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# POPULAR MECHANICS

MAGAZINE

YOU CAN UNDERSTAND IT

REG. U.S. TRADE MARK, GREAT BRITAIN, NO. 415428

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**JULY**  
**25 CENTS**

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# CONTROLLING HEAT FLOW in Spark Plug Insulators

The control and distribution of heat, which determines the "heat range" of the spark plug is a most vital factor in determining resultant engine performance.

A wide variety of lengths and shapes of the traditional conical shaped core was necessary to meet the wide variety of engines and types of service found in modern motor cars. "Hot" plugs for "cold" engines and "cold" plugs for "hot" engines is the rule applied to this well recognized ignition problem. Champion research, engineering and manufacturing science combined to find a solution to this vexing problem. An exhaustive study produced the patented Champion Extra-Range insulator—the only patent of its kind—which accurately controls and distributes heat inherently by virtue of basic insulator shape.

This unique shape automatically controls and distributes heat with such precision that it provides perfect ignition beyond the point where failure occurs with ordinary spark plugs. Heat flow in area (1) is controlled by the scientific shape so it is *always cool enough* to prevent over-heating and pre-ignition. Heat flow in area (2) is likewise controlled by the scientific shape so it is *always hot enough* to prevent carbon and oily deposits which eventuate in fouling.

Only Champions have the patented Extra-Range insulator of exclusive sillimanite. In some types the Extra-Range shaped insulator is not used because it is not necessary, but in every case Champions afford heat ranges or thermal ratings beyond any necessary requirements for specific engines. Remember to insist on Champions for better performance in every engine.

**CHOOSE THE SPARK PLUGS  
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# CHAMPION EXTRA-RANGE SPARK PLUGS

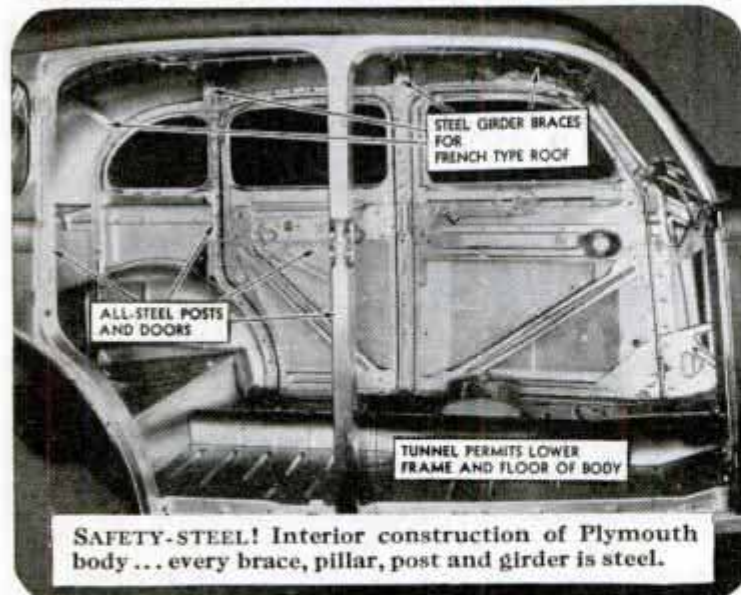
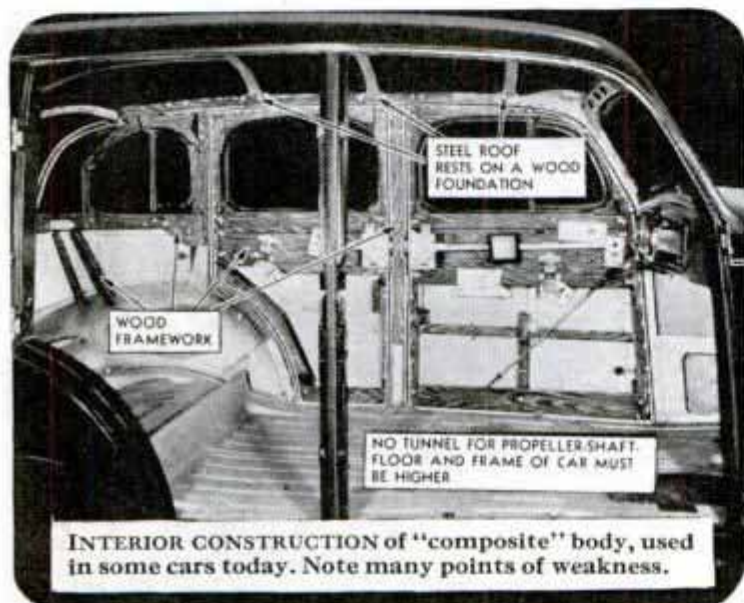


# Steel for Safety!

BUT BE SURE  
IT IS STEEL!



ACTUAL NEWS PHOTO of runaway car that fell on a Plymouth but couldn't crush Plymouth's sturdy Safety-Steel body.



(Right) How "COMPOSITE BODY" DOOR looks (left picture) ... contrasted with all-steel construction of a Plymouth door (right picture). That all-steel, cross-sectioned Plymouth door doesn't loosen up ... sag ... or get the "rattles."

TUNE IN ED WYNN, GRAHAM McNAMEE AND ALL-STAR CAST, TUESDAY NIGHTS, N. B. C. RED NETWORK

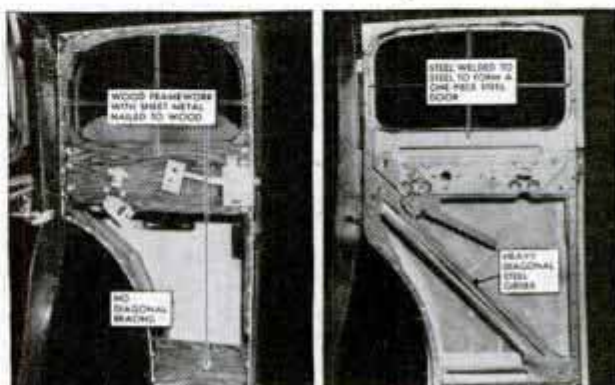
## Engineers Explain Safety-Steel Construction of Modern Automobile Bodies that Gives Most Protection

THE STRUCTURAL "INSIDE" of your automobile body is a very important factor in motor car safety. These pictures show how Plymouth's Safety-Steel body is a perfect example of maximum protection.

This beautiful Plymouth body is, structurally, all of steel. Steel posts, braces, panels, doors, window-frames ... all welded into one unit. Plymouth's body interlocks with the big car frame ... is bolted to it both up-and-down and across ... giving tremendous reserve strength and rigidity.

Of "All Three" only Plymouth has both Safety-Steel body and Hydraulic brakes. "Look at All Three" low-priced cars before you buy. Plymouth's priced with the lowest ... \$510 and up, list at factory, Detroit (special equipment extra). And it's EASY TO BUY ... terms from \$25 a month. Chrysler, Dodge or De Soto dealers.

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# Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

July, 1936

Vol. 66, No. 1

## Special Features

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## New Tasks for Glass

TO MOST of us, glass is just a hard, brittle, transparent substance found in windows, milk bottles and drinking tumblers. If that's your idea of glass—then glass isn't glass any more. Science has taken one of the oldest man-made products, given it new characteristics and changed it into forms which look and behave like almost everything under the sun except glass. Glass wool looks like cotton, another form of glass stretches like rubber, a third absorbs the heat from the sun and a fourth admits the healthful ultra-violet rays. Each is glass but each is a different kind of glass designed for a particular task. Turn to the Coloroto section in August for the first of two articles describing the new roles in which glass is appearing today.

## Next Month

NEW industries and extensions of old industries are resulting from recently discovered uses for rare metals because it has been found that some of these metals can do certain jobs better than any of our common ones. An article next month tells how these rare metals aid industry and describes the search for new and simpler ways of extracting them.

## The Brainstorm Boys

MODERN radio broadcasting is replete with examples of the resourcefulness, daring and hair-trigger thinking of the men who handle the big news breaks and special programs for the networks—the "brainstorm boys" the announcers and engineers call them. Eye witness accounts of federal agents surrounding a gang lair, word pictures of dust storms, stratosphere flights, floods and fires—these are but a few of the programs brought to radio audiences by the brainstorm squad. Read the story of their accomplishments in the August issue.

## Camping in Comfort

THERE are so many new tricks to the game of living outdoors that you can now go camping and live a life of comfort and even of luxury. Next month Bob Becker describes new and inexpensive camping aids that will add to the pleasure of your summer outing.

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This One



KDDK-RTR-480E



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the water,



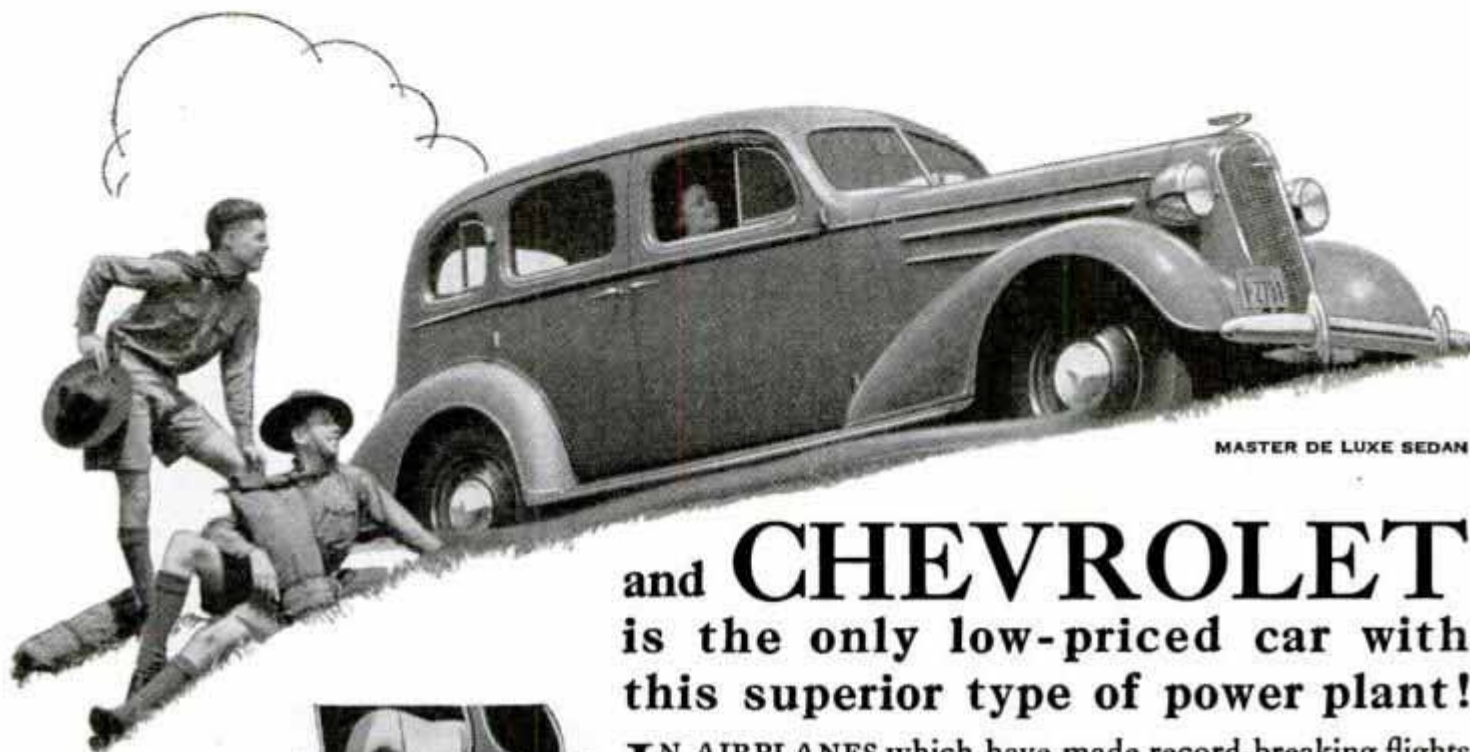
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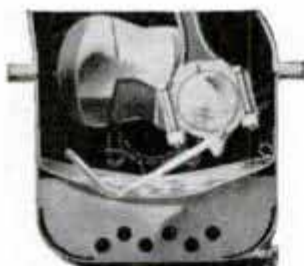
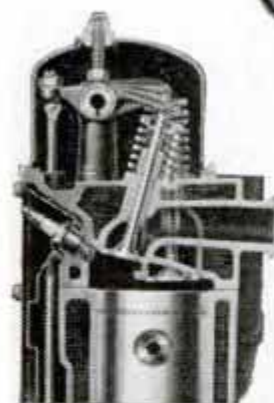
*\*Available in Master De Luxe models only. Knee-Action, \$20 additional*

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# Business Demands Accountancy

## —because Accountants Command Business

**A**CCOUNTANTS have been in demand—at far better than average earnings.

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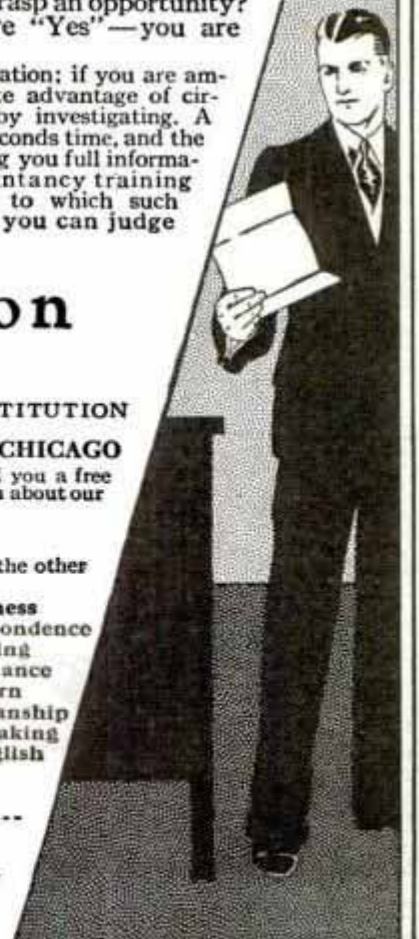
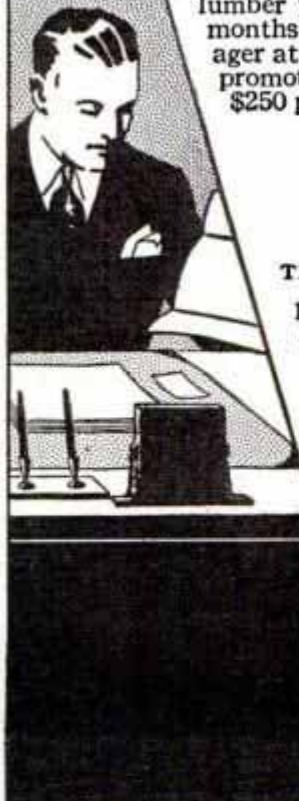
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Melvin Purvis, former G-Man, employing the instrument used to determine the gun from which a bullet was fired

# Getting the Drop on Public Nuisance No. 1

by Melvin Purvis

Former G-Man and Nemesis of Gangdom

WHEN the rataplan of gunfire hushed, Public Enemy Number 1 lay sprawled on the street. This gangster's swift justice marked the end of one of the most vicious gangs in history. And in this spectacular man hunt, scientific skill and close attention to detail played leading parts.

These are the similarities between the manufacture of Gillette Blades and crime detection, although I didn't know this until my recent inspection of the Gillette factory. I couldn't imagine the scientific skill, and tremendous care that is lavished on the Gillette Blade.

At the Gillette factory I saw wonders that a non-scientific mind cannot grasp. The automatic control mechanism on the electric hardening furnaces positively awed me. In these furnaces the world's finest steel is treated with more heat or less heat as required for utmost uniformity with the correct standard.

I was greatly impressed with Gillette's constant use of the microscope to assure perfection in the finished product. I marvelled at a photoelectric device which measures the sharpness of the blade edges, and the huge grinding machines which weigh four tons each and can be adjusted to a fineness of 1/10,000 of an inch.

Actually a man leaves the Gillette plant with a feeling of gratitude to these experts who have the drop on Public Nuisance No. 1—these Gillette scientists who have made the removal of unsightly bristles so much easier and more comfortable for every man.

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**GILLETTE SAFETY RAZOR COMPANY, BOSTON, MASS.**

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# Snap out of it!

## The depression's over

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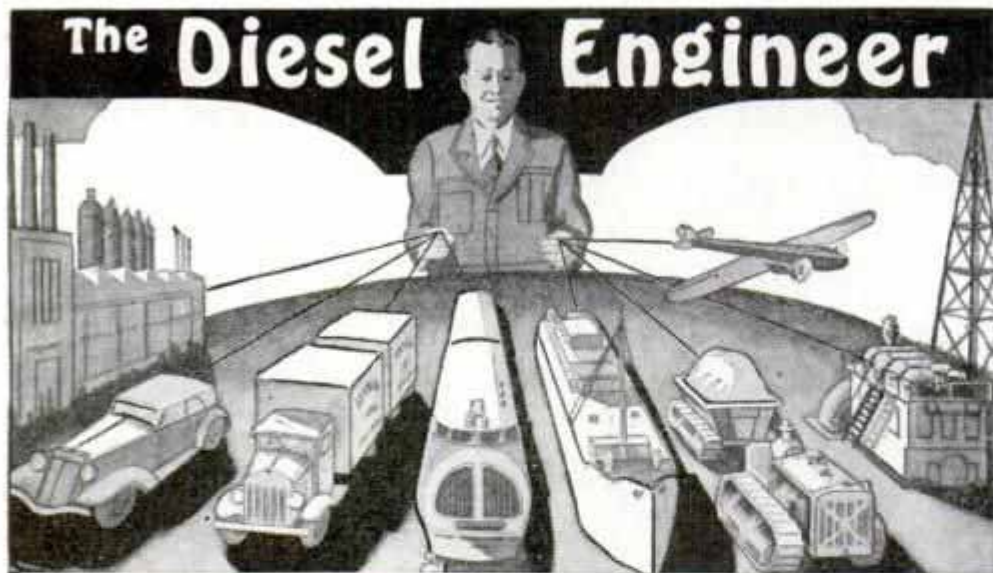
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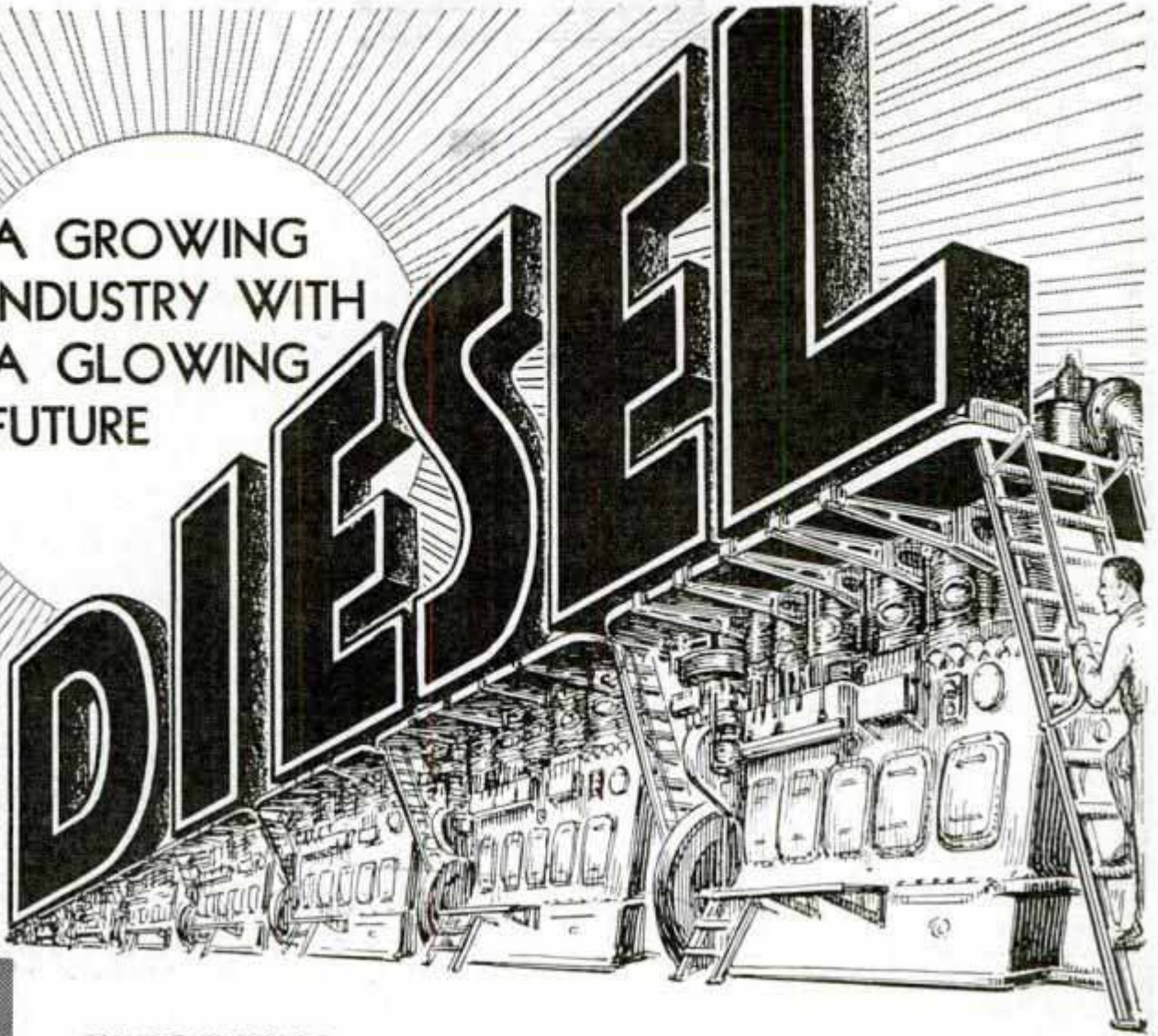
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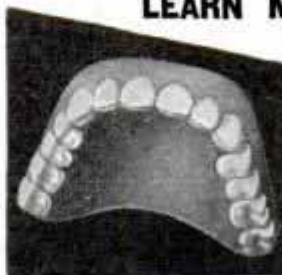
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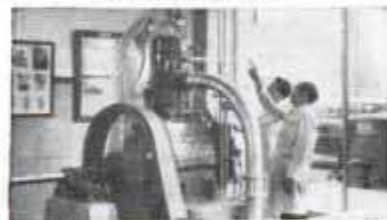
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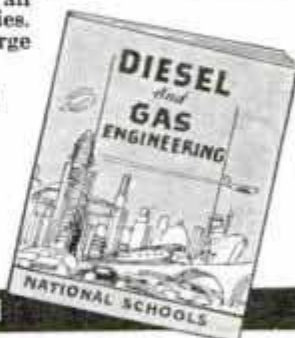
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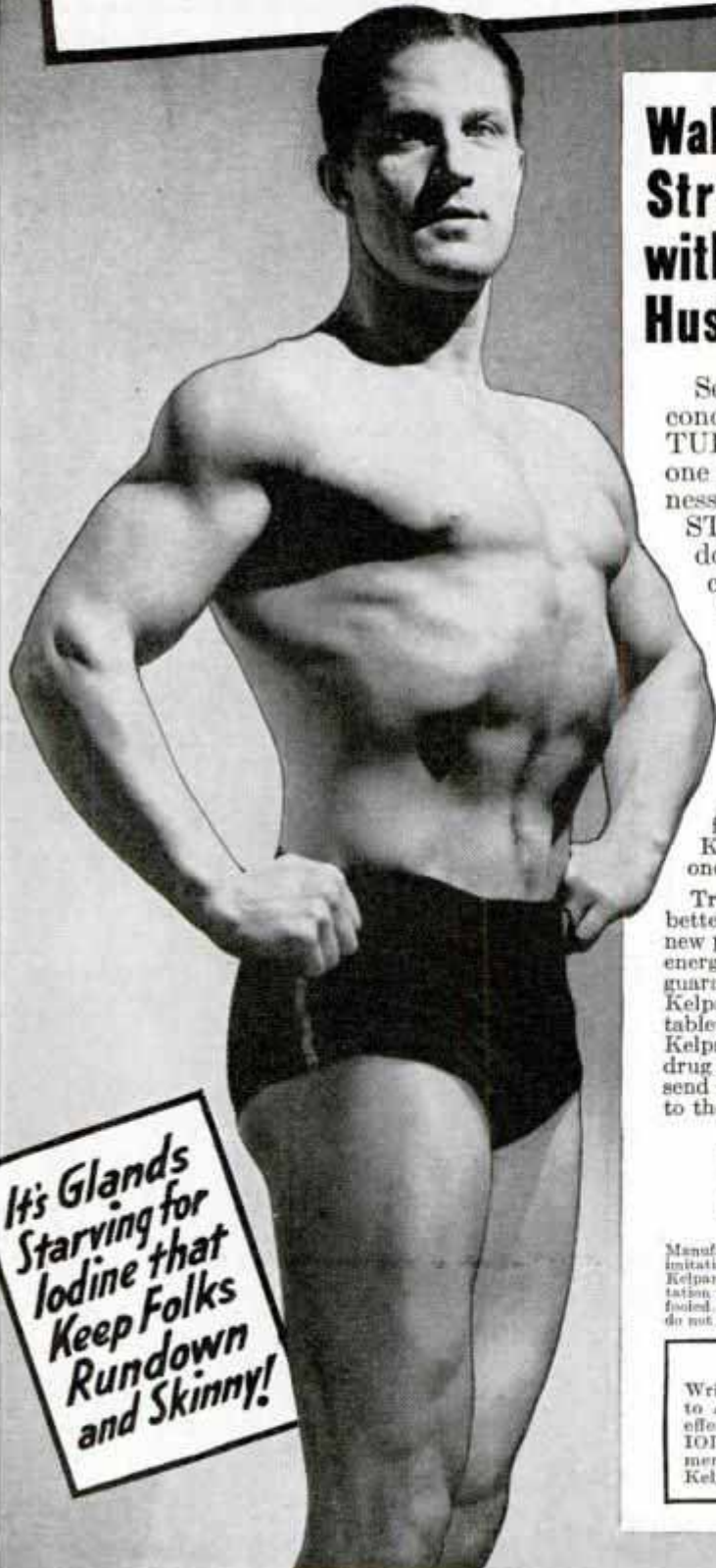
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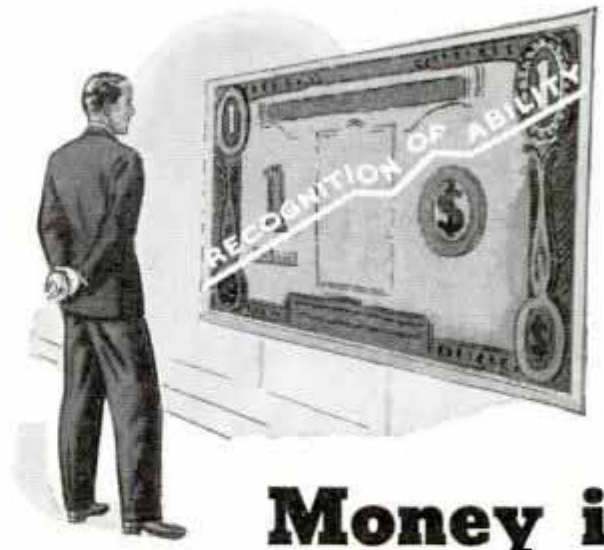


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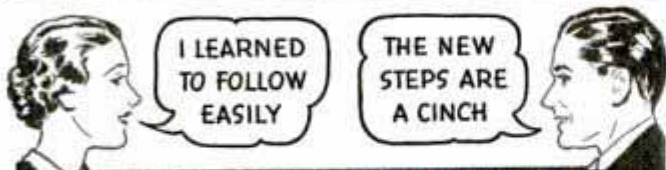
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(Continued to page 34A)



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(Continued from page 30A)

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SONGWRITERS! Poems, melodies. Special offer. Studio PM, Guaranty Bldg., Hollywood.

USED—Rebuilt nationally known instruments. Bargain prices. Supply limited. Write at once for information. Tom Brown Music Company, 315 South Wabash, Chicago.

POPULAR Piano, complete course \$2.50. Kelly School of Modern Music, 942 Market Street, San Francisco.

SONG Poems wanted immediately. Year's greatest opportunity. Established 1916. Weston Studios, 709 Broad, Endicott, N. Y.

I PAY Cash for songs, poems or music. James W. Earle, Station F, Box 115, New York.

SONGS Published, arranged and composed, royalty basis. W. Coast Music Pub., 942 Market, San Francisco.

SONGWRITERS—Get all inside facts. Free booklet by famous Broadway composer. Songwriters Institute, 1234C Broadway, New York.

ADELMAN Bros. Music House, Atlas Building, Washington, D. C., are now accepting song poems worthy of publication.

MANATYPE Prints music by hand. A practical, guaranteed necessity. Only \$2.00. Manatype Co., Ft. Wayne, Indiana.

SONG-WRITERS. Professional phonograph record of your song. Musical arrangements. Free information. Paramount Song-Recording Studio, J-6, Box 190, Hollywood, California.

90 FAVORITE Cowboy songs, 25c (coin). Empire Novelties, Peterboro, Canada.

SONGWRITERS! Don't be misled by promises. Professional writer will give you honest help. Larry Conley, Suite 412P, 1595 Broadway, New York.

SONGPOEMS Wanted. Your song published. National Songland, "PM," Thomaston, Maine.

SONGS! We compose, arrange, publish, sell. Superior Song Studios, 211 Hope Ave., Passaic, N. J.

EARN Your own musical instrument. Get free details and free attractive savings bank at your music store, or write Fred Gretsch Mfg. Co., 521 1/2 So. Wabash, Chicago.

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

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

NEW Deal. Write Sequoia Songwriters Service, Sherman Branch, Los Angeles, Calif.

SONGWRITING. Good money being made from songs through talking pictures, radio, phonograph, music publishers. "Hit" writers revise, arrange, compose music to your lyrics. Lyrics to your music. We submit to studios and other markets. Free reading. Send for booklet. Universal Song Service, 671 Meyer Bldg., Hollywood, Calif.

"1,000 WAYS To Make \$1,000.00." You can do it—others have. This new amazing book will startle you. 475 pages only \$2.50. Popular Mechanics Press, Room (C36), 200 E. Ontario St., Chicago.



## BUSINESS OPPORTUNITIES

**INVENTORS:** Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-seven years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 802-H Victor Building, Washington, D. C.

**PAINT** Manufacturer wants distributors fast seller. Big profit. Artist Color Company, Detroit, Mich.

**LEARN** Marbleizing: With snow-white composition. Imitates marble perfectly and cheaply. Learn flexible mold making with our rubber composition. Equals rubber. Free instructions mold making and marbleizing. Profitable business for young or old. Send dime for sample rubber mold and marbleized cast. Cowell Institute, Grayling, Mich.

**BE A** perfumer. Make and sell from home. All wholesale to others to sell again. Some mail business. Easy to learn, big profits. Hardly any capital. All or part time. Men or women. Send today for free literature. Call-Blossom Perfume Syndicate, 125 W. Main St., Alhambra, Calif.

**MAKE** Fast selling products at home. Formula catalog free. Kemico, 210, Park Ridge, Ill.

**BIG** Profits selling by mail. Home. Spare time. Outfit furnished. Leaderbrand, R-2-1, Springfield, Missouri.

**\$10** STARTS Own business resilvering mirrors. Experience unnecessary. Learn chromium plating. Write Sprinkle, Plater, 127, Marlon, Indiana.

**SUCCEED** With our advertising plan. Profits repeat. Send dime. Carey's Advertising Service, Welmar, Texas.

**FREE** "Folder of Opportunities." Write Fairmont, 9 Hester, New York.

**MAIL** Business. Start small. Everything furnished. Free details. Metromails, P-7, Cincinnati.

**MONEY** In mushrooms! Grow them now, in cellar or shed. Exclusive new process. Bigger, better, quicker crops. We buy. Book free—write today! American Mushroom Industries, Dept. 650, Toronto, Ont.

**14** FORMULAS National advertised products \$1.00. Life of "Will Rogers" \$1.15. "Air-King Radios," 4 tubes \$14.00. Lego Sales, Wadsworth, Ohio.

**\$15** STARTS You in big business. Print posters, showcards, displays, novelties, textiles in beautiful colors without machinery. Print on any surface. Surprising production. Book of instructions with twelve monthly magazines, \$1. Particulars 10c. Standard Color & Chemical Co., 749 - 6th Ave., New York.

**BIG** Profits operating "route" penny peanut and gum vending machines. Start with \$100. Robbins Co., 1141P DeKalb Ave., Brooklyn, N. Y.

**MRS. M.** earned \$267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848-A61 Lincoln Ave., Chicago.

**NOT** Colossal, not stupendous, just ordinary sensible offers. My circulars convince you. George Walker, SPP School St., Brunswick, Maine.

**YOUR** Own business making cosmetic creams, lotions, powders, etc. Free formula and details. Tanti Laboratories, Milltown, N. J.

**100** BLADES 50c. Catalog. Wilson, 1518 Commerce, Little Rock, Arkansas.

**"FREE** Instructions." Write for free 10-page booklet on making beautiful fast-selling novelties, bookends, plaques, etc. Big demand! Big profits. Stewart's Studio, 2102 West 19th, Chicago, Dept. P85.

**WE** Start you in business, furnishing outfits and instructions, operating "Specialty Candy Factory" home. Men and women, earn \$25.00 up to \$75.00 weekly, all or spare time. Booklet free. W. Hillier Ragsdale, Inc., Drawer 4, East Orange, N. J.

**EXTRA** Money! Every week. Practical home mail order business. Clenco, Box 17, Verdun, Montreal, Que.

**I** HAVE Taken over \$5,000 from the mails since January operating simple mail order business sending letters and literature to special class of people I will tell where you can obtain the names of these people. Further information \$1. Tom, Box 171, Bellwood, Penna.

**SUCCEED** With your products. Make-sell them. Learn how. Formulas, Processes, Analyses. Catalogs, circulars free. B. Thaxly Co., Washington, D. C.

**LIQUID** Silver—Just dip—It plates! Brilliant, durable. Particulars free. Metalcraft, Arcade Building, St. Louis, Mo.

**INTERESTED** In owning profitable mail order business, requiring very little capital? Write today for full free particulars. Research Bureau, Box 193A, Pomona, California.

**DISTRIBUTORS,** Salespeople—Lifetime opportunity with "Glaz-O-Wax," America's only dustproof, weatherproof auto-polish. \$1.00 sample \$.50. Specialty Laboratories, Hammond, Ind.

**START** Home mail order business. Instructions 25c. Edco, 506 Thatford Ave., Brooklyn, New York.

**BE A** publisher on \$1 capital. Sample copy and particulars, 10c (coin). Parker Publications, Peterboro, Canada.

**PLAN** For the unemployed. Literature 10c. Thornton, Box 1184, Long Beach, Calif.

**HERE** is your chance to make a good living. Due to other interests, I will sell the plans of my small business. My income from this plan during past year was over \$5,000.00. Complete plans are \$1.00. Arnold Gayne, Dept. 1C, 20 Terrace Rd., Franklin, N. H.

**"LORD'S** Prayer" engraved on your penny will average you \$75.00 per day. Price of machine complete, \$150.00. Send 10c for samples and facts to "Blue Dot" Stamp Co., 124 E. Larned St., Detroit, Mich.

**CALIFORNIA** Vegetable concentrates, powders, tablets, vitamins, making fortunes. Mail order, local. Samples 12c. Gardena Laboratories, Drawer 1310B, Hollywood, Calif.

**24** WAYS To make money 10c. Business Builders, Hanover, Mass.

**STORAGE** Battery recharging compound, long life, rapid charge. Booklet free, chargers wanted. Omoto, 2819 Hyperion, Hollywood, Calif.

**\$1.00** MONTHLY Opens New York office for business and personal purposes. Established 15 years. Co-Operative Mail Service, 126 Lexington Avenue.

**BARGAINS**—Paint spray outfit, gasoline engine drive. Terms—trial. Helmick Paint Spray Exchange, M-764, Troy, Ohio.

**"SUCCEED** Through Tree Surgery." Get particulars. Gulick School, Lambertville, N. J.

**INCREASE** Your income. Sample copy of Income Increaser, devoted to making money quickly and honestly. Ten cents. Income Increaser, 177 State Street, Boston, Mass.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD-1142 Sunny-side, Chicago.

**EARN** Money: Learn corresponding for newspapers and magazines. Write Publishers' Service Bureau, 4258F Drexel, Chicago, Ill.

**BEST** Mail order propositions from everywhere, full year 10c. Scott, 933 Hickory, St. Louis, Mo.

**FREE:** "Mail Order Success." Mail Order Research, 26 South Logan, Trenton, N. J.

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

**BRINK'S** Trade Directory—The most complete ever published for salesmen, agents and mail order dealers. Price 50c. M. Devine, 820 M. Wrightwood Ave., Chicago, Ill.

**IF** You have some time you would like to use operating rug making machine at home, and want big wages besides profit on rugs, ask for proposition. Easy, pleasant, profitable. Work when you like. Materials had everywhere. Send today for offer. C. Old American, American Trust Bldg., San Leandro, Calif.

**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 South 21st, Philadelphia.

**1,000** WAYS To make money in sparetime. Every plan a winner. Literature free. Franklin Publishing Company, 800 North Clark Street, Dept. 2304, Chicago.

**MAKE** Products yourself. Tested formulas—catalogue free. Grinstead Laboratory, Edwardsville, Illinois.

**COMPLETE** Chemical service. Analysis, formulas, processes, trade secrets. Thirty years experience. Particulars for stamp. W. L. Cummings, 228 Gordon Avenue, Syracuse, N. Y.

**MONEY**—Easily earned—No canvassing. Details for stamp. El-Ray Company, Broad Street Bank Building, Trenton, N. J.

**TURN** Spare time into cash. Home work. Profits enormous. Many live opportunities. Details for stamp. Sockel, PM 734 South St., Philadelphia, Pa.

**BIG** Mail 10c. Milton Boss, 2007M 34th St., Rock Island, Ill.

**"TURN** Ideas into cash." Free details. Martinez-PM, San Bernardino, Calif.

**MAKE** And sell your own products. Employ agents yourself. We supply formulas and full instructions for making toilet pre-household specialties. Valuable booklet free. arations, perfume, flavoring extracts, soap. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**POPCORN** Poppers, roasters, kettles, new, used. Salesmen wanted. Northsyde, 2117-Harding, Des Moines, Iowa.

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

**"SCHEMER** Magazine," Alliance, Ohio, prints schemes, ideas, business starters, formulas—big winners; \$10,000 to \$50,000 reported. 38th year; \$1.00. Trial special: Six months only 30c.

**FREE** Plans, books, circulars. Make thousands of dollars selling by mail. Home. Spare time. Mail Order Institute, 193-H Tompkins Ave., Brooklyn, N. Y.

**LIQUID** Marble—Anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

**LEARN** Account collecting. Good income, quick results. Interesting booklet free. National Collectors Assn., Newark, Ohio.

**FREE** Plans, books, circulars. Make thousands of dollars selling by mail. Home. Spare time. Mail Order Institute, 193-G Tompkins Ave., Brooklyn, N. Y.

**ARTIFICIAL** Marble sanitary flooring, instructions covering wood or cement flooring ½ 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.

**PLASTEX** Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1936 business. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

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

**GET** Lots of mail. Money making offers, etc. Your name in 10,000 directories, 25c. Roseco, 4627 Glenshade, Cincinnati.

**START** Little business anywhere. Everything furnished. No canvassing. Maywood, PM-923 Broadway, New York.

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

**SELL** By mail. Books, novelties. Bargains! Big profits. Particulars free. B. Elfeo, 525 S. Dearborn, Chicago.

## MONEYMAKING OPPORTUNITIES

**PATENT** Your idea—Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-seven years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 803-H, Victor Building, Washington, D. C.



**IMPORTING.** Wholesale sources lists over three million items. 25c postpaid. Supplies, Box 451, Manhattan, Kans.

**PRESIDENT Roosevelt relief bust plaque** rubber composition mold and marbled cast. Cowell Institute, Grayling, Mich.

**IF** You did not see our full page advertisement in June Popular Mechanics write for our big money maker for agents. Progress Distributors, D-A, 1 East 43rd Street, New York.

**END** That depression! Make \$1.00 bottle vanilla for 4c! Fifteen valuable extract formulas that have made fortunes for others, with complete plans for starting well-paying business on \$5.00! Send \$1.00 only. Satisfaction guaranteed. National Trade Mart, East Hartland, Conn.

**EARN** Excellent commissions. Free supplies. Henry, 126 Lexington, New York.

**SENSATIONAL** Two-bit mail order plan 25c. Particulars free. Benton, 183 Chestnut, Liberty, N. Y.

**MAKE** Extra money. No canvassing, wonderful opportunity. Plan 20c. McConnell, 1619 Edgewood, Racine, Wis.

**10c BRINGS** Copy National Mail Order News, Box 1773-PM6, Roanoke, Virginia.

**SUCCEED** With your products. Make-sell them. Learn how. Formulas. Processes. Analyses. Catalogs, circulars free. B. Thaxly Co., Washington, D. C.

**PLANS** Others ask dollars for, 10c. Hartman, 2438 W. Lincoln, Nebr.

**LEARN** Sign painting at home. Be independent. Earn \$50 to \$100 weekly. Particulars free. Pomeroy Service, 1121 7th St., Des Moines, Iowa.

**"HOME** Factory." Make and sell 101 useful things. 50c. Elyte Supply, Linden, N. J.

**BIG** Money at home plating auto parts, reflectors, mirrors, chandeliers, by late method. Experience unnecessary. Free particulars. Gunmetal Co., Ave. N., Decatur, Ill.

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

#### FORMULAS, PLANS, ETC.

**6 PINTS** For a quarter. Make finest shaving lather cream from materials obtained any town. Formula. Opportunity Bulletin, 10c. Waldo, Box 266, Dallas, Texas.

**GUARANTEED** Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 33, Park Ridge, Ill.

**A FREE** Sample copy of Income Increaser given to each person sending 18 cents for our collection of 500 money making formulas and trade secrets. Income Increaser Magazine, 177 State Street, Boston, Mass.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD1142 Sunnyside, Chicago.

**500% PROFIT.** Make, sell to stores, colored pencils that write on glass, 5 colors. Formula 30c (coin). Colonial, Box 75, St. Catharines, Ontario, Canada.

**ANY** Formula \$.50, three \$1.00. Cole Laboratories, Bryant Pond, Maine.

**GUARANTEED** Formulas! The kind that pay! A. Terrone, 22 Station S, Brooklyn, N. Y.

**GLASS** Working formulas, etching, drilling, etc. \$1.00. Baic, 1150 Leonard Ave., St. Louis, Mo.

**"DICTIONARY** Of Fireworks" just published, 150 pages, 200 illustrations, formulas, \$5.00. Geo. W. Weingart, New Orleans.

**BEAUTIFUL** Lovely complexion. Formula one dollar. Polk Agency, Franklinton, La.

**EXTRAORDINARY**—Wealth using formulas. Large catalogue free. Brown's Formula, 212 East Waters, Tampa, Florida.

**FORMULAS:** 110 Unusual money-making opportunities. Less than 1c per formula. Particulars free for stamp. Tri-City Service, Box 151, Davenport, Iowa.

**FAST** Sellers analyzed. Duplication guaranteed. Write. Associated Chemists, Indianapolis, Indiana.

**GUARANTEED** Formulas—Simple, inexpensive methods of creating miracle products. No education necessary. Dime for list of 123. Special foot comfort secret, 25c. Hornig Consolidated Service, Elizabeth, New Jersey.

**ANY** Formula three dimes or money back. Catalog free. Ogg Laboratories, Tampa, Florida.

**SUCCEED** With your products. Make-sell them. Learn how. Formulas. Processes. Analyses. Catalogs, circulars free. B. Thaxly Co., Washington, D. C.

**SECRET** Formulas. The lucky seven products that have made millionaires. Enormous demand everywhere. Start at home. No infringements. Small capital. Guaranteed manufacturing instructions, unique sales plan and free coupon, \$1. The Press Service, Buffalo, N. Y.

**POLISHED.** Cosmetics, Inks, specialties, insecticides, trade secrets, etc. Complete collection. Tested; guaranteed. \$1.00. E. McLaughlin, 138, Yonkers, N. Y.

**ICELESS** Ice! Colder! Cleaner! Cheaper! Instructions, 25c. Duffy, Covington, Ky.

**JOHNSONS** Auto and nickel polish. Send one dollar for formulas. J. Johnson, 14899 Patton, Detroit, Mich.

**GUARANTEED** Formulas for athlete's foot and wart treatments. Send 50c coin for both. Mayor Laboratories, Dept. M, 202 S. State St., Chicago, Ill.

**500** MONEymaking Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Indiana.

**TESTED** Formulas—Newest, best, lowest prices. Catalogue free. Grinstead Laboratory, Edwardsville, Illinois.

**3,000** FORMULAS. Facts, processes, trade secrets in Dr. Brown's Book of Formulas—380 pages. Price, postpaid \$1.00. Ogilvie Publishing Co., 57 Rose Street, Dept. 25, New York.

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

#### CHEMISTRY

**SEND** 25c For new illustrated chemical experiment book with over 300 formulas and tests. Also receive entry blank for \$100.00 cash prize contest. Illustrated catalog of apparatus and chemicals free. G. Winn, 124 West 23 St., New York City.

**25** CHEMICALS With experiments, 50c. Kayare Chemical, 5522P Ft. Hamilton Parkway, Brooklyn, N. Y.

**FREE**—Send for list of new technical books at sensational discounts. H. Winn, 124 West 23 St., New York.

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

**FREE** Chemistry catalogs. Supplies at 5c! Equip complete laboratory. Send 10c for postage and handling. Kemkit Corporation, 135P Johnson Street, Brooklyn, New York.

**HANDBOOK** For chemical experimenters, for students and amateur chemists, revised, illustrated, 50c. Chemical catalogue 5c. Booklist free. Reading Scientific Company, Reading, Pa.

**CHEMICALS,** Laboratory glassware and apparatus. Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

#### AGENTS WANTED

**SUMMER'S** Easiest 25c seller. Liquid White, cleans all white shoes, easy demonstration gets business. Large profit. Williams Corp., 368 Pine, Montclair, N. J.

**MANUFACTURER** Offers big daily commissions, steady employment, liberal cash bonuses. Complete new summer line tailored shirts, neckwear, dress and work pants, uniforms. Experience unnecessary. Part or full time. Outfit free Write today. Packard Shirt Corp., Dept. 321, Terre Haute, Ind.

**WANT** The surprise of your life? Amazing opportunity for men and women. Make more money selling our big line fly killers, food specialties and dozens of premium combinations that are wonder bargains. If you're looking for a line to beat chain store prices write today for free proof. C. I. Togstad Company, Dep't PM, Kokomo, Ind.

**\$.65** HOURLY! Amazing No-Flatz fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. C-172, Cincinnati, Ohio.

**GREATER** Demand for leather ties. Large assortment. Send fifty cents for sample and kit. Two branches: Wonder Novelty Mfg. Co., 504 Harmon St., Detroit, Mich. and Windsor Cap & Textiles Limited, Windsor, Canada.

**MAKE** Good money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales kit free! Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

**AGENTS.** Make and sell guaranteed ink. Defies erasers. Send 25c for two quart supply. Retail \$1.00 quart. Acid Proof Ink Co., 911 Holland Bldg., St. Louis, Mo.

**450% PROFIT** In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail \$2.50. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-43, Bradford, Pa.

**TRANSPARENT** Day and night signs. 8"x14"; 4c, retail 25c; over 1000 designs; sample free! Lowy, Department 648, 8 West Broadway, New York.

**SELL** Stores factory fresh gum. Big profits. Sample outfit 50c. American Chewing, Mount Pleasant and Fourth, Newark, N. J.

**\$.60** HOURLY. Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. C-8, Cincinnati, Ohio.

**AGENTS**—Make \$72.00 from \$9.00 investment. Every home, store, factory a prospect. Write today. Quick Bandages, 801 North Sangamon, Chicago.

**STRANGE** Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also, 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 7A, 4525 Ravenswood, Chicago.

**WHOLESALE** Catalog free, 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

**OILEVEL** Indicator. Checks oil from the drivers seat. Sample 50c. J. Ashworth, 54 So. Main, Albany, N. Y.

**BIG** Profits. Comb cleaners, needle threaders. Particulars. Miller Co., 506 East 175, Bronx, New York.

**SELL** "Protect-O-Check" pencils. Big profits. Quick sales. Sample 15c. Centaur Service, Box 1228, Albany, N. Y.

**MAKE** 212% Profit! Metalfix—amazing new "metallic liquid" instantly, permanently repairs metal, wood, glass, leather, etc. without heat, acid or tools. Holds forever! Free sample. Write, Metalfix, Dept. C-313, Cincinnati.

**\$10** STARTS Own business resilvering mirrors. Experience unnecessary. Learn chromium plating. Write Sprinkle, Plater, 128, Marion, Indiana.

**CASH** Paid for butterflies, insects. See Sinclair Display Advertisement on page 14A.

**UP** To \$65.00 weekly easy! Sensational new tire repair fixes holes, cuts, worn spots, for 84c a tire! Spreads on with knife. Dries overnight. Can't come off. Free sample. Plastic Rubber, Dept. C-410, Cincinnati, Ohio.

**AGENTS:** Smash go prices. Santos coffee 12c lb. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Carnation Co., PO, St. Louis, Mo.

**SWEETING** Sensation! New principle potato peeler, cabbage shredder. Removes eyes, peels, slices, shreds like magic. Millions of housewives, hotels, restaurants waiting. Whirlwind profits. Sample 25c. Dozen \$1.50. Money back guarantee. Yates Co., 21 East VanBuren, Chicago.

**I'LL** Give you groceries at wholesale besides splendid opportunity to make \$60 a week. Brand new Ford sedan given as bonus. Details free. Albert Mills, 2771 Monmouth, Cincinnati, Ohio.

**MAKE** Products yourself. Get the whole profit! Tested formulas. Catalogue free. Grinstead's Laboratories, Edwardsville, Ill.

**EVERY** Housewife prospect for new ironing convenience. Big profit. Write for proposition. New England Industries, Winsted, Connecticut.

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

**AGENTS** To demonstrate The Electric Carpenter. See display ad this issue. Carpenters Machinery Co., Dept. A, 572 Madison Ave., New York City.

**SUCCEED** With your products. Make-sell them. Learn how. Formulas. Processes. Analyses. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

**EXCELLENT** Trouserpresser, stretcher, creaser, hanger, \$1.00. \$7.00 doz. Perfect pants hanger, stretcher 10c; 60c doz. Widness, 208 Van Buren St., Brooklyn, N. Y.



**AMAZING** Practical patented combined foot and double-edge razor blade stropper. \$1.00 seller. Sample 10c. Blademaster, 305 Columbus Avenue, New York, N. Y.

**AGENTS** Wanted: 5000 ladies and gents wrist and pocket watches. Hamilton, Illinois, Waltham, Elgin. Good opportunity to become independent. Ask for free catalogue, and new plan. The New York Jobbers, 74 Bowery, New York, N. Y.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs, Monograms. Easily applied. Neonite, Akron, Ohio.

**EASIEST** And best way to make money. 10c will bring sample and details. J. B. Sales, 117 Jourette, New Bedford, Mass.

**100% PROFIT.** Sell new 21 all-folder \$1. Christmas assortment. 10 other fast selling money making boxes. Extra bonus. Samples on approval. Write Schwer, Dept. 410M, Westfield, Mass.

**BIG** Money supplying business houses welcomed exclusive article costing \$2.00. Saves them hundreds. Your price \$1.00. Details 10c. Business Service, Rockville Centre, N. Y.

**TREMENDOUS** Earnings everywhere. Liberal samples. "Window Lettering," 2410 Maple, Los Angeles, Calif.

**\$2.00 OR** More an hour. Men, women. Sell home necessities. Big demand. Samples free. Horner Manufacturing, 578 Jefferson, Pittsburgh, Pa.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, BD-1142 Sunny-side, Chicago.

**FREE** Sample new photo novelties, 300% profit. Novel-Ad Company, 3327 North Ave., Chicago.

**DAILY** Used, steady selling, 25c household necessity. Good profit. Southern Products, Enid, Okla.

**BIG** Commissions taking orders for "Famous Shirts." Free samples. Famous Shirt Company, Dept. PMM, Milan, Tennessee.

**GOLD** Reflecting letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

**SELL** Necessities; amazing profits. Hundreds of fast selling items in our line. New sales plans and free gifts clinch sales. Catalog free. National Products, 116, Berwyn, Ill.

**MEXICAN** Feather pictures, 25c (stamps) brings \$1.00 worth sample and details. Refunded if unsatisfied. Mexican Art, Apartado 1593, Mexico City.

**EXCLUSIVE** Territories! Ake-O-Ver toothache compound! Techniservice, PM-1112 Merchandise Mart, Chicago.

**FREE** Information big income opportunities. Profitable, pleasant occupations. Scientific Research Service, 302 Sixth Ave., Newark, N. J.

**BUILD** Steady income showing amazing new Aluma-weld to machine shops, garages, factories! Successfully solders aluminum, die cast metals, cast iron, stainless steel. Sales kit makes quick easy sales for you! Repeat profits assured—Write today! Aluma-weld, 2440 South Parkway, Chicago, Illinois.

**LOWEST** Prices on earth—100 razor blades 25c, gross shoe laces 35c, dozen needle books 10c, thousands other bargains. Original Mills Sales Co., 901 Broadway, Located in New York only. Other branches discontinued.

**ENGRAVED** Name plates, signs, numbers, profits large, particulars free. Sample 15c. Brett Bros., Winthrop, Mass.

**MAN** In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers, by late method; experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

**ENGRAVED** Initial plates, nameplates, signs, numbers. Enamel finish, five colors, big profit. Hilton Specialty, 29 Portland, Providence, R. I.

**COIN** Money selling colored people. Give away free pictures of Joe Louis with hair preparation. Valmor, 2241-NM Indiana Ave., Chicago.

**MAKE** And sell your own products. Employ agents yourself. We supply formulas and full instructions for making toilet preparations, perfume, flavoring extracts, soap, household specialties. Valuable booklet free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**WANTED**—Direct purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

**AGENTS** Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfits. The Moss Company, 64 Searie Bldg., Rochester, N. Y.

**GOLD** Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

**100 PROFITABLE** Mail order and local business plans. A. Pruitt, Elburn, Ill.

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

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

**GENUINE** Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

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

**BIG** Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

**NEW** Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

**BIG** Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Balco," 1084 Washington, Boston, Mass.

**SELL** Townsend postcards, big demand, large dollar assortment starts you. Charlton Associates, Chicago, Ill.

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**RURAL** Paint men. Manufacturer wants man to take orders for low priced high quality paint (money back guarantee). Also guaranteed roof coating, motor and tractor oils and greases sold on long terms. No down payment. Our men earning \$200 to \$600 per month (sworn statement). Free outfit. No investment. Full cooperation. Box P-4306, Fort Worth, Texas.

**CASH** In on popularity of our new copy-righted "Bank Day" deal and business stimulator for every retail merchant. Sweeping country! No premiums. Positive money back guarantee to increase sales 10% to 30%. Sells on sight. Sure repeater. Up to \$15.00 cash in your pocket daily. Experience unnecessary. Write for complete free outfit. Federal Trade Builders, XX-176 Adams, Chicago.

**EXCLUSIVE!** Full or part time. Superior adv. match book line from mfr. direct. Large spot cash comm. Get facts today. Dept. E-7, Match Corp. of America, 6041 West Grand, Chicago.

**SELL** Jelly-Kwik, sensational instant jelly with true fruit flavor. Fruit juices unnecessary. Users everywhere. Big profit. Free sample. California Jelly-Kwik, Burbank, Calif.

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

**SALESMEN** Get us bad debts to collect from garages, veterinarians, doctors. Pay daily. Budget Co., 408 Advance Bldg., Cleveland, Ohio.

**AMAZING** New kitchen tool. Positive necessity. Sells all home, stores. Clicks instantly. No competition. Gadgets, 2527-P S. Hill, Los Angeles.

**SELL** Union label printing. Lowest prices. Big commission advanced. Business stationery, salesbooks, tags, political campaign literature, process embossed printing, book matches, etc. Free cut service. Samples free. Consumers Press, T-82 W. Washington, Chicago.

**MAKE** More money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales kit free! Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

**SELL** Master portable water softener to homes, businesses. Pays for itself. Convincing demonstration. Complete line, liberal commission. Master, Inc., 708 Pence Bldg., Minneapolis, Minn.

**SALESMEN:** Everybody now buying book matches, labels, carbonized salesbooks, pricing sets, memo books, complete line business stationery. Free deals. Wonderful sideline. Comm. daily. Free sales portfolio. Willens, Dept. KK-2132 Gladys, Chicago.

**SCIENTIFIC** Moth control offers genuine opportunity to ambitious salesmen. Tested sales plan, free elaborate sales manual. Generous bonus. Free gifts make sales easy. Write Arwell, Inc., Dept. 66, Waukegan, Ill.

**LARGEST** Commissions, quickest sales are made on our brushes. Write for proposition. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, New York.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson, Chemist, DT-1142, Sunny-side, Chicago.

**MAN**—Handle regular store route. Place nationally advertised 5c-10c counter card mchse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 7810, Spencer, Ind.

**SELL** Only (4) all wool suits to get yours without cost. No limit to number of suits you may earn. Prices \$14.95 to \$26.95. Zipper leather carrying case. Sample line free. No experience needed to make big money. All suits individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Dept. 36A, 330 So. Franklin, Chicago.

**FLASHLIGHT** Keycase combination. 35c cash or stamps brings sample. Allbright, 170 Fifth Ave., New York City.

**DON'T** Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. G-U-PPM, Freeport, Ill.

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**SOMETHING** New in fire extinguishers—Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

**SALESMEN:** Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

**SALESMEN**—New deal guarantees stores \$10 for one. Two \$15 sales net you \$29 daily. Sayers, 2801-123 Sheffield, Chicago.

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

**BRAND** New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

**START** A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

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**MAN** Wanted—Manufacturer established 46 years will finance responsible man with complete stock of guaranteed food, farm and household necessities—you pay when sold. Mighty attractive proposition. Good living right from start with steady increase for industrious man. Big value combination deals, premiums and fast-selling specials now in effect. B. M. Anderson sold over \$402.70. A. M. Karel over \$347.48, and H. E. McMillen over \$314.15 in one week. Pleasant outdoor work. Experience not necessary. No slack seasons or layoffs. Write today for "No-Investment" offer. McConnon and Company, Room 66GS, Winona, Minnesota.

**LOCAL** Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. G-817, Chicago.



**RELIABLE** Man, each town for sales promotion work. Willard Associates, 126 Lexington Ave., New York City.

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**DESCRIPTIVE** Details free, new big book for landing top notch salary jobs. Don Sweet, 6536 Hayes Drive, Los Angeles, Calif.

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**CASH** Paid for butterflies, insects. See Sinclair Display Advertisement on page 14A.

**BE** Your own boss! Splendid chance to make \$42.50 a week supplying famous "Zanol" products to steady consumers on weekly route. Automobile given if you qualify. Details free. Albert Mills, 2765 Monmouth, Cincinnati, Ohio.

**OUR** Salesmen earn \$7.50-\$30 daily presenting our guaranteed retail stores sales promotion plan. National, 1451 Broadway, New York City.

**PROFIT** Gathering roots, herbs. Details for stamp. K. Merritt, 1752 Nicholson, St. Louis.

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**LEARN** Diesel, radio, air conditioning at home. \$10 complete. Home Systems, 107 Lyon St., San Francisco.

**STAMMERING.** Stuttering corrected. Write Lewis Institute, 12052 Woodward, Detroit, Michigan.

**LETZLER'S** Course explains master salesmanship, 6 volumes postpaid \$3. Wilmack Institute, Olyphant, Penna.

**"MASTER** Salesmanship." Complete \$5 course \$1. Circular for stamp. Lonk Institute, D-1613 Palatine, Illinois.

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**SECRET** Service. Particulars free. Write immediately. George Wagner, M-2640 Broadway, New York.

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**QUALITY.** Quantity. 300 sheets, 150 envelopes \$1.25. Simmons, Cromwell, Conn.

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**EMBOSSO**—Thousand letterheads \$3.95 delivered. Salesmen wanted. Sollidays, Knox, Indiana.

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1000 6 1/2 28 LB. Envelopes \$2.35 plus postage. Excelsior Press, Orange, Mass.

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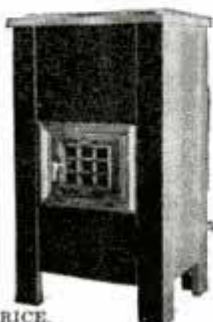
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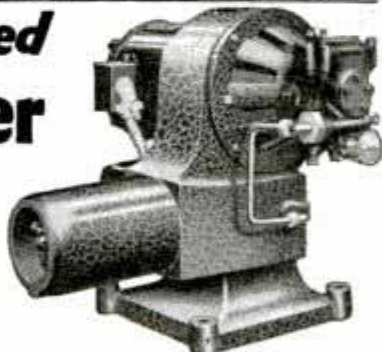
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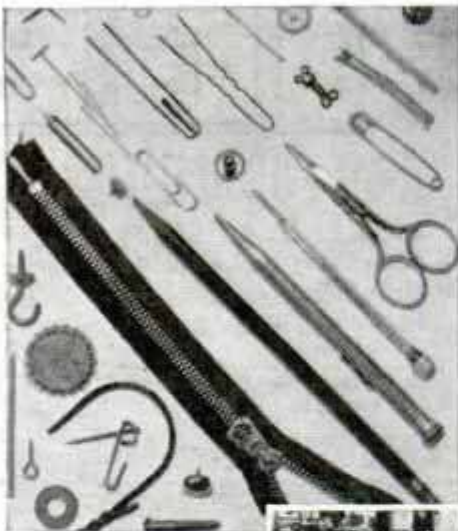
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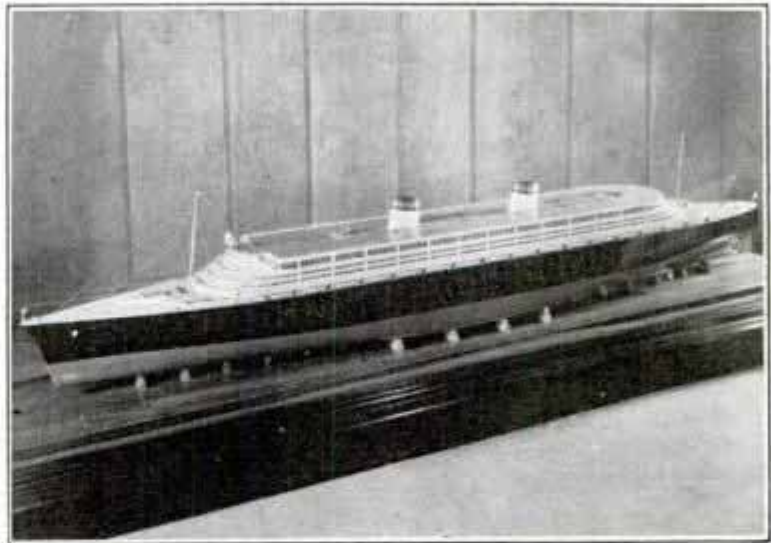


By Don Glassman

**P**ROFOUND changes in ship-building and ship operation are foreseen as a result of recent developments in industry and a demand for lower rates.

The high-speed superluxury ship is not regarded generally as a solution to the problem. These ships are not expected to earn money; they are intended to attract travelers abroad. Once abroad, the travelers spend enough to make up the ship's deficit.

On this side of the ocean, there is a belief that ships should pay for themselves and earn a reasonable profit. The most successful ships on the North Atlantic run are the American twins, "George Washington" and the "Manhattan." These vessels do not hold the speed record but they do hold the affections of many passengers. When these ships were under construction many people feared they would become "white elephants." We had been led to believe



Top, drawing of proposed clippers which offer landing space for planes. Bottom, model of clipper with retractable funnels

that only foreign countries could operate large ships. The "George Washington" and the "Manhattan" scaled down high rates of modern ships, but did not scale



F526

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down comfort or safety. This formula has won many friends among American and European travelers. The American ships popularized "cabin" class to such an extent that most foreign steamship companies have substituted cabin for ordinary first-class rating.

The "George Washington" and "Manhattan" were largely conceived, planned and built by P. W. Chapman and associates. They aimed to set up a new standard, to give the man of average means a safe, comfortable journey for the least price. They succeeded.

One thing has led to another. Chapman and his associates have been working on a plan for increasing the American merchant marine on a basis that will bring the price of tickets within the reach of thousands who cannot now afford it.

The plan provides for clipper ships with a one-way fare of \$50, two people in a cabin, exclusive of meals, which are eaten at the passenger's convenience and are paid for separately.

"Americans," said Chapman, "are accustomed to pay uniform fares. That is

why, aside from the choice of meals, we provide uniformity of service.

"The projected American clipper vessels would be designed by the most eminent authorities. There would be nine cabin, in addition to recreation and service, decks above the waterline. The top deck would form an airplane field base about 140 feet wide and 800 feet long, unobstructed when in actual service. The funnels would be retractable."

According to Edgar P. Trask, naval architect and engineer, who was associated with Theodore E. Ferris in the design of the twin 963-foot American superliners, commercial shipbuilding appears

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Photo courtesy U. S. Lines  
Top, launching British Diesel motorship. Bottom, turbine generator shaft

to be the only branch of transport in this country where no changes have been made in metals entering the construction.

Speaking recently before the Institute of Mining and Metallurgical Engineering, Trask made this prediction:

"When steel is produced with the following characteristics: tensile strength of

29 w. 39 th



90,000 pounds per square inch; elongation of not less than twenty per cent in eight inches, in the 'as rolled' condition, and with four or five times the corrosion resistance of mild steel—it will revolutionize the shipping industry."

Shipbuilders are learning from aviation and railroad companies. If weight-saving is important in the air and on the rails, it is also important on the water. Heretofore, little attention was paid to that method of increasing a ship's pay load. But now marine architects are becoming as wary of excess weight as aeronautical engineers. Considerable weight can be saved by welding, instead of riveting.

Power-plant construction has reached a high degree of perfection. The "Normandie" and "Queen Mary" have engines which give distinction to the men who designed them. At high speed the "Normandie" actually burns less fuel than a 45,000-ton vessel built ten years ago.

Before selecting geared turbine propulsion for the "Queen Mary," the engineers investigated Diesel, Diesel-electric, direct-turbine, and turbo-electric drives.

Diesel propulsion is not adaptable to big ships. The reason is that with an increase in horsepower, a steam engine increases its efficiency proportionately; whereas, Diesel-engine efficiency remains practically stationary. Depending upon the particular installation, the maximum efficiency of Diesel ship engines varies between 5,000 and 20,000 horsepower. Somewhere between these two figures, the steam engine crosses the Diesel. For small vessels, Diesels have certain advantages, and a good many vessels abroad are powered with them.

People often point to the large crews of superluxury ships and ask whether all those men are needed to run the ship itself. Decidedly not. At one shift, only one hundred men can run the "Normandie." Automatic machines do the work of thousands. Most members of the crew are waiters, stewards and cooks.

The number of men in passenger-ship crews compares favorably with the number required to run a first-class hotel. From two to four employes are required for every five hotel guests. And the hotels do not usually provide doctors, nurses, radio operators and navigators.

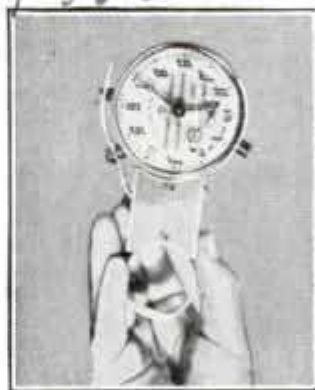
*F516*  
**Light Wheelbarrow with Tires  
 Is Easier to Handle**



*Hyb Lum*  
**Heavy pneumatic tire on aluminum wheelbarrow helps balance the load and reduce shock**

Forty pounds lighter than the ordinary type, an aluminum wheelbarrow can carry that much more "pay load" and thus save part of the bill for human labor. One wheelbarrow now manufactured is made of a strong nickel aluminum alloy, and is equipped with a pneumatic tire.

*F550*  
**Clock Turns on Parking Lights  
 of Car at Dusk**



When darkness comes, a new auto clock turns on the parking lights automatically. The clock is connected to the dimmer lamps of the headlights and to the taillights, operating them at a set hour. The clock

is fastened to the steering post of the car. A three-wire cable, with instructions for installation, is included.

*Automatic appliance Co  
 Box 521 Providence*

*Hyb Lum*  
*Sheehy, Blayman, Corp.*  
*107 Liberty St. Jackson, N.J.*



### Baby Tractor Rides Sidewalk While Cultivating Park



As it plows and cultivates margin of park, this tractor sweeps sidewalk clean behind it

Small enough to drive on the sidewalk a baby tractor is used by the park department of a California city to cultivate the ground along the walks. It drags a three-disk plow on one side to break up the ground and destroy weeds. Behind the tractor is a drag that pushes the dirt off the sidewalk. The wheels have pneumatic tires, the rear ones four feet in diameter and a foot wide.

### Clocks Move One-Way Traffic on Bridge or Road



One-way traffic over a narrow bridge or short road may be regulated by two electric clocks in a simple dispatching system. The clocks are synchronized and have black, orange and white marks placed around the dials at regular intervals. Two minute spaces are painted black, two minutes orange and six are left white on one clock. On the other clock at the other end of the bridge or road, the space corresponding to the white on the first clock must be painted. Animal traffic enters the block controlled by the clocks only when the minute hand is in the black and auto traffic

only when it is on orange. This arrangement, with the six-minute white space, provides ample time for traffic from one direction to clear before that from the other direction starts.

### Mine Roof Cave-In Detected Before It Happens

Designed to sound an alarm when a mine roof becomes sufficiently weak to be in danger of caving in, a new device developed at Pennsylvania State College may be the means of saving many lives. Dr. H. Landsberg has found that a definite break occurs in the overhead rock strata several hours before the final cave-in takes place. The shale and dirt support the roof for some time after the supporting rock has broken. The warning device consists of two steel tubes sliding one within the other. The tubes are held apart by a spring and are placed in the mine so that one tube touches the roof and the other the floor of the shaft. A movement as small as one one-hundredth of an inch between roof and ceiling can be detected. Following the initial break, Dr. Landsberg points out, the rates of convergence of the roof and floor increase rapidly until the entire mine roof collapses. By studying the rates of convergence, the time of the final cave-in can be predicted.

### Caddy Bag Is Used as a Seat When Opened on Fairway

Lighter and smaller than the ordinary golf bag, a kit which opens into a seat for the golfer has just been placed on the market. It opens like a folding chair whenever it is set down. Gravity does the trick, there being no springs or levers. Woods and irons are held in individual compartments, and there is an ample pocket to carry balls and clothing.

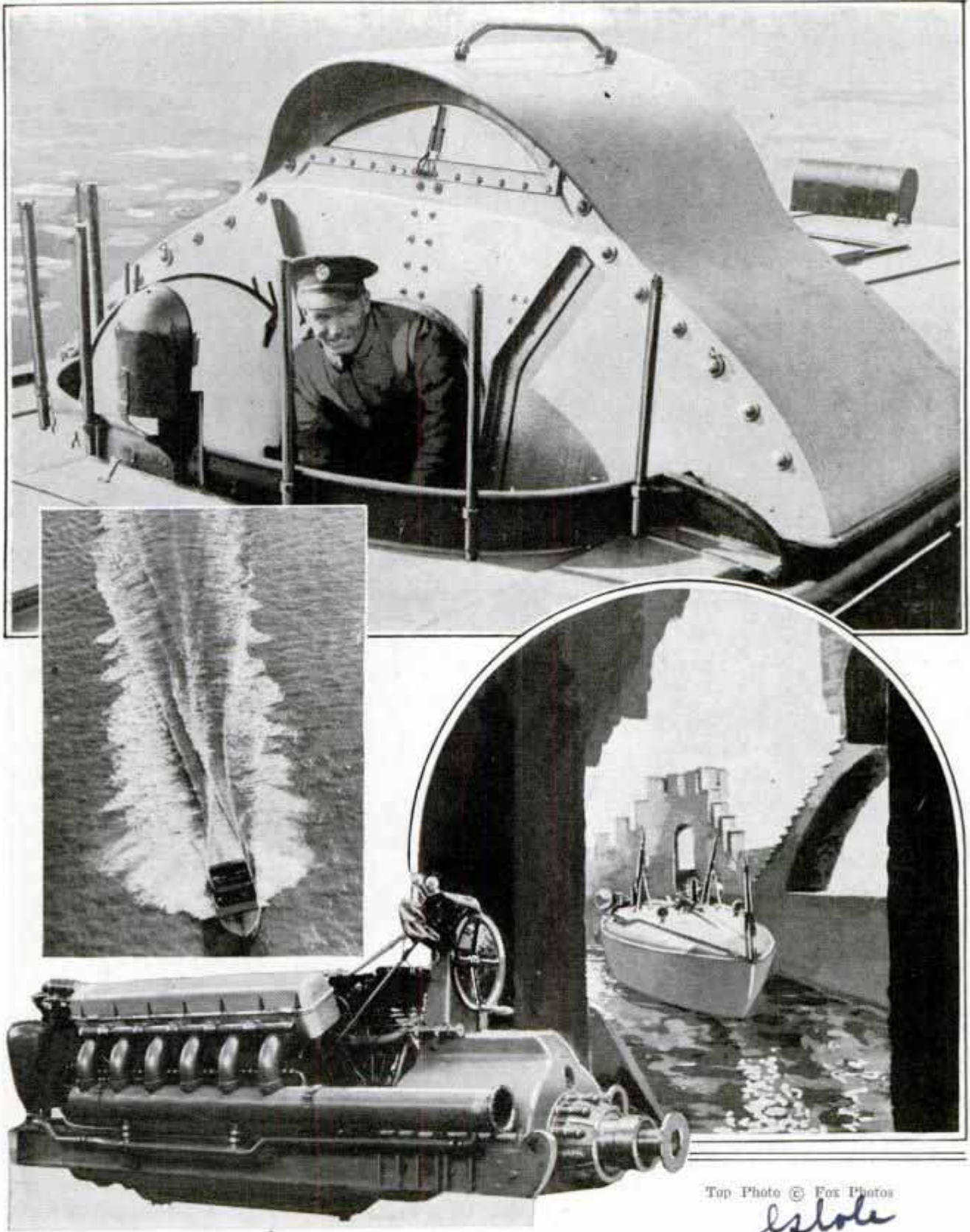


*Comp. Ray Blaine*  
*George S. Kirkhart*  
*1018 Federal Office Bldg. Amaha*  
*F558*  
*F555*  
*F556*

*Science Service 4/21/36*  
*State College Pa*  
*Science Service 4/21/36*  
*F553*  
*Armed M. Lavinich*  
*max experiments lab*  
*Emb. 10/16*  
*Dr. E. Moreland*  
*Essex*



# Speedy Sea Sleds Are Miniature Battleships



Top Photo © Fox Photos

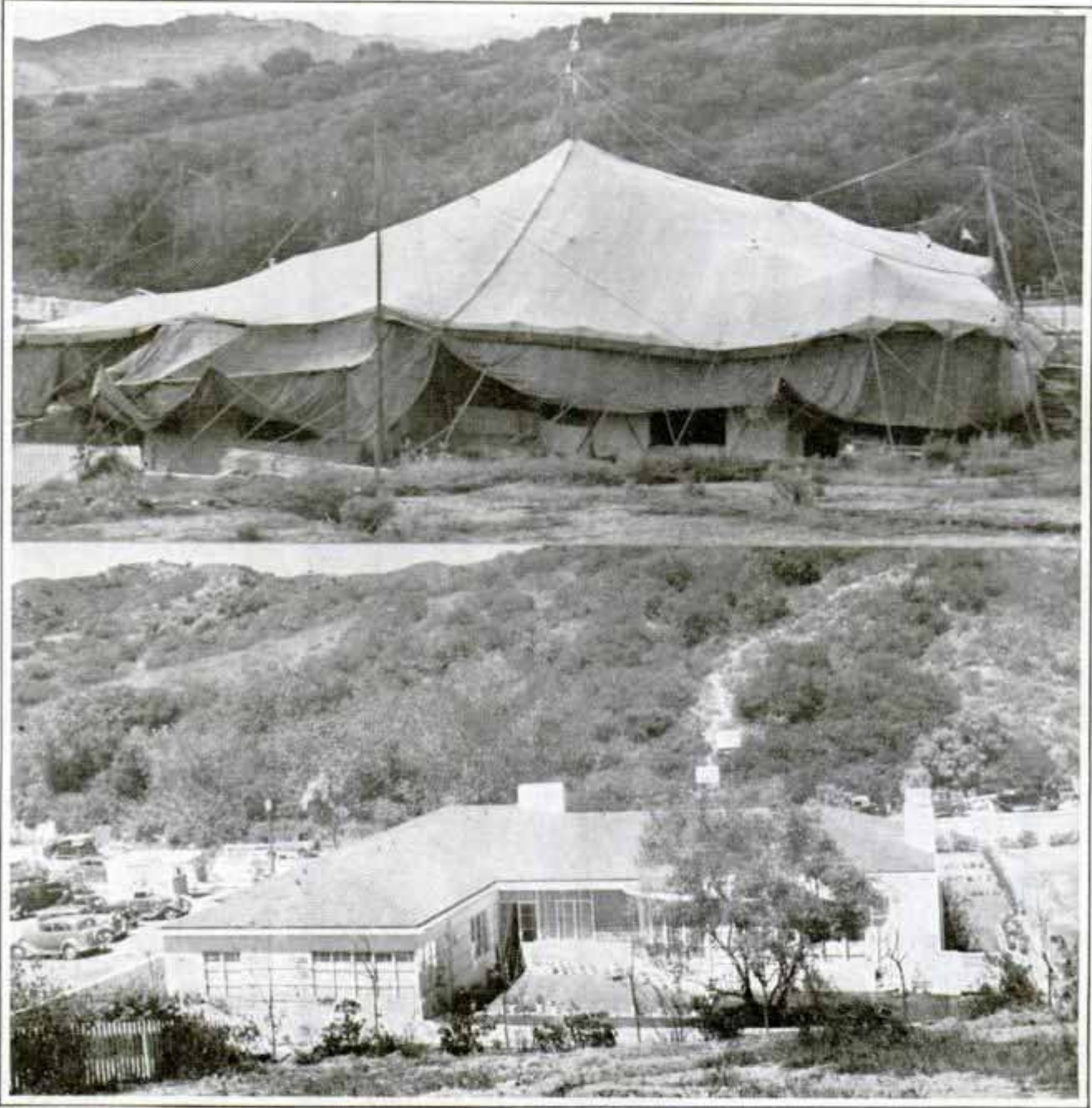
*Eslo*

*Small, lightweight, speedy and highly destructive, sea sleds are important units of the Italian, British and other foreign navies. These boats, little more than metal shells, carrying torpedoes, machine guns and small crews, are actually miniature battleships which can travel from sixty to eighty knots per hour and can sink a warship with a torpedo, properly placed. They are exceptionally effective in submarine warfare since swarms of them can literally blast submarines from the water with depth bombs. Above is an English picket boat capable of twenty-four knots and carrying a crew of forty. Below, British dinghy at top speed, a 500-horsepower motor used in Italian sea sled and light boat with which D'Annunzio captured Fiume*



*... Road: Hollywood*  
*Calif*

# Nine-Room Bungalow Built under Big Tent



*What looks somewhat like a circus tent in top picture is merely the canvas top that concealed building operations from public until bungalow, below, was finished and ready to show*

No one but the builders saw one house in Los Angeles until it was "unveiled." The nine-room modern home was built under a tent. Work went on without interruption night and day, rain or shine, under the shelter of the big canvas top, and when the company which built it was ready to "lift the lid," the finished house was a complete surprise to the public.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

## Vibrations of Building Filmed with Dancing Beam of Light

Almost imperceptible jolts and vibrations caused by the movement of workers in a building have been photographed by an instrument invented by a young student of lens grinding at the Bausch and Lomb optical laboratories in Rochester, N. Y. He designed the "vibrometer" to find a place in the plant where the least vibration existed. A beam of light is projected through a slit upon a mirror floating

*George W. Jacobs*



on a pool of mercury in a hermetically sealed cell. The mirror reflects the light through another slit and focuses it on a film connected with a twenty-four hour clock mechanism. Any vibration agitates the mirror, causing the light beam to dance and record a band of varying width on the film.

### Oil Conditioner Reduces Crankcase Changes

Postponing the necessity for changing oil in the crankcase for several thousand miles, a new filter and conditioner is available for the automobile and the truck. A fibrous compound used as the purifying element removes foreign matter and returns the oil to the crankcase in its original condition. Acids are neutralized, abrasives are removed, sludge eliminated and water and discoloring materials are taken out. As a result of the treatment received by the oil passing through the element, tests after thousands of miles show the oil to have its original color, consistency and lubricating quality. The manufacturers claim considerable gain in economy because oil changes are postponed indefinitely and owners who forget to change their oil at the specified time are protected against damage to the engine. The conditioner may be installed on cars already in use.

### Hot-Water Heat for Diver Is Pumped through His Suit

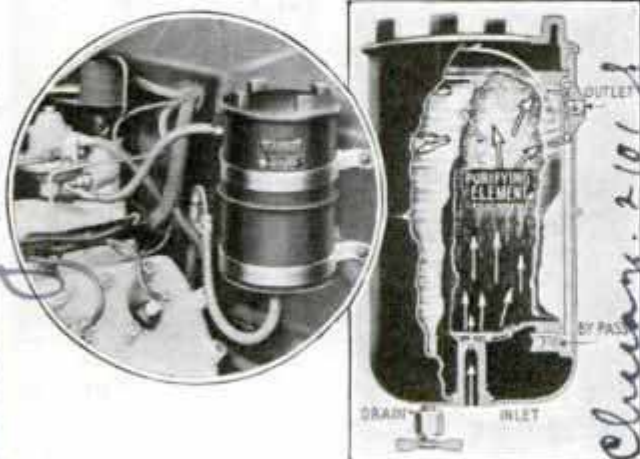


Inventor demonstrating the heated suit which, by means of hot water pumped from the surface, keeps diver comfortably warm

Hot-water heat is the latest thing for divers. An underwater suit recently tested is kept warm by heated water supplied from the surface, permitting the diver to work longer in comfort despite the chilly subsea temperatures. Yves Le Prieur, inventor of the system, demonstrated the suit in a Paris aquarium.

### Touch-Up Tape Marred Auto Finish Retouched with Colored Transfer Tape

That scratch on your automobile fender can be retouched with transfer tape. No mixing of paints is necessary. Decalcomania tape in all the standard colors of current cars is available to apply to scuffed or scratched surfaces of automobile bodies. This method has just been developed, and an amateur can do his own refinishing with expert results.



Two views of oil conditioner. Right, cutaway sketch shows how it works

Handy Governor Carb 3925 W. Ford St. Detroit, Mich

F 548  
F 518  
The Governor Carburetor

Commandant Yves Le Prieur  
Delta le Prieur

Chicago 2101  
Chicago are  
6604  
Walton Co

Handy Governor Carb 3925 W. Ford St. Detroit, Mich  
Evans Walton Co

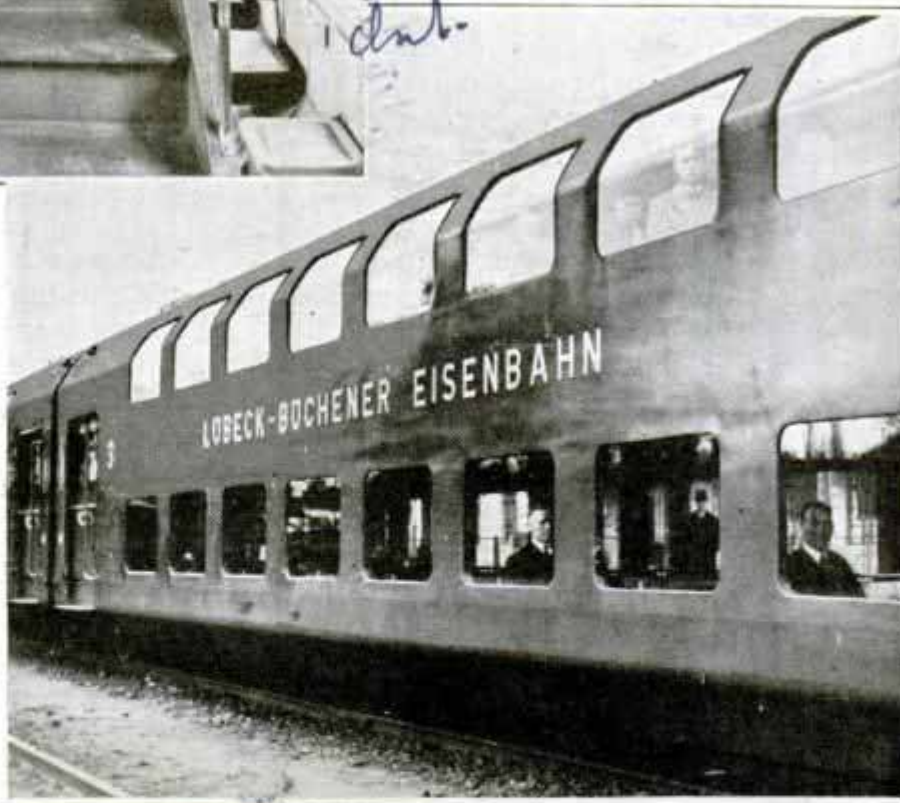


# "Two-Story" Train Carries More Passengers



Designed to increase the capacity of the railway coaches, a "two-story" or double-decker car has made its appearance in Germany. The coach has two floor levels, with seats on both, and accommodates many more passengers than conventional cars. There is abundant space for the passenger on both floors, the second being as comfortable as the first. Passengers reach the second level by a stairway located at the front of each coach. Naturally the construction practically doubles the height of the train, making it necessary for dispatchers to keep the two-story train from attempting to pass through tunnels and under low bridges. The coach is particularly serviceable on suburban lines which handle crowds of commuters during rush hours.

Top, interior shows seating arrangement. Bottom, exterior of train



*F58*

## Five Horsepower Auto Goes Sixty Miles to Gallon

*50 m.p.h. - 5*

Top speed of sixty miles an hour and sixty miles to the gallon of gasoline are claimed for a five-horsepower automobile just put on the market by the Fiat motor car company in France. It is strictly a two-passenger car developed for the low-price market and economical operation. The motor develops twelve horsepower at 5,600 revolutions per minute. Front wheels are independent, there are hydraulic shock absorbers and hydraulic brakes acting on four wheels, rubber block mountings for en-

gine and other parts, four forward speeds and reverse, and stability is enhanced by a very low center of gravity. The third speed is silent, and is used for town driving as well as for hills.

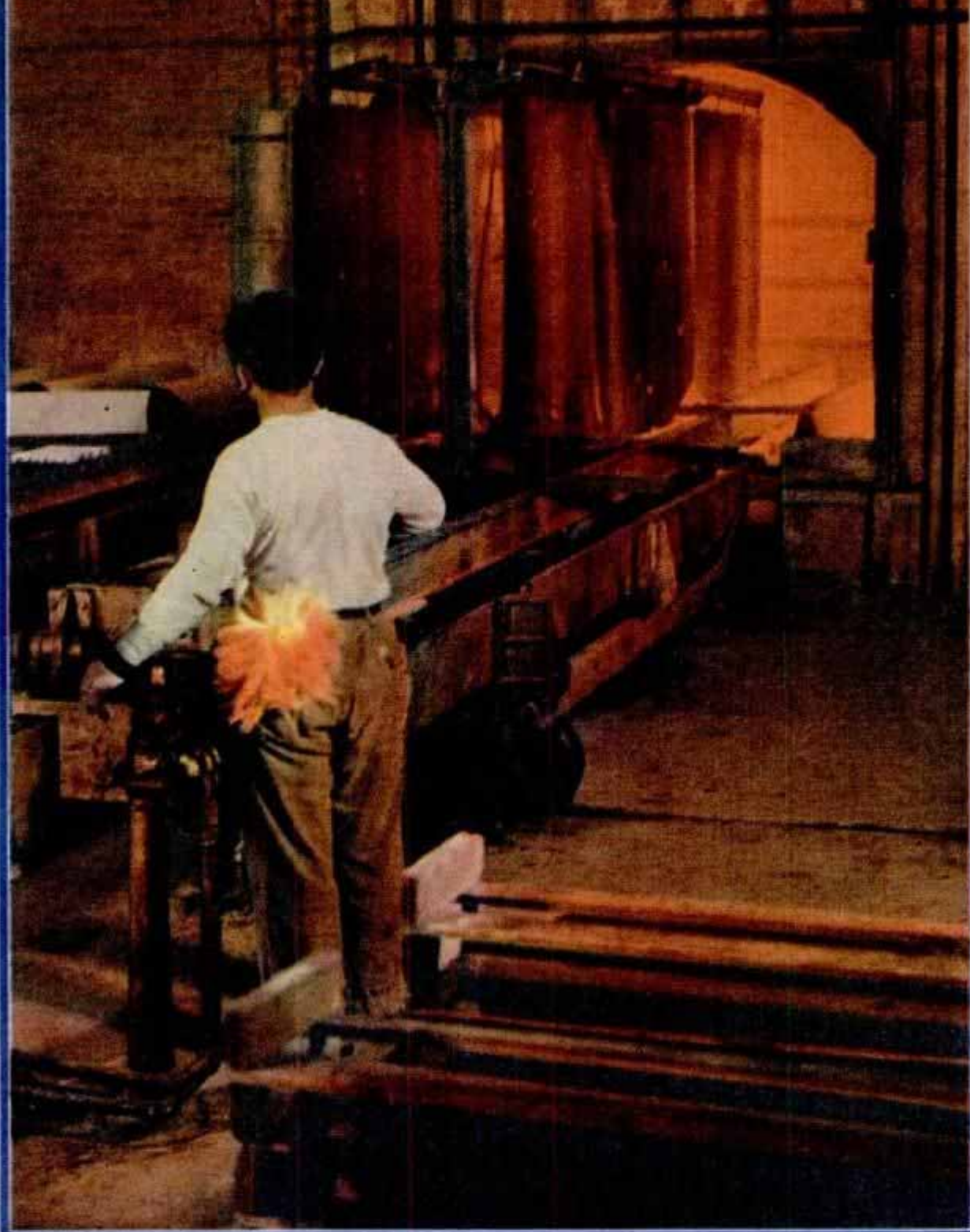
*red hairdress*  
*near Paris*  
*France*

*Handwritten notes on the right margin, including "New 1935" and "Lestrade".*

*Dept. of Commerce 4/24/36*  
*Robert Lestrade*



F2897



# MODERN WONDERS *of an* ANCIENT ART

FUSING porcelain enamel to metal base in oven at temperature of 1,550 degrees.





By H. W. MAGEE

Part II

**I**MAGINE a metal house coated with glass, a home with all the delicate coloring and enduring beauty, inside and out, of age-old cloisonne.

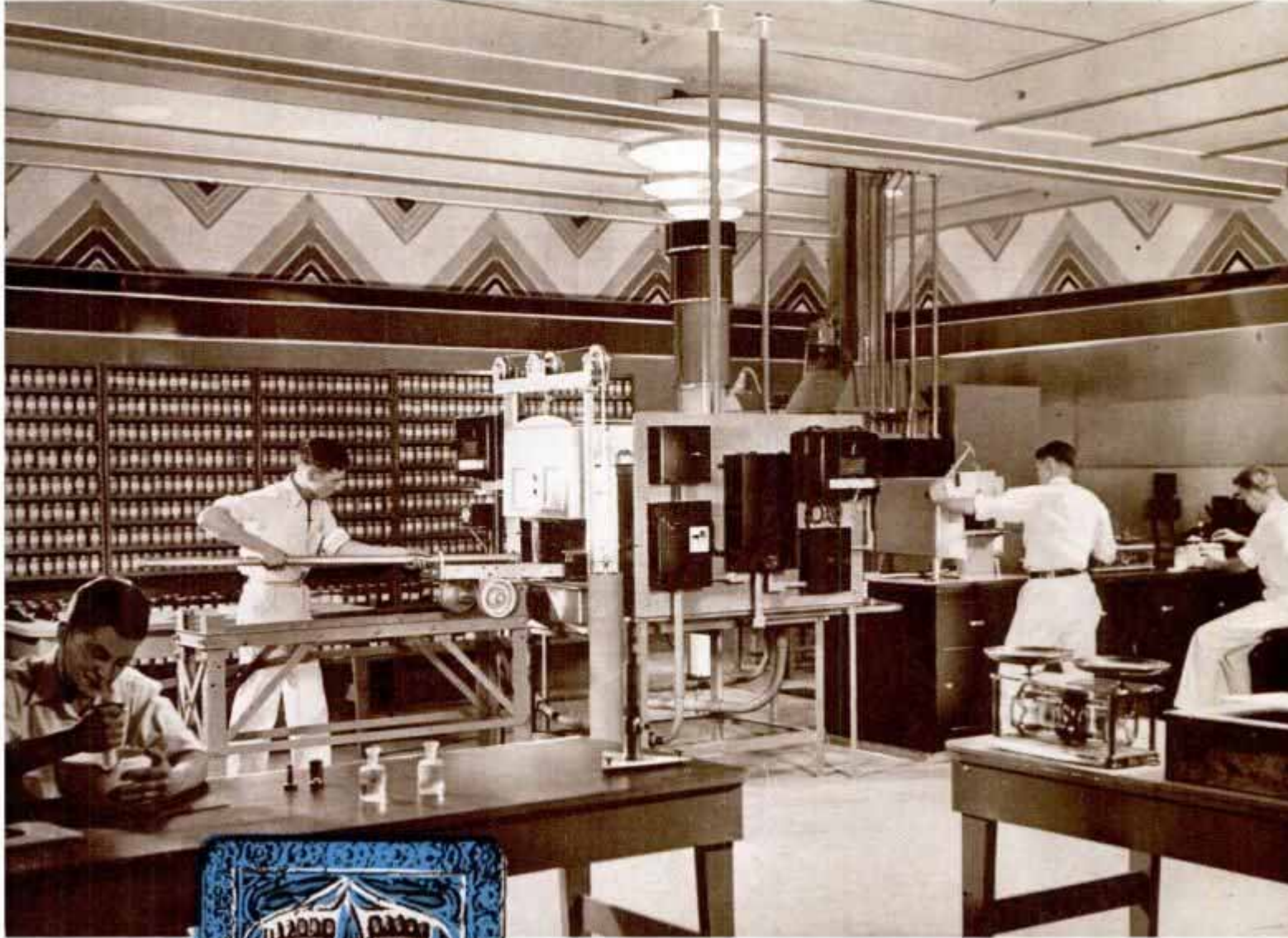
The development of porcelain enameled iron for architectural purposes makes such a home both possible and practical. As a building material, porcelain enameled iron—actually a form of glass fused on to a metal base—offers an admirable union of utility and beauty for it possesses the strength of metal plus the hardness and permanence of glass. It can be produced in any hue or combination of hues in the mineral spectrum, it is colorfast, impervious to weather, non-porous, rustproof and can be made acid-resisting. And it is good for a lifetime of service.

In the past six or seven years, several types of buildings have been designed



**DOUBLE** radius corner constructed of prefabricated porcelain enameled sections. Top, laboratory technicians testing raw materials used in making porcelain enamel.





ONE of three miniature porcelain enameling plants in laboratories of Chicago Vitreous Enamel Product Company where ceramic engineers test each smelt of "frit" produced before the enamel is sold to manufacturers of porcelain enameled products.

in which preformed porcelain enameled panels are laid over a steel or wood frame, or its equivalent in the frameless type of construction. Architects also have applied the material successfully to interior surfaces and obtained a rare combination of permanence and lasting beauty.

One of the earliest uses of porcelain enameled metal for exterior construction work was in the form of roofing shingles. Produced in a variety of designs and colors, this permanent and fireproof roof covering indicated the possibilities of the same material for exterior wall surfaces. One of the first problems faced by builders attempting to cover walls with porcelain enameled iron was how to attach the panels to the frame.

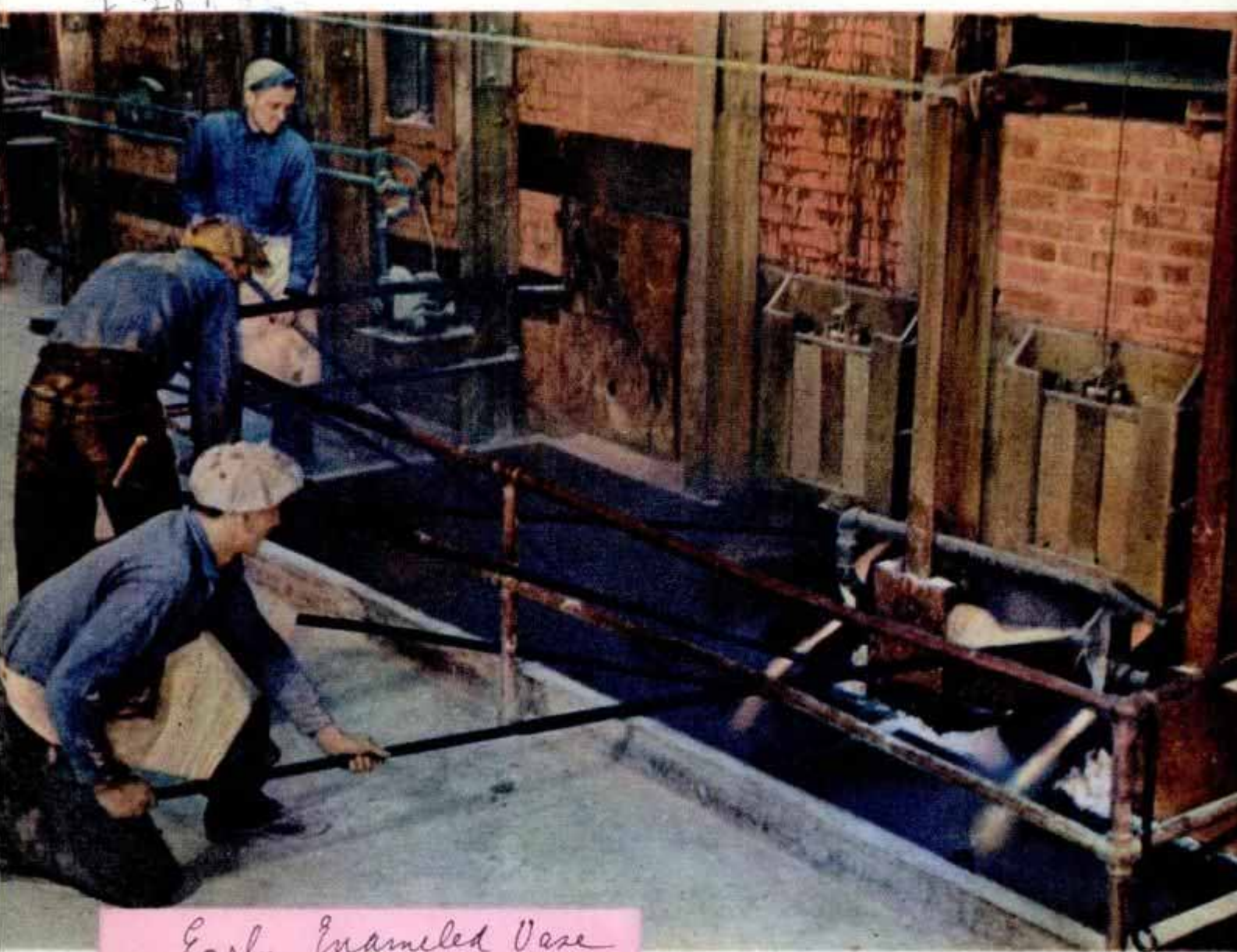
At least half a dozen independent methods of fastening the sheets to the

framework have been devised, ranging from patented keylocking attachments fabricated into the framework to interlocking channel sections and metal strips of special design to accommodate and secure the panels. Most types of porcelain enameled building panels are backed with insulation and provision also is made in most cases for a layer of insulating material between the enameled panels and the wall framework. Model homes with exterior surfaces of porcelain enameled metal were exhibited at Chicago's Century of Progress, one house having enameled panels held in place by wall beads of simple design, while another had panels backed by a cement-like base.

Porcelain enamel as a material for sheathing the exteriors of buildings has been found to supply all the permanence

*Chicago Vitreous Enamel Products Co.  
 1145 S. E. 11th St. Chicago, Ill.*





*Early Enameled Vase*



*at British Museum of Art.*

**TAPPING** smelter preparatory to quenching the molten mass in pits filled with cold water. Left, an ancient porcelain enameled vase.

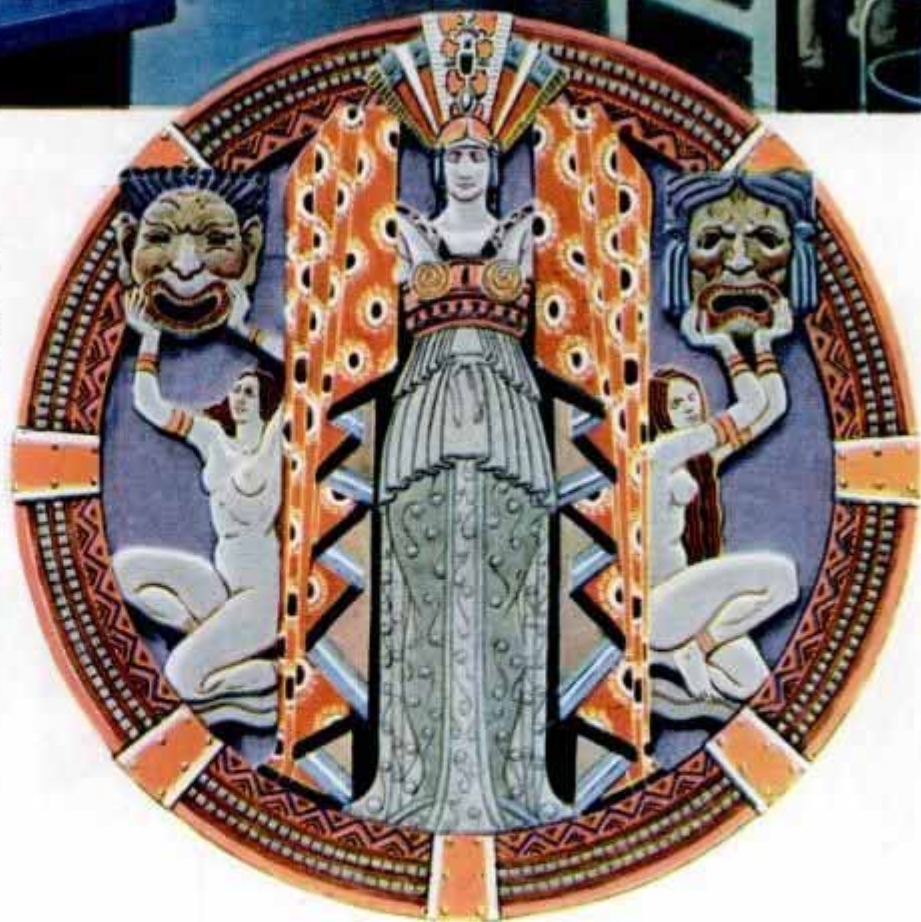
of glass, while at the same time offering a welcome solution to the modern demand for color. While thus far it has been used mostly as an exterior surface for small buildings, many architects see a bright future for it in great commercial structures, notably as a decorative tool. That porcelain enamel lends itself admirably to ornamentation is exemplified by the huge mural ornaments, eighteen feet in diameter, decorating the outer walls of Radio City, sixty feet above the sidewalk. Perhaps mullions, spandrels, moldings, pillars, pilasters, sills, sash, trim and extruded shapes in door panels and walls in our office buildings of the future may be endowed with the grace and beauty of this ancient material.





The material is finding an even wider application for interior finish and decoration. The kitchen which once boasted a porcelain enameled sink or stove and a few pans now may be porcelain enamel from floor to ceiling. Multi-tone wall panels of porcelain enameled metal offer an opportunity for design and color treatment which can transform kitchens and bathrooms into cubicles of arresting beauty. Properly used, porcelain enamel with a natural wood or marble finish also finds its way into other rooms.

One of the first architectural applications of porcelain enamel, and one of the



**DARK** room of porcelain enamel laboratory where delicate instruments determine properties of product. Below, eighteen-foot porcelain enamel ornament on walls of Radio City





most important today, was in the construction of gasoline filling stations. It was found that the material was adaptable to ornate design, colors were permanent and could be carried out in the same material in signs and pumps, construction was simple and the entire building could be taken apart and moved to a new location, if necessary, at comparatively low cost.

Another early application of the material by builders, and one constantly gaining favor, was in the designing or remodeling of shop and store fronts. Since there is no limit to the colors or designs in which porcelain enamel can be fashioned, and since it has a high reflectance, it offers an opportunity for a pleasing alliance between architecture, lighting and advertising



**REFLECTOMETER**, above, being used to determine opacity or light reflecting properties of a sample of porcelain enamel. Below, tapping off a batch of molten enamel in experimental smelter of Chicago Vitreous Enamel Product Company's "Lusterlite Laboratories."



Architect 205 E 42nd

Neuyak



Porcelain enameled sections -  
Porcelain melabs -  
58 Sedgwick - Brooklyn NY

F28 9

appeal in planning a shop to stop the shoppers.

In addition to helping get the customers into the shop, porcelain enamel is aiding in selling them after they enter. In shops where cleanliness, durability and "eye appeal" are particularly desirable, fixtures, counters, display cases and walls are often of porcelain enamel. In such places as drug stores, barber shops, meat markets and restaurants, it has been found that the material, in addition to being sanitary and easy to keep clean, adds to the attractiveness of the shops, particularly where pleasing color contrasts in enamel are employed.

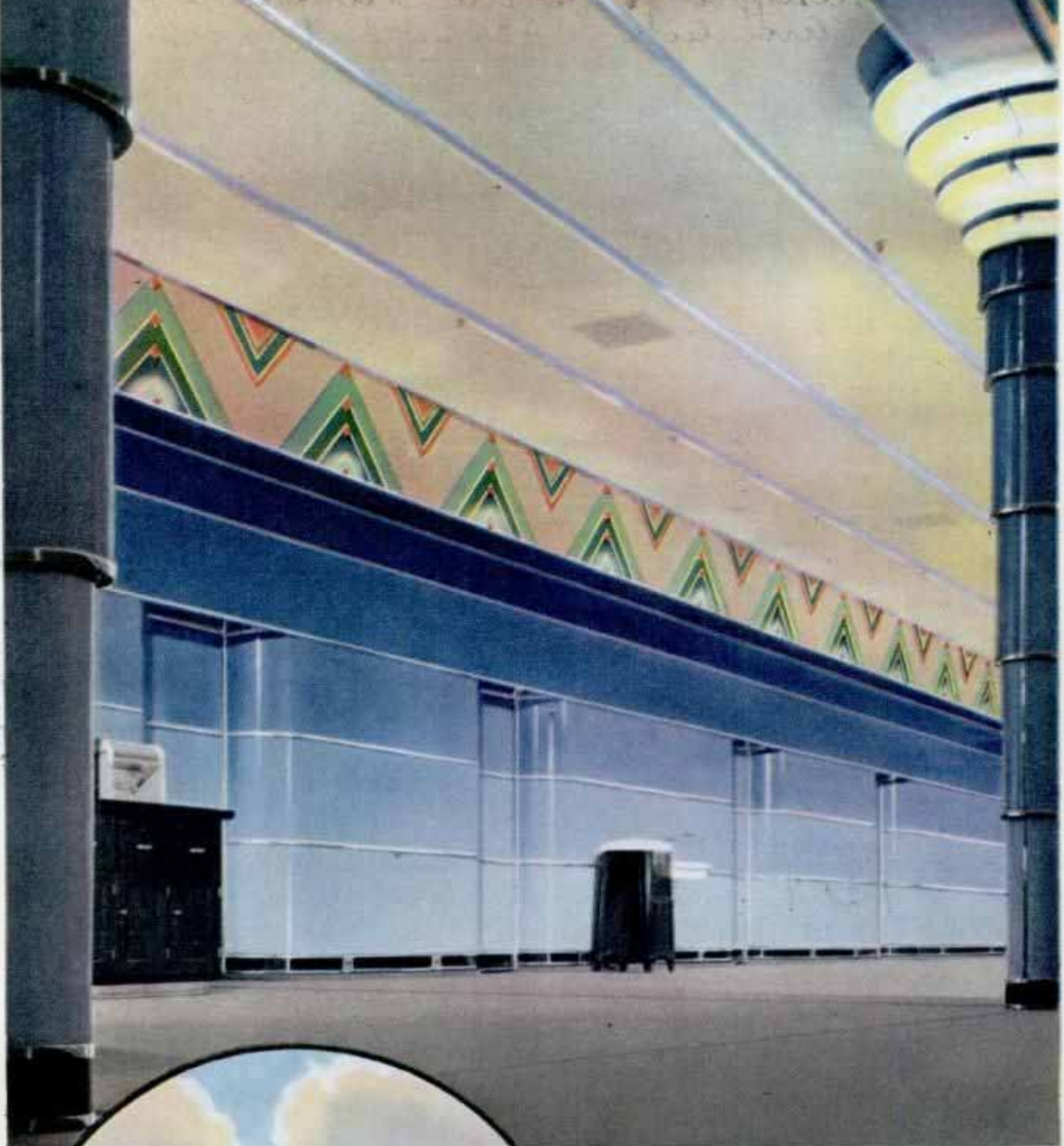
Heretofore, porcelain enameled sinks and bath tubs have been made of cast iron porcelain enameled. Porcelain enameled pressed metal sinks and bath tubs are now also available. The pressed metal products claim light weight as their chief advantage.



STORE front of porcelain enameled metal and, below, porcelain enameled picture of St. Jerome, hundreds of years old, but still in excellent state of preservation.



F287



**COLORFUL** porcelain enamel applied to interior surfaces. Below, a modern use for porcelain enamel.

When it is considered that only a century ago porcelain enamel was virtually unknown except as a finish for costly jewelry and ornaments, it is difficult to predict the future of this product which was ancient when Columbus discovered America. Many of its architectural applications still are in the experimental stage, but in view of what has already been accomplished it is not unreasonable to expect that its field of usefulness will be extended even farther in the next decade than in the past one. So, since you may expect porce-  
*(Continued to Page 132-A)*



F 533.

*Ypsilanti, Mich*  
"Foolproof" Plane for Novice Is Easy to Fly



*Int*  
Low-wing Hammond monoplane tested by department of commerce inspectors. It purposes to meet the need for a "foolproof" ship that an inexperienced pilot could fly safely. Notice landing wheel under nose

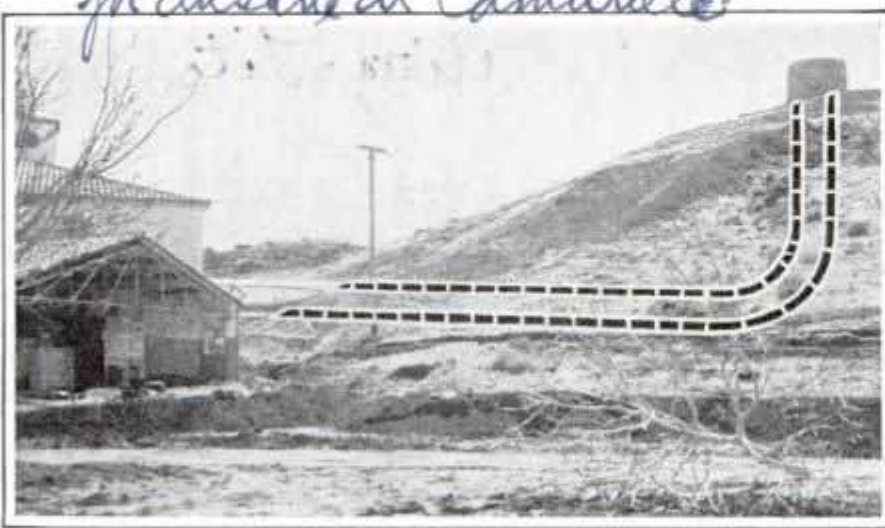
Foolproof flight even by pilots of little experience was one of the first thoughts of the designers of a plane now being tested by the government bureau of air commerce. Its engine is perched high at the rear of the cabin, affording the best visibility for the pilot. Landing at an angle and at a wide range of speed is facilitated by the three-wheel landing gear, with one wheel directly under the nose. It is a low-wing monoplane with two-passenger

cabin and baggage compartment, capable of flying 300 miles against a ten-mile head wind at a cruising speed of ninety-five miles an hour. The four-cylinder motor, rated at 125 horsepower, uses eight gallons of gasoline per hour. It is an air-cooled Menasco aviation engine. Its builders at Ypsilanti, Mich., intended the plane to be so easily controlled that almost anyone could fly it safely. The ship is a Hammond monoplane.

*F489*  
Chimney Bored through Hill Saves Beauty of Landscape

Rather than spoil the natural beauty of the countryside with a tall brick smokestack, engineers building a new state hospital in California bored through a hill

and let the smoke emerge from a stack that resembles an old stone watch tower. The stack enters the hillside horizontally and then makes a right-angle upward turn. From the top of the hill rises a circular chimney top built of native stone. The boiler plant itself is dressed up in ornate Spanish architectural style. This state hospital for the insane is located on a 1,650-acre tract in the foothills at Camarillo, landscaped to take every possible advantage of the natural beauty of the countryside. Instead of prison-like bars, the windows have non-shatter glass reinforced with steel.



Dotted lines show how smokestack bores through hillside, emerging at top as pile of native stone resembling a feudal castle

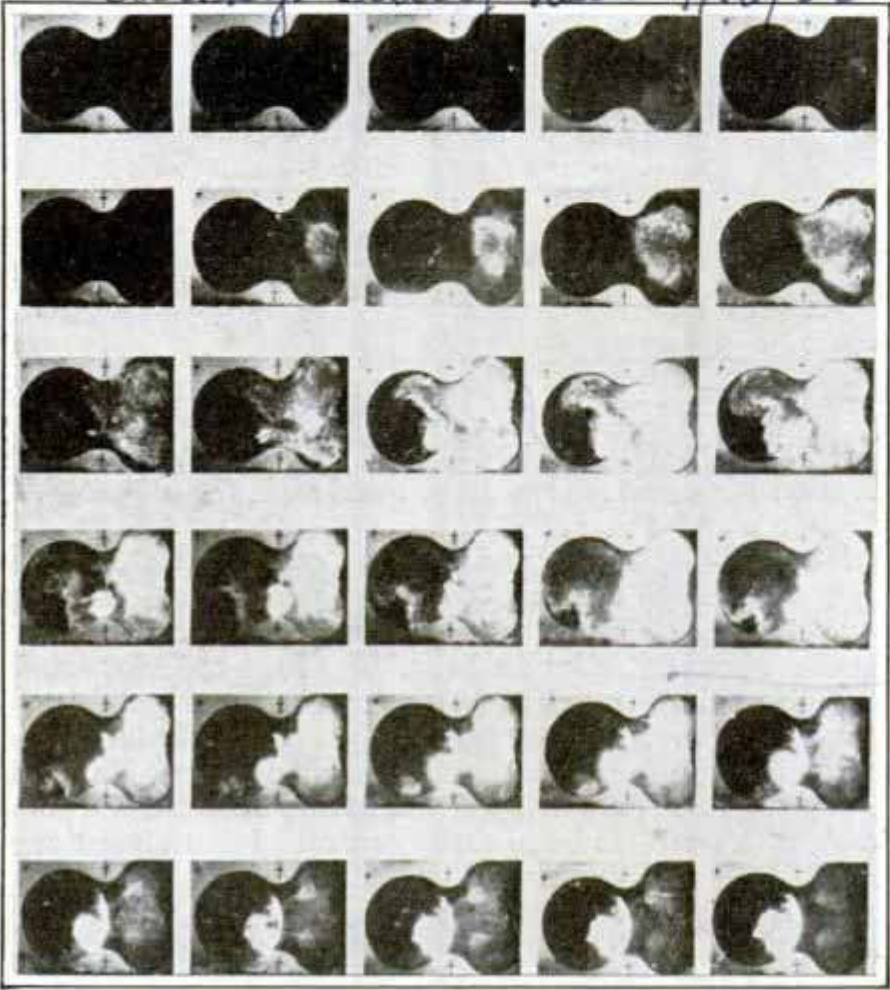
*Cont. Samuel Sansome, 177 S  
Isardine Los Angeles, Calif*

*Cont. Samuel Sansome  
177 S. Isardine  
Los Angeles, Calif*



# Explosion in Engine Filmed by Fast Whirling Lenses

*Chicago Daily News 4/15/26*



Series of pictures showing evolution of explosion in cylinder from spark to final burning out of gas, all in span of about 1/250 of a second

Lenses whirling at 250 miles an hour to take quicker-than-lightning movies through the transparent quartz window of an automobile engine are teaching engineers new facts about internal combustion engines. In the laboratory of General Motors Corporation a special high-speed camera has been installed to "shoot" the story of a cylinder flame from start to finish at 5,000 pictures per second. Motion-picture film moves continuously on a steel disk three and one-half feet in diameter, geared to the motor crankshaft. Thirty small lenses are arranged on this rotating disk so that blurring is avoided even at the high rate that film and lenses must move. The flame inside the cylinder is the only light thrown on the film. With the engine firing at 2,000 revolutions per minute, the equivalent of about 40 miles an hour, the camera must take from twenty to thirty pictures of an explosion that occurs in 1/250 of a second. In one series of

thirty pictures the ignition spark was seen in the second, third, fourth and fifth frames and the flame of the explosion itself first appeared on the fourth negative. When the completed film is projected at slow speed on an ordinary sixteen-millimeter projector the development of the flame and the gas movement aid engineers in studying differences produced by changing fuels and engine conditions. The rotating lenses do not focus directly on the cylinder, but receive the image reflected from a mirror above the cylinder through a stationary lens.

## F536 One-Hand Hammer Drives Tacks Like Machine Gun

One hand can operate a tack hammer that feeds itself like a machine gun. While one hand is holding the material in place or grasping a safety rope in a dangerous position, the other hand merely guides the automatic tacker and squeezes the handle. This presses the



Self-feeding hammer, worked with one hand, drives tack with trip-hammer effect when lever is pressed

*A. L. Hansen Mfg. Co.  
5237 Broadway Ave*

*Camera described in American Chemical Society by Dr. Harold M. Rowland and Dr. A. W. Thorow.*

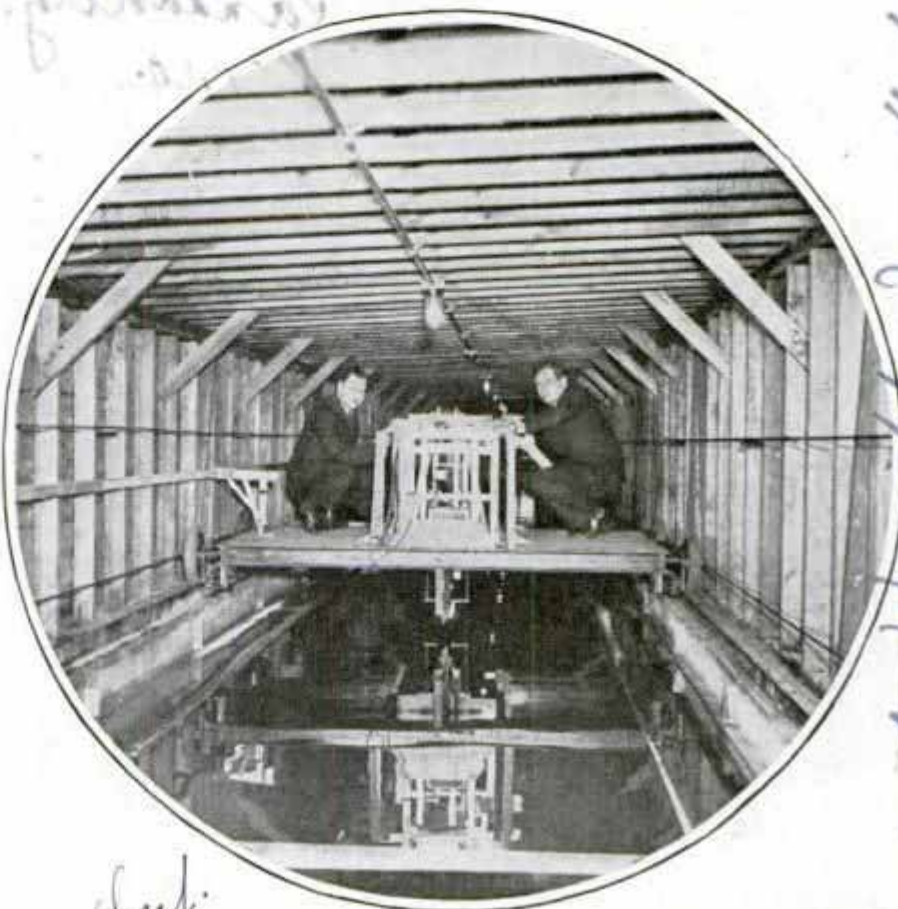


hammer against a spring, lifts it a short distance and drives it like a trip hammer against the tack head. A strip of eighty-four tacks loaded into a channel in the hammer feeds it automatically.

**Light Metal Stage for Painters Holds Heavy Load**

So sturdy is an eighteen-foot aluminum swing stage designed for painters and similar workers that it sagged only two and one-half inches at the center when eight men weighing a total of 1,357 pounds stepped on it. The platform is fourteen inches wide and is covered with one-inch straight-grained spruce to provide non-slip footing for work in high places. Built of a strong aluminum alloy, it weighs only fifty-two pounds yet carried a ton load without distorting under tests. An aluminum guard rail can be added.

**Water Test for Flying Boats Is Given in Towing Basin**

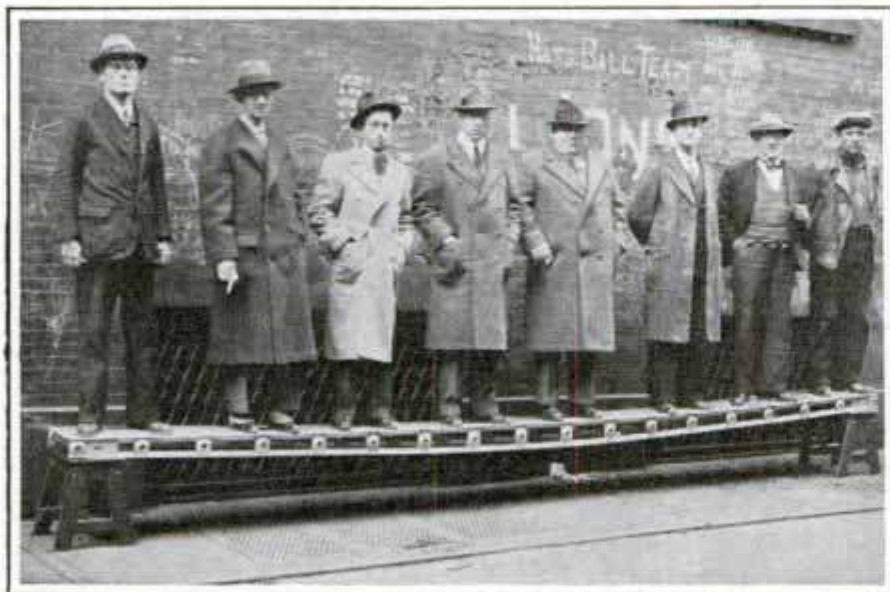


*Aut.*  
Towing car with engineers aboard moves along its track hauling boat hull or seaplane float undergoing tests on water

Seaplane floats and hulls of flying boats are given their "baptismal" test on the water in a towing basin just put into service at the New York University engineering college, under auspices of the Guggenheim School of Aeronautics.

The float is towed on a long, covered canal spanned by a flat car which carries the engineers and equipment. The car moves along with a wheel riding a rail on each side of the basin while the engineers observe the test.

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



Eight men weighing 1,357 pounds test light metal platform and find it sags only two and one-half inches at center

*Aluminum Ladder Co. Pa.*

*University / Dept. of New York City*



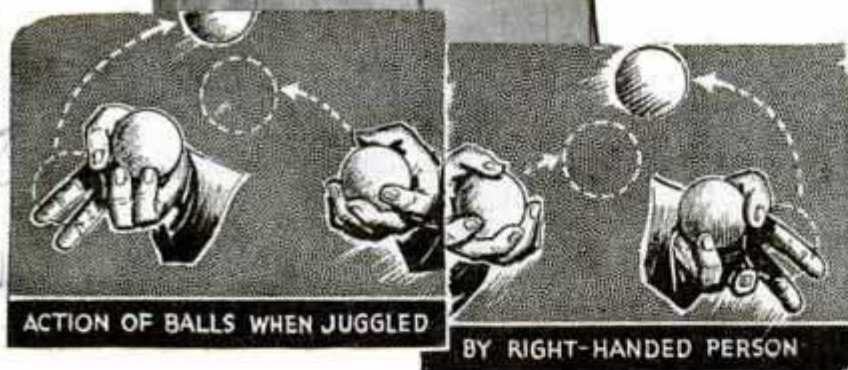
F427

Club James McSweeney.  
20, W. Hartmouth Road

# EASY TRICKS

Kansas City  
Mo.

3164 - 30th St. Astoria L.I. New York



Above, start and intermediate step of orange-juggling trick for left-handed person. Left, procedure for right-handed juggler. Below, sliding plate down arm from shoulder

By Charles Carrer  
Famous Juggler

**I**F YOU are looking for a diverting form of exercise, let me recommend juggling. It is an amusing, healthful pastime.

By spending a few minutes each day practicing or performing feats of balance or manipulation, you can keep your muscles in shape and your waistline trim without conscious effort on your part. And the results are likely to be the same as though the time were spent going through uninspired calisthenics.

This I know from my own experience because I began juggling to improve my

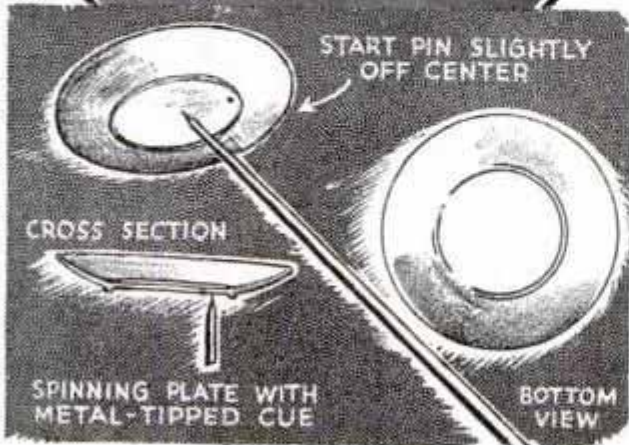




# of JUGGLING

eyesight and this eventually led me into the entertainment field. Several years ago, while working in a factory in Switzerland, I suffered an eyestrain and a specialist suggested I take up juggling in a mild form to strengthen my optic muscles. With this in mind, I began learning a few simple turns and within a few months I had progressed to the point where my services were in demand at company parties and church socials. In a short time my eye trouble disappeared and I have never been bothered since. Glasses are a rarity among the followers of this lively art.

Juggling differs from most pur-



*Top, don't try this stunt without long practice. Below, details of plate-spinning trick and the equipment used*

suits of this kind since one does not need to be highly proficient to derive pleasure from it. On the contrary, the person who has picked up a few stunts "for his own amazement" shares the same thrills and enthusiasms as the seasoned veteran. Success, however, can be measured in terms of your patience, adroitness, and faithfulness to practice.

For a starter in manipulation, the best plan is to take a ball or an orange and toss it into the air about two feet. When it is about to descend, a second one, held in your other hand, is thrown upward. From this point, the two can be kept going in one hand, the one starting up just as



F427



the other is ready to start down. In order to get the proper timing, this first step should be repeated over and over until the action becomes mechanical with either hand.

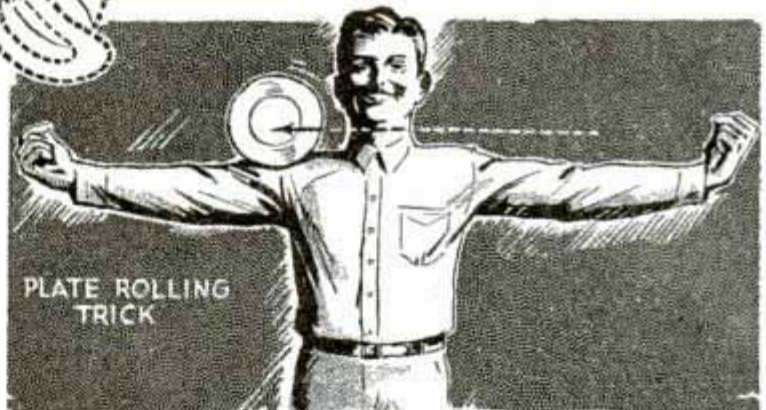
There are many ways of juggling three objects, but the most common, and, I think, the most practical is to place two oranges in your right hand and one in your left. I happen to be left-handed so the order is reversed in the photographs but from the diagram you will see the procedure for a right-handed person. The first orange is tossed upward from the right hand with an easy, inward motion. When it is about to descend, the second orange—held in the left hand—is thrown into the air. As the first orange comes down in the left hand, the third orange in the right hand should be on its way upward. For the left-handed entertainer, the left hand holds two oranges and starts the action.

It is a good idea to begin counting when you first start so you will get the correct

rhythm. Make certain you have mastered this trick thoroughly before going in for any frills. It is the foundation on which the whole system rests and its importance cannot be underestimated. The fourth and fifth objects may be added by degrees and from there on, it's up to you.

Plate stunts exercise an entirely different set of muscles. In this group, the first trick you will want to learn is the "waiter's delight," or the method of spinning a dinner plate on the finger. This is done by placing the index finger a little off center so the plate will get the proper motive power as your finger turns.

Twirling plates with small cues is a little more difficult. The ledge on the bottom of the plate acts as a groove to which the cue adheres as it slowly turns. In this connection, a trade trick may be disclosed. Sharp metal points frequently are inserted in the ends of these cues and small holes are bored into plates near the ledge. When the metal point is fitted into



Top, arm motion for the three-hat trick and, below, rolling a plate across the arms and chest

this hole, the danger of the plate slipping is minimized. Wooden disks painted white or in various colors can be worked effectively with the aid of these metal-tipped cues. Two can be operated simultaneously with a little practice.

It is easy to roll a plate from the right hand, across the chest, to the left hand. The power here is supplied by a quick upward jerk of the wrist. Another stunt is to place the plate against the right shoulder and then catch it with the right hand. The diagram shows the correct way to do it.

No matter what you start out to do with plates, it is safer to practice with wooden ones until you are confident of your abil-



F427

ity. Plenty of leg exercise is offered in the plate and spoon stunt. From the starting position pictured, the spoon is tossed under the leg and lands behind the ear. The drawing shows the intermediate action. The false starts, bends and kicks involved in this feat constitute a good workout for any inexperienced juggler.

Likewise, performing with three hats is as good as a workout with dumbbells in a gymnasium. You start with a hat on the head and one in each hand. The first move is to throw the hat in the right hand slightly higher than the hat on your head. Then in a quick movement, grab the hat off your head and duck into the one in the air as it descends. Heavy felt hats or straws are best to work with and work-



The spoon on the plate is flipped under the leg and upward, landing behind the ear —if you don't miscue



outs before a mirror are suggested for the initial attempts.

That even the simplest juggling trick requires plenty of practice to master should be recognized by the beginner who must be willing to devote the time to the daily routine if he expects to become proficient.

(Another article by Mr. Carrer next month)

*ilpor. Case* *F554*  
**Dripless Penetrating Oil Flows In and Congeals on Metal Parts**

Processed so that it will flow into but not out of places where lubrication is desired, a new penetrating oil is claimed to be dripless. After being applied, the oil congeals into a full-bodied lubricating film of high viscosity. The oil is an all-mineral extreme-pressure lubricant, suspended in a volatile carrier. It reaches its maximum flow immediately for quick penetration, then the carrier evaporates and leaves an

efficient lubricant covering the parts requiring protection from rust and wear. In application to tight fittings, such as auto door hinges, surplus oil may be wiped off while the job is being done. There is no after dripping. The oil is offered for electric motors, fine bearings on precision lathes, band saws, home-workshop machines, sewing machines, electric refrigerators, and other delicate mechanism.

*American Increase Oil Co*



# Tiny Town of Model Homes

## F 52<sup>2</sup> Seen by Throngs of Visitors



*Isloke*

© Fox Photos

This model house, receiving its annual coat of paint, is part of a miniature village in England with its own tiny railway and yacht basin

When the village of Bekonscot dresses up with a new coat of paint, the painter does most of the job while on his knees. The miniature model village at Beaconsfield, England, is visited by thousands every year and is seen here undergoing its annual sprucing-up in preparation for the busy season. Each tiny building is complete in every detail.

### Electric Heater Circulates Air Drawn from the Floor

F 515



*4-50 - \$5.00*

Shaped to draw cool air from the floor, warm it and send it circulating through the room, an electric coil heater of the portable type but without the usual reflector has been placed on the market. Its conical,

*1934 diamond*



Special vacuum cleaner for bookshelves dusts tops of books and sucks up the dirt

*Premier Dust Electric Vacuum Cleaner*

*Cleveland Ohio*

curving base, which sets on the floor, is surmounted by a durable coil drawing 660 or 1,000 watts. This is protected by a strong steel cage. Instead of focusing a hot beam as do some reflecting type heaters, this keeps warm air circulating and in tests has maintained a 1,000-cubic-foot room at 72 degrees while outside temperature is zero. The 1,000-watt model maintains the same temperature in 1,500 cubic feet. The heater is being used in auto trailers, tourist camps, summer cottages, and for emergency warmth in hospital rooms and homes.

### F 508 Book Shelf Is Dusted by Special Vacuum Cleaning Brush

It is no longer necessary to blow the dust from the top of a book—or even to go over the bookshelves with a dust

*Cochran metal Products Co. Sturgis*



rag. A special vacuum cleaner has been designed to do that particular job, and Newton D. Baker, Cleveland attorney and former secretary of war, has been granted a patent on the invention. The electric duster is shaped to reach into the shelves and dust the books, sucking the dirt into a bag.

## Shoppers' Dogs 'Parked' In Fire-Screen 'Kennels'



Customers' pets are shown "parked" outside a millinery shop in kennels made from discarded fire screens

## Clock as Old as Columbus Is Still Ticking F549

More than five hundred years old, and still ticking! Figure out for yourself how many times a clock could have ticked—if someone remembered to wind it faithfully—since about 1410. In New York University's collection of clocks and watches is one timepiece reputed to be the world's oldest clock still in good running condition. Prof. Daniel Webster Hering, curator of the collection, obtained it from a dealer after it had been overlooked for years. Professor Hering is eighty-six—a few years older than this clock was when Columbus discovered America.



Professor Hering with the prize clock of his collection, made about 1410 and still in running order

Where to "park" the dogs of her customers was a problem for a London milliner until she converted several old fire screens into cages or kennels. The screens, fitted together to accommodate various sized dogs, were installed on the sidewalk near the entrance to the shop.

F517

## Closed Keyboard Typewriter Is Quiet and Dust-Free

Noise is reduced and dust and dirt are practically eliminated in a typewriter with a closed keyboard. The square or rectangular keys are automatically held in vertical and horizontal positions, forming virtually four solid banks. This tends to keep typed work in exact alinement. The operation of the machine is unchanged as to touch and position of keys and all standard dimensions are retained. All mechanical adjustments are within easy reach of the operator. The design permits the entire frame, covers and other parts to be made of molded plastic, reducing the weight eight pounds from that of conventional typewriters.



Patd. by R. U. ...  
Sensations 4/1/47



F520. Milwaukee, Wis  
**Window Swings to Any Position for Ventilation or Washing**



Both sashes can be brought down and tilted inward to a position convenient for washing either side

Windows that can be tilted inward to any position, either from the top, midrail or bottom, and slide up and down in the conventional way have just been developed. When the lower sash opens inward it resembles the office ventilator unit which throws fresh air upward into the room but prevents direct drafts and keeps rain and snow from the sill. This flexibility of position is obtained by attaching the window sash to a metal shoe which travels in a channel. The sliding shoe is attached to the usual sash weights, and a pivot pin at the bottom of the shoe allows the sash to tilt inward. Both sashes can be swung in simultaneously to permit washing both sides without leaning out or disturbing screens. If desired, the entire window can be removed readily from the frame, converting the room into an open sleeping porch.

F525  
**Planes to Fight Forest Fires with Chemical Bombs**

Bombing planes are to be converted from their original purpose of spreading destruction and fire into useful weapons

in fighting forest fires. The U. S. Forest Service plans to experiment with dropping bombs laden with dirt in attempts to smother flames, retarding their spread until ground crews reach the scene. Chemical bombs containing "froth" fire-extinguishing compounds will also be employed, and the planes will carry food and messages to fire-fighting squads.

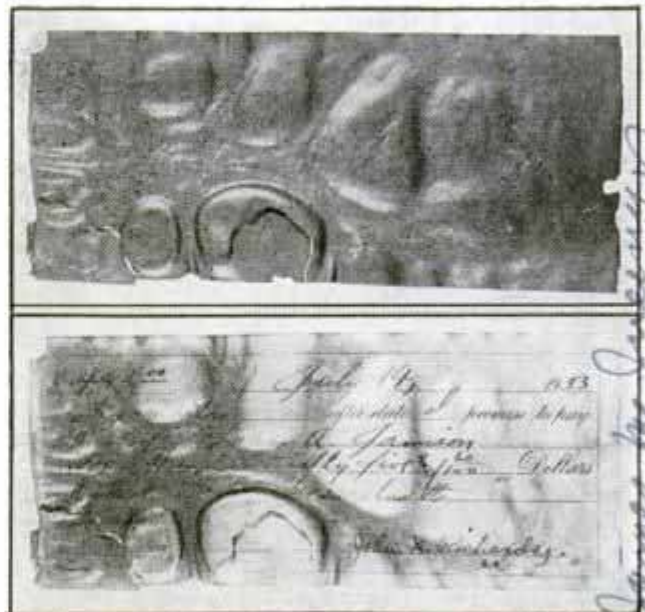
F526  
**Glue Brush Given Double Life by Binding Long Bristles**

Bristles of double the ordinary length can be made to double the life of a glue brush. The bristles are bound around the center with a loop of wire, and when heavy duty has worn the brush down too short for further use, the wire can be snipped off and the brush is again long enough for service.



F537  
**Telltale Evidence Seen in Ashes under Ray of Invisible Light**

Tossing an incriminating paper into the fireplace no longer saves the criminal from detection. Even ashes are telltale evidence now, under the unseen spotlight of



Charred paper at top is made readable, as shown below, by means of infrared ray photography

Science Service  
4/14/31

1201 W. ...  
460 W. ...  
M. ...  
Cm. ...  
20 la. Dartmouth ...  
Panama



the infrared and ultraviolet rays. Photography by "black light"—the infrared or heat ray—reveals things unseen to the human eye; ink printed or written on a burned slip of paper is recorded distinctly on the infrared sensitive film. Important papers charred beyond recognition may be restored to legibility by this method of photographic copying, and it may be that burned currency may be proved valuable to the satisfaction of the U. S. treasury. Forgery can be detected on burned or unharmed paper by invisible light, for two black ink marks that seem identical to the human eye may appear totally different under infrared rays because of different reflecting power. Differences in paper, too, can be observed by this method.

**Harpoon Gun for Big Fish**  
**Is Accurate at Long Range**



© Planet News, Ltd.  
 Comparing new harpoon gun with the old hand-propelled weapon. The gun gives greater accuracy and longer range

Designed for use against shark, swordfish, giant ray and even small whales, a new harpoon gun has a range of fifty yards. It weighs less than ten pounds. The harpoon, which weighs two pounds, is inserted in the muzzle. Remarkable accuracy is said to be possible with the gun.

**Midget Car Has Rail to Protect Driver**

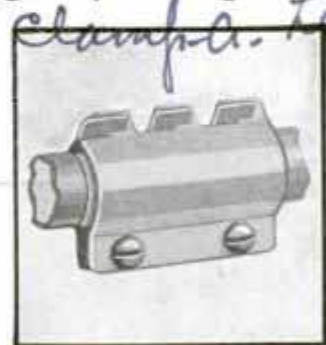
Constructed with a guard railing to protect the driver from other vehicles in traffic, a midget car designed for low-cost operation has made its appearance in Paris. It runs 125 miles on one gallon of fuel, and its top speed is thirty miles per hour. The car is propelled by a small gasoline engine, similar to several motors manufactured in America.



Odd three-wheeled vehicle for one person. It is propelled by a gas engine

**Pipe Leak Is Checked Instantly by an Emergency Clamp**

Quick control of a pipe leak is offered by an emergency clamp which is designed to check the escape of water, steam, air, ammonia or other fluid. The metal clamp is easily assembled over its rubber packing and tightened with two bolts.



Chelsea Metal Stamping  
 P. 25 P. H. P. M. L.

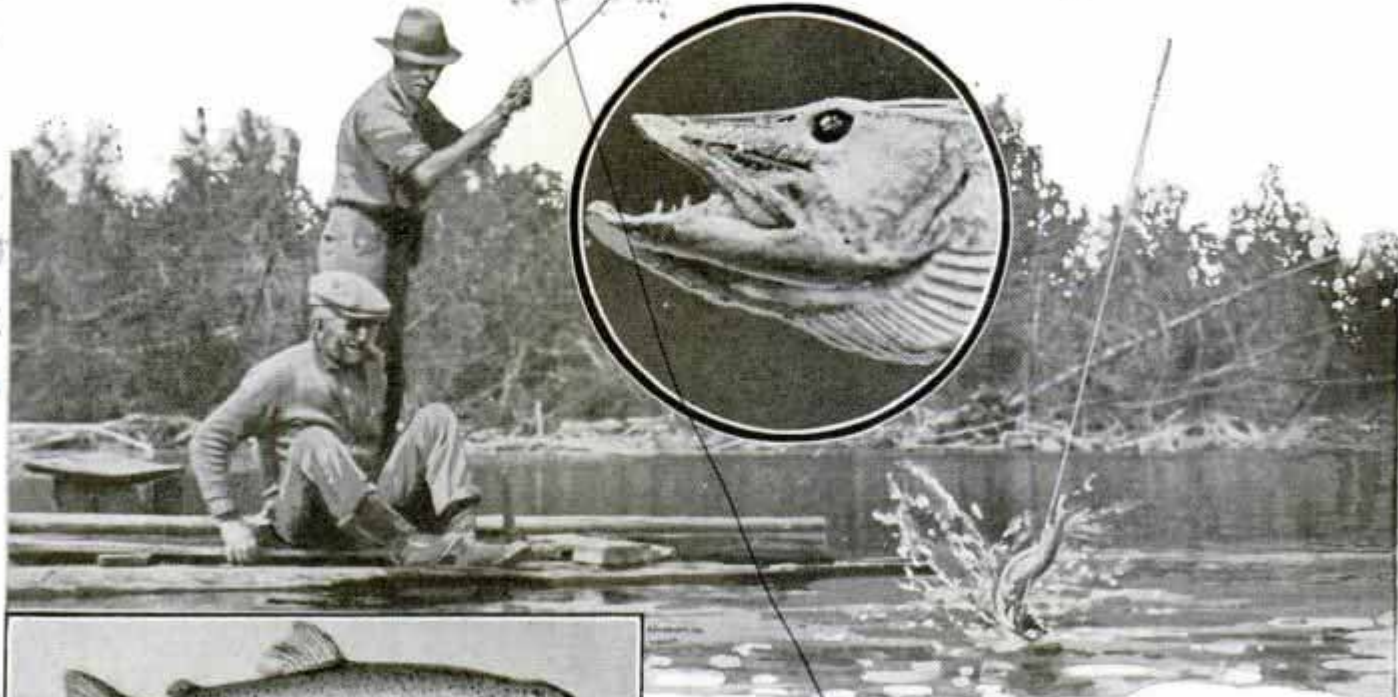
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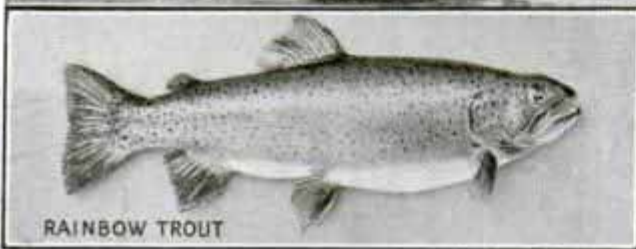
T408

Go sports Dept  
 Tribune, Chicago

# "WHO'S WHO



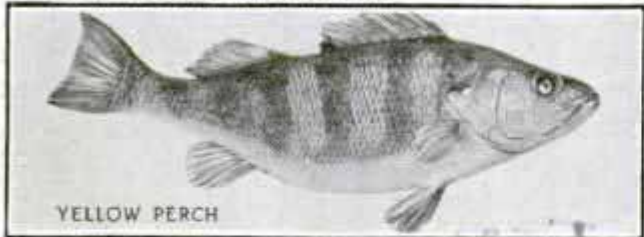
By Bob Becker



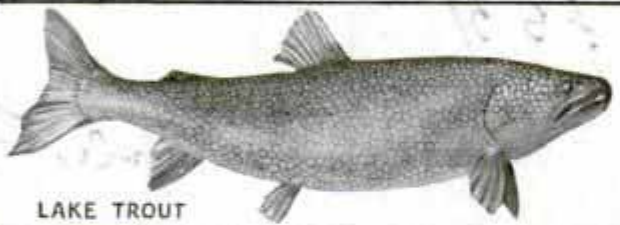
RAINBOW TROUT



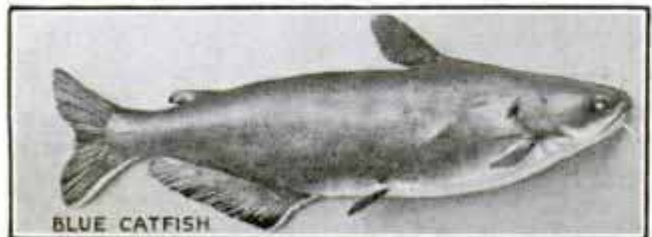
PICKEREL or NORTHERN PIKE



YELLOW PERCH



LAKE TROUT



BLUE CATFISH

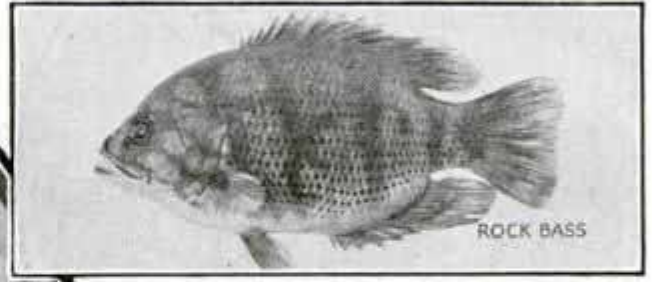
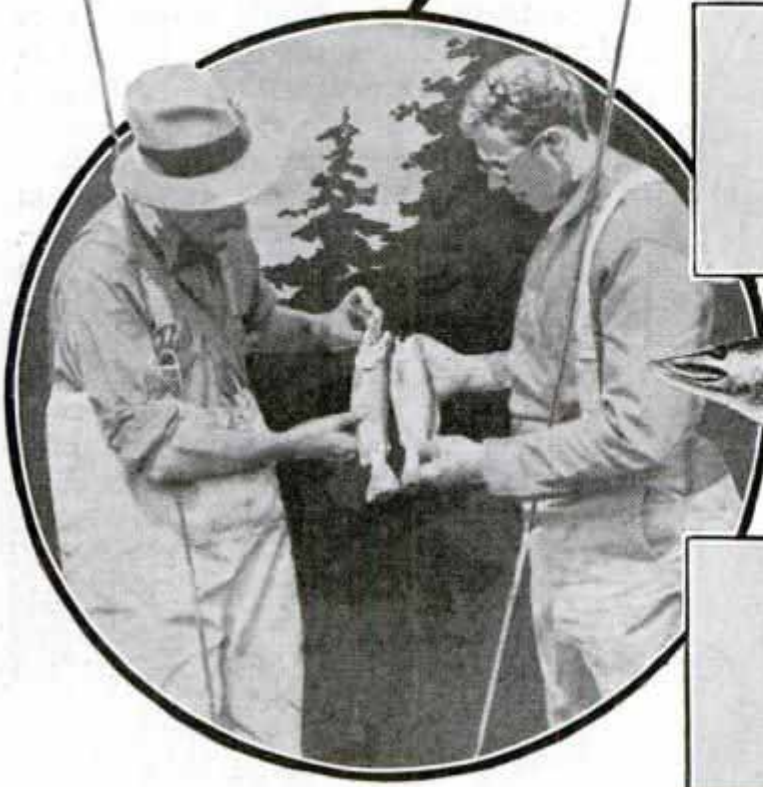
WITH more than 15,000,000 fishermen scanning maps each year for places to fish and wondering what kinds of game fish are in different waters, the finny tribes of America face an annual "show up" that never fails to interest the disciples of Izaak Walton. Many of the fish parade under different names in different parts of the country. Moreover, lures and other tackle items used to catch the different fish also vary.

Here is a "Who's Who" among the fish that provide sport for millions of anglers. Among the more popular game fish to keep in mind when considering a fishing trip are largemouthed black bass, dark green above, with their underparts a greenish silver. They usually have dark stripes on the sides and the corners of the mouths extend beyond the eyes. A dandy game fish, they belong to the sunfish family. They hit all kinds of lures including pork-rind lures, spoons, surface and underwater plugs, feathered lures, and both dry and wet flies on a fly rod. Natural baits are live minnows and frogs. This fish has many names, such as cow bass, grass bass, straw bass, trout, bayou bass, mud bass, Oswego bass, Otsego bass, swamp

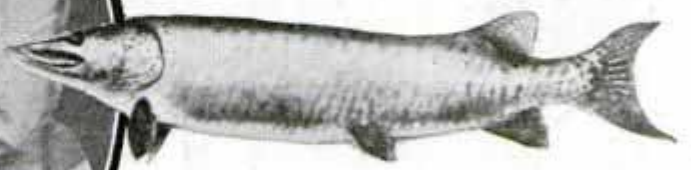
Top, fly fishing a pond for brook trout, and the business end of a muskie



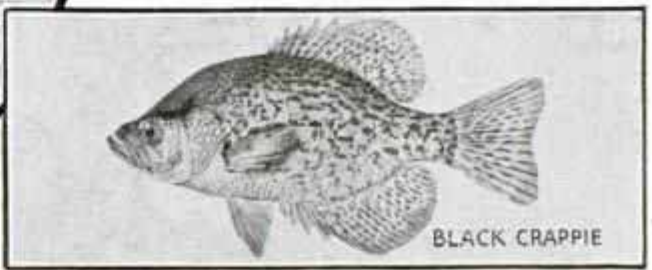
# Among the "FISH"



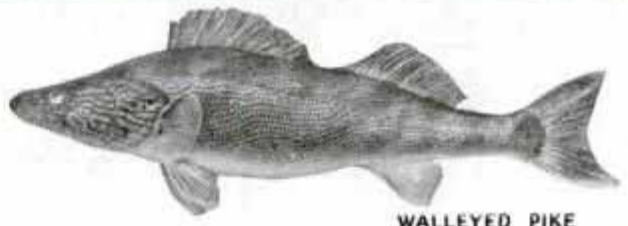
ROCK BASS



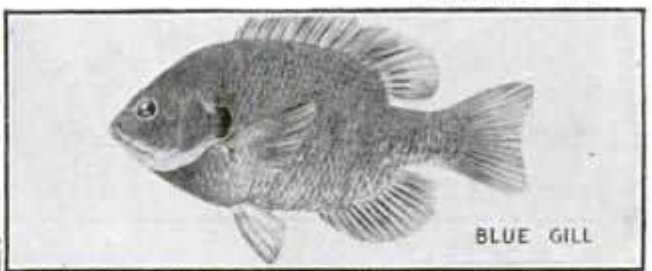
NORTHERN MUSKELLUNGE



BLACK CRAPPIE



WALLEYED PIKE



BLUE GILL

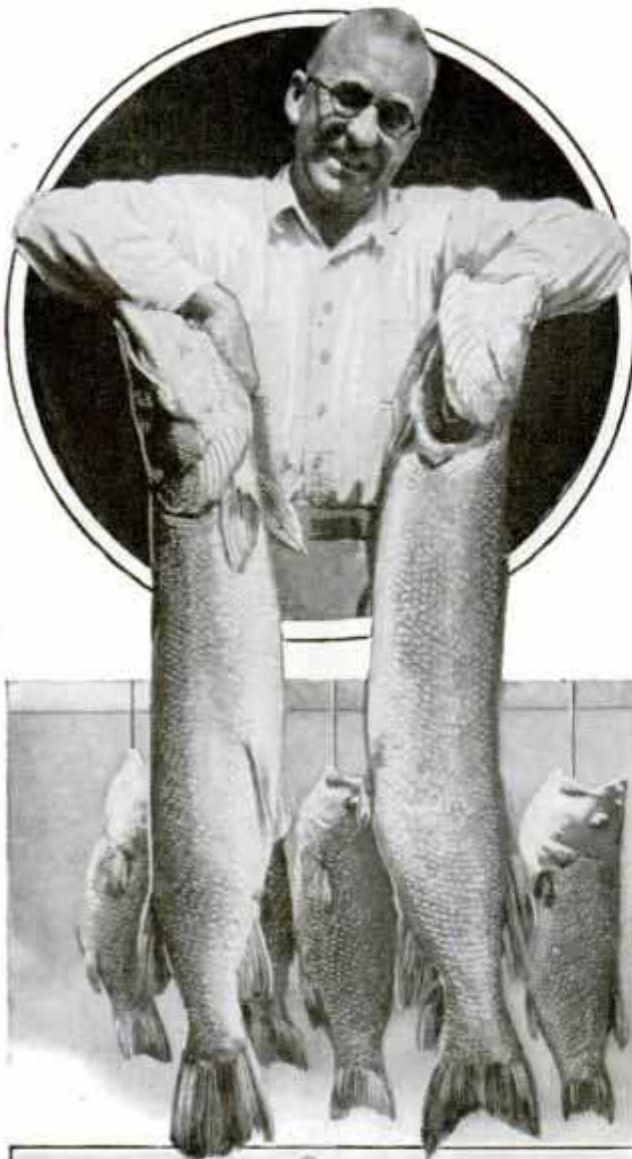
bass, pond trout, and green perch. In the south it is commonly called a "trout." Use a five-foot bait-casting rod and a variety of lures, or a fly rod. The biggest one taken on a rod and line weighed twenty-two pounds and four ounces.

Smallmouthed black bass are highly prized game fish found in Canadian lakes and rivers southward through the United States as far as Georgia, and east to the Atlantic seaboard as well as in Florida. The record is about fourteen pounds,



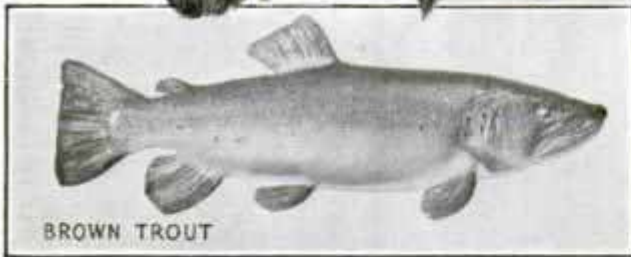
*There'll be fish for supper as evidenced by this string of smallmouthed bass taken from a Canadian lake. Top, typical brown trout found in small western streams*





caught in the south. This species will take many of the lures suitable for largemouthed bass. Anglers use small plugs or pork-rind and spinner lures, handled by a five-foot rod, a quadruple winding reel and a silk line of about fourteen or fifteen-pound test. The most sporting way to catch this fighting fish is with an eight and one-half or nine-foot fly rod, either hollow tubular steel or bamboo. Many fly-rod lures are effective, from wet hair or feathered patterns to floating bugs. It also strikes natural bait lures readily, such as the hellgrammite, frog and minnow.

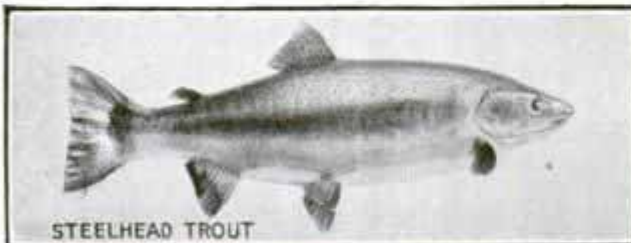
This species has other names, including linesides, trout perch, brown bass, rock bass, jumper, spotted bass, slough bass and tiger bass. Look for it in sandy-



BROWN TROUT



PIKE



STEELHEAD TROUT

bottomed or rocky lakes, on the bars in hot weather, around old snags or stumps, and in the eddies in swift-running streams.

Calico bass and crappies are two widely distributed "little basses" or panfish that are fun to catch on light tackle. They are much alike in appearance. The calico bass usually has seven spines on the dorsal fin as against only six for the crappie. These two fish will take small minnows and worms, but for real sport use a light fly rod and flies. The record weight of a crappie is about three and one-half pounds. This fish was caught in Oklahoma. These fish are commonly called "speckled perch" in the south, but more than sixty names are known for them, including speckled perch, barfish, calico bream, speckled bass, white crappie, lamplighter, roach, Campbellite, strawberry bass, croppie, shad, silver perch, papermouth and spotted trout.

*Top, northern muskies caught in Canada, and a string of largemouthed black bass which was converted into a fish dinner*



*Seaville Club*  
*Santa Monica*  
**Magnetic Board Holds Cards**  
**for Bridge Teacher** *Cald*

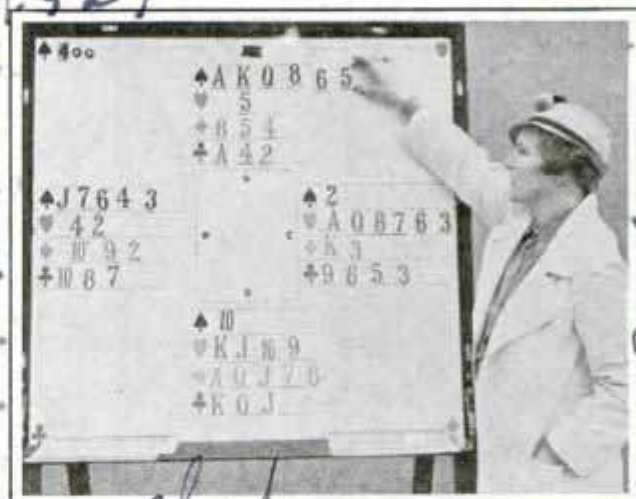
The bluegill is a popular little panfish and very beautiful, too, with its dark greenish tints and deep-colored bars. Worms, crickets, or grasshoppers make excellent natural bait, but the real sport is to take them on a fly rod. They take both dry and wet flies. Look for bluegills around weed beds, old pilings, beds of pond lilies and similar places. They grow large in the south and fight strongly when on a light fly rod. There this fish is known as the "bream." Other names are sunfish, blue sunfish, and coppernosed sunfish.

There are several species of the pickerel and pike family, the most widely distributed being the *Esox lucius*, which has more than fifty names and is found in most far northern lakes and rivers. In the east the common pickerel may weigh from one to ten pounds. Its relative, the northern pike or pickerel, sometimes weighs twenty or thirty pounds.

The *Esox lucius* is a willing biter. It will strike plugs, spoons, pork-rind lures and other fish foolers. The average fisherman uses a five-foot rod and a line that tests at least fifteen pounds. They strike flies, too, and the northern pike feeds on minnows and frogs, so these natural baits will catch them. The pickerel likes weed beds and snags. The northern pike also is known as channel pickerel, grass pickerel, great northern pike, jack fish, lake pickerel, Great Lakes pike, snake, and jack.

The muskellunge takes high ranking among anglers. There are several species from the eastern states westward through Ohio and north through Canada. The list includes the St. Lawrence muskie, the Chautauqua muskie and the northern muskie. All are savage fighters. The world's record is fifty-eight and one-fourth pounds, caught in the Lake of the Woods in Canada in 1932, but a specimen taken with a net some years ago weighed around seventy-five pounds. Many are the lures recommended for the muskie. The bait caster with a sturdy rod, a quadruple winding reel, and a line testing eighteen pounds or more may use a spoon and bucktail, a splashing surface lure, a spoon and pork-strip combination, or other artificial baits. Some cast suckers for muskies. In trolling, a spoon lure usually is used. These fish are taken from weed

(Continued to page 144A)

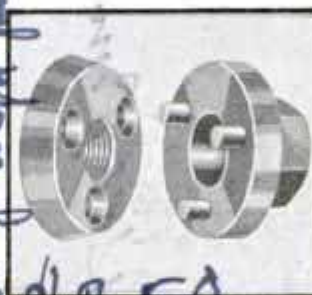


*club*  
 Demonstrating a hand of bridge on large magnetic board designed for instructors

Demonstrating bridge tactics to large audiences is made easy by a magnetic board on which the cards stick wherever placed. The cards may be moved about on the board while it is in upright position, thus overcoming the difficulties of explaining plays. The board measures four by four feet and weighs fifty pounds. It is the invention of Frances Flintom, author and bridge authority.

*F 532*  
**Auto Wheels Saved from Theft by Lock Nuts on Hubs**

Theft-proof locks that guard your automobile wheels against the stripper, fastening the wheel to the hub, are now available. The lock is simply a round nut which takes the place of one of the nuts holding the wheel on the hub. There is no place where a thief could get a grip with a wrench



*\$2.50*  
 to remove it. Three "keyholes" are bevel-drilled in the lock, shaped and arranged individually to match the three pegs of your key. When the pegs are inserted in the holes of the lock, an ordinary wrench will turn it. More than 4,000 variations in the arrangement of the pegs make the lock virtually theft-proof, and one key suffices for the set of four or five locks.

*Seaville Club*  
*Santa Monica*  
*Lafayette Bldg*  
*1115*  
*Theft-Proof Wheel Lock*



### Small Cookstove for Office Plugs in Wall Socket



Showing how small electric stove may be used in preparing lunch in office

Advertisements for stenographers soon may carry an extra requirement, "Must be good cook," if an electric cookstove designed for offices becomes popular. The stove plugs into the nearest wall socket. It is believed that it will find use in small offices located in industrial districts where there are few good restaurants.

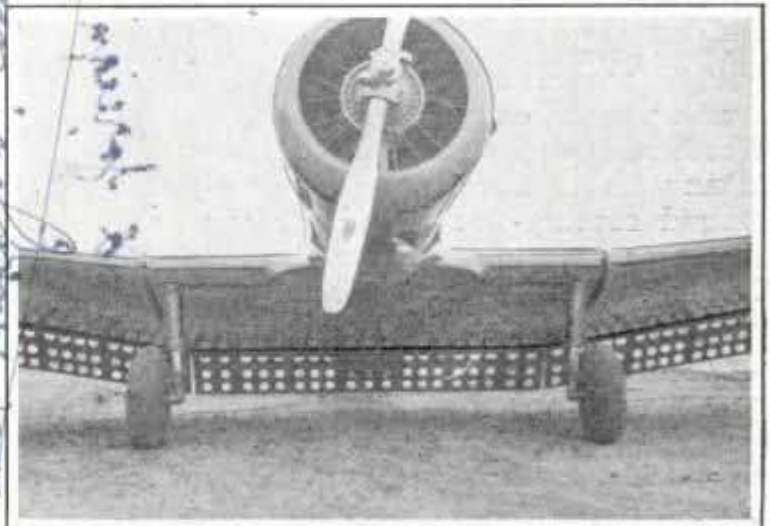
### Two-Row Radial Engine Gives More Power

How to increase power without increasing the weight of the airplane engine too much has been solved, manufacturers say, by replacing the one-row radial motor with a new two-row motor. This power plant produces smaller, but more frequent impulses, resulting in smoother operation and longer life, and horsepower is considerably greater than for the single-row nine-cylinder engine. The maximum power that might be

expected from the single-row plant, engineers say, is about 750 horsepower with an allowable extra power for takeoff of fifty to 100 horsepower, giving a total of 800 to 850 horsepower. That figure is about all that might be produced with safety and satisfactory performance and maintenance. In comparison, one Pratt and Whitney two-row engine is officially rated by the army air corps at 900 horsepower with 1,000 available for takeoff. However, if the engine is opened full throttle at sea level, it will give 1,150 horsepower for a weight of 1,250 pounds, far in excess of anything developed in the single-row engine. The two-row motor is particularly adapted to aircraft in which high performance is necessary to safety and economy.

### 7542. Perforated Flaps Help Plane Land Like a Bird

By using perforated wing flaps, engineers say they have imparted to a new army attack plane a landing action similar to that of a bird. The flaps retard the flight just before landing, approximating the uneven feather fringe of the trailing edge of the bird's wing. Solid landing flaps in general use create a certain amount of wind turbulence that tends to cause shimmy in the tail of a plane. The engineers claim that the new flaps, containing dozens of holes, have approximately the same "drag" as solid ones, but eliminate most of the turbulence. Split flaps, fitting under the trailing edge of the wing in flight, are used widely for reducing landing speeds.



Note the flaps with dozens of holes. The perforations result in better control of the plane on slow-speed landings

7-58  
Pratt & Whitney Aircraft Co  
R. 1486  
Sold by Lee Nathan Merchandise Mart Chicago  
7544  
-112  
Charles W. Leeds  
resident

200 Park Ave. New York

Northrop Aircraft Corp. Inglewood



**Dynamite Made from Corn**

Production of a highly explosive dynamite from corn is one of the latest developments of the chemical laboratory. It is the result of the recent discovery at the University of Iowa of an inexpensive method of extracting inositol, a sugarlike substance, from corn. Inositol is a non-explosive form of alcohol but when nitrated becomes a powerful solid explosive. It can be produced from the waste by-products of the manufacture of cornstarch.

*Prof. Edward Bartow*  
*Dept. of Chemistry*

**Invisible Ray Lures Insects to Death in Trap**

Death rays are now employed to save the garden from insect pests. The ray itself is perfectly harmless, but it is used as a lure in an ingenious trap for the Japanese beetle. Finding that this beetle's eye is "tuned" to receive light waves of a length unseen by the human eye, the inventor designed a trap made of two reflectors, the lower one filled with water and a half-inch layer of kerosene. When the lamp is lighted the kerosene becomes luminous, emitting a blue-white light of very low intensity which lures the beetle to death.



Preparing the beetle trap which employs low intensity light to lure the insects

**Sound Is Weighed to Improve Musical Instruments**



Using tuning fork with the sound-measuring device which promises much for the musician

Delicately adjusted balance scales are used in a new device which weighs sound and which makes possible the improvement of musical instruments and motion-picture sound apparatus. The scales weigh pressures exerted by a given sound to within a few thousandths of a gram of accuracy. The inventor, W. F. Alder, believes the sound-weighing machine will make possible the establishment of the first true unit of sound pressure and that it will result in standardization of tone without the hazard of human error.

**Low-Fuel Alarm for Plane Warns the Pilot**

Serving to warn the pilot where there is any interruption in the flow of fuel from tank to pump, a new safety device for airplanes has been placed in production. A signal light on the instrument board remains off as long as pressure in the fuel system is maintained but flashes when the fuel level drops to the danger point.

*W. F. Alder*  
*19 Cornfield*

*Steel Products Engineering Co.*

*Chicago Daily Tribune*

*Availability*

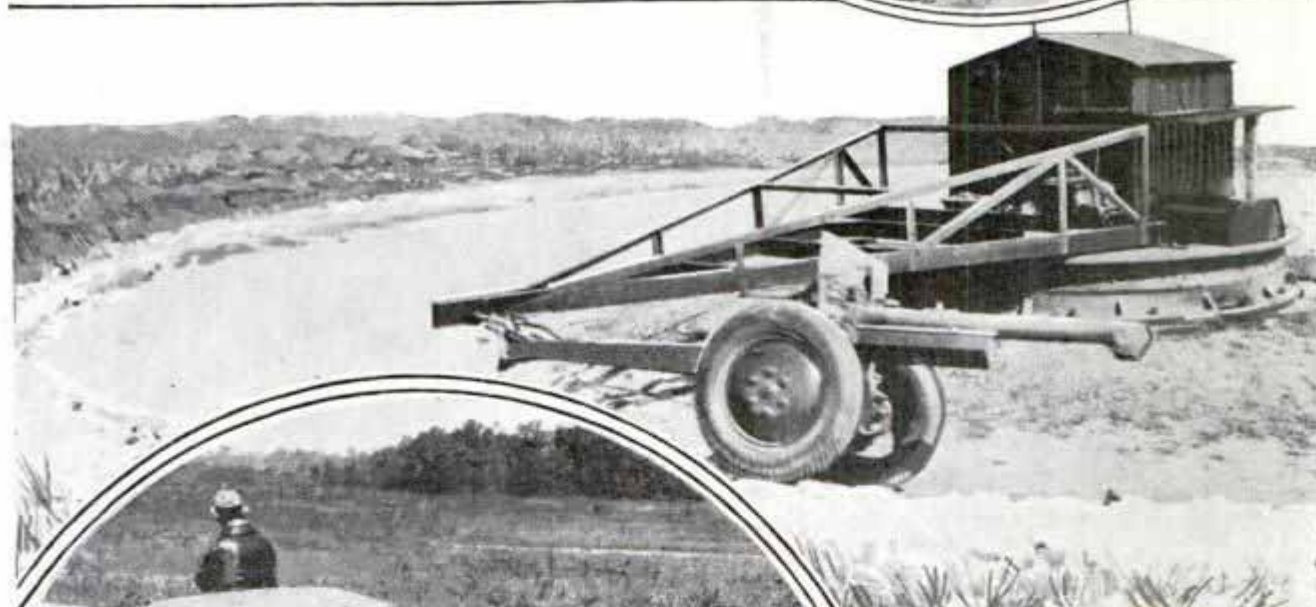
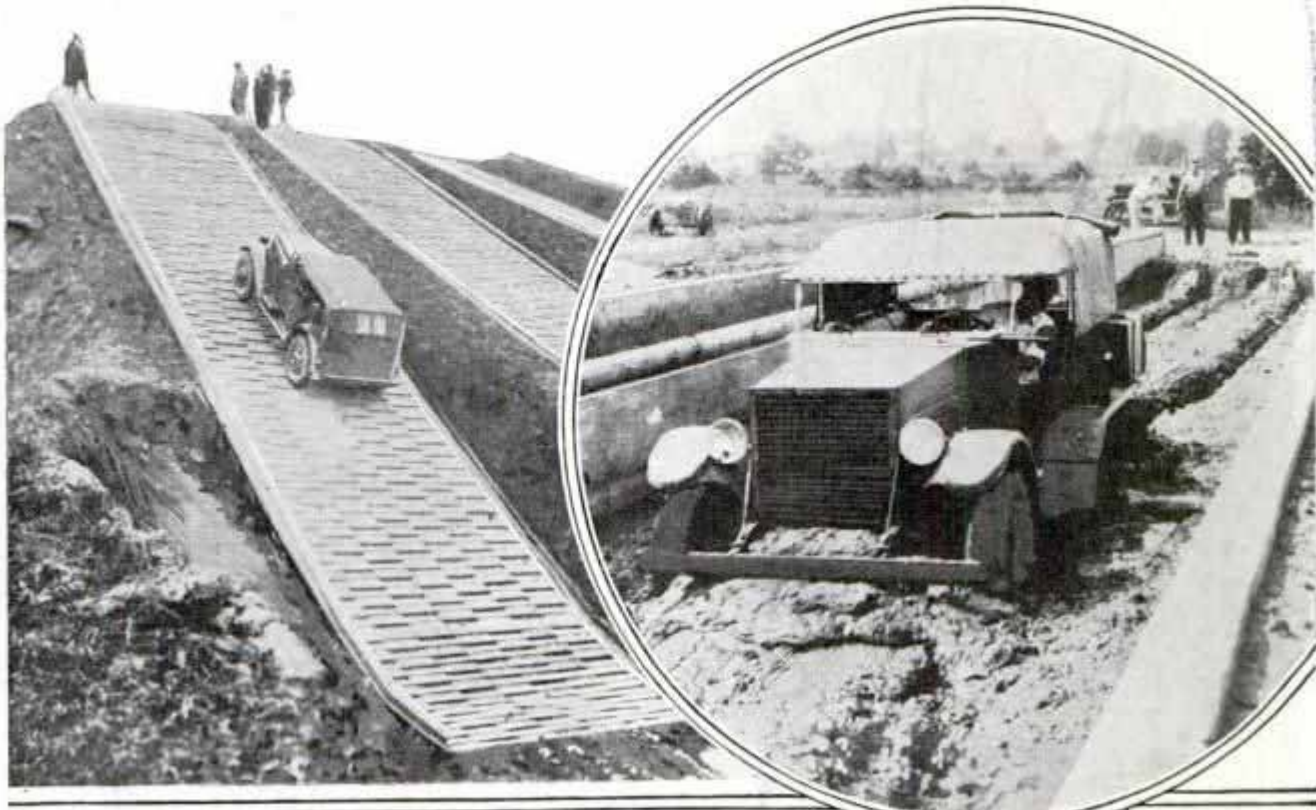
*Altaidenray of Phil...*







# Army "Tortures" Latest Fighting Machines



*clut.*

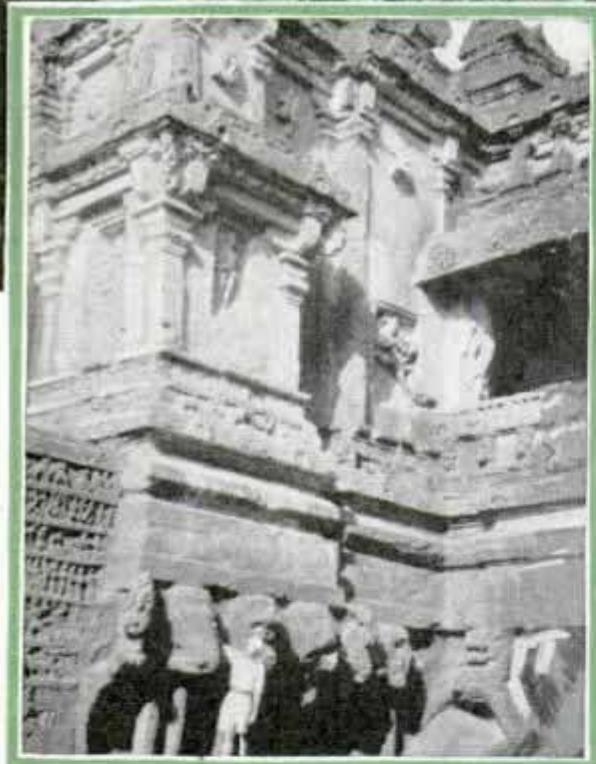
Scenes at Aberdeen proving grounds in Maryland where U. S. army subjects motorized war equipment to grueling tests. Top, left, scout car climbing sixty-degree grade to prove its efficiency. Top, right, track-laying unit plows through thick mud. Center, seventy-five millimeter gun carriage being whirled on merry-go-round of circular cobblestone track. Bottom, light truck used for towing gun carriages splashes through water course

The Aberdeen Proving Grounds in Maryland are the largest and most important of the Army's proving grounds. They are located on the western shore of the Chesapeake Bay, about 30 miles from Washington, D. C. The grounds cover an area of about 10,000 acres and are used for testing and developing new military equipment. The equipment is tested under conditions that simulate those of actual combat. The tests are conducted by the Army's various branches, including the Infantry, Artillery, Cavalry, and Engineers. The results of the tests are used to determine the suitability of the equipment for service in the field.



c/o Adventures Club, 14 N. Michigan Ave., Chicago, Ill. 3  
Home - 27 Meacham Road, Westchester, N.Y.

19 W. 69th St. New York



# TIGERS

*This tiger took its own picture when it tripped the flashlight camera, and some "tame" elephants holding up temple in India*

majestic gentlemen. When mad they are very angry gentlemen—but they are always gentlemen. One can never take chances with them, but if you hold your fire a moment you may learn some interesting things about their habits.

I have sat night after night in a machan or tree platform, over a water hole, watching and listening to the home life of tigers. And I won't kill another tiger unless it is a case of my life or the tiger's. I am convinced that all the so-called killers and man-eaters in the jungle are not as dangerous as some would have you believe.

Many are the legends and stories told about the, to my mind, true king of beasts. The old Mogul emperors entertained their

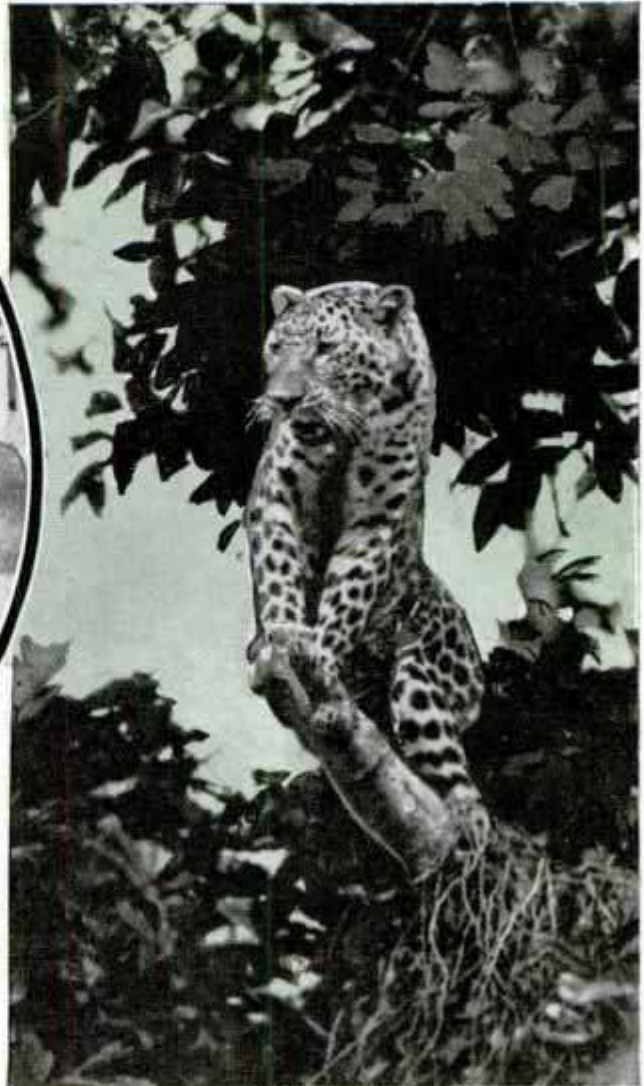
By Capt. John D. Craig

**TIGERS** are gentlemen. They're big clumsy cats with a sense of humor, a shameless curiosity, occasionally possessing an urge to kill humans, but they are gentlemen none the less.

When prowling, they do things not without humor. Surprise them and they actually express curiosity in their faces. When at peace after a feed they are very



F123 C 61 4



*Stone idols adorning a temple in India and, right, panthers like to climb trees —and tigers can, too. Below, equestrian statues guarding gateway to temple in India*

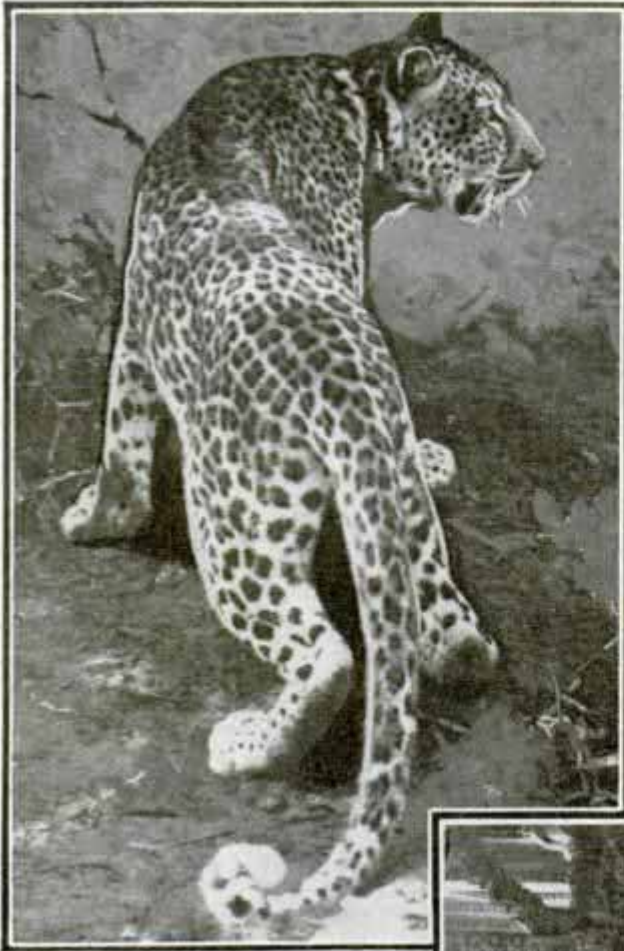
# are GENTLEMEN

guests with animal fights and the major event was usually a death battle between a lion and a tiger, matched evenly. Always it is reported the tiger won. Clyde Beatty told me that in his years of experience in the training ring of leading circuses he had had eighteen tigers killed by lions in fights. Only four lions were killed by tigers. That looked bad for the tigers. But I learned the tiger was a gentleman even in a brawl for when a fight started the lions would gang up on the sole tiger. But when one lion was jumped by one tiger, the tigers let their fellow fight his own battle, and he usually won within two minutes.

Tigers were not originally natives of India at all, but migrated from Siberia and Manchuria. They are also found in the Malays, Sumatra, Java, Siam and







Borneo. There are still tigers in north China, Manchuria and Siberia. They are called "woollie tigers" and some of the pelts have measured thirteen feet from tip to tip. Woollie tigers are very rare, however, as the last expedition sent there seeking them found. It seems the museum that sponsored the expedition became impatient and cabled the leader of the expedition to either get his woollie tigers or come home.

The expedition had suffered untold hardships without even seeing a woollie tiger. Tracks they saw in the snow but not one tiger. Finally, in desperation, the leader decided to do the one thing all sportsmen shun. He decided to use trap guns, mounted three on either side of a game trail and connected with a trip wire. When the game strikes the trip wire the guns are discharged and seldom do many of the six bullets miss their mark. Chinese coolie laborers fixed five gun-traps

mounting six guns each. That night, far off in the jungle was heard the boom of six simultaneously discharged rifles. A little later another boom was heard and again during the midnight hours the camp was awakened by a third crash of gunfire.

Next morning the men rushed out to bring in three tigers. Instead they found three dead Chinamen—so they sailed hurriedly for home.

The largest tigers in India roam the jungles of the Central provinces. The natives tell you tigers will not climb trees, but once one not only climbed the tree in which I was sitting, but came right into my machan which showed a spirit on his part to meet me more than halfway!

We were shooting moving pictures when an incident occurred that showed all tigers are not man-eaters and that often what is believed to be a dangerous cat is really



*A temple scene in India and a spotted "kitty" about to offer objections to having its picture snapped*

only an exceptionally curious one. We had our main camp in a mission compound. They had a twelve-foot tiger wall around the compound and we camped inside that wall. We had built a laboratory there but during our work found it convenient to establish field camps in the jungle where we could work late and be up with the dawn. To get messages back and forth we made use of native runners.

These jungle natives are fatalists. So they go about their business believing that if a tiger is going to kill and eat them, he will do just that, so why worry. The natives know, however, that when they meet



215



a tiger face to face he is likely not a man-eater. Man-eaters usually see or hear the human approaching and sneak off, then pounce upon their victim after he passes.

The natives know when they meet a tiger face on they should stand still and face him. Never do they run. To run would likely be fatal as the cat is a curious animal and might run after the native and knock him down just to see what makes him go. And once you are knocked down by a tiger you might as well be eaten as you likely are dead in any case. The tiger usually stands facing the native with a surprised expression on its face. It

is undoubtedly awed by the appearance of a strange creature that stands on two hind legs. Possibly the tiger is just a little chary at approaching this two-legged creature as in stature he resembles the sloth bear which also stands on two legs when surprised. And the great sloth bear is the tiger's only worthy opponent.

Usually the tiger soon has his curiosity satisfied and wanders off into the grass. Thereupon the man returns to his village posthaste or climbs a tree until he is sure the tiger has really left. Perhaps this procedure started the old story of the strong-

(Continued to page 136A)



Everything about the temple, discovered in the jungle in India, was carved from one colossal block of stone. Bottom, movie expedition "speeding" through India

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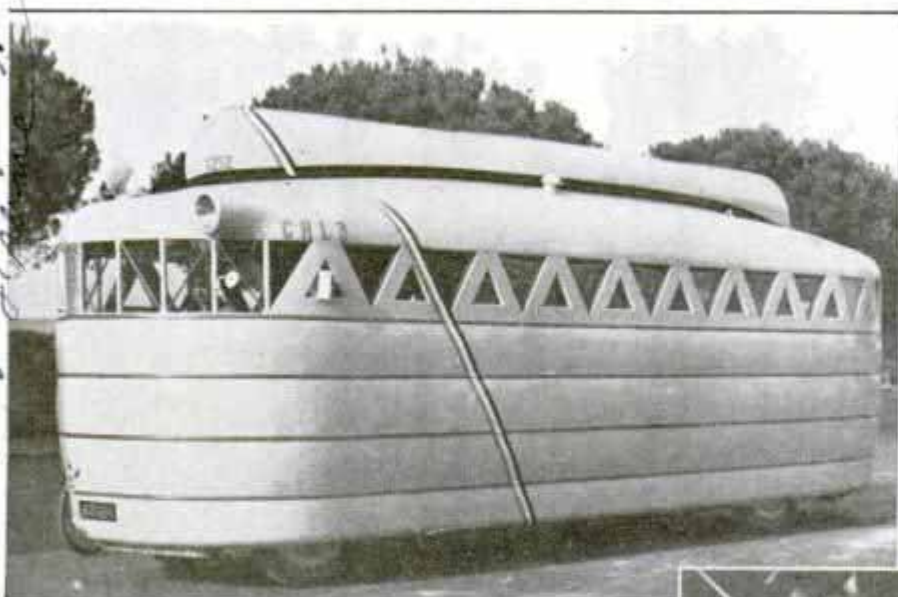
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Handwritten notes at the bottom of the page, including the name 'General A. ...' and other illegible text.



# House on Light Truck Serves Four Tourists

*M. Louvet 84 Boulevard Lavant Paris 2e.*



*Left, exterior of "home on wheels" which accommodates four persons. Below, interior looking forward, showing many conveniences seldom found in rolling houses*

Constructed of small pieces of wood glued and nailed together, then covered with paneling, canvas and paint, a house has been built on the chassis of a light truck by a French inventor. It houses four travelers and incorporates many conveniences not ordinarily found in the mobile home. Principles of airplane construction were followed by the inventor, the house being very light. Its lines are in accordance with accepted ideas of reduction of air resistance in motorized vehicles. The house is twenty-four feet long. There are two sofas which may be converted into beds at night, one double-width bed, a closet for keeping clothing in order, comfortable chairs and a well-fitted kitchen. Auxiliary equipment for sports, fishing and hunting is mounted on the ceiling and a full-sized canoe is carried on top of the car. A space in the roof may be opened to admit fresh air in good weather.



*Scene Service 4/13/36*

## Paint Is Treated for "Sunburn" by Acid-Metal Injections

Paint, like the human skin, suffers from sunburn. Ultraviolet light causes paint to fade, but chemists are now finding ways to prevent this deterioration in sunlight. Various metals are being combined in paint with phthalic acid, which cuts down the penetration of ultraviolet rays and should extend the life of exterior paints. This principle may also be applied to rubber, which deteriorates in sunlight.

*Denny A. Isardner, Institute of Paint*

## Cats Have Two Kinds of Sight Due to Nerve Short Circuit

Cats have two kinds of sight. The vision that enables them to see their food, to walk up stairs and around obstacles, is controlled by the visual area of the brain cortex—but there is another sense of sight which still functions when this brain area is destroyed. A study of cats by a Brown

*Washington, D.C.*

*Scene Service 4/9/36*



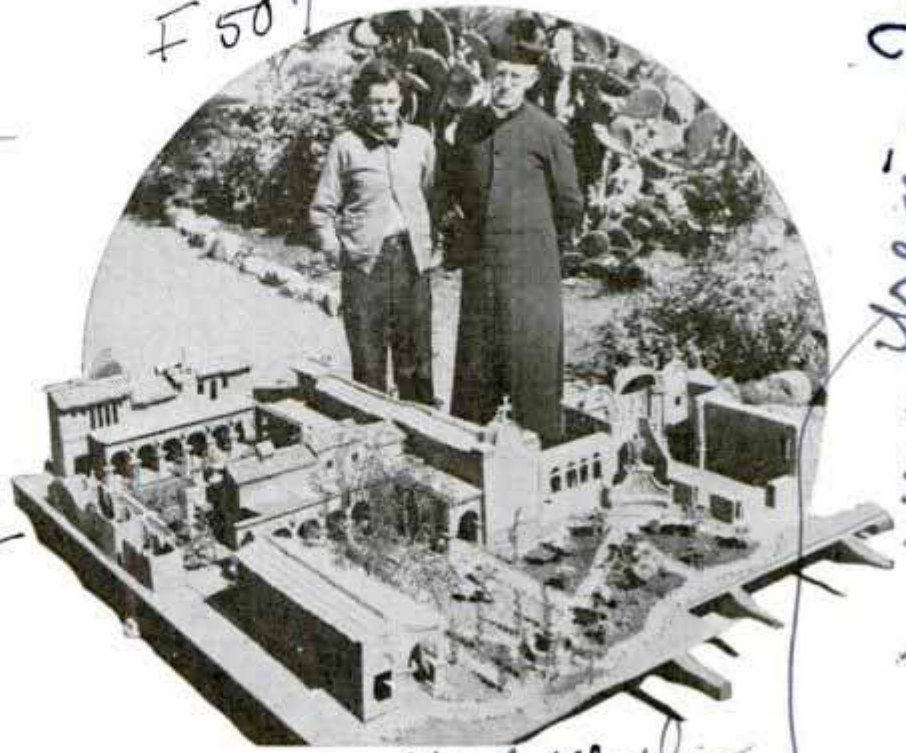
*Prudencia A. D.*

University scientist revealed that after they had

# Model of Famous Mission Is Made in Clay Sections

Mr. Louvet,  
84 Boulevard Davout,  
Paris, 2e,  
France.

*F 501*



View of the clay model of the famous San Juan Capistrano Mission, of California. The model can be taken apart for moving

*bold to buy up to 100 near page*

acted to light and the eyeballs moved when objects revolved around them. Still, they could not find their way to food nor jump from a table. It is believed the eye signal to the muscle was short-circuited through some nerve channel instead of traveling to and from the brain.

## Automatic Dialing Makes Phone Calls Easy

*F 503*

Operation of the dial telephone is made easier by an automatic unit introduced in London. The numbers which the subscriber calls most frequently are printed on a list on top of the device. These numbers are conveyed by notches on a disk inside the machine to the automatic dialing unit. To telephone, the subscriber sets a pointer to the name of the person he wishes to call and presses a lever. The machine does the rest.



London housewife demonstrates device which makes easier the use of dial telephone

Using only his hands as tools, the potter of the San Juan Capistrano Mission in California has made an exact model in clay of the famous mission buildings. Three months of study and careful work were spent on the model, which was constructed in sections that are moved about easily. The builder, Yreneo Mendoza, learned his trade in Jalisco, Mexico, the birthplace of handmade pottery, and scorns the use of even a potter's wheel.

*F 502*

## Weather Map Sent to Ships as Wireless Photo

Up-to-the-minute charts of the weather are now being broadcast to ships at sea much as press photographs are sent across the country over telegraph wires. Several liners already are equipped with instruments for receiving the photograph of the weather map as prepared by the weather bureau forecasters and broadcast by the Radio Corporation of America. In severe weather it would be possible to send maps at frequent intervals to warn ship captains of the course of storms.

*Yreneo Mendoza*

*Dept. of Agriculture 4919 26*

*no further info.*

*30 Rockefeller plaza*



# Model 'Mountain' Railway Built as a Hobby



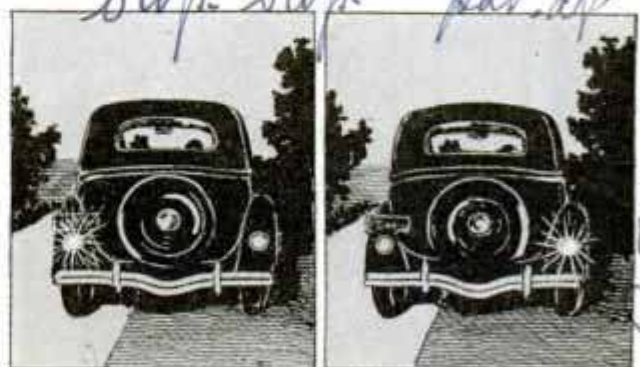
*Wade W. W.*  
 This elaborate model railway boasts 166 feet of track laid through the "mountains." It is one of the most complete miniature systems ever built by an amateur. Note the large switchboard

Eighteen toy engines, both steam and electric models, haul a fleet of trains over a 166-foot model railway built by a Hawthorne, Calif., barber as a hobby. His railroad is landscaped in great detail, tunneling through mountains, snaking through valleys, and even bridging a "mountain" stream of real running water. There is an intricate system of sidings, switches, derails and other trackage. One of his trains is a streamline model, and there are fifty-eight cars in the fleet—sleepers and coaches, flat cars, gondolas, box and tank cars and cabooses—in addition to a wrecker equipped with a traveling crane.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

*F485*  
**Alternate-Flashing Taillights Give Continuous Warning**

Whether you're stepping on the brake pedal, driving alone in dense fog or parking at the roadside, alternate-flashing taillights that can be operated continuously like twin flashers at a railroad crossing assure a warning that drivers in the rear



Sketches show how automatic device flashes one and then the other taillight

*Les P. Hudgman  
 Hawthorne, Calif.  
 1127 E*

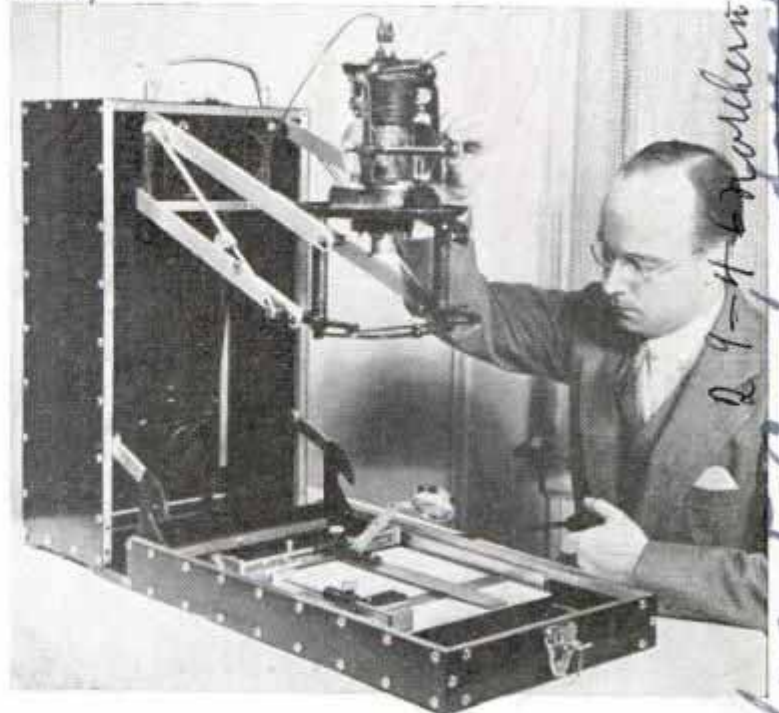
*1125 N  
 Pine & Wackerly  
 Cicero Ave. Chicago*

*Pine & Wackerly  
 Cicero Ave  
 1125 N*



cannot miss. A unit which causes the right and left taillights to flash alternately is on the market. It blazes the red warning "Stop! Stop!" automatically when the brake is applied, but continuous operation is also provided by a switch on the dashboard. One model has two tiny red lamps on the dashboard control which flash in unison with the twin taillights.

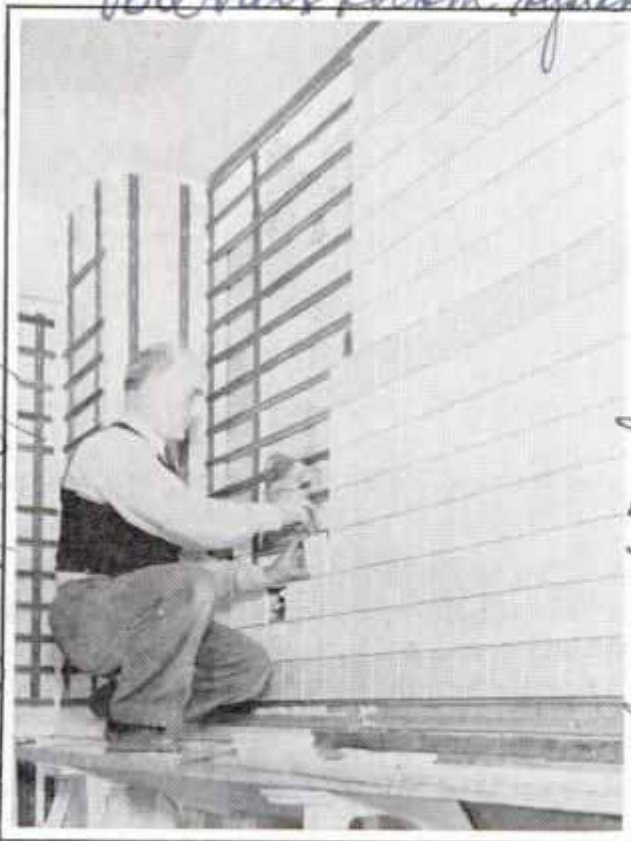
### Photo Enlarger in Suitcase Is Set Up in Two Minutes



Case for carrying photo enlarger is shown open with the apparatus in readiness for work. It can be set up quickly

### Metal Frame Holds Tile in Removable Wall

Something new for the builder is offered by the manufacturer of a combination tile-and-metal wall. The tile blocks are grooved on the edges so that they may be snapped into place in metal frames which may be nailed or screwed to the wall supports. The tile blocks are removable to permit access to plumbing or wiring or to permit a change in the color scheme of the room. Blocks removed from the frames are in good condition and may be used again if desired.



Setting tile blocks into metal frame. The blocks can be removed when desired

You can carry your "darkroom" in a suitcase now. Complete from the enlarging lens to an adjustable masking device which makes white margins, a photographer's portable laboratory that folds into a small suitcase is being manufactured. There is an easel to hold the paper flat while printing, an electric timer which controls automatically the exposure, and a ruby light bulb. It can be set up for operations in a darkened room in two minutes, and folded up even more quickly. The case is impervious to water and acids and is dust-tight.

### Heatproof Paint Is Produced for Furnace Lining

Paint that resists abrasion and chipping at temperatures as high as 6,000 degrees Fahrenheit is being used for coating the linings of furnaces. It is applied with brush or paint-gun. Made on a silicon-carbide base, it will set two hours after application and present a surface harder than the fire-brick or furnace wall to which it is applied, thus lengthening the life of the wall. Corrosive attack of oils, sulphite and gases is resisted and clinkers do not adhere nor soot condense on the paint.

Harbcoat Mfg. Co.  
123 McKeade Ave.

CB 9/20/6 (99)

Barrett Lock system

1 gal. and 5 gal. cans

Q 1-4 Northern Blvd.

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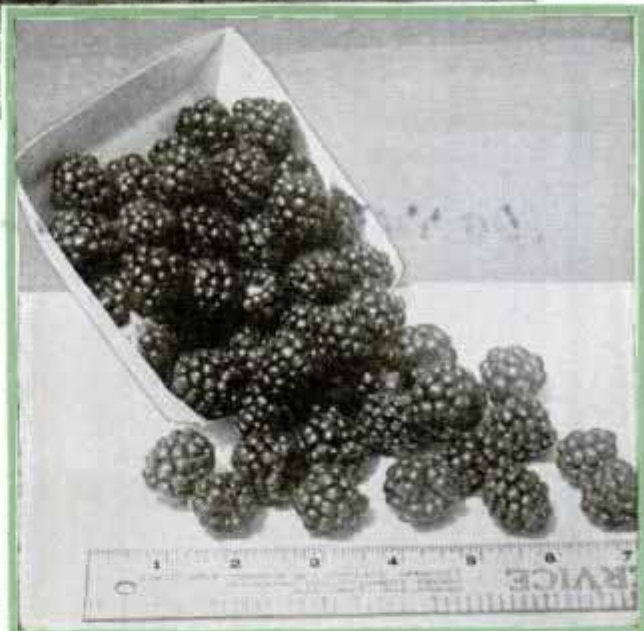
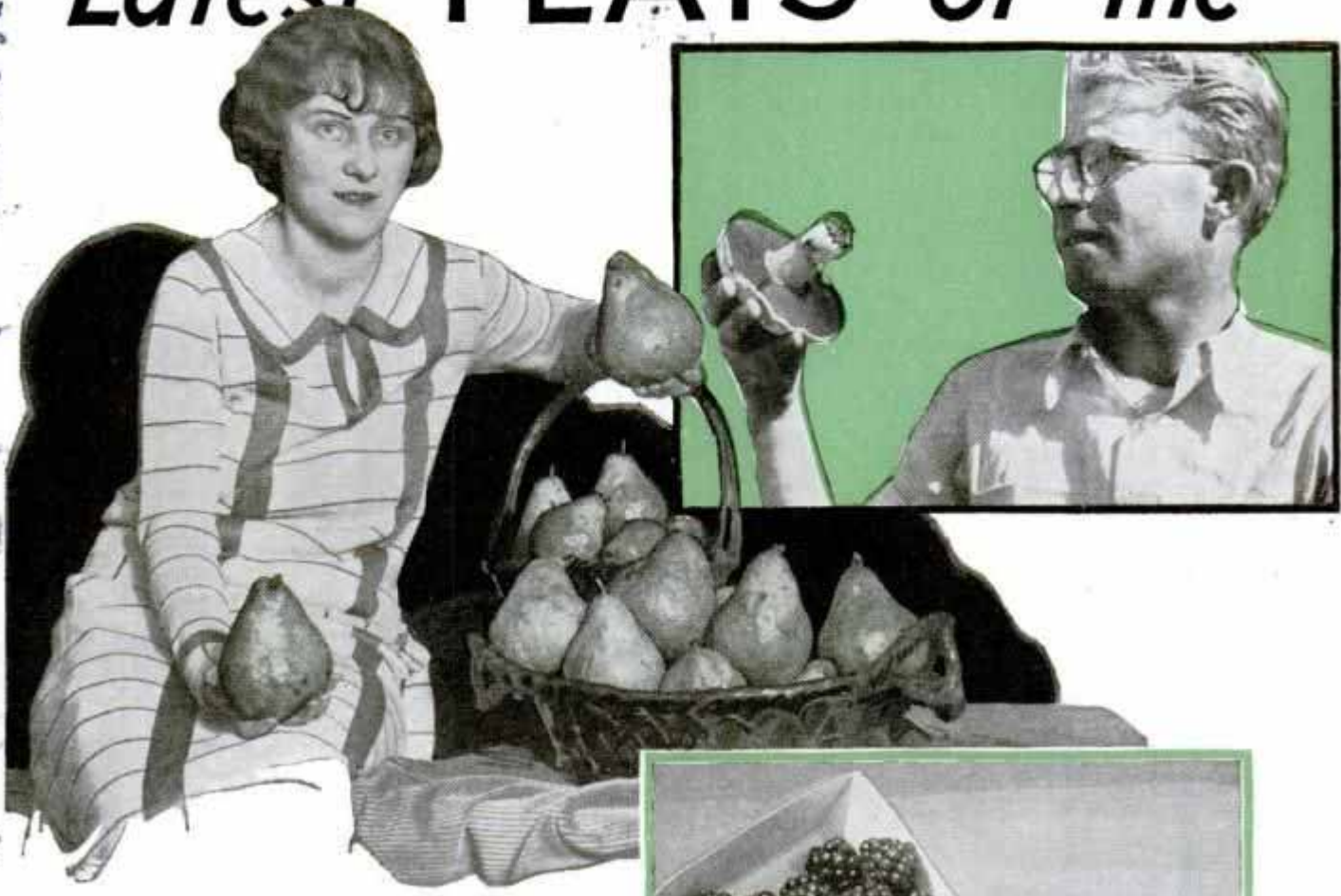
Individual Develop  
ment club?



F349

Mr. Thomas S. Sumner, Jr.  
10555 Holman Ave  
Los Angeles, Calif

# Latest FEATS of the



Giant pears, big mushroom and cross between loganberries and dewberries, result of plant breeding

**T**WENTY-FIVE per cent of the vegetables and annual fruits we eat were unknown ten years ago, says an agricultural authority.

Of course, he adds, common vegetables like peas and potatoes still look the same but we are now using improved strains that didn't exist a decade past. Scientific plant breeding is continually creating new varieties of commercial plants that are larger, better flavored, more resistant to disease, or more desirable in other ways.

Few who buy ordinary cantaloupes in season, for example, know that the melons they get today are a brand new strain. Ten years ago cantaloupes were afflicted periodically by a mildew that caused the meat to resemble that of a leathery cucumber. Then a plant scientist discovered a relative of the melon family in India that was practically useless except for a strong resistance to mildew. As a result of a long breeding program this quality was joined with all the desirable features of the old cantaloupe in a new strain of fruit. Today the melons are as tasty as ever and

also highly resistant to mildew blight. Today, also, we have tomatoes that resist nearly all the old diseases. New lettuce varieties escape the slime and wilt diseases that were periodic menaces, and even a threat to the green onion industry has been eliminated by developing an onion that produces leaves instead of rolled stalks above ground, thus removing the hiding place of parasitic insects. Another

see Aug 1936. 242. Plant Breeder



+349

# PLANT BREEDERS



*Pollinating flower to be crossed with one of another color. Right, placing seeds of new variety in incubator to force growth and save months of time. Below, giant cucumber of new type which retains its moisture and crispness*

innovation is corn that grows on small thin cobs, enabling "corn on the cob" to be marketed in tin cans.

Improvements like these are the achievements of genetics. Meanwhile the hybridizers have created a startling array of new plants that no one ever dreamed about before. Things like the garlion that is a cross between the garlic and the onion, the topeppo that combines the tomato and the pepper, the odorless onion and odorless cabbage, and the lemon cucumber that grows on a vine but looks like a lemon, are all new vegetables. Yard-long string beans are on the market, a coreless carrot is available, and stringless, better flavored "Utah" celery grows in the west.

A new seedless grape with a muscat flavor ripens in July instead of in October. The new boysenberry may replace the loganberry in popularity. Developed by Rudolph Boysen in California, it is a cross between the loganberry, raspberry and blackberry. It is a prolific producer







and has a larger, sweeter fruit than other berries. One test plot of one-tenth acre produced 2,200 baskets of fruit from 100 vines.

A lemon tree whose branches yield a lemon extract is reported from Russia, a freak hardly more astonishing than the distinctive juices that resemble punches and soft drinks of several new orange varieties. These have been grown by the citrus experiment station of the University of California. The purpose was not to create new fruit flavors, but to produce varieties that would flourish in different kinds of soil and to combine strong tree growths with desirable types of fruit. The citrange and the tangelo, the first a hybrid resembling a grapefruit and the second a cross between the tangarine and the grapefruit, are two unusual types gradually being planted commercially.

New kinds and strains of flowers in whole rainbows of colors are being produced. At one recent flower show, more than 250 varieties of chrysanthemums alone were exhibited, as well as new strains of orchids, dahlias, and roses. Dozens of nurserymen are working on roses

alone, seeking new shades and bicolors, longer buds, and better stems. Plant breeding is tedious work, and in 20,000 attempts, only a dozen or so new varieties may be obtained. A new yellow petunia developed by John Bodger was produced only after ten years of work.

"The future possibilities in genetic experiments are practically limitless," one research worker says. He declares that practically any desired characteristic within reason can be produced in any plant, although a particular objective may require many years to reach. In a "scientific Garden of Eden" maintained by the Uni-



*Large grapefruit grown in experimental orchard and, above, tropical papaya which plant breeders hope to make more hardy*

versity of California the work of improving present types of plants, especially common vegetables and flowers, is being conducted along several lines. Resistance to mildew in delphiniums and zinnias is being sought and a breeding program is being carried on to remove the tendency toward wilt in watermelon vines. Elimination of the mosaic disease in celery and spinach is also being sought. A new variety of corn that resists earworm also may be developed. One department of the farm is seeking to transfer the double blossom of the Golden Gleam nasturtium to the other color varieties of the flower.

Most of the work is being conducted along lines followed by Prof. S. L. Emsweller when he created a rust-free strain



of snapdragon after that disease had affected flowers in all parts of the country. After a long search Prof. Emsweller found several snapdragon plants in Indiana that appeared to resist the disease although other plants of the same strain in the same garden were suffering from it. These resistant plants were grown together for several generations until, by crossbreeding, several plants were produced that were entirely free from rust. These in turn were self-pollinated for several years and then carefully crossed with a few commercial varieties. A few years later various strains of snapdragon all free from susceptibility to rust were produced.

Right now an unusual hunt is being conducted among the avocado orchards of the southwest for a few special trees. The avocado, practically unknown in the United States fifteen years ago, produces good crops only occasionally. If a way could be found to make every year a bumper year, the avocado industry could be raised to a commercial plane similar to that of the stabilized citrus industry. Variations in seasonal temperatures seem to determine the size of the crop and orchardists are hoping for a new strain of trees that will bear prolifically no matter whether a winter is mild or cold. The first step is to locate a few trees that seem to bear regularly in spite of winter temperatures. The chances are that these trees will have small fruit, and the next step will be to cross the variety with other trees that produce better fruit.

Another puzzle scientific plant breeders are solving is the strange "sleeping sick-

(Continued to page 124A)

## Painters Risk Lives on Cables High above Giant Bay Bridge



Like flies caught in a giant spider web, these workmen hang suspended as they paint the cables of the San Francisco-Oakland bay bridge

It takes plenty of nerve to paint the small suspender cables on the San Francisco-Oakland bay bridge, which is fast nearing completion. The suspender ropes extend down from the main bridge cables to the steel work. Painters, working from boatswains' chairs, hang high above the bridge, slowly covering the cables with coats of aluminum paint. A false move means almost certain death for these men, but it's a part of the job and they think nothing of the danger.

☐ Honey production may be increased by sowing clover of different blooming habits so part of the field is always in flower.

Country Gentleman  
April 1936 P. 49



*Chicago Tribune  
4/1/36*

# Ten-Wheel Diesel Truck

## F473. Conquers Rough Country



Note how body of truck remains level while the articulated wheels rise over high spots or sink into depressions while traveling rough country

substances studied in the centrifuge acquire weight, they begin to separate, the heaviest parts moving outward to the rim of the centrifuge, the lightest inward. Hemoglobin, the red stuff in blood, has been found to have molecules with a weight of more than 68,000 times the weight of a hydrogen atom, each molecule one-five-hundredths of an inch in diameter. The red molecule was revealed as made up of definite parts, each weighing 34,500 times one hydrogen atom. Similar "bricks" of exactly this weight compose most of the large protein molecules. Thus, similar weight bricks form the molecules of silk, wood, paper, rubber, rayon, bakelite, in fact, most of the films, plastics and molding materials.

*abstingeresellschaft adolf  
number Carbon Dioxide*

Equipped with five pairs of wheels, a Diesel truck exhibited in Switzerland can climb sixty-five-degree inclines, cross ditches six feet wide and travel through water three feet deep. Its wheels act independently so that the chassis remains level while the truck crosses rough ground. A six-cylinder Diesel engine drives the truck at forty miles per hour. The ease with which the vehicle travels over obstacles is of considerable military importance.

### Dime Weighs One Half a Ton

#### F459 in "Weight Microscope"

In a new ultra-centrifuge, a dime weighs 1,025 pounds when a speed of several thousands of revolutions has been reached. Its top speed is 60,000 revolutions per minute. The centrifuge does for weight what a microscope does for size, multiplying actual weight. Thus molecules which cannot be seen with a microscope become so heavy that scientists can visualize the "parts" of which they are made. As the

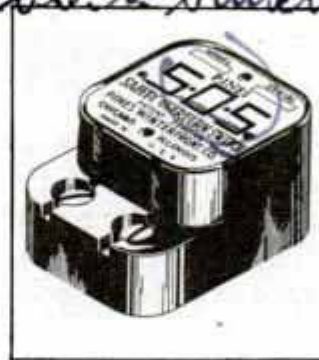
*Designed by Mr. John D. ...  
Dr. ...  
...*

### Automatic Unit Stops Motor

#### F484 if Auto Overturns

Designed to minimize the risk of fire by automatically breaking the ignition circuit when truck or car overturns, a new device

*St. S. S. ...*



is available for application to motor vehicles. It is a small unit of molded plastic containing two mercury tubes. When the vehicle tips over, the mercury flows to the opposite ends of the tubes, breaking

the circuit and stopping the engine. The switch is set at an angle so that the vehicle must be tipped over before the circuit is opened. It is said by the manufacturer that no amount of bouncing or jarring can cause the device to operate as long as the car remains upright.

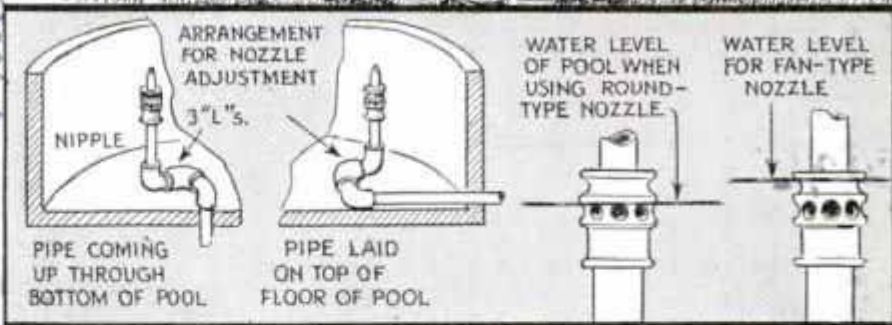
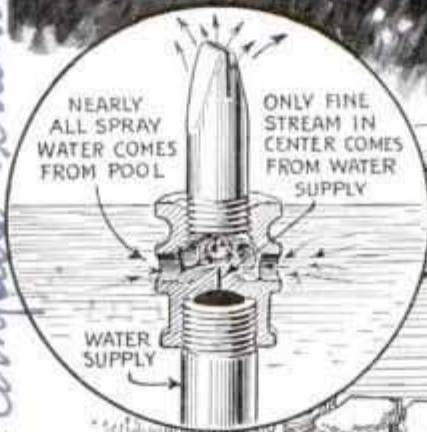
*Pines Winterford  
1135 N. Cicero*



*Andrews & Jeffrey*  
*705 Curw. Newcastle, Pa.*  
*Andrews & Jeffrey*

# "Pinhole" Stream Keeps Fountain Playing

In your garden pool you can build a lovely fountain that requires only a "pinhole" flow of water from the city pipes to keep it spraying. It utilizes the same water from the pool over and over again, and needs but a tiny stream from the tap to equalize evaporation and supply the force for your "geyser." Two types of nozzles throw either a fanlike spray, or a round spray. The secret of the water economy is in the nozzle, which has eight small holes at or just below the water line through which water is drawn from the pool, to be caught by the fine, pin-sized stream from the main and forced up through the nozzle. Water level is controlled by an adjustable screw overflow pipe. If properly adjusted, the falling spray will send tiny ripples and air bubbles against the inlet holes, giving the fountain an intermittent, geyserlike gush. The stream can be thrown from six inches to twenty-five feet high. With no loss except by evaporation, the cost in water is low. A fountain in Pennsylvania operated eight months for three dollars.



Diagrams at bottom show how tiny flow of water keeps geyser spraying in garden pool, which feeds water back to fountain again and again

*Sold by Local Lawn Gardens, Crafton, Pa.*

*Price complete including upward nozzle*

*Price - \$6.50*

*I 44 4*

## Short-Wave Band for Diathermy Proposed by Physicians

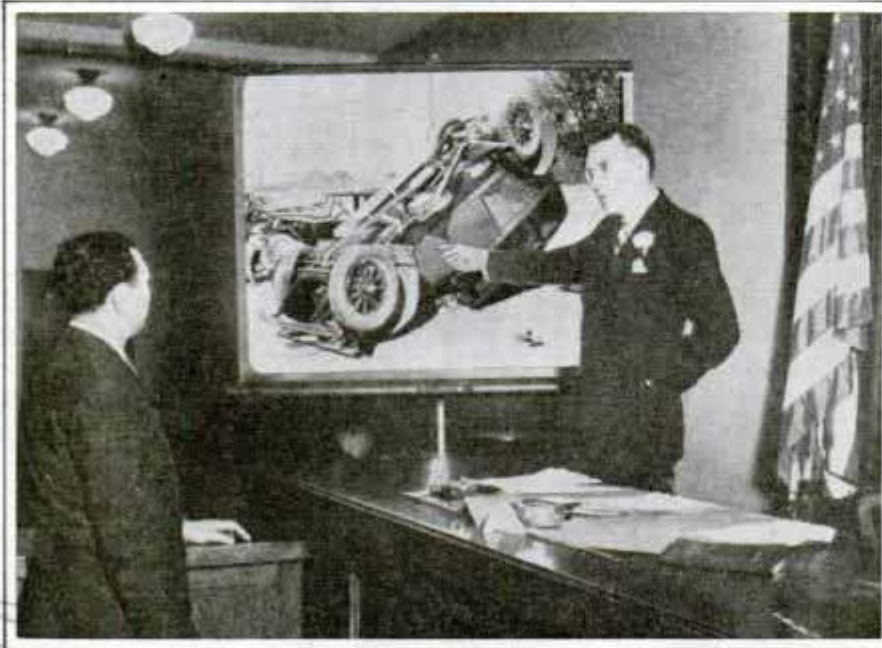
Delegation of a special radio wave length to physicians for short-wave therapeutic purposes is proposed by American medical leaders. Treatment of inflamed joints and other ailments with short-wave diathermy was found to be interfering with reception of radio programs by listeners

in the neighborhood. To prevent this, physicians suggested that manufacturers of these diathermy machines agree on one wave length as most efficient for their purpose, standardize their products on this band and then ask authority for its exclusive use.

*Journal of American Medical Assoc.*  
*535 2 Hershman*



# Court Uses Photo of Wreck to Warn Traffic Offenders



Judge in traffic court points out to traffic violator the consequences of reckless driving. This photo is taken from a safety motion picture

What might have happened as a result of the offense with which he is charged is illustrated to the automobile driver by a large photograph of an accident placed in a conspicuous spot in a Los Angeles court. When the traffic violator is brought before the bar, the judge hears the case and then points to the photograph as a warning that serious accidents may result from minor infractions of the law. The photo shows a wrecked automobile. It is taken from a safety film produced by Plymouth.

## Fumeless Gas Heater for Room Guards against Monoxide



Fumeless, odorless and without visible flame, a gas heater for the home has been developed which obtains almost 100 per cent efficiency in burning the gas. Above the hidden flame but not touching it is a chromium steel element consisting

of tiny cells which become red and, its manufacturers assert, assure the consumption of all carbon passed upward from the flame. By this double-combustion method it is claimed the danger of carbon-monoxide gas is eliminated. The heater is built in the form of a pedestal lamp, of cast iron with porcelain enamel finish. It weighs fifteen pounds.

## Thick Soles Raise 'Stand-In' to Level of Film Star

In features, complexion and build, Francis Lederer's "stand-in" is a good match for the movie star. But Victor Jose Saboni, who takes Lederer's place on the set while cameras and lighting are being adjusted, lacks three inches of the actor's height.



Francis Lederer, left, and his stand-in, who wears three-inch soles to equal the star's height

To overcome this discrepancy the studio property man supplied Saboni with special "sabots," solid wooden shoes with

*Handwritten notes on the left margin:*  
The... Robert...  
3632...  
436

*Handwritten notes on the right margin:*  
...  
436



# Landscape Photo Is Target for Army Machine Gunners

three-inch soles of the lightest available wood. Slipping these "stilts" over his own shoes Saboni wears them eight hours a day while standing by to aid Lederer.



Wearing gas masks, British army machine-gun teams take their turn at short-range firing practice with landscape photograph for target

## Diamonds in Blade of Saw Speed Slate Cutting

One hundred and sixty diamonds are set in the blade of a circular saw, completed recently for cutting slate in England. Each of the diamonds weighs one-half carat. The stones are attached to the blade in the place of ordinary teeth to speed up the cutting. Teeth made of metal wear out so rapidly in this work that it has been found more economical to use diamonds. In addition, faster and more accurate work is possible with a tool of this type.



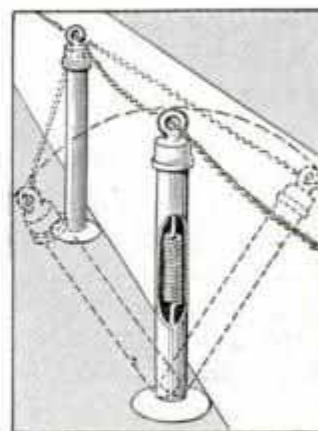
Inspecting saw with diamonds in cutting edge instead of ordinary metal teeth

Automatic buzzers that sound a warning to pedestrians when a taxi goes into reverse are being installed on cab fleets.

British army machine-gun teams are using pictures as targets in practice firing with their Lewis guns. A regiment in training at Aldershot combines target practice with gas-mask drill, and has found landscape photographs more helpful in sighting guns than the traditional target ranges.

## Steel Spring in Metal Fence Post Keeps It Straight on Base

Equipped with a heavy steel spring on the inside, a new metal fence post set in a concrete base is designed to keep its upright position longer than many types of wood, concrete and metal posts. The coil spring serves to pull the post back into position if it is knocked over. The top cap of the post has a hole through which a jack chain is run. The bottom cap, on which the spring rests, is embedded in the slightly tapered concrete base. The body of the post is heavy duty pipe finished in green. The rustproof chain gives a decorative effect to the lawn.



Chicago Tribune 2/20/36 / Industrial Cutting Tools Ltd  
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Yellow Cab Co  
The Sp...  
Post Co. 216

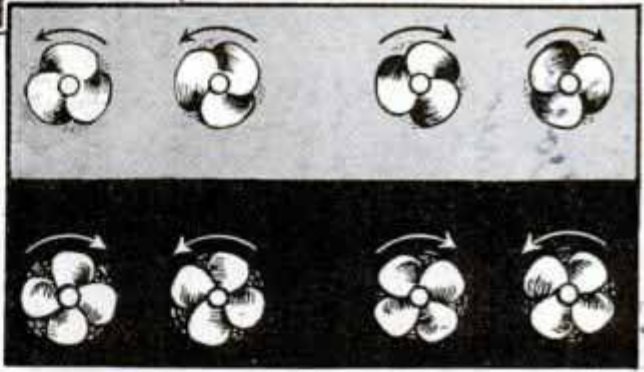
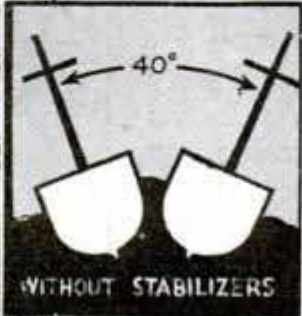
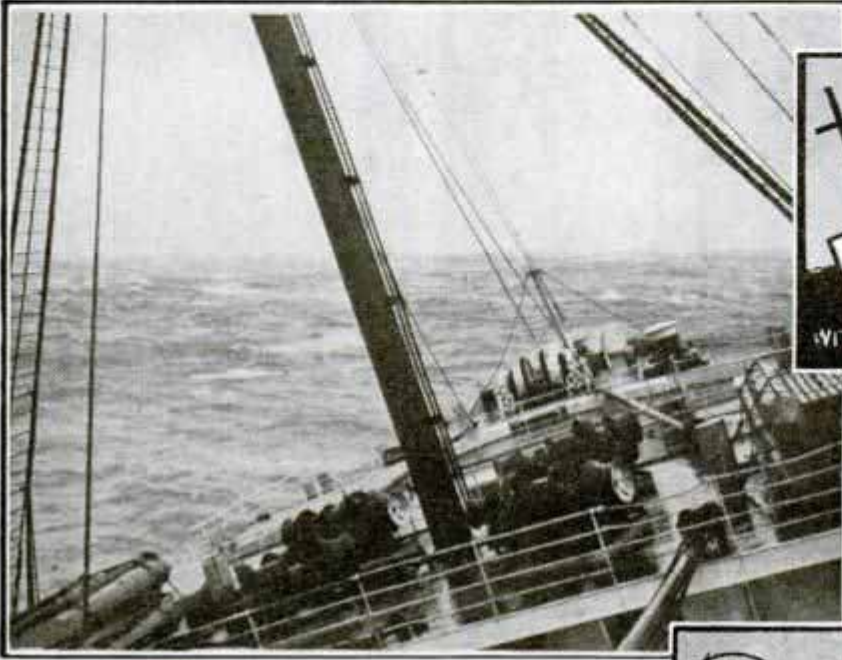
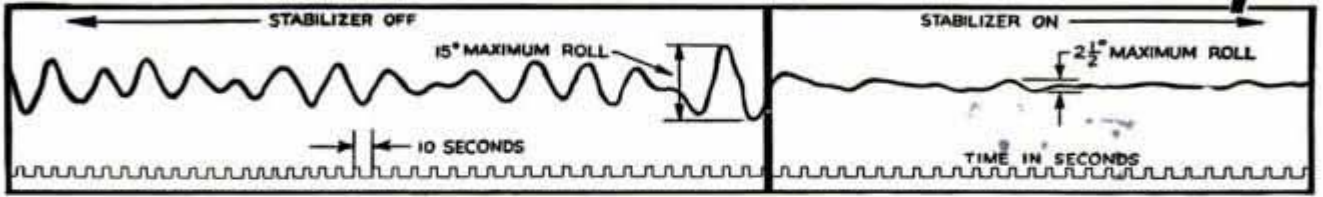
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# TUNING up



Unstabilized ship in storm and, top, stabilizer chart of "Savoia." Drawings show effect of stabilizers and original propellers of "Normandie" and change which reduced vibration

**B**RINGING a mammoth ship to the highest level of efficiency requires the services of many specialists, some of whom ride back and forth across the ocean for no other reason than to tune up the working parts and study the ship's performance.

For instance, it has taken three years for engineers of the Italian line and the Sperry Gyroscope company to learn the behavior in all weathers of the "Conte di Savoia," the first gyro-stabilized express ship. That elaborate study involved the measurement of waves, rolling motions, stability, and the ship's behavior with the wind coming from any quarter. Other specialists study the performance of new equipment and machinery.

In the "Normandie," for example, so many innovations in shipbuilding were employed that a whole corps of "ship doctors" has accompanied the vessel on every voyage so far. No matter how painstaking are the plans of builders, there always remains a tuning job to be done after the ship enters active service. Most ship tuning merely involves the adjustment of working parts, but this must be done by

men who know their business. No one man could possibly be a specialist on all the machinery entering into the construction of a modern vessel. The navigating devices alone are sufficient to tax all one man's time and energies.

Fast ships are commonly affected by the vibration of their propellers and engines. This vibration is still one of the big question marks in shipbuilding. Each ship presents its own problems and requires its own diagnosis. To reduce vibration to the minimum, the "Normandie" carries a group of "doctors" from the Penhoet ship-

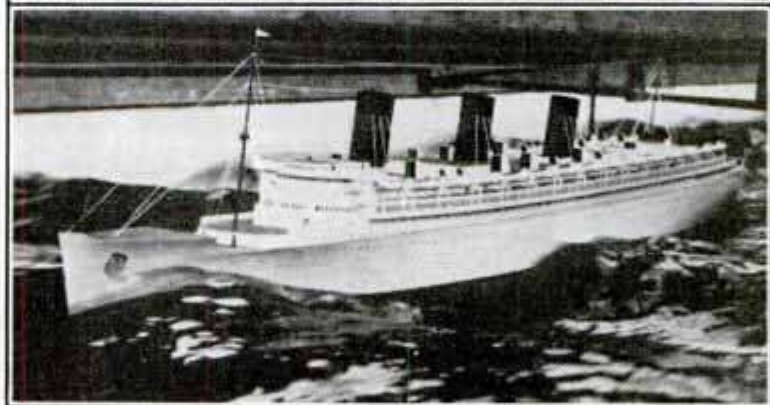
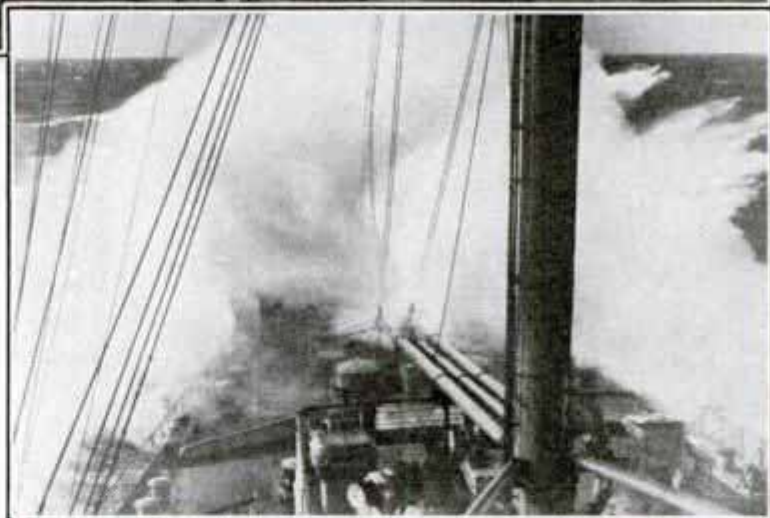
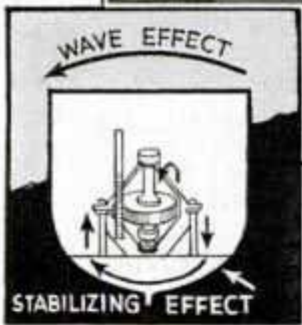
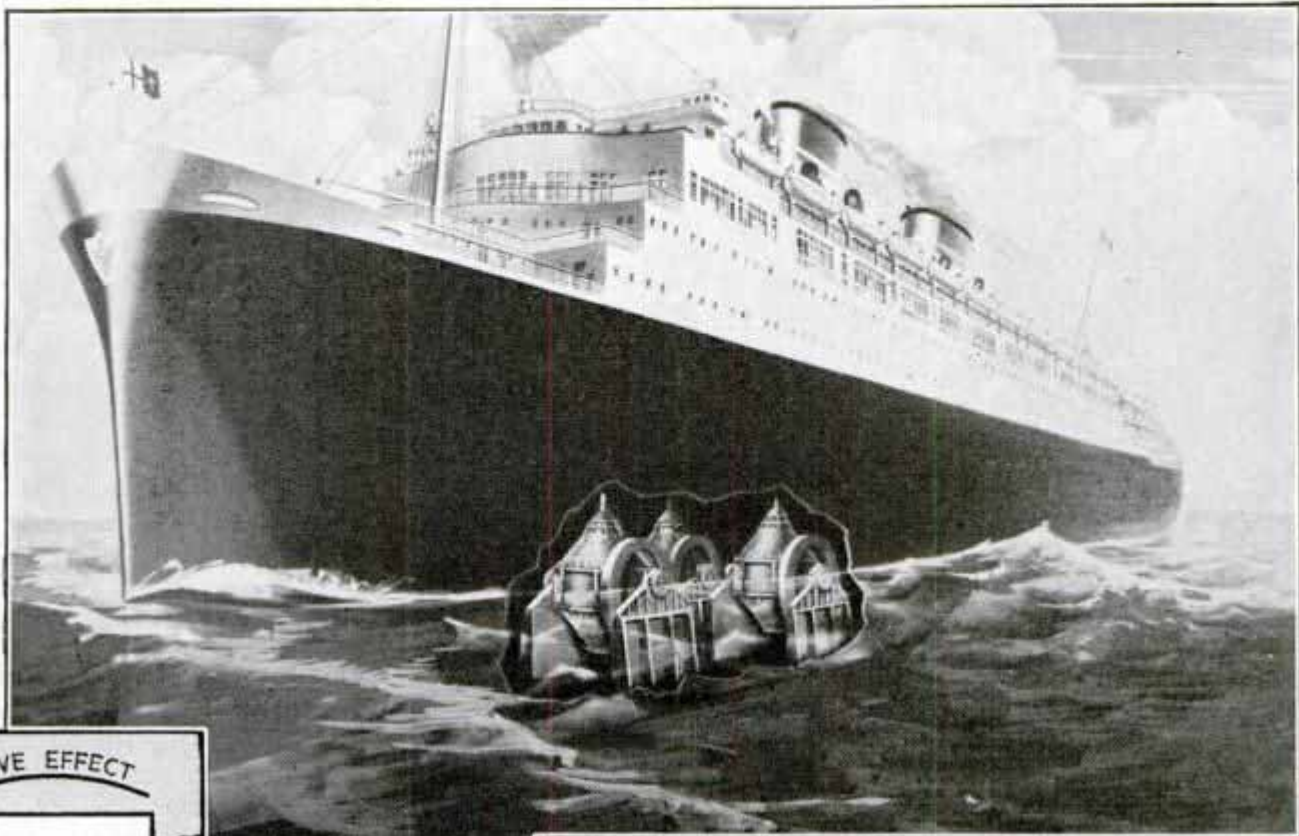
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Vertical handwritten notes on the right margin.



7 400

# an OCEAN LINER

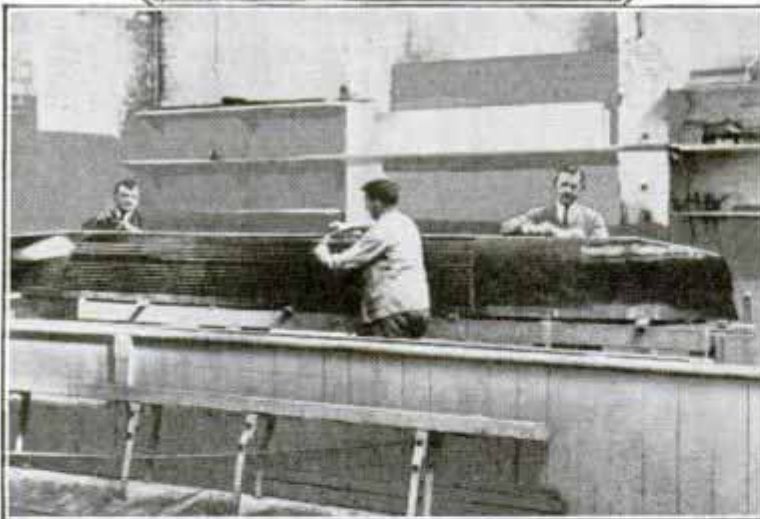
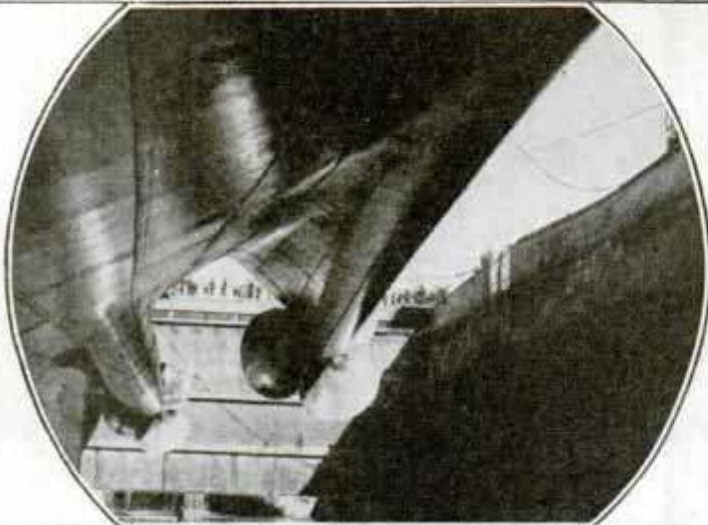
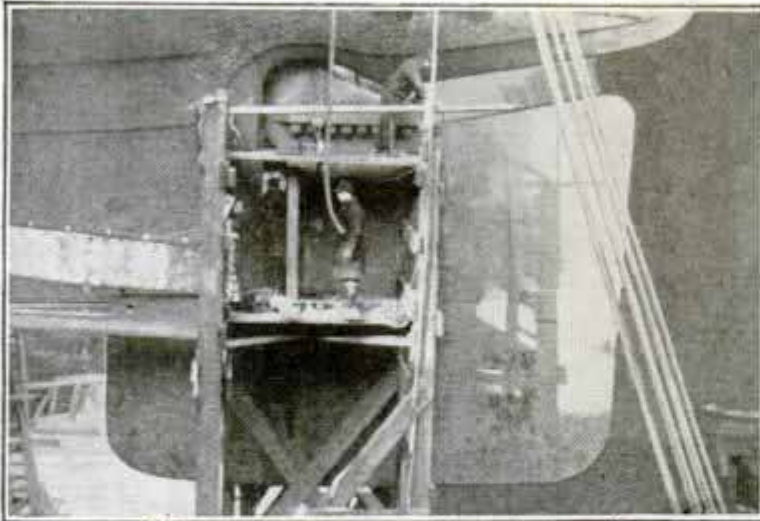


yards and the Als-Thom Engine company. Their business is to measure and analyze the mysterious vibrations in the after-end. Each of the nine voyages during her first season, workmen were busy welding, bracing, and strengthening the interior structural steel.

Far below the water level, where the propeller shafts spin in a bath of oil and deliver 160,000 horsepower to the propellers, they do not wobble one hair from a true line, but up above the water-line, the vibration can easily be felt. The ship doctors, to figure out how that mysterious vibration is transmitted from the moving machinery below decks to the superstructure above, installed precision instruments in dozens of

Section of "Savoia," showing position and comparative size of stabilizers. Below, "Europa" plowing through storm, and testing stability of model of "Queen Mary"





*Adjusting rudder of ocean liner, streamline underwater portion of "Normandie," and shaping model of "Queen Mary's" hull*

places. Then by frequent readings, they soon located the spots most affected. This procedure disclosed that adjacent rooms do not necessarily vibrate with the same degree of intensity. It is possible to have a "dead" spot next to a vibrating partition.

Vibrations appear to be sympathetic movements. That is, one partition may have synchronous vibrations with another

partition. Together, they set up a stronger vibration. It is possible to upset this disturbing harmony by interior bracing, welding, riveting, or rearrangement of partitions. That is part of the work carried on by the ship tuners. Another factor in canceling the "Normandie's" vibration was the change in her propellers. Two of them have been reversed; that is, instead of turning from left to right, they turn from right to left. And the old three-bladed screws have been replaced by four-bladed ones.

The "Queen Mary," likewise, carries a corps of engineer doctors to tune up the vessel's delicate machinery and to study the ship's performance under all sorts of conditions. This elaborate tuning process may require years. Certain pieces of equipment may not perform according to expectation. If so, they may be modified or replaced. In fact, the last finishing touches on a large ship may require years to apply. And even ten years after she has gone into service, important changes may be made in her machinery and design.

In their recent report on ship stabilization, Sperry engineers shattered a few illusions about the size of waves. Even in a hurricane, the longest wave measured never exceeded 1,000 feet. Average storm waves measure between 200 and 600 feet. The longest ships afloat not only exceed the length of the longest waves, they also exceed the distance between the crest of one wave and the crest of another. A small vessel drops easily in the trough of a giant swell, but a large ship rides through the troughs without difficulty.

The action of the "Savoia's" stabilizers enabled Sperry engineers to distinguish clearly between four principal movements of a ship in rough water. They are roll, pitch, yaw and heel. Formerly, the roll was not distinguished from the heel be-

(Continued to page 130A)



F466

# Bay Bridge to Have Eleven Lanes for Traffic

When the San Francisco-Oakland bay bridge is completed in November, it will offer eleven traffic lanes for automobiles, trucks and street cars operating across San Francisco bay. The passenger car level has lanes for six automobiles, three in each direction, while the lower level has tracks for two interurban lines and three lanes for trucks. The bridge is eight and one-fourth miles long.

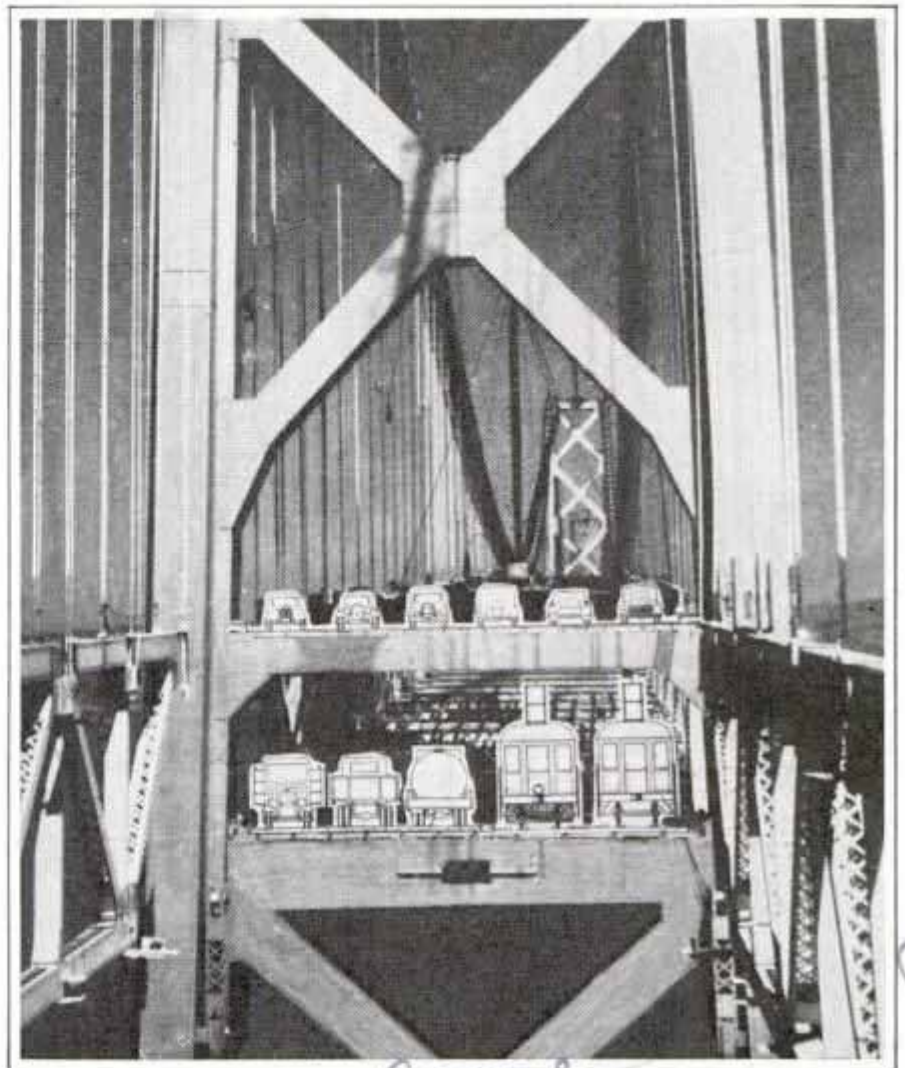


Photo-diagram shows traffic lanes of the double-decked bridge. Note that automobiles will be confined to the upper level

## Fret Saw with Vise Cuts Patterns Precisely

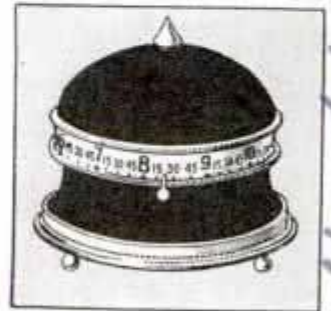
Intricate fretwork can be cut in plywood, leather, rubber, even copper and steel with a hand-operated bench saw with vise attached. The vise holds the work firmly, and can be clamped on any worktable; thus the operator's hands are left free to guide the standard fret-saw blade, following the pattern with such precision that the finished product need not be sanded. Two or more pieces, perhaps one of linoleum and one of metal, can be cut at the same time.



Plywood is held firmly in grip of vise while hand guides fret saw in intricate pattern

## Revolving Band Tells the Time on Rotary Electric Clock

Time travels around the latest type electric clock on a revolving band instead of the conventional face with its hour and minute hands. A stationary needle at the front points to the time on the rotating band. The clock has a metal case finished in black, ivory, copper or green and operates on sixty-cycle alternating current.



Limestone for decorating purposes is being dyed green, red, brown and lilac with a pigment that penetrates the stone.

7155 E. Imperial Ave. Woodruff

The Flynn Co. 1123 Broadway

National Handicraft and Hobby

Fred Bluer & Son

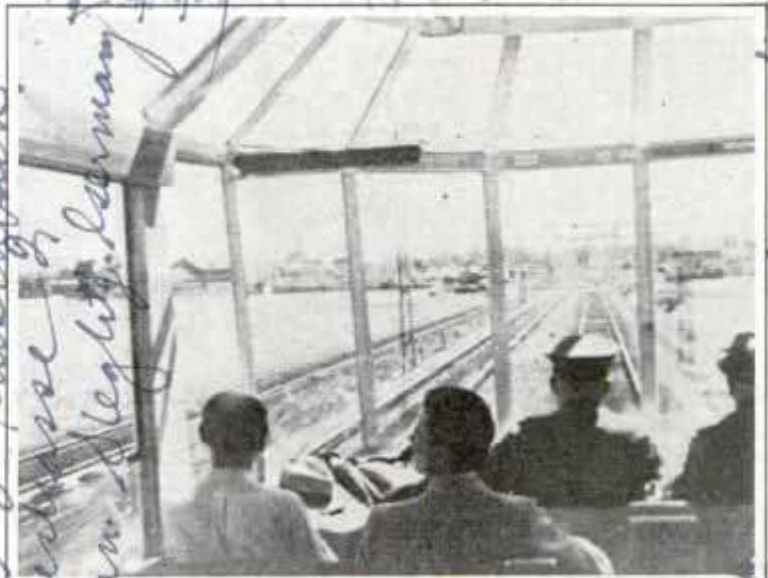






and carried to Pasadena, Calif., on a two-weeks run. After several years of grinding, it will be installed in the new observatory of the California Institute of Technology. Every precaution was taken for the safe transportation of the glass. A master mechanic and a mechanical department representative rode the train on each division of the railroads which handled the car and special care was used in passing all tight clearance spots. Special police were on guard at terminals. Railroad men of half a dozen of the country's great traffic systems spent several months figuring out the safest routing for the unusual shipment. When the "eye" is installed in the telescope, astronomers expect to be able to photograph stars 1,500,000,000 light years away, and to examine Mars and Venus as though they were only a few thousand miles from the point of observation.

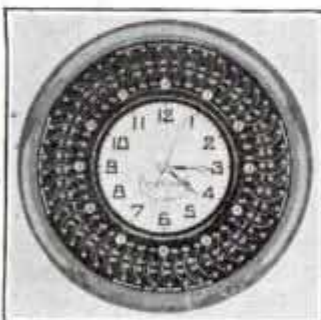
## Train of Glass in Mountains Gives Tourists View of Alps



A glimpse down the track from passenger's seat in the "train of glass" and an exterior view of the Alpine observation car

### Reminder Clock Has Bell for Each Quarter Hour

With forty-eight alarm levers that can be set at one time, an electric "reminder" clock can do your thinking for you twelve hours in advance. Each lever covers a fifteen-minute period. If one is set to buzz in the factory or the kitchen at 4:20 p.m., it will ring for fifteen minutes unless turned off, and the next arm could be set to ring at 4:42. If a shorter ring is desired it can be set to buzz only five seconds. The levers



move in curved slots, being "off" at the outer edge of the clock face and adjustable to the minute as they are moved toward the inner edge. A contact arm behind the dial moving in unison with the hour hand releases the buzzer when it touches an alarm lever.

Tourists can now see the German Alps from a train of glass that travels seventy to 100 miles per hour. The upper half of the cars are of plate glass, providing the utmost visibility for the passengers in the scenic ride through the mountains. The frame is of welded tubular steel plate sections, and the side walls of cold-rolled steel plates. The interior of the walls is covered with soundproof padding and the unbreakable glass roof has a weather-resistant artificial leather covering.

(Thin sheets of stainless steel were laid along a river bed in England to keep the channel free from marine vegetation.

*National Products Co. 1241 High St. Compressed Air Magazine Nov. 1936 P. 499*

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*Reichelsbach - Weibrecht*  
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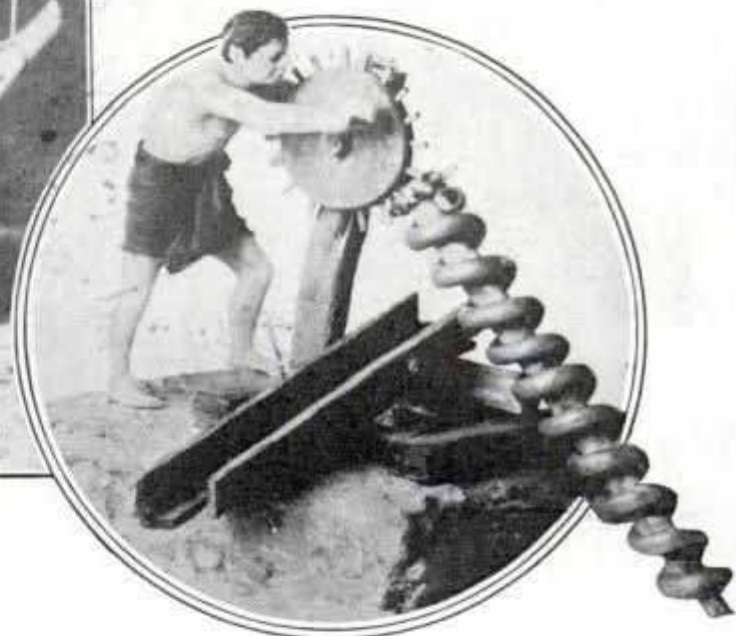


F 311.

Int. John Whittier & Henry  
c/o The Mayfair Apts.

# The FIRST

2763 Main St Buffalo, NY



MAN'S mastery of mechanics which brought about the machine age of today dates back thousands of years to the first machine age when primitive men discovered and applied the two basic principles of mechanics—the lever and the inclined plane—and then invented and used the six elemental machines: the lever and the inclined plane, the wheel, the pulley and the axle—all modified forms of the lever—and the screw, an adaptation of the inclined plane.

Today, in the Seymour H. Knox Hall of Civilization at the Buffalo Museum of Science a unique exhibit titled "Mechanical Power" pays proper tribute to the ingenuity and inventiveness of the ancients. Miniature figures are portrayed using models of the rough, crude, but highly important machines of the first machine age.

As the sub-title of the exhibit explains it: "The discovery and application of simple mechanical principles made possible tasks to which muscles alone were un-

*The pulley, left, enabled man to lift higher than he could reach. The shovel, top, is simply a lever, and the screw, below, is one of the many adaptations of the inclined plane*

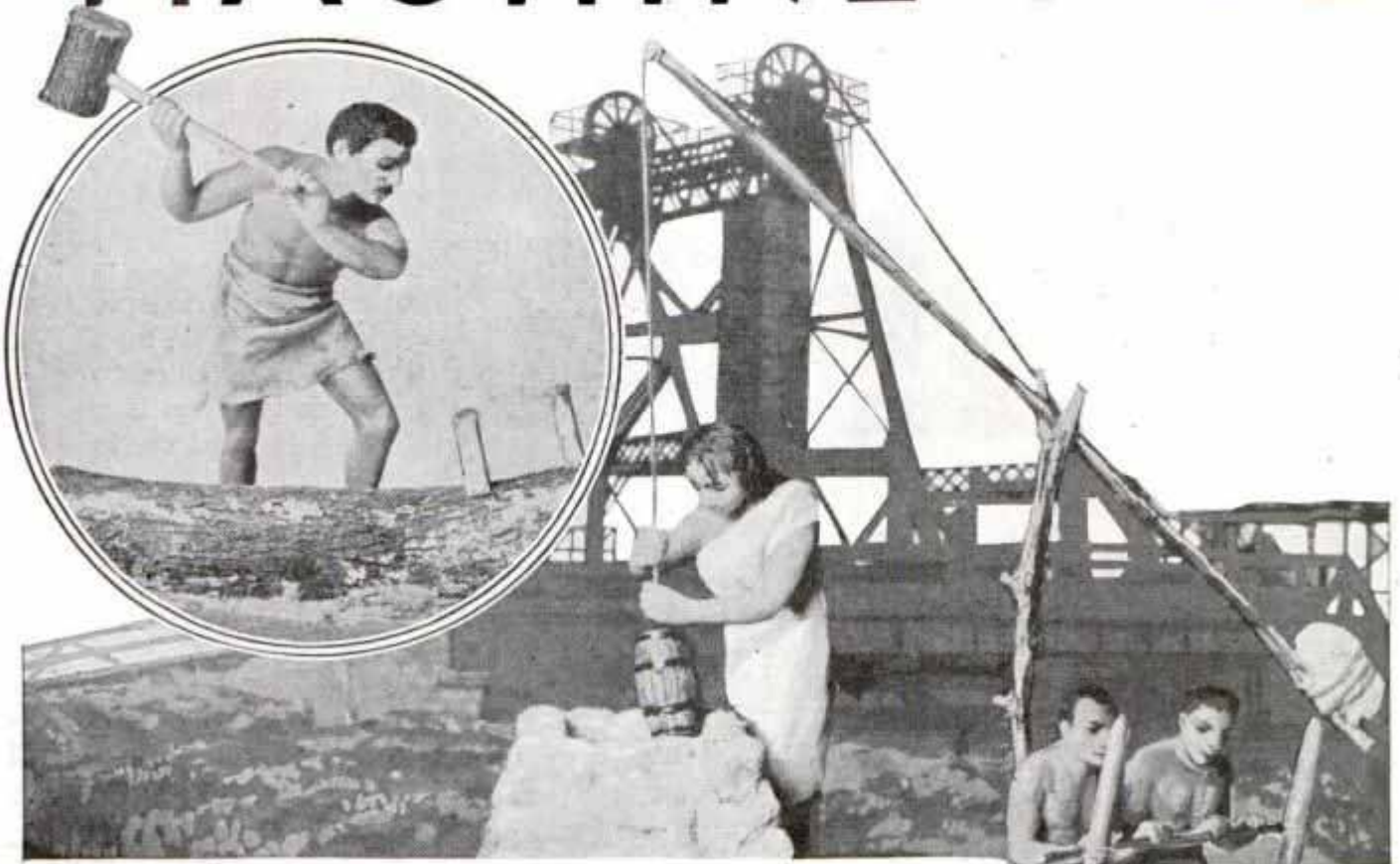
equal." Thus even primitive man proved the superior power of brain over brawn and paved the way for the machine age of today.

One of the two basic mechanical principles, the inclined plane, was originally and most simply applied in the form of a wedge. Every cutting tool is a wedge. Early man's stone axes, arrow heads and spears, modern man's razor blades and surgeons' scalpels, carpenters' saws and files, rotary knives and high-powered lathes that cut hundreds of feet of steel a minute by means of a fixed wide-angled wedge called a cutter bit—all are wedges or combinations of wedges and all operate

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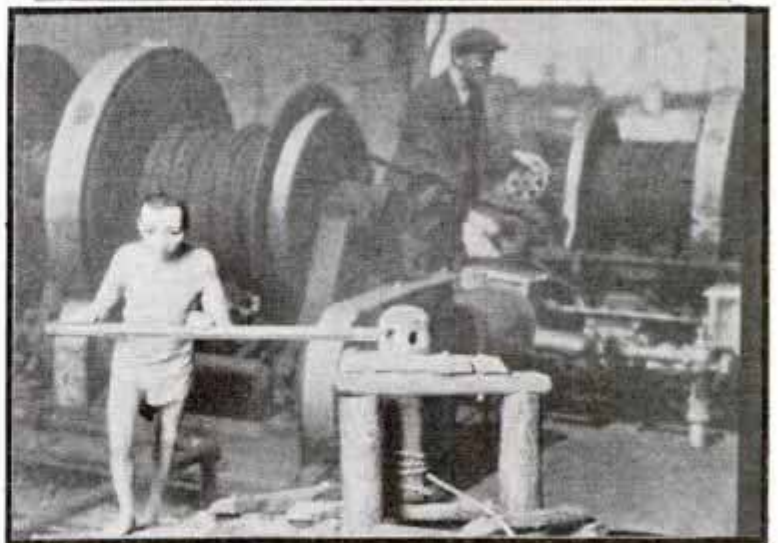
# MACHINE AGE



*The wedge, in circle, is an adaptation of the inclined plane. The well sweep and bridge-lift work on the same principle*

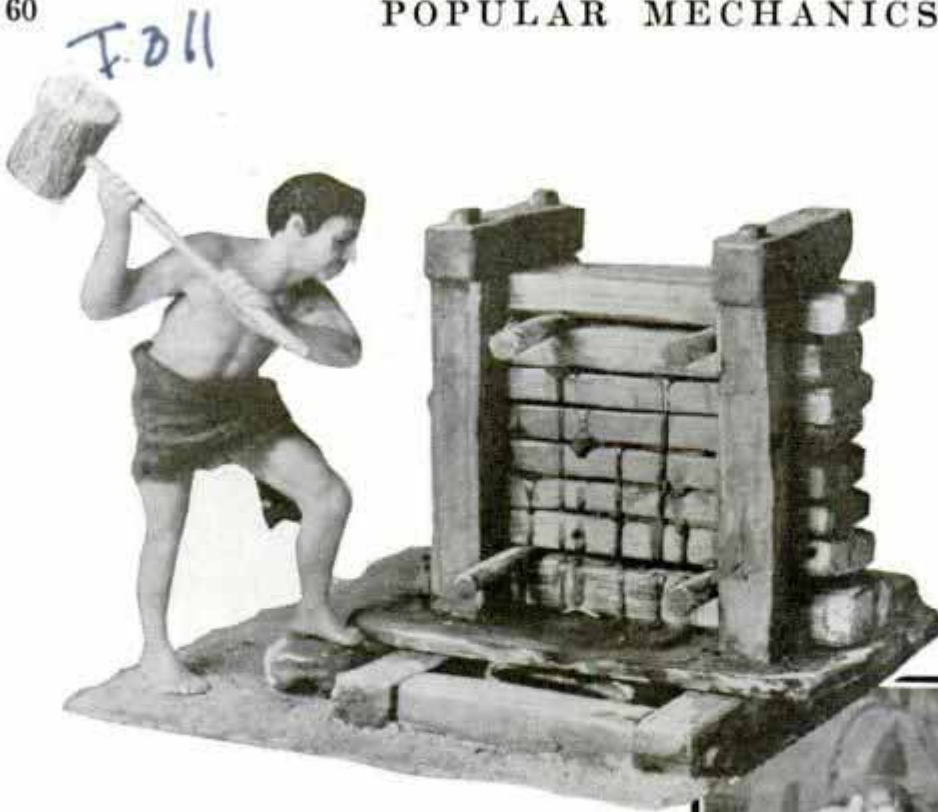
precisely on the basic mechanical principle of the inclined plane. Shears and scissors are pairs of wedges pivoted together. Each of the hundreds of teeth in a lumber mill saw is a wedge.

The mechanical jack-of-all-trades, the most versatile of all the mechanical elements, is a highly modified form of the principle of the inclined plane, the screw. When we make hash we first screw the meat grinder to the table and we feed the ingredients to the grinding knives, wedges, by the way, by means of a revolving screw. To exert powerful pressure or to fix in place firmly we use a screw. To measure in millionths of an inch, science and industry use screws. The section of a screw pulls air-planes through the air and the same simple elementary machine propels the gigantic ocean liners.



*Above, utilizing treadmill to raise water, one of the early applications of mechanical power. Below, the capstan and steam winch operate alike*





The other of the two basic mechanical principles, the lever, in one exhibit is shown, counterweighted at one end, being applied by a primitive maid to draw water by means of an ancient well sweep. The identical principle is applied today in the bridge-lift. A shovel is a lever and nothing else. The most important modification of the lever and one of the most important of all machines is the wheel.

Equally important is the use of the wheel for transmitting power and for motion. When wheels are connected by belting, the transmission of power is made possible. When two revolving parts, or wheels, must bear a fixed ratio of movement to each other, man fits the faces of the two wheels with teeth, wedges again, and calls them gears. Gears drive the works of the tiniest wrist watch; gears crush the toughest cane sugar.

The wheel also is used to store energy. This is the flywheel used to smooth out pulsations in all sorts of machinery from automobile motors to pumps in city water works. This is also the gyroscope used by aviators and the gyroscope that minimizes the rolling of ocean liners.

Another modified form of lever is the pulley. An exhibit shows early man using the pulley in its simplest form. No mechanical advantage is gained. The man had to pull down on his side of the pulley just as hard as the timber pulled down on its side. But this early pulley enabled

early man to lift an object far higher than he could reach.

The modern dredge silhouetted in the background is using precisely the same application of the pulley, but, instead of using only one single-wheel fixed pulley, it uses a set of double or triple pulleys to enable man through mechanics to reach down deep into the depths and on to



Above, another application of the wedge by primitive man. Below, the lever and the wheel combined

the bottom of a harbor, lake or river. Today the pulley is as important in engineering as it was along the Nile 4,000 years ago.

The use of two or more of the six mechanical elements in the same mechanism was the dawn of more complicated and far more efficient machinery. An exhibit shows primitive man and one of his first more complicated machines, an endless-chain bucket pump, utilizing the lever and the wheel, as well as the idea of continuous motion, to raise water.

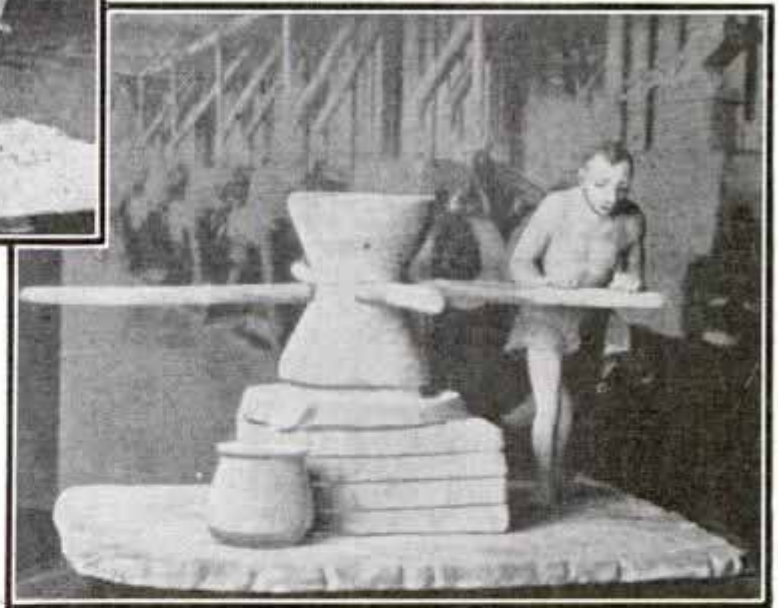
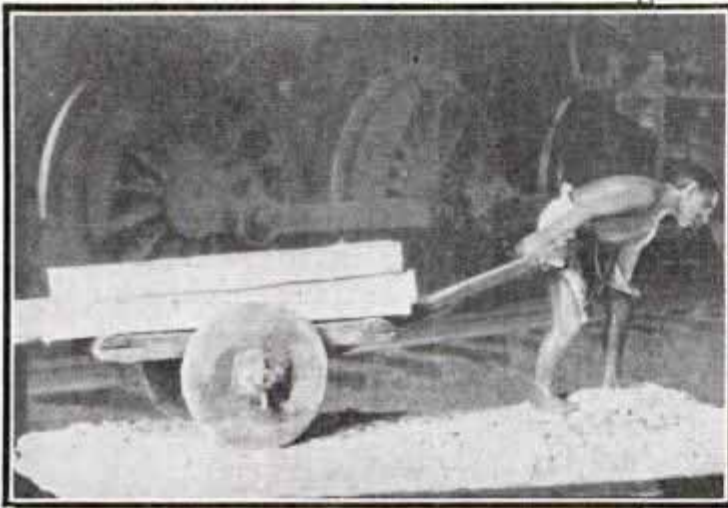
To exert continuous pull or pressure man early applied the idea of continuous motion in the form of a crude capstan as shown in an exhibit with a present-day steam winch silhouetted in the background. Both the ancient capstan and the contemporary steam winch operate on the selfsame principle.

Thus the most up-to-date machine of



today, complex and complicated as it is, dissimilar in appearance though it may be from the mechanical contraptions of the first machine age, nevertheless operates on exactly the same mechanical principles the discovery and applications of which enabled primitive man to proclaim his emancipation from brawn as the sole source of power with which to provide himself with food, shelter, clothing and protection from his twin foes, the elements and the animals.

For thousands of years man's mechanical ingenuity and inven-



tiveness for the most part has expended itself in devising new combinations and modifications of the six crude contraptions of the first machine age. In the thousands of intervening years there has evolved one radical change, a change just as important as the original discovery of the two basic mechanical principles and the six elemental machines—the substitution of motive power for brawn power to run these machines. Windmills and water mills were the first steps in the solution of man's power problem.

Then, in 1765, one man with one invention literally made over the world. So much so that it has been truthfully written: "All the brawn of all the millions of men who lived before 1765 did not change the world as much as did the idea of one brain in the 171 years since. This is the

measure of brain versus brawn." The man was James Watt. The invention was the steam engine—the first paragraph in the final chapter of the book of man's complete freedom from the serfdom and slavery of human brawn power.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

*Left, early use of the wheel. Top, using the wedge in quarrying. Below, an early grain grinder*



# Rainbow and 'Sunlight' Lamps May Revolutionize Lighting



Top, two of the new lamps, demonstrating size. Bottom, one of the steps in preparing the tiny lamps for experimental work

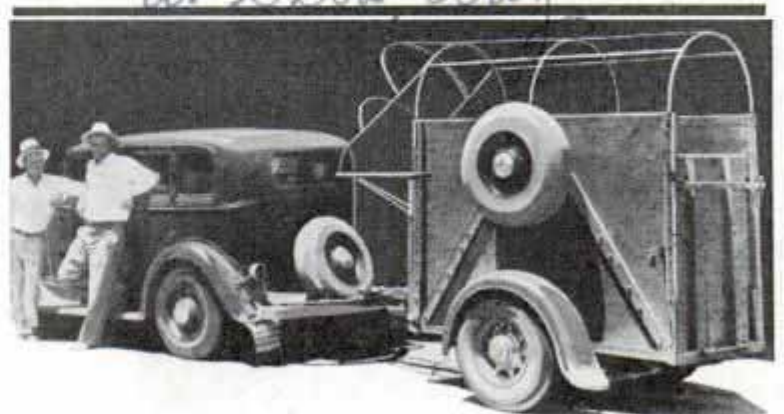
ored light can serve as decorator and scene painter. The "sunlight" lamp, of both air and water-cooled types, can be made to emit about three and one-half times as much light for the electric energy consumed as the average incandescent lamp. Each lamp contains a tiny tube or bore in which extremely high pressure can be developed. Special equipment is required for starting and operation. The water-cooled type, only one inch long and one-eighth of an inch in diameter, will supply as much light as the conventional 1,000-watt filament lamp. At the highest pressures attained in the laboratory, equivalent to several tons per square inch, the brightness of the light exceeds that of the sun.

Two new types of mercury lamps produced recently by the Lamp Development laboratory of the General Electric company may revolutionize the illumination art. One, known as the fluorescent, provides a wide range of remarkable colored lighting effects. The other, of relatively small dimensions, produces, in some cases, a brilliance exceeding that of the sun and emits a wealth of photo-chemical rays useful in commercial, industrial and therapeutic applications. For the electric energy used, the fluorescent lamp gives fifty to 200 times as much colored light as the ordinary colored incandescent lamp, and in addition, produces a quality of color far superior. Within the bulb is a trace of mercury, a small amount of argon gas at low pressure and special fluorescent powder which clings to the inner surface of the glass. This type of lamp might be used widely in homes, theaters, supper clubs, hotels and other places where col-

F432

## Cart Goes Before the Horse Chasing Smuggled Aliens

Inspector Horace Ryman of the U. S. customs service, who patrols the Arizona-Mexico border watching for aliens smuggled into this country, puts the cart before the horse when he starts off into the desert. He must ride into rough country that no automobile could penetrate, so he hitches a trailer to his car, puts his horse,



When hunting smuggled aliens, the inspector motors as far as he can, then mounts the horse he has brought in the trailer

From General Lee +  
Reuben C. Akron Ohio

New Park Cleveland, Ohio

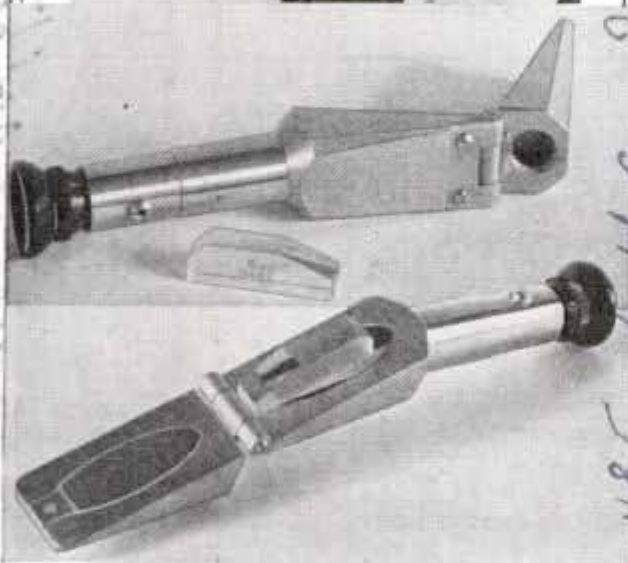
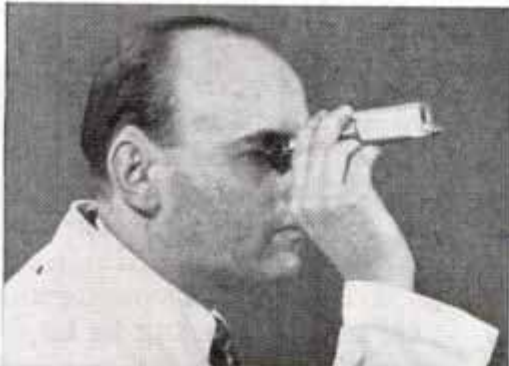


feed, and camping equipment aboard and drives as far as the road goes. Then, leaving the car as a headquarters camp, he mounts the saddle and rides on into the wilderness and mountain trails no automobile could travel, in search of Chinese and Mexicans who have entered the United States illegally.

### Tomato Tester Tells Grower

*7448* When Crop Is Ripe

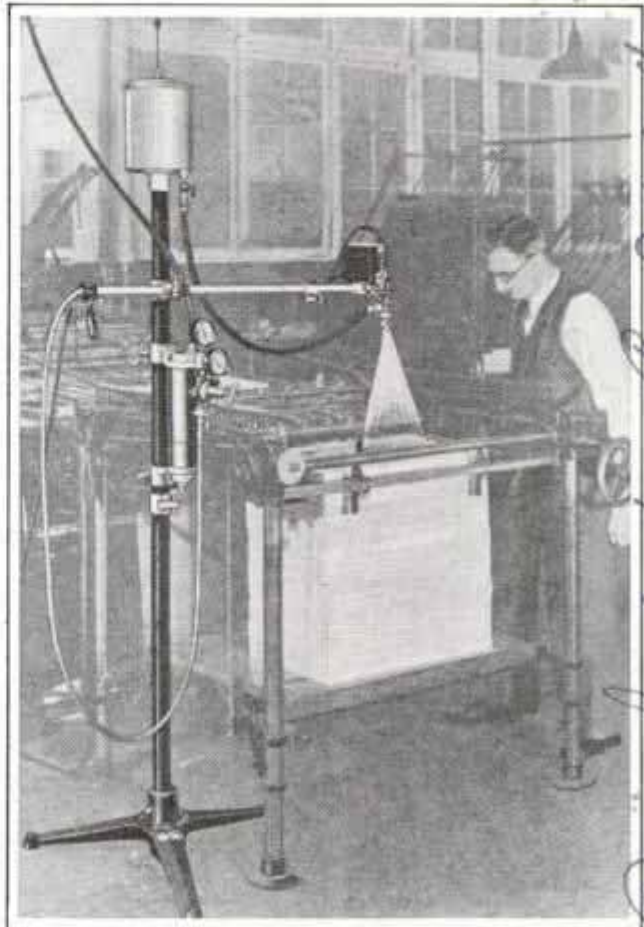
Enabling the grower to test the ripeness of tomatoes on the spot, a handy little instrument shows the proper time to harvest. The device measures the refraction of light in a single drop of juice from the fruit and gives direct readings on the degree of ripeness and quality of the tomato. The instrument also is useful to the buyer, who may test qualities of the tomatoes on the field in making purchases. For selection of seeds and for maintenance of control over preserving processes in preparation of mashed tomatoes in the factory, the refractometer has added value.



Testing drop of tomato juice with handy little instrument (shown close up)

*Carl Zeiss Jena Thuringia*

### Powder on Printed Sheet Eliminates Smudging



Spraying freshly printed sheet with powder to prevent smudging or "offsetting"

Offsetting, the objectionable transfer of ink from a freshly printed sheet to the back of the next sheet as they are stacked by the printing press, can be eliminated. A microscopic "cushion" of powder, spread over each freshly printed sheet as it is delivered by the press, will end this smudging without changing the subsequent printing characteristics, "feel" or clean appearance of the sheets so treated. The powder is applied by spray gun in liquid form, but it dries instantly in the air and falls on the sheet in fine particles. Only a small amount of powder is required. The spray gun is a special type, applicable to all types of printing presses. It is mounted on an adjustable arm which extends over the pile of sheets delivered from the press. The gun is actuated by compressed air. An automatic control regulated by the press times the action of the gun to deliver a quick spray just as each sheet arrives on the delivery table.

*Bunches of paper 3124  
An. Chicago  
30  
485 - 6th Ave New York*



# Robot Cashier Takes Money and Gives Photo as Receipt



Paying up his account to the robot cashier, man at right inserts bank note and receives photographic acknowledgement

When you pay your bills to the "Incassomat," an automatic cashier, out comes a receipt bearing a photograph showing what you have deposited—be it coin or currency, note or other document. This robot cashier with the photographic brain is being tested in England for possible installation in banks and business houses. It records every transaction, takes a picture of the deposit and shows the time it was made.

## Four Timing Devices in One Worn on the Wrist

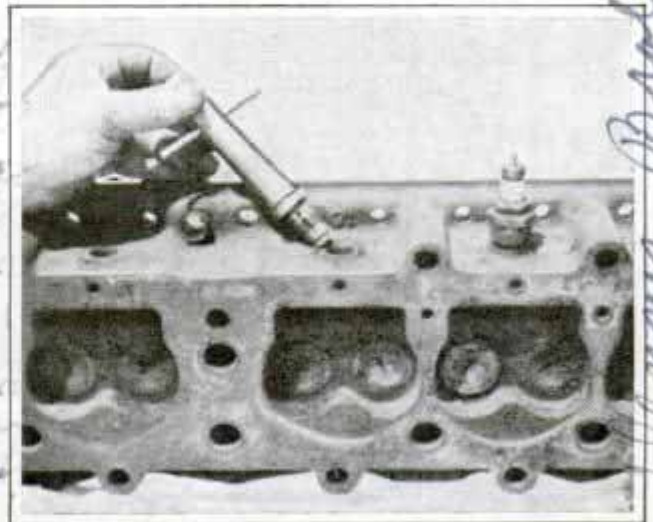


Combining the features of wrist watch, stop watch, telemeter and tachometer, a new timing instrument is handy for sportsmen and persons

engaged in radio work, scientific research, navigation, aviation and other lines. As a stop watch, it times in seconds and fifths of a second. As a telemeter, it indicates the distance of light or sound source from the observer and as a tachometer, it shows the number of miles per hour an object is moving. One example of its use is found in a storm. At the flash of lightning, the wearer presses a button on the side of the watch, setting the sweep second hand in motion. At the sound of thunder he presses the button again and the watch indicates the distance of the storm from the observer.

## Spark-Plug Hole Cleaned with Handy Tool

Designed to clean or cut new threads and to cut away high spots and grease from the cylinder head, a new combination tap and surfacer prepares spark-plug holes for more efficient operation of the gas engine. The tool is hollow so all cuttings from the hole are kept from falling into the cylinder. Since a clean surface for the copper gasket and proper threading of the hole insure a good fit, loss of compression is prevented, resulting in improved operation of the engine.



Handy tool for cleaning out spark-plug hole catches cuttings in hollow body

*Handwritten notes:*  
Top left: "New York City" (vertical)  
Top center: "quich" (handwritten)  
Top right: "58" (handwritten)  
Left margin: "F 465" (handwritten)  
Bottom left: "Retail Macy's" (vertical), "Chromum", "19.95", "gold" (handwritten)  
Bottom center: "F 4 53" (handwritten)  
Bottom right: "Alma Brodie, 1929" (vertical)







F358.

# The Amazing STORY

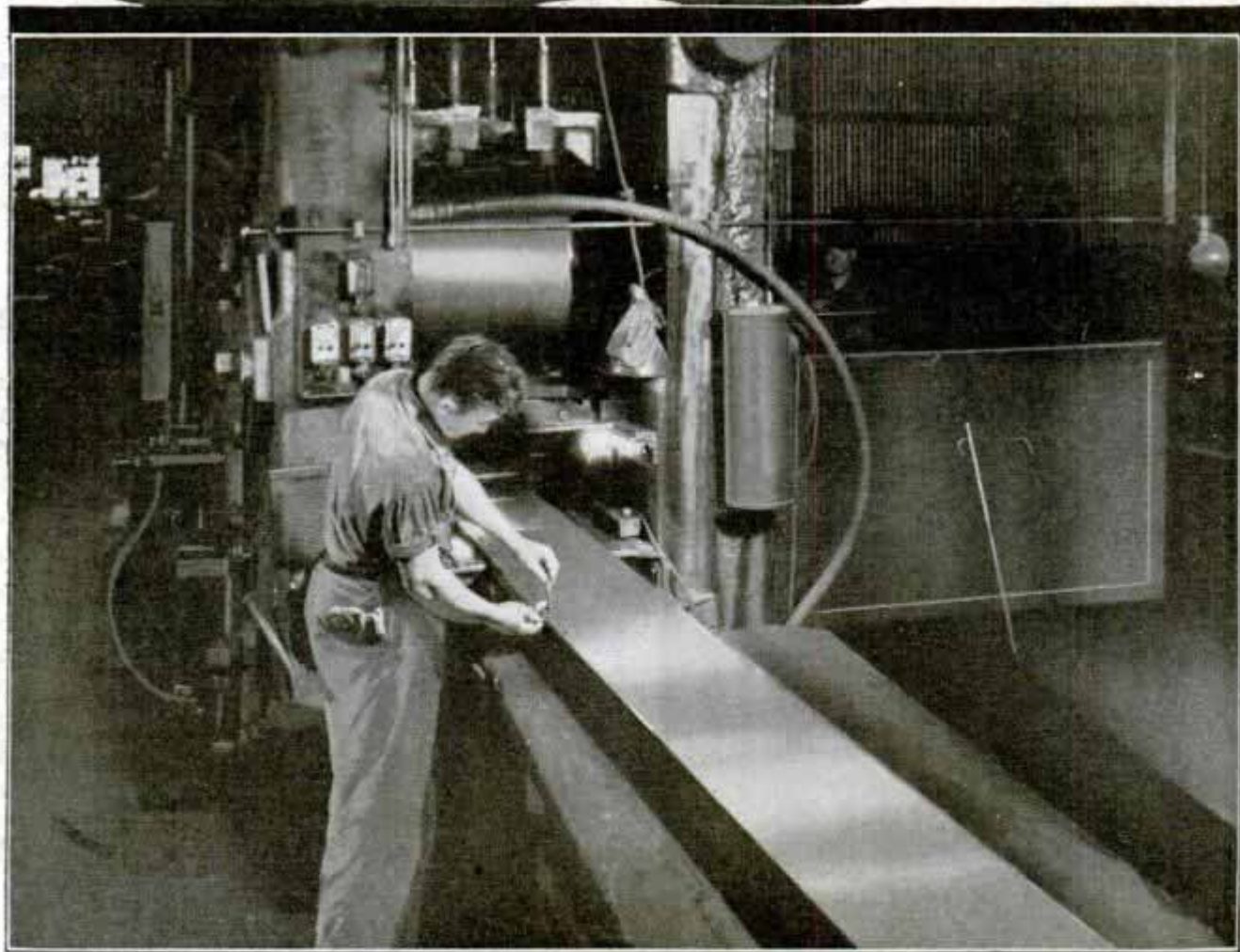
21.3.7 Napolean / made by John Link / of Chicago

Andamajoles / chud.



RUST which, it is estimated, causes a loss of about one billion dollars a year in this age of steel, today is in full retreat before an advance that began about a generation ago. Strangely enough, the big guns of war played a key part in the early stages of the battle.

The history of man's attempt to conquer rust goes back almost to the time when the first iron tool was fashioned. The most important chapters, however, have been written since the beginning of the present century. Today, as the result of



Photos courtesy Republic Steel Corp.

Guitar made of stainless steel and, below, stainless steel sheet as it is produced by the cold-roll mill

Enduro Central Alloy Div. / Millers' Phila.



Republic Steel Corp.  
1900 Scranton Road, Clevel.  
#338

# of STAINLESS STEEL

Cleveland, Ohio



Pl. at Canton Ohio

the struggles, we have stainless steel, wonder alloy that promises to work amazing changes in almost every activity involving steel, particularly the automotive and aviation industries.

The story of present-day rust-resisting steel alloys really began in 1912 and a number of men have had a part in the research. Elwood Haynes of Kokomo, Ind., in an attempt to make spark-plug points that would not corrode and pit, melted iron with nickel, cobalt and chromium. He came very close indeed to a great discovery. Five years later, at the great Krupp works in Germany, Benno Strauss poked about among alloys of iron, nickel and chromium, try-

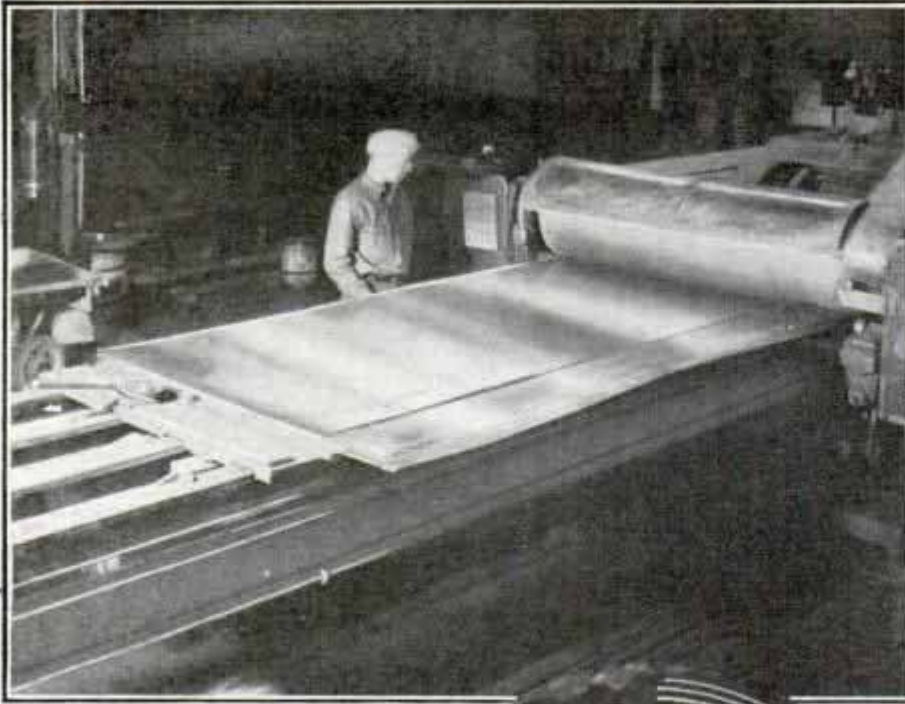


Stainless steel table service used on one of the modern stream-line trains and fifteen-ton electric furnace in which stainless steel alloys are made

Burlington Zephyr

Alloy Sales Dept.  
Republic Steel Corp.





ing to find a material from which he could make better tubes for pyrometers used in measuring very high temperatures.

Here and there, during the next decade, experimenters tried combinations of the three important metals now found in stainless steels in attempts to make such things as scale-resisting castings and alloys that would withstand the cutting action of the oxyacetylene flame. Mixing iron with chromium was not new, for chromium steel made in crucibles had been in use since 1869 for manufacturing locks, crusher parts and burglarproof safes.

But it remained for Harry Brearley, head of a steel company research laboratory at Sheffield, England, to stumble onto the most important property of iron-chromium combinations, their resistance to corrosion. Brearley was trying to find a better metal for lining the bores of big guns. The life of such guns, ordnance officials complained, was too short, largely because of the action of heat and corrosion on the bore. The heat developed in firing a single shot was, in large-caliber guns, high enough to melt a thin film of the metal then being used. In addition, the

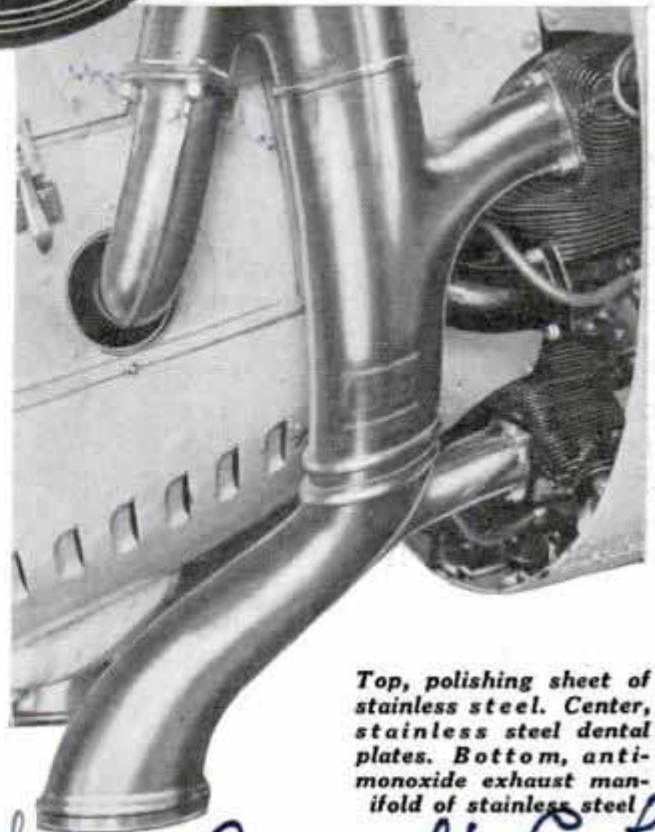


corrosive action of chemical products of explosions attacked the bore.

Brearley knew that a steel that does not contain much carbon cannot be melted as easily as one having a high percentage. By reducing the carbon in the gun-lining steel, he ought to raise the melting point. But something had to be done to retain the hardness. He knew chromium-iron alloys were hard, and stood up well against heat. So he mixed iron and chromium in various proportions, put them through all kinds of tests but could not produce a gun lining that would meet all the requirements.

Part of his testing of these experimental steels consisted of saw-

(Continued to page 116A)



Top, polishing sheet of stainless steel. Center, stainless steel dental plates. Bottom, antimonoxide exhaust manifold of stainless steel

Solar Aircraft Co. Inc.  
San Diego, Calif.



# One-Man Puppet Show Tours in Bike Trailer

During the summer, a one-man puppet show tours the middle western states. The complete show, together with a puppet tent and camping equipment, is carried in a light trailer behind the bicycle which the operator rides from one town to another. The show consists of a collapsible theater constructed of light framing and awning cloth, plastic puppets and the necessary equipment for operating the figures. Eight puppets are used.

Several views of puppet theater and the plastic figures used. Inset, bike and trailer in which equipment is carried



## Examination Paper Grades Itself as Student Answers Question

Examination papers which grade themselves automatically, disclosing to students immediately whether their answers are right or wrong, have been produced by a Mississippi college professor. Under each question are listed several answers, one

of which is correct. With a fountain pen filled with water the student traces the number preceding the answer he believes is right. If the number changes from black to blue, he is correct, but if it changes to red, he is wrong.

*Mr. H. J. Peterson, State Teachers College, Hattiesburg*



*3rd printing place newford*

# Refrigerator for Farms Operated by Kerosene

*Coldspal*



Filling the fuel tank of the kerosene-operated refrigerator. The unit burns intermittently

Economic in operation and independent of electric or gas supply, a kerosene-burning refrigerator has been developed. It is designed especially for the rural home. The kerosene burner, lighted intermittently by a small pilot light, heats a solution of ammonia and water, driving off ammonia gas which is then condensed into liquid ammonia and passes into an evaporator. Here it absorbs heat from the ice trays, brine tank and air of the food compartment. The complete cycle of burning and freezing takes five to eighteen hours, depending on room temperature.

## Telephone Call to Ship Made by Dialing Its Number

Dial telephones are the latest development in ship-to-shore communication. When radio telephones were first installed on shipboard, wireless operators had to listen constantly for messages directed to their vessels. With the automatic radio selector, however, it will be possible for the operator ashore to dial the number of

the steamer he is calling; a series of tone pulses is transmitted to all ships within range, but no audible signal is heard except by the particular vessel called. On this ship the telephone will ring.

## Solid Glass Flashlight Bulb Acts as a Spotlight

Containing its own concentrating lens in its tip, a solid glass flashlight bulb acts as a lens and focuses the rays of light into parallel beams of great intensity. It is claimed by the makers that the use of this bulb increases the efficiency of any spotlight.



## Relay Coil Aids in Starting and Saves Car Battery

Designed for use with the regular ignition coil for a short time after the starter is engaged, a new relay coil adds extra power to the ignition system of the automobile when the starter load ordinarily absorbs a large amount of battery power

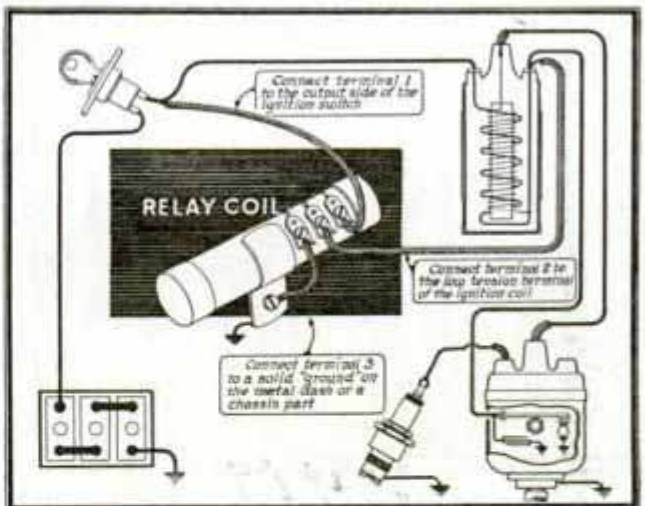


Diagram shows how relay coil is installed in the car's ignition system

normally available for the ignition system. The coil is particularly useful in winter when the heavy drain of the starter motor robs the ignition system of even normal power at the spark plugs. This results

*For U.S. m. / Sears. Roebuck & Co. Chicago, Ill. 99.50*

*F 421 Not for sale part National Carbon*

*1926.41st. newford*

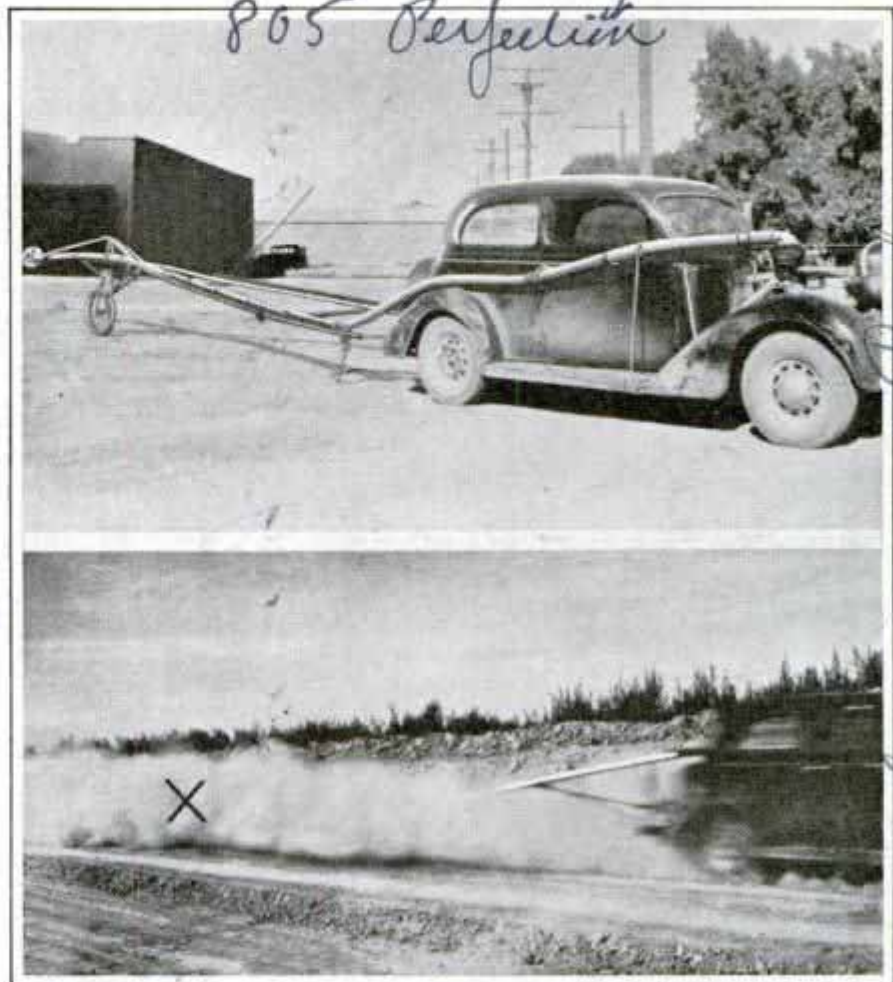
*Bell Record April 1926*

*Thomas A. Edison Co. Electrical Control*



in slow cranking and excessive wear on battery and starter, conditions which the relay coil is intended to relieve. The action of the coil is entirely automatic. It is automatically placed in the circuit when the ignition key is turned, prior to engaging the starter, and is removed when normal power is supplied to the regular ignition coil. The time it operates varies from fifteen seconds in summer to a minute or more in winter. It is built to last the life of the car and its installation is easy.

## Intake Rides in Dust Cloud to Test Auto's Air Cleaner



Top, single-wheel trailer on which intake hose is fastened. Bottom, testing air cleaner in dust cloud created by high speed of car

### Streamline Buggy Is Cushioned on Balloon Tires

To give his child the right start in life, an airplane mechanic at Croydon aerodrome in England pushes the baby in a "teardrop" perambulator styled after the plane. The streamline buggy is cushioned on balloon tires, and is an "open cockpit" model convertible into a weathertight carriage.



English airplane mechanic takes his baby for a stroll at the airport in streamline buggy

In order to test a new air cleaner under the worst conditions, a novel vehicle was devised to carry the carburetor intake. It consists of a one-wheel trailer on which the intake is fastened, with a hose leading to the air cleaner on the car towing the trailer. On the floor of California's Imperial Valley, where the dust is exceptionally thick, the car and trailer attained a high speed, creating a thick cloud of dust in which the intake rode. This method collected an average of nine ounces of dust every 150 miles and gave an idea of what the air cleaner could do toward removing dirt and dust particles from the air before it reached the carburetor. Repeated tests revealed that the cleaner took about ninety-nine per cent of the dust out of the air.

Chemists have produced rayon thread so fine that a one-pound ball of it would stretch from New York to San Francisco.

Clad in cement's Vimmer, 132a 140, Old as Landy.  
 Sand dunes

T 479.

805 Perfection  
 Electric  
 190, 5.2.68  
 792 S.W. 1st  
 Landy

Apr. 14  
 Imperial Valley

no further  
 information  
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 Pont, de Nemours & Co.



# Library Saves Rare Books by Filming Pages



Photographing book at rate of 1,000 pages an hour. By circulating film, book itself is saved from wear

Valuable books and documents in the library of the department of agriculture are being saved from destruction by the wear and tear of use by a new biblio-film service. Instead of lending the rare volumes themselves, the library photographs the book pages on thirty-five-millimeter films. These films can then be loaned to scientists, universities and farm organizations throughout the country, making the books more widely and speedily available. Sixteen book pages can be pictured on a foot of film, and 1,000 pages an hour can be photographed. The film can then be read with a magnifier, or by projecting or printing an enlargement.

## Paint Thickness Is Measured by Magnetic "Pencil"

Intended to reveal the thickness of the paint coating on your automobile or of the enamel on the bathtub or kitchen sink without making a scratch, an electro-

magnetic "pencil" has been patented. By merely running the pencil over the surface whose thickness is to be measured, an instantaneous recording is made. The device works only where the coating is nonmagnetic and, in turn, covers some magnetic metal backing like iron or steel. It actually measures the distance between the pencil point and the metal backing.

## Swordfish Piercing a Boat Is Caught by Camera

Whether the swordfish can pierce the side of a boat is a long-argued question which has been answered by an actual photograph, the only one of its kind, so far as is known. The Academy of Natural Sciences has obtained the photograph, which shows a swordfish puncturing a fourteen-foot dory. The attack took place in the Atlantic ocean, southeast of Martha's Vineyard. Capt. Ira Abbott, sailing master of a yacht out of New York, tells the story: "We harpooned the fish shortly after sighting it, and put out the dory with one man to bring the fish alongside. I noticed that he was having considerable trouble, so I expected something like this to happen. I was standing ready with my camera when I saw a flash of the fish in



First actual photo, so far as is known, of swordfish ripping side of boat

## Paint Thickness Is Measured by Magnetic "Pencil"

Intended to reveal the thickness of the paint coating on your automobile or of the enamel on the bathtub or kitchen sink without making a scratch, an electro-

*John L. Cooney, 460 p. Worcester, Mass.*  
*Am. Soc. Mech. Engrs.*  
*Decency Service, 4/17/36*

*Patent # 2,033,654*

*F496*

*Boat*

*Photo*

*1931*  
*Am. Soc. Mech. Engrs.*  
*1936*

*Am. Soc. Mech. Engrs.*  
*Richard A. ...*

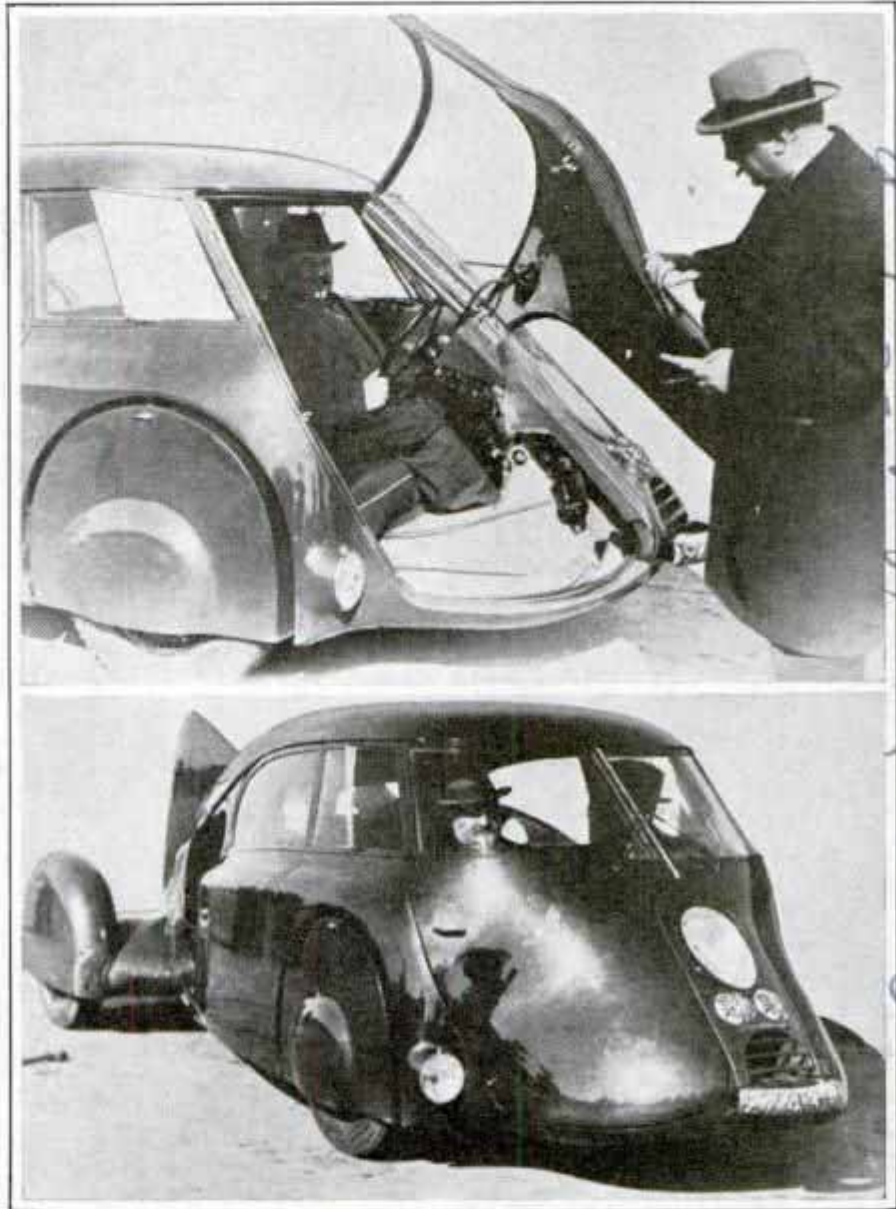


the water. As it approached the dory, I snapped the camera and got the picture. A few moments later, the fish made another savage lunge at the boat and ripped out a plank, sinking the dory, but we rescued the man and landed the 350-pound fish.

7480  
**Auto Built Like a Plane  
 Has Rudder to Aid Steering**

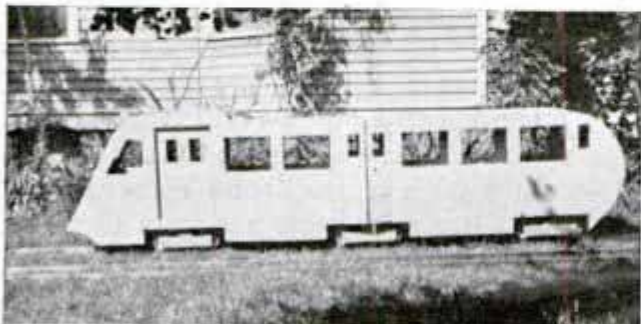
7493  
**Pedal Train  
 Profitable  
 Hobby**

Constructed with a streamline design in accordance with that of the latest railroad trains, a pedal-driven train has made its appearance in the back yard of an Illinois craftsman. It has two cars with articulated trucks and its dimensions are twelve feet in length and eighteen inches in width. The track is made of portable wooden rails which may be laid in a small space. The pedals are operated easily, a five-year-old child having strength to propel the back-yard flyer. The builder, C. C. Kidder, is turning the hobby into money, too, because he has discovered that there is a demand for such vehicles for birthday and Christmas gifts.



Top, door opening at front of novel streamline auto. Bottom, looking toward the "tail" of the car. Note the rudder which aids steering

Designed along the lines of the airplane, the latest French automobile has a rudder at the "tail" of its streamline body. Steering gear is connected to the rudder to facilitate operation. The car has a blunt "nose" into which is built a door for entering at the front instead of the side. When closed, the door fits perfectly into the streamline contour of the auto. The driver's seat is directly above the front wheels.



Back-yard pedal train is constructed on lines of latest streamline flyers

From seeds found by chance in ordinarily seedless Washington navel oranges a new variety has been developed which promises larger crops in drier parts of the citrus fruit belt.

Dr. Andre Blabonne, Paris, France

6625 W. Pershing  
 Road  
 Chuan

Citrus Experiment  
 Station - Ariz.  
 ...



File  
Christmas of 1935  
10555, Holman Ave  
Pasadena, Calif

# SECRETS of the



sailing ship he had been holding to a mast not ten feet high inside the secure walls of a Hollywood sound stage.

The magic of the movie camera brings you all the thrills of a wild night at sea but most of the water in the picture probably comes out of a faucet. The waves that dash over a sinking boat are manufactured by a wave machine helped out by a fire hose. The wind that shrieks through the rigging comes from an airplane propeller. Even the horizon in the background is apt to be artificial. For the sea is no place to make a convincing picture of a howling gale. The lighting is too poor and can't be controlled. The true sounds seem unnatural when they are recorded.



*The movie ship "Bounty," a sailing ship constructed for the M-G-M film, "Mutiny on the Bounty," shown while cruising at sea during making of this picture*

**T**HE oilskin-clad sailor, with one arm wrapped around the swaying mast, cupped his hands and shouted, "Breakers! Breakers off the port bow!"

"Cut!" said a calm voice right below him. The rain stopped, the gale died away, and the sailor stepped from his perch. Instead of clinging to the upper rigging of a

"You can't send camera and sound crews up into the rigging of a ship to film sailors struggling with a sail," one director explains. "To get a good shot we have to bring the mast down to camera level. Similarly, we can't risk lives and equipment to record wave-swept decks when we can do it cheaper and better right in the stu-



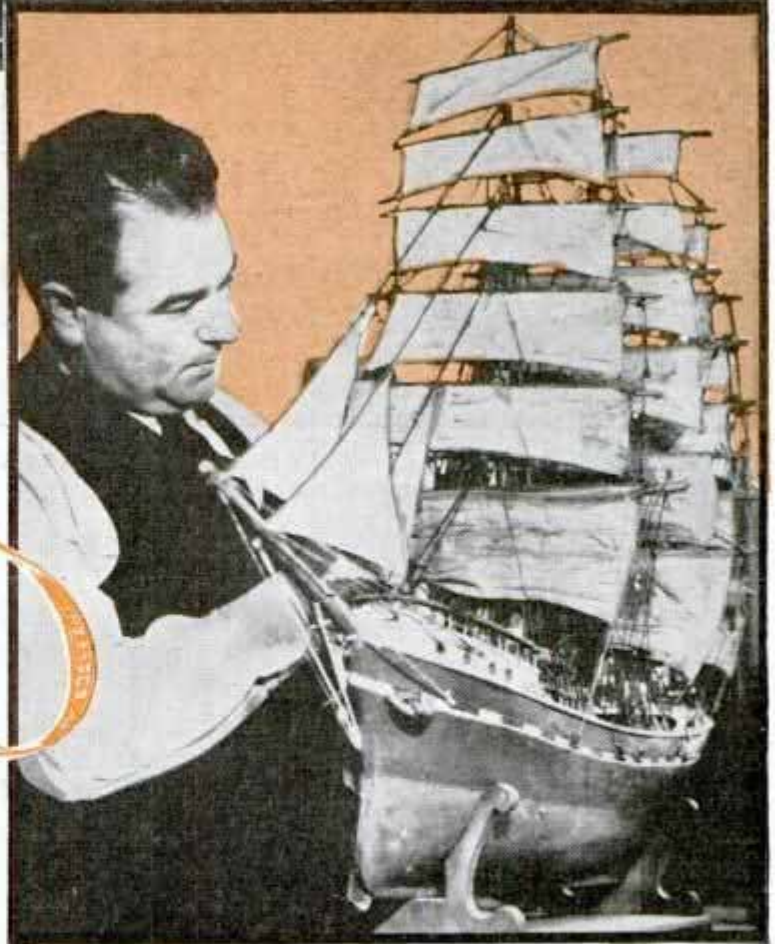
*Paramount Studio 5451  
Marathon St. Los Angeles. 7116*

# MOVIE SHIPS



dio. To obtain a realistic effect we have to take a storm apart and photograph it piecemeal."

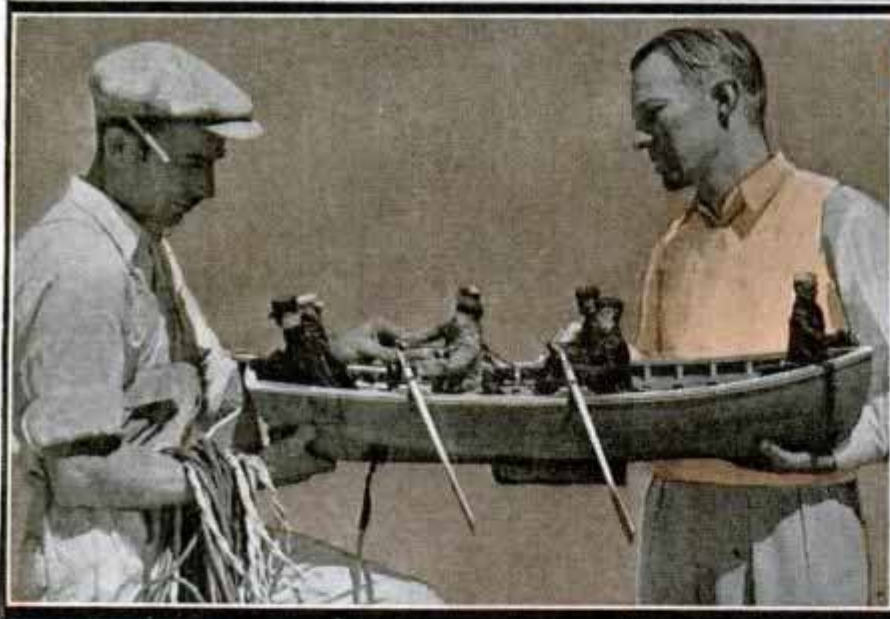
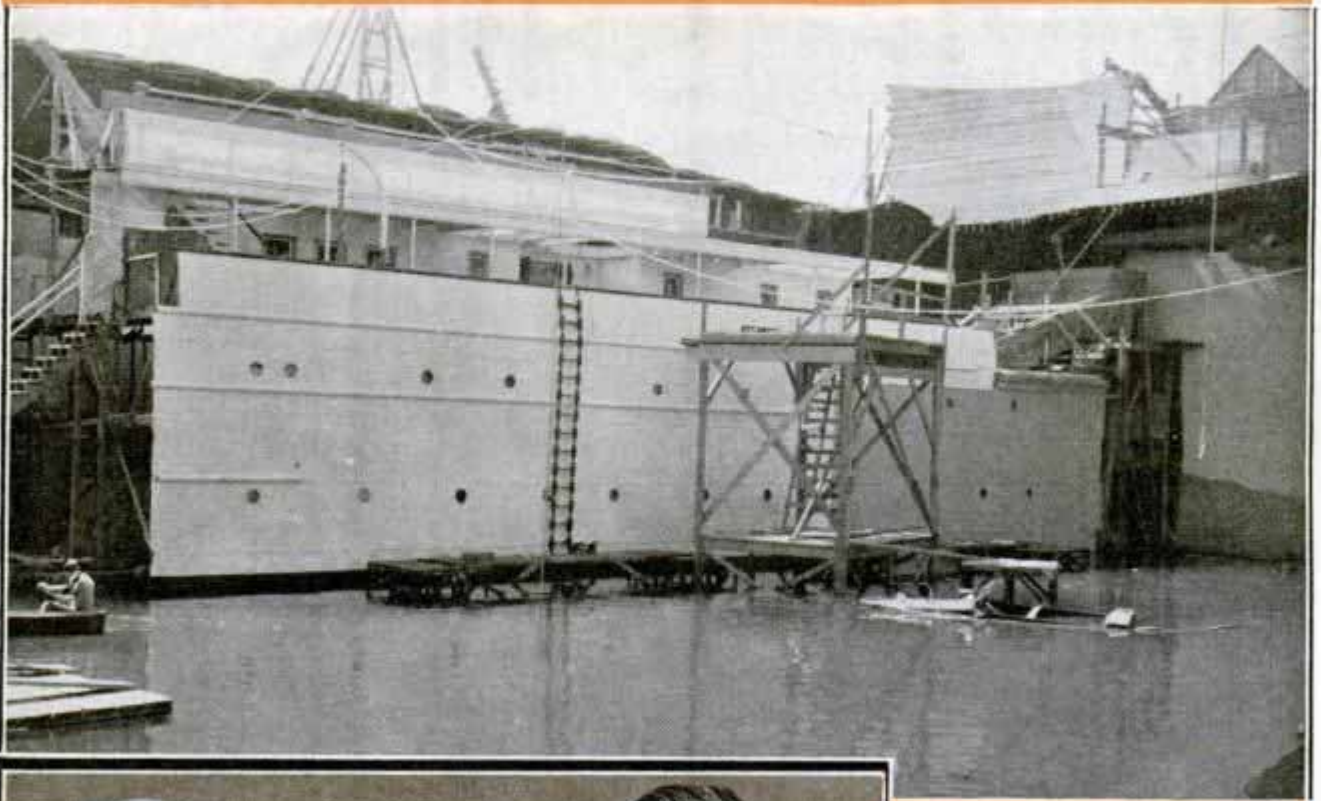
Going to sea in the land of illusion requires no preparation for a long voyage. Hollywood has a dry-land fleet that would be a credit to any port. At one studio are sections of a square rigged ship, complete to every sheet and spar, floating in the water of a concrete basin. If the scene calls for a storm you may observe sailors struggling with the tattered sails in a man-made wind while the ship rocks and plunges. On another lot is the bow of an oil tanker jutting out from behind a replica of a middle western railway station. Afloat in the concrete tank of a third studio is an ocean-going tug lying alongside a Chinese river steamer. Each is built mainly of wood and studio board.



*Stoking scene filmed on sound stage and miniature square rigger used in filming battle of Tripoli*

*John Gulligan  
-Pictures Corp. Universal City, Ca.*





Section of movie liner erected in studio tank, and miniature rowboat with oarsmen moved by a concealed motor

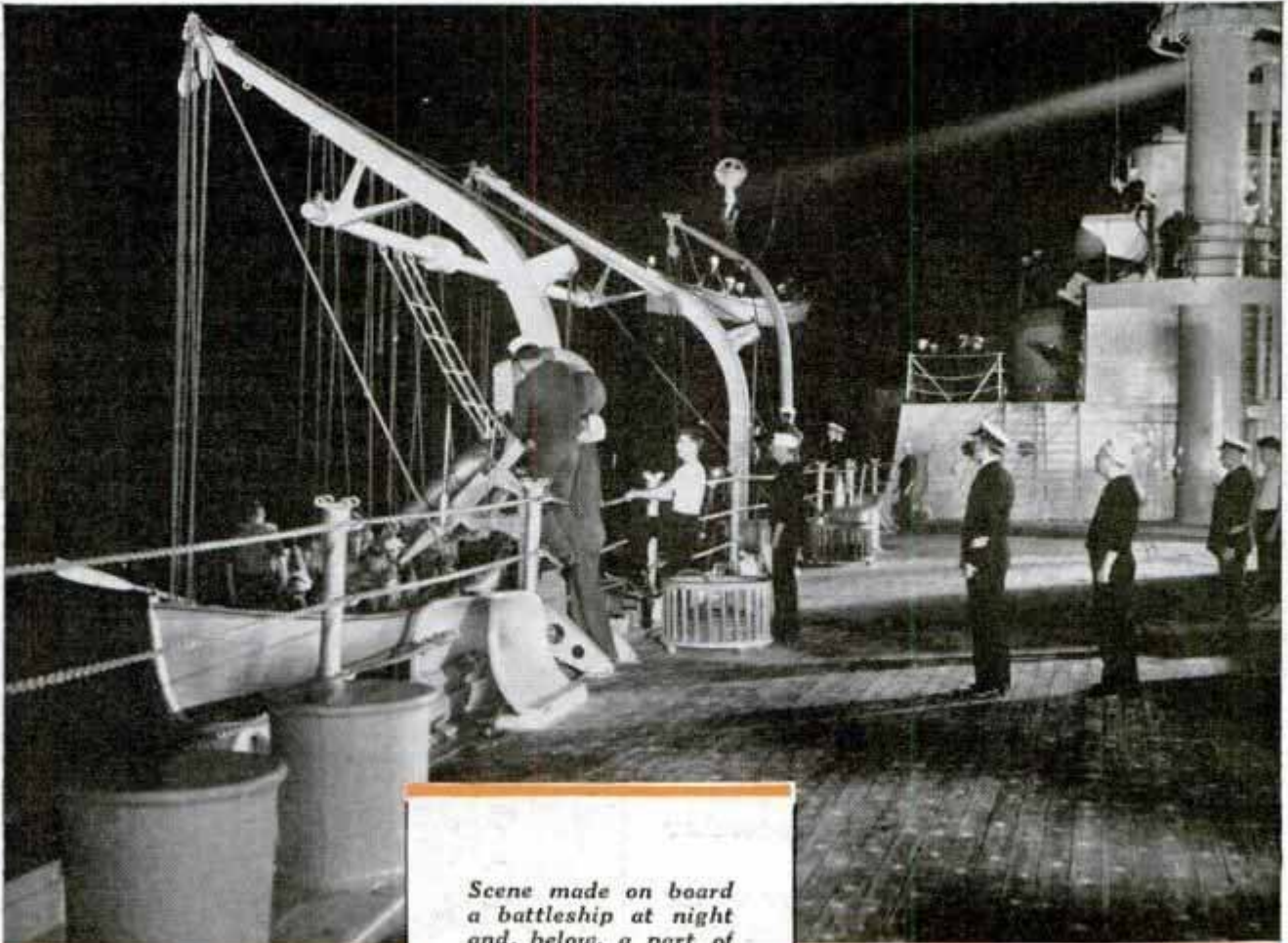
The flagship of the Hollywood fleet is a tremendous liner that towers above the stages and buildings of the Twentieth Century-Fox lot. Built several years ago as a permanent set, the life-size copy of an ocean greyhound looks as if it had been lifted bodily out of the water and set down on dry land. Although thousands of miles of sea travel have been filmed on its decks the ship has never moved an inch. The pier alongside is mounted on rollers and when a "cast-off" scene is filmed, the pier instead of the ship is moved. When the script calls for a new

liner, the studio craftsmen repaint the ship's funnels and superstructure and rearrange the furnishings of its five decks. One script called for scenes inside a ship's engine room and the studio purchased an engine room complete from an old ship and moved it to Hollywood. When the machinery had been re-assembled every part was in working order. For another picture, boiler-room scenes were need-

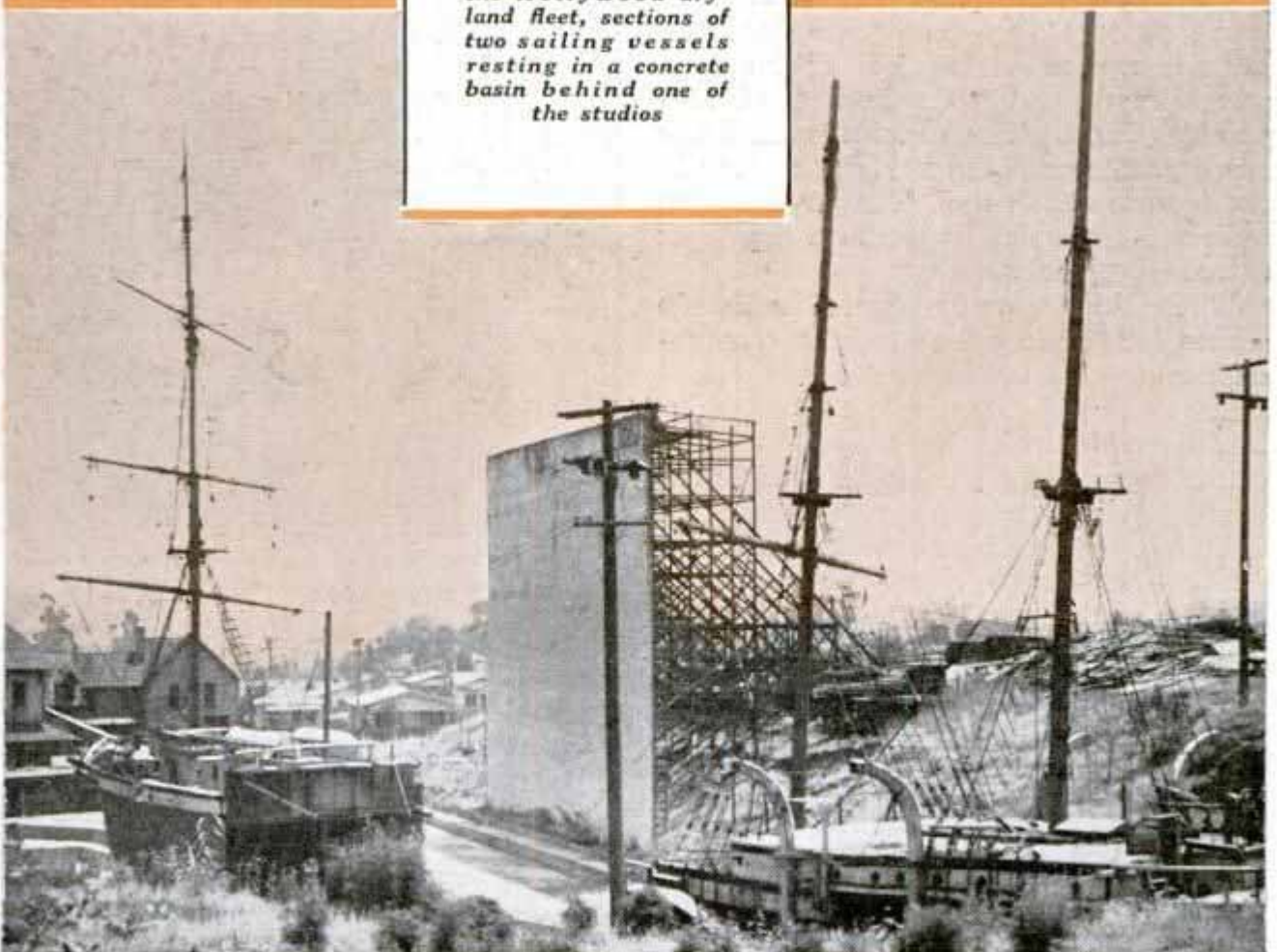
ed, so the boilers and fittings from the same ship were moved into a sound stage.

Last year Fox needed a "practical" eastern canal as it appeared in the last century. The studio workers created an artificial ditch hundreds of yards long inside the studio fence. The finished canal was historically correct to towpaths and locks, and real barges of the period floated in the artificial river. When one studio needed a wave that would sweep members of the crew from the deck of a ship, it built a life-size stern section of a ship 200 feet long and mounted it on hydraulic





*Scene made on board  
a battleship at night  
and, below, a part of  
the Hollywood dry-  
land fleet, sections of  
two sailing vessels  
resting in a concrete  
basin behind one of  
the studios*







board a warship. The studios recreate settings like these on their sound stages. The interiors are exact except for a few technical details and the painted guns recoil on their powerful springs just as if the scene had been made inside an actual turret. Another navy secret concerns the details of the arresting gear used to bring landing airplanes to a stop on the flying decks of the aircraft carriers. When one

jacks. When the heavy set was rocking back and forth a flood of water was released from a giant hose that poured across the deck exactly as would a comber at sea.

Not only do studios create many water scenes right on the lot, but they film some of them inside the sound stages. A shallow tank just deep enough to float the boats is erected on the floor of the stage and is made watertight with oiled tarpaulins. Then, after the tank is filled, the small yachts or speed boats to appear in the picture are floated. The edges of the tank are concealed by faithful copies of actual river banks.

When R.K.O. needed some battleship scenes for "Follow the Fleet," a cameraman made still pictures on board a battleship, to guide the studio carpenters in creating a replica of the quarter deck. Inside a sound stage the studio technicians erected turrets and guns of veneer, an imitation white oak deck, and railings and machinery like those on the real ship. Painted in battleship grey, the set appeared to be a real battleship that had forced itself into a stage building.

The navy has many secrets so when you see ammunition passers inside a gun turret take bags of powder from an ammunition hoist and guide them into the breach of a gun, or watch the gunnery officer inside the armored fire-control headquarters issue his orders to the gun crews, you can be sure no such scenes were taken on



*Stage set representing control room of submarine and stern of movie ship, "Bounty"*

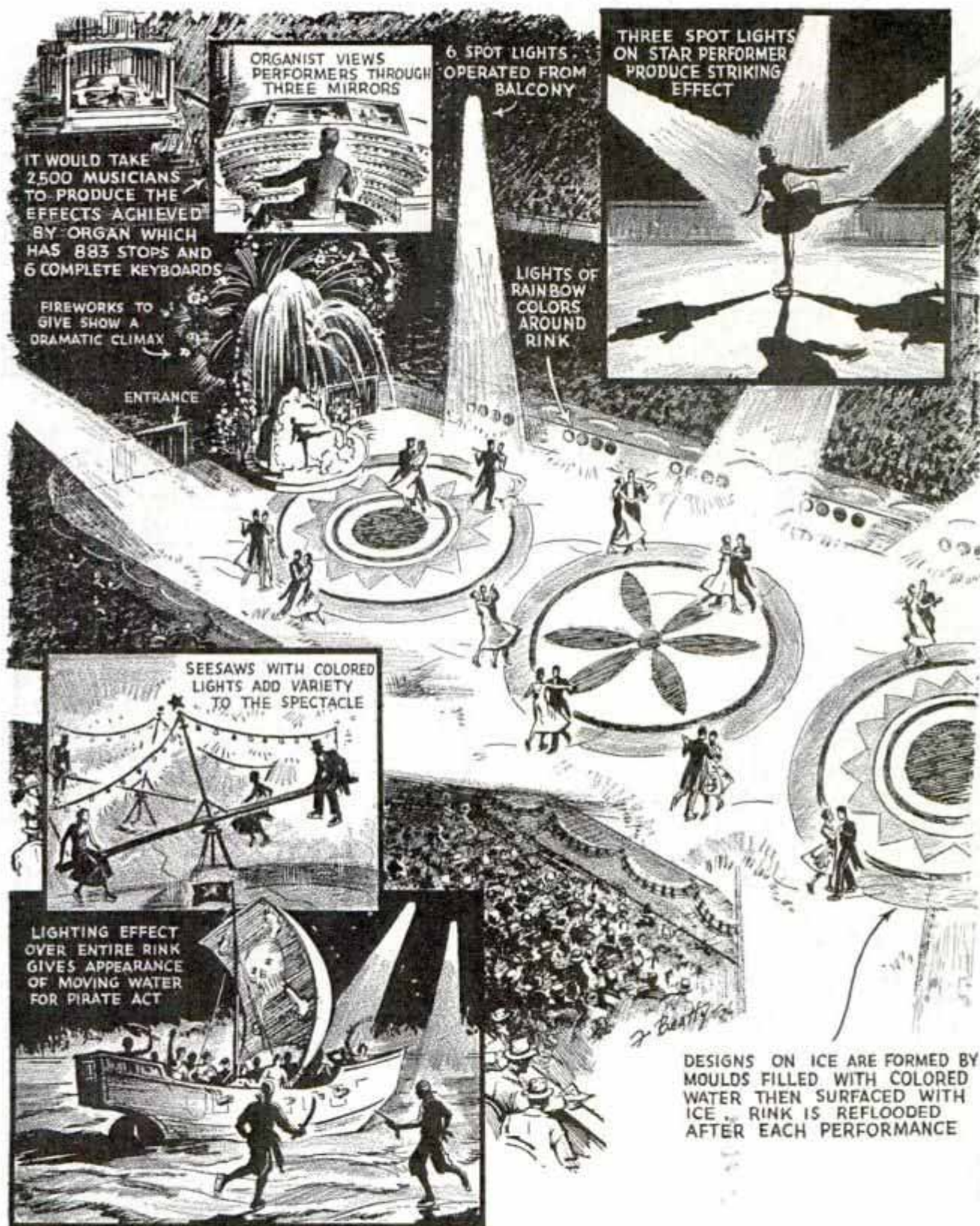
studio found it needed such a deck scene, it obtained all the details available, then built a replica of the flying deck of the U.S.S. "Saratoga," nearly 1,000 feet long, right on its lot.

By using small models of real ships the studios are able to create an illusion of wrecks and collisions that would be impossible to obtain if full-sized ships were

(Continued to page 114A)



# Colored Lights Flood Rainbow Ice at Carnival



DESIGNS ON ICE ARE FORMED BY MOULDS FILLED WITH COLORED WATER THEN SURFACED WITH ICE. RINK IS REFLOODED AFTER EACH PERFORMANCE

Music, movement, and a symphony of colored lights playing on frozen color combine to make an ice carnival a striking spectacle. To produce designs in ice, at the Chicago Stadium, colored water is poured into molds laid on the cement arena and frozen by 61,000 feet of refrigerating tubes in the floor. On this colored ice mosaic clear water is sprinkled to cover cracks between molds and form a skating surface. Batteries of giant spotlights shoot shafts of color or produce wavelike effects on the ice. An organist high above the rink accompanies the skaters with music from a mighty organ of six keyboards and 883 stops, equal to a 2,500-instrument band. Fireworks dipped in sulphur are set off electrically

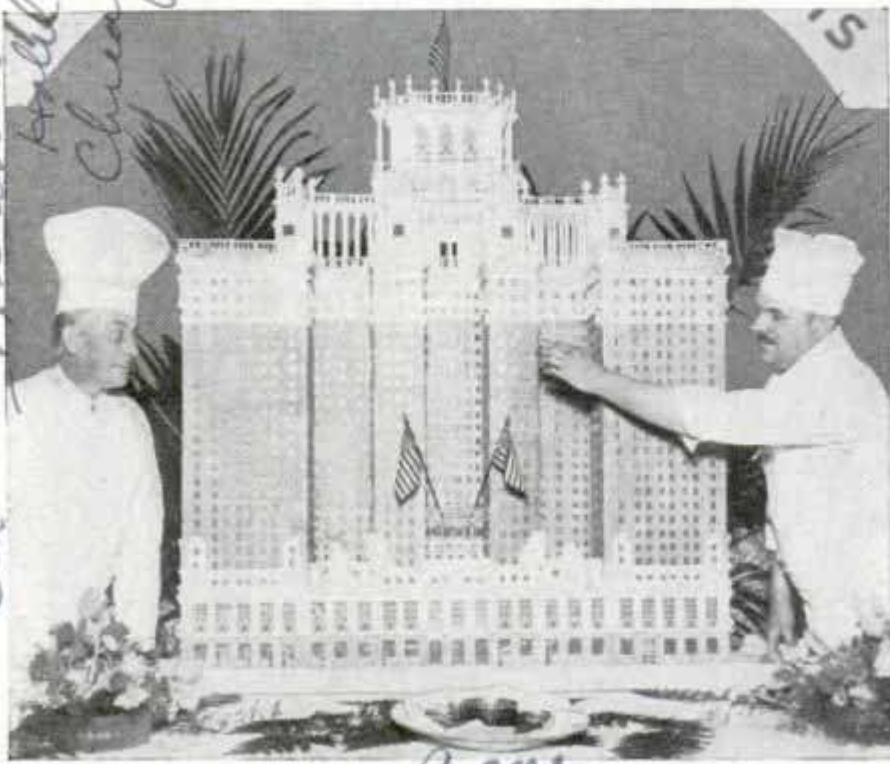
*Donald S. McLeod Manager*



F441

# Scale Model of Big Hotel Is a Masterpiece in Sugar

Head chef Scandinavia France  
and Cyrille du Nut Stears

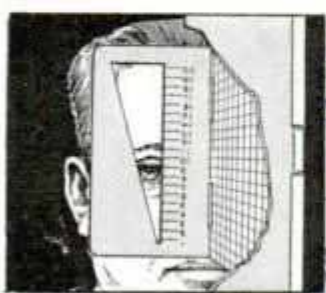


This masterpiece of culinary artistry is on a scale of one-tenth of an inch to the foot. It is a detailed miniature of a Chicago hotel

Fashioned from 135 pounds of sugar and three and one-half pounds of gum tragacanth, a scale model of a 3,000-room hotel has been made by expert chefs. The sugarcandy model was scaled one-tenth of an inch to the foot from blueprints of the hotel. It is complete in every detail.

## Eye Helps Find Exposure Time in Photography Meter

Designed to make use of the fact that the human eye accommodates itself to



different iris openings in different intensities of light, a new exposure meter for the photographer includes a wedge-shaped slot calibrated for various diameters of the human iris. The eye is placed against the slot and moved to correspond to the

Watras Photographie  
Accessory Co. B34  
1334  
new human eye

width of the slot by shifting the entire device up or down. Then the size of the opening is read in a concave magnifying mirror at the other end of the meter and this number gives the exposure directly from the printed scale on the plate. The meter is highly successful for persons with light colored eyes because they can see the iris clearly and hence measure it accurately. The device is used for still or movie photography.

## Truck Delivers Bakery Goods Still Hot

Designed to hold the heat from 280 pans of bakery goods, a special truck used by a New York baking firm makes

it possible to deliver the bread, cakes and pies while they are still hot. The 280 pans, making up a five-ton load, fit closely together in the truck so that heat is prevented from escaping too fast and the goods



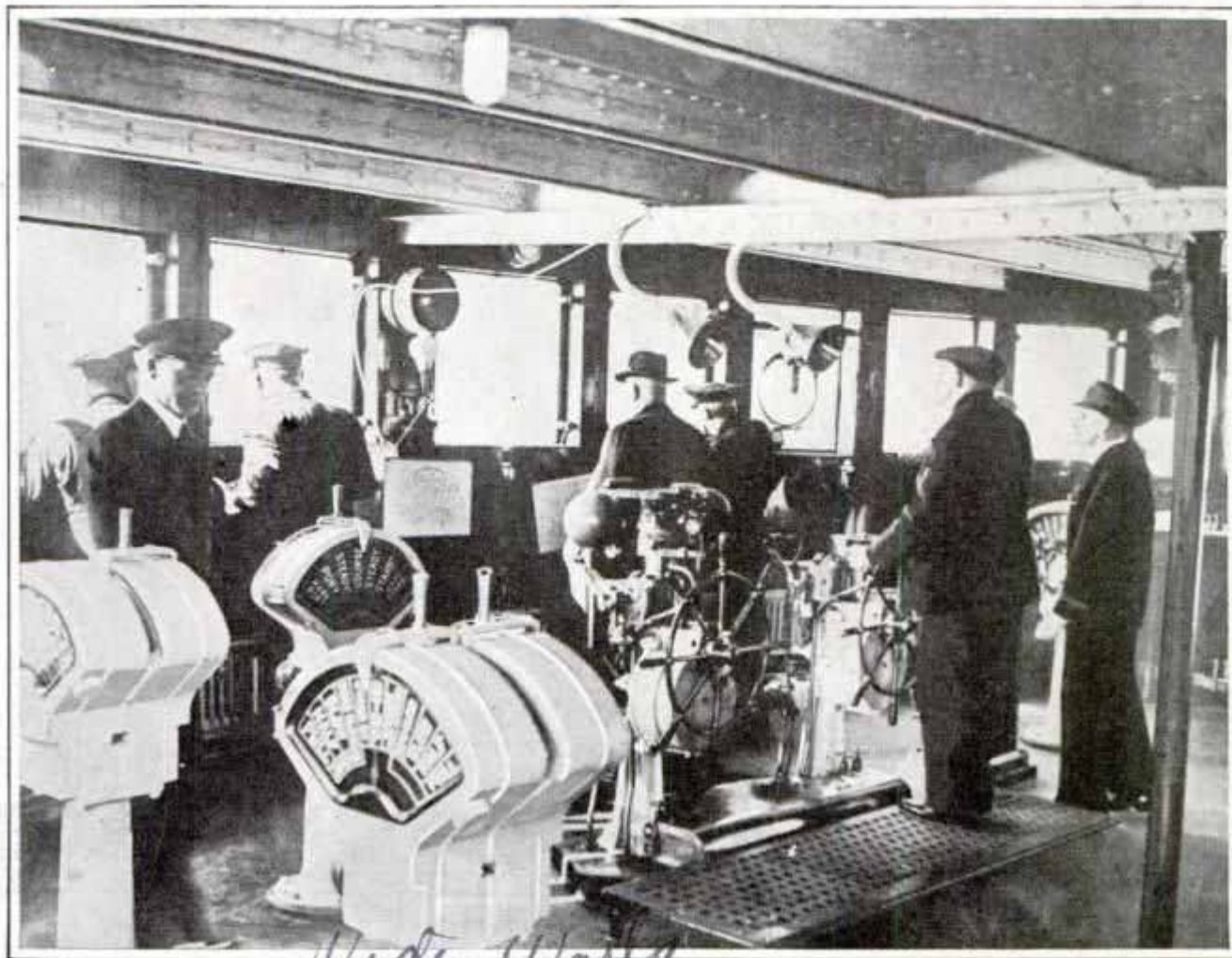
This new truck carries a five-ton load of hot bakery goods to retail outlets

are still hot when the last delivery to the retail outlets is made. The truck is made of stainless steel, is lightweight and designed for maximum capacity. Its inclosed cab is streamlined.

Quadruplex Co  
25th and Grand



# Wheelhouse Is Nerve Center of Queen Mary



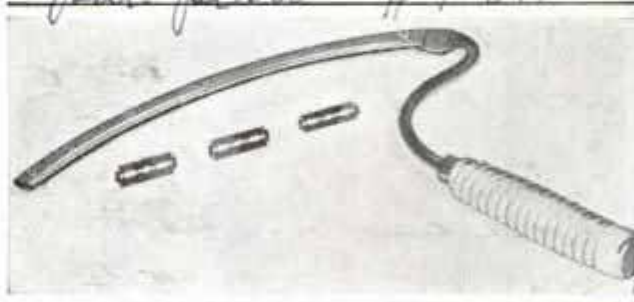
*Wide World*  
 Captain and navigating officers of the "Queen Mary" maneuver the gigantic ship from the wheelhouse, that vital spot on the bridge where human brains and mechanical nerve-ends of the vessel meet

All the vital impulses that travel through the intricate electrical and mechanical "nervous system" of the liner "Queen Mary" emanate from the wheelhouse at the center of the bridge. The wheelhouse is the "brain" that directs the life and movement of the ship. Here a handful of officers watch the course ahead, watch the pulse of the gigantic motors on dials that are nerve-ends connected with the engine room, throw levers or twirl wheels that send instant commands to engineer or directly control rudders. Duplicate wheels are provided for steering. One window on the bridge has a rotating glass that throws off snow or rain, assuring perfect visibility for the captain at all times.

☐ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

*F429*  
**Old Razor Blades in Sickle Trim Lawn or Hedge**

Designed to use old razor blades for its cutting edge, a new sickle trims lawns and hedges quickly and easily. Damaged blades can be removed and replaced. The tool uses any double-edge blade. It is especially useful for clipping the edges of lawns, since it does the work of clippers or shears in one-tenth the time.



Handy grass cutter uses razor blades of the type shown for its edge

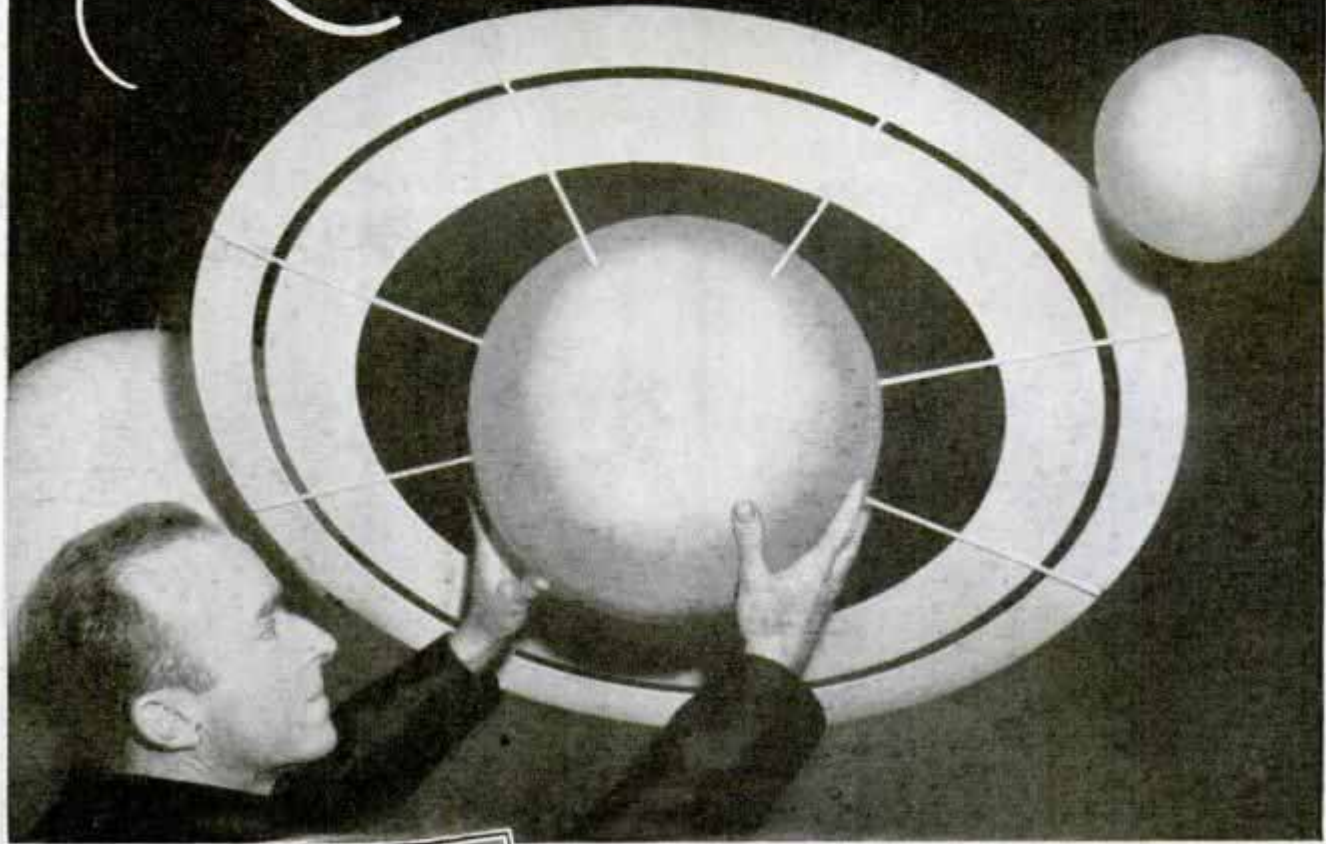
*Israd Sharer Co  
 Ames Bldg.*



F356

Mr. Thomas G. Simpson, Jr.  
10555 Holman Ave.  
Los Angeles, Cal.

# Queer FACTS



*Model of the planet Saturn and its rings prepared from astronomical data*



*Training mirror of sun telescope on spectrohelioscope for studying sun's elements*

**H**AVE you ever seen a picture of a square star? Why do astronomers live longer every year than anyone else? Would you believe it is impossible to look through the world's largest telescope? Do you know astronomers don't always point their telescopes at the stars they really want to observe?

There are no square stars, of course, although the scientists make photographs that show them as squares. They do it with a special camera equipped with a traveling back that moves up and down so the rays from separate stars are recorded as square patches on the film. This makes it easier to measure their comparative brilliance.

Every year is leap year for astronomers and their clocks are geared to 366 days per year. During our usual leap years, however, they still live one day more than the rest of the world and they chart the happenings of 367 days. This is because star time is one day per year faster than the



+ 356

# *about* STAR GAZERS



*Planetarium exhibit depicting moon as it would appear from rocket ship 500 miles away*

solar calendar. No one has ever looked through the 100-inch Hooker telescope on Mount Wilson and no one ever will because this instrument consists of a curved mirror instead of a series of transparent lenses. The mirror collects the light of the stars and throws it back to a point part way up the tube. From there it is reflected outside the tube by a small diagonal mirror. So instead of peering through the end of the telescope an observer stands alongside it and looks into it.

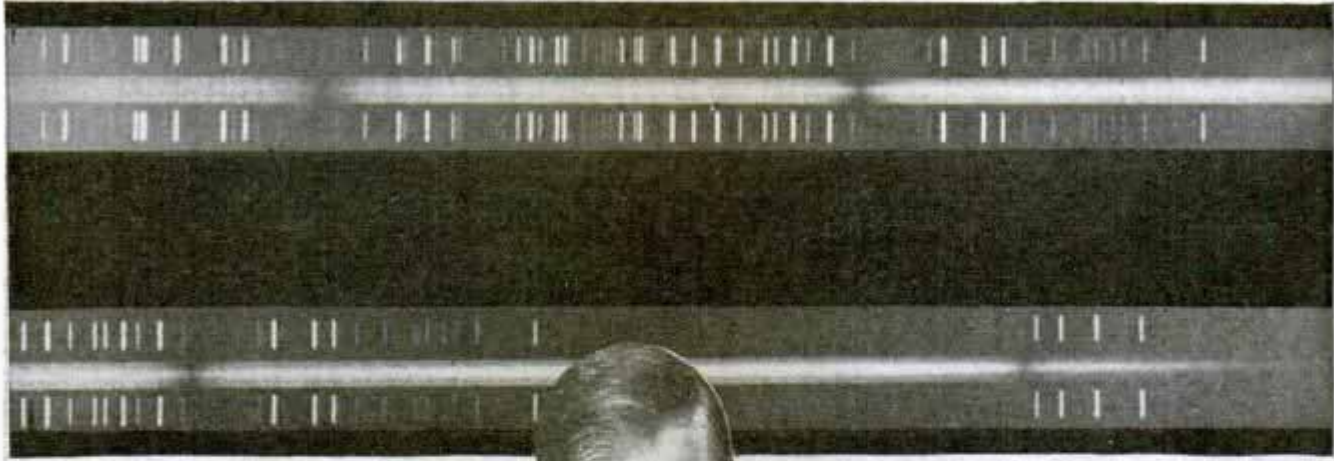
However, it will sometimes be possible to look through the 200-inch "titan of telescopes" being built for the California Institute of Technology because the mirror for this mighty instrument has a small hole in its center through which the collected light may be reflected. Usually, though, the observer will sit in a small house at the top of the telescope and look down into it toward the mirror.

The mirror glass of large telescopes doesn't need to be transparent. In fact, no one would complain if the glass was as black as coal. This is because the mirror surface is placed on the front of the glass instead of at the back. Large telescope mirrors are tremendously expensive even though the glass costs only a few cents



*Pendulum in Los Angeles planetarium which always swings in the same direction as the earth revolves under it*





per pound. The difficulty is to pour it in a large unit without faults or cracks. Glass is used instead of metal because this material is not affected so much by changes in temperature and because it can be ground and polished to exactly the right shape. The latest thing is not to silver the mirrors at all but to coat them with an aluminum surface. Aluminum lasts longer without tarnishing than silver and is a better reflector of some wave lengths of light.

Due to the refraction in the world's atmosphere astronomers rarely point their telescopes toward the true position of a star. Instead they point at the star image they see in the air. At the horizon this offset amounts to about thirty-three minutes of arc, approximately the diameter of the moon. In order to study the light of a certain star astronomers sometimes must actually point the telescope at the real position of a neighboring star.

Nearly everything about the stars is beyond the grasp of most of us. For example, a ball of



fire only an inch in diameter taken from the sun's surface would shine with a brilliance of 1,000,000 candlepower. One of the largest stars is Antares, whose diameter is 350 times that of our sun although it has a density only one-ten-thousandths of our own atmosphere. On the other end of the scale is a recently discovered dwarf whose diameter is only half the radius of the earth. But the density of this pygmy is 36,000,000 times that



Top, star spectrum with lines representing elements. Below, delicate electric eye and thermocouple, and "square" stars produced by camera



of water and its matter weighs 620 tons per cubic inch. On this star the head of a match would be considerably heavier than an automobile on earth. On its surface the gravitational pull is about 3,000,000 times that on the earth. Its surface temperature of 28,000 degrees is much higher than that of the sun.

When astronomers want a new instrument they have to invent it and build it. One instrument they build may weigh hundreds of tons and the next may be of microscopic proportions. Each must be sensitive beyond all ordinary requirements. The new 200-inch telescope will be so powerful, scientists estimate, that except for the curvature of the earth, you could stand on the Atlantic coast and with it read the name of a steamer in the Pacific. As an auxiliary instrument, Dr. Joel Stebbins has built a photoelectric cell and amplifier which, used with the large telescope, might be capable of detecting a candle flame 12,000 miles away. When the astronomers at Mount Wilson first wanted to take the temperature of the stars they decided that a tiny thermocouple, if it could be made small enough, would work.

"The cell had to be so sensitive it would register the heat from a single dim star," says Alfred H. Joy, secretary of the observatory. "Two astronomers worked for months hunting for the best materials and finally decided on a tiny bismuth plate in contact with a small plate of tin and bismuth alloy. The cell was so small they built it under a microscope. Each element of the thermocouple is half a millimeter in diameter, about .01963 of an inch, and is one-one-hundredth of a millimeter thick. The whole mass weighs one-thirtieth of a milligram. The electrical leads consist of almost microscopic platinum wires."

Another useful instrument is the spec-

(Continued to page 120A)

## Planes Bomb 'Ships' Outlined on Dry Lake Beds of Desert



White lines in shape of ship formed target for high-flying bombing planes. Note that several bombs made direct "hits"

Mythical battleships, outlined on the dry lake beds of the Mojave desert, provide the latest target for bombing planes of the U. S. air force. In recent army aircraft maneuvers designed to demonstrate defense steps which might be taken for the city of Los Angeles in the event of an attack, the bombing planes dropped scores of 300-pound explosives on the enemy "ships," blasting great holes in the desert sand and scoring numerous hits. The operations were conducted at high altitudes.

### Flexible Shaft Screwdriver Works at Angles



Equipped with a shaft like a speedometer cable, the latest screwdriver is designed to tighten or loosen screws in close quarters. It works easily at angles greater than ninety degrees. The operator holds the

tip of the tool in the screw slot by means of a loose collar.

Mount Wilson Observatory  
Pasadena



# Low-Priced Home Is Built of Steel Sections

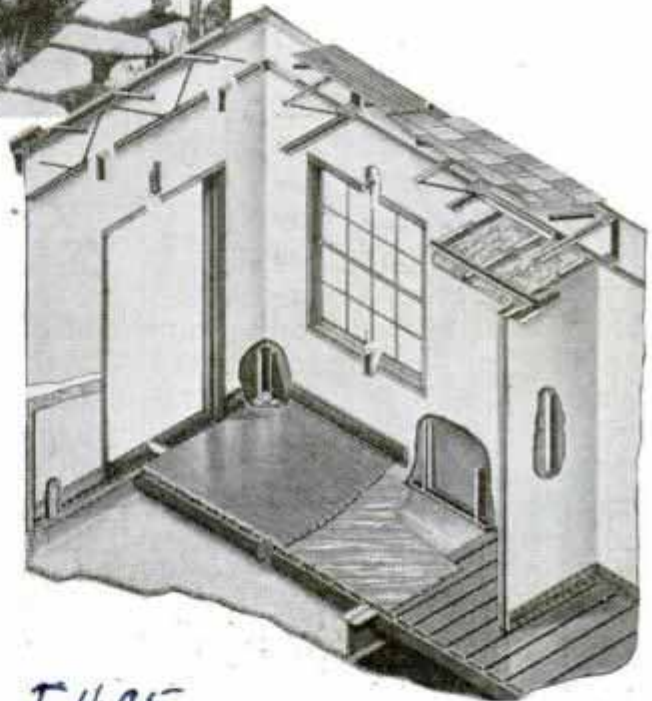
20th Century

W. National Ave  
Milwaukee, Wis



Left, the completed six-room home, built of factory-fabricated steel sections. Its metal construction eliminates the hazards of fire, rodents and termites. Below, cut-away drawing illustrating the method of construction

Steel sections bolted and welded together form the rugged framework of a factory-built home just placed on the market to sell, erected on your lot, for less than \$4,000. It is a six-room house: two bedrooms, living and dining rooms, equipped kitchen and heater rooms and bath. Hip or flat roof is optional, and the house may be built with or without basement. The construction is firesafe, rodent and termite proof, insulated against heat, cold and dampness, and the exterior is weather-resistant. Five framed sections made with twelve-inch welded steel channels, doweled and bolted together, form the base of the house. Each section is reinforced with six-inch cross channels. Galvanized metal sheets under the base lend additional strength and, with an inch of insulating material, seal the floor sections hermetically. The cellarless house rests on fourteen concrete piers poured four feet deep; the home with basement has a concrete block foundation. The hip roof is built in twelve sections of steel rafters to which grooved roof boards are fastened, permitting the nailing of fireproof shingles. Interior doors are of honeycomb core construction with flush veneer sides. Floors are of red oak, except for the linoleum-covered kitchen and bathroom and the concrete-floored heater room. Heat is supplied by an air-conditioning forced warm-air system.



## F405 Engine Horsepower Far Less Than Boiler Horsepower

One boiler horsepower, which equals 33,479 British thermal units per hour, is thirteen times as great as one mechanical or engine horsepower, which equals 2,544.6 British thermal units per hour. The British thermal unit, commonly referred to as B.t.u., is a standard measurement of heat. The reason for the great difference between boiler and engine horsepower is because, in the early days, a 100-horsepower boiler was so called because of its ability to supply steam sufficient to operate a 100-horsepower engine. But boilers and engines have been improved so that today a 100-horsepower boiler supplies steam for

Cont. W. F. Schaphorst  
45 Academy St.







7355  
Oct 4 608, Anantia, 48

# What's the LONG RANGE

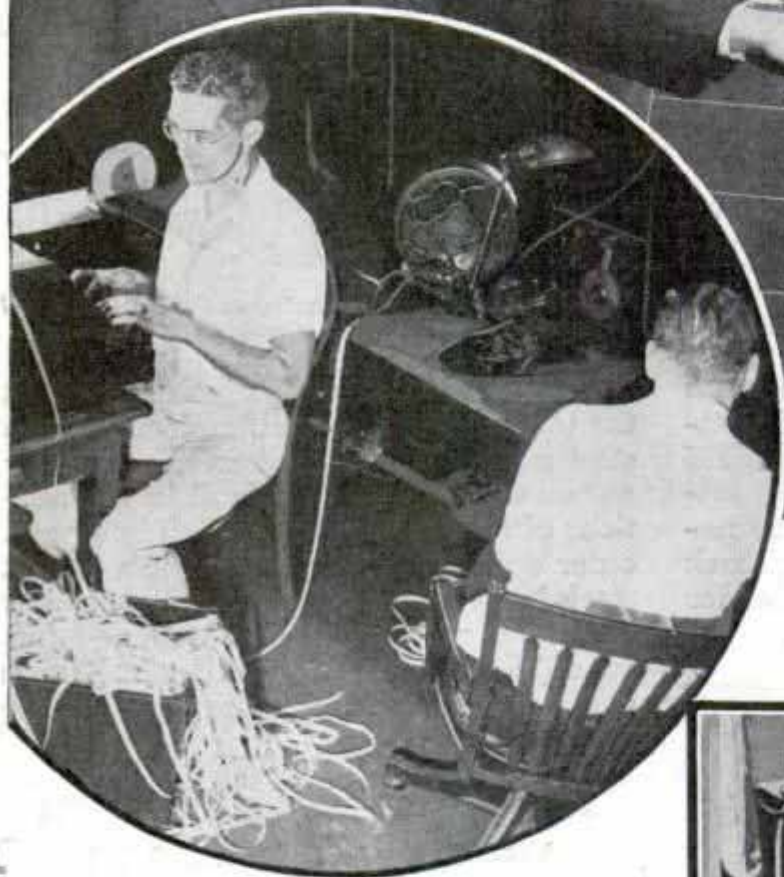
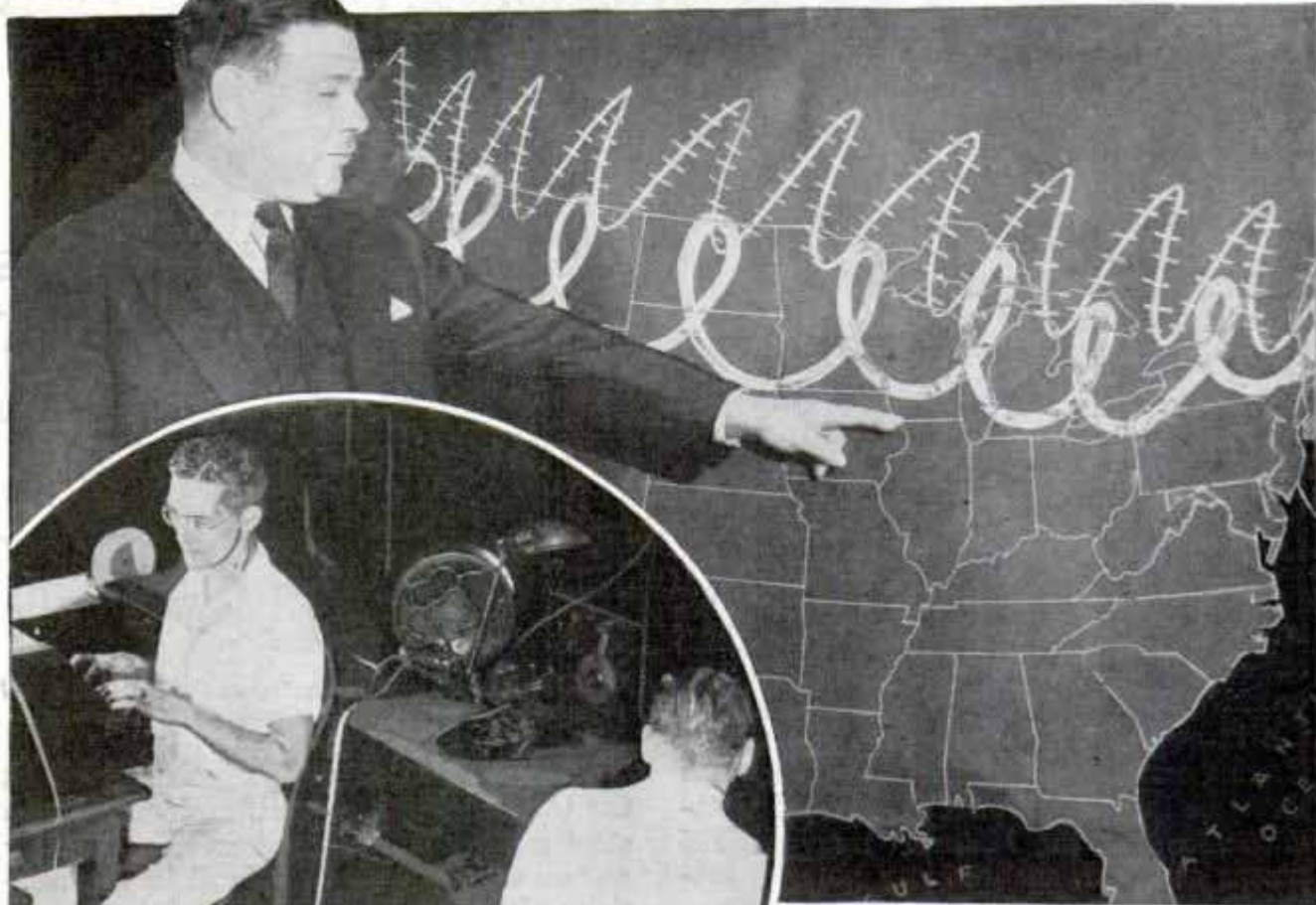


Chart showing how cold comes from north and moves across United States. Left, sending weather data by radio. Below, "brass brain" used to determine weather cycles



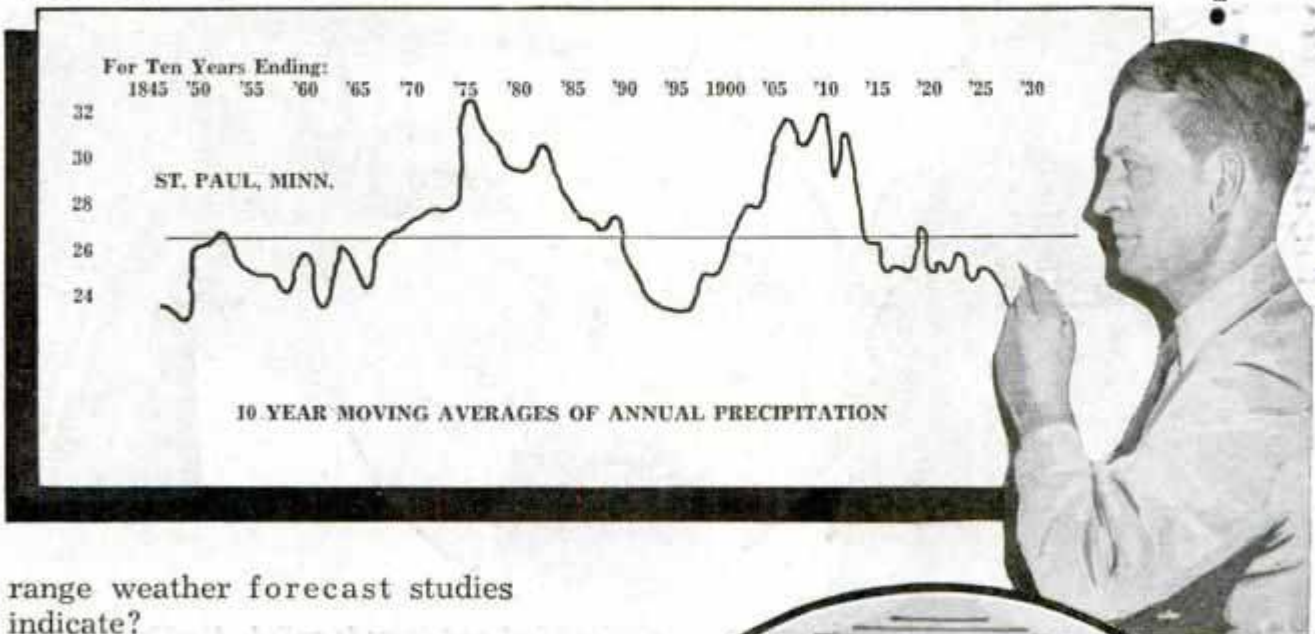
WHEN you finish reading this article, lay it aside until fall, then glance over it again and see if long-range weather forecasting is coming to the fore. Never before has the weatherman, who deals with this type of forecast, had more interesting data with which to work or better opportunity to test his theories.

For the weather today is in an earthquake stage. It has been so ever since last winter—the coldest on record in many parts of the United States. Will the weather continue its gyrations, irregularities and queer quirks? Or will it settle back into placid normalcy? What light can be shed on its future? What do long-



7-355

# Weather Forecast ?



range weather forecast studies indicate?

Weather, says Dr. Charles Abbot, sun scientist and Smithsonian Institution official, has a definite twenty-three-year cycle. This is essentially a double sunspot cycle and means inferentially that the sun has a dominating influence on the weather and that the weather, every twenty-three years has a tendency to repeat itself in any particular part of the world. For instance, if a drought occurs in Nebraska this summer, we may expect subnormal rainfall in the same area in 1959.



Checking weather thermometer, and graph showing rainfall trend in states of the northwest

But we must not take this literally day by day or month by month. In other words, if September 1, 1936, is a beautiful day, we cannot expect September 1, 1959, to be the same. But if September, 1936, in southeastern Nebraska shows a subnormal temperature, we may expect about the same period in 1959 to show a subnormal temperature also for this area. Dr. Abbot has tested this twenty-three-year cycle theory.

In the summer of 1933, Dr. Abbot made weather forecasts involving sixty-six localities throughout the United States for 1934, 1935, 1936 and 1937. A few months ago Dr. Abbot broke the seal on the first of these forecasts—that for 1934—and compared the predictions with the actual

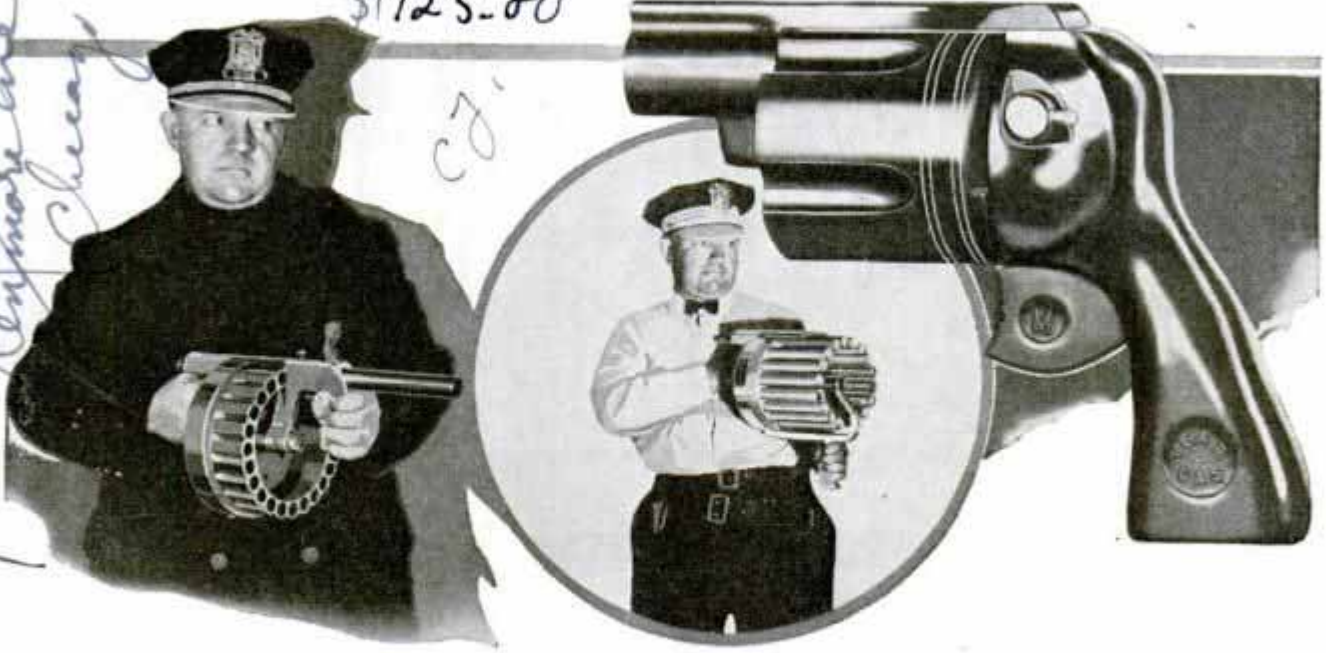
weather recorded for that year in the various localities. Of his year's weather predictions forty-two per cent were shown to be "good" by the actual data, seventeen per cent were "fair," twenty-seven per cent were "excellent" and fourteen per cent were "bad." And this was the first long-range weather forecast ever seriously undertaken, based on the solar radiation hypothesis that the sun, in a great degree determines the weather.

(Continued to page 128A)

*Handwritten notes at the bottom of the page, including "The weather..."*



# Rapid-Fire Gun Spreads Gas over Riot Area



Left, riot gun fires twenty-four twelve-gauge gas shells as fast as trigger is pulled. Machine gun at center shoots eighteen twenty-five millimeter shells; revolver at right holds five twelve-gauge shells

Machine guns that can flood a wide area with tear gas or nauseating gas in a few seconds are the latest recruits to law-enforcement staffs. Forty or fifty feet from the muzzle, the stream of powder has become a cloud of blinding or sickening gas, and the rapid-fire gun can distribute this along a broad front, effectively putting down a riot. The powder shell follows a formula developed by a former army officer. One machine gun shoots twenty-

five millimeter gas shells from a round of eighteen that revolves automatically with each pull of the trigger. Another fires a round of twenty-four twelve-gauge shells, and there is a revolver type of light alloy with chambers for five twelve-gauge shells. This is conveniently carried in a holster. The gas is effective a few feet away, yet is declared to have no permanent harmful effect. Only at close range is there danger of powder burns.

## Burnt Matches Used to Build Two-Story Model House



Two-story model house and Kansas City man who built it entirely of burnt matches

It took ten boxes of burnt matches and a month of his spare time for a Kansas City man to build a model house. The house of matches, a two-story model, was nineteen inches long, sixteen inches wide and sixteen inches high.

## Invisible Fishing Line Leader Is Made of Tungsten

Apparently invisible to fish, especially trout, fishing line leaders made of tungsten may result in larger catches. The General Electric company has taken over a patent on the tungsten leader, which is made of steel wire as fine as human hair. Tungsten wire, which is used in electric-light bulbs, is said to be twice as strong as

*Captn. Frank B. Lewis. 5646 Kenmore Ave. Chicago*  
*Handwritten by H. J. Jensen 4810 1/2 E 9th St. - Kansas City, Mo.*

*350 S Sanford, Mich*  
*\$1125.00*  
*CJ*  
*Pontiac*  
*Michigan*  
*424*  
*4810 1/2 E 9th St. - Kansas City, Mo.*  
*7416*  
*Schenectady, N.Y.*  
*Mr. Chestnut*  
*Plantzenen. Schenectady*



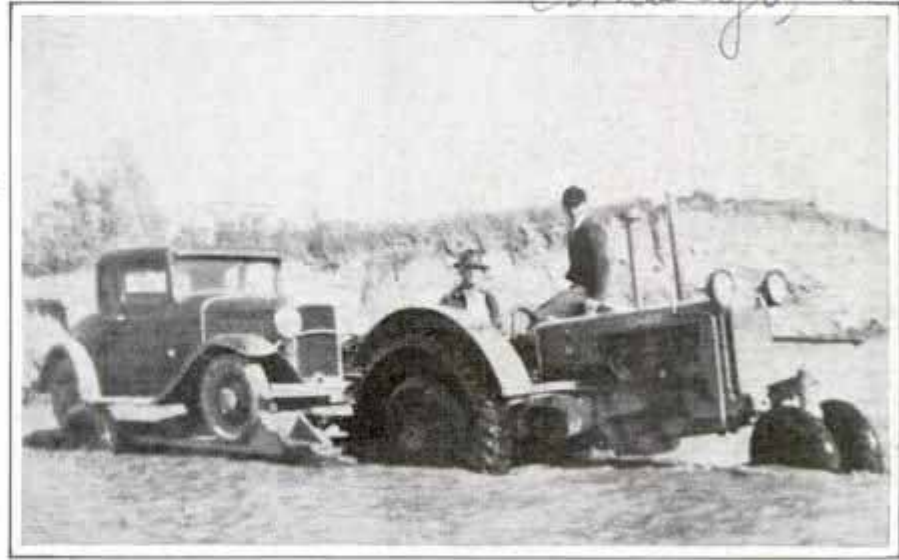
3/20/36

Operated by E. Van Horn

gut, steel or brass wire, does not rust, is readily tied and fastened to the hook and is heavy so that no sinker is necessary when fishing in swift streams. The leader is inserted between the hook and the fishing line.

# Autos 'Ferried' across River by High-Wheeled Tractor

Camargo, Okla.



High-wheeled tractor gives an automobile a ride on its trailer across a shallow river near Camargo, Oklahoma

## Fast-Working Tool Digs Weeds and Holds Them

F438

Easily operated without bending over, a weed digger now on the market digs and picks up plants rapidly with a single movement. It is equipped with a small rake and chamber which holds a dozen to twenty-five weeds before it need be emptied. The digger is adjustable from one and three-fourths to three inches.

Ferryboats are tractors in Oklahoma, where highways still ford shallow rivers in some places. When the stream is too deep, too swift, or treacherous with its sand bottom, motorists take no chances of flooding their engines but drive their cars on the trailer behind the tractor-ferry and ride across in safety. It is high-wheeled, the motor clearing the water, and is equipped with headlights for night crossings. A tractor owner maintains service night and day on Highway 34 near Camargo, Okla.

E. Van Horn

## Rubber Coating Resists Wear and Stops Corrosion

Offered as a protective coating and as a bond for rubber applied to glass, metal, concrete and other surfaces, a new rubber adhesive is now available. It may be used by itself for covering surfaces to be protected against abrasion and corrosion, or as a primer for rubber coatings on smooth or rough surfaces. It is waterproof and has a large covering capacity. The material may be used for repairing, resurfacing, recovering and lining such equipment as conveyor belts, tripper chutes, screen peaks, hoppers, centrifugal pumps, mixing tubs, ore cars, truck cars, agitators, cables, hose, flooring and cabinets. It also is a durable coating for pipes, unions, valves and fittings, and will prevent grit and moisture from getting into rivet holes at splices and joints.

Liqua Rubber Adhesive F446



Leaf bending when

#275 #191 3758

1.65  
1993417

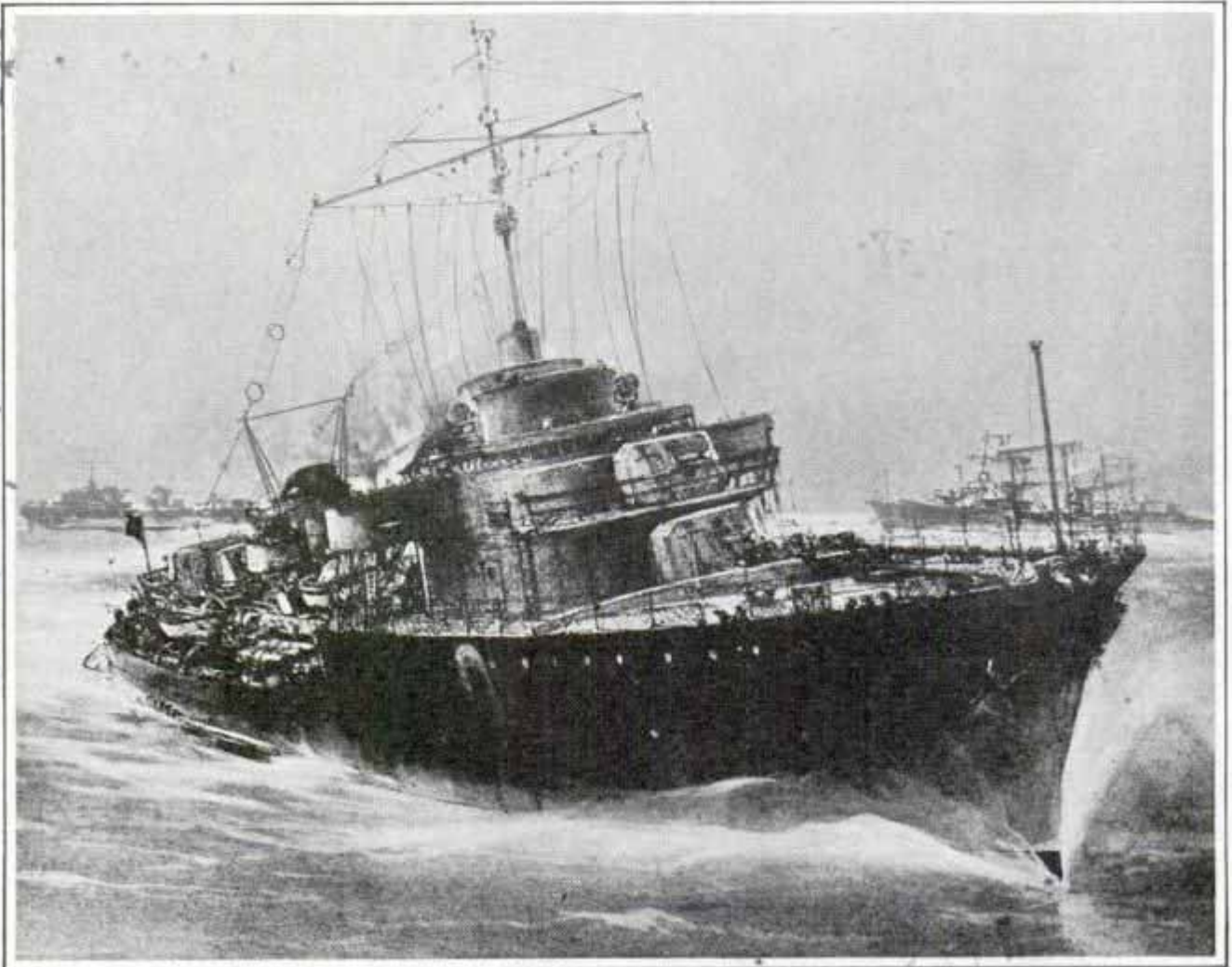
The Jay Chicago-Vaughan digger

Weed digger with chamber that will hold a dozen to twenty-five weeds before it need be emptied

John L. Hoff Self. Vulcanizing 605 W. Washington



# Fast French Destroyers Outpace All Rivals



Speed champion of France's new group of six destroyers, "Le Terrible," is seen above as she raced at record speed of fifty-two land miles per hour. "L'Indomptable," flagship, is in background at right

Swiftest destroyers on the seas are the six new French vessels whose fleetest, "Le Terrible," knifed through the waves in her test speed run at a record rate reported at 45.25 knots. This is the equivalent of a little more than fifty-two land miles per hour. Flagship of this group is "L'Indomptable," officially rated as a destroyer but, with her 2,569-tons displacement, close to the cruiser class. The nominal speed of these ocean greyhounds is thirty-seven knots, yet "L'Indomptable," slowest in test run, reached 41.8 knots. Each ship is armed with five 5.5-inch guns and four thirty-seven-millimeter guns, in addition to nine 21.7-inch torpedo tubes. A crew of 220 mans each vessel. Since the tonnage displacement, armament and design of this fleet do not strictly conform to the traditional description either of destroyer or cruiser class, the French classi-

fication of "contre-torpilleur," which may be translated as "torpedo boat chaser," is usually retained. The last of the fleet, unrivaled among the navies of the world, was launched in April, 1934, and is now in service ready to defend the 20,000 miles of coast line of France and her colonial empire in Africa, Asia, North and South America, the West Indies and the Pacific. Partners of "L'Indomptable" and "Le Terrible" in the group are "Le Fantasque," "L'Audacieux," "Le Triomphant" and "Le Malin."

## "Mask" of Air Protects Worker from Dust and Fumes

Clean air shot down under pressure from a "visor" forms an effective transparent mask protecting the workman from dust, smoke, gas and chemical fumes. A

Illustrated London news March 7 (1936) P. 403-5

Place - England - 34

#451

# 5,032, 101

W. D. Sullivan



*Aktie-gesellschaft  
Manufacture on main*

*American T. Co. Chemical Co.  
5 H. Ave. New York*

patent for such an air "mask" was granted recently. On his forehead the worker wears a shield resembling an eyeshade in the visor of which is an air chamber. From openings on its lower edge air is forced downward in front of the face, acting as a screen without blowing on the face itself.

**Rubber Made from Acetylene Wears Much Longer** F430

Thirty per cent longer wear is claimed for automobile tires made with Buna, a synthetic rubber developed in Germany and based on acetylene. The cost of manufacturing Buna has not been determined, but it is expected to be sixty to eighty per cent higher than natural rubber. In making it, acetylene obtained from lime and coal is converted into butadiene and this, by polymerization, is changed into three forms of synthetic rubber.

**Can Opener Also Makes Pouring Spout** F417

Cans of sirup, oil and other liquids are handled without muss by using a can opener which also serves as a pouring spout. The opener is pressed down on the



Can opener which also serves as a pouring spout for molasses and oil

top of the can near the edge. A guide slides over the side and a metal prong punctures the top. When in place, the top of the opener, which is fitted with a screw cap, facilitates pouring without spilling.

**Bicycle Has Steering Wheel and Chairlike Seat**



Easier riding is offered by this bicycle with steering wheel and comfortable seat

Equipped with a chairlike seat, a bicycle introduced recently in Paris permits the rider to sit up straight in a comfortable position while pedaling. The bike has a steering wheel to insure better control.

**Bending Jig Handles Metals on Scroll or Model Work**

Lending itself to the making of models and decorative scroll work, an inexpensive bending jig is available for the home craftsman.



It is used in a vise, with the jaws gripping a square boss on the bottom of the jig. The cam has six positions. Stock up to one-quarter by one inch can be bent cold.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

*The Butler Craftsmen Co. Newton Mass  
34 Handmade St.*

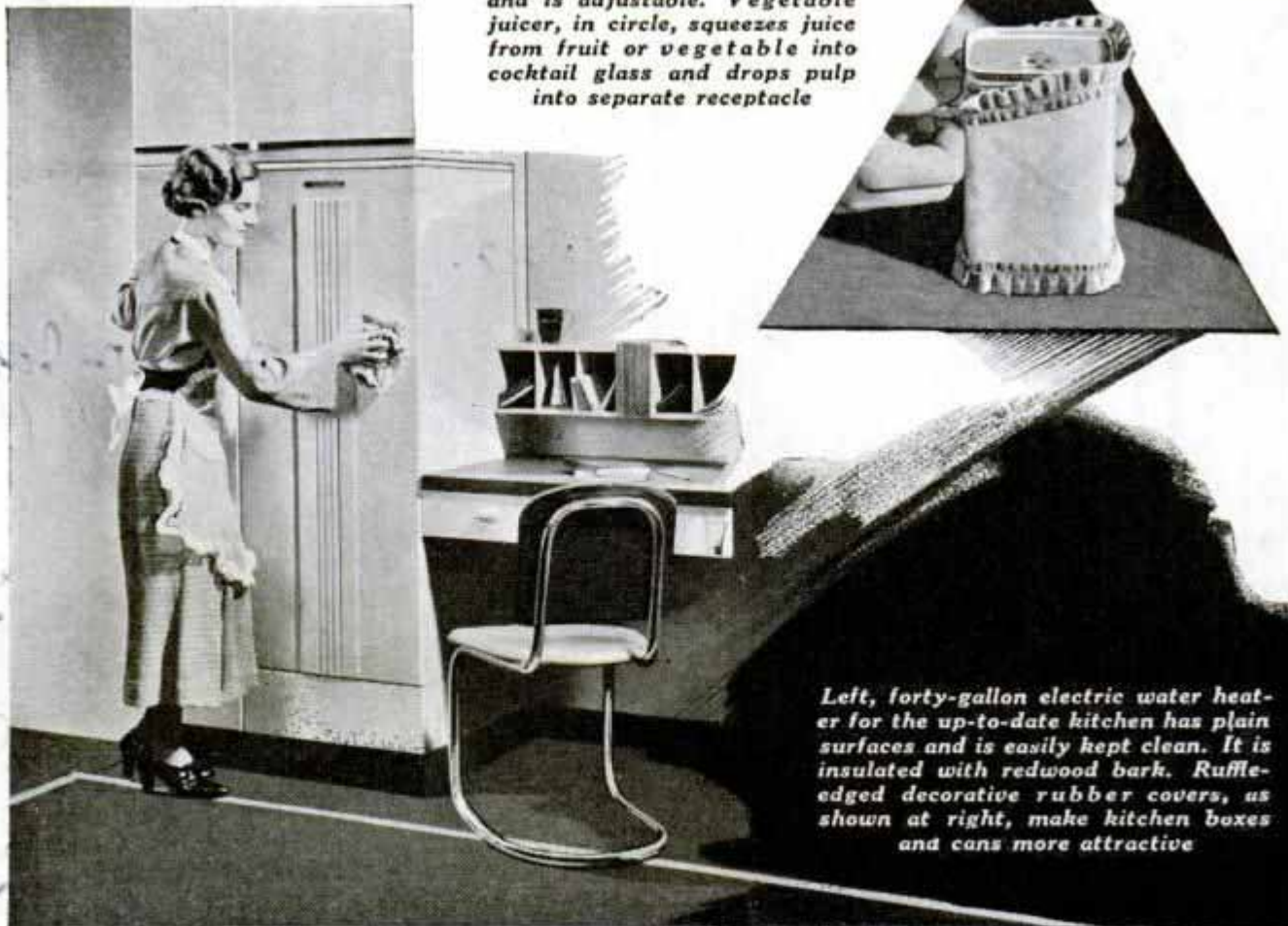
*Red Cap Utensils  
2709 E. Columbus Blvd.*





# New Conveniences for

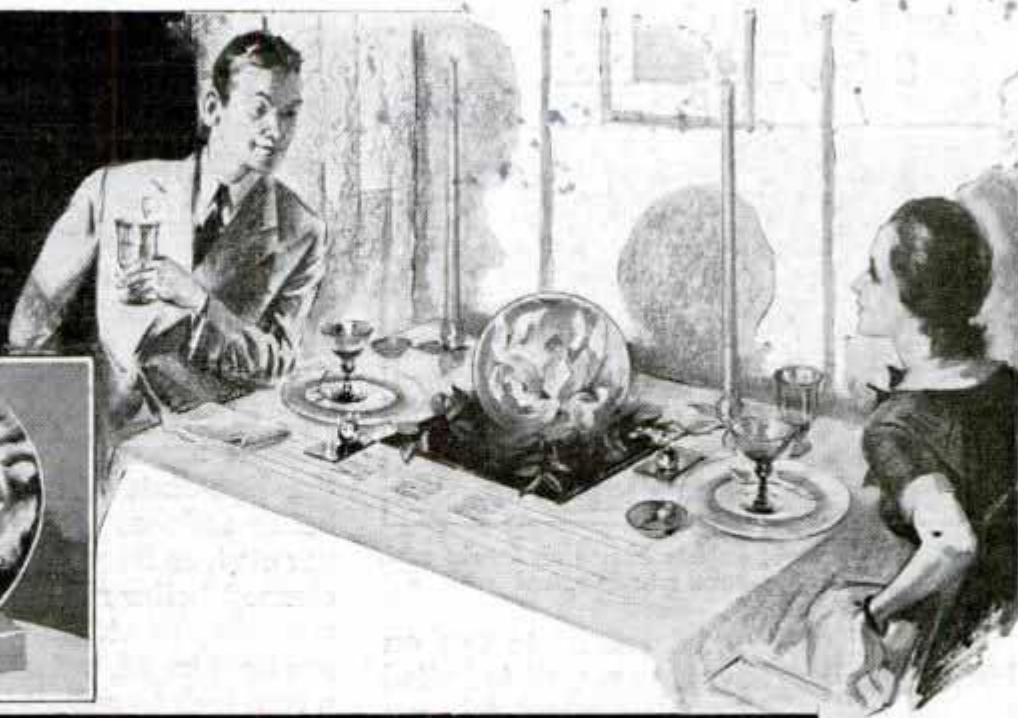
*Bed chair, above, provides comfortable support for the back, and is adjustable. Vegetable juicer, in circle, squeezes juice from fruit or vegetable into cocktail glass and drops pulp into separate receptacle*



*Left, forty-gallon electric water heater for the up-to-date kitchen has plain surfaces and is easily kept clean. It is insulated with redwood bark. Ruffle-edged decorative rubber covers, as shown at right, make kitchen boxes and cans more attractive*



Flowers stay fresh for ten days in this water-filled airtight bowl, without a visible opening. Their beauty is enhanced by silver bubbles that gather like dewdrops on petals and leaves



# YOUR HOME

Neatly packed in "week-end" hairbrush at right is a comb and complete shaving set—razor, five blades, cream, brush; and there's a mirror in the lid



When serving fish, oysters, or tea, the polished aluminum lemon tong above squeezes all the juice from a lemon segment without spraying the table or soiling your fingers. Studio couch, right, is converted into double or twin bed by a turn of the "gear shift" lever





### Road-or-Rail Unit for Trucks Solves Freight Problem



Rail-highway freight vehicle shown on tracks with its rubber-tired wheels raised

Designed to convert trucks to use on highway or railway, a new unit is hailed as the solution to the pickup and delivery problem of railroads. Through a mechanical jack operated by compressed air and worm gear, the rubber-tired wheels are raised and flanged steel wheels lowered when the vehicle is used on the railway. The reverse action adapts it to use on highways. Trucks equipped with the unit make store-door pickups and deliveries of freight, then speed over the tracks at fifty to sixty miles per hour between origin and destination points. The unit may be attached to standard makes of trucks. It has been adopted by a western railroad.

### Water Jacket Around Flame Saves Fuel on Oil Boiler



Designed with a completely water-jacketed combustion chamber to insure better absorption of heat, a new oil-burning boiler now on the market is said to be highly efficient. This feature, together with a combustion chamber of greater height to obtain more complete

combustion of the fuel, makes for lower costs of operation because the boiler ex-

tracts more heat from the oil than does the conventional boiler. The upper part of the boiler is constructed so that the gases alternately spread out and converge, preventing the channeling of the gases without giving up their heat. This action also spreads the gases over a large heat-absorbing area. The stack temperature is said to be remarkably low because most of the heat is absorbed into the water as the gases pass through the boiler. The design of the plant makes it easy to clean, another important feature. Engineers say that one-sixteenth of an inch of soot in a boiler reduces the efficiency twenty-five per cent, so frequent cleaning of the easily cleaned boiler means money in the home owner's pocket. The doors of the boiler are not hinged, but are held in position by a cam lock to reduce the possibility of the doors being blown open by a puff from the burner. This would prevent the gases and soot from escaping into the house.

### Rubberlike Glass Stretches and Bends under Strain

Rubberlike characteristics are being imparted to safety glass by incorporating into its bonding layers a material which permits it to bend. Glass of this type will bend when broken, resulting in greater safety. If a windowpane were made in this manner, it could be taken out and rolled up like a rug after some small boy tried to throw a rock through it. Applications for this glass include cockpit covering for military aircraft, drivers' hoods for racing cars and the normal uses of ordinary safety glass. The secret of the "rubber" glass is a plastic resin material with flexible properties. It is used in the inner layer of the glass "sandwich" which makes safety glass. Acryloid, a chemical derivative of acrylic acid is one type of plastic for this purpose. Acryloid can be molded or machined into various shapes. A transparent violin might be fabricated in this manner. Another material having similar properties is vinal, a synthetic resin of the vinyl group.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

*System used by Oceanic Shore Railroad, San Francisco*

*Handwritten notes: 'Cahland', 'Calif', '1516 Central Bank Bldg'*

*F404*

*Vertical handwritten note: 'Lane' and '516'*

*Vertical handwritten note: 'Cohen' and '191' (Ples), Calaco'*

*Handwritten notes at bottom: 'Lane', '516', 'St Paul'*



... R A  D I O

*£3536*  
Rechargeable  
**POCKET  
BATTERY**

**O**PERATING on the principle of the oil lamp, this rechargeable pocket battery employs lead plates insulated with wood separators and a special absorbent insulator which acts like a wick to feed the necessary electrolyte from a non-spillable low-level acid supply. The assembly is housed in a molded hard-rubber case designed to fit the vest pocket, and may be carried in any position except upside down.

Although primarily designed



for replacing short-life batteries in hearing aids for the deaf, it also provides the radio experimenter with a uniform-voltage rechargeable filament battery for operating belt receivers and other

portable radio apparatus. They are available in 2.2, 4.4 and 6-volt types; however, the containers are all of the same size.

The charger is a small unit of the transformer, dry-electrolytic variety, and may be carried in the traveler's luggage. It is self-regulating and a charge is sufficient for from 6 to 10 hours continuous use on an amplified hearing aid drawing approximately 100 milliamperes, thus eliminating worry about using too much current. The 2.2-volt type is suitable for A-battery filament supply and the 4.4-volt variety for most hearing devices. Any hearing-aid battery plug can be used by inserting it in the pin jacks on the top of the adapter. Knurled terminal nuts are also provided.



*H. E. Clarke Co 70*  
*Pa. Phila Pa*





# ALL-METAL

By Stanley Johnson

LOW cost and ease of construction are features of this compact short-wave receiver which uses two of the new metal tubes. Any beginner can build it, yet it works so well that an experienced amateur will find it a useful piece of equipment for his radio "shack." Short-wave listeners will discover that it is exceptionally good for logging distant stations in the crowded short-wave bands. The strong metal chassis and sturdy metal tubes are well suited to stand the shocks and jars that small sets are subjected to, especially in portable use.

The metal tubes have 6.3-volt filaments, and 135 volts

of B-power are necessary to operate the set. A filament, or "heater" supply can be obtained from a 6-volt storage battery or an ordinary 6-volt filament transformer. Three 45-volt B-batteries are required for the plate supply, or the builder can use the simple a.c.-d.c. amplifier and B-eliminator which was described in the June issue. This will

also permit the use of either phones or magnetic speaker.

A type 6J7 metal tube is employed as a detector in a screen-grid feedback circuit which has become popular because of its excellent stability and the fact that it makes coil winding easy. Regeneration is controlled by the effective method of varying the screen voltage by means of a variable resistor. Resistor coupling is used between the detector and type 6C5 audio amplifier tube. An unusual method is employed for coupling

the antenna to the detector. It is connected to the cathode terminal of the coil "tickler tap." Thus the feedback portion of the coil is used not only to provide regeneration but also for an-

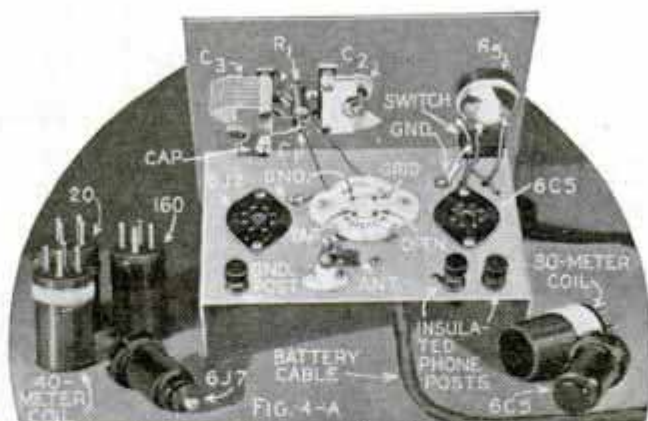
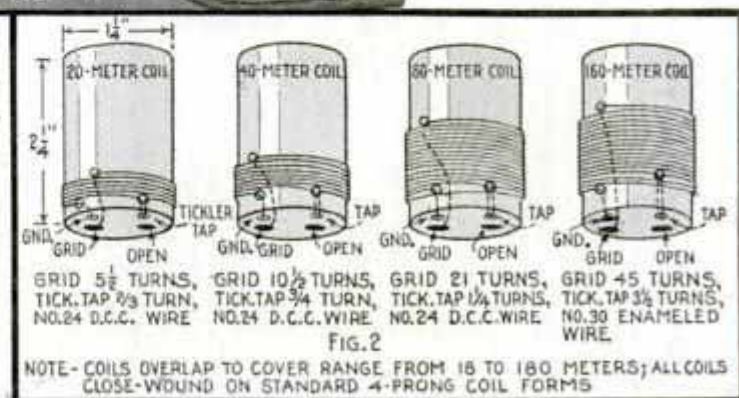
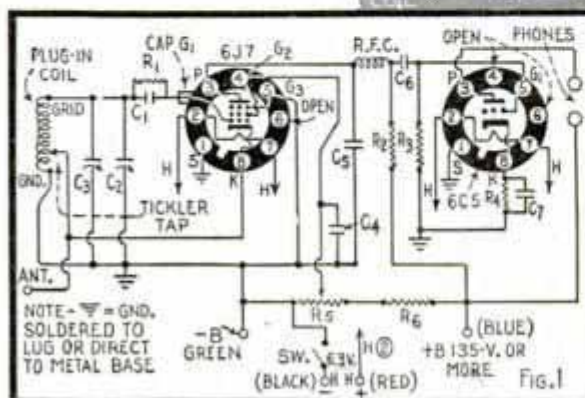


FIG. 4-A



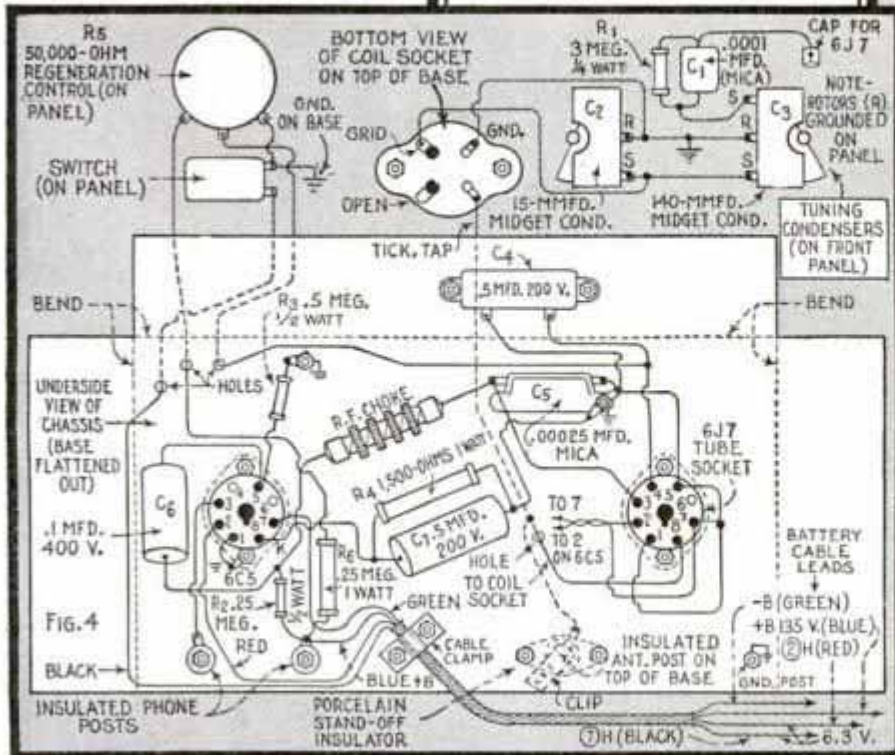
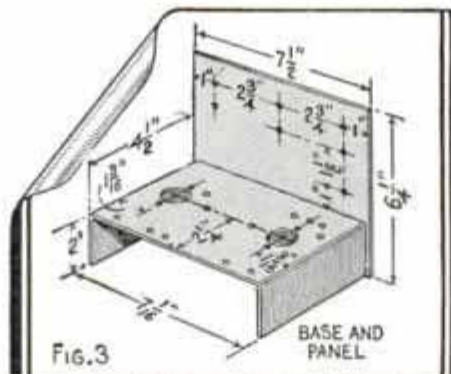


# TWO-TUBE for Short Waves

antenna coupling. This method of coupling permits plenty of signal input without blocking the detector, and further simplifies the set by eliminating the usual coupling condenser.

The schematic circuit diagram is given in Fig. 1, and complete coil-winding data for the plug-in coils in Fig. 2. To simplify the diagrams, these 4-prong coil forms are shown without the prongs; however, the large prongs are indicated by the heavy black dots and it will be noted that only three prongs are used in each form. All four coils are wound in the same clockwise direction, the ends and tickler tap being brought down through the prongs and soldered.

Fig. 4 shows an underside view of the flattened-out base and all wiring in simplified form. The porcelain coil socket,

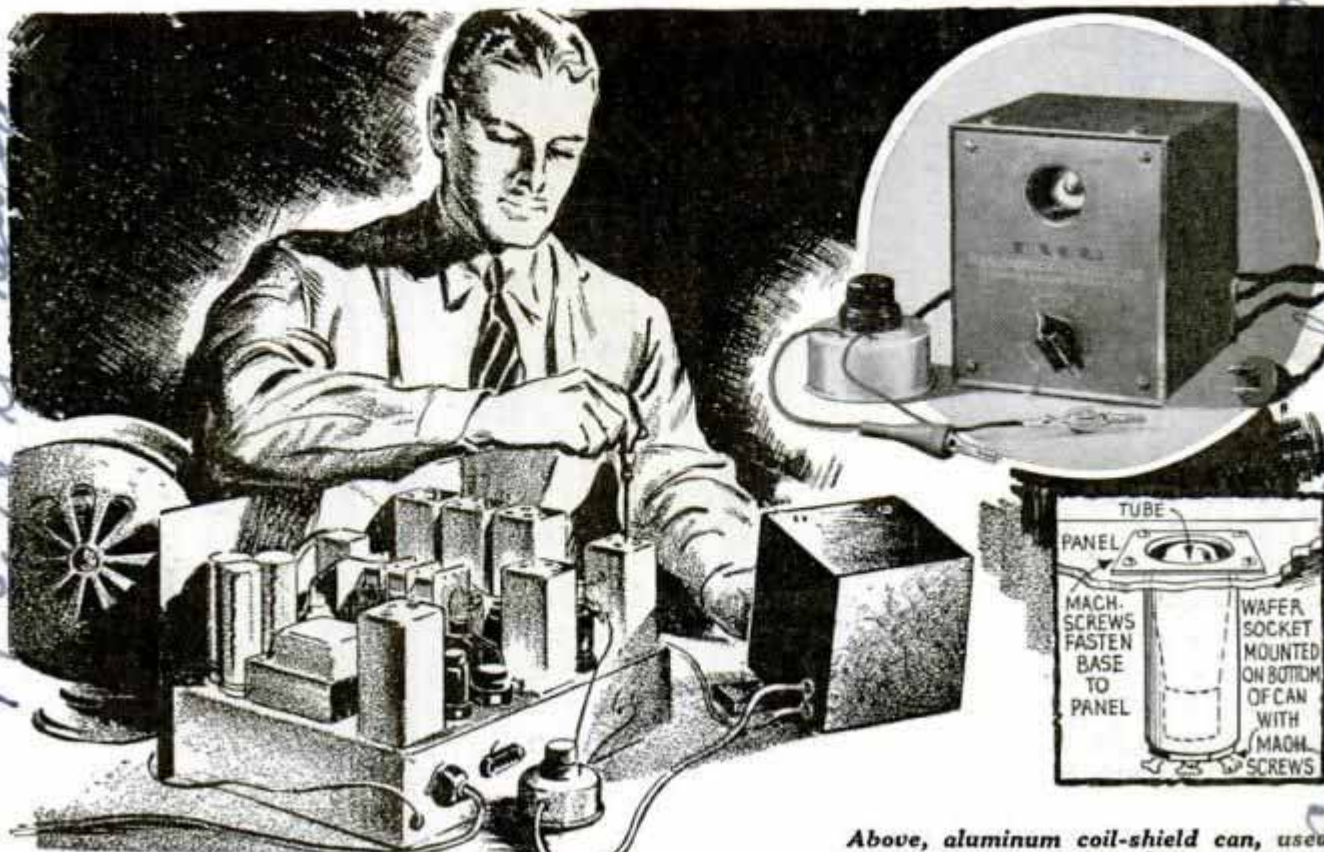


an underside view of which appears above the base layout, is mounted by means of 1/4-in. spacers on top of the base near the variable condensers. Short, stiff copper wire leads are run directly between the condensers and coil socket. Mount the variable condensers, regeneration control and switch directly on the metal front panel. The rotors of the midget variable condensers are grounded on the

(Continued to page 126A)

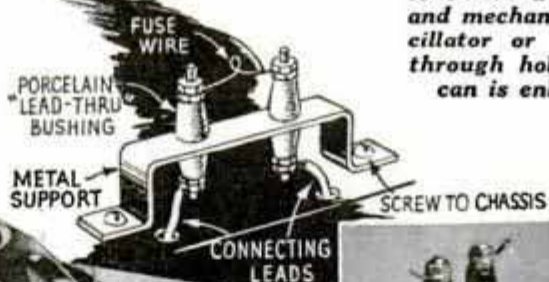


# Easy Solutions for Everyday Radio Problems



Above, lining up a modern receiver by means of a self-powered electron-eye resonance indicator. The unit, shown in the photo at upper right, employs two 6H6 metal tubes and one 6E5. It has numerous useful applications for experimenters and service men

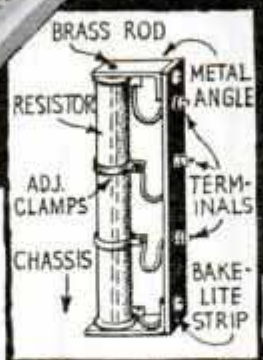
Above, aluminum coil-shield can, used to shield a tube from external pickup and mechanical injury in modulated oscillator or test set. Can is mounted through hole in panel. Hole in end of can is enlarged for the tube socket



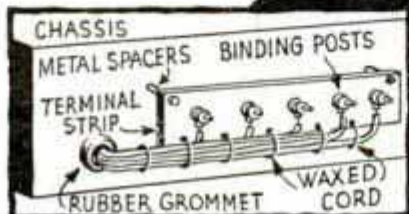
Upper left, small porcelain lead-through bushings make handy insulated supports for mounting fuse or high-voltage knife switch. Left, oil-filled transmitting condenser in round aluminum can, is provided with a metal mounting ring. Below, simple tool for removing tubes from midget receivers is formed from a piece of thin steel, or other stiff metal, and shaped like a wide-tined fork. The space between the curved tines is slightly wider than the distance between opposite tube prongs



Block of "acoustical" celotex makes a good speaker baffle for table-type cabinet or small console. A key-hole saw was used to cut the speaker opening. Right, space-saving vertical mounting for adjustable voltage divider. A brass rod, threaded at each end, extends through hole in the center of resistor, also through angles and chassis. "Hex" nuts on rod hold the assembly together



Right, neatly cabled connecting leads brought out to terminal strip mounted on chassis, improve appearance and efficiency of homemade receiver or amplifier





# How to Amplify

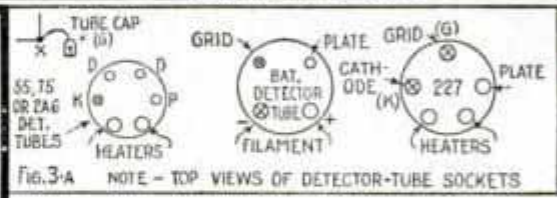
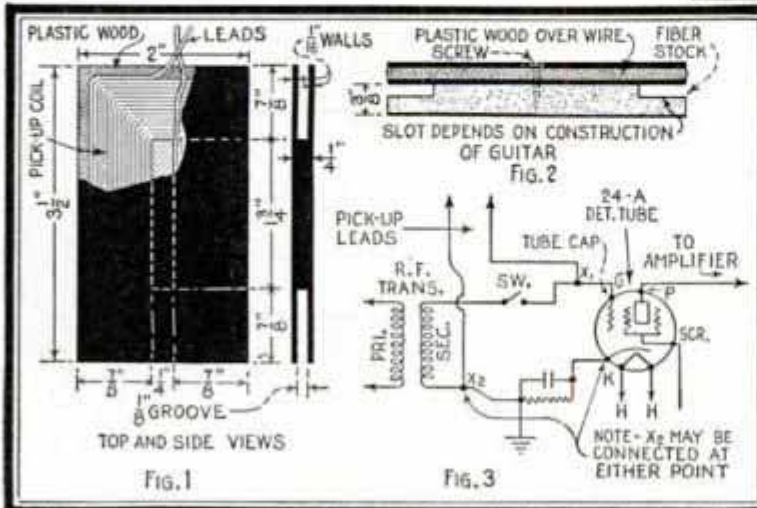
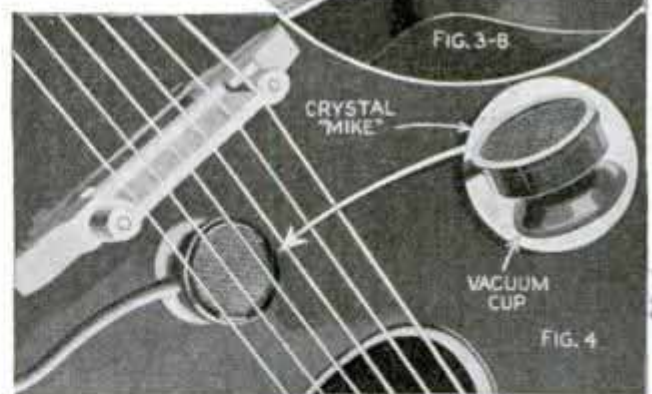
## STRING INSTRUMENTS

By Felix Glavnig

MOST radio receivers have sufficient audio amplification to serve as an amplifier for stringed instruments where additional volume is desired. A simple homemade experimental pickup coil, that may be used with a steel-string guitar, is detailed in Figs. 1 and 2.

The materials are inexpensive and easily obtained. A piece of 1/4-in. bakelite or fiber stock is grooved as shown in Fig. 1. This groove can be cut with an electrically driven saw to provide a spool for winding the coil which consists of enough turns of No. 36, or 38, enameled-copper wire to fill the groove to within 1/8 of an inch of the edge. The start and finishing ends of the coil are brought out as indicated, and a layer of plastic wood holds the winding firmly.

A mounting flange made of wood or fiber, as shown in Fig. 2, holds the pickup in position across the opening of the sound box as indicated in Fig. 3-B. The leads of the pickup coil are soldered to small pin

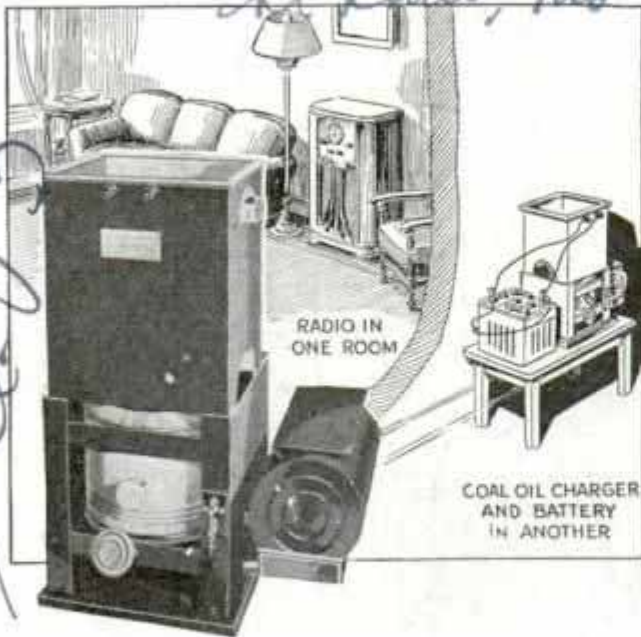


jacks that can be mounted on the coil form. A pair of leads terminating in pin plugs, which are inserted in the jacks, can then be connected to the detector tube that precedes the audio amplifier, as shown in Fig. 3. These con-

(Continued to page 134A)



Coal-Oil Charger for Farm Sets



It is no longer necessary to make trips to town with rundown storage batteries for the radio receiver or the car. For less than one cent per hour, you can operate any farm receiver with this coal-oil battery charger which employs heat to generate the necessary current to keep the battery fully charged at all times. You may be hundreds of miles from the nearest electric-light line and still have all the power you need. The unit and battery can be in an adjoining room, basement, shed or barn. The connections are very simple and may be made with ordinary No. 14 insulated wire. No shielding or complicated wiring is required.

Portable Capacity Indicator



Eliminating guess work and the laborious method of connecting condensers until the right capacity is found to replace the defective part, this

compact unit enables the service man to cut in a wide variety of capacities quickly. Besides giving the correct values for those that have broken down, it offers a means for checking all the condensers in the set, some of which may have gone far enough "off" capacity to interfere materially with the efficiency of the receiver. The indicator shows the exact needed capacity for such a condenser. With more and more radio set manufacturers stamping their condensers with part numbers rather than capacities, the importance of a capacity indicator as a service tool is emphasized. The unit is complete with surge-arrester, test leads and carrying case.

Man-Back Public-Address System



Local business advertising by the "sandwich man" method is brought up to date by means of this portable assembly which consists of a battery-operated power amplifier, battery compartment, built-in loud-speaker, hand microphone and portable phonograph. These units are housed in lightweight

cases provided with shoulder straps, and the total weight is only 32 pounds. A heavy-duty two-button lapel-type microphone may be used instead of the hand "mike" if preferred. Combining music with announcements, this modern sandwich man easily attracts attention.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are available without charge on receipt of postage.

**NEXT MONTH—How to Build a Six-Volt Battery-Operated B-Eliminator for Farm Sets.** A simple inexpensive unit that works directly from your 6-volt storage A-battery and supplies 135 volts at 42 ma. Other features include: **Two-Tube Capacity Relay**, for burglar alarm; **All-Wave Kit Receiver**, uses 8 metal tubes.

Sprague Products Co. 112 W. 14th St. New York

I 3540

I 3542

202 E. 12th St. St. Louis, Mo.

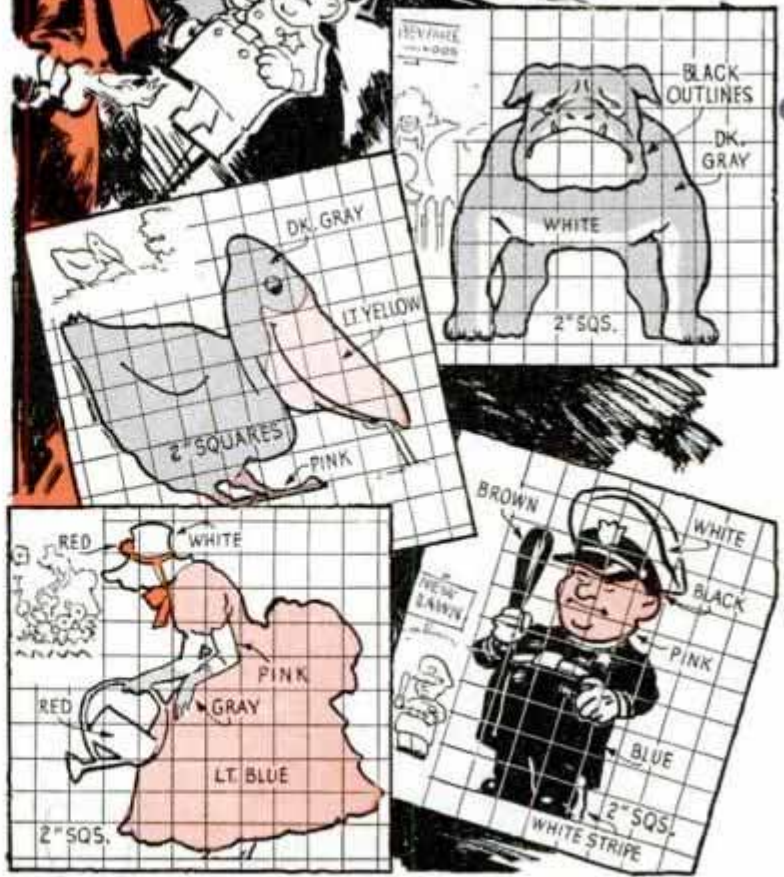




# Jig-Sawed LAWN ORNAMENTS

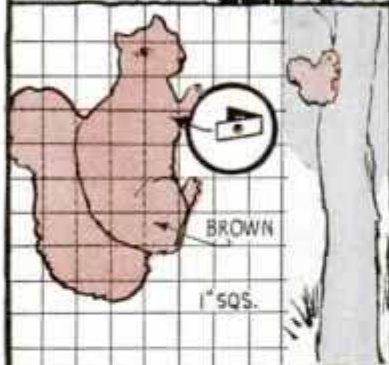
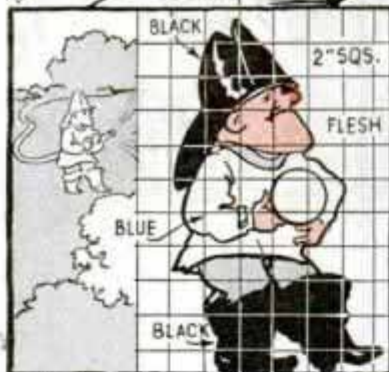
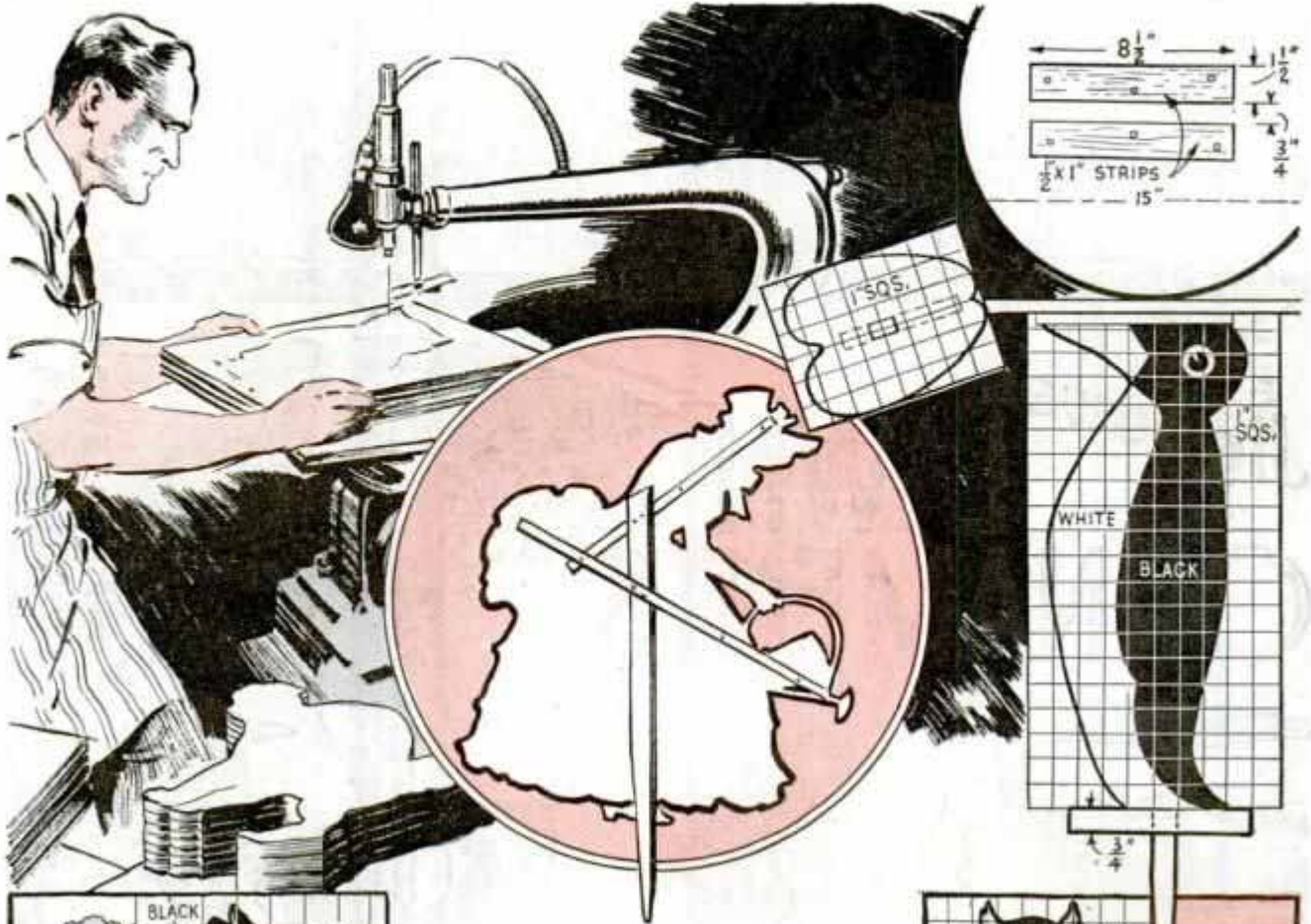


ARRANGED in an effective display around any roadside stand, these colorful lawn ornaments will attract passing motorists and bring in a substantial revenue. One class of figures, primarily for use on the lawn, includes the alert bulldog and the warning policeman to replace the usual "Keep-Off-the-Grass" signs. The sprinkling maid is a popular item as well as the miniature fireman who can hold the nozzle of a garden hose. Another class of ornaments are those like the climbing squirrel, the hanging monkey and the woodpecker, to be used on trees, while a black cat makes a novel silhouette on the ridge of a garage roof, and a taciturn owl watches doings in the garden from a fence post. For those who like small lawn tables to hold books, cigarettes or even for serving tea, the penguin stand has a pointed stake which is



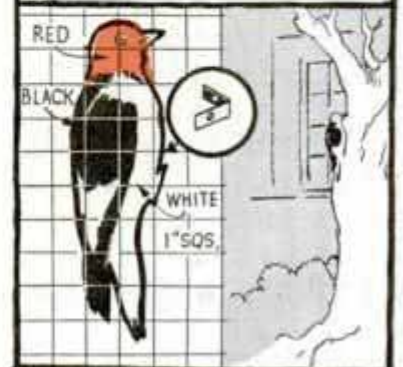
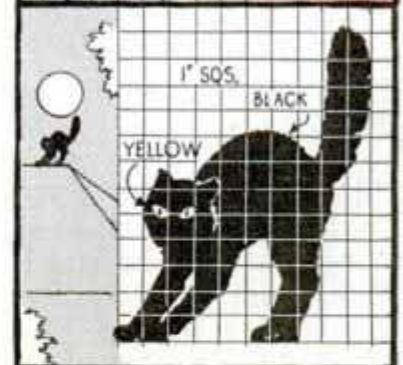
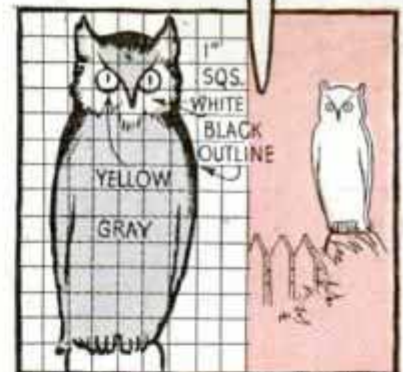
*No blueprints*





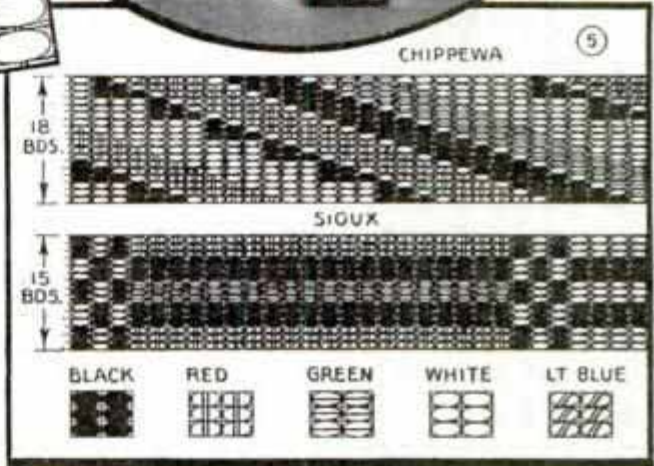
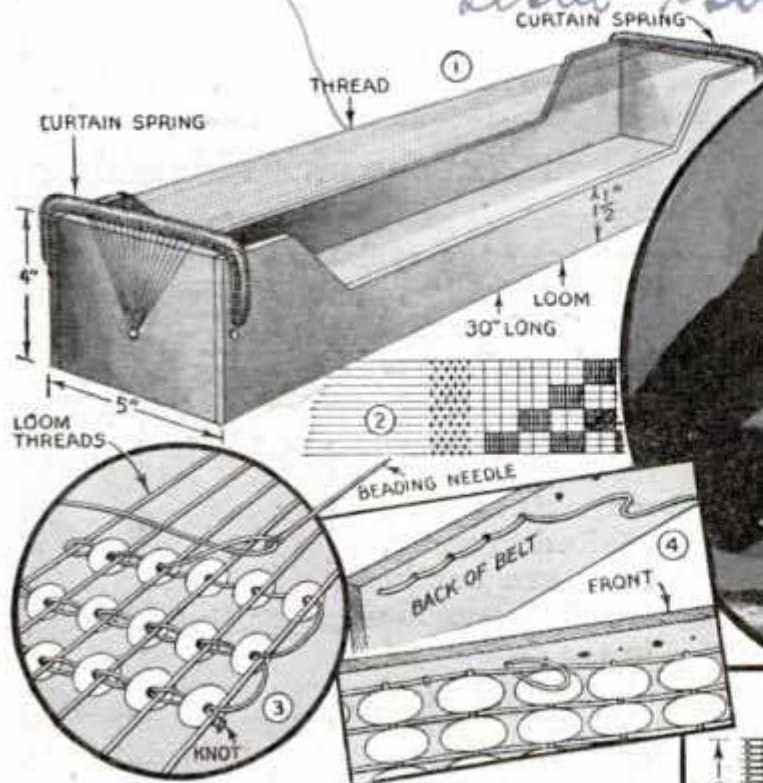
pushed into the ground. Use 1/4-in. stock. Plywood is good material if the edges are thoroughly filled with white-lead paste before finishing, to prevent water absorption. Hard-pressed fiber board may also be adaptable. You can cut out several duplicate figures at the same time by stacking the stock. Where designs have slender parts, likely to break off, use reinforcing strips on the back.

In finishing, apply a base coat of white and over this the finish coat of colors. If you have a paint-spray gun, similar figures can be uniformly finished and decorated in record time by the use of sheet-metal masks to block off portions of the background in colors other than the one you are applying. Some of the figures, of course, will require the use of a striping brush to outline various features.





# Indian Bead Work Is Done on Simple Loom



Decorating belts, purses and other articles with bead work is not only an interesting hobby, but it is a paying pastime as the articles can often be sold at fair profits. For this work, you will need a package of No. 15 beading needles, white buttonhole thread, well waxed, an assortment of colored beads and a homemade loom shown in Fig. 1. This can be a cheese box or it may be made up of thin wood. To start weaving, place the beads in small dishes kept close at hand, separating them according to color. Then stretch one thread across the loom for each row of beads on the belt, using three threads for each outside row to strengthen the edges. Now start weaving as shown in Figs. 2 and 3. Tie your weaving thread to the outside loom thread, string the required number of beads and pull them up between the loom threads from the underside. Then run the needle back through the beads from the upper side, repeating this operation until the job is done. In Fig. 4 is shown the method of sewing the beaded work to the belt. Fig. 5 shows Chippewa and Sioux designs with a key to the colors used.—Bob. Hofsinde, Chicago.

## Hat Held Tightly on Wall by Spring Hook

Instead of hanging your hat on a nail or hook in a closet, where it is often knocked down, try the hanger shown. It is a piece of clock or phonograph spring drilled and



PIECE OF PHONOGRAPH SPRING

screwed to the wall, first rounding the lower end and smoothing the edges with a file. The brim of the hat is slipped between the spring and the wall where it is held tightly. If necessary, use metal lacquer on the springs to prevent rust.

☞Fingernail polish will keep pyro film developer from staining the nails.



## Small Bag on Vacuum Cleaner Holds Scraps of Paper



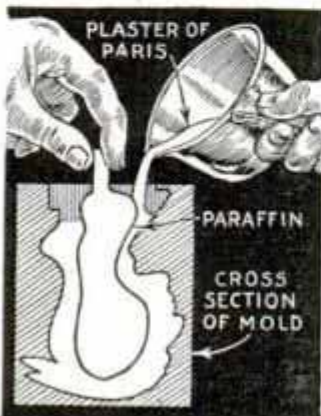
*This bag is handy to hold pieces of paper and thread that the vacuum cleaner misses*

Attached to the handle of your vacuum cleaner, a canvas bag provides a handy receptacle in which to put pieces of paper, thread, etc., that the cleaner does not pick up. A wire ring or frame run through a hem at the mouth of the bag keeps it open, an eye being formed on the ring to slip over a wire hook attached to the vacuum-cleaner handle as shown.

—Opie Read, Jr., Chicago.

## Plaster Casts Made Hollow by Use of Paraffin

When making a large plaster cast, you can save material and reduce the weight of the finished article considerably by using a paraffin core,



which is melted and poured out when the casting is finished. Shave down a piece of paraffin to fit inside the mold with a good clearance on all sides, leaving a small projection at one end. The projection

serves as a handle to hold the paraffin suspended inside the mold while pouring the plaster and leaves a small hole in the casting through which the melted core is poured.—E. Tichenor, Terre Haute, Ind.

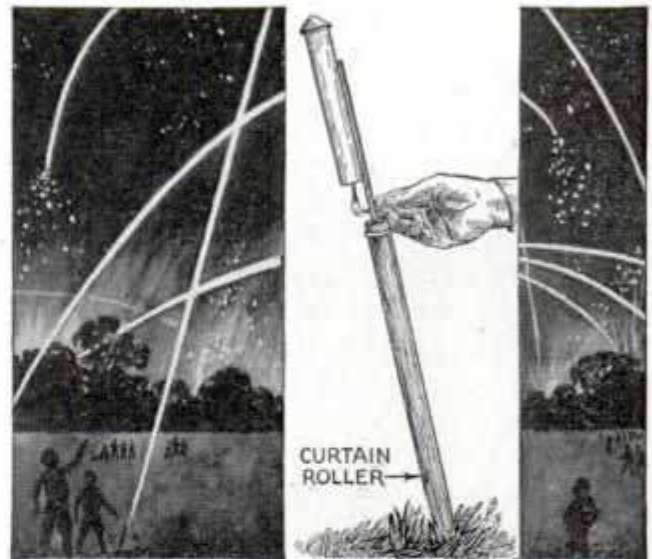
## Plants Mulched with Magazines

Placed around small plants such as tomato, cabbage, cauliflower, etc., old magazines make a good mulch that prevents growth of weeds, checks cutworms and helps conserve moisture in the ground. If the magazines are soaked in water, they are easily torn from one side to the center and slipped around the plant. A little dirt raked over the edges of the paper will help hold it down so that wind will not dislodge it.



## Holder for Shooting Skyrockets from Window-Shade Roller

An old window-shade roller, with the spring assembly removed, makes a dandy holder for shooting skyrockets. The stem of a rocket fits nicely into the hole for-

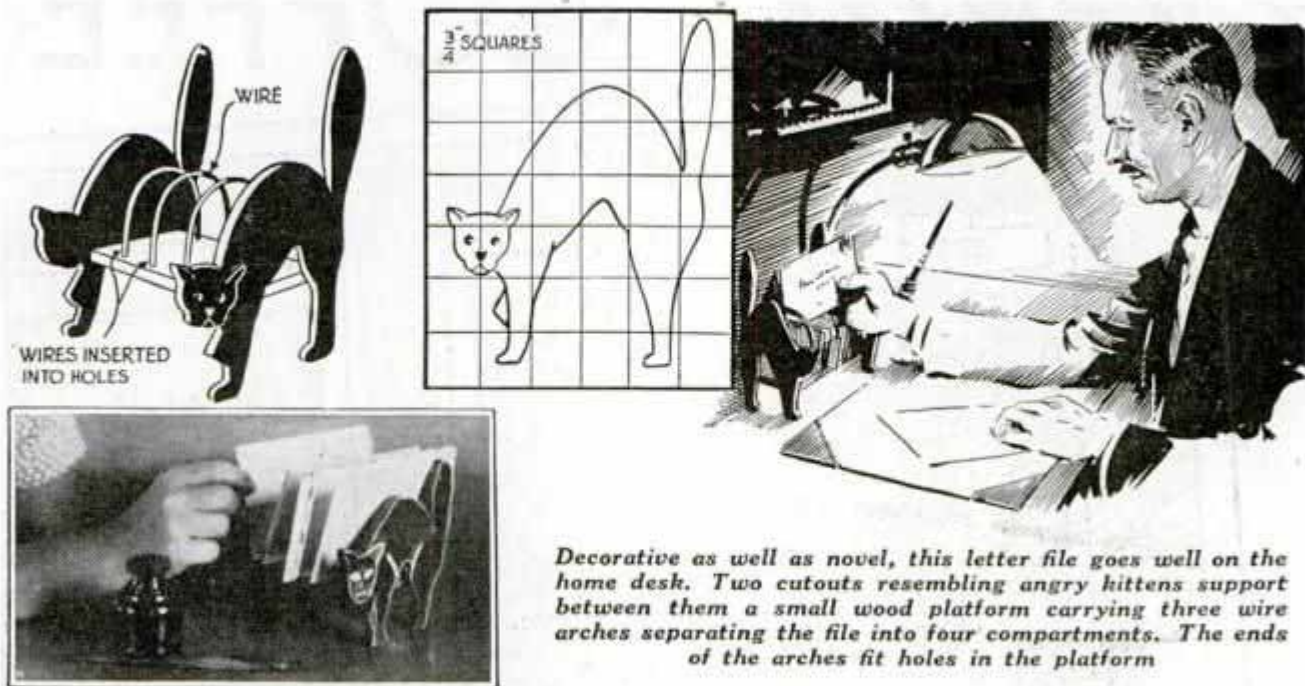


*Skyrockets will take a true course into the air when shot from this holder*

merly occupied by the spring. The solid end of roller is sawed off to the right length and is pointed so that it can be pushed into the ground easily.



# Bristling Kittens Guard Mail in Letter File



*Decorative as well as novel, this letter file goes well on the home desk. Two cutouts resembling angry kittens support between them a small wood platform carrying three wire arches separating the file into four compartments. The ends of the arches fit holes in the platform*

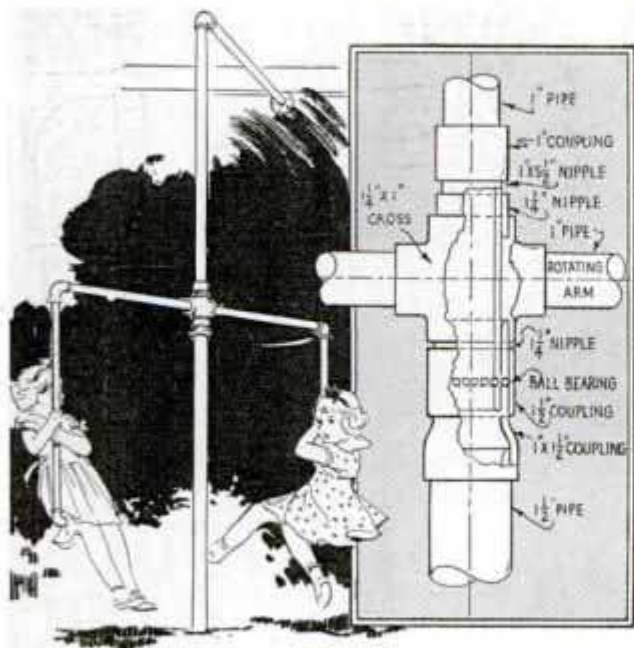
## Speedy, Ball-Bearing "Merry Whirl" of Pipe and Fittings

Here is something unusual in the way of a merry-go-round, and it rotates so easily that any small child can operate it. The cost is nominal and, as the rotating arm is carried on a ball thrust bearing, there is practically no wear on the moving parts. It is best to set the vertical post in concrete at least 2 ft., which not only gives it rigid support, but helps to protect the pipe against rust. The end of the horizontal pipe is attached to a building

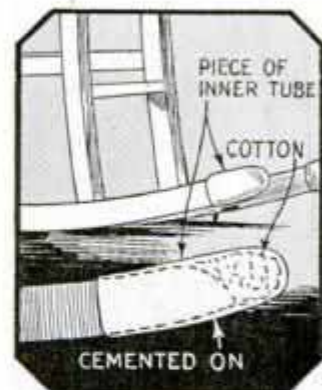
by means of a floor flange. If a building is not convenient, eliminate the upper part of the standard and use much heavier pipe for the lower part, also increasing the size of the concrete base.

## Ends of Chair Rockers Shielded to Protect Ankles

Slipped over the ends of chair rockers, two rubber sleeves padded with cotton will prevent the sharp edges from injuring your ankles should you accidentally bump against them. Also the sleeves keep the rockers from marring the baseboard when the chair gets too close to the wall. The sleeves are made from pieces of inner tube either cemented or sewed together.



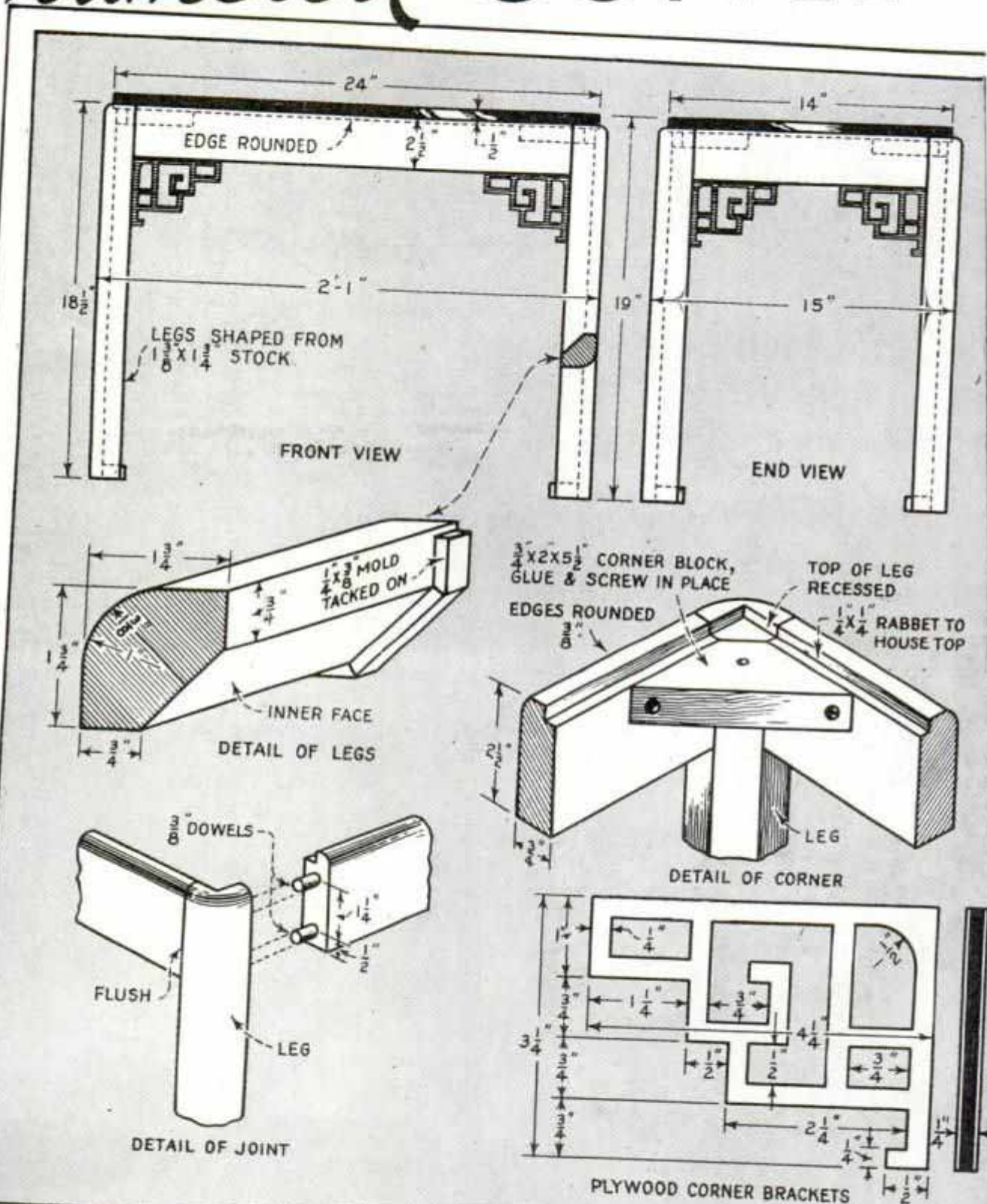
*Short pipes served as seats in the original, but wood clamped to them is more comfortable*



☐ If two glass tumblers stick together, set the bottom one in warm water and pour cold water in the top one, thus expanding one and contracting the other.



# Enameled COFFEE



SCALE  
 DESIGN  
 DRAWING

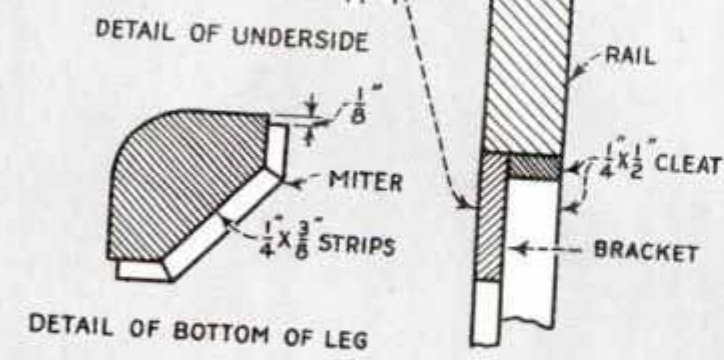
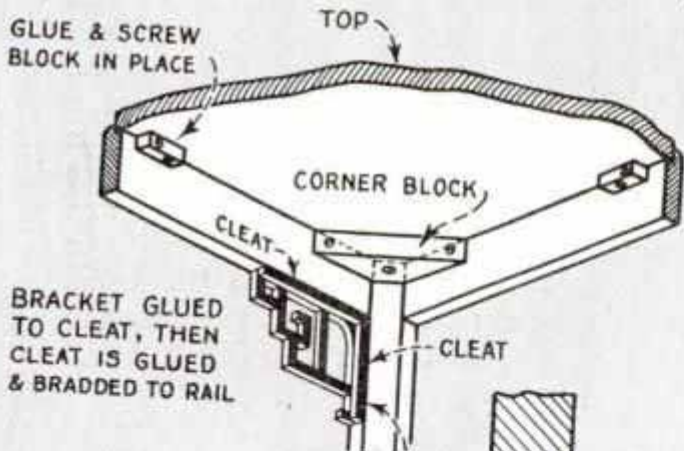
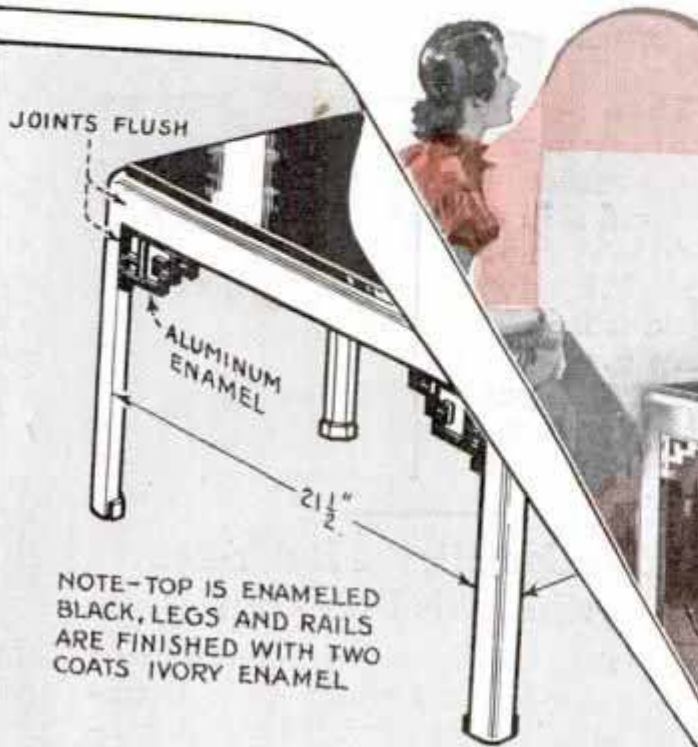
Simple but elegant in design, this table can be built with machine or hand tools. As the entire surface is enameled, no fancy grained wood is required. Black sheet plastic may be used instead of wood for the top.

**POPULAR  
 MECHANICS  
 MAGAZINE**



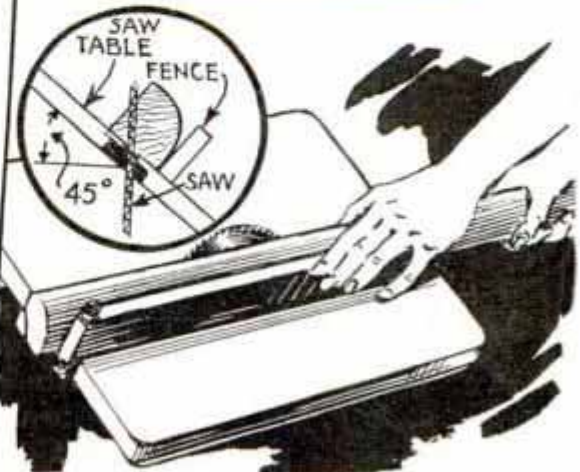
# TABLE in

# Modernized --- Chinese Chippendale



**BILL OF MATERIAL**

- 1-TOP 3/4" x 14" x 24" BIRCH
- 4-LEGS 1 1/4" x 1 3/4" x 18 1/2" BIRCH
- 2-RAILS 3/4" x 2 1/2" x 21 1/2" BIRCH
- 2-RAILS 3/4" x 2 1/2" x 11 1/2" BIRCH
- 8-BRACKETS 1/4" x 3 1/2" x 4 1/4" PLYWOOD
- 8-CLEATS 1/4" x 1 1/2" x 4 1/4" SCRAP WOOD
- 8-CLEATS 1/4" x 1 1/2" x 3 1/2" SCRAP WOOD
- 16-LINEAR 1/4" x 3/8" BIRCH FOR 1/8" INCHES MOLDING
- 4-CORNER BLOCKS 3/4" x 2" x 5 1/2" SCRAP WOOD

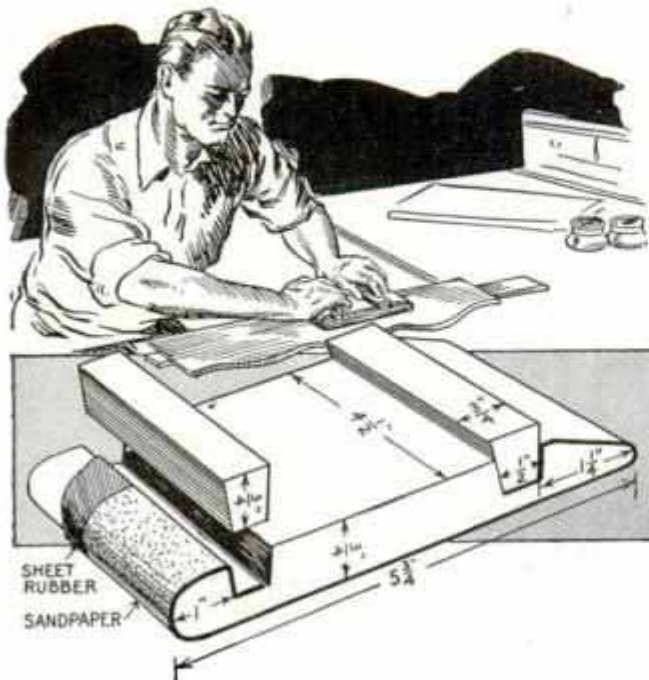


SHEET NO. 1 ISSUE  
POPULAR MECHANICS MAGAZINE  
200 E. ONTARIO ST. CHICAGO

BP936



## Universal Sanding Block Smooths Irregular Work



*Holding a half sheet of sandpaper with minimum of waste, this block smooths flat and concave surfaces*

If you have a special job which requires finishing both flat and concave surfaces, you can save time by making a sanding block which has ends curved to the same radii as the concave parts of the work. The sandpaper is held by means of wedges driven into slots in the block. A thin rubber or felt pad on the bottom and ends of the block, as shown, will add to the life of the abrasive.

—R. O. Buck, Chicago.

## Lifter to Remove Fruit Jars from Hot Water



If you are in the habit of canning fruits and vegetables by the hot-bath method and have no lifter to remove the jars from the water, one can be made from a length of heavy wire as shown. Spring wire is preferable if you have facilities for bending it. Form a coil of

two or three turns at the upper end of the handle so that the jaws will automatically spread apart as soon as the grip of the hand is released.

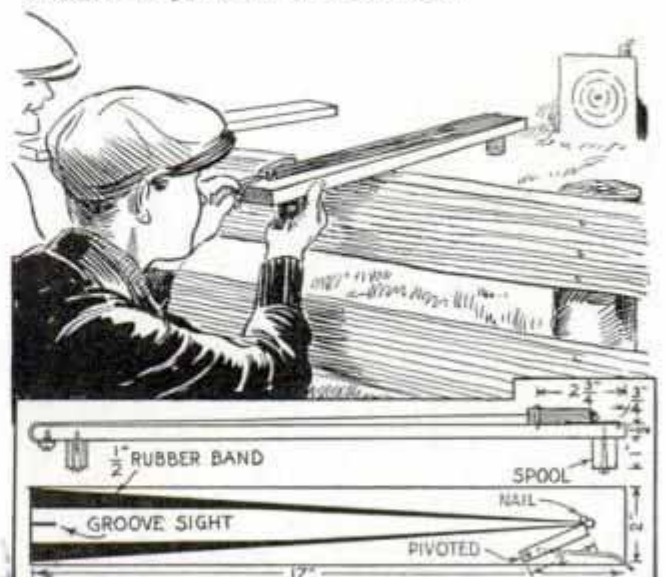
## Thumb Protected by Finger Pad When Peeling Vegetables

When peeling fruits or vegetables, a rubber finger pad slipped over the thumb on the right hand will shield it from the sharp edge of the knife. The pads can be obtained in almost any store.



## You Can Hit the Bull's-Eye with This Play Gun

This rubber-band play gun has a novel trigger arrangement which gives it unusual shooting accuracy. The gun consists simply of a wood block, which has the ends of a strong rubber band tacked to the underside of one end. To load the gun, the pellet or "bullet" is placed in the doubled end of the rubber band, which is then pulled back and held between the end of a pivoted wood strip and a nail as shown in the lower detail. The trigger is a short piece of stiff wire on the wood strip as shown. To discharge the gun, the trigger is pushed to one side.



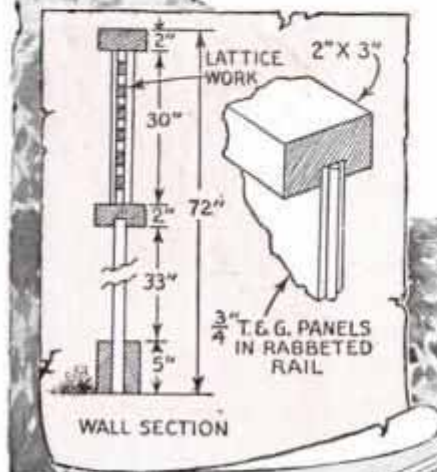
*Made from a wood block and a rubber band, this gun places the shot right where you sight*



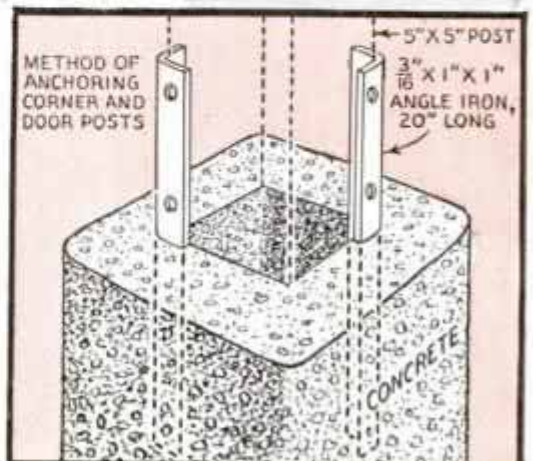
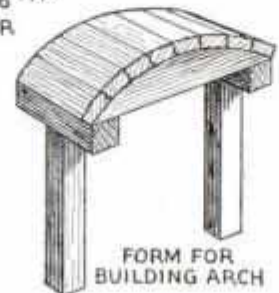
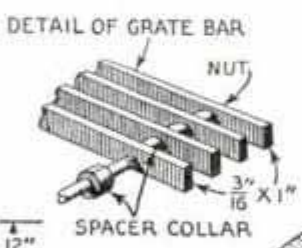
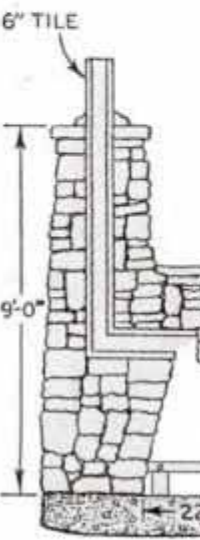
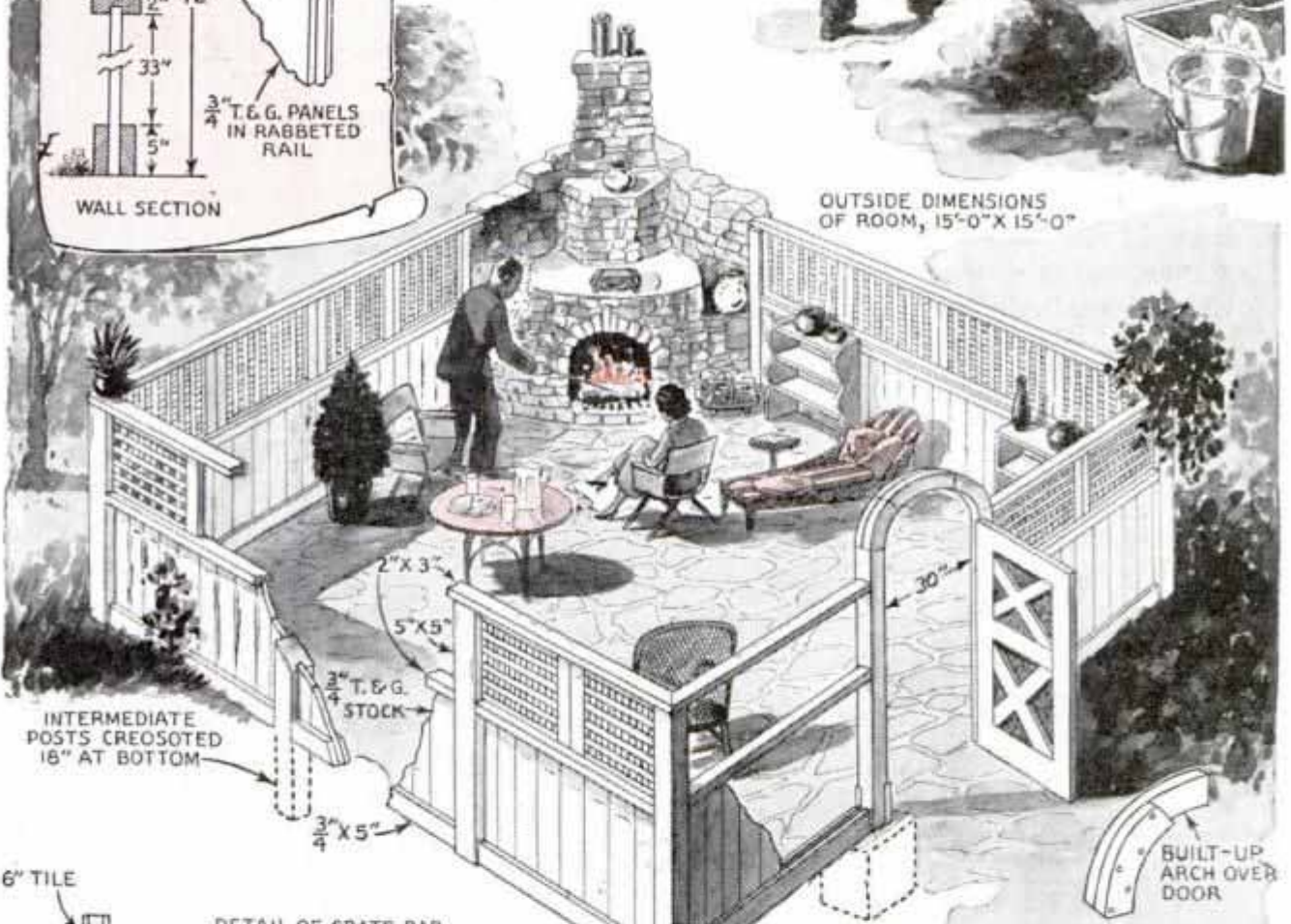
# Outdoor SUNROOM



*This retreat is a pleasant spot when afternoons and evenings are a little cool for comfort in an open garden. A fireplace, built of old brick or field stone, serves as a barbecue in addition to giving warmth*



OUTSIDE DIMENSIONS OF ROOM, 15'-0" X 15'-0"





## World Globe Has Sliding Light to Read Small Lettering

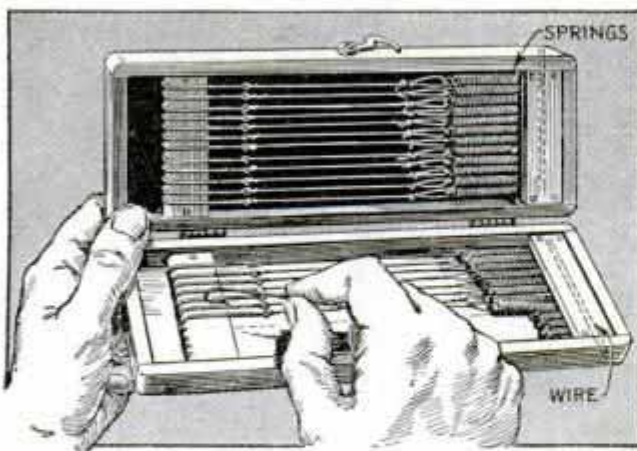


Turn globe to bring lettering under ring and then adjust flashlight directly above it

Sliding on the metal ring encircling most world globes, a pen flashlight mounted on an adjustable bracket is quickly moved to illuminate small lettering on the globe. The flashlight fits in a tube holder soldered to a bracket, which is made of spring steel or brass to straddle the ring with a firm grip.

## Fishhooks Carried in Small Box Kept Neatly in Order

For safely carrying a number of spare fishhooks and leaders, this box has an advantage over other methods in that the



Leaders on hooks are kept taut by small springs when carried in this box

leaders are kept taut by small coil springs. These are fastened to one end of the box by a piece of stiff wire, which passes through the eyes as shown, the eyes at

the other ends of the springs being opened to hook into the looped ends of the leaders. A cleat at the other end of the box holds the hooks.

—Axel L. Johnson, Chicago.

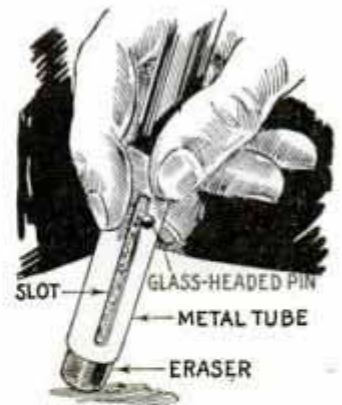
## Rubber Grip for Shopping Bag to Ease Hand Strain

Slit lengthwise along one side, a short length of rubber hose makes a quick, detachable hand grip to slip over the cord handles of a heavy shopping bag to ease the strain on the fingers. If the hose is suspended from one of the handle eyelets in the bag with a string, it will not be in the way, yet it will always be at hand when needed.



## Adjustable Eraser on Pencil

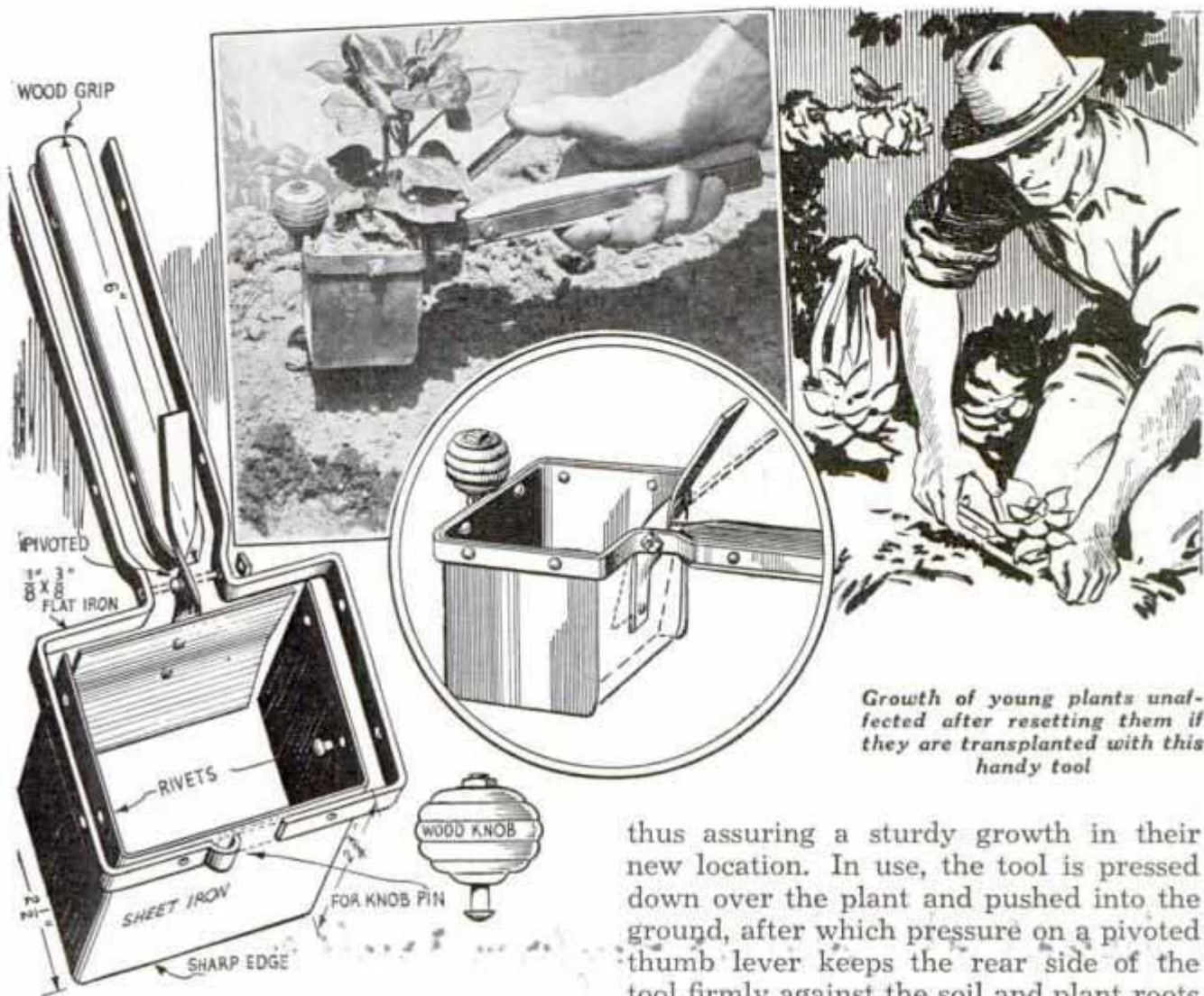
If you are in the habit of using up a pencil eraser before the lead is worn out, make up one of these adjustable ones, which can be switched from one pencil to another. Get a small piece of metal tubing of a size to fit snugly over the pencil. Then slot it as shown, and whittle down a regular penny eraser to fit inside. A glass-headed pin pushed through the slot into the rubber will serve as a knob to adjust the eraser.



Instead of heating dishes in a hot oven, immerse them in hot water; the dry heat of an oven tends to make most dishes lose their luster and eventually become brown and cracked.



# Plants Moved Without Disturbing the Roots



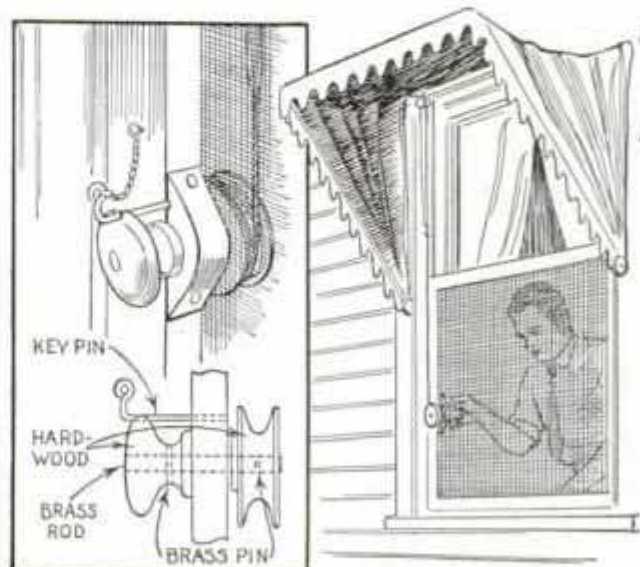
With this transplanting tool you can lift tender plants out of the ground and reset them without injuring the root system,

thus assuring a sturdy growth in their new location. In use, the tool is pressed down over the plant and pushed into the ground, after which pressure on a pivoted thumb lever keeps the rear side of the tool firmly against the soil and plant roots to hold them, this part being hinged as shown. A wood knob at the upper edge of the front side serves as a hand grip.

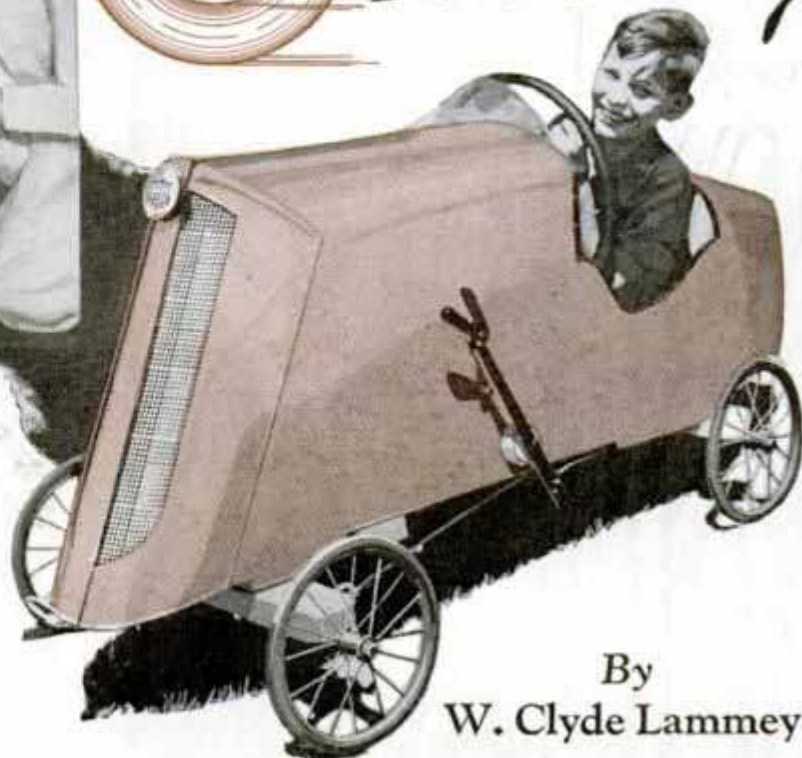
## Awning Adjusted by Tiny Windlass on Window Screen

Removing a window screen to adjust an awning is unnecessary with this pulley arrangement. It consists of a short brass-rod shaft to which are pinned a wood knob and a small grooved pulley, the assembly being mounted on the inner edge of one side of the screen frame by means of a small wood block. In use, the awning is adjusted by turning the knob, which winds the rope on the pulley. A pin, inserted in the mounting block, engages a slot in the knob to hold the adjustment.

For best results, photo-enlarging paper should be held under a sheet of glass during the exposure.







By  
W. Clyde Lammey

**I**N THE two previous installments, several suggestions were made on the construction and assembly of chassis, springs, axles, steering gear and brakes, as a help to those who intend to enter the 1936 All-American Soap Box Derby, the finals of which are to be held at Akron, Ohio. After the chassis has been completed and is ready for running, you may add a body if you desire, although this is not essential to the race or the running of the car—a sturdy, comfortable seat is really all you need. The purpose of a body is to add to the appearance of the car. All the chassis described in previous installments were worked out with the idea of making it extremely easy to add suitable bodies. Assuming that you want to build a body on the racer and

ance of the car. All the chassis described in previous installments were worked out with the idea of making it extremely easy to add suitable bodies. Assuming that you want to build a body on the racer and

*special at wheels & engine rules.*

### Excerpt from Official Rules of All-American Soap Box Derby

Here is a condensed list of rules for the All-American Soap Box Derby of 1936, as needed by the prospective entrant before he proceeds to build. For a complete copy of the official rules, get in touch with a co-sponsoring newspaper in your locality, or write to All-American Soap Box Derby, Inc., whose address will be furnished upon request.

**SIZE:** Wheelbase, 40 in. minimum. (Distance from center of front wheel to center of rear wheel on one side.) Tread, 30 in. minimum and 36 in. maximum. (Distance from centerline of tire on one side to centerline of tire on opposite side, as measured on the ground.) Overall width, 42 in. maximum. Overall length, 75 in. maximum. Overall height, 30 in. maximum—only steering wheel may project above this height.

**WHEELS:** Maximum diameter of wheels including some form of rubber tires, is 15 in. All cars must have four running wheels on ground—two in front and two in rear.

**STEERING:** Drivers must sit up to steer and all cars must be guided with a steering wheel.

**BRAKES:** Cars must have brakes capable of stopping with safety.

**AGE:** Drivers to be classified in two groups, one from 9 to 12 yrs. and second from 13 to 15 yrs.

**WEIGHT:** Car, without driver, not to exceed 175 lbs. Cannot be loaded with extra weight such as iron, sand, bricks, etc.

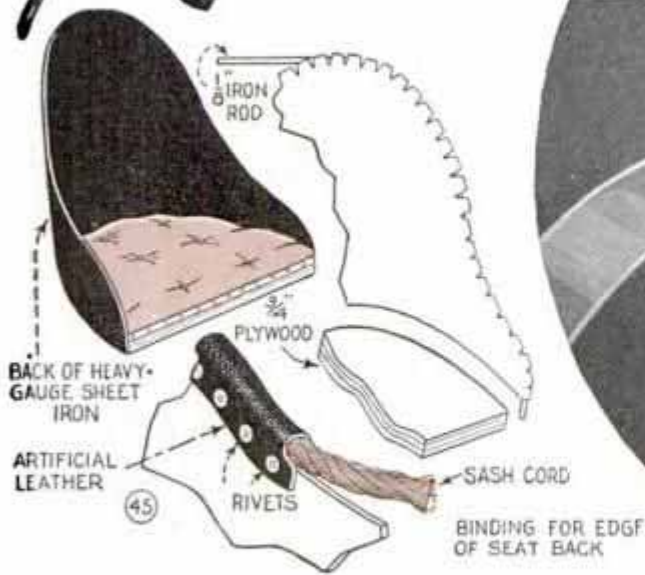
**COST AND PROFESSIONAL HELP:** Total cost not to exceed \$10.00. Only wheels, bearings, tires, axles and steering wheels may be purchased ready made. Major portion of construction must be done by boy himself. Cars showing evidence of professional help in construction to be disqualified. Prospective entrant must sign pledge that these requirements are met, not less than one week before race date.

**MISCELLANEOUS:** Only one person permitted in each car. No attachments that aid in starting or propelling allowed. Cars may have plain, roller or ball bearings. A ring must be substantially anchored in front for towing. All attachments as lights, ornaments, etc., must be securely fastened. No glass permitted on any car.

*Supplies - Form letters  
Bld. Mr. Cronin  
6237 W. Lake Chicago*

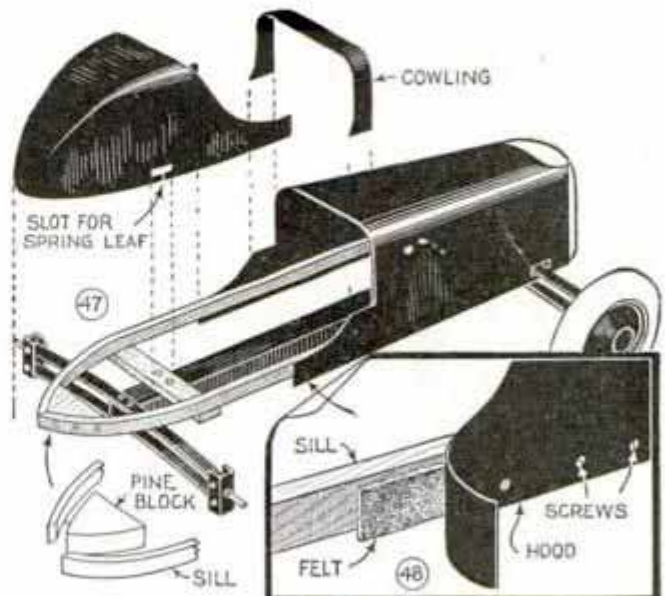
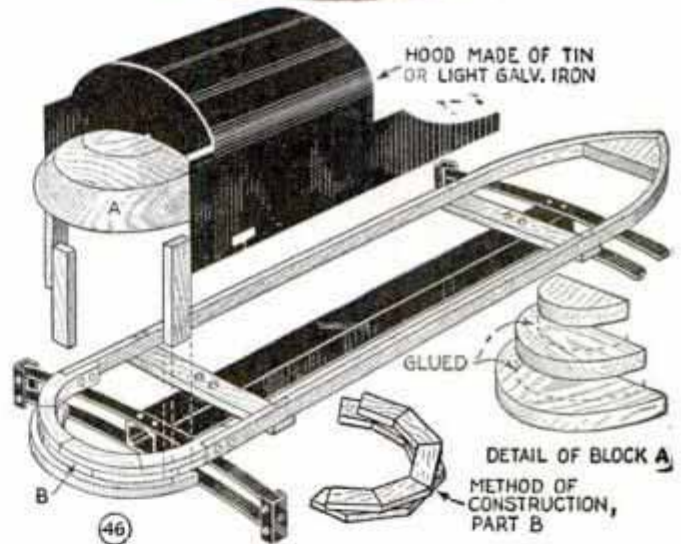


# Your SOAP BOX RACER.



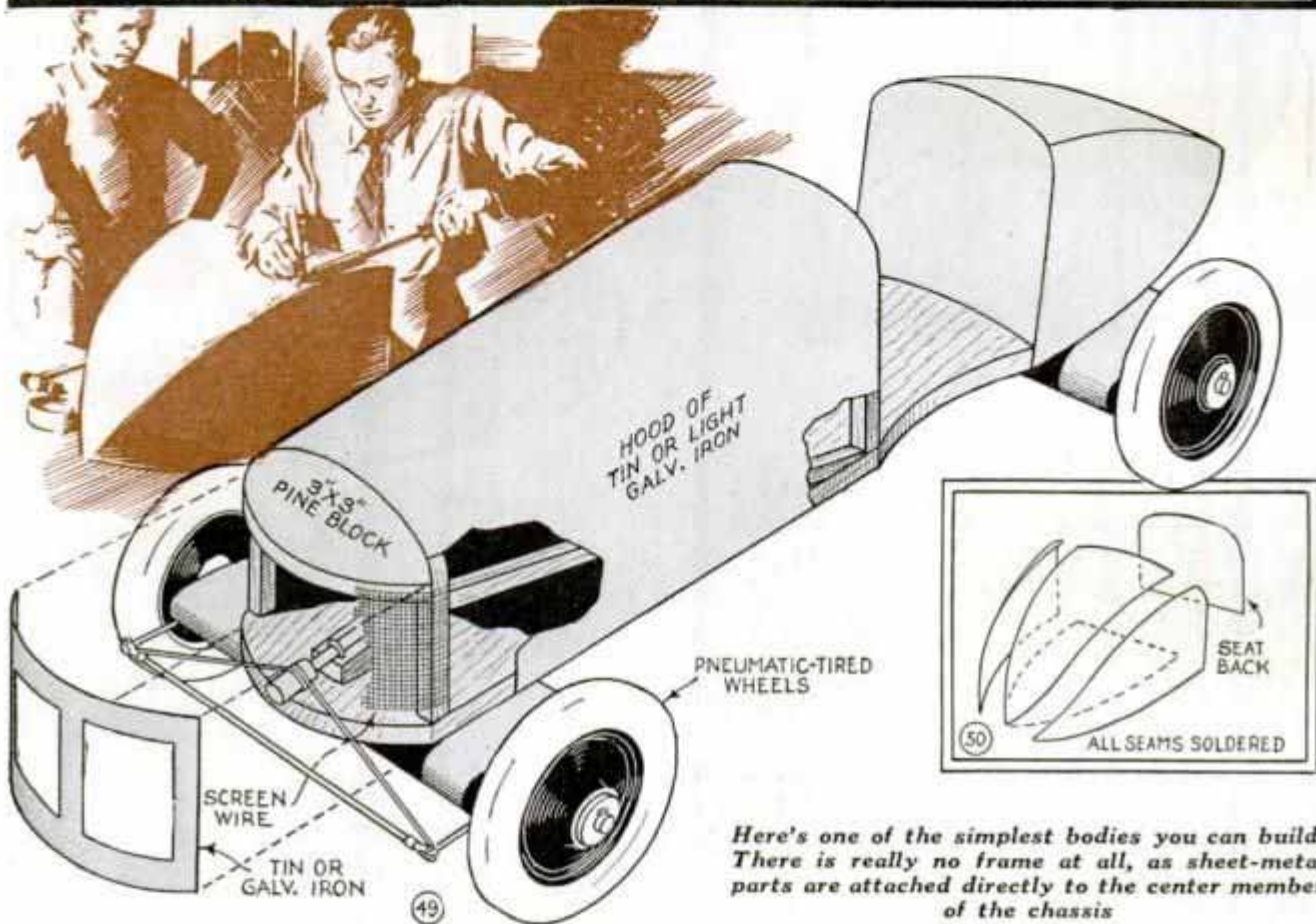
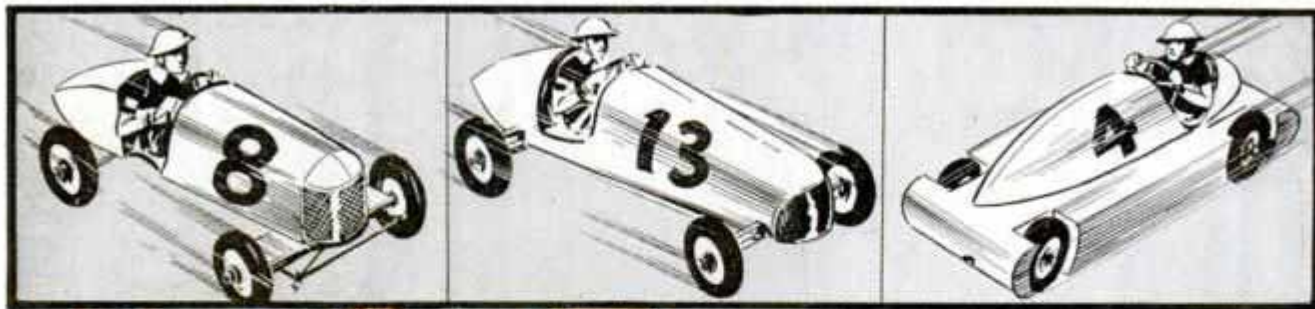
that you have plenty of time to do a good job, first study the official rules of the All-American Soap Box Derby. This will show that the overall measurements of the car are definitely restricted, which means that the body must come within these limits.

Actual construction of a body for an all-metal chassis described in a previous issue, is shown in Figs. 46 and 47. The hood is made of a single piece of tin or light galvanized sheet iron. It's no trick to cut and bend this part, but the rear half, shown in Fig. 47, is somewhat more difficult to handle. It consists of three sheets similar to the arrangement shown in Fig. 50, the only difference being that the side pieces in Fig. 47 are extended to meet the hood. Before you cut out these pieces, look at Figs. 51 and 52. Small projections, or lips, are left on the edges of the side pieces as they are cut. The lips fit into slots cut in the edges of the top piece as in Fig. 51. After being pressed through the slots, the projecting ends are bent over and hammered flat as in Fig. 52, holding the parts together while you flow solder into the seams. Cleaning off the excess solder with a file will make a neat joint. Details of parts A and B, Fig. 46, show how you can build a frame for a rounded grill out of a few pieces of wood. Part B is bolted to the forward ends of the sills. When the whole thing is assembled with screws, it is covered with heavy wire and over this is tacked a piece of tin,



Bodies built like this do not carry the weight of the driver as the seat is mounted on the center member of the chassis, independent of the body frame





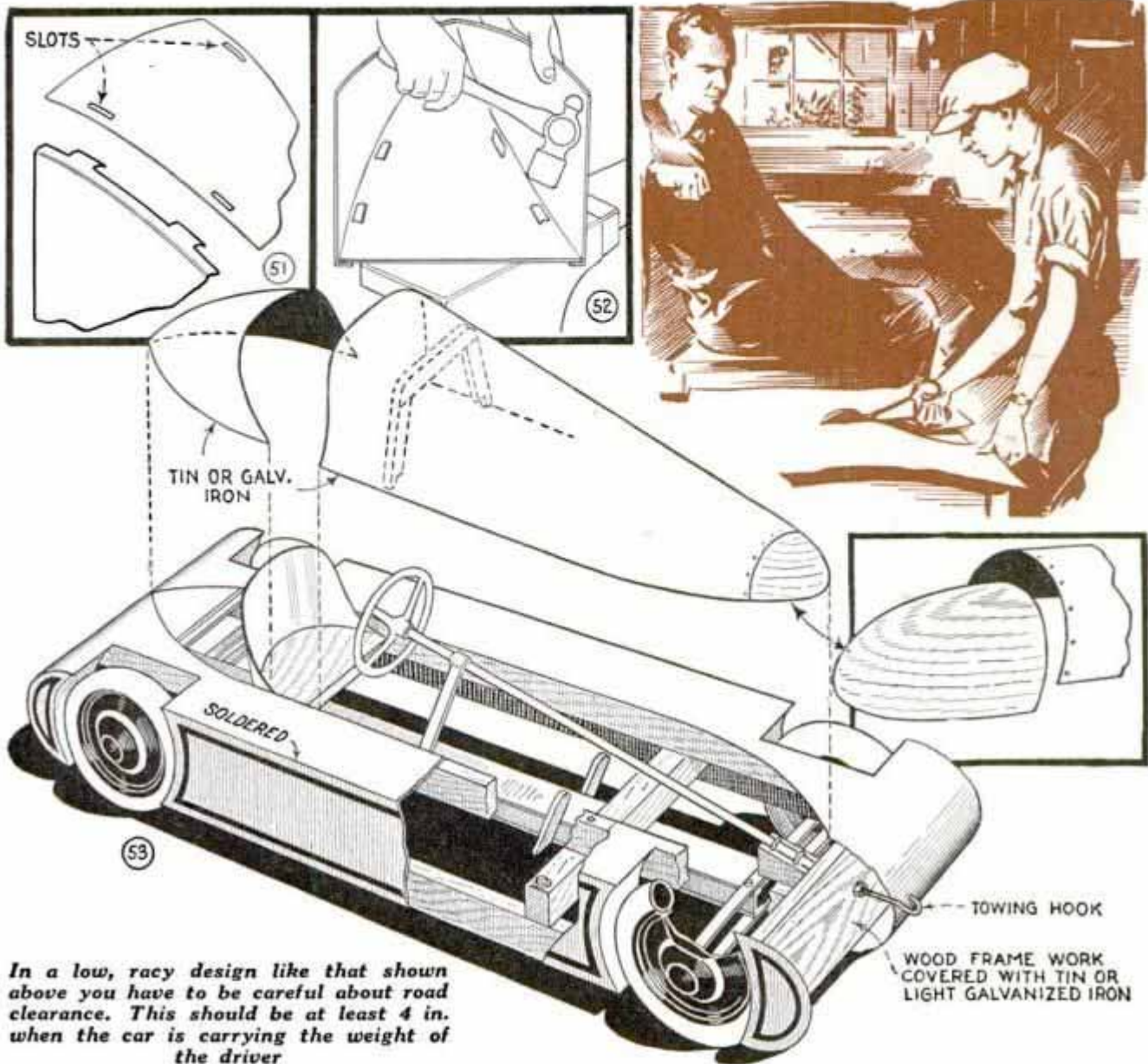
*Here's one of the simplest bodies you can build. There is really no frame at all, as sheet-metal parts are attached directly to the center member of the chassis*

cut as in Fig. 49. If you wish, the wire can be given a coat of aluminum paint. When assembling the body, it's a good idea to place a strip of felt between the sills and the metal parts as in Fig. 48. This will help to deaden any drumming noise from the sheet-metal units while the car is in motion. Slots cut in the metal allow movement of the front and rear springs. Now notice especially that the sills are supported on two cross members and that the seat, Fig. 45, is to be attached to the chassis, not the body. In this way the body can be built of very light material as it does not carry the weight of the driver. The seat, Fig. 45, is easy to make, the bottom being cut from plywood. There are two ways of finishing the edge of the sheet-metal back. One is to make V-cuts along the edge and bend the projections over a heavy wire or rod, after which the

spaces are filled with solder and smoothed up with a file. Another way is looping a strip of artificial leather over a length of sash cord and then riveting the edges of the strip to the edge of the seat. Upholstering can be done before screwing on the back, by placing layers of cotton batting over the plywood, then covering this with artificial leather which is pulled over the edge and tacked to the bottom. The seat is carefully located on the chassis and fastened with bolts or screws. The bottom should be tilted about  $5^\circ$  so that you sit in an easy position to drive.

Fig. 49 shows a body built on the chassis detailed in Fig. 12 of a previous installment. You will remember that this chassis had no springs, the center member being simply a plank bolted to the axles. The body is a very simple affair, the rear half being made of four pieces as in Fig. 50.





*In a low, racy design like that shown above you have to be careful about road clearance. This should be at least 4 in. when the car is carrying the weight of the driver*

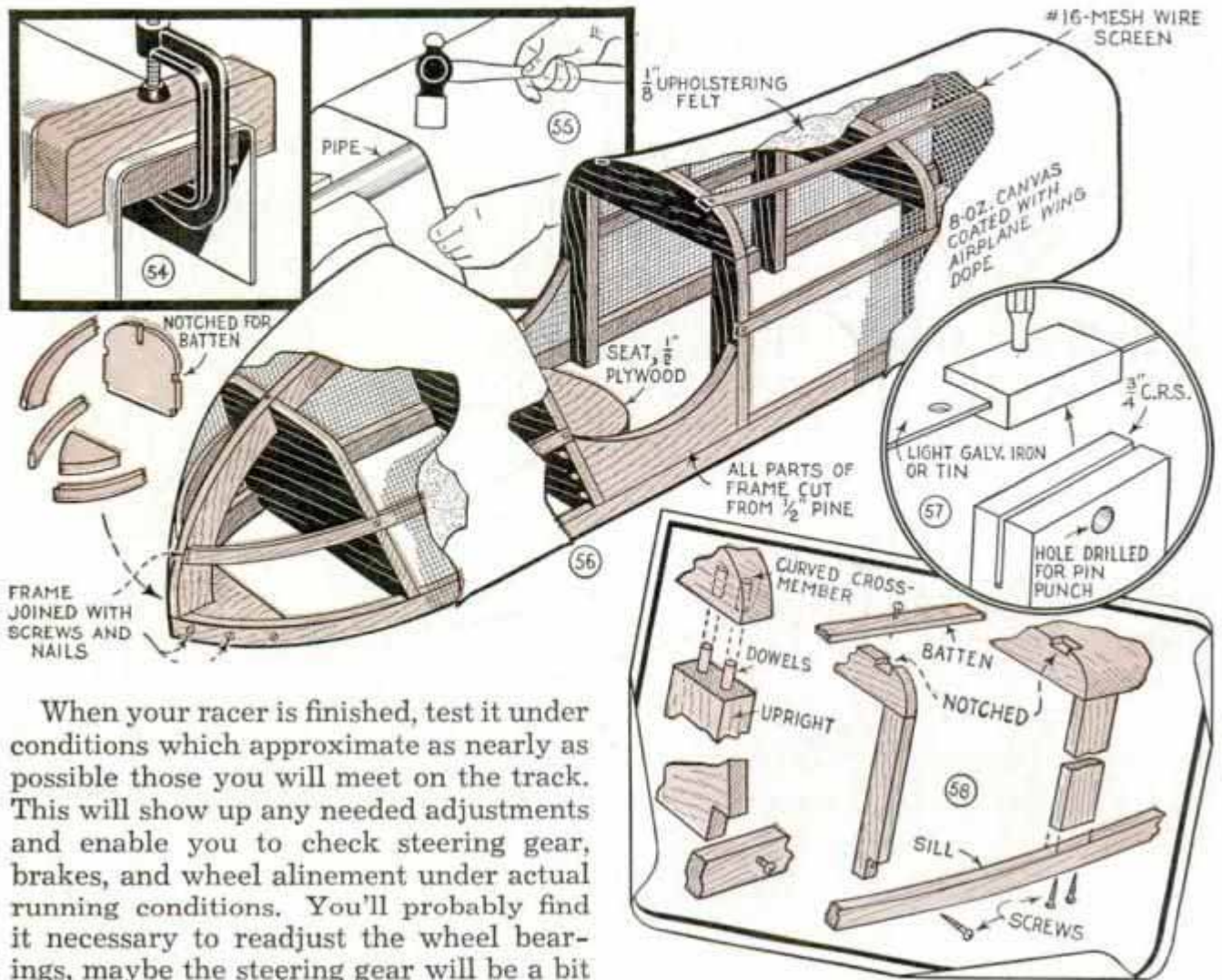
The manner of assembly is the same as shown in Figs. 47, 51, and 52. You don't need a separate seat on this car. Methods of bending the sheet-metal hood are suggested in Figs. 54 and 55, while Fig. 57 suggests a method of punching holes in thin sheet metal.

Fig. 53 suggests another type of body—a low, racy design intended for the chassis shown in Figs. 46 and 47, and in Fig. 1 of a previous installment. Again, you will notice that the seat is an independent unit and that no part of the steering and braking gear is attached to the body. With this one you have to be careful about the overall length and width, due to the construction. It's well to consult the rules before building, so that you have the limitations clearly in mind. Another important point is road clearance. This should not be less than 4 in., when the car is supporting the

weight of the driver. All cars must be provided with a means of towing. Although a hook like that shown in Fig. 53 will serve, the rules call for a ring, so it's best to follow this specification exactly. The towing ring must be solidly anchored at the front of the car and in the center so there is no sidewise pull.

Now you may want to build a body without using any sheet metal. Figs. 56 and 58 show how you can do it by making up a wooden frame to give the shape you want, then covering this with ordinary screen wire, a layer of upholstering felt, and finally a covering of 8-oz. canvas. The canvas is coated with airplane wing dope to shrink it "drum tight" over the frame. The frame for this body should be built of light wood such as pine or spruce, and put together with screws and glue as in the details of Fig. 58.





When your racer is finished, test it under conditions which approximate as nearly as possible those you will meet on the track. This will show up any needed adjustments and enable you to check steering gear, brakes, and wheel alignment under actual running conditions. You'll probably find it necessary to readjust the wheel bearings, maybe the steering gear will be a bit tight, and possibly the brakes will need some attention to get them in proper working order. It's best to use only a light mineral oil in ball and roller bearings. Don't use a heavy grease. Make sure before you run the tests that your tires, if pneumatic, are properly inflated, otherwise you won't have an accurate check on the operation of other parts. Make any improvement in the design of your car that you think is necessary, but don't neglect testing it thoroughly before you enter a race. The designs for both chassis and bodies as described in these articles are merely suggestions and every builder of a Soap Box racer is free to follow his own ideas as long as he keeps within the limitations of the official rules.

### Water Tank under Auto Trailer Works with Pressure

Instead of mounting the water tank under the roof of my trailer, which would tend to make it top heavy, I use a pres-

sure system, which permits locating the tank underneath the body at the rear end in about the position usually occupied by the gas tank on a car. I use a screw cap and gasket on the filler hole, the cap having an old tire valve soldered to it so that I can build up the pressure at a free-air station.—P. W. Miller, Covington, Ky.

### Rubbers Identified in Dark

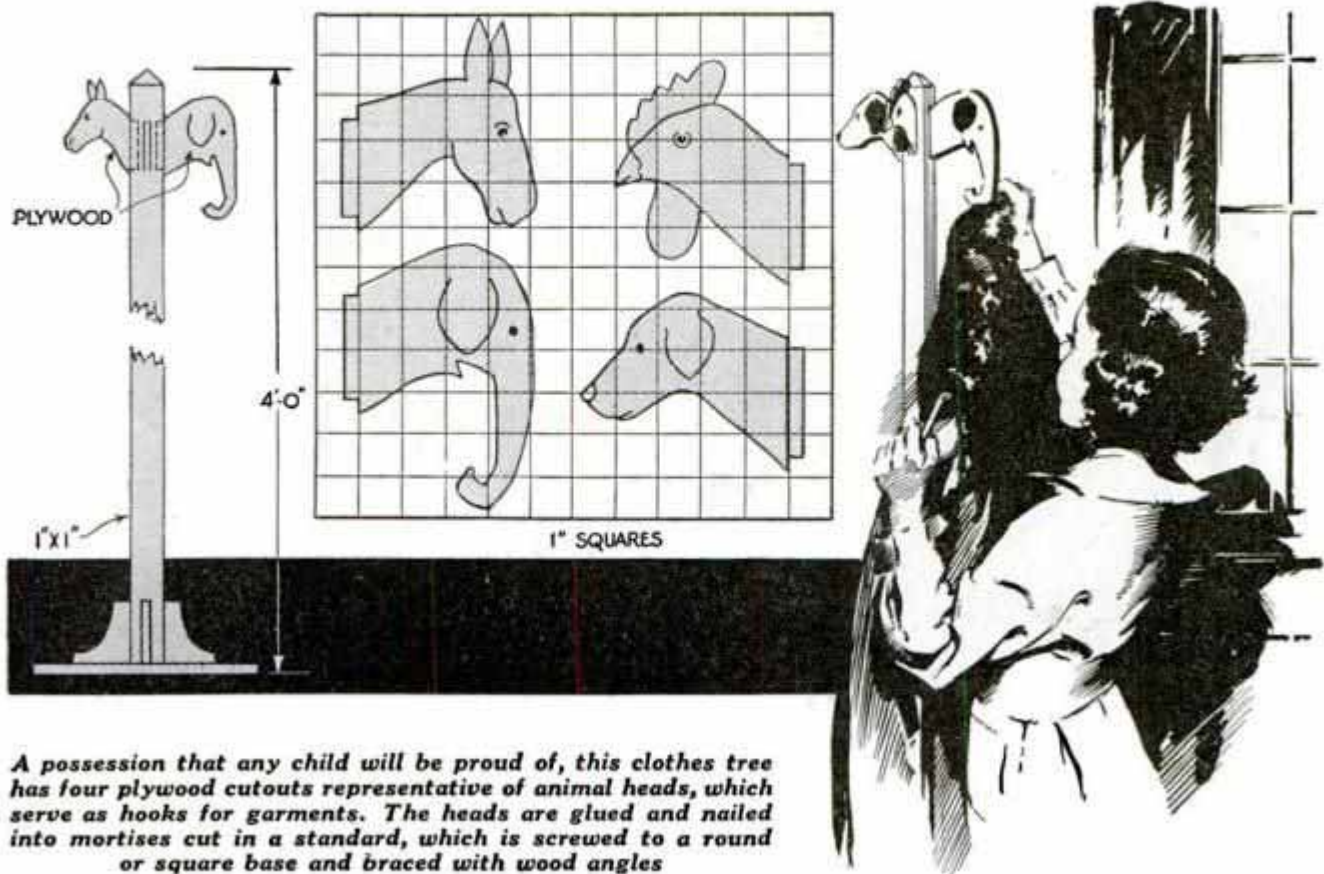


If you have difficulty in getting your rubbers or overshoes on the right feet in the dark, slip a little brass paper fastener over the edge of one of them as shown.

Then, it's a simple matter to feel along the edge of the rubber and pick out the right one. The fastener is so small that it is hardly noticeable to the eye.

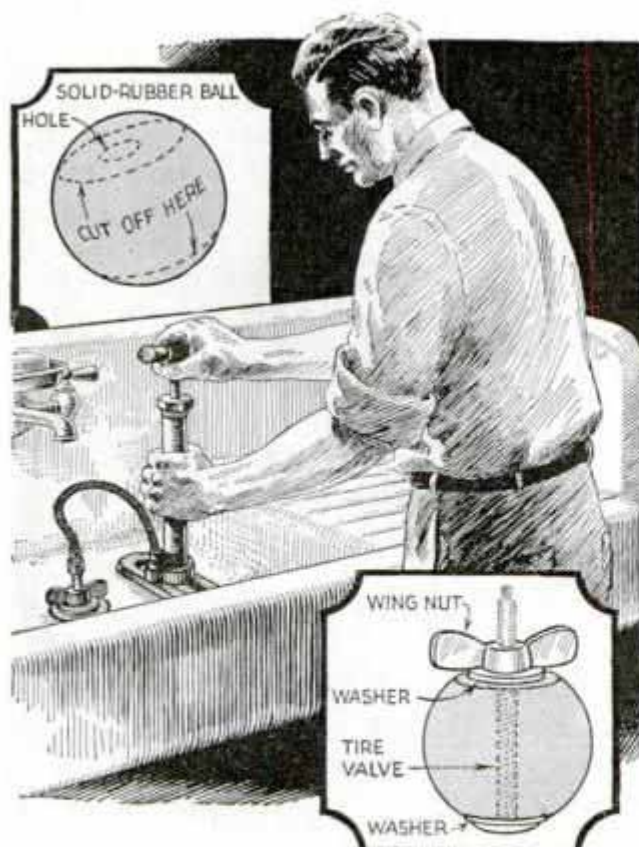


## Animal-Head Hooks Hold Child's Garments



*A possession that any child will be proud of, this clothes tree has four plywood cutouts representative of animal heads, which serve as hooks for garments. The heads are glued and nailed into mortises cut in a standard, which is screwed to a round or square base and braced with wood angles*

## Tightly Clogged Sink Drain Blown Out with Air Pressure



*Air forced into drain by using expanding rubber stopper and auto tire pump*

When a sink drain is clogged so tightly that the usual methods fail to clean it, the home mechanic can often force out the obstruction by plugging the drain opening with this expanding rubber plug and using a tire pump to build up air pressure in the pipe. The plug is a solid-rubber ball flattened on opposite sides and drilled through the center to take a tire valve. After inserting the plug into the drain opening, a wing nut is driven down on the threaded end of the valve stem, expanding the rubber tightly against the sides of the pipe. If a wing nut that will screw onto the valve is not available, the regular valve nut can be used. A plug of this type has many other uses too, such as testing short pipe lines for leaks, checking old lengths of pipe that are to be used again and testing automobile radiators and gasoline tanks for leaks.

When photographs on glossy paper are to be tinted with water color, it will "take" better if the print is first rubbed with fine pumice stone applied with a cotton pad.



## Grass Fires Smothered Quickly with Old Tires



*Dragged over grass fires, old auto tires will check the blaze in a few minutes*

Copying an idea from old-time ranchers, who often extinguished prairie fires by dragging one-half of a beef carcass along the line of the flames, you can quickly extinguish a grass fire by using an old auto tire in much the same manner. The tire is wired to the end of a light pole and is pulled over the burning grass as shown. You can smother many yards of flames in a short time, and there is little danger of igniting the rubber if the tire is moved rapidly.

## V-Shaped Brush Has Many Uses



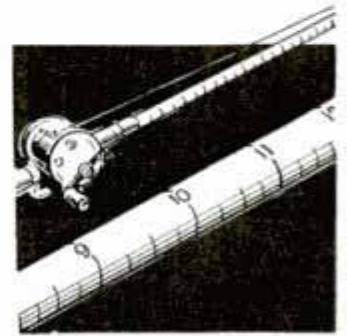
where it is difficult to use a regular brush or broom. To make the brush, two ordinary scrub brushes are beveled along two edges so that they can be nailed together

You will find many uses for this V-shaped brush around the home. Besides being ideal for scrubbing sinks and bathtubs, it is handy for cleaning dirt out of corners in closets, shelves, large drawers, etc.,

at right angles as shown. Be sure to cut the edges back far enough so that there will be plenty of bristles where the brushes join. A leather strap or a strip of folded canvas makes a good handle.

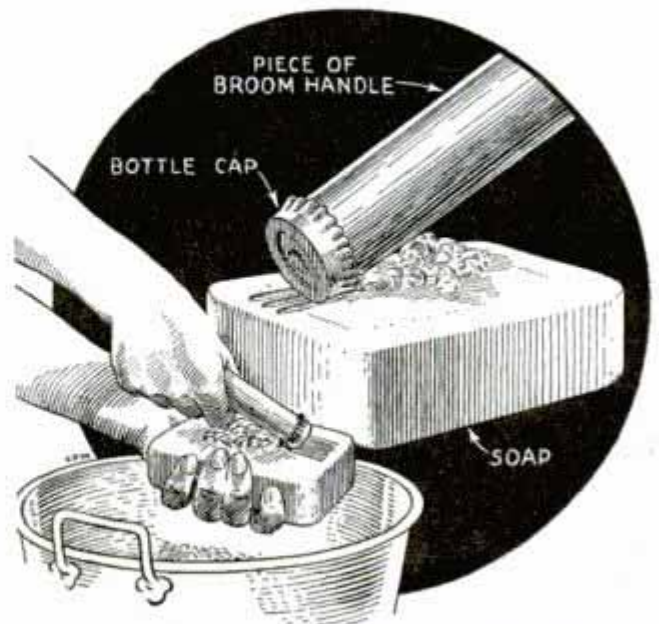
## Scale on Fishing Rod at Hand When Needed

As fish under a certain size are not allowed to be taken from most lakes and streams, a scale painted on your fishing rod to measure those of doubtful length may save you some embarrassment if an officer questions the size of some of the fish in your catch. Starting near the reel, lay off the scale on a white background, marking in the figures and division lines in black.



## Soap Scraper from Bottle Cap Makes Fine Shavings

Instead of endangering your fingers with a knife to scrape shavings from a bar of soap, it is better to use a bottle cap nailed to the end of a short length of broomstick. The tool made in this way is not only safer to use than a knife, but it makes finer shavings.



*You can reduce a bar of soap to fine shavings in a few minutes with this tool*

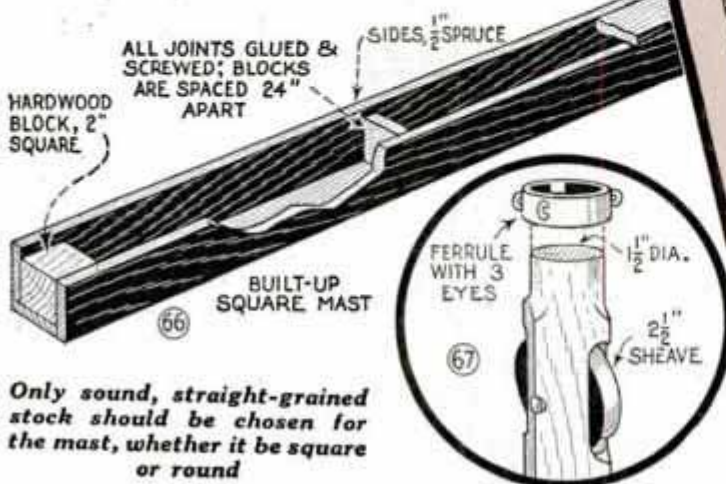


# "ARROWHEAD" Mast and Rigging

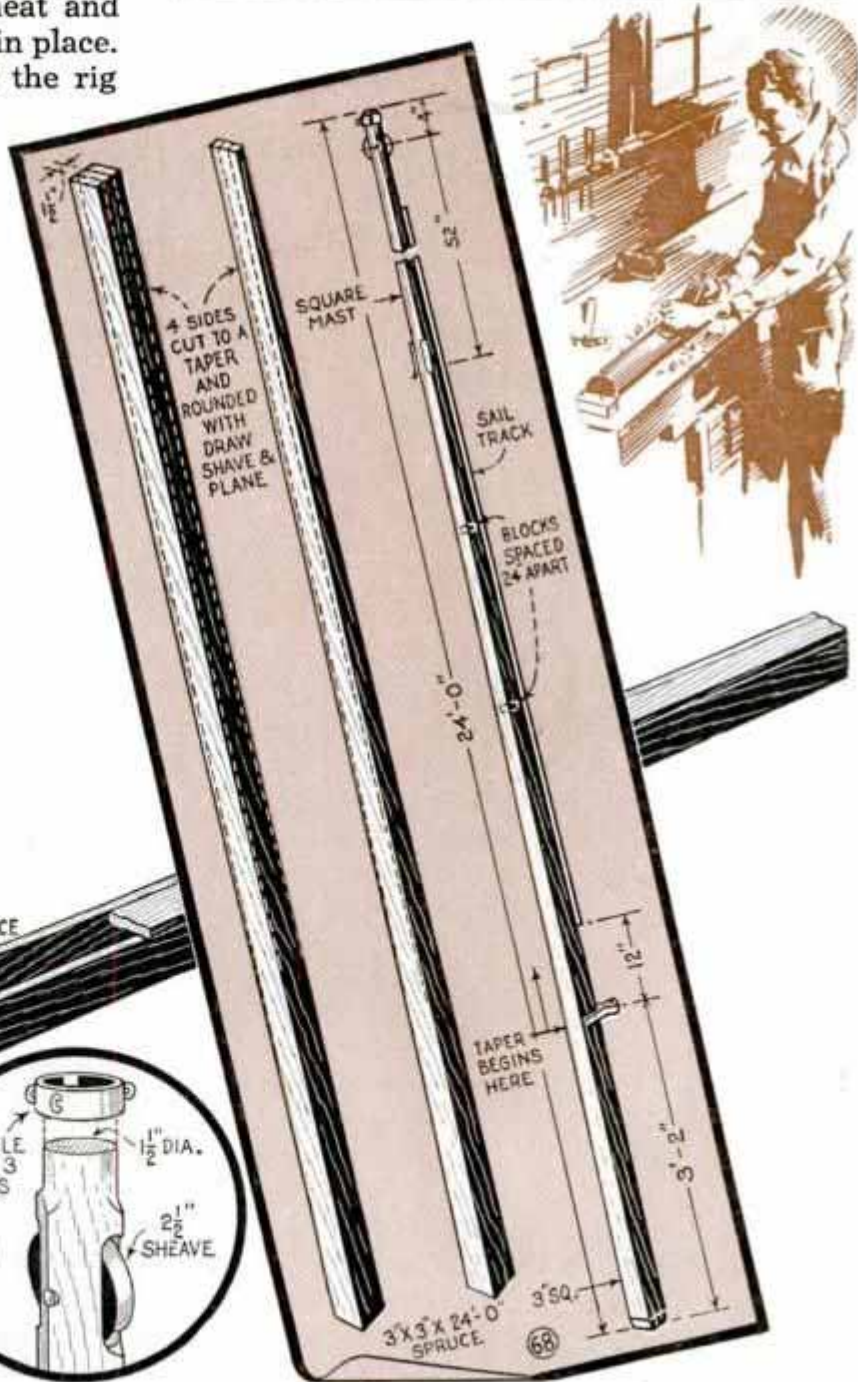
## Part IV



**N**OW up with the mast and rigging! First of all, you have to decide whether you want the square, built-up mast or the solid round type, Fig. 68. If local conditions require the use of a spreader or adjustable backstay rig, as in Figs. 80 and 81, the round mast is preferable, as it is trim and neat and the fittings are more easily put in place. On the other hand, if you use the rig shown in Fig. 76, which is practical under average conditions, the square mast is perhaps the better, due to its greater strength and rigidity. Details for constructing it are in Figs. 66 and 68. From Fig. 68, notice that the section above the gooseneck band, or spider, tapers from 3-in. square at a point 3 ft. 2 in. above the foot to 1½-in. square at the tip. The four ½-in. strips which compose the sides should be a full 24 ft. in length and the taper should be sawed or planed on the pieces before joining together. Great importance attaches to the grain and quality of the wood selected. Nothing but the best will do



Only sound, straight-grained stock should be chosen for the mast, whether it be square or round



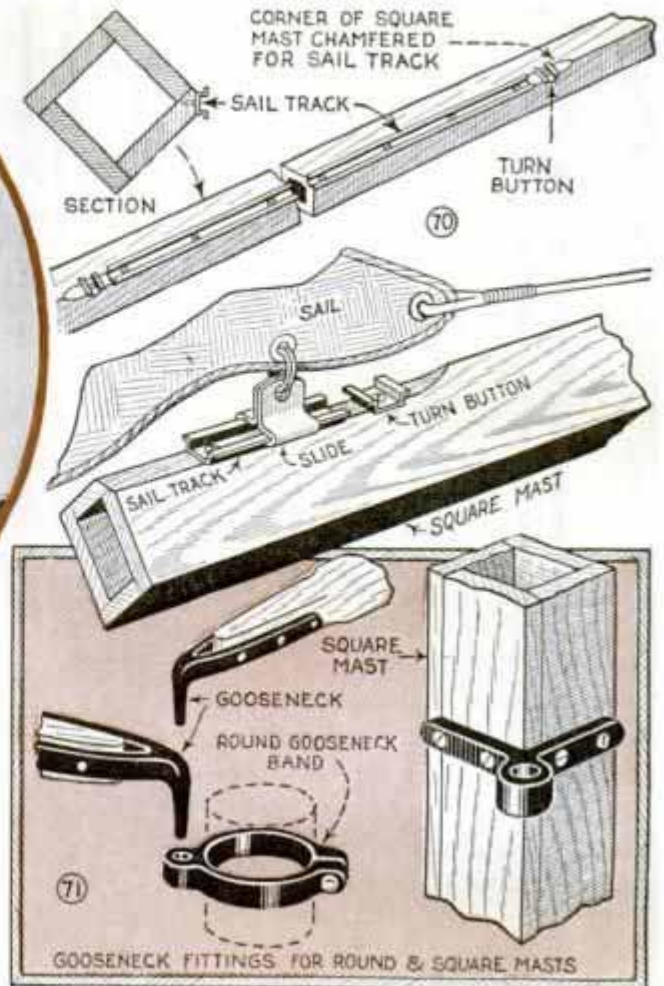




*You'll save time and a lot of trouble with patterns if you buy all the metal fittings ready-made. Then all you have to do is screw them in place and the job is done. Of course, polished brass or bronze fittings are traditional with yachtsmen, but chromium-plating adds a more modern touch and the cost is reasonable*

for this job. Look out for knots or dark streaks that may mean a weakness in the grain. Another important thing is to plane the tapered edges exactly at right angles to the face in order to get a good glue joint all along the length. Then you can set two of the strips at right angles with waterproof casein glue in the joint and draw together with flat-head brass screws spaced about 6 in. apart. Of course, you can use copper nails but screws are better. At the foot a 2-in. hardwood block is fitted, as in Fig. 66. Then ½-in. spruce or pine blocks are spaced 24 in. apart along the length after which they are glued and screwed in place. Addition of the remaining strips completes the mast ready for the fittings. The tip is rounded and fitted with a brass or galvanized ferrule with three eyes for stays. Just below the ferrule the mast tip is mortised diagonally for a sheave carrying the mainsail halyard as in Figs. 67 and 73.

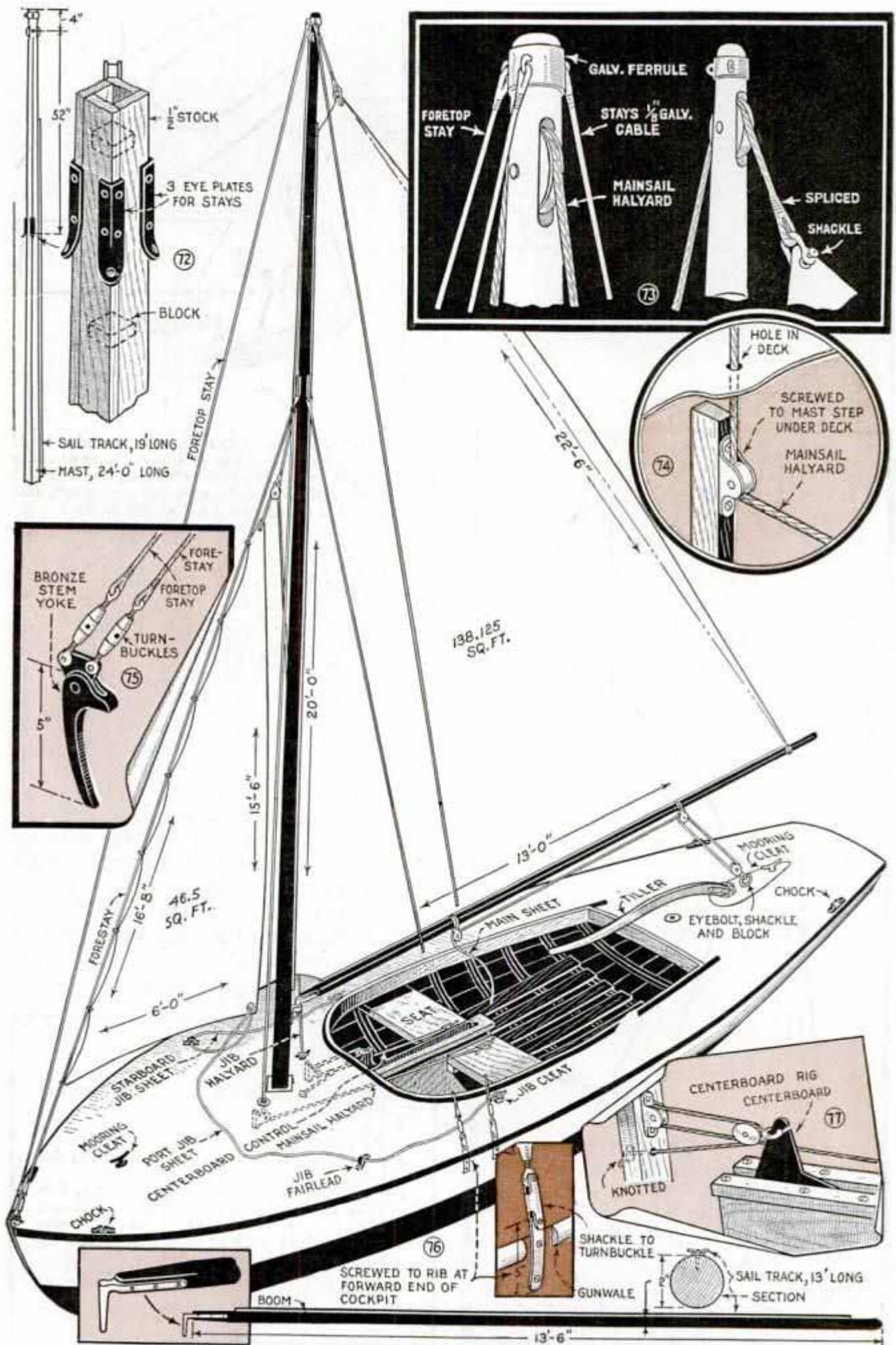
The solid round mast is also tapered, the same dimensions holding for both the round and square types. To begin with you must have a perfect piece of stock, sound, straight-grained and free from knots. Producing the round mast is a



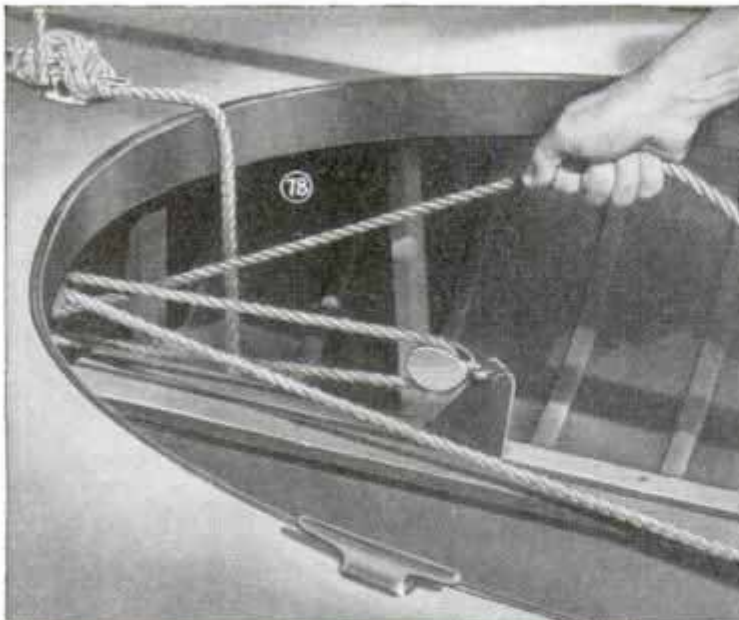
matter of cutting away the waste to the proper taper and then rounding to the circular section with a plane or draw-shave. The thing to look out for in planing down to size is to keep the circular section uniform throughout the length. This is important, as any material unevenness will weaken the mast. When you get it planed down to size, smooth with sandpaper and apply two or more coats of spar varnish. The round mast carries the same fittings and the foot is squared to fit the step. The boom, Fig. 76, is made of the same material and in the same way as the round mast, but is not tapered and is only 2 in. in diameter.

You'll save time and trouble by purchasing all deck and rigging hardware ready-made. The sail track, shown in Figs. 69, 70 and 76, has a turnbutton at each end to prevent the slides running off and fouling the sail. To make the turnbuttons you simply cut short sections from the ends of the sail track and attach them to the mast and boom with separate screws as in Fig. 70. Fig. 71 shows the gooseneck fittings for both the round and square

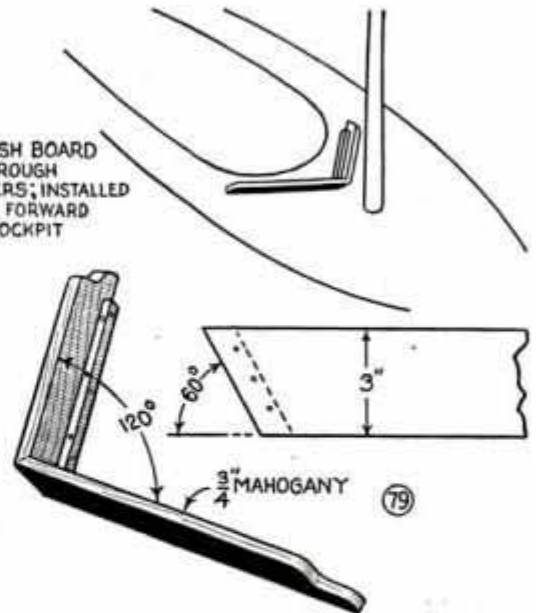




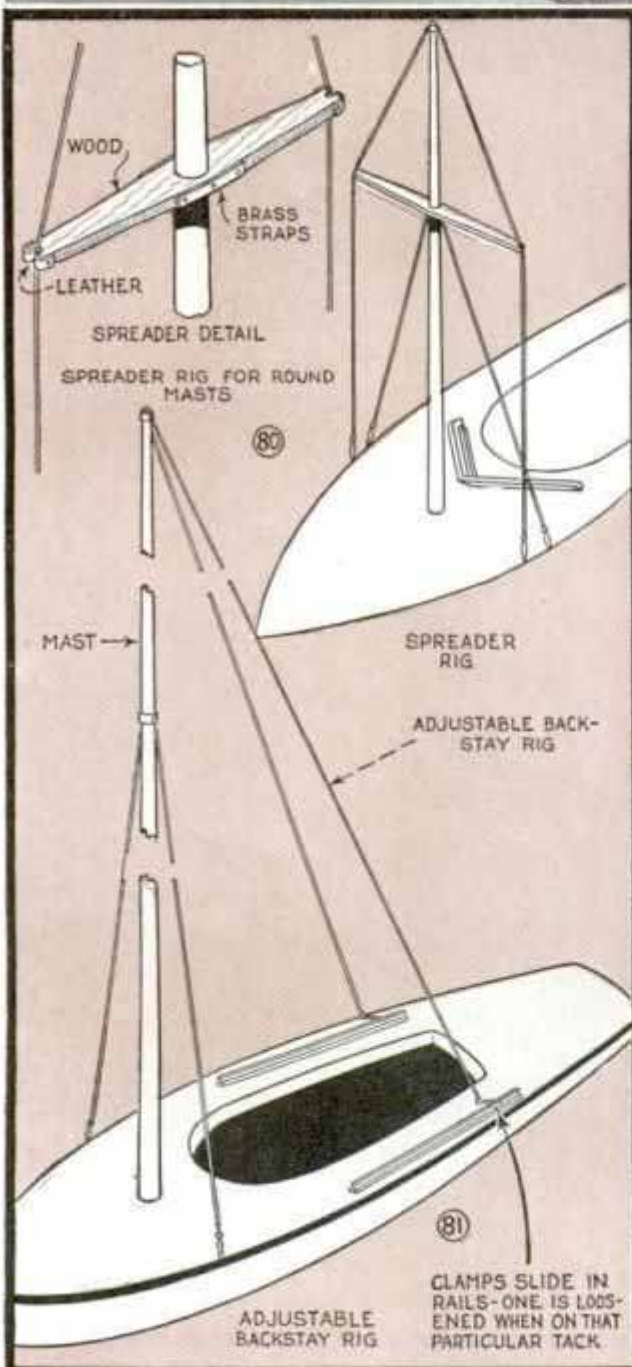




SPLASH BOARD FOR ROUGH WATERS; INSTALLED JUST FORWARD OF COCKPIT



If you prefer, you can use a spreader or adjustable backstay rig on "Arrowhead." Use of either of these rigs is largely up to the builder's own judgment and experience. Splash boards, made of mahogany, will keep the flying spray out of the cockpit



mast. The balance of the rigging details you'll find in Figs. 72, 74 and 75. The centerboard raising and lowering gear is shown in Figs. 77 and 78.

In some waters, splash boards like those shown in Fig. 79 will help to keep off flying spray. These are cut to the curve of the deck and screwed down to the deck beams between the mast and the forward end of the cockpit. Those who wish to use the spreader rig, Fig. 80, will be familiar with its construction. Adjustable backstay slides and clamps, Fig. 81, may be purchased ready-made, the complete unit being fastened to the deck with heavy screws. It's better to have the jib and mainsail made up complete by a competent sailmaker. All he needs are the specifications in the rigging plan, Fig. 76.

### Material List

- 4 pcs. spruce,  $\frac{1}{2}$  by 3 in. by 24 ft., for square mast
- Or, 1 pc. solid spruce, 3 by 3 in. by 24 ft., for round mast
- 1 pc. spruce, 2 by 2 in. by 13 ft. 6 in., for boom
- Marine hardware—sail track, eyeplates, ferule, mooring cleats and chocks, pulleys, blocks and fairleads, stem yoke and gooseneck fittings as required for round or square mast
- $\frac{1}{8}$ -in. plowsteel cable for stays
- Turnbuckles
- Jib and mainsail ready-made



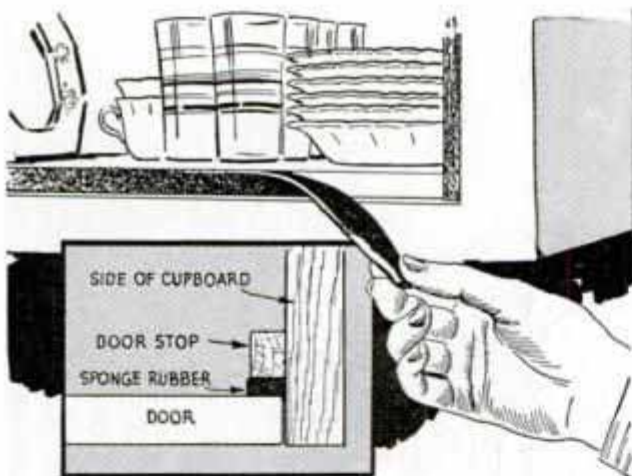
## Catsup Bottle Neck Kept Clean



Screwed to the cap of a catsup bottle as shown, a short dowel that slides snugly into the neck will keep catsup from collecting in the latter, which is not only unsightly but often unsanitary, as well.

## To Make Cupboards Dustproof

Installed between the doors and stops as shown, sponge-rubber weather stripping is excellent material for making cupboards dustproof. Before installing the rubber, the doorstops are set back a dis-



Openings around cupboard doors sealed tightly by sponge-rubber weather stripping

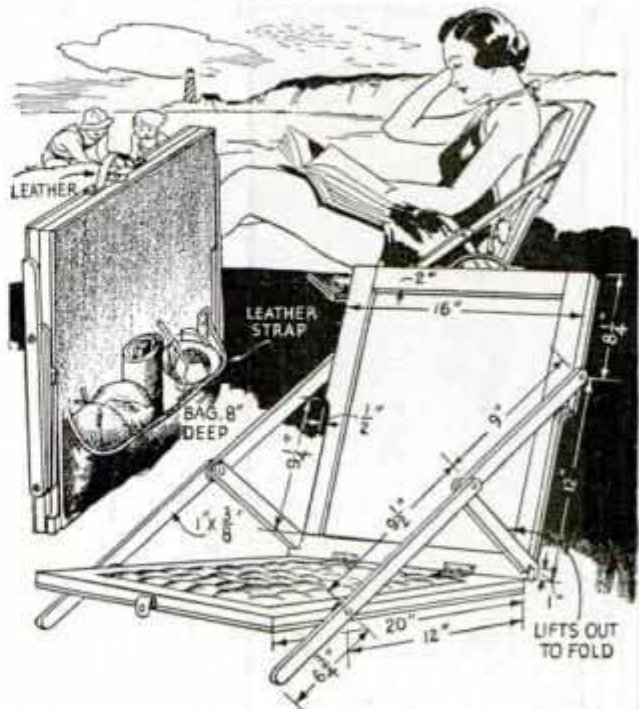
tance equal to slightly less than the thickness of the rubber strips, the difference being taken up by the compressed rubber when the door is closed. Weather stripping of this type can be obtained from almost any store handling auto accessories.

## Painting Tin Roofs

Before painting a tin roof, wash it thoroughly with a sal-soda solution. This makes the surface of the tin porous, providing a good surface for the undercoating of red lead and oil. When the latter has dried, paint will adhere to the roof firmly without checking and peeling.

—L. H. Georger, Buffalo, N. Y.

## "Lazy Back" Gives You Comfort on the Beach



This "lazy back" folds compactly and a canvas bag on the back carries many miscellaneous articles

Folding up like a suitcase, this "lazy back" is just the thing to take along on a picnic or a trip to the beach. The back and seat are hinged together and can be made of plywood, or you can use paneled frames. A pad may be attached permanently to the seat and a cushion used for the back, although the ideal arrangement is to use air cushions on both the back and seat. The cushions can be deflated so that the lazy back will fold.—Chas. Tyler, Chicago.

## Altering Top of Garden Hoe to Weed Plants Closely

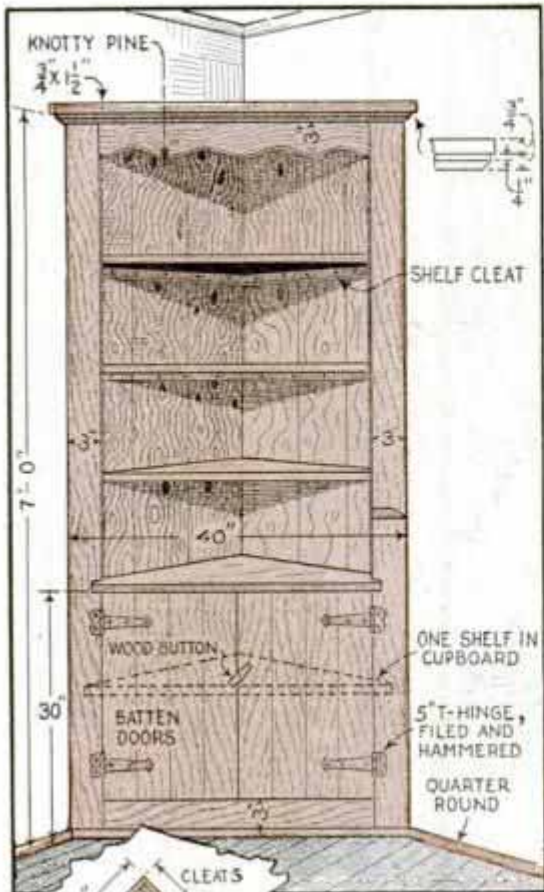
If the sides of a hoe at the top are bent over at right angles so that they project forward, and the edges sharpened, you will have a tool for easily removing weeds close to the plants. In use,



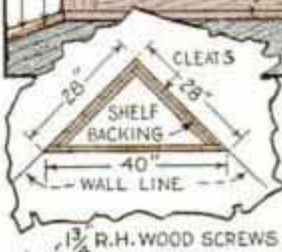
the hoe is turned upside down and then pushed forward so that the bent portions straddle the plant, loosening the soil and cutting the weeds near it.—A. H. Waychoff, Tempe, Ariz.



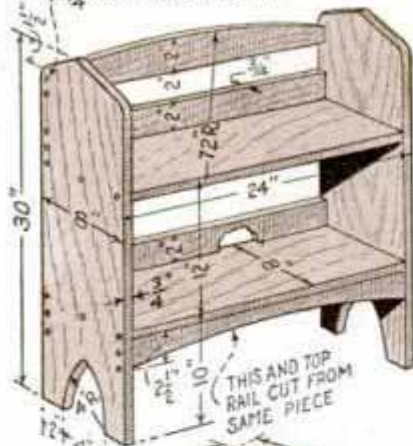
# Furniture for



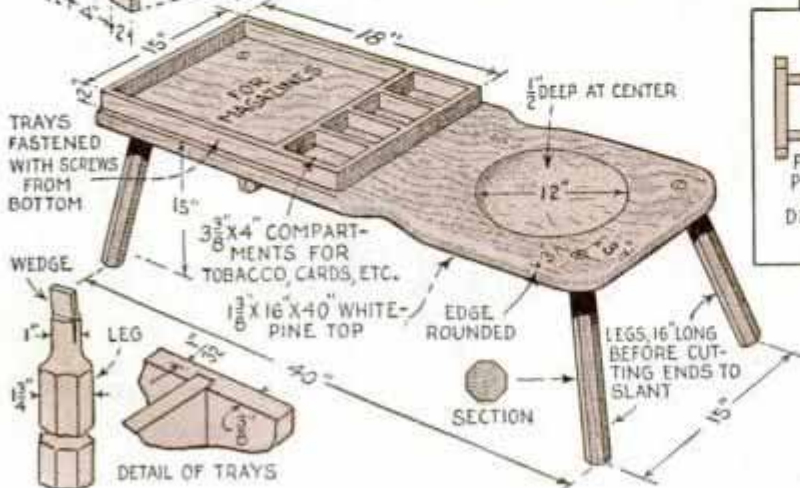
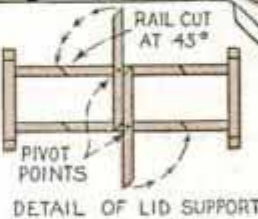
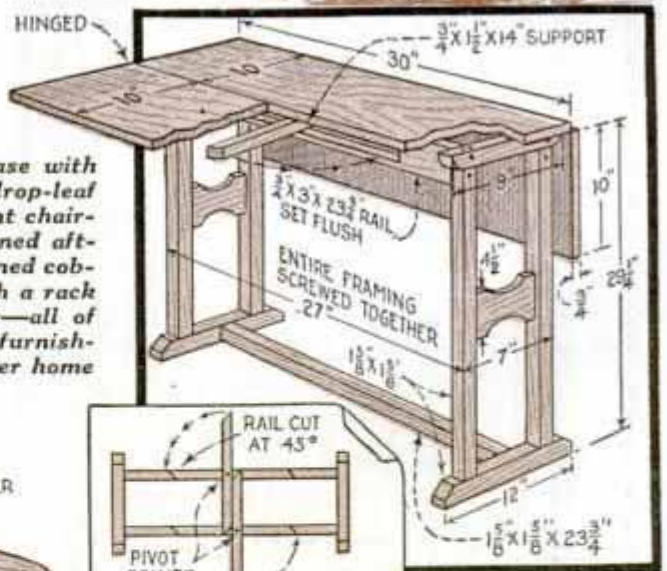
*Knotty pine finishes this corner cupboard in true colonial style*



$\frac{1}{4}$  R.H. WOOD SCREWS



*A simple bookcase with two shelves, a drop-leaf table and a quaint chair-side stand designed after the old-fashioned cobbler's bench, with a rack for magazines—all of these are useful furnishings for a summer home*

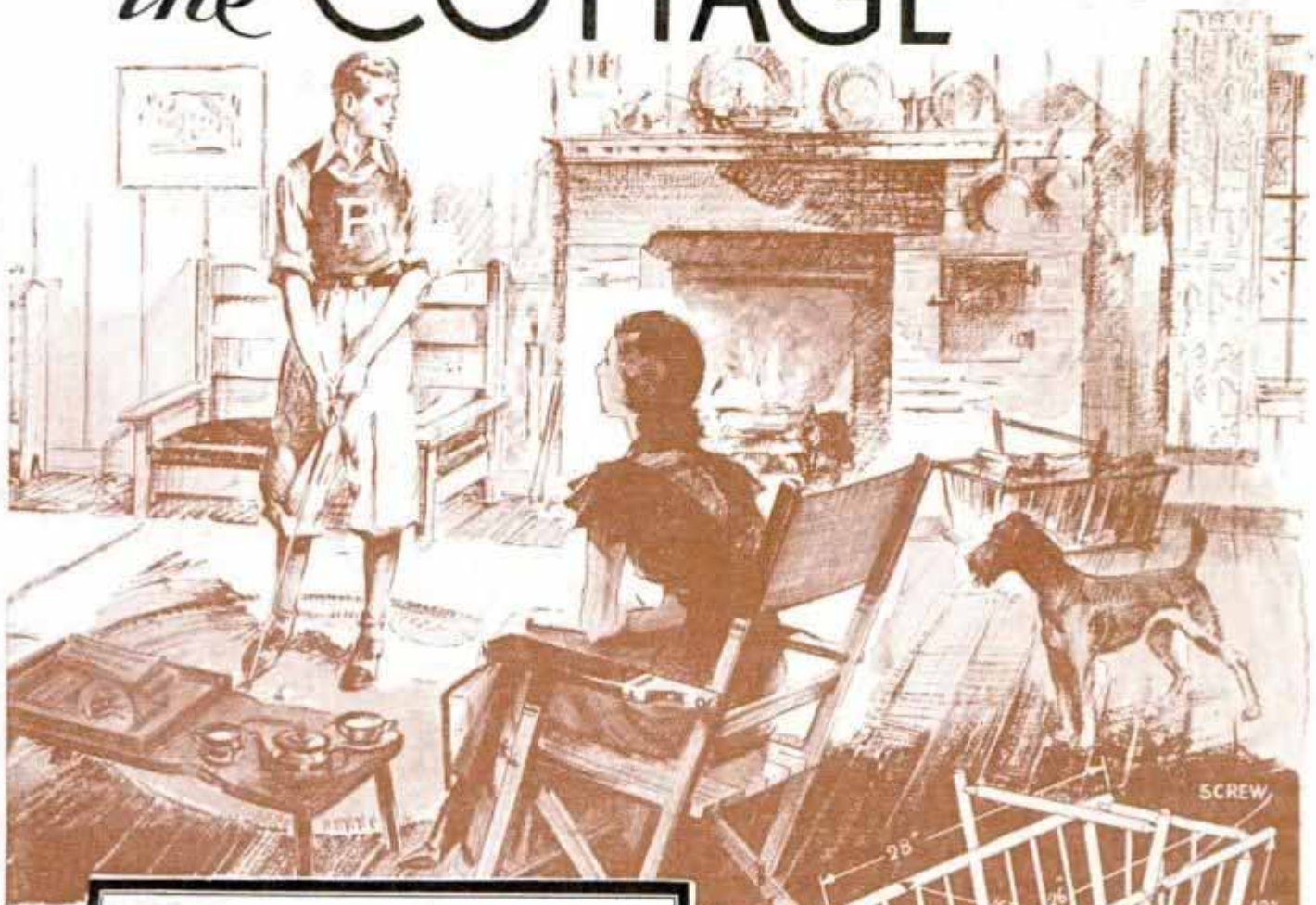


*To match a cottage interior, the four pieces on this page may be finished in the natural color of the wood. This means first a careful sanding, then two coats of orange shellac thinned to brush easily with light sanding between coats, and finally two applications of wax*

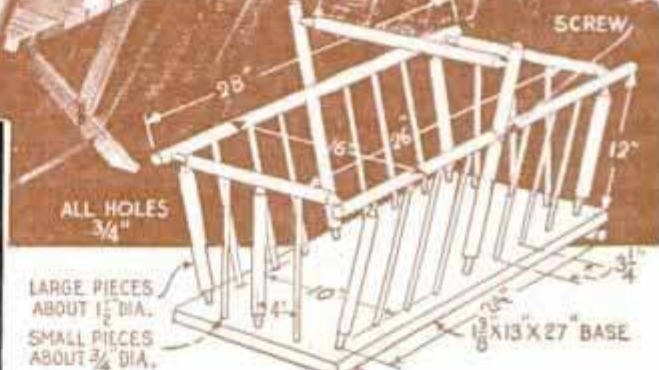
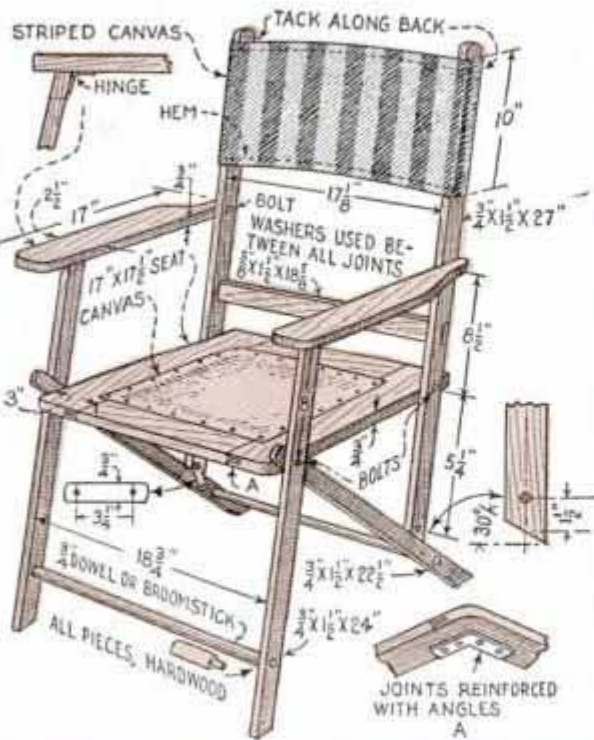


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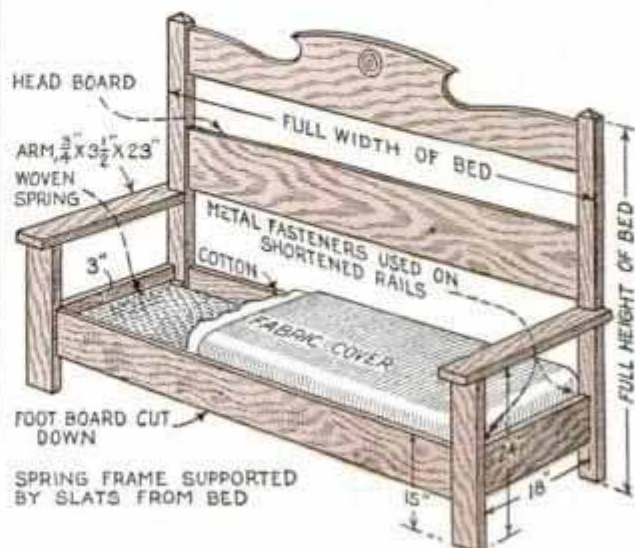
# the COTTAGE . . .



Of course, you must have chairs. This one is sturdy and comfortable and can be folded into a handy bundle for carrying

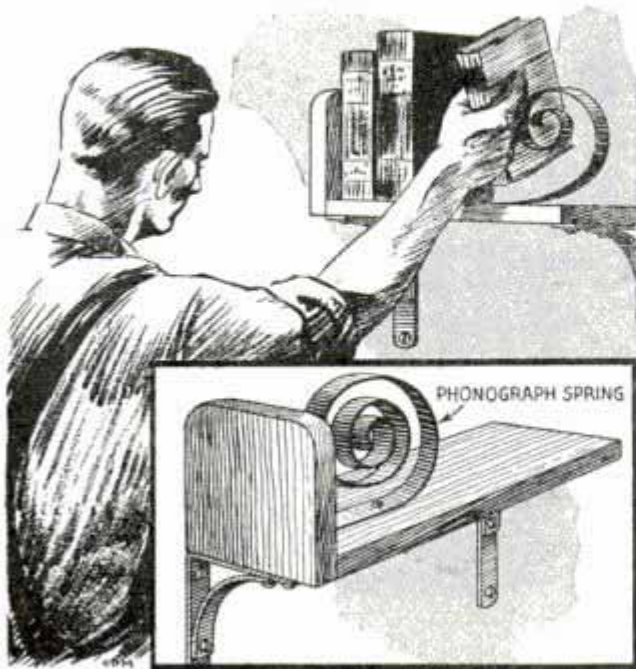


Something different!—a settee for two persons. Cut down an old bedstead as shown below, re-finish, then fit armrests and an upholstered seat





## Coil Spring "Book End" on Rack Is Self-Adjusting

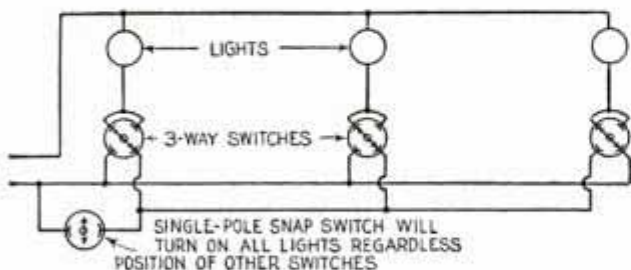


Spring maintains constant pressure against books to keep them in a vertical position

To keep catalogues and reference books safely in place on a shelf near his workbench, one home mechanic uses the holder shown. A length of old phonograph spring is fastened on the shelf so that the free end of the spring coils against the last book, providing sufficient pressure to keep the books neatly in place.

## Controlling Lights in Home with Master Switch

Especially convenient for turning on the lights in your home during parties or for suddenly illuminating the entire house when prowlers are suspected, a lighting system arranged so that one master switch



Lights wired as above can be operated as a unit or they can be controlled individually

will turn on all the lights regardless of the positions of the regular switches is easily installed. As shown in the drawing,

the present single-pole switches in the rooms are replaced with those of the three-way type. The extra poles of the three-way switch are then connected to a single wire leading to the master switch, which is of the single-pole type. It will be necessary to eliminate all socket switches.

## Garden Hose Looped at End Serves as Sprinkler

Not having an automatic sprinkler attachment for my garden hose, I just loop the end, inserting the nozzle through the loop as shown, and set it on the lawn. While I cannot cover as wide an area without moving the hose as I could with an automatic attachment, this arrangement serves nicely in an emergency.

—Wilbert G. Leonard, Oak Park, Ill.



## Two-Part Dishpan for Washing and Rinsing Dishes



Soldered across the center of a large dishpan to divide it into two parts as shown, a tin partition increases the utility of the pan as dishes can be washed in one side and rinsed in the other. This eliminates the extra work of rinsing them under a faucet or on a sink drainboard. A tin dishpan must be used for this purpose, of course, as solder will not adhere to an enameled one.

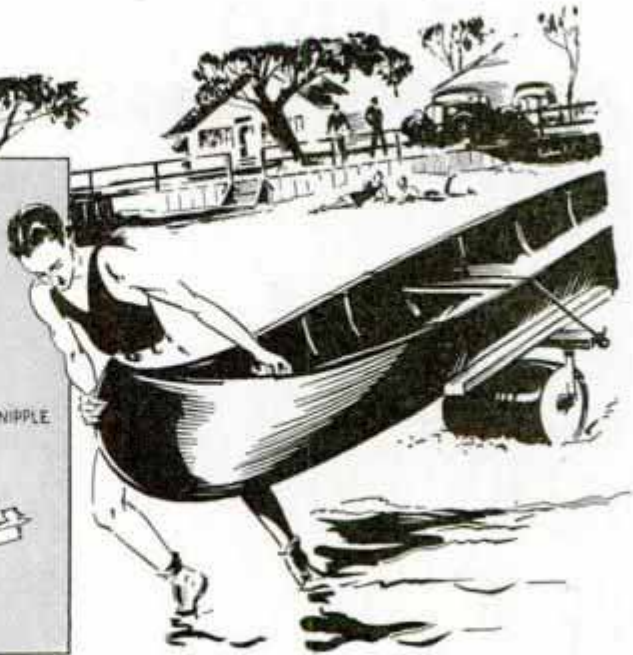
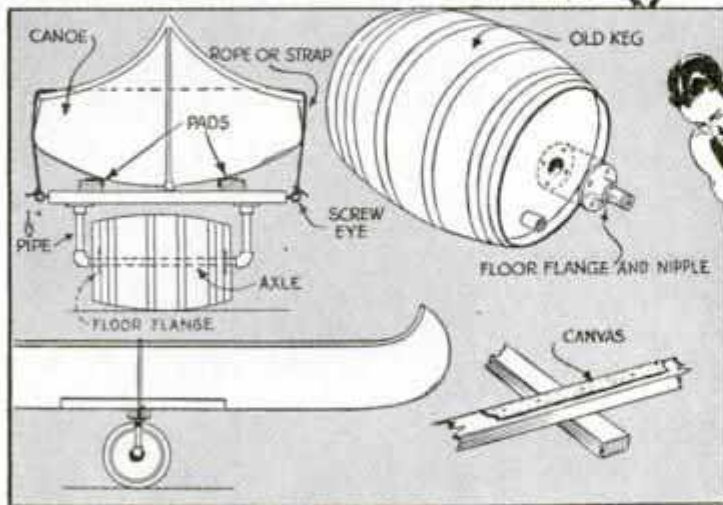
## Keeping Lead Tight in Pencil

Leads that fit loosely in an automatic pencil can be made to fit tightly by covering them with a thin coat of liquid glue. Allow the coating of glue to dry thoroughly before the leads are put in the pencil.—I. M. Howard, Stillwater, Okla.



# Barrel Dolly Moves Canoes on Sandy Beach

*On sandy beaches where it would take three or four men to move a wheeled dolly, this one can be pulled along single-handed*



For handling small boats and canoes on a beach where the wheels of a regular dolly would sink into sand, this one, made from a barrel or keg and some pipe fittings, can be moved with ease. The roller is a wooden keg with the ends bored centrally to take a pipe axle. It is a good idea to use bearings on the ends of the keg to

keep wear from enlarging the holes. The bearings can be made quite easily, as shown, by using nipples and floor flanges of a size to take the axle freely. The axle assembly is attached to a boat cradle with floor flanges, the side members of the cradle being padded with canvas to avoid chafing the boat.—H. G. La Brant, Chicago.

## Comfortable Lawn Seat Made from Old Rocking Chair

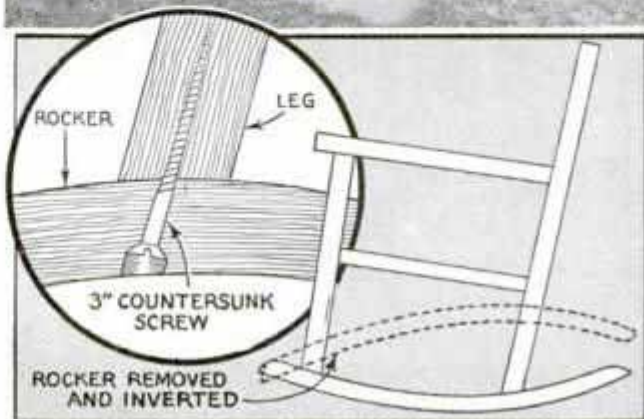
If you have an old rocking chair no longer of service in the home, why not convert it into a comfortable lawn seat? Just remove the rockers, invert them and screw them to the legs, after sawing off the rear ones. The amount to take off the legs depends on the angle at which you want the chair to set. Use long screws and countersink the heads. Crosspieces may be screwed to the ends of the rockers to prevent them from sinking into the lawn.



### Tinting White Paint to Match Other Colors

Instead of trying to buy paint to match some color already on hand, I take white paint and tint it to the color needed. By keeping a can of white paint and a few tubes of color on hand, it takes only a few minutes to mix a small amount of paint to any color or shade I want.

—Charles Latour, Jr., Albany, N. Y.





# TIMELY TIPS —



**R**OUGHING IT" in a tent on the shore of a wooded lake may be great sport if you're properly equipped, and the average camper today, being accustomed to comfort and convenience at home, considers a good gasoline stove the best shortcut to satisfy a whetted appetite—greatly superior to the dirt and soot of campfire cooking. Modern gasoline stoves give very little trouble, but, should something go

wrong, you should know just what to do. And, it is just as important to know how to prevent possible troubles. Only pure, untreated gasoline should be used. Lead-treated gasoline clogs the tiny orifice in the generator tip. In case someone has put this into your stove, the resulting trouble can be overcome by taking the generator apart and thoroughly cleaning it. But, should this happen to your lantern generator, it will be hopelessly ruined and will have to be replaced.

A common trouble experienced with camp stoves is that the flame burns yellow and emits smoke. Invariably this is due to an enlarged orifice in the generator tip. The tiny opening in the tip piece is from .006 to .008 in. in diameter—far smaller than the slenderest sewing needle—and only a very slight enlargement results in too rich a mixture and a yellow flame. The enlarged orifice is often caused by a bent generator tube. The needle tip on the stem then tends to ream the hole as it enters, and an oversize orifice results. Keep the tube straight and carry an extra generator tip and needle stem.

In using a camp stove, don't overload the grids with excessive weight. When heating a pailful of water it is a good idea to place two iron bars across the stove



# for CAMPERS ...



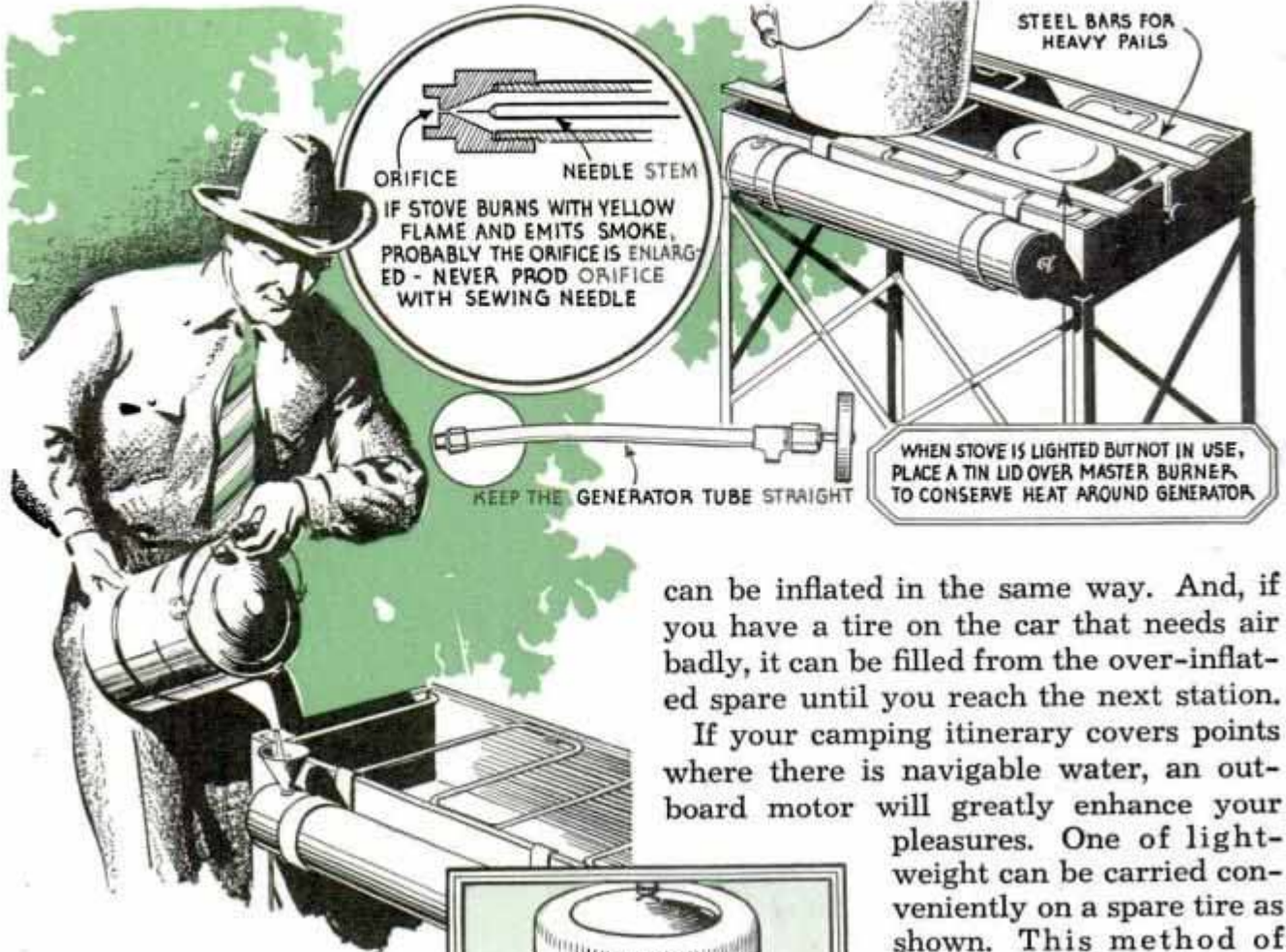
cabinet to support the weight. Two straight tire irons will serve this purpose. A 5-gal. oilcan, rigged up as shown, will prove to be a dandy oven. If a housewife can bake a batch of light biscuits—"the kind that mother used to make"—in the oven at home, she will have no trouble doing it in this improvised oven. The construction of the oven is simple. The upper half of one end of the can is cut out carefully and hinged with small wire rings to form a door, after which small iron rods or lengths of heavy wire are inserted into holes in the sides of the can to provide a grating for the baking pans. A layer of sand in the bottom of the oven will help maintain an even heat to prevent burning the food.

Campers in Yellowstone and Glacier parks often wonder why it takes so long to boil potatoes, and why the coffee and oatmeal seem to have a raw taste. It's the

elevation. Water boils at a much lower temperature here than at sea level. Sealing the boiler with a wide rubber band as shown will remedy the trouble. Merely overlap the pot and the pot lid with the band to make an improvised pressure cooker, in which potatoes and vegetables can be cooked quicker than normally at sea level. A band cut from a large inner tube is handy for this purpose.

A gasoline lantern is a very convenient camping accessory, but many campers have been discouraged in using one because of the frequent breakage of the fragile mantles while traveling. This is because loose mantles chafe against the edge





ORIFICE NEEDLE STEM  
 IF STOVE BURNS WITH YELLOW FLAME AND EMITS SMOKE, PROBABLY THE ORIFICE IS ENLARGED - NEVER PROD ORIFICE WITH SEWING NEEDLE

WHEN STOVE IS LIGHTED BUT NOT IN USE, PLACE A TIN LID OVER MASTER BURNER, TO CONSERVE HEAT AROUND GENERATOR.

of the holders. To eliminate such breakage, the lantern should be carried upside down with its top resting on a soft, springy pad. A carrying case can be made for a few cents, and should be part of the equipment. If you are without a carrying case, set the lantern inverted in a pail packed with rags. Abnormal mantle breakage can be avoided by using care in tying them to the holders. This is best done by first moistening the mantle cords, and then looping them twice around the burners before tying them.

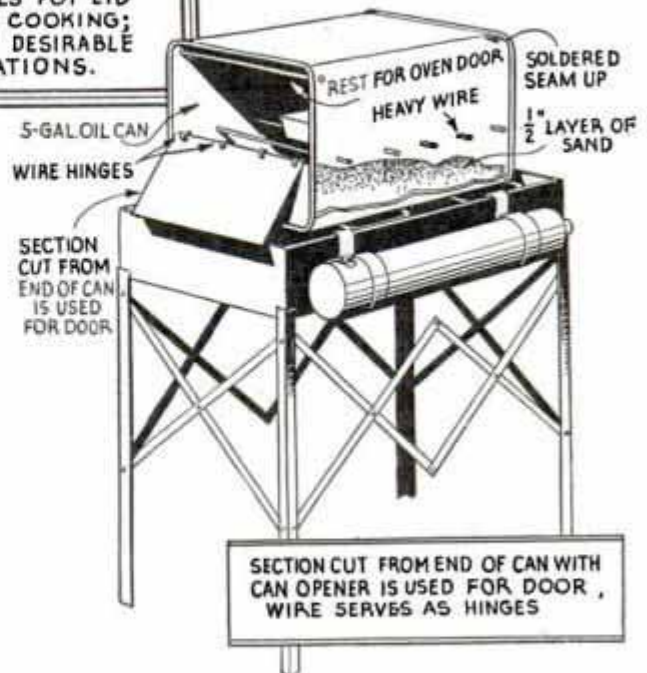
Air mattresses are popular with many campers, but it is a rather laborious task to inflate them with a hand pump. This can be avoided by over-inflating the spare tire at a service station before making camp for the night. Then use the surplus air to fill the mattress. A short piece of air hose and fittings, for this purpose, can be bought at any auto-supply store for a few cents. A rubber pontoon-type boat

can be inflated in the same way. And, if you have a tire on the car that needs air badly, it can be filled from the over-inflated spare until you reach the next station.

If your camping itinerary covers points where there is navigable water, an outboard motor will greatly enhance your pleasures. One of lightweight can be carried conveniently on a spare tire as shown. This method of support is applicable equally well on a side-mounted tire, but be sure to carry it on the right side as traffic regulations of many states prohibit any projection beyond the running-board on the left side

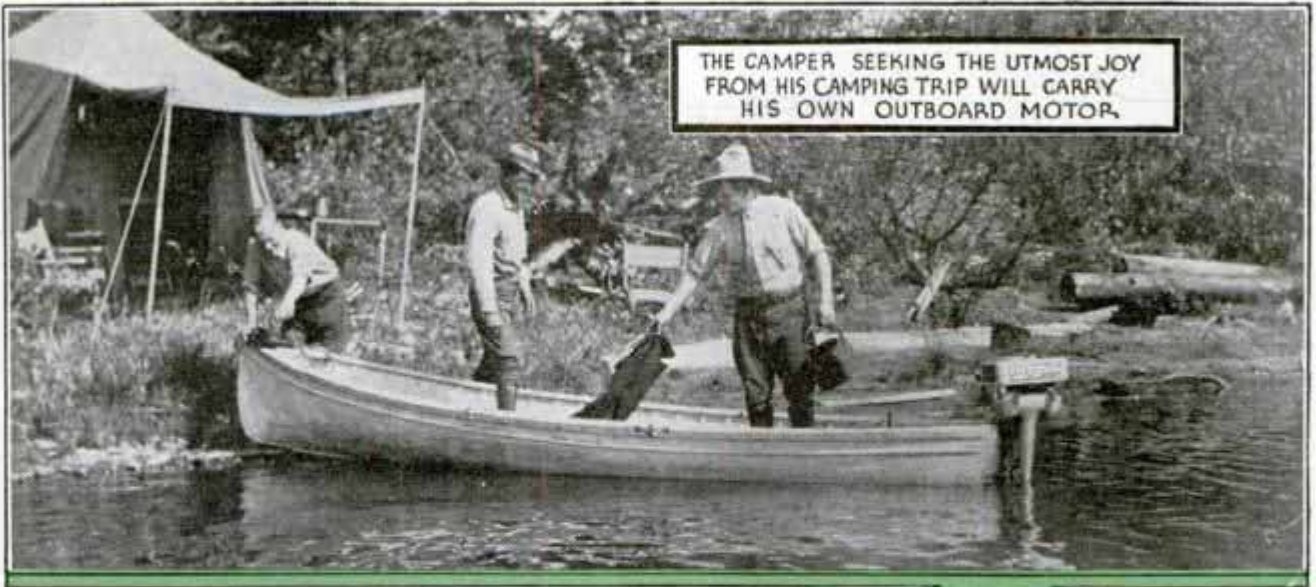


WIDE RUBBER BAND CUT FROM OLD TUBE SEALS POT LID AND HASTENS COOKING; PARTICULARLY DESIRABLE AT HIGH ELEVATIONS.



SECTION CUT FROM END OF CAN WITH CAN OPENER IS USED FOR DOOR, WIRE SERVES AS HINGES





THE CAMPER SEEKING THE UTMOST JOY FROM HIS CAMPING TRIP WILL CARRY HIS OWN OUTBOARD MOTOR.

of a motor vehicle. Every camper should abide by a set of unwritten rules. Some of these are: Don't camp on private property without permission. Never pitch camp in the area of a dry arroyo, particularly in the western states. A cloudburst in the mountains thirty miles away may bring down a 10-ft. wall of water. Always burn all combustible rubbish, thoroughly extinguish every fire, and bury all organic matter before abandoning a camp site. Don't pick wild flowers adjacent to a roadside as other travelers may like to look at them. Avoid excessive sunburn, as it is



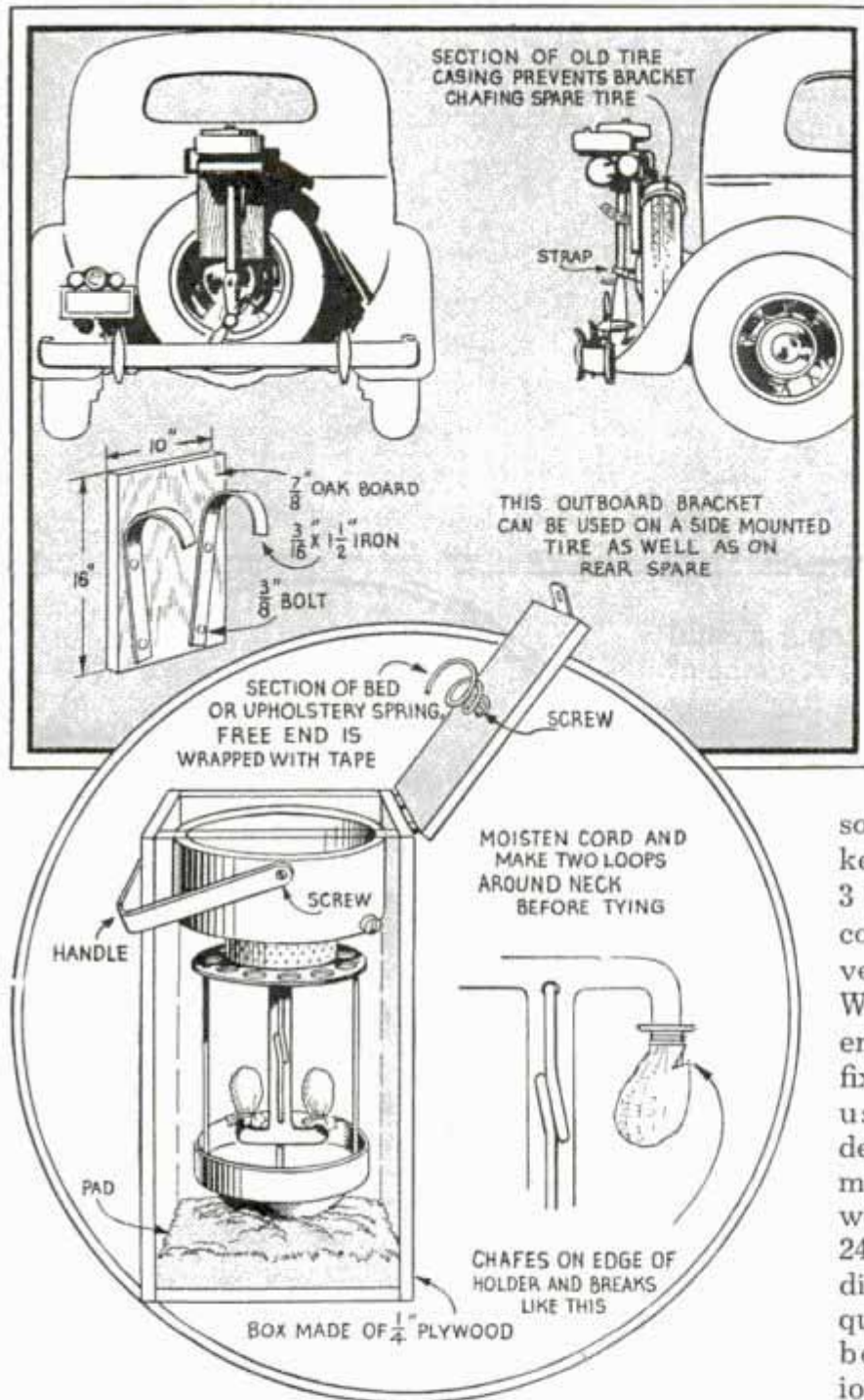
DO NOT HAND FEED THE BEARS IN THE NATIONAL PARKS. THEY ARE NOT A SPECIES OF ST. BERNARD DOG!



OVER-INFLATED SPARE-TIRE PROVIDES AIR TO INFLATE MATTRESSES; CAN ALSO BE USED TO INFLATE A SOFT TIRE  
AIR TUBE AND FITTING CAN BE BOUGHT AT ANY AUTO-SUPPLY STORE

not only uncomfortable, but serious illness may result. Drink only boiled water, or water from a certified source. A crystal-clear brook may find its origin in a barnyard miles away. In rattlesnake country, always carry a snake-bite kit. But, do not depend entirely on anti-venom serum. Lancing the wound and applying mechanical suction is the best known treatment. Special vacuum syringes can be purchased for the purpose. Don't hand feed the bears in the national parks. Some bears don't know when the candy ends and the fingers begin. They are not a species of St. Bernard dog. It is best to judge the success of your camping trip by the natural beauties you have seen, the new friends you have made,





fixing negatives, they can be treated so that this difficulty is reduced to a minimum. When the temperature of the wash water is 75° Fahr. or more, add to the developer a 10 to 15 per cent solution of sodium-sulphate (Glauber's salt) crystals. This will prevent the gelatine emulsion of the negative from swelling excessively in the developer. Follow this by rinsing the film in a hardening bath consisting of potassium chrome alum, 2 oz., dissolved in hot water (125° Fahr.), 2 qts. When dissolved, add 28 per cent acetic acid, 3 oz., and then add enough water to make 1 gal. of

solution. The negatives are kept in this hardening bath for 3 min., and should be agitated constantly for a minute to prevent the formation of stains. When removed from the hardening bath, the negatives are fixed and are washed in the usual manner. The following developing solution is recommended highly for use in hot weather: Water (125° Fahr.), 24 oz.; Kodolon, 75 grains; sodium sulphite, 1 3/4 oz.; hydroquinone, 80 grains; sodium carbonate, 1 3/4 oz.; potassium iodide, 30 grains; sodium-sulphate crystals, 3 1/2 oz., and

and the wholesome joy experienced, rather than the number of miles you have traveled. And, taking your time to make careful observations of every point of interest, will give you many pleasant memories besides making your vacation a real rest. The sort of touring that enables only a passing glimpse, will make your vacation merely a task of constant driving.

### Treating Negatives to Develop Them in Hot Weather

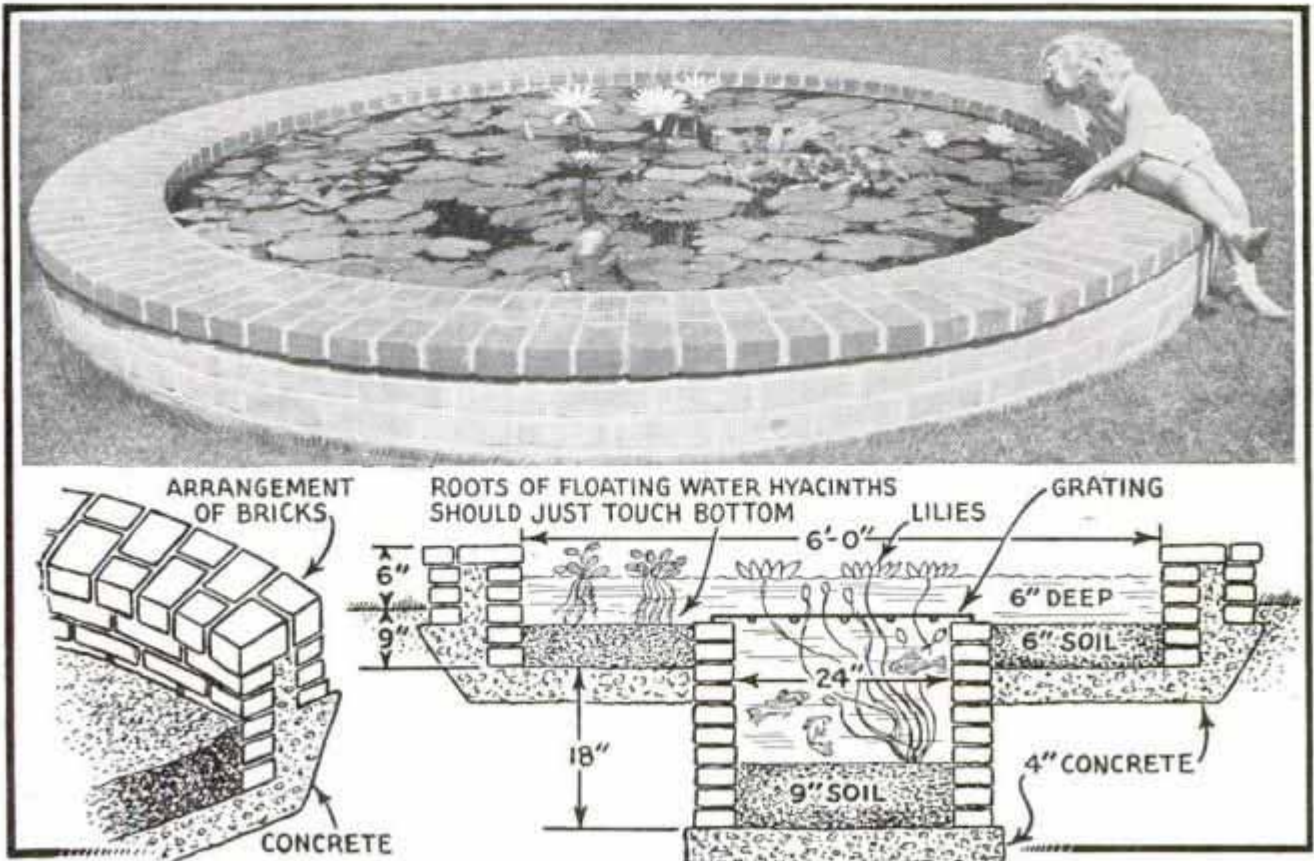
On hot days when it is difficult to keep solutions cool enough for developing and

enough water to make 32 oz. of solution. A like quantity of the sodium sulphate can be added to any favorite developer, varying the amount between 10 and 15 per cent of the amount of liquid, according to the temperature of the wash water, developer and other baths.

☐ Newly mixed paint should never be used until it has been allowed to stand for 24 to 36 hours; then it is strained through a screen a little finer than ordinary fly screen. It will be found that, by this means, the working qualities of any paint will be improved considerably.



# Shallow Garden Pool Is Safe for Children



*Shallow enough for small children to climb out if they accidentally fall into it, this garden pool has a grating-covered well for growing deep-water plants*

The presence of small children and many pets in his neighborhood led a man in California to build this pool so that there would be no risk of the children drowning if any of them fell into it. A ledge around the parapet makes the outside of the pool very shallow, yet a grating-covered well in the center permits the growing of deep-water plants. Construction is simple and inexpensive if used brick are laid in the walls with a mortar consisting of clean, dry sand, 5 parts, and portland cement, 1 part. The concrete work is poured with a mixture of sand, 2 parts, gravel, 2 parts, and cement, 1 part. The concrete is kept moist by means of wet sacks until it has set, after which the entire inside surface of the pool is painted with waterproof cement mixed to the consistency of thick cream. A rich soil well mixed with manure should be laid in the bottom as indicated. When the plants have been set out and the pool filled, the water should be drained out after two or three days. Then refill it and the job is done for the summer.

## Scissors Opened by Spring to Ease Finger Strain

If you do considerable work with a pair of scissors, a small piece of spring steel or brass between the handles will save the extra finger strain of opening the blades.

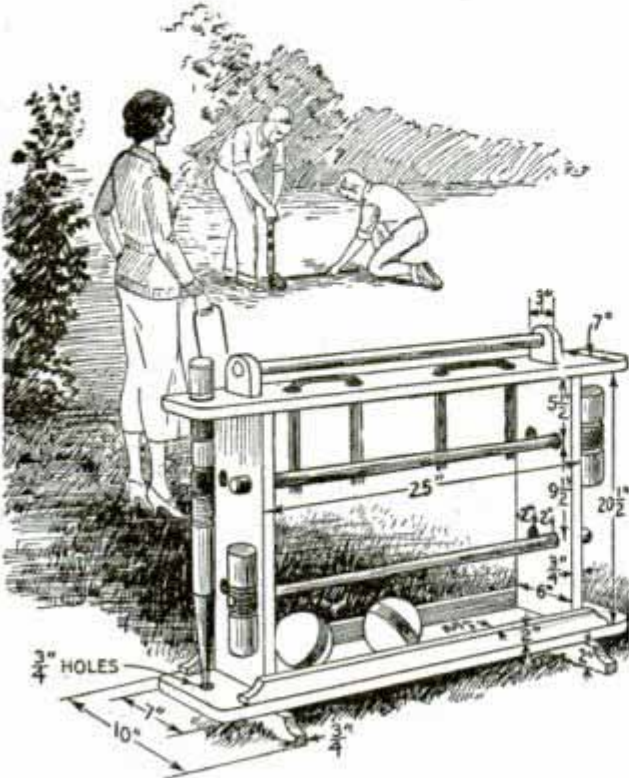


The spring is soldered to one of the handles so that the free end bears on the other one as shown. It will be necessary to file the plating off the handle at the point where the spring is attached so that solder will adhere.

☞ To remove the "morning after" odor of tobacco smoke from a closed room, set in it a jar containing a lump of crystal ammonia to which has been added a few drops of oil of lavender and a small amount of boiling water.



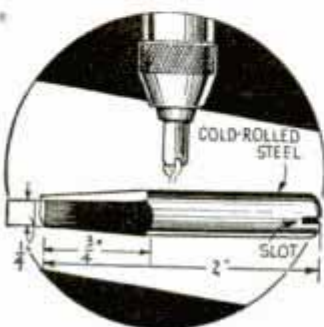
## Your Croquet Set Is Neatly Stored on Portable Rack



*Quickly carried into the garage or basement, this rack keeps your croquet set together in good order*

Accommodating your entire croquet set, this rack can be carried into the basement or garage when the set is not in use. Four mallets fit holes in the ends, and the stakes drop through holes in the top, the points resting in smaller holes in the bottom piece. The arches, too, have their place, and a large tray at the bottom takes care of the balls. The rack is assembled with screws, with the exception of the top. This is mortised to slip snugly over the handle supports. As croquet sets are made in different sizes, it may be necessary to alter the dimensions somewhat from those given in the drawing.

## Screw Eyes Driven Quickly with Brace or Drill

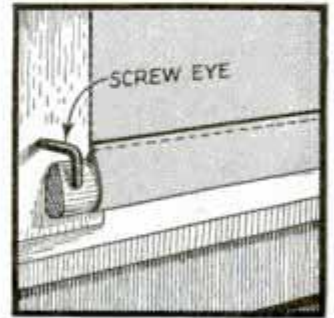


On jobs requiring the use of a number of screw eyes or screw hooks, this tool, which fits either a brace or hand drill, is just the thing for driving

them. Made in a few minutes from a short length of cold-rolled steel or drill rod, the tool is shaped at one end to fit in the brace or drill chuck, and slotted at the other end to straddle the screw eyes or hooks.

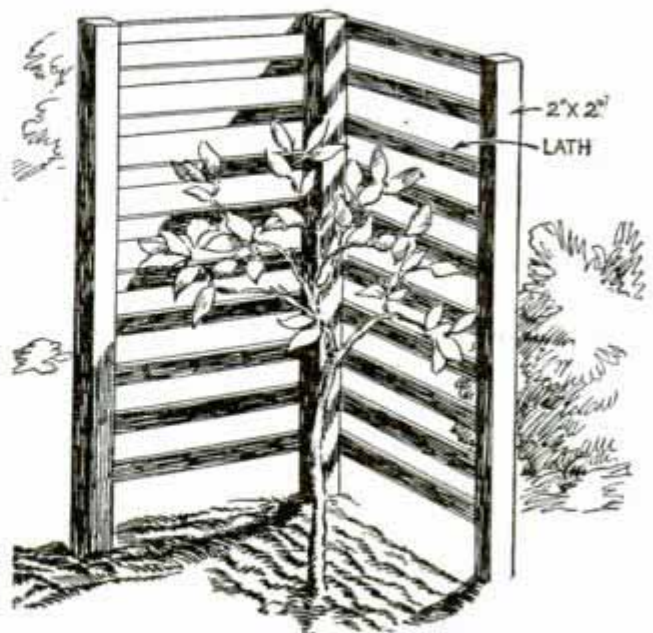
## Flapping of Shade Stopped by Screw Hooks

To prevent a shade that is pulled down over an open window from flapping in the wind at night, drive a screw hook into each side of the window casing and slip the ends of the shade slat under them as shown. It will be necessary to substitute a longer slat which will project a little beyond the edges of the shade.



## Young Trees Protected from Sun and Wind

When young fruit or shade trees are first set out, this lattice guard will afford them ample protection against wind and hot sun until the root system is well started, yet permit plenty of ventilation. The guard consists of three posts or large stakes arranged as shown, and covered with lath spaced their own width apart.



*Lattice set on two sides of small trees protects them until root system is started*



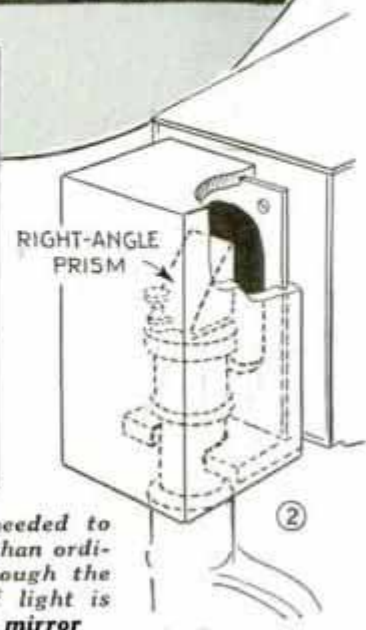
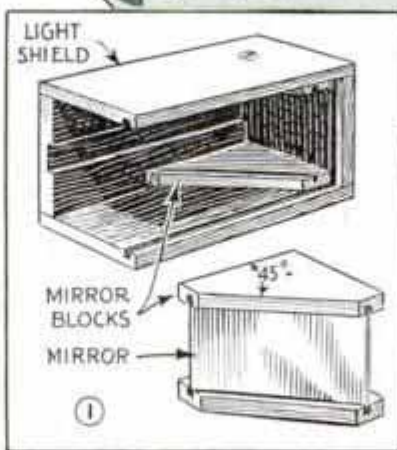
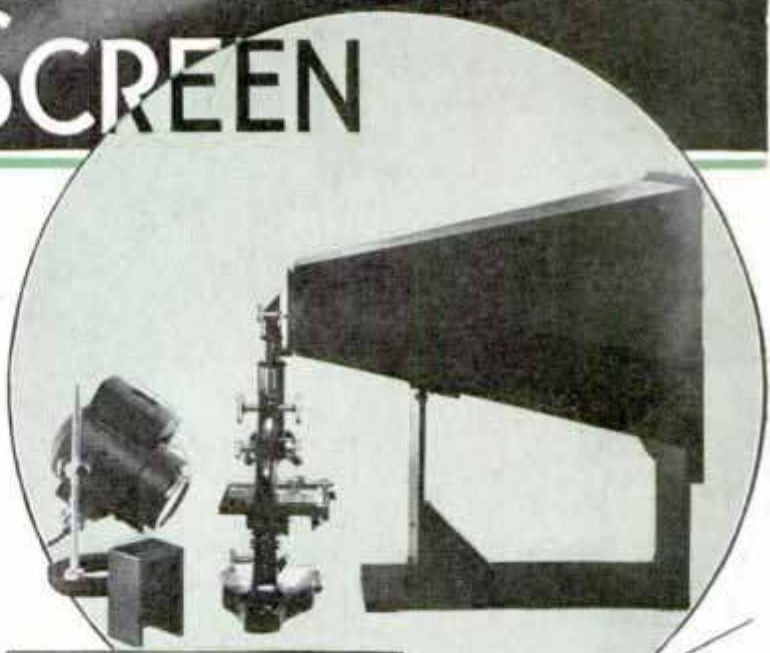
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# MICROSCOPIC VIEWS *Thrown on* SCREEN

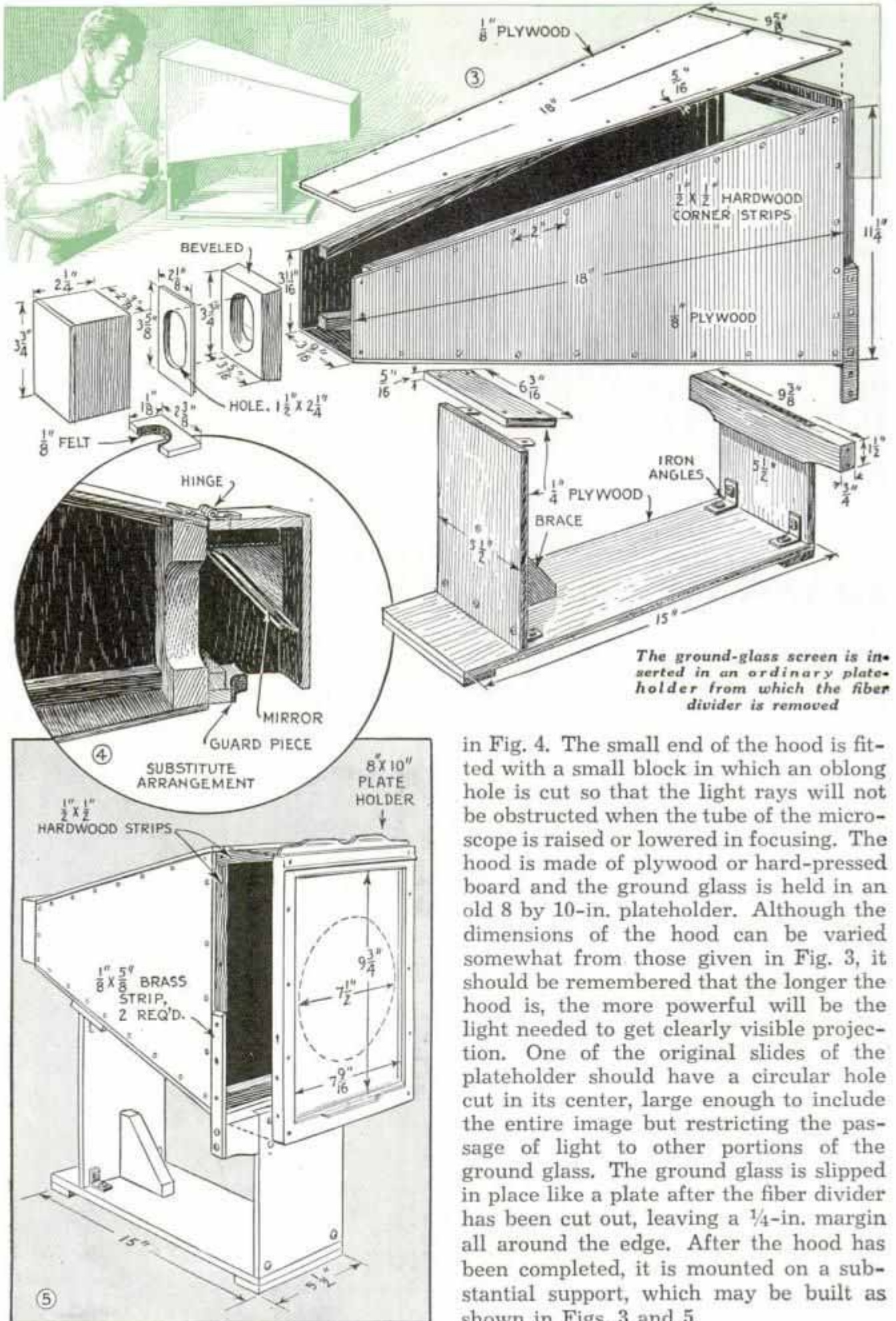
By Charles H. Kruchten

WITH this viewing screen, images seen in the microscope are thrown on a vertical screen so that they can be observed by several spectators. A right-angle prism or mirror, which is located directly over the microscope eyepiece, directs the light rays horizontally through a hood and upon a ground glass arranged in the large end of the hood. Of course, when an image is projected in this way the illumination on the microscope mirror must be greatly increased and the room should be darkened for good visibility of the picture on the ground glass. Although a right-angle prism, as in Fig. 2, is preferable for deflecting the light rays, a good mirror, carefully adjusted at a  $45^\circ$  angle as shown in Fig. 1, can be used. A light shield is used over either the prism or the mirror and is made so that it can be removed readily. For this purpose you can use slides as in Fig. 1 or hinges as



*Much greater illumination is needed to throw the image on the screen than ordinarily used for observation through the eyepiece. The vertical beam of light is deflected by either a prism or mirror*





The ground-glass screen is inserted in an ordinary plate-holder from which the fiber divider is removed

in Fig. 4. The small end of the hood is fitted with a small block in which an oblong hole is cut so that the light rays will not be obstructed when the tube of the microscope is raised or lowered in focusing. The hood is made of plywood or hard-pressed board and the ground glass is held in an old 8 by 10-in. plateholder. Although the dimensions of the hood can be varied somewhat from those given in Fig. 3, it should be remembered that the longer the hood is, the more powerful will be the light needed to get clearly visible projection. One of the original slides of the plateholder should have a circular hole cut in its center, large enough to include the entire image but restricting the passage of light to other portions of the ground glass. The ground glass is slipped in place like a plate after the fiber divider has been cut out, leaving a 1/4-in. margin all around the edge. After the hood has been completed, it is mounted on a substantial support, which may be built as shown in Figs. 3 and 5.



## Cleaning Chamois Skin

Chamois gloves, jackets and wash cloths can be cleaned without danger of spoiling them if they are washed in the same way you do woolen cloth, except that the water must not be hotter than the hand can bear comfortably. Chamois must be kept from drying stiff by having the last rinse water quite soapy, or by putting a little glycerin in the water from which it is last taken. Also, before it is quite dry, the chamois should be pulled and worked until flexible and soft. If there is any rust, dirt or grease on the chamois, this can be removed with a dry-cleaning fluid mixed in the following proportions: Carbon tetrachloride, 1½ gal., cleaning gasoline, 1¼ gal., kerosene, 1 oz., and chloroform, ½ oz. This mixture is shaken well before using. —Charles W. Mehl, Jersey City, N. J.

## Lawn-Chair Cover Rolls Up When Not in Use

For protecting your clothes against a dusty lawn chair, this cover is pulled down over the seat and back, and is rolled up when not in use. It consists of a piece of closely woven cloth fastened to a short



*You don't have to wipe off a lawn chair when this cover is used; just pull it over the back and seat*

window-shade roller. This is mounted between two hardwood blocks screwed to the back of the chair near the top, using regular shade brackets to hold the roller. If the chair is metal, the blocks can be fastened to strips of sheet brass, which are bent around the vertical members of the chair back as shown in the detail.

## Fish Held Securely for Scaling by Weighted Hooks



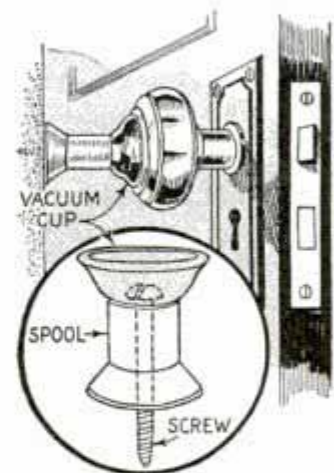
*By holding a fish on a table with two weighted hooks, both hands are free for removing scales*

To hold a fish for scaling, clip off the barbs from a couple of large fishhooks and attach a length of stout cord to each one, looping the other end of the cord to receive a weight, which may be a short pipe, stone or a piece of scrap iron. Place the fish on a table or box, attach the hooks to the head and tail, leaving the weights suspended over the side of the table. In this position, the fish will be held securely, yet it can be turned from side to side.

## Doorstop and Bumper Combined

A noiseless door bumper that will serve as a stop is made by attaching a vacuum cup to the end of an empty thread spool, using a long wood screw as indicated. To use the bumper as a stop, the doorknob is pushed against it and then given

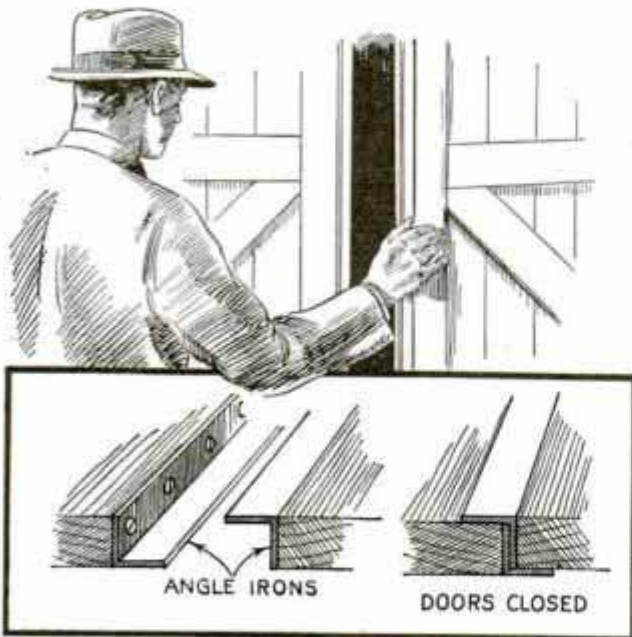
a slight twist to effect a vacuum within the cup.—G. E. Hendrickson, Argyle, Wis.



☐ If you dampen twine before tying a bundle, the knot will not be likely to slip.



## Tight Joint Between Two Doors with Lengths of Angle Iron



Screwed to the edges of double doors as shown in the detail, lengths of angle iron not only make a weather-tight joint when the doors are closed, but they serve to strengthen the doors and prevent them from warping. Another advantage is that angle iron will not swell and stick or bind like wood in damp weather.

## Neutralizing Alkali in Concrete So Paint Will Adhere

When concrete must be painted before it has had time to age sufficiently, an application of zinc-sulphate solution will help to neutralize the free alkali. The solution is made up by dissolving zinc sulphate, 3 or 4 lbs., in water, 1 gal. Apply the mixture with a brush and let it dry thoroughly before going ahead with the paint job.

# Plenty of Fun at a Safe Speed



*This small car, having a 58-in. wheelbase and 28-in. tread, is very easy to operate and may be powered by a 1/2 to 3/4-hp. gas engine of the washing-machine type. It is equipped with effective brakes and pneumatic tires. Plans show three alternate methods of body construction. Easy to build. Our blueprints Nos. 906 to 909 incl. give you all the information necessary. This set will be sent postpaid on receipt of \$1.00.*

**"ROAMER"—765 to 770:** Outboard cabin cruiser. 16 ft. long, 66 in. beam. Requires outboard motor of 20 to 36 hp. Set of six prints \$1.00.

**"ARROWHEAD," A 21-FT. SLOOP—944 to 951:** A trim, fast and able sailboat that handles well and can be built by the average craftsman. See page 121 of this issue. Set of eight prints \$1.50.

**TRELLIS SUGGESTIONS—639:** Six types that will help beautify your home. 25c.

**LAWN CHAIR—529:** Plain sawed from 3/4-in. stock. Easily made with hand tools. 25c.

**ORNAMENTAL WOOD FENCES—640:** Five artistic designs for standard wood stock. 25c.

**CIRCULAR ARBOR AND GATE—637:** Popular style anyone can build. 25c.

**LAWN AND GARDEN FURNITURE—920 to 922:** Collection of designs for arbor-and-seat combinations and swings. (3 prints) 75c.



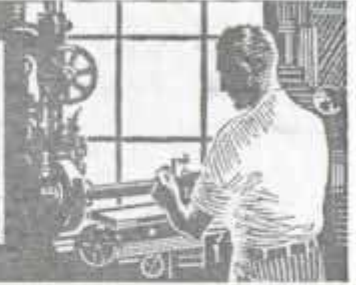
Any six single prints (not sets of prints) will be sent postpaid upon receipt of \$1.00. Address Blueprint Dept.

Popular Mechanics Magazine, 200 East Ontario Street, Chicago

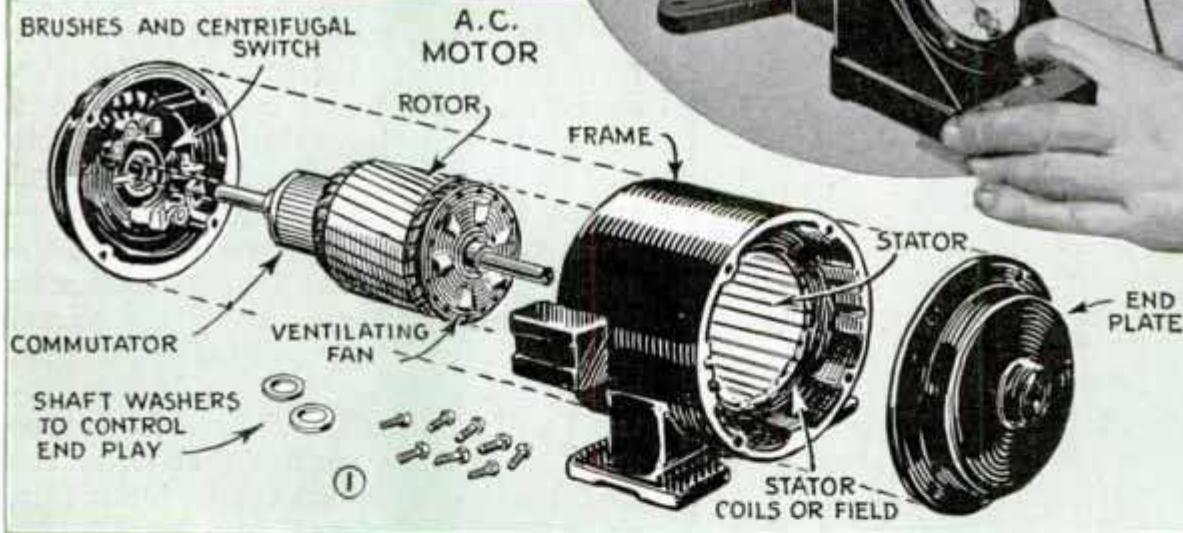




# SHOP NOTES



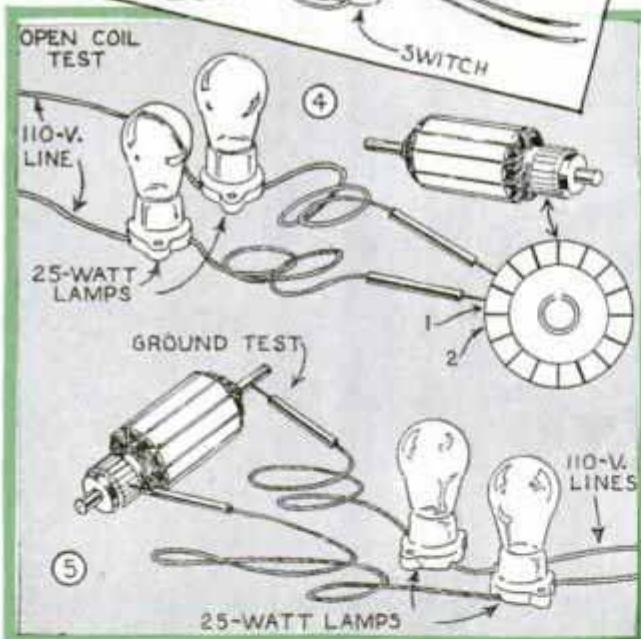
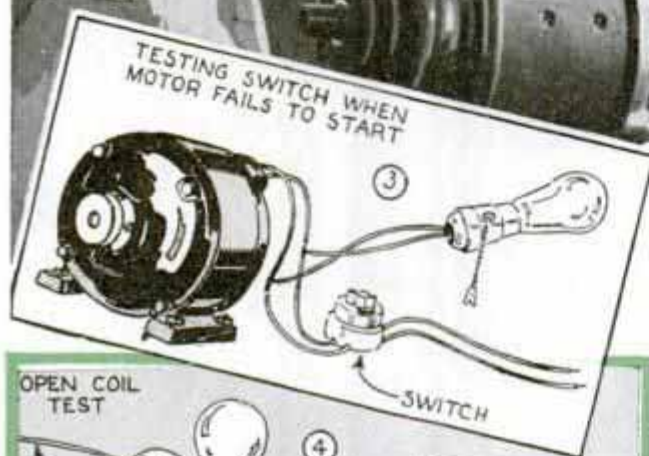
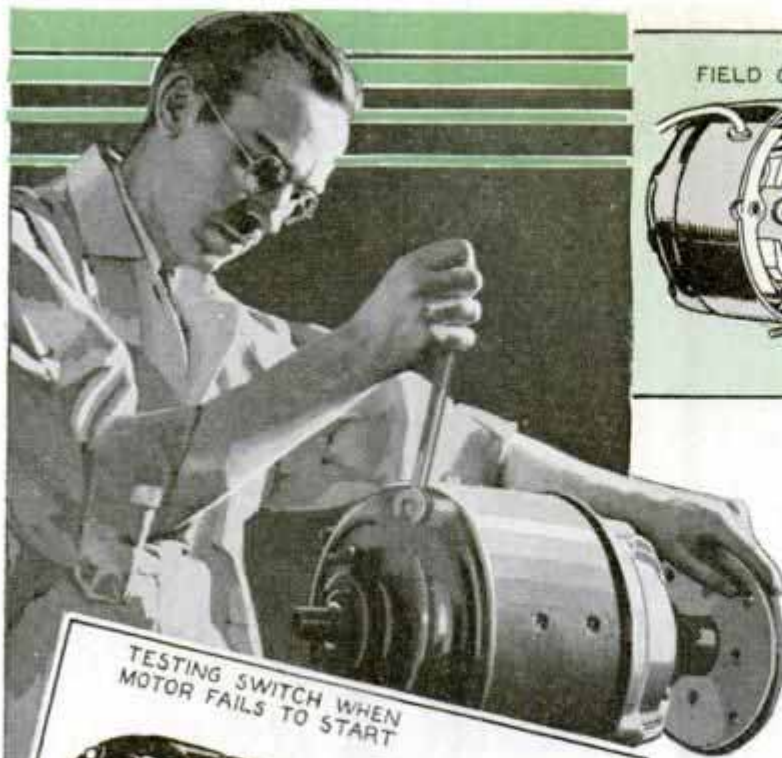
## Servicing ELECTRIC MOTORS by... C.A. CROWLEY



**A** MOTOR which fails to start when the switch is closed is either not receiving power from the lines or has a burned-out coil or a faulty connection inside the machine. First determine whether the fault is in the motor or the switch. Fig. 3 shows how to make this test. The switch is turned on and the test-lamp wires touched to the leads connected to the motor as shown. If the lamp fails to light, the switch is faulty. If the lamp lights, the switch is in good order and the trouble is either a broken wire from switch to motor or in the motor itself.

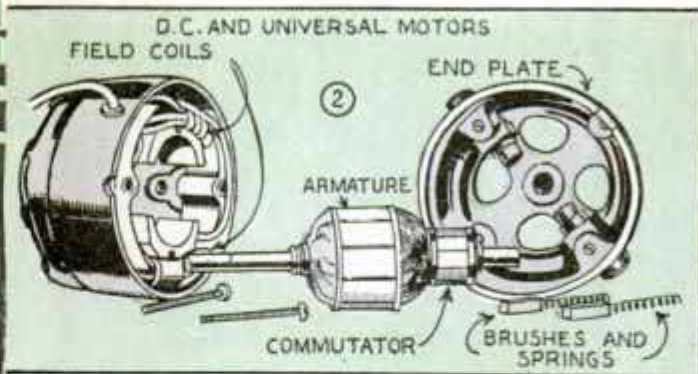
Faults which result in a motor failing to start include burned-out coils, poor connections, worn-out or broken brushes and damaged centrifugal starting switches. The last named are found on split-phase and repulsion-induction motors only. To locate the exact source of trouble speedily, first remove the brushes and examine them. If they are worn out, broken, or have weak springs, they should be replaced. If there is mechanical interference which prevents them from rubbing against the brass rings or commutator, the end plate will have to be removed and





this corrected by taping down the lead wire which has become loose.

A typical a.c. motor of the commutator type is shown in Fig. 1. When a.c. motors hum without starting, either the starting coil or the automatic switch is at fault. This may be verified by removing the load from the motor and giving the pulley a spin by hand. If the trouble is in the starting coil or automatic switch, the motor will take hold and run. The brushes

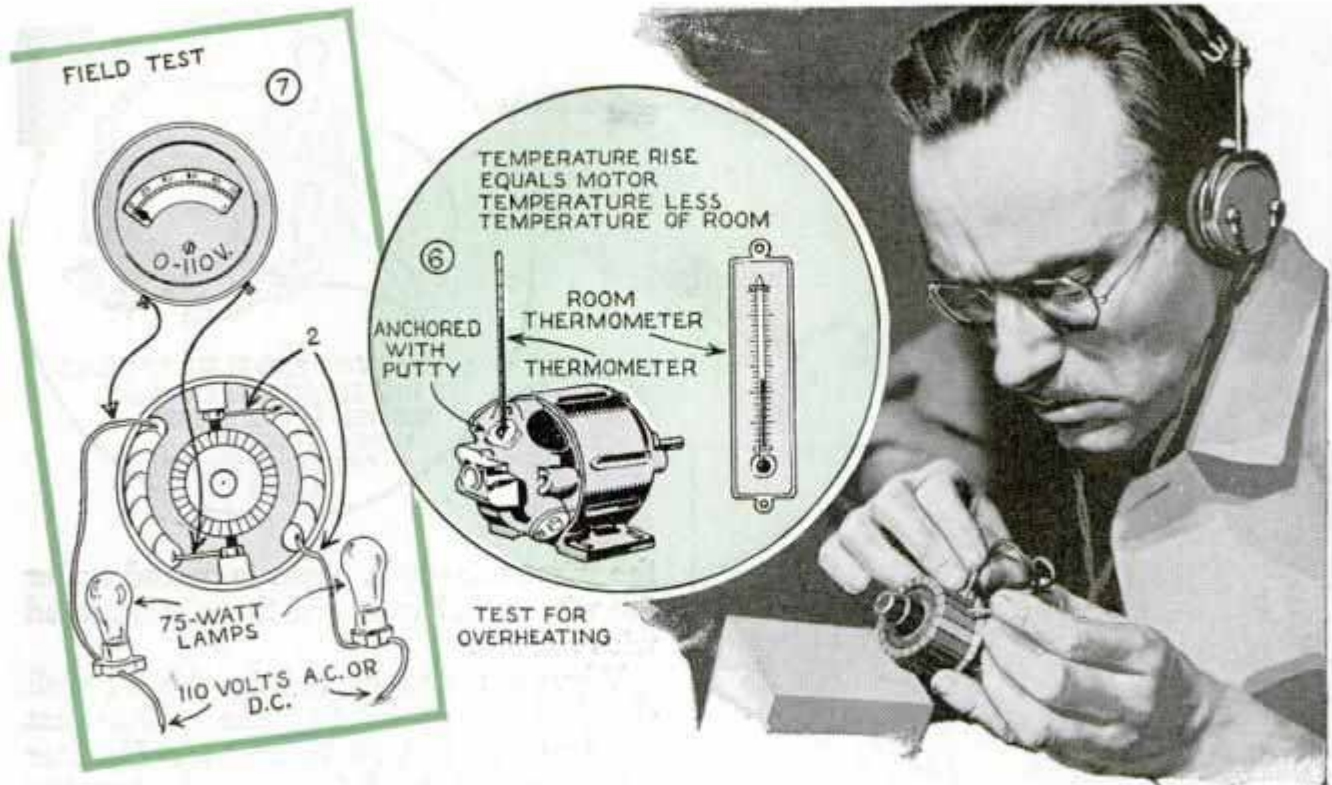


should next be removed if they have not already been inspected. Should they be faulty, replacement will usually result in satisfactory operation. But if the brushes are in good order and the rings upon which they rub are clean and free from corrosion, the centrifugal switch or the starting winding is the source of the trouble. In this case, the centrifugal switch, which is built in as a part of the rotating element of the motor, must be inspected after removing the end plate. There are hundreds of different designs for automatic switches, and it is not possible to point out exactly the procedure to take. However, if the motor is dismantled and the parts inspected, this kind of trouble will be simple to locate. The centrifugal switch is simply a mechanical arrangement, which holds two contact points together when the motor is idle and throws them apart, turning off the current from the starting winding, when sufficient speed is reached. The common troubles encountered with automatic switches of this type are due to weak springs that allow the contacts to open when the motor is idle, or due to corroded contact points.

If the starting switch is in good mechanical condition, the starting coil is burned out and must be replaced to produce normal starting. Split-phase a.c. motors whose starting windings are burned out may, however, be kept in service indefinitely without making repairs if the operator will merely give the belt a husky tug when the motor is turned on. This procedure will start the motor and after once starting, it will run normally without the starting winding.

A commutator motor of the type shown in Fig. 2 which fails to start on occasions,





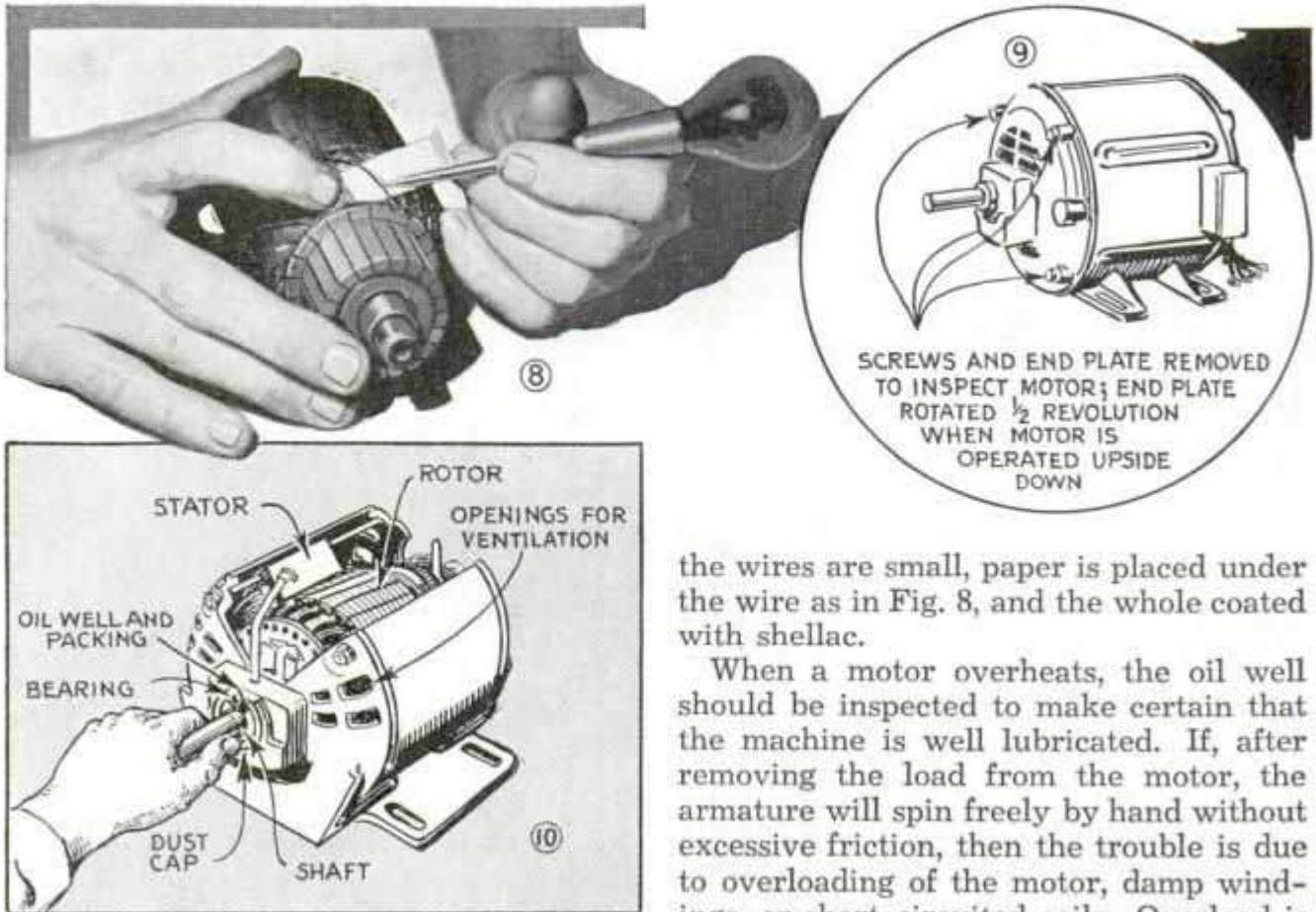
usually has a burned-out coil in its armature. This may be verified readily by turning on the current and rotating the shaft of the motor through a few degrees by hand. If the fault is due to a burned-out armature coil, this will result in the motor taking hold and running but with sparking on the commutator. Then the motor should be dismantled and either rewound or a temporary repair effected.

Fig. 4 shows a method of locating open-circuited or burned-out armature coils. The prods from the lamps are touched to adjacent commutator segments as shown. If the lamps light, the coil between these two segments is in good condition. The points should then be moved to positions 1 and 2 and the test repeated, after which the same procedure is continued until each adjacent pair of segments has been tested. Pairs of segments that do not light the lamps are connected to a burned-out coil. If the user of the motor is familiar with the methods of rewinding, he may remove this coil and replace it with an exact duplicate. If it is not practical to rewind the coil immediately, then the two segments which did not light the lamp may be connected together with a short length of copper wire, constituting a temporary repair. This connection should be made by soldering on the back side of the commutator so that the wire used for

joining the segments will not rub against the brushes or cause mechanical troubles. "Jumping" the segments together in this manner will reduce commutator sparking and allow the motor to start, regardless of the position to which it may come to rest. A motor so repaired will not perform at its maximum efficiency and additional burnouts are likely, particularly if overloaded.

The other cause of a motor failing to start is a burned-out field or stator, as the stationary unit is called in a.c. motors. Tests for fields will be explained later. A motor which does not run at its normal speed is usually overloaded. This condition can be determined by removing the belt and allowing the motor to idle. If it operates at normal speed without load, then a light load should be applied and its effect noted. Other causes for low speed are, poor lubrication; excessive friction in the bearings, due to a bent shaft or to a shaft which has been damaged by grit in the oil wells; short-circuited coils; open-circuited coils and grounds. All of these faults, except damaged coils, may be located by inspection. A grounded armature may be detected by making the tests shown in Fig. 5. To locate shorted coils use a radio headset and touch the tips of the two leads to adjacent commutator segments, progressively, until all have been





9  
SCREWS AND END PLATE REMOVED  
TO INSPECT MOTOR; END PLATE  
ROTATED  $\frac{1}{2}$  REVOLUTION  
WHEN MOTOR IS  
OPERATED UPSIDE  
DOWN

tested in this way. While performing this test, each brush, with the field disconnected, is run to one of the 110-volt supply lines, a 25-watt lamp being cut in each line to furnish the low current required for producing sound in the headset. If the coil connecting a pair of segments being tested is in good order, a buzz will be heard in the receiver, if alternating current is used. If direct current is used, a click will be noticed at the time the feelers are touched to the segments. The absence of a click or buzz indicates that these two segments are short-circuited.

In the case of grounds and shorts, the commutator and coils should be examined for damaged insulation. Some of the wires in the windings will have their insulation damaged and the bare wire either touches the shaft or other metal parts of the armature causing a ground, or touches other wires causing a short. The simplest method of repairing damaged insulation is to place a section of varnished cloth or tape between the wire and its point of contact with metal or other wires. If the wire is large and has sufficient mechanical strength, the tape may be bound in place with thread and coated with shellac. If

the wires are small, paper is placed under the wire as in Fig. 8, and the whole coated with shellac.

When a motor overheats, the oil well should be inspected to make certain that the machine is well lubricated. If, after removing the load from the motor, the armature will spin freely by hand without excessive friction, then the trouble is due to overloading of the motor, damp windings, or short-circuited coils. Overload is easily tested for by allowing it to operate idle, its temperature being noted with a thermometer as shown in Fig. 6. The bulb of the thermometer should be attached to the frame of the motor or to any other suitable part of the motor with a ball of putty. The motor is allowed to run without load until the thermometer ceases to show an increase in temperature. The difference between the room thermometer and the motor thermometer will give the temperature rise of the motor. If this difference is greater than  $100^{\circ}$  Fahr. the motor is often defective. Ordinarily, motors are designed so that their temperature will be about  $75^{\circ}$  above room temperature. Many small motors operate at considerably higher temperature than this, therefore, the motor need not be condemned as faulty if its temperature rises up to  $100^{\circ}$  above the room temperature. If the motor shows up well under test without any load while running, it should again be tested in the same way while pulling its regular load. Overheating, under this condition, means that it is overloaded.

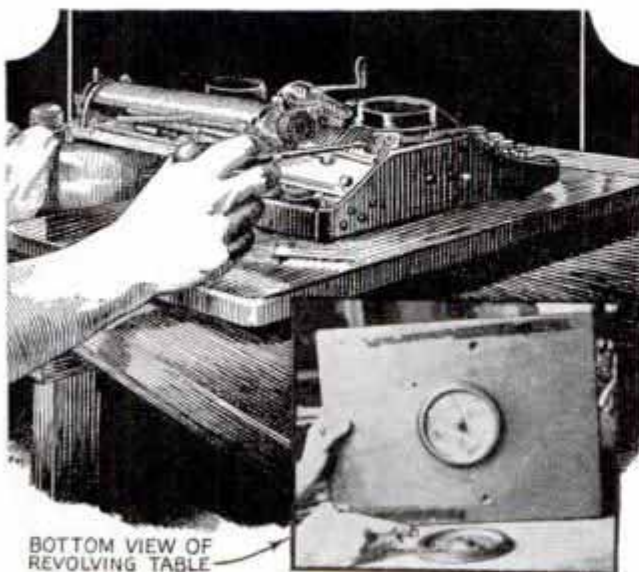
If the field coils are found to heat excessively, the motor should be dismantled and the fields connected to test lamps as shown in Fig. 7. Voltmeter readings are



then taken, one tip being left connected to one lead wire to the motor, while the other is first placed in the position shown, and then moved to the other two positions indicated by 2. It should read the same in both instances. If this is not the case, the coil with the low reading is shorted and should be replaced. In cases of motors having more than two field coils, all of them should be left connected in series and voltages taken across each. After a motor has been dismantled, its reassembly must be carried out carefully. Fig. 9 shows the end-plate screws, which must be drawn up carefully to avoid getting the plate out of alinement. Turning the motor shaft by hand as shown in Fig. 10, while drawing up these screws, will help to produce uniform tension.

### Small Revolving Bench Table Saves Time and Labor

By providing a small revolving table on your workbench, time and labor are saved in handling work that is a little heavy to lift and turn conveniently. There are a number of ways to mount the table. Probably the simplest is to screw a metal-faced wood disk to the underside of the table to bear against a metal disk set flush in the bench top, drilling a hole through the entire assembly and into the bench for a pivot bolt. A pipe sleeve driven tightly into the hole in the table and disk will make a lasting job. When not in use, the table is lifted off the bench and set aside.



*This revolving table enables you to get at all sides of work without lifting and turning it*

### Shopping Bag Supported on Shelf While Opening Store Door



*The appreciation shown by your customers will more than repay you for installing this shelf*

Trouble experienced by his customers in trying to open the door when both hands were full, led one storekeeper to install a shelf near the door for their convenience. The shelf was mounted on the wall about waist high so that the customer could set down the packages in one hand, open the door and then pick them up without stooping.

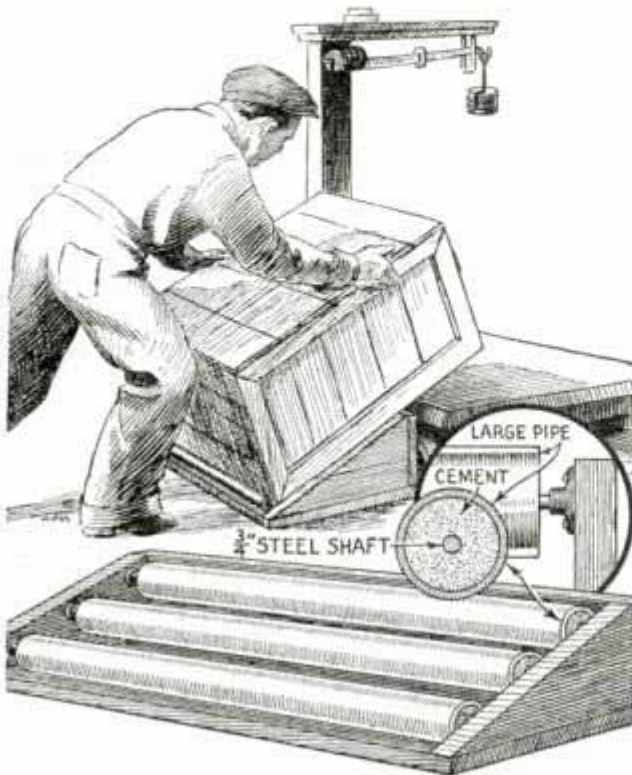
### Pen Wiper from Rubber Sponge

Those who constantly use ordinary writing pens will find a piece of soft sponge rubber an excellent pen wiper. Its resiliency assures getting good contact on the entire surface of the pen, and when dirty, the rubber may be cleaned quickly in warm soapsuds. Any rubber sponge obtainable in the dime store will do for the purpose, and if you wish, it can be cut down to fit a small box or the pin tray of a desk set.





### Heavy Boxes Pushed on Scales with Aid of Roller "Ramp"

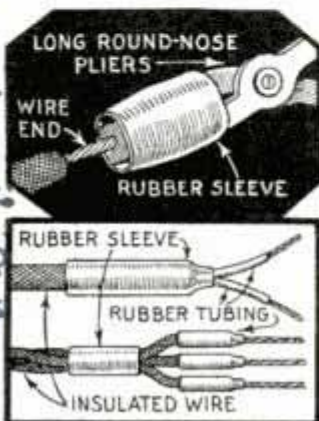


When weighing heavy objects, this ramp saves the back strain of lifting them on the scales

It's easy to push heavy boxes and other objects onto a platform scale when this roller ramp is used. A triangular wood frame of 2-in. material carries the rollers, which are lengths of large pipe with steel shafts centered inside and filled with cement. Floor flanges screwed to the ends of the frame on the inside support the rollers and serve as bearings.

### Electric-Cord Insulation Sheathed at End in Rubber Sleeves

An assortment of 1 to 2-in. lengths of thin rubber tubing from 1/8 to 1/2 in. in diameter will be found very handy for binding the ends of insulated wire, around shops where electrical equipment is made and repaired. Besides providing added insulation, the sleeves of tubing prevent the ends from unrav-

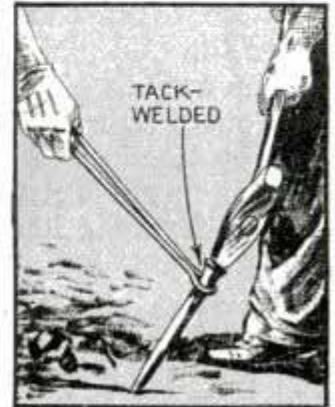


eling and make a neat looking job, especially where the wire ends are exposed outside the equipment. A pair of long-nose pliers are handy for stretching the sleeves to slip them in place.

—Herman R. Wallin, Brooklyn, N. Y.

### Large Chisels Held Safely

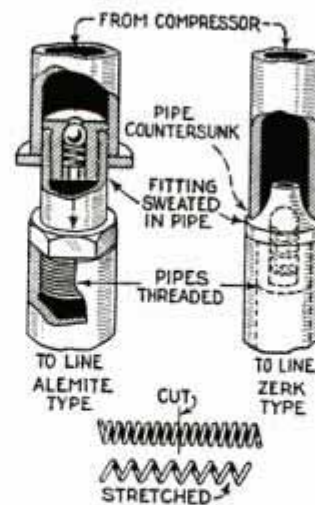
It's safer for the man who holds a pavement-breaking chisel if it is fitted with this long handle, which enables the workman to keep his hands clear of any glancing blow that might be struck with the sledge. The handle is a length of small iron rod folded around the chisel and tack-welded as shown.



A few sledge blows will remove the handle if the chisel is needed for other work.

### Small Check Valves in Air Lines Made from Grease Fittings

Efficient check valves for use with small air compressors can be had by inserting grease fittings of either the Alemite or Zerk type in the air lines as shown.



The ball-and-spring mechanism of the fitting allows free entry for compressed air but effectively prevents a reverse flow. If the spring in the fitting is too strong for the air pressure handled, it can be removed, cut in half and one piece stretched to

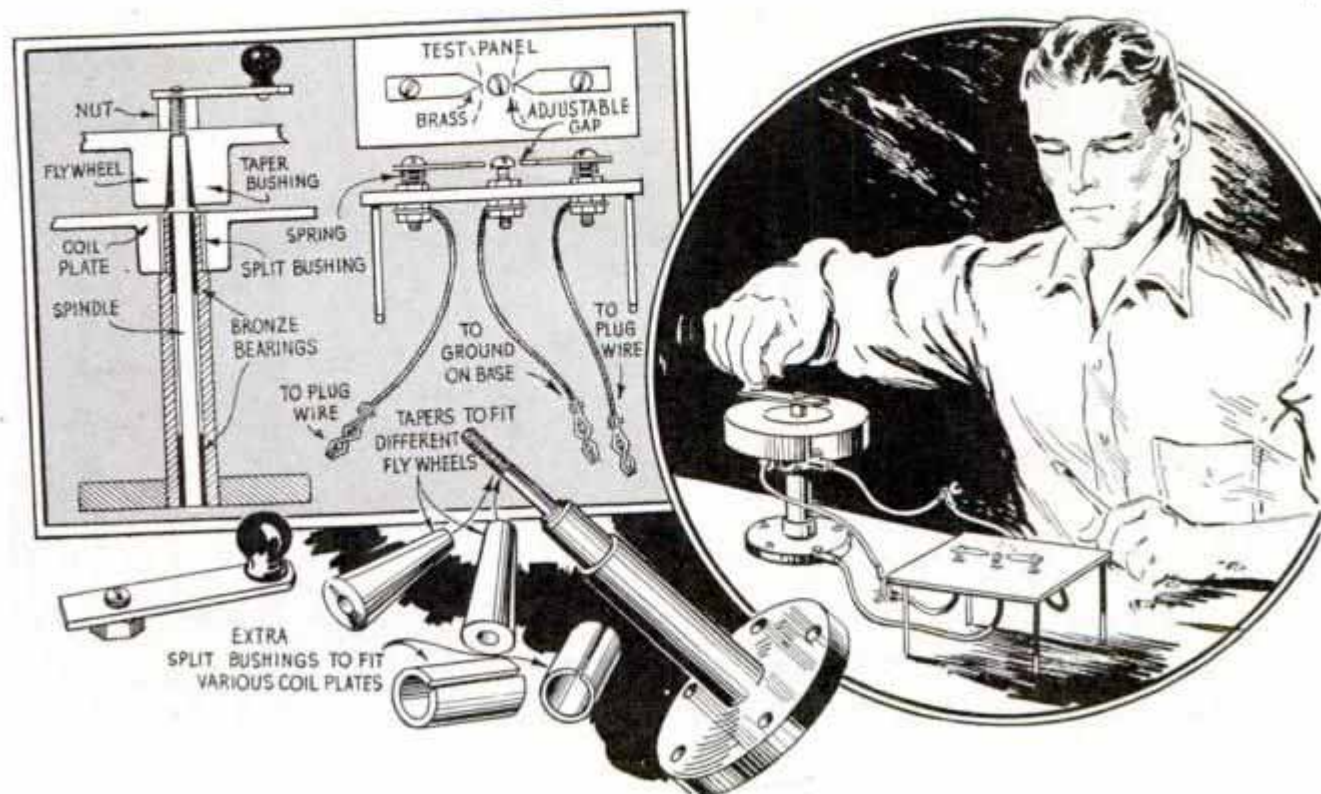
the original length of the spring, thus allowing the ball to release under less air pressure. These improvised valves may be used in making small hydraulic presses and jacks or models of rams.

—W. C. Wilhite, Edelstein, Ill.

Patd by English firm. U.S. Pat. 1,725,638 and 1,748,765



## Outboard-Motor Ignition Checked Accurately



Anyone who has tried to test the ignition system of an outboard motor, while cranking it with a starter rope, will readily realize the advantage of this test stand. It holds the coil plate and flywheel so that the latter can be turned and the intensity of the spark checked between adjustable test points. The coil-plate bearing surface of the stand is made small enough to accommodate the smallest type of flywheel magneto, larger types being adapted to the tester by means of split bushings. The spindle is made as shown, so that different

tapers, to suit all flywheel bores, can be slipped on at will. With the coil plate and flywheel assembled on the stand, the handle-and-nut assembly is screwed onto the spindle, holding the flywheel firmly in position to provide a means of cranking the magneto at a wide range of speeds. The spark-plug wires from the coil are connected to the test points, which are mounted on a hard-rubber base, the center contact of the base being connected to the stand to complete the circuit.

—Jack Beater, Fort Myers, Fla.

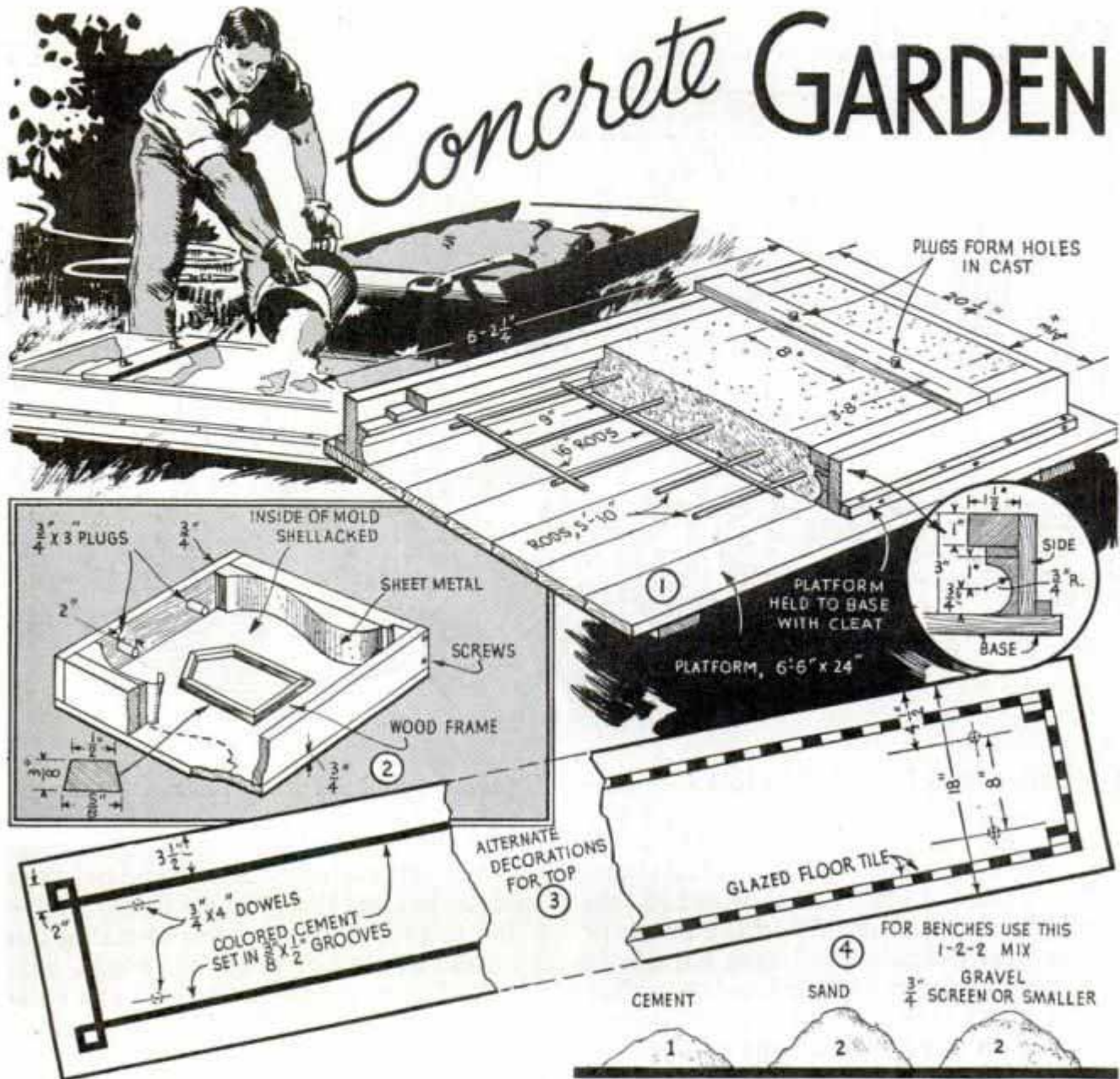
## Adding Machine Rested at Angle Eases Strain on Operator

In our office, where portable adding machines are used on flat-top desks, I find that a machine is much easier to operate when rested against an inclined support as shown. This brings the keys into a position where they are seen without straining the eyes, and are easily reached without getting the hand and arm into an unnatural position. The support is made of wood and set at an angle suitable to the operator.—F. E. Walker, Charlotte, S. C.



☐ Protect your fishing rods by giving them a coat of automobile polishing wax once or twice during each season.





*There's no longer any need to have your garden furniture in the dull gray of natural cement; just add color pigment to the cement and you can get almost any effect from soft pastel shades to bright spots of color that catch the eye*

### Part I—Benches with Inlaid Designs

**H**AVE you ever thought how much more attractive concrete garden furniture would be if it were made up in colors that harmonized with the surroundings? Colored cement is the answer, and all you need to buy is the cement and the color. You can do the work yourself. Molding the parts is merely a matter of some pains in putting together a substantial form out of rough lumber. Then you have to be particular about the cement mix and see that it is thoroughly tamped into the mold to expel the air. And that's about all there is to it.

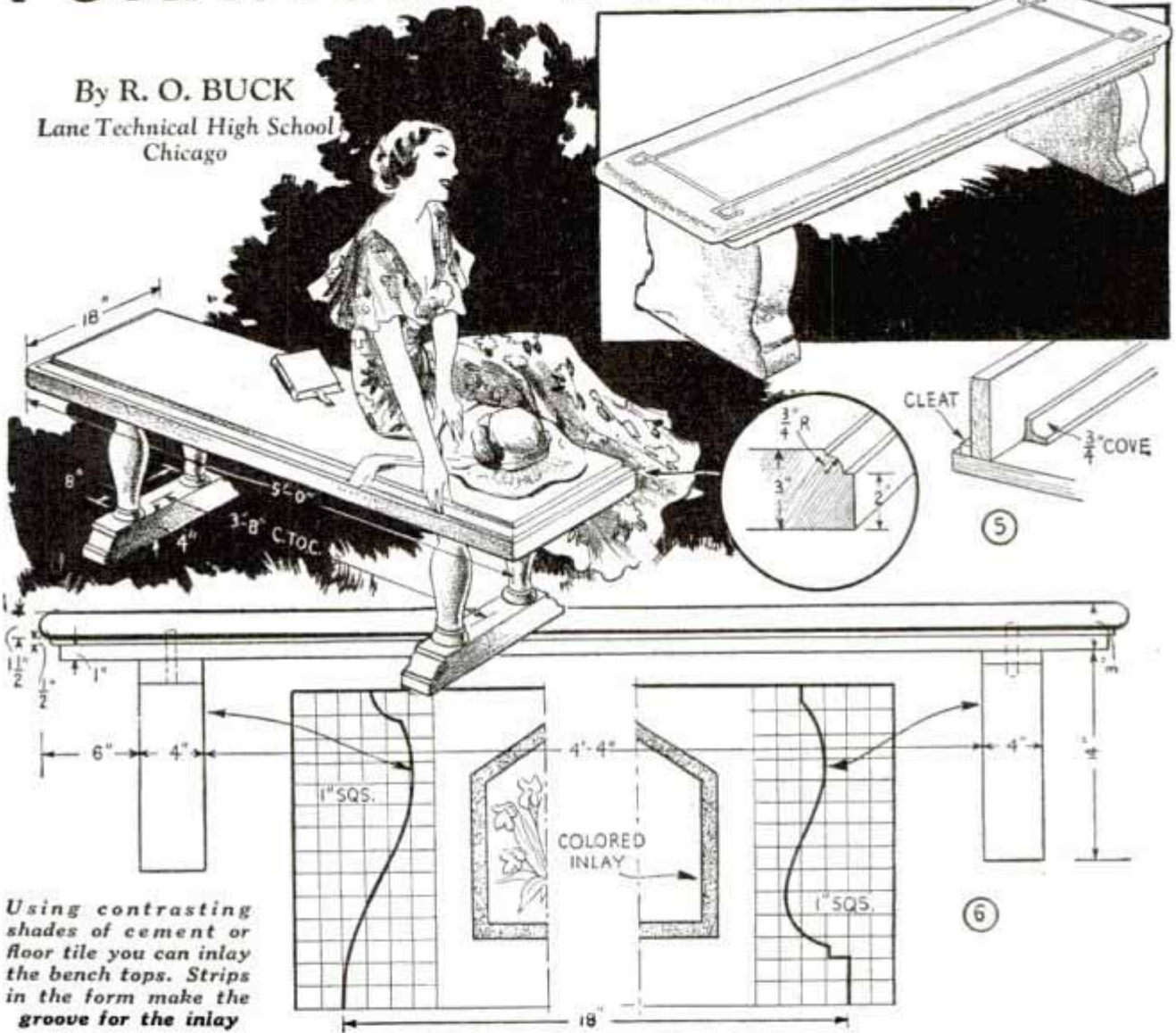
Fig. 1 starts you off with the form for

the top of the bench shown at the right in Fig. 5. The top is cast upside down as in Fig. 1. This bench is made up of three members but requires only two forms. The frame of the top mold is built first, then the various pieces that shape the molded edge are nailed to the inner faces. The pieces are all screwed together so that after the concrete sets they can be removed piece by piece to avoid breaking the sharp edges. As the top is doweled to the ends, four plugs, spaced as shown in Fig. 1, are used to cast the holes. The plugs should fit fairly loose so that they may be removed easily. All concrete forms



# FURNITURE *in Color*

By R. O. BUCK  
Lane Technical High School  
Chicago



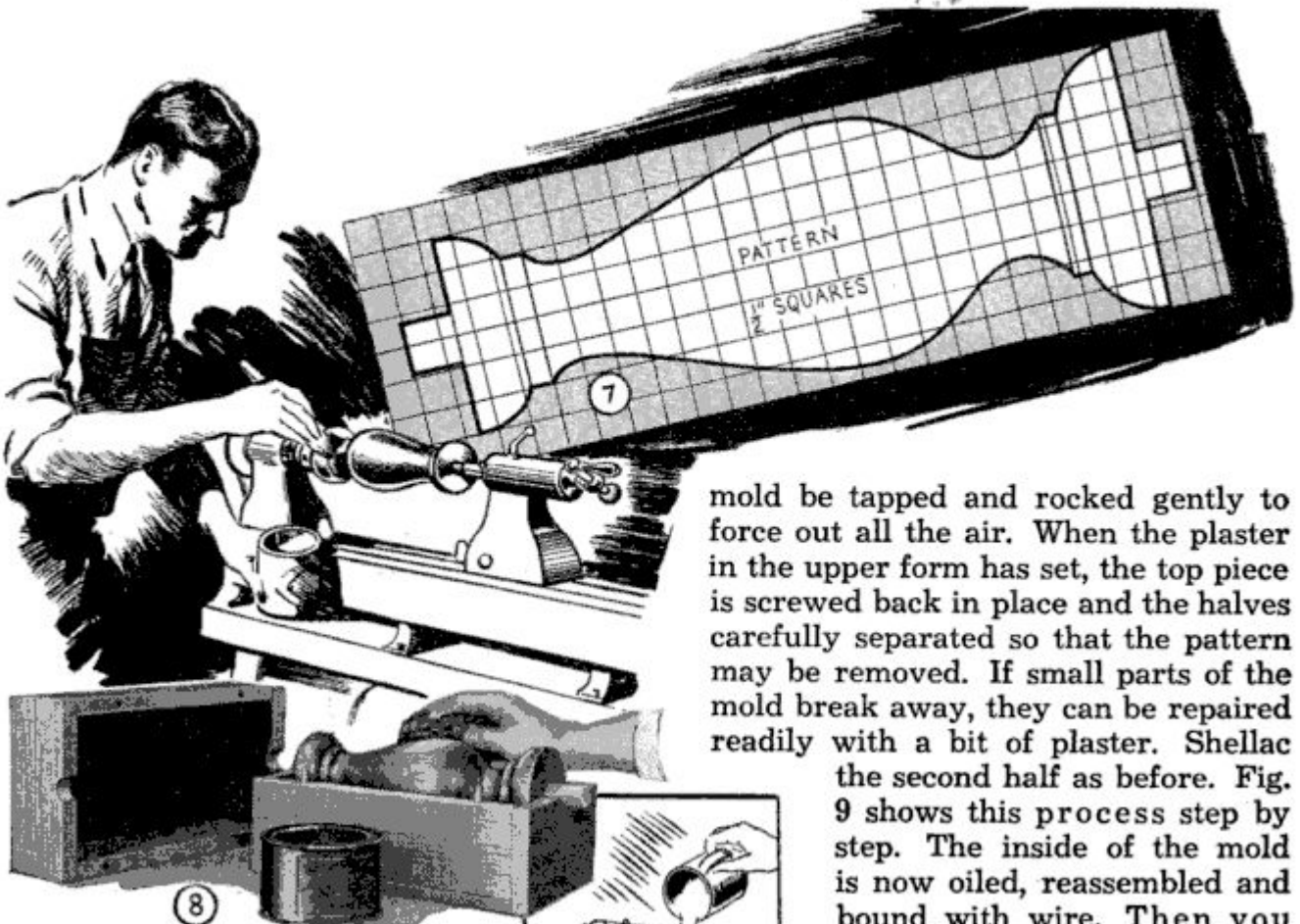
Using contrasting shades of cement or floor tile you can inlay the bench tops. Strips in the form make the groove for the inlay

should be shellacked or painted at least two coats on surfaces that come in contact with the wet mixture. Also, just before casting, the surfaces should be covered with a thin film of oil. No. 20-W crankcase oil is about right. The cement mixture, Fig. 4, is tamped into the mold to a depth of about 1½ in. after which the reinforcing rods are laid in position as in Fig. 1. Care must be taken that the ends of the rods are at least an inch from any surface. The end form is built up as in Fig. 2, the size and possible variation in the center ornament being given in Fig. 6. Molds of this type are filled from the side. Curved blocks are cut out on the band saw to form the sides, as in Fig. 2. Placing the plugs for the dowels, laying the

reinforcing rods and filling the mold varies little from the process just described for the top.

A second and somewhat more difficult design, shown at the left in Fig. 5, consists of seven members but requires only three forms. The construction of the top mold is similar to the one previously described, making use of a simple cove to form the edge, as in the details in Fig. 5. The base pieces are cast in a simple mold, the construction of which is shown in Fig. 10. Only the bottom is fastened with screws. The sides are nailed as they need not be removed to take out the finished casting, due to shrinkage. Two reinforcing rods are suggested. The mold for the leg pattern is made with casting plaster. A





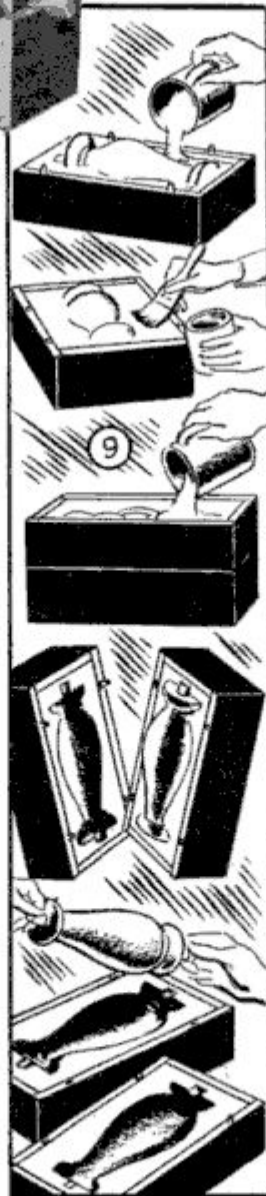
mold be tapped and rocked gently to force out all the air. When the plaster in the upper form has set, the top piece is screwed back in place and the halves carefully separated so that the pattern may be removed. If small parts of the mold break away, they can be repaired readily with a bit of plaster. Shellac

the second half as before. Fig. 9 shows this process step by step. The inside of the mold is now oiled, reassembled and bound with wire. Then you unscrew the ends, set the mold up and insert a piece of  $\frac{1}{2}$ -in. pipe long enough to extend 2 in. beyond the plaster at both ends. The mold is filled with a "soupy" mixture of equal parts of sand and cement. This molding process is repeated until four spindles are produced. The spindles are doweled into the base and top by means of the pipe, the joints being set in a paste made with cement and water as in Fig. 11. A layout for a curved bench top is shown in Fig. 14. The method of casting is similar to that described except that there are six spindles and three bases.

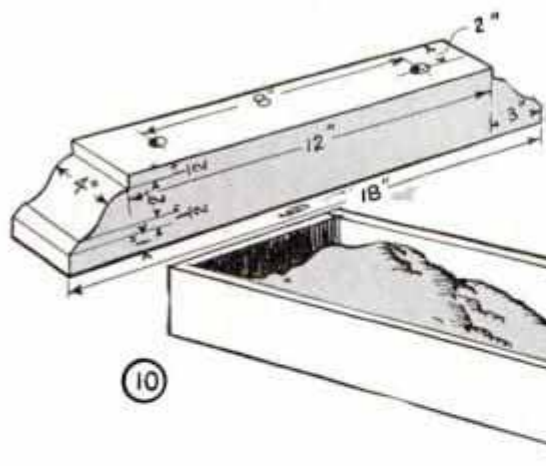
Now something about the possibilities of decoration: One of the simplest ways to decorate the ends of the first bench described, is by means of depressed panels. Fig. 12 shows a pleasing design with this ornamentation. Another feature of the design is the stepped base, which is produced by a mold of the type shown in Fig. 13.

Look at the lower bench in Fig. 5, then at the illustrations above, and you'll see how the legs are made in a plaster-of-paris mold. By packing the plaster about the pattern in the two halves of the mold the latter can be parted and the pattern removed

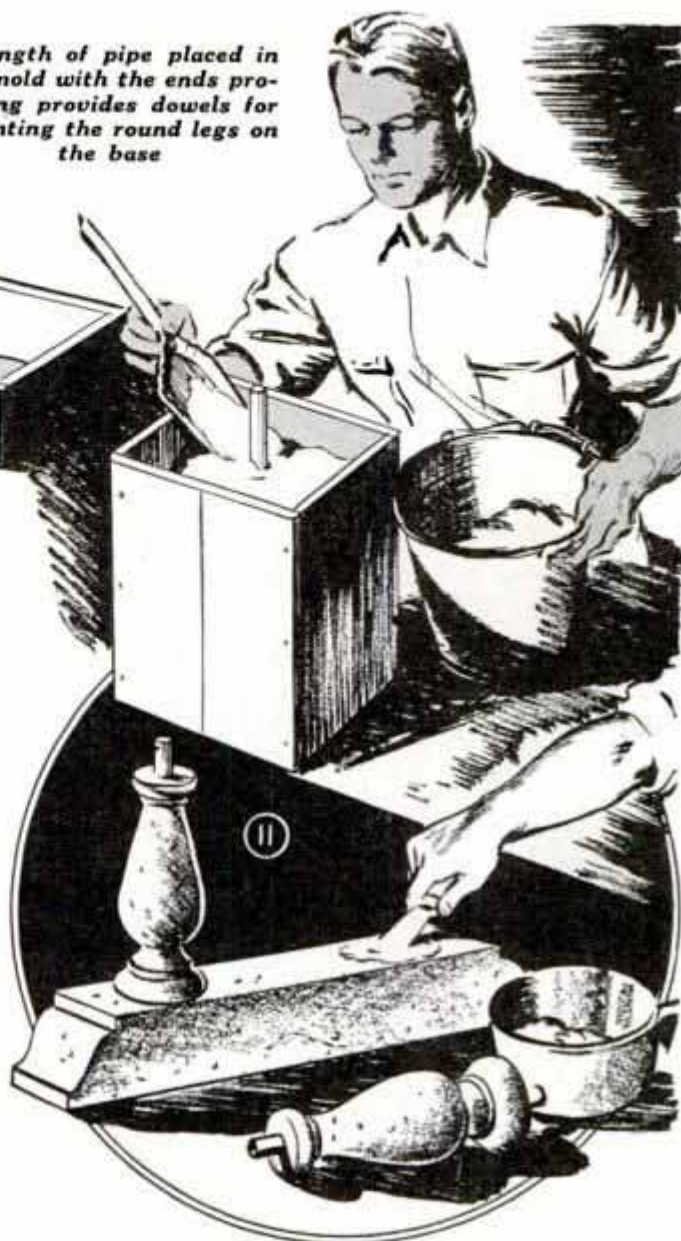
wood pattern is turned up on the lathe and shellacked while still mounted, as in Figs. 7 and 8. Next, you build a box large enough to permit packing about 1 in. of plaster all around the pattern, except at the ends. Use screws to fasten all pieces together. After boring holes in each end large enough for a  $\frac{1}{2}$ -in. pipe, the box is sawed through the center. When the inside surfaces of both halves, as well as the pattern, have been shellacked, as shown in Fig. 8, the mold containing the pattern is filled with plaster of paris and set aside for about 24 hours. Shellac and oil the surface of the plaster to form a parting, then put the empty half of the box in place, remove the top and again fill with plaster. In both pourings it is important that the







*A length of pipe placed in the mold with the ends projecting provides dowels for mounting the round legs on the base*



An attractive form of decoration is shown in the top view, Fig. 3. Strips of wood are tacked into the mold to form a recessed design, which later is filled with a cement of contrasting color. A variation of this method is the use of colored tile, these being embedded in the concrete. This is accomplished by sticking the tile to the bottom of the mold with pitch or rubber cement, along the lines of a design previously marked out.

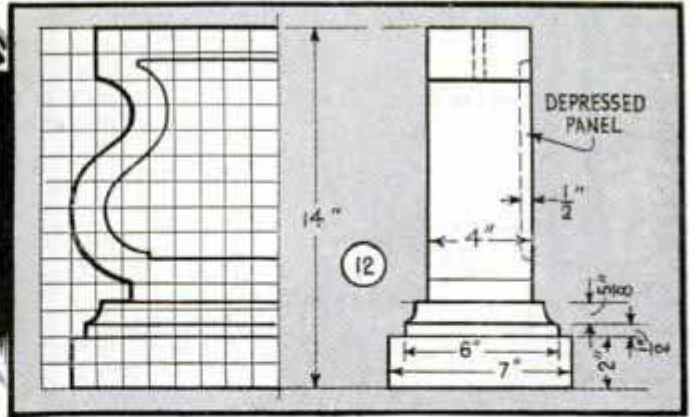
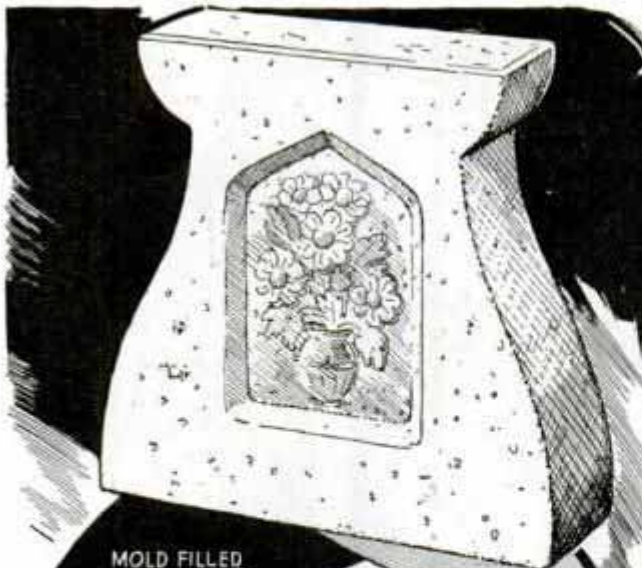
Benches require a 1-2-2 mix, Fig. 4. That is, 1 part of cement is mixed with 2 parts of sand and 2 parts of gravel consisting of pebbles  $\frac{3}{4}$  in. and smaller. The ingredients must be mixed thoroughly before adding the water. It is important that the cement and water be used in the proper proportion. For work of this type  $3\frac{1}{2}$  gal. of water to a bag of cement is about right, provided the sand is rather wet, as is usual. In case a trial batch proves too dry or too watery, it should be brought to the right consistency by adding or omitting some of the gravel; never by adding or omitting water. Your mix should be semi-dry.

Color is obtained in two ways, by mixing mineral colors with the cement to obtain color throughout the piece or by applying a colored mortar with a stiff brush to the surfaces. Less skill is required to get a uniform shade where the color is mixed with the cement. Then the color will be durable, but as a considerable quantity is required, the cost will be greater than that of applying a colored mortar. The color pigment is added to the dry cement and thoroughly mixed, then sand and gravel are added as described above. When light shades are desired,

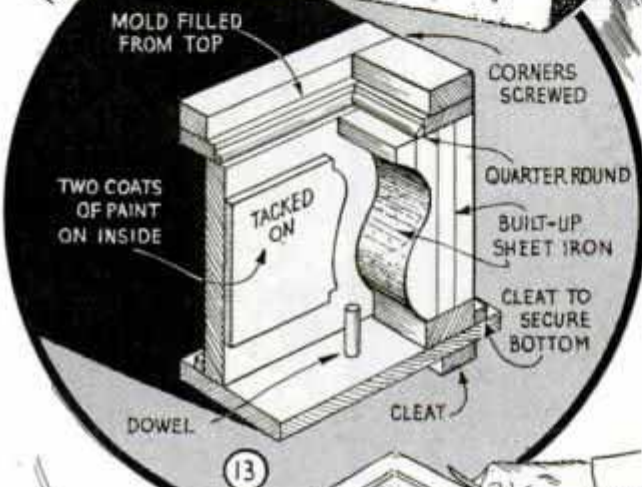
white crushed stone should be used instead of gravel. If the color is to be painted on the work, the pigment is mixed with cement and enough water added to produce a mix with the consistency of cream. This mix is then applied to the work with a stiff brush. Only mineral colors should be used for cement as other pigments are likely to fade or reduce the strength of the mixture. Never add more than 10 per cent, by weight, of pigment to the dry cement as taken from the bag. Varying the amount of pigment varies the exact shade of color. White cement is mixed with color to obtain pastel shades. It's well to remember that the color is considerably darker when wet.

Now it is very important that the dry ingredients, that is, sand, gravel, cement and color pigment, be thoroughly mixed



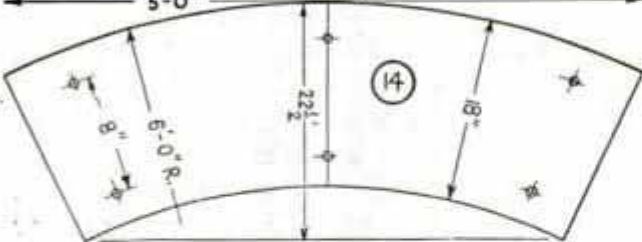
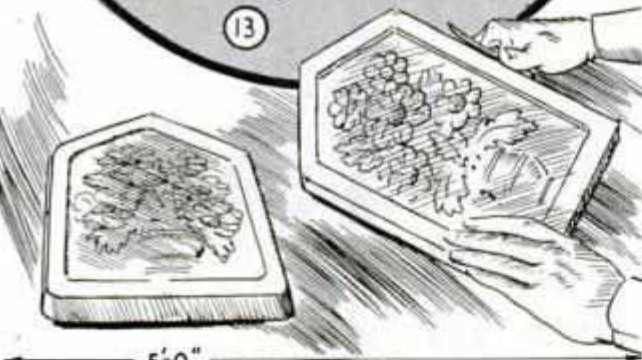


Variation in the ornamental panels of the bench end pieces is possible. For instance, the end can be cast with a stepped base and a plain depressed panel as in Fig. 12. Perhaps you will want to carve a flower or leaf design on the section that forms the panel, with a result like that shown at the upper left



to expel the air and assure even distribution.

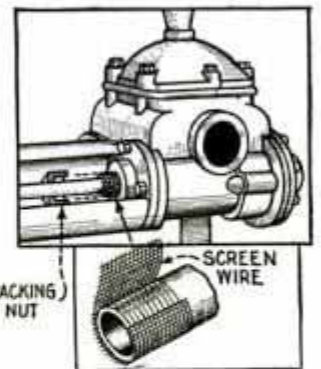
Concrete work must always be cured to prevent its drying too rapidly and producing a crumbly job. Leave the pieces in the mold about three days, keeping the casting moist by covering with burlap, which is sprinkled from time to time. Pieces should be protected from the sun and wind and kept moist several days after removing from the mold.



### Worn Threads on Packing Nut Filled by Screen Wire

When the threads became worn on the packing nut of my small water pump so

that they wouldn't hold, I wrapped the pump gland with one layer of fine screen wire, screwed on the nut and found that it held very tightly. This idea can be used on almost any cap screw, bolt, tool or machine where you are bothered with worn threads. The wire is much better than cloth, cord or thin tin, which is often used.



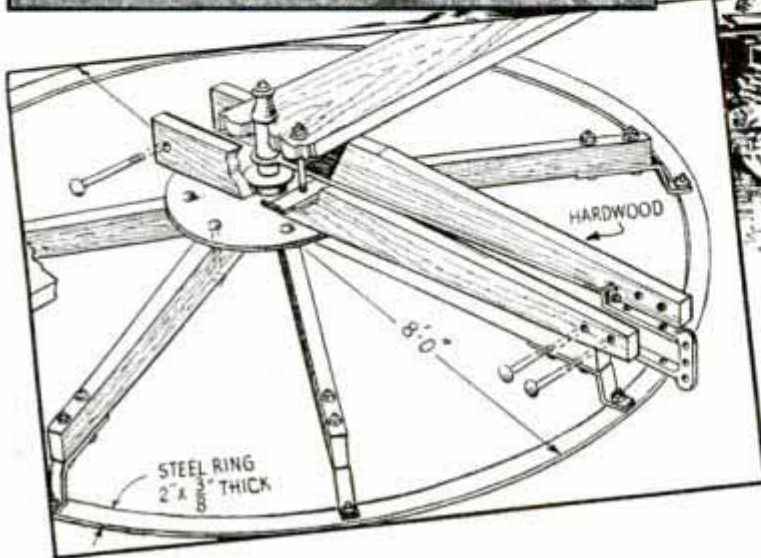
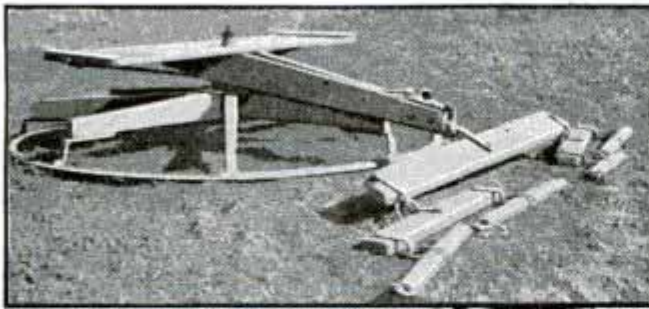
—A. H. Waychoff, Tempe, Ariz.

before you add any water. The box in which you place the various materials should be sufficiently large to hold a complete mix for one bench, otherwise you may have some difficulty getting the proper shade of color. Another thing to look out for is foreign matter such as leaves, small twigs, dirt and pieces of paper. The presence of any one of these will cause trouble in the mold. When you pour the mixture into the mold, it must be tamped

ⓘ Instead of mixing bronze powder with varnish to get a bronze finish, try dusting the powder on the varnished surface while it is still tacky.



## “Merry-Go-Round” Weeder for Hilly Farms



*The blade of this weeder rotates slowly as it is pulled forward, thus having a tendency to free itself of trash as it loosens the soil and destroys the weeds*

Especially effective on rolling ground, this weeder is a very popular one with the farmers around Silverton, Ore. The blade is a large, unsharpened steel ring about 8 ft. in diameter. Six or eight spokes extend from the hub on which an 8-ft. beam is bolted. To one end of the beam a three or four-horse evener is fastened while a transverse platform, about 5 ft. long, is bolted to the rear end. The driver stands

on the platform and his weight on either side of the center will cause the ring blade to dig into the soil on that side. Thus, as the ring encounters more resistance on one side than on the other, it will rotate as the weeder is pulled forward. As the unsharpened blade has a tendency to pull weeds rather than cut them, it is claimed to be more effective in destroying them.

—Henry W. Young, Portland, Ore.

## Milkman's Tray Cushioned to Silence Rattling of Bottles

To keep bottles from rattling in a wire tray and awakening his customers in the early morning hours, one milkman lined the top of the tray with strips of inner tube as shown. The strips are wrapped spirally around the upper members of the frame and partitions, after which the ends are cemented. Rubber hose may be used instead of the inner tube by slitting it and slipping it over the frame members.

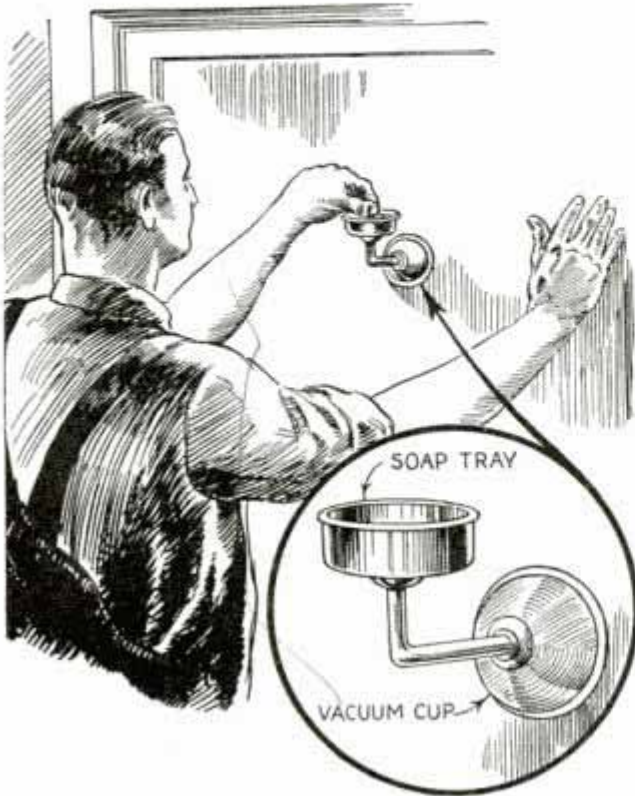
☐ When feeding a printing press, or otherwise handling paper, apply a solution of turpentine, 1 oz., and yellow rosin, 1/2 oz., to the finger tips and you can grasp the individual sheets easily.



*Rubber strips wrapped around upper members of tray prevent empty bottles from touching metal frame*



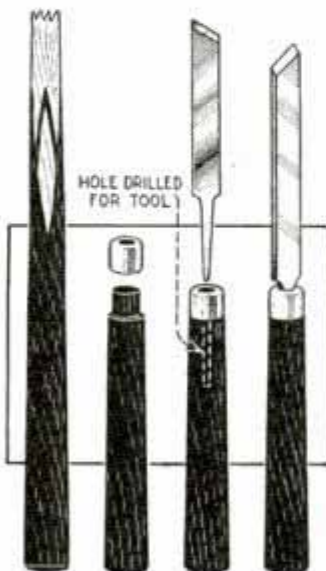
## Glazier's Materials Kept at Hand in Vacuum-Cup Soap Tray



Soap tray, which attaches directly to glass, holds glazier's materials conveniently

Glaziers will find a vacuum-cup soap tray very handy for holding putty, points and other materials when installing windowpanes. The tray is readily stuck to the glass at any convenient position, which leaves both hands free for the job and makes it unnecessary to reach into a box or the pocket to get the glazier's points.

## Wood-Turning Tool Handles from Billiard Cues



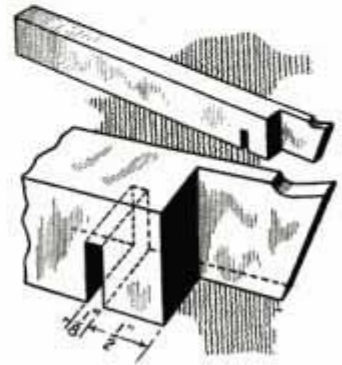
Discarded billiard cues make excellent handles for wood-turning tools. Cut them to suitable length, provide ferrules made from old bronze bushings or brass pipe, and drill for the tangs of the tools. The handle of a cue is generally of mahogany or walnut and although dif-

ferent from the conventional shape of wood-turning tool handles, has an excellent "feel" and balance. There is no need of having all handles in a set exactly alike, variation in them making it easier to select the desired tool.

## Lathe Parting Tool Is Slotted to Stop Chattering

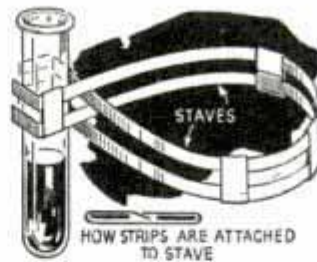
I find that the tendency of a lathe parting tool to chatter or dig into the work can often be prevented by slotting it on the underside about  $\frac{1}{2}$  in. from the cutting end as shown. This makes the tool slightly flexible at this point. This idea works equally well on other cutting tools both in a shaper and a lathe.

—Edw. N. Olson, Philadelphia, Pa.



## Neat Test-Tube Holder

To make this simple test-tube holder take two narrow strips of spring steel or brass and bend the ends at right angles. Then fasten them together with strips of tin, leaving slightly more than the width of one strip between them



## Hypo Solution for Large Tanks Mixed Easily

Instead of mixing hypo crystals and water by the pailful to fill a large tank, I first fill the tank with the required amount of water, put the crystals in a bag made of open-textured cloth, and suspend the assembly into the water a few inches. A small rope run through a screw eye in the ceiling above the tank and tied to the bag simplifies the job. If the crystals are suspended in the water before leaving at night, they will be dissolved by morning.

—Alfred Boutin, Bingham, Me.



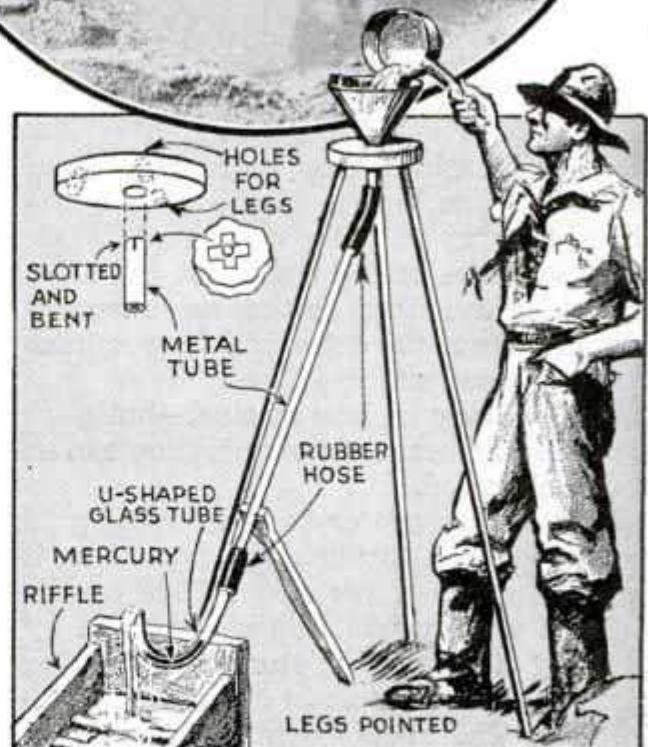
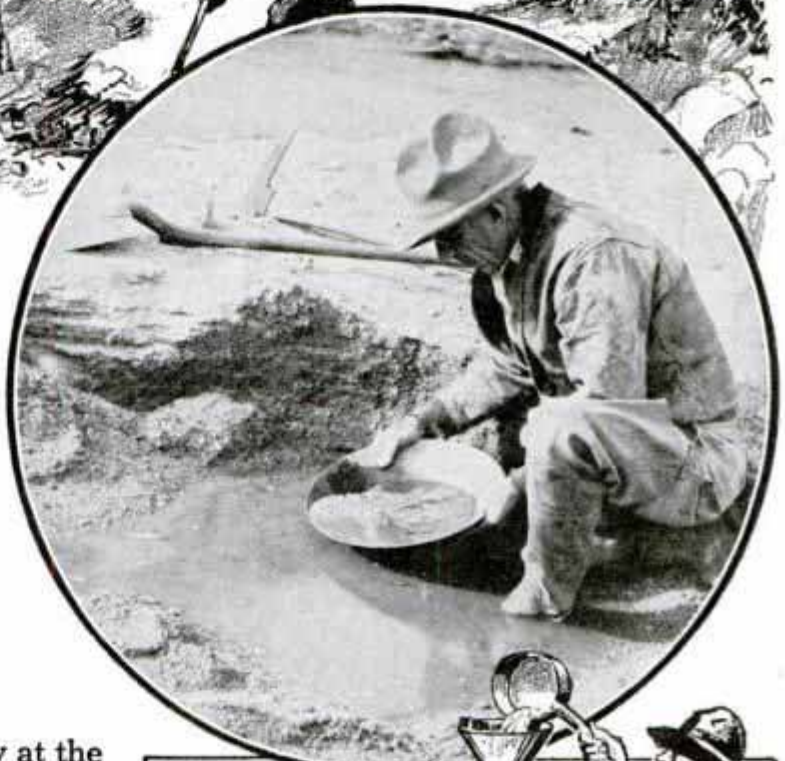
# Finding GOLD in SILT and SAND



By George H. Eckhardt

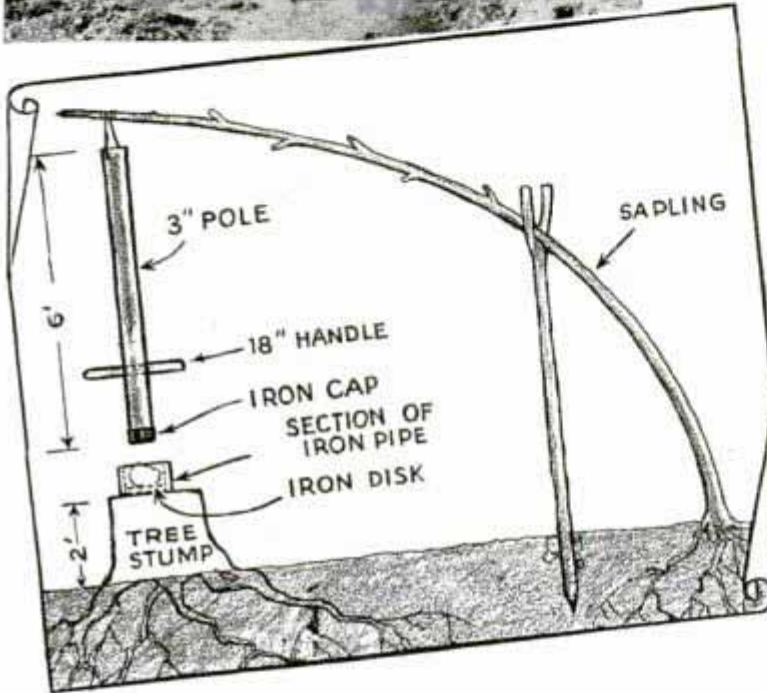
PRIMARILY intended as a simple but effective help for the prospector whose chief object is to find where the gold lies, rather than to mine it on a large paying scale, the simple gold-recovery apparatus described in this article can be cheaply made by anyone, is collapsible and light in weight, and does not require skillful handling to make it work efficiently. It was designed by Samuel Gordon, associate curator of mineralogy at the Academy of Natural Sciences in Philadelphia, to meet actual field conditions, and in connection with its use, Mr. Gordon also gives some valuable information usually not available outside of mining engineering circles.

The apparatus extracts gold from silt, fine sand, clay, and sludge. The whole arrangement consists of a funnel mounted on a tripod, a length of metal tubing connecting the funnel to a U-shaped glass tube, two short lengths of rubber hose giving the required flexibility to this part of the outfit. The U-shaped glass tube is filled with mercury, the mercury column extending well up both arms of the "U." A riffle, made of boards with strips across the bottom, somewhat resembling a wash-board, is placed under the open end of the glass tube to catch and hold any globules



When a gold-bearing sludge is poured through this simple apparatus, the gold amalgamates with mercury contained in a U-shaped glass tube





*Utilizing a sapling, a stump and pieces of iron pipe, the prospector can make a miniature "stamp mill" for crushing small quantities of ore so that it may be run through the gold-recovering apparatus*

of mercury which may be forced out of the tube. The bottom of the riffle is inclined to carry away the water and sludge, but should be sealed tightly at the sides and along the strips so that any mercury escaping from the tube will be retained. The "U" need not necessarily be of glass tubing—it may be iron or steel—but glass is preferable because the operation can be better observed.

Now, before ore or sand carrying gold can be poured through the apparatus it must be crushed very fine. This can be done in a dolly which is easily made by utilizing a sapling, a stump, and a few pieces of iron pipe as in one of the illustrations. The arrangement makes a very effective crusher for small quantities of ore. The fine material that comes from the crusher is thoroughly worked up with

water until it is brought to an easy-pouring consistency. This sludge is then poured through the apparatus, steadily and not too rapidly, adding water if necessary. As the sludge passes slowly through the tube and out into the riffle, the gold amalgamates with the mercury.

It's easy to separate the gold from the mercury and recover the latter for use again and again. The mercury-gold amalgam is removed from the glass tube and squeezed in a chamois, or several thick-

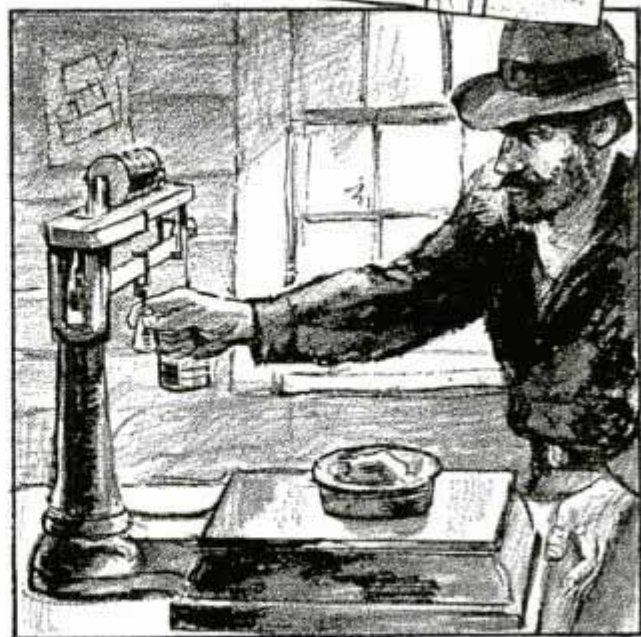
nesses of linen handkerchiefs, to remove the dirt. It is then placed in an iron pan or spade and a large potato is cut in half and the center hollowed out to form a "tent" over the puddle of amalgam. The pan is then held over a fire. The heat volatilizes the mercury, causing the release of its gold content, the latter collecting in a tiny "button" on the bottom of the pan. At the same time the mercury is condensed as globules in the potato where it can be recovered by mashing the latter in a kettle of water. A brass, copper or zinc pan must not be used with mercury, nor should these metals be used in making any part of the apparatus because of the reaction of mercury with these metals.

Strangely enough gold is quite widely distributed among the rocks of the earth's crust, and can often be found in unsuspected places. Scientists have calculated that five-ten-millionths of one per cent of the earth's crust is made up of gold. This may seem an almost microscopic percentage, but it should be remembered that gold is a precious metal. For instance, no one would expect to find gold in the clay excavated for a subway in Philadelphia, yet this was found to contain one part of gold in one million parts of clay, and each cubic foot carried about three cents worth of gold. The Delaware river near Philadelphia has never been famous as a gold-carrying stream, yet workmen have netted as high as sixty cents per day panning gold along its banks. Every county in California contains gold, in fact it is mined in two-thirds of the counties of this state. Yet before 1824 most of the gold brought to the United States mint came



from Georgia, Alabama, North and South Carolina, and Virginia. At present, an iron mine at Cornwall, Pa., yields \$13,000 worth of gold a year as a by-product.

Mr. Gordon says that there are two modes of occurrence of gold which interest the prospector. Everyone is familiar with the fact that gold occurs in veins of quartz. Quartz, however, is the most common of all minerals, and it is obvious that veins of it carrying gold in paying quantity are exceedingly rare on the face of the earth. More often they contain "fool's gold" or pyrite. This is very hard, it cannot be scratched with a penknife, whereas gold is soft and malleable, and forms fernlike crystals rather than the beautiful symmetrical cubes and octahedra of pyrite. Of course, both pyrite and gold may occur in the same quartz vein and this has been a help to the prospector. At the outcrop of a quartz vein pyrite "rusts" or weathers, forming limonite, a yellowish brown porous material which gives the vein a rusty appearance. This weathering of the vein, and leaching away of the more soluble constituents, causes some concentration of the gold in the outcrop, where it can be detected with a hand glass by the prospector. Where this concentration has occurred through the ages, by disintegration of quartz veins in mineralized areas, placer deposits may be formed in the beds of creeks or rivers. Rains and snows wash silt, dirt, clay, and gold down the hills and mountain sides. The lighter materials are carried on to the sea, while there is a tendency for the heavy gold particles to be concentrated in riffles in the stream beds along with magnetite and other heavy minerals. Nature has thus concentrated for the prospector small accumulations of gold. The richest hoards, however, have been found in ancient water courses, that is in "fossil" rivers and creeks, channels where water once flowed, but now filled with sand, silt, and gravel. Perhaps the stream was diverted to another channel, or the district became arid. At any rate, some of the richest finds in Australia and the Klondike have been made in such ancient "gutters."

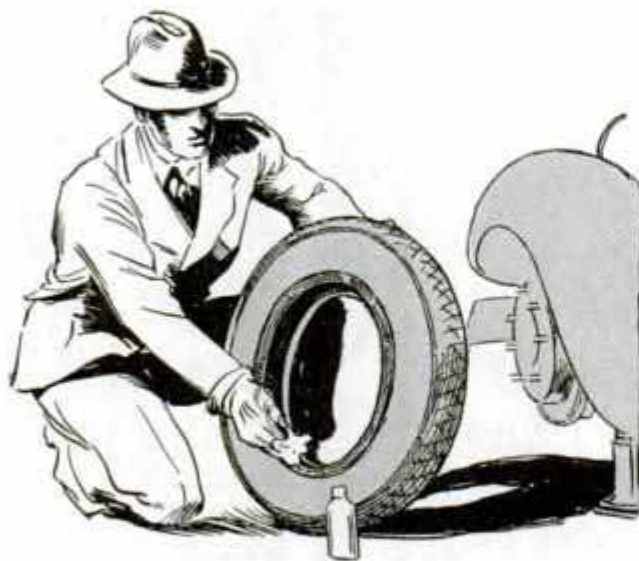


*Recovering both the gold and the mercury is easy. Heat volatilizes the latter which condenses as globules in half of a potato and leaves the gold in the bottom of the container. Mashing the potato in a pan of water releases the mercury*

☞ Cover sharp corners of workshop machinery with adhesive tape to avoid tearing the clothing.



## Tire Beads Are Soaped to Slip on Rims Easily



*It's a simple job to slip a tire on a drop-center rim if you soap the beads*

By applying liquid soap liberally to the bead of a tire before attempting to force it on a rim, the mounting job is made easy, and strain on the beads with tire irons is avoided. This method works so effectively that one auto factory uses it constantly.

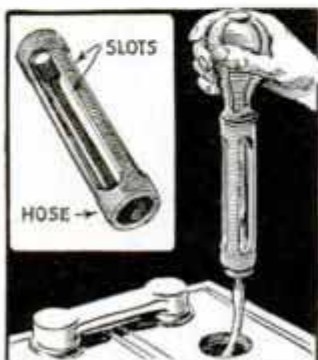
—C. E. Packer, Chicago.

## Radiator Overflow Pipe Plugged When Testing for Leaks

To plug the overflow pipe when testing a radiator for leaks, I use a common penny eraser of the type that slips over the end of a pencil. The eraser is simply pushed into the upper end of the pipe. Pressure of the water will hold it in place, making a leakproof plug. If the pipe cannot be plugged at the upper end, put the eraser on the bottom and tape it in place.

—Emil J. Novak, Omaha, Nebr.

## Shield for Battery Hydrometer

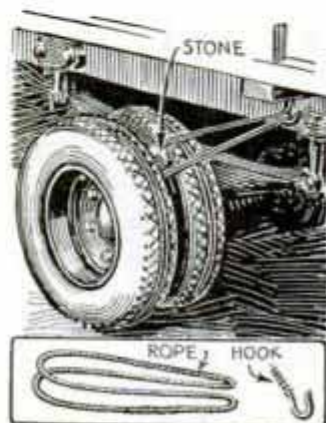


The few minutes it takes to make this shield is time well spent as it may save your battery hydrometer from being broken. The shield is a piece of rubber tubing having

three or four wide slots cut in the side to serve as windows. The slots are made easily with a sharp knife. If the tubing is flexible enough, just squeeze it together with one hand and cut out a slice at the fold with a pair of scissors, thus cutting the slot at one stroke.

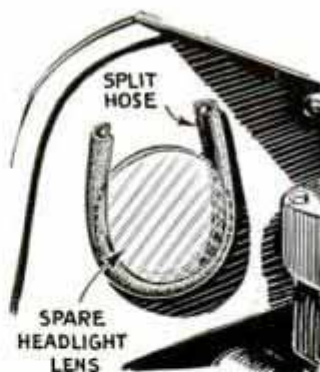
## Stone Between Dual Tires Removed with Rope

When a stone becomes lodged between dual tires on a truck, it is removed quite easily with a stout rope as shown. The rope is looped around the stone and the ends fastened to a large hook driven into the underside of the body, after which backing the truck jerks out the stone in a jiffy.



## Spare Headlight Lens Carried in Holder under Hood

Slit lengthwise and fastened to the dash under the hood as shown, a length of garden hose makes a dandy holder for carrying a spare headlight lens where it will not be broken by other tools. The holder can be nailed in place if your car has a wood dash. But if it is



metal, you can drill three or four small holes through both the dash and holder and use bolts.

## Cooling System Cleaned

Rust, corrosion and foreign matter can be removed from the radiator and cooling system of a car with a solution made by dissolving sodium bisulphate, 14 oz., in enough water to almost fill the radiator. The latter must be drained and flushed if



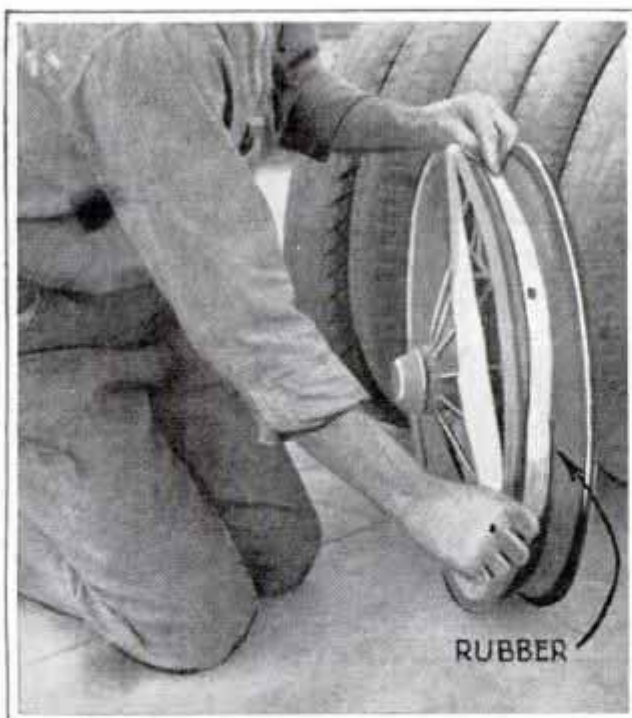
it has contained antifreeze solution. The sodium-bisulphate solution is then poured in and the motor run from 1 to 2 hrs., after which the solution is drained and the radiator again filled with water or antifreeze solution. Radiators that leak slowly or those in which preparations to stop leaks have been used, should not be treated with the sodium bisulphate as the removal of rust and corrosion will only aggravate the tendency to leak.

### Replacing Broken Starter Spring

When you install a new starter spring, always use new lock washers on the bolts that fasten the ends to the shaft. If the old washers are used again, trouble may result as their tension is lost and the bolts work loose and break off, causing trouble in removing the part left in the shaft.

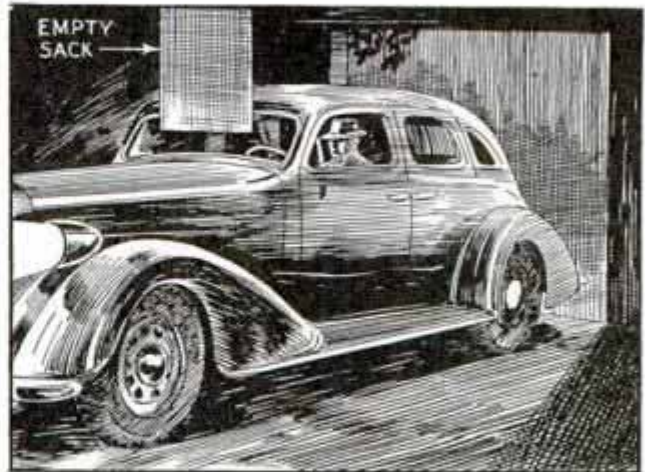
### Rusty Wheel Rim Lined with Inner Tube

When an inner liner is needed to cover a rusty rim and none is at hand, cut a strip from an old inner tube and stretch it over the rim as shown, first making a hole in the strip for the tire valve. If necessary, a long strip can be cut from the tube and the ends cemented together to get a liner to fit the rim.



Emergency inner liner for tire made by stretching piece of inner tube over wheel rim

### Warning Marker in Small Garage Avoids Driving into Wall



Sack suspended from ceiling touches windshield when bumper is close to wall

Suspended from the ceiling of a small garage, a bag or other marker gives the driver fair warning to stop before he runs into the garage wall. It is a good idea to have the bag located so that it touches the top portion of the windshield when the bumper is within a few inches of the rear wall.—I. M. Howard, Stillwater, Okla.

### Car Hubs Shielded Against Stones by Leather Flap

Finding that stones and gravel thrown back by his front tires were directed against the rear hubs and hub caps by the rolled edge of the running board, badly scarring and denting them, one motorist used a leather flap as shown to stop the trouble. The flap, which is 3 or 4 in. wide, was fastened under the heads of the bolts that hold the rear fenders to the running board.



—G. A. Rafuse, Bridgewater, N. S., Can.

☐ Sponges may be kept in good condition if they are occasionally washed in warm water, to which a few drops of tartaric acid is added, and then rinsed in clear warm water.



## Patrons See Shoes from Front in Mirror on Clerk's Stool



Instead of walking to a wall mirror every time they try on a pair of shoes, customers may remain seated and look at

them in a small mirror mounted on the rear end of the clerk's stool. After fitting the shoes, the stool is turned around to bring the mirror in front of the customer. If the mirror is put in a frame, it is a simple matter to screw the latter to the legs of the stool, using small spacing blocks at the lower end to hold it at the correct angle. A mirror of thin glass is best to avoid unnecessary weight on the stool.

## Oil for Outboard Motors

Motors of the two-cycle type, which require that the lubricating oil be mixed with gasoline, sometimes fail because the oil used has a tendency to settle on the bottom of the tank when allowed to stand for a length of time. To avoid this, use a standard brand of pure hydrocarbon lubricating oil containing no castor or other vegetable oil.

By cutting slits in a piece of black paper and placing it over the lens of a camera instead of the regular diaphragm, you can produce unusual and amusing pictures.

# The Next Issue

## MAKING THIN-WALLED CONCRETE POTTERY

Anyone can become proficient in fashioning colored urns of graceful lines that enhance the lawn or garden. Excellent sales items for roadside stands! The thin, concrete walls are reinforced with expanded metal lath held in position by an inner form which is removed after the work has been completed.

## BENT-TUBE FURNITURE FOR MODERN GARDENS

Attractive in your garden, this rugged furniture involves the use of iron conduit. Or, for porch and interior use, you can substitute aluminum tubing.

## ALL-ALUMINUM CANOE IS LIGHT AND STURDY

Built without one piece of wood! Old canoe serves as form for shaping the new hull—overcomes tedious work of making forms, bending ribs, etc.

## GLASS HOUSES FOR YEAR-'ROUND FLOWERS

Just the thing for an ever-blooming garden where you can experiment with tropical flowers, raise vegetables out of season, and start seedlings early.

## COTTAGE KITCHEN FOLDS INTO CABINET

Complete kitchen including sink, stove, table, drawers and compartments for utensils, dishes, groceries, etc.—it all folds into a neat, compact unit.



# VACATION *Thrills*

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 31 years and up.  under 16 years.  
Check your age group.



# Secrets of the Movie Ships

(Continued from page 78)

used. When a story calls for the sinking of a liner, the ship is usually sunk by pulling the miniature under the surface of a small pool by means of a wire running through a pulley at the bottom of the tank. Naval battles and the crash of a ship into an iceberg are other favorite subjects for miniature shots. Once a director wanted to show a large steamer crashing into a submarine that had just come to the surface. Then, in an underwater shot, he wanted to show the crew escaping from the submarine with the aid of the new Munson "lungs." He turned the problem over to Harry Reynolds who built a 10-foot submarine of light aluminum castings. The section to be torn open in the crash was made "breakaway" with a thin sheet of lead. The model liner's hull plowed into this section and crumpled and tore the lead sheet convincingly. The submersible's propellers were turned by a geared automobile starter motor operating from a lightweight "jelly" battery inside the hull. A smaller motor was used to run the periscope up and down. Tiny electric lights illuminated the interior of the conning tower. When running on the surface a smoke pot furnished a convincing exhaust for the Diesel engines supposed to be inside the hull.

For the underwater shot, made by filming through the side of a glass tank, Reynolds rested the wrecked submarine on a miniature ocean floor. By remote control he released a charge of compressed air that blew the escape hatch open and then, after a buoy line had floated to the surface, he allowed the tiny figures of the submarine crew to pop through the hatch and float up the buoy line to the top. Naturally, such a scene could not have been filmed in real life.

When one script called for a rowboat to chase another as it raced toward a steamer on the foggy Thames, Director John Fulton knew he would never be able to get a realistic picture in an actual fog so he made the scene in miniature in a pool inside a sound stage. First, he made a shot of a miniature rowboat racing toward a miniature steamer at anchor near the other end of the pool. The oarsmen rowed like real men, the motion being provided

by a small motor in the boat that obtained its electricity from underwater wires that trailed behind. A film of this scene was projected on a large motion-picture screen behind the tank of water and a full-size skiff with real actors was placed in front of the screen. By placing his camera to catch the real rowboat in the foreground and the enlarged image of the miniature rowboat on the screen at the same time, Fulton created a convincing drama of the sea without leaving Hollywood. In the same picture, he had to show a sailor struggling in the water and then being thrust under by the churning paddle wheels of the steamer. He obtained a realistic effect without endangering the actor by taking a shot of the man struggling in the water, then a close-up of the paddle wheel of the miniature steamer. When the two scenes were combined on one strip of film by double printing the paddle wheel appeared to move up to the sailor and force him under.

Not all movies of the ocean are make-believe. For many kinds of scenes the studios go to Los Angeles harbor where they can charter nearly any type of ship. Once spectators at the harbor were amazed by what appeared to be the front half of a battleship floating in the water. Studio craftsmen had erected the forward turrets and mast of a warship out of studio board and had mounted them on a barge which was then towed to sea. There was no need to build a complete ship since the stern was not to appear in the picture.

Sailing ship pictures are usually filmed in the quiet waters off Catalina island. When M-G-M decided to film "Mutiny on the Bounty," a replica of the "Bounty" was built at a local shipyard. The ship was modeled in outward appearance to resemble the historic vessel but below decks, the "Bounty" is as modern as a transatlantic liner. In addition to Diesel engines for cruising against the wind the ship has electric lights, a modern ventilating system, laboratories for film and sound processing, a five-meter radio transmitting and receiving set and a hospital, galley, and living quarters for a large crew. The ship remained at sea for weeks during the filming of the picture.



# Snapshots this size



with this miniature camera



**Kodak Duo**  
a true miniature camera  
yet it takes a larger picture

**KODAK DUO** is ideal for the miniature camera enthusiast. It has all the advantages of a small, pocket camera... economy, convenience, short focal length—yet it yields a larger picture: Makes sixteen  $1\frac{5}{8} \times 2\frac{1}{4}$ -inch pictures on a roll of 620 Kodak Film... actual size above.

There's no need for posing with Kodak Duo. The Compur-Rapid shutter, with speeds up to 1/500 second, stops action—covers any exposure requirement. The keen *f.3.5* anastigmat lens makes snapshots in almost any light—even at night, with Kodak "SS" Film and Mazda Photoflood bulbs. Complete with depth-of-focus scale, optical finder. Price \$57.50. At your dealer's.



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P. M. 7-36



# The Amazing Story of Stainless Steel

(Continued from page 68)

ing little blocks from them, polishing one surface of each block, and applying etching solutions to bring out the crystalline structure so it could be studied with a microscope. But some of the samples refused to be etched. They retained their mirrorlike finish in spite of the chemicals.

Then Brearley turned from gun barrels to knife blades. He experimented with alloys that would produce, he hoped, hard, tough blades that would hold an edge. He tried some of the combinations he had made in his gun-lining studies, and discovered some of the knife blades did not rust. They were made from the same alloys that had resisted the etching acids. So, in 1916, Brearley received patents on his iron-chromium alloys, and stainless cutlery became the first practical application of stainless steel alloys.

The scene next shifts to Germany, where nickel was added to improve the qualities of the original alloys. Before the World War, manufacturers in America and Europe were making stainless steels under German patents. Today, following a complicated manipulation of patent rights, the stainless steel industry in America is controlled by the Chemical Foundation, owner of patents worth millions.

Much of the stainless steel manufactured in America is made in the Republic Steel Corporation's plant at Massillon, O. This plant is a pioneer in the production of stainless steels in this country. But it also was a pioneer in certain processes involved in producing ordinary carbon steels. Today the oldest part of the steel works at Massillon is being used for one of the newest products because the machinery installed originally for ordinary steels was found to be better adapted to the ticklish business of making stainless alloys than newer, high-speed equipment.

Follow a few ingots of Enduro, as the stainless alloys produced in the plant are called, through the rolling mill that reduces them to relatively thin sheets, then through the hundred and one subsequent processes, and you will be convinced that stainless steel is just about the most temperamental alloy of iron known. Consider, for instance, the ingots stacked outside the rolling mill furnace. These are chunks

of steel, somewhat resembling long, fairly thin tombstones in form. They were produced in Republic's electric furnaces at Canton. But each ingot is covered with a dull thin scale. And you thought the alloy was corrosion-resisting.

"It is." Earl C. Smith, chief metallurgist, explains. "Enduro stainless steels are naturally corrosion resisting mainly because of composition but even more so because of the critically careful preparation. That thin scale is surface oxidation which takes place when the metal gradually cools from the terrific heat caused in the primary grinding process by the powerful high-speed grinding wheels. During the earlier rolling, the heat changes the exposed surface, and this outside skin must be ground off after the billet has passed through the heavy rolls."

Stainless steel is a high-hat sort of metal, for it insists on being itself, and itself alone. If so much as a trace of ordinary iron sticks to it, it refuses to be rust-resisting any longer. That is why the stuff is costly, compared with ordinary alloys. From ingot to frying pan, the metal must be nursed, coaxed and watched to see that it does not pick up some unwelcome iron, scale or other flaw. From the instant it leaves the rolling mill, the sheet is kept away from ordinary steel and iron. It slides over wooden boards or rollers wherever they can be used. Before and after each annealing, cold-rolling and polishing, it is kept covered with paper.

The finish given to stainless steel depends on the purpose for which it is to be used. Sometimes the only finish necessary is that produced by the rollers of the cold-rolling mill. There is one finish that results from buffing the surface with brushes whose bristles are charged with abrasive. Mirror finishes are produced by grinding and buffing with grits of increasing fineness, and finally polishing with a compound that produces a glasslike surface. Such mirrorlike steel is used actually for mirrors, in prisons, hospitals, on battleships or wherever glass would be dangerous. Such steel is, of course, widely used for decorative purposes.

Even in working with stainless steel in

(Continued to page 118A)





**JOE'S VACATION LOOKED LIKE A WASHOUT UNTIL —**



**Don't let Adolescent Pimples make YOU want to shun your friends**

Pimples often occur after the start of adolescence, from about 13 to 25. At this time important glands develop. Final growth takes place. Disturbances occur in the body. The skin gets oversensitive. Waste poisons in the blood irritate this sensitive skin. Pimples appear!

Fleischmann's Yeast clears these skin irritants out of the blood. Pimples go! Eat 3 cakes daily, before meals—plain, or in a little water—until skin clears.

*—clears the skin by clearing skin irritants out of the blood*

Copyright, 1936, Standard Brands Incorporated



(Continued from page 116A)

the shop, care must be taken to keep ordinary iron and steel away from it. Forming dies, vise jaws and other tools frequently are protected with adhesive tape or paper. When this cannot be done, the stainless steel is given a nitric-acid treatment to remove traces of foreign particles, after forming. The nature of the ingredients also contributes much to the cost. Besides the iron itself, there are in various stainless alloys, chromium from Africa; nickel from Sudbury, Ontario; molybdenum from Colorado, and columbium, titanium, selenium and zirconium.

Stainless steel used for automobile running board molding, wipers, louvers and other parts, usually contains sixteen to eighteen per cent chromium. A steel developed for resisting dyeing solutions in the textile industry contains molybdenum. The addition of selenium gives a steel that can be machined well.

Uses to which stainless alloys have been put include kitchen sinks, table tops, cutlery, cooking utensils, plates for false teeth, even the teeth themselves, dental and surgical instruments, decorative panels, moldings and other trim for both inside and outside of buildings, automobile parts, airplane exhaust collector rings and numerous engine and fuselage parts and instruments, contact points for traffic light control equipment, bolts, nuts, rivets, screws, linings for food barrels, decorative tableware, candlesticks, loving cups, parts for boats and etched panels.

These are but a few of the thousands of applications, all the more astonishing because stainless alloy steel has been commercially available for little more than a generation, while its cost, compared with other metals, is high—sometimes \$1.50 a pound in special forms. Even in scrap form, this mirror-finish stainless steel is worth twenty cents a pound.

But in spite of its brilliant record, metallurgists say that only a beginning has been made. Partly because of a lowering of cost, partly as a result of better design of the article being manufactured, and because of the development of improved alloys, stainless steel is likely to cause changes in many fields, particularly the automobile industry and aviation.

J. H. Fishel, Republic Steel Corporation expert in stainless steel, predicts that

stainless alloy automobiles, requiring no paint or other finishing, will be commonplace tomorrow. Today such a car would cost too much. But with the production of high-strength stainless steel alloys, cheaper methods of production, and the streamlining of cars so their parts will be easy to make, non-rusting automobiles will be made available to everyone.

The airplane of the future, as envisioned by Mr. Fishel, will have all-metal wings consisting largely of strong, thin stainless sheet steel, stretched over a framework of the same material. Metallurgists already are at work on the problem of making suitable sheet material. Such planes will be stronger than those in use today, will be fireproof, and will require no special protection against corrosion.

Ordinary iron alloys rust for two reasons. First, the iron is soluble in water, so oxygen can get to it and convert it into oxide. Second, the presence of moisture and other materials among the particles of iron in the metal creates little galvanic batteries, which destroy the iron by electrolytic action. In stainless steel, the chromium present in relatively high percentages has the happy property of changing itself into oxide very quickly, in a few seconds in fact, when exposed to air. Thus there is always, over the surface of a piece of stainless alloy, a very thin, tough layer of chromium oxide, which shields the particles of iron from attack by oxygen. Other ingredients such as nickel also exert a similar protective action, in addition to giving the steel other desirable properties. Elements such as columbium actually guard the individual grains of iron against oxygen, and thus prevent weakening and failure from intergranular corrosion.

Ordinarily, whenever the protective film of chromium oxide is broken, it heals so quickly that corrosion cannot begin, and the metal remains bright and sound. Occasionally a tiny pit, which cannot be sealed effectively by the chromium oxide, is present, and starts a local oxidation that may cause trouble. Likewise, the surface may be disfigured by corrosion of foreign particles of iron deposited by tools.

Few products have gone so far in so short a time as stainless steel alloys. What the future holds, no one can predict in full. Certainly rust will be less of a menace.

*see letter.*



# An Honest Survey of Car Owners Revealed this:

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# Queer Facts About Star Gazers

(Continued from page 85)

trograph. Attached to a large telescope, it separates the light from an individual star into a colored spectrum and this band of light rays allows astronomers to calculate such things as the elements in a star's atmosphere, its velocity in line of sight, and in some cases its distance from the earth. Indirectly they are able to calculate its rotation and the materials of its interior.

One interesting use for the spectrograph has been to determine what the earth would look like if viewed from another planet. The conclusion is that an observer would be able to make out the polar ice caps, the outlines of the seas, and the major cloud masses. A green tinge would prevail in the temperate and torrid zones and the large desert areas would appear reddish. This knowledge was gained by using the moon as a mirror, studying the spectrum of earthshine as it is reflected in the feebly lit portion of the new moon inside the bright crescent.

"Incidentally, we were able to establish once and for all that the atmosphere of Mars contains no measurable amounts of oxygen," says Mr. Joy. "Spectra of Mars contain no oxygen lines. The spectrum of earthshine indicated oxygen to the amount that we know exists in the earth's atmosphere, and this proved the accuracy of spectrographic analysis."

Long-exposure photography has opened up tremendous distances in space and now astronomers are studying pictures of stars no one will ever be able to see directly, even if telescopes many times more powerful than the best we have now are built. The most distant stars that have been photographed are so far away that even the light-year, about six trillion miles, has grown too short to be a convenient measuring stick. A few years ago the astronomers had to invent the parsec, equal to three and a quarter light-years. Now it is becoming unhandy and the kilo-parsec, 1,000 times as long, has been adopted as the largest unit of distance.

Instead of studying the stars directly, astronomers make most of their calculations from photographs. Ninety per cent of their work is done in quiet laboratories instead of at the eyepieces of telescopes. Making a stellar photograph is long, tedi-

ous work because some of the stars are so faint that exposures lasting as long as twenty hours must often be made. On Mount Wilson when a photograph of a star is to be made, the 100-inch telescope is "hitched" to the star by a driving clock that turns the 100-ton instrument at the same speed as sidereal time. For hour after hour the clock keeps the mighty telescope pointed directly at the star image as it moves across the sky.

Even on a night when the "seeing" is good the star never stands still. Heat waves in the atmosphere always cause some motion. In the telescope the customary twinkle of a star is transformed into a slow swaying motion. The telescope is too huge to follow these gyrations so the astronomers move the photographic plate instead. The observer's eyepiece contains cross wires and the astronomer moves control wheels so as to keep a target star exactly on the cross of the wires. Every second or so he makes an adjustment of a few thousandths of an inch, moving the film to the left or right or up or down to follow the star. He stays at his post until the exposure is finished, trying to follow the star so closely that the finished picture will show it as one tiny pinpoint of light.

"Photographs of different sorts tell us many things about a star and its habits," Mr. Joy says. "After studying the pictures we may be able to say that a certain star, 615 parsecs away, weighs fifty times as much as our own sun. No one will ever see the star except in photographs, but we know that it has a temperature of about 50,000 degrees centigrade, that it has a bluish white color, and is moving at a speed of twenty-five miles per second. Also, the pictures tell us that the chief elements in its surface are hydrogen, helium, and oxygen."

For a long time astronomers have suspected that visible light is by no means the only kind of energy radiated by the stars. Cosmic rays and ultra-short radio waves that seem to come from outer space have been recorded and one of the present problems is to devise equipment that can measure energy waves the stars give

(Continued to page 122A)

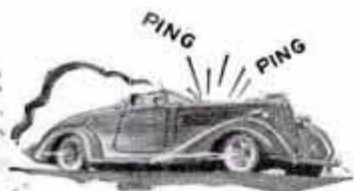


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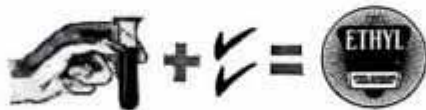
**KNOCK** is the name of that warning "ping." It occurs when a gasoline breaks down (burns too quickly) under the heat of a modern high compression engine.

Cars built in recent years have high compression engines. And in summer the knocking evil is at its worst because hot weather increases engine heat.



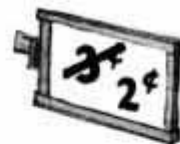
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**\$3<sup>35</sup>**  
(LESS BATTERY)

A GENUINE DELTA

*F 356* (Continued from page 120A)

out aside from light. A start has already been made in measuring the ultraviolet and infrared rays of the sun. Members of the Mount Wilson staff are conducting experiments with the ultraviolet camera that compares the sun's ultraviolet radiations with the amounts of green light that the sun sheds. The camera that picks up the invisible rays is mounted on a small telescope for accurate pointing. Inside the camera are two lenses, one coated with a thin film of gold and the other with a silver film. First the sun is photographed by the green light that passes through the gold-plated lens, and then a picture of the rays that pierce the silver lens is made. The silver allows only a narrow band of ultraviolet radiations to fall on the film. Infrared radiations from the sun are made by direct photography, utilizing red sensitive plates and filters.

Being the star nearest to earth, the sun is a subject of constant study. Astronomers maintain a twenty-four-hour a day watch on its activities year after year. Under an international schedule the Mount Wilson observatory makes fifteen photographs of the sun's prominences and spots at four-minute intervals between 2:30 and 3:30 every afternoon. At 3:30 an observatory in Australia begins its schedule and is followed by others farther west. Sun telescopes are comparatively small but the 200-inch giant, or even the present 100-inch telescope, will never be trained on the sun because the direct heat might be disastrous to the mirrors.

*F 458*

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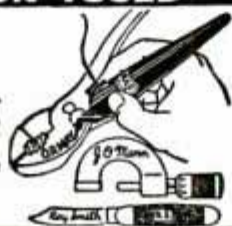
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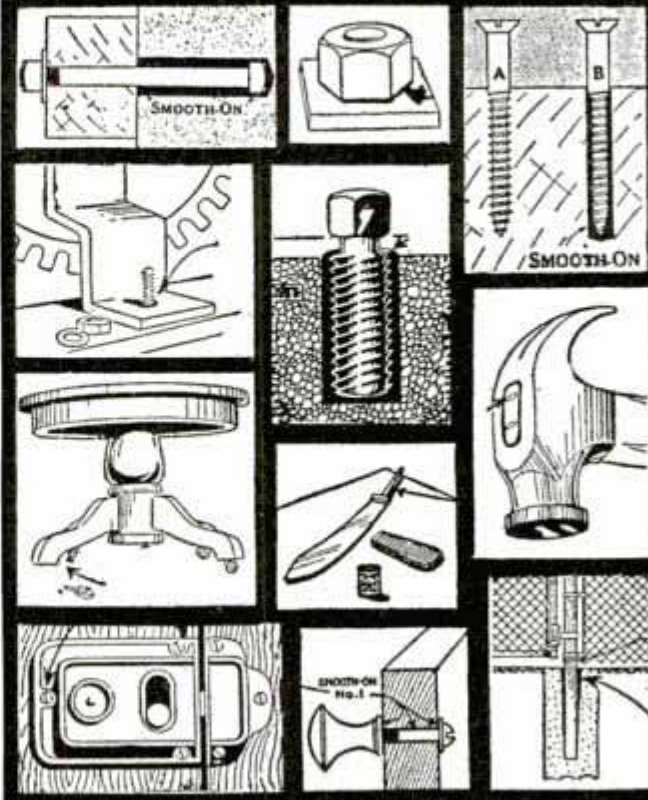
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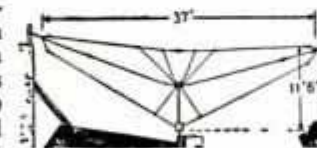
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## Latest Feats of the Plant Breeders

(Continued from page 47)

I 349

ness" that sometimes afflicts northern fruit trees planted in subtropical climates. After a few years of normal bearing the trees seem to oversleep during the spring leafing period and then flower too late for fruit to mature. The explanation seems to be that trees accustomed to a rigorous climate find their seasonal routine is upset when planted in a region where the winters are warm. In the last decade peach trees have overslept five times in California. The answer seems to lie in an orchard of new, unbaptized peach trees that were weighted down with fruit two years ago when no other peach trees in the vicinity produced a crop. Located at the Riverside experiment station of the University of California, the orchard represents the final stage of a breeding program started in 1906. Time after time, trees that appeared to be resistant to winter sunstroke were crossed with northern varieties that usually bear desirable fruit. Now, apparently, several good varieties have been permanently united with other strains that follow a normal yearly cycle in spite of the winter sun.

Another peach that also bears year after year in the subtropics was developed by Dr. E. B. Babcock and George B. Weldon. They sought a member of the peach family that had already adapted itself to warm winters and found it in the Chinese saucer peach that has no commercial value. By breeding they were able to combine its resistance to climatic injury with the juice and flesh from popular northern peaches.

"Accidental discoveries that just happened to be noticed have contributed more to the development of our present plants than all the scientific plant breeding in the world," one hybridizer remarks. "Nature is continually producing hundreds of desirable crosses by accident that are lost to the world unless someone is sharp enough to notice them."

One example is the "Jap" melon that has taken southern California by storm. A Japanese gardener happened to notice an unusual plant growing in his garden and was smart enough to save the seed. He grew the melon for several years and succeeded in fixing the strain. This melon



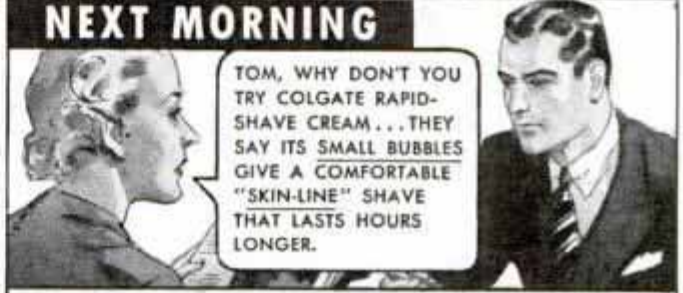
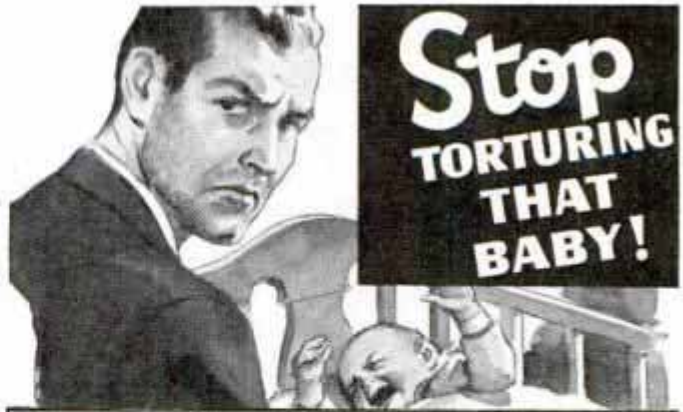
has a smooth, yellow rind, is much larger than a cantaloupe, and has delicious, salmon-colored meat.

Burbank's work did not end with his death in 1926, since hundreds of experimental trees were still growing in his California test orchards. His work was continued by the Stark Brothers of Missouri and in the last few years a number of new varieties of cherries, peaches, plums as big as apples, and other fruit that originated with Burbank have been placed on the market. Some new varieties have been patented and each is an improvement in size or flavor over earlier strains. Among them are the "peacherine" that combines the yellow peach and the white nectarine, and the famous "lost nectarine" that was lost for a time after its first discovery.

Most of the plant patents, about 150, that have been issued since 1930 cover new varieties of flowers. One recent patent protects an astonishing nasturtium of a super-double hybrid type that flowers with sixty petals instead of the usual five. Other plant patents have been issued for improved mushrooms, fruits, and nuts. Inventors usually sell or assign their patents to commercial nurseries for future development.

Plant breeding is slow work but small fortunes are often the reward for discovering and stabilizing some new variety of popular plant. The greatest chance for amateur plant breeders, professionals believe, lies in the field of annual crops and flowers. Progress is most rapid in these plants since new seed representing a new generation is produced each year.

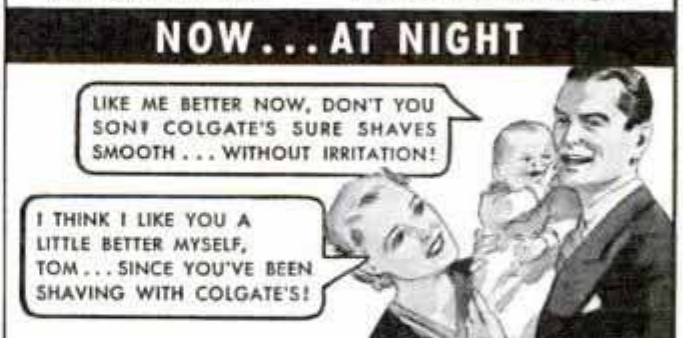
Fifty years from now, plant breeders think, every climatic zone will have a much wider variety of plants than now, due to the creation of new varieties that will flourish when transplanted away from their natural homes. The late Ivan Michorin, the "Burbank of Russia," introduced raspberries, apricots, cherries, and other temperate zone plants to the lower latitudes of Siberia and succeeded in cross-breeding his plants both geographically and botanically, combining temperate-zone fruits with stock that was native to the hardy north. Horticulturists look forward to the time when by similar breeding programs tropical fruits will be grown successfully in most parts of the United States.



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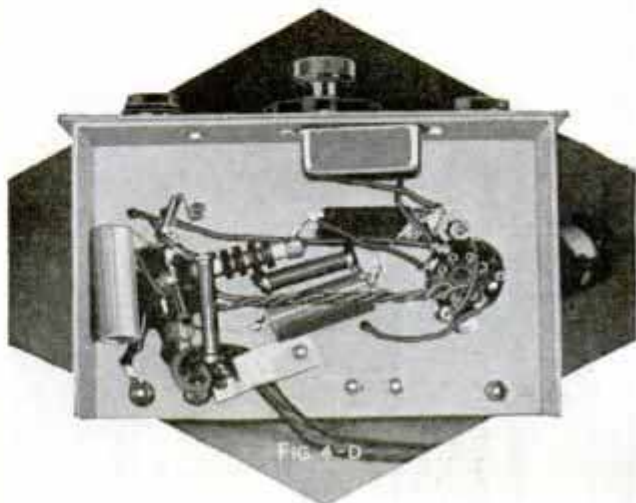


STANDARD ART STUDIOS, 104 S. Jefferson St. Dept. 366-H, Chicago

## Two-Tube for Short Waves

(Continued from page 99)

panel; the grid resistor  $R_1$ , and grid condenser  $C_1$  shunted across it, are supported by their tinned wires from a stator terminal on  $C_3$ , the other side terminating in the cap for the top of the 6J7 tube. Most of the small parts under the base are also supported by their tinned wire leads; ordinary hook-up wire with push-back insulation is used for the other wiring. Use rosin-core solder and make sure that each



connection is well soldered. Note that the phone posts are carefully insulated from the metal base.

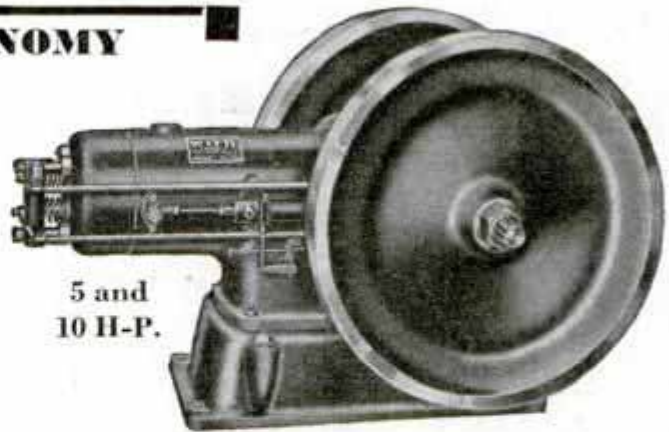
Photos 4-A, 4-B and 4-D show the compact construction and arrangement of the various parts. A complete list of the original materials used in this set, including those for the June a.c.-d.c. amplifier and B-eliminator referred to, can be obtained from Popular Mechanics radio department without charge. The blueprint covering both articles is number R-225. To tune this 2-tube receiver, connect the batteries as shown in Fig. 4-C, fasten the antenna to the clip on the small porcelain stand-off insulator and adjust the large variable condenser to the approximate frequency of the stations to be received. The actual tuning is then done with the small condenser  $C_2$ . This spreads the amateur and foreign broadcast bands over many degrees on the dial. Adjust the regeneration control to a point just beyond where oscillation begins, then tune the set until a station carrier whistle is heard. Now back off the regeneration control until the whistle stops and the station is heard clearly. Slight retuning may be necessary to obtain maximum volume.



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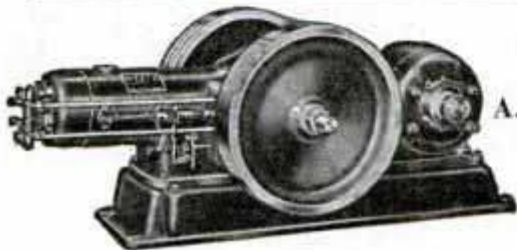


5 and  
10 H-P.

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# What's the Long-Range Weather Forecast?

(Continued from page 89)

If the twenty-three-year cycle works out, our weather for this summer at any particular spot in the United States should approximate the weather of 1913 for the same locality. Let us put the theory to test and select three spots in the United States and see what the weather was there twenty-three years ago—the average temperature for the three summer months. Then, when the summer is gone, compare the figures with the weather bureau records for the same localities for 1936. Let us see how they stack up with the summer of 1913 as regards normal weather.

For this test let us choose Washington, D. C., Chicago, and Bismarck, N. D., three representative localities. Here are the figures:

		Washington			
Summer	June	July	Aug.	Av.	
1913	+0.7	+0.8	-0.7	+0.3	
		Chicago			
Summer	June	July	Aug.	Av.	
1913	+4	+3	+3	+3.3	
		Bismarck			
Summer	June	July	Aug.	Av.	
1913	+3.1	-2.6	+3.1	+1.2	

It will be noted that the average temperature departures from normal of these three localities is a plus. This means that the temperatures were above normal. And normal is the fifty-year or more average in temperature for the localities.

In presenting his twenty-three-year weather cycle theory, Dr. Abbot does not set himself up as a weather prophet or long-range weather forecaster. He is simply trying to correlate weather cycles with sun cycles and checking on a relationship between the two that apparently exists.

This theory has the backing of the ages. Centuries ago the dwellers along the Nile kept, for seeding purposes, the low-water marks of that river. For 600 years those records were kept and they, remarkably enough, support the twenty-three-year weather and sun cycle. It is further supported in the rings of trees from the age-old forests and by the countless ages of deposits in the beds of defunct glacial lakes. It is even supported by weather bureau records.

"For the past twenty-five years," says

J. B. Kincer, head of the crop weather division of the bureau, "there has been a very definite trend of temperatures above normal and rainfall below normal."

In other words, for slightly more than twenty-three years we have been having one kind of temperature and one kind of rainfall. It is a cyclic period. The last rainfall peak occurred about 1909. Since then the rainfall has been less and the temperature higher. This phase of the weather terminated in two very severe droughts, those of 1930 and 1934. Winters for five years averaged warmer than normal throughout the United States, then came the reaction—this past winter—one of the outstanding cold winters.

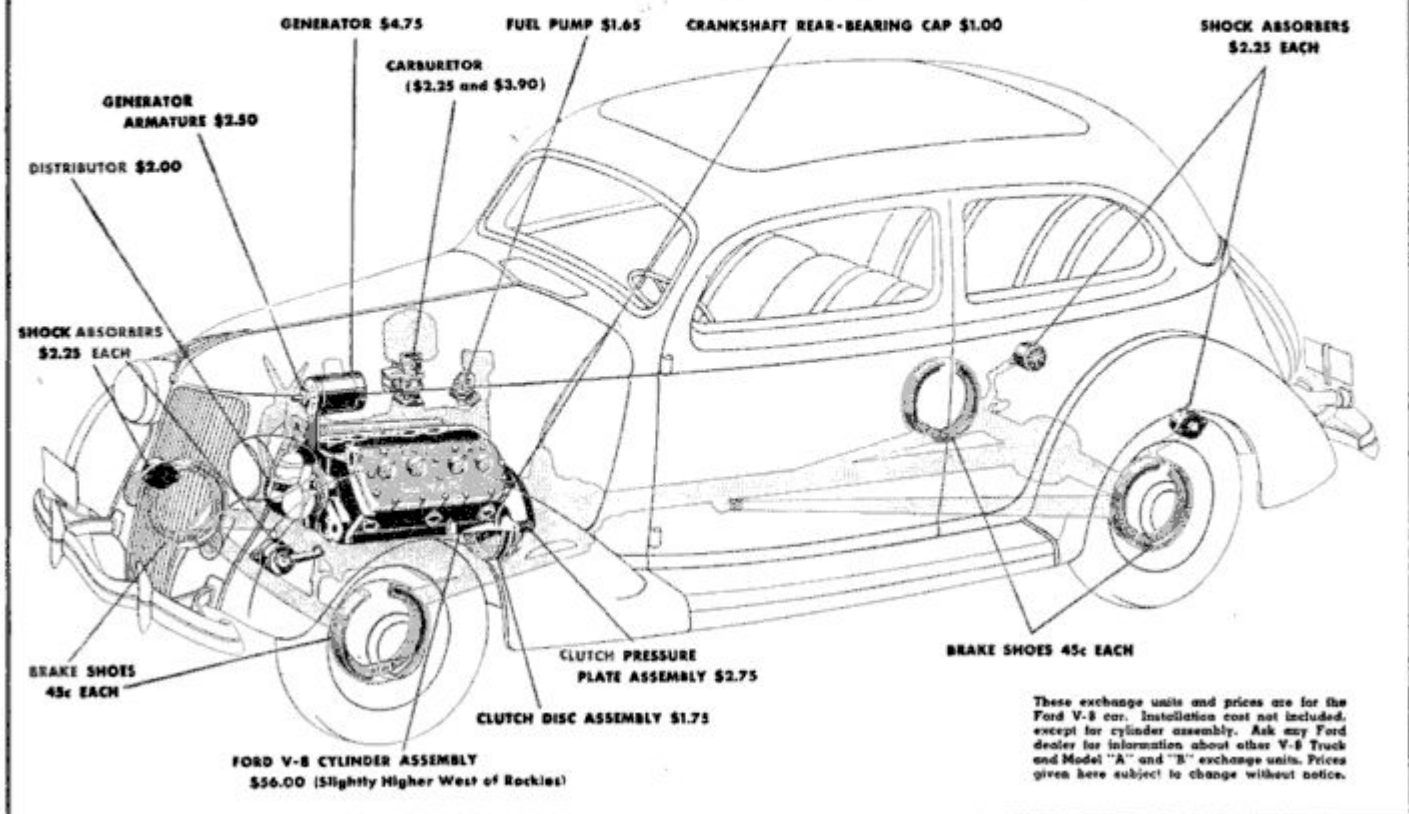
"In reaction from the drought of 1934," says Mr. Kincer, "1935 rainfall for the United States as a whole was about normal. The fact that we recovered from the 1934 drought to about normal rainfall in 1935 and the further fact that, following five years of warm winters, the past winter was one of the coldest over large areas of the country, appears to indicate—though we have no definite assurance that this is exactly the case—that the bottom of the rainfall downward trend has possibly been reached. From this, therefore, it may be reasonably expected rainfall should go up and temperature down for a considerable number of years to come."

This bears out the twenty-three-year cyclic weather tendency—twenty-three years of weather above normal temperature average and below normal rainfall average. Now the reversal—rainfall up and temperature down for a number of years. And this fits in with the solar radiation picture for the sunspots are "coming back"—they are approaching their maximum, forecast for 1938. And increased sunspots cut down solar radiation.

How does all this fit into the 1936 summer weather picture? If colder average weather is coming for a number of years, how can the summer average for 1936 be above normal to fit the 1913 picture? The answer is found in the old adage, "One swallow does not make a summer." One summer does not make a twenty-three-year cycle. It takes twenty-three of them and some may be above normal.



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## Tuning Up an Ocean Liner

(Continued from page 54)

cause both act in similar fashion. Yawing comes from a following sea. It is an alternate swing in the stern from port to starboard and vice versa, under the influence of waves, the bow being a steady point and the yawing motion acting as a lever whose fulcrum is close to the bow.

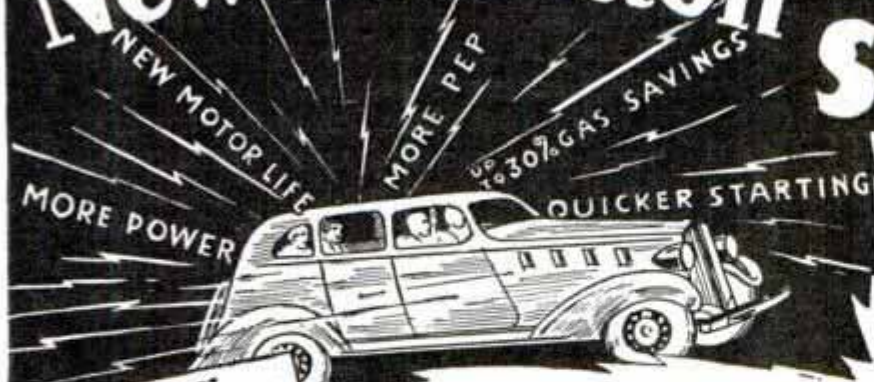
"Even old sailors sometimes have erroneous ideas about waves," says P. R. Bassett, chief engineer of the Sperry Gyroscope company. "A ship anchored in a windless swell in deep water responds just like a cork; it rises and falls, but does not move in the direction of the wave. The wave form passes under the ship without breaking against it. This disposes of the notion that waves 'break' against a ship."

Stabilizers on the "Savoia" have reduced a fifteen-degree roll of the ship's decks to a minimum of two and one-half degrees. In a 2,200-ton vessel, a single gyro-stabilizer reduced roll from a maximum of twenty-six degrees to three degrees. Tests reveal that a ship's engine loses about one per cent of its propulsive power for each degree of roll. In a heavy sea, it is estimated that a ship may waste up to twenty-five per cent of its power in useless rolling. Increased skin friction and low propeller efficiency account for the high loss. The "Queen Mary's" engineers and designers have already placed problems in the laps of the ship doctors. What, for instance, is the effect of her 1,004-foot waterline length on the vibration and stability of the hull? Also, were the builders justified in departing from the recent practice of equipping ships with bulbous bow? The Cunarder engineers claim that their tank tests justify a return to the old knifelike bow, a traditional form among British vessels.

The earliest known form of ship stabilizer was the sail. When sails were discarded, shipbuilders turned to other means of stabilizing vessels. One of the great stabilizing forces in the "Queen Mary" is the combined weight of her steel hull and the engines, 50,000 tons in all. The propellers themselves weigh a total of 280,000 pounds. The owners will depend upon the ship doctors for a report as to how these features of England's new flagship contribute to her stability and comfort.



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(Continued from Coloroto Section)

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On such products as table tops and sinks, where fruit juices and other acids come in contact with the working surfaces, it is desirable to ask for "acid resisting" porcelain enamel, which is especially designed to resist the action of such acids.

One of the outstanding features of porcelain enamel is the ease with which it may be cleaned. A damp cloth or one dipped in soapy water cleans a porcelain enameled surface quickly and easily. If the dirt or grime is a bit tenacious, however, ordinary cleaning compounds can be used.

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## Some Metals Get Stronger as Time Passes

Instead of "crystallizing" and breaking down with age, some metals actually continue to harden for years after they come from the furnace, according to Dr. Harrington of the General Electric research laboratory. Age hardening of metals is a process undergone in production. When a mason lays a brick wall, he sometimes inserts pieces of metal or stone to hold together the different layers of brick. Nature sometimes does a similar thing in steel. Layers of iron atoms may be kept from slipping upon each other by bits of other materials. And these materials may continue to form for a long period after the metal has cooled, according to Dr. Harrington.

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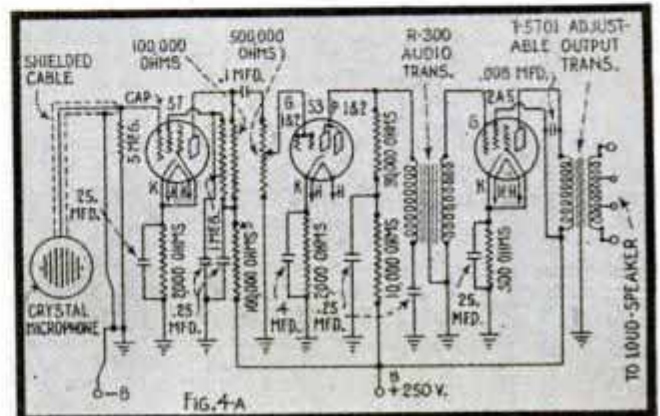


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## Amplifying String Instruments

(Continued from page 101)

nections will, of course, vary slightly according to the type of detector tube. A small s.p.s.t. switch is inserted in the grid lead to the detector tube to simplify the change-over from receiving to pickup. When the switch is closed for receiving, one of the pin plugs in the pickup must be removed or the receiver will not work. The pickup leads are soldered to the grid and cathode; X<sub>2</sub> may be made directly to the cathode terminal of the tube socket. Connections for various types of detector tubes are shown in Fig. 3-A. Before the



guitar can be operated, the steel strings must be magnetized with a horseshoe magnet. This is done by running the magnet over the strings and testing until satisfactory reproduction is secured. A good magnet, of the type used in a model-T magneto, is run along a string with one hand while the string is picked with the other. Move it in one direction only. It may be necessary to reverse the magnet for best results.

Any instrument using either steel or gut strings may be amplified by means of a small crystal microphone and amplifier designed especially for the purpose. This midget crystal "mike" is fastened to a rubber vacuum cup which holds it in the position shown in the photo and Fig. 4. The vacuum cup not only secures the microphone to the instrument, but dampens out extraneous noise caused by handling. A schematic circuit diagram for a crystal-microphone amplifier, suitable for faithful reproduction, appears in Fig. 4-A. This method permits the reproduction of any stringed or wind instrument such as the saxophone, clarinet, violin, banjo or guitar at greatly increased volume.



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### Tigers Are Gentlemen

(Continued from page 39)

willd man staring the wild beast out of countenance. As a matter of fact, the man doesn't stare the tiger out of anything. The tiger merely gets tired of looking.

We had runners who had often met tigers face to face in this way and they considered these experiences the normal thing apt to happen in the jungle. The runners often lost our messages so we attached the envelope containing the message to the end of a split stick and the stick was carried by the runner. In that way we found they never handled the message and took better care of it.

One day Samuel, my best runner, failed to return on time. We became nervous and set out to look for him at dusk. The carnivora begin their prowl at dusk and usually are hungry. That time is the most dangerous to be caught alone in the jungle. So we hurried our search and about a mile from camp found Samuel. He was stretched out in the dust of the trail, his message still on the stick. At first we thought him dead, but on turning him over we discovered he had only fainted. He could only say he had met a tiger.

"What was so unusual about that?" we demanded, for Samuel had met eleven.

"But this tiger was different, Sahib" he explained, "this tiger sat down!"

At first we thought Samuel was lying but thirty paces down the trail, we found the footprints of the tiger. We could read the humorous story in the dust.

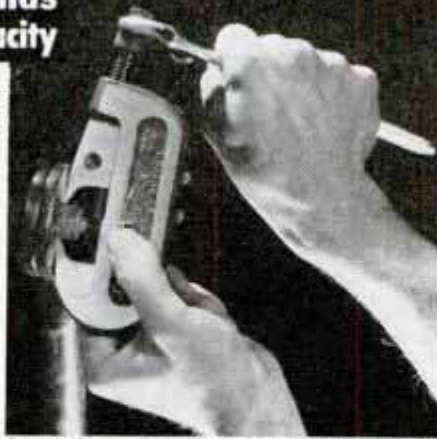
Samuel was right. There was the imprint of the huge cat's body as it sat in the middle of the trail and just behind that imprint was a little fan-shaped declivity scraped by the tiger as it had twitched its tail from side to side. And that gave us a clue to what actually had happened. It denoted extreme tiger curiosity. The tiger probably had seen many men during its wanderings. However, Samuel was different. He had a stick on the end of which was a strange white thing. It was a curious sight, worthy of a sit-down and a rest to better appreciate. And so the tiger sat down to watch Samuel. After a time poor Samuel fainted. How long he stood facing that tiger we could only guess. Anyway, after he fell down the stick stopped

(Continued to page 138A)



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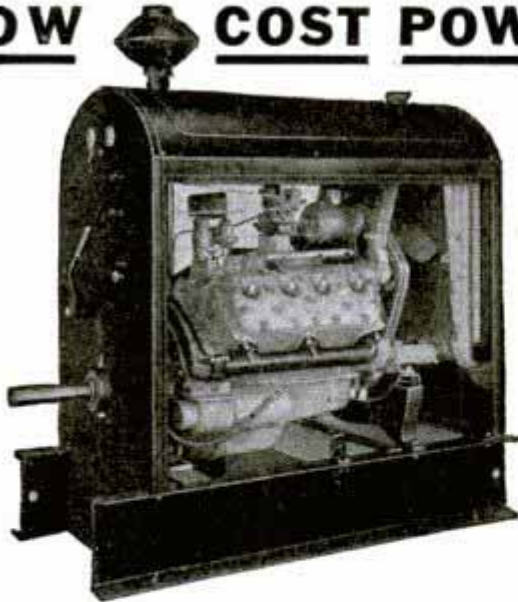
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(Continued from page 136A)

shaking, the tiger was no longer interested and went away. He could have taken Samuel with him, but he was a gentleman.

Another curious incident occurred in that same district. We had shot a tiger. The cat flopped over with the first bullet. Four of us jumped down from our machans without giving the usual shot-in-the-neck that assures a dead tiger. He was a beautiful specimen. The shikaris immediately laid him out to measure while we stood around admiring his size.

In measuring a tiger it is customary to lay him on his belly in a crouched position, drive a stake at his nose, straighten out his tail and drive a stake there. The distance between stakes gives the official length. My shikari finished driving the nose stake, then took hold of the tail and gave it a little yank to straighten it. With that the tiger suddenly coughed, got up, and, while we scattered in undignified confusion, walked majestically off into the jungle before any of us could reach a gun. It merely proved one must never assume a tiger is dead until he is skinned.

Occasionally there are serious accidents when novices hunt tigers before they know the game or fully appreciate that the tiger is one of the world's most dangerous beasts when wounded and cornered. Its tremendous strength, swift roaring, rushing charge and the catlike ability to cling to life when, by all rules of the book, it should have died six shots ago, make it a worthy opponent for any hunter. In India the favorite method of hunting tigers is by "beating." It is a technique developed to give the hunter the greatest amount of safety as well as providing him with a test for his skill. The tiger, it must be remembered, ranks tenth in intelligence among animals.

Usually when we wished to stage a hunt for visiting friends, we first tied out "kills" which were live water buffaloes. The tiger found them in the jungle during his prowling and dragged them away. Knowing the location of the nearest water hole at which we believed the tiger would drink after his feast, we either sat up during the night and waited his coming for water, or we plotted his sleeping place from the location of his kill and the water hole and then "beat" him out with

(Continued to page 140A)



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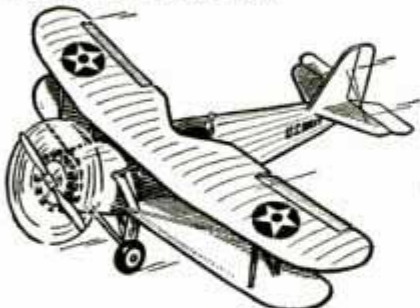
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TRANSPARENT • WATERPROOF



1123 (Continued from page 138A)

native noisemakers while we waited over a clearing through which he had to pass while making his escape. The water hole sitting was done at night, the beating during daylight. We use the same technique when photographing tigers. Instead of shooting them with bullets we use film. The latter is far more exciting.

Our jungle was some 135 miles from the end of the railroad. We had a small motor car with which we transported supplies from the rail head to our field camp. One morning, while returning from such a trip, we were passing through a section of thorn, grass and tree shrubs. The stillness was that deathly silence only the dawn jungle knows. Suddenly there was the sound of a shot not far off the road. I slowed the car and listened. A piercing scream filled the jungle. Two more shots roared, then silence.

Not far inland I found several natives in the trees. They were shivering with fright and pointed into the tall grass near by. Lying face down in the shoulder high cover we found an Englishman. He was dressed in khaki shorts and his tan shirt was ripped from his back exposing a lacerated mass of flesh. He had a nasty gash in his cheek which exposed his teeth. In the grass near by my servant found a tiger, dead. Three heavy caliber bullets had smashed all life from its body. We rushed the Englishman to the mission hospital. The doctor there spent the morning stitching him together.

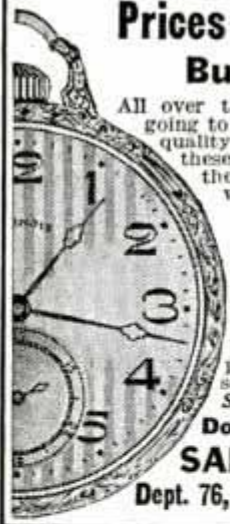
We could find no identification of any kind in the man's clothing but two days later he regained consciousness. He spoke with an acute Cockney accent. This, together with his terrible facial wound made his speech unintelligible. He became so excited when he realized we didn't understand him he lapsed into unconsciousness.

The fourth day there came to the mission a distinguished looking Englishman. He introduced himself as a motion-picture director just arrived from Bombay. He had been making pictures with a large cast in northern India. Their work finished, he had sent his crew home, retaining two cameramen with whom he had camped about thirty miles out. Needing more supplies, he had gone to Bombay to make arrangements and upon returning

(Continued to page 142A)



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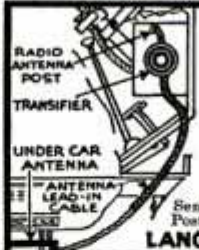


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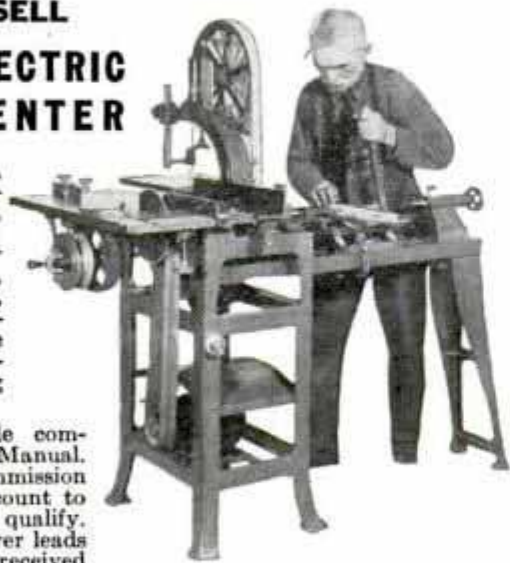
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123 (Continued from page 140A)

to the camp found his cameramen missing.

We suggested he take a look at the unknown patient. Sure enough, it was one of his men. Also he could understand what the injured man had been trying to tell us. For two days that man had been trying to tell us that his pal, the other cameraman, was still out there also wounded by that tiger. We rushed out and found the jackals and vultures had been before us. A bullet hole in the skull was a disturbing discovery but, when we heard the other man's full story, we found it unnecessary to mention it in our report to the forest commissioner.

It seems the cameramen had set their hearts on getting a tiger trophy as a souvenir of their trip. When the natives advised a tiger had been seen drinking at a near-by water hole the visitors determined to get him. They went with the natives to the water hole. They found many tracks of a tiger. The natives said the tiger would return to drink late that night or at dawn. The cameramen and their servants climbed a tree and waited.

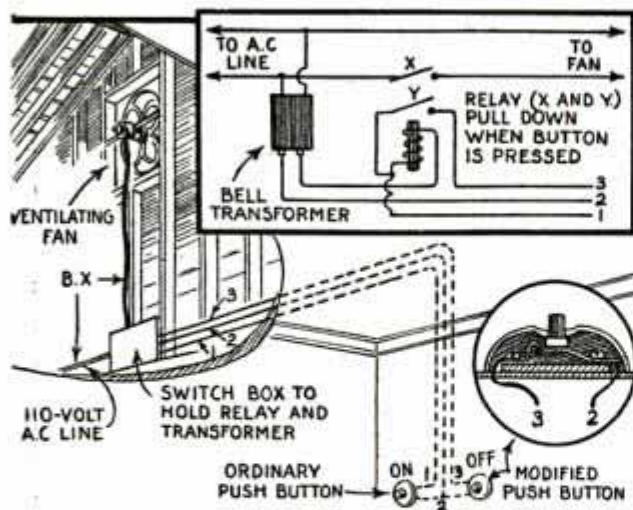
In the hazy half light just before dawn they heard the tiger drinking. An ill-placed shot sent him into the grass where he growled and coughed at intervals. They made the mistake of climbing down and following the tiger on foot. Not far away they saw a tiger crossing a ridge and took a snap shot at it. This must have been the mate for the wounded one was lying quietly in the grass within twenty feet of them. It charged, seized the nearest man, and evidently killed him with one mighty crush of its powerful jaws.

The second two shots I heard had been snapped point blank as the tiger was charging the second man. He tried to run away and was bowled over by the weight of the rushing beast. Luckily, he fell on his face. The badly hit tiger had only enough stamina to scratch a few times and wobbled off to where we later had found him. The cameraman recovered and was invalided home to England. I had the pleasure of forwarding to him the skin of the tiger that nearly cost him his life.

Yes, tigers are gentlemen. They are dangerous if you won't play the game according to nature's rules. But at least a tiger won't botch the job once he gets started—he is a thorough gentleman.



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AT ALL  
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F 408

# "Who's Who Among the Fish"

(Continued from page 31)

beds, around snags, and off rocky ledges. In rivers they are often found in log jams where there is an eddy. Among the common names are tiger muskie, barred muskie, lunge, northern muskellunge, black spotted pike, mascalonge and maskinonge.

No showup of American game fish would be complete without the walleyed pike. This fish really belongs to the perch family, although widely known as a walleye or walleyed pike. A slender fish, easily distinguished from the pickerel or northern pike because it has a second dorsal fin, the walleye bites readily, will often take a lure when bass and muskies won't strike anything, and puts up a fair fight. The record is eighteen pounds, taken from High Lake, Wis. The walleye is a great minnow eater. It also will take frogs. For live bait, use minnows, either cast or trolled with a bait-casting rod. Still fishing with minnows also is effective. Look for it in eddies in rivers, around rapids and falls, and in the pools. It likes swift water but is found on sand and rock bars in lakes. Among its many names are gray pike, ground pike, green pike, horse-eye pickerel, jack, Ohio pike, pickerel, jack salmon, salmon, white perch, white salmon and brook trout.

The rock bass, another popular little panfish, averages around a half pound, but specimens may weigh two pounds or more. It will take anything from a gob of worms, minnow, cricket, or grasshopper up to a small fly cast with a fly rod. It will hit small pork-rind lures, too. One common name for it is goggle-eye.

The yellow perch is a favorite among fishermen who like to use simple tackle and simple methods. Perch travel in schools, so you have a good chance to hook several when a school is located. Most perch fishermen still fish with worms or small minnows, but this fish also will strike spinners and artificial flies, and when taken with a light rod big specimens put up a real fight.

The brook trout is found in many parts of America because it has been planted in the west and as far north as Alaska. The world's record is fourteen and one-half pounds, taken from the Nipigon river, Canada. There are scores of ways of tak-

ing this fish and hundreds of different fly patterns are used. They will take artificial wet and dry flies, artificial nature lures, grasshoppers, worms and minnows. The brook trout also is known as red trout, squaretail and eastern brook trout.

Rainbow trout, cutthroat trout, brown trout, and steelhead trout recall the west because in western streams and lakes you find them in greatest abundance and large size. The rainbow is one of the sportiest fishes in the world, a high-jumping, spectacular fighter. The record rainbow was twenty-six and one-half pounds, taken in the state of Washington. They usually are taken on flies or spinners, but many large specimens are caught with bait.

Brown trout, another popular species, is found in the west as well as in the eastern waters. The largest specimen taken on rod and line weighed twenty-nine and one-half pounds and came from Scotland. This trout is more yellow and its red spots are larger than those on the brook trout. In many streams these fish rise best to artificial flies after sundown.

Lake trout are sought with bait-casting tackle but in the spring the fly fishermen catch them in northern lakes when the fish are in fairly shallow water. The world's record weighed forty-eight pounds and came from Quebec. When caught trolling, the lake trout will take a big spoon. In the spring after the ice goes out they strike spoon and plug lures cast with a casting outfit.

The steelhead trout is another sporty fish. The largest taken on rod and line weighed twenty-nine pounds. They are widely distributed and considered a dandy game fish on a fly rod. Rivers in the west, fast and rocky, offer excellent fishing.

The various species of catfish, especially the channel cat and blue cat, are such scrappers, are so widely distributed, and provide so much fun that they cannot be left out. The channel catfish is fast and likes running water. It's a good fighter on a line. The blue cat grows larger. Specimens have been taken in the upper Mississippi that dwarf the largest muskies. Many are taken on set lines, although anglers also use a rod and line to catch them in the smaller rivers.





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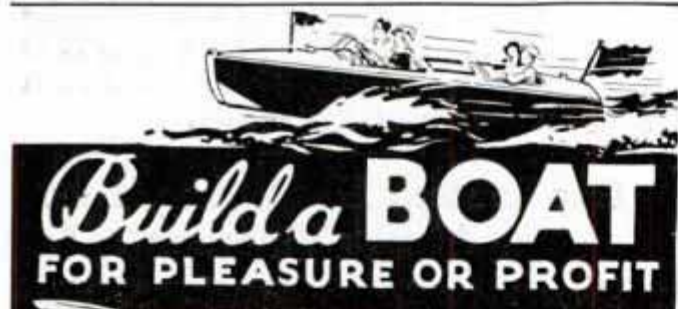


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One of the most complete, most profitable lines in U.S. Prices slashed on all carded goods, tooth brushes, combs, corn plasters, perfumes, iodine, pencils, soda mints and hundreds of other red-hot sellers! Test at our risk—write for sensational new sales plan. Prove without risking a cent this line is a winner! Experience unnecessary! BETTER PRODUCTS CO., Dept. 2684, Marion, Ind.

LOW PRICES.. HIGH QUALITY

## Gelatin Hectograph Lasts Longer by Masking Unused Portion

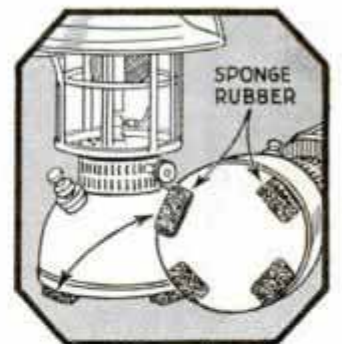


Paper mask over unused portion of gelatin prevents edges of duplicating papers from marring surface

You can almost double the number of impressions that can be taken from a gelatin hectograph by masking the unused portion of the gelatin to keep the edges of the duplicating papers from gradually cutting into the surface as they are applied and removed. The mask is merely a large sheet of paper with an opening in the center to expose the writing. By ruling guide lines on the mask before it is applied to the gelatin, it will serve as a gauge to assure straight copies.

## Gas Lantern Has Rubber Feet to Absorb Vibration

Cemented to the bottom of a gasoline lantern, four equally spaced blocks of thick sponge rubber will help absorb sudden shocks or vibrations, which are likely to break the mantles. As the bottoms of most of these lanterns are deeply recessed, be sure the sponge rubber is thick enough to extend well below the rim.—A. H. Waychoff, Tempe, Ariz.



When a camera ground glass is too coarse for fine focusing, rub a very little glycerin on it with a soft cloth; however, too much glycerin will make the glass transparent.



## TALK - SING - PLAY thru your own radio

**BROADCAST** your voice on programs coming through your radio set—make announcements from any part of home—inject wise cracks, josh and mystify friends. "World Mike" made especially for home use, attached in a jiffy. Not a Toy. Also put on own programs at home, parties, club affairs. Barrels of fun! Easy to operate.

**PRICE 25c POSTPAID**

Johnson Smith & Co.  
Dept. 863, Detroit, Mich.

## CRYSTAL RADIO 25c

This is a radio in itself, as it is possible to get reception with it alone within 25 miles of a station (or up to 100 miles under good conditions). All you need is an aerial & earphone. Completely assembled and wired, with supersensitive crystal, stand, base, crystal cup, arm with set a whisker, etc. Reception guaranteed. Only 25c ppd.



## RADIO BOOK

Tells how to make inexpensive crystal sets, electric sets, short wave radios, etc. Get foreign stations, police calls, etc. Only 10c, ppd.



## TELEGRAPH SET

A Private Electric Telegraph Set for only 15c! Use it as a practice set or send messages to friends (sending and receiving). Learn the Code easily and quickly. Be an expert operator. Key, sounder, magnet, etc., mounted on wooden base, complete with Western Union blanks, code and instructions (with-out battery) ALL FOR 15c




**DOT N' DASH** Telegraph Set  
MOORE CODE

The Boy Electrician 10c

Add 10c for 84 page book all about electricity written especially for boys. Tells how to build batteries, dynamos, motors, radios, telegraph apparatus, telephones, light, electric bells, etc. Price 10c ppd.

## JU-JITSU DON'T BE BULLIED

The Japanese art of self-defense. New methods of attack and defense are given. Illustrated so that you cannot fail to understand them. Deals fully with trips, throws, wrist locks, body holds, defense against revolvers, strangling, armlocks, scissors, splits, head lock, holding a man down, double knee throw, stick attack, defense against knife, one hand throat grip, defense against two assailants, stomach throw, secret thumb knockout, nerve pinches, and numerous others. Learn to protect yourself under all circumstances with nature's weapons. Fear no man, guns or knives! "Science of Ju Jitsu" Only 30 cents postpaid.



## AUTO SCARE BOMB

The Auto Bomb is attached to the motor of your car, one wire to the spark plug and the other wire to any part of the motor. The instant your "victim" steps on the starter, there is a shrill whistle, followed by a loud bang. The driver thinks his car has exploded. Attached in a few seconds. Does not harm the car. More protection than an insurance policy—catches the thief in the act. Price 15c each, 3 for 40c. \$1.35 per doz. Shipped by Express. Not Prepaid.



**BOOM**  
**EEEEEE-OH**  
**BANG**  
**BAM**

**SNAPPY JOKES.** Big collection compiled by a bartender for stag parties, smokers, etc. Price 10c.

## Hands Up! Pistol Cigarette Case 25c

It looks like a deadly weapon, but it is merely a novel Cigarette Case. Better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They quirm and protest. Pull the trigger and the slide flies open, disclosing the cigarettes. **PRICE 25c ppd. Catalog 10c**



## DANCING

**LATEST STEPS.** Be popular. Good dancers are always admired—Always popular guests. Partners welcome them eagerly. The newest, smartest steps without a teacher. Don't make excuses when the music starts. Get lots of fun from parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way. **BOOK TELLS** How to develop poise and control, improve your own steps, art of holding, how to walk to music, how to lead, latest Fox Trot steps, Natural and Reverse Turns, the Reverse Wave, the Quickstep, swaying to music, Waltz, Backward Changes, the Continental, the famous Kie's dance, the Arabian, the College Rhumba, the Carlo, Charleston, and many others. **Art of Dancing. Price 25 Cents Postpaid.**



25 Cents


## BOYS! BOYS! BOYS! THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends. The **VENTRILO** a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it. Never fails. A 64 page course on Ventriloquism together with the Ventrilo. All for only 10 cents postpaid.



## LEARN TO VAMP

Would you like to play the piano or organ without going through the tedious, dry of learning the scales and keys and without tedious practice? The **Vamping Tutor** is a greatly simplified method, which, after a little practice, enables you to play the accompaniment to any tune or song written in any "time" or in any "key." No knowledge of music necessary. Once you have mastered the system, you will be able to play the accompaniment to songs, ballads, waltzes, the latest hits, etc., entirely by ear without any music. Price 12 cents postpaid.



## Good Luck RING

Very striking, quaint and uncommon. Oxidized gunmetal finish; skull and crossbones design; two brilliant flashing imitation rubies or emeralds sparkle out of the eyes. Said to bring good luck to the wearer. **PRICE 25c Postpaid**



## 250 Magic Tricks

An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illustrated. Entertain and amuse everybody. Only 10c postpaid.



**MAGIC MADE EASY**

125 CARD TRICKS. Contains latest and best card tricks. Exposes card tricks used by gamblers. 25c

## ELECTRIC EYE 25c PHOTO-ELECTRIC CELL

**DOORS OPEN**  
**BELLS RING**  
**WINDOWS SHUT**

The Electric Eye—Photo-cell—is one of the latest scientific discoveries that has many practical uses. A flash of light opens a garage, window, door, turns lights on or off, stops or starts a motor, etc. Used in all television sets. The miracle with a million uses! No experimenter, no inventor (and who isn't?) should be without this latest scientific novelty. Can also be used to amuse and delight people by creating weird effects. Lights go off, doors bang, with a flash of light. **Electric Eye, only 25c postpaid. Supersensitive Electric Eye, better quality, 50 cents postpaid.**





## ROCKET SHIPS!

Step into the future with a fast, powerful Rocket Ship. Build a real flying model of your own. Be centuries ahead of anybody in your neighborhood. See a kind of rocket planes, rocket cars or rocket boats. Complete plans are in book form. Rockets require only about an hour to build from inexpensive materials obtainable at your drugist or chemical supply company. Will go far at high speed! **Price 10c postpaid.**



## HOW TO TAP DANCE

Why envy the easy rhythm and fascinating grace of Step'n Fetchit, Fred Astaire etc. Tap dance in ONLY 6 HOURS by a new, simplified course by Prof. Wilson. No special ability needed. Be a smartly everybody's tapping. The whole town in tapping. Beat out a tune with your feet. Hostesses love it. Friends adore it. Besides, tap dancing is not only invigorating and entertaining but is also health-giving exercise for making the limbs supple and giving a "springy" feeling of fitness to the whole body. Promotes slimmer nature's way, without pills, drugs or dieting. Readers say: "... wonderful benefit. Thank you for adding tap dancing to my accomplishments."

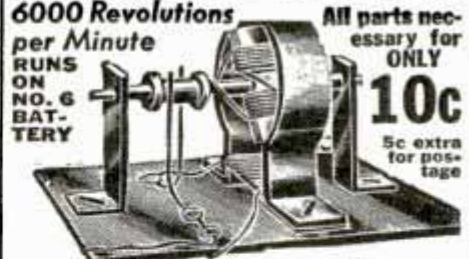
**PRICE 25 CENTS POSTPAID.**



## ELECTRIC MOTOR

6000 Revolutions per Minute  
RUNS ON NO. 6 BATTERY

All parts necessary for assembly ONLY 10c  
5c extra for postage



An Electric Motor for 10c. Sounds almost unbelievable but it is perfectly true. We send all the parts packed in a neat box, with full instructions for assembly. No trouble at all putting it together—it is FUN. Takes but a few minutes. And OH BOY! Isn't it speedy! Runs on a No. 6 or similar dry battery. You can learn more about a motor in 30 minutes than by hours of study. Perform many novel and interesting experiments with it. **Price 10c; postage 5c extra.**

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REVOLVER STYLE 25c  
50c  
\$1.00

Three new models now out, 25c, 50c and \$1.00. Well made and effective. Patterned after latest type of Revolver. Appearance alone will scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps, dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th of July, New Year's, stage work, starting pistol, etc. Small size 25c. Medium size 50c. Large size \$1.00. Blank cartridges 50c per 100. Holster (cowboy type) 50c. Shipped by Express only, not prepaid.

**MIDGET BIBLE.** Size of a postage stamp. Over 200 pages. Said to bring good luck to owner. 15c.

**Dream Book and Fortune Teller.** Tells fortunes. Interprets dreams, gives lucky numbers. Price 10c.



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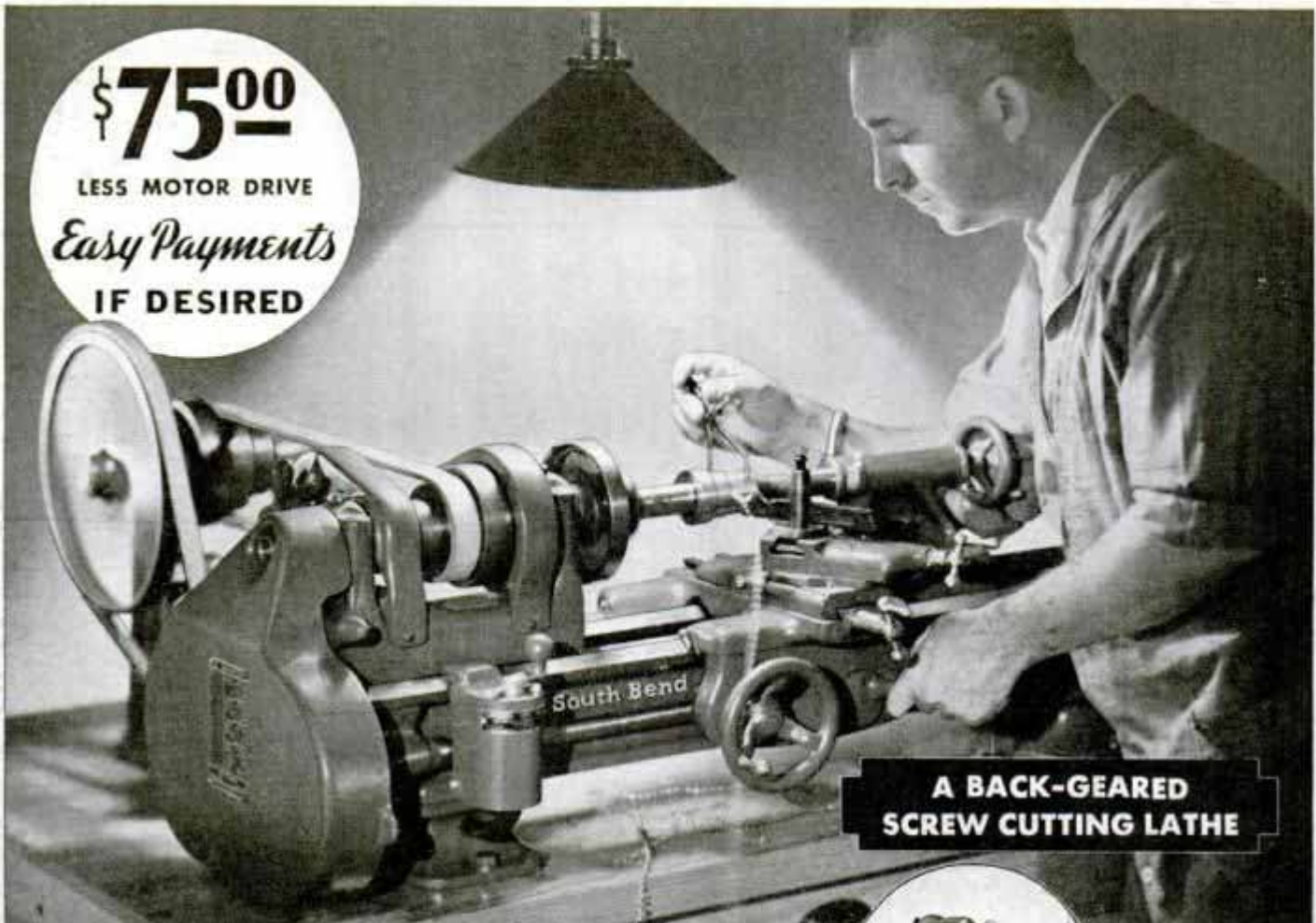
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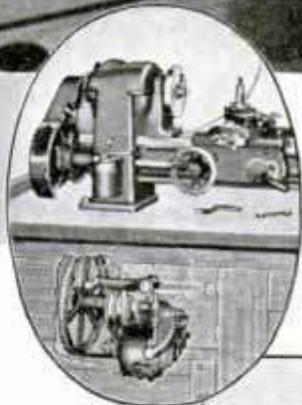

**\$75<sup>00</sup>**  
 LESS MOTOR DRIVE  
*Easy Payments*  
 IF DESIRED



**A BACK-GEARED  
 SCREW CUTTING LATHE**

**9" x 3' Genuine SOUTH BEND  
 WORKSHOP Precision LATHE**

9 1/8" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, 1/4 h.p. Reversing Motor, Switch and belting as shown above. **\$98<sup>25</sup>**



9" Workshop Lathe with Underneath Belt Motor Drive. Motor and drive unit are mounted underneath bench. V-belt or flat belt drive.

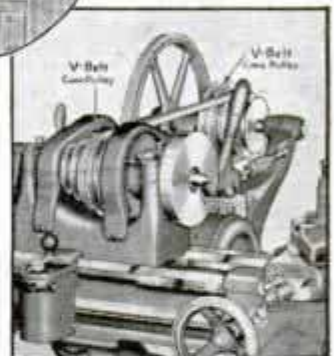
**THIS** new 9" x 3' Workshop Lathe is modernly designed to handle the finest, most accurate jobs in manufacturing—in the tool room, in home workshops and automotive machine shops, for all classes of fine precision work. The quality of materials and workmanship is exactly the same as used in the most expensive models of larger size and thus the lathe represents the greatest value we have ever offered in 30 years of fine lathe manufacturing.

Features include: Twin gear reverse to leadscrew; Ball Thrust Bearing on spindle; Automatic Longitudinal screw feed to carriage; Precision leadscrew for cutting screw threads from 4 to 40 per inch; 3/4-inch hole through spindle taking collets up to 1/2 inch capacity, and a number of other important features all shown in catalog below.

Used by the U. S. Government, Bell Telephone Laboratories, Eastman Kodak Co., Sikorsky Aircraft Corp., Firestone Tire and Rubber Co., and scores of other leading industries in this and 96 other countries.

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V-belt motor drive instead of flat belt can be furnished as an optional feature on all types of 9-inch Workshop Lathes. Full details in catalogue shown below.



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**SOUTH BEND Precision LATHES**



# DOES IT PAY?



## ONLY SILVERTOWNS GIVE YOU GOLDEN PLY *Blow-out* PROTECTION

Put yourself in this picture. Don't risk a blow-out accident like this. Unless you are protected, the chances are better than even you will have a blow-out some day.

\* \* \*

When thousands are killed or injured in blow-out accidents every year isn't it foolish to take unnecessary chances? Even at normal speeds of 30 or 40 miles an hour, terrific heat is generated *inside* the tire. Rubber and fabric pull apart. A blister forms and grows bigger and bigger until—sooner or

later—BANG! A blow-out!

To protect you, the Life-Saver Golden Ply is built into every new Goodrich Safety Silvertown. This ply has a special heat-resisting construction developed by Goodrich engineers to keep blisters from forming and overcomes the great, unseen cause of high-speed blow-outs.

Have your Goodrich dealer equip your car with a set of Golden Ply Silvertowns. They'll give you greater safety and months of extra trouble-free mileage. Yet they cost no more than other standard tires.

HEAT CAUSES BLOW-OUTS. PREVENT THOSE BLOW-OUTS WITH THIS HEAT-RESISTING GOLDEN PLY



**FREE!** Join the Silvertown Safety League. Sign the Safe Driving Pledge and your Goodrich dealer will get for you absolutely free a tail-light emblem with red crystal reflector. No obligation to buy.



The *new* Goodrich SAFETY Silvertown

With Life-Saver Golden Ply Blow-Out Protection





**UNDER THE BIG TOP.** Miss Dorothy Herbert, of Ringling Bros.-Barnum & Bailey, says: "I smoke all I want—eat anything I care for. Camels make food taste better and digest easier."



**STOP PRESS!** "It's a life of irregular meals," says Peter Dahlen, newspaper man. "It's swell the way Camels make food taste better and set better."



**IN THE BROWN DERBY.** The chef puts the final touches to a Lobster *Thermidor*, while within the restaurant the stars of Hollywood gather to dine... and to enjoy Camels. As Mr. Robert H. Cobb, the man behind The Brown Derby's success, remarks: "Camels are the choice of the majority of our patrons."

*For Digestion's sake  
...Smoke Camels*

**Camels stimulate the natural flow of digestive fluids — increase alkalinity**

Sometimes we feel too worn-down really to *enjoy* eating. Science explains that hurry and mental strain reduce the flow of the digestive fluids. Smoking Camels increases the flow of digestive fluids... alkaline digestive fluids... so vital to *good digestion*.

Camels are mild beyond words. Enjoy them steadily. Camels set you right!

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**COSTLIER TOBACCOS!**