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POPULAR MECHANICS

MAGAZINE



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MARCH
25 CENTS



SEE PAGE
343



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THE SPARK PLUGS in your engine so largely and vitally affect its performance that it would be a shame to handicap it with spark plugs that are less dependable than Champions.

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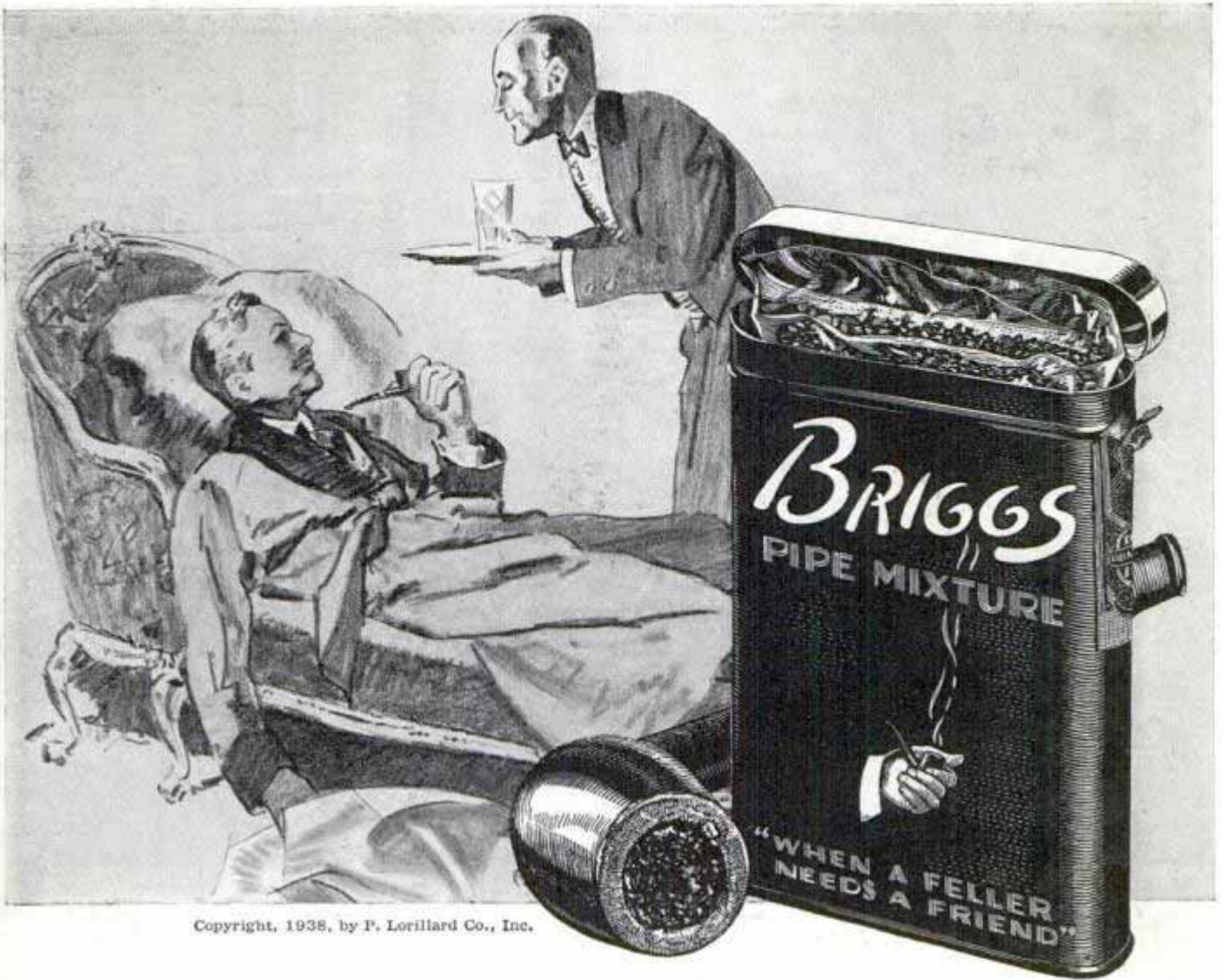
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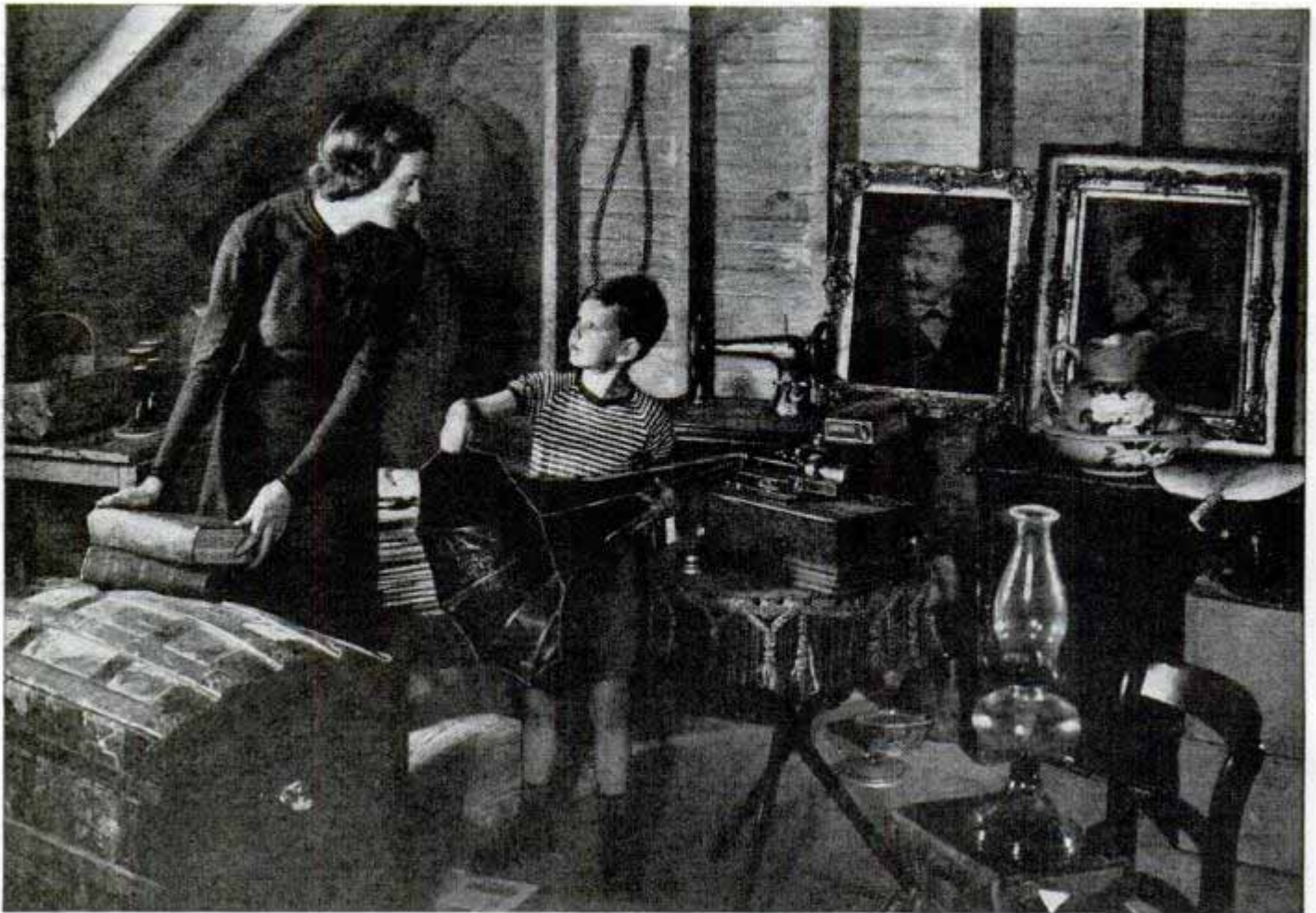
fields . . . reared in Nature's richest soil.

When they come to us, we pack them carefully in stout oaken casks, store them away in shaded, airy sheds. And there they sit for 4 full years. Aged with more pampering patience than is given to many blends selling for from \$5 to \$10 a pound.

Try a tin of this grand old tobacco—15¢—and see what a clearer, sweeter life it brings your pipe; what increased pipe cheer it brings to you.

BRIGGS

CASK-MELLOWED **4** FULL YEARS



"Gee, Mom, Were They All Poor People?"

"Not exactly poor, Bobby. They had money. But they didn't have all the nice things that we have—such as a radio, and electric lights, and a vacuum cleaner. You see, they didn't have electricity, or automobiles, or airplanes. Most of those things hadn't even been invented."

EVEN as late as 1900, only one American home in every seven had a bathtub; one in 13 had a telephone; one home in 30 had electric lights. There were only 8000 automobiles. Manufactured products were scarce and expensive.

Today there are 20 million bathtubs, 18 million telephones, 22 million wired homes, 25 million automobiles, and millions of other manufactured prod-

ucts which were unheard of in 1900 but are now plentiful and sell at a fraction of their former cost.

General Electric scientists and engineers, by applying electrical methods to the tasks of industry, have helped to provide us with the many products that contribute to our comfort and convenience, and to the hundreds of services which we enjoy today.

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

March, 1938

Vol. 69, No. 3

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"The Biggest Thing on Earth"

IT'S called "the biggest thing on earth," and when you see the eight pages of Coloroto pictures of Grand Coulee dam next month, you'll agree that it lives up to its title. When finished, Grand Coulee will be the largest structure ever built by man. It's four times as big as the Great Pyramid, its concrete could build a solid monument one city block square and four times as tall as the Empire State building, and four vessels the size of the "Queen Mary" could be spaced along its top. It's fourteen blocks long and as high as a forty-six story building. Boulder dam could be buried in its base. The entire population of the United States could be placed within its dimensions and standing room would not be crowded. Read next month how pygmy men are building this colossus of concrete—a giant monument to human achievement.

Next Month

WHILE Grand Coulee dam will be the biggest thing ever constructed by man, the most costly moving things ever conceived by human brains are taking form at Philadelphia and New York. They are two super-battleships which will cost \$70,000,000 each and which are expected to be the hardest-hitting and most nearly invulnerable fighting ships in all history. An article next month tells about them.

Invisible Watchdog

THREE masked thugs vaulted a wall and started for the side door of a California home. Before they were half way across the lawn, big floodlights flashed on and a siren screamed. A watchman began firing and the men fled. They probably thought the watchman saw them approaching but they were beaten by black light—the invisible watchdog. Read about it in the April issue.

Grow Your Own Zoo

BEARS in the barnyard, deer in the front yard, pheasants in the poultry yard and raccoons in the parlor—it's all part of tomorrow's agriculture. Wildlife propagation is changing from a "noble cause" to a practical home industry, and game farming is growing into big business. If you don't believe it, read "Wildlife Goes to Town" in the April issue.



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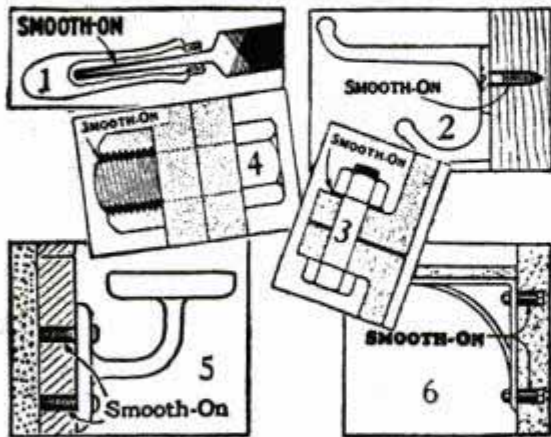
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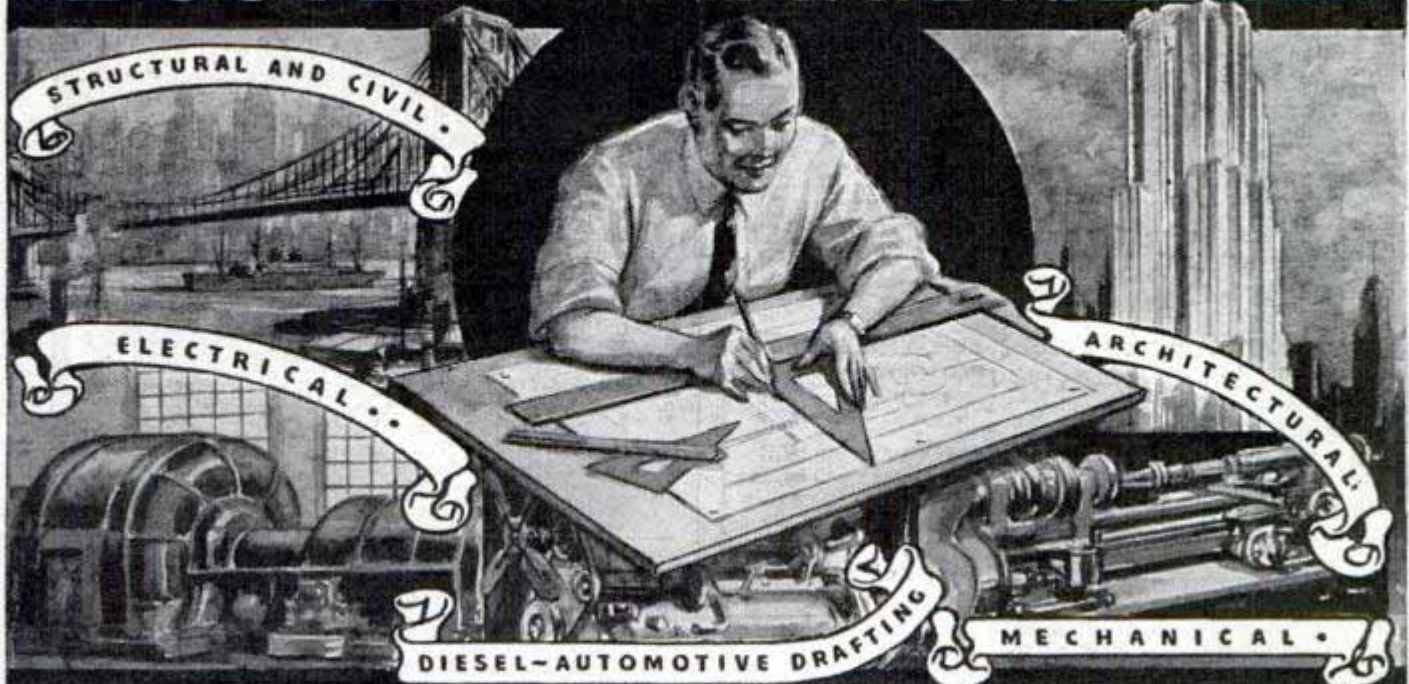
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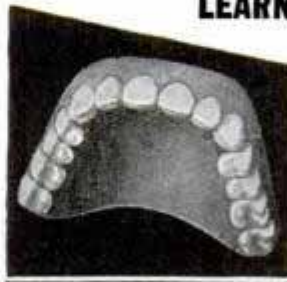
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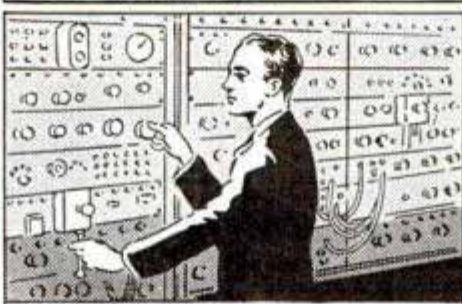
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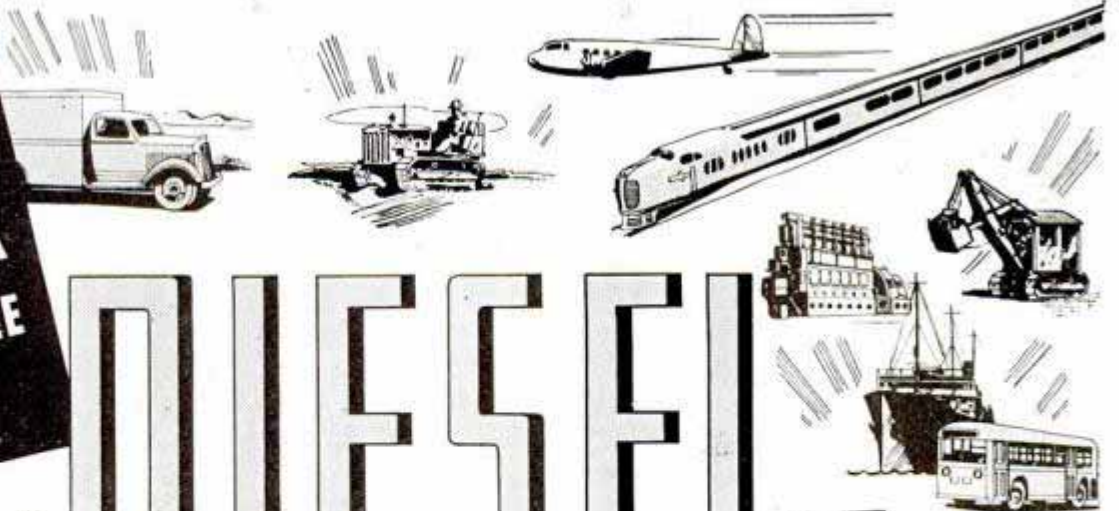
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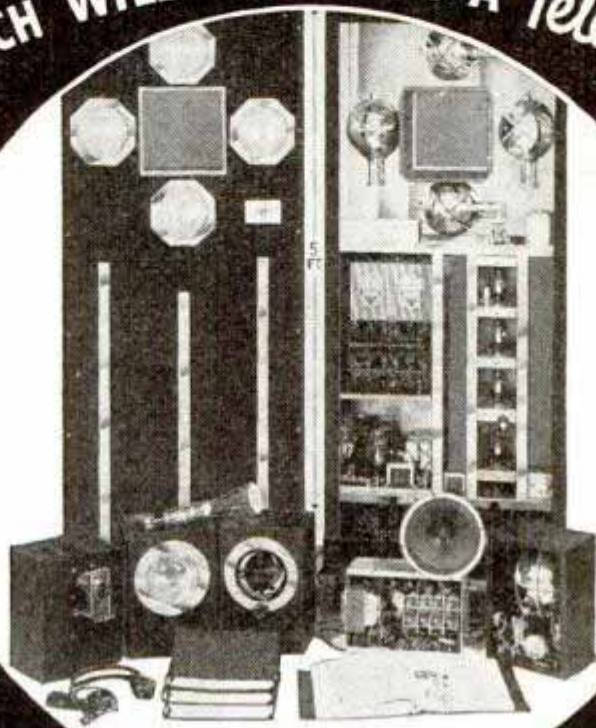
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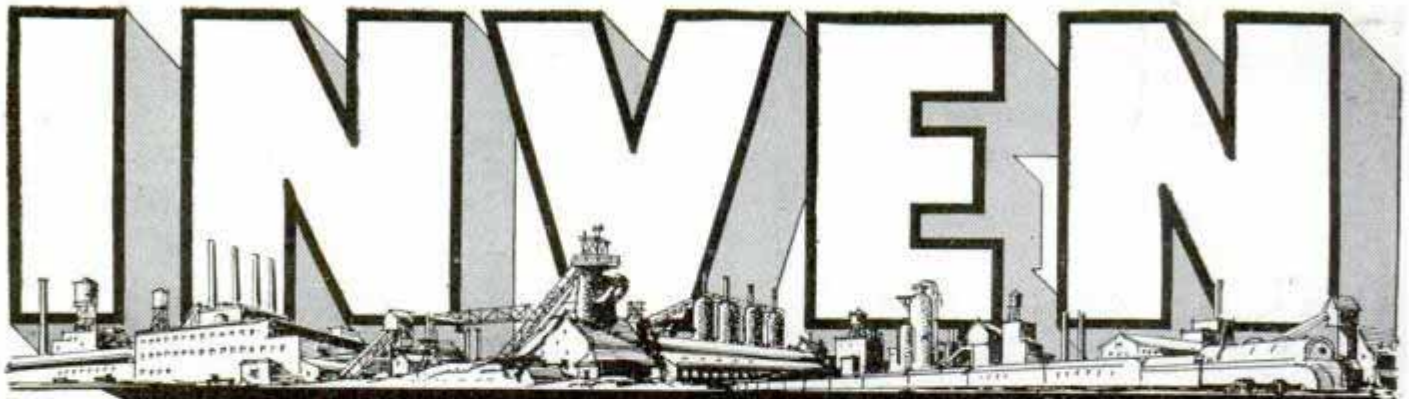
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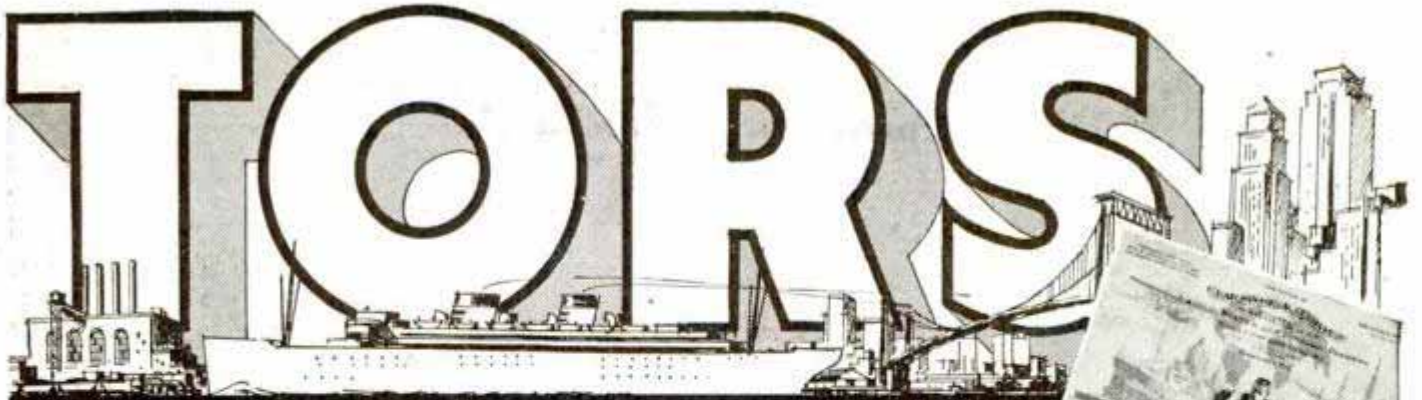
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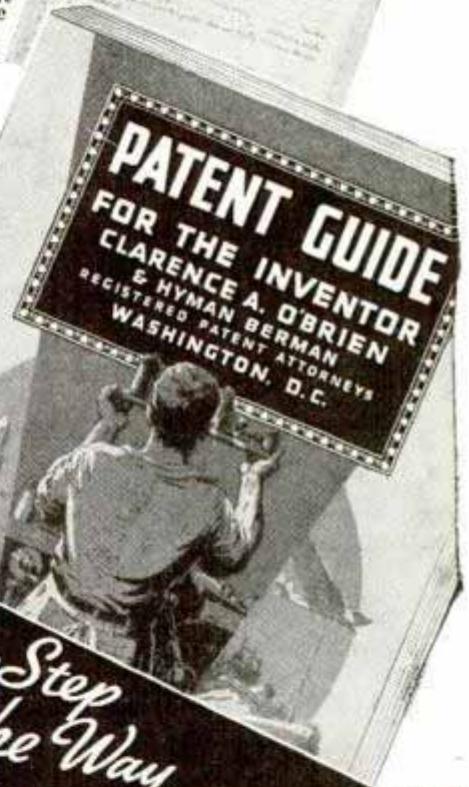
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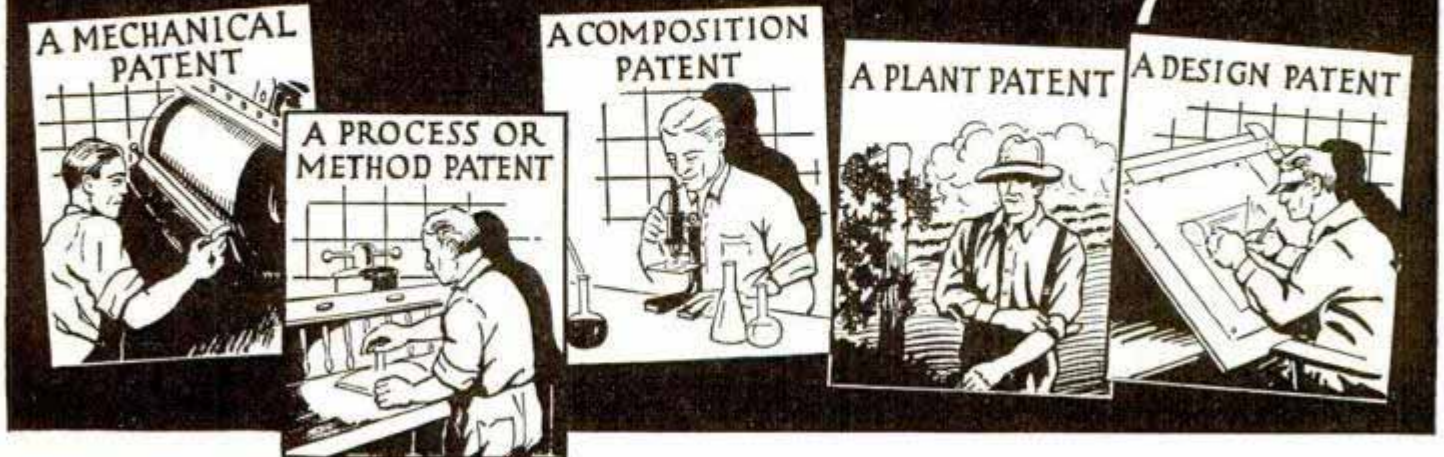
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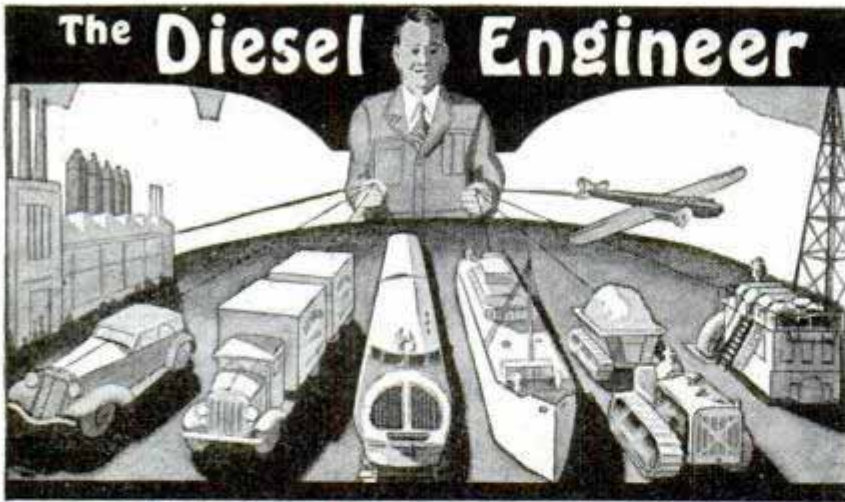
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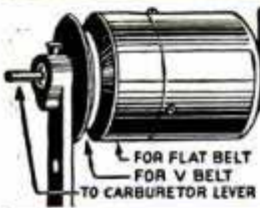
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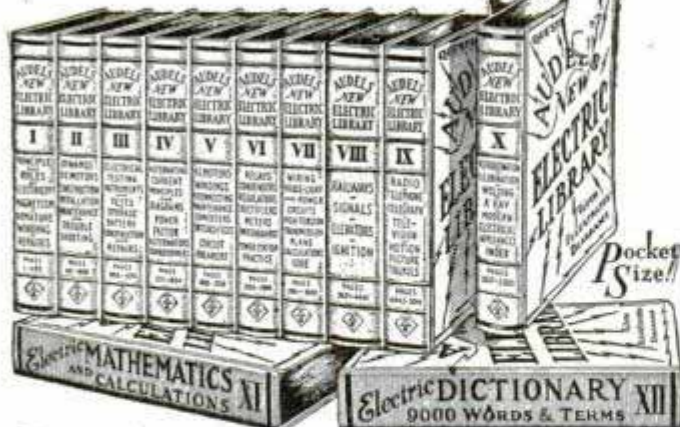


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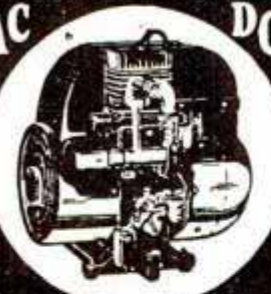
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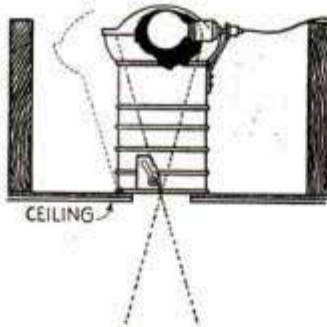


FOR the hot-dog stand having access to electrical connections, an electric cooker recently patented offers a novel means of preparing hot dogs. It consists of a pair of spaced troughs, with a fluid of electrical conducting material in each trough, and



means for connecting electrodes in the troughs to the power supply.

ILLUMINATION from a concealed electrical bulb is provided by a system patented recently. The bulb is installed in a housing above the ceiling and its rays are projected downward by a reflector so that they pass through an opening in the housing and into the room below. The housing is arranged so that the light rays may be directed in a predetermined direction.

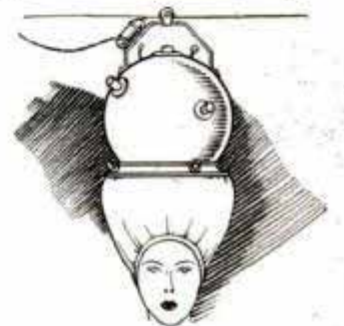


BACK-YARD practice is made possible by a newly patented golf-driving device. It consists of a ball, a rotatable support for the ball and a vertically positioned member on which the support rotates and raises itself when the ball is struck. The height



to which the ball rises determines the force of the drive and is indicated on a yard scale on each side. The ball and the support automatically return to teed position by gravity.

PROTECTION of the head while a hair wave is being applied is afforded by a newly patented cap which may be adjusted so closely that no heated air may escape along those parts of the head not covered with hair. The cap is used in a process by which the wave



is applied by moistening the hair with a permanent-wave fluid and arranging it in waves, after which heated air, of perhaps 100 degrees centigrade, is conducted over the hair with the aid of the cap. With the exception of the openings for inlet and outlet of the air, the cap is entirely airtight.

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The spring has a free end overlapping and normally pressing against the free end of the hook. While the door is closed, a metal ring or loop, holding a milk bottle, may be passed be-

(Continued to page 42A)

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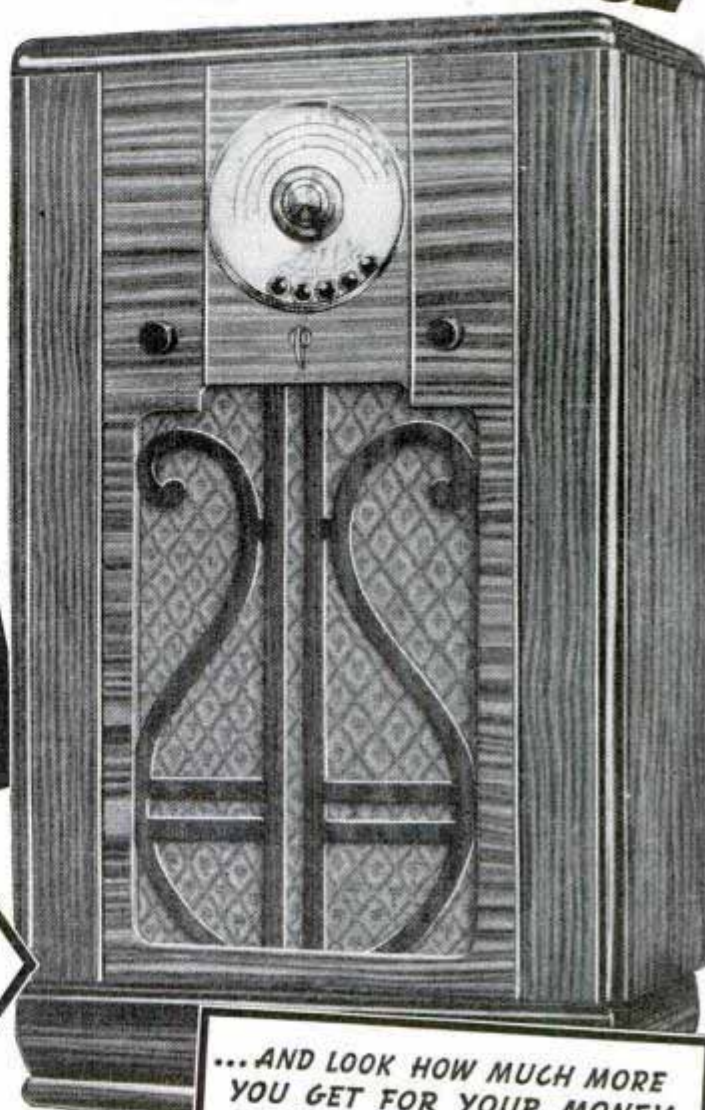
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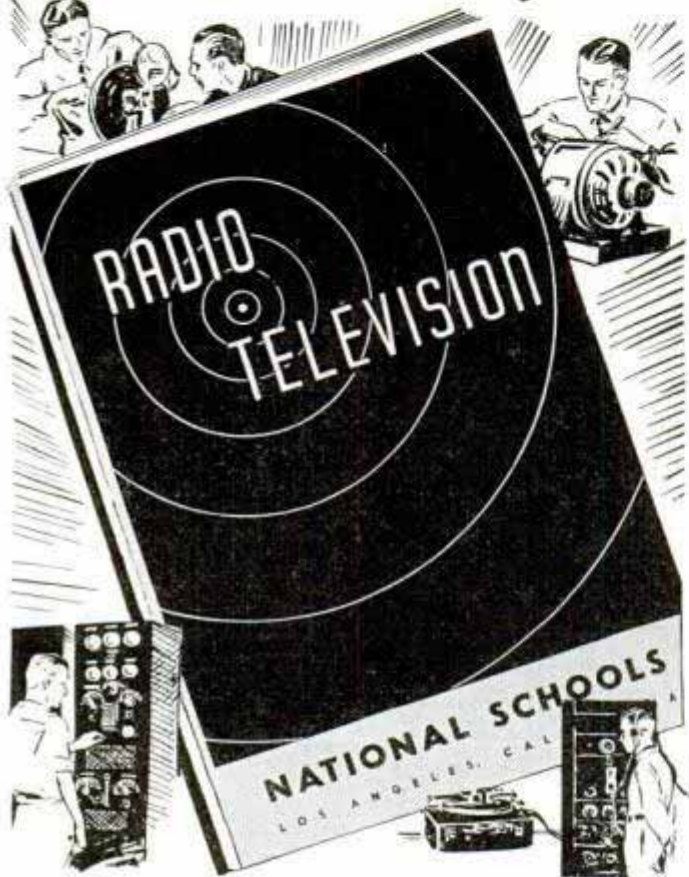
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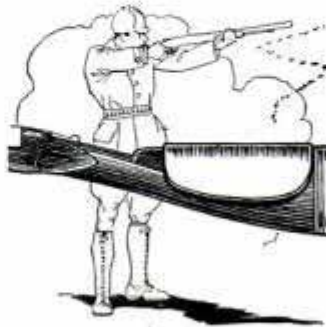
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NEW INVENTIONS

(Continued from page 38A)

tween the overlapping free ends of the hook and the spring and onto the hook. Thus, the bottle will be held in locked position until the door is opened.

PROTECTION of the gunner's face against the kick of a shotgun is provided by a sliding cheek piece just patented.



A slotted guide frame is inserted within the sidewall of the gun stock, then a cheek rest is fitted over the top of the stock and extended

down to the guide slot. A plate bearing against the inner face of the guide frame is arranged to slide back and forth. A spring causes the cheek rest to return to normal position after the firing of the gun.

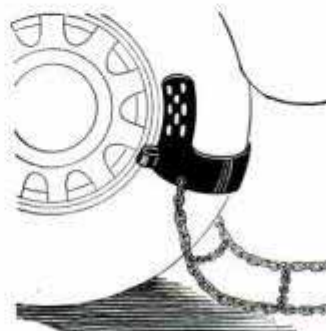
UNDER a new patent, the speedometer is removed from the instrument panel

of the automobile and placed on top of the steering post, in the position usually occupied by the horn button. In this position, the speedometer figures may be read easily and quickly.



The patent provides for a tube surrounding the speedometer to operate the horn and for a glass covering to protect the speedometer. An internal gear permits resetting the speedometer.

PUTTING chains on automobile wheels would be made easy with a device patented recently.



It consists of a bow of resilient material which is applied crosswise of the tire tread. The ends of the bow have parallel roughened leaves, as well as heels,

(Continued to page 66A)

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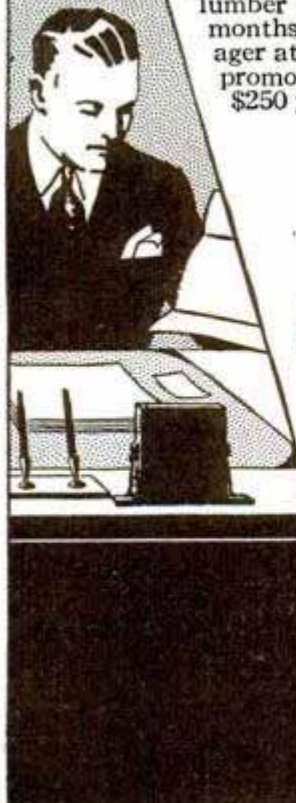
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TREASURE Finders? Read Goldak advertisement on page 138A.

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TREASURE Finders? Read Goldak advertisement on page 138A.

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FREE Melody to songpoems. Publishing. National Songland, "PM," Thomaston, Maine.

SONGWRITERS! Amazing outstanding offer. Hibbeler, C-5, 2157 No. Avers, Chicago.

SONGWRITERS! Marvelous opportunity. Investigate. Standard Song Service, 1412 Great Northern Bldg., Chicago.

SONGPOEMS Revised, set to music, 5 copies. Modern expert service \$2.00. Roy Allen, Kitchel, Ind.

SONGS Composed, arranged, poems, bought. Basil Alt, New Washington, Ohio.

LYRIC Writers, composers. Publication guaranteed. S. Small, 181 Rockaway Parkway, Brooklyn, N. Y.

WANTED Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 42, Toronto, Can.

SONGS Published, arranged and composed. Royalty basis. West Coast Music Publishing Co., 942 Market St., San Francisco, Calif.

COMPOSERS-LYRICISTS. Songs arranged, words or melodies, written, revised by arranger of "Cherry Blossom Lane," "Carolina Moon," "Treasure Island," many others. Send for details. Harold Potter, 1619(P) Broadway, New York.

ORIGINAL Music composed to your words: \$5. Song printed. Reginald Belcher, Chatham, N. Y. 30 years church organist.

SONGWRITERS Wanted, write for free book. Indiana Song Bureau, Salem, Ind.

MUSIC Composed to song-poems. Orchestration arranged. Frank Wildt, Lancaster, Pennsylvania.

SONGWRITERS—Get "How to Write Songs" by famous Broadway composer and free rhyming dictionary. Songwriters Institute, 1234-C Broadway, New York City.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

SONG Poems wanted to be set to music. Free examination. Send poems to McNeil, Bachelor of Music, 4153-PM S. Van Ness, Los Angeles, Calif.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoynes Ave., Chicago.

SONG Poems wanted—Home, love, sacred, any subject. Send best poem today for offer. Richard Bros., 24 Woods Blvd., Chicago.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

PIANO, Self Instruction. Play within an hour. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

BUSINESS OPPORTUNITIES

STATE Distributors in large centers with experience to market through radio dealers and specialty salesmen an entirely new, non-competitive radio attachment. This device allows the user to eliminate annoying commercials or for other reasons reduce the volume to a whisper by simply pressing a switch at remote distances from the radio. Has instant appeal. Retail at \$7.50. Will be nationally advertised and has unlimited sales possibilities, every radio owner being a potential customer. Liberal profits. State business experience and give full information with credit references. Requires \$2,000 to \$10,000 capital to carry merchandise and dealer credits. Send \$5.00 for sample if desired. Radio Reel Co., Washington Bldg., Tacoma, Washington.

MAKE Money repairing automobile radiators. Opportunity where you are. Learn at home spare time. Information free. Radiator Service Dept., Maryville, Mo.

MAKE Big money in floor surfacing with electric sanding machines. Get into something for yourself and be your own boss. Start with as little as \$75.00. A tried and proven money maker. Learn to run one in an hour. No previous experience required. Write D. A. Wing, Box R. Central Station, Toledo, Ohio.

\$100 STARTS "Chain" of chewing gum and confection vending machines. Steady cash income. Details free. Robbins Co., 1141P DeKaib Ave., Brooklyn, N. Y.

NEW Twinphone—priced to sell for \$21.95 this complete system is the only fast selling interoffice communicating equipment on the market. No service expense. No installation problems. In Twinphone are combined technical perfection, exclusive features plus unconditional guaranty of established manufacturer. Inquiries are invited from responsible distributors interested in substantial profits immediately. Write Executone, Inc., 415 Lexington Ave., New York.

FASCINATING Business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to \$15 daily. Complete instructions covering all makes \$3 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 3433, Chicago.

FORMULAS—Fast selling products. Guaranteed. Laboratory tested. Lowest prices. Catalog free. Kemico, 55P, Park Ridge, Ill.

OWN Your own business—make \$3.00 on each quick sale. Many report 6 sales a day. Unlimited prospects. Write for special offer and illustrated folder today. Scott Mfg. Co., 4242 East 54th Terrace, Kansas City, Mo.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 127, Marion, Indiana.

EARN Money supplying merchants certain names. Plan 25c. Herman System, Massillon, Ohio.

IF You'd like an extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

MAKE Money direct from factory. Little Nut Vendor, Lansing, Michigan.

107 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 214 Grand St., New York.

400 SUCCESSFUL Plans, \$1.50. Particulars free. D. Hemingway, Oak Knoll Road, Natick, Mass.

GROW Bumper crops of vegetables and flowers in small space with chemicals. Season's supply with directions \$2.00. W. L. Kemp, Box 866, Selma, Ala.

OPPORTUNITY Here! Earn substantial income, prosperity, year-round, no canvassing. Details free. McArthur, Drawer 339-5, Butte, Montana.

AFTERNOONS Free for outdoors, shows. \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-F, Station D, Los Angeles.

WORLD Market: Firm supplies actual source anything manufactured. Stamp appreciated. Degregory, 509 Fifth Ave., New York.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

EARN Extra money spare time. No canvassing or manufacturing. Business Opportunities, Dept. 44, Box 5005, St. Paul, Minn.

RUBBER Mold bargains! Stamp brings catalogue. Colonial Art, Derry, N. H.

BURGLAR Alarms. Install alarms. Have monthly service income. Midnight Alarm System, Fenton, Michigan.

MANUFACTURE Patented rubber mat from junk tires. Cooperative Crafts, White Plains, N. Y.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

AMAZING Patented screw holding screw drivers! No competition! Factories, hardware stores buy quantities. Big profits, repeats. Free trial! Foreign territories open. Toolco, 5083 Winthrop Bldg., Boston, Mass.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

GIFT Shops, roadstands and stores want articles made in America. You can make them from our samples. \$1.00 dozen. Homecraft Industries, North Chelmsford, Mass.

"THE Mail Order Helper" 10c. Fox, 608 Rogers Ave., Brooklyn, N. Y.

"KEY To Business Opportunities" free. Goodall Advertiser, 742 Market, San Francisco.

YOU Can make \$3.75 to \$9.00 a day. I have. Formula 10c. J. R. Anderson, Parkersburg, W. Va.

ADDED Income ideas. Mail Sales News magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

REAL Money making propositions. Particulars for stamp. Goffot Mailing Service, Box 364, Alhambra, Calif.

MAKE Electric fuses. Fuse and instructions \$1.00. W. Stonebraker, 6006 Harney, St. Louis.

MERITORIOUS Enterprises organized, developed, incorporated, products marketed, prospectus prepared, filed. Actual broker connections. Suttle, 509 Fifth Ave., New York.

\$50.00 WEEKLY! Operate mail order business for us. Product furnished. Iron-So-Ezee, Mt. Washington, Ohio.

"WORLD'S Newest Co-op Plan" sells your product or ours. Easy, simple, sure, no canvassing, peddling. Free particulars. Lewis, Box 243, Minneapolis.

AT Home or shop—Your own manufacturing and retail business—Hand loom weaving and local sales agency. Everything supplied. Man, woman or couple. Honest employment, part or all time. Small investment. Write Wachovia Weavers, Kernersville, North Carolina.

INVESTIGATE Our sound mail order projects. Modest capital. Free folder. Steininger, 706 West North, Pittsburgh, Penna.

FREE Circulars describing hundreds of moneymaking opportunities by mail. Newest methods. Pleasant surprise. Write now. Progress Publishing Co., 2513A N. 9th St., Milwaukee, Wis.

RECEIVE Many letters every day containing 10c. New up-to-date, legitimate money making proposition. Sample and pulling ad that brings the dimes sent upon receipt of 25c. Northern Distributors, 1229 Park Row Bldg., New York City.

ELECTRIC Lawn mower. Attractive proposition. Request literature. Owen, 830-W Euclid, Detroit, Michigan.

INVEST 25c. Earn dollars. New, good anywhere. Easily learned. Instruction 25c. Henry Estberg, Waupaca, Wis.

TREASURE Finders? Read Goldak advertisement on page 138A.

LEARN Mold making: Using rubberite, cheapest and best rubber known. (See samples.) Imitation marble cement, costing less than 2c a pound. Slabs any size don't warp, have beautiful face finish. Also for novelties, art work. All sets solid inside 20 minutes. Dime brings assorted samples. Also valuable proposition. Address Novelty Supply Co., Grayling, Mich.

LAUGH At money worries. Be independent. Successful, new, home money making plan. No selling. Details free. Mayco Systems, Box 4125, Orlando, Florida.

GELLOID Industry pays fortune manufacturing 25c to \$4 article. Hyco, Box 1100, Cleveland, Ohio.

RUBBER Molds easily made. Stamp brings sample mold and directions. Vosburg Laboratory, Austin, Texas.

CATALOG Spare time plans, formulas, books, 25c. Credited Fedra, 7963 B Kingston, Chicago.

BIG Profit manufacturing marble, granite, flooring, roofing, etc. No machinery, latest formulas and methods, free particulars. Cement Arts, 514 Davis Building, Portland, Ore.

STOP Experimenting. I'll show you how to make a fortune without capital. I did. You can. Stamp appreciated. Peris, 107-C, East Rochester, New York.

MRS. M. earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 59, Chicago.

A MOTH Proofing unit pays big. No capital. Circular free. Druley, Box 422, Oak Park, Ill.

ORDERS Waiting! Start home industry—help us fill tremendous demand for new, fascinating, simply-cast, china-like, artware. Nothing like it. Amazing profits. Your start to independence. Pinart, 9 Indian Church Road, Buffalo, New York.

IRISH Moss with my instructions will build you a permanent business. Sample for stamp. A. H. Hammond, Hyannis, Mass.

MAKE Rubber molds from tested liquid rubber. Complete outfit, instructions. Dollar. Eastern Latex Labs., Box 53, Canton, Mass.

OPPORTUNITIES For stamp. Thompson, 300 E. Pierce, Council Bluffs, Iowa.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1938 season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, Ohio.

AMAZING. New, economic plant fertilizer. 25c. Sanquist Co., Pomeroy, Iowa.

MARBLEIZE Cements. Novelties or building material. Best rubber molds and beginner's outfit priced very low. Dime brings convincing samples. The Cowell Institute, Grayling, Mich.

REPAIRING Upholstered furniture pays well. Illustrated instruction book, covers most common repairs, estimating, where to buy supplies, etc., \$1.50. M. Swider, Dept. B, 260 19th St., Brooklyn, N. Y.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenbeulah, Wis.

OPERATE Chain world's finest money making vending machines. Sells four products, same time. Instant success! Small capital, profits immediately. Penny King, 1233 Chouteau, St. Louis.

START Profitable mailorder business at home. Literature free. Ideal, 179, Park Ridge, Ill.

"MAKE Mirrors at home." Big profits. Little outlay. Also emboss, grind—foil, gold leaf, frost, chip and make imitation stained glass. Instruction course \$1.00. Bestovall, 4047-B N. Whipple, Chicago.

RAISE Mink. Bred females available. Dime for general information. Lomman's Fur Farm, Spangler, Penna.

AT Last! Book of moneymaking plans. Start at home, full or spare time. Send for descriptive folder free. Paramount Sales Service, Box 1784 Wilshire-LaBrea Sta., Los Angeles, Calif.

CHIPPING Glass signs. Booklet free. Beveridge, 160-22P Locust, Jamaica, N. Y.

OPERATE Electric Simionizing station, full or part time. Cash in on national advertising with proved labor-saving invention for your car and business. Only \$29.50. Should net you approximately \$300-\$400 month. Write Bissell's Mfg. Co., 3320 Archer Ave., Chicago. Dealers wanted.

"SUCCESS Beacon." 52 pages! Money-making schemes, ideas, plans. Dime. Jay, Publishers, 6054-p Kenwood, Chicago.

POPCORN, Crispette, carmelcrisp, potato chip, salted nut machines. Long Eakins, 1960 High St., Springfield, Ohio.

DONUT, Potato chip, cheese pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

WE Start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

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

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

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Elfco, 438 N. Wells, Chicago.

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

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

CHARTERS? Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

CASH Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

ARTIFICIAL Marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

SMALL Business of Your Own. 1000 tried and proven methods. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

MONEYMAKING OPPORTUNITIES

BE Independent! Huge profits with these coated popcorn. Easily prepared at home. Complete instructions \$1.00. Liberty Sales Co., Effingham, Illinois.

NOW Make money! A \$1.00 magazine (40th year), filled with schemes, tips, business opportunities, formulas, sent six months for only 30c. "Schemer Monthly," Alliance, Ohio.

\$60.00 WEEK Selling twenty "Big Five" flavoring deals daily. Experience unnecessary. 101% profit. Glenwood Products, McLean, Virginia.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 287, Marion, Indiana.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

1,000,000 ARTICLES Wholesale. Directory 10c. Jelismith, 163 Myrtle, Waltham, Mass.

GET Dollar bills in your mail daily. Nearly all profit. Particulars free. Home-craft Arts, Lakeside, Calif.

\$50 WEEK With your camera. Thousands photos wanted. Booklet describing 100 magazine markets, 25 cents. Other live opportunities sent free. Frank H. Battles, Ann Arbor, Michigan.

SELL By mail; big profits; free literature. Hunt Products, 49 Edgemere, Trenton, N. J.

STOP Squealing—Start crowing! Work mornings home—country drives or movies—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

START Now! Make money casting art objects, plaques, book ends, etc. Rubber mold and full instructions only one dollar. Plastic Arts, Box 26, Homewood, Ala.

TURN Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! Dime brings information, none free. Ace, PMA, 322 Empire, Birmingham, Ala.

MAKE Money resilvering mirrors. Instructions 25c. James, 903 Ninth Street, S.E., Roanoke, Virginia.

OPPORTUNITY Guide 10c. Satisfaction guaranteed. Vixon, Winton Place, 14, Cincinnati.

"NEWEST Mail proposition!" Different! Safe! Profitable! Only 500 members accepted. "6000 word folio" 3c stamp. Gardena Institute, 128B, Station "S," Los Angeles.

PUBLISH Shopping Guide your town. Small capital. Marvelous profits with our system. Details quickly. Pennysaver, Penn Yan, N. Y.

SELL By mail—"Mailorder Digest" tells how. Copy 10c. 128 Cannons, Louisville, Kentucky.

10c BRINGS Copy National Mail Order News. Box 1773PM5, Roanoke, Virginia.

\$10.00 DAILY Stamping names on key checks. Outfit furnished. Sample 25 cents. Bohn Co., Box 86, Wilkes Barre, Penna.

TREASURE Finders? Read Goldak advertisement on page 138A.

HYDROPONICS: Grow plants and flowers without soil. Chemical crop culture. Interesting, educational. Unusual yields. Formulas, instructions and selected bibliography, \$1. Hydroponics, Box 613, Guthrie, Ky.

MILLIONS Jobs! Get dollars in mail daily, like we do, for amazing employment information. Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

HOME Industries, 44 pages, year 10c. Melotz, Publisher, Benson, Nebr.

AUTHENTIC Prosperity plans bring \$8.75 daily. Start on \$1.25. Literature free. Direct mail. Box 344, Summit, New Jersey.

PROFIT In vegetables, flowers, using chemicals. Remarkable yields. Proven formulas. Chemicals for 48 gallons solution. Instructions \$1.00 postpaid. Quick Growth, Hollywood Sta., Box 648, California.

NEED Money?? Need work? Hundreds of interesting money-making offers for a dime. Mention paper. Paramount Distributors, Box 864, Denver, Colo.

START Mailorder business. Details free. Pederson, 1609 1/2 East Fifth, Duluth, Minn.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N, Decatur, Ill.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

MOULDS, Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schiercke, 645 Spencer, Ghent, N. Y.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

FORMULAS, PLANS, ETC.

SECRET Barbecue sauce for making barbecue sandwiches. Best yet and a sure money maker. Recipe and instructions \$1.00. W. L. Kemp, Box 866, Selma, Ala.

LUCKY Seven money making formulas, own your own business, become independent, money back guarantee. Send 25c silver. Plan Distributors, No. 900 Faxon, Memphis, Tenn.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49P, Park Ridge, Ill.

THREE Dimes brings 101 hygrade formulas. Household, cosmetics, remedies, Hellsall, 21 Gerard Ave., North Plainfield, New Jersey.

PROFIT With your products. Learn how. VG Chemical, Box 4651, Pittsburgh, Penna.

MEN! Shave without razor! Send 25c for formula for self-shaving soap. Carl Greiner, 5112 N. Oakley Ave., Chicago, Ill.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

TRISODIUM Metasilicate. Strange chemical powder dissolves paint, grease, rust. 10c gets formulas and supply sources. Waldo, Box 266, Dallas, Texas.

FORMULAS! Best produced for exceptional popular necessities. All lines. (Not stock-formula catalog stuff.) Get these unusual offers—stamp brings them. Miller, Manufacturers' Chemist, Tampa, Florida.

LEMON, Orange, flavors. Our private brand. Exceptional quality. Formula \$1.00. Sample 25c. Details stamp. Hamilton Chemical Co., Sheboygan, Wisconsin.

ANY Formula, 5 for \$1.00. Free information. Kurtz, Glen Allen, Virginia.

ANY Formula 30c or money back. New catalog free. Ogg Laboratories, Tampa, Florida.

RE-BLUE Guns for self! For profit! Formula and business instructions \$1.00 cash, 6c stamps. Jerz Lab., P. O. Box 677, New Haven, Conn.

100 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

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

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

COCKROACH Exterminator. 25c makes gal. Send 25c. Research, 347 W. 28, New York City.

CHEMISTRY

CHEMICALS, Glassware, apparatus, instruments. Leading laboratory supply house offers scientific supplies of professional quality at lowest prices. Send 3c postage for free illustrated catalogue and latest chemical price-list. New York Scientific Supply Co., Dept. 15, 111 E. 22nd St., New York City.

HORMODIN—"A" Grows roots on cuttings. Postpaid \$1.00. Chemical catalog 10c. McBee Chemical Company, 1624M Boren, Seattle.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

CHEMISTRY, Biology, mineralogy supplies, microscopes, telescopes. Catalog free. Teeko, Evanston, Ill.

CHEMISTRY Magazine—Research, experiments. Three months subscription 15c. Spanner, 100 Forsyth, New York.

RUBBER Latex. Dime brings literature, twenty experiments. Eastern Latex Labs., Box 53, Canton, Mass.

HANDBOOK For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS, Laboratory glassware, apparatus. Send 5c for catalog CP-1. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

HELP WANTED

MEN—Women—Wear fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags and runs. Rush name and hose size. Wilknit, Desk 37-C, Greenfield, Ohio.

ABLE Men to distribute advertising circulars and handle routes. Make up to \$42.50 first week. Brand new Ford sedans given producers as bonus. Details free. Albert Mills, 8837 Monmouth, Cincinnati, Ohio.

STEADY Work, good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 137, Freeport, Ill.

"SPARETIME Road to Riches," explains hundreds new easy moneymaking opportunities, 10c. Lewis Co., 828-I Carpenter, Oak Park, Ill.

MAN Wanted—by shoe manufacturer established 35 years, for sales work. Ready cash daily. No experience needed. Your own shoes at factory prices. Complete line of almost 300 styles for men and women, including famous Velvet-Eez air cushion nailless insole shoes, sent free. Write Mason Shoe Manufacturing Company, Dept. R32, Chippewa Falls, Wisconsin.

STOP Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-Y Federal, Pittsburgh, Penna.

AGENTS WANTED

REVOLUTIONARY Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

MAGIC Electric brush retails \$1.50—your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket, unbreakable. Send for sample and particulars. Donald Brush Co., Advertising Dept., Camden, N. J.

RAZOR Blades. Agents wanted. Big profit. Louis Eugene, 277 Broadway, New York.

STRANGE Chemical sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Sensational demonstration. Samples sent on trial. Rush name. Kristee, 130, Akron, Ohio.

IF Interested in chipped glass name plates, numbers, checkerboards, mirrors, signs. Get my fortieth anniversary moneymaking offer. Illustrated literature free. E. Palmer, 512, Wooster, Ohio.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 106 E. 19th, New York.

450% PROFIT Quick-Action automatic gas lighter. No flint. 25c seller to every home, office and restaurant. Free sample. New Method Co., Box PMG-63, Bradford, Penna.

MAKE Big money! Give away nationally advertised \$15.00 Packard Lektro shavers. Dime brings outfit. Liberty, Box 235, Eflingham, Ill.

100% PROFIT In new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retails 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PM-63, Bradford, Penna.

KNOCK Them cold deal 100% profit. Send 10 cents postage for sample outfit. Southern Supply, 1017 Seventh, Washington, D. C.

100% PROFIT Selling \$2.50 vest pocket adding machines. Everybody a prospect. Every demonstration a sale. Protected territory. Mascotte Sales Company, 55 West 42d St., New York City.

NEW Necktie amazes everybody! Won't wrinkle, won't stain. Beautiful patterns sell themselves. Information free. 50c two samples and "business kit". No-Stitch Manufacturing, Long Island City, New York.

NEW Fast selling novelty sample. Lesser, Box 44, Clifton, N. J.

MARVELOUS Book. Ideal home entertainer. Beautifully bound. Retail 50c. Rapid seller. Earn \$10 quickly. One book 15c; eight, \$1 prepaid. Rundell, Coshoc-ton, Ohio.

ATLAS Window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

BUSINESS Proposition: Resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

LOW Priced ultra-violet lamps selling fast. Master Manufacturing, Boonville, Missouri.

AGENTS Wanted, nationally advertised radios, Philco, GE, RCA, Zenith, etc., send for bargain set and part catalog. United Radio, N-Newark, N. J.

UP To \$6.00 an hour. Amazing Karnu refinishes autos like new without rubbing, polishing, waxing or painting. Inexpensive—costs little. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. C-8, Cincinnati, Ohio.

500% PROFIT Selling new 20-in-1 kitchen utensil. Retails 25c. Costs you \$1 a dozen or \$6 a gross. Sample 10c. New Method Co., PMM-63, Bradford, Penna.

MEXICAN Curios, tremendous moneymakers. Samples 10c. Marquez-P, Apartado 1176, Mexico City.

SCIENTIFIC Glass rolling pin approved by "Good Housekeeping" containing 1 1/2 pints quality vanilla or lemon. Retail value over \$2.00. Sells 98c. Cost you \$4.80 dozen. A fast, new money maker. Sample deal postpaid 50c cash. Satisfaction guaranteed. Rush order today. Zeldon Products Co., Dept. P, Columbus, Ohio.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 14A.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

POSTAL Brings Mr. Magic. Newest, fastest seller. 500% profit. Box 1971, Cleveland, Ohio.

PERFECT Razor blade conditioner. Money back guarantee. Every man a prospect. Carry sample in pocket. Liberal profit. A. W. Bivans, La Grange, Ill.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

300% PROFIT Selling bankrupt bargain merchandise. Southerners, 164-M Henry, New York.

UNUSUAL Booklet for voters. Large profits. Send ten cents. Ernest Gebbs, 7 East 76 Street, New York City.

BIG Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, uniforms, etc. Sales equipment free! Experience unnecessary. Write Nimrod, Dept. 8, 4922-28 Lincoln, Chicago.

WHOLESALE Price list free, razor blades, notions, hosiery. Bulger, 147B Pemberton, Cambridge, Mass.

FREE Sample—Fast selling necessity. Kleen-Brite, Southside, Oil City, Penna.

AGENTS! Distributors! New wonder bandage, needs no tape. Sensational seller brings \$4.20 for every \$1.00. Write Modern Necessities, 737 Randolph, Chicago.

DOLLAR Dependable fountain pen. Distributors wanted. American-Simplex, Anderson, Indiana.

X-ZIL. World's finest external remedy. Cool x-zil-arating relief for pains, congestion, tired feet, athletes foot. Retails 35c. Countless uses. The ultra-modern remedy praised by thousands of athletes, nurses, etc. Big profits. Repeats! Tube 35c. Details stamp. Hamilton Chemical Co., Sheboygan, Wisconsin.

PERFUME. 3 Samples, different grades, 25 cents. Rayburn, 5946 Eggleston, Chicago.

FLUID Typewriter type cleaner. B. Omoto, 2819 Hyperion, Hollywood, Calif.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

KIROPEP Foot cream offers direct salesmen territories still open, showing big earnings and repeats. For details write Isobell Laboratories, Newark, New Jersey.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

AGENTS! Smash go prices! Santos coffee 12c lb. 4 oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

DOLLARS Daily. No canvassing. Details free. Co-Operative Service, PMA884, Spuzzum, B. C.

GUARANTEED Gold leaf letters for store and office windows. 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

BIG Money applying initials on automobiles; \$1.45 profit on each sale. Write for particulars and free samples. American Monogram Co., Dept. 40, Dunellen, N. J.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H. Decatur, Ill.

BIG, Steady weekly profits for men and women with cut price food route. More than 300 fast selling household and farm necessities. Sensational premium deals get quick cash and build profitable routes quickly. Write Bleecker, 259 E. 4th St., St. Paul, Minn.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

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

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

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. P. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

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

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

HIGH-GRADE SALESMEN

ADVERTISING Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash commissions, bonuses. Full—part time. Big repeats. Samples and kit free. Match Corp. of America, Dept. E-3, 6041 Grand, Chicago.

SMASH Your way into big earnings. Sell America's most complete line of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, engraved like stationery, shipping room supplies, office supplies, printed gummed tape, advertising chewing gum, advertising pencils, thermometers, ash trays, business stimulators. Complete line standardized printed business forms and hundreds of other fast sellers. All competition undersold. Cash commissions advanced daily, plus extra bonus. Experience unnecessary. Brand new huge 1938 outfit free. Northwestern, P-625 Jackson, Chicago.

GET Own suits free as bonus. Make big profits. Show friends movie star styles in made-to-measure clothes at big savings. New fashions and fabrics, inspired by Buddy Rogers, Cesar Romero, other movie stars—\$15.95 up. Guaranteed to fit and satisfy. Big commission for you on every order. 100 large samples and big book movie star pictures and styles free. Jim Foster, Inc., 2250 So. Spaulding Ave., Dept. A-3, Chicago, Ill.

BRUSH Salesmen—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

MYSTERY Electric sign. Third dimension. Salesmen coin money showing to merchants everywhere. Get details today. Jones Brothers, Merchandise Mart, Chicago.

SENSATIONAL Money maker! Sell celluloid calendar business cards to banks, insurance companies, factories. Free samples. P. Pricing Card Co., 124 White St., New York.

SALESMEN, Sell suits on our easy credit plan. Free suits and pants given as bonus besides large cash profits, premiums and gifts. Sell only (5) suits to get a free suit. No limit to number of free garments you may earn. Wholesale prices \$17.99 and up. Sample line free. No experience needed to make easy sales. All garments individually cut and tailored to measure. Satisfaction or money back guarantee. Square Deal Tailoring Co., Inc., 316 W. Van Buren St., Dept. BA-1, Chicago, Ill.

WANTED County distributors. Excellent opportunity for earnings. Nationally advertised product. Large company. Dept. 256, Fyr-Fyter Company, Dayton, Ohio.

DISTRIBUTOR Capable of handling complete distribution of La-Mac'o—the superior all purpose adhesives. Now available to retail trade in 25c tube. Full credit repeat business. Exclusive territory. Lamac Process Company, Erie, Penna.

SALESMEN: Sell business stationery, book matches, social security books, advertising pencils, shelf moulding, labels, sales-books, pricing sets, business cards \$1.50 thousand. 35% comm. daily. Free deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. XL, Chicago.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" individually tailored clothes. Enjoy fine income. Get new suits and overcoats without cost as bonus. Experience unnecessary. Low prices. Quick sales. Outfit free. Fairbanks Company, 2205 Wabansia, Chicago.

SELL Nothing. \$95 weekly. \$500,000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C123, 6227 Broadway, Chicago.

ATLAS Window sign letters. Large sizes. Penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

SUBSTANTIAL Profits made with responsible firm. Write: Universal Supply, 777 Boulevard, Bayonne, N. J.

SELL Printed envelopes from manufacturer to consumer. Commission basis. Repeat orders fully credited. Box 276, Newport, Ky.

FORTUNES Await livewires selling soil-less farming. Grows larger vegetables, flowers, year round without soil. Retail \$1.00. Big profits, exclusive territory. Wire, air-mail. Chemi-Grow, 257-JU Werdin Place, Los Angeles.

DISTRIBUTORS. Exclusive territory. Extraordinary profits. 200 items, brushes, mops, household chemicals, new inventions. Neway Brush Co., Hartford, Conn.

RAWLEIGH Men make good money. Supply everyday household necessities to Raleigh routes of 800 family users. Ambitious men can start making \$30 weekly and up. Sales way up last year. We furnish everything but the car. Write today. Rawleigh's, Dept. C-A-PPM, Freeport, Ill.

SELL Genuine Tungsten spark plugs; 5 tube radio free with 100 plug order; service stations, garages buying on sight. Tungsten Factory, 1402 S. Michigan, Chicago.

SENSATIONAL New invention! Sell everywhere. Huge profits. Write, R-L-O Sales, 6717 North Ave., Oak Park, Ill.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 850 Burkhardt, Dayton, Ohio.

TEXTILE Salesmen succeed selling dry-goods, hosiery, household supplies for entire family. Samples furnished. Fitz-Charles Company, Trenton, N. J.

YOUR Own suits and overcoats free and other attractive bonuses plus big cash profits, for selling your friends quality all wool tailored to individual measure suits. Five popular low price ranges. Exclusive sport styles at no extra charge. Prices defy competition. Elaborate selection new spring and summer all wool patterns. Satisfaction or money back guaranteed by reliable twenty-eight year old tailoring firm. No experience needed. Sample outfit free. Jay Rose & Co., Dept. P-3, 330 So. Wells, Chicago.

LUNCHEON Party organizers, experienced cookware and public utility direct salesmen preferred. Rare management opportunity in few districts with fast growing chic food cutter equipment business. No canvassing. Customers and organizers enthusiastic. Griscer Industries, Fort Wayne, Indiana.

OUR New 1938 complete line of brushes now ready. Largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

SELL 25c Skillwins. Details free. Skillwin Co., South Bend, Ind.

REFLECTO Letters and numbers for trucks, homes, signs. Sell easily when shown. Send \$1 for sample or write National Advertising Service, Box 465, Syracuse, N. Y.

SELL Gas stations new forms, ledgers, files. Symplex, Lamon, Iowa.

SALESMEN To sell hardware stores and garages. Powerful new fast-selling specialty. Liberal commissions. Repeats. Coronado, St. Paul, Minn.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

GREATER Commissions. Increase your income selling \$10,000 accident and health policy; \$25-\$50 weekly benefits. \$10.00 yearly. Other amounts proportionate. Guaranteed renewal income. \$1,045,318.19 securities deposited. Universal Policy, Dept. O, 11 Commerce St., Newark, N. J.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

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

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

EDUCATIONAL AND INSTRUCTION

LEARN Handball scientifically, by the first handball course ever published. Send 50 cents for "The Van Court Scientific Handball Course" to Carroll Van Court, 220 West 46 Street, Los Angeles, California. "World's greatest authority on Handball." Handball instructor at Los Angeles Athletic Club for 25 years.

LEARN Fascinating, profitable profession of Swedish massage at home in 90 days. Make up to \$70 weekly. Write for free anatomy charts and details. The College of Swedish Massage, 1601 Warren Blvd., Dept. 344, Chicago, Ill.

WANTED, Morse telegraphers. Railroad retirement act retires hundreds this year. Prepare now. Information Standard Institute, Box 7C, Highland Park, Los Angeles, California.

LEARN Locksmith trade. Beginners instructions \$1 postpaid. Miller Key Shop, Canadian, Texas.

1938 GOVERNMENT Jobs. Start \$105-\$175 month. Dependable. Prepare immediately for next examinations. List positions, free. Write today. Franklin Institute, Dept. N3, Rochester, N. Y.

"WHAT Every Man Should Know About Diesel," new, sensational 42-page guide to quick sure money in Diesel. 25c postpaid. Guaranteed worth many times the 25c to you or your money back. Dept. P, Harrington Company, 201-204 Manchester Building, Portland, Oregon.

LEARN Watchmaking. Instructions free with tools. Wholesale watch-material catalog 5c. Stewarts, Chemical Bldg., St. Louis, Mo.

KNOCK-EM-COLD! Learn police Jiu Jitsu! 36 secret knockout blows without fists, many one-fingered, headlock breaks, etc. New complete illustrated course by world-famous instructor, only 15c today. S. J. Jorgensen, 410 Maritime Bldg., Seattle, Wash.

WE Prepare you for government clerk-carrier or railway mail clerk examinations. Total cost \$4.75. Includes grading service. Particulars free. Thompson, 319 Park, Kokomo, Ind.

BECOME An investigator. Remarkable "Test Question, Problem and Lesson Correction Method." Modern, practical, thorough. Profusely illustrated. Particulars free. International Secret Service Institute, PM 38, Hoboken, N. Y.

HANDBOOKS—Diesel, aviation, electricity, automobile, others. Rowell, 240 Illinois, Rochester, N. Y.

AUCTIONEERING. Complete short course \$1.00. Wm. White, Vineland, New Jersey.

SUMMER, Winter hotel positions. Beginners instructed. Lee Institute, Tremont Temple, Boston.

LEARN Boxing for self-defense. World's greatest and only correct system, which made Corbett and Jeffries world champions. Send \$1.50 for "The Van Court Scientific Boxing Course," to Carroll Van Court, 220 West 46 Street, Los Angeles, California.

COMMUNICATIONS Engineering instruction. Wayne Miller, Suite 200, Engineering Bldg., Chicago.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

BE A radio announcer. Learn at home. Free information. Write Radio Arts Academy, 3823 Wilshire, Hollywood, Calif.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write, Instruction Service, 101, St. Louis, Mo., immediately.

BECOME Business investigator. Earn good fees in pleasant spare-time work. Write! Business Detective System, 1009 Oak, Elmira, N. Y.

GOV'T Jobs start \$1260-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

DEGREES Earned by home study in arts, sciences, philosophy, education, psychology, theology, law, chemistry, engineering, business, agriculture. McKinley-Roosevelt College, Chicago.

HIGHER Arithmetic solves problems quickly. Frederick A. Smith, 2410 Bernard St., Chicago.

EARN Extra money! Clipping and preparing newspaper articles for publishers. Simple; fascinating; profitable. Send stamp. Division 55A, National Press, 3923 W. Sixth, Los Angeles, Calif.

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LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

MODERN Refrigeration. New industry needs trained men for installing, servicing, repairing. If you seek a new field with larger opportunities get latest book by Alt-house and Turnquist. \$5 postpaid. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

PLAYS, STORIES, MANUSCRIPTS

POEM Writers, songwriters—Send for free rhyming dictionary—songwriters' guide. Submit best poems, melodies today for bonafide, superior offer. MMM Publishers, Dept. 33C, Portland, Oregon.

WRITER'S Service. Particulars free. A. M. Seymour, 126 Lexington Avenue, New York, N. Y.

WANTED. Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

LEARN Sign painting! Make \$25.00 to \$45.00 a week; spare or full time. Plenty jobs available. We supply everything. Write for free literature. Olsen, 7853 May Street, Chicago.

BRUGMANN'S Cartoon Review on vaudeville trick cartoons consisting of chalk stunts, comic strips, photographs, postpaid \$1.00. Brugmann's Cartoon Studios, Bedford, Ohio.

NEW "Gagmatic System" floods you with cartoon ideas! You create! 25c (coin). Cartoonograph, 4506 Broadway, West Palm Beach, Fla.

EXPERT Lettering instruction simplified for home study. Thompson School, Pontiac, Michigan.

ART Magazine. Helps you sketch, paint, model, carve, cartoon, draw human figure, sell drawings, exhibit, form clubs. Regular 25c copy for 10c while samples last. Artist, 320 W. Doty, Madison, Wisconsin.

THE Mur-O-Graph enables one to draw anything without training. Guaranteed. One dollar postpaid. Literature free. Murray Bros., Irving, Texas.

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

CARTOONING. Sketching, etc.—46 lessons, 600 illustrations, including drawing paper, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

MAKE Art Pay. Advanced art students. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

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LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3432, Chicago.

300 NEW Canadian names. Plan, book, magazine buyers \$1. Parker Publications, Peterboro, Ont., Canada.

BARGAIN—50 Words in 20,000 mail order publications 50c. Inch 75c. Three insertions price of two. Parker Publications, Peterboro, Ont., Canada.

ADVERTISING Placed; any publication, anywhere. Copy written. No service charge. Free rate guide. LeGrand Agency, 34 West 33rd Street, New York City.

3,000,000 M.O. Buyers Guide, 12 words \$1.95. Bradshaw, 598 Cohannet, Taunton, Mass.

CLASSIFIED And display advertising placed, any publication. No service charge. Julian J. Behr Co., Cincinnati.

ADVERTISE. Newspapers, magazines. Lowest rates. Experienced counsel. Bush Advertising Agency, Manufacturers Exchange, Kansas City, Mo., or Andrews Building, Dallas, Texas.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine, rate-guide, free. Chicago Union Agency, 20 W. Jackson, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

BUSINESS SERVICE

ENGINEERING Calculations, designs, reports. Drafting service. 20 years practice. State registered. Carl E. Rett, 1426 East 88 St., Cleveland, Ohio.

WASHINGTON, D. C., mail address. For business or personal purposes. Hawkins Mail Service, 817 Fourteenth.

MAIL Headquarters—Message Bureau, 214 Masonic Temple Building, Minneapolis, Minn.

WHERE To buy anything! Manufacturers, wholesalers. (\$1.00.) Kings, 115 Liberty, Jamestown, N. Y.

1937 LETTER-NAMES 300 For \$1. Business beginners; mail dealers; farmers. Century, 108 North Dearborn, Chicago.

CHICAGO Mail address \$1 monthly. Your personal, business mail forwarded daily. Established 1919. General, 56 West Washington.

\$2.00 MONTHLY Maintains Los Angeles address. Dickey, 628 W. 9th.

RUBBER STAMPS AND OFFICE SUPPLIES

FACSIMILE Signature including ink pad \$1.25 postpaid. No C.O.D.'s. Adolf Jaeger, 601 West 177th St., New York City.

CUSHION Mounted, one-two lines 25c, three 35c; facsimile signatures \$1.50. Stamp Works, 814 Bradley, Peoria, Ill.

CUSHION Mounted. One, two lines 25c; three lines 35c. 100 letterheads, envelopes \$1.00. Hauer Press, 1314 Ford Ave., Youngstown, Ohio.

CUSHION Mounted, two-three lines 30c. Catalog. Advance, Pewaukee, Wisconsin.

NAME. Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

WHILE They last: New automatic adding machines. Fully guaranteed. \$2.50. Taylor, 105 East 102nd Street, New York.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302D, Altadena, Calif.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

PRINTING, MULTIGRAPHING, MIMEO- GRAPHING, GUMMED LABELS

INCREASE Your business with our modern printing. Information, samples free. Cherokee, Southern Pines, N. C.

STATEMENTS, 6 $\frac{1}{4}$ " Envelopes, \$2.45 per 1000. Business cards, 1000, \$1.75. Universal Supply, Orange, Mass.

MIMEOGRAPHING, Neat work, reasonable prices, samples. Thornber, Box 342, San Diego, California.

ENVELOPES, Letterheads—1000, \$2 postpaid. Marcus, 1627 S. Hamlin, Chicago.

WRITE "Read" for printing prices; samples. 3401 Parnell Ave., Chicago.

500 VELLUM Business cards \$1.50 postpaid. Capitol, PM285, East Williston, New York.

\$1.00 POSTPAID, 125 Letterheads 8 $\frac{1}{2}$ x11 and 125 envelopes. Benneville, 907 West Roosevelt, Philadelphia.

MECHANICS Are known by their work. Electron Prints, New Orleans, La.

250 RULED 5 $\frac{1}{2}$ x8 Bond statements \$1.00 postpaid. Wood, Bedford, Penna.

150 LETTERHEADS 8 $\frac{1}{2}$ x11 And 150 envelopes, \$1.00 postpaid. Eckholm, Shelby, Mich.

100 LETTERHEADS, 100 Envelopes \$1.00 postpaid. Albert Publishers, DesPlaines, Ill.

LABELS: All kinds. Write, samples. JBSCO, Box 93, Holyoke, Mass.

TRIAL Offer—500 envelopes and business cards printed \$1.00. McGerty's, Manhattan, Kansas.

1000 ENVELOPES \$1.75. Cards \$1.39. Samples. 1710 Madison, LaCrosse, Wis.

BUSINESS Cards postpaid \$1.00 thousand. McBride Printery, 912 Towne Ave., Los Angeles, Calif.

ENVELOPES, Statements, \$1.75, 1000. C.O.D. Wolverine Envelope Co., Grand Rapids, Michigan.

HARVEY Labels, sensational values, samples free. 6618 Quimby, Cleveland, Ohio.

5000 6x9 CIRCULARS \$7.85; 3000, \$4.85. Abbott Press, Oswego, Kansas.

HAMMERMILL Bond special—500 letterheads with envelopes \$3.50. Service 8 $\frac{1}{2}$ x11 letterheads—1000, \$2.95; 5000, \$8.85. Statements, billheads—\$1.95 thousand. Samples. Croydon Press, 108 Fourth Avenue, New York.

FACTORY To you cuts from \$1.00 up. Speedy coast to coast service. Get our prices on linecuts, halftones. Ace Engraving, 560-B Seventh Avenue, New York.

250 LETTERHEADS And 125 envelopes. \$1. Samples 10c coin. Bathgate, 51 Tiffany, Newark, N. J.

EXTRA—1000 Letterheads, envelopes, 6x9 circulars, postcards, statements, \$2.25; 5000, \$8.00 postpaid. Guaranteed. Sudden service. Reasonable in all printing. Try and be convinced. Established 1899. Hustler, Advance, Indiana.

BEST Printing—Lowest prices! Envelope, letterhead specials! Rapid Service, Edwardsville, Ill.

500 GUMMED Stickers, four lines 25c. Cott's Press, Spickard, Missouri.

LETTERHEADS, Envelopes, cards, blotters, circulars, statements, etc. 1938 price-list free. McCall Printing Company, 1326 So. 27th, Omaha, Nebr.

BETTER Printing, lower prices. Send for samples. Moore Brothers, Alstead, New Hampshire.

1000 6 $\frac{1}{2}$ " ENVELOPES \$1.75; 5,000, \$7.00. Hunt, Printer, Morrisville, Penna.

1000 6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.95; 5000, \$8.99. All printing reasonable. Samples. Cuts. Goodprint, Harrisonburg, Va.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

500 3 $\frac{1}{2}$ x2 $\frac{1}{4}$ " FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

2,000 BUSINESS Cards neatly printed \$1.50. Free samples all printing items. Atlas Co., Bedford Ave., Pittsburgh, Penna.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$8.85; job presses \$11 up. Details free. Kelsey Co., E-11, Meriden, Conn.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 6-C; 6 Columbia St., Newark, N. J.

BUILD 9x15 Printing press. Details free. Huebl Coaches, LeSueur, Minnesota.

MAKE Cuts for less than dime each by new simple process. Complete instructions 25 cents, Morrow, Box 254, Des Moines, Iowa.

OUTFIT \$2. Instructions for making, 25c. Lininger Co., 1157-G E113, Cleveland, Ohio.

HAND Presses, type, supplies. Big lists 3c. Landis, Richland, Penna.

BARGAINS, Presses, type. List 3c. Exchange D-15, 22 Orient, Meriden, Conn.

BARGAINS— Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-nine years experience. Highest references. Write us today. The facts in our books, are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 12-C Victor Building, Washington, D. C.

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 589 Adams Bldg., Washington, D. C.

DON'T Tell anybody the secret of your invention! Take steps to protect it before it's too late! Get our free "Certification of Invention" and two free books. They answer hundreds of patent questions and explain our deferred payment plan. Strictly confidential service. U. S. registered patent attorneys. Over 62 years' experience serving inventors all over the world. Write for free books today! C. A. Snow & Co., Inquiries Division, Snow Building, Washington, D. C.

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PATENTS—Any country. Reasonable rates. Free information. Ramsay Company, 273 Bank St., Ottawa, Canada.

PATENTS: G. P. Welch, Registered Patent Attorney, Plankinton Arcade, Milwaukee, Wisconsin.

WE Successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

"INVENTOR'S Guide," 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

PATENTS, Instructions "How to Establish Your Rights" and form. "Evidence of Conception"—sent free! Lancaster, Allwine & Rommel, 411 Bowen Bldg., Washington, D. C.

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L. F. RANDOLPH, 302-B Victor Bldg., Washington, D. C. Low cost. Book and information free.

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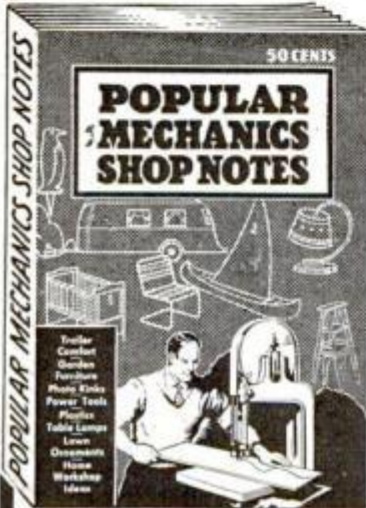
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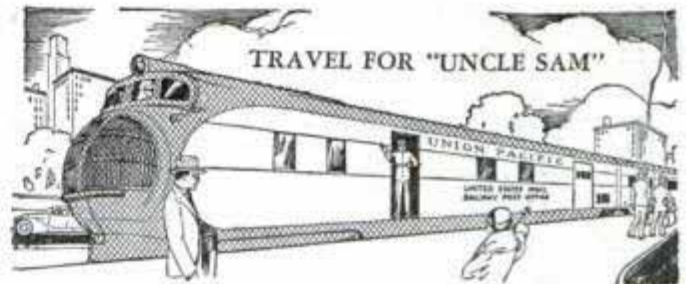
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NEW INVENTIONS

(Continued from page 42A)

adapted to rest on the margins of the wheel. The skid chains are hooked on the bow and carried around the tire so that their pull converts the heels into fulcrums, serving to jam the roughened leaves against the tire sidewalls and prevent twisting the bow out of position.

FOR military barracks, small home or apartment, a newly patented folding trunk locker and shoe rack is a space-saver. It is adapted to be mounted at the foot of beds having uprights. The shoe rack, suspended beneath the locker, may be swung



into a position which permits easy removal of the shoes.

DRIVING or pulling tacks is made easy by a tool patented recently. It has a hollow handle within which is a plunger provided with a head shaped to receive the head of the tack. A spring in the handle serves as a shock absorber between the handle and the plunger as the tool is used for driving a tack.

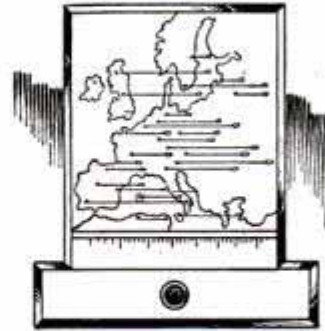


ELIMINATING the nuisance of dangling cord and the strain on cord and connections while clothes are being ironed, a cord holder just patented would be a welcome item for the housewife. It consists of a stationary hook and a traveling hook



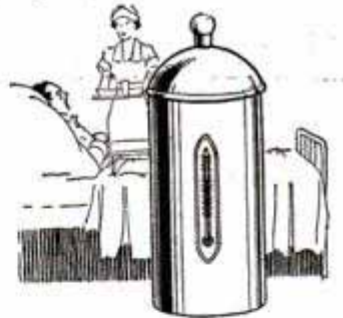
which are adapted to support the cord. The traveling hook moves back and forth on a V-shaped holder as the iron is used.

SO THAT short-wave radio fans may determine quickly the location of any distant station



from which they receive signals or programs, a newly patented tuning dial operates in conjunction with a map. A spot on the map is in register with the geographical location of a sending station and a mark has a position corresponding to the operating frequency of the station by terms of progression of frequency, just as the ordinary dial works. A leading line connects the spot and the mark on the map and a pointer moves in progression of frequency across the map as the dial knob is turned.

PARTICULARLY useful in the nursery and the sickroom is a newly patented bottle in the side of which is an indicator showing the temperature of the contents. The thermometer is insulated from exterior temperatures by an air chamber. Mothers would find the bottle makes it possible to give the baby its milk at the proper temperature.



UNUSUAL among means of cooking is a newly patented broiler having an upright fire pot with open top, a perforated closure near the bottom and a shelf between top and bottom. Legs support the fire pot and an ash receiver beneath the fire pot. The meat



is attached to a grill rod supported at each side of the fire pot, above the source of heat. A crank handle makes it possible to turn the grill rod as the meat broils.

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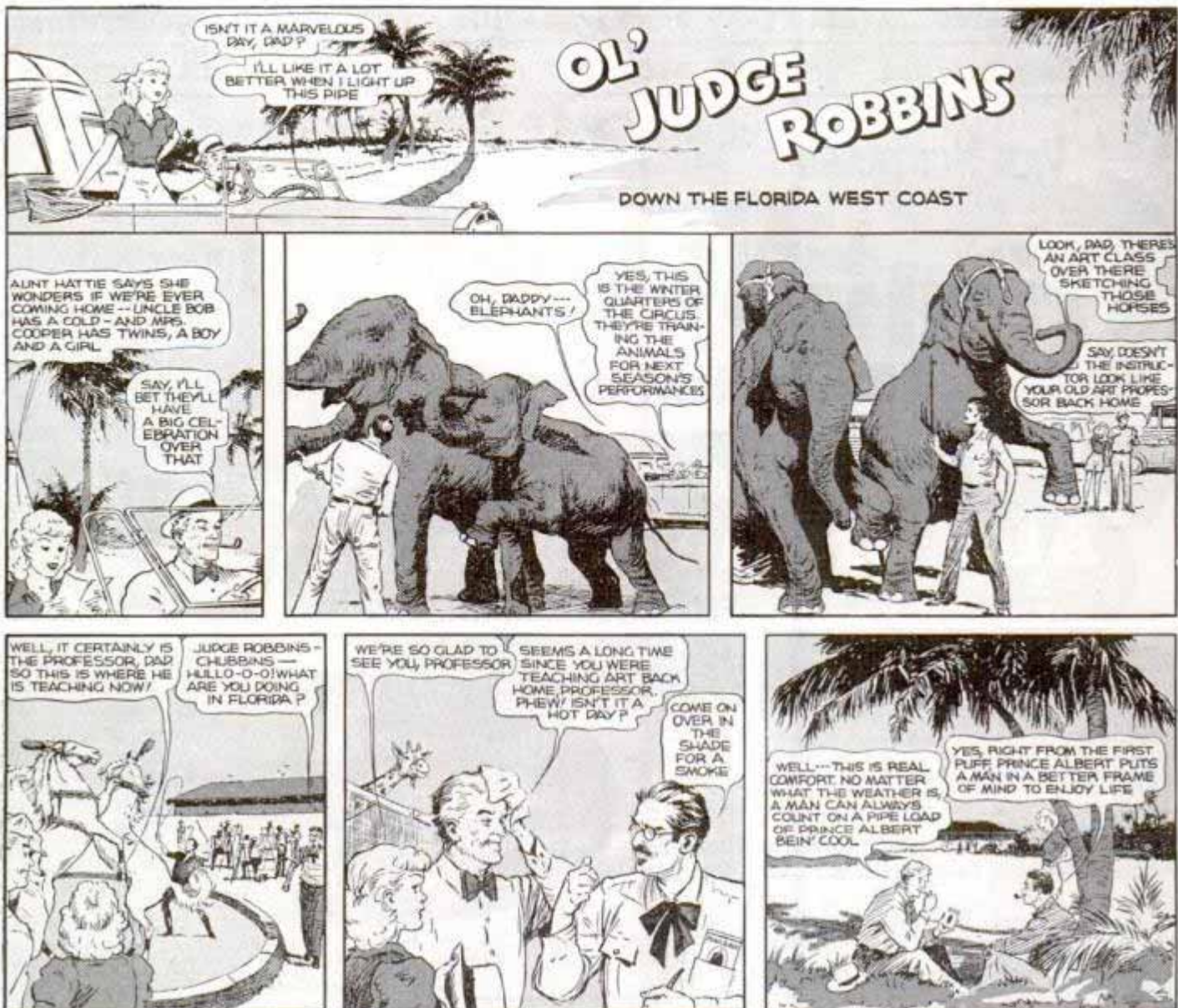
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PRINCE ALBERT

THE NATIONAL JOY SMOKE

Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 69

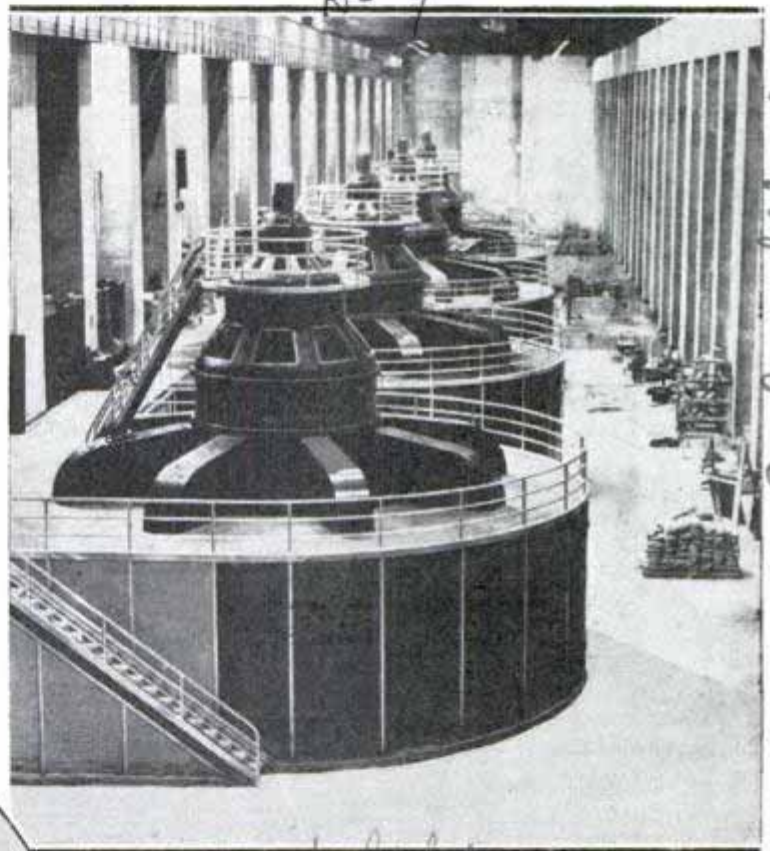
MARCH, 1938

No. 3

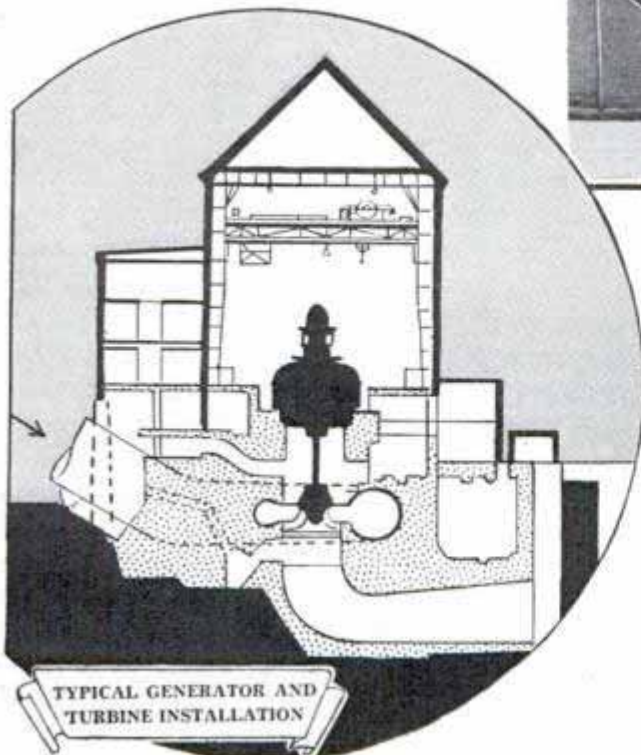
RIVER ^{H-9} to LIFT ITSELF ^{H-9} over a MOUNTAIN

PUMPED up the side of a mountain and drawn by gravity through tunnel and conduit to a power-generating plant miles away, water from the Colorado river will produce electricity to run the pumping station at the beginning of this startling cycle.

Until its various features are examined carefully, this scheme for making a river lift itself by its own power seems to involve the perpetual-motion principle upon which inventors have worked in vain through many centuries. The secret of the project, upon which the United States government is



see below file
Top, generators in hydroelectric powerhouse.
Bottom, typical installation



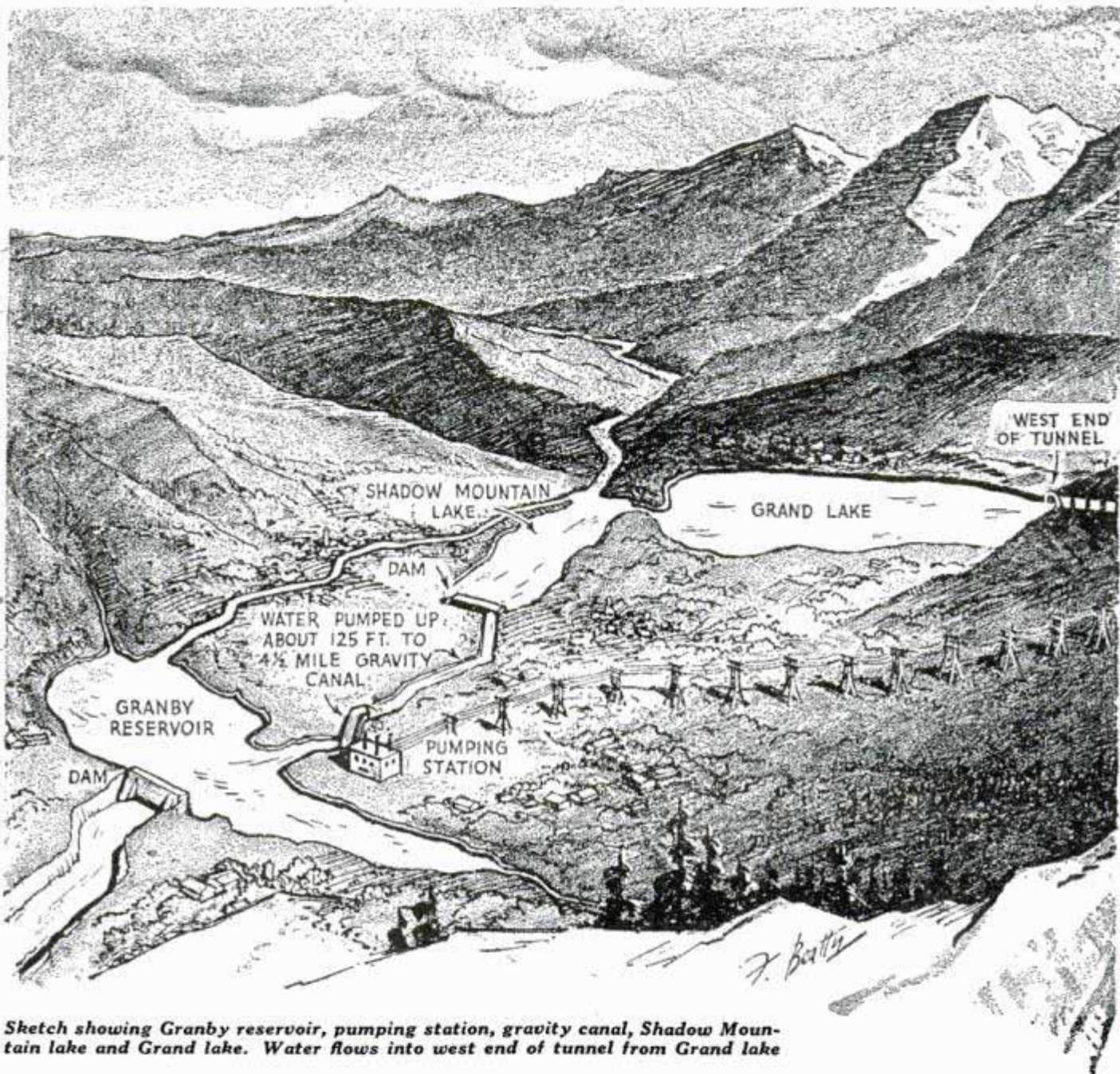
TYPICAL GENERATOR AND
TURBINE INSTALLATION

ready to start construction, lies in the fact that the water will be dropped through tunnel and conduit a much greater distance than it will be lifted by dams and pump, due to a difference in elevations of the power plant and the pumping station.

Known as the Colorado-Big Thompson Transmountain Diversion project, its primary object is to furnish water for supplemental irrigation of 615,000 acres of farm lands in the South Platte river basin. To these farms now under cultivation but inadequately irrigated by the present sys-

*Bureau of Reclamation
Government project.*

*Mr. P. S. Worcester, Secy. of
Bureau of Reclamation*



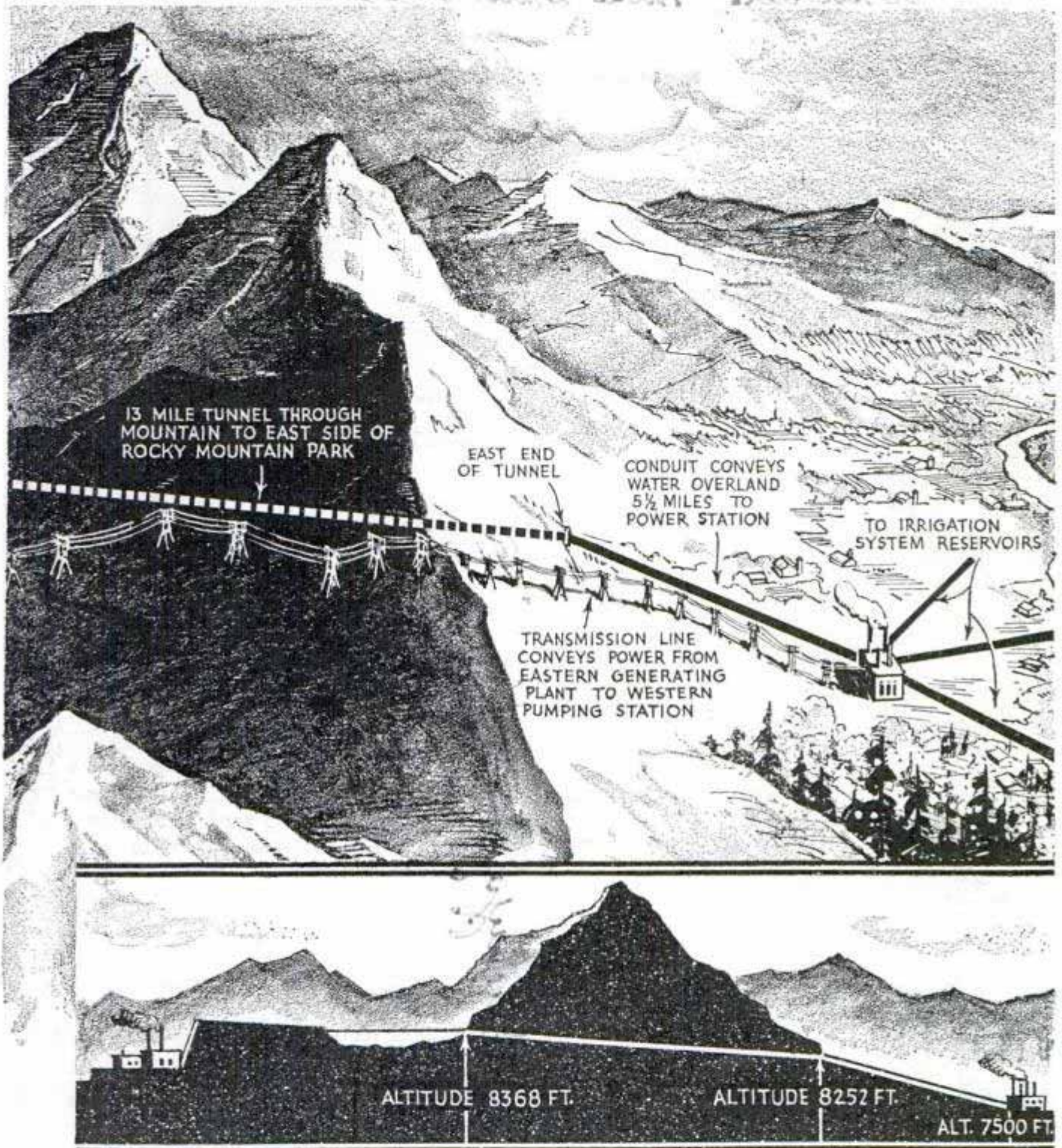
Sketch showing Granby reservoir, pumping station, gravity canal, Shadow Mountain lake and Grand lake. Water flows into west end of tunnel from Grand lake

tem, particularly in drought years, will be diverted enough water each year to cover between 300,000 and 320,000 acres to a depth of one foot. This water will be carried from a reservoir on the Colorado, west of the Continental Divide, through a thirteen-mile tunnel under the mountains and the Rocky Mountain national park to the east side of the divide, then down a sharply sloping conduit to the power plant and finally to the South Platte basin.

Energy built up by the water flowing downhill through the tunnel and the conduit on the eastern slope will be converted into electricity at the generating plant. In addition to meeting power requirements at the pumping station on the other side of the mountains, the plant will produce

72,000,000 kilowatt-hours of constant power and 88,000,000 kilowatt-hours of secondary power for commercial purposes. The secondary power will not be constant.

The water-diversion and power-producing project, to be completed in five years, has been worked out after determination of annual precipitation over all the drainage basins contributory to the project. First, engineers will construct a large reservoir, known as the Green Mountain reservoir, on the Blue river to take care of water requirements of the lower Colorado drainage basin after water has been diverted to the eastern slope. Next will be the construction of the Granby reservoir, near the town of Granby, by building a dam, 223 feet high and 720 feet long, across



Top, drawing of power site, showing tunnel and conduit leading to powerhouse and the power line by which electricity will be carried back to pumping station. Bottom, note difference in altitudes, the secret of the project. The water drops sufficiently in its journey to operate generators developing high-power

the Colorado river. The reservoir will serve as storage for water actually to be diverted to the eastern slope. A diversion canal will carry water from Willow creek, a tributary of the Colorado, into Granby reservoir, which is located south of the Rocky Mountain national park.

Creation of Shadow Mountain lake by construction of a dam forty-eight feet high and 350 feet long just south of the junction

of Grand lake outlet and the North Fork is the next step. Shadow Mountain lake actually will be an extension of Grand lake and both will be at higher elevations than the Granby reservoir.

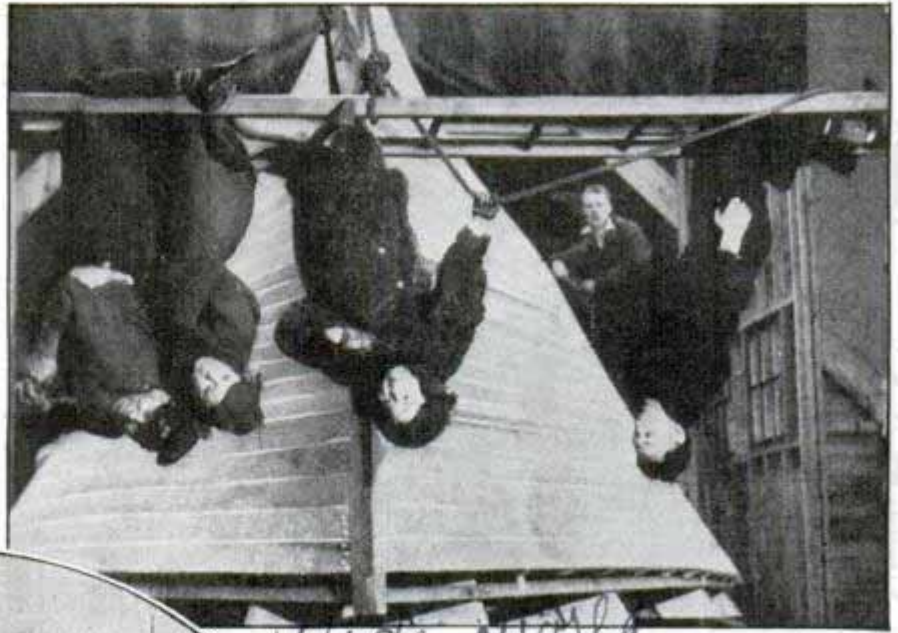
Between Shadow Mountain-Grand lakes and the Granby reservoir will be dug a four and one-half mile gravity canal into which water from the reservoir will be

(Continued to page 157A)

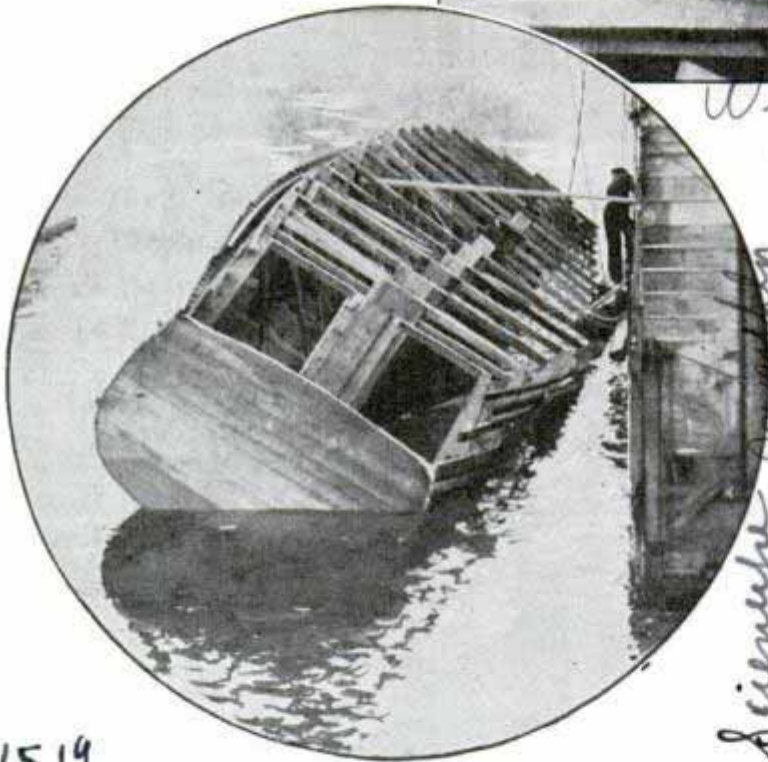
Wash

Boat Christened and Launched Upside Down

After being christened upside down, a sixty-five foot cabin cruiser was launched recently in the same manner. Principal figures in the christening ceremony hung by their knees. The builders found it easier to launch the boat and then roll it over in the water, after the christening, than to turn it rightside up in the boat shop where it was built.



Top, hanging by their knees during christening of cruiser. Bottom, cruiser being rolled from its upside-down position after launching



Hardwood from Softwood Made by Pressing Waste

By transforming softwood into hardwood, lumber mills may soon find a profitable outlet for waste by-products. Research men have found it possible to press ground sawdust and mill waste into hard products actually stronger than the natural wood. Soft lumber of inferior quality thus becomes the raw material for attractive "hardwood" products.

Movie Horse Rides in Style in Heated Trailer with Radio

"Champion," the horse that co-stars with Gene Autry in his cowboy movie parts, has a taste for music, so there is a radio-phonograph in the luxurious trailer in which the horse is transported on movie-location trips and personal-appearance theatrical tours. The trailer is well padded for the safety and comfort of the animal on the road, and is equipped with a heat-control system by means of which any desired temperature can be maintained.



Gene Autry, movie cowboy, and "Champion," with the padded and heated trailer in which the horse travels in comfort

Automatic Knitting Machine Makes Dresses

Believed to be one of the most complicated of modern machines, an automatic plant on the Pacific coast produces knitted feminine attire without the touch of human hands. Comprised of countless needles which work over perforated patterns, the machine turns out vari-colored material upon which are woven artistic designs. The patterns required seven years to perfect. The knitting plant creates from raw materials. In contrast, the same operations were performed in colonial days with a spinning wheel and knitting needles. Then garments with ordinary patterns were knit from spun materials, requiring several days from raw material to finished product. The



Wide World
A striking contrast between modern knitting machine and the old spinning wheel. The machine knits intricate designs

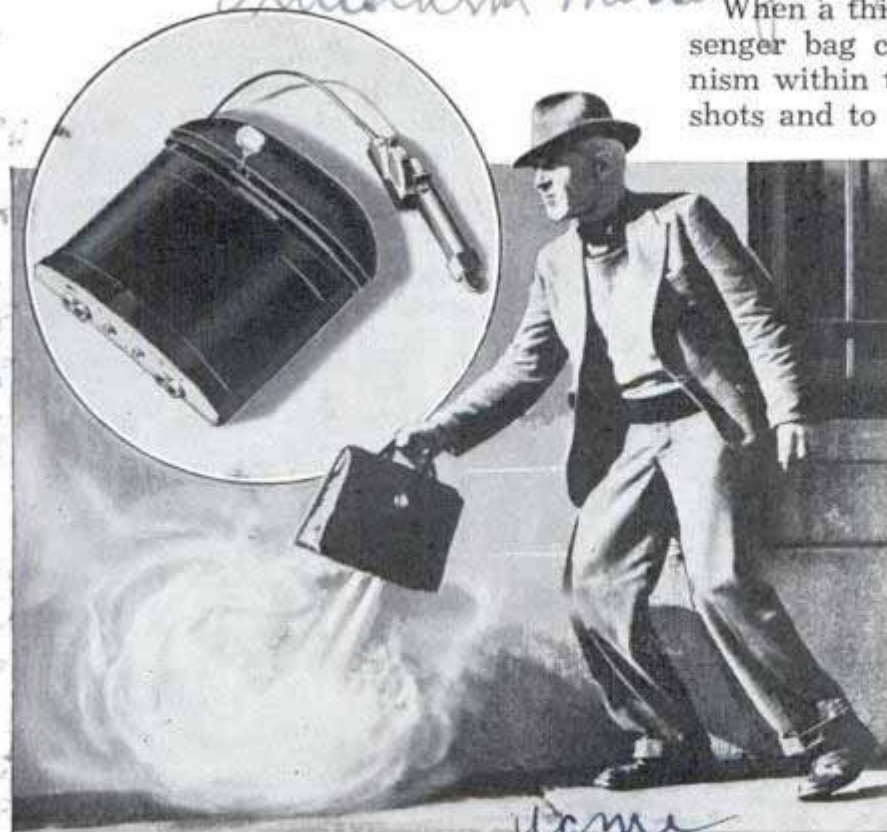
The new automatic knitting machine can create two yards of knitted goods per hour.

Alarm Bag Snatched by Thief Fires Shots and Emits Smoke

Is 1509
Tracalarm messenger bag
When a thief snatches a new style messenger bag containing valuables, mechanism within the bag causes it to fire four shots and to emit dense clouds of smoke.

If the thief attempted to escape, the smoke trail would enable police officers to find him quickly. The mechanism is set in motion by a trigger ring as the bag is wrested from the messenger's hands. The bag was adopted by a bankers protection company to reduce insurance rates on pay-roll trips.

Washington, D.C.
Striped bass tagged by the Bureau of Fisheries have been found to travel an average of twelve miles a day in their southward migration, one specimen covering 550 miles in about forty-four days.



W.C.M.
Demonstrating how pay-roll bag (inset) raises alarm upon being stolen

maker used by Bankers Protection

Los Angeles Knitting Mills, Los Angeles, Cal. Hillbinder Los Angeles, Cal.

Daniel Merriman

Dwarf Trees in Flowerpots Develop Normal Fruit



Here is one of the dwarf trees grown in a flowerpot, ten years old and fully developed

Trees ten inches high, fully grown and ten to fifteen years old are being grown by a western "tree farmer" who has found a way to stunt their growth. The dwarf trees are normal in every way except their size, bearing miniature seeds and fruit exactly as do trees growing naturally. Planted in flowerpots and dishes in his "forest" of midgets are hundreds of orange trees, cypress and jacarandas that ordinarily need plenty of room for their roots. Fifteen-year-old Douglas firs, which grow naturally into hundred-foot giants, are less than a foot high.

Window Brush with Squeegee Cleans, Dries, Polishes



Making it possible to clean, dry and polish windows with one tool in a short time, a combined brush and squeegee is now on the market. After the window has been washed with the sponge-rubber cleaning brush, the

tool is turned over, bringing the squeegee into action. The tool may be lightened before drying the window by removing the cleaning pad from the handle.

Rotary Calendar Alarm Clock Tells Month, Day and Time

Calendar, clock and alarm in one is the rotary clock just put on the market. The clock revolves inside its base, and its horizontal dial moves past a pointer indicating the time in hours and five-minute divisions. Below is another dial showing the day, the month and the date.



Handy Auto Fire Extinguisher Works in Eight Seconds

Effective in as little time as eight seconds, a small portable fire extinguisher is handy for the automobile. It holds two pounds of carbon-dioxide gas in liquid form under 850 pounds pressure. When released the liquid expands 450 times into a white blanket which smothers the flame, penetrating under the hood and around the motor. The gas is harmless to man and materials. When not in use, the nozzle swings down parallel with the cylinder for storage on a hook beneath the cowl.



Smothering fire under hood with aid of extinguisher which fits beneath cowl

James F. J. Chavala, 268 E. 1st St., Los Angeles, Calif.

10555 Hollywood Blvd. Los Angeles, Calif.

Silver 268 E. 1st St. Los Angeles, Calif.

Walter Krolde, 10, 610 West St., Bloomfield, N.J.

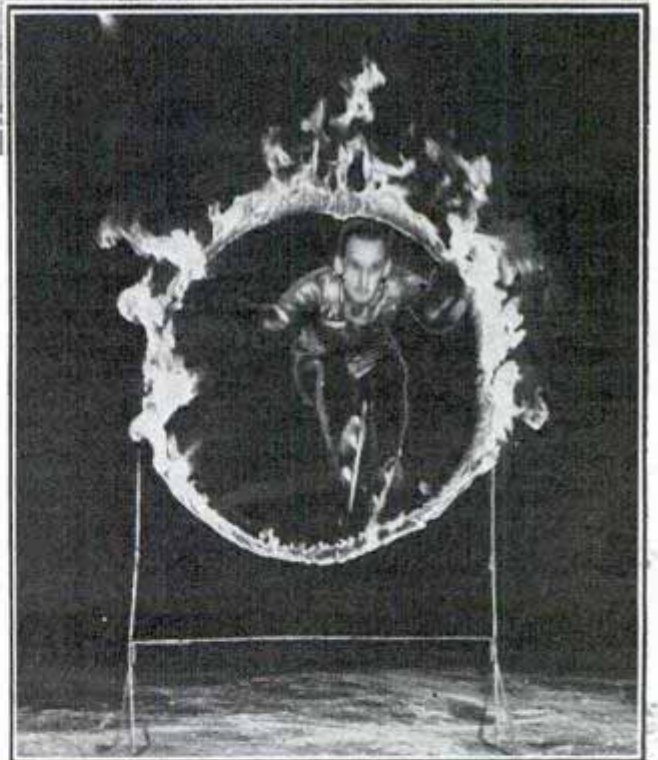
Gordon W. G. Co. 110 E. 2nd St. New York

Ice Carnival Star Leaps through Fiery Hoop



With Warb term.
 Skater leaping through flaming hoop, at right, furnishes one of the newest thrills at this year's ice carnivals. Above is a view from gallery as spotlights weave colors around performers. Notice the flower "painted" in ice in left foreground

Harvis Legg.
 Bringing a new sensation to the ice carnivals, a Canadian skating star flashes around the rink and leaps through a flaming hoop. This is but one of the events of skill and daring on the program of the big ice shows this year. It was a colorful scene in Madison Square Garden, New York, when spotlights played on the skaters and brought out the colors laid in the ice.



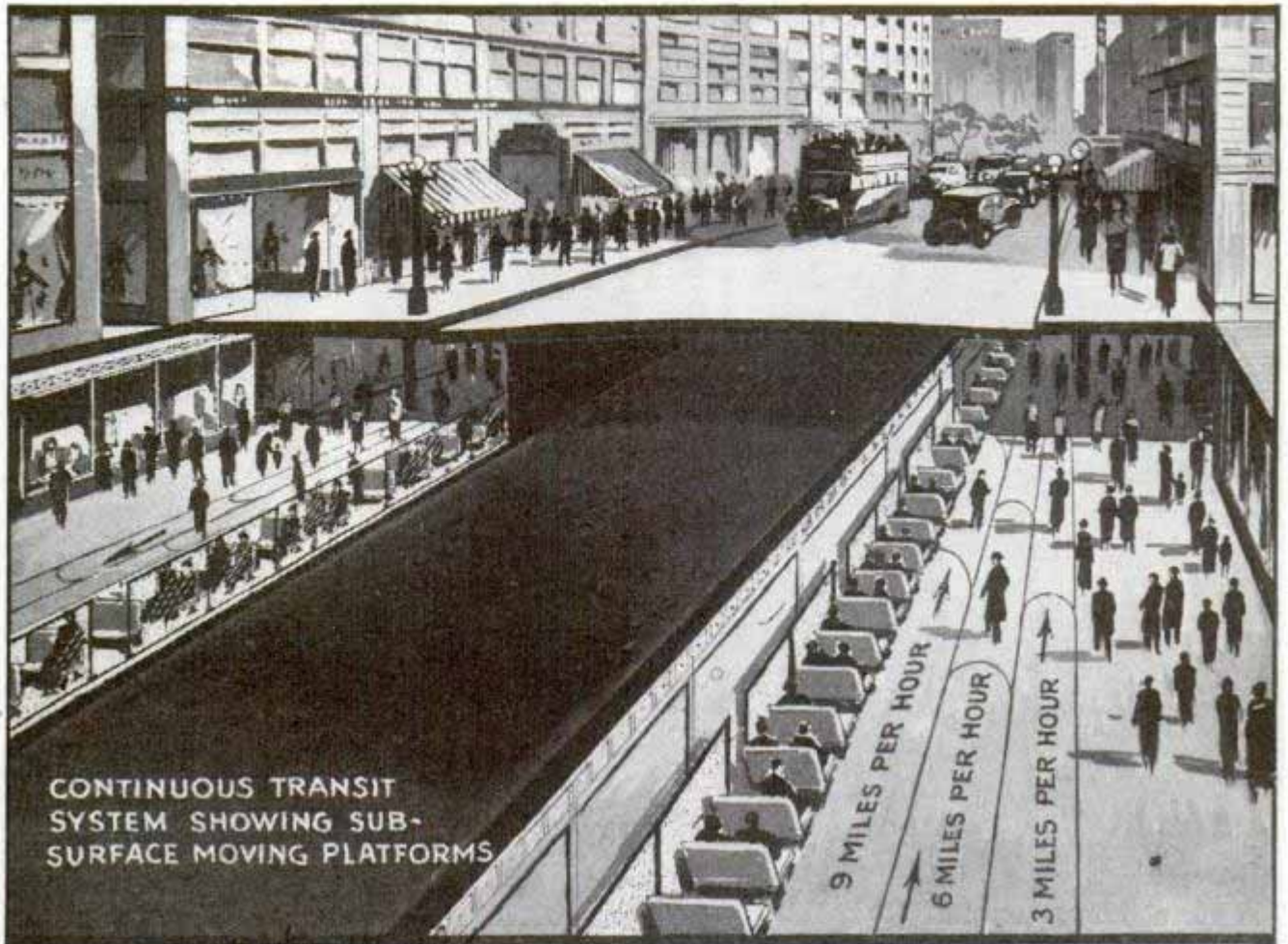
First Diesel Ship Is Still at Sea after Twenty-Five Years

Outstripped by modern engines in everything but age, the first Diesel motors that ever drove an ocean ship still work at the same job after twenty-five years service. The motorship "Selandia" has traveled more than 1,200,000 miles and still plows the ocean on a schedule of 44,000 miles a

year. Since the first marine Diesels were installed in the "Selandia" the world's motorship tonnage has risen to 11,900,000 gross tons, and today a Diesel for such a vessel as the "Selandia" would weigh thirty per cent less, yet deliver forty-four per cent more power and thirty-two per cent more speed.

Scene in Monthly P-65

Tri-Speed Moving Sidewalk to Simplify Traffic



Proposed as remedy for traffic ills of Market street, San Francisco, are these sub-surface sidewalks moving at graduated speeds, perhaps replacing street cars. This would give stores an additional front

Sub-surface sidewalks moving at graduated speeds are proposed as a cure for the traffic problems of Market street, busy San Francisco thoroughfare. The plan, which would cost "not much more than \$7,500,000" to put into operation, according to its sponsor, calls for three traveling lanes parallel to an ordinary sidewalk on a level

beneath the street. Adjacent to the motionless walk would be a lane moving at three miles an hour; the next at six miles an hour, and the outer lane, on which would be a row of seats, at nine miles an hour. This system would make possible the elimination of surface street cars and would give stores an additional level of frontage.

Silver Siamese Coin Is a Handful Valued at Forty Dollars



Eighty-tical coin of Siam weighs thirty-nine ounces

When you carry a Siamese eighty-tical coin you really have a handful of silver! One of these coins, almost spherical, was shown recently at a meeting of numismatists in London. It weighs thirty-nine ounces, and in monetary value is equivalent to about forty dollars.

Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

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es 1493

5813 Mr. C. M. A. Stone, D. C.,

CHEMISTRY and YOU

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PART 4

THIS rayon velvet beret and the dust cloud spurting from the airplane over a southern cotton plantation are both the products of chemistry. In rayon the chemist has produced a man-made fabric. At the same time he is also aiding the cotton grower to produce more natural fabric by developing insecticides.



33D
CHEMISTRY on parade at the New York Museum of Science and Industry. Left, a miniature electroplating apparatus. Right, refrigerant used to preserve flowers.

Freon - Kinetic Chemicals Inc. Washington D.C.
 By **DR. C. M. A. STINE**

Vice-President, E. I. du Pont de Nemours and Company

MODERN medicine is largely applied chemistry. The physician, chemist and biologist working together have swept aside almost the last of the superstitions which characterized the so-called "healing art" for centuries, with the result that tremendous advances in medicine now seem to be just ahead, dependent only upon a continued and even closer alliance of these sciences.

The importance of chemistry to medicine may be readily appreciated when the human body is accepted for what it fundamentally is, a complex and highly integrated chemical machine. It takes food, water and air and converts them

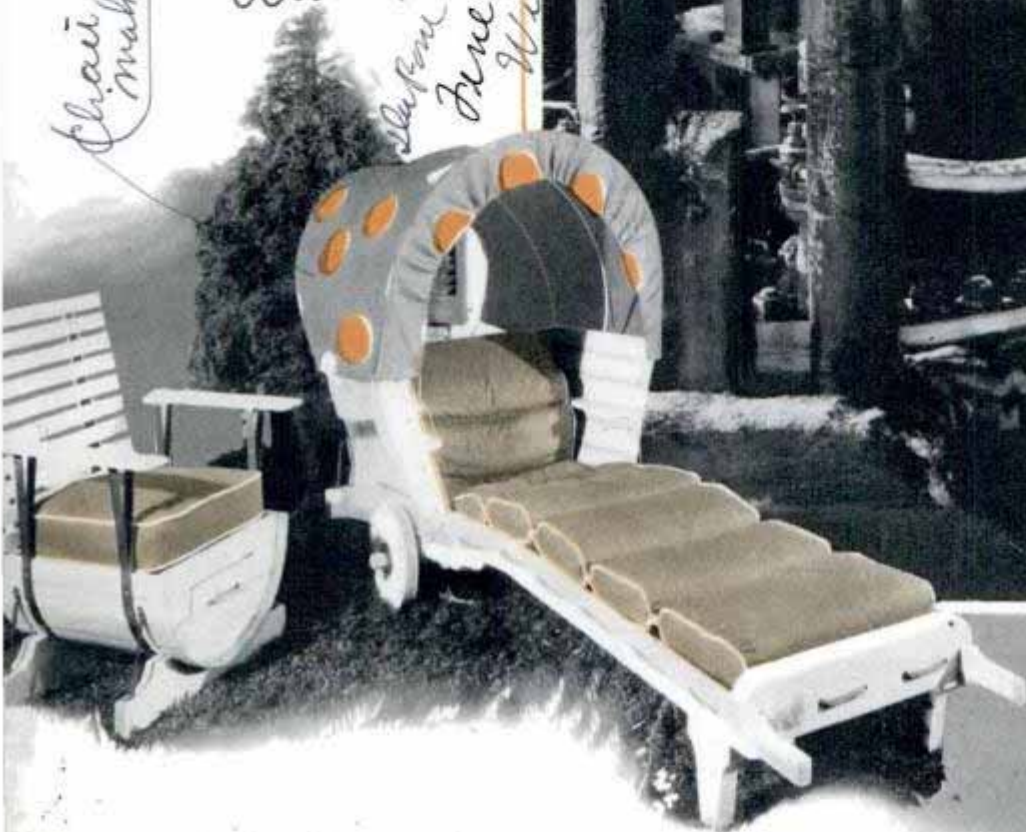
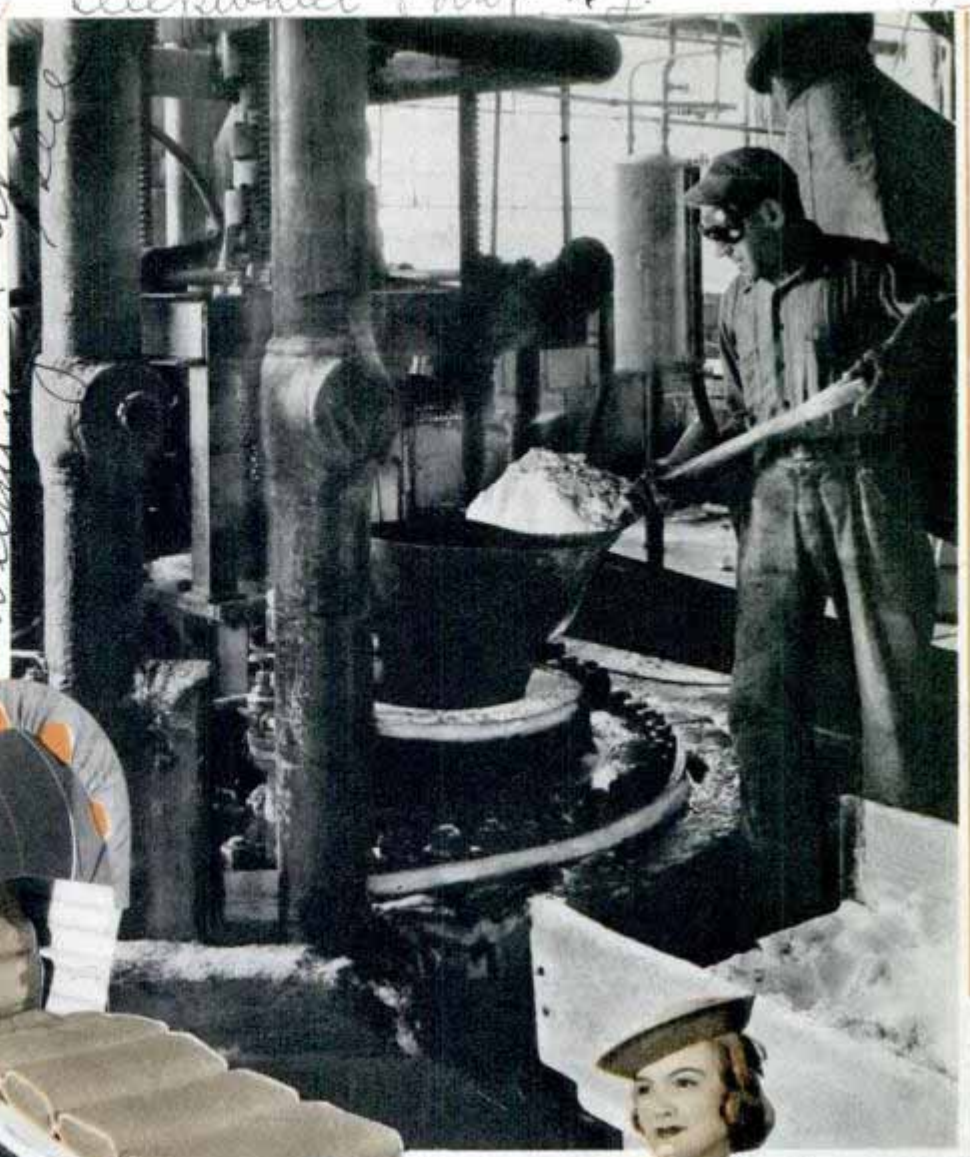
by chemical and biological processes into flesh, blood, bone and energy, in the production of which it employs various chemicals of its own creation. The secret of being able to control normal health and development is knowledge of these materials and processes, to the end that we may supplement them when deficient and supply them when missing.

We know, for example, that chemical secretions of the body known as hormones control the characteristics by which men and women differ in bodily structure, muscular development, voice, amount and nature of the hair, and even in reactions, temperament and personality. Irregularity in any of the characteristics is often a serious handicap that disrupts the life of an otherwise normal individual to the detriment of

Chair like this June 1937
making

MAKING formic acid, right, to be used in camphor. Below, this outdoor furniture is equipped with a fabric made water-repellent by the magic hand of the chemist. Lower right, satin cape treated with a water repellent which does not alter feel or texture of the fabric in any way.

Andex -
Dupont
Fine Chemicals
Wilmington, Del.



himself and society. In the world are literally millions of misfits, through no fault of their own but because the body is chemically out of balance. A way is now pointed to correct abnormalities of this kind, or, better, to insure a normal development in children during growth. Within two years three of the several known hormones have been synthesized in the laboratory. So new is this development and so promising are its implications that as yet we can only guess to where it will lead.

One by one the vitamins are being synthesized or produced by artificial methods, and their role in the chemical functions of the body analyzed and catalogued. Enzymes, the highly complex proteins that make digestion, body oxidations and other physiological processes possible, can be formed out of inactive proteins by suitable chemical changes. Apparently the first step has been taken toward the

25813

eventual synthesis of the blood itself, through the synthesis of porphyrin, related to both hemoglobin, essential substance of the blood, and of chlorophyll, the green coloring matter of plants. Equally important is the development of exact knowledge of medical phenomena only hazily understood and the synthesis of new medicinals for directly combating disease. One very recent discovery points the nature of this work and its broad possibilities.

As long ago as the sixteenth century an observer noted that blowfly larvae or maggots in wounds seemed to have a beneficial effect in healing. The same effect was observed during the Napo-

leonic wars and again during the World War. In fact, following the World War a way was devised to use live maggots in treating extreme cases of a chronic bone disease where conventional methods had failed. But nobody knew why the maggots could heal where science failed.

Biological chemistry has finally solved this mystery of centuries, and with astonishing results. The secret of the maggot's healing lies in a colorless, odorless excretion containing allantoin, which is a painless, harmless, but rather expensive organic chemical compound. Allantoin was then synthesized in the laboratory and the synthetic product was found to have the same healing properties as

337



CHEMIST testing sulphuric acid in coolers of an acid plant. This acid enters into many of the modern miracles performed by the chemist.

Erasselli Chemical Works

THIS dress is of rayon jersey and the hat is a lacquered fabric. Even the slide fastener on the waist is a plastic, a product of the chemist. Below, transparent chair made of cellulose acetate plastic. Tests show it will support the combined weight of two large men.



333

the secretion of the maggot. Since allantoin on decomposition yields urea, the trail was followed to urea itself, which in pure form proved in this instance to have the same healing action as allantoin, and, in addition, is very much cheaper. Weak solutions of urea directly applied were of value in such ailments as diabetic and varicose ulcers, carbuncles, infected burns, osteomyelitis, and certain skin infections.

Urea was the bodily waste synthesized by Wohler in 1828 in the first convincing proof that organic matter can be created by man from inorganic matter. He got his synthetic urea by heating ammonium cyanate, but more than a century passed before synthetic urea was made available in quantity at low cost by industrial chemistry. It is now produced by car-



loads, literally from air and water, and has more than a hundred patented uses. It is used in compounding some of the newest and most beautiful of the plastics, in the preparation of sponge rubber, in the brewing, wine and liquor industries, and as a source of nitrogen in agricultural fertilizers.

Urea is an inoffensive crystalline substance in its pure state, and the fact that it is present in urine is only a detail. It also occurs in many plants used for food, notably in spinach, and in the tissues and blood of animals and human beings. There is little doubt that urea is destined to fill an important role in medicine. It stands as a perfect example of the common bridge between chemistry, biology and pathology over which are being achieved advances that otherwise might be delayed for decades.

Early in 1935 German chemists startled the medical world by announcing the discovery of a new complex compound that enabled mice to survive after being inoculated with deadly blood-cell destroying streptococcus. Apparently the chemical attacked the streptococci directly and killed them. Later this chemical was administered to human sufferers with infected blood, and a variety of diseases—all of them in effect blood poisonings—responded favorably to its treatment. These included septic sore throat, arthritis, erysipelas, peritonitis, and childbirth fever.

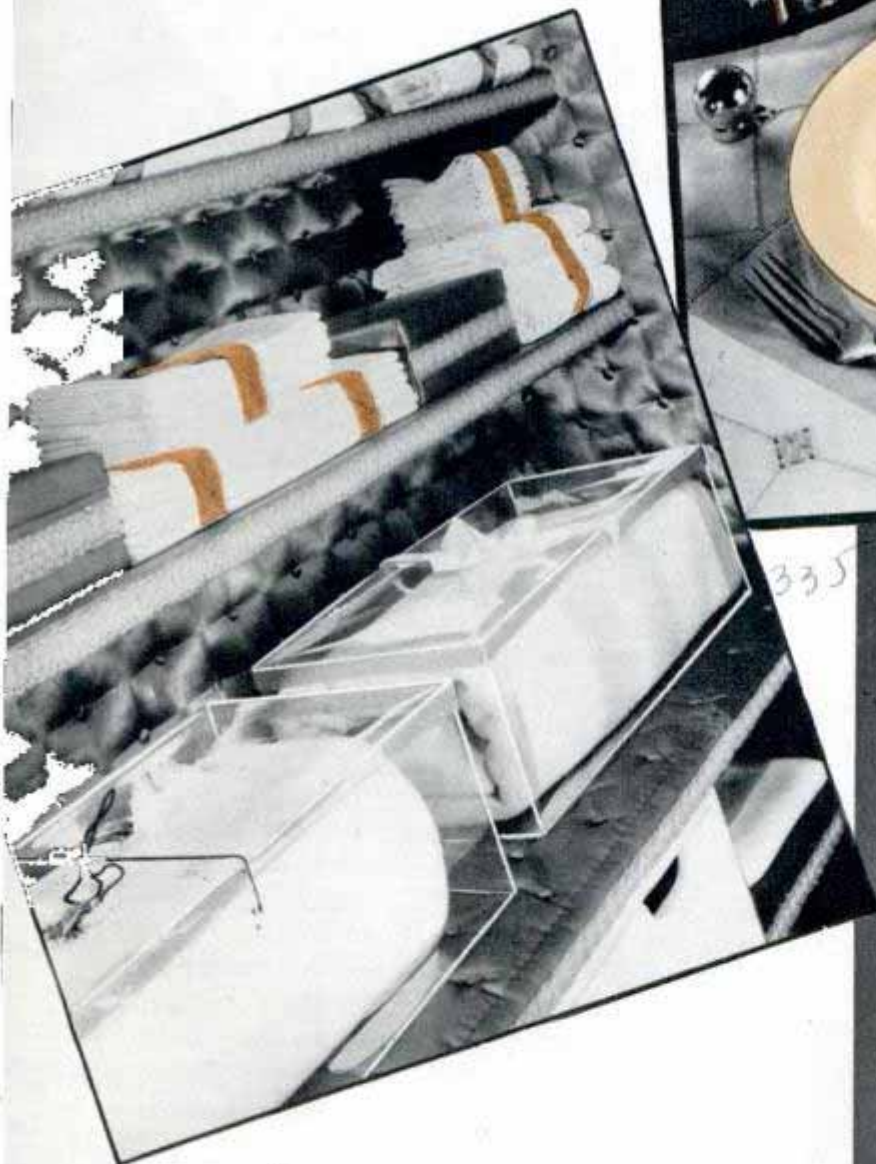
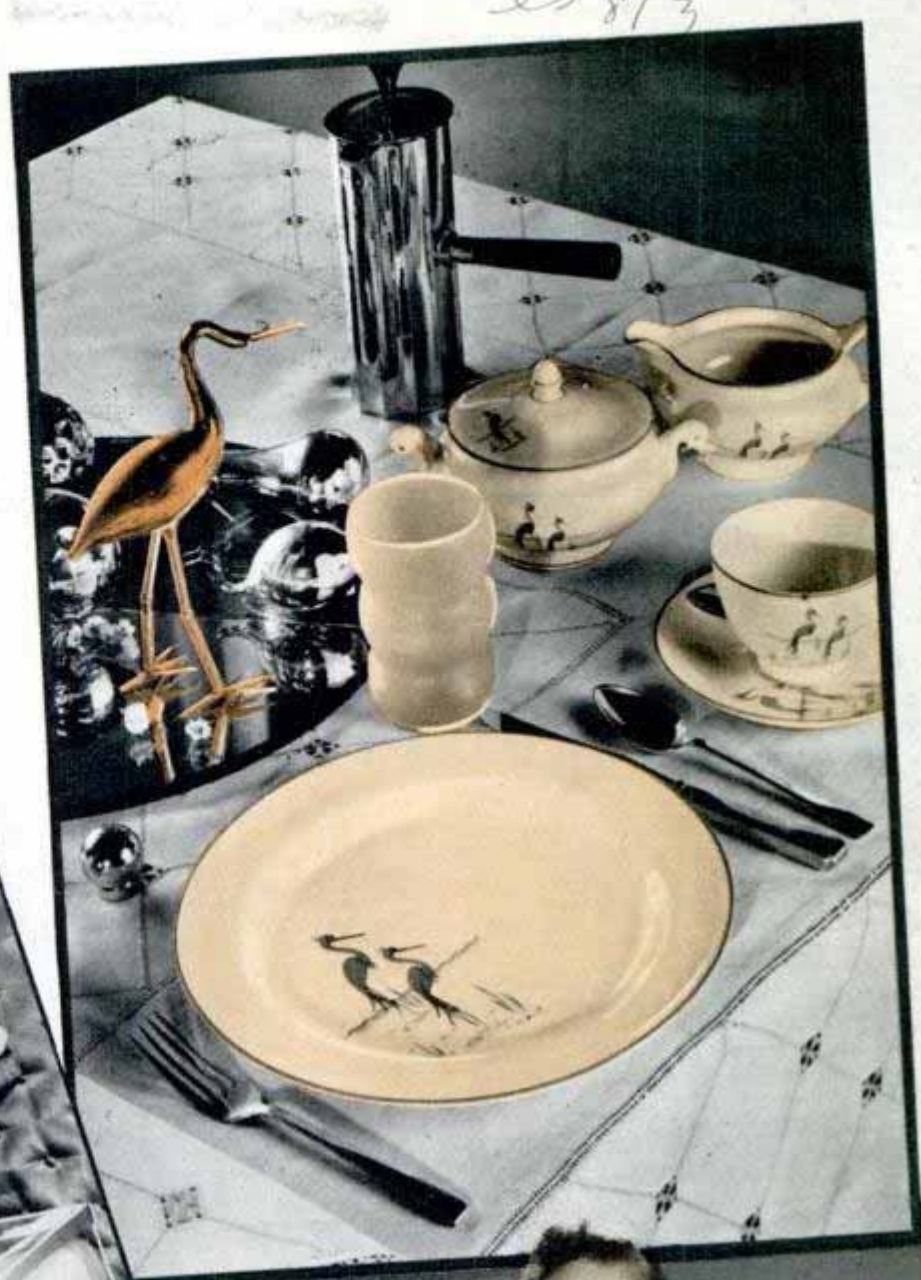
Throughout the civilized world physicians are now studying this chemical discovery of infinite promise and as yet it has developed no unfavorable features, except the



334 SATIN dress which has been treated with chemical preparation making it water-repellent and resistant to spotting. Right, this modern home is wrapped in 6,000 square feet of Cellophane.

limitation that infections must be treated promptly for success. In one form, a bright red solution, it is known as prontosil and administered by hypodermic injection; in its second form, prontylin, it is a white tablet to be swallowed. The significant fact is that it was a common chemical of industry, a sulphamide dye, that served as a clue to the discovery of this long-sought remedy.

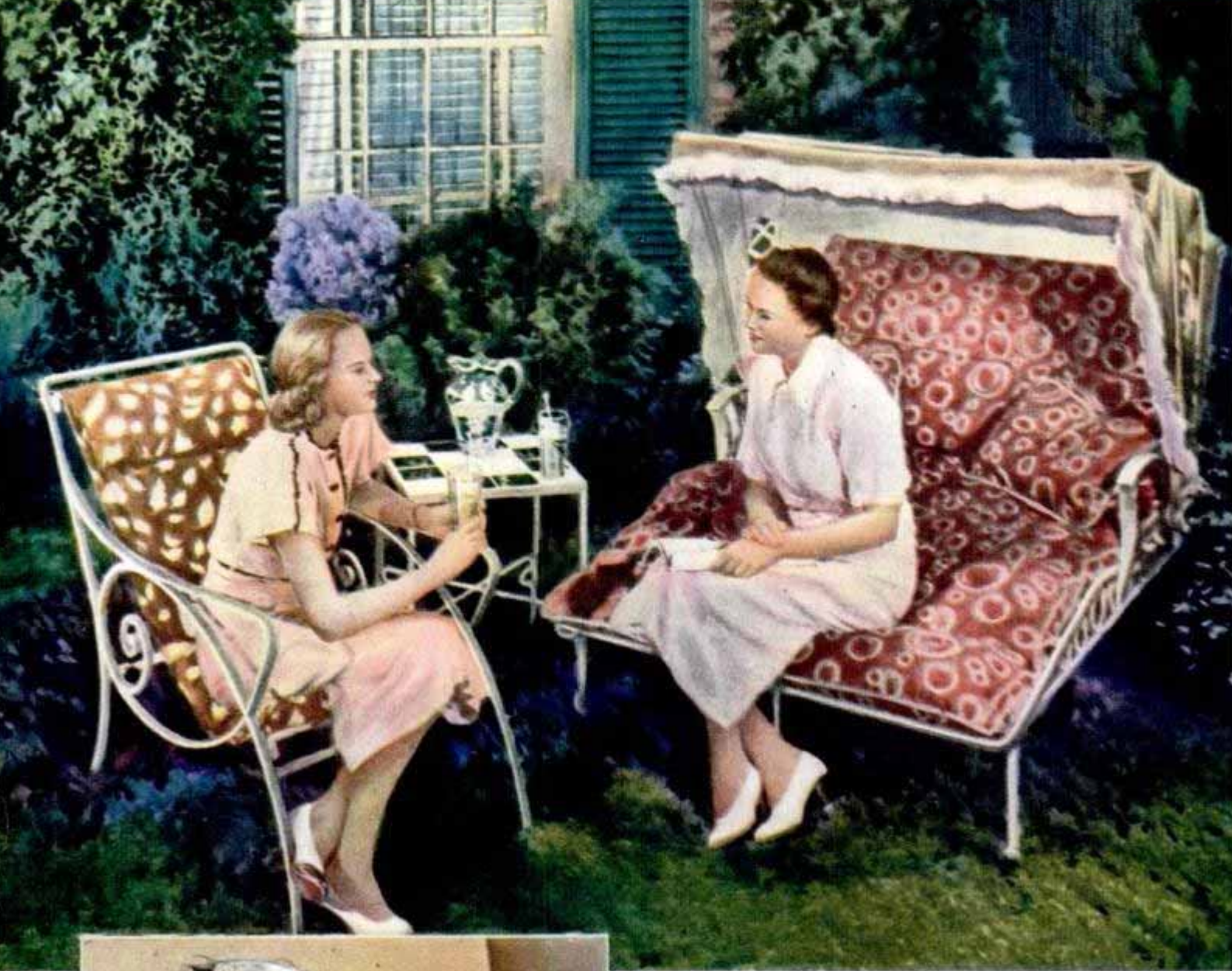
Through chemistry, progress is being made in the world-wide combat against cancer, sufficient to



335

TRANSSPARENT containers for blankets, above, made of plastic material, and dinnerware decorated with American ceramic colors. Right, jacket with fringed rayon.





WROUGHT iron outdoor furniture with synthetic finish that stands weather exposure, and water-repellent upholstery. Below, a "chemical" costume from shoe heels to crown of hat.



lead us to believe that eventual success against this scourge is only a matter of time. For one thing, the past few years have added substantially to our knowledge of cancer-producing substances to the end that cancer in many instances may be prevented. In brief, medicine may be said to be in a stage of transition from a closed field wherein its possibilities are distinctly limited to an open field where the only limits are those of the horizon of expanding scientific knowledge.

Today from one side we hear charges that chemistry is ruining the farm by synthesizing materials once produced exclusively from the soil, and that indeed the time is not distant when we will live

(Continued to page 128A)

es 1493
Year-Around Weather Factory for the Home

Year-around comfort in a neat "package" is offered by a seven-in-one air-conditioning plant just developed for the home. This Westinghouse "weather factory" provides warmth and humidity in winter; in summer it cools and dehumidifies the air; and it cleans, freshens and circulates air. The entire system is contained in a cubic metal case bearing little resemblance to the old-fashioned furnace. At its center is the heating compartment, fired by gas or oil. On one side is the blower, providing air circulation winter and summer; on the other, the condensing unit for summer moisture control. Along the air-supply duct is a cooling coil for comfortable summer temperatures. Filters trap dirt, dust, soot, pollen, lint and other



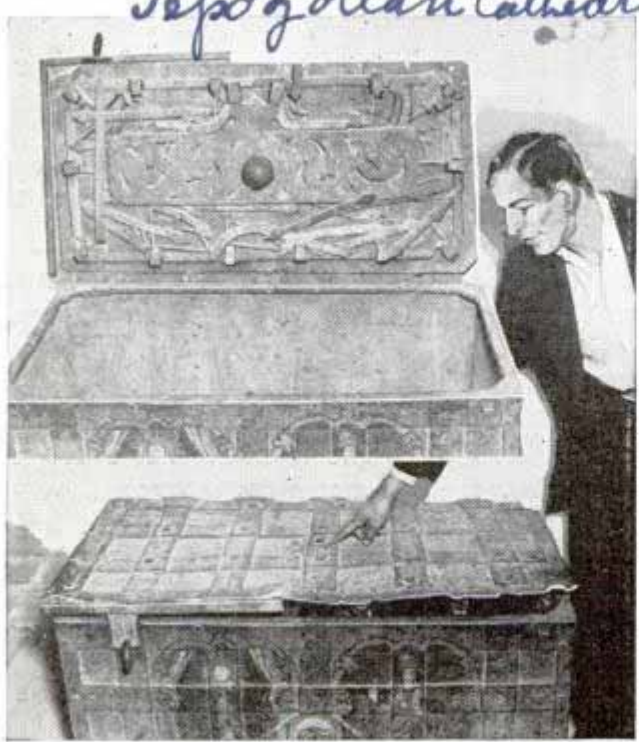
There is little resemblance to the old-fashioned furnace in this unit which heats or cools the home, regulates humidity and cleans air

foreign matter before it circulates through the house. The ventilation scheme assures a regulated addition of fresh outside air, circulated to provide uniform temperature without drafts. The engineers designed the unit for use in homes of all sizes.

es 1492
Single Key Operates Fourteen Locks of Old Strongbox

Regarded as one of the finest examples of locksmith work in Mexico, a strongbox

built by the Jesuits in 1580 has fourteen latches actuated by turning a single key in a lock on the underside of the lid. A false lock and keyhole are on the front of the box, which is constructed of wrought iron. Measuring four feet long by two feet wide by two and one-half feet deep, the box now rests in a cathedral near Mexico City.

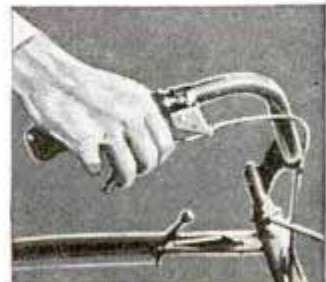


Top, lid of iron box in open position. Note the fourteen different latches

es 1512. 15 miles north Tepozotlan Cathedral

Front Wheel Brake for Bicycle Is Controlled by a Fingertip

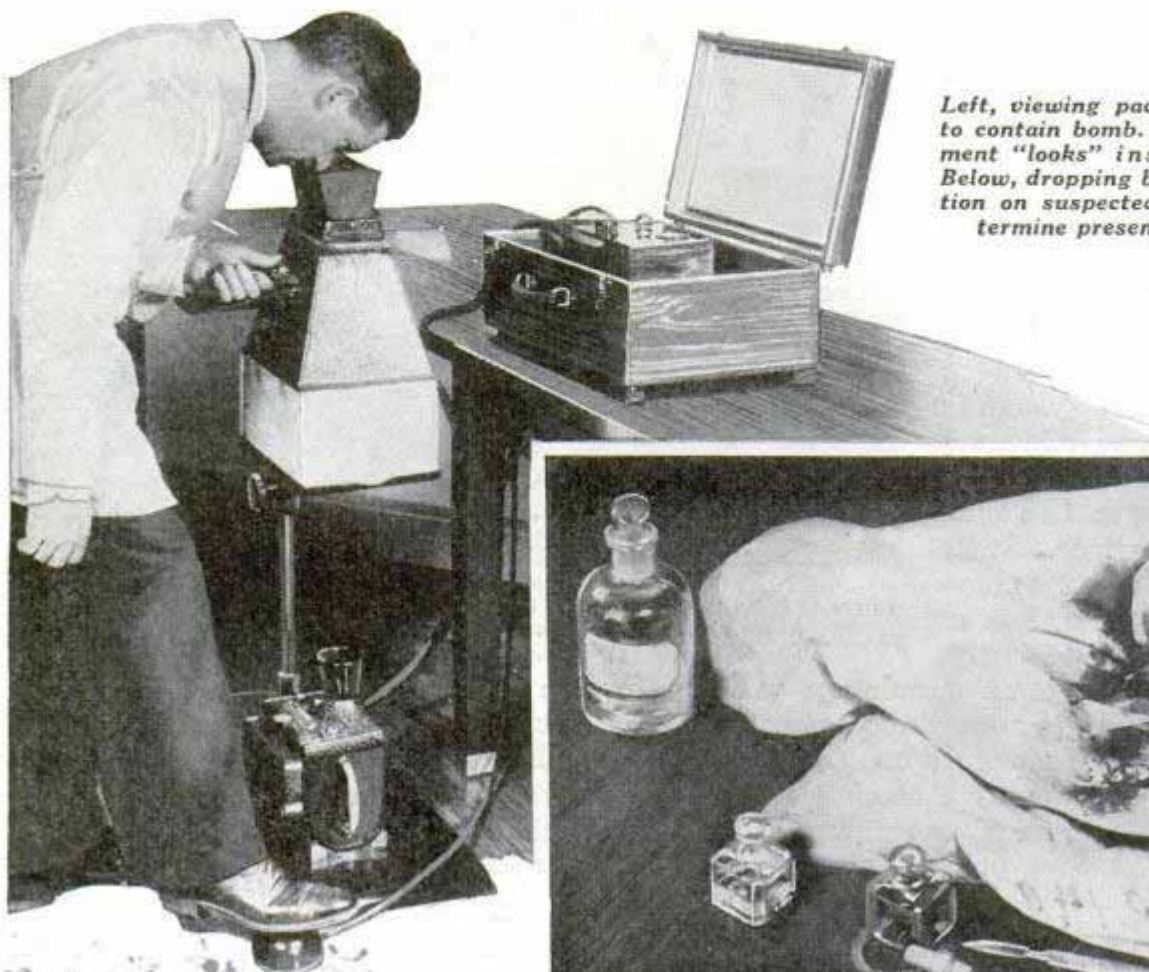
Front wheel brakes for bicycles are being introduced this year. It is not only a safety factor, giving added stopping ability in emergencies and on hills, but it helps to equalize the wear on front and rear tires. The front brake is dustproof, entirely inclosed in the hub, and is controlled by a lever on the handlebar.



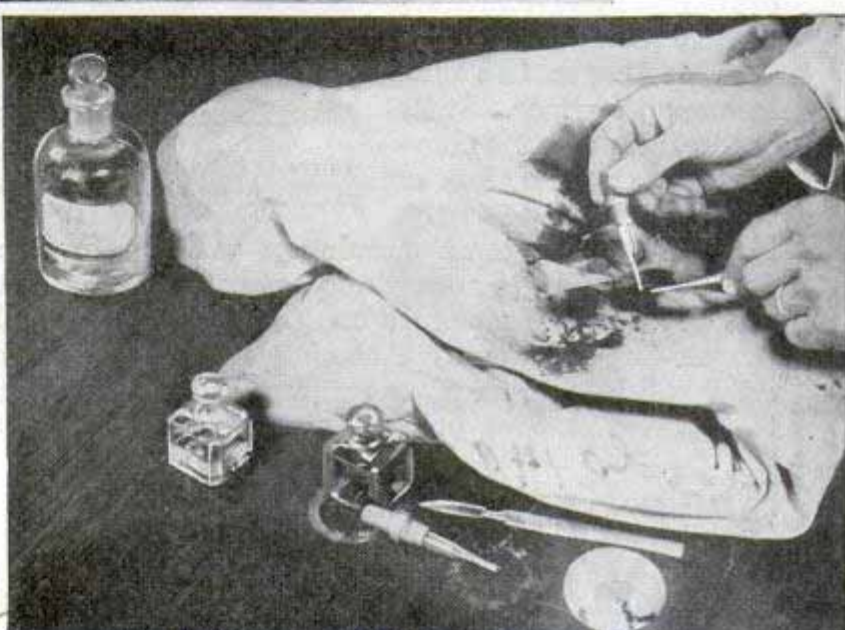
Cent. Jess Laughlin, American Consulate | New Departure slid. General Motors Corp.

es 1197

There's NO HIDING



Left, viewing package believed to contain bomb. X-ray equipment "looks" inside package. Below, dropping benzidine solution on suspected stain to determine presence of blood



232 Maryland Rd
Washington D.C.

By U. V. Wilcox

SOON it may be impossible to lose one's identity as the result of injury, amnesia, pretended loss of memory or use of false names. Perhaps in the near future, measurements of every man, woman and child in the United States and other countries will be recorded, insuring positive identification of any individual, no matter how puzzling the case.

Even without complete records and without access to files of the social security board in Washington, American identification experts are doing well. Many improvements have been made in methods. Old ones have been refined, new ones have been perfected and delicate equipment has been developed that operates in an uncanny way, such as prismatic analysis which takes care of infinitesimal things. Even the biologist and the chemist have become identification conscious. While

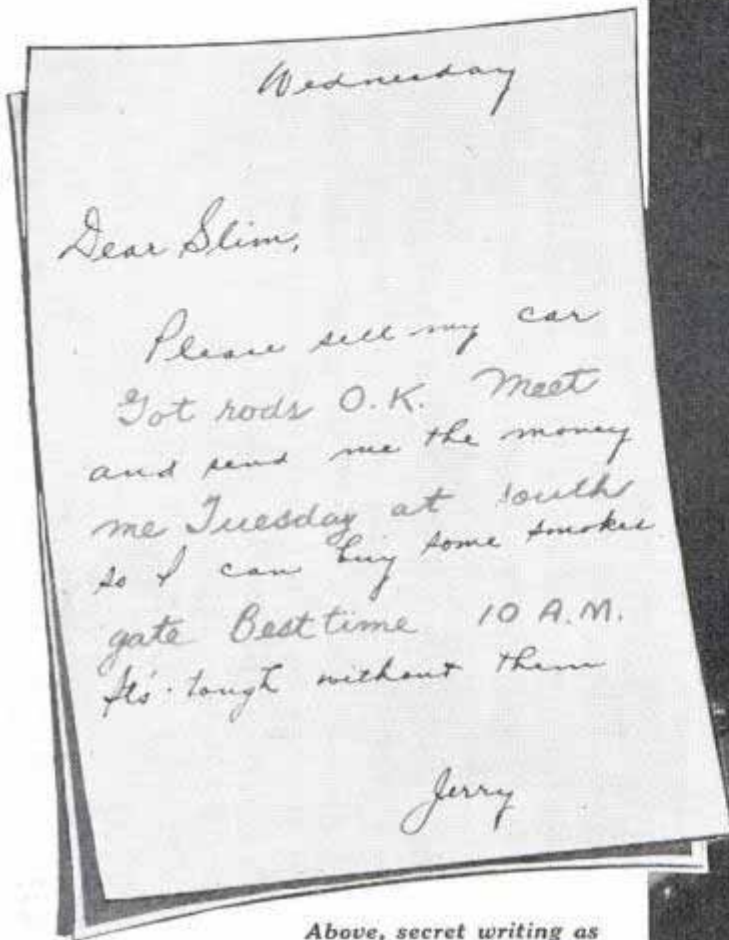
America is leading in this program, other countries are cooperating, particularly in exchange of fingerprints.

A prisoner escaped from a western state penitentiary in 1921 and for fourteen years no trace was found. Then he was arrested in England and his fingerprints were sent to Washington, revealing that he was a fugitive from this country. When another man was arrested in a west coast city on charges of entering the United States illegally, his fingerprints were sent to foreign countries. Soon reports came back showing that he was wanted by police in England, Italy, Austria, France, Chile and China. In vain he had tried to lose himself under a variety of aliases.

Fingerprinting, revised and enlarged to a point once believed impossible, is but a small part of modern identification. Names invisible to the human eye on papers and

PLACE NOW

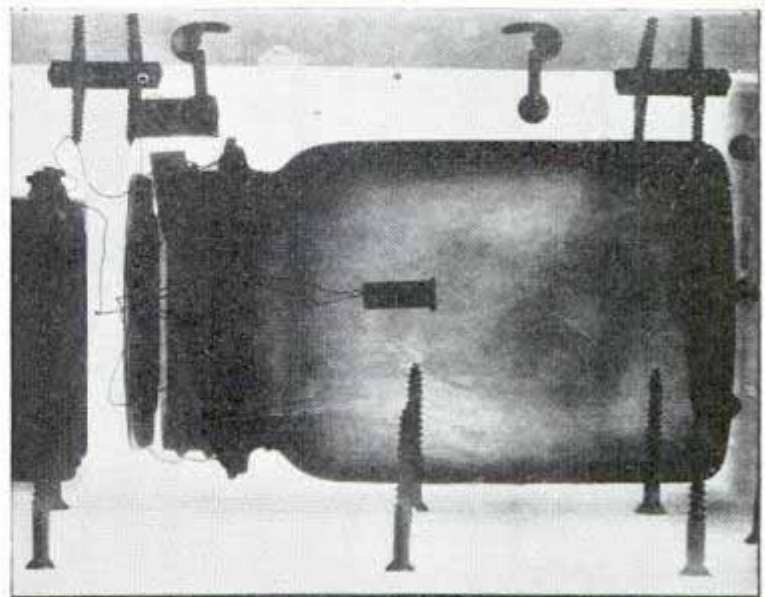
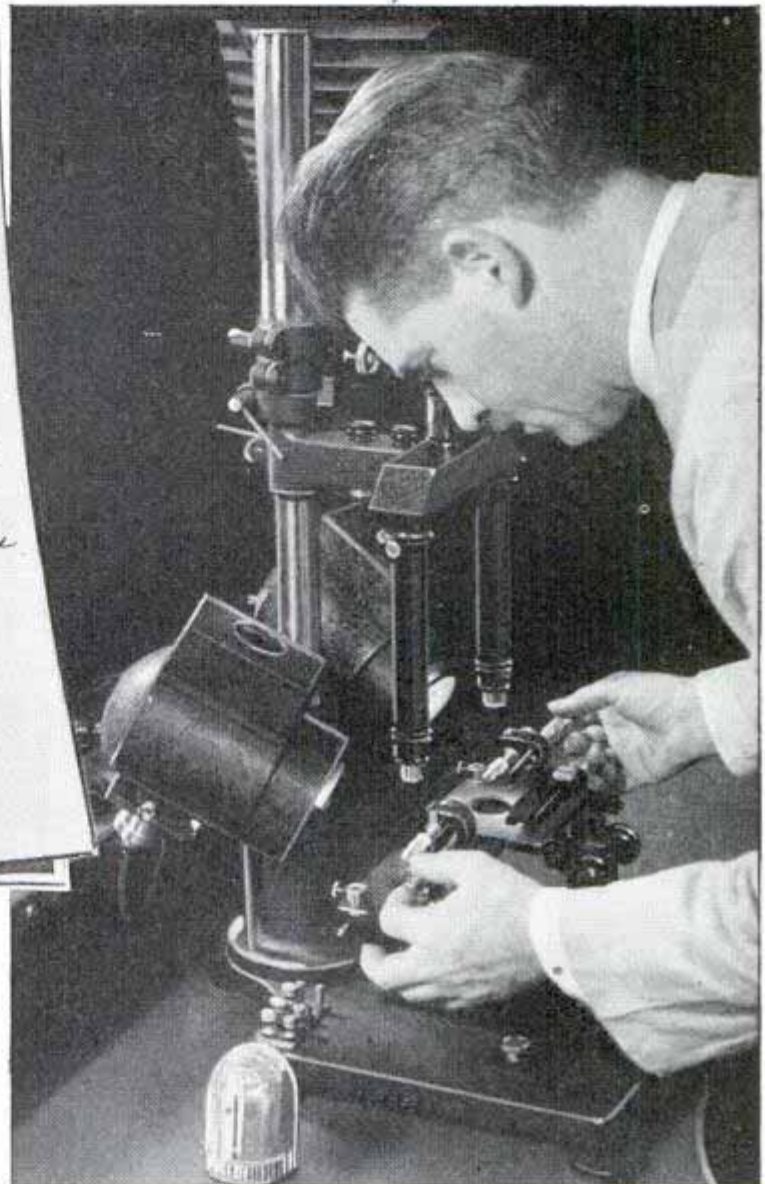
Hexlexometer



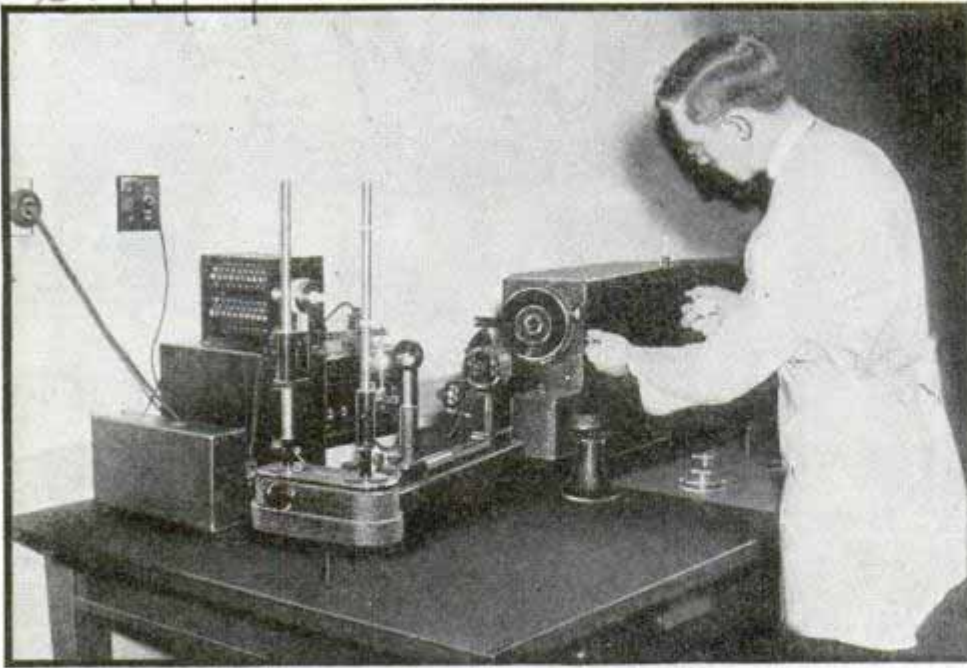
Above, secret writing as made visible by ultraviolet light rays

documents are made clear by spectrographic analysis. Prismatic analysis identifies tiny bits of dirt, metal and various other materials. In a recent case, green-painted canvas bags filled with gasoline had been stored in a building. When the building was burned, a father and son were questioned. Slight traces of green were noticed under their fingernails. Scrapings placed under the spectrograph revealed that the green stains contained the same chemical elements present in the paint on the bags. And the pair decided to plead guilty.

Identification specialists have their petrographic microscope with which polarized light and high magnification reveal clues, since the effect which tiny crystals have upon polarized light shows



Top, right, comparing bullets with aid of microscope. Bottom, X-ray photo showing bomb encased in wooden box



Spectrograph which is employed in making analyses valuable to the identification expert. The machine identifies various elements

when the crystals are identical. With its aid robbers may be caught. Police in a southwestern city recently arrested a man after a series of safe burglaries. Under his bed they found a pair of shoes that he said had not been worn for two months. Slight traces of moisture were visible. Under the petrographic microscope, scrapings from the shoes were found to be identical with specimens of soil taken from the place where the looted safes were found. The suspect confessed and eventually eighteen other safe robbers were involved.

When police in an eastern town investigated the hanging of a valuable dog, they found near by a piece of rope similar to that used on the dog. Experts studied the two samples of rope under the microscope and found them entirely different, resulting in the release of an innocent man.

A few years ago national forest rangers found several pieces of bone on a mountainside. Later, when the snow had melted, they made a more thorough search and picked up bones and clothing scattered over a wide area. A belt buckle initialed with an "H" and a wallet failed to supply clues to their owner's identity. After a careful examination of a jaw bone, a dentist said the bone came from a man about twenty-three years

of age. Police departments of the state were circularized. In less than twenty-four hours, police in a distant city reported that a twenty-three year old college student had been missing. The student's father then identified the belt buckle as the property of his son.

A number of prominent men in the east recently began receiving extortion notes. Laboratory experts found that all the

notes had been written by one person. In the home of one suspect they found a card-index system containing the names of about 150 prominent citizens. The man is now in a federal penitentiary.

Sometimes an examination of handwriting brings unusual answers. A girl student killed a man student in a middle western college, claiming he had written extortion notes to her and that she had protected herself by killing him. But experts found that the notes had not been written by the man, but by the girl's sister.

If a typewriter is used in any criminal case, identification is almost immediate be-



Gathering blood-stained earth for examination and analysis in laboratory by latest identification methods

Science of Dives
12/3/37

Vibrator Rod Lures Worms for the Fisherman



Demonstrating the worm-luring vibrator which saves trouble of digging for bait

Worms may be lured to the surface of the ground by the fisherman if he uses a vibrator rod invented by a Los Angeles dentist. The equipment consists of a steel rod and a corrugated wooden stick. When the inventor puts the rod into soggy earth and draws the stick across the rod like a violinist draws the bow across his violin, the worms come out of the ground, lured either by a certain low hum or by the vibrations. The dentist invented the outfit after seeing worms come out of the earth in great numbers near the base of a tower supporting a high-tension power line. The wires were humming and crackling and apparently causing the tower to vibrate.

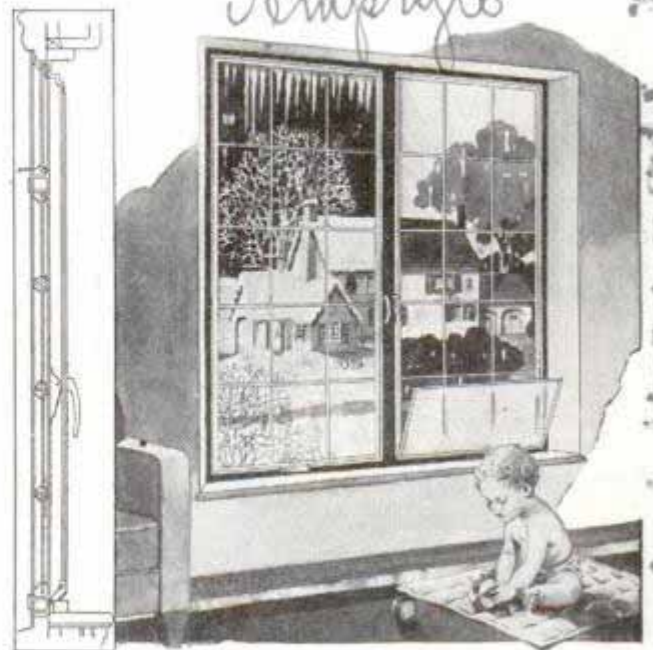
Diver under 344-Ton Pressure at 420-Foot Depth in Lake

When a diver in Lake Michigan descended recently to a depth of 420 feet his body was under a pressure of 318 tons more

than at the surface. The area of an average man's skin is about 3,500 square inches, and atmospheric pressure of fifteen pounds to the inch at sea level adds up to about twenty-six tons. The pressure was about 197 pounds to the square inch at the bottom of his dive. He used an atmosphere of oxygen and helium to protect himself from the "bends," the disease caused by nitrogen bubbles collecting like clots in the blood stream when the pressure is released by too rapid ascent.

Insulating Window Cuts Heat Losses of Casement Sash

Saving on fuel bills by reducing heat losses through casement-type sash, a new insulating window easily installed from the inside is on the market. A dead air space of one inch between casement and insulating window sharply reduces condensation and frosting under ordinary conditions. The frame, equipped with weathering seal, covers the entire casement frame, providing efficient insulation against heat loss. The weathering seal is resilient to insure perfect contact, yet is stiff for durability. The construction is internally reinforced steel, welded at the corners. Attachment to casement sash is effected by knurled head screws and positive contact points. The window is removable to permit cleaning. Glass ventilating panels, or sill vents, are obtainable for use with the window.



Insulating window as used in winter (left). In summer it may be removed (right)

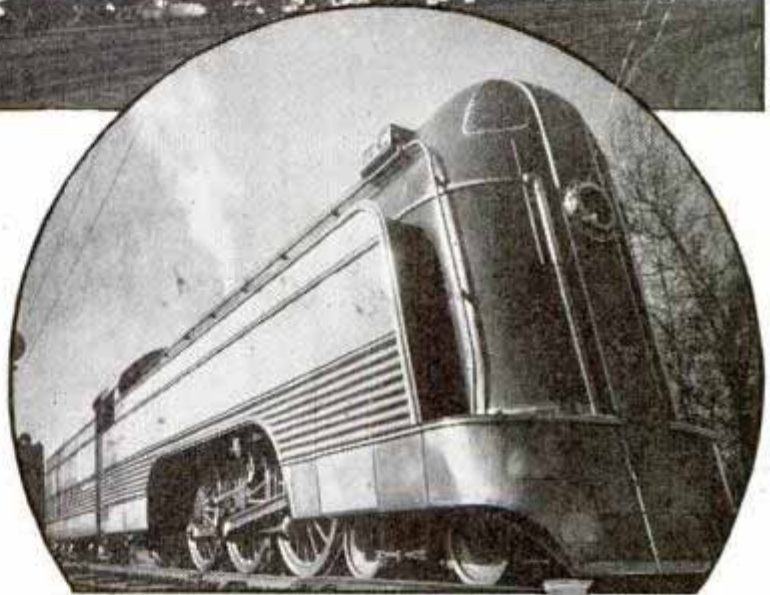
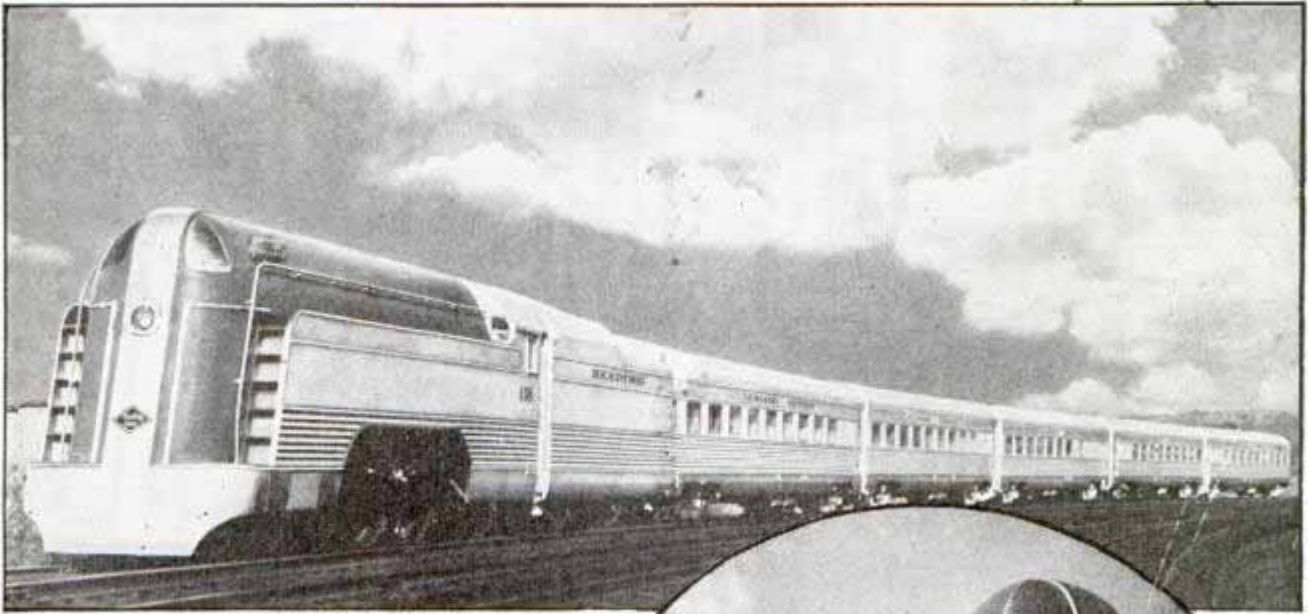
Truscon Steel Co
Yonkers, N.Y.

ed Milwaukee
947 W. 8th St. Los Angeles, Calif.
Dr. W. C. Merrill

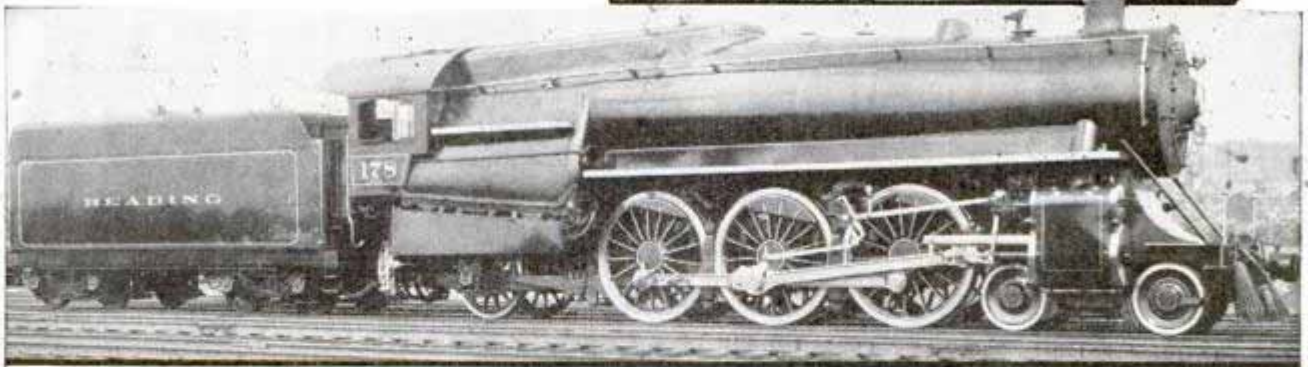
es 1428.

max E kohl

Stainless Steel Coal-Burner Scours Self Bright



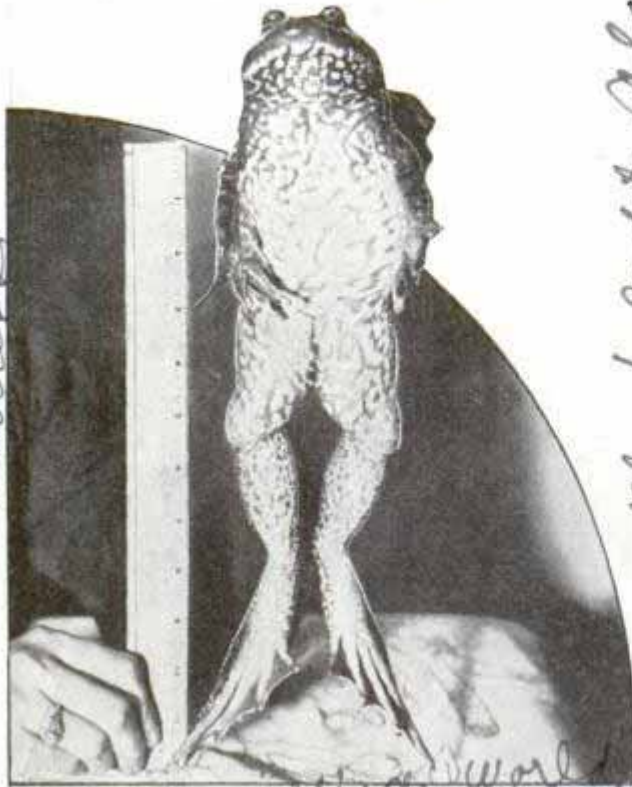
Speeding on two daily round trips between New York and Philadelphia is this Reading-railway streamliner drawn by first coal-burning steam locomotive built of stainless steel. Front and rear coaches are observation cars, becoming lounge when coupled to tender. Engine is identical with the Pacific type below except for the stainless steel sheath



What the Reading railway wanted in its new streamline train was a coal-burning locomotive that would keep itself clean. The result is a five-car streamliner of stainless steel hauled by a steam engine whose soot and cinders can find no resting place on the highly polished flanks of locomotive and cars. The engine itself is a conventional Pacific type, but its stainless steel sheath is so designed that the wind scours off what dust and grit might fall on its silvery body, and the high polish is

maintained with a minimum of effort. A vivid blue is used to enhance the exterior trim. The train makes two round trips daily between New York and Philadelphia, and to avoid turning the entire train on a "Y" it was made reversible, the observation end fitting into the tender to become a lounge on the return trip. Thus there is an observation car at each end, and a diner at the center. Many Diesel-driven trains of stainless steel have been built, but this is the first stainless steel coal-burner.

Frog Farmer Raises a Big One with Eighteen-Inch Stretch



Nearly fifteen inches tall when he pulls in his neck, this fellow can stretch out to eighteen inches

Eighteen inches of frog makes a big splash in any pool. A Los Angeles frog farmer raised the big fellow pictured here held beside a foot rule to prove it is a giant of the family. With a height of nearly fifteen inches in this pose, it could stretch its neck to measure, at full length, a foot and a half, the Los Angeles man asserts. The frog weighed five pounds.

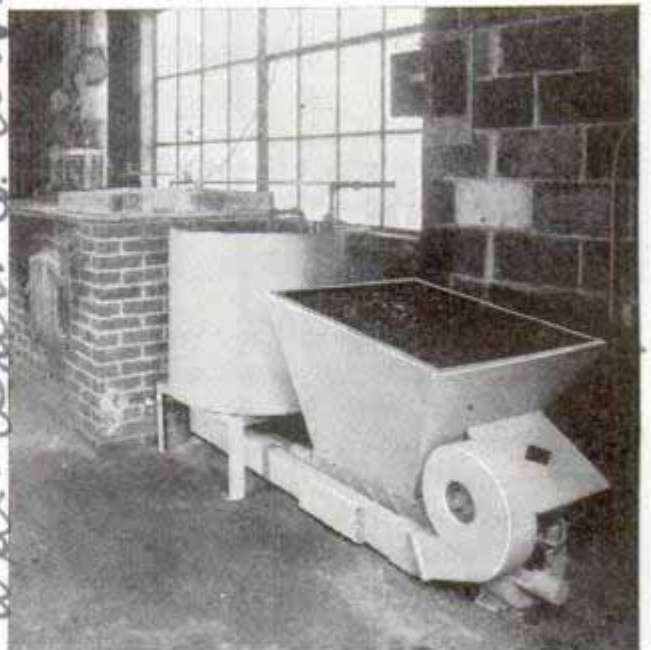
Compound Wood for Building May Bring Low-Cost Homes

Holding the possibility of making low-cost homes available to the masses, compounded wood is being prepared for the market. Uniform in weight, strength and color, it is the product of a large-capacity plant which recently began operations. Compounding of wood is the term applied to the process of peeling veneers to given thicknesses, drying them and gluing them together. Woods unsuitable for many construction uses become the core of compound wood, and other types of wood become the covering or face, in such proportions as will give a board complying to specifications. The compound wood is to

be marketed with a light-colored surface. Logs of various types are fed into a "boiling" pool, soaked to permit greater ease in peeling the veneers and then fed to a high-speed peeling lathe from which the ribbon veneer passes to an automatic clipper to be clipped to uniform size. Thence the veneer goes to a conveyor which drops it selectively into "books" of desired combinations of heavy and light sheets. The sheets are kiln-dried, coated with a phenolic resin adhesive, electrically heated and pressed at proper temperatures and delivered as finished lumber. The boards meet predetermined specifications, with widths hitherto unavailable. With compound wood, simple houses might be constructed. Furniture, railroad and automobile car-body manufacturers may be among the early users of the new wood. If desired, the wood could be treated to make it fungusproof.

Stoker Fires Heat-Treating Unit Keeping Even Temperature

Because of its economy and the ability to control temperatures precisely, a stoker is being used in an Ohio factory to fire a furnace for heat-treating steel parts. Until recently, conventional oil and gas-fired furnaces were used. With the stoker, the heat of the coal-fire "backlog" is penetrating and any temperature required can be maintained.



Automatic controls make possible use of stoker for heat-treating furnace requiring steady temperature

Joe Baneto - no street address

plant - Mobile, Ala

The Well - Burt G. Ervill - Ohio

Meyercard Compound Lumber Co. 208 W. Washington

W. Washington Chicago

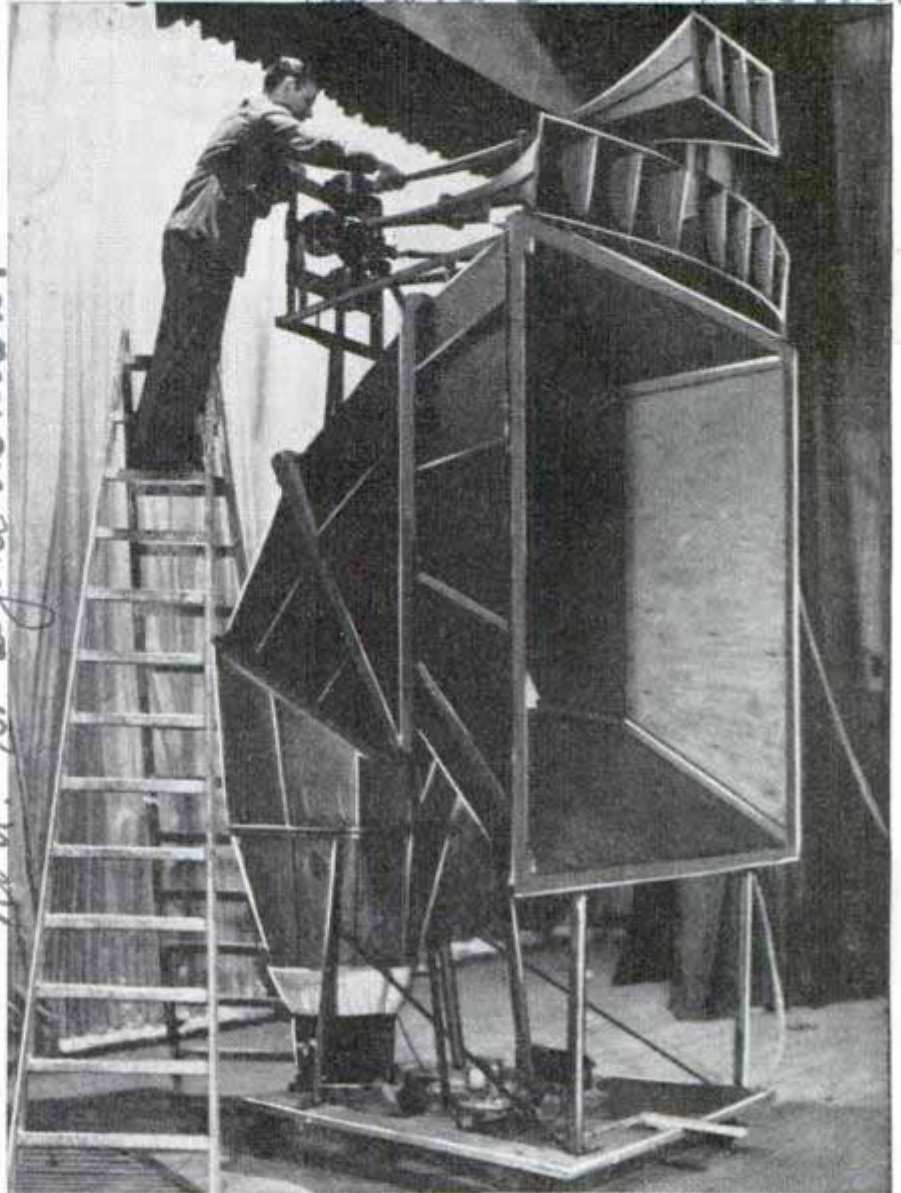
Arthur H. Little, Inc. Cambridge Mass

Es 1483

Es 1486

Big Loudspeaker Cures Theater 'Dead Spots'

Large movie theaters and auditoriums often have "dead spots" where sound reception is poor, despite the efforts of acoustic engineers to assure perfect sound distribution. To overcome these dead spots a huge five-horn loudspeaker has been developed, five times as powerful as the large standard speakers. It is thirteen feet one inch high, with depth and width each six feet seven inches. Unlike traditional loudspeakers, its low frequency part is horn-shaped, with a large square opening. For the high and middle frequencies there are four separate horns above the biggest speaker; each is divided vertically into three sections, and they can be adjusted in any direction to obtain perfect sound distribution through the theater. Large areas can be covered without distortion or double-speech effects, and faithful reproduction of both music and speech is assured.



Loudspeaker horn six feet seven inches square for low frequencies and smaller horns for higher frequencies distribute sound without distortion

Speedy Army Fighting Plane Has Liquid-Cooled Engine



Latest army pursuit plane which has a speed above 300 miles per hour. The landing gear is retractable

Rated at a speed above 300 miles per hour, the U. S. army's latest fighting ship has a liquid-cooled engine, inclosed cockpit, steerable tail wheel, air flaps, and landing gear retractable into the wings. The ship is an all-metal, low-winged single seater monoplane powered by a single engine. All the latest devices developed by aeronautical engineers have been incorporated in the craft, resulting in great speed, high rate of climb and unusual maneuverability.

Curtiss P-37 Pursuit
Curtiss - Wright Corp
30 Rockefeller Plaza New York

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1488

Hallerbachs Afer 30, Berlin 8. 6. 71
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Is 1243

Capt. James Mc Dunning

431 W. 60th Terrace

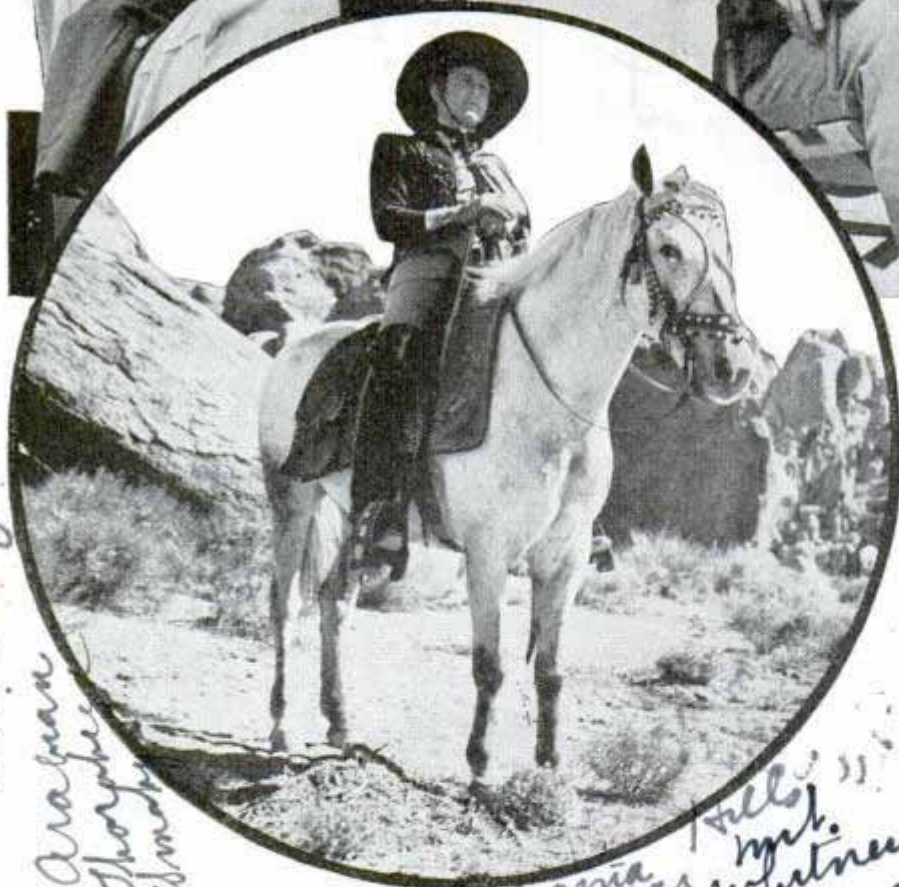
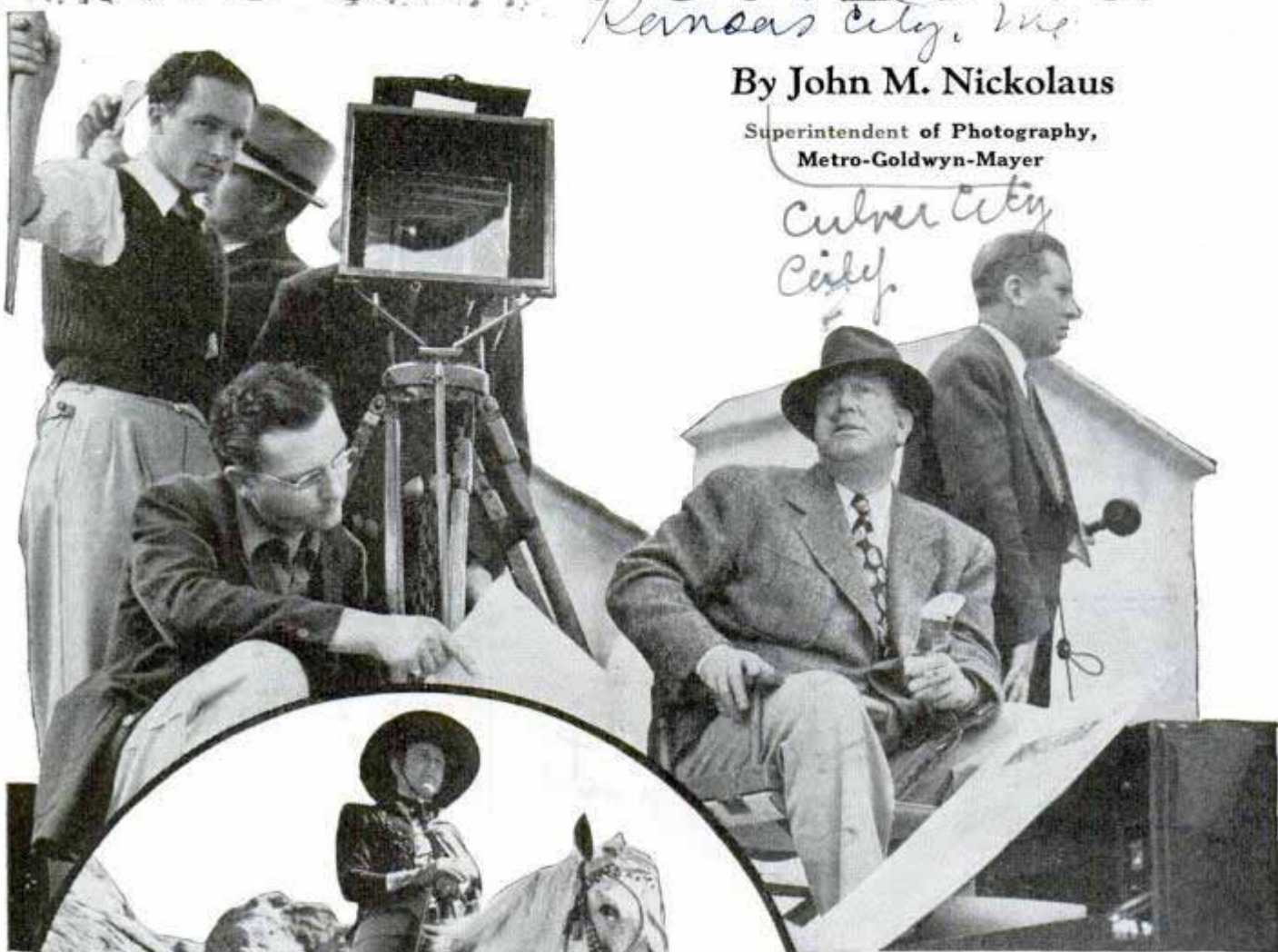
MOOD TONES for

Kansas City, Mo.

By John M. Nickolaus

Superintendent of Photography,
Metro-Goldwyn-Mayer

Culver City
Calif.



Top, during filming of picture, experts confer with director on toning. Circle, actor in mountain sequence of "The Firefly" in which new tone treatment was used

blue tones that project to the audience the atmosphere of a film play more effectively than was possible with black and white.

Tone mood in a picture-making sense is a psychological fact. Take a desert scene, for example. It suggests trackless wastes and heat clouds rising from burning sands. It's

only natural that a film audience would get an infinitely better "feel" of such a scene if it were shown in a sepia tone than in the conventional manner.

The success of this innovation was demonstrated in the film, "The Good Earth."

EXPRESSING the mood of a motion picture through tone is Hollywood's latest achievement. By a process of chemical toning, developed in our laboratories after two years of intensive research, films are being made in a variety of sepia and

Allan Jones

Araban
Thompson
Smith

Alabama near Whitney

Handwritten notes at the bottom of the page, including "Alabama near Whitney" and other illegible scribbles.

es/24.3

MOTION PICTURES

The simple, moving story of a Chinese farmer, Wang Lung, and O'lan, his slave girl wife, this film was tailormade for sepia tones. China's valley of the Yangtze river, the little thatched cottages and the fields, the creaking carts and water wheels, threshing outfits, the gates, the streets and market of a town, every bit of Mongolian atmosphere was translated perfectly for the screen by this toning process. Had it not been for this treatment, many critics feel that the picture would not have achieved such artistry.

In the past several months, many pictures have been made under this process and production schedules indicate a still greater number to come. The full potentialities of this new



Top, regular motion-picture cameras are used in making the new films. Toning is done in the laboratory. Bottom, matching up specially treated films in the cutting room of studio

Es 1245.

Geannette McLendon
as Nina Azara

Allen Jones as Roge Wright
Marionette de Lara



Top, scene from "The Firefly" in which toning was used to advantage. Bottom, novelty dance scene from "Broadway Melody of 1938"

George Murphy
Ellen West



was provided. Hunt Stromberg, the producer, has received such results with this plan that he intends to use it exclusively in future pictures. Other studios are installing the necessary equipment and it is not unlikely that the bulk of the films will be handled this way in the future. Of course, certain films would not be benefited by the process. A story of a cold, grim nature would be robbed of a certain amount of its dramatic intensity if it were filmed in warm tones instead of black and white.

It might be well to point out that sepia and blue tones are not a substitute for color films but a separate and distinct approach to screen beauty. Weeks of tedious experimentation were spent in selecting the proper tones and tints for the musical operetta with the historical background. Each sequence presented a different problem

field of photographic expression are evinced in the screen version of a famed operetta. With Spain and France of the Napoleonic period as locales, a wealth of opportunities for the use of tones and tints

es1243

and dozens of combinations of tones and tints were used in the finished film.

There was a scene in a Spanish barnyard that called for romantic treatment. Sepia and blue were skillfully blended to create the mood of a romantic moonlight night. Later, a gypsy campfire scene was depicted. We used a similar combination except that a small dash of orange was added to bring out the glow of the campfire on the faces of the players.

Just which tones and

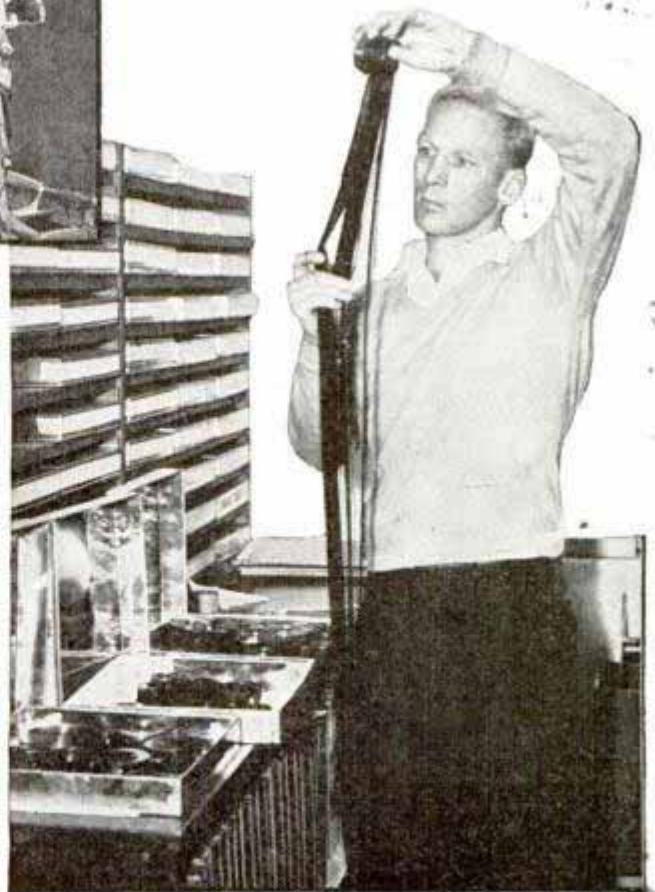


Top, principals in the sepia-toned "The Good Earth." Center, reproduction of Bayonne waterfront as pictured in "The Firefly," an operetta. Bottom, in full-length pictures, dozens of combinations of tints and tones are used to express moods

tints can be utilized is still a matter of conjecture. Due to the nature of the process, its use is more or less limited to the two tones that have been mentioned. Although a shade of green might be ideal for a straight scenic shot, the blues and sepias probably will be used the most where intimate action involving the close-ups of players is depicted.

Apart from the psychological benefits derived, the sepia-tone films are easier on the eyes than any film yet produced. This treatment gives the films greater depth. Characters are picked away from the background, giving them relief and removing the curse of the flat picture effect.

(Continued to page 119A)



1491

Rabbits Raised as a Hobby Yield Profit in Wool

or deal cards. It is suggested, too, for the fingers and palms of ball players. The powder does not mark or stain paper.

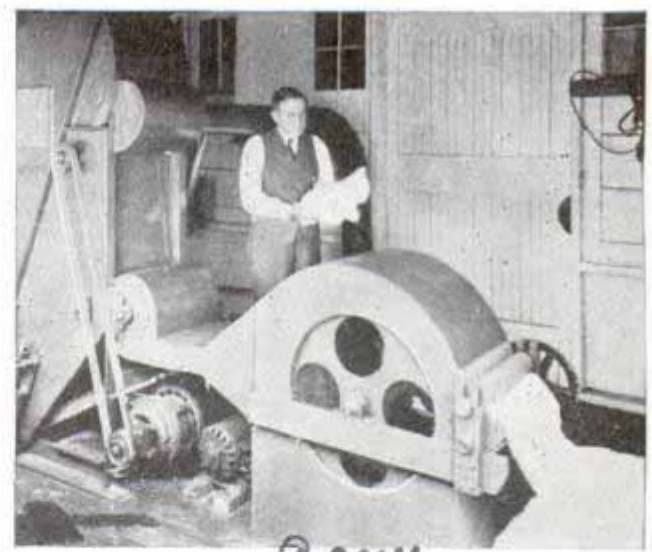
es 1499

Automatic Gas Alarm Warns of Explosion Danger

Invented to protect against the danger of explosions, an automatic gas alarm soon may be placed on the market. It is a small thermal tube containing mercury. A wire penetrates the mercury, with one end connected to an ordinary electric line, the other end treated with chemical paints sensitive to gas. Leaking gas affects the treated end of the wire, causing it to heat up. This causes the mercury to rise in the tube. At a certain point, contact is made with the outgoing wire and an alarm bell sounds. The tube is sealed so that leaking gas cannot be ignited when the electrical contact is made.

es 1520

Revolving Drum Gins Cotton Without Tearing Fiber



New type cotton gin in action. Note ginned cotton emerging at the right

Leaving the fiber untorn and therefore more valuable, a new machine removes the seeds from cotton by centrifugal force. Instead of tearing the cotton to pieces, it whirls the cotton in a revolving drum to free it of seeds and impurities, leaving the original length of the fiber unchanged.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



Shearing the Angora rabbit. Each animal yields two pounds of wool per year

Angora rabbits are being raised as a profitable hobby by one radio and motion-picture actress. The wool, taken from the rabbits once each year, is worth about five dollars per pound. Each rabbit yields about two pounds of wool a year. So prolific are the Angoras that a single pair can produce a family of 3,000 within three years. The rabbits' wool is softer and lighter than that of sheep or goats.

Friction Stone for Fingertips Facilitates Handling Papers



Cleaner than the wet sponge, less clumsy than the rubber finger stall, a friction stone is the latest office assistant to the bank teller, bookkeeper, or anyone handling leaves of paper.

It is a small block of chalklike substance. Gently rub the fingertips on the stone and they pick up a bit of the dry, powdery substance which makes it easy to turn pages, to count currency, sort letters

Arme Rich, La Canada Calif.

less stone 10 cents

Nicherson Typ Co. 1128 California Ave.

Mr Frank H. Watson Jonesboro

Walter Hammock, Attesburg, Miss.

Vol 10

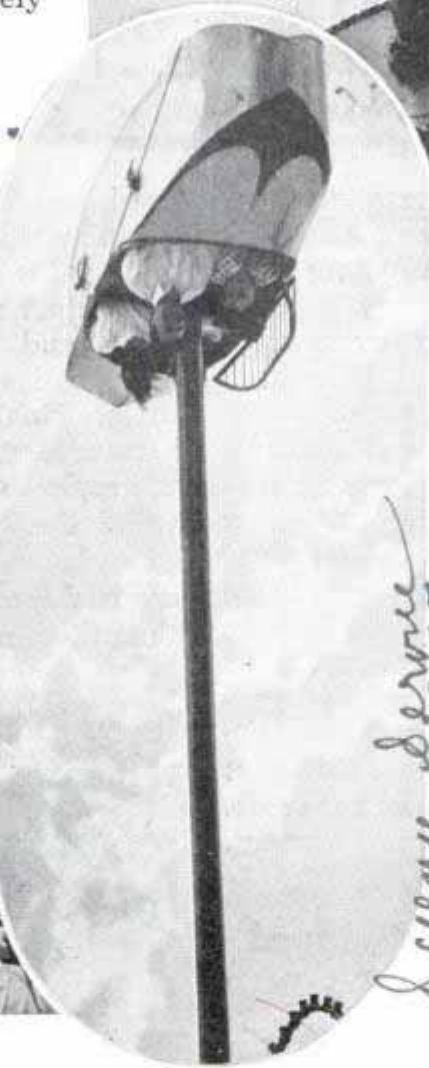
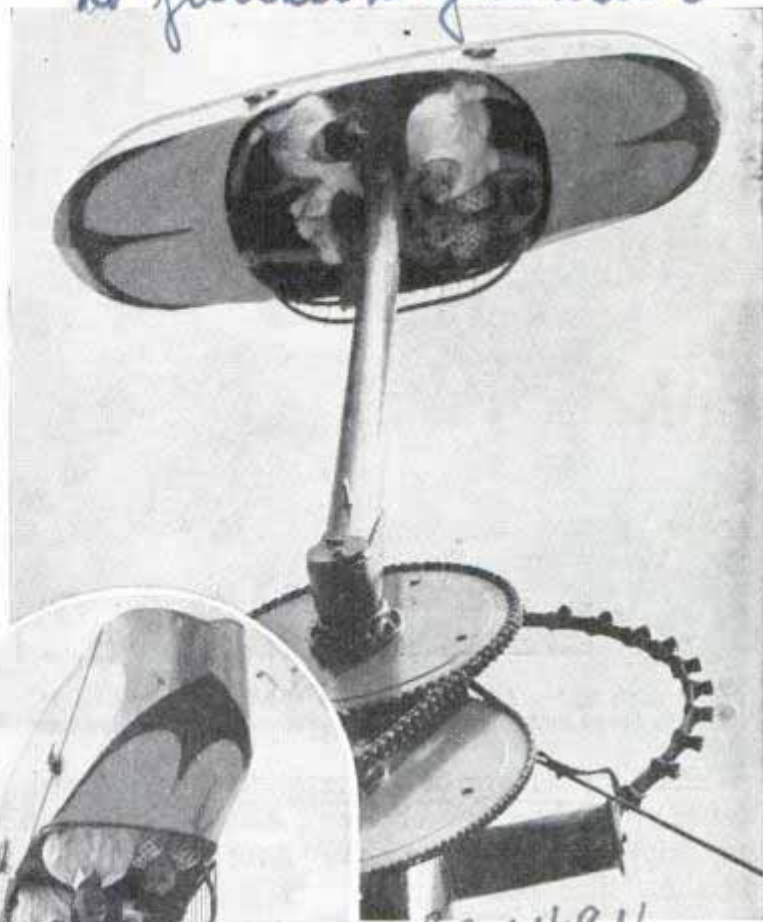
Thrill-Seekers Demand More Speed in Rides

High-riding but sedate Ferris wheels, the thrill of the big fairs a generation ago, are too slow for the speed-loving present generation of fair goers. Their place has been taken by the loop-the-loop. Swinging like a pendulum, the four-passenger streamline car picks up momentum until it finally swings clear around the circuit. At the bottom of the swing it is traveling nearly forty miles an hour. At the top, the operator sometimes sets the brakes and holds the car upside down a moment, giving the passengers plenty of thrills even if they are securely strapped in their seats.

Here are thrills for fair goers. Car at right pauses upside down, then plunges at forty miles an hour



es 1446



Automatic Milker Whistles When It Is Time to Quit

Farmers may soon be able to turn on the automatic milking machine in the dairy barn and then go on about their chores until they hear the whistle blow. A patent has just been granted on a milking machine that whistles when the cow has finished giving milk. It will also signal if one of the vacuum cups becomes dislodged from the cow's udder.

es 1494.
 Pat. # 2,102,275.
 Science Service 12/16/37
 Dr. M. P. Shelby
 Sacramento

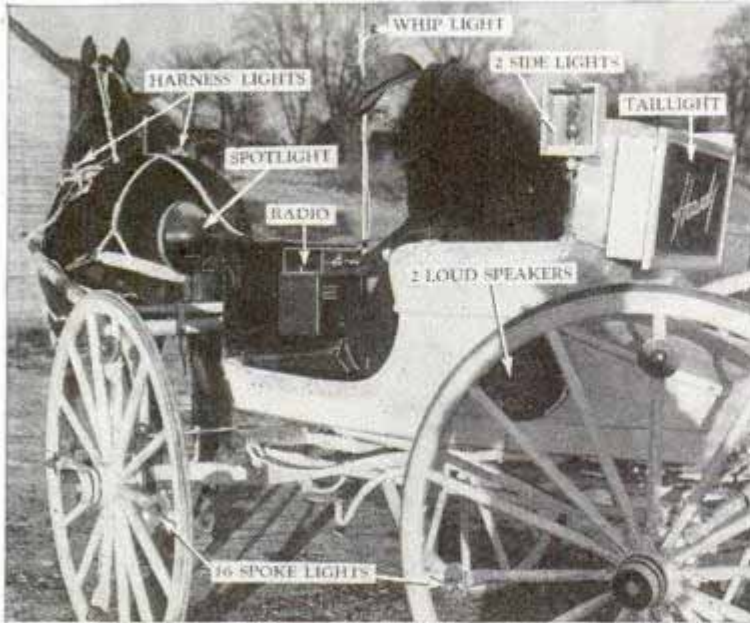
Luminous Leaves on Living Trees Will Help Illuminate World's Fair

Luminous living leaves of trees along the central avenue will help to illuminate the New York world's fair of 1939. Parts of the under surfaces of green leaves fluoresce, or shine with a gentle greenish white,

light, when they are irradiated with certain wave lengths in the high-violet and ultra-violet ranges. Special mercury vapor lamps will cause the leaves of maples, elms and flowering dogwoods to glow softly.

Science Service 12/7/37

Up-to-Date Horse and Buggy Wired for Lights and Radio



Studded with lights from harness to rear wheel spokes, this Wisconsin horse and buggy look like trotting electric signboard

When Frank Dyer of Whitewater, Wis., hitches up his horse and buggy for an evening drive they look like a traveling electric sign. The horse and buggy may be old-fashioned, but their equipment is up to the minute. There is a spotlight on the dashboard. Four light bulbs on the spokes of each wheel revolve as the vehicle rolls along the road. The taillight is an illuminated sign saying "Howdy" to the fellow behind. Two side lights in boxlike reflectors are mounted on the buggy seat. Even the whip has its own light, and the harness is studded with small bulbs. Mr. Dyer's left foot controls the various red and yellow lights by a panel of buttons on the floor, while in front of him is a radio set connected with loud speakers on each side. Five batteries in the rear furnish current.

out, is considerable, particularly in the gas-filled types in general use. The surfaces become blackened because molecules of metal filament, heated to incandescence by the electric current, are carried by convection currents in the gas until they are deposited on the relatively cold glass surface.

Flying Cameras Check Up on Crop Reduction

Uncle Sam takes no chances on farmers failing to live up to their contracts to reduce crop acreage. Aerial photographers make a systematic survey of cultivated areas, and from their maps and altitude data the acreage of various crops can be calculated with great accuracy. Rolls of film exposed at high altitudes over farming country are sent to Washington to be developed, and the map sections to be especially examined for the crop-control checkup are enlarged with precision printing machines. They must be printed in exactly the proper scale, and allowance is even made for shrinkage when the photographic paper dries. Finally the areas on the map are measured with a planimeter, first setting the scale to correspond to the altitude at which the flying cameraman was working. The planimeter computes the area of the crop fields on the map in square inches, and then they are translated into acres.



Applying planimeter to aerial map to measure acreages in checkup of crop-reduction contracts

Light Bulb Blackening Stopped by Built-In Screen

Protected by a patent issued recently, a new electric-light bulb has a built-in screen said to prevent blackening during the lifetime of the bulb. The screen prevents vaporized metal from the filament from reaching the inner glass surface of the bulb. Blackening of bulb surfaces, which cuts down the amount of light given

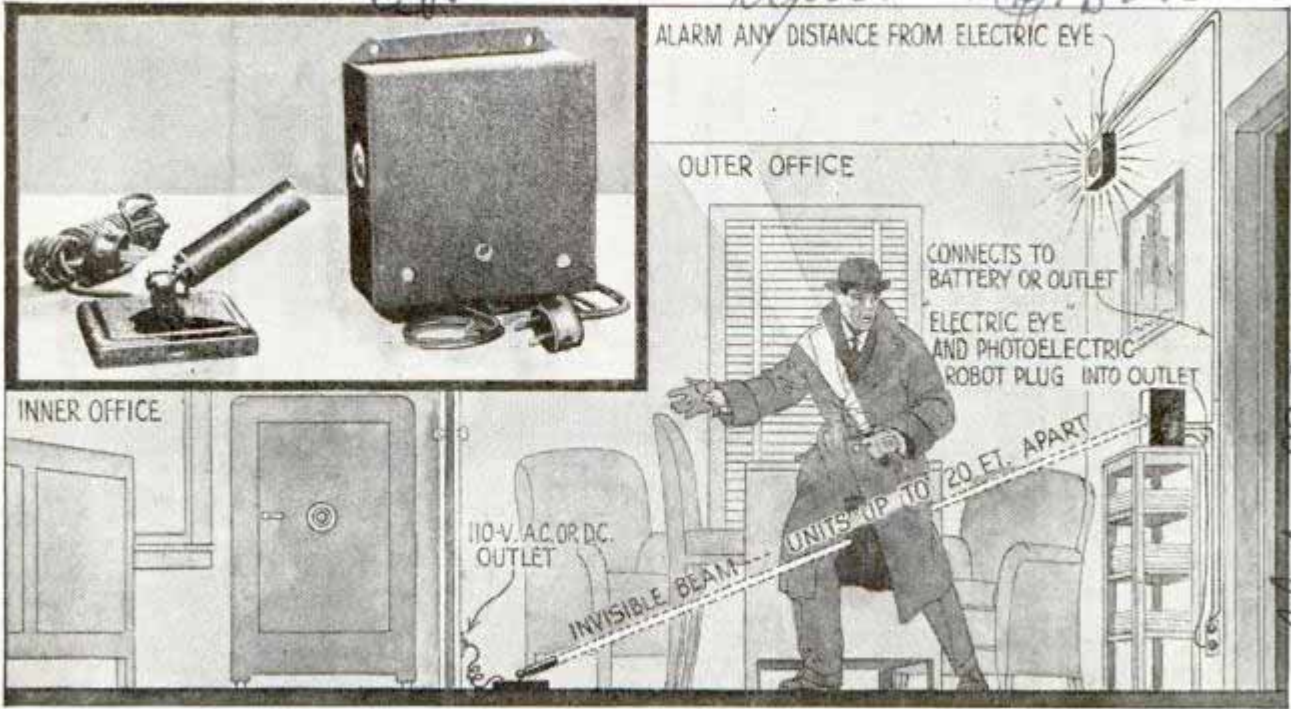
Mrs. Richard C. ...
 1421
 # 2,100,879
 Assigned
 General Electric Co.
 Washington, D.C.

Assigned
 General Electric Co.
 Washington, D.C.

251409. Universal Control

Blencoe, 201 N. Wells, Chicago

Black-Light Alarm Protects Home or Office



Inset, simple black-light alarm equipment, with light source at left and photoelectric unit at right. Large sketch shows how alarm system might be arranged to protect office against intruders

An inexpensive electric-eye burglar alarm is available for protecting home or office against intruders. The device employs black light, a color filter being supplied, so that no visible rays warn of the presence of the alarm in a dark room. It consists of two simple units, a light source which may be mounted anywhere and a photoelectric relay which actuates a gong or siren when the beam from the light

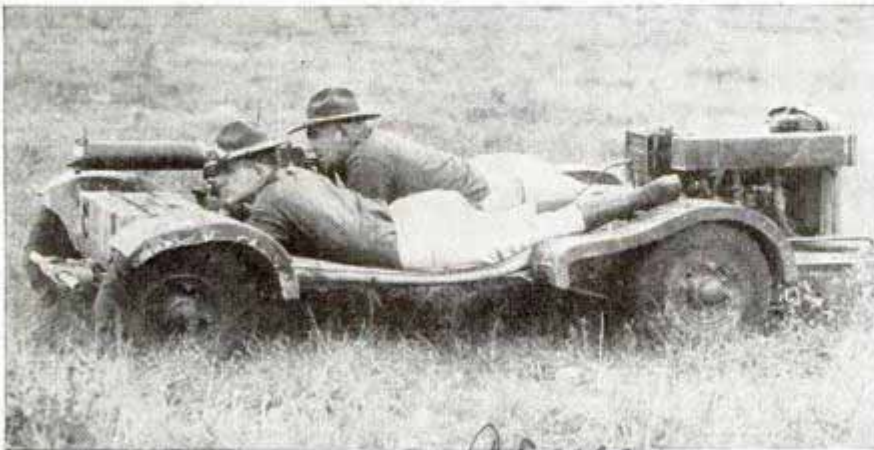
source is interrupted. Any type of alarm may be used with the device. Installation is easy, only a screwdriver being required. First the light source is mounted so that its beam is directed to the relay's "eye," then the relay is connected to the gong or siren. Plugging the alarm into a 110-volt outlet completes the job. The light source has a swivel joint so that its beam may be directed from various angles.

Tel. Randolph. 8884. A. B. 4/16/41

Mobile "Battle Gondola" Keeps Machine Gun in Action

One of the principal handicaps of the machine gun in battle is overcome by a

"gondola" gun carrier invented at the Fort Benning, Ga., infantry school. Machine guns are so unwieldy that usually they are out of operation until properly set up in the lines, and cannot be fired while advancing. This experimental carrier is a low-slung automotive vehicle on which two soldiers lie, one operating the car while the other fires the gun.



Mobile machine gun goes into action, one soldier driving while partner keeps weapon in play. Gondola was invented at Ft. Benning infantry school

Wild life in the United States supplies \$150,000,000 worth of meat and furs each year.

Tested at Ft. Ord, Sonoma
Hunter, Trader and Trapper

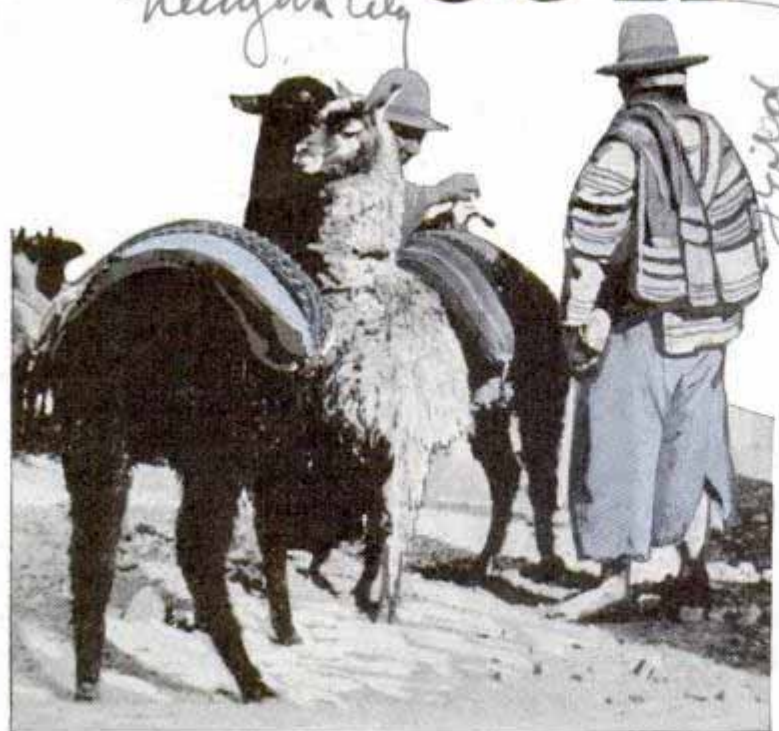
251346



727 Park Ave
New York City

GOLD MINING

By Emile Schnurmacher *Wash*



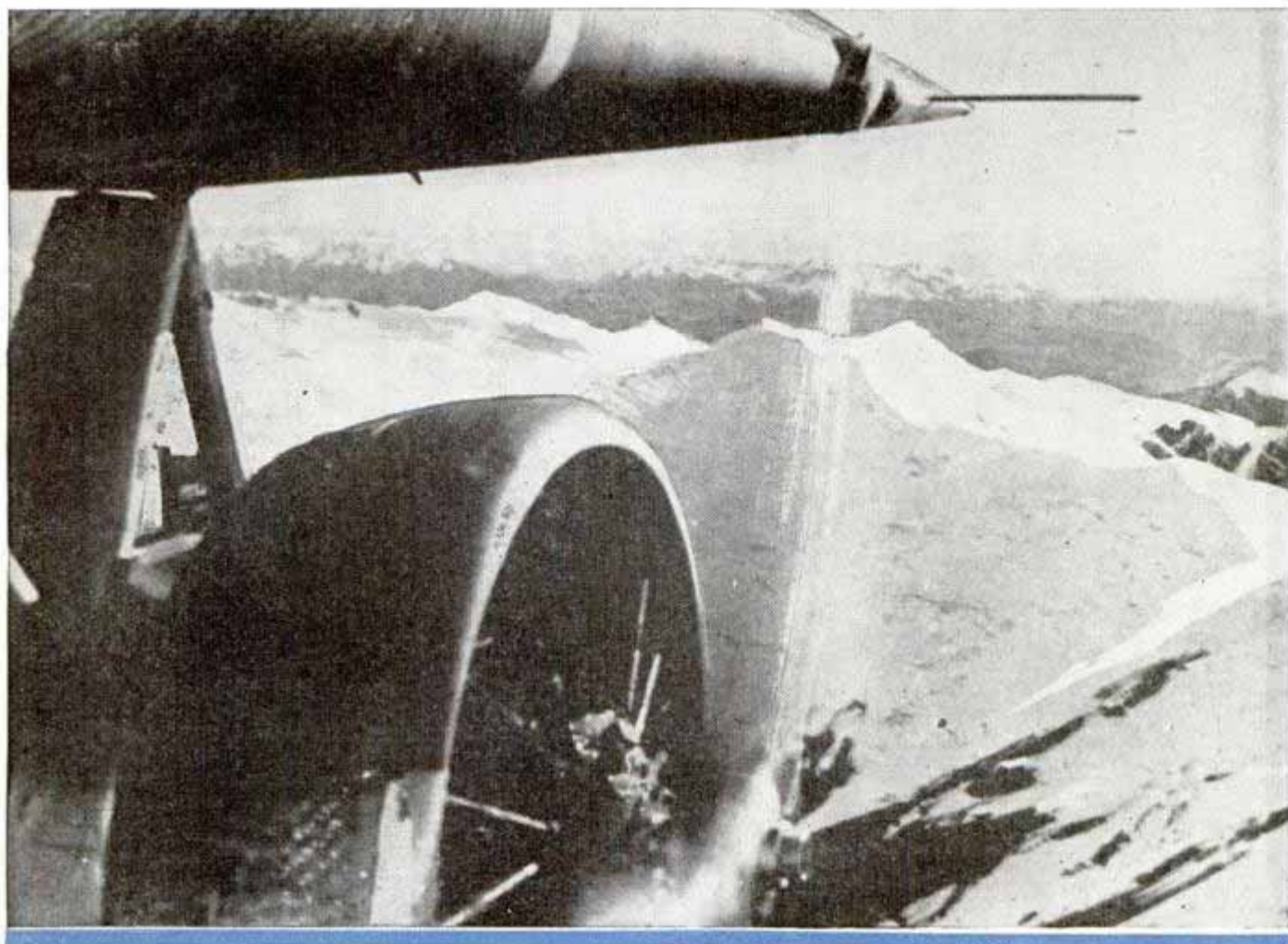
ITS three supercharged motors roaring in the thin air, a modern sky freighter lifts a ton of mining machinery above the snow-capped mountains forming a 4,000-mile barrier down the western coast of South America as a radio message flashes from La Paz, 13,000 feet up, to Tipuani, at sea level on the other side of the Andes:

"Mining equipment now heading for Sorata Pass. Altitude 21,000 feet. Have unloading crew ready in twenty-eight minutes."

Back comes the reply from Tipuani, where is located the Aramayo gold mine:

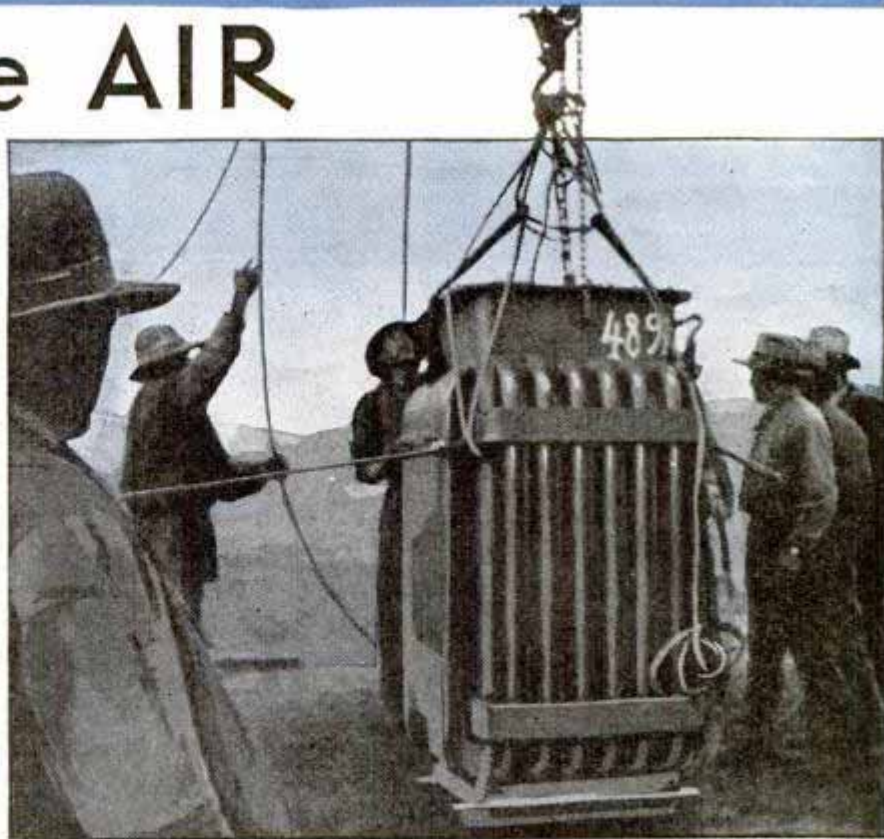
"Everything ready. Expecting to unload 10,000 pounds machinery today."

Top, loading mining machinery into flying freighter. Bottom, the llama, which lies down if given a load greater than sixty pounds, is useless for transporting heavy machinery required in gold mining

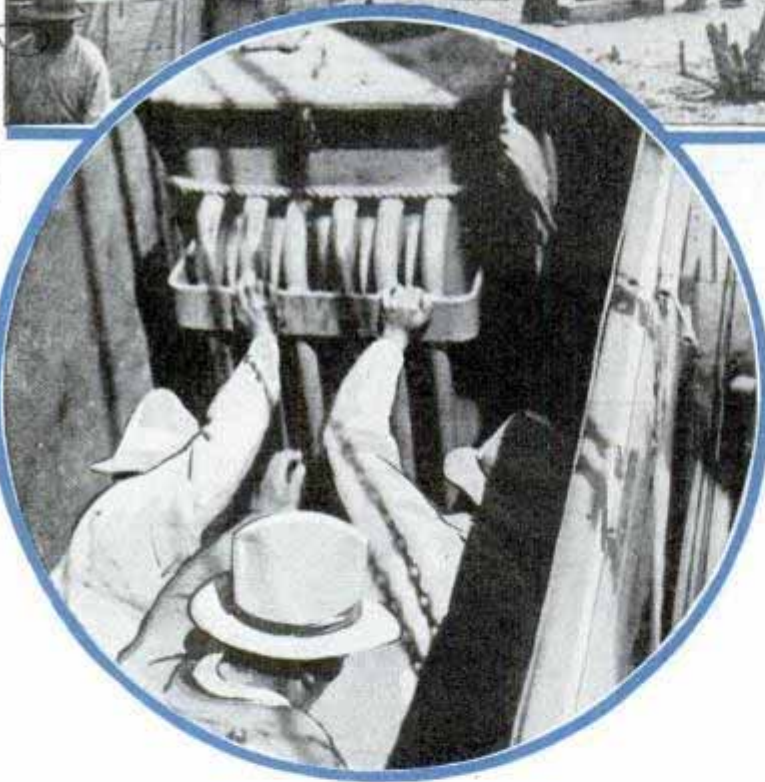


From the AIR

A few minutes previously the flying freighter had taxied up to its loading platform. A large hatch had been opened in the fuselage aft to allow loading of pieces of machinery eight feet long and four feet wide. Then the crew, pilot and copilot-radio operator, had pointed the ship's nose toward the Pass, eighteen miles away, for the high arc over the Andes. Twenty-eight minutes later, having covered a route that requires seven to ten days by land, it glided down a narrow runway to the Tipuani airport. It was a process to be repeated five times



Top, through Sorata Pass, 18,000 feet high, as viewed from one of the big freight planes. Bottom, ground crew readying heavy piece of machinery before lowering it through the hatch into flying freighter for the twenty-eight minute trip over the Andes to the mines



Top, the flying freighter which makes possible mining at almost any place in South America. Bottom, two rails on wheels in fuselage aid in distributing the load

The fabulous wealth of Atahualpa, reputed to be the more than \$150,000,000 ransom demanded by Pizarro; the lost treasure of Valverde, the poor soldier who died rich but who took the secret of a great treasure to his grave; and other treasures eluded scientists and engineers until recently.

One of these rich gold mines, rediscovered after many years, was the Aramayo. Tucked in the jungle-covered valley of the Tipuani river that courses down from the four-mile high Bolivian Andes, sixty miles across the range from La Paz, it was approachable only by a long and exhausting land trail. Here the conquistadores of the sixteenth century guarded a hidden source of treasure that

found its way in a golden flood to the court of Seville. Centuries before, that same glittering stream had poured into the storehouses of the Inca kings. But for the last 200 years the golden trail had been lost.

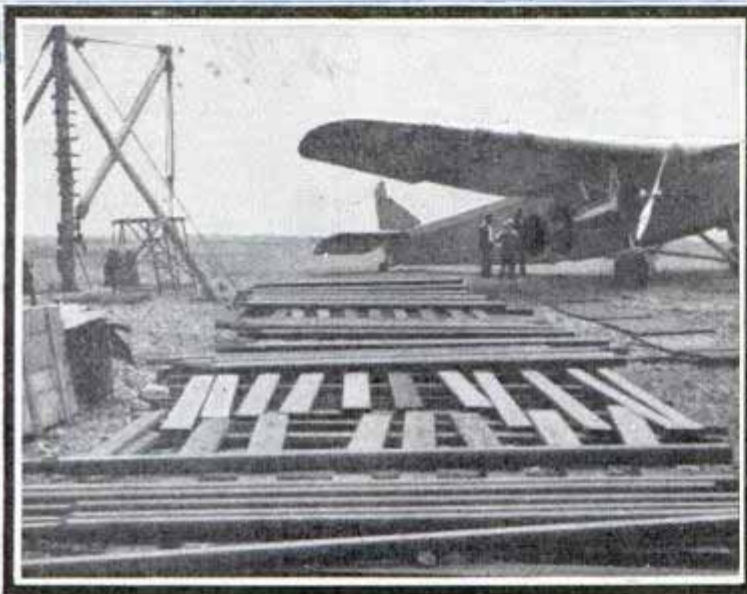
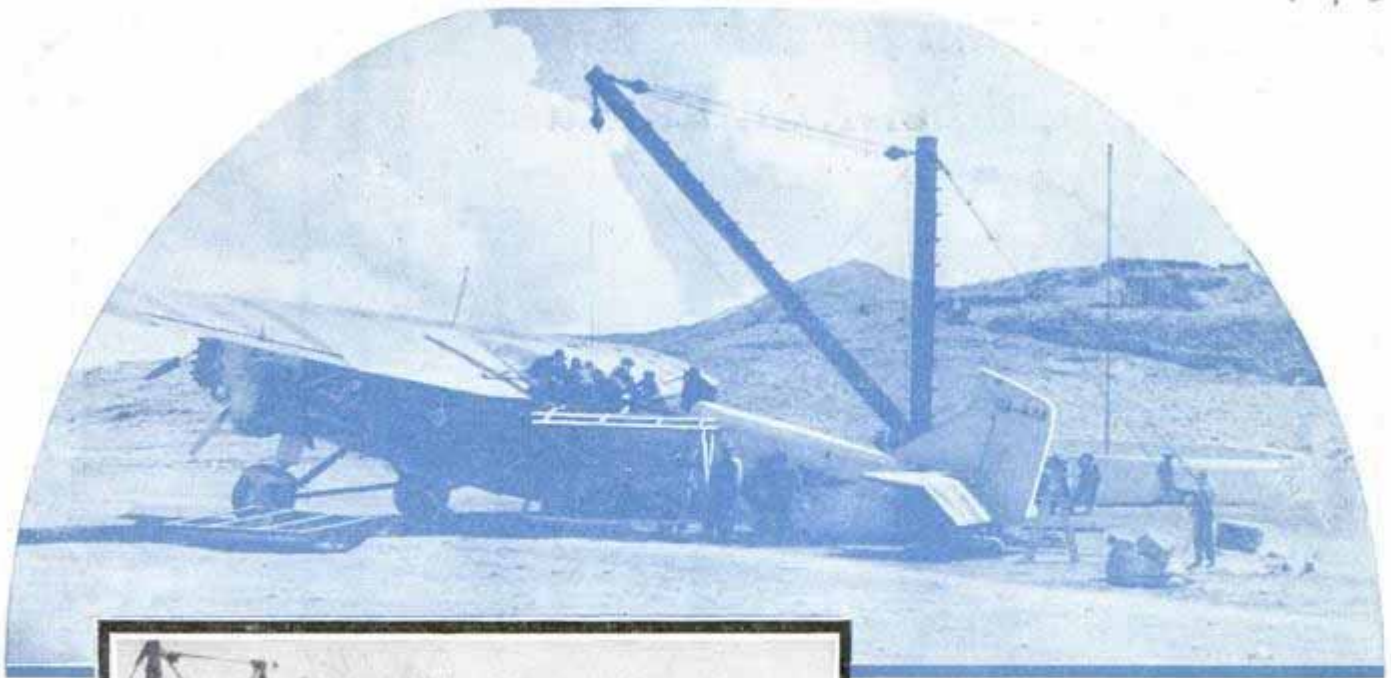
"So inaccessible was the site, so treacherous the only pass through the Andean peaks, only slave labor could make the project go," said a Pan American Airways

a day, for 100 days, until a million pounds of equipment had been delivered and set up at the mine—literally gold mining from the air, making possible the working of many heretofore inaccessible mines.

Ever since the days of the Spanish conquistadores, the mighty Andes have repelled man's attempts to remove countless millions in gold, silver and precious stones.

Robert Shippee, Aerial Explorations, Inc.
405 Lexington Ave., New York

es 1346



Top, freight plane lands twenty-eight minutes after taking off on other side of Andes. Below, huge pipes which could not be transported over torturous land trail

official after completing a series of aerial surveys. "Stories still current in the little valley tell how hordes of slaves gathered the nuggets into packs and toiled over the pass to the shores of Lake Titicaca, whence royal llama caravans carried the treasure to the halls of the Incas in Peru. Conquistadores used the same methods.

"With the end of slavery came the end of the 'golden river.' Conditions were so difficult that free men would neither work the mines, nor submit to the tortures of transporting the ore across the mountains. Even today the descendants of these slaves who still inhabit the valley will not work at the mine."

Struggling with this problem for a decade, engineers of the Aramayo mine determined that the only means of establishing profitable production would be through the use of modern machinery. But this

solution to the labor problem brought up the even more serious one of transportation. Even the smallest pieces of machinery were too heavy for the llama to carry. The llama, beast of burden in the high Andes, will lie down if more than sixty pounds is loaded on its back. The experts tried to meet the emergency by developing "supercharged" burros. The ordinary burro is only about forty per cent as efficient as the llama, for lack of oxygen for sustained periods at high altitudes reduces its vitality. To overcome this deficiency the engineers provided the burros with an extra set of nostrils by opening holes in the nasal cavity when the animals were young.

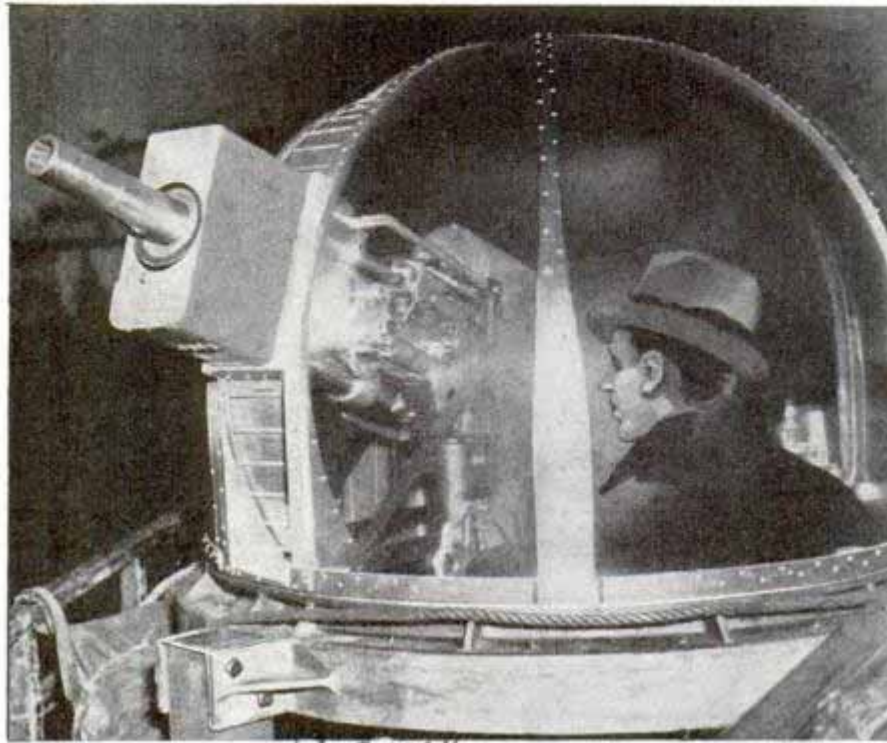
This was only partially effective. It was found the burros could carry only eighty pounds over the higher passes. Engineers estimated that equipment necessary for operating the mine would weigh one million pounds. Since the burros could make only one round trip in twenty days, the job would have required eight years. To increase the difficulties, some pieces of the machinery weighed 1,800 pounds.

In 1933 Pan American Airways carried some heavy machinery over the towering

(Continued to page 144A)

es 1462

Flexible Cannon for Air Craft Fires at 100-per-Minute Rate



Shells weighing more than a pound and filled with TNT are fired at rapid rate by this thirty-seven millimeter cannon designed for air fortress

Heavy cannon that spit high-explosive shells with machine-gun rapidity are making war in the sky ever deadlier. The latest big gun for airplanes is a thirty-seven millimeter cannon mounted flexibly, and housed in a transparent turret. It fires shells weighing one and one-tenth pounds each, filled with TNT, and can fling them at a firing rate of 100 shells per minute or fire a single shot. The safety-type shell cannot explode while being loaded or while in the bore of the gun.

into a current outlet and the iron into the stand. A cold iron placed in the right-hand trough heats quickly. Transferred to the left-hand trough, the iron's heat is kept at soldering point. When the iron is not on the stand it receives full line voltage. One model is for 110-volt irons of forty-four to 150-watt ratings, another for 110-volt irons with 200 to 350-watt ratings. Resistor adjustment for iron rating is accomplished with a screwdriver.

es 1464

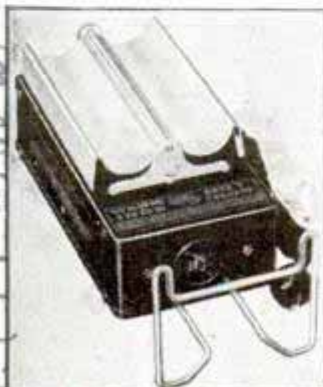
'Eye-Catching' Signs Written in Contest to Stop Accidents

In a campaign for safer streets, the people of Kansas City, Mo., competed in writing "eye-catching" traffic warn-

ings. The contest attracted considerable public interest and resulted in erection of a number of signs that get attention from motorists. One of them, with the winning writer's name printed on it, is illustrated here. Kansas City established a record of fourteen months without a child fatality in a traffic accident.

es 1448

Safety Soldering Iron Stand Has Heat Control



Designed to control iron heat automatically, a new safety stand for the soldering iron gives protection against fire, against burning the iron and against excessive current costs. The stand plugs



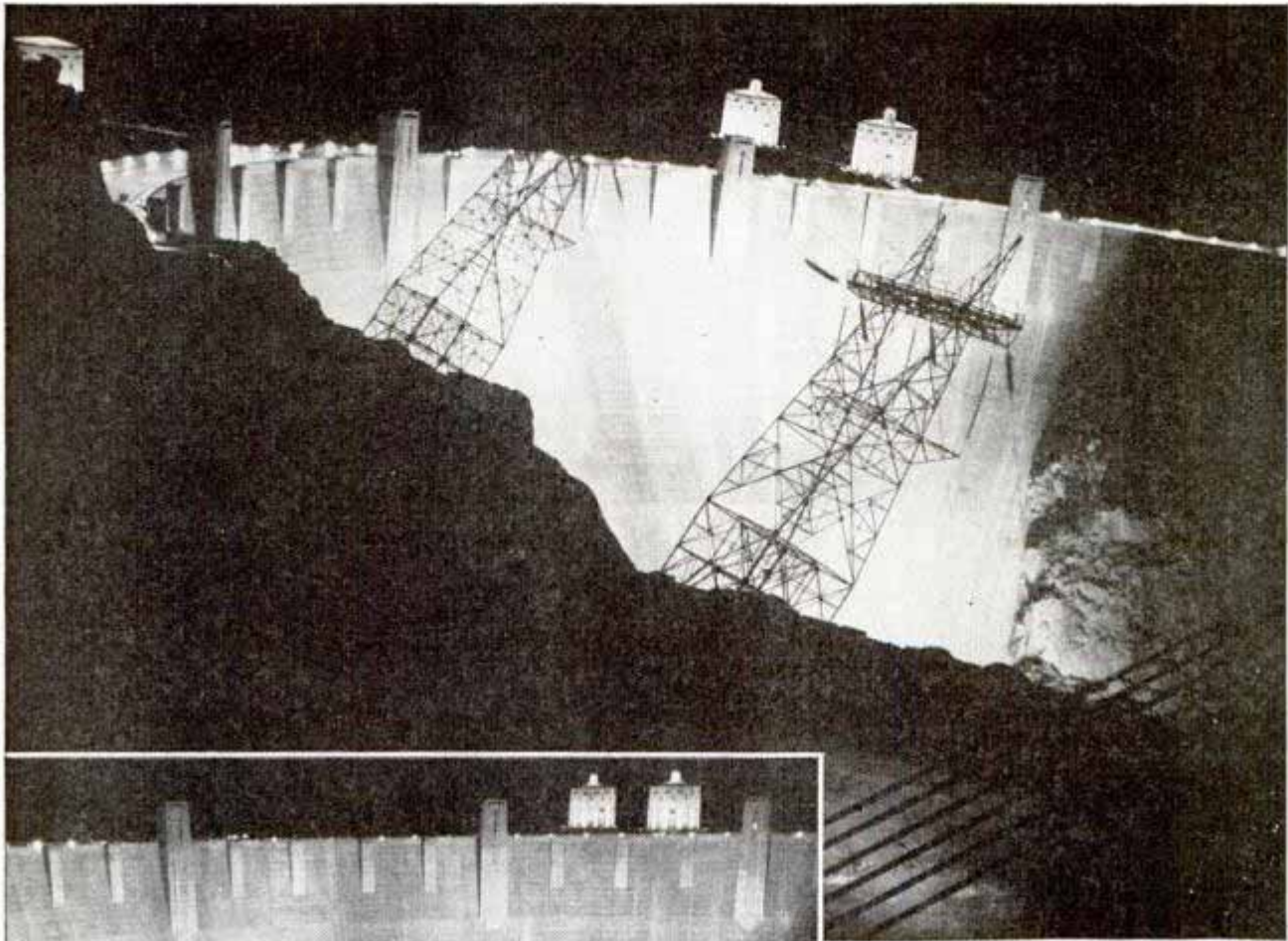
Here is one of the winning signs in Kansas City's safe traffic campaign. It carries the author's name

110 v. (200 - 500 watt)
220 v. (100 - 150 w)
110 v (44 to 150 w)

es. M Laboratories,
1731 Belmont

ms 1398. Cont. J. H. Carvey, 820 N. 6th Ave. Tucson, Ariz.

Footlights Flood Vast Stage of Boulder Dam

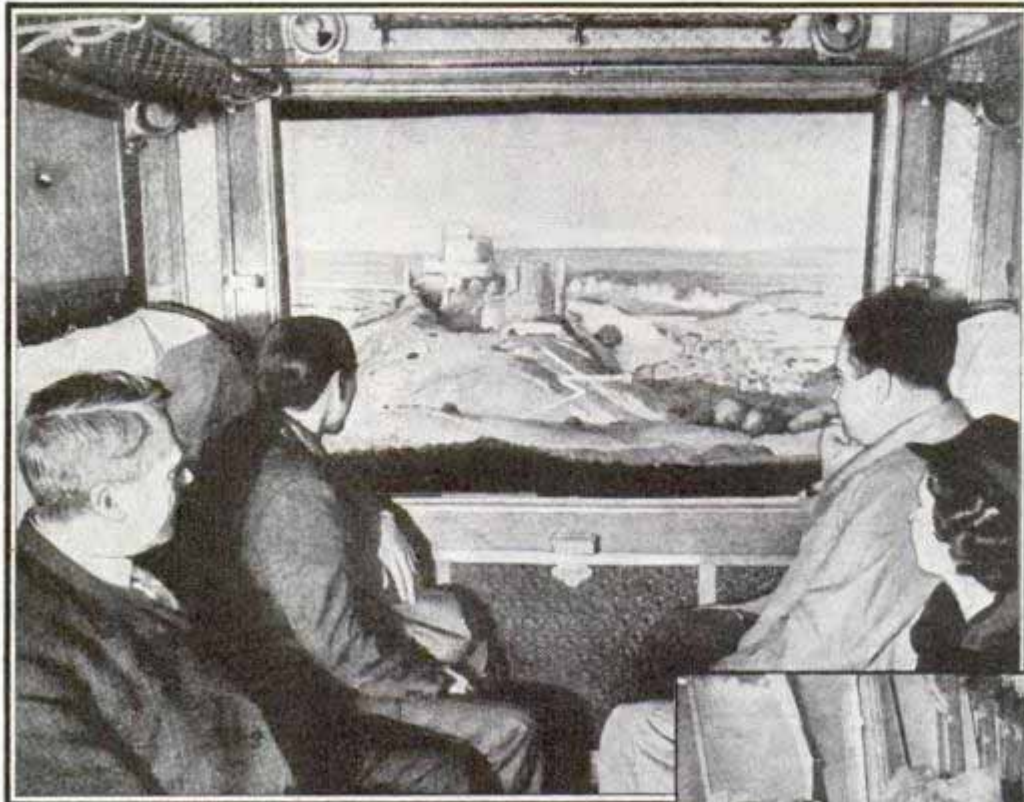


Top, Boulder dam as seen at night from Nevada roadway. Below, a view showing the location of the tremendous battery of floodlights which shine on downstream face of dam from roof of powerhouse

Boulder dam at night is like the backdrop of a titanic stage, its downstream face floodlit by a powerful battery of footlights. The floodlights and the illumination on top of the dam and in the powerhouses and other structures consume enough electricity to supply a town of 1,000 population with eight kilowatts for every home each day. The floodlights arranged on the roof of the powerhouse include thirty-nine 1,500-watt and eighty 1,000-watt lamps, eighteen 500-watt, and scores of smaller lights. The combined capacity of the lights is 208,740 watts using 208.74 kilowatts every hour of operation. Two 3,000-KVA generators furnish electricity for the light and power. At a home rate of six cents a kilowatt hour the lighting would cost \$3,750 a month.

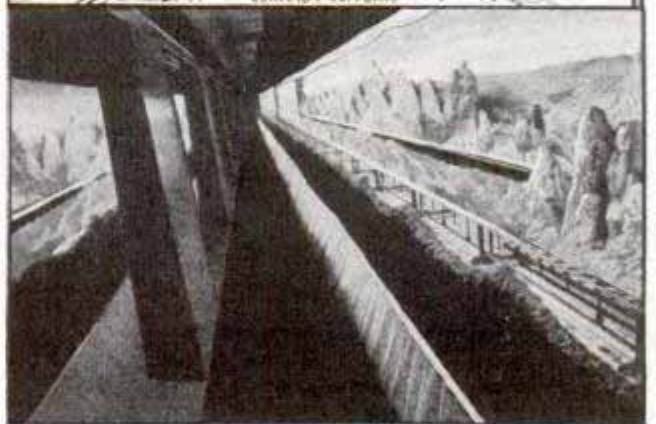
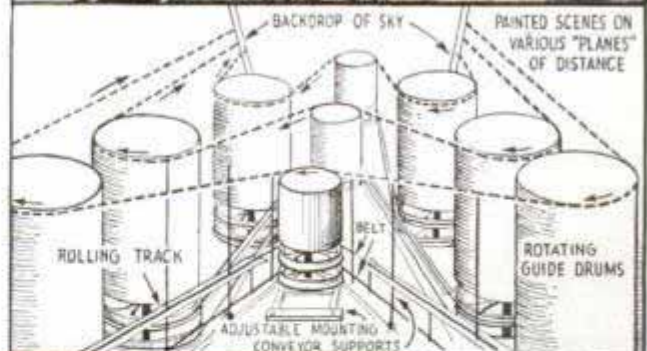
Bureau of Reclamation
Department of the Interior

Scenic Diorama Rolls Past Windows of Train



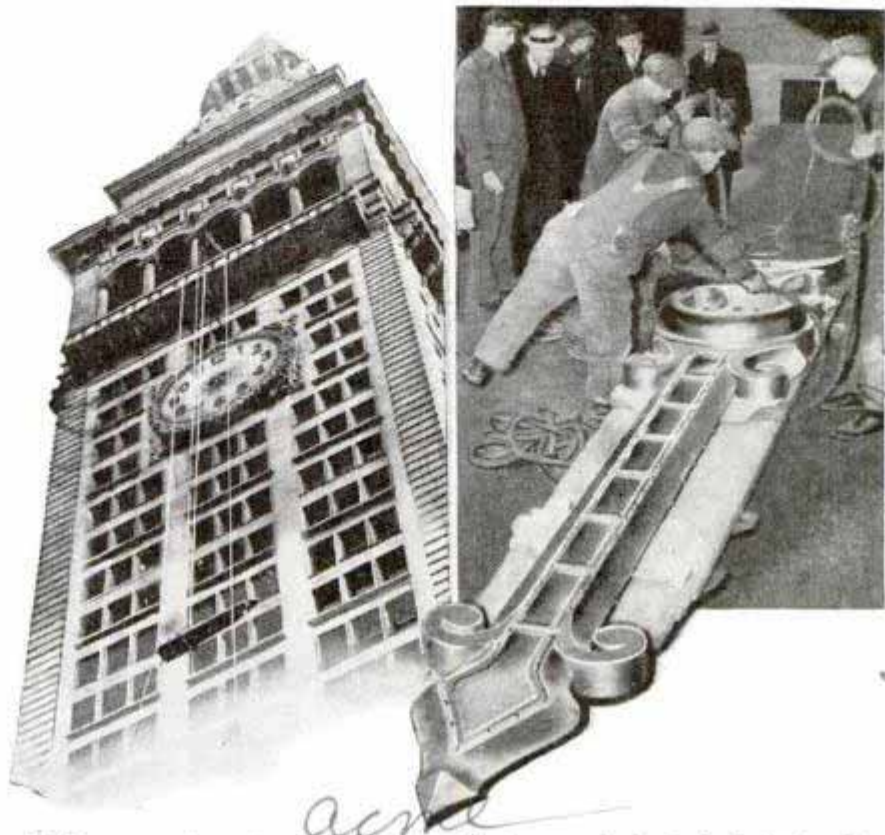
Seated in railway coach, passengers at left "journey through France" by watching three-dimension diorama move past window. Below, photo and diagram show rotating drums which guide screens around end of diorama to return past train standing on next track. Bottom, car windows are at left; at right, diorama screens at various depths

Passengers in a train that never leaves the station are treated to a journey across France as a diorama glides past their coach windows. The French railways, to attract tourist traffic, conceived this dramatic method of giving visitors a taste of the scenery along their lines, for the three-dimensional pictures that sweep past the motionless train are constructed from actual vistas seen from the railroads. Two trains of three cars each stand on adjoining tracks in the "Palace of the Railways." Between them moves the endless diorama, composed of six painted screens placed at graduated depths to produce the illusion of distance. Behind all these is the backdrop of the sky, bathed with blue light, with moving clouds projected against it. Naturally the foreground moves past the car window more swiftly than the distant background, and to keep this realism in the diorama the various screens travel at different speeds, so that the slope close to the "right of way" seems to be moving past rapidly while the castle in the middle distance is in view longer and the horizon crawls slowly out of sight. The screens are mounted on a rolling track, each one operated by its own motor and governed by automatic timers so that the scenes are



properly synchronized. Four batteries of lamps, white and colored, provide even illumination on each plane and prevent shadows. The whole scene is about 500 feet long, its six planes calling for 3,000 feet of painting, and the pictures were assembled from sketches and photographs taken on journeys totaling more than 9,000 miles. Rotating drums at each end of the "theater" guide the scenery around the end so that it can be watched from trains on each side. Rheostats permit control of the lighting so that both day and night effects can be produced on the countryside. This moving diorama has practical applications in other than the railway-tourist propagandist field. It can be used to demonstrate the production steps in an industry, or for educational purposes or museum displays. Its three-dimension plan creating an illusion of distance makes it especially attractive.

Seventeen-Foot Clock Hands Replaced After Long Service



Right, preparing giant hand for installation on clock. Left, hoisting the hand up side of building to face of clock

After many years of service, the seventeen-foot minute hands of a giant four-faced clock in the tower of a New York building have been replaced. Each of the four new hands was hoisted from street to the tower by block and tackle.

Small Plane Steered Like an Automobile Is Easy to Pilot

Equipped with nose-wheel gear to make landings safe and easy, a new two-place

plane steered like an automobile lends itself to operation by the inexperienced pilot. It is an all-metal low-wing plane, twenty-six feet long and with a wing spread of forty feet. Its supercharged motor develops 150 horsepower and a top speed of 130 miles per hour. The plane has two tails, hydraulic brakes, glide control and ailerons for directional steering. Tails and rudder are stationary. At its cruising speed of 120 miles per hour, the ship has a range of 550 miles.



Twin-tailed plane in the air. Note the nose-wheel landing-gear

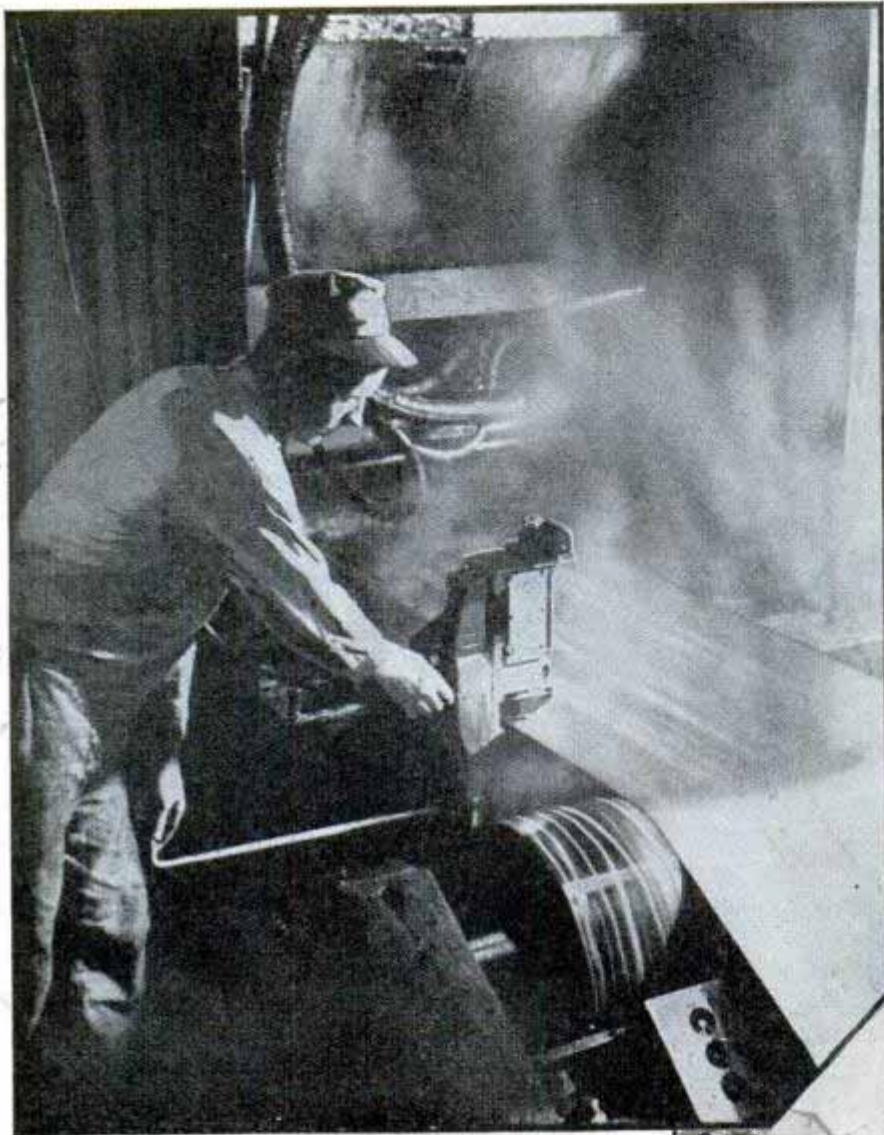
Metropolitan Life & Mercantile Bldg.

201458

*Wichmore Oil Company
2733 W. 28th St. L.A.*

*Stearns, Hammond Co., menard
San Francisco Calif*

SPLITTING HAIRS



possible the quantity production of automobiles, airplane engines, refrigerators, watches, typewriters and scores of other products of the Machine Age. The little blocks, probably the most accurate manufactured articles in the world, are the master gages of industry, the super-accurate yardsticks employed to make the extremely precise and minute measurements necessary to do precision work with machine tools. And precision work with machine tools—making thousands or millions of parts absolutely uniform within fine limits—is the secret of interchangeable parts and low-cost mass production.

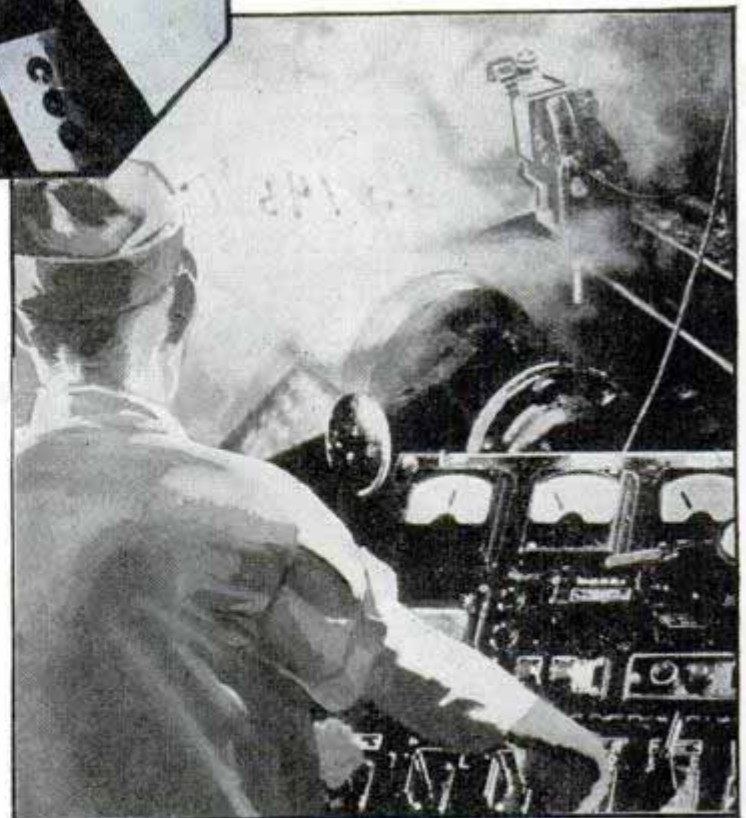
By H. W. Magee

MAN may be unable to attain perfection in anything but, in one instance at least, he comes within a split hair of it.

He makes little blocks of hardened steel with two surfaces flat and parallel within five-millionths of an inch—just that tiny fraction short of absolute perfection!

And five-millionths of an inch is really microscopic. Comparing it with a whole inch is like comparing the thickness of a new dime with the height of the Woolworth building. If you could slice a human hair lengthwise into some 300 equal parts, one of the pieces—if you could see it—might approximate five-millionths of an inch in thickness.

These all but perfect bits of metal make



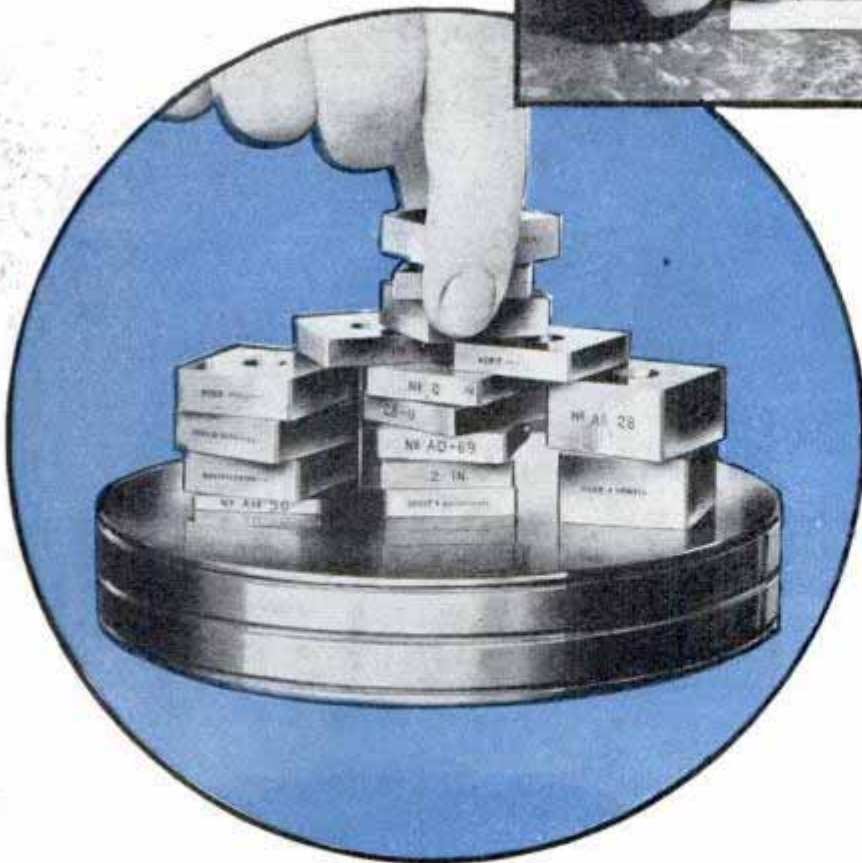
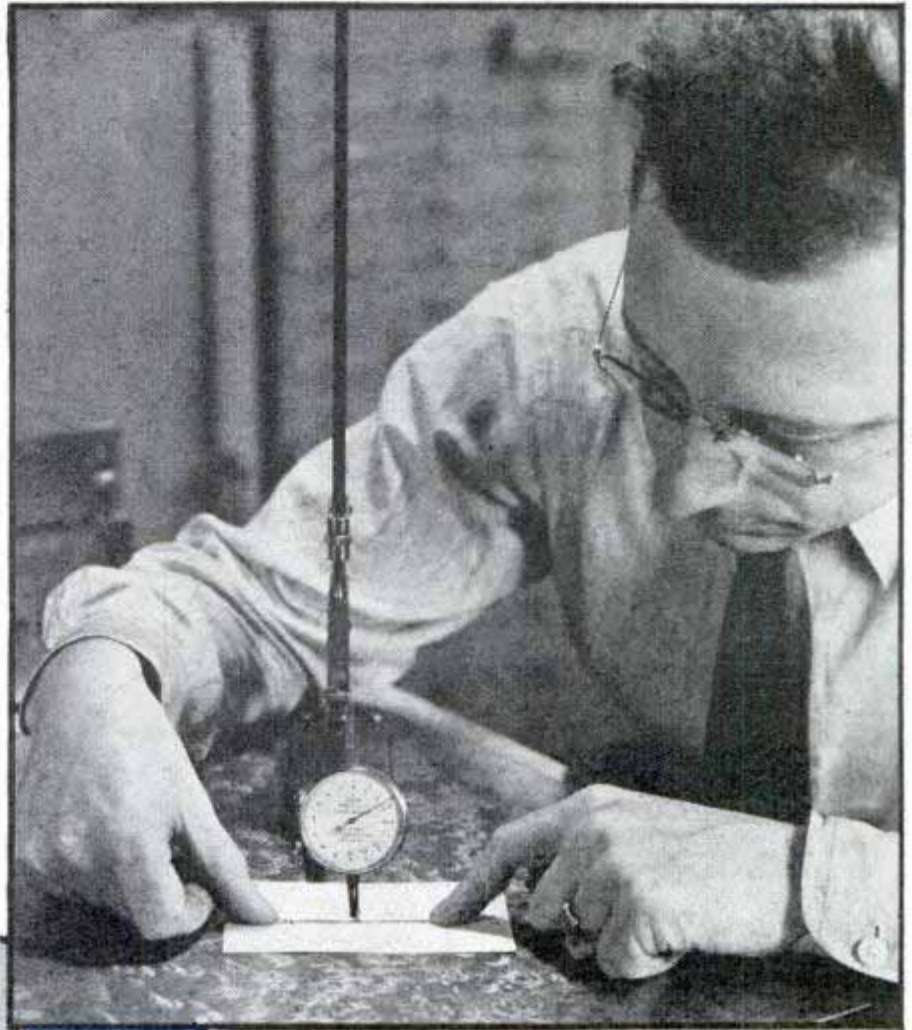
Photographs courtesy Pratt and Whitney
Using the "flying mike," above, to measure the thickness of strip steel. Below, indicating instrument operated in conjunction with gage

Notes: Bennett & Pond Co.
Hartford, Conn.

to MAKE it BETTER est. 1385

The story of the development of precision measurement for machine-tool work is a tale of human achievement as dramatic as any western thriller. At the turn of the century, there was no highly accurate standard of measurement for machine work. When the first horseless carriages appeared, there was no such thing as interchangeable parts made to fit within close limits. The replacement of a worn part usually entailed a lot of filing, hammering, grinding, sweating and, quite often, swearing.

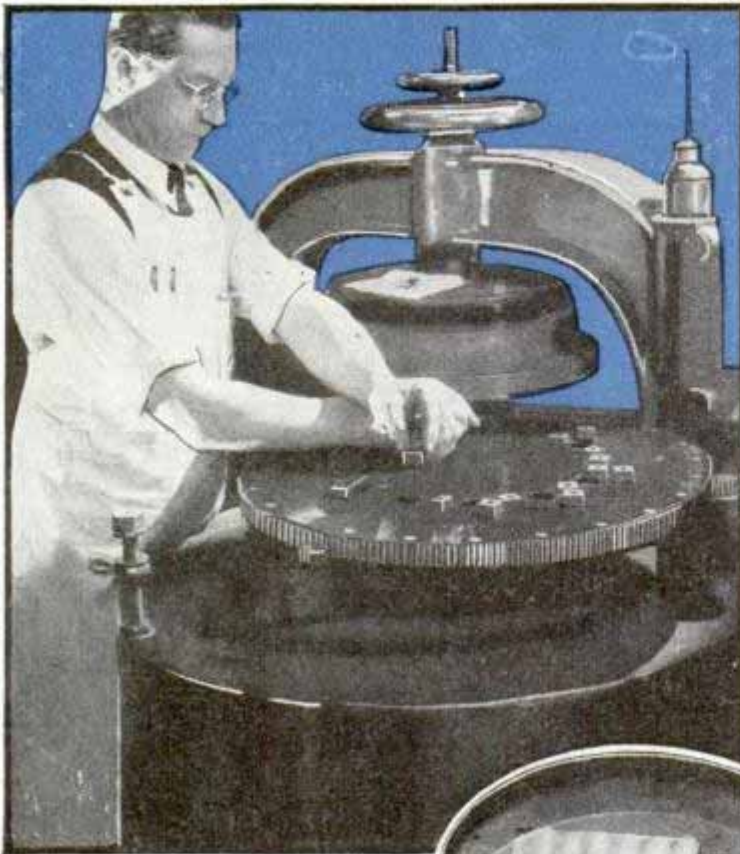
Then, thirty years ago, the builders of an American car performed what



Lifting stacks of Hoke gage blocks which have been "wring" onto each other and onto a toolmaker's flat. Top, measuring thickness of a human hair

appeared to be a mechanical miracle. They sent three automobiles to Europe, demonstrated them and then dismantled them down to the last bolt and nut. The parts were scrambled until no one knew from which car any of the pieces came originally. And then, while foreign engineers looked on in pop-eyed amazement, the Americans assembled three cars from the pile of parts. There was no hammering. There was no filing. Everything fitted. The parts were interchangeable!

But those early cars were noisy and not very efficient. That was because parts were not made to close tolerances. Instead of measuring to one ten-thousandth of an inch, they were measuring to a few hundredths or, at most, a few thousandths. The difference is



Transposing blocks from one side to other of spider in lapping machine

like that between an inch and a foot.

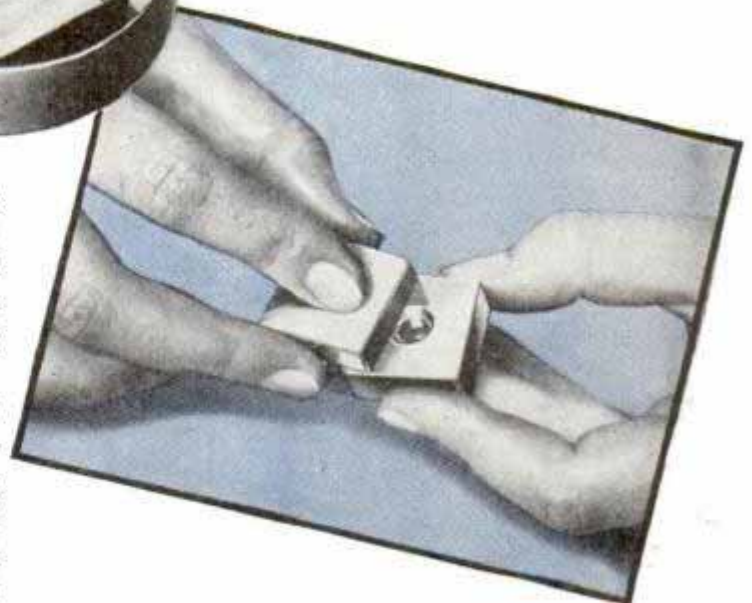
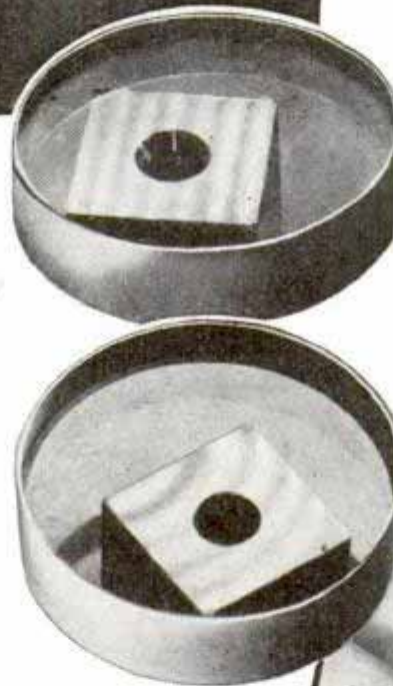
As cars improved and production increased, tolerances became smaller and smaller—so small that a super-accurate method of measurement was needed to calculate the fine limits. A Swedish scientist came to the rescue by producing sets of domino-shaped steel blocks, each block accurate in thickness to within a few millionths of an inch. By combining blocks of different thickness, very accurate measurements could be obtained. But these blocks were not produced in quantity. The supply was limited and they were costly.

Then came the World War and a new problem for American industry—the making of millions of accurate parts for big guns, for example, in shops hundreds of miles apart. All the parts, when brought together for assembly, had to fit exactly to very close tolerances. But quite often they didn't. And the reason they didn't was

that the factories producing the various parts had no super-accurate standard of measurement.

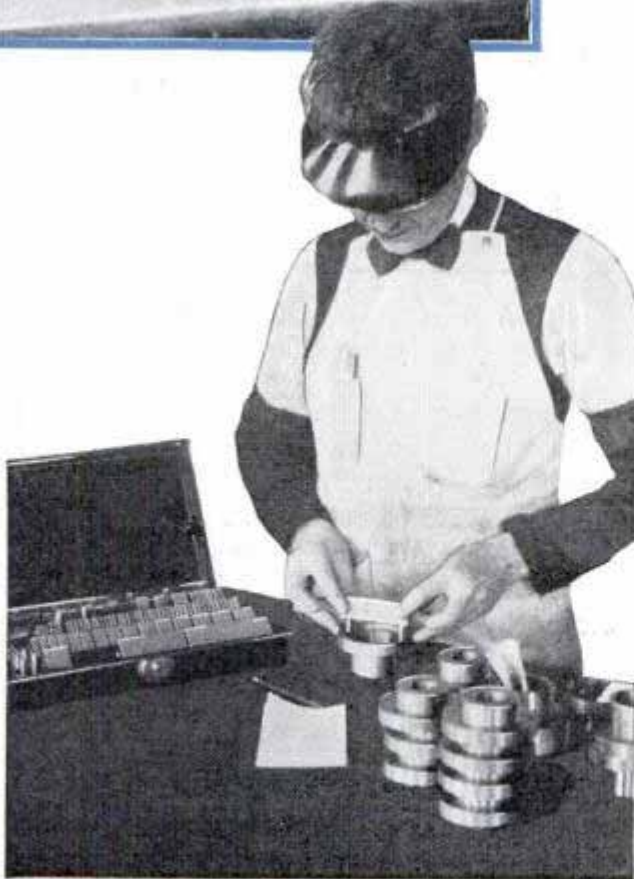
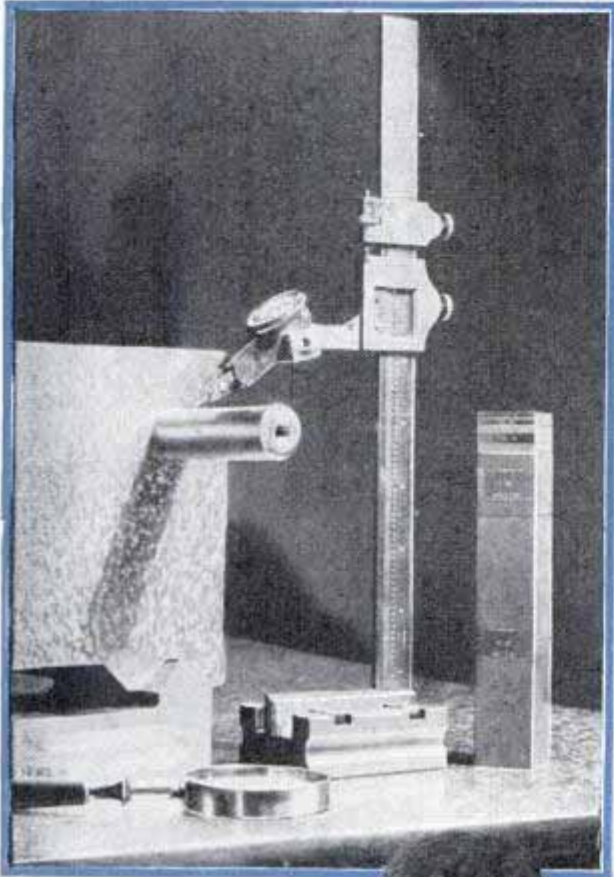
Into this emergency stepped Major W. E. Hoke of the government ordnance department. He found a way to make precision gage blocks in larger quantities and at lower cost than the foreign blocks. Soon factories hundreds of miles apart were turning out parts for military materials which, when assembled, fitted as exactly as though all had been made under the same roof. So indispensable was this system of measuring that, after the war, the Pratt and Whitney company of Hartford, Conn., developed the original idea into a practical manufacturing process. The result was the Hoke precision gage block, basic measuring device for machine shops everywhere.

These gage blocks bring laboratory accuracy to the workbench and there is no better example of this than the modern automobile. Today's cars contain thousands of parts made with a tolerance of only a few thousandths of an inch. This is true of low-priced cars as well as expensive ones because the larger the production, the more automatic must be the machine



Wringing blocks together and, above, optical flat reveals accurate block and an inaccurate one

Inspecting pistons, right, with aid of electrolimit gage. Below, checking manufacturing gage with aid of stack of Hoke blocks. Bottom, using blocks to check internal diameter



work. There are thousands of gage applications for each car and one popular automobile contains some 3,000 parts made to limits of five-thousandths of an inch. With the same uncanny accuracy millions of parts much more "alike than peas in a pod" are turned out for typewriters, adding machines, refrigerators, oil burners and many other machines containing parts which must be exact within fine limits. All these parts are accurate and uniform because the machines which make them are set to size with precision gage blocks.

Examine a Hoke block casually and you might easily mistake it for a small unthreaded nut since each square steel block has a hole in the center through which a rod is placed when several of them are used together. The thickness of the block is the super-accurate dimension, but you do not sense the unbelievable smoothness of the measuring surfaces until you press two blocks together to get the "feel." The sensation is one of rare, silky smoothness, yielding and yet stubborn. Twist or "wring" two blocks together and you have difficulty in pulling them apart.

In fact, if they are properly cleaned and wrung together by an expert, two of these little blocks will support a weight of 200 pounds. Why? No one knows exactly. They are not magnetized and atmospheric

(Continued to page 122A)

Big Snow-Eater Tosses Highway Drifts Aside

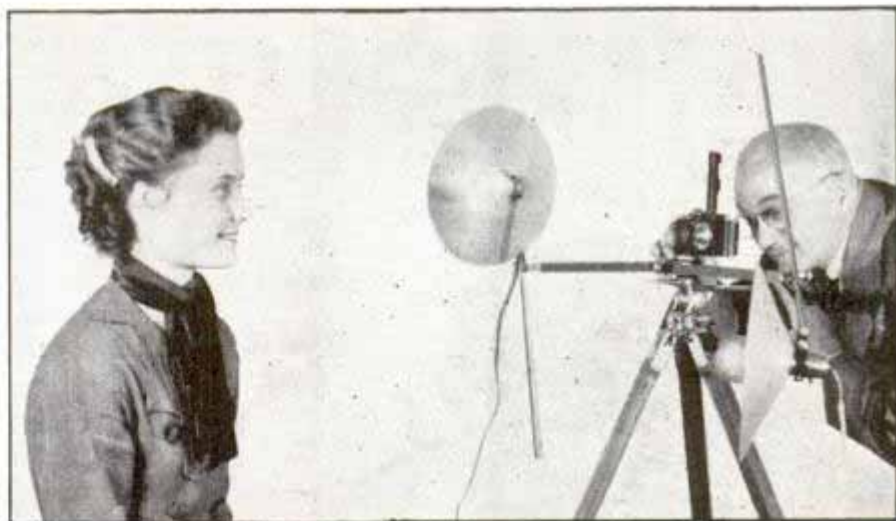


Great snow-eating monsters have been enlisted to aid New York in clearing its streets and highways this winter. Capable of biting their way through big drifts, the motor plow scoops a wide, clean path on the pavement, "inhales" the snow and then thrusts it to the side of the road through a tall, arched tube.

One of New York's mechanical monsters tackling snow-covered highway. It scoops up a drift and throws it aside with overhead conveyor

Floodlight Attachment on Tripod Follows Camera Focus

Automatically providing the proper illumination, a photoflood light attachment for the camera tripod follows the focus of the camera. No matter how many times the position of the camera is changed, the light always is in readiness to illuminate the subject. The reflectors fold for packing.



At right, light moves as camera is focused, insuring proper illumination of subject when camera is snapped

Emergency Fire Squad Car Carries Electric Tools and Movie Camera



This English fire truck carries electric tools, loudspeaker and equipment for resuscitating victims

Even a movie camera is part of the equipment of the emergency squad of an English fire department. Its truck is stocked with apparatus to cope with almost every sort of situation. There are asbestos suits for rescue work, apparatus for resuscitating smoke victims, various electric tools useful in fire fighting, searchlights and a loudspeaker for calling orders. The camera records pictures for evidence.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

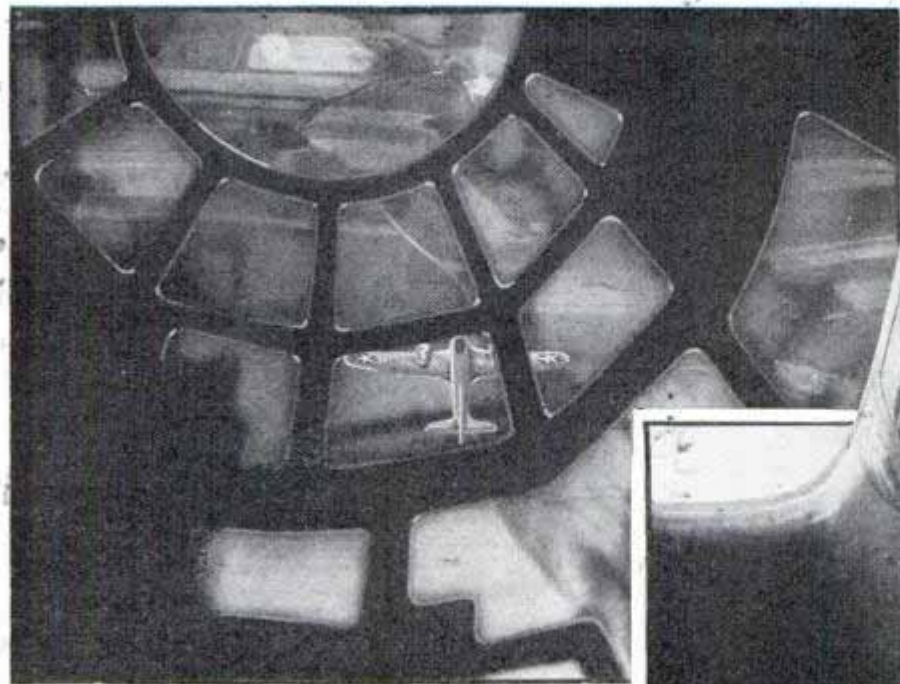
Sender designed by Chief Asst. J.A. Varley.

Escher Snow-grip Co. / Player Mfg. Co. / Lehigh Valley / The Thalhammer Co. / 121 S. Fremont / Blackpool Engine Co. / Schen 11/13/37

2014.63 / Guy Loader Mfg. Co. / 2 Russell. Pa.

acme

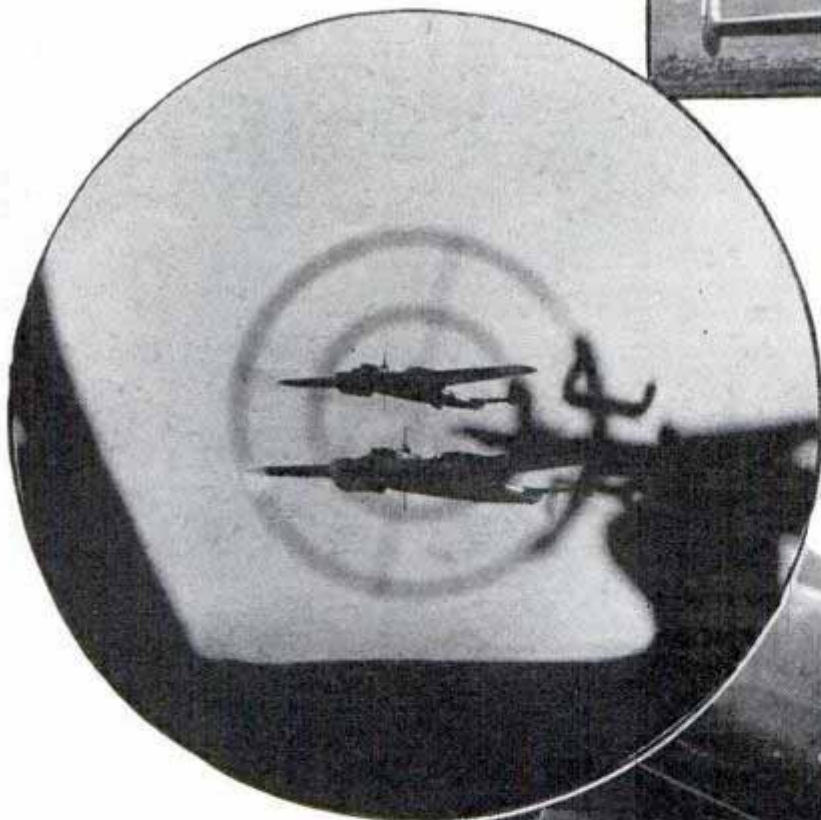
Plane's Glass Nose Gives Clear View of Foe



Here are several views of Germany's latest fighting plane, one of whose features is a glass nose for gunner and commander



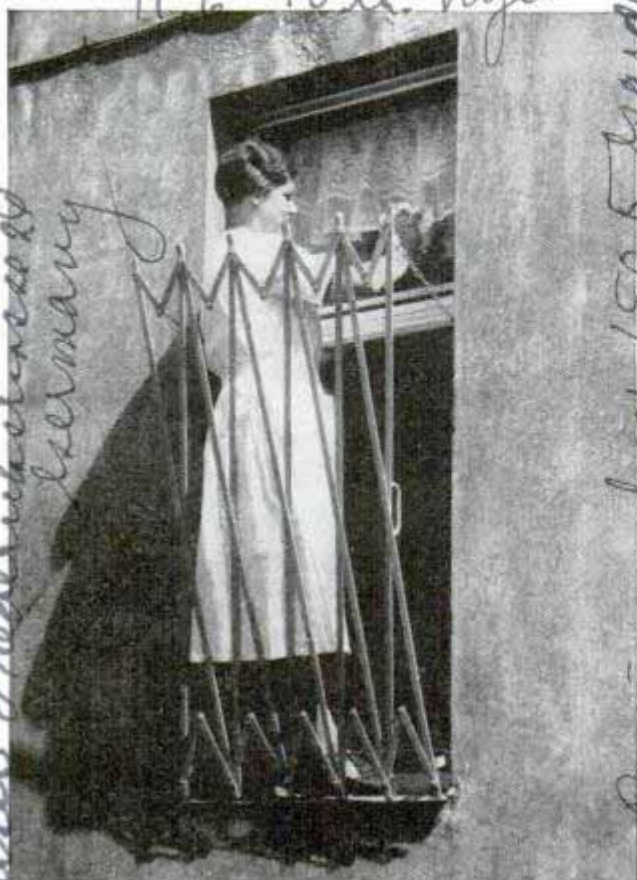
Top, left, view as plane dives directly toward enemy ship. Right, commander and gunner in forward fighting station. Circle, left, here is how the enemy plane appears to the machine gunner



Right, the squadron captain and crew assembled for final instructions before taking off in the giant two-engine plane. In photos showing two ships, one is a sister plane of the new fighting craft and is helping in the attack



Folding Guard for Window Saves Washer from Fall



Washing windows is less hazardous when you have this folding metal guard at your back

Protection for the window washer is afforded by a folding window guard of metal lattice. Anchored at the top by chains, it is easy to install and to remove. It serves, too, as a protection for children left in the house with windows open.

\$1400

Telescopic Range-Finder Tube Sets Camera Lens in Focus

Offering the advantages of a ground-glass screen and automatic focusing of the camera lens, a telescopic range finder can be mounted on top of the camera. The finder is really a duplicate of the optical system in the camera itself. Its lens is the same distance from the inclosed

ground-glass screen as the camera lens is from its plate. The front element tele-



\$20.00 for New York
7' dome speed graph

Raygram Corp.
425. 4th Ave

scopes in the tube, and is coupled with the lens mounting of the camera so that the latter is in focus when a critically sharp image appears on the ground-glass finder. In the eyepiece of the focuser is an eight-diameter magnifying lens which can be adjusted to individual vision.

\$1467

"One-Way Mirror" for Door Is Coated with Aluminum

"One-way mirrors" which can be installed in your front door, letting you see callers without being seen, are now being made with an aluminum backing. Such a mirror is merely glass with a thin metallic coating, not backed up. This allows a person on the dark side to see through it, but in the bright outdoors the light is reflected and the glass appears like an ordinary mirror. The latest method of manufacturing one-way mirrors is to deposit a very thin layer of aluminum electrostatically.

\$1466

Man Walking Ahead of Auto Curbs Speed on Bridge

Recalling the early days of British motoring when a man with a red flag walked ahead of automobiles to warn the public, cars crossing a suspension bridge in India are forced to low speed by a man walking in front. Regulations call for autos to run no faster than four miles per hour across the bridge. The man ahead of the car is a reminder to drivers who might be disposed to speed up a little.

Kulu, India



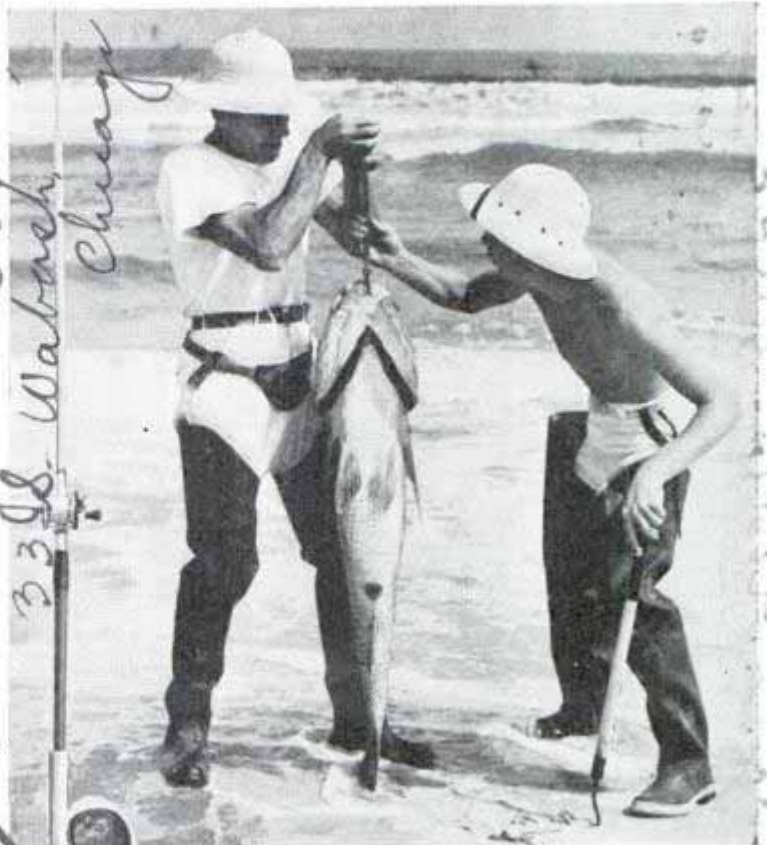
Four-mile speed across bridge is enforced by man walking in front of the car

Acme

Handwritten notes:
Mr. J. J. ...
Architectural
Forum Dec 1937
Wife.
Germany
Pancro ...
made to order
Demonstrate to each
Wife.

Game Fishing in the Surf Offers New Thrills

Gaining steadily in popularity, surf casting offers many thrills to the game-fish angler. One of the most sought after fish is the channel bass or red drum, which averages fifty pounds in weight and which puts up a great fight, lasting several hours in some cases. The surf caster stands on the beach or in the water of the Atlantic or Pacific, casting far out beyond the breakers into the channel where game fish may be found. Experts equip themselves with costly rods, reels, lines and other paraphernalia, but the sport may be enjoyed by the novice with tackle costing about ten dollars.



33 St. Wabach Chicago



Top, weighing a big fish hauled out of the surf. Center, completing a cast. Circle, waist-deep in the surf, this fisherman fights to land a struggling drum. There's plenty of excitement when a big game fish is hooked

Chicago Herald News 12/18/37

ES 1500

Alloys Extend Life of Steel Rails, Fifteen-Year Operating Test Shows

In a fifteen-year test under normal operating conditions, steel rails treated with titanium and silicon have been found more resistant to wear than untreated rails. The rails were made in 1920 and 1921 and 1,000 tons of each alloy were laid on the tracks of the Illinois Central railroad. The titanium rails were placed in heavy traffic lines, while one-half of the silicon steel was laid in heavy traffic and the other half in inter-

mediate service. At the end of fifteen years, it was found that a slightly higher percentage of titanium rails remained in service than of the silicon-treated rails. Both showed better wearing qualities than untreated rails.

☐ Rabbit and hare pelts find their way to the fur market under more than sixty trade names in imitation of other furs.

repolled by Es. Willard Dush

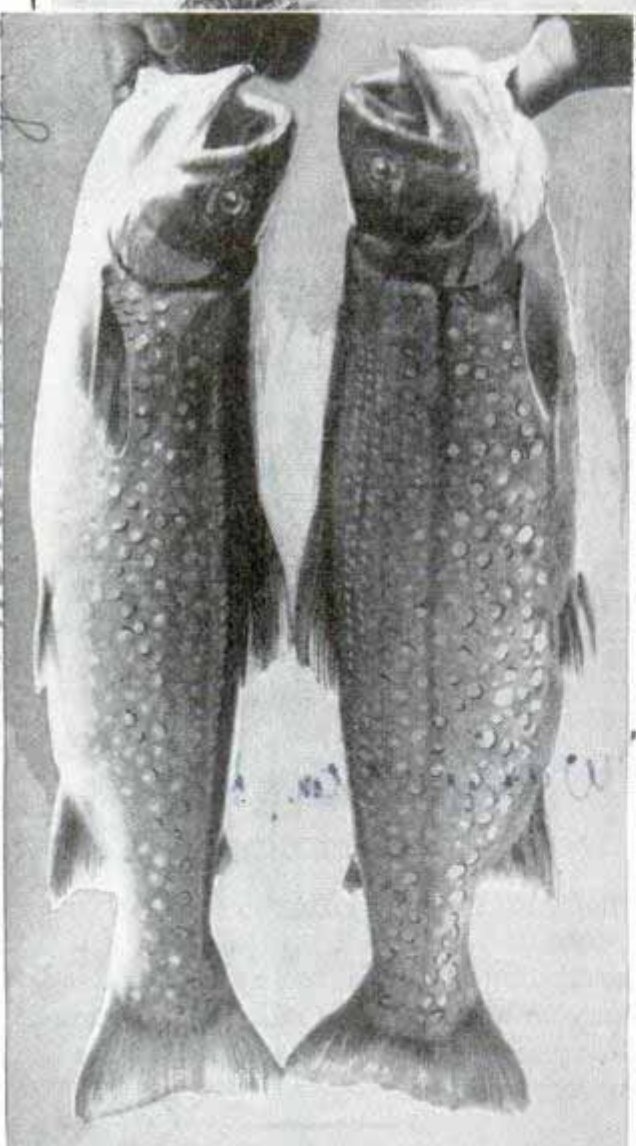
Hunter, Trader and Trapper Land.

Washington, D.C.

Es 1269

WINTER FISH

northern Ontario



Top, tractor-train hauling fish to Canadian railway station for shipment to cities as far east as New York. Bottom, trout caught through the ice

FRESH fish from the northern lakes of Canada's grain-growing provinces are being served this winter in Canada and the United States as far east as New York. Fish as delectable as those which lure fishermen hundreds of miles into the Canadian bush each summer are being rushed by airplane, or fast tractor-sleighs and trains to the dinner tables in cities near the international boundary.

The demand for fresh water fish for winter consumption is so great today in the central west that many lakes beyond the transcontinental railway line in Canada are being fished. A multi-million dollar commercial winter fishing industry has sprung up, giving employment to hundreds who haul fish by the millions through the thick ice and who rush them to the market.

Many cities of the Canadian west and those near the international border in the United States receive fresh-caught fish in time for noon or evening meals, caught that day in lakes where the ice varies in thickness from one foot to four feet. Planes speed fish direct to these cities, carrying perhaps one-half of a ton at a time. Among the firm-fleshed fish taken from these northern waters are whitefish, lake trout, pickerel, tullibee and sturgeon.

Because some of the lakes are barren, the fishermen makes tests before settling

Emb. James Montagnes, 617 Harbour Commission Bldg. 1000 - 2 Club

18/13

from the PRAIRIES



Fishermen testing hole chopped through the ice before stringing nets. These men are from one of the many fishing camps in northern Canada

down for the winter. But fish are so plentiful in most of these waters that it is hard for the fisherman to pick a spot where he cannot get a good catch throughout the winter. The fishing camps are prepared in the autumn, set up on the shores of wooded lakes, some of them near the northern edge of the forest belt, after the fishermen have moved in, frequently with their families. By boat and by plane the fishermen arrive to build the little log cabins which are to house them through the cold months. If there are only men in the party, a tent pitched in a sheltered bit of forest may be used. Several weeks are spent in making the camp comfortable and secure against howling blizzards. While navigation remains open, the fishing camps nearest to the railway bring in horses and sleighs by boat to pull the loads of fish to shore when the lake is frozen over. Camps more distant from the railway bring in husky dogs,

frequently by airplane, to do similar work.

By December the ice is hard enough to form a crust over most of the lakes and by January it is thick enough to support the heaviest tractors used to pull sleighs loaded with fish to the shore. Then the fishermen go out and chop through the ice to the water beneath. In testing these holes, if the fish bite readily, the fishermen next sink a guide line through the hole and pay it out to the length desired. A metal scraper is attached to the guide line on a wooden float. When the fishermen hear the metal scraping against the ice, they chop a second hole. If their calculations are right, they find the guide line in the hole. Hauling it out they stretch a net between the two holes and from the central hole start other nets, or put several nets between the two holes.

Fastening the nets in the ice at the open holes, they set other nets all over the lake



paths carefully because a plunge into the water means loss of tractor and load, possibly of their lives because it would be hard to come up under that thick wall of ice. Airplane operators know the hazards of a forced landing or a broken ski in that remote country, where weeks may have to be spent before a rescue plane can reach the stalled fish freighter.

and next day start hauling in their catch. Then it is a matter of stringing out the nets again, one at a time, as fast as each net is emptied. The fresh-caught fish are cleaned immediately and allowed to freeze in the cold air. Then they are packed in boxes and taken on sleds to the shore where they are picked up by tractor-drawn sleighs or airplanes to be transported to urban dinner tables far away.

Winter commercial ice fishing is extremely dangerous to the fisherman, for he must be on the lookout for fissures and cracks in the ice. Swept into the cold water, he has little chance of being rescued because he works far out on the lake. It also is dangerous for the operators of dog teams and horse sleighs. Under excessive weight, ice weakened by air pockets may give way, pitching men and animals into the water. Tractor-train drivers must pick

Commercial ice fishing is confined to northwestern Ontario, north and west of Lake Superior, to northern Manitoba and Saskatchewan, with some fishing in northern Alberta. Farthest north are the commercial fisheries on Lake Athabaska, just below the Northwest Territories and Great Slave Lake, in the Northwest Territories. Northern Ontario supplies the eastern cities as far east as New York, while the western fisheries supply cities as far as Chicago.

A cold job these fishermen have, with the temperature dropping to forty below zero. Isolated for at least six months, they and their families see only the airplane pilots or tractor drivers who come for the fish. Their nearest neighbors are trappers and Indians or one of the growing number of radio stations installed by air transport operators, mining companies or the government. These may be twelve miles away.



Top of page, pushing a fish transport plane to its hangar. Bottom, fish freighter arriving at camp and landing on skis to be loaded



Top, two beauties caught through hole in ice. Circle, typical fishing camp in northern Canada. Bottom, radio operator whose duties include handling of orders to pick up loads at fishing camps

There are no electric lights at the camps, no doctors and no hospitals. In case of illness or accident, the doctor must be brought in, or the patient carried out, by plane. Even first-aid equipment is scant, usually confined to the larger camps. But the fishermen manage to pass the time, working and listening to news from the outside world over their battery-operated radio receivers.

From a small business supplying fish to the various outposts of civilization, commercial ice fishing has grown to a national industry with the development of a taste for the fine-flavored fish of the cold northern waters and with the establishment of fast transportation. Thousands of lakes, many unmapped and most of them never fished, promise a bright future for continued growth of the industry.

Television Trucks Pick Up Outdoor Events

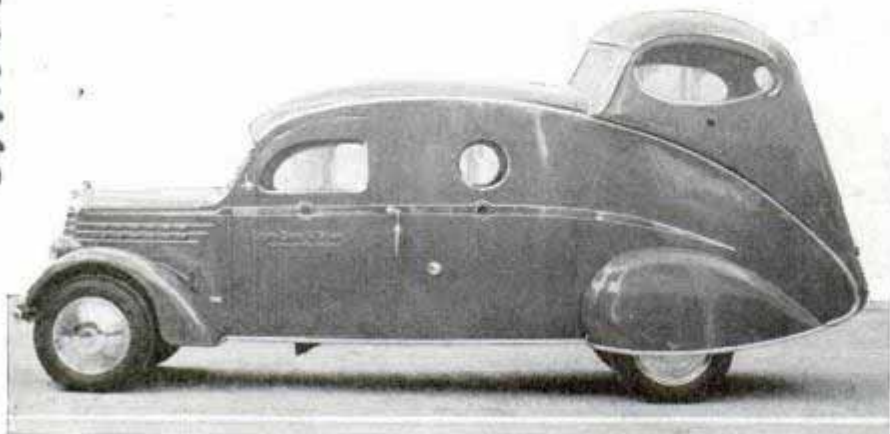


Demonstrating how the television station on wheels will look with equipment in readiness to record news event. Left, cameramen taking pictures. Right, transmitting truck with antenna

Mounted on two trucks, a mobile television station is being used by the National Broadcasting company for experimental pickups of outdoor news events. A special "trolley" antenna which can be raised on

top of the transmission truck carries the television signals into the air. The other truck is used for apparatus, iconoscope cameras and special parabolic microphones for the picture pickup and sound.

Money Car with Gun Turret Has Bullet-Absorbent Walls



From the "conning tower" atop a streamline armored car used by a Los Angeles bank, the guard can maneuver his machine gun through a 360-degree range of fire. There are loopholes for firing beneath the bullet-resistant windows on three sides; in front, two more loopholes provide the guard in the turret with a clean sweep of the sides so that

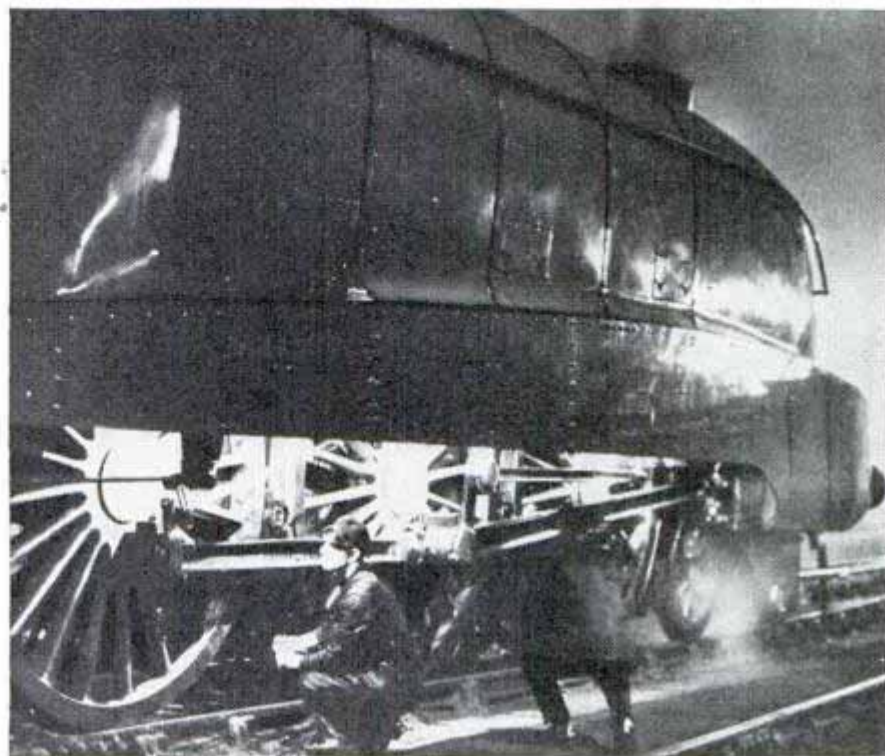
Guard on armored car has clear view in all directions from "conning tower" at rear which has dual ignition switch and brakes for emergency control

Used by Unim Bank and Trust Co. Los Angeles, Calif.

Mack Trucks Inc. 48th Ave and 34th St. Long Island City

no bandit could creep up to the driver's door. The outer shell of the entire car is made of soft steel to absorb gunfire and protect bystanders from ricocheting bullets; inside there is a two-inch insulating layer to check the force of bullets, and then an inner metal shell of bulletproof steel. The car is divided into three compartments—the driver's, the center storage section for valuables, and the turret. Telephones connect all three compartments. In the turret there is a dual ignition switch and brake lever so that the "rear guard" can partly take control in an emergency. The loopholes have sliding doors and the compartments can be sealed to withstand a gas attack for at least a half hour. Equipment includes guns, hand grenades and gas bombs. The bulletproof glass in all windows is an inch and a half thick.

251484.
**Locomotive Wheels Lighted
for Inspection Before Run**



Final inspection of giant locomotive before night run is made easy by floodlighting system on latest British steam engine

Facilitating inspection of moving parts before its departure on the nightly run are floodlights mounted to illuminate the huge driving wheels and connecting rods of a giant streamline British locomotive, "10,000." The big engine hauls the London-Newcastle express.

251479. *London and northeastern*
Radio Maneuvers a Motorcycle in Army Demonstration



Army motorcycle without a rider maneuvers under radio control

Riderless motorcycles may be couriers or weapons in mechanized warfare. In a recent military demonstration at Stahnsdorf, Germany, a motorcycle with sidecar and a rifle mounted on it was maneuvered around a field by a radio operator. The same method has already been used successfully in navigating unmanned ships and flying pilotless aircraft.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information if your request is accompanied by stamped, self-addressed envelope.

Midget Diesel Motor Built by Engineer in Arctic



One-half horsepower Diesel engine designed to furnish power for small lighting plant

One of the smallest Diesel engines ever constructed for commercial use is the tiny two-cycle supercharged motor built by W. H. Greenfield, first assistant engineer on the motorship "North Star," of the Bureau of Indian Affairs. The engine, which develops one-half horsepower at 3,000 revolutions per minute, was built in the ship's machine shop while it was cruising north of the Arctic Circle. It has a one and one-tenth inch bore and two-inch stroke. Mr. Greenfield considers such an engine ideal for small lighting plants and similar uses.

Water Filter of Coconut Fiber Reduces Unpleasant Tastes



Impurities and even objectionable tastes and odors in the city water supply can be reduced by a small filter that fits on the home faucet. The purifying element

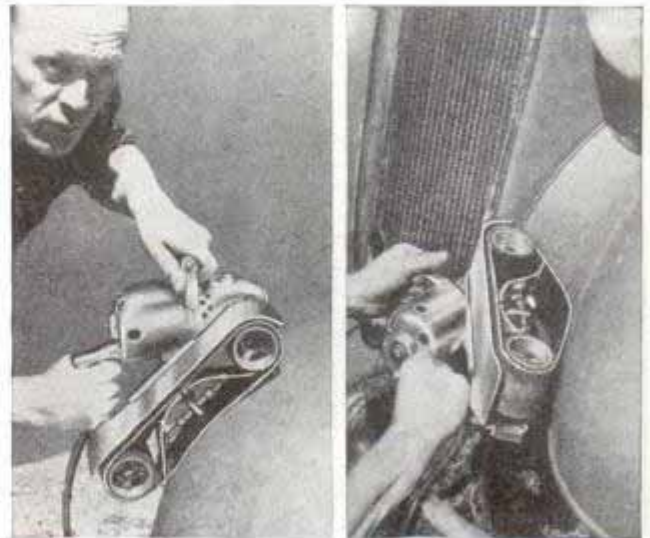
is activated coconut fiber carbon, inclosed in a one-piece cast-aluminum shell. This is the element used in gas masks. In such work as photographic developing, where abrasive sediment in the water could damage films, the filter is especially useful. It fits any faucet, and can be cleaned by reversing its position on the faucet, the water stream flushing out the accumulation.

Dirt Road Doubles Driving Cost Compared with City Street

If you drive your car on dirt roads, you are probably spending twice as much for operation and maintenance as you would on a hard-surfaced pavement. A survey of motoring expenses for 160 rural mail carriers in Iowa showed that it cost an average of 3.07 cents a mile to drive on dirt roads, 2.17 cents on gravel and 1.44 on pavement. The figures covered gasoline, oil, tires and maintenance. It was estimated that twenty cars a day traveling on a dirt road would justify surfacing it to save automobile maintenance expense.

Electric File Adjustable to Fit Work with Curved Surfaces

With a flexible working face, an electric file just introduced can be adjusted to cut any-surface at any angle. It can be set for work on a flat, concave or convex contour and will cut paint, metal, solder and welds without clogging the belt. It is especially useful for auto body and fender work.



Flexible electric file adjusted for work on convex and concave surfaces of automobile body

W. Adams, Chicago

Bear Ings Co. Rock Island, Ill.

Seattle, Wash.

Review Service 12/3/37

Es 1505

Mr. M. J. Jones Seattle Wash.

Es 1429

Es 1443

Es 1447

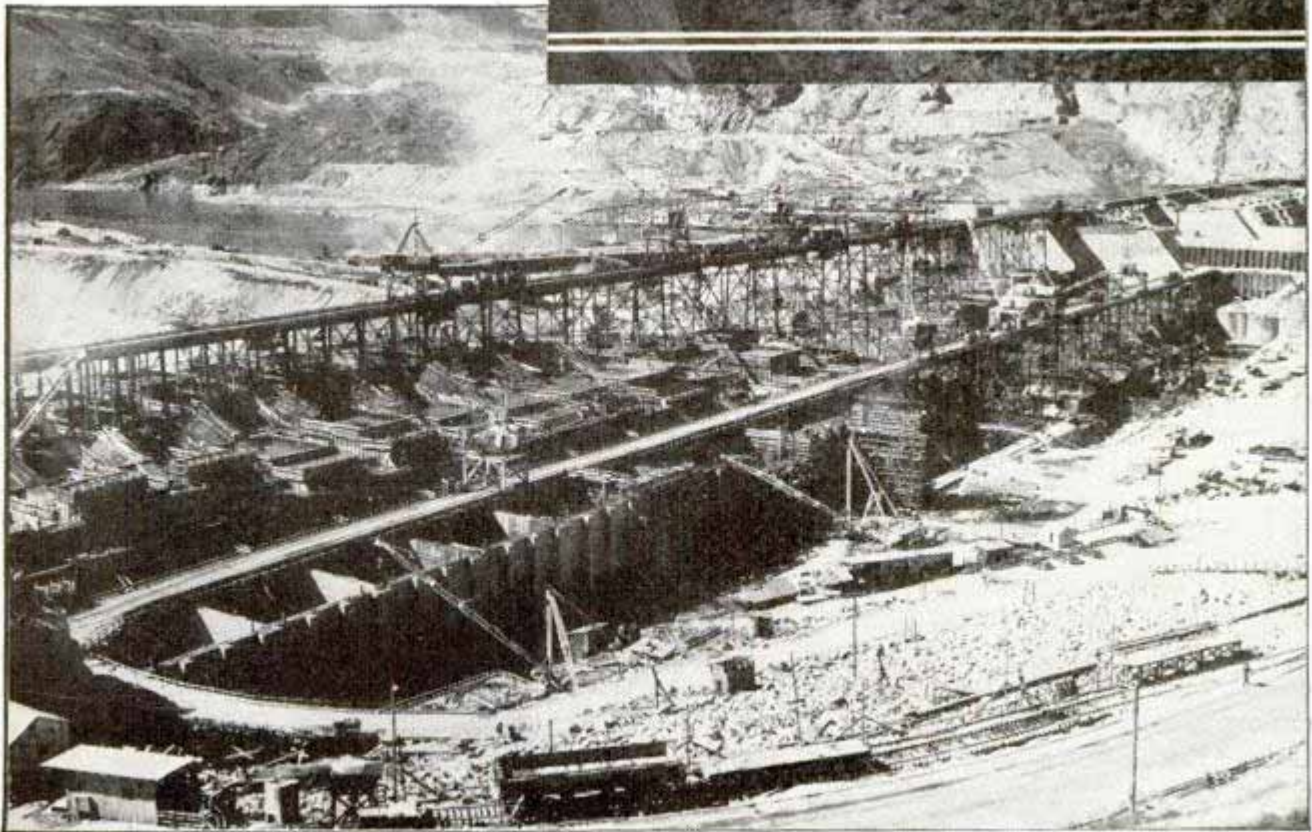
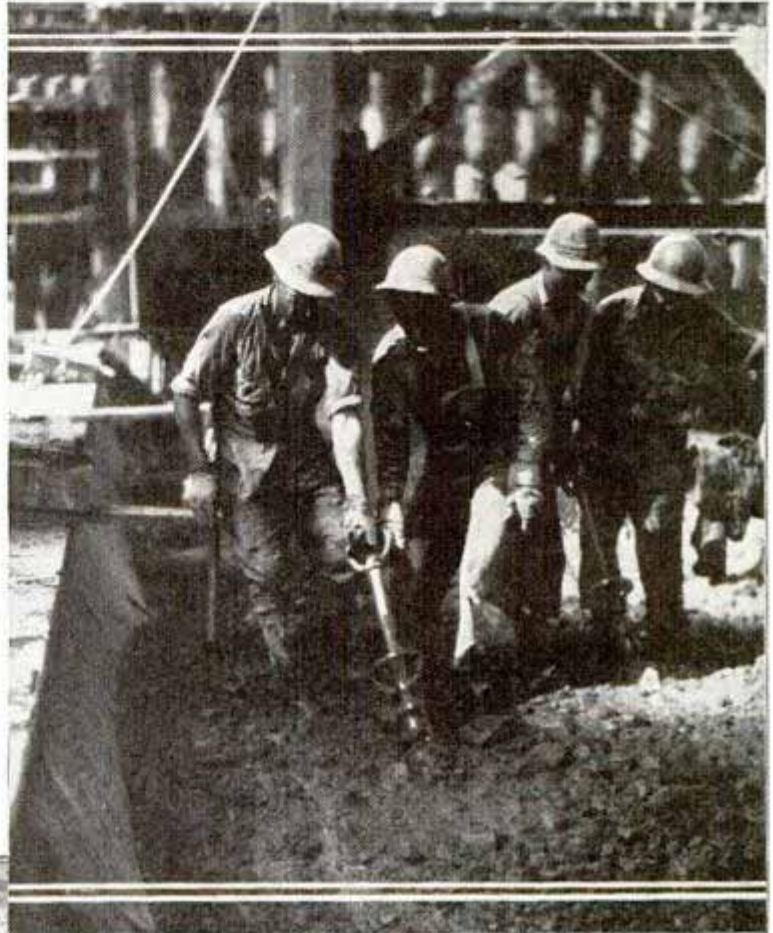
Mr. J. Carson, Butte 26.

Es 1461. Cont. Henry W. Young
6834 S. W. Durlingaine
Av. Portland
Oregon.

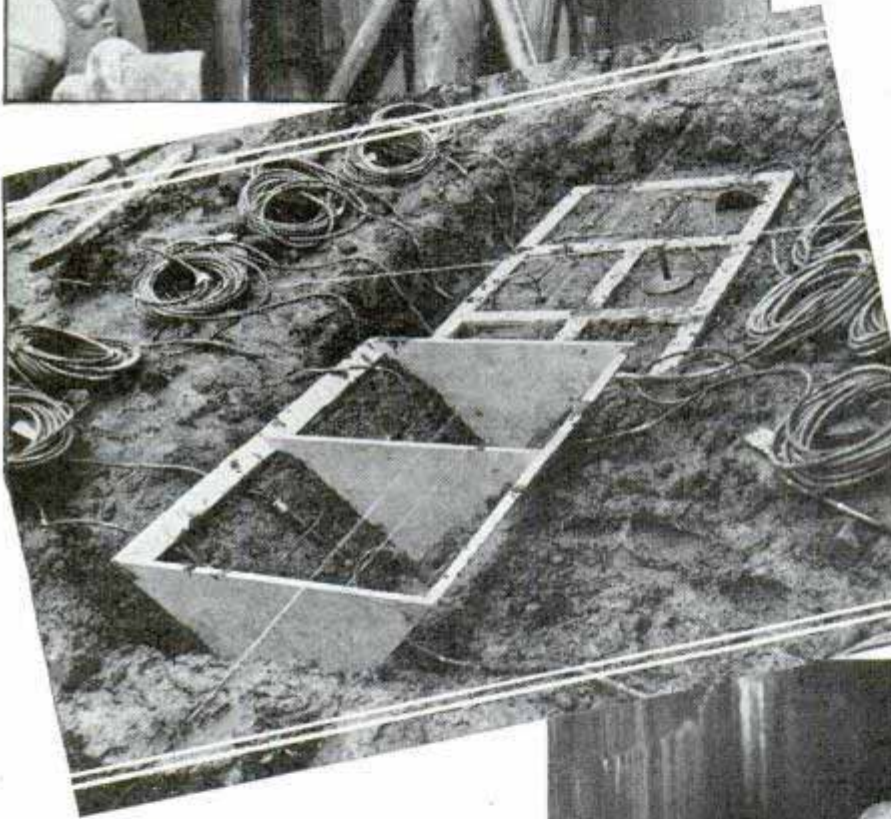
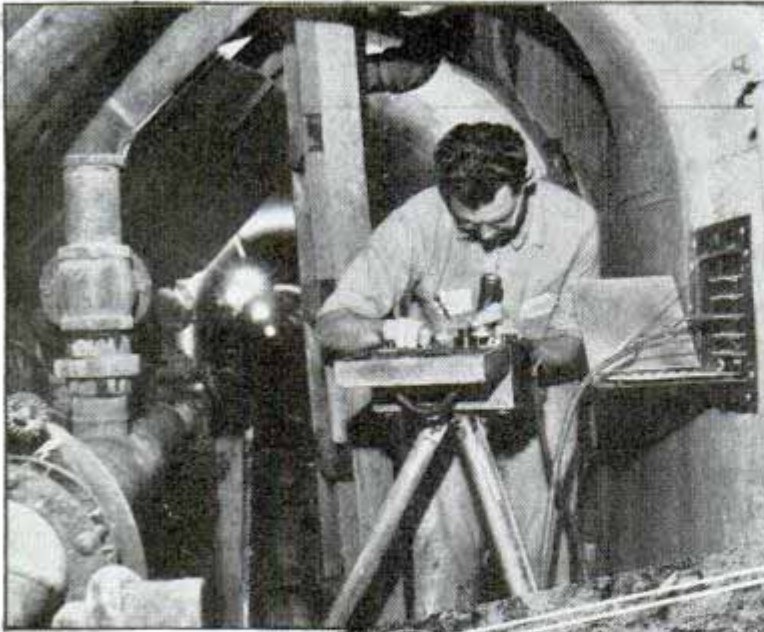
COOLING GRAND COULEE'S FEVER

THE greatest water-cooling system in history is being installed in Grand Coulee dam. With completion of the dam, 2,000 miles of one-inch steel tubing will have been embedded throughout the concrete structure. Through this pipe system, the cold water of the Columbia river is being pumped and heat equal to that produced by burning 20,000 tons of coal will be carried away eventually.

This is a gravity-type dam, depending on its weight to hold back the water. The structure is 4,300 feet long, 500 feet wide and 350 feet high in its over-all dimensions. The pressure exerted by the water at the lowest part will be 151.66 pounds per square inch. No crack or crevice, however small, can be permitted through the mass because water at that pressure



Top, concrete vibrator operators working concrete over instruments which take strain and temperature readings. Bottom, Grand Coulee dam. Note how it is built of concrete blocks



under high pressure, filling the joints and uniting the columns into one solid mass.

But why the cooling system? Great masses of concrete such as this eventually will reach a certain fixed temperature inside, unaffected by changes in the seasons. The ultimate temperature of Grand Coulee dam probably will be between forty-five and fifty degrees Fahrenheit. During much of the year, the concrete is poured at temperatures considerably

above that which the dam will reach. Further, the chemical reaction of cement and water causes heat to be liberated over a long period of time, making the temperature of the concrete rise thirty to forty degrees above its initial temperature. In fact, the temperature in the dam may reach fifty to eighty degrees above its ultimate temperature.

These are the reasons why the cooling system has to be used. Waiting

(Continued to page 114A)

would immediately begin enlarging the opening.

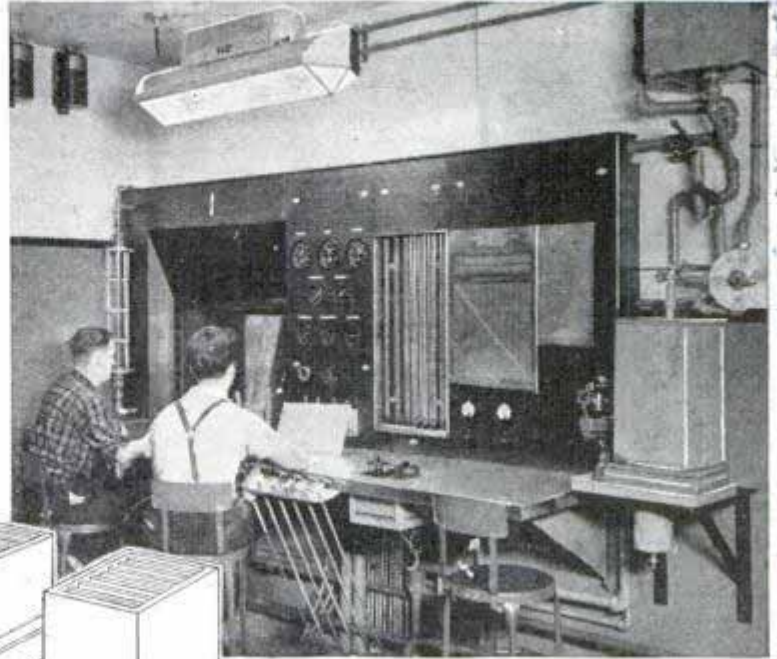
Since concrete expands and then contracts in setting, how can cracks be avoided? It is done by a method of construction like laying up a wall first and putting in the mortar after. The dam is built in fifty-foot-square blocks or columns, poured in five-foot lifts. A contraction joint is left between all column surfaces. Later, when the concrete has shrunk all it will, these joints open up to the extent of an eighth to a quarter inch. Through a system of pipes opening into these contraction joints, a cement and water mixture is forced



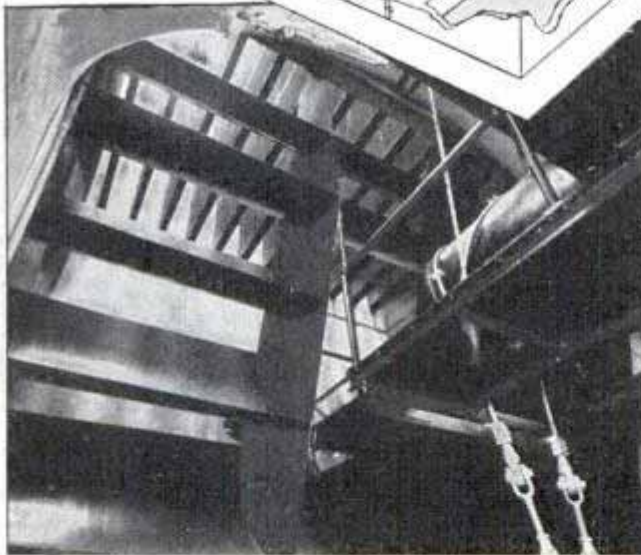
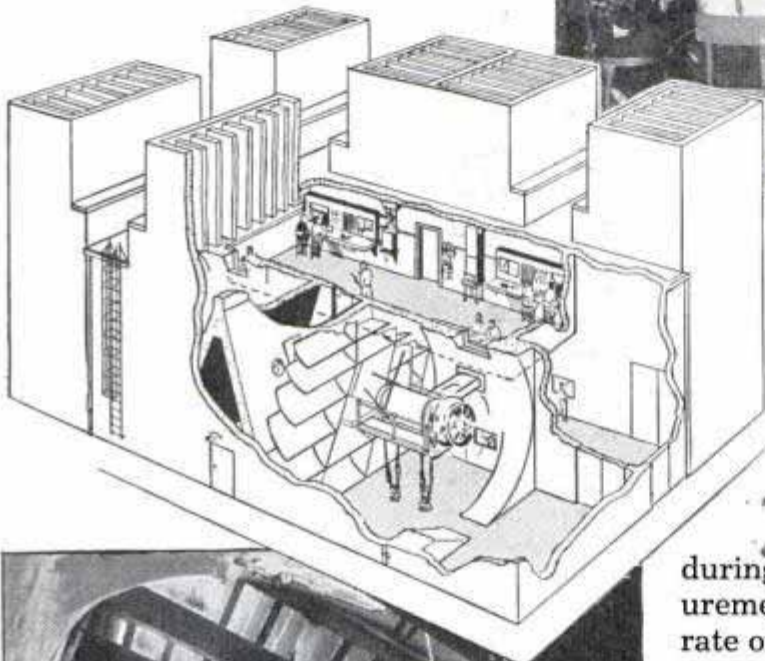
Top, taking temperature readings of concrete mass. Center, strain meters which are buried in concrete. Bottom, header pipes for cooling system extend into galleries of dam

Test House Built for Giant Aviation Engines

Capable of testing engines twice as powerful as any in use today, a new test house at the Pratt and Whitney Aircraft division of United Aircraft Corporation contains four chambers, each of which can accommodate airplane motors up to 3,000 horsepower. The largest engines now in production are rated at 1,500 horsepower. The test chambers are large enough to swing the huge twenty-three foot



Top, operators at control panel. Center, cutaway drawing of test building, showing control room and noise-absorbing stacks. Bottom, looking up an exhaust stack at rear of engine test chamber



control room located on an upper level. The operators sit at four control desks, at each of which is a double soundproof window permitting observation of the engine during the run. The tests include measurement of fuel flow and fuel consumption, rate of oil flow through the engine, oil consumption, measurement of temperatures at various points on the engine by means of forty-eight thermocouples. Each instrument panel also carries a tachometer, fuel and pressure gauges and remote-reading thermometers for measurement of oil and carburetor air temperatures.

Brick Pavement Is Less Noisy if Bricks Are Lengthwise

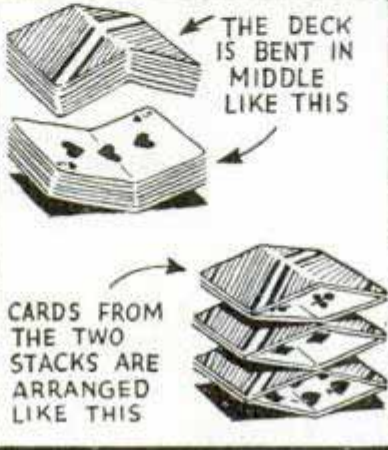
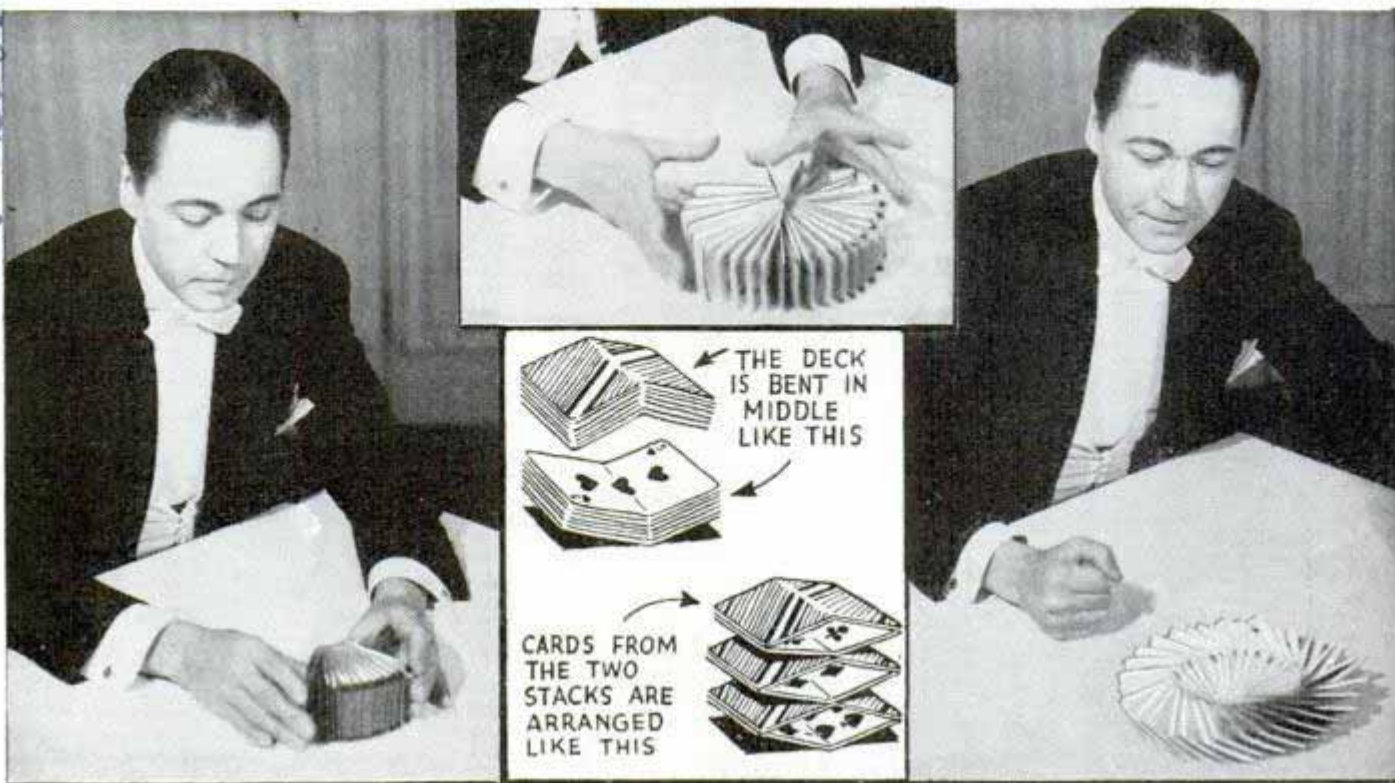
In Ohio, which has more brick highways than any other state, there is one road built of bricks laid lengthwise instead of the usual crosswise method. The result is a quieter pavement, and the engineers reported that fewer bricks were broken in rolling the road. Bricks laid lengthwise also had the psychological effect of making the road seem narrower to the motorist, just as a thin man wearing a suit with vertical stripes seems thinner.

propellers that will be required with these giant engines. Propellers now in use are thirteen feet in diameter. The building has no outside windows. Exterior walls are of eighteen-inch concrete and a new type of sound-absorbing material, known as calistone, is suspended in parallel rows within intake and exhaust stacks. The four test chambers are grouped around a central

es 14 74
East Hartford Conn
es 14 31
Route 31 near Logan
Reported by Prof. J. S. Chandell, U. of Illinois

Es 1372. Carl - James Mc Dilleny.
 431 W. 69th Street
 Kansas City, Mo.
 Paul Le Paul 6290
 Reber Place St. Louis, Mo.

"CARD-TABLE"



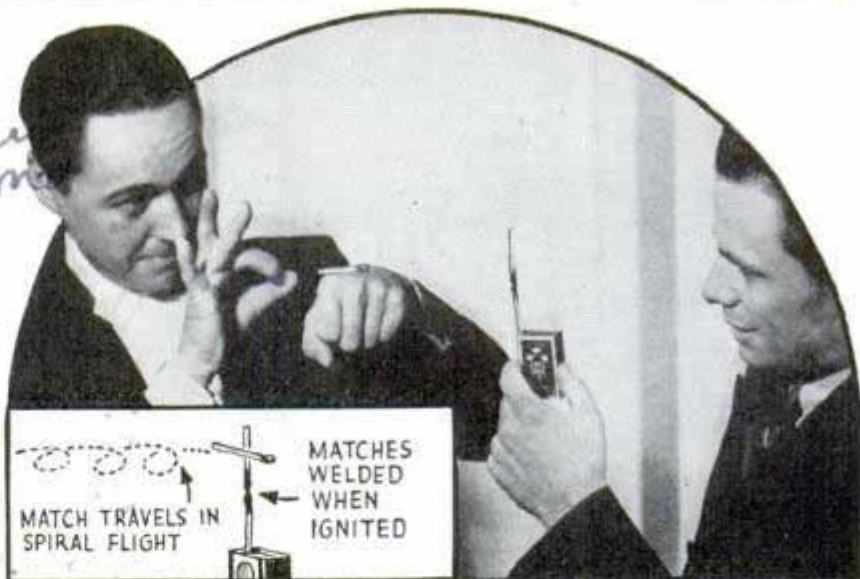
By Paul Le Paul

Professional Magician

WHEN interest in the bridge game begins to droop, magic tricks are in order. Not of the sawing-the-woman-in-half type, but informal, close-up stunts that are a source of wonderment and, of course, amusement to the other players.

To whet everyone's interest, start with a novelty. A clever one can be done with an ordinary deck. By placing it on the table and pushing the cards forward slightly, they will open into a beautiful pinwheel. When you hit the table with your fist, the pinwheel becomes a perfect rosette.

In order to produce these effects, some advance preparation is necessary. The cards are cut into two piles and without changing their order, they are cupped inward sharply toward the palms. The bent piles are then placed on the table, each with backs upward and alternated so they will form a series of diamond-shaped units when the circle begins to take shape. The



Top, tapping a deck of bent cards into pinwheel and rosette. Below, proving "expert" marksmanship with a flipped match

hands should be used in keeping the cards from getting out of the desired figure. The rosette forms automatically when the table is struck.

Here is a card trick that rarely misses. You invite a guest to select a card at random, look at it and return it to the deck without showing it to you. This done, the cards are cut a few times by the spectator and handed to you to find the chosen card. You go through the deck with the cards

es 13 72.

MAGIC"



face up, make another cut for good measure, and then place them in the case. It is jiggled for a moment and the selected card pops into view.

Before beginning the routine, place nine or ten cards of the same suit at the bottom of the deck and make certain these are not disturbed when the card is being selected. Only a few cards off the top of the deck should be offered to the spectator to choose from, the remainder, including the arranged group, being held in the left hand. While the other person is looking at the selected card, you casually cut the pack so the arranged cards are brought to the middle of the pile. Thus, when the chosen card is reinserted into the deck, it will fall among these and you will have no trouble in spotting it as you glance through the deck. Your



Above, making the unknown card selected by spectator jump up from deck in case. Bottom, pencil is broken in half, apparently by sharp edge of folded dollar bill but really by hidden finger

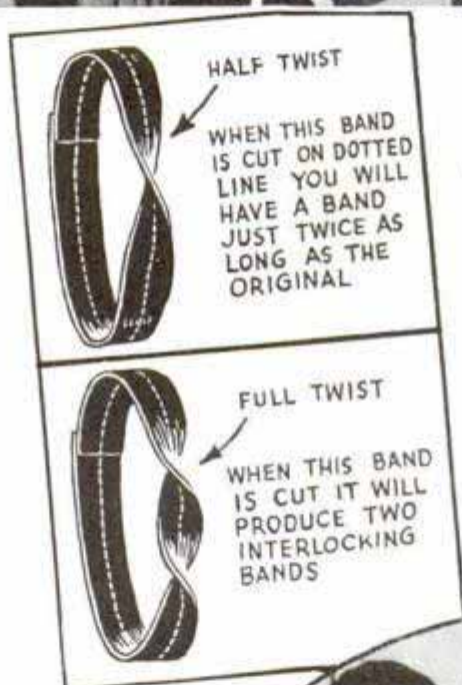


next move is to cut the deck, not for good measure as was stated above, but so that the card in question will be the top card on the side opposite the case's flap when they are put in the box. You then shake the case up and down until the chosen card pops out.

The trick will baffle everyone—once. But don't repeat it to the same audience that evening.

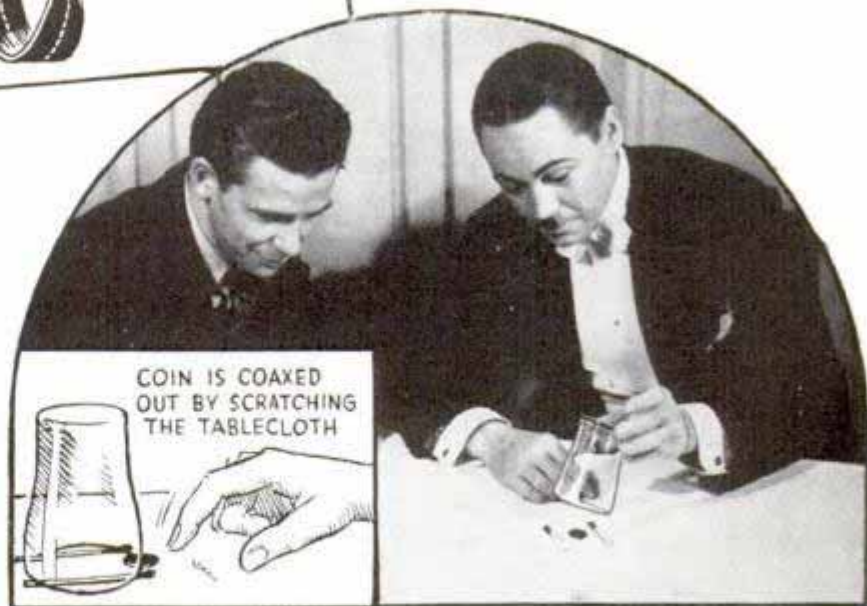
The same is true of the magnetic card stunt. Here you place the cards one at a time beneath your open palm on the table. While doing this, you show each card to be free of preparation. Then mumbling a few magic words, you raise your hand and with it comes the entire deck! A special magic word and the cards drop to the floor.

The secret lies in placing a pin through the callus of your palm at the base of your second finger. The first four cards are placed between the pin and the palm in the form of a cross and the others between the palm and these cards. When the hand is closed slowly the cards are released, the pin falling to the floor unobserved.



Later, you can suggest that you will attempt to pass your head through a playing card. When the hoots of derision have subsided you can call for scissors and proceed to make good. The card is folded and a line cut lengthwise to a point about one-sixteenth of an inch from either end. Then cut the card from the middle and then the outside and when this operation is completed, the card can be stretched and placed around the neck. With special pains, it is possible to make the card twice the size of this necklace.

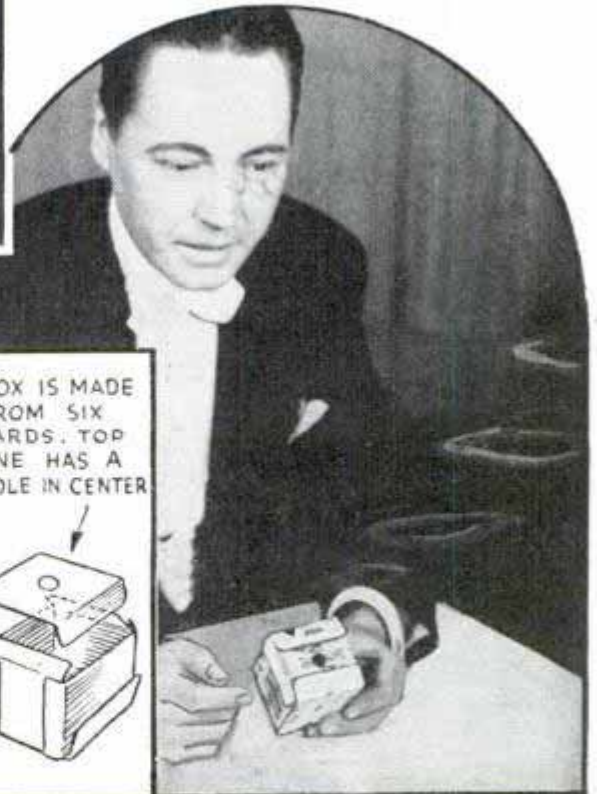
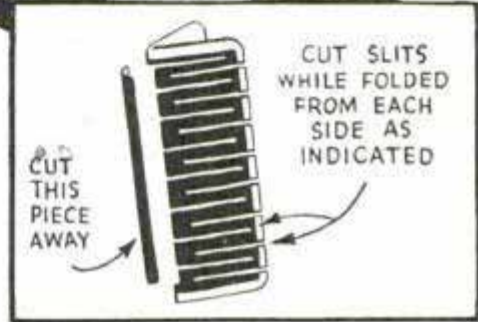
While you have the scissors handy, you may as well do the linking paper bands trick. Take two bands of identical size; cut one down the middle and it becomes a single loop twice its original size. Yet, upon cutting the other one in the same manner, it automatically becomes two links, one inside the other! Any size



Top, hanging hat on wall without hooks. Rub side of pencil on wall to make it stick, and hang hat over it. Drawing shows how to cut paper band to double its length or form interlocking bands. Bottom, scratching cloth lures coin from under glass

bands may be used. The trick is to give one a half twist before its ends are pasted together, and the other a full twist. All you have to do is cut down the center and the results will be as announced.

Shooting the match is a simple stunt that is good for a laugh. Two matches are burned together and stuck in the end of a box. A spectator is asked to hold the box and placing a third match on the back of your hand a few feet away from it, you shoot the third match at



the other two. And you knock them apart, of course. On the face of it, this might appear to be an outstanding feat of marksmanship. But it isn't. The match you flip from your hand twirls in flight instead of going straight, giving you a much greater chance of hitting the upright match, although the spectators will not suspect this.

A good close-up trick with two matches is to hold one in each hand with the head between the index and middle finger and the other pressed against the thumb. The matches are brought together and one match seemingly passes through the other.

In performing this stunt, the large kitchen-type match of wood should be used. As the two are brought together crosswise, the

You can put your head through a card when it is cut as shown at top. Cards picked up mysteriously in palm, left, are supported by pin stuck through rough skin. Below, squeezing smoke rings from box of cards

(Continued to page 133A)

notes American Electric Lamp Co. 1014 Tyler St. Louis, Mo

Electric Vanity Mirror Handy for the Car



Using the illuminated vanity mirror. Inset, the plug-in vanity for auto

Latest help to the woman motorist is an illuminated vanity mirror for the automobile. One style is mounted on the rear of the glove compartment door and lights automatically when the lid is opened. It is offered by Cadillac and LaSalle. Another electric vanity mirror may be connected by an extension cord to any of several electrical outlets in the car. At a flip of a switch on the side of the mirror, a small lamp in the base floods the user's face with soft light.

Flexible Gloves of Metal Mesh Protect Hands from Cuts



Safety gloves made of metal mesh are used by workers in hazardous occupations to protect them from cuts on broken glass, tin work and sharp knives. More flexible than any fabric or leather, they

permit free use of the fingers and increase efficiency since the worker can proceed with confidence that he is protected. Fur farmers, veterinarians, dog catchers, ken-

nel men and stock farmers use the metal gloves for protection from animals. In industry they are worn by butchers and plate-glass workers, glaziers and bottlers and packing-house employees.

Electric "Wick" for Oil Lamp Restores Its Old Charm

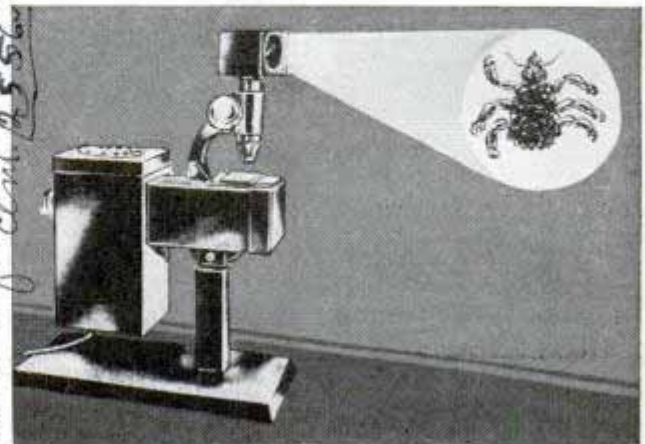
Old oil lamps can be restored to their former charm and usefulness by special adapters that permit the use of electric bulbs without disfiguring or drilling the lamp. The adapter replaces the standard burner. One style is called the "electric wick,"



and produces the effect of an old-fashioned lamp flame with its wick-shaped bulb.

Projector Joined to Microscope Enlarges Image on Screen

Wonders of the microscopic world can be studied with greater enjoyment by means of a microscope projector just developed. It enables the amateur scientist to throw on a screen or a white wall before his home audience the greatly enlarged image under his microscope lens. A drop of water placed on the glass slide in the projector appears as a world of big water organisms. A tiny insect looks like a ferocious monster, and powdery chemicals are shown as large crystals.



Insect placed on glass plate of microscopic projector appears as a monster on the screen

Mr. J. Carascadden, chie. 213 Stephens Blvd. Detroit Mich. es 1494

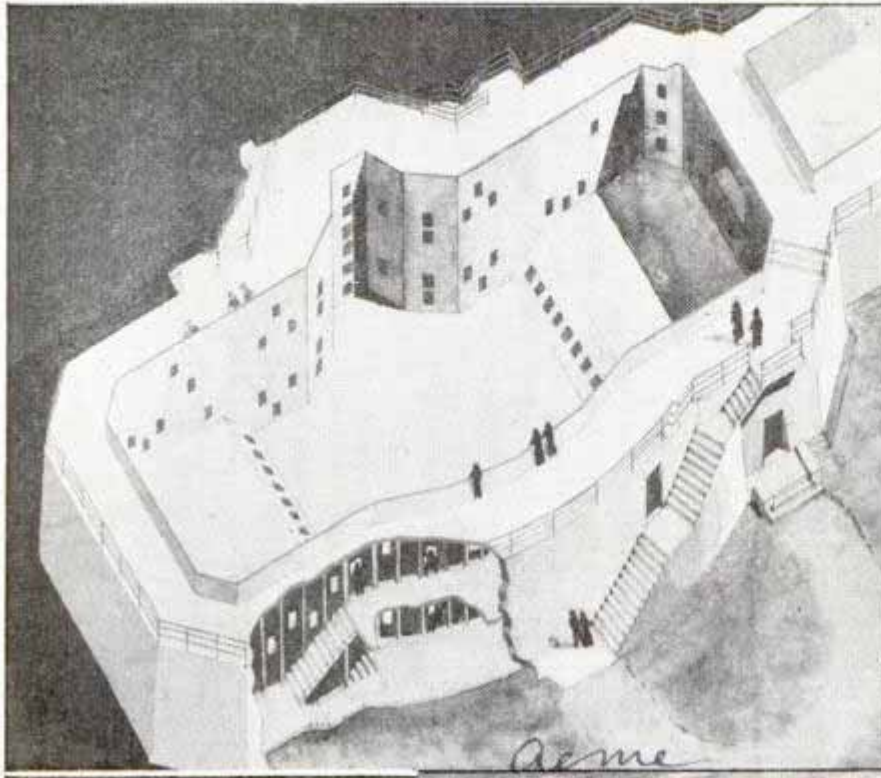
Adapted from U.S. Patent Office. es 1498. es 1513. es 1506. Chicago, Ill. 4550

Whiting and Glaziers Co. Porter Chemical & Glass Co. St. Louis, Mo

es 1354 Marine Studios

Marine Land, St. Augustine Florida

Miniature Ocean Reveals Life Struggle in Sea



and eleven feet deep. In-
closed galleries at various
levels surround them, and
visitors can look down
from the open-air gallery
at the top or peer through
the 200 or more portholes
below the surface. A spe-
cial boat has been built
to gather specimens for
the miniature oceans. In
its hull is a well opening
to the sea through a trap-
door. A metal tank on
rollers is lowered through
the trapdoor in the stern
to the water, where cap-

file
in name
Circ.

SUBMARINE life in the raw, with ocean mammals living their natural lives and fish preying on fish, is to be seen in two miniature oceans being constructed on the sea-shore boulevard south of St. Augustine, Fla. Life in these great tanks will duplicate as closely as possible the normal life of the creatures in the sea. In a coral garden, highly colored coral fish will hide from their enemies. Sea grasses and weeds will grow on the bottom, offering protection for small pipefish, while jellyfish will float near the surface. Lobsters, an octopus and perhaps an eleven-foot spider crab will be visible through portholes ranged around the bottom. These marine studios are intended not only as entertainment for tourists but as a theater in which scientists may study the life struggle of aquatic animals and fish, and motion pictures of the marine drama may be filmed. One tank is rectangular, 100 by forty feet, and eighteen feet deep; the other is circular, seventy-five feet in diameter



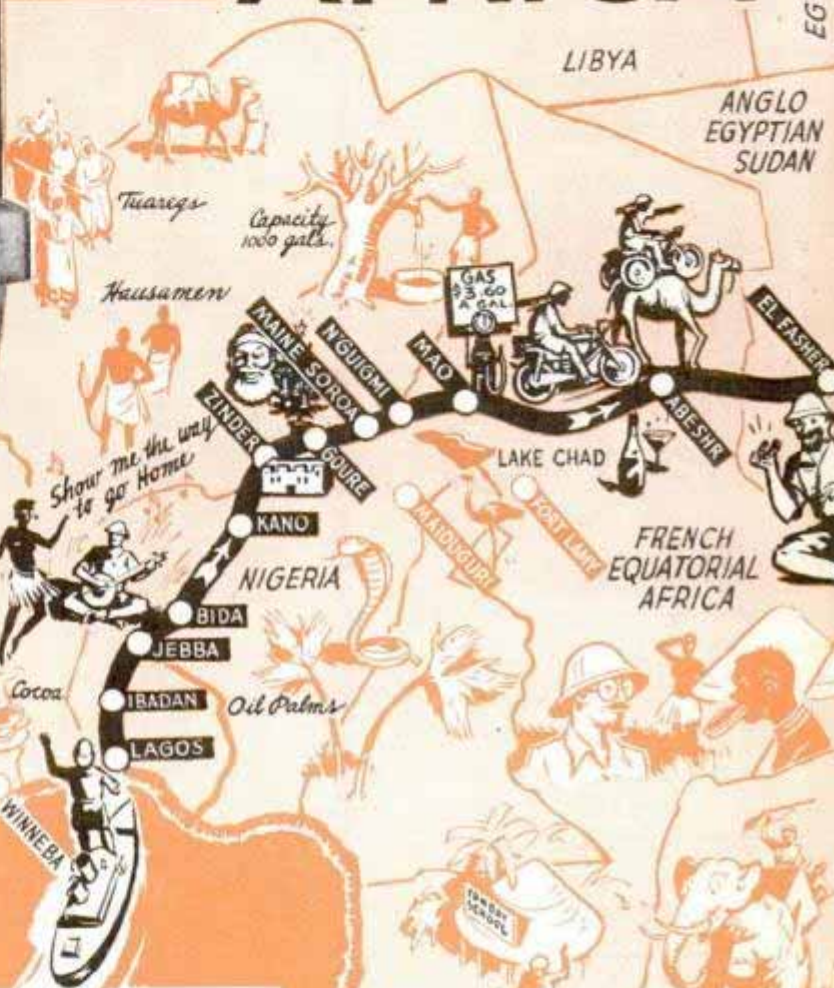
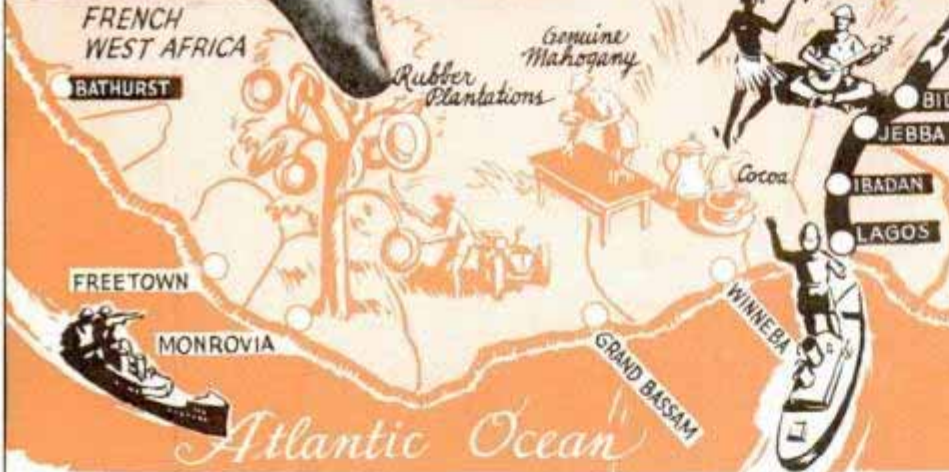
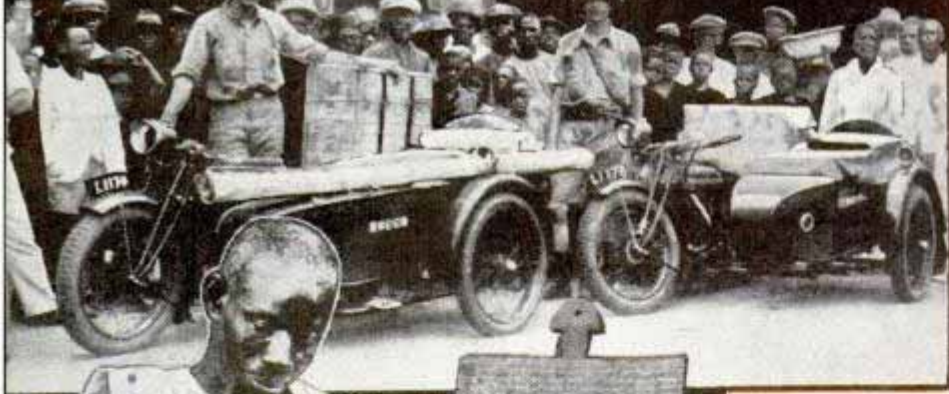
Top, sketch showing construction of tank with its inclosed galleries and windows at various submerged levels, permitting the visitor to watch life on the "ocean floor." Below, a general view of the seaside tanks

tured fish, put to sleep temporarily by a drug injected hypodermically, can be maneuvered into the tank and brought aboard without injury. This method will be used to handle sharks, porpoises, giant rays and other large specimens.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

see May 1939-654

ACROSS AFRICA



1082.

By James C. Wilson, 2348

Slabbe H.
PART I
Denver, Colo.

"ROADS? Ho-ho-ho-ho! Non, non, m'sieur—no roads. Just a caravan trail through the sand—providing you do not lose the trail."

The little French consul shrugged.
"What about garages?" asked my chum.
"Garages, m'sieur, are 2,000 miles apart."
"Filling stations?"

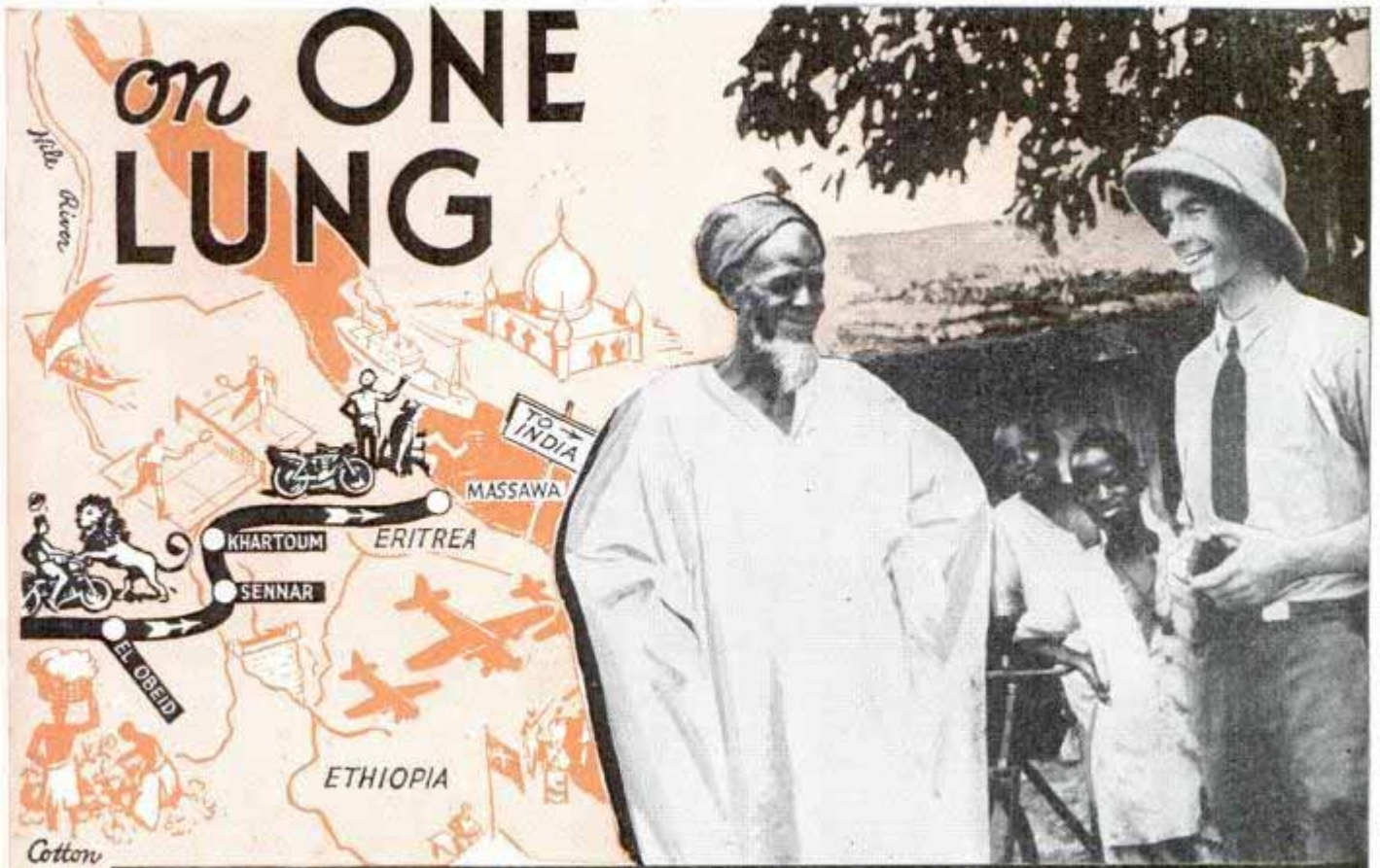
"The same. . . . Oh, perhaps you could get gasoline from the government stocks at Mao, the desert fort halfway across. But you will never get that far. Le gouverneur will not grant permission to two crazy Americans to cross Equatorial Africa by motorcyclette. Nevaire!"

hard with 3800 miles
Nigeria

Top, expedition ready to start across Africa. Center, one-man university in Lagos. Right, map of the continent, showing route of the motorcycle expedition

es 1082

on ONE LUNG



Cotton



Top, a big smile is worth a dozen guns in any language. Bottom, the expedition stops just outside the village of Sharagi, Nigeria, not long after start of long journey

Just two roving journalists writing their way around the world, we knew practically nothing about Africa—and Francis Flood, my chum, had never been on a motorcycle. Camels would have been the logical means of transportation but I was an enthusiastic motorcycle fan. Besides, the motorcycle company had agreed to donate the machines, and had promised us a substantial bonus—if we succeeded.

Yes, we had made up our minds—and we would make up the governor's, too.

Impressed by our letters of introduction, and worn out from three hours of persistent argument, he finally visaed our passports, and before the sun went down that day, we had collected all necessary documents, permits and licenses authorizing us to set out on the 3,800-mile trek through "Darkest Africa" from Lagos, Nigeria, to Massawa, on the Red sea.

The adventure, we figured, fell naturally into four sections. First, there was the 800 miles of jungle and forest from Lagos, on



the Gulf of Guinea, to Kano, on the southern edge of the Sahara desert. Second, the 1,000-mile stretch of alternating desert and grassland from Kano to Mao, the great French fort and radio station. Third, the long, long grind across central Africa from Mao to Khartoum, on the Nile; and last, the 400-mile hop from Khartoum to the Red sea. Our first goal, then, would be Kano, that mysterious walled city on the southern shore of the Sahara.

Next morning we set to work collecting tools, spare tires, repair parts and supplies. This was the first attempt ever made to cross Africa by motorcycle. Carefully I went over the machines, made a list of parts most likely to give out, and ransacked the parts department of every motorcycle shop in town. We got everything except breaker bearings and a connecting rod. We even

of maintenance at Jebba

dug up a spare cylinder. At the railroad shops we picked up brass rods and a tin of borax. Might have to weld a frame somewhere back there in the bush 1,000 miles from a garage. We solved the problem of how to carry camping equipment by leaving nearly all of it behind. After all, you can eat with your hands and sleep on the ground, but the best mechanic can't make a new drive chain out of a bunch of pots and pans.

Gasoline was the knottiest problem. Out of strap iron we built two luggage racks strong enough, we hoped, to carry 1,000 miles' supply. My heart sank when I saw that towering pile of gasoline cases balanced precariously over the back wheel of each bike. But we couldn't go without gas.

All the 90,000 citizens of



Top, Superintendent Mullins in his de luxe sedan chair. Center, Mullins' triple-thatched bush house with eighteen-inch mud walls. Bottom, Mullins' blacksmith who welded the broken fork of motorbike

Lagos, it seemed, were there to see us leave, the blacks babbling wildly, the whites dubiously shaking their heads. Sidecars careening crazily, we slid off down the main street and soon were popping along through the jungle with 3,800 miles of we



knew not what ahead. Dark walls of tropic greenery pressed in on the narrow road from either side, clasped limbs and tendrils overhead and dropped long tentacles through the gloom—tentacles which, if left to grow, would strangle a road or a plantation within a year. We were not alone in our new world. Back there in the bush were hundreds of little farmsteads, plantations and villages of grass huts, for southern Nigeria is thickly populated. In an area somewhat less than that of California live more than 14,000,000 souls.

From the friendly inhabitants of the bush—not at all like the African “savages” one reads about—we got our food—plantains, bananas, oranges, yams, millet



Top, visiting a powerful West African chief. Center, a problem in international trade. Bottom, crossing river in sixty-foot mahogany pirogue

meal, scrawny little chickens, questionable eggs and a hundred and one exotic items we could neither pronounce nor eat!

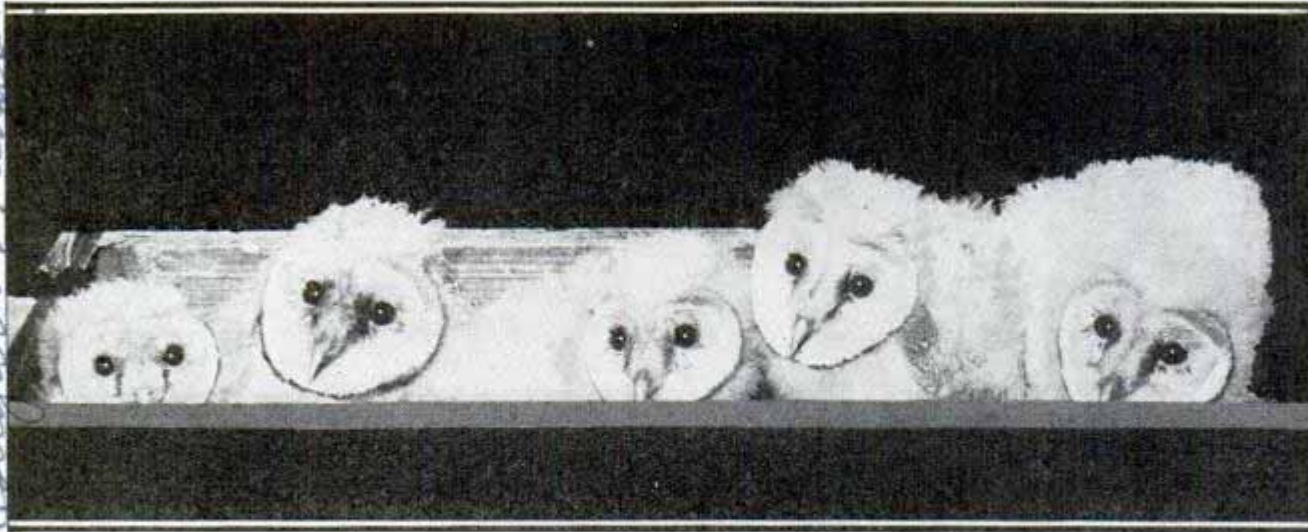
Our motorcycles were typical little sport models, one-lungers, rated at less than five horsepower. But they were sturdy and simple in design, equipped with three-

(Continued to page 149A)

English machine
 cylinder air-cooled
 Triumph - single cylinder

Alaki of Akopula

Quintuplet Baby Barn Owls Pose for Picture



Nesting in the eaves of a Pasadena, Calif., building these quintuplet barn owls were discovered. A photographer climbed eighty-five feet to snap this picture of the snow-white babies while their mother was out

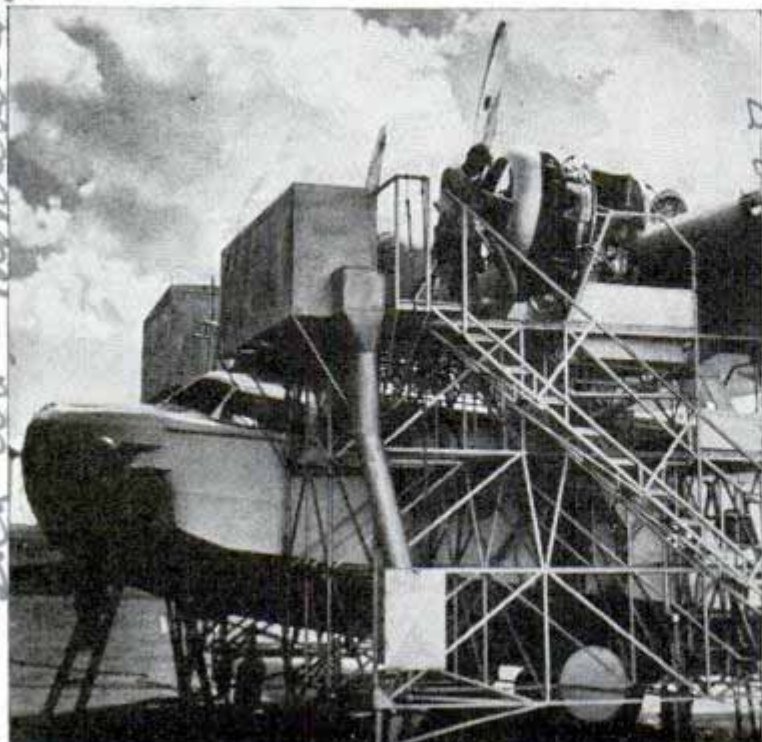
Dressed in their fuzzy white suits, five baby barn owls posed for a picture for the family album in their Pasadena, Calif., home. The quintuplets and their mother live in a nest eighty-five feet above the

ground, in the eaves of a building. The youngsters are snow white until they attain full growth, and until they are big enough to shop around for themselves their mother provides choice meals.

Sky Clipper Is 'Dry-Docked' between Portable Platforms

Every day the big ocean clippers that fly between North and South America go into "dry dock" at the Miami, Fla., base of Pan American Airways. Inspectors and me-

chanics give the flying boats a thorough going over, using portable metal platforms which are rolled up on either side of the ship's cabin to provide easy access to the motors and controls. A large pipe conveyor is used for depositing waste materials, for no chances can be taken of leaving rags or discarded parts around the plane to foul the mechanism of the engines or the controls.



Portable "dry dock" for servicing ocean clippers. Tube at center is for disposing of waste materials during overhauling

Accident-Repeater Found Big Peril of Road

Comprising less than four per cent of the drivers, the accident-repeater is mixed up in nearly two-fifths of all auto accidents, according to Dr. Harry M. Johnson. The scientist based his findings on a study of nearly 30,000 Connecticut drivers who had licenses and presumably operated cars from 1931 to 1937. Numbering only one-fifth of the drivers involved in accidents, the repeaters

390
201454
Cmbr. by La O...
Montebello Calif
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201430
Accident research
Highway Research

Washington
Accident research
Highway Research

Artist Fashions Quaint Dolls from Bits of Waste Material

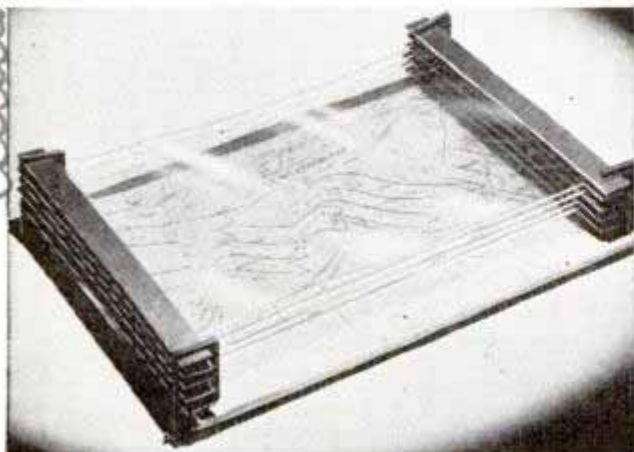
managed to have thirty-nine per cent of the fatal accidents, thirty-six per cent of non-fatal personal accidents and thirty-eight per cent of the accidents in which no one was injured. Dr. Johnson also found that the repeaters tend to shorten the time between accidents as their accidents accumulate. Because this small number of drivers cause so much damage, employer, insurance company and licensing authorities should have, if possible, a record of all accidents, whether their consequences are important or trivial, in order to establish a basis of predicting the behavior of their drivers as soon as possible, Dr. Johnson concludes.



Scraps of bath towels and feathers, old dresses and neckties were materials a Chicago artist used to make these picturesque character dolls

Transparent Multi-Level Map Shows Winds in Upper Air

To show the air currents and weather conditions at various levels above the earth for the benefit of aviators, a multi-layer weather map has been made of a transparent plastic material. The printed map itself forms the base. Above it are laid layers of the plastic, each representing for example 2,000 feet of altitude. The wind at that altitude is plotted on each layer so the entire situation can be seen at a glance.



Each transparent layer represents an altitude level on which winds are charted for advice to aviators

made by J. Felton
U.S. Weather Bureau

From the wastepaper basket, the rag bag and the junk pile come the "makings" of picturesque dolls fashioned by a Chicago artist, Anton Rogalski. A scrap of torn cloth becomes the Paisley shawl draped around an old woman's shoulders. The remains of a discarded bath towel serve as the robe of an oriental type. They are no ordinary dolls, but characters in old cloth. Each one represents a real person whom the artist has met or observed at some time.

es 1412

Saucepan Handle Holds Spoon in Cool and Handy Position

What to do with the dripping spoon between stirs is solved by the saucepan that holds the spoon on its handle. There the spoon is always handy when needed. It stays



cool, for the handle is made of a non-conductor of heat and there is a space between spoon and handle for air circulation.

L. E. Robins
Schenectady County

Celluloid Corp 108 40th. N.Y.C.

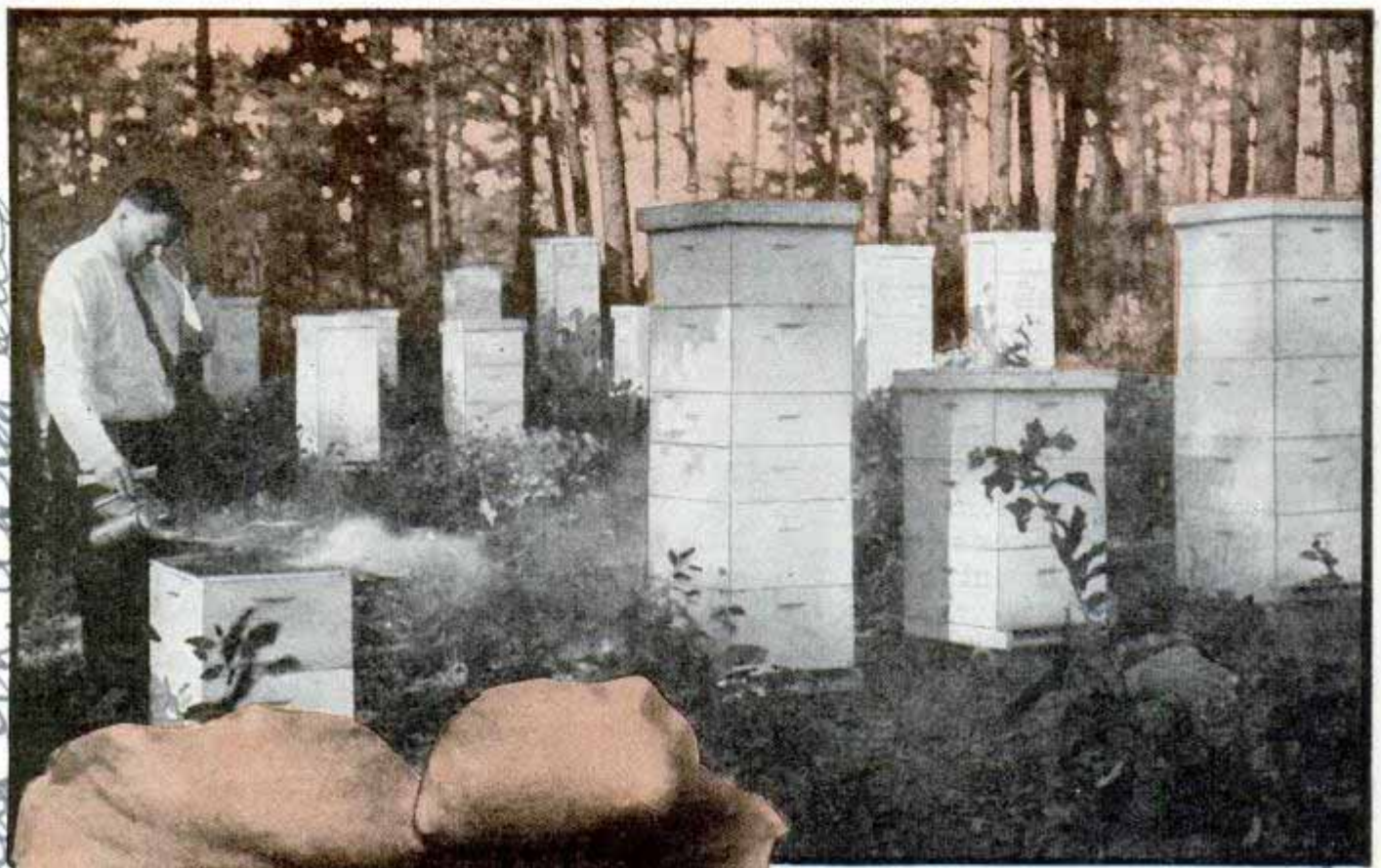
10-14 N. Idemilage. Chicago
Especially for
Scatter, N.Y.

Es 1255

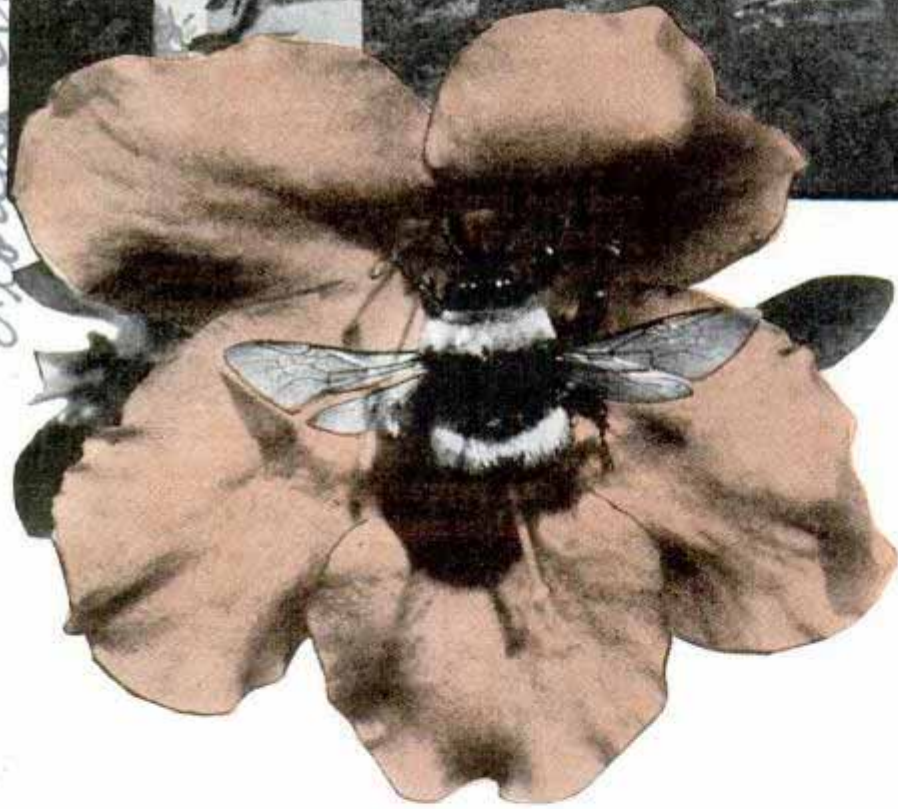
Belleville Mo

FUN *and* MONEY

Ed Comd. Walter E. Dwyer, 10.32
Florida, Av. Chas. Chas.



Beehives at experimental farm. Left, bumblebee sipping nectar. Honeybee is entirely different



of hives within their limits. Bee clubs vie with social organizations. While members of a bridge club are discussing queens and jacks, amateur apiarists are meeting to talk about queens and hives—and comb foundations and foul brood.

Beekeeping in the United States can be classified under three heads: that conducted on a full-time basis, where the owner

IF YOU have a back yard or a few square feet of other outdoor space, you can become a honeybee hobbyist. In the United States there are more amateur apiarists than people who raise bees to make money.

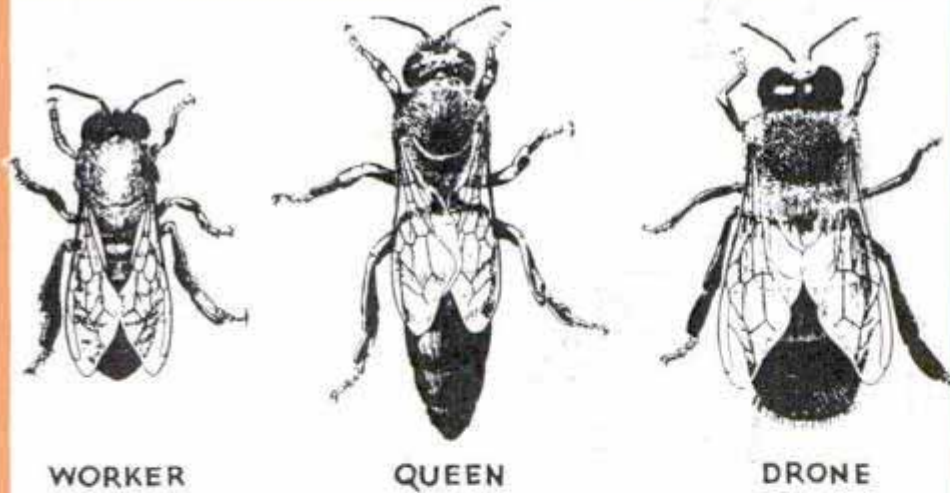
There are more beekeepers living in cities than in the country. Los Angeles, New York, San Francisco and many other densely populated centers have hundreds

makes bees his sole business; as a side line to other agricultural activities, and as a hobby for city dwellers.

People who keep bees as a hobby do it for much the same reasons that others raise Siamese cats or collect book matches. They do it because they want something to occupy leisure time. However, bee culture can be made a profitable hobby.

in BEEES

Right, holding screened cage which serves as nursery for virgin queen bee. Adult bees feed and care for the queen through the screen until she is old enough to be mated artificially. Below, sketches of the worker, queen and drone in honeybee family



bee research at the Bureau of Entomology and Plant Quarantine, U. S. department of agriculture, says:

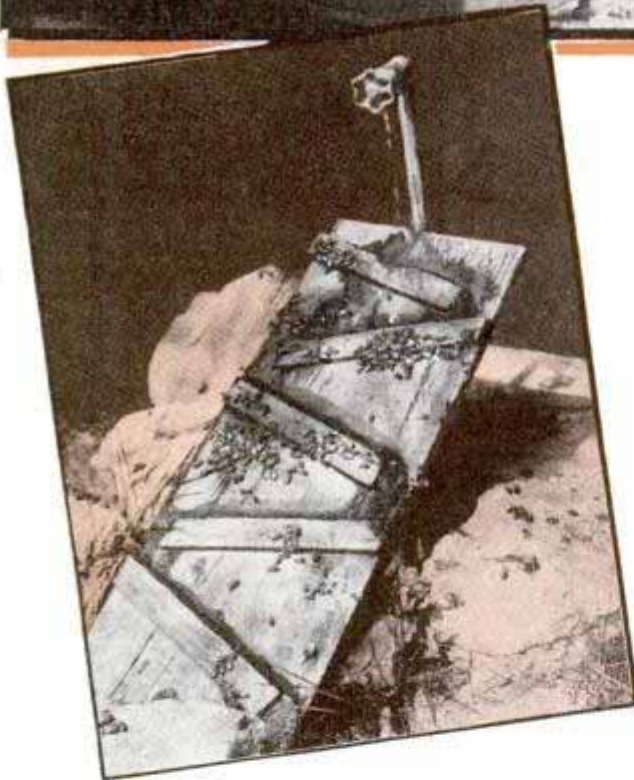
“Marriage or mating exists among the plants just as it does among man and animals, and honeybees are often referred to as the priests who perform the marriage ceremony. For many plants, cross-pollination by bees is indispensable to the formation of abundant and perfect seeds. Many of our useful plants have pollen too heavy for the

Production of honey and beeswax is not the most important job of the honeybee. Far more valuable is the service the bee renders to flowering plants, being the chief or only means of cross-pollinating certain plants, without which the plants would not be able to produce fruit and seed, and hence would die out in a short time. It does this by transferring pollen from one flower to another.

James I. Hambleton, who has charge of

wind to carry any distance; or they have flowers with parts so arranged that it is unlikely that fertilization will be effected with their own pollen. Most of these plants depend largely upon bees for cross-pollination.”

From all this activity, the farmer and the gardener and the bee raiser benefit. They get honey and beeswax in one direction, and abundant crops of seeds, fruits and vegetables in the other. Mr. Hambleton



Top, checking bees' changes in weight during honey flow. Under favorable conditions a strong colony may increase in weight as much as twenty pounds in one day. Bottom, watering trough for bees at U. S. department of agriculture's bee culture laboratory

estimates that the benefits resulting from cross-pollinating activities of honeybees are perhaps ten times as valuable, on an actual dollars and cents basis, as the honey and wax produced. Thus the person who keeps a hive of bees in his yard just for the fun of it is doing the entire community a service. His bees are busy, perhaps over

an area of four or five square miles, cross-pollinating the flowers in other people's gardens. Seldom do the bees work very close to their own hives, so there is little likelihood that the bees worrying your neighbor are from your hive.

The average bee colony has from 30,000 to 80,000 bees in it. Several hundred of these individuals are drone or male bees who do no work, but whose job is to propagate the colony. There is one queen, who does nothing but lay eggs. The rest of the colony is composed of female workers.

If you keep bees, you will get stung now and then. You will develop a certain immunity to the effects of the sting after a while, but it always will be more or less painful. Contrary to popular belief, bees do not learn to know their keeper. During the busy nectar-gathering season, a worker bee lives only six weeks. The first two are spent at household duties about the hive. Then for a month it goes out into the fields gathering pollen and nectar. The keeper opens his hives perhaps once a week. So a worker bee, during its entire life, does not come into close contact with its owner more than six times. An experienced bee man can go into a strange apiary and work with the bees just as easily as with his own, and get stung no oftener.

No honeybee now living ever stung any-

251255

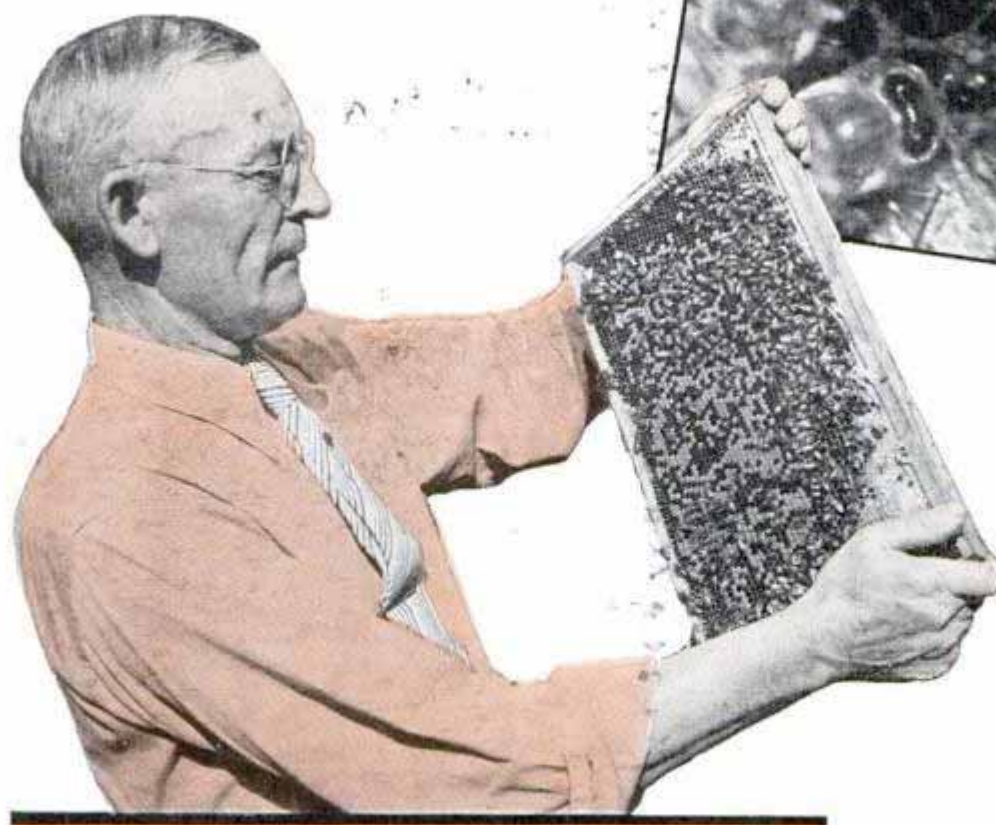
one. When a honeybee stings you, it commits suicide. The needle-like sting is embedded so firmly in your flesh that the bee cannot extract it. When the bee tries to do so, the sting is pulled out of its body, bringing with it the poison sacs and ducts. The bee dies in a few minutes as a result of this injury.

There are, in general, two conditions under which you will get stung. One is when you crush a bee or otherwise force it to sting in self defense.

The other is when you approach the hive and are set upon by the guard bees, whose duty is to protect the colony at the sacrifice of their own lives.

Nature, by arranging for the services of this suicide squad of guards, makes it unlikely that the entire colony will be destroyed by self-preservation efforts. This system makes it easy for the beekeeper to handle his swarms. By squirting smoke into the hive, he can put the guards to

(Continued to page 141A)



Top, modern beehive compared to old-fashioned straw skep. Center, queen surrounded by her retinue of worker bees. Bottom, George Schatz of Fayette County, Iowa, examines a frame of bees in his apiary

Extra White Line in Road Warns of Blind Spot



Drivers in state of Washington are warned of blind spot ahead by white line painted in opposite lane

To warn motorists of a blind spot on the road, at the crests of hills and on curves, the Washington state highway department is marking an extra white line parallel to the center line. Signs at the roadside tell the driver it is unsafe to pass a car at any point where the extra white line appears in the opposite lane.

Stripe on Law-Breaker's Car Will Warn the Public

Conviction of serious traffic-law offenses in one California court will result in suspension of the driver's license and the judge's order for a red stripe to be painted on the law-breaker's car. The stripe is intended to warn the public that the car may be in the hands of a reckless driver and to warn highway patrolmen to be on the alert for a driver who has no right to

be at the wheel. Patrolmen will be stopping the marked car constantly to learn whether the offending driver is violating the law again. The stripe, running entirely around the car, will remain in place during the period the driver's license is suspended.

Flasher Typewriting Chart Aids Beginners

Levelle High School, Levelle

Designed to overcome tendency of the beginner typist to look at the keys, an illuminated typewriter chart is being used in a Wyoming school. Wired to the instructor's typewriter, the chart flashes to give emphasis to any character when a key is depressed. Initial exercises and reaches are illustrated by the instructor on the chart, by means of his own typewriter, and duplicated by the students on the blind keyboard of their own machines. The chart also is said to be conducive to visual imagery, suggesting word-patterns of flashing lights to the student when he encounters familiar letter combinations. The device is used only until the student becomes familiar with key locations and finger reaches, and therefore is not a substitute for conventional typewriting material. Incorporated into the chart is a rhythm device which can be used to indicate typewriting speeds up to 100 standard five-character words per minute.



Flasher board lights as instructor touches the keys of his own typewriter

esl 367
Cm. J. A. Newton 7/16 Studied
Bldg. Portland
Oregon
Shirlean
same monitor 11/27/37
es 1396

designed and constructed by

H. D. Craig

Judge James A. Allen
S. to Mrs. Allen

Hunting Game with Telephoto 'Rifle' Camera

For sharpshooting at big game on his African expeditions, Commander Attilio Gatti, the hunter and explorer, arms himself with a "rifle" camera that permits quick sighting, accurate focusing and rapid-fire operation. The smallest part of this photographic gun is the camera itself, of the miniature type. It is mounted on an ordinary rifle stock by means of a single screw, attachable and demountable in two seconds. A telephoto lens overcomes the obstacle of distance in "shooting" shy animals, and by means of a double arrangement of reflex mirrors, a ground-glass screen, magnifying lens and telescope finder the cameraman can hold his cheek near the stock as if to aim the gun and then



Three views show how "rifle" camera is sighted and fired. Camera itself is a miniature, with telephoto lens added, and eye sights through telescope finder using reflex mirror arrangement and ground-glass screen. Notice twin triggers, one operating rapid winder and other releasing shutter

focus comfortably through the lens itself, holding and turning it with his left hand. There are twin triggers under the stock, one operating the rapid winder which advances the film for quick successive shots; the other pressing the button for a double cable release unit of which one cable lifts the mirror just as the other opens the shutter. The hunter can follow through his telescope finder a loping giraffe or gallop-

ing zebra, or the weaving run of a football player, while pressing the trigger at half-second intervals for a succession of quick action shots, keeping the camera always in sharp focus. Commander Gatti has spent thirteen years leading nine expeditions in central, eastern and southern Africa and knows the difficulties of hunting shy game with the camera. Now, however, he believes he has found the right weapon.

Poultry Factory Tries Radio on Egg-Layers

Believing that soothing music may induce hens to lay more eggs, operators of a city poultry farm tune in musical programs on a radio to which are connected loud-speakers located throughout the old factory in which they keep 10,000 chickens. Four floors of the building are filled with hens, each in her separate wire coop arranged in batteries, three tiers high and twenty-five feet long. Beneath the batteries is an automatic cleaning system operating on a belt-conveyor system. When the hens lay, the eggs roll gently into a trough beneath the cages and are collected.



Top, turning on radio in poultry farm. Center, old factory in which chickens are housed. Bottom, collecting eggs from battery of cages



14 38
Rotary Electric Spindle Sander Smooths Irregular Surfaces

Sanding carved or irregularly formed woodwork is simplified by the use of an inexpensive brush-backed spindle sander developed recently.



Curved chair arms, grills and similar work usually sanded by hand can be handled faster with the machine. The sanding heads, which use standard four-inch sandcloth or leftover pieces of old sand belts, are mounted on extended spindles and revolve against the work. When the sand is worn off, the ends are clipped and fresh abrasive surfaces unrolled from the sleeve. A three-horsepower motor furnishes power to operate the sander.

Cement and Paint Waterproofed by Aluminum "Soap"

Aluminum "soap" is finding increasing use in waterproofing textiles, leather, paint and cement, ropes and ceramic articles. Stearic acid combined with sodium or potassium forms common soap; combined with calcium, aluminum, magnesium or copper it forms a metallic soap or stea-

*McLoughlin's Vitzgen's Egg
 Subway said Egg
 19 W. 26th Street*

*Vonnegut Maulder Carb
 machine Ave and Canal St.*

*Industrial Bulletin Arthur Little
 Cambridge Mass
 No. 12 1938
 Maldenbrook
 Chemical Works
 Maldenbrook*

rate. Aluminum stearate causes fluid oils to "jell," and so is used in manufacturing solid lubricating greases. Calcium and aluminum soaps, being insoluble in water, are applied from volatile solvents to give waterproofing treatments. The dry products are mixed in cement, destroying the water-absorbing qualities of the resulting concrete. Aluminum and zinc stearates are used as flatting agents in paints and varnishes. Inks, rubber, plastics, crayons and cosmetics are other products manufactured with the aid of the metallic soaps.

Clark, Harrison, of

Goggles Lowered by a Nod to Safeguard Eyes

By merely shaking his head, the wearer may lower a new type of goggles to protect his eyes. No matter what he may be doing or what he has in his hands, the worker may protect his eyes instantly by nodding. A welder, for example, likes to have his torch and rod ready before lowering his goggles. The new headframe makes this possible. Another feature is the steady pressure which keeps the goggles firmly in place regardless of movements of facial muscles.



Safety goggles shown in raised position. Shaking the head lowers them over the worker's eyes

The goggles may be worn over any type of head covering, or without, and still be comfortable. The headframe is lightweight, most of it being fiber, with metal parts of brass and rustless steel.

Cornell
Ling Co, 2327 Seminary Av
Oakland, Calif

Shovel "Headlight" for Work in Garden or Cellar at Night



Flashlight mounted on handle of snow shovel makes it easy to guide when scooping the drifts off the sidewalk at night

Shovels can "see" to work at night in the blackness of the coal bin or in the yard by means of a special "headlight." It is a flashlight attached by a clamp to the shovel handle. Sundown need not stop gardeners who equip spade or hoe with the light, and householders can attach one to a snow shovel for clearing walks after dark.

Reflector in Bike Handle Grip Warns Auto Drivers

Equipped with a brilliant red glass reflector, a new bicycle handle grip warns motorists approaching from behind. A bike fitted with reflector grips on both handles shows automobile drivers its width in the darkness, enabling them to make the proper allowance for passing.



Quigley, Battery, Co. Inc. Freeport, N. Y.

Cornell Speed Frame

Wm. H. A. Cornell
Master Body Corp.

101457

Ground Speed Calculator Checks Air Liners' Flights



Checking speed of air transport with the aid of calculator which shows speed between points on route

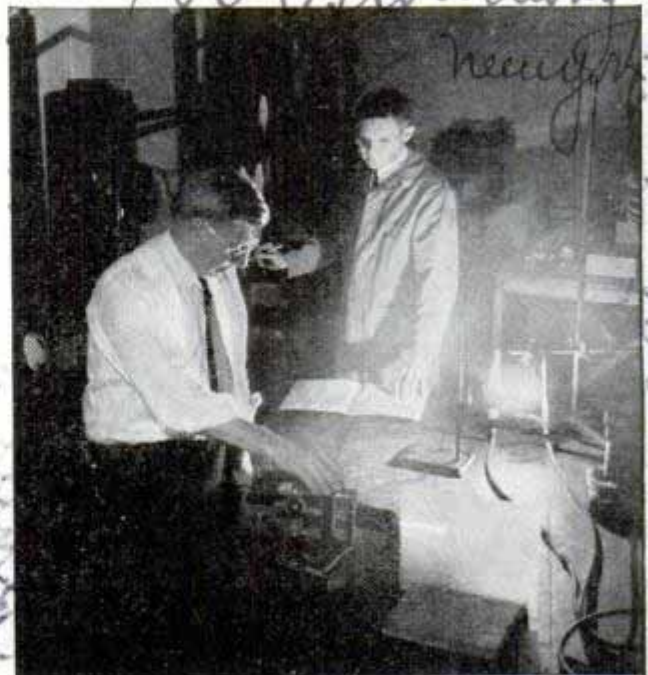
For checking the speed of air liners a simple calculator has been devised. It is of heavy pasteboard construction, with a movable disk beneath which is listed miles per hour between certain points. While in flight, a pilot checks his ground speed by turning this dial to the name of the town over which he is flying. For instance, at Davenport, Ia., there is located what is known as a contact point. When passing over this contact point, a transport should be traveling 180 miles per hour, ground speed. By turning the dial to "Davenport," the calculator will show at a glance if the ship is maintaining the scheduled speed.

followed by thunder. The noise, he explains, is "the result of a pressure wave caused by the sudden expansion of air created by a quick lightning discharge. All flashes do not release energy with the same speed. Our studies have revealed that in some cases the electrical current is built up and released slowly; that is, in one or two-tenths of a second as compared to millionths of a second in other discharges. This so-called slow lightning produces no thunder." To the human eye, the thunderless flash looks like any other.

101459

Latest Man-Made Light Is Bright as Sun

Estimated to have an intensity at its core of about 165,000 candlepower, which makes it intrinsically as bright as the sun, a new mercury vapor lamp is being tested in the Westinghouse laboratory. It is rated at about 8,000 candlepower. Quartz mercury arcs even brighter have been developed in the same laboratory. Still in the experimental stage, these powerful illuminants are expected to become commercially practical in the near future.



Scientists working with 8,000-candlepower lamp in Westinghouse laboratories

101484

Lightning without Thunder Clap Is Result of "Slow Flash"

Thunder does not always follow lightning. In a general storm there may be many flashes without the usual reverberating crack afterward, but the observer may not notice this fact. K. B. McEachron, General Electric engineer, in his investigations of lightning has discovered that thunderless flashes are just as bright, but slower and less destructive than the flash

Schenectady, ny

Cont. Cy. by J. J. ... 137 ...

101457 ... 101459 ... 150 Broadway ...

Covered Wagon Retraces 1787 Pioneer Trail

Dressed like the pioneers of 1787 who pushed overland from Hamilton, Mass., to Marietta, O., the four youths at right are among party of thirty-six repeating the trek. Below is their ox-drawn covered wagon and the church from which the group set out last December third



Acme



Following the trail of a band of pioneers who had set out from Massachusetts 150 years before, a party of thirty-six youths started with a covered wagon from Hamilton, Mass., last December 3, expecting to reach Marietta, O., the first city established in the old Northwest Territory, by April. A yoke of oxen was harnessed to the big wagon, and the young "frontiersmen" were equipped and dressed just as the travelers of 1787, with fur caps, high boots, muskets and powder horns. The expedition commemorates the trail-making trip of the group led by the Rev. Manasseh Cutler, who was pastor of the First Congregational Church of Hamilton—then Ipswich Hamlet, Mass., and the start was made from

that church. Before venturing on the 2,800-mile overland journey, arduous when attempted with only the equipment of Revolutionary times, the youths went into training at Fort Devens, Mass.

Modern strip-mining equipment has made it profitable to dig away fifty feet of soil to reach a layer of coal five feet deep.

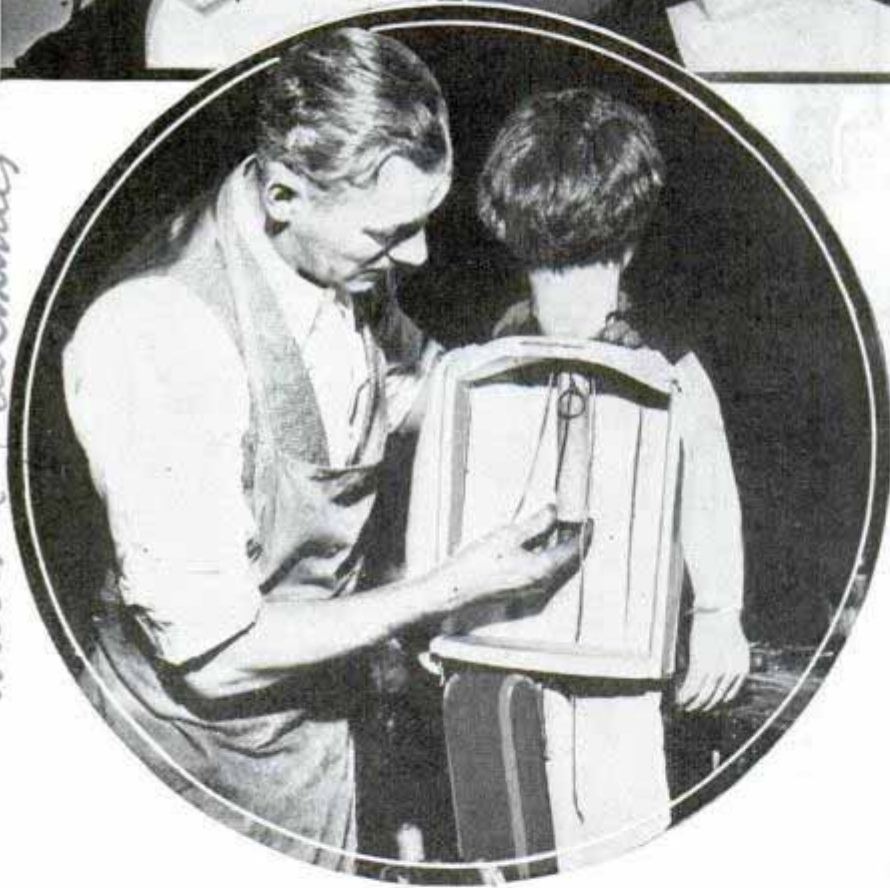
Image Sub. 12/6/37

*See May 19 36-703
Bucyrus-Erie Co.*

Es/27 Mr. James McMillan
481 W. 60th Terrace
Kansas City, Mo

RADIO REVIVES

837 N. State
Frank Marshall, 5578 S. 200th
builder of dummies
Chicago



Top, three different expressions of the famous Charlie McCarthy. Bottom, builder of dummies setting head in place. This shows how controls are worked by slipping the hand through the dummy's back

legs. When the vaudeville halls went out, ventriloquists could not work. Radio was not for them; the charm of their art lay in seeing the dummy talk. One by one, the wooden Mickeys, Noseys, and Sambos were forced into retirement. Only Charlie McCarthy remained.

His boss wasn't ready to throw in the sponge. He'd revamp his act and try the smart supper clubs. In the back of his mind was a fantastic no-

IF YOU own a radio, you're acquainted with Charlie McCarthy. He's the impudent little dummy who sits upon the lap of Edgar Bergen, his creator, and entertains millions weekly with his comedy.

To Charlie goes credit of reviving an ancient art, ventriloquism, which was practiced in the temples before the coming of Christ. Before he became radio's man-of-the-hour, ventriloquism was on its last

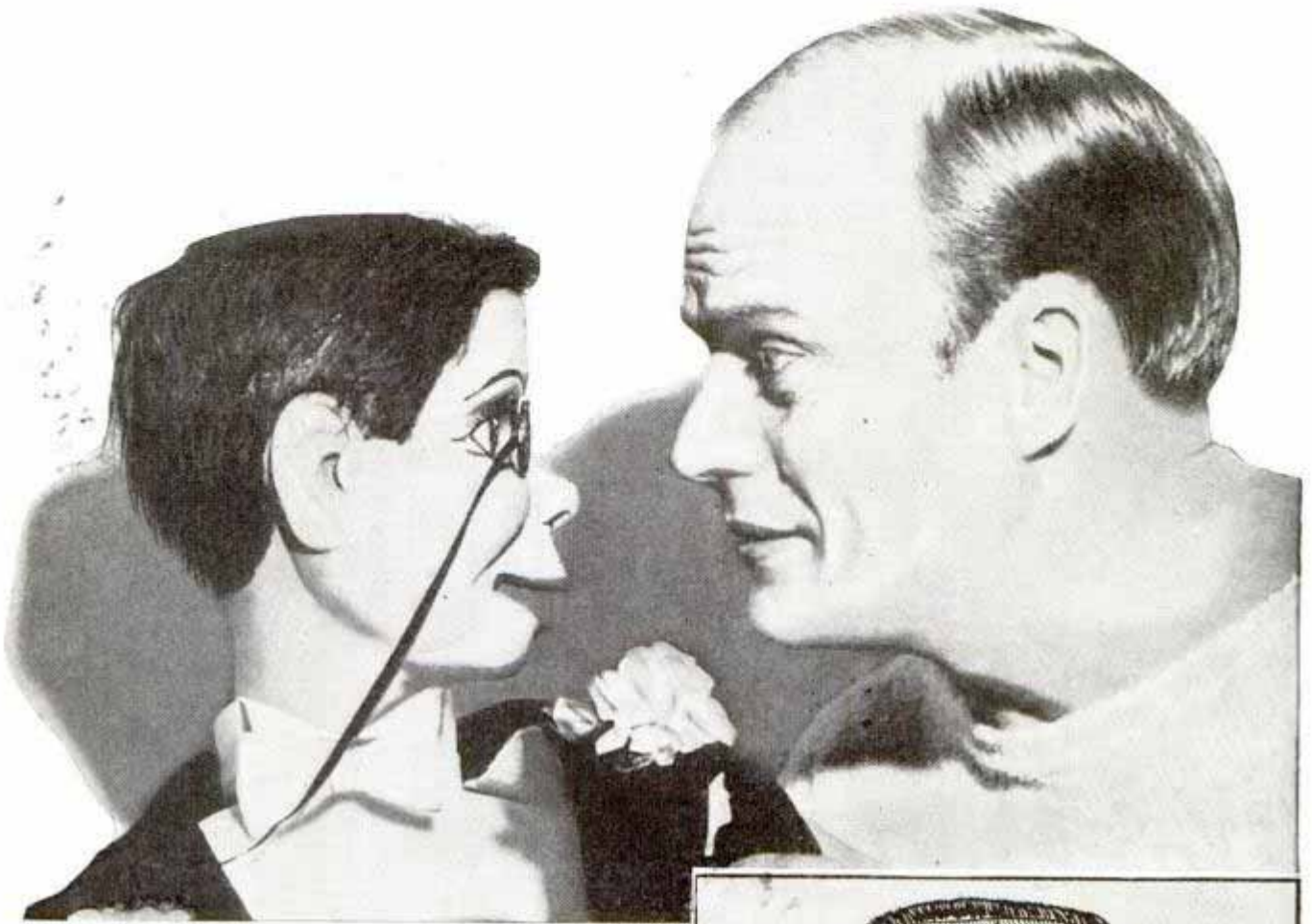
tion of getting on the radio, making the invisible audience visualize the dummy through crackling dialogue.

The plan was carried out. Armed with some new routines, Bergen, after dressing Charlie McCarthy in white tie and tails and giving him a monocle and an English accent, captured the cabaret crowds. Then Bergen attempted to get into radio. The broadcasting executives were disinterest-

read April 19 38
P. 60a

es 1246

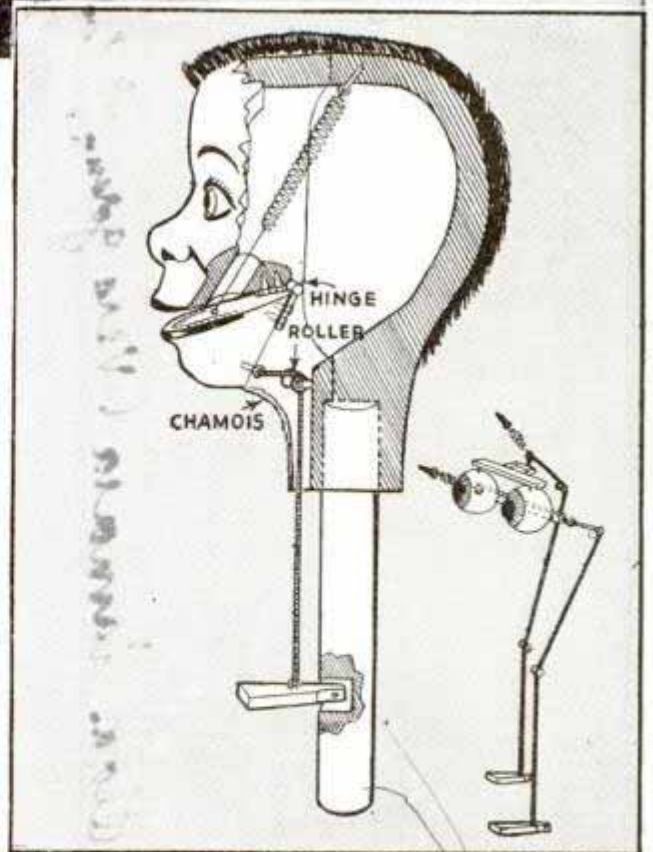
an ANCIENT ART



ed, but finally, he was given a hearing. Two appearances on a New York station brought an offer to appear on a coast-to-coast hour.

Before turning the microphone over to them, the master of ceremonies impressed upon the listeners that the voices were coming from the same man. Then Charlie and Bergen began their patter with the former doing most of the talking. To everyone's surprise, with the possible exception of Bergen, Charlie was an immediate success. Within a short time, the dying art of ventriloquism was reviving. Veterans dusted off their wooden stooges and stepped into engagements. And once again, youngsters began probing the mysteries of voice throwing.

Charlie and his quiet, self-effacing boss have a three-year contract on one of the air's big shows, Hollywood is paying handsomely for their services in motion pictures, and they can name their own terms for theater engagements and personal appear-



Edgar Bergen with the dummy, Charlie McCarthy.
Below, diagram showing how the dummy is worked.
Right, diagram of a dummy's movable eyes



needed a new character. After considerable research he decided upon Little Audrey. She was the bubbling, magpie type. Naturally, a face with plenty of animation was needed. When the character was completed, Bergen saw his mistake. The face was too animated. She had to talk at top speed to preserve the characterization. She simply wore the audience out, so Little Audrey was forgotten.

A bashful rustic named Elmer

(Continued to page 120A)



ances. Charlie McCarthy charms, dolls, games, and other items are being rushed into production.

"Ventriloquism," explains Bergen, "is a pressure on the voice—a sort of a grunt voice. The term 'voice throwing' is not exactly correct, in my opinion. I prefer to call it 'voice diffusing.' Because the voice comes from the stomach, it appears to be coming from a distance. Through the power of suggestion, the ventriloquist makes his audience think the voice is coming from somewhere else."

A ventriloquist usually has one voice and the dummy—face and figure—must be fitted to it, Charlie's creator says. "Many ventriloquists," he adds, "have made the mistake of making the dummy first and then trying to fit the voice to it. Their acts flop because the words that are put in their mouths do not seem to fit them. A definite personality should be established first and then the dummy built to fit the ventriloquist's conception of him."

To fill in on encores, Bergen



Top, another view of Bergen and McCarthy. Center, builder shows dummy's controls, including air bulb with which operator can control dummy's mouth movements from a distance. Bottom, scene from color movie in which the dummy appears

Olga Samara (Vera Gorn, Ralph Meigs)

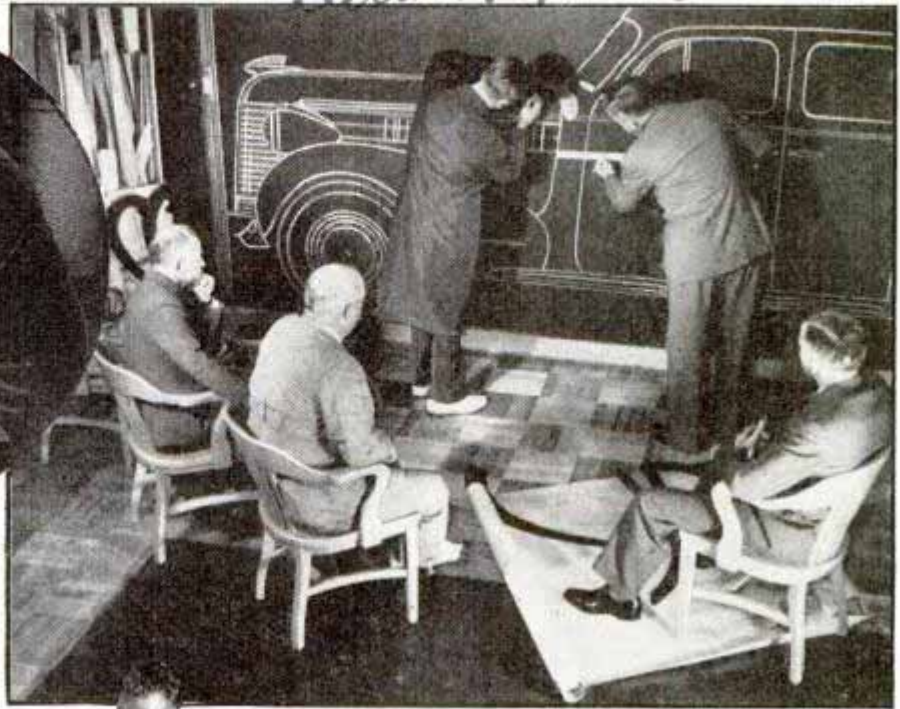
Howard Marshall

Isidore D. Jones

Secrecy Guards Designing of Tomorrow's Car



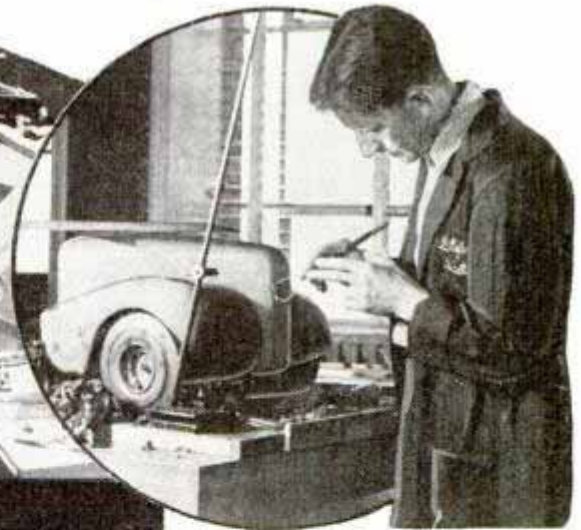
Here are several views from the styling section of General Motors' units. Designing of tomorrow's auto is shrouded in secrecy, each unit of the corporation working separately



Center, the artist at his drawing board. There the new design is started. At the artist's left and right are craftsmen working on models of the new car. Top, left, working out a contour in clay on a model. Right, engineers checking dimensions of the design, shown on the blackboard in full size



Below, inspecting a model complete except for motor, frame and chassis. It is difficult to distinguish this from a real car

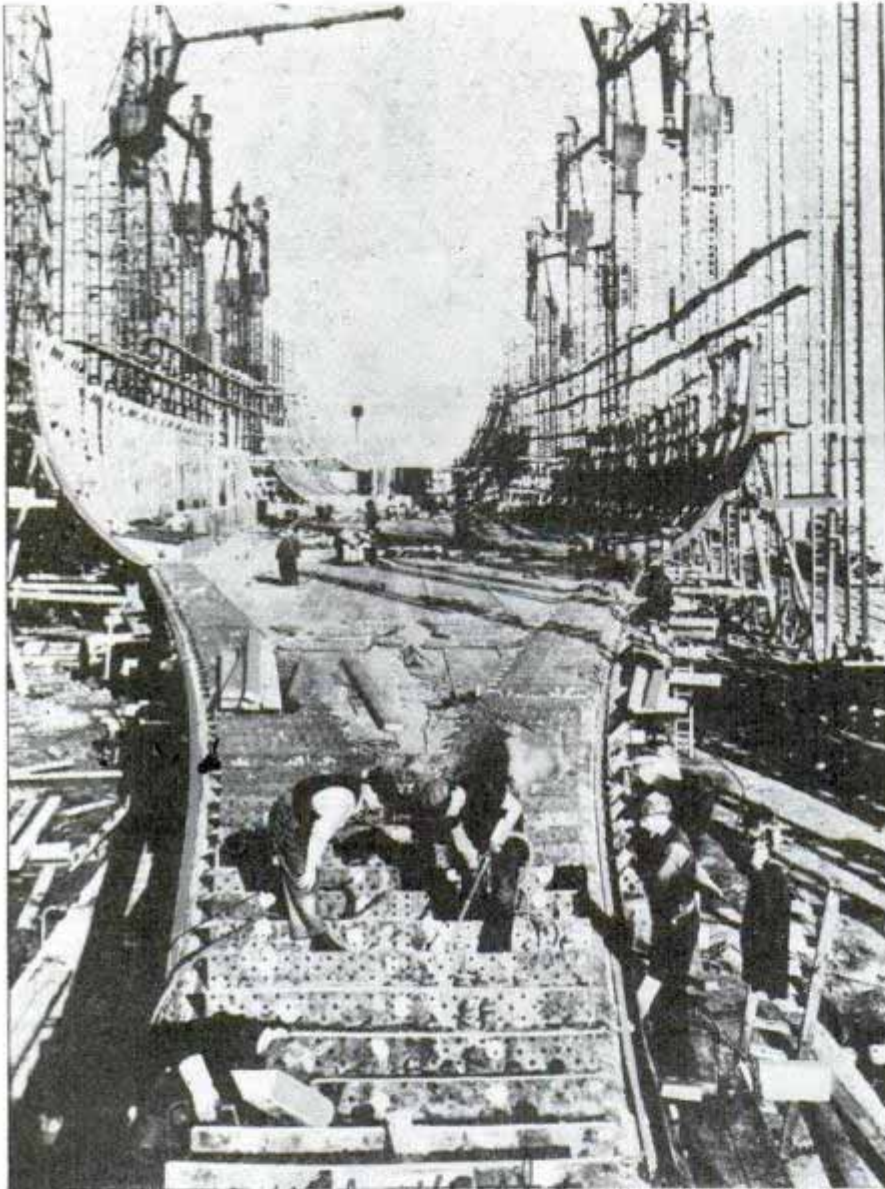


Styling section artists, given free rein, prepare about 1,500 sketches in working on one finished design. Unused sketches are filed, perhaps to be incorporated into a model five years hence. Only a few high executives are admitted to some parts of the eleven-story building in which General Motors houses its styling section

5005 12/28/18
San Francisco

es 1009

Skeleton of Giant Ocean Liner Takes Shape in English Yard



Resembling a giant spoon from this angle, here is the beginning of a 32,000-ton ocean liner that will be the largest ever built in England

Cammel Laido

Wide Water

"Number 1,029," destined to be a 32,000-ton ocean liner, is slowly taking shape in an English shipyard at Birkenhead in Cheshire. Its steel ribs are rising and the framework of its slender prow has been laid. The new Cunard White Star liner will be the largest ever built in England, as the "Queen Mary" and her sister ship now under construction are both products of Scottish shipyards.

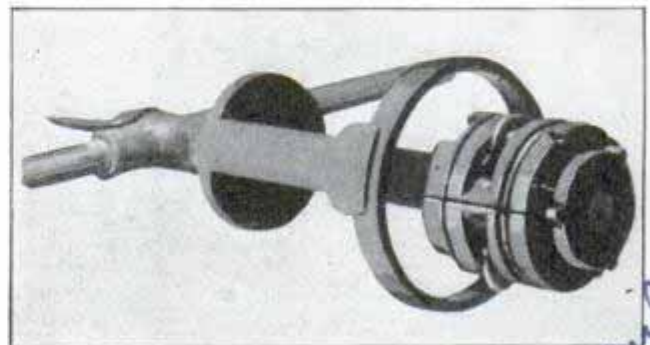
Dyes Trace Water Currents to Guard Health at Fair

For determining the extent and location of the sewerage field from the proposed sewerage outfall of the island site of the

1939 Golden Gate Exposition on San Francisco bay, aniline dyes are being used. In tracing the currents, the engineers employed uranin. So penetrating is red uranin that one pound will color 10,000,000 pounds of water. One pound of the powder released from the engineers' boat on the ebb tide colored an area of several acres off the island a light greenish hue that could be distinguished from the San Francisco-Oakland Bay bridge several miles away. Many other markings were made on both outgoing and incoming tides. Currents were plotted by observers on the bridge. In charting the course of these colored areas it was found that the 20,000,000-cubic-yard fill of the exposition site, which is a man-made island, has altered the currents of San Francisco bay.

Sleeve Pipe Cutter Is Operated from Inside

Invaluable for cutting off short pieces from pipes inserted in concrete floors and intended to be used as sleeves for pipes running through the floor, a



Fitted to the inside of pipe, this handy cutter does a neat job quickly

es 1410

Al Stringer, 112
7050 N. Oakley
Milwaukee

'Candid Mike' without Wires Disguised as Table Bouquet

new pipe cutter differs from the standard type in that it cuts from the inside of the pipe. In use, it is inserted in the pipe, after the depth of the cut has been adjusted and set with a screw, the top nut is tightened until the three circular knives are snug against the inside of the pipe and the large handle at the top is rotated. The pipe is quickly and easily cut.

Pump for Filling Grease Guns Fits Barrel

For filling hand and power grease guns, a handy pump that fits into the bung opening of lubricant barrels is now on the market. The pump, operated by turning a crank, handles any lubricant from light chassis to heavy fibrous grease. At room temperature, it pumps one pound of chassis grease into a gun in thirty to forty seconds.



You would scarcely suspect that the beautiful bouquet conceals a "candid microphone." The vase-like "mike" with silver antenna is seen at right

Candid cameras are having their effect on radio. Candid microphones that masquerade as silver vases and bowls of flowers are replacing the "forest" of ugly microphones that used to surround the speakers at a banquet table. The audience wants to see and hear, but it does not want to be distracted by a battery of "mikes." One of these "candid mikes"

is a decorative vase-like piece with silver handles and a silver rod as antenna. For it is not only a microphone but a complete short-wave transmitter requiring no wire connections. Covered with flowers, it becomes a floral centerpiece for the table, and it has even been carried disguised as a floral muff. Candid microphones also get close to the news by riding on the chest of an automobile race driver, in the helmet of a deep-sea diver, or beneath a manhole cover in the street where the sound of marching feet, shopping crowds and mobs can be picked up.



Filling grease gun by means of pump which fits bung of lubricant barrels

The Lubricator Corp
917 N. Michigan

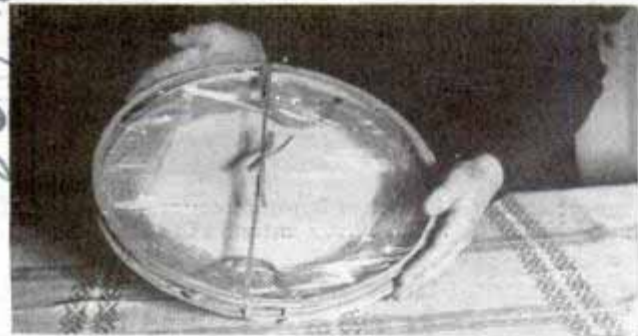
Use of pipe cutter - 2/3

30 Rockefeller Plaza

George H. Eckhardt 2047
N. Park Ave. Phila

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

Cake Cover Like Plug Hat Folds Up for Storage



Collapsible cake cover shown in use and folded flat for storage. Spring metal ribs hold it erect

Housewives are being introduced to the transparent "plug hat" cake cover. Made of Cellophane, it collapses like a top hat when it is stored away. Two strips of cloth-covered spring metal keep the cover erect when it is on duty keeping a cake moist and clean.

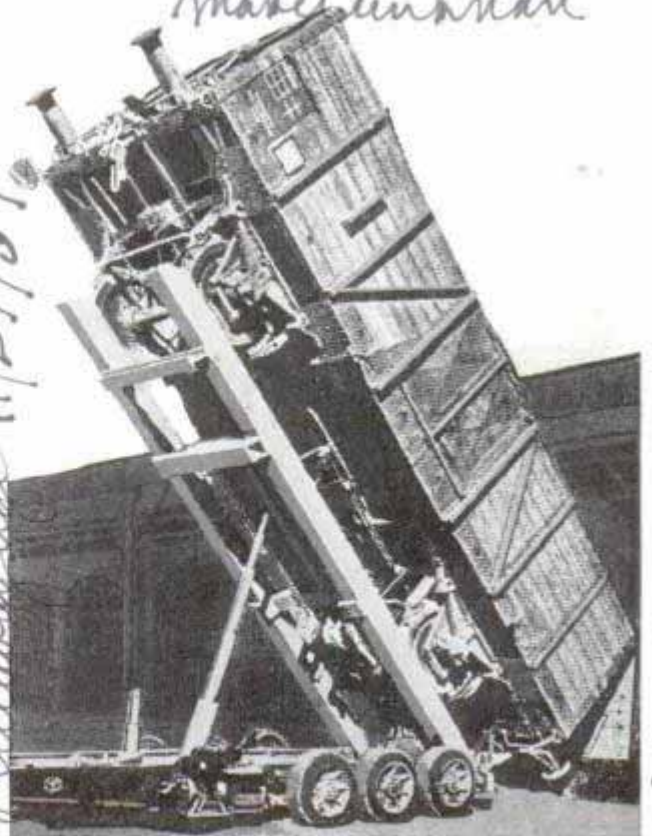
Auto's Life of 2,100 Hours May Be Extended by Care

Estimating the average life of automobiles at 2,100 hours, L. C. Eldridge, of Shell Petroleum Corp., says that the car owner may prolong the useful life of the car if he treats it with reasonable care at all times, avoids overheating, keeps it in good mechanical adjustment and gives it the best lubrication possible. If the car is driven an average speed of thirty miles per hour, its life may be figured in miles at 63,000. Some automobiles are driven much farther,

however, indicating that the owners have given them the proper attention. Stressing that proper lubrication is the most essential thing in prolonging the life of the car, Mr. Eldridge recommended: draining and flushing the crankcase and refilling with clean oil when the oil becomes badly contaminated; starting with a light oil for a new car and increasing the body of the oil consistent with the increase in running clearances developed by wear; servicing the air cleaner at regular operating intervals; renewing the filtering unit of oil cleaners when they become saturated with contamination, and keeping the cooling system clean, thus preventing operating temperatures from being excessive.

Truck Carrying a Freight Car Tilts Upward to Unload

Freight cars travel the highways in Germany on specially built trailers which can even tilt upward to dump a carload of sand or coal or grain in your receiving yard. The trailer chassis has a hydraulic tilting platform operated by a telescoping tube. This method enables the railways to handle bulk shipments which otherwise would be shipped by highway truck because of the



Telescoping tube tilts trailer platform to dump bulk shipment from German freight car at destination

Richard's Buggy and Repair
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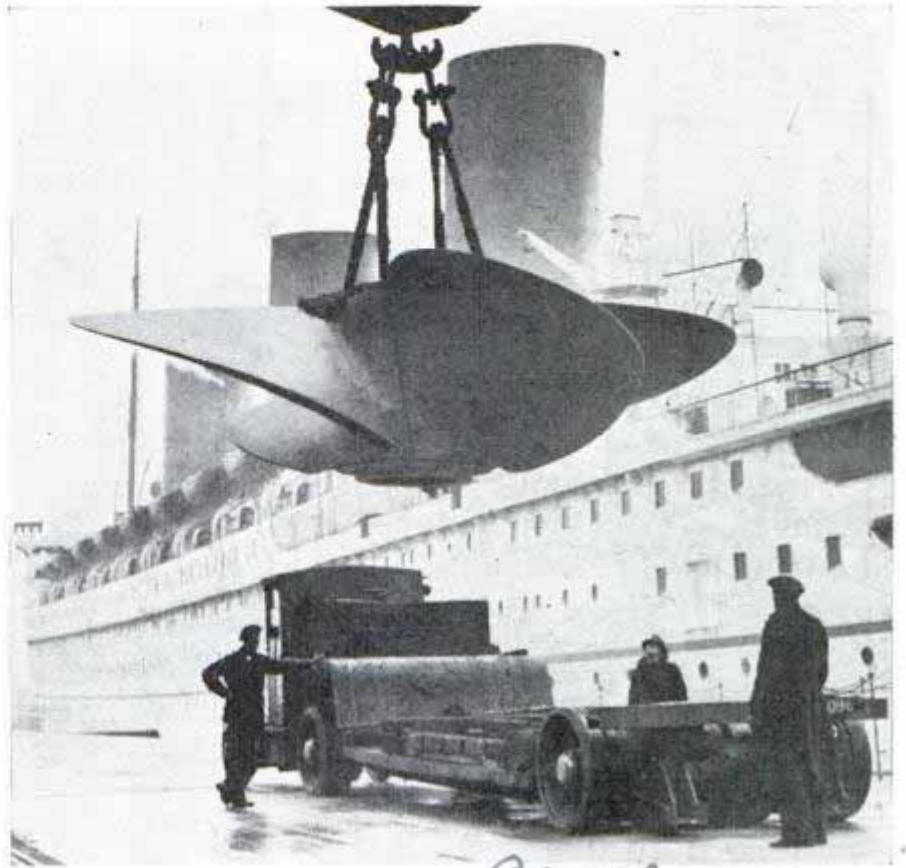
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Shell Bldg
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cost of unloading freight cars on the track. This coordination of rail and highway traffic includes also the transfer of cars, such as diners, from one local station to another over city streets, using the truck and trailer instead of the slower system of switching on rails.

25/433
Thirty-Five Ton Propeller of "Queen Mary" Is Landed

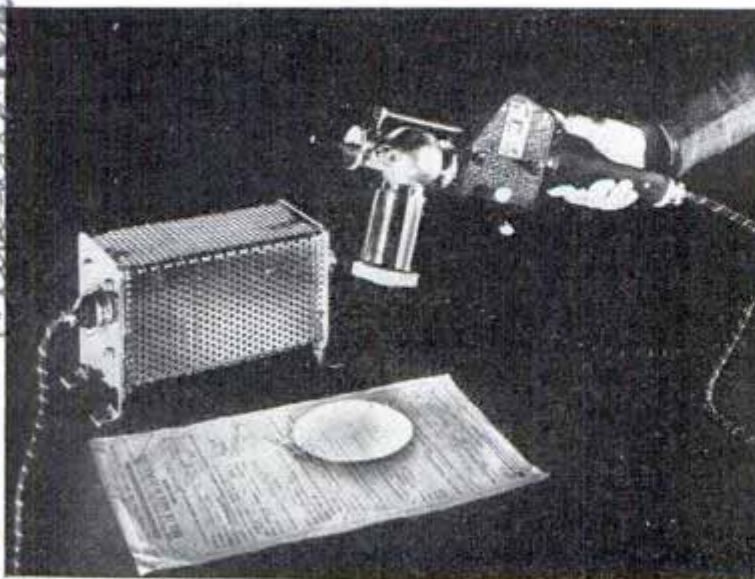


Asme © Planet News, Ltd.
 Propeller that took "Queen Mary" on fast transatlantic voyages is landed on trailer. In the background is the "Empress of Britain"

Some idea of the massive strength of the "Queen Mary's" propeller is gained from a view of the huge screw as it was hoisted ashore at Southampton. Weighing thirty-five tons, the propeller was swung over the side of the Canadian Pacific liner "Empress of Britain" and set down gently and precisely on a trailer on the dock. The "Empress" was already in dry dock, and the "Queen Mary" was preparing for an extensive overhauling in dry dock.

Ultra-Violet Lamp to Fight Crime Is Portable

Permitting examination of much material not easily transported to a laboratory, a portable ultra-violet lamp has been developed to aid in crime detection. The machine may be used for analysis, inspection, detection and identification by means of fluorescent effects. Fingerprints on paper, cloth and other materials may be revealed; erasures and overwriting on legal documents can be detected, and minerals, chemicals, oils, drugs, organic substances and food products may be examined.



Portable ultra-violet lamp weighs less than fourteen pounds. Changes in documents can be detected with the lamp's aid

Soap Is Made from Coal Fat When Other Fat Is Scarce

In Germany you can buy soap made from the fat obtained from coal. While "coal" soap costs slightly more than that produced from animal or vegetable fats, scarcity of these natural fats in Germany has made it economical to develop coal fats and an effort is being made to reduce the cost by large-scale production methods.

Journal of Industrial and Engineering Chemistry

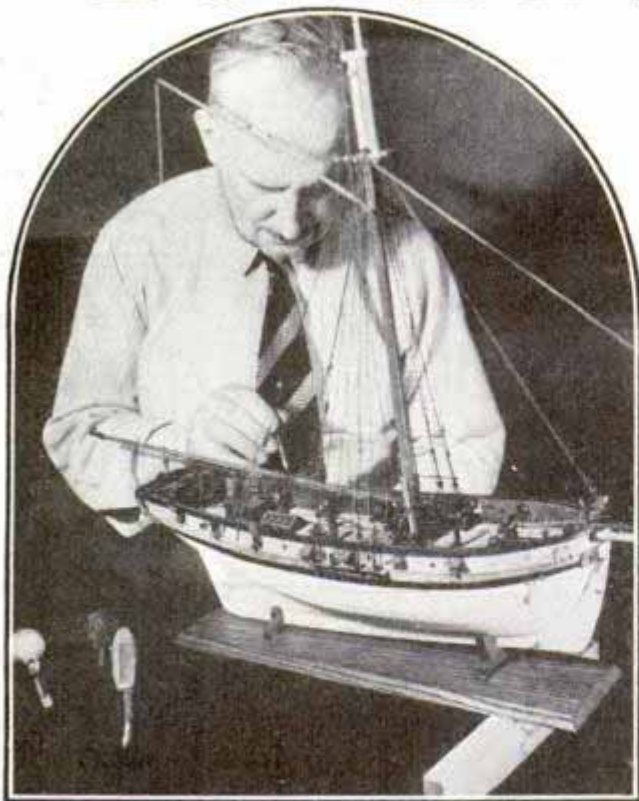
National Carbon Co. U.S. 701 Madison Ave.

es 1241

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BUILDING SHIPS



Frederic Craven in his well-equipped "navy yard" workshop at his home in La Porte, Ind., and putting the final touches on a model of the English revenue cutter "Diligence" of 1810

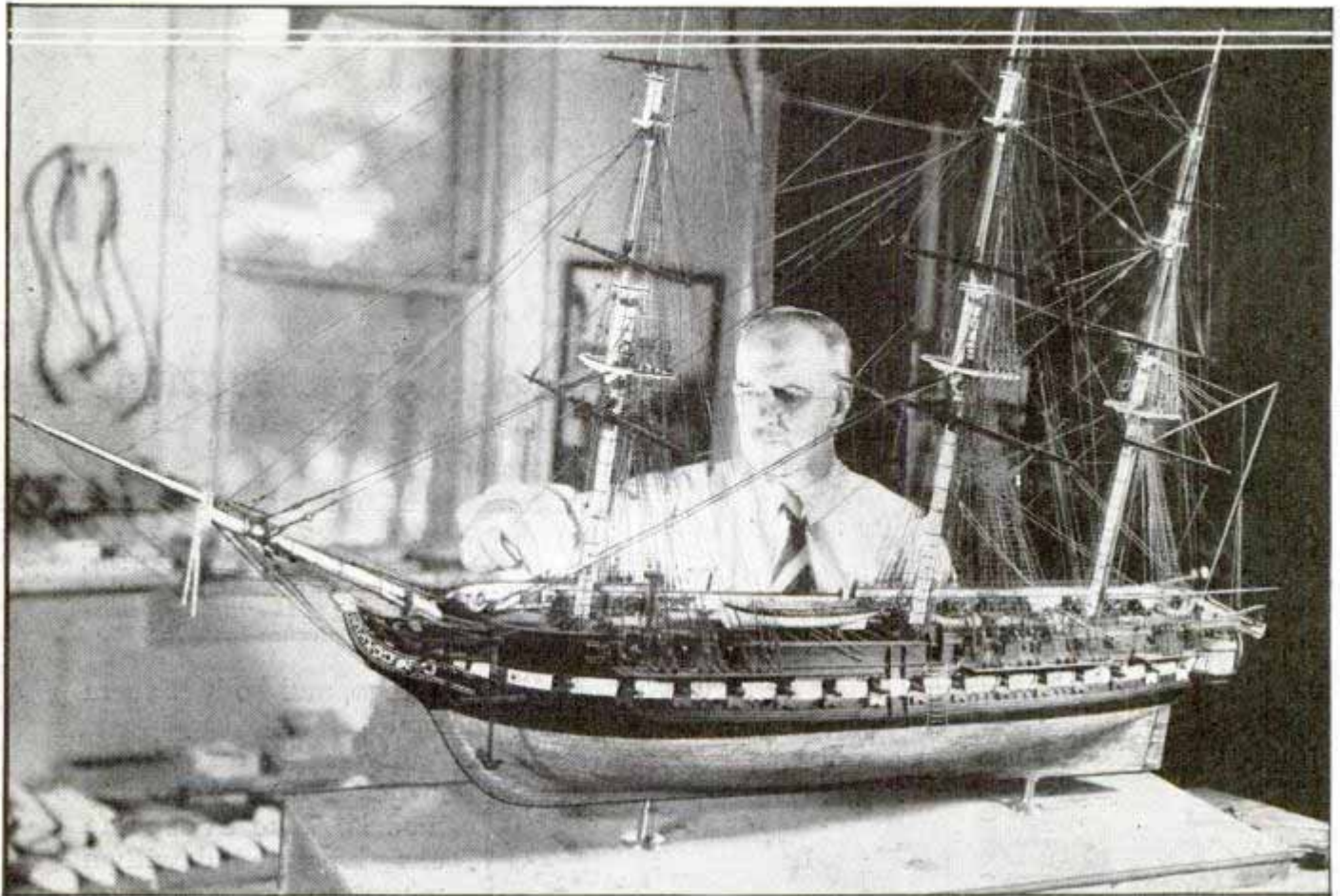
SEVEN hundred miles from the nearest ocean, in a small city in Indiana, four ships are being built for the United States navy.

The landlocked navy yard where the light cruiser "Brooklyn," the submarine "Salmon" and the destroyers "Gridley" and "Porter" are swiftly taking shape is the shop of Frederic A. Craven of La Porte, Ind., who builds ships for showcases.

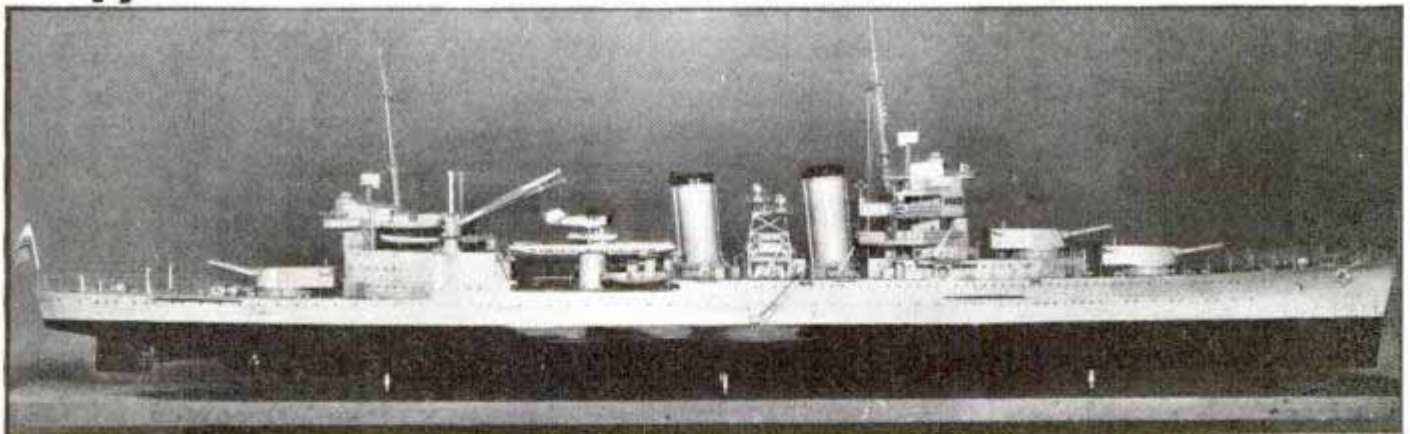
In the last four years, as modelmaker for the navy, Mr. Craven has constructed four big little war vessels. If you have visited the navy building at Washington you probably have seen his "Ranger," giant of the model fleet, which took two men seven months to complete. The destroyer "Farragut" and the heavy cruiser "New Orleans" came from the little workroom in La Porte, and the dreadnaught "Mississippi," so like the great warship itself that the newspaper photographs you see of the "Mississippi" often may be photographs of the model, with sky and sea superimposed by the navy cameramen, the model's over-

Frederic Craven

1435 Pennsylvania Ave.



for SHOWCASES



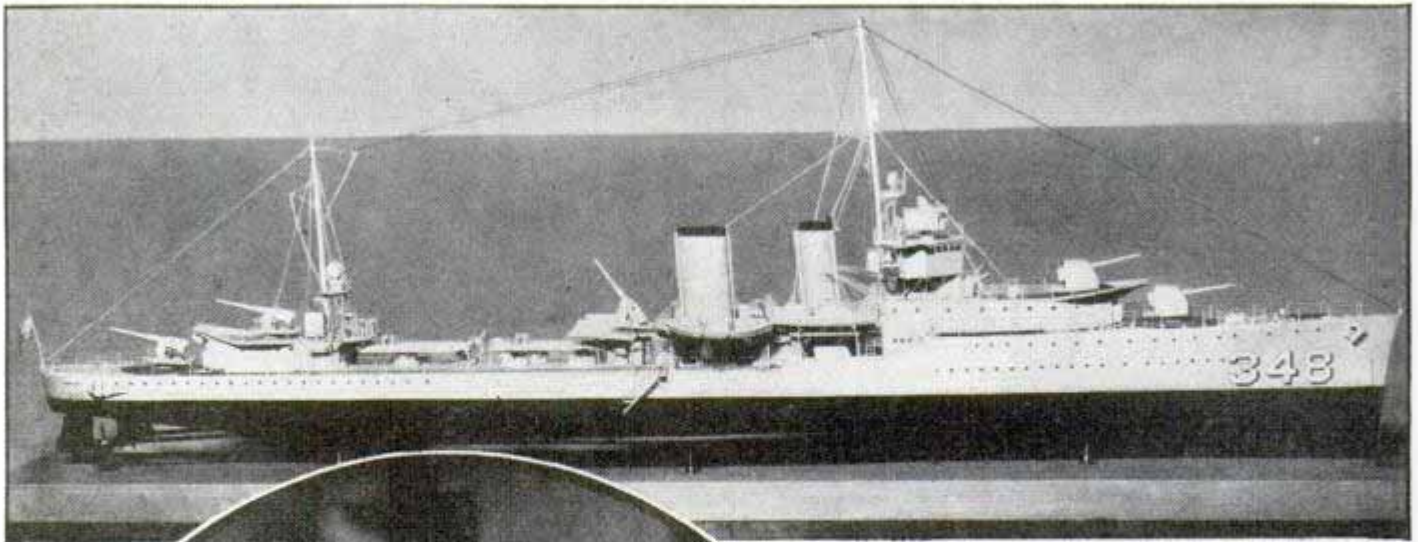
*Top, the model builder with his "Old Ironsides," complete even to beds in the captain's quarters.
Below, model of the 10,000-ton cruiser "New Orleans," built for the navy*

side ladder painted out and the ensign painted in at the battle gaff to show the battleship is at sea.

Put those mantelpiece navy boats in their proper element and perspective and they'd fool an admiral. They ought to look pretty much like the real thing, after all; they're built from original navy blueprints. That sleek, sixteen-foot copy of the aircraft carrier "Ranger" is so true to its original that even Mr. Craven has never been

able to obtain a photograph of the model. The navy guards its secrets.

Building ship models is one of the most popular of workshop "sports." There are plenty of amateurs; not so many "pros." What does it take to be model builder for the navy? Precision, patience. You must be an expert sculptor, brazier, carpenter; skilled at metal working, soldering, sanding, painting. Translating blueprints is no small task in itself.



Above, showcase edition of U. S. destroyer "Farragut." At left, Mr. Craven is finishing carving trailboard of the "Exeter," British two-decker built in 1719

garage, and both of them ran!

About 1925 Mr. Craven switched his love to ship models. Like everyone else, he started with a miniature of "Old Ironsides." Then along came Popular Mechanics with plans for a model of the "Flying Cloud." He went to work on that, won a bronze medal and cash prize from the magazine, became really interested in his back-yard ship shop, and graduated into "the money." He sold a "Flying Cloud" at auction

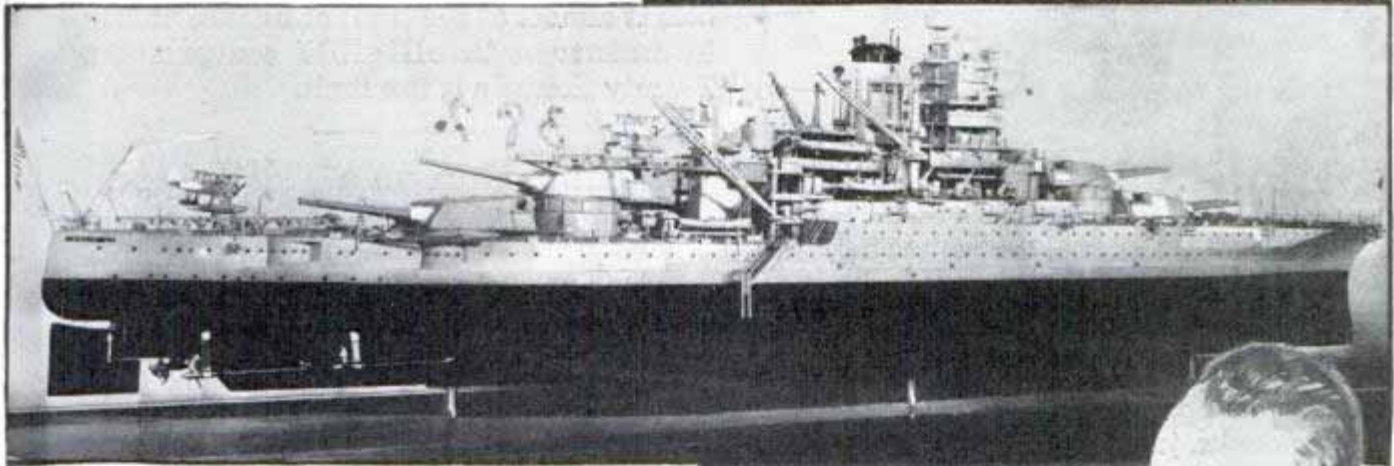
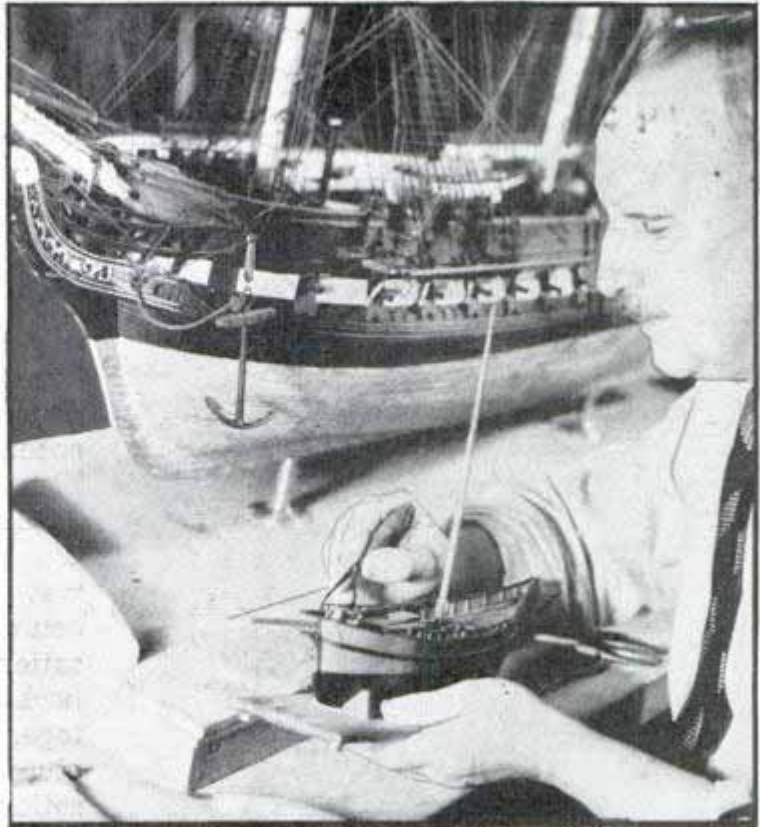
As far back as Frederic Craven can remember, he was always tinkering in a shop. For a while he was more interested in model locomotives than boats. He built his own home, from the foundation up, with the help of a crew of employes from the local factory where he was an engineer. And automobiles—he boasts of making "two Fords bloom where only one grew before." He had an old Model-T crank-winding variety. Self-starters came along and he added one. Demountable rims were born and he bought a set. It went along like that, one thing after another, until he had almost enough for an extra car. He picked up an old body for twenty-five cents, and lo, there were two cars in his

for \$600. Commissions came in from the Rosenwald Museum of Science and Industry at Chicago, and one of his models of the "Savannah," the 120-foot coal and wood burner that was the first steamer to cross the Atlantic (in 1819), is in the mariners' museum at Newport News, Va. The original "Savannah" left the city of that name May 25, 1819, and reached Liverpool, June 20. Three years later it was wrecked on Long Island.

Big money? Well, if you're not selling warship models to the navy, sailing ships are the most popular and the market consists chiefly of museums and collectors. Mr. Craven's top price received for an old sailer was \$3,800, but buyers at that figure

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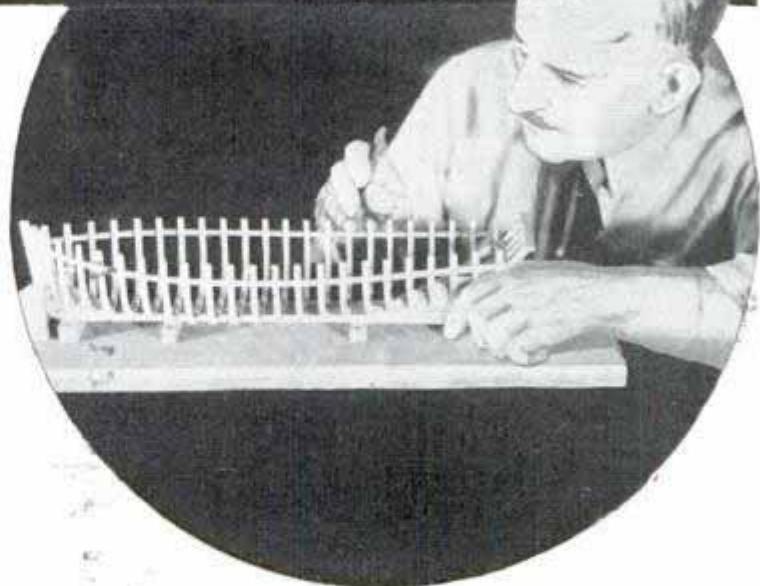
are not plentiful. In the basement at La Porte is a big model of the "Constitution," and you can buy it for, say \$3,000. It may sound costly, but consider that it took 2,052 hours to build. It is shaped from dagame or "lemonwood," a tropical American tree, harder than boxwood. Navy ships are of white pine, but the old sailing vessels require a very hard wood. The sides of the "Constitution" are covered with 1,800 copper plates, "tailor-made" right there in the shop, and treated with sal ammoniac for a weathered-green finish. The rigging is of linen fish line. Windows are of celluloid. If you could look between decks you'd find the cannon all equipped with ropes to check the recoil, just as on the famous old warrior it-



self. And even the captain's quarters are completely outfitted with beds and other furniture.

There are two ways to build showcase ships. Get your plans, even a kit of parts if you like, from a model-supply company and do the assembling job in your shop. Or—do the whole job yourself. Until recent years there were few sets of plans available; models of more or less accurate design were contrived from photographs or paintings of old timers. You can still do it that way if you're ingenious, but you can also buy blueprints of many famous ships; you may obtain photostatic prints

(Continued to page 116A)



Top, with the "Constitution" at his elbow, the shipbuilder works on model of a "pinky," fishing schooner popular about 1870. Center, dreadnaught "Mississippi," in navy building at Washington. Below, frame for English trawler "Alpha"

Marine Decks Decorate Apartment House



Unorthodox apartment building. Note the rounded marine decks and railings

Latest of apartment houses is one with marine decks, just completed on Gezira island, a suburb of Cairo, Egypt. The building, six stories high, shows radically new trends in modernistic design. There are five marine decks above the ground floor. Each deck is equipped with curtains which may be used to give privacy or to keep out rain or wind. The decks are rounded and give an unusual appearance to the building.

"Backseat Driver's" Advantage Shown by Acoustic Study

Studies of the relation between automobile noise and speech intelligibility show that it takes ten times the intensity of speech sounds to carry intelligible conversation from driver to backseat occupant that it does for the latter to talk to the driver. Three positions in a car were investigated and reported by Dr. J. C. Stein-

berg and W. A. Munson of Bell Telephone Laboratories to the Acoustical Society of America. When seated side by side in front, intelligible conversation could be carried on by two occupants at speeds up to sixty miles per hour with little trouble. An increase of sound intensity of only two decibels was needed and this can be obtained by raising the voice. From backseat occupant, humorously referred to frequently as the backseat driver, to the driver, no shouting was needed until a speed of fifty miles an hour was reached. Then a two-decibel increase was required. At sixty miles an hour, a six-decibel rise was needed. From front seat to back, it was necessary to raise the voice to eighteen decibels to obtain intelligible conversation at sixty miles an hour. Thus the backseat occupant has a decided advantage. The result is that the driver soon gives up attempts to carry on the conversation. A sound intensity of sixteen decibels is almost at the limit of human ability to maintain intelligible conversation. Twenty decibels is the limit.

Machine Gun on a Tall Tripod Sweeps Sky to Fight Planes

For defense against low-flying battle-planes that swoop down to attack troops in the trenches, the Dutch army has developed a machine gun mounted on a high



Dutch machine gunners elevate their weapon on tripod "stilts" to maneuver it against attacking planes

tripod. With a longer effective range than the ordinary machine gun, this weapon can be swung freely around to sweep the sky in every direction.

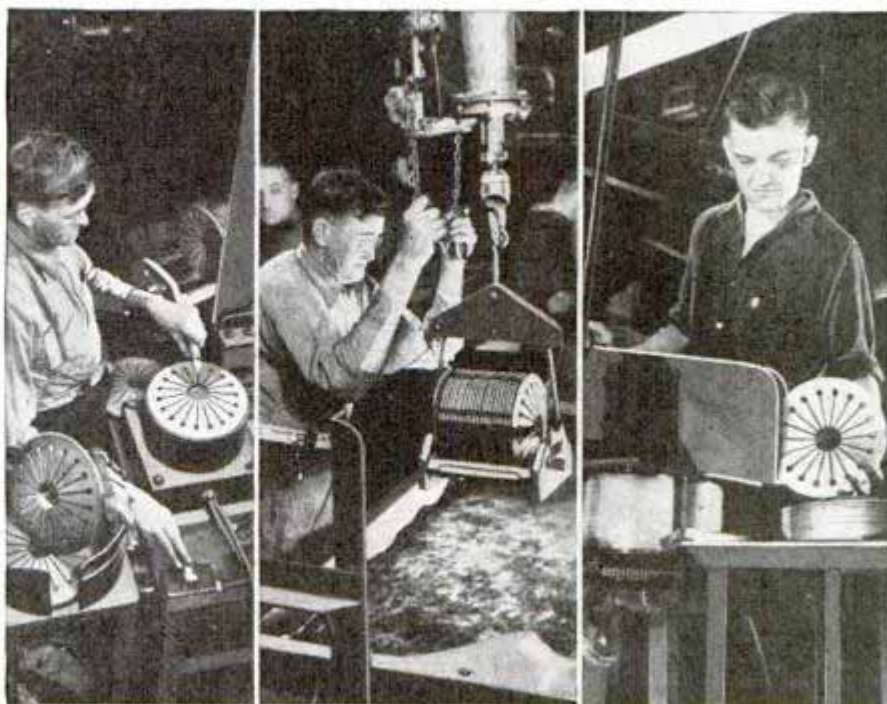
See more 111382
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Electro Mech

Cracks in Clutch Spring Found by Magnetism

Automobile clutch springs are checked for flaws and cracks too small to be visible to the naked eye by a process of magnetizing the springs. First the spring is magnetized. Then a group of springs is put on a rack and dipped in a bath containing fine iron dust in suspension. Upon removal from this iron bath the springs are washed, and if there are any cracks the inspector will find fine iron dust adhering to the edges like a pencil mark. Perfect springs are finally demagnetized by huge electrical solenoids.



Clutch springs are magnetized, arranged in rack to be dipped in bath of iron dust, and finally demagnetized by passing over huge solenoids

es 1396

Tester for Moving-Picture Film Shows Light Density

For testing light density of movie film, a handy device has been constructed by a cameraman. It consists of a metal tube three inches long in which are two focusing lenses and a slot for thirty-five millimeter film. Attached to this is a metal tube

camera tubes



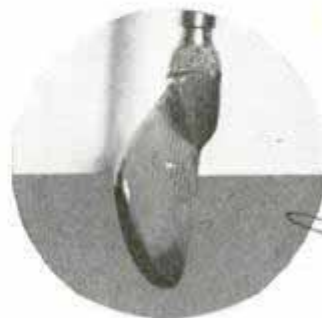
Examining film for light density with the aid of handy testing instrument

holding two flashlight batteries. At the end of this tube is a tiny frosted bulb and a thin ground glass partition. Previously directors and cameramen examined the light tests of film by holding it up to the light. Only single-frame film can be viewed with the device, but its maker believes a similar tester might be made for double-frame thirty-five millimeter color transparencies and film such as that used in miniature cameras.

es 1395

Golf Club with Adjustable Head Is "Bag of Clubs in One"

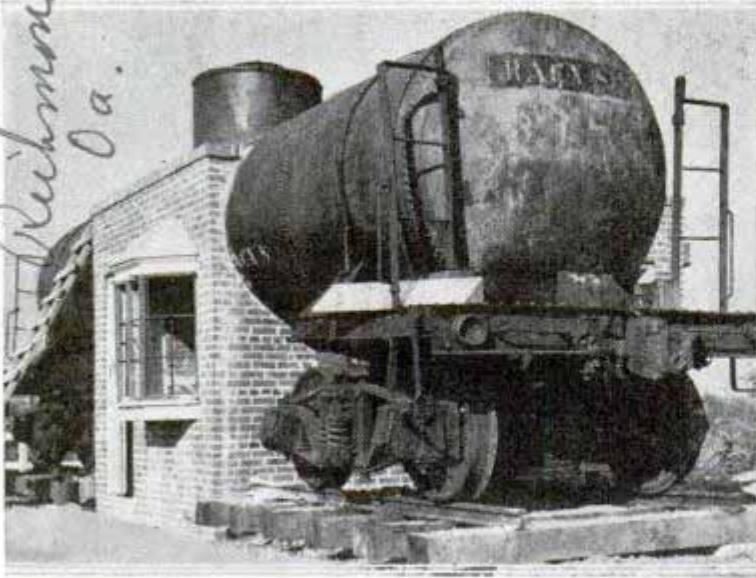
Virtually a "bag of clubs in one" is the golf club with an adjustable head. The face can be tilted to any position from that of the driver to a number nine club, and can also be adjusted for putting. If a wooden club is desired, the adjustable head can be removed and a wooden driver, brassie or spoon screwed on the shaft in its place.



and Harry Fischbeck
Paramount Pictures

New York City
 Retail: Clair Dr. Barton, Air Depot, San Antonio, Tex.

Tank Car Quits the Railroad to Become a Filling Station



Filling-station office built around its midsection, this car is now a stationary tank mounted on a track of its own

Its traveling days over, a railway tank car has gone into retirement in Richmond, Va., in a new occupation where it will meet more people. Mounted on a track just long enough to hold it, the car is now being used as a gasoline tank at a filling station. A small red brick office has been built around the center of the car.

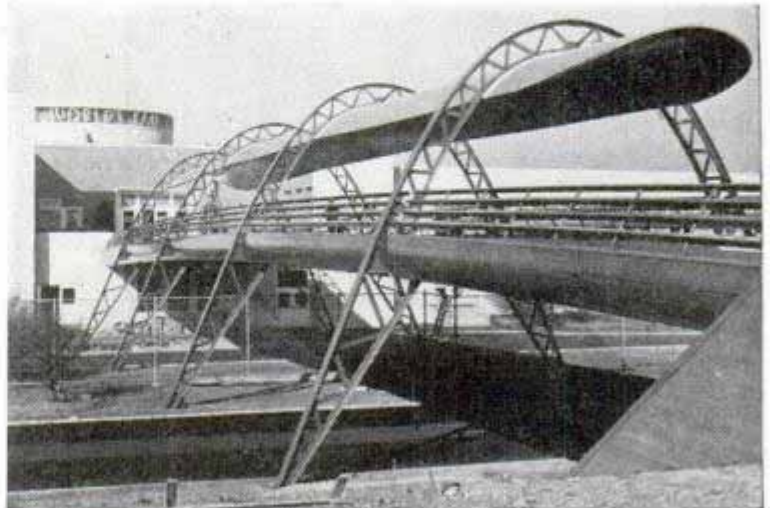
Horse's Tail and Bowling Ball Cause Freak Accidents

There is no really safe place in the world. A ten-year-old boy went into a stable to pet a horse and a little later was found dead. The horse's tail, lashing out, encircled the boy's neck and the long hairs caught like a noose, hanging him. That was one of the odd accidents of the last year recorded by the National Safety Council. Even a bowling alley is dangerous! An Illinois man stuck his thumb and two fingers into a heavy ball, took aim and swung—but the ball did not roll down the alley to scatter the pins. It clung to his fingers, swung around in an arc and struck him over the eye. A hitchhiker was marooned in solid ice for three hours when his peg leg froze in the mud as he thumbed at passing motorists. Gas exploded

under a Chicago street and flipped manhole covers high; one of them soared over a five-story warehouse and dropped down an elevator shaft, killing an operator. Two passengers on the elevator were unhurt. A Missourian bumped into a wire one cold, dark night and couldn't back away; the chill steel had frozen to the fluid of his eyes. When her husband failed to answer a call to dinner but kept on snoring, a St. Louis woman tapped him on the head with the heel of her slipper and fractured his skull. A Cleveland dreamer dreamed he was being chased, and jumped from a second story window in his sleep, but only fractured an ankle. And a little girl in Iowa who didn't want a spanking held a can opener in the way and punctured her mother's hand.

Fair's "Bridge of Tomorrow" Has Lines Like Yacht

Yachtlike in design, a "bridge of tomorrow," now in service on the grounds of New York's world fair of 1939, has "hull," rails and abutment finished in clear-varnished fir. Flooring of Celotex squares and the upper side of a canopy are covered with aluminum paint, while the steelwork is painted blue. The bridge, among the first fair structures to be completed, connects the second floor of the administration building with the site of one set of gates in the central exhibit area of the exposition.



This unusual bridge is a part of early construction at the New York world's fair of 1939

es 141
 Tank Car as a Car
 Richmond Va.
 es 1427
 Public Safety
 Street 9:39

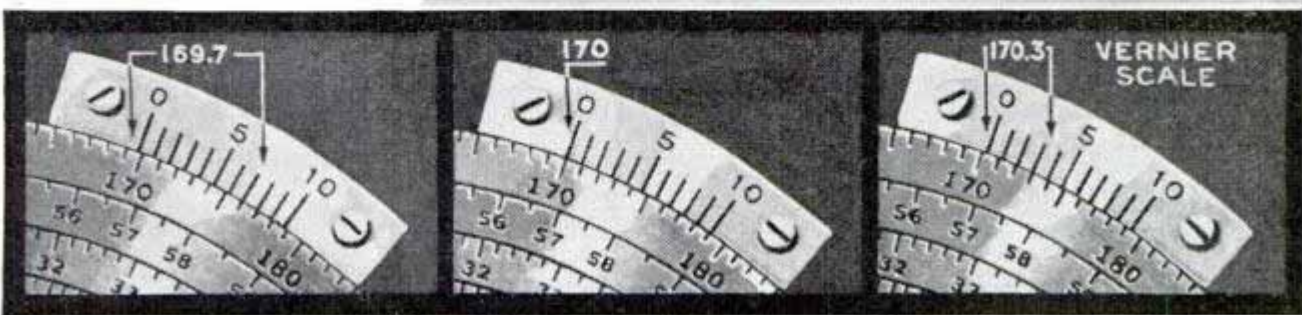
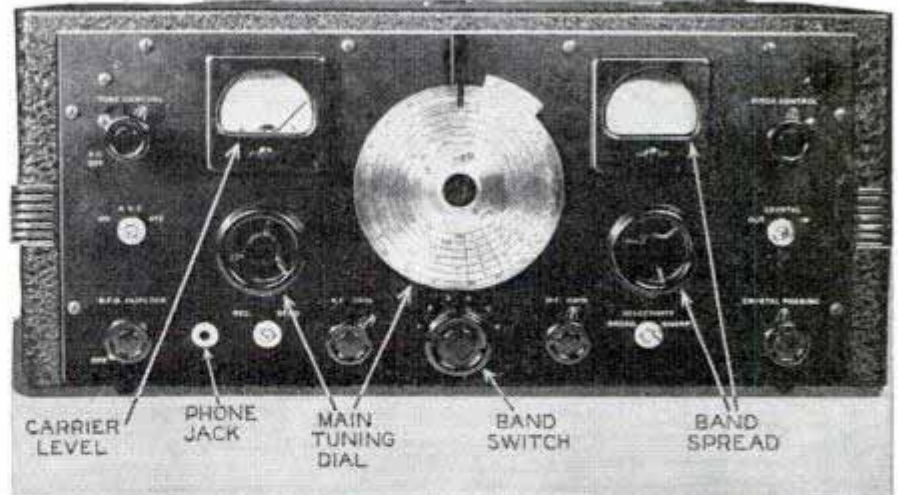
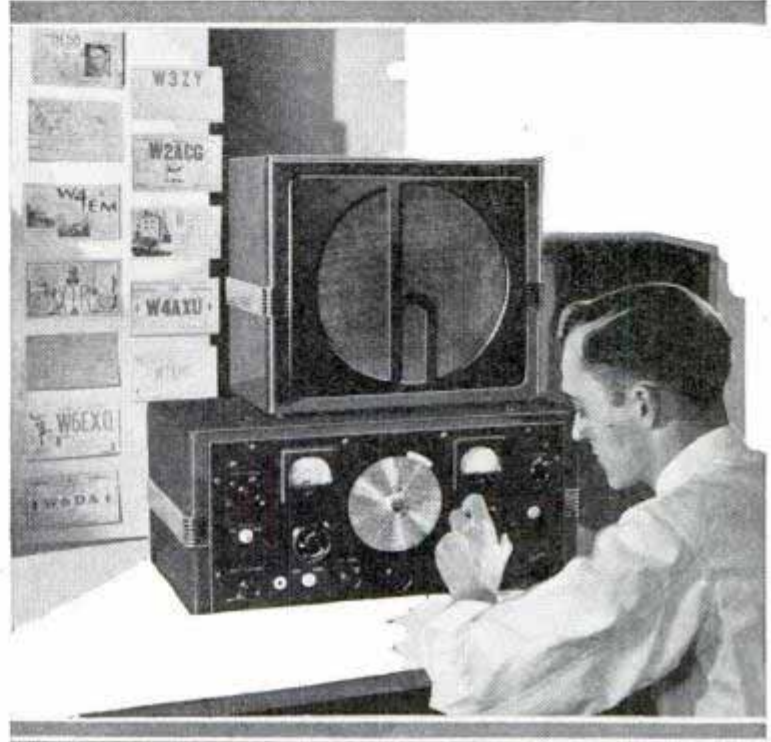


Radio

Six-Band All-Purpose RECEIVER

TUNING from 5 meters to the top of the broadcast band, this 11-tube superheterodyne is designed to meet every requirement of the broadcast and DX short-wave listener, as well as the critical radio amateur. High sensitivity, efficient tone control, independent r.f. and audio-gain controls enable the owner to bring in short-wave stations that are usually buried in interference.

The main tuning and band-spread controls are inertia driven for ease in tuning. A crystal filter provides a degree of selectivity usually found only in special commercial communication receivers. By means of a vernier scale, the "super skyrid-er" main tuning dial may be read and reset to one-tenth of a division, as illustrated below.



*The RadioCrafters Inc.
2641 Louisiana Ave. Chicago*

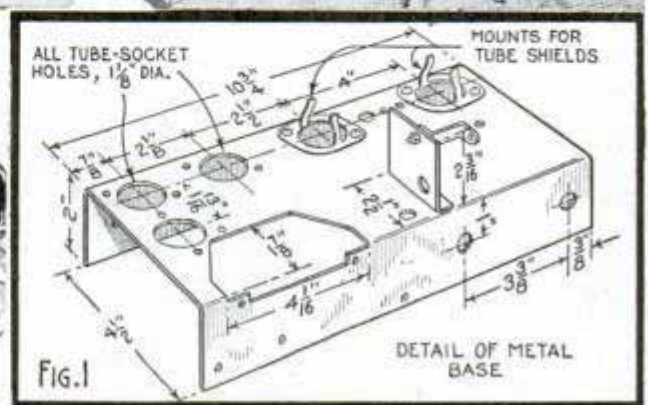
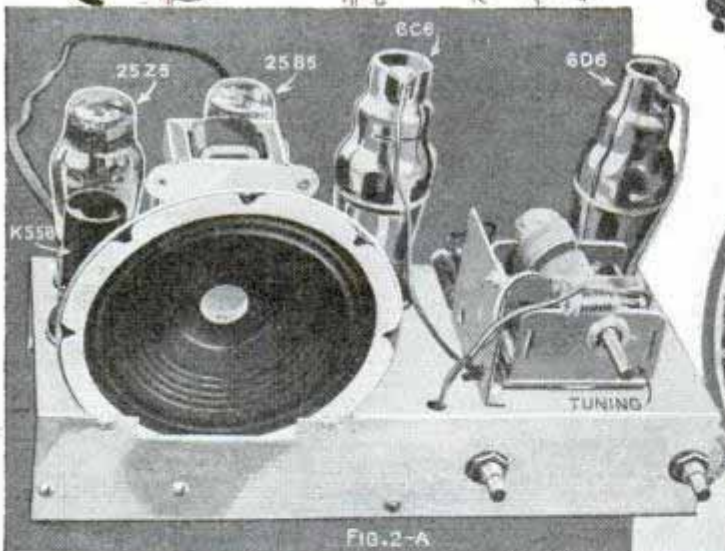
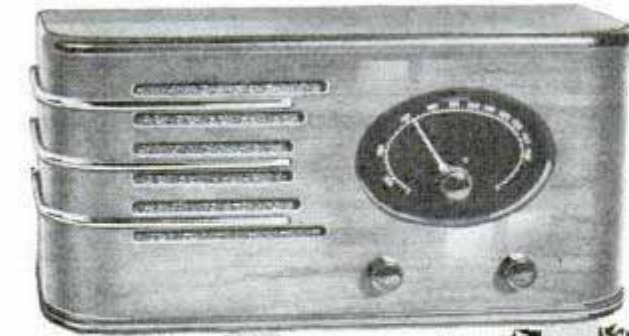
Little Giant PORTABLE

By Frank M. Lund

THIS improved and simplified model of the most popular portable a.c.-d.c. midget broadcast receiver ever described in Popular Mechanics Magazine, now has variable tone control, pickup jacks with switch for phonograph or microphone, and can be built by beginners. It includes police calls, has about 2 watts output and operates on a 20-ft. antenna.

There are several very good reasons for the popularity of this t.r.f. receiver, the original of which was a first-prize winner in a set-building contest held by the Hawthorne radio club, an employees organization of the Western Electric company. It makes an excellent low-cost general-purpose set, has good distance-getting ability, fine tone and surprising volume for a compact receiver.

Operating on 110 volts, either a.c. or d.c.,



AC.-D.C. Receiver

1938 with
*"phono-mike"
 pickup and
 tone control*



the line supply can be any-
 thing from 25 to 60 cycles.

All parts are simple and inexpensive; however, they have been selected carefully and should be as specified to insure maximum results. The metal base, detailed in Fig. 1, can be either homemade or purchased formed and drilled as desired. A simplified wiring diagram is given in Fig. 2 and the schematic circuit diagram in Fig. 3. A ballast tube is employed instead of the

(Continued to page 130A)

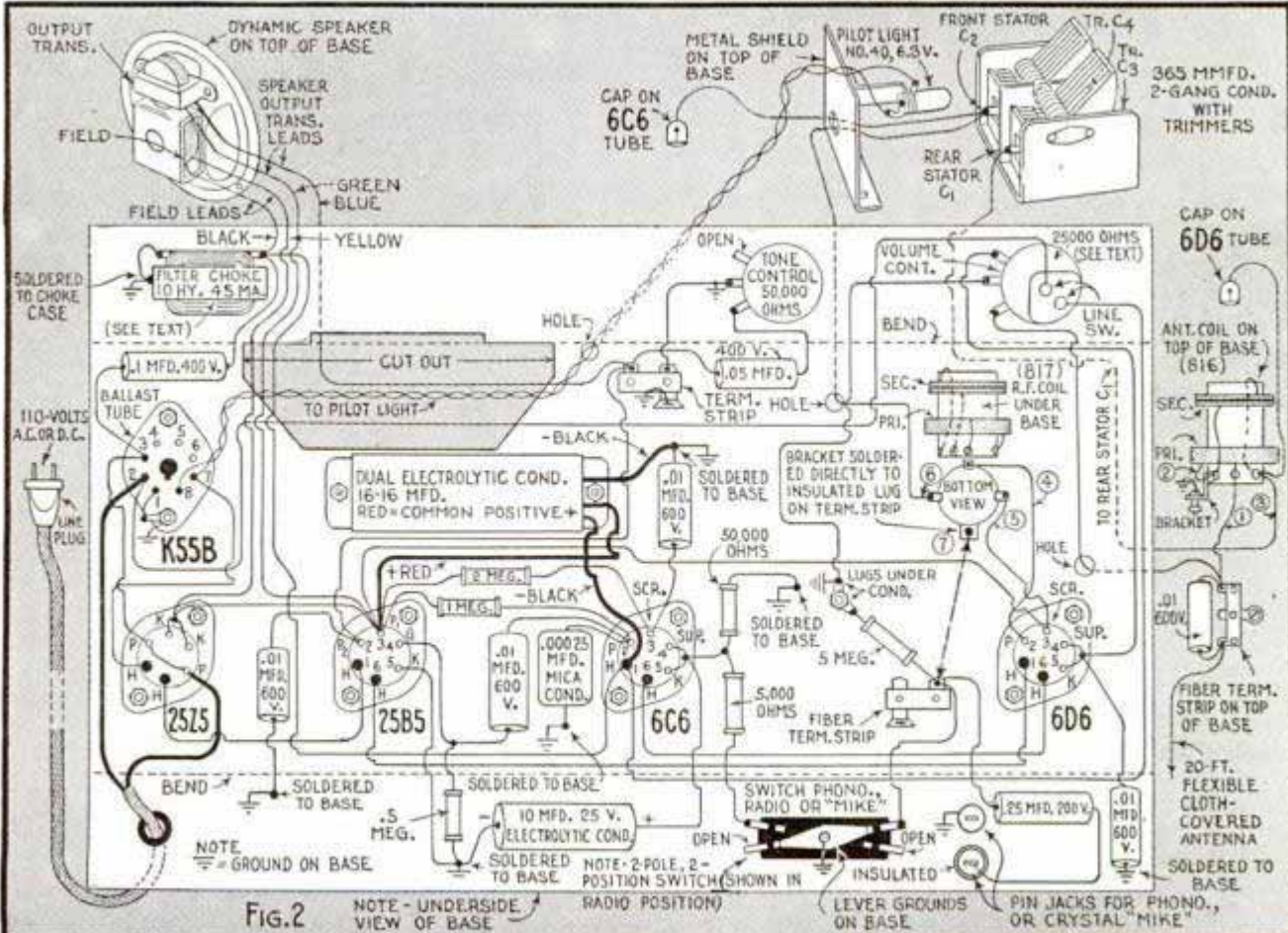
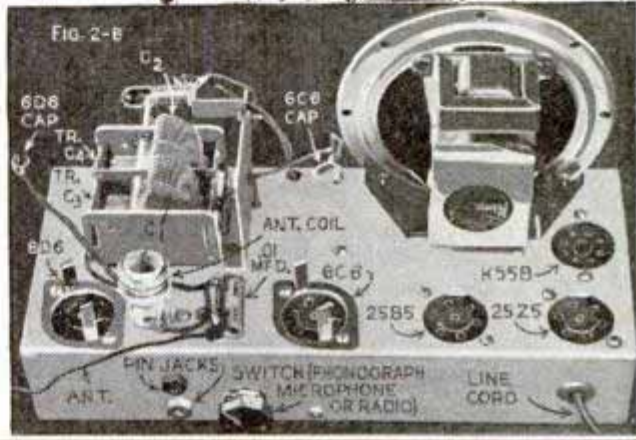


FIG. 2

How to Build a Low-Cost 804 Radiophone

By F. L. Brittin, W9DCX

LOW cost consistent with good flexibility, and a reasonable amount of power output, were the main considerations in the design of this phone transmitter. In the medium-power class, it provides the student amateur with a good healthy 100-watt step up from his first 50-watter in the phone field.

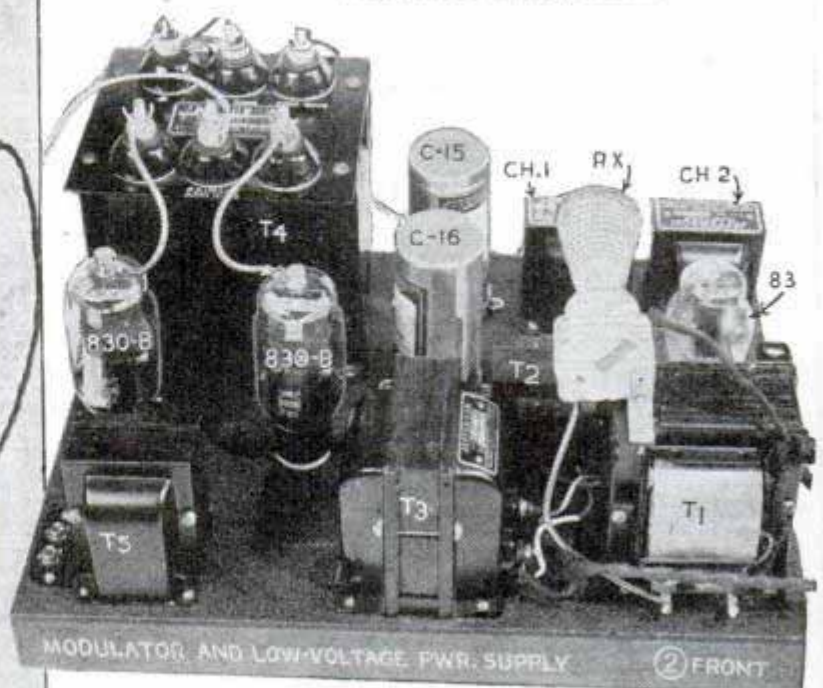
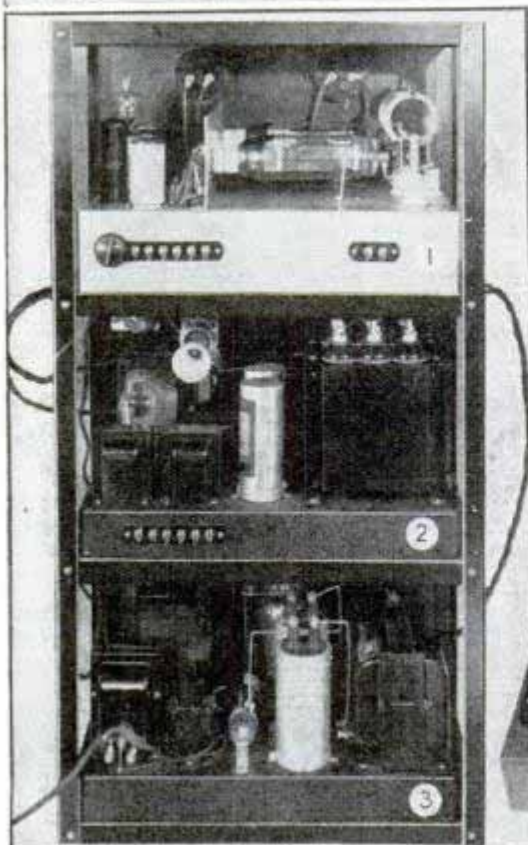
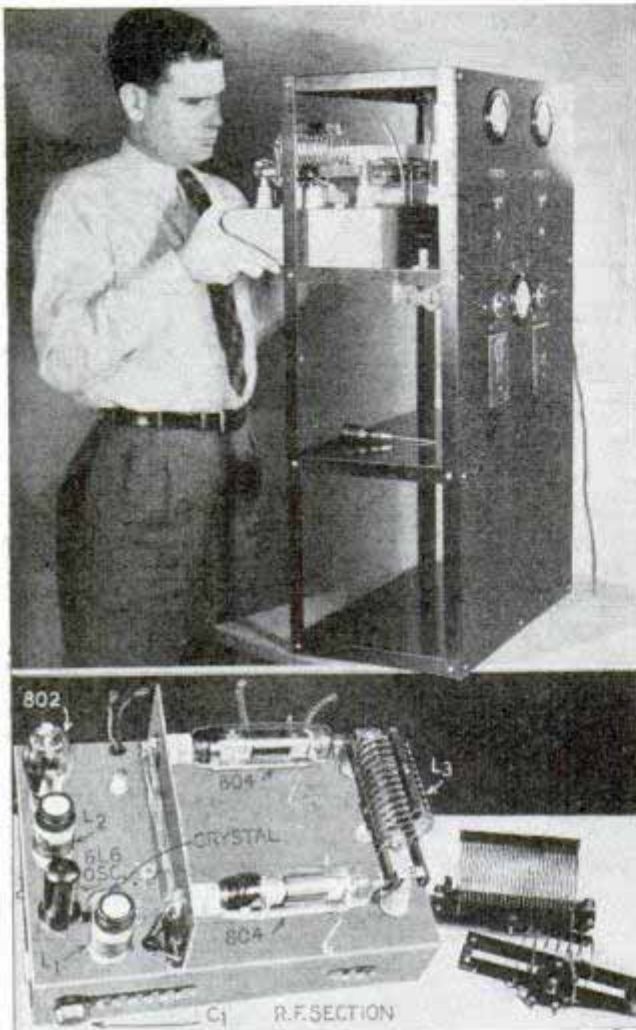
Type-804 RCA tubes were selected for the output stage because of their low excitation requirements and satisfactory power-handling capabilities. Since these tubes do not require neutralizing, it seemed logical to choose a buffer-amplifier tube of the screen-grid type, therefore the RCA 802 was tried and proved to be all that was desired. The type-6L6 as a crystal oscillator gives ample excitation on the 10, 20 and 80-meter bands. Two type-830-B tubes are employed as Class-B modulators.

As only three tuning controls are used, adjustments are very simple; all stages may be tuned to the crystal frequency, or the 802 can be used as a frequency doubler.

The rack shown in the upper photo is available in knockdown form. It is 36 in. high, 19 in. wide and 12 in. deep.

A circuit diagram appears in Fig. 1. This diagram and the photos of the various units should be studied carefully before starting

(Continued to page 136A)

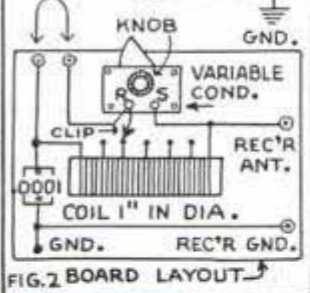
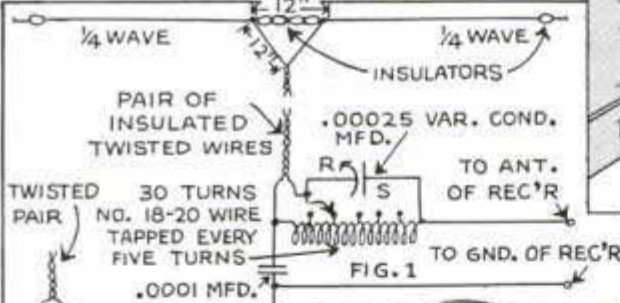
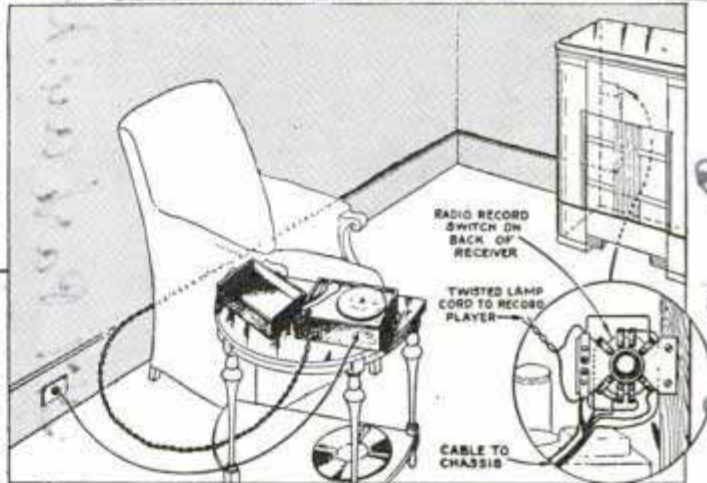


*M. H. Rhodes, Inc.
Rockefeller Centre
New York*

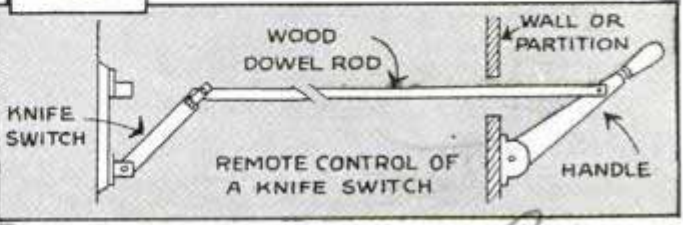
Practical RADIO SUGGESTIONS



Portable timing switch turns current on or off, operating radio or other device at any predetermined time within 10 hours



Above, simplified hookup to convert your radio receiver into a modern radio-phonograph combination. The record player includes switch and necessary parts for installation; either radio programs or recorded music are available by means of the selector switch shown in insert sketch. Left, Figs. 1 and 2 are detailed diagrams for a simple easily tuned unit to couple a twisted feeder line and doublet antenna to older types of receivers. Each section of the flat top should be 1/4 the wave length of the main band desired. Lower left, multi-test speaker requires no field supply, can be used for checking either battery or a.c. sets. Below, a safe method for operating high-voltage switch. Left, bushing on drill limits depth of hole



*Wright-He Carter Co.
St. Paul, Minn.*

*WCA mfg Co
Camden N.J.*

Radio Also Serves as End Table



Designed to be placed alongside a chair or sofa, this 6-tube 3-band superheterodyne receiver does double duty as an end table. All controls are located under a sliding lid. The set provides domestic broadcast reception and short-wave programs on 49, 31, 25, 19, 16 and 13 meters, plus police, aviation and amateur calls. Features include automatic tone compensation and phonograph connections.

Table Set Has Fingertip Dial



Ten of your favorite broadcasting stations can be logged and labeled for instant tuning on the automatic dial scale of this 5-tube receiver which combines

the simplicity of a telephone dial with the smoothness of vernier drive. The dial is illuminated at the point of tuning.

Dynamic Microphone Is Compact

This small pressure-operated microphone requires no excitation or power supply. It is designed to fit a wide variety of common public-address and "close-talking" applications. Frequency range is from 100 to 6,000 cycles.



Low-Loss Material for Radio Parts

Coil forms, tube bases and terminal blocks for high-frequency apparatus are now available made from a new low-loss



Bakelite polystyrene molding material. This thermoplastic material is said to have many electrical advantages helpful to radio engineers and manufacturers of short-wave equipment parts.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a One-Tube DX Short-Wave Flashlight-Battery Receiver. An excellent companion set for the popular flashlight-cell broadcast receiver R-227, described in previous issues. Works with one type-49 tube and three flashlight batteries. Also—**How to Add Push-Button Tuning to Any Receiver**

Intercontinental Radio Corp. 247 Park Ave. New York

20 30 40 50 60

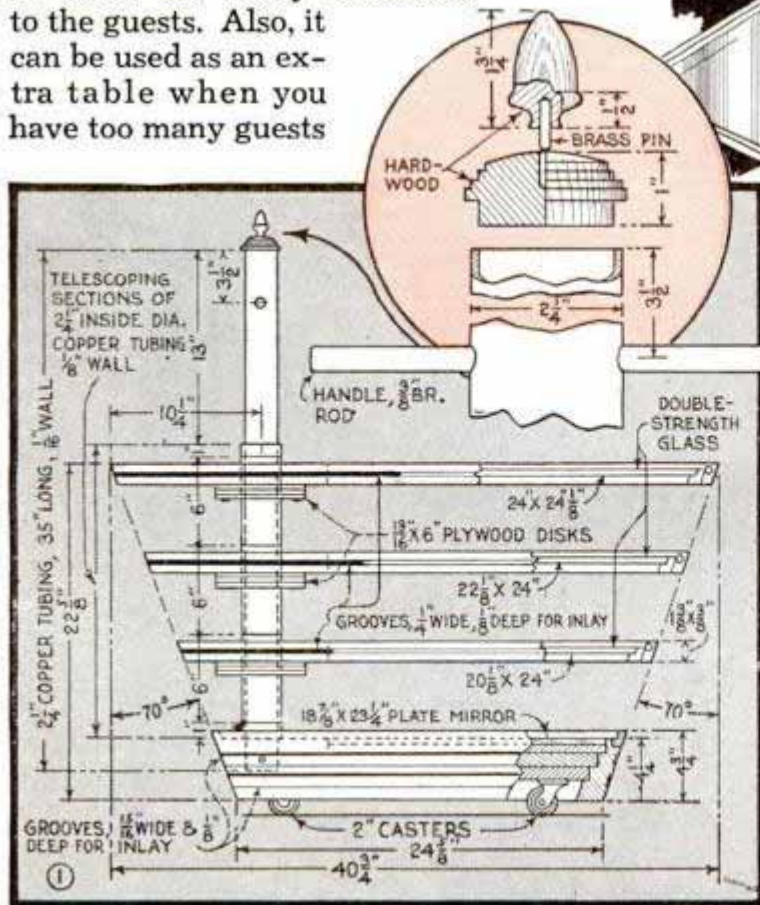
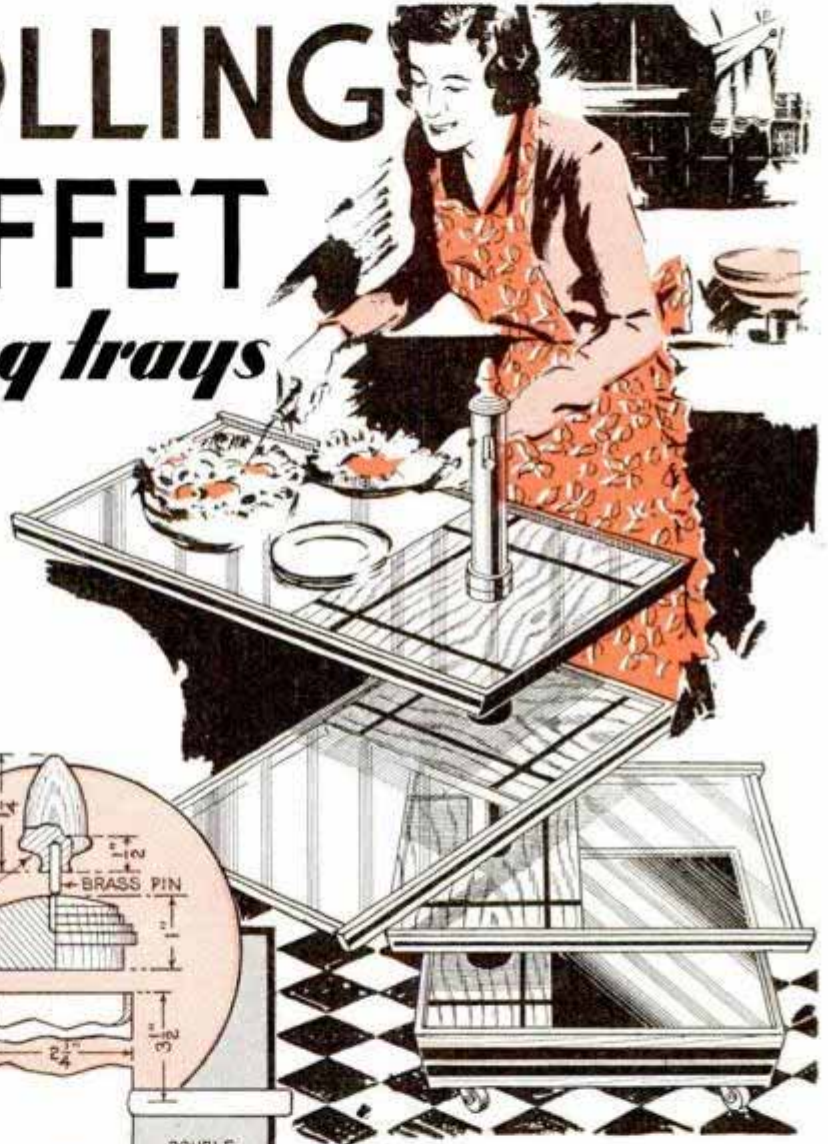


Modern ROLLING BUFFET

has swinging trays

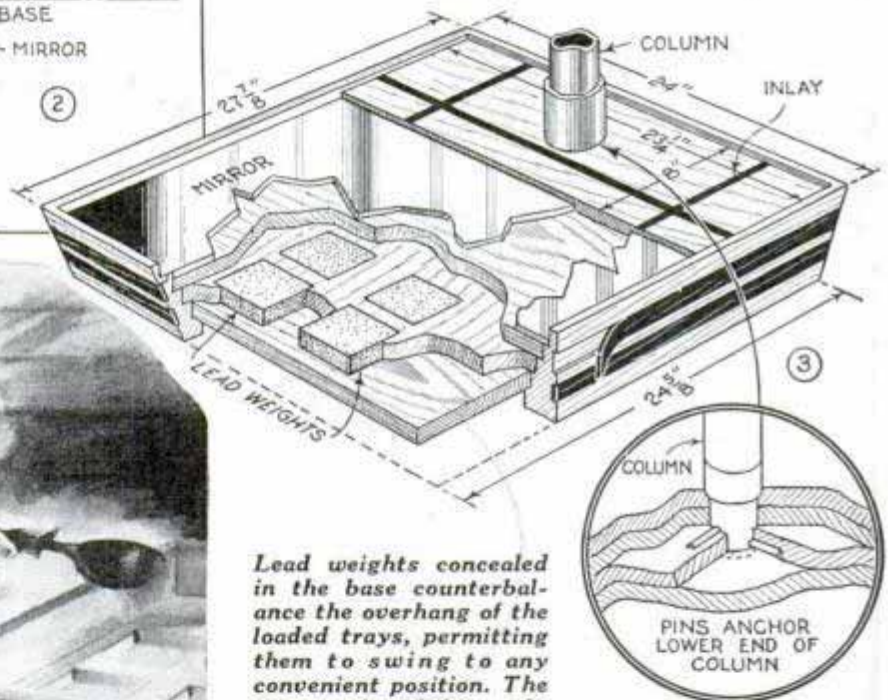
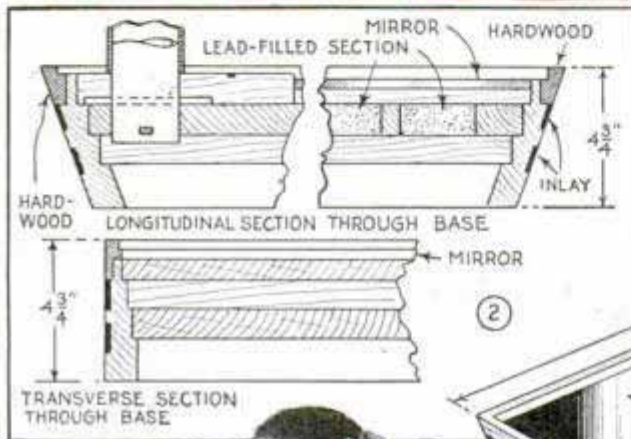
By
OSKAR J. W. HANSEN

WHEN serving refreshments this buffet saves the hostess many steps, and its pivoted trays swing to one side so that all items are easily accessible to the guests. Also, it can be used as an extra table when you have too many guests



to seat them all at the dining table.

The first thing to make up is the metal column on which the swinging trays are pivoted. This consists of two sizes of telescoping copper tubing, the longest piece being 2 1/4-in. diameter with a 1/16-in. wall. This tube slips inside another which is 2 1/2-in. diameter with a 1/8-in. wall. Now if you study Figs. 1 and 6 you will see that the outside tube is cut into three 6-in. lengths, and one 1 in.



Lead weights concealed in the base counterbalance the overhang of the loaded trays, permitting them to swing to any convenient position. The mirror should be cushioned on a layer of 1/16-in. felt, which is held in place with spots of glue

long, Fig. 1. Meeting ends of all sections should be trued up in the lathe. Then the sections can be polished either by holding in the chuck or by plugging the ends with hardwood and mounting between centers. Use No. 000 paper to get an attractive "spun" finish. Coat the work immediately with metal lacquer. As you build up the base "bread-and-butter" fashion, Figs. 2 and 3, the inner tube or column is anchored by transverse pins in the base as shown in Fig. 3. Care should be taken to

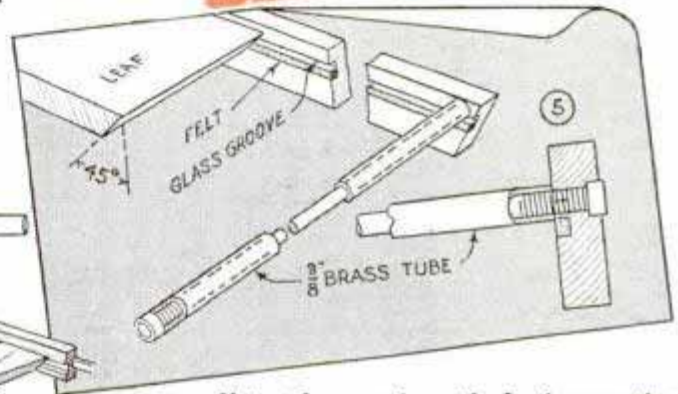
assure a good snug fit as the column must support considerable weight. Next comes the leaves, Figs. 1 and 6. These are made of plywood inlaid as shown and, although they are all the same length, they vary in width as you will see from Fig. 6. Border strips, stop-grooved for the glass trays, are fastened to the edges of each tray with screws passing through holes drilled in the bottom of the groove for the inlay strip as shown. These strips extend to form supports for the glass trays.

Now the job of mounting the leaves. Each of the copper sleeves is drilled as in Fig. 4, to take pins which are inserted the thickness of the wall of the tube and soldered. Then the projecting ends are mortised half into the bottom of the leaf and half into a 6-in. disk as shown in Fig. 6. Screws draw the disk tightly against the

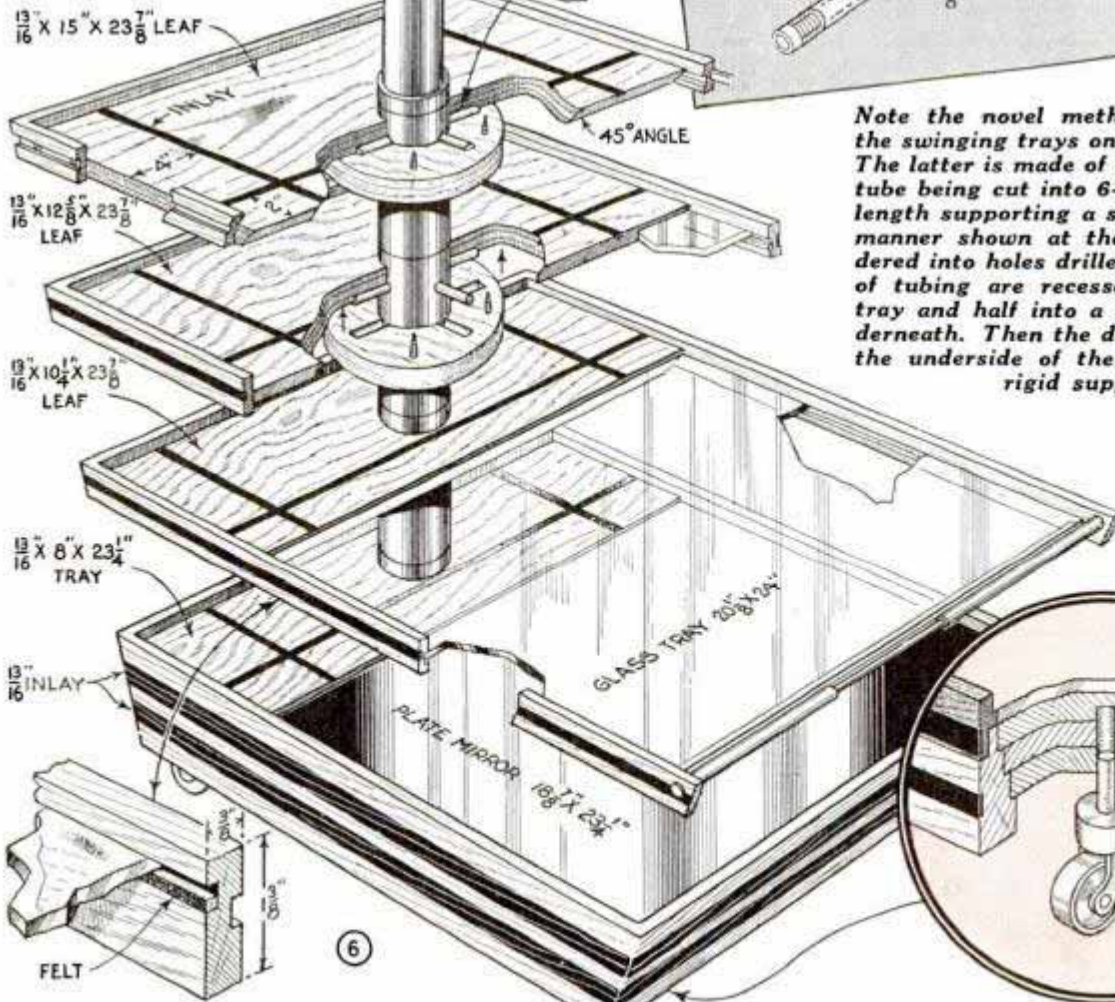
bottom of the tray to form a rigid support. All three leaves are mounted in the same way. Although plate glass is the best for the trays, double-strength window glass can be substituted. In either case the edges of the glass are supported in a groove cut on the inside face of the projecting border strips. The width of the groove must be greater than the thickness of the glass as the latter is supported on a strip of felt which is glued into the groove as in the detail in Fig. 6. The outer ends of the

strips are drawn together with a length of brass rod threaded at both ends and passing through a sleeve of brass tubing as in Fig. 5. The nuts which turn onto the ends of the rod are round, which makes a neater job when countersunk as indicated. They can be made from disks of brass, center-drilled and tapped. The nuts can be turned sufficiently tight without a wrench. All that remains is to fit the base with four casters, turn out the column ornament and handle and set the mirror in the base.

The wood parts will take a French polish nicely. Dampen a lintless cloth with denatured alcohol. Next apply white shellac to the rag with a brush. On top of this place a few drops of mineral lubricating oil. Rub onto the work until the pad becomes dry. Renew the shellac and oil and then repeat the process until the desired polish is obtained. For a still higher polish, first apply a coat of boiled linseed oil, allow to dry for 48 hrs., then continue with the French polishing.

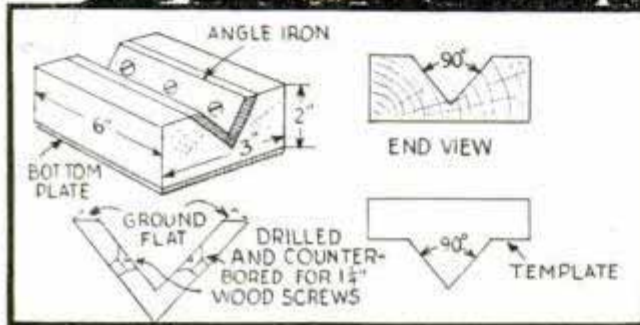


Note the novel method of mounting the swinging trays on a round column. The latter is made of tubing, the outer tube being cut into 6-in. lengths, each length supporting a single tray in the manner shown at the left. Pins soldered into holes drilled in each section of tubing are recessed half into the tray and half into a wooden disk underneath. Then the disk is screwed to the underside of the tray, making a rigid support



6

V-Block for Your Drill Press from Angle Iron

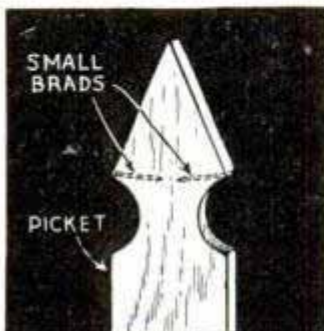


Length of angle iron set in wood block provides a good V-block that you can make with ordinary tools

Here's a V-block that you can make with ordinary tools from a piece of hardwood and a length of angle iron. First, square up the wood block accurately and cut a groove in it to take the iron. Screw the latter in place and countersink the heads. Then grind the edges of the angle iron flat as indicated. If desired to protect the bottom of the block against wear, screw a piece of heavy sheet metal to it.

—M. M. Warren, Monterrey, N. L., Mexico.

Reinforcing Ends of Fence Pickets

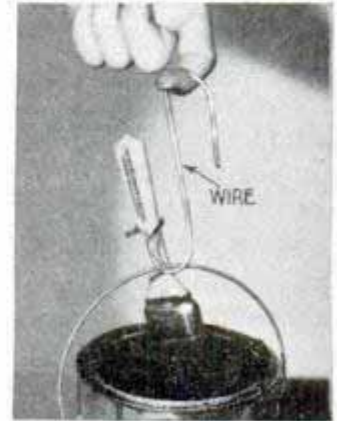


If you make a lawn fence in which the tops of the pickets are cut similar to the one in the drawing, drive a couple brads into each one at the points indicated so that it

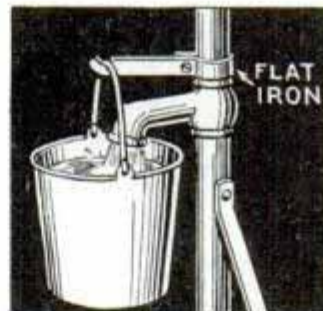
will not split off. It's a good idea to countersink the heads slightly and press white lead into the openings so that moisture cannot reach the brads and cause them to rust after the picket has been painted.

Simple Hook for Paint Pail Also Holds Brush

This simple wire hook will hold a paint bucket and brush on a ladder rung, and allow drippings from the brush to fall into the bucket. The lower end of the hook is bent to a U-shape to engage the brush handle.



Bucket Support on Well Pump to Avoid Splashing Water

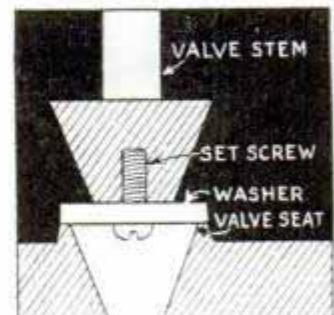


When a bucket is hung on the regular pump spout, wind is likely to spray water over your clothes. To avoid this, one man uses a support made of light flat iron clamped

to the pump so that it holds the bucket close to the spout, as indicated.

Repair for Worn Valve Seats

After the seats in some small globe valves, in the water system of my home, became worn so that they leaked badly, I repaired them as shown. A hole was drilled and tapped



in the lower end of the valve stem to take a screw which held a fiber washer. The washer and screw were taken from an assortment sold in a ten-cent store to repair regular faucets. This makes the same kind

of valve as in the ordinary compression faucet, and while not an ideal repair, it was made without any alteration to the valve and served the purpose for a long time.—Ralph Elizardi, New Orleans, La.

"Electric Pencil" Removes Dust from Inside Camera

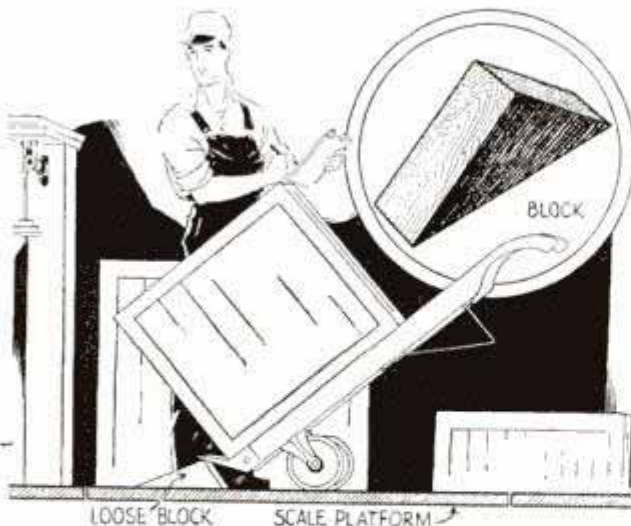


Instead of removing dust from the inside of a camera with compressed air, which might damage the bellows, use a stick of sealing wax which has been rubbed briskly against the nap of a clean rug. This

charges the stick with static electricity and causes it to pick up the dust and lint when it is moved around inside the camera.

Hand Truck Rested on Block While Weighing

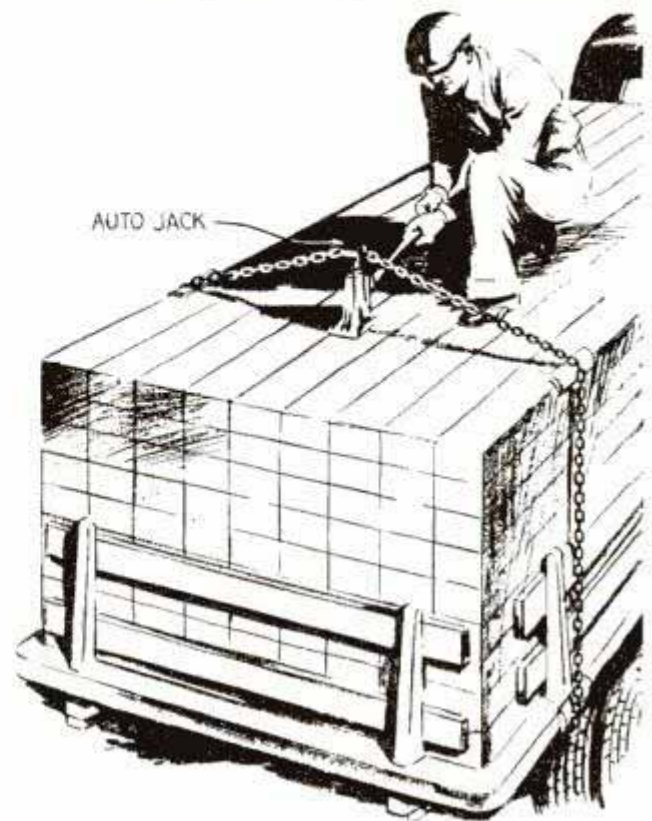
When heavy crates or boxes are loaded on a two-wheel truck and transported to a floor scale, the workman usually has to lower the truck to a horizontal position and then lift it again after weighing. If a



Workman rests truck on block to eliminate effort in lowering and raising heavy load

triangular wood block is placed on the scale platform, the truck may be tilted forward slightly to rest on the block as indicated. The same idea can be applied when opening and closing doors.

Load of Lumber Bound on Truck When Jack Tightens Chain

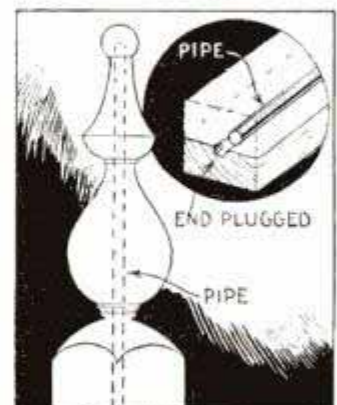


Auto jack quickly tightens chain used to bind large loads of lumber on auto truck

When hauling large loads of lumber, one truck driver tightens the binding chains with auto jacks. The chains are put around the load loosely, after which the jacks are set on top of the load under the chains as indicated.—G. E. Hendrickson, Argyle, Wis.

Wood Turnings Are Reinforced by Lengths of Small Pipe

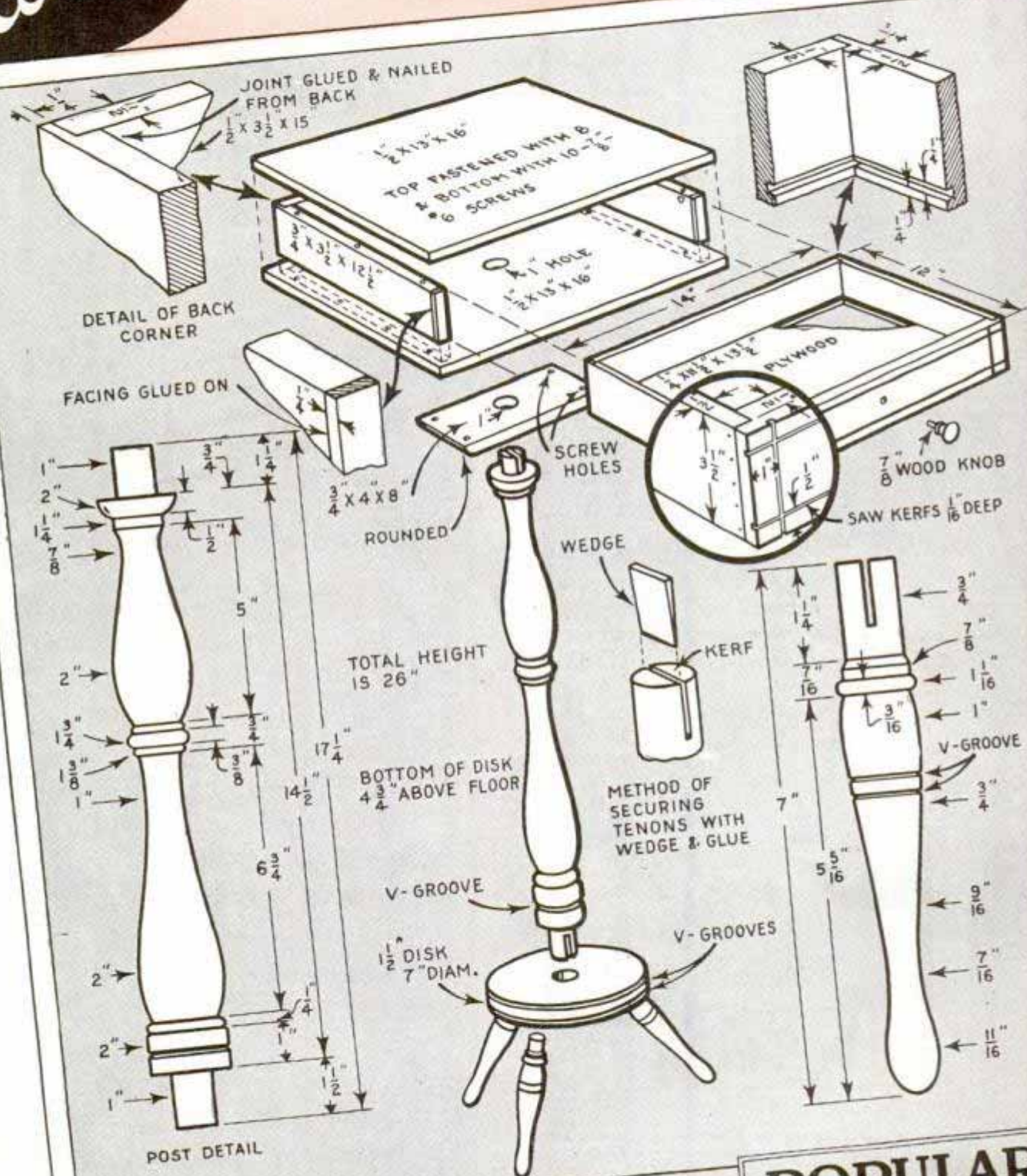
Small or intricate turnings can be reinforced by putting lengths of small pipe in their centers when gluing up the rough stock, as shown in the circular detail. Strengthened in this manner, the stock can be



turned down to small diameters with little danger of breaking it. This enables you to make extreme designs that would be impossible in the ordinary way.

—Axel E. Ogren, Chicago.

Colonial NIGHT STAND



COLONIAL NIGHT STAND
 SCALE OF DETAILS
 TRACED BY H.W.M.
 BY R.O.B.

**POPULAR
 MECHANICS
 MAGAZINE**

has "Spinning-Wheel" feet

MAPLE - BIRCH
OR GUMWOOD

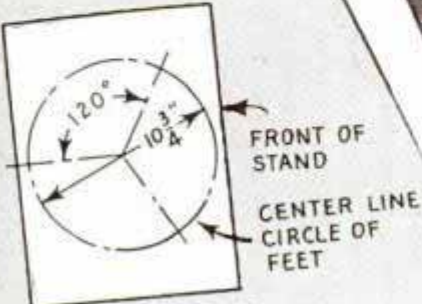
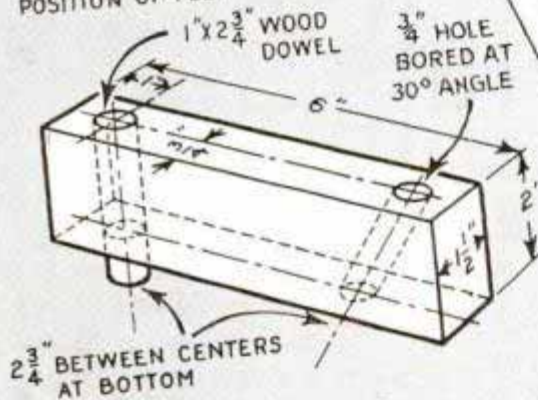
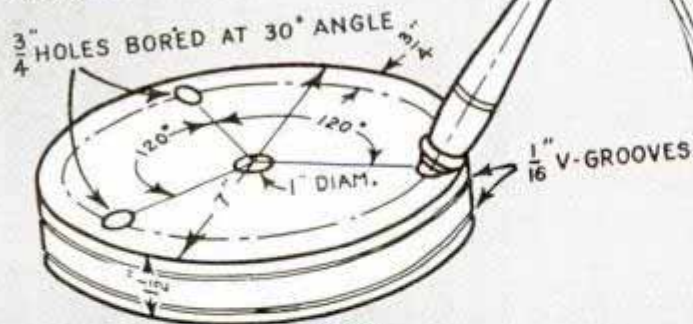


DIAGRAM SHOWING
POSITION OF FEET



DETAIL OF BORING JIG

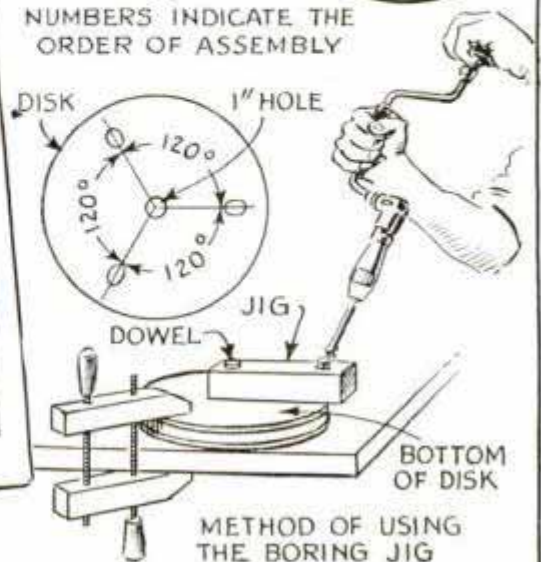
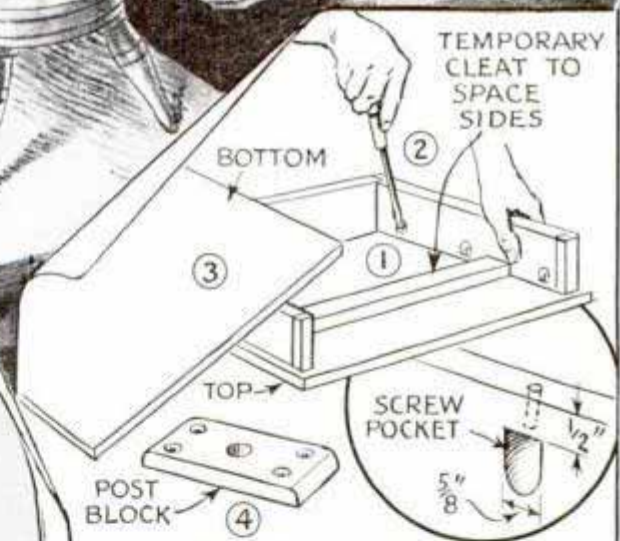


DETAIL OF BASE

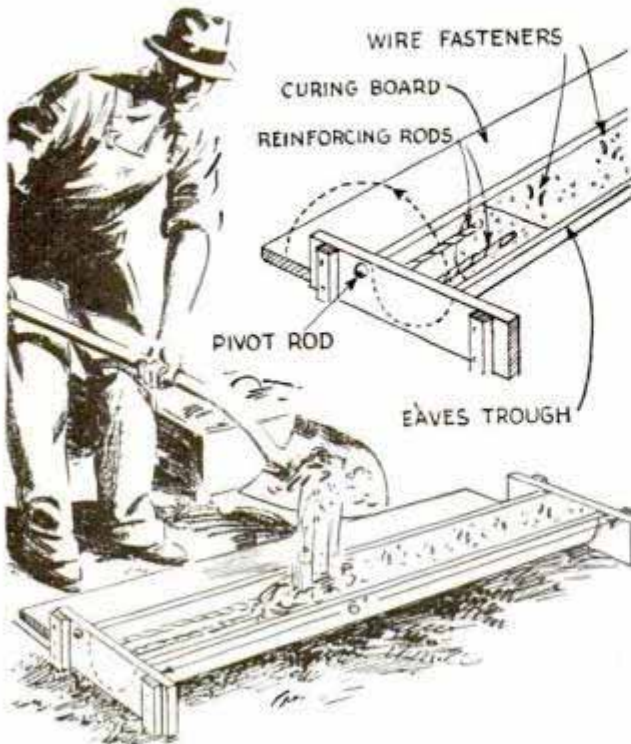
NOTE - ASSEMBLY SHOULD START WITH TOP PIECE AND
PROCEED IN ORDER TOWARD THE BASE

Just the thing to go with your maple bed-
room suite. Makes an ideal lamp stand or
bedside table and has a convenient drawer
for medicine or toilet articles which may be
reached from the bed. Or, you can use it
as a lamp table beside a studio couch or
your favorite chair

974



Concrete Fence Posts Molded in Eave Troughs



Molds swing over to drop "green" posts on curing board after concrete has hardened

To avoid the expense of building wooden forms or molds with which to make concrete fence posts, a Wisconsin farmer used 6-ft. lengths of 4-in. eave troughs. These were pivoted on rods inserted through the rolled edges of the troughs and supported between stationary end boards. As the concrete was poured, reinforcing rods and tie wires were inserted. When the posts had cured sufficiently for removal, each trough was swung over to inverted position to drop the "green" post on a curing board.

Plywood Guard on Emery Wheel Aids in Truing Holes



When fitted with a guard as shown, an emery wheel can be used to good advantage in truing up large holes in sheet metal or boiler plate, especially those formed by drilling small holes and cutting out the center portion.

The guard is simply a piece of plywood about $\frac{1}{2}$ in. thick, cut to a circular shape and drilled to slip over the spindle back of the abrasive wheel. In use, it helps prevent the work from slipping off the wheel.

Spring Steel Formed into Wedge Stops Saw from Binding

Carpenters who work with heavy timbers will find that spring-steel wedges can be used to good advantage in preventing their saws from binding in the wood. Such wedges are formed by bending pieces of spring steel into loops and inserting the ends in the saw cut.

K. J. Abbott, Gonzales, Calif.



Cork Fitted into Lens Opening Prevents Double Exposures



Double exposures, resulting from accidentally bumping the trigger release on a box camera, can be avoided by slipping a cork into the lens opening. Care should be

taken not to use a cork long enough to damage the camera shutter.

Nails Pulled with Carriage Bolt

When it is desired to pull nails from wood without damaging the surface considerably, try using a carriage bolt. The bolt is bent and held as shown and driven under the nail head. By lifting the end, the nail will be drawn sufficiently to be engaged by the claws of the hammer.

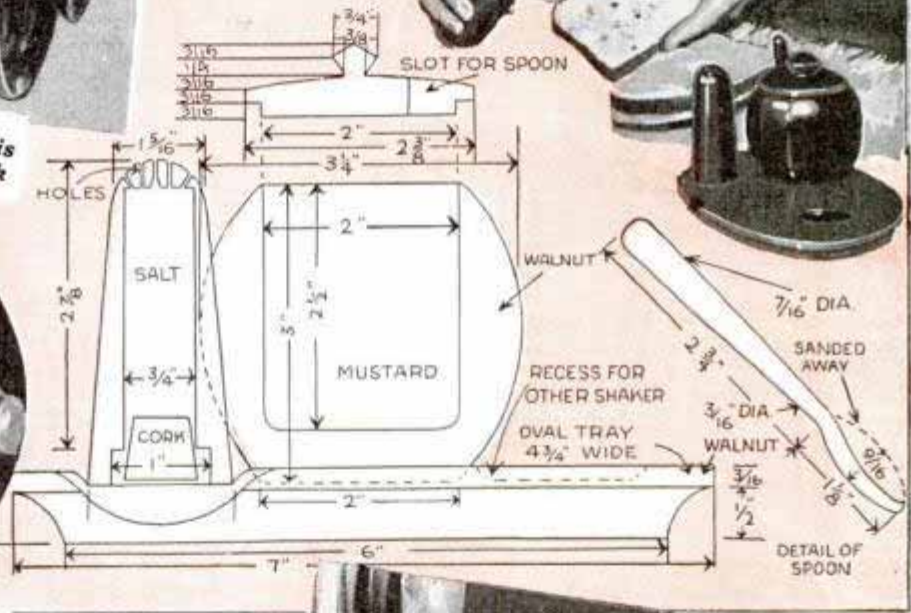
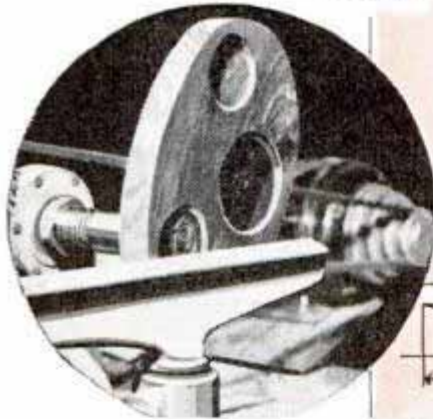


Wooden CONDIMENT SET

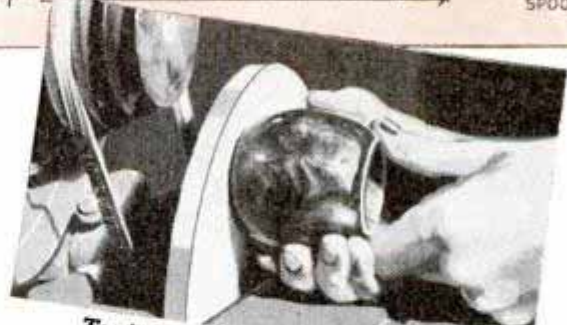
turned on your lathe



Lid for the mustard pot is turned from a single disk



EBONY or rosewood should be chosen for this novel table set because these woods turn out with crisp, sharp edges and can be polished to a high luster. Blocks for the salt and pepper shakers are counterbored as in the dimensioned detail. Then a 3/4-in. dowel is centered in a turned disk on the lathe faceplate to form a chuck for turning the shakers to size. Drill 1/16-in. holes for pepper and 3/32-in. holes for salt. The mustard pot is a simple turn-and-recess job on the faceplate while the spoon is shaped entirely by hand. The base or tray is oval-shaped, 7 in. long and 4 3/4 in. wide. It's first jigsawed to size, then the edges may be molded. Turning three recesses 1/8 in. deep requires three operations, one for each recess.



Truing flat surfaces on the disk sander makes a neat job



The edge of the tray can be molded on a shaper

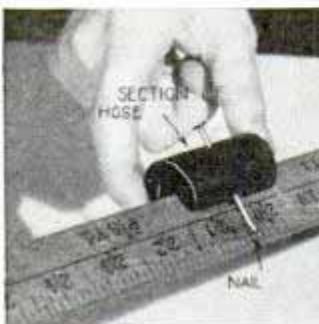
Non-Splash Well Curb Drains Waste Water from Pump



Drain pipe leading into depression in curb under pump spout carries away water

The unsanitary feature of having a bucket under the pump to catch waste water is eliminated with this splashless well curb. When laying the curb a pan is sunk in the soft concrete directly under pump spout until its top is flush with top of the water curb, forming a depression into which water falls. A pipe placed below the surface of the concrete serves as drain. After the concrete has set sufficiently, the pan is removed and strips of metal are placed on edge in the concrete flush with the top of the opening to prevent water from splashing.—Stanley Russell, Vincennes, Ind.

Yardstick Has Sliding Indicator to Mark Measurements



Workmen who frequently employ a yardstick to take measurements, will find this sliding marker an aid in avoiding mistakes. It consists of a short piece of garden hose split at one side, and a sharp nail driven through it to serve as the pointer. The hose grips

Workmen who frequently employ a yardstick to take measurements, will find this sliding marker an aid in avoiding mistakes. It consists of a short piece of garden hose split at one side, and a sharp nail driven through it to serve as the pointer. The hose grips

the stick securely so that accidental movement from position is not likely, yet it may be slid easily along the stick.

Pot-Lid Holders Are Formed from Galvanized Wire

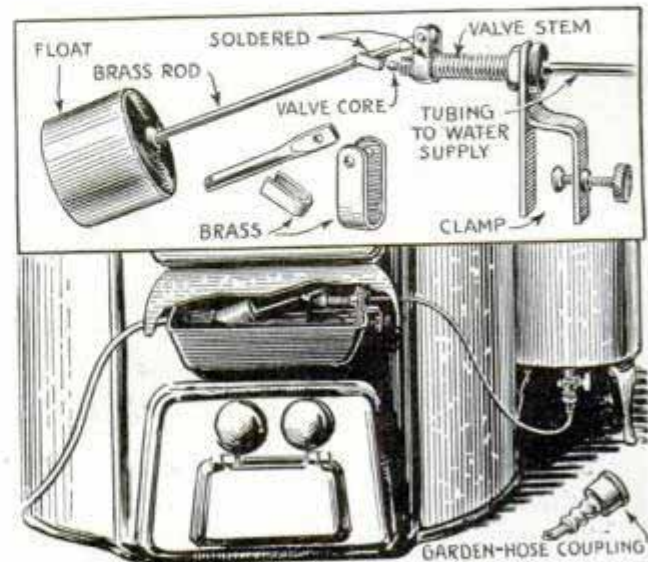
Pot-lid holders that can be attached to a wall in the pantry or to a door in a cupboard are formed easily from lengths of galvanized iron wire as indicated. Length of the wire needed will be determined by the size of lids. It's a good idea to first shape the holder from small wire that is easily bent and then use it as a pattern to make one from heavier wire.

—Mrs. Ida E. Merchant, Bend, Ore.



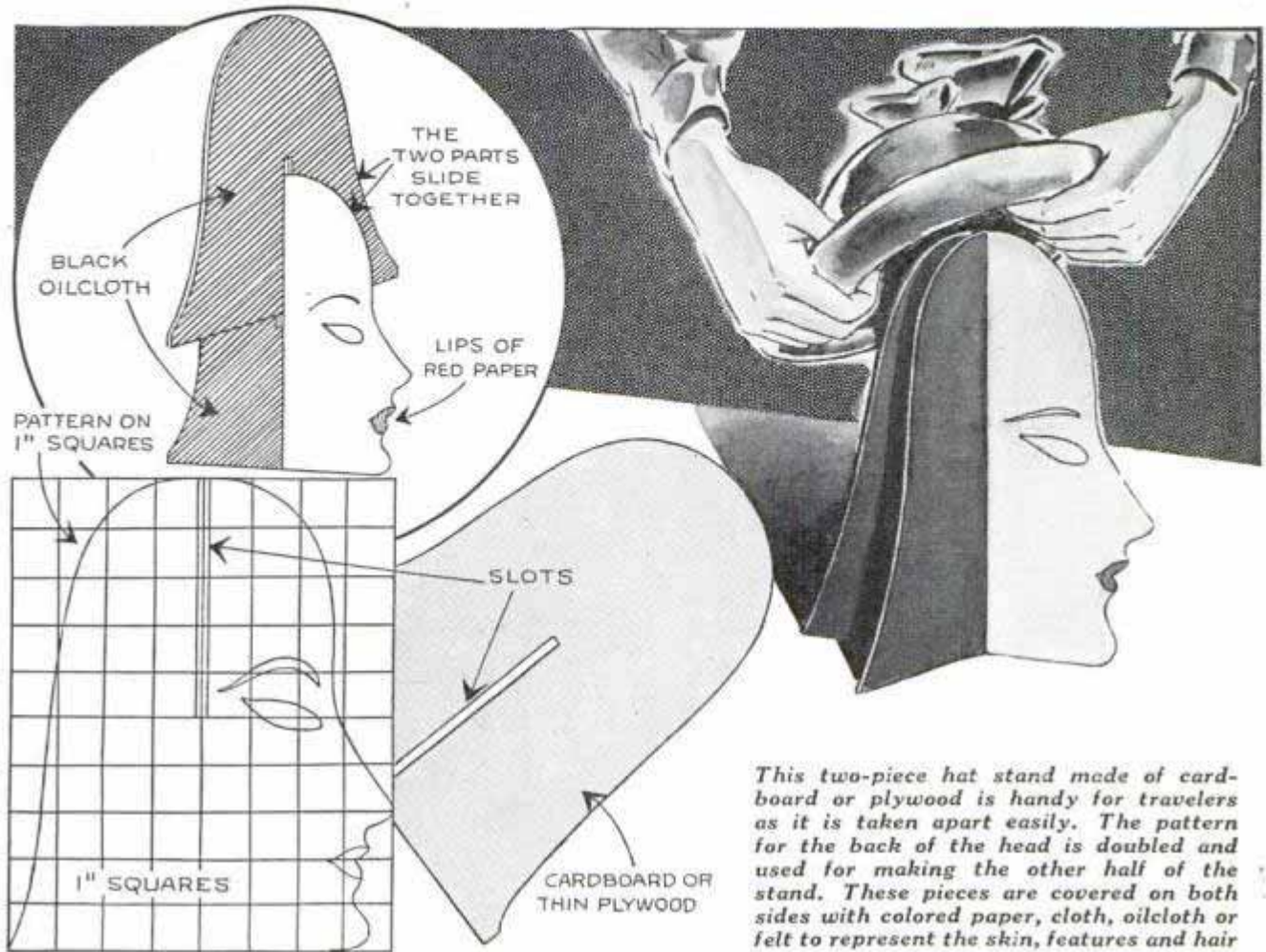
Furnace Water Pan Kept Filled by Automatic Valve

Utilizing the float from an old carburetor to depress an auto tire valve, this automatic water valve keeps a furnace humidifying pan filled to the proper level. Parts, as shown, are assembled and the unit clamped to the furnace pan after which the float is adjusted and an overflow is provided. The only attention required is an occasional changing of valve cores.—M. L. Harmon, South Bend, Ind.



Daily job of filling a furnace water pan can be eliminated by installing this automatic valve

Traveler's Hat Stand Comes Apart for Packing

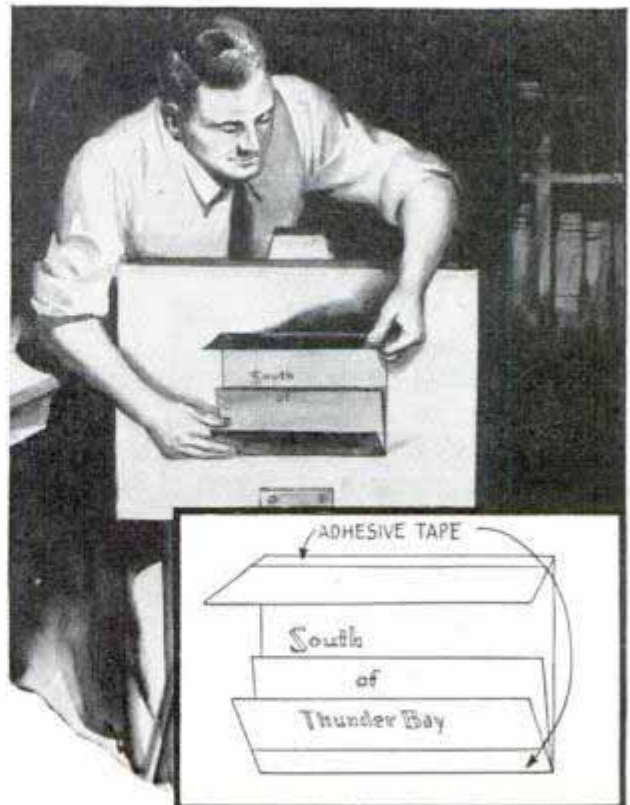


This two-piece hat stand made of cardboard or plywood is handy for travelers as it is taken apart easily. The pattern for the back of the head is doubled and used for making the other half of the stand. These pieces are covered on both sides with colored paper, cloth, oilcloth or felt to represent the skin, features and hair

Folding Title for Home Movie Gives Odd Effect on Screen

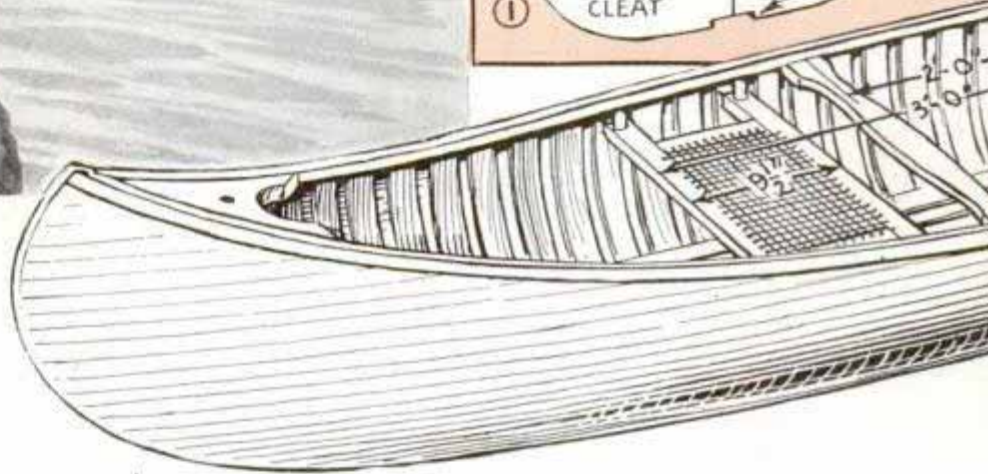
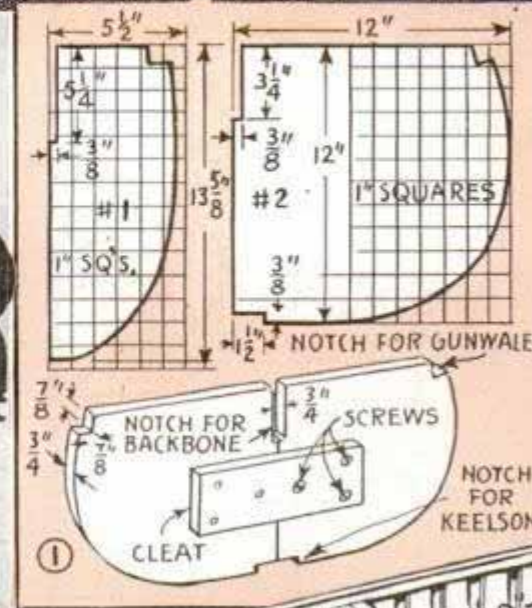
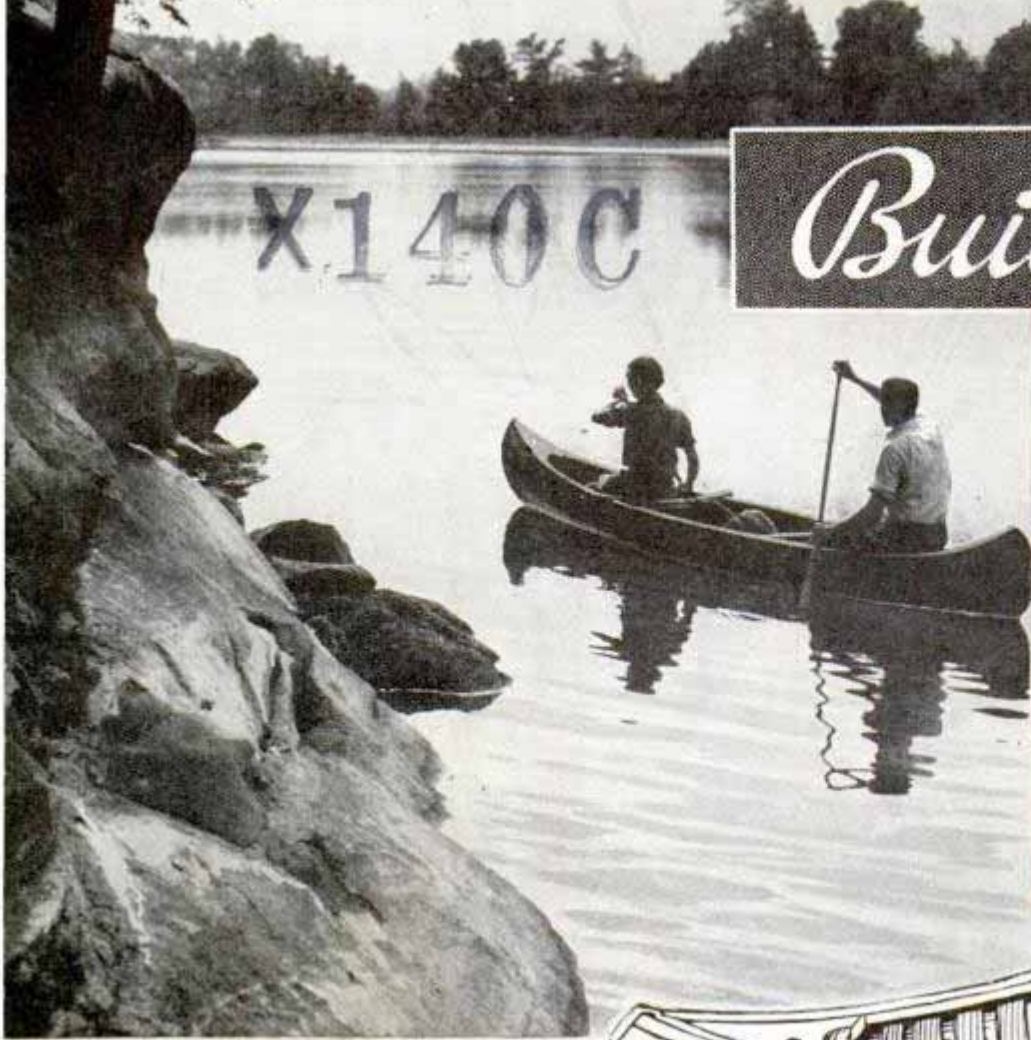
Amateur movie makers who like to experiment in producing novel title effects, will find this method gives an interesting variation. The title is lettered on three separate cards of different sizes, which are hinged together at the bottom with adhesive tape, and the introduction is lettered on a fourth card hinged to the top edge of the largest card as shown. In use, lift the card carrying the introduction, start the camera and fade in the part of the title on the larger card. Then slowly lift the second and then the third card after which the introduction card is brought down, followed by a fade-out. If the title is photographed over a picture background, the double exposure will seem very striking.

☐ Short, illustrated articles are always needed to fill these pages. We are looking for material that is original, practical and of interest to the majority of our readers. Address Homecraft Editor.



X140C

Build Your



63 P. 81 2.
8/11.

By
R. O. BUCK

WITH its low ends and flat bottom, which extends well up into bow and stern, this 16-ft., Canadian-type canoe is well adapted to the needs of the average builder. It is used by the forestry service because of its steadiness on the water, ease of paddling and the fact that it is little affected by cross winds on account of its wide beam which is 33 in. amidships. The weight of the finished canoe will be about 70 or 80 pounds.

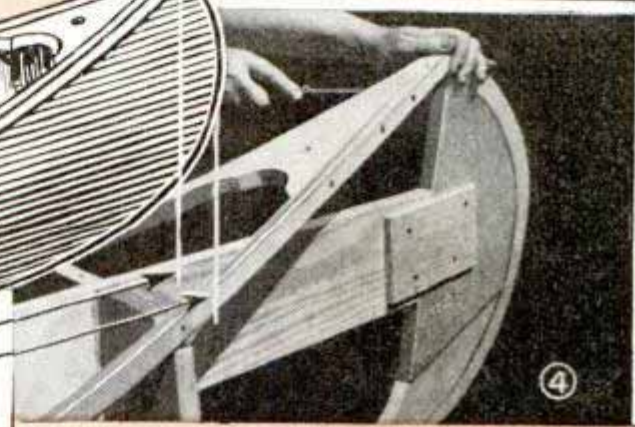
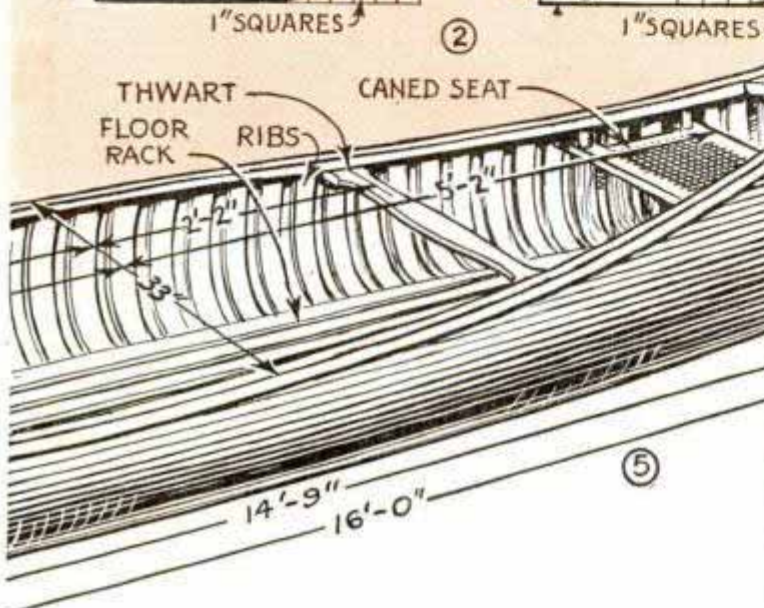
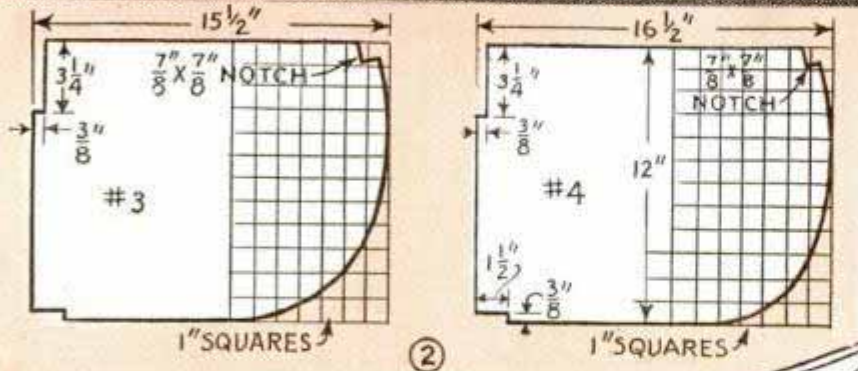
Construction begins with a temporary framework consisting of a set of molds and a backbone, to which the molds are fastened. Paper patterns are made from the squared drawings, Figs. 1 and 2, to trace the outline of the molds on the stock. Each mold is made in two halves, fastened together temporarily with cleats. As both ends of the canoe are identical, two molds of each size, with the exception of the cen-

ter one, are required. The backbone is a piece of 3/4-in. stock, 5 1/4 in. wide and 14 ft. 6 in. long on the upper edge and 14 ft. 4 1/2 in. on the lower edge. See Figs. 3 and 7. The keelson is a piece of clear, straight-grained ash or oak, cut to size and tapered at each end as shown in Fig. 7.

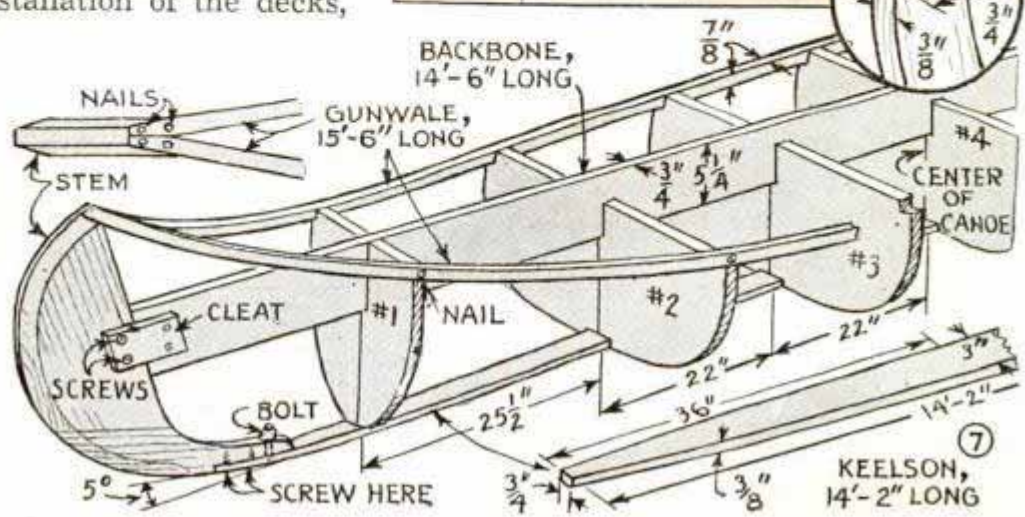
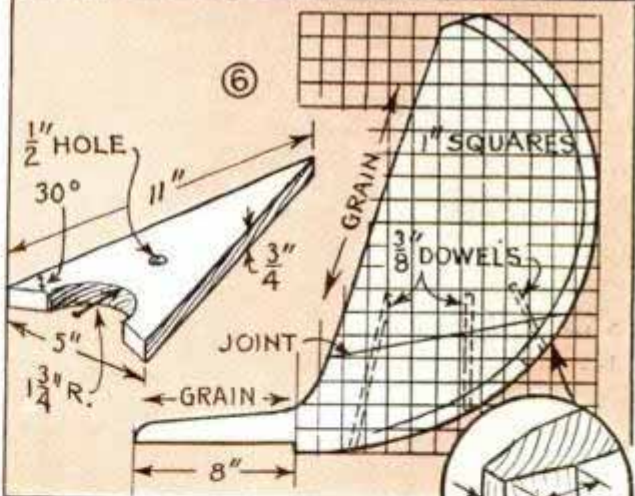
Bending canoe stems is a cranky job, even with special equipment for the business, so you use stems built up from regular stock as in Fig. 6. The grain should run nearly at right angles as in Fig. 7, and casein glue and dowels should be used in the joint.

Assembly is started by locating and nailing the molds in position along the backbone, as in Figs. 3 and 7. The frame is then turned over and the keelson nailed temporarily to each of the molds, after which the stem pieces are screwed between the cleats at the ends of the backbone, Fig. 7.

Own CANOE



The ends of the keelson are bent down to meet the stem pieces, where they are fastened permanently with brass screws and bolts as indicated. The gunwales running from stem to stem are made of straight-grained ash. They should be wrapped with rags and soaked with hot water until they become pliable. The ends are beveled and fastened permanently to the stem pieces with nails. The installation of the decks, Figs. 5 and 6, greatly strengthens the framework and aids in drawing the gunwales to shape. The decks are fastened with brass screws as in Fig. 4. Now, four ribbands, equally spaced and reaching from stem to stem, are screwed to the molds on each side of the

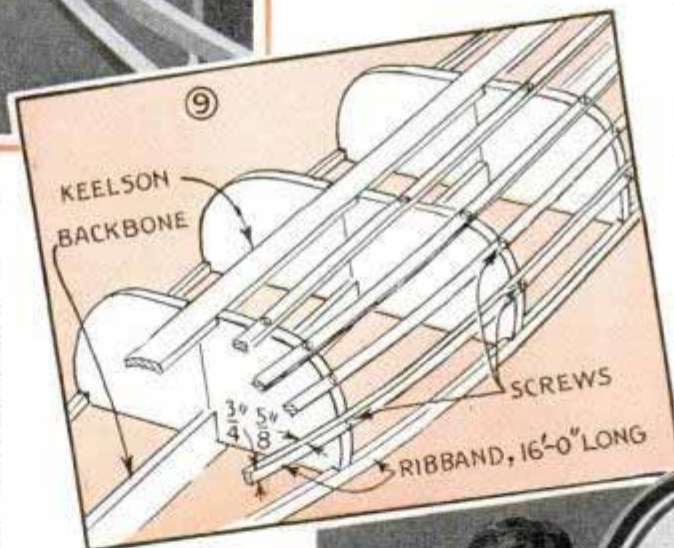




keelson as shown in Figs. 8 and 9.

Although the 2-in. white-cedar ribs are $\frac{3}{16}$ in. thick instead of the usual $\frac{1}{4}$ or $\frac{5}{16}$ in., this variation does not weaken the construction as the ribs are spaced 1 in. apart to compensate. Steaming, Fig. 13, is necessary to make them sufficiently pliable to take the bends. Each rib should be long enough to reach from gunwale to gunwale over the outside of the ribbands. Begin at the center and install each rib as shown in Fig. 14, drawing it into position with C-clamps and nailing at the keelson and gunwales, starting at the center of the canoe and working toward the ends. The ribs in front of the first mold are bent so sharply that it is practically impossible to prevent them from splintering. Where a rib comes over a mold, it is simply spaced out and omitted temporarily, Fig. 15, until the molds have been removed.

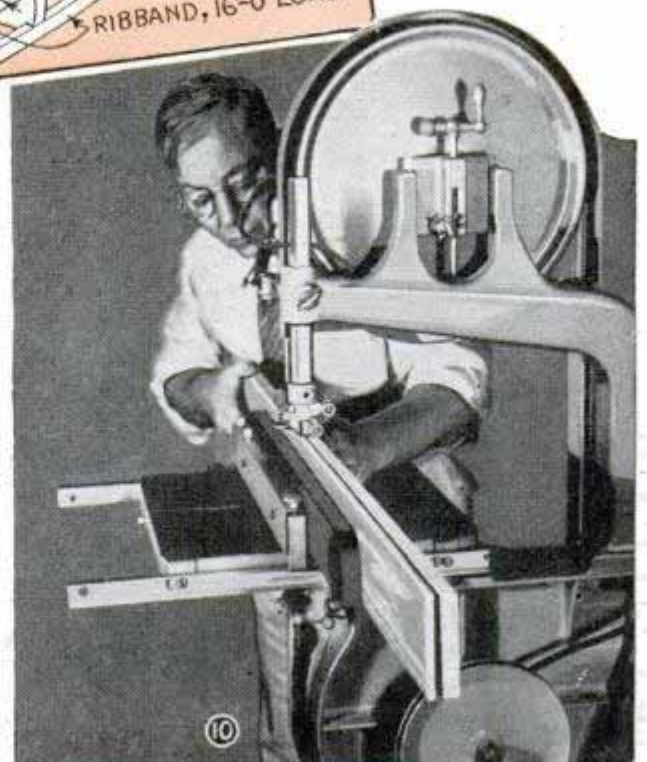
When the ribs are all in place, the ribbands are taken off, making the job ready for the $\frac{1}{8}$ -in. cedar planking. If your band



saw is equipped with a ripping fence you will be able to save money on the ribs and planking by resawing them yourself, as shown in Fig. 10. The planks are soaked for several hours, then the first full-length plank is laid with the edge parallel with the center line of the keelson, Fig. 11, using clamps to draw it into place. Copper nails are used for fastening the planking to the ribs and all nails must be clinched across the grain on the inside of the ribs, Fig. 12. Fig. 11 shows the arrangement of the planking. Notice that the first five bilge planks run from stem to stem on each side of the keelson. The freeboard planks run out to points fore and aft as shown.

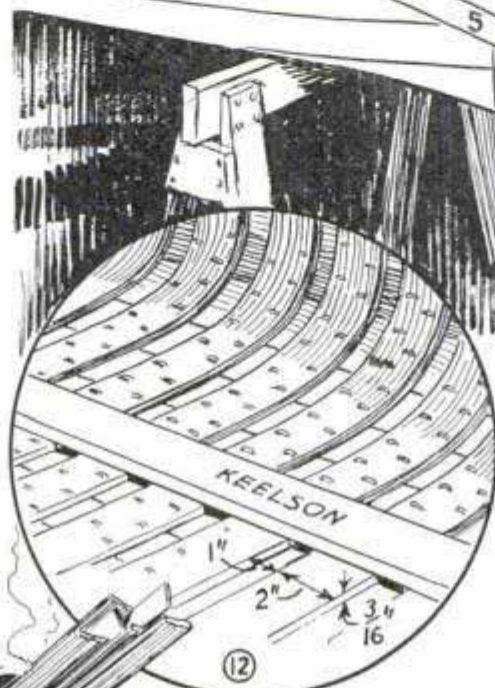
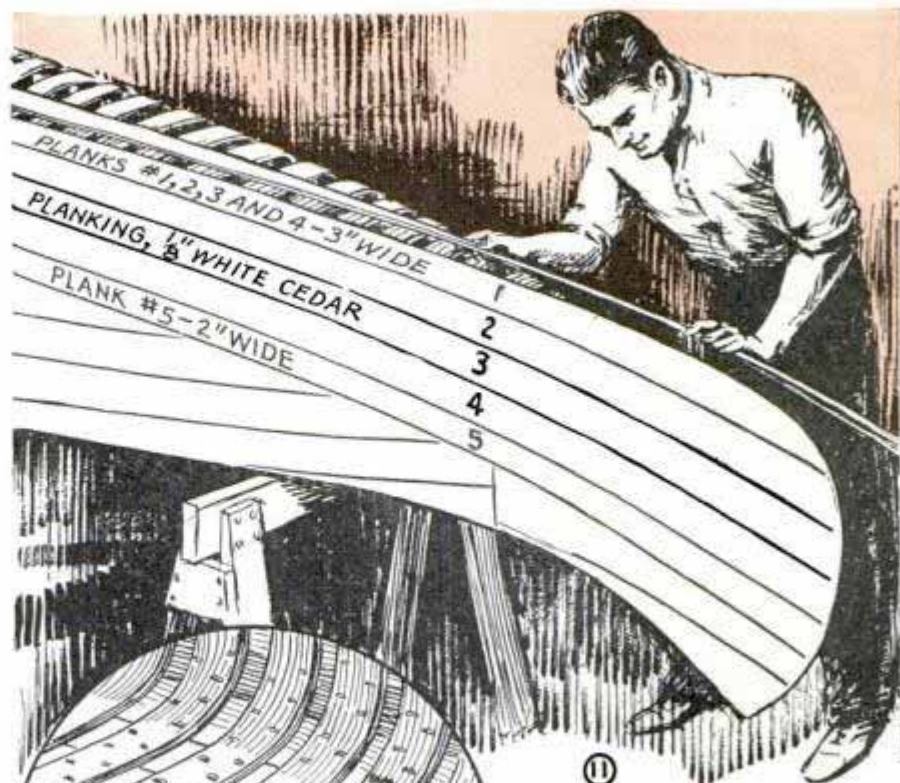
To remove the backbone, take out the cleats and saw it through at the center. Take out all but the No. 3 molds. Bolt the maple thwarts, Figs. 5 and 16, to the underside of the gunwales to prevent the hull

from springing out of shape. The seat frames, Figs. 5 and 18, also may be fitted at this time. Actual measurement must determine the length of the seat stretchers. The rear stretchers are bolted direct to the

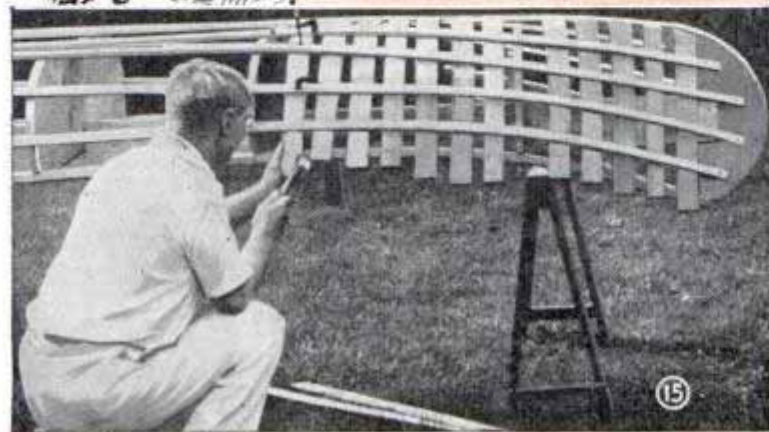
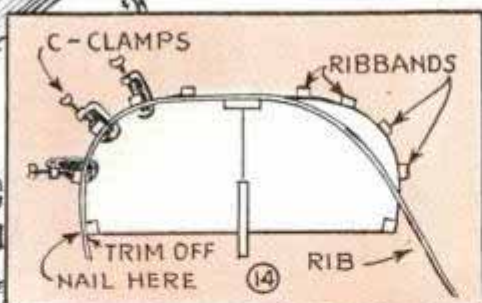
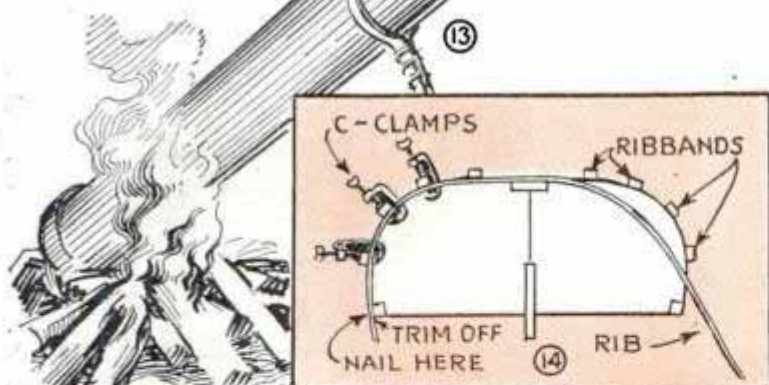


gunwales but the two forward are lowered 3 in. by means of hardwood spacers as in Fig. 18.

For canvassing you need two pieces of 8-oz. canvas, long enough to reach from stem to stem with about a foot to spare, and wide enough to reach from the gunwale to the keel with allowance for a lap. Start by spreading the canvas over half of the canoe, tacking temporarily near the center of the gunwale. Pull the covering tightly around the bilge and place a few tacks along the keel, near the center. Wet the canvas and pull it lengthwise over the stems, and tack. As it dries, the fabric will stretch and take the shape of the hull. When dry, pull out the tacks at one end and fit the canvas neatly around the stem,

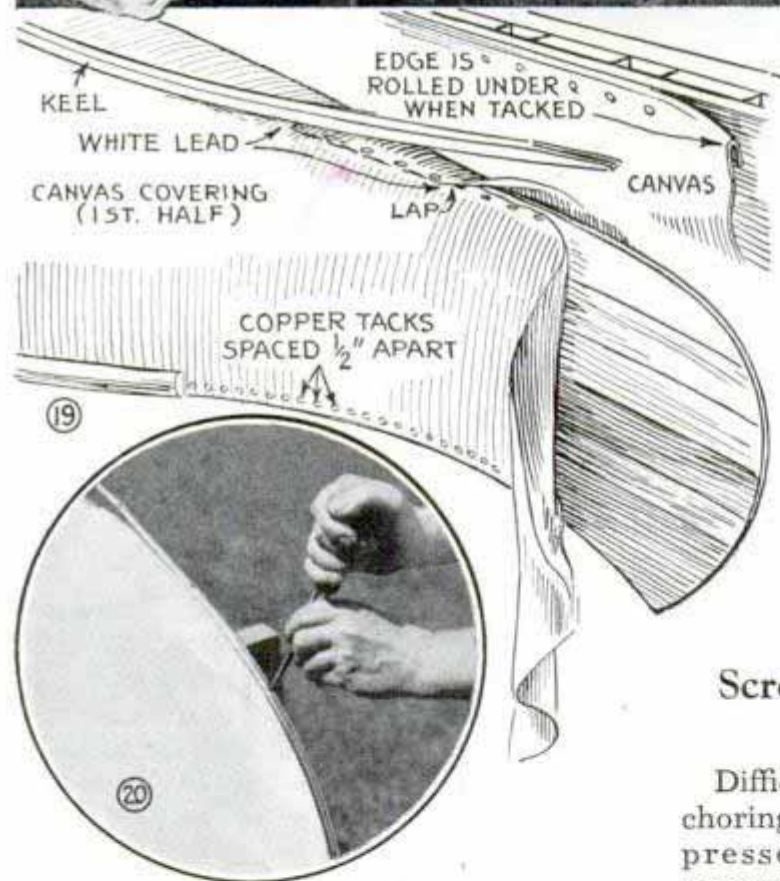
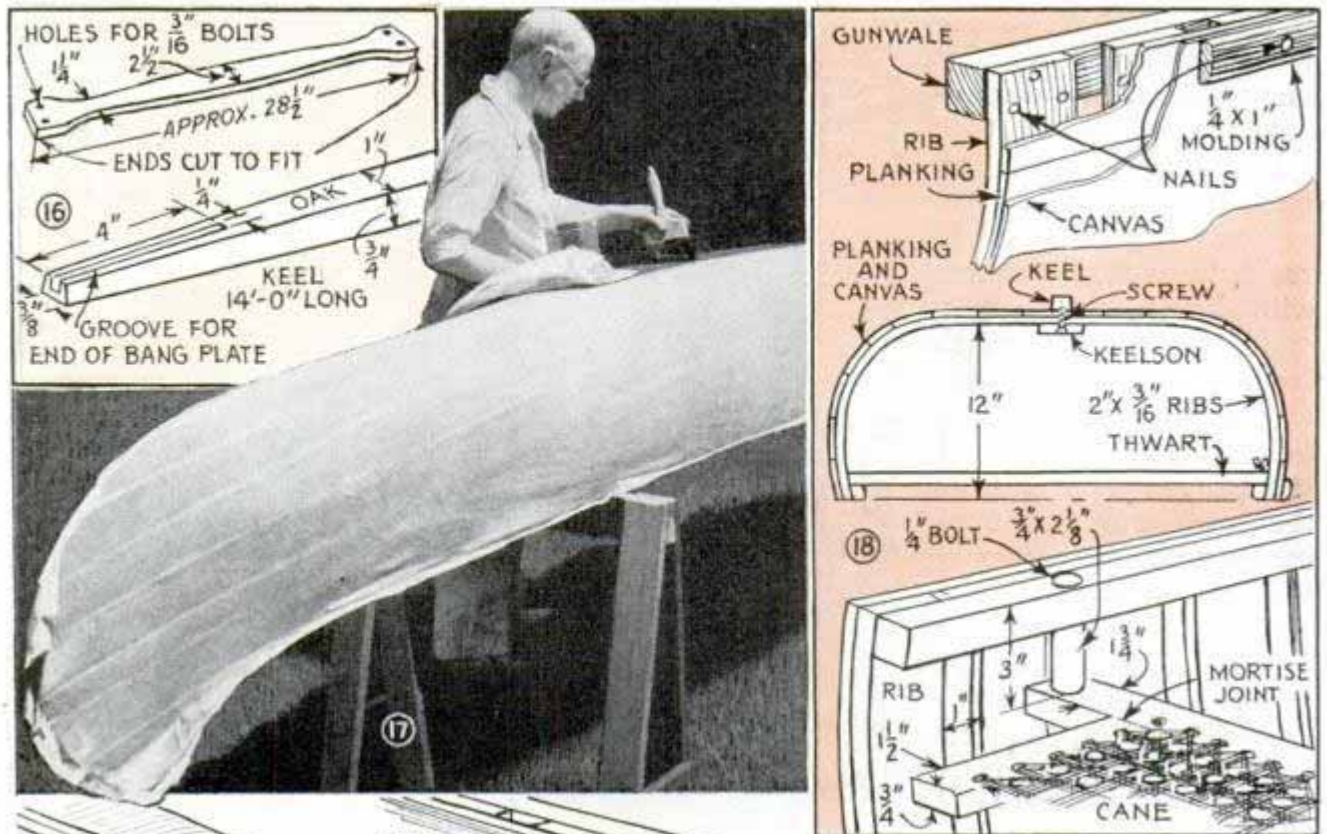


NAILS ARE CLINCHED ACROSS THE GRAIN



from the point of the keel to the gunwale, lapping 1 in. over the stem. Fasten with $\frac{3}{4}$ -in. copper tacks, spaced 1 in. apart. Then remove all other temporary tacks and roll the canvas back off the canoe.

Beginning at the tacked end, apply a coat of waterproof canvas cement to a section of the planking along the keel, using a stiff brush, Fig. 17. Do not cover a large area as the cement dries quickly. Unroll the canvas over the cemented area, pull tightly lengthwise and fasten the loose end temporarily while tacks are placed closely along the gunwale and keel of the cemented portion. As you tack be sure that the cloth lies flat without any wrinkles. Then squeegee the canvas with the palm of the hand to make sure that it is in contact with the cement at all points. Take the next section of the hull in the same manner continuing by successive stages until you finish at the opposite stem. The second half is stretched and tacked in the same manner as the first allowing for the lap under the keel. This done, you trim the canvas along



and varnished. Apply the gunwale molding, Fig. 19, with round-head brass nails, and finish the canoe inside and out with two coats of spar varnish. In varnishing the inside, care should be taken to prevent the varnish "piling up" in corners between the ribs and planking. Two thin coats are much more durable and less apt to check. Finally the keel is varnished separately and screwed in place as in Fig. 19. Finish up with the 1/4-in. half-round copper bang plates.

Screws Held in Pressed Wood by Cellulose Cement

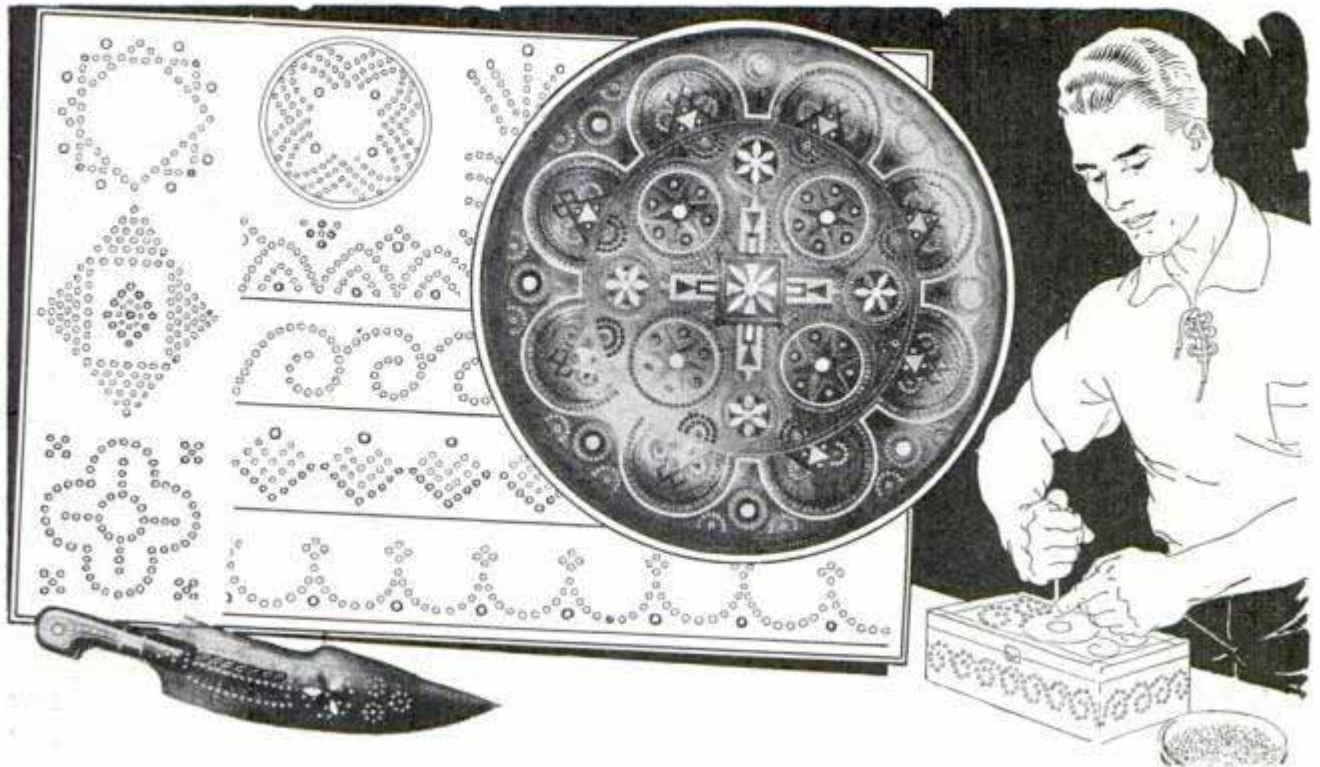
Difficulty of anchoring screws in pressed wood is overcome by filling the hole drilled to drive the screw with cellulose cement or thick lacquer. After it has dried the screw is driven into place. Within an hour the cement will have dried to the pressed wood about the screw so that the latter is held securely.



the gunwales and finish tacking the stems, using copper tacks, which should be spaced about 1/2 in. apart.

Allow a few days for drying, then apply a coat of canvas cement over the entire surface. When dry, sand smooth and finish with one coat of deck paint and one of flat color after which it is again sanded

Wooden Articles Decorated with Glass Beads



Bead inlaying on plates, bowls, boxes and other woodenware is something that anybody can do, and you'll be surprised at the unusual, striking effects that can be produced by the use of beads of different colors and sizes. The opaque kind are generally preferred for contrast. The first thing is to select or draw a design suitable to the shape and size of the object to be decorated. After transferring the design

to the wood, which can be done with carbon paper, you drill holes about $\frac{3}{16}$ in. apart and just deep enough to take the beads so that the latter have to be pressed in place until flush with the surface of the wood, using a hardwood stick for the purpose. This snug fit eliminates the need of glue to hold the beads. They should all be set so that the holes are centered.

—Bess Livings, Batavia, Ill.

Sidewalk Bridged to Provide Crossing for Wheelbarrow

When using a loaded wheelbarrow around his home, one man bridges the sidewalks with channel iron so that he can push it over them easily. The iron is cut and bent down at the ends as indicated to form approaches to the bridge. The side member of an old auto frame will serve the purpose nicely and can be obtained from almost any junk yard.

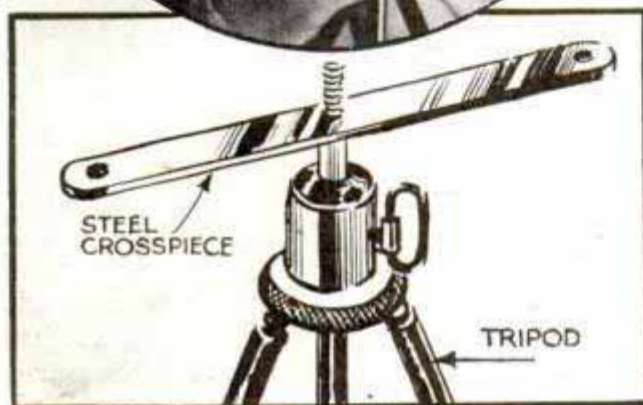
Soda Saves Plaster in Castings

When casting articles from plaster of paris, you can save quite a bit of plaster if a little bicarbonate of soda is added to the wet mixture. The soda reacts with the plaster and forms gas bubbles in the casting. This makes it much lighter in weight, yet does not reduce its strength.



Loaded wheelbarrow pushed across sidewalk easily on bridge consisting of a length of channel iron

Still and Movie Cameras Mounted on Same Tripod



Three cameras mounted on one tripod to take movies and still photo of same object

Still and motion pictures can be taken at the same time if the cameras are mounted side by side on one tripod. Also, telephoto closeups and "shots" with standard lens can be taken in the same way. In the photo, a still and two movie cameras are used, the latter to take both standard speed and slow-motion of the object. A length of flat iron supports all three cameras, which are attached with tripod screws. The cameras at the ends must be adjusted to cover approximately the same area in the view finder as the camera in the center.

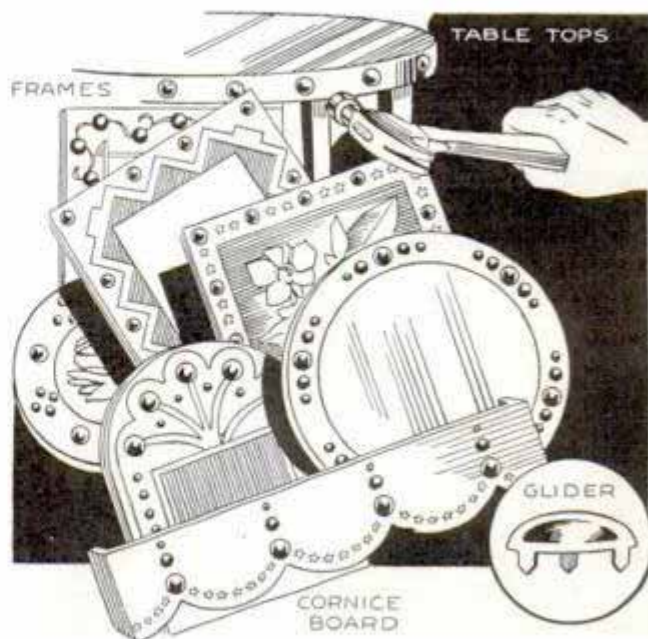
Removing Glass Bottle Stoppers

I have found that a good way to remove glass bottle stoppers that stick, is to first run warm water over the bottle neck. Then, removing the bottle from the water, support it upright, grasp the neck in one hand, place the ball of the thumb on the

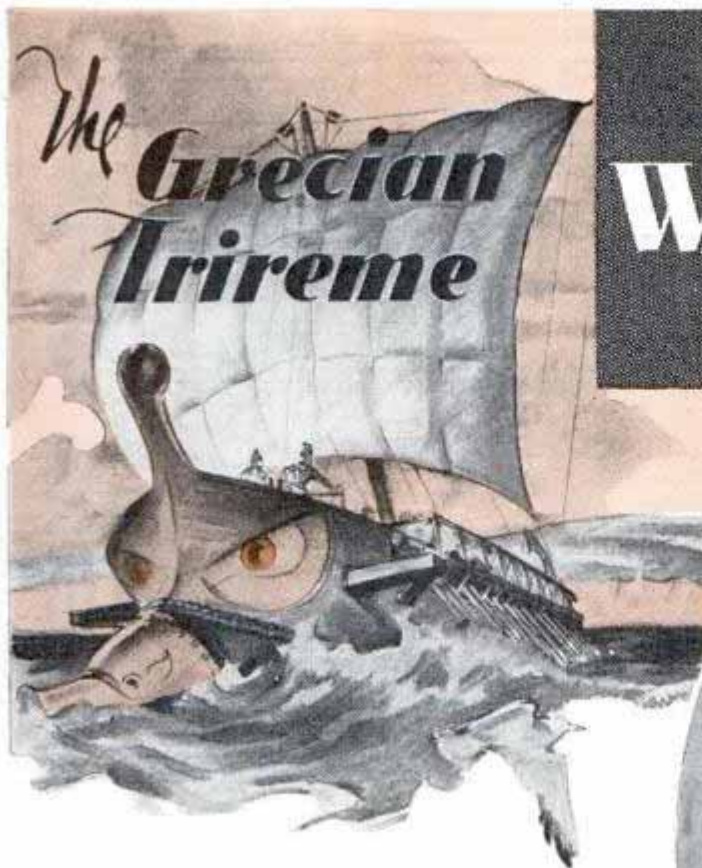
lower part of the stopper and exert an upward pressure. At the same time gently tap the stopper with the wooden handle of a knife or similar instrument. Besides expanding the bottle neck, the warm water tends to dissolve the material causing the stopper to stick.—M. R. Pesce, Chicago.

Metal Gliders for Decorating

Plain wood surfaces of mirror or picture frames, window-cornice boards, door and window frames, serving trays, occasional pieces and many other articles of interior decoration can be ornamented in a strikingly modern manner by the use of shiny furniture gliders that are commonly used on the ends of chair legs. Pleasing combinations can be worked out using them with star-shaped thumbtacks, upholsterers' tacks or with fancy tie-back pushpins. These can be arranged in border designs or clusters, with no other decoration at all, or they can be combined with wood overlay patterns and painted designs. They look equally well on natural or painted wood. A great many variations are possible with a little experimenting, and it will be found a very simple means of bringing distinction to otherwise ordinary objects. In applying the gliders, lay out the design and mark their positions with a pencil on the article. Hold a felt-covered block of wood on top of gliders when hammering them, to prevent marring or denting the shiny surfaces.



Small tables, picture frames and other articles are decorated easily with metal furniture gliders



The Grecian Trireme

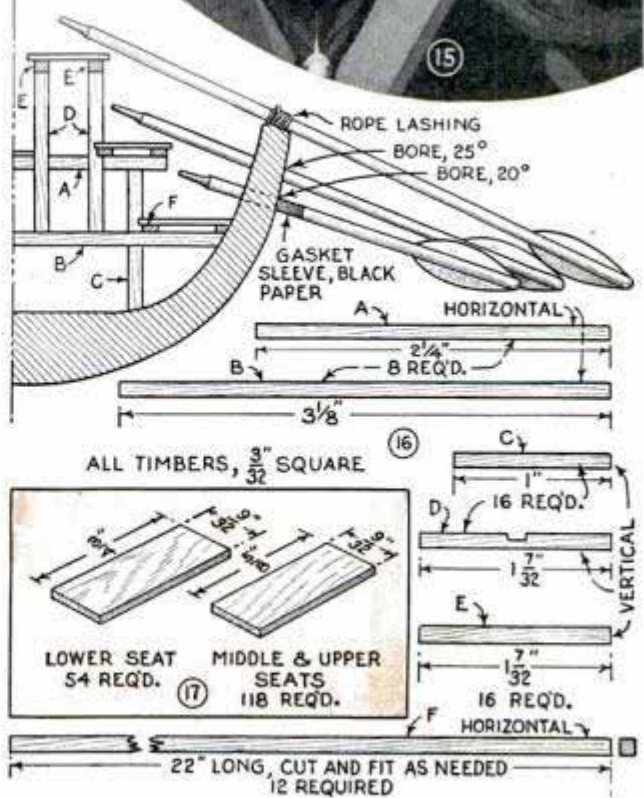
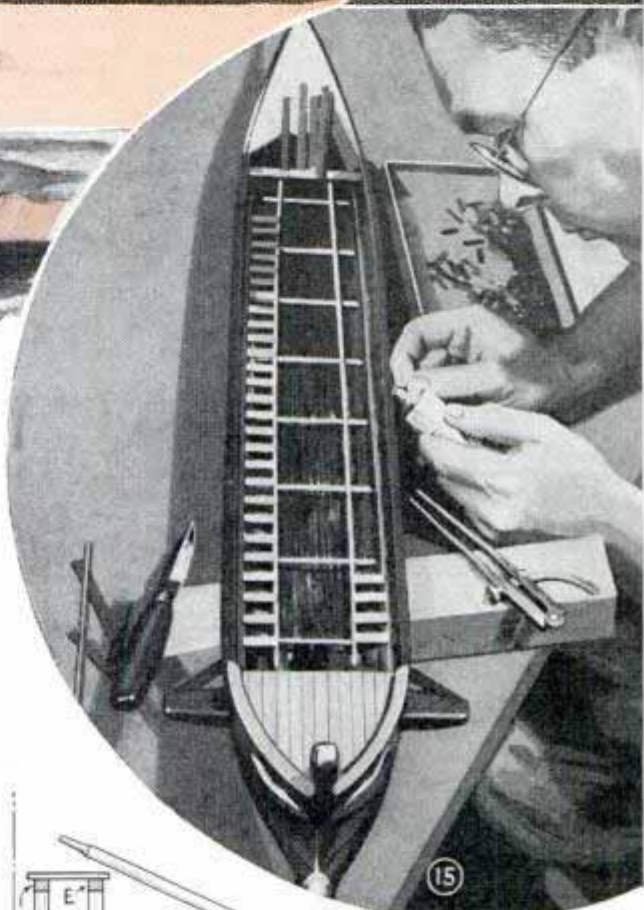
model of a WAR GALLEY of 600 B.C.

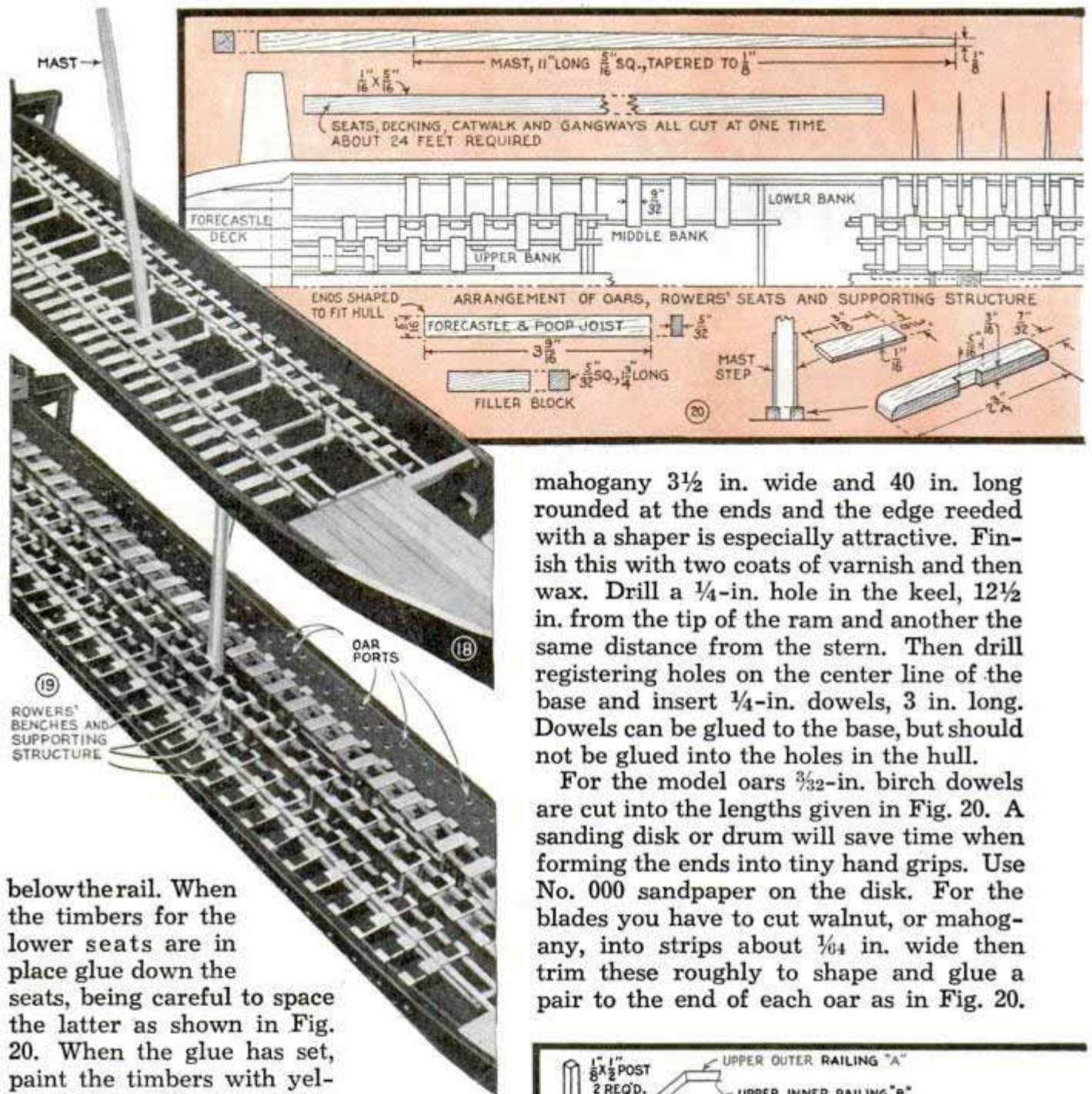
By ALEXANDER MAXWELL

PART II—Decking, Rowers' Benches, Mast and Sail

BEFORE you get into construction of the fittings one job remains on the hull proper—the short decks fore and aft. The planks are $\frac{5}{16}$ in. wide and are trimmed to fit individually, then glued and pinned in place one at a time. The inner ends rest on joists fore and aft. The glue on one plank should be allowed to set before planing the next one. Bank pins with the heads clipped off are the thing for fastenings.

Now, in Figs. 15 to 20 inclusive, you find the details on installation of the rowers' benches. The letters A to F inclusive in Fig. 16 locate the parts of the bench structure and give dimensions. The latter are only approximate. Begin the installation of the supporting structure with the cross members B and the uprights C in Fig. 16. The lengthwise members F must take a slight curve as in Fig. 15. Note that the seats overhang the supporting members approximately $\frac{1}{32}$ in., which makes a guide for spacing the lengthwise timbers. The top face of the cross timbers B is $\frac{7}{8}$ in.



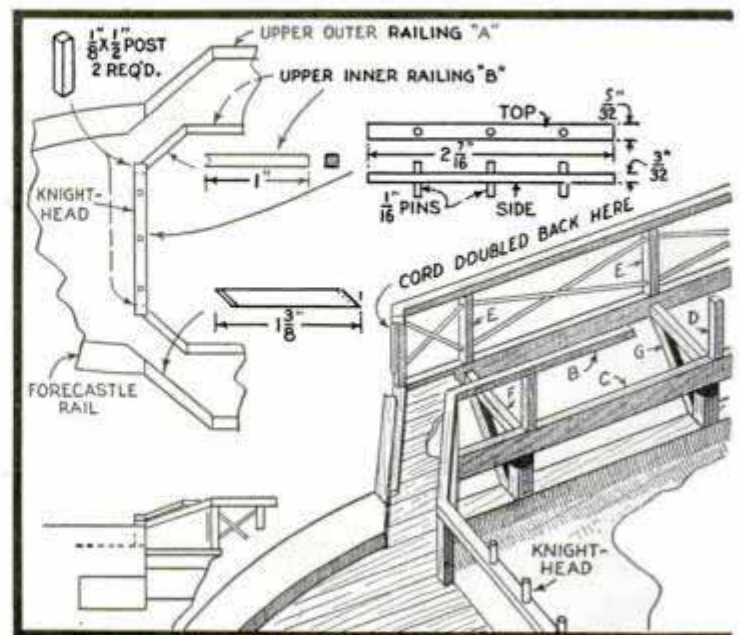


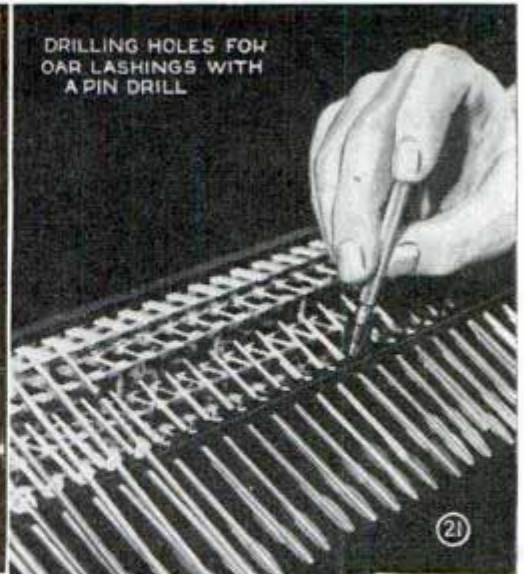
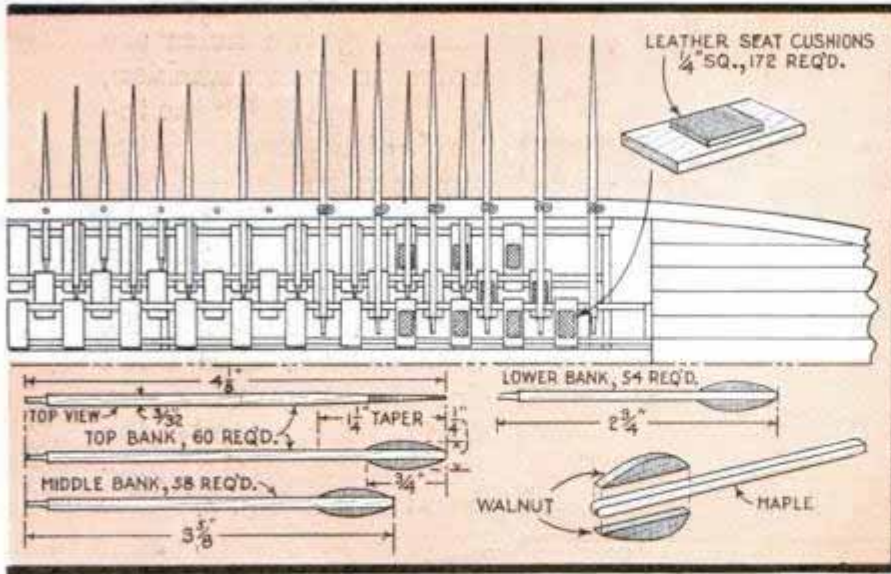
below the rail. When the timbers for the lower seats are in place glue down the seats, being careful to space the latter as shown in Fig. 20. When the glue has set, paint the timbers with yellow ochre and the seats white and let the paint dry before continuing. Before this job goes any farther the two inside cathead braces should be installed as in the lower detail in Fig. 22. This done, the remainder of the structure can be built up. Before a joint can be glued, the paint must be cut away to the wood. If the work is taken one bank at a time, and each joint allowed to harden before the one above it is made, the whole structure will go together easily. An old kid glove or suede leather belt cut into $\frac{1}{4}$ -in. squares makes businesslike seat cushions.

Now the hull can be mounted on a base. This can be very simple, a length of $1\frac{3}{16}$ -in.

mahogany $3\frac{1}{2}$ in. wide and 40 in. long rounded at the ends and the edge reeded with a shaper is especially attractive. Finish this with two coats of varnish and then wax. Drill a $\frac{1}{4}$ -in. hole in the keel, $12\frac{1}{2}$ in. from the tip of the ram and another the same distance from the stern. Then drill registering holes on the center line of the base and insert $\frac{1}{4}$ -in. dowels, 3 in. long. Dowels can be glued to the base, but should not be glued into the holes in the hull.

For the model oars $\frac{3}{32}$ -in. birch dowels are cut into the lengths given in Fig. 20. A sanding disk or drum will save time when forming the ends into tiny hand grips. Use No. 000 sandpaper on the disk. For the blades you have to cut walnut, or mahogany, into strips about $\frac{1}{64}$ in. wide then trim these roughly to shape and glue a pair to the end of each oar as in Fig. 20.

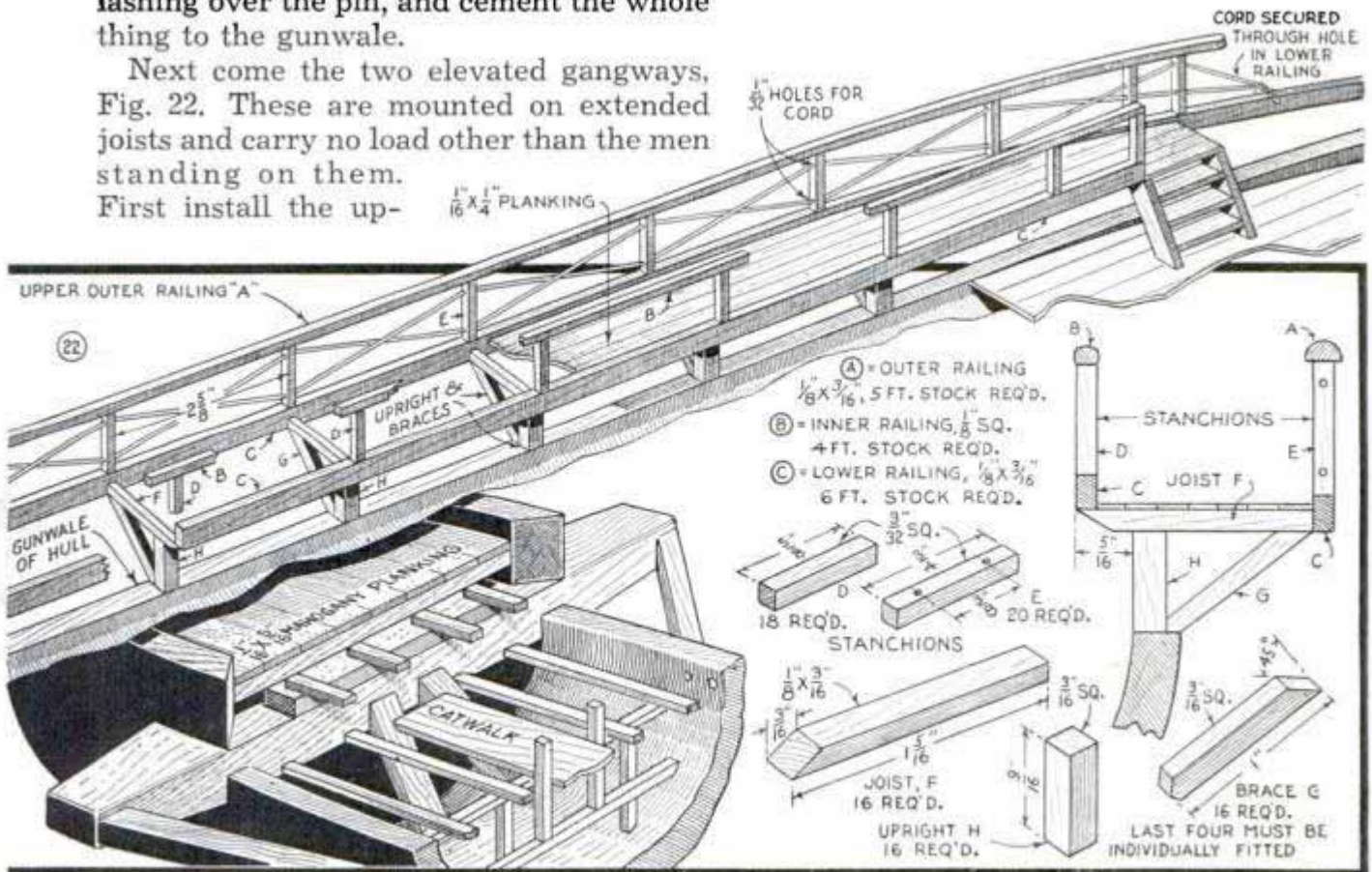


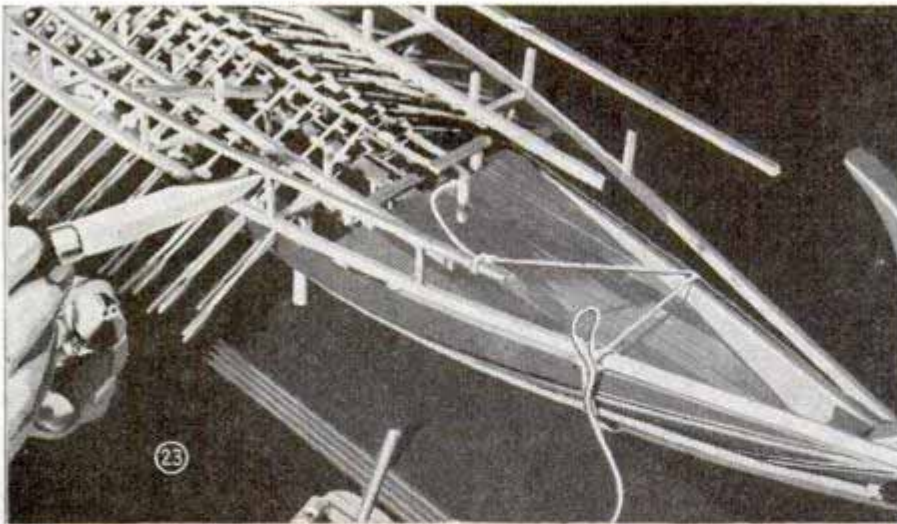


The shaft and blades are trimmed to uniform size, sanded to a knife edge at the tip, and tapered up to the full thickness 1 1/4 in. from the end. Coat with varnish and lay on wax paper to dry. Leather sleeves on the lower bank of oars can be simulated with black paper glued to the shafts. Each oar is held in place with a drop of cement on the shaft, just inside the hull. The oars of the upper bank operate on thole pins, which are 1/32 in. in diameter. Bore holes for them as in Fig. 21, cut away a patch of paint and glue in place. Then loop thread lashing over the pin, and cement the whole thing to the gunwale.

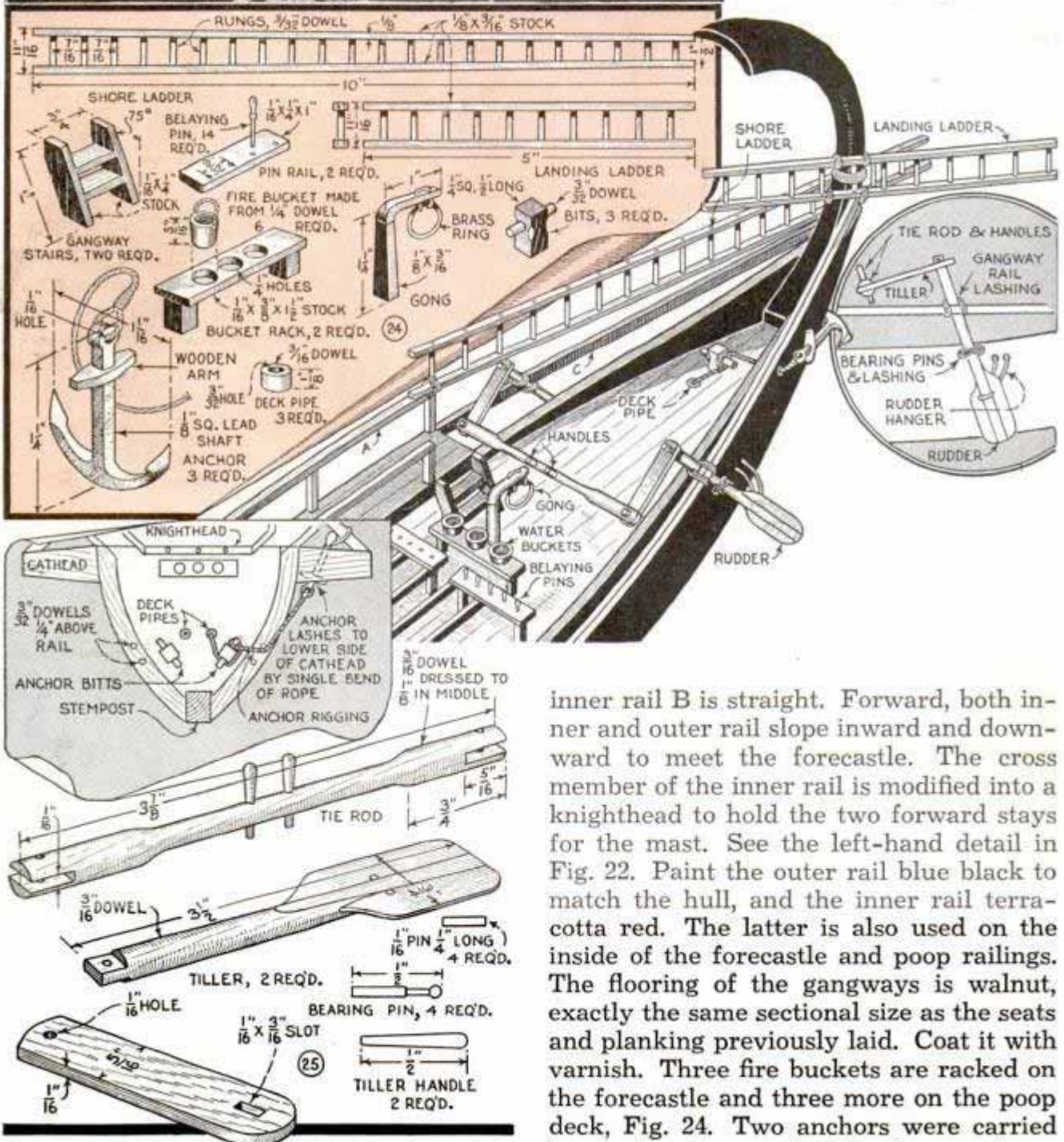
Next come the two elevated gangways, Fig. 22. These are mounted on extended joists and carry no load other than the men standing on them. First install the up-

rights, H, then the joists, F. Align the joists carefully or the gangway will be uneven. As the rail C must be bent, you glue it first along the straight section and allow to dry. Then brace securely with scrap material, bring the end up to the sternpost and glue





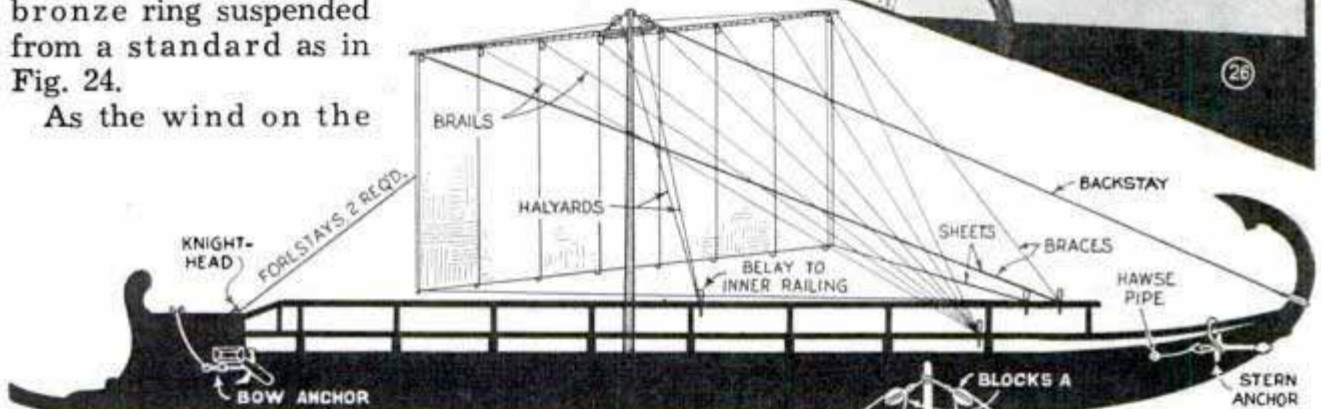
and tie in place. Before installing, two holes are bored in each stanchion, parts D and E, for the interlacing cord. As the upper rail B ends at the last stanchion, it must be braced and coaxed in place with a cord passed around the hull, Fig. 23. Mahogany is ideal wood for this type of work. Each joist is braced to the upright H, as in the right-hand detail, Fig. 22. The



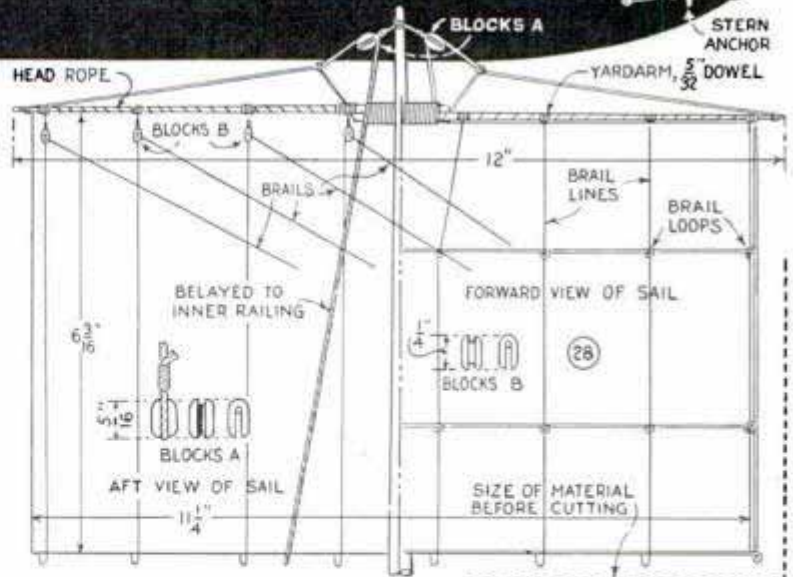
inner rail B is straight. Forward, both inner and outer rail slope inward and downward to meet the forecastle. The cross member of the inner rail is modified into a knighthead to hold the two forward stays for the mast. See the left-hand detail in Fig. 22. Paint the outer rail blue black to match the hull, and the inner rail terra-cotta red. The latter is also used on the inside of the forecastle and poop railings. The flooring of the gangways is walnut, exactly the same sectional size as the seats and planking previously laid. Coat it with varnish. Three fire buckets are racked on the forecastle and three more on the poop deck, Fig. 24. Two anchors were carried forward and one aft. The bow anchors,

Fig. 27, are slung to the underside of the catheads. A pair of timberheads, or bitts, forward and one aft, belay the anchor cables, which emerge from below by way of deck pipes. See Figs. 24 and 25. Fittings such as fire buckets, anchors, blocks and belaying pins may be purchased ready made from dealers in ship-model supplies. The two ladders, Fig. 24, are made of mahogany with tiny birch dowels for rungs, finished in the natural color with varnish, and lashed to the gangway rail and sternpost as shown. The rudders, Fig. 25, were suspended from rope hangers which passed through the blade and up to the hull. A pair of pegs acted as bearings. Blades and shaft of the rudders are made of the same woods as the oars except that the blade is $\frac{3}{4}$ in. wide and $1\frac{3}{4}$ in. long. A pair of stairways, Fig. 24, gave access to the gangways. Signals were given with a bronze ring suspended from a standard as in Fig. 24.

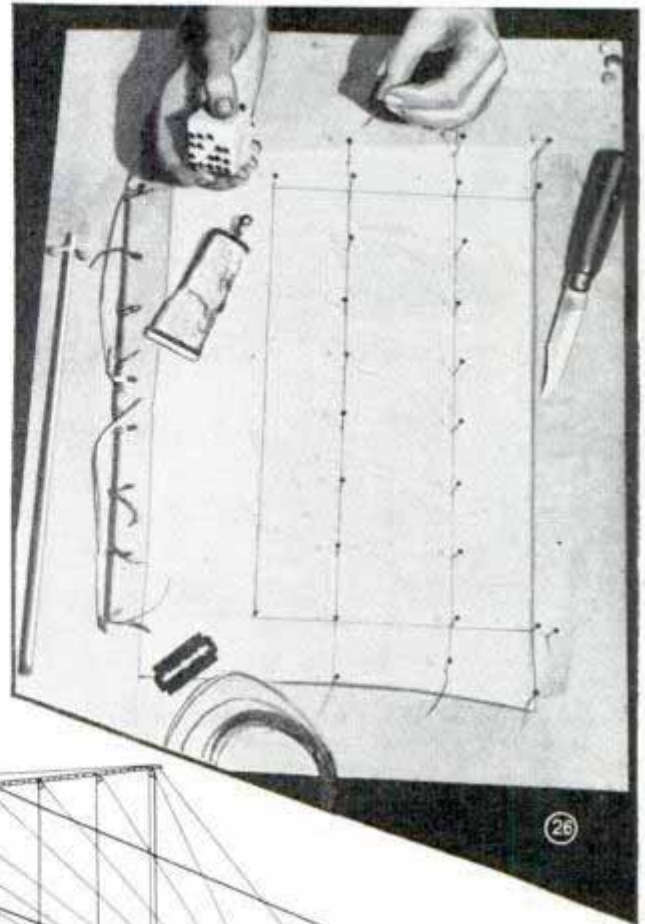
As the wind on the



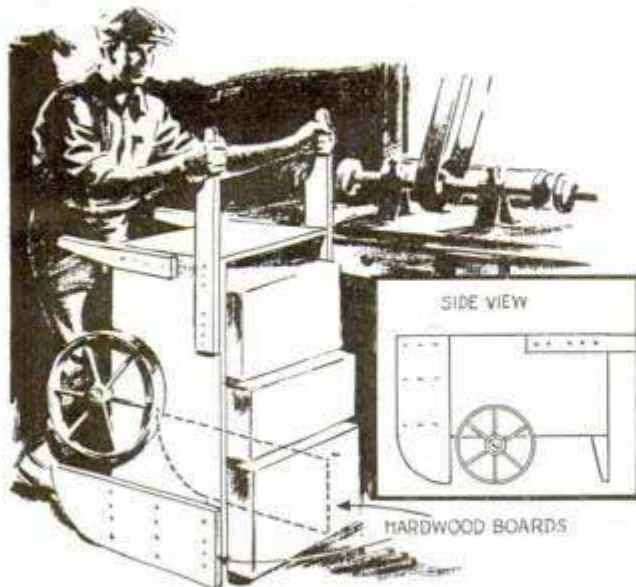
Mediterranean was light and unreliable, the mast was comparatively short and the sail was very large in proportion. The mast is stepped as in Fig. 20. The sail was made of linen and rolled up much like a porch awning, requiring eight brailing ropes, Fig. 28. The yardarm is made of two $\frac{5}{32}$ -in. dowels, dressed to shape and lashed together in the middle. To model the original sail, pin broadcloth to a drawing board, outline the sail and put a pin in each corner, Fig. 26. Stretch a piece of linen fish line and cement it to the cloth. Two other reinforcing ropes are stretched across the sail. Each of these contains eight loops for the brailing ropes. Drive pins in place, loop the rope about them and fasten with cement, making sure each loop is well coated. When dry, cut out the sail



and lash to the yardarm. Use brown linen thread for the brailing ropes, threading it through the loops with a needle, up the aft side of the sail, through the blocks and down to the pinrail where it is secured with a belaying pin. Sheets and braces, Fig. 27, go to pins set in the outer railing.



Hand Cart Fitted with "Rockers" to Dump Heavy Loads

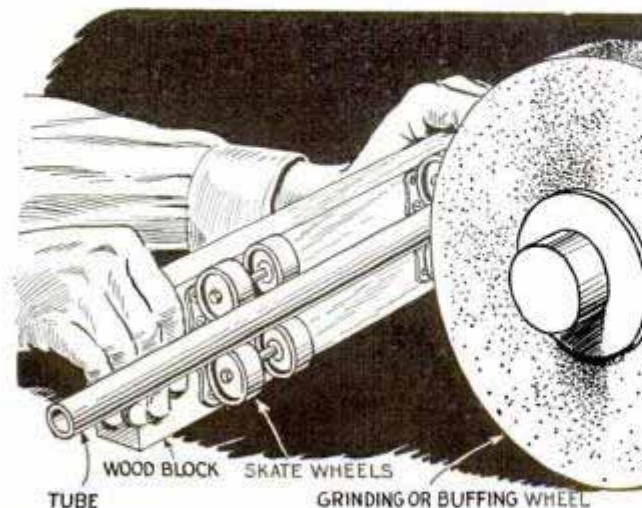


Truck is "rolled" to a vertical position instead of lifting the dead weight by the handles

You won't have any difficulty in dumping heavily loaded hand trucks when they are fitted with these "rockers," which allow the trucks to be tipped from a horizontal position with ease. The rockers are hardwood boards nailed to the sides of the cart at the front end, so that the lower ends clear the floor by 2 or 3 in., the leading edges of the boards being rounded off.

Round Work Held in This Jig Rotates While Grinding

Mounted on a block of wood of convenient size, a set of skate rollers makes a useful jig that permits tubing or round rods to be held against a grinding or buffing wheel.

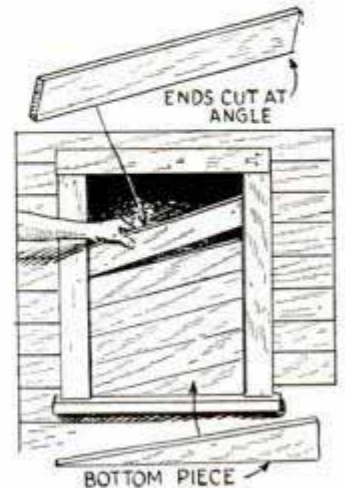


When work is held in this jig while buffing, there is no danger of leaving flat areas

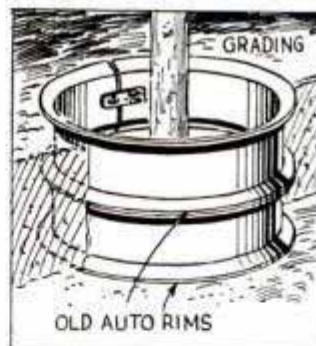
ing wheel without danger of leaving flat areas. The rollers allow the work to rotate with the wheel.

Bin Boards Cut Diagonally to Facilitate Removal

Retaining boards for doors of grain and coal bins are easy to remove when the ends are cut diagonally as illustrated. The bottom board, the shape of which determines the angle the ends of the other boards must be sawed, is cut out first. When this is in place, a second board is fitted, which in turn serves as a pattern for the other pieces.



Split Auto Rims Protect Trees from Grading

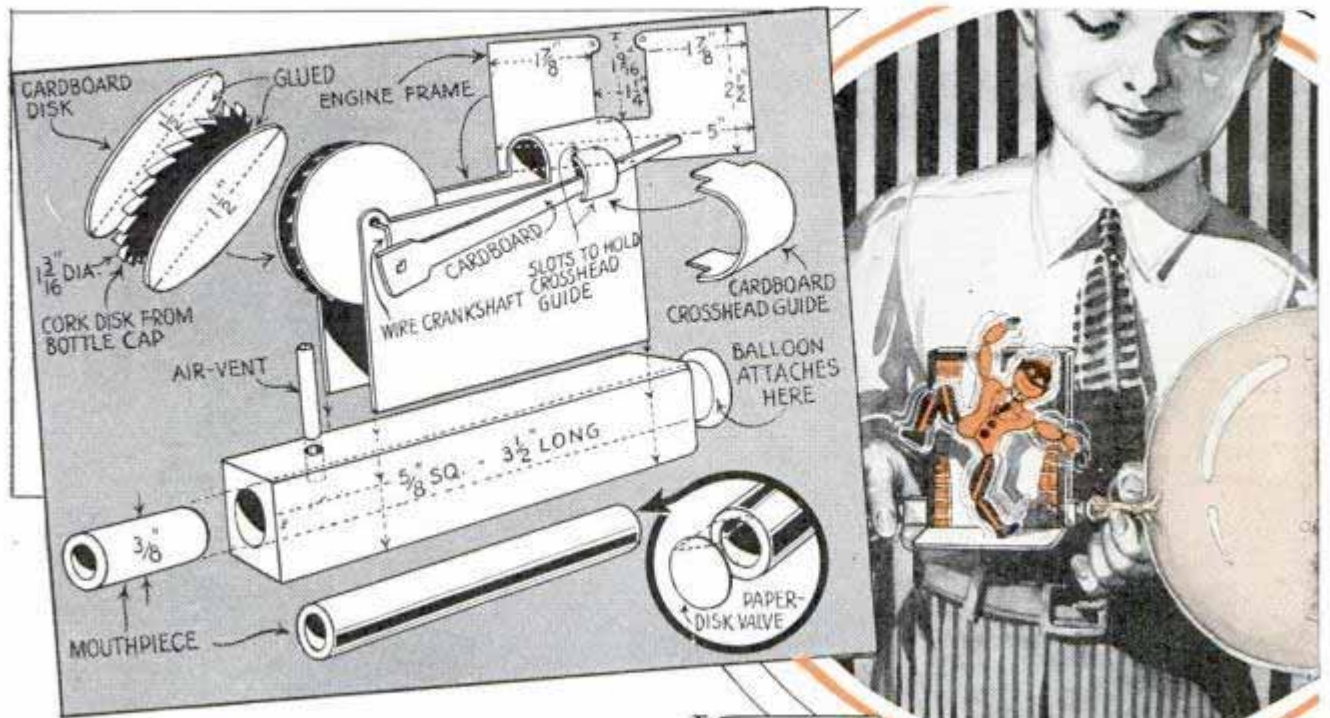


If a lawn is graded after trees have been planted, the roots are likely to be smothered by being covered too deeply unless some means is provided to avoid piling the dirt around the bases

of the trees. Old auto-wheel rims are good for this purpose. The dirt may be filled up to the top of these without danger of smothering the trees. Leaves and dust may be allowed to collect inside gradually, as the steady growth of the tree will overcome any possible ill effects.

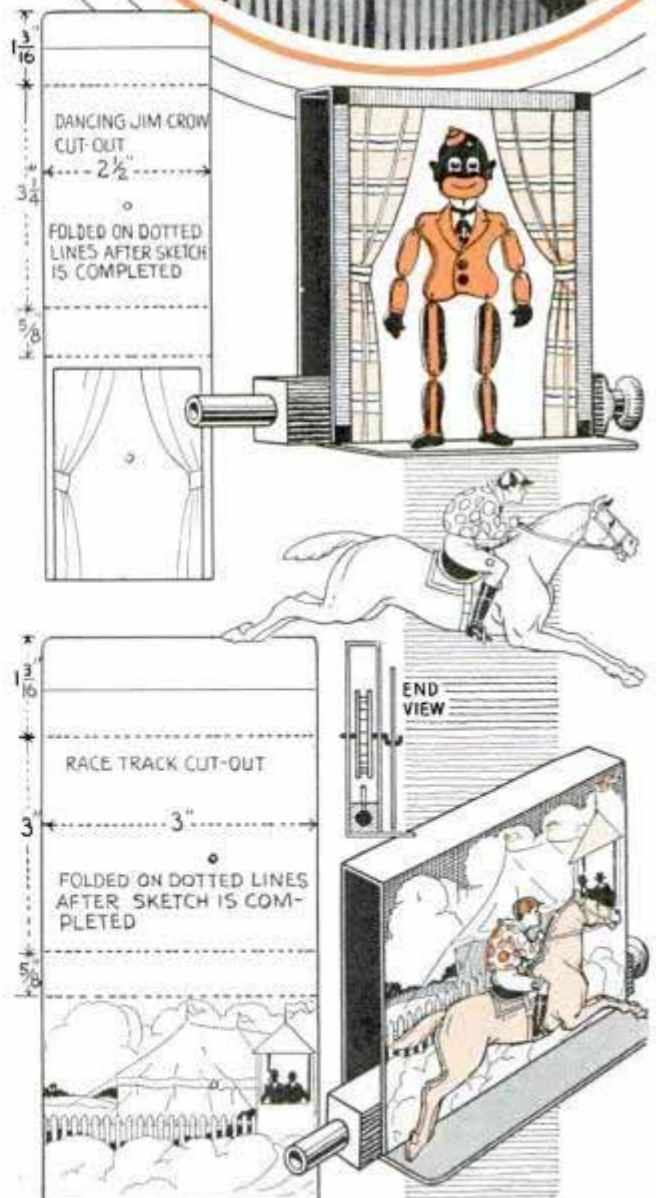
□ Your solution of some troublesome problem might be of interest to many of our readers. Popular Mechanics invites you to submit material you think is suitable for short articles on these pages. Write to the Homecraft editor, telling your story in as few words as possible and enclose a snapshot or rough drawing to illustrate the idea.

Balloon-Powered Action Toys Are Amusing

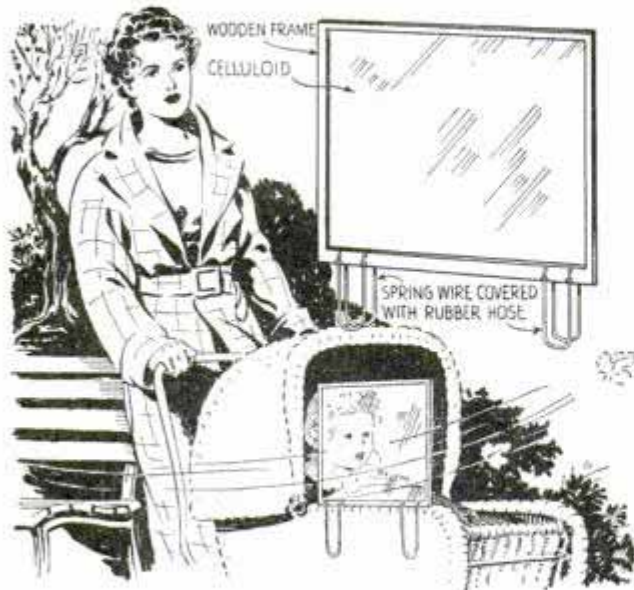


ACTION and plenty of it is what you get with these toys, which run on air supplied by small rubber balloons. The "dancing Jim Crow" and the racing horse at the right are just two of the many variations. A small air turbine is the heart of each toy, and can be assembled quickly from cardboard, a cork disk from a bottle top and a piece of soft wood. The base of the turbine is fitted with a mouthpiece at one end and a tube for attaching the balloon at the other. The mouthpiece has a paper disk attached at one end with a drop of glue to serve as a check valve to direct the escaping air from the balloon through the air vent. Care must be taken to locate the vent so that the air strikes the turbine at the correct angle. A turbine is made for each toy, or, if desired, figures and backgrounds can be detachable so that one turbine can be used for different toys. Figures of the two toys shown are pivoted to the end of the crankshaft, which gives them a revolving motion. For some toys, slots can be made in the backgrounds and the figures attached to the connecting rod of the turbine to give them a reciprocating motion. The toys can be made to operate slowly or rapidly by pinching the neck of the balloon to regulate the air supply.

☛ For a hair drier, light the oven and place an electric fan on the open door.



Windshield on Baby Carriage Deflects Cold Drafts

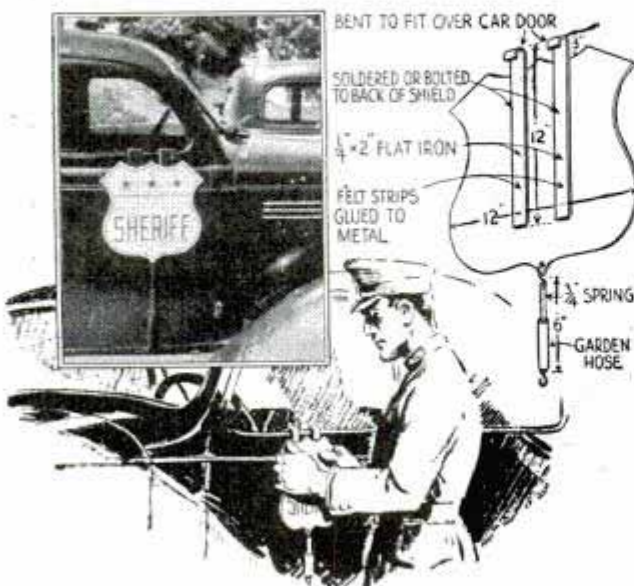


Baby's face is protected by windshield, which can be used on front or side of buggy

Before you take the baby out in the buggy on a cold windy day, assemble this simple windshield and use it to keep cold wind from blowing in the youngster's face. A wooden frame is covered with celluloid or Cellophane and fitted with spring-wire clips for attaching it to the front or either side of the buggy.

Identification Shield on Car Hooks over Window Sill

Demountable insignia of identification to be hooked over the window sills of law officers' cars are a recent wrinkle which



Identification shield hooked over window sill and fastened to bottom of door is quickly removed

state and county sheriffs are using successfully in Lincoln, Nebr. Each shield weighs only a few pounds, and when not needed, can be stored under the rear seat. Lengths of flat iron are soldered or riveted to the back of the shield and have hooks bent on the upper ends to fit over the window. The hooks are padded with rubber or adhesive tape to protect the car finish. A hook and spring at the lower end of the shield attach it firmly to the bottom of the door.—Don W. Sigler, Lincoln, Nebr.

Emergency Plumb Bob from Knife

The next time you need a plumb bob and none is at hand, just take your pocket-knife and slip the end of a length of string or chalk line under the blade at one end



as indicated. Then use the knife in the same way that you would a regular plumb bob. Adjust the string to get the end of the open blade in a true vertical line with the twine.

Accidental Locking of Door Hasp Prevented by Coil Spring

After having been shut in a building by the accidental locking of the door hasp over the staple, I took steps to prevent it from happening again. A small spiral spring, taken from the rear cap of an old flashlight, was fastened to the door jamb as shown. The spring does not interfere with the normal locking of the hasp, but it does prevent the hasp from swinging over the staple when the door is closed with a slam.

—W. C. Wilhite, Carlinville, Ill.



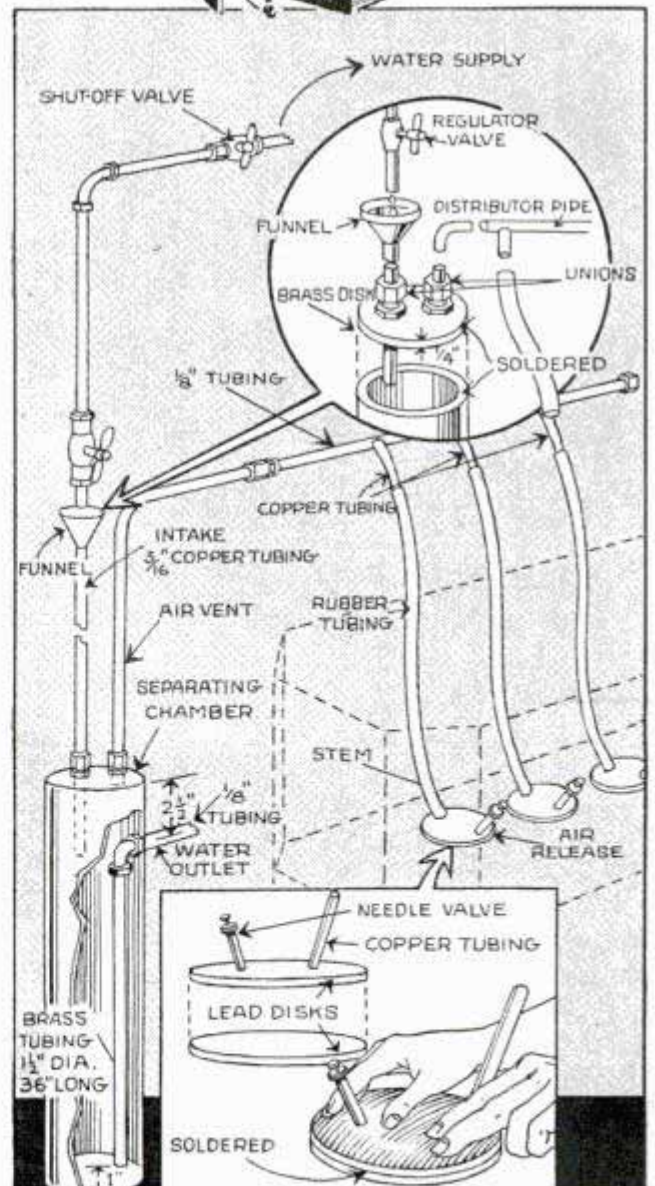
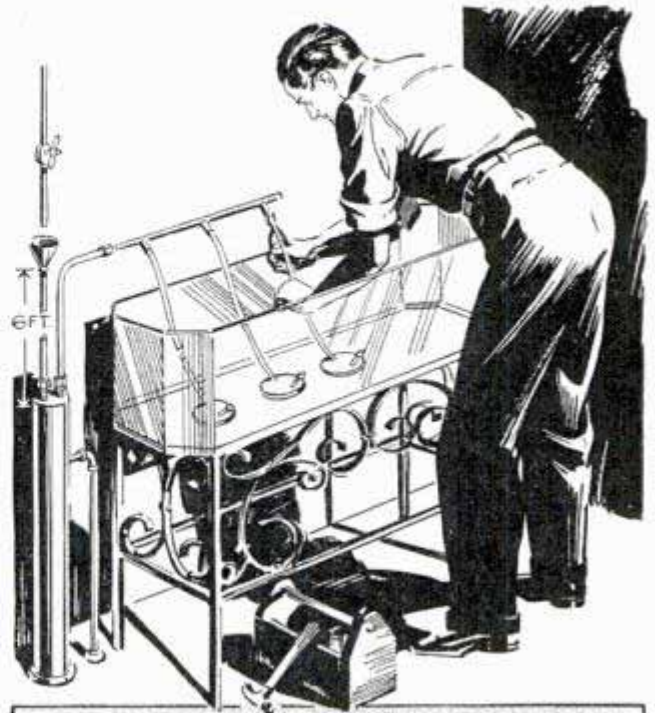
☐The cutting blade of a kitchen food chopper can often be sharpened by slicing a cake of abrasive hand soap and running it through the chopper.

Dripping Water Operates Aquarium Aerator

This homemade aquarium aerator can be built cheaply, will not wear and requires no expensive power for operation. Successive drops of water descending into a tube carry pockets of air between them. The air and water both enter a separating chamber, which diverts the water through a waste or outlet pipe and discharges the air through a vent, which terminates in a series of releasers in the aquarium.

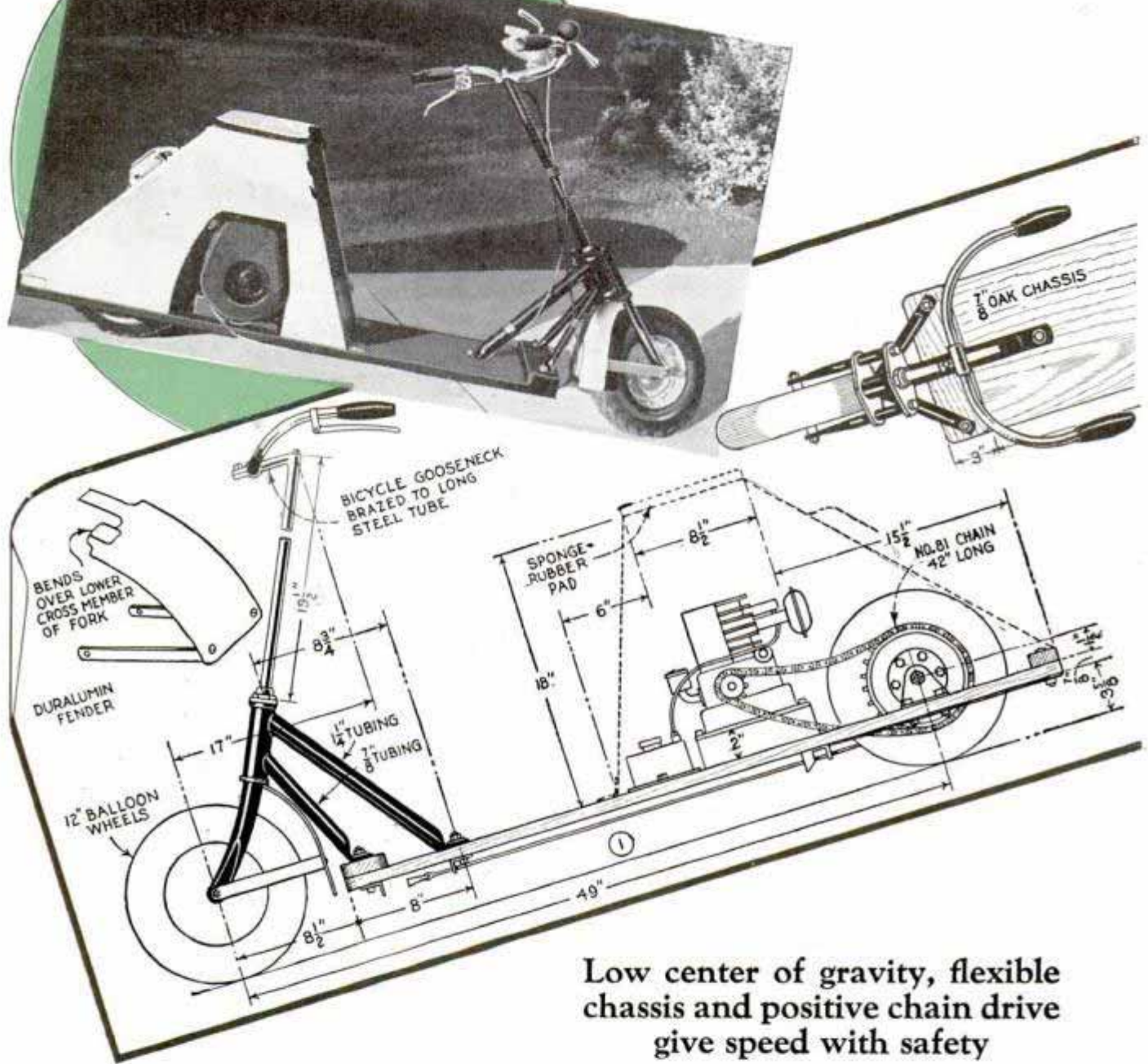
The separating chamber is the heart of the aerator, and consists of a large brass tube closed at both ends. The waste or water outlet pipe enters 2½ in. from the top and extends downward inside to within 1 in. of the bottom. The air vent and the inlet tubes both enter at the top, the latter extending downward to the level of the outlet pipe, while the vent tube just extends through the metal end of the chamber. Short pieces of copper tubing soldered over holes in the vent tube, take rubber tubing, which connects the air releasers. Each of these consists of two lead disks soldered together, one being 1½ in. in diameter and the other ⅛ in. larger. The latter is formed slightly concave so that there is a space between them. Each releaser carries a needle valve and a nipple for the tubing.

The pipe leading from the water supply carries two valves, one to shut it off and the other to regulate the drops, and should not be over ⅛ in. in diameter. It should be centered exactly over the inlet tube. The distance from the mouth of the intake tube to the separator should not be less than 6 ft. With water entering the intake tube at the rate of 1 gal. every two hours, the aerator will pump approximately 924 in. of air. Length of the water outlet pipe inside the chamber must be greater than the depth of the water in which the releasers are placed. A releaser submerged in 18 in. of water will not operate unless the water outlet pipe in the separator is at least 20 in. long. When the releasers are placed at different depths, the needle valves must be adjusted individually according to pressure exerted on each one by the water.—F. E. Heine, Milwaukee, Wis.



☛ Boiling new clothespins in salt water reduces the tendency to split.

"POWER MOUSE"-



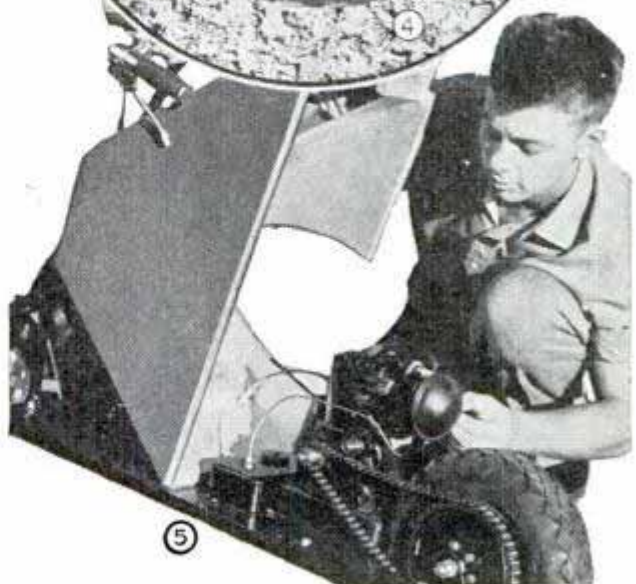
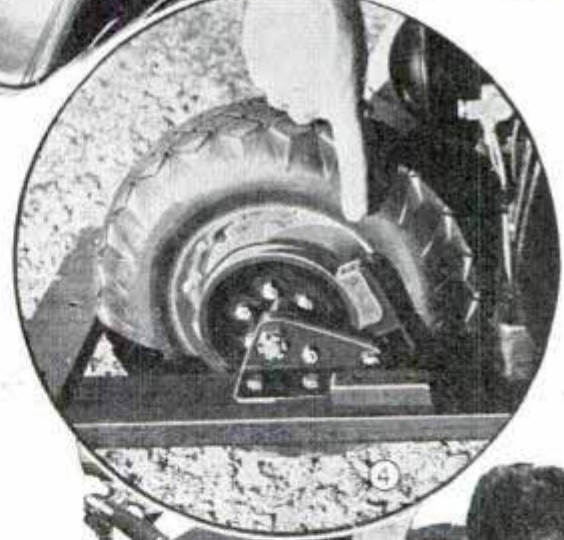
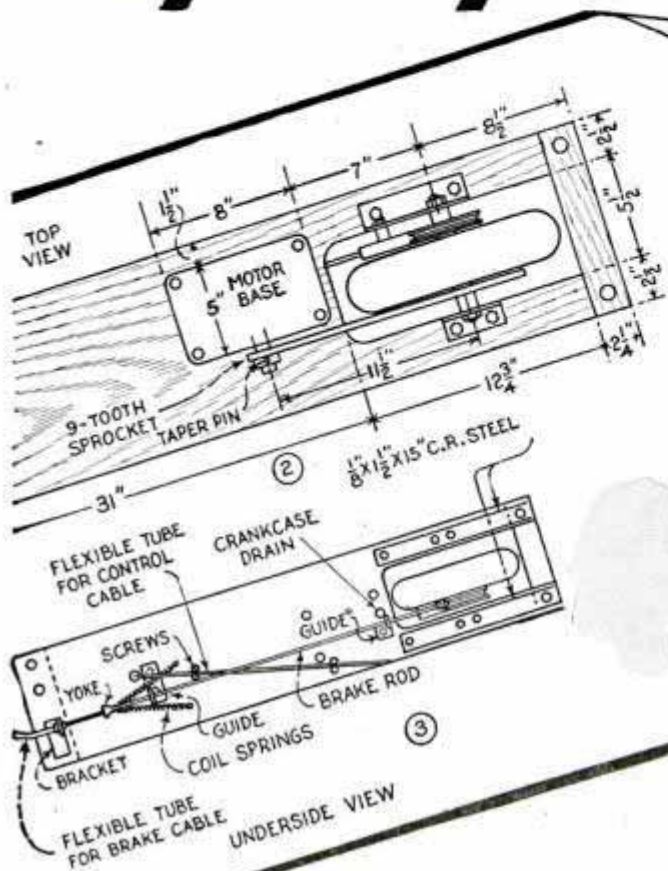
Low center of gravity, flexible chassis and positive chain drive give speed with safety

DUE to its exceptional simplicity, building this motor scooter is no lengthy, tedious job. The chassis is nothing more than a sturdy oak board, which was selected instead of a channel or angle-steel frame because it absorbs road shocks not taken up by the tires. The brake is applied by a lever on the handle bar and has sufficient power to slide the road wheel with only a moderate pressure. There is no clutch. The wooden hood over the power unit aids in silencing the engine and drive and directs heat and fumes out the rear.

Figs. 1 and 2 give the general dimensions while the underside of the chassis is illustrated in Fig. 3. Note that flat-iron plates are used where bolts come through the bottom, reinforcing the structure with a negligible addition of weight.

In construction, make the oak chassis first. The type of engine used may make some alteration necessary but on the original, cross cleats are bolted at each end of the chassis, a built-up block installed for the engine base and angle brackets made to serve as rear axle mounts. The right-

Speedy Motor Scooter



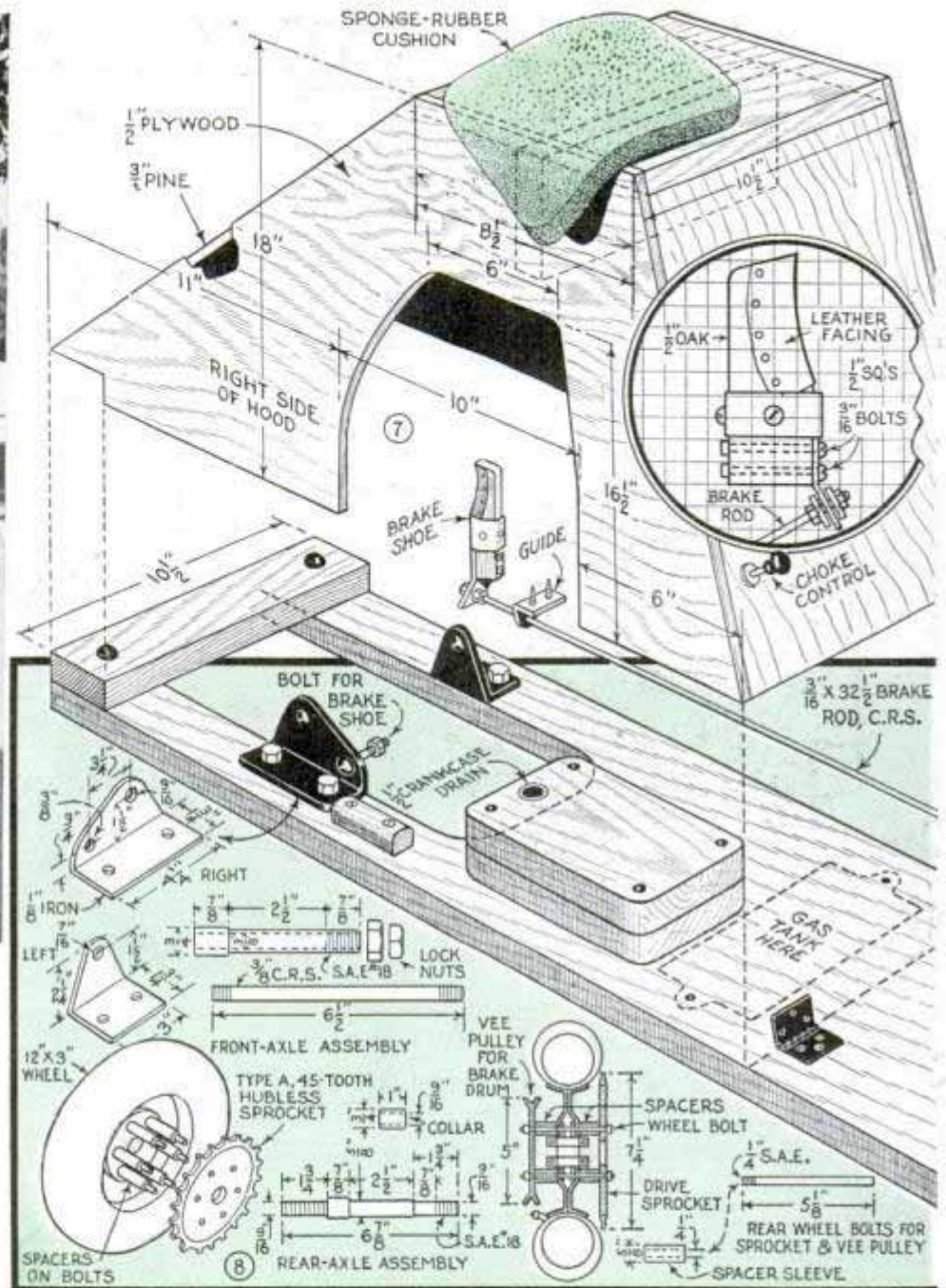
hand bracket is longer to carry the pivot bolt for the brake shoe. This brake, Figs. 4 and 7, is a hardwood block with a portion trimmed to fit into the V-groove of the brake pulley and covered with medium-weight leather. A strip of flat iron is bolted to the lower end of the block, providing a hanger to which the brake rod is connected. It is carried through guides, Fig. 6, and at the forward end two coil springs are connected to hold the shoe away from the pulley. A cable is carried through a flexible tube to the hand lever on the handle bar, Fig. 10. This latter equipment is from the braking assembly of a bicycle.

For the steering-post support three lengths of steel tubing, such as that used in a motorcycle frame, are welded to a heavier tube, as in Figs. 9 and 10. The angle of the tube A with the chassis should not exceed 30°. The fork is assembled as shown, with tubing from a motorcycle fork. The members B, Fig. 10, are flattened at the ends and drilled for the axle, and, with the tube D, are welded to the cross mem-



ber C. In welding part C to D, weld only on the underside, as a ball-bearing cone is fitted on the underside of C, and the rough spots left by welding would interfere with a neat fit. Steel plugs ground or turned to a force fit are driven in the top ends of the two tubes B, a hole being drilled and tapped in each plug for the bolt which is to hold the cross member E in place. A duralumin front fender is made as detailed in Fig. 1. This is a very simple but entirely satisfactory job. For the steering post, Fig. 10, a length of $\frac{7}{8}$ -in. tubing is brazed to a bicycle gooseneck, slotted at the bottom and a long bolt made to screw into an expansion plug.

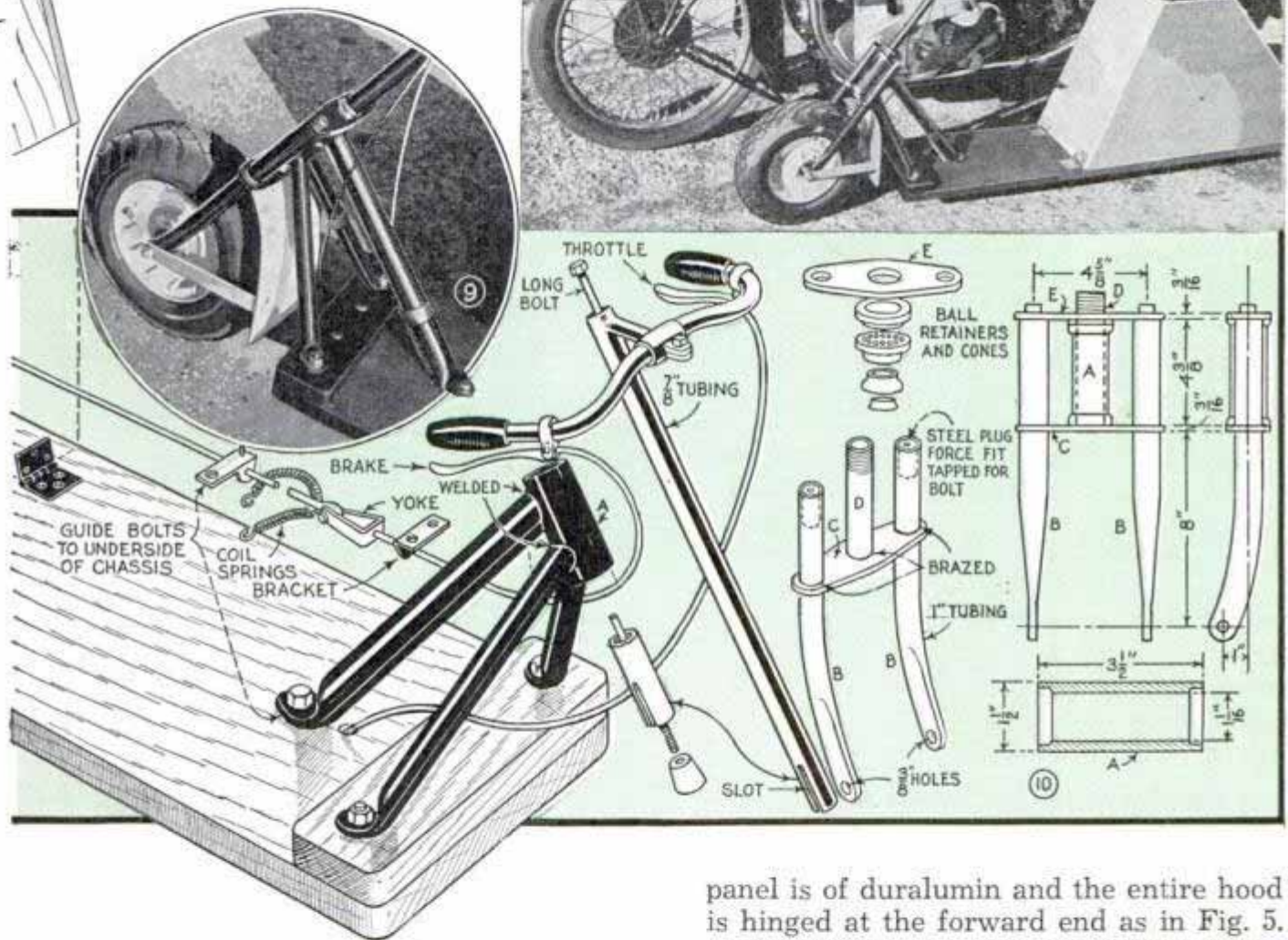
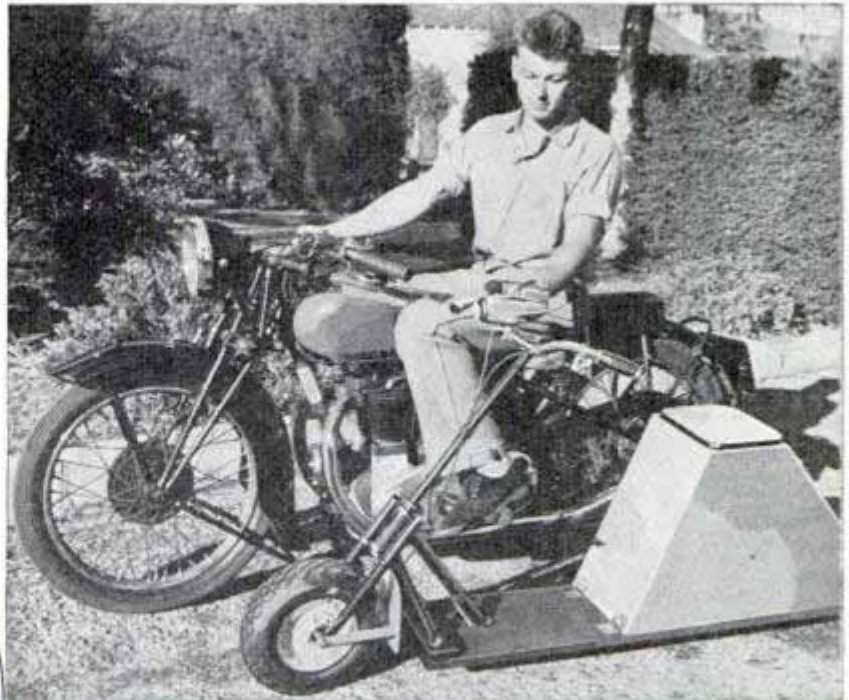
The front axle, shown in Fig. 8, consists of a rod, passing through a sleeve. This construction permits the assembly to be dismantled easily by unscrewing one of the nuts on the smaller axle. Ball-bearing wheels with 12x3-in. pneumatic tires, proved just the right size. As the rims are



in two halves, bolted together, the original bolts are removed and $6\frac{1}{4}$ -in. rods, cut to length and threaded on each end, are substituted. Sleeves cut from heavy tubing fit over the ends of the rods on both sides of the wheel. See the sectional view of the road wheel in Fig. 8. These sleeves space the sprocket and V-pulley so that both clear the tire. The wheels ride upon a stationary axle provided with one loose collar, and one integral collar as in Fig. 8.

For all-around service a 5-to-1 gear ratio is satisfactory. With a $\frac{1}{2}$ -hp. engine running at 2,000 r.p.m., the speed of the scooter on the level is about 17 m.p.h. For hilly sections, install a 6 or even a 7-to-1 ratio. The driven sprocket is of the hubless type

with a bore large enough to clear the axle. For a 5-to-1 ratio, the driven sprocket should have 45 teeth, and the driving sprocket 9 teeth. The driving sprocket must have a hub on one side bored to fit the projecting end of the engine crankshaft. It should be keyed to the shaft. Use a No. 82 roller chain to drive. This arrangement



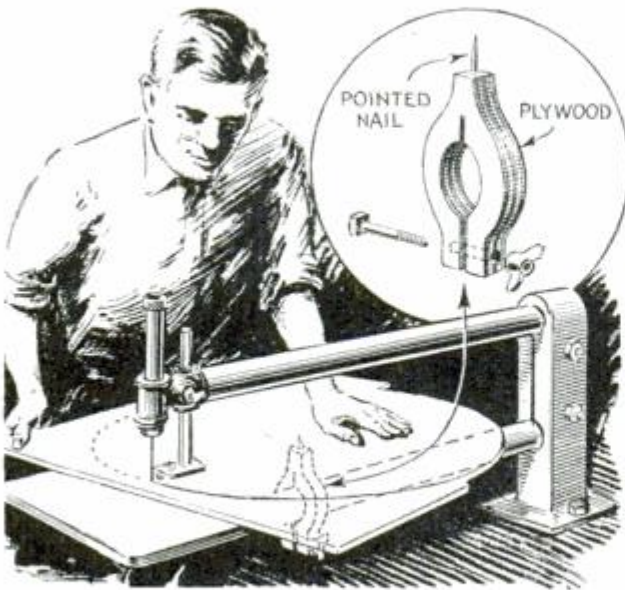
eliminates many complications involved in a clutch or jackshaft drive. Direct drive proved more satisfactory because a slight push starts the motor, and in stopping the latter acts as a drag as soon as it is shut down, stopping the scooter more quickly than if the engine were de-clutched.

A wooden hood, Fig. 7, is easier to construct, more quiet and more satisfactory than a metal one. No great heat is accumulated inside because the engine fan carries it out back, along with exhaust fumes. Vents can be cut in the back of the hood for added circulation if desired. The rear

panel is of duralumin and the entire hood is hinged at the forward end as in Fig. 5. A single bolt with wing nut in back holds it in place. Note that the choke is installed in the front panel near the floor, Fig. 7, but the builder can place it anywhere he finds convenient. The gas tank is bolted to the floor in front of the engine, and batteries for lights can also be installed under the hood if lamps without self-contained batteries are used.

Chinese red and black make a good color combination and can be seen readily by motorists. A natural wood finish on the oak chassis is attractive. Tail and head lamps can be had at reasonable cost at any bicycle shop.

Cutting Disks on the Jig Saw with Aid of Center Pivot



Pivot point clamped to lower arm of jig saw permits work to be rotated into blade to cut disks

By equipping his jig saw with an adjustable center, on which the work could be rotated as it advanced to the blade, one craftsman was able to cut disks or circles quickly. The point is made to slide on the lower arm of the saw and is clamped in a vertical position with a wing nut and bolt. The saw is operated with the blade turned sidewise with the pivot point, at an exact right angle to the cutting edge of the blade. This arrangement provides a permanent set-up, which, when not needed, can be pushed down out of the way.

Grease Applied in Small Amounts from Flexible Tubes



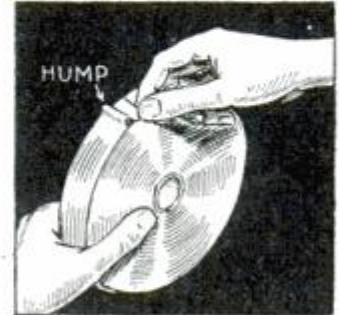
Shop owners and others who frequently use small amounts of grease or hard oil, will find an empty toothpaste tube or similar container a good applicator. The tube is first unrolled and the clip at the bottom removed, after which a stick is used to open it up to as near its original shape as possible. The tube is immersed in hot water, which softens any toothpaste left inside so it can be

Shop owners and others who frequently use small amounts of grease or hard oil, will find an empty toothpaste tube or similar container a good applicator. The tube is first unrolled and the clip at the bottom removed, after

washed out. Then the grease is packed into the tube with the stick. The tubes are also useful for holding emery dust and grease to be used on a cloth pad for polishing and finishing wood turnings in a lathe.

Marking End of Friction Tape by Hump on Roll

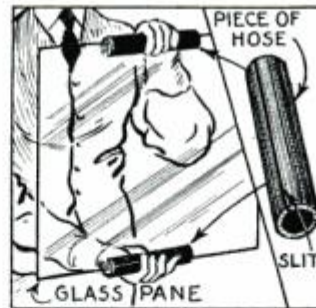
Instead of running your finger around the edge of a roll of friction or electricians' tape several times before you locate the end, form a tiny hump on the roll at the end of the tape.



This can be done by making a shallow fold just back of the point where the tape is torn off each time.

—Harry E. Torbitt, Seattle, Wash.

Large Glass Panes Carried Easily by Using Hose Grips



When it is necessary to carry a large piece of glass, such as a windowpane or a desk top, take two pieces of garden hose, slit them along one side and push them over

the edge of the glass. In this position, they serve as handy grips to hold the glass and also prevent one's hands from being cut.

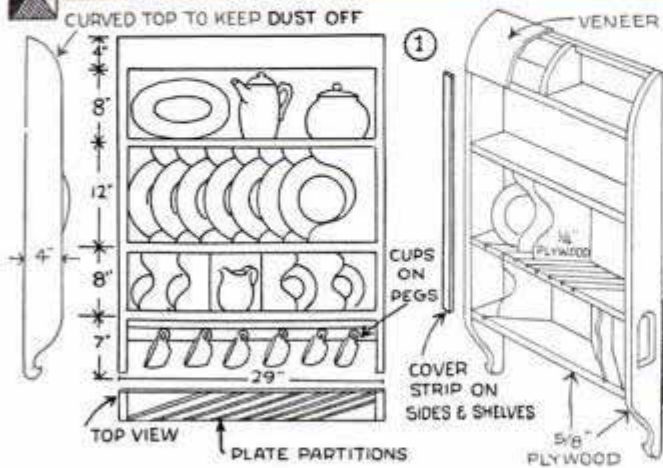
Holder to File Washers

The next time you have to file the side of a washer to make it a trifle thinner, slip it over a tack or nail as indicated and you can hold it easily. The nail

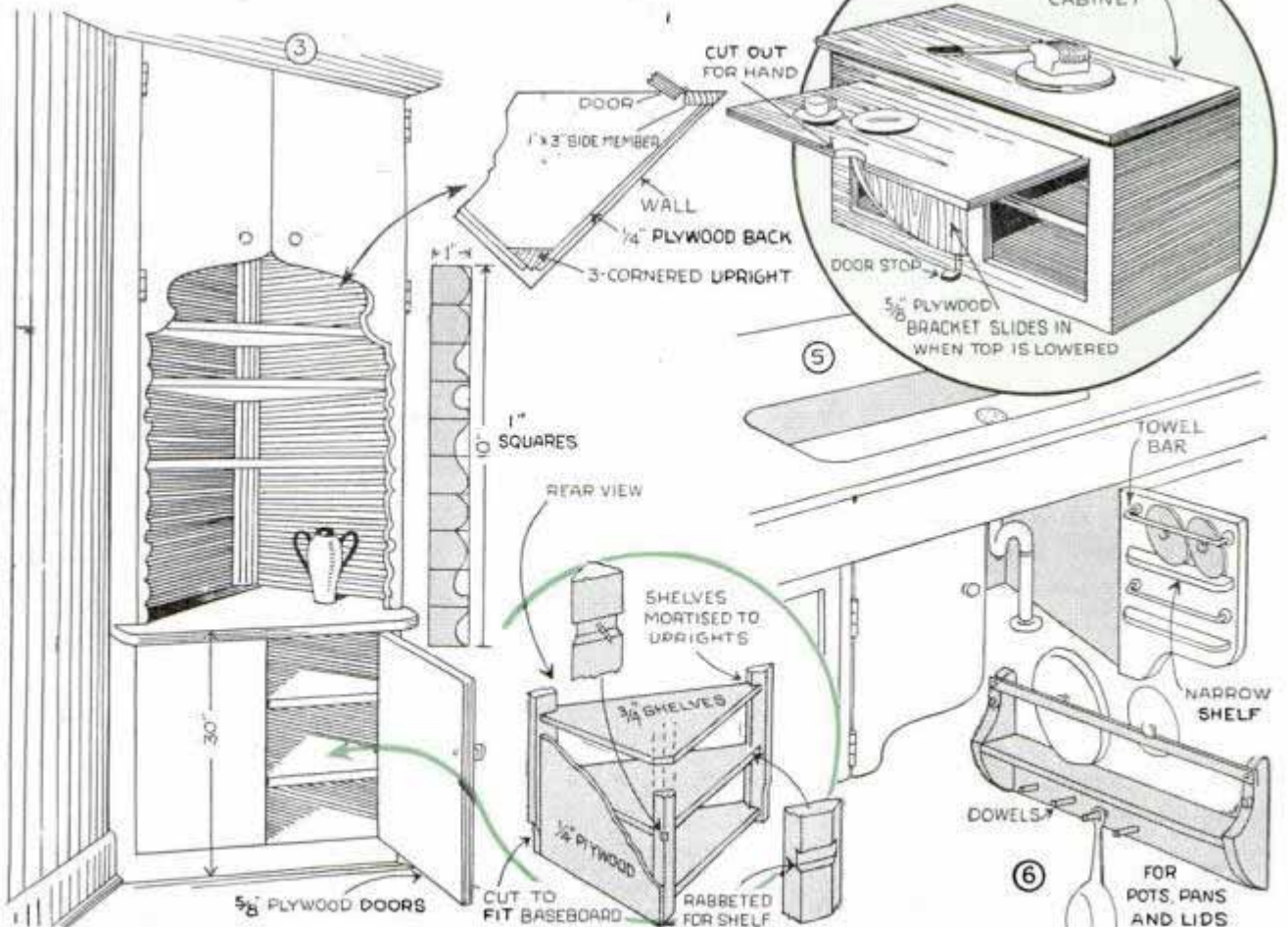


should be driven far enough into the wood so there is no chance of it coming in contact with the underside of the file.

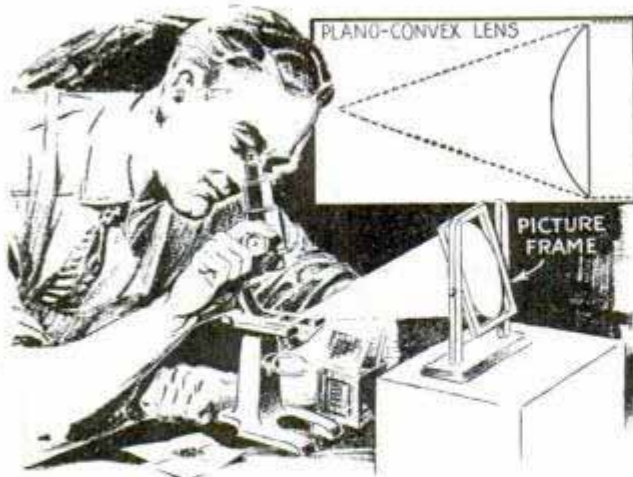
Space-Saving CABINETS



These cabinets are particularly useful in small homes as they utilize waste space. The corner cabinet, in Fig. 2, is of unusual design and has drawers, which are hinged at one end so that they swing out. The side members of the corner cabinet shown in Fig. 3, give a hint of Mexican influence, and are popular in the southwest. The plate and pot racks in Figs. 1 and 6 are made of plywood and are easily assembled. Fig. 5 shows how you can store pot lids on swinging doors under a sink, while Fig. 4 shows how additional table area is provided when a solid panel is substituted for the doors on a kitchen cabinet. The panel is hinged at the top



Opaque Specimen on Microscope Illuminated by Lens



Plano-convex lens mounted in tilting picture frame concentrates light on opaque specimen

When studying an opaque specimen with a microscope, light can be concentrated on the object with a plano-convex lens. This is mounted in a small tilting picture frame as indicated. In use, the frame is set on a support to raise it above the microscope table, after which it is tilted to concentrate the light where wanted.

—George Vias, Chicago.

Hat Aids in Measuring Distance Across Body of Water

Have you ever wondered just how far it was across a river or small lake? If so, you can measure it quite accurately with equipment no more complicated than the brim of your hat. To do this, stand erect on the bank of the river or lake and tip your hat slowly down over your eyes until the edge of the brim is on a line with the



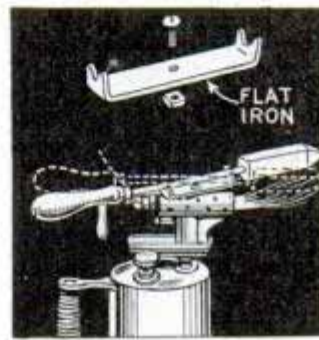
Line up brim with opposite bank, then turn and line up object on shore and step off this distance

edge of the opposite bank. Then, holding your head carefully in this position, turn to the right or left until you see some object that is exactly in line with the edge of your hat brim. The distance between this object and the place you are standing will be approximately the same as that across the body of water.

—Sigmund Sameth, New York, N. Y.

Heat of Soldering Iron Controlled by Support on Blowtorch

When a soldering iron is heated with a blowtorch, and is used only at intervals, this swinging support to move the end of the iron in or out of the flame makes it

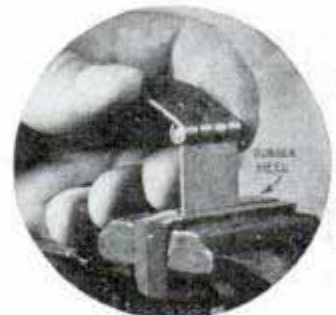


unnecessary to adjust the latter repeatedly. The support consists of a piece of flat iron drilled through the center to take a bolt by which it is pivoted to the burner of the blowtorch. V-shaped notches

are cut in the ends of the angle iron, which is bent upward at right angles to take the shank of the soldering iron as indicated.

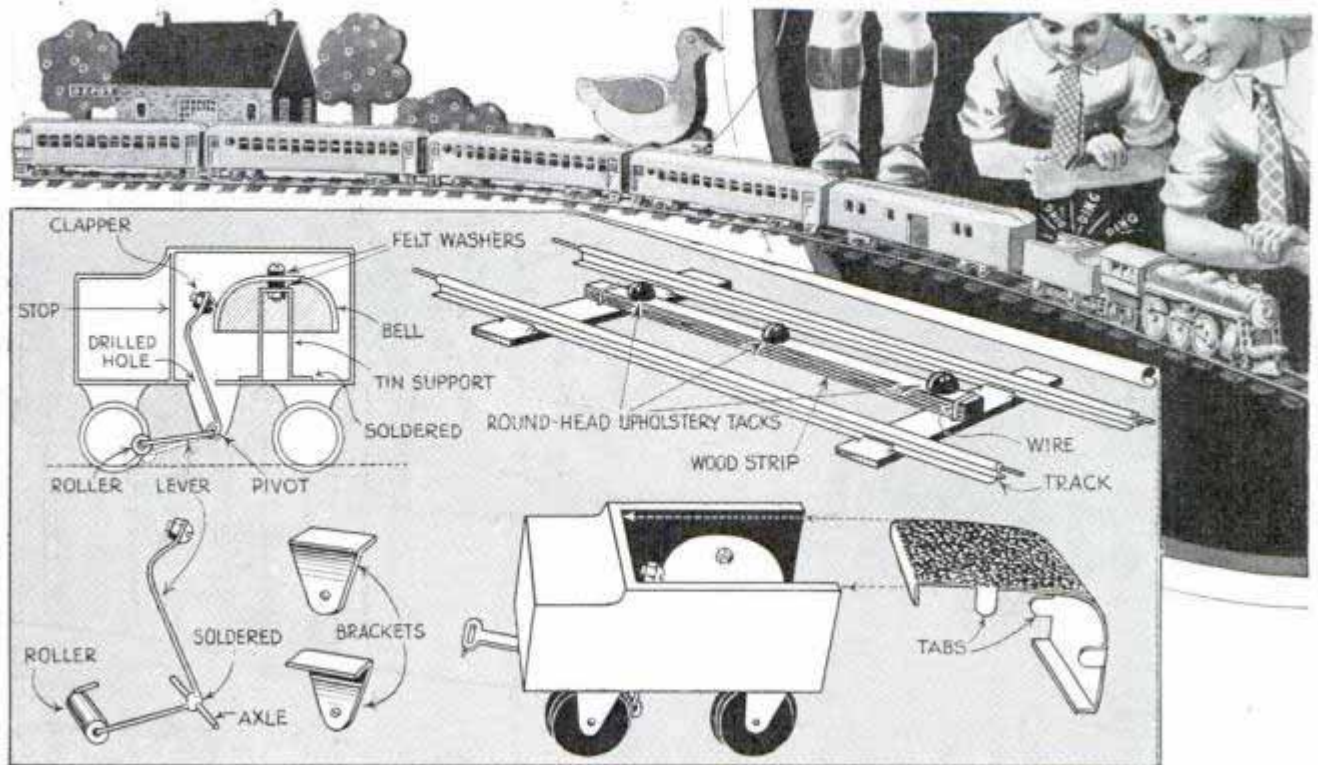
Rubber Jaws for the Vise

When you want to clamp an article in a vise that might be marred by contact with the steel jaws, get a couple of rubber heels and use them as auxiliary jaws. These are also handy as silencers when filing a saw clamped in the vise. A little shellac will help hold the rubber pieces in place if the vise jaws are smooth. Heels trimmed to size are useful on the jaws of a wrench to protect a plated nut on sink faucets and similar work.



☞ Parsley planted in your window box during the winter provides fresh garnish for your table, and food for birds and fish.

Bell on This Toy Train Rings Automatically



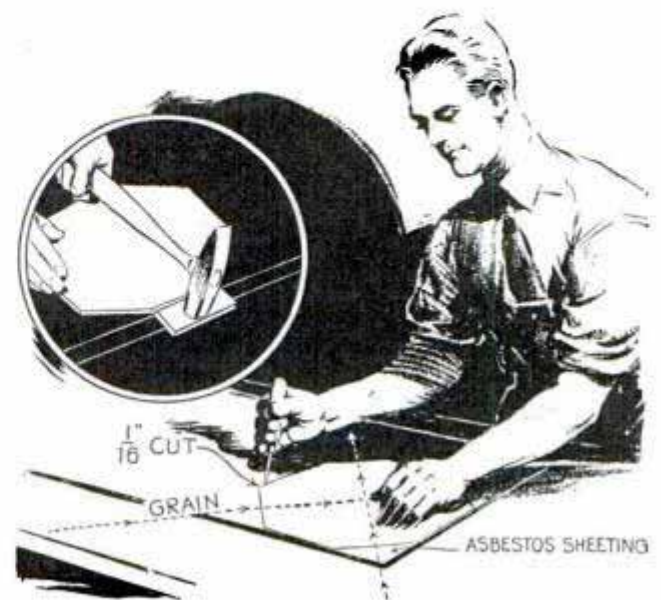
Fitting in the tender of a spring-wound train, this bell will sound automatically at any desired point on the track. No batteries or electrical connections are required, and there is only one moving part. A small lever projects from the bottom of the tender, like the third-rail contact on an electric locomotive. When the lever strikes an upholstery tack, driven into a strip of wood between the rails, it is lifted upward sharply, causing the clapper on

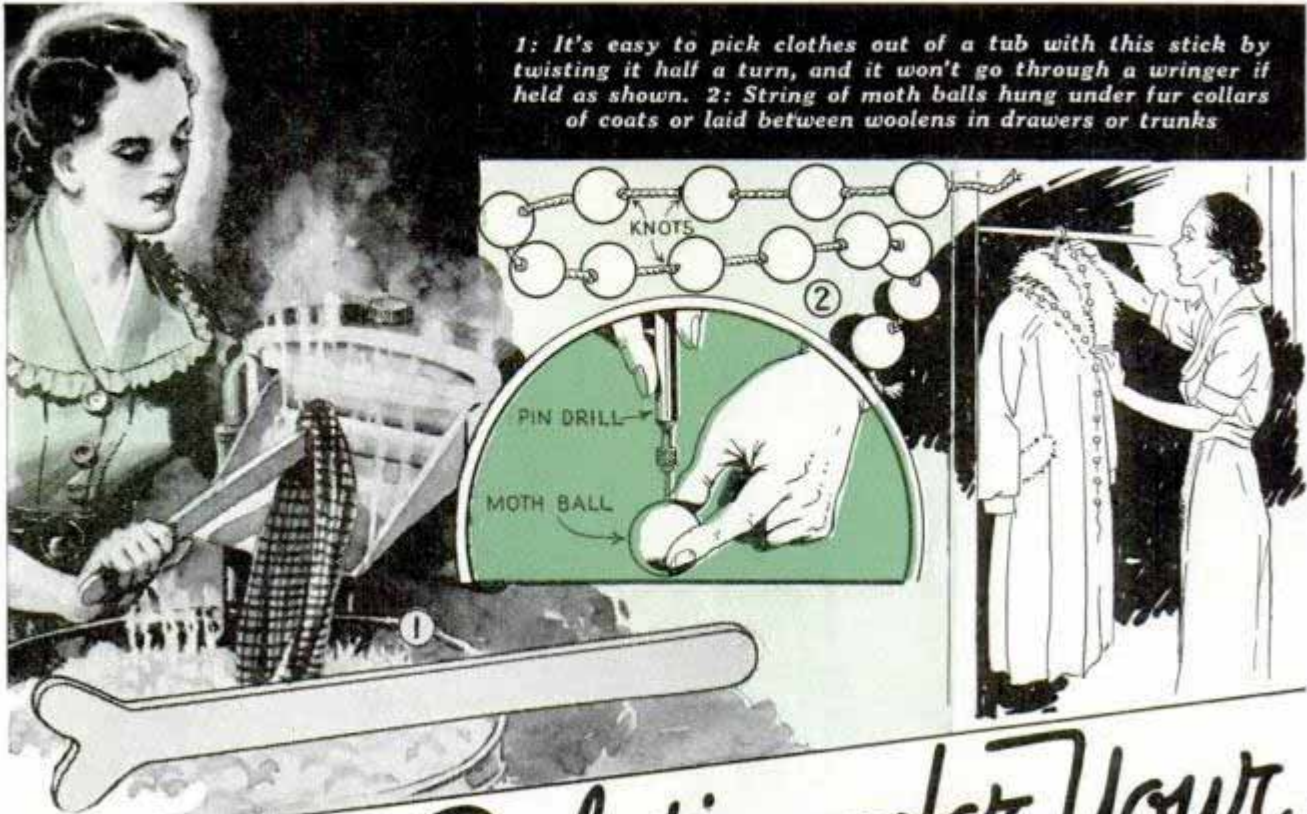
the other arm of the lever to strike against the bell. The bell may be mounted differently from the one in the drawing if it will fit the space better. Do not clamp it tightly, as this will deaden the sound, which will also be the case if the clapper is clamped tightly against the bell at striking. A stop should be provided to prevent the lever from dropping too far. Adjustments can be made by simply bending the lever up or down.—J. L. Story, Oklahoma City, Okla.

How to Cut Thick Sheet Asbestos to Get Smooth Edges

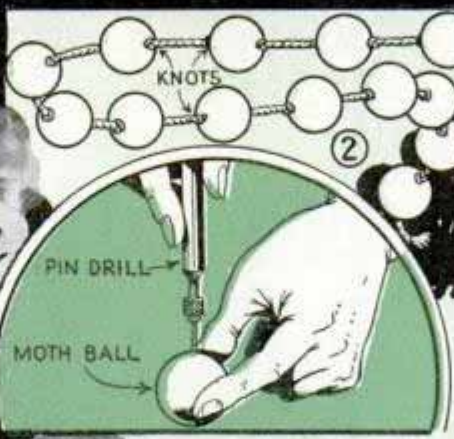
I have found the following method of cutting sheet asbestos highly successful. When cutting across the grain first score a line about $\frac{1}{16}$ in. deep and lay the sheet on a table or bench with the scored side up and with the score directly over the table edge. Then give the projecting part a few light taps with a hammer where the line begins, after which a sharp blow near the outer edge will break the work cleanly. When cutting with the grain, the operation is similar, except that the scored side of the sheet is placed next to the table and the hammer is used on the un-scored side.

—Charles W. Mehl, Jersey City, N. J.



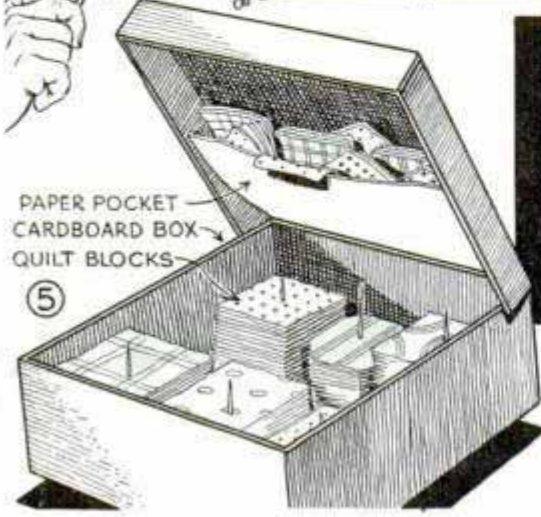
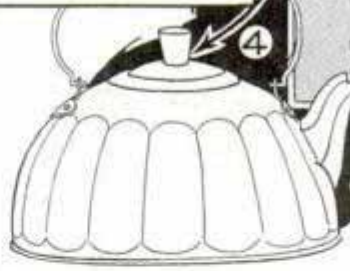
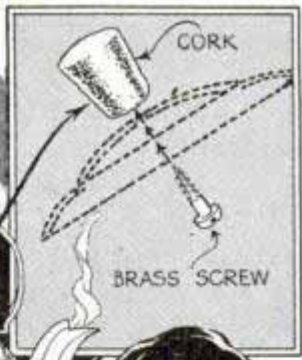
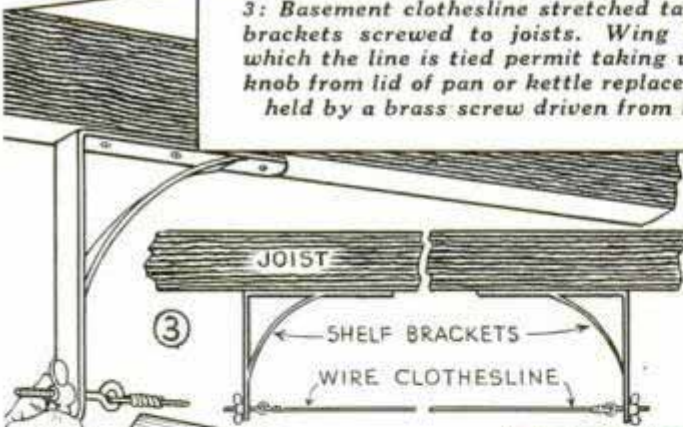


1: It's easy to pick clothes out of a tub with this stick by twisting it half a turn, and it won't go through a wringer if held as shown. 2: String of moth balls hung under fur collars of coats or laid between woolens in drawers or trunks



Easy Solutions for Your

3: Basement clothesline stretched taut between two shelf brackets screwed to joists. Wing nuts on eyebolts to which the line is tied permit taking up the slack. 4: Lost knob from lid of pan or kettle replaced quickly with a cork held by a brass screw driven from the inside of the lid



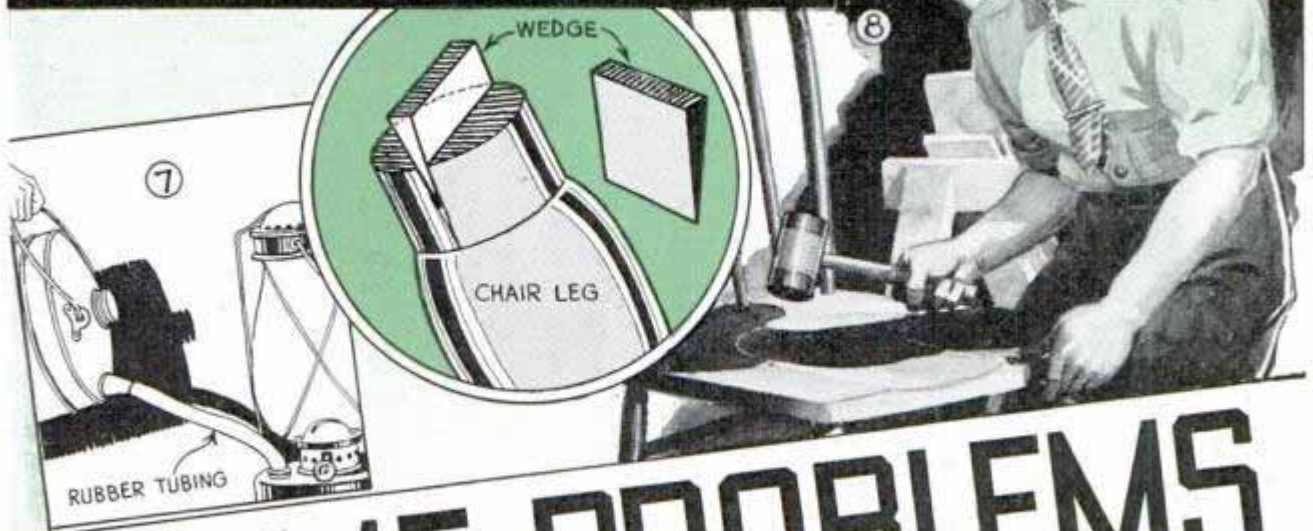
5: "Filing" quilt blocks according to color, size or design, on pins that stand vertically in a large box. The pins are pushed through cardboard disks which are glued to the bottom. 6: Short lengths of soda straw inserted through slits in a pie crust to permit escape of steam and thus relieve pressure which often causes juices to run over in oven



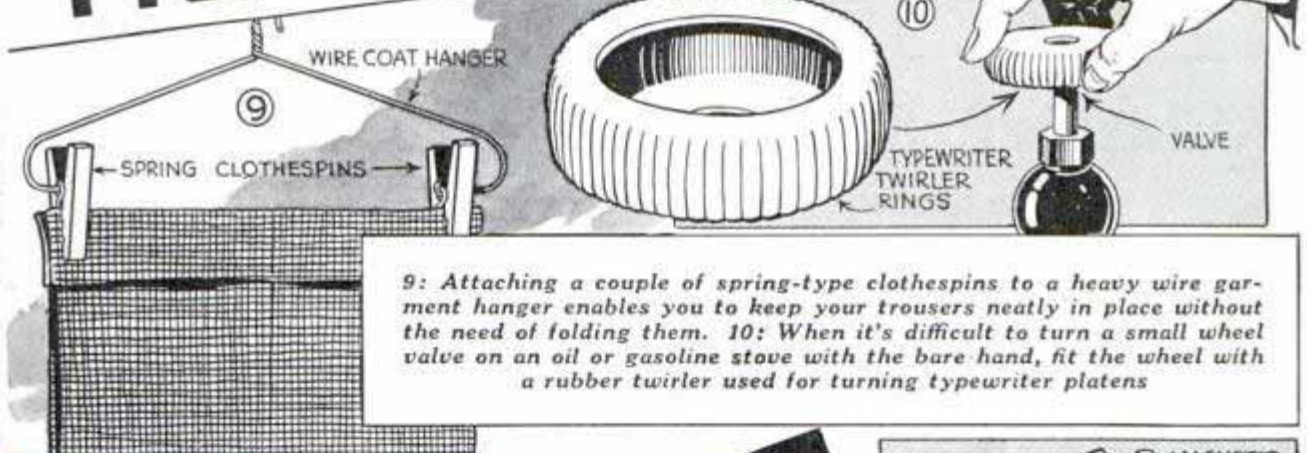
SHORT LENGTHS OF SODA STRAW



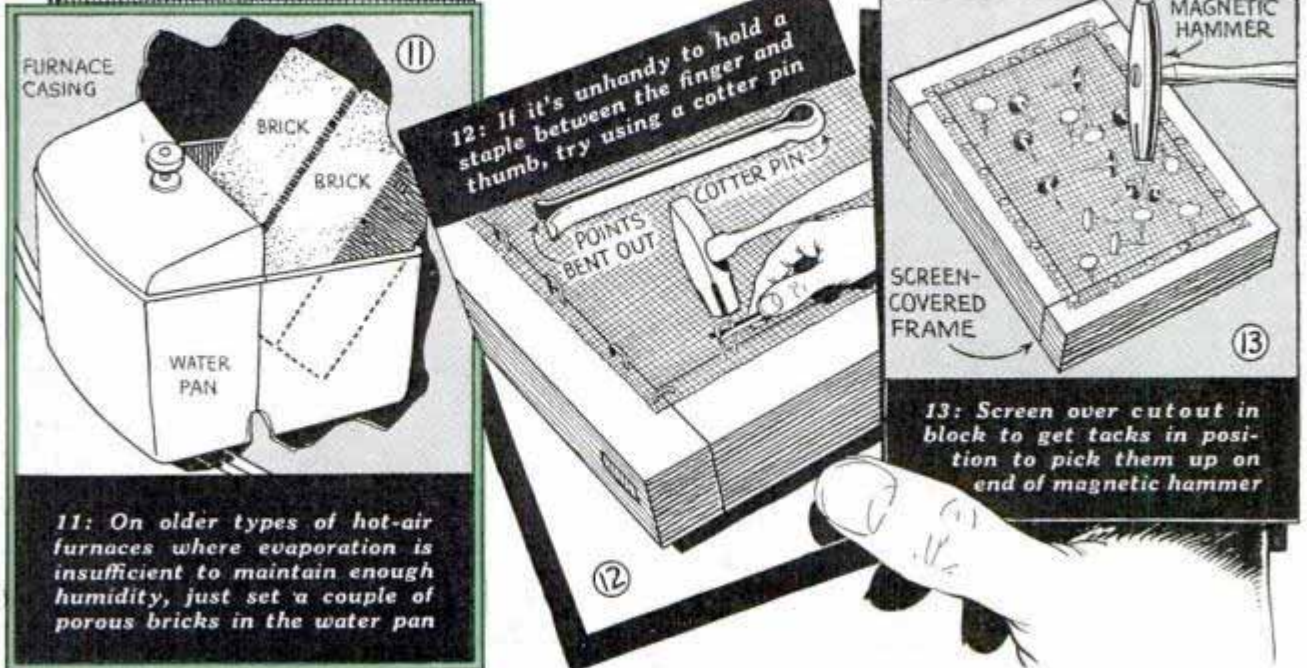
7: The job of filling a lantern or oil-stove tank is simplified by slipping a rubber tube over the spout of a kerosene can.
 8: Chair legs will not loosen again if a glue-coated wedge spreads the end of the leg inside the hole



HOME PROBLEMS



9: Attaching a couple of spring-type clothespins to a heavy wire garment hanger enables you to keep your trousers neatly in place without the need of folding them. 10: When it's difficult to turn a small wheel valve on an oil or gasoline stove with the bare hand, fit the wheel with a rubber twirler used for turning typewriter platens

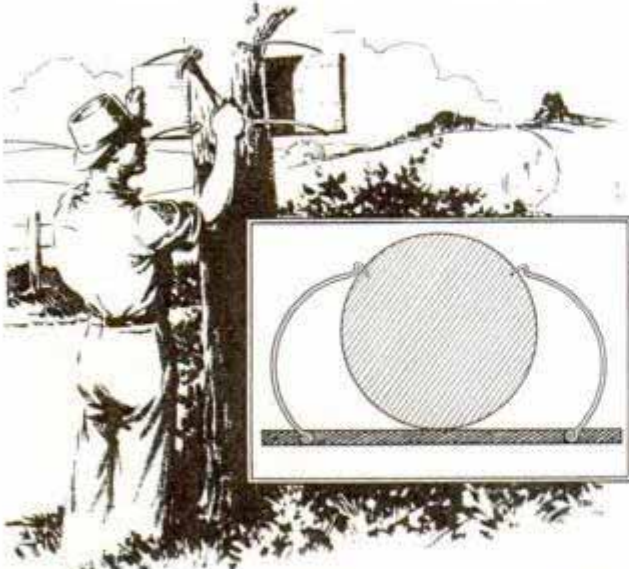


11: On older types of hot-air furnaces where evaporation is insufficient to maintain enough humidity, just set a couple of porous bricks in the water pan

12: If it's unhandy to hold a staple between the finger and thumb, try using a cotter pin

13: Screen over cutout in block to get tacks in position to pick them up on end of magnetic hammer

Small Temporary Signs on Trees Have Hooked Fasteners



These fasteners are instantly adjusted to a tree or post and hold a sign tightly in place

In conservation areas and on highways or public grounds where small signs are often put up temporarily on trees or posts,

these fasteners will save time. Shaped from 1/4-in. iron rods, the fasteners are pivoted to the signs with screws, and have hooks formed on the free ends which are forced into the trees or posts.

Vacuum-Cup Feet on Tripod Grip Smooth Surfaces

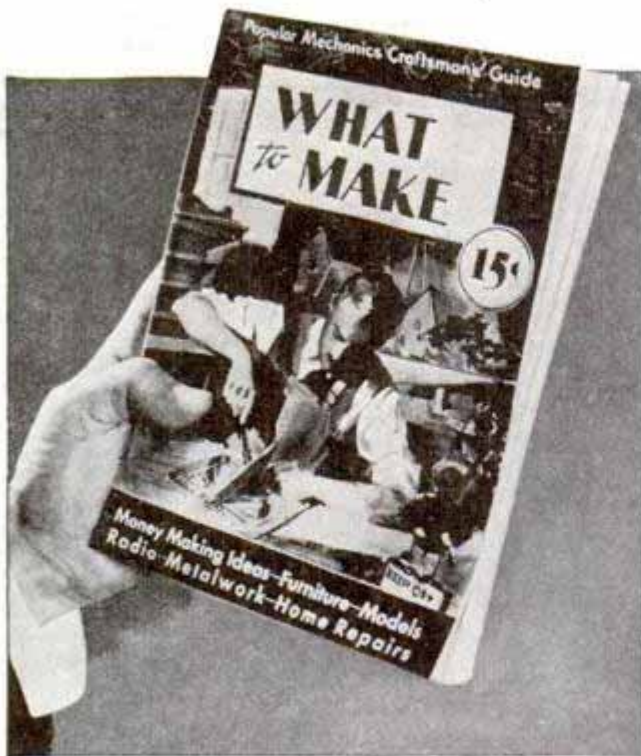
Photographers who experience difficulty in setting up a tripod on a smooth surface, such as concrete or hardwood floors, will find that rubber vacuum cups on the tripod legs solve the problem. For convenience in attaching and removing the cups, they can be fitted to short lengths of metal tubing.



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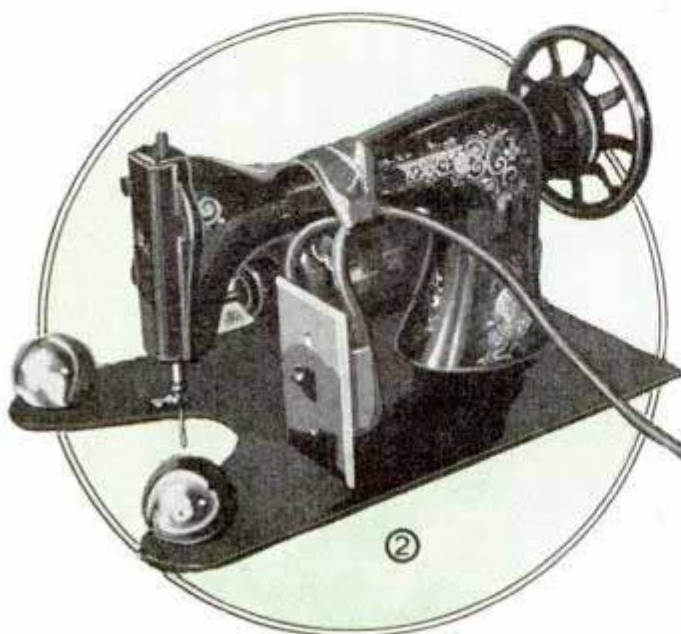
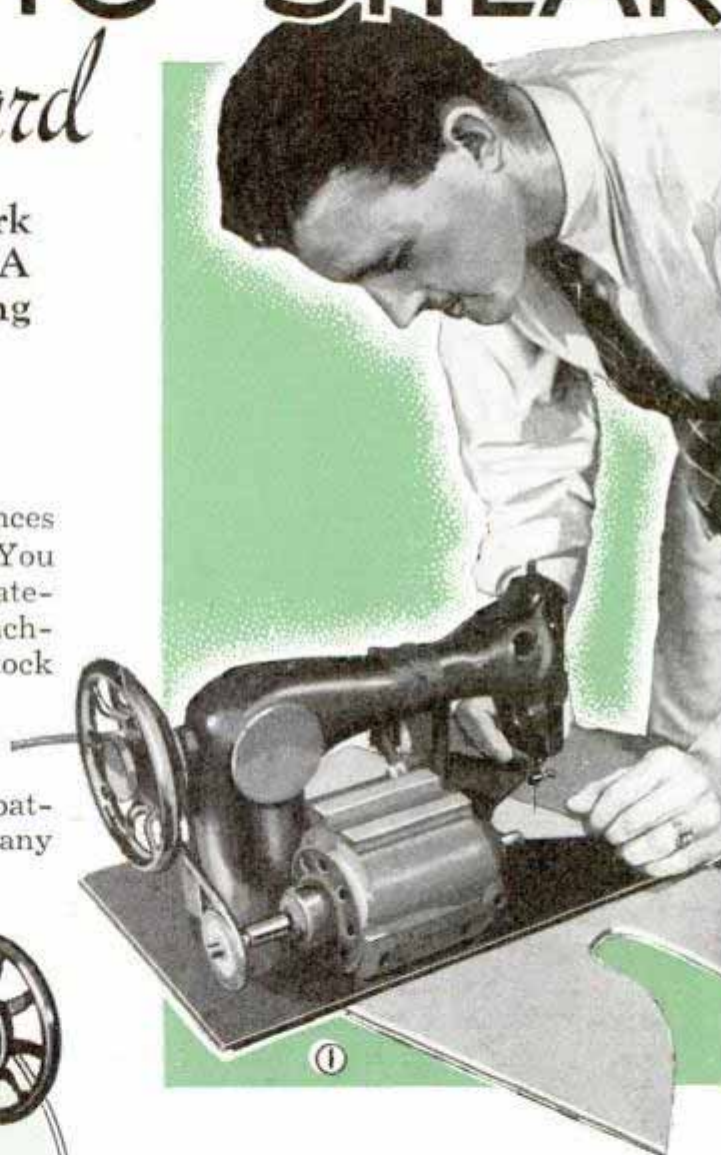


Power-Driven JIG-SHEAR *cuts wallboard*

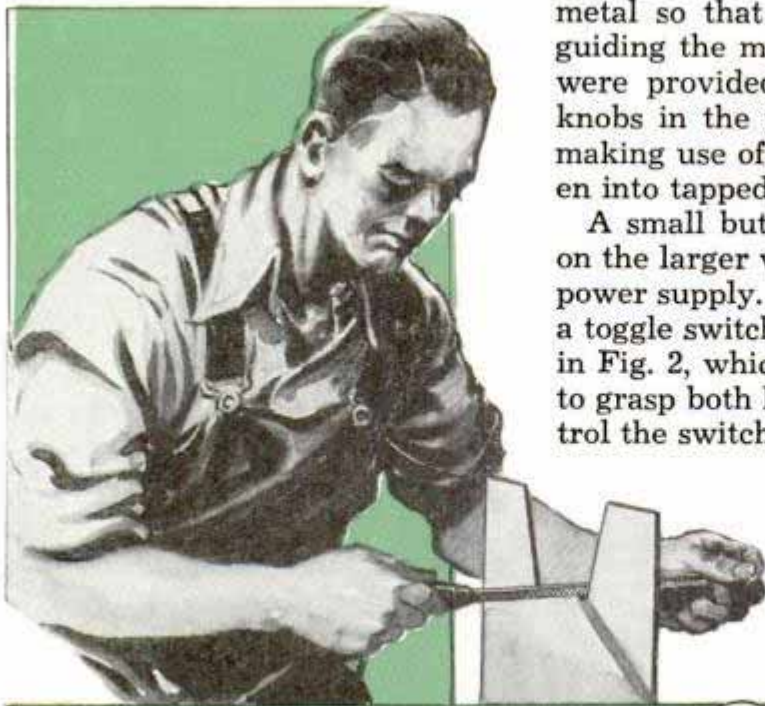
The tool slides over the work to cut out intricate designs. A darning needle does the cutting

By WAYNE C. LECKEY

WITH this jig-shear, there are no fences or spacing gauges to adjust. You simply guide the machine over the material, the rapid strokes of the needle punching a line of perforations through the stock on the border lines of the pattern. As the tool is a self-contained unit and can be moved over the surface of the work in any direction as in Fig. 1, the pattern of the cutout can be practically any size or shape.



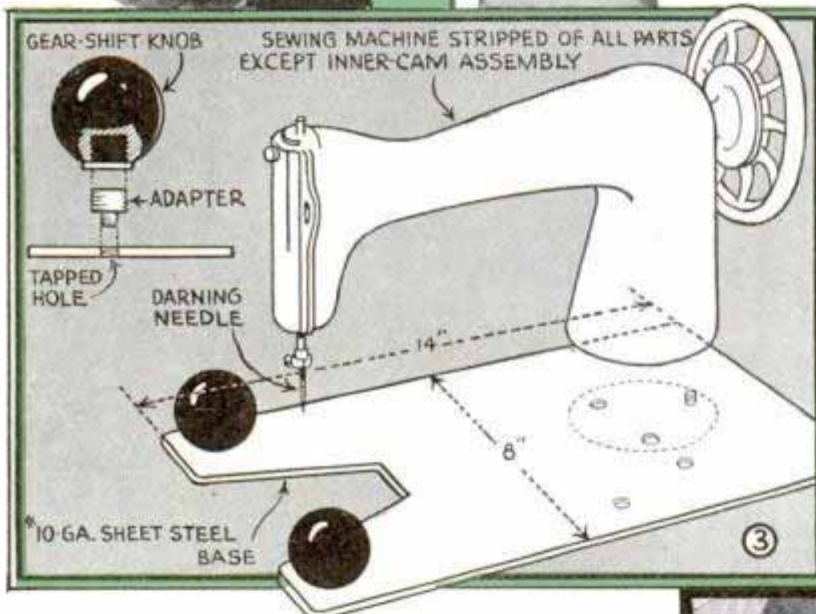
It is quite apparent from the illustrations that this jig-shear was constructed from the head of an old, standard type of sewing machine. First the machine was stripped of all its moving parts with the exception of the inner cam, which gives the up-and-down movement to the needle spindle. As the head and bed were cast together, forming one unit, the bed was cut off square-



metal so that it will slide easily. Handholds for guiding the machine in any direction on the work were provided by mounting two auto gear-shift knobs in the positions indicated in Figs. 3 and 4, making use of standard adapters which were driven into tapped holes.

A small but high-speed motor of the kind used on the larger vacuum sweepers, was employed as a power supply. For the convenience of the operator, a toggle switch was mounted in the position shown in Fig. 2, which makes it possible for the operator to grasp both handholds and at the same time control the switch by the movement of a finger. Com-

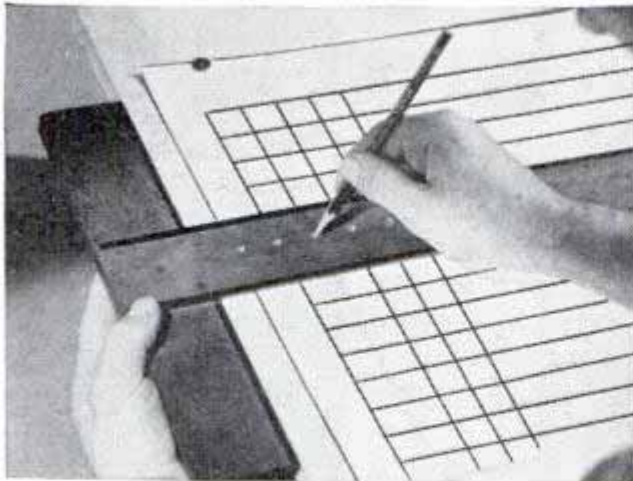
mon darning needles of the heavier type are used for the cutter bits, although a machine-type shoemakers' awl was found to give even a cleaner cut than a needle. In use, the work to be cut should lie perfectly flat on a smooth bench or table top of wood or linoleum. Or, it may be advisable to use a sheet of plywood or hard-pressed board directly under the work to take the punching of the needle when it passes through the work. While this tool is rather unusual, some practice will soon give you the knack of manipulating it in either curved or straight paths, depending on the pattern you are following.



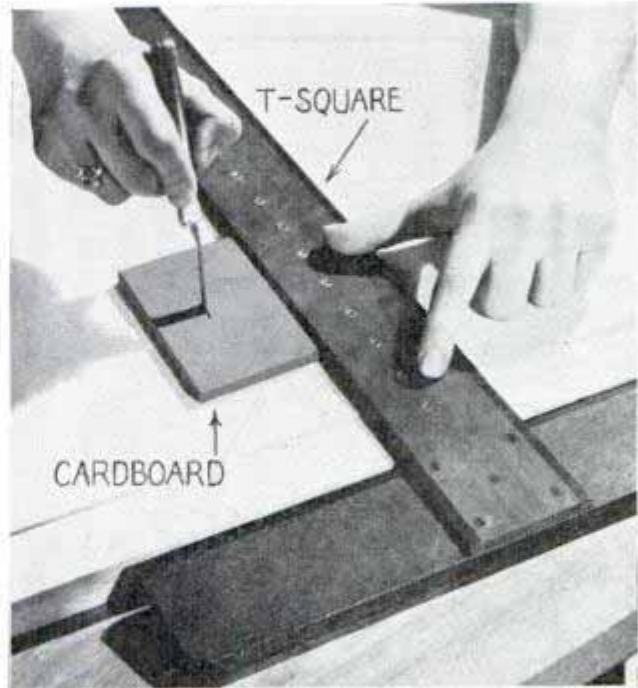
ly at the base with a hacksaw. A flat base of No. 10-gauge sheet steel was then cut out and the head squarely fastened to it by means of flat-head screws, which were countersunk flush with the underside. When the bed was cut, the factor of weight of the entire outfit and the convenience of handling it were taken into consideration. The V-shaped opening through which the pattern line on the work is visible, was cut with a hacksaw and cold chisel, the bottom edges of the opening being rounded by filing so that the machine can be drawn over the work without scratching the surface. Also, the underside of the bed was given a smooth finish by rubbing it vigorously with fine emery cloth. If desired, a coating of wax also may be applied to the



T-Square for Cross Ruling and Paper Cutting



In drafting rooms, where cross-ruled forms are used for various purposes, much time can be saved in measuring and marking if small holes are drilled equidistantly in the blade of a T-square. In cross ruling, the square is held in the position indicated above, after which it is slid along the board while a pencil point is inserted through one of the holes. If a T-square is employed as a straightedge when cutting pa-



per and cardboard with a sharp knife or razor blade, the edge of the square can be protected by inserting the point of the knife through a square of cardboard as indicated at the right.

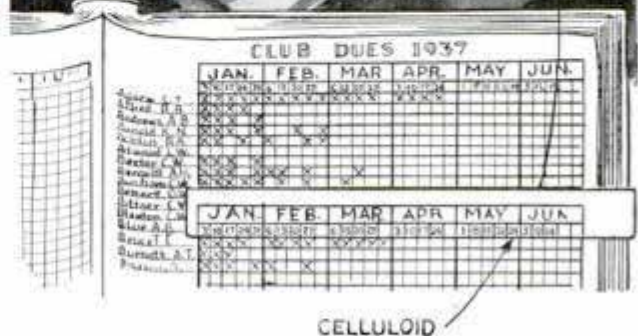
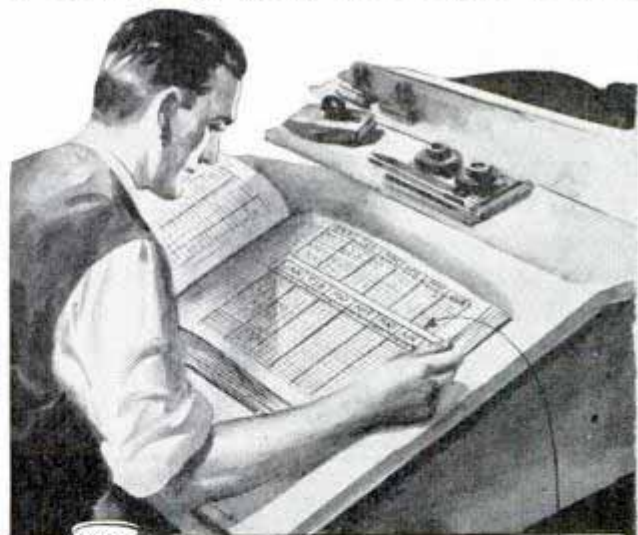
Column-Heading Guide Saves Time When Posting Data

Bookkeepers, statisticians and others, who keep records that require many pages of entries, will find this guide helpful when making entries below the center of a page, as it keeps the heading of each column in front of the eyes. The guide saves time, helps to assure accuracy, and tends to reduce eyestrain by making it unnecessary to raise the eyes to the top of a page each time an entry is made. It is merely a strip of clear celluloid on which the column headings are lettered as indicated. If several different page headings are required in your work, a guide can be made for each one.—K. L. Martin, Cleveland, Ohio.

Scroll-Saw Blade Rounded on End Easily Slipped into Saw Vise

On scroll-saw work, where holes have been drilled to start internal cuts, considerable time can be saved if the end of the saw blade is rounded. This makes it easy to insert the blade into the saw vise.

—K. B. Sanborn, Altadena, Calif.



This guide keeps the column headings in front of your eyes when posting below the center of a page

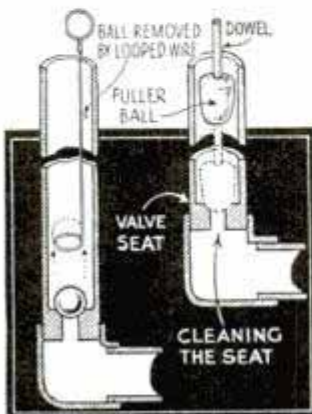
Singletree Guard of Rubber Prevents Tangled Lines



Bridging the space between the singletrees keeps lines from getting under them

Farmers and teamsters who have suffered annoyance, and often serious run-aways with their teams, by having the lines get caught under the ends of the singletrees, can avoid such trouble by bridging the space between the singletrees with a strip of rubber. This is cut from a discarded inner tube and is tacked to the ends of the singletrees. The rubber strip does not restrict the movement of the hitch.

Seats in Ball-Valve Pumps Cleaned with Fuller Ball

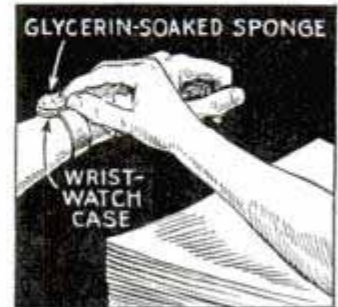


Seats of ball valves in pumps on steam-pressing machines and similar places are cleaned easily without dismantling by using a fuller ball "charged" with powdered abrasive on the end of a

small dowel. A looped wire may be employed to lift and remove the ball valve, after which the tool is inserted into the pump and rotated so the abrasive will clean and polish the seat.

Printer Carries Glycerin Sponge on His Wrist

Printers and others who handle paper, will find an old wrist-watch case a handy receptacle for a glycerin-soaked sponge for moistening the fingers.



Angle Mirror Permits Easy Check of Percolator Burner

Instead of stooping to see the burner on a coffee urn or percolator, one restaurant manager uses a small mirror which is per-

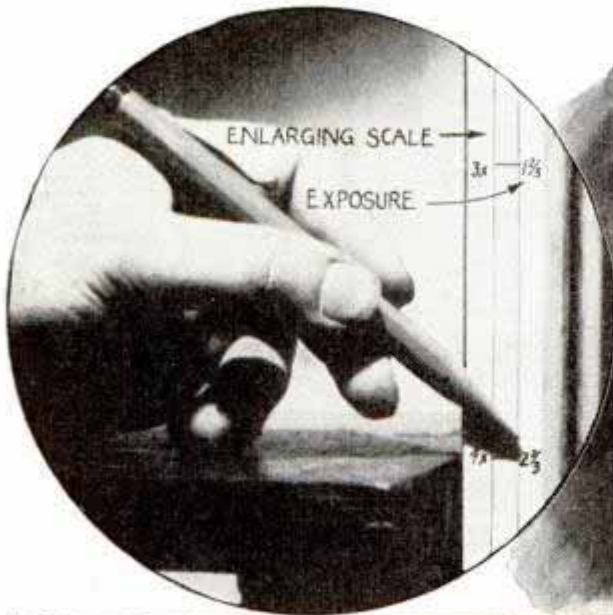


Glancing into mirror set at angle in front of burner shows how to adjust flame without stooping

manently attached to the counter in front of the burner opening. A glance into the mirror may be made in passing and the gas adjusted as required.

¶ If a piece of wax paper is folded over a knife, butter or cheese will not stick to it and can be sliced as thin as desired.

Exposure Chart Saves Time When Enlarging



SCALE OF ENLARGEMENT		MASTER SCALE	
1x	2x	3x	4x
5x	6x	7x	8x
9x	10x		
1 2/3	1	2/3	1/2
RELATIVE EXPOSURE			
RELATIVE EXPOSURE	1	1/2	1/3
SCALE OF ENLARGEMENT	2x	3x	4x

SCALE FOR ENLARGER

POINTS FOUND BY EXPERIMENT



As the exposure time, when making photo enlargements, increases in proportion to the distance between the lens and the easel, and also in proportion to the size of the enlargement, photographers will find that the relative exposure chart given above, saves time and paper. Whether applied to a vertical or a horizontal enlarger, the idea is the same. You locate a strip of paper at right angles to either lens board or easel, whatever one is moved. After drawing a centerline, the points of various enlargements are marked on the strip as 2X, 3X, etc. Then the relative exposure chart as shown in the detail is lettered on the other side of the centerline. According to the scale you will note that an enlargement of three times the negative size, indicated by 3X, requires a relative exposure of one and two-thirds as much as a 2X enlargement. For instance, if a 2X enlargement requires 10 sec., a 3X enlargement will require 16 2/3 sec. Small test strips are used at 2X to determine proper exposure at this distance and then any size print can be made without guesswork.

Acid Soldering Flux Container from Empty Mucilage Bottle

Mucilage bottles that have a rubber spreader of the type shown, provide handy containers for acid soldering flux. The acid is applied easily through the slit in just the right amount without any waste and there is no danger of spilling it if the container is accidentally upset. The rubber spreader, of course, resists attack by the acid and will last indefinitely.

—Harvey Paisley, Edmonton, Alta., Can.



☐ For good photo composition, the object of principal interest should be located either to the right or left of the exact center of the picture.

Vegetable Baskets on Skid Chains Easily Pulled to Rear of Truck

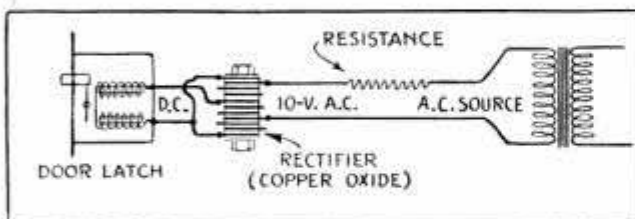


Baskets of fruit set on skid chains laid in truck bed easily moved to rear by pulling on chains

A farmer, who delivers potatoes and other farm products in baskets direct to the homes of his customers, found that he could use skid chains to eliminate climbing in and out of the truck to reach the baskets. The chains are laid lengthwise of the truck bed before the baskets are loaded. In delivering, he merely drops the end-gate of the truck and pulls the chains to bring the baskets within reach.

Buzzing of Electric Door Latch Overcome by Using Rectifier

Residents of apartment buildings who are annoyed by loud buzzing of an electric door latch operated on alternating current,



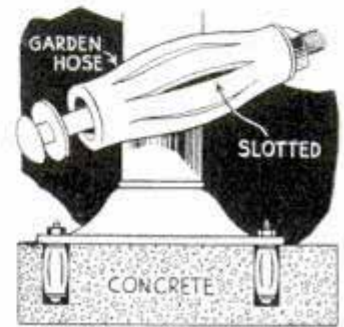
Rectifier in electric door-latch circuit changes alternating current to direct current and eliminates buzz

can eliminate the noise by installing a small rectifier in the line, which changes the alternating current to direct current. When the latch is operated on direct current, the bolt moves only once each time the switch is pushed. The rectifier, which

is of the copper-oxide type, can be taken from an old storage-battery charger. If the alternating-current supply to the latch is higher than 10 volts, it will be necessary to provide one ohm of resistance for each volt over 10. Or, you can use a 6 or 10-ohm rheostat and adjust it until the door latch clicks just once each time the switch is pushed.—N. J. Forsman, Milwaukee, Wis.

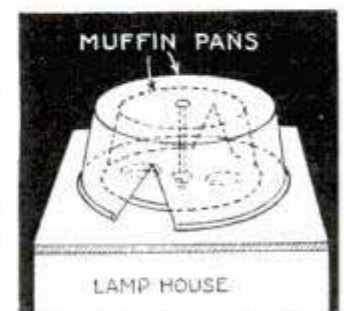
Expander for Pump Anchor Bolts Improvised from Garden Hose

When bolts to hold a well pump are permanently anchored in a concrete platform, it's a good idea to anchor them with expanders so that they can be replaced should the threads happen to be damaged accidentally when removing the pump for repairs. Expanders for this purpose are easily improvised from lengths of rubber hose by making several slits in the latter as indicated. When the hose is slipped over the bolt and set into the holes in the platform, drawing up the nuts tends to expand the hose tightly against the concrete.



Ventilator on Photo Enlarger Is Light-Tight

This light-tight ventilator on a home-built photo enlarger consists of two muffin pans. They should be the same depth, but one should fit inside the other with a clearance all around. Each has a V-shaped notch cut in the side. After painting the inside surfaces of the pans a dull black they are assembled on the enlarger, over the ventilating holes, with a long bolt so that the notches are located opposite each other as shown.



—William Botts, Cincinnati, Ohio.

Turn Right!

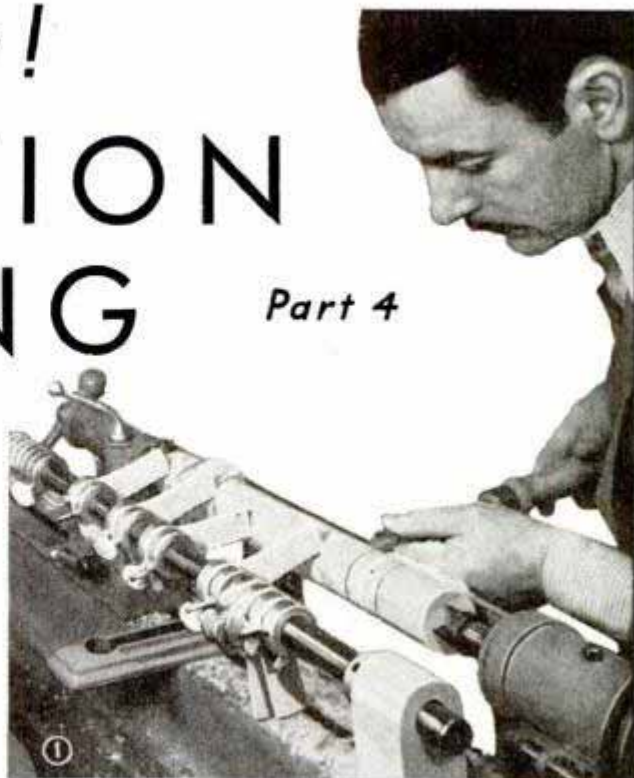
PRODUCTION TURNING

Part 4

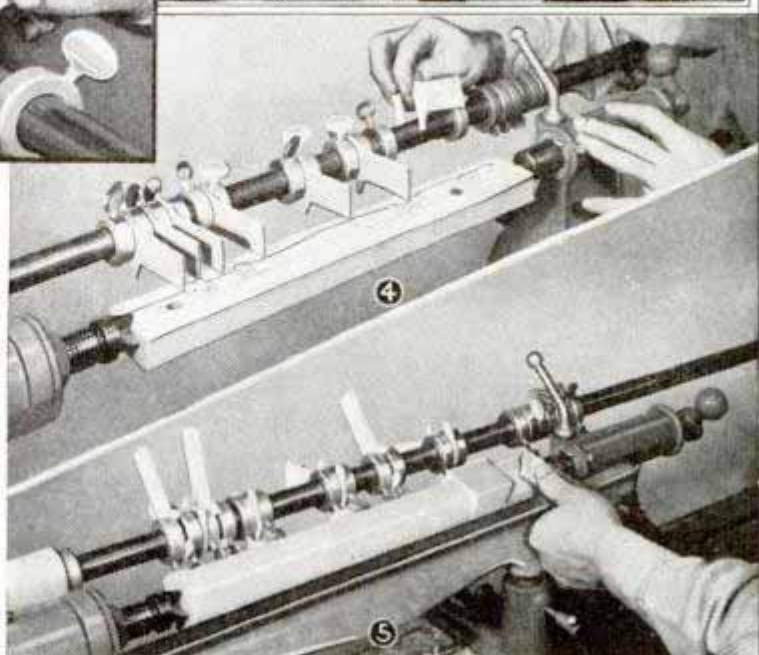
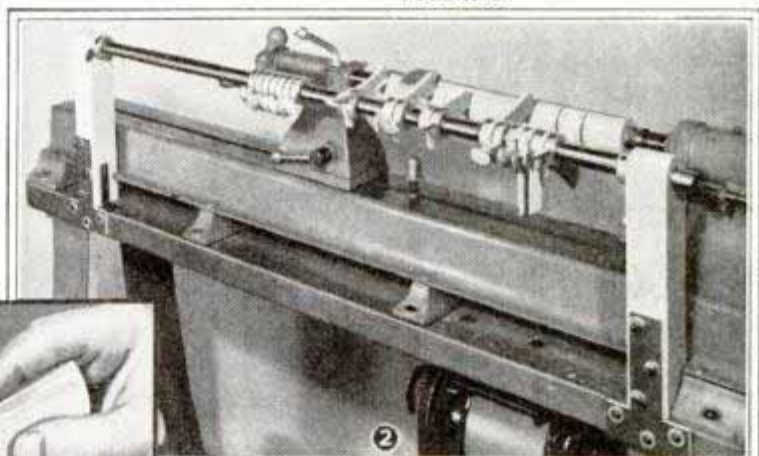
WHEN turning ten or more spindles of the same shape, various jigs to speed the work and to effect greater accuracy should be used. The most satisfactory type of jig is one which is more or less universal in scope, being convertible from one job to another without undue loss of time.

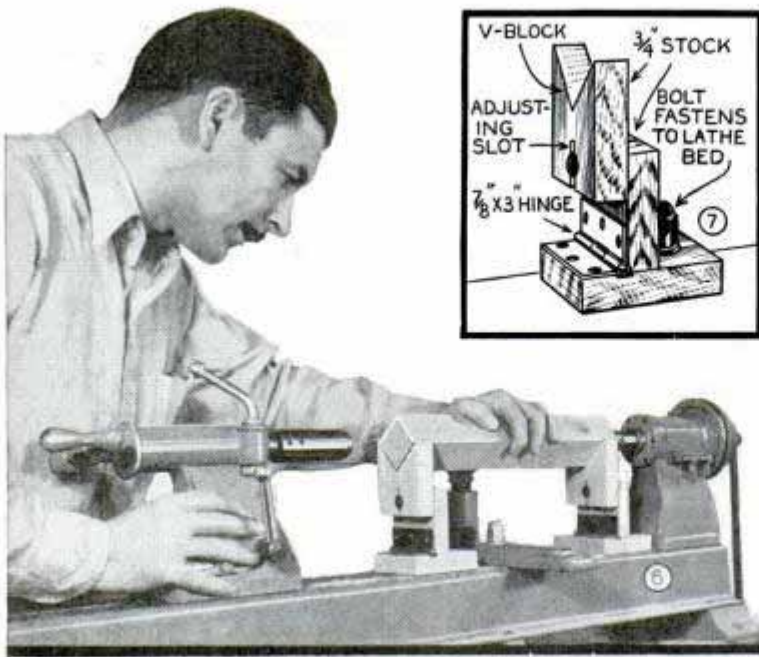
One of the simplest types is the semaphore jig shown in Fig. 1. This is a setting-out device, used to automatically mark all important lengths and diameters of the turning. It can be used to advantage by the home craftsman as well as the professional turner. Fig. 2 shows the general arrangement. Two uprights are fastened to the lathe, and these in turn support a suitable length of $\frac{7}{8}$ -in. shafting, the center of the shaft being level with the lathe centers. The shaft carries from 20 to 40 metal collars, which are used to set the semaphore arms at the required positions. A complete set of arms should be made up to all common diameters used in wood turning, and each arm should be stamped or marked with the diameter which it measures. The arms should be a press fit, Fig. 3, on the shaft so that they will not fall off.

The manner of using the semaphore jig is shown in Fig. 4. A full-size, half-pattern of the turning is laid out on thin cardboard, and tacked to a piece of $\frac{3}{4}$ -in. stock. The pattern is then placed between lathe centers. All important dimensions along the turning are set with correspond-

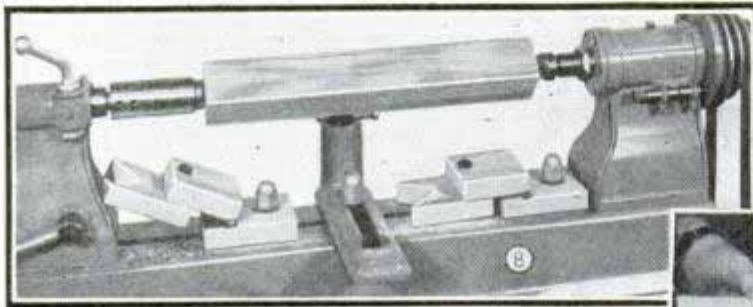
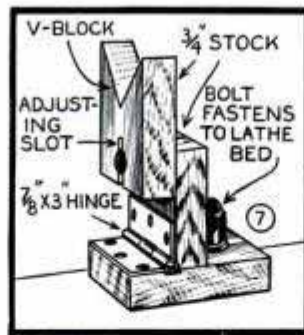


THE "SEMAPHORE" JIG IS USED TO SET OFF ALL IMPORTANT DIAMETERS AND LENGTHS OF THE TURNING





RAPID CENTERING IS MADE POSSIBLE WITH THESE SIMPLE ADJUSTABLE CENTERING BLOCKS. WHEN THE WORK IS HELD BETWEEN CENTERS THE BLOCKS ARE FOLDED DOWN TO PERMIT TURNING



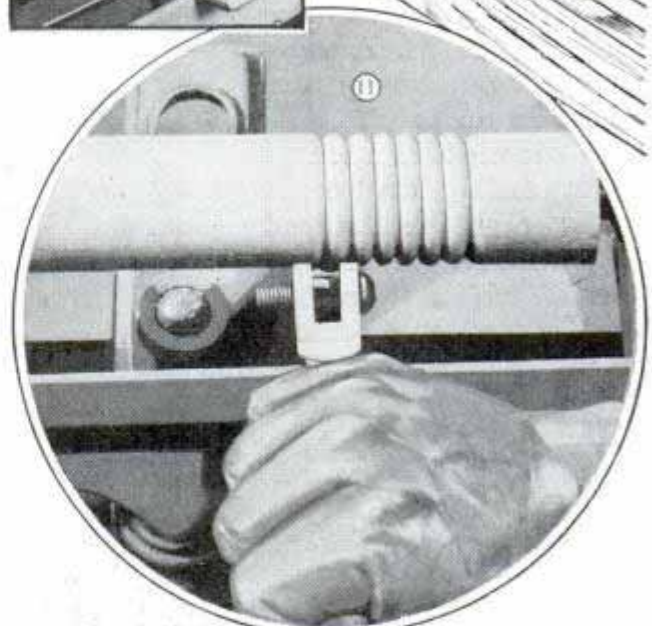
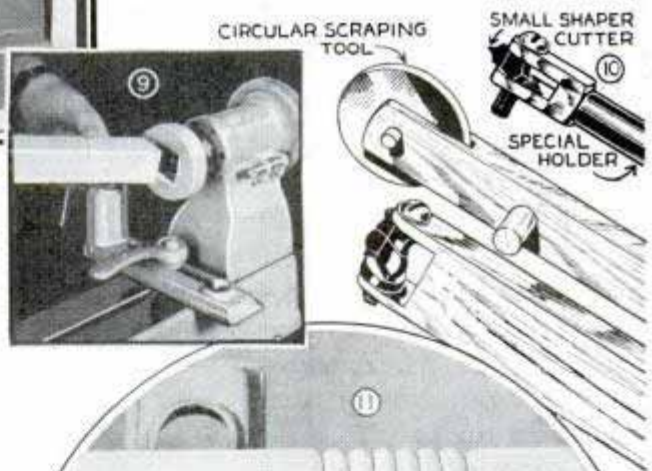
ing semaphore arms. Thus, if a certain portion of the turning is to be $1\frac{1}{4}$ in. in diameter, a $1\frac{1}{4}$ -in. semaphore arm is placed at that point. Each arm is held between two collars snugly, but not tight enough to prevent a free swing. After completely setting out the turning, the arms are turned back to permit rough shaping to cylindrical form, Fig. 5. The arms are then turned over to rest against the work, and the parting tool is used to make each cut until the arm drops below the turning, indicating that full depth has been reached. With all important points cut in this manner, it is a simple job to finish-turn the spindle to shape.

Any production turning has for a first consideration some quick and accurate method of centering the work. One of the best methods of doing this is shown in Figs. 6 to 8 inclusive. The centering blocks, made as shown in Fig. 7, are first set at the required position. Each succeeding square of work is centered by placing it upon the blocks and forcing the tailstock against the

dead end. A spur center should be sharpened well so that a light push will be sufficient to seat the work. After centering, the blocks are moved back to permit turning, as in Fig. 8. If the end thrust is likely to damage the lathe bearings, one centering block can be used in combination with a square-hole chuck, Fig. 9.

Where specially shaped chisels are used in combination with the centering and semaphore jigs, you have a fairly rapid and accurate set-up for varied short-run production jobs. Turning tools can be wood chisels ground to all common bead and cove shapes, or the worker can use standard shaper cutters mounted in special holders, as in Figs. 10 and 11.

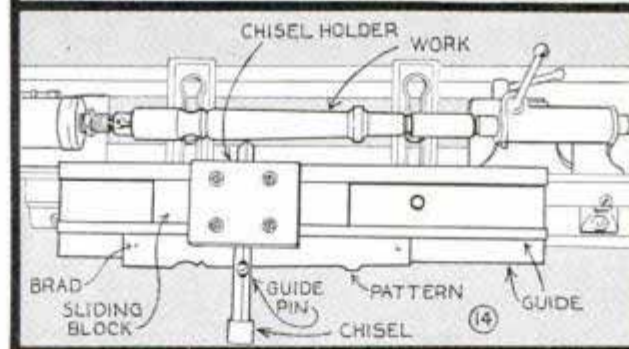
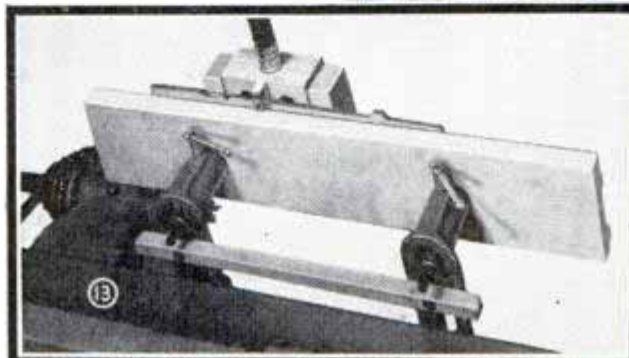
A simple method of working that eliminates all need of setting-out devices or special chisels is pattern turning, as shown in Figs.



SPECIALY SHAPED HAND CHISELS OR SHAPER CUTTERS IN HOLDERS SIMPLIFY CUTTING OF INTRICATE SHAPES

12 to 16 inclusive. A wood or metal pattern cut to the profile shape of the turning is used as a guide. The chisel or other cutting tool is fitted with a guide pin, which moves the cutting edge in and out as the cutter is pushed along the pattern. The entire operation can be done with scraping chisels, using the circular chisel, Fig. 10, for roughing cuts, and the diamond-point chisel, Fig. 15, for finishing. Faster work on roughing cuts can be made with a round-nose router bit, using a heavy-duty flexible shaft as a drive. In this set-up, the shaft is firmly clamped between two wood or metal blocks. The underside of the block carries the guide pin, which should be square with slightly rounded edges. The thickness of the pin is the same as the diameter of the router bit—preferably $\frac{5}{16}$ in. The shaft block slides in and out between guide blocks, and these slide along the turning—a simple form of compound slide rest. The router bit should rotate 5,000 r.p.m. while the lathe should turn not more than 200 r.p.m. The path

PATTERN TURNING IS PRACTICAL AND ACCURATE. IT IS ESPECIALLY USEFUL FOR SHORT-RUN WORK ON LONG SPINDLES

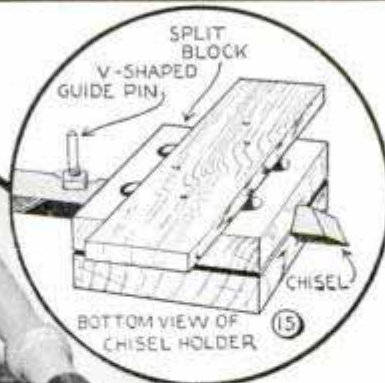
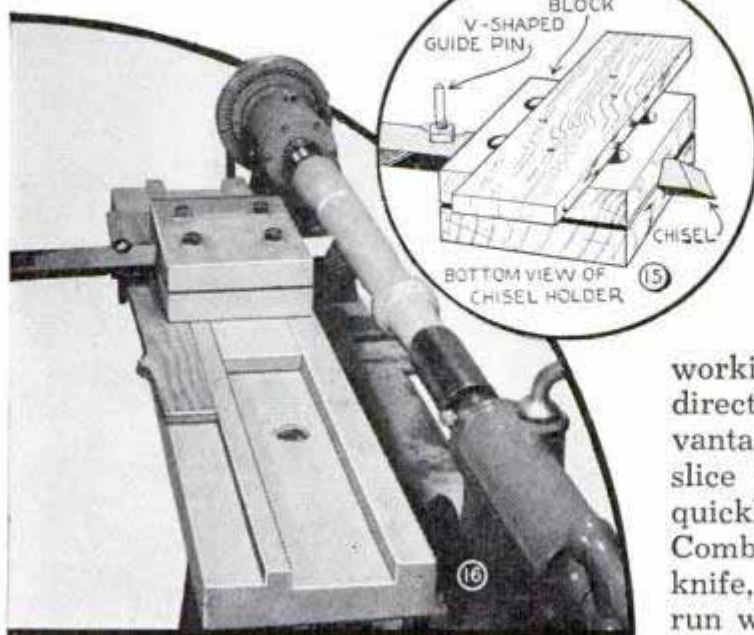


of cutting is always from headstock to tailstock, and the router bit must be exactly on center. The finishing should be made with a scraping chisel fed slowly along work rotating at high speed.

One very essential requirement for successful pattern turning is rigidity.

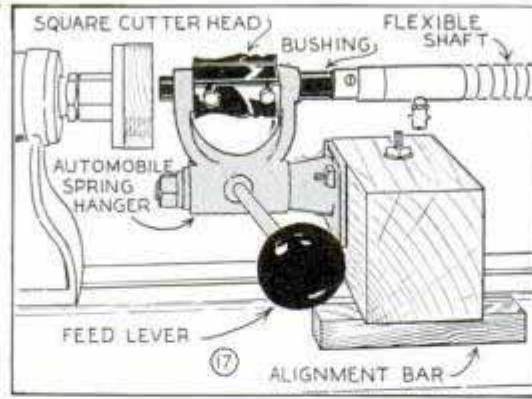
There must be no play in the sliding ways, yet all parts should slide smoothly without binding. Where the spindle length is not too great, various other methods can be used to duplicate quickly any turning. The rotary head, Figs. 17 and 18, gives fairly good results, its main drawback being a slight tearing of the wood common to all wood-

working operations where the cut is made directly across the grain. The main advantage of the rotary head is speed—it will slice into any small turning almost as quickly as the handle can be pushed down. Combined with a finishing cut with a flat knife, this method is very good for long-run work. The cutterhead should turn at 5,000 r.p.m., rotating toward the operator;



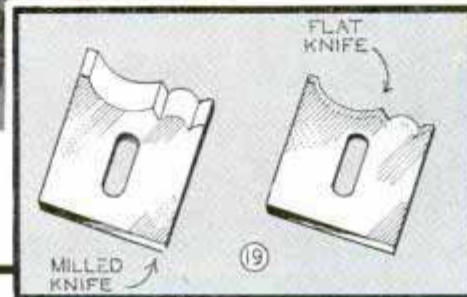


A NUMBER OF DIFFERENT SET-UPS CAN BE MADE FOR PRODUCTION TURNING OF SHORT SPINDLES



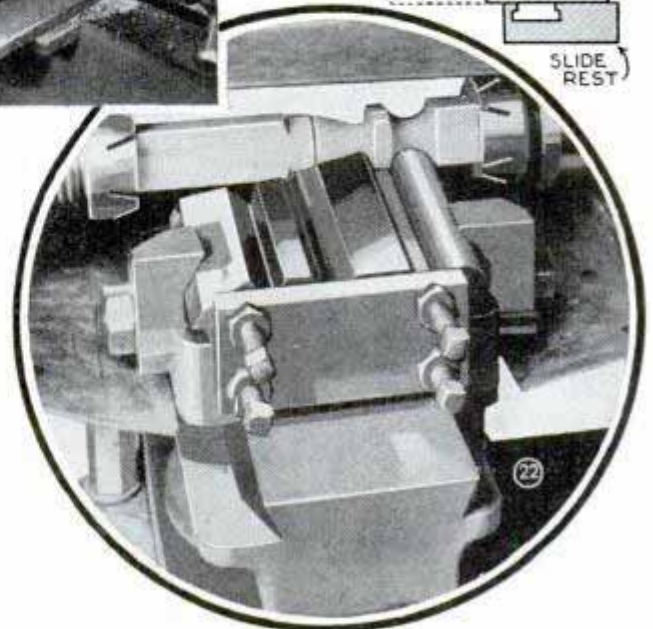
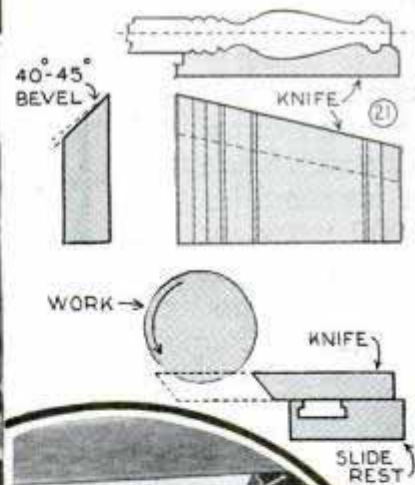
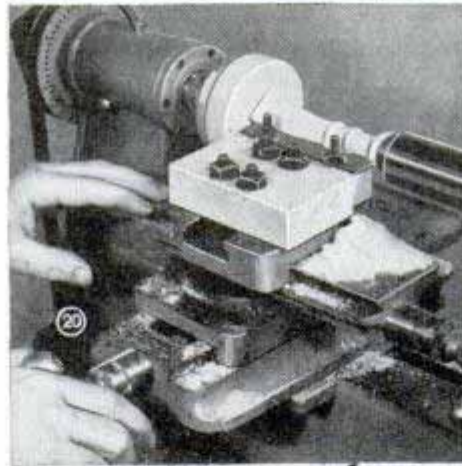
into the wood is considerably lessened. The knife works below the center of the spindle, as shown at the bottom of Fig. 21, so that as the turning is made it is supported at all times. It will be noted in this diagram that the rotation of the lathe is reversed,

the work running opposite to the usual direction. The knife feed can be fairly rapid—6-in. spindles can be finished-turned at the rate of about one a minute.



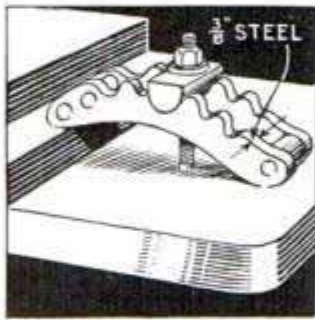
the work should turn at 200 r.p.m., rotating away from the operator.

The simplest set-up for short spindles uses a flat knife, ground to the profile shape of the required turning. This is mounted on the lathe slide rest, the cutting edge being on center. Fig. 20 shows the set-up. Knives are made from carbon or high-speed steel, and are from $\frac{1}{8}$ to $\frac{1}{2}$ in. thick, depending upon the cut required. Blank knife stock, $\frac{1}{4}$ in. thick by $3\frac{1}{2}$ in. wide costs about 40 cents per inch in carbon steel. A faster cutting knife is the milled knife, shown in Fig. 19. This has the profile shape of the turning milled on its face. The milled knife has two great advantages over the flat knife—it can be sharpened by simply grinding straight across the cutting edge, and, moving tangent to the work, it forms a positive support at all times. Its main disadvantage is cost as made-to-order knives run from \$2.50 to \$4.00 per inch.



This Clamp Is Self-Alining

For use on a planer or milling machine, or any other place where it is necessary to hold irregular-shaped work, this clamp automatically alines itself to various con-



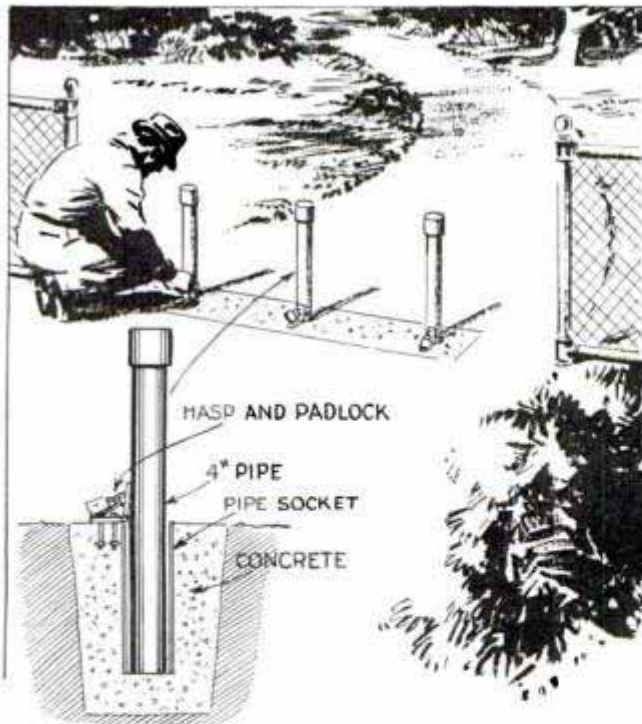
tours. It consists of two pieces of $\frac{3}{8}$ -in. steel riveted together with suitable spacers between them, and a rocker or alining piece which fits in teeth cut in the edges of the pieces as indicated. The

clamp is held by a bolt, which passes through the rocker to take a nut.

—Chas. H. Willey, Penacook, N. H.

Posts at Gate to Public Grounds Are Padlocked in Place

Where it is desired to prevent the entrance of vehicles into public parks, school grounds, etc., except on special occasions, removable posts can be assembled from



These posts, which close the entrance to drives seldom used, slip into pipe sockets set in concrete

pipe and padlocked in place. The posts fit into lengths of pipe set in concrete, and have a large U-bolt welded to them to fit a hasp anchored in the concrete with bolts.

File Cabinet Mounted on Dolly Is Pulled to Worker's Desk



File cabinets mounted on dollies save many steps as they can be moved to the worker's desk when needed

In one large office, the file cabinets that are used most frequently are mounted on dollies so that the workers can move them to their desks. This saves many trips between the desk and cabinet during the day. The dollies consist of shallow wood boxes fitted with heavy casters and painted to match the cabinets. If desired, a strap or rope can be attached to each dolly to pull the cabinets over the floor.

—Opie Read, Jr., Chicago.

Papers Clipped Together Are Held by Piece of Sandpaper

When sheets of cardboard or paper are held together with a wire clip, cut a strip of sandpaper, fold it, and slip it over the drawings before the clip is attached.

This will prevent the sheets from being pulled out of place easily, and there will be no loss of time in resorting.



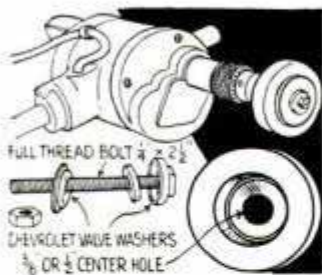
Top Edge of Opened Nail Keg Shielded to Protect Hands



Rubber-hose shield around top edge of opened nail keg prevents injury to arms and hands

Storekeepers who sell nails from open kegs can prevent any possibility of injuring their hands or arms on the edge of the keg by shielding it with a length of rubber hose as indicated. The hose is split lengthwise to slip over the edge of the keg and is fastened in place with small brads.

Mandrel for Grinding Wheel Is Self-Centering



Emergency mandrels for chucking small grinding wheels on electric drills, drill presses, etc., are readily assembled with bolts and Chevrolet valve washers. The bolts should be threaded their entire length in order to draw up properly the washers, which automatically center grinding wheels having $\frac{3}{8}$ or $\frac{1}{2}$ -in. center holes.—Joe Diaz, Los Angeles, Calif.

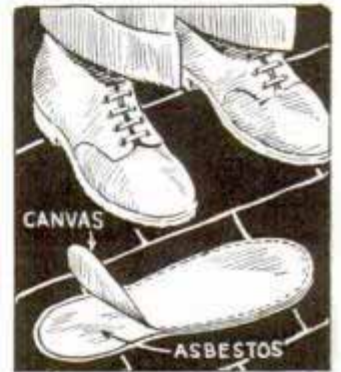
Two Dry-Cleaning Preparations

A dry-cleaning fluid that combines the efficient grease-dissolving powers of naphtha and carbon tetrachloride in proportions

that are non-inflammable is made as follows: Mix together carbon tetrachloride, 3 gals., cleaners' naphtha (deodorized), $1\frac{3}{4}$ gals., benzol, 24 fl. oz., and chloroform, 2 oz. A benzine paste that is exceptionally efficient in removing all kinds of grease is made by dissolving castile soap, 3 oz., sodium carbonate, $\frac{1}{8}$ oz., in water, 15 oz., with the aid of heat. When the solution has cooled, add strong ammonia, $\frac{3}{4}$ oz., and stir thoroughly. One pint of benzine (inflammable) is next added in small quantities while stirring vigorously. The fabric to be cleaned is stretched over blotting paper and sponged with this paste. It should not be used close to an open flame.

Insoles Shield Workman's Feet Against Hot Roofs

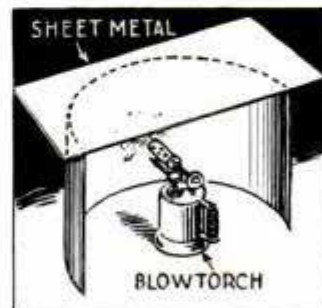
As men working on roofs usually wear rubber-soled shoes which absorb heat quickly and often cause sore and blistered feet, one workman buys his shoes a little large to take insoles consisting of asbestos and



canvas sewed together. He claims shoes of this kind may be worn as comfortably and safely on the roof as on the ground.

Shop Heater from Blowtorch and Sheet Metal

Here's an emergency shop heater that will take off morning chill or keep small quarters quite warm. It consists of two sheets of rather heavy galvanized iron, one sheet bent to a semi-circular shape, and the other placed on it as indicated. In



use, the flame of a blowtorch is directed against the curved piece, which serves as a reflector. Also, the large surface of hot metal quickly transfers the heat to the air.

Photo **COPYING TABLE**



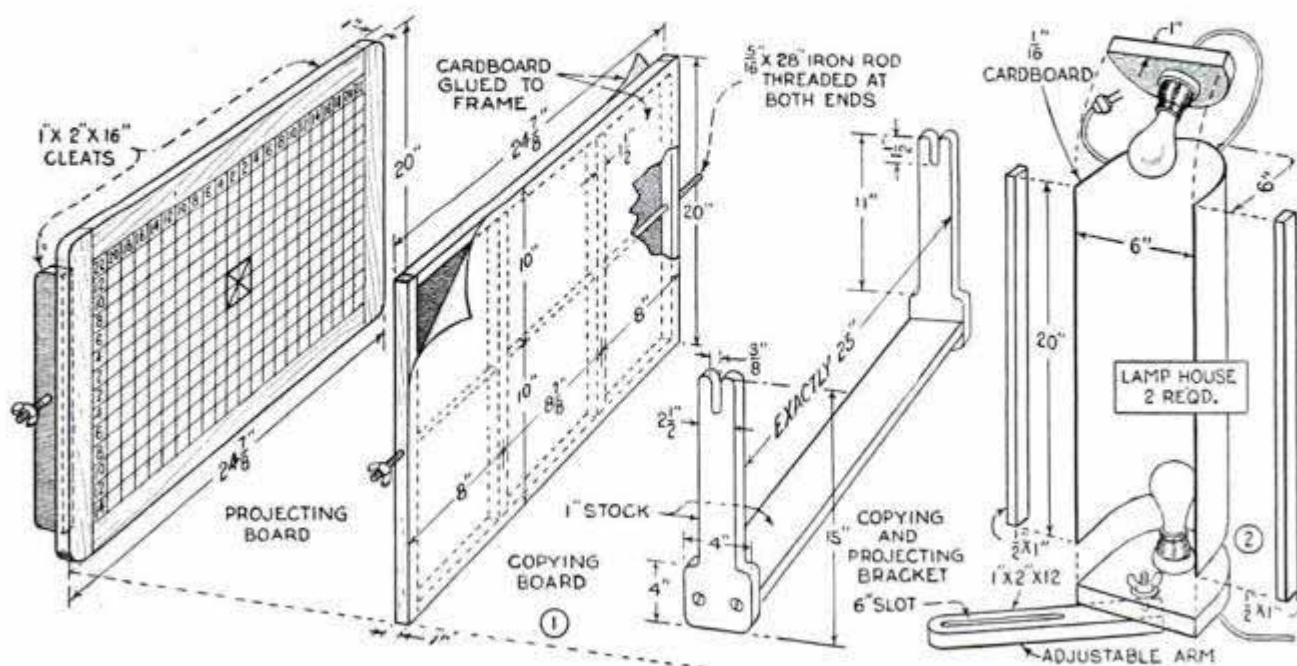
By JOSEPH S. OTT

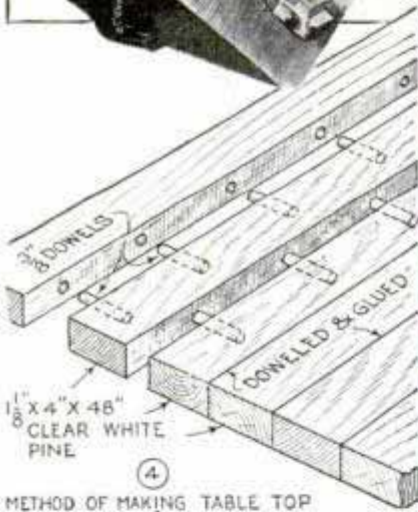
*folds into
a compact
unit*

WHILE designed for copying and projecting work, this folding table also may be used when making contact prints or developing films. After use it may be stored easily in a small space. Construction must start with the top which is preferably of narrow widths of $1\frac{1}{8}$ -in. stock edge-glued and doweled to build up to the total width given in Figs. 4 and 8. Round the corners and finish with sandpaper.

The cross members, Fig. 10, serve a double purpose, bracing the top and also acting as a stop for the folding legs. One cross

member must be notched for the camera slide, Fig. 8. The legs can be shaped and tapered from 2-in. square stock as in Fig. 8, or may be left straight. They are braced with $\frac{3}{4}$ -in. dowels as shown. Hinge the legs to the top with 2-in. butt hinges. Either sliding or rolling casters make it easy to move the table about the room. Note that the variation in distance between the legs,





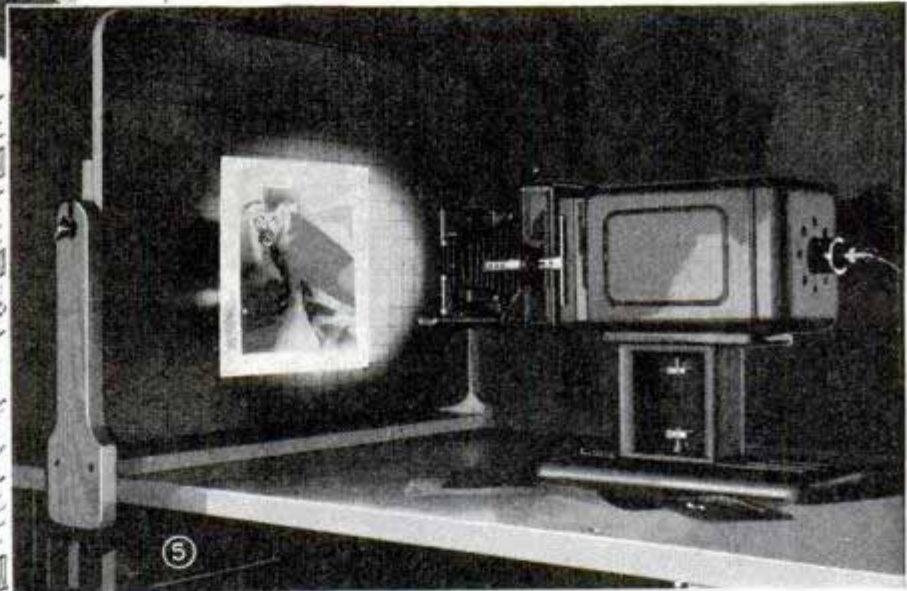
METHOD OF MAKING TABLE TOP

front and back, allows the assembly to fold flat when the table is collapsed as in Fig. 3. The cross members serve as short secondary legs should lack of space necessitate the placing of the portable unit upon some other table or flat surface. If the table is to be used on the folding legs exclusively there is no need of sawing the curved lower edge shown on the cross members. Hooks, which hold the legs open, should be sufficiently heavy to prevent any tendency of the table to swing or tilt.

Dotted lines in Fig. 8 show the location of the guides for the camera slide, which are fastened with screws driven down through the top and up from the bottom. Should these be too tight to permit free movement of the slide, they can be shimmed with heavy paper. The slide

should move easily for preliminary focusing of the camera. The camera mount is assembled from a brass tube 9 in. long by $1\frac{1}{2}$ in. in diameter with a $\frac{1}{16}$ -in. wall. A standard $\frac{1}{4}$ -in. cap screw projecting $\frac{3}{16}$ in. through the collar, as shown in Figs. 7 and 9, will fit the tripod socket of all cameras. After drilling and tapping the plugs which fit into the top and bottom of the tube, they are soldered in position. Then, to fasten the tube to the slide as in Fig. 9, a $\frac{1}{4}$ -in. machine bolt passes through a hole drilled in the slide and turns into the lower plug.

Now back to the projecting and copying boards detailed in Fig. 1. The bracket should be made to fit the table top snugly so that it will hold the assembly firmly in place. The copying board is simply a frame

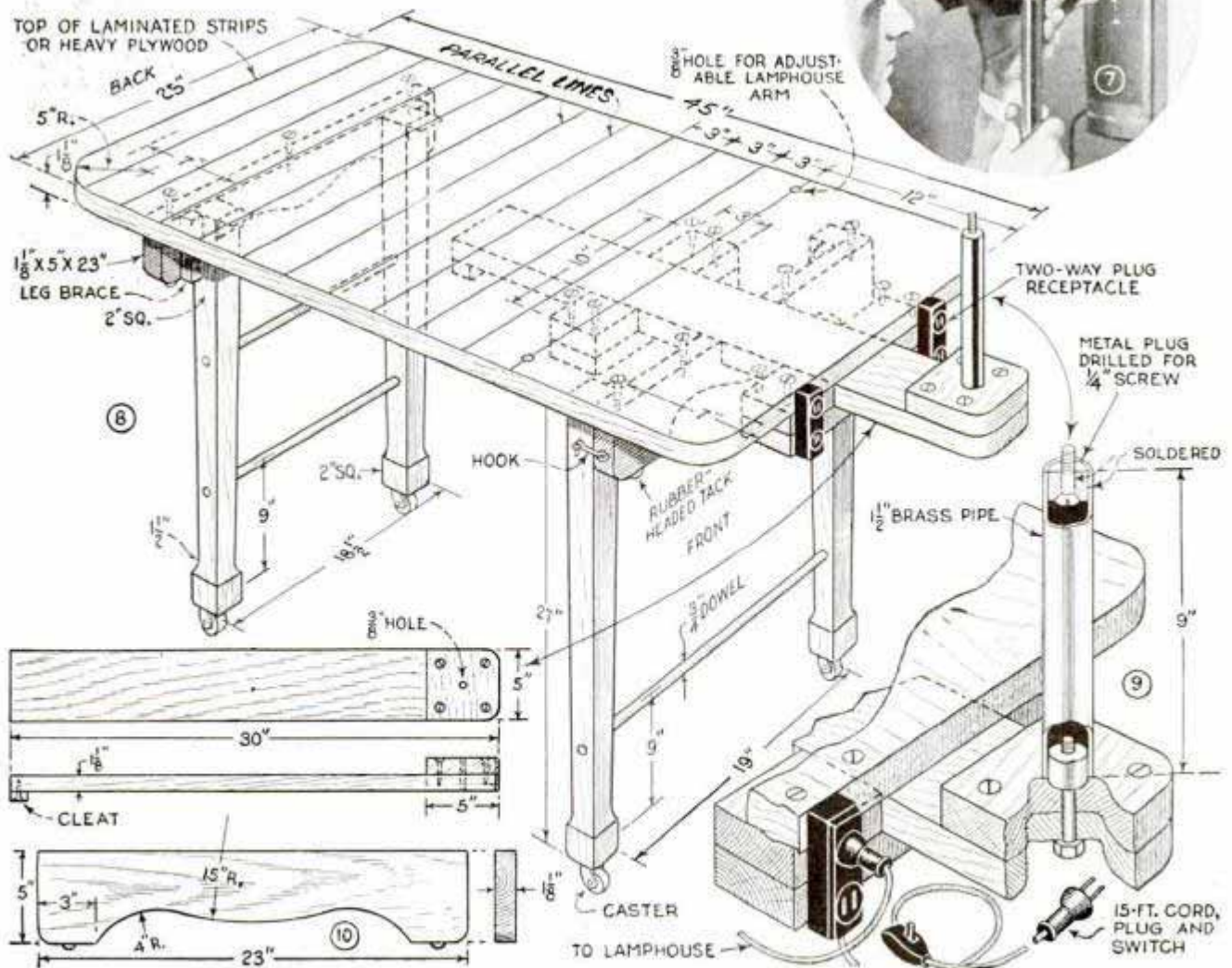
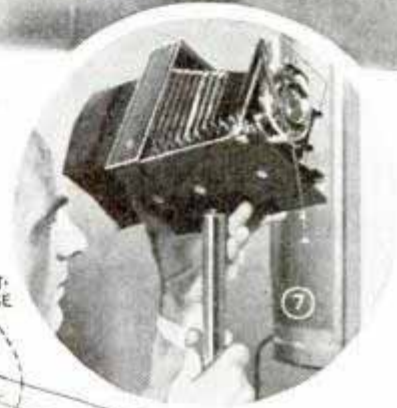
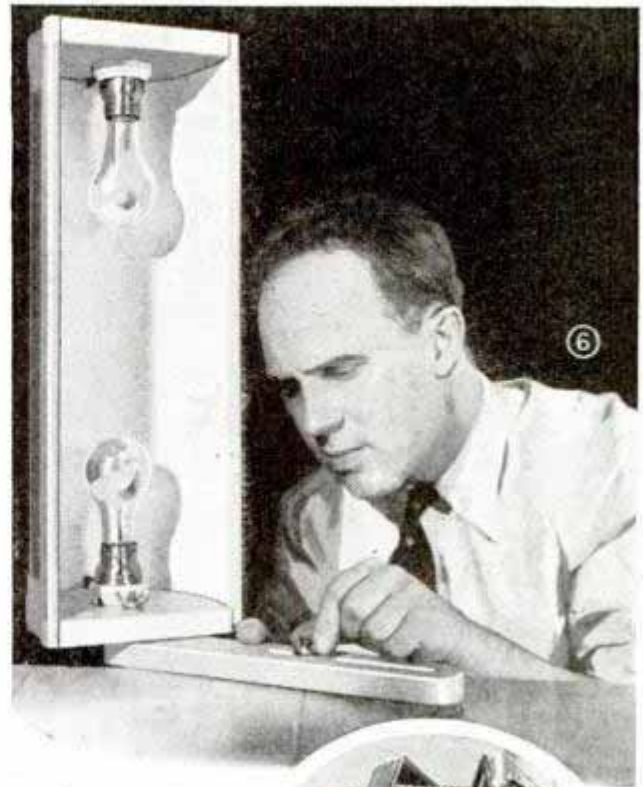


assembled from small strips of pine and covered with cardboard. One side should be black and the other white. A rod, threaded at both ends, passes through the frame lengthwise as shown. Gummed tape can be used to finish off the edges. The projecting board, Figs. 1 and 5, can be made of soft pine or a small drawing board may be cut down to the right size. Soft wood is necessary as the projection paper is usually attached with pins or thumb tacks. One face of the board is cross-hatched in 1-in. squares, the numbers shown indicating the size of the image vertically and horizontally. Some adjustment of the bracket may be necessary to assure that the camera lens lines up with the center of the projection board.

The lamp houses, Figs. 1 and 6, are used

when making copies and consist of two semi-circular blocks which serve as a top and bottom around which a wall of $\frac{1}{16}$ -in. cardboard is nailed as shown. Two small strips of pine reinforce the edges of the cardboard and prevent bulging. Gummed tape is used to finish off the edges. A socket is mounted in the bottom and in the top of each of the two houses. The wiring runs from one socket to the other with an extension of approximately 5 ft. from the bottom socket to a plug. The adjustable arm permits the lamp houses to be moved in all directions. They are held in place by $\frac{5}{16}$ by 3-in. bolts and wing nuts.

Finish the table with shellac and smooth the surface with fine sandpaper. To make it easy to place the projection bracket at right angles to the camera, parallel lines are ruled 3 in. apart on the table top, Fig. 8, with India ink. If you have the necessary equipment, narrow grooves can be cut instead of the ruled lines. Finally two plug receptacles, Fig. 8, are added and wired in parallel with a 15-ft. cord. For average use 60-watt lamps will provide sufficient light.



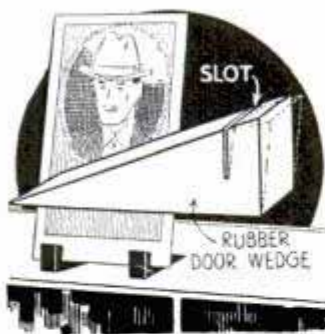
"Giant Pincers" Remove Articles from Crowded Show Window



Small items in a crowded show window removed with these pincers without disturbing other articles

Store clerks who often have to remove small articles from a crowded show window will find these "giant pincers" just the thing for the job. A large paper clip is fitted with a couple of long, light handles, which are attached to the clip with screws.

Floor Display Cards Supported on Rubber Door Wedges



Large display cards, of heavy cardboard, which are to be set on a floor, can be supported by means of rubber door wedges. A slot is cut across each wedge so that the rubber can be opened for the insertion of the card. These improvised easels are easily attached or detached, and make it possible to move the card from place to place.

How to Make Wallpaper Cleaner

Anyone can make this inexpensive wallpaper cleaner by mixing the following ingredients: Whiting, 1½ lbs., wheat flour, 5 lbs., common salt, 3 oz., soda ash, 5 oz.,

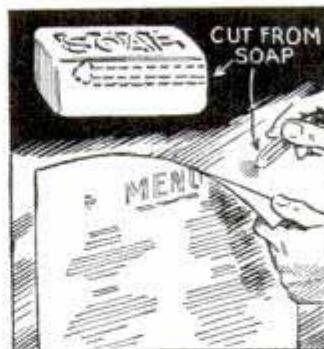
powdered pumice stone, 4 oz., oxalic acid, ½ oz., and sal ammoniac, 4 oz. The powders are mixed dry and before using enough water is added to make a stiff dough. When the mixing with water is partly completed, kerosene, ½ oz., is added and worked in. The resulting ball of dough is rubbed over the paper in long even strokes, the face of the ball being kneaded into the mass as it becomes soiled.

Seed Samples Are Displayed in Window Envelopes

Instead of displaying samples of farm seeds in open sacks, where some of them were wasted by the prospective purchasers who removed small quantities for examination, one seedsman used "window" envelopes to display the samples. All the necessary information regarding kind of seed, quality and grade, as well as price, was typed on the envelopes and sufficient seed was placed inside to allow the prospect to examine it through the window.



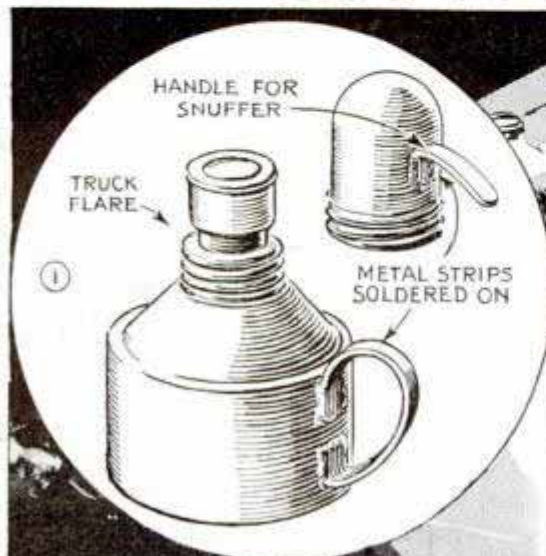
Signs Fastened to Glass with Soap



Paper signs, menus, etc., may be attached to the inside of display windows with common, yellow laundry soap. This is moistened and rubbed on the window in two or more spots before the paper is pressed against it. If the soap is shaped like a pencil it is easy to handle, and the residue is readily cleaned from the glass after the signs serve their purpose.

☞ Before cleaning a stove or furnace, rub soap under your fingernails and dirt will not get under them.

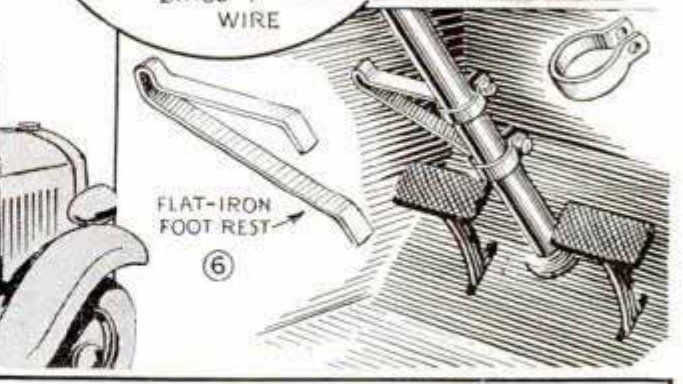
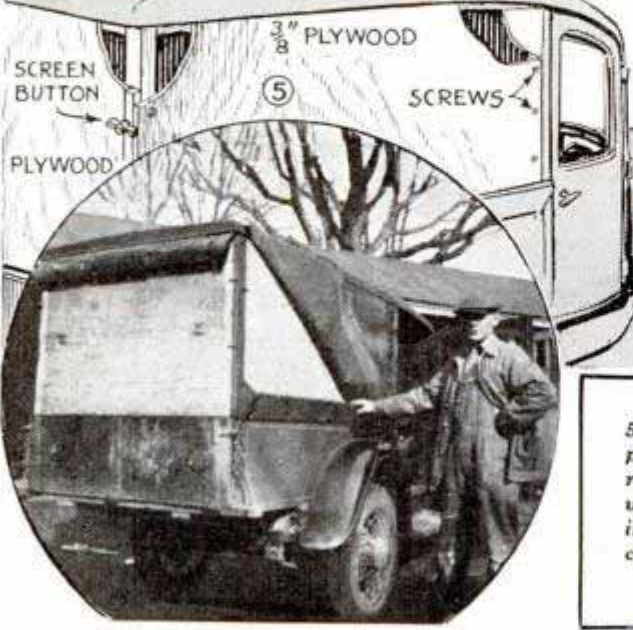
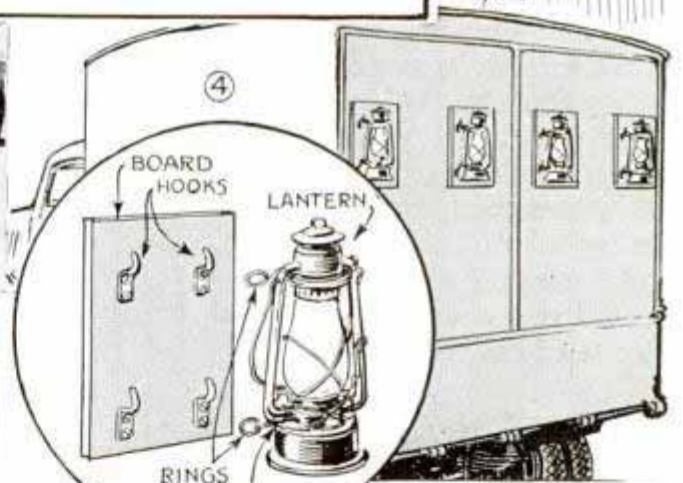
Helps for the TRUCK DRIVER



1: You'll find a hot road flare easy to pick up if both the flare body and the snuffer are fitted with handles. 2: Glare shield operated by foot is pulled down when meeting a car without distracting driver's attention from the road

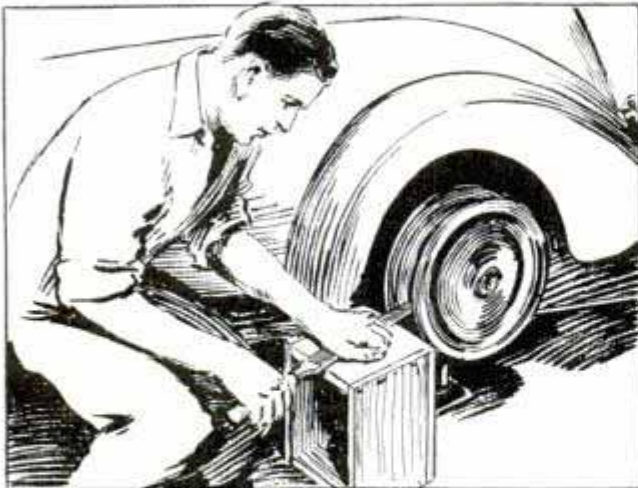


3: Truck spare tire carried on a flat-iron rack bolted to chassis frame. 4: Red lanterns are kept from swinging if wires are fitted to them to slip over hooks on boards



5: Insulating canopy-top truck against freezing temperatures by using plywood panels in addition to regular curtains. Sealing both panels and curtains with tape provides an air space which increases the insulating effect. 6: To ease his foot and avoid cramps on long trips, one driver has a flat-iron rest clamped to the steering column

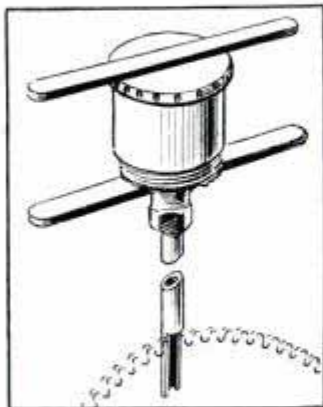
Rust Removed from Rim with File While Wheel Rotates



End of file held steadily against rim as wheel rotates removes rust, which often wears holes in inner tubes

When a rim is rusty, it can be cleaned in a jiffy as indicated. Jack up the wheel, start the motor and put the car in low gear. Then hold the end of a large file against the rim as it rotates, using a block or box as a tool support. Care must be taken in using the file to avoid breaking it or damaging the rim. Also, it's a good idea to wear goggles to protect the eyes against flying particles of rust. After the rust has been removed, polish the rim with fine emery cloth and give the metal a very light coating of graphite grease. If the rusted rim is on a front wheel, transfer it to one of the rear wheels.

Pressure "Gun" for Lubricating Window Regulators



Finding that much of the trouble experienced with window regulators is caused by insufficient lubrication, I made this "gun" so that grease can be applied to the mechanism without removing the trim and upholstery

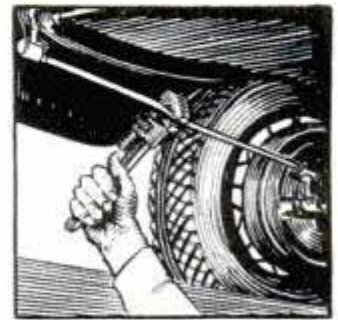
from the door. The gun consists of a grease cup with a 20-in. length of $\frac{1}{4}$ -in. copper tubing soldered or brazed to the bottom, and two 3-in. lengths of flat iron which are

soldered or brazed to the cap and bottom of the cup. A portion of the tube is cut away at the bottom as indicated so that it will slip past the gears. In use, the tube is pushed down beside the window glass to the gears, after which the cup is turned to force out the grease.

—George S. Miller, Cleveland, Ohio.

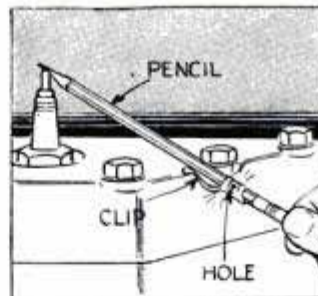
Rattle in Brakes Removed by Kinking Rods

When annoying rattles develop in the rod assembly of some brakes, they often can be removed by kinking each rod slightly with a wrench as indicated. It is necessary,



of course, to do the work carefully, and it is usually necessary to adjust the brakes afterward to equalize them at each wheel.

Spark Plugs Tested with Pencil

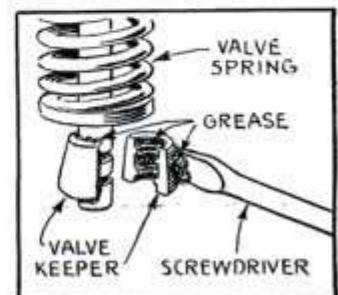


By drilling a hole through a pencil, near the ferrule end, and sliding the metal clip along so that it is as close to the opening as possible without covering it, one may

construct a simple but practical spark-plug tester. When the point of the pencil is placed on the plug and the clip rested against the engine head the spark, if strong enough for ignition purpose, will jump from the drilled opening to the metal clip.

Replacing Split Keepers on Valves

Of the many methods to replace split keepers on valves, I have found that the simplest is to use a screwdriver with a little heavy



grease on one side of the blade. Also put a little grease on the inside surface of the keeper. Then press it against the screw-driver. The grease will hold it so you can slip it in place on the valve stem, and the grease on the inside of the keeper will hold it against the stem until the spring is released.—Ed. L. Ruble, Denver, Colo.

Oil-Can Spout Is Extended with Umbrella Rib



In an emergency, one of the U-shaped ribs from an old umbrella frame serves as an extension on an oil-can spout to reach the mechanism inside auto doors and windows. The rib may

be soldered to the spout, or it may be attached temporarily with fine wire.

Paper-Tape Catalogue Marker

For marking pages in catalogues and magazines, a garage mechanic sticks a strip of gummed paper tape to the fly-leaf of each book, letting enough of the tape project so that it can be inserted between the pages at any place. This simple method avoids the waste of time in repeatedly looking up desired information.



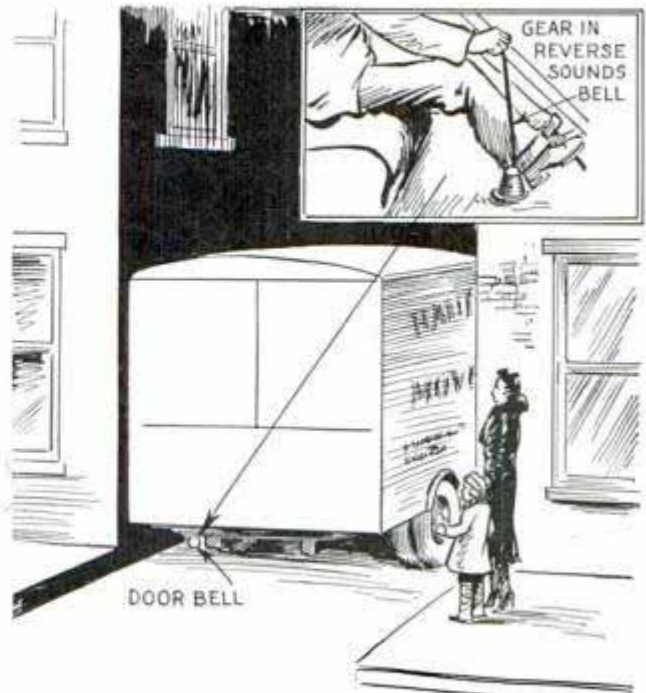
Repair for Ford Door Catch



If a spring breaks on the door catch of a model-A Ford, get a conical spring of the type used on the V-8 Ford water pumps and insert it behind the catch

as indicated. This repair can be used only on doors that have a pivoted catch.

Bell on Rear of Truck Sounds When Gears Are in Reverse

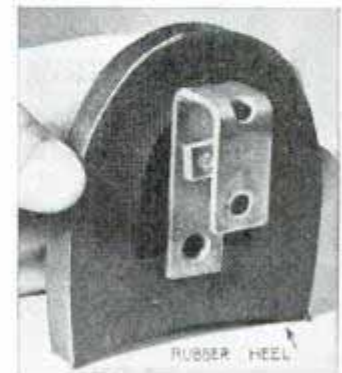


Pedestrians are warned of truck backing out of alley by bell, which rings when gears are put in reverse

To warn people on a sidewalk when backing out of alleys, one truck driver has a doorbell mounted under the body at the rear and wired so that it rings whenever the gears are put in reverse. This is done by running one of the bell wires to the gear-shift lever where a piece of spring brass, screwed to the floor, makes contact with one on the lever when the latter is moved to the reverse position. Both contacts must be well insulated from metal, of course, to avoid "shorts."

Brake and Clutch Pedals Extended by Rubber Heels

Drivers who find the clutch and brake pedals a little short for comfortable driving, and the driver's seat cannot be moved forward any farther, can extend the pedals by slipping rubber heels over them.



A piece of flat iron is bent as shown to form a clip that fits over the pedal, and is attached to the heel.

Mats on Floor of Parking Garage to Wipe Shoes



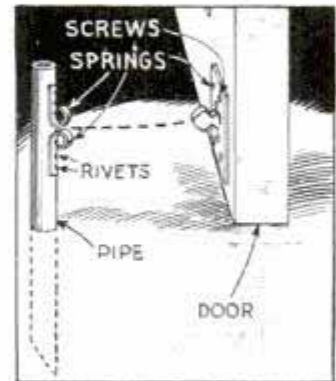
Customers walking into this night-parking garage wipe their shoes on mats before entering their cars

Noticing that his customers often soiled the floor mats in their cars by grease and dirt picked up on their shoes from the floor, the owner of one night-parking garage placed mats between the cars as in-

dicated. The mats are fastened to the floor as the cars are always parked in the same place between lines painted on the floor.

Doorstops for Your Garage

Doorstops of the kind shown will hold garage doors open, and you don't have to stoop to operate them. Each stop consists of two parts, a pipe with two spring clips riveted to it and a fixture on the door to engage the clips. The fixture consists of a metal plate with an arrow-head shaped piece welded to it as indicated.



—Frank T. Evans, Joffre, Pa.

☐ Dog hair can be removed from car cushions by drawing a squeegee over them several times which tends to bunch the hair so that it can be picked up.

The Next Issue

LATEST HALL CLOCKS SERVE DUAL PURPOSES

Three smartly styled cases, one containing a bookcase and another a small radio in addition to a clock movement. Gleaming metal combined with a bone-white finish effects a pleasingly new attire.

ELECTRO-ENGRAVING WITH A BOTTLE CORK

Monograms or initials etched on tools or other metal articles by passing electric current through a cork die impregnated with an engraving solution.

POTTERY FIRED IN KITCHEN OVEN

With a clay that fires at a temperature of 250 degrees Fahr., you can make pottery articles and fire them in the oven of the kitchen stove.

TO BUFF AND TO POLISH METAL

Tells you the kinds of wheels to use for grinding, polishing and buffing, and at what speeds to run them. Also tells what abrasive to use for polishing.

GROW FLOWERS WITHOUT SOIL

Flowers of unusual size grown right in your home by setting seedlings in peat moss and feeding with solution consisting of inexpensive chemicals.

BE KING OF THE ROAD



MOTORCYCLE riders everywhere are setting the pace for fun! Picnics, gypsy tours, reliability runs, hillclimbs and other thrill-packed events — the world's greatest all around sport. Get into the thickest of the fun yourself — on a Harley-Davidson motorcycle! Go to your dealer — swing into the saddle of a classy new 1938 Model. Ride it! Get the "feel" of this great sport. No obligation. And mail the coupon TODAY.

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Cooling Grand Coulee's Fever

(Continued from page 378)

for the blocks to cool off naturally, would take so much time that the dam never would be completed, so the blocks are artificially cooled and preshrunk.

At the bottom of each five-foot lift, a grid of one-inch steel tubes is laid and covered up with the concrete. The tubes are spaced about five feet apart, those in adjoining sections being connected with compression couplings. After several months, when the bulk of the reaction between cement and water has taken place, the cold water from the river is circulated through the tubes and the blocks are cooled to what will be their ultimate temperature. All contraction then ceases and the joints are ready for sealing. This is going on as the dam progresses. There are galleries left all the way through it for the header pipes for the cooling system. The lifts in each column, as well as adjoining columns, can be poured as fast as the ordinary setting time of the concrete will permit, on the basis of strength, and the cooling and shrinking of the columns or blocks take place later.

The engineers determine when any particular section of the mass has been cooled sufficiently to preclude all further shrinkage by using thermometers. Millions of dollars of construction work are at stake, as well as the fate of a vast irrigation project. There can be no guesswork. Electrical-resistance type thermometers or temperature recorders are buried all through the mass as the pouring progresses, roughly at twenty-five-foot vertical and horizontal spacings. In a specially constructed tube is a length of copper wire loosely wound on a spool, with its two ends connected to conductors leading out into one of the numerous galleries. Electrical current passed through this copper wire will vary with the temperature of the wire, according to a well-known principle of electricity. By measuring the current that will pass through the wire under a given voltage, at stated intervals, the findings may be converted to temperatures.

From week to week and month to month, younger engineers go through the galleries of the dam with their electrical measuring instruments, taking temperatures at hundreds of points far down in the concrete

mass. They are the internes of the business. From their tabulated and charted findings, it is determined when the "fever" in a block has subsided, so that it is safe to go ahead and seal the joints.

In spite of all this, the engineers are not satisfied with the temperature readings alone. So they have these checked by causing another set of delicate electrical measuring instruments to be buried at intervals in the block masses. These are known as stress and strain meters and are constructed on the basic principle that a wire when elongated will be reduced in cross-section. Current flowing through this wire will be reduced in proportion to the reduction in cross-section. The meters are complicated devices which may be described briefly as two metal disks, which make bond with the concrete, mounted on the ends of two telescoping shells which are surrounded with rubber and do not make bond. If the two disks either pull apart or are pushed toward each other, wires are so arranged within the shells that tension is superimposed on their initial tension and elongation is the result. Taking periodic readings by passing current through these wires, it is possible to tell when all actual physical movement of the disks has ceased.

The first contract for the foundation of the dam was completed in December, 1937, fifteen months ahead of schedule. About three years more will be required to build it to full height. The dam was designed and is being built along lines that will make it the most solid, impenetrable and enduring structure possible to build with present engineering knowledge. One thing alone could harm it, the on-coming glacier of the next ice age. Such a glacier, hundreds of thousands of years ago, prepared the present site for Grand Coulee dam. Perhaps by that time engineers will be so far advanced that they can dispute the advance of the polar ice cap by circulating hot water through the cooling system and melting a little oasis for Coulee in the midst of the desert of ice.

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Building Ships for Showcases

(Continued from page 413)

of some vessels from such institutions as the New York public library, or study the pictures and data of world navies in Jane's "Fighting Ships," or—if you are a model builder of recognized standing—the British Admiralty office may furnish details of historic warships of the navy that "rules the seas."

But don't try writing to the secretary of the navy at Washington for battleship plans. You might be investigated as a spy, or you might just raise a laugh. Mr. Craven works from navy blueprints, but he is under contract to the navy. The plans are forwarded to him as the model work progresses, and if you'd like an inkling of the tremendous amount of detailed planning required, be informed that the builders of the new navy dreadnaughts "North Carolina" and "Washington" will need more than 7,000 detail plans for each ship, and probably as many as 5,000 more plans for the machinery and equipment to be installed on each battleship. If Mr. Craven is commissioned to construct a model of one of these dreadnaughts he would require 400 or 500 of those 7,000 plans. He used 380 different blueprints in building the "Mississippi" model!

Everything that goes into a Craven model is handmade in his own shop; everything from keel to ensign—except the chains. Making a tiny brass chain by hand, a link at a time, is a little too much to ask of the most meticulous modelmaker. And anchor castings from a hardware store are sometimes used, but they need "remodeling" to fit the ship.

Long before the navy contracts came through to La Porte last fall Mr. Craven was preparing for the job by building the tiny brass guns, small boats, planes, ladders and other fittings he knew would be needed. His ladders are not toy store ladders. They are small strips of brass through which he drills needle's-eye holes to insert the fine wire of which the rungs are made. Each rung is thrust through the hole and soldered in place. Railings are made the same way. No place for "mass production" in this workshop. The nearest thing to mass production is the assembling of such items as anti-aircraft guns or navy airplanes, several of which may be needed on

one ship. And it takes ten days to build two anti-aircraft guns! A single carronade, the heavy, old-fashioned cannon of early warships, consists of fifty-two to fifty-four distinct parts.

The modelmaker builds from the keel up just as the navy yard does; with chisel, saw, gouge, plane and sandpaper, shaping the contour of the battleship one "lift" at a time, following the table of offsets shown on the blueprints. Every detail is on the standard scale of one-fourth inch to the foot.

You may have guessed that building ships to satisfy admirals is no child's play. Just ask Mr. Craven what's the toughest part of the work.

"If you mean elbow work," he will tell you, "painting and rubbing take more out of you than anything else.

"To end up with the sleek, gray finish of an armored cruiser we start with a priming coat over the sanded white-pine hull of the model; then more rubbing with wet sandpaper; three or four filling coats, an undercoat of enamel and a finishing coat of enamel.

"That's about the routine now. But that's with the new synthetic enamels that make work so much easier. When I built the 'Mississippi' I had to work with lacquers, and it took twenty-one coats to dress up that battleship!"

Incidentally, if you consider yourself a topnotch painter, try your skill by spraying battleship gray paint on one of those diminutive brass chains without clogging a single needle's-eye link. It's a real feat.

Largest of the ships under way in the La Porte "navy yard" today is the twelve-foot, six-inch model of the 10,000-ton cruiser "Brooklyn." The "Gridley" and "Porter" are seven and eight feet long and the shark-faced submarine "Salmon" is six feet six inches long. They are scheduled for "launching" in a Washington showcase in 1938.

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makes me like
to have a pipe
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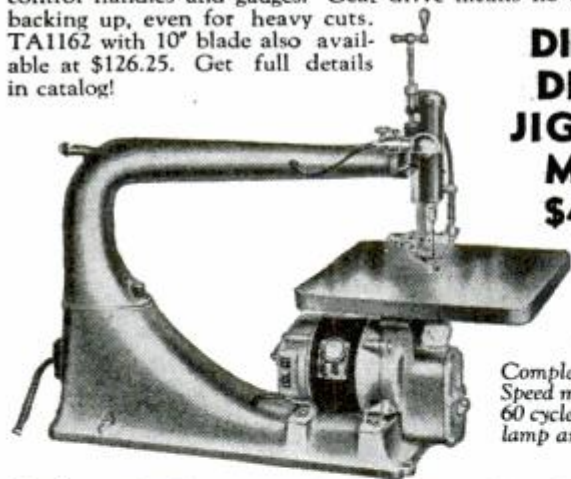


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There's No Hiding Place Now

(Continued from page 341)

finds a way to take the deadly package apart in order to begin tracing the sender or the manufacturer.

Ten drops of blood may mean ten years in Sing Sing. Even a small red spot turning brown with age can point the direction the murderer fled from his crime. An employe was discharged for inefficiency by a cateress in a southern town. One night she was attacked by a man who struck her over the head with the butt of a gun. On the former employe's person was found a gun with stains that looked like blood. The technicians grouped the blood of the victim and the suspect and their testimony sent the gun's owner to prison for ten years.

But another man in an eastern state was more careful. He worked hard washing away all the blood after he had killed his wife. He even washed the mop, the clothes he wore and the pick handle with which he hit her. But clinical studies found the presence of blood on all of them.

A third man had a shotgun with which he had killed many rabbits and squirrels. While he was hunting he failed to notice that each shell was marked individually. One day he had a dispute with a state officer. A shell found at the spot pointed to the man as the officer's slayer.

Fingerprints are determined by the papillary ridges on the bulbs of the fingers. Even Siamese twins, triplets and quadruplets have different arrangements. Plastic surgery will not wholly eliminate this basic individuality. One bandit paid \$5,000 to have his fingers treated, but 300 points of similarity were noted when he was in the morgue. The courts have many times held that but twelve points of similarity constitute positive identification.

To keep from being lost, to save sorrowing loved ones, fingerprints give helpful protection, even bringing aid to amnesia victims and those in hurricanes, floods and wrecks. Every year thousands of persons are buried unnamed because they had not the foresight to insure their identity by having their fingerprints recorded.

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Mood Tones for Motion Pictures

(Continued from page 349)

Just as the studios' scenario departments have turned to the classics for some of their finest material, so we technicians have gone back to one of the oldest photographic principles for this idea. The sepia-tone film is the throwback to the Stone Age of photography when the sun furnished the light for taking and printing all photographs. Forty-two years ago we called these pictures sepia platinum prints.

In the early days of the motion-picture industry, this general plan was attempted by a few producers. Owing to the lack of proper facilities and the tendency to economize, the finished products were not very representative. Tinting was much more common in the early days. One film, "Vanishing American," left an indelible impression on my mind. In one scene, an Indian was shown dying on the desert. The producer had the pool of blood around the Indian's head hand-tinted in gory red. Many film-goers remembered this grim bit long after they had forgotten the rest of the picture.

As every amateur photographer knows, the impression of an actual scene on a photographic film, through the usual system of lenses, reverses not only the image but also the values of light and shade. This means what is white in the scene becomes black in the negative film and vice versa. This does not become apparent until the exposed film has been placed in the developing bath, which turns to black all the silver salts on the film acted upon by light. So from this negative a positive print is made in order that the picture can be seen in its proper character. The values must be reversed a second time to bring them back to what they were in actual life.

Under this toning process, the positive print is placed in a series of chemical baths which turn the black silver salts on the film to any color desired. If a tint is wanted apart from the specific tone, the film is then placed in a pure aniline-dye solution, which does not adhere to the tone portion of the film but merely tints the clear part or high lights, as they are called.

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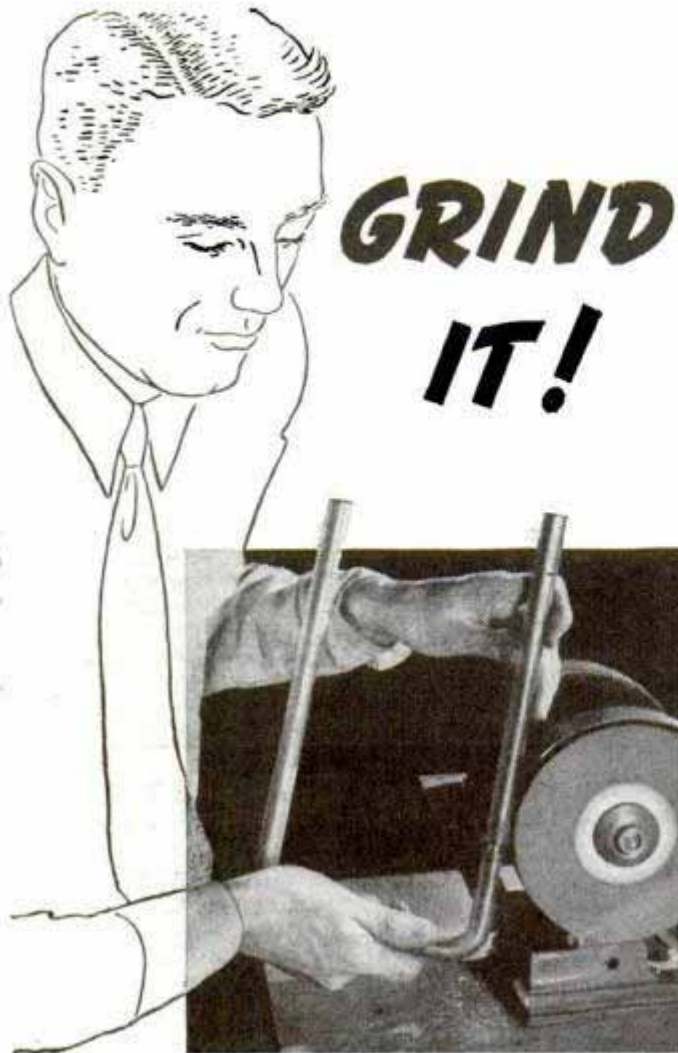
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Radio Revives an Ancient Art

(Continued from page 404)

Snurd was his next protege. "As soon as I had his voice perfected," he relates, "I tried to translate the personality I had built up in my mind into a sketch. Elmer was the adenoid type; his voice called for a 'goofy' face, droopy eyelids, buck teeth and a large-size Adam's apple. When I had drawn a sketch that pleased me, I proceeded to model him in clay. He didn't click—there was something wrong. It was his thin upper lip and his firm chin. A thin lip, you know, connotes meanness and any character expert will tell you there's



Edgar Bergen and another of his dummies, the bashful rustic Elmer Snurd

strength in a firm chin. So I gave Elmer a thick, protruding lip and a receding chin—and he was perfect."

Charlie McCarthy is blessed with a fortunate expression. From the front view he has a pert, smart-alecky look that fits his character perfectly. When his head is turned toward Bergen he appears to be quizzical and when his mouth is opened slightly, he gives the impression of being on the verge of tears. There's something about him, too, that defies duplication. A half dozen woodcarvers have been commissioned to make copies of him but none has been successful.

If the dummy can be copied, Bergen has a plan that will give him a greater field of expression. He would like to duplicate his face in four moods. Then, if Charlie were in love a head with a moonstruck expression could be used. A sorrowful counte-

nance could then be substituted for the next scene while Charlie were airing his troubles, and so on. An experiment is also being made with a dummy made of rubberized composition to achieve this same result.

The association of this famous pair dates back to Bergen's high-school days. With a longing for a medical career, he decided to use his gift as a means of furthering his education. To the shop of Ted Mack, a woodcarver, the student went with a charcoal sketch of a newsboy who sold papers near his school. Could the woodcarver make him a head with that expression? The woodcarver could and did—and Charlie McCarthy was "born." Delighted with the result, Bergen paid him thirty-five dollars and then went home and built the body himself.

The head was carved from a block of basswood. It is in six pieces, glued firmly together and reinforced with screws. His eyes are of brown glass and his complexion ruddy. The entertainer visited shops in many cities looking for a paint that wouldn't shine in the spotlight. He finally worked out the solution himself by loading the paint with pumice stone. Periodically, he gets a new paint job; a very special one for his appearance in a colored motion picture.

The manner in which Charlie is manipulated is fairly simple. The lower portion of the jaw is operated by a paddle on the stick that connects to the head. This is held by the manipulator through an opening in the back of the dummy's coat. Although Charlie's eyes are stationary, Elmer's can be moved from side to side and up and down by means of a special arrangement. Bergen is building a dummy whose actions can be controlled by a keyboard arrangement in the head.

Theater bookings have carried the pair all over the world, England, Canada, Russia, Lapland, Stockholm, Iceland and Venezuela.

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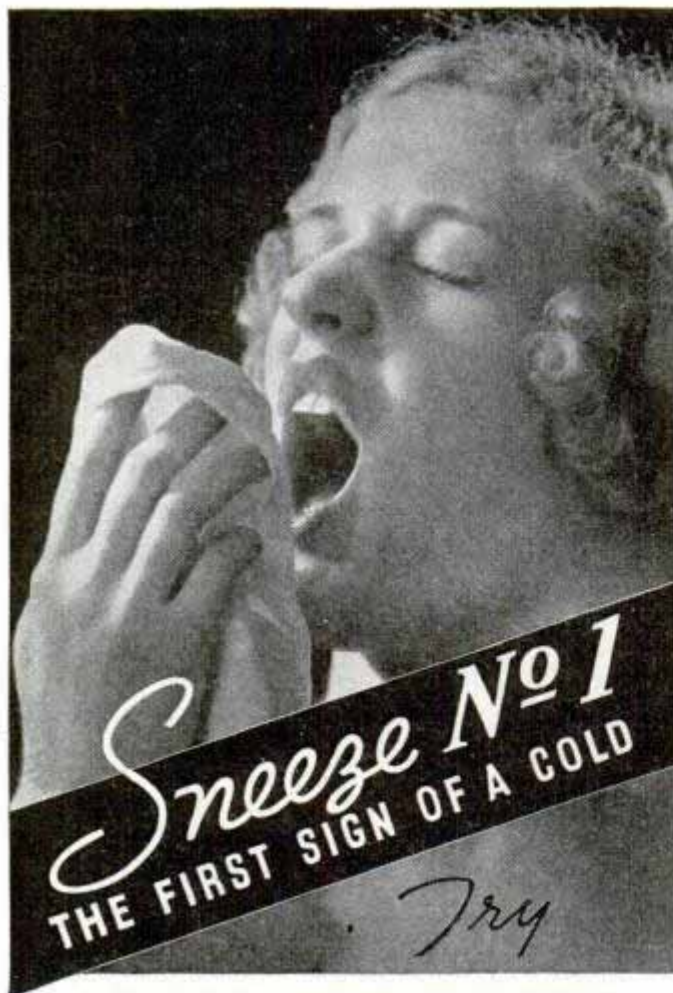
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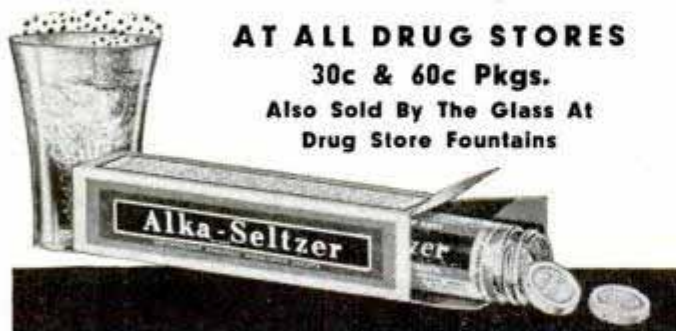
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Splitting Hairs to Make It Better

(Continued from page 365)

pressure is only fifteen pounds per square inch, so it isn't air pressure alone. Some believe the surfaces are so nearly perfect that molecular adhesion occurs when the blocks are pressed together. At any rate, they cannot be left in contact for long periods or they cannot be pulled apart at all. If the five-millionth of one inch of error were eliminated, it might be possible to "freeze" two blocks, making a perfect bond simply by pressing them together!

The little square blocks are made in sets, each block in a set differing in thickness. By combining blocks of different thickness, any desired dimension within their range can be obtained. This is one reason why the blocks must be so very accurate. Combine ten and, if there were any appreciable error in each, it would be multiplied ten times in the final measurement.

So super-accurate are the blocks that a change of even a few degrees in temperature may throw them out of line. They are finished in air-conditioned rooms held at a constant temperature of sixty-eight degrees and are accurate at that temperature. While the heat from the human body will expand one of these blocks a few millionths of an inch within a few seconds, temperature can usually be disregarded when the blocks are in actual use, since the metal in the blocks and the metal being measured are likely to have about the same coefficient of expansion.

Making these little precision blocks in quantity naturally requires the utmost care and skill coupled with machining and measuring equipment which is a source of wonder to the layman and skilled mechanic alike. The metal used is a high carbon, chrome alloy steel which, when properly treated, produces a block resistant to wear and corrosion and comparatively free from strain and consequent minute size changes. Preliminary operations include cutting bar stock to suitable lengths, grinding the surfaces and slitting into desired block sizes. Then the rough blocks are drilled, countersunk and burred after which they are subjected to exacting heat treatment in electrically controlled furnaces.

Then the blocks are rough ground and put through a special stabilizing treatment which produces in a short time the same

(Continued to page 124A)



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After artificial seasoning the blocks are finish ground, and size and serial number markings are placed on each one. No markings can be stamped on a precision gage block because stamping introduces strains which are permanent and which destroy the stability which is so essential. Instead the markings are etched.

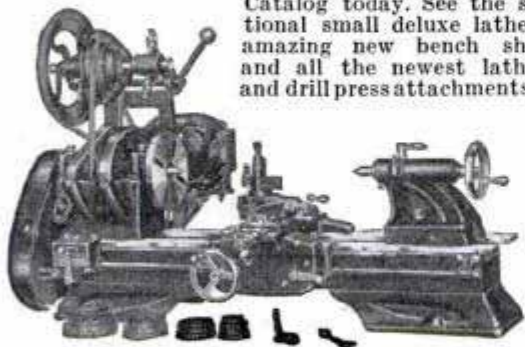
The secret of quantity production of the blocks by machine methods is a patented lapping process which reduces the blocks to millionth accuracy and gives the satin-like finish to the surfaces. The blocks are held between cast-iron lapping surfaces in a moving spider in the lapping machine. The spider has both a rotating and oscillating motion, providing a complicated path of travel for each block. A very fine abrasive in kerosene is used for the final lapping and skilled operators know the correct pressure to be applied and how much metal is removed during a given number of revolutions.

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The precision gage blocks have also made it possible to combine accurate mechanical gaging with electrical magnification in an instrument known as the "electrolimit gage" for obtaining either external or internal measurements. It speeds up the inspection of parts made to close limits and is widely used as an inspection instrument for selective assembly of parts.

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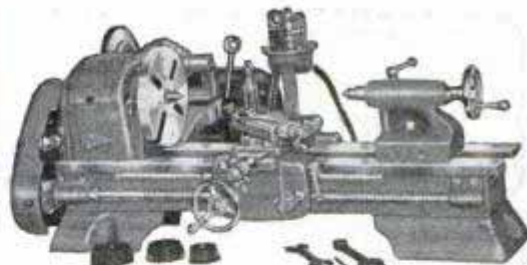
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ep 1385
(Continued from page 124A)

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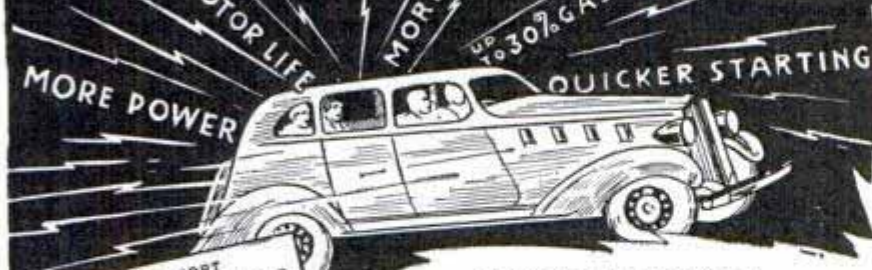
The gage utilizes an electrical circuit so arranged that any mechanical movement of the gaging points "unbalances" a magnetic field. Size differences in pieces being gaged thus are greatly magnified electrically and this magnification is displayed on an indicating instrument.

The automobile industry utilizes the electro-limit gage to inspect wrist pins, pistons, connecting-rod bearings, cylinder bores and other parts made to fine limits. As a result, the assembly of such parts is simplified. Wrist pins must fit pistons tightly—but not too tightly. Without an accurate gaging device, an operator might have to try several pins until he finds one which is just right. But if he knows pins and pistons are going to fit within one ten-thousandth of an inch, his job is made easy. So he uses the electro-limit gage to sort pins and pistons in piles a ten-thousandth apart. The swinging needle of the electric indicator makes a variation of a ten-thousandth look like a quarter of an inch and this speeds up the work. And the operator uses the little gage blocks to set the electric gage before he starts.

Without the electro-limit gage, streamline cars with steel tops and big fenders would be all but impossible. Strip steel for such purposes must be accurate in thickness to ten-thousandth of an inch. With the old hand gages, only about 300 feet per minute could be measured and the rolling mill could run no faster. Now there is a continuous gage called the "flying mike" which measures the thickness of strip steel at the rate of 1,500 feet a minute. The strip passes between small rollers which are the gaging points. As long as the indicating needle actuated by these rollers remains at zero, the thickness of the strip is within the limits set. If it moves to right or left, the operator moves a control which adjusts the thickness.

Thus accuracy, developed by war, now contributes to peace. The machine which drilled a hole in the barrel of a rifle today drills an oil passage in the crankshaft of an automobile. Greater accuracy in machine-tool work has given us interchangeable parts made in quantity at a fraction of previous costs. And from this idea has grown the mechanical age—an age which would be impossible without a practical means of measuring to close limits.

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

Automatic - Nothing Like It!

The self-starter — four wheel brakes — knee action — streamlining . . . and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

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3 to 7 MILES MORE PER GALLON
MOTORIST SAVES \$180.00 a YEAR
 "On my V-8 Ford it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—Ralph Fields, Mass.
 "Very glad to say, the Buick showed an increase of 5 miles more per gallon."—A. V. Grace, Washington.
 "On my Plymouth, I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of \$15 a month or \$180 a year."—F. S. Park, Calif.
 "It saves me one gallon a day. I had to buy 3 gallons each day—now only 4 cents."—L. V. Sweet, Pa.
 "I have twelve VACUMATICS on cars now, and they all show an increase in mileage. The car owners are very well pleased."—Fred Taylor, Okla.
 "I have been plating VACU-MATICS on expert-mechanics' cars. All are well pleased."—I. W. Douglas, W. Va.

Guaranteed Gas Savings
 VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

Fits All Cars
 VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

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 You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

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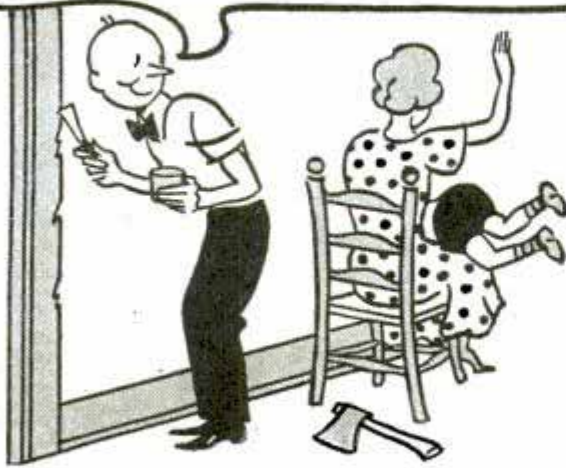
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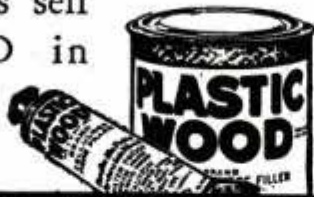


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\$7.50

Chemistry and You

(Continued from Coloroto Section)

not on natural but on synthetic foods. And from the other side we hear that agriculture's future lies in the chemical conversion of huge farm crops to industrial uses, in the transformation of wheat, corn and potatoes into factory raw materials for motor cars, fuels, buildings, roads and other as yet unheard-of things.

The truth of chemistry in agriculture lies somewhere between these extremes but it inclines more toward the second view. Food compounded in pills is a technical possibility now but a most remote practical probability. Man is too fond of meat, vegetables, fruit, milk and bread to desert them for centuries to come.

The chemical conversion of farm crops into factory materials is not new. It dates back at least to 1845 when Schoenbein made guncotton or nitrocellulose. Followed "Celluloid," rayon, smokeless powder, pyroxylin plastics and finishes, and the literally thousands of things made today from the cellulose of cotton. It is estimated that cotton now goes to the retail market in no less than 10,000 forms and that the industrial consumption of cotton linters now approximates 500,000,000 pounds. The coated textile industry consumes more than 110,000,000 yards of cotton cloth yearly.

There is half a ton of seed produced to each bale of cotton, and fifty years ago thousands of tons of cotton seeds for which no use could be found were dumped into southern streams. Chemists devised ways to use the oil of cotton seeds in soaps, in cooking and salad oils, and later in butter and lard substitutes. The cottonseed crop is now worth \$200,000,000 in a normal year to southern farmers, and indeed all oil-bearing seeds have become valuable.

Parallel developments have converted a tenth of the corn crop to industrial uses, have made oat hulls a source of furfural for plastics, wheat straw a raw material for corrugated paper boxes, and sugarcane bagasse and other fibrous stalks the chemical basis for wallboards used commonly in modern building insulation. The chemist's ability to convert crops to uses other than food is the smaller and less difficult part of the problem. The real difficulty is the farmer's, to grow and sell crops

at prices low enough to make their conversion justifiable and economically practicable. Competition is keen in industry. Why make alcohol from corn when that from molasses is as good and cheaper? Why make paper from cornstalks, which our grandfathers could do, when wood pulp costs much less and is more readily available? Why use wheat when sawdust will do as well? The big problem of wholesale use of crops by industry is one of economics, not chemistry.

It is not easy to lower prices in an industry where they are already close to or even below costs of production. Nevertheless this can be done in agriculture. Losses suffered by farmers mount to almost unbelievable figures. More than 6,000 known species of insects cost growers each year something like \$2,000,000,000. Thirty-four insect species alone cause a known damage of \$924,000,000. Losses traceable to weeds are estimated at \$3,000,000,000. Add to these figures another \$1,500,000,000 chargeable to plant diseases, and the total of \$6,500,000,000 is staggering.

Almost may it be said that for every dollar the farmer now earns he has another dollar taken from him by enemies against which he must wage ceaseless war. Chemistry is doing its utmost to help him save some portion of that dollar. New large-scale laboratories for an intensified study of better scientific means to control pests, weeds and plant diseases are even now being built.

A new science in fertilization of the soil is being developed, as well as a wide range of improved chemical fertilizers, based on discoveries in soil chemistry that promise much in improving both the quantity and quality of yields. It has been found that the presence or absence of minute quantities of certain elements in the soil may determine the success or failure of a crop, or the health or disease of animals feeding on the land, or even of human beings who use the animals' meat as food. A science of plant genetics is being developed that will enable farmers to grow crops to order, ways of speeding up growth are being studied to permit shorter growing seasons and reduce losses from late and early frosts and better ways for preserving fruits and storing crops are being devised.

Like medicine and most of our manu-

(Continued to page 133A)

Treet Topics



Treet Safety Razor Corporation, Newark, New Jersey

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Most powerful made collapsed to less than a foot in length. Multiple lens system - 30 mm. objective in heavy brass mount. Directions included for using as a compound 4 lens microscope. American made. 10 day money-back guarantee. We pay the postage. Only \$2.19. **BROWNSCOPE CO., Dept. 43, 5 W. 27th St., New York, N. Y.**

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VEST POCKET ADDING MACHINE

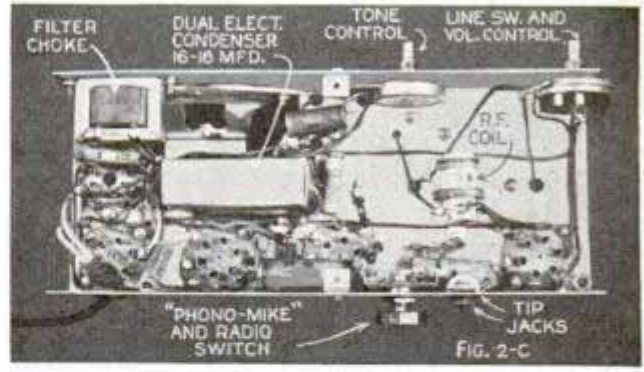
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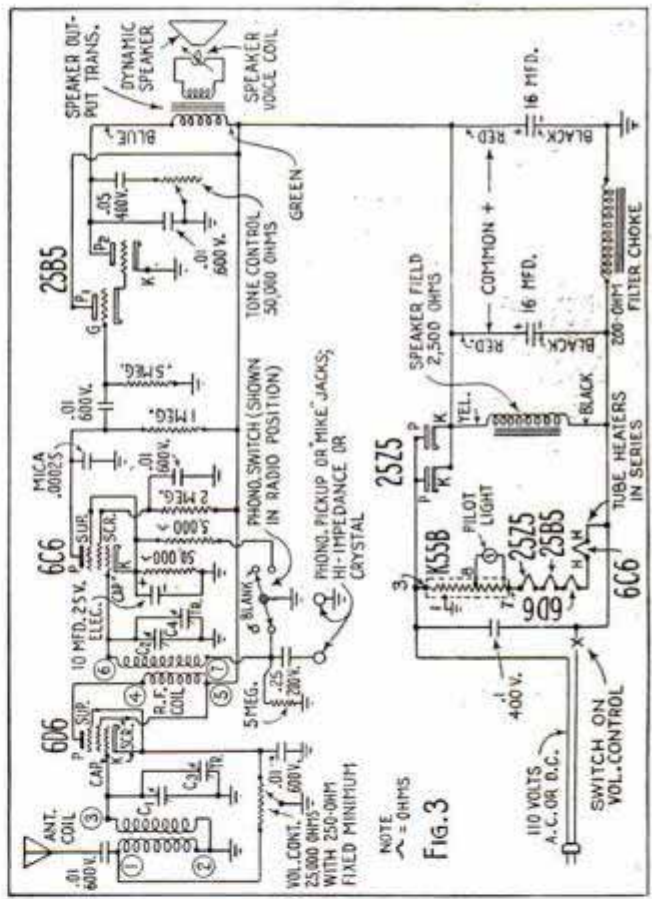
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Little Giant Portable Receiver

(Continued from page 419)



usual line-cord resistor. Photos Figs. 2-A, 2-B and 2-C, show various views of the completed chassis. A list of the original parts used can be obtained from Popular Mechanics Radio department without charge. The blueprint number is R-250.



To balance the set, turn the variable condenser about seven-eighths open and adjust the two trimmers (C_3 and C_4) with a small screwdriver, for maximum noise. If used on a d.c. line it may be necessary to reverse the plug in the wall socket. To be sure the set will get the 1712 kc. police calls, unscrew both trimmers as far as they will go, then adjust trimmer C_3 to maximum noise; the front trimmer C_4 will then be automatically aligned.

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LATHE TOOL SET
\$14.50



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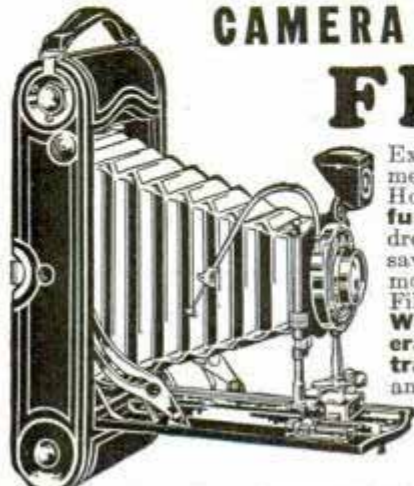


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See our full page ad p. 165A, Feb., 1938, issue.

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that have Automatic take-up-for-wear. Same principle as our large rotary power pumps. Just the "ticket" for pumping oil, gas, paints, etc., from drums and barrels. Large capacities—no priming. WRITE for FREE BULLETIN showing 14 Different Models at LOW PRICE.

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PIERCE GOVERNORS
THE BRAINS OF ANY GAS ENGINE

25813
(Continued from page 129A)

facturing industries, agriculture too is in a state of transition from old methods to new, with chemistry furnishing the bridge for its progress.

We have entered the Chemical or Scientific Age. The Machine Age could not go beyond the limitations of natural materials, so that in the main it was limited to improving things known for centuries. The Scientific Age is taking us beyond into a realm of new materials not to be found in nature, and from them we are creating things that did not exist before.

This new ability of man to create, and the new vision it has given us, in turn is creating a new economy—an economy that is putting wealth, in the true sense of greater enjoyment of life, within the reach of millions who never before knew it, that is creating new opportunities for work, new leisure, new health. Above all it is creating new knowledge in the light of which almost nothing stands as impossible.

251372
"Card-Table Magic"

(Continued from page 383)

thumb of one hand is released quickly to make a tiny gap through which the other match passes. After a little practice, this can be done quickly and to a spectator, it appears as though one match actually passes through the other.

Did you ever try breaking a pencil in two with a dollar bill? It's not difficult when you know the secret. Take any pencil, preferably a round one, and ask a spectator to hold its two ends with thumb and finger of each hand. You take a dollar bill and after creasing it in the center and sharpening it for a while, bring it down in a quick, sweeping motion against the center of the pencil. It will break in two. The work, in reality, is done by your finger, which is unnoticed in the fold of the bill. The motion must be quick or the pencil won't break.

If you have another pencil, here is another trick to offer: tell your guests you are going to hang your hat on a door without hooks or nails. They will tell you it cannot be done and you can show them they are wrong.

An octagon-shaped or flat-sided pencil that is without eraser or metal trimmings

(Continued to page 134A)

BEARD BATTLER!



● Jack Dempsey's face is always on parade. In his famous New York restaurant he greets celebrities every night. And with a beard that's a terror, shaving is *important* to him. Says Dempsey: "I've no time to spar around with experiments—no temper for nicks or half-shaves. So when I shave myself, I use a Gillette Blade in my Gillette Razor. This combination gives me clean, close shaves that *really last!*"

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LESS THAN 1¢ A DAY

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PRECISION-MADE
FOR EACH OTHER

Gillette Blades

MORE SHAVING COMFORT FOR YOUR MONEY

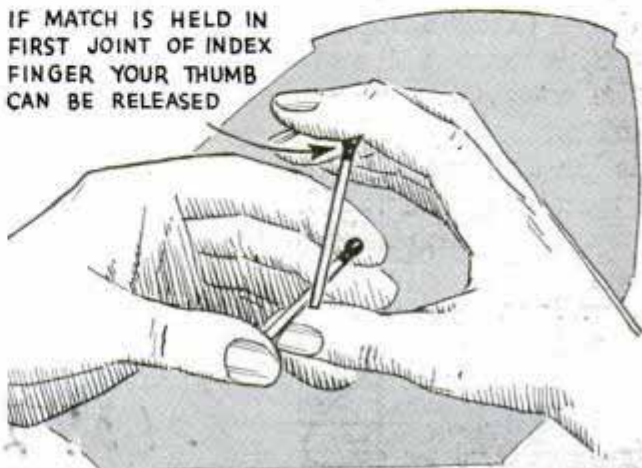
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(Continued from page 133A)

is needed. The pencil is pressed hard against the door and drawn up quickly. The heat generated by this action makes the paint on the pencil sticky and causes it to adhere to the door. The hat must be placed on the pencil very gently in a downward motion.

For a wind-up, place two matches on the table and a dime between them. Then place a glass over the center coin so that it rests on the two matches, and explain to

IF MATCH IS HELD IN FIRST JOINT OF INDEX FINGER YOUR THUMB CAN BE RELEASED



One match appears to pass through another, but actually thumb is released and match held by finger

the spectators you can remove the center coin without touching either glass or coins. To do this, you simply scratch the tablecloth with the forefinger about two inches from the glass. The coin will slip under the glass and move toward your finger.

Although there is no mystery about it, smoke rings can be blown from a box made of cards by gently tapping the side. It is fashioned from six cards put together with edges folded.

Simple enough, these stunts, yet they are always a source of diverting fun during an evening with friends.

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Bath soap that can be carried on your wrist is now available. It is a large cake, molded over a small ring hung on a light bracelet. Thus it is always handy in the shower bath.



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Indian

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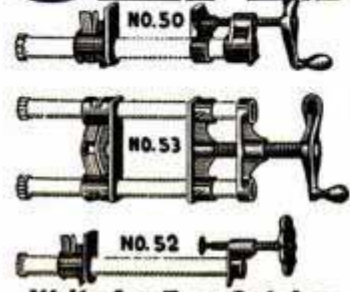
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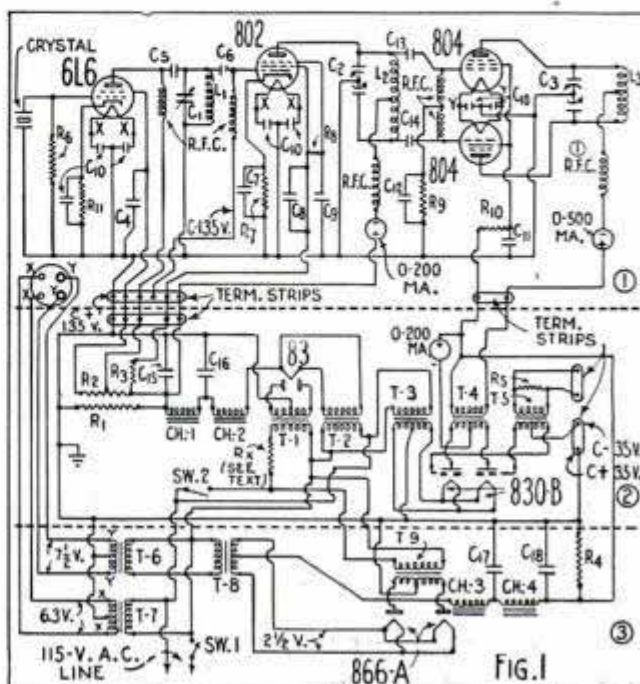
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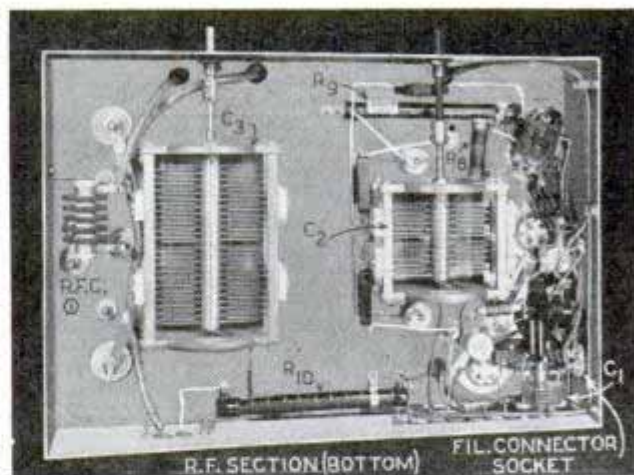
(Continued from page 420)

construction. The r.f. section is assembled on an eraydo-metal base, 11 $\frac{3}{4}$ in. wide, 16 $\frac{1}{2}$ in. long and 3 $\frac{1}{2}$ in. high. Bases for sections 2 and 3 are formed from sheet



metal, and are 11 $\frac{3}{4}$ in. wide, 16 $\frac{1}{2}$ in. long and 2 in. high.

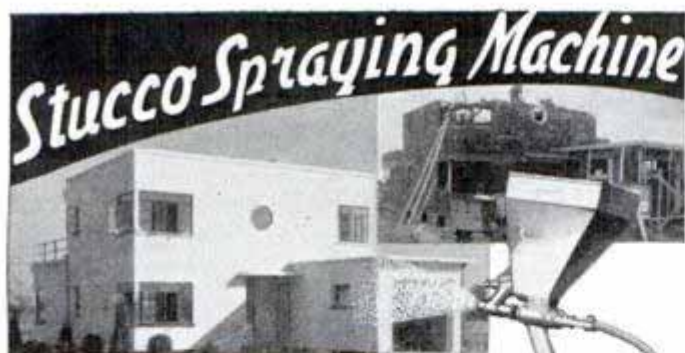
It will be noted that the 804 tube sockets are mounted on a metal partition, or bracket, 11 $\frac{3}{4}$ in. wide and 4 in. high. No. 12 bus-bar wire is bent to form supporting cradles for each tube. Johnson plug-in in-



ductors are used in the final stage for all bands. A list of the original parts and complete tuning data, can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-251.

All oscillator and doubler coils are

(Continued to page 138A)



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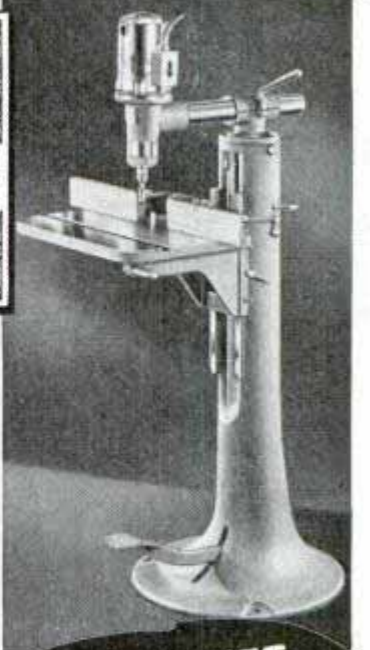


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Says J. Powell W9-DGH

Gentlemen:

I have used transformers of various makes, among them two Jeffersons. The results with Jeffersons were so satisfactory that I decided to use them throughout. Immediately my R reports increased considerably. As no other changes were made, I attributed this increase to the high quality and workmanship of your transformers.

J. Powell
W9-DGH

Leading set builders, radio engineers and amateurs realize that the name "Jefferson" is a safe guide to transformer quality.

You will get the best results with Jefferson Transformers, too Our Latest Catalog 372-R will help select the types. Send for a free copy and manual of Amplifier Circuit Diagrams . . . JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.—Canadian Factory: 535 College St., Toronto, Ont.



JEFFERSON RADIO TRANSFORMERS

Jefferson Electric Company, 902 25th Ave., (P.M.)
Bellwood, Ill.

Please mail free Catalog 372-R and Amplifier Manual to:

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Address.....

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Wind Driven Electric Plant

Build your Own—We show you How!

Make old auto generator light buildings, play radio, operate washing machine and other motors. Dime brings complete plans and valuable catalogue listing 500 electrical items. Over 50 other generator changes into 6, 12, 32 & 110 volt plants, motors, welders, etc.

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FINDS BURIED TREASURE! NEW GOLDAK RADIOSCOPE

Most efficient metal and mineral ore locator ever known. Money-back guarantee to detect buried GOLD, SILVER, or any other metal. Extremely powerful new models. Put your prospecting on a scientific basis. If you know of buried treasure, find it with the new Goldak. Write world's largest manufacturer of successful mineral locators for information.

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1031 South Broadway, Los Angeles, Calif.

GET THIS HANDY METAL PUNCH!

For punching holes up to 3/4" in metal up to 16 gauge thickness. Forged steel handles. Clean-cutting. Will punch in center of 3" disc. Height of gap 3/4". Weight only 2 1/2 lbs. Furnished complete in metal box with magazine and 7 sets of punches and dies. Standard set 3/8" to 3/16" by 32nds—or your choice any 7 from 1/4" to 3/16" by 64ths. Cash with order or C.O.D. only. We pay postage. **\$6.75**

WHITNEY METAL TOOL CO., 80 Forbes St., Rockford, Ill.

WET BASEMENTS!

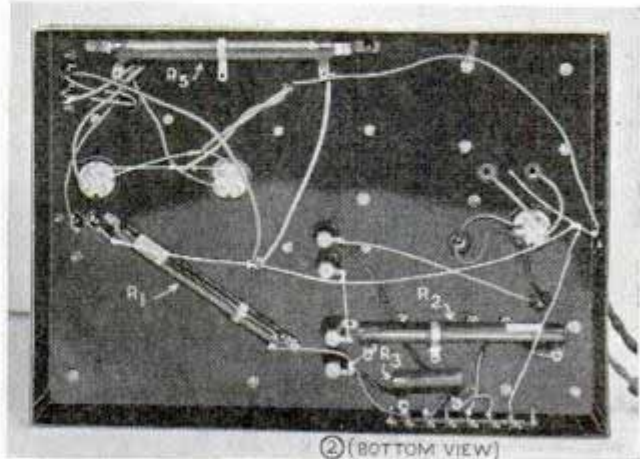
Amazing new Seal-Seep method, anyone can use. Applied to inner masonry wall and floor surfaces; no digging. Guaranteed permanently effective. Agents write for unusual earnings opportunity. Details FREE.

National Seal-Seep Co., Dept. 392, Cincinnati, O.

Waterproof
Your Own
Save up to
\$100 to \$150

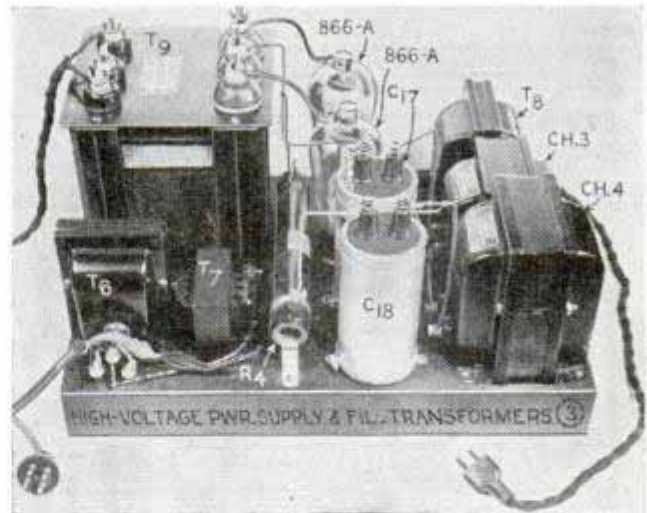
(Continued from page 136A)

wound on 4-prong Hammarlund isolantite short-wave coil forms. The 20-meter oscillator coil, also used for 10 meters, consists of 7 turns of No. 18 enameled wire, spaced 1/8 in.; the 80-meter oscillator coil, also used for 40-meter C.W. if desired, consists of 26 turns of No. 18 d.c.c. wire,



(2) (BOTTOM VIEW)

close wound. The ends of these coils are brought down to the large prongs. Three buffer coils are required, the center tap taken down to what would normally be the plate prong. A flexible lead for the 802 tube cap is connected to the top turn. There are 4 turns of No. 18 enameled wire,



HIGH-VOLTAGE PWR. SUPPLY & FILT. TRANSFORMERS (3)

spaced 1/4 in., on the 10-meter buffer coil; 10 turns of the same wire, spaced 1/16 in. for the 20-meter buffer, and 28 turns of No. 18 d.c.c. wire, close wound on the 80-meter buffer. The Jefferson transformers and chokes in sections 2 and 3 are placed for ease in wiring and to conserve space. For modulation, any speech amplifier with an output for 500 ohms may be used; R-230 described in the November, 1936, issue is suitable. Input connections are to primary terminals of driver transformer T5.



TAKE-ABOUT SANDERS

Give every job an expert finish in minutes instead of hours

Don't let slow, tiresome, tedious hand sanding and scraping spoil your finishing and refinishing pleasure. Do it this modern, efficient way with a Take-About. No experience necessary, just plug it into the nearest light socket and it will do your job in a jiffy. Use it on straight or slightly curved surfaces. Use the front pulley as a spindle sander on curved work.

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Precision Tools Since 1906

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\$70.20 IN 4 DAYS FOR BRADLEY OF MICHIGAN

An amazing 3 in 1 cleaner—sweeps rugs, carpets, cleans walls, ceilings, mops floors. Woman's hands never touch water. You make money quickly. Arnold a beginner made \$505.40 in three months; Gibson \$165.60 in two weeks. Prospects galore—every housewife, stores, hospitals, factories, offices, will do business with you. Get in on the ground floor NOW. Get your share of these profits. Write for our two selling plans. We deliver and collect for you if you desire. You pocket liberal commissions in advance. Get busy. Described on Page 163A, Feb., 1938, issue.

Distributors—protected territory for producers.

ARTMOORE CO., Inc., Dept. 89, 108 N. Water St., Milwaukee, Wis.

"FIRST CHOICE"

No. 60 Sport Model

—in KNIVES

Byrd, Peary, Lindbergh and other famous names top the list of explorers and sportsmen who know that --



MARBLE'S Knives give the utmost in service and satisfaction. No. 49—4 1/2 in. blade, \$2.00; No. 60—4 in. blade, \$1.50. Prices include sheath. At Dealers or direct. Write for catalog. (A-149)

Marble Arms & Mfg. Co., 578 Delta Avenue, Gladstone, Mich., U.S.A.



NEW SUPER-QUALITY KITSELMAN FENCE

Heavier, tougher pure zinc galvanizing. Stronger, tougher Copper-Bearing Steel. Same low Factory Prices. WE PAY FREIGHT, 160 styles and heights Farm, Poultry and Lawn Fence; Steel Posts, Gates, Barb Wire, Pails, Roofing. Write today. **KITSELMAN BROTHERS** Box 94 Muncie, Indiana



Earn Cash at Home!

Raise giant Patented Mushrooms! We supply materials, instruct with pictures, & our 25 branches buy all crops. Big FREE book, photos, tell if your cellar, shed, barn, etc., suitable. Write today. Est. 1908. **UNITED CO., 3848 Lincoln Ave., Dept. 309, CHICAGO**



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In it you will find: Metal Lathes, Artist air brushes and spray guns, Elec. Bench Grinders, Model Gas engines and kits, Motor attachments, Grinding Wheels, Lathe Chucks, Micrometers, Pulleys, V Belts, Carving Tools, Elec. Drills, Compressors and many other tools. **BALCO'S** complete stocks and fast service save you time. Write today for your FREE copy.

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A GENUINE **JOHNSON** Sea-horse **OUTBOARD MOTOR**

FOR ONLY

\$49.50

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Write for the new Sea-Horse Handy Chart describing the nine great motors of the 1938 Johnson line, including two sensational, low price, bantam-weight beauties with Underwater Exhaust, 360° Steering and Reverse and other exclusive Johnson quality features. Sent free!

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17 LBS.! SPEED UP TO 6 M. P. H.!



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BUILD IT WITH DOENUTS

Build your own wheelbarrow, scooter, bicycle trailer, wagon, midget auto, street marker, DOENUT wheels. Developed and patented by the originator of the airwheel for airplanes. Sizes 10" x 2.75" and 12" x 3.30". Operate on as low as 15 lbs. air. Absorb surface obstructions. No jolting. Do not sink into sand or soft ground. Roll same load with less than HALF THE EFFORT. Send 25c for simple blue print drawings of any vehicle shown here or \$1.00 for all 5 with literature and prices.

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MAKE YOUR ELECTRICITY FOR 1c PER KILOWATT

\$650

Easy Payment Plan

Make your own electric light and power the "Diesel Way" with **WITTE Dieselelectric Plants**, 2500, 4000, 6000 watts, for Less Than ONE CENT per KILOWATT on cheap non-explosive fuel. 110 volt A. C. or D.C. for direct lighting, 32 volt for battery operation. Charging costs lowered 75%. Easily installed in small space. Also stationary Diesel Engines 4, 6 and 12 H. P. Use a Diesel for Economy and Safety.

and up F. O. B. K. C., Mo.



2500 Watts

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WITTE ENGINE WORKS

Thrilling NEW

EVINRUDE "Ranger"

ONLY \$47.50



A brand new Evinrude . . . amazingly light, handy and powerful. Literally packed with big-value features including famed Hooded Power—Evinrude Co-Pilot—Underwater Silencing. Starts instantly!—spins into action with a flick of the starting cord. Runs three hours on a single fill—and costs less than 3¢ an hour to operate. Send for catalog!

ELTO PAL only \$37.50

Elto PAL (built by Evinrude) weighs only 14 pounds, and drives boats at twice the speed of oars. Elto ACE, \$47.50—the husky Handi-twin, only \$67.50. Each a stand-out value in its class!

FREE CATALOGS! Write for 1938 Evinrude and Elto catalogs, Boat Directory and Boat-and-Motor Selector. All free. Address EVINRUDE MOTORS 5391 N. 27th St., Milwaukee. PRICES F. O. B. FACTORY

WEIGHS ONLY 16 LBS.
CRUISES 3 HRS.
ON A SINGLE FILL!

EVINRUDE OUTBOARD MOTORS



STOP Backtracking

Haven't you often driven the wrong road and had to backtrack many miles? The Hull Streamline Auto Compass always shows your direction of travel, prevents backtracking, saves money and time for only \$2.95 at your dealer. Two-piece model \$1.95. Write for circular.



HULL MFG. CO., P. O. Box 246-Dx, WARREN, OHIO

TRY THIS

ALL-PURPOSE MOTO-TOOL

10 DAY MONEY BACK TRIAL

saves time and labor on all craft work

Everybody who works with his hands—at home, shop, school, or profession—can use the efficient, attractive Moto-Tool to advantage. With this practical machine you can do in seconds jobs that require hours of hard hand work. Moto-Tool handles hair-line precision work or does power jobs with equal ability. Plugs in any AC or DC socket. Absolutely safe. There are thousands in use.

Model 1
\$9.85
POSTPAID

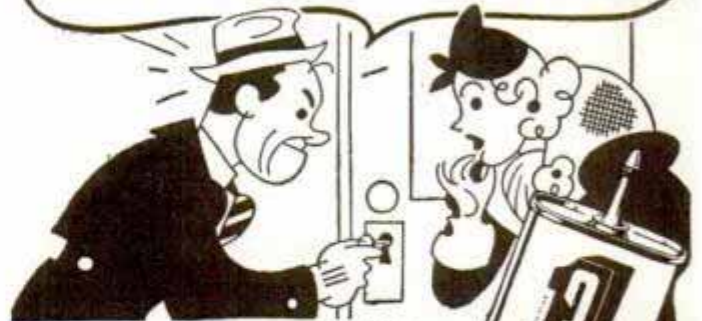
Model 2
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POSTPAID

Two sturdy Moto-Tools serve every purpose of the craftsman. The No. 1 machine—weighs 6 oz., 25,000 r.p.m.—is recommended for light bench jobs. Model 2—weighs 13 oz., 27,000 r.p.m.—is a more powerful, rugged machine with extra mechanical refinements that shop men want and appreciate. Order on 10-day money back trial. Send for FREE booklet.

20 pc. craftsman's tool set, for either model
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DRAT IT! I SHOULD HAVE PUT SOME 3-IN-ONE OIL ON THIS LOCK!



3-IN-ONE oil is specially blended to keep moving parts clean, free from rust, and lubricated. Use it regularly on hinges, locks, sewing machines, tools. At hardware, drug, grocery and 10¢ stores. Get a can today and try it.

3-IN-ONE OIL

ATLAS Stick-On Letters WINDOW SIGNS

Beautiful GOLD Colored. New Styles. 5 year Guarantee. Large Sizes—Penny each. Tremendous Demand. Amazing Profits. Write for FREE SAMPLES and Starting Equipment. HURRY!
ATLAS Sign Works, 7943 Halsted, Chicago

120 Miles PER Gallon \$125 and up FOB Factory.
30 Miles per Hour!

AUTO-GLIDE Power to burn, has passed auto up stiff climb! Amazing economy, less than 1/3¢ a mile! Thrilling, no other ride like it! Ruggedly built, not a toy. Has traveled 7,000 mi. in 9 mos., no replacements! Powerful 1 1/2 to 2 H.P. Cushman engine. 3 models: (1) illustrated, (2) with parcel carrier, (3) 3-wheel, side-car model. WRITE for Free Book. DEALERS get Spl. Offer!

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PARMAK ELECTRIC FENCER

UTILITY MODEL
\$12.50
SAFE 6 VOLT

NOW WITH THE AMAZING NEW FLUX DIVERTER

TENS of thousands of farmers use PARMAK Electric Fence. Now only the precision built PARMAK Electric Fencer has the **EXCLUSIVE NEW FLUX DIVERTER** that gives a better electric fence for less money. Doubles service of SAFE six volt batteries. Fences entire farm. One used barbed wire on light stakes costs less than \$10.00 per mile. Long term guarantee.

SENT ON 30 DAYS' TRIAL

See for yourself how a single wire holds your worst fence breakers. See the huge saving in money, time and labor. Write today for FREE CATALOG and TRIAL OFFER. A 1¢ postcard will do.

AGENTS WANTED: Money-making territories open! Revolutionary new Flux Diverter makes PARMAK more efficient, more economical, easier to sell. Be first in your locality. Write today.

PARKER-McCRORY MFG. CO.,

(Established 1923)
100-C—2609 Walnut, Kansas City, Mo.



WRITE FOR FREE CATALOG

When writing please mention Popular Mechanics

Fun and Money in Bees

(Continued from page 395)

sleep. The other bees won't sting because they have not been assigned to guard duties, consequently the hive can be handled with safety. If a guard happens to recover from the smoke while the beekeeper is present, it probably will obey orders, and sting. Away from the hive, bees cannot easily be induced to sting. The bee is more afraid of you than you are of it. Even if you pick it up and hold it in your cupped hand, without squeezing it, you are not likely to suffer. This is true of the honeybee but not of bumblebees and other wild bees.

Scientists are studying the chemistry of bee stings. The general belief that a sting is painful because of the injection of some sort of simple acid is misleading. The poison from a honeybee sting is a very complex chemical, and may be a mixture of different chemical materials or a product of chemical reaction. There are two poison glands in a honeybee's body. One produces an acid substance and the other an alkaline one. These are kept separated until brought together in the wound by insertion of the sting. Research indicates that the poison is very much like the venom from a rattlesnake.

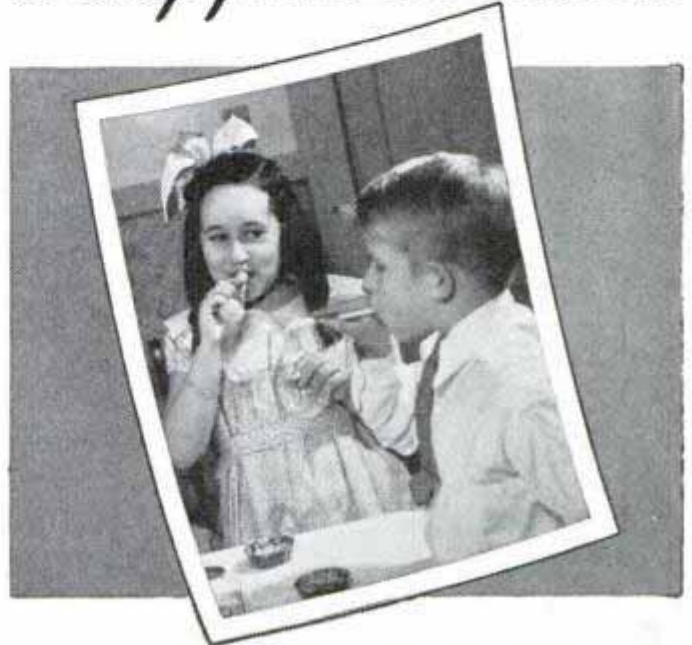
The keeper of honeybees soon learns to overcome the mental condition that magnifies the effect of a sting; and with such modern bee-handling equipments as smokers and face nets, he can handle bees in perfect comfort.

Most people believe that honeybees are domesticated insects. They are not, according to Mr. Hambleton. The honeybees in your apiary are just as wild as those that swarmed on the earth millions of years ago, for the honeybee has not changed as most other insects and animals have. Evolution takes place as the result of new experiences. In the honeybee colony, the individuals that get the new experiences are the workers. But they are sterile females, which do not lay eggs. The queen and drones, who propagate the colony, live pampered lives of seclusion, and therefore are not influenced by changing conditions. And so the honeybee is today just the same in every respect as it was ages ago. If you transfer a swarm from a modern hive to a

(Continued to page 142A)

FUN

to snap pictures indoors



... and G-E MAZDA Photo lamps make it EASY!

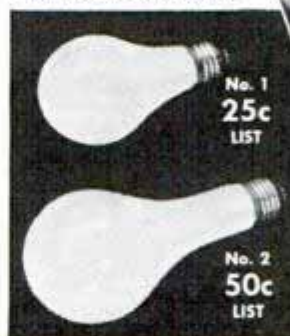
ENJOY happy memories more vividly in the years to come, through snapshots taken indoors or at night with your camera.

It's fun and it is easy, with G-E MAZDA Photoflood lamps. Their brighter, whiter light gets you brilliant, clear shots. And they last for dozens of pictures.

For action, use G-E MAZDA Photoflash lamps. Each lamp gets one picture 15c list.

Go to your druggist or camera dealer for photo lamps, but be sure they're marked G-E, to be sure of better pictures.

G-E MAZDA
PHOTOFLOOD LAMPS



FREE FOLDER

Suggests pictures you'll want, tells how to take them. Write for your copy today. General Electric Co., Dept. 166-PM 3, Nela Park, Cleveland, Ohio.

GENERAL ELECTRIC

MAZDA PHOTO LAMPS

(Continued from page 141A)

BIG MONEY

Assembling Mead's New

50 lb. Portable

OUTBOARD BOAT!



PRICED LOW—and

PAY as You BUILD!

A sensation! Build this 50-lb. tough, durable, seaworthy, portable Outboard Ki-Yak in 2 days at home! Then it's always ready to go anywhere by hand or car. Safe, leakproof. More speed per horsepower. More miles per gallon! Mead's perfected aluminum-ribbed, Cut-to-Fit Construction Kit guarantees successful assembly easily, quickly—and profitably (if you build to sell to others). Amazing LOW Factory-To-You Introductory Prices, and if you wish you can even *Pay as You Build!* Mead Ki-Yaks and Ki-Yak Kits sold *Direct from Factory ONLY*. So rush dime and Coupon below, for details!



9 HOURS TO BUILD NEW

SPORTSMAN'S

BOAT!

For FISHING
CAMPING
HUNTING
SAILING

"CK-2"

Paddle Boat Is

Quickly Converted
Into Speedy Sailboat!

Assemble Mead's "CK" Sportsman's Ki-Yak in 2/3 LESS time with new construction principle. "Home Assembly" saves you nearly HALF factory-built cost! Most revolutionary boat development in years! Weighs only 30 lbs. Portable by hand or car! Thousands in use! Sold Factory-To-You ONLY. No rush dime (covering handling, postages) and Coupon for giant new Coured Circular, low Introductory Factory Prices, \$6.00 Gift Paddle Offer. *Hurry!*

**\$6 PADDLE
GIVEN**
with your Ki-Yak
—if you hurry!



MAIL COUPON RIGHT NOW!

Gentlemen: I am enclosing 10c postage handling charge. Please rush me your New Boat Catalog, Low Introductory, "Factory-To-You" Prices and \$6 Gift Paddle Offer.

NAME.....

STREET & NO.....

CITY.....STATE.....

RUSH ME WITH 10c TO

MEAD GLIDERS 15 So. Market, **CHICAGO**
Dept. B-38

hollow tree, it will get along just as well; and if you capture a swarm of "wild" bees and transfer them to a hive, they will be perfectly at home.

Honeybee research carried on by the U. S. department of agriculture and by most state departments is aimed generally at the production of better bees and the developing of methods of reaping greater benefits from them. Some of the subjects studied by the government at its agricultural research center at Beltsville, Md., and elsewhere include:

Package bees; breeding of queens; wintering methods, in an effort to reduce the ten to twenty per cent cold-weather loss usually experienced by keepers; gathering and utilizing pollen; honey plants, their location, value, etc.; problems of reproduction among bees, including artificial insemination; bee diseases; apiary management for honey production; composition and other characteristics of beeswax; bee culture equipment.

Package bees are bees grown in the southern states and in California or other sections where conditions are favorable for building up strong colonies in early spring, and shipped to northern areas where severe winter conditions have killed off or weakened a considerable portion of bees kept there. A bee package consists of two, three or five pounds of bees and a queen. By buying, say, a three-pound package, an established apiarist will have just about as many as he would have left in a colony he kept over winter. The package offers the beginner an easy way of getting started. In six to eight weeks, the three pounds will have multiplied to a colony that will produce 100 to 200 pounds of honey that season, provided other favorable conditions exist.


The increasing use of package bees suggests that the practice of keeping bees over winter in severe climates may die out. To winter a colony, the apiarist has to set aside fifty or sixty pounds of honey for feeding it; and then he has to nurse the bees through the cold period. In many cases it is cheaper to destroy the bees in the fall and purchase new, packaged ones in the spring.

Queen bees, which are sold separately for requeening swarms, are also shipped by

(Continued to page 144A)

KILL RATS WITHOUT POISON

YOUR MONEY BACK IF RATS DON'T DIE



This rat-killer won't kill Live-stock, Pets or Poultry—Gets Rats Every Time. K-R-O is made from *Red Squill*, a raticide recommended by U.S. Dept. Agr. (Bul. 1533). Ready-Mixed, 35¢ and \$1.00; Powder, 75¢. All Druggists. Damage each rat does costs you \$2.00 a year. K-R-O Company, Springfield, O.

K-R-O KILLS RATS ONLY

★ Ship or Coach Model, \$1



Make money building these beautiful ornaments. Hulls of Calif. Redwood, fully shaped and all parts cut exactly to fit, including sails. Full instructions and drawings. Also 27 in. Queen Mary, \$2.50, and many others \$1.00 to \$6.00. Send 3c stamp for illustrated catalog. **MINIATURE SHIP MODELS, Dept. RT, Perkasio, Pa.**

Amazing TYPEWRITER BARGAINS

SAVE ONE-HALF — 10¢ A DAY! Nationally makes. Recent standard models reconditioned, refinished. Fully guaranteed! Look and operate like new! ALSO PORTABLES, FREE SHORTHAND AND TYPING COURSE. **FREE TRIAL!** Easy terms or as low as \$10 cash. **MONEY BACK GUARANTEE.** Send for illustrated circular and details TODAY. **PRUITT CO., 779 PRUITT BLDG., CHICAGO**



RAISE GIANT FROGS

FREE BOOK "GOOD PRICES YEAR ROUND!" Nation-wide markets waiting for all you can ship. Sell to us also. **WE BUY!** Get ready now for next spawn. Breeder lays 20,000 eggs yearly. Start with a small pond, creek, marsh or lowland. **Free book** shows sketch. Men & Women starting in every state and Canada. See what others are doing. Send no money. Just write your name and address on a postcard and get our special offer to beginners. Write today! **AMERICAN FROG CANNING CO., Dept. 133-CC, New Orleans, La.**



450 Miles a Gallon of Gas!

Potential Gasoline Mileage

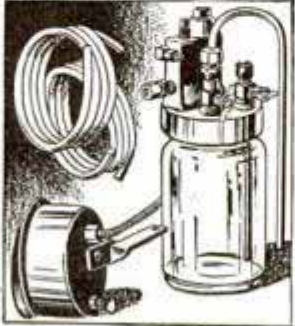
ACCORDING to an article by the president of the world's largest motor research corporation, there is enough energy in a gallon of gasoline if it were converted 100% in mechanical energy to run a four cylinder car 450 miles.

NEW GAS SAVING AND TOP-OILING INVENTION Astonishes CAR OWNERS

A Marvelous Device has accomplished wonders in utilizing a portion of this waste energy. It saves gasoline, gives better mileage, reduces carbon formation, creates more power, gives quicker starting, snappy pick-up and a smoother running motor. Saves many repair bills.

Big Profits and Free Offer! ... To obtain national distribution quickly, men are being appointed everywhere to help supply the tremendous demand. Free samples furnished to workers. Write today for this free sample and big money-making offer.

Diamond Fuelizer, Dept. 155, 600 High St., Akron, Ohio



★ Cash FOR SPARE TIME!

MAKE \$25 TO \$30 PER WEEK AT HOME IN YOUR SPARE TIME



THE IDEAL LAWNMOWER SHARPENER

Like magic, the Ideal Lawnmower Sharpener makes old, dull, half worn-out mowers cut like new. Simply set the mower in the Ideal and the machine does the rest. Sharpens any lawnmower to a perfect edge in 15 to 20 minutes. . . . and you make \$1.00 to \$1.50. Attach to light socket. Start in your basement or garage. Work in spare time. Attachments furnished for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc. **FREE CATALOG** tells complete story.

WHAT THESE MEN DID . . . YOU CAN DO

Remember, no experience is necessary. Most men sharpen lawnmowers in spare time only. A. V. Gebhardt writes: "Have made \$1,000.00 the past 6 months." George Seitel writes: "I have sharpened over 500 mowers and every customer is well pleased." A. M. Larsen writes: "I average 9 mowers a day." Roy F. Stier says: "I live in a town of 500 and to-date have sharpened 200 mowers at \$1.25." Edward A. Mynderse writes: "Have sharpened around 500 mowers this season." Nick Bailes says: "Last summer I sharpened 200 mowers at \$1.00 each." Bucher Battery Co. writes: "We sharpened over 600 mowers last year at \$1.50 each."

FREE BOOK Shows How!

Right now, before you forget it, send for a copy of our **FREE BOOK**, "How To Make \$25 to \$30 per week in SPARE TIME."

SEND POST CARD TO
THE FATE-ROOT-HEATH CO.
 308 Bell Street Plymouth, Ohio

HOW TO MAKE \$25 TO \$30 PER WEEK IN SPARE TIME



WANTED AT ONCE!

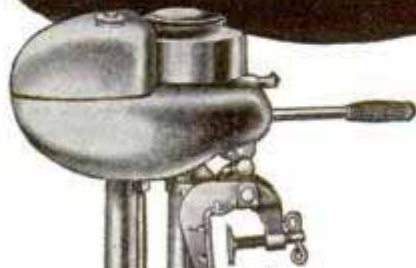
More City and Rural Dealers

Start your own business with our capital. It pays better than most occupations. Buy everything at wholesale—sell at retail. Be your own boss. Make all the profits on everything you sell. We supply everything—Products, Auto-Bodies, Sample Cases, Advertising Matter, Sales and Service Methods, etc. 15 Factories and Service Branches. Prompt shipments. Lowest freight and express rates. Superior Rawleigh Quality, old established demand, lowest prices, guarantee of satisfaction or no sale, makes easy sales. 200 necessities for home and farm, all guaranteed the best values. Rawleigh's Superior Sales and Service Methods secure most business everywhere. Over 41 million Products sold last year. If you are willing to work steady every day for good pay, write for complete information how to start your own business with our capital.

W. T. Rawleigh Co., Dept. C-36-PPM, Freeport, Ill.

271255
(Continued from page 142A)

Still
the Greatest
**OUTBOARD
MOTOR BUY**
ON THE MARKET!



NEW
1.2 H.P. SINGLE
\$39.50

FREE

Send for illustrated folder giving details and prices



Before you say you "can't afford it" - see the 1938 NEPTUNES! They're built for enduring service, yet priced for the average purse.

A new light-weight 1.2 H.P. Single built especially for fishermen - a 9 H.P. Alternate-Fire Twin - and four other dependable models - \$39.50 up to \$164.50 - all with new improvements and quality features unknown at such prices.

Investigate early - get more quality for less money - buy NEPTUNE!

MUNCIE GEAR WORKS, Inc.
MUNCIE, INDIANA

NEPTUNE
Motors

BUILT FOR SALT WATER AS WELL AS FRESH WATER

MAKE MONEY IN PAINTING BUSINESS



Paint walls, ceilings, screens, furniture, radiators, machinery faster, better! $\frac{3}{4}$ H. P. motor 110 Volt 60 Cycle AC, complete with Spray Gun, 15 ft. hose. Weighs only 44 lbs. Carry anywhere. FULLY GUARANTEED. Only \$31.15 f. o. b. Chicago. \$5 Deposit, Balance COD. or SEE YOUR DEALER. Circular FREE. Get started making money NOW!

Ideal Automatic Pump Co., Dept. PM3, 801 Washington, Chicago **\$31.15** Complete



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Now you can always be well groomed. Use an Empire. Save time, pressing bills, wear on clothes. Press pants, coat collars, sleeves, lapels, ties, etc. in a few minutes at home, office or when traveling. No wet cloth, board or boiler. Easy to use. Plug in any socket. Weighs 10 oz. Underwriters' Approved 6-ft. cord. Over 500,000 Empires now in use. Circular free.

EMPIRE ELECTRIC COMPANY
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\$2

at stores or postpaid on Money Back Guarantee.

mail. They are placed in small containers, together with a supply of food and a few workers to act as attendants. Beekeepers find it desirable to replace queens for a number of reasons. As an example, it may be found that the bees in a given colony are of the "cross" type. In other words, they have a high temper and are a bit too willing to sting. Simply by removing the old queen and replacing her with a new, gentle one, the problem is solved. The cross bees will die off in about six weeks, and are replaced by well-behaved offspring of the gentle queen.

Farmers and orchardists are finding it profitable to place colonies of bees near their orchards during the blossoming season, to carry on the work of cross-pollinating the flowers. They set the container in the orchard or field, pull the plug and the bees do the rest.

Someone has figured out that, during the busy season, there are about 280 billion honeybees at work in the United States, producing over 150 million pounds of honey and eight million pounds of beeswax.

Once the benefits of the bee are appreciated by the general public, and its habits fully understood, beekeeping as a hobby and as a means of making money will become more commonplace.

Gold Mining from the Air

(Continued from page 357)

Andes, so the mining engineers held a conference with the aeronautical engineers and scientists. If the million pounds of equipment could be carried by air to the Aramayo mine, then gold mining from the air would be possible anywhere in South America and hidden stores of gold might be released to the world.

As systematically as if planning a new air route, the aeronautical engineers went to work. A tri-motored plane was fitted out. A preliminary aerial survey showed that the job meant loading equipment at a height of 13,000 feet, flying through the 18,000-foot Sorata Pass and then down into a narrowing valley which, except for small farm clearings here and there, is choked with heavy jungle. The range drops from the 18,000-foot crest almost to sea level within a few miles. The aerial gold miners made a second survey, then a third. Me-

teological stations were set up to record wind and weather conditions. The valley was marked with smudge pots in order that air currents might be studied and analyzed. Fog, clouds, winds and the intensity of precipitation were charted. When all of the data were studied it was found that the job could be done. Since prevailing winds were either down or up the valley, it was possible to hew an airport out of the jungle brush that would provide a narrow runway nearly a mile in length, stretching up and down the river. A loading station was set up at the airport at La Paz and equipped with derricks for raising the larger pieces into the flying freighter. Another station for unloading was built at the Tipuani airport.

Engineers refitted the husky tri-motor plane. A large hatch was opened in the roof of the fuselage aft to allow the entrance of large pieces of machinery. Within the fuselage was built a two-rail track along which a platform could be rolled. By this means, the load could be distributed throughout the fuselage. In this manner, even at these high altitudes, the tri-motored plane could lift loads of from two to three thousand pounds.

Taking off from La Paz with its first load, the big aerial freighter made the trip right on schedule. Eager hands manned the unloading derricks at Tipuani. Then the plane made another trip . . . and another. The towering Andes had been made to relinquish their grip on their treasures at last.

"The importance attached to this operation cannot be over-estimated," says Robert Shippee, president of Aerial Explorations, Inc. "It means that one branch of aeronautical science has caught up with another, and the two make gold mining from the air possible in many of the inaccessible spots where other types of mining operations have proved unsuccessful or unprofitable.

"Prospecting for gold by air is already well established since it was inaugurated a few years ago. First came the preliminary reconnaissance, in which the aerial prospector or geologist could comfortably fly over a large area of terrain and observe likely outcroppings indicating the presence of gold.

"This is followed by a second, more detailed, flight over the selected area while

(Continued to page 146A)



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LIFETIME-STRENGTH CASCO GLUES THINGS FOR GOOD!

Home-owners! Now you can get CASCO, the high-test industrial *weatherproof* glue, for home use...to repair furniture, toys, loose linoleum, luggage, books, everything "glueable."

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4 Handy Sizes—10c to 65c—At Your Hardware Dealer's

es 1346

(Continued from page 145A)

CHEESE IT! HERE COMES FATHER!



WHAT A SMELLY PIPE! Mother tried a dozen times to make dad throw it out. But Uncle Ted had a more reasonable suggestion. He said to clean it well, and—



NOW WE ALL WEAR GRINS. Father says it's the world's mildest blend of tasty burleys. Even mother likes that sweet-and-lovely aroma. Try a two-ounce tin today!

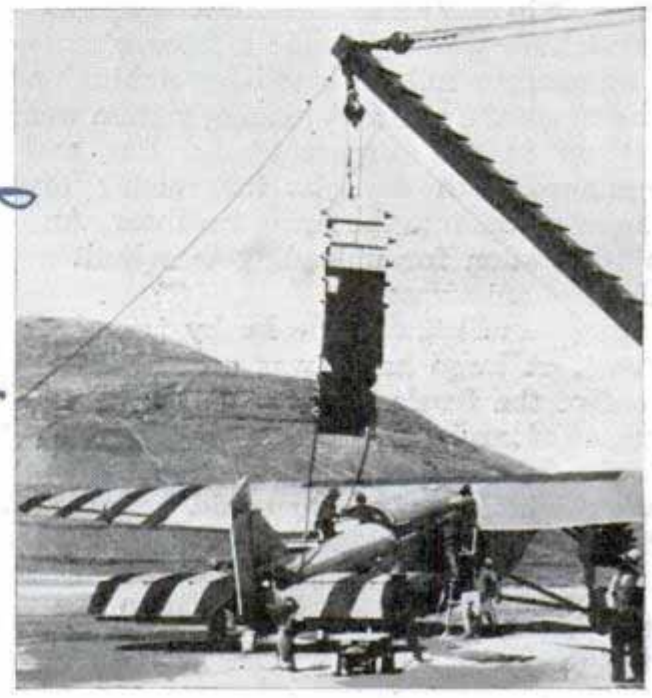
HOW TO TAKE CARE of YOUR PIPE

FREE BOOKLET tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky. Dept. P-83.

TUNE IN Tommy Dorsey and his orchestra. Every Wednesday, 8:30-9:00 P. M., E. S. T., coast-to-coast NBC Red Network.

a series of obliques or vertical pictures, depending upon the nature of the terrain, is made. These photographs when pieced together, reveal details not readily observed by the unassisted eye.

"From now on, aerial gold mining may become a matter of scientific routine after the prospecting phase is completed. An

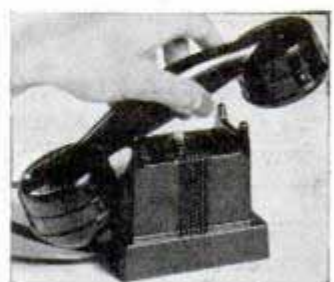


Preparing freighter for another trip with a ton of modern mining equipment

aerial engineering and mapping flight will determine the best route to fly and where, if any place, to establish emergency landing fields. Further test flights made with the cargo plane will give data regarding the establishment of radio communication and cargo-carrying ability. Then the same procedure may be followed as in the case of the Aramayo mine."

Inter-Room Desk Telephone Run by Four Dry Cells

Four dry cells or a six-volt battery operate a convenient telephone set that can be installed in the home, office, factory or a trailer. It requires no central switchboard, calls being made by pressing a signal button after lifting the handset. Two or more instruments can be installed in a system.



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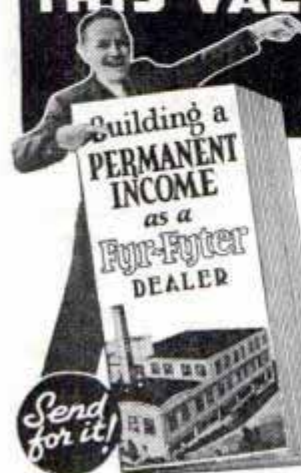
Anything from a candy box to walls and ceilings can now be covered with suede velvet felt or velour finish with our newly developed hand spray set. (See page 252 February issue.) The Binder is first applied, the object is then sprayed with pulverized fabrics! Can be applied to paper, cloth, wood, leather, plaster and metal—Drying time 15 minutes.

Introductory offer 1 Binder Gun, 1 Fabric Gun and enough binder and pulverized fabric (suede) to cover about 15 sq. ft. for only \$1.95 postage paid in any of the following colors—tan, blue, navy, brown, black, red. Be the first to profit by this new discovery! Order your outfit now! Send for free circular—10c brings four attractive finished samples.

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**EXCLUSIVE,
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The exclusive NON-SKID Point amazes even the oldest tool users. It G-R-I-P-S the screw slot . . . drives and removes screws easier and faster . . . no slipping . . . no injured fingers . . . no damage to polished surfaces. Tool users like the "feel" or balance of this quality tool, with its highly-insulated and hammer-proof EBONOL handle, and its chrome alloy steel blade. See the popular NON-SKID for yourself at your Hardware Dealer's. You'll want one! Guaranteed by The Bridgeport Hdwe. Mfg. Corp., Bridgeport, Conn., U. S. A.

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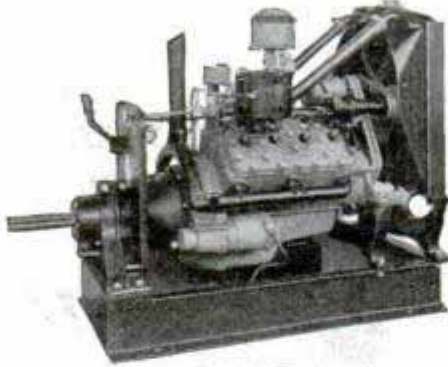
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Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks **out of actual savings!**

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc., etc.

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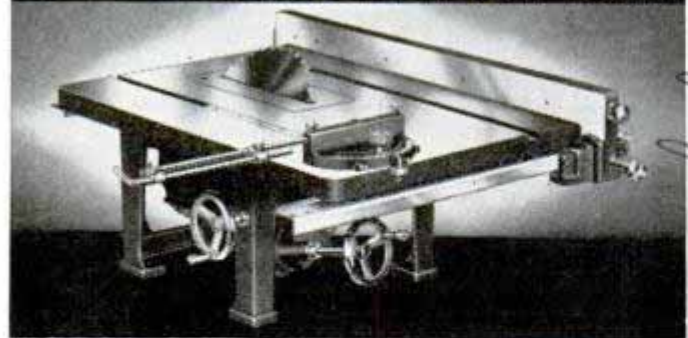
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ELECTRIC
No gasoline, oil, noise, or bother to start!
Instant action—anyone can ride it—even a 9 year old child. Variable speeds—perfect control—brakes, lights, horns, etc. **PLENTY OF POWER!** Hi-speed model goes 35 m.p.h.—any speed available! Entirely self-contained power unit and charger. Simply plug into light socket (patented). Unusual range—Heavy duty tires and spring frame give smoothest ride! **ULTRA STREAMLINED**—available with air-flo parcel carrier. Write for literature on complete line including gas models.



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Until you actually SEE Boice-Crane Power Tools . . . and you can see them in most cities . . . you have no idea of the Greater Quality that is built into every Boice-Crane.

NEW SHAPER

Quality that leads to better performance, easier action, greater accuracy, longer life without repairs . . . are all YOURS when you buy Boice-Crane.

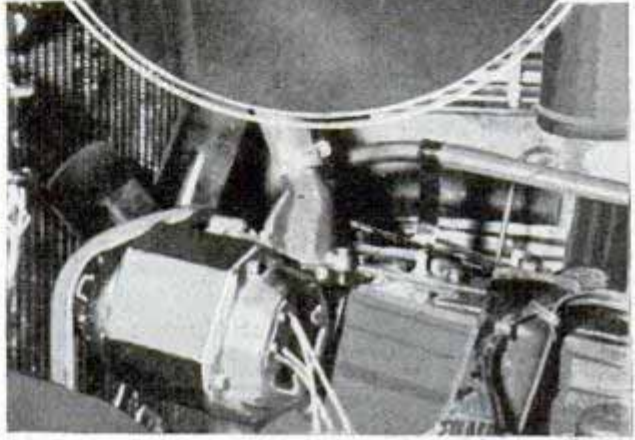
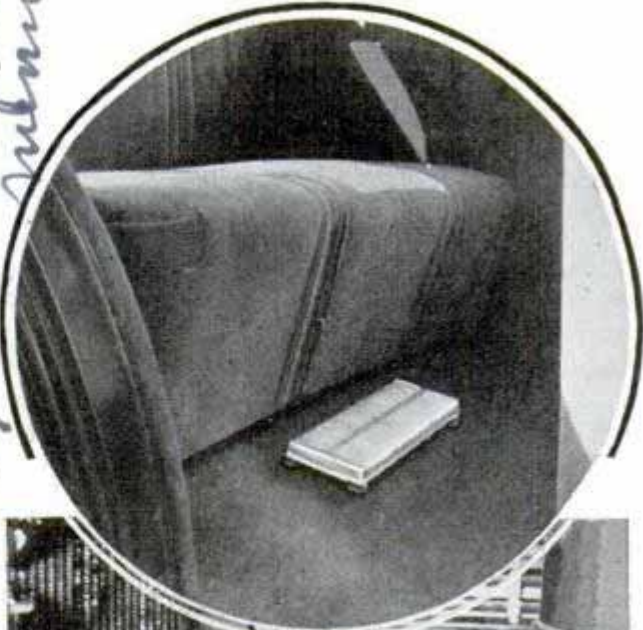
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**Electric Heater for the Car
Has Generator on Engine**

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Top, rear compartment outlet for heater. Bottom, generator for electric heater

Quick, clean heat for the interior of an automobile may be obtained by installing an electric heater introduced recently. The secret of the heater is a newly patented alternating-current generator, which bolts on the engine block so that its pulley lines up with the fan belt. With the generator belt in place, the generator produces enough current to operate one, two or three heaters without draining the storage battery. The heater gives warmth almost instantaneously. It can be installed anywhere in the automobile and is especially desirable for the rear compartment. Each unit can be regulated to the heat volume desired. The generator is said to give auxiliary service with minimum attention.

Our Bureau of Information keeps on file the names and addresses of makers of, and dealers in, all devices described in the pages of Popular Mechanics Magazine. We are glad to furnish this information to our readers upon request, accompanied by stamped, self-addressed envelope.

204082

Across Africa on One Lung

(Continued from page 389)

speed transmissions and two-inch super-cooling fins, and pulling the sidecars, they would easily make seventy miles to the gallon of gas if we had given them half a chance. But we didn't!

The seasonal rains—one should say torrents—had just finished falling. Southern Nigeria gets ninety inches a year, and nearly all of it falls at once and goes rushing down to the Gulf of Guinea, taking bridges, trails and roads along with it. By the time we were 200 miles inland, there wasn't any trail at all—only a place where the trail had been. Grinding, pounding,



James Wilson dickering with a couple of wily Hausa traders at Kano

clanking, those gallant little motorcycles crawled along through a wilderness of gullies and washouts. Time and again we enlisted half a village to carry and push. Time and again we slashed and tore a detour through the jungle around an impassable washout.

One day as we rolled a log to one side, a long black shape slithered out, coiled up within a yard of Flood's bare leg, and poised to strike.

"Look out!" I yelled.

We both threw our hatchets at the same time. A cobra lay in three pieces, writhing in the dust.

Nervously Flood mopped his forehead.

"Good shot!" he said. "Now back to work."

(Continued to page 150A)

DISSTON

-of course



time to buy a new Hand Saw

Enjoy the treat of a finer saw than most men have ever owned! Ask dealer for DISSTON D-23. Lightweight, straight back, narrow blade. Butt, 6 3/8"; point, 1 1/2". Precision balance, true taper, easy running, fast cutting. Disston's world-finest saw steel. Mirror polish, striped back, beautifully etched. Applewood handle, full carved. Cross-cut or rip. One of Disston's finest. 26" length for only **\$3.85**

Ask your dealer also to show you DISSTON D-8, world-famous as the "Saw Most Carpenters Use". Skew back. 26" length, **\$3.50**. Also made Lightweight Pattern for home workshop, **\$3.50**

D-23
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(Continued from page 149A)



Here's an offer with a double feature. A complete set of one dozen assorted Nicholson X.F. Swiss Pattern Knurled Handle Needle Files . . . all the files you need for super-accurate filing . . . for the delicate filing strokes that can assure the success of a difficult project.

And . . . with the top off, the box automatically becomes a bench stand for the 12 different shaped files. It keeps them within reach. It protects them from rubbing.

Ask your hardware store for the new set of knurled handle Needle Files in the convenient box. If he should not be able to supply you, write us direct. Nicholson File Company, Providence, R. I., U. S. A.



A FILE FOR EVERY PURPOSE

Ripping, slashing, tearing, foot by foot we fought our way. Crashing, bumping, bouncing over rocks and potholes and miniature editions of the Grand Canyon, with an overload of seventy-five per cent, the punishment at last was too much for the bikes. Flood's rear fork snapped in two.

We spread out our portable machine shop on the ground and made a rough strap-iron clamp that held the two ends together until two days later, when we came straggling into the village of Jebba, a station on the Nigerian railroad, which runs from Lagos 800 miles inland to Kano. The clamp tore loose just as we pulled up in front of the headquarters of Archibald Mullins, the British superintendent of maintenance for that stretch of line.

"Cheer up, chappies!" he chirped, "I'll 'ave me blacksmith weld your fork." And he did. Mullins was the only white man in Jebba or for miles around. He lived alone in a big grass hut, with two six-foot pet cobras, two monkeys, and his native boy. Every two weeks he ordered up a hunk of English roast beef and "trimmings" on the train that met the mail boat, donned his Tuxedo and boiled shirt, and dined in solitary state.

"It keeps me from going native," he explained. The Englishman gave us the best dinner we'd had since leaving home.

Then back to the jungle and the same old heart-breaking grind. We counted ourselves lucky the day we made thirty miles in sixteen hours and suffered nothing worse than a broken axle. But when we went to install a spare, we found they had given us axles for the twin-cylinder model—a half-inch in diameter instead of seven-sixteenths. What a difference a sixteenth of an inch of metal makes!

"We'll have to file 'em down and re-thread 'em," I said.

"But we've only got two files—and that's steel," objected Flood.

"Sure," I told him, "the files'll be worn out when we're through, but what do you suppose I brought that little vial of acid for. By tomorrow morning they'll be as good as new. We can use those files until they're almost paper-thin."

I had learned that trick from Popular

(Continued to page 152A)

NEW *Multi-Speed* SCROLL SAW



Note:

If you are one of the many thousands who already own a No. 1200 Delta Deluxe Scroll Saw—you can obtain this wonderful Multi-Speed Drive at very small expense.

Send for Circular

Check the proper square in the coupon below and you will be sent the special circular giving full details and prices on the new Multi-Speed Scroll Saw. If you have not received the 1938 Delta Catalog showing the complete line of latest Delta motor-driven tools—send the coupon for your copy as well as special circular on new Multi-Speed Scroll Saw—and the latest Delta Project Book No. 4—packed full of new and different things to make, with many photographs, working drawings and complete instructions. Enclose 10c for Project Book. Catalog will be mailed postpaid.

DELTA MFG. CO. Dept. A338, 600-634 E. Vienna Ave., Milwaukee, Wis.

Delta is happy to announce a *second* great step forward in Scroll Saw design—the perfected *Multi-Speed Drive*. Through this remarkable development you can select *any speed* you want from 790 to 1700 R.P.M. regulating the speed within 1 or 2 R.P.M. if you wish. You can cut any material within the range of the scroll saw with full assurance that you have the best speed for your purpose. Furthermore, scientific design has made this improvement simple, foolproof and trouble-free. Every user of motor-driven tools should get the full story of this unusual engineering achievement.

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I enclose 10c (stamps or coin) for which please send me one copy of the new 1938 Book No. 4 of "Practical Delta Projects." Also place me on your mailing list to receive 1938 Delta catalog of quality motor-driven woodworking tools.

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NEW REMINGTON NOISELESS PORTABLE

AT LAST! The famous Remington NOISELESS Portable is yours for only ten cents a day. Brand new. Not rebuilt. Standard keyboard and every modern feature. Free carrying case and typing course. 10-Day free trial. You don't risk a penny. WE PAY ALL SHIPPING CHARGES. Act now! Write Remington Rand Inc., Dept. 152-3, 465 Washington St., Buffalo, N. Y.



10c A DAY

TWO-CYLINDER STEAM ENGINE

for small boat models complete with propeller, shaft, fire screen, denatured alcohol torch and fuel tank. Torch will start cold engine in 2 minutes, run it for 12 minutes.

Price complete as described \$3.00 postpaid
Shawnee Engine Co., Box 162, Station D, Cincinnati, O.



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SOIL TEST KIT \$ 2.00

Complete with instructions and data on plant needs

Use this kit and be your own soil chemist. New larger model gives 20 individual tests for nitrogen, phosphorus, potash and acidity, giving all essential information for successful lawn or garden. If not sold by your dealer, send \$2 direct to manufacturer.

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Welding Business Earns \$150 to \$300 for You Each Month



"BUILD-YOUR-OWN"

Just couple your own engine to this unit, mount it on chassis and you have money making advantage of a portable welder at a saving of \$100 to \$500.



30 DAY'S TRIAL
AT HOBART'S RISK
AND EASY
"PAYS FOR ITSELF"
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Free! VALUABLE
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CHECK YOURS AND MAIL
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New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart Welders are easier to operate, faster, guaranteed to bring you quality welding business... extra profits will pay for welder without expense to you.

NO INVESTMENT TERMS—PROFITS PAY FOR IT

Extra earnings and savings possible with Hobart Welders make it easy to own without expense. You can even rent a new Hobart and later purchase it without loss. Coupon brings details.



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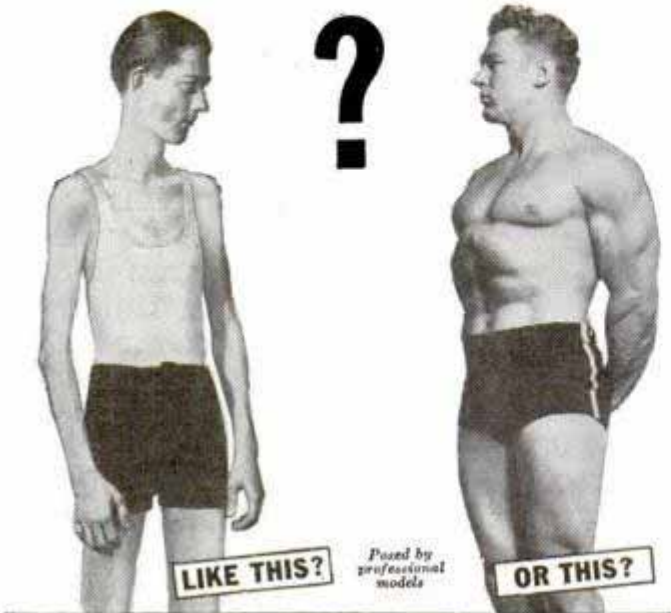
Gentlemen: Send me information on () Build Your Own Welder () Electric Drive Welder () 30 Days Trial, Easy Terms () Rental Plan. Also send me free books I've checked.

Name.....

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(Continued from page 150A)

HOW DO YOU LOOK IN YOUR BATHING SUIT



**SKINNY? THOUSANDS
GAIN 10 TO 25 POUNDS
THIS NEW EASY WAY**

NEW IRONIZED YEAST ADDS POUNDS gives thousands normal good looks

ARE you ashamed to be seen in a bathing suit, because you're too skinny and scrawny-looking? Then here's wonderful news! Thousands of the skinniest, most rundown men and women have gained 10 to 25 pounds of firm, normally good-looking flesh with this new, scientific formula, Ironized Yeast.

Why it builds up so quick

Scientists have discovered that many are thin and rundown only because they don't get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite and not get the most body-building good out of your food. Now you get these exact missing elements in Ironized Yeast tablets.

They're made from one of the world's richest sources of health-building Vitamin B—the special yeast used in making English ale. By a new, costly process this rich yeast is concentrated 7 times, taking 7 pounds of yeast to make just one pound of concentrate—thus making it many times more powerful in Vitamin B strength than ordinary yeast. Then 3 kinds of strength-building iron (organic, inorganic and hemoglobin iron) and pasteurized English ale yeast are added. Finally every batch of this Ironized Yeast is tested and retested biologically for its Vitamin B strength. This insures its full weight-building power.

No wonder these easy-to-take little Ironized Yeast tablets have helped thousands of the skinniest people who needed their vital elements, quickly to gain new normally attractive pounds, new popularity.

Try it without risking a cent

To make it easy for you to try Ironized Yeast, we do better than offer you a small sample package. We offer you a FULL SIZE package, and you don't risk a penny. For if with this first package you don't begin to eat better and get more benefit from your food—if you don't feel better, with more strength, pep and energy—if you are not convinced that Ironized Yeast will give you the normally attractive flesh you need—the price of this first package will be promptly refunded. So get Ironized Yeast tablets from your druggist today.

Special offer!

To start thousands building up their health right away, we make this valuable special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists, Ironized Yeast Co., Inc., Dept. 533, Atlanta, Ga.

Mechanics when I was eleven years old. We bolted our big monkey wrench to my luggage carrier for a vise and whittled out two hardwood facings for the jaws to hold the axle fast. Slowly but surely I trimmed it down to size. It took about two hours. But, although I used a three-cornered file on the ends, I succeeded in preserving only a slight semblance of the threads. "You'll never get a nut to go on there," said Flood, hopelessly.

"Wait and see," I told him, remembering I had thrown in a whole handful of extra castellated nuts. Selecting one the right size, I filed the castellations till they were die-sharp, started the nut on backward and began to twist.

"Well, I'll be darned," exclaimed Flood, as the tiny steel shavings began to appear.



Flood surveys an Englishman's garden on the first lap of their long cross-Africa trip

In half an hour, after repeated sharpenings of the nut, I had cut new threads.

But we were still 400 miles from Kano—and when we got there, what about the 3,000 miles of desert that lay beyond?

There was no bridge across the Kaduna river, so the natives ferried us and our machines across in a sixty-foot mahogany canoe, hollowed out of a single log. They went into raptures over the gift of two copper pennies apiece. Useless to them as currency, two pennies were worth at least a day's work as ornaments.

Fifty miles beyond the Kaduna we encountered a British engineer with a crew of native laborers, building a new trail. The new trail would eliminate upward of

(Continued to page 154A)

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SET-UP makes any electric razor shave **CLOSE** and **QUICK**

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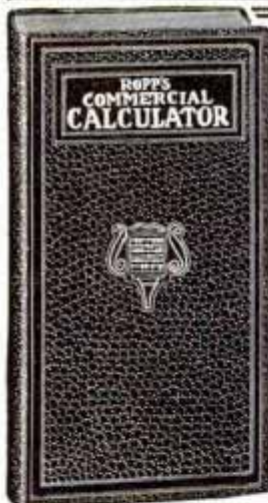
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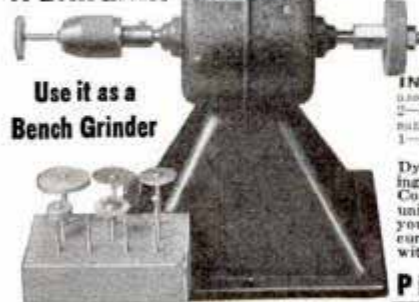
Shows the Answer as Quickly as a Watch shows the Time to all Problems likely to occur in the Office, Store, Shop, Bank, Farm, or Factory.

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The NEW UNIVERSAL GRINDER

Complete **\$395**

THIS INCLUDES 30 PIECE ARBOR SET

The grinder that is truly universal in its application to jobs impossible with other power tools. This versatile tool is needed by jeweler, optician, dentist, laboratory, model maker and home craftsman.

INCLUDES 30 PIECE ARBOR TOOL SET: 9—Grind stones with brass centers; assorted sizes. 2—Bakelite cut-off wheels. 3—Assorted engraving or carving burrs. 2—Polishing buffs. 1—Mounted point. 1—Bristle polishing brush. 10—Assorted sanding discs emery, sand, garnet, fine, coarse and medium. 2—Screw mandrels. 1—Large grind stone.

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Dynamically balanced hi-speed motor with heavy cast removable base. Self-aligning bearing semi-roller and oil reservoir in each bearing. Tool steel motor shafts. Compact design enables you to work on delicate jobs. Equipped with a three jaw universal arbor chuck, adjustable to take drills as fine as a hair. Arbor tool set enables you to grind, drill, rout, curve, sand or polish. Operates on 110 volt A. C. or D. C. current. Variable Speeds from 10,000 R. P. M. to 500 R. P. M. Can be obtained with use of rheostat \$2.50 additional.

Rush \$1.00—Balance C. O. D.

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Indispensable to Jeweler, Laboratory, Model Maker and Home Craftsman. The ideal outfit for fine accurate grinding, sanding, routing or carving. Includes 12 grindstones with brass centers in assorted sizes, 5 bakelite cut-off wheels, 5 assorted engraving, routing or carving burrs, 2 polishing buffs, 1 mounted point, 2 bristle polishing brushes, circular and cup shape, 3 mandrel arbors, 20 assorted sanding discs of emery, garnet, sand, fine, medium and coarse.

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INDUSTRIAL PROD. CO., Dept. 14M, 48 W. 48th St., NEW YORK, N. Y.

ES 1082
(Continued from page 152A)

John made \$42⁵⁰ in one day in his NEW Business



clubs, country estates offer tremendous possibilities. Our new **DETERGER** washes upholstered furniture, drapes, tapestry, all sorts of fabrics electrically right in your customer's home, with a new soapless soap whipped into dry suds. We have helped hundreds of men get into business for themselves with our automatic equipment. The U. S. Government and many of the world's largest hotels use our machines.

Make Money the FIRST DAY

You are ready to go to work the minute you get the outfit, so you ought to be taking in **big profits** the first day. J. S. Corson made \$279.50 his first month. Barrett says, "Made \$28.00 in 8 hours." We want an honest, ambitious man in every locality. If you are that man we will help you get started for yourself in a business with tremendous possibilities. Only a limited amount of money is needed for a down payment—the balance you send on easy terms. You don't need to rent a shop or hire a building, for the work is done in your customer's home.

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Automatic Tuning Models \$11⁹⁵ Priced as low as.....

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CHICAGO, ILL.

200 washouts in the next forty-seven miles, said the engineer, but we were three months too soon to use it. It took us five days, a broken spring, a broken luggage carrier, a broken sidecar frame and seven broken spokes to make that forty-seven miles, and we spent a week in Zaria repairing our machines.

West African natives are natural mechanics and craftsmen, but some things they have to be taught. On a trail-blazing project near the coast, our engineer friend had ordered wheelbarrows sent to replace his natives' head baskets for carrying clay. He was gone the day they arrived. When he got back, the natives had uncrated them and were using them like head baskets.

On and on we pushed, plowing, grinding, sweating—giving up hope regularly every night, renewing it every morning. Gradually we emerged from the thick, steamy jungle into the broad, rolling grasslands bordering the Sahara, and finally, almost a month after leaving Lagos, we came clattering up to the great mud wall that surrounds Kano, metropolis of northern Nigeria, gateway to the Sahara, terminus of the Nigerian railroad, and end of the first lap of our trek!

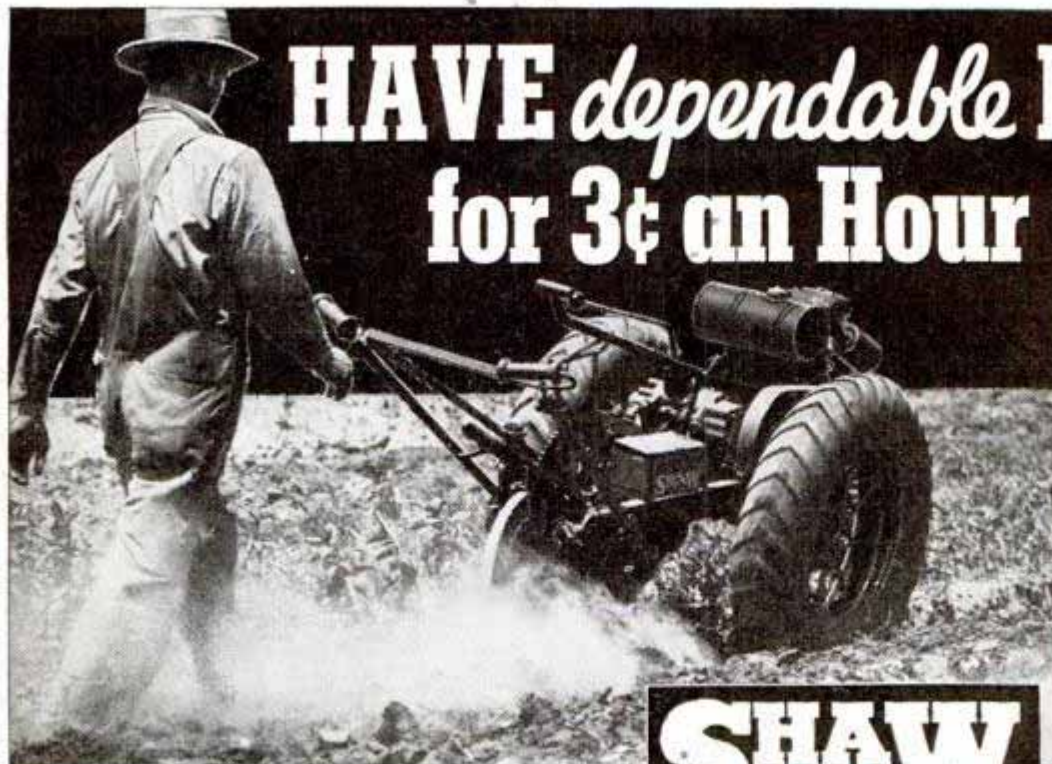
Kano, crossroads of jungle and desert, greatest commercial and manufacturing center of the western Sudan, is a city of 100,000, built entirely of mud! Under the flat roofs of the square mud houses the weavers clack away at their shuttles and the tanners and dyers bend over their pots. And in the markets, traders buy and sell and swap and cheat in a dozen different languages. A black, shiny Hausa man plucked at my sleeve and pulled out of his pack a long red blanket of barbaric design.

"What's it made of?" I asked him. The trader scratched his head, perplexed. "'E be— 'e be— 'e be sheep's feathers, mastah," he announced triumphantly.

Kano was the dividing line. In passing from jungle into desert, we were going into a different world. What problems would it bring? And would we succeed in solving them? Could we conquer the great Sahara with our two tiny motorbikes?

(Continued next month)

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



HAVE *dependable* POWER for 3¢ an Hour

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GET untiring speed and power with a Shaw DU-ALL at an amazingly low FACTORY-TO-YOU price—so low it will surprise you. DU-ALL does work of many men and two or three mules for only 3¢ an hour. Soon pays for itself in money saved. Greatest time, labor and money saver made. Can be run by woman or 10-year-old boy.

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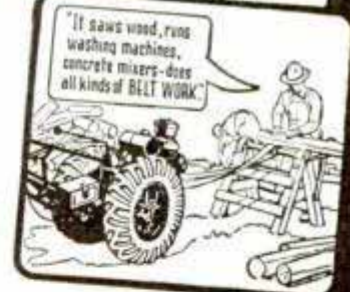
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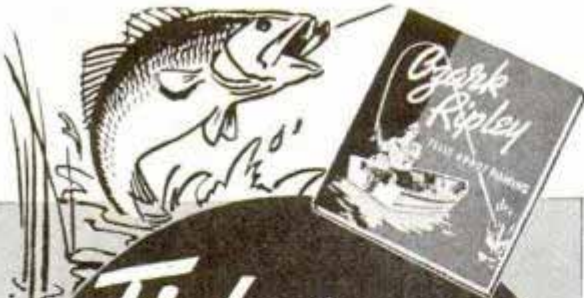
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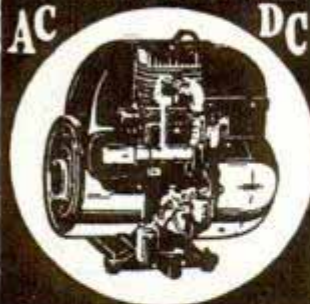
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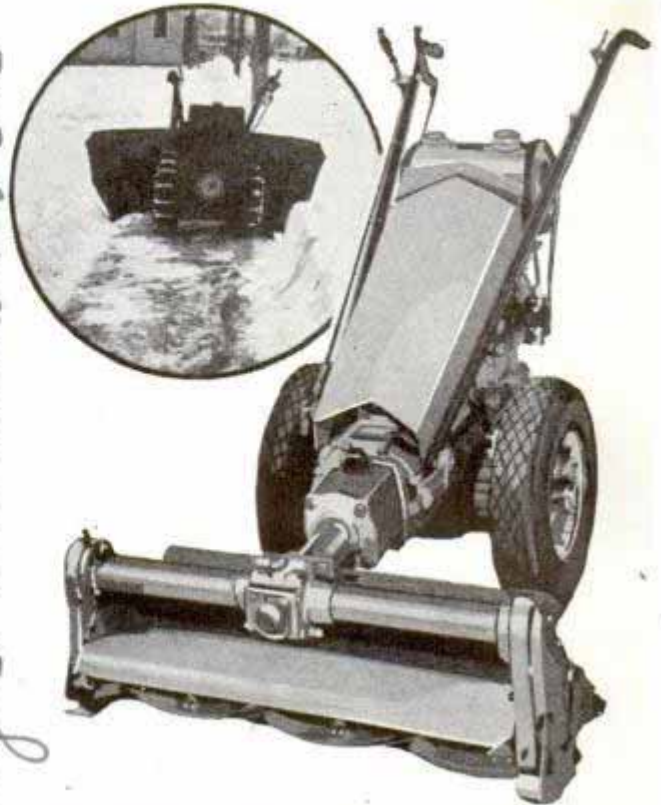
There's a big demand for the many hand-tooled articles you can make with the Easco Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores or order direct and pay postman on arrival. \$2.50 outside U. S.

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Clears Walks in Winter**



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Clearing sidewalks and driveways in winter is made easy by a walking power mower which has a snowplow attachment adjustable to remove snow from a path forty to fifty-four inches wide. For summer use the mower has both rotary and sickle bar attachments for cutting the grass. The attachments are held in place by four bolts which are easy to remove.

251496
**Wrist Magnet Holds Pins
or Nails for Worker**



Strapped to the wrist like a watch, a handy magnet now on the market will relieve the busy worker from holding pins, tacks or nails in his hands or mouth. It is powerful

enough to prevent tacks or nails from falling off when the wearer uses a hammer. Hairdressers, dressmakers, upholsterers, cabinetmakers, window-display men and carpenters are among those for whom the magnet is designed.

Gravelly Co. Danbury, Va.
35 Dennis St.
Pitt. O. Martine Co.
Danbury, Va.

man
Berchester

River to Lift Itself over Mountain

(Continued from page 323)

lifted about 125 feet by pumps. Once in the canal, the water will flow downhill into Shadow Mountain lake, thence into Grand lake. Then it will pass through the tunnel to be bored through the mountains. Thirteen miles long and about nine and one-half feet in diameter, the tunnel will have a capacity of 550 cubic feet per second. Its inlet portal in Grand lake will be at an elevation of 8,368; its outlet on the eastern slope at 8,252, a drop of 116 feet. A conduit five and one-half miles long will convey the water from the tunnel to the power plant, located at an elevation of 7,500 feet, just east of Estes Park, Colo. Thus, the water will drop an additional 752 feet from the eastern outlet to the power plant, to give a total fall of 868 feet from Grand lake.

After the water has served its purpose of generating power, it will flow into the Big Thompson river from which it will be diverted into storage reservoirs for distribution through irrigation systems to farms along the Poudre, Big Thompson, St. Vrain and Platte rivers. An additional drop of 2,000 feet from Estes Park to the plains is ample for additional power plants.

Two giant hydroelectric generating units in the Estes Park power plant will produce current which will be carried back to the pumping station by high-voltage lines. As the power market develops, five additional plants will be installed, one on the north fork of the Big Thompson, three on the main channel of the Big Thompson and one on the Green Mountain dam, built on the western side to create the Green Mountain reservoir on the Blue river.

In the region to be served with water for irrigation live 175,000 people, all directly or indirectly dependent on farming and cattle and sheep fattening. There is not enough water to irrigate the land properly under normal conditions, the average annual shortage during the last eleven years amounting to twenty-six per cent. During drought years, as represented by 1933, 1934 and 1935, the shortage was forty-nine per cent. The water supply began to dwindle in 1925 and the sugar beet, corn, potato, small grains, bean and other crops began to show losses, eventually amounting to \$5,000,000 annually.

(Continued to page 158A)



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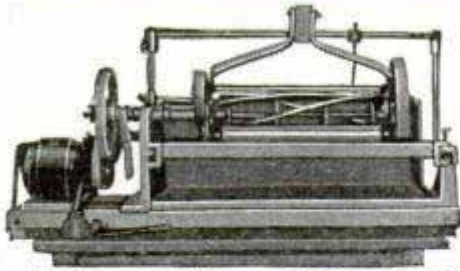
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Only 8 mm. Projector Under \$26.

Shows any 8 mm. film; motor-driven; automatic rewind; shows color movies; 16 minutes continuous show; backed by written guarantee! **\$1495**

UniveX HOME MOVIES

Sharpened over 2,000 lawn mowers last season



"I sharpened between 2,000 and 2,500 lawn mowers this season. I cover a territory of 50 miles around my home town and have all the work I can handle. With the Foley Lawn Mower Sharpener I can handle up to 40 mowers a day."—Ivan G. Long, Penn.

Many other men like Mr. Long are independent and making big money in the fine cash business of sharpening lawn mowers with the

FOLEY Electrakeen Lawn Mower Sharpener

No experience required. Simply put mower in the machine—the Foley does a perfect job automatically, in 15 or 20 minutes. Sharpens all kinds and sizes by factory method. You get \$1.00 to \$2.00 each for hand mowers and \$4.00 to \$6.00 for power mowers. Investigate NOW!

We also make the FOLEY Automatic SAWFILER

Files hand, band, circular saws. Saves eyestrain—does perfect work. Used by over 3000 repair shops.

FREE Attachment for grinding axes, hatchets, knives, etc., included FREE. Brings you business the year 'round. Small investment, easy payments. Best season just ahead! Write today for FREE business-getting plans—no obligation, no salesmen will call.

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Make Big Money

We pay you \$37.90 on every order. Simply ride and demonstrate this wonderful new motor-bike in your spare time. Many owners quickly pay for their own machine by sending us orders from friends.

100 MILES PER GALLON

The Sachs Motor-Bike is a powerful, high grade machine with chain drive, and speeds up to 40 Miles per Hour. Write quickly for special wholesale offer, Address,

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ARMATURE REWINDING



Rewound.....\$1.50 each
Lots of 6.....1.40 each
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DEALERS, write on your letterhead for 68 page catalog of armatures, rewinding service, vac and washer parts. 3/4" drill armature rewound \$3.25, 1" \$5.00, 1 1/2" cleaner armatures \$5.75, 3/4" \$7.00, 1 1/2" \$8.75, 1 3/4" \$10.50. **Low Prices on Sanders, Grinders, Motors, etc. All work fully guaranteed.**

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KANSAS CITY SPECIALTIES CO.
P. O. Box 6022 Kansas City, Mo.

(Continued from page 157A)

Of the total cost of the project, \$24,800,000 will be chargeable to irrigation. The U. S. bureau of reclamation estimates that 310,000 acre-feet of water can be sold each year at a price of two dollars per acre-foot and thus pay off the amount chargeable to irrigation in forty years, without interest. An acre-foot of water is that sufficient to cover an acre of land to a depth of one foot. During the last ten years surplus water has sold for nine dollars an acre-foot and the average price has been four and one-half dollars. Farmers in the northeast Colorado section to be served by the project estimate that the annual crop value from the irrigated lands will increase about \$12,000,000 if sufficient water can be obtained. The bureau also estimates that sales of power above that required by the pumping plant, based on a price of five mills per kilowatt-hour for the constant energy and one and eight-tenths mills for the secondary power, will amount to \$487,000 per year. Deducting depreciation, operation, interest and retirement payments, the bureau expects an annual surplus from power of \$92,000 from a single power station, and more from the additional stations now contemplated.

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Coffee may be ground to the exact size desired in the home by an electric mill now on the market. The mill has a glass container which holds one pound of coffee beans. A tight-fitting cover on the container keeps the coffee fresh. After the mill is plugged in, flipping a switch starts the grinder. The grinding

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es 1485

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You can do almost anything with the WHIZ ELECTRIC POWER TOOL. Sharpen knives, scissors, tools; grind axes, dies, molds; remove paint, rust from auto-fenders, woodwork, and metals; smooth rough surfaces; finish off machinery castings; sand woodwork; saw metals, wood; drill holes in steel, wood; etch glass; polish metals; and 1001 other jobs—in the home-workshop or factory. Ready to work the instant you plug it into any light socket—110 volt, AC or DC powerful motor, 3/4 inch chuck capacity, ball bearing thrust, STANDARD MODEL with Normal Speed (uses 50 different accessories) only \$6.95. SPECIAL "2-SPEED" MODEL, combines Normal Speed and High Speed in one outfit (uses 200 different accessories) only \$8.95. FREE Accessory outfit (worth \$2) includes set of drills, mounted 1 1/4" grinder, sanding discs, cutting wheels, mounted brush, polishing wheel. FREE with either outfit ordered NOW. Everything sent postpaid (C.O.D. if preferred) on 10 Day MONEY BACK TRIAL. PARAMOUNT PROD. CO., Dept. 3-A, 245 Broadway, New York



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A profitable set for hammered metal work. Complete at \$2 with wood, nails, special metal, tools, tapping hammer, sandpaper, patterns. Send money order for either set to

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FREE
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Outstanding . . . SKOOT-MOBILE

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See our advertisement page 160A February 1938 Popular Mechanics
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Popular Mechanics Press 200 E. Ontario St., Chicago

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Every idea set forth in these books has been used by others for profit. They are well worth your consideration.

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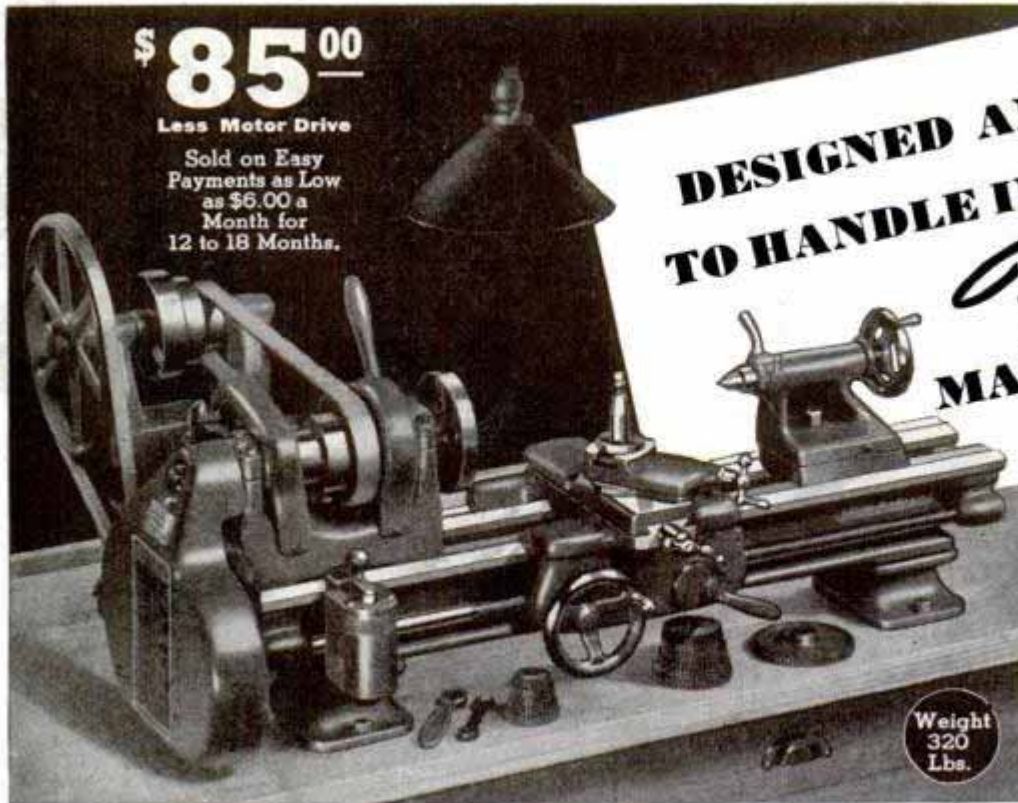
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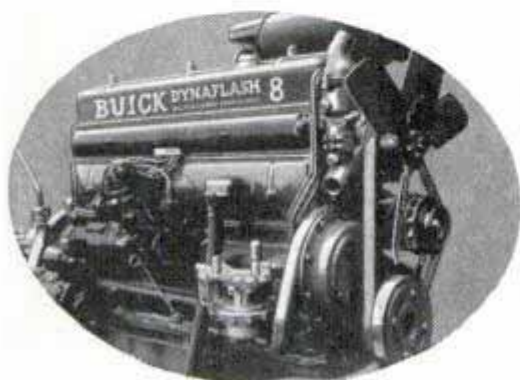
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