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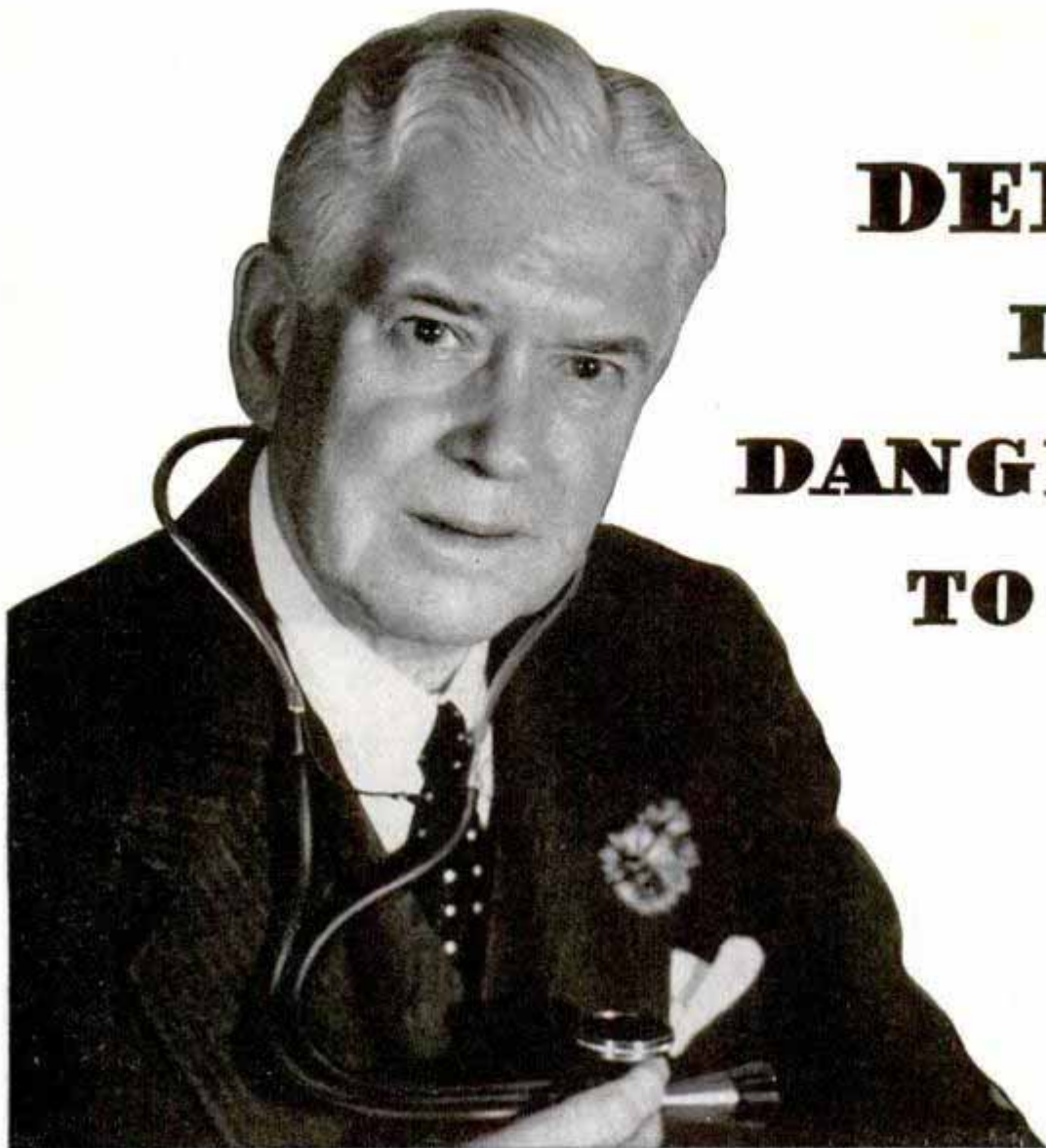
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JULY
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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

July, 1939

Vol. 72, No. 1

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Electric Home of the Future

IN THE home of the future you'll cook your dinner with radio short waves, warm your house with heat units wrung from the cold outside atmosphere, and breathe germfree and dustless air. The home you live in today will be regarded as quite primitive and picturesque. Imagine roasting a ham with steam when short waves would do it in one-sixth the time! In the August issue George Bucher, president of the Westinghouse Electric & Manufacturing company, tells how the electric home of the not distant future will be operated by push buttons and switches located at convenient control stations throughout the house.

Sixteen Thousand Miles on \$4.20

DANA and Ginger Lamb turned their childhood dreams of a South Seas idyll into enchanted reality. With \$4.20 and a tiny boat they paddled and sailed 16,000 miles together, living a Robinson Crusoe existence as the lone inhabitants of Cocos Island. They tell their story of vagabondage in two adventure-filled articles, the first of which appears next month.

Next Month

FUNNY things would happen to you on Mars. You could high-jump ten or fifteen feet, but it would be an effort to sit down. Your pendulum clock would lose twenty-two minutes each hour. You couldn't strike a match—there isn't enough oxygen to light one. You'd have to carry your own air and water; in fact, if you went walking without your pressure suit you'd probably explode. Next month two Mt. Wilson observatory scientists take you on a personally conducted tour of Mars.

Building a Home?

WHAT about these prefabricated houses, bungalows without basements, plywood and steel and concrete "packaged" homes? Can you really build a low-cost home that won't sag and rot and cost you double in upkeep over a period of years? Plenty of new ideas have popped up in the construction field in the last ten years. New materials, new ways of using the old. An article in August offers many a tip on how to save money in building a home.

Trailers Grow Up

KITCHENETTE and bedroom, comfortable and safe at sixty miles an hour, with bath, running water, electric lights, heated and insulated. That's the modern trailer home, quite grown up despite its comparative infancy. One of them blew a tire at seventy miles an hour the other day, but it was scarcely noticed. A story next month, with eight Coloroto pages describes the 1939 trailer.

Why Should Your Fine New Engine Bow to These Five Threats?



From the beginning your fine new automobile engine is faced with five serious threats. Carbon that fouls valve action and steals power lingers with every piston stroke. Corrosion that eats vital metal surfaces away attacks when operation temperatures climb high. Of much present day concern is engine "varnish." This lacquer-like substance, formed in heat, binds itself upon piston faces. In many cases it presents the serious possibility of jammed or "frozen" pistons. As for sludge and gum, these accumulations are almost certain to be lurking to contaminate and harm.

Since engines must burn fuel and run in oil, these five threats form an ever present detriment to the well being of your car, new or old. But there is a way to lay these damage creators low. Pyroil will do it!

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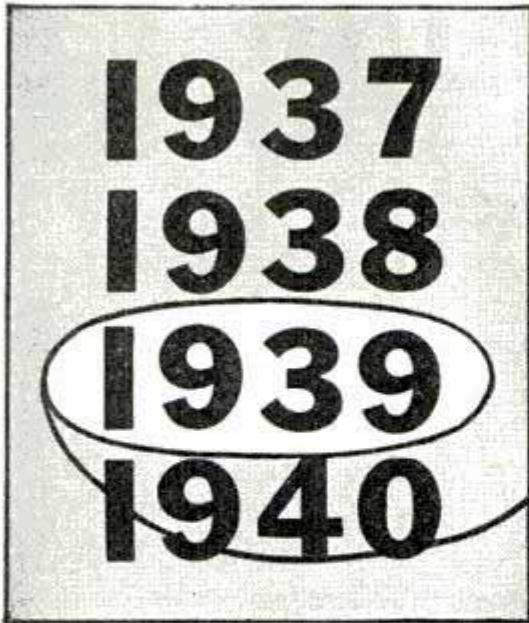
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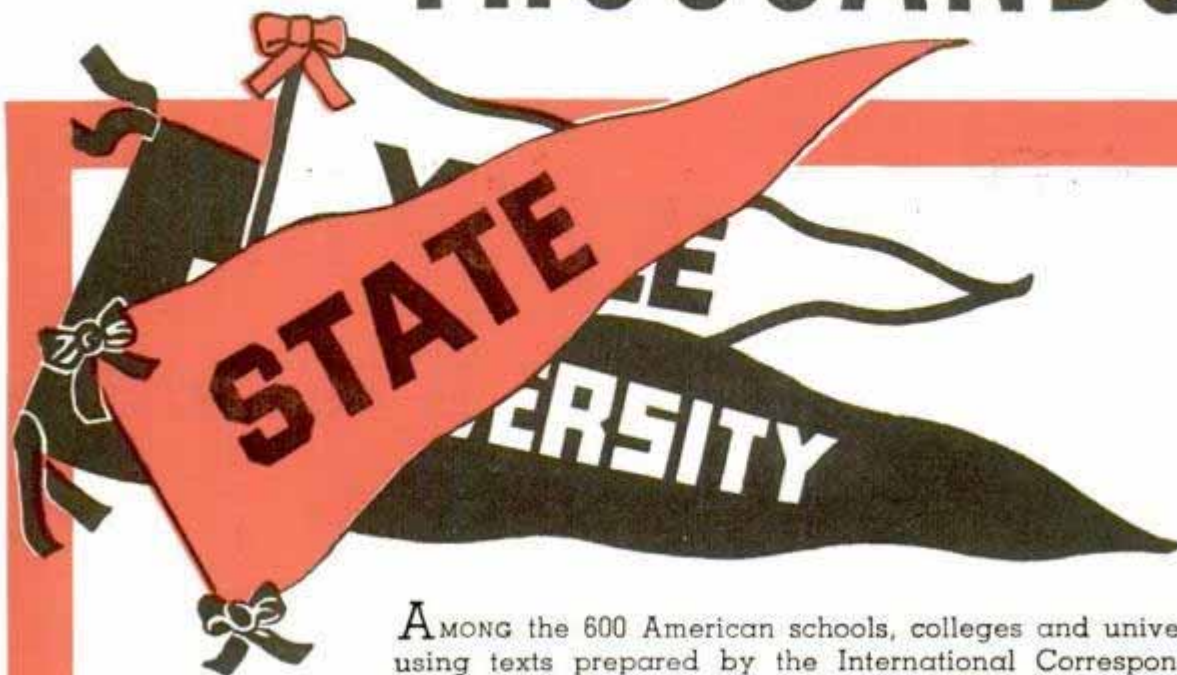


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| <input type="checkbox"/> Bridge and Building Foremanship | <input type="checkbox"/> House Planning | <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Radio | <input type="checkbox"/> Telegraph Engineering |
| <input type="checkbox"/> Bridge Engineering | <input type="checkbox"/> Heating | | <input type="checkbox"/> R. R. Locomotives | <input type="checkbox"/> Telephone Work |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Machinist | | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> Toolmaking |
| <input type="checkbox"/> Chemistry | <input type="checkbox"/> Management of Inventions | | <input type="checkbox"/> R. R. Signalmen | <input type="checkbox"/> Ventilation |
| | | | <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Welding, Electric and Gas |
| | | | | <input type="checkbox"/> Woolen Manufacturing |

BUSINESS SUBJECTS

- | | | | | | |
|--|--|--|--|---|----------------------------------|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> Advertising | <input type="checkbox"/> College Preparatory | <input type="checkbox"/> Grade School Subjects | <input type="checkbox"/> Railway Postal Clerk | <input type="checkbox"/> Signs |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> C. P. Accounting | <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> High School Subjects | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Spanish |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> First Year College Subjects | <input type="checkbox"/> Foremanship | <input type="checkbox"/> Illustrating | <input type="checkbox"/> Secretarial Work | |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> French | | <input type="checkbox"/> Lettering Show Cards | <input type="checkbox"/> Stenography and Typing | |
| <input type="checkbox"/> Cartooning | <input type="checkbox"/> Civil Service | | <input type="checkbox"/> Managing Men at Work | <input type="checkbox"/> Traffic Management | |

DOMESTIC SCIENCE SUBJECTS

- | | | |
|---|---|--|
| <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
| <input type="checkbox"/> Foods and Cookery | <input type="checkbox"/> Professional Dressmaking and Designing | |

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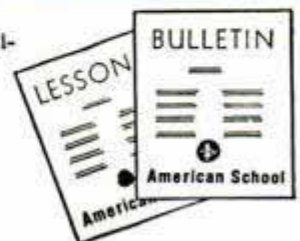
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| <input type="checkbox"/> Automotive Engineering | <input type="checkbox"/> Drafting and Designing | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Automobile Repairing | <input type="checkbox"/> Electric Refrigeration | <input type="checkbox"/> Merchandising |
| <input type="checkbox"/> Bookkeeping and | <input type="checkbox"/> Heating, Ventilating, | <input type="checkbox"/> Private Secretary |
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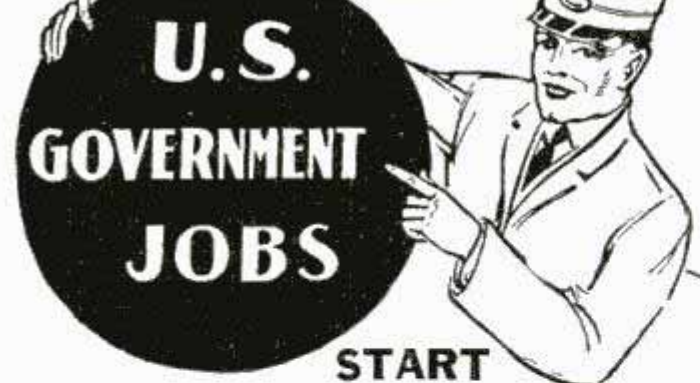
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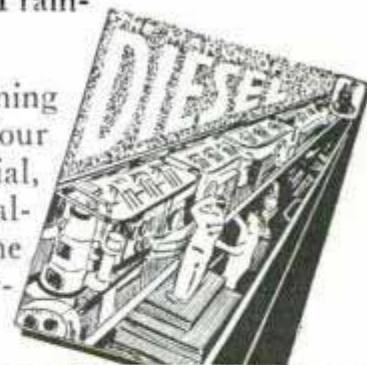
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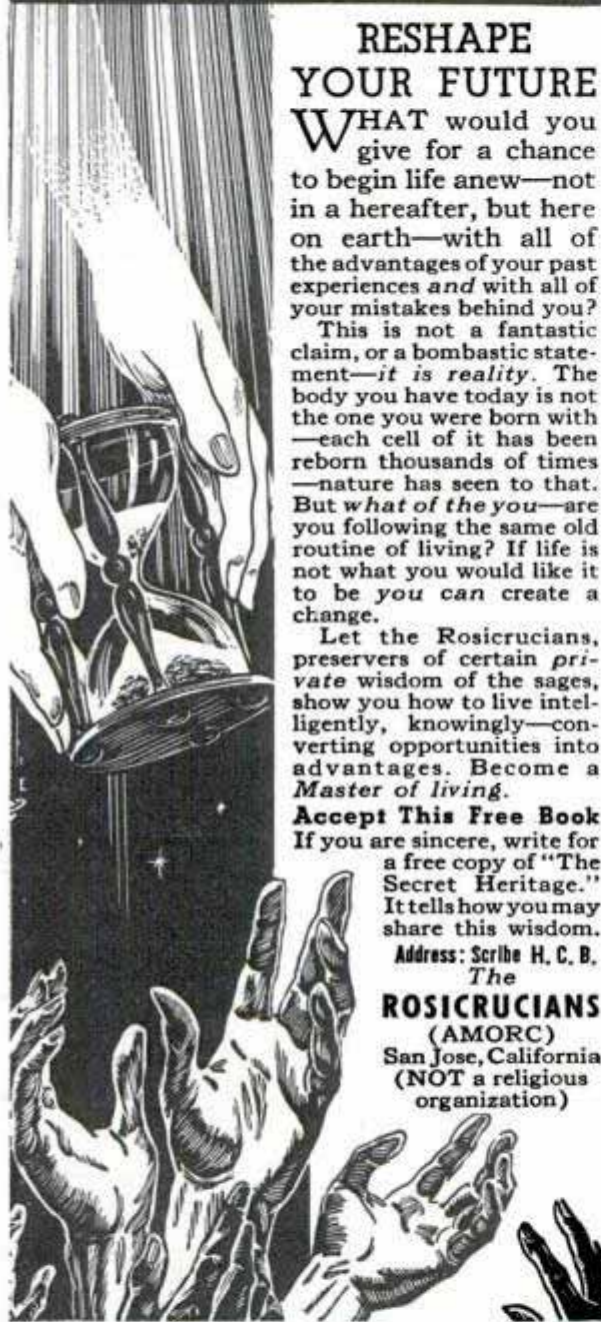
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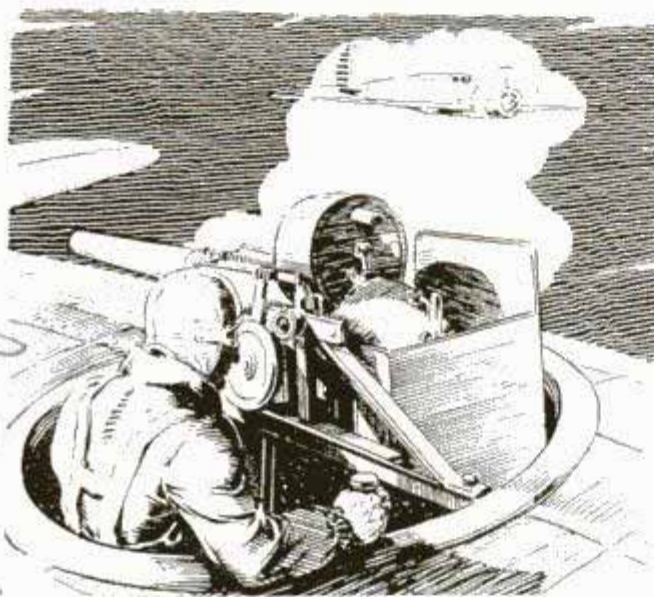
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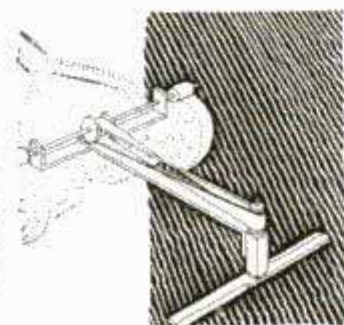


SPECIAL gun-firing mechanism, apparently designed for fighting planes, has been patented. It provides for automatic



operation of the gun, including an automatically actuated breech block and automatically cocked firing means having a firing trigger. The tripping means for the trigger is self-actuated when forced in one direction and released. The gun is also equipped with mechanism operatively connected with the breech block and tripping arrangement for forcing the trip in one direction when the breech block is opened and for releasing when the block is closed.

DESIGNED for cutting tall grass ahead of the lawn mower, and thus make mowing easier, an attachment patented recently would be an aid to the lawn keeper.

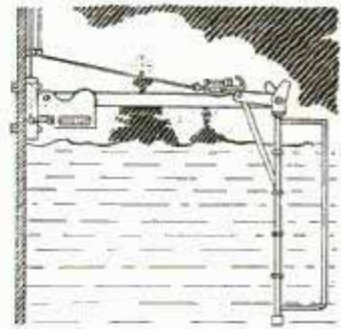


Located in front of the mower, with suitable supporting means, it is operated by belt

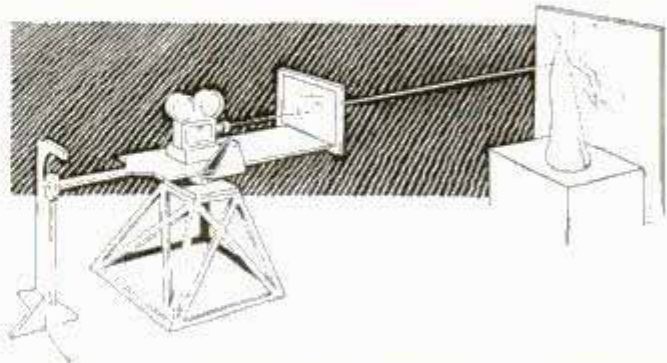
from a shaft rotated by contact with the lawn mower's wheels. Revolving in horizontal plane close to the ground, the cutter shears off the longer grass and clears the way for the mower to complete the job.

PROTECTION of ships against torpedo attack is the purpose of a newly patented invention.

It consists of a guard to be attached to the side of the ship above the water line, with arms pivoted for movement into vertical or horizontal position and brackets extending outwardly to support the arms. Grids pivotally suspended from the arms may be moved into position in a manner to protect the ship above and below the water line by preventing the torpedo from striking the side of the vessel.



TWO patents issued recently involve means of producing unusual motion-picture effects. One is for apparatus de-



signed for obtaining diminution and growth of an image of an object in successively different positions on successive film frames. A camera and a distorting lens lo-

(Continued to page 22A)

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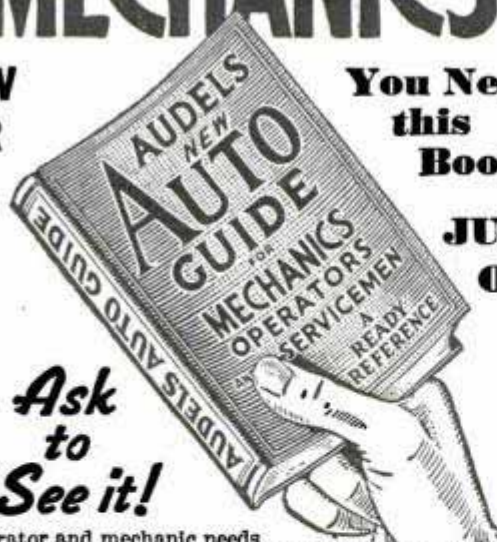
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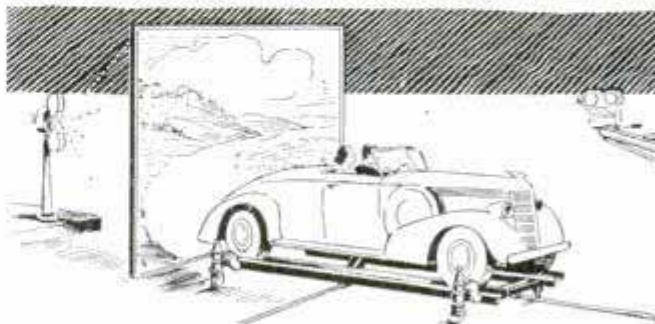
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NEW INVENTIONS

(Continued from page 18A)

cated between the camera and the object to be photographed are arranged, with connecting mechanism, to produce the desired effects. The second patent covers a support for an automobile, with a motorized jack to elevate the auto to the position



desired in front of a translucent screen. A projector behind the screen flashes moving pictures of highway and appropriate scenery into which the automobile may be set. A camera in front of the screen may then photograph the car and the background scenes appearing on the screen.

HANDY for the schoolroom, office or home is a patented illuminated terrestrial globe. An electric light built into the globe provides the illumination which throws all markings on the globe into sharp visibility. The globe may be of the translucent type, to enhance the value of the arrangement. Having an electrical cord connected to a wall socket from the bulb inside does not interfere with rotation of the globe.



SPILLING the nail polish is too common an occurrence for the housewife who cares for her own fingernails. A newly patented device, designed to grip the bottle between fingers of the hand under attention, is intended to eliminate this nuisance.



(Continued to page 24A)



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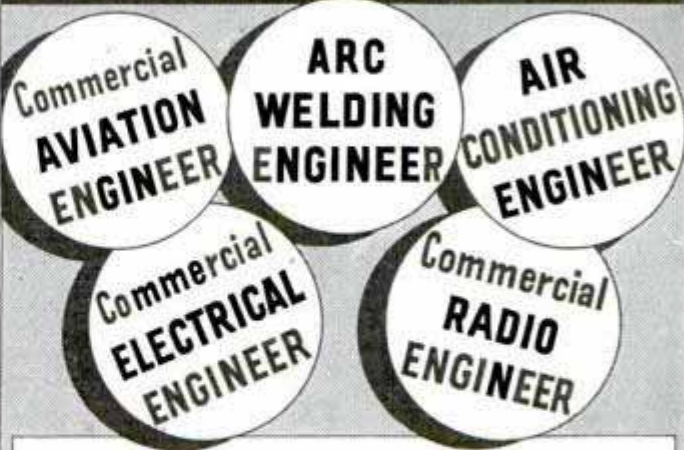
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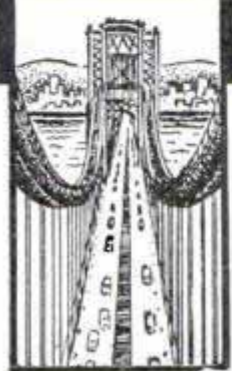
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NEW INVENTIONS

(Continued from page 22A)

AMONG the latest electrical appliances for the home is a cordless iron. Lacking the cord, the iron is easier to handle than the conventional electric iron. It is heated by contact with a stand on which it rests when not in use.



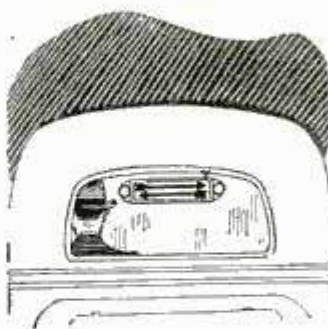
This stand has an electrical heating element and thermostatic switch for controlling operations.

INCREASED safety for persons using ladders is the intent of a newly patented device for supporting the lower end of the ladder, preventing the legs from slipping.



Two bracing legs, extending forward of the ladder's legs, are firmly attached to the ladder, one on each side. The bracing members are placed so that there is less danger of the ladder slipping to either side, as well as forward.

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Such a signal has been patented. Rubber vacuum cups support the device on the rear window. Arrows, one pointing to the left and another to the right, flash as the driver operates a control.

Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.



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(Original letter on file in our office)

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35MM. Special. Developed and enlarged to 3 1/4 x 4 1/2 Velox glossy prints, \$1.30. Any 6 or 8 roll 25c. Free enlargement coupons. All work guaranteed. Kelso, Box 549-B7, Inglewood, California.

MINIATURE Film, fine grain development, 2 1/2 x 3 1/2 enlargements. 35mm. \$1.00, bantam 25c. Film Capital Service, Box 504, Rochester, N. Y.

SPECIAL—4x6 Enlargements from small negatives—Fine grain developing—8 exposure roll 25c—16 exposures 50c—36 exposure Leica \$1.00. Enlargements last forever. Flash Photo Service, P.O. Box 333, Covington, Kentucky.

NOW! Quality finishing. Instant service. Eight Velox prints, two enlargements, 25c coin. Snap Shop 12, LaCrosse, Wis.

ROLL Developed and printed 20c in coin. Reprints 3c each. The Photo Finisher, Station E, Box 42, Columbus, Ohio.

CLEAR, Sharp prints begin with good negatives. Roll developed with 6 or 8 deckle-edge prints, 25c. Panel enlargement coupon free. National Amateur Photo Club, PM-27, 367 Main St., Buffalo, N. Y.

PROMPT Service—Guaranteed work. Two beautiful portrait type doubleweight enlargements, eight neverfade gloss prints, each roll 25c. Dubuque Film Service, Dubuque, Iowa.

ROLL Developed, 16 guaranteed prints, 25c. Smart Photo, Winona, Minnesota.

MILLIONS Now know "Hollytints means better prints." Trial roll printed including two beautiful enlargements—25c. Fascinating premium coupons. Hollytints, P-1350, Hollywood, California.

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PROMPT Service—Quality work; 2 beautiful doubleweight gloss enlargements, 8 guaranteed neverfade prints each roll, 25c. Excel Photos, Dubuque, Iowa.

ROLL Developed, 16 prints 25c. Wilkes-Barre Photo Service, Box 64, Wilkes-Barre, Penna.

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IDEAL Photos. Professional deckle-edge prints and free enlargement each roll only 25c. Illustrated price-list free. Write today. Ideal Photos, Box 2255, Paterson, N. J.

IMMEDIATE Service! Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two plain enlargements and 8 guaranteed prints, 25c coin. Special! Coupon for 8x10 enlargement given with every 25c worth Kodak finishing. Any 36 exposure, 35 mm. film fine-grain developed and each good negative enlarged to 3x4 prints for only \$1.00. 3x4 reprints, 4c each. One day service. Details and mailers free on request. American Studios, Box B, LaCrosse, Wis.

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16 PRINTS With roll 25c. 16 reprints 25c. Rex Photo, Ogden, Utah.

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YOUR Own business! Selling by mail. Details free. Maples, 3418 South Marshfield, Chicago, Illinois.

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

INVENTORS—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.

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.

BIG Money easily made in home or office. Business of your own; booklet describing 107 money making plans free. Chilton, Box 1105, Oakland, Calif.

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.

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

START Your own business. Make large profits. Sell new and used auction or bankrupt bargains in clothing and general merchandise. Experience unnecessary. Free wholesale catalog. Superior Jobbing, 1250-V Jefferson, Chicago.

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

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

ELITE Collection of business plans, contains 107 tested plans and scores of formulas. Start own business; home, office. Particulars free. Elite Co., 214 Grand St., New York.

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 big wholesale season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

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

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

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. Breniser, 257 S. 21st, Philadelphia.

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.

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

FINANCIAL Independence obtainable by placing coin operated merchandise vending machines, out on percentage basis, no experience required, little capital needed, write for free details. Torr, 2047 1/2 South 68th Street, Philadelphia, Pennsylvania.

1059 WAYS To start a profitable business. Get Popular Mechanics book of modern formulas and methods for practical specialty manufacturing. Price only \$1.25 postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

MONEYMAKING OPPORTUNITIES

BIG Mails of opportunities, samples imprint circulars, mailorder propositions, information budgets, three months 10c. Harvey Teeple, Decatur, Indiana.

MONEY Making secrets exposed. Particulars, stamp. Woelfel, 105 South Fairview, Upper Darby, Penna.

HUNDREDS Of fine money-making plans and ideas. Stamp please. Spangler, 1724 Warwick, Baltimore, Md.

3 MONTHLY Mail order magazines, filled with money making opportunities, 10c. George Fenner, 1618 Lucia, Louisville, Ky.

START A profitable business. Income guaranteed. Stamp brings details. Howard, 1424 South Water, Wichita, Kansas.

MILLION Articles. Buy wholesale. Valuable directory. Dime. Ideal Service, D-7, Park Ridge, Ill.

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

\$50.00 WEEKLY. Men, women, selling new nautical jewelry. Dollar sample 25c. Sestero, 275 West 73, New York.

SOILLESS Gardening, latest mail selling opportunity. Advertising counsel, service free. Sample dollar manual instructions and valuable plan 25c. Begin with \$10.00. Pyramid profits. Will help you succeed. Growers Guild, Barryton, Michigan.

HOW To make household product of 100 uses. Sell by mail or agents. Enclose stamp. Ribot, 620 East 62nd, Chicago.

BIG Profits operating mailorder business. Make own product. Details for stamp. Tatum, 6930 Greenview, Chicago.

START Your own mailorder or agency business with small capital. Details free. George F. Talbot, Norwood, Mass.

AMAZING Money making opportunities 10c. O'Neill, Box 634, Denver, Colo.

"OPPORTUNITIES Galore!" Receive dozens of new propositions, moneymaking offers, also "Opportunity Journal," Monthly, for 12 months, 25c. Raymond Schwarting, South Amana, Iowa.

FREE—Spare time profit propositions galore. Advertisers' Assistants, West Liberty, Kentucky.

RECEIVE Dollars your daily mail. 97c profit each dollar. Anyone can operate. Send stamp for particulars or \$1.00 for starting instructions. Gifford, Aberdeen, South Dakota.

EARN Money collecting reptiles, frogs, toads for us. Part or full-time opportunity! Instructions furnished. Particulars dime. Biological Research Laboratories, Dept. M-13, Springfield, Missouri.

RECEIVE Dollars in your daily mail, 97 cents profit on every dollar. Particulars and money making tips, secrets, formulas and information 10 cents. Richard Service, 1159-B Railroad Ave., Augusta, Ga.

EARN Extra money writing for publication. Simple method. Demand inexhaustible. Details free. Dona Veretts, 17 Gorton, Lowell, Mass.

OPPORTUNITIES Galore in mail order business. Make money at home. Write Gold Bond System, Box 1436, Long Beach, Calif.

FREE—300 Wonderful business, mail-order and home work money-making offers. Lewis Co., 828-D Carpenter, Oak Park, Ill.

UNEMPLOYED? Here is help you need. Genuine. Boyd, Excelsior, Minn.

MAKE Big money growing plants without soil. Amazing results. Details free. Logan Sales, Adel, Georgia.

MANUFACTURE For us or sell direct to homes and public buildings. A new invention, made from discarded tin cans. Retail for 50 cts. Full particulars and sample \$1.00. Albright Specialty Co., Burbank, Calif.

LEARN And earn with hand engraving. Simple easy instructions \$1.00. Your name beautifully engraved 10c. twelve \$1.00. The Scribe, 310 East 9th, Little Rock, Ark.

MILLION Articles, lowest wholesale prices—directory; with over \$200 in formulas, money-making plans and three issues Money Maker's Magazine only 25c. Mailingsmart, P2138 North Carlisle, Philadelphia.

MONTHLY Advisory letter service finds; analyzes; shows; latest money-making opportunities; methods. Extensive research \$1.00 yearly. Box 362, Great Neck N. Y.

PROFITABLE Home business opportunity. Details 25c. Sesby, Box 576-A, West Los Angeles, Calif.

MONEY In butterfiles, moths. See Sinclair Display Advertisement on page 10A.

EARN Good income on \$1.00 capital. Complete plan 50c coin. Corcoran, Box 2558, St. Johns, Portland, Ore.

DON'T Throw away your old radios, cameras, tools, etc. Get cash or trade for things you need. Big double offer—send 50c for year's subscription to Tell & Sell. Receive free stainless steel rule and depth gauge. Acme Publishing, Box 3332-A, Akron, Ohio.

KEEP Dollars received supplying by mail satisfying employment information. Millions jobless. We fill your orders. Co-Operative Service, 77 Swan, Buffalo, New York.

SOCIAL Security stamping outfits. I. Dunn, 116 Hale Ave., Brooklyn, N. Y.

GROW Plants without soil. Folder free. Gordon Laboratories, 509-J Fifth Ave., New York.

EARN Extra dollars spare time, details free. Mutual Service, 124 Highland Ave., Buffalo, N. Y.

ENJOY Perfect health become professional equilibrist. 3 cents brings particulars. Knoff, 2154 M North 52nd Street, Milwaukee, Wis.

START Profitable mailing business. We trust you. Monthly payments. Particulars 10c, credited first order. Hunt Co., 49 Edgemere, Trenton, N. J.

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.

BIG Money easily made: 107 test plans for your choice. Home, office. Descriptive booklet free. Elite Co., 214 Grand St., New York.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 1107 Broadway, New York.

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

FORMULAS, PLANS, ETC.

WINDOW Cleaner and bug remover. Just spray and wipe off. Leaves no smear. Formula \$1.00. Sample 25c. Barton, 2403 Brownsville Road, Pittsburgh, Penna.

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

10,000 PROFITABLE Formulas, \$2.25 postpaid. Morgan, 1223 So. G, Tacoma, Wash.

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

CHANGE Automobile engine into fast pumping air compressor. Instructions \$1.00. Tuck Garage, 73 Shirley, Pontiac, Mich.

10,000 MONEY-MAKING Formulas, recipes, trade secrets, 1939 book, 883 pages. Special \$2. Satisfaction guaranteed. Adams Brown Company, Chestnut Hill, Mass.

HUNDREDS—Successful manufacturers—inexperienced beginners are using this exceptionally dependable formula service for latest interesting sellers' all lines. Stamp brings amazing details; free copy formula messenger. Miller, Chemist, 1705 Jetton, Tampa, Florida.

ONE Ingredient formulas! Big profits! Fast, repeat sellers. Catalog free. A. Kinford, Wayne, Penna.

THAXLY Formulas for perfect products. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

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

WATERLESS Soap guaranteed. Clean dirtiest hands in America. Formula \$1. Jerome Jones, Hollins, Alabama.

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

FORMULAS: 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

ELITE Formulas and plans; make and sell your own products. Descriptive booklet free. Elite Co., 214 Grand St., New York.

CHEMISTRY

FREE: 40 Page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and supplies, scientific books at big discount. JE-7 Winn, 124 West 23 Street, N. Y. C.

CHEMICALS In 10c quantities. Catalog free. Chapman Chemical Company, Pittsburg, Kansas.

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

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

CHEMICALS, Laboratory, glassware, apparatus. Send 3c for catalog C.P.I. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

HELP WANTED

MAN And wife—to run local coffee agency. Earnings up to \$175 a month. New Ford sedan given you as bonus. I send complete outfit. You don't risk a penny. Details free. Mills, 6041 Monmouth, Cincinnati, Ohio.

M. 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. 60, Chicago.

MAKE Money working spare time. Detailed plan, stamp. Industrial, Box 701, Sioux City, Iowa.

\$30 WEEKLY. Grow mushrooms. Cellar, shed. We buy 30c lb. Mr. B made \$270 spare time. World's largest company. 40 page book free. Mushrooms, Dept. 701, 2019 Second, Seattle, Wash.

SALARIED Positions—\$2500 yearly and up. Let us find one for you. Write for valuable information. Executive's Promotion Service, (16) Washington, D. C.

AGENTS WANTED

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 G-37, Greenfield, Ohio.

LOCAL Agents wanted to earn bonus suits and demonstrate to friends. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples absolutely free. H. J. Graves, 1300 Harrison, Dept. U-817, Chicago.

AGENTS—To mail or distribute our new Foot Balm literature. Excellent profits and repeats. Send 25c for sample bottle and merchandising plans. Phelps, 1843-E Mannering Road, Cleveland, Ohio.

SENSATIONAL New vacuum rubber mop with squeegee, lowest priced in field yet paying profits up to 125%, going like wildfire! Write for free details and amazing pre-tested winning sales plan. Econo, 2901M LaSalle, St. Louis, Mo.

500% PROFIT! Transfer sign letters for windows, offices, trucks, signs. Colors: gold, silver, red, many combinations. Auto monograms. Easily applied. Neonite, Akron, Ohio.

MYSTERIOUS Disc heats water instantly without coal, gas or oil. Pays up to 233% profit. New principle. No risk sample offer. Write Lux Co., Dept. H-4, Elkhart, Indiana.

PERFUMED Starch is rapidly replacing the ordinary kind. What woman wouldn't prefer the flowery fragrance it gives to clothes? Let the housewife smell it and it's sold. Write Amazul Products Co., Dept. P, P.O. Box 3427, Sta. O, Philadelphia, Penna.

SENSATIONAL New seller. Retail 25c. Samples, particulars, dime. Mango-M, 496 S. 16th, Newark, N. J.

IF Earnings up to \$45 first week will satisfy you, I'll send complete outfit to run home-operated grocery agency. Absolutely no money risk. Details sent free. Write Mills, 6041 Monmouth, Cincinnati, Ohio.

GAS Powered midget automobiles for sales promotion. Aircraft Mechanics, Colorado Springs, Colorado.

CLYMER Thru-windshield spotlight. New streamlined model. Thousands sold. Big profits to representatives. Write qualifications. Clymer Spotlight, 222 West Pico, Los Angeles, Calif.

LORD'S Prayer, Ten Commandments, Crucifixion on U. S. pennies, individually carded, \$4.50 gross. Samples 75c dozen. P.M. Perkins, 1104 Lawrence, Chicago.

JUST Out! Amazing fast selling 25c household necessity. Saves up to hundreds of dollars. Sell 3 to 4 each home. Make up to \$6.00 daily. Free sample. Puro, 3107 Pine, Dept. K-299, St. Louis, Mo.

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 $\frac{1}{2}$ c. Razor blades 10 for 8 $\frac{1}{2}$ c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

500% PROFIT With new perfected (1939) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 10c. New Method Co., Box PMG-79, Bradford, Penna.

BEAUTIFUL Bird pictures handmade with genuine feathers. Sell on sight! Large profits! Free particulars. Samples 10c stamps. Marquez-PJ, Apartado 1176, Mexico City.

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

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. Sales way up this year. No experience needed. Steady work for right man. Write Rawleigh's, Box G-2-PPM, Freeport, Ill.

SELL Signs, mottoes. Write Schaffner, 1336 West Rush, Philadelphia, Penna.

WHOLESALE Catalog. Razor blades, needles, soaps. Bulger, 114 Rindge, Cambridge, Mass.

BARGAINS. 100 Razor blades 25c; electric razor 70c; candid type camera 75c; soap gloss cakes \$1.44; blankets each \$1.44. Free catalog. World's lowest priced wholesalers. Mills Sales, 901 Broadway, New York.

SELL Social security plates. Over 40 million buyers. 500% profit. Full or part time. New plan. Employ others. No money needed. Don't wait. Act now. Free outfit. Federal Name Plate Co., 287 Broadway, New York City, Dept. PM-7.

LOWEST Prices—Reversible topcoats. Tremendous profits. Yale Clothing, Meriden, Conn.

START Own business. Make, sell new utility item. Also good mail order product. Information for stamp. Young, 3148 North, Chicago.

BIG Profits selling filling stations, garages, stores, radiator cleaner, stop leak, glass cleaner, mechanic's soap, carbon remover, polish, etc. Finest quality, attractive prices, make repeats easy. E. T. Barron Co., 17 E. Lake, Minneapolis, Minn.

OPPORTUNITY To handle Winco household products. Attractive offer on reasonably priced daily used products. Write Winchester Compounds, Winchester, New Hampshire.

SWANK, New lipstick. The talk of New York. Fast seller. Tremendous repeats. 100% profit. Full size sample 50c. Charlie, Jamaica, N. Y.

SELL New electric shaver-vibrator-massager. Large commission. Particulars free. Thompson Co., Baldwin, Michigan.

SELL Gas-Miser. New, Scientific. Improved automobile operation. Saves gasoline. Unconditional guarantee. Agents coining money. Write Malone & Moles, Sioux City, Ia.

"ONE-SHOT"—Powerful radiator leak-seal. Brand new! 60c seller. Test sample free. Thermo Works, Peoria, Ill.

SPEED-EE Heater for water. New principle. 175% profit. Legitimate. Write Cleveland's, Inc., Dept. P, Elkhart, Ind.

REFLECTING House numbers, signs to stores, homes. Sample dime. Kajo, 839 Six Ave., New York City.

SOCIAL Security plates 10c (stamped, with case postpaid). Beautiful designs. Producers of only 5-line identification plate. Special designed and colored plates, souvenirs to order. Calfskin wallets, key-cases, Leather billfolds. Gold stamping free. Security Plate Co., 608 Eye Street, N.W., Washington, D. C.

SELL Signs, printed novelties, samples 10c. Churchill, 4316 South Salina, Syracuse, N. Y.

RUGS. Beautiful hand-made hooked rugs. In animal, floral, and geometric patterns. Fast sellers for agents at this season. Write for particulars. Sample prepaid \$1. Condon, Box 176, Upper Darby, Penna.

500% PROFIT. Gold and silver colored sign letters. Offices—stores. Large sizes, 1c. Free samples. Modernistic, B-3000 Lincoln Ave., Chicago.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 10A.

450% PROFIT. Millions need eyeglass cleaner. Sample 10c. Box 107, Seward, Nebr.

SAVES Gas, oil, repairs. Every motorist prospect. Sample 25c. E. Corcoran, Box 2558, St. Johns, Portland, Ore.

OPERADO—Fits any radio. Proved by thousands. No-cost sample. Mission Co., A-2013, Columbus, Kans.

SELL Fan razor blades. Sample free. National, 430 Central, Cincinnati.

MONOGRAMMING Automobiles real moneymaker. Write for samples. International Co., Box 9360, Philadelphia, Pa.

AGENTS—Speedy seller. Big profits, repeats. Samples, details free. Universal, Orange, Massachusetts.

HAVE Fun with Mexican jumping beans. 15 for 25c. Agents wanted. J. J. Frank, 525 Palm, Rockford, Ill.

GRAB This new amazing product. Seals punctures automatically. Run ice-picks into tires without losing air. Auto owners amazed. Whirlwind seller. Tremendous profits. Write immediately. Air-Seal Distributors, Inc., 8053 Beverly Blvd., Los Angeles, Calif.

REBUILT Vacuum cleaners. General Elec., Hoover, Eureka, Electrolux and other makes. look and work like new. Low prices, large profits. Economical Distributors, Box 224, Albany, N. Y.

AGENTS Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-S Dodier, St. Louis, Mo.

WORLD'S Biggest seller. Write for particulars. Girard Company, Washingtonville, Ohio.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

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

ATLAS Window sign letters. Large sizes—penny each. Get beautiful samples. Atlas, 7941 Halsted, Chicago.

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

300% PROFIT Selling gold leaf letters for store windows; high grade letters 1 $\frac{1}{2}$ c each. Free samples. Metallic Co., 438-B North Clark, Chicago.

SELL Social security plates. Sample 10c. Particulars free. Reliable Sales Co., 6 West 28th Street, New York City.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order decalcomania name plates. "Ralco," 1305 Washington, Boston, Mass.

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

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

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.

BIG Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

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

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

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

GLAZOL Makes old cars shine like new. Works like magic. Whirlwind seller. (See our display ad on page 158A June issue.) Write at once. Buell Mfg. Co., 2974 Cottage Grove Ave., 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. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

HIGH Grade salesmen. 211 actual samples in our sales-kit makes selling printing easy. Our prices are much lower than local competition because of enormous volume and specialized equipment. Every profession and business uses printing daily—letterheads, envelopes, statements, cards, tags, blotters, invoices, etc. Full or part time. Many of our best salesmen never sold printing before. Write for details, giving present occupation and references. Everybody's Printer, Dept. 11, Indianapolis, Ind.

THE Vecchio refillable economical safety fuse. 2 fuses—6 refills, price 25c complete. Fifteen or thirty ampere. Delivered any place in United States. Cash with order. Distributors wanted. Write for complete information. Vecchio Products Co., Syracuse, New York.

SELL America's largest line business necessities. Book matches, gummed labels, political items, restaurant supplies, salesbooks, shipping supplies, office supplies, advertising specialties, business stimulants, business stationery and forms. Hundreds fast sellers. New low prices. Commissions advanced daily. Experience unnecessary. Complete outfit free. Northwestern, AY-625 Jackson, 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, Colorado.

SALESMEN: Distributors. 200 items, brushes, mops. Marvelous magnetic brush—excels vacuum cleaner. Big profits. Neway Brush Co., Hartford, Conn.

SELL Printing at cut prices. 2,000 business cards \$1.50, 1,000 envelopes or statements, etc. \$1.75, 25 printed sales books \$1.50, 1,000 process embossed cards \$1.50, 2,000 two-color labels, free holder \$1.50, 2,500 printed handbills \$1.75, 500 book matches \$1.50. One-third comm. Free outfit. Bargain Prtg. Co., 189-F W. Madison, Chicago.

DID You make \$50 last week? Does your job offer you real future? If not, why not start a wholesale business of your own? Start with little as \$2.50. Handle line 200 nationally advertised 5c-10c products. Show merchants new plan for increasing sales and profits. Handle everything from your home at start. Chance to operate one of our Silver Fleet service trucks. Facts free. World's Products Co., Dept. 10-G, Spencer, Ind.

BIG Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

ADVERTISING Book matches—Sell union label book matches. Fastest selling line in America. Large sales producing kit, sample matches, complete cut catalog, eight color combinations make selling easy. Commission in advance. Superior Match Co., 7530 Greenwood, Dept. M-7, Chicago.

JUST Out! Every worker buys. 100 sales daily easy. Sells 35c. Tremendous profit. Take orders. We deliver. Sample free. Manager, AA-435 North Clark, Chicago.

SELL Business cards \$1.50 thousand. Business stationery, book matches, advertising gummed tape, advertising pencils, salesbooks, rubber stamps, pricing sets, advertising specialties. 35% commission. Money making specials. Free sales portfolio. David Lionel Press, 312 So. Hamilton, Dept. HS, Chicago.

SELL Mexican novelties. Commission. Free samples. Marquez, Apartado 1176, Mexico City.

\$84.50 PROFIT In one day by Hewett; \$1100 in seven weeks by Barber; over \$200 per week all summer by Felton; all selling our special tool set to garages. Exclusive territory. Write Mesco, Beaver City, Neb.

SALESMEN: Sell me information for publication in trade journals. Pay on acceptance. Send for instructions. Cooper, Box 1470, Tampa, Florida.

BIG Profits selling "Push" to stores. Attractive packages, displays. Write for sample. T. R. Gibbs Co., 1007 H St. N.W., Washington, D. C.

OPENINGS! Call on all dealers with new trade-stimulator plans. It's "hot." \$3 commission on each \$5 sale. Big repeat commissions. No investment. Sales kit free. Universal, 6227 Broadway, Dept. C57, Chicago.

SALESMEN Sell calendars, book matches, fans, advertising novelties. Samples free. Fleming Calendar Co., 6543 Cottage Grove Ave., Chicago.

FOOD Manufacturer offers permanent, exclusive distributorship. Sell jobbers, stores, cafes. Consumer-dealer advertising furnished. Big profit. Minute Foods, 255-WE Werdin Pl., Los Angeles.

ADVERTISING Book matches offer daily cash profits. Experience unnecessary. Full, spare time. Show exclusive line to all businesses. Low prices for top quality, direct factory service bring easier orders—faster repeats. Free outfit. Match Corporation of America, 3433 W. 48th Place, Dept. E-7, Chicago.

SALESMEN. Making \$20 to \$50 daily demonstrating new Airo Plane type fans to stores, restaurants, taverns, etc. Also driveway signals to gasoline stations. Write. Universal Fan Co., Peru, Indiana.

NEW. Mysterious device enables anyone to easily weld, braze and solder. Ideal for automobile, home and shop repairs. Works instantly off light socket. Low price and amazing demonstration makes you easy sales and big profits. Get yours free for introducing. Electro Torch Co., 2613-EE Michigan Ave., Chicago.

WAGON Jobbers! At last a high quality tire patch kit retailing at 10c. Easy sales, big profits! All retailers prospects! Write for free delivery plan! Hussey Co., PM, Atlanta, Georgia.

BLADES. Finest quality. Factory prices, postpaid. Ace Blades, Buffalo, N. Y.

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

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.

EXCELLENT Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

EDUCATIONAL AND INSTRUCTION

LEARN Welding in Hawaii—Learn while you enjoy a vacation in the most beautiful islands in the world. Hawaii contains the U. S. largest army post, second largest U. S. navy yard, employing hundreds skilled steel workers. We offer free employment service should you desire to locate here. Total price of course including round trip steamer ticket from westcoast, room-board and practical training for over 2 months \$565. Write for free booklet. Honolulu Technical Schools, Honolulu, Hawaii.

BLUEPRINT Reading course, complete, \$1.00 postpaid, or stamp for particulars. Shervin Publications, Box 116, Breathedsville, Maryland.

AIR Conditioning and refrigeration offer wonderful opportunities for trained men. Learn at home in spare time. Employment service for graduates. Universal School Air Conditioning, 612 P. Manhattan Building, Milwaukee, Wis.

WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., G-2001 Manhattan Building, Chicago.

FOR An extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

BE A good conversationalist! Our practical course "How to Become a Good Conversationalist" should repay low cost many times in social and business contacts. For information write Nankers Company, Box 884, Colorado Springs, Colo.

"UNCLE Sam" jobs. \$105-\$175 month. Prepare immediately. Full particulars—list positions—free. Franklin Institute, Dept. M3, Rochester, N. Y.

CERTIFIED Electric welders in demand everywhere—shipyards, dams, construction work. Oldest, largest school on coast. The best training pays best. Write. Dunn Welding School, 2033 NE. Union, Portland, Ore.

SHORTHAND \$1.00. New fonetic chart, 24x36, 25c. Simmons, Rocky Hill, Conn.

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SAVE All the gold pan in 1/4 the time. A new gold pan with recessed return lip around 3/4 of rim and removable cylindrical copper screen containing fibrous material which holds quick silver forming amalgam cushion. Pan with instructions \$2.50. Cushion 85c. Gold Savers Co., 315 Southern Title Bldg., San Diego, Calif.

SOUVENIRS New York world's fair. Bronze coin 10c. Reliable cigarette lighter \$1.00. Locket holds 2 photos, gold filled \$1.50. Zwickell, General P.O. 60, Brooklyn, N. Y.

NICKEL-SILVER Identification plates. Gun case, golf bag, luggage, dog collar, etc. Name, address imprinted, 25c; 5, \$1.00; doz, \$2.00. Identification, Box 74, Frackville, Penna.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 10A.

CARRY Lucky stone. \$1.00. Gen-Dol, 92 Stevenson, Buffalo, N. Y.

COLONIAL Hand hammered copper candlestick or ash tray, morning-glory design, sent post paid \$1.00 each or set for \$1.50. Acceptable gift, bridge prize, party favor. R. S. Ellison, Box 81X1, East Falls Church, Virginia.

TATTOOING Outfits, supplies, illustrated list free. Percy Waters, Anniston, Alabama.

LUMINOUS Paint shines in the dark. 25c bottle. Myers, 211 Broadway, Niles, Michigan.

REFINE Used oil without cost. Particulars. F. Gerwin, Fairview, Oklahoma.

MEXICAN Jumping beans. The best curiosity in the world. Joaquin Hernandez, Exporter, Alamos, Sonora, Mexico.

AMATEUR Cartoonists wishing steady income copying and duplicating cartoons for advertisers, write Ad-Service, Argyle, Wisconsin.

LAM-A-FAB. The cloth cement, acid and waterproof. Permanently repairs anything made of cloth. Sails, hunting equipment and suits, football suits and athletic equipment, rugs, canvas chairs and work clothing. S. J. Russell Co., P. O. Box 187, Peoria, Ill.

SWAPPER'S Friend, R4, Saline, Michigan. Interests swappers, collectors. 50c year, sample 10c.

Now BOAT BUILDING MADE EASY

Famous Boat Book Shows How

Detailed instructions, plans, materials, methods for building 15 most popular power, sail and row boats. Get Popular Mechanics BOAT BOOK and build your own at low cost. Prepared for those with limited skill and few tools. Includes also—"What a boat enthusiast should know." Only \$3.00. Pay postman on delivery or write for descriptive circular.

Popular Mechanics Press
Room 739D
200 E. Ontario St.
Chicago

GROW PLANTS WITHOUT SOIL Startling New Development

Complete Directions for Small and Large Scale Growing

Get the new book "Soilless Growth of Plants" and learn this new

technique which everyone is talking about. Three methods described—Water Culture, Sand Culture, Sub-Irrigation. Explains all operations. Tells how to make containers and nutrient solutions from raw materials at small cost—how to grow flowers, vegetables and fruits without soil. A fine hobby and a money-saving investment for city dwellers. A source of new business for gardeners, nurserymen, etc. Only book of its kind. Order today "Soilless Growth of Plants." Sent postpaid for \$2.75.

POPULAR MECHANICS PRESS Dent. 739 200 E. Ontario St. Chicago

The World's Biggest

Get Shop Notes for 1939! Only 50 cents. May easily be best investment of your entire lifetime. Contains 417 money-making, time-saving ideas, kinks, short cuts for mechanics, farmers, home workshop fans, handymen—for everyone who uses tools. 224 pages, 417 articles, 806 illustrations. Get 1938 Shop Notes too. Only 50c.

POPULAR MECHANICS PRESS
Room 739-C, 200 E. Ontario St., Chicago

50¢ WORTH

SHOP NOTES FOR 1939

Get this Book Now!

MONEY MAKING FORMULAS

1059 PRICELESS FORMULAS ALL IN ONE BOOK FOR \$1.25

FORTUNES MADE WITH FORMULAS LIKE THESE

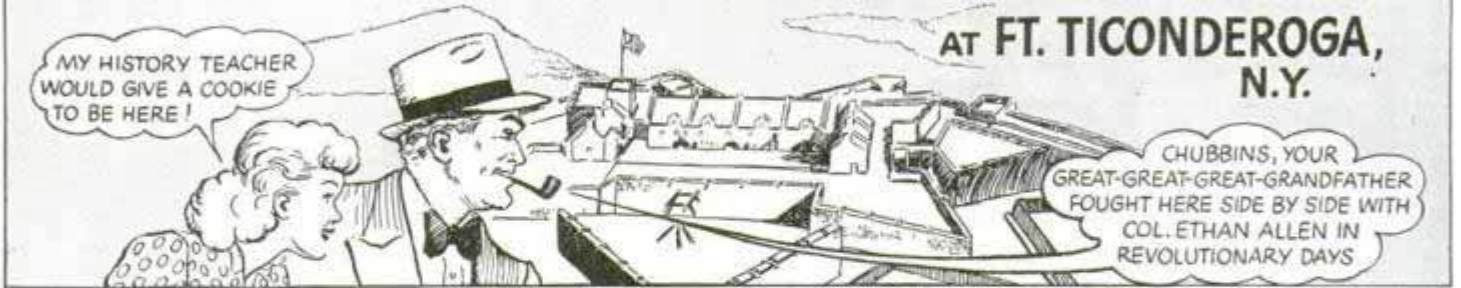
Cosmetics Remedies Beverages Paints Glues Polishes Inks Soaps Fertilizers Preservatives Lubricants Auto Products Food Products Metal Products, Etc.

Hundreds of big selling products—earning millions in profits—grew from a simple formula. Your own product may bring you fame and fortune. Get this big 200 page book with 1059 formulas, and start a spare or full time business of your own. Everything explained—what to make—how to make it—where to get materials. This is the book that lifts the veil of secrecy from a profitable and fascinating business. Get your copy now. Only \$1.25 postpaid.

Popular Mechanics Press, Dent. 737-B, 200 East Ontario St. Chicago

OL' JUDGE ROBBINS

AT FT. TICONDEROGA, N.Y.



MY HISTORY TEACHER WOULD GIVE A COOKIE TO BE HERE!

CHUBBINS, YOUR GREAT-GREAT-GRANDFATHER FOUGHT HERE SIDE BY SIDE WITH COL. ETHAN ALLEN IN REVOLUTIONARY DAYS



I'LL BET THOSE OLD CANNONS GOT PLENTY HOT IN THE THICK OF BATTLE



OH, A LITTLE HEAT DIDN'T BOTHER THOSE REVOLUTIONARY SOLDIERS. AS YOU KNOW, JUDGE — THEY EVEN SMOKED PIPES MADE OF LEAD



HM-M, A HOT SMOKE ISN'T NECESSARILY THE PIPE'S FAULT. TOBACCO IN THOSE DAYS DIDN'T SMOKE TOO COOL!

HUMPH! I KNOW WHERE THERE'S AN OLD LEAD PIPE, JUDGE. LET'S TRY SOME OF YOUR TOBACCO IN IT JUST FOR THE FUN OF IT



OKAY—I'M ALL READY!

HA! HA! JUDGE, YOU WIN—WE BOTH KNOW PRINCE ALBERT WOULD SMOKE COOL IN ANY PIPE!

ETHAN ALLEN DOORS



REMEMBER, CHUBBINS, WHEN WE WERE CROSSING THE MISSISSIPPI? THAT MAN BET ME MY BRAND WOULDN'T SMOKE COOL IN A CORN-COB

YES! AND HE WASN'T SORRY TO LOSE THAT WAGER—HA! HA! HE BORROWED HALF YOUR TIN OF P.A.



PRINCE ALBERT HAS OPENED MANY A PIPE-SMOKER'S EYES TO HOW MELLOW YET RICH-FLAVORED A TOBACCO CAN BE

YES, P.A.'S JUST RIGHT—THERE'S NO OTHER TOBACCO LIKE IT!

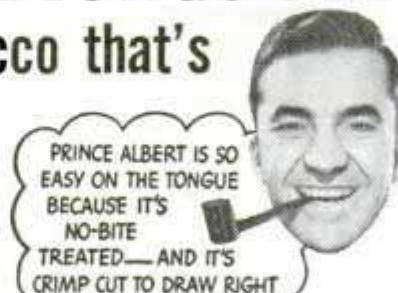
Copyright, 1939, R. J. Reynolds Tobacco Company

Declare your independence from **TONGUE-BITE!**

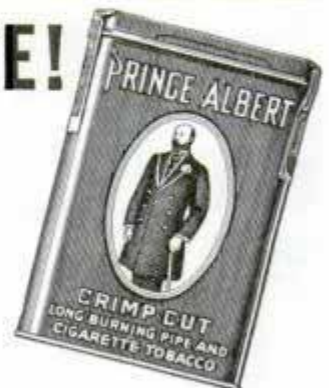
Get the pipe tobacco that's

MILDER

yet **tastier—**



PRINCE ALBERT IS SO EASY ON THE TONGUE BECAUSE IT'S NO-BITE TREATED—AND IT'S CRIMP CUT TO DRAW RIGHT



NO-RISK OFFER

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage.

(Signed) R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina

P. A. IS MILDER, TASTIER IN YOUR "MAKIN'S" SMOKES TOO

50 pipefuls of fragrant tobacco in every pocket tin of Prince Albert

PRINCE ALBERT THE NATIONAL JOY SMOKE

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 72

JULY, 1939

No. 1

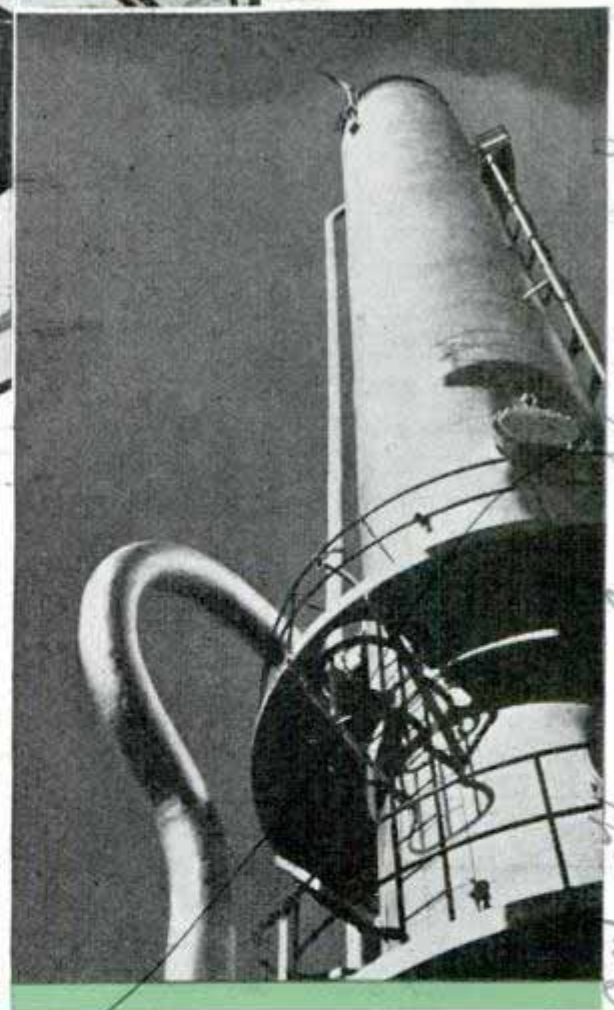


**SUPER-
GASOLINE**
for Your
CAR

A HIGH-POWERED gasoline that is nearly ready for market will give your car the flashing performance and efficiency of premium fuel at no extra cost.

This new fuel, a revolutionary discovery of the petroleum industry, is the highest grade basic gasoline ever made. It is cheaper than present premium brands. It can be created from tar, asphalt, or refinery wastes as well as from any type of crude petroleum. Its recovery process enables a refiner to extract much more gasoline from a barrel of crude than was possible before.

Engineers worked on this super fuel for fourteen years and spent more than \$10,000,000 to perfect it. It is the creation of a French inventor, Eugene Houdry, and its secret is the use of a catalyst in the refining process. Ninety-six patents cover the process and equipment.



Photos courtesy Union Oil Co.

Circle, engineer in old passenger car testing acceleration and performance of different fuels in worn engine. Right, an unusual photograph of a fractionating tower in petroleum refinery

Reference: Public Relation Dept

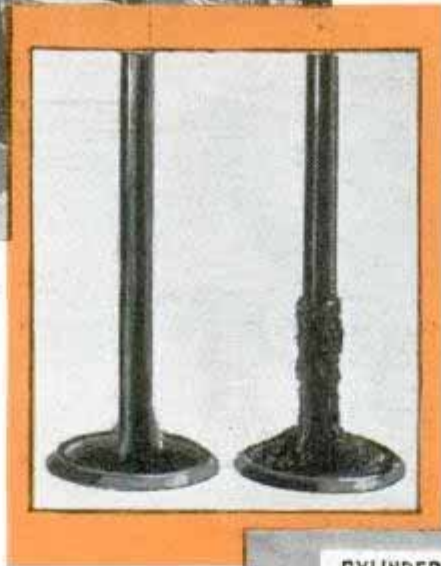


The hot oil vapor under treatment is forced through porous masses of this catalyst. Ordinary thermal cracking requires pressures of around 1,000 pounds per square inch and temperatures of up to 1,100 degrees, but catalytic cracking takes place at only twenty to forty pounds per square inch pressure and 900 degrees temperature.

Not only does catalytic cracking create more gasoline than any other method but the gasoline can hardly be made to detonate in today's automobiles. The fuel has a natural octane rating of from seventy-eight to eighty-one, the equivalent of the best premium gasolines on the market. After

treatment catalytic gasoline has very low gum and sulphur contents.

It may be a year or so before this new gas is on the open market. Seven million gallons of it were manufactured last year but most of this was snapped up at once as the base for 100-octane aviation gasoline. Sun Oil company of Philadelphia is operating one 15,000-barrel plant and



Crude petroleum is a mixture of assorted hydrocarbons in gaseous, liquid, and solid states, including some that make up gasoline. In the usual recovery process the percentage of natural gasoline in the crude is removed by distillation and then the heavy hydrocarbons that remain are subjected to heat and pressure in a thermal cracking process that breaks some of them up into smaller structures, yielding more gasoline.

In theory an entire barrel of crude oil could be converted into gasoline without waste but this does not work out in practice. Up to sixty-eight per cent can be transformed into motor fuel by modern methods but the average is less than fifty per cent. The Houdry process boosts this percentage by turning fifty per cent or more of the residue into gasoline.

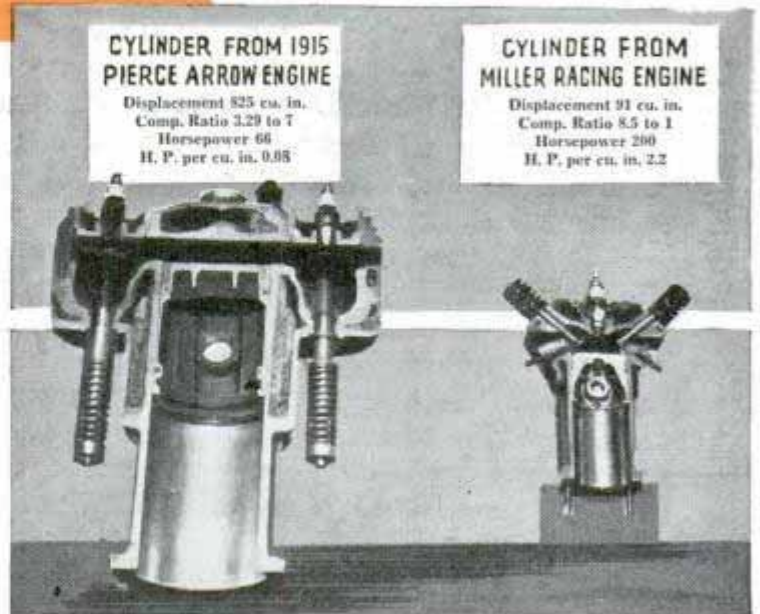
Houdry discovered that the breaking down of heavy hydrocarbons of oil and tar into the hydrocarbons that form gasoline is accelerated when a quantity of aluminum silicate is present in the cracking still.

CYLINDER FROM 1915
PIERCE ARROW ENGINE

Displacement 825 cu. in.
Comp. Ratio 3.29 to 1
Horsepower 66
H. P. per cu. in. 0.98

CYLINDER FROM
MILLER RACING ENGINE

Displacement 91 cu. in.
Comp. Ratio 8.5 to 1
Horsepower 200
H. P. per cu. in. 2.2



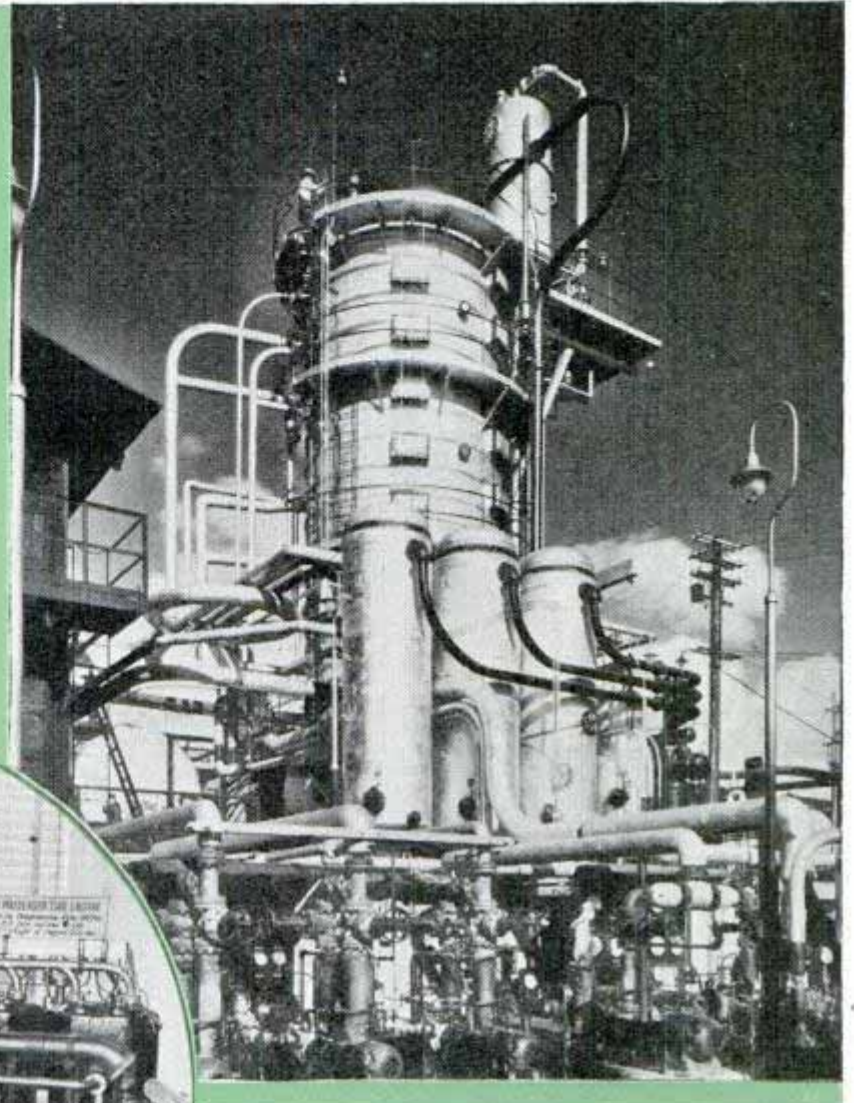
Top, measuring octane rating of fuel by placing it in "knock engine" that shows detonation. Center, comparison of engine valves in Standard Oil of Indiana test. Note valve at right has heavy gum deposit that might have been prevented by anti-oxidant in gas. Bottom, comparing early and modern cylinders

Learning agent - E. B. Badger Sons Co
 75 Pitts. Du. Ba. Ind.

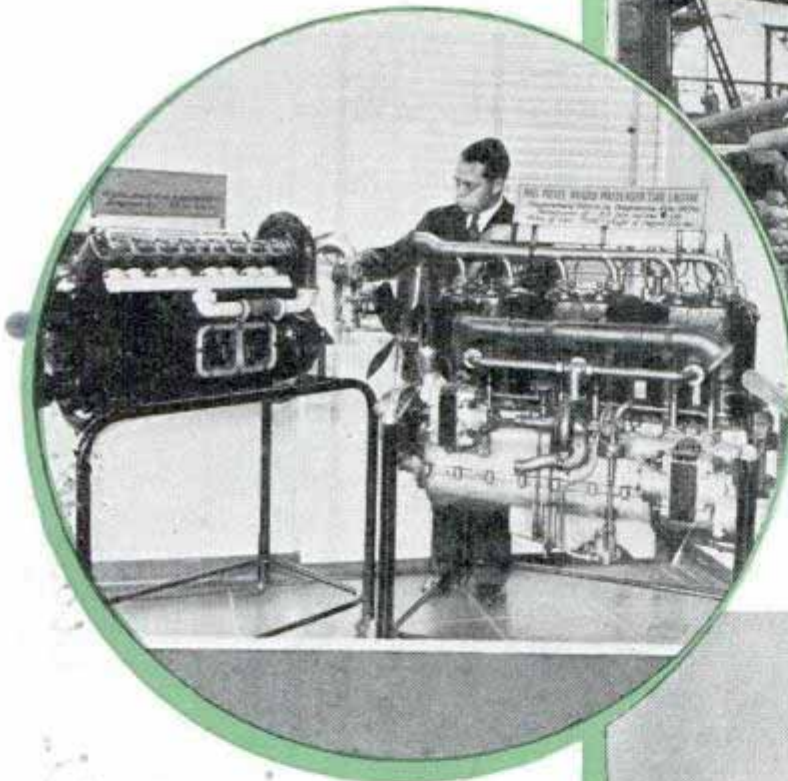
2-32
2

Socony-Vacuum has three others in production. Some of the gasoline that these plants are turning out is being blended with lower-grade fuels to improve its anti-knock value. Ten new Houdry plants costing \$35,000,000 are under construction and licenses for additional plants are being issued.

The position of the United States in the air is materially strengthened because this fuel provides a source of aviation gasoline. Efficient military aviation engines need fuel of 100-octane rating or better for peak performance,

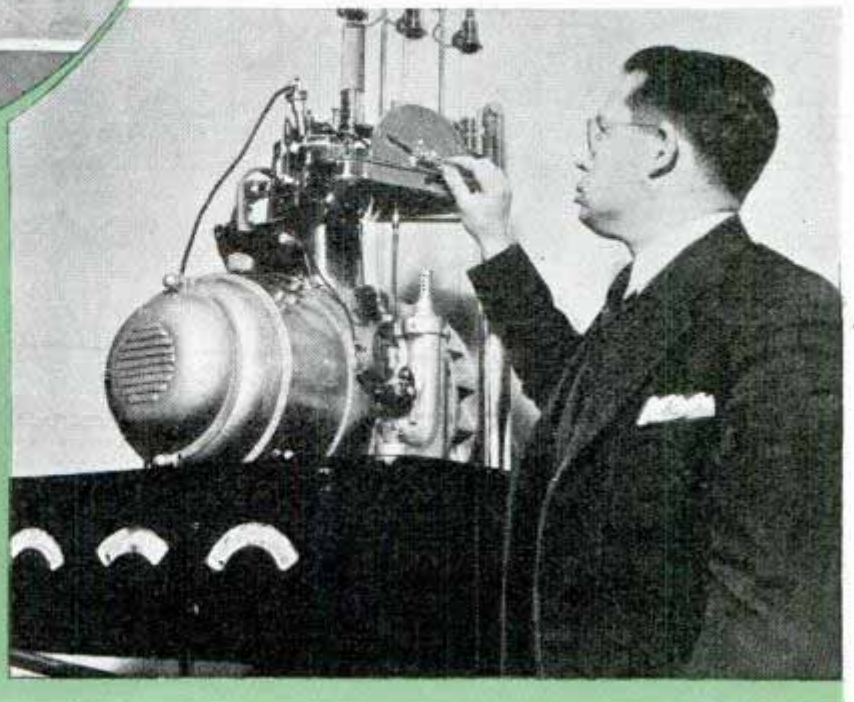


Above, vacuum distillation unit of refinery extracts lubricating oil from crude petroleum after natural gasoline has been drawn off. Circle, 200-horsepower racing engine (left) compared to old-fashioned sixty-five horsepower auto engine. Bottom, measuring power developed by engine

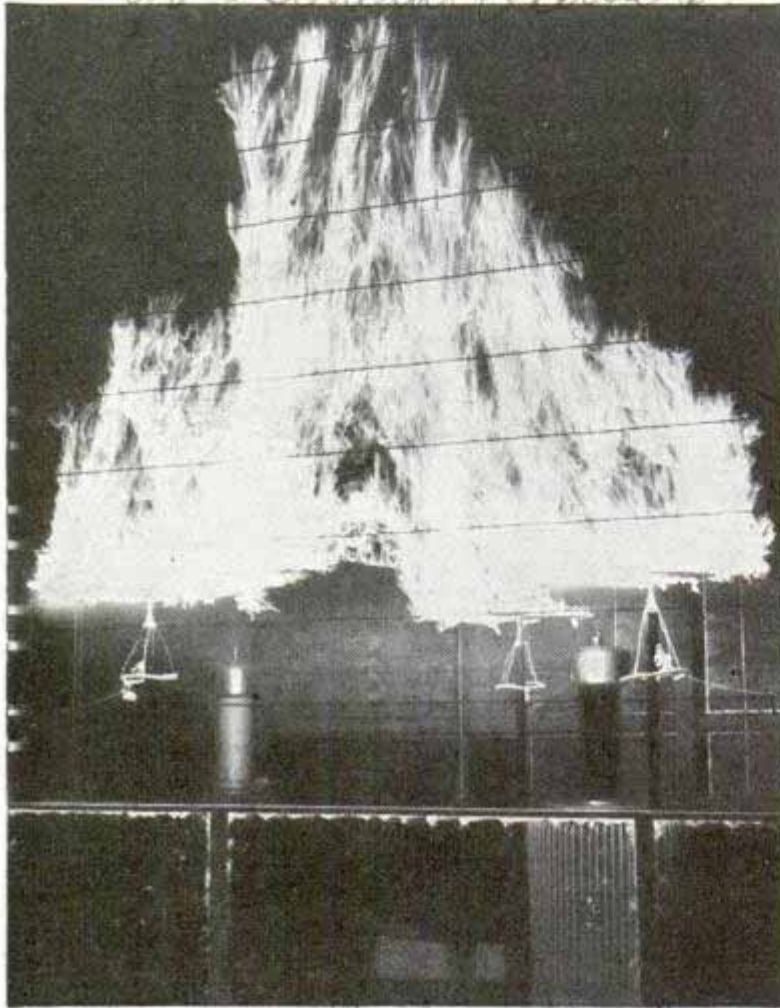


and 100-octane gasoline has been relatively rare. Such fuel has been manufactured from the highest grades of crude, doped up with large quantities of tetraethyl lead and pure iso-octane, a high anti-knock hydrocarbon. It has cost in the neighborhood of half a dollar a gallon. But only small quantities of knock inhibitors need to be added to catalytically cracked gasoline

(Continued to page 141A)



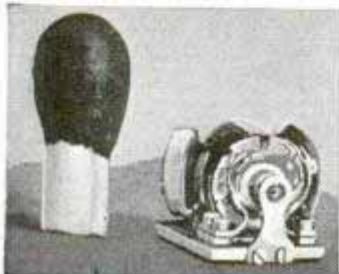
Million-Volt Electric 'Bonfire' Forms a Spectacular Display



Visiting the General Electric exhibit at the New York fair you may see this vivid display of electrical fireworks

One million volts going up in flames! The weirdly beautiful spectacle—not flames at all, but electrical fireworks—is a part of the General Electric demonstration at the New York world's fair. Power is supplied from a generator feeding the transformers. It is applied at low voltage and built up gradually. As the voltage rises, the cable and spinning arms glow with the violet light of the corona and at the peak a speed of fifty revolutions a minute is reached.

Motor the Size of a Match Head Built by Swiss Craftsman



No larger than the head of an ordinary match, an electric motor built by a Swiss won an international contest at Zurich for con-

struction of the smallest motor. Placed beside an American nickel, the motor just reached as high as the buffalo's hoofs. In spite of its diminutive size it actually turns 3,000 revolutions per minute, operating on direct or alternating current and consuming 5/1,000 watt. Built with the delicacy and precision of a watch, the motor is a little over three millimeters high, with a platinum commutator and composition metal brushes. The coils are composed of thirty-five turns of hair-like copper wire.

Goggles Kept from Fogging by a Chemical Cloth

Goggles can be kept free from fogging by rubbing them with a special chemically treated cloth just introduced. Not only is condensation retarded, but the cloth cleans and polishes the glass. It is serviceable for a long period.

Talk Timer for Telephone Warns When Time's Up

Telephone charges that mount up rapidly after the initial three or five-minute period can be minimized by using a meter, now on the market, to show when the time is up. On the dial is a pointer to indicate the passing of minutes, and fifteen seconds before the end of the time limit a bell rings, warning the caller.



Set timer when starting phone conversation and it will warn you before extra charges begin to pile up

La Nature, Mar 15, 1934

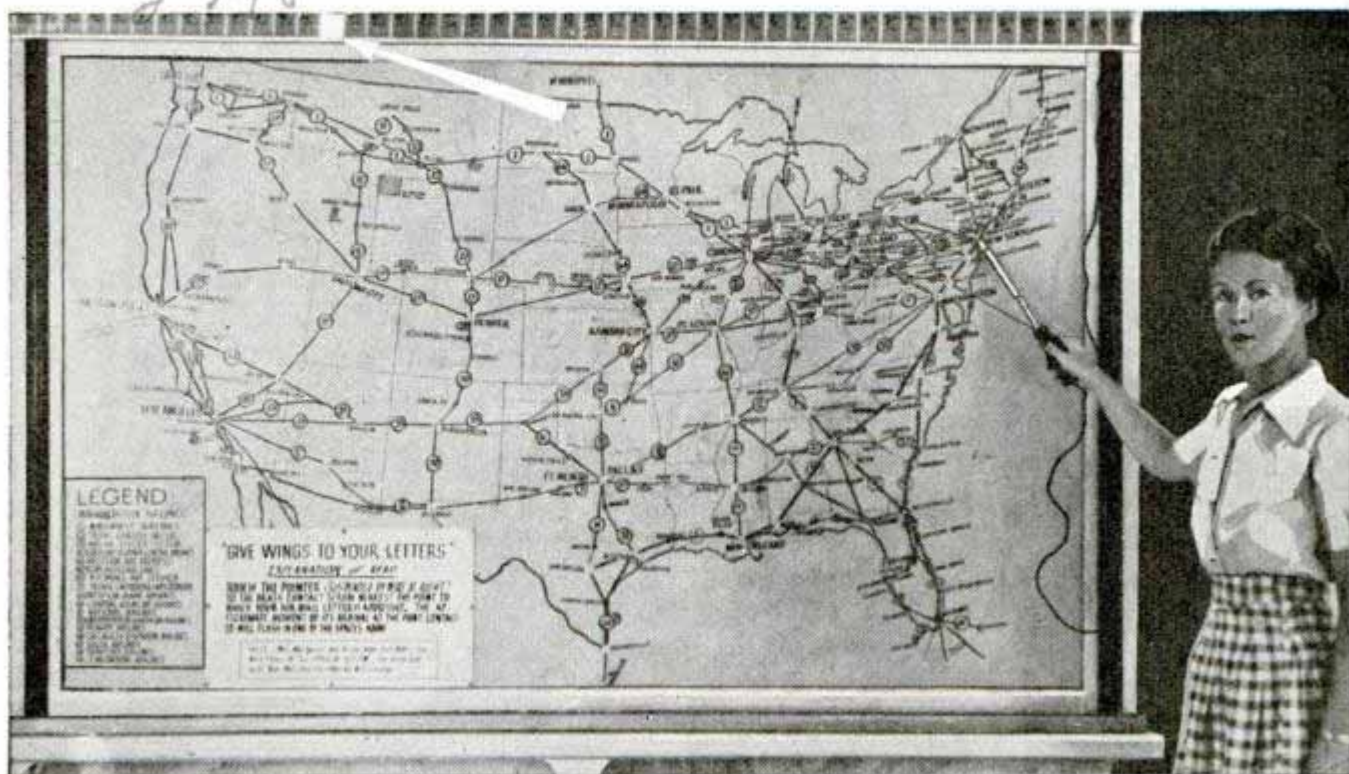
M. Huguenin

Phone Co. Meter Co

393 main St. Orange, N.J.

Bieringer - Hendrickson
2755 N. 8th
Philadelphia
General Electric

Electric Map Shows Air-Mail Arrival Time



Placing pointer at New York on the map lights up window, indicated by arrow, which shows the time your air-mail letter will be delivered. There is an electric contact point at each city

Without consulting timetables, anyone who sends an air-mail letter at the post office in West Palm Beach, Fla., can learn when the plane carrying it will arrive at its destination, by touching a wired pointer to the city in question on an electrified

map. A light above immediately flashes on to indicate the scheduled "arrival time." Conceived by the local postmaster and constructed by employees using donated material, the chart, which contains over 500 feet of wiring, can be moved about easily.

Oxygen Piped from Bottles Protects Group in Gas Raid



Instead of using individual oxygen "bottles," the gas masks all tap a common pipe line fed by large oxygen tanks in air-raid refuge

Gas masks "plugged in" on an oxygen pipe line furnish protection to groups of refugees from a wartime gas attack or companies of firemen engaged in combating deadly fumes in a fire. A single tube is connected to a battery of oxygen bottles, and the individual masks are coupled to this pipe.

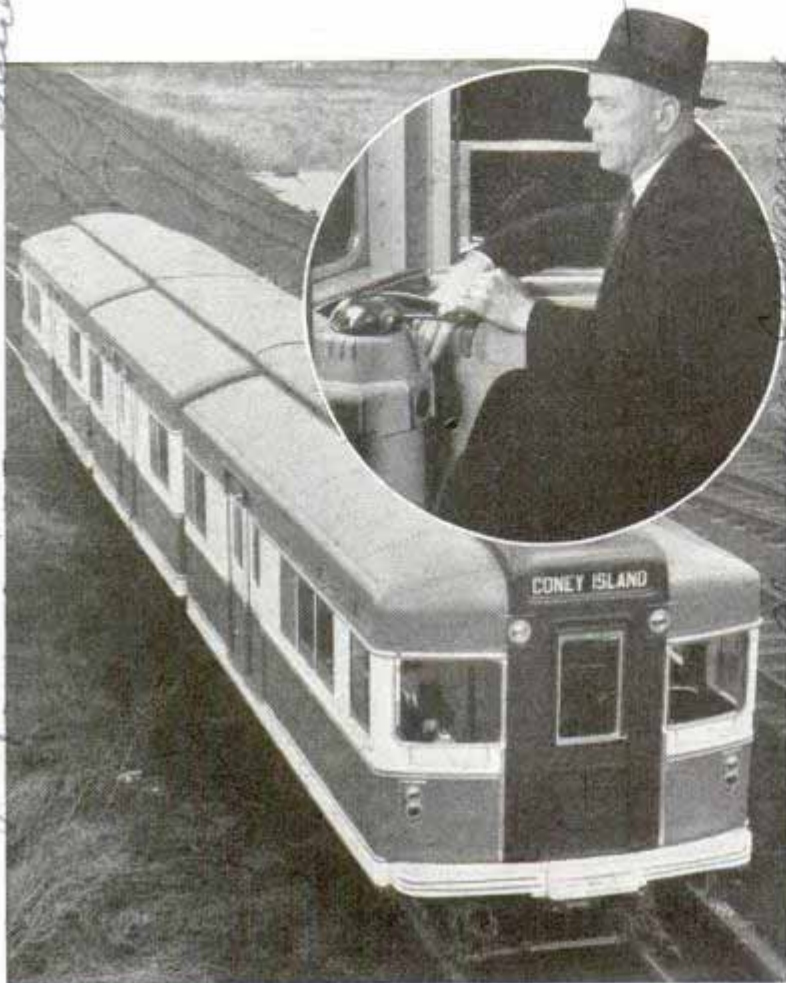
To prevent any increase in gasoline consumption, no new cars can be registered in Tokyo unless they are equipped to operate on charcoal gas or other substitute fuels.

Handwritten notes on the right margin:
C. B. Carr, W. C. Carr, W. C. Carr, W. C. Carr
4/16/39
used in Paris France

Equip. Suppl. New York Rapid Transit

Single Controller Operates Motor and Brakes

Manufactured by Clark Creek Equipment Co. Battle Creek Mich.



Clark Creek

Built of 12,000 pounds of aluminum and duralumin, and cushioned by more than a thousand rubber parts, the new subway car on New York's Brooklyn-Manhattan line could be driven by a one-armed motorman. Its single controller, called the "cineston," operates both motors and brakes, providing quick and smooth acceleration and deceleration. Worked from left to right, the cineston feeds current to the motors; moved up and down, it operates the brakes. The car consists of three articulated units weighing altogether 76,000 pounds, with only half the axle loading of old-type cars. Noise is absorbed by rubber used throughout the car to eliminate metal-to-metal contacts. Conical rubber springs on the trucks soften thrust in any direction, and rubber sandwiches nearly two inches thick between the steel tires and wheels dampen out shocks from rail joints and switches. The car has a three-way braking system.

Moving the handle sideways controls the power, while vertical motion of controller operates the brakes of new subway car

B. Filwood & Co. Akron

Camouflage Net Hides Gun Aimed at Invading Planes

ad Anita And Calif

Anti-aircraft gunners guarding southern California from "invading" aircraft during recent war games along the coast lay hidden under a big tent of netting. Without this protective covering the circular gun emplacement would be spotted by enemy observers.



Anti-aircraft gun mounted on circular steel platform would easily be spotted from the air but for the camouflage net covering it

A grand piano weighing 555 pounds hangs on a wire only sixty-three thousandths of an inch in diameter, demonstrating the strength of steel to visitors at the U. S. Steel company exhibit at the Golden Gate fair.

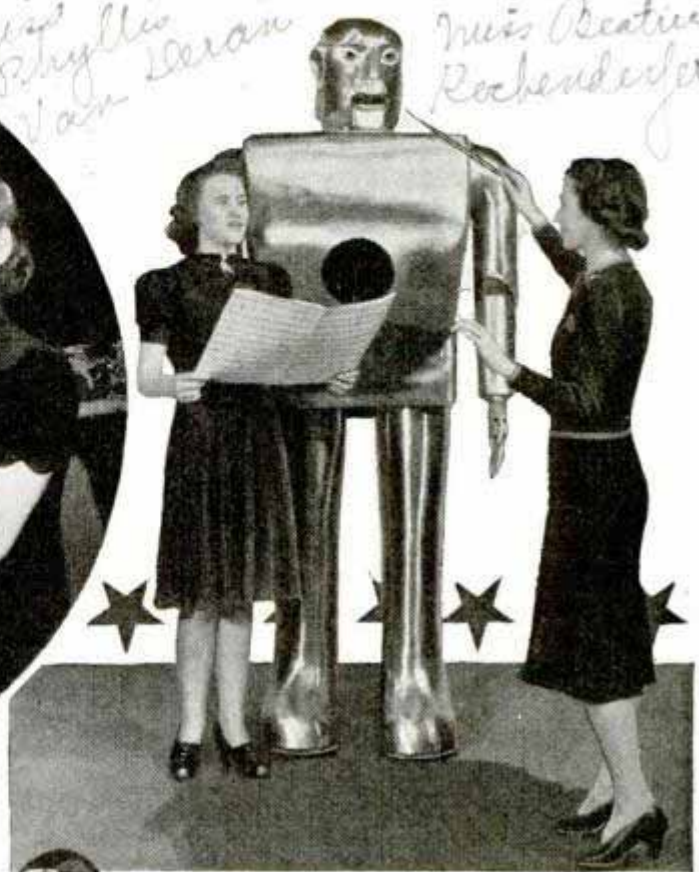
Brooklyn

Acme

at work at night
Miss Phyllis Van Deran

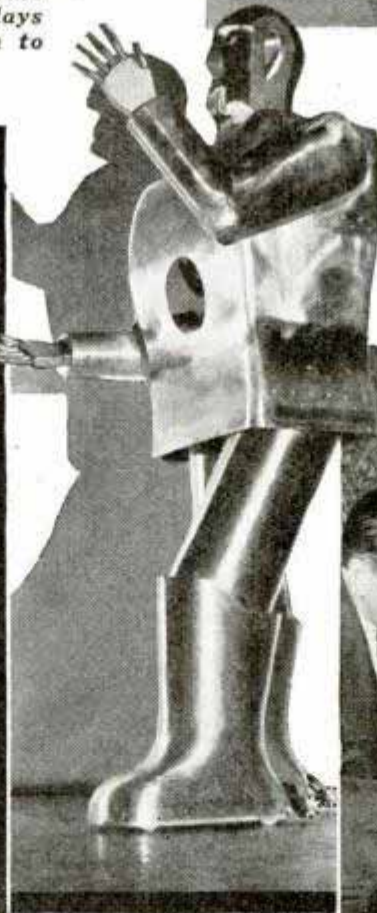
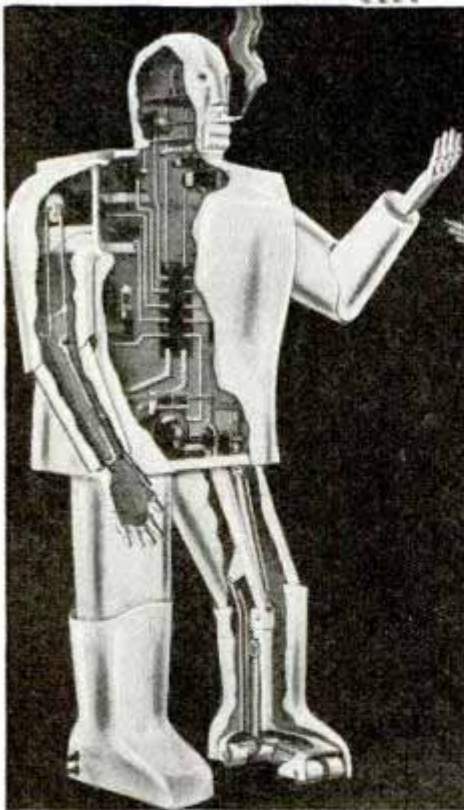
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Giant Robot Walks, Talks and Tells Colors



This is "Elektro," the seven-foot robot built by Westinghouse. Motors, relays and other mechanism enable him to perform thirty-six tricks

Top, left, showing some of the electrical cords used to control the moto-man. Right, the robot sings through his sound mechanism, his mouth waggling open and shut. The robot is made of 900 parts, the frame is steel and the covering is aluminum. His tricks include walking, talking, distinguishing colors, smoking and bowing

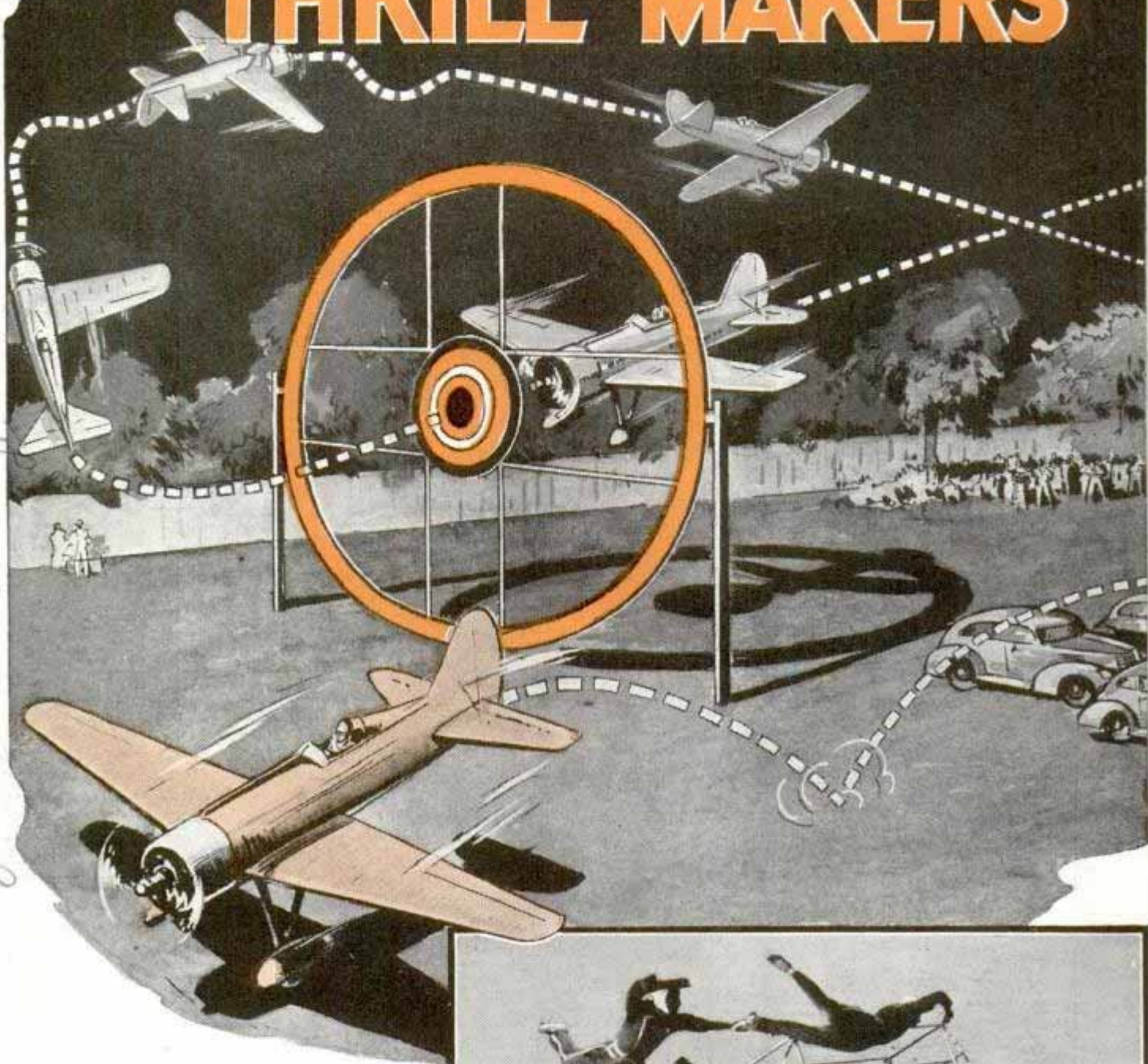


Above, showing mechanism which enables the moto-man to do his tricks. Center, the giant walking. Right, oiling the joints. The robot's brain lobes consist of forty-eight electrical relays, his spinal column is made of wire—enough of it is wound on coils to encircle the world at the equator

Westinghouse Electric & Mfg. Co.

Emb. James McQueen, 43, W. 60th Terrace,
Q 320
Kansas City,
Mo.

THRILL MAKERS



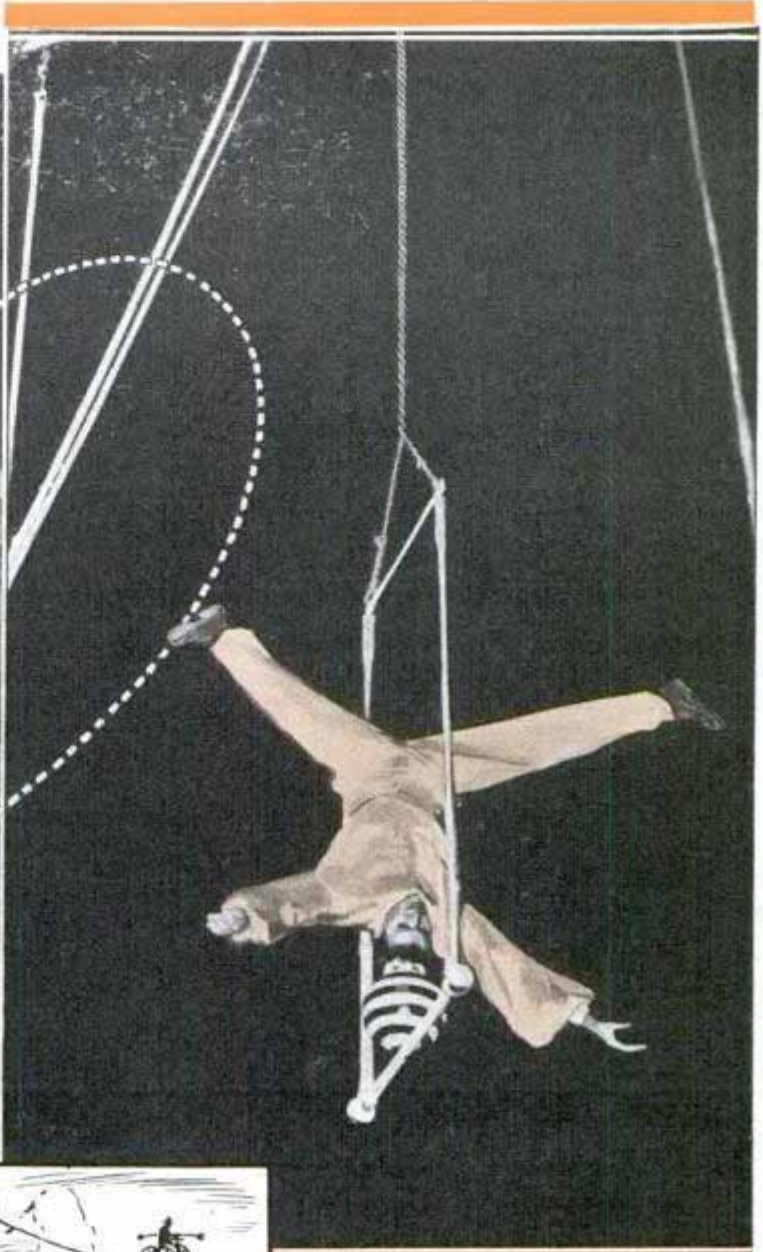
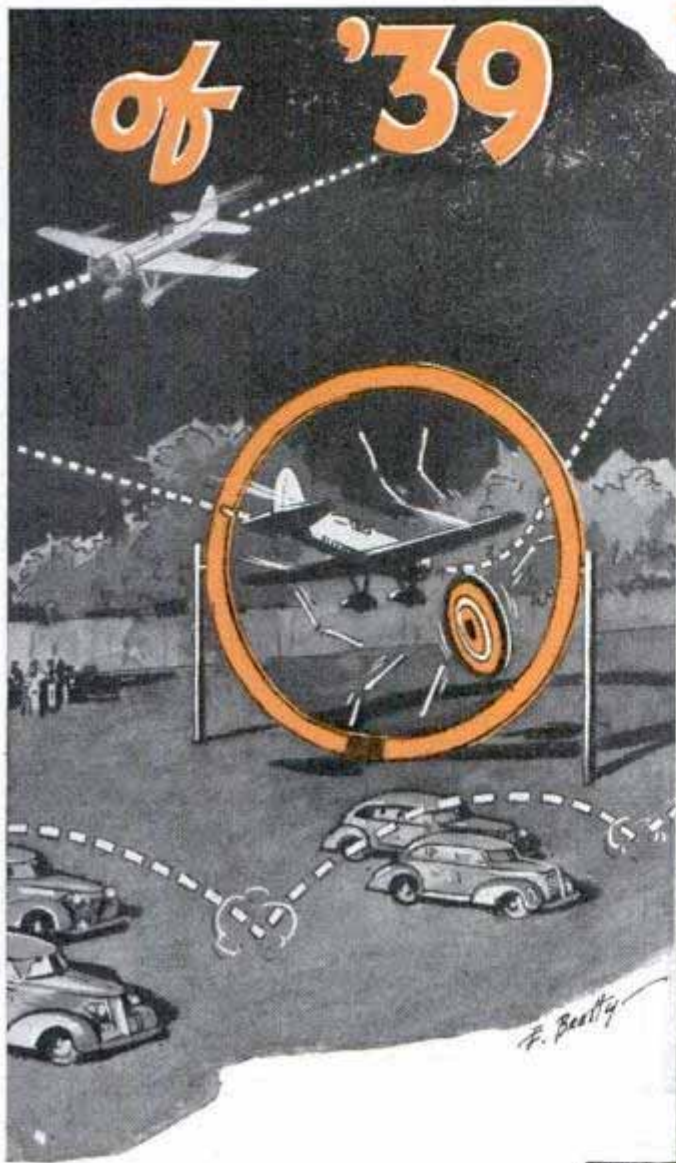
SWOOPING low across the field, the plane heads straight for the roof of a barn. Spectators grow tense as the pilot, instead of bailing out, ducks his head and sends the ship plowing into the shingles with a splintering crash.

Instantly, flames shoot from the demolished structure. Firemen hurry to the spot to extricate the pilot from the flames, if by good luck he has managed to outwit death in the crash.

But out of the debris a moment later he comes with only a few scratches on his face, and perhaps



Three daredevils perform acrobatic stunts on this odd contraption while a fourth cycles around the narrow track so fast the wheels spin in air



a strawberry on his elbow. Without so much as a sigh over the tangled wreckage, the flier hurries home to his family without a care in the world—or at least, not for a week or so when he will again attempt to roll an old crate into a ball. He's Captain F. F. Frakes, and this happens to be his business.

Plane crashing is not an easy way of making one's living, but neither is driving a motorcar through a brick wall, doing a backward somersault from a 110-foot ladder into a shallow tank rimmed with fire, motorcycling through a glass showcase, and a few more spine-tingling performances of the current crop of daredevils.

It's big business, this thrill-making. At 2,500 outdoor fairs and celebrations this



Across these pages and on the cover you see Dick Granere at his pulse-stopping feat of flying through two bull's-eyes and playing leapfrog over parked automobiles. At upper right, Millette holds spotlight with a balancing act on a spinning trapeze. Below, crossing Niagara on a wire—a thriller of a generation ago

summer and fall the top-liners will display the ultimate in daring for approximately 50,000,000 persons—all morbidly expecting "something to happen," which, comparatively speaking, rarely does.

Air records, fast dropping elevators, and our new sports where the accent is on speed and excitement have so jaded the modern thrill-seeker's taste that daredevils almost have to

destroy themselves to win favor. Aside from the performances of Blondin, Lincoln Beachey, and a few others, the so-called death-defying feats of the past would rate no more than a collective yawn today.



ever, and auto poloists, human flies, high-wire walkers, and divers moved into the spotlight. Lately there's been a swing back to the air and motor thrills of the shock type.

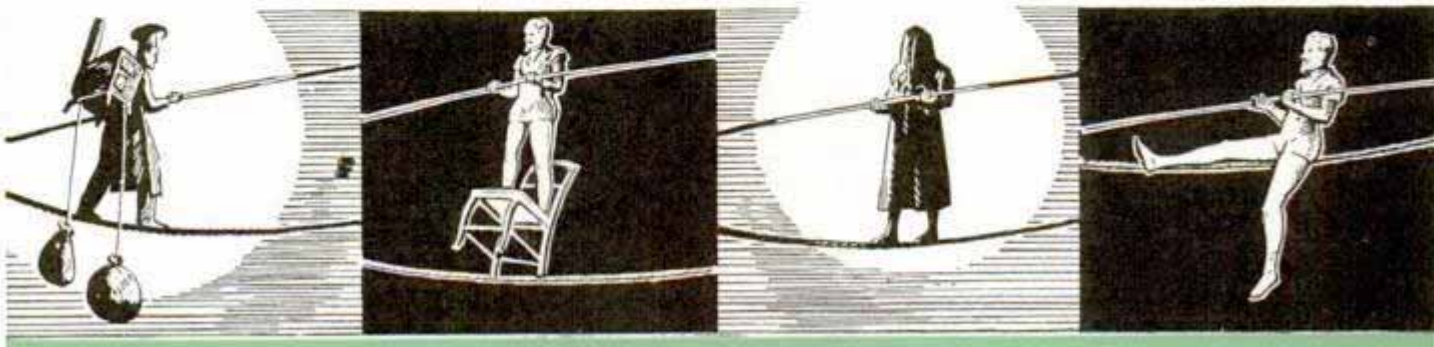
There's been a sharp increase in the number of fatalities and accidents—convincing proof the crash artists and performers are taking bigger chances than ever before. Although a defective supporting wire or a broken swivel on a trapeze causes an occasional obit-

uary in the press, the bulk of them, according to Sam J. Levy, veteran thrill merchant, are traceable to carelessness.

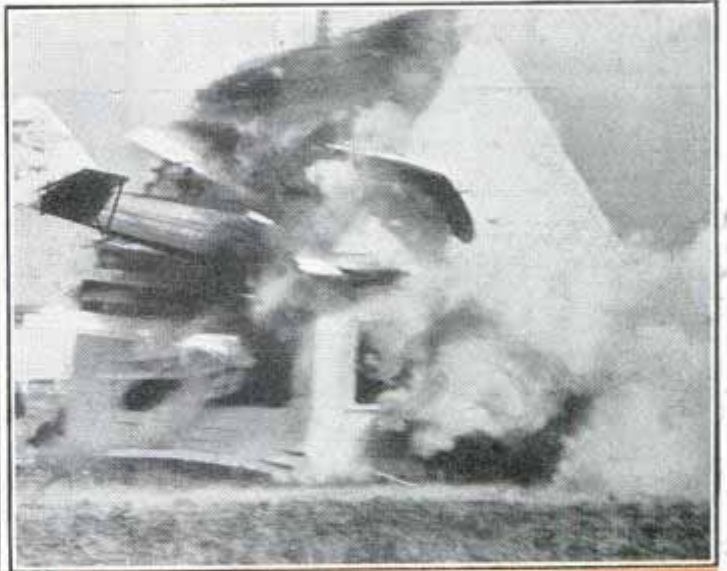
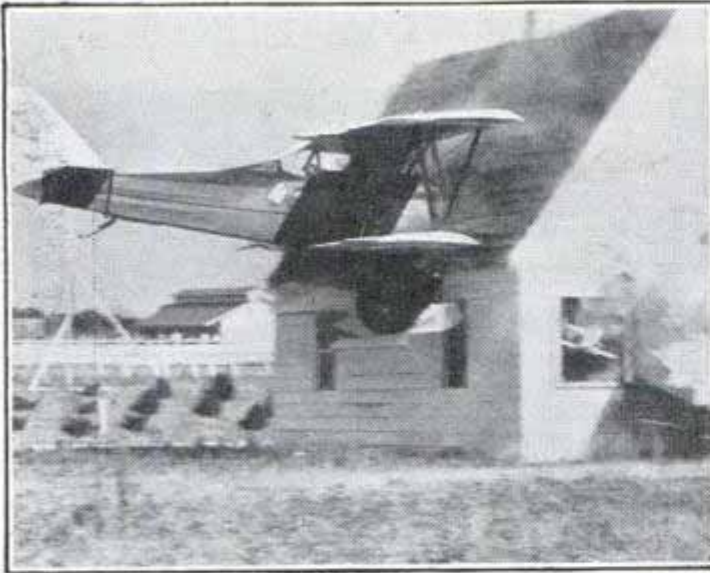
"A performer," explains the showman, "who does a stunt several times a day for weeks at a time occasionally loses sight of the dangers involved and becomes haphazard in taking precautions. For example, a motorcyclist traveling sixty-five miles an hour who has his mind on his income tax instead of the business at hand is likely to hit the glass wall at an angle instead of straight-on and be fatally cut.

A pioneer of thrill-making, Blondin stretched a rope across the 1,100-foot chasm below Niagara Falls and then walked across it, carrying a man on his shoulders. To top this, he later crossed the rope on stilts.

Subsequently when Beachey flew over Niagara and beneath the arches of the upper steel bridge, and later performed virtually every "impossible" air stunt, he set styles in thrill-making that survived him. The loop-the-loop artists and wing walkers began to pall on the public, how-



At top, left, May Merkel does her fly-walk on the ceiling, with only her suction shoes to save her from a headlong plunge. Bottom, some of the tightrope feats that amazed the crowds of bygone years

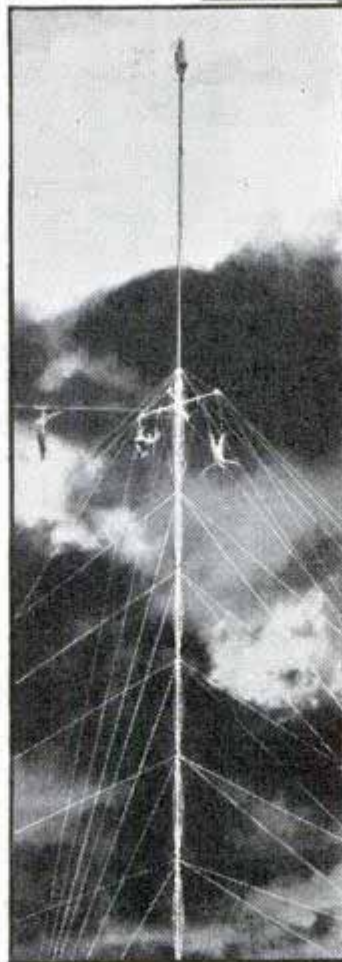
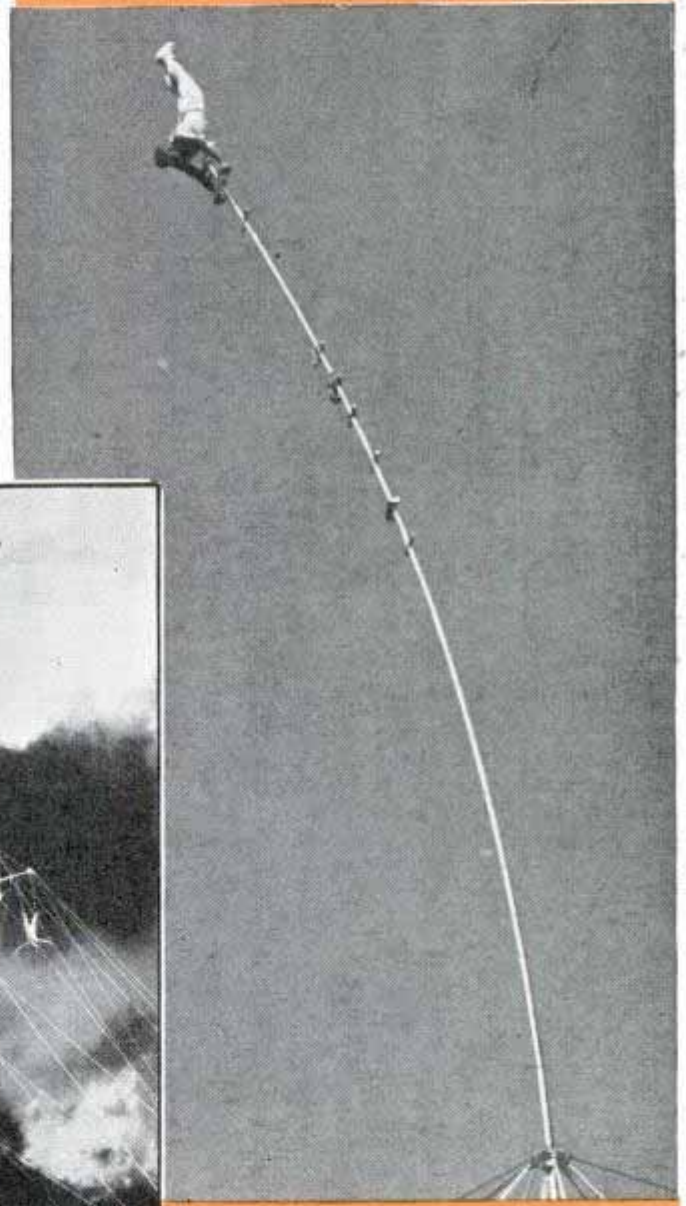


Likewise, the high diver who doesn't concentrate on knifing the water in the tank properly may be disabled permanently, if not killed outright."

Identified with aviation since the early twenties as a barnstormer and instructor, Captain Frakes saw a bonanza in cracking up old planes. He quit his job as test pilot, worked out the details of the stunt, and then sought the ear of a fair official. Upon hearing the pilot out, the official became dubious, not of the stunt's drawing power—any showman knew it would pack 'em in—but of the flier's sanity. A trial was given him, however, and Captain Frakes scored a bull's-eye. He's been at it ever since, crashing into barns, the sides of mountains, into lakes and straight on the ground—more than fifty crack-ups in all, and all for gold.

An extra dramatic punch has been added to his more recent performances, that of firing the structure the moment the plane strikes it. In this way, the crowd's excitement is enhanced by the danger of his burning alive if he isn't already smashed to death. The despair of government air officials, the daredevil uses no special protective equipment other than a crash helmet, a safety belt, and the

(Continued to page 143A)

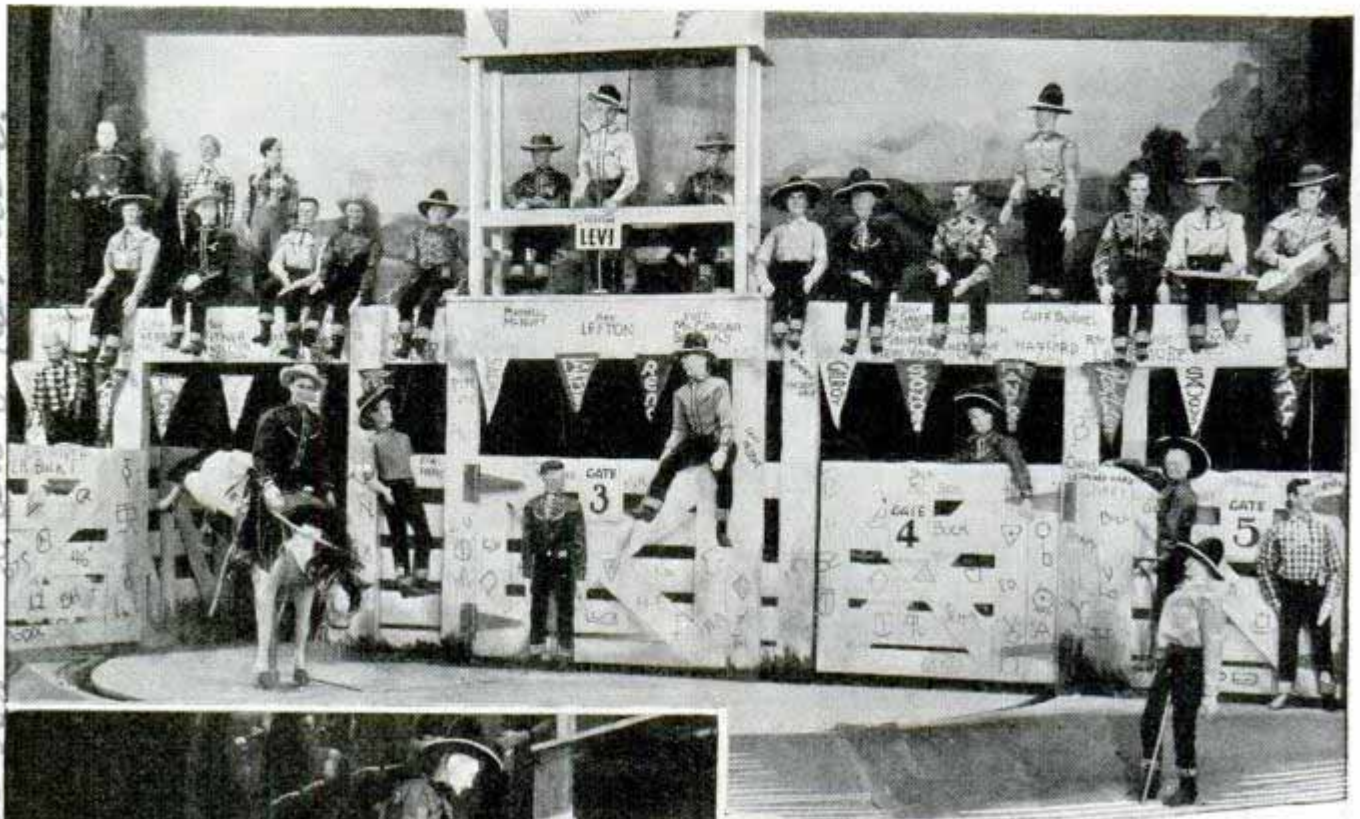


In three split-second pictures at top you see Captain Frakes crash his plane into a barn. As it bursts aflame he walks out, with maybe a little bruise. Below, A. Selden, the "stratosphere man," stunts on high trapeze, then climbs to top of the 130-foot pole to hand-balance while he sways dizzily in a twenty-five-foot arc

101 Hanelwood Ave
San Francisco, Calif

Rodeo Model Has Life-Like Moving Figures

Designed and built by: A. O. Wyndyfe
67 Alameda Street, San Francisco, Calif
A. O. Studios



One of the largest of its kind, a model of a western rodeo scene is complete to realistic bucking horse, gaily dressed cowboys who sit on a fence waving to the crowd, a clown, a band and an announcer. The model is synchronized with a sound reproducing system that furnishes music and voices for the figures

Top, general view of the model, with bucking horse just entering arena. Center, stage in construction of horse, just after wooden legs and head were assembled

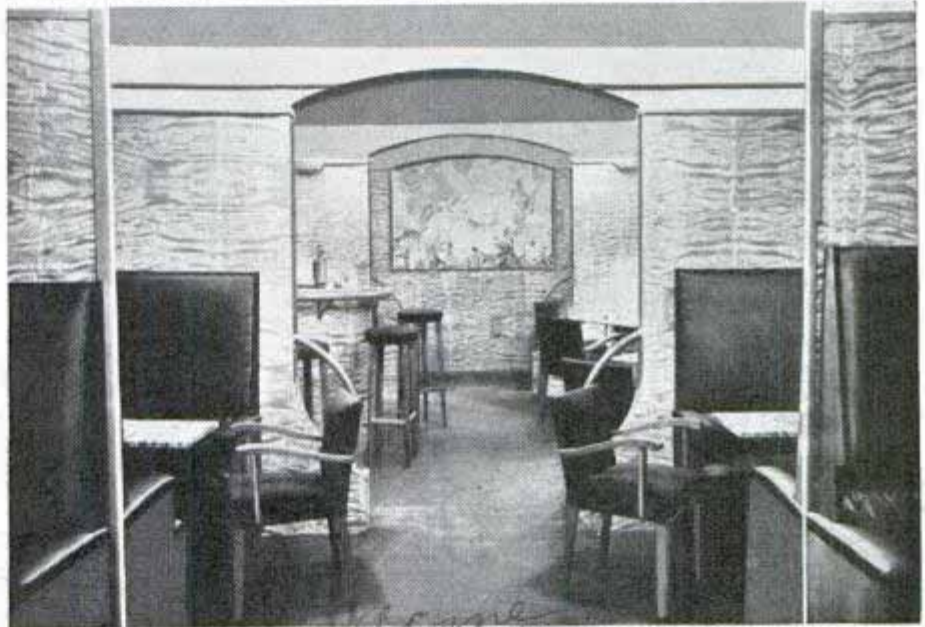


Circle, heads of cowboy figures were carved from photos of prize-winning riders. Left, intricate mechanism that animates the cowboy models makes each wave the right arm when each is introduced by name by the announcer. Action of the model is controlled by six motors and thirty-two solenoids



Two-Story Transocean Plane Has Six Engines

Six motors of 1,500 horsepower each will power the vast flying boat the French war ministry has ordered built for the transatlantic service of Air France. Its cabin will be a two-story structure with the first floor lounge and drawing room so designed that it can be converted into separate passenger cabins at night. Upstairs are the piloting and navigation posts, a room for the crew, two cabins for passengers, two drawing rooms and a kitchen. The ship will have a maximum speed of about 150 miles an hour and fuel capacity to cruise 3,750 miles nonstop. It will be 133 feet long and thirty feet high, with 173-foot wing span, and will weigh seventy-five tons.



Top, drawing of six-engine transatlantic plane. Below, a view of lounge, convertible into separate cabins

Maritime News 460 w 54 St New York

Merry-Go-Round Boat Trains School's Rowing Crew



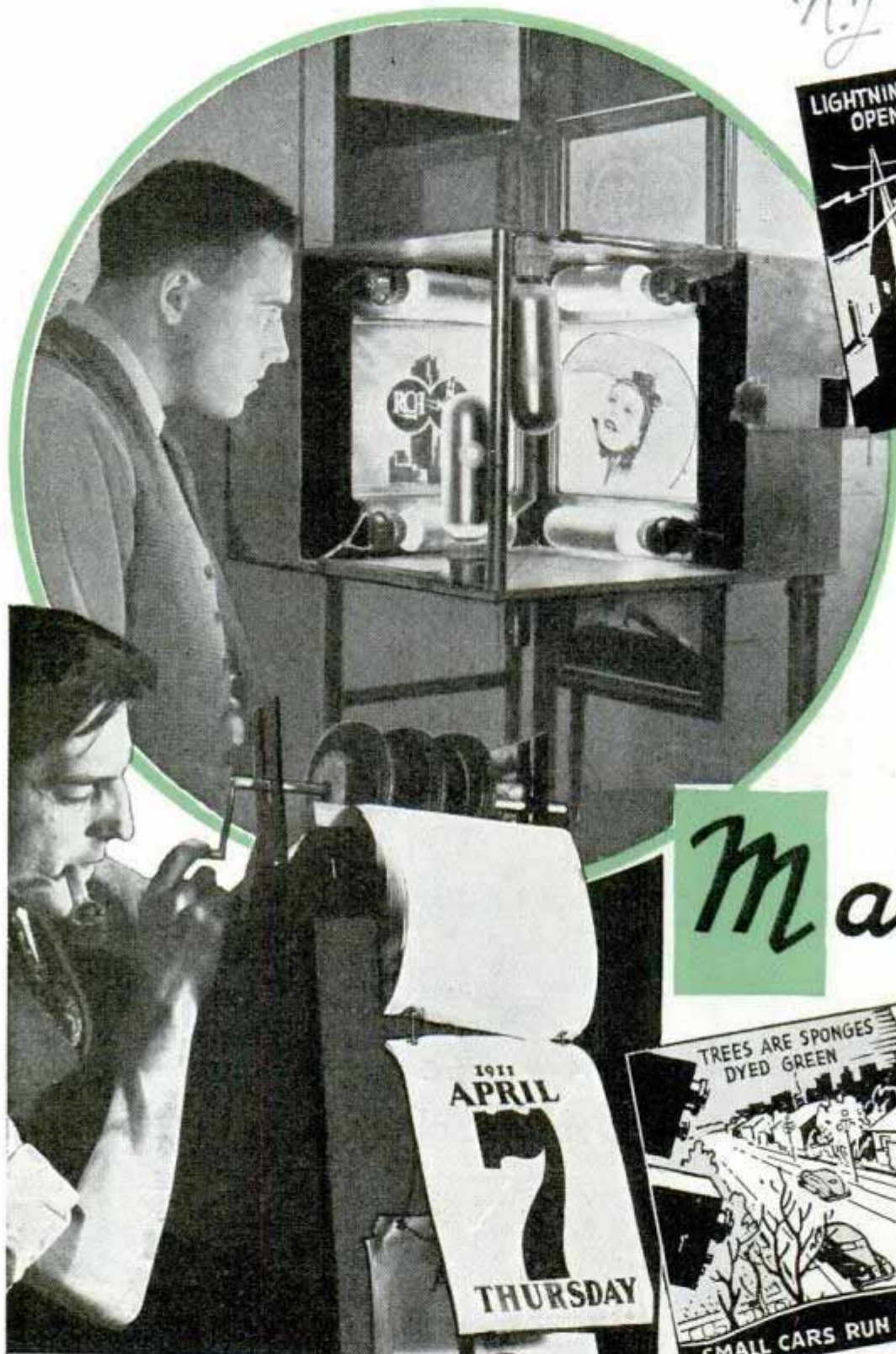
Seated at the rim of a huge wheel-shaped boat pivoted at the center, oarsmen row in circles to develop speed and endurance for races

Members of the rowing crew at a North Carolina school for boys practice for races on what they call a coffee grinder because of its circular motion. Necessity for the machine was the shortness of the lake available for their oarsmen. Now the boys can develop top speed and endurance, going around and around on long runs without grounding their craft upon the shore. The training machine was designed by a member of the school's faculty.

J-461
 Mrs. Jean A. G. Lolley, Box 60 2

355
26

H. W. ...
Stand Road, Ramsey
N.J.



Creating dramatic effects for the television camera is beginning to occupy the attention of artists, particularly those with a flair for producing the desired results with miniature figures and objects. The sight-effects man is going to play an important role in television

Making



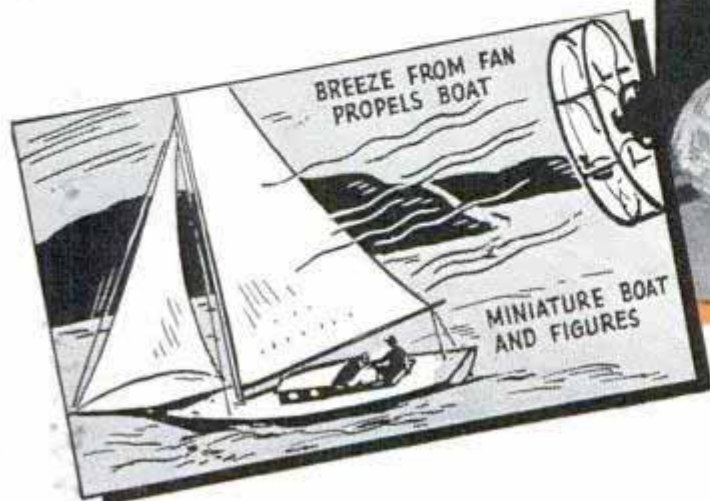
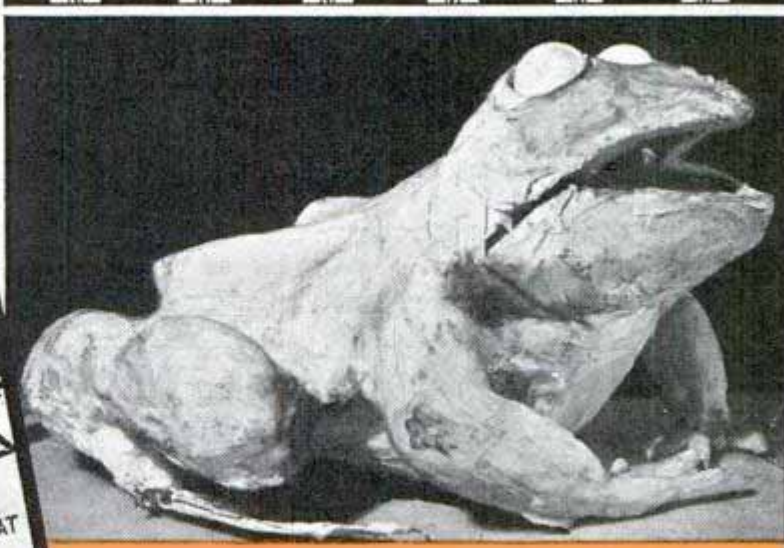
Top, circle, television titling machine invented by William Eddy of National Broadcasting company makes one title dissolve into another. Below, turning the handle rolls the calendar leaves, indicating the passing of time in television scenes

Sketches on this page, and the next, show how realistic scenes are created for television. Model villages with one-half candlepower lights, midget autos controlled by cable, dyed-sponge trees and shrubs and carefully constructed buildings are employed effectively. Lightning flashes are obtained for the village by opening and closing an electric switch



TELEVISION "Props"

Above, performing spiders, made of cork, felt and a few beads, appear before the television camera. Animation is provided by a motor turning wires inside the hollow members of the spider web. Bottom, left, model sailing ship gets its breeze from electric fan hidden from camera's eye. Entire fleets of model boats are used to produce naval maneuvers for television. Some realistic airplane scenes have been created by combining aerial movies and bomb bursts formed of cotton. Model airplanes are useful to the sight-effects man



Center, illustrating how candle is dimmed, then extinguished to dramatize the passing of life. Below, animated frog is made to perform by flexible shaft. A rubber bag pulsated by compressed air simulates breathing. Cables move the ping-pong-ball eyes

Worcester, Mass

Wain

24 28

Loud Speakers in Clouds Talk to People Below



Demonstration given at Redbrooke Kent, England

Mr. Col. V. Bromley, 6401 Waring, Hollywood, Calif

Acme © Planet News, Ltd. Loud speakers carried into the clouds by captive balloon send voice over wide area to people below

Talking to the populace from the sky has been tried out in England by the Royal Air Force. Dangling on the end of a cable suspended from a captive balloon, a nest of loud speakers spreads the sound over a wide area.

W. J. Ballou Centre

Cost of Farm Electrification Cut Sixty Per Cent in a Decade

New types of electric wires, a vibration-proof tie between line and pole, and wider spacing between poles have combined to reduce the cost of bringing electricity to American farms by sixty per cent in the

Jennie Service 4/17 39

last decade. Formerly it cost \$1,200 to \$1,500 a mile to erect a distribution system. Now it costs \$500. Less expensive wire is being made of high-tensile galvanized steel and copper, or galvanized steel alone. The new tie at the pole reduces wire breakage from vibration and makes it possible to space the poles 1,000 feet apart as compared with 250 feet some years ago.

Double-Jointed Tobacco Pipe Folds to Fit in Pocket

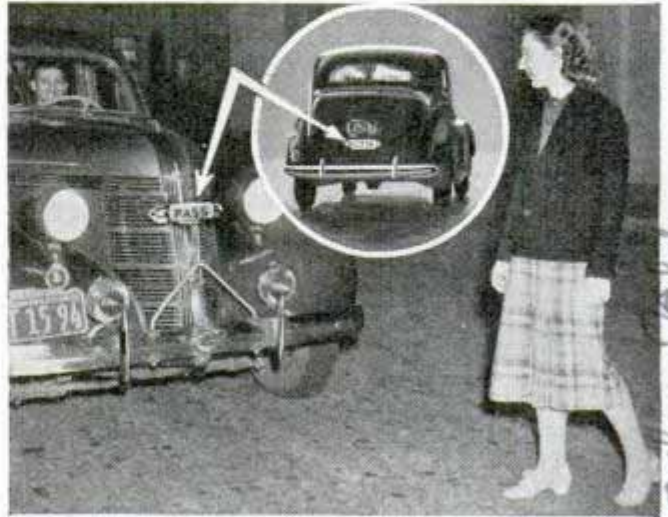
Hinges built into a pipe stem at two places enable it to be folded around the bowl, reducing its size so the pipe will fit snugly in any small pocket. The danger of stem breakage is minimized by folding and the joints will not leak when straightened.



Dr. J. J. U. P. O. S. P. 6401 Wain

"Pass" Sign Flashed by Driver Makes Motoring Safer

Motorists who want to give the right of way to other vehicles can do so in a definite way by equipping their cars with a signal that illuminates the word "pass" when the switch button is pressed. Mounted at both front and rear, the light gives a distinct sign of the driver's intention and is said to be an added safety factor for pedestrians as well as other cars. Trucks can use the sign to signal trailing automobiles when it is safe to pass.



Driver flips switch to light up "pass" signal indicated by arrows at front and rear of automobile

Joe LaSerna, 1134

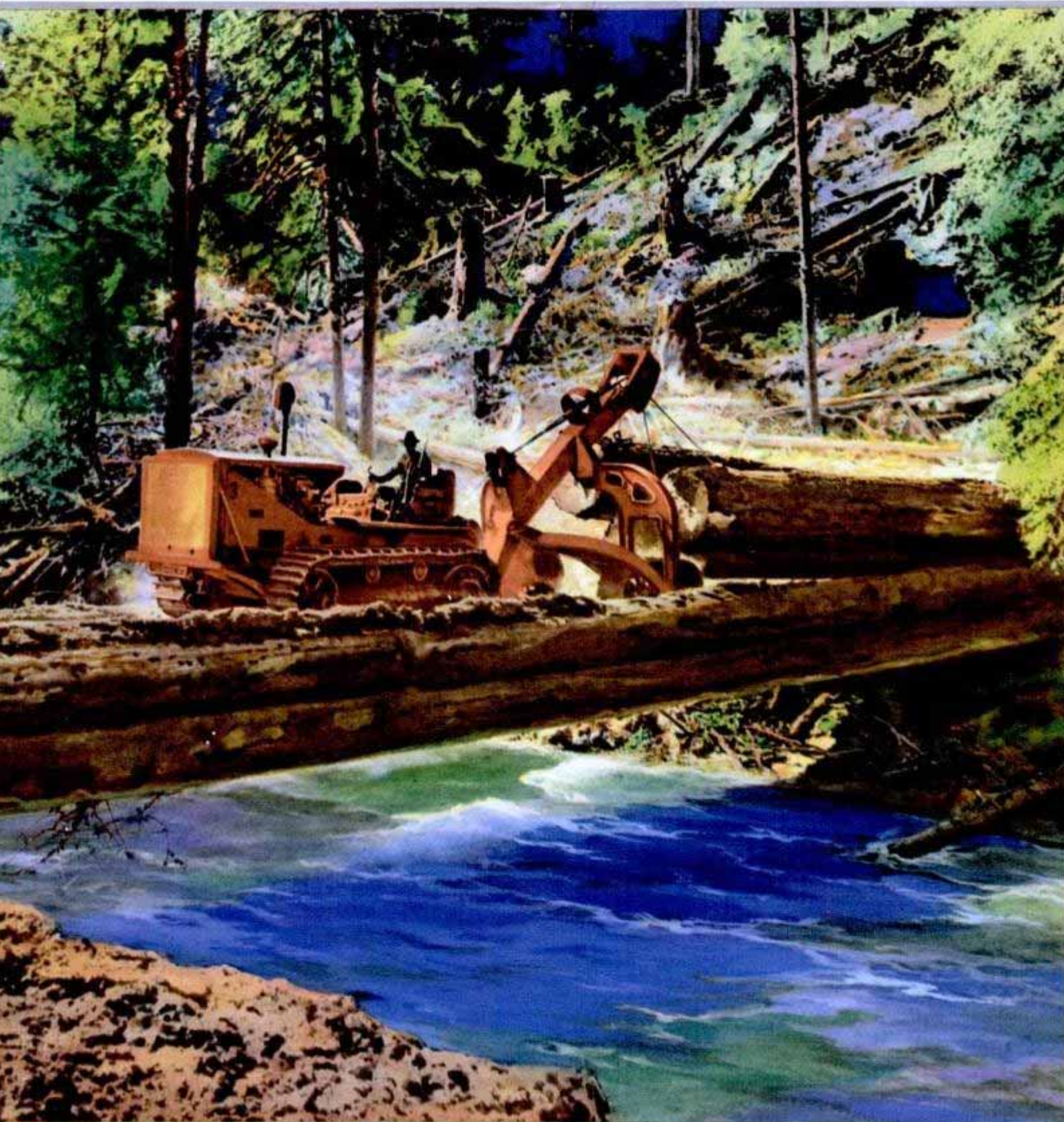
Angela, Cal

4177 93 Long Acre, London, W. 11
England.

LOGGING

Goes **MODERN**

Willamette Arch.



*Reference: James Stevens, West Coast
Lumbermen's Assn. Stuart Bldg.
Seattle
Wash.*

THREE giant logs in tow, a Caterpillar Diesel tractor crosses a timber trail bridge over a mountain stream on its way to an Oregon lumber camp. Notice how cables are slung to hoist "noses" of logs above ground.

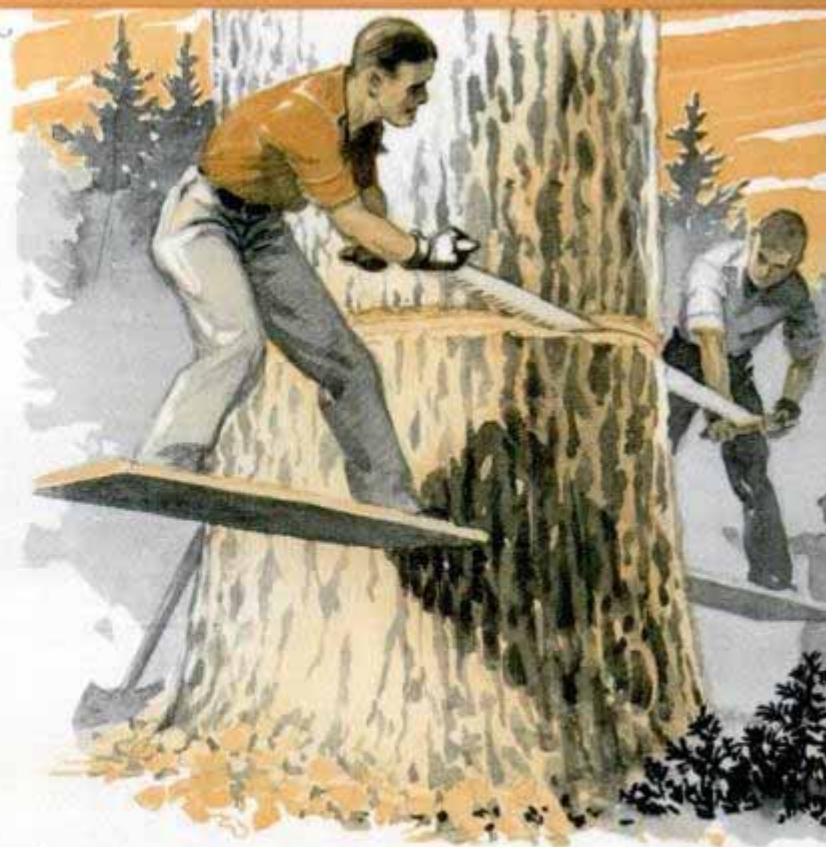


Camp #10, Hyster Cruiser

141490
THERE is a new breed of lumberjacks in the northwest today. They still wear heavy mackinaws and calked boots but their resemblance to earlier woodsmen stops right there. Brute force has lost out to engineering skill and modern lumberjacks do much of their work at the switches of electric motors and at the throttles of heavy gasoline and steam engines.

Old methods of logging are almost worthless in the forests of Oregon and Washington because one great tree alone often contains more wood than an entire acre of eastern timber.

In the northwest trees are so tall that "it takes two men and a boy even to look up to the top of a big fir." Trees measure ten and twelve feet across the stump and are 200 feet high. There is frequently enough lumber in a single acre of forest to build all the houses in a full city block. The great commercial redwood trees of northern



MODERN tractors handle tremendous pine and fir logs with ease, but there's still work for the lumberjack's muscle in felling and cutting the logs with ax and saw.

Inc. Thomas E. Swinson, Jr.
 10555 Holyoke Ave.
 Los Angeles, Calif.



Comax Lake

DUMPING logs from trail to lake, above. Below, jets wash dirt from log as it approaches sawmill so that saws will not be dulled by grit and mud.

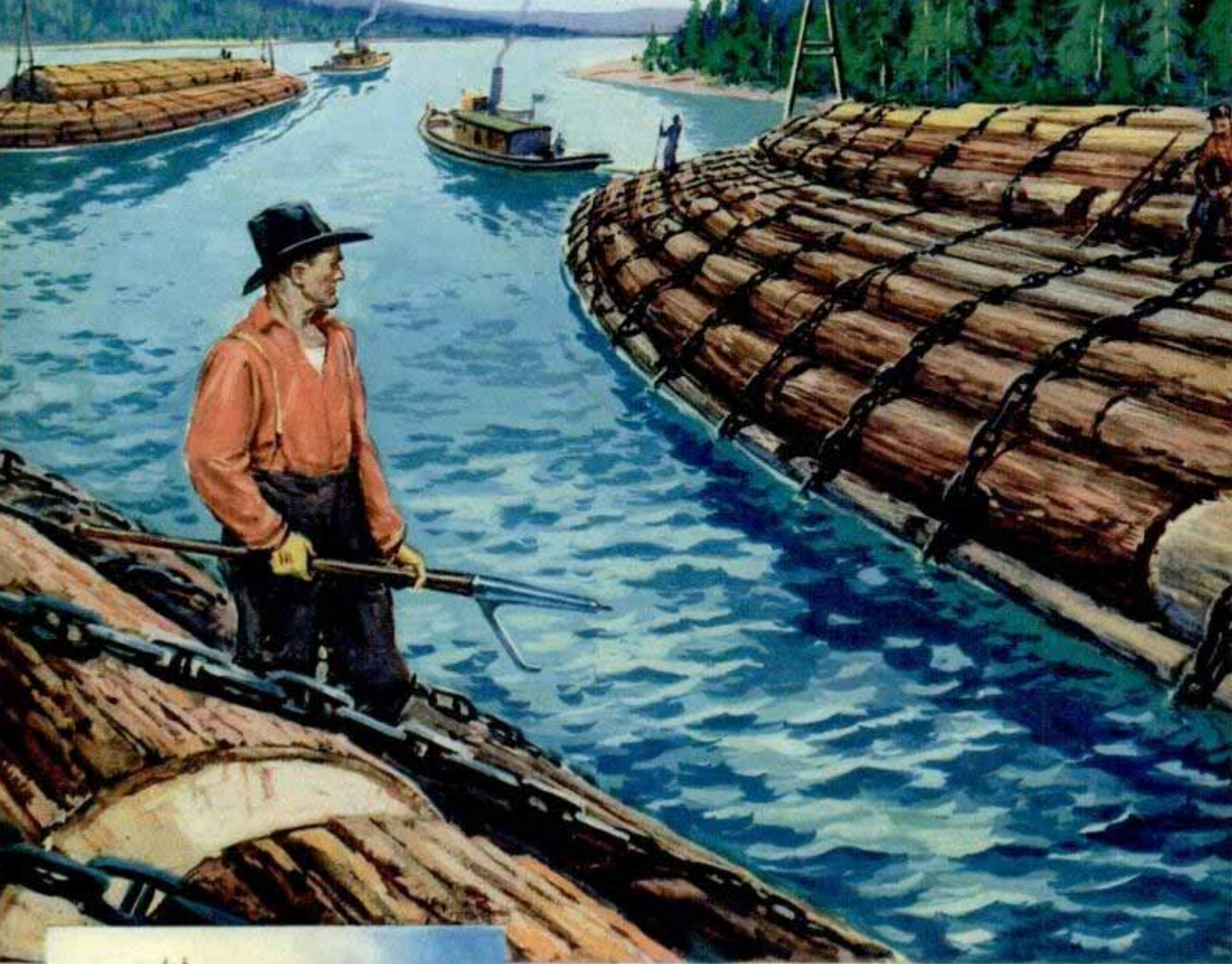
Haulup

7-1490

California are largest of all though the western cedar, spruce, hemlock, and fir are close rivals. One tree may contain more than \$1,000 worth of lumber at retail prices. Some of them scale above 50,000 board feet.

Logging trees like these would have taxed the ability of Paul Bunyan, the mythical giant of the north woods. But college-trained lumberjacks, using up-to-date methods and equipment, have turned such a feat into simple routine. Far up in the woods at some isolated lumber camp you can watch a great log almost as big as a boxcar come charging through the air across the canyon from the opposite hill, supported by an aerial tight-line system of steel cables. From another direction a giant tractor chugs into view, dragging behind it the raised end of another big log. Overhead, a great wooden boom swings over, drops steel tongs around a log and lifts it as easily as a matchstick onto a waiting flat-car bound for the mill.





DOWN to the open sea, tiny tugs pull colossal rafts of logs chained in a solid mass to avoid losses in rough water. Left, a dangerous moment for the "high rigger" clinging to his perch 200 feet up.

Cutting a tree down is one of the few things still done by hand in the woods. Two choppers working together plan the layout, clearing a path away from the tree in a direction where its fall will do the least damage to other trees and where it can be handled easily by cables or tractor after it has been bucked up into shorter lengths. Redwoods are more brittle than other species and in redwood logging a bed of limbs and small logs is laid across the path to break the fall of the giant.

It takes much more than sheer muscle to cut down a tree, and part of the choppers' art is to make it fall exactly where planned. First part of the job is to chop a deep notch in the trunk on the side toward which the tree is to fall. Spirit levels are used to keep this undercut even. One of the choppers sights along "gun sticks," two long rods hinged together with the two ends placed in the notch of the trunk, to make sure that the notch faces in exactly the right direction.



12 1490
 Then with a long twelve-foot falling saw the two men start cutting through the tree from the opposite side, driving in steel wedges behind the saw to pry the tree off balance and make it fall in the direction of the notch.

A falling tree is a stirring spectacle. As it first starts to lean the choppers shout the warning "Timber!" and then dodge clear of the base. The crackling sound of the tree breaking through the last few inches of the cut changes to a mighty swish and roar as it gathers momentum, and it crashes to the ground with a reverberating thud. Choppers usually can drop a tree to within a foot or so of the direction planned. Working in big timber, two men may be able to cut only one and a half trees a day. Then comes the work of chopping off the limbs and "bucking" the trunk into logs from twenty-four to forty feet long.

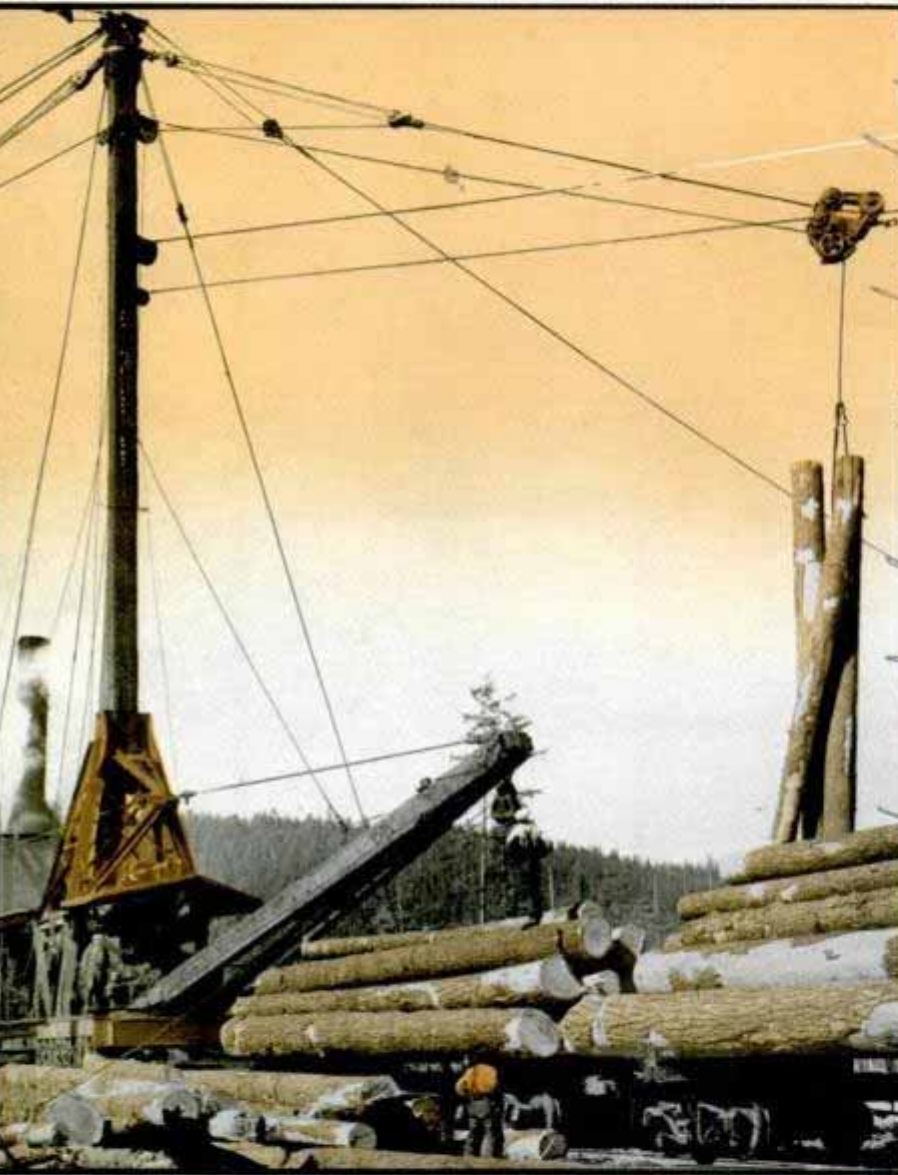
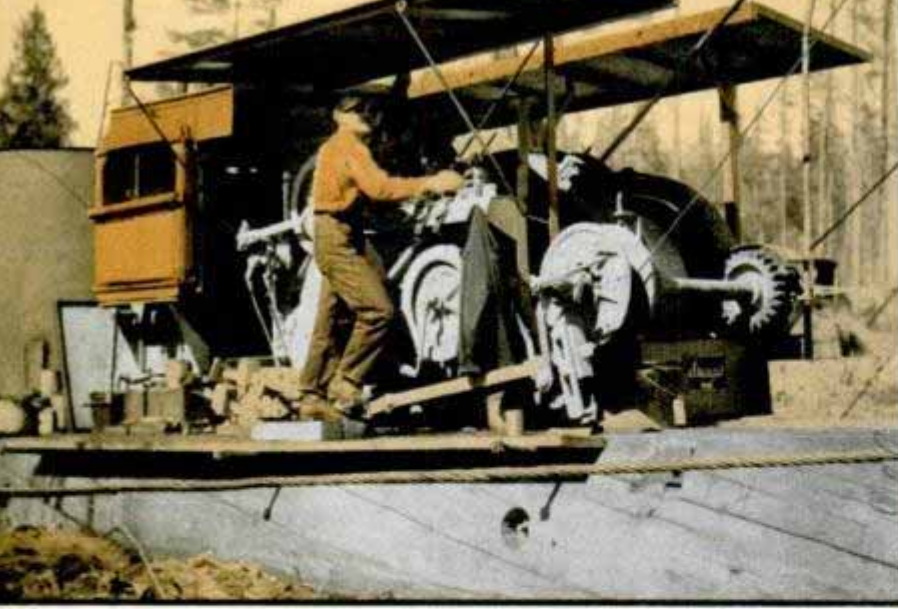
The most spectacular job in the woods is that of the high climber, the lumberman steeplejack who performs the most hazardous task of all. At the yarding point, before any logging is done, a tall tree is selected as a spar to which the high-lead cables and the load-



*careful
 reactor*

*Le Tourneau Hyster
 Arch*

BULLDOZER at top shoves a big one into river close to sawmill camp. Below, riding herd on logs in fast water is risky business. One mistake may mean crushed limbs or drowning.



ing boom may be attached. With sharp steel spurs strapped to his legs and with an ax, saw and safety belt strapped to his waist, the high climber starts up the tree, trimming off the limbs as he ascends. At 150 feet or more above the ground, possibly seventy-five feet below the top, he leans out against the pull of his safety belt and saws through the tree. This is a ticklish job and he can take a bad beating high in the air. As the top of the tree begins to fall free it kicks back and the upper part of the trunk jerks back and forth in blurring arcs. Meanwhile the high climber has dropped his tools and is clinging to the trunk for dear life. Later the spar tree is guyed all around with steel cables running to buried deadmen and a one-ton steel block for carrying the high-lead cables is fastened to the top. A steam engine, Diesel, or even a big electric motor at the base of the spar turns the big drums that carry the cables for dragging the logs out of the woods to the loading point.

These days a group of lumberjacks can cut, load, and move a million board feet of timber to the sawmill pond in a day's time. The men live in comfortable headquarters camps on the private logging railway line and are

DIESEL "yarder," top, handles trees like toys. Center, 100-foot steel spar helps load big sticks aboard a train. Bottom, thirty-eight sled train of logs weighing 1,102 tons is hauled fifteen miles on iced road by tractor, which makes two trips a day with this tremendous load.

shaghit Iron works. Bedouin

Ridgewood and loader

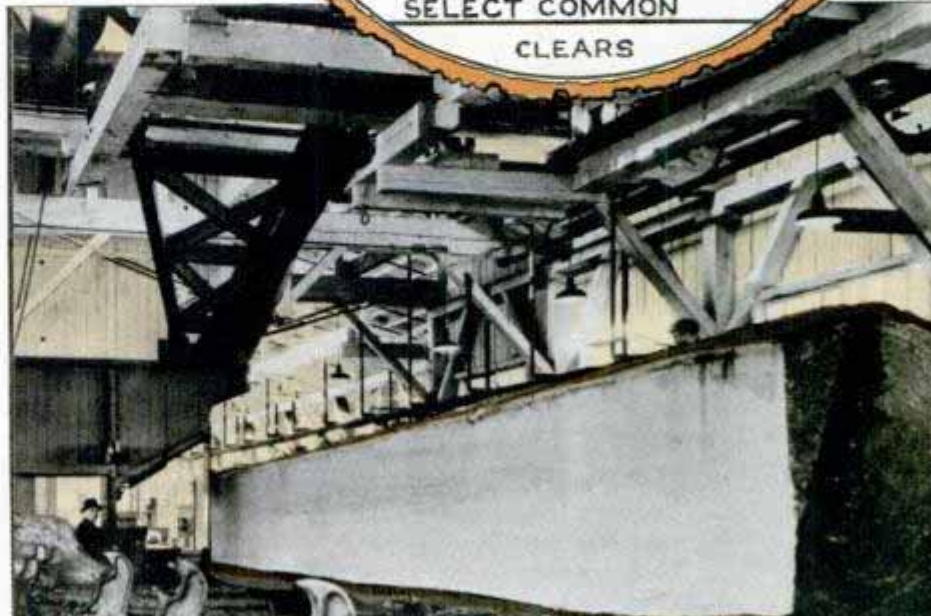
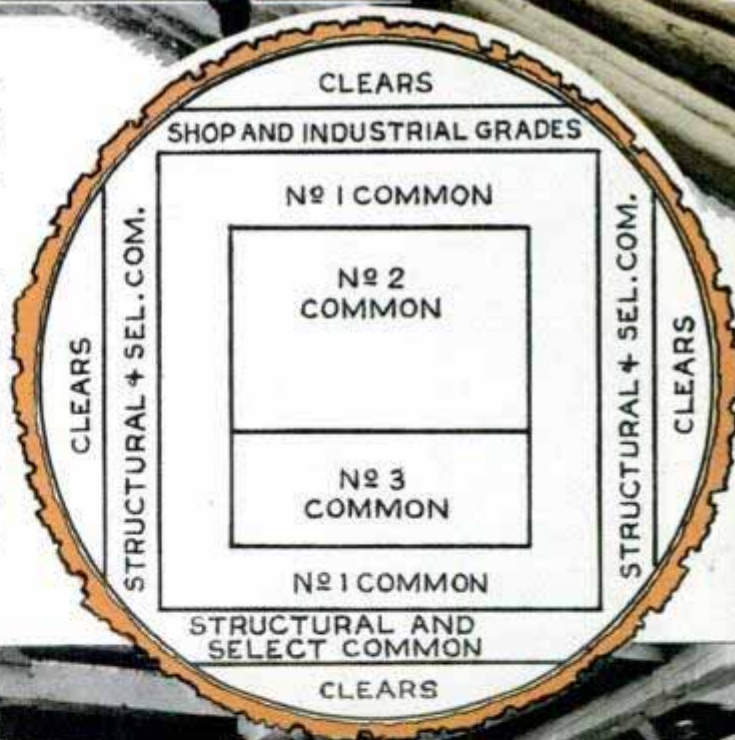


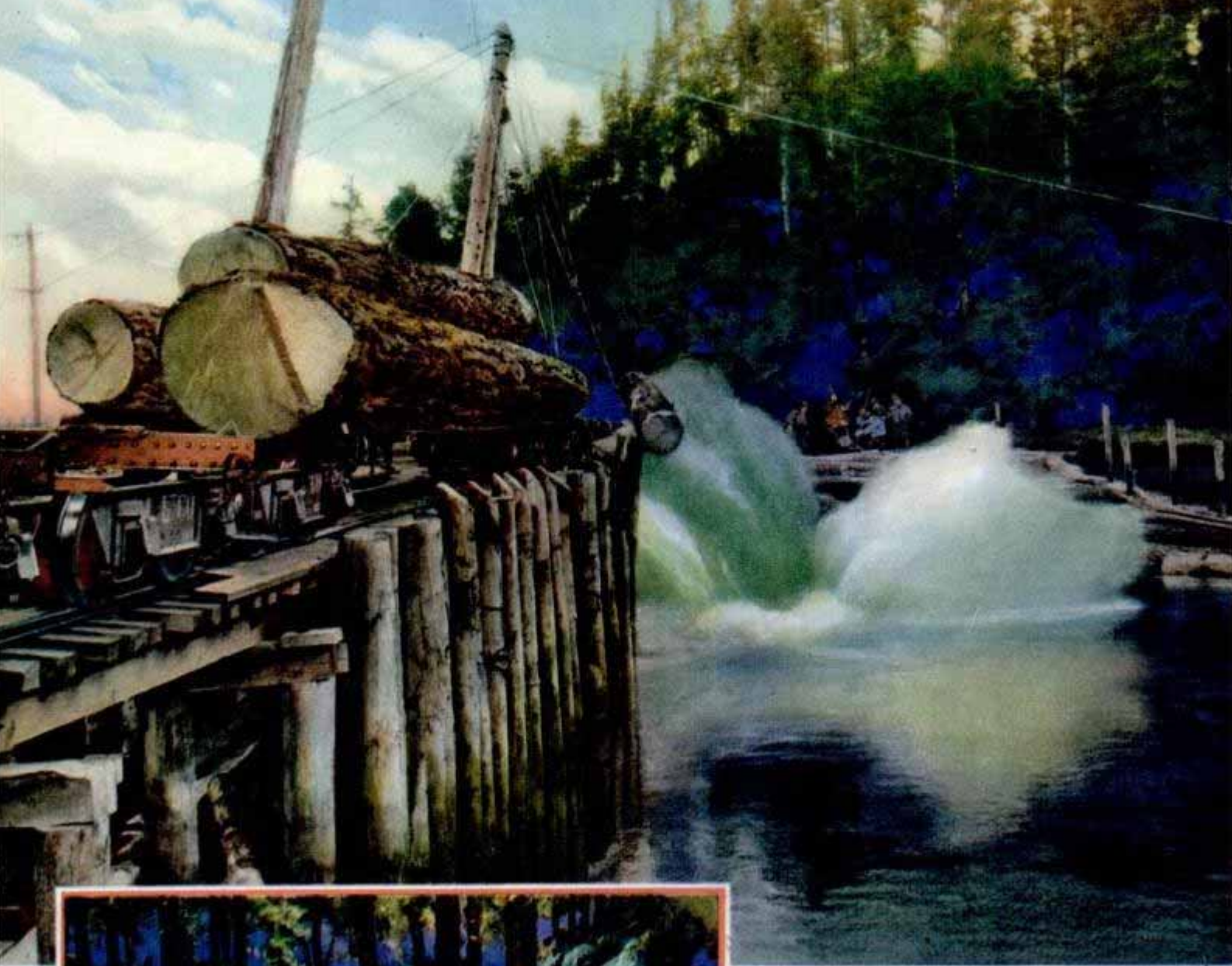
Calderhill
SKIDDING tall timber to the railroad, top. Right, cross-section diagram of average Douglas fir or western hemlock; common lumber comes from heart of log, best grades of structural and clear lumber from outer areas. Bottom, a six-foot log on sawmill carriage.

1490
 carried to and from their work in large speeders. In many cases every building in the camp is mounted on wheels and is sidetracked from the working rails. After a few months or a year in one location the whole camp is moved to a new stand of timber. Bunkhouse cars, cookhouse car, dining cars, office car and recreation cars are dragged to the new location as soon as the track is laid.

For some time conservationists have been wondering how much longer our forests will last, predicting that the time would come when the last stand of timber would be cut down and one of America's great natural resources would vanish. But now the chances are that such a day will never appear. For one thing, substitute building materials have eased off the demand for wood.

At the present rate of around seven billion feet per year of cut timber, it is estimated that the forests of the northwest will last for another seventy or eighty





FROM the forest to your front porch, trees travel by rail, on trucks and sleds, on the tow trail, in log booms on quiet water, by flume and in chain rafts. Top, dumping logs in a pond at rail-end. Below, a tractor drags a log down a forest stream.

years, without considering replacement or new growth. There is enough Douglas fir alone to provide homes for 50,000,000 families. At present timber is still being cut faster than it is being replaced by new growth, but in spite of this woodsmen think that the country will never run out of wood. This is because of the increasing amount of forest management and conservation that is being practiced. The federal government, state governments, and such organizations as the West Coast Lumbermen's Association are fostering programs destined to replace the forests and provide a permanent lumber supply.

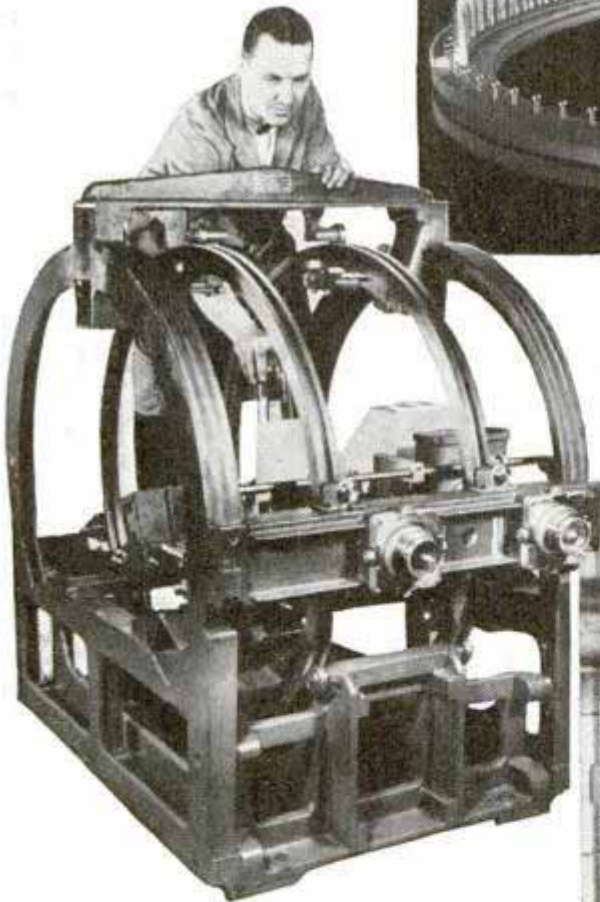
New forests are growing in the northwest at the rate of almost three billion board feet annually and this rate of growth is expected to continue for many years to come. (Continued on page 128A)

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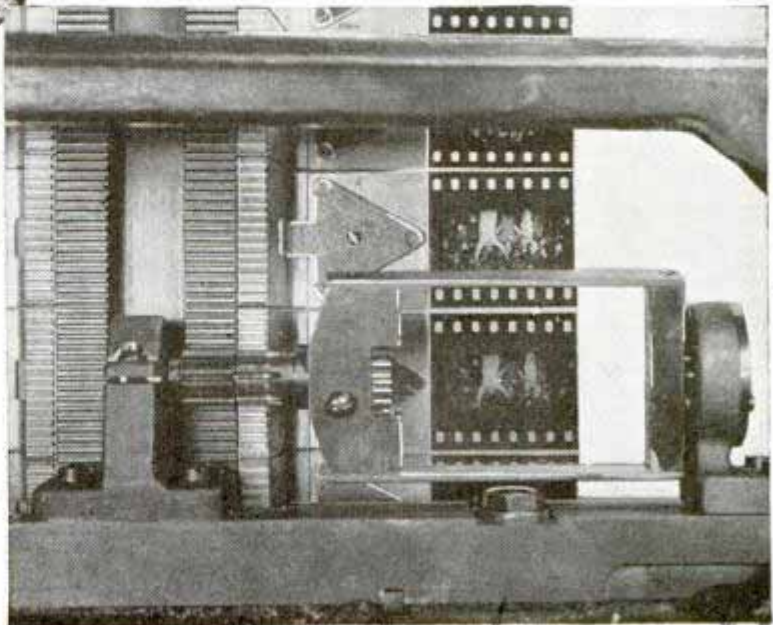
Vast Projectors Paint Scenes in 'Hall of Color'



Top, the vast screen in Eastman's "Hall of Color." Right, one of the "drum" gears on each of which ninety-six color slides are bolted. The gear is forty-five inches in diameter and carries 1,440 teeth



Left, installing one of two 2,500-watt lamps in twin-lens projector. Each of eleven projectors weighs 2,700 pounds. Water cells and near-freezing air blast are used for cooling. Below, the ingenious device which keeps film image centered in lens and rock-steady on screen even if slide is out of position; small plate of optical glass spins as film drum turns, refraction through glass centering the image. The natural-color transparencies used were made with cameras similar to your own



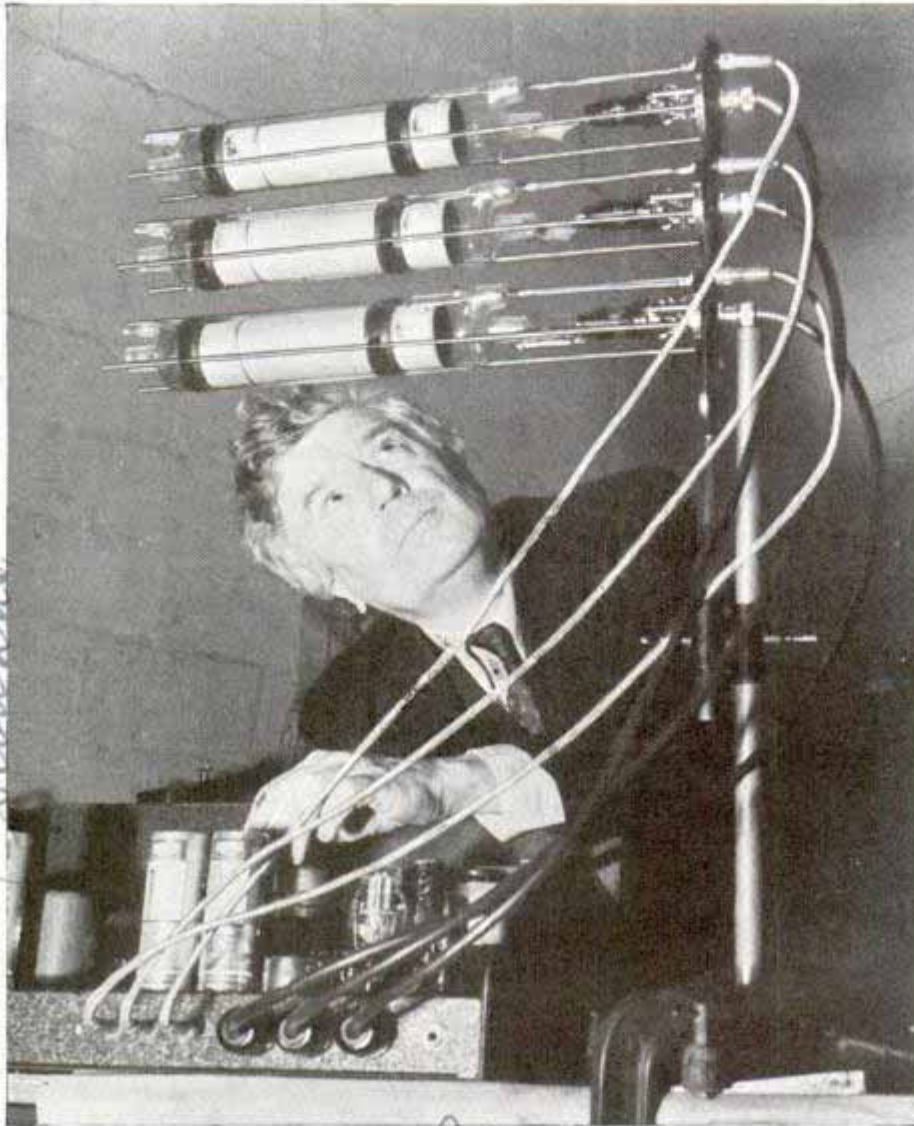
Mural paintings in colors that seem to surpass nature in vivid beauty flash from tiny Kodachrome slides in giant twin-eyed projectors to an enormous screen 187 feet long on the semi-circular wall of Eastman Kodak company's New York fair exhibit. Each one-inch frame appears seventeen feet wide, magnified 50,000 times in area. Sound and music accompany the pictures, changing constantly for twelve hours daily

Eastman Kodak Co., Rochester, N.Y.

Cosmic Ray Trap Sets Alight New York Fair

Forty-year-old rays from the star Arcturus helped inaugurate Chicago's Century of Progress Exposition by turning on its lights on the opening night in 1933. New York world's fair officials assigned that honor to cosmic rays for their 1939 show. To put the cosmic rays to work, they are collected in a Geiger counter machine which attracts and records the passage of the rays. They set molecules in motion in the gas-filled tubes; these molecules exert a force on electrons which build up enough energy to actuate a vacuum tube that turns on the electrical mechanism to light the fair grounds.

Cosmic rays captured in Geiger trap activate molecules in gas-filled tubes and build up electron energy which is used to turn on lights at fair

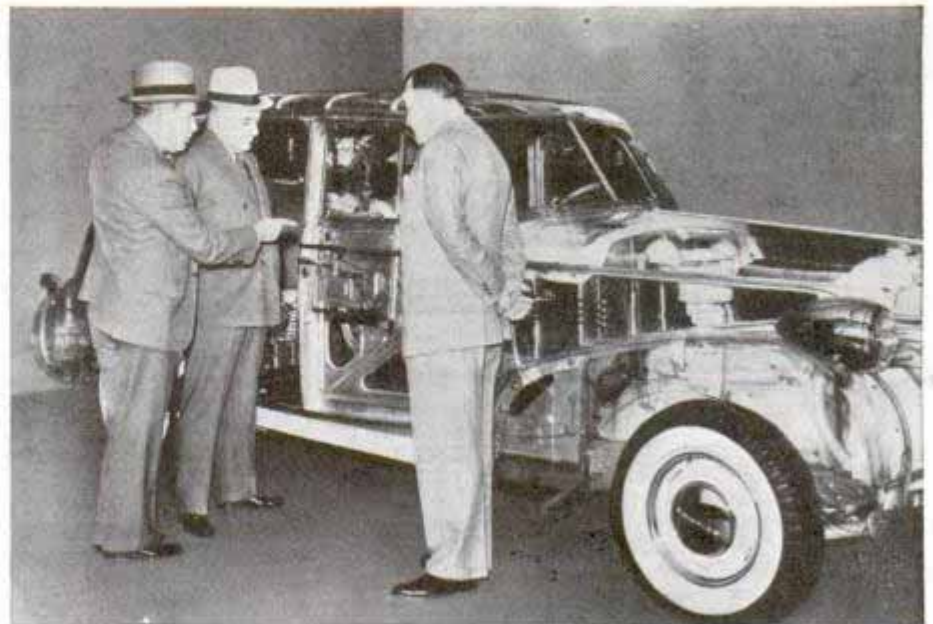


general Motors. Portiers. deluxa 6 / Quiet by Dr. W. F. L. Swanlin

9500 acme.

Auto Made of Glass and Plastic Provides "X-Ray" View

Glass and transparent plastics from roof to fenders, a "phantom" automobile at the New York world's fair reveals the sturdy body construction and interior bracing of the modern car. A crystal-clear synthetic plastic forms the body panels, hood, roof and fenders so that the structural steel parts and all the working mechanism — engine, doors, windows and ventilators—are seen as if in an X-ray picture. The car could be driven on the highway on occasion.



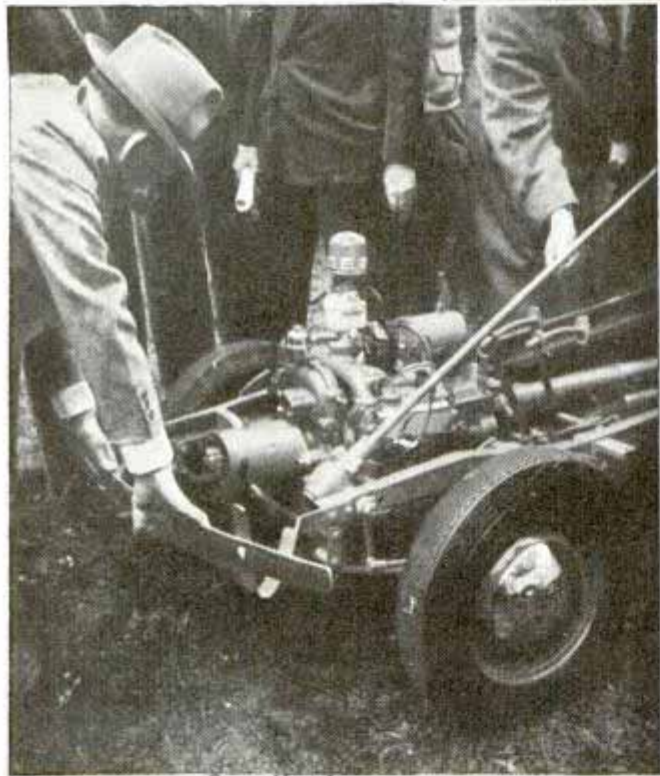
Body panels, hood, roof and fenders of "phantom" car are made of transparent synthetic plastic so that structural frame and motor are visible

Two-Cylinder Engine Drives Economy Car

Designed to average fifty to sixty miles per gallon of gasoline, cruise comfortably at forty-five miles an hour and accommodate four passengers, an entirely new economy automobile has been introduced by the Crosley Corporation. Weighing only 925 pounds, the car is powered by an air-cooled, two-cylinder engine. It has an over-all length of 120 inches, a



Crosley car with four comfortably seated. Left, view of the motor and front of chassis. The motor is air-cooled and has two cylinders



height of fifty-six inches, a tread of forty inches, has a four-gallon fuel tank and an oil capacity of two quarts. Power is transmitted to the rear wheels by a direct drive through a torque tube without use of universal joints. The four-wheel mechanical brakes, cable operated, are a new development pioneered in the aviation field. Having no riveted linings, the brakes give twice the braking surface of neutral or two-shoe brakes and can be relined by simply removing the wheel and inserting a length of brake lining in the brake drums. Front springs are semi-elliptic, rear springs are one-quarter elliptic and four shock absorbers are fitted. Safety glass, adjustable driver's seat and strongly constructed channel section frame are other features.

Six-Gun Attack Bomber Carries 800 Pounds of Bombs

Six machine guns packed into the Vultee attack bomber just delivered to the army air corps for trials make it a formidable weapon in the sky. The ship carries 800 pounds of bombs. An all-metal monoplane manned by a crew of three, it is driven 240 miles per hour by a fourteen-cylinder radial air-cooled engine.



This heavily armed attack bomber has a speed of four miles a minute

Richmond Indiana
back cover
May 1911
See ad inside
Hartford Conn
Acme
of a - 1/2 powered by wash

Cont. James M. Sweeney 431 W. 60th St. New York, N.Y. 10019
1580

Streamlining the HIGHWAYS



Left, Riverside Drive in New York demonstrates highway grade separation of cloverleaf type used at heavily traveled intersections. Above, same spot illuminated at night

opportunities for accidents could be designed out of our streets and highways.

Out of the maze of traffic surveys conducted within recent years, there has come a new type of road construction that automatically compensates for the driver's mistakes while eliminating many accident factors.

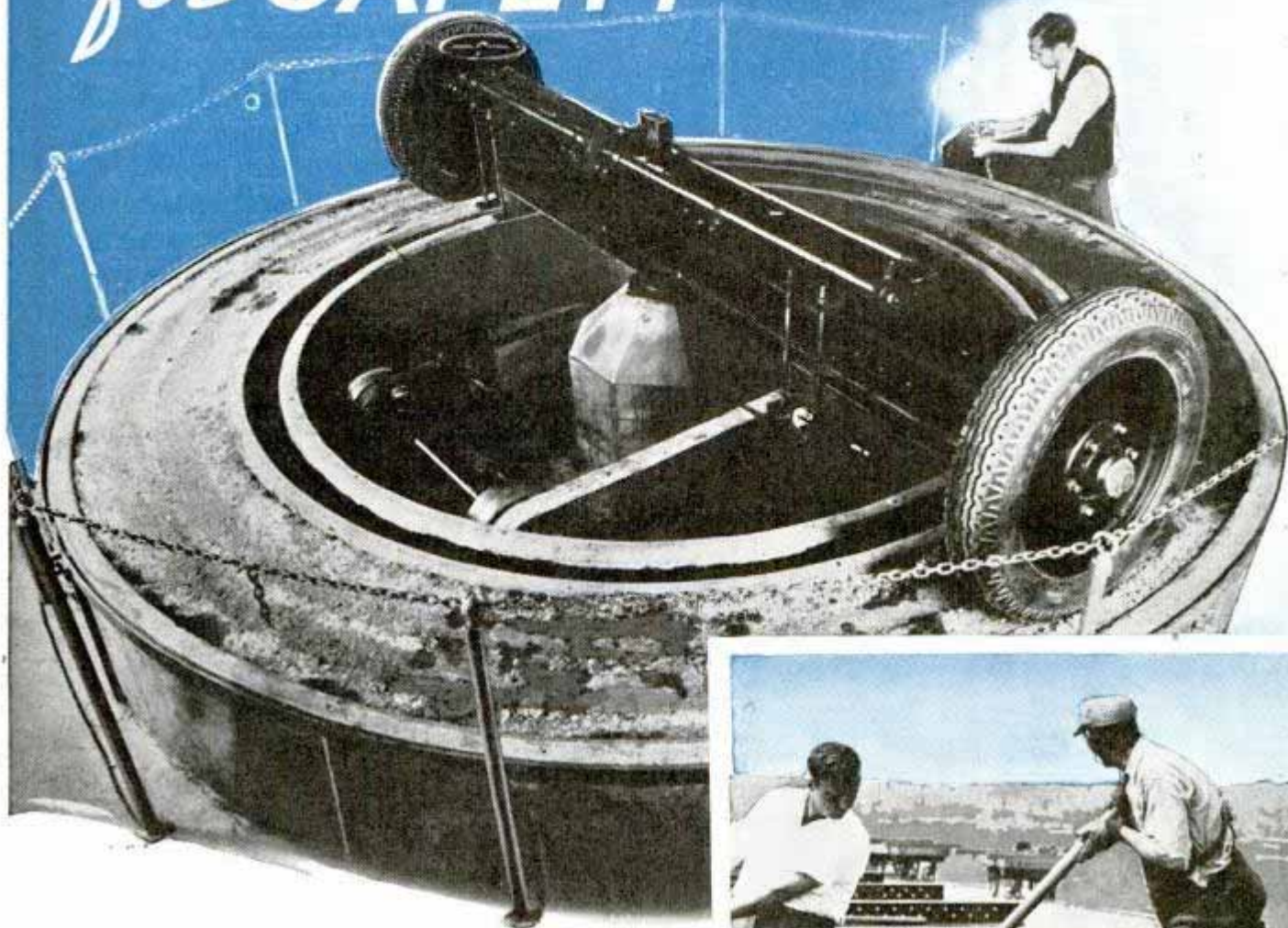
NO LONGER does America have to wrinkle its brow over the complexities of modern traffic. Slowly but surely, the traffic engineer has been getting the problem in hand.

From his years of research amid motor-car exhaust fumes and policemen's whistles and his careful study of thousands of highway-accident reports, the specialist in this field sees faulty road design as the tap-root of our accident evils. If unlimited funds were available for road building, he is confident ninety-eight per cent of the

Such roads cannot be adopted generally for the same reason everyone doesn't own a yacht, so the traffic engineer is largely concerned with incorporating the safety element into our roadways as is physically and economically feasible. The newer engineering safeguards are beginning to bear fruit as they were a prime factor in effecting a twenty-per-cent decrease in vehicle fatalities last year—an approximate saving of 8,000 lives.

Functionally, at least, a major portion of our roadways belong to the horse-and-

for SAFETY



Top, testing qualities of low-type road surface in U. S. Bureau of Public Roads laboratory. Center, dividing concrete highway by moving slabs laterally with aid of compressed air in fire hose. Bottom, automatic traffic counter aids in highway planning

buggy era. In other words, motorcars capable of speeds up to eighty and ninety miles an hour are being operated on roads that were designed to carry light traffic at maximum speeds of between thirty and thirty-five miles per hour. And to complicate matters, a high percentage of the country's forty million drivers have only twenty-five-mile an hour capabilities.

Streamlining of roadways to meet the exacting requirements of present-day trucks, buses, and motorcars has been advocated for several years by Dr. Miller McClintock, head of the traffic bureau



at Yale. Whenever a city falls victim to creeping paralysis of traffic congestion, he can prescribe a sound remedy with the certainty of a family physician treating a case of measles.

The friction theory he formulated while analyzing Chicago's traffic muddle of a few years ago has become the principal working tool of traffic engineers everywhere. Every accident that occurs can be classified under one of four general types of friction.

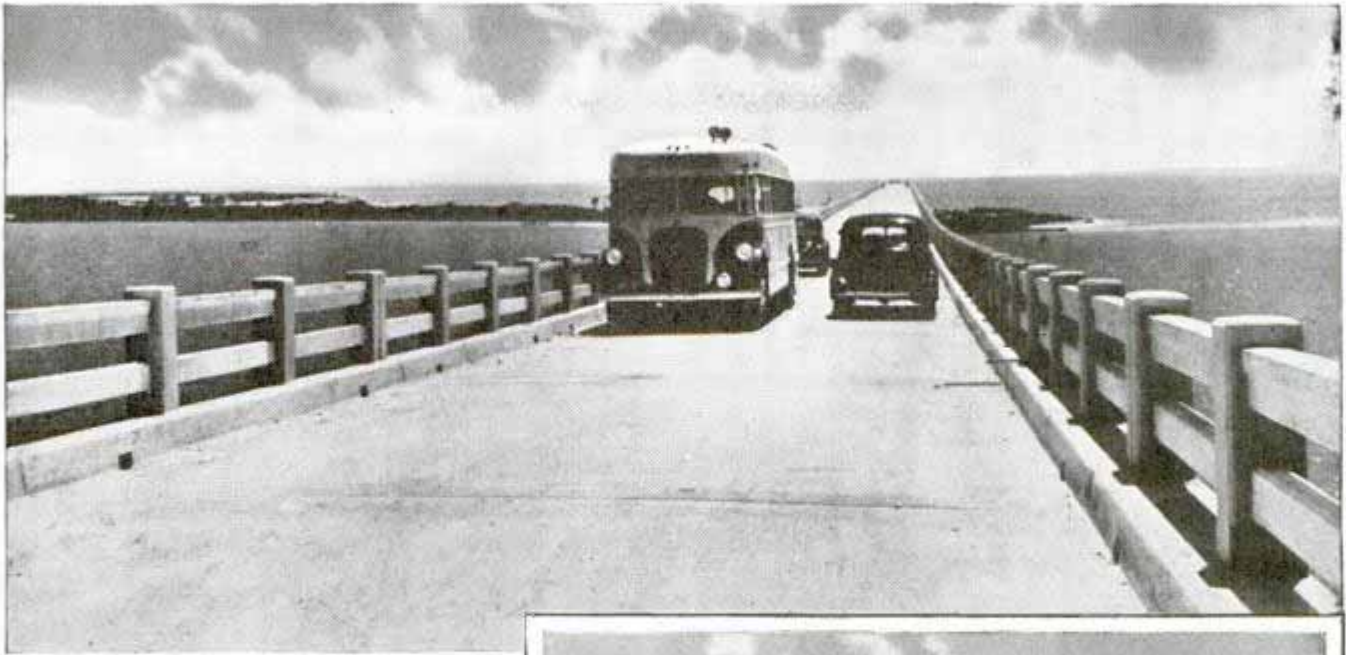
Streets and highways carrying traffic in both directions in the same roadway give rise to what McClintock calls medial friction—the rubbing together of traffic streams moving in opposite directions. There is a constant temptation for one stream of cars to overflow in the path of those going the other way.

Where traffic streams cross, that's called intersectional friction. It is the underlying cause of the most exasperating traffic tie-ups and the front page crashes.

If all the motorcars kept in their own lanes and moved at the same rate of speed, there wouldn't be any internal stream friction, the engi-

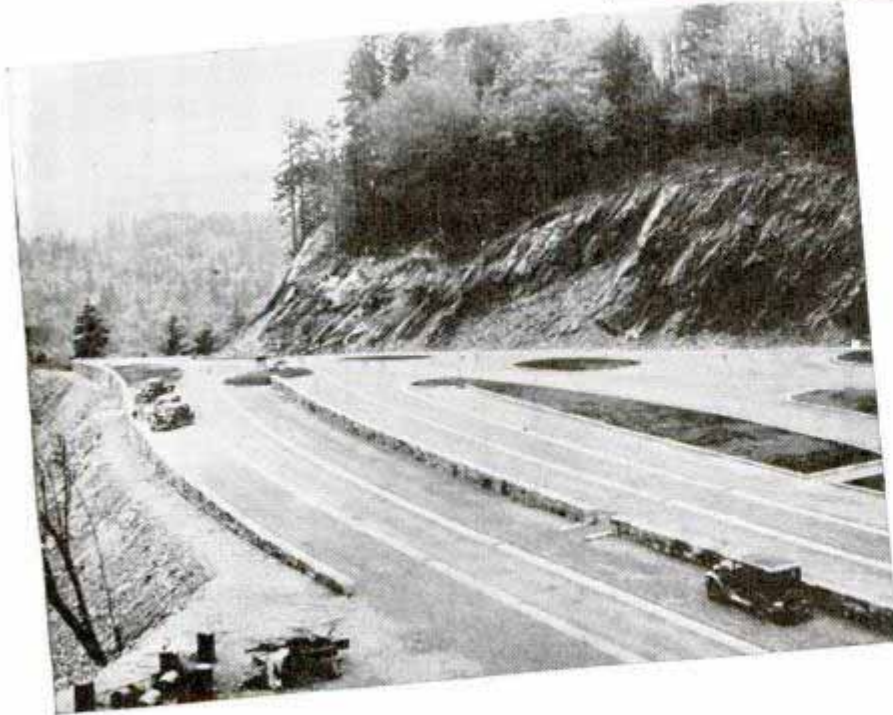
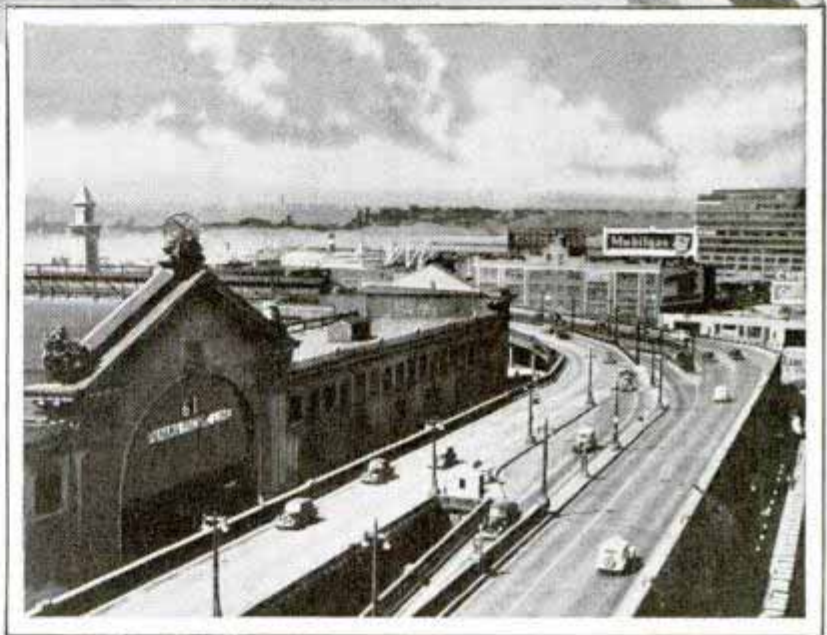


Top, portable device used to weigh trucks. Center, elevated routes with opposing streams of traffic minimize chances of accidents. Bottom, divided roadway helps reduce accidents



neer's way of referring to rear-end collisions and fender brushings occasioned by cars cutting in and out of their respective lanes. Forty per cent of all accidents can be laid on the doorstep of internal stream friction.

The pedestrian who steps from nowhere directly into a car's path, the delivery car that bounces onto a thoroughfare from a driveway, the parked car, and the car pulling out



Top, overseas roadway to Key West, Fla. Center, elevated highway in New York. Bottom, roadway with special parking space

from the curbing are conditions giving rise to marginal friction, the cause of twenty per cent of the accidents.

The road designed by the Yale traffic expert which makes it difficult for a motorist to go wrong when faced with some emergency thinking is the "limited way." It calls for a separation of traffic streams by a center mall, ten to thirty feet in width, creating one-way traffic on double roadways and precluding head-on smashes and side-swipes. Intersectional jams and crashes are erased by means of grade separations, over and under passes, and clover-leaf detours for making turns.

(Continued to page 130A)

Tomorrow's America Modeled in 'Futurama'



the latter being in operation on the highways. The "futurama" gives the beholder an illusion of seeing a panorama of the city of tomorrow from a high altitude as though peering from the gondola of an airship. One of the cities is complete with air terminal, private landing fields, and a base for handling seaplanes; a zep-



Above, visitors riding in sound chairs see what world of tomorrow will look like. Below, scale-model air terminal on outskirts of large city

Dramatic views of tomorrow's countryside unfold in a vast lifelike scale model at New York World's Fair. The thrilling innovations, designed by Norman Bel Geddes for the General Motors Highways and Horizons exhibit, cover 35,738 square feet and extend for a third of a mile on several levels of the building it occupies. Seated in moving sound chairs, visitors hear the voice of one describing the different scenes as they gaze upon more than 500,000 miniature buildings and houses, 1,000,000 trees and 50,000 motor vehicles, about 10,000 of

pelin base includes a hangar resting in a pool of oil so it may be turned to meet any wind direction.

Army Plane Speeds at 575 Miles in a Power-Dive Test



This plane turned nose earthward at terrific speed of 575 miles an hour

at Montreal.

In a test before Canadian air force officials a new fighter-bomber plane was reported to have hit a speed of 575 miles an hour at the end of one of its power dives. The ship is powered by a 750-horsepower Pratt and Whitney Wasp Junior motor.

Hartford, Conn.

Wittbold Studios
Clark Churn

Constructed by George
1505

2511

Test pilot George Ayde

club.

Television Trouble Shooter Has 648 Worries

Trouble shooters in the television studio will have plenty to think about if something goes wrong. The General Electric transmitting station will have 648 vacuum tubes, every one of them essential to a television broadcast—and failure of any one of about 400 would cut the sound and pictures off the air. Frequent tests, of course, will minimize the chance of program interruptions. The tubes range from peanut to melon size, the largest being the big funnel-shaped tubes in the television camera. Most expensive of the tubes are those in the transmitting tower twelve miles from

Schenectady
my



At left are some of the 648 tubes involved in the complicated task of broadcasting television. They range in size from the big camera tubes to the midget held between fingertips. Above, one of the costly water-cooled tubes which do the real work of transmitting

the Schenectady studio; fourteen of the 163 tubes installed there cost three times as much as all the rest put together. These costly ones are the twelve-inch water-cooled tubes that perform the actual work of transmitting the broadcast. Television requires more tubes than ordinary radio

broadcasting because of the extremely complicated circuits needed for synchronizing purposes in the transmitter. Because of the larger number of tubes in the transmitting apparatus, however, the receiving sets can be simplified. Ordinary broadcasting takes less than 100 tubes.

Sun Heat Trapped and Stored in Solar Silo Would Be Used as Needed

Using a solar heater, of the focusing mirror type, invented by Dr. Charles G. Abbot, secretary of the Smithsonian Institution, it is proposed by Dr. F. G. Cottrell, Washington scientist, to capture surplus sun energy that is now wasted and store it in underground silos as trapped heat. The silo

would be a deep, concrete-lined pit filled with loose, dry sand and capped with a heat insulator like glass wool, according to a recent report of the institution. Heated air pumped through pipes from the solar heater into the silo can be withdrawn by a second set of pipes whenever needed.

2440

Washington D.C.

Quayle Service
Washington D.C. 1939

3904 *Washington D.C.*

FLYING



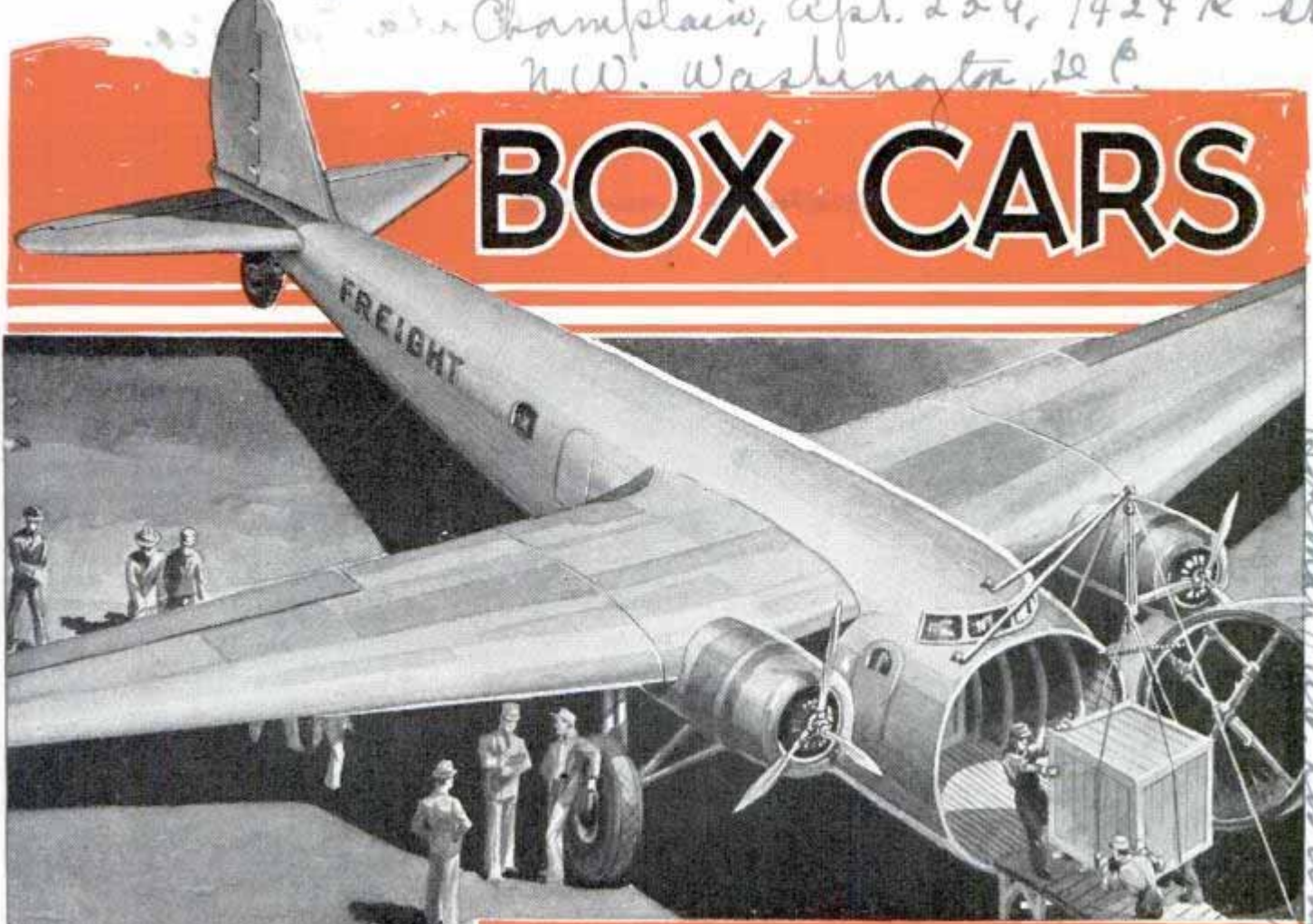
2563
L EADING the rest of the world in air travel, the United States lags far behind other countries in the companion service of hauling freight by air. Last year domestic air-express companies transported more than 7,000,000 pounds by plane but this figure was easily beaten, even in Canada where much larger quantities of goods are shipped by air.

This picture, it seems to aeronautical leaders, is going to reverse itself in the next few years. They think many times the present tonnage eventually will be moved by air. Large numbers of cargo planes designed as box cars

Above, drawing shows how Benny Howard's freight-carrying plane is loaded, with hinged tail swung back. Circle, loading express into compartment in the nose of an air liner

Champlain, Apr. 22, 1924, 1424 R. W. Washington, 20 P.

BOX CARS



will be droning along the airways. Even dairy products, fish, and early vegetables and fruit will be moved regularly by air.

Trucking concerns in the midwest and east are studying the advantages of moving rush orders and perishables by cargo plane. Without advertising their interest, the air lines are keeping in close touch with developments.

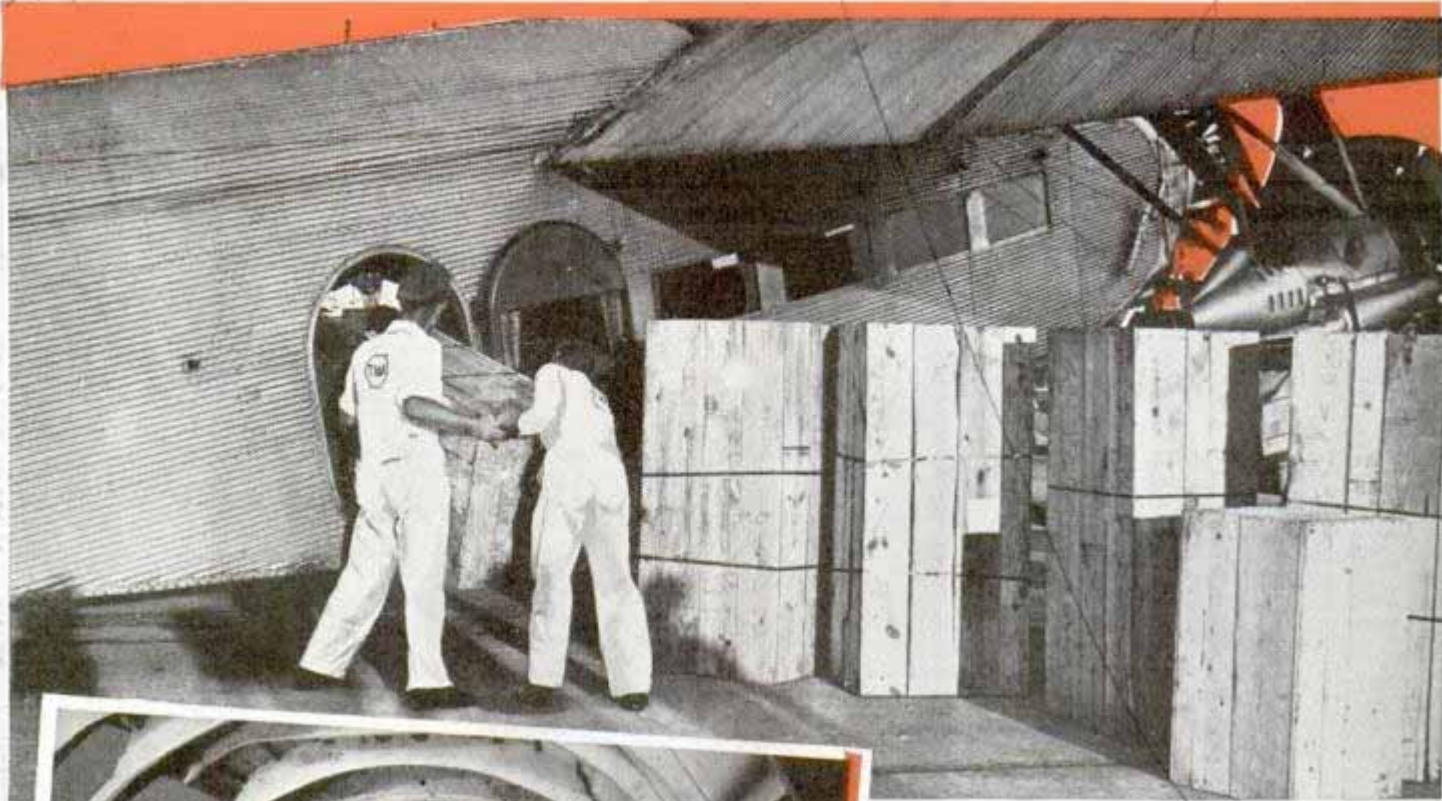
One reason why air freight has been slow to grow in the United States is that surface transportation facilities are already reasonably fast and dependable. Again, shipping by air today is expensive because shippers have to pay for space on de luxe air liners. In other parts of the world rail and truck services are either less satisfactory or are completely lacking. Lumber

and coal are hauled by air in Alaska and logs and livestock are transported by plane in Central America simply because ground transportation takes too long and is relatively expensive.

The move to put wings on the commonplace box car got its start in part from the demands of air-freight operators abroad. These fliers have been using outmoded

Island Central Air
Top, showing how the Charles Babb plane would be loaded, with nose of ship open. Below, lobster shipment arriving by air for a middle western hotel *Snake*

*also Thomas & Stephens, Jr. 1955
terminal
celebrate. Calce*

Santa Monica
Calif

Top, loading a flying box car with heavy consignment of machinery. Left, interior construction of Douglas "DC-5," which is capable of carrying a three-ton load.

Bennie Howard, well-known test pilot and designer who anticipates a boom in sky freighting. "The limousine can carry a fair load but its costs are high. It can't compete commercially with a truck built for such service. Air freight is lagging today because efficient cargo planes are not available."

American equipment, Fords, Fokkers, and Curtiss transports retired from passenger service in this country and modified for freight handling. Today this equipment is wearing out and there is nothing to replace it. Air liners retired from domestic use today are too expensive, land too fast, and are otherwise objectionable to demands of heavy cargo runs in frontier countries. What they want, the freight operators declared, is a new airplane specially designed to move heavy loads at minimum cost and capable of landing in make-shift fields.

"Hauling cargo in a converted passenger plane is about the same as yanking out the seats and boarding up the windows of a limousine to convert it into a truck," says

At present Howard is getting ready to market something new in aerial transportation, a sky truck that is designed to compete on a dollars and cents basis with fast surface transportation, moving cargo in much less travel time with only a small premium for speed.

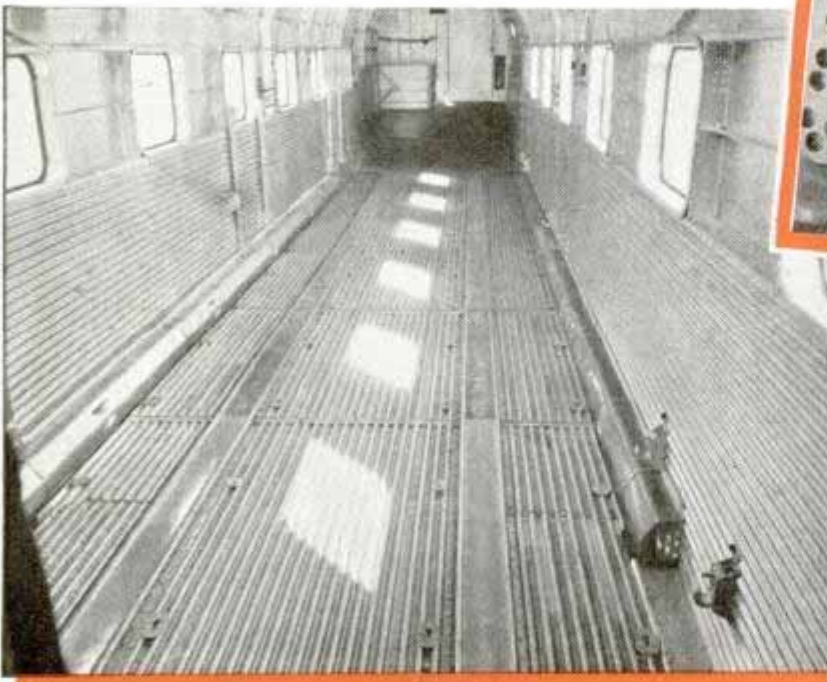
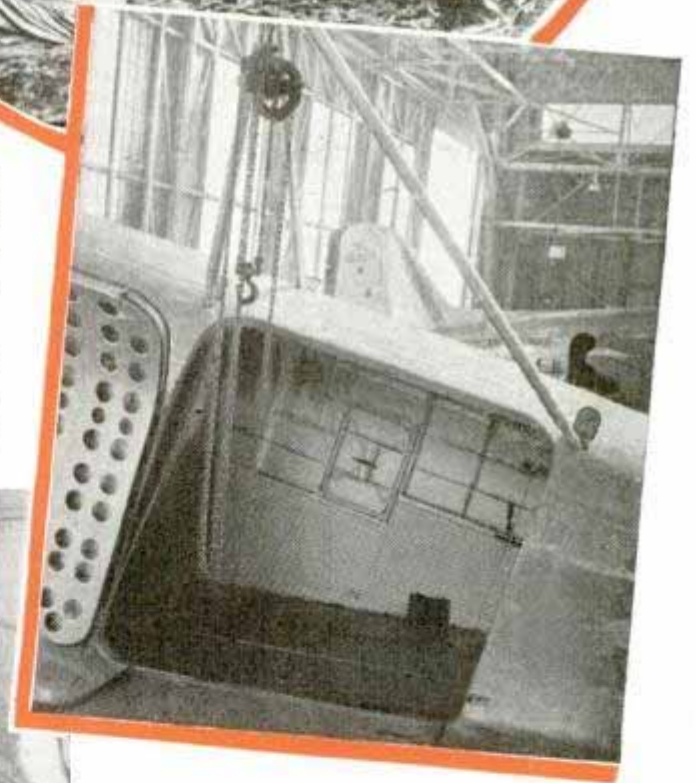
Howard estimates that in a flying box car of 8,000 pounds cargo capacity the cost of shipping by air can be brought down to one and a half times the cost of express shipments by rail, only a fraction of what it costs to ship by air today. Including pick-up and delivery, this rate would meet operating expenses, overhead, and equipment write-off charges with the plane carrying less than half its capacity. This tentative rate rests on an estimated airplane

operating cost of thirty-nine dollars per hour, or twenty-six dollars per 100 miles of flight. This in turn breaks down to a basic rate of something like three-thousandths of a mill as the cost of flying one pound of cargo one mile.

"The flying freighters will do much of their work at night," Howard says, "because their existence will depend partly upon their ability to make over-night deliveries to points that can't be reached in the same period by train. This rules out short hauls of less than 500 miles.

"The flying freight will be faster and more dependable than the present air mail because the planes will be of a single-purpose type and will not be grounded by weather conditions that hold up the mail when passengers are booked for the same plane."

Howard's freight plane design is a high-wing monoplane with tricycle landing gear, of eighty-foot span and powered with two

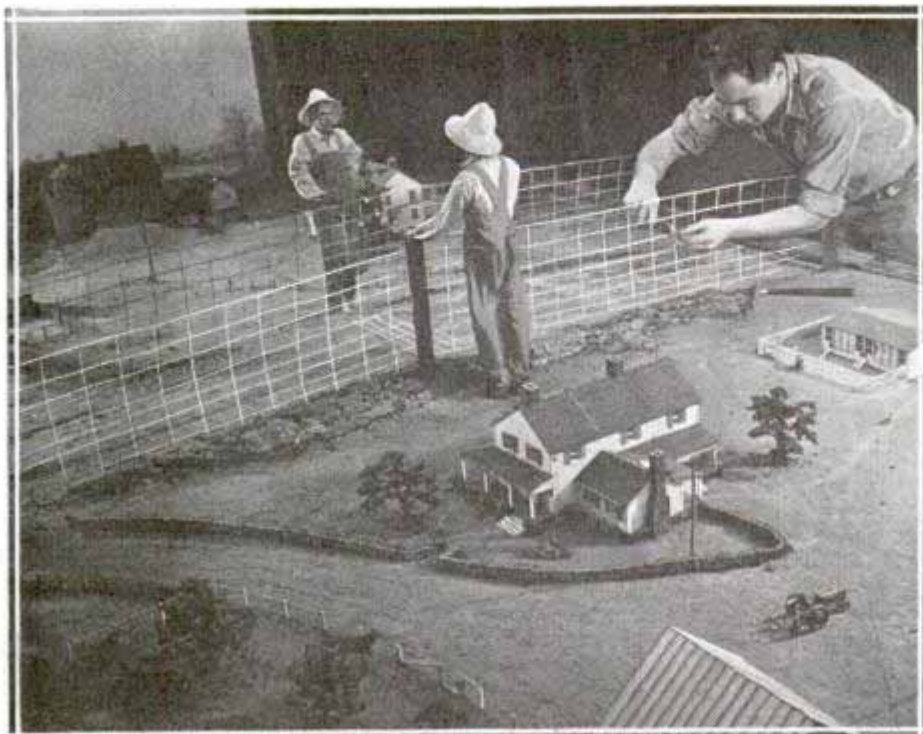


750-horsepower Cyclones. The wing is of the so-called plastic type, made of wood veneer and phenol resin for long life and cheap repair costs. The fuselage consists of a welded steel-tubing frame sheathed with dural in front and fabric toward the stern. Landing gear is non-retractable. Radio equipment is necessary since the plane would do much of its work after dark. The plane is designed to cost about \$65,000.

The most revolutionary feature of
(Continued to page 114A)

Top, attaching food package to army bomber. Released, it floats to earth by parachute. Center, wide cargo door of Douglas freighter. Bottom, tracks and cargo tie-downs in the flying box car. Note large space for the load

Electricity as Farm Servant Described by Talking Model



Gossiping over the fence two farmers in animated exhibit reveal advantages of employing electric power as a helper to do many daily tasks

Benefits obtained by using electricity on the farm to perform many daily chores, are placed in striking contrast with old-fashioned methods in the Westinghouse rural electrification exhibit at New York World's Fair. The exhibit portrays two miniature farms, and their tiny animated owners engaged in a lively discussion. One of the farmers employs outmoded ideas and does most of his work by hand, whereas the other uses electric power. During a five-minute dialogue, made interesting by lip movements and gesticulations of the models, the more progressive neighbor reveals how electricity milks his cows, operates the corn-sheller, tool grinder and saw, and fills the silo. The housewife, he explains, uses electric power to run the refrigerator, kitchen range, vacuum cleaner, dish washer, ironer and water heater.

Liquid Rock Applied with Brush for Waterproofing Walls

Basement walls can be waterproofed and building exteriors of concrete, brick and stone types given a strong protective covering with a dry compound that is applied with a brush. Stirred into water, this mineral and aggregate compound forms a liquid stone that is flame-repellent, and proof against moisture, acid and electrolytic ac-

tion. Muslin strips soaked in the liquid rock can be wrapped around water lines, refrigeration and steam pipes, forming a rock-hard coating within a day. Available in white and five colors, it can be applied without expert help. When brushed on porous surfaces such as concrete, plasterboard, stucco, unglazed tile and stone it becomes a part of the original surface; it cannot be used over paint, wood, metal, glass, or oily or glazed surfaces unless applied with muslin.

Wheel Chair Driven by Battery Costs Little to Run

In an electric motor chair with four-ply jumbo tires on its tricycle wheels you can ride thirty miles for about twelve cents. It is driven by two fifteen-plate auto starter batteries which, at ten miles an hour, run thirty miles per charge. The chair is especially designed for aged and disabled persons.



"Wheel chair" designed for aged or infirm persons is driven by automobile batteries

San Francisco Calif

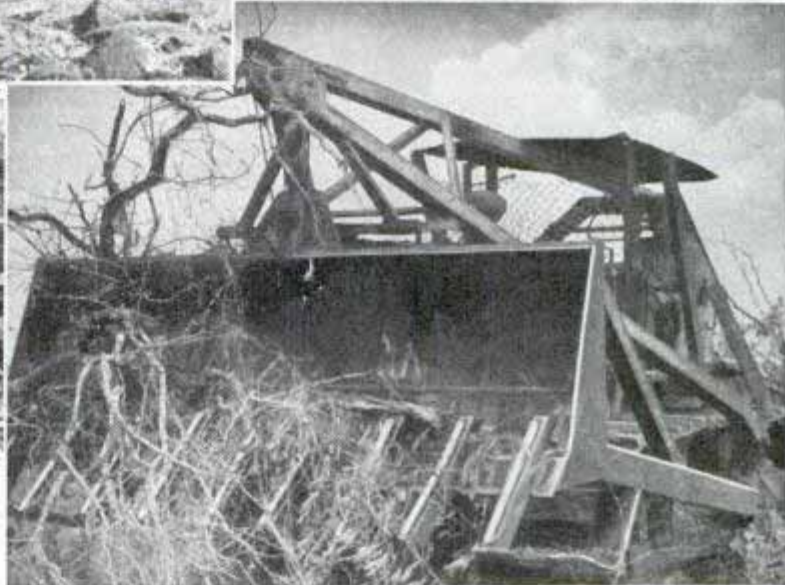
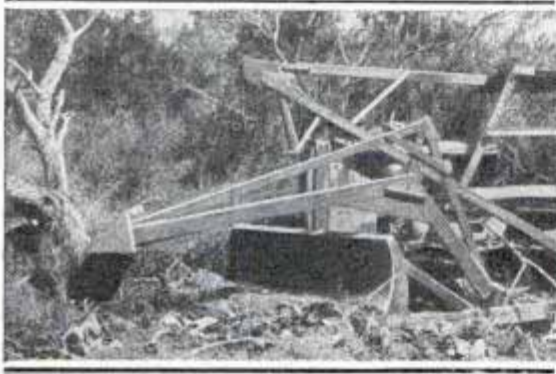
475
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44
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Electric Chair
Electric Chair

Proria. Ill

Diesels Help to Conquer Mesquite "Jungle"

Right, tractor with sharp-nosed ram held aloft clears small brush off land with heavy blade. The tractor is Diesel-powered



Top, left, plowing after tractor has pushed over mesquite tree (bottom, left) and swept debris into piles (bottom, right)

For clearing land quickly, development companies are using Diesel-powered equipment in South Texas. A mighty tractor equipped with a heavy blade for moving brush and a sharp-nosed ram for uprooting large mesquite trees do the work in a fraction of the time formerly required for removing the "jungle" growths which

originally covered a large part of that region. Early methods of preparing the land for agriculture called for a crew of laborers to attack the mesquite trees, catclaws, retamas, prickly pears and various cacti with machetes and axes. Discovery that the land was valuable for growing citrus trees brought a demand for faster work.

4-434

Room Comfort Can Be Read at a Glance with Rotary Thermometer

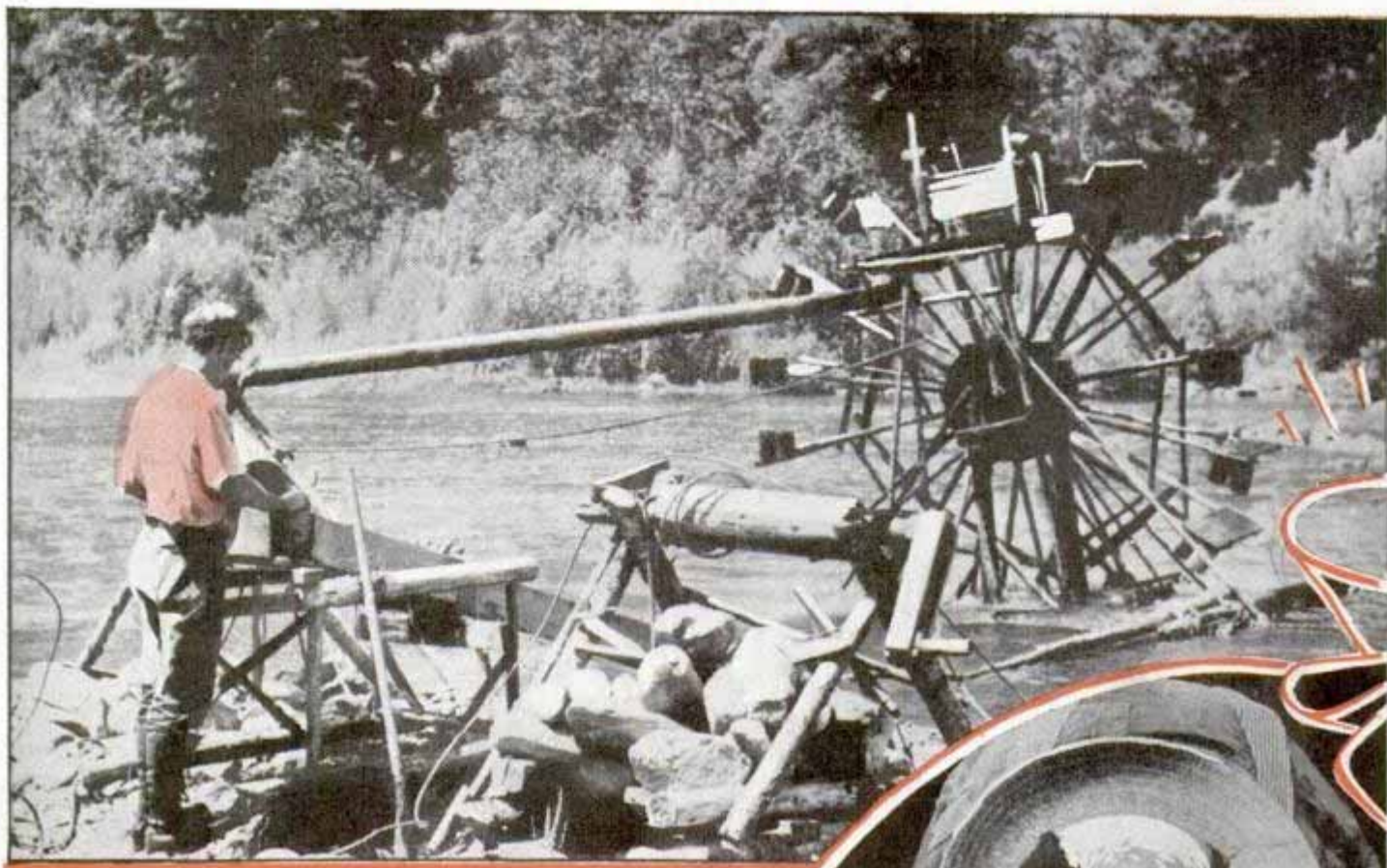
Combining the principles of both the thermometer and hygrometer, an instrument now on the market not only gives both the temperature and relative humidity in figures, but also indicates whether or not a healthful and comfortable relation between the two exists. Two revolving drums working side by side tell the story. So-called health zones, determined by experiments in room comfort, are plotted in black opposite each other on the drums and anyone can tell quickly by comparing them if the reading is within the comfort limits. The instrument registers with precision and needs no adjustments.



Carson Mfg Co. 1611 N. W. 10th St.

Harold Wise, Grants Pass, Ore. N 155

GOLD *is* WHERE



Above, homemade outfit with which two to four dollars worth of gold per day was taken from a river bed. Right, panning for gold. Bottom, cleaning out gold from sluice box

By Dr. P. G. Worcester

Chief of the Department of Geology
University of Colorado

to ridder Cold
EXPERTS agree that the days of the old-time, sour-dough prospector are about over and that modern scientific prospecting is necessary to keep up the present gold production, but after all, gold is where you find it. Do not get the idea, however, that all you have to do to make your fortune is to start digging in your own back yard, for if you do, you probably will be disappointed.

Gold was discovered in Colorado in 1858, and it was not an accident. A party headed by the Russell brothers came out from Georgia with the avowed purpose of finding gold, and they found it. Their discovery led to the great "Pikes Peak or Bust" gold rush of 1859 and 1860, when thousands of men from the East came to Colorado. These gold hunters spread all over the state, prospected all the creeks for placer



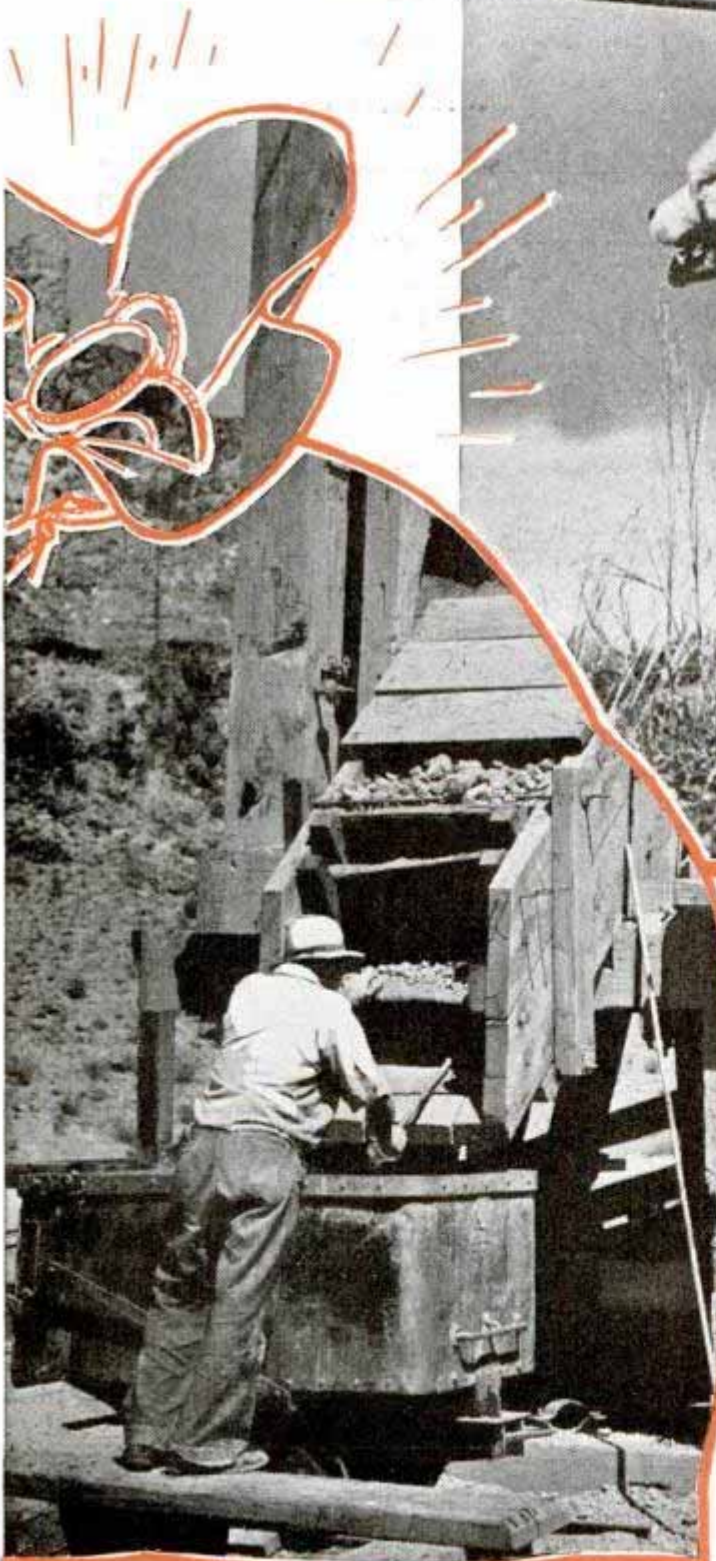
Manhattan, Nevada

You FIND IT

Right, typical old-time prospector. Bottom, ore coming from chute at a reclaimed gold mine



*Yuba
near. Early
mine
Canada*



Tom Reed gold mine

gold, and traced the "colors" to their source in the veins situated in scores of different localities.

One would think that in this great gold rush all the mining districts of the state would have been discovered, but this was not the case. The world-famous Cripple Creek district was not discovered until 1891, and then largely by accident.

Bob Womack went to work for a large cattle company whose ranch covered most of the region. His duties were not very heavy, and he spent his spare time prospecting. He uncovered a few veins that carried some gold, but in most cases he did not even bother to have assays made, and although he staked out some claims, he did not take the trouble to record them. One

Bullcock Run shaft

California in 1848. They found the Comstock Lode near Virginia City, which has produced nearly \$400,000,000 in gold and silver, and discovered gold in several other districts, such as Leidy, Montezuma, Manhattan and Tonopah. Yet gold was not found in Goldfield until 1902. Even then the first prospectors did not recognize the values of the gold-bearing formations, and the district was all but abandoned. In May, 1903, someone made a rich "strike" and the boom was on. Within three years the town of Goldfield grew from nothing to a city of 15,000 people, with more than fifty mining companies operating in the district.

small discovery led to another. Finally, other more intensive prospecting was done, rich ore was found, and fortunes were made. Between 1891 and 1938 this famous old camp produced more than \$375,000,000 in gold, and it is by no means through.

Western Nevada was crossed by thousands of prospectors in the fifty-year period following discovery of gold in Cali-



Top, scene in reopened gold mine. Circle, recent mining operations at Central City, town abandoned after gold supply apparently had been exhausted. Bottom, old-style hauling method in Colorado

San Juan Mountains

Records of some of the values found at shallow depth are almost beyond belief. One group of claims, known as the Bowes-Kermach lease, netted for some time more than \$10,000 a day. Before the lease expired, early in 1905, the claims had produced more than \$1,000,000 in gold. It is estimated that within three years more than \$2,000,000 was stolen from three mines. Miners turned down wages of twenty dollars a day to work in undeveloped mines and accepted four or five dollars a day to work in mines where the



Top, modern miner wearing mask and running electric locomotive. Left, couple working on flume in hunt for gold. Bottom, using dry washer in old river bed

ore was exposed. Between the discovery date and 1936, Goldfield had produced values amounting to more than \$87,000,000, and it is still going strong with an estimated production of \$680,000 last year.

At the Red Arrow mine near Mancos, Colo., on the west side of the Laplata mountains, a discovery contrary to all geologic principles was made in 1933. The rocks of the region are thick-bedded sandstones, limestones and shales. There are no igneous intrusions near by that might account for the ore. Geologically it

(Continued to page 122A)



April 14, 1939

Mobile Ram Pounds Street to Break Up Old Pavement



Dots on pavement are marks left by the hammer as it moves along, the distance apart being regulated by speed of the truck

To prepare the way for a speedy removal of old pavement, highway engineers use a mobile battering ram that crushes the bricks or concrete. Mounted on a truck, the 2,500-pound steam-driven hammer pounds the pavement like a pile driver, striking eighty blows a minute.

Madison Combrack G. Edwards

Letters, Numbers on Warplane Are Key to Type of Fighter

Army and navy planes have a code of their own. Glance at the letters and numbers on the wing of a fighting ship flying high above your home and, if you know the key, you can tell whether it's a pursuit plane or bomber, observation or patrol ship, and whether it is on duty or still experimental. Letters refer to the type, numerals to a particular model. Usually a higher number means a more recent model, although this rule is not invariable. Bombers are designated "B." The army's flying

2-473

fortress is the B-17; when it was given superchargers for high-altitude flight it became the YB-17A, the "Y" meaning it was on service test and the "A" indicating it was slightly changed from the original flying fortress. Pursuit ships are marked "P" and an "X" is added if the plane is still in experimental stage. The XP-38 is the twin-engined army fighter that hopped from coast to coast recently at 400 miles an hour. The BT-9 is a basic trainer for student pilots, the BC-1 a basic combat ship. Attack planes are marked "A," observation planes "O" and cargo carriers which transport personnel and supplies are designated by "C."

One Trigger Fires Camera and Gun at Same Time

Police can photograph the fleeing criminal with the same gun they fire to bring him down. Big game hunters, with a single pull of the trigger, fire a bullet and "shoot" the animal's picture. The combination camera and gun was invented by a German engineer. The camera is mounted over the barrel, with its shutter release arranged so that firing the gun automatically exposes the film. The photographic "evidence" of the shot helps improve the aim.



Gun and camera are synchronized so that a pull of trigger takes picture and fires bullet

No U.S. agent here

Chicago 4445 N. 8 corner

From J. Peter Combrack

Artist Caricatures Famous Folk with Eggs

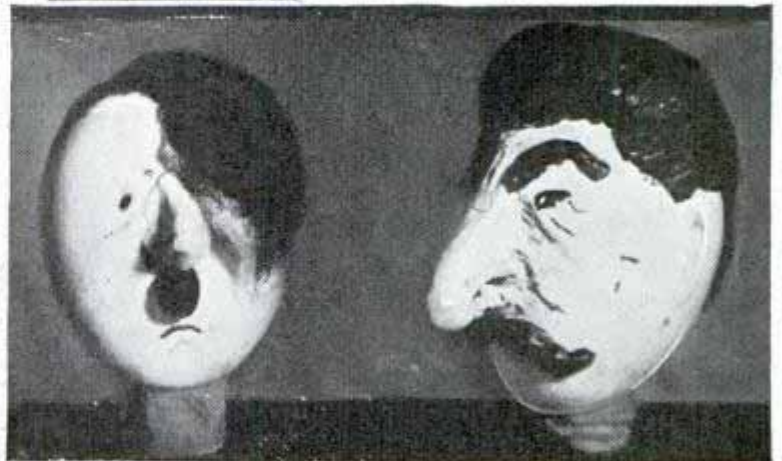
Oldy. 122 E. 42 no. needed



Here's a new recipe for serving eggs. You take an egg, a cup of wax, cotton-wool for dressing and a garnish of sealing wax; blend them in proper proportions and you have—amusing cartoons of the great and near-great. Walter Trier, the artist, is shown above with his paintbrush, completing the transformation of an egg into one of the caricatures on this page



Copious cotton-wool whiskers and eyebrows on that literary egg, at top, identify it plainly enough as George Bernard Shaw, the English writer. At left, a straw hat furnishes the finishing touch to a frowzy, bleary egg you recognize as the artist's conception of Charles Laughton, film star of "The Beachcomber"



Photos © C. Anders & Co.

If you want your egg cartoons to last, they should be hard-boiled like those dictators above, Hitler and Stalin. Or, of course, the cartoonist can use hollowed eggs. At the left is the white-haired David Lloyd George, Welsh prime minister of England in world war times

Bob
Allen
Irvine
Calif.

Model Craftman
Magazine, 110 W 42nd
St New York

RACING the

2 395



Speeds up to forty miles per hour are attained by model speedboats equipped with small engines and entered in regattas held frequently in various parts of the United States. Children's wading pools make almost ideal race courses, since the water is not too deep for the boat owners to handle their craft. The boats range in design from the "engine on a shingle" to beautifully streamline hulls, while the latest power plants include four-valve jobs, with twin carburetion. Delayed action devices, which change engine adjustment after the boat gets under way and thus prevent stalling in launching, are being used. This makes it possible for the boat to start with only part of its power

Edmund Kalpus

Henry Parod's Eleanor



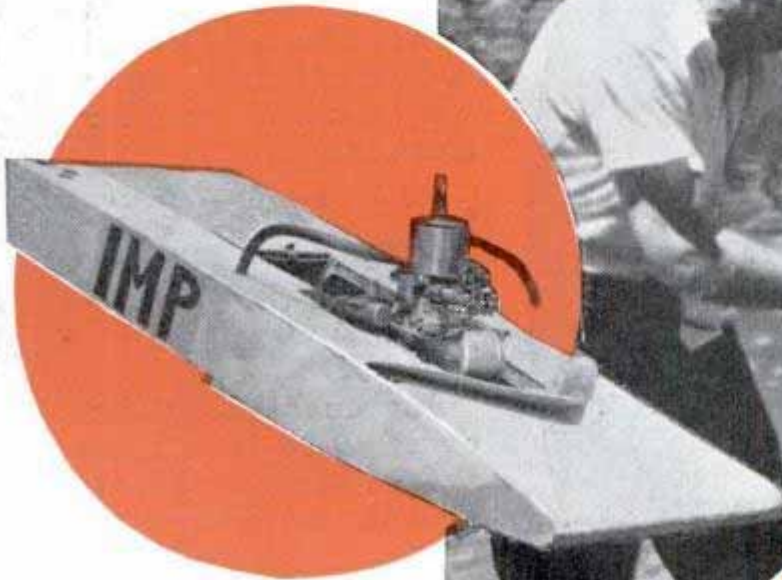
Top, left, "Phantom," record holder. Right, speedster making turn, with line attached to right side of boat. Circle, a flash steamer doing thirty miles per hour. Bottom, starting a boat

H. S. Brailsford's Class A 1

Number 9 395

WATER FLEAS

Right, this is how gas-engine boats are started. Owner yanks rope wrapped around the flywheel, in outboard-motor fashion, to start the tiny power plant



Above, typical Class C hydroplane powered by water-cooled two-cycle engine. Owned by Robert Graham of New Jersey, it will do about eighteen miles per hour. Circle, right, Archie Kimmel tuning up his boat. Note cloud of spray thrown up by the tiny propeller. The engine is four-cycle, air-cooled



Left, Walter Joss of Detroit blowing out an obstruction in one of the feed lines of his steam-powered boat. Many tricks are employed by builders to get more speed. The highly polished bottom of "Phantom" is partly responsible for its speed

Biggest way mechanics supply

Food Sold in Rubber Balloon Will Not Dry During Storage

Alway Chemical Co Cambridge



moves air within the package thus drawing the wrapper close to its contents, after which it is heat-sealed. Immersion in warm water or application of warm air then shrinks the bag to its original size, giving a lustrous, transparent covering. The food then is frozen. Meat preserved and stored in this manner has remained fresh for more than a year.

Explosives Truck Rides on Ten Big Tires

For cushioning the shock when its wheels strike a bump, as well as for aiding movement over marshy land, a truck designed for transportation of explosives is equipped with ten large tires. There are two tires at the front and four on each side of the explosives compartment. The tires help to "float" the truck over marshes through which the truck travels in carrying explosives to aid in the search for oil.

Sleevy

Quick-frozen foods are prevented from drying out while in storage by the development of transparent, vaporproof rubber balloons in which they are wrapped before being subjected to the freezing process. This also protects the contents against contamination in handling, and the rubber, consisting of compounded latex which has no sulphur in its makeup, does not impart any foreign odor or taste. The bags are supplied in any size or shape to accommodate various products, and in applying a balloon it is stretched over a wide-mouthed box and distended by either filling it with air or withdrawing air from the box. With the food inside the bag, a vacuum hose re-



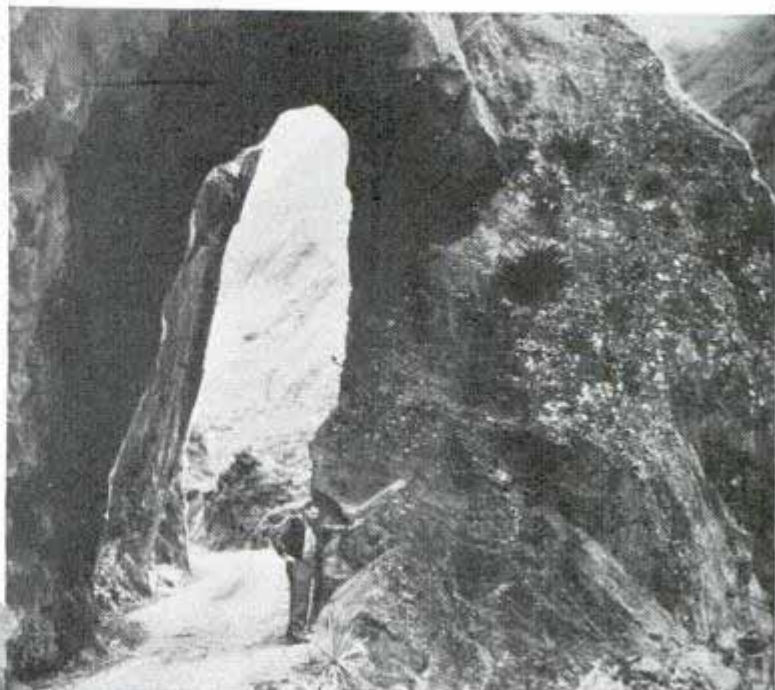
Here's how the big tires support truck as it travels through marshes

Truck used by Continental

7900 Gas. Campaign
Habitat much

'Highway in the Sky' Climbs over the Andes

Literally a highway in the sky, the road through the Andes mountains in Peru rises at times to altitudes of 10,000 to 16,000 feet. At that height the air is thin, too thin for comfortable breathing and for efficient operation of automobiles adjusted for lower levels. In spots the road is so narrow that traffic is regulated by calendar, all moving in one direction one day and in the opposite direction the next. This is particularly true be-



Top, one of the narrow passages cut through mountainside for the highway. Bottom, left, Dodge good-will truck passing a Llama herd on the road. Right, truck crossing deep gorge

tween Cerro de Pasco and Huanuco, where a truck equipped with dual wheels must remove the outside set to squeeze through narrow places. Often rough as a washboard and tilted in spots at alarming angles, the road passes through country en-

dowed with nature's beauties. Completion of the Pan American highway, linking North and South America, will soon make it possible for motorists from this country to visit the Andes and to travel in safety over this now almost impassable road.

"Rubber" Fender and Plastic Body Challenge Steel in Automobiles

Plastics are making a spectacular invasion of the realm of steel in the automobile industry, and research men are even working toward the day when the entire car body will be molded of plastics. A colorful ceiling of plastic instead of fabric is al-

ready being considered. One company is discussing molding "rubber" fenders, hood and trunk of plastic materials. Plastics are already common in steering wheels and instrument boards, knobs and various decorative parts of automobiles.

Chirina Chanchi says highway Peru

near Croya Peru

Huachaga River

and San Rafael

2496

Business Week April 15 1939

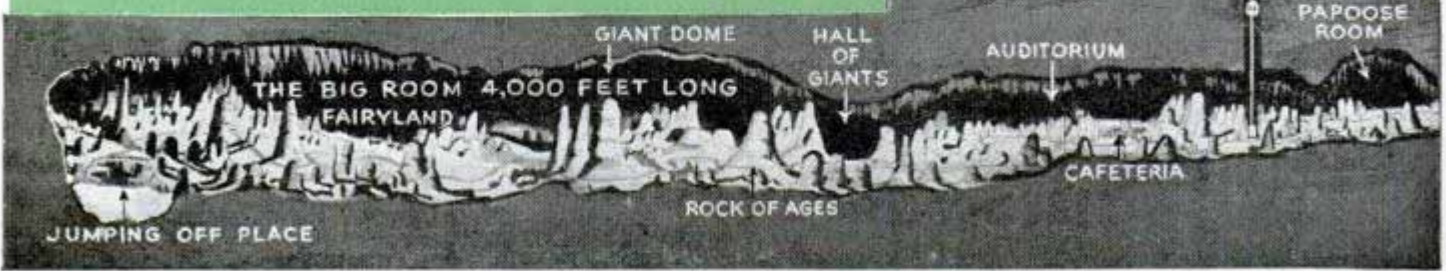
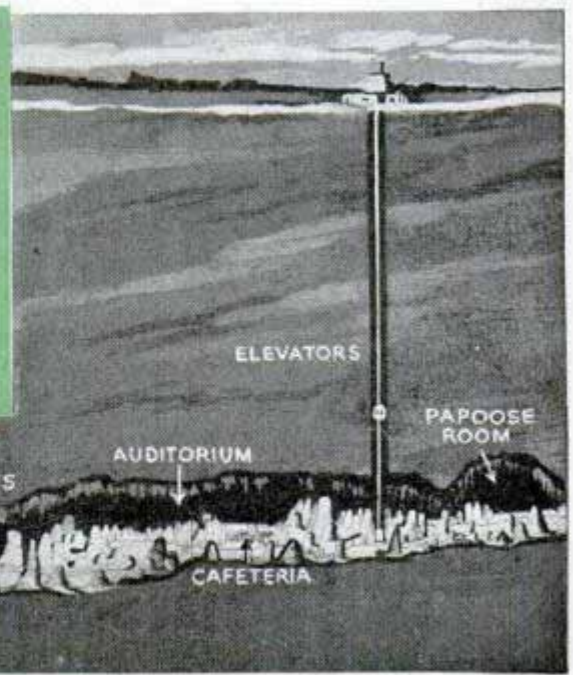
431 W. 60th Terrace
Kansas City, Mo



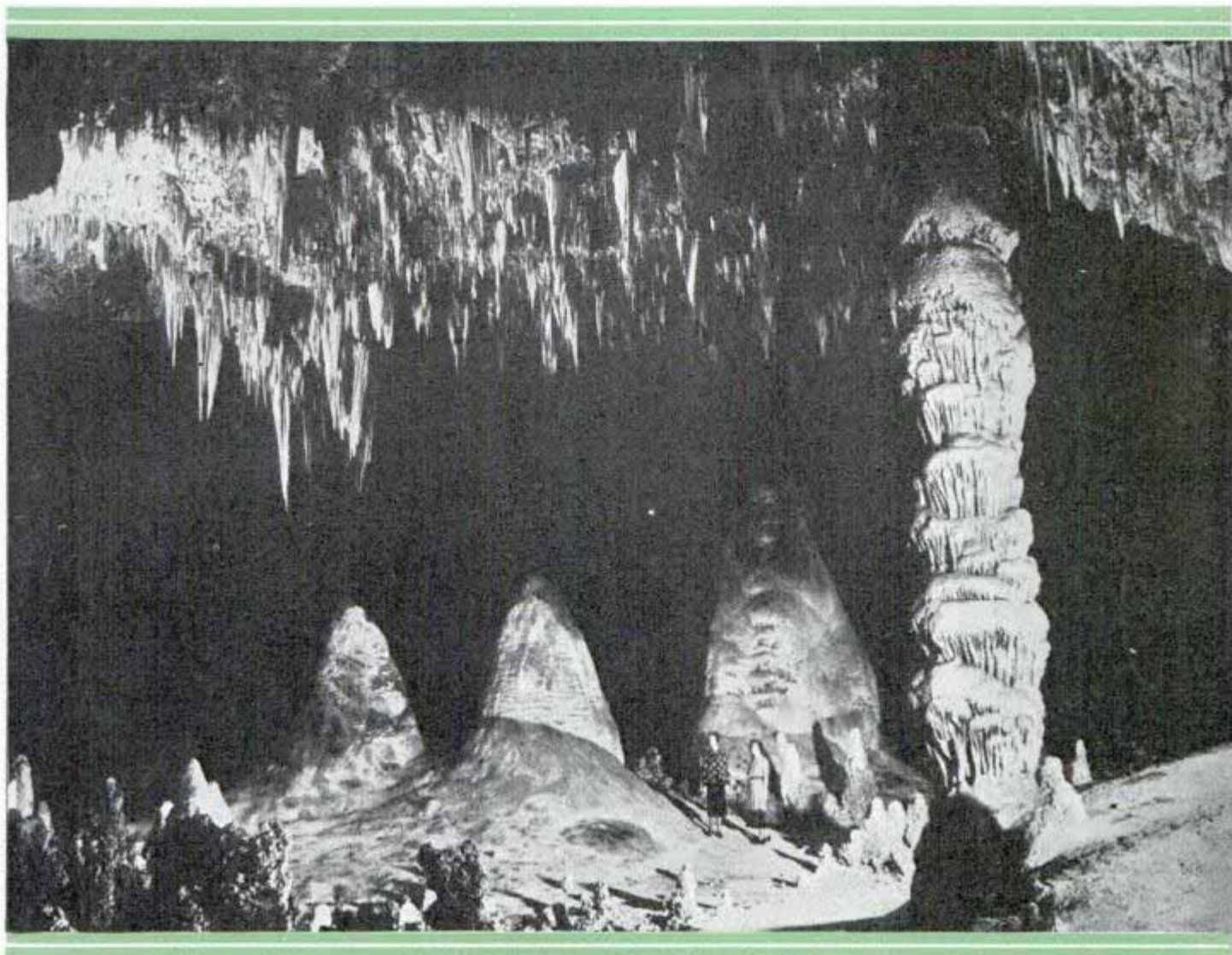
NATURE, the greatest showman of them all, outdid herself on Carlsbad Caverns. For sixty million years she worked in fashioning a fantastic spectacle under the desert of New Mexico, but it remained for modern science to make it accessible and convert it into the most dramatic natural phenomenon in the world.

Discovered shortly after the turn of the century, the caverns received scant attention until they became a national monument in 1924. Even then, tourists who did venture into the underground wonderland found it too wearying to be enjoyable. There were endless flights of stairs to climb and hours of walking over sharp stones and boulders. Its stone treasures were impressive, but many could not be seen to advantage because of inadequate lighting.

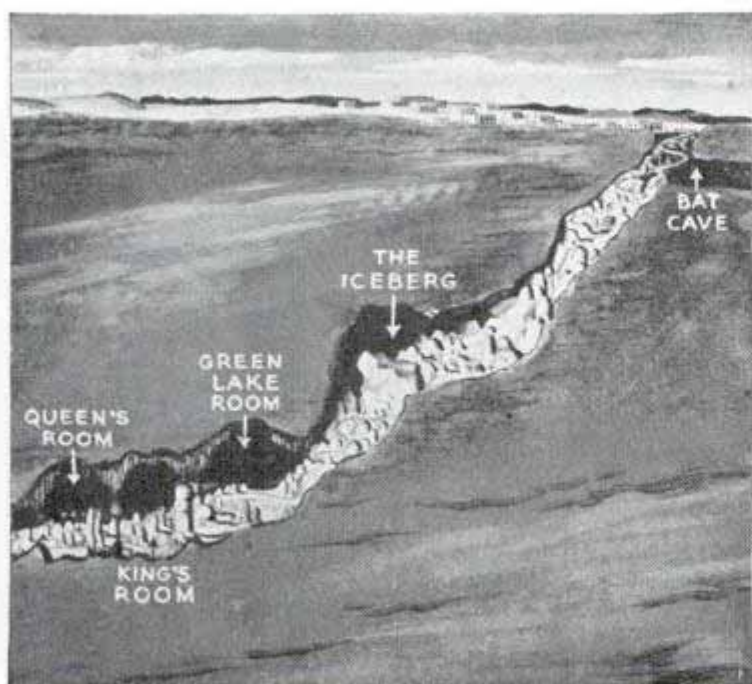
GREATEST SHOW



Top, entrance to Carlsbad Caverns in New Mexico, through which more than 200,000 visitors passed in 1938. Gentle grades and well-made paths have replaced most of the original stairways and two high-speed elevators, seen in diagram of caverns at bottom, bring visitors up the 750-foot shaft to surface

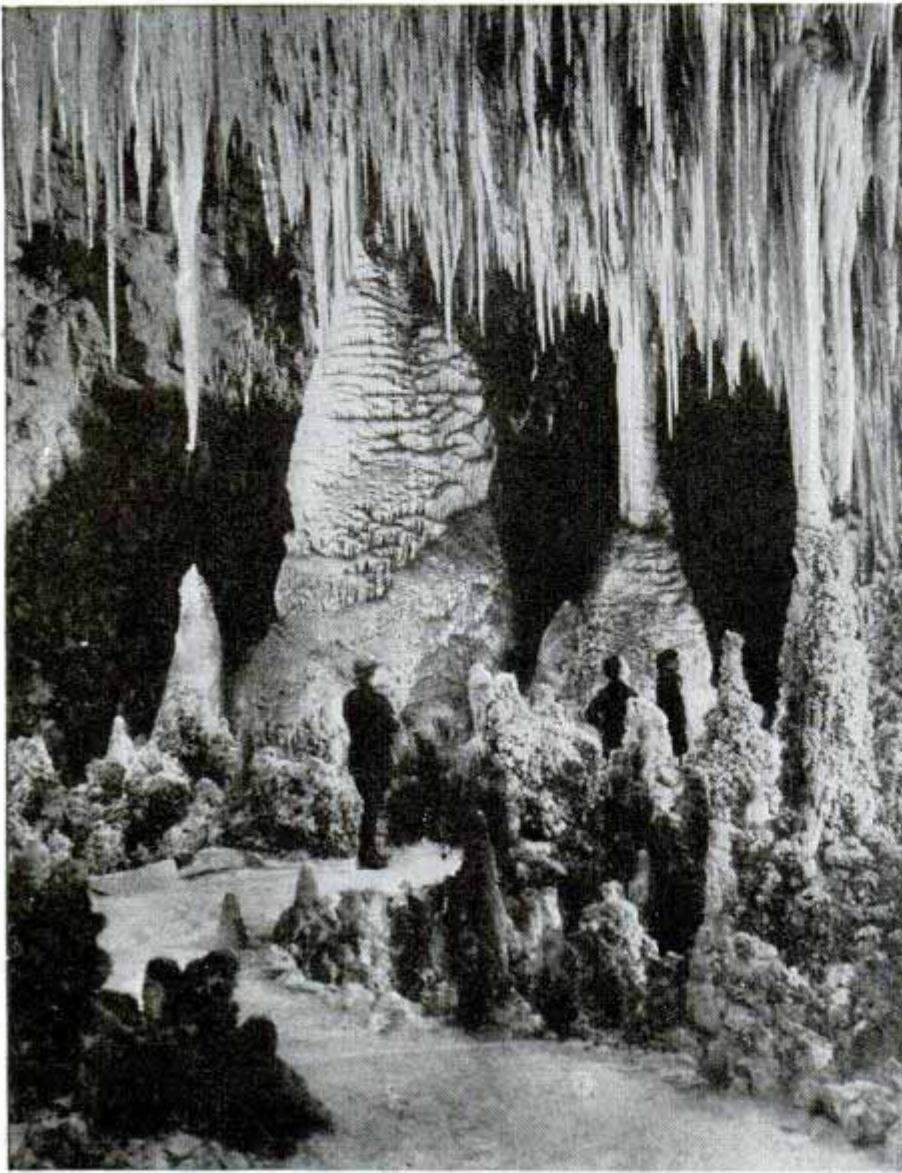


Under the EARTH



Concealed lights accentuate the beauty and delicate natural colors of the myriad stalactites and stalagmites. At top is the "Hall of the Giants"

When Colonel Thomas Boles was named superintendent of Carlsbad Caverns in 1927, however, prospects brightened. An engineer and a veteran in national park service, he saw that with certain improvements the caverns could be made into the greatest show under the earth. He set about to acquaint himself with all the features on the 750-foot first level—the great galleries, forests of stalagmites, stalactites, and helictites, huge domes, grotesque temples, and cascades frozen in stone. He learned there was another level at 900 feet, which had not been fully explored, and a third at 1,320 feet of which little was known. But the development of the known areas was his chief concern. Paths had to be built and wide ramps substituted for stairs wherever possible. The 950 steps leading down to the floor of the cave were reduced to 200, and over well kept trails



No theatrical production ever received greater attention than did the lighting of these formations. The spectator sees their full beauty almost without consciousness of the source lights. Some of the sculptured effects festooning the walls are illuminated to resemble giant jewels glistening in the night. Other beams bring out tints of tan, rose and green.

Methods employed in lighting caves are radically different from those used on other illumination projects, according to W. A. Oglesby, lighting engineer who helped design the Carlsbad system. Each effect has been obtained by trial and error and imagination. An effect may be obliterated

and passageways the five-hour trip can be made with no more discomfort than might be experienced on a shopping excursion. A shaft was sunk eighty-four stories into the bowels of the earth so two high-speed elevators might carry visitors to the 750-foot level in a minute's time. They are regarded as the second-longest single-lift elevators in America, surpassed only by those in the Empire State building.

Floodlighting the seven miles of trails was his next step. Telephones were installed in the lower chambers to connect with the administration building; water was piped from the surface to drinking fountains along the way. In one of the larger cave rooms is a cafeteria.

Engineer Boles could have rigged up an air-conditioning system had not Nature beaten him to it. Instead of the mustiness you might expect, the air is fresh and clean, the temperature remaining at fifty-six degrees the year around.



Top photo courtesy Southern Pacific Co.

Thousands of stalactites in "Temple of the Sun," at top, make it appear like a great ice palace. Below, tourists entering elevator for trip to the surface

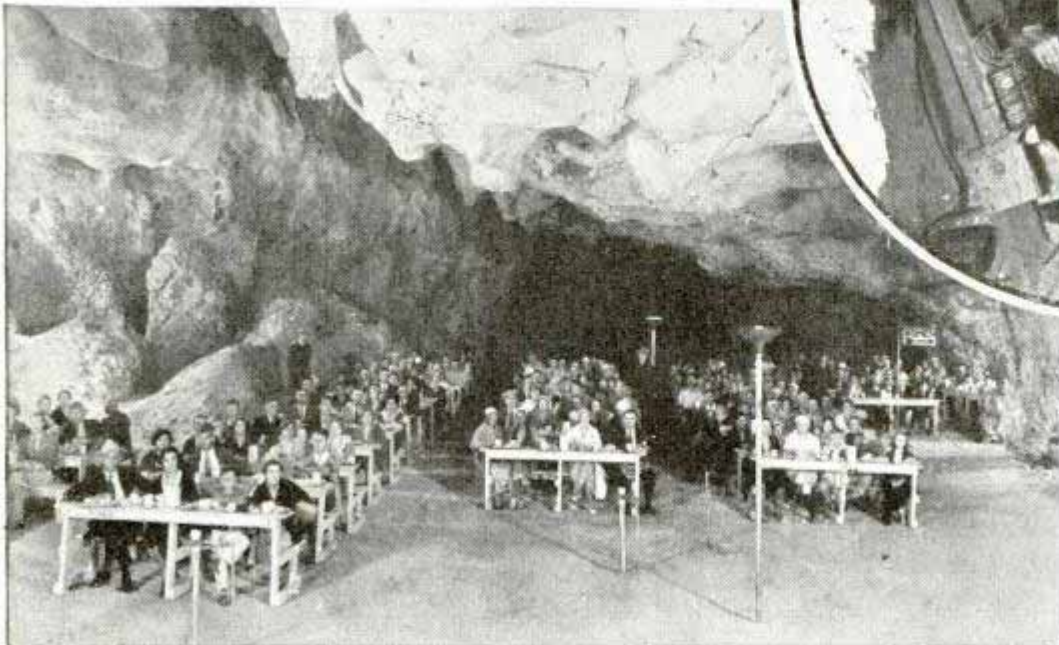
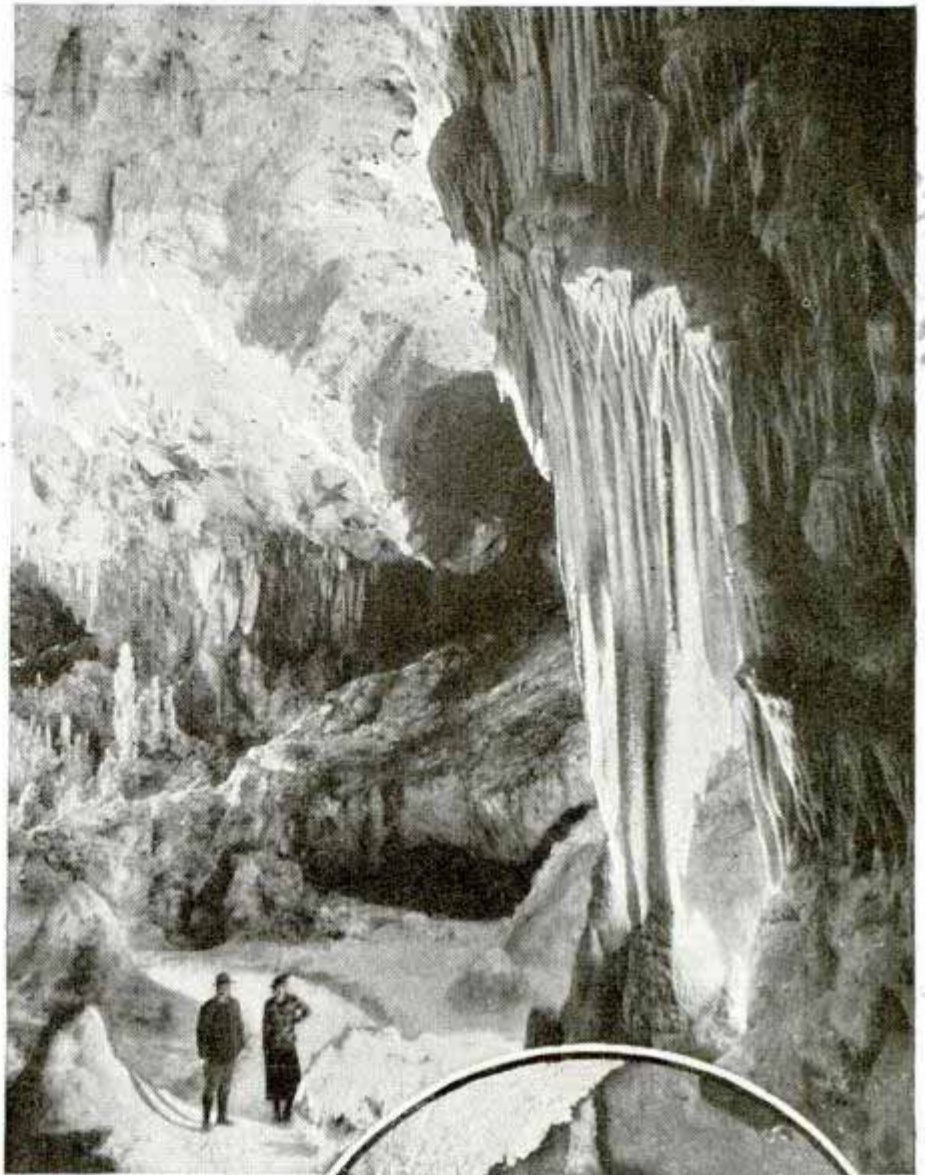
by moving a lamp a few inches one way or another, or by use of unsuitable reflectors.

One experience Oglesby had at Carlsbad illustrates the care that must be exercised. After one chamber had been permanently wired, an excellent scene appeared to be ruined and he and his associates were on the point of ripping out the wiring and starting over when it was discovered one lamp had been installed three inches from its proper location. As soon as this error was corrected, the effect was perfect.

The lighting system is divided into twenty-four sections. As a group of tourists enters a section, the front guide pushes a button and lights flash on for 1,000 feet ahead. The ranger at the rear shuts them off as the last visitor files out. Three and four-way switches have been used extensively. Ample power is supplied by a Diesel generating plant.

Not one of the 500 floodlights ranging

(Continued to page 133A)



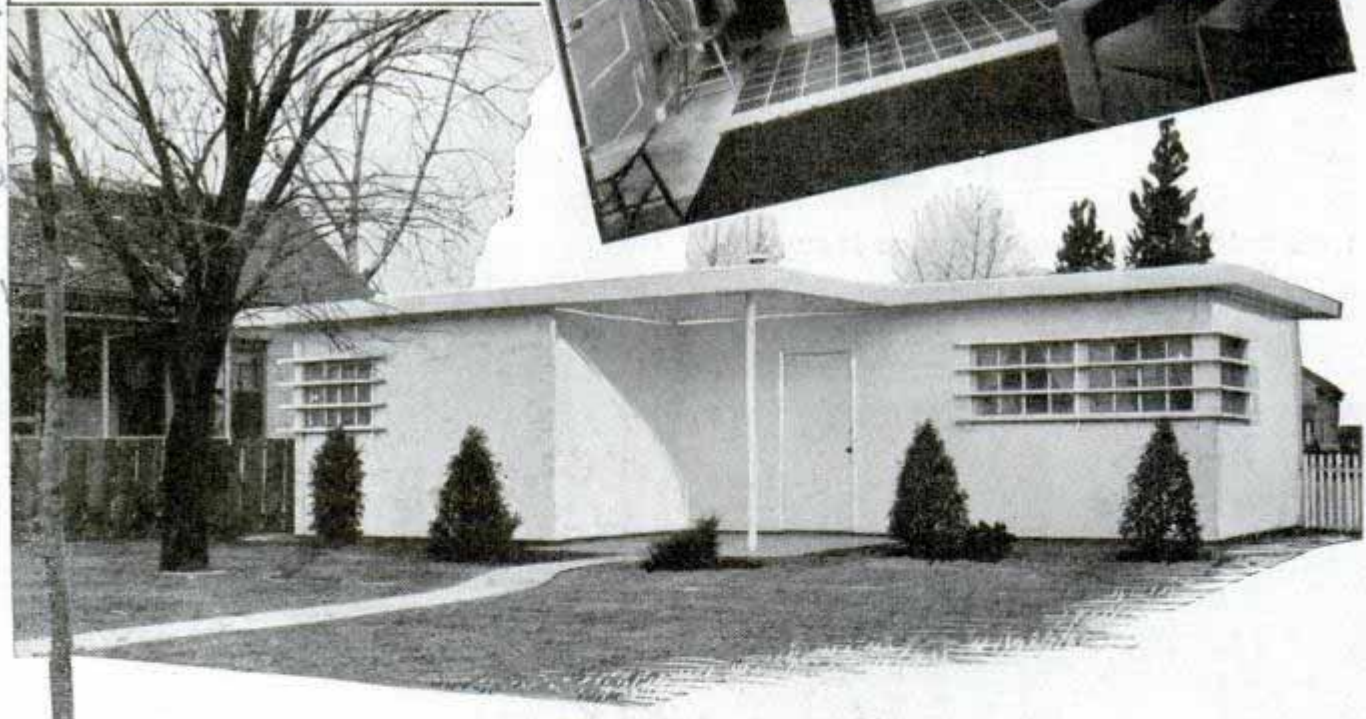
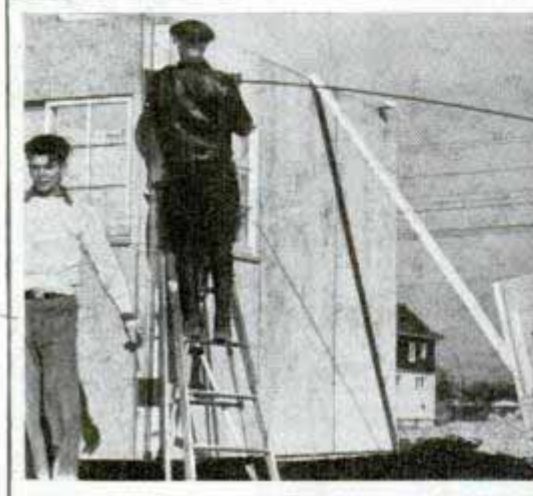
Top, a corner of the "Big Room," 4,000 feet long and 625 feet wide with ceiling as high as 350 feet. In circle, telephones hidden at strategic points enable rangers to handle large crowds without confusion. Left, tourists at luncheon in underground cafeteria, which seats 1,000 and is being enlarged

Housing Authority, 914 - 8

Clinton Park Wayne, Mich

Three-Room Plywood House Is Built in a Day

Comb. Cletus Jurek, 1409 Pemberton
Dwyer Wayne Mich



Upper left, unloading plywood panels at homesite and inserting tie rods in wall. Right, views from both ends of combination living room and kitchen. Below, finished three-room house, built for less than \$900

see letter

For less than \$900 a prefabricated house of plywood can be built in a middle western city. Once the concrete floor is laid over its nine-inch gravel bed, unskilled labor can put the house under roof in an hour and forty minutes, after which the asphalt roofing material is applied and

plumbing fixtures installed. The house is a three-room structure with walls and ceiling panels of phenol-resin bonded plywood nailed and glued to two-by-four framing members prebuilt at the factory and filled with rock-wool insulation. Paper tubes inserted in the panels form channels for

April 18, 1939

tie rods used to bolt the assembled structure together and reinforce it. There are two bedrooms, a bathroom, and combination living room and kitchen. A small "space heater" warms the house and maintains a hot-water supply in the bathroom storage tank. The house rents for \$2.50 a week.

2495

G-Men's Super-Microscope Makes Hair Cell Visible

So powerful that it makes a human hair look as big as your thumb, a specially built precision microscope is the latest weapon of the G-men. In the technical laboratory of the federal bureau of investigation, a single hair clutched in the hand of a crime victim can be compared in magnified form with a hair from a suspect's head. The two hairs are blended optically until, if they match, they appear as one hair. The super-microscope brings out the color in threads so tiny they seem colorless to the eye. The instrument enables investigators to split hairs lengthwise or in cross-section to study their individual cells.

2422

Fighting Bull on Wheels Develops Grace of Movement

For safety's sake, aspiring bull fighters should start training with a bull on two

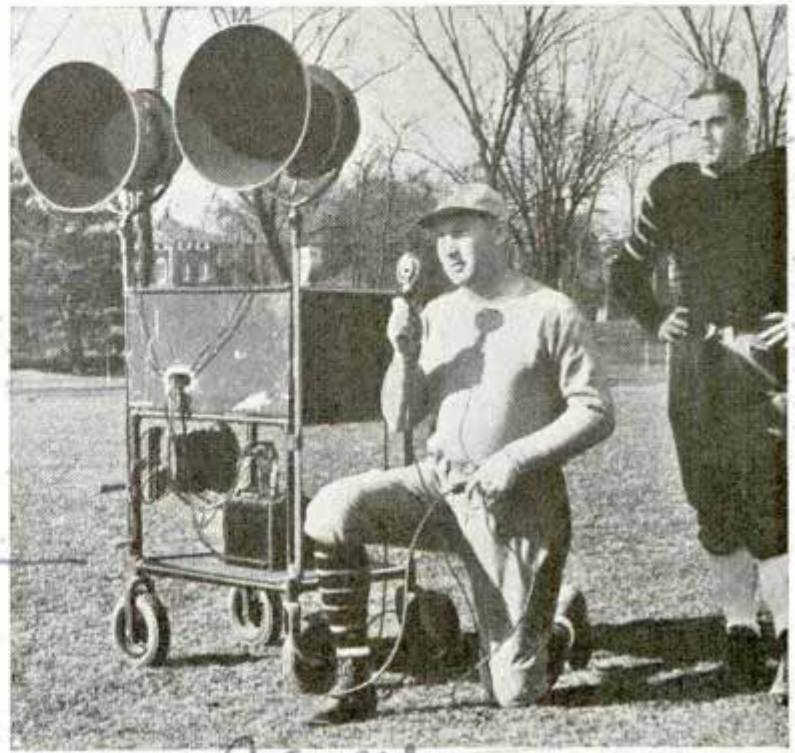
wheels. The head of a longhorn mounted on a two-wheeled truck is used at a school for bull fighters at San Antonio, but because the matador becomes one of the most graceful persons in action, the rolling bull is also used to teach grace of movement. It affords excellent training in footwork for dancers.



Practicing footwork and grace of movement with aid of two-wheeled bull

Conducted by Edwards

Loud Speaker Helps Coach Talk to Players on the Field



Coach directs football squad by talking into microphone of voice booster as he watches players go through maneuvers

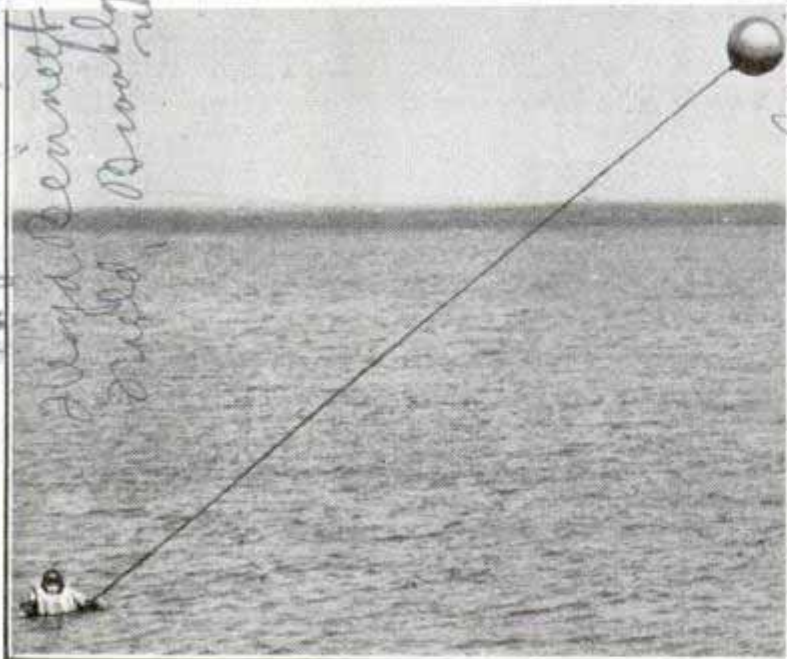
To save his voice and yet be heard by football players in all parts of the field, a coach has added a portable loud-speaker system to his equipment. The rolling amplifier permits him to move about the gridiron during practice sessions.

Em. L. Edward. Denver

Gasoline in Saskatchewan must be white if less than sixty-five octane, red above seventy-five octane, and green or blue between sixty-five and seventy-five; purple denotes gasoline for agricultural use.

Auto Index

Balloon Guides Rescuers to Pilot Down at Sea



Top, "rescue balloon" fastened to pilot's arm is inflated with helium gas by pulling cartridge trigger; center, pilot inspects armband before taking off. Pilot, bottom, supported by life jacket, sends up balloon to help rescuers locate him

Balloon rescue markers may save the lives of navy pilots who are forced down at sea. Each flier would carry a balloon attached to a band on his arm, complete with a cartridge containing helium under pressure and 200 feet of strong twine. Should his plane be forced down the pilot would pull the cartridge trigger, quickly inflating the balloon and sending it aloft. Recent tests proved that this could be seen from a rescue plane ten miles away.

Tiny Shot Sharpens Image of Metal under X-Ray

X-ray photographs of irregular metal objects are more sharply defined by covering the object, such as a monkey wrench, with fine copper or steel shot—spherical particles finer than sand. Hidden to the eye, the edges of the wrench are clearly outlined in the X-ray picture. The same photograph made with the wrench held in the air would have blurred outlines. The explanation is that due to the difference in absorption of X-rays by metal and by air, the part of the negative not in back of the metal object is over-exposed, the exposure "spills over" and blurs the edges of the object.

Auto Parts Are Nicknamed by Factory Workers

You would hardly expect to find a "big bertha," "player piano," "percolator," "hay baler," "jack rabbit" or "corn popper" in an automobile plant, but such are the names by which some of the big machines are known. Workmen, shunning the technical terms of engineers, have manufactured a jargon which anyone would recognize as appropriate if they saw the machines in operation. For instance, steel rings are curled by

Experiment conducted by U.S. Naval Air Reserve Base

Bennett, Air Force Brooklyn, N.Y.

General Bennett

Alfred Bennett
Died, Brooklyn

2494

2446

Diets.
April 1939

a "permanent wave" machine, coil springs are squeezed into place by a "robot," while only the melody is lacking as the "merry-go-round's" spindles rise and fall in machining motor blocks. Car parts also come in for nicknames. A "tin hat" is worn on the rear axle, and a "hairpin" holds pedal springs in place. The muffler clamp becomes a "dog collar." Lamp guards are known as "fish," shock absorbers have a set of "horseshoes," there's a "bottle cap" on the engine water jacket, and elsewhere an auto has its "pancake," "spider," "snowshoe" and "banjo." A bit of humor enters the factory slang when a three-foot pipe wrench is called "Little Percy."

2-415

Table with Adjustable Leg Fits over Lap or Bed

Convenient for sewing, card games, reading or writing, a wooden lap table has a single adjustable leg which holds the table at the proper height when a thumbscrew is tightened. It can be rested on the lap or the arms of a chair, or used as a bedside serving table.



One-legged table can be set at any convenient height by adjusting thumbscrew

6-A Specially
2nd 2 1/2 ft

"Air Crash" Draws Diners to Roadside Eating Place



Passersby fear the worst when they see this airplane nosed through a roof, but it's only an invitation to come in and eat

Motorists who stop to examine what seems to be an airplane crashing through the roof of a house find it is simply a clever way of calling their attention to a roadside dining room. The enterprising owner makes a good living by feeding those whose curiosity causes them to stop.

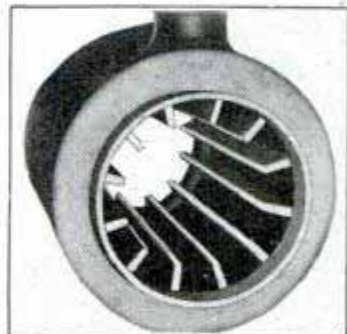
Club.

near Wilmington, Del

add detail \$1.25 kb. 2 433

Lost Heat Is Captured in Flue to Keep Water Tank Hot

Heat that escapes with burned gases into the stack of a warm-air heating furnace can be put to work if a new type water heater is installed in the flue. It takes the place of a section of the pipe, and is like a water jacket with fins inside to catch the heat as it passes and transfer it to the water. From there the hot water rises to the storage tank. Flue gas temperatures in warm-air furnaces may run as high as 400 to 500 degrees Fahrenheit, and it is claimed this water jacket will equal in capacity a forty-gallon indirect heater as used in a steam-heating plant.



Master Craft Steel Extractor

Harvey Whipple

2. 167

newark 2/10

MAKING WEATHER around the GLOBE

Bottom of page,
left, air outlets
on liner. Right,
interior view of
U. S. Capitol air-
conditioning pow-
er plant

By
Willis H. Carrier

Chairman of Board, Carrier Corp.

Air Conditioning

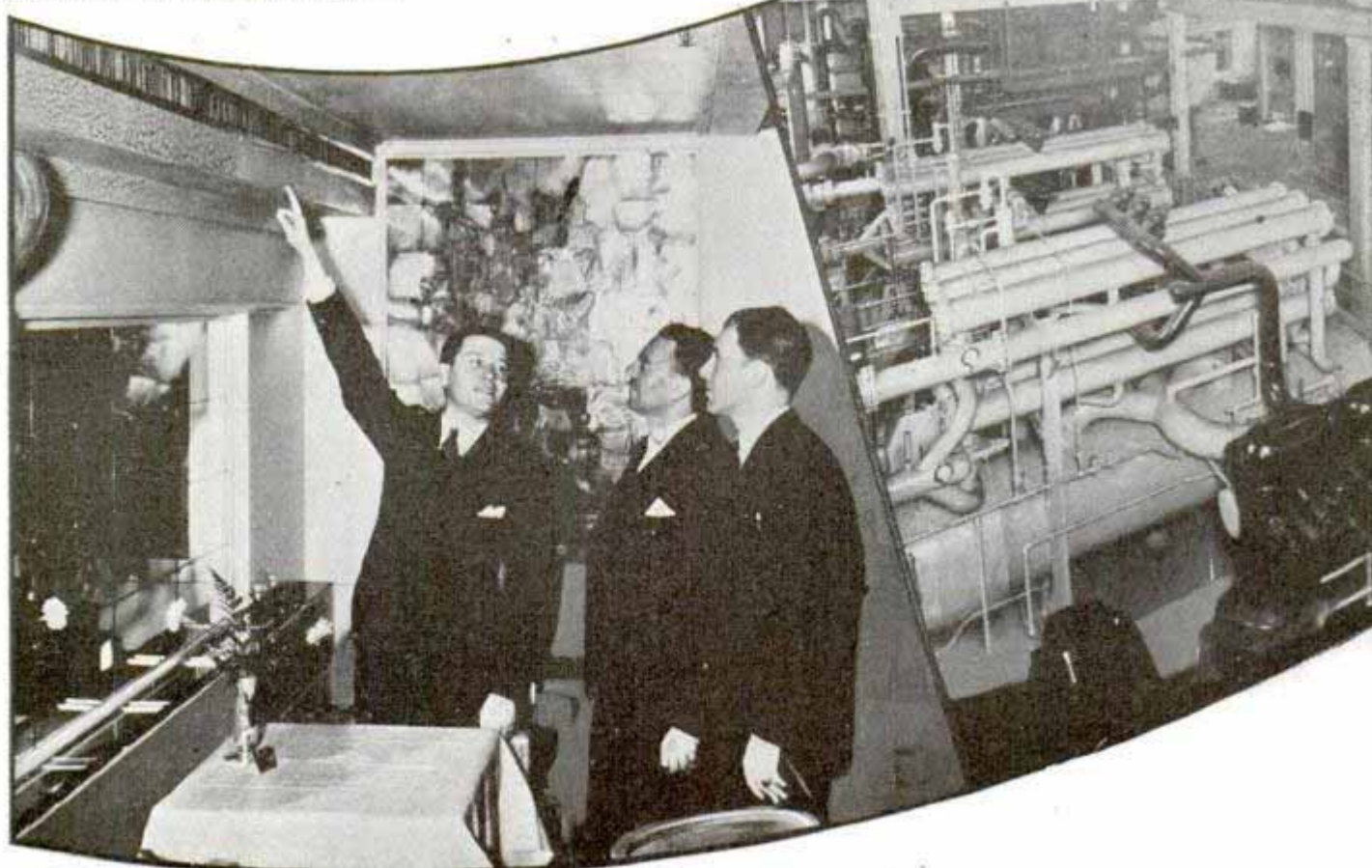
ONCE confined to the needs of a few of our industries, air conditioning has been carried by American engineers to the earth's out-of-the-way corners.

No matter where you go, you find indoor weather—1,000 feet up in an office building and 8,500 feet below ground in a gold mine; in a tobacco factory near the Arctic Circle and a telephone exchange on the equator in Sumatra.

The industry has grown up. In 1932, equipment sales amounted to \$8,000,000 and just five years later they were ten times that figure. By 1945, we expect the yearly total of installations to be in proximity of \$350,000,000, and eventually, a billion-dollar-a-year market will be created.

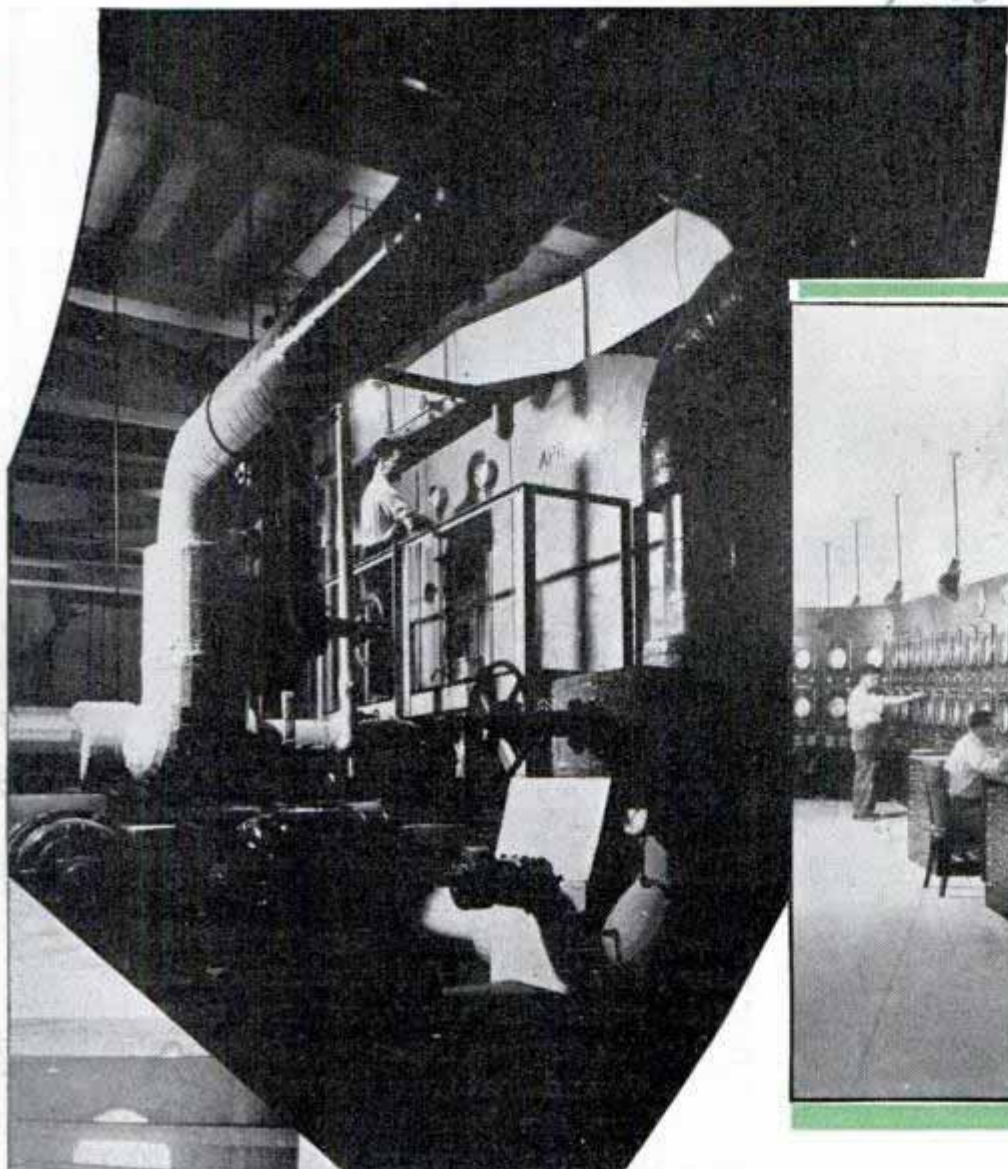
Life along the Persian Gulf shores of Saudi Arabia was almost unbearable for a party of oil scientists, drillers, and laborers until summer-resort weather was installed in their field cabins, offices, and recreation halls. A portable unit has been carried into the jungles of Venezuela to protect the supplies of a missionary band.

*Holland-American Line
Nieuw Amsterdam*



431 W. 68th Terrace
Kansas City, Mo.

Left, pump and tank for washing air supplied to NBC studios in Radio City. Below, right, control panel for regulation of temperatures in twenty-seven radio studios

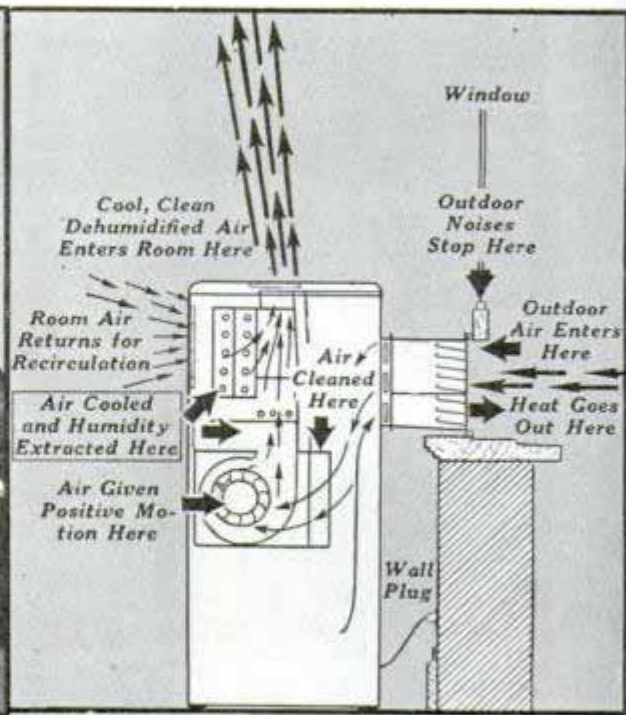


In Colombo, Ceylon, where high relative humidity and high temperatures are frequent, the stable of a prize race horse has been air conditioned in an effort to improve its stamina and speed. Tea tasters of the London Cooperative Wholesale Society find the sensitivity of their palates sharpened in the cool, clear atmosphere in which they now work. And if they or their countrymen ever have occasion to use the city's bombproof and gasproof cellars, man-made weather will make their sojourns comfortable and healthful.

Delicate scientific instruments expand in severe heat so those used in the physics department at Raffles College in hot, humid Singapore are kept in a room where atmosphere conditions are scientifically controlled. Indoor weather has been provided for the comfort of the Mah Jong players who gather at an exclusive Chinese club of the Straits Settlement city, and also in a barn housing a herd of valuable cattle.

Some of the punkah fans of Hindus and Mohammedans in India have been supplanted by more modern methods of weather making. On the backs of elephants, weather-controlling equipment has been carried to Chithhar Hill in Rajputana so that regardless of outside climate, the Maharajah may live, dine, and sleep without a moment's discomfort in his new \$4,000,000 Jodhpur palace.

Air conditioning's greatest success story has been written in the gold mines of South Africa where the available gold supply of the world has been increased fifty per cent. When we first talked with the operators of the Robinson Deep mine on the Rand, from which \$5,000,000,000 in gold has been extracted in the last forty-five years, they were



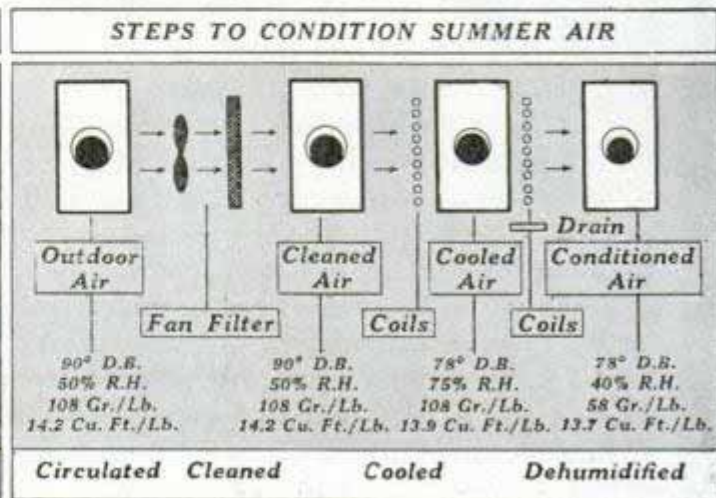
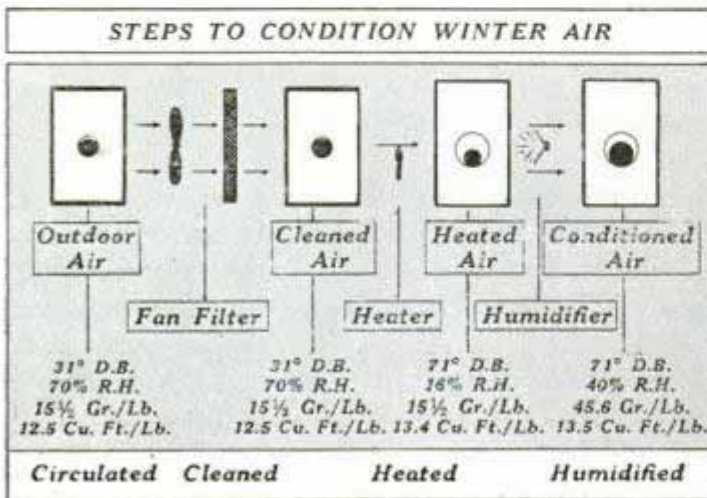
Left, unit which removes three quarts of water per hour from air of room in summer. Right, diagram which shows how portable unit prepares air, washing, cooling and dehumidifying it

anxious to improve working conditions within the mine but were skeptical of turning manufactured weather into this, the world's largest shaft. At the 8,500-foot level, with temperatures over ninety-five degrees and relative high humidities, natives could work only in short shifts, and their efficiency was far below normal.

After evolving a working theory on rock cooling in mines, we designed a plant which, by means of large fans located 6,000 feet above sea level, sends cool, washed air through the three miles of underground tunnels. Entering the shaft at the surface, the air is cooled uniformly throughout the year to a temperature of thirty-five de-

grees, permitting efficient operation of the mine at its greatest depth, although at the latter point the temperature rises to eighty-six degrees because of compression of the air and heat from the rocks.

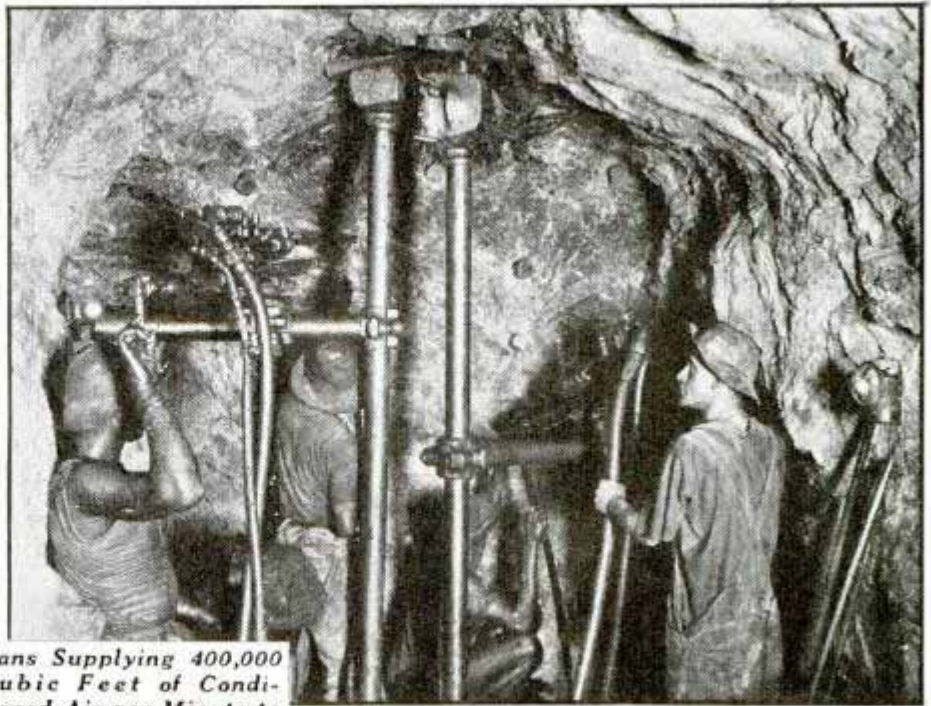
Workers are brought up through the cold shaft from the warm, humid depths to the surface. At the outset it was feared such a temperature change would increase illness and the incidence of pneumonia already prevalent among miners. As a partial safeguard, workers were required to stop at the 4,000-foot level on their way up and put on sheepskin jackets. Contrary to expectations, however, the incidence of pneumonia has decreased more than thirty



per cent since refrigeration machinery was set in operation.

Summer lay-offs occasioned by heat and humidity in the Magma Copper mine at Superior, Ariz., likewise have been averted in this manner. Operations here, too, have been stepped up by cutting the time formerly required for the cooling of a new level to a workable temperature.

With the advent of deluxe air-conditioned sleeper buses, much of the



Fans Supplying 400,000 Cubic Feet of Conditioned Air per Minute to Mine Through Tunnel

Above, air conditioning has resulted in increased gold production in South African mine. Left, diagram of installation in mine. Bottom, air-conditioned telephone booth

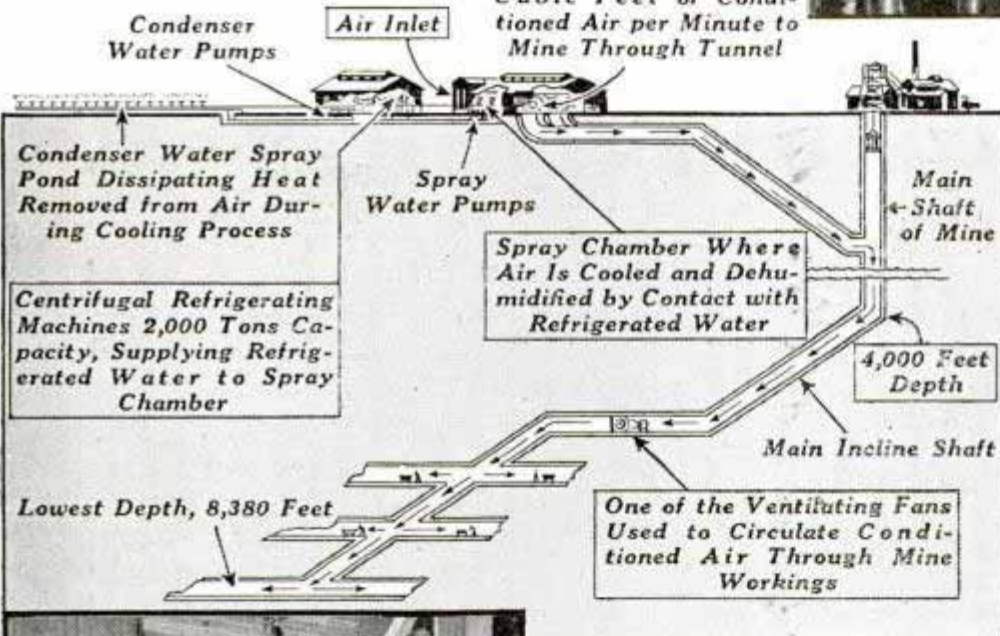
sting has been taken out of travel across the Arabian desert. The twenty-hour ride between Beyrouth, Damascus, and Baghdad over a roadless route* covered by sand and sagebrush with temperatures around 120 degrees can now be made in comparative ease and comfort in these sealed,

Diesel-powered dromedaries. Oddly enough, this equipment supplies heating as well as cooling, air circulation, filtering, and ventilating because the mercury drops to freezing during the winter months on a high plateau in east Syria.

Noteworthy progress has been made on the high seas. Machinery with a cooling capacity equivalent to the melting of a half million pounds of ice daily supplies indoor weather for several dining rooms, main lounge, and barber shop on the "Queen Mary." The installation on the "Normandie" has made possible an innovation in marine design—that of placing the 300-foot dining room in the center of the ship and flanking it with outside staterooms, which usually are in demand and bring premium rates.

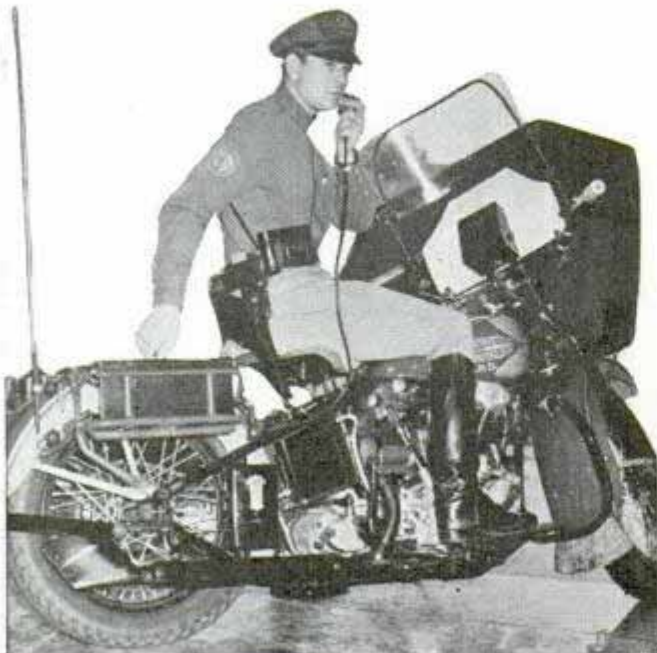
When a large circus decided to take Gargantua, a giant gorilla, on tour, veteran animal men shook their heads.

(Continued to page 137A)



South Atlanta

Motor Cops Carry Camera and Two-Way Radio



Motorcycle officer reports to headquarters by radio and takes flash picture at scene of crime

City police of Beverly Hills, Calif., have been equipped with cameras to take evidence. Carrying a camera on a shoulder strap, they ride to the scene of crime or accident on motorcycles equipped with two-way radio telephones over which they can talk with headquarters. The camera is a miniature, with flash gun.

If You Must Take a Bitter Pill Rub Ice on Your Tongue

Chill your tongue first with ice if you have to take a dose of bitter medicine. Dr. Harald Tangl of Budapest reports that

taste buds of the tongue scarcely function at all when cooled, while warmth stimulates them. Hot coffee requires less sugar to sweeten it than iced coffee. There are 3,000 taste buds on the human tongue. Antelopes have about 50,000 and cows 15,000. Whales have very few, and gulp their food so quickly that taste is no object. Fish taste with their whole body.

Capless All-Rubber Valve Stem Has No Replaceable Parts

Even though it does not wear a cap, no dirt or water can enter an all-rubber tire valve stem now on the market, a constant seal being maintained at the opening by a spring valve that keeps the air in. Its internal parts, made of non-corrosive metal, are permanently fixed and never need to be replaced. Being tough and pliable, the stem will not tear out of the tube or damage it in case of a blowout or puncture.



Conveyor Powered by Gravity Loads Freight Cars

Portable so it may be moved instantly to any desired location, a conveyor mounted on wheels requires no motive power for its operation. Packages travel by gravity on its slightly inclined track. Portability makes the apparatus especially handy for loading and unloading railway cars.



This portable conveyor lets weight of packages do the work in carrying them from one end to the other

normal medicine arsen.

both and clearly

g 393

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New York City

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Dr. Tangl

Bank's Stop-Theft Drawer Dumps Money into Safe

Useful Bank of America San Francisco



Pressing button throws money into the safe. Weight drops out, too, so tray can snap back

At the first sign of a robbery, bank tellers using a special kind of cash drawer can empty its contents into a safe by simply pressing one of four buttons, which may be done by leaning against them if hands are upraised. The drawer is controlled by five buttons, all exactly alike, but only one of them will open it, and even if a bandit succeeds in entering the cage before the cash is dumped he still would have only one chance in five of selecting the right button. If his choice goes against him the bottom of the drawer drops automatically.

Clamp Aids in Repairing Racket by Holding Broken String

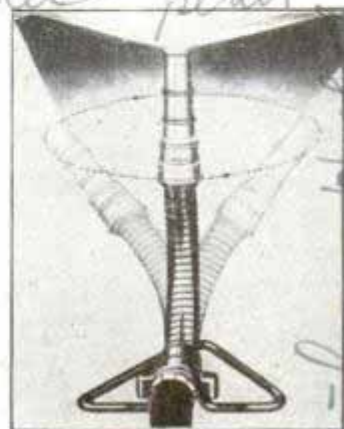


Replacement of broken strings in a tennis racket is made easier by a splicing clamp just introduced. It takes an expert to make repairs when one hand is engaged holding

tight the last string with a pair of pliers. The clamp, easily and quickly applied, grips the string firmly and leaves both hands free to complete the splice. It is not used for restringing, but for replacing one or two broken strings.

Hose Is Turned into Sprinkler by Nozzle Holder

Converting the ordinary garden hose nozzle into a lawn sprinkler, a flexible metal neck attached at the end of the hose has its own stand. No special sprinkler head is needed, and it is not necessary to remove the unit in using the hose by hand. Placed on the lawn, the neck may be turned to sprinkle in any direction.



Mixer to Keep Food from Burning Fastens on Cooking Utensil

Fastened across the rim of the cooking utensil, a mixer with three paddles facilitates stirring and helps the cook keep food from burning. A cross bar holds the unit firmly in place, and it is a simple matter to give the handle a few turns as needed.



An occasional twist of the handle turns the mixing paddles, keeping food in motion so it will not burn

C. S. Osborne & Co.

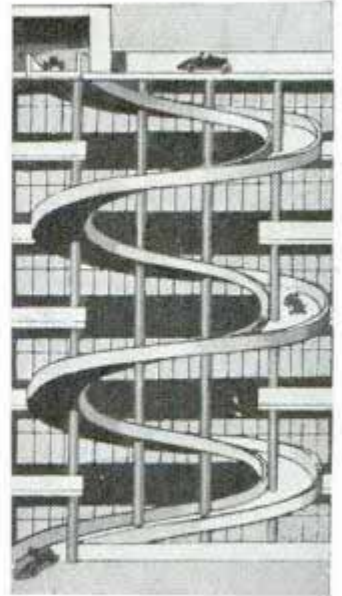
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I R the Clintock Co Bank Protection Service Inc. 739 Snyder Ave. Minneapolis Minn.

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Race Track on Factory Roof Tests New Cars

Modern Wonder 2/25/35



New automobiles produced by Fiat of Italy are given their first test on a race track built on the roof of two factory buildings. The track is seventy-eight feet nine inches wide and the length of two straightaways is 1,423 feet. Turns at either end are banked to permit higher speeds. Spiral roadways lead from the ground to the roof track. As the drivers pass up the roadway, they climb the production ladder of the Fiat, as each floor represents a new stage in the process until the finished car rolls out on the roof.

Left, race track on roof of factory buildings where cars are given their first test. Right, spiral roadway for reaching the roof

One Man Guides Giant 'Jumping Frog' Tamper on Road

It looks as though a superman would be needed to operate the giant tamper used to pack the surface and "shoulders" of German highways. Actually, in spite of its weight of more than 5,500 pounds, the "jumping frog" is guided with ease. At the touch of a button, an explosion of benzol lifts the tamper about sixteen inches above the ground, and because of its inclined cylinder shaft it simultaneously jumps forward about eight inches.

see Aug 1935-251



Benzol explosion controlled by operator makes tamper jump upward and forward, pounding road with 5,500-pound weight

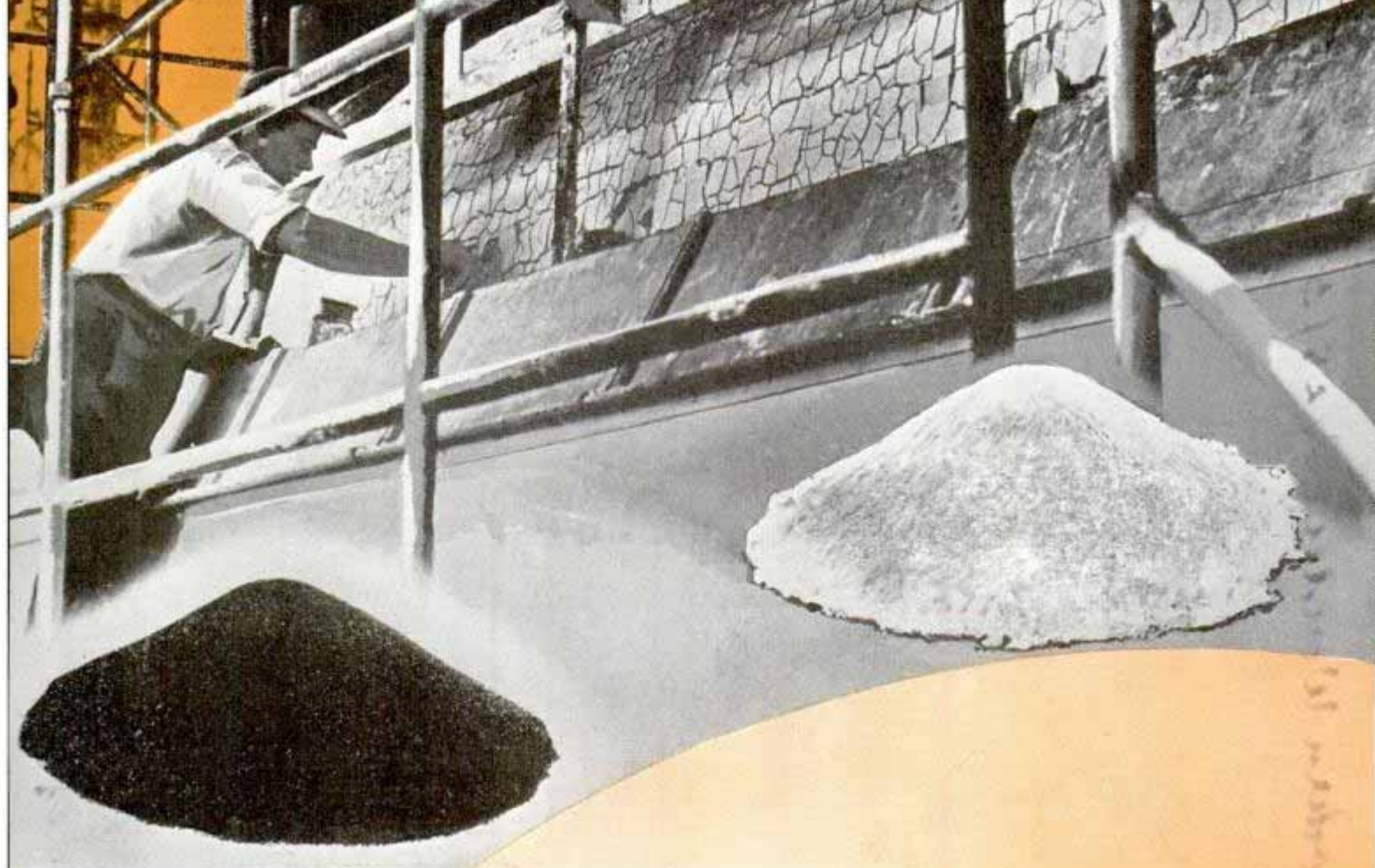
From Air Conditioning

A "non-allergic" bedroom exhibited at Golden Gate International Exposition is designed to protect sleepers against everything that might produce an irritating effect.

U. of California

The Calhoun Co. agent.

maker. Mess. Helweg



PAINTING *the* WORLD

By
Julian P. Leggett

TURNING an ultra-black ore into a super-white paint is only one of the many seeming miracles that the chemist is performing to meet demands for protective and decorative coatings for a vast majority of the things which contribute to the safety, comfort and convenience of the modern family.

Noah used pitch, the Bible tells us, when he constructed the ark about 4,000 years ago. That, apparently, was the only protective substance known then. Today millions of pounds and millions of gallons of more than 20,000



Top, "Ilmenite," fine black sand, is transformed into snow-white titanium dioxide. Background, filter for reducing water content in titanium dioxide. Bottom, sand test for determining how fast finish will dry

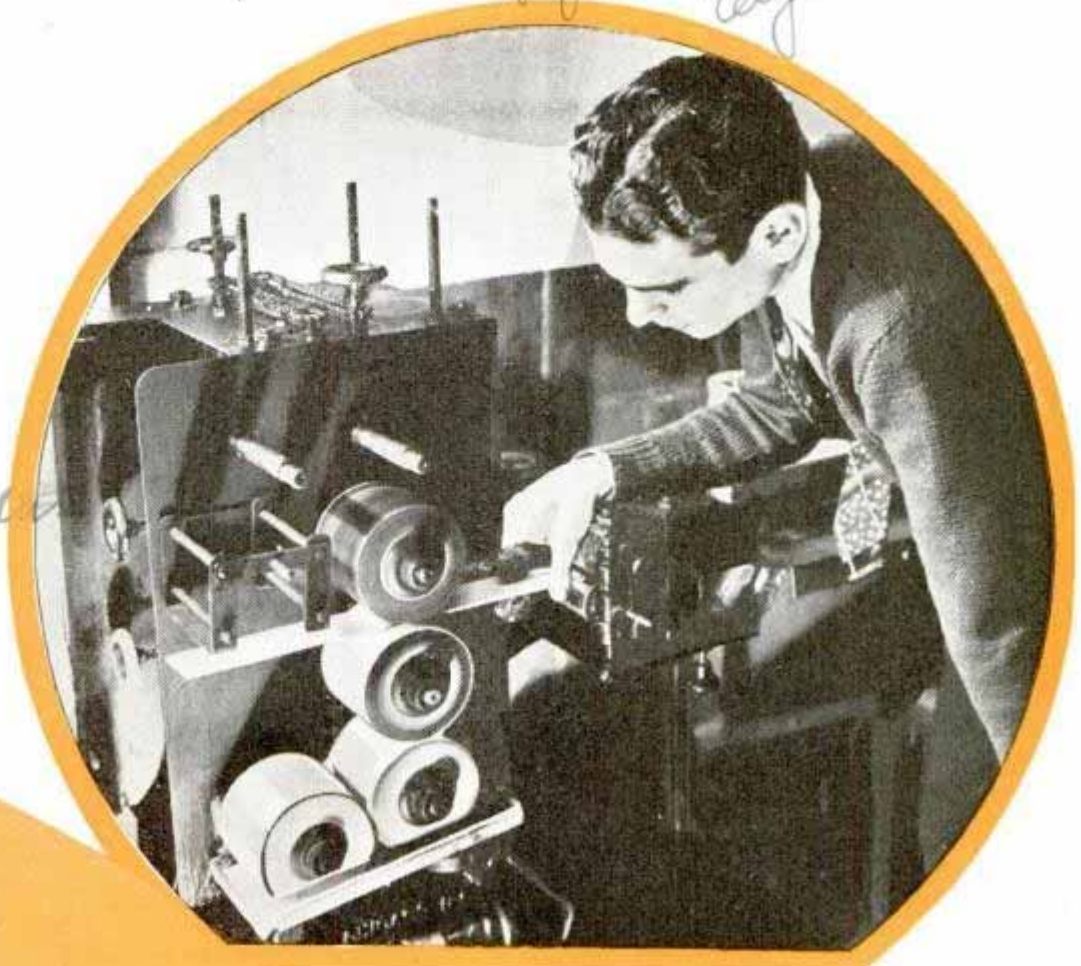
at Edgemoor, Leeb and Pionment Leeb

Krebs
Sept. Ed
Pont Co.
Edgemoor

Right, testing Venetian blind finishes in laboratory. Bottom, paint farm in Florida tests finishes on thousands of panels exposed to the weather. Careful record is kept on each panel

Photos courtesy
E. I. du Pont de
Nemours & Co.

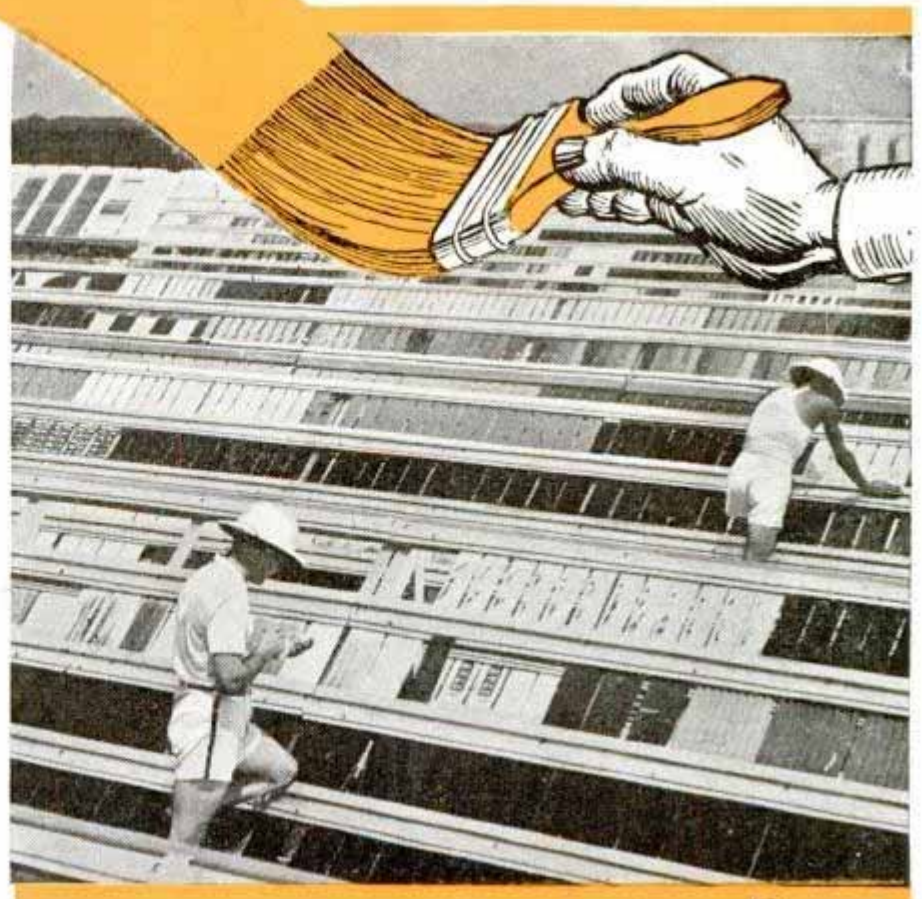
Wilmington
Del.



in NEW COLORS

different paint combinations are produced and sold every year in the United States. In 1937 the market value of pigments, varnishes, lacquers, enamels and other forms of paints made by more than 1,100 plants in this country amounted to \$538,460,000.

The pitch with which the ark was protected from water during the flood in Biblical times was obtained from trees. Soft and liquid at first, it hardened into a resinous substance when exposed to the air. The ancient Egyptians went a step further, adding various oils to hardened pitch or other natural resins to formulate the varnishes

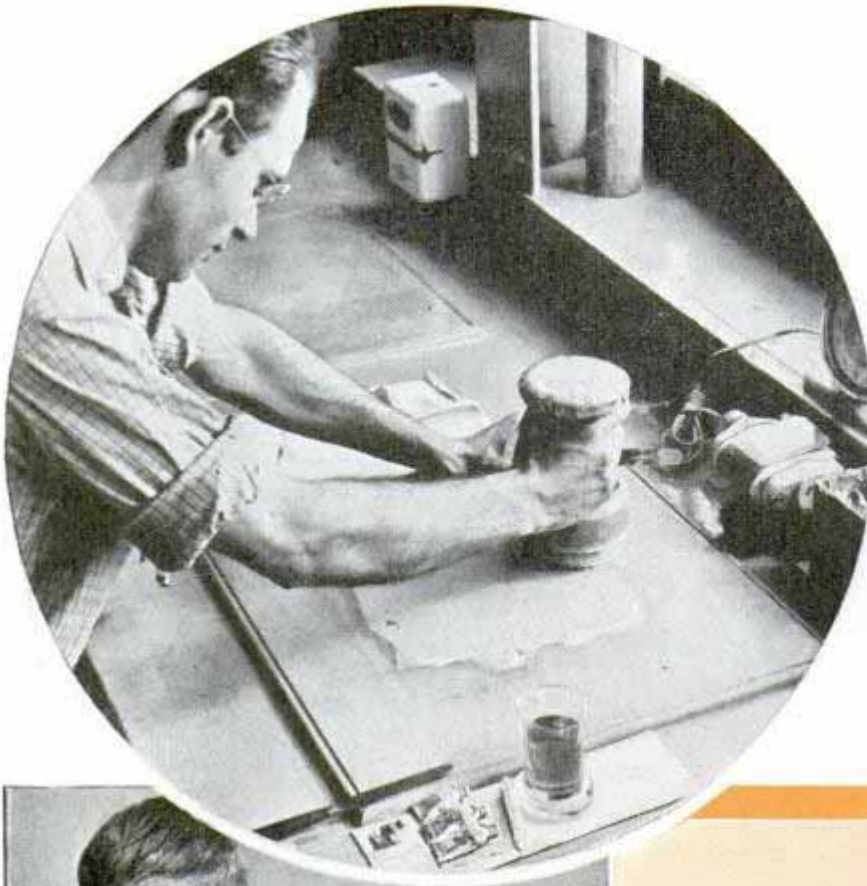


E. I. du Pont de Nemours & Co.

which oils are treated and combined with natural resins over coke fires under conditions where temperature and ingredients can be controlled closely.

Some readers may remember the closing days of the century and the gay carriages with lustrous, polished surfaces that required weeks for the application and drying of coat after coat of varnish. Some of the paint jobs on the first automobiles took two weeks to a full month to achieve because the finishes dried so slowly.

Since 1900 progress of the finishes industry has been



which have protected mummy cases remarkably well for as long as thirty centuries. Monks of the Middle Ages devised still other processes for combining resins with linseed oil, which was taken from the common flax seed, to produce varnishes for various uses. And so through the ages, there was a gradual development of the varnish art. Now, varnishes are made commercially in large varnish stacks in

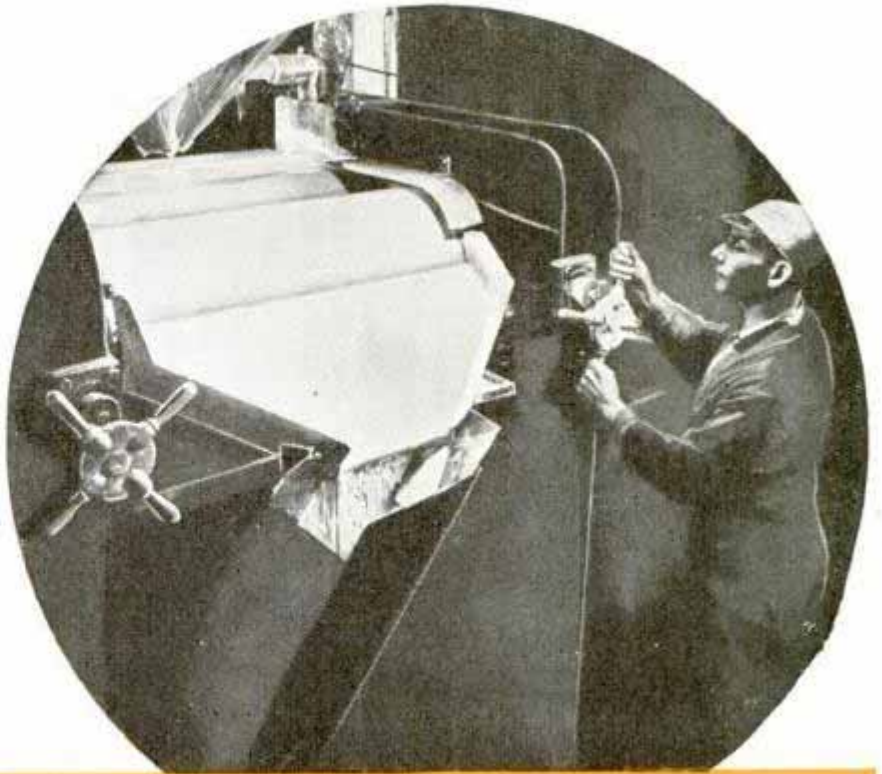


Circle, testing hiding power of titanium pigment to assure uniformity. Center, left, examining test panel covered with auto paint. Right, light reflected from paint-covered panel helps determine degree of gloss in lacquer. Bottom, closeup of light striking the panel

rapid. New ingredients such as tung oil and soybean oil were mixed with resins to produce finishes with certain improved characteristics. Nitrocellulose lacquers revolutionized the finishing business by substituting fast spray jobs for laborious, slow hand brushing. They were quick-drying and durable, the ideal combination sought by the automobile industry to speed up the painting of cars made un-

Klarashen - used in 1939 to sold

der volume production methods. Chemists formulated synthetic resins and oils, which are of known chemical composition and therefore require fewer blending and refining processes to overcome variations found in natural resins. Great advances were made in pigment-making; the use of zinc oxides, for example, to improve the color retention of house paints; the use of finely divided aluminum powders to improve the protection of metal against the weather; and the development of lithopone and titanium oxide pigments to im-



prove the whiteness, the economy and the safety of paints for many purposes. Titanium oxide, the strongest and whitest pigment known, is remarkable in that it is produced from a black ore called "Ilmenite," a veritable miracle of chemistry. This pigment, and modifications of it, are used in a wide variety of paints for both exterior and interior purposes.

Of course, no one has yet

(Continued to page 120A)



Top, bases for paint flowing through roller mill. Center strip, left to right, applying interior house finish; paint mixing and shading in fifty-gallon batch, and color test by spraying. Bottom, machine breaks color into its spectral components, making possible actual physical measurement of color values

at Philadelphia plant

Record-Smashing Speedboat Sets Five Marks in One Day



Sweeping across Miami waters, Mortimer Auerbach piloted this power boat to world records for twenty-four miles, one hour and three hours

Its broad shoulders skimming along the surface at a terrific rate, the "Emancipator VII" dropped five world speedboat records in a day at Miami recently. Piloted by Mortimer Auerbach, the streamline racing boat set new marks for twenty-four miles, one hour and three hours in the four-liter class and twenty-four miles and one hour in the unlimited class.

chase Exposition, life expectation jumped to 48.2 years, and then to fifty-three years when the Panama-Pacific Exposition was held in 1915. The sixty-year mark was passed by the time of the Century of Progress in 1933 and 1934, and today, with two simultaneous World's Fairs as the milestone, it is estimated that an additional year has been gained, bringing the figure to 61.5 years for a white male and 65.2 for a white female.

Reel Keeps Eraser Handy at Side of Typewriter

Attached conveniently at the side of the typewriter by a set screw, a reel keeps the typist's eraser always handy when needed. When released, the eraser is drawn back to its holder by a spring.

Seventy-Year Life Span by 1980 Predicted for Americans

By 1980 the average American may expect to live until he is seventy years old, say statisticians of the Metropolitan Life Insurance company—and this mark will not be exceptional, but the average age reached by individuals. Taking the dates of previous World's Fairs as convenient milestones in the record of American longevity, it was found that during the period between the Centennial Exposition of 1876 and the World's Columbian Exposition in 1893, the average length of life among white males remained unchanged at almost forty-two years, despite many advances made in medical science during that time. This was explained as being due to the lag between discoveries and their application. By 1904, at the time of the Louisiana Pur-



Spring draws eraser back to reel, shown in inset, when typist is through with it

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One madam eve headah

acme
April 2, 1939

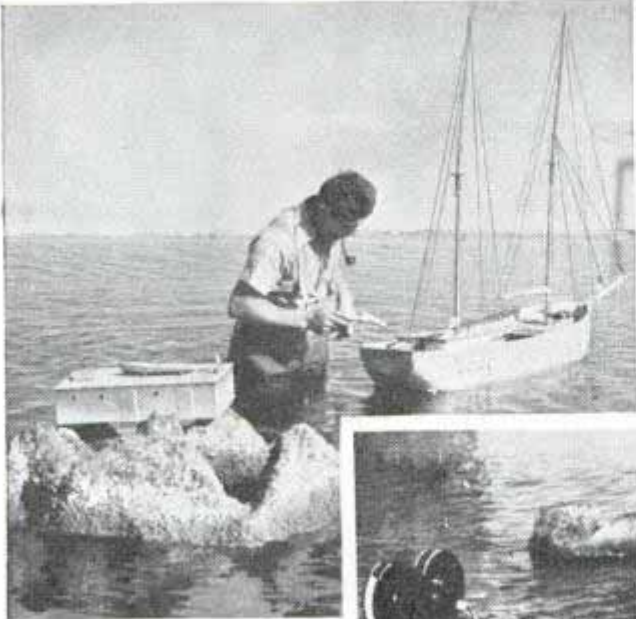
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April 5, 1939

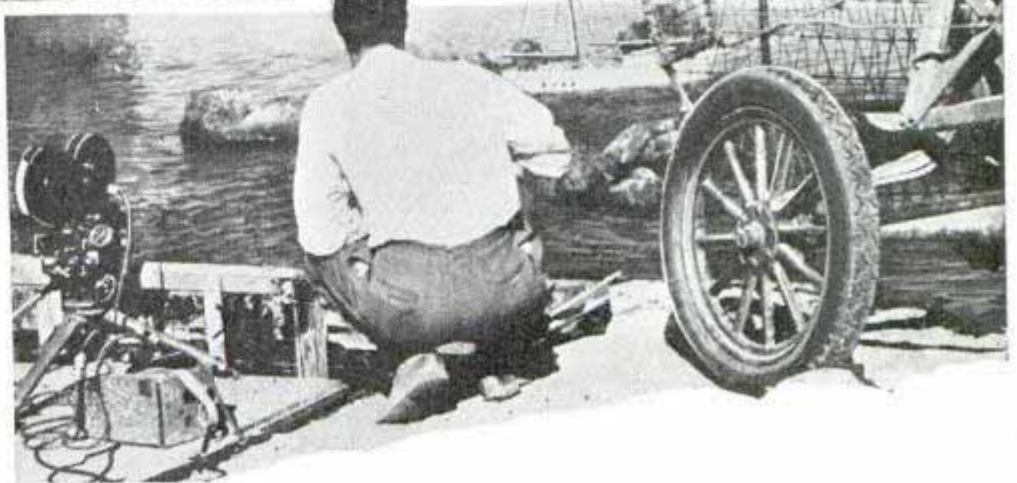
Havallite Products Co

*1221 1/2 Fifth Ave
Los Angeles, Calif*

Ship Blast Movie Filmed by Using Model Boat

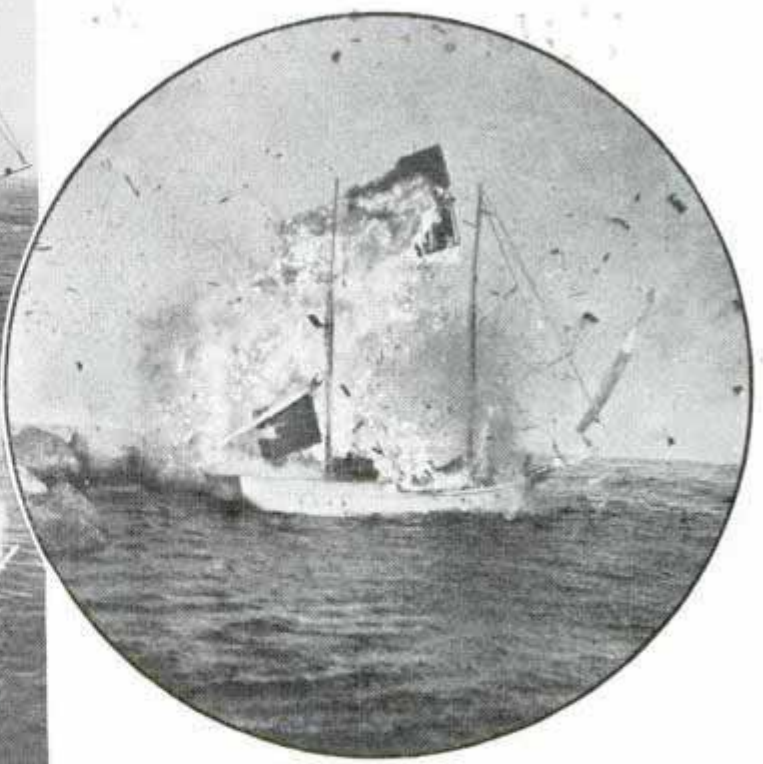


Realistic views of a ship explosion have been filmed by using a model boat in the outdoor tank of a motion-picture studio. Below, wind machine for creating waves. Note movie camera at left



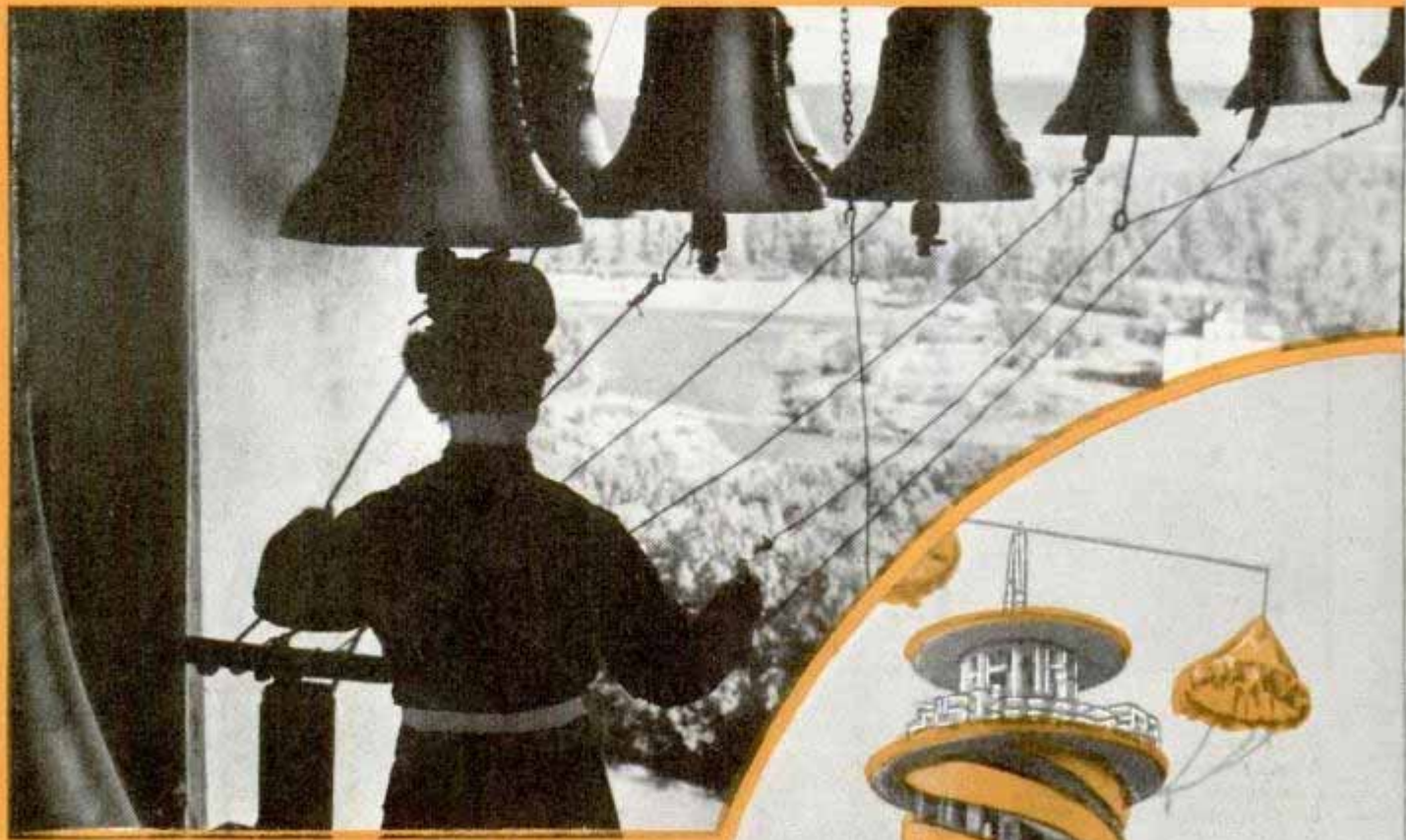
Above, workman putting black powder charge and connecting a wire so that blast may be set off with switch ashore. Cabin is replaced on schooner when charge is ready

Left, special-effects man pours kerosene on ship and sets it afire, then pours on "liquid smoke" and moves out of camera range with the bottle in his hand



Above, the explosion—and it appears like the real thing—is set off with shore switch. Left, pouring "liquid smoke" over boat after blast to get another spectacular shot. The camera catches the scenes at about 110 frames per minute

P 225



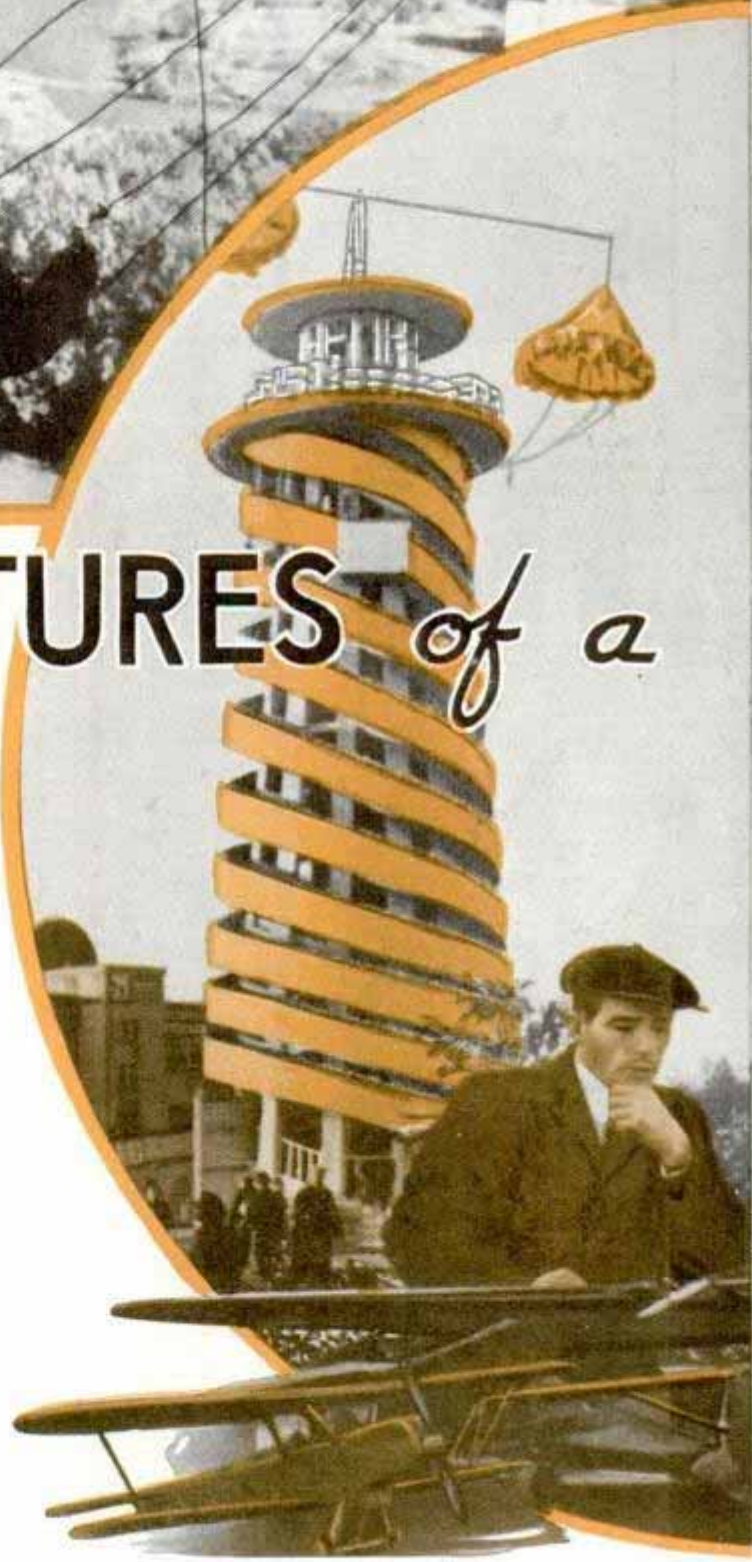
ADVENTURES *of a*

By JULIEN BRYAN
Titusville, Pa.
 PART II

PERHAPS it's adventure you crave. Or perhaps picturemaking around the world is purely business to you. Adventures aplenty will meet you, nevertheless.

Not necessarily violence and peril of death; true, I've had my share of that in nine years of roaming with a movie camera. There are thrills in filming forbidden ceremonials, bringing home uncensored movies of Nazi Germany, facing an angry crowd in the Mexican backlands. But to me the highest adventure has been to visit strange tribes, live with them in friendship and record their lives in pictures.

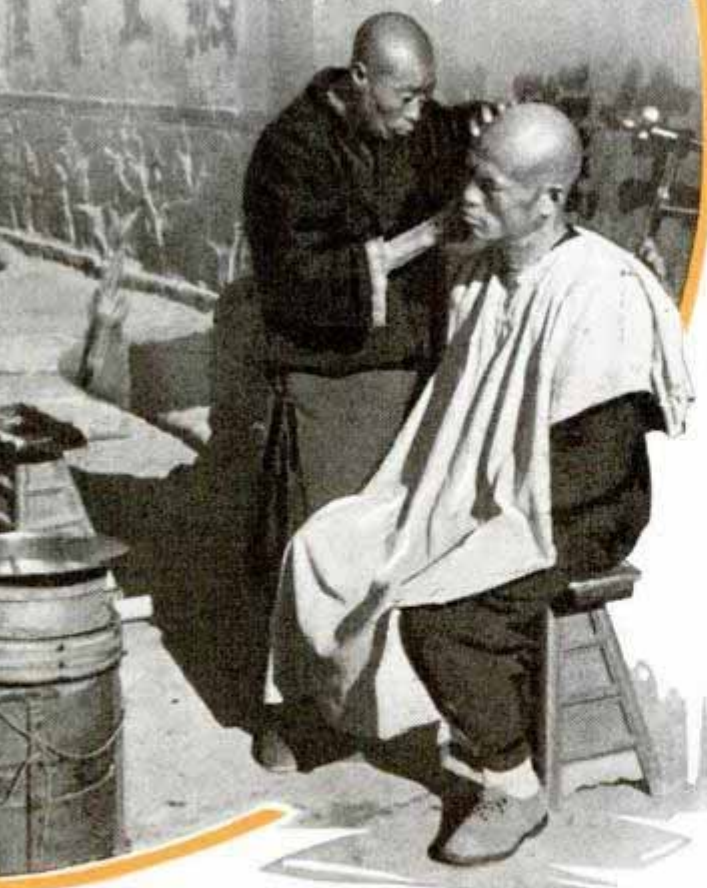
Five years ago I tramped across the Siberian tundra with Professor Petrie, greatest explorer of that region, to visit the Tuturi Tungus—people who have never eaten vegetables, live in birchbark wigwams and subsist on reindeer milk, game, pine nuts and cranberries. Petrie and I stood enchanted at our first sight of the



Top, ringing bells in tower of ancient monastery in Finland where monks live as in middle ages. Below, parachute jump and model planes in a Moscow park



ROVING CAMERAMAN



No Maypole dance is engaging Chinese laborers at top—their ropes are plying a primitive pile driver. Below, an outdoor barber shop on a street in Jehol

village. Slowly the Tungus came to meet us. There were no shouts, no gestures of greeting. Finally the old chief spoke: "From what region have you come, comrades?" Petrie explained he had come from Irkutsk. I told the chief I came from the United States of America. Puzzled looks spread over their faces; then the chief asked: "How far is your country from Irkutsk?" I explained that if you could walk thirty miles every day for nine months and cross a wide sea you might arrive in my country. His people concluded that I must be a long way from home.

So a banquet was prepared, and meanwhile I began to make friends, being careful not to show my camera nor antagonize these primitive folk in any way. It is best to let others make the advances. Within an hour they were showing me their tepees, telling how they roll up the birchbark covering and move the village whenever the domesticated reindeer have eaten all the moss in the neighborhood and need fresh forage. The women were softening animal skins for clothing, sewing birchbark



utensils, making thread from reindeer sinew. Finally it was time for the banquet around the fire in the chief's wigwam. Here was a problem of etiquette: Where was I to sit? It was a serious offense to sit in the wrong place. Professor Petrie hinted that the guest of honor should sit in the worst place—where the smoke gets in your eyes. I sat there, but the chief and his friends protested that I move to another place. I pretended reluctance, although choked with



smoke. Finally I moved a few feet, and after much argument found myself in the place of honor, next to the chief—where the smoke would not get in my eyes.

Now came the meal. Tea, a great luxury from Mongolia, diluted with rich reindeer milk. Fresh trout, followed by wild game—bear, wild goat, reindeer—with mushrooms, cranberries and pine nuts. Lastly, a special dish for me alone. I found it delicious and ate three helpings. When it was over, they told me what it was: the upper lip of the Siberian elk.

One morning I was busily taking pictures when suddenly I was lifted violently and thrown into a swamp. Luckily neither I nor the camera was hurt. I turned around to see the Tungus holding their sides with laughter, and not far from me a rather ferocious-looking reindeer which had decided I was an interloper. The Tungus were laughing because every one of them had at one time or another been tossed by his reindeer.



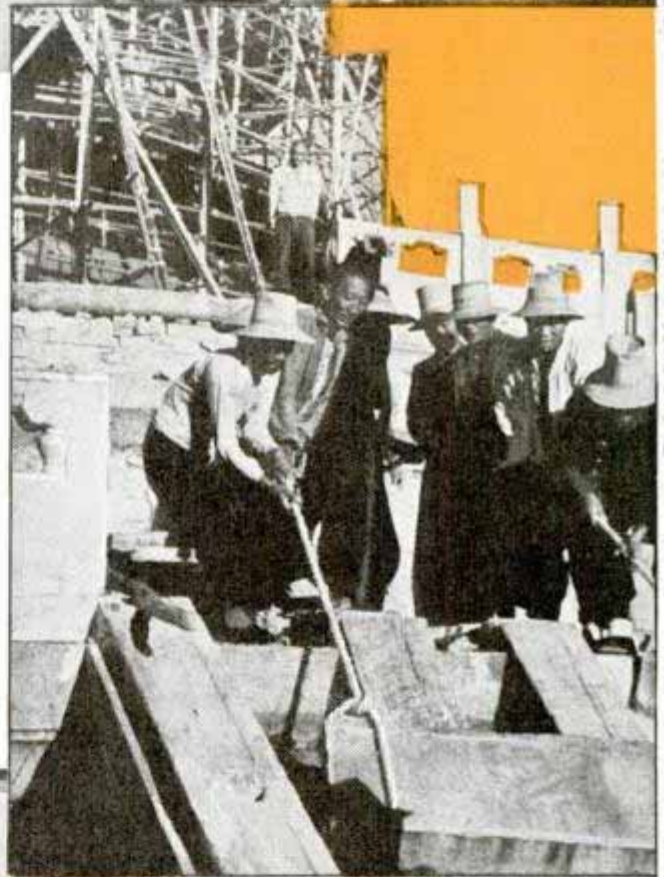
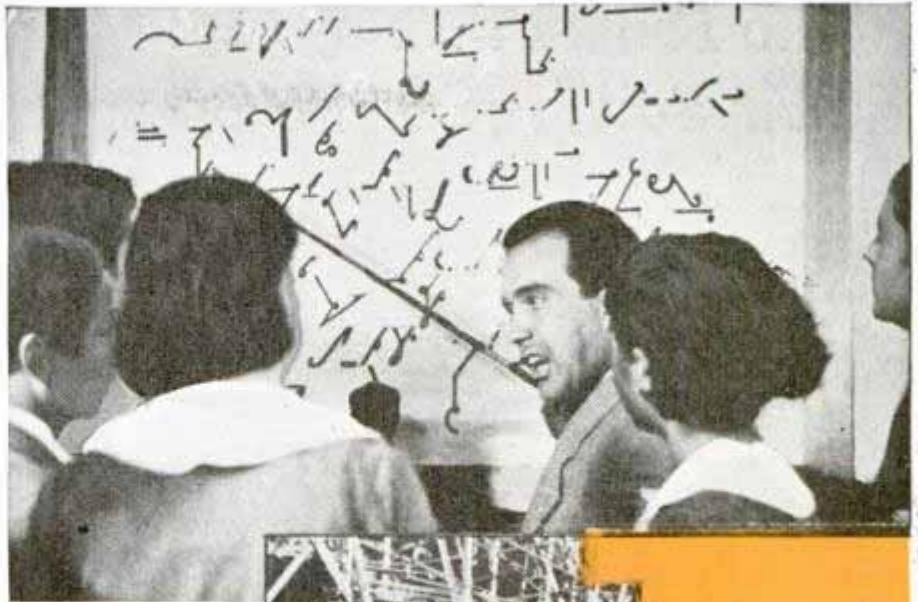
Top, women hod carriers working on a building in Moscow. Below, the roving cameraman grinds out movies of a Mexican woman at her baking. At the right, a Tungus priest in northern Siberia stamps out ceremonial fire; bits of cloth in his hand are used to drive away evil spirits

When we departed, we left a few gifts, among them a Santa Claus book for the children. They laughed at that, telling me reindeer never flew through the air as the pictures showed.

Gifts are always better than bribes. The best substitute for bribery is a frank manner, a smile, and patience. Now and then a few small gifts make friends—an inexpensive fountain pen, or little gilded safety pins.

Most difficult of all pictures to film is anything having to do with religion of primitive peoples. Last summer I tried many times to obtain pictures of Mexican Indians at worship. Just before sunset one day I reached the village of Ixmiquilpan. After a leisurely supper we walked to the church. What a gorgeous sight we found—hundreds of Indians crowded outside in semi-darkness, and in the great church more than a thousand more weaving about with a myriad of lighted candles. It was the greatest fiesta of the year, the day sacred to this very church. With my assistant I ran to the inn, grabbed the camera, loaded it with special film of a speed over 100 Weston, and dashed

(Continued to page 124A)



Ankora Lyell
 Top, instructor in one of Turkey's new business schools explains shorthand symbols. Center, Chinese laborers repairing Temple of Heaven, at Peiping, haul up heavy stones by hand, a method as old as Pyramids of Egypt. Bottom, a puppet show in Japan, with puppeteers in black masks

Radio Runs Farm of Future from Sowing Seed to Canning



At "nerve center" of farm depicted in diorama, "farmer of the future" sends radio signals controlling harvesting, irrigating and other machines

Tomorrow's farmer, if a diorama at the New York world's fair prophecies aright, will be rather a radio navigator and dispatcher than a tiller of the soil. The diorama depicts the farm engineer seated in his glass-enclosed radio tower, manipulating switches that transmit radio signals to the robot machines that sow and cultivate, irrigate, harvest, sort and can, freeze and pack the crop, all by remote control.

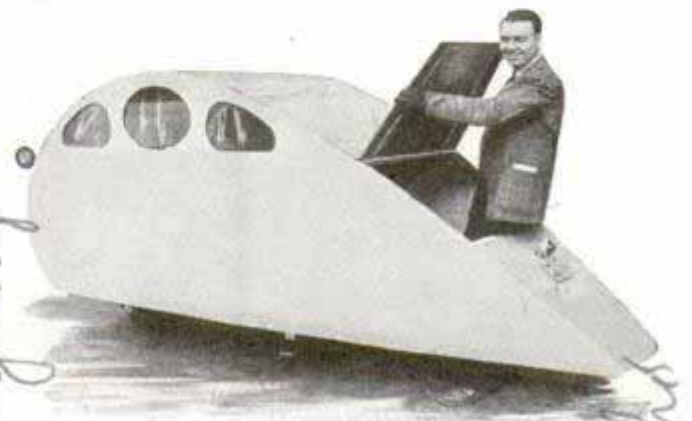
House of Colored Stainless Steel Promised at Low Cost

Stainless steel in colors, the latest product of the metallurgical engineer, promises a new rustproof housing material that may bring another revolution in the building industry. It was announced recently by Oscar B. Bach, industrial designer and metallurgist, after a long search for a

method of tinting steel. He believes that a home now costing \$10,000 could be built on a prefabricated, mass-production plan for \$3,800 with this material. It is light and strong, with a minimum of chromium content. By using asbestos as an insulating base and covering it with a thin skin of bachite, the tinted stainless steel, he developed a fireproof and verminproof material lending itself to quick assembly in sections on the building site. Mr. Bach foresees its use also in airplane and railroad construction, claiming for bachite half the weight and double the strength of duralumin.

Streamline Hood for Motorcycle Made of Plywood

Seeking protection from the discomforts of dust and wind and rain, an inventive motorcycle rider inclosed his machine in a streamline shell of plywood, bracing it with steel. The housing of the odd vehicle, with a trap-door entrance in the rear, weighs fifty pounds and cost fifteen dollars.



Through hatch at the rear driver slips into seat of motorcycle where he can laugh at the rain

U.S. Steel Subscribers Director
of Broadway

My James
4/1/29

Bachite development d.w. Leonard J. ...

Autos built by fathers & racers

Children Race in Gas-Powered Midget Cars



Closeup shows motor installation in young driver's gas-powered racing car. Children between six and sixteen thrill large crowds in weekly speed events at San Marino, Calif.



Above, action on the midget track. Tiny cars are powered with engines of one horsepower or less and have chain or belt drive. Speed ranges up to twenty-five miles per hour



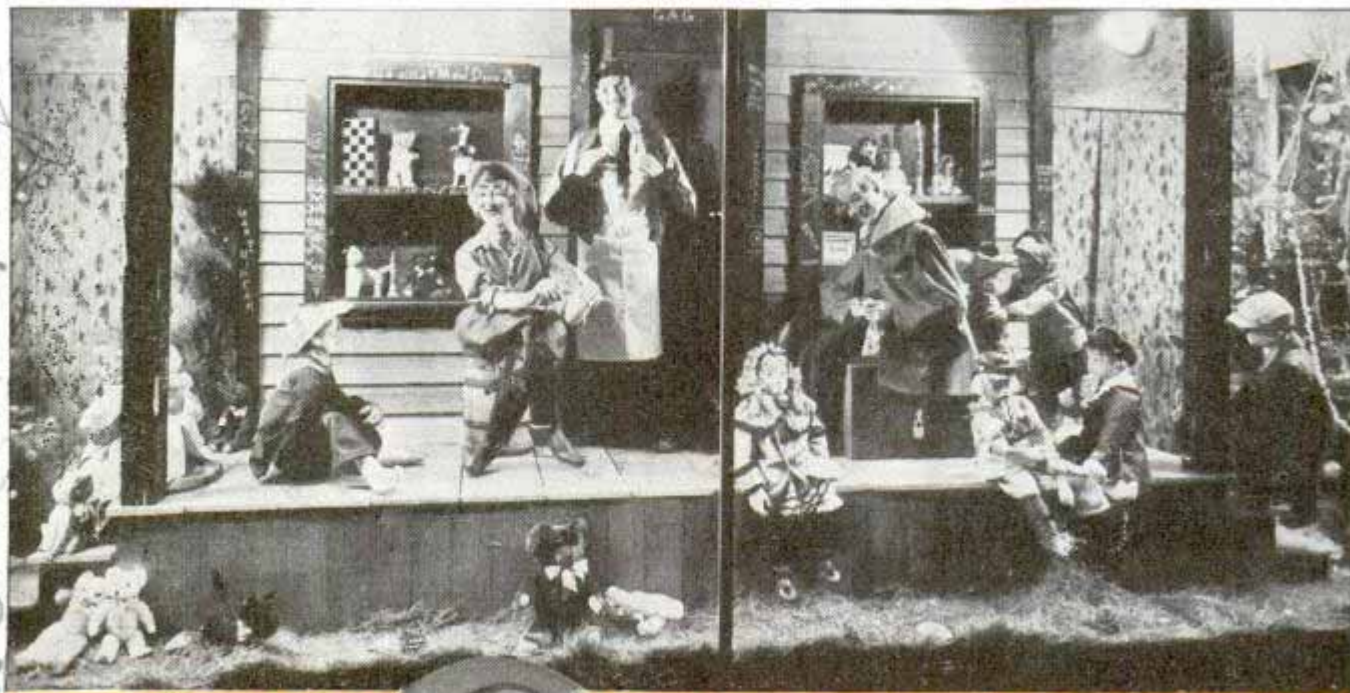
Above, carrying car and small driver to starting position, and broadsiding on a curve. Right, the midget autos closely resemble big racing cars. Note the crash helmets worn by the drivers



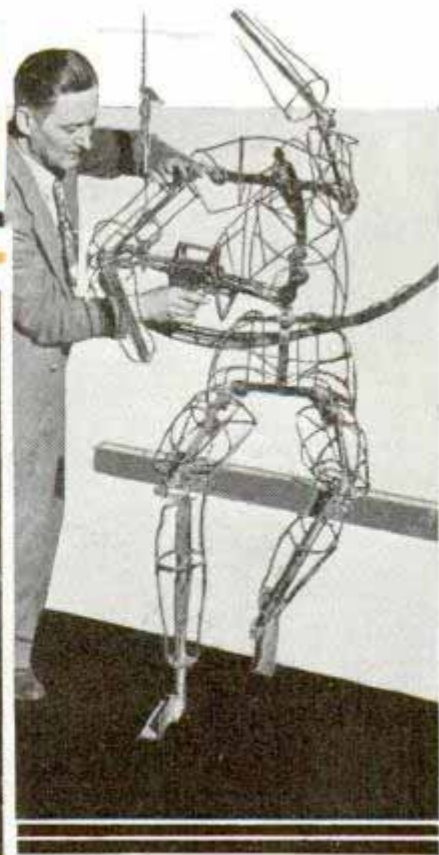
Lowings 90 Star. New and Post. Pasadena, Calif.

Cent. Store

BUILDING MOTION



Above, "The Country Store," one of Delmar Gray's animated displays. Gray utilizes talents of artist, sculptor, stage props maker and mechanic to turn out figures that perform with surprising life-like movements. Below, framework of dummy is heavy gauge wire welded in place over steel matrix. Hinge or ball-bearing joints give action to movable parts



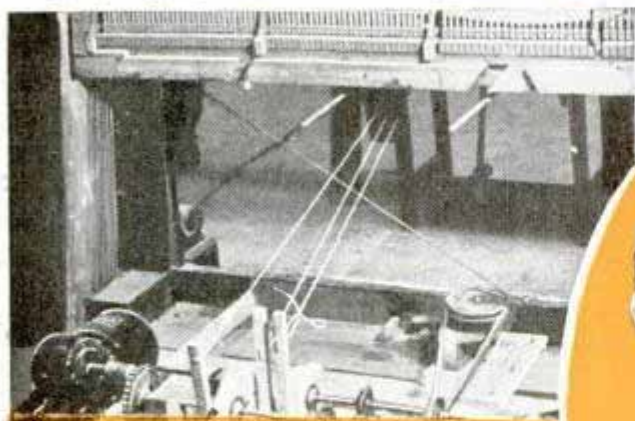
Above, installing the arm mechanism of a violin player. Right, head of dummy, made of paper in halves which are put together and the joint covered smoothly. Here the rear part of the head is being taken out of a plaster mold. Head motors operate the eyes and lips



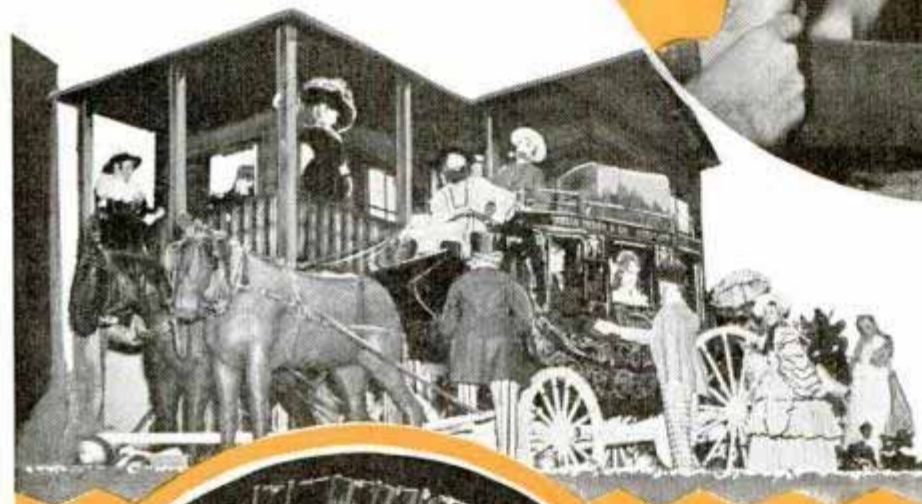
Delmar Gray Studios 675 Steegen St. San Francisco, Calif.

799 Bay St. San Francisco, Calif. Q-289

into DUMMIES



Above, controls for operating animated pianist. Right, two heads for comic figures, one with mouth cut away for articulation mechanism



Left, part of huge set built to depict with moving dummies the day of the stagecoach. Below, installing cam and motor which operate mechanism in dummy's head. The motor operates on a 110-volt electric circuit and the pulls run up through the pipe



Above, core of horse's neck is made so that the head can be moved. Motor is mounted in the body, which is made of laminated paper. Group sets are generally operated by control boxes, each with six to fourteen cams. Interior motors in figures are controlled by mercury switches. Rockers, pitmans, working pieces of rack against tooth gear, and weight lines all help to give grace and smoothness to the dummies' actions



W. E. Freer

Radio Waves Create Light Inside Glass Sphere



Glass sphere emits yellowish green light when exposed to bombardment of high-frequency radio waves

Held aloft without any wire connections, a glass ball was made to glow a bright yellowish green in a recent demonstration by Westinghouse lighting experts. The light was produced by coating the inside of a sphere with fluorescent pigments, and then shooting radio beams through it.

"Swamp Buggy" for the R.F.D. Defies Snowdrift and Mud

Getting the mail through is pretty tough sometimes on a North Dakota rural route,



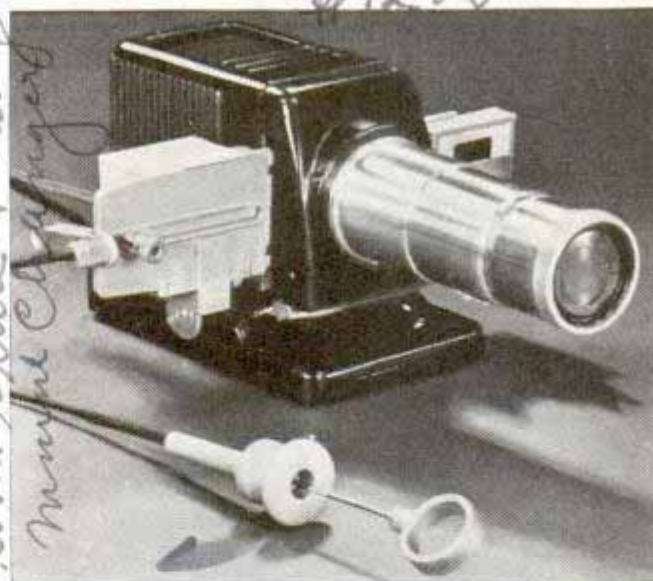
High front wheels and tractor tires on rear carry the mail through regardless of road conditions

but W. E. Freer of Dunn Center has built a "swamp buggy" that will take him on his thirty-two mile round every day, in blizzard or bog. Using the rims and tires of a hayrake, he built a pair of high front wheels for his coupe; on his rebuilt rear wheels he mounted tractor tires for extra power. With this combination of high clearance and power he travels through three-foot snowdrifts and spring mudholes without missing a day on the route.

Missing Element "43" Is Made in Giant Atom Smasher

Element Number 43, one of those missing from the chemical periodic table, has been invented rather than discovered. It was manufactured in the giant cyclotron at the University of California by bombarding the molybdenum atom with deuterons or neutrons. The element is closely related to manganese, molybdenum and ruthenium.

Remote-Control Slide Projector Operated by Cable Release



Pressing the ring plunger of cable release sends a fresh slide into projector

Fifty pictures can be thrown on the screen in proper sequence by a magazine-feed device operated by remote control. Without removing his eyes from the screen, the operator simply presses the plunger of a cable release to change the slide in the projector, then pulls the plunger out to prepare for the next slide. At the end of the showing, the slides are found in a receiving magazine in proper order.

D. H. B. Webber, Lighting Engineer

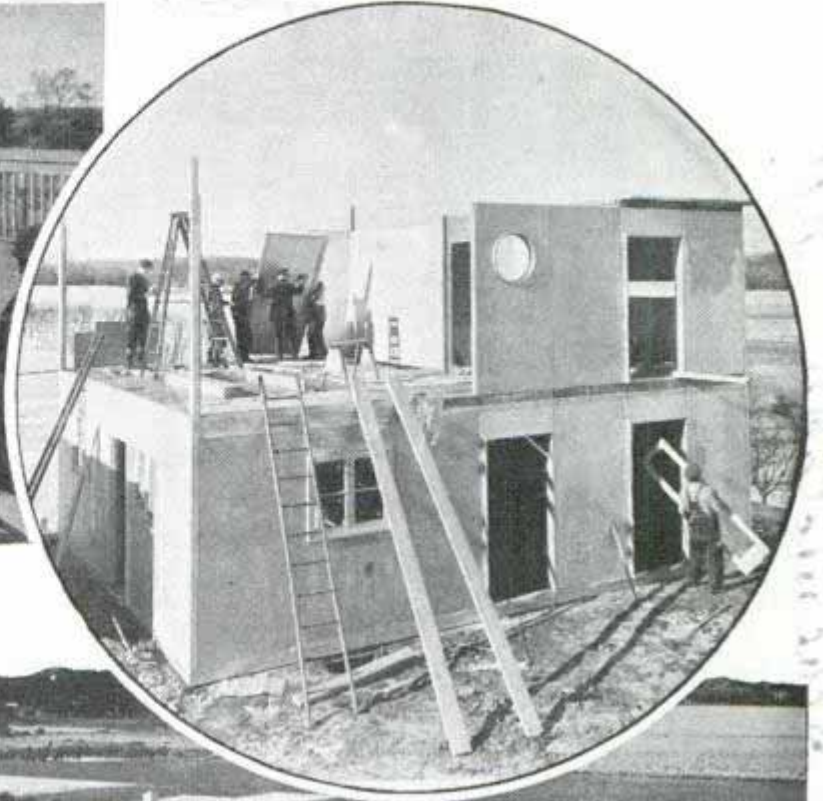
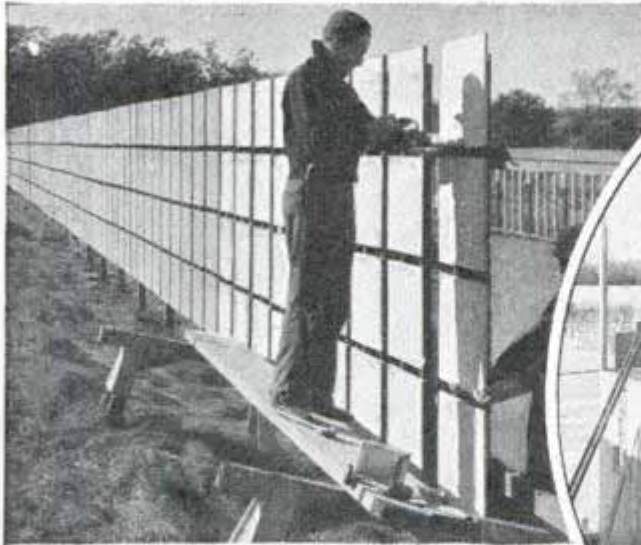
car used by W. E. Freer, Dunn Center, N.D.

Berkeley Calif 494

Kodak Slide Projector

Eastmaji Kodak Co

Resin Bath Weatherproofs Wood at Low Cost



Above, exposing treated and untreated plywood panels to weathering test. Right, building plywood house of "resin-bathed" panels, and two finished houses

Chemists at the U. S. forest products laboratory at Madison, Wis., have discovered a relatively inexpensive formula for arming wood against its worst enemies—moisture, decay, acid and fire. The method is to dissolve certain chemicals in water and inject the solution into the cell structure of the wood, where it forms synthetic resins that effectively seal out moisture. Thus far the treatment has been found best adapted to plywood, and it is estimated that it would cost but one cent per square foot of one-sixteenth inch plywood veneer, although initial cost is unimportant in view of the lengthening of life achieved. If commercially successful, this resin "medication" may end the curl-



ing of plywood furniture and sagging of roofs, and add years to the life of the prefabricated plywood panel home. The wood is impregnated either by ordinary soaking in the chemical bath for eight to fifteen hours, or by hydraulic pressure. After drying, the wood is ready for gluing into plywood sheets with waterproof glue.

Explosives Made from Natural Gas Are Cheap and Safer to Handle

Natural gas, air and steam are the sources of two high explosives which chemists at Purdue University have found inexpensive to produce. Their process involves adding nitrogen to hydrocarbons and condensing the product with formaldehyde. While as powerful as nitroglycerol, used for dyna-

mite, the two new explosives are only half as sensitive and therefore can be handled with greater safety. Only an insignificant fraction of the natural gas available in this country would be required to furnish all the high explosives necessary under normal conditions.

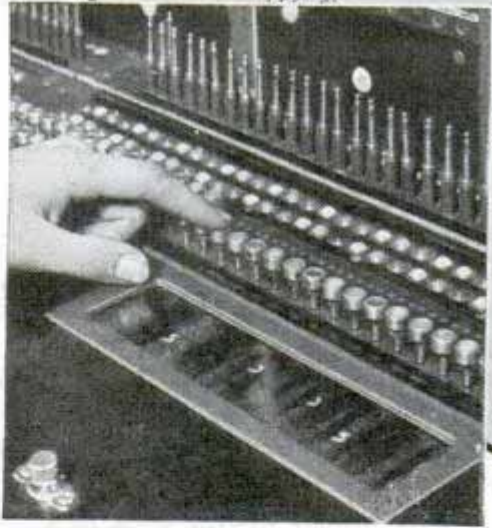
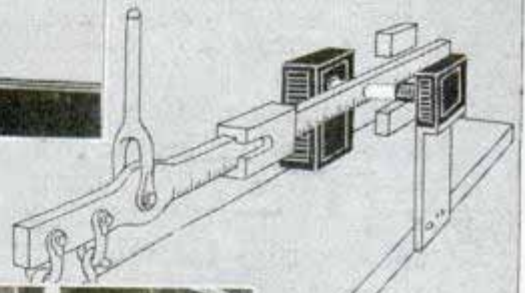
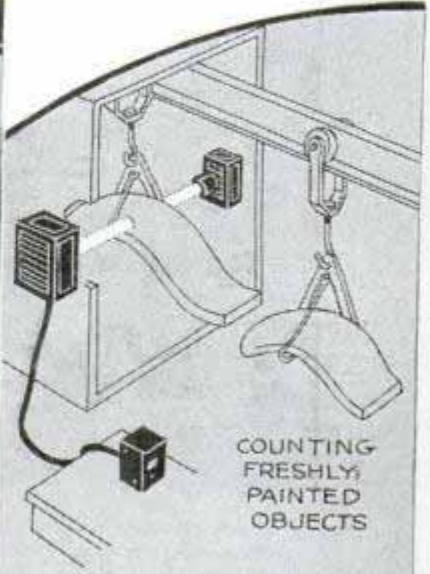
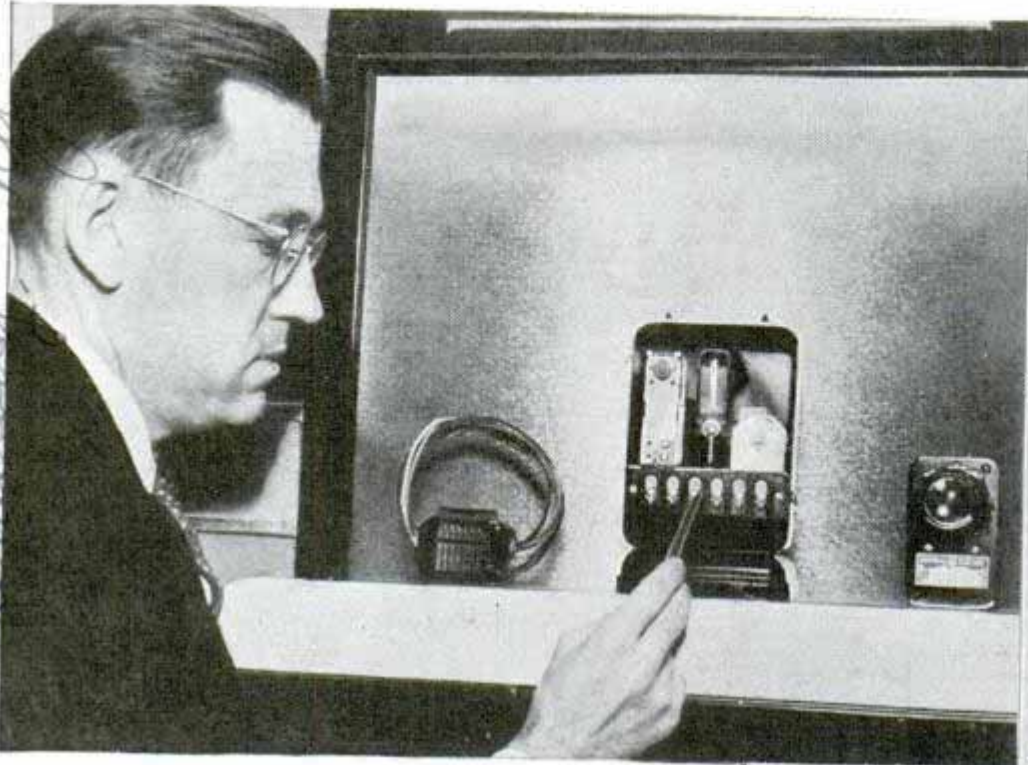
West Lafayette, Ind.

426 W. Old St. Madison Wis
 I 399
 Prof Henry B. Hass
 Eugene A. Brown

10565 Holman Ave
Los Angeles Calif

ELECTRICAL BRAINS

g. 1
General Electric Co
Schenectady, N.Y.
Publicity Dept., Industrial Exhibitions



NOW that man has harnessed electricity to perform much of the world's work he is training it to do some of his thinking.

Machines that figure things out for themselves are taking over the drudgery of routine occupations. Robots, made of metal and fed with electricity, are performing complicated tasks as well and in some cases better than man could do them. Electrical brains are trained to safeguard workers at hazardous jobs.

Today, thinking machines automatically keep light and heat at proper intensities in buildings, open doors and run motors of automatic elevators, and are left in charge of such tasks as measuring and cutting paper to the right size in paper factories or labeling and capping bottles in a soft-drink plant.

In one modern furniture store an electric washing machine begins to operate as soon as you step close to it. The heat elements of an electric stove turn on as a customer approaches. Vacuum cleaners and dish-washing machines demonstrate themselves as you walk up to them. In stepping close to the displays you interrupt a light beam focused on a photoelectric cell. The cell throws a switch that starts the demonstration. How would you like to

Top, photoelectric relay. When light beam aimed at light-sensitive tube to which the man points is interrupted, a magnetic relay closes a circuit to ring bell or perform other work. Bottom, call indicator lights numbers in manual telephone exchange when call arrives from automatic exchange

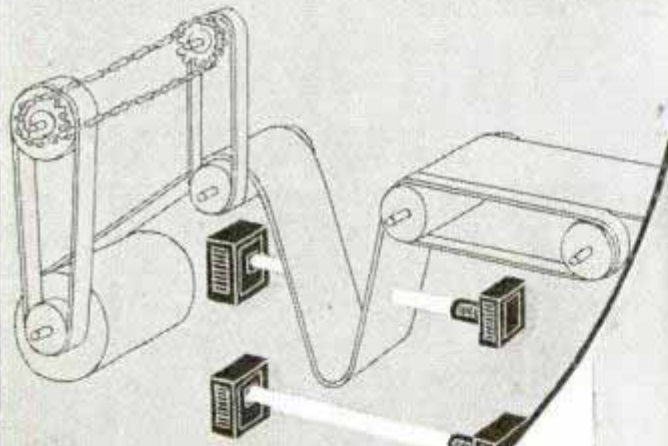
attend an animated lecture in which an electric brain gives you its personal attention? One manufacturer is building such a machine at present. When you walk into this hall, devoted to a display of petroleum products, colored lights flash on a large wall map and a voice begins to explain the

Help RUN the WORLD

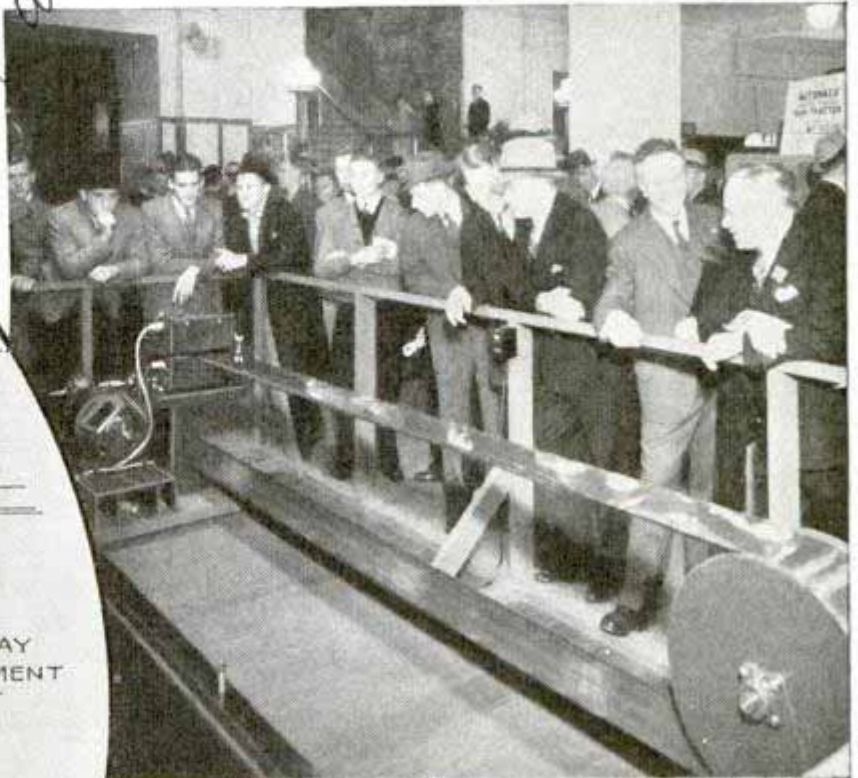
*Perkins
Dodge
Chicago
2-159 W.*



OPERATING ONE-WAY
DOOR-OPENING EQUIPMENT
IN RESTAURANT



CONTROLLING LOOP OF
FABRIC BETWEEN REEL
AND CUTTING TABLE



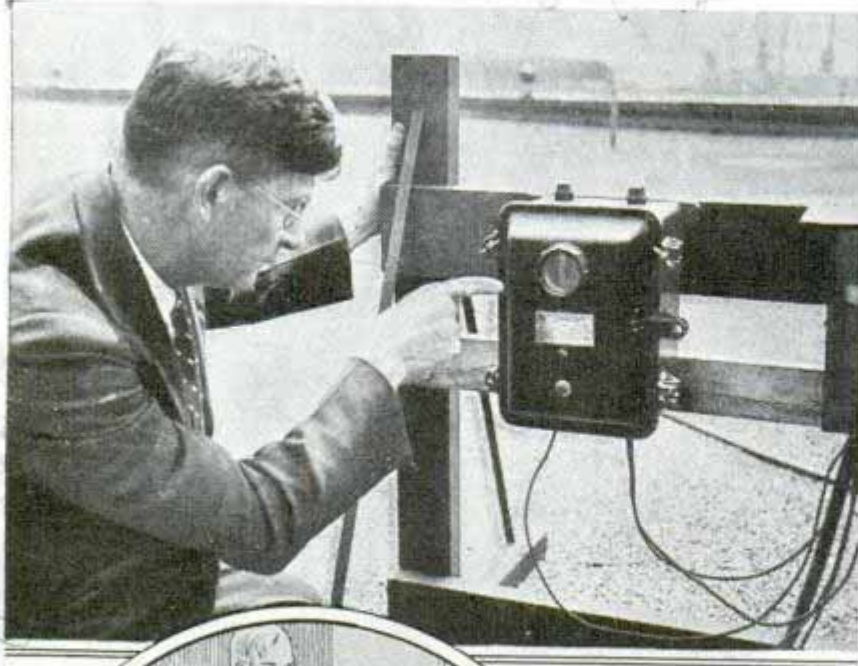
significance of the lights. As the voice continues other lights appear, drawing your attention to the places that the voice describes. In a question and answer dialogue voices from opposite sides of the room carry on a conversation, then the main speaker's voice asks you to step to a table to inspect a display of products. As you do so lights at the table flash on and a new

Left, some tasks performed by "electric brain." Right, pinhole detector for catching flaws in steel. Bottom, if player steps over foul line of bowling alley, the photoelectric detector immediately reveals the error

reciprocating P over and night Corp

Chas. Elgin d. l.

W. attach Periscope 1937



trains from San Francisco to Oakland over the Bay bridge are protected by a myriad of electric bodyguards. More than 4,000 electric relays set the track switches, signal ahead reports of approaching trains, and operate the controls that establish proper car speeds.

In industry, electrical brains are squaring up the weave in cloth in its final stages of manufacture, are automatically sorting poor from perfect watches in watch factories by comparing their ticks with those of a standard time-piece, and are refilling water

tanks when their contents have fallen to certain levels. Water-softening machines automatically test the hardness of water in municipal water systems and then inject the proper amounts of chemicals to soften it.

Electric brains are used by engraving plants for turning out perfect work, safeguarding

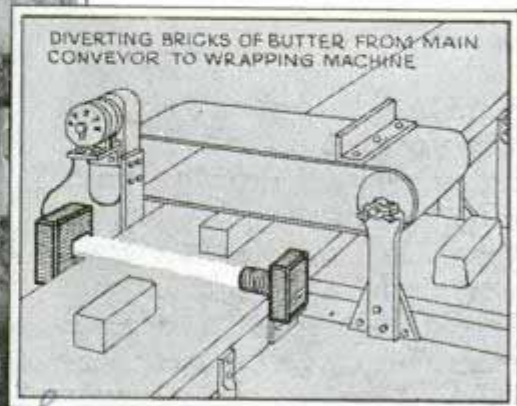
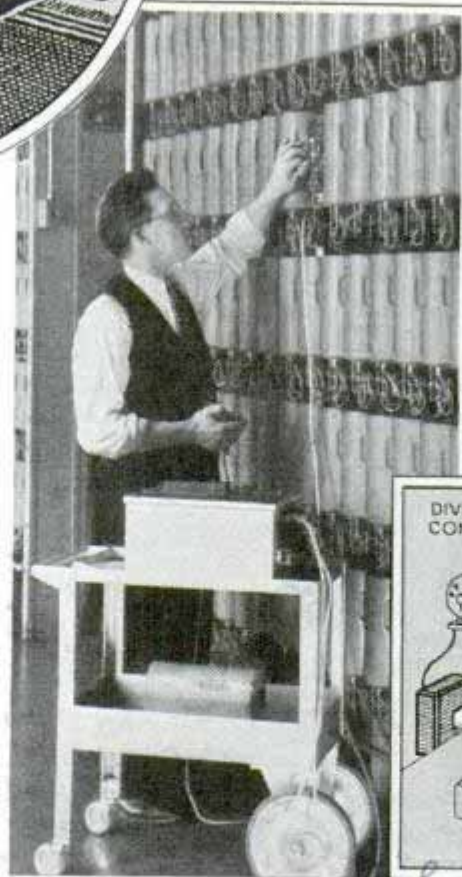
ballot boxes, scanning steel for flaws, and signaling when a player's foot passes over the foul line in bowling alleys. One recent invention is a photoelectric method of determining strikes and balls in a baseball game.

In hospitals, doors open automatically and water faucets turn on at the approach of doctors and



voice, close at hand, begins to describe the objects you are looking over.

The interesting thing is that you are entirely alone. An electric brain runs the whole thing. You threw the switch that turned on the brain when you broke a light beam at the entrance. When you leave the room everything turns off and the electric brain goes back to sleep, waiting for another customer. A few photoelectric cells, rotary switches, time switches, phonograph records and loud speakers comprise the invisible thinking apparatus.



DIVERTING BRICKS OF BUTTER FROM MAIN CONVEYOR TO WRAPPING MACHINE

Top, outdoor photoelectric relay controls nine street-lighting circuits. Circle, "electric eye" sets off alarm if sleepwalker gets out of bed. Below, testing automatic telephone exchange switches. Right, another use of "electric brain"—diverting butter to wrapping room

Passengers on interurban

Used by W. D. Darrall, Esq. Eve. Works. Engineering Dept

Talking Traffic Light Warns Motorists of Dangers Ahead

technicians who have sterilized their hands and must not contaminate them.

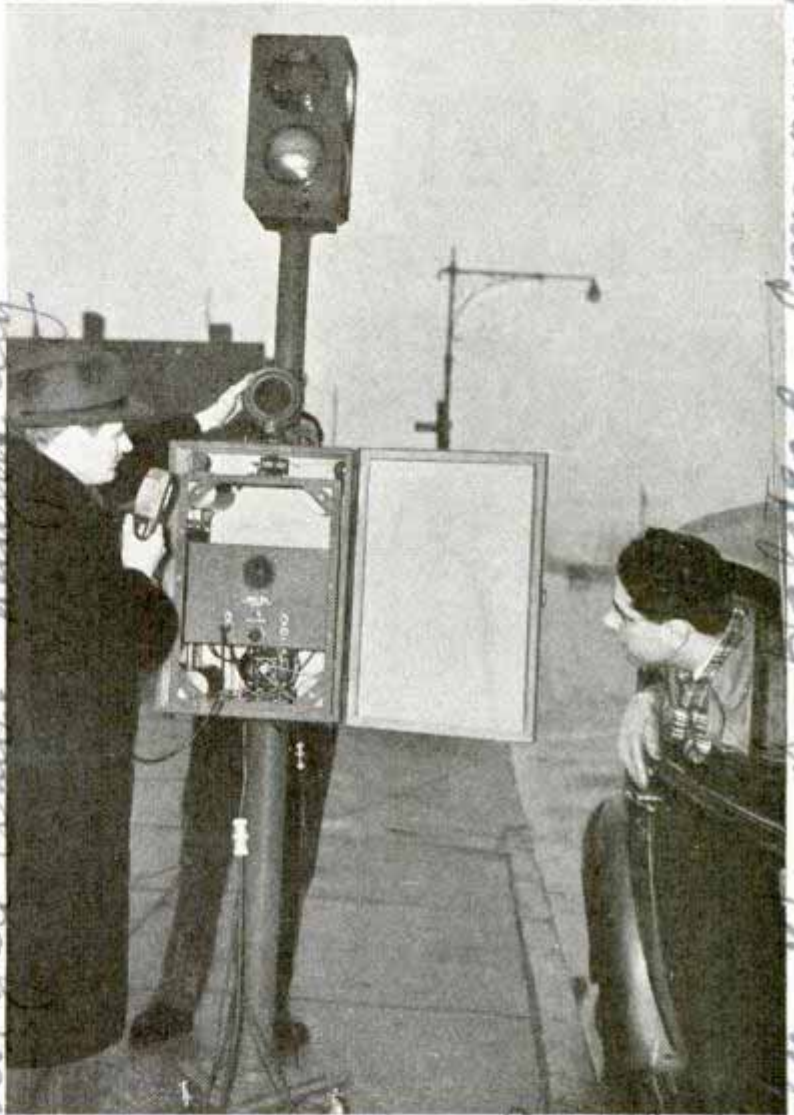
The same kind of photoelectric cell guards operators of dangerous machines, opening the switch if the operator carelessly approaches too closely or forgets to pull his hand from under a descending press. Electric counting machines insert the correct number of drops in medicine bottles and the right number of pills per box. The "electric stool pigeon," an oscilloscope, signals the presence of guns or other metal objects being carried into a prison by visitors. In the manufacture of cardboard tubes in a paper factory, the tubes are stopped and sawed through at the proper lengths by a photoelectric device, as they issue from the tube-making machine.

In many industries a perplexing problem is the matching of exact shades of color. The quality and intensity of the light and even the color sight of an operator all help to make the exact matching of colors extremely difficult. Mistakes are avoided by a new device developed by the General Electric company, called a recording photoelectric spectrophotometer. This instrument measures color and reduces any shade to a curved line on a graph, permitting exact comparisons and duplications. No human eye could do the job as well.

In aviation, engineers have coupled the automatic pilot with the radio beam receiver, so now machinery not only attends to the details of flying the plane but also keeps it on its proper course. Another effort-saving hook-up in the cockpit ties the weather broadcast radio receiver up to an automatic typewriter, freeing the pilot from the necessity of listening to weather broadcasts and copying them down.

The weather bureau is beginning to employ mechanical men to

(Continued to page 118A)



Radio traffic signal speaks a warning ten seconds before lights turn red; drivers hear it on their own radio sets

Traffic lights have been given a voice to warn pedestrians and drivers of signal changes and of special safety precautions at intersections. An experimental model of the "radio policeman," recently invented, consists of a transmitting unit mounted on a portable light standard, and makes use of a magnetic steel tape for sound recordings which are broadcast either continuously or intermittently. These messages can be changed as required. A sign placed before the radio zone would call attention of the motorists equipped with radios and give the transmitter's frequency. By adding a loud speaker pedestrians can be told in advance when the lights will change at busy street crossings.

General Motors
Cleveland
A Diesel engine of 1926 weighed 70,500 pounds—188 pounds per horsepower; its modern counterpart weighs only 19,000 pounds, or thirty-one pounds per horsepower.

Developed by Wm. J. ...
 7270-6th Ave.
 ...
 ...
 ...

Mounted Police Use Radio to Help Control Crowd

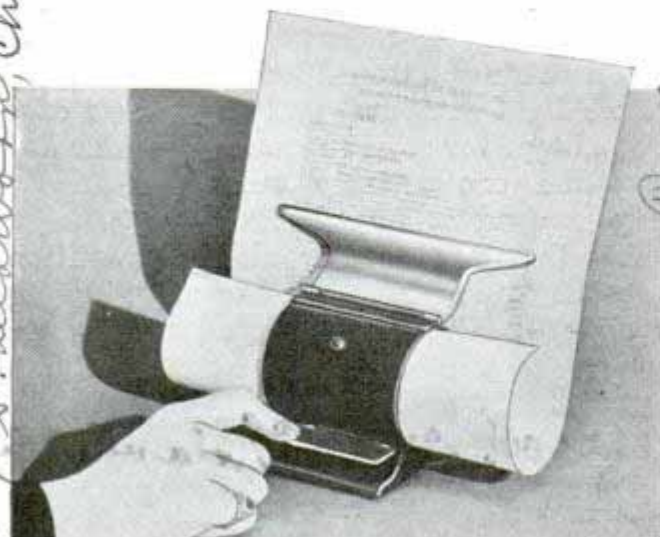


British policeman with headphone and speaker, and with radio set on saddle, directs traffic at races

Mounted policemen patrolling the course of the Grand National Steeplechase at Aintree, in England, carried two-way radio sets in the saddle. Headphones and mouthpieces enabled them to keep in constant touch with headquarters and thus coordinate traffic and control the crowds at the races.

Typist's Line-Spacing Copyholder Rolls Letter Upward

Rolling a letter upward so new lines will appear as copying progresses, a copy-

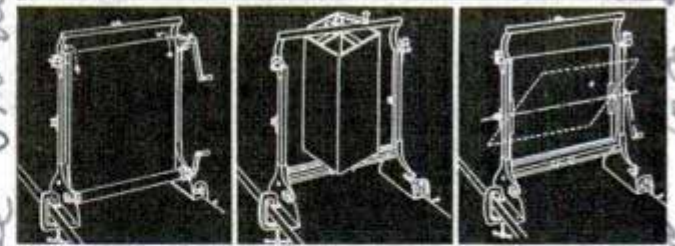
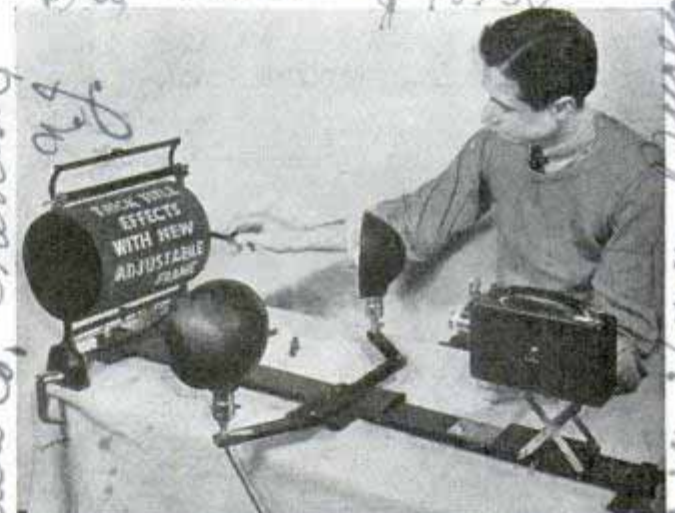


Finger-tap on space bar of copyholder moves paper upward to the next line for convenience of typist

holder now on the market includes a line spacer that operates by a tap of the typist's finger, similar to operating the space bar on a typewriter. Light in weight and portable, it is in no way connected with the typewriter but may be placed at the most convenient angle for best vision and light, and extension guides are available for handling copy twenty inches wide.

Trick Titles for Amateur Movie Filmed on Rotating Frame

Amateur moviemakers can produce many of the titling effects of the professional movies with a versatile title frame now available. Into the frame fits a revolving drum on which titles and captions can be made to turn vertically or horizon-



Top, set-up for making movie titles with revolving drum; below, scroll, box and "flop-over" screen

tally; a block, for similar effects; a scroll which is cranked upward or downward for moving titles, and various other accessories for "flop-over" and page-turning tricks. All the equipment for making traveling titles can be obtained in kit form.

There are about 20,000,000 automatic telephones in service around the world—probably sixty per cent of all the phones; only forty-four per cent of the phones in this country, however, are dial-operated.

acme

2364

Pro Int. \$18.50

Becher Products Co., Trenton, N.J.

Watt & Kellogg, Inc. 7 S. Dearborn, Chi.

Automatic Electric Co. 109 W. Corn

Watt & Kellogg, Inc. 7 S. Dearborn, Chi.

Auto-Line Corp.

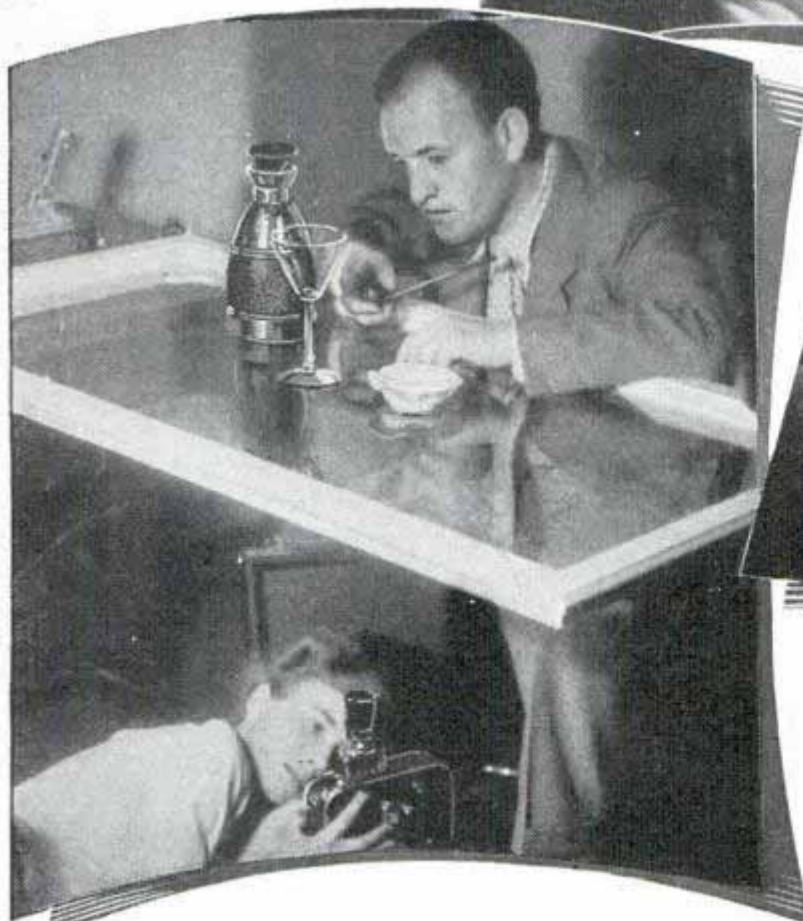
11400 L. St. N.W.

Odd Shots Made with Small Movie Camera



Unusual effects can be obtained with the miniature movie camera. Right, snowball closeup results from tossing snowball and then the camera at the subject, who must leap aside at just the right moment. Above, ready to throw camera, which falls safely into soft snow

Above, odd photo taken by shooting from beneath glass plate (as in photo at bottom, left). Camera is fixed on revolving disk resulting in an illusion that all objects on glass are slowly moving in circles



Above, camera fixed on toy railroad trucks rolls along the parallel tracks and photographs the subject as it moves closer and closer. Absence of rocking is a feature of this arrangement

Handwritten notes on the right margin:
 Herman...
 420 Lexington Ave, New York
 1100 100th Street, Astor, N.Y.

Handwritten notes at the bottom of the page:
 1100 100th Street, Astor, N.Y.

Soldiers Risk Lives to Save Comrade on Cliff



Two soldiers on Alpine duty risk their lives in precarious rescue work as they lower themselves down sheer cliff with injured companion roped to stretcher sled slung from a projecting pole

Mountain climbing takes cool nerve and steady muscle. It takes even more nerve and skill to accomplish the rescue of a helpless comrade who must be brought safely down the perpendicular rock wall of a peak. In the spectacular photograph shown here, soldiers have rigged up tackle on a pole projecting from the brink of a precipice and are working their way down the sheer face of the mountain while they support a wounded companion roped to a sled used as stretcher.

Moth Rescues a Continent from Becoming Desert

Australia was swiftly becoming a desert. More than a million acres a year were being devoured by the prickly pear. In its native habitat—the United States, Mexico and South America—this cactus is sometimes grown in gardens, and is kept under control by insects and the competition of other plants; but when it was introduced in Australian gardens a few decades ago it found a cactus paradise where there were no natural enemies. Prickly pear ran wild. By 1925 it had turned 60,000,000 acres of once good farm and grazing land into useless jungle. Scientists hunted frantically for an enemy that could quell the prickly pear without becoming a pest itself. Entomologists feared that they might introduce an insect which could attack the cactus but would also bore into apples and other fruit. At last, however, with the aid of U. S. government scientists, the tiny Argentine moth was chosen to rescue Australia. It lays eggs in strings of twenty or thirty on a cactus leaf, and the larvae bore into the leaf in a joint attack. A colony of these moths was introduced at a point in Australia where there was an almost un-

Smithsonian

The Wocho 2/22/39

2 421

broken belt of dense prickly pear jungle 100 miles long. Two years later the jungle had collapsed under the assault of the moths, and ninety per cent of the land was available again for farming. Altogether, the insect has already reclaimed 15,000,000 acres of cactus desert in Australia.

Fast Bounce-Back Tennis

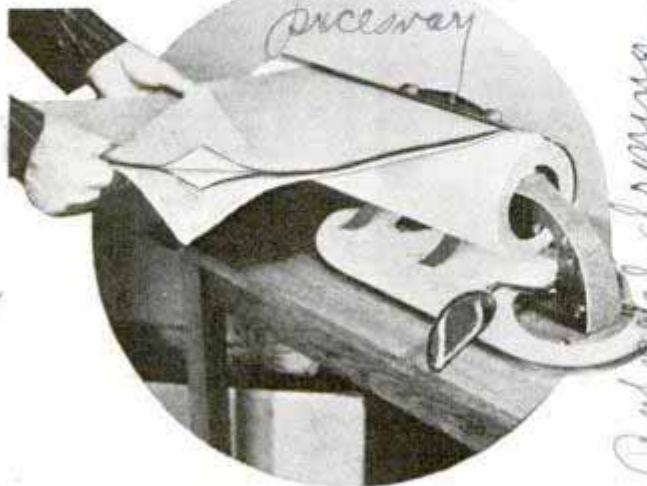
Is Played in a Small Space



Tennis players have to hustle on this quarter-size practice court where the ball bounces back rapidly after striking board behind the net

Cloth Back for Map or Photo Mounted by Applying Heat

For reinforcing maps, charts and photographs with a cloth backing, there is a dry-mount cloth that is applied simply by using a flatiron. The coated side of the cloth is laid over the back of the blueprint or photo, heat is applied and when the print cools it is smooth, strong and flexible. It can be rolled or creased without cracking, and since the backing seals it against moisture the print will not curl. While an ordinary iron can be used, there are available special rotary ironers for large maps and pictures.



Sealing dry-mount cloth backing on big blueprint by running through rotary heating element

Affording players more than mere humdrum practice, an outdoor "battle board," devised by Mary K. Browne, instructor at Lake Erie College and a former tennis champion, provides excitement and pleasure of an actual game and calls for just as much skill. Although only one-fourth the size of a regulation court, it is said to be faster, one set giving a workout equivalent to two sets of regular tennis. The ball is served over the net and against a specially constructed board; then it is played alternately in the usual manner. Two or four players can participate in the game, using standard rackets and balls, points being scored as in tennis.

Rubber soling, now on the market for retreading and repairing overshoes, is applied with ordinary repair shop equipment.

Charles & Photos
Princesway
Acme
Instant
Seiberling Rubber Co

"Bomb" Exploded in Bulb Coats It with Sodium

W. A. Criggles, Research Laboratory



Above, indicating tiny bomb at end of filler apparatus, and bomb compared with sodium vapor lamp

Sodium vapor lamps, becoming increasingly common on highways, are given their illuminating substance by exploding inside an evacuated bulb a tiny glass "bomb" filled with sodium. This appears as a mirror-like deposit in the bulb when it is cold, but vaporizes and glows with a golden-orange light when the current is turned on. The metal is difficult to handle as it oxidizes rapidly when exposed to moist air. It will attack most non-metallic elements and hence the lamp is coated with a sodium-resistant flashing glass to prevent damage. The bombs are filled and sealed by a complicated system of glass vessels, developed by General Electric company, which involves a triple distillation process to remove impurities in the sodium. Attached by slim necks to the fourth vessel are twelve little bulbs which are filled simultaneously, providing bombs for a

dozen sodium lamps. After the lamp has been evacuated and a bomb placed inside, a high-frequency coil is used to induce heat in the sodium, causing it first to boil and then to explode its glass container. Since the glass case of the bomb is not more than six thousandths of an inch thick, the shattered particles are reduced to a fine dust and can be left in the lamp.

240

Millionth of an Inch Films Have Insulating Value

J. Reynolds

Films of organic materials such as barium stearate, so thin—a millionth of an inch—they are expressed in terms of molecules instead of inch fractions, have been found in some cases to hold insulating values comparable to those of the best known dielectrics. Molecules themselves are only 1/10,000,000 inch in thickness, but scientists of General Electric research laboratory, by electrical measurements, can tell within an accuracy of two such layers how many there are. It was through similar experiments that the laboratory samples of glareless glass were produced.

2379

Old Refrigerator Car on Farm Multiplies Profit from Fruit

Buying an old refrigerator car and moving it to his orchard, a Michigan farmer was able to make a \$900 profit on a carload of peaches. When the market was glutted,



Iceing the refrigerator car which is "parked" permanently in farmer's orchard to keep perishables fresh

Collegiate, East Lansing, Mich.

he held the fruit in his secondhand refrigerator for ten days and realized an advance of \$1.20 a bushel. The "icebox" cost him \$175 on the sidetrack. He had to pay to have it rolled over the roads to his farm, but by selling the running gear and other scrap metal totaling ten tons he brought the net cost down to \$139.89. The ice is obtained from a near-by pond and stored in his icehouse near the car. Now the farmer can always take advantage of market conditions and hold his fruit, vegetables, eggs and other produce to await better prices.

9-424

Giant Electric Typewriter Prints News Flashes

World's fair visitors at New York can watch the latest news flashes printed on a fourteen-ton typewriter, exact copy of a standard machine but as high as a two-story building. Remotely controlled from a master electric typewriter, its forty-five-pound type bars punch out the news continuously in letters three inches high, on "stationery" measuring nine by twelve feet. The ribbon is five inches wide. It took three years to build the giant, and two boxcars were required to ship it to the fair grounds. The carriage alone weighs 3,500 pounds.

Safety Togs for Any Hazard Shield Worker Against Injury

Sammy Cunningham



Wade Warka
Young lady bedecked in some of the latest safeguards worn by workmen to ward off accidents and diseases in dangerous jobs

In the drive to stop industrial diseases and accidents before they happen, an endless chain of

safety gadgets is being produced for the protection of workmen. What the well-dressed worker will wear for safety was shown at a recent exhibition. Included in the display were aluminum toe guards, fiber shin guards, a non-inflammable and adjustable eyeshield, safety belt studded with red reflectors, and a respirator for miners and stone workers that filters out dust and does not interfere with speech.



Remotely controlled, this big machine prints news bulletins at fair

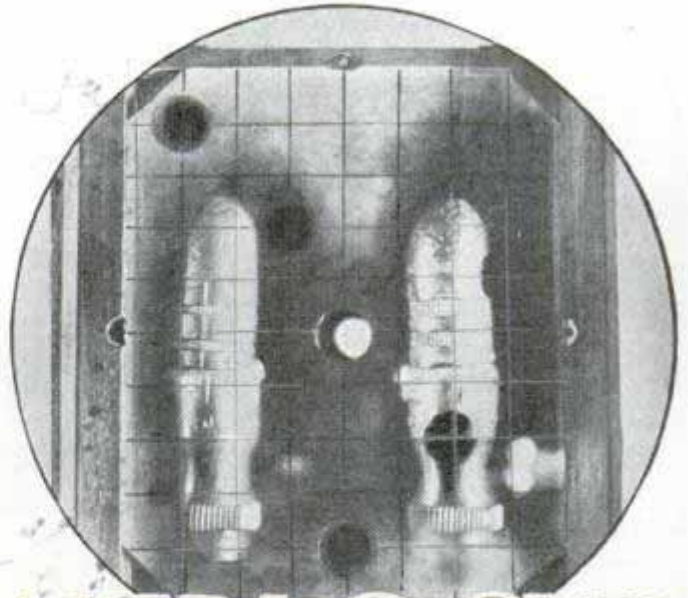
Underwood Elliott Fisher, Anderson

see march 1939
see march 1932
at Spokane & Ellwood City, Pa.
show and foot guards - Ellwood

Young lady bedecked in some of the latest safeguards worn by workmen to ward off accidents and diseases in dangerous jobs
at Cleveland, Ohio
at Cleveland, Ohio
at Cleveland, Ohio

0-5
EVEN the master criminal signs every crime. He may leave behind only a silhouette in dust, a fleck of paint the spectrograph alone can "read," a telltale wisp of fiber that will tell plenty under the microscope. But somewhere the criminal leaves his signature for modern science to decipher.

One killer tried the cowardly way of murder by mail. Bombs brought by the postman, he thought, would do their deadly work and erase all traces of the sender. They did their work; two men were killed as they opened the parcels—but the murderer reckoned without the detective sci-



MODERN SHERLOCKS



Acme

entist. The Journal of Criminal Law and Criminology, reporting the case, tells how wood technicians examined imprints of a plane on wood fragments from the bomb, matched them with marks on wood in possession of a suspect. Chemists analyzed glue in the two wood samples, found them identical. The microscope proved that nails from the bomb and from the suspect's workshop came from identical dies.

Candle grease in a burglar's pocket sent him to prison. Infrared photographs of a

footprint trapped another criminal. Microscopic pictures of a cabbage stalk brought a farm thief to justice. Chemical analysis of the ashes of a hat identified its murdered owner as a missing Boy Scout.

These are samples of the work of the modern scientific Sherlock Holmes. You wouldn't recognize him on the street. You'd probably take him for a college professor—which he very likely is, when not engaged in "master minding." For the detective who solves the "perfect crimes" of

*3-5-34
Chromy
of ash...*

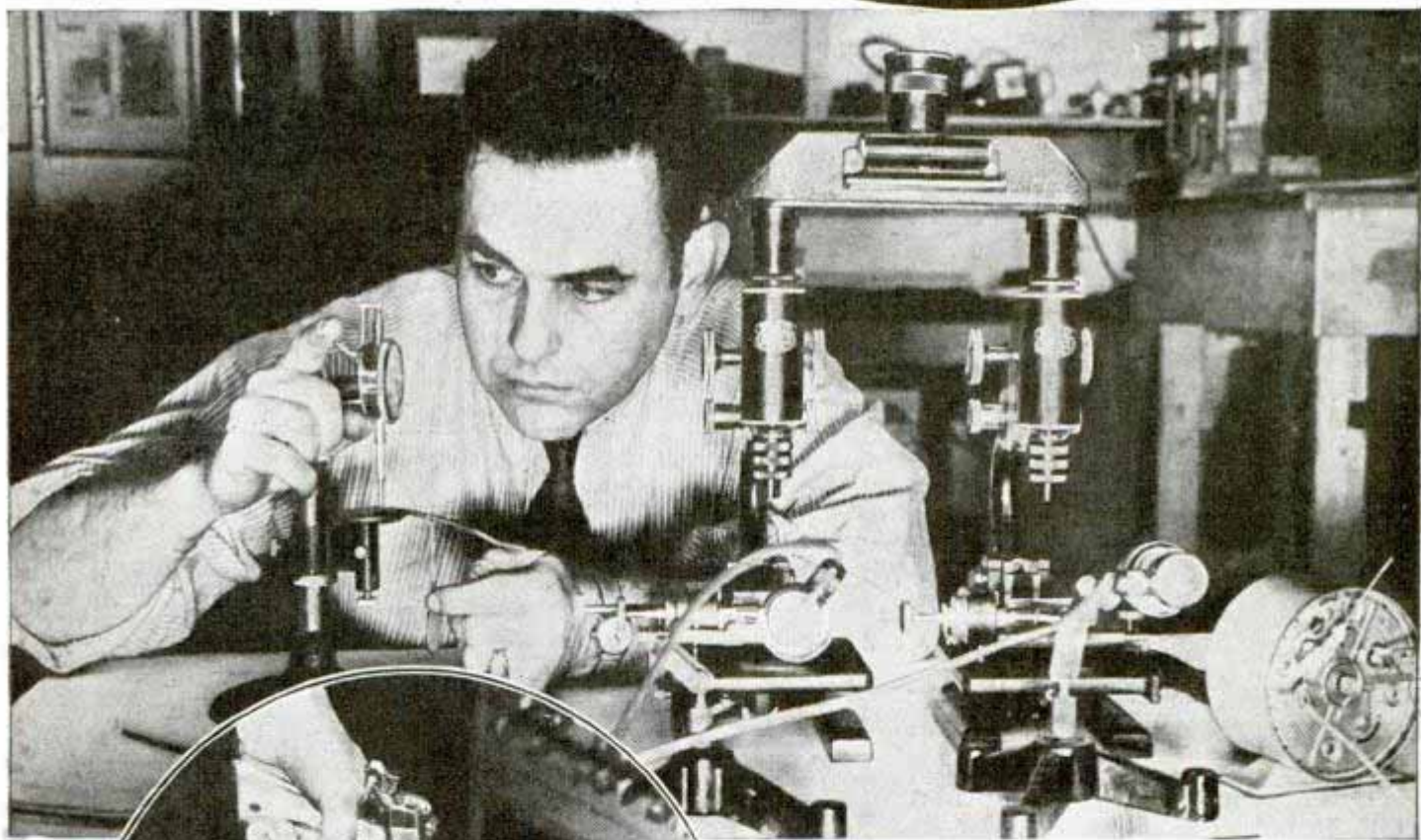
*Consulting Chemist,
Pasadena Police Dept*

At top of opposite page, two bullets seen through ground glass of camera; rifling marks on test bullet at left are being compared with fatal bullet at right. Below, demonstrating the polygraph "lie detector." On this page, top, blowing iodine vapor to develop fingerprint. Center, using dial micrometer to measure diameter of wire used on time bomb. Bottom, firing bullet into basket of cotton for ballistic test



*Mr. W. E. Brown and his laboratory
Chicago Police Scientific Laboratory*

Battle "PERFECT" CRIMES



1939 is not the pipe-smoking fellow of fiction nor the burly plain-clothes man you read about in the big city newspapers. Rather he is a laboratory technician whose tools are the spectrograph and comparison microscope, the camera, electric furnace, test tube and polygraph.

Sherlock Holmes of old would sit in his clubroom, glance at a passerby and tell you instantly the stranger was an old soldier, recently discharged from the India service; a non-commissioned artillery officer,

away from

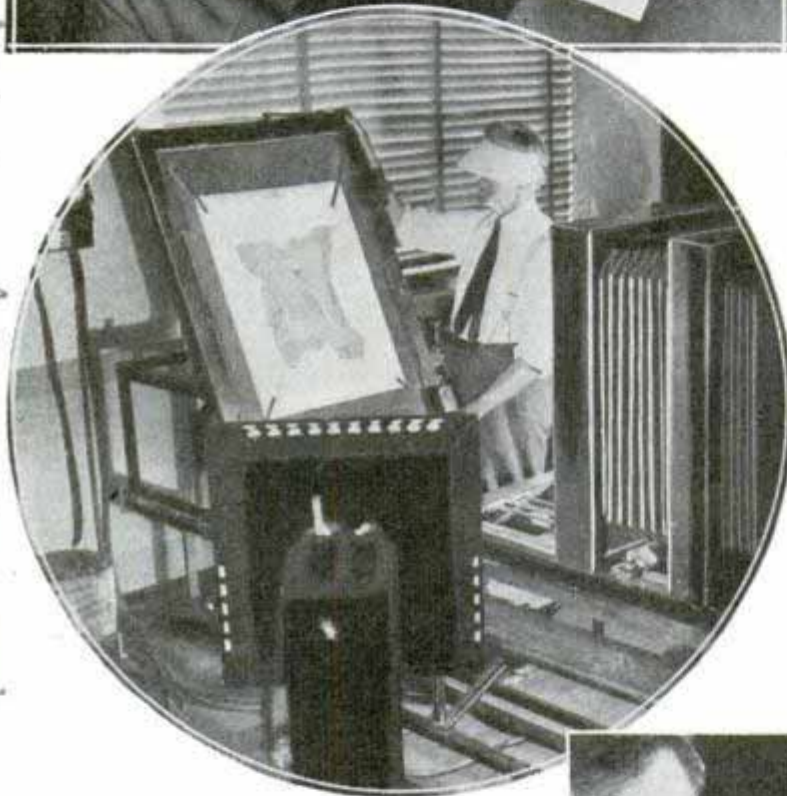
handwriting school



City police go to school these days to learn scientific methods of gathering clues. They speed to the scene of a crime in a squad car equipped with two-way radio, fingerprint kit, camera and lights, moulage set and all the essentials for collecting evidence. Then, often, they turn the clues over to trained criminologists for analysis. The Chicago police have their own laboratory, acquired from Northwestern University, which had founded the first scientific crime-detection laboratory and school.

It was experts from this Northwestern laboratory who by micro-analysis worked the first solution in a series of murders, riots and bombings in a mine field. Two suspects were in custody, accused of blasting a mine powerhouse; but they denied guilt, asserting the explosion probably was caused by coal dust or gas. The experts wrecked that defense. From the shattering effect of the blast—one 125-pound chunk of cast iron was blown 150 feet—they determined it was a "high" explosive, probably dynamite, with a velocity of 5,000 to 25,000 feet per second. Coal dust and gases, which classify as "low" explosives, were ruled out.

Federal Bureau of Investigation



widowed, with two children. Sherlock was a master of observation and deduction.

His 1939 counterpart might be a little less keen with the naked eye, but more effective when armed with laboratory instruments. One modern Sherlock, for example, was given a bit of string that had been wound around a bundle of dynamite in a bombing. By microanalysis he sorted the debris on the fragment of string into feathers, hair and pollen; he was able to identify the locale from which the dynamite came and describe the terrain and its animal and land products.



Top, handwriting expert compares words from threatening letter with writing of suspect. Circle, photographing blood-stained handkerchief for evidence. Bottom, studying fingerprints with dactyloscope and analyzing dust on state's evidence

Who prof. make a
Dolan
former
Dr. M. S. A. Hill
New Western Crime Lab.

Dr. Robert Sears
Police

Following the radiating paths of flight of the debris to their focus, the experts found fragments of adhesive tape, copper wire and bits of an alarm clock. They reconstructed a clockwork mechanism used to set off the charge. In a radio repair shop at the home of the suspects they found bits of copper wire and a roll of adhesive tape from which two strips had been torn. But how to connect the fragments from the bombing with those in the workshop, to send two men to prison?

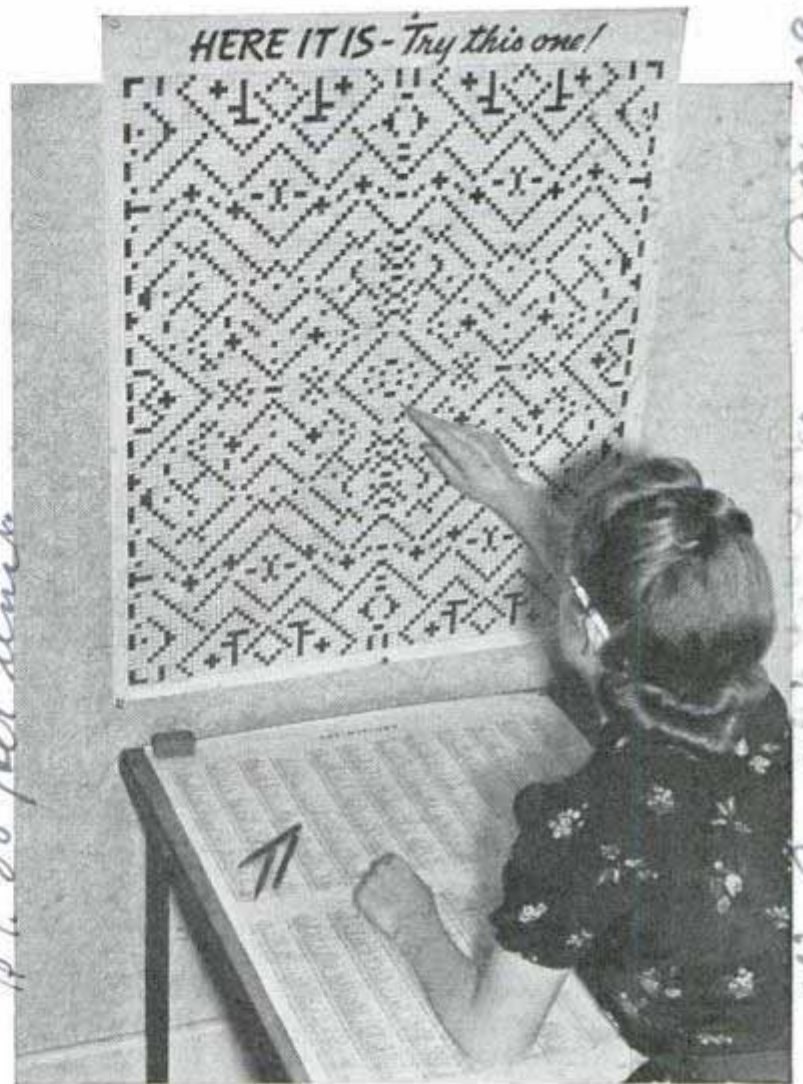
Under the microscope the scientists counted 322 torn filler threads in the adhesive tape found at the suspects' home; thread for thread, they matched in thickness, in numbers and in tears the tape wound on the time bomb for insulation. Using methods of the ballistic expert, they found identical grooves on the various copper wires, proving they were drawn from the same dies. Cross-sections of the wires were photographed under a metallurgical microscope; the suspects' wires and those on the bomb were identical in grain structure. The jury looked at these photomicrographs and sent the bombers to the penitentiary.

One burglar shot a man, was arrested, and five witnesses swore he was miles away at the hour of the attack. Ballistic experts proved the defendant's revolver had fired the shot, and as his alibi was shattered, the prisoner remarked with a wry smile: "This sure has put my witnesses in a hole."

Sometimes a scrap of cloth is the only clue. Even the imprint of the cloth is enough. On the fender of an automobile that police suspected was involved in a hit-and-run killing, they found a tiny imprint. Photographed and enlarged, the pattern was found to contain thirty-one lines to the inch—identical with the threads in the dead man's shirt. The shirt bore minute flakes; dissolved in alco-

(Continued to page 116A)

Giant of Crossword Puzzles Result of Two Years' Labor



Trying to think of word that fits near center of huge crossword puzzle which may take the young lady a year to solve

It required two years of work to complete a huge crossword puzzle, now on the market, which embodies 3,071 words, and it is said that the average fan will take one year in solving it. The design measures twenty-eight by thirty-four inches.

Half a Ton of Paper Is Used Each Year by Average American Family

If yours is an average American family, you use every year more than half a ton of paper costing about forty dollars. The U. S. Forest Service reports that nearly 16,000,000 tons of paper were consumed in this country in 1937—more than half the paper produced in the world. About 100 pounds of the 246 pounds used by the average person represents newspapers, magazines, books and stationery; the rest was wrapping paper and cartons, building board and other products. Spruce, hemlock and fir furnished three-fourths of the pulpwood for paper.

Mrs. C. W. Cressinger, 1001 109th St., Berkeley, Cal.
 Dept. of Agriculture

Tall Grass Is Cut by Mower with Whirling Blades



Cutters rotate at high speed in one direction, slashing off high grass and weeds gripped between tines

Spinning freely in a horizontal plane, the cutting arms of a gasoline-powered lawnmower clip off grass and weeds up to twelve or fourteen inches high. Momentum is sustained evenly by a flywheel to which the arms with their sharp knives are attached, resulting in continuous operation with very little power. There is no rubbing or clashing of metal against metal, and the cutters do not clog, since grass clipped in front of the mower is immediately conveyed to one side where it cannot tangle with the mechanism. The driving power comes from a four-cycle engine developing 2,200 revolutions per minute.

Salt Shakers Prevent Explosion of Dust in Coal Mines

Dust explosions, one of the greatest dangers in coal mining, may be prevented by so simple a device as a giant salt shaker.

It is impossible to eliminate coal dust entirely. But British mining men have found that scattering large quantities of powdered rock in the mines would reduce the hazard, the rock dust settling with the coal and diluting it so that it would not burn. Seeking some substitute for rock dust which could be used in small quantities and make certain a non-inflammable mixture, they chose common salt. Finely powdered salt dusted throughout the mine, with powdered chalk and magnesia added to prevent caking, proved an effective deterrent to mine explosions, and it took only a tenth as much salt as rock dust.

Vacuum Cleaner Bag Has Tray Easy to Lift Out and Empty

Dust and dirt picked up from the floor are deposited into an "ash tray" built into a special vacuum-cleaner bag designed to replace the one in your cleaner. Disposal of the refuse is simplified since the tray can be removed easily by its handle and emptied without raising dust. More frequent cleaning of the bag is induced, resulting in greater efficiency of the vacuum.



It's easy to remove dust drawer from vacuum cleaner bag and empty it into trash basket without spilling

A new rotary lawn mower

420

Safety News

Research Board
No. 1001 Science

Vac. A. Labor

New York City

The



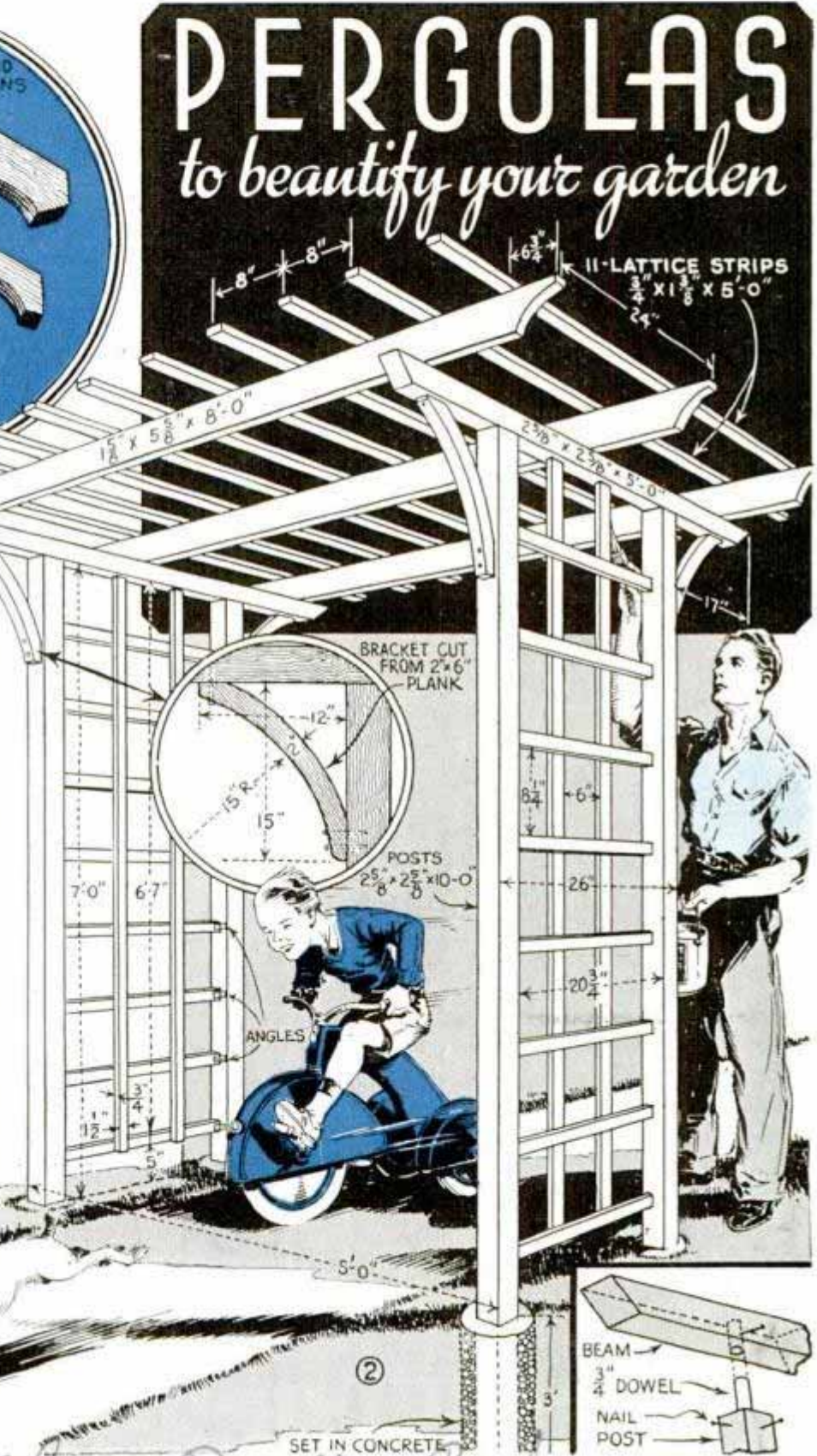
CRAFTSMAN



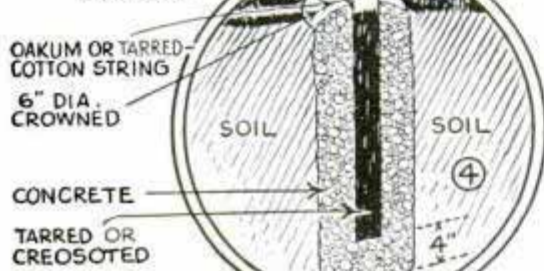
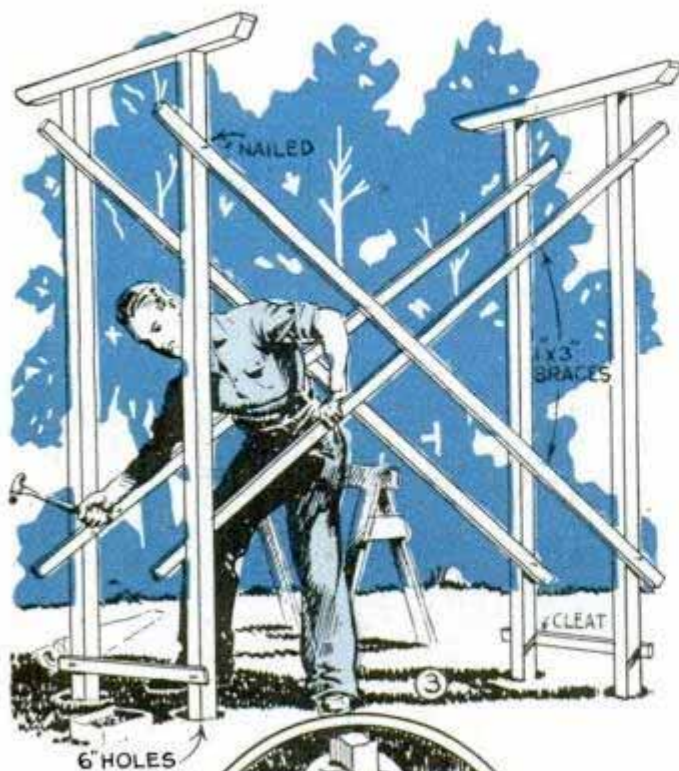
PERGOLAS to beautify your garden

THESE neat pergolas are an economical and satisfactory means of beautifying your garden, and anybody can build them with a hammer and saw. Any weather-resisting lumber can be used, but redwood or western red cedar are especially suitable as they are durable, hold paint well and are easy to work.

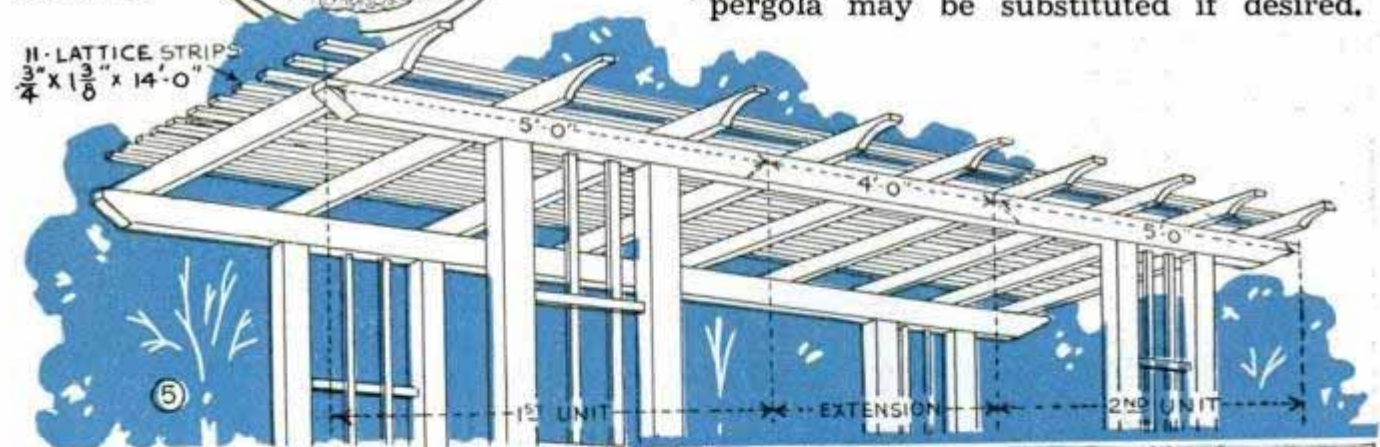
An attractive flat-topped pergola is shown in Fig. 2. First assemble the posts in pairs and



Cruskey Radio Corp.



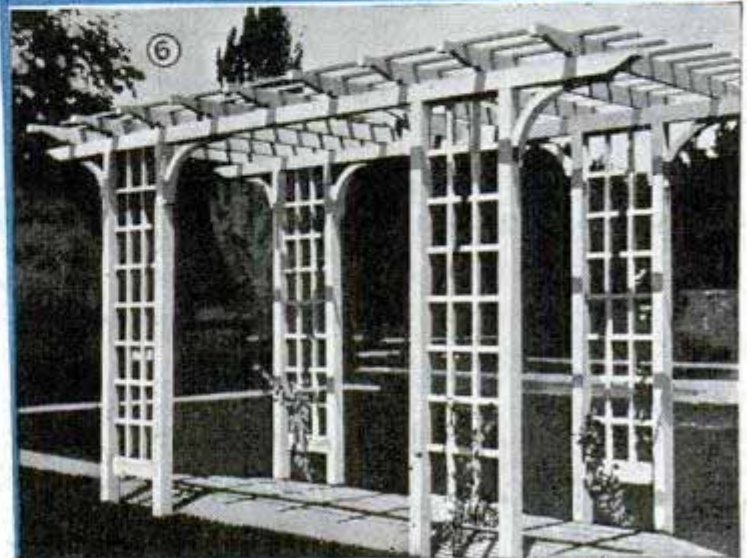
11 LATTICE STRIPS
 $\frac{3}{4} \times 1\frac{3}{8} \times 14\text{'-}0\text{'}$



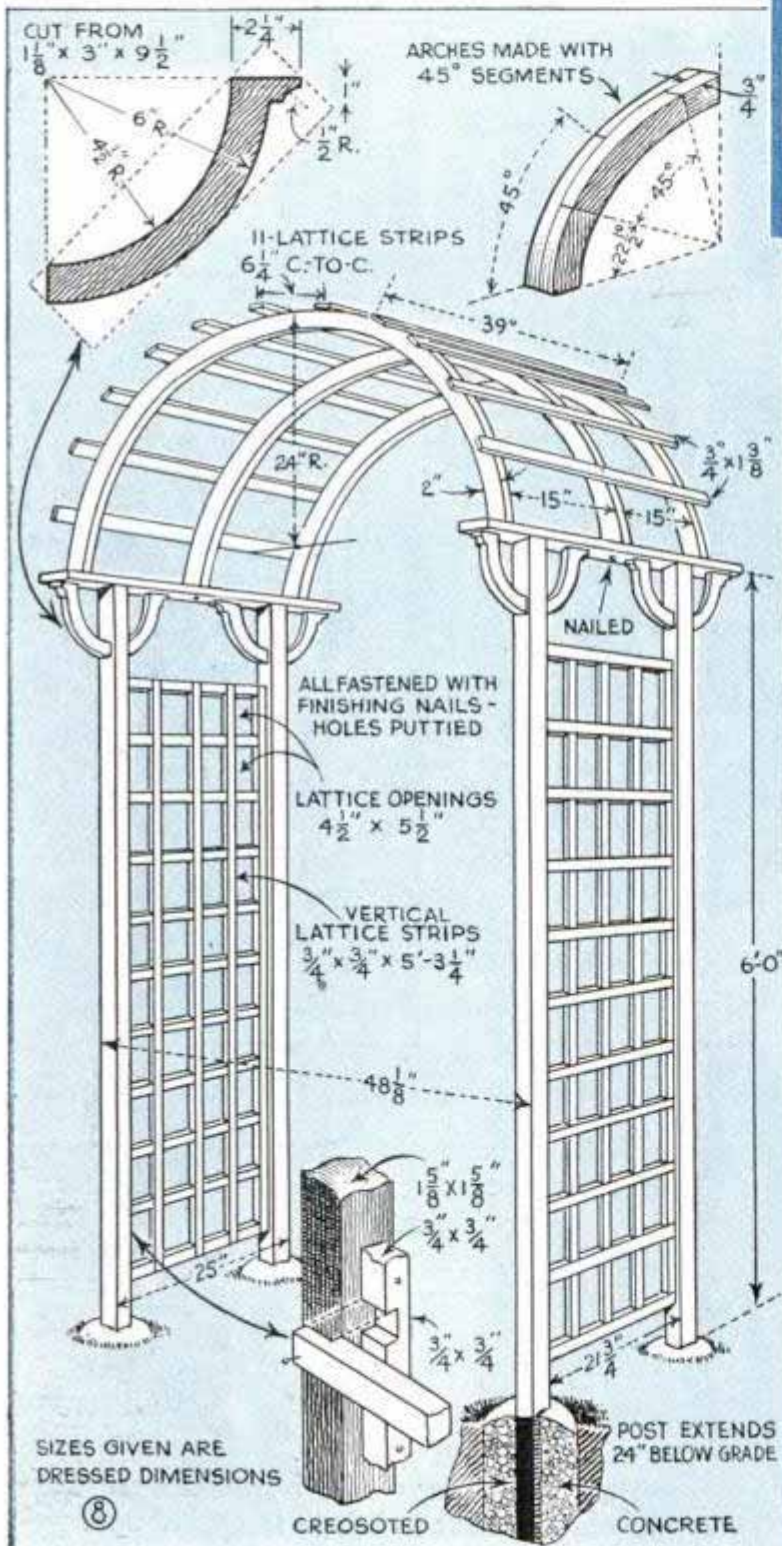
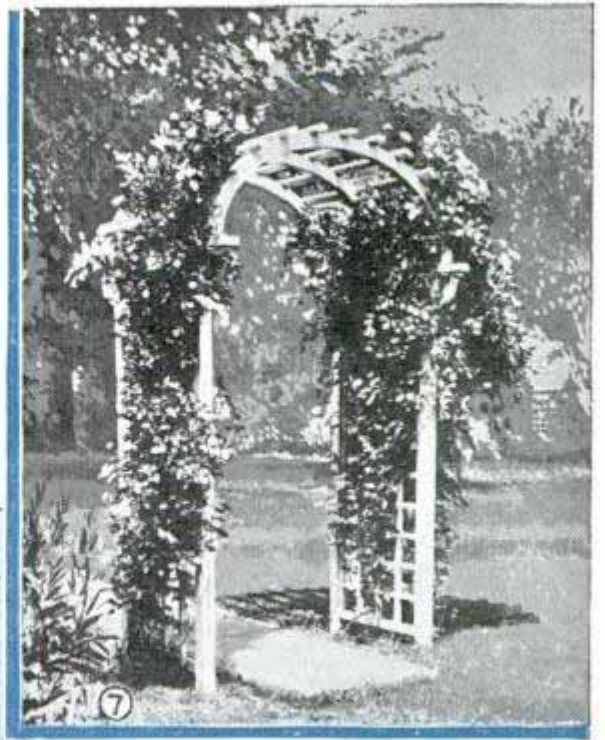
brace them temporarily with cleats across the bottom, and diagonal members between them as in Fig. 3. The two beams at the top are doweled and nailed as shown in the lower detail of Fig. 2. Holes that are dug for the posts should be 6 in. in diameter and about 4 in. deeper than the portion to be under ground. After the two end assemblies have been set in the holes, the latter are filled with well-tamped concrete. When this has dried out a slight shrinkage around the post will likely leave cracks through which water might seep, so

these should be sealed as suggested in Fig. 4. Creosoting the underground portion of the posts is also advisable. The three rafters are next toenailed into place. You can cut the scroll on the ends by hand, but most lumber yards are equipped to make these cuts at nominal cost. Fig. 1 shows alternate designs for the end scroll. The lattice pieces are laid out on a floor in their correct position and nailed where they cross to form panels. After assembling the panels, they are screwed to the posts with three small brass angles on each side, placed to the inside of the structure. Experience has shown that this method of fastening is satisfactory as the panels are not part of the main structure. It is also convenient when painting as the panels may be removed. The brackets, which have previously been sawed to shape, are next screwed in place. Installing the top lattice completes the structure.

The semicircular top pergola, shown in Figs. 7 and 8, is a bit more elaborate but far from difficult. The lattice fillers are made up of strips lapped into each other to give a level surface. However, the same method of construction as used for the first pergola may be substituted if desired.



After the panels have been nailed into place, the assembled ends are constructed and erected in the same manner as previously described, using nails instead of dowels at the top of the posts. The brackets should be left off until the roof arches have been screwed into place as they would be in the way. Arches are built up of two layers of segments. A cardboard pattern of one segment is used to mark out the pieces for sawing to shape. Waterproof glue and nails, spaced at 4-in. intervals, are used to join the segments. The edges are smoothed outside with a plane and inside with a rasp. The final oper-



ation is to nail the roof lattice in place and install the ornamental brackets with nails.

Should you desire a longer pergola, either of the types shown may be extended by simply constructing additional units. The use of stock-size timbers results in considerable economy as there is no waste. Figs. 5 and 6 show the method of constructing an extended pergola. Pergolas are usually painted white or stained with creosote stain. This is applied before the structure is assembled, and will add to the life and appearance of the pergola. Three coats of any good paint or two of creosote stain will give ample protection for a period of years.

Making Arrows Visible

To locate your archery arrows easily after shooting them, wrap bands of tinfoil on the shafts just in front of the feathers, and shellac the bands to prevent tearing. The tinfoil will glisten in the sun so that an arrow can be seen at a distance of many yards. This method is especially effective where the arrows fall in tall grass, weeds, etc.

—Stephen Stanford, Logan, Utah.

Angle Worms Brought to Surface by Vibrating Pitchfork

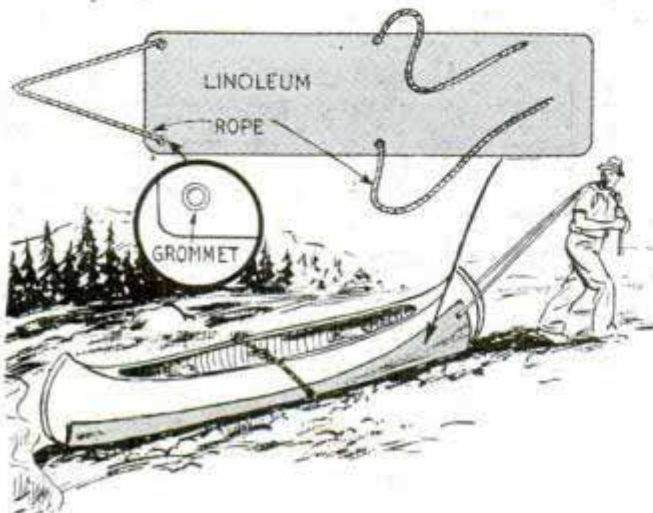


The next time you have a hard time finding worms for fish bait, force the tines of a pitchfork into the ground where there should be worms and twang the handle. This sets up vibrations that cause the worms to come up to the top.

—Kenneth W. Olson, Pendleton, Ore.

Canoe Pulled over Rocky Beach on Linoleum Cradle

If you have to move your canoe over a beach covered with small rocks, the bottom will soon wear through, unless you

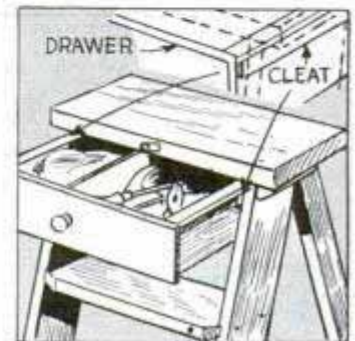


use some kind of cradle to protect it. This one is a piece of linoleum, which will stand considerable hard use if properly handled. Grommets are put near the corners of the linoleum at one end to receive the ropes, and also near the edges at the center to receive a couple of ropes with which the cradle is tied to the canoe.

—L. B. Robbins, Harwich, Mass.

Drawer in Stepladder Is Handy for Small Articles

Suspended from the underside of a stepladder top, a small drawer provides a handy place to keep small tools most frequently used when working from a stepladder. A catch should be provided for the drawer to keep it closed when the ladder is being moved.



Alcohol Dries Fisherman's Flies

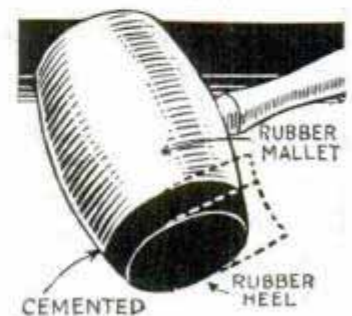


The problem of drying flies is solved by one fisherman who puts them in a bottle of alcohol, inserts the cork and shakes the bottle. The alcohol absorbs the water

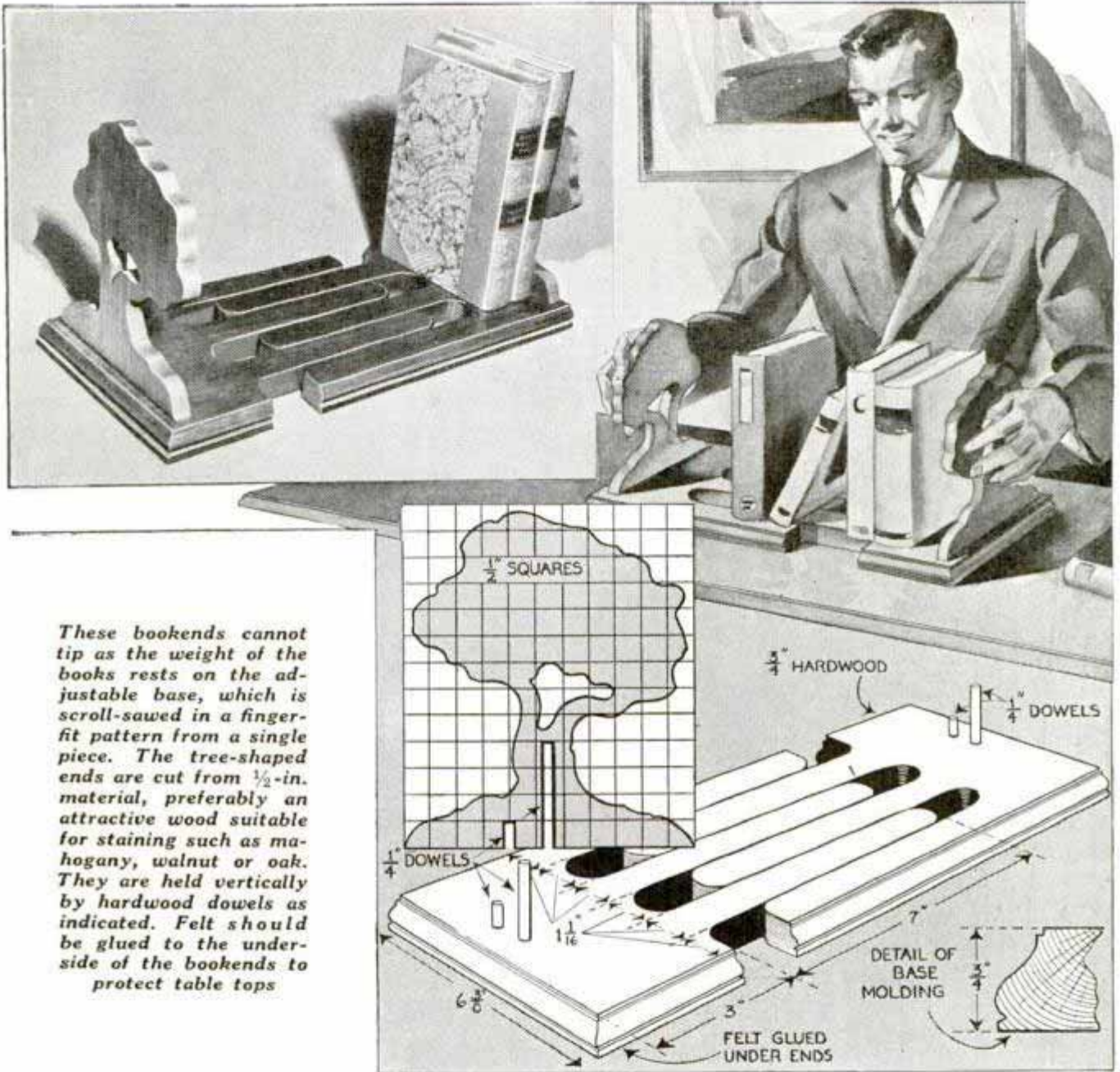
quickly and evaporates almost instantly when the hook is exposed to the air.

Shoe Heel Repairs Rubber Mallet

When the ends of a rubber mallet become worn and battered, cheap, rubber heels will serve nicely as new facings. Cut off pieces from the mallet end equal to the thickness of the heels, cement them in place and then trim them to shape.



This 'Finger-Fit' Rack Holds Books Securely



These bookends cannot tip as the weight of the books rests on the adjustable base, which is scroll-sawed in a finger-fit pattern from a single piece. The tree-shaped ends are cut from $\frac{1}{2}$ -in. material, preferably an attractive wood suitable for staining such as mahogany, walnut or oak. They are held vertically by hardwood dowels as indicated. Felt should be glued to the underside of the bookends to protect table tops

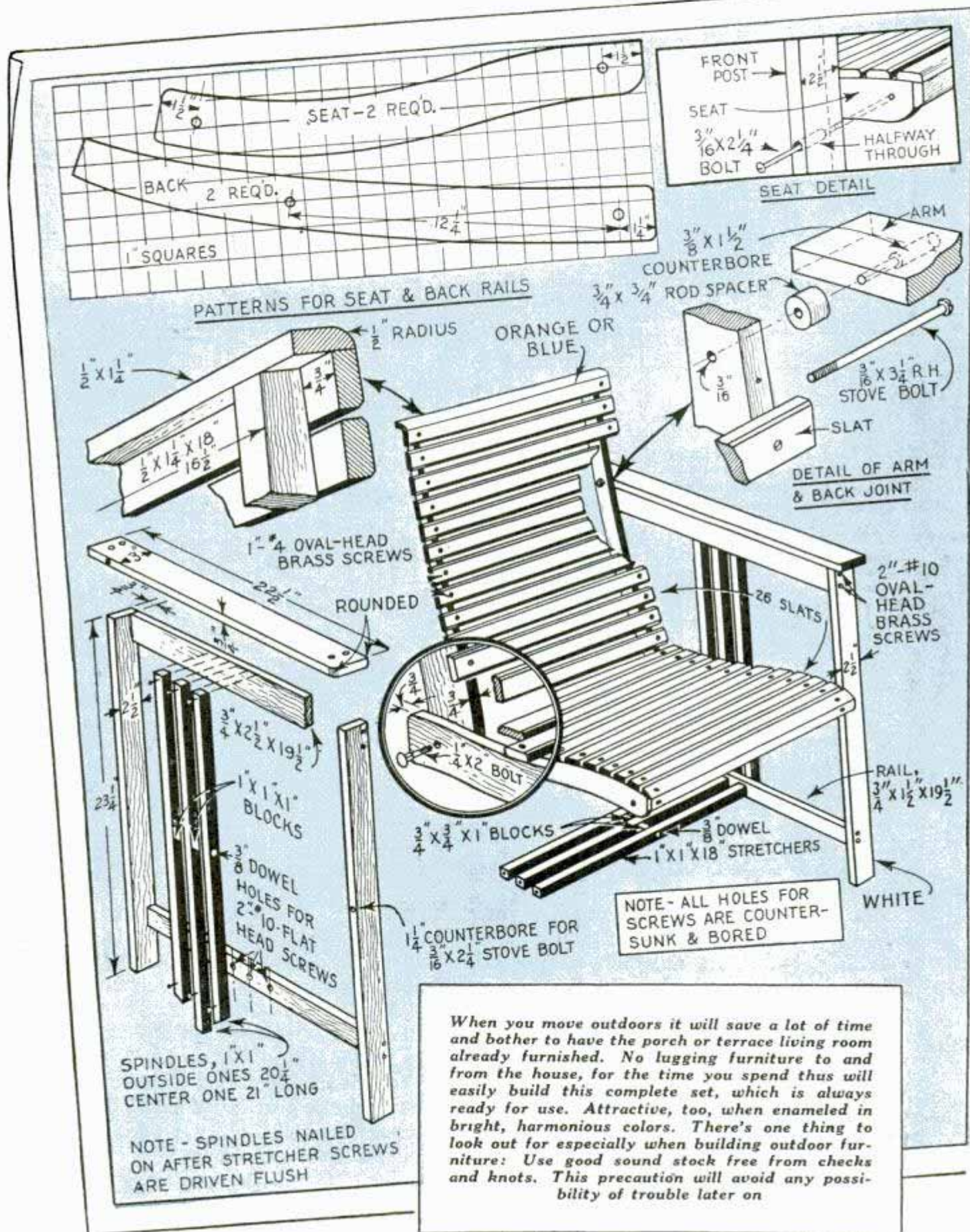
Small Paper Cups Have Many Uses in Home Workshop

An inexpensive convenience in your home workshop is a supply of small paper cups obtainable in any ten-cent store. They are particularly handy when doing small jobs of finishing, or in mixing paints and stains. When tin cans are used for this purpose they always must be cleaned for the next job, and frequently bits of skins or traces of the old color remain. But paper cups are merely thrown away when a job is finished. Labels and measures can be marked on them easily with a pencil, and liquid levels show clearly through the translucent sides. The shop worker will

find many other uses for the cups. They are handy for washing tiny parts, and similar work. Also, they provide good containers for storing small screws, brads, bolts and nuts, washers, etc., one of which can be threaded through the side of each cup to show at a glance what it contains. In addition to this, they are useful to hold screws, bolts and other small parts when dismantling small objects, such as motors, clocks and household appliances.

☐ Oranges can be peeled easily if they stand in boiling water for about 5 minutes.

PORCH SET *assembled*



When you move outdoors it will save a lot of time and bother to have the porch or terrace living room already furnished. No lugging furniture to and from the house, for the time you spend thus will easily build this complete set, which is always ready for use. Attractive, too, when enameled in bright, harmonious colors. There's one thing to look out for especially when building outdoor furniture: Use good sound stock free from checks and knots. This precaution will avoid any possibility of trouble later on

with screws

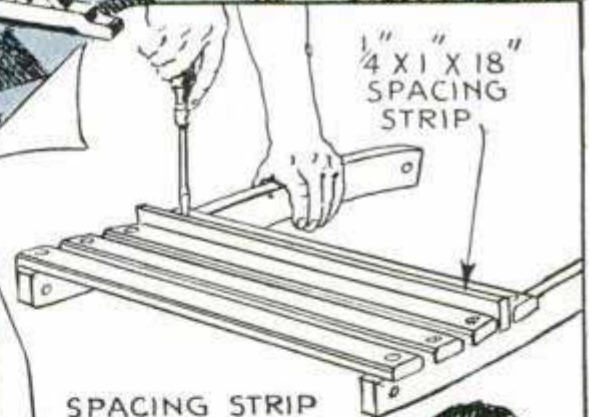
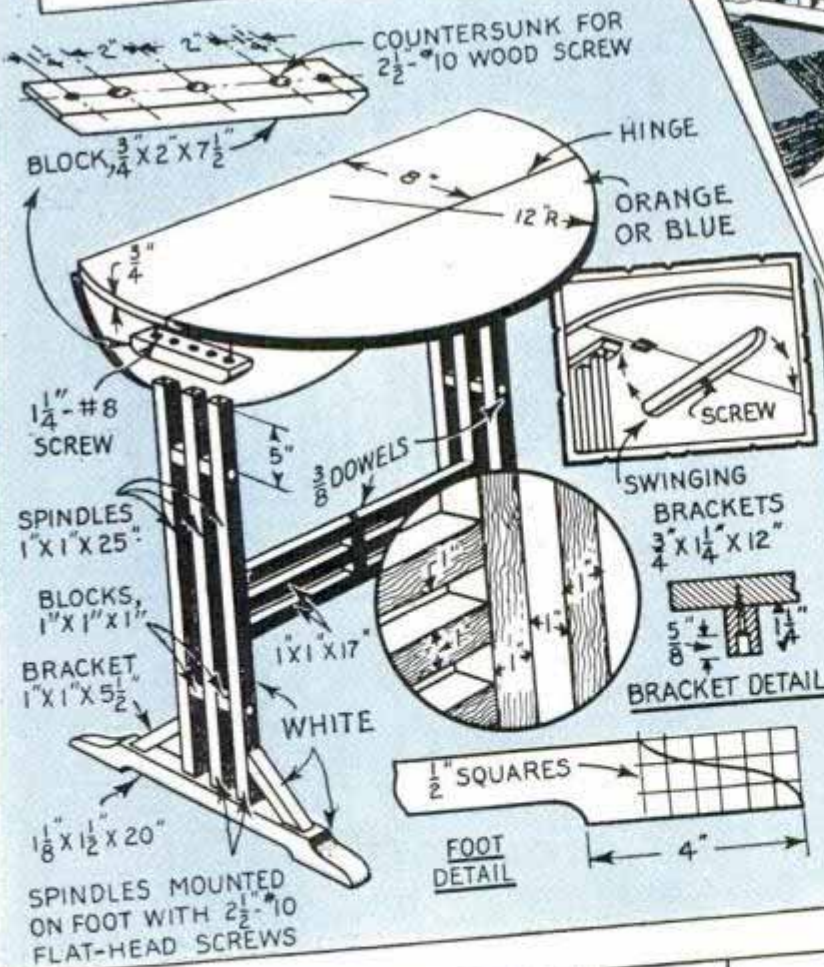
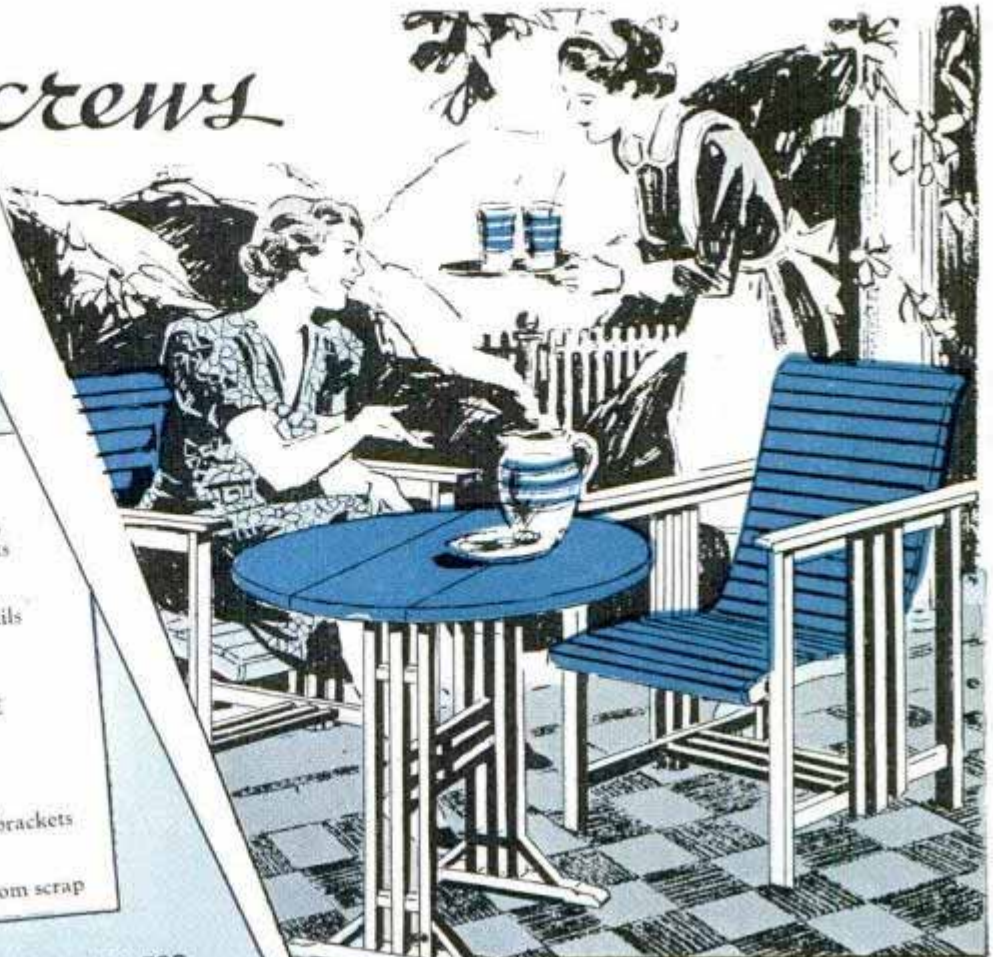
FINISHED WITH ONE COAT OF FLAT AND TWO OF ENAMEL

MATERIAL LIST FOR CHAIR

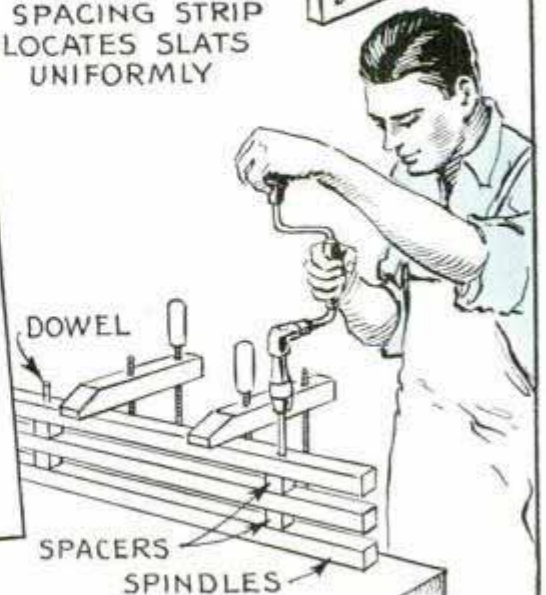
- 26 pcs.— $\frac{1}{2}$ x $1\frac{1}{4}$ x 18 in.—Slats
- 2 pcs.— $\frac{1}{4}$ x $3\frac{1}{2}$ x 19 in.—Seat supports
- 2 pcs.— $\frac{1}{4}$ x $3\frac{1}{2}$ x 22 in.—Back supports
- 2 pcs.— $\frac{1}{4}$ x 3 x 22 $\frac{1}{2}$ in.—Arms
- 2 pcs.— $\frac{1}{4}$ x $2\frac{1}{2}$ x 19 $\frac{1}{2}$ in.—Top rails
- 2 pcs.— $\frac{1}{4}$ x $1\frac{1}{2}$ x 19 $\frac{1}{2}$ in.—Bottom rails
- 3 pcs.—1 x 1 x 18 in.—Stretchers
- 6 pcs.—1 x 1 x 21 in.—Side Spindles

MATERIAL LIST FOR TABLE

- 3 pcs.— $\frac{1}{4}$ x 8 x 24 in.—Top
 - 2 pcs.— $\frac{1}{4}$ x 2 x 7 $\frac{1}{2}$ in.—Top blocks
 - 6 pcs.—1 x 1 x 25 in.—End spindles
 - 3 pcs.—1 x 1 x 17 in.—Stretchers
 - 2 pcs.— $\frac{1}{4}$ x 1 $\frac{1}{2}$ x 12 in.—Swinging brackets
 - 2 pcs.— $\frac{1}{8}$ x $1\frac{1}{2}$ x 20 in.—Feet
 - 4 pcs.—1 x 1 x 5 $\frac{1}{2}$ in.—Brackets
- Note—1 x 1 x 1 in. spacer blocks cut from scrap

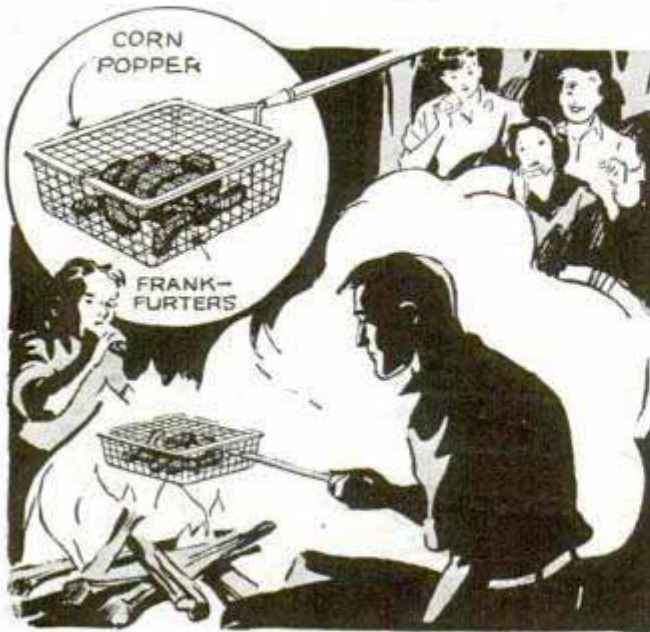


SPACING STRIP LOCATES SLATS UNIFORMLY



SPINDLES ARE CLAMPED TOGETHER WHILE BORING DOWEL HOLES

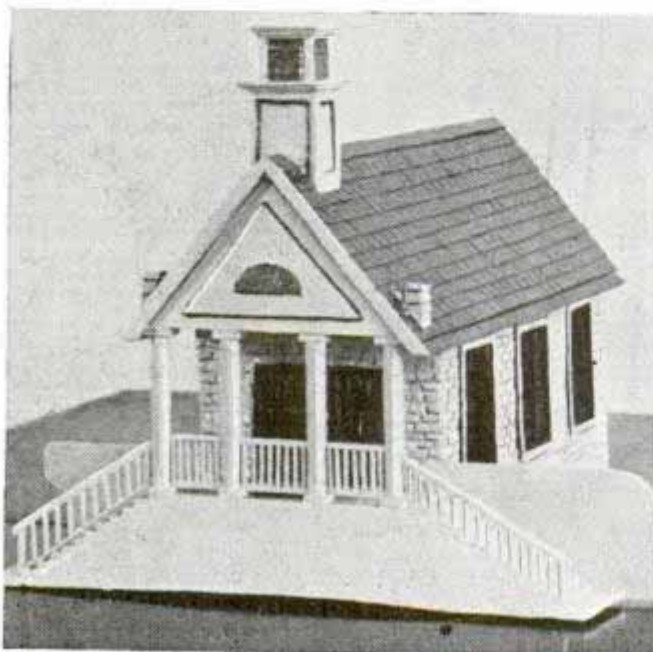
Roasting Several Frankfurters in Corn Popper



When you go on a picnic where frankfurters are to be roasted over an open fire, slip a screen-wire corn popper into the car with the provisions. Several frankfurters may be roasted in it at one time.

Brick Veneer on Model Buildings from Plastic Compounds

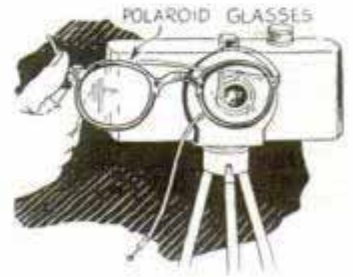
Model makers who desire realistic brick effects on buildings can utilize one of several materials sold for filling cracks in wood, tile or plaster. The most common of these is plaster of paris, in which a few drops of vinegar are added to retard drying, or a mixture of sal ammoniac, plaster



of paris and iron filings, which hardens into hard gray blocks like granite. Any of the dry filler powders mixed with water and molded, or the ready-prepared ones pressed into shape and allowed to harden look realistic when glued in place and painted a natural color.

Bright Objects Photographed Without Glare

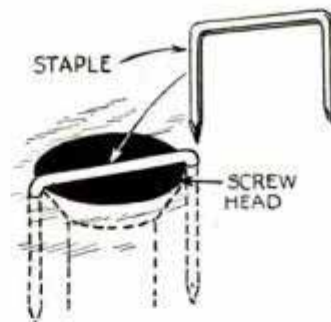
Polaroid eye glasses often worn by motorists and others to reduce glare serve as good filters when photographing bright objects. The



glasses can be obtained at most optical stores and are held in front of the camera lens in the same position that they are supported in front of the eyes.

—Bert S. Rohn, Chicago.

Wood Screw Locked in Position with Small Staple

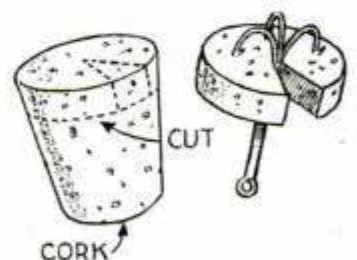


When a wood screw has a tendency to loosen, drive a small staple into the work to straddle the screw head and fit the slot as indicated. This will keep the screw

from turning, and is especially useful in soft wood, with which the trouble frequently occurs when subject to vibration.

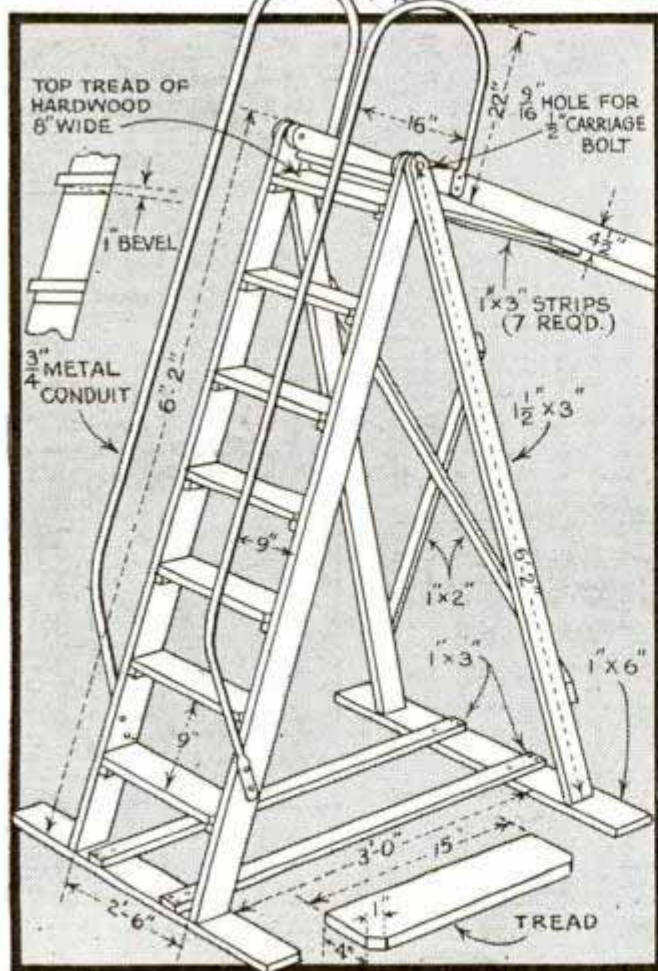
Cork Keeps Tackle Untangled

The snarl which usually results by placing unprotected lures in a tackle box is done away with by notching a slice of cork and slipping

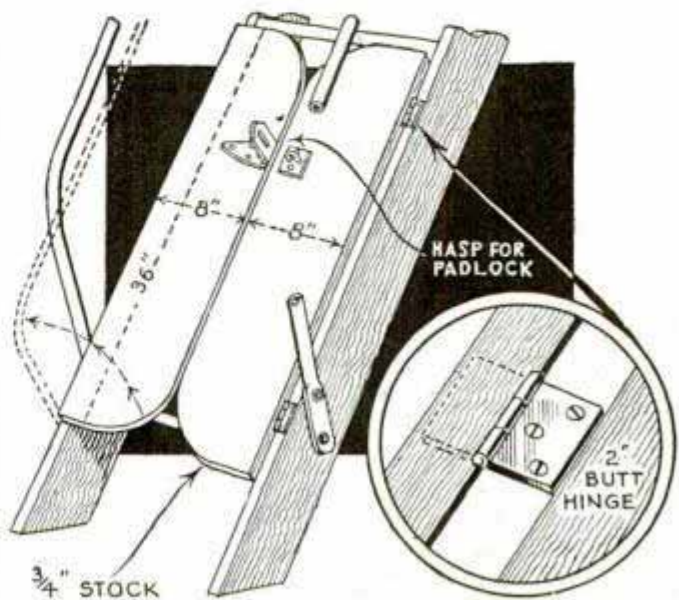


it over each of the hooks. The cork can be sliced easily with a used safety-razor blade.—Albert Zanelli, Clifton, N. J.

Daddy builds a BACKYARD SLIDE



Set up in your backyard, this slide will afford your children and their friends many hours of pleasure safe from street traffic, and it can be dismantled and stored for the winter in a jiffy. A wide slide bedway, stairs and "take-off plate" all make for safety of the children, and a couple of hinged boards near the bottom of the stairs can be locked over them to keep tiny tots from climbing the slide without supervision. A sheet-iron bedway assures long life, and hardwood bedway pieces well sanded and varnished reduce the splinter hazard to a minimum



Tire Steps at 'Ol' Swimming Hole' Easy on Bare Feet



Bathers who favor certain locations on lakes or streams where a steep bank has to be descended to reach the water, will find that old tires make good steps. They are set in the bank as indicated and filled with sand to make smooth, level steps.

Rubber Shield on Hand Sledge Catches Flying Particles

The risk of flying particles hitting your eye or face, when breaking stone or concrete, can be minimized by using this



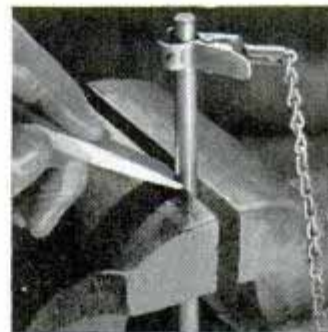
sledge shield. Cut from a piece of inner tube, the shield is slipped over the handle first and then over the head of the sledge.

Soap "Pencil" Relieves Itching of Mosquito Bites

Common yellow laundry soap moistened and rubbed over mosquito bites as soon as the wounds are made will relieve itching. One fisherman cuts pencil-shaped pieces from a soap cake and protects them with wrappings of gummed-paper, which can be torn off as the pencil is used.



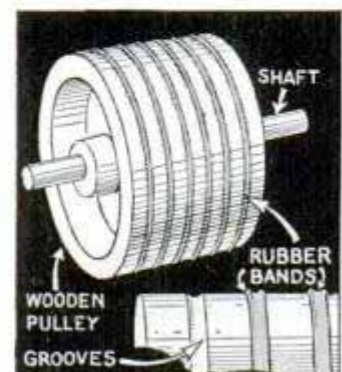
Vise Clip Holds Severed Work



When cutting off a rod or other work while it is clamped in a vise, use this holder to keep the work from flying when it is severed. The holder is an electrical test clip fastened to a small chain, which is in turn fastened to the vise. For large work, you can use a small C-clamp in the same way.

Non-Slip Belt-Sander Pulleys

If a sanding belt has a tendency to slip on the pulleys, the trouble can be stopped by putting rubber bands on the pulleys. Before doing this, cut a number of shallow V-grooves in the surfaces of the pulleys and snap the bands into them. The bands should be slightly wider than the grooves so that their edges project a little.—Jesse Baker, Houston, Tex.

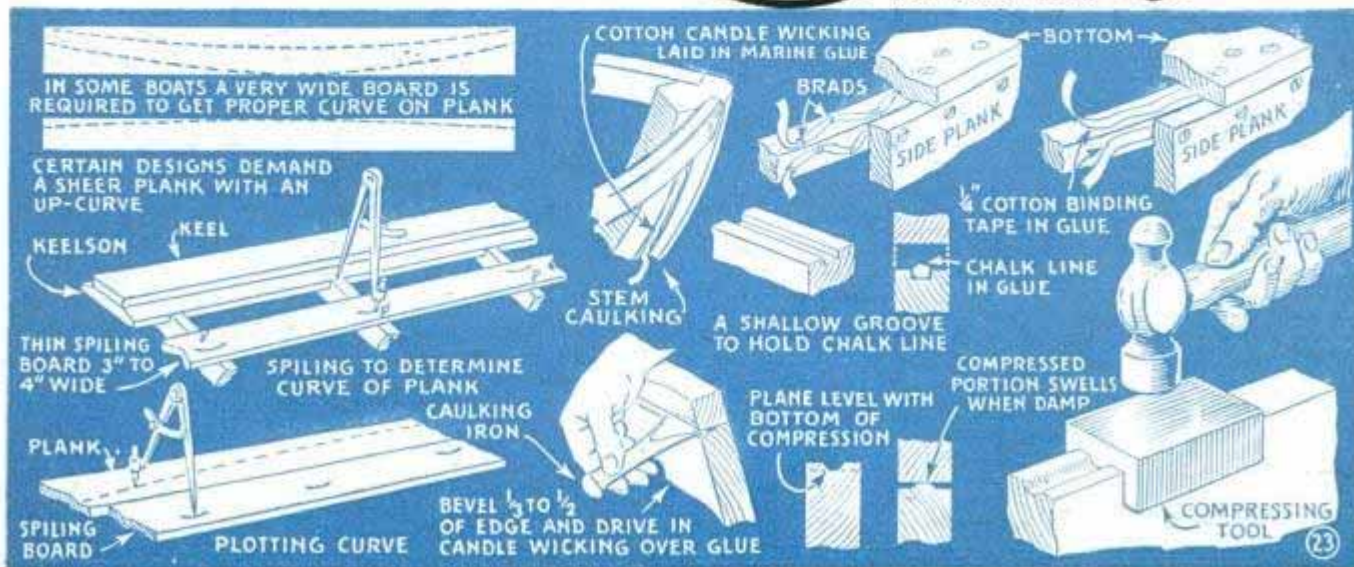
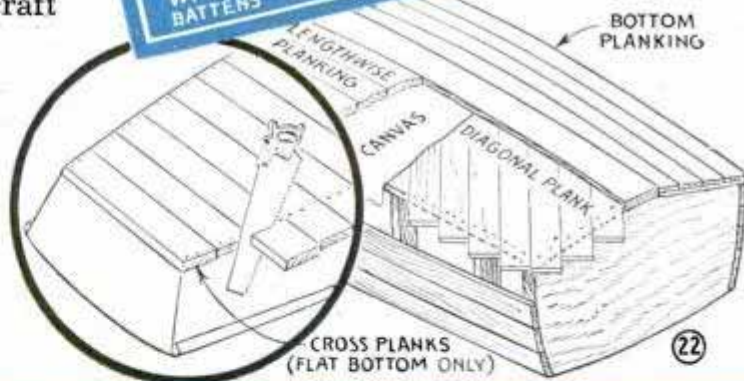
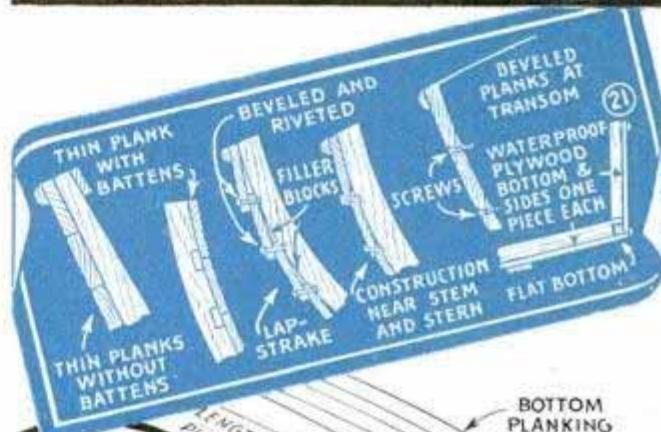


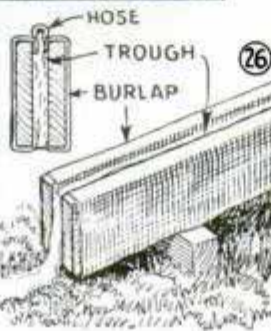
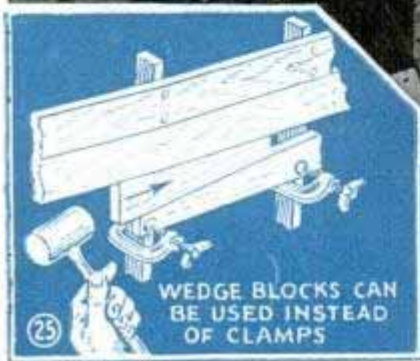
BUILD YOUR BOAT RIGHT!

Editor's Note—Before starting on a specific boatbuilding project, the amateur should become familiar with boat terminology as well as various practices and methods involved so that he knows the "how" and "why," which is customarily not explained in plans. This article explains various methods of applying planking; gives procedure of spiling; tells what to consider when making well and centerboard installations as well as other important data

PART II

HAVING erected the frames on the keel in their relative position, planking is the next step. There are several arrangements of planking, illustrated in Fig. 21. Thick planks, $\frac{3}{4}$ in. and up, can be installed on the frames without battens, because there is enough surface on the edges to permit beveling from $\frac{1}{2}$ to $\frac{1}{3}$, the thickness forming a V-groove into which cotton candle-wicking can be driven over marine glue or white lead. The thicker planks are advised for heavy-duty boats, deep-sea cruisers, and others designed for rough going rather than speed. For lighter craft such as outboard runabouts and speedboats, planks from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. can be used provided battens, Fig. 20, are placed behind the joints. Overlapping planks, or lapstrake, are suitable for several types of hulls. The lap is secured with copper rivets, marine glue or white lead being applied first to the contacting surfaces.

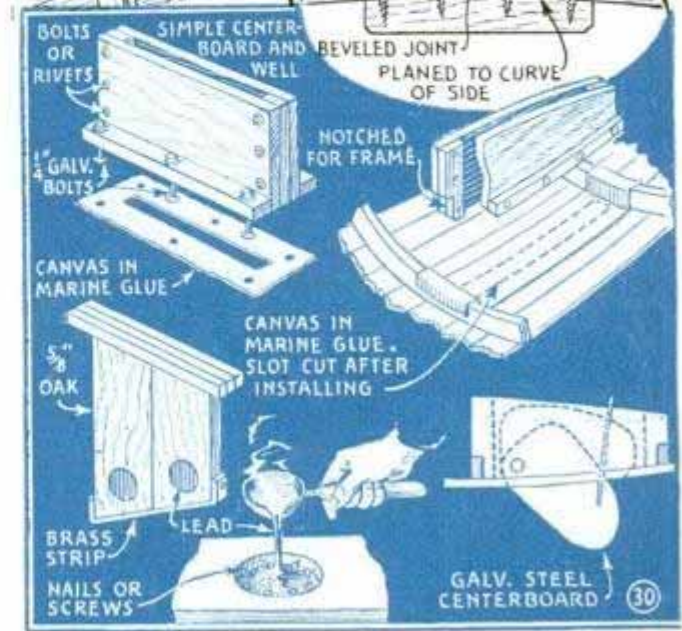
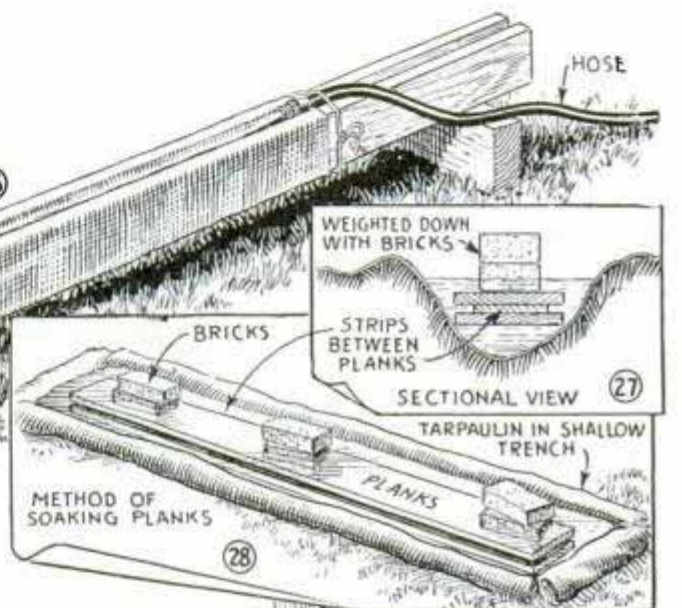
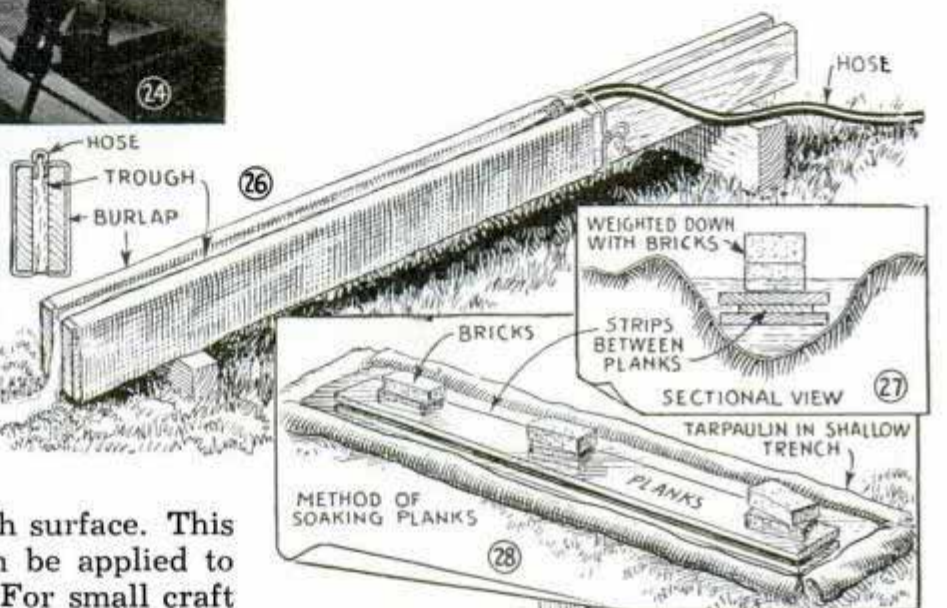




spiling board 4 or 5 in. wide is laid alongside the keel, and at each frame a mark is made with a compass, Fig. 23. The spiling board is removed, a hull plank is laid beside it and the marks are transferred to the plank. A batten is then laid along the marks to give the true curve of that plank as it fits against the keel. A handsaw is best for cutting the plank to rough shape. Allow for finishing with a jointer plane. Before drilling screw holes for the planks, they should be drawn snugly against preceding planks with either cabinetmaker's clamps, or wedges, as in Figs. 24 and 25. Only galvanized or brass screws

Toward stem and stern the bevel of the planks becomes wider, until at stem and transom the planks present a smooth surface. This arrangement of planks can be applied to round or V-bottom hulls. For small craft such as skiffs under 12 ft., $\frac{1}{4}$ -in. or $\frac{3}{8}$ -in. waterproof plywood makes construction very simple and the job needs caulking only at chines, stem and transom. In putting planks on the frame, usually the sheer planks are installed first, alternating one plank starboard, then one on the port side, and so on until all are installed. Bottom planks can be laid longitudinally, crosswise, or diagonally. In the latter case a double bottom is often made, Fig. 22, with thin diagonal planks directly upon the frames, a sheet of canvas in paint between, and lengthwise planks over that. Ends of the planks are not trimmed to chine and transom lines until all are laid.

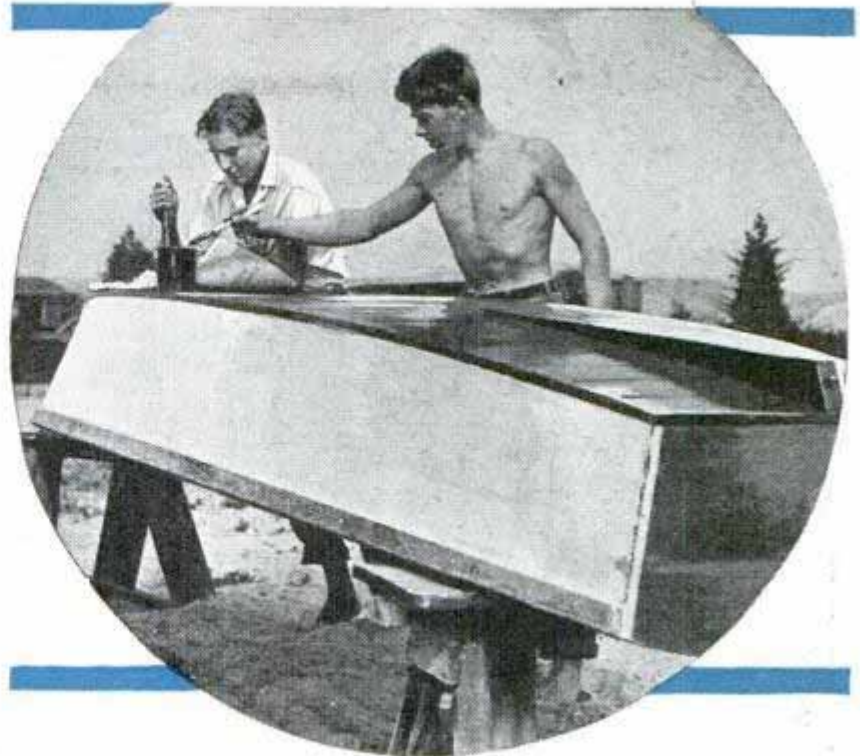
"Spiling" planks: Very few hulls are designed to take planks that are the same width the full length. Usually they must be tapered toward the stern, or toward both stem and stern. Transferring this curve from the boat to the plank is called spiling. For instance, to lay out the garboard strake, or plank next the keel, a thin



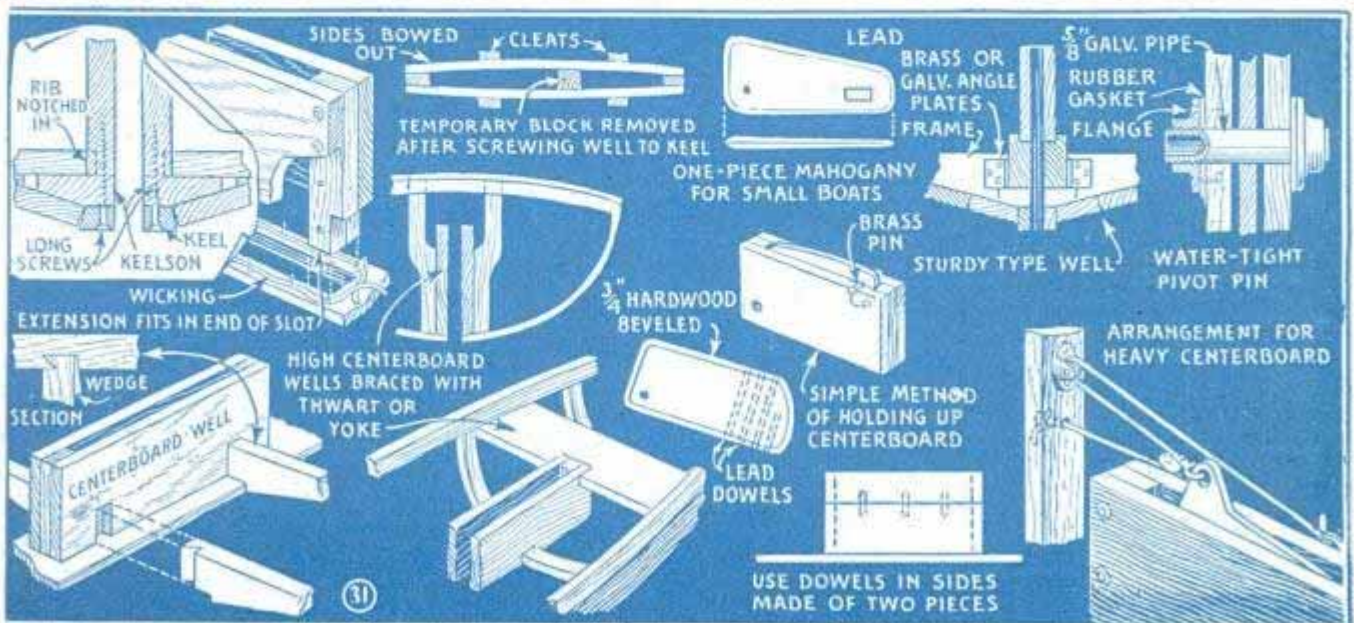
should be used, the heads countersunk, and covered with putty after the first coat of paint. Remember that the planks are first partly beveled along the edge before being installed permanently.

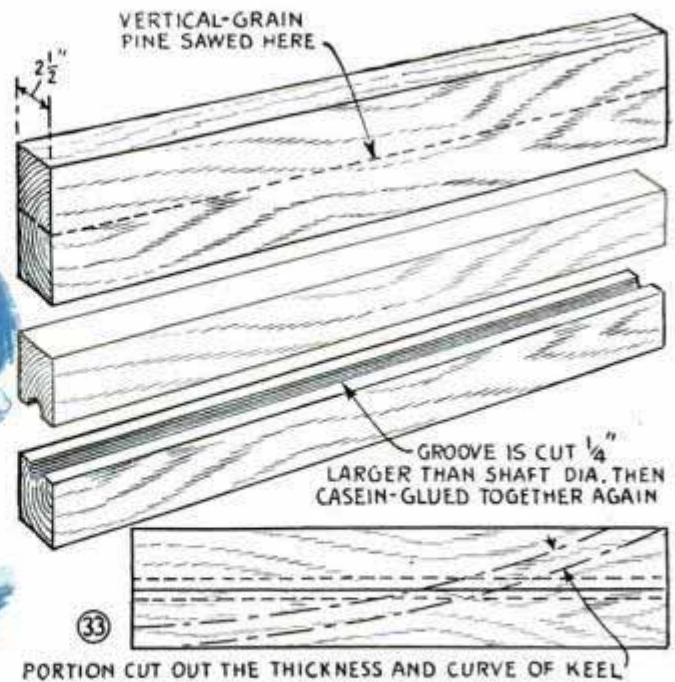
Caulking: As nearly every boatbuilder has his favorite method of caulking, several methods are shown in Fig. 23. When the edge of a plank has no curve it can be grooved to a depth equal to about half the diameter of a chalkline, a strip of the latter laid in on marine glue, and the next plank brought up tightly against it, compressing the chalkline. A favorite method of waterproofing at the chines is to fasten cotton candle-wicking diagonally with brads hammered over, and laid in marine glue. Binding tape serves the same purpose, with the screws staggered on each side of it.

Compressing the center portion of the plank edge with a special tool also gives satisfactory results, as shown in one of the details, Fig. 23. The wood is planed down to the level of the depression, the planks placed closely together, and subsequent dampness swells the compressed portion quickly, making a watertight joint without caulking. Then there's the old reliable method of tamping in candle-wicking with a caulking tool over marine glue. For the stem rabbet a cable of five or six strands

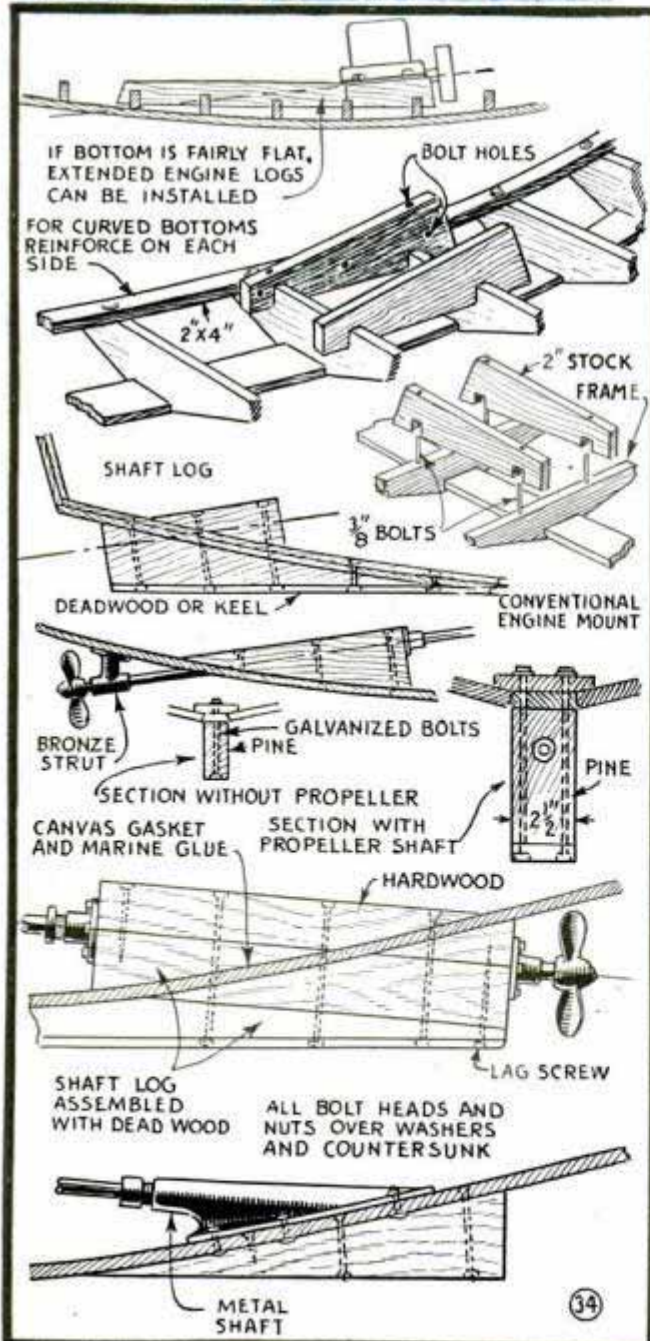


of wicking is laid in marine glue, and the same procedure followed on the edges of the transom. If the planks must take an unusual twist, and no facilities are available for steaming or boiling, a good soaking in water will limber them up. If only one end is to be bent, wrap in burlap as in Fig. 26, and let a stream from the hose trickle down, it throughout the night. For full-length soaking, dig a narrow trench, Figs. 27 and 28, lay in an old tarpaulin, fill with water and weight the planks with rocks or bricks. Place strips of wood between them so that water will reach all sides. Fig. 29 shows the method of using butt blocks where the planks are not long enough to reach the full length of the boat.





PORTION CUT OUT THE THICKNESS AND CURVE OF KEEL



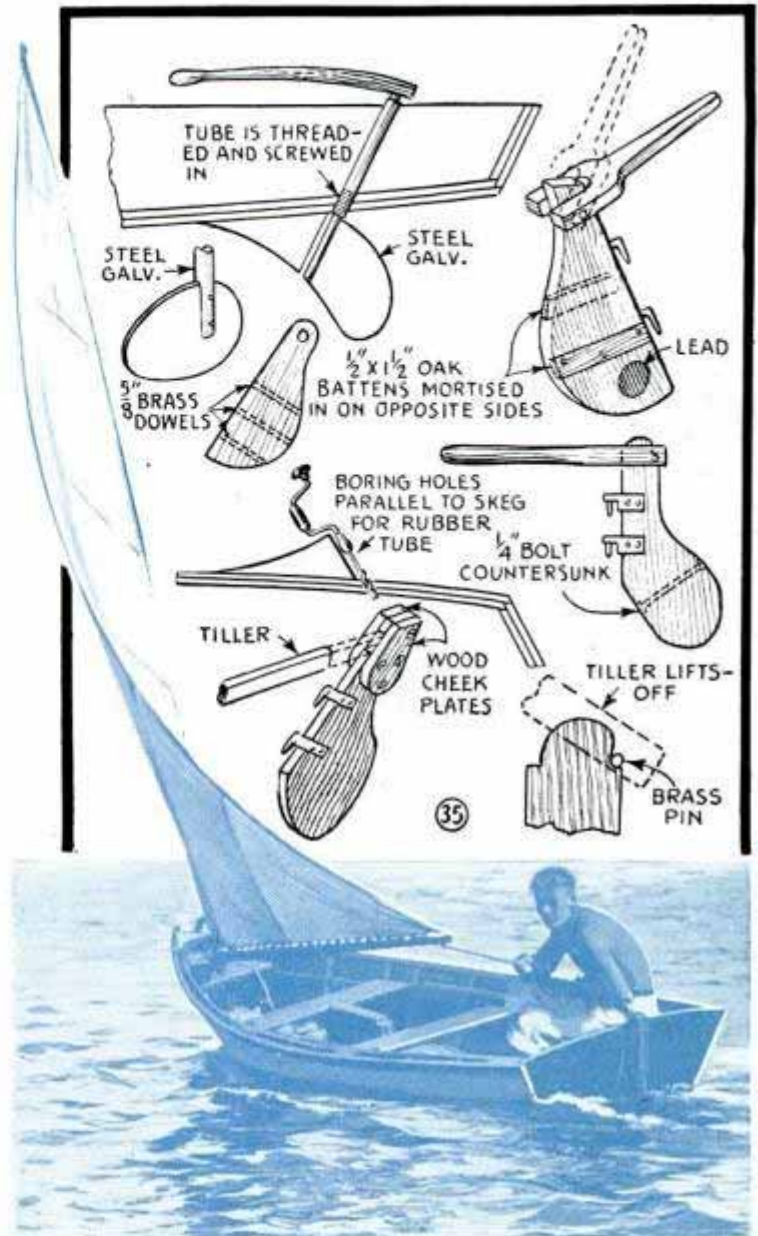
Centerboards and wells: Special care must be given to the construction of the centerboard well because it is here that leaking invariably begins after a rough sail. With considerable pressure against the board under sail, the well is subject to increased strain. A simple, satisfactory well is shown in Fig. 31. Cleats along the sides are bolted through the keelson, with a canvas gasket in marine glue laid between. The centerboard for this is $\frac{1}{2}$ -in. oak weighted with lead, anchored in circular openings with nails or screws. A brass strap along the bottom serves to reinforce the board and forestall warping. Whenever a wooden centerboard is used, allow at least $\frac{1}{4}$ in. extra width in the inside well opening to take care of swelling and warping. Another method of caulking the well is shown in Fig. 31, which also details methods of framing the well in the hull. Two important points are covered here: Wedging the well with a temporary block until it is screwed in place, which precaution counteracts the tendency of the damp inside walls to warp inward. The second point in this construction is that the inner, vertical cleat has an extension which sets down into the end of the slot in the keel, making a watertight joint. See the upper-left detail. The hull frames are notched into the well sides, or a dovetailed joint can be made which prevents the ends of the frames pulling out under stress. Steel centerboards, properly galvanized, are superior to the wooden ones since they

do not warp and at the same time serve as ballast. For small craft a one-piece mahogany or oak centerboard, weighted with lead, is permissible. Weight is added in some wooden boards by drilling holes and inserting, or pouring in lead "dowels." To hold the centerboard up, especially if steel, a brass pin can be used, or a block and pulley, with line and cleat. When a fairly high well is required, and two boards are necessary on a side, dowel the joint to keep the edges in alinement.

Engine logs: It is important that the timbers supporting the engine be substantial and very securely anchored. The usual arrangement is illustrated in Figs. 32 and 34, the timbers being cut on an angle to correspond to the angle of the propeller shaft. The timbers are notched and bolted to the hull frames but unless the bolts are put in during construction it will be necessary to use lag screws driven in from the top. To make the bed exceptionally rigid where there is too much up-curve fore and aft for long timbers, install two-by-fours on each side to cover several frames. Of course only galvanized, bronze or brass hardware should be used. Long timbers are always desirable if the design of the boat permits.

Installing shaft log and deadwood: The deadwood or keel extension is assembled as in the lower details of Fig. 34, being used on the sides of the propeller shaft. Bolt heads must be countersunk on the bottom, so that the deadwood presents a smooth surface when striking obstructions.

Making and installing a shaft log is quite easy if done as in Fig. 33. Select a piece of vertical-grain pine at least 2½ in. thick, and saw through the middle as indicated by the dotted lines. Then cut a groove in each half so that when put together the hole will be ¼ in. larger in diameter than the propeller shaft to allow for clearance. Assemble the two halves with casein waterproof glue, and then saw away on a diagonal curve corresponding to the thickness of the keel at point of installation. The completed job is shown in Fig. 34. In this detail the shaft log is assembled with



the deadwood. The latter can also serve as the lower exterior half of the shaft log. A hardwood strip is bolted along the bottom of the deadwood. Metal shaft logs, purchased from marine hardware dealers, make the work very simple. With this arrangement no woodwork is required.

Rudders: Except for racing, the simple rudder board, hinged to the transom and fitted with a tiller, is adequate. The in-board rudder post makes the neatest assembly, and requires a brass tube running through the deck and into the keel, as in Fig. 35. The rudder post should be galvanized, and the rudder can be installed in a slot and riveted. Wooden rudders, if very wide, should be re-inforced to prevent splitting under stress. Tillers in most cases are made to lift off. Edges of wooden rudders should be beveled.

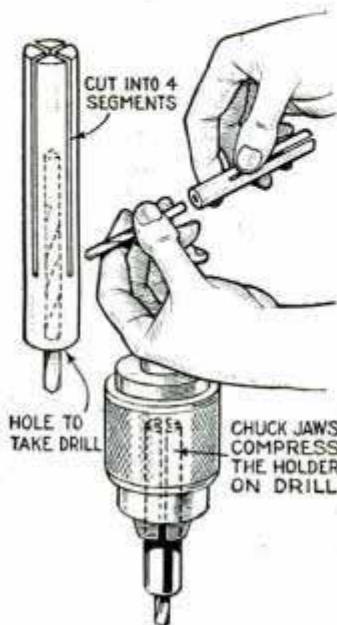
(To be continued)

Windshield on Skyrocket Shooter Aids in Lighting Fuse



To set off skyrockets with safety, and also to protect the flame of a match from being extinguished in the wind when lighting the fuse, drive a length of pipe into the ground at the desired angle. Then wire a tin shield to the upper end.

Combination Holder and Gauge for Small Drills



This holder not only reinforces small drills to reduce breakage to a minimum, but it also serves as a depth gauge. Made from mild steel, the holder is slit down from one end to provide four segments, and is drilled lengthwise from the other end to take the drill. When a drill is inserted

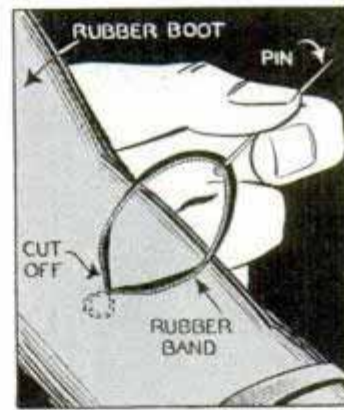
and the holder clamped in a chuck, the assembly is held securely. It is best to make a holder for each drill, although two consecutive sizes will usually fit one holder.

Smoked Spoon Hook for Trout Simulates Black Bug

The next time you are trout fishing and none of your lures tempt the fish, smoke a spoon hook and try it. A Wisconsin fisherman has good luck with such a hook because it closely simulates a black bug or beetle, on which the trout feed.



Repairing Leaks in Rubber Boots

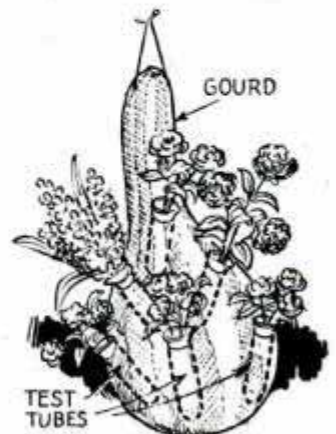


Pinhole leaks that often appear in the creases of rubber boots can be repaired by forcing small rubber bands into the holes. To do this, push a pin through the band to serve as a needle. If a rubber band is not

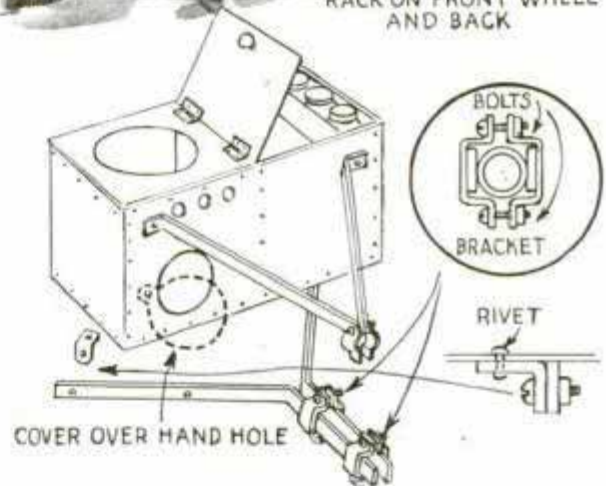
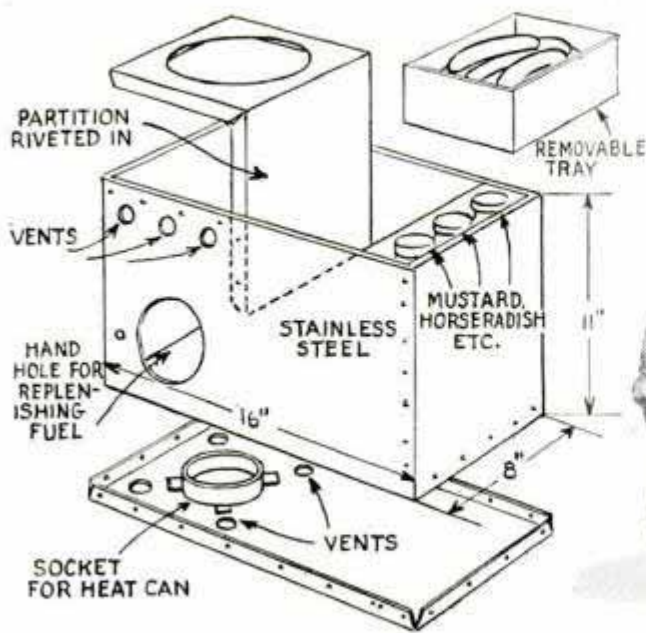
at hand, you can use a sliver of rubber cut from the boot heel or an old inner tube.

Test Tubes in Gourd Hold Flowers

A hanging container for cut flowers can be made from a gourd and a number of test tubes. Cut holes through the sides of the gourd at random to admit the ends of the tubes and fasten them in place with wood putty or glue, leaving as little of the tubes project as possible. Paint the gourd in gay colors and put water in the tubes.

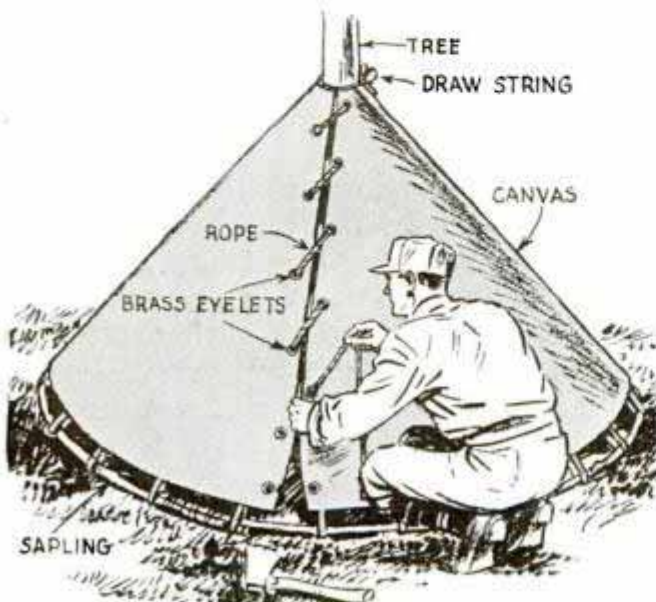


Hot-Dog Dispensing Cabinet for a Bicycle



Compactly assembled of metal, this hot-dog dispensing cabinet is carried in a convenient position on the front of a bicycle. The cabinet is made of galvanized sheet iron or stainless steel, and all joints are riveted. Canned heat or a small alcohol lamp is recommended for fuel, which is replenished through a handhole in the back. A partition prevents fumes from entering the compartment where rolls and uncooked frankfurters are stored. No dimensions are given for the flat-iron frames as these must be made to fit the individual bicycle. The frame members should be wrapped with tape before bolting on the bicycle to prevent marring the finish.

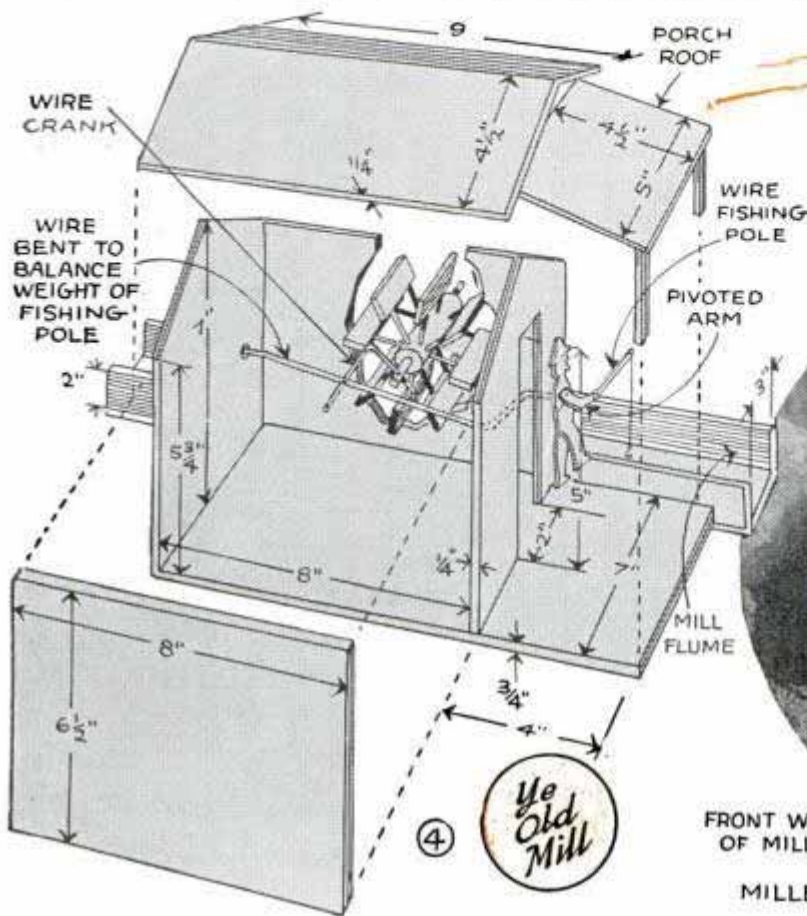
Hiker's Tepee Tent Folds into Light Bundle for Carrying



This novel tent was used several seasons by a woodsman. It is set up around a tree trunk, which serves as a center pole so that all the hiker carries is the canvas and the drawstring or top cord. The tent consists of several segments sewed together tepee fashion with a ground diameter of 10 ft. and a center hole that can be opened to 10 in. To keep the canvas taut, a number of small rope loops are sewed to the lower edge, through which small saplings are run and the ends lashed together.

☞ Peonies need plenty of water after they have bloomed as the plants are forming buds for the next season at that time; also, wood ashes are good for peonies any time.

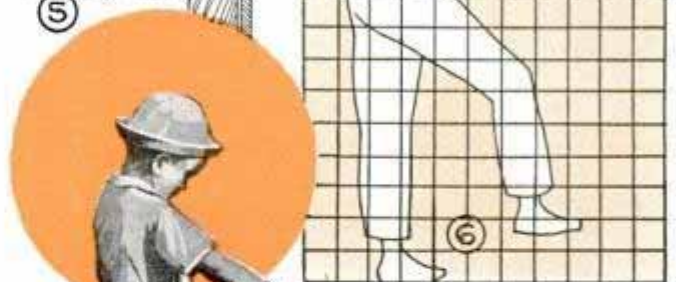
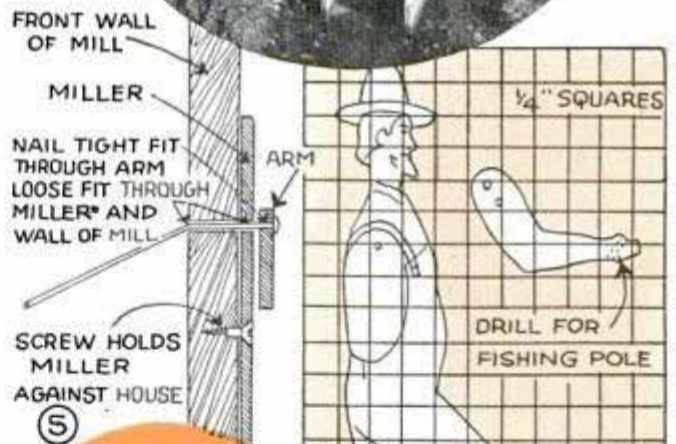
PADDLE-WHEEL TOYS



you slowly pull the boat through the water.

You can build a fancy bit of secondary motion into the side-wheeler shown in Fig. 3. As the wheels turn, a walking beam rocks up and down on its bearings. This craft is well worthy of a bit of bright paint over the first coat of aluminum paint. Make the paddle wheels red, paint black window frames and doors on the pilot house, and stripe the smokestack.

At the old mill in Fig. 4, you will find the lazy miller who spends most of his time fishing, and who gets a pole-tugging bite every time the wheel goes around. Place the mill beside a stream and cause some of the water to flow through the flume. The wheel will spin and the miller will jerk his pole up as he tries to hook imaginary fish. A wire crank in the end of the wheel axle brushes another wire, which is connected to the miller's arm to move the fishing pole. Fig. 5 shows this arrangement, and Fig. 6 gives the size and shape of the figure cut-out.



☞ To keep nickel fixtures shiny and bright, dry them carefully after washing.

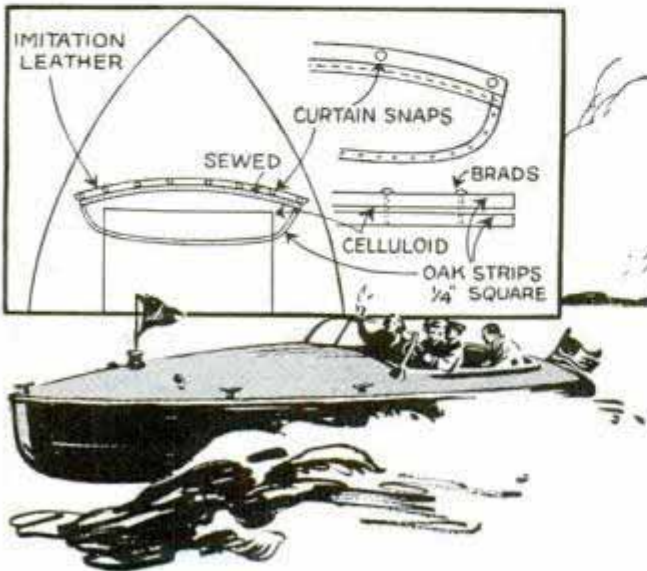
'Candelabrum' for Birthday Cake Keeps Wax Off Frosting



To keep candle wax from dripping on the frosting of a birthday cake, one housewife sets it in the center of a plywood disk and sticks the candles in holes staggered around the edge of the wood. The disk is finished with enamel, and flowers are painted around the holes.

Boat Windshield of Celluloid Is Removable

Having a boat of the runabout type, I fitted it with a windshield, which could be removed when hauling it on a trailer or when diving from it. The windshield is a



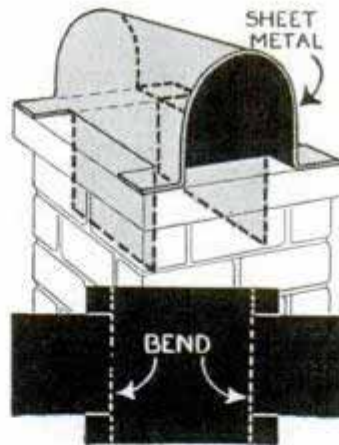
piece of heavy celluloid cut to shape and bound on the sides and top with 1/4-in. oak strips and on the bottom with imitation leather. It is fastened to the boat with heavy curtain snaps, one half of each one being sewed to the imitation leather binding at the bottom of the windshield, and the other half being screwed to the boat deck.—K. J. Abbott, Gonzales, Calif.

Gardeners' Waterproof Knee Pads

When working on your knees in the garden, a pair of pads cut from an old inner tube are waterproof and will protect your knees against damp ground. Cut a section of the tube as shown and, if it is too tight, a piece can be spliced in with rubber cement.



One-Piece Chimney Cap Attached Without Bolts or Rivets



A simple cap or hood to prevent back drafts in a low chimney can be shaped from a sheet of metal and attached without the use of bolts or rivets. The metal is cut as shown and is bent along the dotted lines.

The two center fins are sprung to allow for insertion into the chimney flue, and the smaller fins, when bent outward, support the cap.

Lettering Brush Has Finger Grip

Slipped over the ferrule of a lettering brush, a pencil eraser of the type shown makes a good finger grip. The end of the eraser is cut off, forming a sleeve.

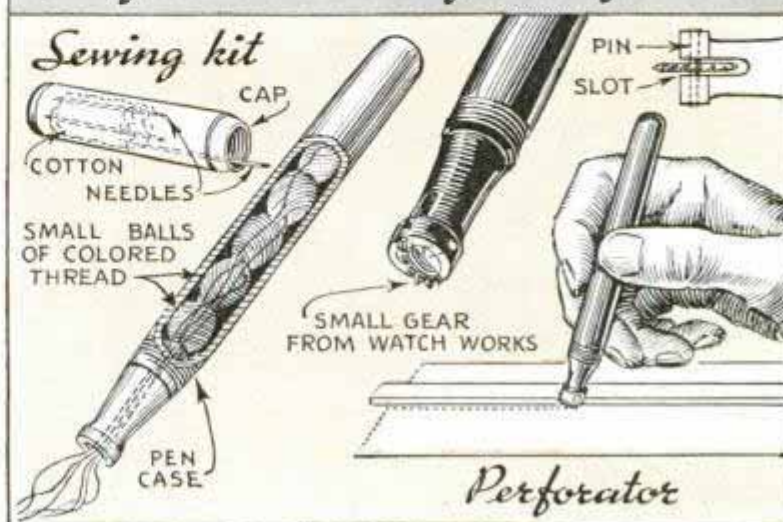
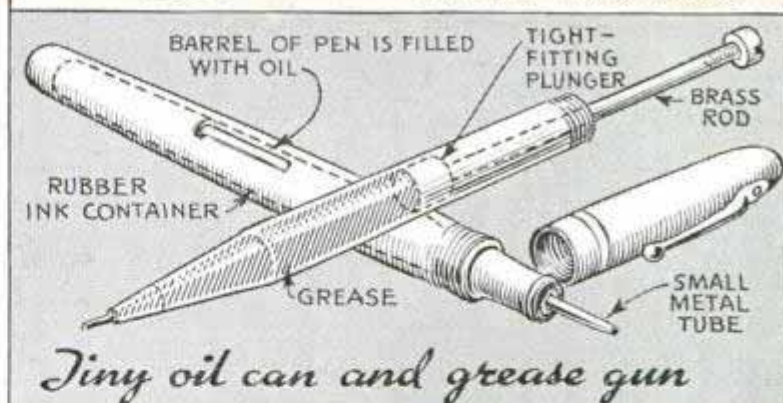
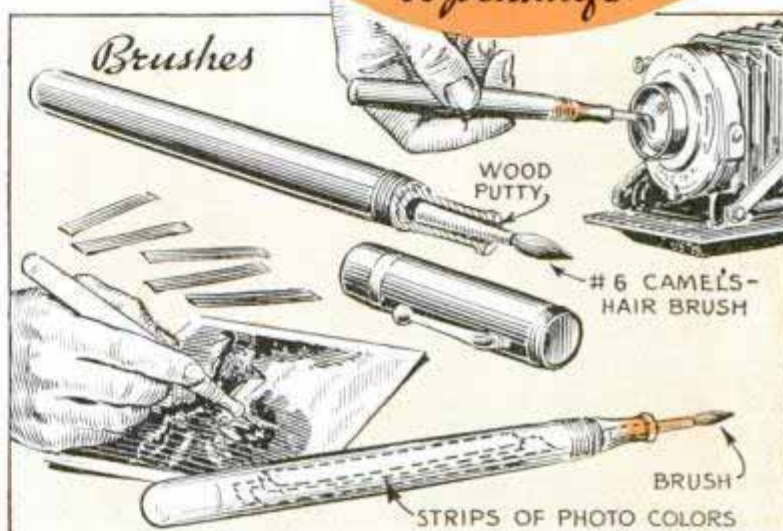
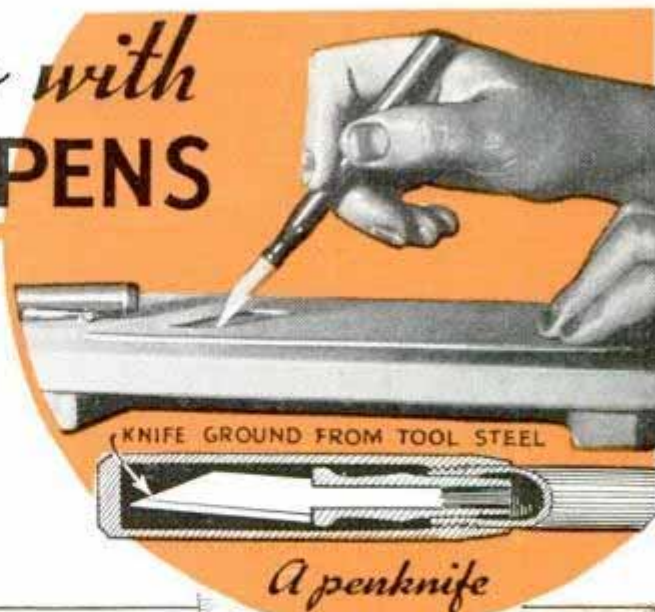


What you can do with OLD FOUNTAIN PENS

MOST fountain pens that have outlived their usefulness still have the barrel and cap in good condition. These two parts can be utilized in a number of ways, several examples of which are shown on this page. You already have the clip for carrying in the pocket, and by grinding a small blade from tool steel and fitting it in the lower end of the barrel as indicated in the detail, you have a handy knife which can be carried safely in the pocket because the blade is always protected by the cap. An old pen can be converted into a special brush for cleaning camera lenses or for photo tinting. In the latter case you provide strips to carry soluble color, which are cut to fit inside the barrel of the pen. Of course, the cap protects the brush when not in use.

Certain types of small motors have sleeve bearings designed to be lubricated through tiny pressure grease fittings. In this case an old automatic pencil fitted with a plunger as in one of the illustrations makes just the size and type of grease gun for this purpose. Another use for a fountain pen as an oil can is shown in the same illustration. Here a very small tube is inserted in the lower end of the barrel and when the tube is filled in the regular way with oil instead of ink, you have an oiler that will place a single drop of oil just where you want it. If you need a special perforator or a traveling sewing kit, details in the lower illustration show how these can be improvised.

Plain cookie sheets, obtainable in department stores, are an inexpensive source of sheet aluminum for many types of metal-working projects.



Adjustable Wrench to Open Cans Made from Timing Chain

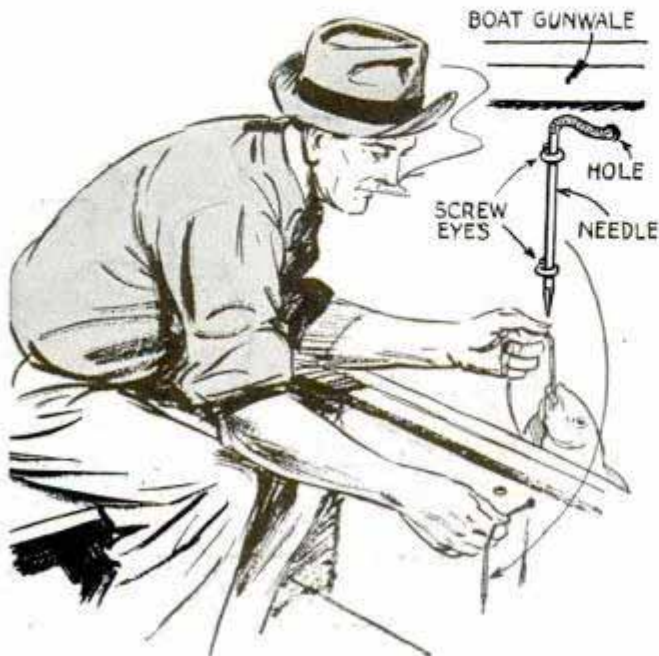


Tight-fitting screw caps of cans are removed easily with this wrench without damaging the cap. The wrench is a length of flat iron with a piece of timing chain pivoted at one end, a slotted piece of iron being riveted to the handle to take the end of the chain after it has been wrapped around the cap to be removed.

—Benjamin Nielsen, Aurora, Nebr.

Fish Stringer Held Safely on Boat Yet Removed Quickly

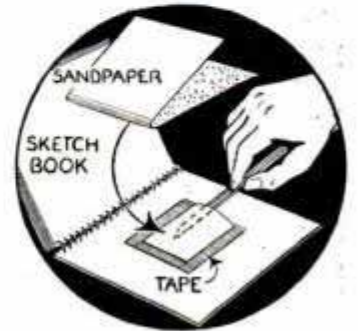
To keep from tying and untying a fish stringer to an oarlock or some other part



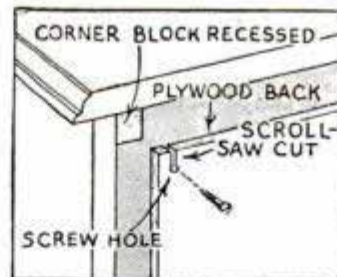
of the boat, why not attach it with a couple of screw eyes as shown? To remove the stringer, just lift the end from the screw eyes and pull it through the hole in the boat side. You can do this in a few seconds and there is no possibility of the stringer becoming dislodged.

Pencil Pointed in Abrasive Pocket Taped to Sketchbook

Instead of gluing a strip of sandpaper to your sketchbook for pointing a pencil, fold the strip with the abrasive side inward and tape it to the book. This forms a pocket to collect the powdered lead and keep it from getting on your hands and the book pages.



Slots in Rear Panel of Cabinet Prevent Splitting



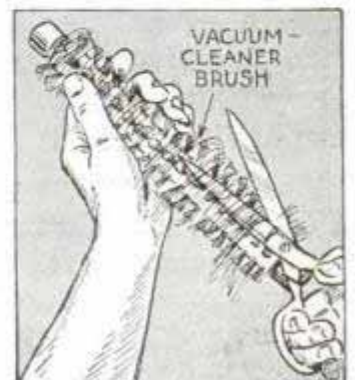
When closing the rear of cabinets, book shelves, etc., with plywood, screws that must be placed near the edge of the panel can be prevented from splitting the

wood by slotting the panel as indicated. The slots widen slightly as the screws are driven and reduce the strain on the wood.

—Raymond B. Wailes, Bethesda, Md.

Removing Threads from Brush of Vacuum Cleaner

To remove thread that winds around the rotating brush on a vacuum cleaner, run a pair of scissors lengthways through the bristles and clip the threads, then brush them off.



DEVELOP YOUR FILMS IN DAYLIGHT



Beginners in photography will have no troubles from over-development by using this simple method

THIS daylight method of developing pictures works on the principle of time and temperature, and the danger of over-developing, scratching or otherwise marring the negative is practically eliminated. Everything you need is shown in Fig. 1. There are several styles of tanks available. The more expensive ones enable the film to be transferred directly from the roll in daylight. Another type, shown in Fig. 2, must be loaded in a dark closet but from then on works in daylight. Other equipment needed are two fruit jars, clock, thermometer, measuring cup, a viscose sponge, $\frac{1}{2}$ gal. of borax developer and $\frac{1}{2}$ lb. of hypo fixing powder. The latter two items come in powder form. Prepare them according to the instructions on the package. These are your stock solutions and may be used over and over until exhausted. Store the jars tightly capped and in a cool, dark place.

Loading the tank requires absolute darkness. Practice threading an old film into the reel as in Fig. 2, till you can do it with your eyes shut. Handle the film by the edges to prevent the heat of your fingers from melting the gelatin and ruining the pictures. Some reels load from the middle, some from the outside. With the reel loaded, place it in the tank and press down the cap. Now step out into the daylight. The film must be developed for exactly 20 min. at a temperature of 65 degrees Fahr. There is a slight latitude permissible, but the tem-



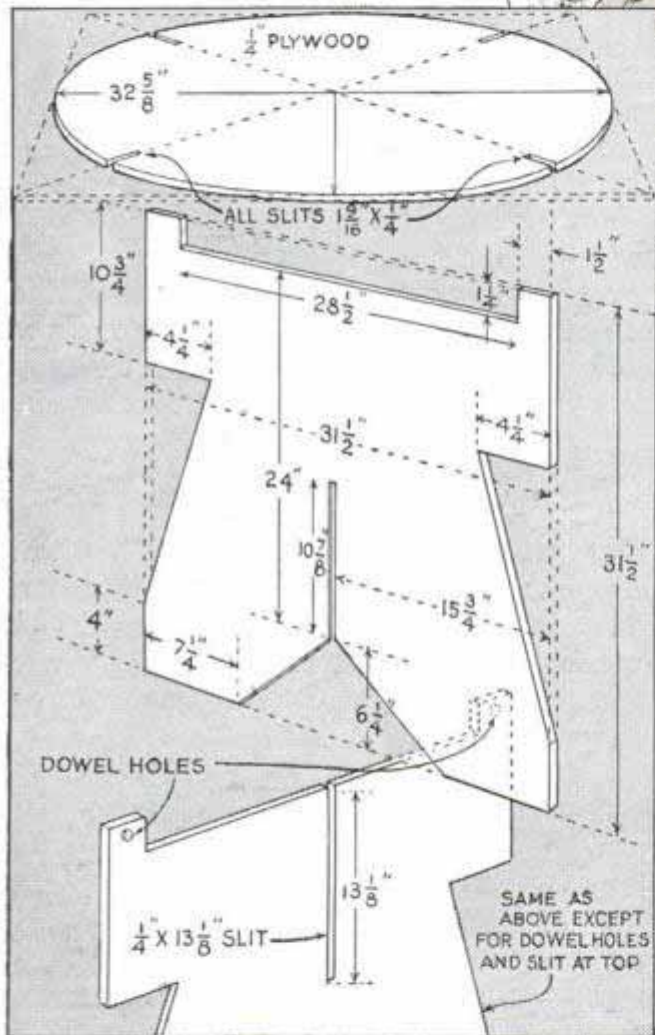
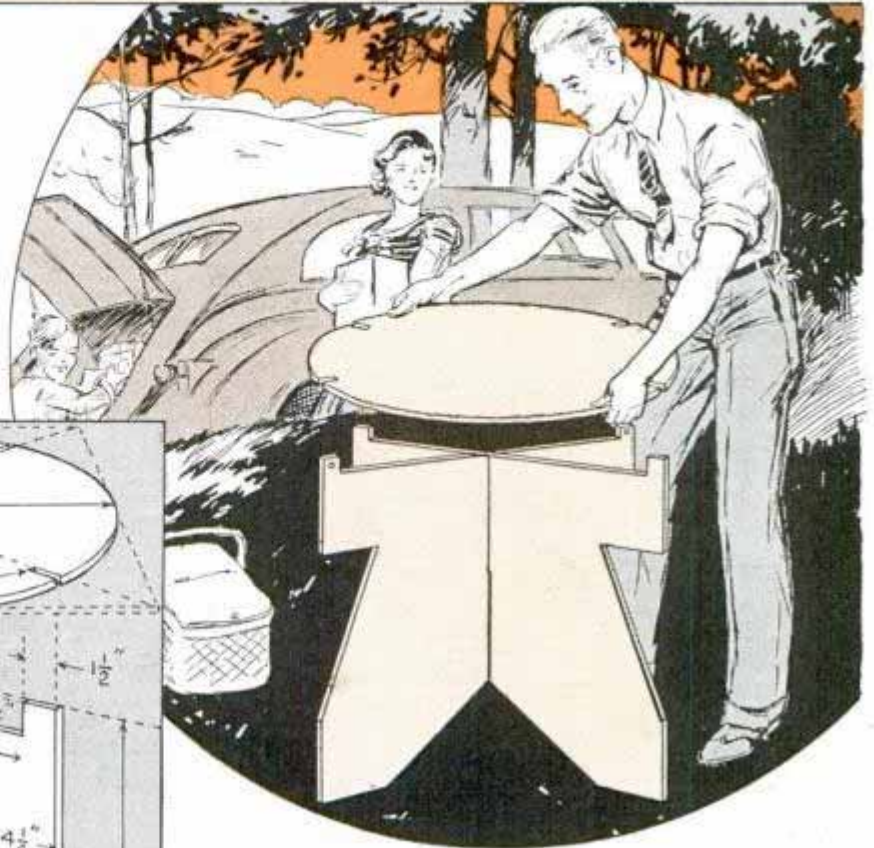
perature of the solution never should be allowed to rise higher than 70 degrees or the gelatin on the film will soften. In winter the jars of developer and hypo may be heated by placing them in pans of warm water, and in summer, cooled to the correct temperature by placing them in pans of ice cubes. Test with the thermometer. Always test the developer first and never put the thermometer into the developer after it has been in hypo without first washing it a full minute in running water. One drop of hypo will ruin a whole jar of developer. The same rule applies to your hands and the measuring cup. Pour the borax developer into the measuring cup and fill the tank through the hole in the top, Fig. 3. Now insert the stirring rod and rotate the reel several times to break up any air bubbles. Watch the clock. Every 3 min. the reel must be rotated four or five times, gently, in a counterclockwise

direction, as in Fig. 4. At the end of 20 min. pour the developer out of the tank back into the jar. This is done through a hole provided for the purpose, Fig. 5. Do not remove the lid of the tank. The film must be washed now for 5 min. in clear water. Fill the measuring cup and pour water into the center hole of the tank, allowing the overflow to run out. Turn the rod several times, then pour out all the water and refill. At the end of 5 min. dump out the water and pour in the hypo. Agitate for the first minute after the hypo is in the tank, then allow to stand for 15 min. or longer. A cake pan and half a bath spray hose make an inexpensive and efficient washer, Figs. 6 and 7. The hose allows the water to enter at the bottom of the pan. As the hypo is dissolved the waste water is carried upward and over the edge. One hour is enough to wash a film, but 2 or 3 hrs. are permissible. Let the stream flow gently, and keep the temperature just under 70 degrees.

The final operation is drying. Remove the negative from the water very gently as the gelatin is soft. Pin the film to a clothesline by the tab end. Soak the viscos sponge in water until saturated. Squeeze dry, and lightly but firmly run it the length of the film on both sides as in Fig. 8. Make one stroke do. The film should hang in still air for 6 or 8 hrs. If the day is damp it may take longer. Do not handle it even though it tends to curl. It will straighten when completely dry.

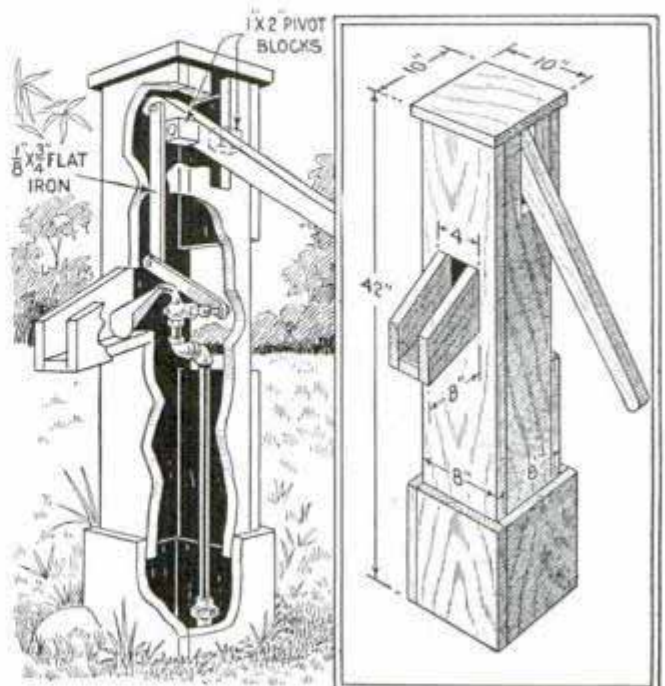
KNOCK-DOWN PICNIC TABLE SLIPS INTO CAR TRUNK

You will always have a table for your picnic dinners if you make this one, which can be carried in the trunk of your car and set up in a minute. There are no nails or screws to drive because the table is quickly assembled by slipping the slotted members together as shown in the details. Regular $\frac{1}{4}$ -in. fir plywood will do for the purpose. It is a good idea to impregnate the edges with paraffin



Ornamental Pump Covers Faucet in Greenhouse or Garden

A quaint, old-fashioned pump built around the hydrant in your flower garden improves the appearance considerably. The pump can be made useful by connecting the handle to the faucet so an upstroke turns on the water and the downstroke shuts it off.

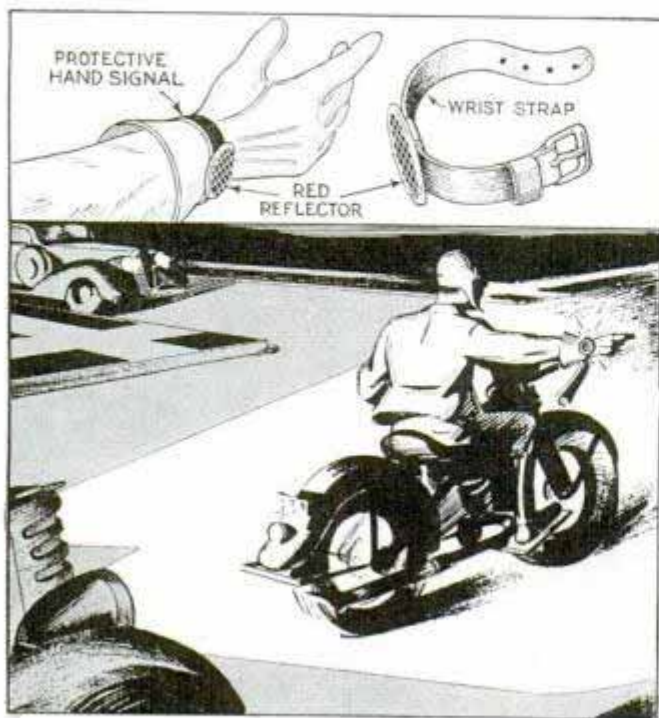


Repairing Worn Goggle Frames

When the binding used on many types of goggles begins to deteriorate, small rubber gas tubing can be used to replace it and provide a cushion for the wearer's face. Another equally effective method is to employ the special molded rubber tubing used for draft excluders. This has a rubber tongue throughout its length and is much easier to sew or cement to the goggle rims than regular gas tubing.

—Ivan J. Stretten, Detroit, Mich.

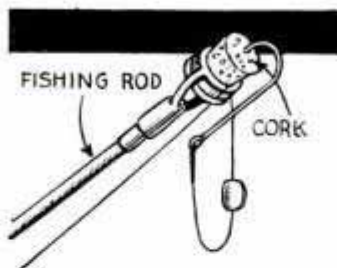
Reflector Disk Flashes Intentions of Motorcycle Rider



An investment in a ruby reflector and a strap to hold it to your wrist may save you from being run down in a fog or rain. When your arm is outstretched the flash of red is easily seen by the car following.

Cork Protects Casting-Rod Tip and Holds Hook Safely

Accidental breakage of the agate tip in a casting rod is prevented by inserting a tiny cork inside the guide as shown. The hook is also shielded by sticking it in the cork to cover the barbed end.



"Evergreen" Decorates Lamps on Driveway Posts



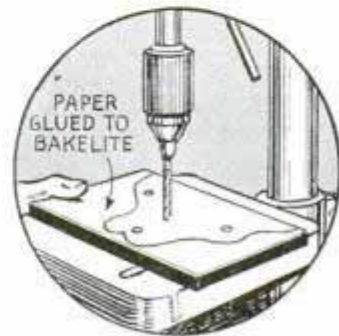
A novel and artistic effect was obtained by ornamenting the lamps of driveway posts of an Omaha estate with miniature fir trees made of copper. Imita-

tion of limbs was effected by serrating the lower edges of conical pieces of copper spaced one above the other on the electrical conduit, which projected above the tops of the posts. The conical pieces were made progressively smaller in diameter toward the top of the trees.

—Dale R. Van Horn, Lincoln, Nebr.

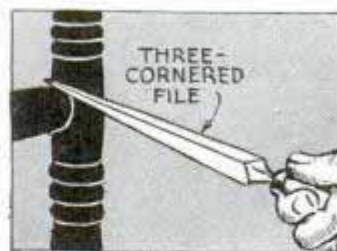
Cutting Designs in Sheet Plastics

Instead of scratching a design in the surface of hard plastics like Bakelite for a guide in cutting it, glue paper over the work and sketch the design on it. Then, if necessary, a correction can be made in the design without marring the surface of the work. The paper can be removed easily after the cutting or drilling has been done.



Scraping Tool from Old File

By grinding off the teeth of a worn three-cornered file and sharpening the edges on an oilstone, you have a good tool for scraping off paint or varnish on chair rungs, molded edges of tables, intricate relief work on wood and other hard-to-reach places. Also, it is handy for smoothing wood articles that are difficult to sandpaper, and it can be used on metal or for scraping carbon from motors with equally good results.

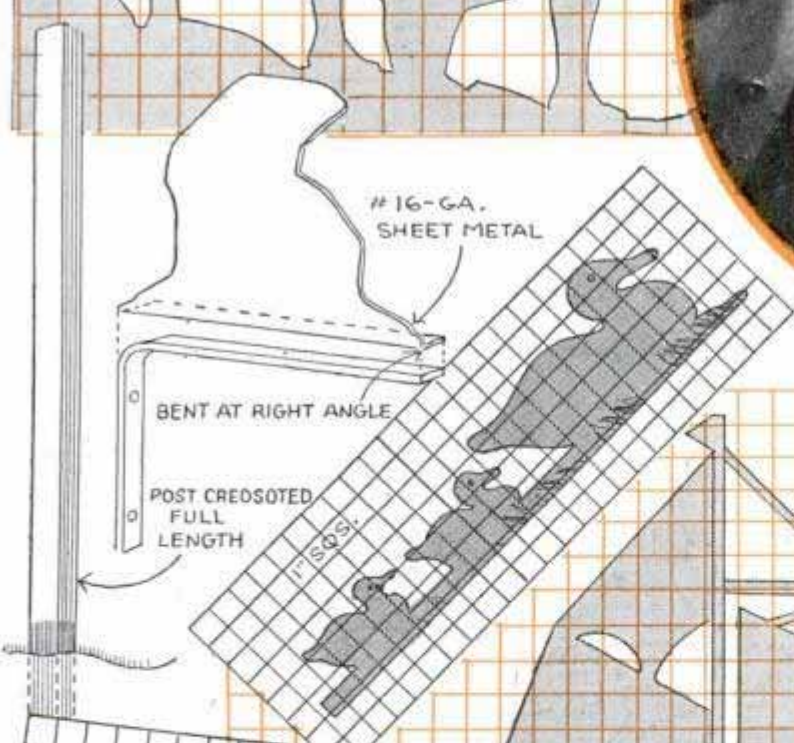
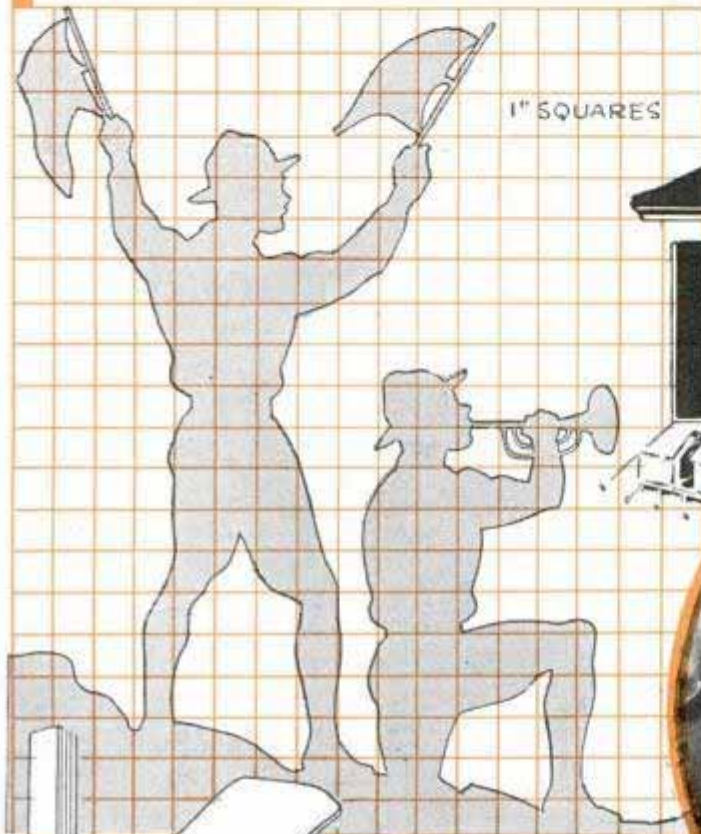


—V. Robinson, St. Paul, Minn.

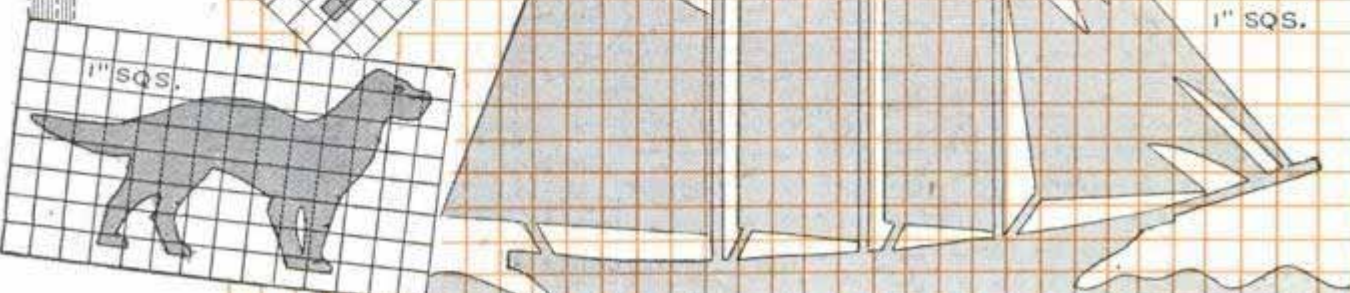
Most of the short articles on these pages were contributed by our readers. If you have an idea for an article, tell us about it. You need not be an expert writer—just state the facts and illustrate your point with a rough drawing or a snapshot, or both. We will do the rest. Remember, your idea must be original, practical, and have general appeal. Address the Home-craft Editor.

SHEET-METAL SIGNS

cut with hammer and chisel



Sheet-metal signs offer an interesting and profitable hobby for your spare time. Cut from copper or brass, the designs shown are only a few of unlimited possibilities

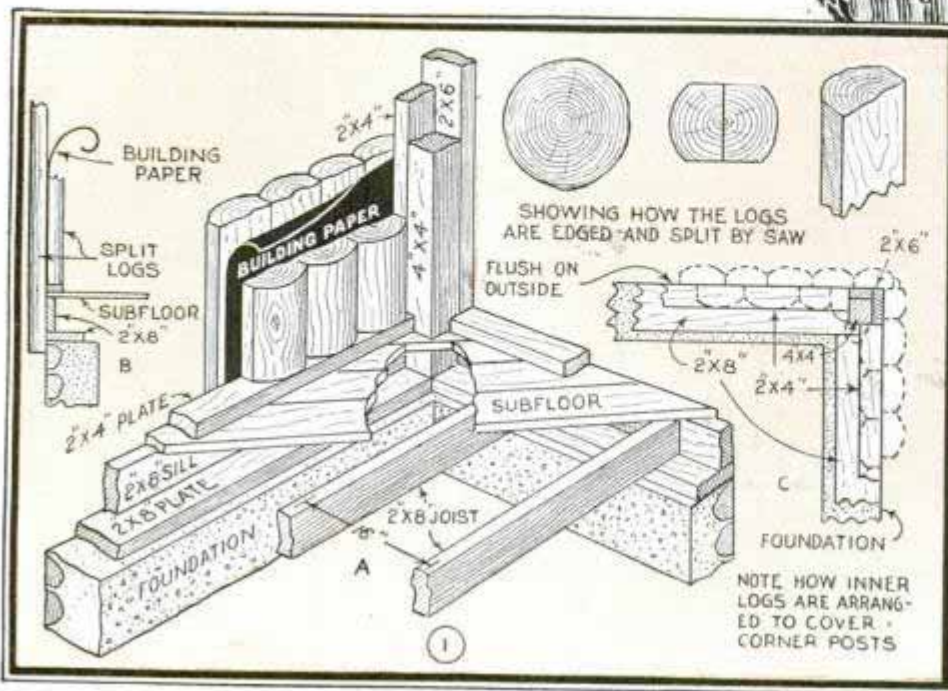
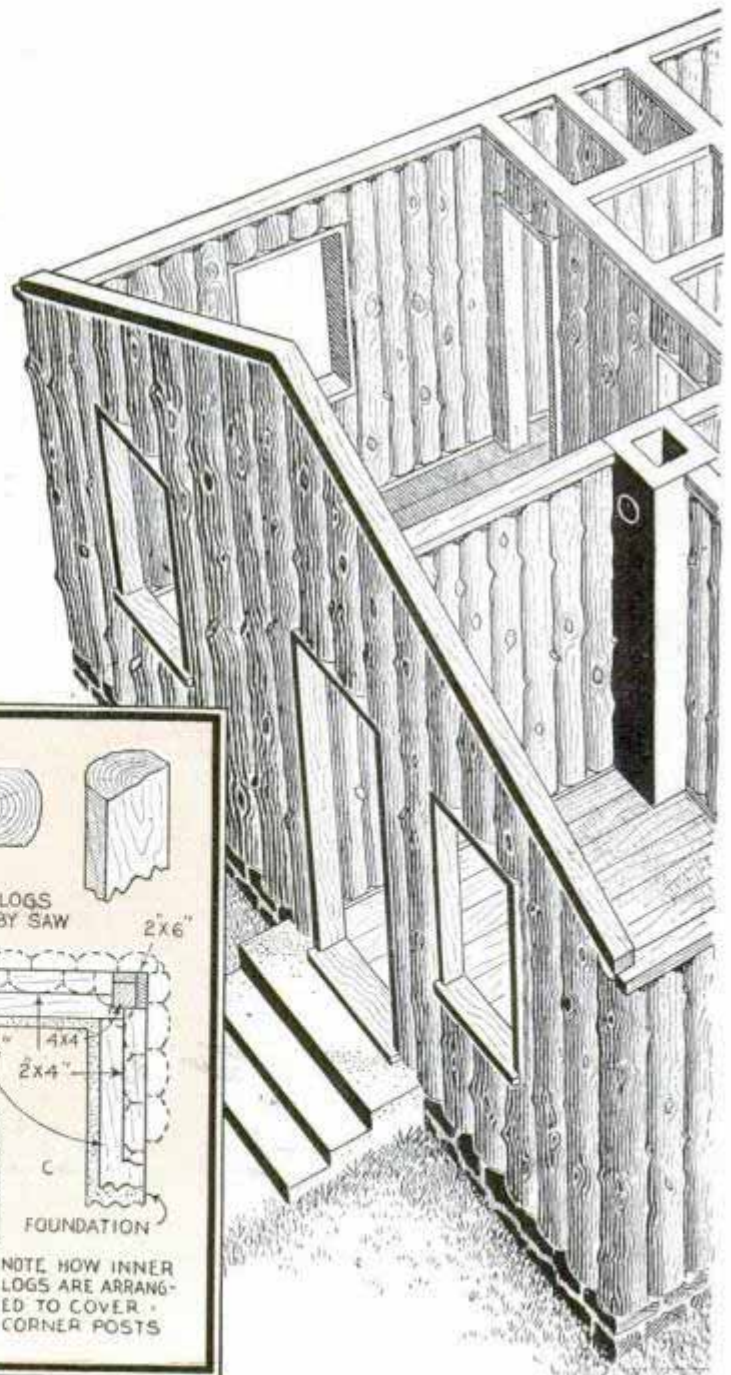




Build your own

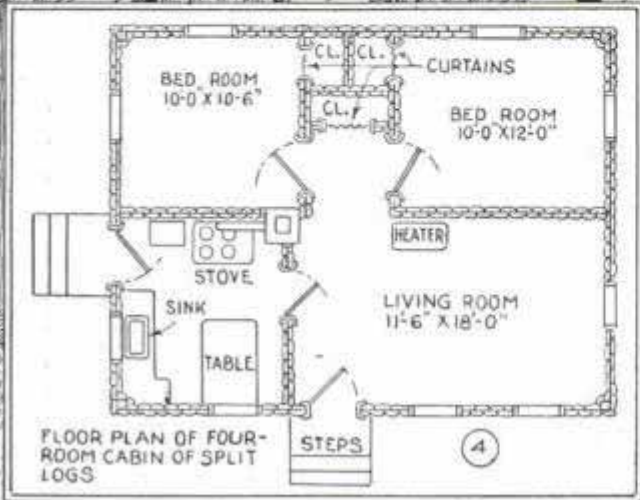
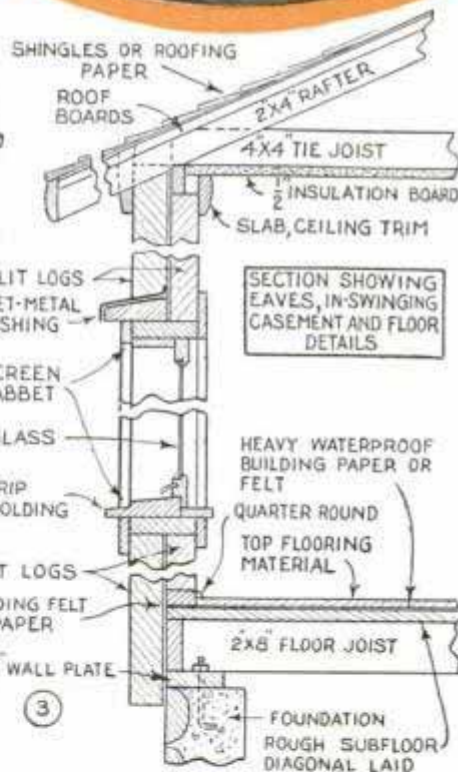
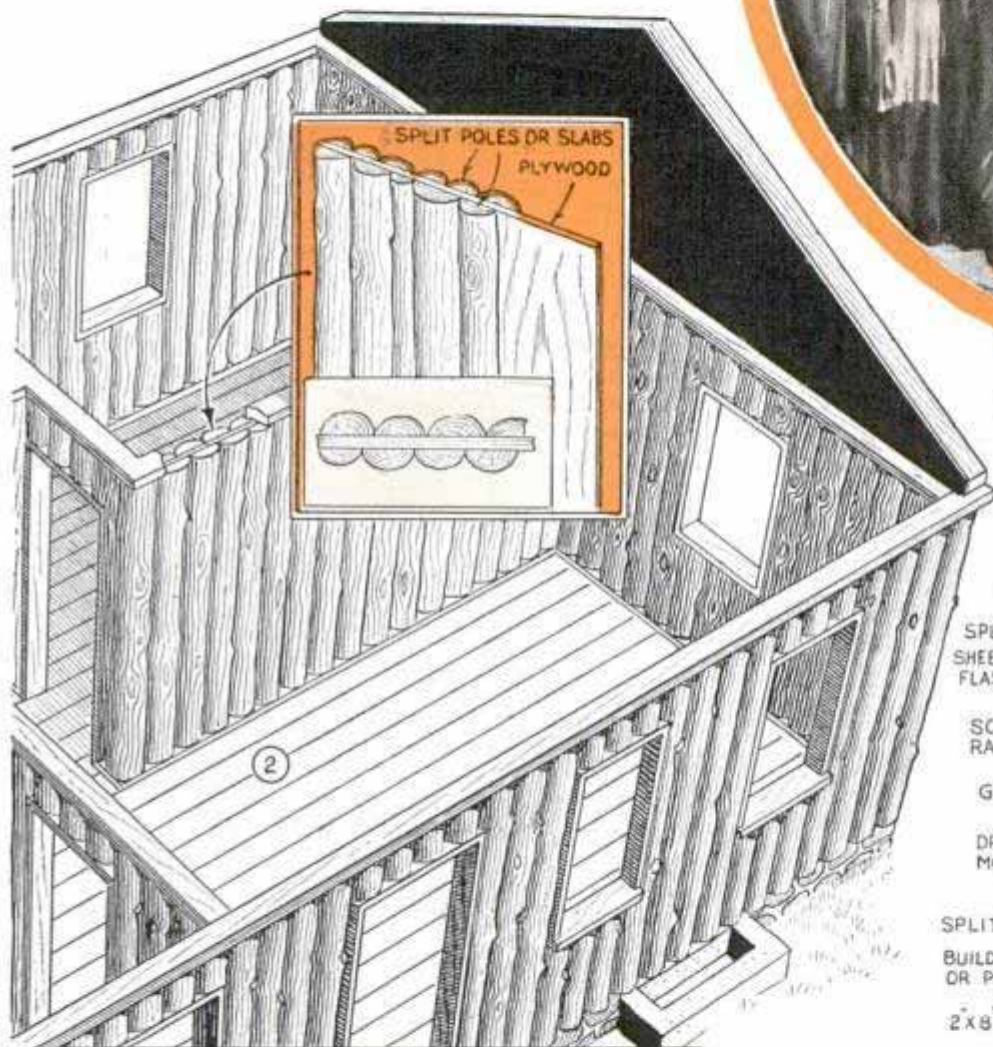
By
LESTER LEHNHERR

A PICTURESQUE year-round cabin of logs, a week-end house, or a permanent hunting and fishing camp far off beaten trails can be yours at very little cost if you follow this simple method of construction. If you're fairly handy at building a masonry foundation and handling a hammer and saw you can do the whole job yourself, for there are no heavy materials and no tricky saddle-notched corners such as are found in the conventional log cabin. Here the logs are halved and edged as in Fig. 1 and assembled vertically, "stockade" fashion, which makes it possible to use small logs from second-growth timber such as aspen and poplar. Although these timbers do not endure for long when laid horizontally, either will be entirely satisfactory when placed vertically since there are no crevices to catch and hold moisture. Placing the logs vertically also does away with the messy and difficult job of chinking.

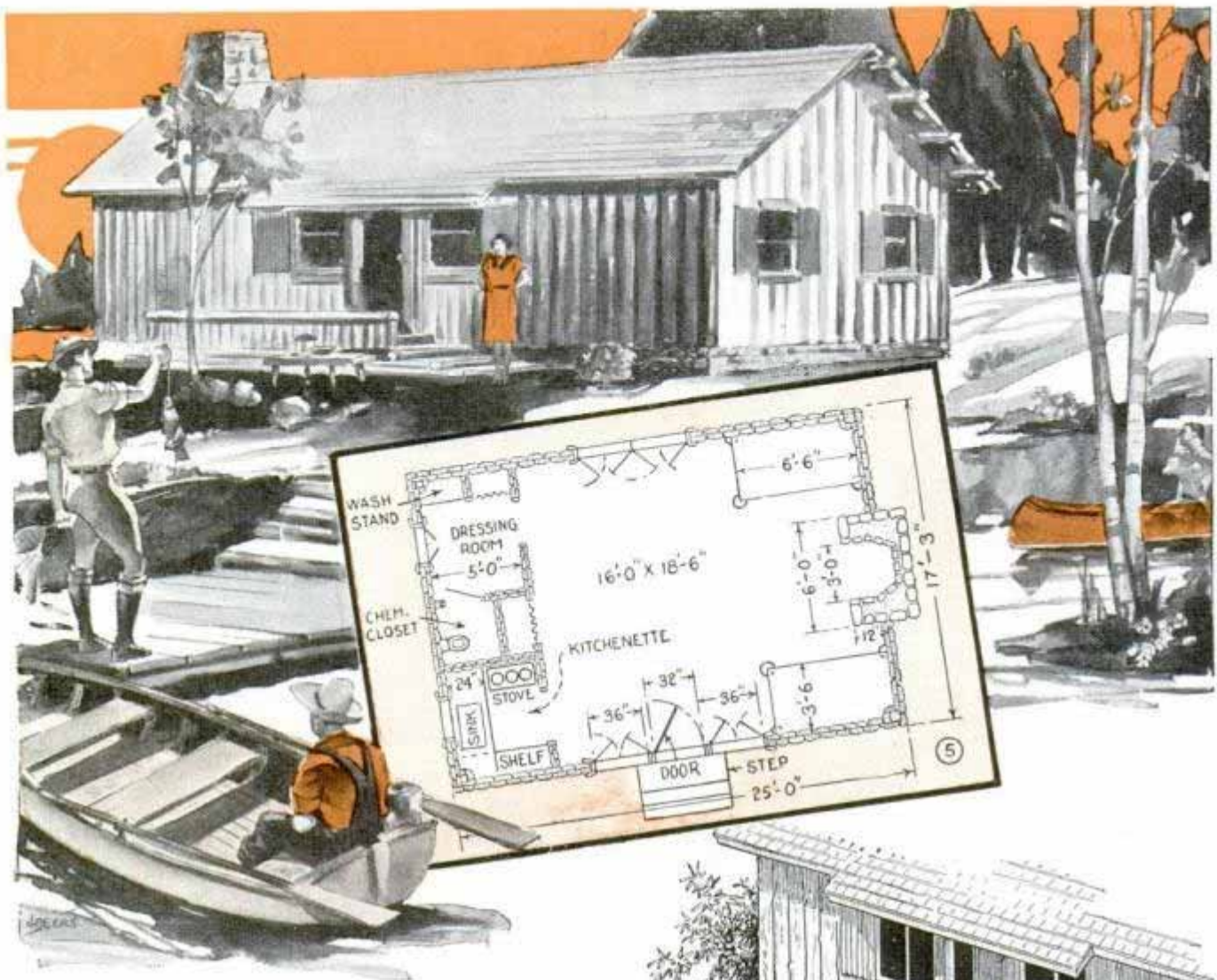


LOG CABIN

"Stockade" walls of vertical split logs do away with chinking and saddle-notching

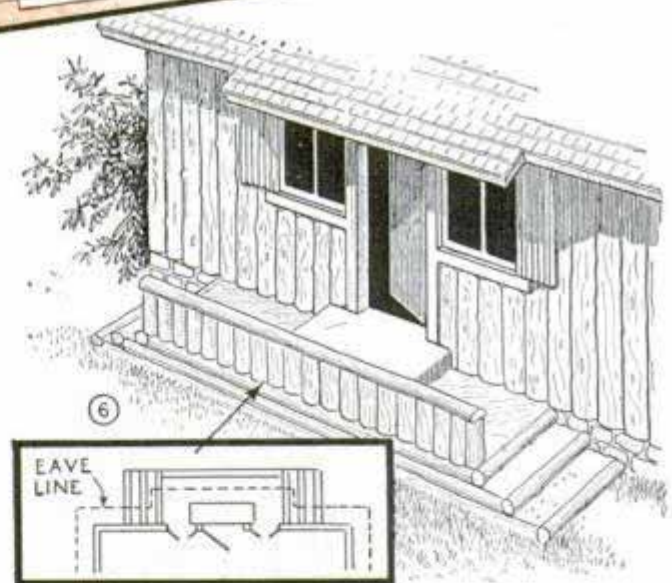


Preparing the logs: Logs should preferably be cut during the late fall or early winter so that they may have at least six months to season. As soon as cut they should be taken to the mill and split, edged and peeled. A peeled log can be treated more surely to resist decay and insects. The split logs should be coated thoroughly with boiled linseed oil thinned with a little turpentine and applied warm with a soft brush. After the first coat has dried for two weeks or more, a single coat

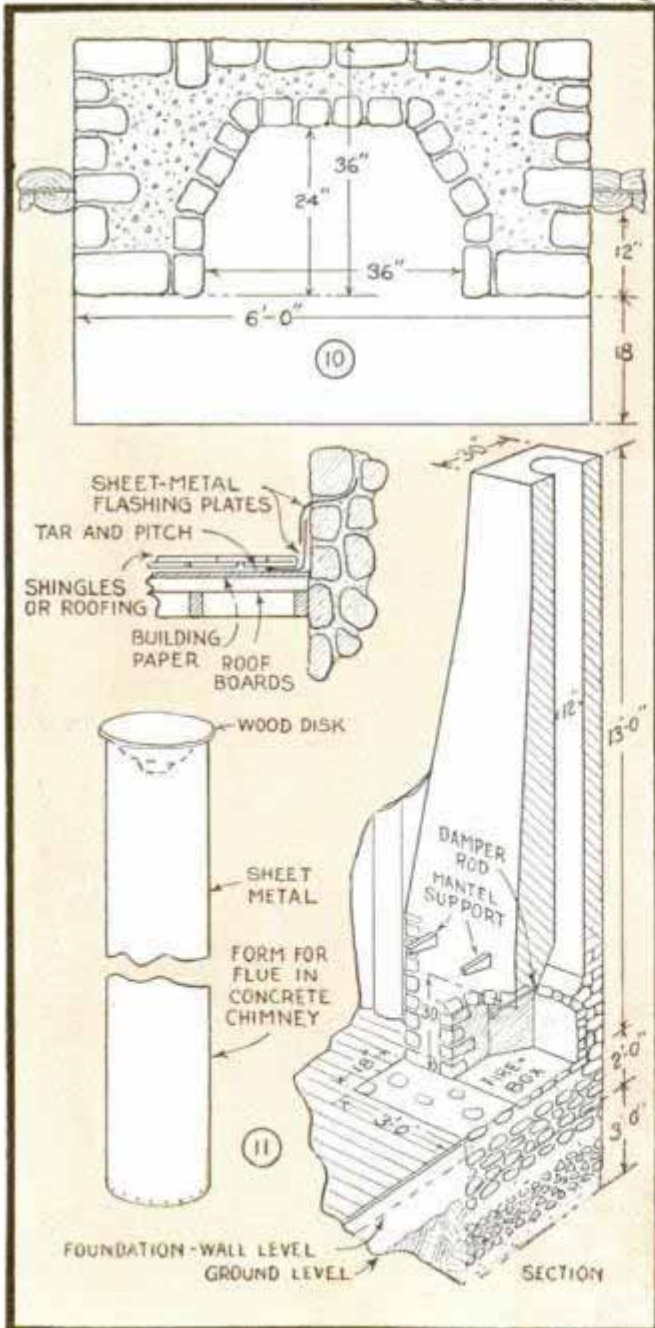


of pure linseed oil should be given. A third coat may be applied after the cabin is completed. Logs in contact with the earth should be painted with a creosote solution before being used. Creosoting the sills and floor joists is also advisable.

The foundation: Having chosen your site carefully in regard to drainage, water supply, view, etc., level the surface of the ground and mark out the locations of the walls and fireplace, Figs. 7 and 8. Then dig the foundation trench about 3 ft. deep and 16 or 18 in. wide. Excavate the space for the fireplace also. Have the sides of the trench neatly squared and you will not need a form up to the grade level. The footing should be about 6 to 8 in. deep and should cover the fireplace area as well. Use a mixture of cement, 1 part, to sand, 2 parts, and gravel, 3 parts. Once the footing has set, continue the wall about 1 ft. above the grade, using wood forms. If native rocks are handy, an attractive wall can be built by incorporating these with the cement, Fig. 7. While the concrete is



soft, long bolts or rods threaded at the top are embedded in the mixture at regular intervals to provide anchors for the plates. Care must be taken to have the plates perfectly level. Large rocks are packed into the fireplace pit on top of the footing already laid, Figs. 10 and 11. This layer will bring the level up to about 18 in. from the surface. Top this with a layer of sand and then pour on 6 in. of concrete. Add a 1-ft. layer of small stones and cover with concrete up to the grade level. Use selected rocks laid in courses to bring the fireplace foundation up to the height of the walls.



frame square and true until the outside logs are nailed on. Lastly, a 2 by 4-in. plate is nailed to the floor flush with the outside edge all around except across the door openings. Later the inside logs will be toenailed to this plate, Fig. 1, A.

The split-log walls: The frame is now ready for the outside logs. Starting at one of the front corners, two 9-ft. lengths of heavy building paper or felt are stretched between the top frame and the sill. The first length is carried around the corner about 10 in. and tacked on. The second piece overlaps the first, making a weather-proof corner. Locate the first log with the vertical edge flush with the corner post. The lower end should extend down over the sill and cover a few inches of the stonework, Fig. 1, B. It is then spiked to the sill, wall plates and the top frame. Continue nailing the logs in place, working toward a doorway, hanging sheets of building paper ahead of the logs. As you approach the window opening, nail the frame in place against the door uprights, Fig. 9. Then using short logs, cut to length, place them in under the window and nail the frame to them. On the end opposite the fireplace, begin at the center with the longest split log. This supports the ridge pole and should be located in the exact center of the wall. Of course, a length of building paper is first stretched from the nailing joist to the sill. Finish from the center log to the corners, running the paper only up to the nailing joist. After the end wall is completed, rafters are spiked to the upper ends of the logs and the latter trimmed flush with the rafters. Then tack building paper to the logs above the nailing joist. The height of the center pole determines the pitch of the roof. The roof shown in Figs. 2, 3, and 9 rises 12 in. in 3 ft., a pitch which is about right for a cabin of this type and size. Note that the logs which support the purlins carry the weight of the ridge roof down to the foundation. These logs should be full length.

Now back to the fireplace again. The ridge pole and part of the frame will rest on the stonework as in Fig. 9. The side wall of logs must be cut to fit closely to the masonry to make a weatherproof seal. A form for the flue can be made from a sheet of metal bent around two wood disks, the lower disk slightly smaller to give the

form a taper, Fig. 11. Wrap the form with paper so that it can be withdrawn from the concrete easily. After finishing the chimney to the ridge line allow to set thoroughly before the ridge pole and the two purlins are put in place. These purlins will have to be trimmed to fit onto the supporting masonry. Both purlins and ridge should extend 2 ft. over the walls to form wide eaves. With these parts in place the chimney can be finished to the desired height.

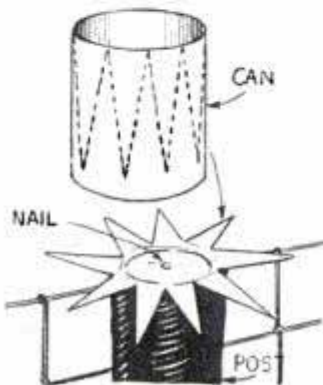
Now for the interior logs. Begin with a narrow split log in a corner and make sure that the joint between the last log and the one succeeding will fall on the flat face of the outside log in the same fashion as the "broken" joints in masonry or brick work, Fig. 1, C.

The roof: Before setting up the rafters finish up the gable ends with short logs. Center rafters can extend a few feet in front to provide a short roof overhang for a porch, Figs. 5 and 6. Use $\frac{3}{4}$ -in. stock for roof boards. A layer of building felt or paper goes on under the shingles. Flashing is built into the chimney in the manner shown in the upper detail, Fig. 11.

Finishing the interior: Figs. 3 and 9 show how the doors, windows and screens are installed and the trim put on.

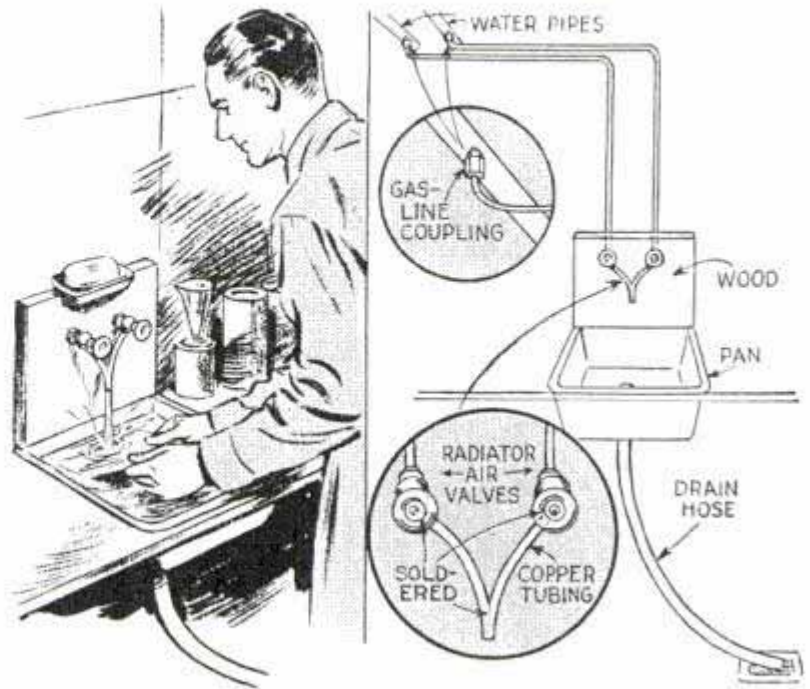
After the top floor is laid, over building paper, the partitions are installed. Floor plans shown in Figs. 2, 4, and 5 are suggested interior arrangements of rooms. Partitions are built up of split, peeled saplings which are nailed to each side of plywood sheets, Fig. 2.

Serrated Cans on Fence Posts Keep Out Cats



To keep cats out of his poultry yard, one fancier uses tin-can guards nailed on top of the fence posts. The cans are serrated as indicated, each point being bent out at right angles.

Running Water in the Darkroom Provided at Small Cost



Plenty of running hot and cold water—blended to just the right temperature—may be had in any darkroom at small cost. The pipe and fittings are auto gas lines except the faucets which are radiator air valves used on hot-water systems. After shutting off the water at the main valve, the hot and cold-water pipes are tapped to take the compression couplings to which the pipes are attached. These are then led through the darkroom wall and down to the sink. This can be a tray or pan of any convenient size in which has been soldered a fitting to take a drain hose. At the back of this tank, a board is provided to hold the radiator air valves to which the water lines are soldered. From the valve outlets two lengths of copper tubing are soldered to conduct the water into the tank. To blend the water, however, these should have their sides filed away for a distance of about 2 in. and the exposed edges soldered together. To maintain the water at any desired depth in the tank, an overflow pipe can be fitted in the drain outlet to a height equal to the desired depth of the water.

☞ When washing your lamp shades remember that the quicker they are dried the better. Turn an electric fan on them as soon as you have rinsed them. Quick drying helps to prevent colors from running.

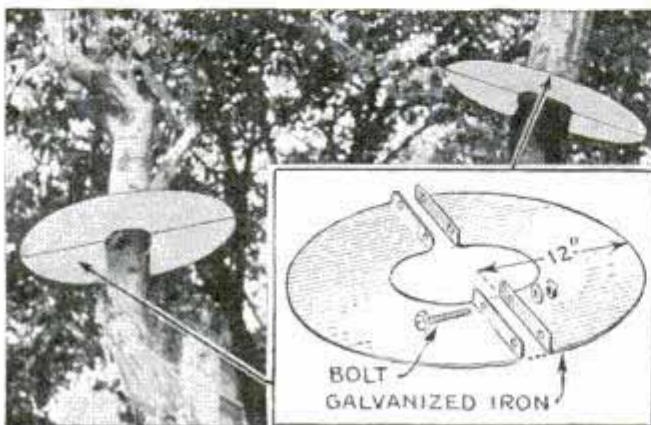
Hook Taken from Fish's Throat with Pencil Eraser



To remove fishhooks from the throat of his catch in the most humane way possible, one fisherman employs a pencil and eraser. The latter is notched so that it will slide into position along the line and allow the hook to be loosened without unnecessary tearing or injury.

Metal Squirrel Shields on Trees Bolted in Place

These shields are easily fastened on trees to keep squirrels from climbing them. Cut from galvanized sheet iron to the size and shape indicated in the circular detail, the shields can be clamped in place with stove bolts. It is a good idea to examine

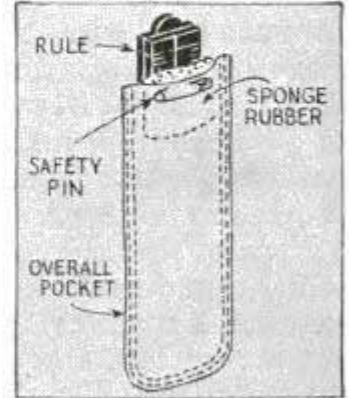


the shields annually and adjust them to compensate for growth of the trees.

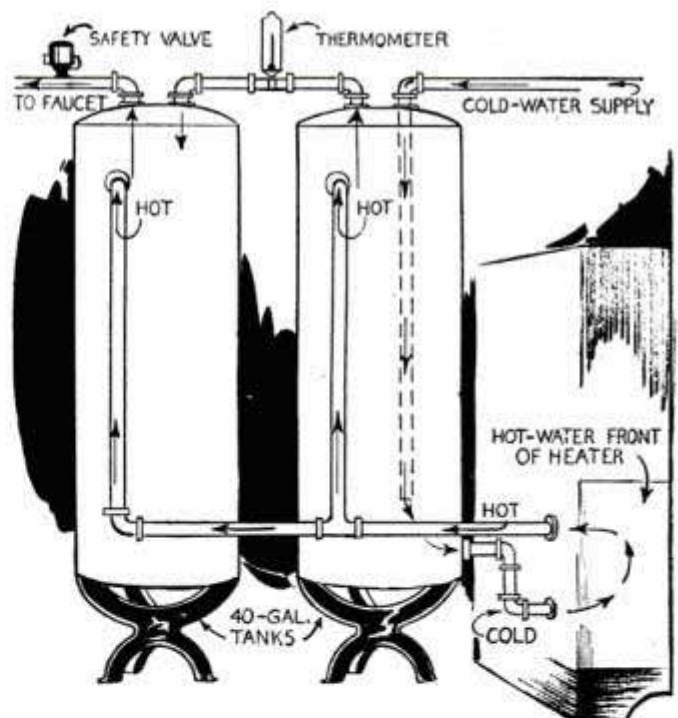
-John P. Behrens, Jr., Whitestone, N. Y.

Workman's Ruler Held in Pocket by Sponge Rubber

It will be almost impossible for a folding rule to slip out of your over-all pocket if a small piece of sponge rubber is pinned inside the pocket at the top as shown. Friction of the rubber against the rule holds it securely under ordinary conditions, but does not prevent its removal.

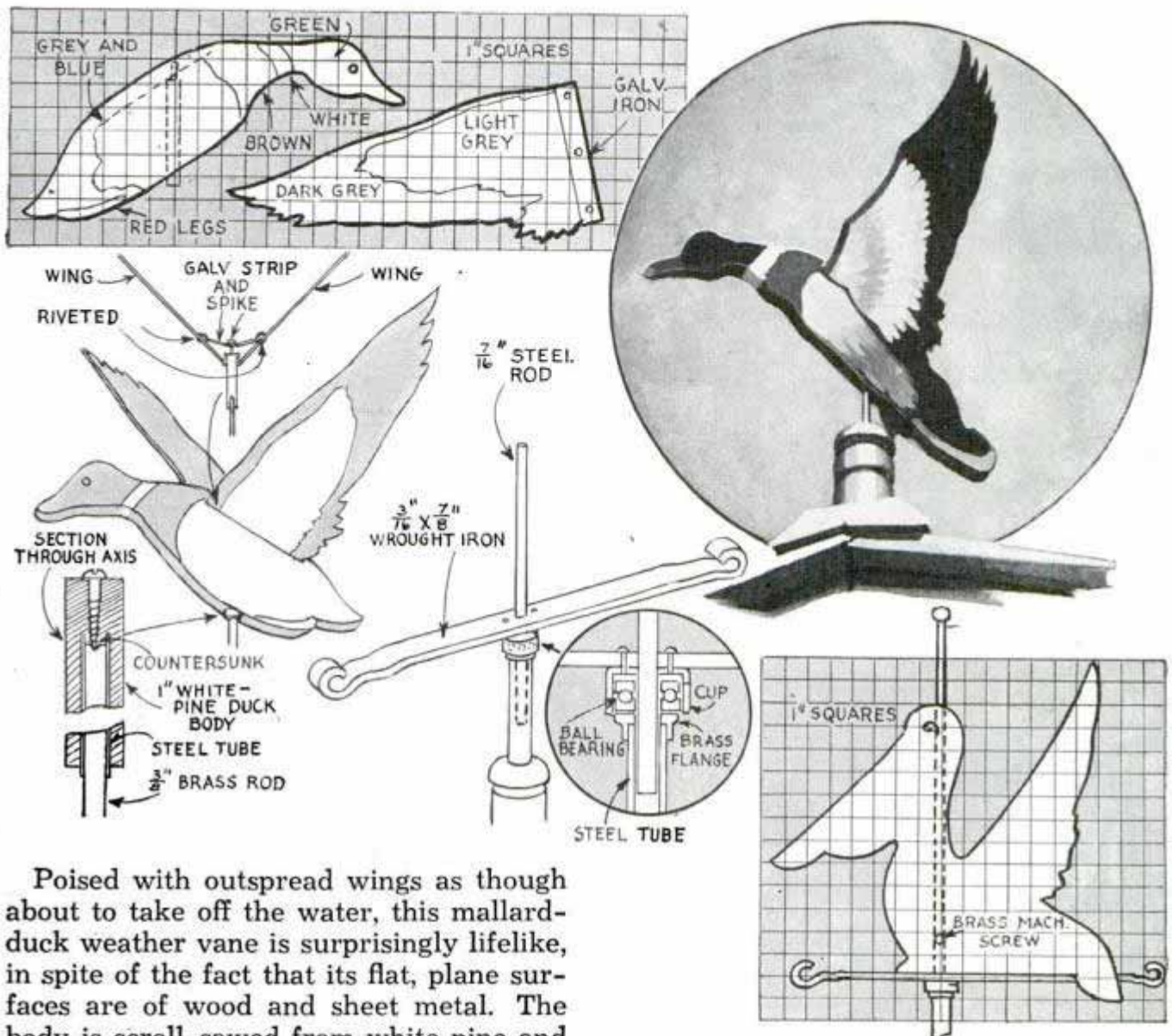


Uniform Supply of Hot Water from Dual-Tank System



The disappointment of having the hot water chill in the middle of a shower is postponed considerably by connecting two tanks as shown, rather than using a single large one. Cold water is admitted to the first tank only, and the syphon system conducts only the hottest part to the second tank, doubling the reserve capacity. The second tank remains hot even when the first is almost filled with cold water.

Water Fowls Are Imitated in Weather Vanes



Poised with outspread wings as though about to take off the water, this mallard-duck weather vane is surprisingly lifelike, in spite of the fact that its flat, plane surfaces are of wood and sheet metal. The body is scroll-sawed from white pine and the wings are cut from galvanized sheet iron. The latter are attached to the body with small screws, and braced by a galvanized strap riveted between the wings and supported by a large spike. The duck is mounted on a weatherproof axis that turns freely without lubrication. A steel tube is installed in the body and at the top a wood screw with the point slightly

rounded is set in a countersunk brass rod. This arrangement is non-corroding, and the entire weight of the bird is carried on the point of the screw. Accurate painting of the duck has much to do with the lifelike appearance of the weather vane. The pelican weather vane is a sheet-metal cut-out mounted on a ball-bearing pivot shown in the lower details.

Golf Tee Wears a "Bracelet" to Keep the Ball at a Uniform Height

Golfers who have trouble in teeing up a ball at the proper height will find that a faucet washer slipped over the lower edge of the tee will put an end to guesswork. The hole in the washer should be enlarged just enough to permit it to be pushed on the tapered shank of the tee.—Wm. Gault, Milwaukee, Wis.

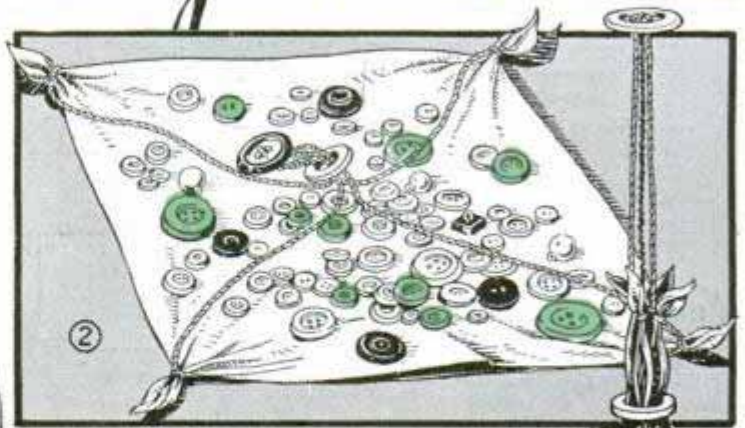
☞ Grease marks can be removed from book pages by first sponging them with benzine and then placing them between sheets of blotting paper and pressing with a hot iron.



Solving HOME

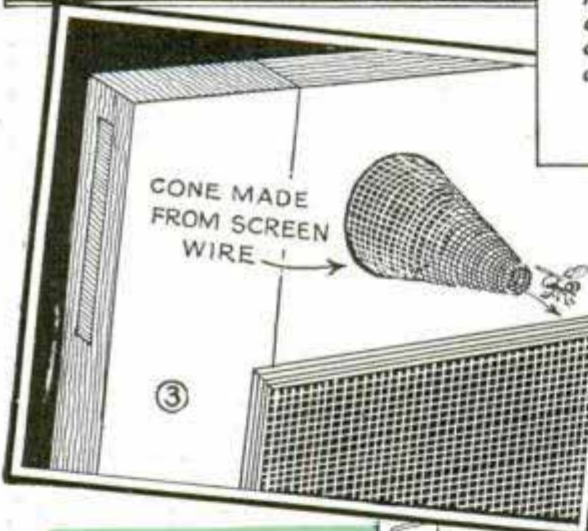


① CORRUGATED RUBBER

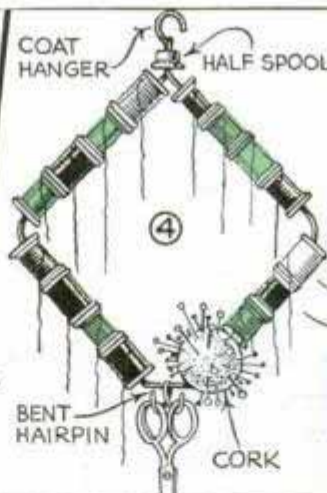


②

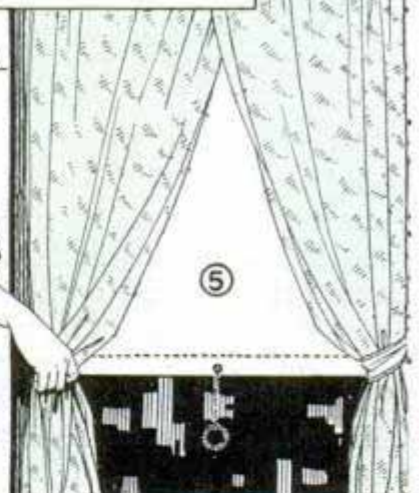
Mixing pans will not skid on porcelain or metal-top tables if set on a piece of corrugated rubber as in 1. Cloth button bag, Fig. 2, opens completely to expose contents and has sliding ring to hold it closed. Flies collecting at the top of a screen door, inside the house, find their way outdoors through a screen cone as in 3. Sewing-thread spools, a cork pin-cushion and a pair of scissors are all kept on a wire coat hanger, Fig. 4, which can be conveniently hung up out of the way



③



④



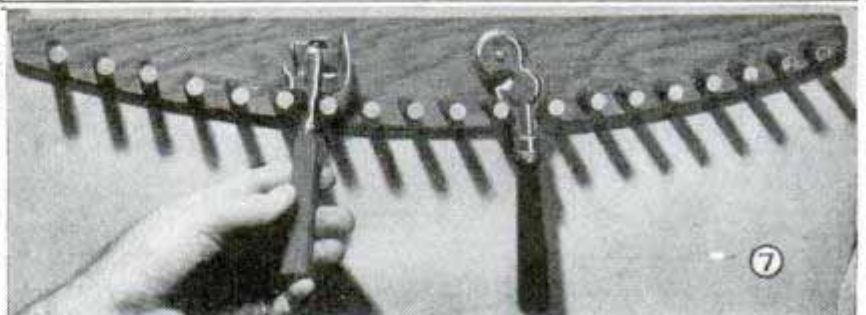
⑤



To locate curtain tie-backs accurately at the same height on both sides of a window casing, use the shade as a guide, Fig. 5.-Celluloid windows in hat boxes, Fig. 6, enable you to select the right hat at a glance without lifting the lids. A board with short dowels spaced equally along the lower curved edge as in 7 provides a handy rack for kitchen knife sharpeners, can openers, etc.

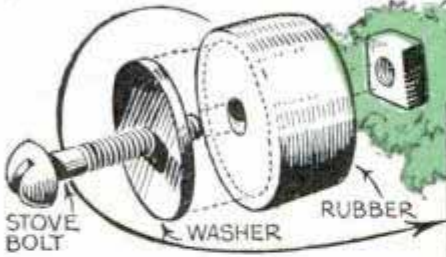


⑥

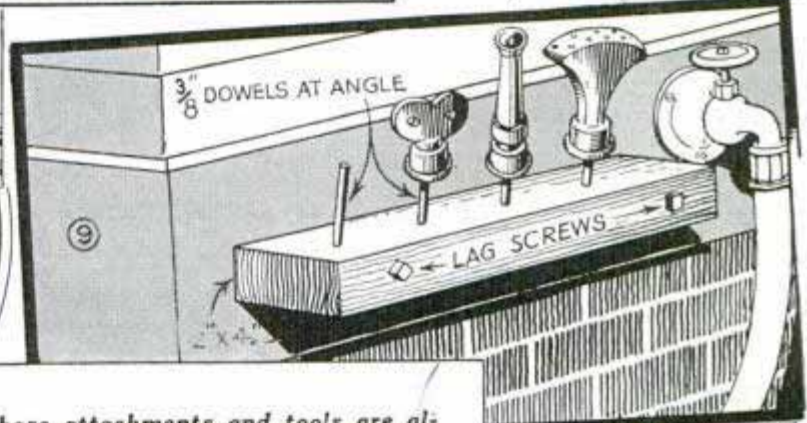
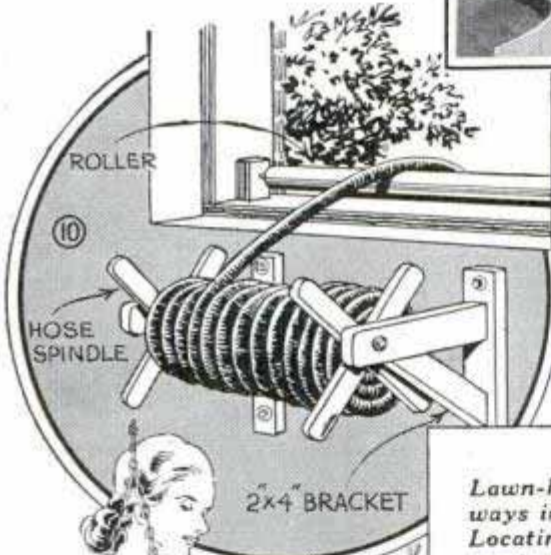
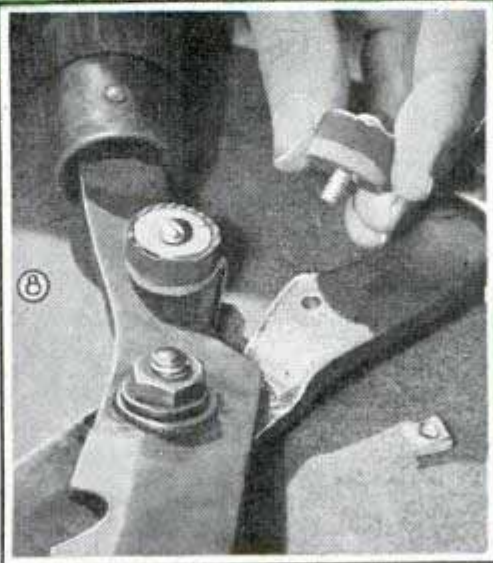


⑦

PROBLEMS



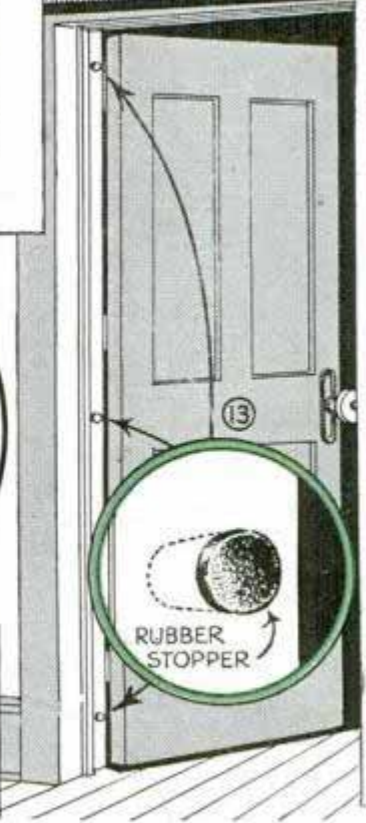
When trimming a hedge, repeated jarring of wrists and arms as the shear handles come together, can be avoided with rubber shock absorbers in 8. Locate them so that they will touch just when the blades close completely. Tightening the screws to compress the rubber will take care of any slight inaccuracy in locating the holes



Lawn-hose attachments and tools are always in order when kept on the rack in 9. Locating your hose reel inside the basement under a window as in 10 saves carrying a heavy reel and hose outside. Just open the window and pull out the hose when needed. Footrest on porch swing as in 11 adds comfort for short persons



Lock your lawnmower with a bicycle padlock as in 12 and small children will be less apt to injure themselves. Rubber bottle stoppers forced into holes in a door casing, Fig. 13, prevent rattling of door in a draft



Heavy Boat Is Moved over Beach on Oil-Drum "Dolly"

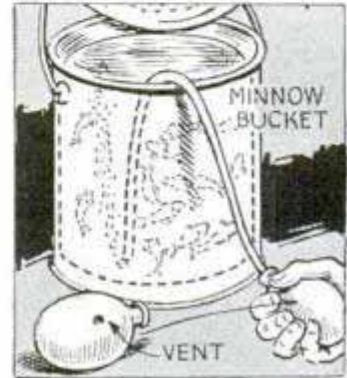


Having a rowboat that was too heavy to move short distances on hard ground, one man improvised a dolly from an old drum and four large furniture casters. The lat-

ter were set in the gunwale and were spaced to contact the drum sides a little past the center as shown. When the boat was turned upside down on the drum and pushed, the casters served as bearings so that the assembly could be rolled without difficulty. If the boat is too wide at the center to fit a drum, mount the casters near the front end where it is narrower.

Bulb to Aerate Minnow Bucket

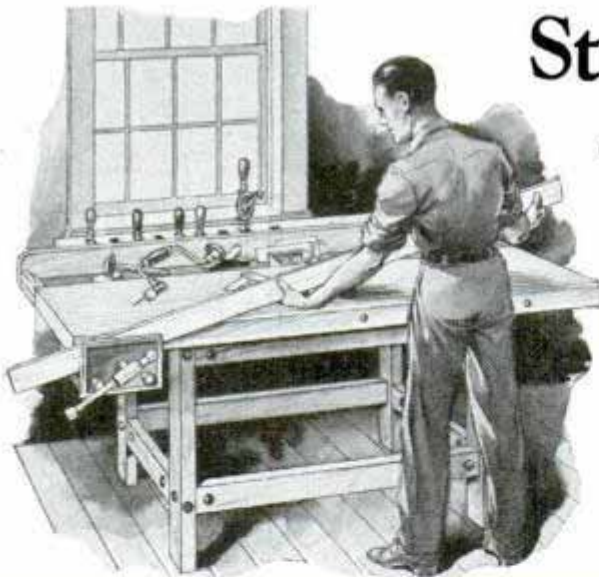
Minnows can be kept alive much longer in a bucket if a bulb with a short hose attached is used to aerate the water. A small hole should be punched in the bulb to serve as a valve, which is closed with the finger when pumping air into the water.



—G. E. Hendrickson, Argyle, Wis.

Sturdy Workbench

quickly dismantled for moving



Fully Portable

It takes just a few moments to dismantle the bolted framework so that the bench can be packed flat for moving.

Unusually Rigid

The frame members are drawn together tightly by means of eight bolts. When humidity conditions cause the wood to shrink slightly, give each bolt a twist.

Maple Top of Flooring

Maple flooring, set on edge and bolted together, provides a hard-wearing top which is planed smooth.

Sunken Tray and Tool Rack

Additional convenience is furnished by a sunken tray and a rack that keep tools within easy reach.

POPULAR MECHANICS MAGAZINE
200 E. Ontario St. Chicago

Enclosed find 10 cents for Craftplan No. 3006 on
Sturdy Workbench

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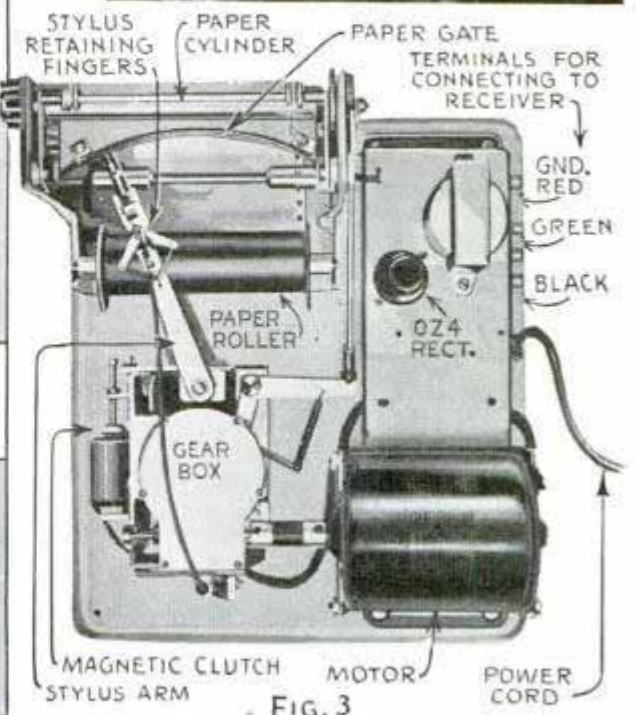
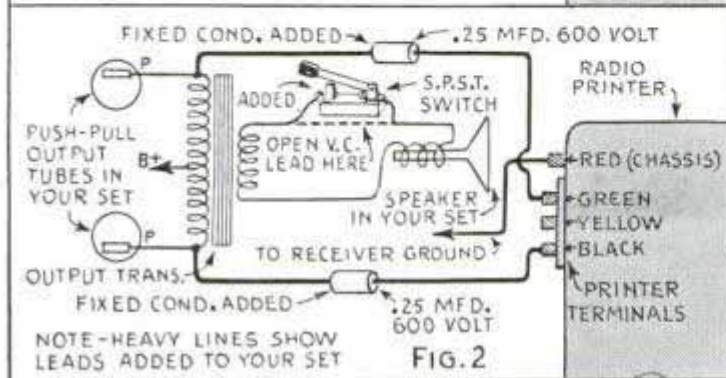
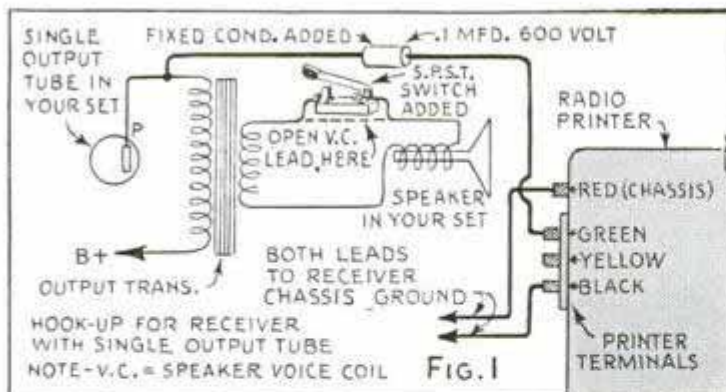
State _____



RADIO PRINTING

EXPERIMENTAL facsimile news items, weather reports, ball scores and pictures are now broadcast by Mutual chain stations during early morning hours much in the same manner as radio programs. There is nothing mysterious about "radio printing," the printer shown in photo, Fig. 3, can be assembled from a kit of parts and easily connected to any home radio set that delivers 5 watts or more. Diagrams Figs. 1 and 2 indicate simple set connections necessary to switch from speaker to printer.

An electric eye at the broadcasting station replaces the usual microphone and visualizes the material transmitted. These radio waves, tuned in and amplified on your receiver, are converted by the Finch method into text and pictures, printing a facsimile of the original on sensitized white paper in excellent detail. The specimen strip shown was the writer's home reception result of the first experimental chain broadcast sent out by stations WGN, WLW and WOR on March 11th.



Crosley Radio Corp

BEGINNER'S BATTERY SET

Photos Figs. 2-A, 2-B, 2-C and 2-D show various views of the completed set; simplified wiring diagram Fig. 2 indicates all parts and connections above and below the base. A complete schematic diagram is given in Fig. 3, and this also shows all A, B, and C-battery connections. With 90 volts of plate (B) voltage, 9 volts of C-bias are required; if but one 45-volt B-battery is used the C-bias should be 6 volts. Because of the increased A-battery drain it is best to use No. 6 dry cells connected in parallel as shown. Although the receiver will operate on a single small 45-volt B-battery, two are advised for maximum loudspeaker volume.

When wiring the audio stage, note that the phone-tip jacks on the 1-tube set portion of the layout are wired to the primary of the added audio transformer. Also the filament prongs for the type-1C5 tube socket are wired in parallel with the filament prongs on the 6-prong RK-43 socket. The switch on the regeneration

(Continued to page 136A)

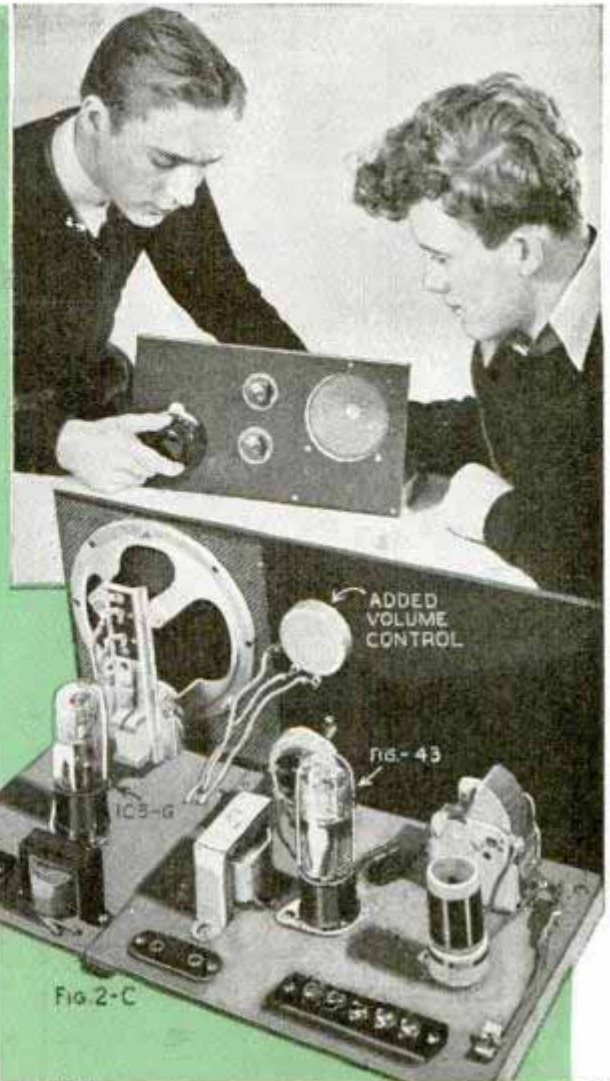
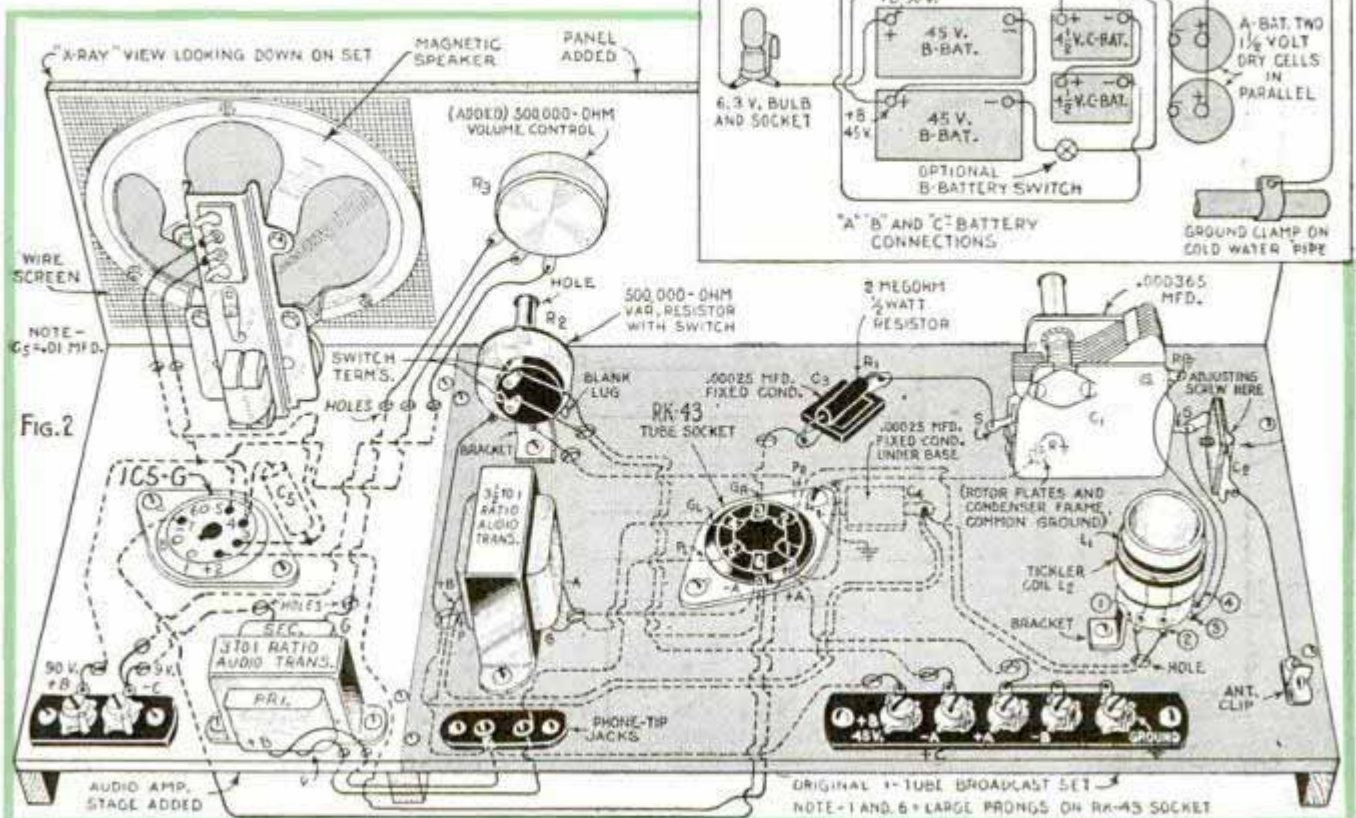
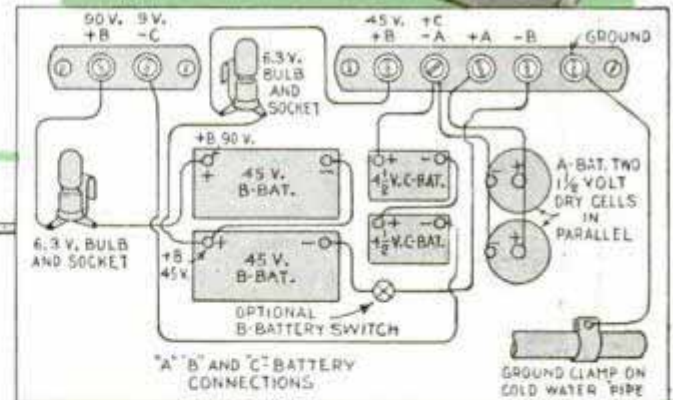


Fig. 2-C



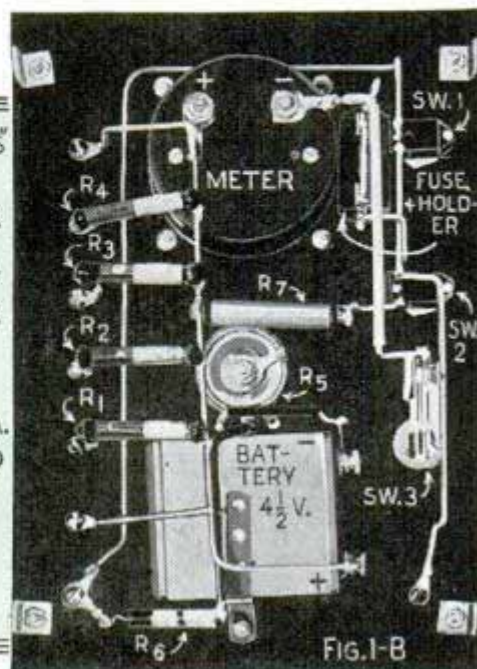
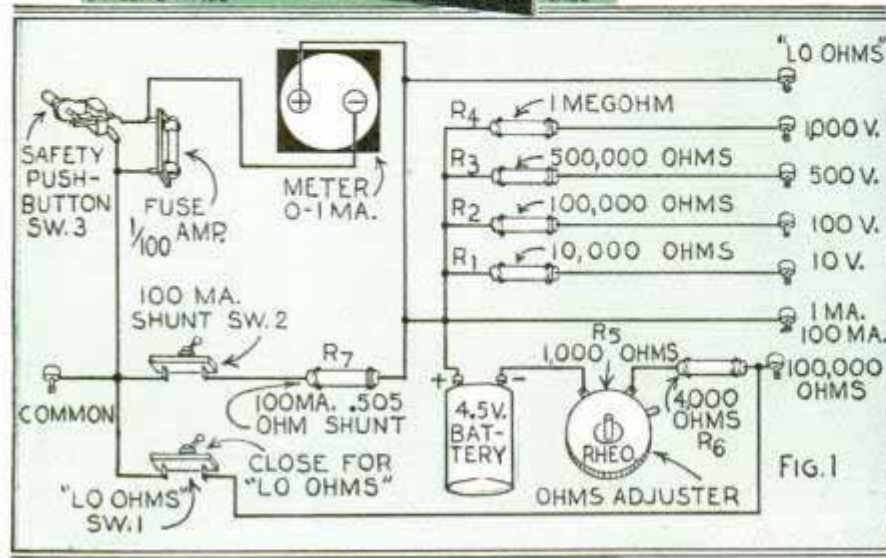
How to Build a Universal Set-Testing Meter

By John T. Wilcox

METERS capable of measuring voltage, current and resistance constitute perhaps the most important part of the radio experimenter's equipment, enabling him to check his own construction and wiring, locate defective parts and track down circuit troubles. If separate meters were required for these various types of measurements the cost would be prohibitive to most experimenters. Fortunately, however, it is possible to use a single inexpensive standard 0 to 1 ma. milliammeter together with a few semi-precision resistors and switches to serve all of these purposes.

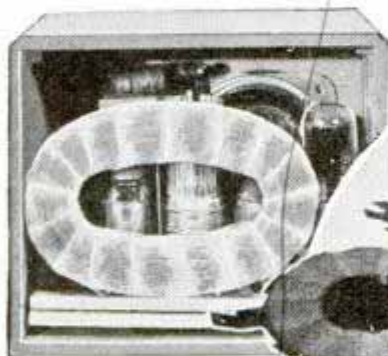
The homemade meter unit illustrated meets all requirements and provides the following d.c. measurement ranges: 0-1 and 0-100 milliamperes for current measurements; voltage—0-10, 0-100, 0-500 and 0-1,000 volts; resistance—0-500 and 0-100,000 ohms. Direct-reading calibrations are given on the multi-range meter scale for five of the eight ranges provided, and for the other three ranges it is only necessary to divide or multiply one of these calibrated ranges by ten. All parts, as specified and detailed in Fig. 1, cost about \$8.00 and this includes the 1/8 by 7 by 10-in. Bakelite panel. The case is a standard 7 by 9 by 2-in. sheet-steel chassis which is available "extra" either in natural or black-crackle finish. The semi-precision fixed resistors are

(Continued to page 132A)



1575 Milwaukee Ave. Chicago

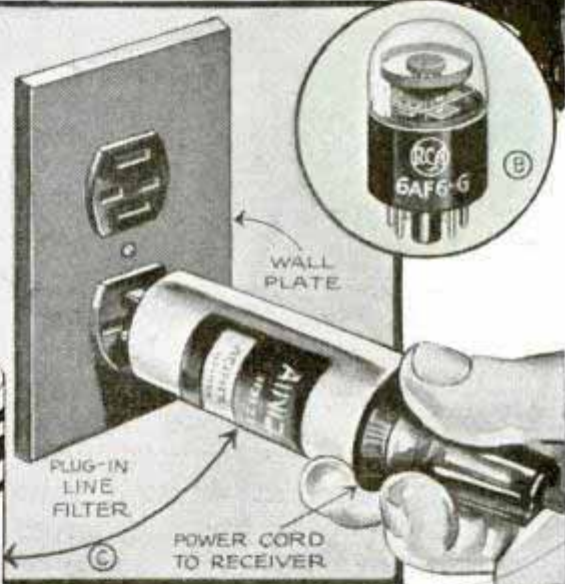
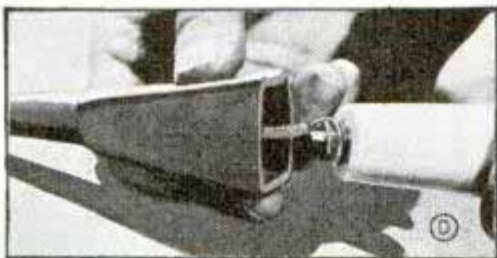
Practical RADIO HINTS



(A) Make your midget receiver really portable with a spiderweb antenna. These compact coils cost about 75 cents and may be used to replace the 25-ft. flexible antenna usually supplied. They are available in several types, some self-supporting and others wound on fiber forms provided with mounting brackets. Experimenters can rotate the coils for directional effects and use them to replace antenna coils in receiver circuits

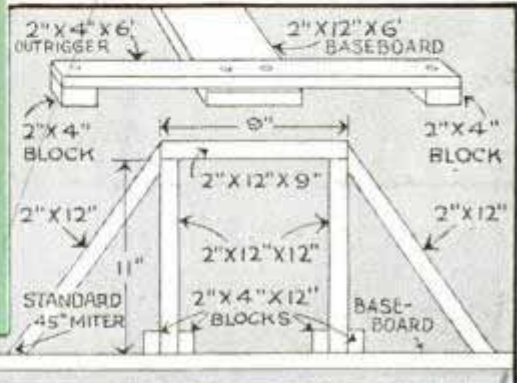
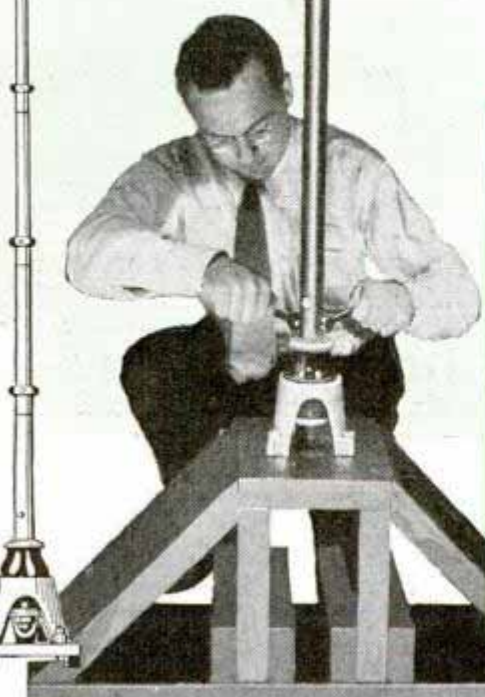


(B) Small electron-ray twin tuning eye provides two shadows as a visual aid for accurate tuning of compact radio receivers



(C) Handy plug-in line filter reduces strong-intensity radio interference from electric vibrating devices

(D) Large rubber insulator, of type used on battery clips, makes good safety cover for high-voltage terminal. (E) Telescoping vertical radiator for 10 and 20-meter transmitters. Diagram and photo show mounting for flat-roof installation; outriggers are held down with sandbags



Premier Products Corp. Brooklyn, N.Y. 1575 Milwaukee Ave. Chicago

Radio Record Player Has "Mike" Jack for Home Broadcasting



When placed at any convenient point in the home and plugged into the 110-volt a.c. outlet, this "wireless" record player plays phonograph records through your radio receiver without any connection whatsoever between the two. It is also provided with a jack into which a microphone of the "home broadcasting" variety may be plugged for announcing purposes.

Power Line Noise Analyzer



Five popular types of line-filter circuits are built into this compact instrument for radio interference work. These circuits are connect-

ed to a rotary switch so that the desired interference-eliminating circuit may be inserted quickly for checking between the power line and the suspected electrical equipment or radio receiver.

Push-Button Converter Unit

This compact unit provides a complete push-button tuning system for any a.c. superheterodyne receiver which has an intermediate frequency of about 456 to 465 kc. It employs a 6A7 tube as a mixer and oscillator. Power is obtained directly from the receiver through a short connecting cable.



Ham Transmitter in Console

Housed in an attractive steel console finished in black crackle and chromium, this 450-watt de luxe amateur transmitter provides all-band operation from 10 to 160 meters. Three power units supply operating voltages. A separate table-mounting cabinet contains the speech amplifier.



Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

NEXT MONTH—How to Build a Tiny Four-Tube A.C.-D.C. Receiver. New bantam-type tubes are employed in this inexpensive miniature set which has exceptionally good tone and volume. Parts cost about \$4.75 less tubes and cabinet. Also —details of **Sound and Picture Receiver Kit for Experimenters**

Jobe Deutchman, Corp.
 Cannon, Mass.
 Wholesale Radio Service Co.
 100 S. State
 Street
 Newark, N.J.

Mr. Carmel
 Ill
 S. S. Anderson, Inc.
 2611

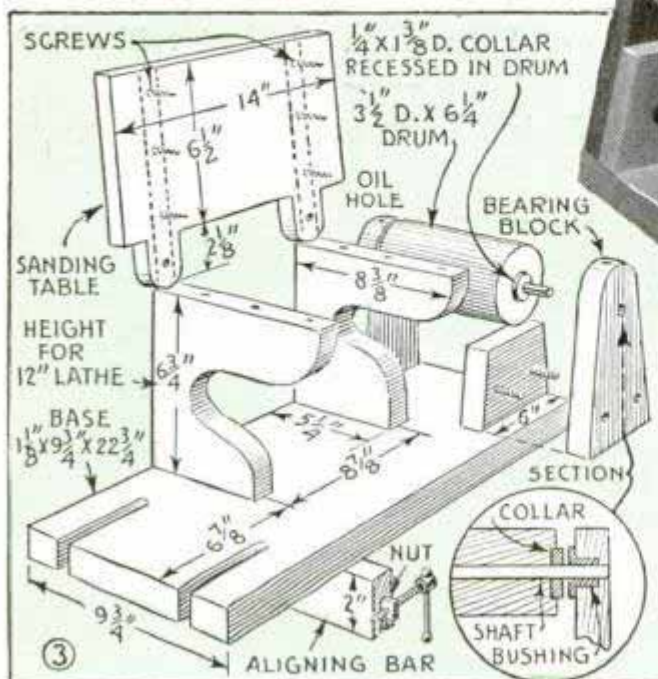
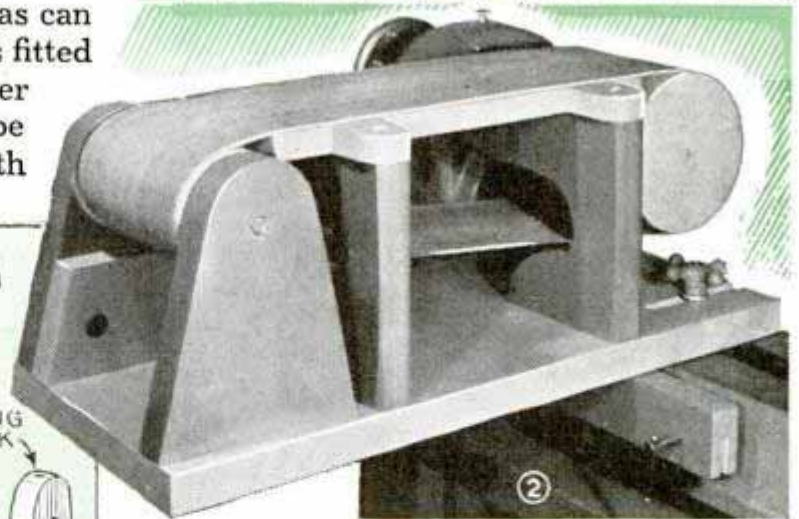


SHOP NOTES

BELT SANDER *fits your lathe*

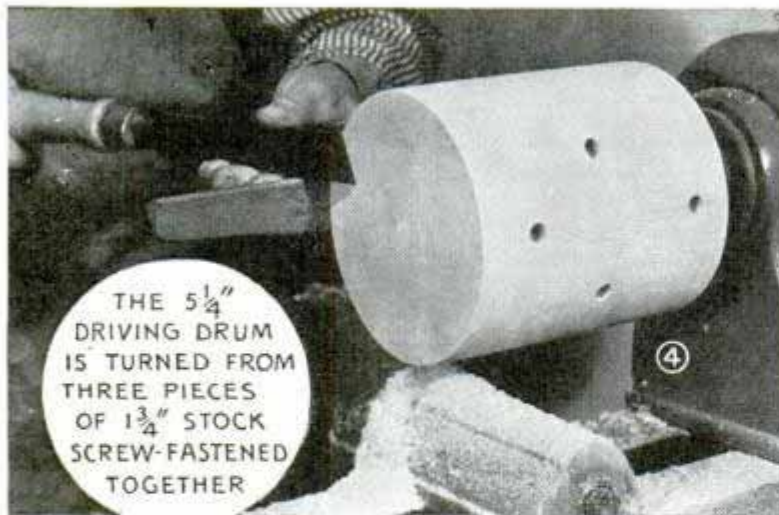
DESIGNED to take a standard 6-in. abrasive belt, this lathe sander is an inexpensive unit capable of handling any type of work ordinarily run on a small belt sander. Accurate adjustment for tensioning and tracking is furnished by means of an alignment bar fastened to the underside of the base, which tilts the sander laterally to align the idler with the driving drum, and, at the same time tightens the belt.

Construction should be started by making the two drums. The larger of these—the driving drum—is made from three pieces of $1\frac{3}{4}$ -in. stock, glued and screw-fastened together to permit turning as can be seen in Figs. 2 and 4. The drum is fitted on a standard 3-in. faceplate. The idler can be built up similarly or can be turned from a single solid block. Both



drums are $6\frac{1}{4}$ in. long. Wood stock for the other parts is $1\frac{1}{8}$ in. thick with exception of the sanding-table supports, Fig. 3, it is advisable to make these of plywood.

To fit the sanding belt in place on the completed unit, the removable bearing block at one end of the idler is taken off by



By turning one screw more than the other, proper alignment of the belt for straight tracking is assured. The adjusting screws can be obtained from small C-clamps. The screws are pointed at the free end with a file and engage in shallow holes drilled in the side of the lathe bed. Adjustments are made with the base loosely clamped to the bed, the base bolts being tightened after tensioning and tracking have been done.

loosening the wing nuts which hold it in place, Fig. 1. The belt is then slipped over the drums, after which the bearing block is replaced and the nuts tightened. The unit is fitted to the lathe by means of two studs which engage in the slot in the lathe bed. Tension is provided by means of the two screws fitting through the aligning bar.

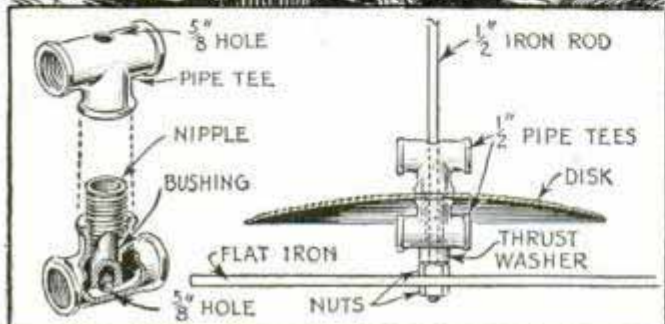
For certain types of work a fence is handy. This is easily cut from scrap stock and attached to the solid bearing support of the idler with screws. It is not shown in the details as most users will want to adapt it to their own special needs. Use a stick belt dressing on the driving drum to prevent slipping of the belt on heavy work. An occasional application will be ample.

Sharpening Blades of Disk Harrow with Aid of Holder

Grinding the blades of a disk harrow is speeded up, and the work done with a fair degree of accuracy with this holder, which permits the blade to rotate slowly when held against a grinding wheel. The holder is assembled from two pipe tees and a close

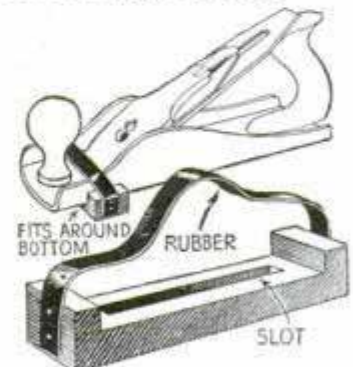
nipple. Both tees are drilled as indicated to take an iron rod, and the lower tee and the nipple are bushed with a brass nipple to serve as a bearing on the rod. The lower end of this is threaded and fastened to a length of flat iron with two nuts. In use, the blade to be sharpened is clamped between the two tees, and the assembly held as indicated to press the blade against the grinder. A thrust washer under the lower tee permits the blade and tee assembly to rotate freely.

—J. Willard Munsil, Centerville, S. D.



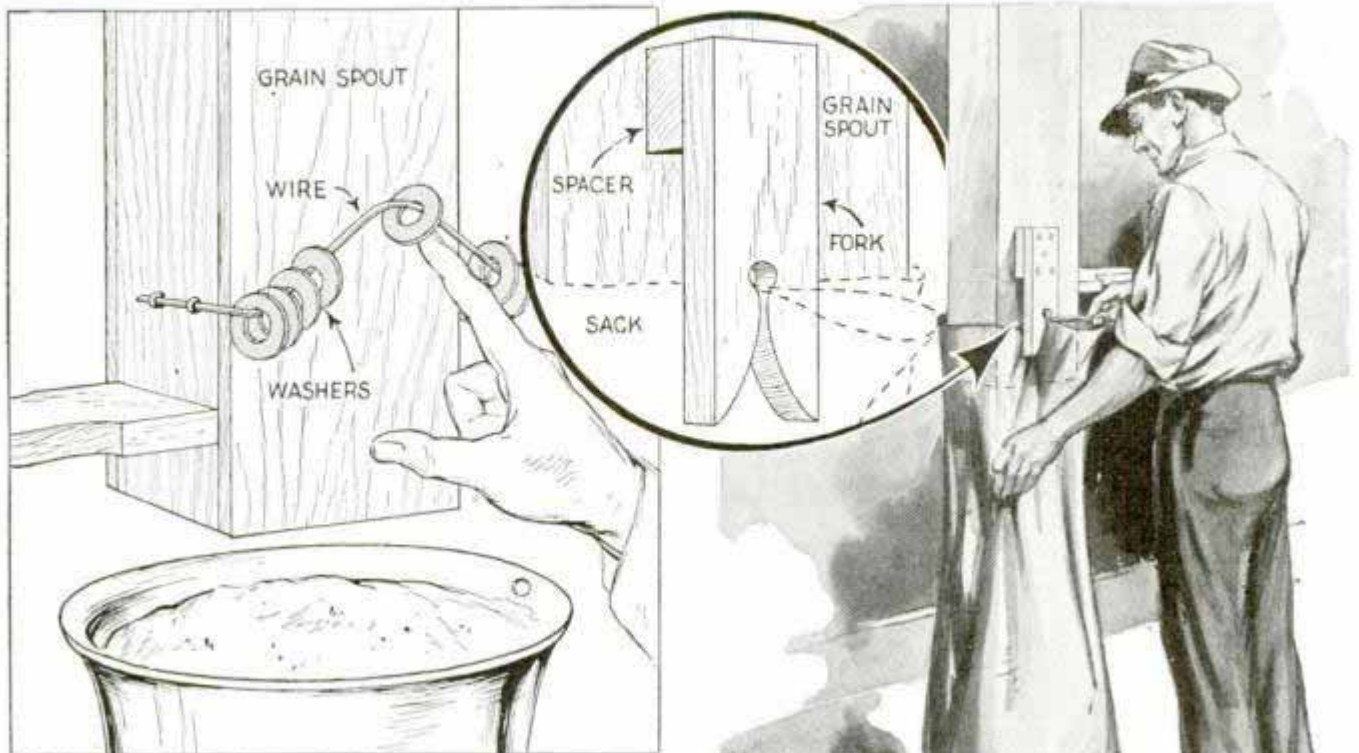
Shield Protects Plane Iron

This shield protects the cutting edge of a plane iron when the tool is stored in the toolbox or set aside temporarily. A strip of inner tube holds shield on the plane.



☛ You can spray-paint wicker furniture with a household fly sprayer, using a mixture of lacquer, 2 parts, and thinner, 1 part.

Sack Holder and Counter on Bin Grain Spout



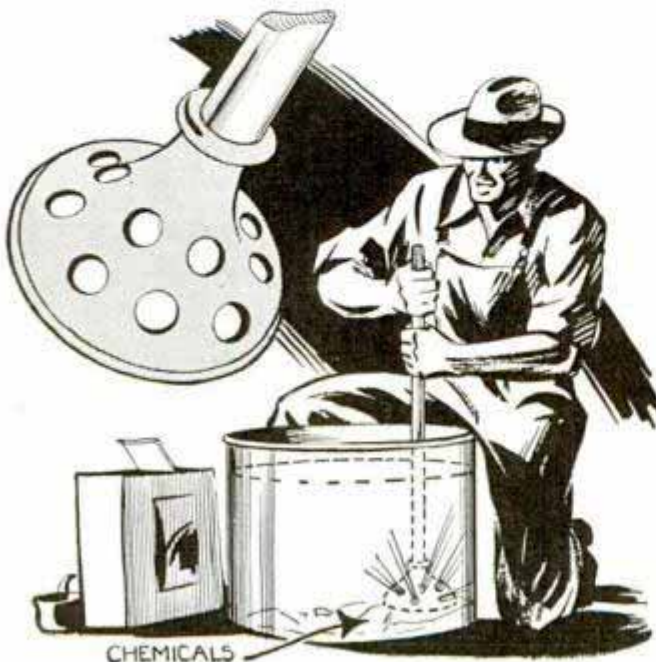
Sacks are held tightly on a bin grain spout for filling, with this fork, which has no hooks to tear the cloth. It is sawed from a piece of wood, and is nailed to the spout with a spacer block between them. In use, the sack is drawn around the spout and pulled up through the fork as indicated. To count sacks or measures, one

farmer uses washers strung on a bent wire attached conveniently to the spout. By sliding a washer along the wire each time a sack is filled, the total can be determined.

Tree-Spraying Solutions Mixed with Plumbers' Force Cup

For stirring large quantities of water to dissolve chemicals in making spray solu-

tions, one orchardist recommends a plumber's force cup. Holes are cut in it so that a short motion of the handle will pump the chemicals and water in and out of the cup. The largest cup obtainable should be used.



Mitten Hung on Potato Barrel to Keep Hands Clean

In order to avoid soiling one's hands when putting up orders of potatoes in a grocery store, one grocer hung a large mitten on the side of each barrel. It took only a moment for a clerk to slip the mitten on his hand before starting to fill the orders.



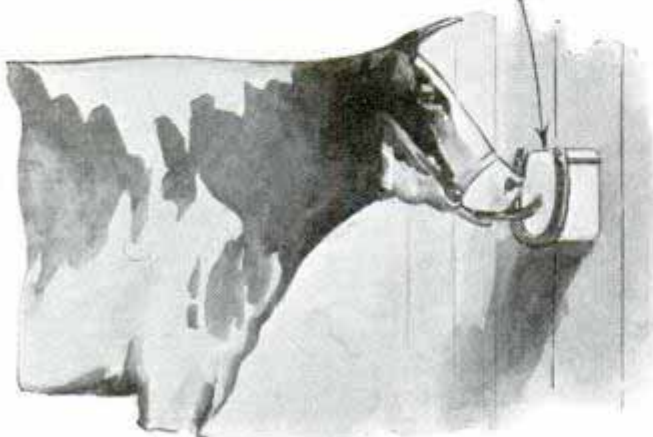
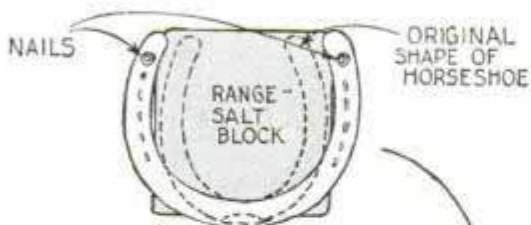
'Well' Holds Thumbtacks Handy in Drawing Board



Bore a hole through your drawing board near the upper right-hand corner, tack a piece of inner tube over the underside and you have a handy container for thumbtacks. Pressing on the underside of the rubber will raise the tacks so they can be picked up easily.

Horseshoe Supports Range Salt Off the Ground

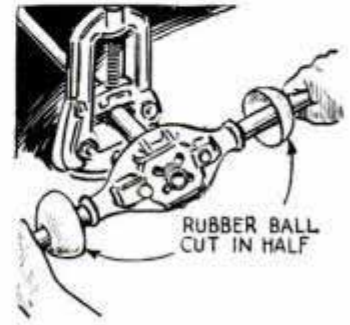
Large horseshoes provide good supports for keeping blocks of range salt off the ground where live stock can reach it easily. Drill the toes and heels of the shoes for long bolts and fasten them to posts or



sides of a building, spacing the shoes from the post or building far enough to take the salt blocks. These can be broken in half if desired. The shoes also provide good individual salt holders in the stalls of cattle and horses.—Jack La Londe, Portland, Ore.

Oil Guards Keep Die Handles Dry While Threading Pipe

Instead of letting oil run down the die-stock handles when threading pipe, slip one half of a hollow rubber ball over each one as indicated. If a piece of waste is packed in each half of the ball, it will absorb the oil and can be discarded when the job is finished.



—Chester Jasin, Chicago.

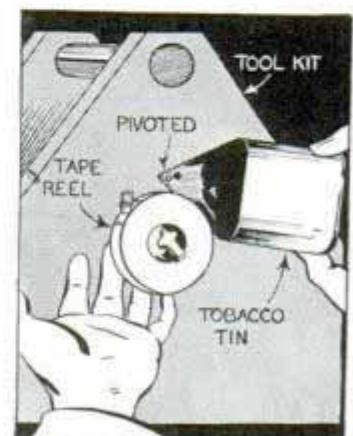
Wooden Block Improves Card File



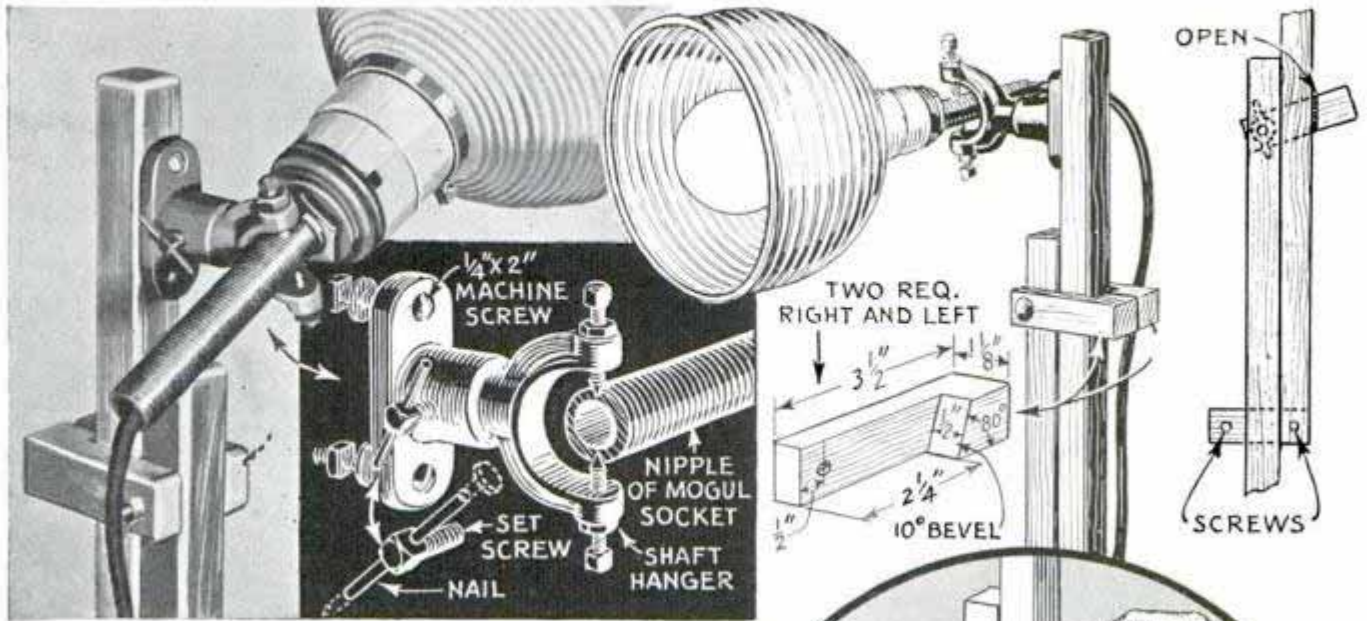
When cards in small file boxes have a tendency to extend over the front and interfere with closing of the cover, a small wedge-shaped block slipped into the box at the front end will correct this trouble. The block should be of a size to fit inside the box, and may be finished to match it.

Pivoted Receptacle on Toolbox Holds Tape Measure

Cut to the shape shown and pivoted to the end of a toolbox, a tobacco can provides a good holder for a carpenter's tape measure. Tipping the can upward, as illustrated, rolls the measure into the hand.



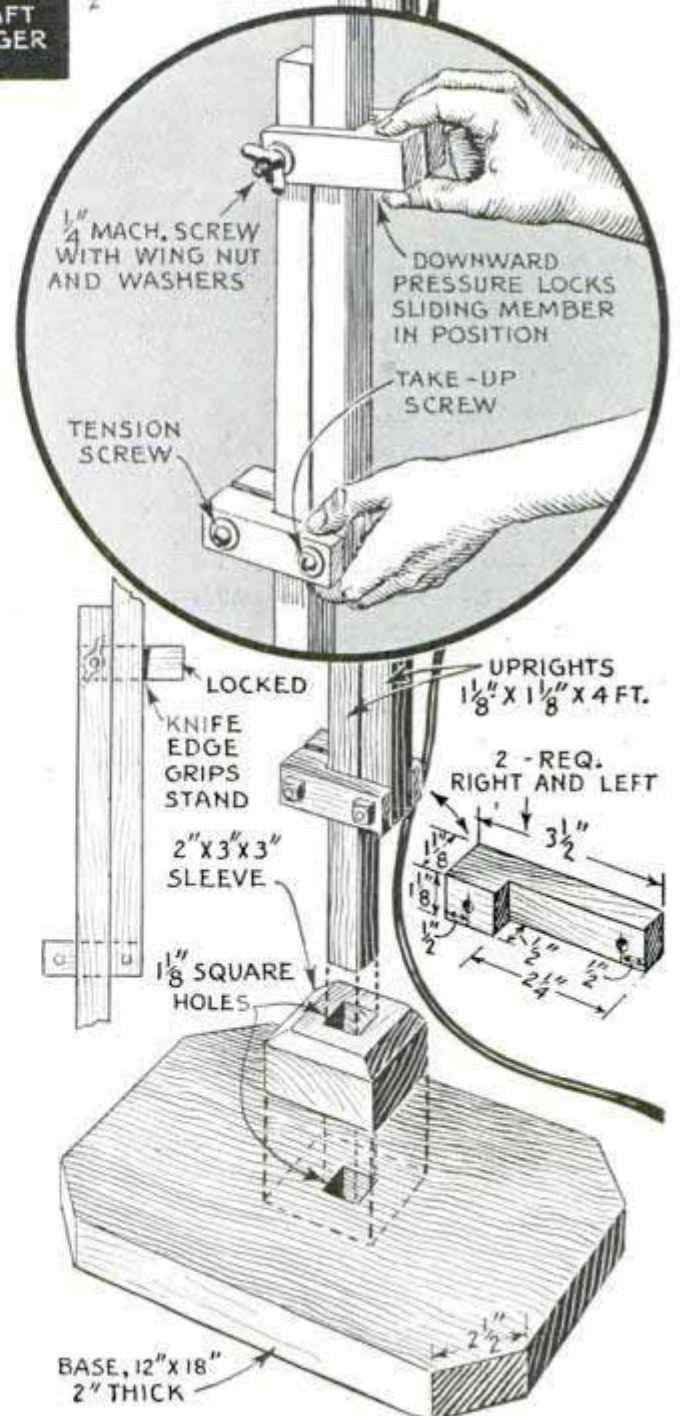
Floor-Type Shop Light Adjusts Three Ways



Adjustable to a height of 7½ ft., this inexpensive shop light has a pivoted lamp that can be set to direct a strong beam in any direction. The standard is made entirely of wood and consists of a base and two vertical members, one of which slides up or down against the other. These are held together by two locking pieces assembled as indicated. After adjusting the light, downward pressure of the hands on the locks sets the adjustment. The lamp assembly consists of a mogul socket, reflector and a 300 or 500-watt bulb. A bracket to hold this assembly is made from a shaft hanger. The bearing of the hanger is removed and the mogul-socket nipple is gripped between the trunnion screws. These permit lateral adjustment of the lamp, and a set screw tapped into the hanger socket and fitted with a nail through the head for a handle takes care of the vertical adjustment. Use hardwood for the base to provide weight, or recess it to take a piece of lead, if the lamp is used where it is likely to be knocked over.

Rubber Grip on End Wrenches

To assure a safe and comfortable grip on a small double-end wrench and thus protect the palm of the hand against bruises, it is a good idea to use a rubber bicycle or motorcycle handlebar grip. Except on very large wrenches, the grip can be pushed over the ends easily, and changed back and forth as required.



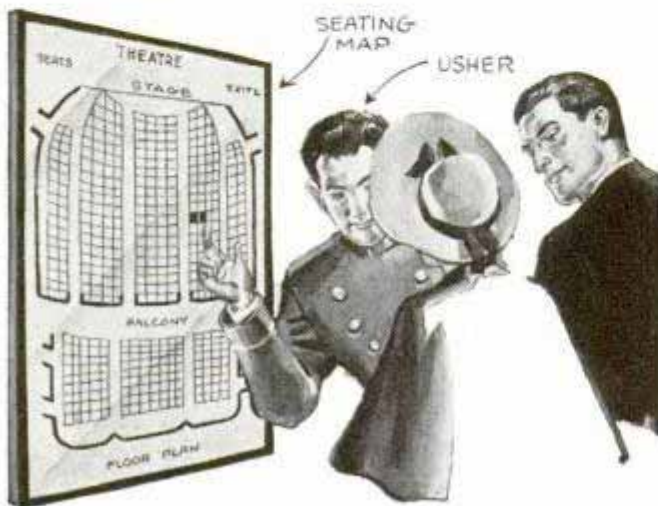
Height Gauges on Store Awning Attract Window Shoppers



One owner of a men's furnishing store increased his business by suspending height gauges from the awning in front of his store and marking the height of each manikin in the show window. This enabled window shoppers to get a better idea of how a suit would appear on them by checking their height on the gauges and picking out a manikin of the same height.

Map of Seating Arrangement Aids Theater Patrons

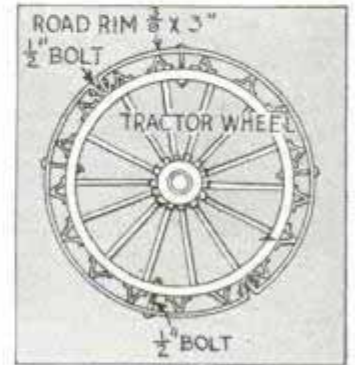
To prevent disturbance caused by patrons walking up and down dark aisles



looking for desirable seats, one theater manager hung a map or plan of the seating arrangement in the lobby. This enabled the ushers to point out the locations of the vacant seats so that the patrons could walk directly to those selected.

Road Rims Shield Tractor Lugs to Travel on Pavement

Tractor owners who have occasion to travel short distances on surfaced roads will find these rims suitable as shields over the wheel lugs. The rims are thin steel bands, which fit over the lugs where they are held in place by four or five carriage bolts.



Drawer Pulls Form Pockets for Pins and Paper Clips

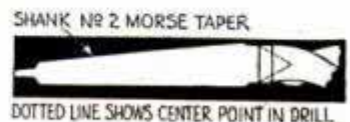


Inverted and screwed to the inside surface of a desk-drawer front, metal drawer pulls provide hidden receptacles for pins and paper clips. Located in this position, the desk accessories are always out of

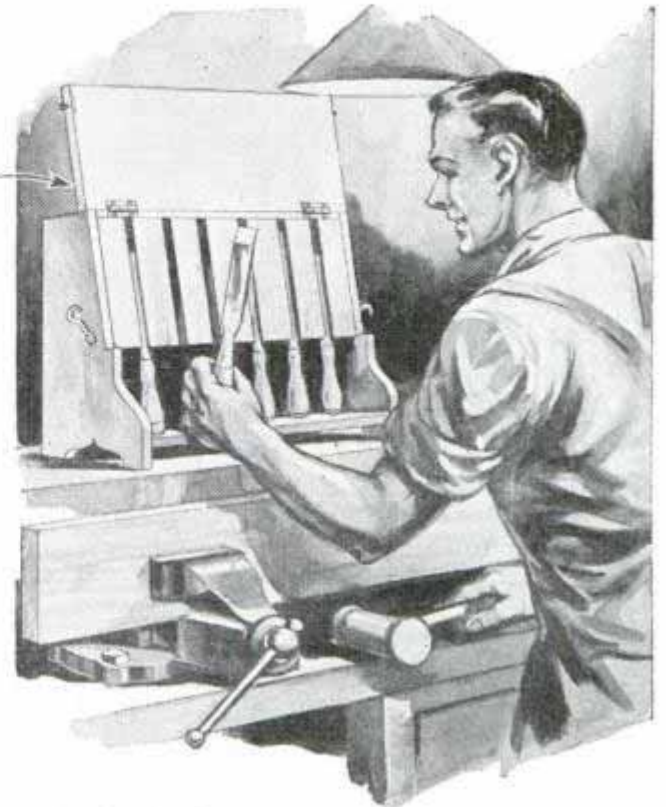
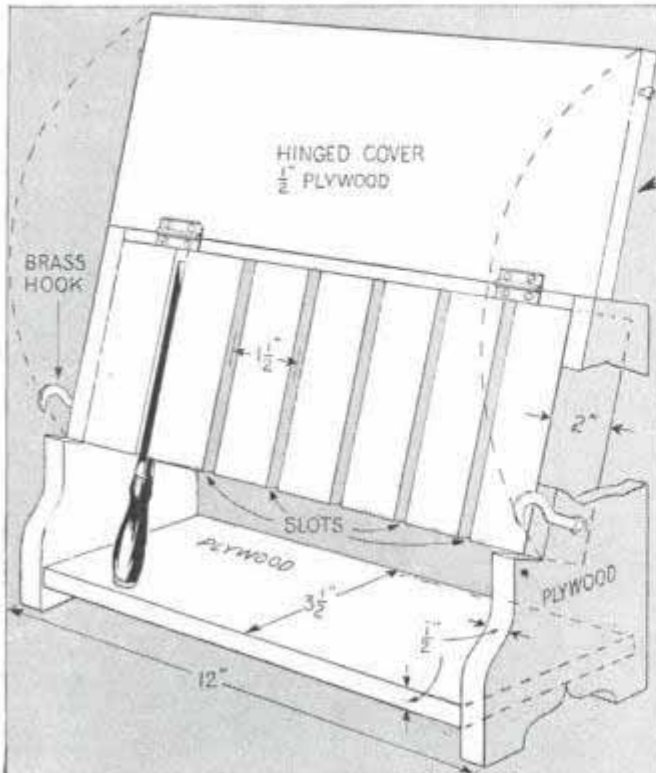
sight, yet are easily reached any time they are needed.—Morris Katz, Aurora, Ill.

Lathe Fittings from Drill Shanks

Discarded taper-shank drills can be made into good metal and wood lathe centers, as well as arbors, drill pads and crotch centers. The drills are made of high-speed steel and can be annealed and machined for headstock use. For tailstock use, the body can be annealed, machined, hardened and ground.—Harry Nosala, Chicago.



Chisels Missing in Rack Noticed at a Glance



Accommodating a set of six or eight chisels, this rack will not only protect and keep them in neat order, but it will enable you to see at a glance if any are missing. The chisels rest edgewise in narrow slots cut in a 2-in. pine block, the length, width and depth of each slot being cut to suit the

individual chisels. The base and sides of the rack are cut from $\frac{1}{2}$ -in. stock, and two flat brass hooks keep the hinged cover closed. If desired, the rack can be screwed solidly to a shelf near the workbench and fitted with a small padlock.

—Wayne C. Leckey, Aurora, Ill.

Steak Thickness Guides on Store Counter Aid Shoppers

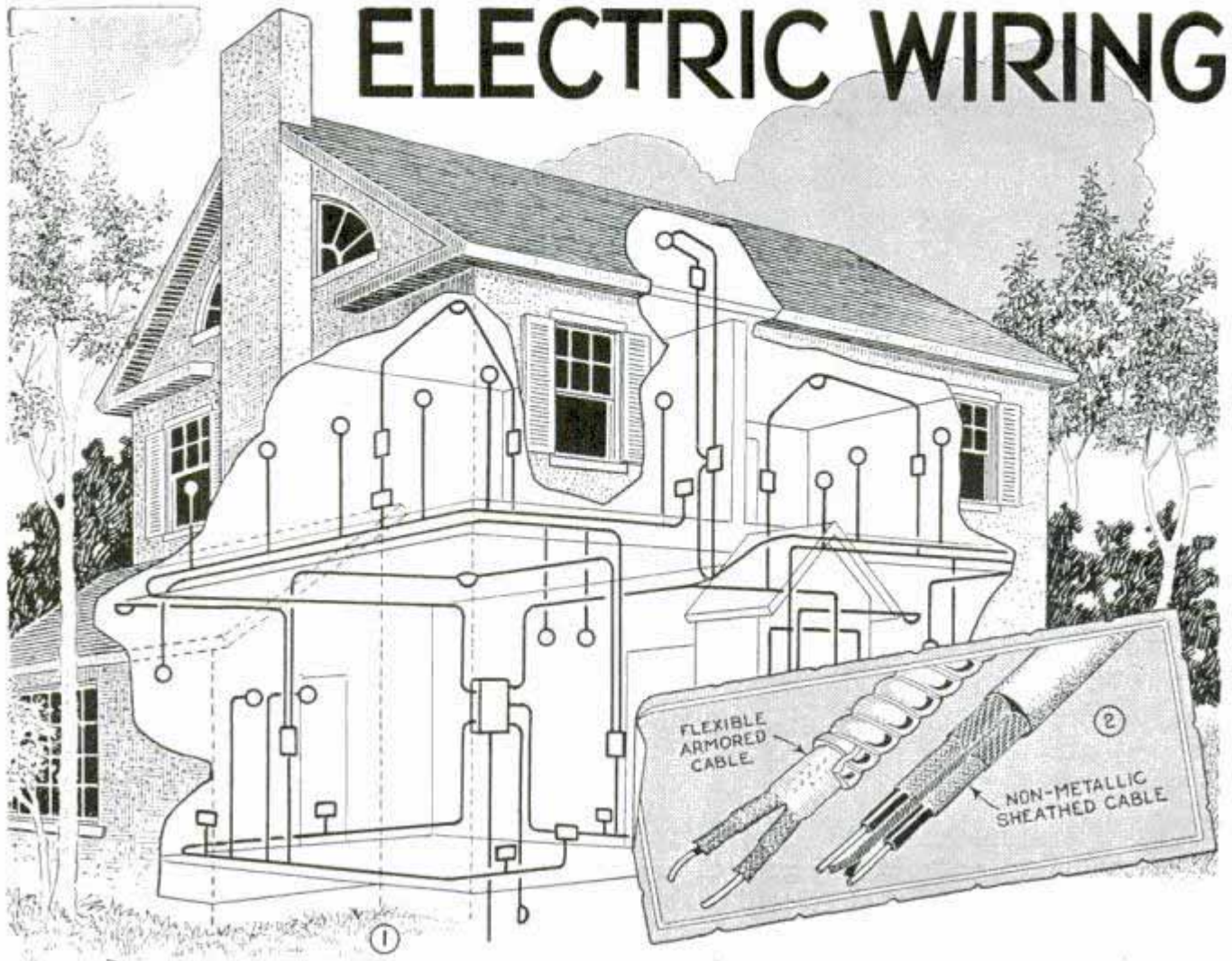
Finding that many of his customers had difficulty in indicating the thickness of meat cuts they desired, one butcher cut strips of red paper in various widths and cemented them on the front of the showcase. The strips were numbered so that the customer could look at them and call off the number of the strip corresponding to the thickness of the meat cut desired.

Protecting the Face Against Orchard Sprays

When spraying trees with insecticides, it may be desirable to protect the operator's face. This can be done by fastening a piece of clear celluloid to the front edge of the operator's hat, and letting it hang down over the face. When the mask becomes covered with spray it is discarded and replaced with a fresh sheet.



ELECTRIC WIRING



WHEN wiring old houses or adding new convenience outlets in houses already wired, it is first of all a job of careful planning to determine all the requirements including the location of the outlets, materials to use, wire size, load distribution and other factors. Then, it is just as important to do the work correctly in accordance with approved wiring practice to meet electrical and safety requirements.

Materials: For wiring an old house, the most convenient materials to use are armored cable, commonly known as "B-X," and non-metallic sheathed cable, Fig. 2. General installation methods are the same for both. Knob-and-tube and conduit installations are more difficult in finished buildings and will not be considered as they occasion considerable damage to walls and floors. Also, knob-and-tube work is not permitted in many localities.

Code Requirements: The National Electrical Code, published by the National

PART I

Planning the Installation and Arranging for Service Connections

By C. A. CROWLEY

Board of Fire Underwriters, gives minimum requirements for safe electrical installations. All recommendations contained in these articles

are in accord with the national code. However, some localities have additional restrictions and one should find out about these before undertaking a wiring job.

Types of Service: Service supplied by the power company may be alternating or direct current, usually the former at between 110 and 120 volts. Before making any plans, find out what type of service is to be used. In the case of both a.c. and d.c. there are two types of service commonly furnished; two-wire and three-wire. Fig. 3 shows the difference. Most power companies supply three-wire service, except for very small installations. The power company will install lines up to the house. From that point on the service connections (lines to the fuse boxes, including switches, meter, etc.,) are usually installed at the expense of the owner. The power company

in the HOME

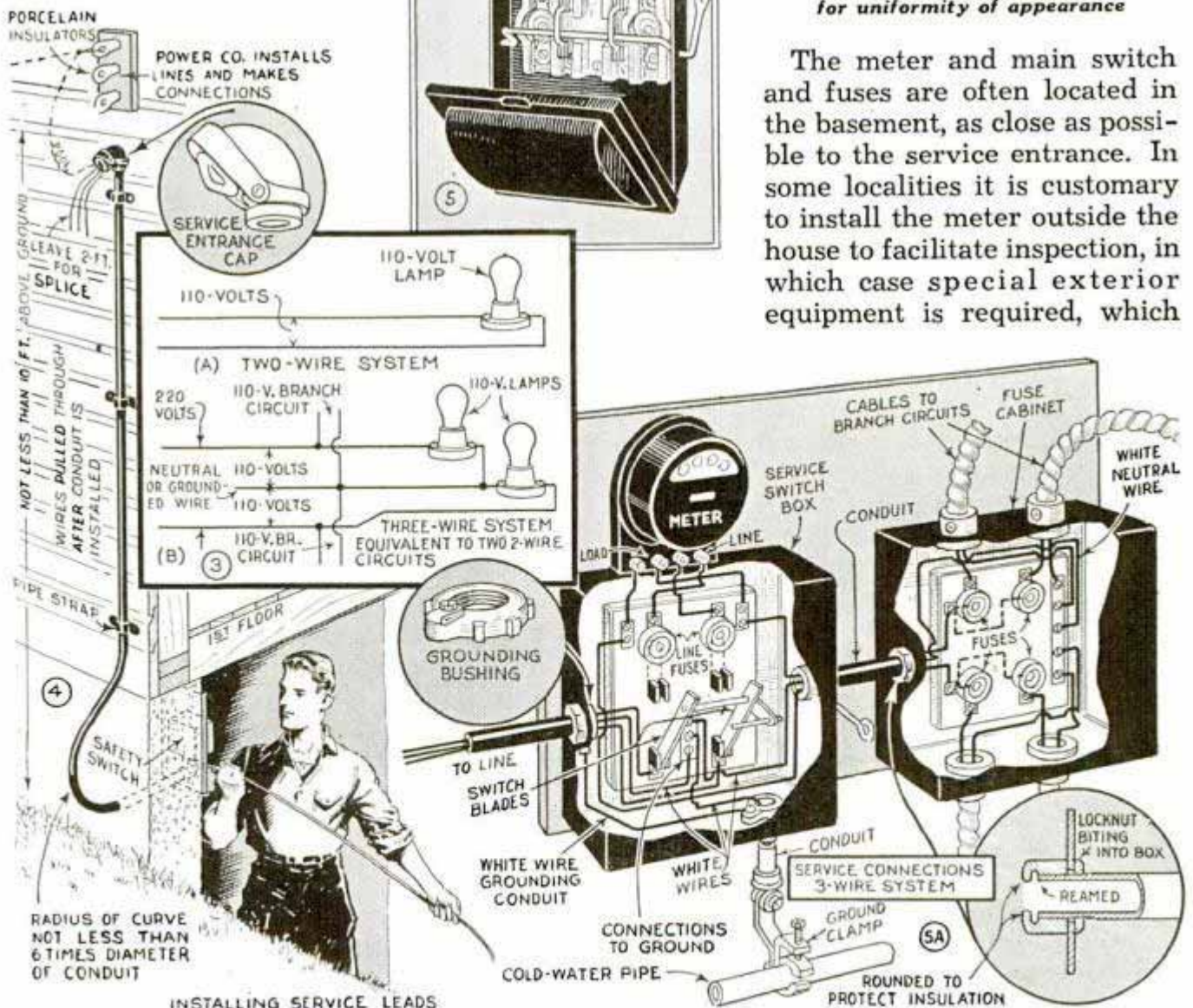
lays down specifications as to type and size of equipment and its location.

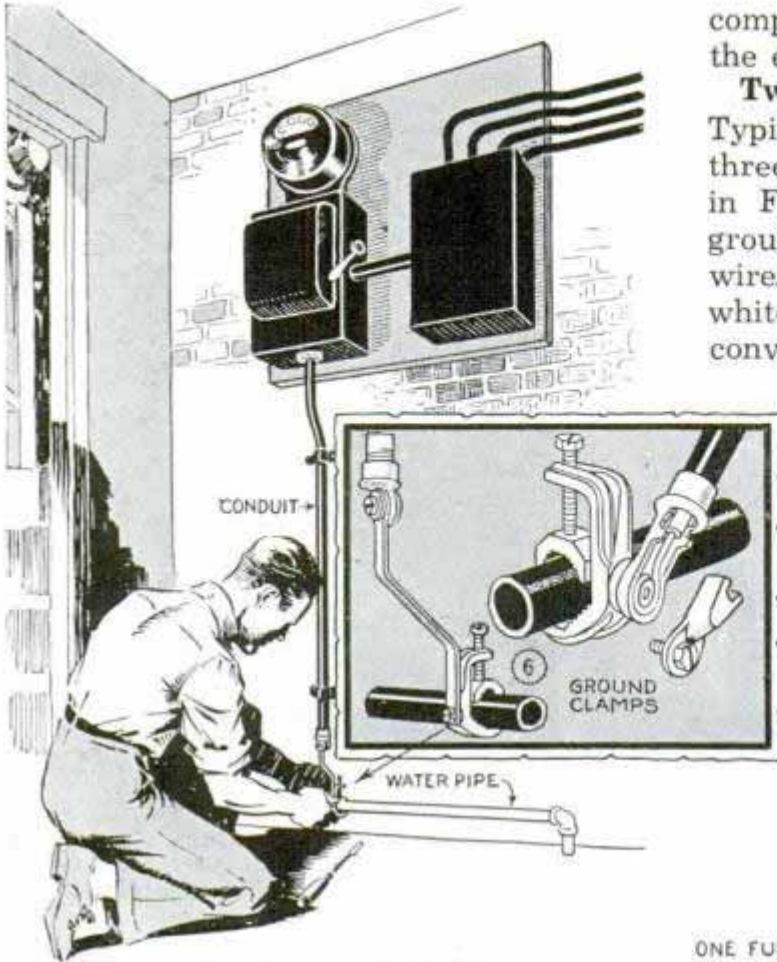
Service Connections: The easiest, and in most cases the required method will be to inclose the wires from the power line inside rigid conduit, which is a special smooth pipe designed for holding electric wires. It is either galvanized or enameled. Ordinary pipe will not do. Conduit of the 1-in. size should be used for three No. 8 wires; $\frac{3}{4}$ -in. conduit will take two No. 8 wires. The conduit is run outside the building, where it is secured with pipe straps. A service cap of the type shown is installed at the top to keep out water. The conduit is bent into a curve of large radius where it enters the building as shown in Fig. 4.



All convenience outlets should be spaced the same distance from the floor for uniformity of appearance

The meter and main switch and fuses are often located in the basement, as close as possible to the service entrance. In some localities it is customary to install the meter outside the house to facilitate inspection, in which case special exterior equipment is required, which





Effective grounding is accomplished by connecting a conduit from the switch box to a cold-water pipe by means of a special clamp

can be determined by consulting with the power company. For a basement installation, a board is nailed to the wall for mounting these units. The end of the conduit is cut off and threaded, leaving about $\frac{3}{8}$ in. to extend inside of the switch box. One of the numerous round depressions called "knockouts" is removed by a sharp blow with a screwdriver or hammer, and the hole is reamed to remove burrs. An approved safety-switch of the general type shown in Fig. 5 must be used. A locknut is put on the end of the conduit, the box is put in place, and a bushing is screwed onto the end of the conduit, as shown in a detail of Fig. 5A. The locknut is then tightened.

The wires are fished through the conduit by passing a light wire through the conduit, attaching the wires to it, and pulling them through. Usually, for average-size homes, the wires for service connections should be No. 8 rubber and cloth covered. One white and one or two black wires should be used. This size wire will carry a maximum load of 30 amperes. For larger loads, larger feeders are required. See Table I. As pointed out above, the power

company will generally specify this part of the equipment.

Two-Wire and Three-Wire Connections: Typical service connections for two and three-wire 110-volt a.c. or d.c. are shown in Figs. 5A and 7. The connections to ground, and the use of white and black wires should be noted in particular. The white wire always should be grounded for convenience in tracing. Grounding of all electric conduits and boxes is a matter of safety as it automatically causes a fuse to blow if a live wire accidentally touches exposed metal parts, thus preventing dangerous shocks and possible fires. For

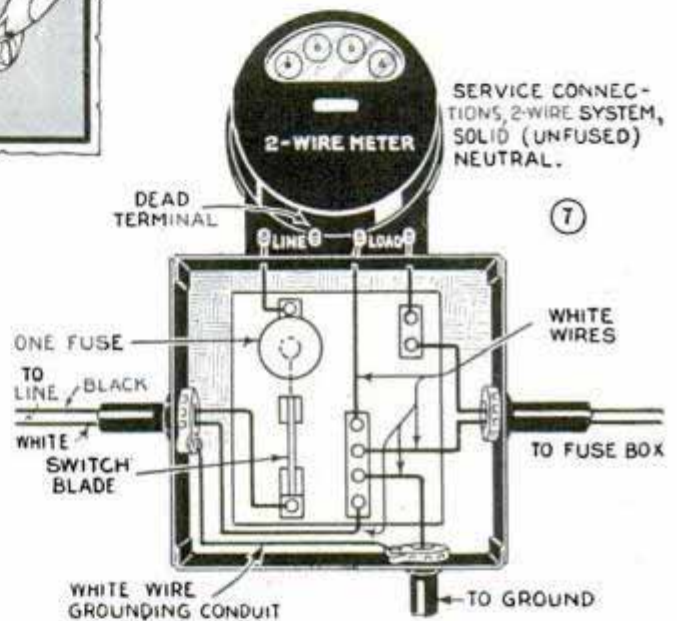


TABLE I—SERVICE CONNECTIONS

Wire Size	Fuse Size Amperes	Max. Load (Watts at 110 v.)	Minimum Conduit Size (in inches)		
			3-wire	2-wire	1-wire*
8	30	3,300 or 3,850	1	$\frac{3}{4}$	$\frac{1}{2}$
6	50	5,500	$1\frac{1}{4}$	1	$\frac{1}{2}$
4	70	7,700	$1\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$

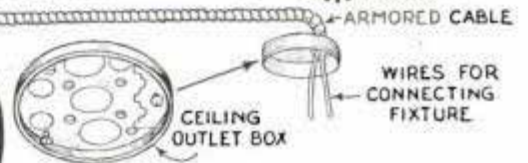
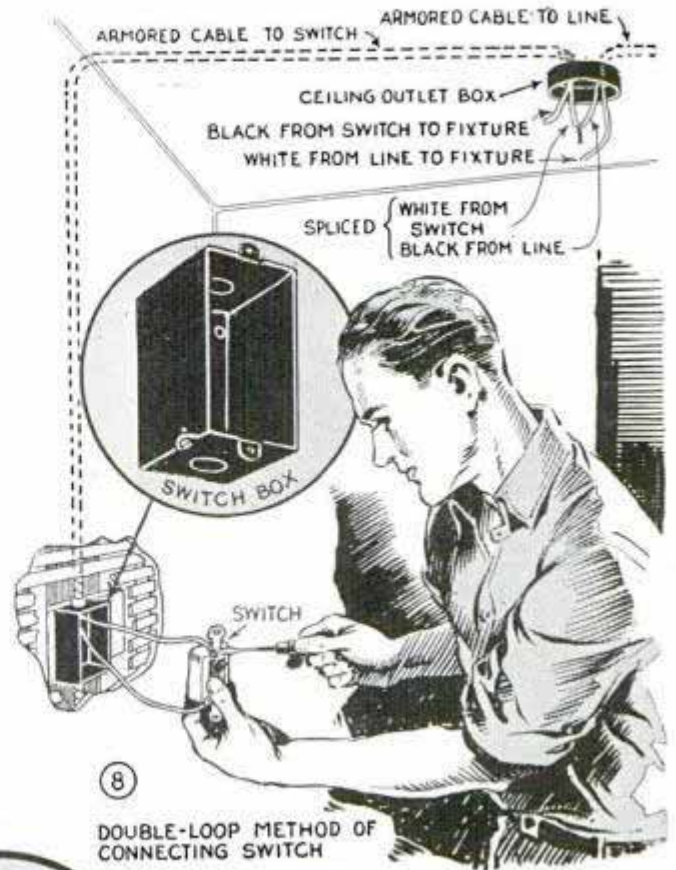
* For grounding wire only, when required

grounding, a conduit is run from the switch box to a water pipe and clamped to the pipe with a ground clamp of the type shown in Fig. 6. A single No. 8 white wire is run inside this pipe and securely fastened to the terminal provided at the pipe. A No. 8 copper wire should be fastened to this conduit and also to the power-line conduit. The grounding bushing shown in a detail of 5A makes this easy. The wire inside the ground conduit is attached to the proper terminal on the switch.

Fuses and Meter Connections: The main-line fuses should be installed in the

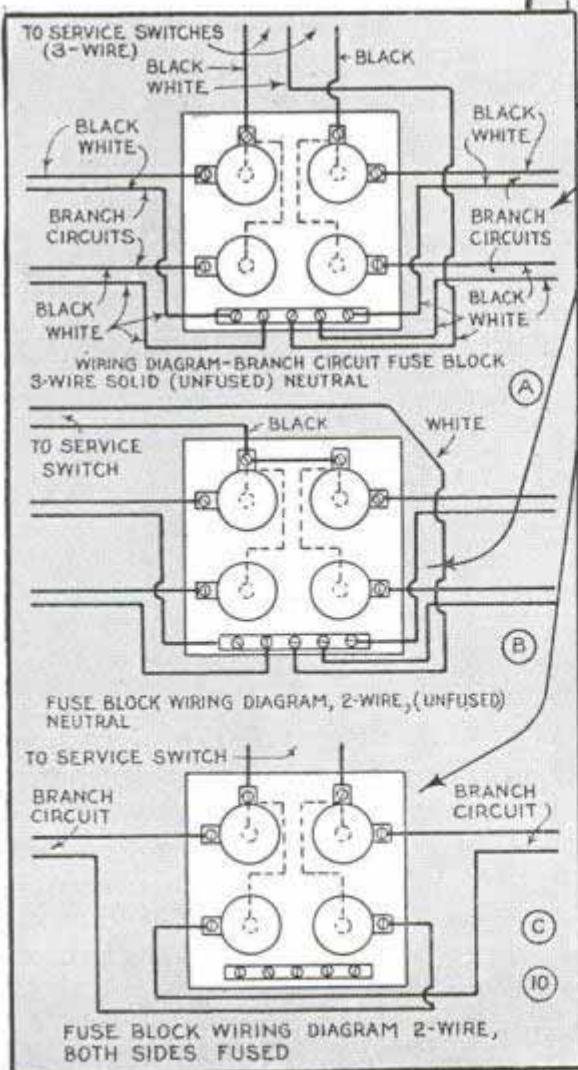
box with the service switch. For most homes 30-amp. fuses are required. The connections to the meter are usually made by the power company. A short length of conduit can be run from the line switch box to the fuse cabinet, and the wires can be pulled through readily. Bushings and locknuts must be used. The fuse box or cabinet contains one fuse for each branch circuit. The neutral or grounded wire is continuous or unfused at all points. However, some localities require fusing the neutral wire also. The "hot" wire (black wires) are fused in all cases as shown. When a fuse blows, the reason should be located and eliminated. A fuse block for a four-branch circuit installation is shown in the circular insert above Fig. 10, while methods of wiring are shown in details A, B and C of Fig. 10. It is wise to get a fuse box larger than needed, to provide for future expansion.

Survey of Needs: Next determine the number and location of electrical outlets. By an outlet is meant any point at which



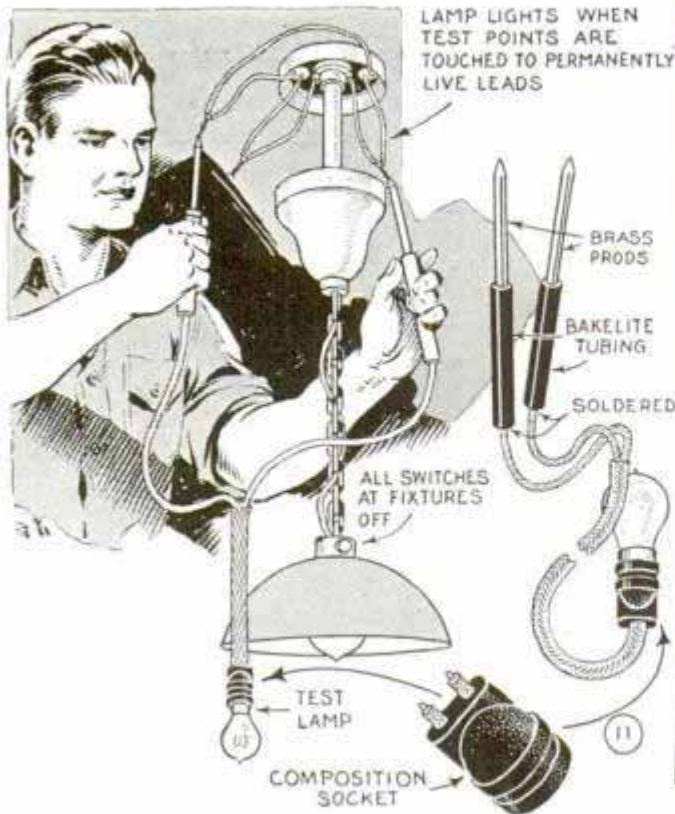
The double-loop and single-loop methods of connecting wall switches to outlets are shown in Figs. 8 and 9

electricity can be drawn from the line. This includes lighting fixtures, heating devices and machines that are permanently attached to the line, and convenience outlets for attaching portable lamps and apparatus. Switches are not counted as outlets. It is best to be rather liberal in planning outlets. There is no reason for omitting lights in any room, even closets. All ceiling lamps should be controlled by wall switches. Lights on stairways should be controlled by switches at top and bottom. Convenience outlets should be spaced about one every 10 ft. of wall space (counting doors and windows), in living rooms, and usually 15 to 20 ft. in bedrooms and dining room. It is best to locate them where particularly needed. Generally they are placed just above the baseboard. At least



SINGLE-LOOP METHOD OF CONNECTING SWITCH

controlled by switches at top and bottom. Convenience outlets should be spaced about one every 10 ft. of wall space (counting doors and windows), in living rooms, and usually 15 to 20 ft. in bedrooms and dining room. It is best to locate them where particularly needed. Generally they are placed just above the baseboard. At least



Locating live wires with test-prod and lamp assembly when adding new outlets to a branch circuit

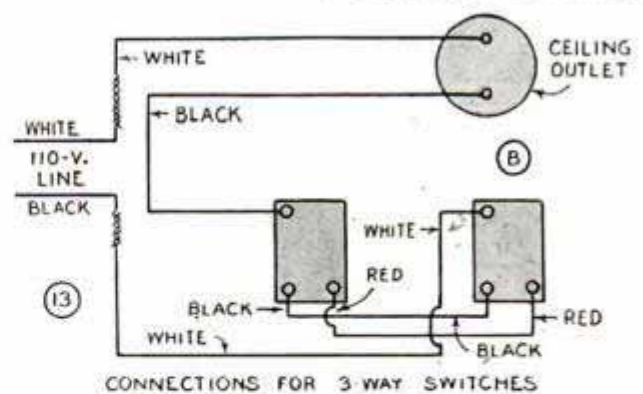
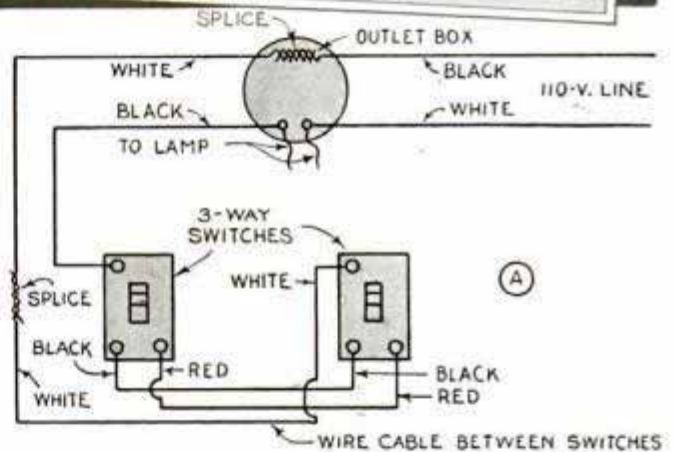
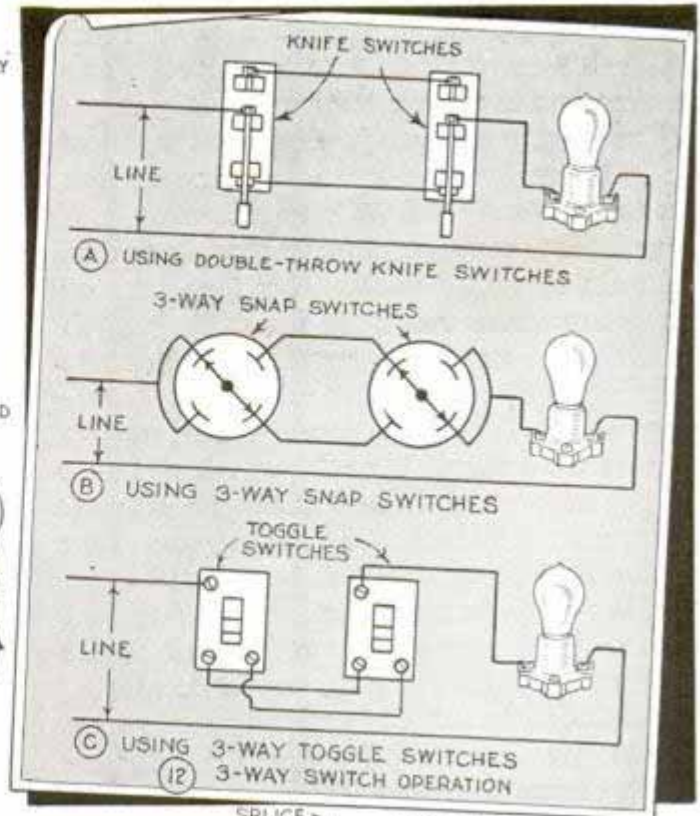
TABLE II—WIRE SIZE FOR BRANCH CIRCUITS

Wire Size	Max. Safe Load (Watts—110 v.)	Use Fuse Size Amps.
14	1,650	15
12	2,200	20
10	2,750	25
8	3,850	35

two outlets should be provided in the kitchen and outlets in the basement should be located to care for washing machine, iron, mangle and workshop.

Branch Circuits: Each branch circuit usually feeds a number of outlets. In most homes all branch circuits are wired with No. 14 wire. The load on each branch circuit is therefore limited by the carrying capacity of this size wire, or to 15 amperes. In planning branch circuits, therefore, it is wise to limit the possible demand to a value below 15 amps. As most electrical appliances are rated according to power consumption in watts, and volts times amperes equal watts, the maximum safe load for No. 14 wires is 110 times 15, or 1,650 watts. Generally circuits are designed for an estimated load of 1,200 watts at most, as required in many cities. Frequently it is also required that no branch circuit include more than twelve outlets.

Generally it has been found that independent circuits should be used for the following devices or groups of devices: Oil



burners; laundry lights and outlet for washing machine or mangle; workshop lights and outlets for power-driven tools; refrigerator; any heating appliance drawing more than 1,000 watts; any apparatus with larger than 1/4-hp. motor. Should any appliance draw more than 1,500 watts, larger wire as specified in Table II will be required for its circuit.

In three-wire systems it is quite impor-

tant that the load be balanced or evenly distributed between the two legs of the circuit. There is a complete 110-volt circuit between each hot wire (black wire) and the grounded wire (white wire) of a three-wire system. The loads on these two legs should be approximately equal.

Connecting Wall Switches: There are two methods of connecting wall switches. In the double-loop method, Fig. 8, the hot and grounded wires are led into the outlet box. A cable is run from the outlet box to the wall switch and is connected as shown. Note particularly the use of the different colors of wire. The hot wire to the outlet box is black as usual. This is connected to the white wire leading to the switch. The black wire from the switch, which is hot when the switch is closed, and the white or grounded wire are then connected to the fixture.

The single loop is an alternative method which can be used where the double loop would be inconvenient. For example, if the lead to a fixture passes right past the site for the switch; or if the lead to a fixture must be brought up from below. Connections are made as shown in Fig. 9. The hot wire is broken before it comes into the outlet box.

Use of Three-Way Switches: Three-way switches are installed to act as illustrated in Fig. 12. They are always used in pairs so that lights may be turned on or off independently at two locations. The color scheme for single and double loop methods of connecting this type of switching circuit is shown in Fig. 13.

Locating Live Leads: When adding new outlets to a branch circuit, it is necessary to locate live wires into which the new lines can be tapped. To accomplish this, first open the switch at the meter, and then open an outlet box that you think will offer the desired leads. The tape is removed and the wires are separated carefully so that there is space of at least an inch between them and no chance of them touching each other. Then the main switch is closed and all other switches turned off. Each pair of wires is now touched with the prods of a test lamp, as in Fig. 11. If the lamp lights, the two wires it is touching are permanently hot and will serve as a starting point for the new connections.

(To be continued)

Platform Distributes Weight When Digging Postholes

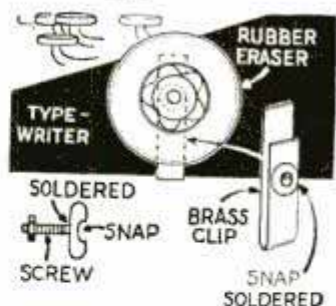


Finding that his weight increased the tendency of sandy ground to cave in when digging postholes, a workman made a circular wood platform to stand on. This distributed his weight over a large area near the hole. An opening in the center of the platform permitted using the post auger.

—Opie Read, Jr., Chicago.

Eraser Snaps on Typewriter

Your typewriter eraser always will be at hand if it is attached to the machine with a large size snap fastener. One part of the fastener is soldered to the

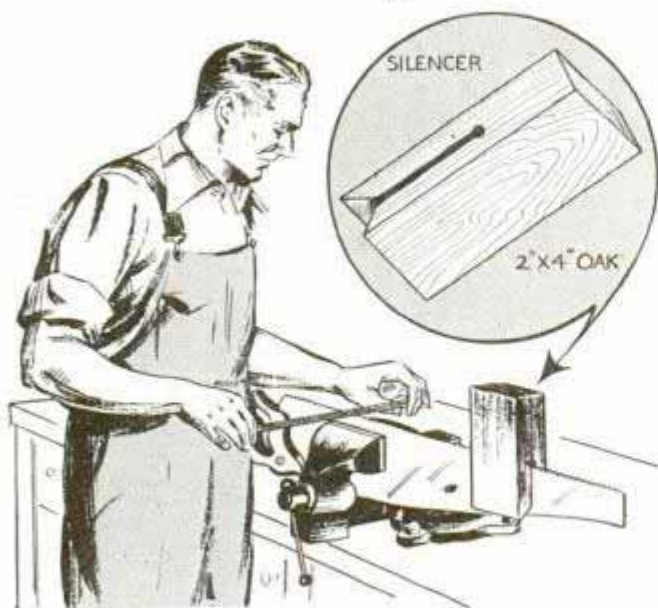


head of a screw, which fits a hole drilled in the typewriter frame. Or, if you do not want to drill in the frame, just solder one part of the fastener to a spring-brass clip, which can be slipped over some part of the machine. The other part of the fastener is similarly soldered to a screw, which is slipped through the hole in the eraser.

—Herman R. Wallin, New York, N. Y.

☞ If you form a deep depression in the center of your compost pile to catch and hold rain and snow, decomposition will be much more rapid.

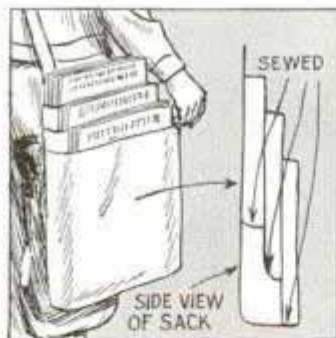
Wood Silencer Stops Screeches When Filing Saw



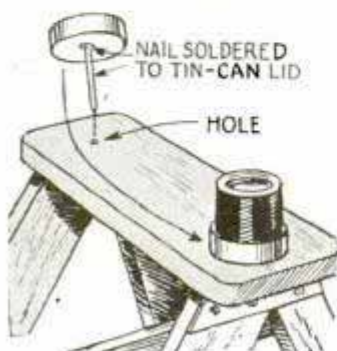
When filing saws, slip a giant "clothespin" of hardwood over the blade. This will dampen the vibration sufficiently to lower the pitch of filing to a point where it no longer irritates.

Newsboy's 'Stepped' Carrying Bag Displays Different Magazines

One newsboy who sold two or three different magazines divided his carrying bag into compartments with cloth partitions and stepped the bottoms of the compartments as indicated. This brought the titles of all the magazines into view.



Removable Holders on Stepladder for Small Paint Cans



Sign writers who work from a stepladder need have no fear of small paint cans being accidentally knocked off the top if a few shallow can lids are carried in the

work kit. A nail is soldered to each can cover to fit a hole drilled in the ladder top. Small paint cans will even rest securely in these holders when the ladder is moved.

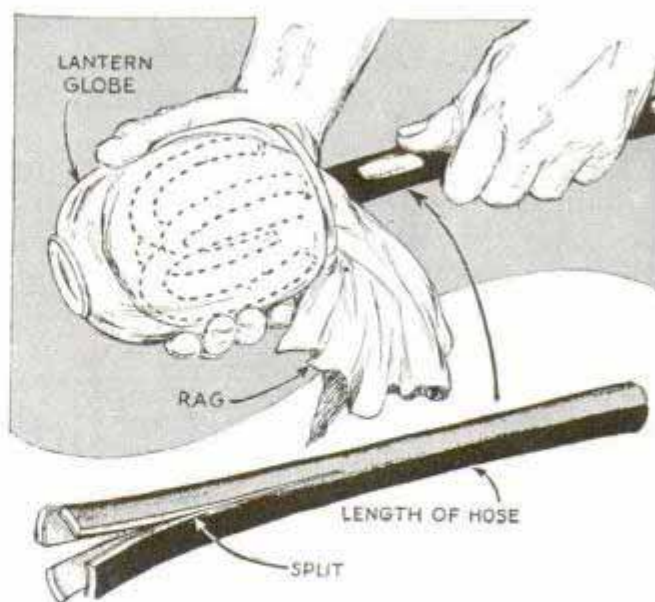
Clothespin Clip on Market Basket Holds Delivery Slip

To avoid possible error or delay in delivering groceries, by having the patron's order slip lost or removed from the basket, a grocer fastened a spring-type clothespin to the handle of each delivery basket with screws. After filling an order, the delivery slip was clamped in the clothespin.



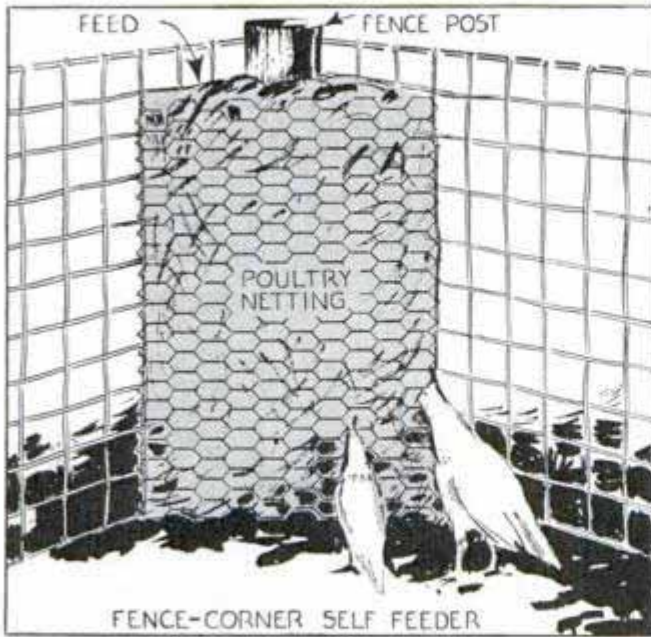
Lantern Globes Cleaned Easily with Rubber Hose

Having a number of signal lantern globes to clean each day, one workman simplified the job by using a length of rubber hose to work the cleaning cloth around inside of them. The hose is split back from one end



to provide four sections, which are doubled back as the cloth is pushed inside of the globe. These sections expand to press the cloth against the inside surface of the glass as the hose is turned.

Poultry Feeder and Waterer in Fence Corner



One poultryman saved space and made it easy to get at his chicken feeder and watering pan by mounting them in a fence corner. The watering pan was supported 4 or 5 in. above the ground on wood slats pushed through the fence as indicated, and wired or stapled in place. An inexpensive self-feeder for grass, chopped alfalfa, etc.,



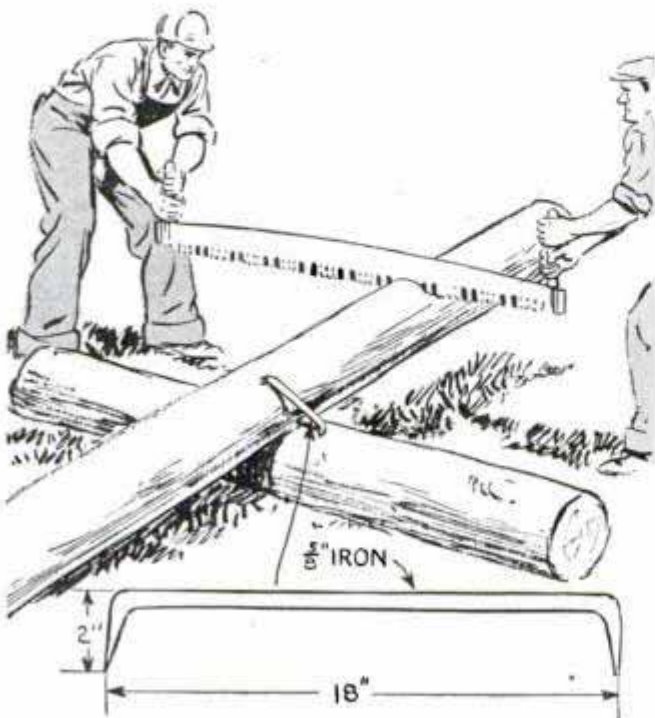
was assembled by stretching a short piece of poultry netting across another corner of the fence. The green stuff is packed inside the three-cornered compartment. Both the feeder and watering pan can be filled without entering the poultry yard.

Log Is Anchored by "Staple" While Using a Crosscut Saw

Bent from an iron rod and pointed at the ends, this bracket takes the place of the usual ax or iron wedge to keep a log from rolling when supported on another log or

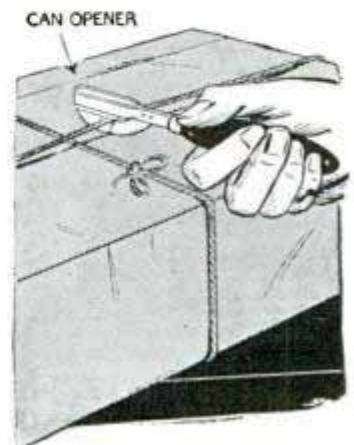
stump while using a crosscut saw. The bracket will not loosen easily, can be used on almost any size of log, and is sunk quickly into place with an ax or sledge. A slight pry with a strong stick will remove the bracket.

—C. W. Small, Meredith, N. H.



Can Opener Used as a Cutter for Package Room

Packages may be opened quickly with a can opener, which has been sharpened till it cuts string with slight pressure. It also remains in the department longer because the temptation to remove it is not so great as with a knife.



Stock-Tank Supply Pipe Attached Easily with Seat Spring

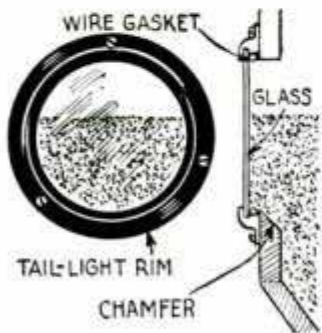


Instead of stooping to lay the end of his tank supply pipe on the well platform when it was removed from the pump, a farmer fastened it to a wagon-seat spring, which was bolted to a wood block. When he wanted to remove the pipe from the pump, he just pushed it down and to one side, reversing the operation to attach it when filling the tank.

—F. A. Tallen, Harrowsmith, Ont., Can.

Contents Gauge or Peek Hole for Boxes and Bins

When a gauge or peek hole is desired near the bottom of a large box or bin to determine when the contents are almost gone, it can be made easily from an old auto tail-light lens rim. A clear-glass disk is substituted for the old lens and the rim is screwed over an opening

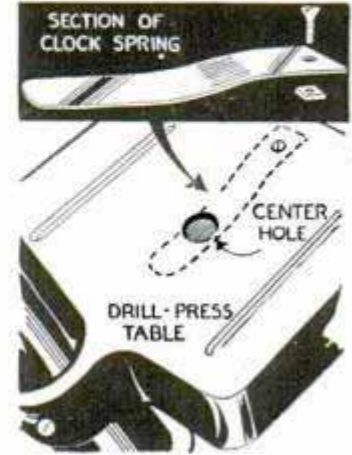


cut in the bin. A piece of insulated wire serves nicely as a gasket between the glass and bin. If the sides of the box or bin are

thick, the inside edges of the opening can be beveled to prevent the contents from lodging in the opening.

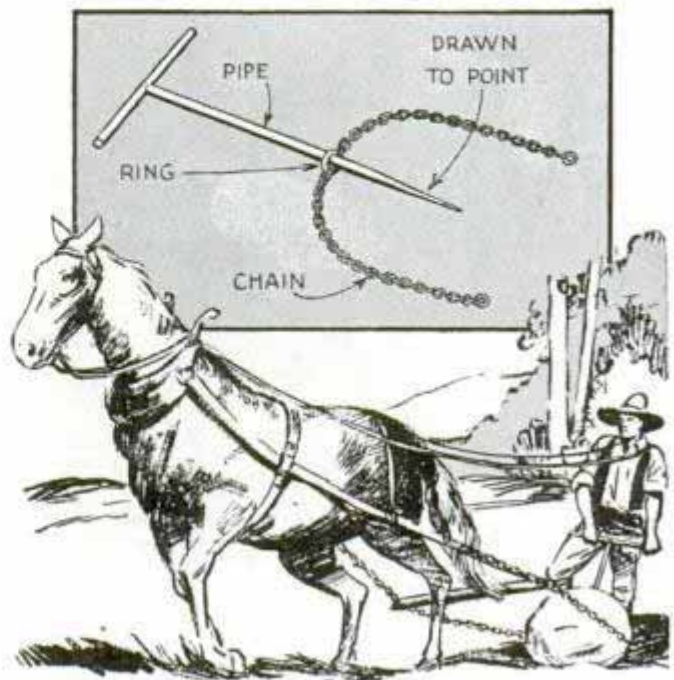
Spring under Drill-Press Table to Avoid Dropping Drills

Accidental dropping of drills through the center hole of a drill-press table when released from the chuck, can be avoided by attaching a length of clock spring under the table to cover the hole. The spring does not interfere with the regular use of the hole as it will flex under pressure of a drill.

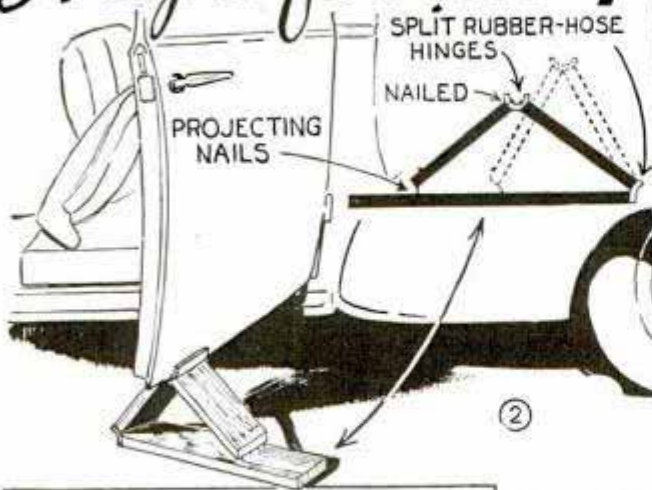


'Harness' to Remove Buried Rocks with a Horse

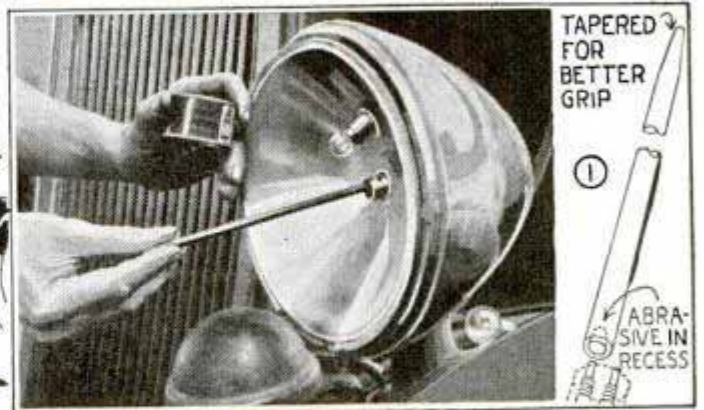
This harness and a horse to remove partly buried rocks when clearing a field, will save labor. The harness consists of a T-shaped assembly of pipe pointed at one end, and a length of heavy chain with a large ring welded in the center. To move a rock, put the harness around it, insert the point of the bar through the ring into the ground at an angle next to the rock, and the horse will move it.



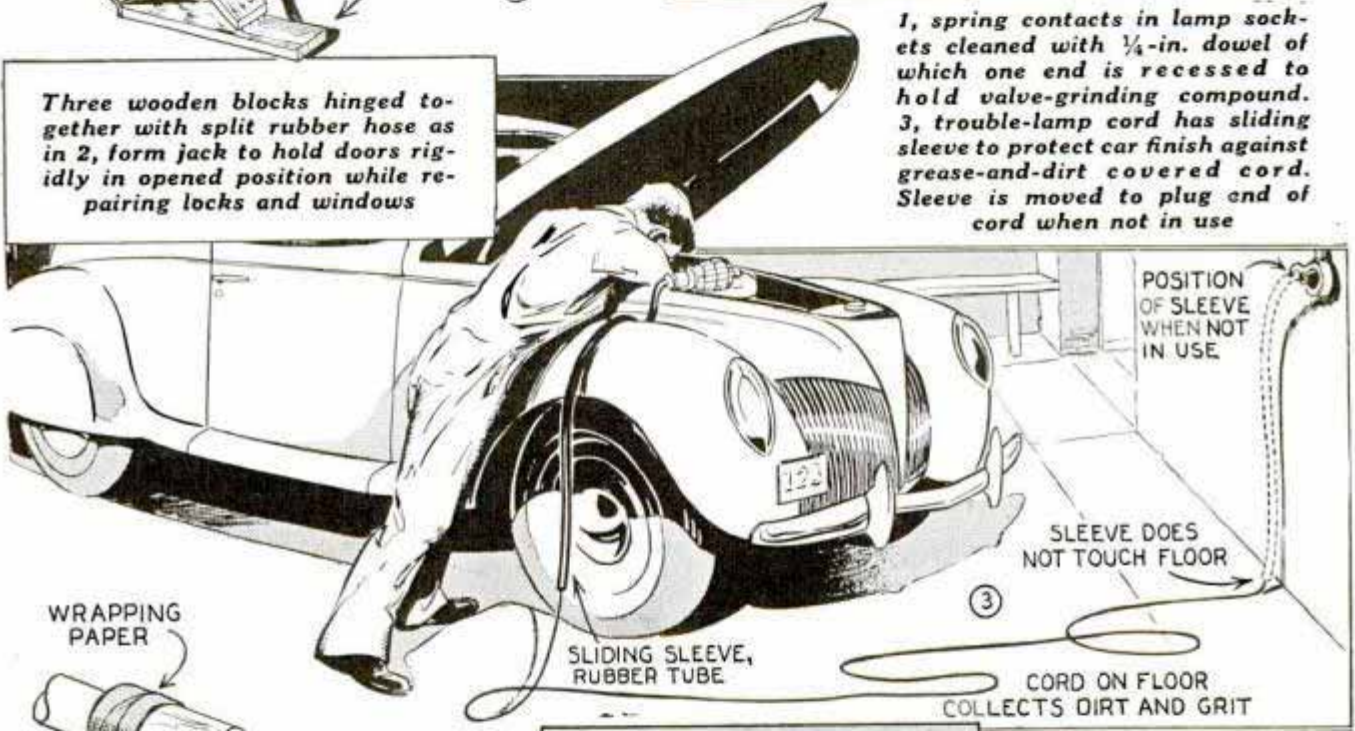
Helps for the AUTO MECHANIC



Three wooden blocks hinged together with split rubber hose as in 2, form jack to hold doors rigidly in opened position while repairing locks and windows



1, spring contacts in lamp sockets cleaned with $\frac{1}{4}$ -in. dowel of which one end is recessed to hold valve-grinding compound. 3, trouble-lamp cord has sliding sleeve to protect car finish against grease-and-dirt covered cord. Sleeve is moved to plug end of cord when not in use

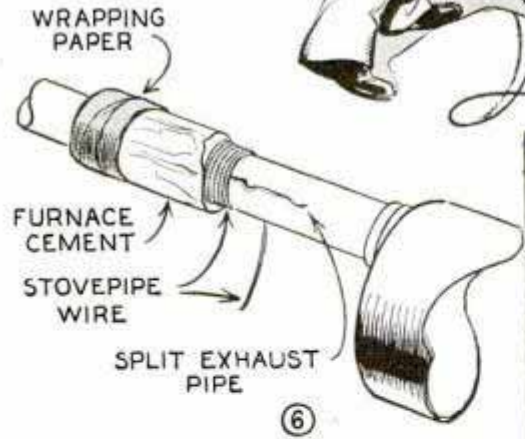


POSITION OF SLEEVE WHEN NOT IN USE

SLEEVE DOES NOT TOUCH FLOOR

CORD ON FLOOR COLLECTS DIRT AND GRIT

SLIDING SLEEVE, RUBBER TUBE



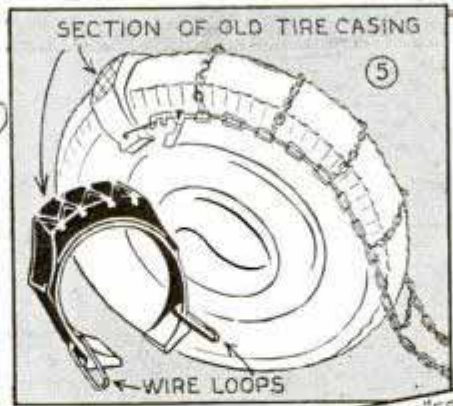
WRAPPING PAPER

FURNACE CEMENT

STOVEPIPE WIRE

SPLIT EXHAUST PIPE

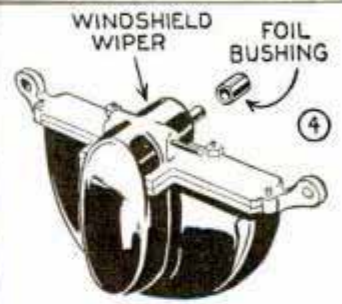
6



SECTION OF OLD TIRE CASING

5

WIRE LOOPS

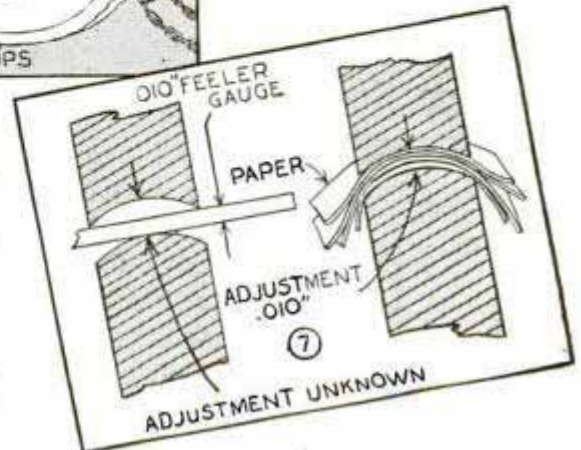


WINDSHIELD WIPER

FOIL BUSHING

4

Air leakage around the bearing of a worn shaft on a vacuum windshield wiper can be stopped often by inserting a bushing formed from tinfoil as in 4. A section of old tire provides a handy clamp for the end of a skid chain when "rolling" it on the wheel as in 5. You can repair a cracked exhaust pipe by wrapping it tightly with stovepipe wire and covering with furnace cement as in 6. A paper wrapping holds the cement until it sets, after which the paper is removed. Tappets cupped by wear can be spaced with strips of paper having a combined thickness equal to the desired clearance. When a feeler gauge is used, it bridges the cupped end as in 7 and gives inaccurate spacing



.010" FEELER GAUGE

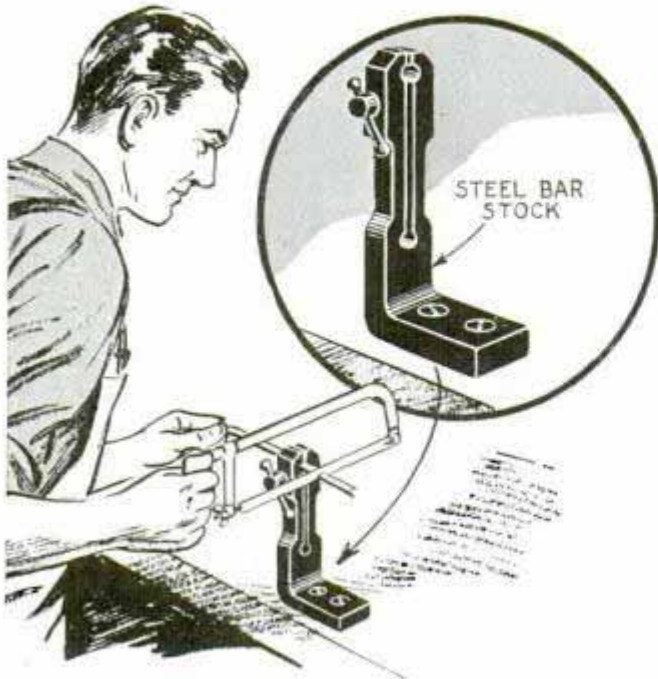
PAPER

ADJUSTMENT .010"

7

ADJUSTMENT UNKNOWN

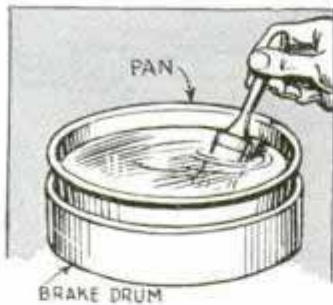
Small Vise Grips Copper Tubing without Crushing It



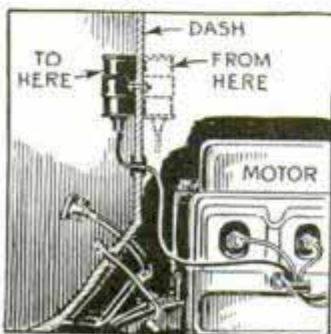
Mechanics who work with copper tubing will find this simple vise just the thing for holding it. Pressure is applied uniformly around the tubing so that there is practically no danger of crushing it if reasonable care is exercised.

Gasoline Wash Pan Set in Drum Prevents Tipping

When a pan of gasoline is kept on a workbench for cleaning small parts, the risk of tipping it over accidentally is minimized if it is set in an old brake drum. The pan should be of a size to fit into the latter without too much clearance at the sides.



Hot Ignition Coil Affects Motor



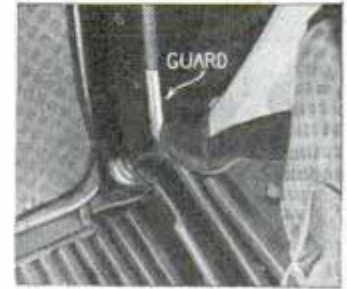
A motorist whose motor missed after it heated up found that the trouble was caused by the coil, which failed to work efficiently when it was

warmed by heat from the motor. To correct the trouble, he removed the coil from under the hood and placed it inside the dash, drilling a hole through the latter and insulating it with a fiber tube to take the wires from the coil to the motor.

—John Wiesemann, Delair, N. J.

Beading Around Door Shielded with Aluminum Sleeve

Scuffing of the cloth beading around the door in getting in or out of your car, is avoided by fitting an aluminum guard over the beading. The



guard is fastened under the nails or screws that hold the beading in place.

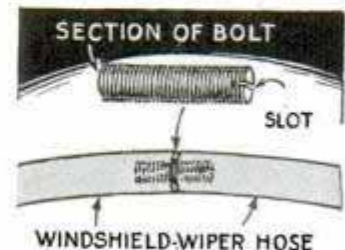
—Burl Knutson, Bismarck, N. D.

Inefficient Starter Operation Caused by Bad Grounding

On some cars that have rubber engine mountings, a flexible copper strap is used to ground the motor to the frame. Wearing or breaking of this strap by vibration often results in inefficient starter operation, the latter being barely able to turn over the motor with a well-charged battery. Such trouble can be overcome by grounding the starter housing to the car frame with a piece of battery cable long enough to allow the car motor to vibrate freely.

Installing New Vacuum Hose on Windshield Wiper

If you have to install a new hose on a windshield wiper, fasten it to the end of the old one and it will be pulled into place as the old hose is pulled out. A good connector is made by cutting the head off a stove bolt, which should be larger than the inside diameter of the hose. Slot the end of the bolt and drive it halfway into the end of the new

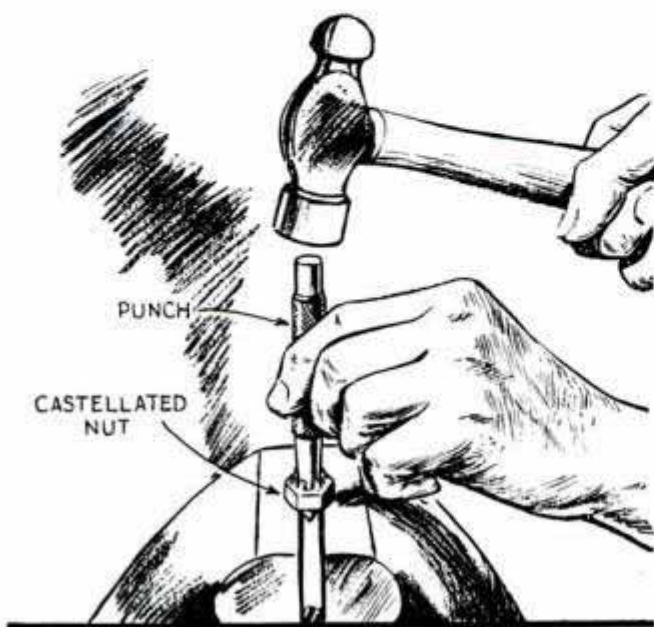


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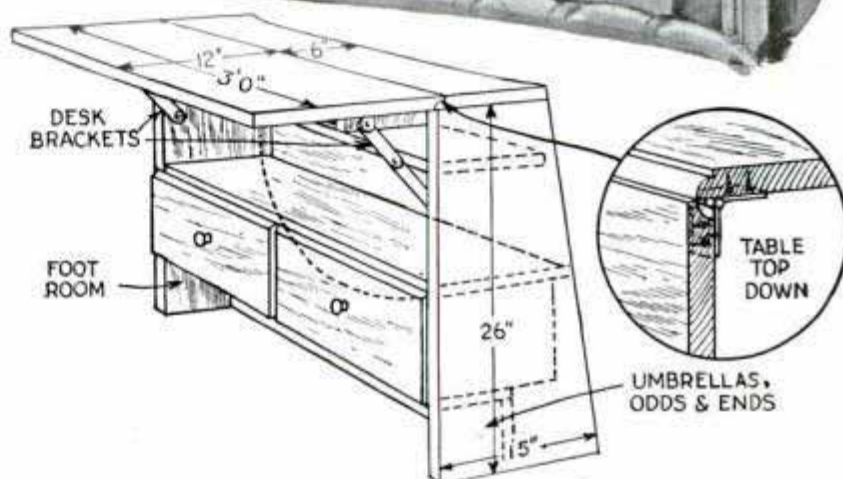
hose. Then force the end of the old hose over the projecting end. It is a good idea to lubricate the outside surface of the new hose with talcum or soapstone so that it will slide through the passages easily.—W. C. Wilhite, Carlinville, Ill.

Nut Started on Bolt with Bad Threads

When the threads on a bolt fitted with a castellated nut become battered, the nut can be used as a die to clean the threads. To do this, spread the castellated end of the nut slightly with a tapered punch or drift and then drive the castellated end of the nut onto the threads. When this has been done, remove the nut and you can drive it on in the regular way. If the threads have been damaged quite badly, put a little valve-grinding compound on them before starting the nut, and then work it back and forth carefully to allow the compound to reshape them.



Folding Picnic Table in Car Stores Your Food and Dishes



Crawling insects, damp ground and other inconveniences will not detract from the enjoyment of a picnic lunch if you have this cabinet in your car. It fits snugly on the back of the front seat and does not reduce foot room. Inside the cabinet you can pack all the necessary things for a picnic lunch where they are out of the way and protected from sun and dust. When a place to park is found, lift the lid which covers part of the cabinet front and it serves as a table. Beneath the lid are two drawers that can be removed and taken into the "kitchen" when the lunch is being made up, thus doing away with a cumbersome hamper. Another advantage is that things placed in the drawers remain right side up.

When removing carbon from a motor, the last few threads of a spark-plug hole can be cleaned with an old "long-reach" plug. Remove the center electrode and file or saw three vertical slits in the threaded part so that the plug, when screwed in carefully, will act as a tap and clear the threads without jamming.

Adjustable House-Trailer Brace Is Strong and Inexpensive



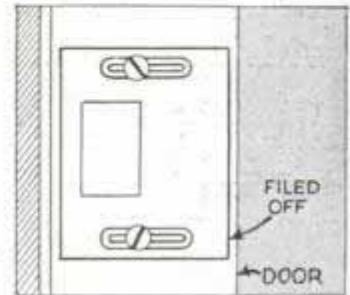
Three lengths of 2 by 4-in. stock is all you need for this trailer brace, which, because of its long base, will hold well even on soft ground. Notches at both ends of the base permit adjustment. Two braces can be carried underneath the trailer on U-shaped hangers bent from flat iron.

Removing Motorcycle Battery

Solder or weld wing nuts to the nuts that tighten the holding straps of a motorcycle storage battery and you can remove it without wrenches. The wing nuts should be bored out to clear the threads of the holding bolts.

Edge of Door Catch Filed Off to Take Up Wear

When a door catch has been taken up as far as possible and the door still does not close tightly, remove the catch and file off the edge so that it can be moved over farther. It may be necessary to lengthen the screw slots to do this.



Speedy Model Boat Travels Circular Course



This 32-in. motorboat, powered by midget gas engine, develops speed of 20 to 25 m.p.h. on circular course. Set of four blueprints, Nos. 965 to 968 inclusive, which includes full-size frame patterns and all necessary constructional details, will be sent postpaid upon receipt of a \$1.00 remittance.

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- SPEEDY MOTOR SCOOTER—989 and 990:** Easily assembled on an oak-plank chassis. Gas engine of the washing-machine type drives scooter 40 to 60 miles on gallon of gas. (2 prints) 50c.

Any six of these plans (not projects) will be sent postpaid upon receipt of \$1.00

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Building an addition to the world's largest camera works means substantial savings on practically entire 1939 Kodak line

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Kodak Junior Six-20, Series II, Bimat lens	11.00	10.00
Kodak Junior Six-16, Series II, Single lens	10.25	9.25
Kodak Junior Six-16, Series II, Bimat lens	12.75	11.50
Kodak Senior Six-20, K. A. f.7.7 lens	17.00	15.00
Kodak Senior Six-20, K. A. f.6.3 lens, Diomatic shutter	21.00	19.00
Kodak Senior Six-20, K. A. f.4.5 lens	28.00	25.00
Kodak Senior Six-16, K. A. f.7.7 lens	19.50	17.50
Kodak Senior Six-16, K. A. f.6.3 lens, Diomatic shutter	24.50	22.50
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Be sure to see your Kodak dealer about these remarkable price reductions.

Flying Box Cars

(Continued from page 37)

the freighter is its loading facilities. Getting a bulky load through a small hatch is always a problem in today's make-shift aerial box cars and Howard solves it by cutting his fuselage in two, hinging the tail group so that it swings away to one side and exposes the rear dimensions of the main cargo space. The cargo hold measures seven by seven by twenty-two feet. Automobiles, tractors, or even army tanks can be driven up a short ramp into the body of the plane. Control cables for the tail group are carried along the hinged side of the fuselage and the whole assembly locks back into place when cargo has been stored inside and secured.

Another entry in the flying freight picture is planned by Charles H. Babb, international airplane broker, based on his years of experience in converting and selling old passenger craft for use as freighters abroad. Babb's flying truck is an airplane stripped down to bare necessities and will cost about half the price of a new passenger air liner. It is designed with an eye on the foreign market where hours of operation are considerably fewer than in the United States due to lack of lighted airways and incomplete radio and weather services. Fewer possible revenue hours per year imply low maintenance costs and high depreciation costs, a special situation that Babb will solve on demand by making available inexpensive rebuilt engines, propellers and instruments.

Babb's plane is an all-metal twin-engined high-wing monoplane with tricycle landing gear, 100 feet along the wing with a sixty-five-foot fuselage. Much larger than Howard's design, the plane is intended to carry a normal pay load of 11,500 pounds and to cruise at 170 miles per hour over a range of 1,000 miles. The fuselage represents a circular cargo space that carries straight through the plane without obstructions, the pilot's cockpit being positioned above the cargo area. Applications have been made for patenting numerous parts of the design.

Loading is accomplished by unhinging the nose and swinging it to one side, exposing the forward end of the cargo hold. Loading is facilitated by the level position of the plane, its closeness to the ground,

the use of a short loading ramp, and mono-rails and electric hoists for pulling cargo into the plane and handling it into position.

Other entrants in the field are two new Douglas ships. One of these, the "DSC," is a typical Douglas air liner resembling the "DC-2," stripped down and modified for freight service. Known as a super-cargo transport, the type has been used by the Army Air Corps for freight and cargo hauling for a number of years. The "DSC" is a twin-engined, low-wing monoplane that cruises at just under 200 miles per hour and carries a useful load of 7,335 pounds. Wing loading is twenty-two pounds per square foot. The plane is complete to automatic pilot, radio, and other safety devices.

The main cabin is thirty-three feet long, five and a half feet wide, and six feet three inches high. The cabin walls are sheathed with corrugated sheet metal and numerous tie-downs are provided for fastening loose pieces of cargo in place. Metal tracks on the floor permit rolling or skidding heavy articles into position. A wide loading door is located at the after end of the cabin on the left side. The cargo gear includes a flat loading platform that attaches to the jamb of the main loading door, and an overhead tripod that fits into the fuselage roof to support a chain hoist for hauling cargo in and out of the plane.

The other new Douglas, the "DC-5," is a high-speed twin-engined monoplane, fitted with a high wing and retractable tricycle landing wheels. The plane was designed either for short-range air-line operation or for cargo hauling. It is built to get in and out of small airports easily and has unusual stability at low flying speeds. At sixty per cent of power on a 500-mile trip the plane can carry sixteen passengers and a crew of three, or a pay load of more than three tons when fitted as a freight carrier. It has a top speed of 248 miles per hour.

Flying the freight, Howard says, won't be the humdrum service you might think, either. The freight runs may prove to be the guinea pigs of air transportation, a service on which all the new devices and developments of aviation can be tried out before they are adopted as standard equipment on passenger liners.

...plenty of **VELVET**
and plenty of time
*best vacation for
man and pipe*



*Better
smoking
tobacco*

Velvet

- for **MILDNESS**
fine old
Kentucky Burley
aged in wood
- the **FLAVOR**
of pure maple
sugar for extra
good taste

*Velvet packs easy in a pipe
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IF YOUR GIRL HAD HER WAY—



YOU'D HAVE A BARBASOL FACE

There's a woman's side to shaving, you know.

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For with Barbasol you shave the whiskers off close, right at the skin line, easily, comfortably.

How modern and wonderful Barbasol is, compared with the old-fashioned method that tends to dry, irritate and roughen. Barbasol leaves your skin softer, finer, younger looking.

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Why not make today the day to start using Barbasol? The easiest, quickest, cleanest shave you ever had! And within several weeks, a skin so greatly improved, you'll be pleased as punch.

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For Modern Shaving



No Brush • No Lather • No Rub-In.

Modern Sherlocks

(Continued from page 95)

hol, the flakes proved to be the same paint as that of the fender. The jury was convinced.

When the nature of a textile is an essential part of the evidence, it is submitted to burning or ignition tests, fluoroscopic, microscopic and chemical analysis. Animal fibers, such as wool, burn slowly with a pungent odor like feathers; vegetable fibers like cotton burn quickly with little or no odor.

Infrared light has long been used to detect differences in ink on questioned documents. In one instance infrared photography solved a baffling burglary. The intruder had knocked to the floor a red card and stepped on it. To the naked eye the footprint on the card was indiscernible. But the infrared picture of the card brought out clearly the outline of the shoe where its pressure had picked up infinitesimal bits of dust from the carpet. Infrared light accentuated the difference in reflective power of the dust and the red card. It has even been suggested that, although fantastic, it might be possible to guard valuables by arranging a motion-picture set-up that would take infrared pictures of an intruder entering a dark room.

Although not yet accepted in all courts, the polygraph or "lie detector" has become one of the most depended-on tools of the criminologist. Basically a medical instrument, it graphs the emotions of the "patient" in terms of blood pressure, pulse, respiration and muscular reflexes while he submits to questions. There's no use trying to fool it. One defendant thought he would pull a fast one by remaining silent whenever any specific questions about the crime were asked. He might as well have talked. The needle of the polygraph jumped out of bounds in token of the prisoner's guilty conscience.

Two bank-robbery suspects took the lie detector test and it indicated they were innocent. Three witnesses, however, swore they saw the crime committed and identified the pair as the robbers. The prosecutor succeeded in barring the lie detector's evidence from court, but two days later the real robbers confessed. If the

polygraph can't talk to a jury, it can help investigators in collecting evidence, disproving charges and wringing confessions.

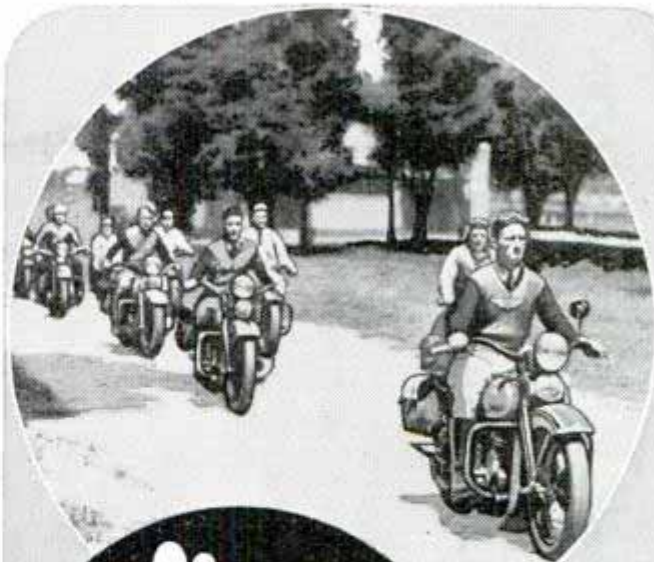
Like the lie detector, scopolamine—the "truth serum"—has not won admittance to all trial courts but it, too, is a potent tool of the scientific detective. Not a serum at all, it is a drug under whose influence the conscious mind is "suspended" and the "truth must out."

Scopolamine brought a strange denouement to one murder case on record. A man was found dead under suspicious circumstances. His widow called it suicide, but skeptical police arrested a man with whom she had been friendly. He disclaimed any connection with the supposed murder and readily agreed to be questioned under the "truth serum." Even under its influence he insisted he did not kill the man, but confounded the police by saying he had thrown the pistol in the river and covered the body with branches. Something was wrong here; the man had been found dead in bed, the pistol at his side. When the question was repeated, the suspect said he had hidden the gun in a field of heather in a Canadian province.

When he returned to full consciousness and was asked about a murder in Canada, he turned pale and confessed he had killed two persons in Ontario some time ago, but of the recent murder he was innocent—the wife had killed her husband.

A bank employed the polygraph to find an embezzler among its employes. Fifty-six employes submitted to questions; the lie detector showed up not one, but nine embezzlers and twelve liars! Since then the instrument has been used to check up on employes at regular intervals; it not only uncovers any irregularities and dishonesty, but discourages any future attempts at embezzlement.

Crime detection is going into the hands of specialists. The photographic expert, the fingerprint expert, the wood specialist who traces lumber to its source by the microscopic grooves left by the plane; the spectrograph expert who sifts dust and ashes into their light rays and can identify the metal of a bullet from fragments left in passing through fabric. The Sherlock Holmes of tomorrow will be the paint expert, the student of iron and steel, the glass and soap and hair specialist.



Rolling
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GOOD
TIMES!

Yes, Siree — owning a motorcycle is great sport these days! No more nothing-to-do days! Enjoy plenty of action and fun every day — and make lots of new friends. Go in for gypsy tours, reliability and endurance runs, hillclimbs, tourist trophy races, and other thrill-packed motorcycle events. Join a live-wire riders' club. Visit your Harley-Davidson dealer — find out about the great fun club members everywhere are having — and get an eyeful of the latest model Harley-Davidsons. Also ask about his Easy Pay Plans — and above all, be sure to mail the coupon NOW!

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ASK YOUR DRUGGIST



TUNE IN THE NATIONAL BARN DANCE SAT. NIGHT...NBC

AT ALL DRUG STORES BY THE PACKAGE OR GLASS

DISTRESS FROM TOO MUCH FOOD OR DRINK AND HEADACHES OFT ANNOY, BE WISE AND ALKA-SELTZER-IZE AND GET YOUR SHARE OF JOY.



IT'S GREAT TO BE ALIVE, AND HOW! DON'T LOSE A SINGLE DAY. RELIEVE THOSE ACHING MUSCLES NOW, THE ALKA-SELTZER WAY.



Alkalize with Alka-Seltzer

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in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and

Electrical Brains Help Run World

(Continued from page 85)

keep it informed of the rise and fall of rivers and to obtain advance warning of floods. Instead of going down to a river to measure its height the weatherman merely dials a number on his phone and listens to ensuing signals with his stopwatch in hand. The robot mechanism at the river goes into operation when the phone circuit is completed, sounding an initial signal that is followed shortly by another. The time between the two signals, heard over the



Adjusting sensitive eye of photoelectric relay that switches lights in room on or off as needed

phone, informs the weatherman of the vertical height of the water above a fixed zero point.

A close relative of this machine is the automatic telephone, a complicated electrical brain that is an outstanding example of how man has trained electricity to do his thinking for him. When you dial a number in another exchange an intelligent switch called a line-finder goes on the job, fanning back and forth across the circuits to find and connect you with an idle set of lines leading to the proper exchange.

To an engineer a modern electrical brain is nothing more than a combination of a few simple switches and relays. By coupling a few circuits together he produces results that seem uncanny until their operation is explained.

One of the devices he uses is the photoelectric cell. This relay generates a small amount of current when exposed to light. It is used to start an operation either when light falls on it or when a steady light beam is interrupted. As an automatic door-opener it starts the motor that opens the door when a person's body breaks the beam of light pointed across the entrance. One of the latest uses of the photoelectric cell is to automatically control the lighting in schoolrooms and factories. A sensitive eye fastened on a wall measures the amount of light in the room and operates magnetic switches that turn on additional lamps when the light falls below a minimum level, switching them off again when the amount of external light entering the room increases.

The latest development in thermostatic switching is the new Fe-Ni-Cr-Si group of alloys that gain or lose magnetism at critical temperatures. These alloys, consisting of iron, nickel, chromium and silicon, cease to be magnetic at temperatures that depend upon the amounts of the elements in the alloys. Below the critical temperature the metal is magnetic, above that temperature the metal has no magnetism.

Another group of automatic switches is of the pressure type. Such a switch consists of a diaphragm that works against a spring, movement of the diaphragm opening or closing an electrical circuit, allowing automatic control of pressures in such devices as compressed-air tanks.

Time switches, run by electric clocks, turn lights on or off at pre-determined times, defrost electric refrigerators at the right intervals, operate domestic water heaters and furnaces, and are used in many other ways.

If split seconds are to be measured a thyatron tube is hooked into an electrical circuit. In such split-second operations as spot welding in airplane manufacture, the thyatron tube gauges the weld to the fraction of a cycle, permitting enough heat for a good weld but not enough to injure the thin sheet metal.

Switches such as these, together with various kinds of mechanical limit switches, tracks and gears, and rotary switches, are the raw materials from which an engineer builds up a complicated electrical brain.

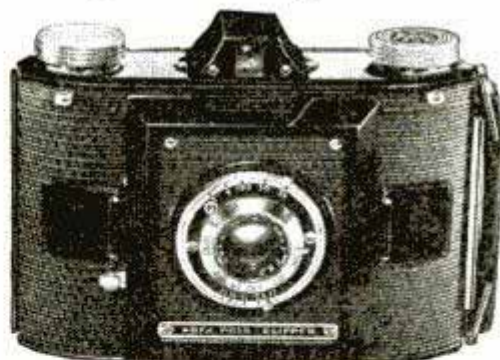
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New Agfa f6.3 Clipper... \$15⁵⁰



THE Agfa f6.3 Clipper Special features new telescoping front which eliminates bellows; shutter speeds of 1/25th to 1/100th second, bulb and time, hinged back, easy loading arrangement, shutter release guard, tripod socket, and built-in depth-of-field scale. Takes 15 pictures, (2 1/2 x 2 1/16) on one roll of PD16 (616) film. Complete with neckcord and lens cap, \$15.50. *Made by Agfa Ansco Corporation in Binghamton, New York, U.S.A.*

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8192
Painting the World in New Colors

(Continued from page 69)

produced a single type of paint that would serve all purposes. And the paint manufacturer has had to devise special combinations for practically every use that will incorporate the properties of durability, or of hardness, or of flexibility, or of color, or of drying time that will fit the particular need. "That being the case," the home owner asks, "what kind of paint should I use in painting my house? How often should I paint for proper protection of the building and what should I use for the various interior parts of my house, the floors, the walls, the woodwork, the porches and the cellar?"

Du Pont chemists tell us that since almost every part of the United States has some peculiarity that affects exterior paint, such as salt in the air near the seashore, or smoke in the air in industrial centers, the home owner will get the best results if he will consult a reliable painting contractor or dealer in his own territory, outlining his requirements. Usually the painter and dealer have studied the local situation carefully and can recommend the paint embodying the very characteristics sought by the customer.

Generally, the chemist can give the home owner a few tips on how to do the painting himself, such as: Choose a day when the weather is clear, dry, and the temperature is above forty degrees Fahrenheit. Never paint over a wet or damp or frosty surface. Use three coats on unpainted surfaces and two on repaint jobs. He can also tell you how to figure the amount of paint to be used. This is done by multiplying the distance around the building in feet by the average height, then dividing by 350 square feet, which is the average spreading capacity per gallon for two coats of prepared paint. Thus, if the distance around the building is 140 feet and the height is fifteen feet, you get a total of 2,100 square feet. Dividing this by 350 results in six gallons, the amount of paint required for the two coats.

Paint dealers usually can supply small pamphlets telling how to paint a house, the furniture, the floors, boats and a vast number of other things. The housewife with an overwhelming urge to paint something can

9 192
do a splendid job of refinishing furniture if she follows these simple instructions: wash and sand the surface to get it thoroughly clean and smooth; use a clean, preferably new, brush about one and one-half to two inches wide; stir the paint to keep the pigment well mixed, and work with the brush well filled with paint, brushing first across, then with the grain. Directions found on cans of enamel, transparent finishes and clear varnishes should be followed. Previously finished furniture often requires only one coat, but two give a more durable finish. New wood needs at least two coats. Each coat is allowed to dry thoroughly, then the surface is sanded lightly and the dust removed before the next coat is applied.

The development of a new finish is a much more complex matter than is generally understood. In the first place there must be an understanding of the need that exists. Next there must be a determination of the properties that would have to be possessed by the finish if this need is to be served. Then comes a blending in various proportions of the almost countless possible raw materials that may produce these properties, with a testing of each composition to see if the result has been produced. And finally there is the rigorous testing of the promising products which have been formulated for the particular use. This may involve testing for resistance to humidity, hardness, flexibility, gloss, adhesion, ease of application, and finally the determination of economic value. And with these tests must be included the all important test by time and weather. This involves exposure to the effect of the sun and rain on test fences, of which du Pont has several scattered around the country, with perhaps 65,000 individual test panels on exposure. And finally, before a paint can be sold its performance actually must be tested on houses, boats, automobiles or refrigerators as the case may be.

Spray Duco lacquer, known to everyone as a fast-drying nitrocellulose finish for automobiles, was the result of a long-continued experimental program of the type described, and the many improvements which have been made in it are the

(Continued to page 122A)

DOES TWO JOBS AT ONCE



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Gives a WAX POLISH
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(Offer good in U. S. only)

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9 192
(Continued from page 121A)

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result of similar programs. And this process of improvement still continues.

Dulux enamel came into being in much the same way. Products sold under the Dulux name are fast drying, have exceptional durability and hardness, and are highly resistant to chipping. White Dulux has an unusual property of staying white. Refrigerator manufacturers have found it an ideal finish for their product. It brings beauty to woodwork in homes and institutions. Today Dulux paints and enamels provide finishes for ocean-going steamships, steel bridges, automobiles, streamline trains, airplanes and countless things in the home, such as electric ranges, kitchen cabinets, tables and furniture.

Once paint making was regarded as an art, but today it has become a science, an evolution that has meant more profit for the manufacturer and better products for the consumer.

Gold Is Where You Find It

(Continued from page 43)

is about the last place one would look for gold; yet, C. H. Starr and associates, prospecting along a fault, found gold nuggets, some as large as the end of your thumb. Nearly all were flattened by earth movements, and most were covered by iron rust, which probably explains why they were not discovered sooner. The mine has averaged \$40,000 to \$50,000 a year since the discovery, which, after all, is not bad.

Perhaps the most unusual of all recent discoveries occurred in 1938 in the oldest mining district in Colorado at Central City and Blackhawk. John Gregory discovered the first lode mine in Colorado in May, 1859. Ever since then the region has been a center of interest for gold hunters. Hundreds of mines have been located. Scores of fortunes have been made and lost. Prospectors have tramped the hills by day and the streets by night for nearly eighty years. Last summer two placer-mining outfits started operations, one in Central City, the other on north Clear Creek within sight of the town of Blackhawk. The Central City outfit, operating on a piece of ground smaller than a city block, took out \$9,000 in a few weeks. The Blackhawk outfit, with a larger area and better equipment, grossed \$7,000 to \$10,000 a week. Both

127558
 outfits used simple equipment, consisting of steam shovels that could dig twenty to thirty feet through the gravel to bedrock. The gravel was dumped into hoppers, then carried over screens to take out large boulders, pieces of timber, etc., that had accumulated along the bed of the stream. The fines were carried over sluice boxes, and the gold was caught either in these boxes or on the amalgam plates below them. Steam shovels that dig cheaply to bedrock are the secret of success.

In both Cripple Creek and Goldfield the gold occurred under geological conditions that were entirely unfamiliar to the early prospectors. At Cripple Creek the gold near the surface is combined with tellurium and silver in various proportions, making the minerals sylvanite and calaverite. These minerals do not break down readily to liberate the gold. Therefore, the streams that flow from the district contain very little placer or "free" gold. When the prospectors of the last century looked for new gold regions, they usually "panned" the creek gravels, and traced the gold to its source in the veins. This explains why Cripple Creek was so long overlooked.

The Goldfield situation is somewhat different. The region is in a desert with a multitude of low hills, small cliffs and inclosed basins. There the prospectors evidently looked for the gold in the outcropping ledges that had escaped erosion. But, strangely enough, the gold actually occurred in the disintegrated volcanic rock that covers the basins.

The recent placer mining at Central City must have made a lot of prospectors' faces red. We forget that Mother Nature operates now just as she has for countless ages. The little stream that trickles along right beside the street in this famous old town has been busy for three quarters of a century wearing off a ledge here, picking up a little gold from an old mine dump there, washing out unrecovered gold from an old mill tailings deposit somewhere else. All this was more or less concentrated in the stream gravels. It is only fair to add that the richest gravel lies on bedrock, at such a depth that it probably was not reached by the pick-and-shovel placer miners of the past.

After all, I guess we will have to agree that "gold is where you find it."

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Certified Re-Wiring takes the guesswork out of re-wiring service. The mechanic who does the work has been trained in the latest, most satisfactory method of checking for defects in the electrical system—he has a Certificate to prove it. Only Packard cable of the correct gauge is used in replacement—and Packard is the recognized quality cable of the automotive industry. In other words, you are assured that the job will be satisfactory.

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Authorized Certified Re-Wiring Service may be identified by the blue and gold metal sign. Other service stations have mechanics who have received their Certified Re-Wiring Certificates. Ask to see the mechanic's Certificate, and be sure that Packard cable is used in your re-wiring job. Packard Electric Division, General Motors Corporation, Warren, Ohio.

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Roving Cameraman's Adventures

(Continued from page 75)

back. With fast film and an f1.3 lens I was able to record this amazing scene inside the church. Meanwhile the Indians were becoming resentful that a white man should make sport, as they thought, of this sacred event. My friend, who spoke Spanish, told me feeling was rising rapidly and I had better move off. I dashed out with film and camera while he stayed bravely behind to argue it out with the irate Indians. It took several hours of explanation before the local magistrate. Finally all was peace and we left town the next morning.



Native Mexican scraping the inside of a dugout canoe at edge of Lake Patzcuaro

By good luck I once photographed the secret shamanistic rites of the Buryat Mongolians. The ceremony took place in a yurt, a sod-roofed log cabin. In it the shaman, or medicine man, seeks to appease the spirits by talking to them through the spirits of animals. I told the Buryats I was a shaman in my own land and might work some magic. They must not be alarmed whatever happened, I explained. For hours the ceremony went on with incantations while alcohol was distilled from some sort of treated milk in a huge clay globe. Now the natives were shouting and bowing their heads to the ground. The ceremony was at its height—but how could I photograph it in the dark? I tried my magic. In my pocket were two magnesium flares. Sticking them in the earth, I lit them. The little room was flooded with light; I ground out my pictures quickly, but in a minute the smoke was so thick no one could see. I asked the Buryats to walk out quietly, and they did, continuing the rites outside.

Q 225

Two years ago I obtained a beautiful film of an ancient monastery in Finland where 500 monks live as if in the middle ages—bearded monks of eighty or more and boys with long golden hair painting murals in the dome 140 feet high.

It is a common mistake of photographers and tourists abroad to offend natives by acts which are all right in Kalamazoo, Mich., but utterly out of place in Mexico or China. Here is the sad story of my failure to get pictures of a most interesting Uzbek dance in the Crimea. In a sanitarium above the Black Sea, a former palace of the Emir of Uzbekistan, were 300 patients come from central Asia for recreation. They had never met an American and we had an exciting time together. I agreed to come back that evening with my camera if they would do their Uzbek dance in costume. They were enthusiastic. They sent a truck for me, on its floor a huge Bokhara rug worth \$5,000, spread as a courtesy to the foreign visitor.

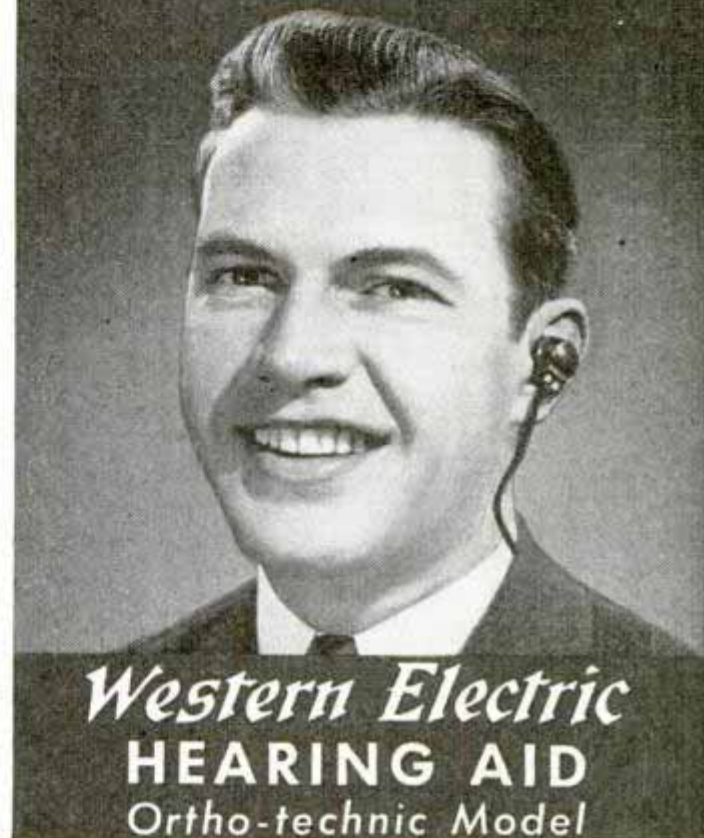
First there was a rehearsal. I explained to the two principal dancers how they must keep within the camera's field of vision. But here I made my tragic error. I touched, very lightly, the shoulder of the leading woman dancer. It was an innocent movement, done only to show the young lady where to stand; but immediately the room was in uproar, and the male dancer was ready to have my blood. Why? Because I, a foreigner, a non-Moslem, above all a Christian, had dared touch an Uzbek woman. It was pretty exciting for awhile, but the dancer's more sober male friends held him back and things calmed down. However, there was no dancing. A chagrined American cameraman departed without pictures, leaving behind a feeling of resentment instead of friendliness.

Better luck came in the Turkish Republic—one of the most difficult lands to photograph, for the Turks have long been suspicious of foreigners, especially a foreigner with a camera.

My job was almost done. I had scenes in the mosques and bazaars, the vineyards, the new schools. To complete the story I needed pictures of President Ataturk. So far as I could determine neither outsiders nor the Turks themselves had ever made an intimate motion picture of their president. I tried the American ambassador, the

(Continued to page 126A)

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Name

Address

(Continued from page 125A)

governor of Istanbul, two or three members of the Turkish cabinet. To no avail. Just before I was to leave Turkey, I was lunching at my hotel. By chance the cabinet was also lunching there, without the president. An idea struck me. I sent my interpreter to say to the prime minister (who today is the president): "Mr. Prime Minister, the pictures of you and the cabinet will be taken in the garden when your lunch is over."

The cabinet apparently thought this had been arranged for some publicity purpose, so after luncheon they came into the garden obediently, I took the pictures, and that was that.

Next day I proceeded to the palace of the president, taking with me a friend on the Turkish police force and my interpreter. In an imposing car we entered the courtyard and received the sentinel's salute. What to do now? I had addressed a letter to the president explaining my case. My police friend presented it to the private secretary of Ataturk. Soon the policeman came out with a broad grin; I had been granted a five-minute interview with the secretary. I told him my story. He said there was no hope, the president had never permitted such pictures. I told him of the pictures I had taken of Turkish industry and agriculture, the schools, the cities.

"Do you think," I said, "that I will have a complete picture of modern Turkey to show in America if we omit the greatest character Turkey has had in the last 400 years?" Before the secretary could reply I added: "Will you convey to the president my disappointment, and tell him not only will I be omitting him from the picture, but will be showing pictures of all the members of the cabinet with the exception of himself?" With that I left the palace.

Three hours later Ataturk's private secretary telephoned. I was to be the guest of the president for two days at his summer home. Of course I accepted, and the pictures were mine.

Two years have passed. Ataturk is dead, a new president has been elected, and I am proud to have a historical document no one else in the world possesses, a motion picture showing the first president of Turkey in a human, natural way.

So this is the end of my story, but not of my adventures.

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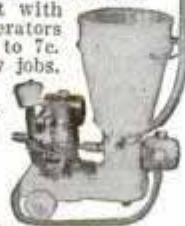


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2737 S. Mary Street Chicago, Ill.

Logging Goes Modern

(Continued from Coloroto Section)

pected to increase to close to ten billion feet per year as forest management becomes better understood and observed. If necessary it would be possible to grow twice as much wood on the Pacific slope as is now required, on land more suitable for growing timber than for any other purpose.

Modern lumbermen regard timber as a crop that can be harvested time after time instead of as a mine that is worthless after it has been worked out. Forest management and fire control are the two keystones of the new attitude and the work of providing everlasting forests is well under way. More than a million dollars is being spent every year in western Washington alone for reforestation.

Another thought that has been taking hold is that to keep a forest healthy it must be used. That is, individual trees should be logged upon reaching maturity to permit new trees to grow where they stood. Young timber grows faster than old timber and upon passing their prime some big trees become "cocky" or over-ripe. Some companies have already started programs of selective logging by which individual trees are cut down and used as soon as they come into their prime, leaving the rest of the forest growing intact. They make certain of never running out of timber by estimating the supply that is added to the forest each year by natural growth, and restrict their logging to that amount.

Many large operators are starting their own private nurseries and are growing selected stock for transplanting in cut-over land. One company is already setting out two million seedlings every year.

Left to itself, almost any cut-over area will restock itself from natural seeding if given sufficient time. This type of reforestation is far too slow to be dependable and another part of the reforestation program is to leave large clumps, rows, or a scattering of individual seed trees still standing in areas that are being logged. This permits seeds from mature trees to be scattered broadcast over the ground. Usually 1,000 or more seedlings per acre take hold from this method within a couple of years and a new forest has started.

Forest fires are the dread of the lumberjacks since one fire alone is apt to destroy

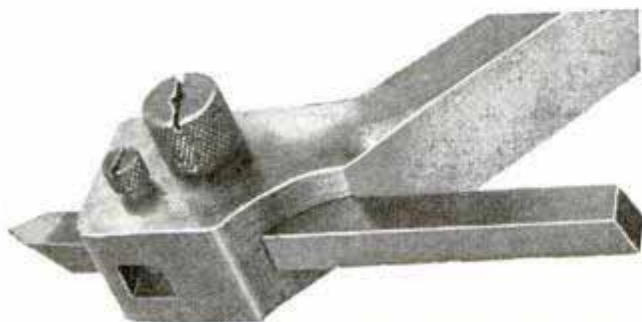
enough timber to meet a mill's requirements for several years. In the woods, one of the best ways to prevent a big forest fire is to start a fire. Normal logging leaves behind it a great deal of debris in the nature of tops, limbs, bark, and underbrush. These slashings dry out rapidly and if left to themselves would be permanent fire hazards. The debris is cleared away by burning it off, setting it afire just before a good rain is due so that it can be kept under control.

During fire weather, short periods of time in the summer months when the humidity is so low that fires start easily and spread rapidly, many lumber camps shut down all operations and pull all of their men except a few fire patrolmen out of the woods. Warnings of impending fire weather are spread to the camps by radio and many camp superintendents watch their own hygrometers to keep a check on the local relative humidity. At times of low humidity fires are almost impossible to control and they start from such unusual causes as the friction of a moving steel line against a stump, or a small limb being caught up and lodged in a pulley block.

Reforestation, fire prevention, and economical logging methods are already showing their effect in the woods. Today, lumbermen think they have found the way to grow forests that will last forever.

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Notice the two openings at right angles for tool; a turn of knurled clamp screws locks bit in place

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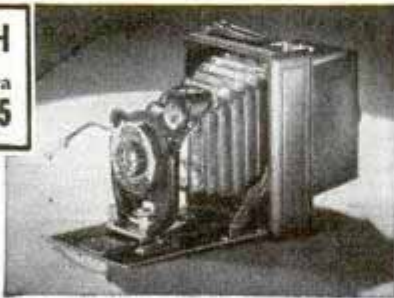
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Streamlining the Highways

(Continued from page 31)

The limited way is either raised above the level of the ground or below it, which disposes of the pedestrian problem. Provision is made for accelerating and decelerating lanes for fast and slow traffic leading from the main highway.

Chicago's Outer Drive approaches the limited way design and its success has prompted the city to entertain plans for the construction of a network of elevated highways. Already New York has constructed two West Side elevated highways and eventually Manhattan will be encircled by these super highways. When com-



Specially designed electric lights are used to reduce hazard at important intersections

pleted the system will make it possible for the 200,000 cars that enter the city daily to drive for miles above traffic-clogged streets without encountering a signal light.

Conventional express highways, such as St. Louis' thirty-eight-mile stretch that delivers traffic from the outlying districts to the business district without interruption, have been hanging up convincing safety records as have the divided highways built in various sections. In fact, the double roadway idea is being generally accepted in more modern street design, and engineers predict that all roads built in the future will be of this type.

More and more road builders are looking to future traffic requirements. A striking example of this is on State Route 59 in northern Illinois. A ten-mile strip with a width of twenty-two feet has been built to carry future loads at greater speeds. It is

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centered on a line twelve feet from the centerline of a 100-foot right of way. Thus, when traffic warrants it, a second twenty-two-foot strip can be added, and when completed the opposing streams will be divided by an island.

There are 324,000 miles of state highway and to bring but five per cent of the total within hailing distance of the modern road designs would cost, according to R. E. Toms, chief designer of the U. S. Bureau of Roads, \$4,000,000,000.

The highway engineer cannot endow the motorist with judgment, he adds, but can provide sufficient clear vision for the exercise of good judgment. Road safety depends fundamentally upon the ability to see, particularly when traffic moves as it now does over rural highways.

If a highway is built so impatient or careless drivers are encouraged to remain behind slow-moving vehicles until they see a sufficient length of highway clear of opposing traffic for passing, he says head-on collisions and other accidents will be fewer in number than if the road is constructed with inadequate sight distances.

When you go fast you need more space than when you go slow, so highways must be wide enough to allow a clearance in keeping with road speeds. Shoulders wide enough for stopping, consistently smooth, non-skid surfaces, and the elimination of deep side ditches are safety measures that are now being practiced universally.

Approximately sixty-seven and one-half per cent of all motor-vehicle deaths in urban areas and thirty-five per cent of those on rural roads are pedestrian fatalities. To cope with this phase of the safety problem, tunnels are being built under or over heavily traveled roads near schools, large industrial plants, public beaches, playgrounds, and business districts.

Relocation of highways and grade separations are the most practical ways of handling the railroad-crossing problem.

Highway engineers visualize that in the future America will have 60,000 miles of super highways connecting centers of population and providing free nation wide travel. They will be designed for 100-mile-an-hour speeds, be four to eight lanes wide with opposing traffic streams divided, trucks segregated, pedestrian traffic eliminated, and no grade crossings.

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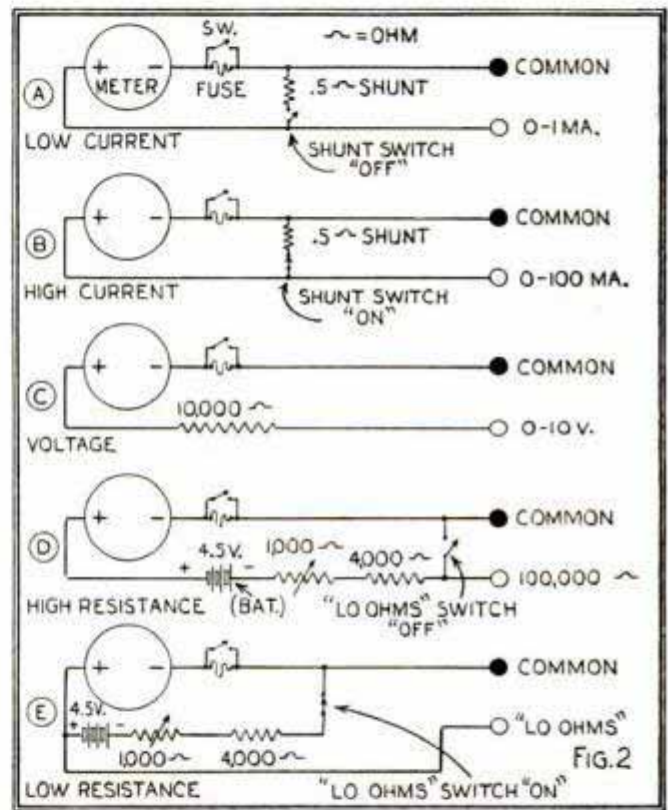
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Universal Set-Testing Meter

(Continued from page 138)

1-watt carbon types supported by their own leads and the wiring, which is done with No. 12 bus-bar wire. The multi-range meter scale, meter-shunt resistor, toggle switches, push-button switch, fuse and holder are all included in the kit of parts available from radio supply houses.

The fuse introduces a little additional resistance in the circuit and this will cause inaccuracies in reading certain ranges. To avoid this, the safety push-button switch (SW3) is provided; when depressed, the



fuse is short-circuited and accurate readings thus obtained. Diagrams, A, B, C, D, and E in Fig. 2 clearly show the connections employed for making all tests. In every case one test lead is connected to the "common" binding post, the other lead being connected to the binding post marked with the desired range. To measure resistances below 500 ohms, the "lo ohms" switch is placed in the "on" position and the "ohms adjuster" knob varied until the pointer on the meter rests at the extreme right end of the scale. For high-resistance measurements a similar preliminary adjustment must be made. To do this the "common" terminal is temporarily connected directly to the 100,000-ohm terminal and the knob is adjusted as before.

Greatest Show under the Earth

(Continued from page 53)

from fifty to 2,000 candlepower is visible. All have been artfully concealed behind rock shields and mounds. Likewise, transformers and switches are out of sight and cable, pipes and conduit have been covered with dirt to preserve the naturalness of the caverns.

Colored lights have been tried, but since the formations have their own inherently delicate and beautiful coloring, it has been found desirable to present them in their natural state, hence daylight lamps are used exclusively.

The elevators are virtually the same as those found in modern office buildings. In the eighty-four-story shaft that was sunk to the floor of the cavern, a steel tower was erected to form the two hatchways and provide supports for the guide rails. All the wiring in the shaft had to be made waterproof so the various circuits would not be affected by the water which is constantly seeping through the walls.

A million and a half dollars have been spent on the improvements, but admittance fees have paid for both improvements and upkeep.

Thanks to modern science, the growth of interest in the caverns has been rapid. From a few hundred in 1925, the attendance has increased steadily to last year's record of 207,041 visitors from every state and sixty-five foreign countries. The largest crowd of the year was 3,771 persons on July 4; the smallest, 101 on February 2.

At the peak season, fifty national park rangers direct traffic, conduct tours, answer questions, and keep an eye peeled for anyone tempted to break off a formation for a souvenir.

A trained nurse is in constant attendance. Occasionally, a visitor suffers from claustrophobia and a ranger eases him out. The average is about one case among every 5,000 visitors. In case of illness, tourists are treated at first-aid stations.

One of the side shows of the Carlsbad Caverns trip is the bat spectacle. Every evening at dusk, except during the period of hibernation, three million bats come forth from their apartment 180 feet down in the earth, spiraling through the great entrance of the cave for more than three

(Continued to page 135A)

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Use **MOTO-SCOOT**s to make economical deliveries for stores, service stations and messenger service. Models for every purpose—Solo-Tandem, Delivery, Sidecar and Trailer. Rugged steel construction.

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Save On **GUT!**
—Buy Direct from Factory **SILK!**

Earn big profits restringing tennis rackets at home. Easy work. Experience unnecessary. Save on your tennis, badminton, squash! Send for **FREE CATALOG** of Tennis Equipment—*Hurry!*

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Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you **IN GOOD PAYING BUSINESS.** Write today for **FREE** particulars and proofs.

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No investment needed—no experience required. No stock to carry—No deliveries to make. We supply everything **FREE.** Millions waiting to buy. Sells everywhere shops, factories, offices, workers, etc., etc. Each sale leads to fifty more. Everyone happy to get what you have. **FREE SAMPLE.** Write quick—a postcard will do.

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The Simple Sensible Red-I-Kut way as thousands have. **DIME** brings **PLANS** and sixty picture "HOW" Book pricing many fine brass weight **Westminster, tube chime, electric and battery movements** showing nine beautiful colonial grandfather cases. **WHY WAIT LONGER?**

KUEMPEL CHIME CLOCK CO., Bldg. 30, Guttenberg, Iowa.

(Continued from page 133A)

hours and streaming off in search of food. At dawn they return, having consumed more than eleven tons of moths, flies, beetles, and mosquitoes during the night.

On the trip through Carlsbad Caverns, you are introduced to the sights by easy stages. By the time you reach the Green Room, the walls begin to grow whiter and on all sides are grotesque figures and perfect waterfalls stopped in action and molded in stone. Farther on, there are prehistoric animals of gleaming onyx, scrolls and drapes, chandeliers and lily pads; and an infinite variety of shapes that your imagination may translate into birds, mummies, or animals. These ornate forms are all due to the deposition of limestone which has been carried in solution by ground water and which crystallizes as the water evaporates or when dissolved carbon dioxide, which it may contain, escapes to the air. The coloring results from iron or other minerals in the limestone.

The size of some of the galleries is a matter of wonderment to all. Especially is this true of the Big Room, 4,000 feet long and 625 feet wide with a ceiling scaling up to 350 feet. Here is the Giant Dome, the world's largest stalagmite. Sixty-two feet in height and sixteen feet in diameter, it grew at the rate of an inch a century so you can figure out its age yourself.

A clever dash of showmanship climaxes the visit. After circling the Big Room, a matter of two miles, visitors are seated in front of the Rock of Ages, oldest of all formations. Announcement is made that the lights are to be turned off.

A hush falls over the crowd and the switch is pulled. You are in total blackness—a fearful inky blackness. Sixty seconds tick off and there is a faint glimmer of light at the far end of the room as an unseen quartet begins to sing "Rock of Ages." One by one the lights reappear and by the time the rangers conclude the hymn the room is fully illuminated.

A dramatic fillip for the greatest show under the earth.

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.

Making these repairs with SMOOTH-ON No. 1 is like finding money!

Stopping leaks at screw threads, gaskets, press-fit joints, seams, connections, cracks, etc., in water, steam, gas, air or smoke pipes, boilers, furnaces, fire pots, heaters, tanks, radiators, sinks, troughs, etc.

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SMOOTH-ON No. 1 has enabled thousands of householders and home mechanics to make the above and similar repairs at absurdly low cost—to restore full usefulness to many impaired household appliances that otherwise would have required expensive replacement.

Smooth-On No. 1 hardens and its adhesion and expansion in doing so effect a tightness of parts or a seal against leakage that withstands pressure, heat, cold, vibration, moisture and chemical action. The Smooth-On restores original efficiency quicker, with less effort and at less expense than by any other practical repair procedure. Try Smooth-On (no heat, special tools or previous experience required). Your worst repair becomes simple and you can make annual savings that amount to a substantial figure.

Many Smooth-On repairs can be made in various ways. The one which produces the best results most economically is easily determined from the instructions and diagrams in the free Smooth-On Home and Auto Repair Booklet.

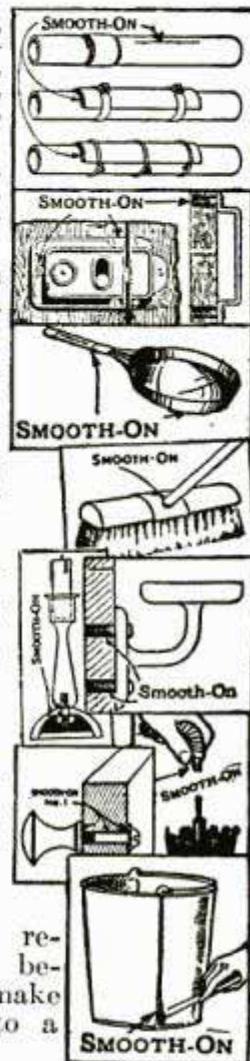
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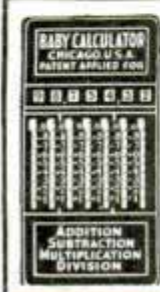
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WORLD'S LOWEST PRICED ADDING MACHINE

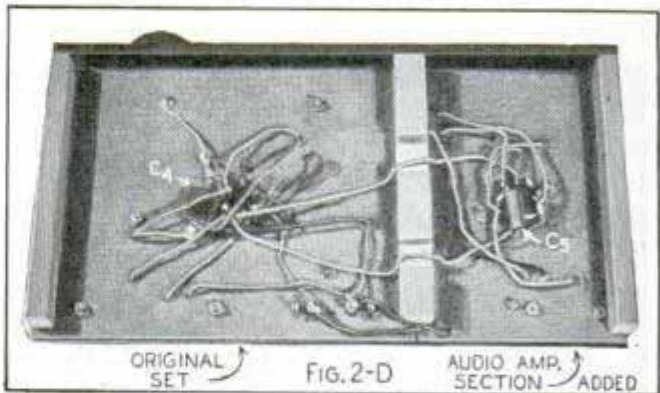
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SEND NO MONEY
MONEY BACK GUARANTEE. Send name and address. Pay postman only \$2.50 plus postage. (Send full cash if outside U. S.) Money back in 10 days if not delighted. **AGENTS WRITE. CALCULATOR MACHINE COMPANY (Mfrs.), DEPT. 107, P. O. BOX 1118, CHICAGO, ILLINOIS.**

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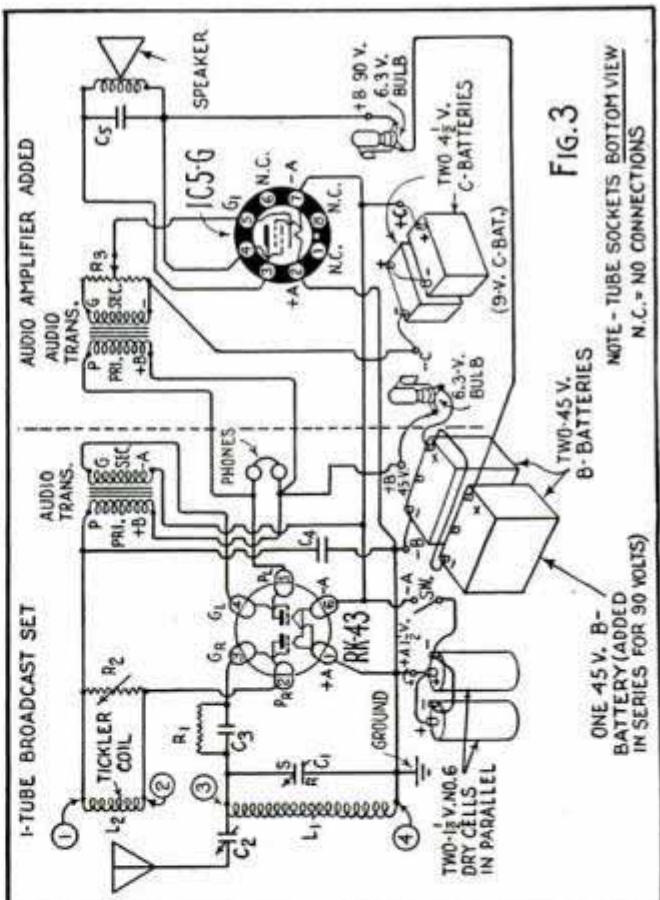
(Continued from page 137)

control (R₂) shuts off the A-battery current for both tubes.

Receiver tuning is the same as before the amplifier was added, the volume con-



trol having no effect on the tuning but serving to keep the volume at a reasonable level. Do not use the volume "full on" as it may overload the amplifier stage. Headphones may be used by simply plugging



them in the phone jacks; when this is done the 1C5 tube should be removed to silence the speaker. The 6.3-volt bulbs act as fuses and protect the tubes from burning out in event of accidental short or error in wiring.

Making Weather

(Continued from page 61)

Trouping meant wide temperature variations and knowing of apes' susceptibility to respiratory diseases, they arrived at one conclusion: the 450-pound beast would be down with pneumonia before the show completed its New York run. Circus officials disagreed. They built a glass cage with 840 cubic feet of space and we were assigned to regulate the air within so it duplicated the climate found in the beast's habitat in the Belgian Congo. This was done and at the end of a 19,466-mile tour, Gargantua was very much alive. His trainer told us the gorilla not only escaped colds and illness but gained in weight and height and his pelt can only be compared to the pelt of a silver fox. It has been found any temperature change greater than one degree per hour would result in a shock that might bring Gargantua down with pneumonia.

During a hot spell, the system serving NBC's twenty-seven broadcasting studios and executive offices in Radio City will remove 10,800,000 B.T.U. of heat from the atmosphere hourly—enough to warm 250 average-size homes a whole winter. Each studio requires a separate temperature control and there are delicate, sensitive mechanisms to compensate for such factors as the number of people in attendance and the amount of illumination being used.

Providing for human comfort is but one branch of this science. To many industries, artificial weather is as important as a central power station. Without it, for example, the chemist would never have succeeded in beating the silkworm at his own game in producing the silkless silk known as rayon, because of the acid condition of the air in the spinning rooms.

New jobs for scientific weathering bob up daily. Because dirt and dry air are important causes of paper deterioration, many libraries, including the Library of Congress Annex, have made installations to help preserve rare books. Shoes, sugar, dairy products, pharmaceuticals, tobacco, electrical goods—virtually everything we eat or wear and many of the things we use are less expensive because of air conditioning. And that brings up the question: just what is air conditioning? Generally

(Continued to page 138A)

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YOU can shoot the center out of a target at 100 yards with Western XPERT L.R. .22's, they're so accurate! Yet YOU DO NOT PAY EXTRA for their sensational accuracy. They make high scores easier, whether you use the .22 Long Rifle size, the .22 Long or .22 Short. XPERT is the REAL THING for all-around shooting. NON-CORROSIVE! Smokeless! CLEAN ammunition! Mail Coupon for free 72-page shooting guide.

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MOTO-TOOL**

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\$9.85

New Mechanical Sensation

Speed of 25 to 27 thousand revolutions per minute without vibration makes it possible to do all kinds of fine work such as carving, grinding, engraving, drilling, routing, etc., with a Dremel Moto-Tool and to do it in a jiffy. Two models to choose from—No. 1 as shown, only \$9.85 and No. 2 for heavier work only \$16.50. Indispensable for home work shop fans, sportsmen, handy men and home owners. Many improvements not found in other tools. If your dealer is out of stock write for complete description, 10-day trial offer and booklet showing dozens of accessories which can be used and special combination offers. No obligation, booklet is FREE.

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Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store

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SENSATIONAL MOTOR TUNE-UP!

ONE Fretone application frees sticky valves and piston rings—releases Carbon—restores PEAK ENGINE COMPRESSION. Effective "Upper Lubrication." Assures clean, longer-wearing motor. Saves oil, gas, money. Write for special trial sample—send only \$1.00. Distributors wanted. Write for details. **J. W. SPEAKER CORPORATION, Dept. P-2, 1655 North Water St., Milwaukee, Wis.**



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The Webb Portable Water Softener gives every housewife, soft water in an endless flow for washing dishes, laundry, bath, shampoo and every home purpose. Softens hardest water instantly at the turn of the faucet. Provides healthful drinking water equal to many expensive bottled waters.

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TOMGUT "Court-Tested" Tennis & Badminton Strings



(Continued from page 137A)

speaking, it implies control of any or all the physical qualities of the air. More specifically, it includes the simultaneous control of temperature, humidity, movement, and purity of air within an enclosure.

The centrifugal refrigeration machine contributed in a great measure to the application of air conditioning in large buildings. The safety of the refrigerant, simplicity of operation, economy, and compactness make possible efficient large tonnage installations in a limited space. Development of Freon, a gas with the property of rapidly giving off heat under pressure and rapidly absorbing it when pressure is released, and other refrigerants opened the way for the design of small machines of the reciprocating type for about half the cost of the ammonia machines formerly used.

There are two phases to the process of home air conditioning. The first, in winter, requires the addition of heat and moisture, while the second in summer involves the removal of excess heat and moisture from the air. Not much emphasis has been placed on winter conditioning but we believe it to be the more important of the two. We've found colds are caused not by low temperatures but by improper temperature distribution.

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Gentle exercise for the body is the purpose of an electric bed offered for hospital or home use. As the body turns on the moving sheet, rhythmic and deeper breathing can be practiced. The motion also induces light exercise of the muscles and tissues.



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for racers, large & midget autos, cycles, boats, aviators, firemen. Race rules require them. Play safe, wear one. Catalog FREE.

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(Continued from page 3)

to bring it up to fighting grade. It is even possible, by recycling raw gasoline through the catalytic still, to reform it into a base fuel that has an octane rating as high as ninety-one before other treatment.

Catalytic cracking apparently solves another big refining problem. In the past large quantities of heavy fuel oils and asphalts were unavoidable by-products in the manufacture of gasoline. The refiner had to sell them or store them until he found a market. Today he can feed them into a catalytic cracking still and convert them into high-grade gasoline and light furnace oil without any residual waste. Within limits he can control the proportions of the products that he obtains.

The implications of this new process are much wider than merely providing an inexpensive high-octane motor fuel for today's cars. By making higher grade fuel available at a reasonable price, catalytic cracking opens up an entirely new horizon in automotive engine design.

Every one knows that the efficiency of a gasoline engine depends upon its compression, the degree to which the fuel charge is compressed before it is ignited. Since 1931 the maximum brake horsepower in the automotive field has increased sixty-two per cent while displacement has increased only three per cent. That means that more than half as much power again is developed in substantially the same engine, due to increases in compression pressures. The part that the petroleum industry has played in this advance has been to provide fuels of high anti-knock value that would not detonate at the higher pressures. To a great extent high compression has had to wait for the proper fuels.

Until recently the indications were that anti-knock fuel had reached a level in octane rating above which it was impractical to climb because of higher costs. That threatened to halt the design of efficient engines using higher compression ratios.

Now that high-compression gasoline can be manufactured at non-premium prices automobile engine manufacturers will be able to build engines of higher compressions that will take full advantage of the new fuel. Tetraethyl lead probably will

(Continued to page 142A)

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(Continued from page 141A)

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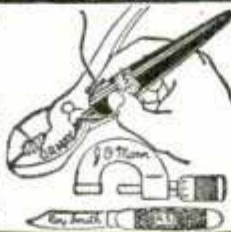
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still be used with catalytically cracked gasoline to raise its octane value even higher, further increasing the range of engine design. It is estimated that an automobile engine designed to take full advantage of 100-octane fuel would be about half the size of one of today's engines, would deliver the same flashy acceleration and high speed, and would be forty per cent more economical in its use of fuel.

Aside from improving the quality of gasoline, every forward step in refining helps to put off the day when the world's petroleum resources will be used up. It is estimated that thermal cracking alone, by extracting more gasoline than otherwise could be obtained from petroleum, conserved one and a quarter billion barrels of crude oil in such a representative year as 1935. By supplying more gasoline from a smaller amount of raw material catalytic cracking likewise promises to reduce the rate at which crude oil is consumed.

More and more, petroleum refining is approaching the status of a true chemical industry. Ethyl alcohol, sulfuric acid, rubber substitutes, pickling agents, anti-freeze liquids, paint and lacquer compounds, and various plastic resins are all being manufactured from crude petroleum. As a consequence of the new developments new words by the dozen are being added to the refiners' language. Terms such as alkylation, isomerization, tri-isobutene, and methylcyclopentane are a few of the jawcrackers the refiners are learning. Gasoline, of course, remains the important product of the refinery. If necessary a great quantity of 100-octane motor fuel could be manufactured from the various gases that are by-products of cracking.

Other catalysts are being sought that will make it possible to convert petroleum into many other products on a more efficient basis than in the past.

Twenty-four years ago it took 1,325 pounds of passenger-car engine to develop sixty-five horsepower. A modern midget racing engine weighs 205 pounds and develops 150 horsepower. High-octane gasoline plus high compression plus supercharging makes this possible. Today's passenger-car engine is not as efficient as the racing engine, of course, but this comparison shows the progress already made and gives a hint of what the future holds.

Thrill Makers of '39

(Continued from page 11)

conventional aviation strap. He keeps the plane under full control until crash time. If he were to cut off his motor in advance, he's certain he'd be picked up in a wicker basket.

Just before ripping into the flimsy structure, he ducks; one arm goes up to protect his face, and the other is braced against the dashboard. A few of the pointers he's picked up would be helpful to regular pilots, he feels, if ever they had to make forced landings in suicidal surroundings.

There's never a dull moment when Dick Granere entertains fair crowds. From an altitude seldom above fifty feet he runs the



For a comedy thriller Dick Granere demonstrates how not to fly by hurdling parked cars on his course

gamut of stunts ordinarily performed at 1,500 feet. For comedy, he demonstrates how not to fly by dragging the plane's wings on the ground, leapfrogging over motorcars, and winding up with a tailspin starting at 300 feet.

His most noteworthy act is flying through a target at one end of the grandstand, pulling his plane into a loop and on the way down, with the ship in a half roll, flying through the second target. The rims are left standing, the targets shattered. The targets are forty feet in diameter and the Canadian war ace allows himself but a few feet for wing clearance.

Take a look at Arzeno E. Selden, who does what is said to be the highest trapeze and swaying pole acts in the world. Life in the "stratosphere" didn't begin for him until after he had passed the forty-year mark, even though he had for thirty years been a daring young man on the trapeze.

On a bar ninety feet off the ground, he balances himself on a kitchen chair and

(Continued to page 144A)

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(Continued from page 143A)

does a half-dozen other acrobatic turns before shinning up to the top of the 130-foot pole to do handstands while the pole sways in a twenty-five-foot arc. In the awful hush that settles over the crowd as he starts his hand balancing, the crack of a peanut shell sounds like an explosion and when he returns to the ninety-foot perch and puts a strap in his mouth for a slide down a 500-foot rope, the spectators feel as if they have been pulled through a wringer.

Selden's big trouble was not in getting up his courage but in finding the proper rigging. He consulted professional equipment builders but none could suggest ma-



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(Continued to page 146A)

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(Continued from page 144A)

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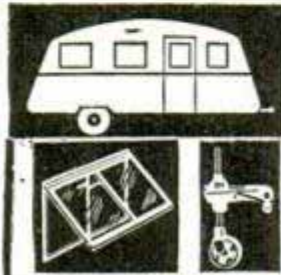


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MEAD GLIDERS, 15 So. Market, Dept. B-79, CHICAGO

ground that injured her severely, but these did not deter her from working out this thrill-packed novelty.

Where do the thrill-makers get their ideas? Everywhere. Jimmy Lynch, in talking to a number of people found almost all of them took a melancholy pleasure in seeing motorcar crashes. He decided to capitalize on this human foible by organizing a circus of stunt drivers who could stage head-on collisions, drive through flaming barriers, do high-speed roll-overs, and put cars over the jumps. His coterie is always in demand.

The ability to think quickly in an emergency is a quality every thrill-maker needs. A classic example of this occurred during a performance by the Balancing Wallendas on a high wire. They were doing one of their top-heavy, quivering pyramids when everything toppled. Balancing poles and a chair dropped into the arena. Two of the Wallenda brothers caught the foundation wire neatly. Another brother managed to grasp it with one hand, caught his sister, Dorothy, who was falling clear of any support, with his legs, and squeezed her in a scissors until a safety net was summoned. He then released his hold, not realizing he had strangled her unconscious. She revived quickly and soon was back in the act.

Despite the fact that thrill makers are supposed to have ice water coursing through their veins, there's one phase of their work they are reluctant to discuss. During a season, a performer for no apparent reason will falter on a stunt he's been doing for months. Just why, no one knows; but two or three bobbles and a performer becomes chary of a turn. As a result, he has to quit for a while or his career may end abruptly. A number of troupers have been killed by forcing themselves to do a stunt against an inner voice that tells them they'd better not.

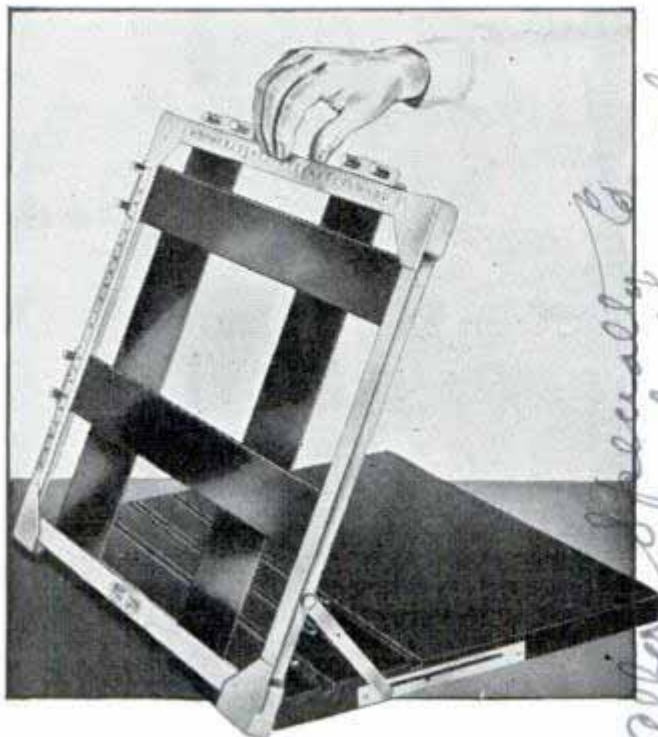
Others, too, at the peak of their careers, suddenly do a fade-out. Why? No special reason, but just a feeling death is about to catch up with them.

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2436

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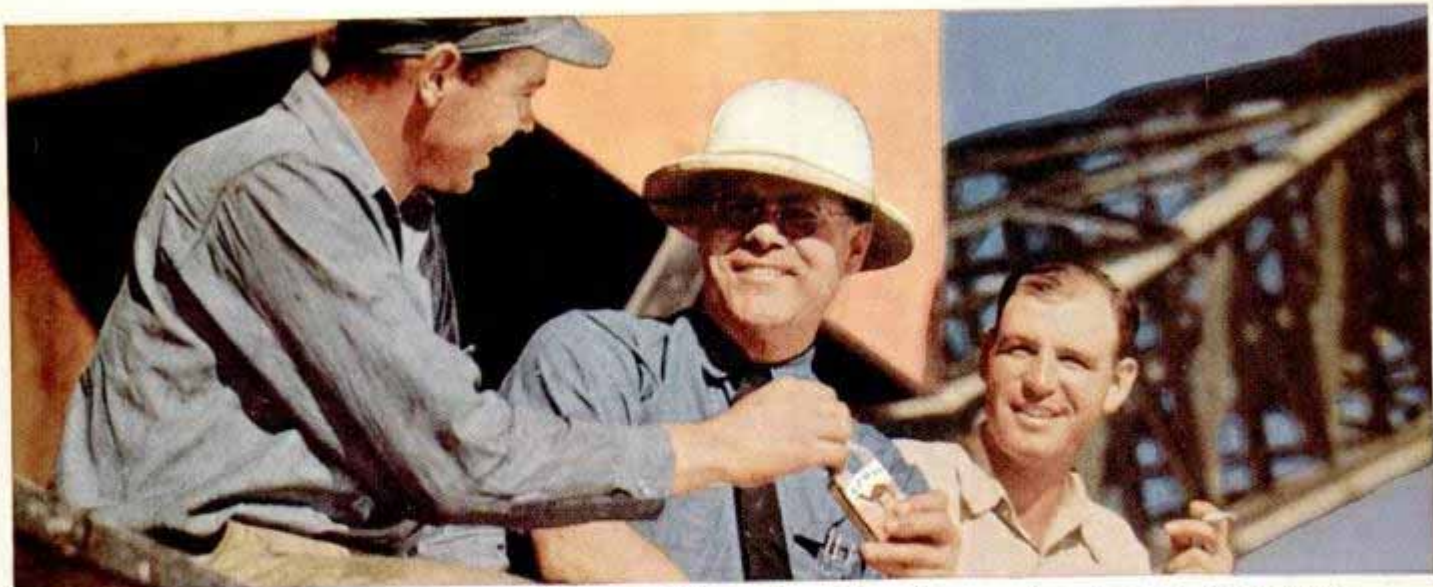


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