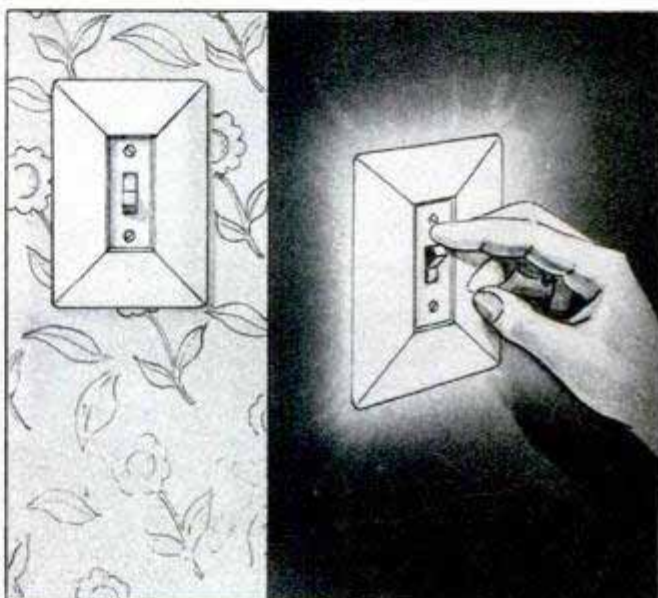


SANDWICH SEALER prevents juicy filling from squirting out when you bite into the sandwich. It seals the bread by compressing the edges and toasting. When the two halves of the sealer are closed, the bread is cut into circular pieces. It can be used over any flame and for any toasted sandwich

FRUIT JUICER with a top that tilts backward when raised is said to extract all of the juice from the fruit with less than one turn of the lever. Very little pressure is required to operate it. The strained juice runs into a built-in container in base

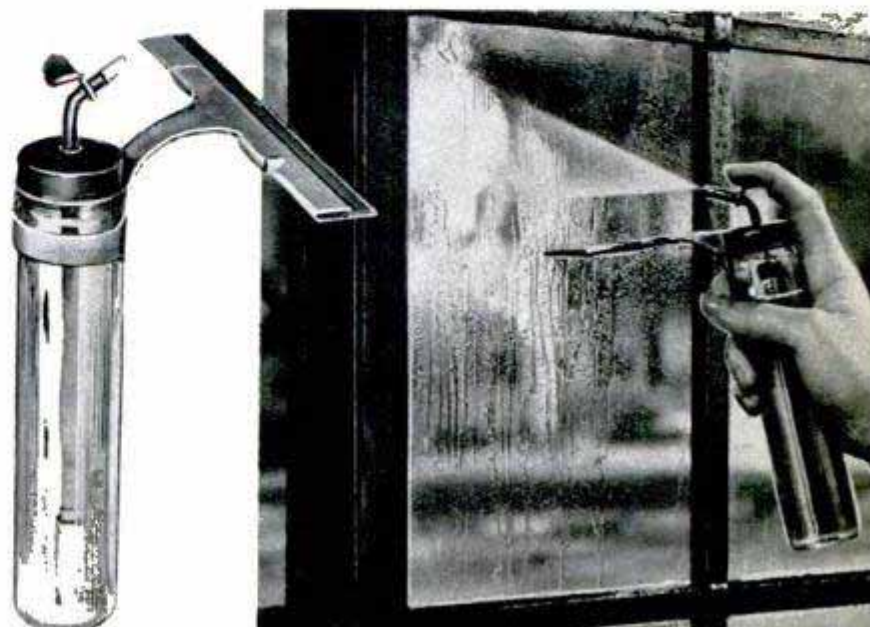


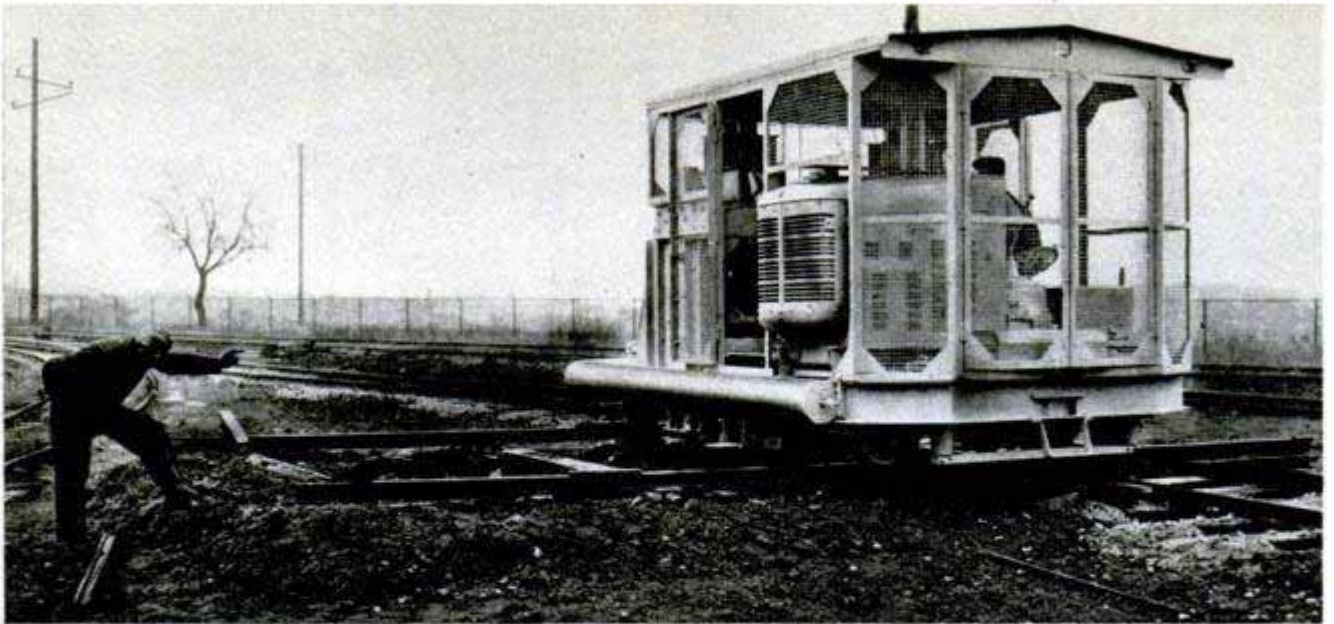
BATHROOM MIRROR, attached to the medicine cabinet by an extension bracket, can be adjusted to any angle. For normal use, it opens in the regular manner



GLOWING LIGHT SWITCH shines in the dark for hours after each exposure to light. Made of plastic, it is a complete plate that attaches in the usual way

WINDOW WASHER requires only one hand to operate and eliminates dripping sponges and clothes. Water is sprayed on by a plunger pump, wiped off by squeegee





Pullman-Standard Company photos

Built-in lift raises track ballaster, above, allowing sidewise movement off rails when main-line trains approach. Below, shoes forcing ballast beneath ties

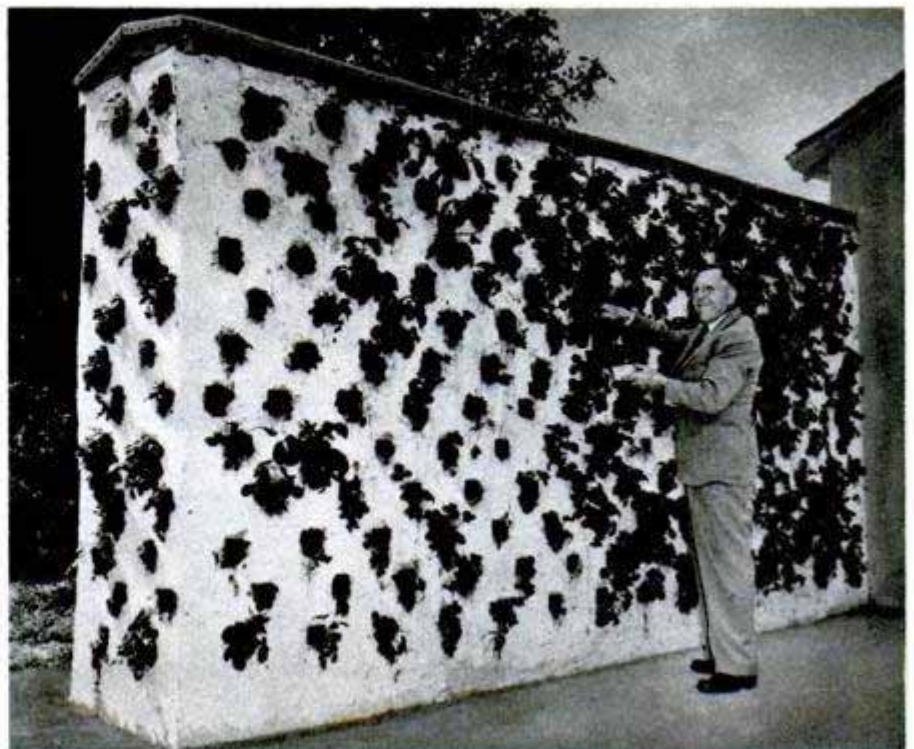


Railroad Track Ballaster

Rail-track ballaster is tamped down more than three times faster by a car now in service on the New York Central. It has a 2½-ton crosshead bar with 32 tamping shoes, which is motor-lifted and then dropped with a pile-driving action. The operator positions the tampers over a tie by looking through an opening in the floor. Then, while four helpers shovel in stone, cinder or gravel ballast, he lets the cross-head drop the number of blows required to pack it firmly. The ballaster can also straighten crooked ties. To get the car off the tracks, compressed-air cylinders force two horizontal bars down on the rails to raise the machine. Workers then slide rails under extra pairs of wheels at each end.

Stone-Wall Garden Grows Better Crop

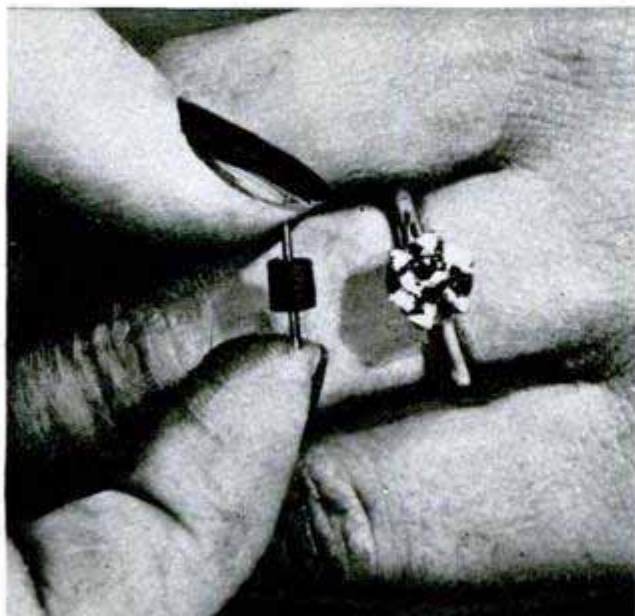
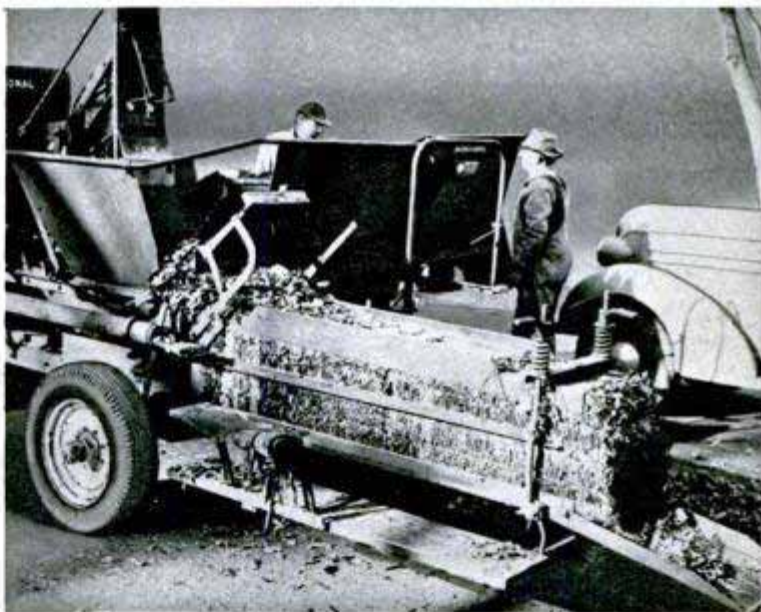
If you don't have room for a strawberry patch in your backyard, you can tip the garden upright and grow a better crop. That's what one California resident discovered when he planted strawberry vines in a vertical wall. The wall is made of two layers of concrete blocks with soil and moss between them. The vines are planted in openings in the wall. A water pipe at the top provides moisture. Because birds have no place to perch, they can't damage the berries as they do in patches.





Conveyor Bales Leaves Picked Up in Street

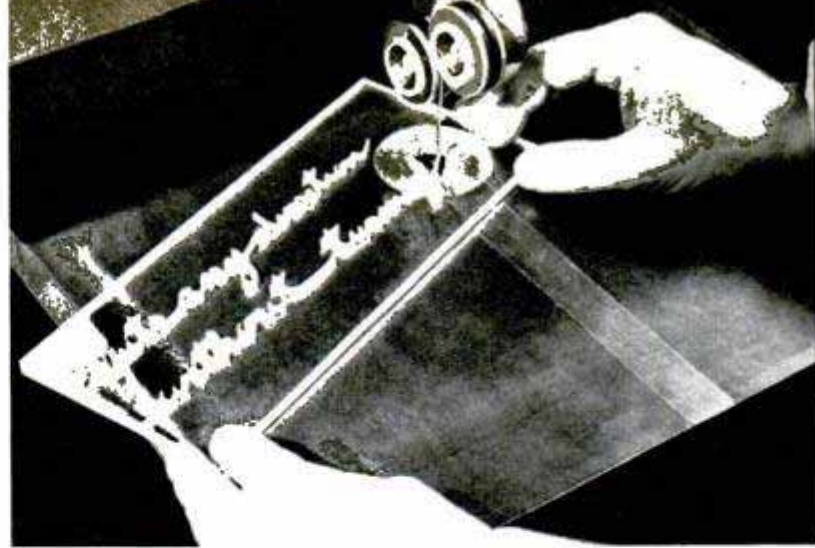
Gathering leaves from street gutters and parks presented a problem in Pueblo, Colo., until Herman Klipfel, highway commissioner, hitched a pick-up conveyor to an old hay baler. The machine gathers and bales the leaves in one operation. A grader shoves the leaves away from the curb. The system is faster and less expensive than sweeping up the leaves and loading them on trucks. Two men now do a job that formerly required a fleet of trucks, loading machine and several men.



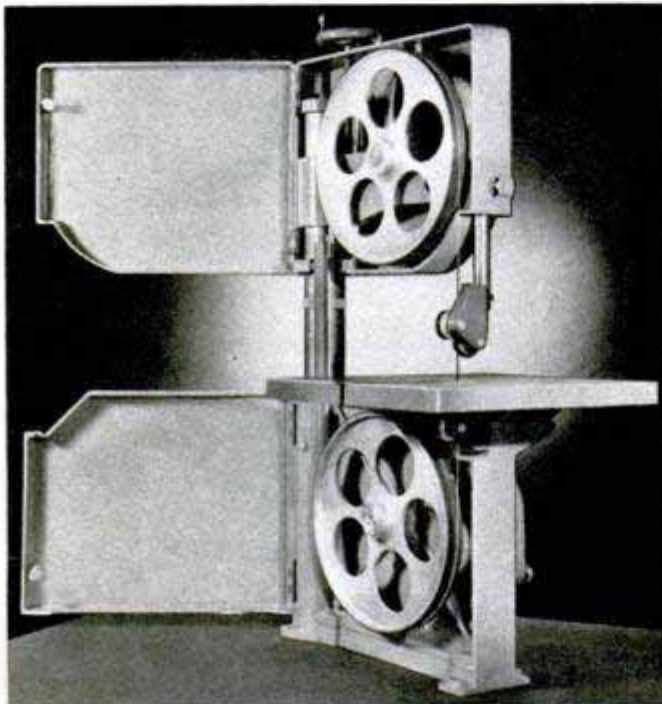
Motor Dwarfed by Diamond

Dwarfed by a 1.4-carat diamond is an electric motor that weighs less than a gram. It is the smallest of a series of sub-miniature motors being made by the U. S. Instrument Corporation for use in moving-picture cameras, mechanical toys and animated Christmas-tree ornaments. It measures only $\frac{3}{16}$ inch in length and diameter, requires $1\frac{1}{2}$ volts and runs with high efficiency at 7000 revolutions per minute.

Popular Mechanics is always ready to supply further information to readers about various products described in any issue. Just write to Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, for a prompt reply



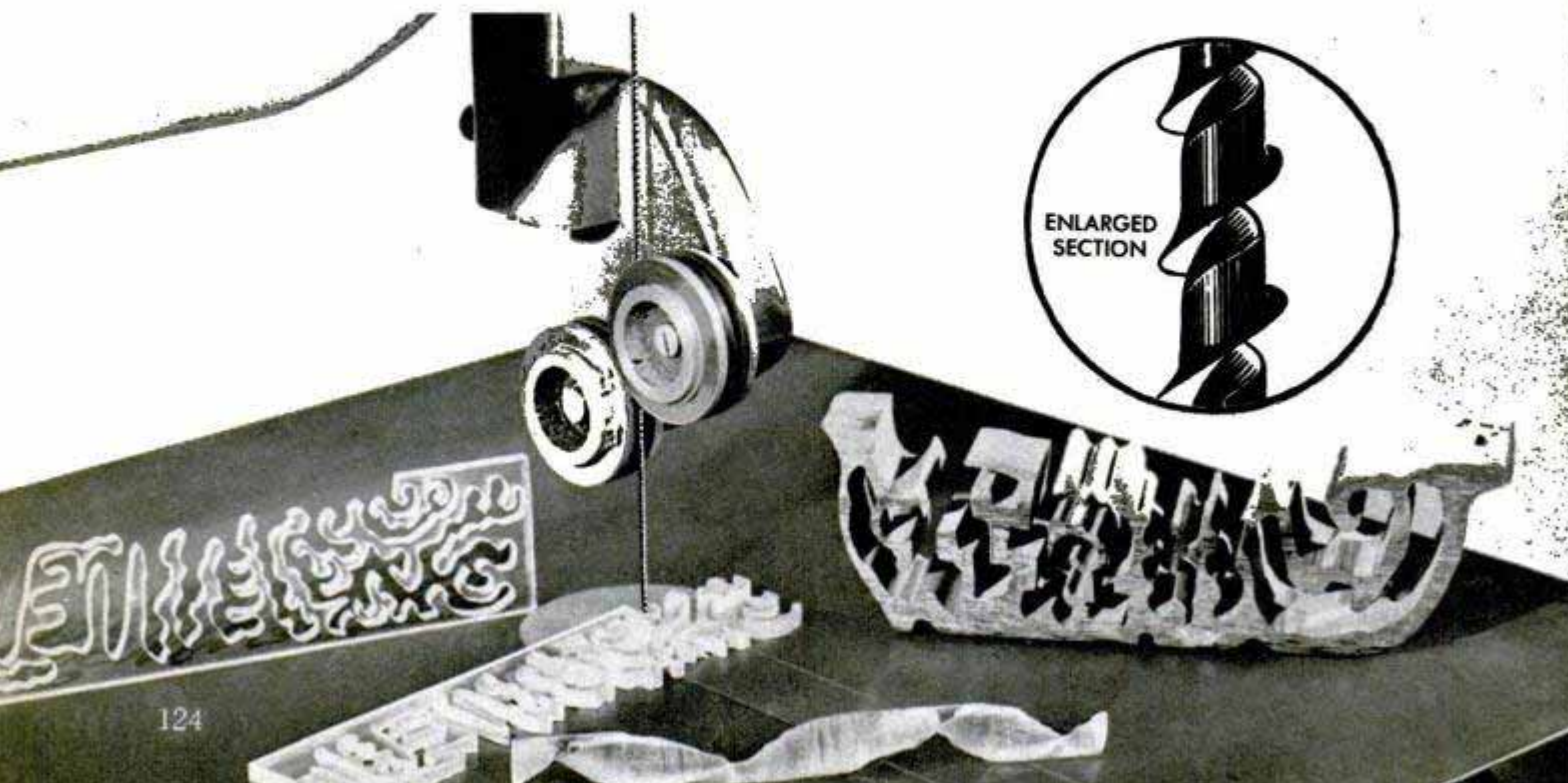
Left, the spiral saw can be used with a master pattern for sawing duplicates. Note the sharp turns made by the blade. Right, turning the work is unnecessary when "writing" in sheet plastic with 360-degree saw

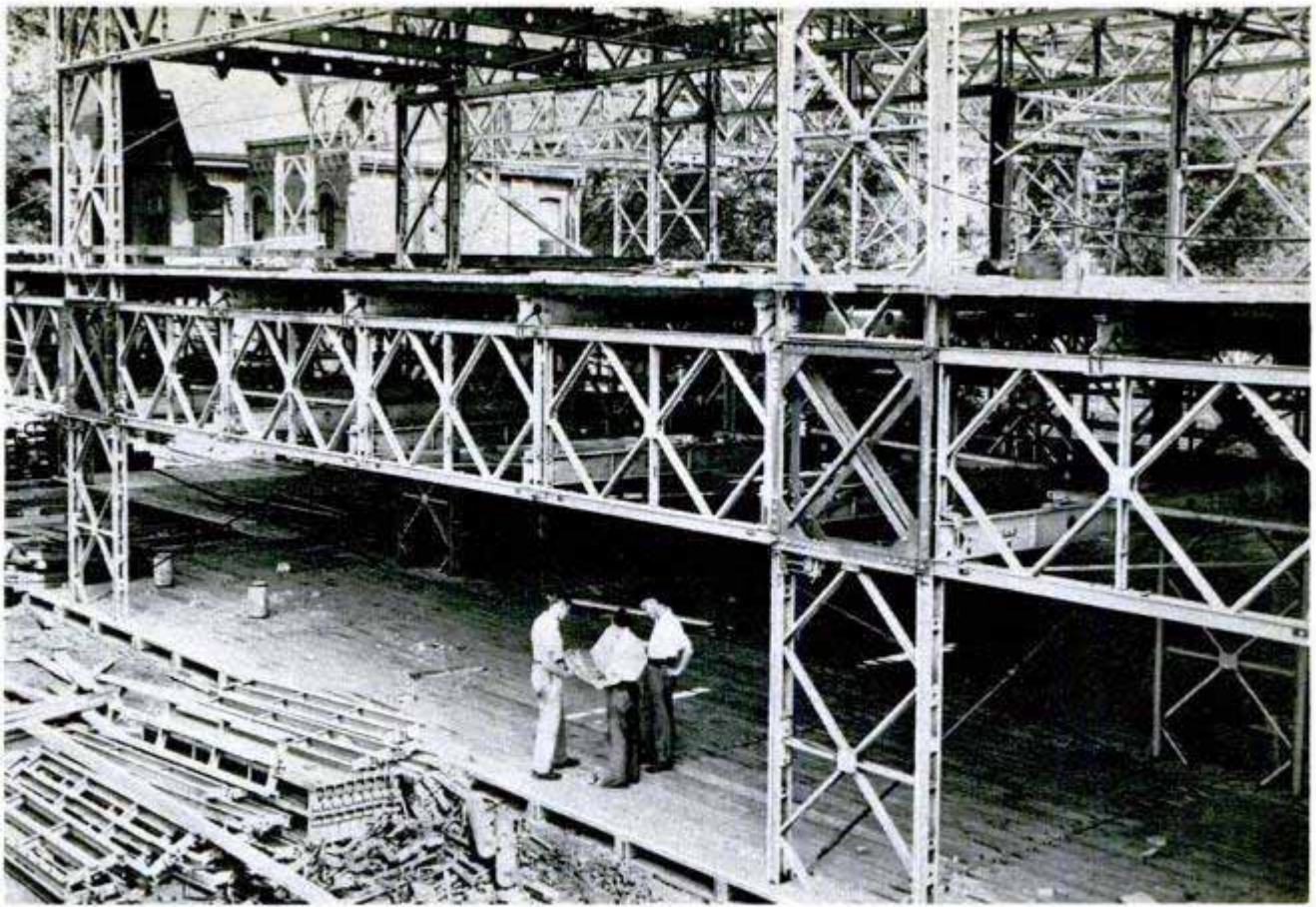


Sawing Is Like Drawing With a Spiral Bandsaw

Using a spiral blade that cuts in any direction without the work being turned, a new bandsaw will follow any line you can draw. To change the direction of cut, you merely guide the work along the line. Sawing is continuous. Thus, you have a 360-degree saw that cuts its way in and out of complicated fretwork with no backtracking. It saws wood, metal and plastics without chipping or grabbing. Even soft rubber can be cut leaving clean, square edges. It is safe to operate because the spiral blade won't grab or tear the hands. The saw is 36 inches high with a 12-inch throat. Blade speeds are changed by shifting the drive belt on a four-step cone pulley.

Above, neatly designed, the bandsaw is 36 inches high. A vertical post supports the upper housing. Below, rubber-tired rollers guide the .040-inch blade. Here are samples of its work. Insert shows shape of blade

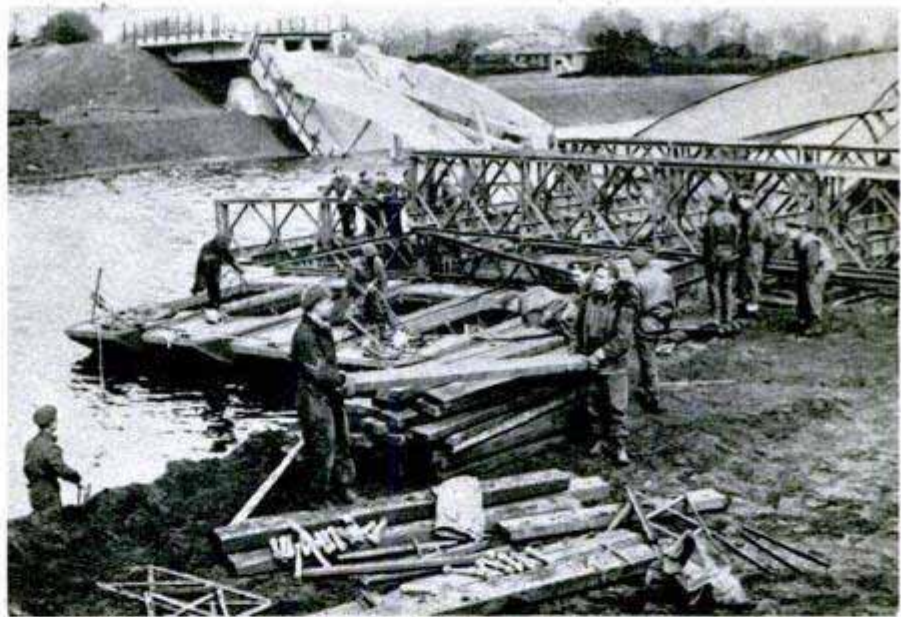




BAILEY BRIDGE BECOMES OFFICE BUILDING

Army bridge sections like that below converted into framework of office building to solve steel shortage

Bailey bridges — the spans quickly thrown across European streams by the Army during the war—are being converted into the framework for an office building in Toronto. The bridge is a package of interchangeable steel parts. The Hydro-Electric Power Commission of Ontario required a new office building but could not locate material for the framework because of the steel shortage. The Commission solved the problem by buying all available Bailey bridge material from the Canadian War Assets Corporation. The parts are being used as uprights and girders in the new two-story building which will



have 20,000 square feet of floor space. The Commission also is building bridges at dam sites with the parts.

Gauge Uses X-Rays to Detect Tiny Thickness Variations

Using X-rays, a thickness gauge that does not touch the material being tested can indicate a thickness variation of .000005 of an inch. It consists of two X-ray sources transmitting rays through a sample of known thickness and through the test ma-

terial. When the two are of equal thickness, the X-rays passing through them are equal. Variations show up instantly on the gauge. Designed by Westinghouse, the gauge will be used in the production of cold-rolled steel, paper and other materials.

Terrain Models of Rubber

MOUNTAINS" of cardboard, plaster and foam rubber are used in building the first "world" that many Navy trainees see. Those who give them their first look at faraway places on the globe are workers at the Naval Photographic Interpretation Center, Anacostia, Md., headquarters for the construction of rubber terrain models. No region in the world is too difficult for them to simulate with exactness. There is a continuing need in peacetime training activities for the models that were so widely used in wartime naval and military planning. Hundreds of the lightweight miniatures, which can be rolled up for mailing, were constructed of the Normandy coast and such islands as Kiska, Guam, Saipan and Iwo Jima. Technicians doing the job at Anacostia, some of whom are former movie-studio artists and museum sculptors, use a wide variety of materials that include burlap, plaster, rubber latex, paints and modeling clay. On these two pages are shown steps in the preparation of the rubber terrain models.

Official U. S. Navy photos



1—Determining exact area to be covered and assembling necessary information about it are the first steps for Navy men building rubber terrain models

2—Next step is to convert map's contour lines into solid, three-dimensional forms. Heavy cardboard cut into strips is used to depict elevation's interval of rise

3—The cardboard is arranged like terraced land, then secured with rubber cement and tacked to baseboard

4—Space between cut contours is then filled with modeling clay to simulate area's appearance from air

5—Modeler next adds cultural detail such as city patterns, textures to imitate vegetation and roads

6—A splash coat of plaster is laid over the model. Into it is laid a light, coarse fabric called scrim

7—Reinforced ribs of burlap dipped in plaster are anchored to casting and frame to make it stronger

8—The negative plaster cast is then lifted off the original terrain model and given thin coat of paint

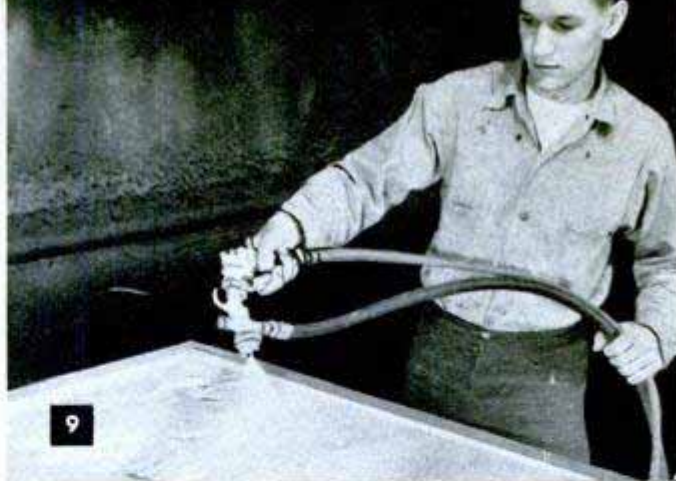
9—Several coats of rubber latex are sprayed on the negative cast, each drying before next is applied

10—A batch of foam rubber is poured over thinly coated cast and struck off even with edges of form

11—The sponge-rubber relief map is cured during 24-hour exposure to 180-degree steam. When pulled away from negative, a perfect scale model results

12—Final touch is duplicating with extreme accuracy color of earth and vegetation in the sector modeled



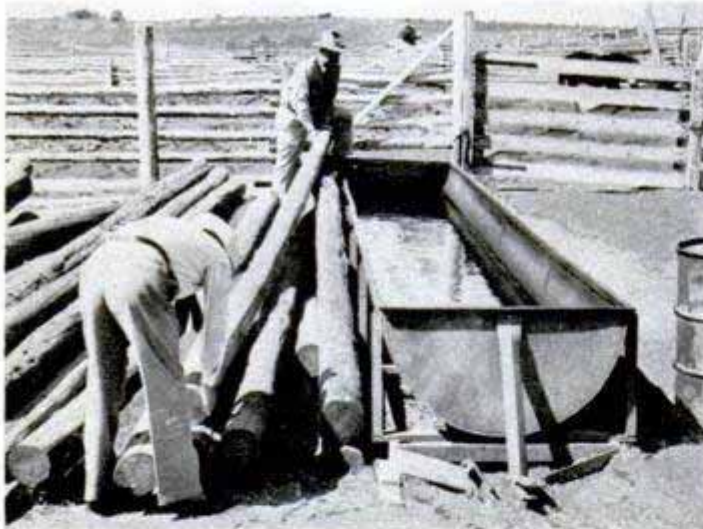




Upholstered Pianos Match Walls

Pianos are upholstered to match the decorative scheme of any room by craftsmen in Beverly Hills, Calif. Old pianos are cut down to the smaller modern size. Then the instrument is upholstered in much the same manner that a chair is reupholstered. Upholstery tacks give the piano an attractive finish. Materials are chosen to match

the drapes, tapestries or walls of the room. A motion-picture studio ordered a piano upholstered to match the satin costumes of the dancers in a musical number. Finishing materials include genuine and synthetic leather, plastic, velvet, brocade, satin, silk, glass and tile. Initials, names and decorations often are worked into the decorative scheme. The average cost of refinishing a piano is about \$125.



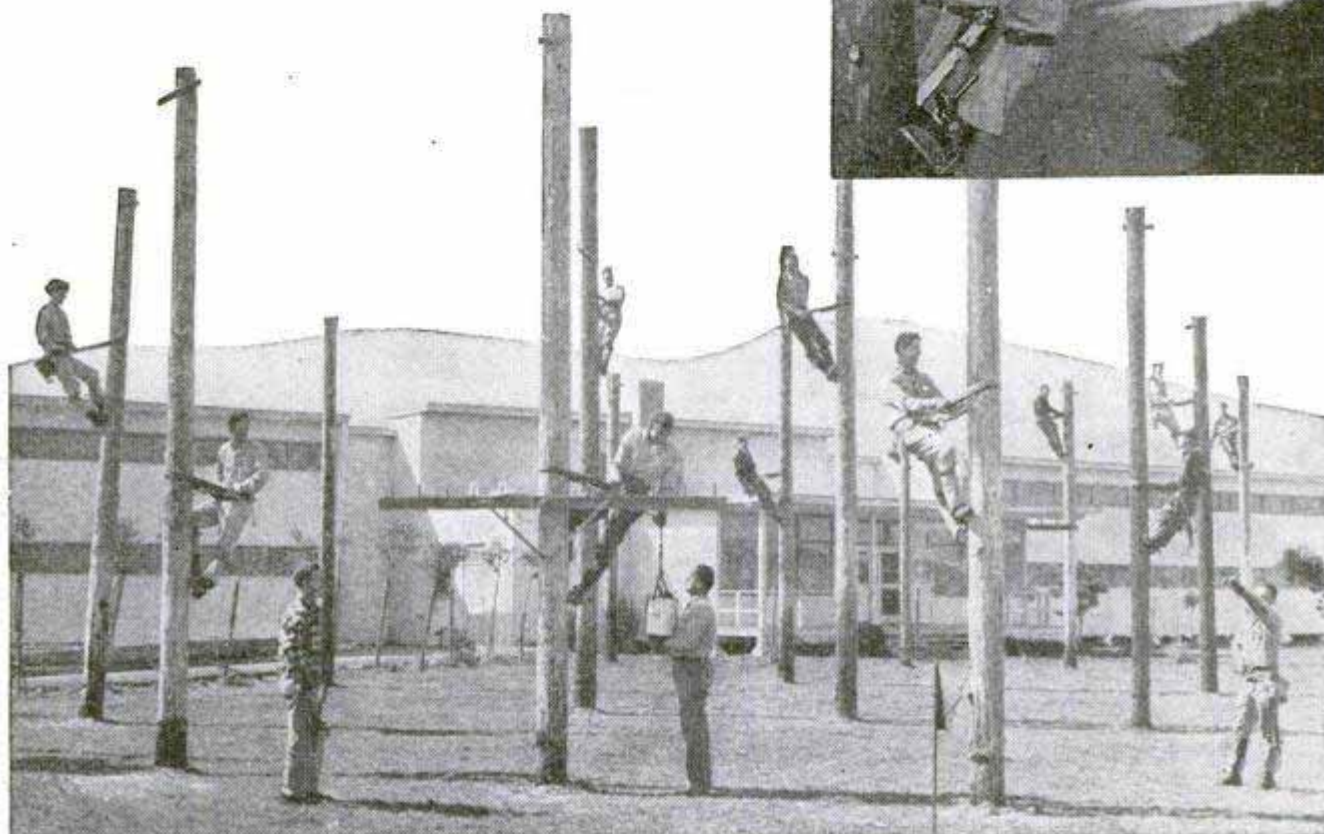
Bath Preserves Pine Posts

Lodgepole pines, long considered a secondary species of wood, are being soaked in a preservative to produce long-lasting fence posts that are much less expensive than cedar posts. The preservative, called pentachlorophenol, is easy to apply and lengthens the life of the post by three or four times. Tall lodgepole pines are cut and stripped of their bark, then seasoned for several months. They are cut, punched at the base and soaked in the preservative

for several hours. One gallon of the chemical solution is mixed with 10 gallons of stove or Diesel oil. Many farmers of the West are cutting and treating their own fence posts in this way instead of buying cedar posts. Treating each post costs about 10 cents. No sticky residue is left on the post, the chemical will not corrode metal and can be covered with paint. Because pentachlorophenol is practically odorless, the treated timbers can be used in potato cellars and vegetable bins where wood treated with creosote is unsuitable.

SCHOOL FOR LINEMEN

Telephone linemen, like squirrels, have to scamper up and down poles quickly and safely. On the West Coast, student linemen practice in "classrooms" that are fields sprouting telephone poles. Courses cover everything from connecting cables to lowering victims of electrocution to the ground. Initially, they practice on crossarms close to the ground and gradually move up to the top of the pole. They learn to keep their knees stiff and away from the pole when working; to keep their toes pointed up when climbing, and how to take good care of their safety belts.



Learning to use "climbers" on practice poles, student linemen will someday be as handy with hooks as the veteran troubleshooter working high above the street in the top picture. Below, students learn close to the ground. Left, apprentice hooks up a terminal box. Right, two others tie in wire on crossarm

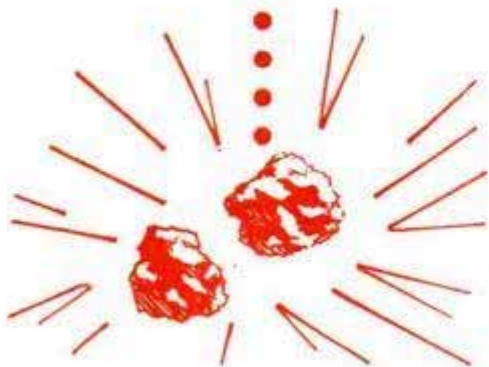


Hungry Plants Guide the Ore Prospector



Flowers make a tireless search for valuable minerals, too. By following botanical signposts, one prospector found a fortune in gold through the stem of a "horsetail" weed

By Maxwell Reid Grant



Glass jars have taken the place of pick and shovel or gold pan in modern prospecting. Leaf and stem specimens are slipped into the jars for later study



On a map of the area prospectors mark the spot where each sample is found. If assayer's report is favorable, area is searched for ore bodies. Below, streams may carry minerals, so water samples are collected





Leaves at "location 27" showed that a mineral might be found nearby, so prospector turns to pick and shovel

IF YOU should see a prospector filling his sample bags with leaves and flowers, don't laugh.

He's one of the new "geobotanical" experts who apply laboratory magic to plants and trees, extracting clues to hidden mineral treasure.

There's the Finnish mining engineer, Kalervo Rankama, who used the spectrograph and the leaves of a birch tree to locate a copper and nickel-ore body buried beneath a thick blanket of glacial debris. And the Chilean prospectors who were led by a common weed to rich copper ore in the high slopes of the Andes.

Then there's the incredible but authentic case of the man who assayed a batch of leaves and stems from the plant known as "horsetail" and discovered gold in the ashes to the value of nearly \$100 to the ton!

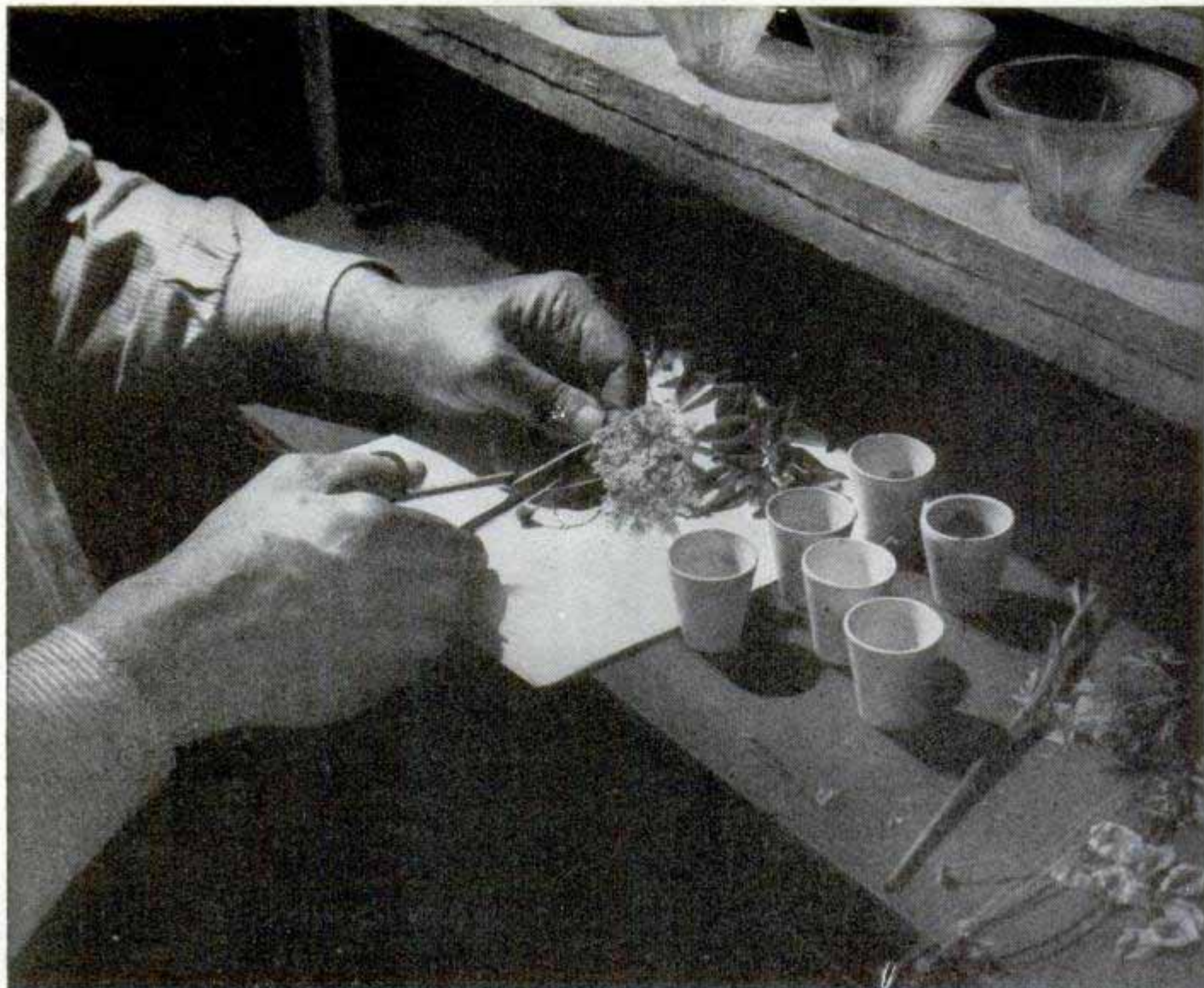
If you should assay a potato and discover silver, don't get excited. Potatoes, wher-

ever they grow, contain a small amount of the white metal, says Dr. John Herman, Los Angeles chemist, who has assayed potatoes from all over the world in his research in this new branch of prospecting. There's never enough, however, to make you rich, for the potato stores up only the amount of silver it needs for growth.

This hunger of plants for certain minerals is the secret of the new geobotanical prospecting. In their search for minute quantities of metals which they must have to grow, trees and plants send their roots probing far beneath the earth's surface.

Up from the depths the moving sap brings these "trace metals," concentrating them in the leaves, fruit and flowers. That's why you may see the geobotanical prospector stop every few feet to pick leaves and stems, pop them into a numbered bottle and jot the number on a map.

In the laboratory the assayer burns the



Leaves, flowers and stems are shredded to bits and placed in crucibles as the first step in assaying plants

leaves in an electric furnace, then crams the tiny pinch of ash into the cupped carbon electrode of the spectrograph. He throws a spectrographic pattern upon photo film. From the telltale black bars on his developed negative, he reads a record of all metals in the sample.

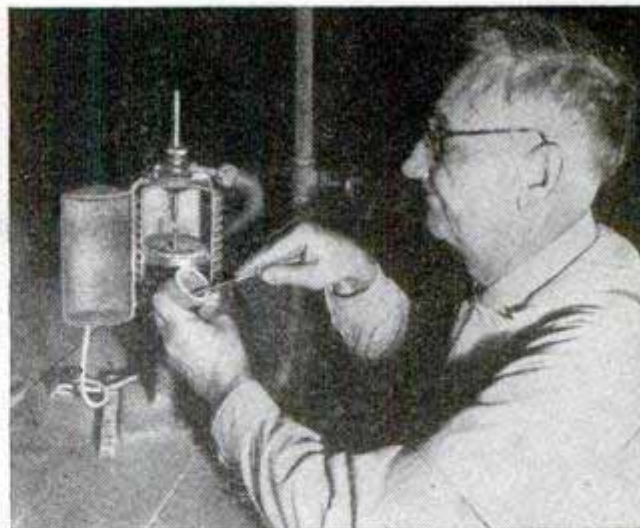
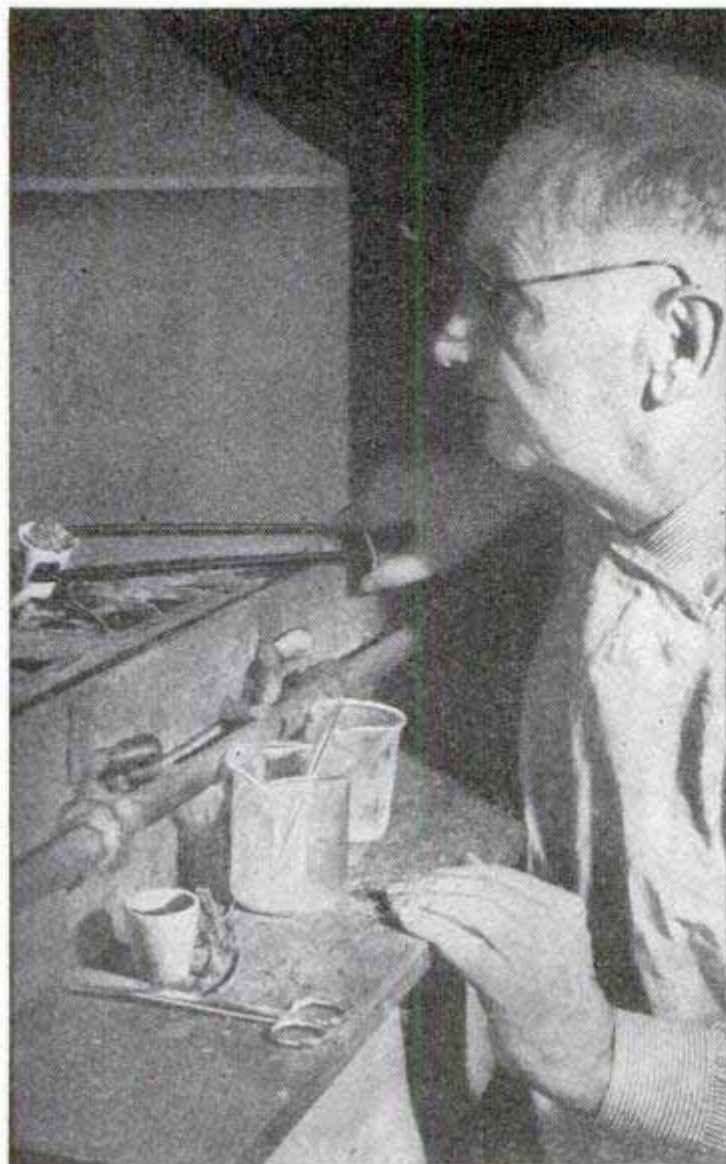
The "indicator" plant may be expected to show a certain amount of the trace element in its leaves and flowers, but if these showings are unusually strong, the prospector knows he is on the right track. Perhaps he's gathered leaves of the lupine, knowing that the blue-flowered plant requires manganese for its development. Marking the results of the assay on his map, he can pin-point areas where manganese showings seem to be concentrated.

Where did the lupines get their manganese? From here on, he must depend on his knowledge of the plant's habits, plus prospector's horse sense, to find the right answer. Merely digging at the base of the richest bushes may reveal no ore, for the mineral may have been carried a long distance in solution and absorbed by the plant

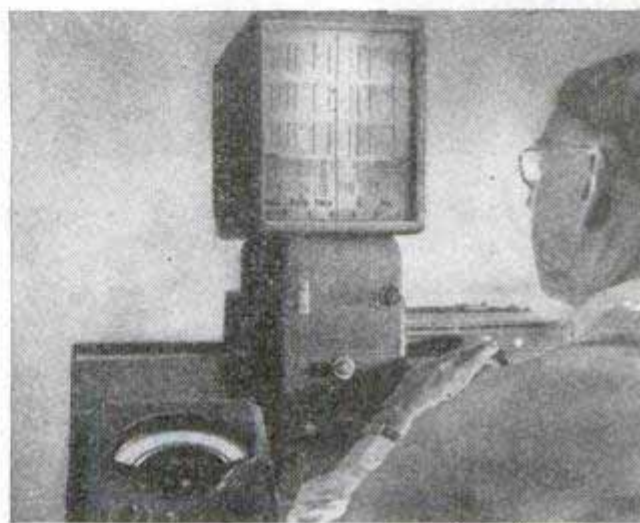
in its "drinking water." The prospector then must follow the water to its source.

Many springs may honeycomb the area, but the prospector walks up slopes and takes samples of water from a number of sources, marking each spot on his map. Now he returns to the laboratory and a new instrument comes into play—the polarograph, which uses an infinitesimal electric current flowing from a dripping stream of mercury to register the resistance of solutions containing various chemical elements. Each element in solution is known to break down abruptly when a particular voltage is applied. Graphing this action, the chemist obtains a pattern as characteristic as a fingerprint. The test is one of the most sensitive known to chemical science. For instance, Dr. Herman, who in his Los Angeles laboratory has performed hundreds of such analyses, has been able to identify minerals in water to the unbelievably small proportion of a few parts in 100,000,000.

Armed with the reports on his water samples, the prospector refers to his map,



Slipping the ash of the plant into a clean cup, the assayer prepares it for study with a spectrograph



↑ Cuttings are heated to reduce them to ash. Right, spectrograph shows telltale pattern when mineral is present

follows the natural drainage and discovers where rain and melting snow have leached out minerals, carrying them down to the telltale plants. This clue now leads him directly to the vein.

Like most human beings, different plants have different tastes. One craves a mineral which may be poison to another. For instance, if a prospector discovers patches of a certain wild pansy where little else is growing, he may well suspect that zinc-bearing ores are nearby. Another plant, known to science as *Amorpha canescens*, flourishes in Missouri near galena deposits and is considered a valuable clue in prospecting for lead. Two other plants are so hungry for copper that they threaten to drive out other plants in soil rich in copper.

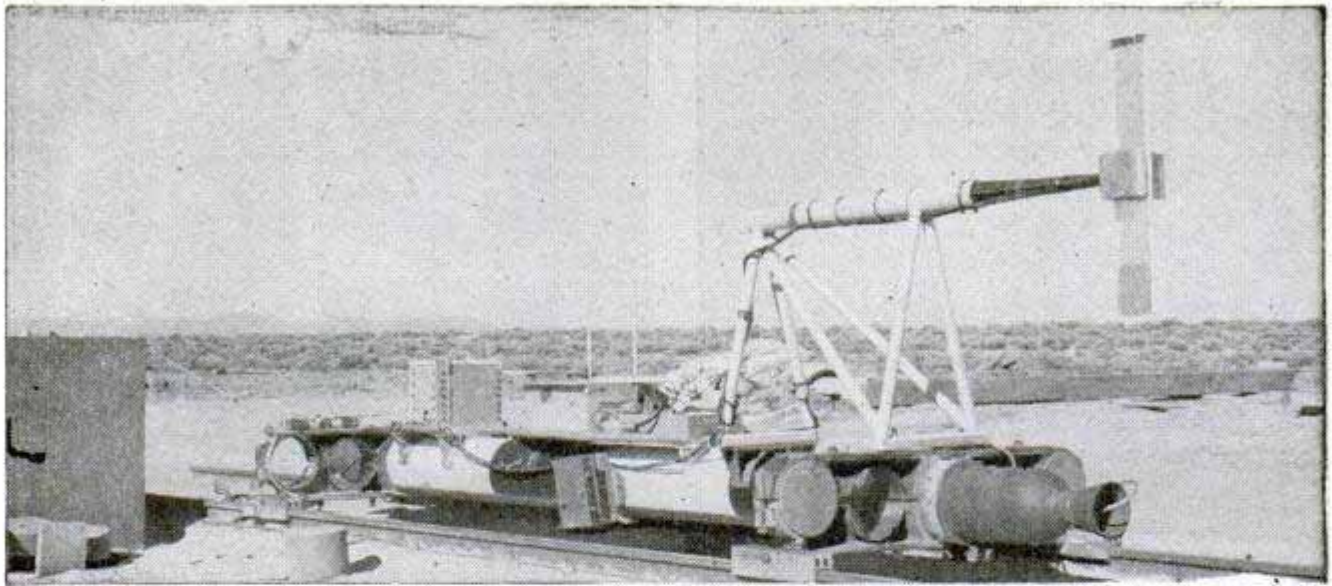
Unusually bright flowers or foliage often contain high percentages of the trace elements—a valuable clue to the prospector. Young, vigorously growing leaves seem to contain more of the trace elements than older, yellowing ones.

A strange phenomenon of geobotany is the natural enrichment of deposits on the

forest floor. As time goes on, rains dissolve soluble elements from the fallen leaves and carry them deeper into the ground. Left behind on top layers are the less soluble minerals, especially gold, manganese, cobalt, nickel and others.

Geobotanical prospectors have used their skill to locate tin and tungsten in the British Isles, chromium in Greece, silver in Sweden and copper in Chile and Australia. U. S. experts have tracked gold, zinc, lead and molybdenum in many states.

Geobotany may be applied not only to ore prospecting, but also to curing diseases afflicting farm plants. Deficiency of manganese, zinc, boron, copper and molybdenum contributes to a long list of plant diseases ranging from deformities and weakness in zinc-hungry apricots, peaches and maize, to dying branches and falling fruit on tomato vines pining for molybdenum. So far, relatively few of the earth's millions of plant varieties have been catalogued to learn their peculiar tastes in minerals, but the growing list is valuable new lore for the scientific prospector.

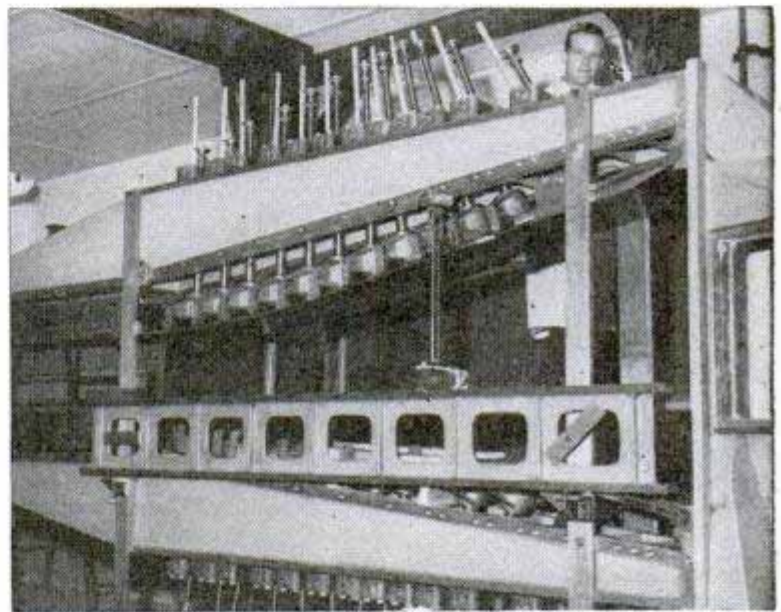


Northrop Aircraft photos

SUPERSONIC "SLEDS"

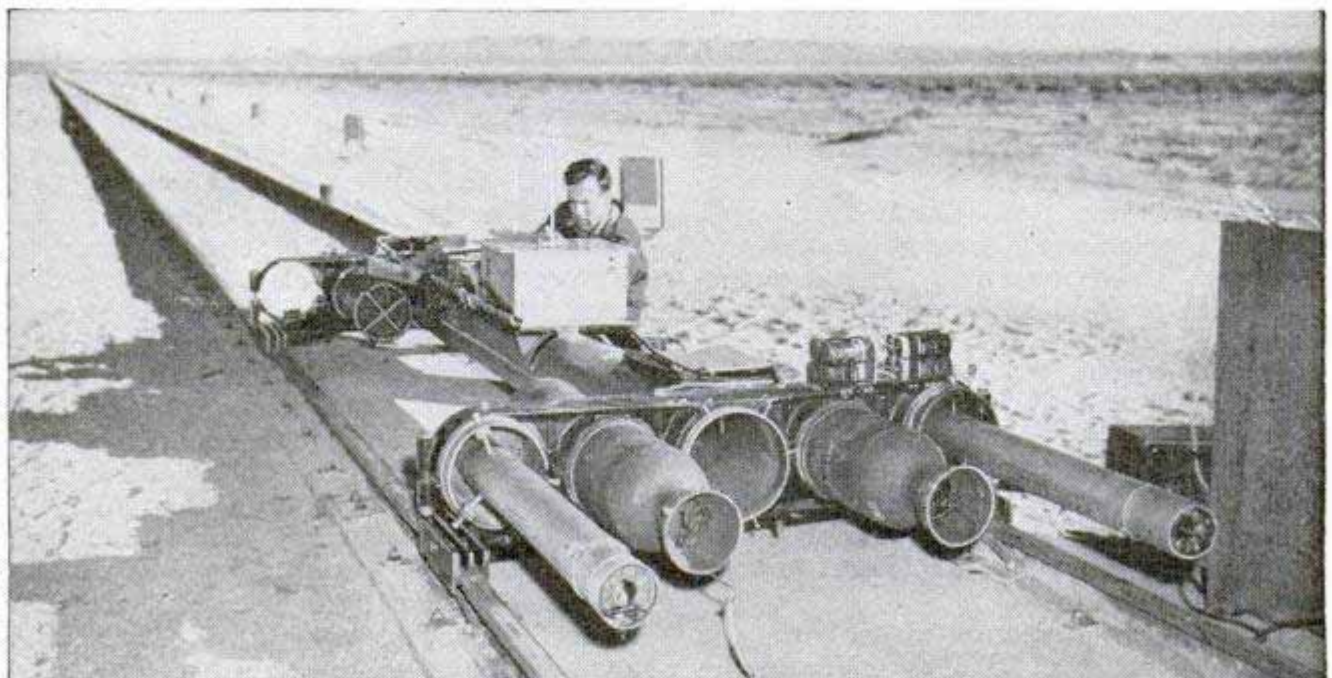
Rocket-propelled "sleds" traveling over 1000 miles an hour are serving as outdoor "wind tunnels" for supersonic speed experiments at Muroc, Calif. They reverse the system used in indoor tunnels, where air is rammed past suspended models. Fifteen feet long, the sleds skid over 2000 feet of standard-gauge track on spring-lined "slippers," magnesium runners with flanges that hug the rails. They carry experimental sections of airfoil or wing, mounted on a boom, and electronic measuring devices. At the California Institute of Technology the problem is being studied from another angle by squeezing air through a flexible 12-inch nozzle at over 1500 miles an hour.

Snow isn't needed for USAF's rocket-propelled "sled" above to travel over 1000 miles an hour in testing supersonic airfoils



California Institute of Technology photo

Above, air is squeezed through flexible nozzle of CalTech's 12-inch tunnel to simulate speeds of over 1500 miles an hour



Jeep Mower's Blade "Rides" the Contours

Always in full view of the operator is a six-foot sickle bar that attaches to the front of jeeps and other vehicles. The blade, controlled from the driver's seat, can be set to cut directly ahead or to the left or right front. It locks in any position to follow the contour of the ground. Only two bolts are used in attaching and detaching the mower after the original installation has been completed.



Retractable Wheels for Bike

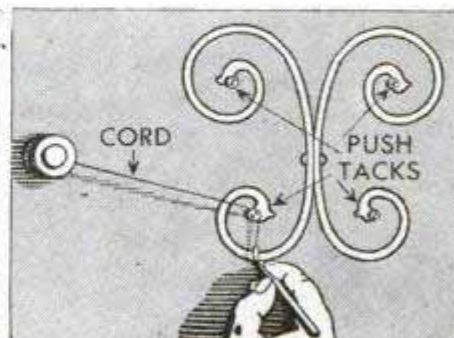
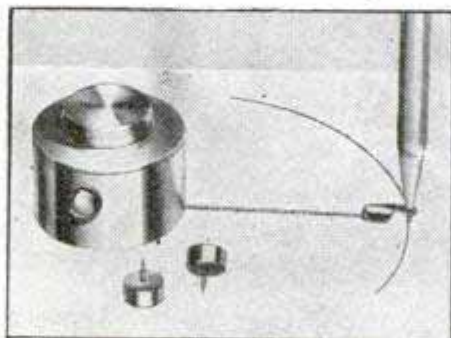
Two retractable wheels attached to his bicycle make cycling safe for Edward Dyksma of Harvey, Ill., who was crippled by infantile paralysis when he was two years old. Dyksma found that he could not ride a standard bike because of the hazards of starting and stopping. He invented the retractable wheels, which fold up after the bicycle is in motion and can be lowered as the rider slows down. Dyksma plans to give a sample of his invention to a nearby Veterans Administration hospital.

Ground Generators Produce Rain

Rain making from the ground may be possible by means of silver-iodide generators, according to the Department of Commerce. Experiments in producing rain and snow by seeding with Dry Ice from airplanes flying above the clouds have been successful, but the new method, using silver-iodide particles instead of Dry Ice, will produce similar effects over larger areas much more cheaply than by seeding clouds from an airplane.

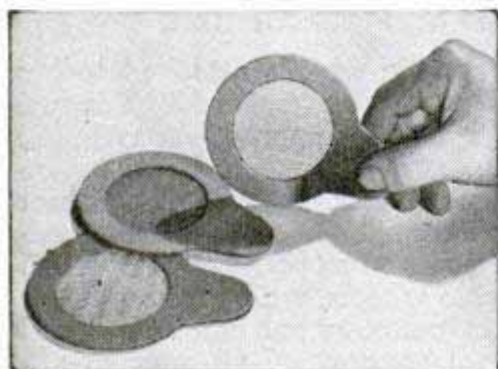
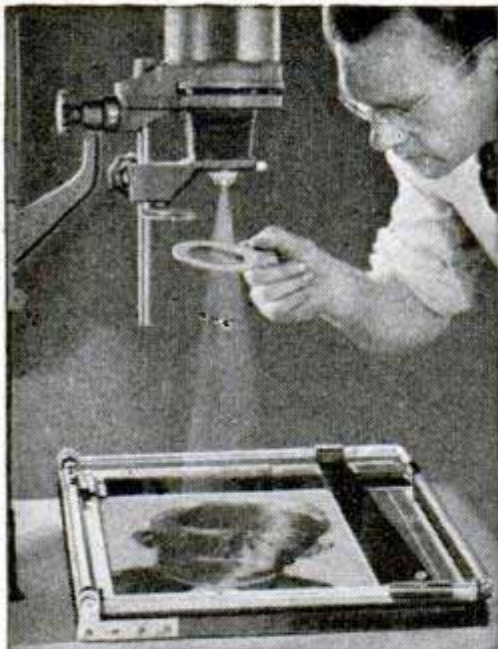
Miniature Compass Draws 12-Ft. Circle

Circles from 2 inches to 12 feet in diameter can be drawn with the aid of a compass that fits the vest pocket. The compass is an aluminum cylinder enclosing a reel of linen line controlled by a button. To draw a circle, a push pin is pressed into the drawing board and the compass placed over the pin, which becomes the center of the circle. After pressing the



button, the operator pulls out the line to the desired radius. A pencil point then is inserted in an eye on the end of the line and the circle is drawn.

Meter Judges Auto Speed by Radio



DIFFUSED ENLARGEMENTS are made by projecting the light rays through a wire screen. A kit of three diffusers containing screens of different meshes enables the photographer to select the degree of diffusion desired. Carboard frames protect the screens during use

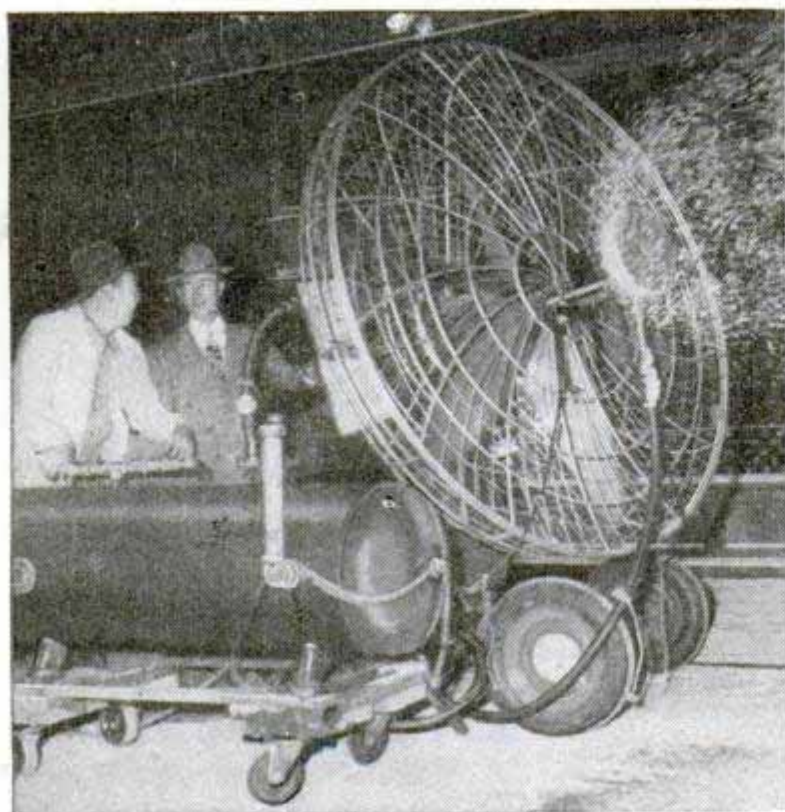


Auto speeds are determined by a meter which actually is a complete broadcasting and receiving set powered by a car's electric system. The meter, based on the Doppler principle, is used by highway engineers to determine safety factors in designing safer highways. More accurate than an ordinary speedometer, the meter sends out waves which are reflected back to the set by approaching vehicles. The time intervals are converted into miles per hour and register on a dial. The meter is so compact it can be carried in a suitcase. Because it is a broadcasting set, it must be licensed by the Federal Radio Commission.

Fire Fighter Turns to Snow For Hollywood Cameras

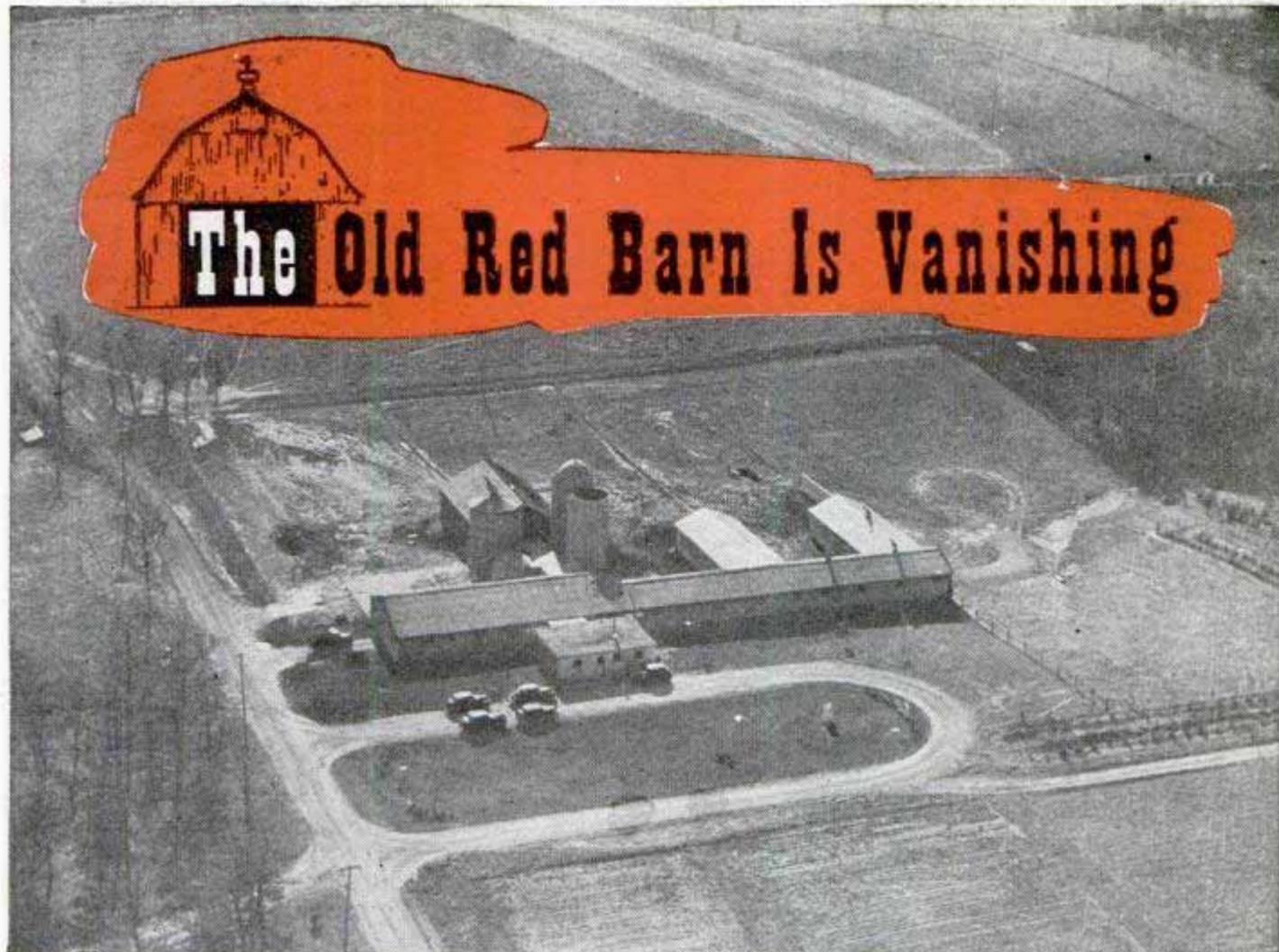
Originally produced as a fire-fighting material, Foamite also makes realistic snowstorms that can be turned off and on for the benefit of Hollywood cameras. Released under high pressure in front of a huge fan, the Foamite solidifies in flakes that swirl and fall like nature's own. With the fan spinning at high speed, blizzards are created, while at low speed the flakes fall evenly and lazily on the set.

Information, including manufacturers' names and addresses, concerning the products described in this issue may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11. Your letter will be answered promptly





The Old Red Barn Is Vanishing



Carnegie-Illinois Steel photo

Site-welded of steel, this one-story barn at the University of Wisconsin points way to better farm structures

THERE'S a halo of nostalgia around the old red barn, that traditional landmark of farm country from Pennsylvania to Kansas. The old barn is fast disappearing, and the nation's farms are in for a face-lifting. Agricultural experts hope to replace old-style barns with 5,000,000 gleaming buildings made of materials tailored to farm needs.

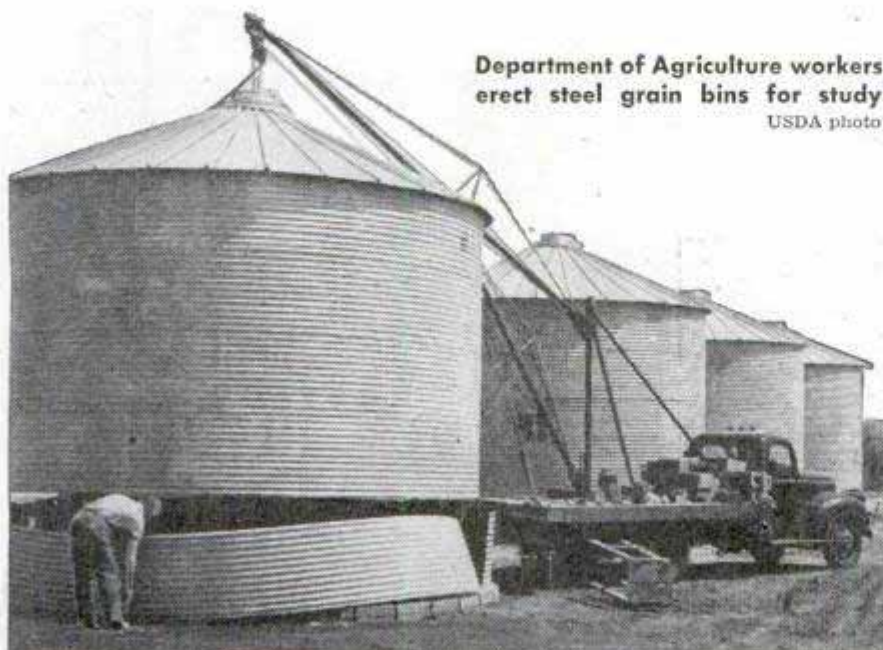
By Clifford B. Hicks

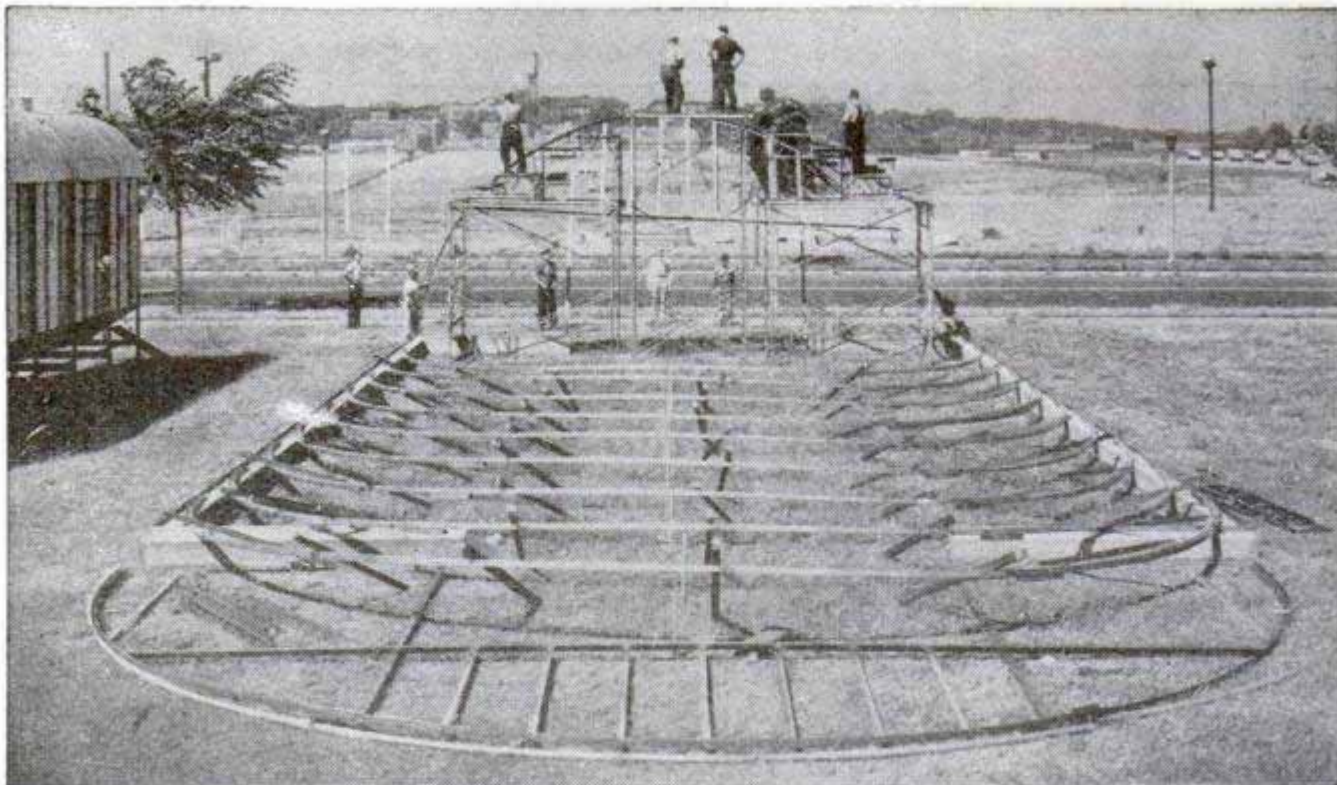
"Inefficient," say today's farm experts, pointing to the time and effort wasted in the wood-frame barn. Stalls for horses that were sold long ago, and a mow for Dobbin's feed, represent waste space. Other farm structures show the same inefficiency. Corn raised and harvested by the latest mechanical methods still is stored in sagging cribs where rats gobble up 20 percent of the kernels.

Agricultural experts from the government, universities and industry are teaming up to give the farm a "new look" that will save money for Old MacDonald, savings that can be passed on to the public. The experts aren't dreamy professors, but down-to-earth specialists who consult the farmer as to his needs.

Research men have plowed up some interesting farm facts recently. With stopwatches clicking they timed to the second every movement of the farmer and his hired hands. These time studies show that the farmer is growing away from his land. The dairy farmer, for example,

Department of Agriculture workers erect steel grain bins for study
USDA photo





Reynolds photos

Frame of aluminum building is assembled on ground. Below, flanged sheets slip into frame to form the walls



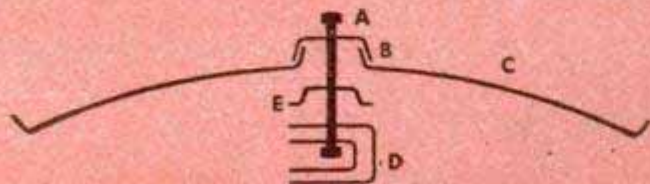
spends more than 80 percent of his time in and around the barn. Obviously the old red barn won't serve a modern layout. The planners have come up with interesting answers.

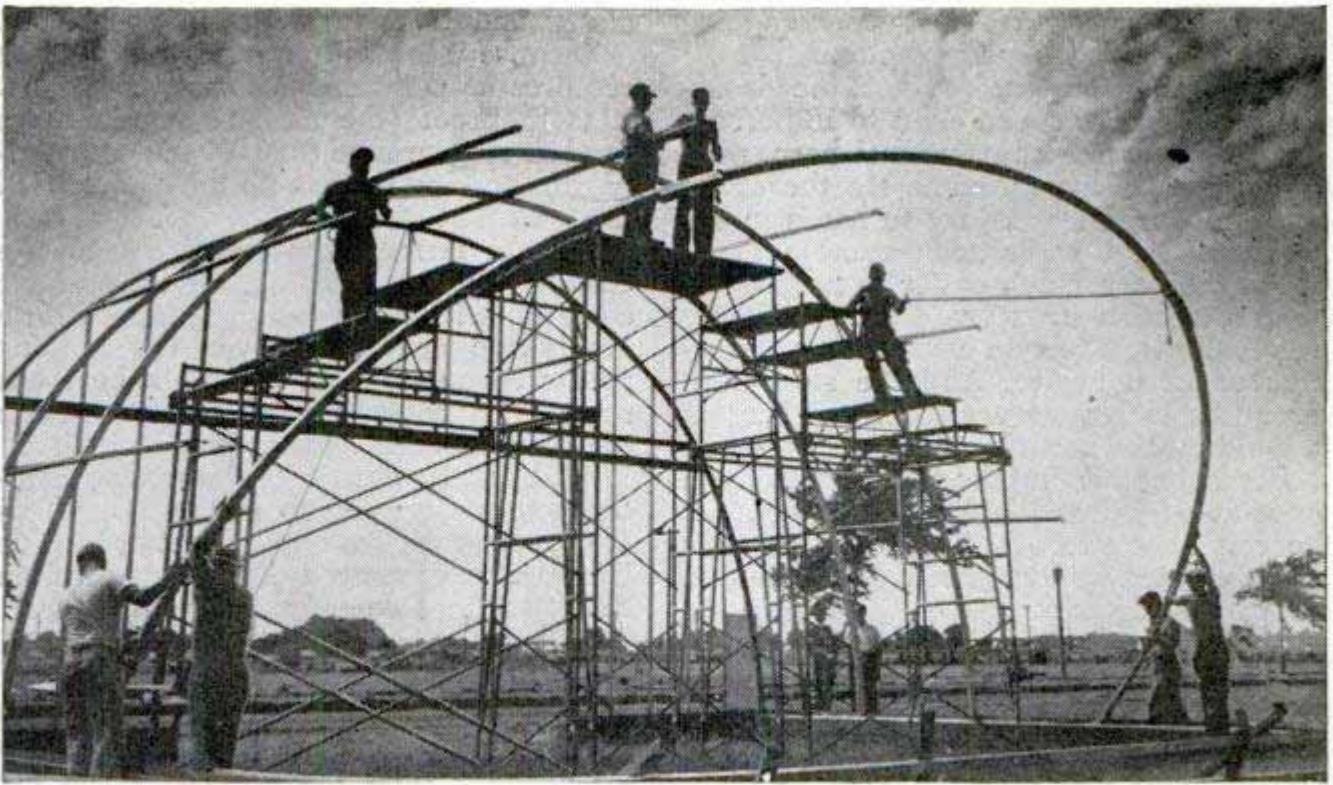
For example, an experiment at the University of Wisconsin completely changes the character of the dairy barn. The experiment has proved that cows don't need stalls; that the living area of a barn needs to be cleaned only once or twice a year; and that cows in an unheated enclosure in subzero weather give as much milk as those carefully tended in a heated barn.

An all-steel, one-story barn has



Right, builder tightens bolts across arch of roof. Below, same arch in cross section showing: A, bolt holding assembly together; B, arch cover called the "hat"; C, flanged sheet; D, arch frame; E, support member





Additional arches are fastened together on the ground, then raised and tied in position with spacer bars

been erected at the university for long-term study. Carnegie-Illinois Steel Corporation put up the building with a cost-cutting process of site welding.

A previous study showed that 150 man-hours were required to tend each cow properly every year. If the chores could be made as efficient as growing corn, the time could be reduced to 30 man-hours per Bossy. So the planners decided on the "loose housing" type of barn. In this kind of structure much of the barn area is a big "living room" in which the cows may

room at will. The door is left open summer and winter so the cows can step outside for exercise.

In one end of this lounge is the "dining room" where the cattle eat while awaiting their turn in the "milking parlor," a separate room. Only in the parlor are stanchions provided. The layout caters to Bossy and should increase her contentment.

In order to test the efficiency of the loose-housing design the barn was split three ways. One herd was housed in the unheated area, another in a conventional

Completed aluminum building, erected in 150 man-hours, has big doors, over 2000 square feet of floor area



stanchion barn that was heated, and a third in a heated loose-housing section.

Research men report that the loose-housing sections saved eight to 18 percent in labor over the conventional barn, milk production was approximately the same, and there was less injury to herds in the lounges. Steel walls and concrete floors made the barn much easier to keep clean than a wooden structure. Heat apparently has had little effect on either milk production or herd health. And the steel barn promises to last several times as long as the old timber barn.

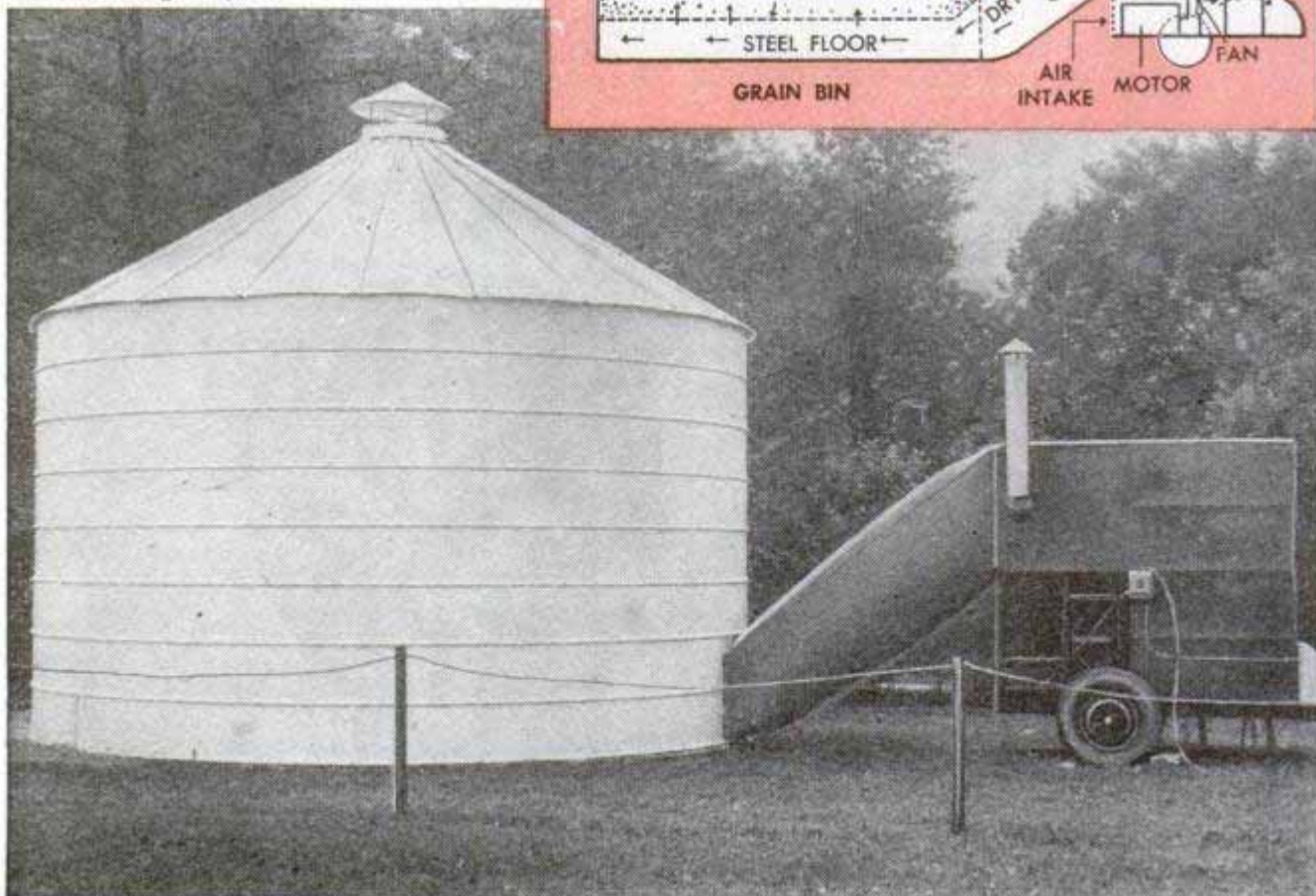
Replacing his buildings is generally a once-in-a-lifetime job for the farmer. Yet he can knock together some of the new prefabricated buildings in a few days and they'll last decades.

Specialty of the Reynolds Metals Company is a sparkling all-aluminum prefab—a general utility building recommended as an implement shed, cattle shed, crop storage barn, tool house or workshop.

Of the arched-roof type, the building is 36 by 60 feet with the entire floor area clear of posts or other interior supports. The building can grow with the farmer. If he prospers and needs more storage space, one end of the building can be lopped off, six-foot sections

↓ Drier is wheeled up to a steel grain bin and connected by canvas tube. Diagram shows heat being forced through false floor

American Rolling Mill photo

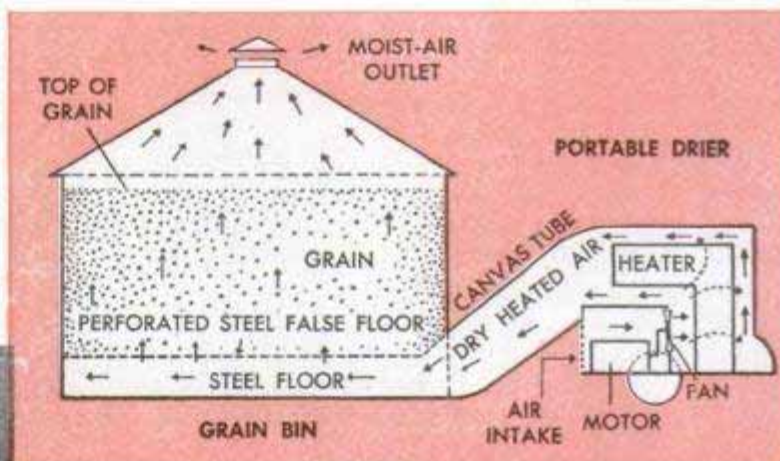


added, and the end fastened in place again.

Because it is all aluminum, the building requires no paint and will not rust or rot. It is fireproof (the nation's annual farm fire loss runs around \$100,000,000), virtually ratproof and reflects up to 95 percent of the heat that strikes it.

For the farmer who wants a complete change in all his buildings, designers have come up with a one-building farm with a family-size apartment over the milking parlor. As a step-saver it can't be beat, but some farm wives may object to cows in the basement and hens across the hall.

In order to outwit the weather, more farmers are turning to artificial methods of drying grain. An experiment at Purdue University sponsored by the American Rolling Mill Company shows that grain with high moisture content can be dried by artificial methods without spoilage. Such systems cost the farmer about three cents a bushel, which he can mark off as insurance against wet weather when the crop should be drying under the sun.





Cows are not confined in stanchions but allowed to roam through unheated "living room" of loose-housing barn

As a result of the Purdue experiments, engineers have devised a grain-storage bin with a built-in drying system. The steel bin has a perforated false floor.

A portable heating and ventilating unit can be wheeled up to the building, attached by means of a canvas tube, and started in operation. An oil-burning heater forces air through the tube and up through the false floor to dry the grain. The lid of the crib is bolted down and the farmer can store his grain until he chooses to sell. The drier may make it possible to shell corn as it is harvested, which would subtract many hours from the farmer's work. The same heating unit, used as a handyman, will dry hay in the mow, warm the machinery shed when repairs are required, and heat the hog house and dairy barn. One farmer has estimated that the unit would pay for itself in three years. To date the project is experimental, but the units are expected to be available this year.

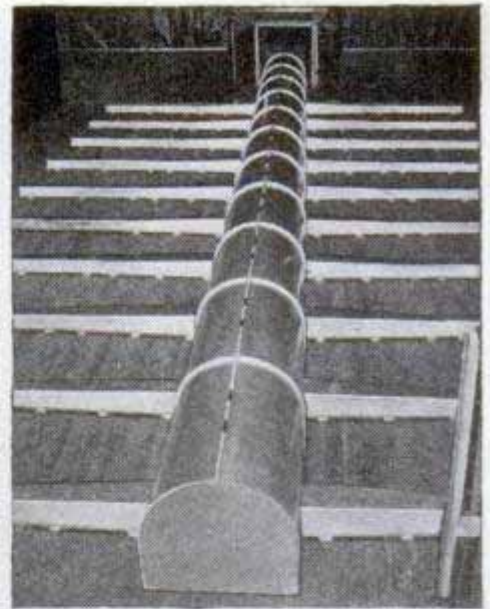
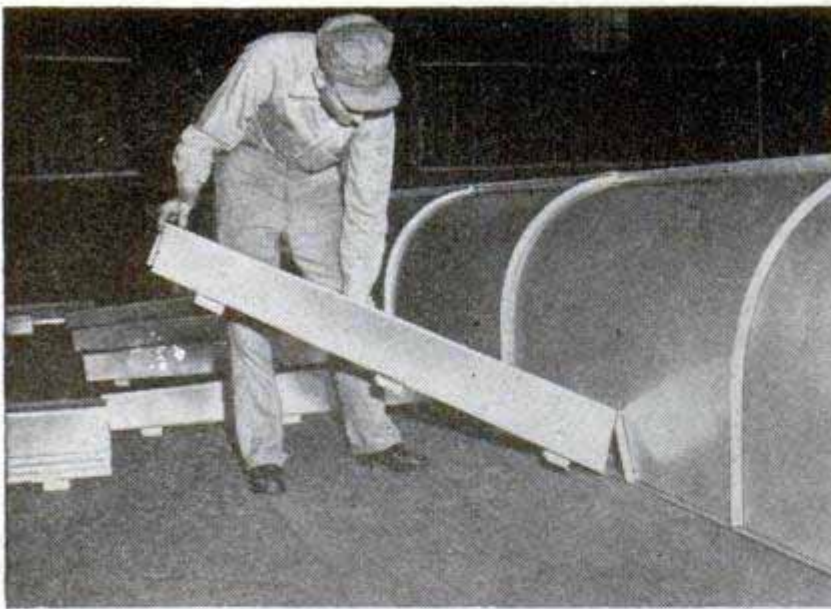
In some cases, experts point out, sturdy barns of the old type can be remodeled with new equipment to provide almost as much efficiency as a completely new metal layout. One problem always has been the drying of hay inside the barn. A farmer who depends upon nature to dry his hay before bringing it to the mow is flirting with a loss of much of his crop. One answer is a permanently installed mow drier. Most driers consist of ducts usually made of wood through which air is circulated to dry the hay from the bottom up. Such sys-

tems often are clumsy and occupy a great deal of space even when not in use.

Experiments at Iowa State College with a prefabricated drier made of sheet metal may point the way to an inexpensive drier with great efficiency. The drier is a network of nesting ducts with one main tunnel. As the hay is used, individual ducts can be removed and tossed on top of each

Milk production in the steel barn is recorded daily





Louden photos

Prefab mow drier distributes heat through the hay. Ducts can be removed and stacked up as the hay is used

other to leave the mow floor free. Both loose and baled hay can be dried in this manner.

Farmers are buying buildings today through mail-order catalogues. The order will be delivered in a few days with the building ready for erection either by company workmen or by the farmer.

One building offered in a mail-order catalogue is a frame utility structure 16 feet square designed for use as a small barn, poultry house or storage house. The basic unit is like an accordion—extra sections can be added to increase its size.

Specialists from the Department of Agriculture are designing tomorrow's farm buildings today. Experimental steel grain bins have been erected for study of the

best means of storing grain. Requirements for poultry houses and livestock sheds are being sought so the farmer can tell whether a building will suit his climate.

Still other plans are afoot to change the rural landscape. New products include a glass-lined silo that isn't affected by chemical attack, aluminum roofing that makes any farm building up to 15 percent cooler, and a gleaming prefab equipment shed.

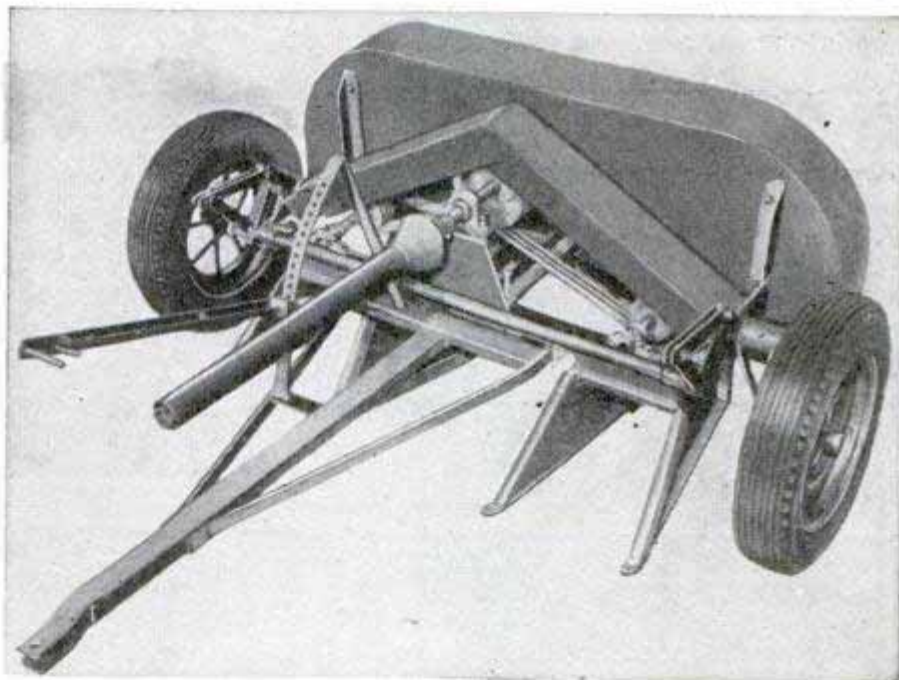
Even the old milking stool is disappearing. Many of the new barns have "elevated cow stalls" in the milking parlor, a setup where the farmer stands in a pit so he won't have to bend over while he's milking. The farm cat that begs a squirt will have to learn to take it from long range on tomorrow's farm.

Mail-order building made of wood is quickly erected
Sears Roebuck & Co. photo



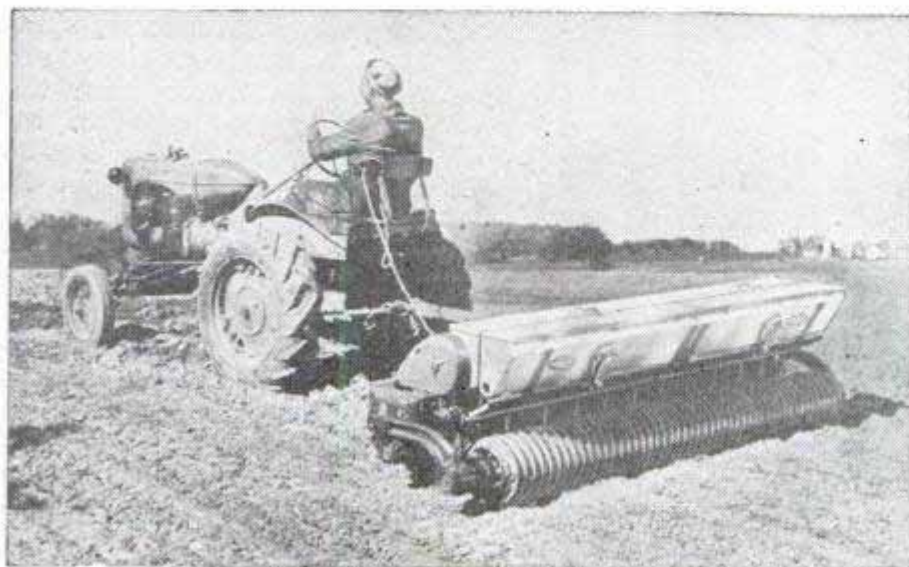
Knives Shred Stalks To Return Soil Food

Cornstalks are shredded into small pieces by a tractor-drawn cutter. The machine operates from the power take-off and prepares the stalks for plowing under. Arms on each side of the cutter guide the stalks into slots, where eight knives whirling at 1000 revolutions per minute cut them into small pieces, scattering them evenly over the ground. Six V-belts, which deliver power to the cutting blades, can be adjusted so that the machine can be used with most tractors, large or small. The machine is seven feet wide, weighs 620 pounds and can be adjusted to any desired cutting height. Cornstalks are plowed under to replace food value in the soil. In addition, corn borers can be eliminated by burial.



Wood-Knot Sealer

Low-cost lumber serves longer as exterior siding material when its many "live" knots are sealed with Bakelite and Vinylite resins before painting. The two plastics resist the paint-destroying pitch and volatile substances exuded from the knots.



Shallow Planting Cuts Seed Costs

Savings of five pounds of seed an acre are predicted by the manufacturer of a grass seeder with wheels spaced only two inches apart. Each wheel rolls independently to permit easy turns. The front wheels form shallow grooves into which seed drops. Covered lightly by the rear wheels, the seed has early germination.



Telescoping Camp Trailer "Shrinks" for Traveling

In two minutes, a large "box" on wheels can be transformed into a comfortable trailer that accommodates four persons. Built by an Iowa businessman, Clay E. Murray, the trailer contains a refrigerator, stove, sink, cabinets and two beds that protrude from the sides when made up for sleeping. A hand crank at the left rear raises the roof section to make the trailer high enough for comfort. When collapsed, the trailer tows much more easily than a full-sized model and is low enough to go under any bridge that will clear the car.

↑ For travel, the trailer is low and compact. By turning the crank at the rear, the owner raises it to full size (below)



Aluminum Shingles Reflect 95 Percent of Heat

Better insulation and protection against lightning as well as the ordinary elements is claimed for newly developed aluminum shingles. Self-aligning, they are mounted raised away from the roof sheathing to form an air pocket that reflects as much as 95 percent of the heat from either direction. The shingles are corrosionproof, and can be installed either painted or unpainted.

☐ The Naval Air Transport Service flew over 320,000 passengers nearly 500,000,000 passenger miles in 1947 without a passenger fatality, about 75 percent of the route miles being outside the continental United States.



DIVING MECHANICS

By Andrew Hamilton

ARISTOCRATS of the construction world are the deep-sea divers. They are often pictured in helmets and lead shoes prowling around the watery hulks of sunken ships in search of Captain Kidd's gold. Treasure hunting may lure some, but most present-day divers find cash and satisfaction in licking a dangerous underwater job.

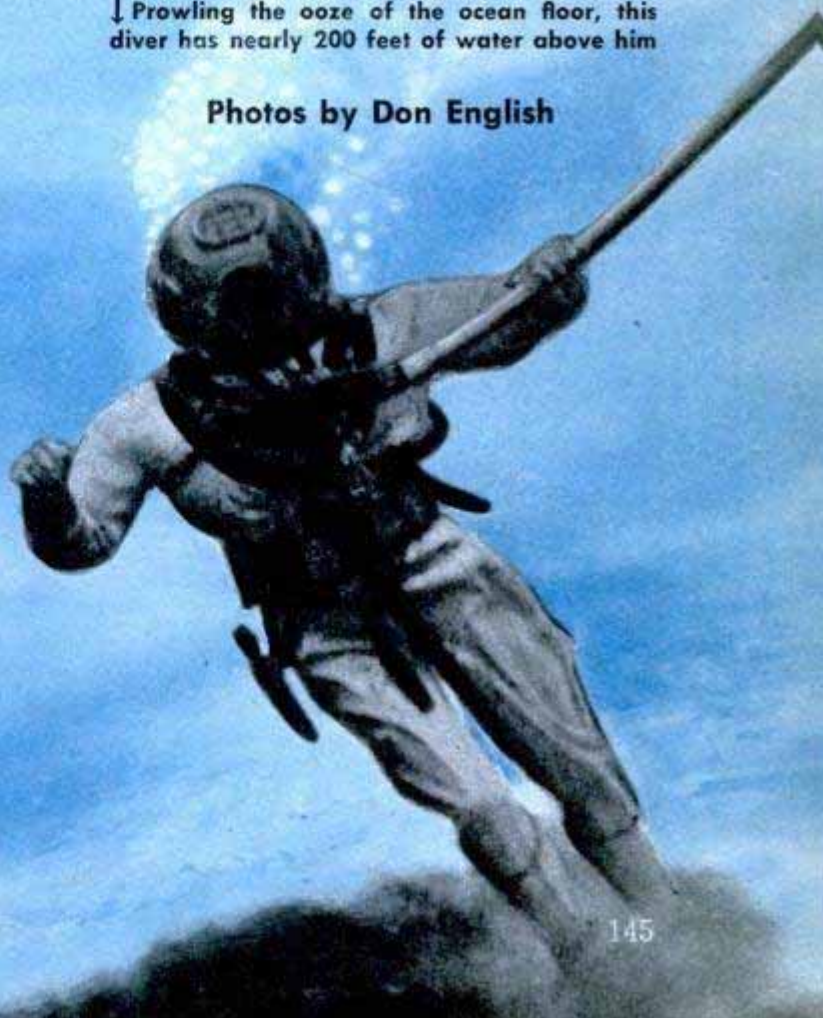
They weld, cut and burn metal, do carpentry work, shore up bulkheads, pour cement, rig equipment, lay pipe, make repairs in steel and wood, set dynamite and operate cameras.

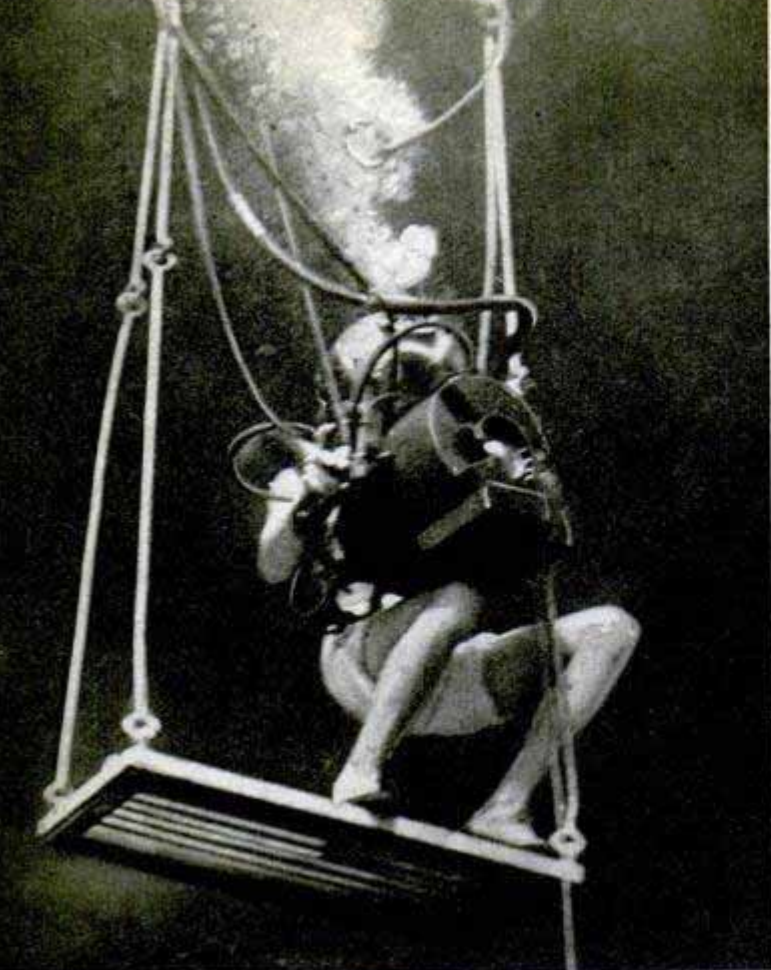
Nothing so difficult about any of these jobs—except that they're done beneath 10 to 300 feet of murky water inside a diving suit that weighs 190 pounds, and is almost as constricting as a strait jacket.

↑ Training barge deliberately is anchored in murky waters. Divers learn to work in dark

↓ Prowling the ooze of the ocean floor, this diver has nearly 200 feet of water above him

Photos by Don English





With an underwater camera, diver records life around decompression stage suspended far below surface

In addition to being a jack-of-all trades, a diver must be in top-notch physical condition, possess cool judgment and have a taste for adventure. Wages range from \$20 a day for a man working in shallow water without his own equipment to \$200 a day for a diver using his own gear in very deep water. Most divers average around \$10,000 a year.



There is an increasing demand for well-trained divers. Petroleum companies now need divers for new offshore drilling. Breakwater, bridge and dam engineers require underwater craftsmen. Salvage and ship-repair outfits depend heavily upon such skills. Insurance companies hire divers to identify sunken ships or automobiles. The sponge-fishing industry in Florida and the abalone-fishing industry in California could not exist without divers. More and more construction and engineering outfits are paying high wages to mechanics and riggers who can also dive when the occasion demands.

Although several thousand divers were trained by the Army and Navy during the war, deep-sea diving is a profession that is still wide open. Many emergency trained divers couldn't stand the gaff and have gone into other lines of work.

How does a young man step into this exciting game?

Many of America's best divers are former Navy men. About 1912, when the submarine began to show promise, the U. S. Navy began to give diving instruction. Since then it has developed the finest program in the world. The Navy today maintains diving schools at Bayonne, N. J., and Washington, D. C. Army divers are trained in Navy schools.

The only civilian school in the United States at present is the Sparling School of Deep Sea Diving in Wilmington, Calif., which packs a three-year course into 20 concentrated weeks. It is certified under the GI Bill of Rights and many of its students are veterans.

This school is run by Lt. (j.g.) E. R. Cross, USNR, an ex-Navy diver of 14 years experience. He made his first dive from the destroyer tender USS Dobbin and since then has gone down approximately 2000 times. During the war he was an instructor on the Normandie job and served on salvage vessels in the Atlantic and Pacific. During the atom-bomb tests at Bikini in 1946 he was Flag Secretary to the Commander of the Salvage Unit and made several dives into radioactive water.

"Modern engineering," Cross declares, "requires that a man not only have the guts to go down—but to know what he's doing when he gets there."

The ideal age for a student diver is between 20 and 30. Applicants must be muscular because it requires considerable strength and stamina to walk and handle tools in deep water. They should not be overweight because fatty tissue absorbs and retains harmful nitrogen. Above all, a

Even a short hike is too far in diver's shoes. Each weighs 17½ pounds, has a lead sole, brass toe cap

diver cannot be nervous because his life may depend upon calm thinking and sound decisions.

After five days of preliminary instruction, a student undergoes his first "elimination" dive. If he shows extreme excitability or talkativeness, he is advised to take up some other line of work. One in about every 30 students decides that diving is not the career for him.

From then on a student works long and hard. He learns the history and physics of diving, first aid and accident prevention, the use of salvage tools, the care and upkeep of diving equipment, above water and underwater cutting and welding, seamanship and underwater rigging, demolition and the use of explosives, general salvage work, marine specimen collection, and pearl, abalone and sponge fishing.

What Navy men have called "one of the best training devices in existence" has been developed at the Sparling School of Deep Sea Diving. It consists of a \$30,000 doughnut-shaped tank—30 feet across and 10 feet high. Students submerge in the area represented by the dough and the instructors watch them from outside portholes and from a compression chamber inside the doughnut's "hole."

When deep dives from a barge in the ocean begin, a few more enthusiasts are washed out. A student may be a master in the diving tank, but when he reaches 100-foot ocean depths where inky blackness enfolds him, rocks foul his lines, seaweed grabs at his legs and great sea creatures slither past, his courage sometimes fails.

Upon graduation, the novice diver finds a wide field of opportunity awaiting him. A bridge is being built in Sydney, Australia, and divers are needed to erect coffer dams for the foundation. Pipe is being laid in Venezuelan offshore oil wells. A hulk is blocking the entrance to the Thames River and must be removed. The University of California is interested in a peculiar type of seaweed that grows in the warm waters of the Gulf of California. New York police suspect that a murder weapon, a revolver, has been thrown off the George Washington Bridge. A salvage company is clearing Manila Harbor.

The tools of a diver's trade are the standard ones of the construction business—plus some underwater specialties. Small tools are carried in a canvas bag that holds up to 200 pounds of equipment. Larger tools are lowered on a line.

Special tools for underwater work include an underwater knife with a saw blade on one edge; a cement gun for grouting work; power tools for cable-cutting, pipe bonding, wire-rope bonding and rivet expanding and removing; washing nozzles or



Student at left wears light suit for shallow work, while "deep sea" man at right wears 190-pound rig. Diver is given final instructions on the use of oxy-hydrogen underwater cutting torch for salvage work.



lances for slipping a cable beneath a sunken ship; and pontoons of various sizes and dimensions.

The most useful tools of the diver, perhaps, are his torches. These are of three types—the oxyhydrogen cutting torch, oxyelectric cutting torch and electric arc welder. There is little difference in the theory and technique of welding whether done on dry land or in Neptune's watery kingdom.

But how can a diver use a cutting or welding torch under water?

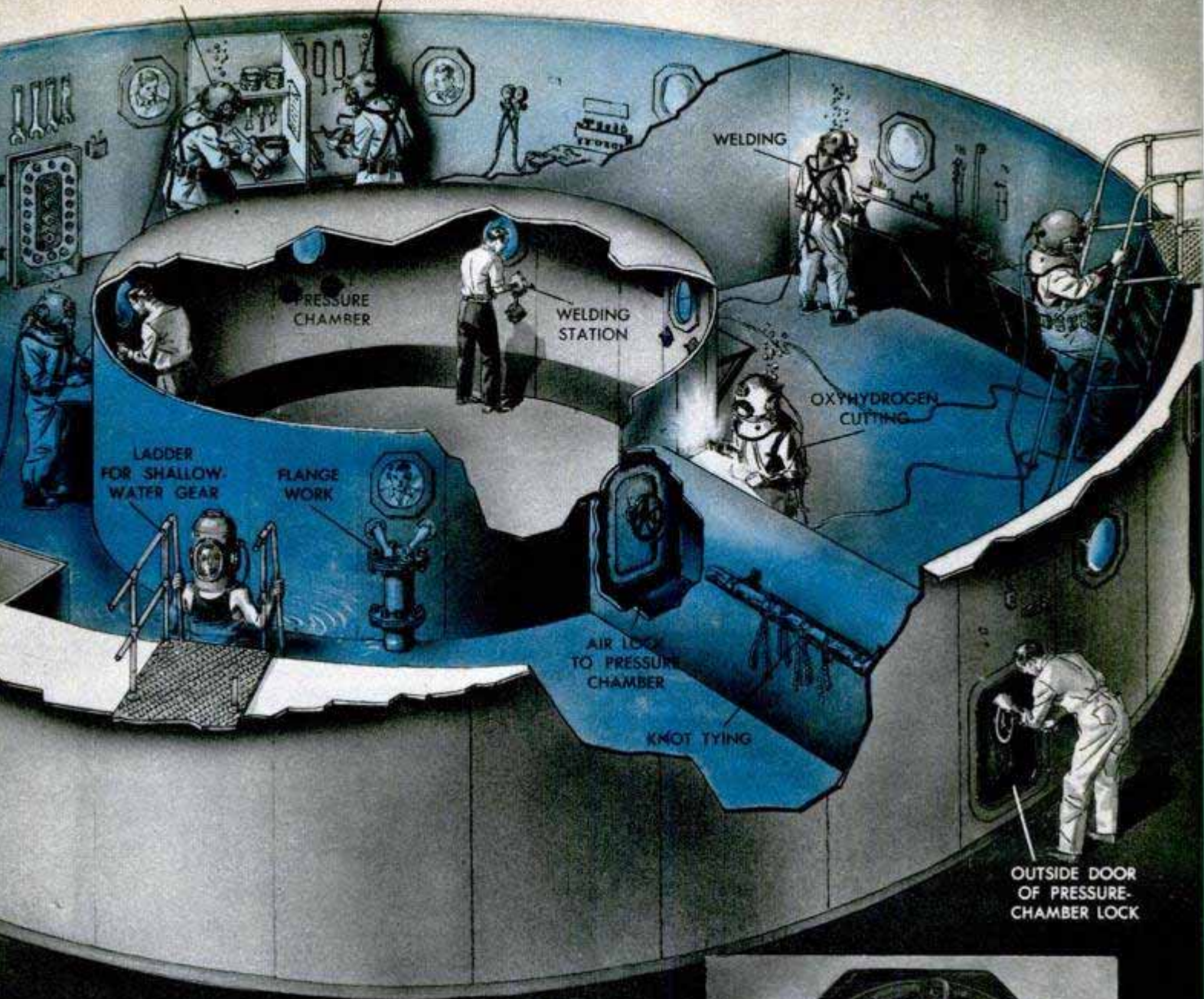
When the oxyhydrogen torch is used below the surface, the water immediately around it is forced away in all directions by compressed air to form a four-inch bubble in which the flame burns. Underwater torches are equipped with special tips called "bubble nuts" which hold the flame the correct distance from the metal. The electric arc burns inside a bubble of gas in much the same way.

Salvage is one of the significant phases of deep-sea diving. World War II was responsible for 600 sunken ships along the Atlantic coast, 113 in the Caribbean and 40 in the Pacific. In less than 100 fathoms of water, these sunken hulls contain crude rubber from South America, ore from Europe and U. S.-built, wartime equipment in waterproof coverings.

The master mechanics of the deep also play an important role in ship repair. Often underwater damage as a result of collision or stranding requires repairs to enable a ship to reach dry dock. Small holes and ruptured plate seams are repaired with pneumatic metal calking tools and soft-wood patches and calked with oakum or tallow. Medium sized holes are closed temporarily with blankets, mattresses or collision mats. Large holes are more difficult and compli-

↓ Instructor gives pointers over a diver's telephone to a student in the training tank. Below right, inside the pressure chamber a veteran diver checks a student's progress in underwater arc welding through a porthole



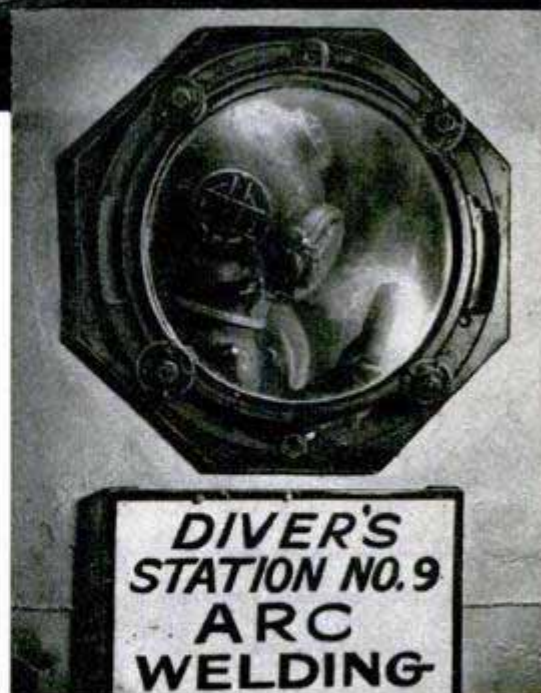


cated. First a diver goes down, clears away all fractured or torn plate and measures the hole. A template is constructed under water to the dimensions of the hole and the curvature of the hull. On deck a patch is built from the template and lowered to the diver who bolts it in place. When a ship reaches a repair yard, permanent repairs are made.

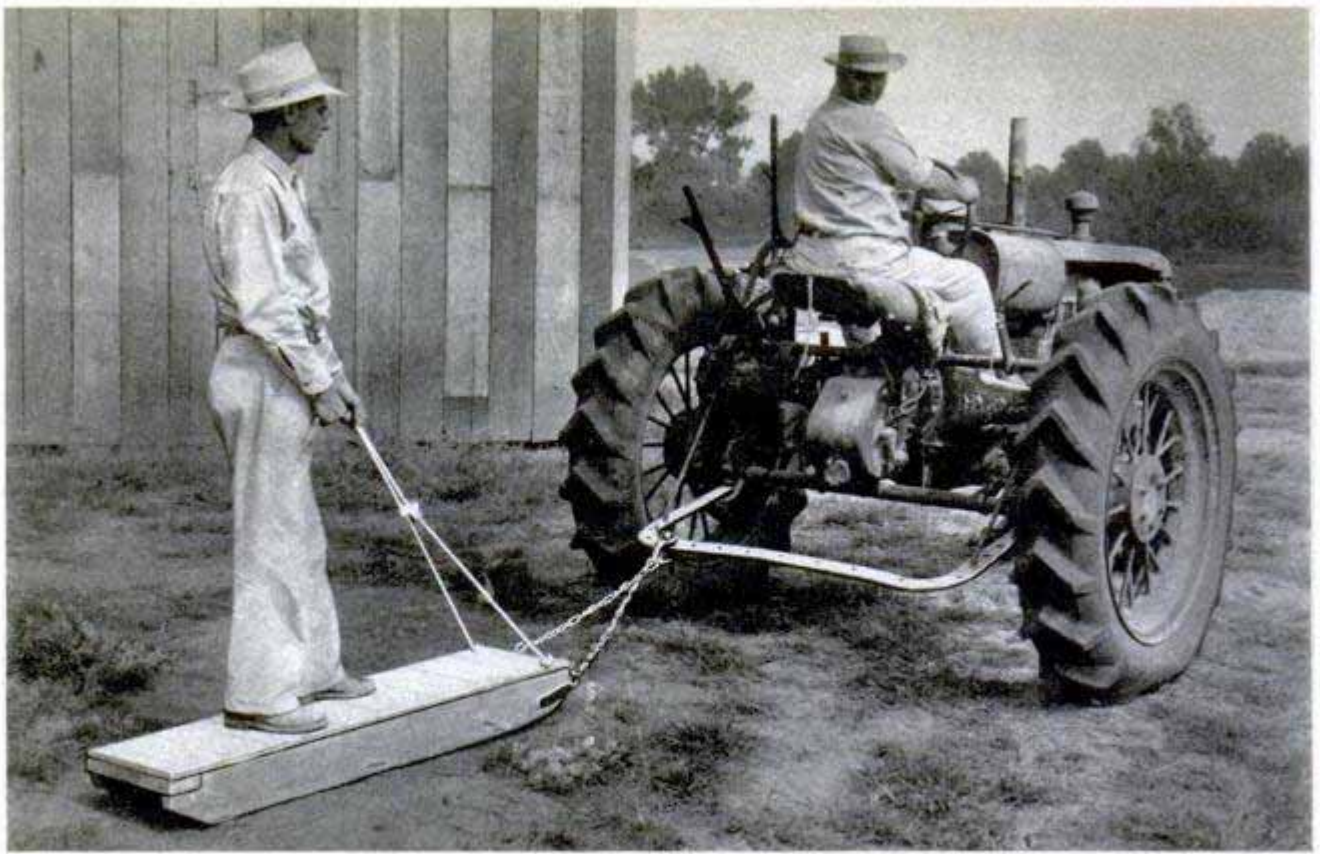
A knowledge of carpentry and shoring up bulkheads often comes in handy. In salvage and repair operations, for example, it is sometimes necessary to construct bulkheads of various sizes by spiking horizontal tongue-and-groove planking on vertical timbers. The planking always is fitted on the pressure side of the bulkhead. For large jobs, timbers up to 12 by 12s are used.

A skillful deep-sea diver knows almost as much about seamanship as a Navy boatswain's mate and must be a skilled rigger. This involves a familiarity with knots, splices, guy lines, shackles, block and tackle, scaffolding and slings. A rigger does not play hunches. He makes sure he is right by checking his

(Continued to page 232)



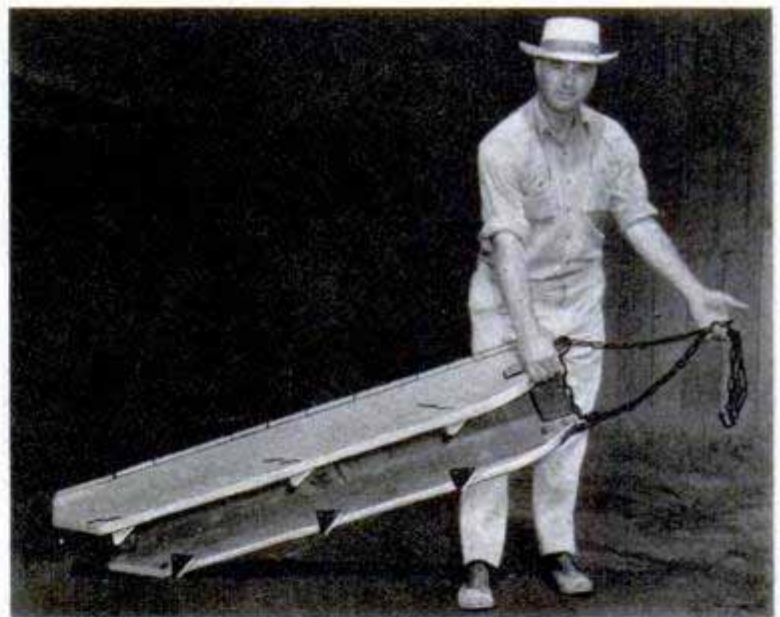
Drawing shows "doughnut" training tank where students practice almost any type of underwater work from knot tying to rivet cutting. Insets show portholes through which instructors check students



Vine-Cutting Sled

Sweet-potato vines on a state farm in Louisiana are cut at harvest time by a sled with runners made of mowing-machine knife sections. In an hour it does work that takes 30 to 40 men half a day. The sled straddles rows of vines and, bearing a man's weight to aid cutting, is pulled by a tractor. It is 4½ feet long, 16 inches wide and weighs about 50 pounds. The knives are attached to the runners with long spikes.

Discarded mowing-machine knife sections, nailed to sled runners, speed sweet-potato vine cutting on state farm in Louisiana



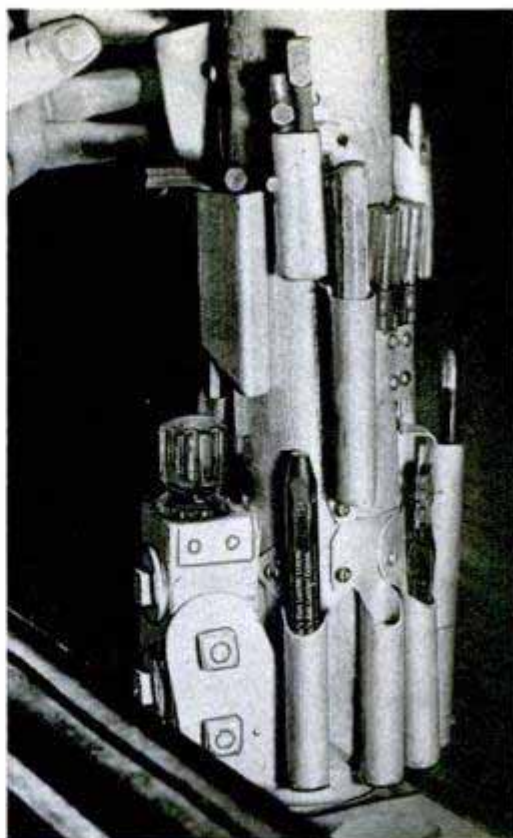
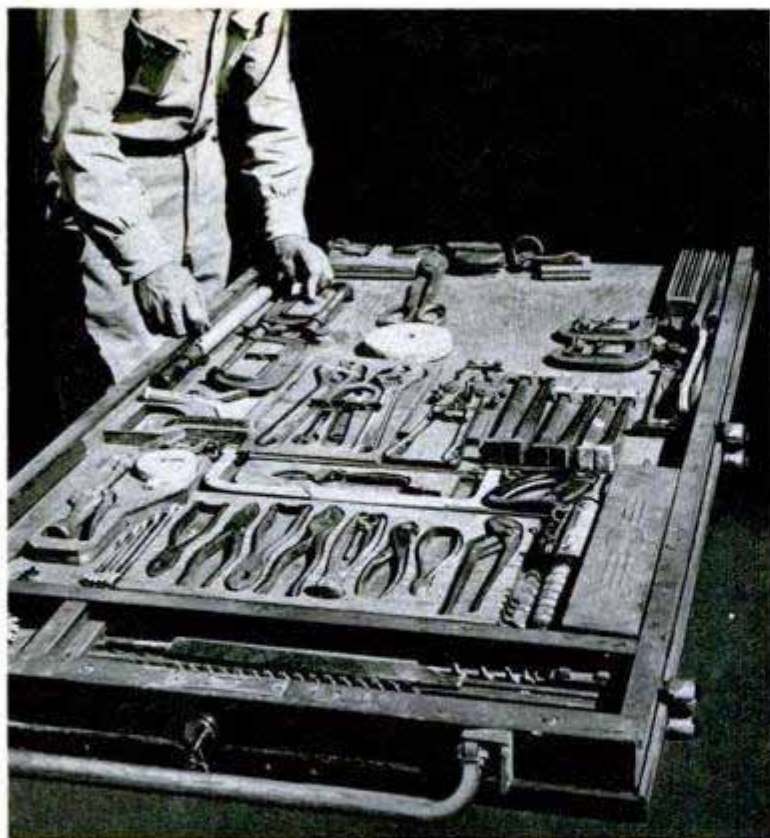
Bus Converted to Mobile Cartoon Theater for Youngsters

When J. K. Venard of National City, Calif., drives up in his bus, the children from the neighborhood come on the run.

Venard has converted a war-surplus Navy bus into a mobile theater and travels a regular route showing 16-mm. cartoons to

the children. He has added a trailer to the bus to serve as a ticket booth, loading platform and projection room. Most stops on the route are in federal-housing projects and the children have learned what day and hour to expect the mobile theater. The bus seats 80 children or 60 adults, who also attend the movies.

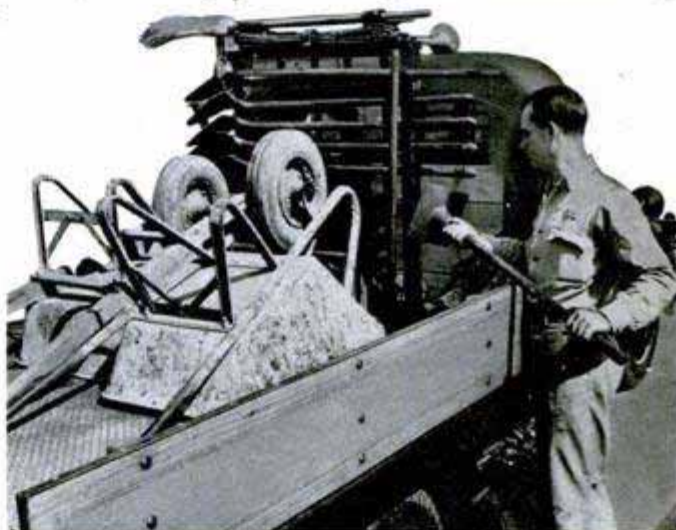




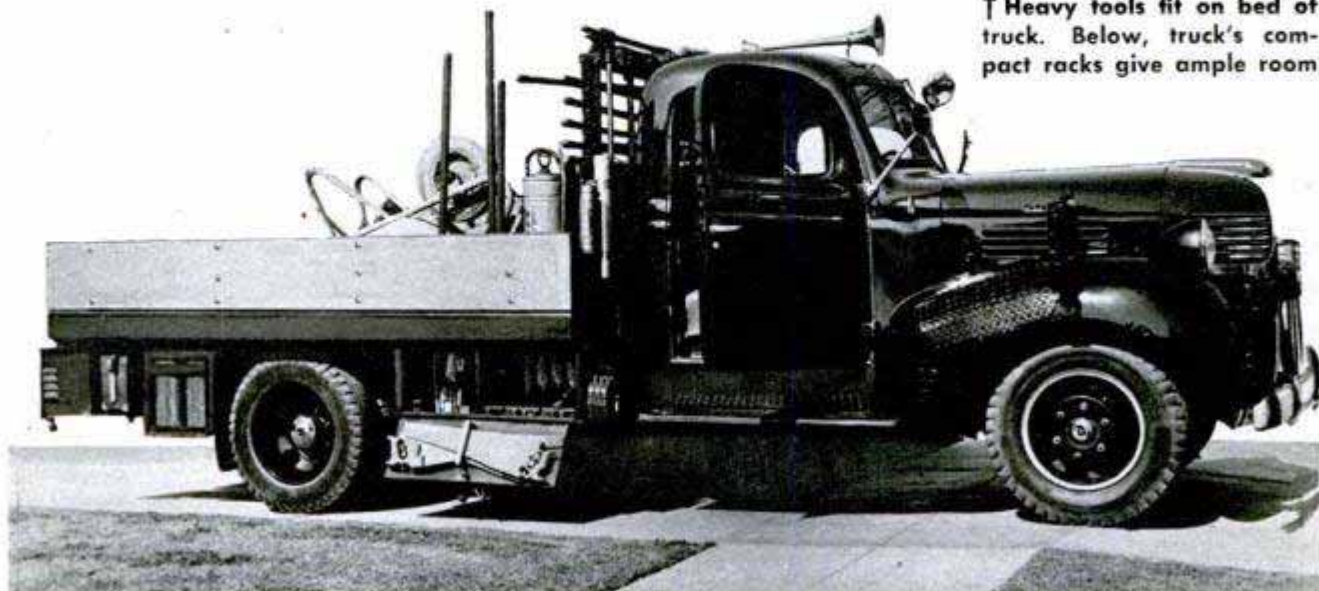
Left, drawer has tool compartments cut to exact shape. Above, small carpenter tools slip into aluminum tubing

MOBILE TOOL SHOP

Every tool has a fitted "home" in a tool-house truck designed by a Los Angeles cement contractor. The truck supplies 15 workmen with all the tools required for excavating, building forms and pouring concrete. A rear tool drawer made of heavy plywood slides out to reveal all the small tools required on the job. The tools fit into compartments cut to exact shape. A glance at the drawer at the end of working hours reveals immediately whether any tool is missing. Shovels, saws and other large tools are slipped into fitted racks. The truck bed with fittings costs about \$650.



↑ Heavy tools fit on bed of truck. Below, truck's compact racks give ample room



Doll Doctor



"Doc" Nash gives his patients a 'post-operative examination after they have recuperated in his hospital

By Walter E. Burton

A MAN with a sick wife and 50 ailing dolls on his hands was the unexpected key that enabled George A. Nash of Conneaut, Ohio, to make a childhood dream come virtually true.

When Nash was in that period where a boy is expected to make up his mind about a lifetime occupation, he wanted to become a doctor—either a physician or a dentist. But his father ruled against it. "Too much

hard work, too-long hours," he declared. So Nash, now 46 years old, obeyed his father's wishes and went into business. But he never lost his desire to be a doctor.

Eventually Nash became vice-president of a concern manufacturing electronic equipment. He developed an assortment of hobbies which included horses, painting, guns, stamp collecting and a home workshop. The rush of the war years, coupled perhaps with a deep-rooted dissatisfaction with a field of work that was not his primary choice, damaged his health. So he resigned his position. This gave him, for the first time in years, an abundance of hobby time to dabble in paints or putter with his lathe, drill press or jigsaw.

One day an acquaintance said to him, "George, I'm on a spot, and I think you can help me off it." Then he told his story. His wife had been sick for months. She had built up a business repairing dolls, and when she became sick she had about 50 broken ones on hand. The owners had been pestering him for six months. He couldn't fix a doll on a bet, but he thought that George, who was handy with tools and



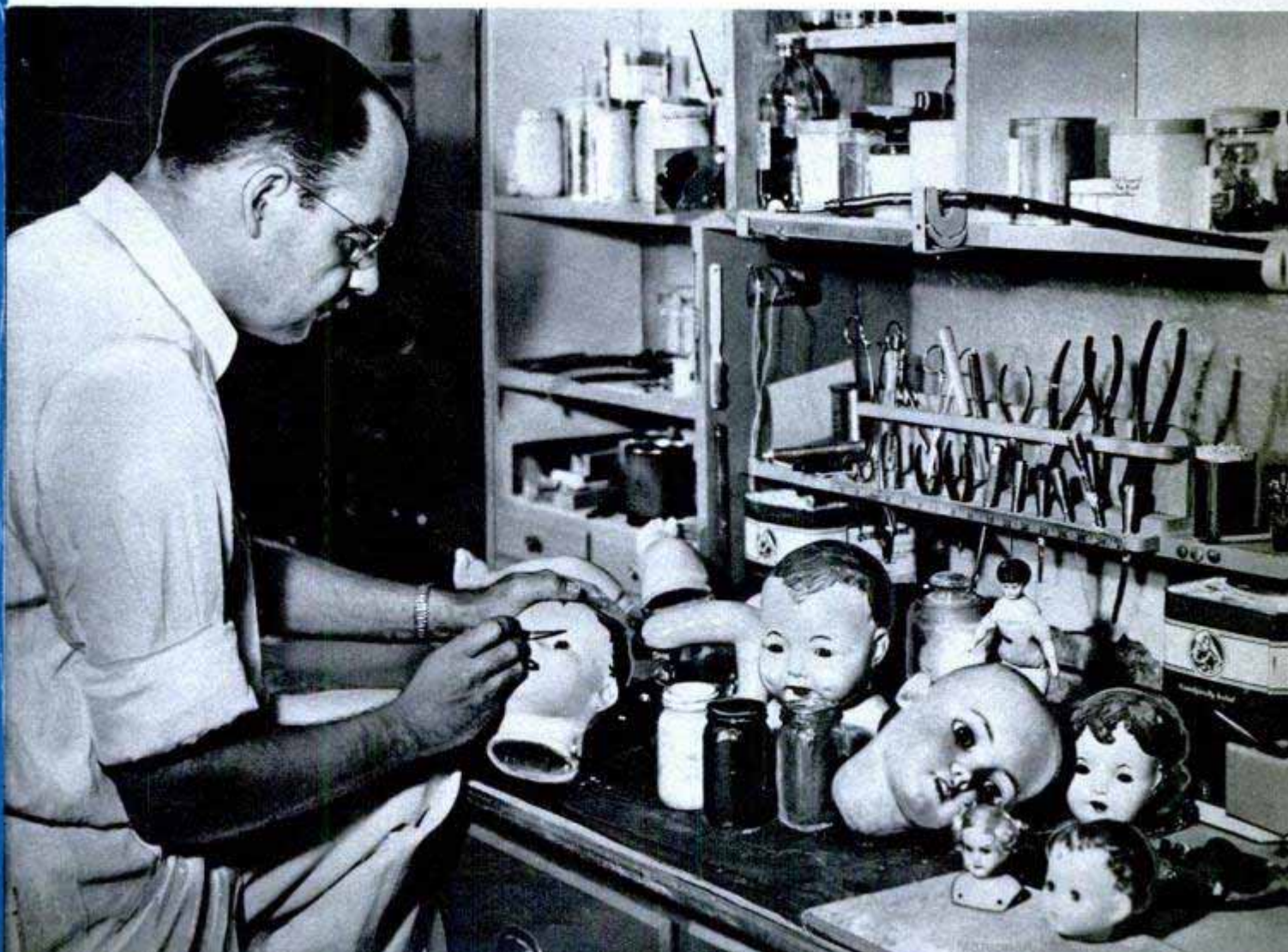
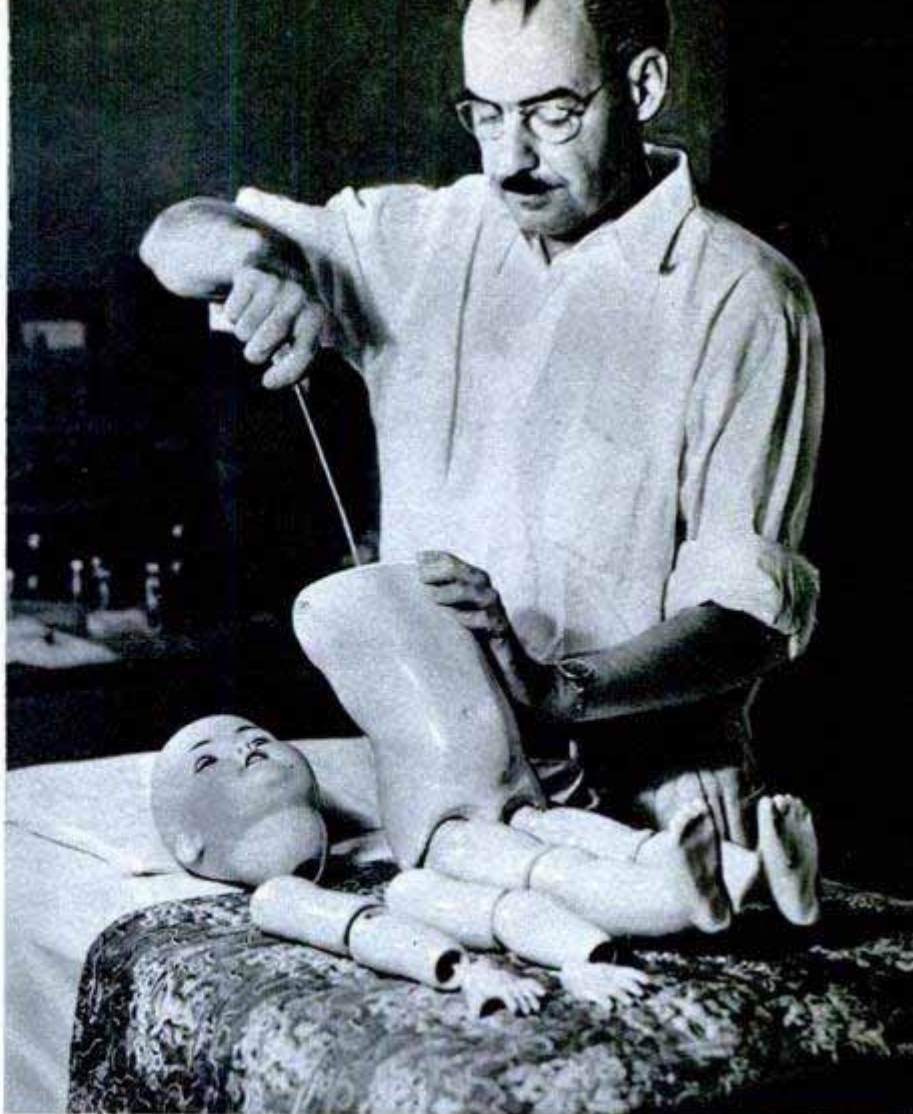
Among tools are real surgical instruments. Flexible shaft in foreground operates dental burrs for carving

knew paints and color, might have time to tinker with them. Nash, not suspecting what lay ahead, agreed to take on the work.

Before long, it began to become apparent that, after all, he had become a doctor—a doctor of ailing dolls. Since then—that was in 1946—he has decided that this profession has certain unique advantages over other fields of medicine. It has, too, some similarities. For example, he keeps about as lengthy hours as any doctor, although he doesn't make emergency middle-of-the-night calls.

Nash went to work on the 50 distressed dolls, developing his technique as he progressed. His pay was entirely in experience. The dolls' owners were pleased with the complete recuperation, and they told other doll owners about it. Almost before he knew what was happening, Nash had been propelled into the doll-repair business. The work came in rapidly. Sick dolls, like humans, must have a place in which to regain

Right, "surgeon's" skillful hands resting a patient on the miniature operating table
↓ In repainting the tiny facial features, the doll doctor uses waterproof enamels





Old-fashioned medical containers hold the hospital supplies

health, so Nash decided to open a permanent doll hospital.

There are quite a variety of "doll hospitals" in this country. Nash has visited a number of them. Many, he reports, are primarily small retail shops where doll repairing is a sideline. None that he has heard about measures up to his conception of a real "hospital." Not one of the places he has visited has an actual operating table, or genuine surgical instruments!

Today, Nash has what he believes to be the only true-to-life doll hospital in the country—an institution complete with genuine pill and medicine bottles, actual surgical and dental instruments, an operating table and a special operating-room chandelier (from an old dental office). The staff consists of "Doc" Nash and his wife. At first, Mrs. Nash's interest in dolls was negligible, but constant association with the innumerable characters that moved through the operating room and repair wards, plus the fact that the work was becoming too much for one person to handle, persuaded her to become an active partner. Today she is busy making doll clothes and wigs, tinting faces, taking care of visitors and doing other hospital work.

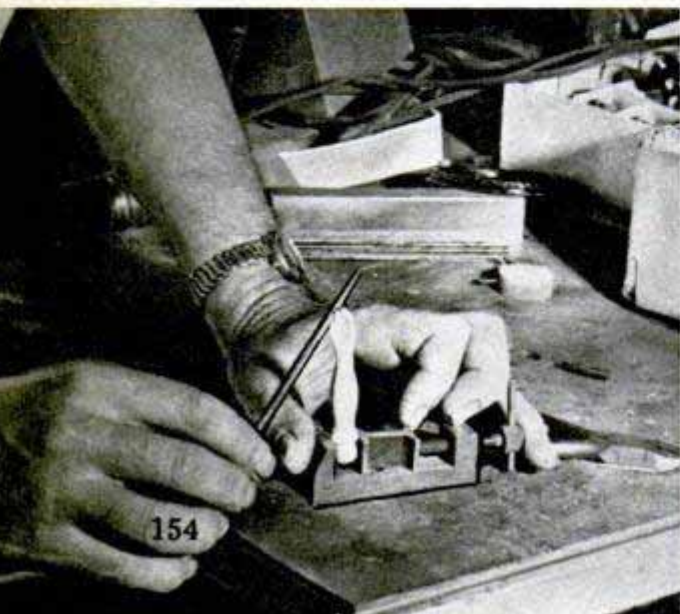
The Nash hospital occupies the second floor of an old building behind the Nash home. Two of the five rooms vie for top rating in visitor interest. One is the display room where several dozen finished dolls, some in pert new costumes, some wearing only a wig, are grouped. There also are a number of china, bisque, and metal doll heads and some stock accessories such as doll shoes and gold-finished under-bed plumbing.

This room doubles as a business office and reception center.

The other room that attracts attention is the main operating room. Near its center stands a tiny operating table, illuminated by the dental chandelier. The medicine cabinet in one corner contains a collection of old-fashioned druggist's herb and pill jars and bottles which earn their keep by holding hospital supplies.

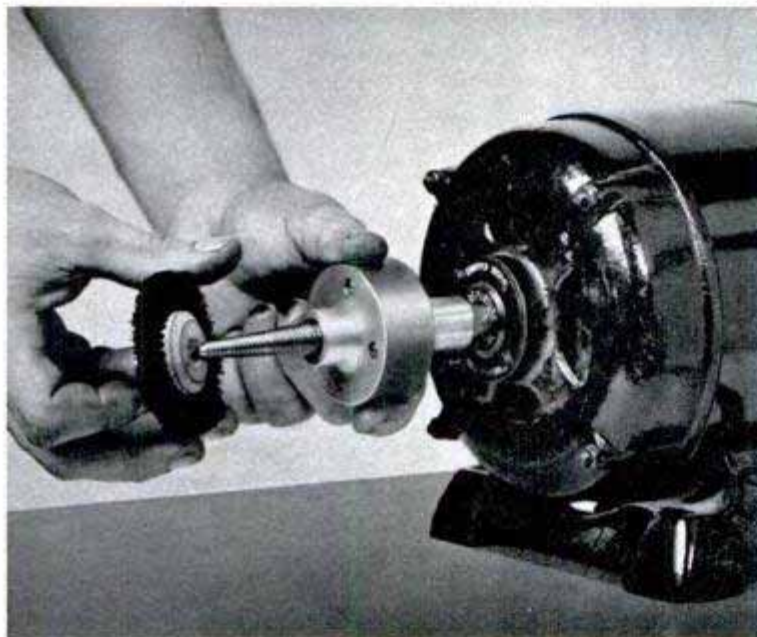
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When doll's arm is missing, Nash carves a new one from wood. Right, dental burr shapes finger on new hand



Earth Mover Loads in Reverse

Handling of bulk materials is sped up and improved by a device that enables tractor-mounted earth movers to load in reverse. With it, movers can be backed in close to buildings, fences, stock piles or excavations, eliminating the need for hand shoveling. The scoop takes a bite 24 inches wide. Loads are picked up and carried, instead of dragged, and dumped in a pile or spread and leveled.



Quick-Change Spindle For Polishing Wheels

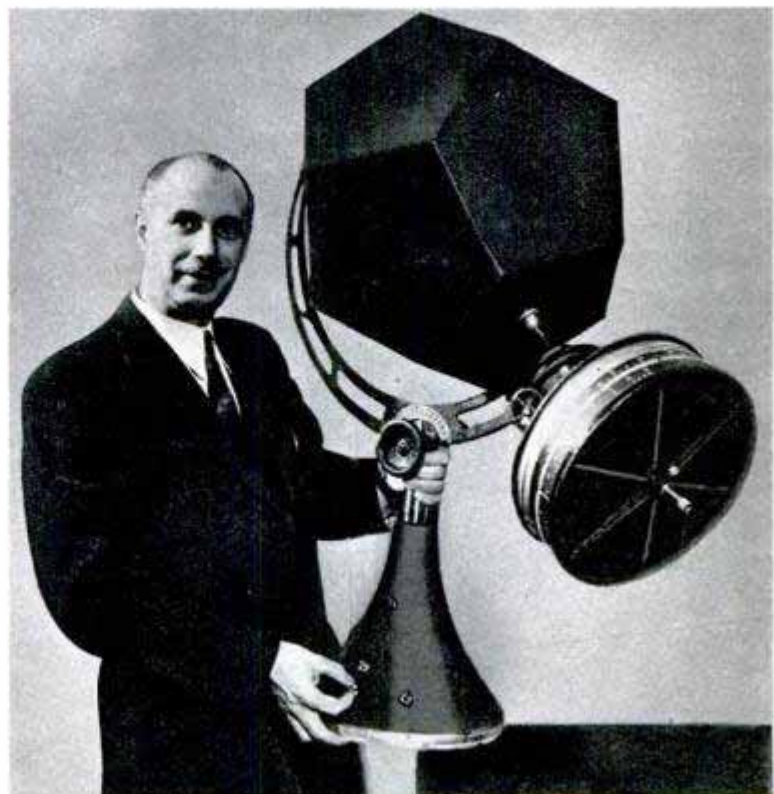
Polishing and buffing wheels can be put on and off the shaft without stopping the electric motor when a free-spinning spindle is used. To stop the spindle the operator grasps the large collar behind the threads. This does not affect the spinning shaft. The spindle has tapered threads for quick changing of the wheels.

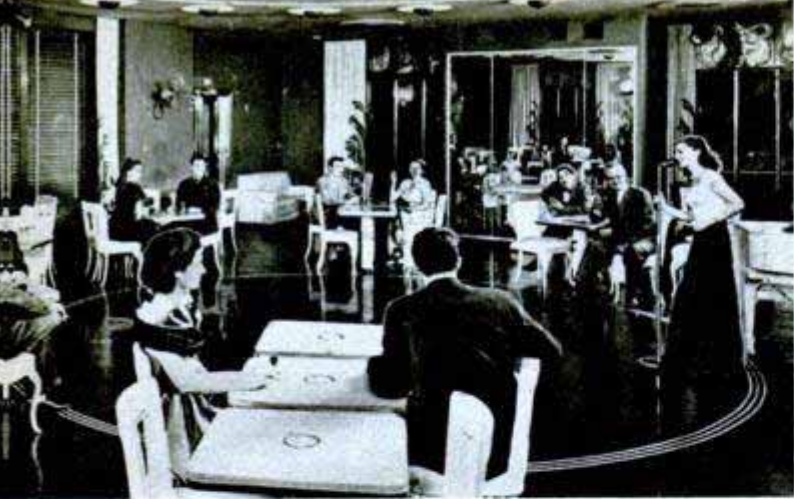
☐ Metal tags were attached to the flippers of nearly 20,000 seal pups in the north Pacific to start a check on their migratory habits that will be completed when they are ready for killing in 1950.

Portable Planetarium Weighs Only 25 Pounds

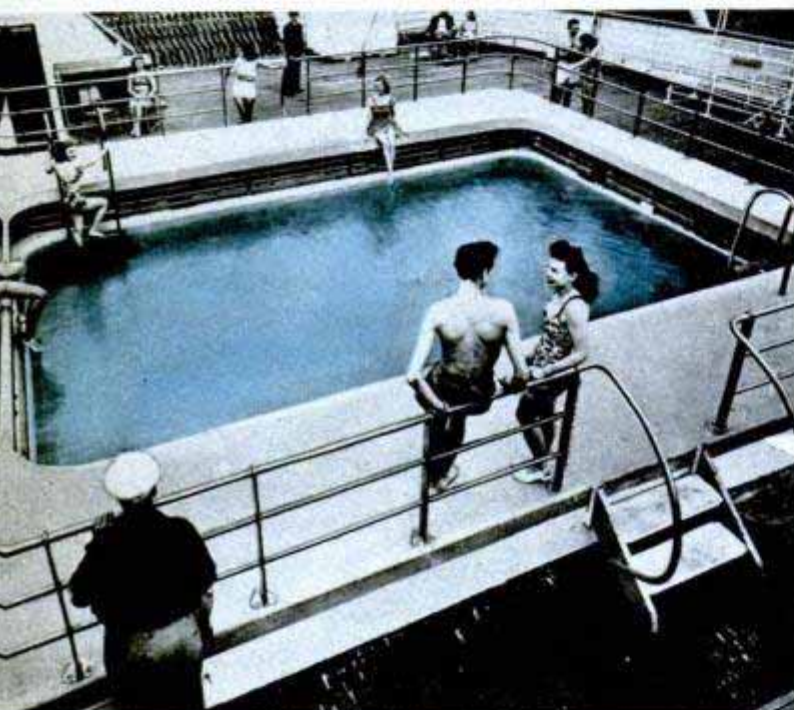
Only three feet high, a portable planetarium can be used in schools or homes for studying the paths of the stars in the sky. The 25-pound unit projects images of all stars down to the fourth magnitude or most of those that are seen by the naked eye. The 12-sided housing, made of Vinylite plastic, contains a special bulb that projects its light through holes punched in the plastic. While the planetarium can be used on a flat ceiling, portable domes that give greater fidelity are available.

☐ Radarproof canisters prevent ignition of photoflash bulbs by radar waves during air shipment.





Passengers won't be bored during their trans-Pacific voyage. There's entertainment galore. Marine veranda (above) is a combination night club and movie theater



The ship has two swimming pools. Deep recess near the top (above) prevents splashing during stormy weather

Children love the merry-go-round (below) in the play-room. Thatched hut in rear is a junior-sized washroom



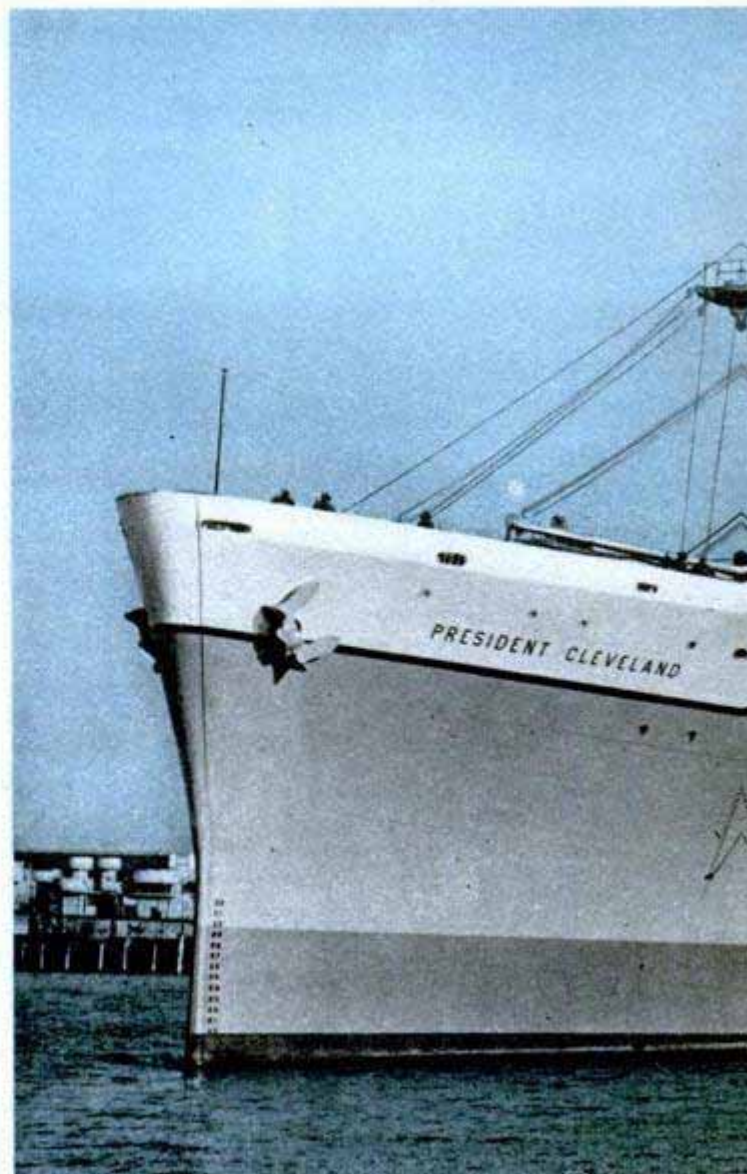
HOTEL TO THE ORIENT

By Thomas E. Stimson, Jr.

THE FINEST ships under any flag on any ocean!" Those were the specifications laid down for America's twin post-war ocean liners, the President Cleveland and the President Wilson, designed and built for the trans-Pacific trade.

Each is 610 feet long, weighs 23,000 tons, and can be driven at 21 knots by its 20,000-horsepower turbo-electric motors.

Flying the house flag of the American President Lines, the President Cleveland went into service late last year on the San Francisco-Honolulu-Manila-Hongkong-Shanghai-Yokohama run. The Wilson is scheduled to make its maiden voyage over the same circuit this month. The



vessels are the largest ever built on the west coast and were constructed by Bethlehem-Alameda Shipyard in California.

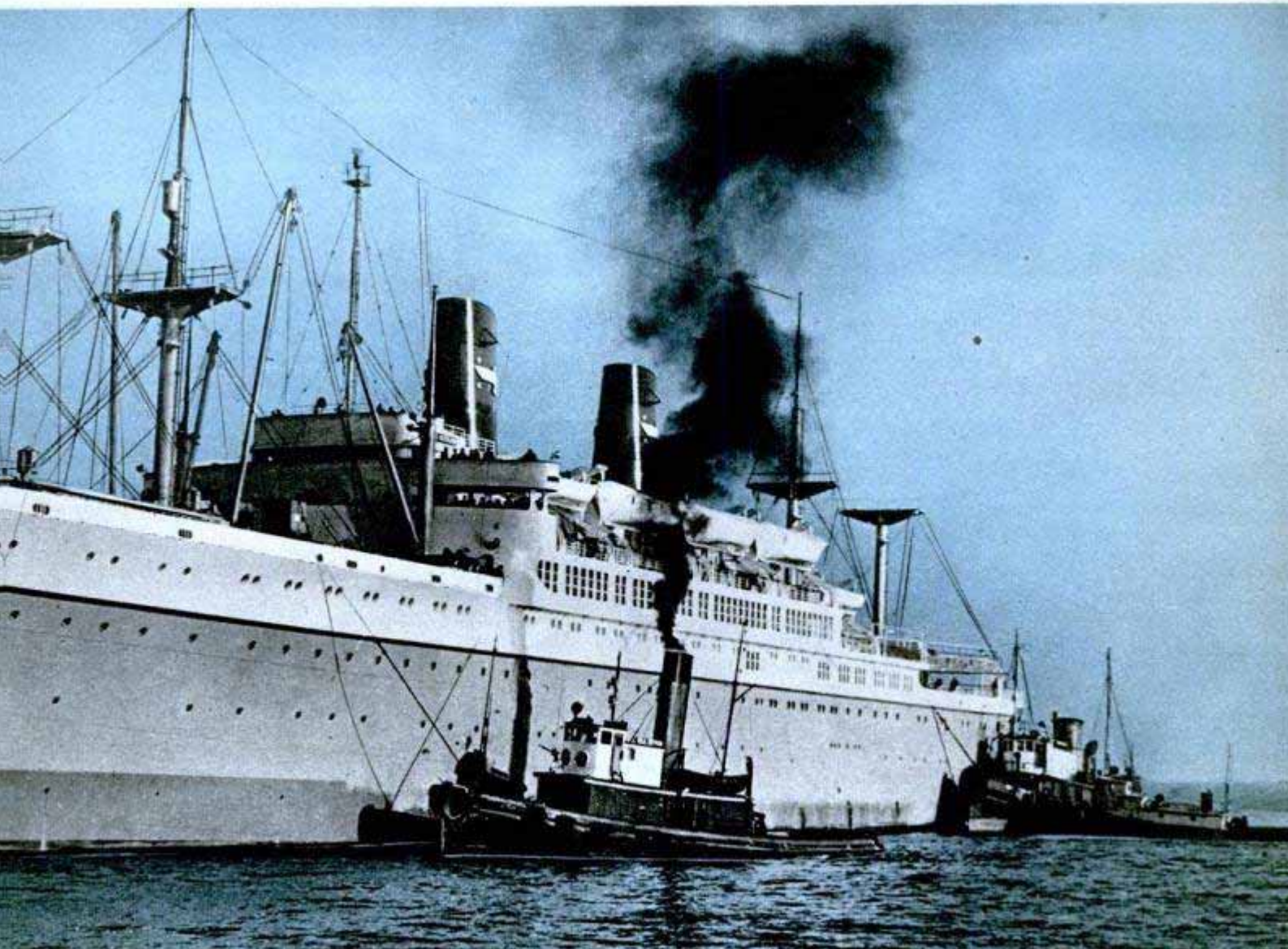
Each is a combination of luxury passenger liner, express freighter, refrigerator ship and tanker. In addition to 550 passengers and 350 crew members, each can carry more than 600 tons of cargo refrigerated to 10 degrees below zero, more than 700 tons of tung, coconut, and other edible oils in special tanks, and nearly 5000 tons of general cargo.

Refrigerated cargo and general ship's stores are loaded on the vessel by a new type of overhead trolley that can be extended on retractable booms through an opening in the ship's side. Called the Siporter, the trolley can pick up as much as three long tons of stores from the pier alongside the ship, carry it inboard, lower it into a hold and return for another load in 2½ minutes. The usual deck booms and winches are used for loading and unloading the other holds.

The ship manufactures its internal weather, has two illuminated swimming pools, a passenger elevator, movies, radio-broadcast receivers and public-address systems, dial telephones and a long-range ship-to-shore radiophone. There is a marine veranda on the promenade deck, a

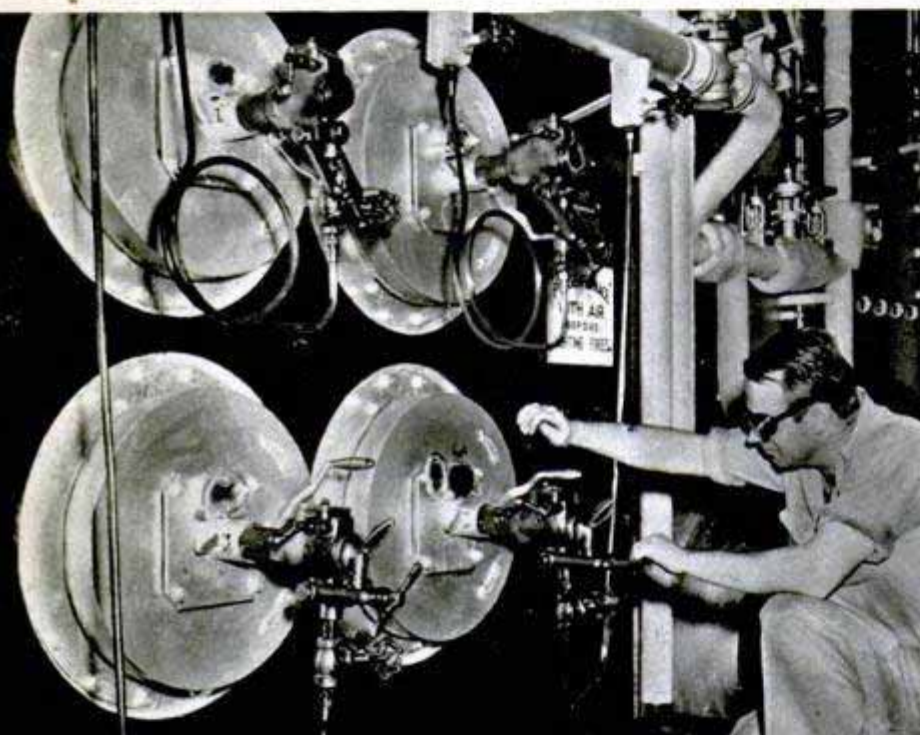


Signal-flag locker on the flying bridge is forward of the streamlined aluminum funnels. Below, powerful tugs ease the big liner into the main channel

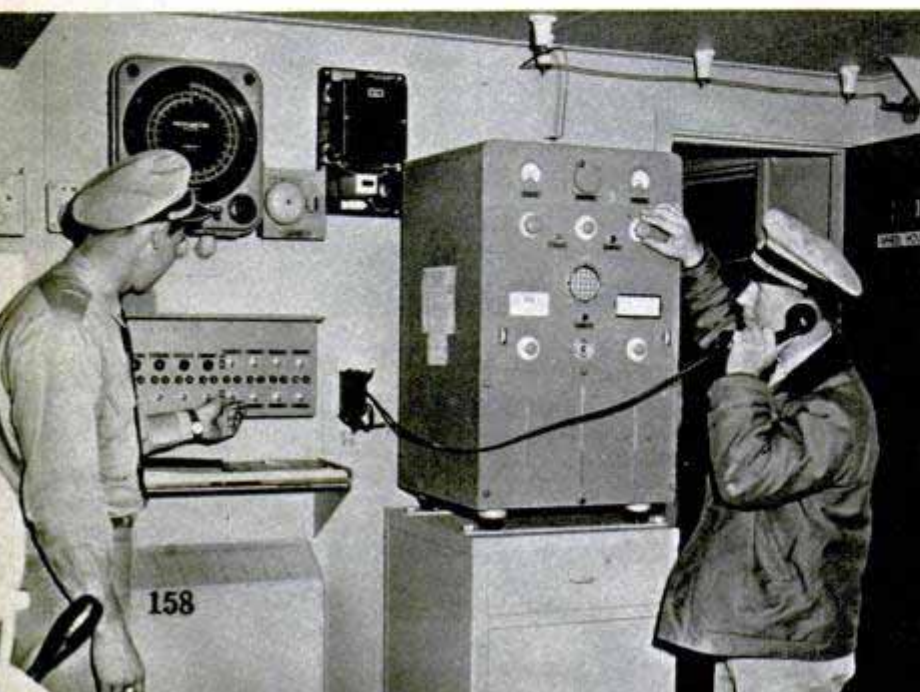




Alarm system sounds a warning in fire-control room (above) when automatic devices detect smoke or flame in any part of the ship



Safety-goggled fireman (above) inspects fuel-oil flame in one of the boilers by opening peep hole in fire door. Below, long-range radiophone on the bridge enables officers to talk to other ships or to shore stations. Officer at left turns on navigation lights



lounge and a circular dance floor. Most of the furniture in the public areas is made of aluminum, covered with attractive leather or plastic fabrics.

Adult passengers make use of a gymnasium, massage parlor and beauty parlor, while the children have a special playroom containing playhouses, a carousel and a miniature ship's bridge from which the ship may be "steered." Pets are kept in kennels that are steam heated in cold weather.

The ship has three main galleys and five pantries and 54 waiters are required for serving the first-class, tourist and third-class passengers and the officers and crew. Crew members have air-conditioned lounge rooms. Hospital facilities include a fully equipped operating room, dispensary and diet kitchen.

A radical departure from standard construction is that each ship from the boat deck up consists almost entirely of aluminum structural shapes and plates. Lifeboats, davits, funnels and the midship houses all are of riveted aluminum. The saving of some 75 tons of weight high in the ship contributes to stability.

Because they were designed to serve as potential wartime auxiliaries, both vessels incorporate certain novel safety features in addition to all the latest peacetime safety measures. The two engine rooms, for instance, are entirely separate and self-contained. Each has its own pair of high-pressure steam boilers, its own General Electric impulse reaction turbine and its own group of turbine-driven generators. The boilers are fed with preheated fuel oil and with air heated to 240 degrees, and are served by automatic combustion regulators that maintain the correct fuel-air ratio at all times.

Each engine normally powers one propeller, but either power plant may be connected to both propulsion motors in an emergency. Either engine can produce 80 percent of normal cruising speed when driving both propellers. Dynamic braking allows the ship to go from full speed ahead to full speed astern in much less time and distance



Left, speed and direction of movement of propellers are regulated at this main propulsion control board. Right, quartermaster operates hand steering gear as ship nears harbor. Officer (rear) watches radar screen

than is possible with most merchant ships.

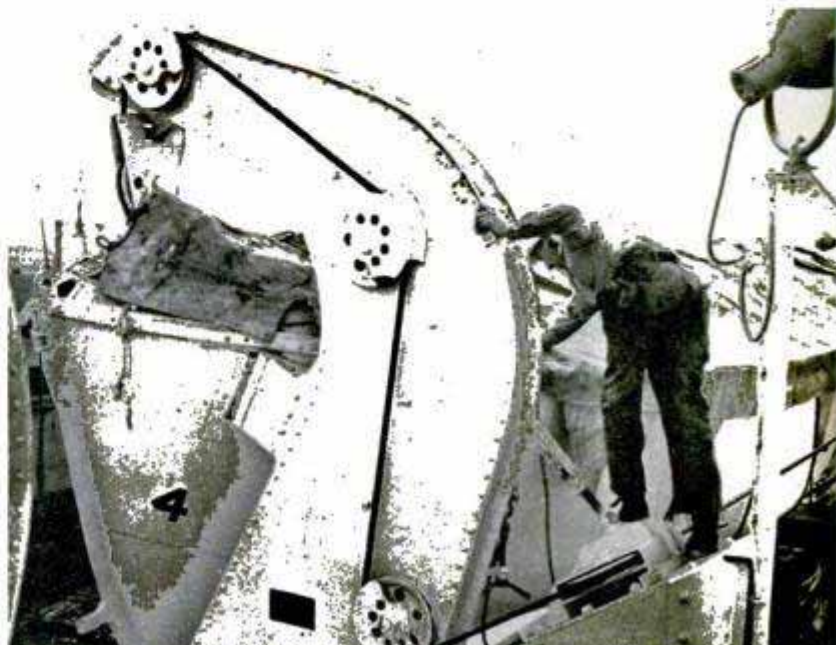
The ship has 35 sliding steel doors that may be operated manually or by electricity from several control points to divide the vessel into 14 separate watertight compartments. In addition there are numerous electrically operated fire-screen doors to close passageways and divide the ship into fire zones, each of which has its own fire-fighting apparatus.

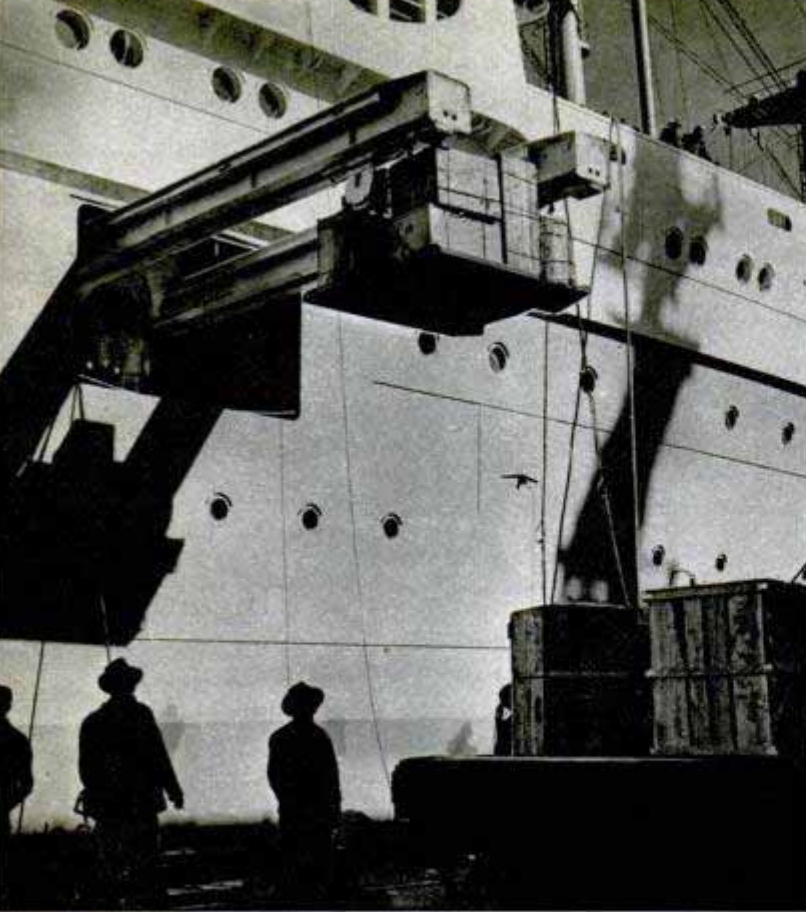
Fire detection equipment is so complete that the ship has a special fire alarm and control room adjacent to the bridge. In this headquarters a fire in virtually any part of the ship is detected at once by eye, ear or nose.

Alarm bells ring automatically, both on the bridge and in the fire-control room,

when any detection system "senses" fire. Electric thermostats in the passenger and crew areas operate an "automatic supervisory fire-alarm annunciator" in the fire-control room if they become overheated, flashing on a number to show the location of the trouble. Another continuous detection system uses electric eyes to examine the air that is pumped from 51 portions of the ship for traces of smoke. The air exhausts into the fire-control room where smoke is detected immediately by its odor. From the fire-control room the ship's watertight doors can be closed, the fire-screen doors operated and the ship's ventilation system shut down. In addition to the usual fire-fighting apparatus in many parts of the ship, special areas are protected by

Left, indexed signal board flashes a warning when any unit of the ship's machinery doesn't operate properly. Right, aluminum lifeboats can be lowered instantly by gravity davits. Two lifeboats have motors and radios





All the comforts of a luxurious hotel are found in the lounge. The clock is of special Chinese design

Left, called the Siporter, this loading device is used to lift cargo from dock and carry it inside to the hold eliminating the top deck booms and winches

built-in carbon-dioxide systems operated by remote control.

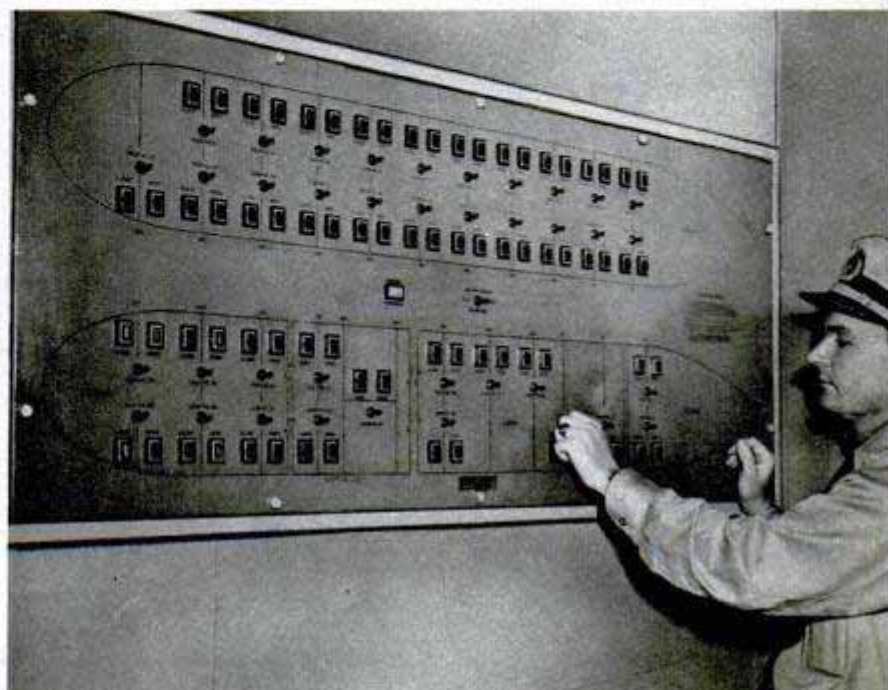
Fireproof construction is employed to a much greater extent than in prewar ships. Most partitions in the vessel's living spaces consist of two inches of a fireproof material such as glass wool with steel facings. Fire-resistant Vinyl-plastic deck coverings are used instead of rubber tile in most of the enclosed spaces and passageways. As a final precaution, three fire watchmen are on patrol all night long, no matter whether the ship is at sea or in port.

Naturally, the postwar ships are equipped with the latest types of navigating equipment. These include radar and

loran in addition to an echo depth sounder, radio direction finder and gyro-compass with eight repeater stations, plus several magnetic compasses in the wheelhouse and on the flying bridge. An automatic steering system employs electric telemotors that control the rudder pumps for manual as well as automatic steering. The main steering gear itself is of the hydro-electric double-ram type and can move the rudder from hard-over to hard-over (70 degrees) in less than 30 seconds when the ship is moving ahead at full speed and at full-load draft. The steering motors and their ram pumps can be controlled from any of five

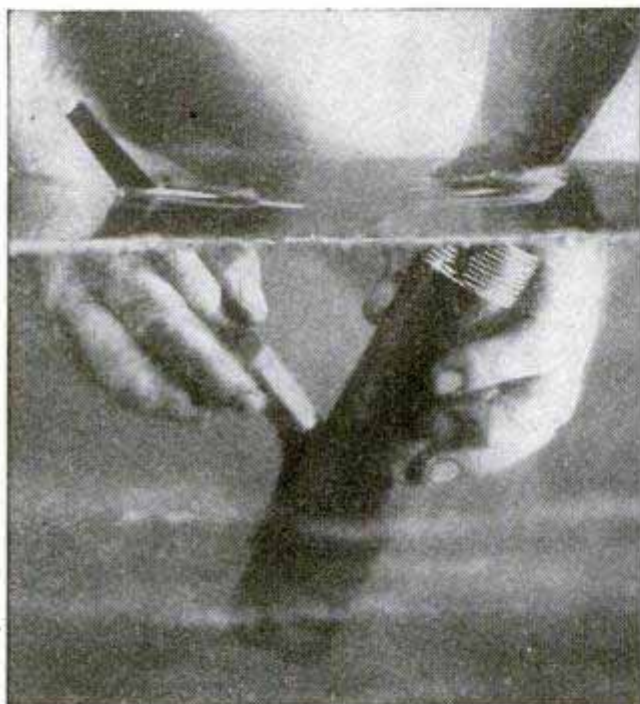
(Continued to page 256)

Left, 48 electric eyes examine air throughout the ship. If smoke is present, a light flashes on this board. Right, master indicator board operates 38 steel doors that divide the ship into 14 watertight compartments



Electrical Giant Hauls Coal Trains

Designed for hauling trains heavily loaded with coal from the West Virginian mines over the Allegheny Mountains to Roanoke, Va., an all-electric locomotive weighing a million pounds was put into service recently. It develops 6800 horsepower, making it the most powerful locomotive of its type in the country. Four have been ordered by the Virginian Railway from General Electric.



Underwater Paint

Preventing moisture penetration, a protective coating for concrete, masonry and steel can be applied on damp surfaces or even underwater. Composed of asphalts, plasticizing and adhesive compounds, the paint does not contain any tar. It does not impart any taste to drinking water, dairy products or other liquids and is not affected by diluted acids or alkalis.

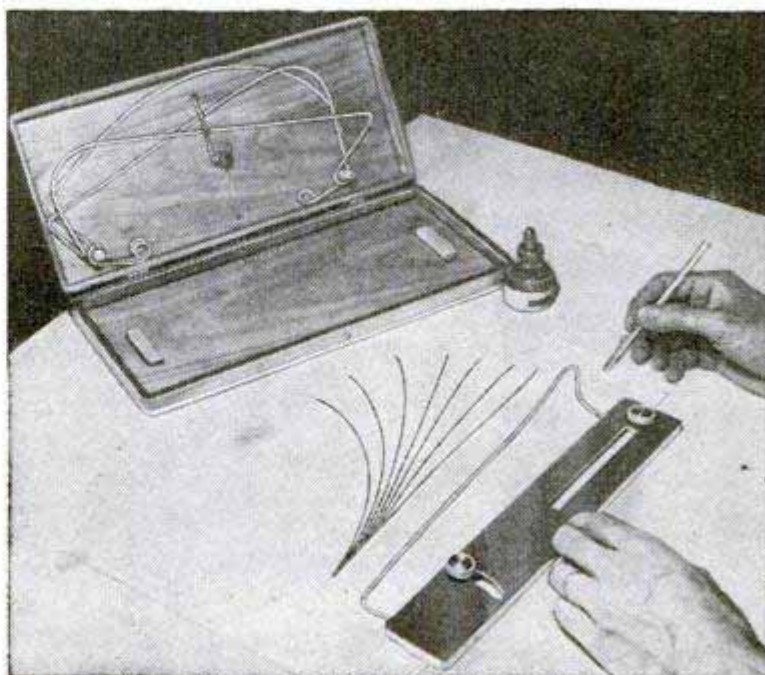
Milk-Fed Vegetables

Even vegetables grow fat on a milk diet, according to experiments conducted at Montana State College. Yields of tomatoes and onions were markedly increased when buttermilk and skim milk were added to the soil either alone or in combination with commercial fertilizers. In addition, the soil was in better condition after the tests than before.

Curved Wires Aid Drawing

Almost all types of curves, even those in reverse, can be drawn accurately with a five-piece unit intended for draftsmen, designers, commercial artists and pattern-makers. It consists of four pre-formed wire curves and a 12-inch base that holds any one of them in place. They are used singly and inserted by snapping the looped ends over adjusting screws. Their shapes can be altered by adjusting one or both screws along slots.

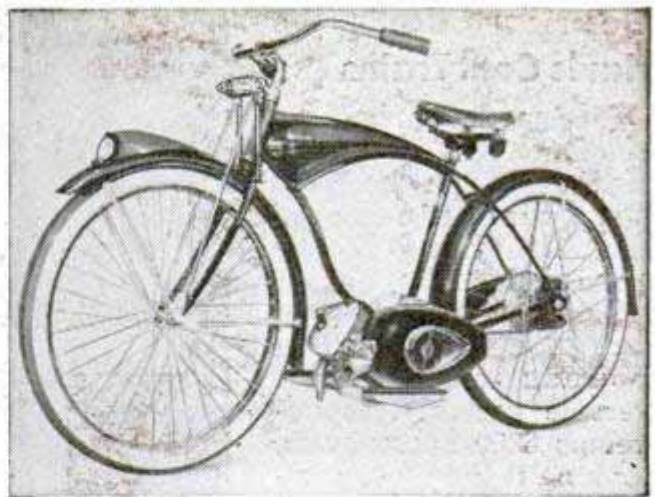
☐ Since 1941, when there were only 121,220 acres of tree farms in the United States, the total has increased to 14,864,413 acres of which 9,360,388 are in the South.





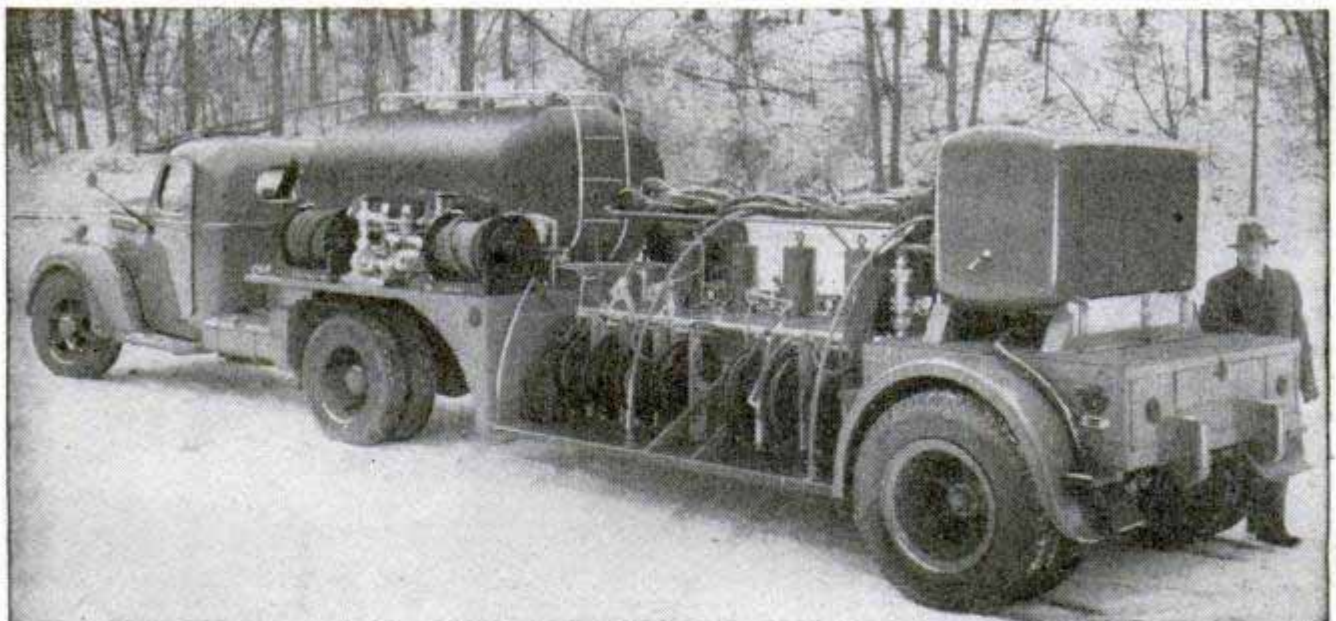
Press Reshapes Piano Hammers

Misshapen piano hammers are squeezed back into shape by a hand press similar to a pair of pliers. The press was invented by J. Kaye Booth, a Salt Lake City piano tuner. The inside surfaces of the press are shaped like a striking hammer. When squeezed around a hammer that has been bent, the press forces it back into the correct shape.



Bicycle Power Unit Replaces Pedal Crank

One pedal controls the throttle, clutch and brake on a bicycle power unit that attaches at the pedal-sprocket housing to provide a low center of gravity for safety and comfort. The power supply is built into a compact unit that is easily installed after removing the pedal crank. Rubber bushings absorb engine vibrations. The single control is operated by the right foot. When the toe is pressed down, the throttle opens and the clutch engages. Pressing down on the heel closes the throttle, throws out the clutch and applies the large drum brake in the rear hub. A heavy chain transmits power from the engine to the rear wheel. Speeds up to 45 miles per hour are possible and gas consumption is one gallon for 125 to 150 miles.

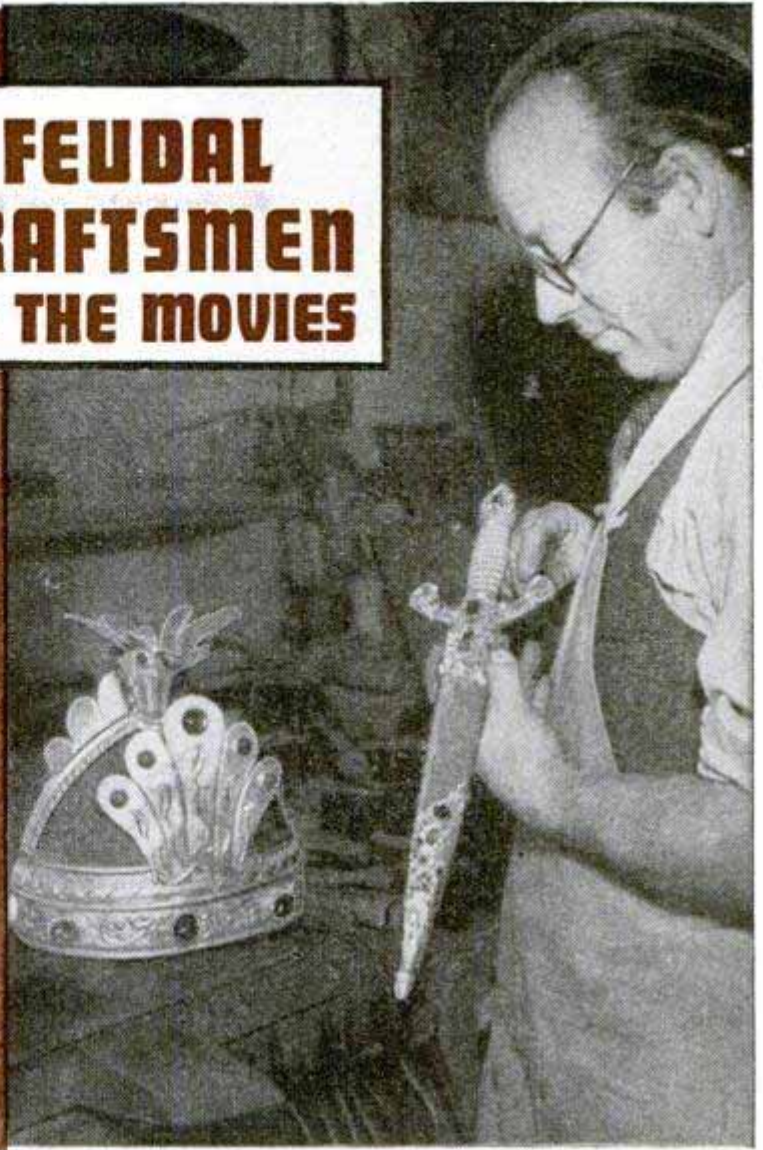
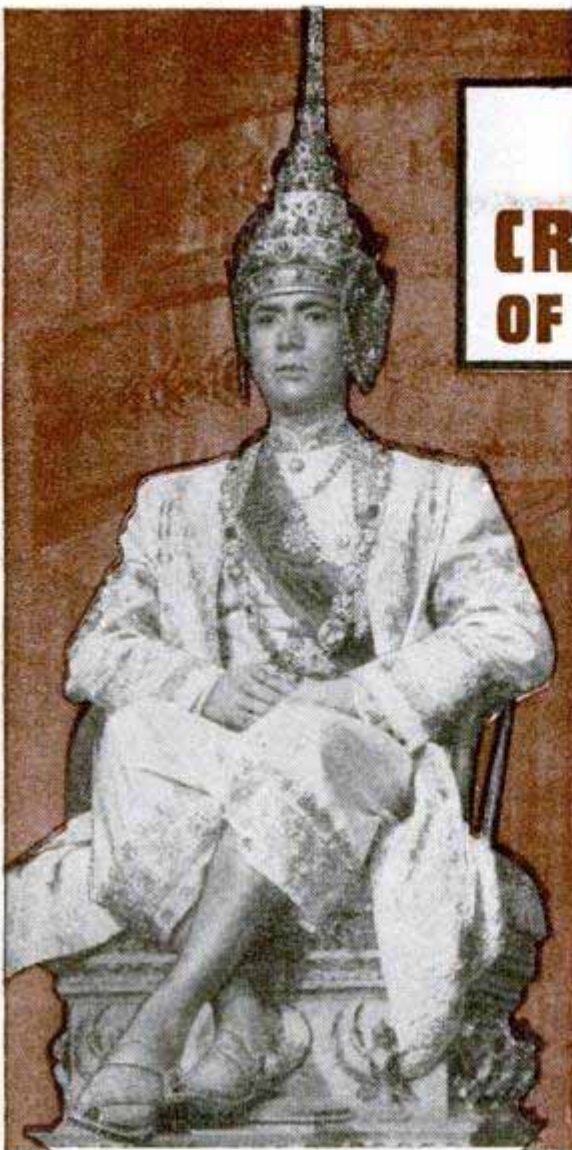


Mobile Service Station

Trucks on large construction jobs are serviced at the scene by a mobile service station with full facilities for maintenance. Mounted on a 21-foot trailer, the unit carries 700 gallons of gasoline and Diesel fuel,

200 gallons of oil and grease, 60 gallons of water, a supply of kerosene and a heavy-duty gasoline-driven air compressor. On each side of the assembly is a battery of nine hose reels for dispensing the materials. A crew of four can simultaneously service two trucks in 15 minutes.

FEUDAL CRAFTSMEN OF THE MOVIES



The gold and silver in the Hollywood reproduction of the Oriental headpiece (left) are real, but the stones are paste. Right, a skilled goldsmith works on a jeweled dagger and a royal crown for use in a recent film

THE MOVIE studios of Hollywood are modern counterparts of picturesque feudal baronages of the Middle Ages. Inside their walls artisans representing more than 80 crafts have revived many ancient skills.

Armorers are busy hammering out suits of linked mail, jousting lances, war shields and hooded visors. Bootmakers recreate thousands of pieces of footwear worn by man from the Stone Age to the present. These include prehistoric rawhide sandals, long-toed "Arabian Nights" crakows, the white leather boots of Hussar cavalry officers and bejeweled slippers of the court of France's Louis XIV.

Wax impressions of every known royal crown, scepter, jewel and decoration have been taken for moviedom's archives. Working directly from these molds, goldsmiths have reproduced the symbols of authority with uncanny fidelity. Although paste gems are, of course, used by the movie craftsmen, the bases of the replicas are made of solid gold and silver.

It's not enough that antique clocks and

By Mel Wharton

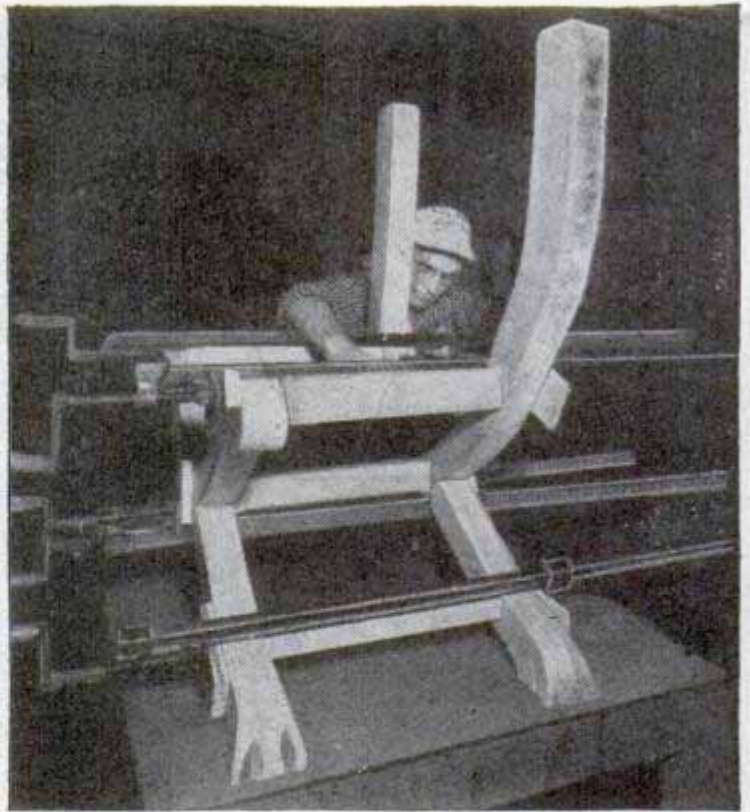
watches photographed on sets be genuine in appearance.

They must also run. This is called for when scripts require close-ups showing old pieces ticking off time. "Guildsmen" who repair these heirlooms have breathed new life into the all but obsolete craft of time-smithing.

What happens when a scene must show an Etruscan bronze plate? A dynastic Chinese metal teapot? The massive hinges of a medieval drawbridge? A Roman oil lamp? An ancient Grecian hand mirror or a Scottish claymore?

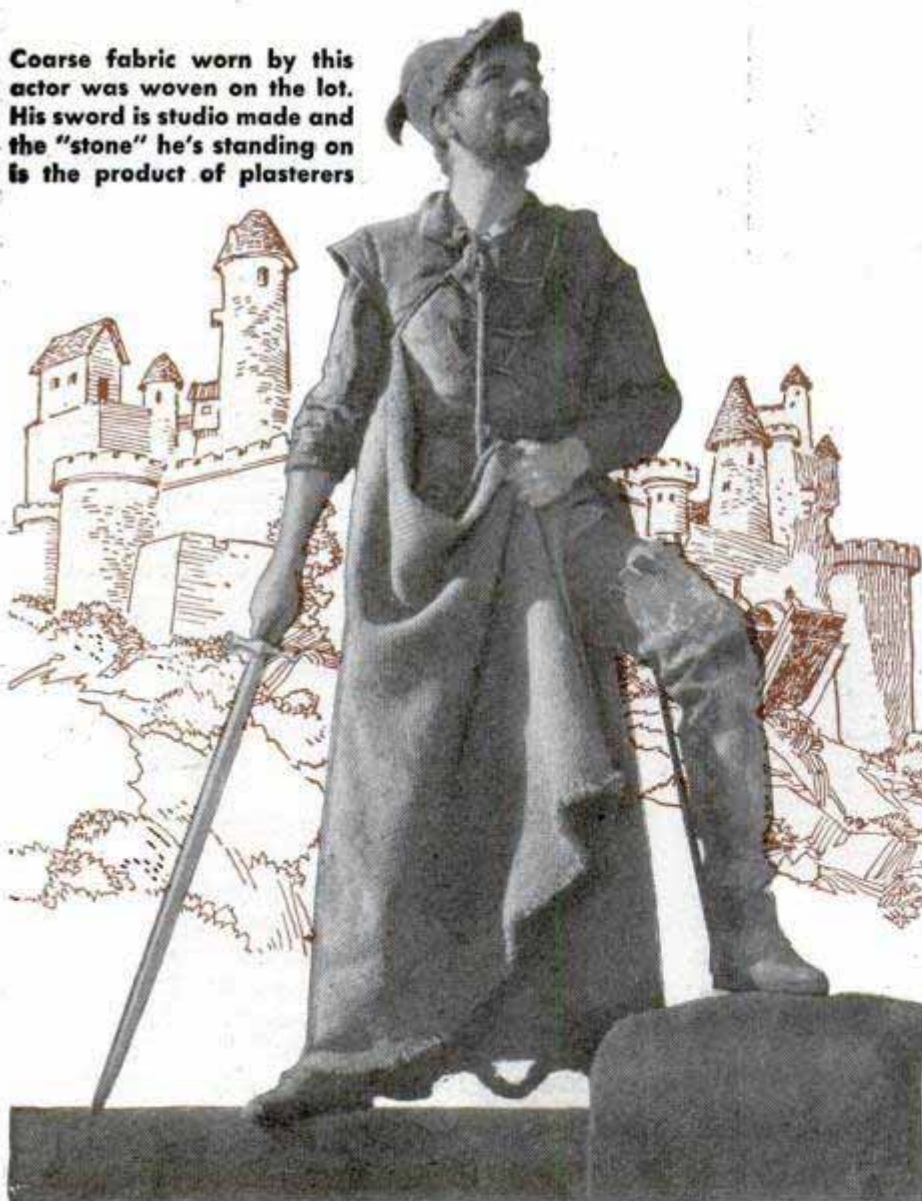
A drawing of the article is taken to a studio machine shop. There, usually working with the same metal as the original—wrought iron, bronze, pewter, copper or brass, although aluminum is becoming a favorite—the ancient piece lives again. But where once it took days to fashion certain items, the studio craftsmen using power lathes, hammers, drills, shapers and welding equipment turn out better work in minutes or hours.

Plying a trade that was old in Biblical



Left, not a museum, but a costume room in a studio. Right, a studio craftsman builds an "antique" throne prop

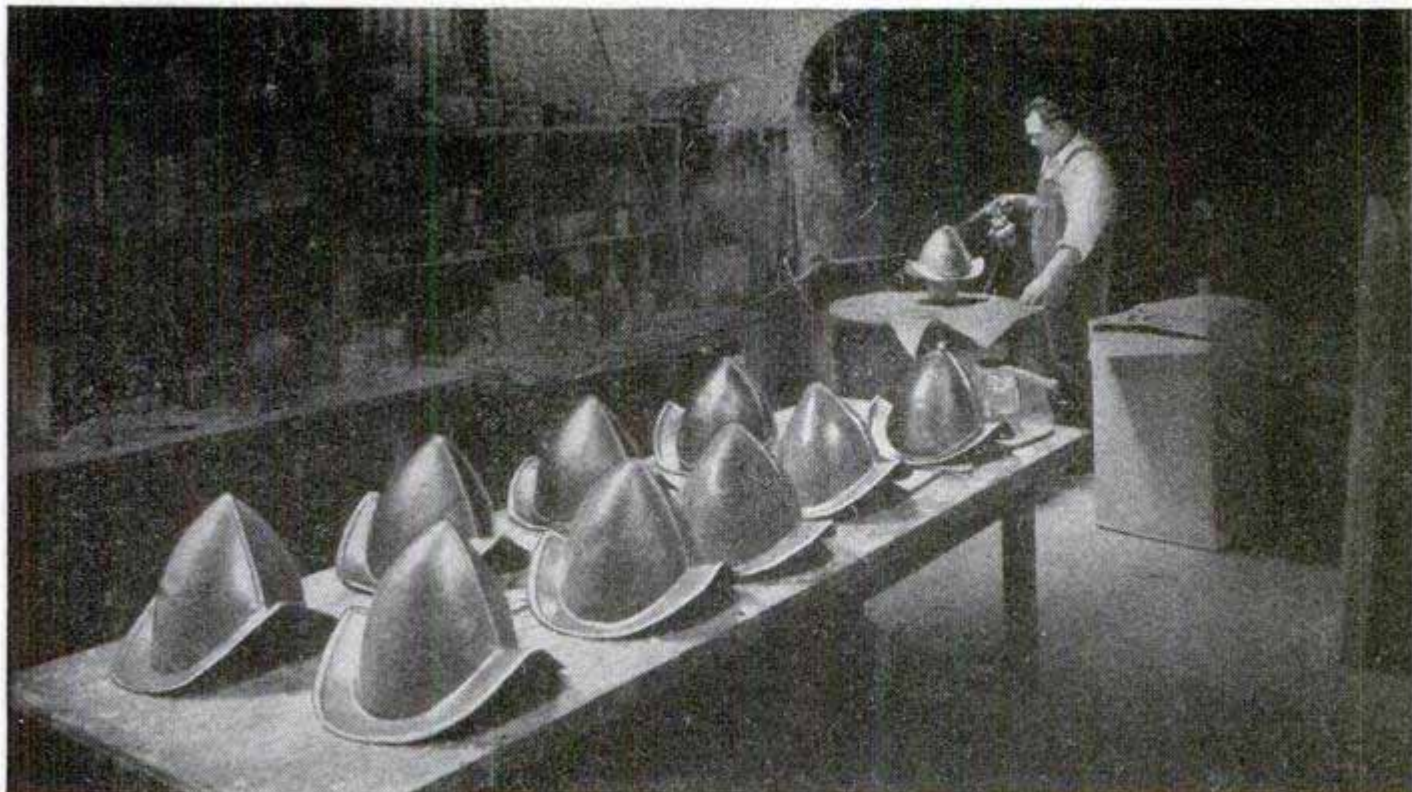
Coarse fabric worn by this actor was woven on the lot. His sword is studio made and the "stone" he's standing on is the product of plasterers



times, tile setters and terrazzo workers find no difficulty in translating the designs of any period into ornate walls, pavements and ceilings.

Several motion-picture lots have looms on which weavers turn out authentic copies of long-outmoded fabrics. Other craftsmen, using a technique which is centuries old, are reviving the all but defunct art of glass blowing. In the field of movie plaster work, some studios employ as many as 120 craftsmen. These skilled artisans can duplicate in plaster and color the carved frieze of a Greek temple, a bunch of bananas, a statue, an iron balustrade, a T-bone steak or the square face of London's Big Ben.

"In common with the great estates of feudal Europe, every big movie lot has enough of its own resources and talents to carry on independently," explained a producer. "There's no need to go outside for anything



These cavalier helmets look like originals, but the craftsman of yore had no spray gun to speed his work

—not even a new dress, suit, hat or pair of shoes. There are tailors, dressmakers, hatters and cobblers, as well as barbers, beauticians, carpenters and painters.”

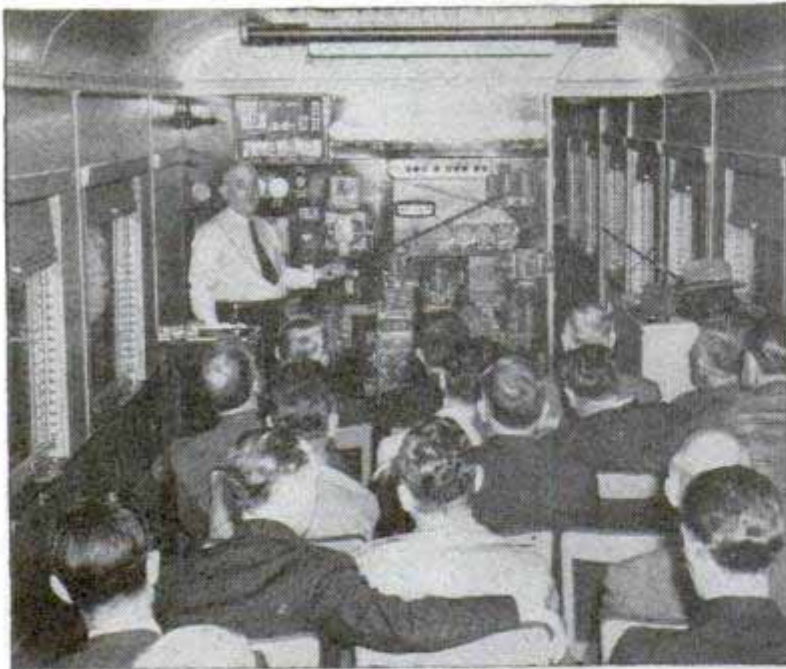
Hollywood's film baronages even have their own electric power plants standing by for use during interruptions in regular service. The plant at Warner Brothers can generate enough electricity to supply every industry, home and office in nearby Burbank, a city of 70,000 inhabitants. Sev-

eral studios have drilled artesian wells so they will be able to pump their own water when outside sources temporarily fail.

Next time you see a movie that features old Roman galleys and chariots remember that some 20th-century craftsmen, working with the latest type of power tools, built those galleys and chariots on a Hollywood lot. And very probably the modern versions are sturdier and more efficient than the originals were in their prime.

Movie plasterers are pouring "rocks" that will look like nature's own to the eyes of the movie audience





Traveling Classroom for Casey Jones

School travels to the students by means of a "traveling classroom" used by the Chicago and North Western Railway to instruct enginemen and mechanics. The classroom is a 70-foot all-steel car fitted with modern control equipment and training aids. The car's lecture room seats 35 employees. On the forward wall is a panel containing a battery of gauges and dials, which can be operated to demonstrate air-brake equipment. From a booth in the rear the instructor can project motion pictures or slides during his lecture. In another room of the car is a set of instruments which record time, distance, brake-cylinder pressure and brake-pipe pressure. Time-interval pens automatically mark this information on rolls of paper. The instruments record all the infor-

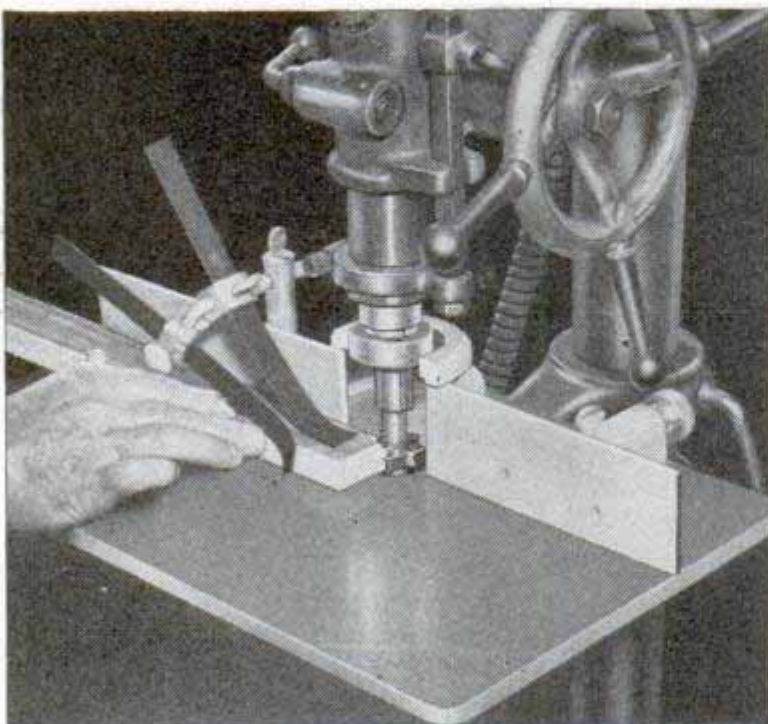


← Classroom's forward panel reproduces action of brakes. Above, instrument records all essential information about train. Below, instructor explains brakes



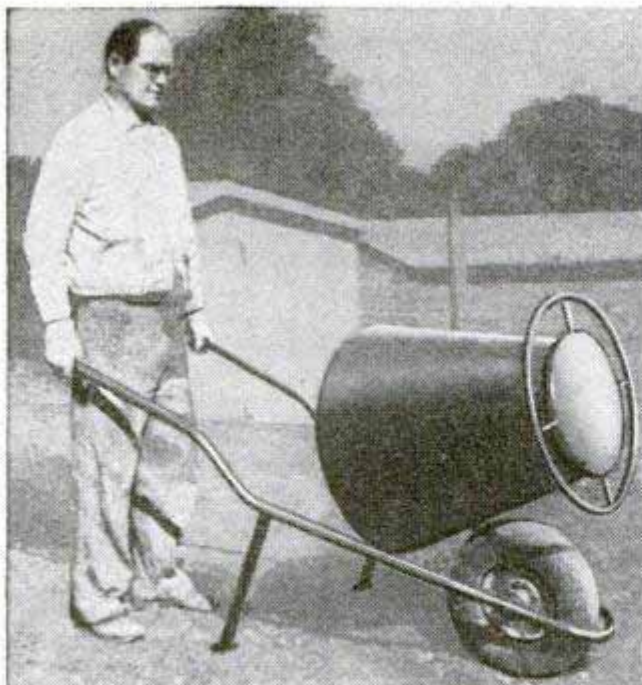
mation provided by a dynamometer car, the conventional test car, except drawbar pull. The car also has complete quarters for the instructor including a living room, bedroom, bath and kitchen. In eight months, more than 14,000 employees have been trained in the car.

All-Metal Shaper Fence for Drill Presses and Small Shapers



With guide plates of aluminum to eliminate warping, an all-metal shaper fence is designed to fit all standard drill presses and many small shapers. The right-hand face can be adjusted in and out by a knurled knob for variations in shaping and molding cuts. It accommodates various cutters up to 3½ inches in diameter. Two steel hold-down springs and anchor bolts are included.

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



Wheelbarrow Has Mixing Hopper

For small construction jobs a wheelbarrow has a hopper in which cement can be mixed. The cone-shaped hopper is mounted on ball bearings and rotated by a handle on the lid. It is made of 16-gauge steel and has a capacity of $2\frac{1}{4}$ cubic feet. The wheelbarrow frame is made of steel tubing. A conventional body can be installed on the frame to move dirt or dry material.

"Okay Pass" Signal



Drivers will appreciate a light signal that tells when it is safe to pass the vehicle ahead. It is a lamp that attaches to the rear of buses, trucks or autos, on which the words "Okay Pass" appear when the driver presses a button.

Paperlike Insulation Defies Flame

Made of nearly pure asbestos and a mineral binder, a paperlike insulating material will not burn at any temperature. The material, developed by General Electric, is unaffected by most chemicals and can be processed in a modified papermaking machine in thicknesses less than the diameter of a human hair. The mineral binder in the material is clay. Superior to asbestos paper in thermal life and insulating properties, the material is made stronger by treating it with varnish.



Portable Drafting Kit Folds Like a Notebook

Convenient for draftsmen who work in the field, a portable drafting kit that folds like a large notebook is available in two sizes: $9\frac{7}{8}$ by $11\frac{7}{8}$ inches and $13\frac{3}{8}$ by $18\frac{7}{8}$ inches. Instead of the usual four drawing instruments, only two are necessary with the kit. One is an L-square that is squared on marginal straightedges. The second is a 45 by 60 by 75-degree triangle with the center cut in the shape of a quadrant to serve as a protractor. Thumbtacks are not needed in the kit as strong clips hold the paper in place.

Mirrors Form Sight for Golf Club

Two mirrors embedded in the head of a golf putter function as a sight in lining up strokes on the green. The upper mirror slants in the direction of the putt and the bottom mirror is parallel with the ground.

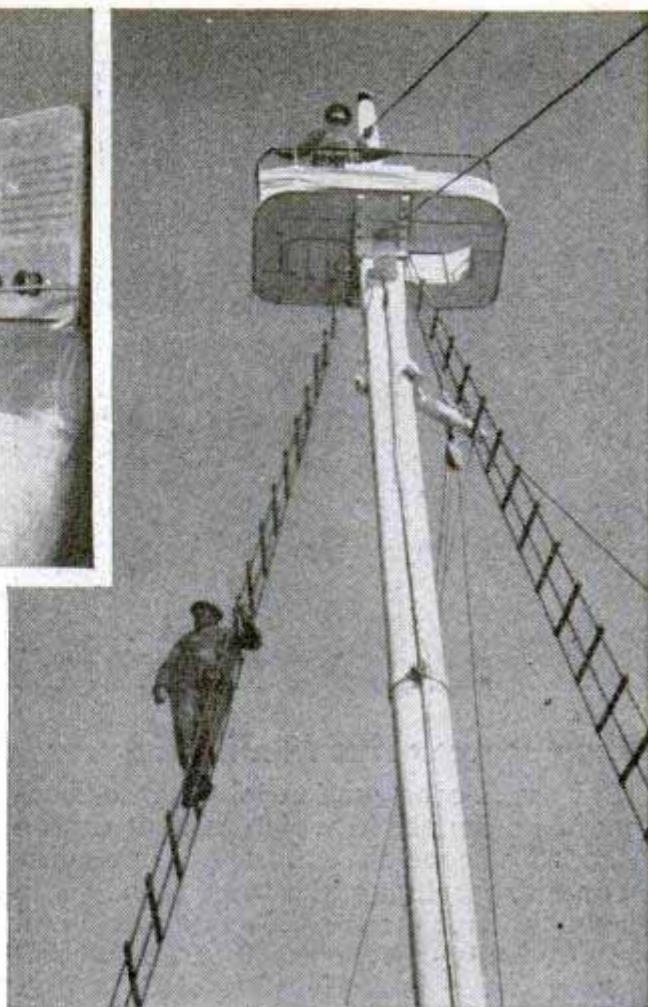


The golfer sights down the club until the hairline on the bottom mirror cuts directly across his eyes. He then pivots the putter until he can see the flag pin in the slanting mirror and center it on the sighting line. The head of his club then is in line for a perfect putt. Other sighting lines on each side of the center line of the slanting mirror permit aiming when the stroke must be off-center to allow for rolling ground.

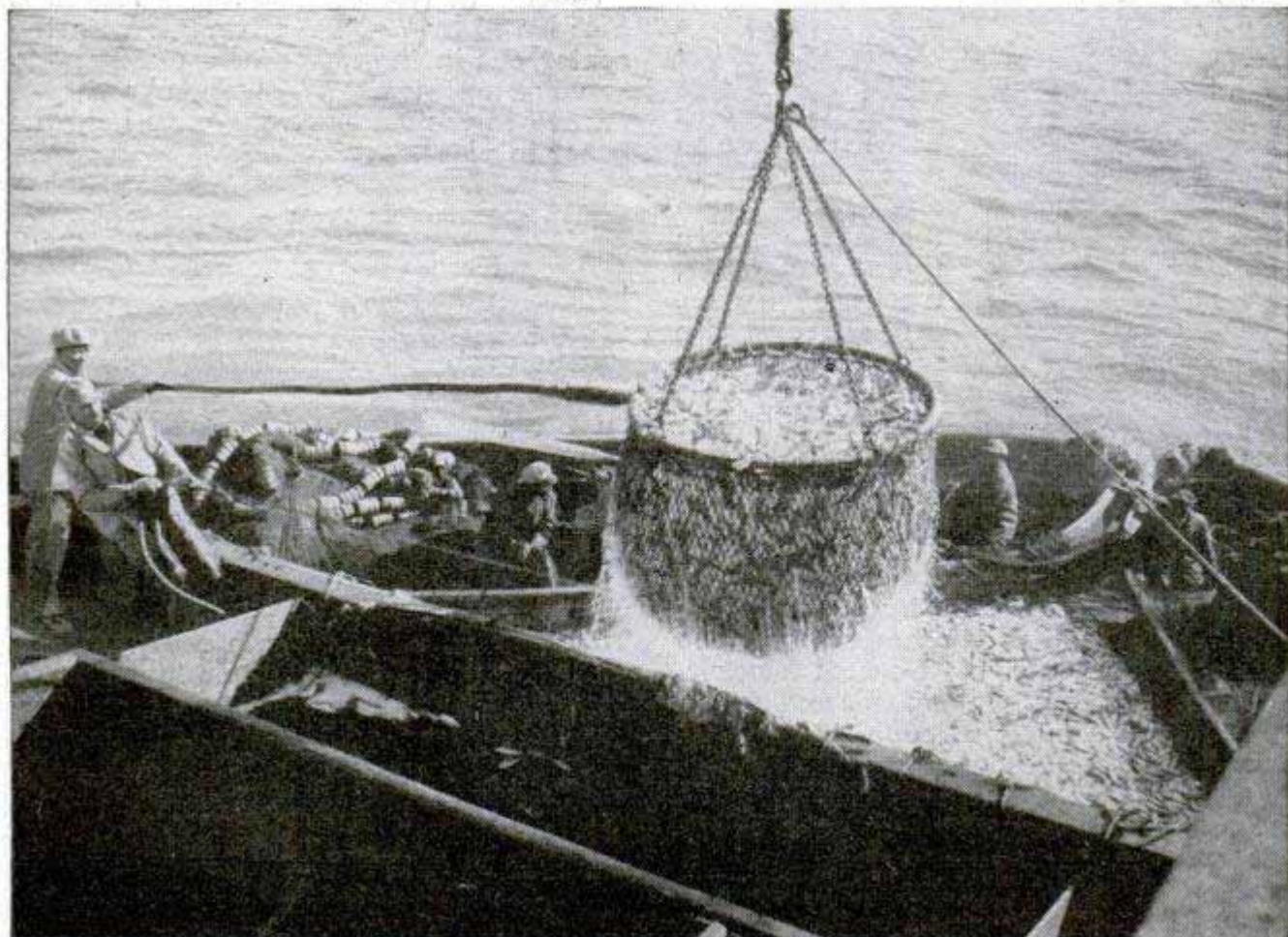


America's Kingfish!

Top spot on our fish parade goes to the menhaden, a lowly shad relative that you won't find on the menu. But the 1946 catch yielded \$10,000,000 worth of oil, meal and dry scrap valuable to industry and the farmer. Annual take of 900 million menhaden represents 20 percent of the U. S. total fish catch. Based in North Carolina, a fleet of trawlers gets radio reports from airplane observers when fish are spotted. The boats speed to the scene to make their haul. The menhaden are cooked and oil extracted in coastal processing plants.



Top left, airplane spotter radios location of fish to fleet. Above, nearing the spot, lookouts watch for schools of menhaden. Below, unloading the catch



The CRAFTSMAN

★ This month we're top billing photo hobbyists with full instructions for building a 35-mm. slide projector. It has a lamp housing so designed that it can be built partly from plywood, which simplifies construction. Parts are all stock items readily obtainable. Turn to page 194.

★ Woodworking craftsmen will like the desk described on page 177, especially its "island" bases and simple, modern styling. The top and panels are made from plywood. False drawer forms a rigid base for a portable typewriter.

★ It's easier and cheaper to build an outdoor fireplace of poured concrete, and while you're doing the job, include an incinerator. Plans on page 170.

★ Rowing a canoe in the same way as you would a boat (see page 185) can be a lot of fun if you use a sliding seat and outrigger oarlocks.

SLIDE PROJECTOR

KNEEHOLE DESK

OUTDOOR FIREPLACE

ROWCANOE



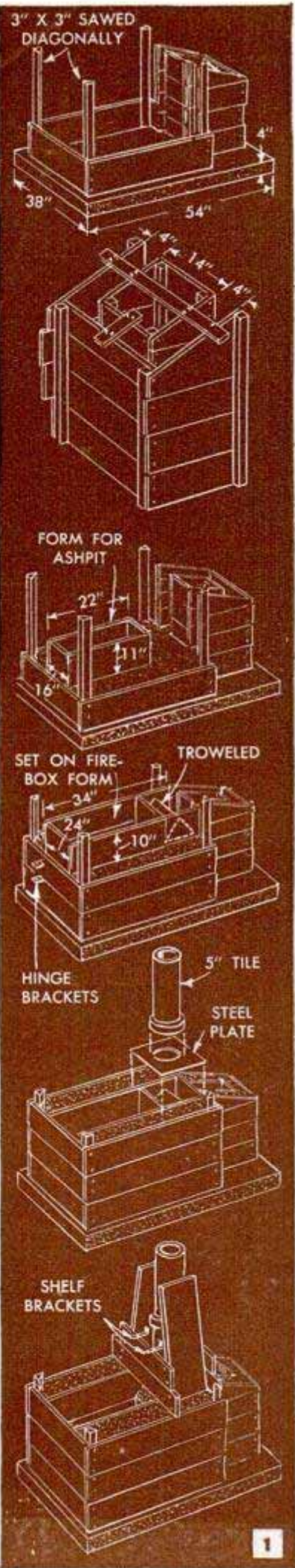
OUTDOOR FIREPLACE of poured concrete

X286

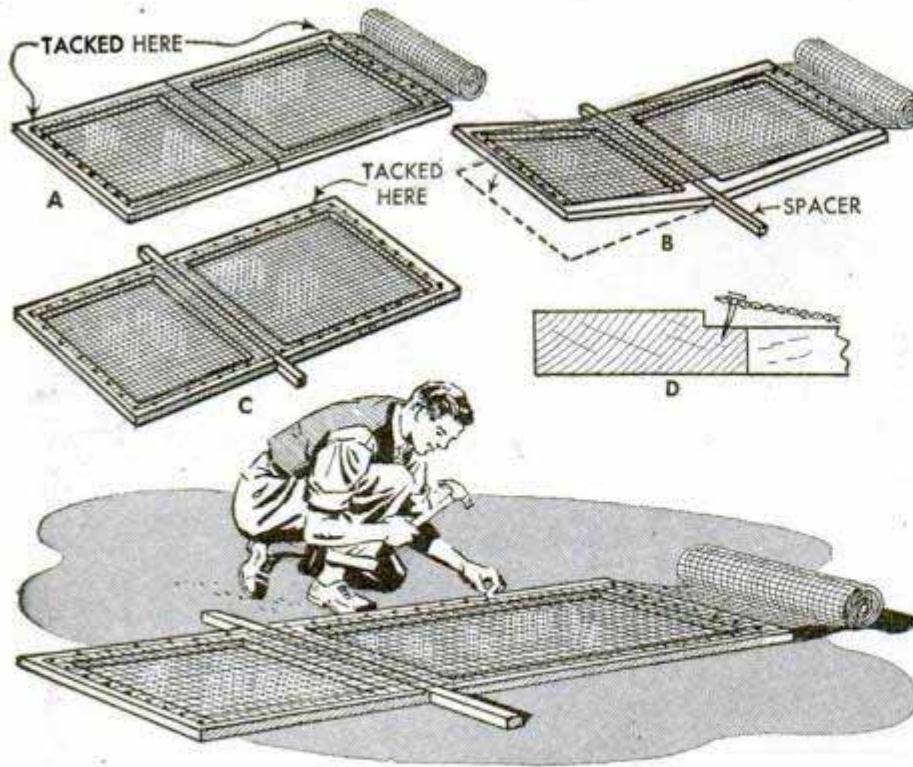
By Hi Sibley

THE CLEAN LINES and massive appearance of this poured-concrete fireplace form an interesting center of attraction in the yard, and it will make possible many an outdoor feast on balmy summer days. The design includes an incinerator which is served by the same chimney as the barbecue grill, and a concrete smoke deflector prevents smoke from circulating from one firebox to the other. The wooden forms are easy to build and may be constructed from any kind of dry lumber. Forms should be oiled on the inside surface to prevent sticking to the concrete. Fig. 1 shows step-by-step construction of the forms, and the necessary dimensions are given in Fig. 3. The cutaway view, Fig. 2, indicates in perspective how the grates, chimney and deflector should appear.

Begin construction of the fireplace by digging the 4-in.-deep excavation for the slab foundation. After the concrete for the foundation has been poured and allowed to harden, use 9-in. boards to build up the sides of the main form to the bottom of the ashpit. At this time assemble the double form for the incinerator, placing iron bars for the grate so they will be embedded in the concrete. Note that the main-form cleats are triangular in shape and are nailed inside the corners, while on the incinerator they are located on the outside. Fill the main form and incinerator form up to the top of the 9-in. boards and allow the concrete to harden. Next, place the ashpit form in position, add boards to the main form until it is level with the top of the ashpit form, and pour



Screen Wire Stretched Firmly By Covering Two Frames at a Time



When renewing screen wire this spring, a taut, even screen can be had by covering two frames of the same width at one time. Start by laying the two frames end to end and tacking the screen wire to them as shown in A. Next, insert a wooden spacer between the frames, B, and force them flat to stretch the wire tightly. The wire is made taut crosswise by tacking one side of both frames, C, and applying tacks to the opposite side at an angle, D. Then tack the wire to the remaining sides of the frame and cut them apart.—A. W. France, Raritan, N. J.

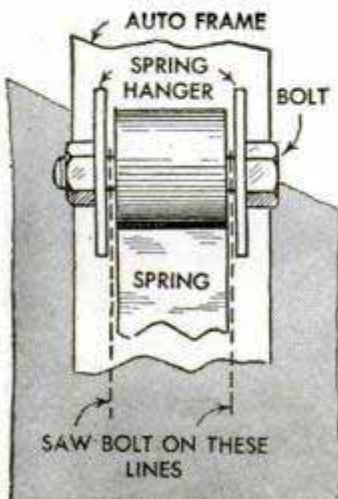
Plaster-of-Paris Sanding Block Molded to Match Contour of Work

A quick, easy way to sand irregular-shaped molding is to use a sanding block of plaster of paris molded to the shape of the work. To form the block, cover an identically shaped piece of work or the work itself with a sheet of wax paper and carefully mold a thick block of plaster of paris on the wax paper to fit the contour. For small work, wood putty may be substituted for plaster of paris.



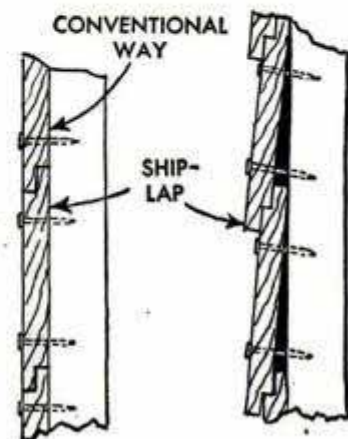
Removing Rusted Bolts From Car Springs

Recently when trying to remove the rear springs from my Chrysler, I found that the shackle bolt on the front spring hanger had rusted to the steel bushing. Penetrating oil would not free the bolt, nor would pounding with a heavy hammer. Not having a cutting torch at hand, I used a hacksaw to cut through the bolt at each side of the spring, and then knocked out the parts with a punch. As the bolt was not hardened, the hacksaw did the job.—D. W. Brentlinger, Richmond, Calif.



Shiplap Gives Bevel-Siding Effect

Shiplap will give the appearance of the more expensive bevel siding, if nailed to the studding in the manner shown. It is best to plane off the tongue from the bottom or starting board and also to use a furring strip under the base of this board to retain the bevel effect. Take care not to draw the lower nails too tightly or they may split the boards where they lap.—Herbert E. Fey, New Braunfels, Tex.

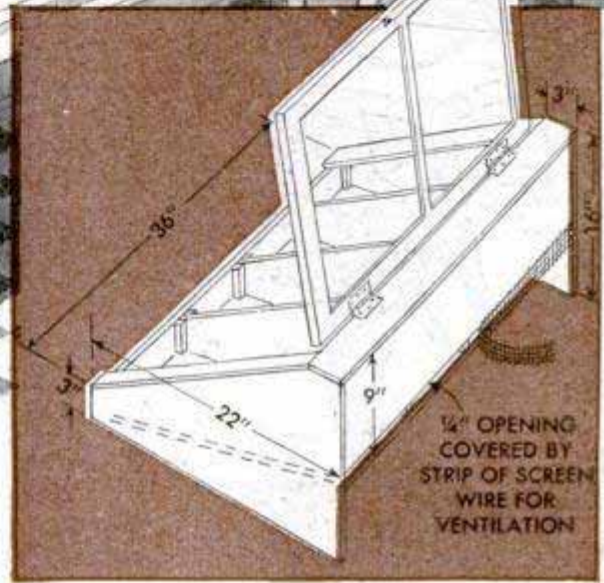


Four-Section Bin Stores Vegetables

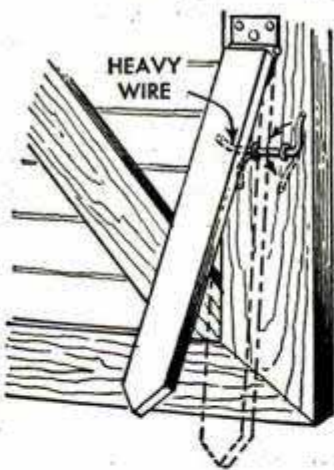
Constructed of 1/4-in. plywood or hard-pressed board and mounted on a worktable or cabinet, this storage bin provides easy access to fresh vegetables and fruit in either the pantry or basement. It also may be modified to fit inside a cabinet in the kitchen. The bottom of the bin is sloped toward the front, permitting the vegetables to roll forward as the lower ones are removed. Note that a 1/4-in. opening is left along the lower edge of the back panel to allow ventilation. The bottom and sides of each section may be lined with sheet metal or oilcloth to facilitate cleaning. A standard storm-window sash will serve as a cover, or a suitable one may be made by building a frame from 1-in. stock and glazing with single-strength glass. A sash lift provides a handle for the cover.



Handy storage bin for fresh fruit and vegetables has glass-paned cover and compartments that slope toward front



Self-Setting Garage-Door Prop



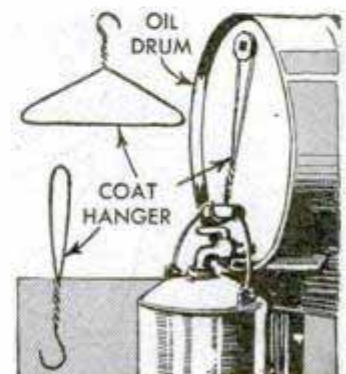
Here's a novel drag-type prop designed for swinging garage doors which automatically resets itself when the doors are closed. It is reset by giving the doors a slight jar when closing them. This causes the hinged prop to swing upward momentarily to allow a wire

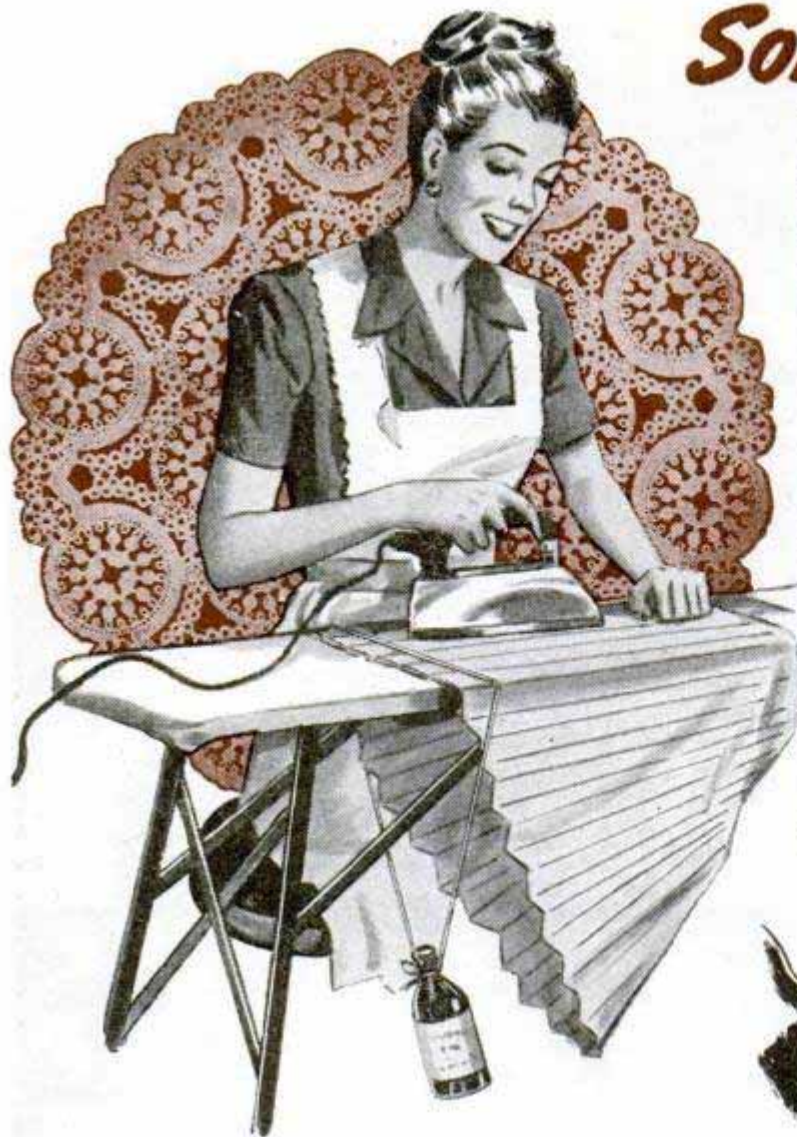
trip lever to disengage the prop and permit it to drag when the doors are again swung open. To close the doors, the trip lever is set to hold the prop in a raised position. To install the prop, hinge a short wooden picket to the inside of each door so it extends about 2 in. below the bottom of the door when in the drag position. Then bend a trip lever from heavy-gauge wire and

fasten it to the door loosely with staples to hold the prop in such a position that it will clear the ground as the door is closed. The lever should be loose enough to drop down when the weight of the prop is removed from it momentarily as the door hits the frame. Be sure to attach the props several inches away from the outer edge of the doors.—Walter A. Humphrey, Reynoldsburg, Ohio.

Wire Hook on Oil Drum Holds Can for Filling

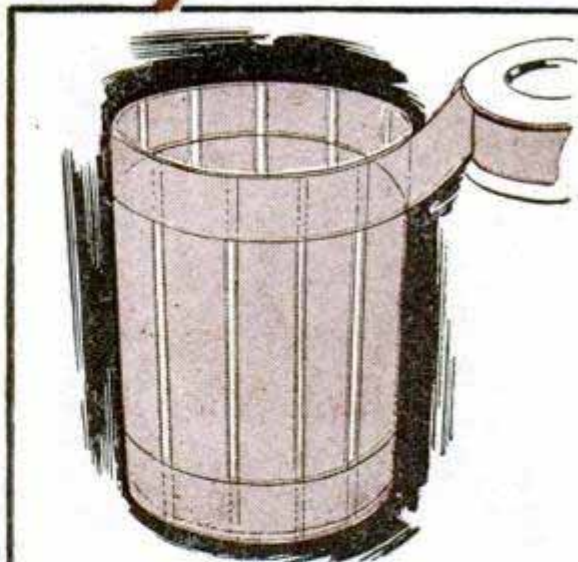
Filling a 5-gal. can from a fuel-oil drum is made easy if the can is held under the spigot by a wire coat hanger. Loop the hanger around the filler plug and form it to hold the can at the proper height.





Pressing a pleated skirt is simplified by using a loop of string attached to a weighted object, such as a bottle, to hold the pleats flat. The pleats are pressed up to the string, and the string is removed before finishing. This is faster than pinning the pleats

Here's an idea that has been found effective in preventing tubular-metal furniture from marking linoleum. Just apply cellulose tape to each corner of the chair legs. Being transparent the tape is inconspicuous and is easy to renew when worn merely by peeling it off



A drinking glass used by a small child who is apt to drop it can be rendered "shatterproof" by covering the outside and bottom with strips of cellulose tape

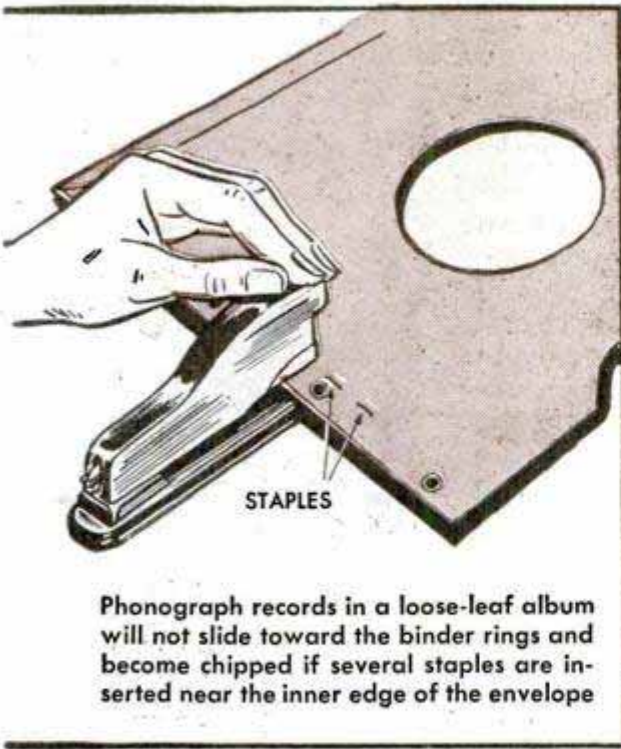


To remove a white ring caused by a beverage glass on a varnished surface, try rubbing the discoloration with cigarette ash moistened with water. Rub the ring gently with a piece of cleansing tissue and then finish with furniture polish. The ash acts like pumice

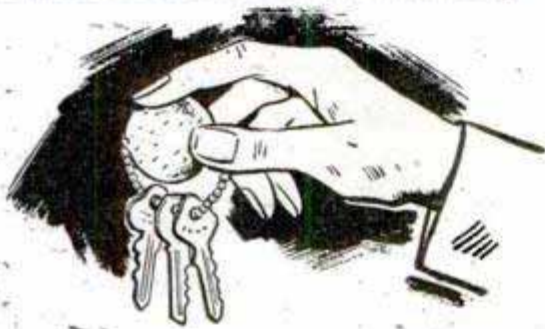
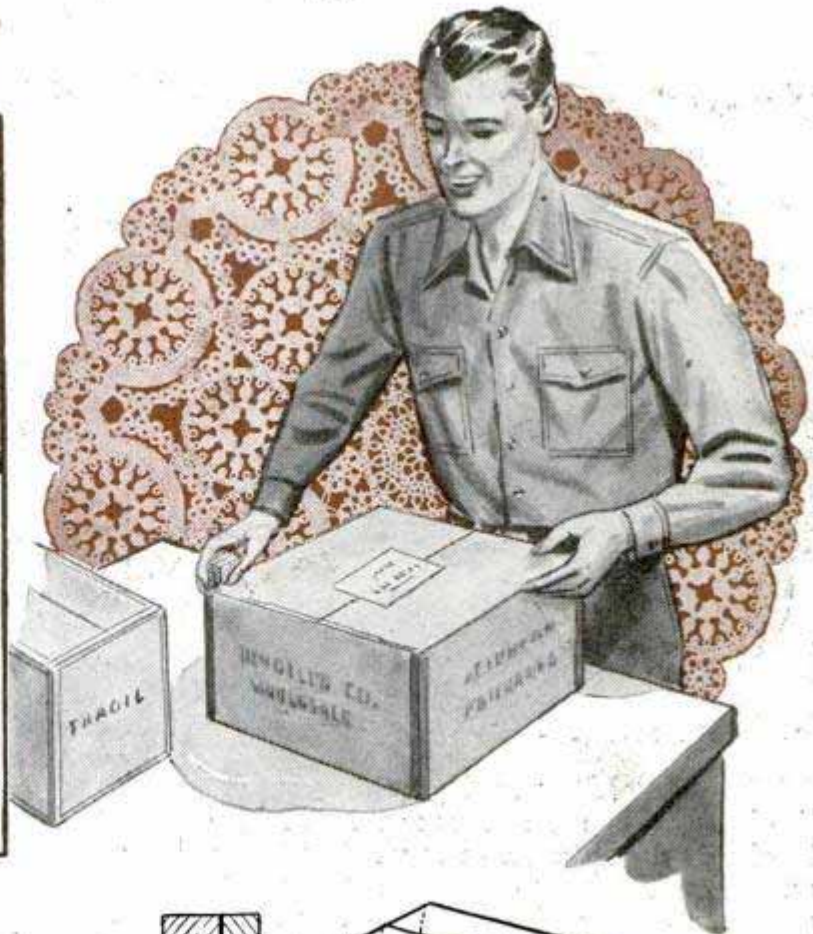
Scouring an oven encrusted with baking drippings is made easier if you first turn off the pilot lights and place a bowl of household ammonia in the oven and close the door. Fumes from the ammonia will loosen the charred drippings, making them easy to remove



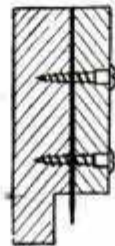
PROBLEMS



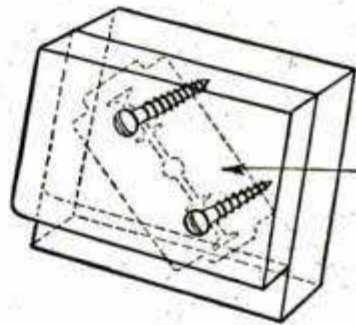
Phonograph records in a loose-leaf album will not slide toward the binder rings and become chipped if several staples are inserted near the inner edge of the envelope



Household keys will be easy to find in a cluttered drawer if they are strung on a key chain threaded through a round cork fishline bobber. By painting the cork a bright color, it will stand out from other items in the drawer. A hot wire will burn a hole in cork



END VIEW

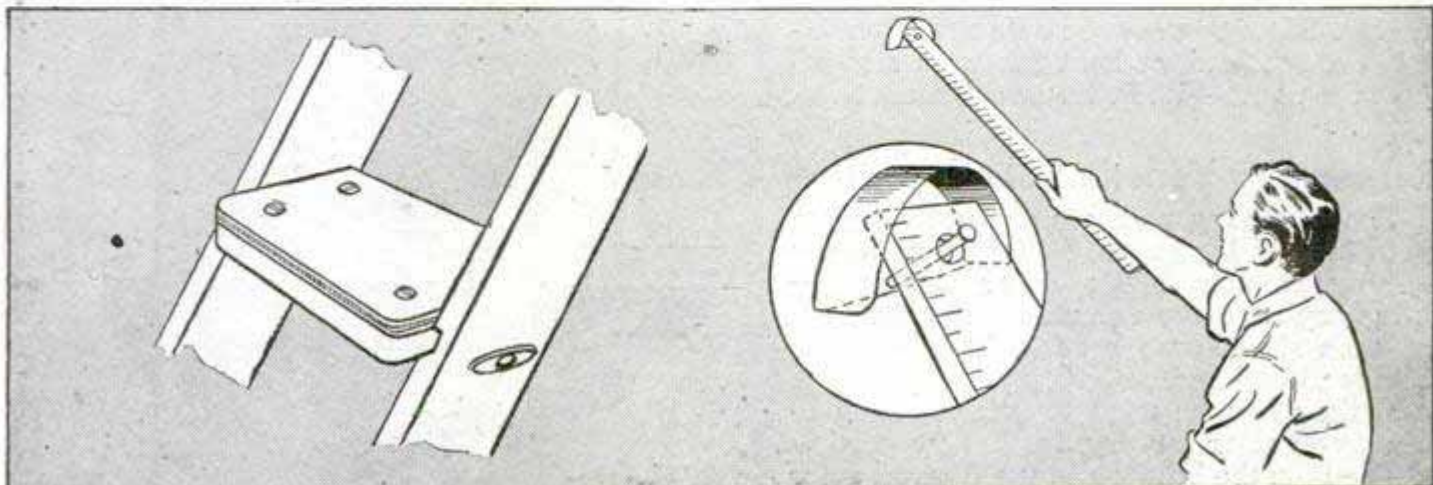


RAZOR BLADE

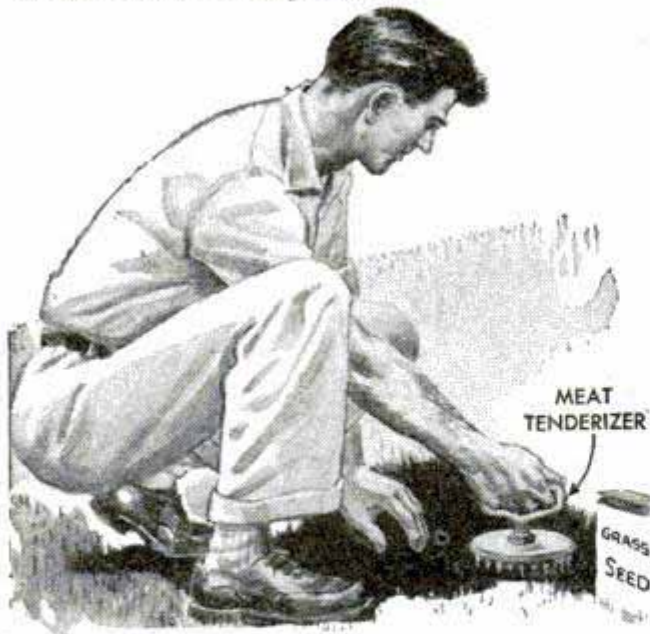
Sealed cardboard cartons received in the mail are easy to open with a simple razor-blade cutter. It consists of two wooden blocks, one being slightly larger than the other and rabbeted, between which a double-edge razor blade is clamped with two round-headed screws

When the steps of a stepladder become worn to the point where they are apt to split under normal weight, reinforce them with plywood. Use 1/2-in. plywood and cut it to the same shape as the step. Then attach to the top surface with glue and screws

Fumbling for the nail on which to hang a yardstick is not necessary if part of the lid from a baking-powder can is used as a cup to guide the end of the yardstick. Cut the lid in half and fasten it to the wall by driving a long casing nail through it at an angle



Meat Tenderizer Prepares Ground When Reseeding Lawn



When reseeding and patching spots in the lawn where the grass is thin, difficulty is often encountered in loosening the soil without disturbing the grass. A household meat tenderizer of the type shown is ideal for this purpose. When pressed into the ground, the tenderizer loosens the soil and leaves small holes for the seed. At the same time, it does not uproot growing grass.

Harold E. Benson, Denver, Colo.

Garden-Hose Ring Supports Bushes



The spreading of small garden bushes may be prevented by supporting them with a ring made from garden hose. The ring is formed by inserting heavy-gauge wire and twisting the ends together. Three or four stakes are

used to support the ring at the desired height. Because the hose acts as an insulator, the sun cannot heat the wire and injure the plant.—W. P. Houser, Organ, N. M.

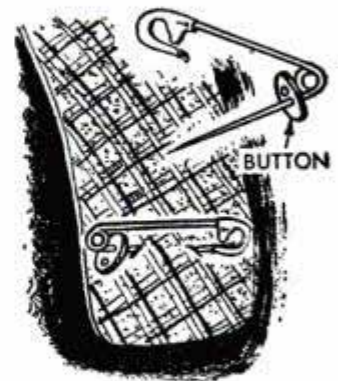
Renovating Venetian Blinds

The following pointers are useful when painting and repairing Venetian blinds having wooden slats: After taking the blinds apart, drive a small brad in the ends of each slat. These brads will enable the blinds to be handled easily while painting, and they can be used to attach string to hang the slats for drying. If new cord is needed for the blinds and the desired color

is not available, purchase white cord and dye it with a cold-water dye. In replacing the tape, select one that will not stretch and cause the slats to sag and hang unevenly.—Francis W. Henry, Pottsville, Pa.

Button on Safety Pin Protects Clothing

Clothing often will become caught in the coil of a safety pin and is apt to tear, in addition to making removal of the pin difficult. To prevent this, slip a button over the end of the pin. The button will act as a shield over the coil and protect the clothing material from possible damage. The button, of course, must be of a size that will permit the pin to close.—I. M. Fenn, Chicago.



Chairs Form Improved Pen For Small Baby

Here's a stunt that is worth remembering when visiting friends, if you have a small baby and no playpen or high chair is available. Just take two dining-room, or other type chairs having stretchers, and place one upside down on the other as shown. Tie the legs together, place a pillow on the seat and you'll have a safe and comfortable enclosure in which to place the baby. The ends of the legs can be padded, if you wish, to avoid possible injury.

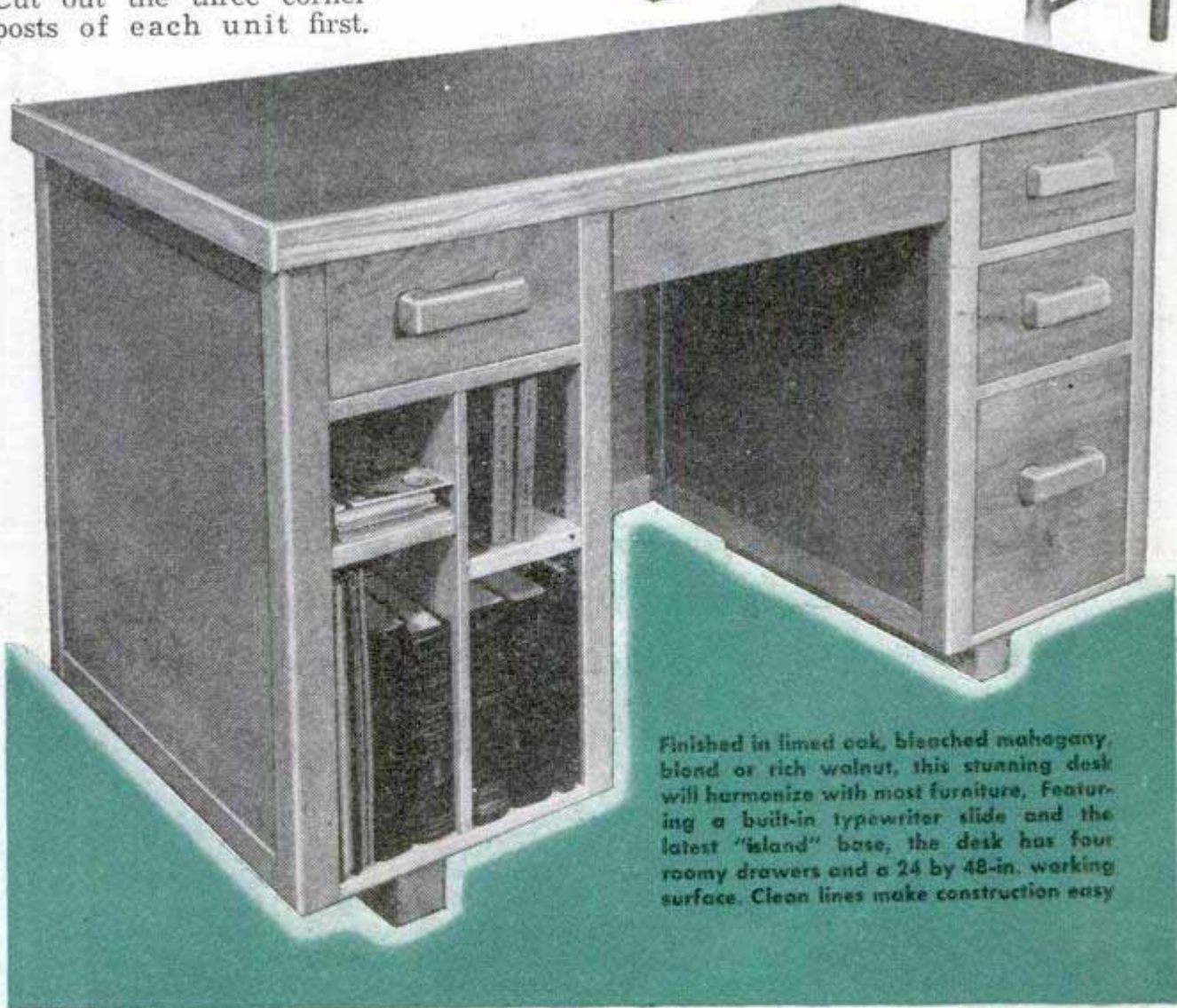
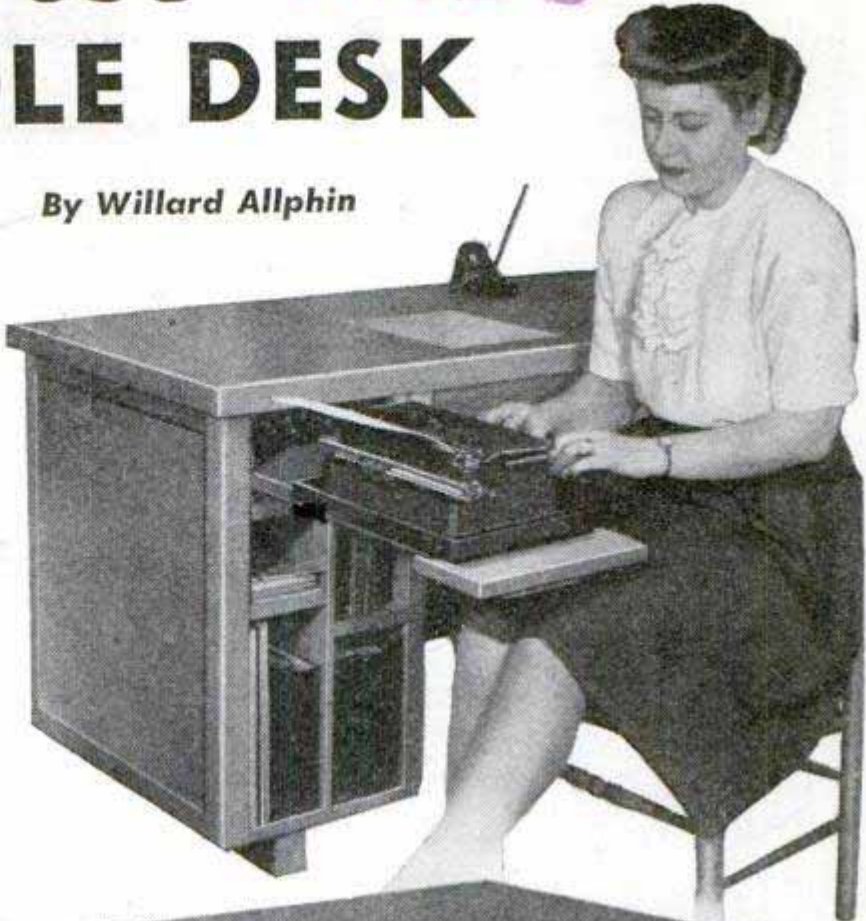


Furniture you can't find elsewhere

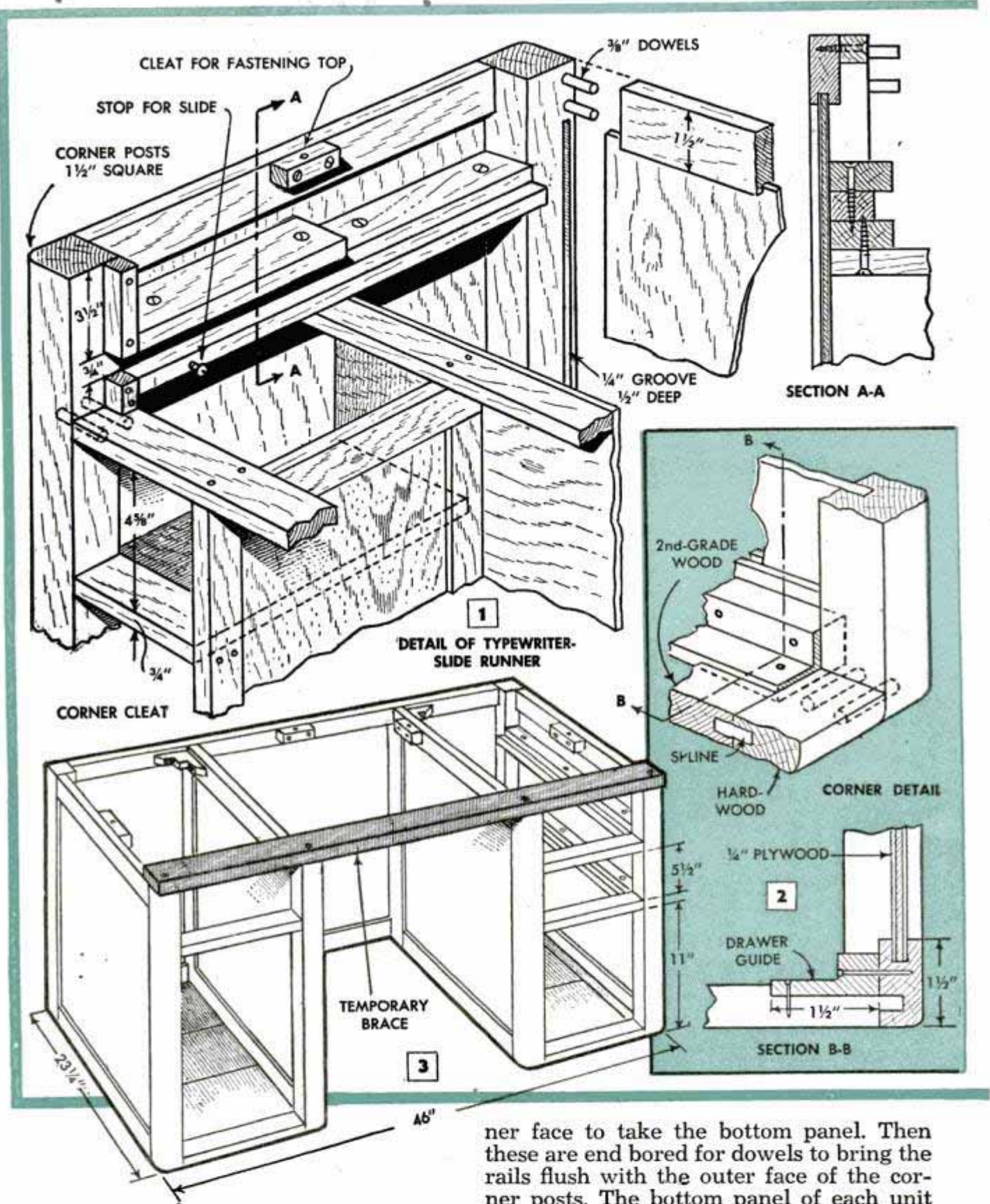
All-Purpose X218 KNEEHOLE DESK

HERE is the desk you've been waiting for—a big roomy one, good looking, with built-in typewriter slide, and designed to harmonize with both modern and traditional furniture. What's more, it is very easy to make. Ends, front and top are plywood, hardwood faced, which can be had in oak, birch, walnut, mahogany, etc. The rest of the desk is made of solid hardwood stock with inner shelves, partitions and other unexposed parts being made of soft and less expensive wood. Both end compartments of the desk are assembled as separate units. Cut out the three corner posts of each unit first.

By Willard Allphin

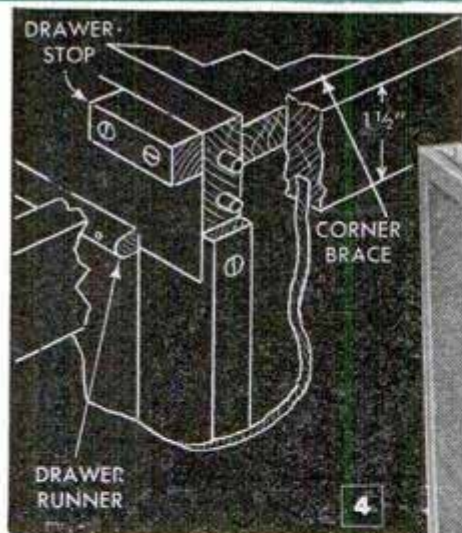


Finished in lined oak, bleached mahogany, blond or rich walnut, this stunning desk will harmonize with most furniture. Featuring a built-in typewriter slide and the latest "island" base, the desk has four roomy drawers and a 24 by 48-in. working surface. Clean lines make construction easy

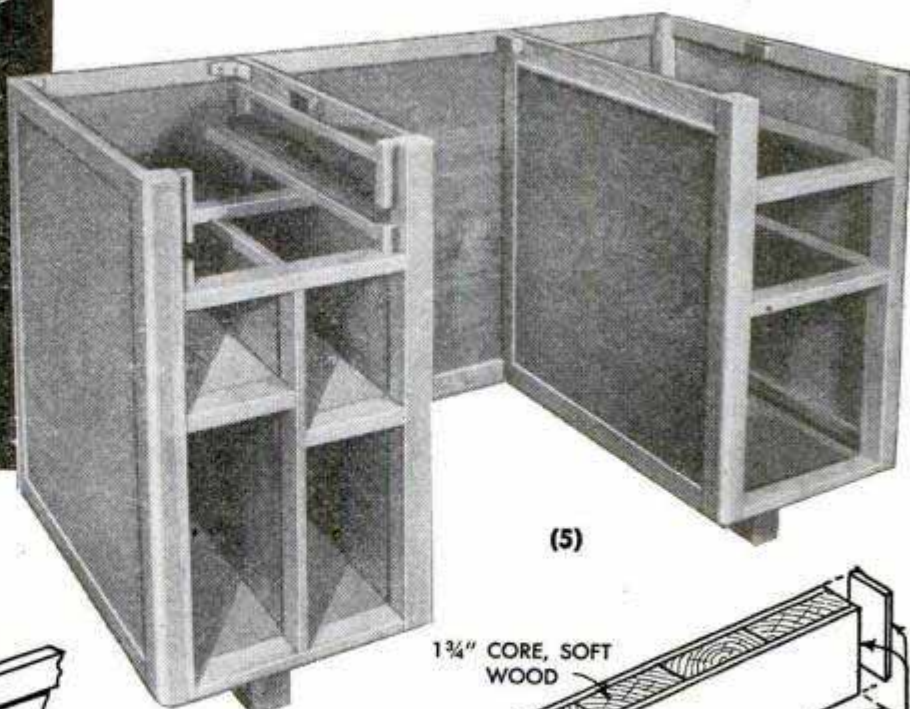


These are 1 1/2-in. square stock and are grooved lengthwise for 1/4-in. plywood. Note that the grooves are run 1/4 in. in from the outside edge and that they are stopped 1 in. from each end for dowel joints. The rear posts of each unit are grooved on one face only, whereas the others are grooved on two adjacent faces. All end rails are edge-grooved for the plywood panels, the lower ones also being grooved on the in-

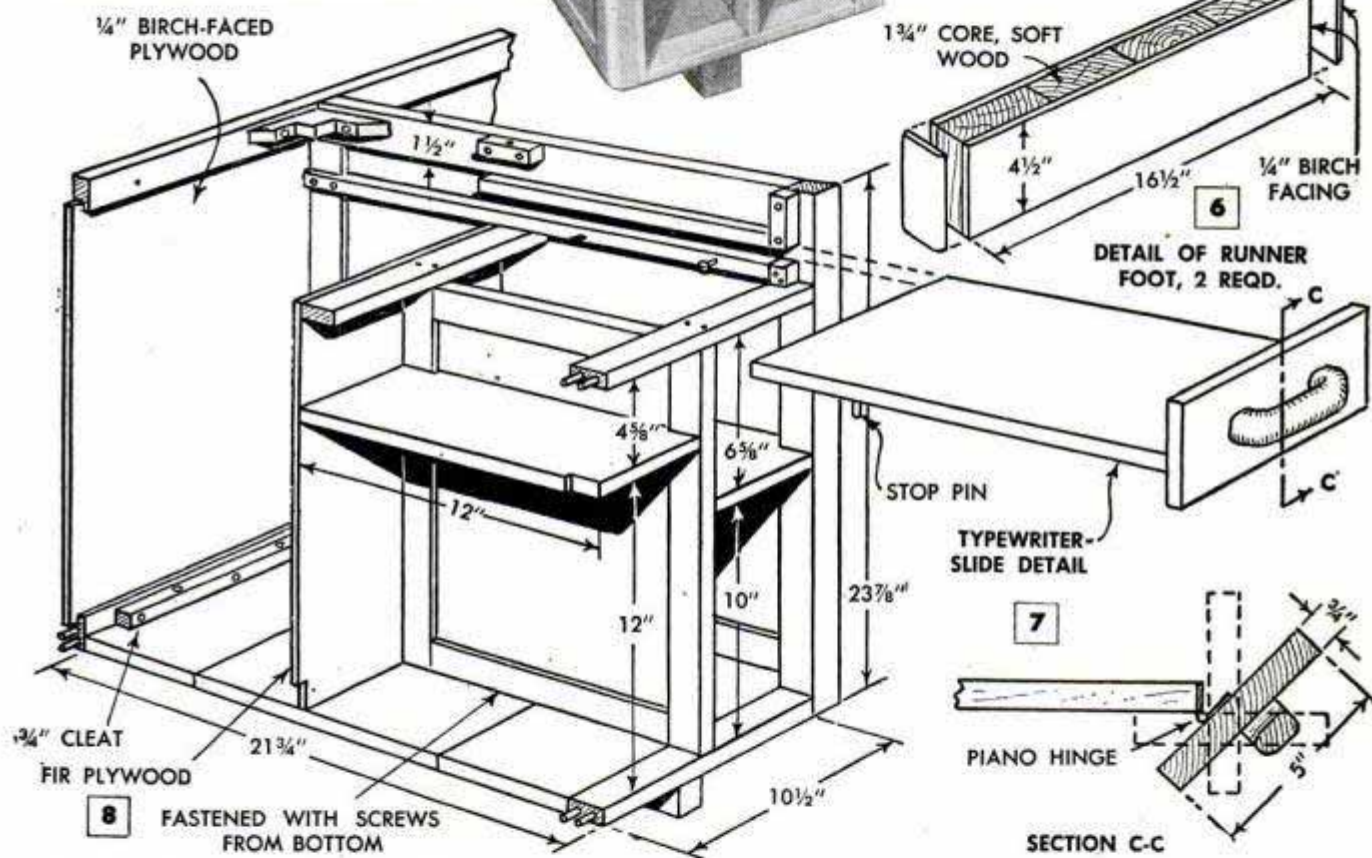
ner face to take the bottom panel. Then these are end bored for dowels to bring the rails flush with the outer face of the corner posts. The bottom panel of each unit is made up of soft wood and the front edge is faced with a hardwood rail. The bottom panel of the right-hand unit differs from the other in that a shallow groove is run along each edge for an L-shaped drawer guide, as detailed in Fig. 2. The outer corners of all posts and the lower edge of all bottom rails are rounded 1/2 in. The panels of the kneehole are made the same size as the end panels, except that the edge which butts against the front panel is edged with



Detail above shows how knee-hole panels are notched and doweled to front panel. Note corner brace is screwed to inside



(5)



DETAIL OF RUNNER FOOT, 2 REQD.

STOP PIN
TYPEWRITER-SLIDE DETAIL

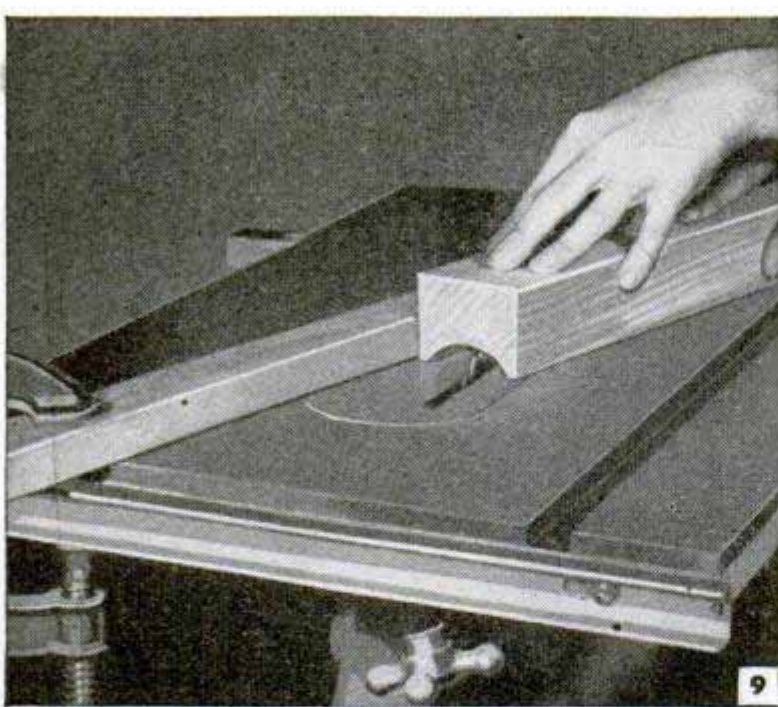
SECTION C-C

a $\frac{3}{4}$ -in. member notched to fit over the lower rail, Fig. 3. Fig. 4 shows how a notch is formed at the top, after which the piece is doweled to both rails at the top and bottom.

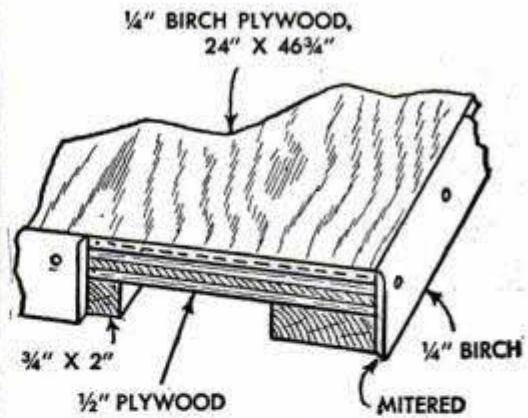
Start assembling the parts by gluing and clamping together the rear ends of the units. Follow this by gluing and clamping the outer end panels to them. When this is done, place a brace diagonally from post to post and nail temporarily to hold the assembly square while the glue is drying. Next, put in the dustproof bottom panels and then add the knee-hole panels. Finally, glue and clamp both assembled units to the

front plywood panel. In doing this, fit the dowel joints of the knee-hole panel first. When dry, spring out the corner posts to engage the dowels in the ends of the rails. Your desk should now look like Fig. 3. Note that a temporary wooden brace is placed across the two units to hold the assembly square.

Fig. 8 details the book compartments for the left-hand unit, and you'll notice that these do not extend the full depth of the unit. Here, the shelves are edge-faced with hardwood as before, the facing strips being fastened to the posts with screws driven from the underside and at an angle. Figs.

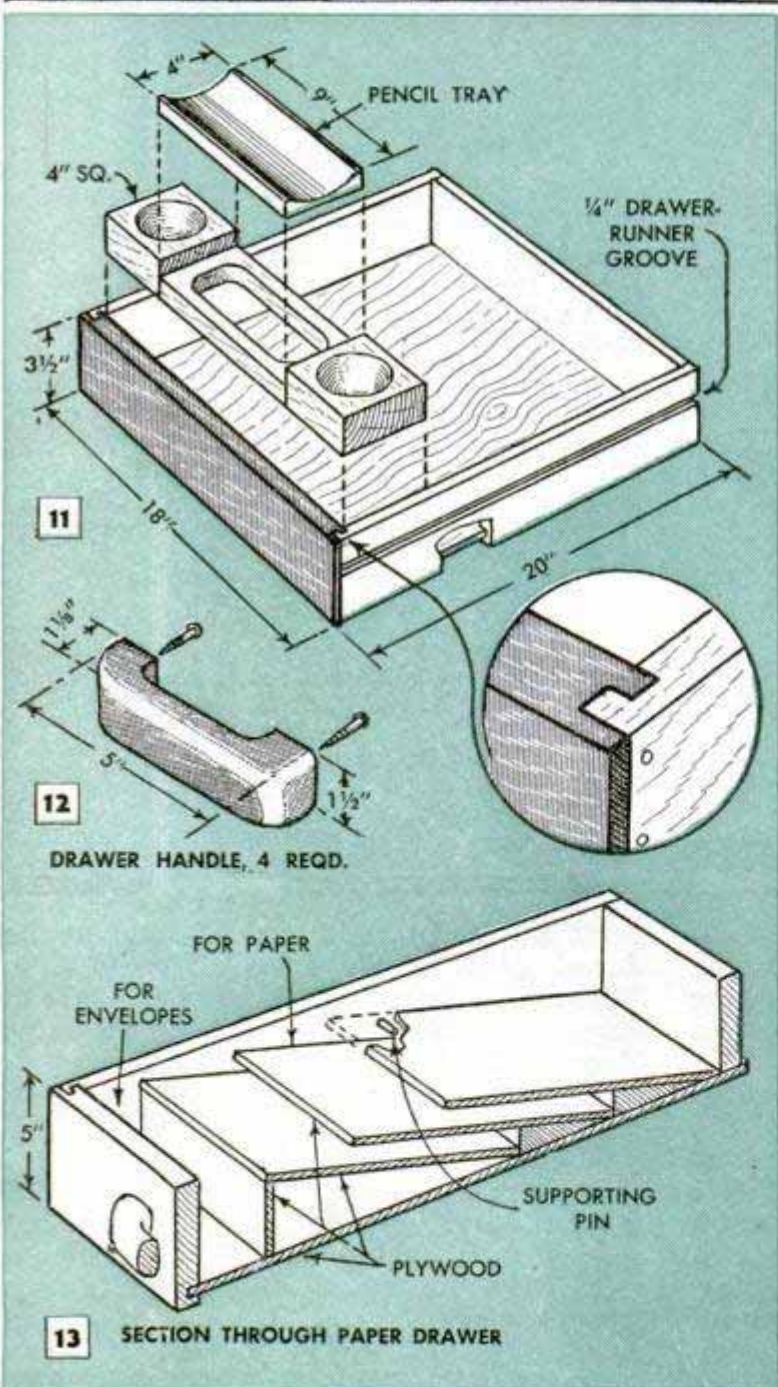


9



10 HOW TOP IS BUILT UP

Here is how the thickness of the top is obtained. Two thicknesses of plywood, plus $\frac{3}{4}$ by 2-in. battens, form core which is faced around the edge with $\frac{1}{4}$ -in. hardwood



1 and 8 show how the guide is installed for the typewriter slide which folds up to represent a drawer when not in use. Section A-A shows how three strips placed on top of one another form a channel for the slide. Construction of this varies slightly when installing it on the opposite side, as shown in Fig. 8. Fig. 7 details the slide itself and how the front is hinged.

Next come the bases. These are of the popular "island" type and are built up as in Fig. 6. A core of softwood is faced with $\frac{1}{4}$ -in. hardwood and then counterbored holes are made through the core for attaching the base to the bottom and in the center of each unit. At this point the desk should look like Fig. 5. This brings you to the construction of the top, Fig. 10, which is built up of two panels of plywood, one being of $\frac{1}{2}$ -in. fir plywood, and the other $\frac{1}{4}$ -in. hardwood faced. These are glued together and backed with five $\frac{3}{4}$ by 2-in. strips, which run lengthwise to add thickness and provide a gluing surface for a $\frac{1}{4}$ -in. edging.

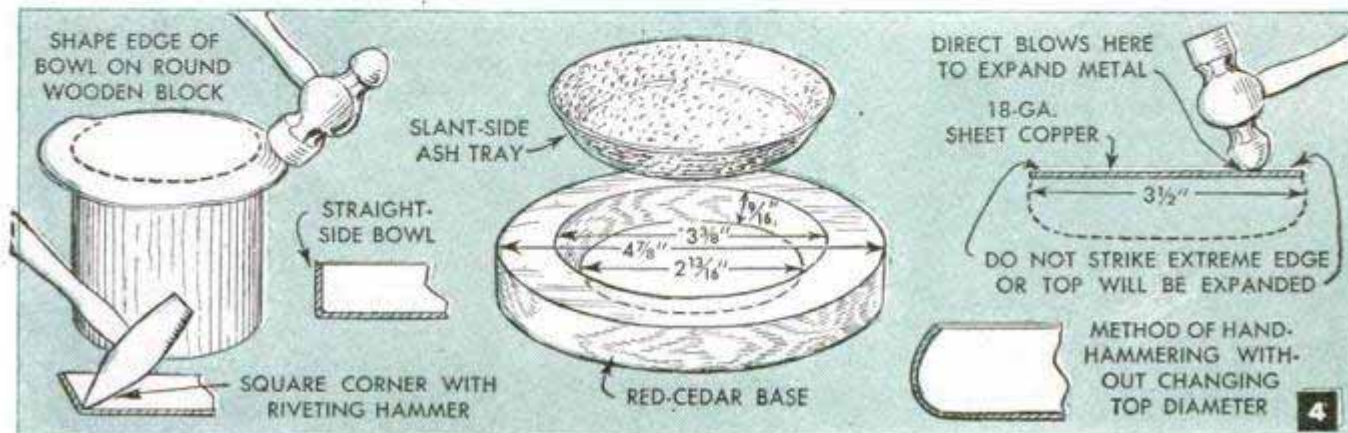
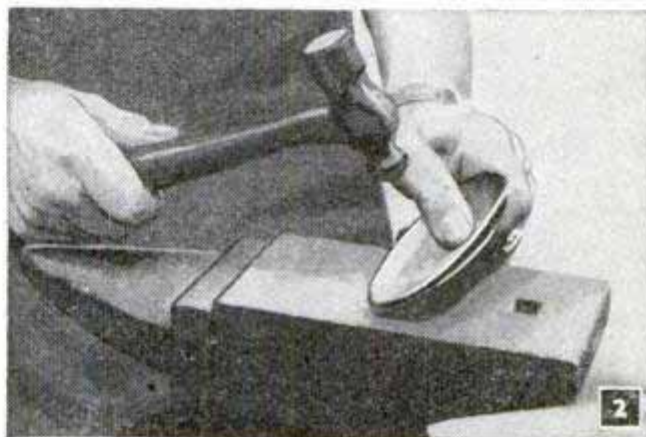
The drawers are detailed in Figs. 11, 12 and 13. The center drawer has no handle. Grooves cut in the side of the drawer, ride over runners which are bradded to the sides of the kneehole panels. Fig. 9 shows a method of cutting the pencil tray by repeatedly passing the work across a rotating saw blade at an angle.

HAMMERED COPPER BOWLS

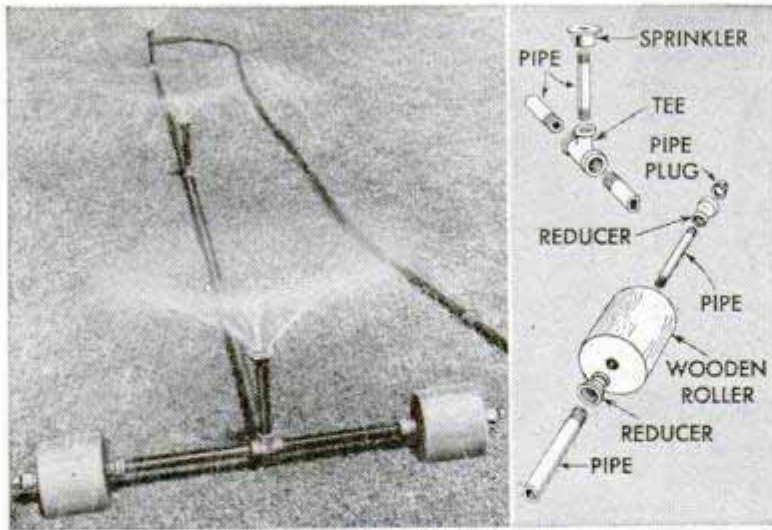


By Dick Hutchinson

HAND-HAMMERED copper bowls, Fig. 1, provide beautiful ash trays and serving dishes. They are especially attractive when set in a wooden base such as red cedar. To hammer a copper disk into a bowl having the same top diameter as the disk, right-hand detail, Fig. 4, use a ball-peen hammer and an anvil, as in Fig. 2. Direct each hammer blow toward the edge of the disk, but be careful not to hit the extreme edge as this will expand the metal and increase the diameter of the finished bowl. Hammer the entire surface once, and then anneal the disk by heating it to a cherry red and plunging it in cold water. Continue hammering and annealing in this manner until the desired shape has been attained. The top may be curved inward by holding the bowl in the hand and tapping around the rim with the planishing end of the hammer. Trays and flat-bottomed bowls are formed on a hardwood block, hammering around the edge and in toward the center as shown in the left-hand detail, Fig. 4. To flare the rim, hammer it against the edge of the anvil, as in Fig. 3. When the bowl is completed, lacquer it to prevent tarnishing.



Multiple Lawn Sprinkler on Rollers Moved Without Damaging Sod



This multiple lawn sprinkler permits the watering of large areas at one time, and the wooden rollers allow it to be moved about without damage to the lawn. The unit is assembled from pieces of pipe and standard fittings, and the rollers are turned from wooden blocks. Outlets are spaced at intervals along the length of pipe so that the spray will cover the largest possible area. Any of the various types of stationary and rotary sprinkler heads or spray nozzles may be attached to the outlets. The rollers are held on the axles by pipe reducers and a pipe plug is inserted in the end of each outside reducer. Assemble all fittings with pipe compound.

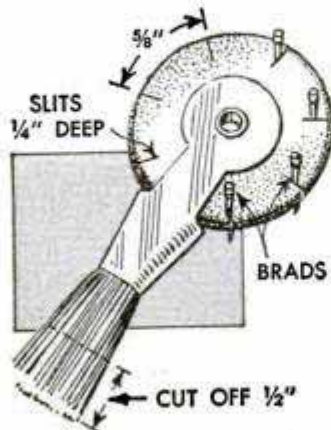
Small Table Lamps Easily Modernized to Give Soft Indirect Light

Small table and boudoir lamps can be converted easily to the more modern hurricane lamps which give an indirect light, by fitting them with a glass shade taken from an old-type chandelier. If the lamp has a harp-type shade holder, this is discarded because, if a cloth shade is used in addition to the glass one, the cloth shade simply rests on the top of the latter. The glass shade is attached to the lamp socket in an inverted position, as shown, using a standard metal shade holder, which also can be taken from the chandelier. The socket on the lamp must be the type that has threads for screwing on the holder.



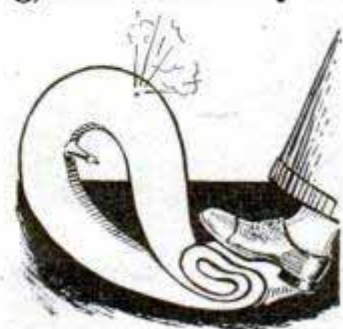
Typewriter Eraser Saves Fingers When Starting Small Brads

Tiny brads difficult to hold between the fingers can be driven easily when held in the edge of a typewriter eraser. Cut several slits about $\frac{1}{4}$ in. deep in the edge of the eraser to take the brads. When a brad is started, the eraser is pulled free and the brad is driven home, or a number of brads can be started and then driven all the way. If a brush-type eraser is used, the brush part will serve as a convenient handle. The bristles can be shortened, if you wish, to make a stiffer handle. Cut off about $\frac{1}{2}$ in. of the bristles.



Locating Inner-Tube Leaks

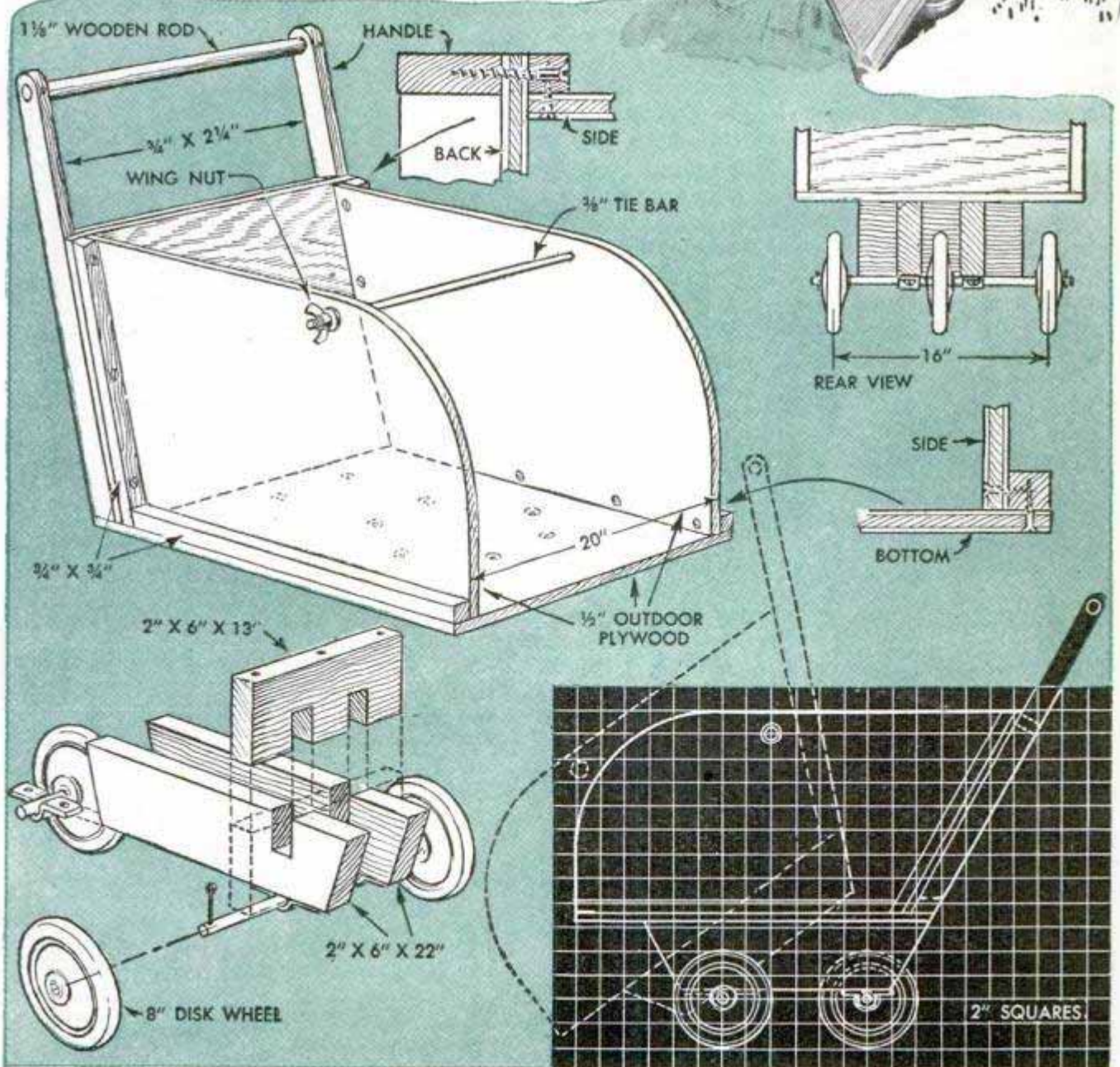
By rolling up a portion of an inner tube and applying pressure with your foot as shown in the drawing, small leaks may be located even though a pump is not at hand to inflate the tube. If the leak is not located at the first attempt, try rolling up another section of the inner tube.

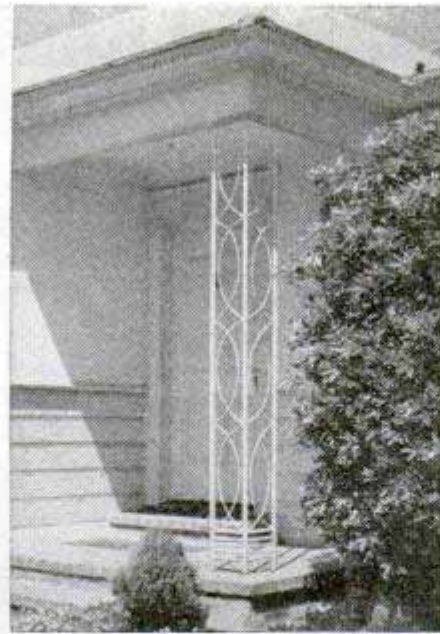


THREE-WHEEL GARDEN BARROW

By Hi Sibley

In this garden barrow a good part of the load is carried on the two front wheels, thereby allowing it to be dumped easily. When making turns, the single rear wheel is lifted clear of the ground. Build the body of $\frac{1}{2}$ -in. outdoor plywood, cutting the sides according to the squared drawing. The body is put together with galvanized screws, casein glue and cleats, the cleats being placed on the outside so that the inside of the body is smooth and easy to clean. A tie bar prevents the sides from spreading when hauling dirt, but wing nuts make it easy to remove the bar when the barrow is used to haul leaves or grass. The body is attached to a 2 by 6-in. wooden chassis with flat-headed screws, and flat-iron straps anchor the axles. Equip the axles with rubber-tired disk wheels.



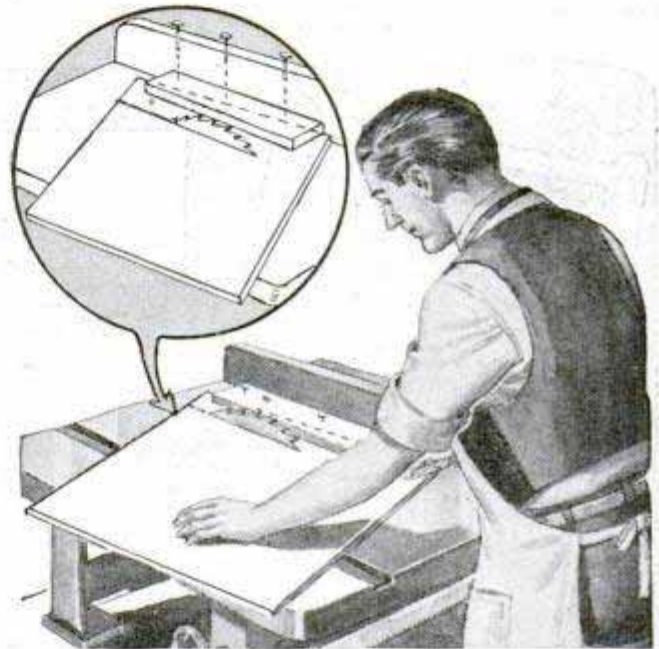


Modern Entryways Enliven Homes

To relieve severely plain architecture and add interesting detail to his front entry, one man built the wooden frame shown in the left-hand photo. He painted the wood a light tone and set brightly colored flower pots on the horizontal members. The right-hand photo pictures an entry column, made from lengths of pipe and galvanized wire, that simulates ornamental iron.

Wooden Strip Guides Large Work When Sawing Tapered Edge

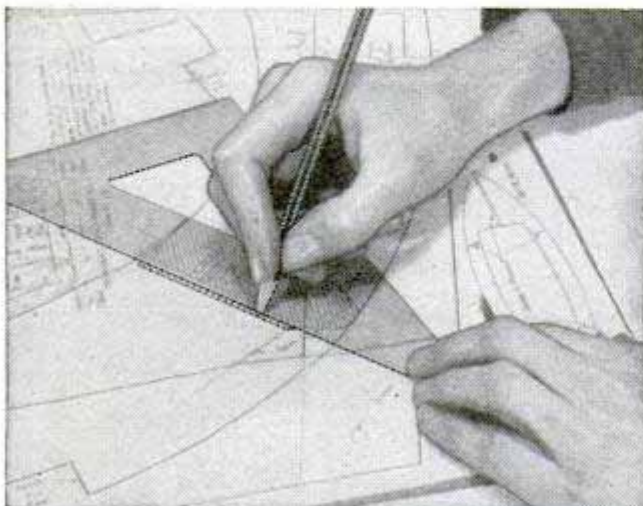
It's no job at all to saw a tapered edge on a large sheet of plywood or other material if a wooden strip of uniform width is tacked temporarily to the stock to hold the line of taper parallel with the saw fence. To position the guide strip for a certain angle, mark the taper on the work, lower the saw blade all the way and place the work on the table. Then lay the strip on top of the work and against the fence so the line of the taper is parallel with the edge of the strip. When in this position, tack the strip to the work, remove from the saw and raise the blade to make the cut. The width of the guide strip is determined by the angle of taper. The greater the angle, the wider the strip must be, although a fairly narrow strip can be used by first sawing off the waste corner of the work 1 in. or so from the line of cut. The nails holding the strip should be driven into the waste part of the work. This stunt is especially useful in cutting plywood sheets, although it is helpful in cutting any stock where the size



of the work is greater than the capacity of the crosscut guide.

Michael Ligocki, Gary, Ind.

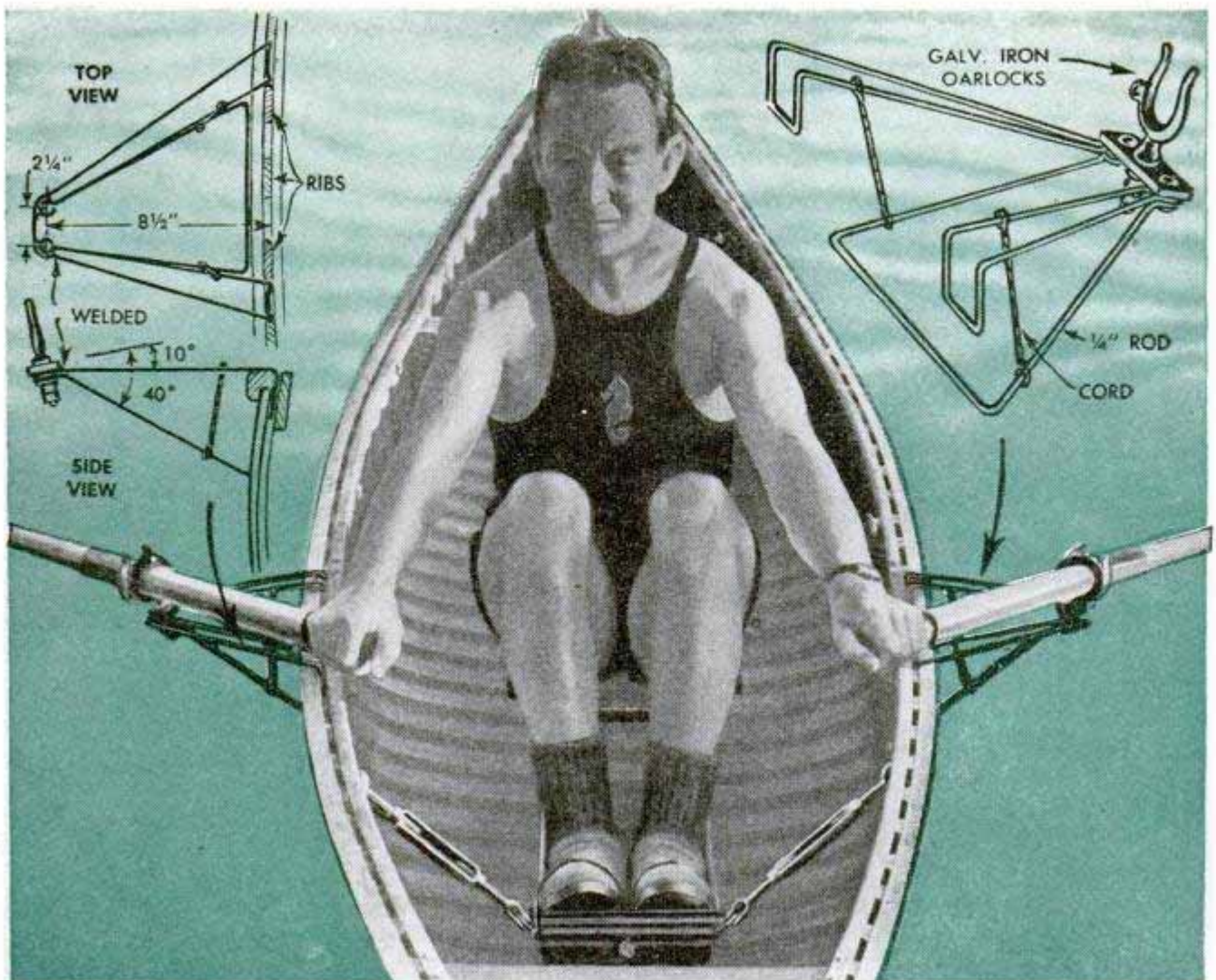
Progress Made in Tracing Patterns Easily Seen by Using Colored Pencil



When transferring patterns to another sheet of paper or directly onto the work, it's an easy matter to tell just which lines have been traced if a hard-lead, colored pencil is used. This is especially helpful when tracing complicated patterns, and if they are to be traced several times, a different colored pencil is used each time.

Graphite Restores Fly Line

Powdered graphite will impart a hard, smooth surface to worn oil-processed fly line. Before rubbing-in the graphite, wash the line in lukewarm water and dry thoroughly. Do not use soap when washing.



furniture casters. Foot plates and heel board are easy to make from $\frac{1}{2}$ -in. waterproof plywood. Toggles on the center partition turn down over one rib and prevent creeping of the seat frame while in use. The sliding seat may be flat but it is more comfortable if made from solid wood and shaped to saddle-seat form.

The axle keepers are designed to provide 3-in. travel for the axle, and the spacer plate which keeps the axles in parallel alignment can be made from aluminum. Sheet-metal clips bent around the axles and riveted to the plate hold the axles securely in place. To make the outriggers, you'll need about 20 ft. of $\frac{1}{4}$ -in. steel rod, one pair of size No. 1 galvanized malleable, U-type oarlocks and four $\frac{3}{16}$ -in. flat-headed stove bolts, with nuts and washers. The upper member of each outrigger spans three ribs, and the inner ends are bent to form hooks that fit snugly into the gunwale slots. One arm of each outrigger assembly is a little shorter than the other so that when in position they rake forward slightly and have a 10-deg. downward tilt at the outer end. The $8\frac{1}{2}$ -in. extension suggested is correct for the oars dimensioned. However, the extension may be increased somewhat if you prefer longer oars. The

lower, A-shaped brace for each outrigger bears against the outside of the canoe hull about 5 in. below the gunwale. Fishline bindings over dowel spacers keep the assembly rigid when in place.

Oars for use with the outrigger should be 6 ft. 8 in. long over-all, with the blade and loom dimensions closely approximating those shown. Working a pair of regular oars down to these dimensions is quite simple to do. The leather and button should be located as shown. Bend the horns of the oarlocks so that the oars will not slip out when in rowing position, and key the oarlocks to the outriggers to prevent loss of the oars.

Pad Altered for Outdoor Sketching

Nail polish applied across the loose ends of sketch-pad pages prevents them from being disturbed by wind when sketching outdoors. This will still permit removal of the pages.



Camp Stove From Ammunition Can

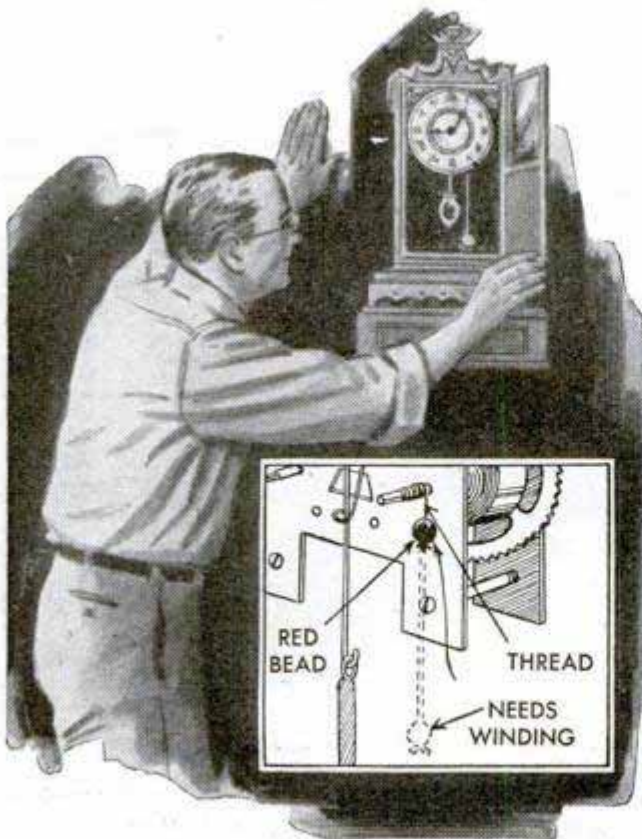
A compact, easy-to-carry camp stove for cooking and furnishing heat for a small tent or cabin can be made from two war-surplus items—a .30-cal. machine-gun ammunition box and a twin-burner alcohol sterilizer of the type used in field hospitals. Holes, $\frac{1}{2}$ in. in diameter, are drilled in one side of the can to form the top of the stove, and the alcohol burner, which gives off intense heat when ignited, is inserted in the can, as shown. The lid of the can is used as a draft control to regulate the amount of heat. When not in use, the ammunition can serves as a container for food.



Colored-Bead Telltale Indicates When Wall-Type Clock Needs Rewinding

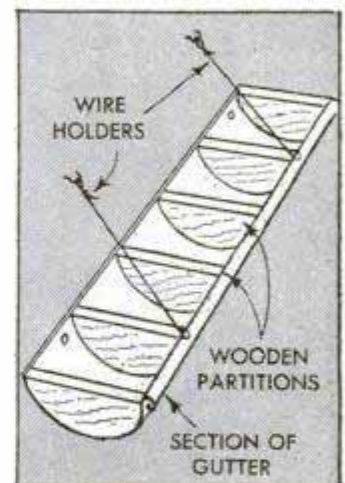
A brightly colored bead attached to a length of thread fastened and wound around the key shaft on the mainspring of a wall clock, will serve as a reminder and show at a glance when the clock needs winding. To attach the thread and bead, let the clock run down, give the key one com-

plete turn and fasten the thread to the shaft with cellulose tape. Then make a mark on the door of the case even with the bead and rewind the spring. As the spring unwinds, the thread unwinds on the shaft, lowering the bead into view. When the bead reaches the mark, rewind the clock.

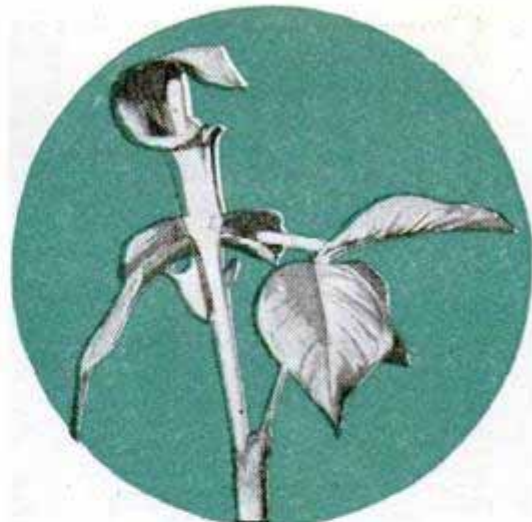
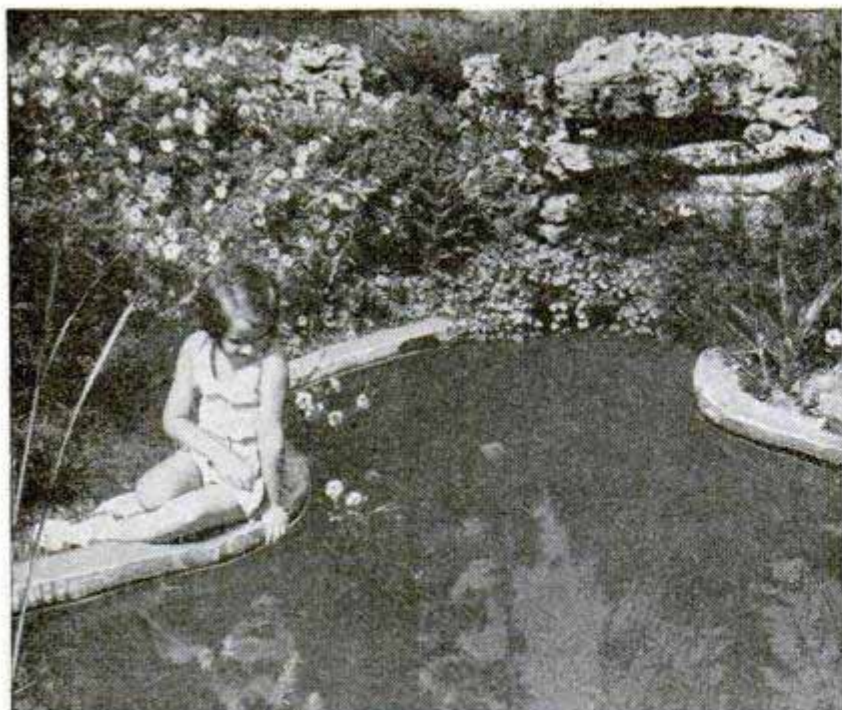


Handy Tray for Small Parts From Length of Gutter

Here's a small-parts tray that is excellent for holding tiny screws, brads, washers, etc. The rounded bottom of the gutter from which it is improvised makes it easy to remove items that are difficult to pick up with the fingers. Thin wooden partitions divide the tray into separate bins which can be labeled to indicate different sizes of brads or screws. Attach the tray to a wall with pieces of wire and screw hooks as shown, or nail it to the end of a bench.



Domenick Bava, Detroit, Mich.



There's no need to go to the woodlands for wild-flower blooms. You can grow them easily in your own garden

WILD FLOWERS for 'TAME'

SELECTION of the varieties, environment and exposure, and the proper soils are the essential requirements for the propagation of wild flowers in a "tame" garden. If space is limited, a half dozen varieties selected for color, profusion and time of blooming, and growth habits will make a small garden of continuing interest and decorative value throughout the season. As a rule, different varieties of wild flowers cannot be crowded in with tame plants of differing habits of growth. Wild plants withstand transplanting unusually well under average conditions, and once established in the new location, even the smallest of them are vigorous growers. But they must have

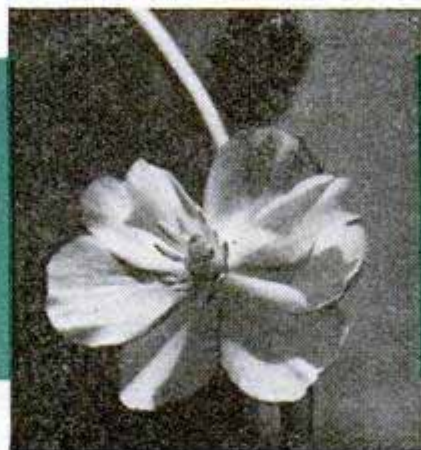
room if they are to do their best. Plant in a separate bed, and space the plants in the row according to their height and spread at full growth. Some plants spread from a single root system. Others of perennial habit reach maximum growth each season. Still others grow in height and spread progressively from season to season, taking several years to reach the maximum. These growth characteristics should always be kept in mind when transplanting, otherwise crowding will result when the plants reach maturity.

Some flowering plants grow wild in areas of the deep woodlands where they are tree-shaded all day. Such plants will not thrive if trans-

By Paul Hadley



HIBISCUS (rose mallow): Grown as individual plant or in a pruned hedge. Has medium-large flowers, papery petals, blooms profusely



MAY APPLE (also called mandrake): May-flowering native perennial with shield-shaped leaves. Thrives in moist soil, south slopes



SPRING BEAUTY (claytonia): Another spring-flowering perennial. Dwarf plants 12 in. high. Thrives in damp, rich soil. Profuse bloom

planted to a garden plot in bright sunlight, or even in a plot that is partially shaded. They must have the full shade to which they are accustomed, but they should not be planted in the solid shadow cast by a building or wall. Likewise large and small plants that grow wild along the sides of damp, rocky ravines cannot be planted in open beds exposed to drying winds and sun. They will do well only in the protected, partially or wholly shaded areas of a rock garden, or on the north side of a sloping rock wall where proper soil and moisture conditions can be provided continuously. Other plants will be found growing in the wild state in more exposed locations where there is only broken or partial shade during the day from the trees or other plants. Still others thrive best in the open in drier soils

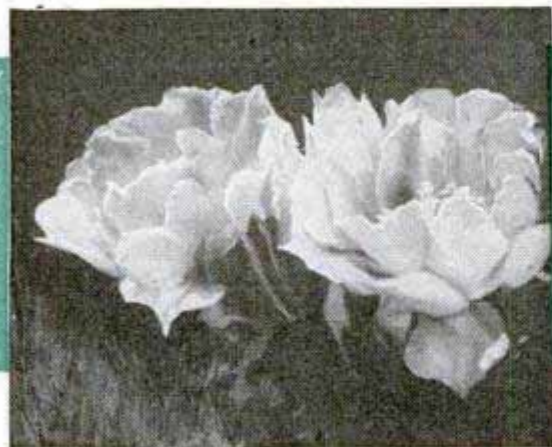


GARDENS

where they are fully exposed to the sun.

In digging up wild plants for transplanting it is important to disturb the root systems as little as possible. Where convenient to do so, the ideal method is to soak the area around the plant and then remove the plants and roots together with a large, unbroken ball of earth. In this way you get the root system practically intact. When transplanted in this manner, growth is interrupted very little, if any at all. Those with the shallow root systems such as violets, bluebells and others generally are found in the shaded areas of woodlands and are easy to remove. Others such as the jack-in-the-pulpit, lilies of certain varieties, may apple, etc. grow from bulbs and

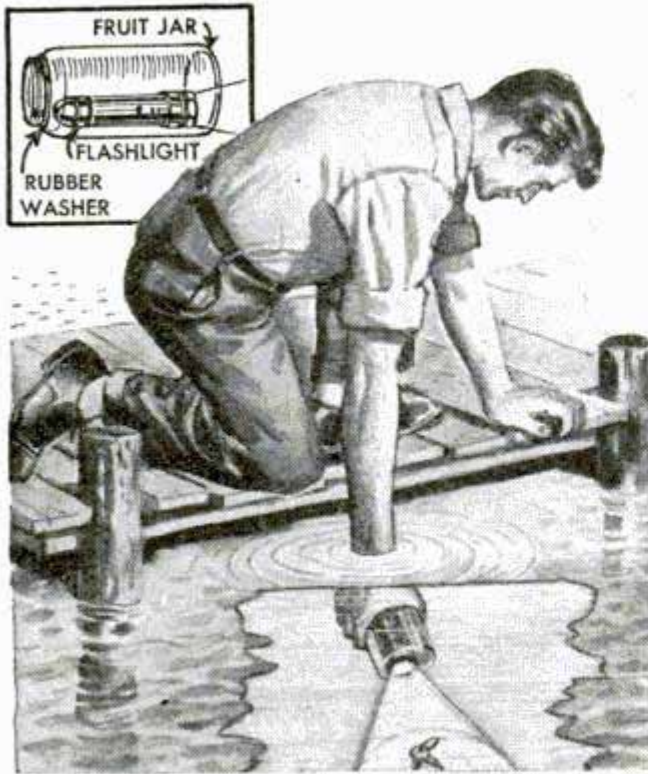
deep root systems and are more difficult to remove without damage. Where possible, plants should be removed and transplanted during cloudy weather, or after a rain. Even then, precautions should be taken to prevent the roots and the soil about the root system from drying out. Most wild flowers can be transplanted in spring when the plants are in bloom as they are more easily found at that time. Certain varieties are difficult to recognize when not in bloom. As a rule, those that flower in the early spring are more easily moved than the varieties that bloom in the late summer. The late-blooming plants are mostly annuals which propagate from seed. The early bloomers are nearly all perennials.



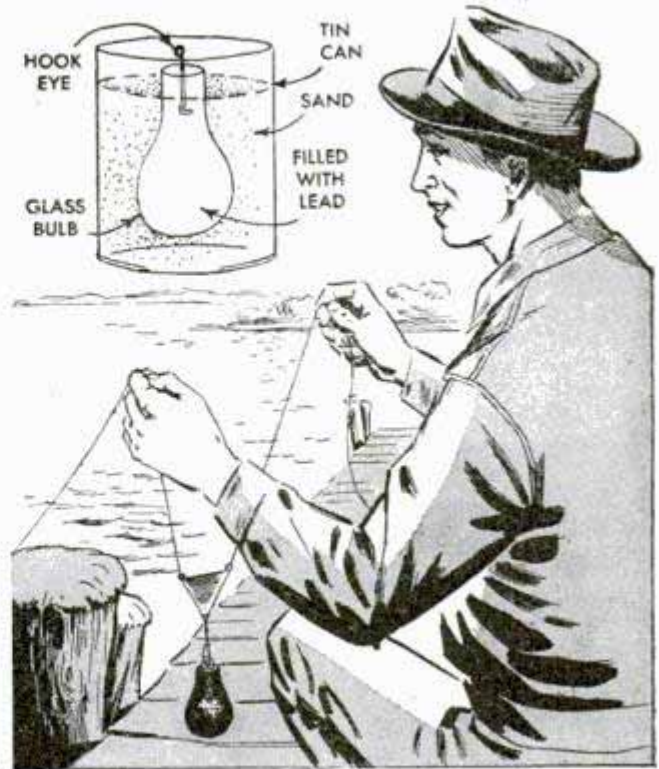
CACTUS (prickly-pear group): Quite widely distributed and a novel plant for wild gardens. Has large cup-shaped blossoms. Thrives best in the open in dry, sandy soils



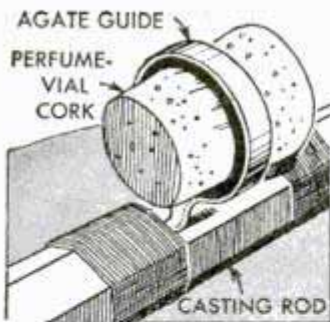
HINTS TO HELP SOLVE FISHING PROBLEMS



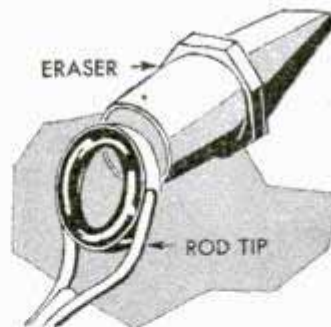
AN UNDERWATER FLASHLIGHT for locating key rings, fishing tackle and other objects dropped from a pier or boat in shallow water at night, can be made by sealing a small flashlight in a fruit jar fitted with a rubber ring. To do this, turn the light on and place it in the jar so that the beam is directed through the bottom. After making sure that the rubber lid washer is in good condition to prevent water from seeping into the jar, screw the lid on tightly. Then hold the jar under the water, and the flashlight should provide enough illumination to permit locating the item



CASTING LEAD SINKERS of the type used for deep-water fishing may be done with an improvised mold made by embedding a burned-out lamp bulb in a can of sand. Dampen the sand and pack it around the inverted bulb, but let the sand dry before casting the sinker so that steam will not generate between the sand and the outside of the bulb. After the bulb is filled with molten lead, quickly suspend a hook eye in the lead and let cool. If many sinkers are to be cast, it is best to make a regular two-part sand mold, using the bulb as a master pattern

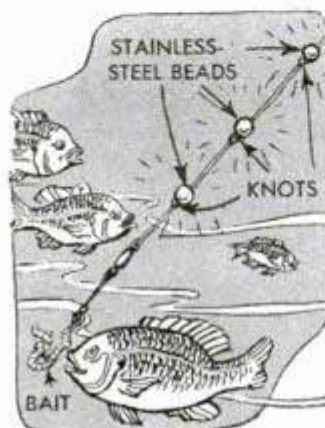


AGATE GUIDES on casting rods are protected from being cracked or broken when the rod is not in use by inserting a small cork of the size used in perfume vials in each guide. If the corks are too large, sand them until they fit snugly in the guides



ROD-TIP BREAKAGE due to rough handling in transit will be reduced if a pencil-tip eraser is placed over the rod tip. The eraser should be a tight fit so that it will not slip off. The bulb from a medicine dropper also will serve the purpose

FISH LURE of bright, stainless-steel beads attracts perch, bass, bluegills and similar fish for one fisherman when other ways fail. Beads are about the size of BB shot and are held in place on the line by tying knots under each one. The first bead is fastened about 6 in. above the bait and several others are attached at 4-in. intervals



SPLIT SHOT eliminates tying and untying of knots when attaching lures or fishhooks to a line, permitting them to be exchanged quickly. The end of the line is fastened to the hook or lure as shown, and the shot is clinched with a pair of pliers. To separate the line and release the hook, just pry open the shot with knife-blade edge

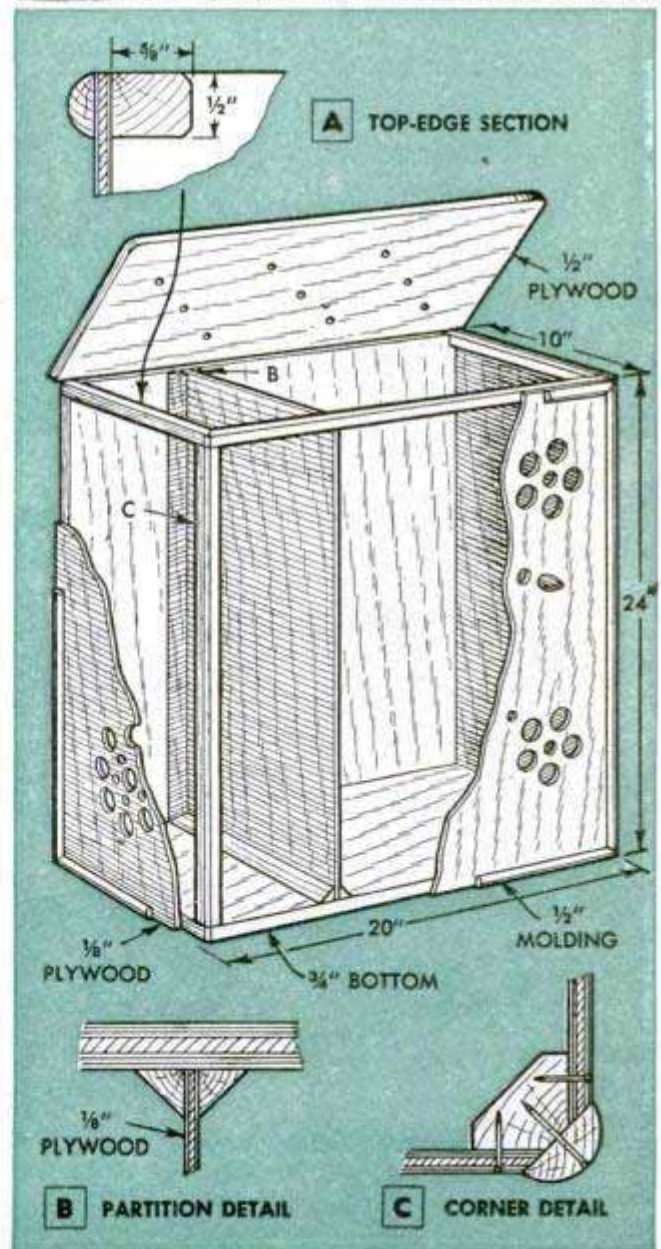
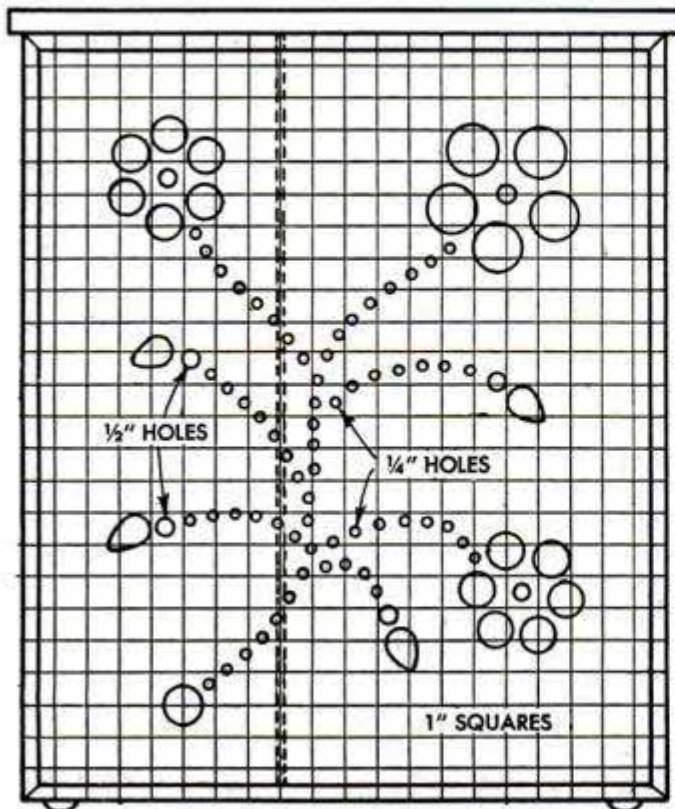


CLOTHES HAMPER

THIS hamper was designed with the simplest possible construction in mind and it is as easy to build as a box. Design features are a novel floral pattern, made by boring holes of varying size in the front and sides, and a recessed panel effect obtained by finishing the edges and corners with half-round molding, detail A. If an enamel finish is desired use birch plywood, $\frac{1}{2}$ in. thick for the back and hinged top, and $\frac{1}{8}$ or $\frac{1}{4}$ in. thick for the front and sides. Cut the back and bottom panels to size and join with screws and glue. Then make the frame, using $\frac{1}{2}$ by $\frac{5}{8}$ -in. strips for the horizontal members and 1 by 1-in. strips for the corner uprights. Plane these latter members to a triangular shape as indicated in the sectional detail C, and assemble the frame members with nails and glue, or use screws. Next, cut the side and front panels to size and locate and bore the holes forming the floral design as shown on the squared pattern. Holes also are shown in the side panels and top, but these can be omitted if desired. Bore the large holes with an expansive bit. Then attach the panels to the frame using small brads and glue. True up all exposed edges by planing and sanding, then bevel the two front corners as in the sectional view C. Install the partition, using small triangular strips to hold it in place as in detail B. Sand the edges of the plywood top and hinge to the back panel. Finally attach the half-round moldings.

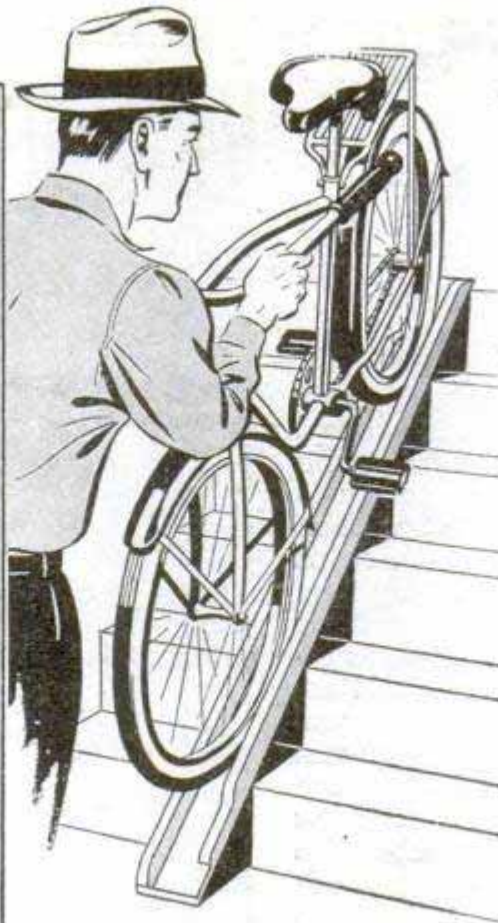
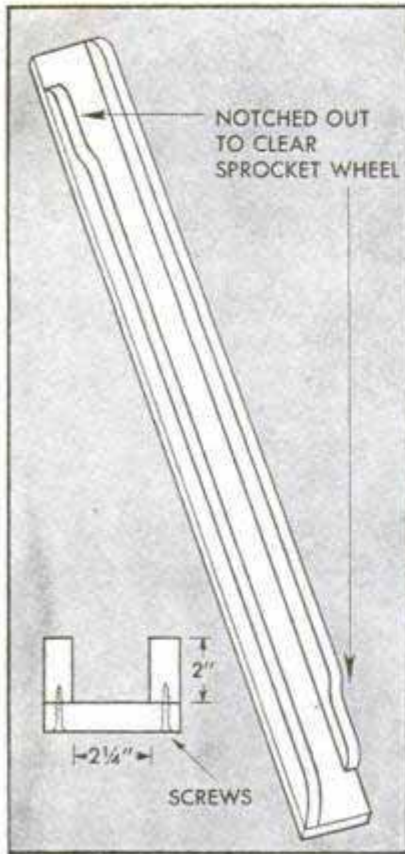


100 W. P.



Channel Runway Aids Wheeling Bike Up or Down Steps

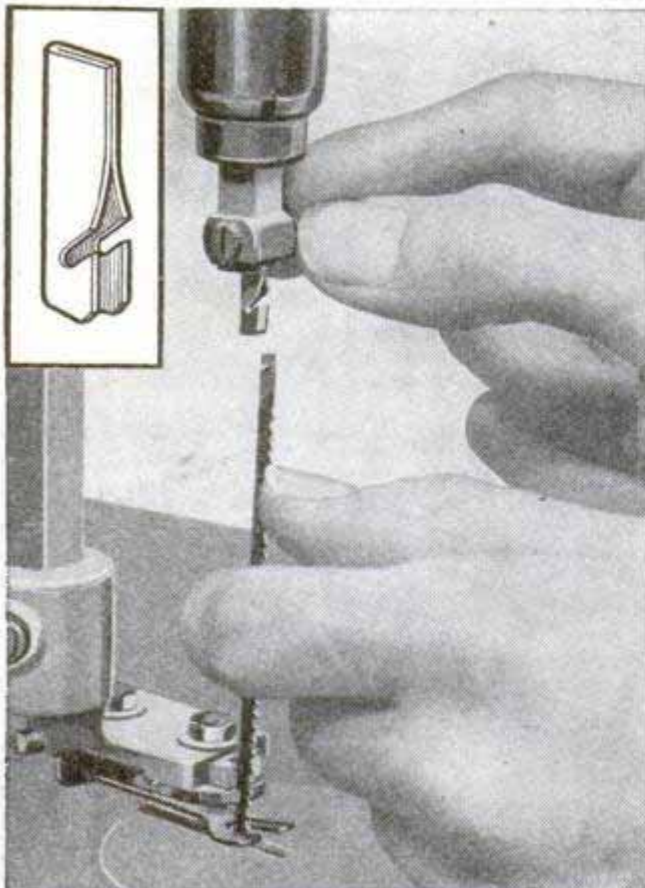
If a bicycle is stored in a basement or on a porch, this portable wooden runway will facilitate wheeling it up and down the steps. While the length of the runway, of course, should suit the particular stairway, the sectional dimensions given will accommodate most bicycles. Note that opposite sides of the runway are cut down at each end to clear the sprocket wheel and mud guard. If both ends are cut alike, it makes no difference which end is placed at the top of the stairs. In wheeling the bicycle up or down the runway, it is more convenient to hold it by the handlebars.



Quick-Change Attachment for Pin-End Blades Fits Scroll Saw Chuck

When making internal cuts in intricate scroll saw work, the bother of loosening the clamping screw in the upper blade chuck to release the blade is eliminated if the

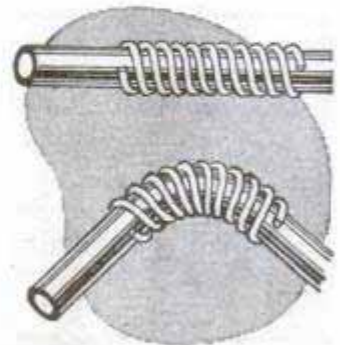
chuck is fitted with this auxiliary attachment. It is designed for use with pin-end blades and is made from sheet metal, folded double. One end is spread apart to take the end of the blade and notched as shown. To release the blade from the attachment it is only necessary to pull down on the plunger to relieve tension and then unhook the blade. The pin in the lower end of the blade must be removed so that it can be clamped in the lower chuck in the regular manner. The teeth should point downward.



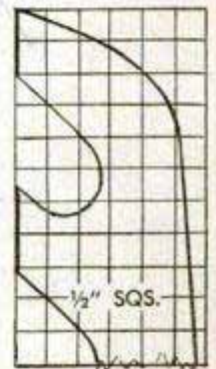
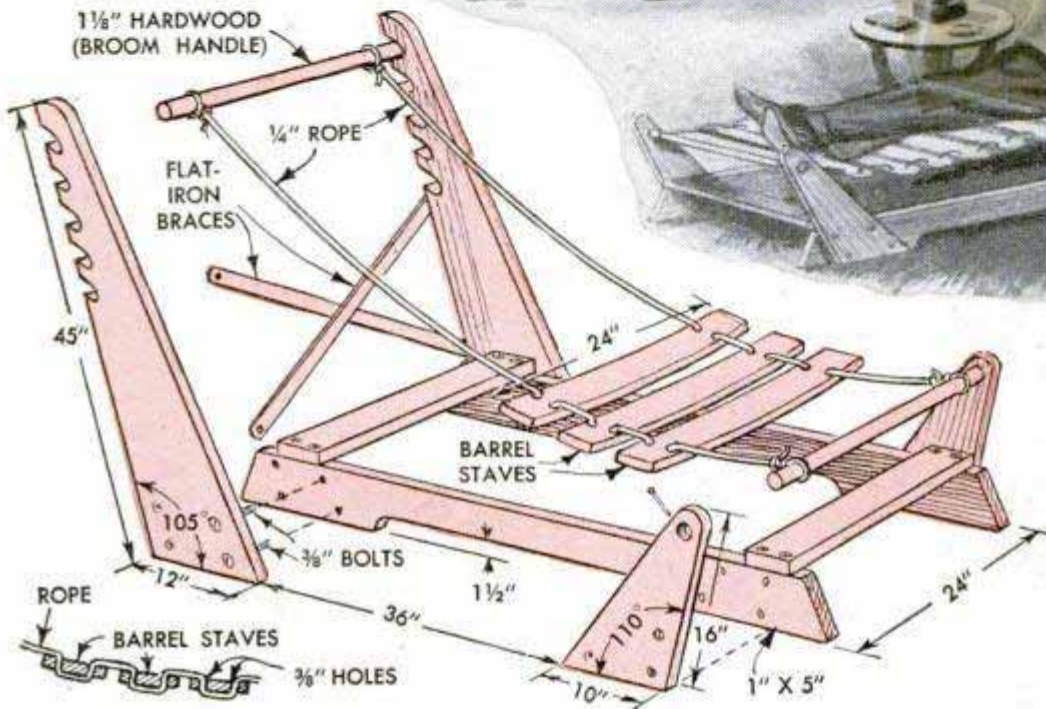
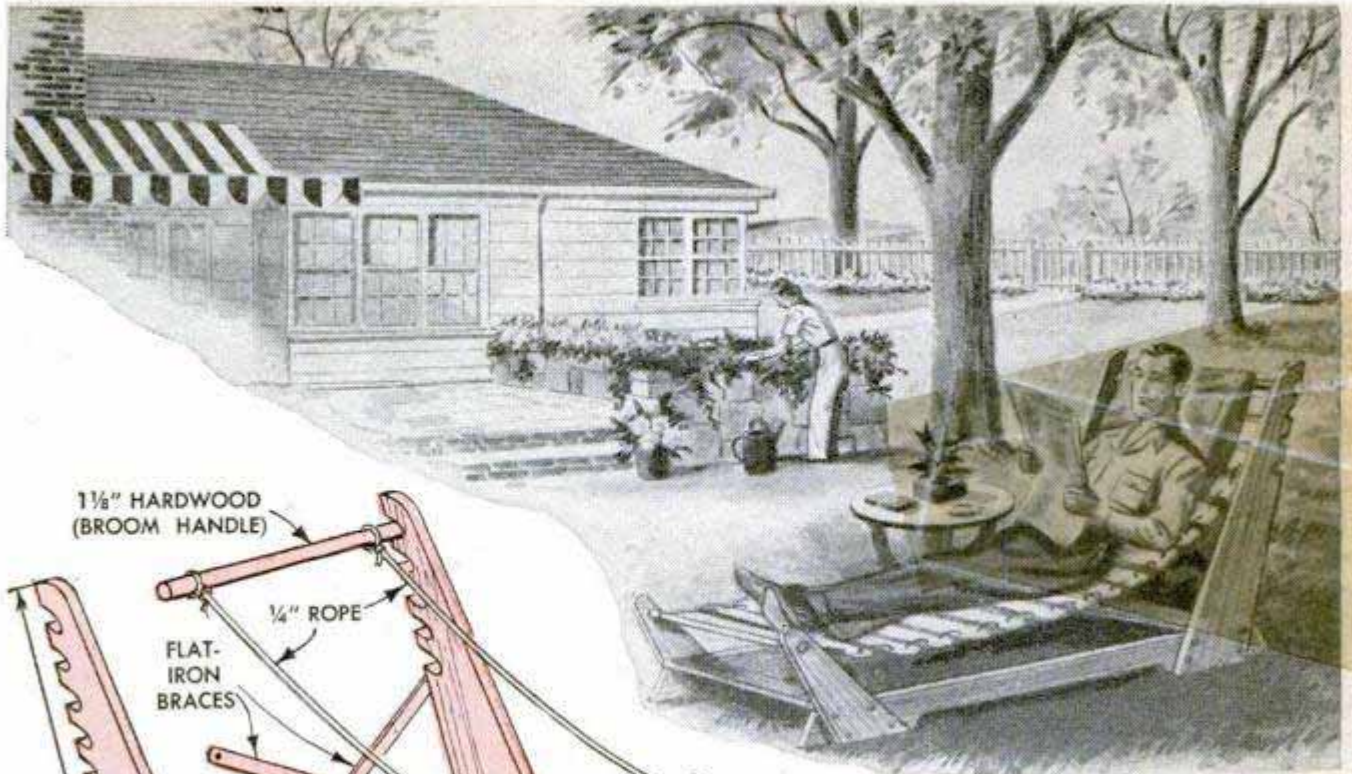
Copper Tubing Bent Without Kinking

Where it is necessary to make sharp bends in copper tubing to fit special requirements, one mechanic finds that a coil spring is more convenient to use than filling the tubing with sand to prevent it from kinking. A snug-fitting coil spring is pushed over the place to be bent, and after the bend is made it is readily slipped off.

G. E. Hendrickson, Argyle, Wis.



Garden Lounging Chair Has Barrel-Stave Seat



A good-looking lawn chair that's as comfortable as it is easy to build, is made by suspending a barrel-stave seat from a wooden frame. The notches in the back uprights permit the seat to be adjusted to suit the individual requirements of the user. The chair is constructed as shown in

the drawing, $\frac{3}{4}$ -in. pine or similar wood being suitable for the frame. The squared pattern will aid in cutting the notches accurately. After sawing the barrel staves to length, drill $\frac{3}{8}$ -in. holes near each end and string the staves about 1 in. apart on two lengths of $\frac{1}{4}$ -in. manila rope.

Ticking of Clock Soothes Small Puppy or Kitten During First Nights

If a young puppy or kitten is restless and whines or cries during the first few nights you have him home, try placing a small clock in the pet's sleeping box. The ticking of the clock will keep him company and prevent him from getting lonesome.

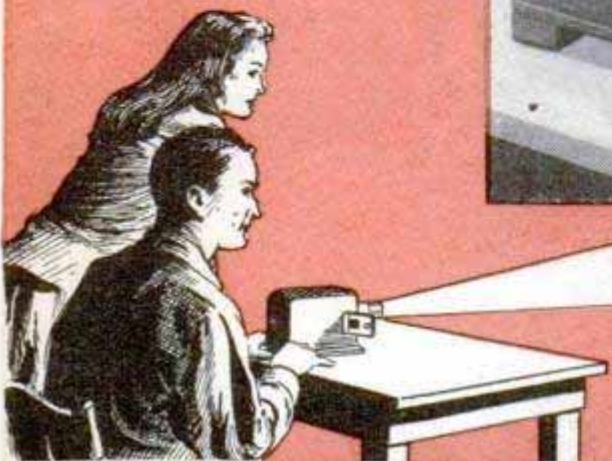
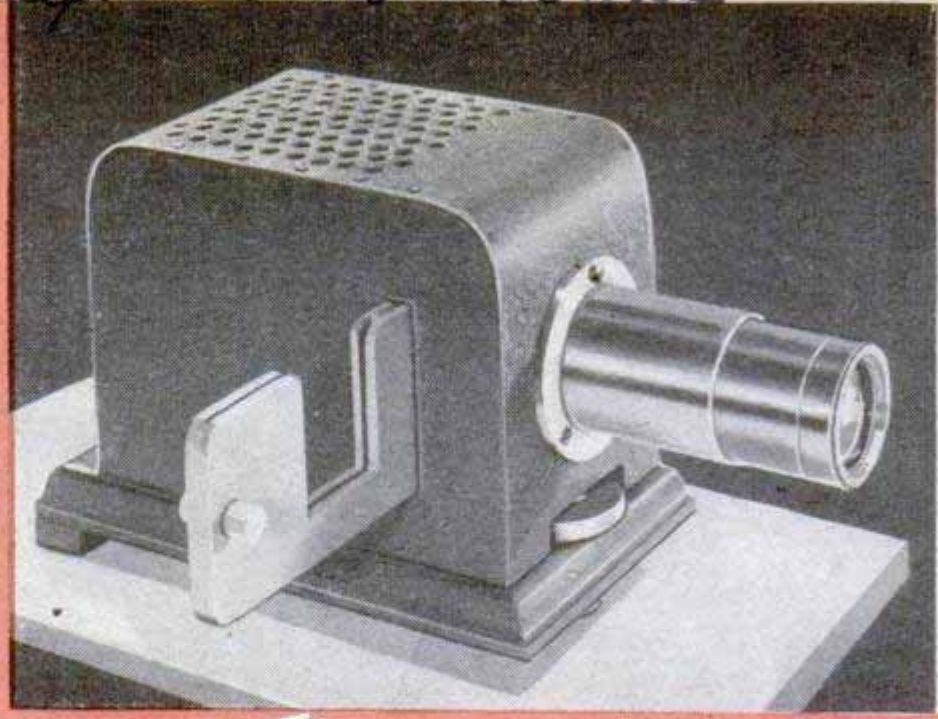
William Swallow, Brooklyn, N. Y.

When applying only one finish coat to interior walls, better coverage will be insured if the white undercoat is tinted with a little of the finish color. This will be especially helpful if the walls are to be finished in a delicate shade.



U.S. Pat. 2,164,171 Rep. also Rep. in Photo Kinks Book

35-MM. SLIDE PROJECTOR



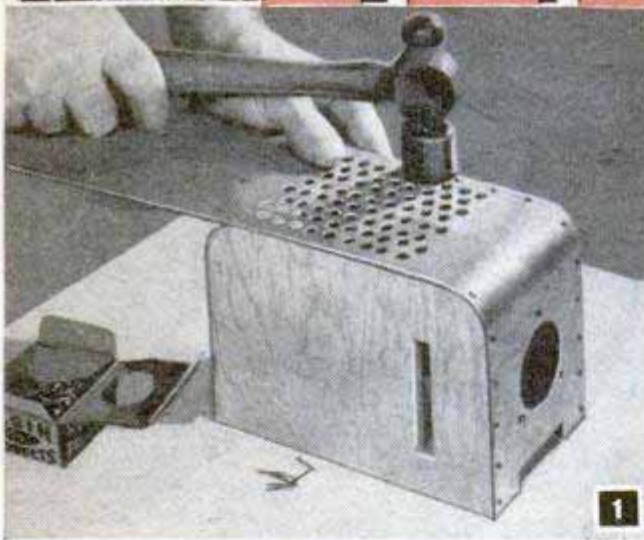
By Sam Brown

THIS SLIDE PROJECTOR can be built at a very reasonable cost and is an interesting job for the home craftsman. The unit takes a 2 by 2-in. cardboard ready-mount, which is the common mounting for both purchased slides and the transparencies you shoot with your own camera. Lenses suggested are stock items and can be obtained from optical supply dealers. Tests have shown that performance of the unit is excellent.

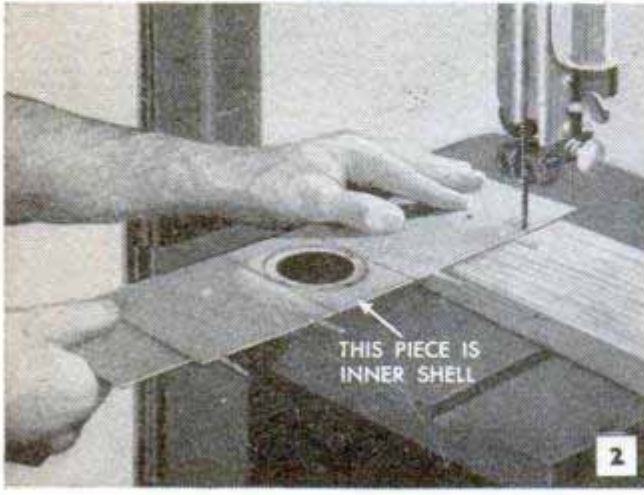
A full-size detail of the lens mounting is shown in Fig. 12, and this should be the first item made. Its construction can be varied to suit—a lot depends on just what you can pick up in the way of tubing. The lens mounting screws inside a piece of tubing which is a slide fit inside a second tube, and the latter is attached by means of a threaded ring to the outer case.

The condenser mount is detailed in Figs. 3 and 5. This is a split turning, made by turning down the part in the full round and then sawing in half about 1/8 in. beyond the center. Grooves for the condenser lenses must be measured carefully as the lenses should snap lightly in place, and once seated they should be fairly loose in the grooves.

Make the lamp-socket support by turning down a piece of brass to fit, Figs. 3 and 7. Next, cut the brass support arm and then sweat-solder the two parts together. Chuck the work in the lathe and bore the support arm to the same internal diameter as the socket support. Drill and tap for a

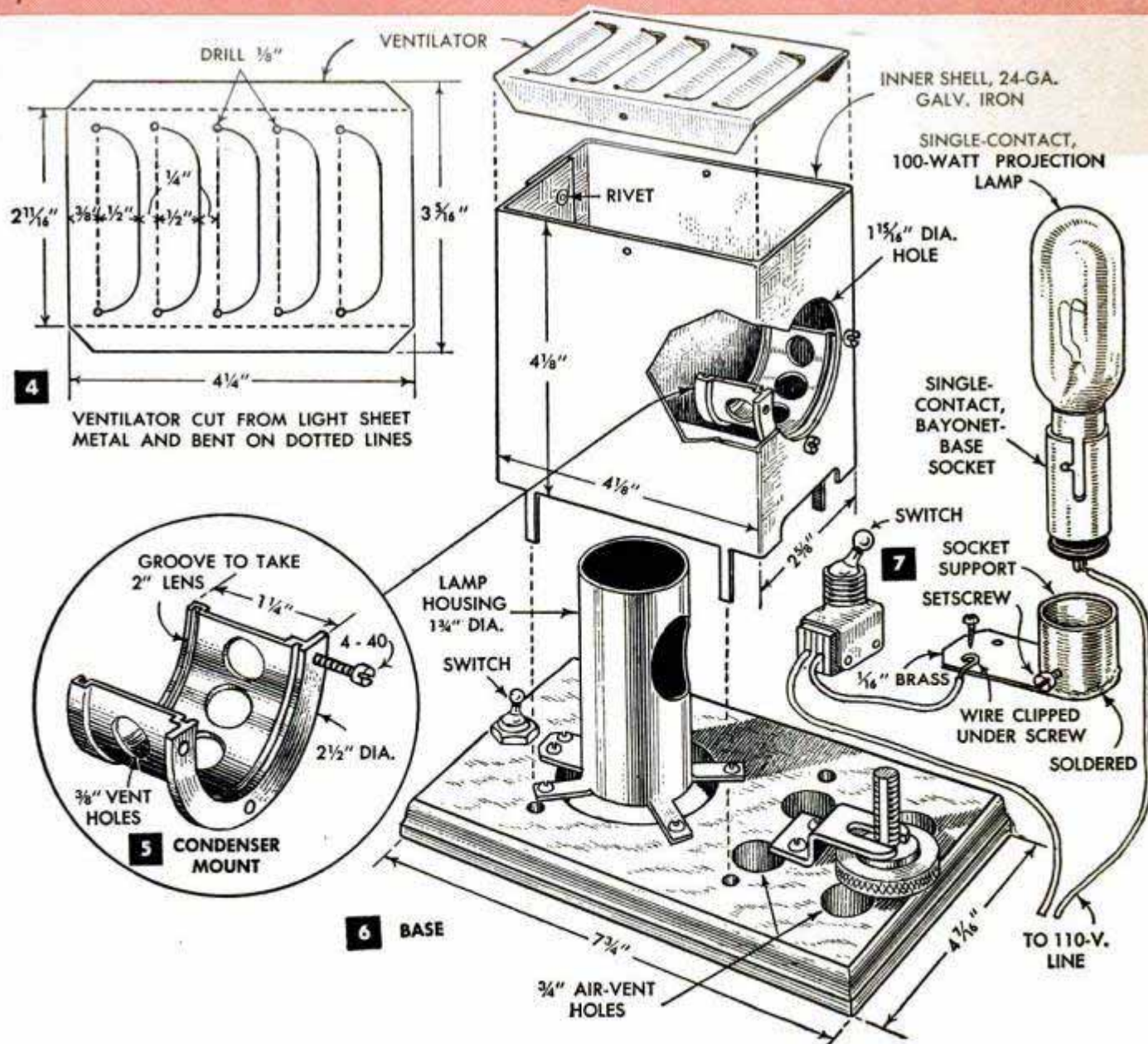
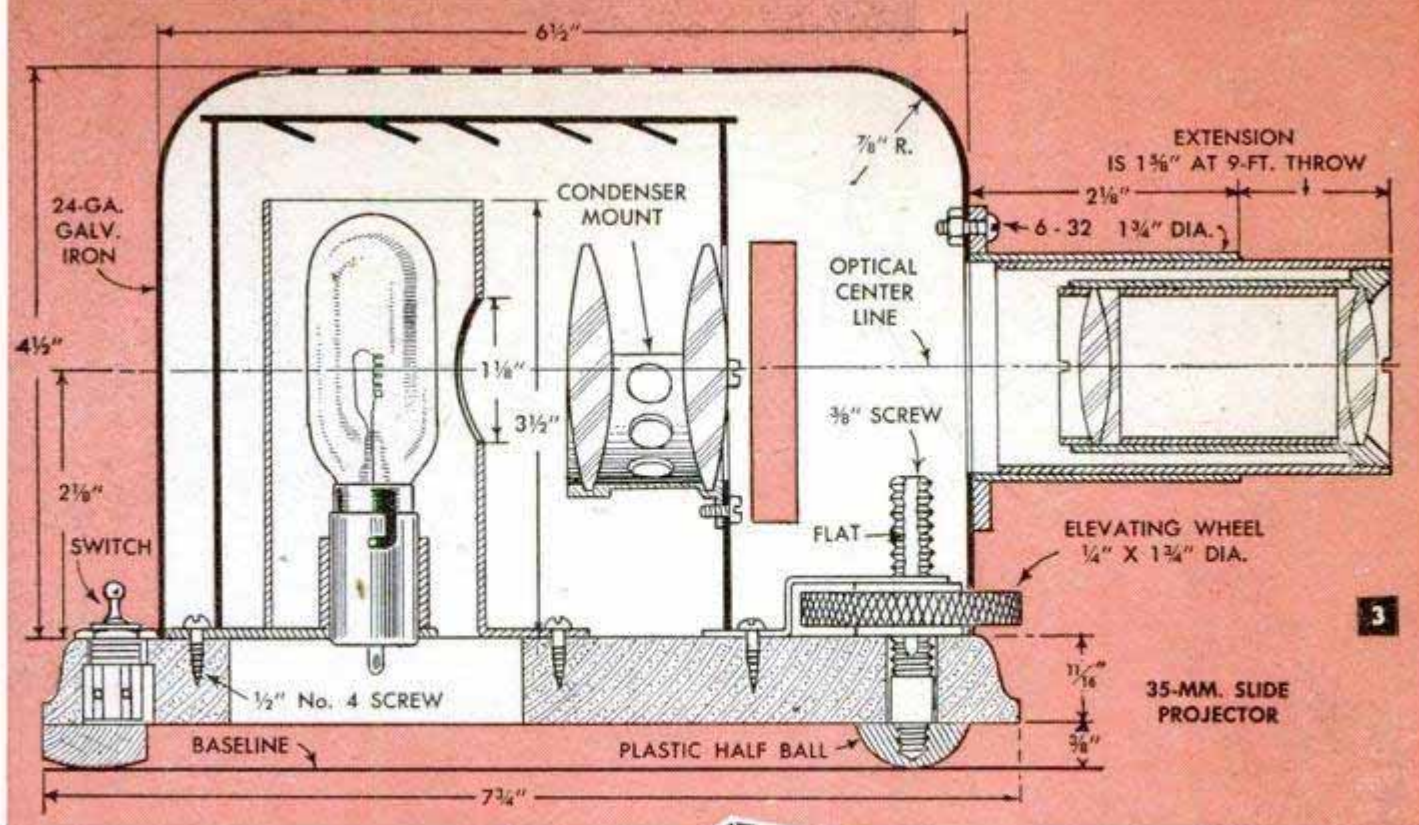


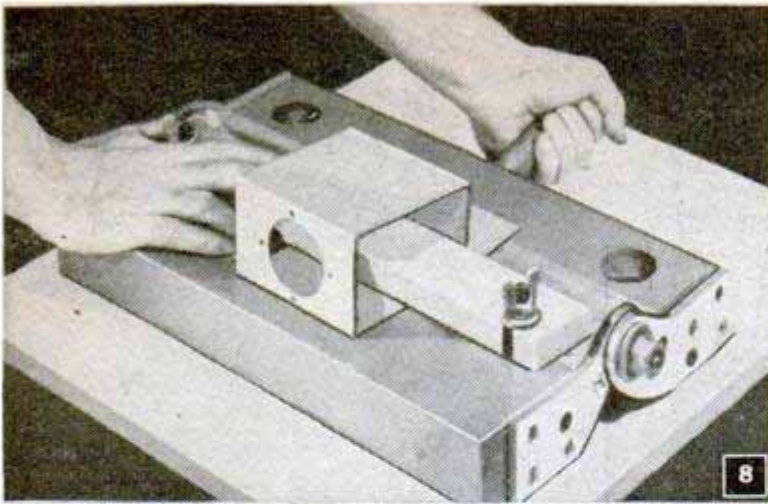
OUTER CASE IS SHEET METAL OVER PLYWOOD SIDES



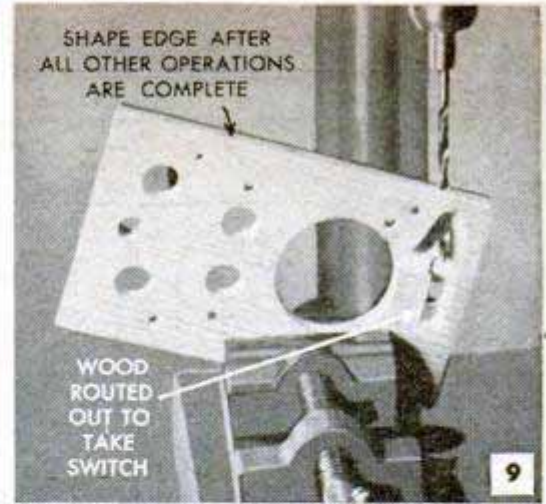
THIS PIECE IS INNER SHELL

SHEET-METAL PARTS ARE SAWED ON BANDSAW





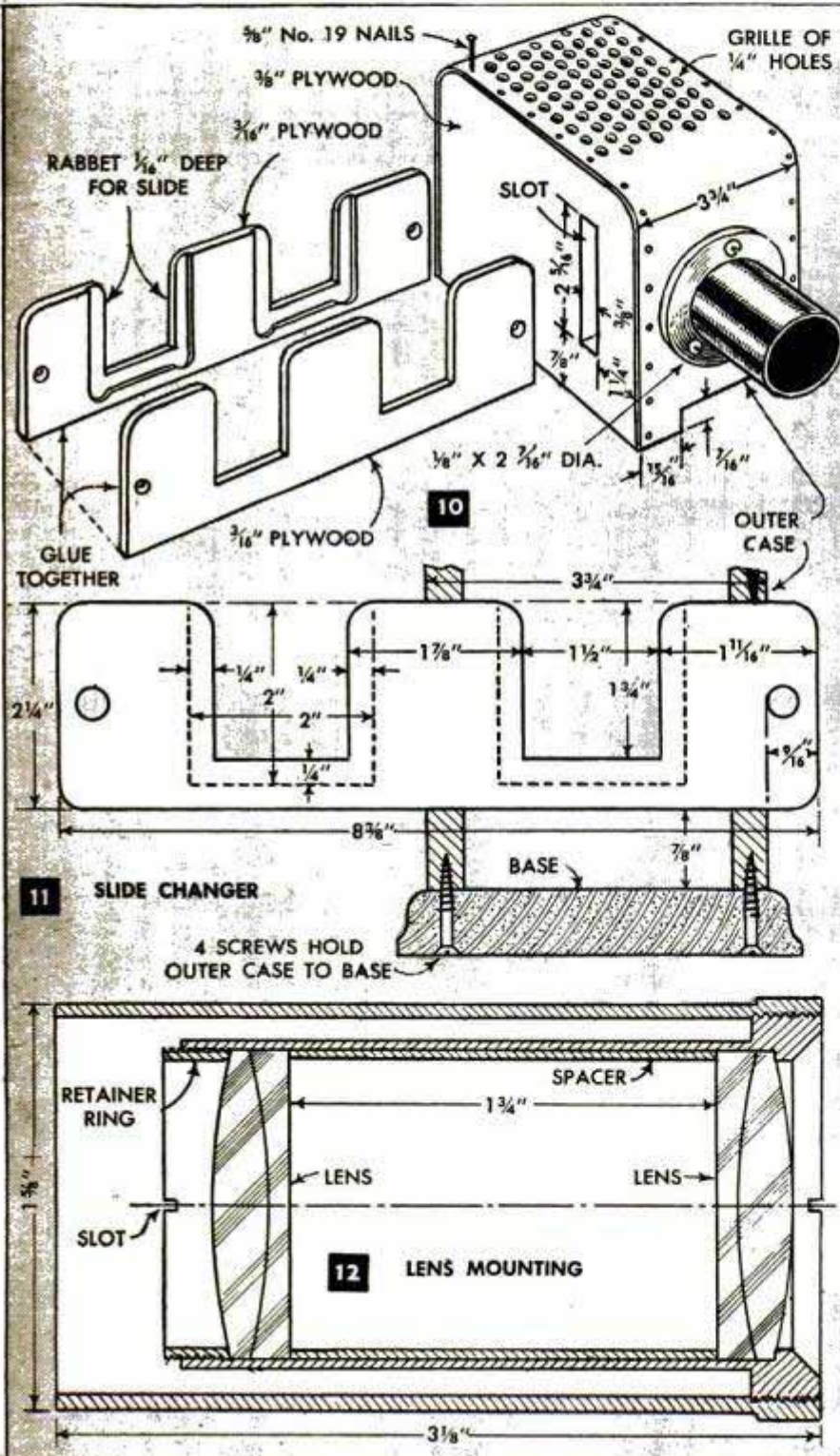
BENDING THE INNER SHELL WITH BENDING BRAKE



SHAPE EDGE AFTER ALL OTHER OPERATIONS ARE COMPLETE

WOOD ROUTED OUT TO TAKE SWITCH

DRILLING HOLE IN BASE FOR WIRE

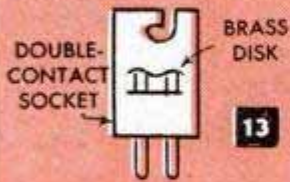


setscrew to hold the lamp socket in position.

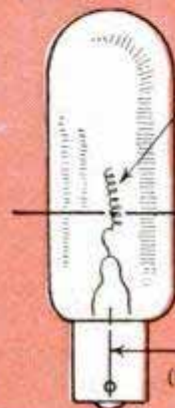
The outer case, or housing, consists of 3/8-in.-plywood sides covered with galvanized sheet metal, Figs. 1, 2 and 3. If you like metalworking make an all-metal case. The wooden sides simplify the construction somewhat and are quite practical as they are well protected from lamp heat by the housing and inside shell. Tack the plywood sides together and saw out both parts in one operation, including the opening for the slide changer. Mount the lens on the case, and then make the slide changer, Figs. 10 and 11. Note that openings into the slots are rounded over before gluing so that the slides can be inserted easily. Wipe excess glue out of the slideways.

The base, Figs. 3 and 6, is wood. Note that one end of the lamp housing is split four ways to form lugs for attaching to the base. The inner shell, Figs. 3 and 6, is 24-gauge galvanized sheet metal. Since the inner shell carries the condenser mount and the combination ventilator and light trap, Fig. 4, it should be made accurately to stand square; cut it to size on the bandsaw, Fig. 2. Opening for the condens-

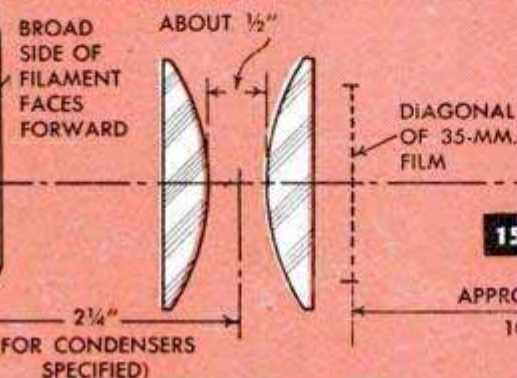
OPTICAL SYSTEM
SHOULD BE MADE UP OF OPTICS SHOWN, OR CLOSE SUBSTITUTES. CONDENSER SYSTEM IS CHECKED AS SHOWN IN PHOTO. DETAIL BELOW SHOWS HOW DOUBLE-CONTACT SOCKET CAN BE CHANGED FOR SINGLE-CONTACT LAMP



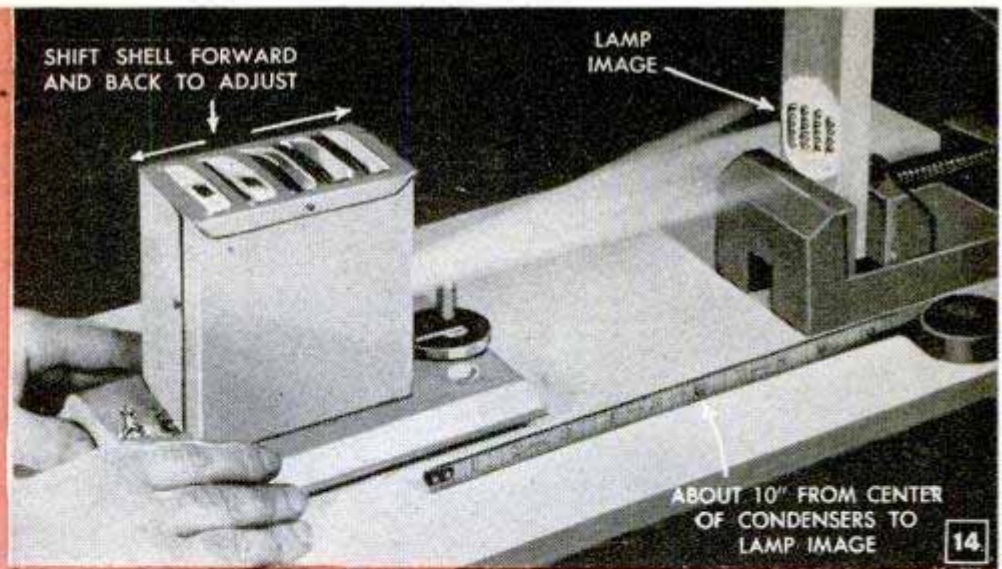
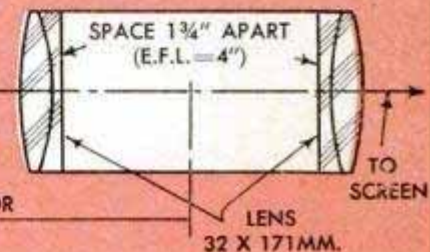
LAMP
100-WATT, SINGLE-CONTACT PROJECTION LAMP



CONDENSERS
PLANO-CONVEX OR CROSSED CONVEX. 2" DIA. BY 3" FOCAL LENGTH. E.F.L. = 1 1/2".



PROJECTION LENS
USE TWO ACHROMATS OR SINGLE PLANO-CONVEX LENSES. DIAMETER SHOULD BE 1 1/4" AND FOCAL LENGTH 6 3/4" (32 X 171MM.). LARGER DIAMETER LENSES CAN BE USED, UP TO ABOUT 1 1/2" AND F. L. CAN VARY BETWEEN 5 3/4" AND 7 1/2".



ers is cut on a jigsaw or with a holesaw. It is important that the 2 1/8-in. dimension from the top of the base to the optical center line be maintained in making all parts, Fig. 3. Fig. 8 shows the inside shell being bent on a sheet-metal brake, but of course this can be done in a vise, using wooden blocks to bend the corners square. Fig. 9 shows the base being drilled for wiring. Note that the bottom is routed out to take the toggle switch, Figs. 6 and 7.

The light unit for the projector is a 100-watt projection lamp of the single-contact type, and is fitted into a corresponding single-contact bayonet-base socket, Fig. 15. You can use a double-contact lamp and double-contact socket. However, the single-contact lamp is a standard item, but the single-contact socket is not standard. You can alter a double-contact socket, as in Fig. 13, by soldering a disk of brass over the contacts. Then use the double post as a single post and take the second wire from the screw holding the socket support, as in Fig. 7.

At this stage the unit should be tested. Make the setup in Fig. 14 and move the partly assembled projector forward and backward until the image of the lamp filament is sharply focused. Note that the

distance from the center of the condensers to the image should be about 10 in. Some adjustment is possible by moving the inside shell forward or backward. The 10-in. distance is specific for the lenses shown. If you use a larger-diameter lens, pick up the lamp image about 15 in. from the center of the condensers.

While the optical elements specified are standard, there are certain substitutions. Condensers must be at least 2 in. in diameter in order to cover the diagonal of the slide. Focal length of the condensers should be about 3 in.; two of these very nearly in contact have an equivalent focal length of one half the individual lenses. For the projector lens, two 32 by 171-mm. achromats are suggested. Spaced 1 3/4 in. apart, the equivalent focal length will be about 4 in., which is the right figure for average home use where the throw from the projector to the screen is 8 to 10 ft. Shorter focal-length lenses will give a larger image with a shorter throw while a longer focal length results in a smaller image and a longer throw.

The finish on the projector must withstand heat. Use a baking enamel, black inside and any color outside. Bake at low heat in the oven with the door open.

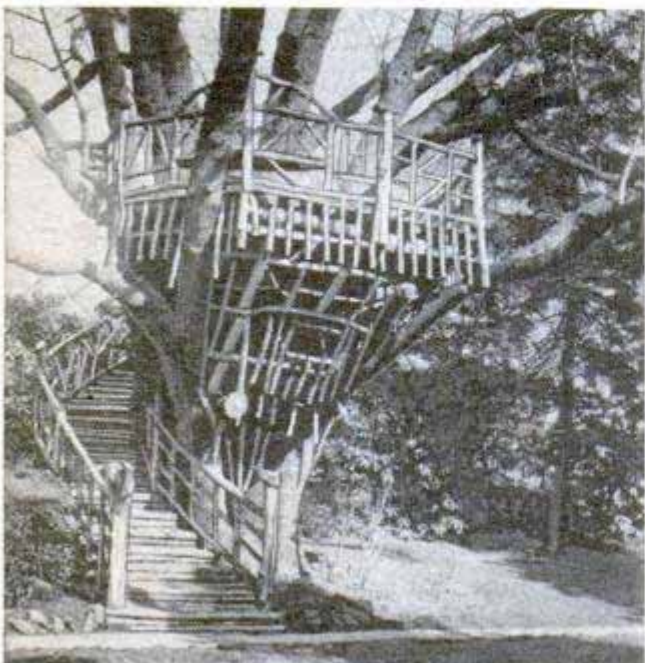
Match-Book Flap Is Resetting Target For Outdoor Use With Air Rifle



An excellent outdoor air-rifle target that will reset itself is nothing more than an empty match book tacked to the top of a convenient post. When the flap of the cover is bent vertically, it will have enough flexibility to return to that position after being hit. It is unlikely that the pellet will penetrate or tear the cover unless it is fired at close range. A thumbtack will serve to hold the book in place.

Outdoor "Sitting Room" in Tree Provides Restful Retreat

When it's too warm in the house, you can retire to this outdoor "sitting room" and relax in comfort. A tree with a large trunk and spreading branches near the ground should be selected. A platform about 12 ft. square provides ample space



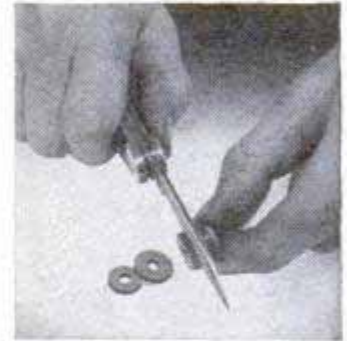
to build several rustic seats around a railing, and a stairway to the sitting room winds around the tree trunk. Because of its durability, redwood is especially suitable for this purpose.

Paul Hadley, Philadelphia, Pa.

Mounting Pads for Small Motors Cut From Fuller Balls

Soft-rubber pads for mounting small high-speed motors, eliminating rattles in automobiles and dampening vibration in other pieces of equipment, may be cut from an ordinary fuller ball. Such balls come in a number of sizes and are easily sliced into thin washers with a sharp knife or razor blade.

Richard Hanscom, Elmhurst, Ill.



Grease Pencil Marks Glass When Cutting Freehand

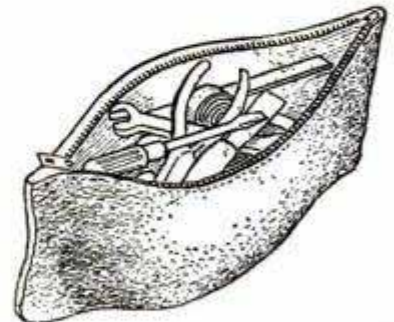


Following a curved or other irregular line when cutting glass freehand is made easy if the pattern is drawn directly on the underside of the glass with a grease pencil.

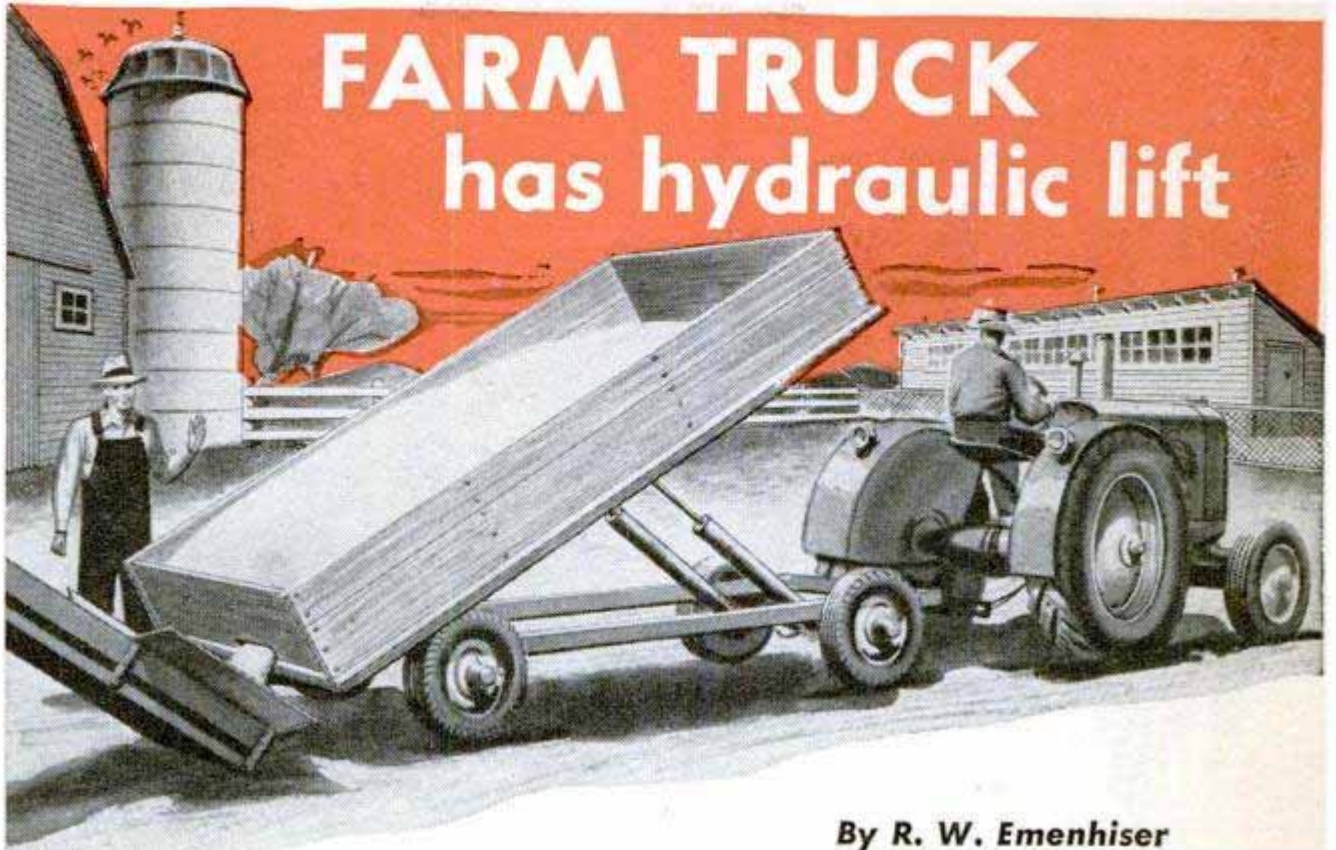
There's no shifting of the line as when a line is drawn on a paper pattern and the glass placed on top of it. In following the guideline, watch it by looking directly over the cutter.

Purse Serves as Tool Bag

A lady's discarded purse, or a large tobacco pouch, preferably one with a zipper fastener, will serve as a handy tool kit for use in the home, car or on a bicycle. The



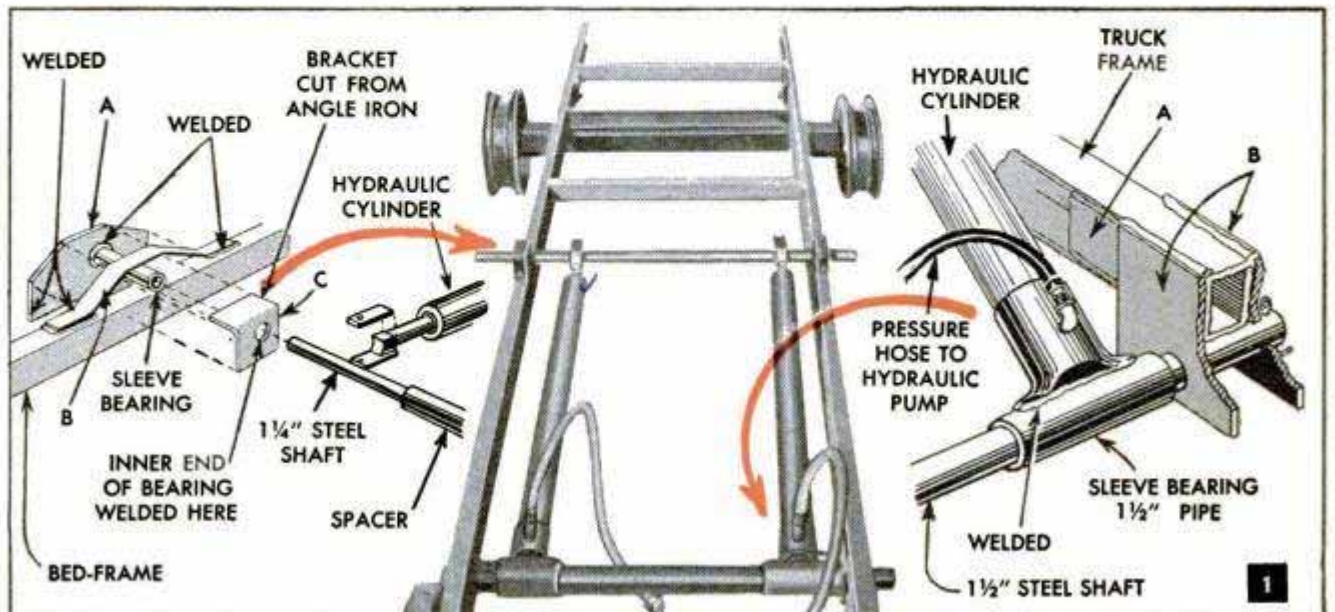
tools necessary for most minor repairs will fit neatly in a purse of average size. When used on a bicycle, it can be fastened to the frame or luggage rack with two leather straps.—Jo Ro Jung, New Orleans, La.

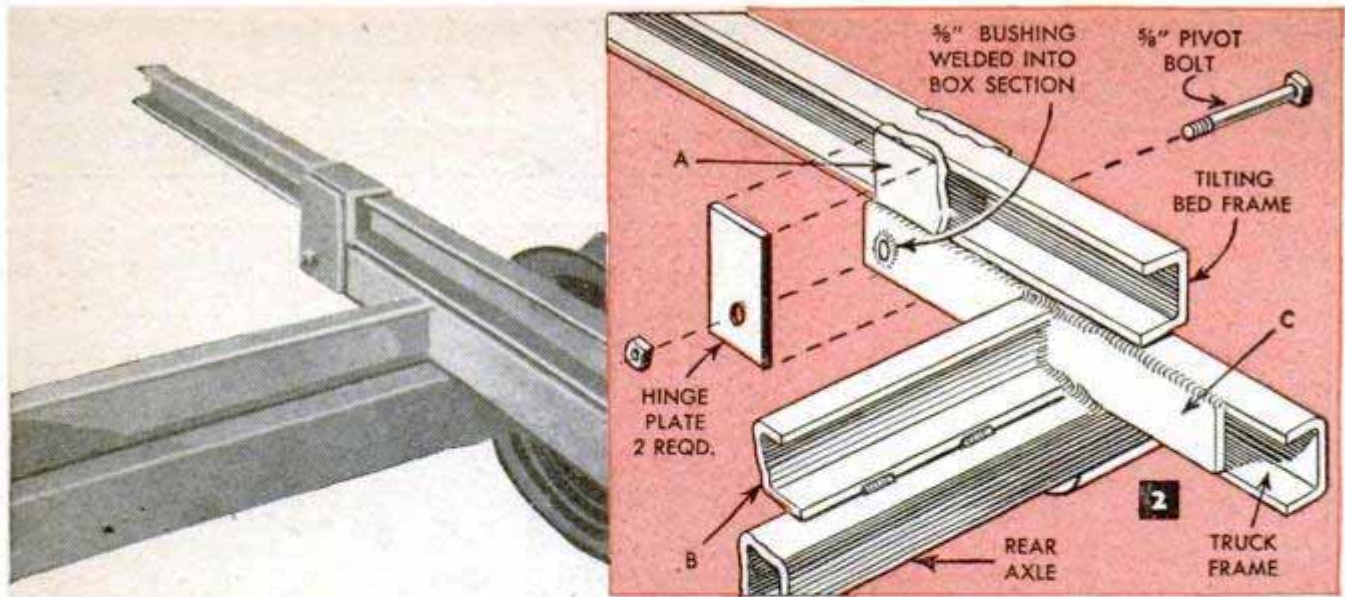


By R. W. Emenhiser

WHY SPEND TIME and hard labor to unload grain, cobs, sand or gravel from a tractor-drawn trailer truck with a hand scoop when it is so easy and inexpensive to put a hydraulic lift on the trailer to dump the load just where you want it? This type of lift gives positive control of the height and rate of lift, which is important when dumping grain into an elevator hopper or when spreading a load in a

grading, filling or field-leveling operation. All parts of the trailer truck pictured and detailed in Figs. 1 and 2 are stock items readily obtainable at nominal cost. Standard trailer-truck axles are used. Both the subframe, or truck frame, and the tilting frame are made from steel channels, and the necessary reinforcing gussets and other small parts of each assembly are cut from heavy sheet steel. The

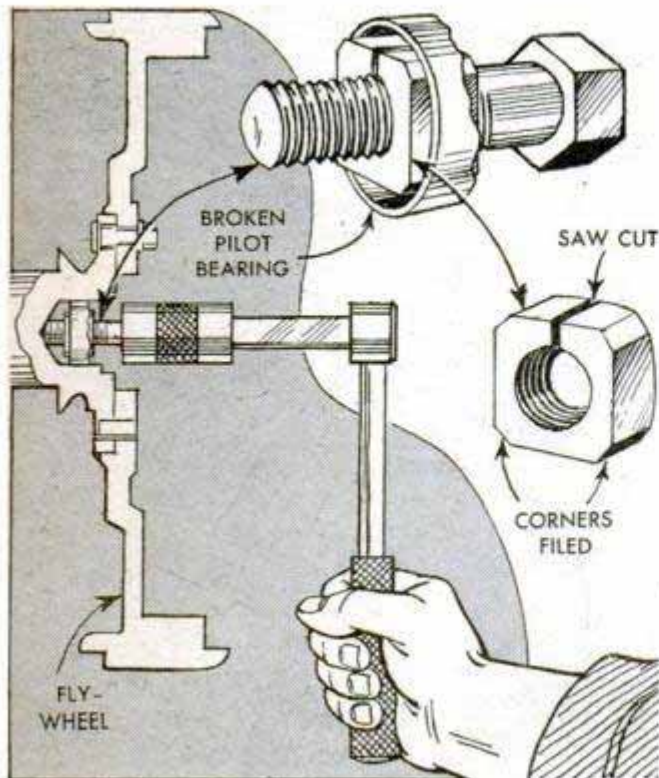




tilting bed frame pivots on the truck frame at a point just back of the rear axle, as shown in Fig. 2. The bed frame should be raised about 1 in. above the truck frame, or the truck frame cut at an angle of 45 deg., to allow the bed frame to tilt. In addition to the two channels on each side, this pivot assembly consists of the parts A, B and C welded in the positions indicated. Note from the detail that the truck-frame cross member, B, is welded to the box-section axle. Of course, the truck frame can be bolted to the front and rear axle if desired. Hydraulic cylinders are of the type used with tractor scoops, but any similar cylinders can be used. The lower ends of the cylinders pivot on a shaft mounted on the truck frame by means of the parts

A and B shown in the right-hand detail, Fig. 1. The hydraulic plungers bear against a shaft pivoting in sleeve bearings mounted on the tilting frame as in the left-hand detail, Fig. 1. The sheet-metal parts A, B and C are welded to the frame in the positions shown to form the bearings. In making up the truck frame, be sure that the front wheels have clearance for turning. Determine this before welding the box-section cross braces to stiffen the tilting frame as shown in Fig. 1. Use a pipe tee and hydraulic unions to connect the two lines from the hydraulic cylinders to a single line running to the hydraulic pump on the tractor. The bed is of usual construction, 7-ft. wide, supported on hardwood sills bolted to the tilting frame.

Race of Broken Pilot Bearing Removed Easily With Machine Bolt

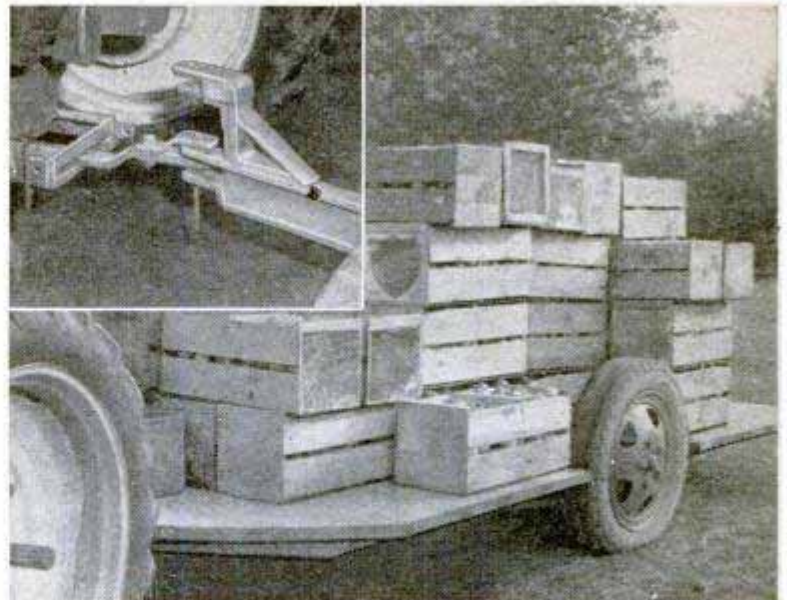


Faced with the problem of extracting the outer race of a broken pilot bearing in an auto-engine flywheel, I hit upon a simple way of removing it with a machine bolt. First, I selected a short bolt having a nut which measured slightly more from corner to corner than the inside diameter of the race. Then I slotted the edge of it, as shown, and squeezed the nut to close the slot. Next, I filed down each corner at a slight backward taper so that the nut just fitted inside the bearing race. After this, I expanded the nut in the race by opening the slot with a cold chisel and turned the bolt into the nut. When the end of the bolt made contact with the crankshaft, continued turning with a wrench forced out the race.—T. O. Carlsson, Chicago.

Flat belts and V-belts used on equipment in the shop, home or on the farm, may be cleaned safely and efficiently by using carbon tetrachloride. This liquid is non-inflammable and it will not injure the belt.

In addition to being well suited for moving heavy farm machinery on the road or from field to field, this trailer is especially handy for hauling fruit from orchard to packing house. Freshly picked fruit must be handled carefully by hand, whether it is sacked or packed in crates, and the wide trailer platform, underslung only a few inches above the ground, makes it easy to lift and stack the fruit for hauling. A multiple hitch consisting of two clevises welded to the drawbar, one directly above the other as in the inset photo, permits hitching the trailer to either a tractor or truck. By using a welded axle of channel iron, the width of the trailer can be built out to the maximum allowed on the highway.

This Low-Lift Platform Trailer Hitches to Your Tractor or Truck



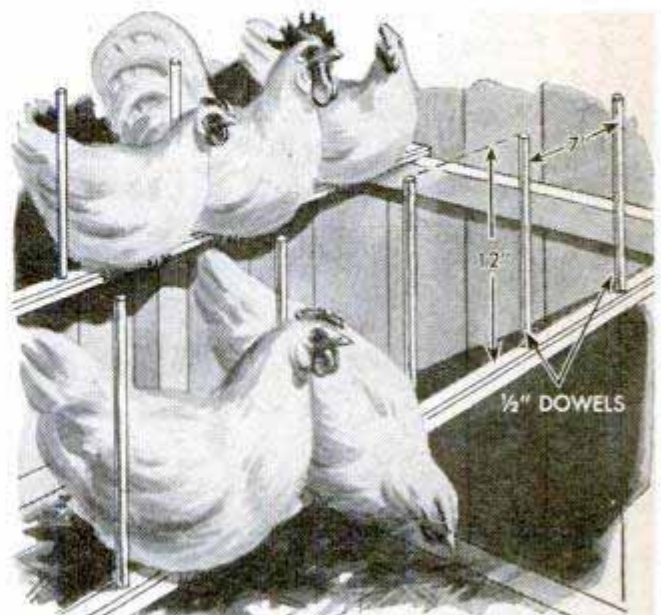
Red Core in Car-Battery Post Identifies Positive Terminal

After noticing that the negative and positive terminal markings on rental batteries soon became defaced and thereby confused customers who often installed the batteries themselves, one garage attendant permanently identified the positive post of the battery in the following manner: First, he drilled a $\frac{1}{4}$ -in. hole down through the center of the positive post, about $\frac{1}{2}$ in. deep. He was careful not to drill all the way through the post. Then he melted the lead drilling chips from the hole and colored them with a small amount of dry red lead. After this he poured the lead back in the hole in the post. This formed a permanent colored core that cannot be destroyed by the points of a tester or by repeated clamping of battery cables.

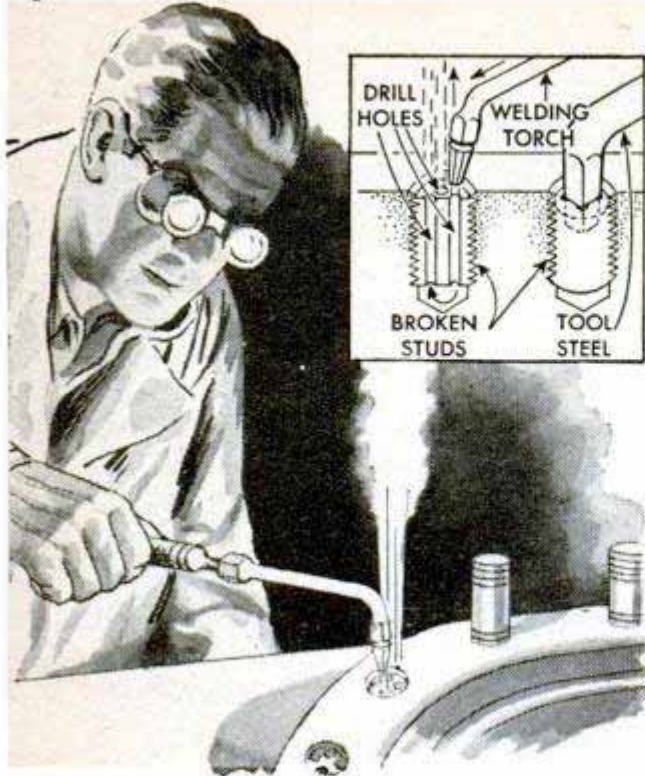
Roosts Divided Into Stalls Prevent Crowding

Nearly every poultryman has trouble at times with individual birds in his flock who crowd others from pole-type roosts. One poultryman has found that dividing the roosts in the manner shown helps prevent this trouble. Simply drill holes about 7 in. apart and insert 12 in. lengths of $\frac{1}{2}$ -in. dowel stock. The dowels will effectively keep the birds separated and provide each with an equal amount of roosting space.

When cutting a stencil on a typewriter, errors will be easy to locate if a piece of carbon paper is inserted between the stencil and its cardboard backing so that the copy will be reproduced on the cardboard.



Broken Stud Bolts Removed By Two Simple Methods

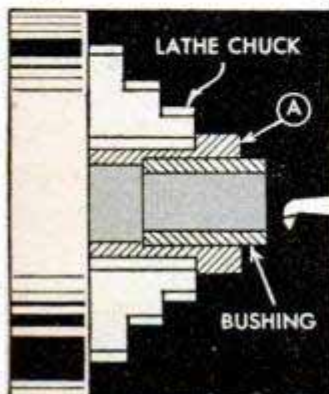


Here's a method which I have found very effective in extracting a broken stud bolt. First, drill four small holes lengthwise through the stud in a square pattern. Then direct the flame of an acetylene torch into one of the holes so that it will emerge from the others, as indicated in the left-hand detail. Heat the broken stud to a cherry red and let cool. The heating-and-cooling treatment will cause the stud to shrink slightly and make it easy to remove with slim-nose pliers.

Another method which works well when removing the broken part of a large stud is to drill a hole in the center of the stud and then drive the square and tapered end of a steel rod in the hole. The square corners of the rod will bite into the edges of the hole, and with the rod bent L-shape, the broken part can be backed out of the hole by merely swinging the tool.

L. D. Barner, Waco, Tex.

Jig Aids in Boring Small Bushings



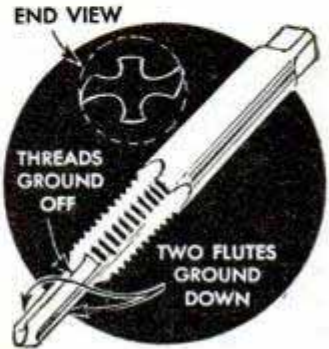
When it is necessary to enlarge the hole in a small bushing exactly concentric with the outside diameter, this boring jig will save time and afford greater accuracy than mounting the bushing directly

in the lathe chuck. Bore a hole in a short length of brass or soft-steel rod to a push fit over the bushing, detail A. If you wish, leave a small internal shoulder to back up the bushing, but be sure it will not interfere with pushing out the work. Then, insert the bushing in the sleeve to project a short distance and chuck the assembly. Light cuts with the boring bar at a fairly high speed will do an accurate job.

Drill and Tap for Cast Iron Combined in One Tool

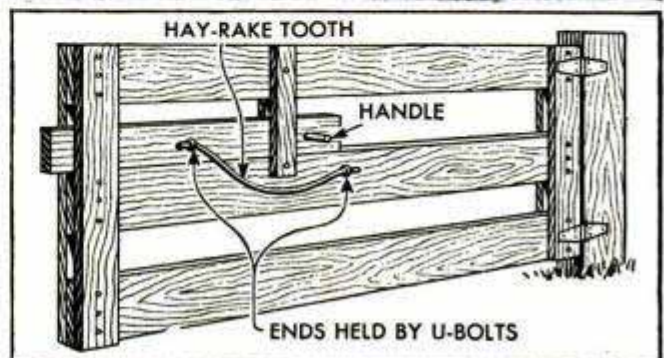
Made from a 4-fluted high-speed tap, this combination tool permits drilling and tapping through cast iron in one operation. Grind off the threads about halfway up from the bottom of the tap and grind off two opposite flutes, forming cutting edges so this portion of the tap will serve as a drill. To use, chuck the tool in a drill press and bore through the work until the threads are reached. Then tap the hole by turning in the remaining half of the tool by hand. This tool has been used successfully on cast iron up to $\frac{1}{16}$ in. thick.

Charles N. Dyer, Kansas City, Mo.

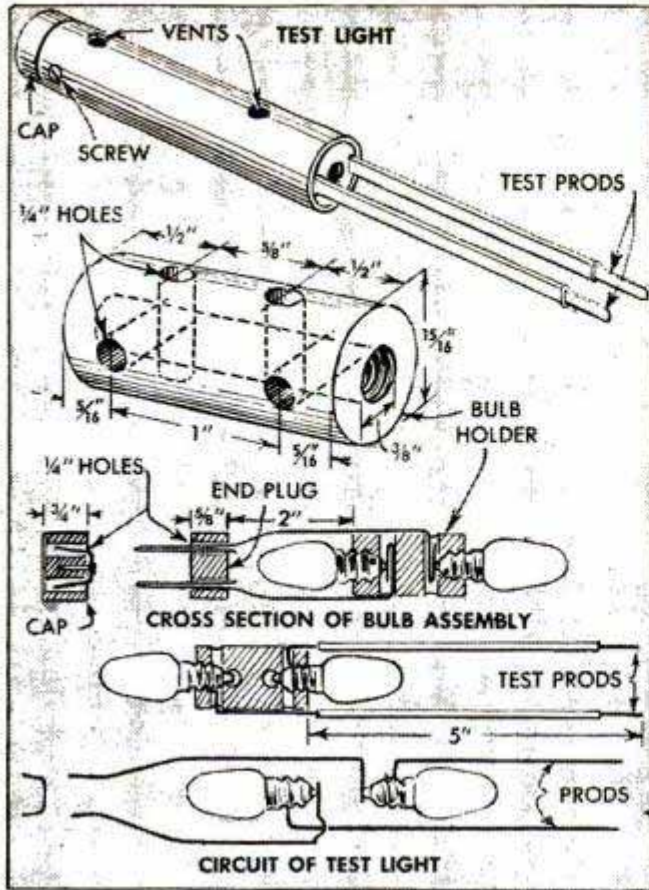


Spring-Action Latch on Farm Gate

Spring action provided by a hay-rake tooth closes the latch on this farm gate as soon as the handle is released. The latch is a heavy sliding member with a broomstick handle. One end of the tooth is attached to the latch and the other is fastened to a fixed cross member of the gate.



Electrician's Test Light Built From Stock Parts

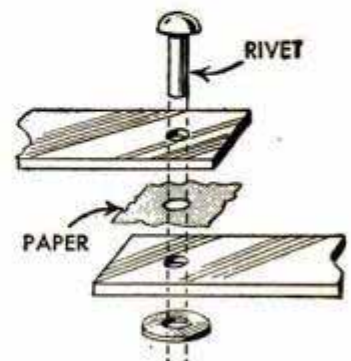


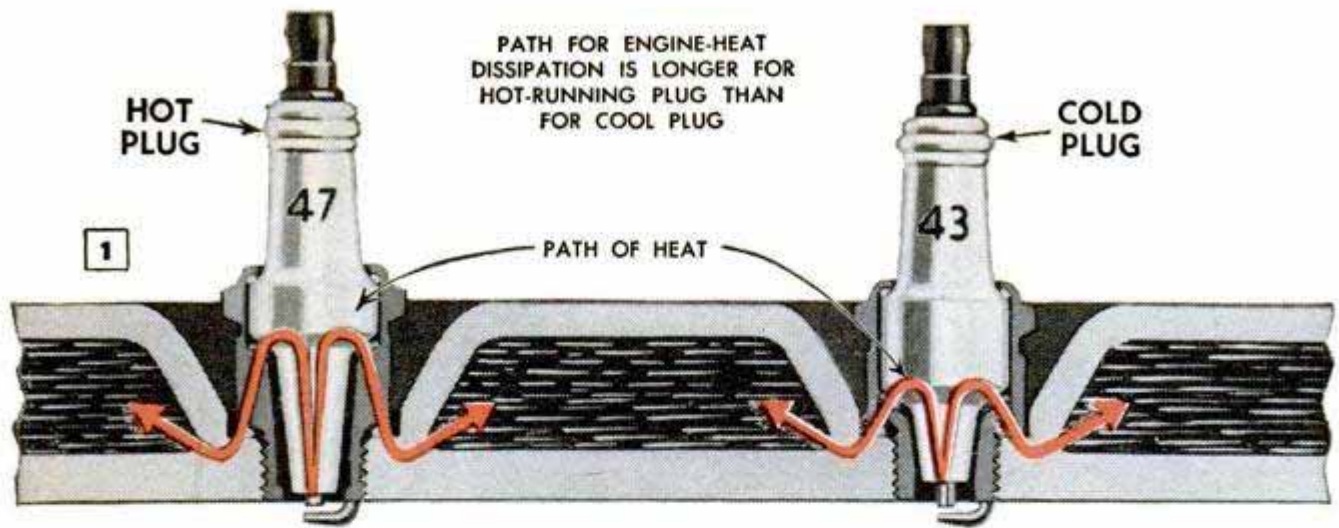
In addition to the regular flexible prods for locating defective fuses and open circuits, this test light has a novel and useful feature. A removable end cap allows the light to be plugged into a 110-volt outlet, either a wall receptacle or an extension cord, for testing fuses and locating grounds or open circuits in electrical equipment without danger of grounding the source of power. The housing is made from a length of fiber tubing and the bulb holder is a round piece of wood cut from a shade roller. Two 110-volt candelabra-base bulbs are used. With care these can be turned into the holes in the ends of the bulb holder to form their own threads. The end plug supporting the plug prongs and cap can be cut from the same wooden stock as the bulb holder. Contact strips for the whole assembly are made from $\frac{1}{2}$ -in. spring-brass strips, $\frac{1}{4}$ in. wide. After assembling and wiring the parts, the assembly is forced into the fiber holder. Slip the end plug over the plug prongs and close the opposite end of the holder with a fiber disk notched to provide openings for the test prods. The cap is fitted with a bent strip of metal held in place with a small brad, as shown in one of the sectional views. A disk of thin fiber is glued to the outer face of the cap to cover the small holes drilled in the cap to take the ends of the strip. When the cap is in place, the metal strip

closes the circuit between the two prongs so the unit may be used to locate defective fuses and open circuits in the usual manner. Removing the cap and plugging the tester into a receptacle on the end of an extension cord allows the user to test grounded motors and other equipment for open windings and circuits without danger of grounding the "live" side of the circuit, as one lamp is in each lead. With the prods touching, both lights will be on at half brilliancy. However, contact with a grounded circuit will cause one light to be extinguished while the other reaches full brilliancy.—T. W. Benson, Philadelphia, Pa.

Smooth-Working Pivoted Joint

If you wish to obtain a smooth-working pivoted joint when riveting two parts together, this may be accomplished merely by inserting a small piece of paper between the parts before riveting. After the joint is riveted, the paper is removed, allowing sufficient clearance for the parts to pivot freely.—F. Tashiro, Seattle, Wash.





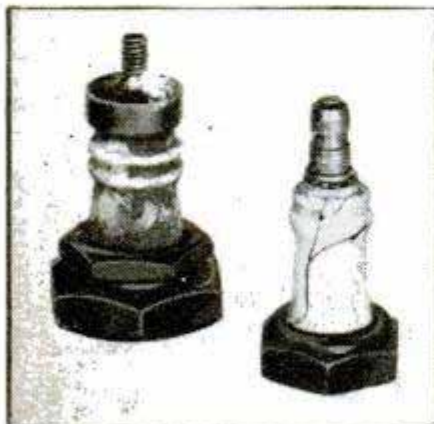
WATCH YOUR SPARK

REGULAR servicing procedure applies to the spark plugs, just as it does to all other parts of the car that require periodic attention. Plugs should not be removed, cleaned and adjusted by a haphazard schedule. This may often do more harm than good as frequent removal and reinstallation of plugs is ordinarily unnecessary and causes undue wear on the threads of both the plug and cylinder head. This is especially true when the car is new, unless, of course, faulty engine performance at some time during the first few thousand miles fouls the plugs. In older cars the plugs, and also the ignition system, require a careful check more often to keep these parts performing properly. Badly worn pistons, cylinders and rings accelerate wear on the plugs. On the average, plugs need a careful check every 3000 to 5000 miles, and should be replaced with new ones every 10,000 miles. They will run longer, of course, but with greatly reduced efficiency. At the regular checks of other parts of the car examine each plug to see that the exposed portion is clean

and dry, and that the plug wire snaps over the terminal firmly and with a clean connection, Fig. 10. Other parts of the ignition system should be inspected regularly to assure delivery of the normal high-tension current to the plugs.

The basic parts of a plug are shown in the cross-sectional drawing, Fig. 2. Inspection of these parts will tell a lot about how the plug is performing and what to do about correcting any trouble that may develop. The six photos below picture some of the common causes of plug failure.

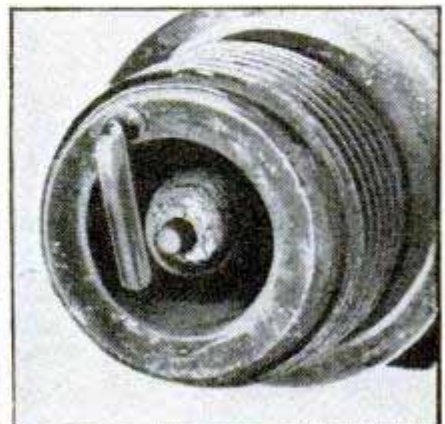
A plug must run hot at low engine temperatures, and cold at high engine temperatures. The running temperature of the plug must be sufficient to burn off ordinary carbon deposits but not so high as to cause detonation, pre-ignition, fusing or blistering of the insulator, or rapid erosion of the points. To obtain the right plug temperature, use a plug of the correct "heat range." This is determined from the type of engine and the operating conditions. When buying a set of plugs, remember there are three "heat range" types—hot, normal



Cracked, dirty insulators affect engine performance, cause compression leaks, shorts, fuel waste



Plug has been running too cool. Shell, electrodes and insulator are fouled with hard carbon deposits



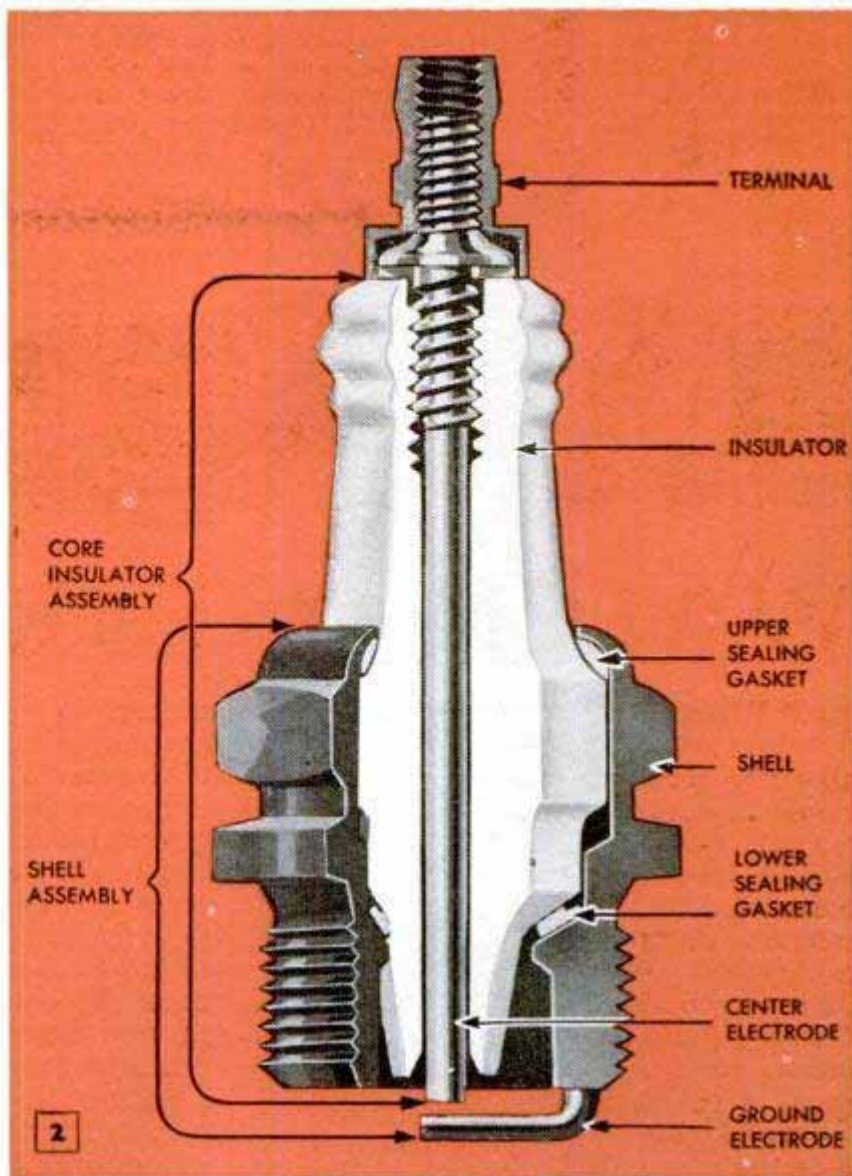
Insulator eroded by oxidation. Tends to short the plug, causing the engine to miss at high speeds

Clean plugs, properly chosen for heat range, give peak engine performance with very substantial savings in fuel and oil consumption and reduce costly repairs

By Phil Ruskin

PLUGS

and cold. The hot plugs, Fig. 1, have a long insulator with a correspondingly longer path for the dissipation of heat to the engine block. The insulator on the cold plug is short, heat is dissipated rapidly, and it operates much cooler. A plug operating at the correct temperature will have a soft, powdery deposit on the nose of the insulator—either a grayish tan or rusty brown in color. Wear of the points will be normal and confined to the faces of the spark gap. If point wear is rapid while the color of the insulator is normal, the gap may be incorrectly set or the fault may be in the wrong type of coil. It's well to keep in mind, too, that in old cylinder heads there is the possibility that water passages near the plug may be partially or wholly blocked with hard deposits, causing a hot spot in the head that may affect the plug. Plugs operating too hot will show



dark spots or blisters on the insulator nose. The points will be badly burned, in proportion to the length of time the hot condition has existed. Fused and glazed deposits on the insulator may "short" the current and cause misfiring.

Often a plug will be of the correct heat type for a particular engine and still run hot. In this case, the plug may not be tightened sufficiently, permitting hot gases to



This happens when a plug runs too hot. Undue wear of the electrodes shows in comparatively short time



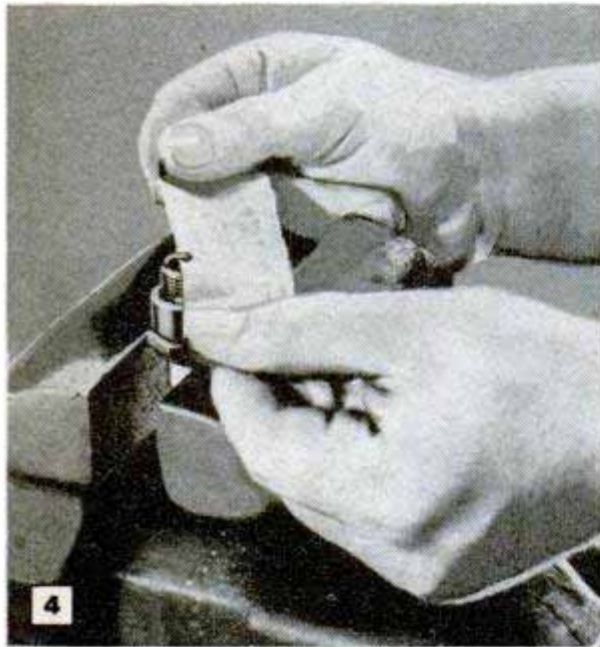
According to reliable tests, plugs in this condition may waste as much as one gallon of fuel in ten



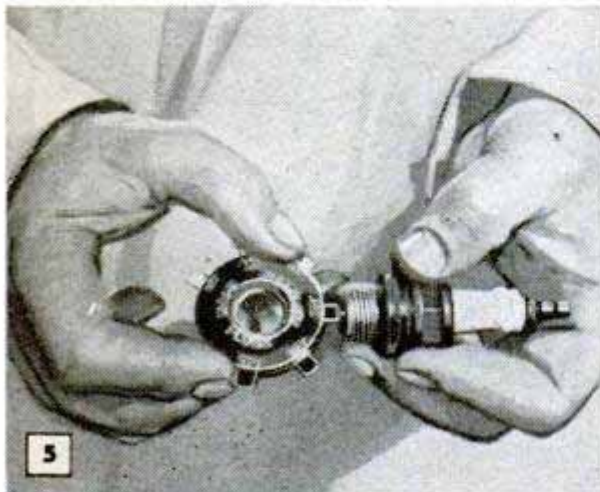
Insulator broken at the lower end may be due to hot operating conditions or careless installation



3
Clean the threads of the shell thoroughly. Carbon deposits here will retard dissipation of heat



4
Shallow-pitted electrode points can be restored by the careful use of fine-grit abrasive or a file

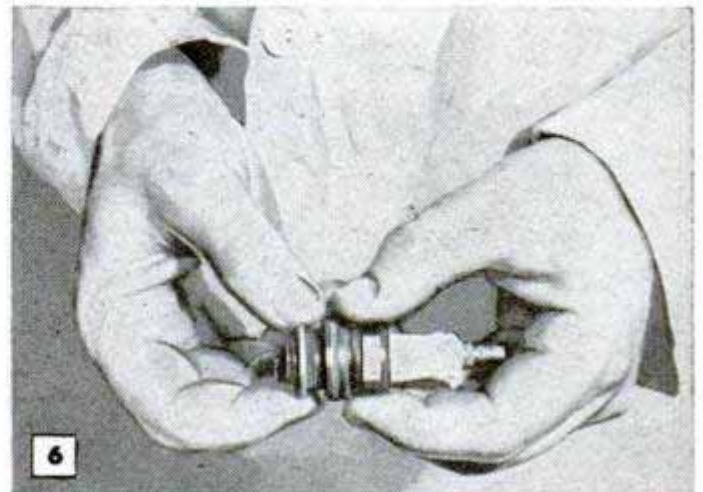


5
Use a round gauge to check the gap. Adjust to exact distance recommended by the manufacturer

escape and heat the plug in passing out. There may be gas leakage between the insulator and the electrode, or between the insulator and the shell. This condition can be detected by soot streaks on the outside portion of the insulator. A lean fuel mixture, wrong ignition timing, poorly seating valves and other faulty engine conditions, can cause plug overheating. Plugs running too cold will be sooty, gummy and possibly oily. Oil pumping from the crankcase, too rich a fuel mixture and long idling periods will cause this condition. Fuel fouling is indicated by a dull, black, fluffy deposit; oil fouling, by a shiny, black, hard deposit. In judging plugs for heat range, be sure normal operating conditions have existed for a time before making the inspection. Otherwise, one may get a false interpretation of the average plug needs of the engine.

Although servicing a spark plug looks simple enough, there is danger of permanent damage to the plug unless certain precautions are carefully followed. Use a socket wrench of the correct size to remove the plug—never use an end wrench or other makeshift wrench that is likely to burr the plug nut or slip off and break the insulator. Blow dirt out of the plug well before removing the plug to prevent it from falling into the cylinder. Condition of the gasket is important. Inspect it carefully each time the plug is removed. It may be the key to plug trouble or poor engine performance. If the gasket is flattened or badly scored, it may be the cause of a baffling compression leak as well as a hot plug. On the other hand, if the gasket is still rounded, it is probable that the plug has never been correctly tightened. This condition may also be the cause of a hot plug or a compression leak. If there are indications of soot and burning on the gasket, it was not tight enough to seal. The gasket serves the dual purpose of sealing engine compression and acting as a bridge for the dissipation of heat.

After removing and inspecting the plug and gasket, clean the shell threads, insulator and



6
Before replacing a plug, turn a new gasket over the threads by hand. Make sure gasket is properly seated

points carefully as in Figs. 3 and 4. Or if desired, take the plugs to a service station equipped with a spark-plug cleaning machine. If the insulator is badly fused, cracked or blistered, the plug should be replaced. Plugs with badly corroded and worn points also should be replaced. Adjust points to the correct spacing by bending the side electrode, never the center one. Use a round gauge, Fig. 5, to check the gap setting recommended by the car manufacturer.

When installing the plug, always use a new gasket and turn it over the shell threads as in Fig. 6. Before screwing the plug into the cylinder head clean the gasket seat with a cloth as in Fig. 8. Turn the plug in by hand, making sure the thread is not crossed and the gasket is not cocked at an angle. Snug it up by hand also, then tighten with a socket wrench only one half to three quarters of a turn, Fig. 7. Wipe the insulator as in Fig. 9 and be sure to connect the correct wire to each terminal.

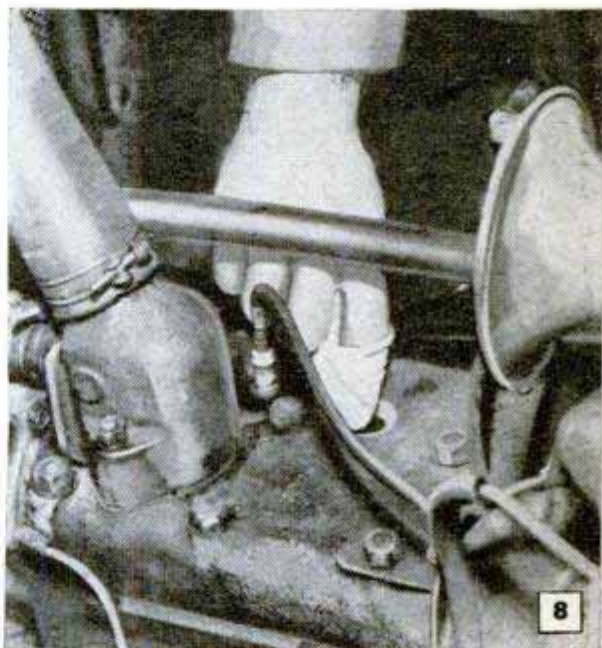
If plugs foul in a new engine, check for wrong lubricating oil in the gasoline for run-in purposes; carburetor adjustment out; improper choke adjustment; car driven too slowly during break-in period; distributor points incorrectly set; coil or condenser weak; plug gap set too close. If the engine misses at high speeds or under a heavy load, check these common causes: distributor points dirty, glazed or incorrectly set; weak coil or condenser; carburetion incorrect; valve-tappets out of adjustment; plug gap set too wide; overheated plugs, calling for cooler plug in the heat range, overheated plugs due to gasket leakage or other causes.

If the engine "rolls" when idling, check the carburetor adjustment; distributor points; coil; engine compression; valve-tappets; improper valve timing; sticking valves and the plug gap. When making any inspection with the plug removed, always check the gap.

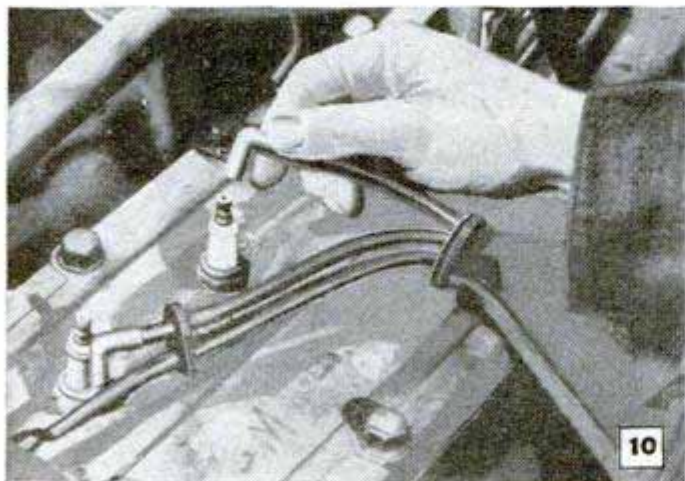
Certain photos and details by courtesy of A.C. Spark Plug Div., General Motors Corporation; Champion Spark Plug Co., and The Electric Auto-Lite Co.



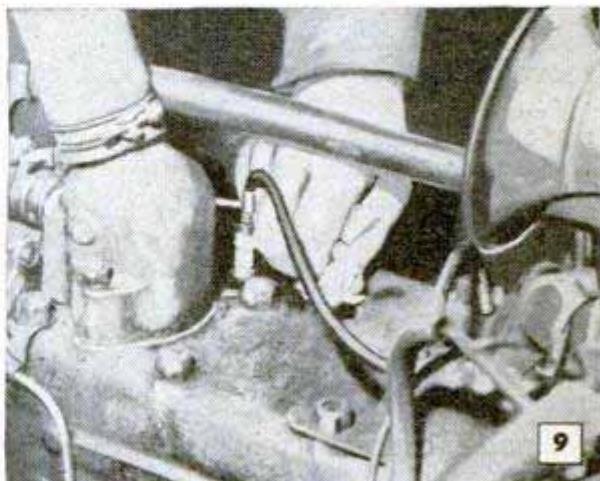
When removing or tightening plugs, use a socket wrench. Other wrenches may burr the hex section



Wipe the gasket seat with a clean cloth before installing plug. Avoid pushing dirt into opening



It's very important to attach the correct ignition wire to the terminal after cleaning and installing the plug



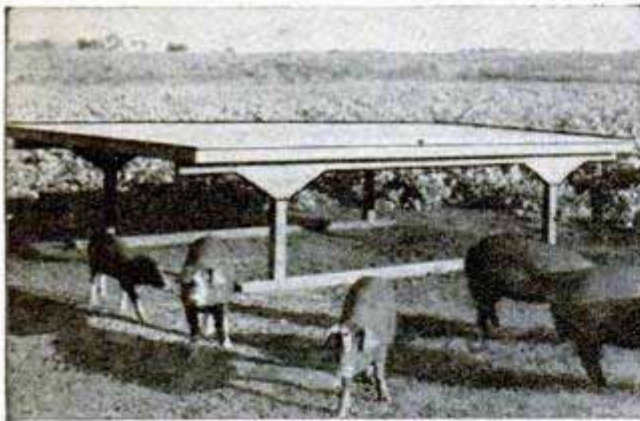
Clean the insulator after installing the plug to prevent shorts through caked dirt or hard grease

Lands on Facets of Mandrel Nut Prevent Punch From Slipping



Skinned knuckles resulting when using a hammer and punch to tighten or loosen a saw-mandrel nut that is too big to turn with a wrench, led one man to provide lands in the nut so that the punch would not slip off. The lands can be formed by milling a shallow notch or grinding a flat in opposite facets of the nut as shown.

Flat-Topped Sunshade for Hogs Moved by Small Tractor



This sunshade is easy to build and it's moved about from range to range merely by hitching to a small tractor. The runners are made from 4 by 4-in. stock rounded at the ends, and are fastened to the vertical posts by pieces of flat iron bolted in place. The roof is made from rough boards covered with roll roofing or sheets of corrugated-metal roofing.

A. M. Wettach, Mt. Pleasant, Iowa.

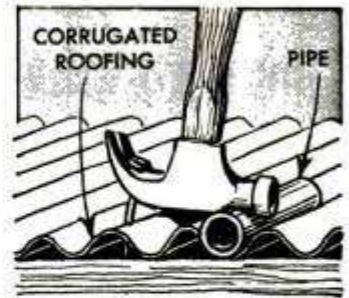
Silicon-Carbide Dispenser

Small talcum-powder cans provide ideal dispensers for silicon carbide or similar abrasives. If several grades of the abrasive are used, label each can with the grit

size it contains. The holes in the top of most of these cans may be used to control the flow of the material.

Removing Corrugated Roofing In Usable Condition

If corrugated metal roofing or sheathing is to be removed from a building and used again, the nails can be pulled without damage to the roofing by using a short length of pipe as a fulcrum block as shown in the drawing. This method is especially helpful when dismantling shed-type buildings and salvaging the materials.

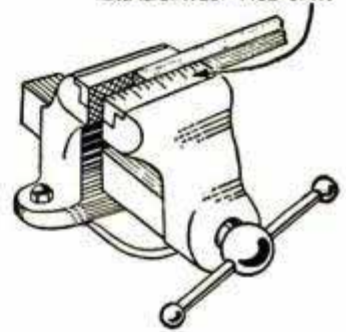


Bench Vise With Calibrated Jaw Speeds Small Cutoff Jobs

Measuring and cutting off short pieces of stock is speeded up by scribing an inch scale on the vise jaw, inserting the material to the required dimension, and sawing it flush with the end of the jaws. As this method is not intended for especially accurate work, divisions of $\frac{1}{4}$ in. will be found suitable for most jobs.

Ronald Eyrich, Milwaukee, Wis.

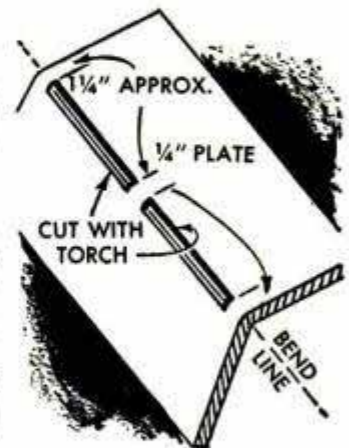
GRADUATED VISE JAW



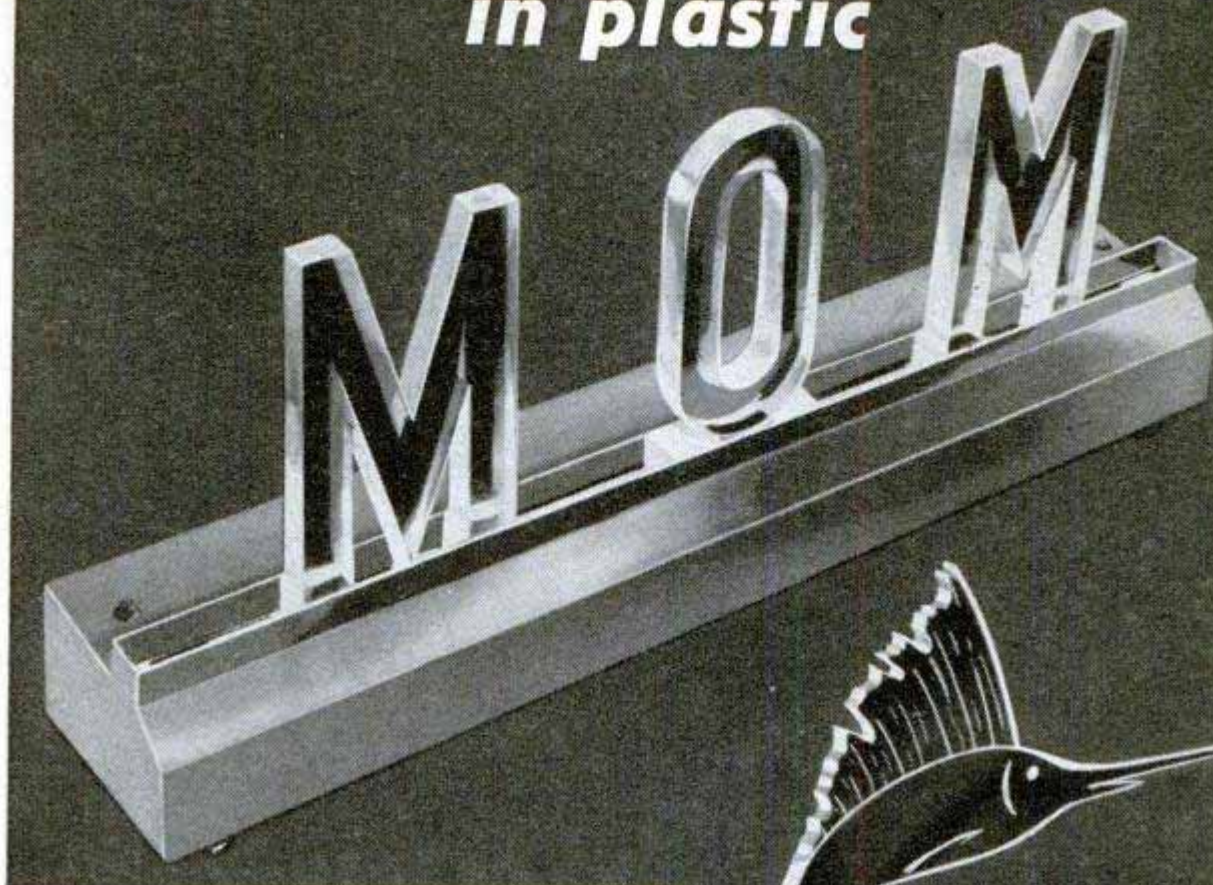
Slots Cut Through Steel Plate Aid Bending It

A piece of $\frac{1}{4}$ -in. steel plate can be bent in a vise with comparative ease and without the usual equipment, if it is first slotted along the bend line with a torch. Leave about $1\frac{1}{4}$ in. of material between each slot and at the ends. Should it be necessary to strengthen the plate after bending, fill the V-shaped channels formed by the slots with welding rod.

Earl R. Goddard, Denver, Colo.

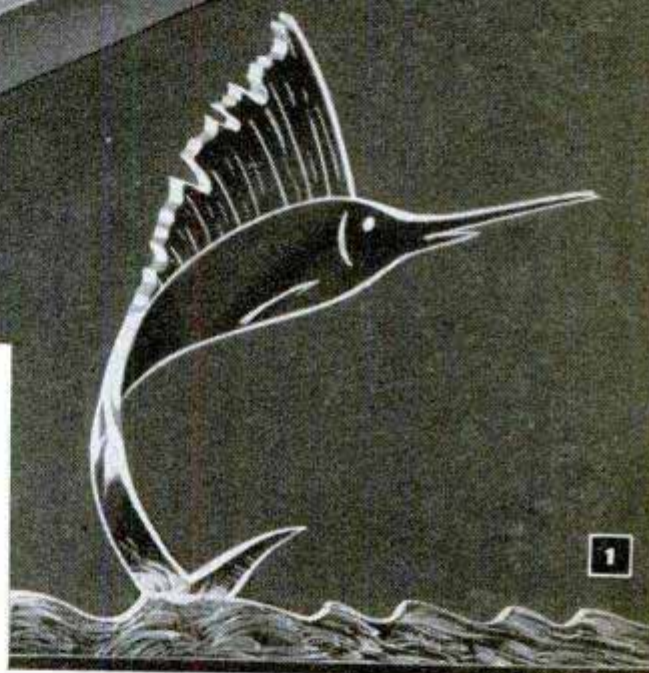


EDGE-LIGHTED SIGNS in plastic



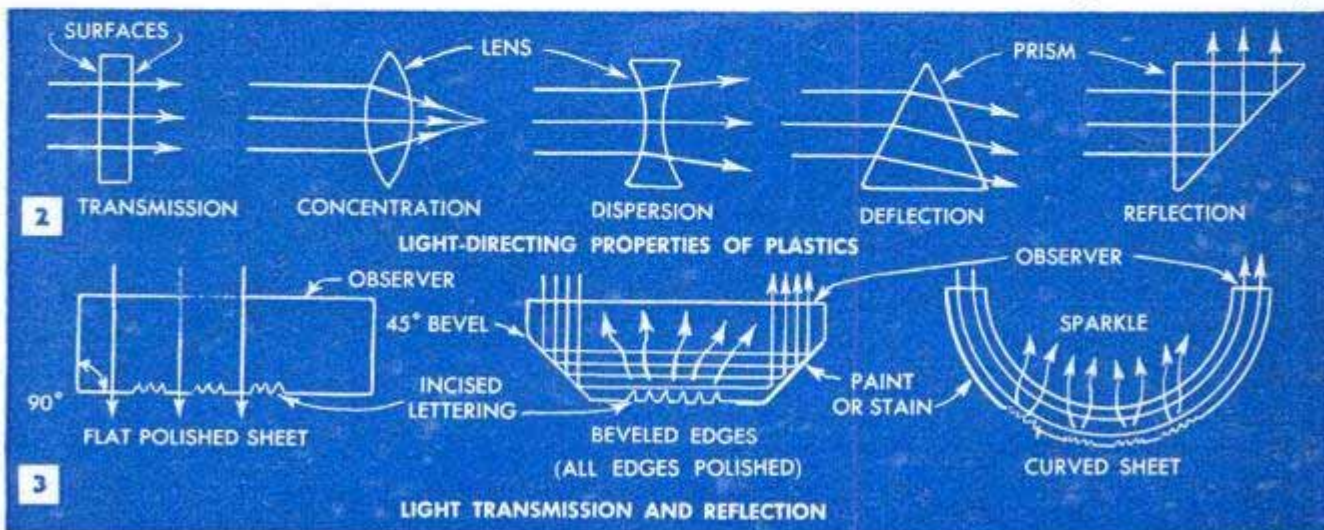
By John P. Arnold

UNUSUAL and striking effects in lettered signs and displays are obtained by skillful use of the light-transmission and deflection properties of transparent plastics. These are both light and strong, and are good electrical insulators. They are readily formed by heating and can be engraved, etched, stained and painted. Properly finished, these plastics possess qualities of light-transmission, dispersion, reflection and refraction equal to those of fine-quality optical glass, Figs. 1, 2 and 3.



Rohm & Haas Co. photos

In the top sign a fluorescent bulb concealed in a slotted metal base gives the striking edge-lighting of the plastic block letters. In the lower design, light is "piped" through the curved body of the sailfish to the fin where it brilliantly outlines the edge



Marrix Shoes

YOUR FOOTWEAR



SCRIBED, OUTLINE LETTER



BLOCKED IN BY CROSSHATCHING



ROUTED TO AN EVEN DEPTH



PAINTED, GILDED, LUMINOUS PIGMENTS, ETC.



TRANSPARENT OVERLAY CEMENTED TO VENEERED BACKGROUND



FROSTED BY ETCHING OR SANDBLASTING

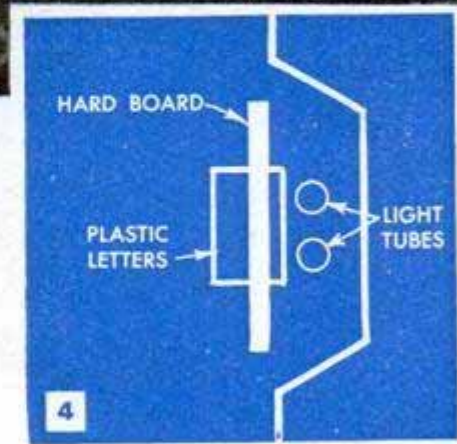


ENGRAVED OR CARVED



FORMED LETTERS INSERTED IN OPAQUE BACKGROUND AND LIGHTED FROM BACK

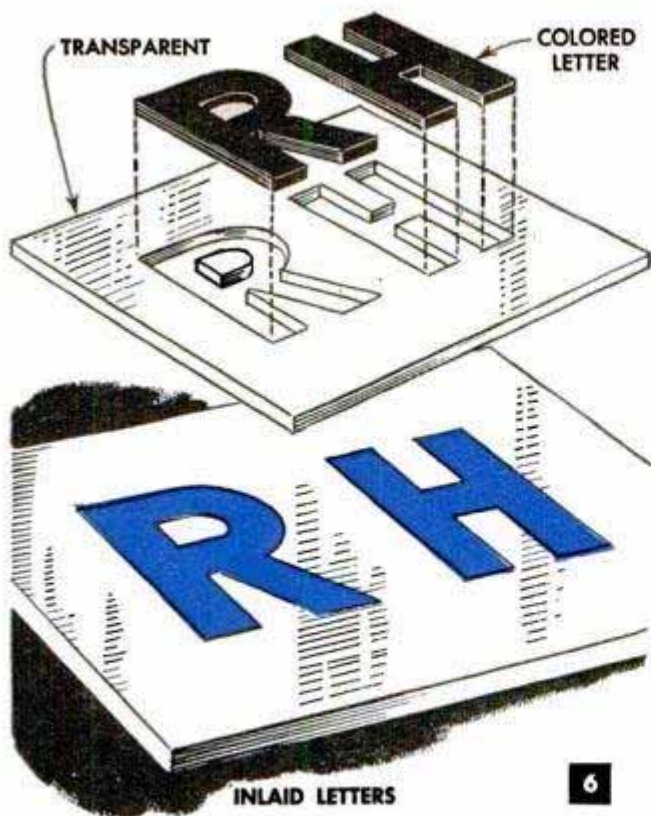
COLORED PLASTIC INLAID IN TRANSPARENT OR COLORED BACKGROUND



The effectiveness of edge-lighted script letters is brought out with the simple lighting installation shown in the detail above. The letters are inserted

For signs which are to be viewed either by diffused artificial light or daylight, the most useful effects are those which result from internal reflection within the plastic itself. If the sign is made from a transparent plastic having parallel faces and square polished edges, and the design, or lettering, is applied to the side away from the observer, practically all of the incident light is transmitted directly through the plastic itself. If the back edges are beveled or the piece is curved, light entering from the front or the edge will, by a series of internal reflections, make the sign appear to have a brightly luminous border. Applied or incised lettering will stand out with greater brilliancy. If the reverse surface is either stained or painted, the color also will be picked up and transmitted to the eye. Light-directing effects are limited by conditions which must be carefully observed in order that the incident light will be internally reflected. Light cannot be successfully "piped" around a curve having a radius less than three times the thickness of the material or through angles greater than 48 deg. from the vertical without most of the light escaping from the surfaces of the plastic, Fig. 9. Light also will escape wherever the polished surfaces are scratched, abraded or painted. Such applications or incisions will appear brightly illuminated.

Sharper effects are obtained by the edge-lighting method shown in Fig. 1, where the letters are illuminated by a



INLAID LETTERS

6

Block letters cut from colored plastic can be inlaid in transparent plastic or inserted in openings cut through. Hard board or sheet metal can also be used

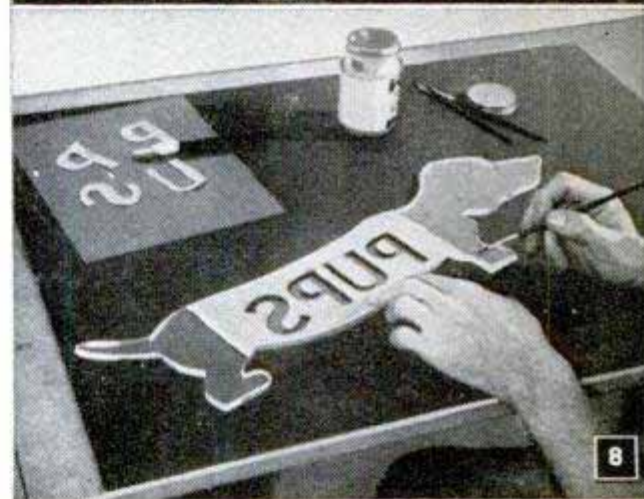
fluorescent bulb concealed in a metal base which is slotted for the letters. Fluorescent lights are preferred to incandescent bulbs for small, unventilated signs as they radiate less heat and provide continuous light for illuminating the edges of thin plastic sheets.

Signs employing this edge-lighting effect should have the top edges of letters or designs painted white and the sides and bottoms highly polished. In Fig. 4 the plastic script letters are inserted in slots cut in the background to a depth equal to the thickness of the plastic. The edges of the slot preferably should be lined with black felt or other light-absorbing material.

As it is only necessary to interrupt the passage of light through the polished surfaces of the plastic to make lettering stand out, sign-makers employ methods of etching, engraving and abrading suggested in Fig. 5. Another simple method of inlaying letters of colored plastic is detailed in Fig. 6. Colored block letters also can be inlaid or inserted in hard board or sheet metal. The letters are laid out and jigsawed in the same manner as the design shown in Fig. 7. In Fig. 8 letters are painted directly on the reverse side of the transparent plastic by using a stencil. The top coat is applied first and this is followed by one or more ground coats. The process is the reverse of normal painting procedure. Incised lettering and carving also can be stained and the cavities filled with plaster.

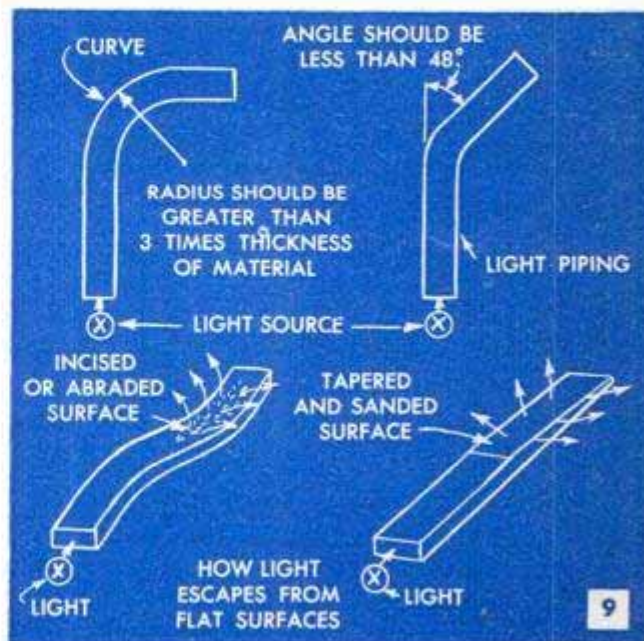


7



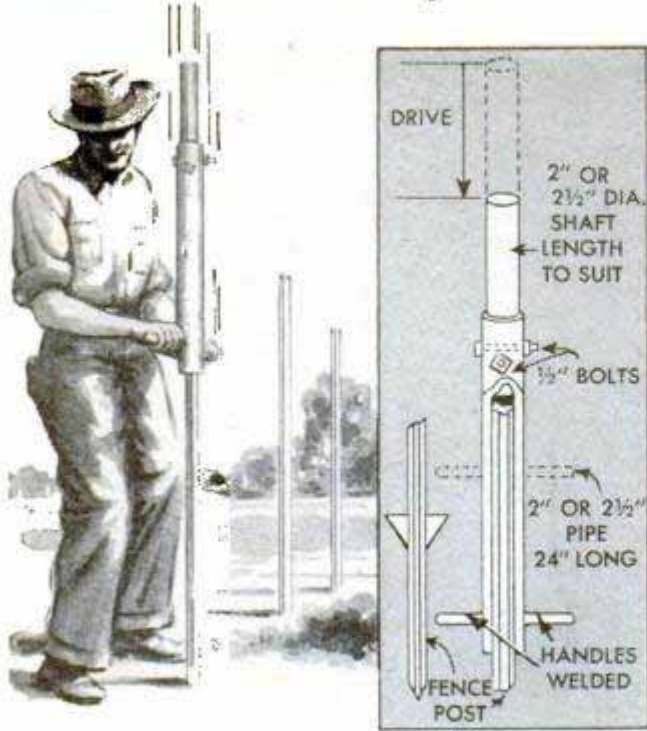
8

Using a simple stencil, block letters can be painted on the reverse side of a transparent panel or figure outline. Apply the top coat first, then ground coat



9

Driver to Set Steel Fence Posts Made of Shaft and Pipe



Constructed from a 24-in. length of 2 or 2½-in. pipe and a piece of steel shafting, this steel fence-post driver is fitted with handles that simplify operation and permit greater downward force to be exerted. Weld the handles to the pipe near the lower end and then fasten a steel shaft to the top of the pipe with crossed bolts. The length of the shaft, of course, will depend on the weight desired.

Clarence Klumb, Rockfield, Wis.

Eliminating Whistle in Car Louvers

A whistling noise sometimes heard in '41 Oldsmobile and Buick cars at speeds of 30 to 40 m.p.h., frequently is caused by air passing through the louvers at the sides of the grille. The noise may be stopped by fastening a piece of wire vertically inside the louvers so it will break the air stream. To determine if this is the cause of the noise, cover louvers with cloth and drive the car at the speed at which it occurs.

Hive Cover Held by Coil Spring



To keep the covers of his beehives from blowing off, one man devised this method of anchoring them with coil springs. A hole is bored in the side of the cover from the inside and a coil spring is fas-

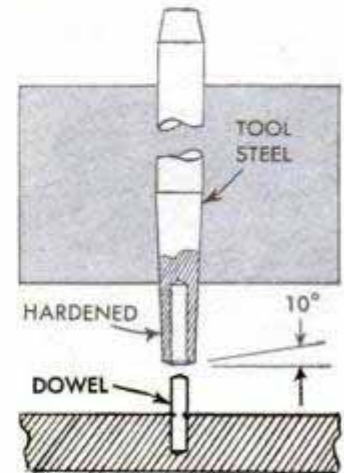
tened in the hole with a nail. The spring is turned so that the outward end of the coil is pointed upward, permitting the cover to be placed over the super without trouble, but also furnishing enough friction to prevent the cover from blowing off in high winds. One or two of these on one side of the cover should serve the purpose.

Benj. Nielsen, Aurora, Nebr.

Stud-Upsetting Tool

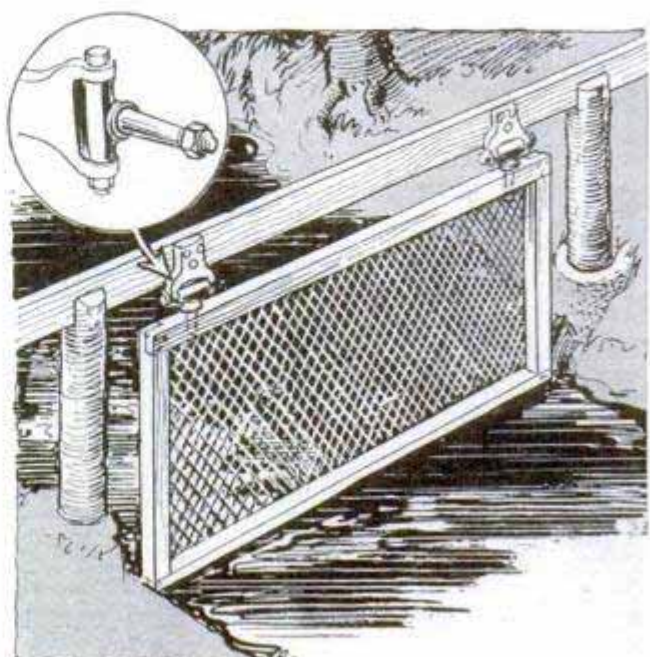
Fastening steel dowels securely for use as studs or locating pins is done rapidly with this tool which upsets the metal around the dowel. Use tool steel to make it and drill a hole in the end for a close fit over the dowel. Chamfer the edge of the tool 10 deg. and harden the end.

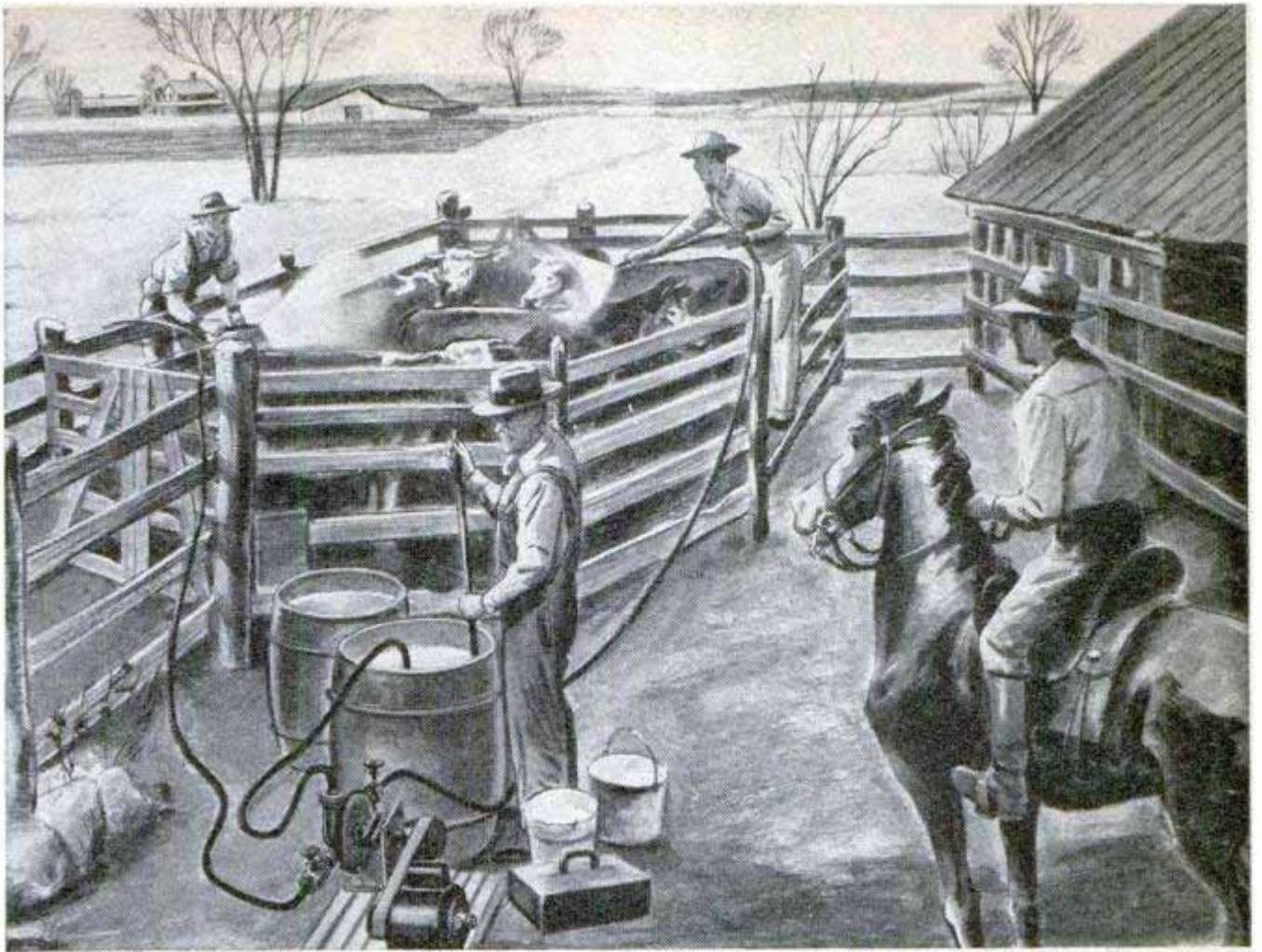
In use, drive the dowel snugly in position, place the tool over the dowel and tap it sharply with a hammer.



Sturdy Hinges for Floodgates

Frequently farmers and ranchers have trouble with the hinges on floodgates because they are too light for such heavy service. One farmer found that front-wheel axle spindles could be made to serve as sturdy hinges. The axle is cut down and drilled for bolts to attach it to the cross-beam, and the spindle is threaded and bolted to the gate by inserting in holes drilled through the edge of the frame.

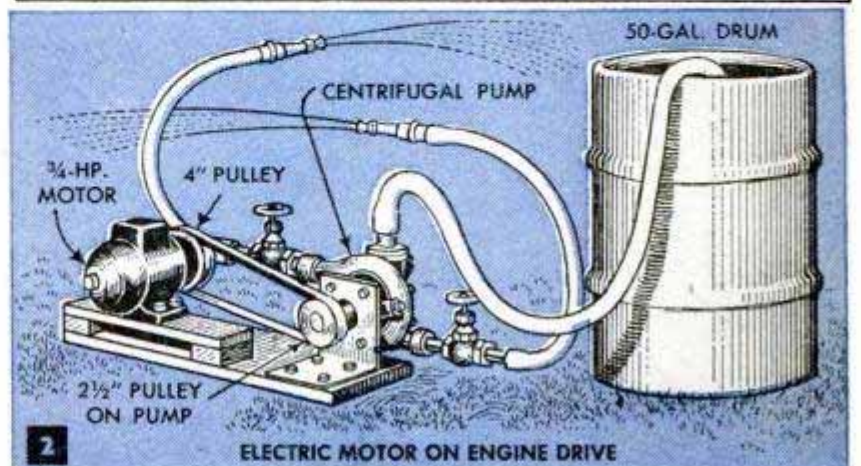
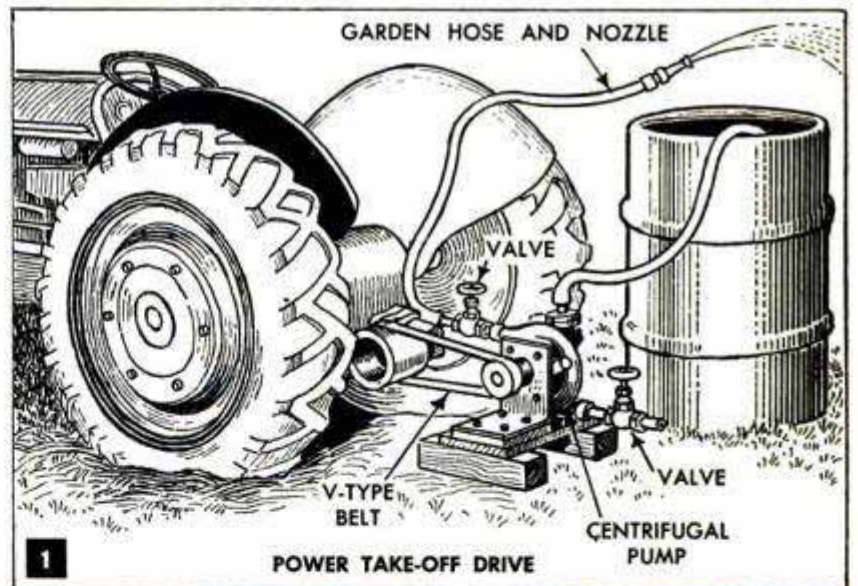




CATTLE SPRAYER IS POWER DRIVEN

RANGE cattlemen and dairymen will find this simple cattle sprayer easy to build from parts which are readily obtainable at a cost of about \$25, less the engine or electric motor. Some operators belt the sprayer directly to a tractor as shown in Fig. 1, while others drive it as in Fig. 2. Ordinary garden hose and nozzles will serve for handling the solutions commonly used to control such insect pests and parasites as lice, horn flies and ticks. To control horn flies and lice use a solution of 3½ lbs. of 50 percent wettable DDT powder mixed with 100 gal. of water. For control of ticks use a solution of 7 to 8 lbs. of 50 percent wettable DDT powder to each 100 gal. of water. Dissolve the powder in a small quantity of water, then add the full amount later.

C. A. Stone, Bastrop, Tex.



"SEA CRAFT" - a 25-ft.

WHEN the planking is completed and the seams below the L.W.L. have been calked, sand and give the planking a coat of flat white paint. The seams above the L.W.L. are filled later with a plastic seam sealer. When sanding, keep the machine constantly in motion to avoid sanding one area more than another, thus causing low spots.

The 1 by 3½-in. oak sheer clamps, shown in Figs. 31 and 38, extend from the transom to station 2. Note in Fig. 30 that one clamp is placed above the other at station 7 where the sheer line drops. When screwing the clamps to each rib, allow the top edges of the clamps to project above the hull sheer line slightly. These are later planed down to come flush with a 2-in. crown in the decks. The sheer clamps from station 1 to the bow stem are lapped and bolted to the long sheer clamps at station 1 and are fastened to the bow stem with a block.

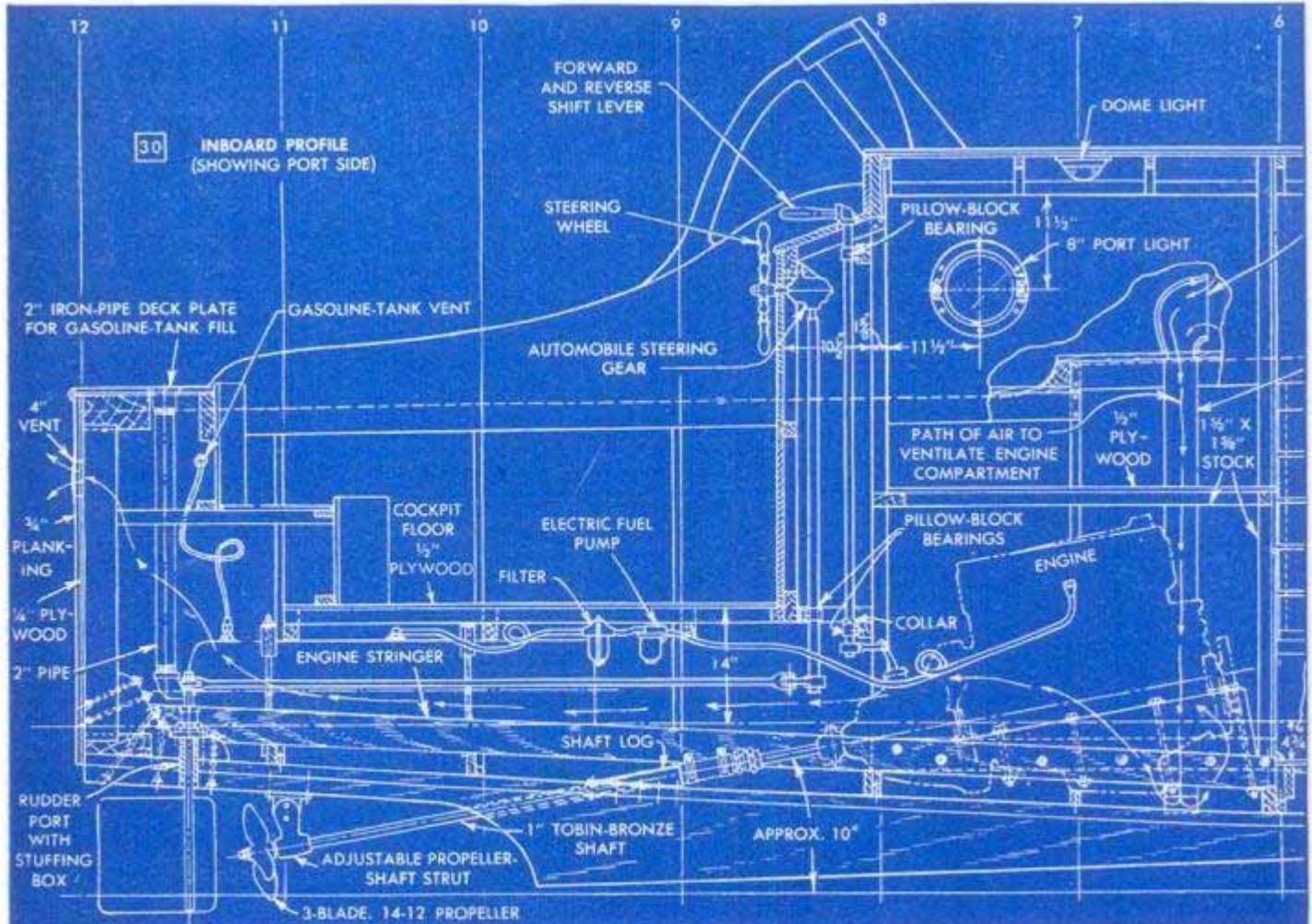
At this time, decide what kind of an engine will be used in the boat. A marine engine is best. However, many automobile engines work well when converted to marine use. Kits are available for converting the engine

Part III

yourself, or a marine machinist can convert your engine by removing all gears except the reverse and high gears and installing a thrust bearing. A water pump to circulate cooling water also is necessary. Sea Craft's Chrysler engine, Fig. 29, was converted in this way. Note the extra oil sump welded to the bottom of the oil pan to permit the engine to be operated on an angle.

The engine-bed pieces, Fig. 33, are made of 2-in. oak and bolted to the engine stringers, Fig. 38, which extend from the transom to a 2 by 4-in. tie bar, which replaces the original tie bar on the frame of station 6. The engine stringers are placed approximately parallel with the keel apron, and are notched out and screwed to the lower transom beam and ribs. If placed 19 in. apart they will accommodate most engines. However, this dimension should be checked with the engine before installing them. The floor stringers, Figs. 33 and 38, are bolted to the outside of the engine stringers and are notched for the ribs to which they are screwed. The port stringer extends from station 3 to ⅝ in. forward of station 8; star-

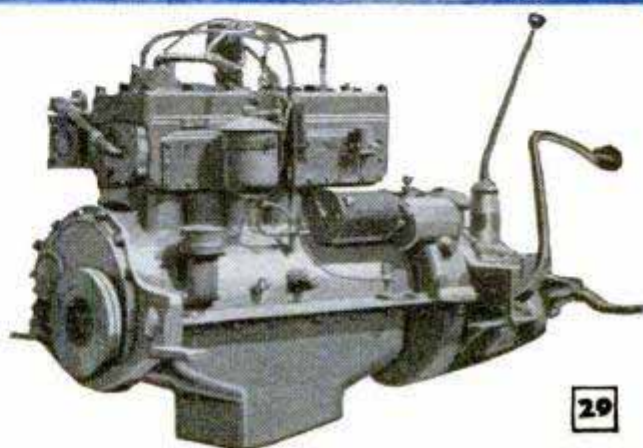
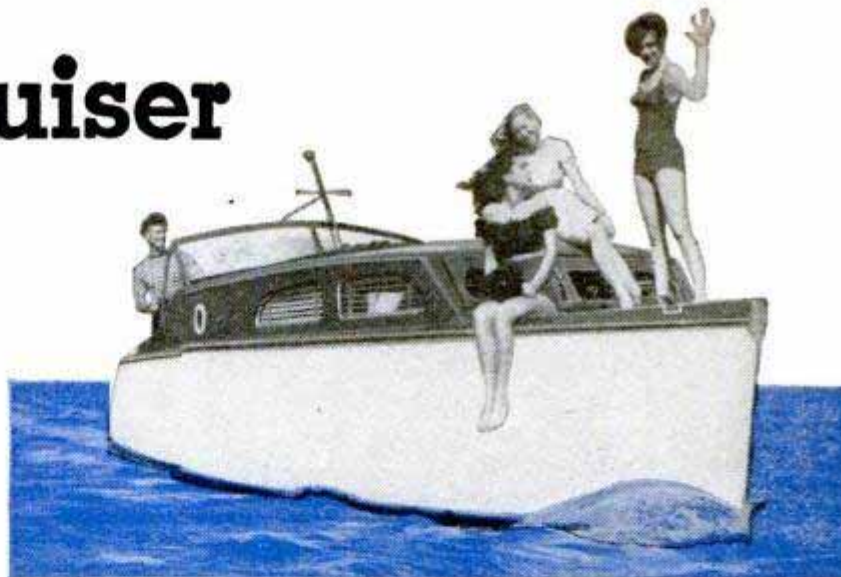
By Edward Colby



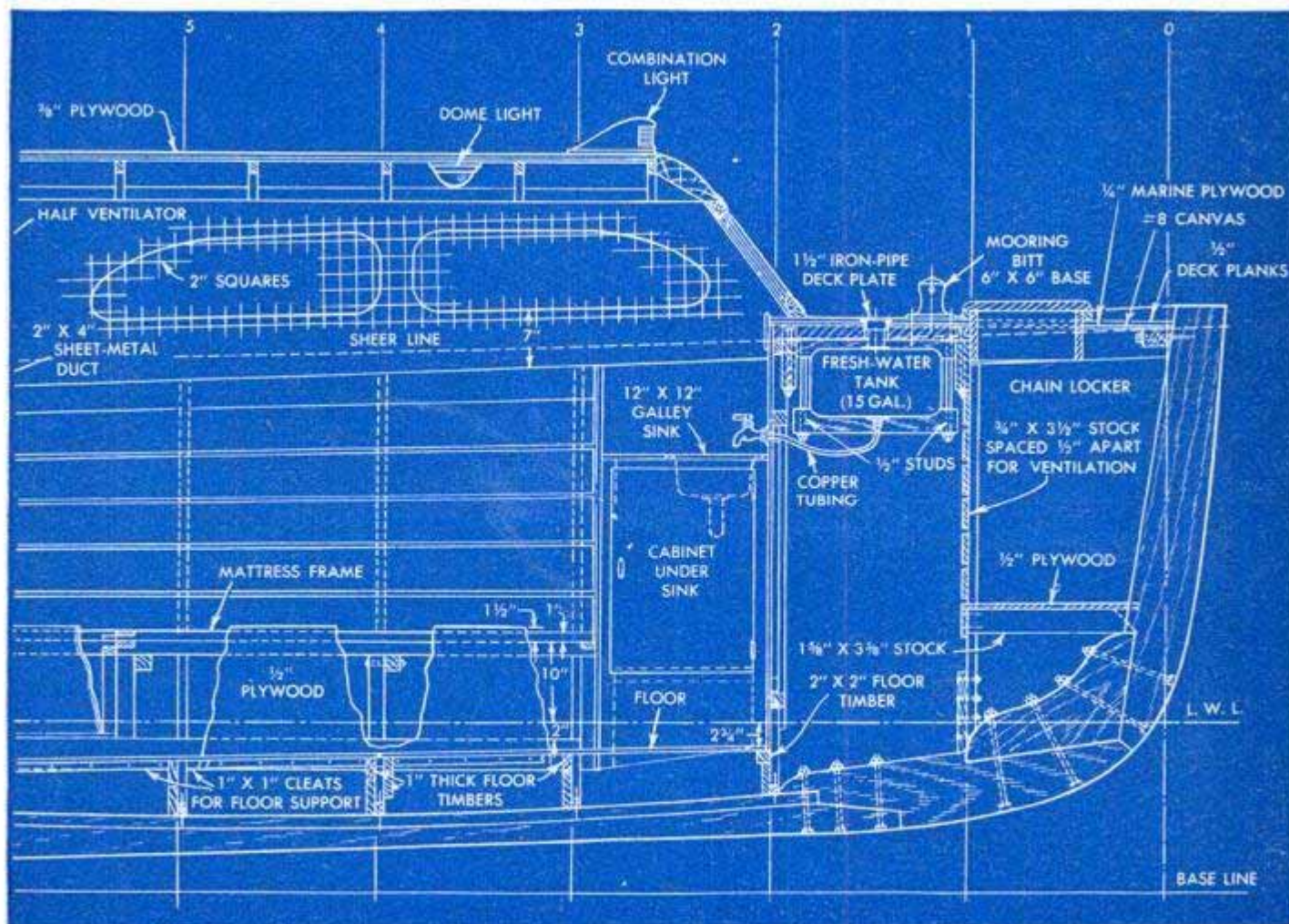
Cabin Cruiser

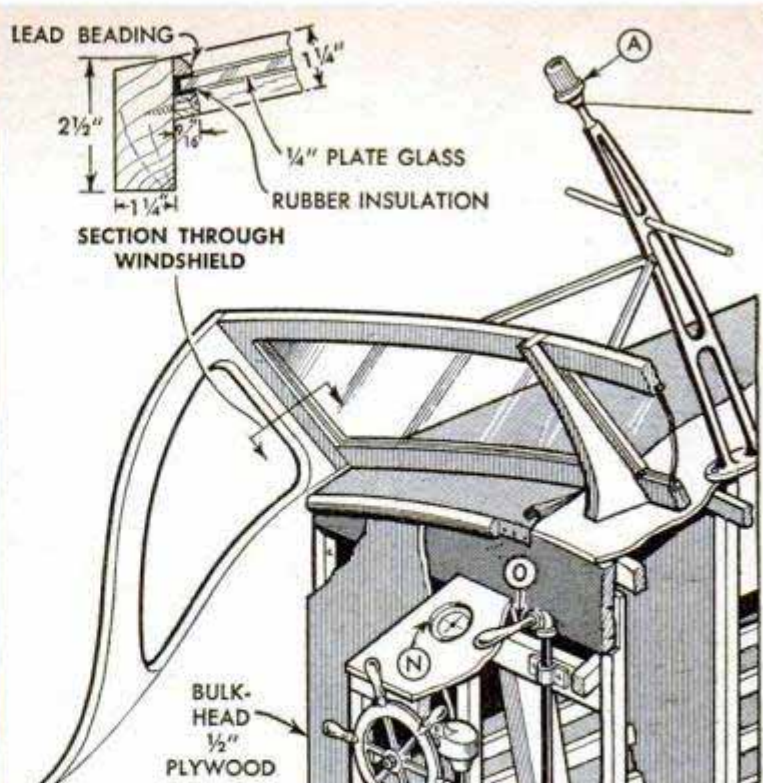
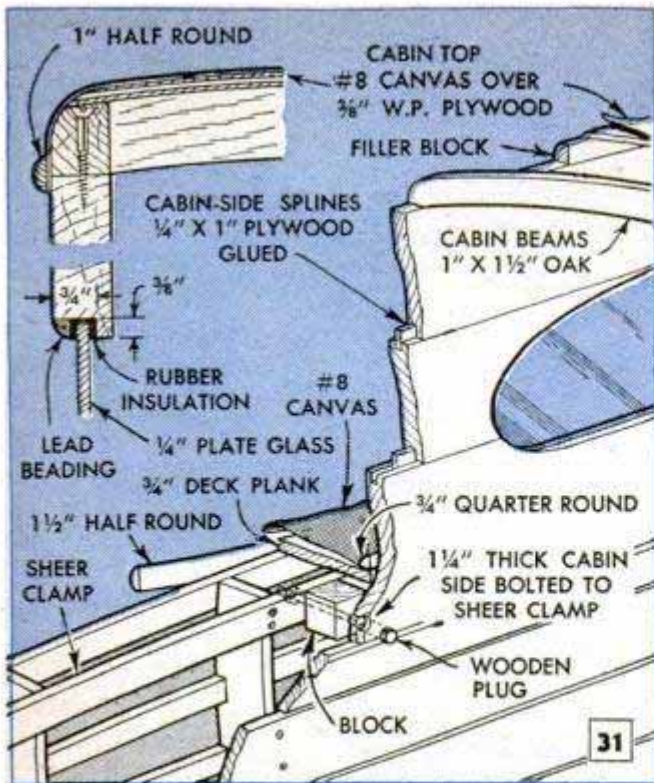
board stringer from station 3 to 11 $\frac{5}{8}$ in. aft of station 8.

Before determining the shape of engine-bed pieces and the location of the propeller-shaft hole, the exact position of the engine in the hull must be determined. This can be done best by making a full-size, cutout pattern of the engine profile on heavy paper. Carefully mark the location of the mounting brackets and center line of the crankshaft on the paper. Place the pattern on the full-size profile drawing between stations 6 and 8 and shift it around until the crankshaft center line is at an angle of 10 deg. or less with the L.W.L. Check the oil pan, flywheel and the transmission housing for clearance with the apron and ribs. When the engine pattern is in position, Fig. 30, fasten it down with tape and draw an extension of the crankshaft line across the keel and apron. Other parts, such as the rudder, propeller, shaft log, rudder post and propeller-shaft strut, shown in Figs. 30 and 33, should be on hand so they may be

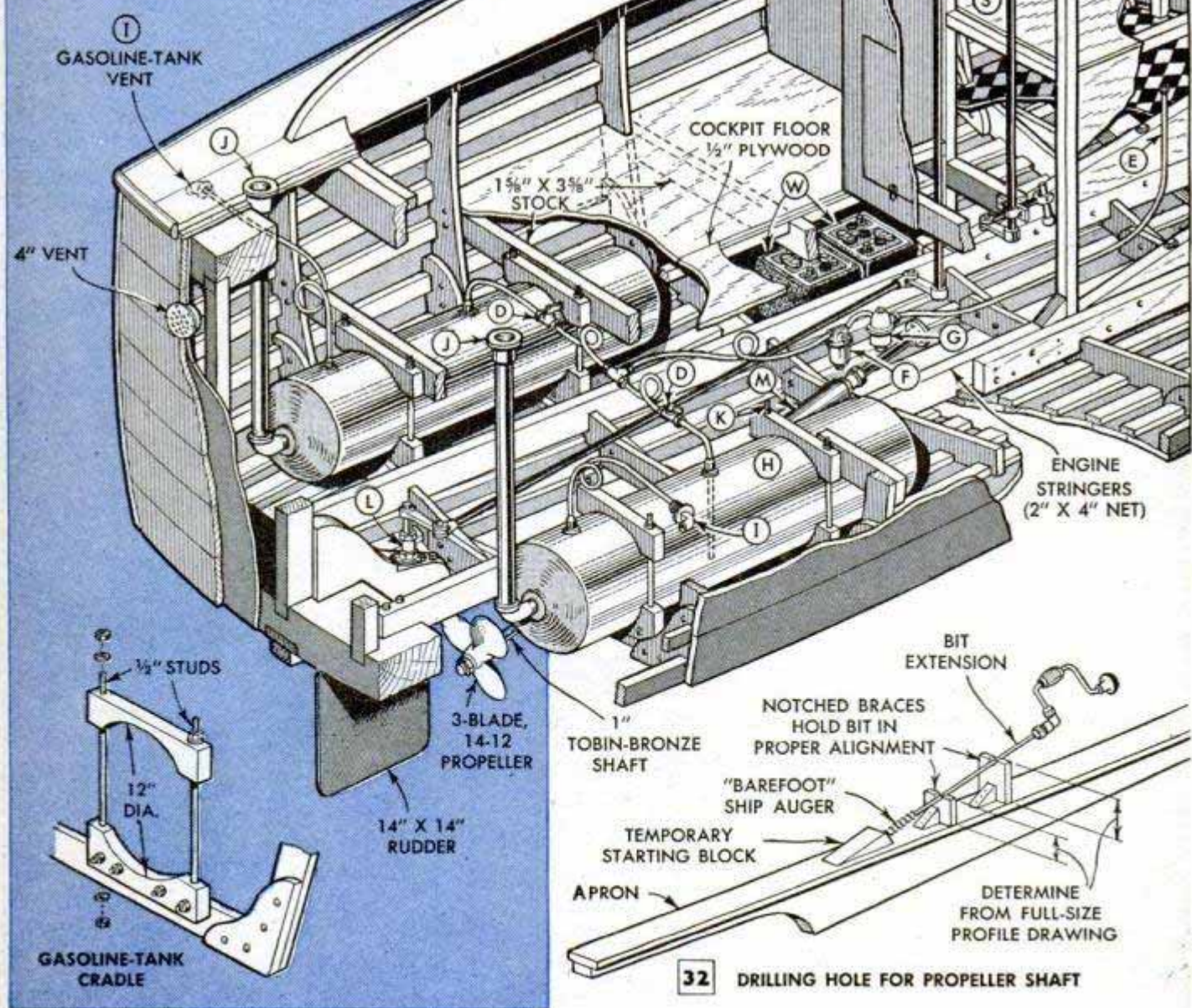


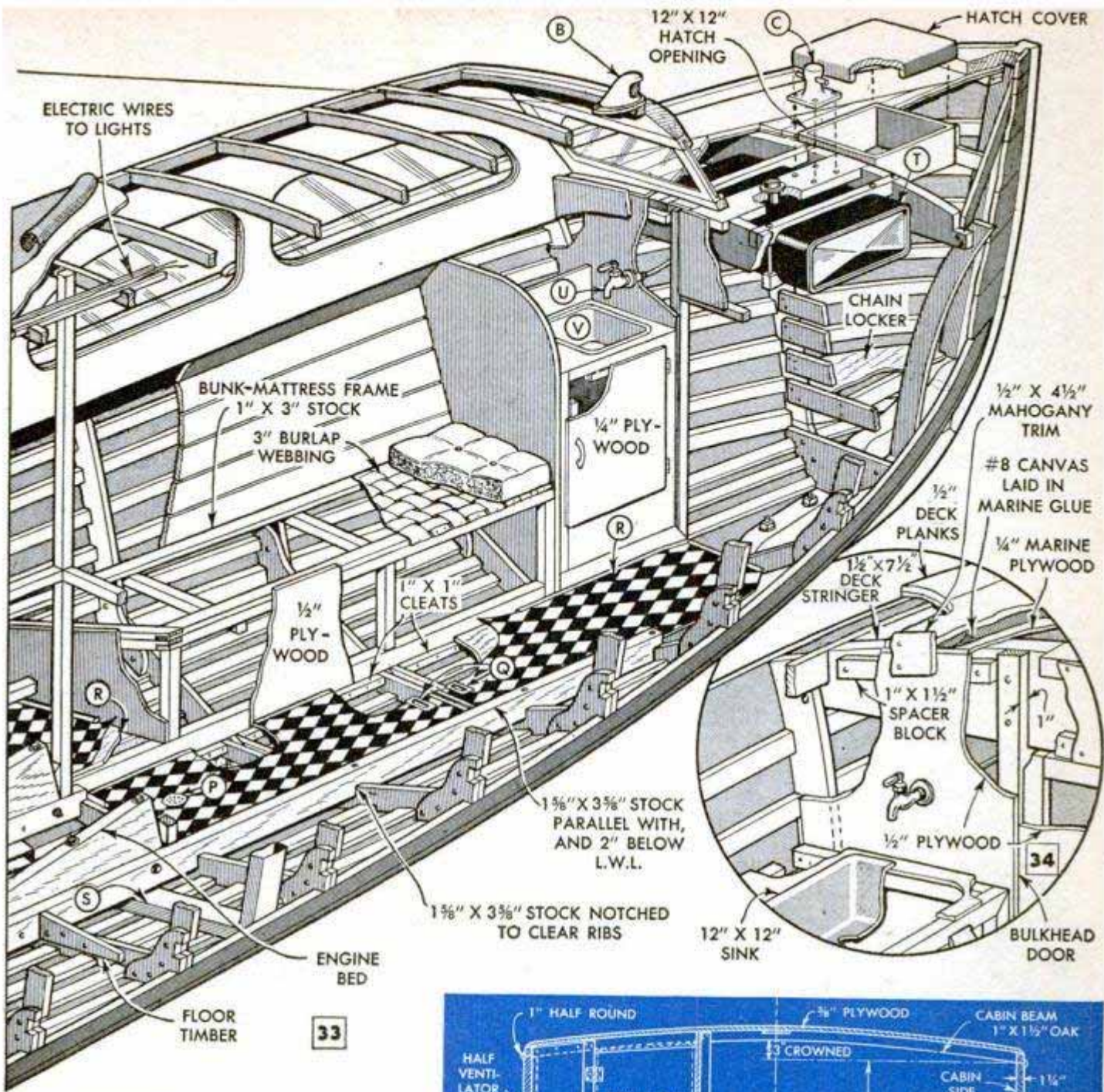
Auto engine converted to marine use gives dependable, low-cost power. Only high and reverse gears are used



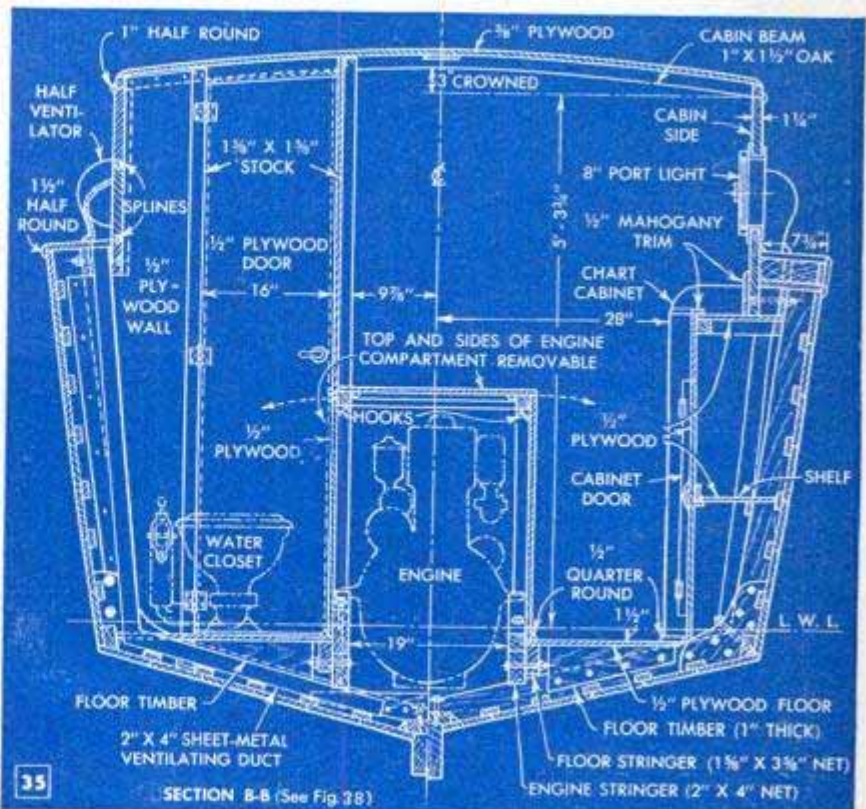


Drawings by Eldon Schiel





- A—MAST LIGHT
- B—COMBINATION LIGHT
- C—MOORING BITT (6" X 6" BASE)
- D—GASOLINE-LINE SHUTOFF VALVE
- E—COPPER TUBING (GASOLINE LINE)
- F—GASOLINE-LINE FILTER
- G—ELECTRIC FUEL PUMP
- H—24-GAL. GASOLINE TANK
- I—THROUGH-HULL, GASOLINE-TANK VENT
- J—PIPE DECK PLATE (For Filling Gasoline Tank)
- K—1/2" STUDS
- L—RUDDER PORT WITH STUFFING BOX
- M—PROPELLER-SHAFT LOG
- N—MARINE COMPASS
- O—FORWARD AND REVERSE SHIFT LEVER
- P—DRAIN PLATE
- Q—FLUSH-TYPE LIFTING HANDLE
- R—FLOOR (1/2" PLYWOOD COVERED WITH LINOLEUM)
- S—2" X 4" SHEET-METAL VENTILATING DUCT
- T—15-GAL. FRESH-WATER TANK
- U—FRESH-WATER FAUCET
- V—12" X 12" GALLEY SINK
- W—TWO 6-VOLT STORAGE BATTERIES



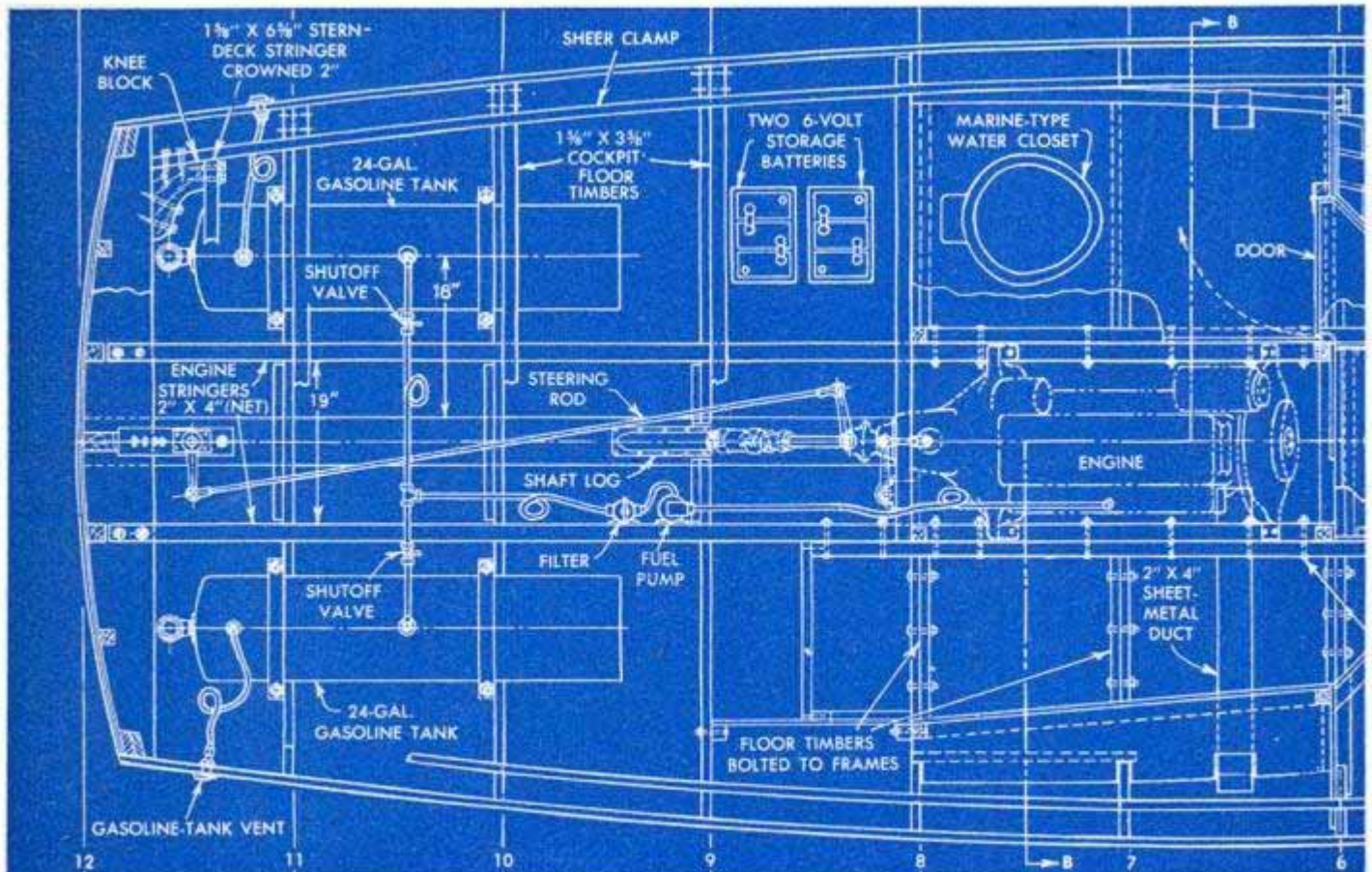


sketched in on the profile drawing to check for clearance.

A method of holding the bit at the correct angle when drilling the propeller-shaft hole is shown in Fig. 32. The braces and starting block should be sketched on the profile drawing and their exact location transferred to the hull. Since the propeller shaft is 1-in.-dia. Tobin bronze, the hole must be $1\frac{1}{4}$ in. It is started with a

regular wood bit because a "barefoot" ship auger has no lead screw. In the event the hole runs out slightly, a bar of iron heated red hot can be used to burn the hole in the proper direction.

Next, bolt the propeller-shaft strut to the keel, and drill a hole through the transom knee, apron and keel to take the rudder port. Locate the positions of the strut and port from the sketches made on the profile drawing. Assemble the shaft log to the apron temporarily with two wood screws and insert the propeller shaft. A flanged coupling is used to connect the shaft to the engine. The engine stub shaft and the propeller shaft will require some machining to take the flanged coupling. After setting the engine on its bed, it can be lined up with the shaft by bringing the faces of the coupling flanges together and gauging the distance between them at four places 90 deg. apart around their periphery with a mechanic's feeler gauge. The shaft log may have to be shifted somewhat and the engine raised or lowered to get them in proper alignment. If the installation makes it impossible to line up the engine and shaft, a universal joint and thrust bearing can be installed between the coupling and shaft log. After the boat has been in the water a while, the propeller shaft may start to "pound" due to dampness from the bilge swelling the engine bed and throwing the motor out of alignment. However, once the motor has been realigned it rarely requires further adjustment.



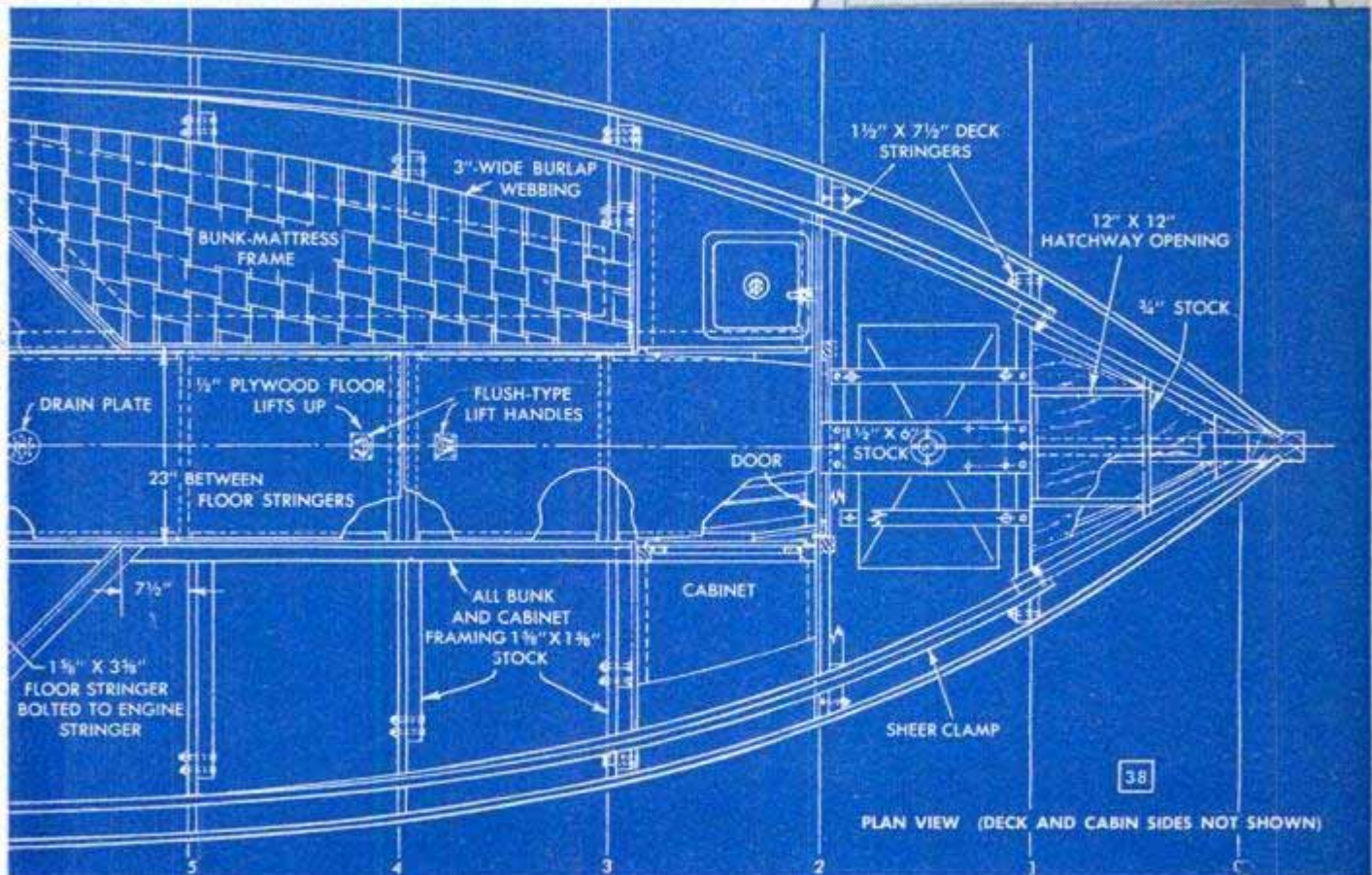
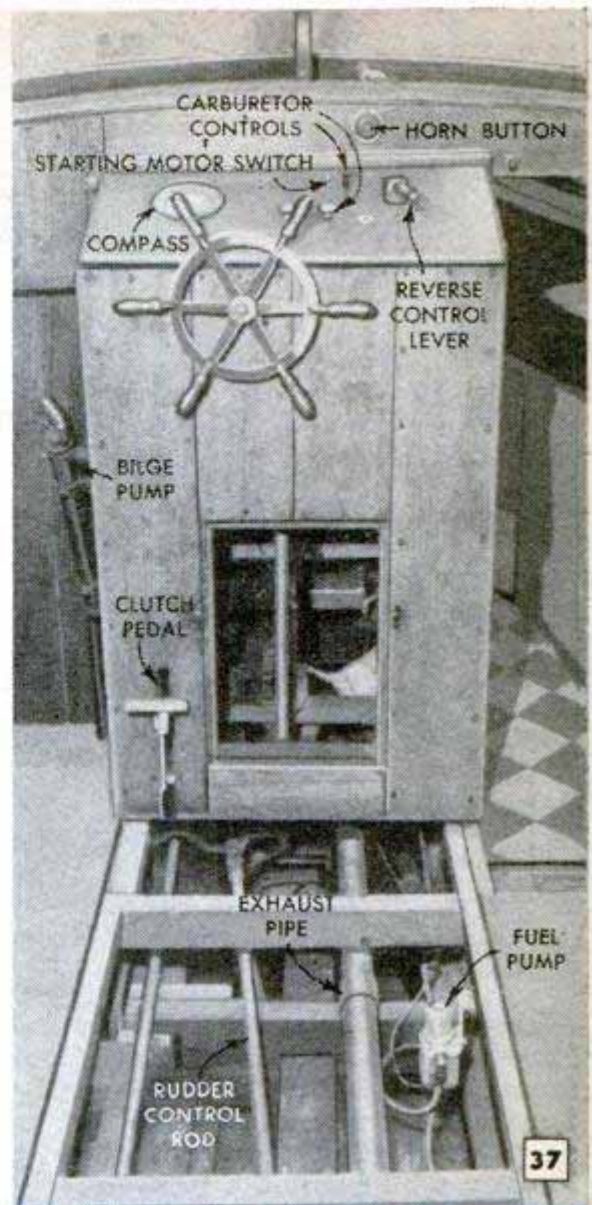
Although many boats do not have a clutch-control pedal, it will be found useful. If an automobile engine is used, it is a simple task to saw off the clutch pedal, install the necessary linkage and connect to a foot pedal extending out of the control box, Fig. 37. The gearshift lever also is sawed off and connected to the forward and reverse lever as in Figs. 30 and 38.

Water to cool the engine is piped from an intake scoop to the pump. The scoop is fitted in a hole drilled in the bottom of the hull. Engine exhaust gases are carried through a 2½-in. galvanized pipe from the engine manifold to a hole in the transom 2 in. above the L.W.L. Cooling water from the engine also runs out the exhaust pipe. Asbestos must be wrapped around the exhaust pipe between the manifold and the cooling-water-pipe connection. The water keeps the rest of the exhaust pipe cool.

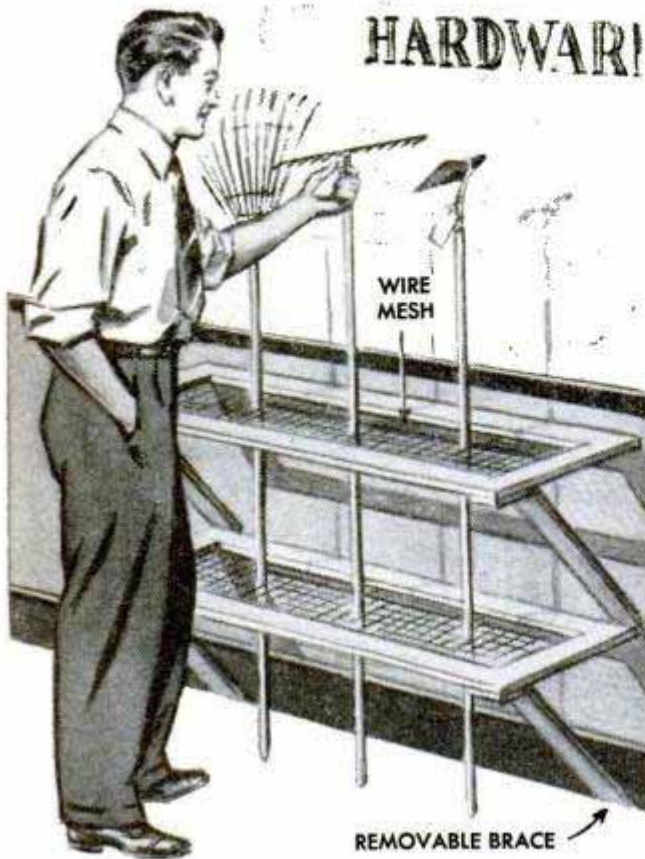
Sea Craft has two 24-gal. round tanks supported by cradles. However, any type of marine gasoline tanks can be used provided they have the fill pipe connected to deck plates located on an open deck so there is no danger of gasoline being spilled into the bilge. The tanks also must be vented through the hull as indicated. Copper tubing, coiled to absorb vibration, carries the gasoline to the engine by means of an electric pump. The tank outlet is the type fitted to the top of the tank to minimize the possibility of leakage.

Air for engine and bilge ventilation is supplied by sheet-metal ducts between stations 6 and 7, Figs. 30 and 35. Circulation is maintained by two plate vents in the transom.

(To be continued)



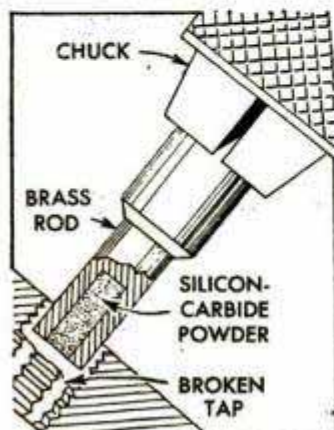
Hinged Poultry-Wire Frames Display Garden Tools



To display rakes, shovels and other long-handled farm and garden tools effectively, one hardware dealer constructed two wire-mesh frames to fit under the show window at the front of his store. Poultry wire holds the tools in a vertical position so they can be examined easily by prospective customers. The frames are hinged to fold downward and out of the way when not in use, and are held in the raised position by removable wooden braces as shown.—Opie Read, Jr., Chicago.

Hand Grinder Removes Small Taps Broken Below Work Surface

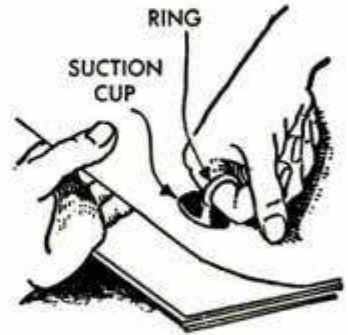
Very small taps which have broken below the surface of the work are easy to remove safely by grinding away the center of the tap with a brass or bronze rod containing an abrasive in the tip. The rod is chucked in a high-speed hand grinder. With the rod rotating in the grinder, file it down to a diameter slightly less than the root diameter of the tap. Next, drill a small hole lengthwise of



the rod and about 1/2 in. deep. Then fill the hole with valve-grinding compound or a mixture of silicon carbide and oil. The abrasive will feed down from the hole and grind away the center of the tap, after which the flutes can be picked out with an awl.—F. E. Averill, Jr., Santa Ysabel, Calif.

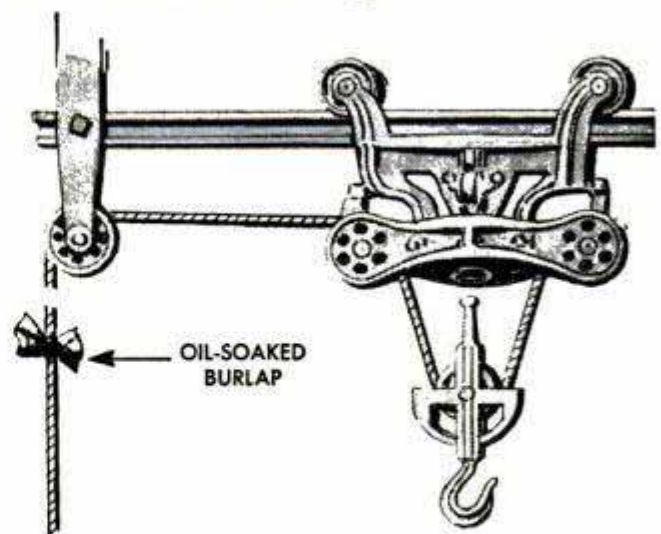
Suction Cup Lifts Corners Of Stacked Metal Sheets

If your job requires lifting pieces of sheet metal from a stack, you can make it easier by using a suction cup to lift the sheet momentarily, allowing you to grasp it with the other hand. I took an ordinary suction cup with a metal center, cut off the projecting end and then soldered the cup to a metal ring.—H. Horikawa, Seattle, Wash.



Oil-Soaked Burlap Tied to Rope Lubricates Hay Carriage

Because of its inaccessible location, keeping a hay carriage lubricated usually is a difficult job. However, by simply tying a piece of oil-soaked burlap to the hay rope, the pulleys of the carriage and hoist are oiled automatically as the rig is used. Use a piece of burlap large enough to be compressed slightly and deposit oil when it passes between the sheaves of the pulleys. Tie the burlap to the rope about 15 or 20 ft. from the carriage.



When a stationary thresher, irrigation pump or similar machine is operated on a windy day, the long tractor belt can be kept from whipping by setting up a snow fence windward of the belt and parallel with it to break the wind.



A GHOST IMAGE CAUSED BY REFLECTED SIGNALS



B ORIGINAL IMAGE AS MONITORED AT TV STATION

ELIMINATING TELEVISION "GHOSTS"

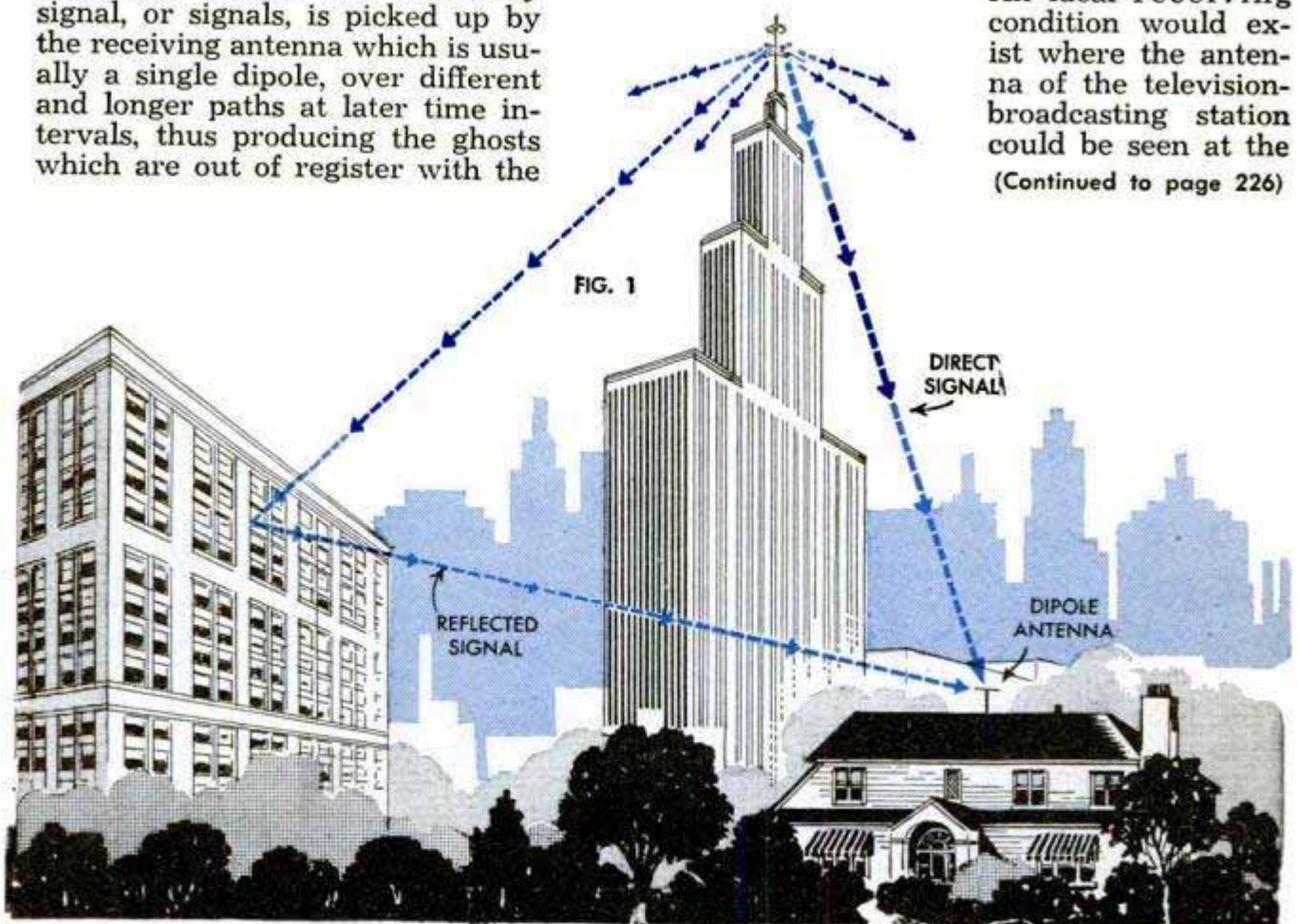
SHADOWS, or "ghosts" as they are commonly called, produce effects in the received television picture similar to that shown in photo A. These overlapping images occur when the transmitted-picture (video) signals strike objects which reflect secondary waves. The secondary signal, or signals, is picked up by the receiving antenna which is usually a single dipole, over different and longer paths at later time intervals, thus producing the ghosts which are out of register with the

primary direct signal. This effect is quite common in cities where tall buildings are numerous, as illustrated in Fig. 1.

High-frequency television-picture signals travel in straight lines, similar to light waves, until some object blocks their path.

An ideal receiving condition would exist where the antenna of the television-broadcasting station could be seen at the

(Continued to page 226)

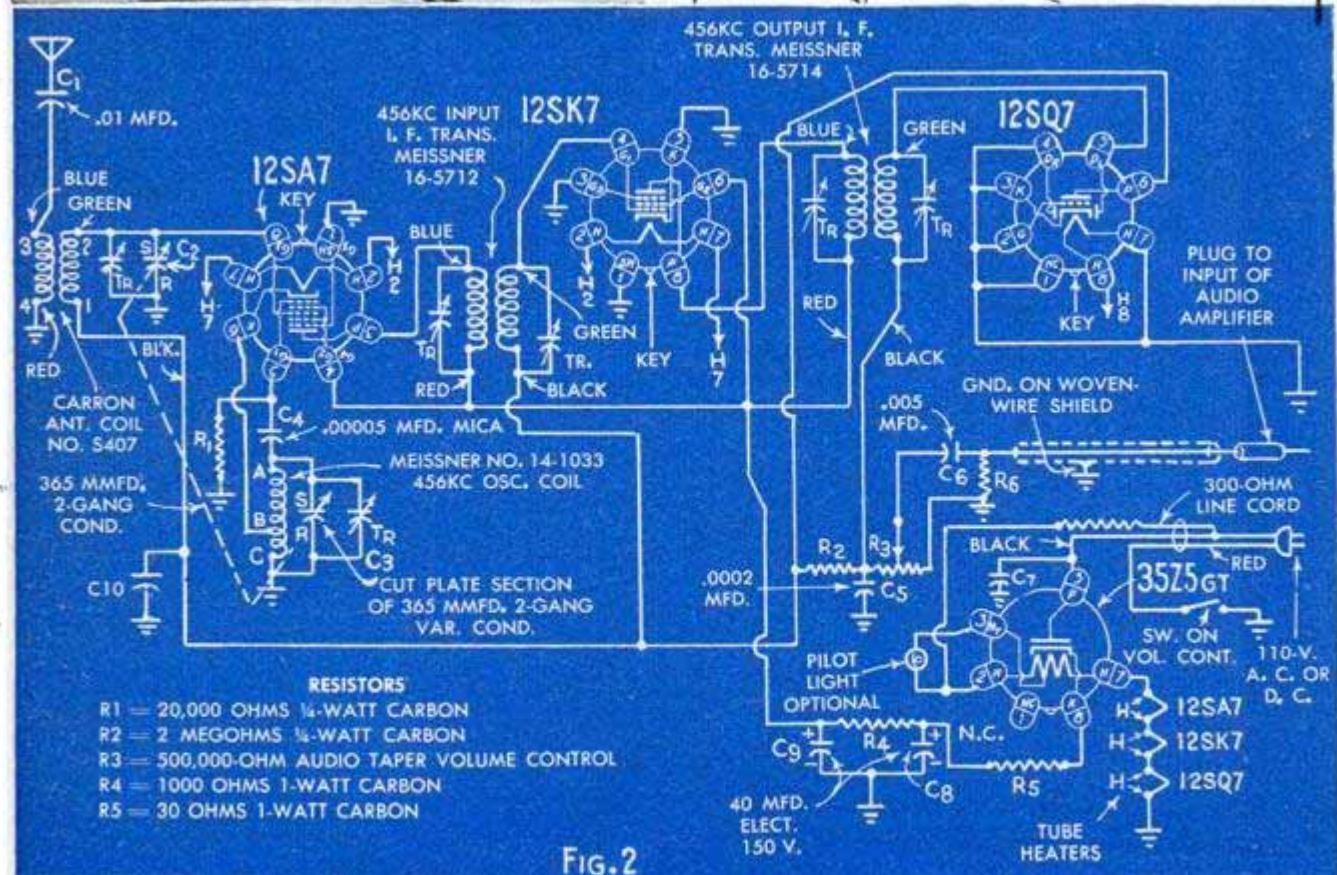
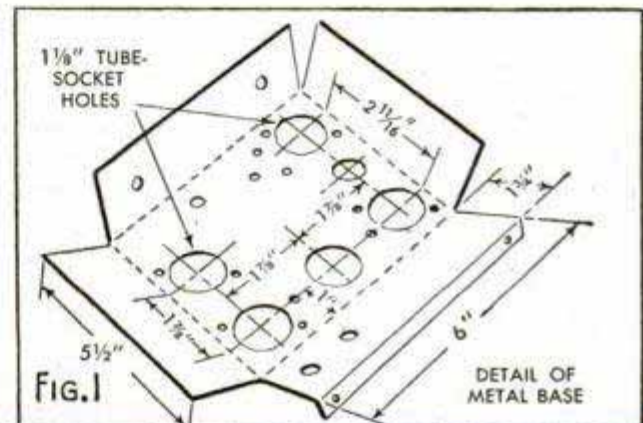
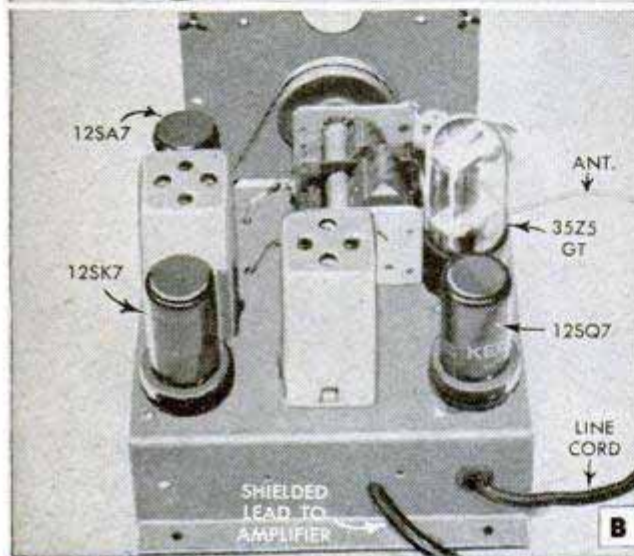
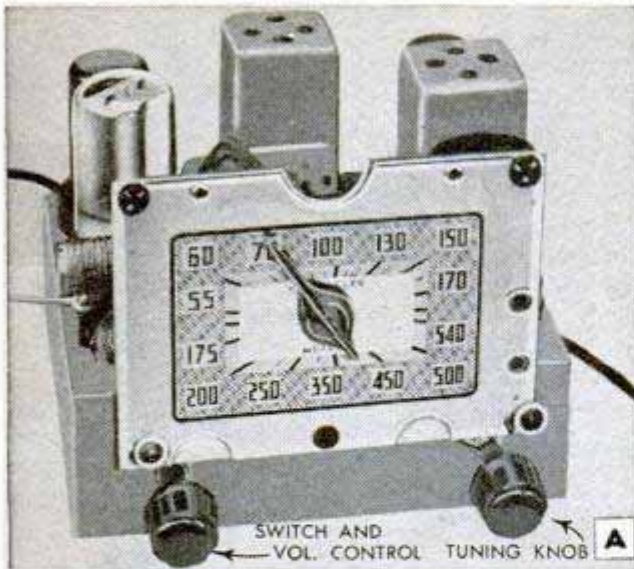


FOUR-TUBE SUPER BROADCAST TUNER

By Joseph Vanella

UNUSUALLY compact and highly efficient, this AM super tuner will provide the owner of any public-address system with a means for supplying "on the spot" radio music, news and public events at picnics, ball games, meetings or wherever PA systems are used. It also makes an ideal addition to sound installations of the type used in industrial plants for playing recordings for employees. It may be employed as a remote tuner for any radio receiver that is equipped with phono input jacks or with any of the audio amplifier units that have been described in past issues of this magazine.

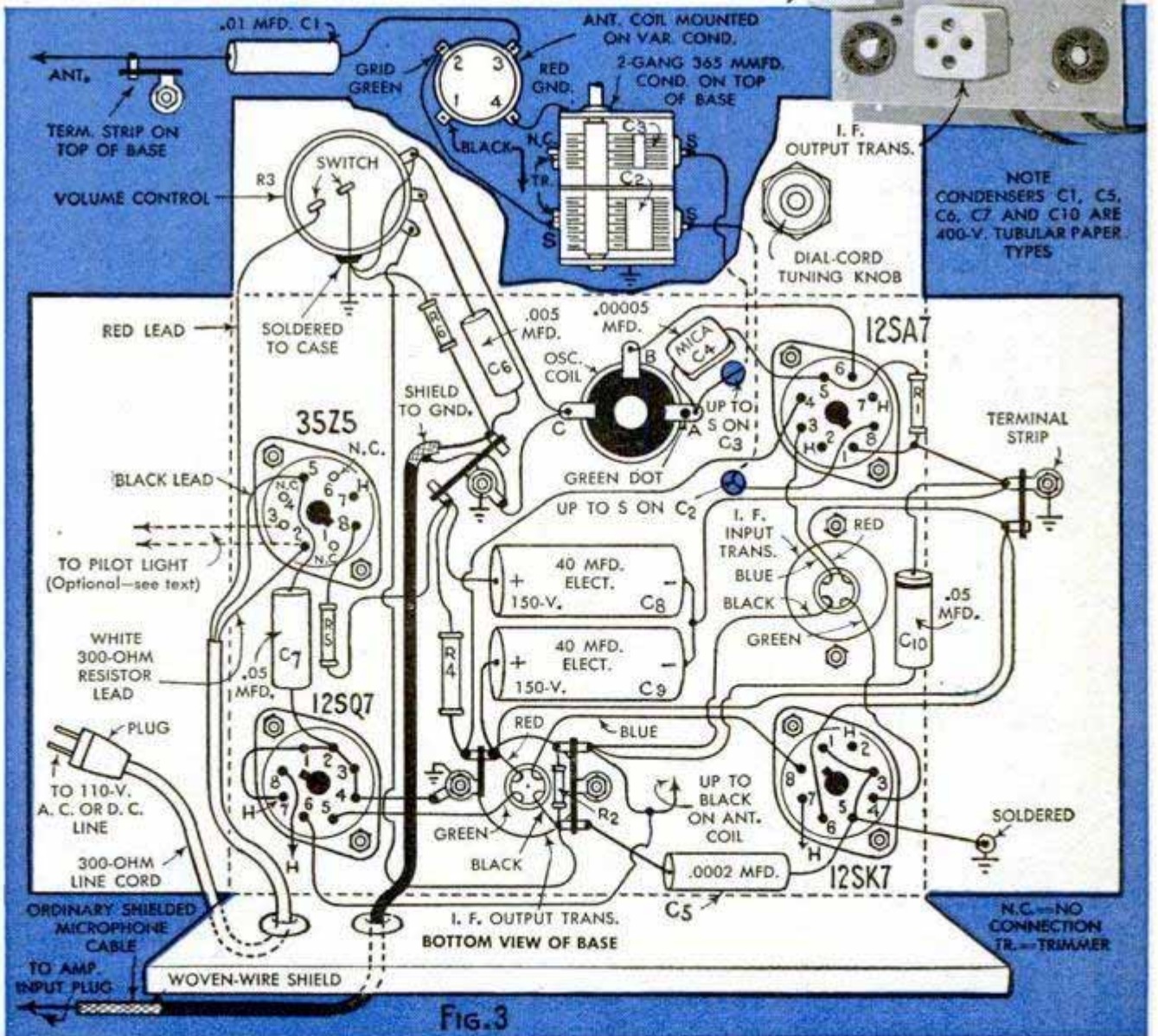
The straightforward superheterodyne circuit consists of a converter stage employing a type 12SA7 tube in an electron-



FOR USE WITH ANY AUDIO AMPLIFIER

coupled oscillator circuit. All parts are standard and available from any of the radio supply houses. The antenna coil is a Carron No. S407 and the intermediate frequency (I.F.) transformers and oscillator coil are all Meissner types well known to radio students and experimenters. The 2-gang 365 mmfd. variable condenser has a cut-plate section and trimmer condensers on each section. Photos A, B, C and D show various views of the completed unit and the parts should be arranged just as shown in order to facilitate wiring. The simple sheet-metal chassis base is detailed in Fig. 1. Note that the antenna coil, in photo C, is mounted above the base in a horizontal position by soldering its red ground terminal No. 4

(Continued to page 228)



PRACTICAL RADIO SUGGESTIONS

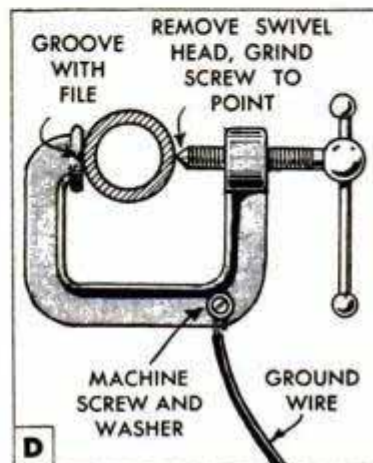
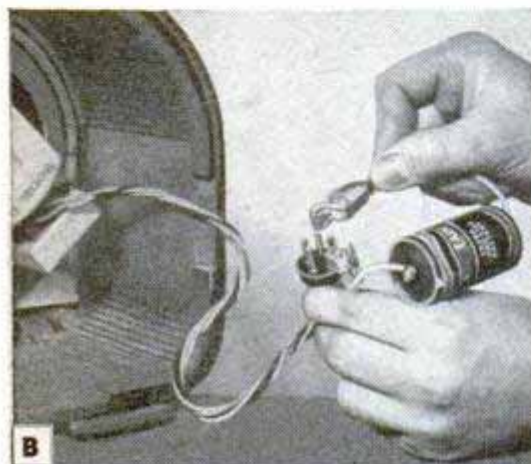


A—When oscillation or hum cannot be traced to a defective part, try a temporary shielding plate between tubes as shown. If reception is improved, standard tube shields are indicated

B—To test for an open coil in a loudspeaker or speaker-output transformer, use a small flashlight battery with short leads soldered to each end. Check for click at plug prongs; if no sound is heard, test directly across speaker terminals

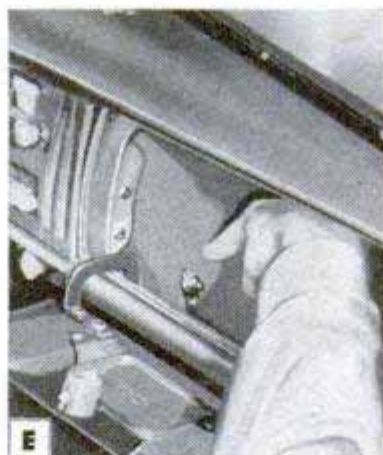
C—Compact tester for checking tiny hearing-aid batteries tests batteries under full operating-load for greater accuracy

D—An efficient ground clamp for use on rusty or corroded pipes may be improvised from an old C-clamp. The pointed screw bites into the pipe and provides a clean contact



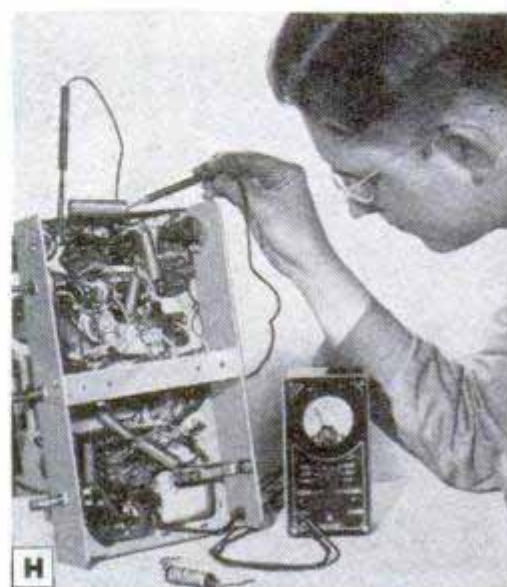
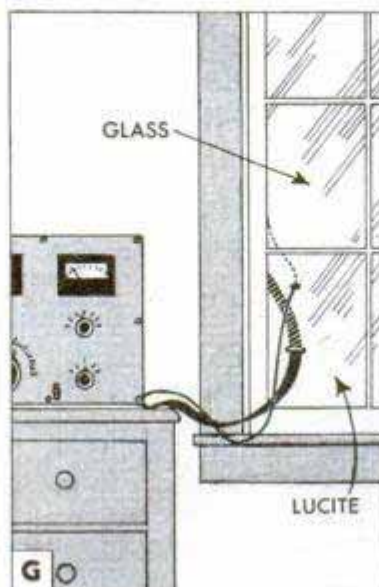
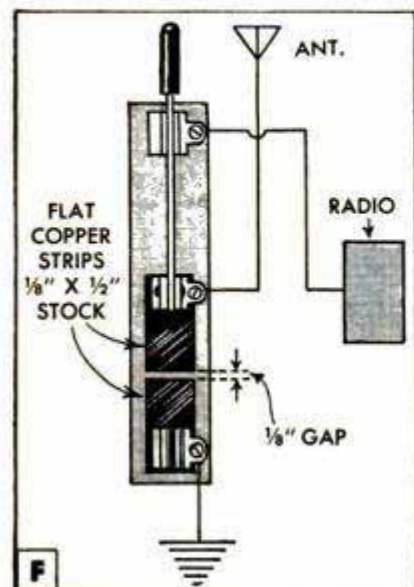
E—Master switch for car radio is mounted in glove compartment. The switch is connected in series with the wire leading to the regular radio switch. Being ahead of the set switch, it provides a master control when the glove compartment is locked during owner's absence

F—Emergency lightning arrester added to antenna switch furnishes protection in case the regular switch is not thrown to ground. Copper strips are mounted under the center and ground terminals; the gap may be reduced to about 1/16 in. if the capacity effects are not too great



G—To solve problem of running antenna leads through glass in a 4 or 6-light sash remove one pane of glass and substitute a sheet of clear Lucite or Polystyrene, which insulates, and drills easily

H—Check voltage across defective condensers before installing new ones. If condenser is shorted it should be removed after checking polarity and the voltage tested across opened leads



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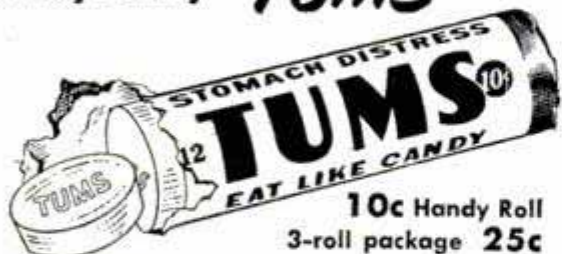
Like good food?



Don't appear rude
Always carry
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- TUMS neutralize excess acid almost instantly—relieve gas and heartburn fast!
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Night and day, at home or away,
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QUICK RELIEF FOR ACID INDIGESTION



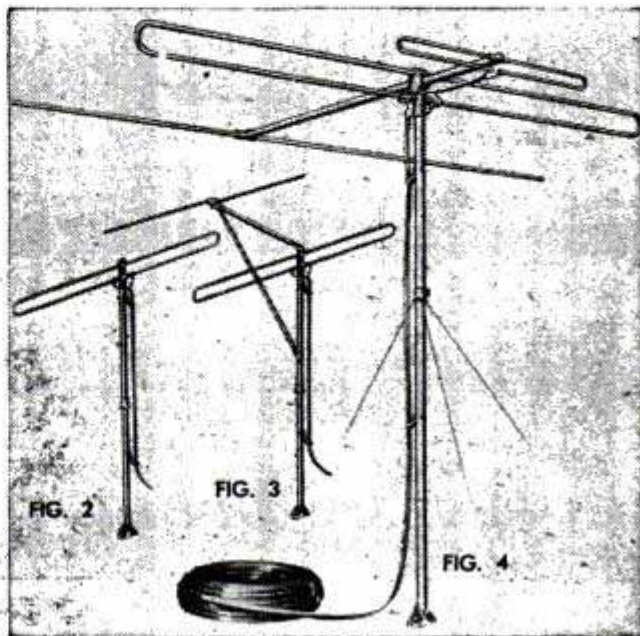
TUMS ARE ANTACID — not a laxative. For a laxative, use mild, dependable, all-vegetable NR Tablets (Nature's Remedy). Get a 25c box today.

SAY YOU SAW IT IN POPULAR MECHANICS

Eliminating Television "Ghosts"

(Continued from page 221)

site of the receiving antenna. Fortunately, reception is fairly good even when the direct signal is partially obstructed by large reflecting surfaces. As the video signals are radiated in all directions from the transmitting-station antenna simultaneously, the receiving antenna must be highly directional or it will receive both the



direct and multipath reflected signals. These undesired reflected ghost signals can be eliminated by directional antenna systems. The antenna installation is usually made by two men, one at the controls of the television receiver and the other on the roof, with the antenna temporarily installed but free to be turned in any direction until oriented for best results.

Various types of modern television receiving antennas are shown in Figs. 2, 3 and 4. The folded dipole, Fig. 2, is satisfactory under favorable receiving conditions, and is an improvement over the single dipole; Fig. 3 is a folded dipole with a reflector element and is designed for use in low signal areas. Fig. 3 is a new Amphenol television antenna array designed to give a unidirectional receiving pattern over both television bands, 174 to 216 mc. and 54 to 88 mc. It is claimed to eliminate ghosts caused by multipath signal pickup. Consisting of two broad-banded folded dipoles and a low-band reflector with a common transmission line, this unusual design permits the large folded dipole (for the 54 to 88-mc. band) to be used as a reflector for the small folded dipole, which is tuned to the 174 to 216-mc. band. The array is substantially unidirectional and maintains high front-to-back and front-to-side ratios.

How to adjust power tools accurately

● Yes, your modern power tools are marvels of speed and accuracy *if*—and it's a big IF—*you* are accurate in their use, if *you* make them do their best work. And that's where your flashlight comes in handy. Better keep it powered with "Eveready" batteries. Powerful, dependable, *they outlast all other brands.**



← Gauges for power tools are frequently in shadow where they are hard to read. That's where you need your flashlight to make adjustments with a fine degree of accuracy.



A clamp on the side of the table → will keep your "Eveready" flashlight handy, ready for use.



● Brighter light, longer life! That's what you want in a flashlight battery—that's what you get with "Eveready" brand batteries. Laboratory tests prove it. And the best "laboratory" of all—*your own flashlight*—proves it! That's why "Eveready" batteries *outsell* all other brands—because they *outlast* all other brands!*

**According to the "General-Purpose 4-Ohm Intermittent Test" devised by the American Standards Association, which most closely approximates average use.*

The registered trade-mark "Eveready" distinguishes products of
NATIONAL CARBON COMPANY, INC.
 30 East 42nd Street, New York 17, N. Y.
 Unit of Union Carbide and Carbon Corporation

Proof! . . . in the laboratory . . . in your own flashlight . . .

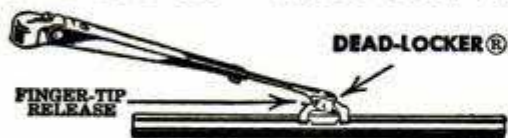
"EVEREADY" BATTERIES

OUTLAST ALL OTHER BRANDS!*

ANCO® RAIN-MASTER®

WINDSHIELD WIPER BLADES and ARMS

**Blade snaps on—Stays put
Can't fall off—Can't blow off**



Don't Blame Your Gas-Pump Man!

Sure, he knows how dangerous it is for you to drive your car . . . in stormy weather . . . with dull old windshield wipers that *smear* and **SMEAR!**

He'll gladly put on for you—quickly—a pair of keen new ANCO RAIN-MASTER Blades—or Blades and Arms.

HE NEGLECTS YOU?

He has RAIN-MASTERS . . . But he forgets to remind you? Too busy?

After all it's *YOUR* car to protect. . . So, *YOU* ask *HIM* for RAIN-MASTERS next time you buy gas. . . Patented features. . . Original equipment on DeLuxe Models of high-grade cars . . . because RAIN-MASTERS *Clean quicker—Clean cleaner—Last longer.*

*Get yours—next time you buy gas.
May save you a costly smashup!*

Made by ANCO . . . makers of the new CLEAR-FLEX* Wiper Blade—the only Blade worth more than RAIN-MASTER. Costs more. Ask your good ANCO dealer to show you why.

*Trade Mark

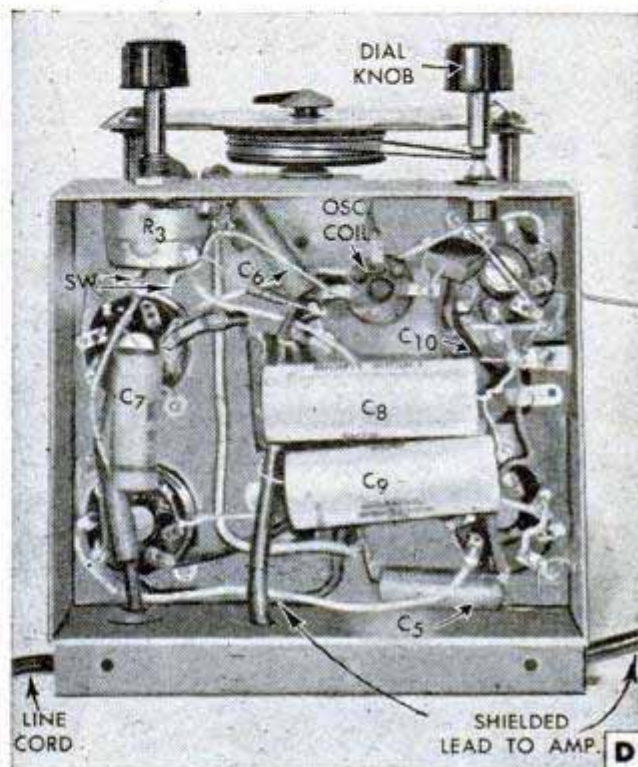
Quality Protected Under Fair Trade Laws
ANCO Patented Products—Patents Make Jobs

THE ANDERSON COMPANY
Established 1918
GARY, INDIANA

Four-Tube Super Broadcast Tuner

(Continued from page 223)


directly to the frame of the variable condenser at front. This connection is indicated with a wire lead in Fig. 3. Antenna terminal No. 3 on this coil is marked with a blue dot; the green grid terminal No. 2 connects to the stator of C₂; the black No. 1 terminal lug is connected to a lead that will run



down through a hole in the chassis and is to be connected to the terminal strip on the underside of the base as indicated by the arrows. Fixed condenser C₁, which is in series with the antenna, connects to the blue coil terminal No. 3; it is mounted directly under the antenna coil.

A complete schematic circuit diagram appears in Fig. 2. The pictorial wiring diagram, Fig. 3, shows all parts in their relative positions and every wired connection

(Continued to page 232)



Model Builders Attention!

| | V | V-2 | V-3 |
|---------------|---------|---------|---------|
| Hex | 1/2" | 3/8" | 5/16" |
| Thread | 3/8"-24 | 1/4"-32 | 1/4"-32 |
| Thread Length | 7/32 | 7/32 | 5/32 |
| Weight, Grams | 8 | 3 1/2 | 2 1/2 |

Actual Size V-Plug
Champion Spark Plugs for model gas engines give the same dependable performance as regular Champions. Champion Ceramic insulation—Sillment sealed. Alloy needlepoint electrodes for easy starting. One piece construction.

CHAMPION

SPARK PLUG COMPANY • TOLEDO 1, OHIO

Dependable

CHAMPION

America's Favorite Spark Plug



Crisp-firing spark plugs are a primary factor in keeping your car's engine in good operating condition. They are truly vital in maintaining its performance, gas and oil economy, and dependability. It's Spring again, so have your spark plugs checked. If new ones are needed, insist on the spark plugs preferred and used by most motorists — dependable Champions.

Champion Spark Plug Company, Toledo 1, Ohio.



FOLLOW THE EXPERTS DEMAND NEW DEPENDABLE CHAMPIONS FOR YOUR CAR

Listen to CHAMPION ROLL CALL, Harry Wisner's fast sportscast every Friday night, over ABC network

At Last! THE POWER

SHOP SMITH

REG. TRADE MARK

\$159.50

Complete five-tool unit
with 1/2 H.P. ball
bearing motor \$195.50

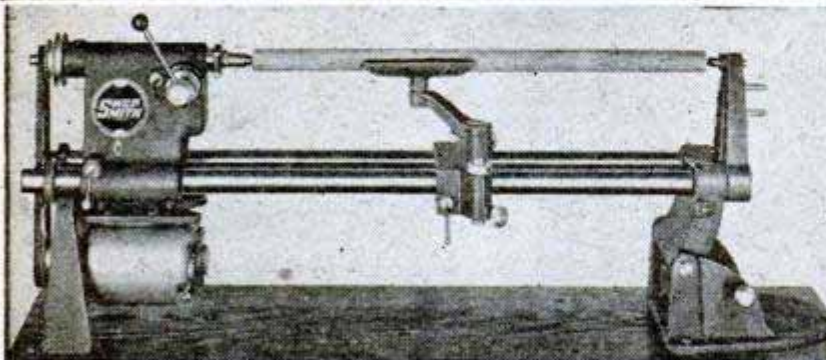
BUILT RUGGED

with cast iron headstock and carriage. Centerless ground and polished steel ways. Heavily-ribbed aluminum table. Four life-long grease-sealed Fafnir ball bearings. Unit weighs over 200 pounds. Will last a lifetime.

SHOP SMITH AS A CIRCULAR SAW

Has maximum distance of 46" between saw blade and fence. Tilts to any angle—positive lock. New principle provides micro-adjustment of distance between fence and saw blade. Specifications: Saw Blade: 8" Dia. Depth of cut: 2 1/4". Table: 12 1/2" x 17"; with extension, 54" x 17".

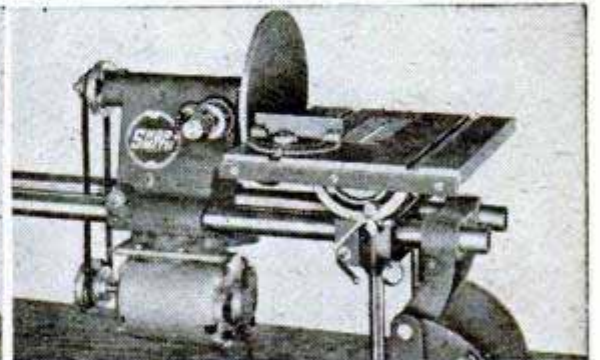
Standard Equipment: 8" saw blade and arbor. Table extension. Mitre gauge. Rip fence. Saw guard.



SHOP SMITH AS A LATHE

84" between centers. Swing: 15". Variable speeds. Quill Feed: 4 1/2".

Standard Equipment: Tool rest. Drive center. Dead center.



SHOP SMITH AS A DISC SANDER

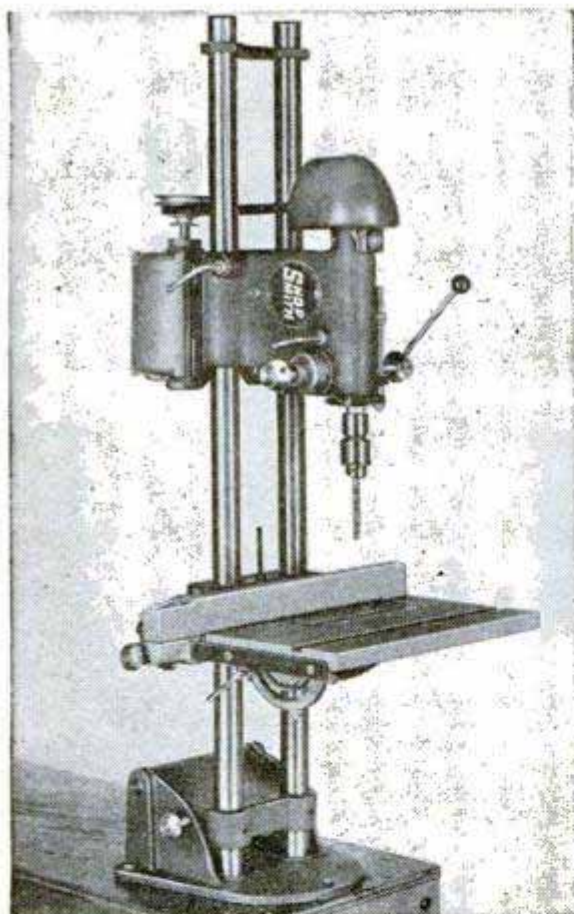
Disc Diameter: 12". Table Dimensions: 14 1/2" x 17". Tilting Table.

Standard Equipment: 12" disc. Mitre gauge.

TOOL YOU'VE ALWAYS WANTED

CIRCULAR SAW • DRILL PRESS VERTICAL AND HORIZONTAL
WOOD LATHE • DISC SANDER

Five Sturdy Tools...each better than a single-purpose tool—engineered into one compact unit. Thousands already in use. Is rugged enough to last a lifetime. And priced so you can afford it



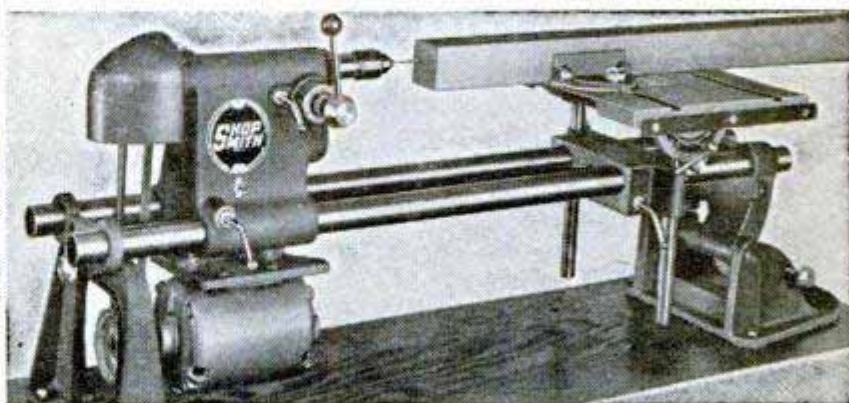
SHOP SMITH AS A VERTICAL DRILL PRESS

Capacity: Drills to center of 15" circle. Clearance: Table to chuck—27" max. Spindle: $\frac{3}{8}$ " Dia., 6 spline, hardened tip. Spindle Feed: $4\frac{1}{2}$ ". 4 grease-sealed Fafnir ball bearings. Variable speeds. Table: $14\frac{1}{2}$ " x 17".

Standard Equipment: $\frac{1}{2}$ " Jacobs key chuck. Fence.

SHOPSMITH—built for man-size work—is no toy. Compact (59" long by 21" wide by 18" high). Shopsmith weighs over 200 pounds. There's an 8" combination circular saw that cuts $2\frac{1}{4}$ " deep... big capacity lathe with 15" swing... accurate 12" disc sander... horizontal drill press with no limit to work length... vertical drill press with $\frac{1}{2}$ " capacity Jacobs key chuck. Shopsmith also excels as grinder, buffer, drum sander, router. And you can change from tool to tool in less than one minute!

Demand, of course, is ahead of production. But Shopsmith will soon be available to the thousands of craftsmen who have long demanded a compact, sturdy multi-purpose power tool. Your wait will be rewarded. Magna Engineering Corporation, 465 California St., San Francisco 4.



SHOP SMITH AS A HORIZONTAL DRILL PRESS

Only Shopsmith performs this highly useful function. No limit to length of work. Provides accurate method of drilling for doweling, etc.

Action

YOU'VE NEVER EXPERIENCED BEFORE IN A ROD



That's what experienced anglers say about the No. 411 South Bender. It has an action all its own that adds a new thrill to bait casting. Controlled flexibility produces a live suppleness that gives just the right whip for perfect, effortless casting.

No. 411 SOUTH BENDER ROD

The solid tip is machined from a new, high-strength metal alloy . . . and it weighs *only* 3½ ounces. Foolproof reel and tip locking device. Maroon trim. Length 4 feet, 11 inches \$15.

PERFECTORENO REEL

No thumbing—no backlashes. Makes casting easy and a real pleasure. \$10, \$11, and \$13.50.



LEVEL-WINDING ANTI-BACK-LASH REEL

A favorite with casters. Built for long, hard usage. Precision-built. \$5.60, \$8.50, \$9.50, \$11 and \$15.



BLACK-ORENO LINE

The bait casting line you can trust. Braided of nylon. \$1.25 to \$2.30 per 50 yard spool. Silk slightly higher.



No. 973 BASS-ORENO

Famous fish-getter. World's greatest bait \$1.10. Also 4 smaller sizes 65¢ to 95¢.



FREE! NEW '48 BOOK ON FISHING

"Fishing—What Tackle and When" shows South Bend and Oreno tackle. Color pictures of fishes. Fly and bait casting instructions. Every fisherman needs a copy. Write for your copy today. Sent FREE!

SOUTH BEND BAIT CO.
891 HIGH ST., SOUTH BEND 23, INDIANA



SOUTH BEND

A Name Famous in Fishing

in the unit. Mount all tube sockets with the keys in the positions shown in Fig. 3. The pilot light is optional and was not included in the model. However, it can be a No. 47 in a clip-type pilot-lamp socket which is easily mounted on the tuning dial. The ground connection on volume control R3 is soldered directly to its case as indicated in Fig. 3. The shielded lead to the audio amplifier may be 2 or 3 ft. long, and the shield must be grounded on the underside of the base to a soldering lug placed under the terminal-strip mounting screw as shown in Fig. 3.

A long and high outdoor antenna will give best results in locations remote from broadcasting stations. For local stations, a short indoor antenna will be satisfactory. To balance the tuner unit, connect the antenna and audio amplifier, and tune in a station at about 670 kc. The I.F. transformers are peaked at the factory and require very little adjusting. A slight adjustment of the trimmer condensers in the top of each unit is all that is necessary to bring in the station at maximum volume. With the unit still tuned to this station, adjust the trimmer on C3, which is the oscillator cut-plate section, to bring in the station at its proper dial reading. Now tune in a station at about 1400 kc. and adjust the trimmer on C2, which is the antenna-tuning condenser section, until the station is received with maximum volume. Detailed student material list R-366 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Diving Mechanics

(Continued from page 149)

gear and methods against approved rigging standards.

A knowledge of cement and concrete work is essential also—not only for patching ships but for building foundations. Strength, water-tightness and ability to adhere to steel are principal requirements.

Concrete mixtures set in sea water in about 45 minutes, but do not reach maximum strength for three or four weeks. A diver, therefore, uses cement of high early strength and dumps a large amount into his mixture. For example, 1 part cement, 1½ parts sand, and 2 parts rock.

At times, a diver's life depends upon his skill with explosives. It may be necessary to cut through a stubborn piece of steel, sever a large timber or breach the side of a vessel. The newest explosive used in underwater work is blasting gelatin which

(Continued to page 238)

Exclusive Du Pont Formula Speeds Car Polishing

...GIVES A
BRILLIANT LUSTRE!



A small section of the surface of an average car magnified 20 times. The left side is shown still covered with Traffic Film. The right side has been cleaned with Du Pont NO. 7 POLISH.

DU PONT NO. 7 POLISH

Contains "stroke saving"
methyl cellulose



Car polishing doesn't have to take all day. You can do the job quickly and easily with NO. 7 POLISH. It is made by a patented, exclusive Du Pont formula . . . removes dirt and grime quickly, without tedious scrubbing. And it cleans up *fast*, leaving a dry, brilliant shine. Use NO. 7 POLISH as a short-cut to that "showroom shine"!



BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY



Attention . . . NEW CAR OWNERS!

Here's a wax-polish made especially for new cars—and others whose finish is in first-class condition. It cleans and wax-polishes in one easy operation. Gives a brilliant lustre. Keeps cars looking new.



DU PONT SPEEDY WAX

May is National Nu-Enamel Month

Paint Your Automobile

Paint Your Entire Car With **NU-ENAMEL** For Only **\$3⁴⁵—**

Paint All Your Fenders For Only **\$1⁹⁵—**



ONE COAT COVERS
NU-ENAMEL
TRADE MARK REG. U. S. PAT. OFFICE
NO BRUSH MARKS

Ask Your **NU-ENAMEL** Dealer For This Instruction Folder

Contains the step-by-step story of how you can Paint-It-Yourself with Nu-Enamel and get a professional looking job.



"Paint-it-Yourself"

It's EASY! It's FUN!

Clinic



for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Condensation Reduces Efficiency of "Side-Arm" Water Heater

Q—The pipe that carries fumes from my thermostatically controlled side heater to the chimney is made from gutter downspout. When I use the heater, water runs out of the pipe about 2 ft. from the heater. Where does this water come from?

M. R.—Canton, Ohio.

A—Your trouble is caused by condensation. Combustion releases water vapor in considerable quantity. When the heater shuts off, the pipe cools more quickly than the moisture-laden air inside. This moisture condenses on the cooler inner surface of the pipe and runs out at the joints. One remedy is to shorten the vent pipe and reduce the natural draft through the burner. This can be done by installing a draft deflector on top of the burner unit.

Partitioning Kitchenette and Living Room

Q—My front door opens directly into the living room and there is no partition between the living room and kitchenette. What can I do to make a more pleasing arrangement?

H. B.—West New York City.

A—What you can do depends on the size of the room, that is, the amount of space you have available in which to make changes. Usually, where the outside door opens directly into the living room, there isn't much you can do about this particular situation without extensive remodeling which would involve changes to both the interior and exterior of the building. However, attractive interiors can be made by installing an open partition and counter between the two rooms. This gives only a partial separation, but it is sufficient to obtain a more pleasing arrangement of the furnishings of the two rooms.

Filler Turns White on Hardwood Floor

Q—I sanded my hardwood floors myself, then applied a light-oak wood filler and two coats of shellac. Now the filler has turned white. What can I do to remedy this?

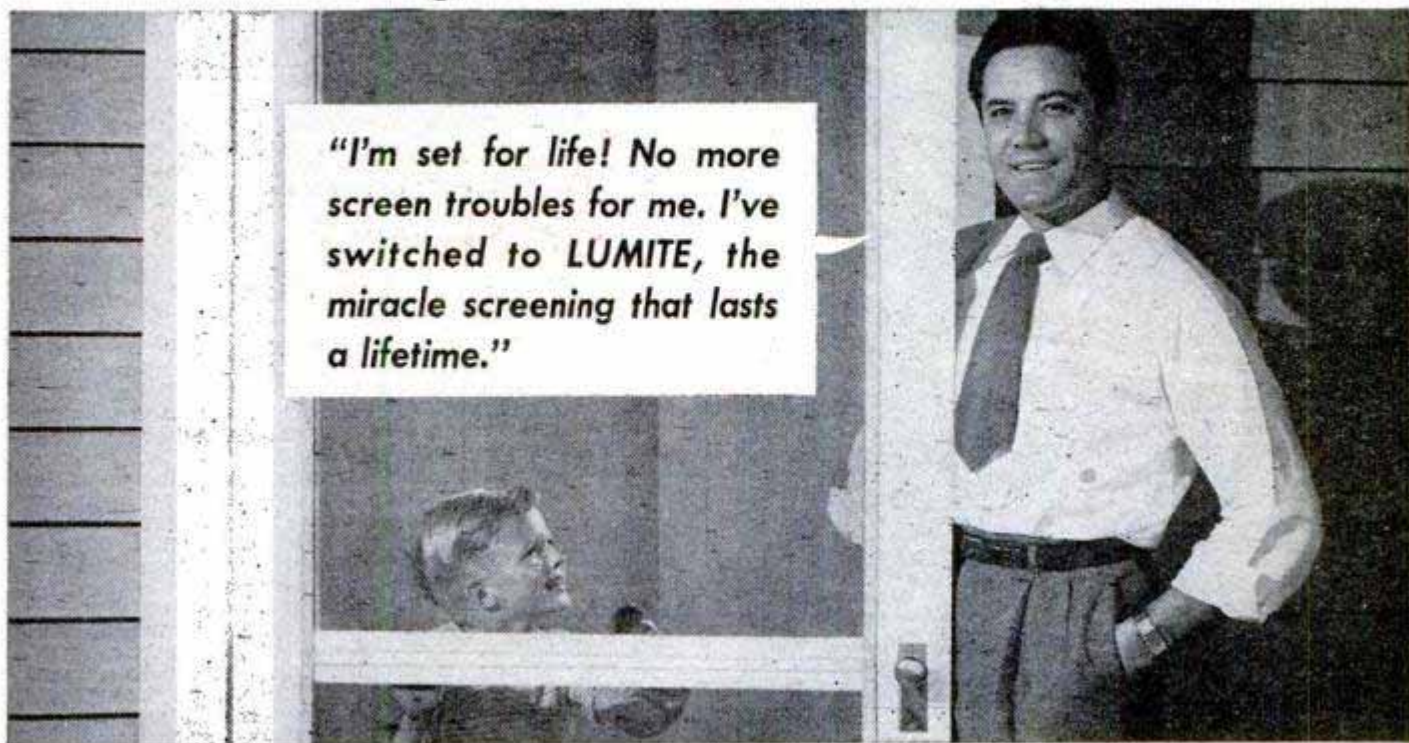
W. D.—Overland, Mo.

A—We believe it is the shellac, rather than the filler that has turned white on your hardwood floor. There also could be other reasons, but we cannot say definitely without knowing more about the floor's history. At any rate, we believe that the best and probably the surest procedure would be to remove the shellac, taking care to get all of it off, and then apply a sealer. Allow this to dry a little longer than the prescribed time, then follow with a coat of floor varnish. This should give you a good finish.

(Continued to page 236)

NOT IN 100 YEARS

Will this screening ever rust, corrode or stain your house !



This spring get this amazing new screening that's sweeping the country

Incredible, but true, LUMITE screening will NEVER rust, NEVER corrode, NEVER stain your house! Laboratory tests . . . and actual use in homes throughout the country have proved that LUMITE will not change in any weather or climate!

Woven of saran's tough, resilient plastic fibres, LUMITE is virtually indestructible. It never needs painting . . . always stays

taut and firm . . . protects the beauty of your house. This amazing new kind of screen is in stock today at your Hardware, Lumber, or Building Supply Dealer. If you need screens for any part of your house this spring, be sure to order your supply of LUMITE now!

For further information and free sample

write Dept. 42, Lumite Division
Chicopee Manufacturing Corporation
47 Worth Street, New York 13, N. Y.

Rustproof!

Stainproof!

Never needs painting!

Lasts a lifetime!

*®



Screen once and for all with

LUMITE*

Woven of saran

**53¢ VARNISH
VALUE
FOR ONLY 25¢**



**TOUGH! HARD!
UNHARMED
BY LIQUIDS!**

★
**FINEST VARNISH
DEVOE EVER
MADE**

★
REPLACEMENT OR A REFUND OF MONEY
Guaranteed by
Good Housekeeping
IF NOT AS ADVERTISED THEREIN

DRIES IN 4 HOURS

(May vary from 3 to 6 hrs.
depending on conditions.)

Users from coast to coast
acclaim Devoe 87 Spar as the
postwar varnish miracle!

Devran*, the new resin created
in the Devoe Laboratories, makes
it the most damage-resistant var-
nish in generations!

USE TEST COUPON TODAY—This offer
gives you enough to finish a piece
of furniture or 20 sq. ft. of wood-
work, floor or linoleum! Mail cou-
pon direct to Devoe with 25¢ for
full ¼ pint of Devoe 87 Spar!

*Patent applied for

87 SPAR TEST COUPON

DEVOE & RAYNOLDS CO., INC., Dept. J-1
787 First Avenue
New York 17, N. Y.

Enclosed is 25¢ for a ¼-pint test sample of
Devoe 87 Spar Varnish (retail value 53¢)

Name.....

Address.....

City..... State.....

This offer expires June 1st

ANOTHER DEVOE PRODUCT

DEVOE & RAYNOLDS COMPANY, INC.

787 First Avenue, New York 17, N. Y.

Removing Linoleum From Concrete Floor

Q—My home has a concrete floor covered with roll roofing and linoleum cemented down. We would like to remove this covering and lay a hard-wood floor. Is this advisable and how should it be done?

V. F.—Kalkaska, Mich.

A—We doubt the advisability of attempting to remove a floor covering which has been installed as you describe. Although it can be done, with painstaking care, it is difficult to get up the covering intact. If your floor is dry the year 'round—and it should be with the treatment you describe—we see no reason why you cannot lay the new floor over the old one by anchoring wood furring strips to the concrete. However, floors laid on furring strips tend to develop squeaks and looseness due to the fact that the nails cannot be staggered.

Painting a Concrete Floor

Q—How can I paint a concrete floor, the surface of which seems to be poorly bonded so that I sweep up fine sand and dust constantly?

A. G.—Sullivan, Ind.

A—Your description of the concrete floor raises the question of the condition of the floor. If we correctly interpret your description of the way the floor "dusts" when swept, it seems rather doubtful if painting would remedy the trouble. In ordinary procedure a concrete floor is prepared for painting by thoroughly cleaning the surface then applying zinc sulphate, which acts as a neutralizer and prevents discoloration of the paint or enamel. This is followed by one or two coats of floor enamel as the job requires. However, if your floor is dusting badly, as it seems to be, it is a question whether the zinc-sulphate treatment plus the enamel coating would be sufficient to anchor the loose material on the surface. If this looseness is due to normal wear then the paint film is likely to be broken up. Another suggestion is to cover the floor with either asphalt or rubber tile. However, this would be practical only if the surface is reasonably smooth with no offsets due to cracks.

Cleaning Marble

Q—I have a slab of marble which apparently has been used for a long time. It is rough and stained. I tried pumice stone but this does not seem to remove the stain. What will clean the marble?

W. H.—Greenville, Tex.

A—Ordinarily, marble is cleaned readily with a mild solution of oxalic acid applied with a sponge or cloth swab. (Do not get the solution on your hands.) The marble must be washed immediately with quantities of clean water to remove all traces of the acid. After this treatment, you can at least partially restore luster by rubbing with precipitated chalk. Make a paste of chalk and water and rub with a soft pad—an old shoe polisher will do.

Bonding Sandpaper to Disk

Q—I have tried several adhesives—wood glue, rubber cement, etc.—for bonding sandpaper to a metal sanding disk. None of these seem to hold satisfactorily. What should I use for this purpose?

M. M.—Brockton, Mass.

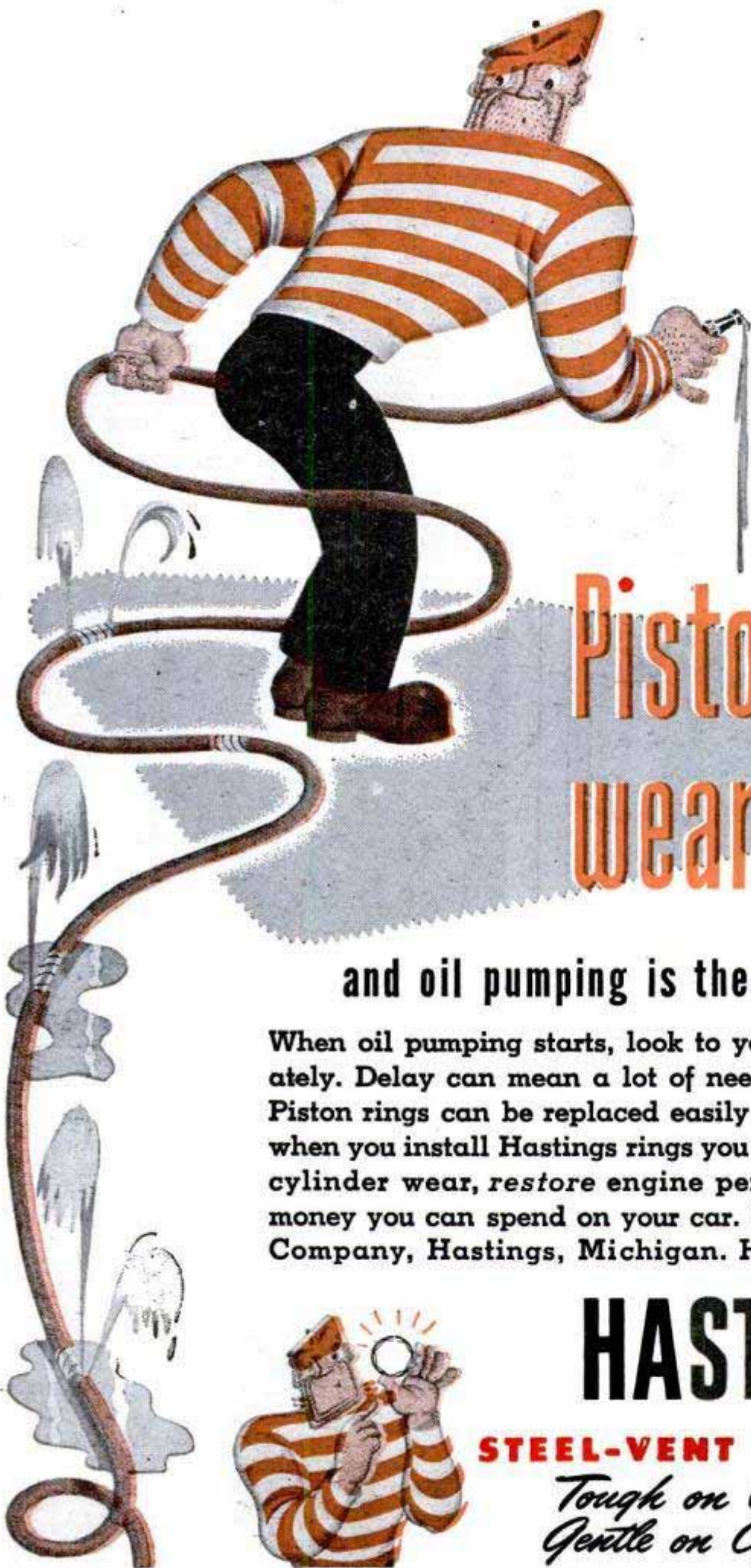
A—A stick adhesive is most commonly used for bonding sandpaper to disks. This is readily available from dealers handling power tools and power-tool accessories.

How To Remedy "Hammering" in Water Pipes

Q—When I open and close water faucets in my home, there is an unusual pounding noise and the water pipes seem to vibrate. What is this and how can I correct it?

R. R.—Apopka, Fla.

A—This is known as water "hammer" and usually is due to air entrapped in the system. The simplest and generally the surest remedy is the installation of an air chamber. Just where to locate this is difficult to say offhand without examining the system, but usually it should be placed at the end of a long run of pipe. A common installation is to cut the pipe, install a tee and a piece of pipe varying in length from 1 to 4 ft. or more. The end of the pipe is closed with a cap to form an air chamber. This type of installation usually cures the trouble.



Piston Rings wear out, too

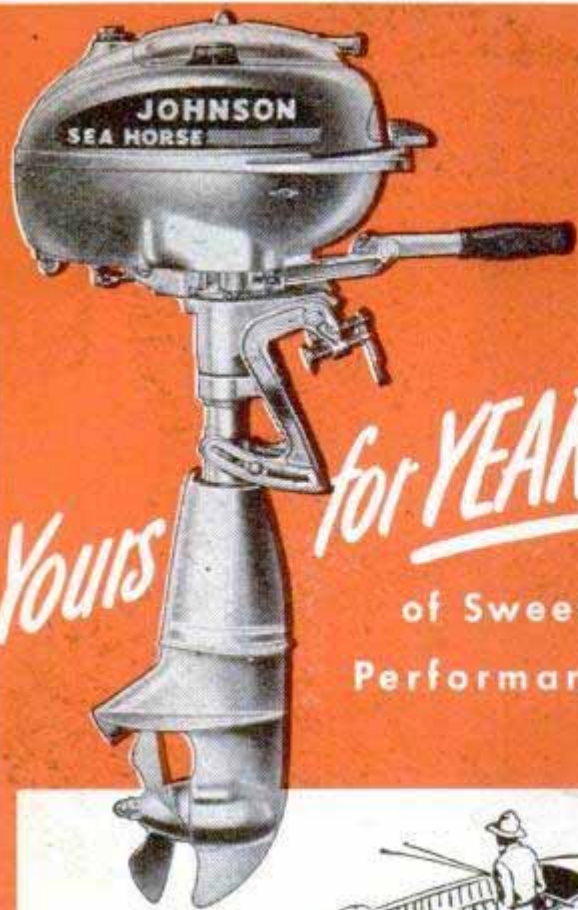
and oil pumping is the first symptom

When oil pumping starts, look to your piston rings immediately. Delay can mean a lot of needless grief and expense. Piston rings can be replaced easily and inexpensively. And when you install Hastings rings you *stop* oil pumping, *check* cylinder wear, *restore* engine performance. It's the best money you can spend on your car. Hastings Manufacturing Company, Hastings, Michigan. Hastings Ltd., Toronto.

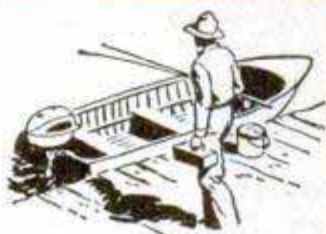
HASTINGS

STEEL-VENT PISTON RINGS

*Tough on Oil Pumping
Gentle on Cylinder Walls*



Yours for **YEARS**
of Sweet
Performance



When you look for quality features in an outboard motor, look for them in the line where they were originated, developed, and perfected!

- | | |
|----------------------------|---|
| Perfected Alternate Firing | Ready-Pull Starter |
| Dual Carburetion | Die Cast Cylinder Block |
| Reverse | Anti-Cavitation Plate |
| Rotary Valve | these, and more, are Johnson developments |
| Shock Absorber Drive | |

JOHNSON
SEA-HORSES
for *DEPENDability*

FREE HANDY CHART

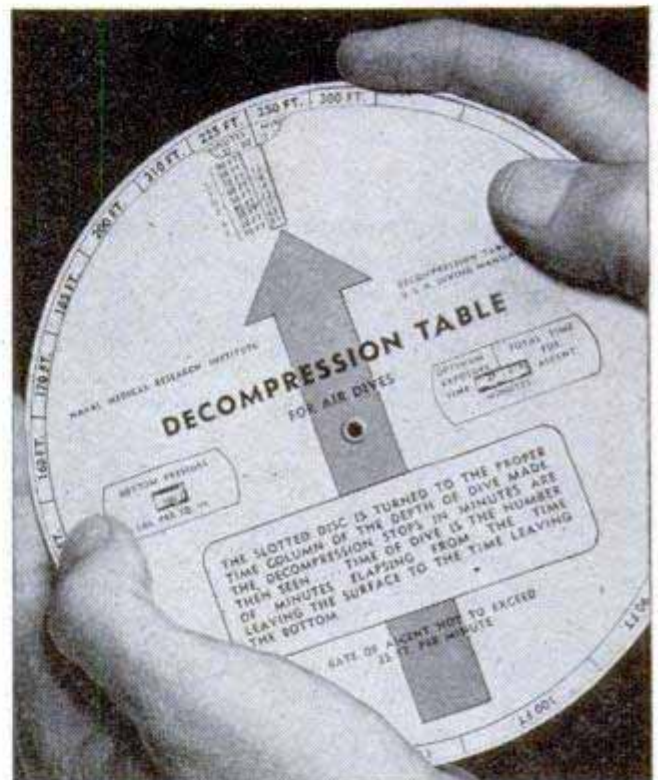
New! Illustrates and charts the 5 great Johnsons for '48. Sent free. Write... Look for the name of your Johnson dealer under "Outboard Motors" in your classified telephone book. JOHNSON MOTORS; 400 Pershing Rd., Waukegan, Illinois
Johnson Motors of Canada, Peterboro, Canada

the Navy calls Composition "C." When the superstructure of a sunken vessel is to be blown off, cratering charges are used. For cutting metal or wood, the explosive is kneaded into a manila rope and wrapped around the object to be cut.

There are two real dangers in underwater demolition jobs: undiscovered explosives in the ship, and a premature explosion while the diver is in the water.

Although most divers today are skilled underseas craftsmen, some of them branch out into unique businesses of their own.

An ex-Pfc from Oregon could hardly wait until he'd finished his course at diving school before heading back to the Rogue River. He figured that gold-bearing gravel could be taken out of the river with an air



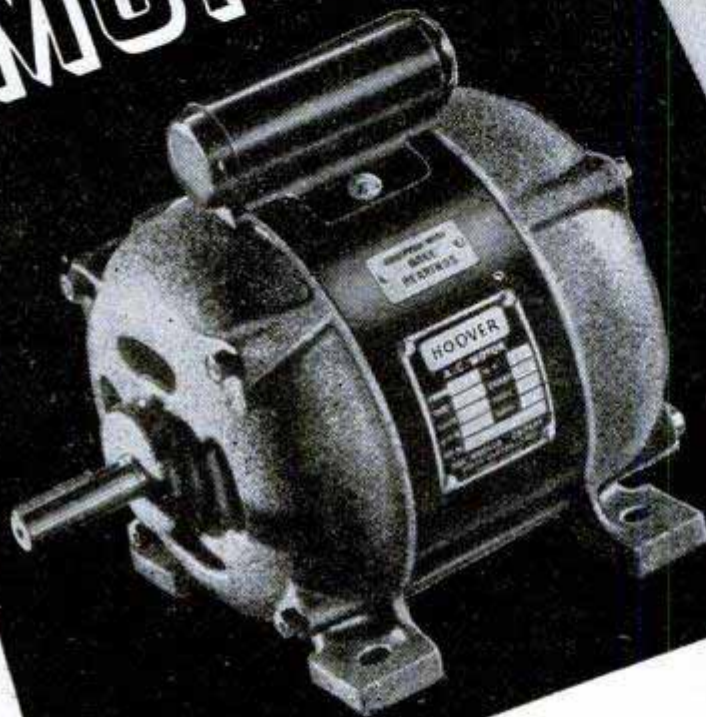
Decompression table shows how long deep-sea diver should remain on underwater "stages" to avoid bends

lift—in places too deep for the prospector and his cradle, too shallow for the dredges. When last heard from he was removing 15 to 18 tons of gold-bearing gravel a day which ran from \$3 to \$4 a ton.

A former Navy man from Pennsylvania also had a money-making idea. Picnickers and vacationists on the lakes of Pennsylvania, Ohio and New York were always dropping watches, binoculars, diamond rings, outboard motors and other objects into the water. Why not set up a regular route to these vacation spots—hitting each one about once a month? Six, eight or 10 persons who had lost something in the water would pay his day's wages.

(Continued to page 240)

HOOVER MOTORS



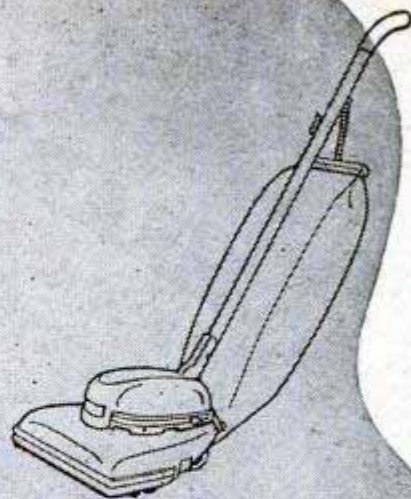
1/4 up to 1 horsepower

Yes, Hoover motors are built by the makers of the world-famous Hoover Cleaners.

This means every Hoover motor is backed by the same reliable skill that has built over seven million Hoover Cleaners.

No wonder a rugged Hoover motor will give you years of efficient, dependable service.

Put a Hoover motor to work—in your home, in your workshop or hobby shop. Watch how it speeds your job, saves your time.



**A GREAT NAME . . .
A GREAT MOTOR**

HERE'S WHY YOU'LL LIKE HOOVER MOTORS

Induction run . . . single phase . . . 60 cycles . . . dual voltage —110/220 . . . 1725 R.P.M.

Capacitor start . . . more than 300% full load starting torque with minimum current flow.

No vibration or "shift" . . . integral feet, carefully machined to give solid mounting and quiet operation.

Low temperature . . . electrical and mechanical design for low-temperature operation. Ventilated open type. 40° C. Rise.

Laminated steel rotor . . . carefully ground and balanced for maximum efficiency.

Centrifugal starting switch . . . designed and built for years of trouble-free operation.

High-grade ball bearings . . . sealed against dust and grit, give smooth performance and long wear.

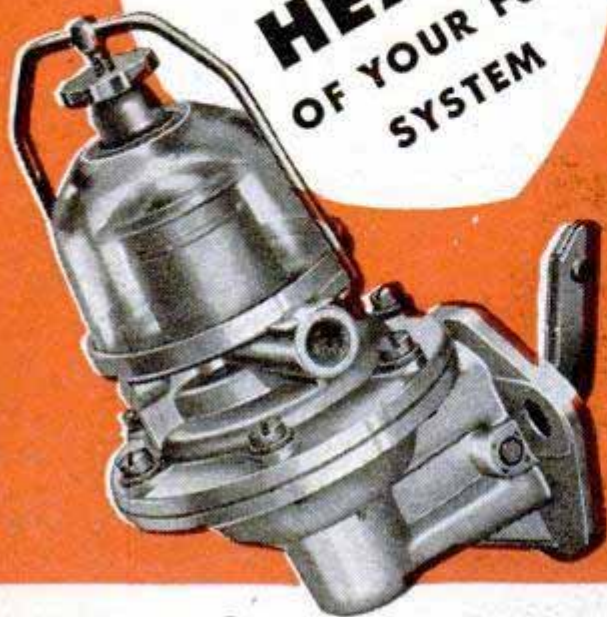
Rotation . . . clock or counterclockwise.

See your authorized Hoover motor dealer. If unable to locate, write

THE HOOVER COMPANY

Electric Motor Division, North Canton, Ohio • Hamilton, Ontario, Canada

THE FAITHFUL
HEART
OF YOUR FUEL
SYSTEM



**OVER
30,000,000 IN USE
TODAY**

Pulsing steadily, nearly 100,000 times an hour, your AC Fuel Pump is the strong, reliable heart of your fuel system. It has given you long, faithful service because of its inbuilt quality and scientific design.

You can prolong that faithful service indefinitely, if you insist upon a new AC when you replace your present pump.

There is no satisfactory substitute for quality.

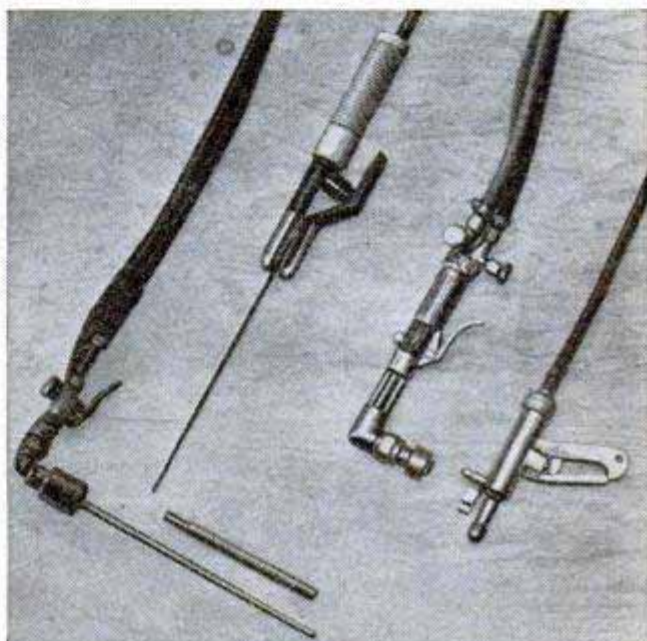


AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

A New Zealander, after completing diving school, remained in California to become a collector of agar, a sort of deep-sea alfalfa. Agar is finding a number of uses in the manufacture of confections, paint, cosmetics and pharmaceuticals. When the weather is good he collects three tons of agar every three days at \$85 a ton.

Two young men on the St. Marie's River in Idaho noticed that logs floating downstream in the spring and summer often rammed into mud banks and became stuck under water. "Let's learn to dive and get these things free," one of them suggested. Now they spend eight months of the year freeing logs, and their pay at \$15 per thousand board feet allows them to ski at Sun Valley the other four months.

So there's money to be made in the pro-



Essential tools for cutting and welding are, left to right, oxyelectric torch, electrode holder, oxyhydrogen torch and air-operated igniter for torch

profession of deep-sea diving — whether you want to be a skilled underwater craftsman or go into the diving business for yourself.

Consider what Lieutenant Cross says:

"Sonar and other underwater sound gear, developed by the Navy during the war, are going to make treasure hunting a lot easier from now on."

In addition to sunken treasures of the past centuries there are at least two new ones. In World War II the Army dumped \$8,500,000 worth of silver coins off Corregidor. Much of it has been recovered, but there is still a fortune lying in the mud. Another treasure, estimated at several million dollars, was dumped into the Black Sea by a central European government threatened by the Nazis.

"These and others await anyone who can dive for them," says Lieutenant Cross.

SAVE YOUR PRECIOUS EYESIGHT!

Soften that **GLARE...**
wear these genuine

U. S. ARMY AIR FORCE TYPE

SUN GLASSES



SPECIAL OFFER
WHILE
THEY LAST!



Regular \$15.00 Value

SUPER-SENSATIONALLY PRICED

at only **\$2.49** including convenient leather case
Men's and Women's sizes!

Imagine! These attractive, optically-correct sun glasses at such a bargain price! U.S. Gov't. approved for meeting all specifications for absorption of ultra-violet and infra-red rays.

DON'T BE A SUMMER AND WINTER SQUINTER!

Effectively protect your eyes from harsh glare of summer sun and winter snow. Wear these smartly-made, official Army type sun glasses for carefree, glare-free pleasure . . . the year 'round!

- Ground and polished 4 base lenses.
- Gold plated adjustable frames.
- Pearlloid sweatband and pads.
- Made to highest optical standards.
- Absolute satisfaction guaranteed or money cheerfully refunded.

LIFETIME GUARANTEE!

If at any time during the life of these sun glasses you return them to us for repairs, we will be glad to fix them for a nominal service charge of 50c.

AMERICAN HANDICRAFTERS, INC.

Division of S & B Surplus Sales Co.

2905 W. Madison St.

Chicago 12, Ill.

HURRY! FILL OUT AND MAIL THIS ORDER COUPON NOW!

AMERICAN HANDICRAFTERS, INC., Dept. P5
2905 W. Madison Street, Chicago 12, Ill.

Please send me _____ men's _____ women's SUN GLASSES.

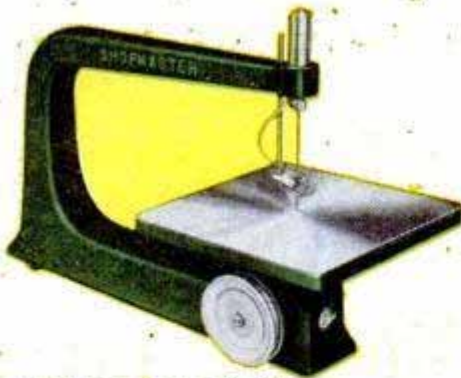
- Send C.O.D.
 Enclosed find check or money order for \$2.49 pr. postpaid.

Name _____

Address _____

City & State _____

(Illinois residents add 2% ret. occ. tax)



15" Tilting Table Jig Saw



A boat of your own will add to your fun this summer. You'll find one easy to build with Shopmaster Tools.



Travel in your own house trailer. Parts are now available and you can build one yourself with Shopmaster Tools.



Enhance the beauty of your home or lake cottage with trellises, garden furniture and other projects easily made with Shopmaster Tools.

Large projects or small, you can give them that professional touch which means beauty and long life, when you use Shopmaster Tools.

Shopmaster tools are built to meet the requirements of precision work, yet the controls and ease of operation makes them ideal for the beginner and home craftsman. They embody design and operational features found only in the best equipment. Handsome additions to your workshop, you'll find Shopmaster Tools most reasonably priced.

15" Tilting Table Jig Saw — new style blade support, blower, and with mechanism encased in oil.

6" Jointer-Planer — with sealed-for-life ball bearings and an exceptionally large table capacity.

12" Bench Type Drill Press — performs perfectly on drilling, routing, mortising and other jobs.

8" Tilting Table Bench Saw — with ball bearing arbor, accurate calibrations and many other features not ordinarily found on bench saws.

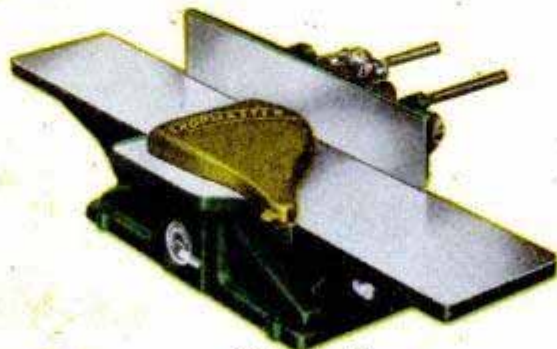
Adjustable Stands — two models designed to hold power tool and motor.

10" Wood Turning Lathe — exceptionally accurate to full 31 inch capacity.

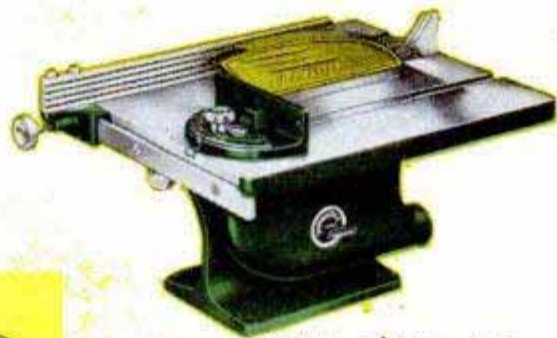
12" Tilting Table Band Saw — with fully enclosed adjusting and operating mechanism, and dynamically balanced wheels.



12" Bench Type Drill Press



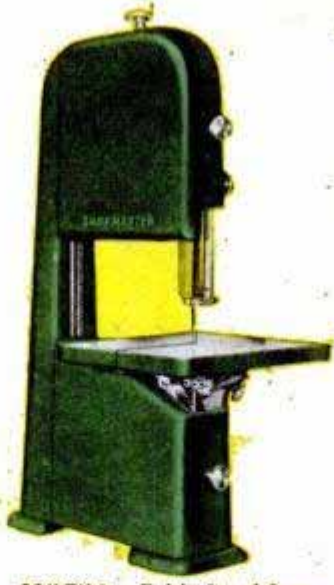
6" Jointer-Planer



8" Tilting Table Bench Saw



Adjustable Stand



12" Tilting Table Band Saw



10" Wood Turning Lathe

SHOPMASTER, INC.
1214 Third St. S., Minneapolis 15, Minn.

Please send me information on Shopmaster Tools.

NAME _____

ADDRESS _____

CITY & STATE _____

SHOPMASTER, INC.
1214 Third St. S., Minneapolis 15, Minn.



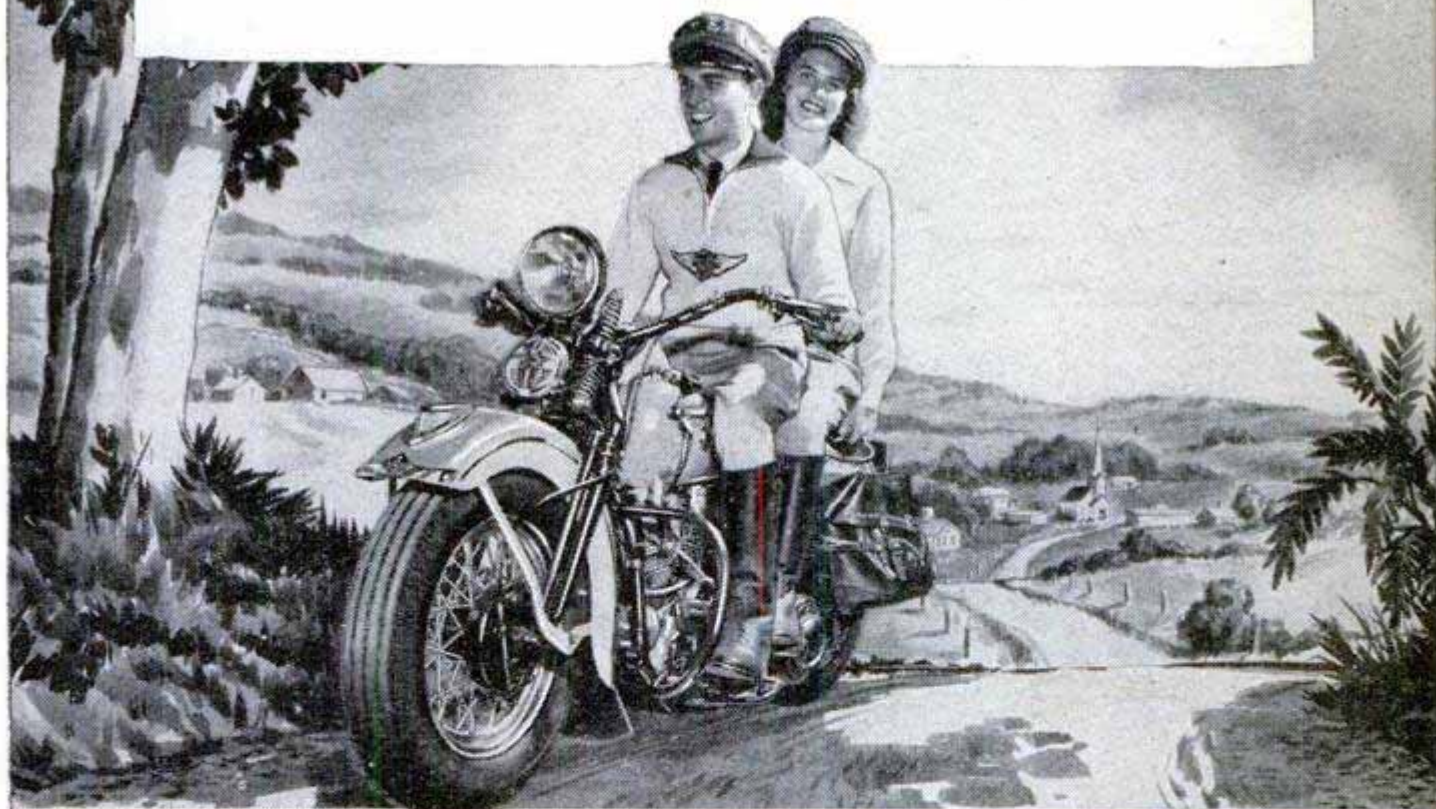
fun thrills
excitement



when you own a

HARLEY-DAVIDSON

Like to roam? Does a winding road fascinate you with its alluring promise of something new around every bend? Do you enjoy country air, the fragrance of fields, meadows, woodlands? Do tumbling waterfalls, quiet lakes, broad rivers bring you back to them again and again? Then you'll like motorcycling, world's greatest sport! For it takes you places, out in the open, to scenic wonderlands, faraway cities, brings you the thrills of gypsy tours, race meets, hillclimbs, exciting vacations . . . makes every spare hour mean happier, healthier outdoor enjoyment. It's so easy to enjoy motorcycling, easier than you think to own a genuine Harley-Davidson. Why not get started now? See your dealer. Mail coupon today.



HARLEY-DAVIDSON MOTOR CO.
Dept. P, Milwaukee 1, Wis.

Send free copy of ENTHUSIAST magazine, filled with motorcycle action pictures and stories; also literature on 1948 models.

Name.....

Street or R.F.D.....

City..... Zone..... State.....

"Hope this won't make
you mad, Jerry..."



JERRY: What's on your mind, Uncle Pat? I can take it.

UNCLE PAT: Well, you'd better return that saw and get your money back—if you still can.

JERRY: What do you mean? What's the matter with this saw?

UNCLE PAT: It's one of those bargain counter orphans, Jerry. No brand name. No reputation. Nothing behind it to back it up. It'll let you down just as sure as you're born.

JERRY: Brand names aren't *that* important, are they?

UNCLE PAT: They are to *me*. I want *quality* when I buy tools. That's why I always do my buying at the hardware store, where they carry the best in every line. And believe me, I never put my money down till I see a brand name I can trust.

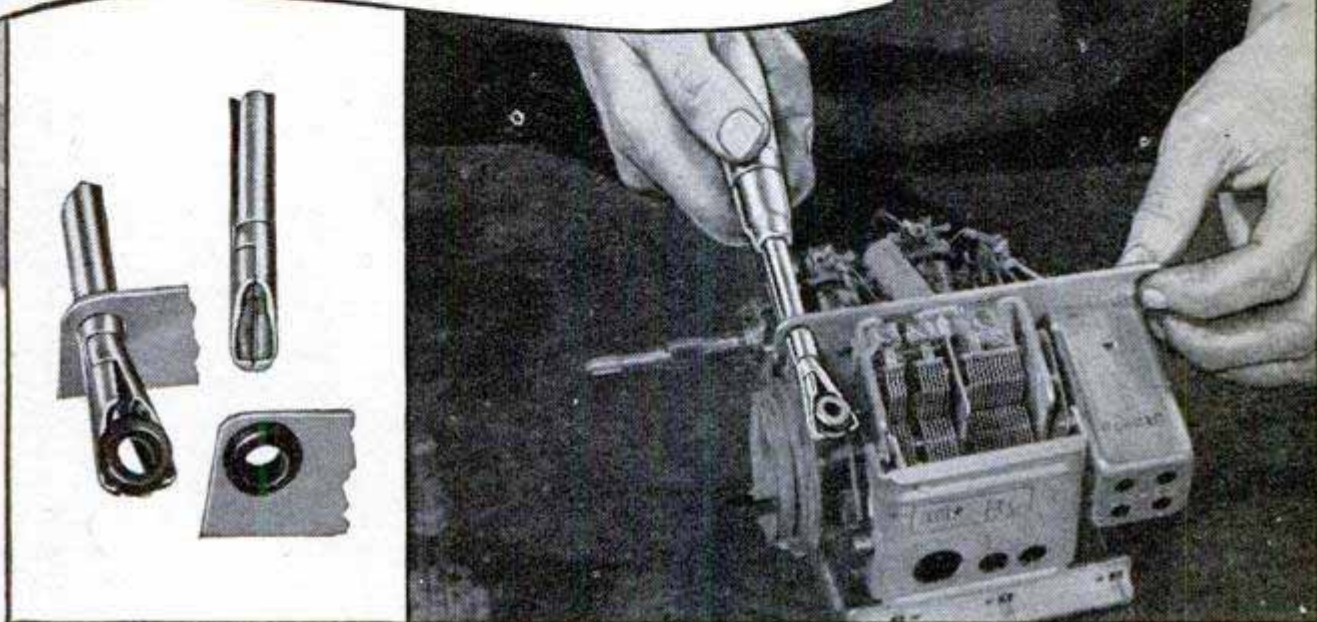
Your **HARDWARE DEALER** sells **QUALITY** tools
and hardware... Buy from HIM



POPULAR MECHANICS

Ingenious New Technical Methods

To Help You
Simplify Production



New Tool Inserts Rubber Grommets Quickly . . . Easily!

A new tool called a Grommet Inserter is shown above inserting a rubber grommet in a Sub-Chassis of a Zenith 7H820 Table Model Radio. The inset illustrates a close up view of the Grommet Inserter before and after the grommet has been inserted.

Anyone can insert grommets in an instant with the new Grommet Inserter. Saves time, labor, and assures perfect fit. No longer is it necessary to use the time-consuming, cumbersome method of insertion by hand. The new Grommet Inserter does it efficiently.

Simple as A-B-C. All you do is push the Grommet Inserter through the hole, open jaws, place grommet in jaws, and pull back—leaving grommet firmly in place, and perfectly fitted. Comes in four standard sizes: $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{7}{16}$ ". Can be furnished in any special sizes to order.

You can count on chewing gum, too, to help step up employee's on-the-job efficiency. Chewing gum helps relieve tension and thereby enables him to work quicker and easier while leaving hands free. That's why more and more plant owners are making Wrigley's Spearmint Gum available to everyone.

*Complete details may be obtained from
D. B. Rich Manufacturing Co., 6217 Melvina Avenue
Chicago 30, Illinois*



Grommet Inserter



AC-64

Doll Doctor

(Continued from page 154)

On the work areas are racks and drawers containing standard surgical and dental instruments plus some common workbench items and an assortment of special knives, pallets and hooks which Nash designed and made. The dental and medical instruments help lend an authentic atmosphere, but they are not primarily for show. Nash actually uses them in many of his doll-repair operations. A haemostat, for instance, makes an excellent clamp for holding the elastic cords used to string a doll's arms, legs, head and torso together. And there are a hundred uses for a surgeon's scalpel. A flexible-shaft outfit originally intended for a dental laboratory is handy for delicate carving on doll heads, hands and other parts. The patching material used to close a break in a head or body can, after drying, be smoothed quickly with a dental burr driven by the shaft.

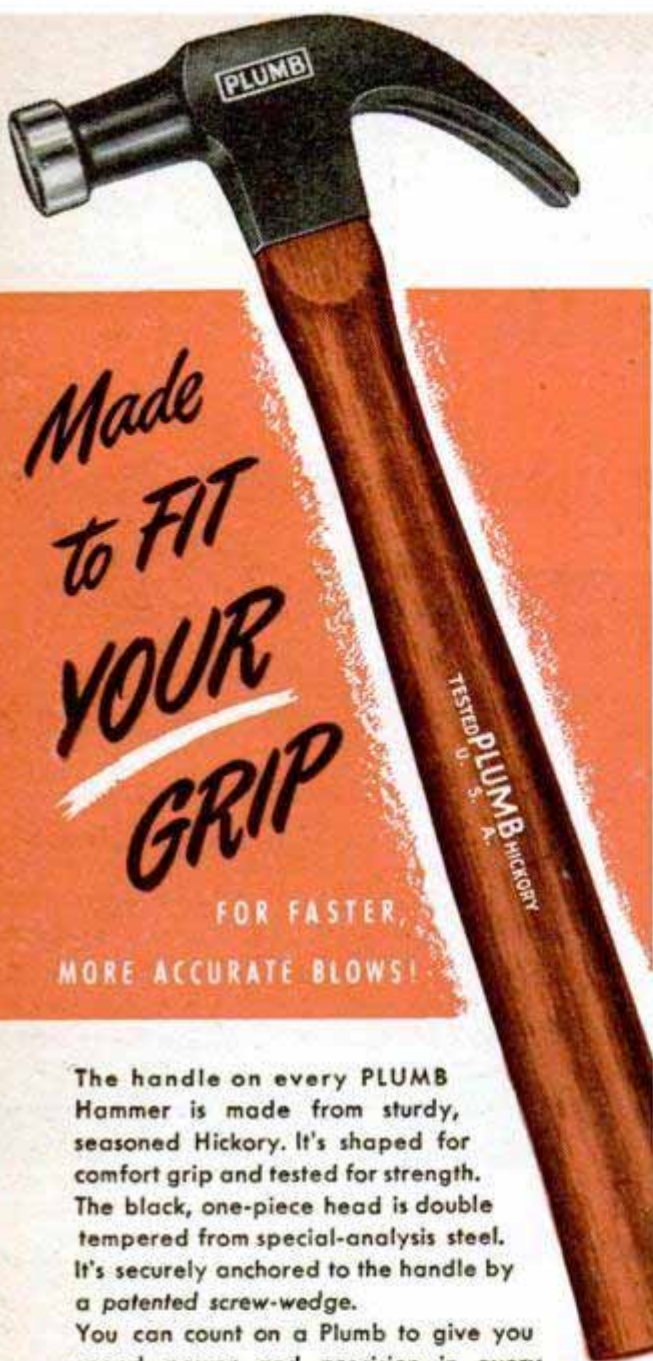
Another room is used for making wigs and clothing and for painting and tinting doll heads and bodies. Wig-making is discouraged, but when a customer brings in hair and wants it made into a wig for a keepsake doll, there isn't much Mrs. Nash can do except comply. Usually a stock wig is used, made of material like mohair or horsehair—seldom of human hair.

Doc Nash now is looking for an old-fashioned dentist's gas outfit that he can install in his operating room for atmosphere. And he plans to convert the fifth room of his establishment into a six-bed ward for doll babies.

Nash claims to be one of the few doll-repair specialists who actually repair. That is, he makes a practice of rebuilding broken heads, arms and other parts whenever possible; only as a last resort does he replace the damaged parts with new or usable old ones. In this way, the customer feels that he or she is getting the original doll back. Sometimes a doll looks beyond hope—with the body completely disassembled, perhaps a considerable hole in the head, part of a foot missing and invariably one or more fingers no longer present.

The first thing Nash does is to clean up the body and remove the original finish. Then, using his own plastic repair materials, he mends breaks, fills holes and rebuilds missing parts. He spent some time with paint manufacturers in developing a satisfactory rapid-drying enamel for finishing doll bodies. He can produce either a shiny or an eggshell finish. The normal re-finishing requires one or two applications

(Continued to page 248)



Made
to FIT
YOUR
GRIP

FOR FASTER,
MORE ACCURATE BLOWS!

The handle on every PLUMB Hammer is made from sturdy, seasoned Hickory. It's shaped for comfort grip and tested for strength. The black, one-piece head is double tempered from special-analysis steel. It's securely anchored to the handle by a patented screw-wedge. You can count on a Plumb to give you speed, power and precision in every blow. Yes, Plumb is a lifetime tool, built for permanence. Fayette R. Plumb, Inc., Philadelphia 37, Pa.

Quality Comes FIRST
PLUMB
is FIRST in Quality

The red handle with the black head—exclusively Plumb.

PLUMB

HAMMERS • HATCHETS • AXES • FILES

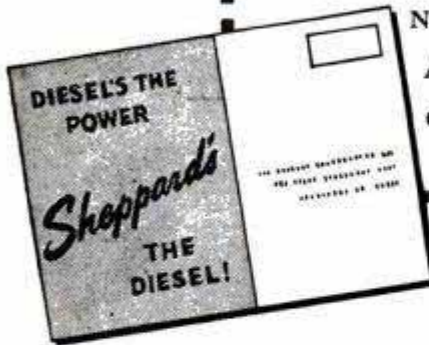
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R. H. SHEPPARD CO., INC., 305 Philadelphia St.
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Please send me your FREE Sheppard Diesel Engine Booklet.

I am especially interested in (check one):

- Diesel Power Units
- Diesel Marine Auxiliaries
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FREE Sheppard Diesel Engine Booklet

Find Out How These Amazing Small Diesel Engines Can Solve Your Power Problems

At last—here's safe, dependable, economical Diesel power for SMALL engine users! Sheppard Diesels will do any job a gasoline engine will do—at one-quarter the fuel cost—with less maintenance. Farmers, contractors, plant operators, coal mines, oil wells, hatcheries, air lines, railroads, boats and ships are all saving money—getting a better job done—with Sheppards! They're using them to drive cranes, pumps, compressors, mills, generators, conveyors, rollers, scrapers and other power-driven equipment. So find out how Sheppard can help you solve your power problems! Mail coupon today for FREE Sheppard booklet. No obligations!

These Sheppard Features Mean Ease of Operation!

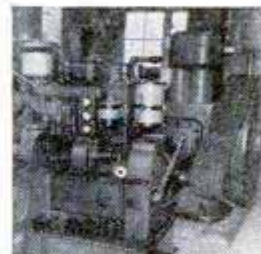
PUSHBUTTON STARTING . . . in any weather. A child can start any Sheppard Diesel! Just press button; to stop—close throttle. Operates itself.

AMAZINGLY LOW FUEL COSTS! Uses only half as much fuel as gasoline engine, and fuel costs only half as much—less than 1/4 of operating cost of gas engine.

SIMPLE DESIGN FOR EASE OF MAINTENANCE! Only ONE moving part in the injector. No carburetor, no ignition system. Easily serviced.

DELIVERED COMPLETE, READY TO OPERATE! No extras to buy on any Sheppard Power Units. All the accessories are STANDARD EQUIPMENT.

SHEPPARD DIESEL CUTS ICE PLANT POWER COSTS 66 2/3%! Evergreen Fruit Farms, Warwick, N. Y., formerly operated its cold storage compressor from a tractor drive—now uses a Model 6A Sheppard Diesel, and saves 2/3 of former power costs—because Sheppard does more work with 1 gallon of fuel, at half the price, than the tractor did with two.



SHEPPARD DIESEL POWERS MACHINE SHOP FOR 3 1/2 YEARS WITHOUT OVERHAUL. Henry Riehl & Son of Philadelphia secure power for their entire machine shop from one Model 6 Sheppard Diesel, which was installed in June, 1941, and operated the shop 9 hours a day, 6 days a week, for 3 1/2 years before overhaul became necessary! Another example of Sheppard dependability.

Which of These SHEPPARD DIESELS Will Solve YOUR Power Problems?

SHEPPARD AIR-COOLED DIESEL (Model 14)—5.4 H. P., pushbutton starting. Delivered complete, ready to operate.



SHEPPARD POWER UNITS—3.5 to 100 H. P. Pushbutton starting. Delivered ready to operate, no extras to buy.

SHEPPARD GENERATING SETS—2 K. W. to 36 K. W., A.C. or D. C. Pushbutton starting. Optional automatic starting.



SHEPPARD MARINE ENGINES—3.5 to 100 H.P. Pushbutton starting, reduction gears, etc. are all standard equipment. No extras to buy.

SHEPPARD MARINE AUXILIARIES—Complete with fire, bilge or fish wash pump; compressor; generator. Other special equipment as required.



DIESEL'S THE POWER *Sheppard's* **THE DIESEL**



... Quick Easy Way to BIG PROFITS

Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9 1/2 hours' work on Monday and Tuesday."
 "Enclosed are twelve orders secured after supper this p.m."

Housewives are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one... That's the reason why our distributors are so successful... You also have the advantage of our other QUICK SELLING PRODUCTS that step up your Volume Sales and Profits.

Hands Never Touch the Water—Can be put in Boiling Water. Housewives Like It.

48" Long Handle

Sales QUICK, EASY Every Locality

SALES ARE EVERYWHERE... Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes... Scores can be sold on a single street... Note the Drain Bracket in the illustration... This squeezes out the water so thoroughly that HANDS NEVER TOUCH THE WATER... Makes no difference what you ever sold, you will like this proposition... Your name on a Post Card will bring you FREE PARTICULARS.

CELL-U-MOP CO., Dept. P-5 FREEPORT, Ill.

We Teach You How •

Gets down under and around for MOPPING, DUSTING or WASHING

DOES THE WORK OF 6 TOOLS IN 1

Get Choice Territory NOW!

Holds 20 times its weight in water.



32 DRAWER UNIT \$4.95
 64 DRAWER \$8.95

for home or shop

THE JIFFY CABINET

WITH LAMINATED FIBRE BOARD DRAWERS THE HANDY WAY TO KEEP SMALL PARTS, WASHERS, NAILS, SCREWS, NUTS, BOLTS AT HAND

DRAWER SIZE
 1 1/4" DEEP
 3" WIDE
 6" LONG

CABINET SIZE
 32 Drawer Unit
 6" DEEP
 12 3/4" WIDE
 15 1/4" HIGH
 Shipping Weight approx. 9 lbs.

64 Drawer Unit
 6" DEEP
 25 1/2" WIDE
 15 1/4" HIGH
 Shipping Weight approx. 18 lbs.

For small items, the low-cost Jiffy Cabinet, 32 or 64 drawer units that put office, shop, work bench, household and hobbyist needs at your fingertips. Metal flange drawer guides. Spot welded all metal cabinet with sturdy laminated drawers insures long time-saving service. Why fumble? With the Jiffy you know where it is. 32 drawer unit—\$4.95; 64 drawer unit—\$8.95. Send check or money order—No C.O.D.'s please. Ohio orders please add 3% Sales Tax. Shipping charges parcel post collect.

KAYTEE PRODUCTS
 Dept. M, Box 588 Canton, Ohio

Sand Casting — Forging — Heat Treating — Case Hardening BRONZE FOUNDRY



In your own workshop allows you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATUARY, ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a FOUNDRYETTE. Three sizes are available capable of making bronze castings of 1 1/2, 3 and 6 pounds weight, aluminum, copper, brass, etc., \$22.50, \$29.50, \$42.00 f.o.b. Kansas City. Domestic gas supply and 110 volt AC or DC energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
 Box 6022, Dept. P-4 Kansas City, Mo.

NONE BETTER! SUPER DRILL GRINDER



Sharpens round shank drills from 3/32" to 1-1/16" in diameter, up to 11" long. Grinds old drills like new in 4 different point angles, using hand or power grinding wheels. Money-back guarantee.

Price only \$2.95
 At Dealers or Postpaid
 CRANDALL MFG. CO. 1512 W. Slauson, Dept. FA-29, Los Angeles 44, Calif.

OWN A Printing Business

Cards, Tickets, Stationery, etc. Good profit in spare time. PRINT YOUR OWN greeting cards, movie titles, church work, etc. Save money. Easy rules supplied. Raised printing like engraving too. Have home shop. Sold direct from factory only. Send time for supply book, suggested outfits, all details and advice on your needs. No obligation. **KELSEY, INC. C-37, MERIDEN, CONN.**

PISTON TYPE COMPRESSOR EASY PROFIT IN PAINT SPRAYING



Paints walls, ceilings, screens, furniture and machinery faster, better. All complete as shown less motor. Carry anywhere. Fully guaranteed. Could be used with 1/4 H.P. motor or less. Price \$35.00 less motor F.O.B. Chicago. \$5.00 deposit balance C.O.D. or see your dealer. With motor \$55.00. **IDEAL AUTOMATIC PUMP CO., Dept. P.M. 8 Chicago 7, Ill.**

PACKAGED BOATS MARINE MART BOAT PATTERNS



Save 50%—build from our precision cut, plywood kits—preassembled frames—row, power, sail—dinghies—inboard and outboard runabouts—5 to 18 feet—finest design—full hardware—nothing else to buy—illustrated instructions—\$34.50 up—send 25c (coin) for literature.

BUFFALO 7-M, N. Y.

Order cut-to-shape patterns, blueprints, from Boat Pattern Catalog containing 60 world's best plywood designs—kayaks to cruisers—by outstanding specialists, MacGregor and Deed. Send \$1.00 for catalog plus Wm. Deed's booklet "Plywood Boats" (Pattern Catalog only, 25c coin).





THE TOUGHEST ALL-AROUND KNIFE IN THE WORLD!

Men, here's the world-famous Marine combat knife at tremendous saving. Brand new...with razor-keen 7" Parkerized rust-resistant blade....5" grooved leather handle....heavy leather sheath. Beautiful rugged knife unexcelled for a thousand outdoor and workshop uses. ORDER NOW AND SAVE! Send check, money order, cash. WE PAY POSTAGE!



Made by Ka-Bar and Camillus for the Marines

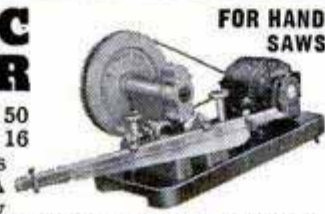
now \$2.00 just 3 for \$5 (f. o. b. Los Angeles)

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855 S. LOS ANGELES ST., LOS ANGELES 14, CALIF.

AUTOMATIC RETOOTHER

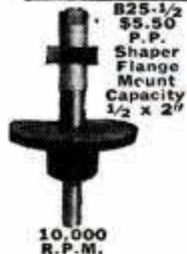
Cuts new saw teeth in 50 seconds — any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job. Write today for details on GREATER PROFITS FOR SAW SHOPS.



FOR HAND SAWS

BURR MFG. CO. 8933-Q Venice Blvd. Los Angeles 34, Calif.

BUILD YOUR POWER TOOLS



B25-1/2 \$5.50 P.P. Shaper Flange Mount Capacity 1/2 x 2"

WITH OUR GUARANTEED INDUSTRIAL POLY BALL BEARING ARBORS

New Departure Self Lubricating Bearings



10,000 R.P.M.

(No extra charge for left hand threads) C5-5/8 Pictured C4-1/2x12 1/2 spindle, housing 2x8 \$7.95 PP. C5-5/8x12 1/2 spindle, housing 2x8, \$8.25 PP. C6-3/4x12 1/2 spindle, housing 2 1/4x8, \$9.25 PP. D8-1x17 1/2 spindle, housing 2 3/4x11 \$17.00 PP. 1 INCH BETWEEN WASHER AND COLLAR

SHAPER ARBORS 3 inches between collars, C4-1/2 \$14.25, C5-5/8 \$14.25, C6-3/4 \$15.25, D8-1 \$23.00, B25-1/2x2" (pictured) \$5.50. SPECIAL SAW ARBOR LENGTHS for 1 1/2, 2, 3, 3 1/2, add \$1.50.

POLY PRODUCTS, 2032-A E. Walnut, Pasadena 8, Calif.



Opportunity UNLIMITED

Today hundreds of average American men and women are building a profitable business of their own with Tradio-ette, the coin radio functionally-designed for booth operation in taverns, restaurants, ice cream parlors, etc. Making money with Tradio-ette is about the simplest and most lucrative business you ever imagined. You need no experience and your educational background is of minor importance. You merely install the sets on a percentage basis in locations all around you and make periodic collections. Only a small investment is needed to get in on the ground floor. Opportunities for expansion are unlimited.

Send for complete information. Write: Dept. N-5.

TRADIO, Inc. ASBURY PARK NEW JERSEY

TACK WITH A GUN

It's Quick—It's Easy
It's
DUO-FAST

\$7.50
FACTORY PRICE



FOR YOUR HOME

NEAT — QUICK — PROFESSIONAL WORK

Making screens—insulating your home—reupholstering that old chair—tacking shelf paper—lining dresser drawers—tacking carpet and linoleum—attaching shade cloth to rollers—repairing furniture. Wherever tacks are used, DUO-FAST will do it better—quicker—neater.

FOR YOUR SHOP

INDUSTRY SAVES LABOR AND MONEY

Furniture mfrs.—carpenters—woodworking plants—shippers—sign makers—chain stores—home builders—display houses—luggage—screen wire—theatres—stock rooms—dept. stores—mechanics—mattress mfrs.—insulation—upholstering—automotive.

FOR YOUR SHIPPING

SIMPLIFIES WORK

Shipping tags
Waterproof lining

Protective padding
Lining box cars

It's DUO-FAST Wherever Tacks Are Used

DUO-FAST will do it Better—Quicker—Neater. It's lightning fast—just squeeze the handle—staples are driven rapidly, accurately and easily—even in close quarters.

The DUO-FAST Gun Tacker is operated with one hand, leaving the other hand free for holding work

RAPID LOADING — RAPID TACKING

140 staples per load in 2 different leg lengths 1/4" or 3/8"

5000 1/4" staples \$2.00

5000 3/8" staples \$2.25

Prices F.O.B. Chicago

Remit with order to save C.O.D. and postage charges

DUO-FAST makes many other tackers to fit your individual business. Write for information on Hammer tacker, Air tacker, Lip tacker and Narrow crown tacker.

Certain dealer territories open—write for full information.

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FASTENER CORPORATION
854 Fletcher St.
Chicago 14, Ill.

Please send me the following:

- DUO-FAST Gun Tacker
- For medium gauge staples \$7.50
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- For heavy gauge staples \$7.50
- C.O.D.
- Remittance Enclosed
- 5000 1/4" staples \$2.00
- 5000 3/8" staples \$2.25
- More information

Amount \$ _____
Remit with order to save C.O.D. and postage charges.

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★ HERE'S ONE for your boat!

The right one! From the complete six-model Evinrude line, it's easy to choose the motor that gives you exactly what you'd like in power and performance. Three thrilling four-cylinder motors . . . smoothest on the water! A brilliant new "Sportwin" with dozens of exciting new features! Two models with the revolutionary FISHERMAN DRIVE — *weedless, shoal-riding, snag-proof* . . . a boon to fishermen! See your Evinrude dealer — look for his name under "Outboard Motors" in the yellow pages of your phone book. Catalog FREE — write EVINRUDE MOTORS, 5762 N. 27th St., Milwaukee 9, Wis.

SPORTWIN
28 thrilling new features — it's complete even to a fuel gauge!

SIX MODELS
the right motor for every boat — 1.5 to 33.4 certified horsepower.

WRITE FOR CATALOG!



of undercoater followed by one to three finish coats. Using the same waterproof pigments, he paints in new eyebrows and other features. For the pink cheeks that are characteristic of most dolls he uses ordinary lipstick, blending it into the painted surface with a cloth. The lipstick, if it wears off, can be restored by anyone.

Doll surgeons usually find it difficult to obtain replacement parts that match the originals. Nash simply steps into his shop and, with the aid of power equipment and hand tools, fashions a new hand, leg, or other required bit of anatomy.

By watching the procession of Nash's clients, an observer can gain a fairly accurate idea of the doll hobby in the United States. Some of his visitors are doll collectors. Some collectors specialize in old china heads. Others will accept any kind of doll as long as it is 30, 40 or maybe 100 years old. Still others collect character dolls. And there are collectors who are happy to possess any kind of doll, new or old, that is attractive or interesting.

But a large percentage of Nash's hospital patrons are persons who might be called one-doll devotees. Sentiment is often the basis for a doll-repair job. One day a woman, who obviously was close to 75 years old, came into the hospital with a French doll in her arms. She wanted to know whether it could be restored to its original freshness. Nash, after a diagnosis, assured her that it would not be a difficult case, and asked her how she came to have the doll. Years before, the woman and her husband had lost their 13-year-old daughter. Later the husband had bought the French bed doll. Still later the husband died, and the doll since has traveled extensively with the woman. The years of wear made a trip to the hospital advisable.

Another French doll, a fashion type about 75 years old, was brought to Nash by a man who was a leading attorney in an Ohio city. After the doll had been repaired and dressed in a new costume, the attorney took it to his office and placed it on his desk. To curious visitors he explains that the doll belonged to his grandmother. Did he need a better reason for giving the doll a throne of honor?

Nash says that many men are doll fanciers. The ones that Nash has encountered are more critical than women collectors, know exactly what they want, and when they find it they are not inclined to haggle over the cost.

As a doll grows older it may become one of the few of its kind in existence. A bisque or china head aged 50 years may be worth

(Continued to page 252)

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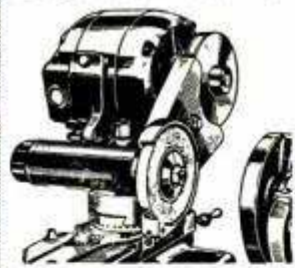
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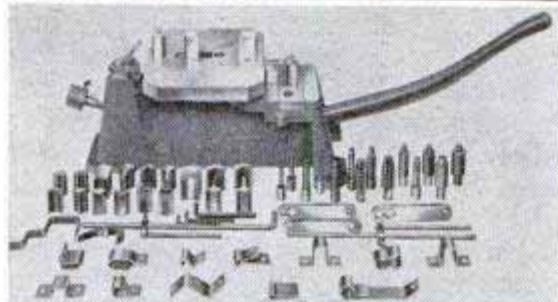


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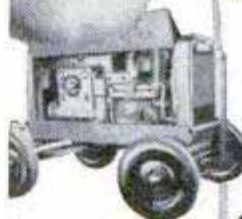
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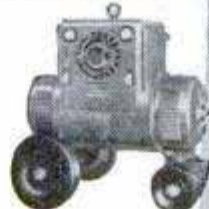
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from \$5 to \$20. Complete dolls range upward in value with practically no ceiling; and the costume may represent more than half the doll's worth. A French fashion doll as big as a sizable child and dressed in gay silks and satins may carry a \$250 price tag.

A great many persons who bring in a doll to be repaired expect, for sentimental reasons, to keep it themselves or present it to a grown daughter or other member of the family. It is becoming fashionable to display dolls on mantels, dressers, beds, pianos, desks or in glass-doored cabinets. A small group of doll heads makes an interesting whatnot display.

"If you have a childhood doll, get it out of its trunk or box and have it repaired and dressed in new clothes," Nash suggests. "Many old dolls are valuable, and should be kept in good condition. Old bisque and china heads are getting scarce, and any damage to them, such as a chipped or broken edge should be repaired."

After Nash gives a talk to a women's club or other group, many members of the audience get out half-forgotten dolls and either try to fix them themselves or bring them to Doc Nash.

Amateurish doctoring, Nash says, can prove as disastrous to a doll as to a human. Even giving dolly a bath may lead to a lot of trouble. While many dolls can be cleaned merely by washing them with soap and water, others are allergic to such baths. Some doll makers form eyebrows and other facial details with paint that is not waterproof. Many dolls are ruined by owners who apply fingernail polish to the doll's hands and feet, or attempt to use such polish for tinting cheeks. If you color a doll's cheeks, use ordinary lipstick.

A dry-cleaning fluid such as carbon tetrachloride (which is fireproof) often can be used for cleaning soiled hair and hair ribbons, cloth bodies or body parts, and even entire dolls, provided there are no wax or rubber parts. The piece to be cleaned may be immersed in the solvent, gently swooshed about, and then hung up until all solvent odor disappears. Never use naphtha gasoline—it's too dangerous.

Whenever a doll, fully recuperated, leaves Doc Nash's hospital, he presents the owner with his combination business card and post-operational pill supply. This is a standard physician's pill envelope bearing the hospital's name and address and a prescription advising the administering of one pill a day. The pills? Little candy pellets. Nash originated his pill-envelope cards as an advertising stunt and a novelty for children; but he has found that they already have become collector's items.

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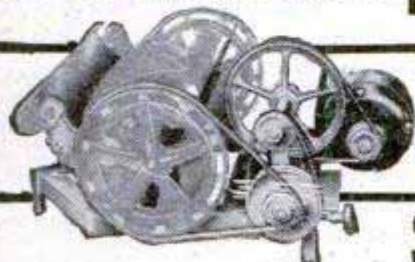
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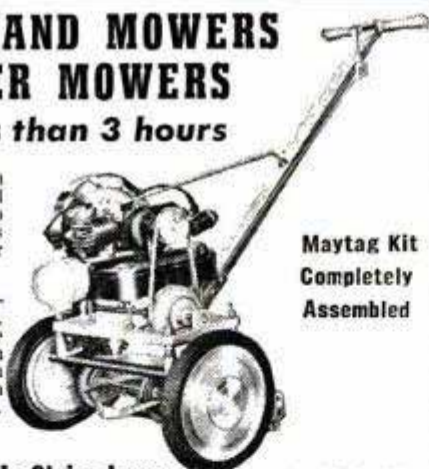
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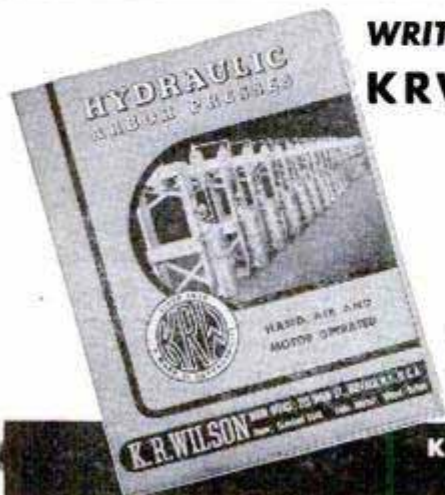
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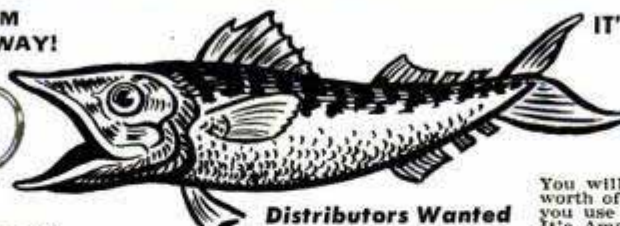
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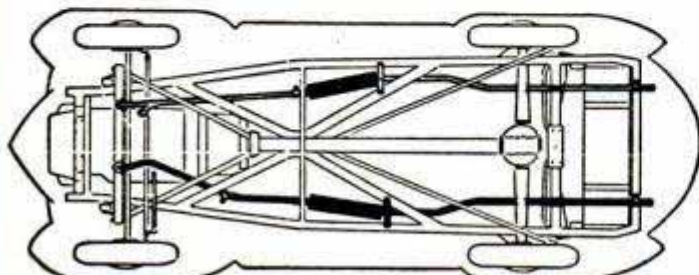
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(Continued from page 160)

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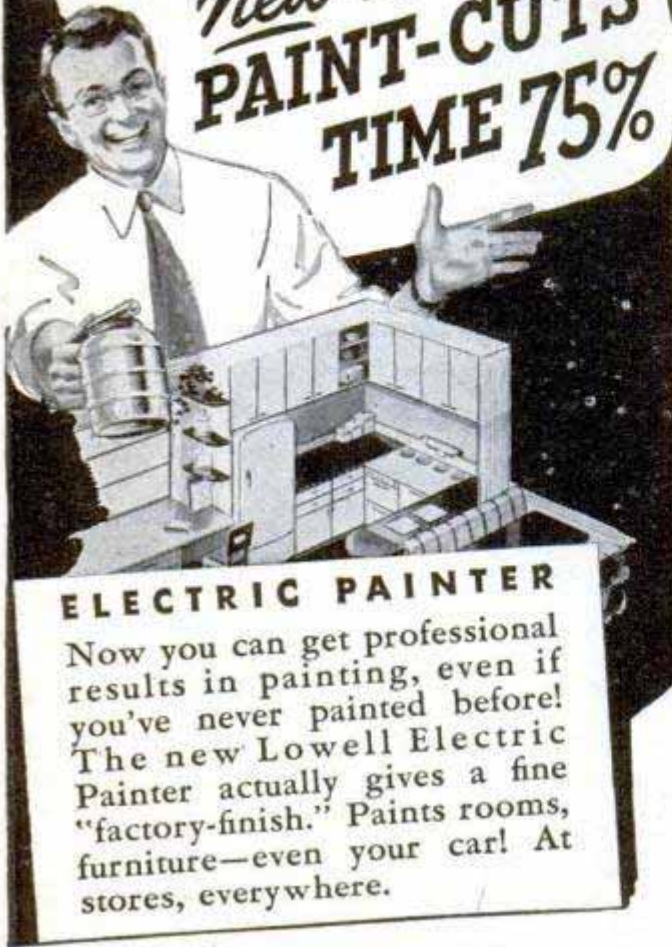
Radio equipment is far more complex than in earlier ships and includes an automatic alarm that rings bells in the radio room, wheelhouse and radio-operator's cabin whenever the ship's call letters are picked up on the air. The main radio installation, in addition to radio navigation equipment, includes four telegraph transmitters and four receivers that cover all regular and emergency wave lengths, plus a broadcast and high-frequency receiver that can be plugged into the ship's loud-speaker system for spreading music and radio programs.

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Electric Painter
COMPLETE
No Extras To Buy

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Slightly higher in western territories.



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LOWELL
Manufacturing Co.
World's Largest Manufacturer of
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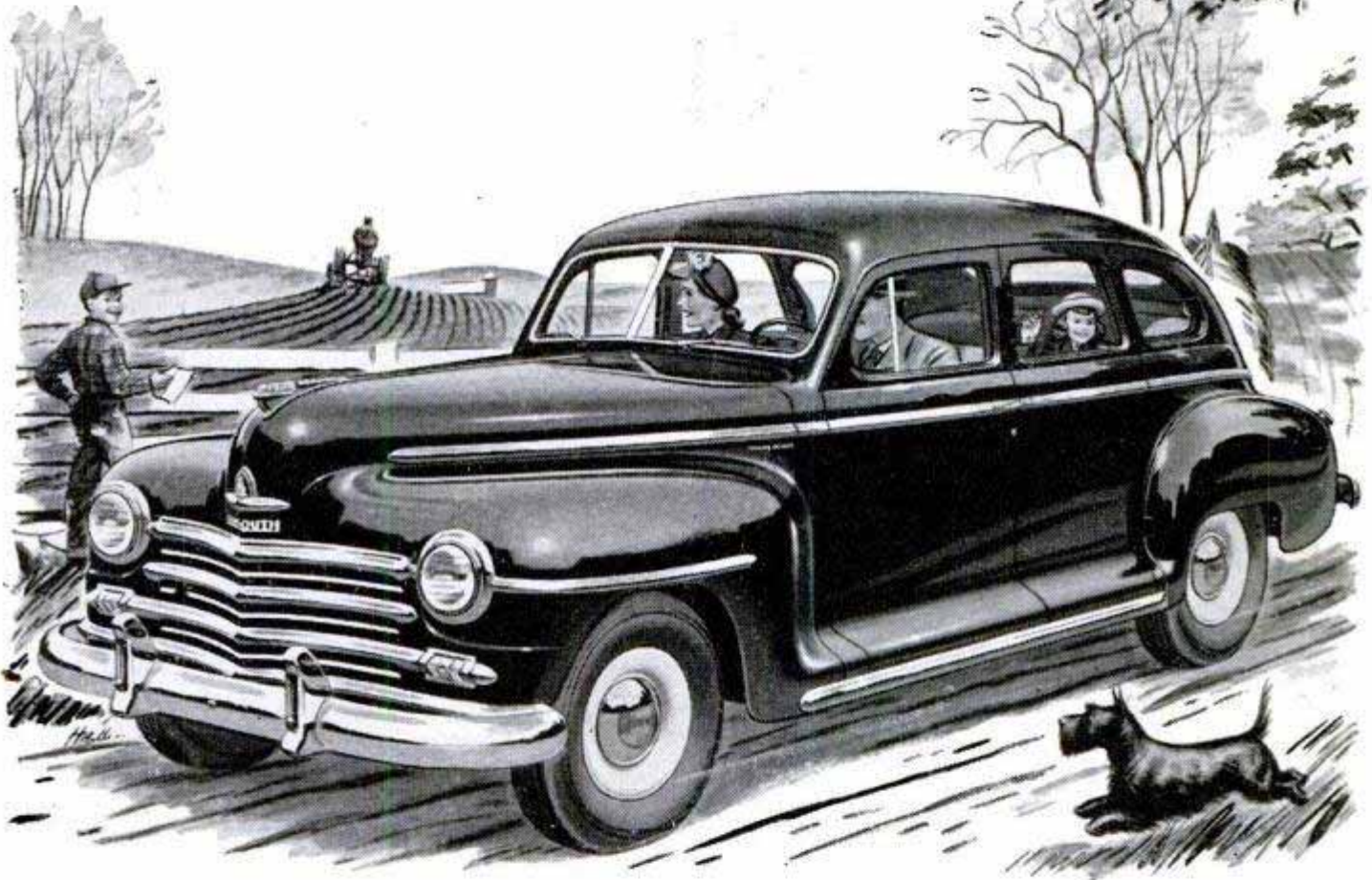
All cars have **TIRES**
but in the lowest-priced field only **PLYMOUTH**
has **SUPER-CUSHION TIRES** on **SAFETY-RIM WHEELS**

Bigger, softer-riding Super-Cushion Tires are standard equipment with Plymouth. They reduce chances of tire failure but if trouble occurs you have the added protection of Plymouth's new, wider Safety-Rim Wheels.

All cars have **SPRINGS**
but in the lowest-priced field only **PLYMOUTH**
has **AMOLA STEEL SPRINGS**

You draw extra dividends of continuing comfort with Plymouth's famous high-tensile Amola Steel Springs. They're tough for long life . . . soft-acting always for front and rear riding ease on all types of roads.

**It's easy to tell
where the Value is!**



It's easy to tell that low-priced Plymouth leads the field in reduction of tire-failure hazards and increase of riding ease.

It's just as easy to tell that Plymouth stands out for all-around safety, comfort and top performance. A look at the Quality Chart at your Plymouth dealer's will show you that Plymouth has 20 of 21 features common to most high-priced cars.

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*Sponsored by Plymouth Motor Corporation
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it's **PLYMOUTH** you want

**28,000 MILES
for \$200**



It's sensational! Smart Crosley station wagon seats 4 or carries 1/4 ton load; yet costs \$600 to \$700 less than any other station wagon and operates for about half as much. For instance:

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← **SEDAN:** Seats 4 in comfort, with ample luggage space.

PICKUP: Cuts → service, delivery costs.



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Revolutionary 4-cylinder engine

CROSLLEY

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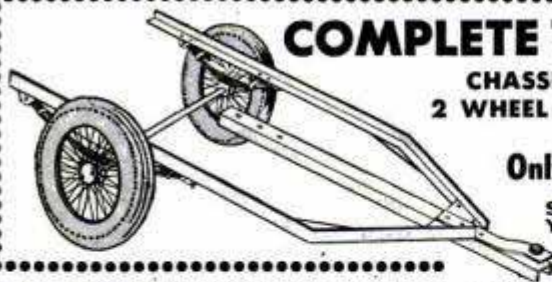
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Never before offered at this low price. Tested to carry 1000 lbs.—built to take hardest usage . . .

COMPARE!—in construction—utility—value! You'll agree there's nothing like it.

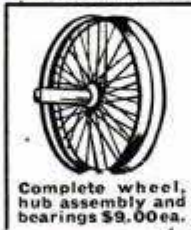
YOU GET: Complete draw bar assembly, chassis of steel angle, 2 automobile type springs; 2 wheels with Timken roller bearings take standard 4.75 x 19 tires, 2 hub caps and grease rings . . . 91" Overall, 57" Tread. Less Tires, Tubes.

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Solid, tough wood construction—**ALL STEEL LEGS.** Very large drawer, tool rack, shelf, 34 1/2" high, 59" x 23". **COMPLETE WITH ALL HARDWARE.** Shipped KD with easy instructions. **ONLY \$15.35 F.O.B., Yonkers.**

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SINGLE EXHAUST BLOWER DELIVERS 100 CU. FT. AIR PER MINUTE. Ready to install yourself with any household tools. It's built for that. Housing is solid cast aluminum to last indefinitely. 110 V., 50-60 cycles. Cont. duty motor.



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Designed especially for speech amateurs, P.A., recording . . . High impedance, output 54.2 db below 1v per bar. All chromium plated; rubber covered, shielded cable. 5' cord. Remove from base for hand use. We know it's so good, we sell it on 5 day, money back guarantee! Ship. wt. 2 lbs. Lists for \$10.75. **COST TO YOU \$4.95.**



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25¢ COIN FOR ALL THREE
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ELECTRIC WELDER
 AC or DC 110 Volts
 Pre-war type—All metal—No chemical—5 year written guarantee. Welds ¼" thick metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Comes complete with rods, unit directions and eye shield.
\$6.45 COMPLETE
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 DEALER SALESMEN—Earn \$10 to \$25 daily. Easy \$1 deal all merchants need and want, you keep the dollar, and big repeat commissions. Free actual samples and kit offer. Write Quick!
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... THAT ANY OLD PISTON RING WILL DO



Some people think it doesn't matter what piston rings they use in their cars. But the truth is, there's a great difference between brands. And there are good reasons why Burd Piston Rings are better. Burd uses an individual pattern for each type of ring and each ring is individually cast from Burd's own electric furnaces. Further refinements are accomplished by accurate machining plus a careful "Graf-Flox" finishing treatment. These scientific methods are your guarantee that each type of Burd Piston Ring has just the right degree of hardness, flexibility, and tension for its specific use. Burd "Graf-Flox" Piston Rings stop fuel and oil losses . . . restore pep and power to your car. Mail coupon below for further facts.

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No Job for a Dub

You've never used a finer tool than this new drill



Hop right down to your favorite hardware store and take a good look at this brand new automatic drill . . . (it'll be prominently displayed). See if your fingers don't itch to hold it . . . heft it . . . put it to work. Note that *man-size* handle . . . feel how snugly it fits your grip. Sense that *balance*. See how easily and rapidly this drill works . . . how smoothly it's controlled.

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Greenfield, Mass.

DIAL THE DRILL POINT YOU WANT

. . . and out of a hole in the handle drops any one of 8 points, $\frac{1}{16}$ " to $\frac{11}{64}$ "

MILLERS FALLS TOOLS 80th ANNIVERSARY
No. 100
AUTOMATIC DRILL
Complete with 8 drill points \$3.50 Slightly higher in the West

Millers Falls Tools



Celebrating 80 Years of Toolmaking

Stepping Up the Speedboats

(Continued from page 111)

edge. It was used both on Copperhead and Blue Blazes and a dozen other inboard and outboard craft that set 1947 speed records.

"We were forced to develop a prop to match the boats," Johnson says. "For the real strain comes when the boat gets to riding on struts alone. Then only one blade is hitting the water at a time. The other blade, in the air, acts as a flywheel doubling the strain on the submerged blade. This will cause it to bend, even though it is actually stronger than the shaft.

"The new propeller is sharp on the leading edge and thickens as it goes back, like a butcher knife. In fact, some of the racing boys call them 'cleavers.' Strength is increased without adding thickness to the leading edge.

"This design is possible because tests disclosed that water on the back side of the blade does not come down to a thin, trailing edge but goes straight back after passing over the widest part of the blade. Actually the new blade is not so thick in its thickest part as old-type propellers.

"As a second feature, the tip of the new blade has a smaller radius than that of the conventional blade. Our tests also showed that, both in commercial work and racing, it required less power to split the water with the new blade.

"An incidental but important third feature developed from the fact that the new design left extra surface at the hub. This permitted the drilling of two tap holes so the prop could be pulled off the shaft without damage with a simple pulling device which is inserted in the tap holes.

"Important in propeller development is the quest for stronger materials. Bronze, the perfect metal for commercial use, is too weak for props that turn faster than 7000 r.p.m. Right now," Johnson says, "we are using a semistainless steel that is twice as strong as bronze. When we can get more material we'll improve on this."

Such developments indicate that the peak of motorboat speed in each class is still in the future even with restrictions on hulls and motors. However, some restrictions are being lifted. The American Power Boat Association recently raised the motor restriction in Division I of the 225-cubic-inch hydroplane class to allow motors up to 255 cubic inches. To put this added power into the same hull which carried a 225-cubic-inch motor last year means the power will be enough to push an added gear step-up of 20 percent, says

(Continued to page 264)

More Sport for your money with

Marlin's **CLIP** **MAGAZINE** .22

IT's a whale of a value—this man-sized .22 repeater! A real Marlin, ready for instant action on vermin or small game. There's eight rapid-fire shots in the clip to get 'em, no matter how fast they run. You'll get the most sport for your money with a Marlin 80-DL!

Look over these specifications for big value at low cost!...

American Walnut buttstock, with fluted comb and semi-beavertail forearm.

Quick-release trigger; self-cocking action; side ejection; Off and On safety.

24" tapered blued steel barrel; Ballard type rifling; crowned muzzle.

8-shot clip magazine. Shoots .22 caliber short, long, long rifle cartridges—regular and high speed without adjustment.

Equipped with peep sight, hooded ramp front sight and sling strap swivels.

BOYS: Be a Ranger! Write Sportsmen's Service Bureau, 343 Lexington Ave., New York, for **FREE** booklet on marksmanship.



Marlin's 80-DL is a go-getter for small fur-bearing game—fox; squirrel; woodchuck; muskrat; mink.

A handy target rifle with its clip magazine, the 80-DL also takes care of marauding crows, hawks and rats.



Marlin 80-DL

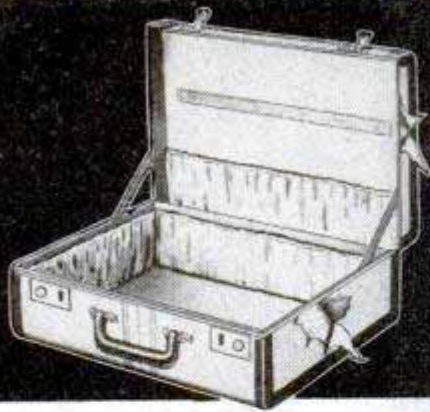
8-shot Clip Magazine
.22 Cal. Repeating Rifle

Who said
good blades
have to be high priced?



\$22.90 Price slightly higher
west of the Rockies
and in Canada.

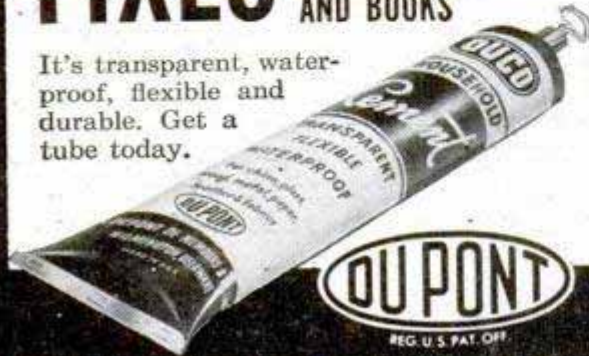
THE MARLIN FIREARMS CO., NEW HAVEN, CONN. • Fine Guns Since 1870



FIXES

LUGGAGE, FURNITURE,
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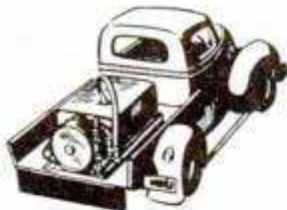
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KILLS WEEDS — SPRAY LIVESTOCK Eliminate Flies and Mosquitoes

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STAR METAL BOATS



STAINLESS STEEL
& GALVANIZED BOATS

FOR ROUGH USE

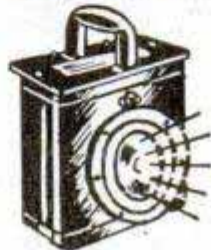
STAR METAL BOATS lead in comfort, convenience, durability, and lightness. Always dry and ready . . . no upkeep. Smoother riding for oars or outboard, spray rails stamped in hull. New lifetime Stainless Steel models, easily carried, nearly puncture-proof. Air chambers. Reasonable prices. Write for folder.

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Brand New Delta Extra Heavy Duty NAVY LANTERN



An unexcelled value for general utility. Rigid handle on top. Operates on two standard No. 6 dry cells. Red enamel finish. This lantern is vapor proof and gives more than 800 ft. spot beam. Type JR-IS. Special. less batteries . . .

\$4.95



FISH LURE and LIGHT

Uses one ordinary flashlight battery. A floating fish lure that brings 'em in. Also can be used as a regular flashlight. Brand new.

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FOR JOINTING
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ALL TYPES OF CIRCULAR SAWS

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- ... 4" wheel & tire, 5/16" sleeve bearing & hub cap 50.45 ea.
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BUILD YOUR OWN— Wagons — Scooters — Soap Box Racers — Welding Carts — Baby Pens — Etc. To order above wheels write number wheels wanted in space provided, tear out and mail this ad with check or money order and your name and address. If other sizes are wanted write for FREE LIST.

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BUILD YOUR OWN

- DRIVEWAY
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BLOCK MOLDS**

COMPLETE PLANS FOR ONLY \$1 DOUBLE PURPOSE

Send NOW for a complete set of fully illustrated and easy to understand working plans. Build your own block mold for only a few cents worth of lumber. All you need is found in your own basement or workshop. Mold a dozen blocks in as many minutes. The H&H block mold will make a curbed slab for a double ribbon drive way... turn it over and make a plain slab ideal to fill in the drive or for walks and patios. Five cents per square foot for concrete walk. Write today...

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Extra value and longer life built into genuine Gerstner chests for machinists and toolmakers. Free catalog.

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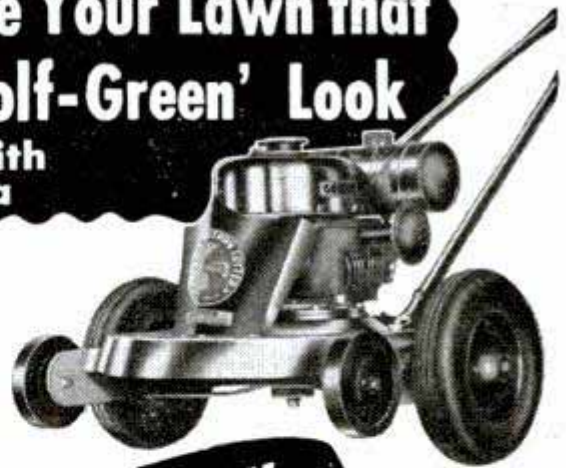
Electrical and Radio Tester sent absolutely FREE with each Progressive Radio Kit. PLUS FREE membership in Progressive Radio Club. Entitles you to free expert advice and consultation service with licensed radio technicians.

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Give Your Lawn that 'Golf-Green' Look with a



Goodall POWER MOWER

ENDS GRASS-CUTTING DRUDGERY You take it easy behind a GOODALL Rotary Power Mower... it cuts your lawn in 1/3rd time, cuts any height grass or tough weeds... cuts on any terrace or hillside... gets into hard-to-reach places easily.

NOTE: GOODALL is the original U.S. patent holder of direct vertical drive — at better dealers everywhere.

Cuts Grass Velvety Smooth in 1/2 time



EXTRA FEATURES

GOODALL is the one and only 4 CYCLE — VERTICAL CRANK-SHAFT — DIRECT DRIVE Rotary Cutter manufactured... successfully used by thousands from coast to coast.

Precision built for years of low cost service... Two wheel flexibility.

Many imitators... No successful duplications!

Write for Picture Folder and name of nearest dealer

Goodall MANUFACTURING CORPORATION
DEPT. PM, WARRENSBURG, MO.

Get that NEW-CAR FEEL again!
SEALED POWER PISTON RINGS
The only ring with the Full-Flow Spring!
SEALED POWER CORP., DEPT. G-3, MUSKOGON, MICH.

AMERICA'S FINEST BUMPER JACK

Here's an all-around hydraulic utility jack with hundreds of uses where easy lifting or pulling is required. Safest, quickest, easiest to use on any car built. Result of 15 years of advanced precision engineering. Extra long, heavy duty steel chain with forged steel grab hook picks up loads from 4" BELOW bottom of jack to 22" ABOVE. Base, handle socket, head and chain plate are all tough malleable iron castings. 17" hydraulic lift, 3000 lb. capacity. Order now at your dealer or send money order or check to

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\$15.95
Complete with chain, hook and handle.

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SHEBOYGAN, WISCONSIN

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Enclosed find check or money order.

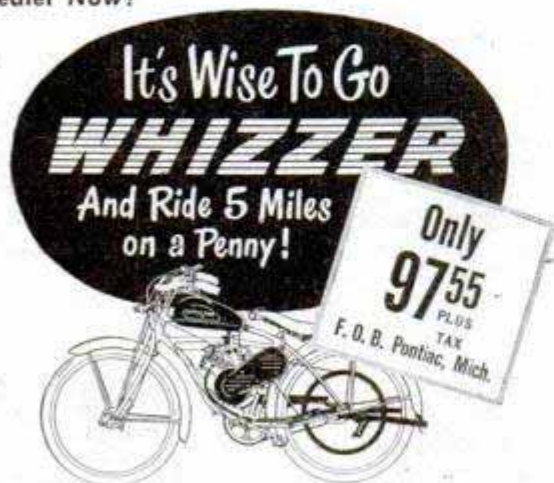
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"Stop Pedaling, Pal...Get Wise to WHIZZER!"

Cover the town for a penny—with a WHIZZER Motor on your bike. Good-bye, pedal pushing—with 2½ rugged horsepower to take you everywhere. 125 miles to a gallon of gas! See your Whizzer Dealer Now!



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Choice of experts in every art and craft field. A blade for every purpose—quickly interchangeable. Singly and in sets, 50¢ to \$50.00. (Slightly higher in Canada.)

Buy where you see this sign—
At hobby, hardware, gift and dept. stores.

X-acto Crescent Products Co., Inc., N.Y.
In Canada, Handicraft Tools, Ltd., Toronto

*Reg. U.S. Pat. Off.

Smith. This will add about 1000 r.p.m. to a propeller speed already nearing the five-figure bracket.

Judged from this and the "taking-off point" that some boats reached in 1947, the problem in 1948 and 1949 will be to push them up on the r.p.m. and hold them down to the water.

If the marine speedsters of 1948 ride on anything less than they did last year it will be air! That would put motorboat racing under the jurisdiction of the Civilian Aeronautics Administration. The American Power Boat Association wouldn't like that at all!

How Your Car Shifts for Itself

(Continued from page 106)

In the General Motors Hydra-Matic the foot clutch is eliminated entirely. The Hydra-Matic is more nearly full automatic than any of the designs just mentioned. Two sets of planetary gears (they are used in modern automatic overdrives and 30 years ago in Model-T Fords) are arranged in series—one in front of the other—making possible four forward speeds. A fluid coupling permits smooth engagement of engine power on starting and during shifts.

Shifts from one ratio to another are made by hydraulic controls, in accordance with car speed and accelerator-pedal position. Each speed is engaged by frictional pickup of gears under engine power. On standing starts, the transmission shifts 1-2-3-4 but the changes are so smooth that the average passenger is not aware of any difference in acceleration. Downshifts are normally 4-3-1, skipping second.

There is a low range for the drive-selector lever. In this low range, used chiefly for downhill braking, the transmission is restricted to first and second. No more power is provided in low range, as these same speeds also are used in high range.

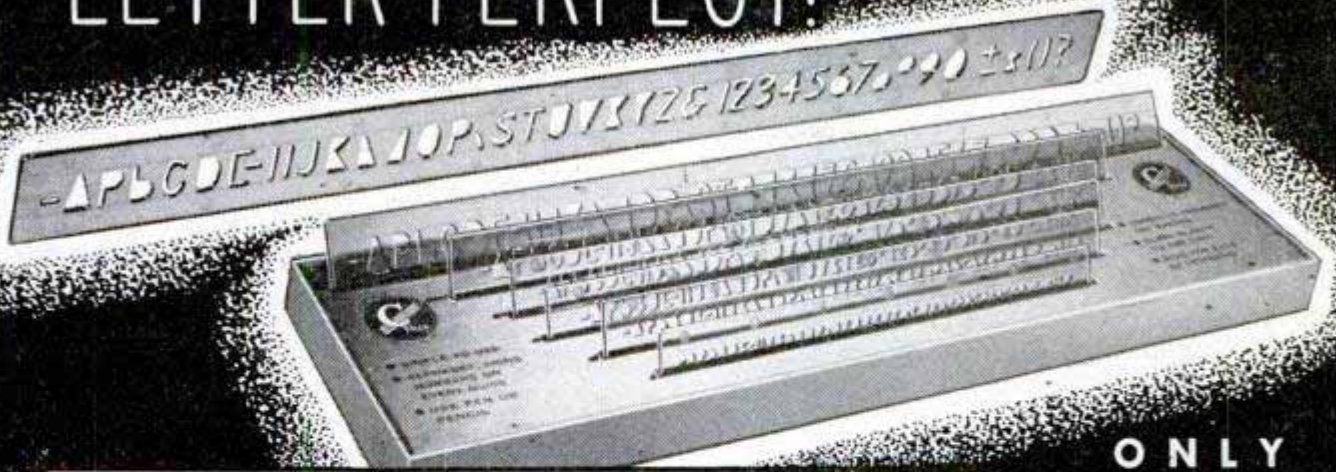
The Hydra-Matic has been sold since before the war on Oldsmobiles and Cadillacs, and now also can be obtained in the 1948 Pontiacs.

The new Dynaflo transmission provides an automatically variable drive ratio without use of gear shifting. There is no clutch pedal—in this respect, the same as the Hydra-Matic.

Drive ratio is self-changed gradually by means of controlled oil flow in a hydraulic torque converter. The first of its kind ever used in an American passenger car, the Buick converter permits perfectly smooth acceleration without shifting gears. All normal driving is done without moving the

(Continued to page 268)

"LETTER PERFECT!"



WITH THE New C-THRU LETTERING GUIDES

You too, can letter perfectly with the new C-Thru plastic LETTERING GUIDES. An amazing time saver for the expert draftsman, designer; or the home workshop "Hobbyist," at an unheard-of price. A complete set of six, different sized lettering guides, with many new improved features, at one-third the price of the ordinary, old fashioned type. Each C-Thru LETTERING GUIDE has a complete alphabet, numbers from 1 to 10 and commonly used symbols ON ONE GUIDE—no lost motion changing guides—makes old slow motion methods obsolete. These Durable, Practical, Beautifully designed guides are undercut to prevent smudging—beveled edges insure a perfect letter every time, using pen or pencil. You too, can dash off professional looking lettering and dimensions, like magic.

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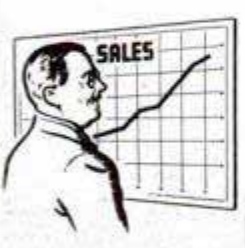
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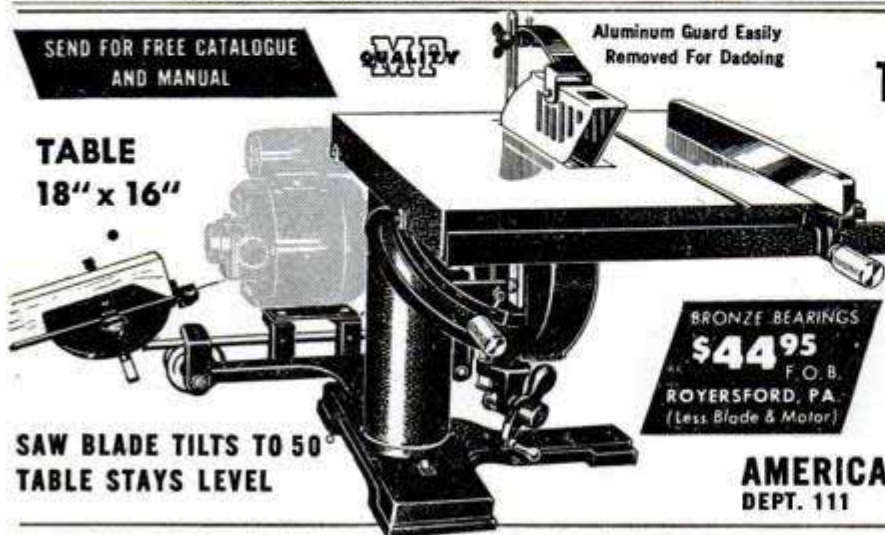
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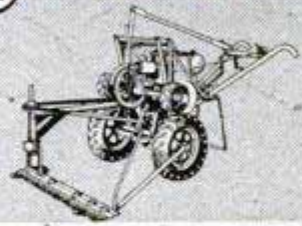
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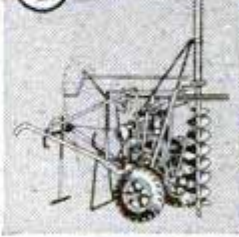
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drive-selector lever under the steering wheel. The action is reminiscent of old-time steam cars whose speed was controlled entirely by the throttle.

On starting the car the driver merely flicks the selector lever to D (meaning "Drive"). With engine idling the car does not move. As the accelerator pedal is depressed the engine speeds up, its power increases, greater push is transmitted to the rear wheels and the car moves off.

The converter produces the hydraulic equivalent of a mechanical-gear transmission. Unlike the geared arrangement with only three or four ratios, the converter provides a continuously variable set of drive ratios over its total range.

The complete Dynaflo transmission consists essentially of the torque converter (which looks something like a fluid coupling) in front of a hydraulically applied two-speed-and-reverse planetary transmission. Direct drive is used for most forward driving.

Production automatic transmissions now available provide a wide range, all the way from the standard shift to full automatic operation. Arranged by increasing order of "automaticity" (from the driver's standpoint) these transmissions are: (1) conventional, (2) conventional plus overdrive, (3) Chrysler and DeSoto Fluid Drive, (4) Hudson Drive Master, (5) General Motors Hydra-Matic, and (6) Buick Dynaflo.

"Automaticity" is a matter of personal preference. Some drivers, particularly women and beginners, like to be relieved of as much "machinery manipulating" as possible. To these people either the Hydra-Matic or Dynaflo is well suited. Other drivers prefer to retain more personal control of transmission action, and as a result favor the Drive Master or the Fluid Drive, or perhaps the standard transmission plus automatic overdrive.

Power loss in the transmission, unfortunately, seems to be closely related to degree of automaticity. That is, the more nearly automatic a transmission is, the greater its power loss appears to be. A standard transmission generally has the highest efficiency.

Power loss concerns the driver because of fuel economy. Automatic transmissions, by themselves, do not help gas mileage. (The automatic overdrive is a possible exception.) Most designs, however, permit other car changes which recapture some of the lost power and fuel economy.

The most popular method of recovering losses involves slowing down the engine,

(Continued to page 272)



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The electron microscope magnifies bacteria more than 100,000 diameters to help fight disease, radar sees through fog and darkness, all-electronic television shows events taking place at a distance, radio-heat “glues” wood or plastics, Shoran locates points on the earth’s surface with unbe-

lievable accuracy, Teleran adds to the safety of air travel.

Advances in radio-electronics are a major objective at RCA Laboratories. Fully developed, they are part of the instruments bearing the name RCA, or RCA Victor.

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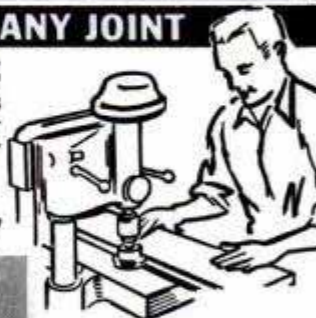
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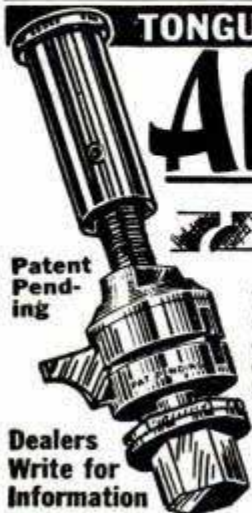
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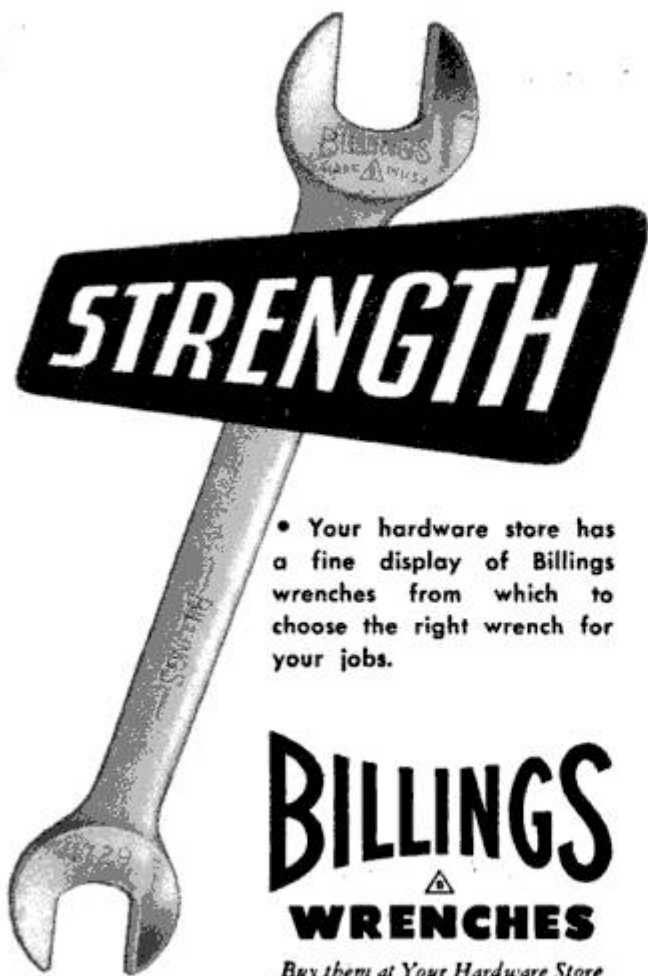
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so that it turns over fewer revolutions, and uses less gas, for each mile of travel. In a standard car this change reduces pickup and hill-climbing ability; but with an automatic transmission a lower gear immediately is available when more power is demanded.

In comparison with a standard car, improved fuel economy on open intercity highways will be obtained consistently with the more nearly full-automatic makes. The gain may be as much as two miles per gallon. For slow-speed traffic more gasoline probably will be used by these same automatic jobs. The reason is that more driving is done in the lower, less-efficient gears. Here the loss may be as much as two miles per gallon—a price paid for better performance and freedom from gear shifting.

The over-all effect on gas mileage, then, depends on how much the car is used in city traffic and how much on long trips. A heavy footed driver also is a big factor.

Automatic transmissions like the Chrysler and General Motors designs cost the car purchaser from \$150 to \$200 extra. The standard transmission and clutch which are replaced cost perhaps \$30 to \$50, making the total value \$180 to \$250. Based on the same relative manufacturing costs, an engine can be built for somewhere between \$120 and \$180.

Critics point out the inconsistency of a transmission, even though automatic, which costs more than an engine. Before automatic jobs become standard equipment, they say, a better cost balance should be obtained between transmission and engine. In the meantime, however, there are plenty of buyers apparently willing to pay \$200 extra for automatic shifting.

The engineers now do not know how to build a satisfactory low-cost automatic shifter. They do not yet agree what standardized kind of self-shifter is desirable for the average car buyer. In the process of answering these questions a wide variety of designs is being and will be offered to the motoring public. In the final analysis the buyer will determine what transmission the manufacturers will build, and how much it will cost.

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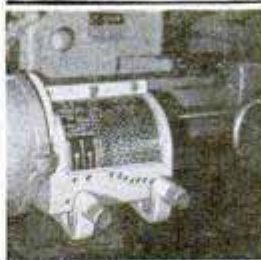
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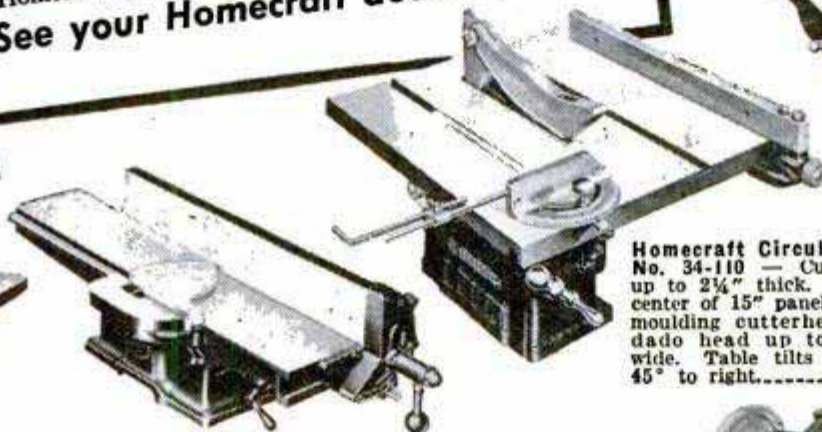
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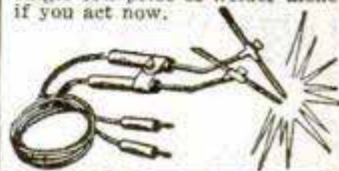
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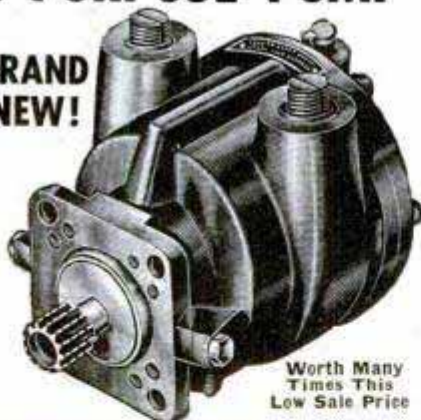
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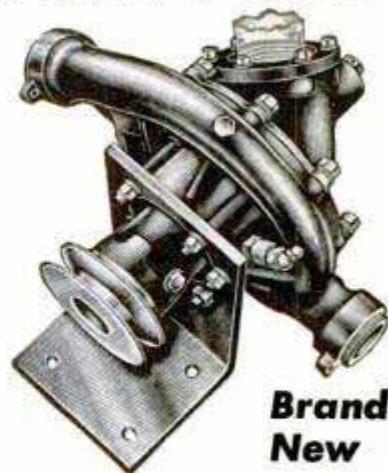
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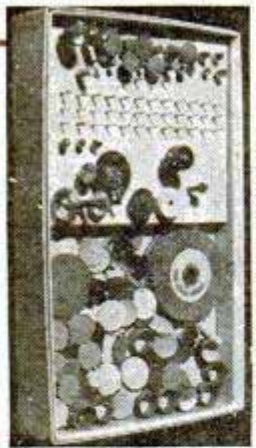
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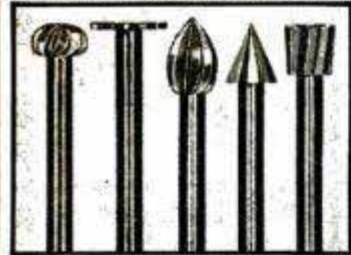
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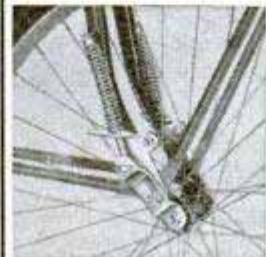
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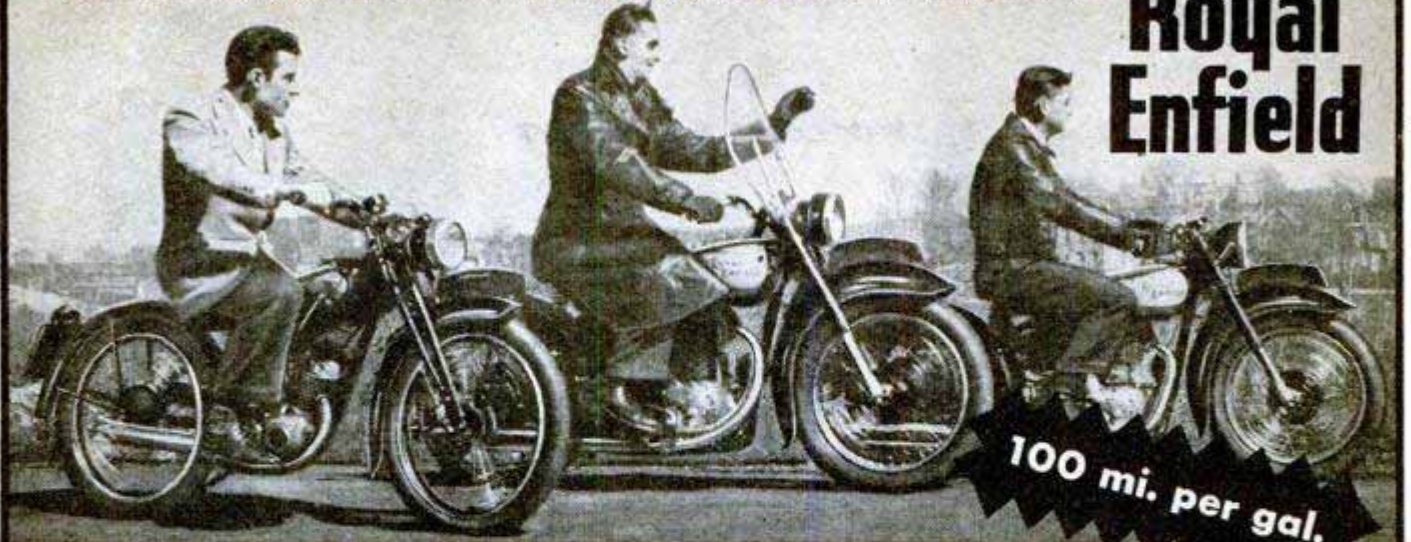


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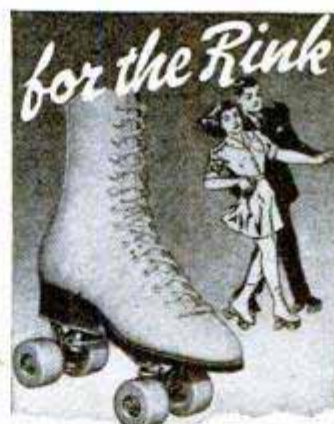
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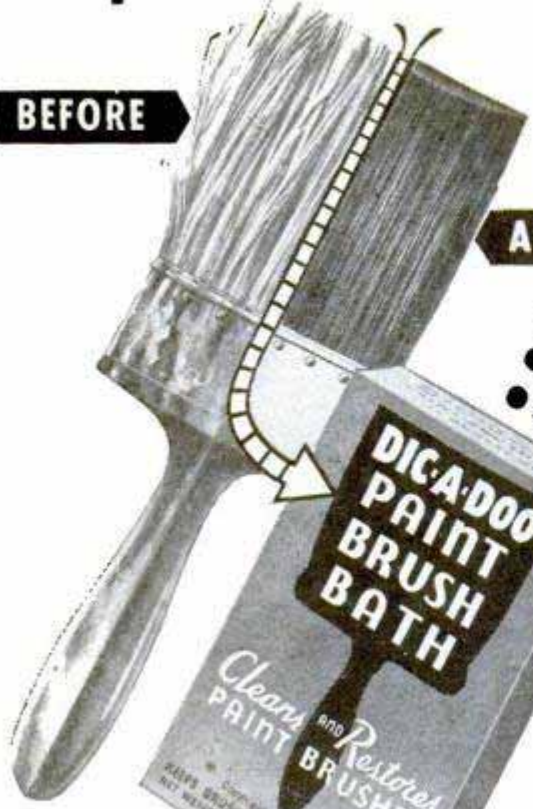
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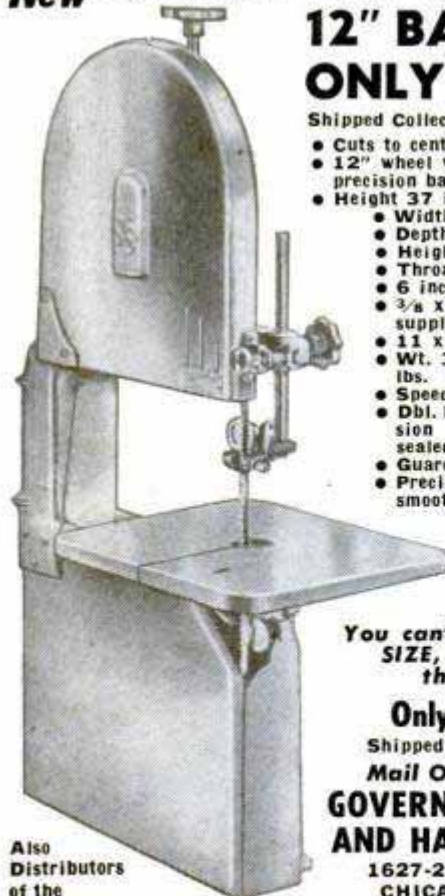


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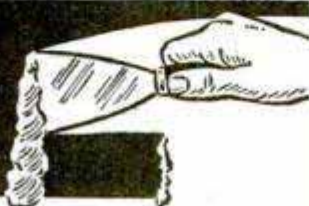
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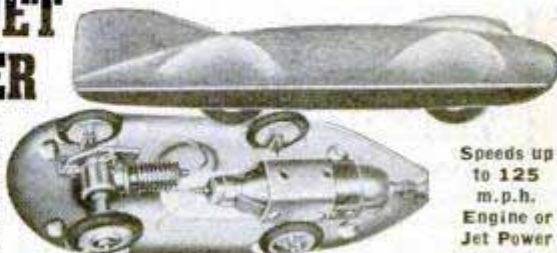
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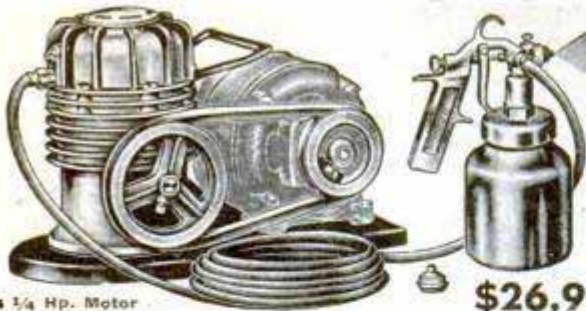


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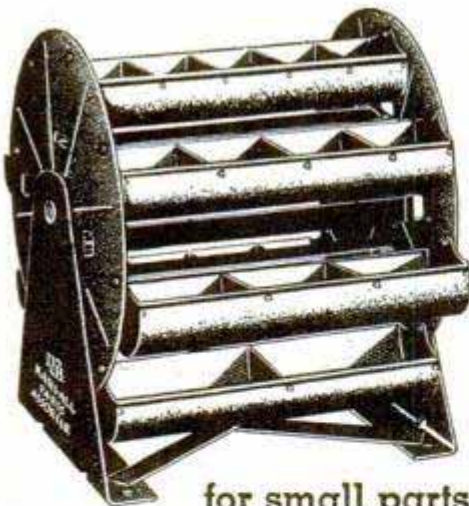
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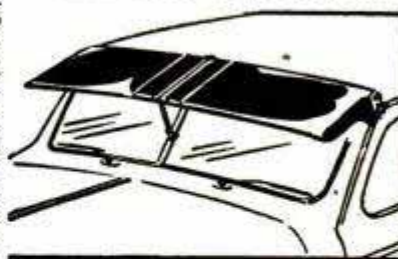
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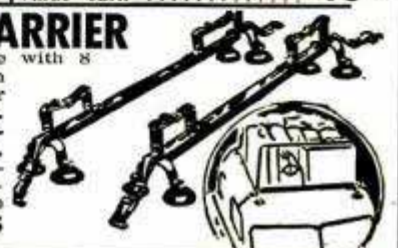


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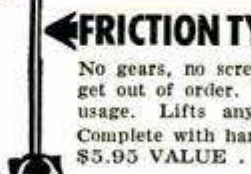
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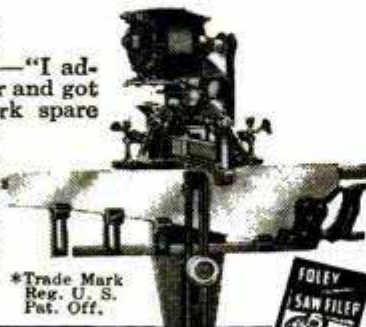
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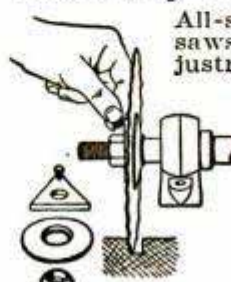
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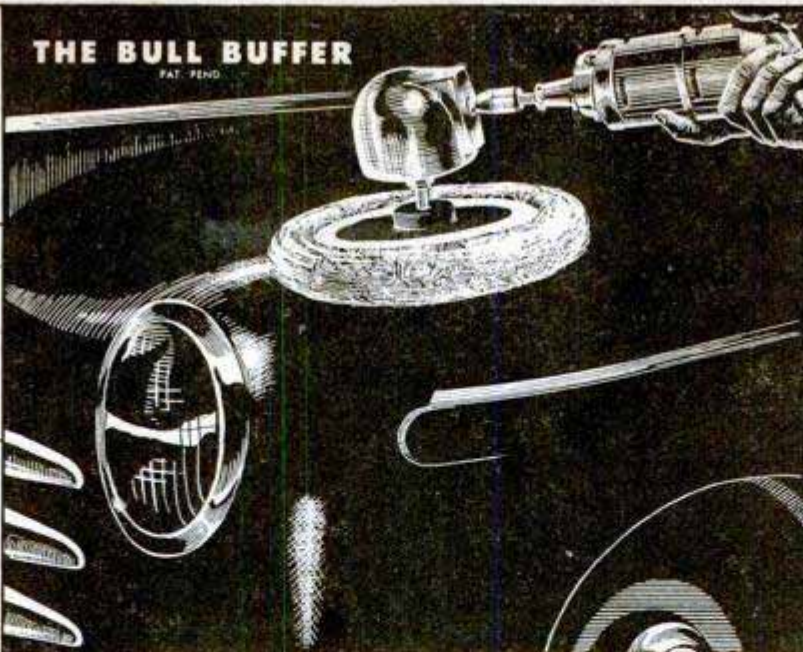


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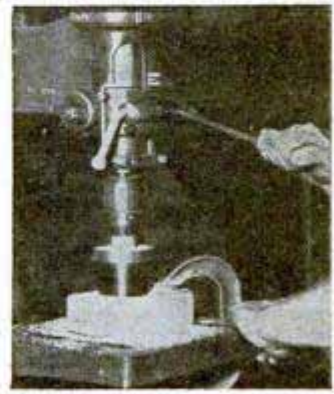
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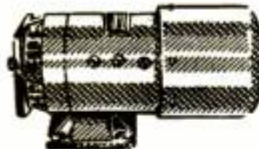


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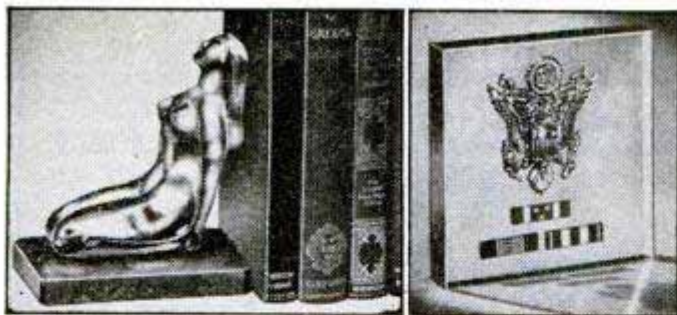
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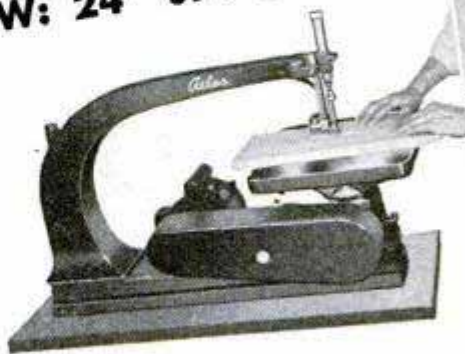
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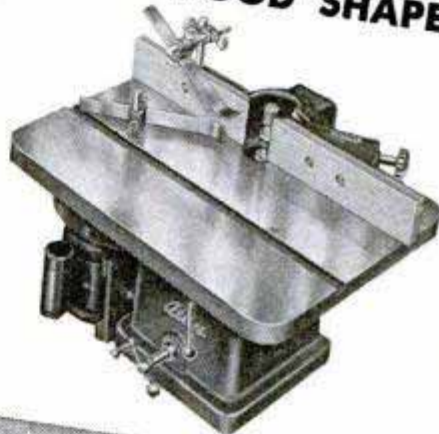
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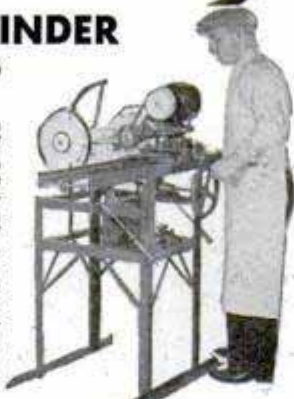
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This **READY-CUT 12** ft. fishing boat can be assembled in 8 hrs. without forms or special tools. Kits are complete including all hardware, paint, and etc. Send for free folder.

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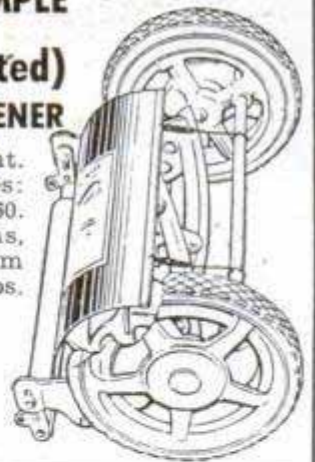
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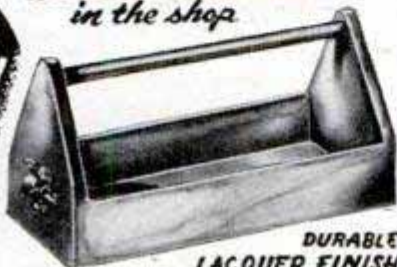


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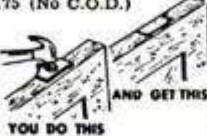
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- CUTS 26" SWATH
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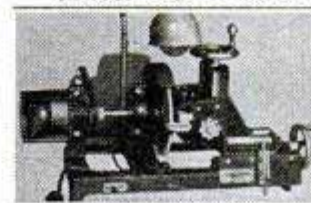
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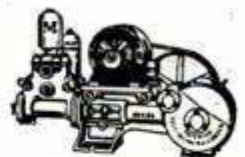
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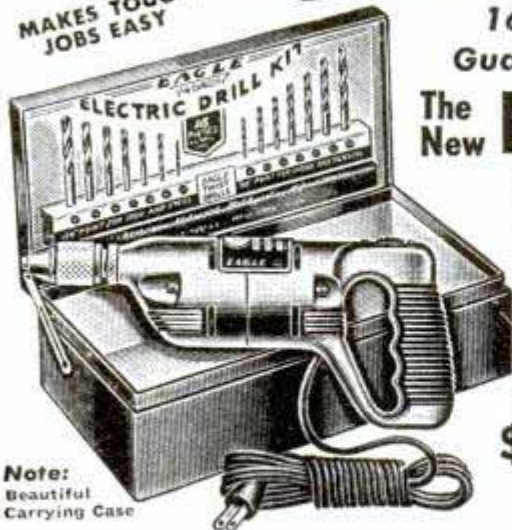
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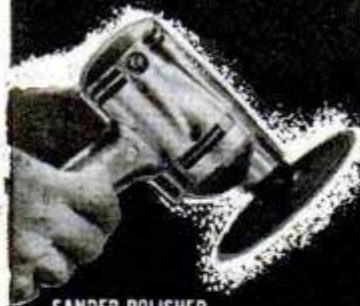
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\$36.50

(F.O.B. Muskegon)
(Accessories listed above—\$28.90)
Sander-Polisher with accessories
\$65.40

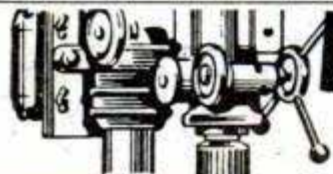
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Converts Any Motor, Drill Press, Electric Drill, Electric Fan Into A Handy Rotary Tool

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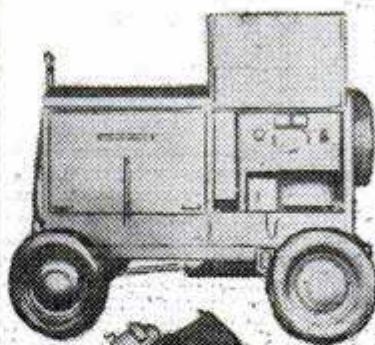
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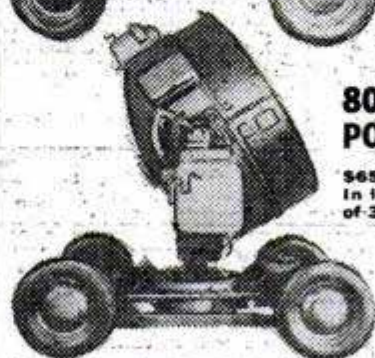
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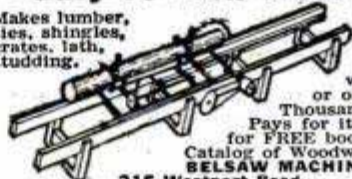
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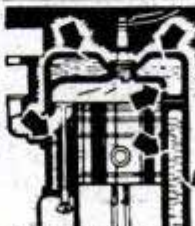
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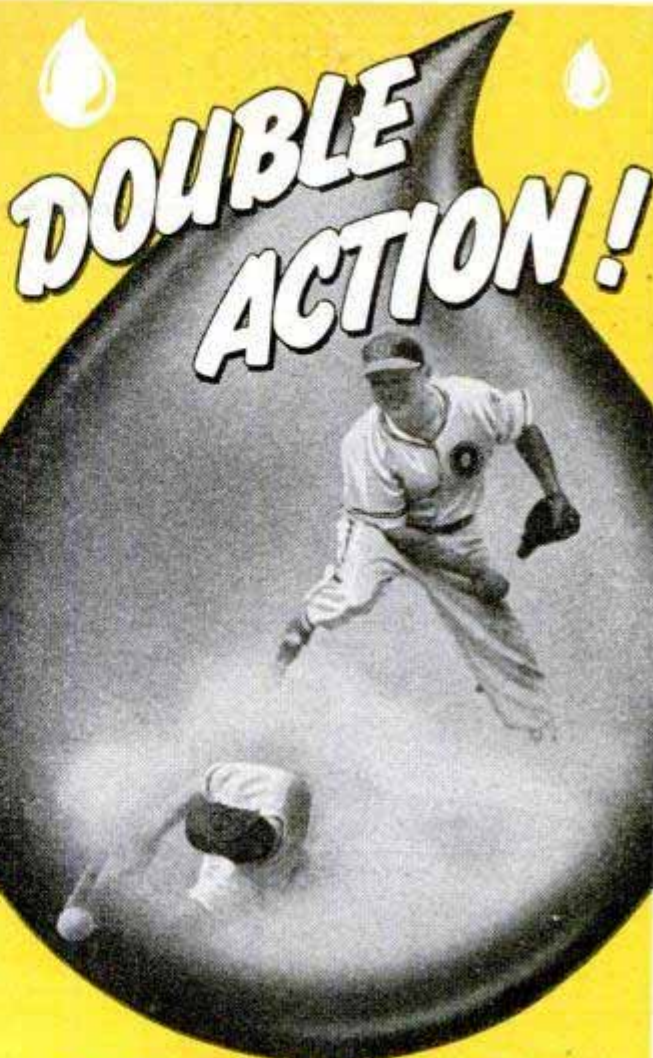
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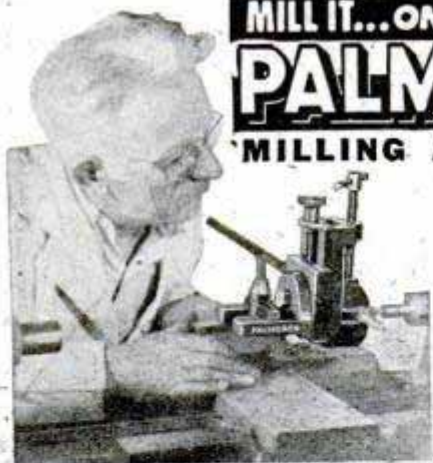
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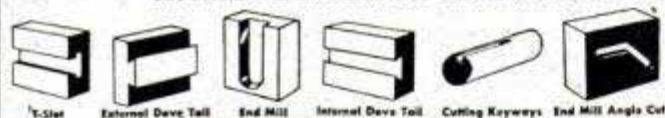
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|------|------------|------------|-----------|---------------|----------------|----------------------|
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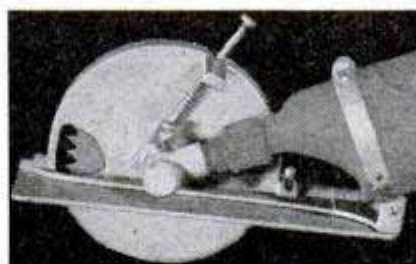
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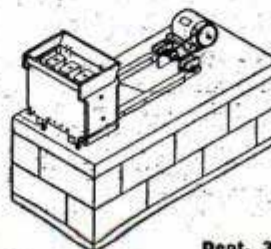
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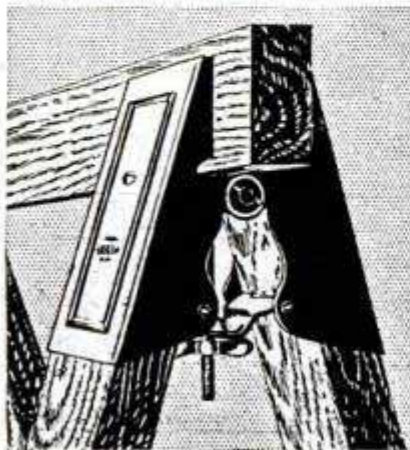
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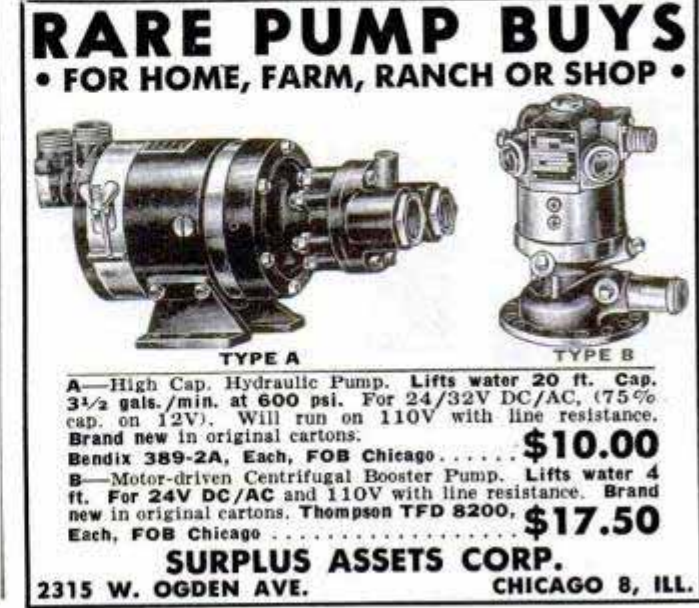
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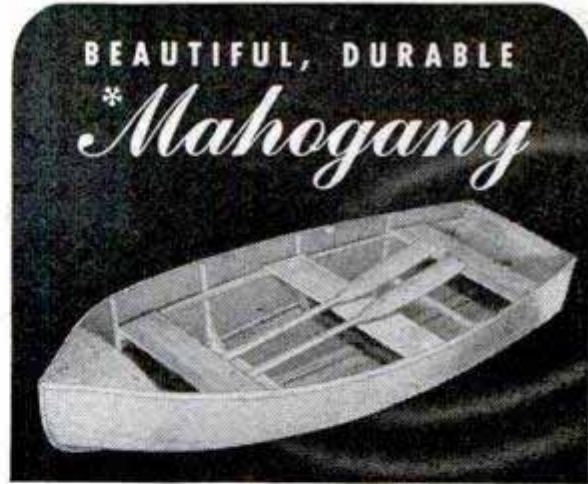
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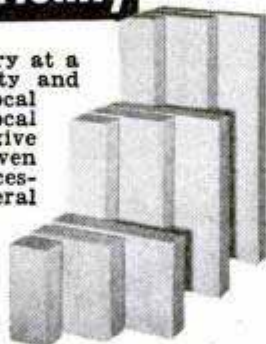
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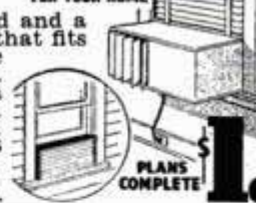
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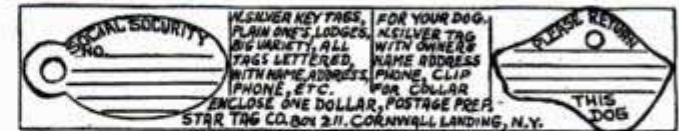
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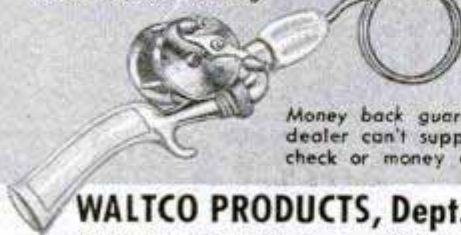
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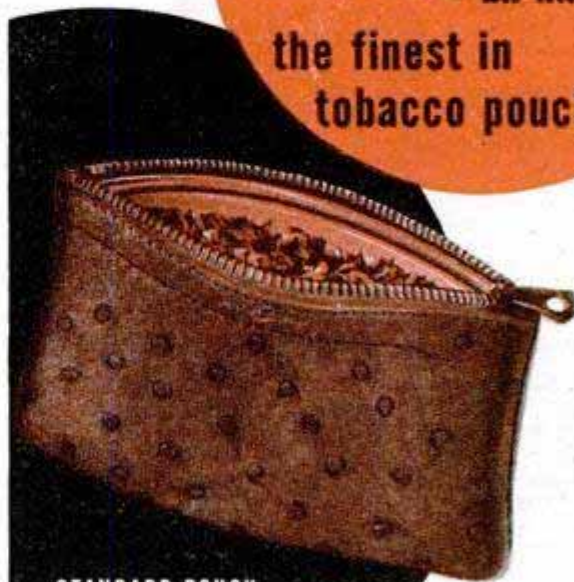
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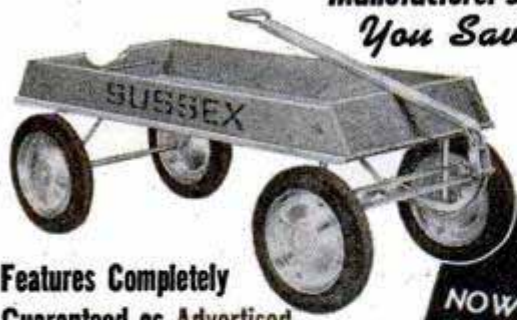
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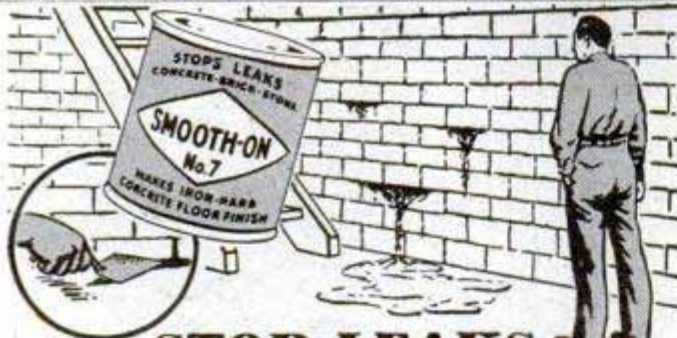
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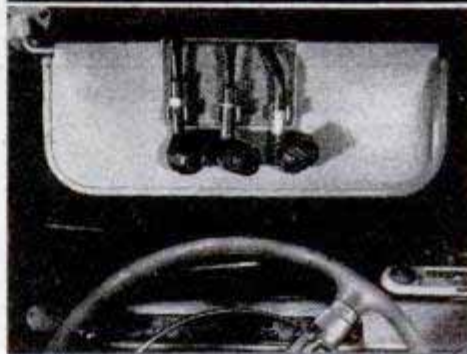
Assemble GOLF-CART in 15 minutes with ordinary household tools. Order direct from factory and save middleman's markups and extra labor costs. Never before has a golf club carrier of this quality been offered at this sensationally low price. Special aluminum-alloy construction—light but strong. Easy-rolling, ball-bearing wheels. Full cushion pneumatic tires. Folds for compact storage without pressure on clubs. Instantly adjustable for any size bag. Ample storage space for raincoats, etc. Unconditionally guaranteed one year against mechanical defects. Dealers Wanted.

SAVE
UP TO
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THE SUN VISOR
PIPE RACK
FITS ANY CAR
\$1.00 postpaid
anywhere

Holds all shapes and sizes. Pipes drain properly and are out of sight when not in use. Pipes held in place securely by new scientifically developed spring steel clips. Modern golden bronze hammer-tone finish. Neat, compact, attractive. Completely made of tempered steel and constructed to last a lifetime.

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Car Owners! Meet Master Glaze—the sensationally different luster for new and used cars! Not a wax—not an oil polish—not a paint!—nothing that "smears" over the surface.

MASTER GLAZE is a unique discovery—a creamy liquid—quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster—beautiful, sparkling clean and brilliant! Doesn't finger-mark—doesn't smear! A match box full glazes an entire car. Seals the pores—protects! **NOTHING LIKE IT!**

AGENTS
An unusual opportunity! Quick, flashy demonstrator. Big profits. Good territory. Write today!

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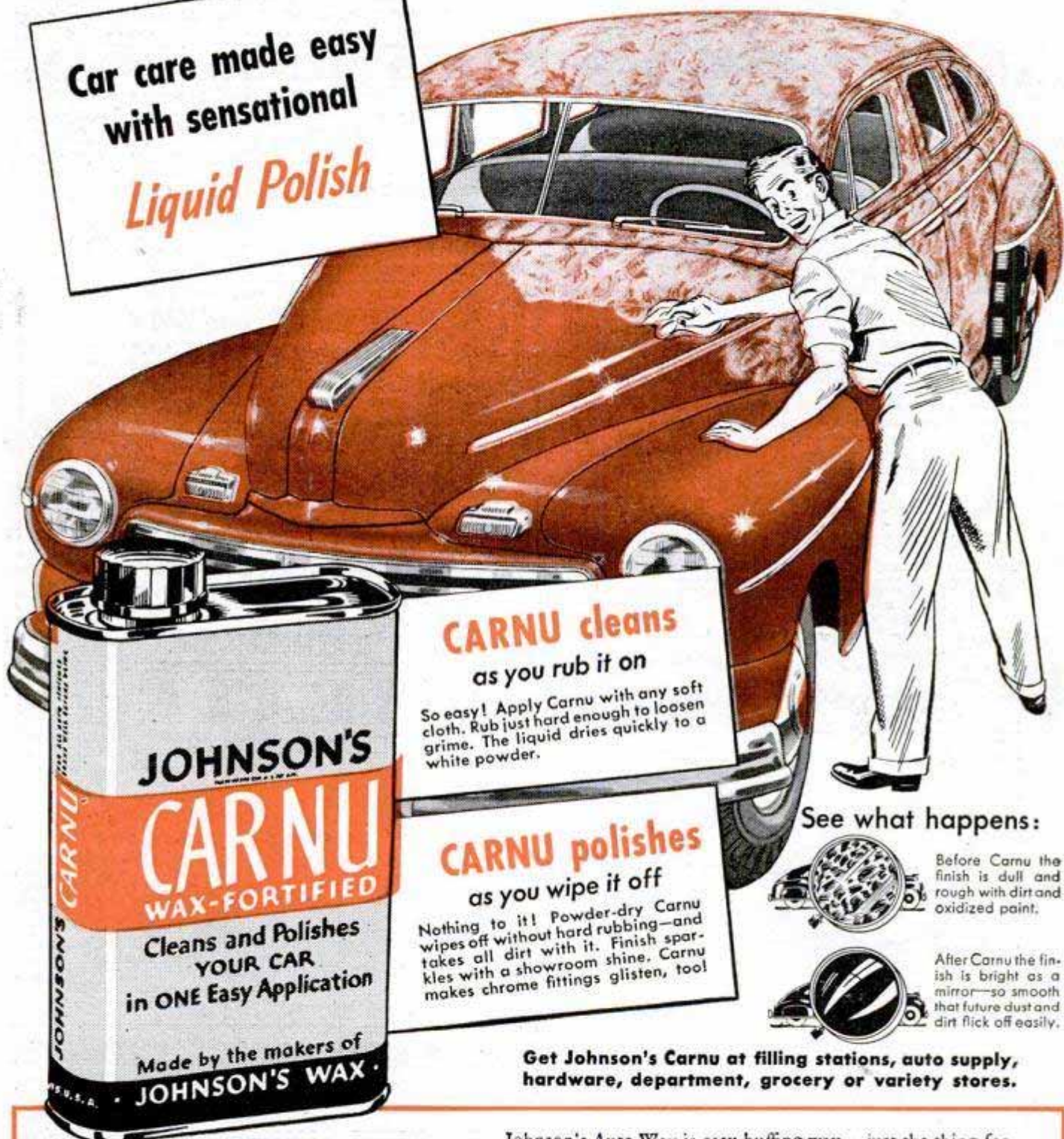
MASTER GLAZE CO., 7720-657 W. Harwood Ave., Milwaukee, Wis.

Do both jobs

cleaning *polishing*

at once!

Car care made easy
with sensational
Liquid Polish



CARNU cleans
as you rub it on

So easy! Apply Carnu with any soft cloth. Rub just hard enough to loosen grime. The liquid dries quickly to a white powder.

CARNU polishes
as you wipe it off

Nothing to it! Powder-dry Carnu wipes off without hard rubbing—and takes all dirt with it. Finish sparkles with a showroom shine. Carnu makes chrome fittings glisten, too!

See what happens:



Before Carnu the finish is dull and rough with dirt and oxidized paint.



After Carnu the finish is bright as a mirror—so smooth that future dust and dirt flick off easily.

Get Johnson's Carnu at filling stations, auto supply, hardware, department, grocery or variety stores.

How to weatherproof a Carnu Polish

A tough, protective coat of Johnson's Auto Wax does all three:

1. Maintains the Carnu shine
2. Protects the finish in all weather
3. Helps preserve the color.

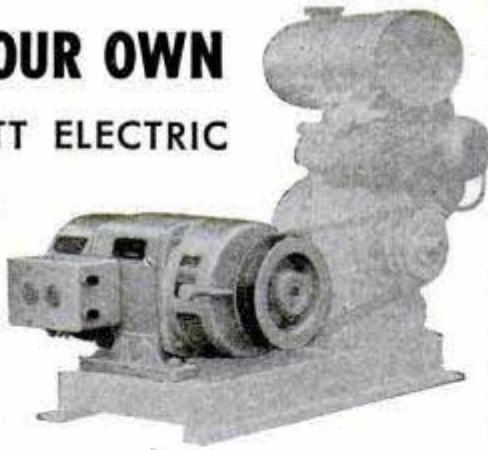
Johnson's Auto Wax is easy-buffing wax—just the thing for any home handy-man who wants to give his car a professional shine. And there's no better protective coating. Johnson's Auto Wax guards the finish against sun, heat and moisture. You'll find it easier, too, to keep your car clean and shining—dirt can't imbed itself in the smooth, hard waxed surface. Johnson's Auto Wax is sold wherever Carnu is sold. Try it!



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BUILD YOUR OWN 2500 WATT ELECTRIC LIGHT PLANT



All you need is a standard electric generator, a small 6 H.P. gasoline engine, an angle iron base, 2 sheaves, and 2 v-belts. You can assemble the unit in your spare time far cheaper than any factory with high overhead expense.

Start out by buying the electric generator shown here. Costs \$125.00 (without sheave or belts), freight prepaid to your city. It is a Leland Alternator, 2.5 KVA, 120 volt, single phase, 60 cycle, alternating current. It must turn at 1800 r.p.m. Voltage is self regulating.

Produces enough current to burn 50 fifty watt bulbs, or 100 twenty-five watt bulbs. Just the size to start and operate a 3/4 H.P. electric motor. Current characteristics suitable for all standard electric appliances, and most electric motors.

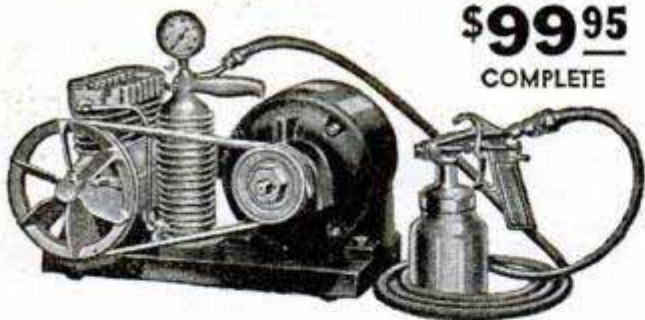
Generators are available in this one size and type only, and complete instructions for constructing base and assembling are furnished. We ship the same day order is received if accompanied by bank draft or cashiers check. A slight delay on orders with personal checks.

HOPFER & COMPANY

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SPRAY PAINTING OUTFIT



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Our price only, FOB, K. C.

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or other uses. Only, FOB K.C.

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Water, Vapor and Shock Proof

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This exclusive patented way... saves 3/4 the time. Does a better job. 25c can enough for 4 cars. At your dealer or send 25c for can postpaid.

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Quick and easy. Do your car in less than an hour. Contains expensive, pure Carnauba wax, hardest wax known. Lasts up to 6 months.

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In ready-to-use powder form. At your dealer or send \$1.50 for big 10-oz. can (enough for 4 cars) and get Timex Wax Polisher FREE. Limited offer! C.O.D. orders, plus postage.

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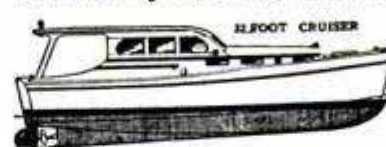


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Save 80% ASSEMBLE YOUR OWN ARC WELDER Only \$24.95



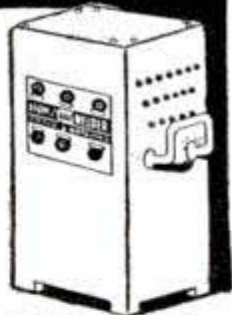
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You get a real thrill when you put this husky he-man tool to work on your toughest jobs. Drives twist drills for drilling up to 1/2" holes in steel—1 1/4" in wood—drives hole saws for holes 3/4" to 3 1/2" in wood, steel or composition—also drives sanders, buffers, etc. Saves hundreds of hours. Not a toy, even at this low price. PERPETUALLY GUARANTEED. Order yours today... only \$39.95... \$5.00 down, balance C.O.D. Shipping wt. 8 lbs.

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SAVE BACK-BREAKING WORK!

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Saves time...
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Adjustable
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Double Row Seeder
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Get a better job and avoid risk of sowing cracked or broken seed. Sow all kinds of seeds... from the smallest up to beans and corn. For small gardens—the Single Row Seeder; for larger gardens use two singles to make a Double Row Seeder. The exclusive Garden-All hitch allows seeders to follow contour of ground regardless of position of tractor.

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**War and Factory
SURPLUS
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Superior Warranted
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Large 26"
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Handy for every tool shop, work shop, experimenter... in the home, on the farm, in the factory... a wonderful surplus value worth many times this low price.

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Set of 3 Great Neck

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\$1.00
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Continuously cleans and RE-REFINES motor oil as you drive (by utilizing motor heat)—keeps oil in high grade lubricating quality at all times—reduces motor wear to a minimum! Proves conclusively that "Oil Does Not Wear Out Mechanically" as stated by U. S. Bureau of Standards, (Bulletin 86).

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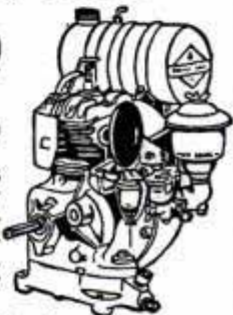
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Engines will develop almost 2 Hp. at 3600 RPM. Hurry don't wait, buy now while limited supply lasts. Suitable for lawn mowers, garden tractors, motor bicycles and scooters, midget cars, etc. Will power many kinds of machinery.



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INSTANTLY—THOROUGHLY
CLEANS CLOGGED DRAINS
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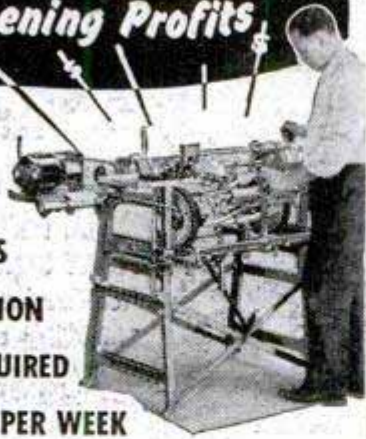


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Saw blade tilts table stays flat

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This is all you wear! \$75 Complete.

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A TESTED TOOL THAT PACKS YEARS OF PLEASURE

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(Less Moto-Tool)

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Juvenile wheels, solid tire—No Bearings

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- 12 x 1.75"\$3.25
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Industrial wheels for heavy loads

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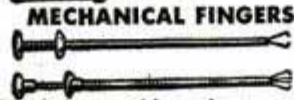
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For antennas, motors for windings coil winding cores, etc.



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5 speeds - 5 drives. Very useful for pulleys. Input 18 volts and 4.5 amps. Output 450 volts 0.060 amps. Speeds from 4000 r.p.m. up. Each.....

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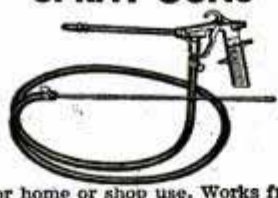
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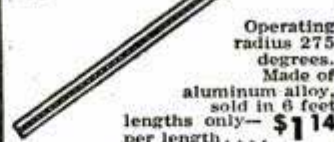


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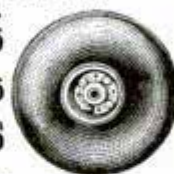


Light weight durable composition, covered with water repellent cloth. Adjustable chin strap. Adjustable sweat band. Sizes 6 3/8 to 7 3/8. Made to exacting specifications for our service men in the African campaign. For outdoor summer wear. A bargain! Each.....

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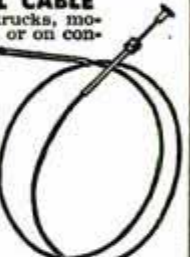
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Brand new 5:00 x 4 wheel, bearings, tire and tube. Tire 6-ply, smooth tread, width inflated 4.8" overall height inflated 13.1". Wheel—split wheel, 5/8" axle hole, width at axle 2" - \$1450
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Complete tire, tube, wheel, bearings and axle stub, load cap. 29,000 pounds. Used, good condition, each..... \$9400
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NEW 30 x 7 Tires 8-ply, Nylon and rayon cord, equal to 7:00 x 16, each..... \$1495



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For autos, trucks, motor scooters or on controls beyond reach. Length 8 feet. 2 1/2" pull. Can be mounted through 3/8" hole and has brass knobs. Only



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Oil and gasoline resistant. A thousand uses. Each only



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Tapped with 1/4" pipe thread on both ends of the 500 cu. in., 1000 cu. in. and the 2100 cu. in. Smaller tanks, 1/4" pipe thread one end. For compressors, pneumatic units, hydraulic, liquids, or portable air storage for tires, etc. Tested to 500 pound pressure per sq. inch.



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| 104 cu. in. | 1.4 cu. ft. \$1.25 |
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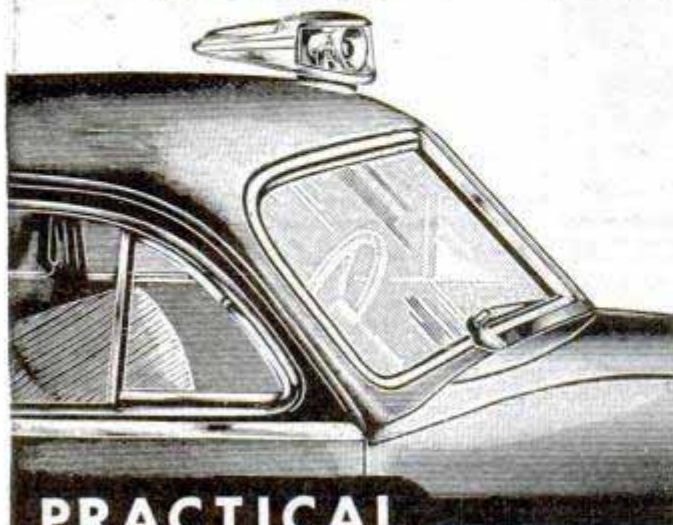
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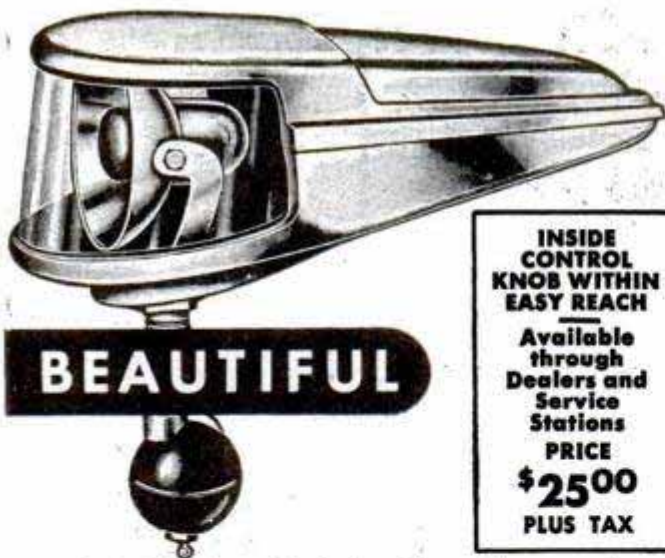
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INSIDE CONTROL KNOB WITHIN EASY REACH

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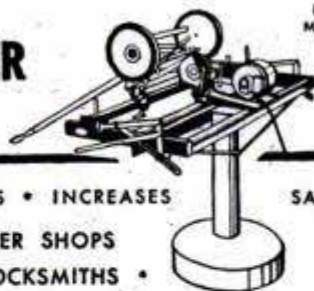
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UNCONDITIONALLY GUARANTEED ONE YEAR

Comes complete with Floating motor mount—miter gauge with adjustable stop—aluminum guard—soft aluminum insert—spring steel splitter—heavy gray iron fence—(no motor—no blade). Table 12" x 14". Tilts to 45°—Oilite bearings. Shipping Wt. 48 lbs.

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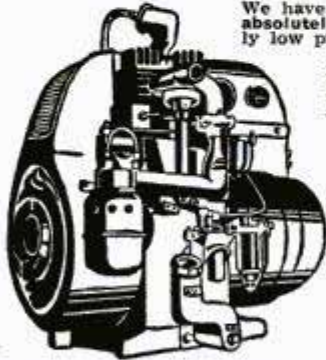
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1000 Watts—110 Volts AC—Manufactured by Onan and Sons. Generator 4 pole, self-excited, self-regulated, direct connection to the engine. Drip-proof, conservatively rated. Engine 1 cylinder, 4 cycle, air cooled, gasoline driven, magneto ignition, radio shielding. Manual Start. Brand New Units. Shipping weight 27 1/2 pounds. Factory Price \$295.00

Special Price **\$195.00**

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Ingersoll-Rand AVC-11 with air control, push button throttle, takes up to 5/32 rivet. Like new. Weight 5 pounds. List Price \$73.00—Special Price..... **\$7.95**



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Model PRS-10, Alligator jaws, or PRS-10, "C" Type Yoke. Weight 3 lbs. List Price \$39.00—Special Price..... **\$12.95**

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USE AS 6 VOLT GENERATOR—Generate your own power. Can be operated on your bicycle wheel. Furnishes sufficient power for two 6 volt bulbs. Resistor furnished free with each motor enables you to maintain constant voltage. Special Price \$2.45, or 4 for \$7.50, or 24 for \$36.00.

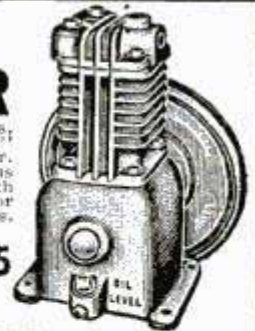
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Piston type, size 2 x 1 1/4, head in valves, bronze bearings, splash lubrication, "V" Belt drive, Intake muffler and cleaner. Capacity 2.8 c.f.m. at 100 lbs. continuous pressure or 150 lbs. Intermittent, with 1/2 HP motor. Can be used with 3/4 HP or 1 1/2 HP at lower speed. Weight 14 lbs. Operating instructions furnished.



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Oil resistant, pressure 0-to-200 lb. Reduced pressure 0-to-75 lb.; 3 outlets 1/4". Wt. 2 lbs. **\$5.75**



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Prevent leakage after compressor stops. 1/4" Check Valve..... **\$2.50**
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Standard air gauge, 1 1/2" diameter, 0-200 lb. pressure. **\$1.75**



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SPECIAL OFFER! SAVE 1/2 PORTABLE AIR COMPRESSOR SPRAY PAINTING OUTFIT



1/3 HP. GE MOTOR **\$49.50** COMPLETE LESS BASE

2.8 C.F.M. Displacement Compact Power Plus
Complete as shown, less base

Here is what you get: 1/3 HP. GE motor or equal, 110 volt, 60 cycle, 1 phase, 1750 RPM, with 6 ft. cord and plug; Compressor, 2 x 1 1/4 piston type; Spray gun with qt. cup, 2 nozzles, round-fan spray, air filter, 15 ft. hose and fittings; belt and pulley. All bolts necessary for mounting on base. We pass the big saving in labor on to you. All you have to do is mount on base as shown. Complete operating instructions furnished. Weight 50 lbs. **\$49.50**
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\$32.50 COMPLETE



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1/3 H.P. General Electric Motor—110 volt—60 cycle—1750 RPM; 6 foot Stow or Mall heavy duty shaft, 3/8" core, ball bearing handle and arbor, 4" wire brush. Weight 32 pounds. **\$32.50**
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These motors also furnished in 3450 R.P.M. at same price.

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Complete With Wheels, Tires & Bearings Made To Outwear Other Type Wheels

| SIZE | TIRE | BEARINGS | LOAD | ONE | TWO | FOUR |
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| 4.00"x8" | Pneumatic 16" O.D. | T.R. 1" | 700 lbs. | \$13.50 | \$26.00 | \$50.00 |
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Three sizes . . . please specify

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Handles all identical

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2 for \$1.75 — 3 for \$2.50

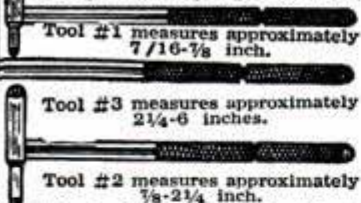
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Micrometer Accuracy Inside Measurements 7/16 inch to 6 inches ONLY

\$4.95 C.O.D. PLUS POSTAGE

Completely finished parts. SAVE \$10. Anyone can assemble in less than one hour. No tools of any kind needed.

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Use as 1/2 Hp. 24/32 vdc. motor or 24/32 vdc. to 110 vac. 400 cycle converter. Complete instructions furnished. Excellent condition.

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For HOBBYISTS and EXPERIMENTERS



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Shipping Wt. 5 lbs.
\$14.50

Ideal call and communication system for homes, offices, factories, stores, etc. Makes excellent electronic baby watcher, easy to assemble with every part supplied including simple instructions. Distance up to 1/5 mile. Operates from 110-V A.C. 3 tubes, one master and one remote speaker.

GN58 GENERATOR

Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs. **\$7.95**



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An electric motor operating a generator on same shaft—hundreds of uses—gives high voltage from storage battery.
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A beautifully constructed tuner containing the best in variable condensers, coils, vernier dials, etc., at least \$30.00 worth of parts, complete with conversion instructions to transmitter and receiver. Add postage for 20 lbs. **\$2.49**



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10 times as powerful as a walkie talkie



\$14.95
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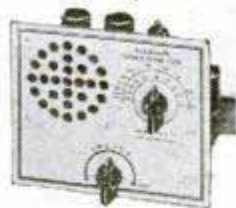
PE101C Dynamotor for 12 or 24 Volt storage battery operation \$3.95
110 V A.C. Power Supply to operate BC 645 from house current \$11.95
T-32 Table Microphone..... \$2.95
Microphone Transformer..... \$1.00
5" PM Speaker for BC 645 \$2.80

HEATHKIT 3-TUBE ALL-WAVE RADIO

110-volt AC operation

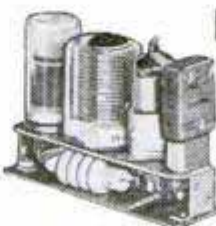
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An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit. Operates loud speaker. Battery model for use where no AC house current is available. Add postage for 3 lbs.



Heathkit Beginners' Radio 110-volt type \$5.95
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Headphones for either type HS 30 per set \$1.00
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Batteries, complete kit for battery type set \$3.25

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Complete kit to assemble a 1 Watt battery operated amateur 80 meter transmitter, including tube and crystal. Range up to 500 miles. Only accessories needed are sending key and batteries. Complete instructions supplied. Add postage for 2 lbs.

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Complete kit to build a beautiful 5" oscilloscope. Ideal for studying and servicing television and FM radio. 6 tubes including 5BP1 cathode ray tube. 1500-volt power supply operates from 110-V 60 cy A.C. Has compensated vertical and horizontal amplifiers and 15 cy to 30 KC sweep generator. Detailed instructions make assembly easy. Shipping weight, 35 lbs. Nothing else to buy **\$39.50**



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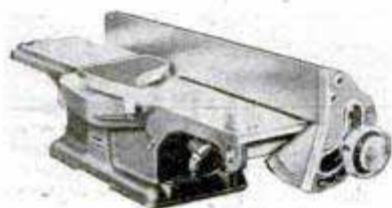


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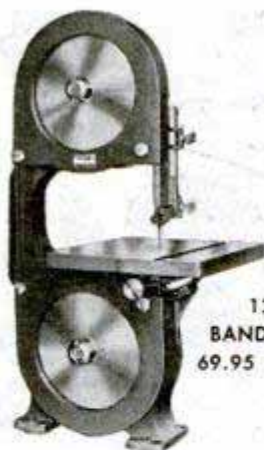
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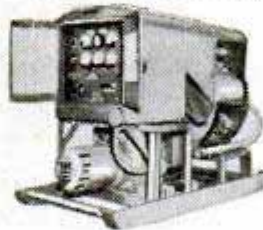
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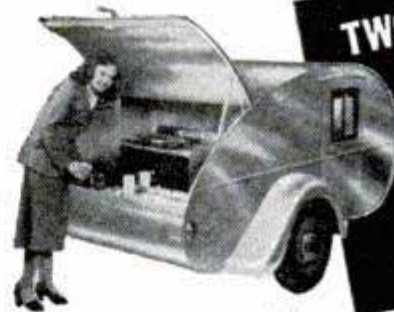
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Whether an invention is patentable can be substantially determined by a search of the U. S. Patent records. Without obligation, write for information explaining the steps you should take to secure a patent.

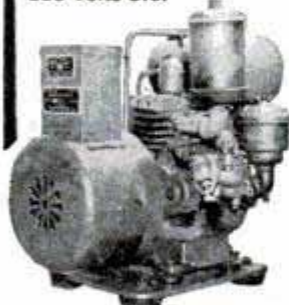
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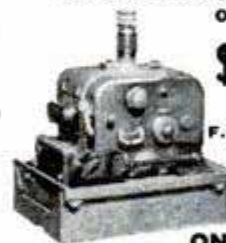
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With Sight Finder and Stop Button. In Case with Folding Cover. Perfect for travel.

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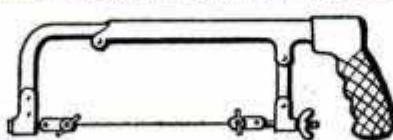
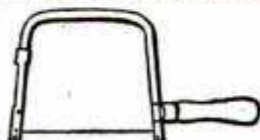
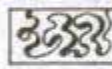
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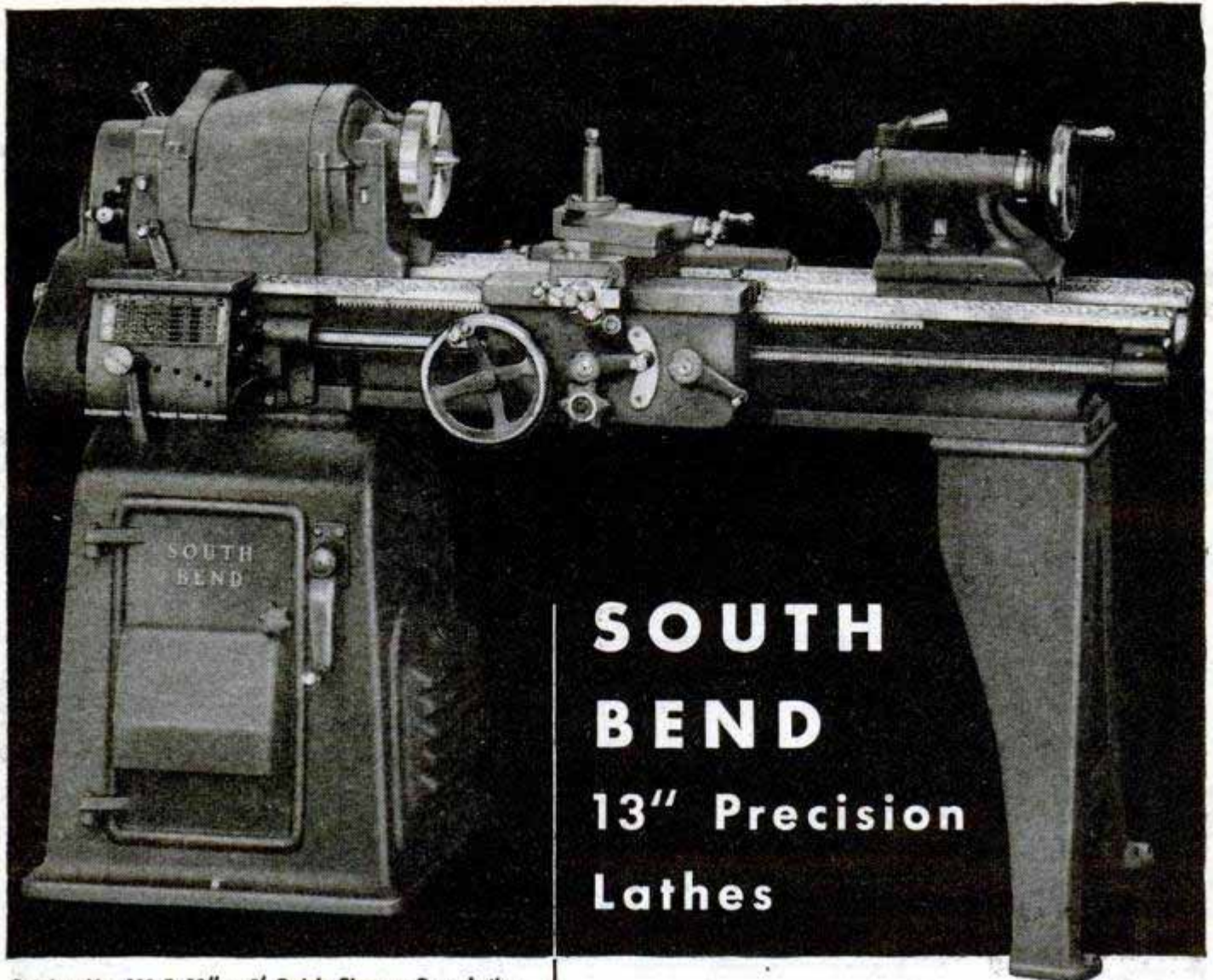
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| POWER CROSS FEEDS: 48 | .0006" to .0312" |
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| COMPOUND REST TOP ANGULAR FEED | 3 $\frac{1}{2}$ " |
| TAILSTOCK SPINDLE TRAVEL | 4 $\frac{1}{4}$ " |
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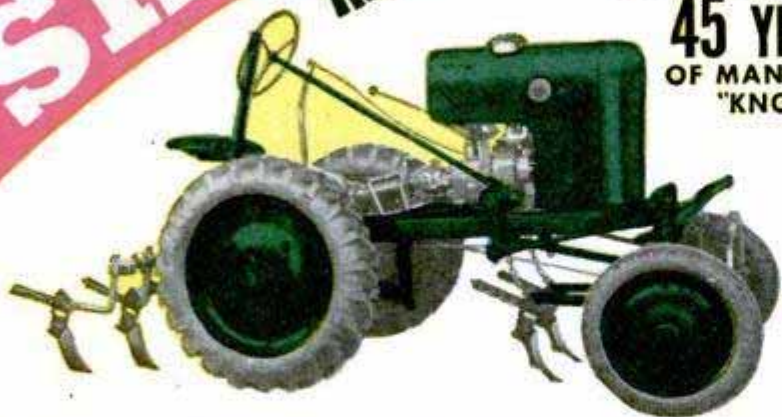
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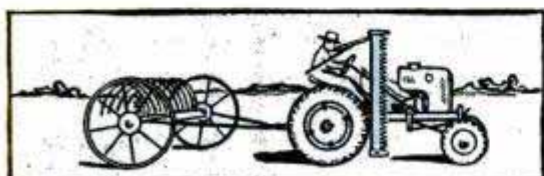


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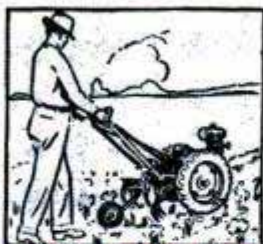
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