

FLYING THE WINGED BULLETS

POPULAR MECHANICS MAGAZINE



YOU CAN UNDERSTAND IT

REG'D. TRADE MARK. GREAT BRITAIN. INC.

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OCT.
25 CENTS



SEE PAGE 546

YOU CAN DEPEND ON CHAMPIONS



FOR OUTSTANDING ENGINE PERFORMANCE

There are many reasons why Champion Spark Plugs excel and outsell; but none so convincing as the fact that Champions exact maximum performance and dependability from every engine.

In the recent 11th annual Albany-to-New York Outboard Marathon, 77 boats started out on the 132-mile ride in the worst weather in the history of the race. Each entrant had but one goal—to win.

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The winners and all who survived the choppy seas used Champion Spark Plugs and gave them punishing treatment without parallel in any type of service. Most of the boats were powered by two-cycle engines, requiring double the sparking frequency in general and automotive use, turning speeds up to 7000 r.p.m., and using a mixture of gas and oil—all of which combined to make it an extreme test of spark plugs.

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**ACTUAL SIZE
V-PLUG**



V- $\frac{3}{8}$ "
24 Thread
V-2 $\frac{1}{4}$ "
32 Thread
65c

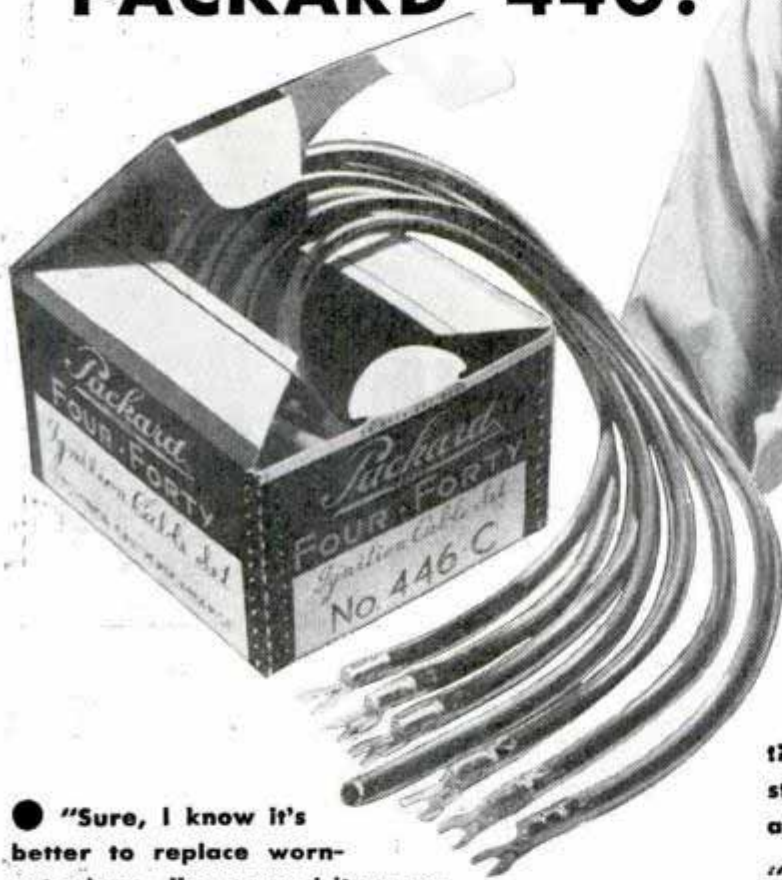
**MODEL BUILDERS
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Specially designed for model gas engines giving the same dependable performance as regular Champions. Absolutely gas-tight, alloy needlepoint electrode, one-piece construction. If not available through your dealer, write Champion Spark Plug Company, 900 Upton Ave., Toledo, Ohio.

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"I insist on Packard Four-Forty because it's the first cable I ever saw that can 'take' the heat under that hood in hot weather . . . remain flexible and crack-free under the cold of winter months . . . and still withstand the effects of corona, age, oil and abrasion after miles of high-speed driving.

"I needn't go into all the details about Packard Four-Forty's secret-formula inorganic sheath—just take my word for it. I know what I'm talking about—and you'll agree with me, after you see how much better your car runs with a new set of Packard Four-Forty!"

Packard Four-Forty Ignition Cable Sets for any car are available at most service stations. Install a set NOW. The cost is low and you'll benefit by faster pick-up, more power and lower gasoline bills. Packard Electric Division, General Motors Corporation, Warren, Ohio.

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Popular Mechanics Magazine

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

October, 1938

Vol. 70, No. 4

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Three Seconds from Death!

THERE are seventeen men and six women in Hollywood who live entirely by seconds, seldom being more than a count of three from disaster while working. They draw twice as much salary as the average movie star for the actual time they work, they are seen on the screen daily by millions, yet they are totally unknown except to their friends and fellow workers. This little group is composed of the thrill-makers of motion pictures, the "stunters" of the movies. In their work, a second means more than a day to most of us because it generally spells the difference between safety and tragedy. "Timing" is their religion for they work entirely by count, a count which becomes almost subconscious with them but which, if they forget it, may mean death. An article next month takes you on location with a Hollywood stunt man. It's the kind of story readers with weak hearts will want to skip.

Next Month

THE rapid strides of radio in recent years make possible world-girdling hook-ups which, in the space of an hour, transport you around the world—into yesterday, today and tomorrow. What goes on behind the scenes in these ether-jumping programs makes an interesting story which you'll find in the November issue. It is titled "Ether Jumpers Never Sleep" and is illustrated in Coloroto.

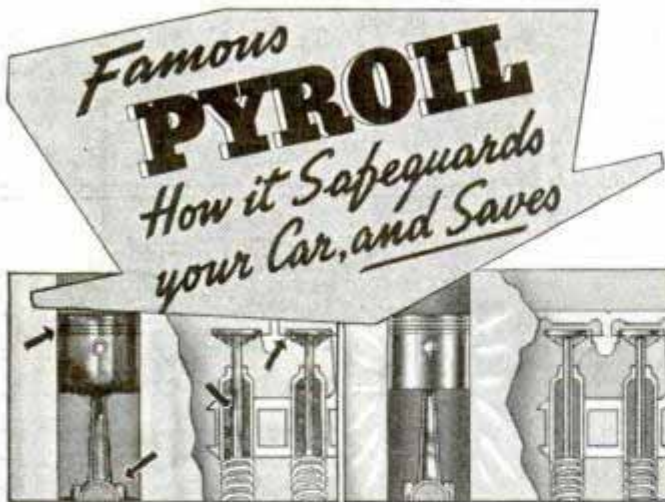
Secrets of Speed

THE world's fastest airplane is an Italian ship which cost more than \$1,000,000 and flew 440 miles an hour four years ago. That record could be broken today at much less cost. A 500-miles-an-hour ship could probably be constructed for \$60,000. The price of speed has gone down because our knowledge of speed has increased. The secrets of speed form the basis for an article next month.

Winged Lifeguards

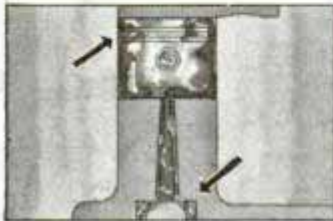
EARTHBOUND and surfbound for generations, the Coast Guard has taken to the skies. The service now uses giant long-range flying boats which cruise more than 2,000 miles non-stop at 125 miles an hour. The boats can land in rough water far out at sea to pick up twenty or more people in an emergency. An article in the November issue describes the work of the aerial branch of the Coast Guard.

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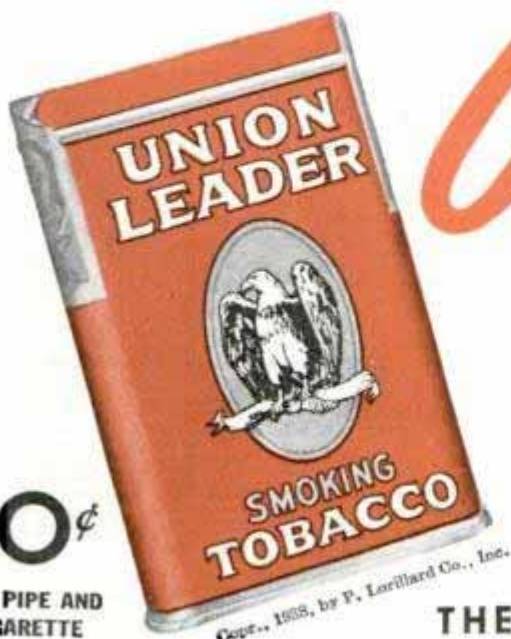
...through the years



IN 1907 . . . "Meetin' the right pipe tobacco is pretty near as difficult (and important) for a man as courtin' the right girl. I didn't get hep to Union Leader until a travelin' man loaned me some about the time this snapshot was taken. But I've had cause to thank that fellow ever since for my favorite smoke."



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or plug service.



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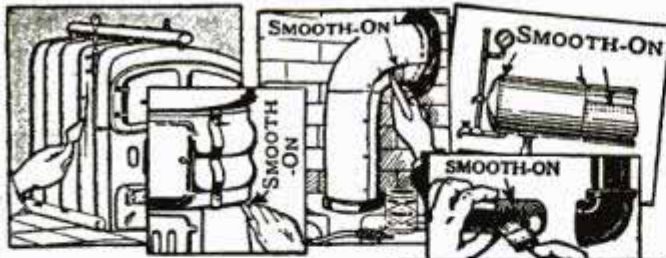


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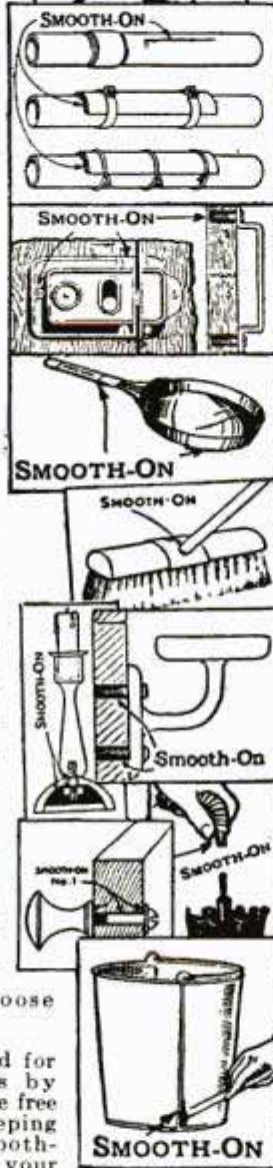
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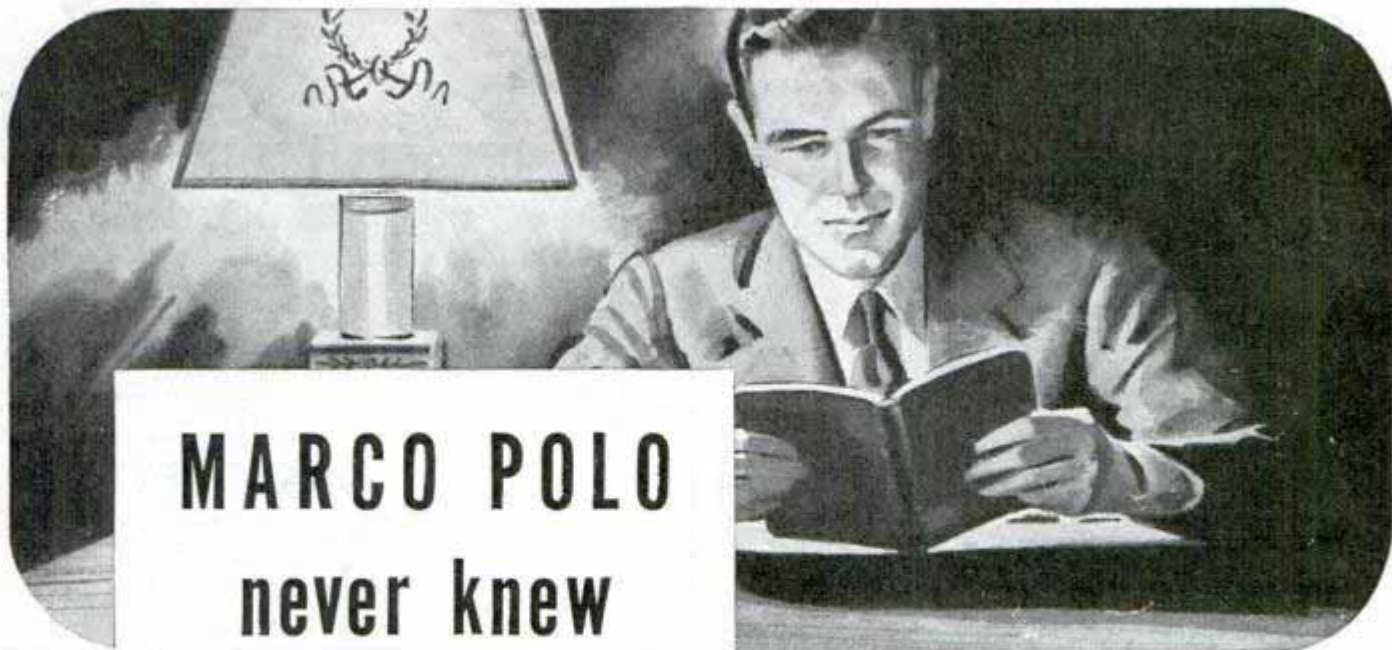
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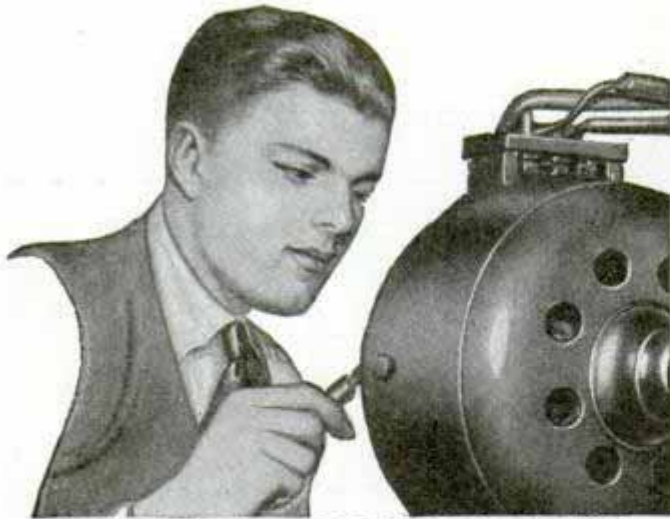
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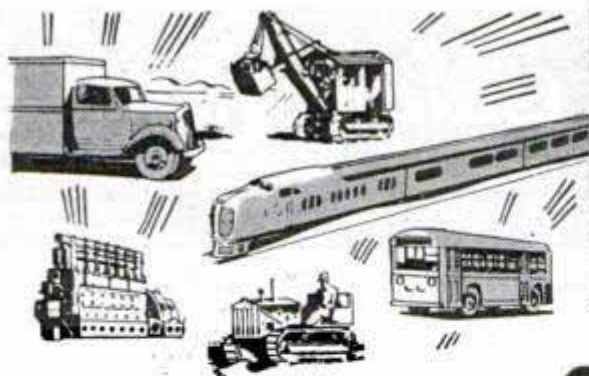
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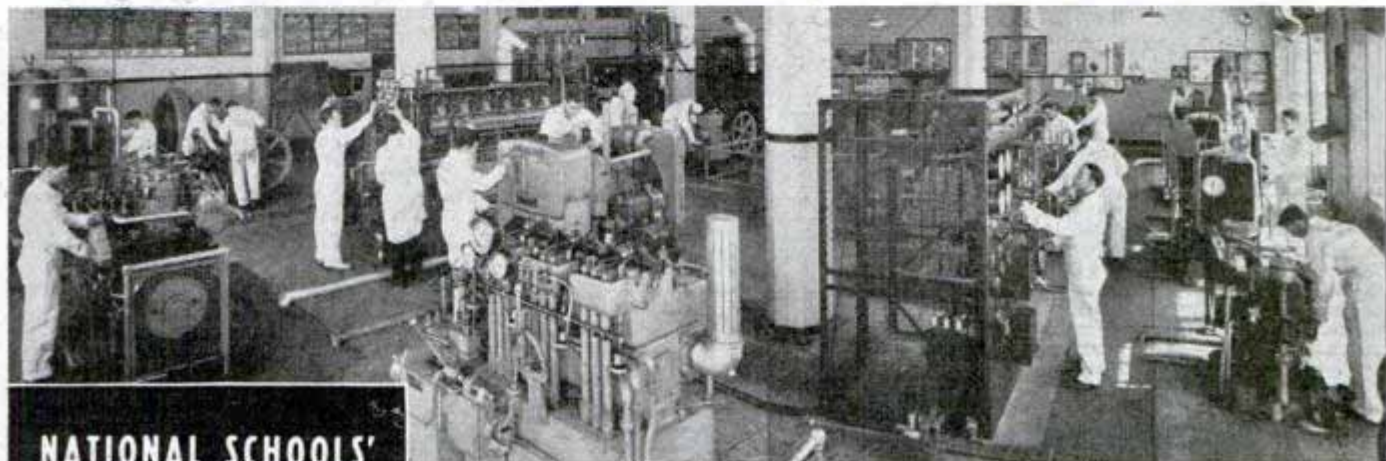
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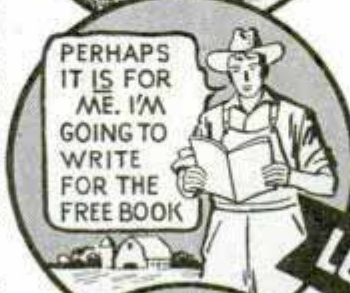
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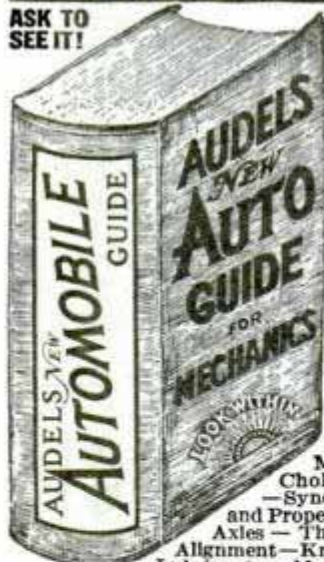
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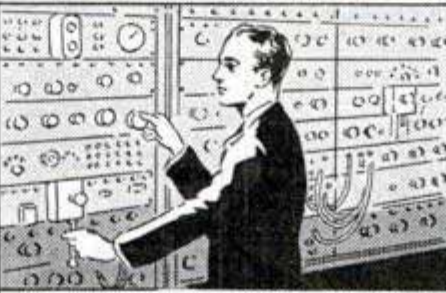
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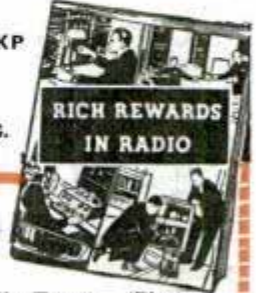
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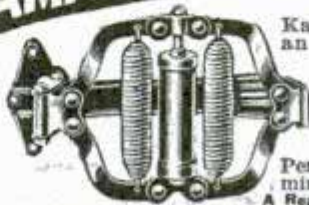
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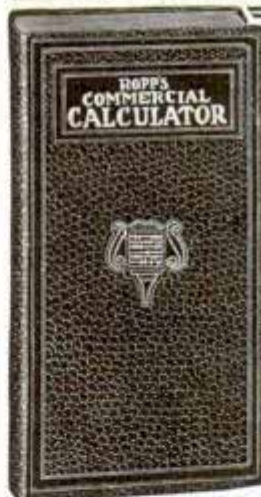
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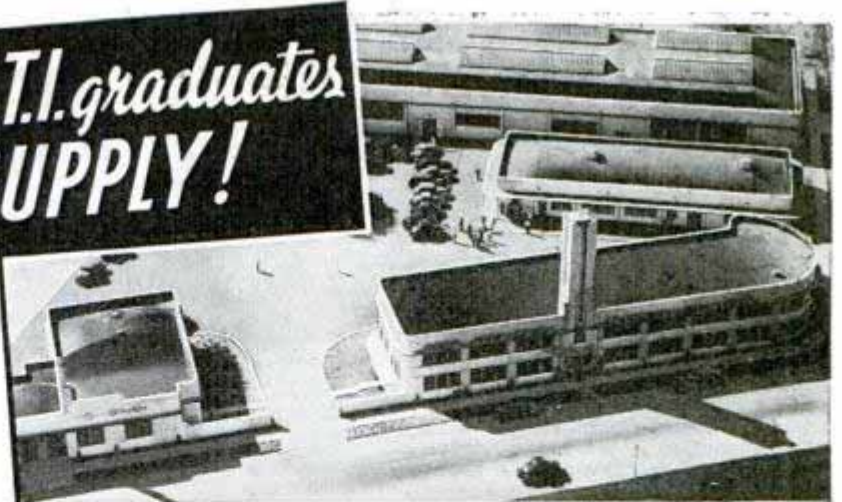
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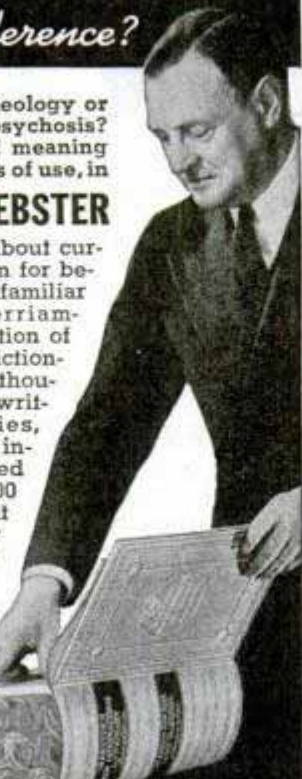
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NEW**INVENTIONS**

FOR the convenience of milady, a newly patented lipstick mirror is equipped with a light that facilitates application of lipstick at night. The illumination is directed on the user's mouth so that the image is reflected sharply in the elongated mirror.



The light is switched on by holding the mirror between the opposed fingers of one hand. Its rays come from a small window at the side of the mirror.

AMONG the latest ideas in window construction is one for a standard vertical sliding sash equipped for opening inward like a French window. This sash, in the standard window, would be the lower one, the upper sash being of the usual construction. Improved control of ventilation is among the claims made for the sash.



SOMETHING that may revive the popularity of the rumble seat is a newly patented cover which protects the occupants from the weather. The cover, or hood, may be lifted to permit access to the rumble seat or it may be detached when weather



conditions permit. The hood consists of a unitary windshield, rigid side wall structure and means for holding the flexible, detachable cover in rigid position. The hood is attached at its forward edge to the automobile to facilitate opening.

INCREASING the safety factor for airplane passengers by using a giant parachute to lower the ship or the cabin in emergencies is not a new idea, but a recent patent seems to be a step ahead of others in practicality. The cabin is detachable, as well as airtight. A cover, hinged at the rear of the plane, may be released in an emergency, permitting the big parachute to pull the cabin out of the plane in a rearward sliding movement. The cabin slides on a skidway formed by the opened cover.



DRIVERS who find it difficult to use the rear-view mirror with which the modern car is equipped probably would welcome a new version patented recently. This mirror is designed to reflect to the driver's eyes the image of whatever is behind the car, but the image is caught over the roof of the vehicle instead of through the rear window. This arrangement is said to give a wider range of vision than is possible with present mirrors.



(Continued to page 33A)

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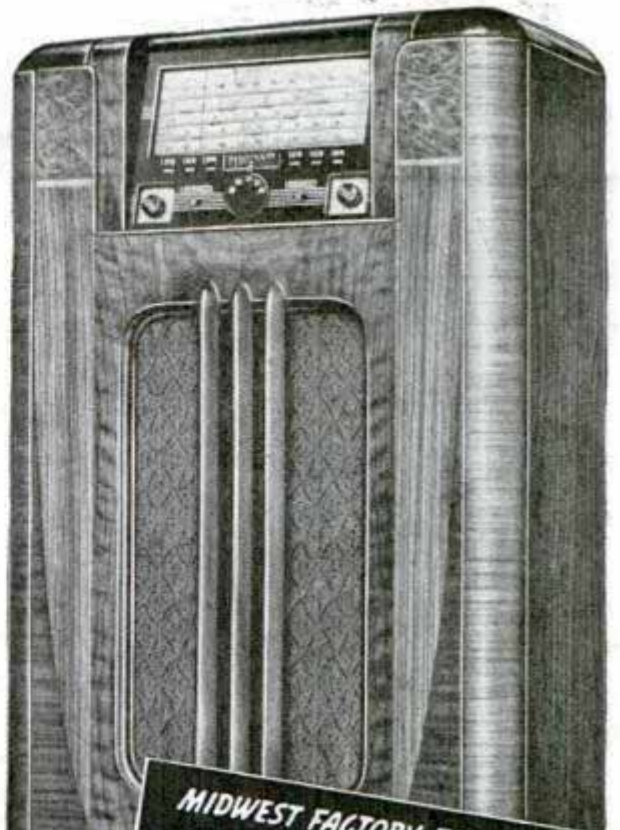
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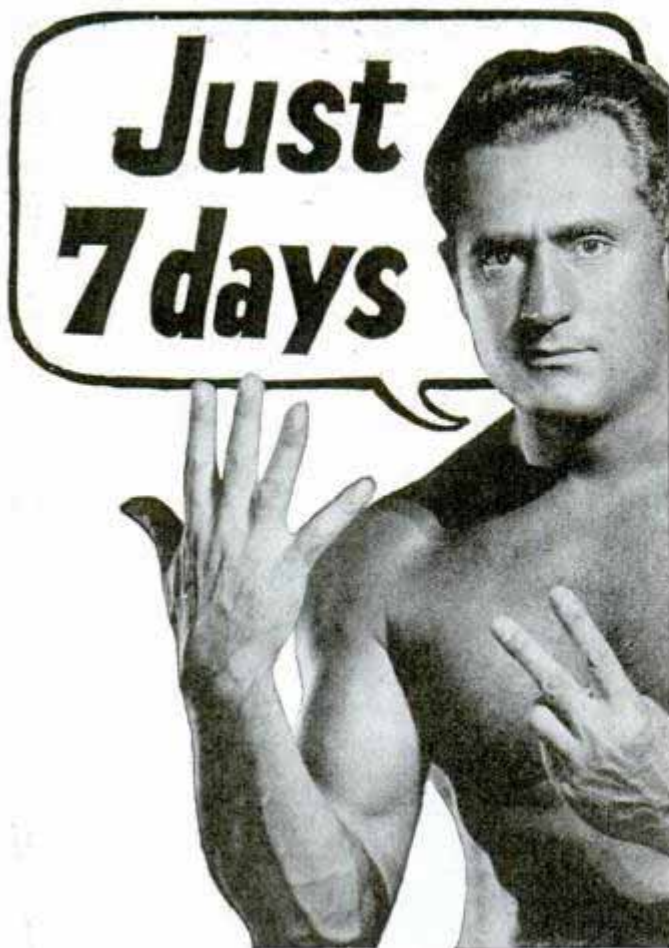


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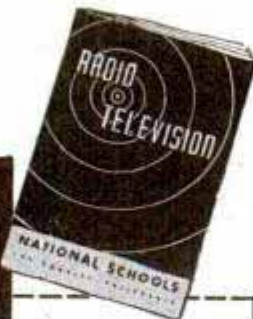
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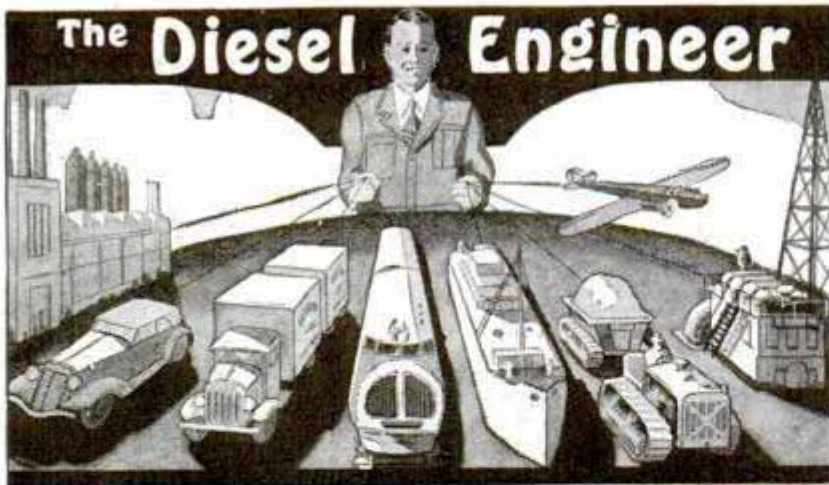
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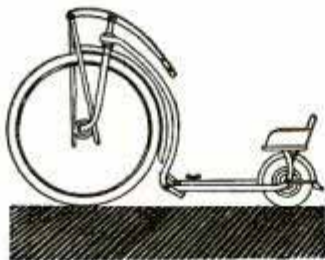
(Continued from page 24A)

DESIGNED to reduce glare from approaching headlamps, a simple eye shield for the automobile has been patented. It has a bracket to which a panel of anti-glare material is attached. The panel is movable, so the driver may swing it out of the

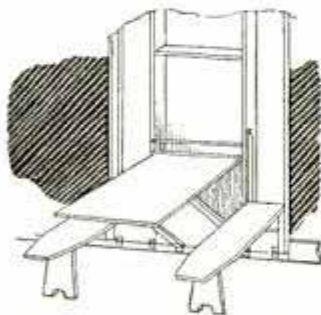


way during the day or when it is not in use at night. The bracket, with the anti-glare panel, is mounted outside the car, on the cowling. A metal arm with a handle extends into the driver's compartment so that the shield may be swung to and fro.

INTEDED probably as a vehicle for children or for sports purposes, an odd-looking bicycle patented recently is manually operated. It has a high front wheel and a low rear wheel, above which is located the seat. The operator places his feet on the low platform connecting the wheels, then propels the bike by pushing a lever up and down to actuate the front wheel.



FOR the apartment or small home, a newly patented combination ironing board and bench for the breakfast table is a space-saver. From a cabinet positioned within the wall, the ironing board may be lowered from folded position to serve either of its uses. A leg, which supports the board when it is used as breakfast-table bench, folds against the under side when ironing is in progress. A brace supports the board for ironing. The board is adjustable, up or down.



(Continued to page 54A)

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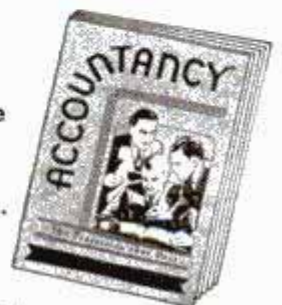
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BARGAIN Gun catalog, send 5c. Bargain tackle catalog, send 5c. J. Warshall & Sons, First and Madison-PM, Seattle, Wash.

REPAIR And remodel your own guns. 20 books on gunsmithing and firearms. Free catalog. Samworth, Marines, N. C.

GOLF Clubs. Five club matched set \$2.50. Lincoln Surplus, 123 Galena, Freeport, Ill.

TREASURE Finders? Read Goldak advertisement on page 131A.

FIELD GLASSES, TELESCOPES AND MICROSCOPES

FREE Instructions. Build powerful telescope. Atensco, Box 213, Flushing, N. Y.

USED Microscopes, binoculars, astronomical telescopes—Bought, sold, repaired. Send 10c for list. Rasmussen, P. O. Box 294, Amsterdam, N. Y.

TELESCOPES, Microscopes, binoculars; 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

TELESCOPES, Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

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I CAUGHT 46 coons last season. Have male Coon Hound, 3 1/2 years old, Bluetick-Redbone bred, large size, wide hunter, fast, good voice, true at tree, rabbit, fox, stock, deer proof, \$15.00. Ten days trial. Bank reference, picture of myself furnished. J. N. Ryan, Murray, Ky.

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"**BABY**" Saint Bernards shipped anywhere our risk. Dime brings illustrations; souvenir! Royal Kennels, No. 8, Chazy, N. Y.

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\$315 SECURES Bank bargain, 40 acres, considerable fruit, 2½ miles fine town of 9000; 6-room house and barn; price only \$915, easy terms; picture page 106 free catalog of 2000 bargains. Strout Realty, 255-P 4th Ave., New York City.

GOVERNMENT Lands ten cents acre up. Information all states twenty-five cents. National Tax Service, 600A Majestic Bldg., Detroit, Mich.

40 ACRES, Near White River, unimproved; poultry land. \$175, \$5 down, \$5 monthly. Free list and literature. Hubbard, 216 Grossman Bldg., Kansas City, Kans.

GOOD Farms available. Washington, Minnesota, Idaho, western Montana, Oregon. Dependable crops, favorable climate. Write for impartial advice, literature and list of typical bargains. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

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"RAISE Frogs!" We buy! Good prices year round. Small pond starts you. Free book shows sketch. American Frog Canning, (153-T) New Orleans, Louisiana.

RAISE Mink, dime for general information. Lomman's Fur Farm, Spangler, Penna.

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NATIONWIDE Opportunities—10c. Get on our list. Swaty's, Mentone, California.

MAKE Rainbow photo rings, initial jewelry. Samples 10 cents coin. Rainbow Ring Company, Box 690, Omaha, Nebraska.

TREASURE Finders? Read Goldak advertisement on page 131A.

SELL Greeting cards all year. 100% profit. Baker Brothers, Roselle, New Jersey.

WANTED Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. P66, Toronto, Can.

COUNTRY Drives or movies afternoons! Work mornings home. No canvassing! Folio-H, Station D, Los Angeles.

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RAISING Jumbo frogs. Interesting. Big future. Females lay 10,000 eggs. Free literature. American Frog Industries, Box 336, Rayne, La.

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BOY Mechanic—Famous library of 3 volumes covers the building of almost everything a boy might want to make. Actually covers 3,000 different articles. Each volume 460 pages, fully illustrated. Cloth. Price \$2 each or set of 3 vols.—\$5 postpaid. Popular Mechanics Press, Room (C38), 200 E. Ontario St., Chicago.

YOUR Favorite magazine, postage only. Exchange basis. Information dime. Exchange, Box 13, West Wichita, Kansas.

GAMES—ENTERTAINMENT

FUN Playing Cuban. Easily made. Directions, full size layout, 25c. Fran, 17195 Strasburg, Detroit, Mich.

BINGO Games make money everywhere. Catalog free. Warwick Bingo Co., Conimicut, Rhode, Island.

CROQUET Owners: New, interesting, copyrighted game for your set rules. Instructions postpaid 25 cents. Gobakay Co., 1517 Rock Glenn, Glendale, Calif.

SHUF-L-BORD Played anywhere, two or three players; 9x2 "board," discs and pushers, \$2.50. Lange, R.802, 20 E. Jackson, Chicago.

PLAYS, Operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 203 N. Wabash, Dept. 11, Chicago.

CARNIVAL Games make you money. Outfits supplied. Illustrated literature 10c. "Moore-Made," LaPeer, Mich.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

KNIFE Throwing secrets exposed! Beginners and experts get this book now! 40 tricks and throws used by professionals, \$1.00 postpaid. Frank Dean, 1294 E. San Fernando St., San Jose, California.

FREE! Oaks Marvelous Memory—Spectacular mindreading cards—with 200 page magic catalog, ten cents. Oaks Magical, Box 171M, Oshkosh, Wis.

BE A magician. Large professional magic catalogue of latest tricks 25c. Cash paid for complete Tarbell Magic Courses. Write, Ireland, C-109 North Dearborn, Chicago.

SVENGALI Magic decks, magic, magic cards, joker's novelties, puzzles. World's largest manufacturers. Catalog describing 300 items free. Adams Company, Asbury, Park, N. J.

FREE! Magic catalog 500 tricks. Amaze. Mystic friends. Write today! Lyle Douglas, Station-A-5, Dallas, Texas.

LARGE 172 Page magic catalog. All prices. 25c. Chicago Magic Company, 2300 North Mason Avenue, Chicago.

VENTRILOQUISM, Complete instructions and dialog \$1.00. Illustrated puppet catalog 25c. Frank Marshall, 5518 So. Loomis Blvd., Chicago, Ill.

EARN Money in any crowd. Call names of strangers, tell unspoken questions. Professional course mind reading, spirit writing, etc., \$1. Henderson, Box 341, San Bernardino, Calif.

LEARN Ventriloquism, 3c stamp brings particulars. Smith, 125 N. Jefferson, Peoria, Ill.

WORLD'S Largest magic shop professional catalog, 25c. Holden, 220 W. 42nd St., New York.

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STAMP Dealers: Illustrated wholesale catalogue featuring Canadians, New foundland, British Colonials. Free. Empire Stamp Company, Dept. 5, Toronto, Canada.

AIRMAILS And commemoratives, 25 different, including Columbian, Edison, Olympic, etc., only 5c with United States and foreign approvals. Marco Stamp Co., Box 888, San Francisco, Calif.

UNITED States approvals. Write for selection on approval. 19th century airmails, revenues. No premiums but good stamps, fast service. John Daub, Wabash Bldg., Pittsburgh, Penna.

FREE—World's largest stamp, catalogs \$1.25, to approval applicants. Charles Cleveland, 806 North Humphrey Avenue, Oak Park, Illinois.

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COLLECTIONIST Liquidating Mexico. Unusual 50—100—150 all different; 30c—90c—\$3.00. Other opportunities. V. Trevino, Apartado, 79, Guadalupe, Mexico.

FREE—20 Different commemoratives. Postage 3c. Penny approvals that satisfy. Dolve, 621 - 15th Ave. S. E., Minneapolis.

U. S. 6c 1918 Airmail used, catalogue 85c for only 25c. U. S. or foreign approvals with each order. W. C. Phillips, 750 Main St., Hartford, Conn.

ROOSEVELT Guatemala miniature sheet \$1.00. Approvals by countries. Creevey, Berwick, Penna.

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EARN Cash-stamps, sell my approval books. Nickel packets. Ellison, 2841 West 37th St., Brooklyn, New York.

\$2.00 CATALOG Value 10c approvals. Quality Stamp Shop, Englewood, Colorado.

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DEALERS (Also part time) send for free samples printed philatelic forms. These, 10526 Anzac Ave., Los Angeles, Calif.

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SOMETHING New. Make big money giving away cards. No selling. Fleck, Box 306P, Columbia City, Indiana.

"\$10.00 DAILY." Stamping names on keychecks. Sample and details 25c. Bohn Co., Box 86P, Wilkes-Barre, Penna.

MAKE Wringer rollers for washing machines. Instructions one dollar. Universal Service, Anderson, Ind.

PROFITABLE Home work, complete instructions 25c (coin). Webster, 3931 Third St., Detroit, Michigan.

TREASURE Finders? Read Goldak advertisement on page 131A.

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

MONEY Means pleasure. My 64 page book shows how, 25c. Write today. Gurney, 4825 So. Marshfield, Chicago.

DIME Brings six months Our Salesman, 1202 Mathewson, Wichita, Kansas.

YOUR Name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines, 583-P Monroe, Brooklyn, N. Y.

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

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

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

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

10c BRINGS Copy National Mail Order News. Box 1773-PM11, Roanoke, Virginia.

EARN Money collecting reptiles, toads, frogs. We buy all varieties. Splendid opportunity. Particulars free. Biological Research Laboratories, Dept. 14-d, Springfield, Missouri.

FORMULAS, PLANS, ETC.

FORMULAS — Fast selling products. Guaranteed. Laboratory tested. Any formula 50c, three \$1.00. Franklin-Allen Laboratories, South Paris, Maine.

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

PROFITABLE Products. Get my formulas. Particulars free. Ritter, 1713 Powers, Cincinnati, Ohio.

SELECTED Formulas, for every article. Write Grinstead, 505 Fifth, New York.

25c **BRINGS** 5 Outstanding quality formulas. Solar, 3026-32, Minneapolis, Minn.

SELL Perpetual incense! Formula 25c coin. Philip Bruce, Box 341, Palo Alto, Calif.

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

"**ANYTHING** in Formulas." \$1.00 each, five \$3.00. (Satisfaction guaranteed.) Research Bureau, 100 Chelsea, Charlestown, Massachusetts.

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

MANUFACTURE High grade auto cleaner-polish. Complete instructions \$5.00. A. B. Schooley, Waukegan, Illinois.

SECURE Latest formulas free from world's foremost chemists. Source information \$1.00. Burton, Box 298, Richmond, Va.

WHY Buy necessities? Make them. Adhesives, cleaners, photography, etc. 100 guaranteed formulas 25c. Chemco, 1754 Weeks Avenue, New York City.

NEWEST Guaranteed formulas. Lowest prices. Valuable information free. Hodge Laboratories, Elkhart, Indiana.

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

ANY Formula 25c; 6 for \$1.00. Satisfaction guaranteed. Bestovall Formulary, 4047 No. Whipple St., Chicago.

THREE Up-to-date mirror formulas \$10.00. Samples free. Nashville Mirror Co., 427 Broadway, Nashville, Tenn.

MONEY Makers, 60 pages, 100 plans 25c. P. Beck, 317 West 109th, New York.

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

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

CHEMISTRY

PERSONAL Prompt answer by chief chemist to any technical question. Expert advice on engineering problems by qualified engineer. Absolutely confidential. Patent protection service. Our technicians regularly consulted by America's leading industries. Send \$1.00 with your question. Technical Service Bureau, Laboratory 22, 6803 North Clark, Chicago.

PROFIT From chemistry; through manufacturing. Write Grinstead, 505 Fifth, New York.

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

CHEMICAL Analysis, industrial problems, estimates free. Essco Laboratories, 2206 Lycaete, Detroit, Michigan.

FREE—Chemistry's history, also chemical bacteriological catalog. Bactachem, 737 Stone, Brooklyn, N. Y.

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

TELESCOPES. Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

HELP WANTED

MAN Wanted by sales division of largest shoe manufacturer in direct selling. Good pay every day underselling competition. No experience needed. Complete sales outfit and air-cushion sample sent free. Write Consolidated Shoe System, Dept. D4, Chippewa Falls, Wisconsin.

WEAR Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 37-J, Greenfield, Ohio.

STEADY Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 216, Freeport, Illinois.

INSTRUCTION — Obtaining positions, homework. Free offers. Henry 126-A Lexington, New York.

EXECUTIVES Earning \$2,500 or more yearly and seeking advancement should write Executive's Promotion Service, 301 B-st., S. E., Washington, D. C.

AGENTS WANTED

GREATEST Need for every business fulfilled. Agents enthusiastic. Your territory might be open. Write Advertising and Collection System, 607 Law Building, Richmond, Virginia.

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

EARN Up to \$4 daily—spare time, showing smart personal Christmas cards. Also 21-card assortment, \$1. Profit 100%. Others; 50 with name, \$1. Samples free. Wetmore & Sugden, 749 Monroe, Dept. B.J.L., Rochester, N. Y.

CASH In on new patent; 12 ounce trouser creaser. Removes knee bag! Presses knife edge crease over night! Start now—your sample and particulars \$1.50, satisfaction guaranteed. Box 445, Vancouver, Washington.

BIG Money taking orders: shirts, ties, hosiery, underwear, raincoats, pants, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AN Lincoln, Chicago.

CHRISTMAS Card sensation! Sell 21 gorgeous Christmas folders in "Copper Gift Box" for \$1; profit 100%. 7 other assortments. Finest personal Christmas cards, with name. Get samples. James Art Studios, 198 Anson Pl., Rochester, N. Y.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1 a dozen or \$7.20 a gross. Sample 10c. New Method Co., P.M.M.-69, Bradford, Penna.

EASY Cash—Show new "Ruby" 21 folder Christmas assortment. Big \$1 seller. Your commission 100%. Many other Christmas assortments, gift wrappings, religious, birthday. Also personal cards with name. Big money makers. Samples offered free. Chilton Greetings, 179 Lincoln, Dept. 2-D, Boston, Mass.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. K-842, Cincinnati, Ohio.

SELL 50 Personal Christmas cards \$1.00. Amazing bargain! 50 folders with customer's name imprinted. Sells fast. Pays big profit. Free samples. Also unequaled \$1 Christmas card assortments. General Card, 400 S. Peoria St., Dept. P-309, Chicago.

CHRISTMAS Cards. Double profits with Dixie line. Boxed assortments packed from overruns. Retail value \$1.00. Your cost 25c box. Minimum order ten boxes. Order now. Keelin Press, Dept. P, 153 Spring N. W., Atlanta.

AMAZING Opportunity—Give away valuable premiums and samples with famous quality coffee, spices, 400 other necessities. Steady work—excellent pay. Your groceries at wholesale. \$500.00 yearly bonus and free samples to all qualified dealers. Experience unnecessary. Togstad Co., Dept. 672, Kokomo, Ind.

BE Your own boss! Operate used-new clothing business from store, home, auto. 200%-300% profit. Everything furnished. Catalog free! V. Portnoy, 566-AL Roosevelt, Chicago.

NEW Invention turns auto headlamps into amber foglights. Snaps on. Inexpensive. Sensational seller. Samples sent on trial. Rush name. Kristee, 106, Akron, Ohio.

AMAZING Invention, fast selling ink-well specialty. Pills fountain pens automatically without use of pen mechanism. Distributorships open. Terry Penfiller Co., Dept. PM 10, Janesville, Wis.

UTTERLY New scientific substance. Solid, potent, flexible, sensuous, translucent, waterproof. Must see, feel, smell, use to know all 28 joys for men, women. 3 regulars (75c worth) 17 ways sell dozens daily. Bank letter and refund coupon sent for 25c. Origin, 224 S. Michigan Ave., Chicago.

EARN Cash quick. Sell double value Christmas cards. 1938 leaders. Personal cards, stationery, box assortments. Season's most complete line. Profit up to 100%. Experience unnecessary. Free samples. Wallace Brown, 225 Fifth Ave., Dept. 71-D, New York.

WE Have that sells itself article that every man and woman wants. Sample 25c. Inventors Laboratory, 1821 Farrington, Memphis, Tenn.

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

CHRISTMAS Cards. Absolutely finest assortment. Big profits. Write for samples. Robinson Cards, 401 Orange, Clinton, Mass.

"**KEENEREDGER**" Produced 750 smooth shaves from one blade. Sample \$1.00. Keeneredger, Oblong, Ill.

MAKE Extra money spare time showing my gorgeous, new \$1 assortment 21 Christmas folders. You make 50c box. Friends, others buy eagerly. Other fast-selling Christmas money makers. Free sample offer. Schwer, Dept. J-30, Westfield, Mass.

MEXICAN Novelties! 100%-300% profit. Free particulars. Samples 10c stamps. Marquez-PC, Apartado 1176, Mexico, City.

NEW European novelty, used by every man and woman. Sells itself. Direct or retail trade. Send 25c for samples. A. R. Beveridge, 3771 West 23rd Avenue, Vancouver, Canada.

WATER Pen: Fill with water, writes ink. Price \$1.00. Agents wanted. Trident Traders, Inc., 67 Wall Street, New York City.

DOUBLE Profit: making and selling. Write Grinstead, 505 Fifth, New York.

PHARMACEUTICALS. Household, toilet specialties, soap. Williams Mfg. Co., North Bellmore, N. Y.

AGENTS!—205 Moneymaking opportunities. Start your own business from home, office, etc. Descriptive booklet free. Stamford, 3762-A Broadway, New York.

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

500% PROFIT With new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMG-70, Bradford, Penna.

MAN Wanted to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. J-53-PPM, Freeport, Ill.

CALLING Cards—Splendid sellers. Good profit. Samples free. Chestnut Press, 6019 Chestnut, Philadelphia, Penna.

SIZZLING! Hot! Snappy illustrated 3 color Sho-Cards. Fastest 25c sellers. Cost 4c. Samples 10c. Hansen Signs, 3129 N. Linder, Chicago.

DOUBLE Your money! Wolverine zipper money pocket dress belts sell quickly. Made of cowhide bridle leather; black, brown, gray; initial or harness tongue buckle; 65c. Be convinced! Mail money order for sample. Wolverine Belt Co., Detroit, Mich.

100% PROFIT For agents, truck jobbers, distributors. Sell Super-Lax, the sensational peppermint candy laxative packed in rolls of 14 tablets for 10 cents. Full carton of 12 rolls and information, 50c in coin. Name counties wanted. Super-Lax Company, Anderson, S. Car.

YOUR Social security number, auto and operator license numbers, name and address stamped in chrome plated identification tag, lightweight and attractive, can be attached to key ring. You should have one. 25 cts. postpaid. Agents wanted. J. F. Roulter Co., 221 Frost Ave., Rochester, N. Y.

CHRISTMAS Cards. Sell 50 assorted folders, name imprinted, \$1.00. Cost you 50c. Samples free. Dunbar, New Brunswick, N. J.

AGENTS. Lowest subscription rates ever offered. Metropolitan Magazine Service, 71 Jewell Street, Garfield, New Jersey.

JAY-WAY Doorholder money-making proposition. Jay-Way, 26 Journal Square, Jersey City, N. J.

YOUR Own shoes as bonus and quick cash commissions showing complete shoe line. Experience unnecessary. Selling outfit free. Tanners Shoe Co., 843, Boston, Mass.

OFFICIALLY Approved advance world's fair views. Sell individuals, stores, sub-agents. 35c brings fifteen samples and terms. Mead Publishing Company, Dept. 10, Middletown, N. Y.

THE Klik hook locks on belt; carries safely; keys, knife, flashlight. 25 cents. Postpaid. Morrison, 8335 Anthony Circle, Hollywood, Calif.

MEN—Women, sell the new Bulmer corn decolber. Makes corn canning easy. Bulmer Machine Works, 3123 Alderwood Ave., Bellingham, Wash.

FLUID Typewriter type cleaner. B. Omoto, 2552 Hyperion, Hollywood, Calif.

WRITE For big money making proposition. Sadin Company, Richmond, Virginia.

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

THREE New fast sellers. Vincent, 822 N. 24th, Milwaukee, Wis.

ELGIN, Waltham, Hamilton watches. Make big money. Send for illustrated catalog. Plymouth Jewelry Exchange, 163-B Canal Street, New York.

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

DON'T Be a "job hunter" all your life! Settle down in permanent grocery agency with earnings up to \$45 first week. I'll help you; operate on my capital. Details free. Albert Mills, 6271 Monmouth, Cincinnati, Ohio.

FAST Selling necessity. Costs 2c, sells 25c. Sample 10c. Linnell, Box 1963-E, Cleveland, Ohio.

DISTRIBUTORS, Dealers, agents and tradesmen, to sell new ladder roller, just out. Particulars. Write Marless Safety Rollers, Appleton, Wisconsin.

PERFUME Concentrate. Big profits, quick sales. Pleasant work for ladies and gentlemen. Free carded odors. Persian Perfume Company, 1231 Olive, Desk 12, St. Louis, Mo.

HABERDASHERY Store in your pocket! Huge selection customized shirts, each made in 90 sizes! Complete line of hosiery, ties, underwear, pajamas and winter jackets. Half price offer creates terrific values. Simply display complete self-selling free outfit. Write orders. We deliver and collect. Advance cash commissions; bonuses! Everything guaranteed one year! We pay over \$100,000.00 yearly commissions. Get your share. Postcard brings you outfit prepaid. Rosecliff-Quaker, "Shirtmakers since 1895," 1239 Broadway, Dept. 108, New York.

WORLD'S Fastest money maker. Sell 50c packs of razor blades for 5c. Tharp, 914 Lexington, Cumberland, Md.

100-300% PROFIT! Suits \$1.50, coats 50c, dresses 10c. Catalogue free. Fairmount, 164-M Henry, New York.

CHRISTMAS Card box assortments selling like "wildfire." People who have never sold a thing in their lives are reaping harvests with our sensational 21 folder "Champion" assortment. Costs 50c—Sells for \$1.00. Also amazing etchings, gift wrappings, religious, humorous and everyday assortment. Write today. Samples on approval. Silver Swan Studios, 320 Fifth Ave., Dept. 74, New York.

SANTA Claus card talks like phonograph, speaks the greeting, Merry Christmas. Sensational seller. Sample 10c. Talking Card Company, 4451 Irving Park Blvd., Chicago.

MAKE \$35 Weekly passing out free baking powder. Write Blako, 9459 Alstyn Ave., Elmhurst, New York.

SELL Magic Kote. New sensational product. Guards hands against paint, grease, etc. Free particulars. Paramount Products, Box 74, Sta. A, New Haven, Conn.

FREE Information! Three daily necessities. Repeaters. Burlite Company, Hudson, Ohio.

NEW Beauty thrill—"Valizon Bubble Bath." Sample 10c. Valtex Products, Rochester, N. Y.

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

AGENTS: Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., P.O. St. Louis, Mo.

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

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

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

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

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

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

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

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

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

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

BIG Profits. The perfect eyeglass cleaner. Wonderful demonstrator. Prevents steaming. Sample 15c. Shurberg Chemical, Hartford, Conn.

GUARANTEED Gold leaf letters for store and office windows. 300% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

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

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

EARN Money in your spare time taking subscriptions to Popular Mechanics. Unlimited possibilities, every family a prospect. Easy to sell. Bonus paid in addition to liberal commission. Send postcard for further details today. Circulation Dept., Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

CASH Income weekly for salesmen—Spare or full time. Many make \$50.00 or more in a week selling highest quality Stark trees, shrubs, roses, etc. Healthful outdoor work. Write quick for free sales making outfit and weekly income plan. No cash or experience needed. If you can't sell, buy Stark trees. Largest nurseries in world. Nearly 125 years old. Write for catalog. Stark Nurseries, Box C-8108, Louisiana, Mo.

SALESMEN Sell suits on our easy credit plan. Free suits and pants given as bonus besides large cash profits, premiums and gifts. Sell only (5) suits to get a free suit. No limit to number of free garments you may earn. Wholesale prices \$17.95 and up. Sample line free. No experience needed to make easy sales. All garments individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Inc., 330 South Franklin St., Dept. CA2, Chicago, Ill.

\$50 WEEKLY Possible from start placing nationally advertised counter card goods with stores. Chance to double earnings in few weeks. Most unusual selling opportunity in wholesale field. Permanent connection. World's Products Co., Dept. 1010-A, Spencer, Ind.

SPECIALTY Salesmen to sell new line of advertising calendars and earn good commission. Write letter telling your territory, we will send samples and contract. Shield Press, Indianapolis, Ind.

SELL Candidates. No competition. Unaffected by "recession." Most complete line of auto-signs, posters, novelties on market. Also investigate our new Art-Plax line of thermometers, silhouettes, mirrors. Ad-Nov-Co, Newton, Iowa.

SELL Clothes on credit. Get own suit as bonus. Finest union made-to-order suits, overcoats retail \$20.75 up. Quality woolens, styling, workmanship. Undersell all others. Special fabrics selected your locality. Amazing features get you 50% more orders. Big commissions. Two orders daily pay up to \$60 week. Cash bonus too. New multi-vision outfit free. Fairbanks Tailoring Co., Dept. F-36, Oakley at Wabansia, Chicago, Ill.

MANAGERS, Supervisors, age 25-60; also distributors wanted at once for established firm; to appoint, manage authorized exclusive dealers, every town 200 population up. "New automotive method and proposition alone in field"—product makes spectacular, truly convincing demonstration. Fast turnover, conducting new Super Sales Parades and Circuses; large profits now and on repeat business, based on sales. If desired, a dealer-consignment plan available with 100% insurance protection for you. A guarantee for you under Plan "A". Write, wire, today for details. Craver-Jay Corp., Dept. 108, Kansas City, Mo.

HUNDRED Christmas and calendar bargains! Catalogue free! Twenty-one piece boxes 15c; 12 pieces 8c; fifty imprint folders 25c; Cellophane packages 5c. More profits! Easier sales! Elfko, 436 North Wells, Chicago.

SELL Business cards \$1.50 thousand. Business stationery, book matches, advertising tape, paper towels, drinking cups, pencils, salesbooks, labels, rubber stamps, tags, menu covers. Free sales portfolio. 35% commission daily. Money making specials. Willens, 2130 Gladys, Dept. AN, Chicago.

NEW Patented specialty. Ideal gift. Start now. Year's salary in two months. Beebe Specialty Co., Box 501, Binghamton, N. Y.

NO Competition—Selling new product. Experience in drug lines preferred but not necessary. Stainex, Leavenworth, Kans.

SELL Monogrammed stationery. Make big money. Read, 3401 Parnell Avenue, Chicago.

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

FREE Booklet describes 205 moneymaking plans. Start your own business from home, office, etc., making \$25-\$75 weekly. Stamford, 3762-A Broadway, New York.

SELL New Hexagon portraits. Big profits. Lowest prices portraits, frames. Catalogue free. Picture-Man Friedman, Dept. 9, 528 Cornelia, Chicago.

POPCORN Machines, caramelcrisp, crispettes, cheese coat, potato chips. Long Eakins, 2035-K High St., Springfield, Ohio.

SALESMEN! Collect \$3.00 profit from every service station and garage. New invention revolutionizing industry. Airpower Co., Newton, Iowa.

SELL America's most complete line of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, embossed stationery, shipping supplies, office supplies, printed gummed tape, advertising pencils, thermometers, business stimulators, holiday novelties, beautiful line greeting cards and calendars. Complete line printed business forms and hundreds of other fast sellers. Competition undersold. Cash commissions advanced daily, extra bonus. Experience unnecessary. Complete sales outfit free. Northwestern, AR-301 South Desplaines, Chicago.

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

BIG Commission selling celluloid pricing tickets, metal shelf moulding, menu covers, signs, celluloid buttons, cards. P. Pricing Tickets, 124 White St., New York.

SALESMEN To sell florist ribbon. Bargain prices. Big commission. Arrow Textile Co., 1123 Broadway, New York City.

WONDERFUL Opportunity. Secure exclusive territory Push-Pull self cleaning rake and Push-Pull hoe and cultivator. Big commission. Push-Pull, Dept. K, Independence, Kansas.

MAKE Simple, costless cylinder oil reclaimers—save hundreds. Instructions 50c. Also information other processes, fast-sellers, money-makers for manufacturers and salesmen free. Thermo Laboratory, Peoria, Illinois.

MAKE Big daily cash profits selling top quality advertising book matches. Low prices. Experience unnecessary. Full time profits unlimited. Free sales kit. Zipper case offer. Match Corporation of America, Dept. E-10, 3433 West 48th Place, Chicago.

SELL Beautiful Colorado evergreen Christmas wreaths; grave blankets; crosses. They're new. No competition. Season starting, Riley, 2657 So. Lincoln, Denver, Colo.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 644 Burkhardt, Dayton, Ohio.

CHRISTMAS Cards selling now. Get early start. Make more money. Special box assortments of 21 and 25 cards, ready for imprinting. Colorful, artistic. Big profits. Write at once to Star Novelty Utilities, 107 S. Wells, Chicago.

ENORMOUS Daily profits selling wholesale, retail, fastest selling household necessity; needed wherever water runs. Top-eka drain cleaners; scrapes pipes clean inside; sample, territory postpaid 50c. Patented Products Company, Dept. PM, Topeka, Kas.

SALESMAN—Experienced, educational field. References required. Jourden Schools, Philadelphia, Penna.

SALESMEN—Sell calendars, complete line, all sizes, including jumbos; beautiful subjects. Samples free! Fleming Calendar Co., 6539 Cottage Grove, Chicago.

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

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

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

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

SALESMAN—Make over \$12.00 daily now, and a harvest at Christmas time, selling 25c to \$1.00 ready-to-fly model airplanes to stores. Western Aircraft, 1271 S. Norton, Los Angeles.

EDUCATIONAL AND INSTRUCTION

LEARN Watchmaking. Lessons, Elgin model, trial tools, wholesale bargain watch, tool, material catalog \$1.00. Stewart Watches, 721 Olive, St. Louis, Mo.

IF You like to draw, sketch or paint—Write for talent test (no fee). Give age and occupation. Write Federal Schools, Inc., Dept. PM 108, Minneapolis, Minn.

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

"UNCLE Sam" jobs. Start \$105-\$175 month. Men-women. Prepare now for next examinations. Common education usually sufficient. Particulars, list positions, free. Franklin Institute, Dept. B3, Rochester, N. Y.

BECOME Casualty investigator and adjuster. Dignified, fascinating, profitable profession. Easily mastered. Capital unnecessary. Overstocked publisher sacrificing new, regular \$5.00 instruction course, complete, 25c silver. Box 302, Alhambra, California.

ATTAIN Mastery! Nervousness, fear, worry! Psychological instructions. Free literature. John A. Englund, Ontonagon, Mich.

LEARN Electric arc welding, by experienced welder. Free particulars. Roy Ankerman, Wapakoneta, Ohio.

BECOME Practical scientific investigator. Modern, illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, PM-108, Hoboken, N. J.

IF You are unemployed or dissatisfied with your present position, earnings or pay check, and believe our investigation will disclose you as honest, moral, upright, energetic and of average intelligence, write at once, giving your age, present occupation and past experience to The Modern Scientific Extension Aid, Dept. A, Box 114, Rochester, New York.

DRAFTSMEN—Increase income \$100 to \$1000. Preliminary instruction, 25c. Draftsmen's Foundation, West Medford, Mass.

WORK For "Uncle Sam." Books \$1.00. Postal, auditors, messenger. List 50 jobs, questions, qualifications, free. Pergande, Publishers, PM, Milwaukee, Wis.

UNEMPLOYED! Discouraged? For results try our job hunting methods. Write Employment Counsellors, Box 1283K, Milwaukee, Wis.

WATCH Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 2010 Manhattan Building, Chicago.

PREPARE For big jobs. Drafting for diesel, welding and streamlining; blueprint reading. Manager, 7050 Kimbark, Chicago.

SIMPLIFIED And mental arithmetic, you can understand. Pay postman \$1.98 plus postage or sent postpaid for \$2.00. Arith-Magic, 60, Elmhurst, Ill.

SHORTHAND—Touch typewriting. Easily learned at home. Details free. Severance, 220 Garden, Fountain City, Tenn.

DRIVING Easily learned with simple illustrated instructions. Free details. Educational Service, 261 Boerum St., Brooklyn, N. Y.

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

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

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

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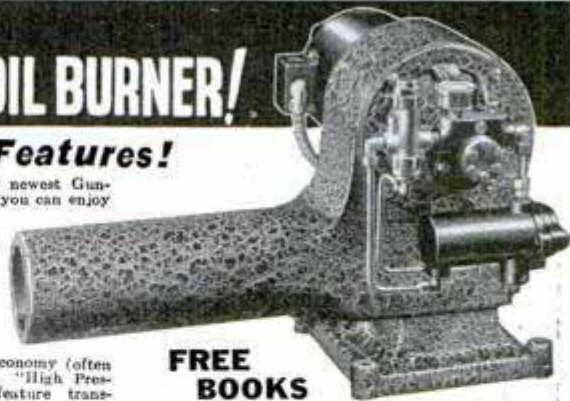
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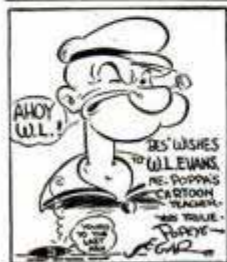
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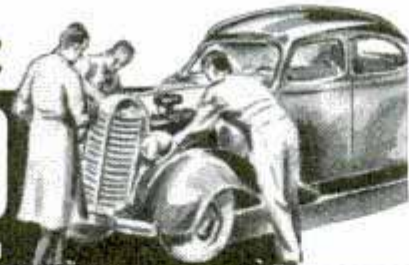
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| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Steam Electric Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Civil Engineer <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Bridge Engineer |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Bridge and Building Foreman |
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| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> R. R. Locomotives <input type="checkbox"/> Air Brake |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> R. R. Section Foreman |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> R. R. Signalmen |
| <input type="checkbox"/> Patternmaker <input type="checkbox"/> Boilermaker | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
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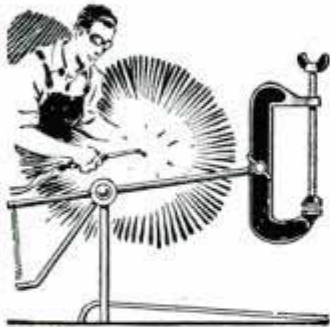
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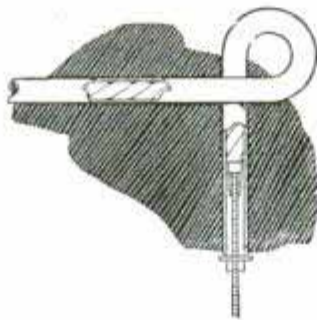
NEW INVENTIONS

(Continued from page 33A)

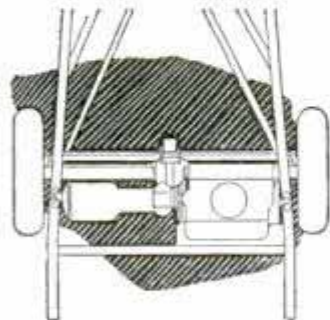
HANDY for the amateur or professional craftsman is a multiple purpose welding jig patented recently. A V-shaped support, a pair of arms slidably mounted on the support and a clamp on one end of the arms are arranged to hold the work. The jig has counterbalancing means and a base which holds the support in upright position. The jig would be especially useful to the amateur who frequently runs the risk of burning himself by attempting a welding job without the proper tool to hold the work.



AN INEXPENSIVE bending and off-setting tool for copper and other pliable tubing was patented recently for field or bench work. One size tool with cables and pulling rods will bend three-fourths-inch, five-eighths-inch and three-eighths-inch tubing without the aid of expensive dies. To insure easy drawing out of the cable for uniform bends and to avoid marring, rubber is fastened on all curved bending surfaces.



OF UNUSUAL interest in the automotive field is the patent issued to Henry Ford on a saddle motor to be mounted over the rear axle of passenger automobiles. The motor is designed to be installed without upsetting the delicate balance of passenger cars. The cylinder block and crankshaft are mounted over one-half of the rear axle and the engine flywheel, clutch and other heavy parts are balanced over the other half with a rigid shaft con-



necting them. Driving gears, connected with the two balanced halves of the engine, are located exactly at the middle of the axle. Automobile manufacturers have long considered the feasibility of producing rear-engined cars. This patent, regarded as overcoming many difficulties which have prevented mass production, may be an important step toward giving American drivers a new kind of vehicle.

FASTER loading of sand, gravel or similar materials is the purpose of a newly patented device which is constructed for attachment to trucks. It consists of a vertically swinging frame supported at the fore part of the chassis, near the driver's compartment. A pair of levers, pivotally connected to opposite sides of this frame, may be swung vertically to either side. The levers support a load carrier, such as a large scoop. The device has means for swinging the load carrier to either side and for releasing and lowering the frame, so that the load of material may be deposited in the truck body.



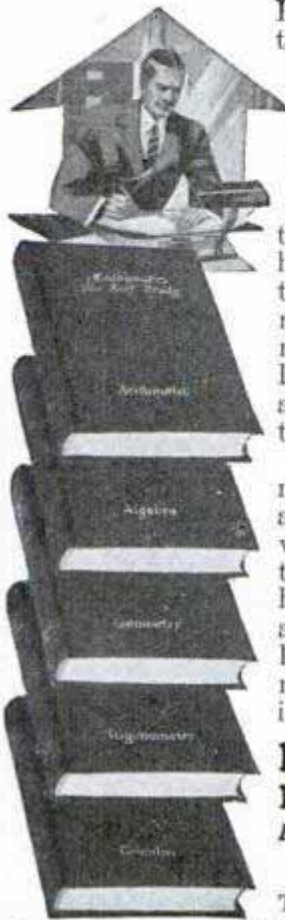
UNUSUAL in the watch and small-clock field is a timekeeping device enclosed in a crystal cylinder equipped with a cover. The cylinder is adapted to receive the movement so that it is held firmly. A frame partially surrounds the cylinder, for protection, but leaves an opening through which the dial is fully visible.



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

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AT GLOUCESTER, MASSACHUSETTS

HOWDY SKIPPER--I SEE YOU'RE STILL YOUR TRIM SELF!

AHOY! WE'VE BROUGHT OUR SEA-LEGS AND EVERYTHING!

GLAD TO SEE YOU AGAIN, JUDGE. JUST TAKE YOUR THINGS BELOW, PLEASE. WE'RE ABOUT TO GET UNDER WAY. **LIVELY NOW, LADS!**

IT'S VERY SHIPSHAPE BELOW, SKIPPER. I SEE YOU KEEP PLENTY OF STORES ABOARD

YES, ESPECIALLY TOBACCO. I ALWAYS REMEMBER AN EXPERIENCE MY GRANDFATHER HAD YEARS AGO

OH, PLEASE TELL US ABOUT IT!

"WELL, MY GRANDFATHER'S SHIP, 'THE GULL', WAS LONG DELAYED BY CALMS, AND THE TOBACCO RATIONS RAN OUT. THE MEN STARTED A MUTINY FOR WANT OF A SMOKE, WHEN SUDDENLY-----"

SAIL HO! ON THE PORT BOW!

"FORTUNATELY, THE PASSING SKIPPER OBLIGED THEM WITH SOME OF HIS OWN TOBACCO RATIONS, AND THE CREW WAS HAPPY AGAIN. SO GRANDAD'S SHIP MADE PORT SAFELY."

BY THE LOOKS OF ALL THE PRINCE ALBERT ABOARD, I SEE YOU ALSO MAKE SURE THAT THE TOBACCO IS THE **RIGHT** KIND TOO, EH SKIPPER?

YOU BET YOUR BOOTS WE DO, JUDGE. WE SEAFARING MEN KNOW WHAT A GRAND SHIPMATE PRINCE ALBERT IS ON A LONG VOYAGE

ON LAND OR SEA, P.A. ASSURES RICH, MELLOW SMOKING IN EVERY PIPEFUL. PRINCE ALBERT'S THE **STANDBY FOR PIPE-JOY**, ALL RIGHT!

SMOKERS! MAKE EVERY DAY A HOLIDAY FROM TONGUE-BITE!

PRINCE ALBERT IS **NO-BITE** TREATED—SMOKES **COOL** AND **MILD** WITHOUT HARSHNESS!

P.A. IS CRIMP CUT—TWIRLS **FAST INTO TRIM**, **MELLOW 'MAKIN'S'** SMOKES TOO—I GET AROUND **70 TO A TIN**

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Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 70

OCTOBER, 1938

No. 4

Poor Boy Still Makes Good- CORRIGAN Proves It!

By Lowell Thomas

THERE are but few men on this earth—outside of those in high official rank—whose names require no added words of explanation. For example, if you mention Charles A. Lindbergh, everybody from Pt. Barrow, Alaska, to the “ham” radio operators at the Cape of Good Hope will know instantly what he stands for, what he has accomplished. You would hardly need all the fingers of one hand to count all the other living persons of whom this is true.

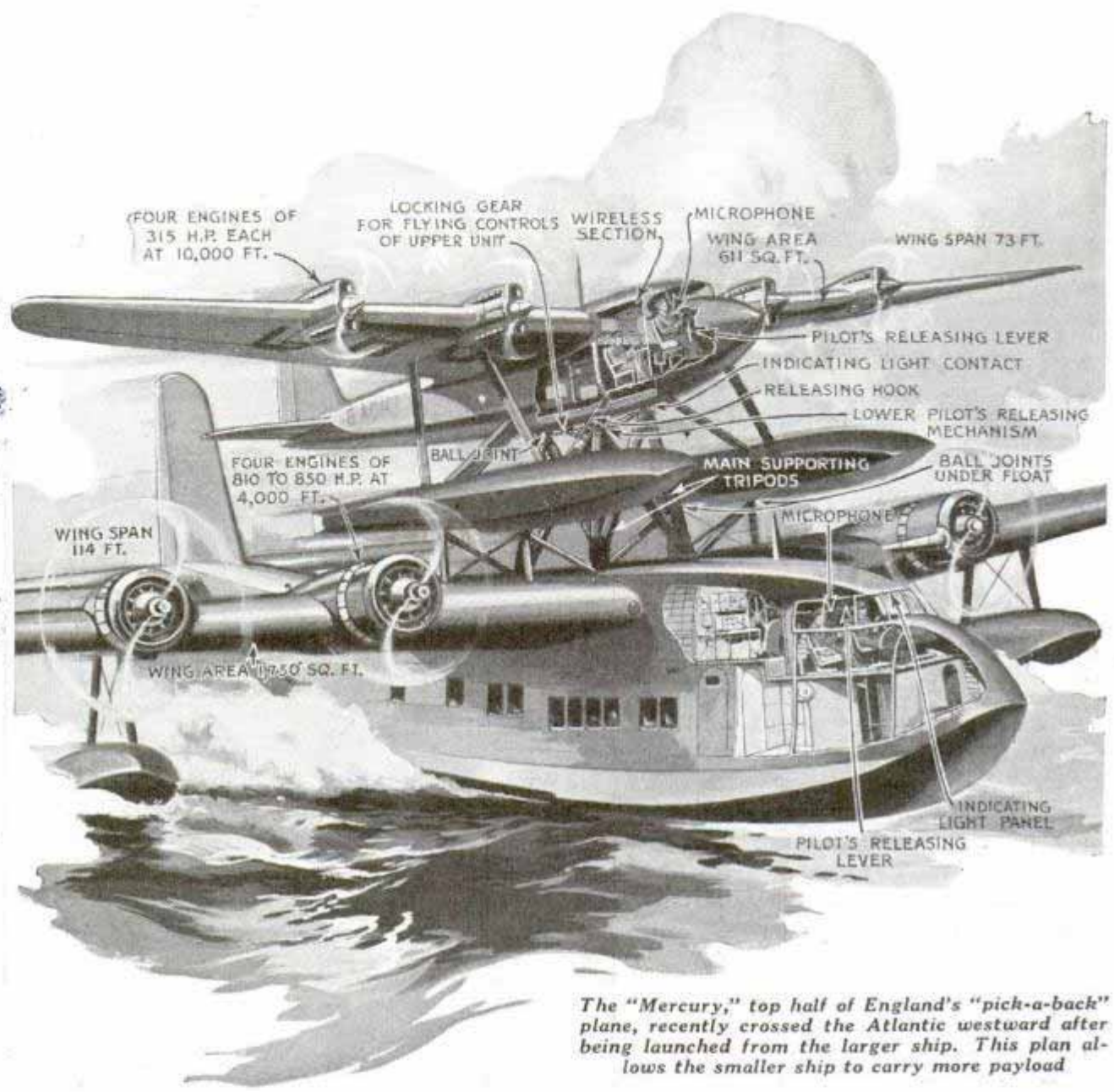
But there is one recent, overnight addition to the list. Two months ago we had never heard of him, did not know he existed. Today the name of



The \$900 plane in which Douglas Corrigan flew the Atlantic and, above, Corrigan working on his ship in New York before the take-off for California by way of Dublin

4877
Rudy Arnold Photos
Corry & Bennett
Airport. Brooklyn N.Y.

14 877
482



The "Mercury," top half of England's "pick-a-back" plane, recently crossed the Atlantic westward after being launched from the larger ship. This plan allows the smaller ship to carry more payload

young Douglas Corrigan is on the lips of all, young and old. Physically he flew, completely without benefit of publicity, from New York unaided and alone to Dublin. Actually he flew in twenty-eight hours, swiftly and surely, into the hearts of everybody with eyes to read or ears to listen. And that is putting the case mildly.

Now the first, fine, careless rapture of excitement and amazement is over. So let's examine what lies behind the exploit that has made Corrigan famous.

One fact that captured the world's admiration was the Lindberghlike precision with which the flight was executed. Corrigan had none of the instruments with which Howard Hughes was equipped. An ordinary compass and an inclinometer, which he had installed himself at a cost of

\$60, represented virtually the whole of his scientific apparatus. Nevertheless he reached his goal easily and surely. Insofar he quite earned the admiration and respect that have been showered upon him.

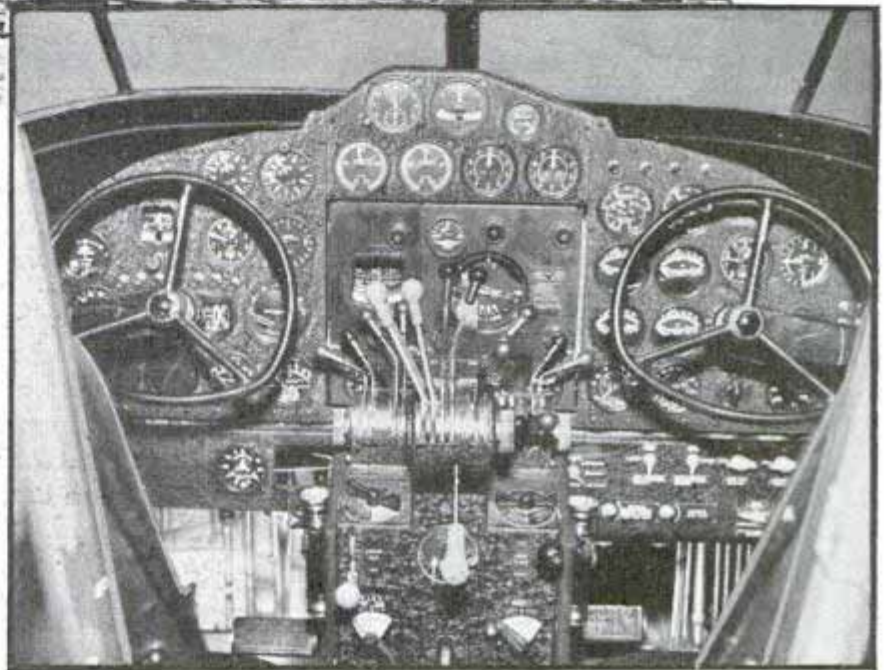
But Corrigan achieved more than that. He illustrated with graphic and unmistakable clarity the capacity and resourcefulness of the mechanical mind. He became the latest personification of the type of mentality that has lifted mankind within three centuries from a race of crawlers to a generation of fliers, the kind of mind which has given us modern surgery, modern plumbing and the ability to talk to one another though separated by thousands of miles of space.

Since it first began to function, the mechanical mind has been up against a long,



unvarying, endless struggle, not merely the struggle to acquire knowledge, to overcome difficulties, to express its ideas in elaborate machines and instruments. Its toughest struggle has been the conflict with scepticism. Its worst enemy has been the Brahmin mind. The Brahmins say: "Thus and so is the world, thus and so it must remain." They have said: "It is impossible to travel faster than fifteen miles an hour. Nay more, it is wrong." The mechanics replied "Is that so? Then take a look at this." Whereupon they produced the steam locomotive. There is not a single modern appliance, whether telegraph instrument, motorcar or radio set that was not developed in the teeth of similar hostility.

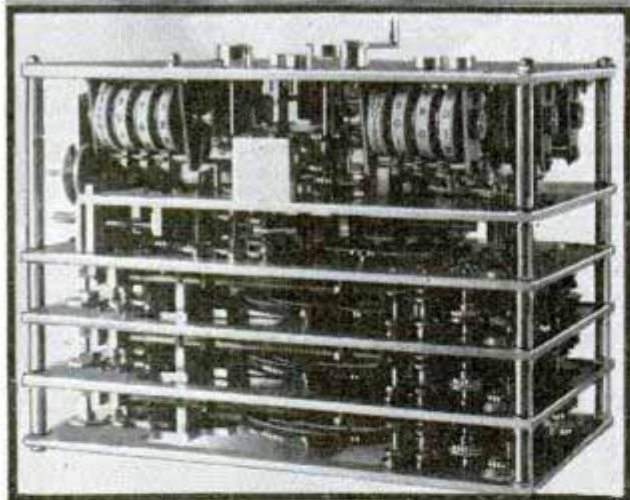
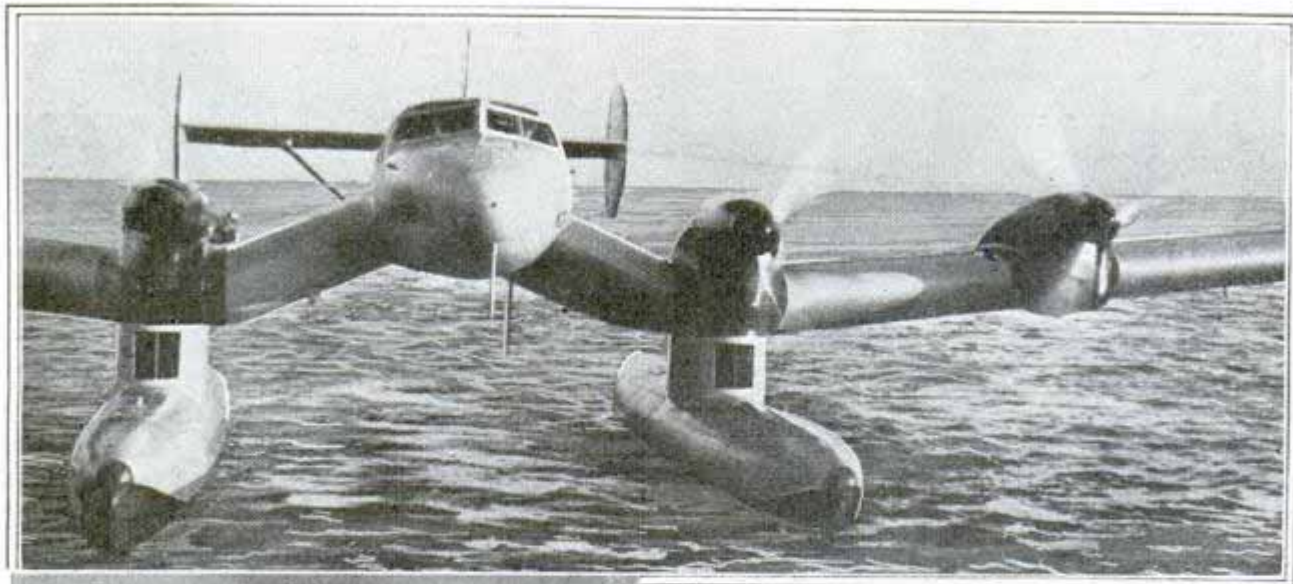
Probably it was experienced by the genius who invented the wheel and thus laid the foundation for all the swift means of locomotion on land. Every schoolboy knows it was the fate of Galileo Galilei who established that the planets move around the sun, then was tortured until he made his lip-service recantation. Didn't somebody nickname the first steamboat in America "Fulton's Folly?" And in the Smithsonian Institution is an antique flying machine known as "Langley's Folly."



Cockpit of Hughes' round-the-world ship and, above, the German catapult seaplane, "Nordmeer," after her Atlantic crossing

What about the two bicycle mechanics at Dayton, O., who worked independently of Prof. Langley and who beat him to it by being the first to demonstrate concretely and beyond dispute that man can fly? The Wright brothers encountered even more scepticism and jeers than attended the experiments of Langley. For after they had flown, most of the editors of thirty years ago brushed aside those historic experiments at Kitty Hawk and asked: "So what? Of what importance is it?"

Douglas Corrigan, mechanic and airplane pilot par excellence, has not yet invented anything, so far as we know. Neither had Col. Lindbergh when he accomplished his epoch-making flight to Paris in 1927. But it is significant that since then he has applied his mechanical mind to the workings of the human body and has



Head-on view of one of German catapult planes and, bottom, front and back views of U. S. Army Air Corps robot computer carried by Howard Hughes for determining latitude and longitude of plane in flight. To operate the device, you take two sights on the sun or a star, note the time and then turn cranks. Out comes the plane's geographical position

developed apparatus that is making a notable and valuable contribution to the advancement of surgical science, a contribution so important that Lindbergh has been adopted as a collaborator by the eminent

Dr. Alexis Carrel. So if, ten years hence, we hear of Corrigan's having achieved some addition to mechanical development, I, for one, will not be surprised.

However, that lies in the future. We are now concerned with what this modest young mechanic has done already. In the light of what he accomplished, his background is particularly interesting because there is so little of it. His history is that of thousands of young men who can be found any day in factories, machine shops and garages anywhere in America. Any one of those thousands have the same advantages, antecedents as good as Corrigan has. The difference lies in what Corrigan has made out of the assets with which he started.

Douglas Corrigan has no diploma from any famous technical school. He has in short, no academic background whatsoever. But he is a born mechanic. Working at it has been not merely his means of earning a livelihood. It has been his passion, the best fun he knows, his life. Not only his hours in the factory but his spare time—playtime to other men—has been given up to mechanics. The only pastime he has known, sailing, he made a means to the end he accomplished when he flew the Atlantic.

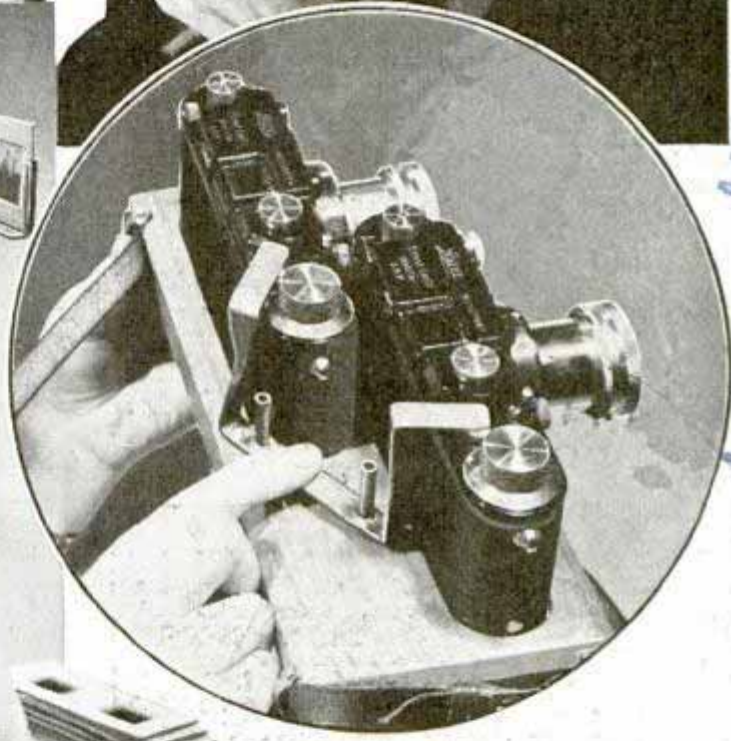
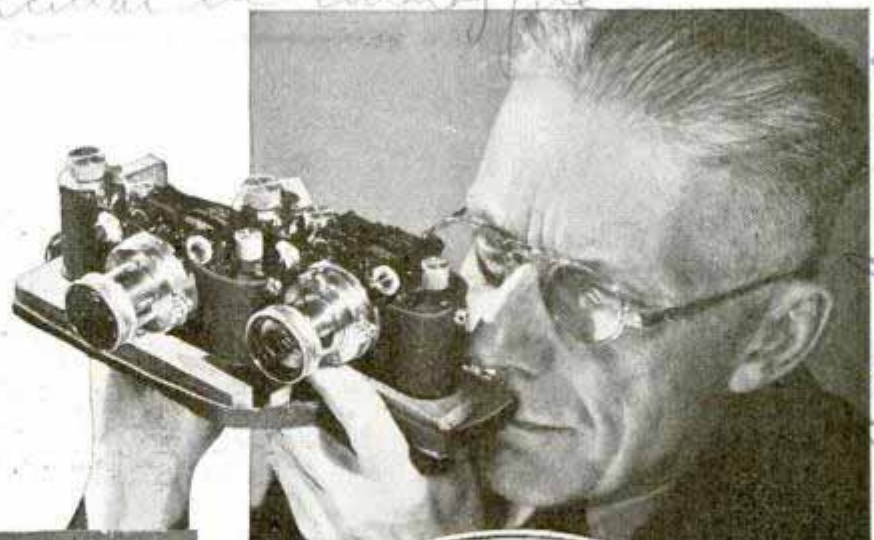
In this he had the help and encouragement of an uncle, the Rev. Frazer Langford, Los Angeles minister. He taught young Douglas the pleasures and science of sailing and the art of navigation. In the pleasant hours they passed handling a boat, the boy got from his preacher-sports-

(Continued to page 149A)

H 887

Three-Dimension Pictures in Natural Colors

Old-time stereoscopic pictures are revived with startling reality and beauty by the use of modern natural color film. Three-dimension color scenes in the garden, at the beach, in vacationland and national parks have a breath-taking quality of depth; pictures of the family and action shots are vivid and lifelike. To make these stereoscopic pictures the new way, twin



Top, sighting for three-dimension scene; below, the dual shutter release. Left, looking at color picture in stereoscopic viewer

cameras are mounted side by side—their lenses as far apart as your eyes—and equipped with a joint shutter release for simultaneous exposure. Each camera is loaded with color film. Exposure time, distance focus and diaphragm opening must be identical. After being developed, the twin color films are framed and mounted in cardboard made to slip into the slots of a stereoscopic viewer. In mounting the two films side by side care must, of course, be taken to place the "positive" from the left-hand camera at the right of the viewer.

Eraser Made Like a Lead Pencil Has Paper-Strip Wrapper

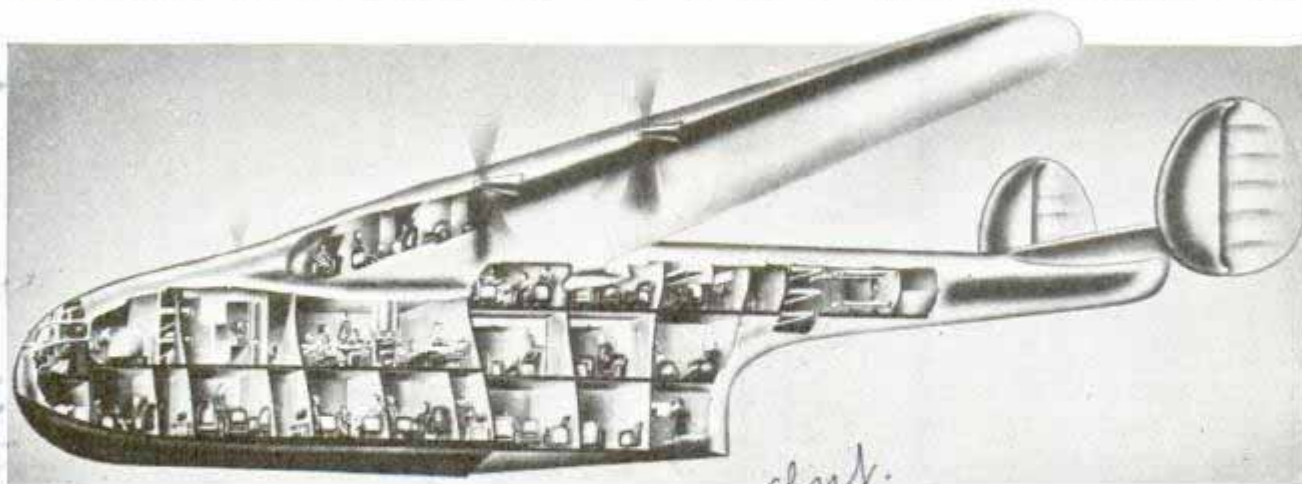
Made like a lead pencil, a rubber eraser bound in paper strips is especially handy for fine work. As the rubber wears down, a new section is exposed by unwinding one of the strips. The eraser is six and one-half inches long and its rubber core has a quarter-inch diameter.



Blaidell Pencil Co
141 Berkeley St.

Chicago Stereographic Attachments
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Cabins in Wings of 100-Passenger Flying Boat



Cutaway drawing shows placement of cabins in high wing of Consolidated Aircraft's version of 100-passenger transoceanic flying boat. With four engines, this aerial hotel will have 5,000-mile cruising range

Cruising at an altitude of 20,000 feet, the oceanic flying boat designed by Consolidated Aircraft corporation for Pan-American Airways will race along with its hundred passengers and crew of sixteen at a top speed of 276 miles an hour—four and one-half miles a minute! Thirty-six of the passengers will be accommodated in cabins enclosed in the high wing, the rest

being assigned to the main compartment. The cabins will be soundproof and air-conditioned. Specifications call for a wing span of 194 feet, an over-all length of 102½ feet and gross weight of 168,000 pounds. The four engines of 2,150 horsepower will enable the ship to reach an absolute ceiling of 30,000 feet, and it will have a cruising range of five thousand miles.

corp. San Diego Calif

14786
Man-Power Giro-Cycle "Flies" Without Aid of Motor



Rider pedals to drive the big airscrew, then pulls lever which the man is shown operating. This changes airscrew's pitch and the machine "flies"

Vertical flights of a heavier-than-air machine, propelled solely by human power, are being made. The machine is known as a giro-cycle, which is a helicopter of the simplest form. Its lifting element is a two-bladed variable pitch airscrew of fourteen feet diameter, mounted on a vertical drive shaft driven through a pinion gear of two-to-one ratio by bicycle foot pedals. As set up in the laboratory, the giro-cycle is not yet a completely free flying machine, but is controlled laterally by a stationary tripod. The operator mounts the saddle, revolves the propeller to the maximum velocity obtainable with his power while the blades remain flat or at zero pitch. At the moment the highest speed is attained, the operator pulls the pitch control handle, thus increasing the pitch of the blades to the position of maximum lift. The thrust thus produced raises the machine and the rider into the air. While ascents have been no more than one or two inches, the machine is expected to be capable of twelve-foot flights when perfected.

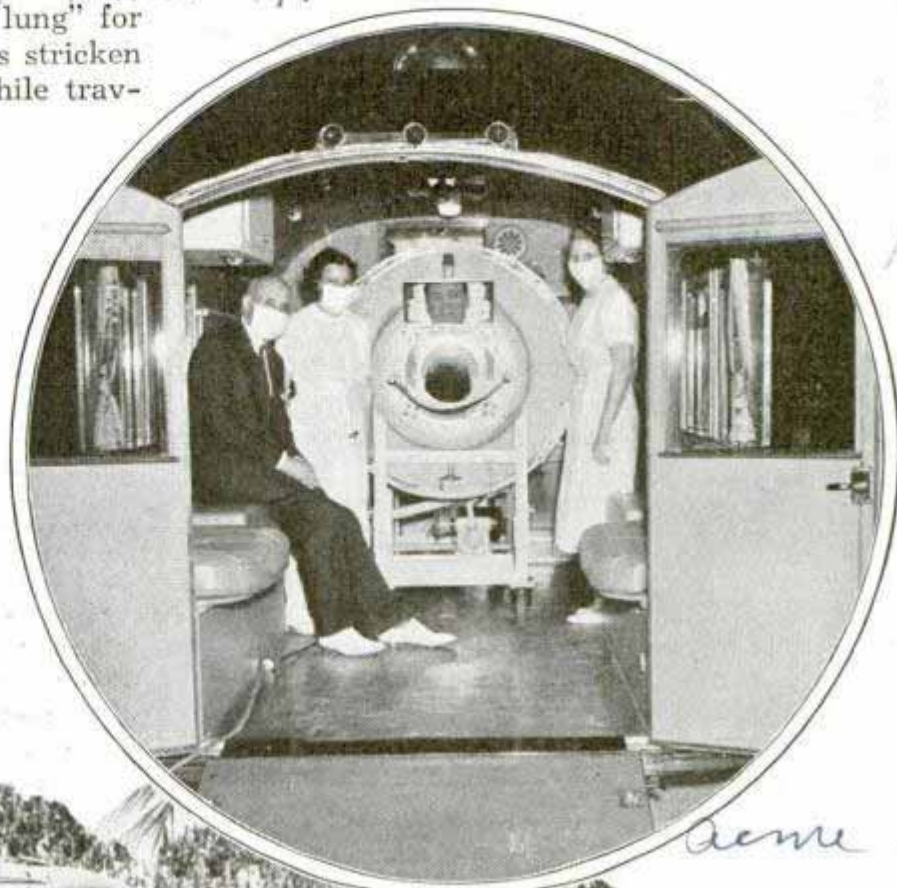
designed by Dr. W. Frederick Herhard.

ms. Juliana de Tucson Olympic Games

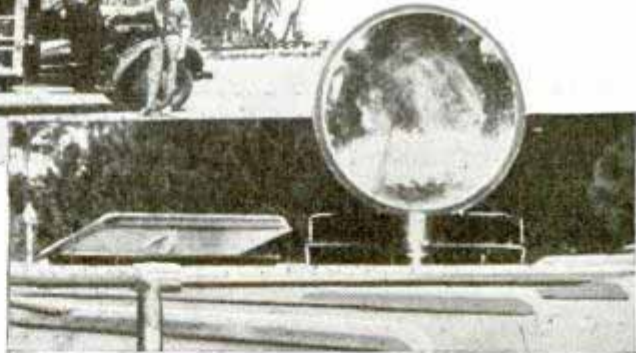
Idea. Sept. of permanent stability engineering with 1 cent.

Patient Travels in Trailer with an 'Iron Lung'

Kept alive by an "iron lung" for many months since he was stricken with infantile paralysis while traveling in China, Frederick B. Snite, Jr., of River Forest, Ill., now has a trailer fitted with an iron lung for touring in this country. The portable "lung" is pushed up a runway into the trailer and supplied with power by a generating plant behind the cab. The mechanical device does his breathing for him while he watches the scenery in a rear-view mirror or in a periscope mirror on the roof. The trailer is air conditioned and has its own kitchen.



Top, patient in his "iron lung" smiles into mirror in which he sees view through rear observation window of trailer. Left, the air-conditioned trailer which has kitchen equipment. Right, periscope mirror on top



Airplane "Props" Drive Tractor over Swamp and River

Wading through marshes and on rivers and bayous near New Orleans is a "swamp buggy" driven by two airplane propellers. The "wheels" of this amphibious tractor are large drums, light enough to keep the strange vehicle from bogging down or sinking in the rivers. Two eight-cylinder automobile engines are connected to the propellers by chain drive. The "buggy" can average thirty miles an hour.



Twin propellers turned by automobile engines drive this "drum-wheeled buggy" over southern marshes

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

Built by an air company.

see April 1937

529

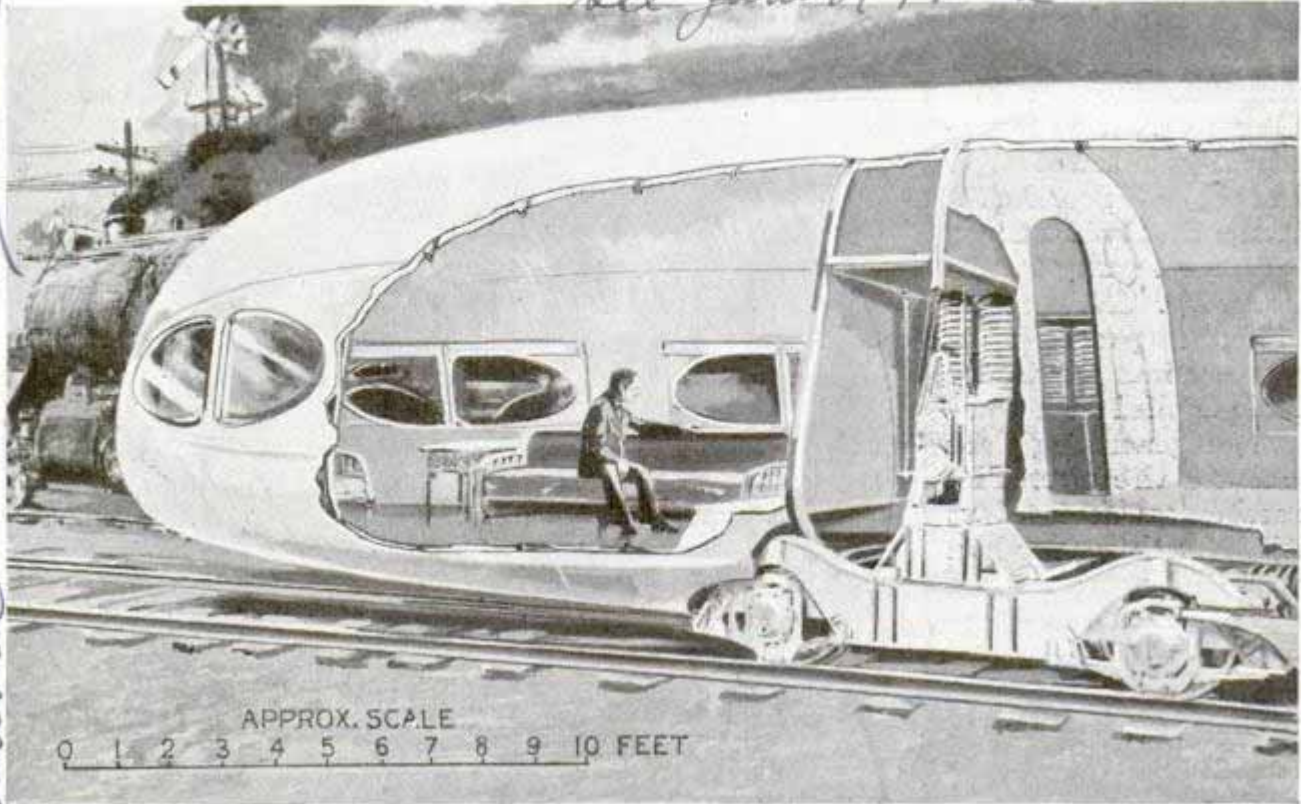
1876

Acme

'Pendulum' Car Takes Curve Like Monorail

Calif
see Jan 1941-2

Developed by W. E. Van Doren, J. C. Lindvall, and C. J. Hill



Cutaway drawing shows flexible coil springs mounted on towers over trucks of coach. This suspension mechanism is enclosed in narrow space between sections of car, to which it imparts a pendulum motion

One glance at the cutaway drawing reveals the radical departure in "pendulum" suspension which makes the Santa Fe railroad's experimental coach ride like a monorail. Instead of resting on springs, the car hangs like a hammock. It borrows the principles of the overhead-suspended

monorail. On a curve, the floor swings out farther than the ceiling, its pendulum motion averting any sensation of centrifugal throw. Above the four-wheeled truck are two towers reaching halfway to the ceiling. The car is hung from flexible springs mounted on the towers.

Television over the Telephone Sends Images of Speakers



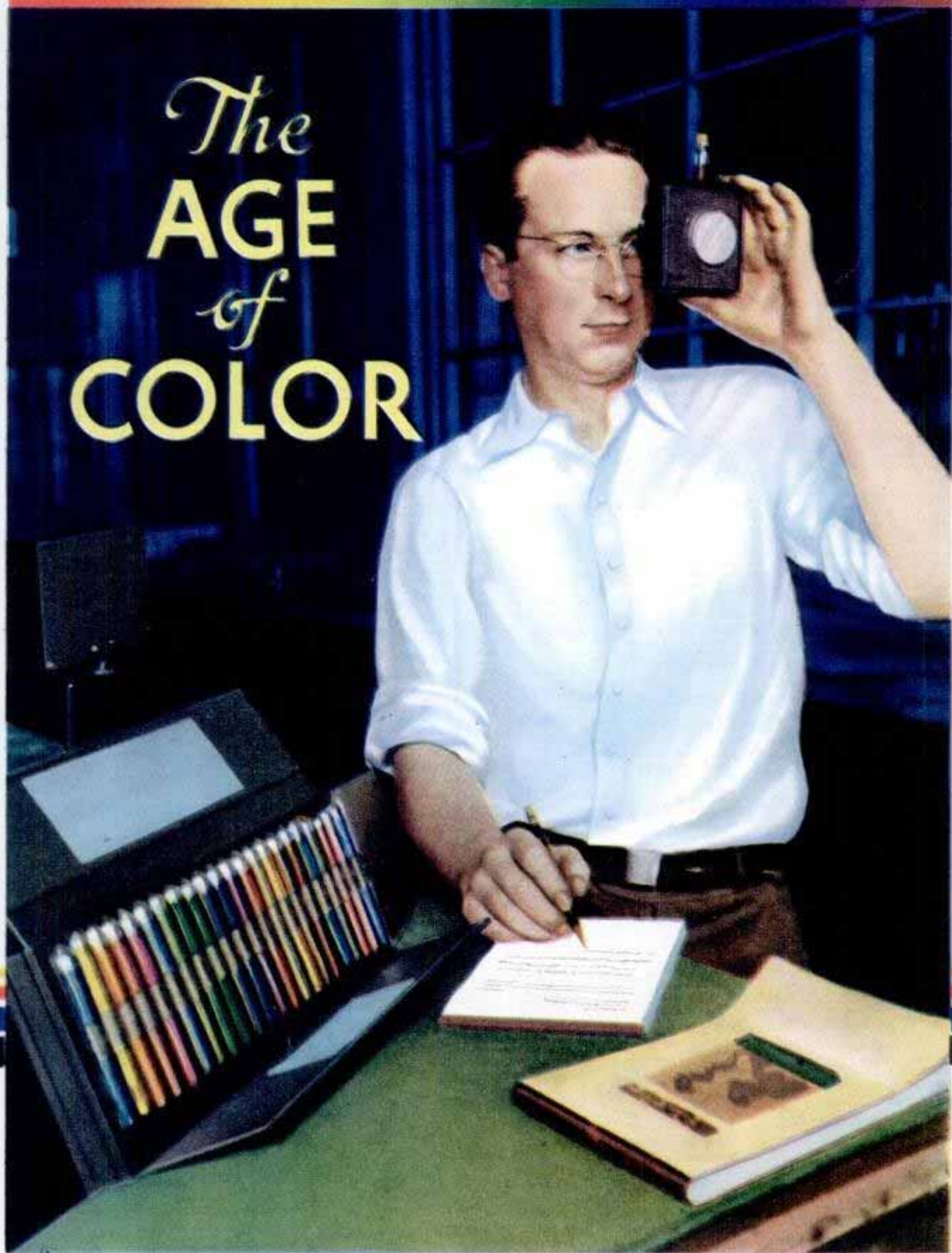
Distant speaker is seen in window on wall; round television "eye" sends picture of local operator

Television by telephone has been achieved in Germany. In a conversation over 400 miles of telephone line between Berlin and Munich the operators not only heard but saw each other. With this milestone passed, the technicians press on to the distant goal of making regular television service available to telephone subscribers. In the photograph, the microphone on the transmission cell held by the Berlin operator is not necessary on ordinary connections; the microphone and loudspeaker partly hidden beyond the operator transmit impulses between cities. On the wall is the picture received of the Munich operator; to the right, the round "eye" picks up the image of the Berlin speaker and sends it to Munich.

1941
Jan 1941

12 14 Cont. James Mc Feely 451 W. 60th
Terrace, Kansas City, Mo

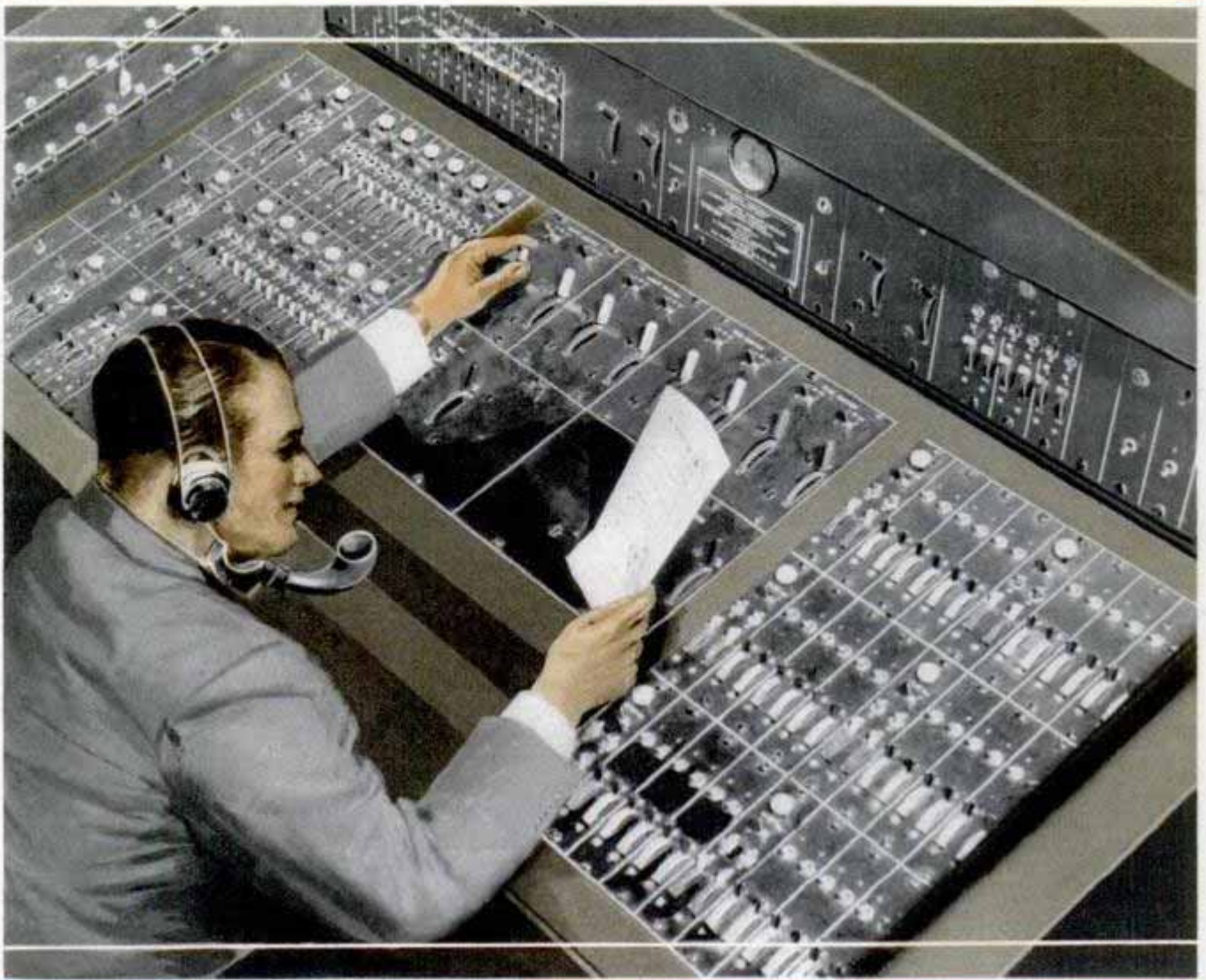
The AGE of COLOR



484

MEASURING color of a varnish. Sample is placed in vial and matched with one of series of colored glass disks mounted on wheel in black box.

1874



490

LIGHT control board for theater. One of the rules of the theater is to play comedy scenes in yellow light which seems to relax the audience.

THE world is spending millions for color today and, as a result, is rapidly changing from a dull, drab sphere into a gay and cheerful place garbed in all the hues of the rainbow.

America alone is using about \$50,000,000 worth of dyes a year. These dye-stuffs sell, or help to sell, six or seven billion dollars' worth of merchandise annually because, to a great extent, we buy what pleases the eye.

Without color, the demand for many everyday articles would decrease or, in some cases, vanish entirely. Changing the color of an article or even the color of its surroundings may induce you to buy it, or refuse to buy it, since color exerts a psychological influence on all of us.

More billiard tables were sold when purple felt covers were substituted for green, and the sale of wall mirrors jumped when they were offered in colored glass. A packing house increased

meat sales by changing the interior of its coolers from white to turquoise blue and a cafeteria doubled the sale of salads by displaying them on green plates instead of white.

While colors relieve the monotony of our surroundings; they also exert an emotional effect upon us. Red is regarded as the symbol of war, hate, danger and courage while orange signifies warmth, harvest and autumn. Green is linked with victory, safety and sickness and we associate yellow with cowardice and deceit.

Blue exerts a cooling effect, a fact of which one manufacturer took advantage in painting workbenches where welding was being done. They were colored light blue to counteract the feeling of heat produced by the welding. The tops were painted a deeper blue to suggest coolness while an orange trim relieved the monotony of the blues.

Howard Ketcham, color consultant for

49

du Pont

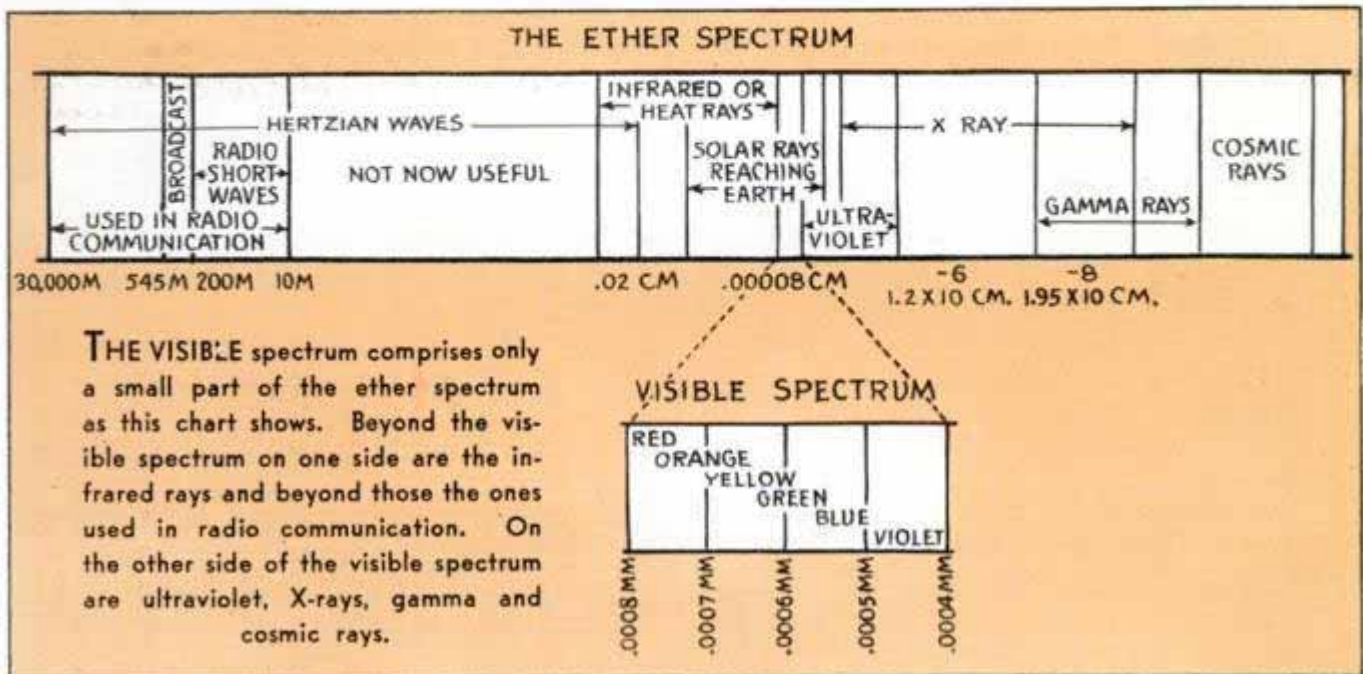
A 74

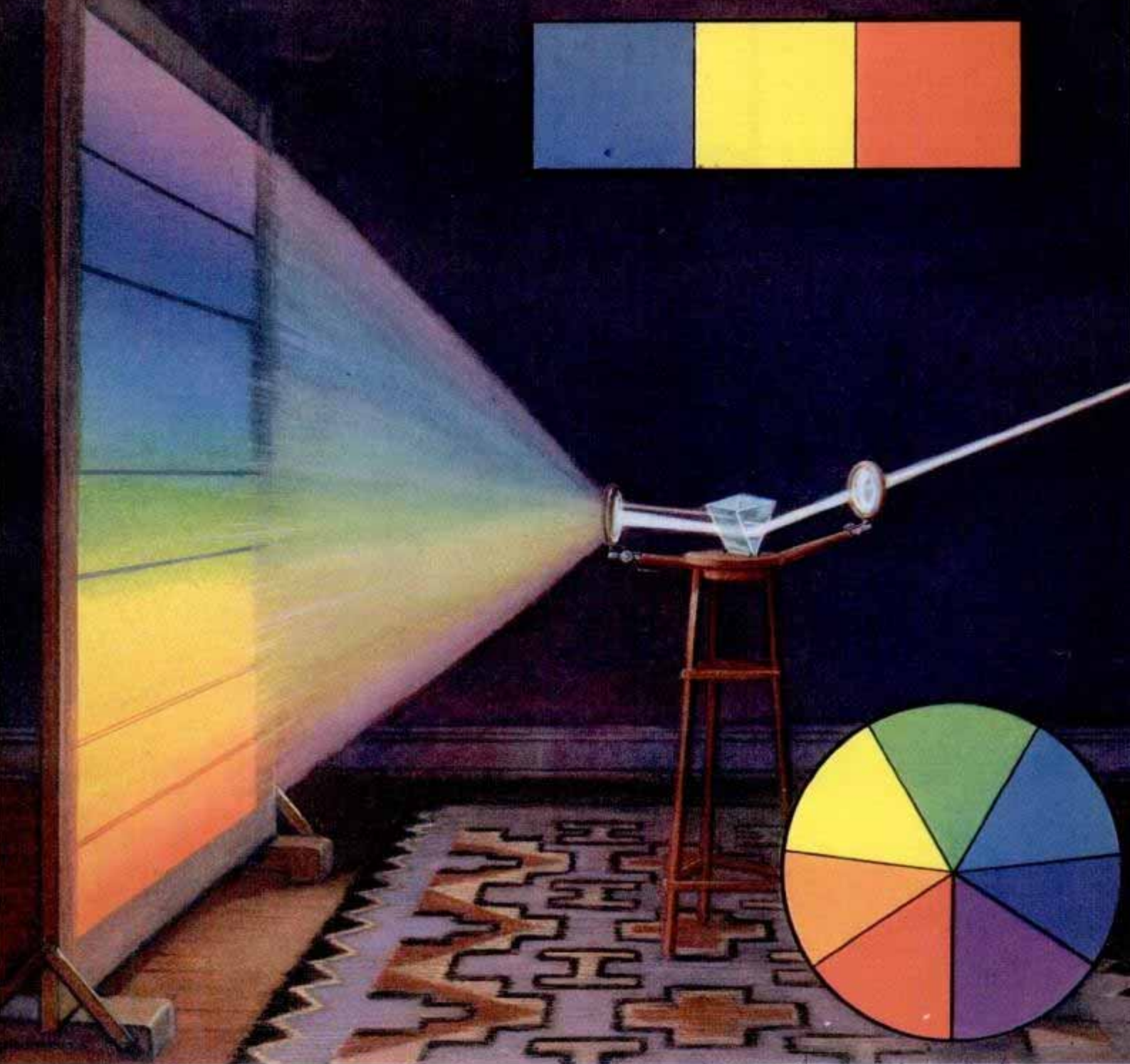
several large manufacturers, has found blue is the favorite color of most American men and red of most women. He has made color surveys for everything from toothbrushes to motorcars and once showed that a red handle sells more ten-cent toothbrushes while amber sells more twenty-five cent ones. He has even determined the color preferences of house flies. Flies like orange, dark yellow and dark blue but shun light green and ivory.

Color is responsible for every sensation made upon the eye. We see shape because of the contrast of one color with another. Color, however, is not a quality of objects. When we look at a blue car, it appears blue simply because its surface reflects chiefly the blue rays of white light and absorbs most of the other colored rays. If it absorbed them all, the car would appear black. If it reflected most of them, you would see a white car.



TESTING colored skeins of yarn for strength and shade of the dye used. A trained eye can recognize thousands of different shades.





THE COLORS in sunlight are shown by passing a ray of light through a prism to break it up into different wave lengths. Insets show primary and solar spectrum or rainbow colors.

The eye is sensitive to only a narrow band of light rays, but in this band a trained eye can recognize thousands of colors. Skilled observers who examine skeins of yarn in testing dyes can detect the presence of one twenty-thousandth as much red dye as yellow in a batch of yellow skeins. A machine could do this too, but a machine cannot determine the psychological response to color while the eye can.

One machine, developed by Mr. Ketcham, does more than the eye can do, however. It is called Colorcable and, by means of a simplified system of code letters, can transmit thousands of separate

colors over regular telegraph or cable communications. In this manner it is possible, for example, to send the most popular shades exhibited in a Paris style show to New York in a few hours, or even a few minutes.

There are two principal sources of all the color we enjoy, pigments and dyes. Dyes are soluble in something while pigments are insoluble in water and usually in most other liquids. Also, a dye must have an "affinity" for the substance it colors and be able to become a part of it. A pigment, however, lends color merely by mixing physically, not chemically, with whatever it decorates.

Pres. Howard Ketcham, 74
 492
 1201 W. Rightwood Ave
 Chicago
 New York
 Plagen

Esartner Scientific Co.
 1201 W. Rightwood Ave
 Chicago
 Also Central Scientific Co.

493

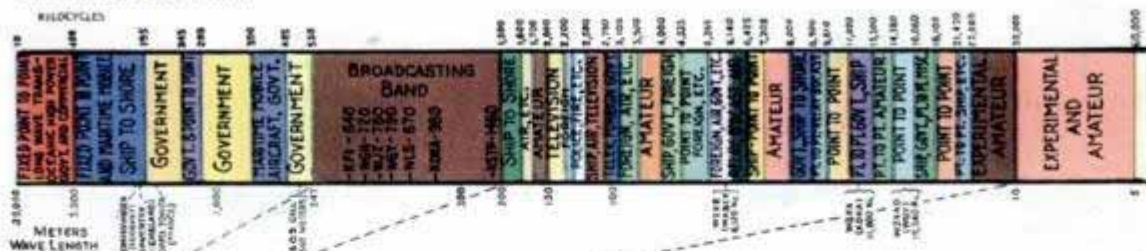
1294

COLOR matching and analyzing machine being used to check flat paint samples, one of the many testing processes developed to insure uniformity of color.

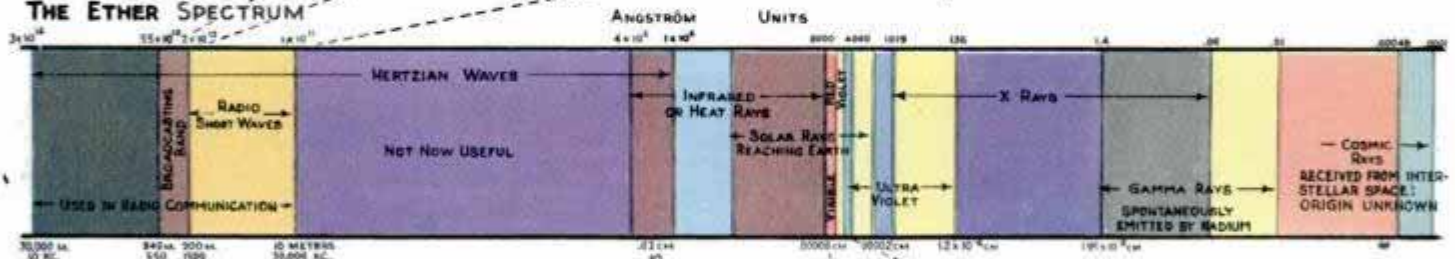


THE RADIO spectrum, below, constitutes only a small part of the ether spectrum but the visible spectrum and the photoelectric spectrum are even smaller. The audible spectrum, lower left, ranges from about sixteen to 16,000 cycles per second.

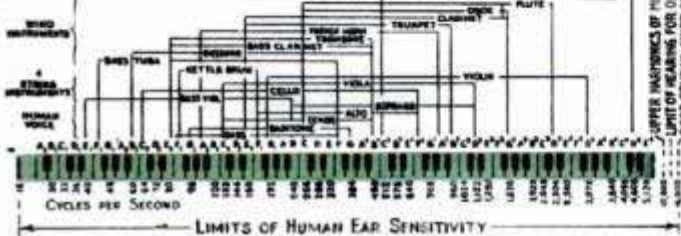
THE RADIO SPECTRUM



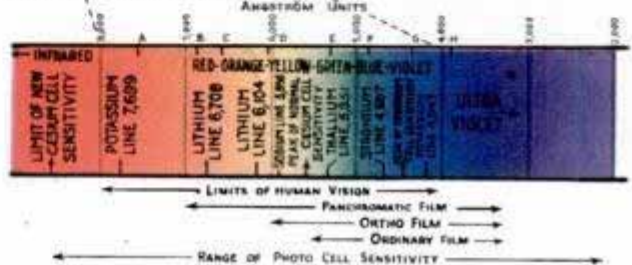
THE ETHER SPECTRUM



THE AUDIBLE SPECTRUM



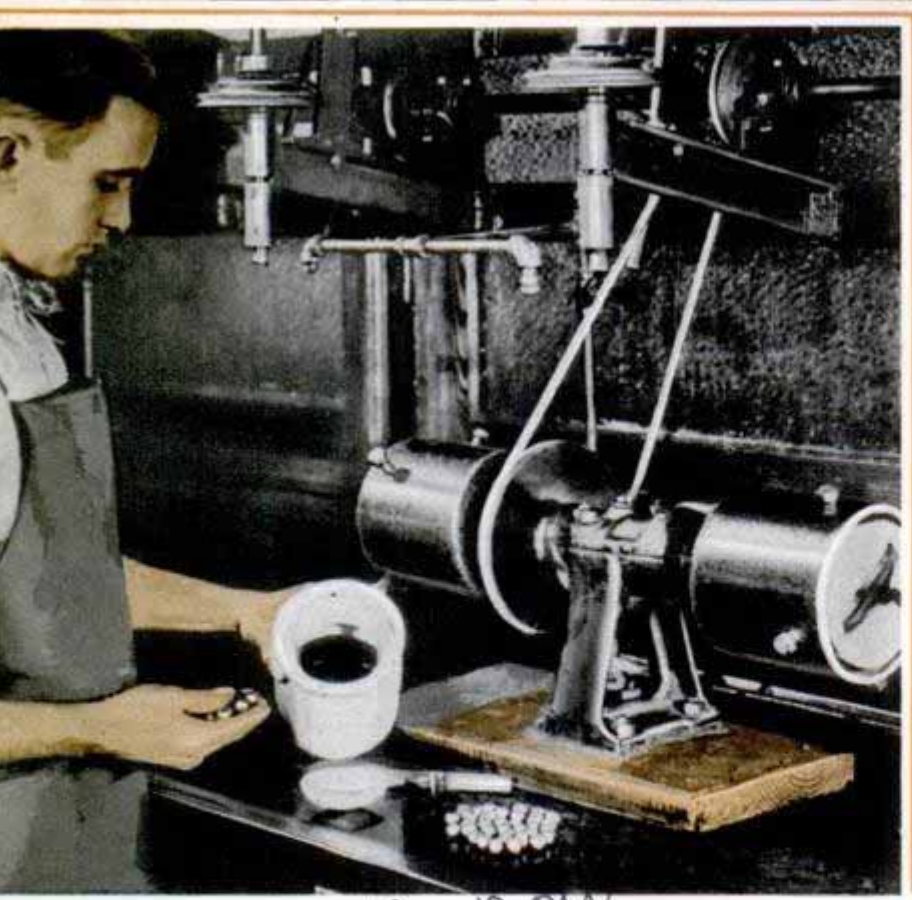
THE PHOTO-ELECTRIC SPECTRUM



1274



494



In his first attempts to capture color, man used the pigments and dyes of nature. He obtained a red pigment from iron oxide or green from copper salts and he got his dyes from woods, berries and various plants. The earth pigments which can withstand high temperatures still provide the colors for ceramic ware.

But obtaining soluble colors such as dyes from natural substances was both unsatisfactory and very expensive. Frequently the colors would not unite with the product which man wanted to color. Or if the early dyer did find something which would unite with the product, perhaps it was not the color he desired. So for hundreds of years only royalty and the very wealthy

the p m v
BALL grinding machine which pulverizes pigments for inks and, above, winding four skeins of yarn from forty-eight spools to obtain average weight and composition before making dye test.

*Technical Laboratory. Dyestuffs Dept
 Leebswater, Paul, N.Y.*

could afford richly colored possessions.

Today nearly everything we own is decorated with color and the most inexpensive piece of cotton goods may be adorned with most of the hues of the spectrum. This miracle has been wrought largely by coal and chemistry.

When coal is heated, as in making coke, it yields a thick, gummy tar. The residue of this tar, after the volatile substances are driven off, is pitch which we use to make roofing and asphalt. In the middle of the last century, Sir William Perkin, British scientist, tried to make quinine out of one of the constituents of coal tar.

The substance he obtained, when dissolved in water, produced a red solution which imparted a mauve color to various products to which it was applied. Instead of quinine, he had produced the first artificial dye, a dull red color from black, sticky coal tar!

But this was only the beginning. To his amazement, the Englishman found that by varying the chemical treatment he could produce still other colors. Or by starting with a different coal-tar base, yet more hues were obtained. Locked in this evil-smelling, gooey tar were hundreds or even thousands of colors waiting to be released by the magic hand of the chemist.

When coal tar is distilled, it yields different substances at different temperatures. One is benzol, a clear liquid. Another is naphthalene, a white, crystalline solid which, when pressed into a marble, is our

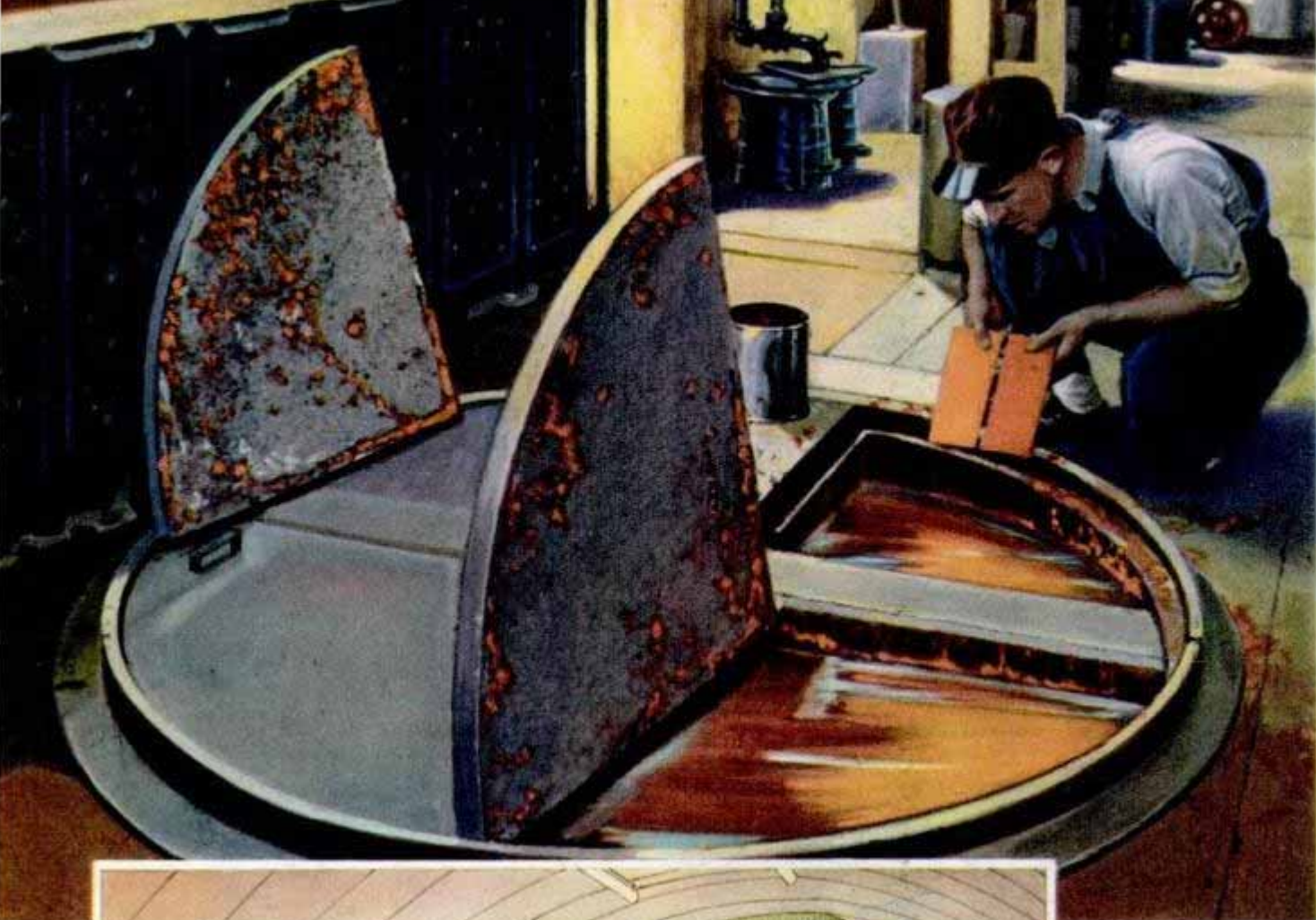
A TEXTILE printing machine testing dyes which are to be used to color fabrics.



496

274

Technical Laboratory
Sleepwater Court, N.Y. (Seymour's lab)



COMPARING sample of paint taken from tank, above, with standard color chart. Color today is ascending into the skies as indicated by drawing at left, showing interior of new Boeing Stratoliner arranged as a lounging room.

familiar mothball. A third is anthracene, closely related to naphthalene. There are others, but these three bases or "crudes" are the starting point for many dyes used today.

When these and other crudes are treated with acids, alkalis and other chemicals, intermediates are obtained. Intermediates are not dyes and they are not crudes. They are the bricks of the color house because, when two or more of them are combined chemically, dyes

result, the color depending on the treatments they have received.

Benzol, for example, yields a colorless intermediate, aniline, which, when treated and combined with other intermediates, yields hundreds of dyes. But finding the intermediates to use and the treatment to produce a certain color was a long and expensive process.

One German company spent twenty years and \$5,000,000 before it found how
(Continued to Page 128-A)

12-180

Electric Sunshine Floods Night Baseball Game



View from top of grandstand as 80,000 fans watch night baseball game in Cleveland's Brookside Stadium. Field is drenched with light from batteries of lamps totaling 150,000 watts, making highest fly visible

When man-made sunshine floods the baseball diamond at night, the fans flood the grandstand. Eighty thousand persons, rivaling a world's series game, crowded into Brookside Stadium in Cleveland the first night they turned on the battery of a hundred 1,500-watt floodlights that had been installed by the Westinghouse Elec-

tric and Manufacturing company. Even the highest fly can be spotted clearly against the black sky. The floodlights are mounted on eight towers—four for the outfield, two near home plate and two more off first and third base. Each light has an individual fuse, and power is distributed by seventy-five-kilovolt-ampere transformers.

12794.
Powerful Diesel Road Grader Has a Reversible Blade

Equipped with a blade which can be turned completely around for working in reverse gear, a powerful Diesel-power road grader has been produced for efficient and economical road building and maintenance work. The reversible blade feature is valuable for sub-grade work, shaping bad spots, working short stretches or where turning is difficult. A six-cylinder Diesel engine is mounted directly over the driving axle.



Here is the big road grader, at work on a typical job. The blade can be turned completely around for working in reverse gear

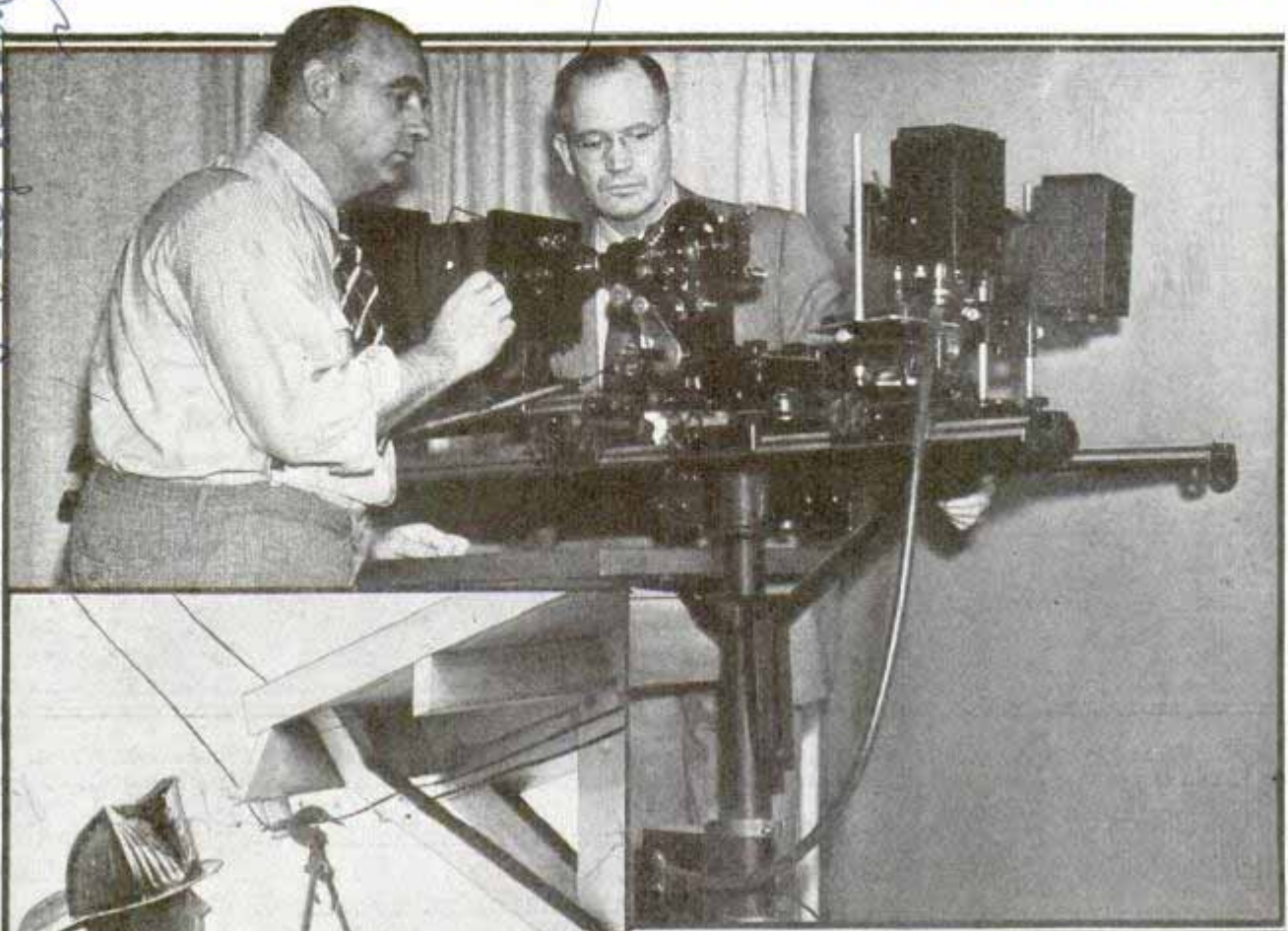
Caterpillar Tractor Co

H 862

Montgomery

SETTING TRAPS

George Schumacher
Chief Arson Laboratory



Preparing to take photomicrograph of remnant of burned fur coat to determine whether coat was valuable. Left, snipping electric wires leading to burning residence to prevent shocks to firemen inside



By Capt. Everett Harris

Chief Investigator, Arson Bureau,
Los Angeles Fire Dept.

A FEW months ago a passerby saw smoke seeping around the window cracks of a bungalow and turned in a fire alarm. There was no one home, apparently, for windows and doors were locked and the shades were down.

The firemen forced the door, expecting to find a big blaze. But there were no flames in the front rooms. In the kitchen they found a pile of papers smoldering by

the stove. A couple of squirts from a portable extinguisher put the fire out.

But there was too much smoke to have come from a pile of papers. The walls in every room were scorched. Starting at the front door and leading first to one overstuffed piece of furniture and then another, and on into the other rooms was a winding trail of cotton batting, black and charred on top and smelling of gasoline. The beds and clothing in the closets were dripping with the inflammable fluid.

It was an arson job, pure and simple. The fire bug had laid his trails, gone out, tossed a match inside, then had walked away after closing the door. But he didn't provide any ventilation. The fire had flashed into every room, consuming some of the gasoline and blistering the walls, then had died.

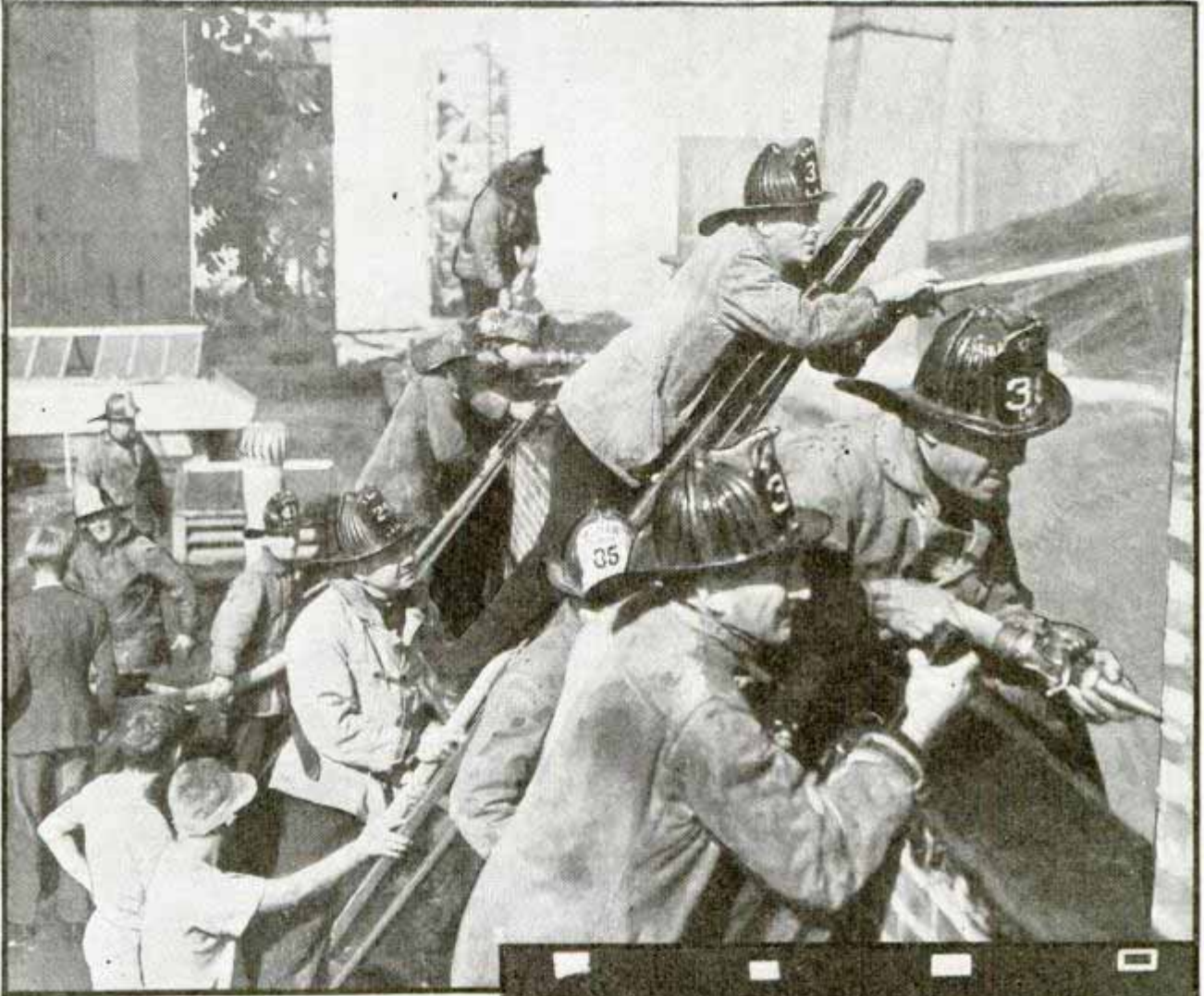
We figured the owner had set his house

Capt. Thomas E. Shuman, Jr.
10555 Holman Ave
Los Angeles.

217 d Hae H

H 8.62

for FIRE BUGS



on fire to collect the insurance. But he proved he had left the house a couple of hours before in the presence of witnesses who had been inside and had seen nothing out of the ordinary. The owner and the others had gone to a ball game where he met other friends. His alibi was perfect.

But we were sure he had guilty knowledge of the fire. He must have employed a fire bug to do the job for him. Two of the arson squad investigators dropped in at the owner's store to question him further. The phone rang and the owner answered. He talked in a low tone and replied in monosyllables. The detectives figured the fire bug was on the line, so one of them grabbed the phone, tried to



Top, firemen attacking roof blaze. Bottom, arson squad members looking over pictures of suspicious fire in effort to determine how it was started

Capl. Harris

Investigator
Montgomery



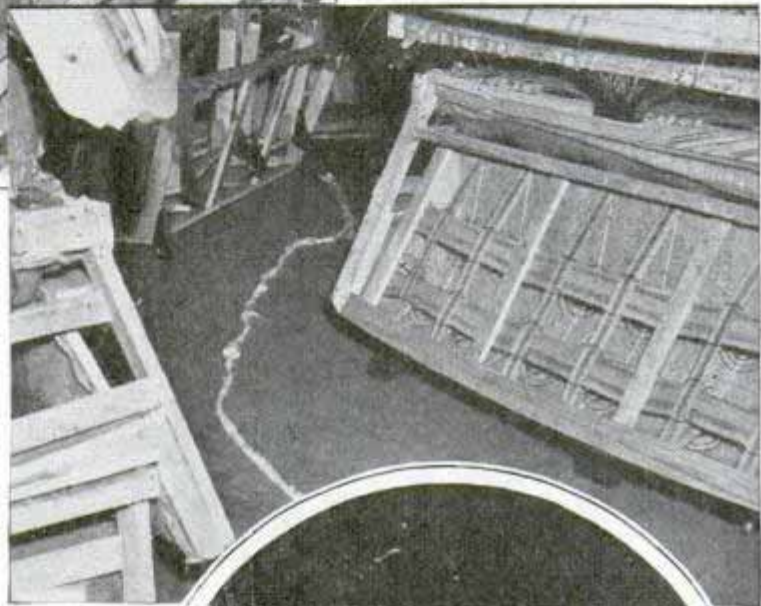
disguise his voice and spoke four words, "Where are you now?" Unsuspectingly the man at the other end told him. The detective replied that he would see him in a few minutes. Then, with the owner still in custody, they went and made the arrest. From then on it was cut and dried.

This case is typical except that the fire bug forgot to open a few windows so the fire would keep burning. But we catch them even when the fire virtually destroys the building. For one thing, open windows and doors are a dead giveaway in an unoccupied house. Holes chopped in the roof or the lower floor also will be observed by the firemen. Suspicious bits of evidence added together usually tell the story.

Professional fire bugs are constantly changing their tactics in an effort to outwit the arson squads. In the old days, "torches" used clockwork to delay the start of a fire until they had gone out and established an alibi. But gears and springs don't burn and sharp-eyed fire detectives usually found them. Then the fire bugs tried candles, the fire starting after the candle had burned down to a kerosene-soaked string which led to a pile of rubbish. But that also was easy to spot, once the place where the fire started had been found and the burned surfaces examined under a microscope. Inflammable chemicals were popular for a while as a time-

delay means, but here again the fire bugs learned that it's pretty hard to burn up all the evidence.

Lately they have turned to gasoline to spread the fire. They avoid leaving any evidence of a time-delay mechanism simply by tossing a match toward one end of a gasoline trail as they leave the house.



These pictures helped convict fire bugs. Top, papers attached to roof inside attic to help spread fire. Center, fire trail consisting of gasoline-soaked cotton. Bottom, photomicrograph showing how broken knife blade fits cuts in lath made by fire bug to provide ventilation

But the fire bug has trouble trying to establish a fake alibi, and there's always a chance he may be seen leaving.

One trick they tried was to fill a bladder with gasoline and suspend it from a ceiling by a string, over a pile of trash that was burning slowly. That gave the fire bug a

Handwritten notes in blue ink at the bottom of the page, including "Café! Home" and other illegible scribbles.



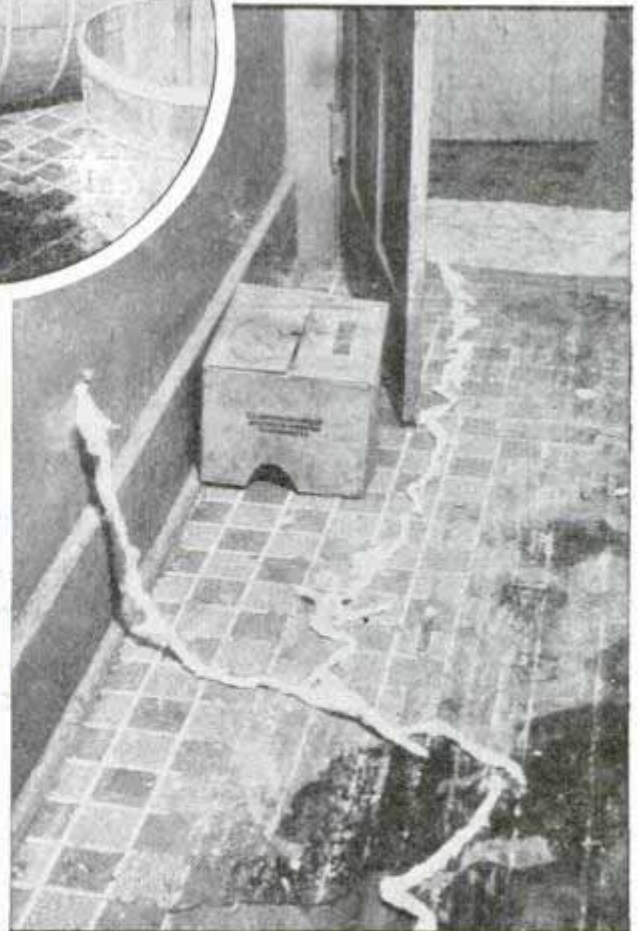
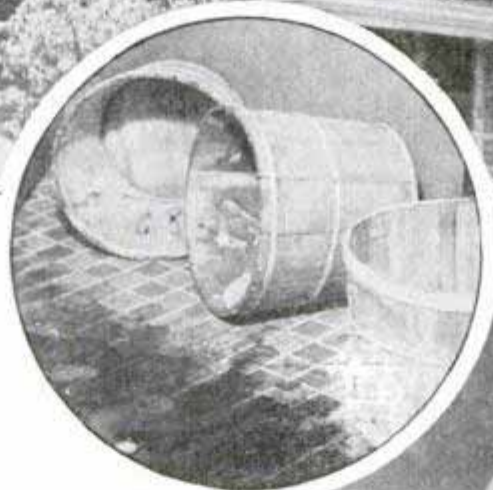
Top, fighting roof blaze. Right, these wooden tubs had been tied with string, instead of metal hoops, and filled with gasoline by a professional torch

few minutes to get away before the heat burst the bladder, scattering flaming gasoline over the room. The trouble was that the gasoline did too good a job, burning things so completely that there was no plausible reason for it.

Another stunt was to substitute string for the metal hoops of a wooden tub, filling the tub with gasoline, and setting up a slow-burning fire trail that led to the tub. When the fire reached the strings the tub would collapse, flooding the floor with gasoline. But everything low in the room would be burned more than the walls and the upper parts of the furniture. So such fires were easy to solve, particularly since large quantities of gasoline leave an unmistakable odor.

A while back, we had an epidemic of clothes-closet fires. Someone would explain he had struck a match to see into a dark corner of the closet, the match had

(Continued to page 142A)

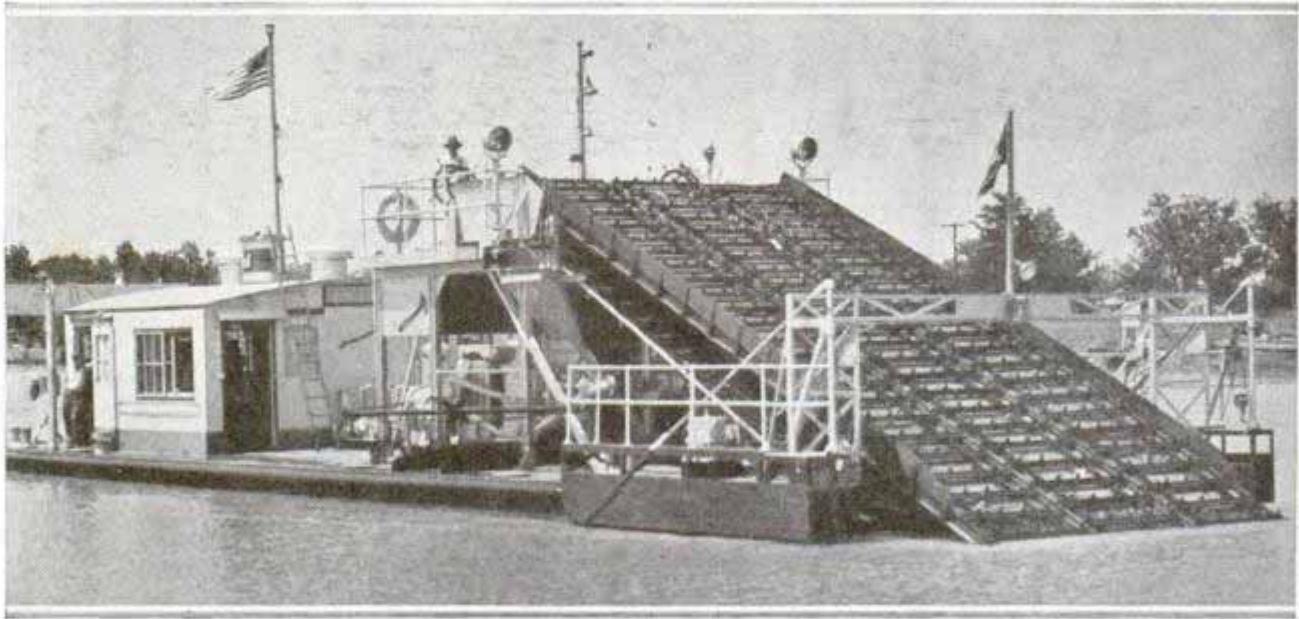


Typical fire trail of gasoline-soaked cotton batting discovered by firemen before it could be touched off by a fire bug

no. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

cont. Is. H. Gray, 1736 Es St., N.W. Washington, D.C.

Bayou 'Battleship' Fights Plant-Locked River



Purple water hyacinths that choke river navigation in the south climb to their death on this escalator. Caught by moving belt at front of barge, plants are carried up to be crushed between corrugated rollers

Engaged in a war to break the blockade of shipping in the rivers, bayous and coastal inlets of Louisiana and Mississippi is a unique battleship. The enemy is the gorgeous purple water hyacinth, whose luxuriant masses form floating islands that entangle ships and hinder navigation seriously. Attempts to keep the channels open by hand-removal of the flower pests or by poison sprays proved impractical; the sprays endangered human and animal life, for cattle relish the hyacinth as feed. Now the U. S. engineer corps has put to work the all-steel, self-propelled barge "Kennedy," whose bow is an endless belt of toothed conveyors. Extending two feet under the surface, this belt acts as a "water rake" gathering up all the vegetation in its path and carrying it up to a hopper where corrugated rollers crush and pulverize the plants into harmless debris. Hydraulic rams driven by a small air compressor hold these two crushing rollers against each other under twenty tons pressure. Outriggers which support a pair of swinging guides at the extreme forward corners of the barge hull steer the water plants into the conveyor, and the barge is usually pointed upstream and held stationary to let the current drive the vegetation into it. One of the crushers has a swing of six inches to let small logs pass through. A centrifugal flush pump delivers 1,100 gal-

lons of water per minute to wash the macerated debris overboard. The bayou "battleship" last year converted 2,625,000 cubic yards of hyacinth into "mincemeat."

285

Pilot Tries a Diver's Helmet on High-Altitude Flight

It worked satisfactorily under the water, so why not over the earth? So a pilot at Milwaukee put on a new diving helmet the other day and climbed into the cockpit of his plane to try it out at high altitudes. The helmet was made of spun copper, and



Putting oxygen bottle into cockpit of plane before altitude flight. Pilot is wearing a diver's helmet

Edward Weber.

oxygen was fed into it from a bottle by means of automatic valves. A telephone built into it permitted the aviator to converse during the experiment.

Wrench with Reversible Jaw Works Automatically

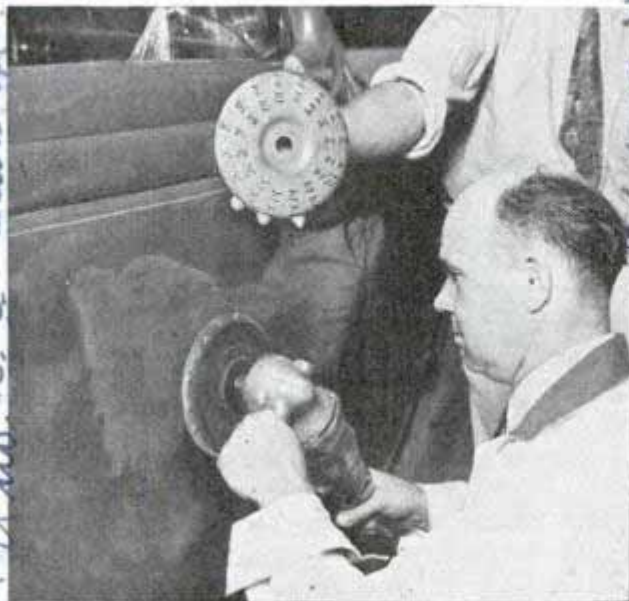


Featuring a reversible jaw, a new wrench operates either right or left and does not slip. It works automatically, no adjustments being necessary. The handle is made

loose so that it may be shoved to one side when working in close places. The tool is designed to handle bolts and pipe.

Scratcher Disk Removes Paint with Self-Sharpening Teeth

Heavy paint that would ordinarily fill up an abrasive disk can be removed quickly with a scratcher disk just put on the market. It has a circle of self-sharpening teeth of extremely long wearing qualities. Adapted particularly to removal of heavy paint from trucks and buses, it can be used also for scraping paint from metal signs and for cleaning the gummy insulation from inside car bodies before straightening.



Notice teeth on abrasive disk. Operator is scratching paint from auto door without harming surface

Ocean Hunters Shoot to Kill with Compressed-Air Gun



Compressed-air submarine gun shoots a brass dart and can kill a fish at fifty feet on the ocean bottom

Hook, line and net are old-fashioned. Deep-sea hunters are using air guns now. Divers on an expedition in Puerto Rican waters have been equipped with one of these compressed-air weapons for shooting fish on the ocean floor. It fires a brass dart under 2,000 pounds pressure and can kill fish at a distance of fifty feet under water.

Alarm Clock Wears a Shutter for Protection on Trips

With a sliding shutter to cover its face, an alarm clock intended for travelers is well protected when packed in a suitcase or parked on a dresser in trailer, train or boat. One key winds a single spring operating both time and alarm, and the red alarm hand follows the same numeral track as the hour and minute hands.



Western States Mfg Co. Times City

Westclox General Time

Blvd. A. is aware!
we the I. have writ New
Stam. C. & Shunkalo

John D. Craig
Writen John D. Craig
Hook, line and net are old-fashioned.
Deep-sea hunters are using air guns now.
Divers on an expedition in Puerto Rican waters have been equipped with one of these compressed-air weapons for shooting fish on the ocean floor.
It fires a brass dart under 2,000 pounds pressure and can kill fish at a distance of fifty feet under water.
8 3.95

Chief Engineer
Wind Tests on Model Autos Show Design Efficiency



Scale model of car is suspended upside down in wind tunnel to test operating efficiency of body lines

Plymouth Roadking
Just as aviation tests its planes in miniature form in wind tunnels before they are built, the automobile industry is turning to the wind tunnel to determine operating efficiency of the latest model cars. The exact-scale midget autos are installed upside down in the tunnel, just as are the planes, and winds of various velocities are created by powerful blowers. The tests show the efficiency of the car's body design, whether it is resistant to wind and to what degree.

1834
Anti-Skid Flange for Rural Auto Is Attached to Tire Chain



Icy roads meant nothing but trouble for a rural mail carrier at Belvidere, Ill., until he devised a scheme to make his car skidproof. He installed extra flanges, attaching them to the tire

chains in such a way that the automobile could not sideslip on the glassiest ice of a high-crowned country road, nor would it skid with the brakes applied hard while turning a corner. The nonskid flanges were rolled out of one-inch flat stock and brazed to a one-inch back. Now the mail always goes through regardless of winter highway conditions.

H 781
Generator for Bicycle Lamps Mounts Under the Saddle

Designed with a remote-drive feature that makes possible its mounting on the frame under the saddle, a new bicycle lamp generator yields a steady five volts at all speeds. Attached under the saddle, it is powered from the rear tire. The generator also may be mounted on the front of the bike or in the tool and battery case



Bicycle lamp generator with remote drive can be mounted to take power from front or rear wheel

with which many bicycles are equipped. Another feature is automatic lighting, enabling the rider to have light at all times, even when standing still. The generator lights both front and rear lamps.

W. E. Lincoln
Belvidere, Ill.
Chrysler Corp
34 Massachusetts
Dr
Belvidere, Ill.

Harold H. Nichols
engineer

Sheppard Wastes
No. 7, article, 1/22/35
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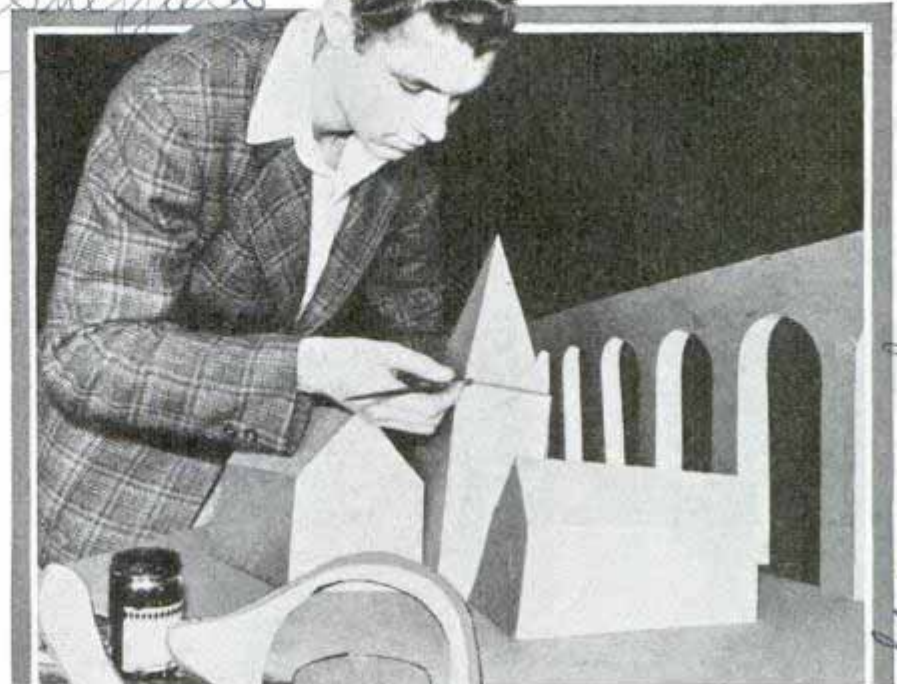
44.95 - 45.50

11 699

Color Photo Projected for Backdrop of Stage

Photographs taken in natural colors replace the usual painted scenery as backdrops for stage sets in a community playhouse at Pasadena, Calif. In one play which required forty-seven different scenes, the tremendous expense of preparing the traditional scenery was avoided by building miniatures, photographing them and then projecting the transparent color pictures on a white backdrop screen. The projector is concealed above the stage, casting the picture down at a sharp angle to allow the

Edward Sheffield



Above, building models to be photographed; below, method of projecting scene on backdrop of stage

actors full use of the stage without interfering with the beam. This entails a forcing of perspective in making the pictures. Buildings are constructed in miniature with broad bases and slanting walls so that they appear in natural perspective when projected down against the backdrop. A squat tree with wide base becomes tall and willowy when thrown on the curtain. The miniatures are usually small cardboard models, hand-painted in the colors desired.

Apples Milled into Baking Flour Produce Tasty Bread

Bread baked from apple flour is a tasty innovation in Seattle. Each one and one-half pound white loaf contains the equivalent of a large apple. The milling of apples into flour was made possible by a vacuum dehydration process which reduces the moisture content to about one per cent; the

flour is then added to other dry ingredients used in the bread mix, including a proportion of wheat flour. Due to the presence of apple pectin, apple bread does not dry out like ordinary wheat breads and so can be used to the last slice. A ton of apple flour calls for fifteen tons of apples.

Pomona Products Co., Selah, Wash.

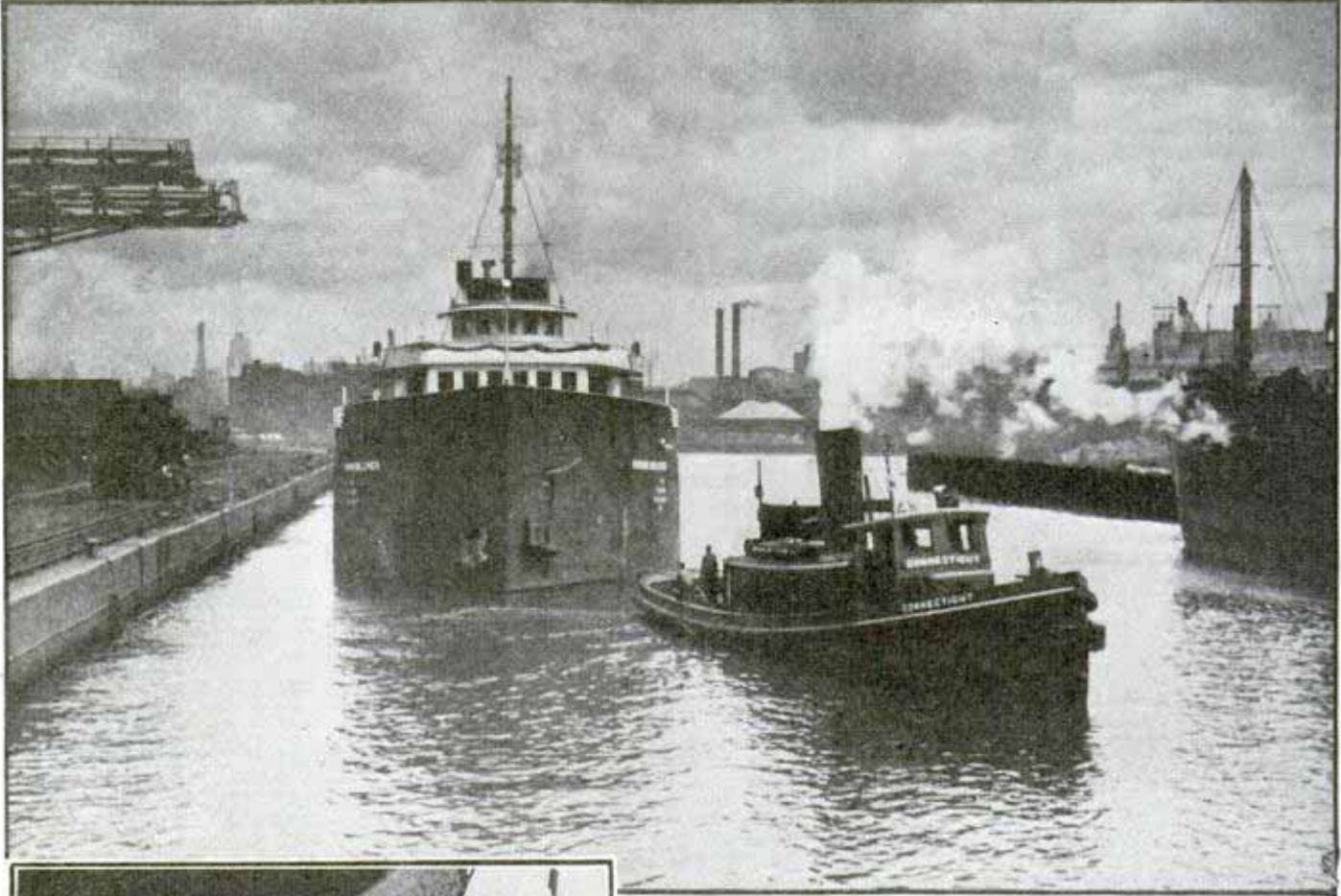
Thomas & Stinson, Jr. 10555 Holman Ave. Los Angeles, Calif.

The Appella Corp.

A 843

Cont. Alexander Maxwell,
720 Sherman Ave.
Evansville, Ind.

STEEL CARVES



PEOPLE on vacation along the shores of the Great Lakes usually are mystified by the long, lean steamers crawling along the purple horizon. They go their way, quietly, efficiently, bothering nobody. Because they mind their own business and shun the haunts of vacationland very little is heard of them.

But whether you live in the "Corn Belt" or in South Africa, those boats play an important part in your life. The car you drive was once iron ore. It was carried by boat from the Minnesota mines down to the steel mills of Chicago, Detroit or Lake Erie. Quite likely the finished car took a ride on a lake freighter before being delivered to you.

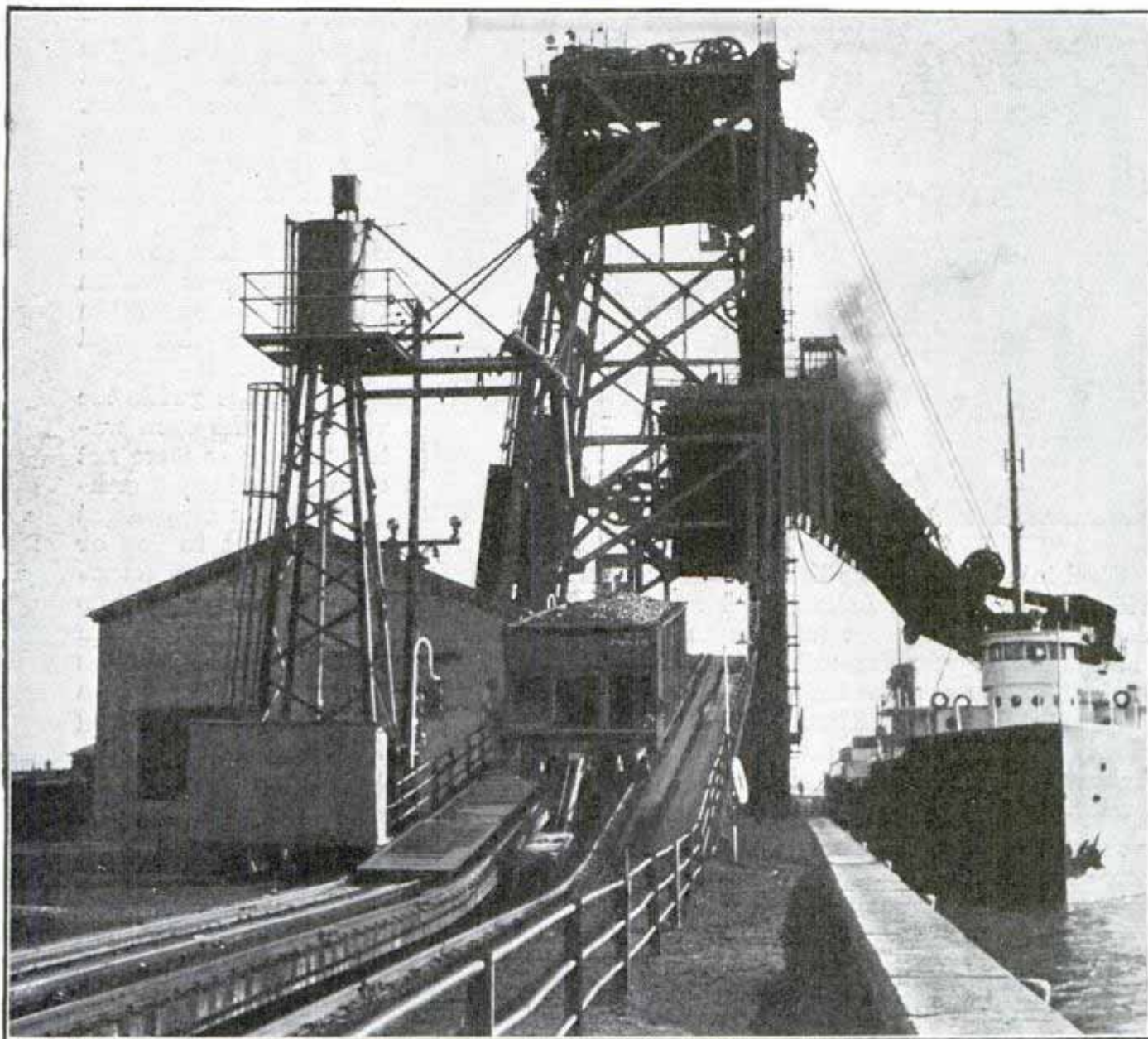
Nearly all American steel is made from Minnesota iron ore. Wherever civilization penetrates, American steel follows in the form of farm machinery, railroads, hardware, fence wire, munitions and even kerosene cans. There is hardly a man in the entire world who has not come in contact with American steel in some form or

The rudder of this lake freighter is twenty feet high and ten feet wide. Top tug assisting a lake freighter up the Cuyahoga river at Cleveland.

Frank Bellinger

4843

a WATERWAY



Coal being loaded aboard a freighter, a carload at a time. The entire gondola is hoisted and tipped, the coal pouring down a chute into the hold of the vessel

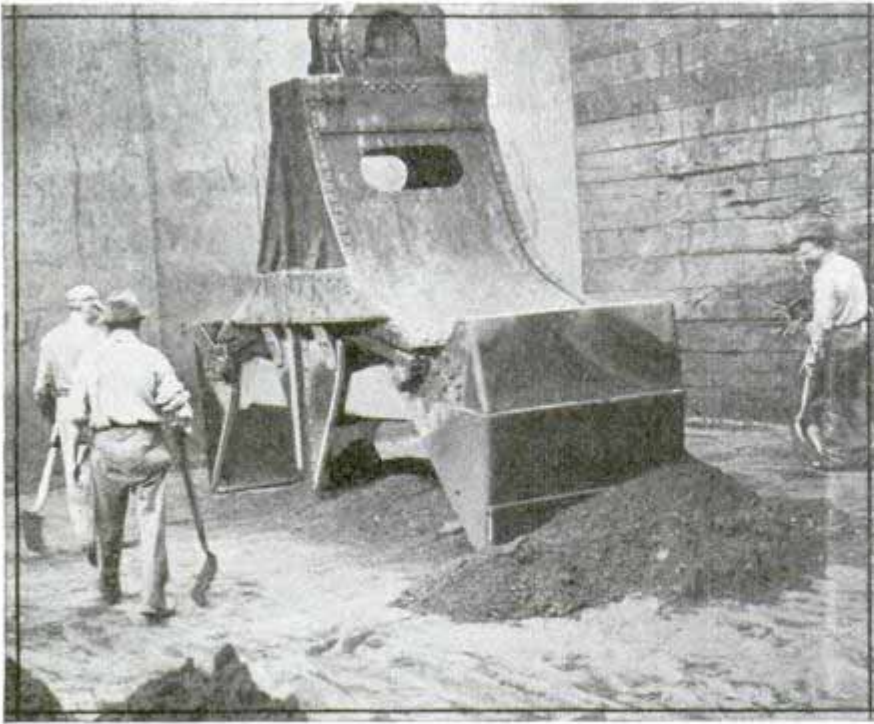
Martin Muller Brownhoist loader

other, and ninety per cent of it has been carried in the long, silent lake freighters.

American and Canadian grain feeds the world. Wheat, oats and corn come by rail to Chicago, Milwaukee or Fort William, Canada, to be loaded on boats and sent to the mills or shipped abroad. Wherever people need bread, American grain goes, and it makes part of the trip in a lake freighter.

There is no coal in the northwest, so the boats that carry down grain and iron ore bring back coal. The tonnage carried annually on the Great Lakes would stagger

the imagination, yet it is done so quietly nobody even notices. It was not always this way. Fifty years ago a trip the length of the lakes was a major adventure. Bleaching ribs and battered hulks studded the shore lines. The lakes, deep, cold and stormy were connected by narrow, winding rivers, full of sharp rocks and sandbars. Niagara Falls isolated Lake Ontario and the St. Marys Falls kept ships out of Lake Superior. The only open water route was between Port Huron and Chicago, and one-third of this was through island studded channels.



Steel interests on Lake Erie looked enviously at the virgin Lake Superior iron deposits. It would cost millions to get them, but progress demanded more and better iron. Canada, the United States and private interests worked hand in hand and slowly but surely the treacherous Great Lakes were converted into the safest and busiest waterway in the world. The Soo Canal, started as a private enterprise, was taken over by the government, enlarged and improved until it can handle four giant steamers at once.

The rock-bottomed St. Marys river was chipped and blasted into a channel twenty-six feet deep. In one place, a brand new channel was cut through dry land to make two traffic lanes, one up and one down. Sandy Lake, St. Clair and the connecting rivers were dredged. Below Detroit another channel was cut through a swamp, making a double traffic circuit. Today more than 200 of the 850 miles between Duluth and Buffalo is through channels with banks of stone, concrete or piling.

The waters leading to the channels are marked by buoys. A skipper looks for buoy number one, then for number two, and so on until he gets into the channel. The buoys are lighted at night and some have bells and whistles for foggy weather. In the winding channels the captain steers by rifle-sight methods. Lights on the bank are so arranged that as long as he is on

his course two are visible, one above and behind the other. The boat is steered toward these until two more lights are seen around a bend, then the first pair is forgotten. By day these lights appear as twin targets, white with identifying black markings. Each pair is slightly different, so if the captain forgets which ones he has passed, a glance at his chart will remind him.

Lighthouses guide the vessels on the open water, but these were not enough and radio compass stations supplement them. Thus in fog or

when the light is below the horizon, a vessel still can find its position. The radio compass transmitters are grouped in threes, because it requires three readings to establish a bearing. Each group has a different wave length. Any vessel desiring a position tunes in a group of three stations, notes the angle of each in turn, marks these on the chart and where the three lines cross is the spot the vessel is



Unloading iron ore with the aid of clamshell unloaders such as the one shown at top of page

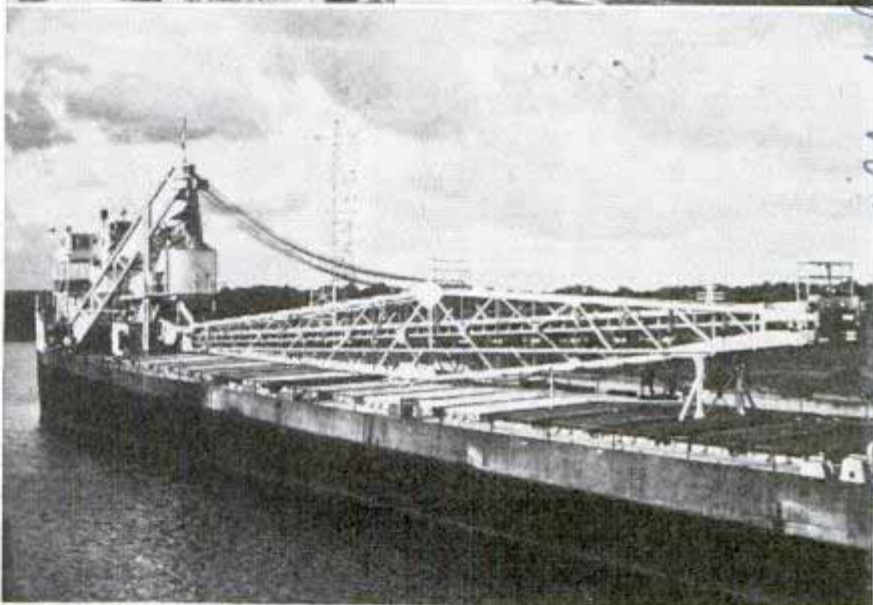
U. S. Kerr, Lorain, Ohio

located. This method of radio direction finding is quick and very accurate.

The lake vessels are large. The deck of an average ore carrier is higher than a three-story building, the roof of the pilot house towers another three stories and the boat is as long as a city block. Lake boats are highly specialized and their appearance is disturbing to one used to pictures of ocean liners. They are designed for just one purpose, to carry as much ore as possible. Supplementing this are the factors of meeting the prevailing weather, and navigating the numerous channels with speed and safety.

In spite of the extreme length, they are as responsive to the wheel as a good automobile. It is possible to steer a freighter through a channel where the sides clear the banks by a matter of inches and not scrape off any paint. This must be done at least once each trip, for all the docks on Lake Erie and most of those on Lake Michigan are several miles up narrow, winding rivers. Tugs are used on the worst of these, but many of the smaller ports have no tugs and the ship must get in as best it can. They always get in. And not only that, they get out again. Many a salt-water sailor has groaned in agony as he saw a lake boat courting what he considered positive disaster, then slipping through with ease when all appeared lost.

(Continued to page 138A)



Top, deckhands of a docking lake freighter being sent ashore on the landing pole while the ship is still twenty feet out in the channel. Center, the chromium boom of a self-unloader. Bottom, seagoing post office at Detroit transferring mail to a lake freighter with the aid of a bucket on a rope

J. F. S. Schellkopf Jr.

Sea Life Made Visible in Tanks with Portholes



Left, crowd looks on sea life from rim of Florida marine gallery. Below, view through underwater porthole as diver ventures into tank where porpoise, turtle, and other creatures live in natural surroundings



Two large tanks equipped with portholes are being used to reveal the wonders of the sea to the public. Visitors watch colorful and strange creatures of the sea from above the tanks or through the portholes, of which there are 207. The tanks, housed in a brick and steel structure located in Florida, contain a wide variety of marine creatures. A large porpoise and its baby, a 300-pound turtle, sharks and fish of all kinds are housed in the tanks, living together as they would in the open sea.

Acme
Archimede

Fifteen Riders Thrill Crowd by Stunting on Three Bikes



Chicago's motorcycle police ride five-passenger motor bikes—but only for stunt riding. At a recent spectacular demonstration by police and firemen, a team of fifteen riders climbed aboard three motorcycles and, linked abreast, swept across the arena. Three were in the saddles; three more, heads dangling down in front of the wheel, rode backwards on the fenders; nine others rode standing in two rows linking the motorcycles together.

Count them—three drivers and twelve passengers perched precariously on three motorcycles, one of the thrilling stunts at a Chicago police show

14808.

Capt. Ashley C. Mc Kinley

40 Babylon Seaplane

Base, Babylon, L.I.

Seaplane Floats on Rubber-Balloon Pontoons

Seaplanes are wearing rubber shoes. In place of the metal or wooden pontoons, a former army air officer has developed rubber balloons which, inflated to a low pressure, act as shock absorbers in taking off and alighting and thus eliminate the jolts transmitted throughout the plane when the former type of rigid floats struck the water. The rubber pontoons are impervious to corrosion and act as their own bumpers when they collide with buoys and driftwood.



Above, pumping up rubber pontoons. At left, the floats are inflated and ready for takeoff



Each pontoon is divided into five compartments with separate valves, and is inflated to three pounds pressure per square inch; along the sides are rubber tube "spray" strips, slightly inflated, which flatten out as the ship gains speed, and aid in the takeoff.

H. 892.

Earth's Crust Tested by Blasts Recorded on Seismograph

Is this world made like an onion, its crust consisting of concentric layers of rock? Scientists are putting that theory to test by setting off explosives to induce artificial earthquakes, and recording those tiny tremors on supersensitive seismographs. Twelve of these portable instruments are stationed at intervals within 100 miles of the site of the blasts, and from the read-

ings at the various posts the scientists hope to derive information on the nature of rock formations twenty miles deep in the earth's shell. Each recording station also has a radio set and the time lag between the actual blast, as received by radio, and the recording of the shock by the seismograph can be determined. An earth movement of 1/100,000 inch can be detected.

Scientific Monthly Aug 1938

Andrew Talbain 3741-83rd St. New York
 Jackson Heights

Psychological Society of America
 3419 W. 107th Street, New York

Police Use Shield and Armor Like a Medieval Knight



Paris policeman girds himself for battle in bullet-resistant chest protector, headguard and shield

Breastplate and shield reminiscent of the armor worn by knights in the middle ages are carried by policemen of the Paris gas squad for protection in gun battles with desperate criminals. The bullet-resistant chest guard is hung from a strap around the neck. The left hand holds a rectangular metal shield, and a head shield fends off bullets from the upper part of the face and skull.

Sawdust Practical as Fuel for Heating Homes

Sawdust is being used in heating more than 15,000 homes, offices, theaters and other buildings in British Columbia. In cooperation with combustion engineers, the forest products laboratories of the Canadian department of mines and resources have devised methods of using sawdust as fuel and for storing it safely. As a fuel, sawdust is clean, cheap, very low in ash content and light in weight. It burns freely, requires little attention and makes a fire that is easily controlled. The sawdust requires an auxiliary grate, but special furnaces are unnecessary. The grate is de-

signed so that it may be attached to any standard heating unit. The fuel is fed as required by gravity from a storage hopper placed above the grate. The hopper is filled two or three times a day. Formerly regarded as unavoidable waste, sawdust soon may be returning to mill owners of the United States and Canada thousands of dollars for a product once sent to refuse burners. The quantity of sawdust produced annually in Canada is estimated to be sufficient to cover fifteen to twenty city blocks to a depth of 100 feet.

Moistureproof Metal Finder Hunts Sunken Treasure

Unaffected by moisture, a metal locator invented by a Miami man hunts treasure in sunken ships or plumbing pipes under the earth. It was used recently to find several hundred buried relics of Indians in southern Florida. It is adapted, too, to practical uses by surveyors and electricians. When seeking submarine metal, the circular locator is let down with a cable. As it approaches the metal, a recording is made on a meter box aboard the boat.



Dropping the metal locator from stern of power boat, the operator watches record made on meter box

*Civil. George J. Paul
537
Chicago*

*Canadian Dept. of
Mines and Resources
see material here*

Headed in sub address

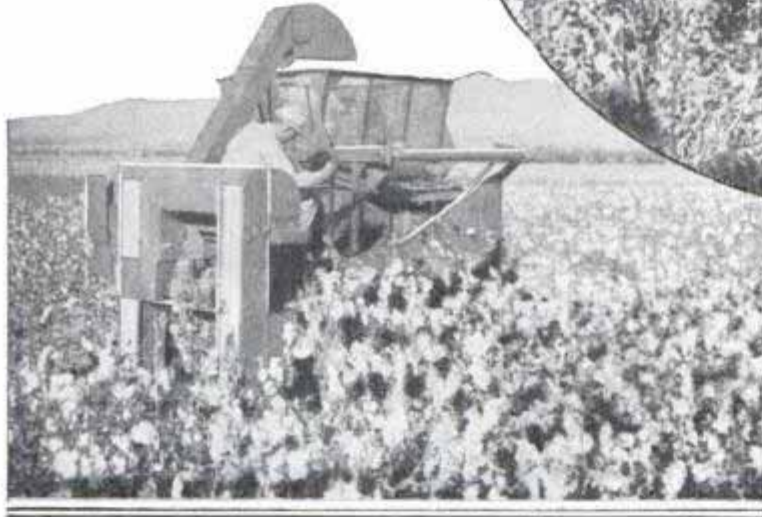
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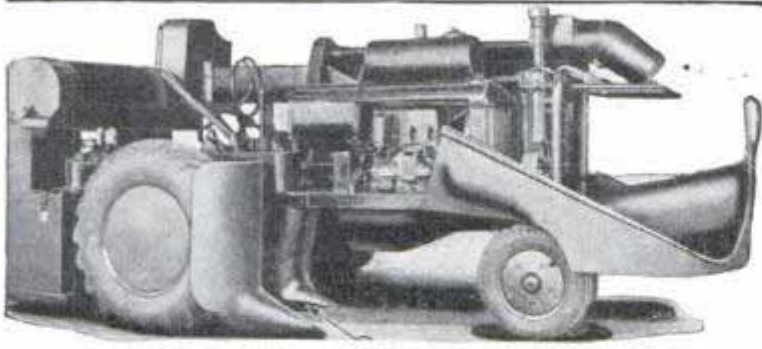
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Locators. see
10230 (11) Secura*

180 N. Michigan Chicago
Cotton Picker Does Job of Seventy-Five Men

Thrusting its barbed, rotating fingers into the heart of the cotton plant and drawing out the ripe cotton, a mechanical picker introduced by a leading farm implement company this year can do the work of seventy-five average hand pickers. Attached to a standard type farm tractor, this single-row harvester has two vertical and parallel revolving cylinders between which the cotton plants pass. From each cylinder protrude 154 spindles



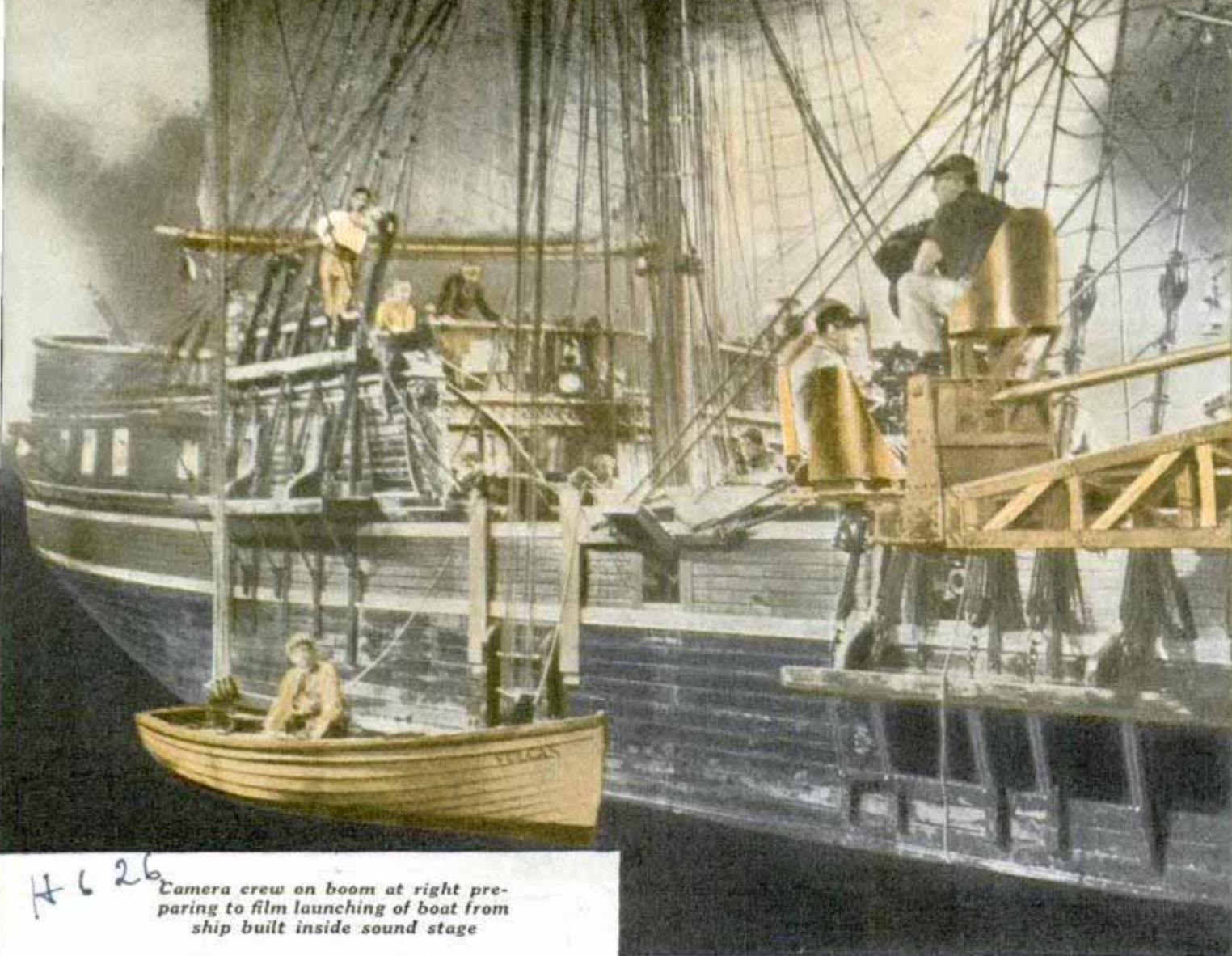
Picker at top deposits cotton in bags; left, basket collects cotton from conveyor. Below, another view of spindle-type harvester attached to standard farm tractor



machine. Traveling at two and one-half miles an hour, the picker covers one-half to three-quarters of an acre in an hour. The amount harvested depends on yield per acre, but assuming a yield of one bale per acre it picks an average of 1,500 pounds of seed cotton in an hour and twenty minutes, which when ginned makes a standard 500-pound bale. The manufacturer points out that the machine results from more than thirty years of development, and

which remove practically all the cotton from the stalks without doing serious damage to the plants or immature bolls. Each spindle has many tiny needles or barbs to catch the lint, and as the revolving drums carry the spindles around, the cotton is removed by doffers rotating at a higher speed than the spindles; then the cotton falls on a conveyor belt and is carried to an overhead basket or bags on the front of the

that refinements are still being made. While the rising cost of hand-picking and increasing scarcity of field labor are expected to stimulate the demand for mechanical pickers, introduction of these machines will be gradual over a long period before they affect the labor situation. Numerous cotton-picking machines have been patented since 1850, yet cotton still is the least mechanized division of agriculture.



H 6 26
 Camera crew on boom at right preparing to film launching of boat from ship built inside sound stage

MILLIONS *for* MOVIE

Los Angeles

THERE is upward of one million dollars waiting for you in Hollywood if you can find a satisfactory way of projecting motion pictures in three dimensions. There's another million for some device which will create a universal focus for a camera. Possibly you could drive an even better bargain.

But before you start, remember that the best brains in the industry have been struggling with the ideas for years and nothing worth-while has been found. Hundreds of letters come to the studios, containing both shrewd suggestions and fantastic ideas, and still the search goes on. Scores of patents have been issued on both subjects and yet nothing good enough seems to have turned up.

Motion pictures seem almost perfect when compared to the pictures of twenty

By Frank Lloyd

Paramount Producer-Director

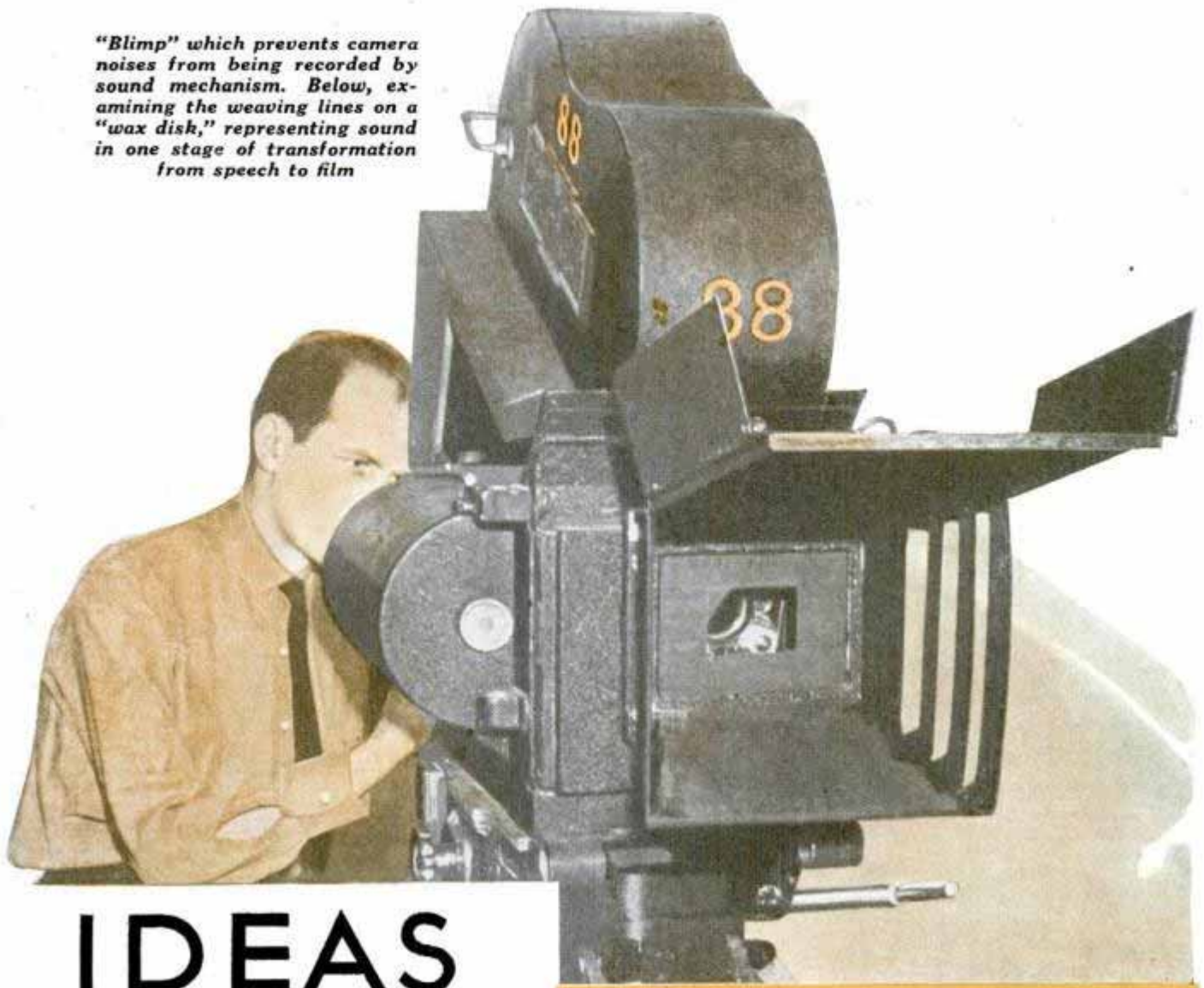
54 51 Marathon

or even five years ago, but there is still room for improvement. To mention only a few things, we would like to achieve a more even gradation of light across the screen. We would like to improve the steadiness of the image on the screen. Eliminating side-seat distortion would be a great advance, and a lot remains to be done in obtaining perspective in sound.

The goal of the sound technicians is the "delay" idea. They want you to hear sounds exactly as you would have heard them had you been present when the original sounds were made, the only difference being the delay in releasing them until you decide to listen. Such an improvement may come next year, in ten years, or possibly never.

Color is still so new we are looking for many improvements. Some will enhance

"Blimp" which prevents camera noises from being recorded by sound mechanism. Below, examining the weaving lines on a "wax disk," representing sound in one stage of transformation from speech to film



IDEAS

the quality of color on the screen and some will never be apparent to an audience, but will be important because they will make color easier to handle in the studio. At present color is expensive and demands special lights, special film, and special training by everyone who handles it.

Continuous improvement in technique and equipment has been the history of motion pictures. Some who helped develop the art have become famous. The point is that progress never stops and many more improvements are going to be made. The door of opportunity is still open.

Of course, improvements such as increasing the quality of sound usually result from adding togeth-



14626



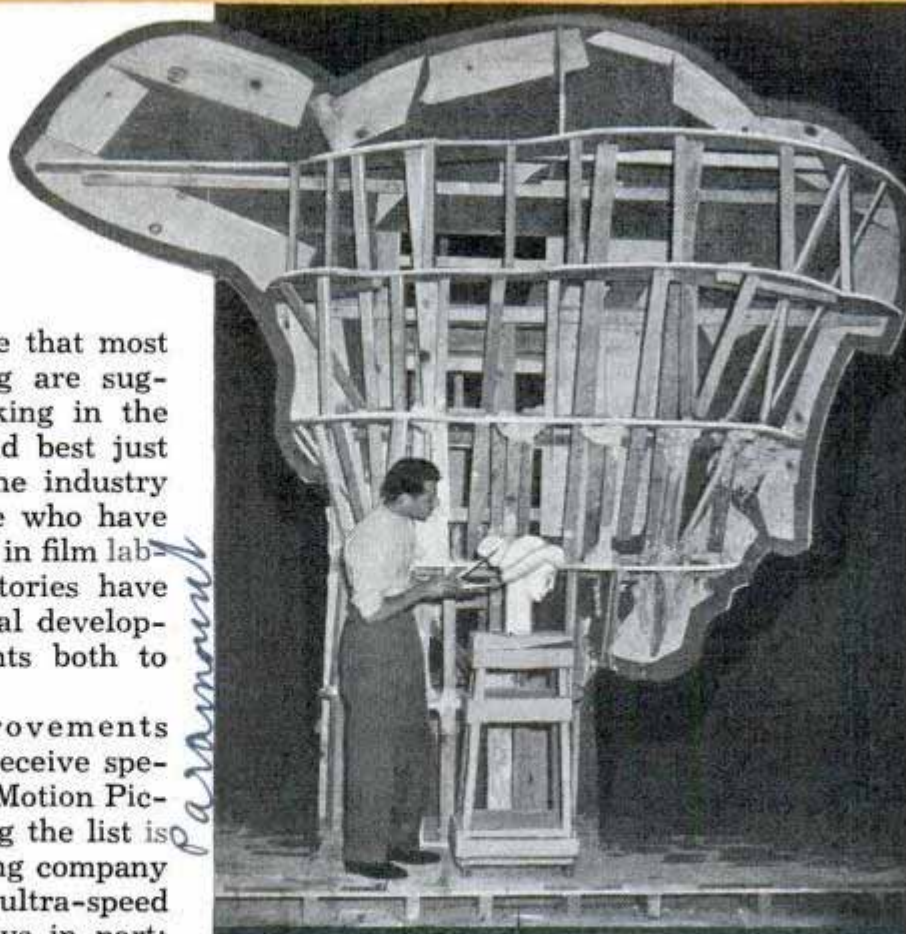
emulsion manufacture ... and has provided a tool to obtain, under adverse conditions, high quality photographic results heretofore impossible."

Eleven awards were made for outstanding technical achievements in the industry last year, including awards for a new design of film drive mechanism, a semi-automatic follow focus device and its application to cameras, and for a multi-plane camera that tends to create an illusion of depth in color cartoons.

Another award was given "for the exceptional application of acoustic principles to the sound-proofing of gasoline generators and water pumps."

er many minor improvements instead of being achieved by one revolutionary invention. Usually, too, a technical achievement results from a group of men working together over a common problem. But sometimes credit must go to one man alone. It's also true that most improvements in movie-making are suggested by people already working in the studios because they understand best just what the problems are. But the industry owes a debt to scores of people who have never seen Hollywood. Workers in film laboratories and telephone laboratories have played their part in the technical development, contributing improvements both to film and sound.

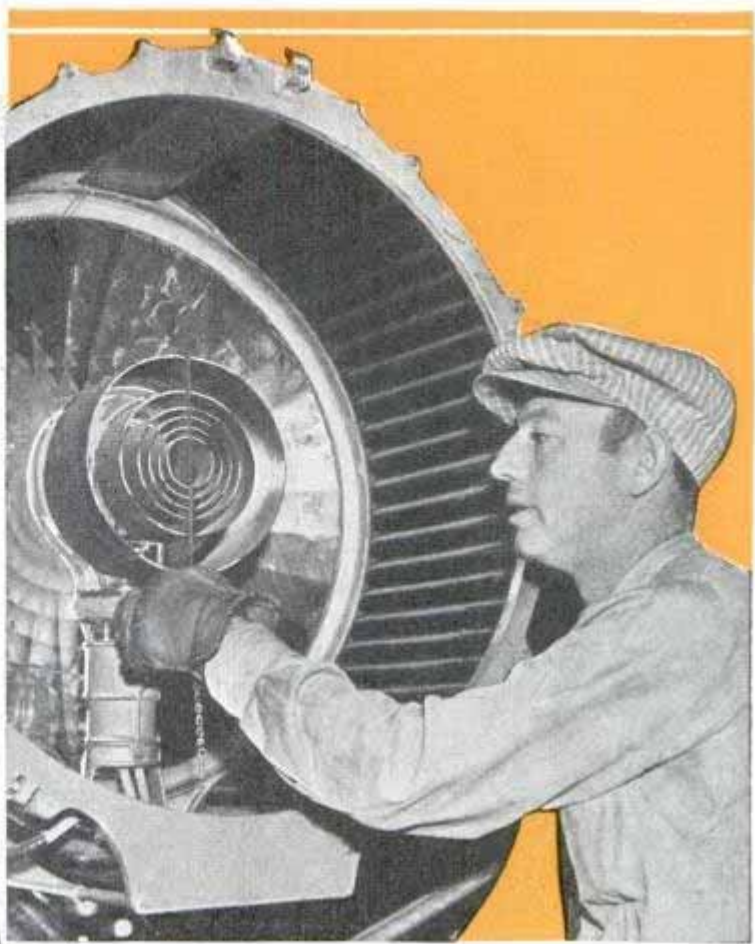
Here are some recent improvements judged outstanding enough to receive special awards by the Academy of Motion Picture Arts and Sciences. Heading the list is an award to a film manufacturing company for the development of new ultra-speed films. The award statement says in part: "The development of these two films represents a major achievement in research and



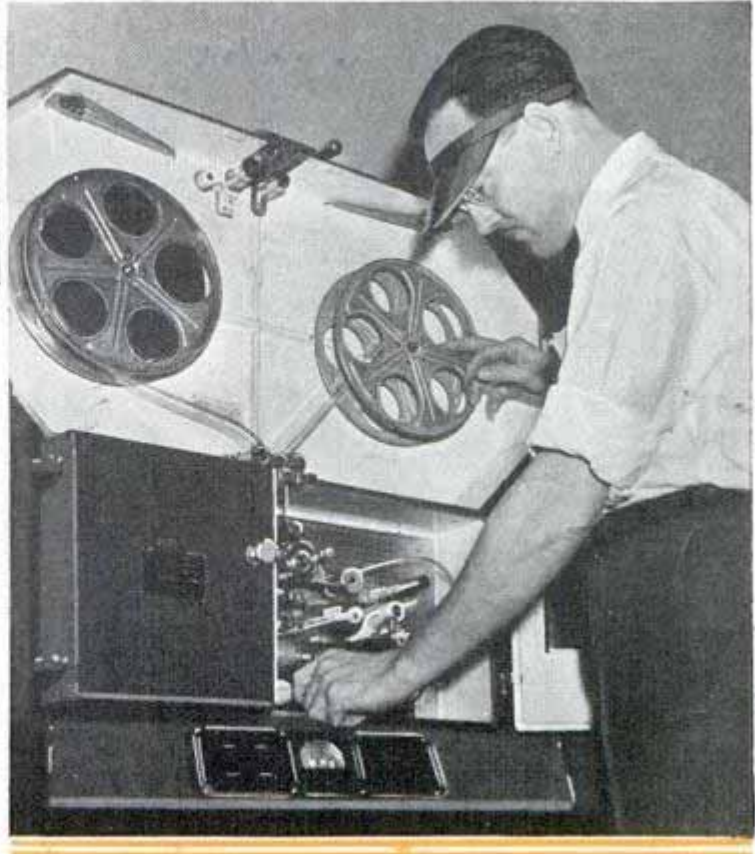
Building woman's head from model in studio plaster shop. Top, adjusting camera's electric motor drive in the studio camera repair shop

This might seem to have little to do with making better pictures. But it is noteworthy because now such units as generators can be operated close to the microphone without creating noises and that's important in sound pictures. Even an improvement to a sound boom or a better way of loading film may be important.

In the past, awards have been made for a multi-cellular high-frequency horn and receiver, for the production of infrared films,



Setting focusing vanes, top, in one of sun arcs used in making colored movies. Left, plaster sculptor working on large hand for movie set. Below, "playback" machine with which sound tracks on film are dubbed together



for the development of a quiet wind machine, for improved spotlights, an air-turbine developing machine, and for recording sound with ultraviolet light.

Such developments, few of which are ever heard about, are occurring all the time. It is estimated that the studios this year are going to turn out pictures for \$6,000,000 less than last year because of better use of process-background and trick-photogra-

(Continued to page 116A)

Science Service
6/24/38

Ship Monument Marks Site Where Swedes Landed



Monument in Delaware park commemorates establishment of Fort Christina by Swedish colonists

Surmounted by a sculptured sailing ship, a monument dedicated recently in Fort Christina (Delaware) State Park marks the spot where Swedish colonists landed to establish their first settlement in America, three hundred years ago. The crown prince and princess of Sweden came to this country to participate in the tercentenary ceremonies of Fort Christina.

Energy Source to Replace Coal May Be Learned from Stars

Long before our coal and other power sources have dwindled away, man may learn new sources of energy from the sun and stars. Dr. Arthur H. Compton, Nobel prize physicist, believes science will some day find the secret of what keeps stars bright and productive of heat. For a billion years the sun has poured radiant heat on the earth at about the same rate. Chem-

ical energy such as coal burning in oxygen could not have supplied this power for more than 1,000 years before the sun would cool. Most promising of stellar heat theories now is based on atomic nuclear reactions similar to radioactivity. These can be produced in the laboratory, but how they can be made an efficient source of energy on earth is a problem for the future.

Pumps No Larger Than the Hand Serve Many Purposes

So tiny that they can rest in the palm of the hand, midget electric pumps are used for many purposes—to operate small fountains in gardens, rockeries, floral shops and even on banquet tables, to maintain regulated flow of water in miniature aquariums and to make liquids flow or bubble in window displays. Industrially, the pumps are used for air-conditioning and refrigeration equipment; circulating water and light liquids in filter systems, washing baths, condensers and constant temperature instruments; draining commercial refrigerators, seepage in basements and fire pits; to pump cutting solvent on lathe tools, for wet grinding of valve faces in machine shops and garages; in food and drug laboratories and by dentists and doctors. Noiseless in operation, these pumps come in several models and capacities. There are vertical types ranging from twelve ten-



Inset, tiny pump rests in palm of hand. Below, fountain operated by midget pump

U. of Chicago
H 977

Centerville

Oakland Calif

Lloyd Bowen
14 2 Santa Clara
Dr.

Diesel-Powered Ocean Liner Sets a Speed Record to U. S.

thousandths of one horse-power to a fiftieth. The smallest will pump one-half gallon a minute to a height of one foot and the largest one gallon per minute to a height of six feet. There are horizontal types with motors from a fiftieth to a quarter horse-power and capacities from a gallon per minute to a height of four feet to twenty gallons per minute to a height of twelve feet. Both types are easy to install. The smallest will run 100 hours for between three and four cents at an average electrical rate.

H 803

Tiny Glass Spheres Sprayed on Signs to Reflect Light

100 gal.

Tiny glass spheres shot from a spray gun make traffic signs luminous at night as far as the rays of a headlight beam can reach. A liquid binder, clear or colored, is first spread in the pattern or lettering desired, then the spheres are applied while the binder is still sticky. Spread thus on a traffic dividing line, on the end of a culvert or highway

Empire State Bldg. New York

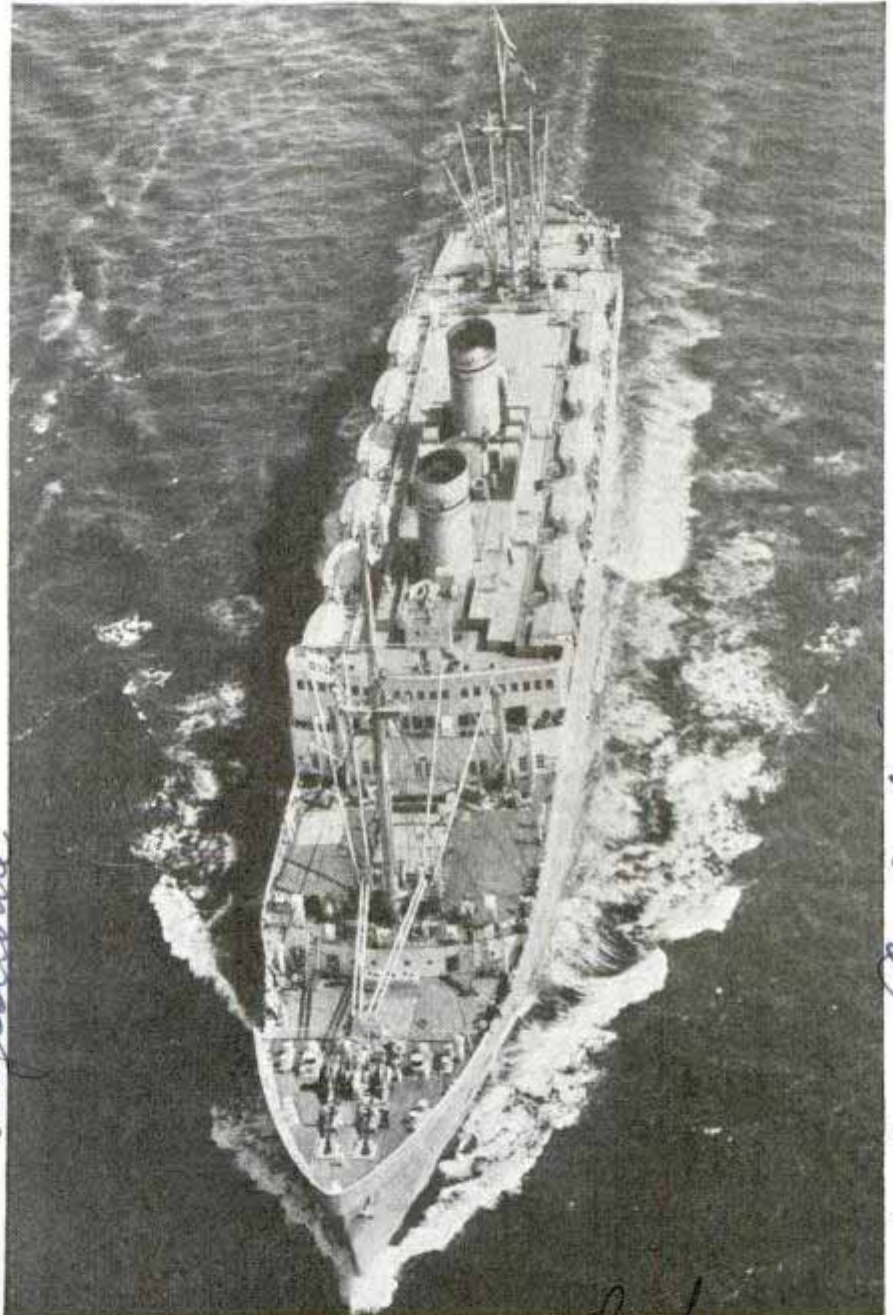
Reflectants



Spray

sign, or on sides and rear of a truck, the bits of glass catch the glint of headlights. The hard, pebbly surface withstands the severest weather.

Highway Safety Products



dup.

Looking downward on the Diesel-powered liner as it arrives at New York after first crossing from Norway in record time

motor liner - Caleford

Highest powered ocean liner ever designed for propulsion with hydraulic-gear Diesel engines, the new flagship of the Norwegian-American Line recently set a speed record for the direct crossing from Norway to the United States. The time was cut from seven and one-half to seven days. The liner, with a capacity for 800 passengers, has a speed of twenty knots.

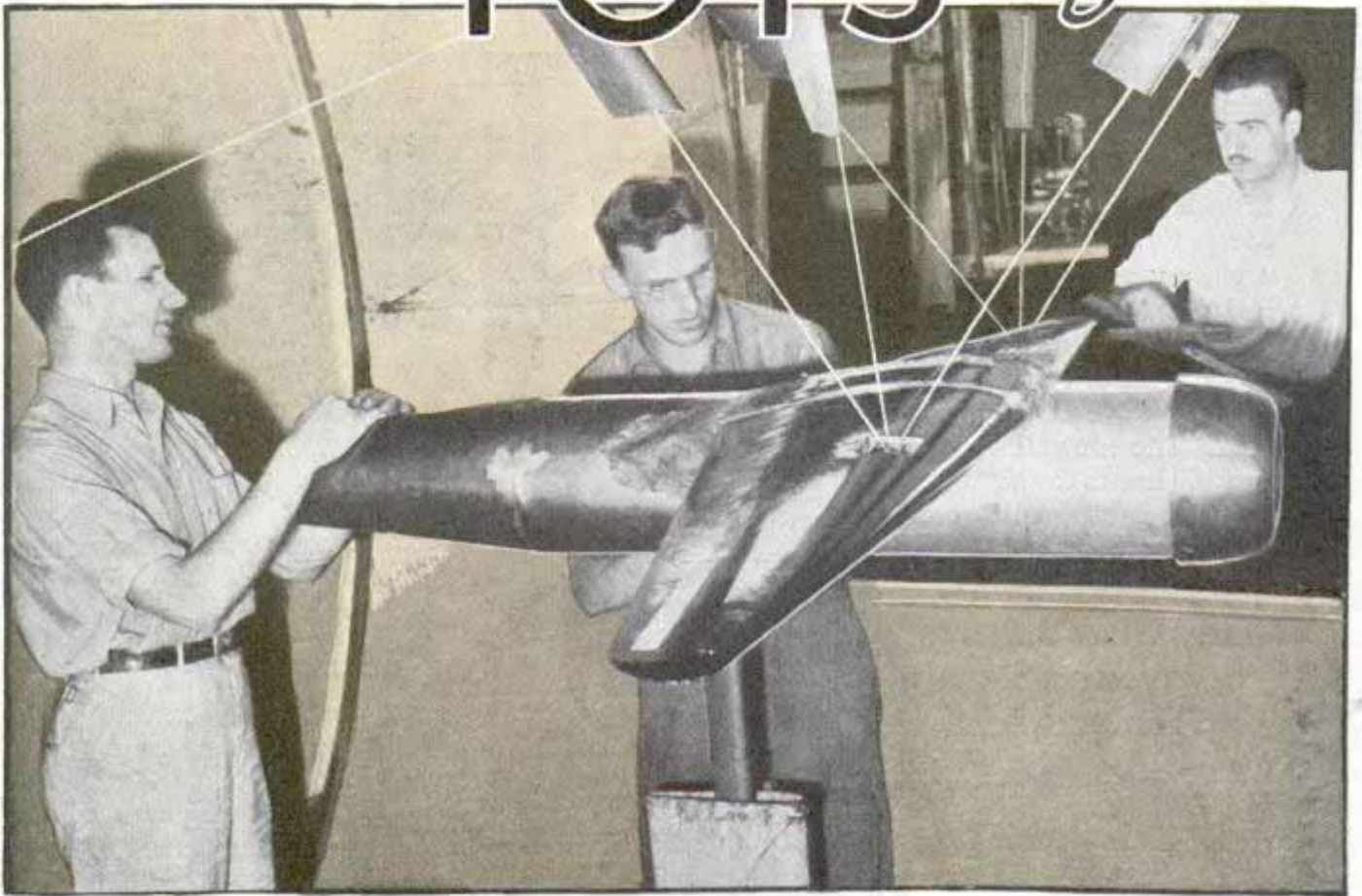
24 State, New York

When the 43,000-pound Douglas DC-4 Super-skyliner, largest American land plane, took off for its first flight it carried 8,500 pounds of test instruments.

Douglas Aircraft Co. Santa Monica, Calif

H 67 1. Thomas E. Stinson, Jr.
10555 Holman Av
Los Angeles

TOYS for



Preparing scale-model plane, above, for wind-tunnel tests at California Institute of Technology. Below, scale model of Mount Palomar observatory dome used to check wind, rain and snow loads



WORK is mere play for the research engineers. At least, that's how any small boy would look at it if he saw these grown men tinkering with toy trains and planes, boats and automobiles, electric motors and compression engines.

But if you could examine all the playthings of all these engineers, you would enjoy a glimpse into the world of the future, for the toys of today are working models of the mechanical marvels of tomorrow—reflections of engineering visions.

Toys have had a profound effect on human progress. The gyroscope, for example, was merely a toy until its properties

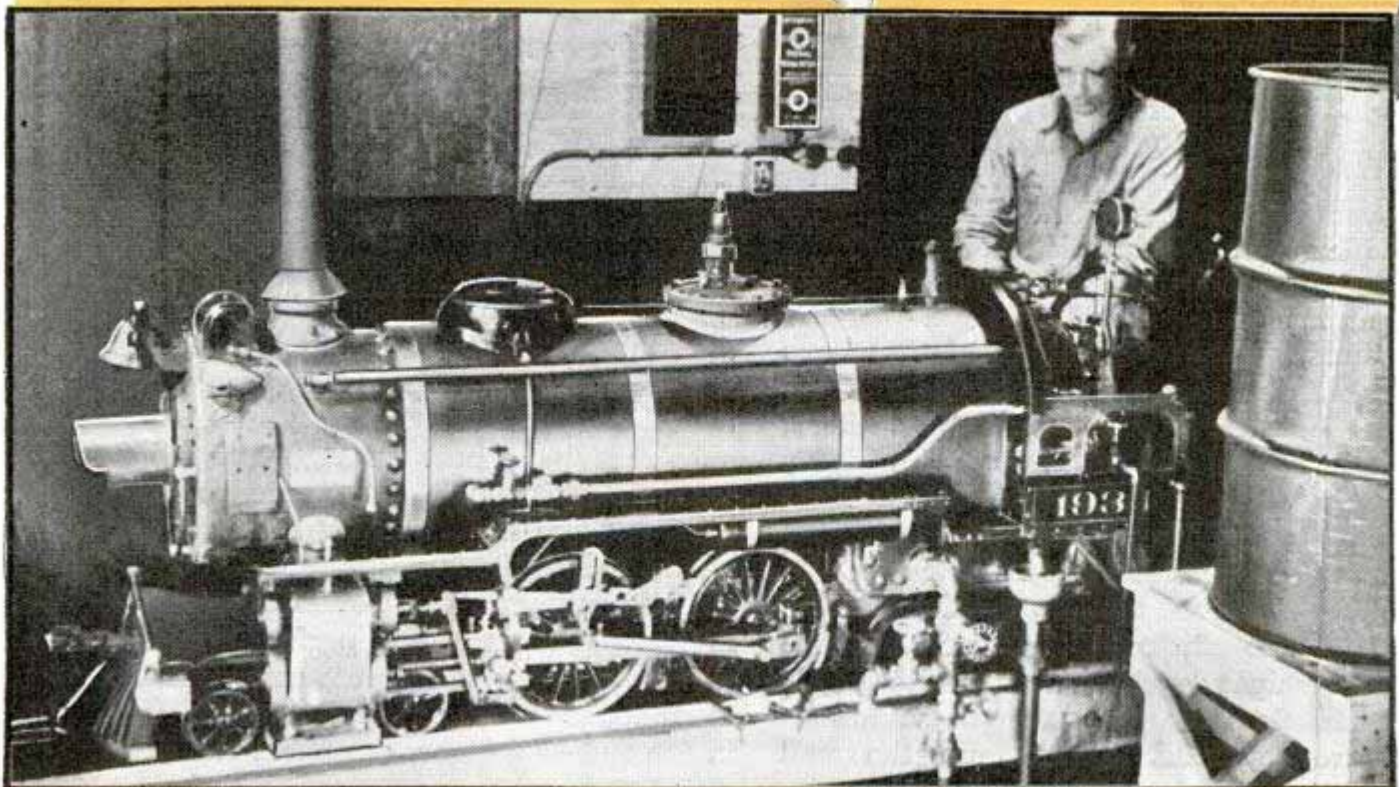
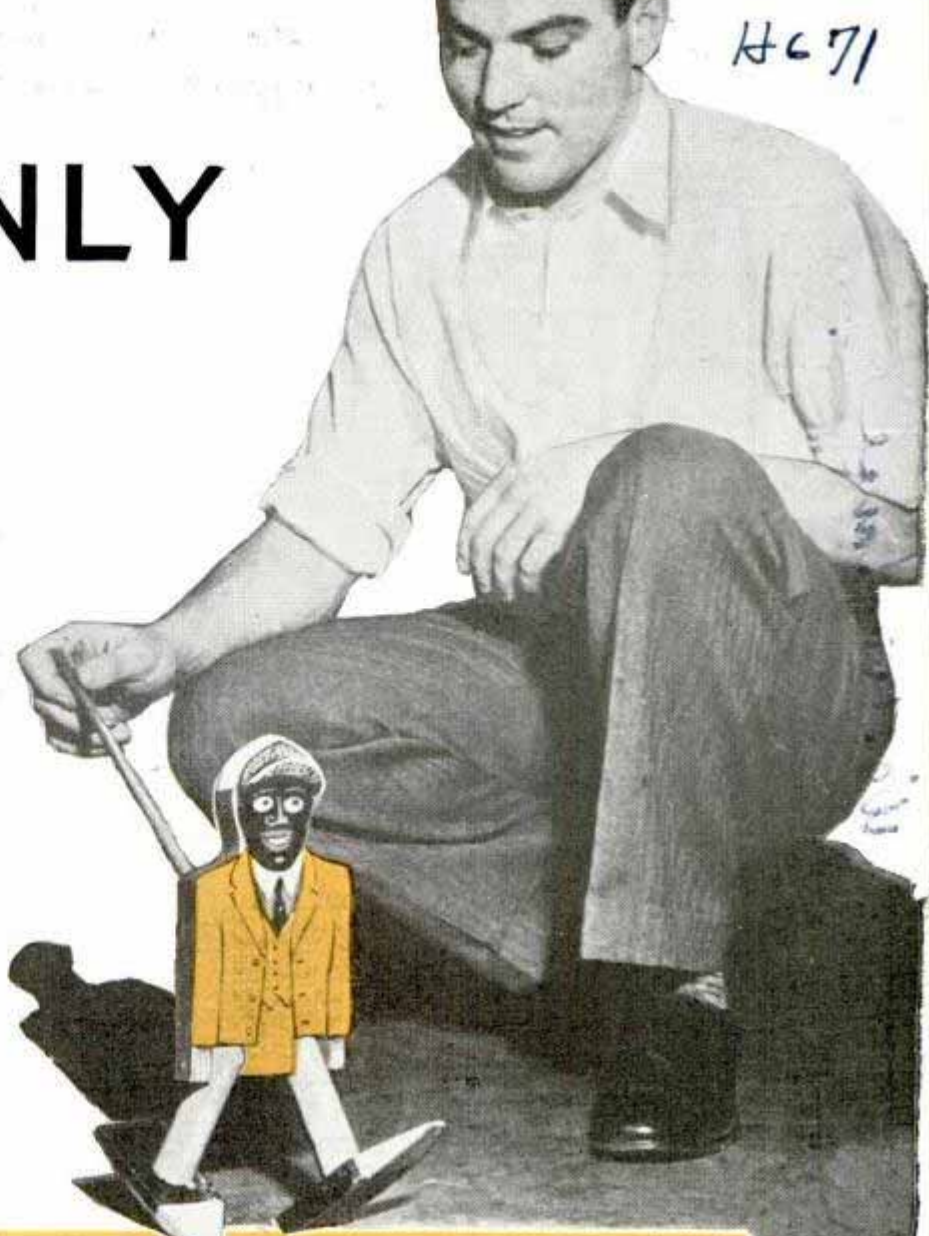
Hc 71

MEN ONLY

were applied. Then it grew up to fly airplanes and steer ocean liners. Boys sent electric trains dashing around toy tracks long before railroads used electric locomotives, and operated toy machines with miniature electric motors while the wheels of industry still were being turned by steam.

Today trains cling to the rails better, automobiles run more smoothly and planes travel faster partly because research men have learned valuable lessons from toys. Without working models, engineering and scientific progress in many fields would be retarded greatly because man still would be forced to learn by the costly process of trial and error.

When the modern engineer starts to design a new airplane, a new car or a new boat, he first evolves a plan which appears sound in theory, something which "looks all right on



Walking wooden doll, top, which displays same sort of vibration that causes machines to shake apart. Bottom, scale-model locomotive boiler in which corrosion-resisting agents are studied

Laboratory - Dearborn Chemical Co. 521
205 E. 42nd St New York City



Another type of vibration has plagued the railroads, lateral pressure of wheel flanges against the rails which causes lateral derailments. By using a toy electric locomotive, a Westinghouse researcher was able to study the forces which cause lateral derailments. He ran the locomotive on two rollers at a top speed corresponding to ninety miles an hour for a full-size engine. By taking motion pictures of the toy he determined the oscillations at different speeds and eventually demonstrated with his toy that a modern electric locomotive can operate safely at a speed even greater

Westinghouse

paper." Then he builds a working model and by experimenting with it he finds the "bugs" in his design before he constructs his plane or car or boat. Nothing is too big or too complicated to be duplicated in miniature. A model was built of Boulder dam and models have been constructed of whole watershed areas in studying flood-control projects.

Working models of complicated machines may cost hundreds or even thousands of dollars but they pay for themselves many times over by enabling engineers to discover their mistakes ahead of time. Models have enabled engineers to eliminate dangerous vibrations from machines. Waterwheel generators weighing thousands of tons have shaken themselves to destruction in the past because of self-induced vibrations, airplane wings have "fluttered" with an intensity which threatened to tear them from the fuselage and motors have felt the power of such vibrations in their bearings.

The engineers used to build machines, then try to eliminate whatever vibrations the machines developed. Now, with the aid of models, they eliminate the vibrations before they build. By calculating the small vibrations of a machine model, they can predict whether the actual machine will be susceptible to self-induced vibrations.



Model of Golden Gate International Exposition and, above, boat propelled by heat from alcohol lamp

than the highest for which it is designed.

In testing new airplane shapes, wind-tunnel experiments with scale models not only reveal the best fuselage design but aid in determining the effectiveness of ailerons, rudders and other control surfaces, and in finding the forces required to operate these surfaces. Quite often, after learning how a scale model performs in the wind tunnel, and taking into consideration the amount of power which is to be used in the full-size plane, engineers can predict speed and other performance figures of a plane within one-half of one per cent—before the plane is built.

Boulder P.D. Joyelle

Handwritten notes and signatures at the bottom of the page.



But airplanes are not the only models subjected to wind-tunnel tests. Architects use wind tunnels to test building models and thus learn in advance the effect of wind pressure on buildings during violent storms and cyclones. The latest models to be subjected to wind-tunnel tests are the various types of windmill vanes used in

Cornelius Vanderbilt Jr

generating electric power from the wind on farms.

The effects of earthquakes on various types of buildings are also studied with models. The "earthquake" is produced by a quick-acting piston which shakes a table on which the models are mounted. There are models of coal mines where engineering problems can be worked out before ground is broken for a shaft, and there are models, too, of rivers, beaches and oceans for studying navigation and flood-control problems. Even lightning is produced in the laboratory in model form to study its effect on buildings.

One of the most difficult models ever attempted was that of the supports for the 200-inch telescope being constructed on Mount Palomar in California. Here Westinghouse engineers were called upon to build a miniature of something so unusual that no one had ever seen it or anything like it. It was

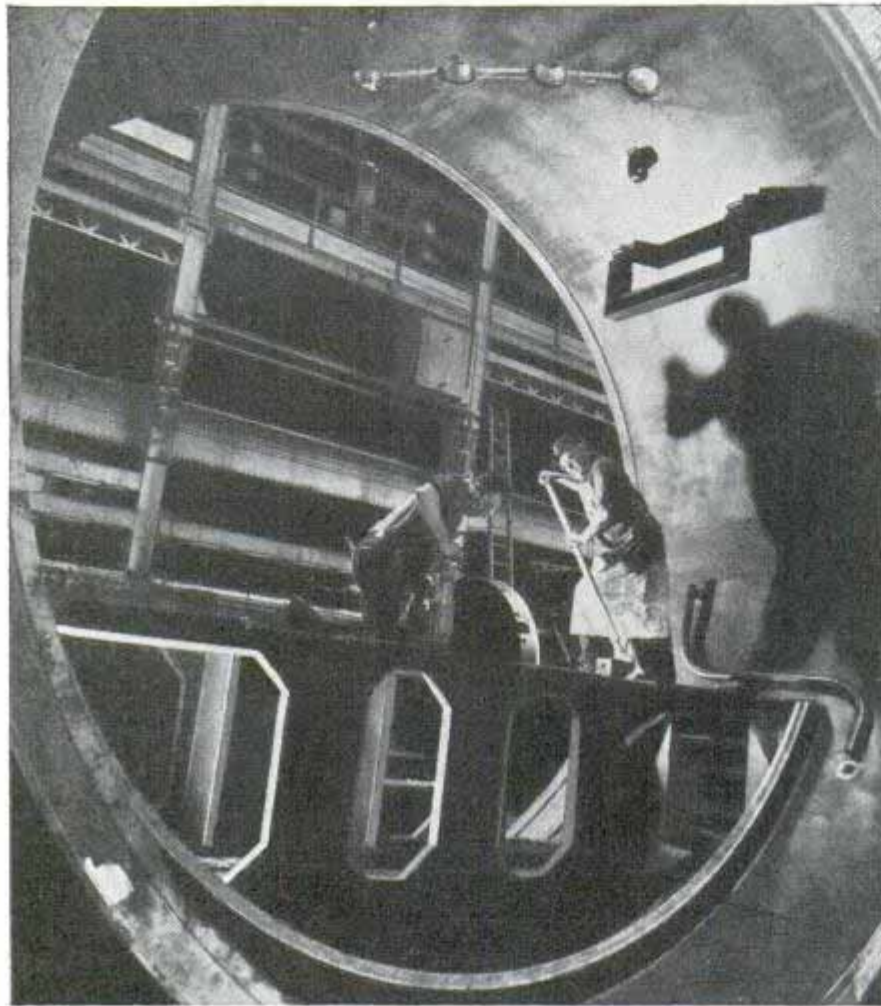
(Continued to page 125A)



Model homes like this enable builders to solve many construction problems in advance. Top, model street and model buildings used in studying traffic problems

A. H. G. model I am at San Diego

Hydrogen Tank Forms Setting for Pageant of Modern Power



Assembling the bearing and gas cooler section of a big hydrogen tank enclosure destined for a power station of Southern California Edison company

Dramatic as the setting appears, this picture is no staged portrayal of man's conquest of earth by machinery. The two workmen were caught by a photographer while assembling a bearing and gas cooler section of a giant hydrogen tank enclosure. It was being manufactured by the Westinghouse Electric & Manufacturing company for the 60,000-kilovolt-ampere hydrogen-cooled synchronous condenser, to be installed at a Southern California Edison company substation at Chino, Calif.

Each Pittsburgh Pa

Dept. of Commerce 6/27/38 mem

Dry-Sprinkler System in Plane Rids Cabin of Insects

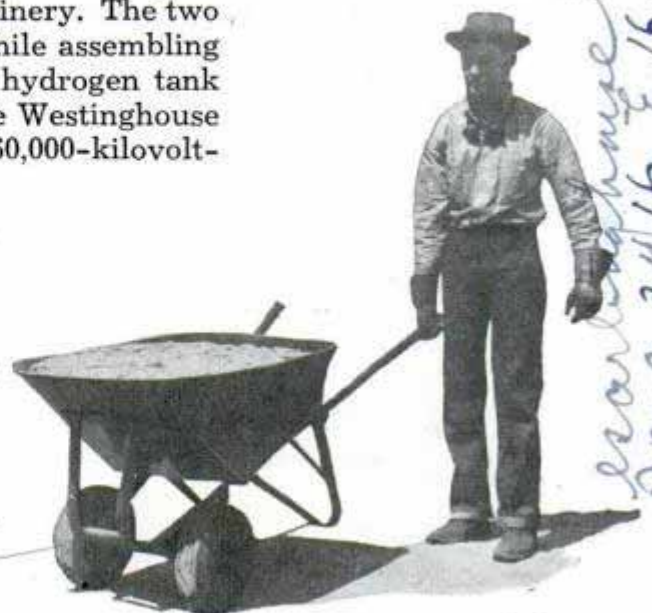
To rid airplane cabins of insects and prevent migration of the tropical pests from one area to another, Imperial Airways engineers have developed an insecticide sprinkler system. The disinfecting fluid is forced under pressure through a piping

system and emerges from vents as a fine dry spray which permeates every corner of the aircraft. Non-inflammable, the spray does not affect upholstery or clothes and has no objectionable odor. The system is being tested on a plane in South Africa. Insect traps have been used on air vents of Imperial Airways planes for some time.

H 740

Two-Wheel Barrow Makes the Load Easier

With two wheels instead of one, a wheelbarrow can carry four or five hundred pounds of material with much less human effort. By centering the weight about a pivotal point, the designers reduced the necessary handle-lift so that a 400-pound load requires an effort of only eighty-seven pounds, against a 125-pound lift with the ordinary type. The wheelbarrow has pneumatic non-skid tires.



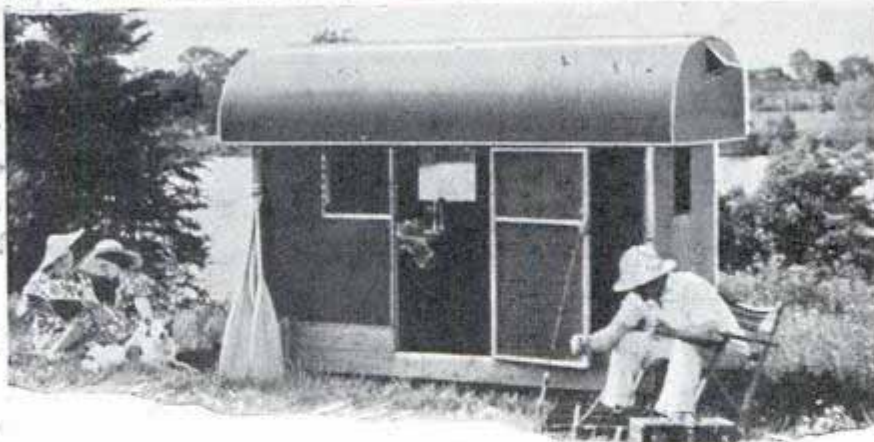
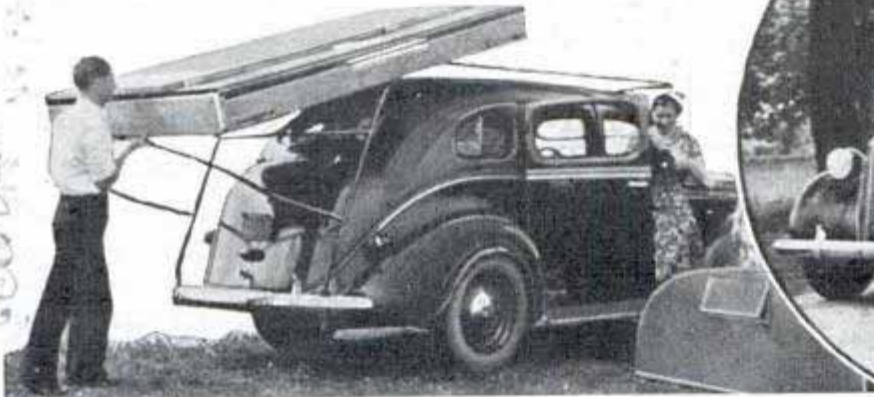
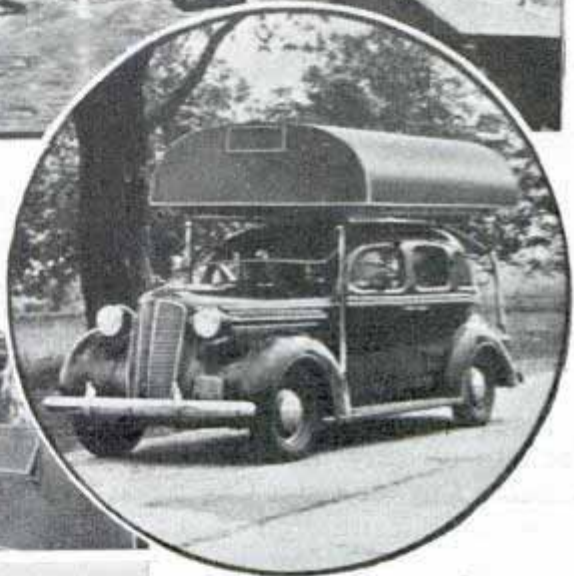
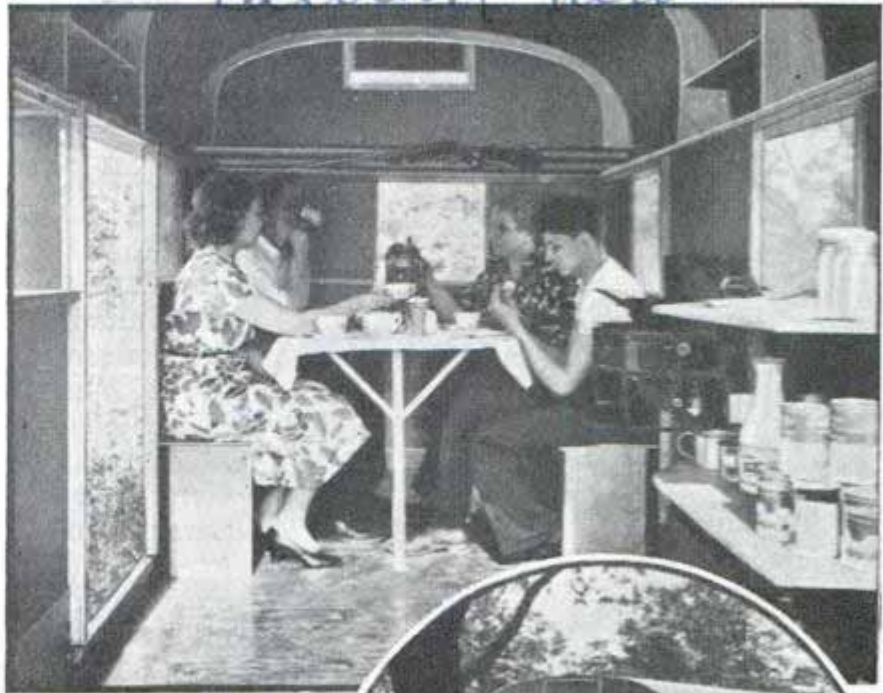
Workman can manipulate this two-wheeled barrow with one hand, its construction easing the load

earl westinghouse 1800. 2416 E 16th Ave

more to be used H A I

Collapsible Camp House Carried on Car Roof

Vacation tourists can carry their traveling home on top of the automobile. A collapsible, lightweight house just put on the market folds into a six-by-nine-foot "package" extending only two feet above the car, where it rests on a metal rack. Whenever the tourists reach an inviting camp site, one man can unload the house, and in ten minutes it can be ready for use. Adjustable legs keep it level despite uneven ground, and the solid wood floor is always six or eight inches above



The turtle carries his home on his back—and so can the motoring vacationer! Here is a collapsible house carried (circle) on bracket over the car; at left, one man eases it down and erects it on ground in ten minutes. Top, interior view at lunchtime; bottom, exterior of the portable camp

\$99.50

ground. A table is installed at one end of the room, and benches drop on hinges to seat four persons. High-placed beds avoid interfering with use of the house, and when not occupied the beds may be rolled against the wall. The material is moisture-proof and the walls have a dead-air space for insulation. There are six windows

with sliding glass and permanent screens. Less expensive than the more luxurious trailer and offering no difficulties to the driver, the collapsible house provides a shelter for overnight or summer-long stay. An arm attached to house and roof-top rack acts as a fulcrum, making it easy for one person to carry the load in dismantling.

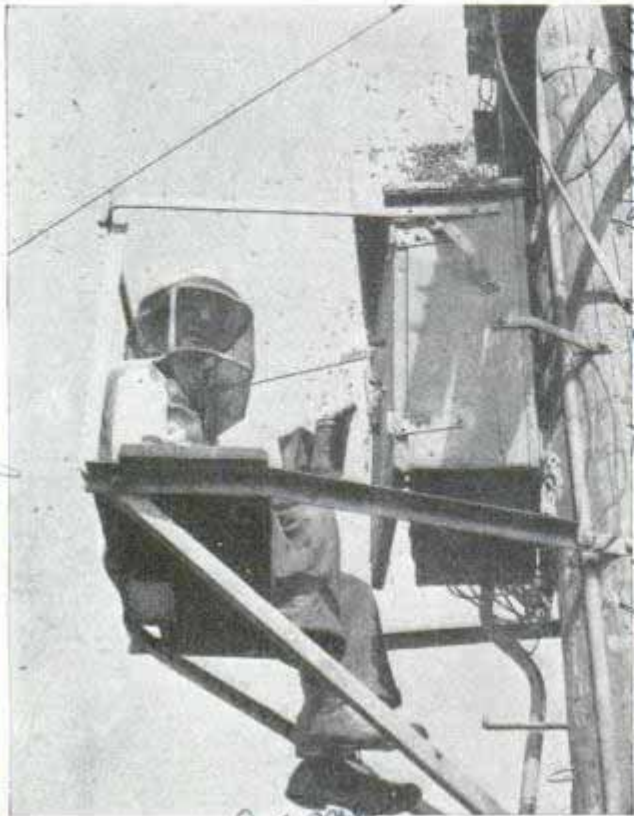
Patrick Collapsible House Carried on Car Roof
5220 Third St. Detroit Mich

Patricia - Carried on Car Roof

Patrick Collapsible House Carried on Car Roof

Bee Trouble a New Hazard for Trouble Shooter

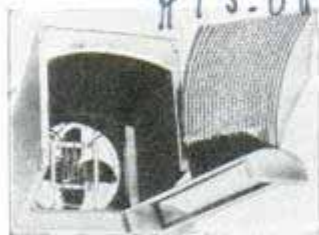
chamber holding twenty-four prints of eight by ten inch size or a larger number of smaller prints. Current consumption is less than 400 watts.



Wax insulation proved attractive to bee colony, so the trouble shooter had to carry out eviction order

As if there were not enough varieties of trouble already in his line of work, the trouble shooter for a California telephone company encountered bees the other day. They were swarming in a terminal box on a pole, and it was his assignment to dispossess them. Always ready for anything, the trouble shooter put on a helmet and gloves and smoked out the intruders. The wax insulation on the heavy wire had attracted them.

Electric "Oven" for Photo Prints Speeds Up Drying Process



Photographic prints dry out rapidly in a compact electric "oven" in which a fan forces warm air over the paper. Single-

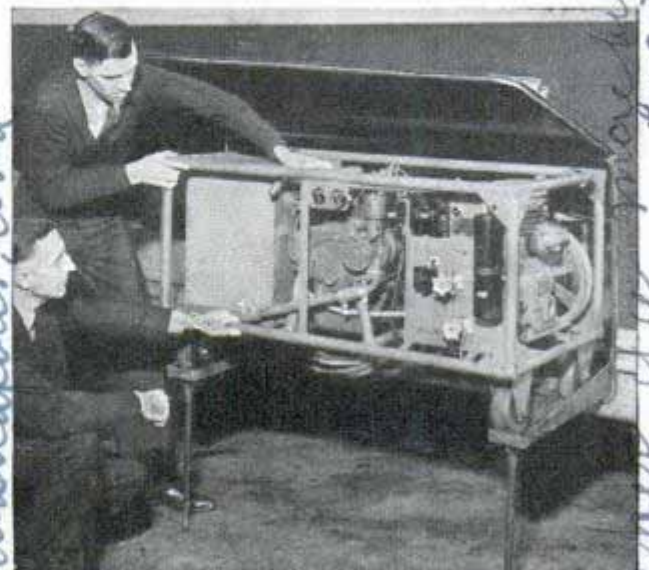
weight prints are dried practically flat in thirty to forty minutes. They are placed face down on chemically treated lintproof blotters, the ten by ten by fifteen-inch

Castor Bean Finds New Uses in Paint and Chemicals

Castor oil as a substitute for the tung oil from the Orient is but one of the products stimulating growth of the castor bean in the United States. The stalk of the bean has been found to contain a fiber that may prove valuable. The inner stalk can be fabricated into a cellulose material more absorbent than cotton. Some poisonous element in the plant is deadly to grasshoppers and may be isolated as an insecticide, leaving a residue possibly suitable for stock feed. The protein remaining after the oil is removed from the beans can be made into plastics, and is good for fertilizer. Castor oil blended with petroleum is a highly regarded automotive lubricant.

Air-Conditioning Unit for Bus Filters Out Dust and Odors

Cross-country bus travel is cleaner and more comfortable in the buses equipped with an air-conditioner which not only filters out dirt and dust but eliminates fumes and odors as well. Its thermostatic control keeps temperature in the bus constant. Flexibly connected, the unit can be pulled out from its housing for inspection while in operation.



Flexibly connected, the air-conditioning unit is pulled out from body of bus to be serviced

Freeman F. Robertson, Co. Los Angeles. Associated Telephone Co.

American Society of Agricultural Engineers

From International Telephone & Telegraph Co.

Castor Bean - American

Belts - Lenaha

15 2 2

Moore Products, 5921 Guilford Ave

Telegrams Ride the Tones of Electric Organ

Telegraph engineers have learned from the electric organ how to send ninety-six telegraphic messages in one direction over a single wire at the same time. They borrowed from the Hammond organ the idea of dispatching multiple messages on different tone pitches. To demonstrate how the organ generator functions in such a telegraphic system, Western Union engineers installed an organ console next to a bank of carrier channel equipment and used a "tone detective" which, by a series of clefs on the musical scale, showed the frequencies of the tones produced on the organ and the tones being used by the generator for the telegrams.

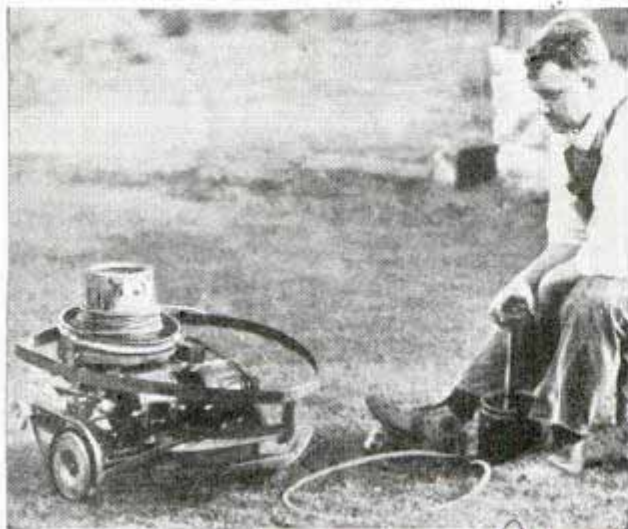


Telegraph operators team up with electric organ to demonstrate how messages can be transmitted over different tone pitches on single wire

H 731

Wear water

Twin-Motored Lawn Mower Steered by Remote Control



Separate motor runs each wheel of lawn mower, enabling operator to steer it remotely by varying speed

Ideal for the lazy man is the remote-controlled lawn mower invented by a Pennsylvania mechanic. While he sits in a comfortable chair the operator can guide the twin-motored cutter around the lawn. Starting with a regular cutter, the inventor installed two motors whose speed is regulated by the control box beside the chair. When both motors are running at the same speed the mower runs straight; by diminishing the speed of one or the other, the machine is turned to right or left. A 100-foot length of wire, connecting the controls to the motors, is wound on a revolving paint can mounted on the mower. An old barrel hoop and mixing bowl provide bumper and shock absorber.

Alvin Lodge
Millsville, Pa.

Dredge to Seek Sunken Gold Lost in Shipwreck of 1799

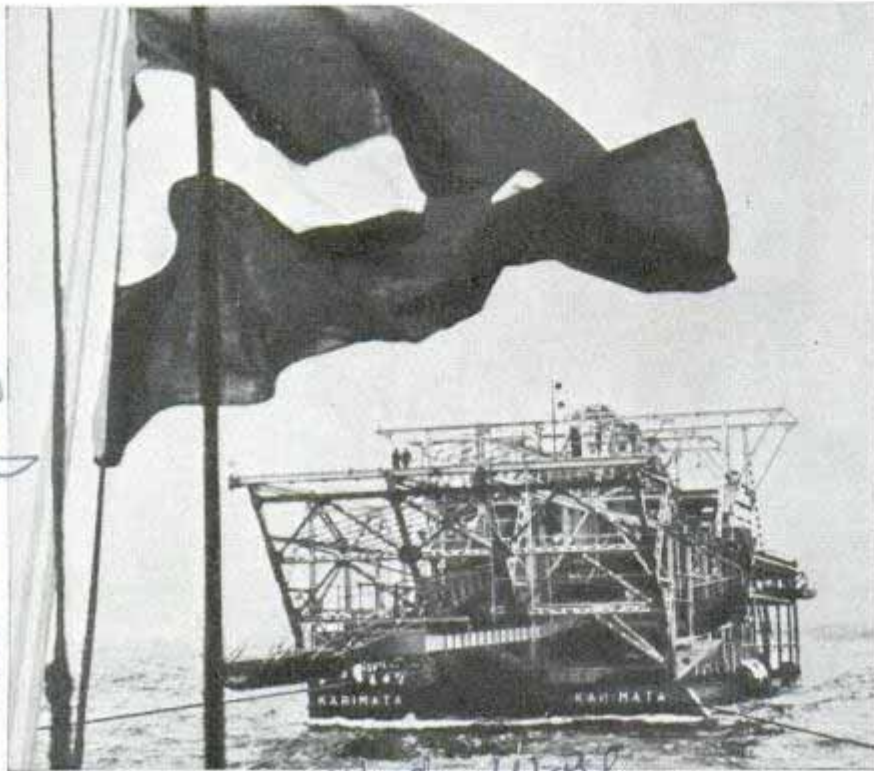
expected the color chart will be used by horticulturists so that flowers of identical color will have the same color name around the world.

Paint Machinery Co
The Hague Holland.

Biltton

Chicago
slightly news
6/25/58

Robert F. Wilson, Dir.
Director, British Color
Council, and Committee



Towing the salvager "Karimata" to the site off the entrance to the Zuyder Zee where gold-laden English vessel has rested on bottom for 139 years

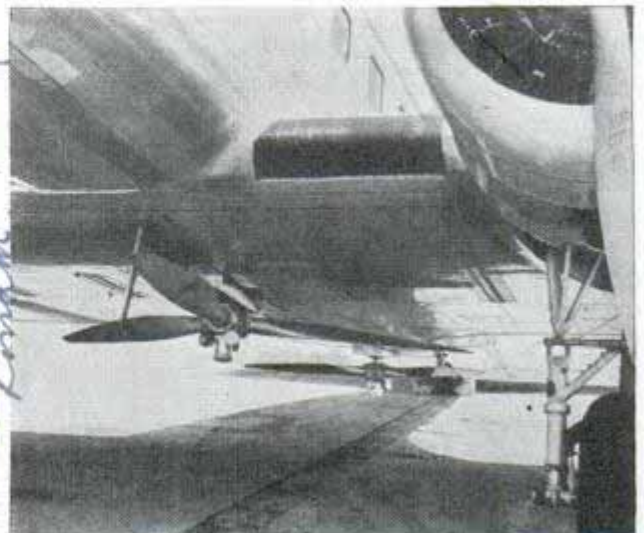
Sunken treasure that has lain on the ocean floor for 139 years is the goal of the S.S. "Karimata," salvage ship from The Hague. A terrific storm in October, 1799, sent the British naval vessel "Lutine" to the bottom with gold bullion valued at about ten million dollars. Much of the cargo has been recovered, including the ship's bell that signals arrival of marine news in the office of Lloyd's of London; but there still remains enough treasure to lure the 250-foot "Karimata" to the scene of the wreck, off the entrance to the Zuyder Zee. The ship has a dredging depth of 100 feet.

Three Thousand Flower Colors Are Named and Charted

After three years' work, a British committee has charted and standardized 3,000 flower colors. Four thousand different flowers from around the world were included in the survey, and sixty-four full hues were subdivided into the many shades. Of the few pure colors found, the committee listed the orange of marigolds, the yellow of mimosa, the red of salvia and the blue of gentian. When published, it is

Plane Carries Two Spare Propellers for Emergency

Spare propellers may be carried on army and commercial transport planes soon, just as spare tires are carried on automobiles. Army airmen at Wright Field are testing this method of preparing for emergencies. Two extra tri-bladed propellers are fastened under the fuselage of a big transport ship by means of braces, the job taking fifteen minutes. It would take three hours to assemble controllable-pitch propellers from the "knockdown" state, and blades and tools are not always available when emergencies demand them. The spares carried outside the plane are expected to reduce air speed not more than five miles an hour.



Army transport plane tries out practicability of carrying extra propellers under fuselage for emergency

Wid. Wall
London Society

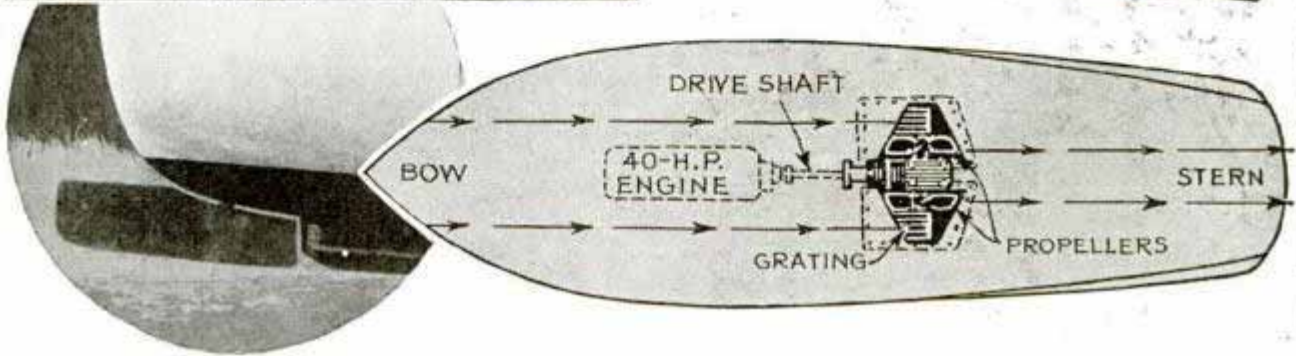
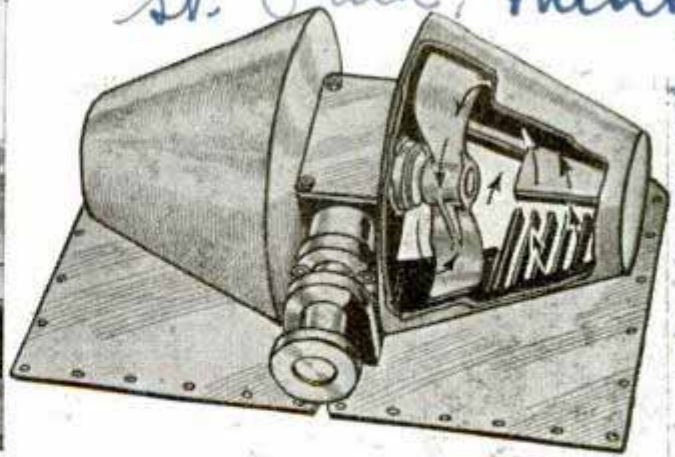
H 766

H 775

H 70 Fred Hingle Boat Works

Mississippi River app. Airport
St. Paul, Minn.

Propellerless Boat Cruises in River Shallows.



Left, propellerless Mississippi river boat and view of stern, showing rudder without usual screw. Right, diagrams show how blades revolving in twin cones at center of hull draw in and expel water

Cruising in the shallows of the upper Mississippi is a power boat without a propeller, first of its kind built in the United States. Instead of the traditional screw, this forty-foot cruiser is driven by two thirty-three-inch cones imbedded in mid-section of the hull, operating on the principle of the centrifugal pump: pulling in and expelling water by means of revolving blades. An opening under each cone allows water to enter through metal grids.

Weeds and debris sucked through the grids are ejected without causing damage. Since the cones do not extend beyond the surface of the hull there is no danger to the motive equipment in shallow water, and the boat draws only twelve inches of water, running as smoothly as do propeller-driven boats in deep water. Its forty-horsepower engine drives the craft at fifteen miles an hour. The hull is a miniature of that of the liner "Queen Mary."

Glassed Kennel on Car Fender Carries Dog in Comfort



Sedan "kennel" is copy of car on whose fender it is mounted. The dog disdains its protective windshield

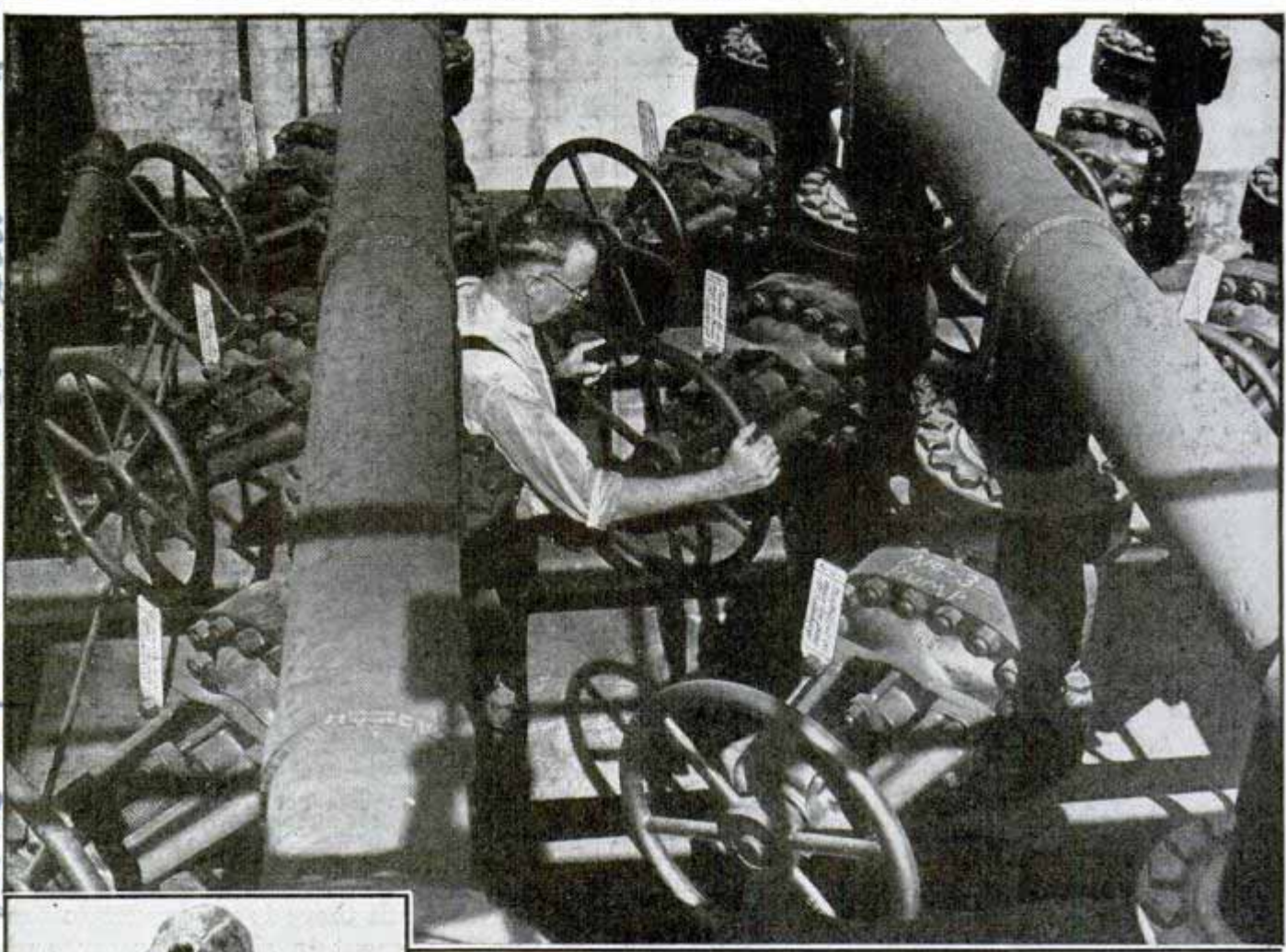
If a family can tour comfortably in a closed car, why not the pup? A Spokane motorist could see no reason why not; so he built traveling kennels for his dogs. The first was merely a well-padded box mounted over the left front fender, with a high windshield. "Mike" likes to stay in the lee of that windshield, but "Pooch," the other dog, with ten years' motoring experience, prefers riding with head and forefeet on the outside shelf at high speed even though his new touring kennel is completely glassed-in and modeled after the newer car on which it is mounted.

Wash
C. L. ...

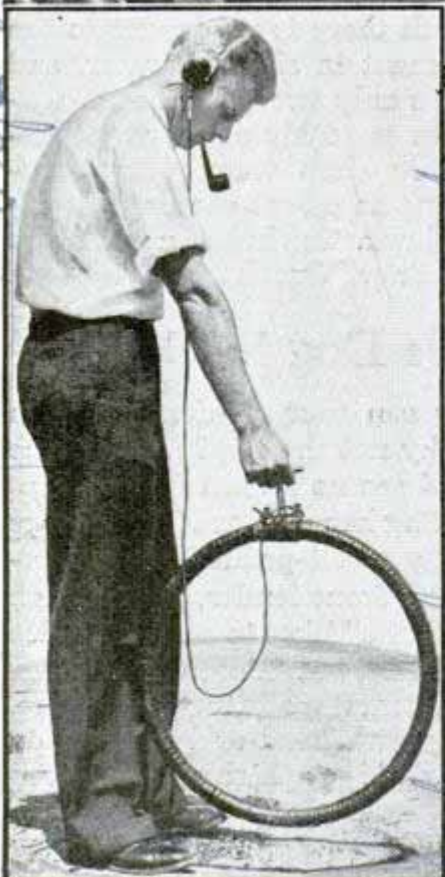
Cons. Advertis. Co., Ltd., 423 Long
Acre, London W.C. 2, England.
Page 6, Modern Wonder, June 18/1936.

DISPATCHING on the

Pipeline. Cntl. & Transm. - Reference
Pipe Line Dept. General Petroleum Corp.



Some of the valve handles in a pipe-line "switching yard."
Left, electrical exploring coil for detecting buried pipe used
by thieves to lead off part of flow



makes unknown - suggest

SHIFTING his eyes from the complicated chart in front of him, the chief dispatcher of the pipe-line system picks up his phone and dials a pumping plant several hundred miles away.

"Charlie? A slug of aviation crude will be coming along about two o'clock. Switch it to Line four for Long Beach. Repeat."

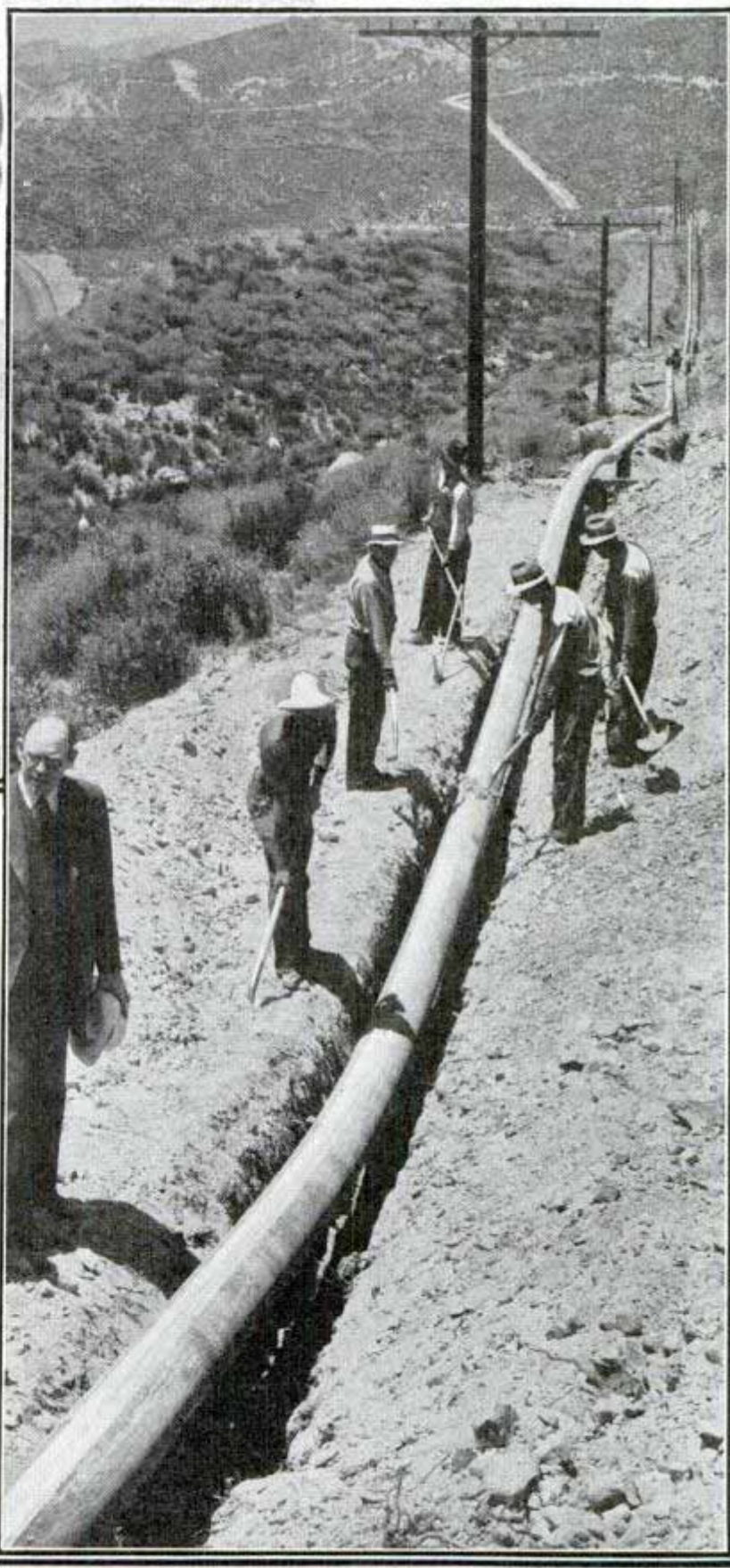
As the pumpman's voice repeats the message, the dispatcher checks every inch of the complex pipe line to make sure the 10,000-barrel shipment will flow direct to the proper tank 1,000 miles away. Orders for one shipment may involve turning dozens of valves and a single wrong order or mistake by one of the switchmen might divert the oil to a city far from its proper destination. Closing a wrong valve against the moving stream of oil might blow up the line. A man's first mistake is his last on the pipe lines.

The great "white oil" trunk lines of the middle west, filled with gasoline and kerosene from Texas and Okla-

108 W. Second St. 3rd
Los Angeles Calif
pipe locator -
Engineering Laboratory

1874

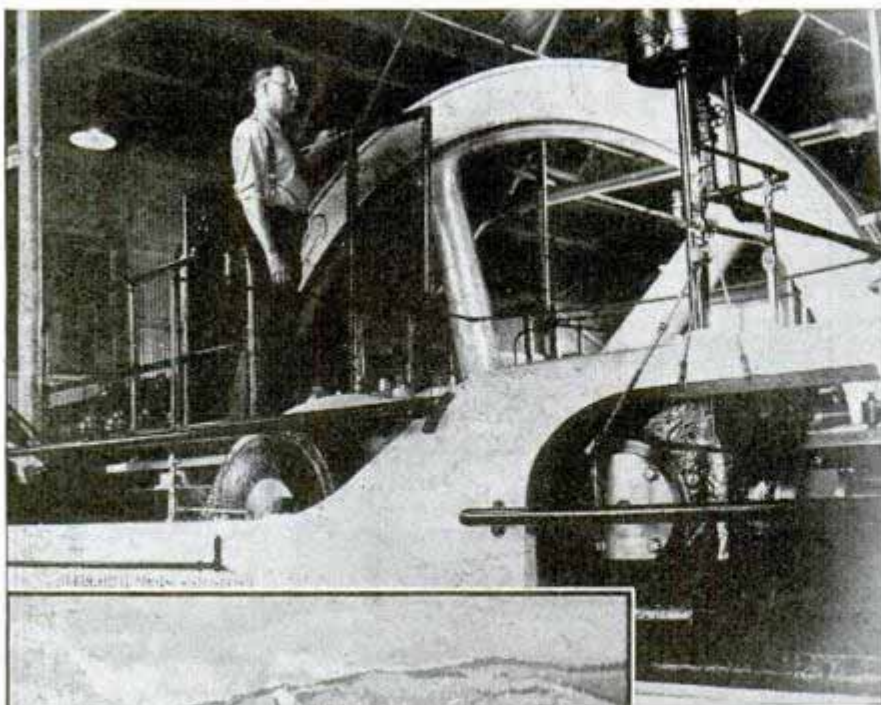
UNDERGROUND RAILWAYS



homa refineries, may move half a dozen different shipments, one behind the other. One shipment may be destined for Kansas City, the next, of a different grade, for New York, and a third for Chicago. Each slug or shipment is marked at the end with colored dye so the switchman, drawing samples from the line, can tell when to open one valve and close another. Black oils can't be marked with dye, and the dispatcher must recall a dozen problems in pump displacement, viscosity, heat, and hydraulics in preparing a timetable for his orders.

These vast underground railroads form the cheapest and least known important type of transportation. More than 1,000,000 miles of main pipe lines are in use in the

Construction crew laying a ten-inch high-pressure line. Above, "go-devil" used to clean out a four-inch petroleum pipe line



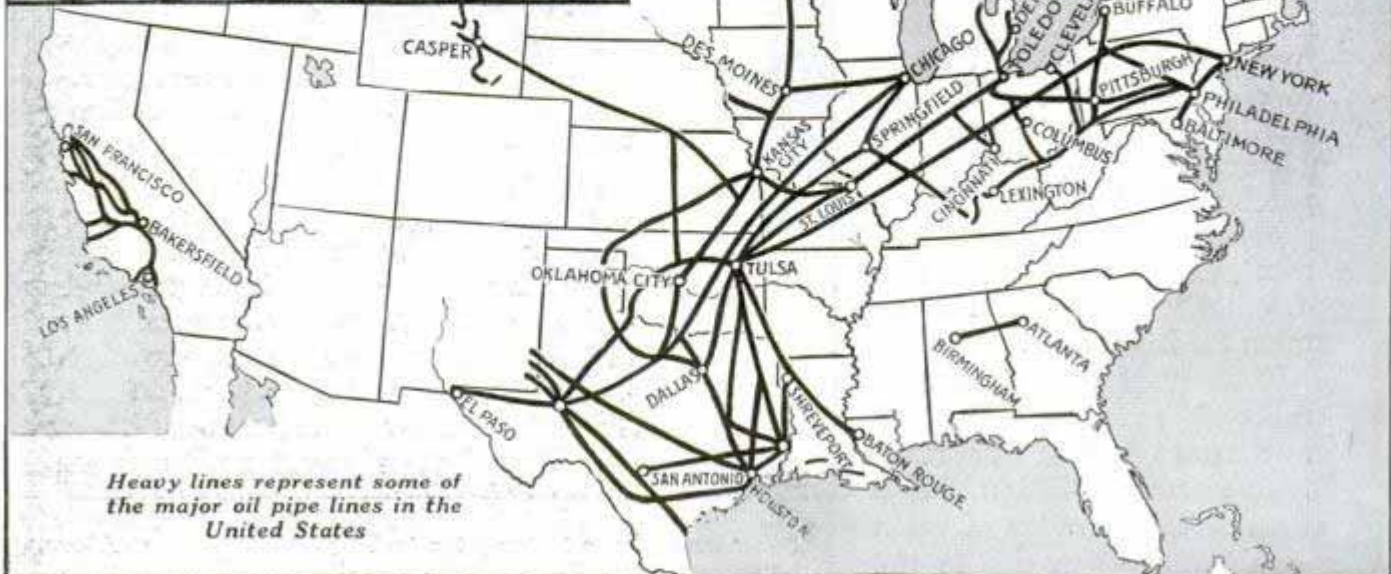
United States, four times as much as the total railway trackage. The lines move tremendous quantities of petroleum products. Some of the big lines are public carriers and accept shipments at numerous fields for delivery at distant points. Each major oil company maintains its own private system. Usually each system uses separate lines for black and white oils to avoid contamination. Gasoline and kerosene are moved through one line and crude, lubricating, and fuel oils flow through another.

These liquid cargoes are pumped at pressures up to 850 pounds per square inch and move at speeds of five miles per hour. Powerful pumping stations are spaced a few miles apart on the up-hill sides of mountain ranges and may be seventy miles apart on the descending slopes.

Dispatching oil is similar to train dispatching. Movements are scheduled ahead of time and orders are issued over tele-

Top, one of battery of pumps in petroleum pipe-line pumping plant. Left, the British Aluminum company uses this river, imprisoned in pipe lines, to turn its turbines

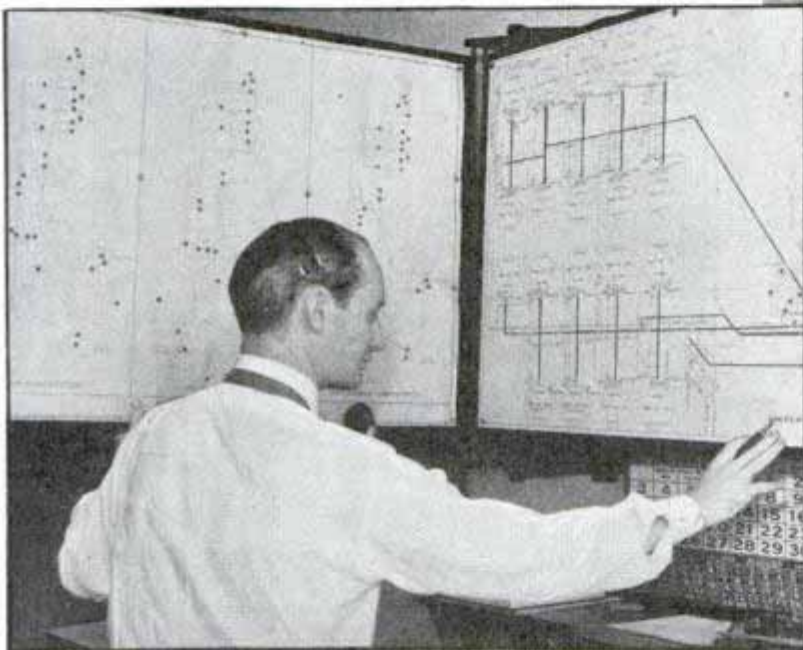
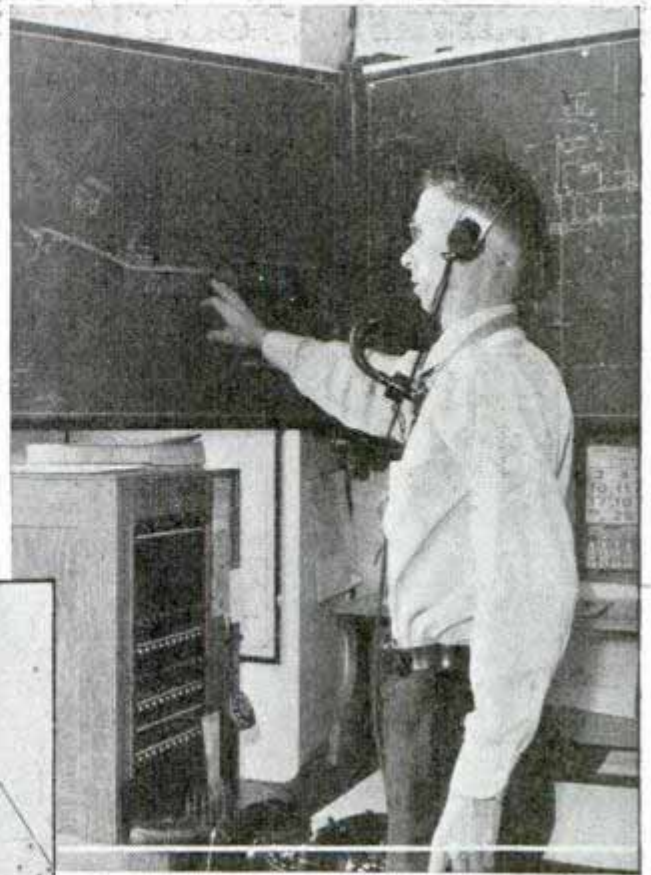
Karlochereva, Aigyptskine Engd



Heavy lines represent some of the major oil pipe lines in the United States

phone or teletype lines that connect all the pumping stations and switch points. It's a ticklish job and a fortune in oil could be spoiled in a few minutes if a wrong order goes out.

"One thing that complicates pipe-line operation is the temperature problem," says a dispatcher for the General Petroleum Corporation. "A day's schedule may call for a shipment of light oil drawn from a tank at atmospheric temperature to be followed by 20,000 barrels of fuel oil fresh from the refinery with a temperature of 160 degrees. After this there may be another consignment of cold oil or a ship-



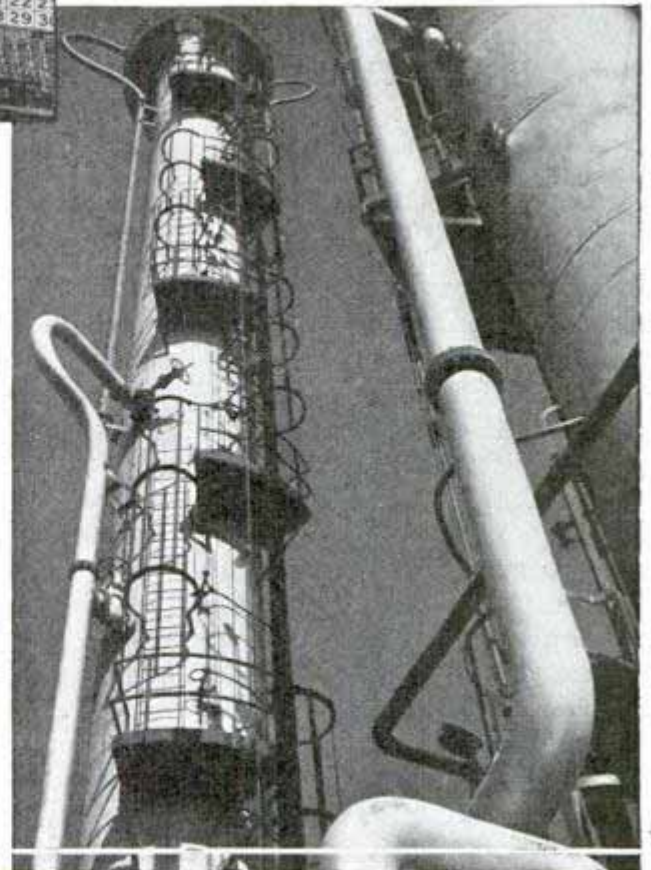
Bottom photo courtesy Union Oil Co.

Dispatcher, above, checking valve numbers in planning an oil shipment. Left, checking valve number on chart before telephoning orders to pump house. Below, 125-foot cracking tower in a modern refinery where petroleum is broken down into gasoline and light oils

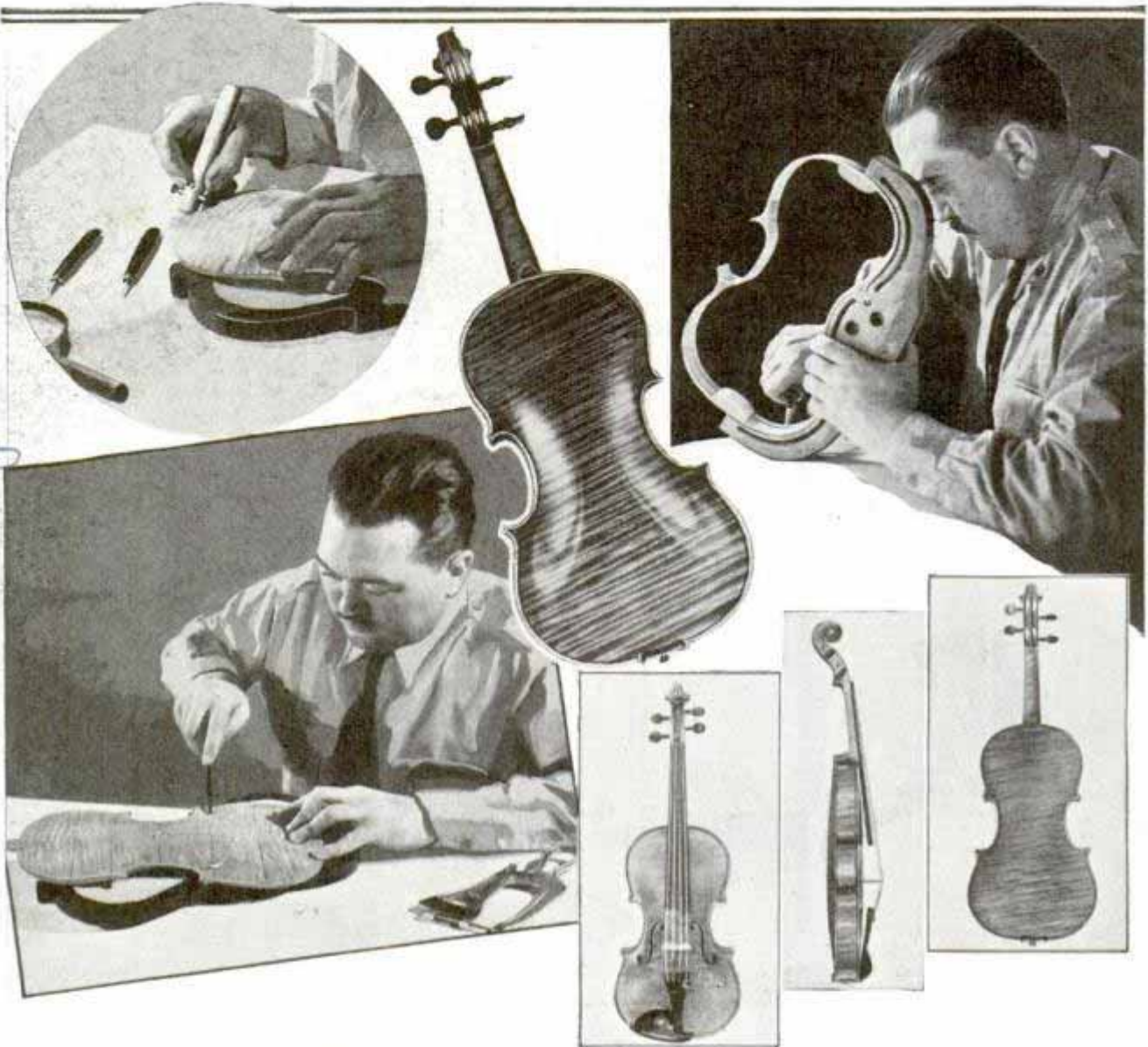
ment of heavy crude so viscous it must be reheated at every pumping plant. Dispatching a hot shipment immediately after a cold one may expand the line, making the pipe twist under ground and even humping it out of its trench at some point. This puts a tremendous strain on the connections and may start leaks.

"Far worse is what occasionally happens when a shipment of cold oil is put into a pipe immediately behind heated oil. In this case contraction takes place and a pull-apart may occur. Thousands of barrels of oil then are apt to be lost. Care in slowly introducing oil of a different temperature into the line and numerous expansion sleeve joints on the pipe keep temperature troubles at a minimum. Most leaks occur in hard ground that grips the pipe and

(Continued to page 144A)



'Stradivari' Violin Built in Amateur Workshop



Reflections on violin at center show how light is used to obtain perfect symmetry. Top, left, marking edge for inlay; right, trimming lining of frame; lower left, gouging arch of back; right, the finished violin

Offhand, you'd say that violinmaking is no hobby for amateurs. You would be inclined to leave such delicate work to experienced craftsmen. Yet a Chicago man, S. A. Sheridan, who is a metallurgical engineer and had attempted nothing in the way of handicraft since high-school days, has just finished constructing a violin of rare beauty and tone whose value has been estimated above \$1,000. It is a faithful copy of one of the violins made by the eighteenth century master, Antonio Stradivari, and the wood of which it is built came from the same forests where Stradivari obtained his materials. Tone qualities of the violin depend upon the texture of the wood, the craftsmanship, the varnish

and the aging. Given the patience and the will, an amateur shop worker can build a violin without previous experience, as Mr. Sheridan demonstrated. Starting "from scratch," he obtained drawings and the necessary special tools—scrapers, purfling knives, saws, gouges, assembly forms and the like—which are available commercially. Long-aged maple of beautiful grain, for the back, and spruce for the face of the violin are obtainable from the same European forests the old master violinmakers used. The varnish materials and methods of the craftsmen of 1700 are known. Time and care are important elements. Mr. Sheridan spent 980 hours at the bench over a period of more than two years, insisting on

all ad 4 0 P. under music

100 23 Perry Ave. Chicago

completing the work himself; he built his violin to micrometer measurements, carving and scraping the beautiful arching rather than pressing the wood into shape. The curves were perfected by working with oblique illumination and shadows in a photographic darkroom, watching the reflections of light on the arched back and face and smoothing the wood to perfect bisymmetry. A creditable violin, it is said, can be turned out by an amateur in less time than Mr. Sheridan devoted, but he was striving for perfection and it was his first handicraft project. The result is a violin described by professionals as "the best ever made by an amateur, and better than most professionally made violins."

H P 3 3

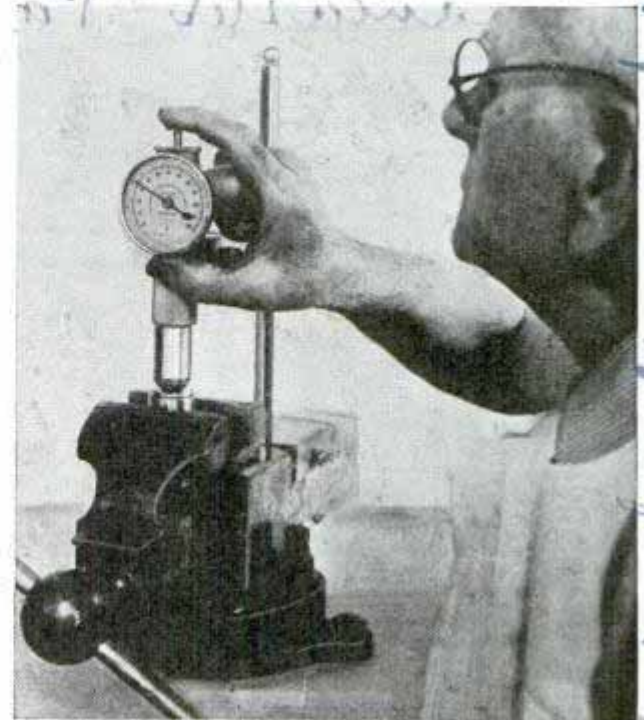
Backward Roll of Car Stopped by Automatic Brake

Inconvenience and danger in stopping an automobile on a hill are eliminated by an automatic check which holds the brake set and keeps the car from slipping backward downhill. It can be installed on recent model cars which have hydraulic brakes. When he halts the car, the driver applies the brake and disengages the clutch in the conventional way; the automatic check keeps up the hydraulic pressure in the brake system as long as the clutch pedal is depressed, so that the driver can take his foot off the brake to operate the accelerator. When the clutch is released, the brake is automatically released and the car moves ahead.



Drawings show location of backroll brake mechanism; it operates so long as clutch is depressed

Pocket Size Hardness Gauge Gives Fingertip Reading



Press the button on top of barrel and the dial instantly shows hardness of metal being tested

Only six inches long and weighing one pound, a pocket size hardness indicator tests metals at the touch of a finger. The test can be made in a bench vise, on a surface plate, or free-handed. The instrument is placed on the work, and the button on top of the barrel is pressed down. The pointer then automatically indicates the hardness on an enclosed dial.

H P 3 7

"Handyman" for Garbage Can Prevents Loss of Lid

Here's an end to the mysterious disappearance of garbage-can lids. A "handyman" just introduced holds the can in a bracket, and the lid is fixed to a swinging arm projecting from a post. The lid lifts and swings to either side, then drops automatically on top of the can when it is swung back in place. The holder also keeps the garbage can off the ground, away from dogs and free from insects.



Walter J. Fishering
Leo Road
Waukegan, Ill.

Wagner Electric Corp. are M. Lewis, Ind. 6400 Plymouth Ave.

I have instrument & but I am. Wash line and call.

Automotive Parts
Lid.

14822
Armstrong Coil & Vibroking
POPULAR MECHANICS
Pittsburgh Pa
Lancaster Pa

'Map Rug' for the Playroom Shows Main U. S. Highways



Playing "trailer tourist" on the map rug. Notice the drawings around the border showing development of transportation on land and sea

Youngsters can tour the highways of the United States on a felt base playroom rug on which is printed a huge map of the nation. The states, their capitals, principal cities and emblems of their leading products are indicated, and around the border is a panorama of the development of transportation on land, sea and in the air.

Red and Green "Traffic" Lights Police Electric-Power Flow

Like the stop-and-go lights that keep traffic moving in orderly fashion across the nation's highways, nearly 200 sets of red and green lights "police" the flow of power along the transmission lines from Boulder dam to Los Angeles. So long as a circuit remains closed, a red light shows on one of the panels in the main powerhouse. But let lightning or other trouble interfere

and within a half second a relay trips a circuit breaker and a code message flashes back in "carrier current" to the main control panel and a green light tells the operator to reroute the power or wait until trouble on the line is cleared. Power and carrier current never interfere with each other, since they travel on different frequencies.

Model of Stratoliner Performs in Wind Tunnel

Before the four-motored "stratoliners" now under construction are sent up for actual flying tests, a model is being given performance tests in a wind tunnel glass-walled for observation purposes. The model is subjected to terrific wind velocities to determine reaction of the liners to various weather conditions. Six of the sky giants are being built to carry passengers across the continent at 15,000 to 20,000-foot altitudes, at 242 miles an hour.



Watching test of model in glass-walled wind tunnel

K 864

Aeronautical engineer

14822
Armstrong Coil & Vibroking
Pittsburgh Pa
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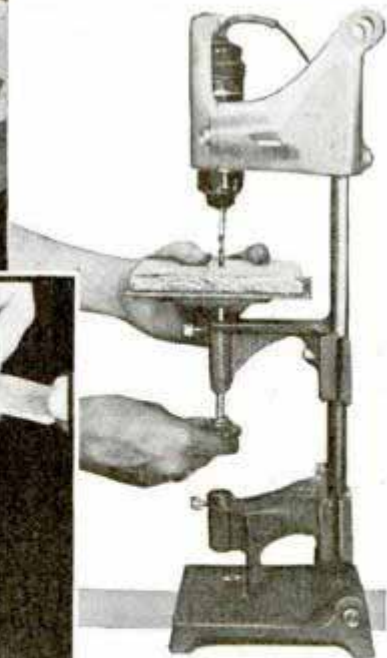
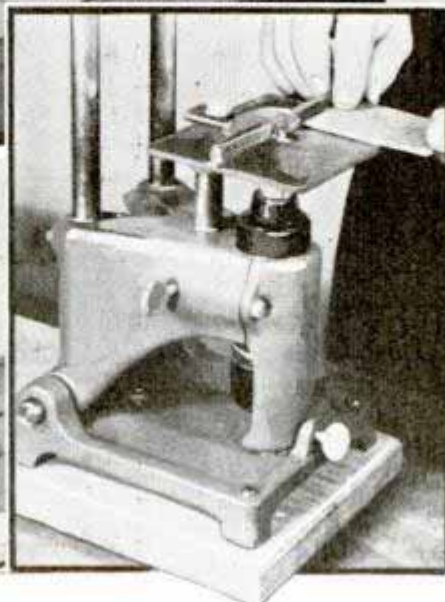
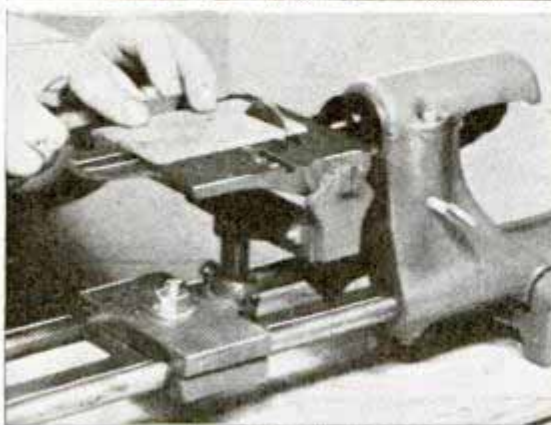
Washington D.C.

H 755. Checo wheel and mfg. Co.
 1101 W Monroe Chicago
Table-Top Power Tool Unit for Modelmaker

Requiring only three square feet of space on table or workbench, a combination power-tool outfit is available for the modelmaker or apartment-dwelling craftsman. A small, high-speed hand grinder serves as the power unit and is clamped in a casting. The lathe has a clearance of eight inches between centers and is useful for small turnings, such as chessmen and numerous items for modelmakers. Only a moment is required to replace the tool-post holder with a circular-saw table fitted with a miter and a rip fence so that cuts from forty-five to ninety degrees can be made. This arrangement also serves as a table for a disk sander. When used as a drill press, the unit is set up vertically and a thumbscrew is tightened to lock it in position. In this position, the unit also is used for small routing jobs.

For shaping and spindle-sanding operations, the unit is inverted and a cutter or sander mounted in the motor chuck. For routing or carving on large work, the grinder can be detached from the head casting and used separately.

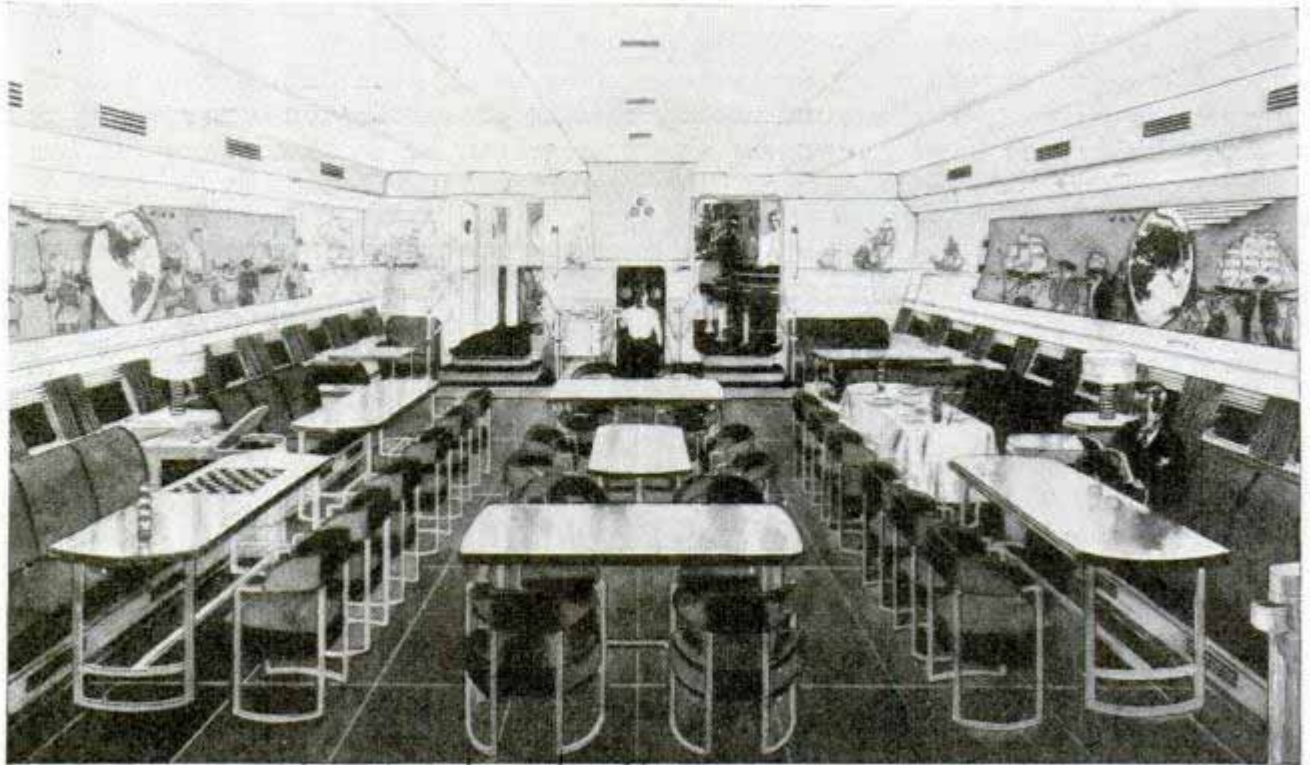
Several views of table-top shop and jobs on which it may be used. Top, in use as a lathe



Top, left, table-top shop and attachments. Bottom, left to right, three more uses of the compact unit

3150 S. ...
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Giant Flying Boats for Week-End Sky Cruises



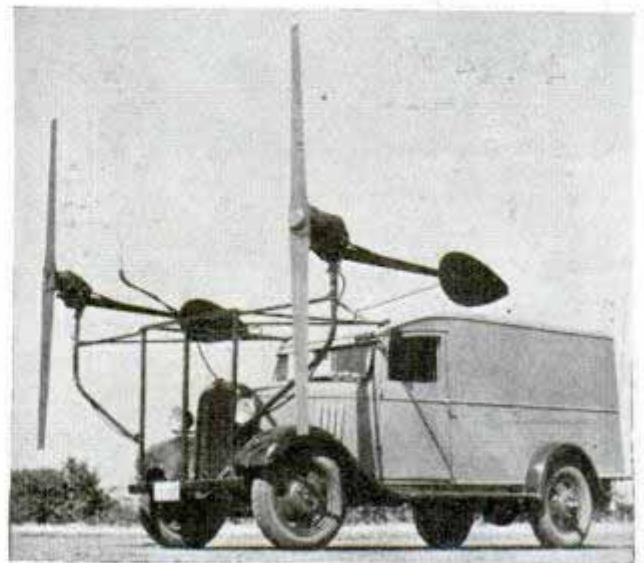
© Sikorsky Aircraft

Budapest, Conn.
Artist's idea of dining saloon aboard giant flying boat of the future. The saloon might be used also for recreation. Accommodations for 100 passengers would be provided

Comfortable week-end cruises to the North Pole or one-week cruises around the world in 100-ton flying boats within a few years are predicted by Igor I. Sikorsky, aeronautical engineer and designer of two widely used types of clipper planes. These flying boats, which will bring Liverpool within twelve or fifteen hours of Quebec, or India and Australia within three days of America, will appear like zeppelins with a wing on the upper surface, he says. A 100-passenger flying boat, designed by the engineer in response to Pan American Airways' request for a ship having a payload of 25,000 pounds capable of flying 5,000 statute miles at speeds between 200 and 300 miles per hour, would have stateroom accommodations, dressing rooms, dining saloon, a galley and crew quarters for sixteen. The designer points out that it appears that above the sizes of fifty or 100 tons, the flying boat will become the most efficient and also the most practical type of heavier-than-air machine. The Sikorsky "S-42," the clipper used by Pan-American between New York and Bermuda and on other runs, is more efficient in many respects than its smaller and older sister ship, the "S-40."

Twin-Blade Truck Gives Test to Wind-Electric Units

In order to test wind-electric units and conduct experiments in their design, an engineer devised a special truck which carries two propellers on frames mounted over the engine. Between the blades there is a highly sensitive velometer to determine the exact wind velocity during the



Twin instrument boards inside the truck show wind velocity and current generated by propellers

*Carris. Lunni
Cuda. Clarinda. Clary*

Salome Strone 6/22/38

*4760
4859*

tests. Inside the panel body of the truck are the instruments—master ammeters, voltage gauges, velometer dial and batteries of various voltages. With duplicate dials the engineers can obtain comparative readings on any two wind-electric units while operating under identical conditions.

Four Mirrors on Dressing Table Show Head at Several Angles



Posing with four mirrors to produce four different angle photos suggests the use of extra mirrors on dressing table

Portable "Plug-In" Stove for Cottage or Apartment

Built for "light house-keeping" in apartment, summer cabin, tourist camp or small home, a portable electric stove of the "plug-in" type offers the advantages of low costs both for installation and operation. Yet it is big enough to cook for a family. There are two surface units and a ten-quart roaster and baker which has automatic controls. Available with or without chrome legs, the stove is offered in various wattage combinations, one with the low total demand of 2,660 watts and the other a total of 4,410 watts.

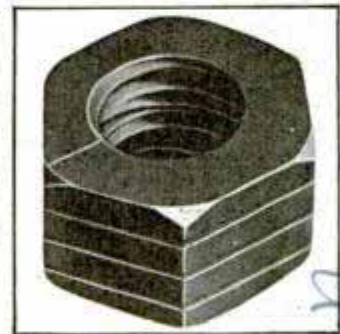


Putting dinner into baking-roasting unit. The stove is compact, portable, and adequate for family cooking

Giving greater visibility when the user desires to inspect her hairdress or hat, four mirrors may be arranged at the dressing table to give views from different angles. The idea was suggested by a photographer who used several mirrors in snapping a picture of Florence Mitchell, selected as daisy queen in a Maine festival.

Safety Nut Locks on Bolt and Cannot Loosen

Similar to a steel spring in which a thread is cut, a new safety nut locks on the bolt without the aid of locknut or spring washer. It cannot become unscrewed. If the nut is screwed up tightly, it is compressed into contact with maximum surface area and the tension of the springing effect locks the nut in position. It is the product of a German engineering company.



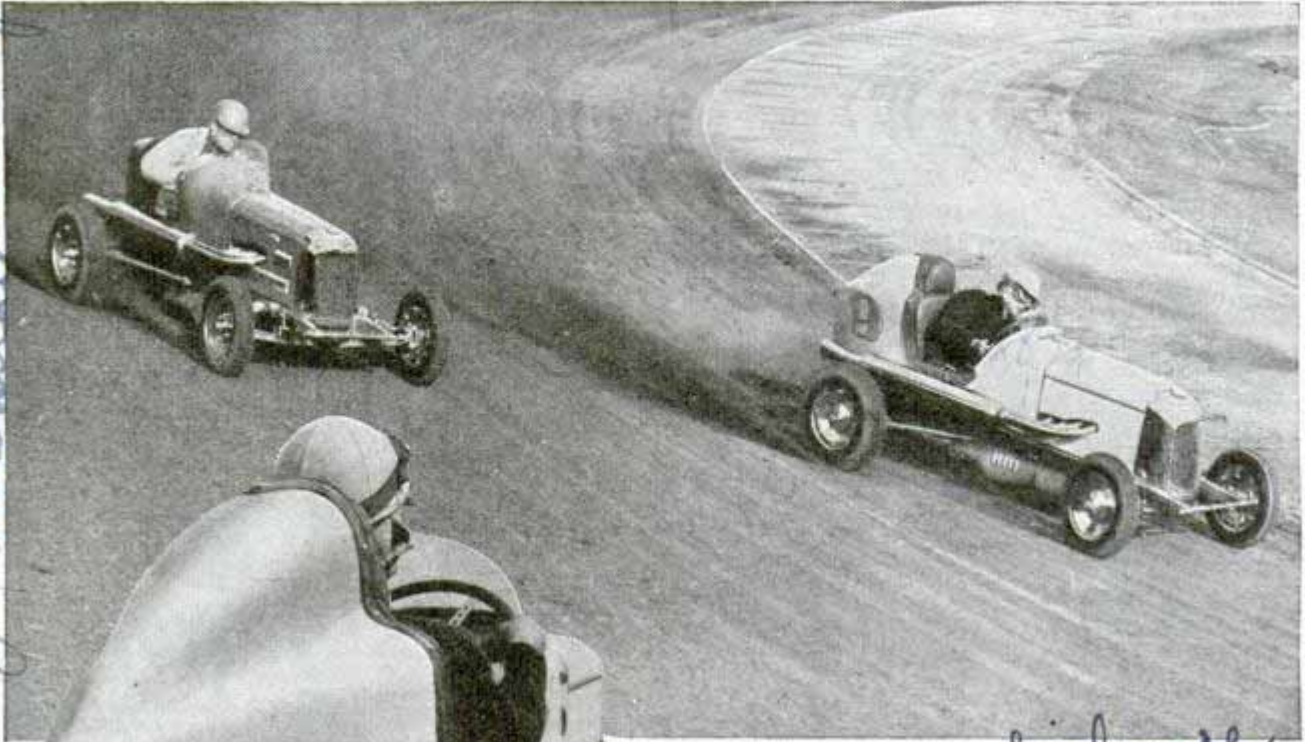
*malleable iron
C. Deaver*

*U.S. agent
American*

*Wilde W. ...
Bangor
ma 11 - machinery fabric
Augsburg, Nürnberg, Germany*

Designer: Clyde Jones

Midget Car Is 'Fishtailed' for Speed and Safety



Silvane

Streaking around a Los Angeles stadium the other day, a "fishtailed" midget racing car set up an unofficial record of 138 miles an hour. Its streamline form was given part of the credit for the fast time, but the stubby, fin-topped tail has another reason for existence. Besides speed, it promotes safety. Acting as a headrest, it relieves the driver from stiff neck and nerve strain in bucking the wind, and in case of an upset it forms a protection beneath which the driver can crouch as the car rolls over.

Hugging inside of track is 138-mile-an-hour "fishtailed" car, rear view of which is seen below

One-Man 'Plow' and Winch Replace Gang Filling Ditch

One man guiding a mold board hauled by a winch can do the work of the pick-and-shovel gang in back-filling trenches dug for pipe or cable lines. The winch is controlled by a truck driver who applies motor power from the cab. The steel cable hauling the "plow" board is drawn through a guide pulley on the truck bumper and thence to the winch at the back of the cab. When the dirt load has been deposited in the trench, the winch clutch is released and the board pulled back into position.



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

Designed and constructed by Clyde Jones. Large California representative for index reports. Los Angeles

17844

17844

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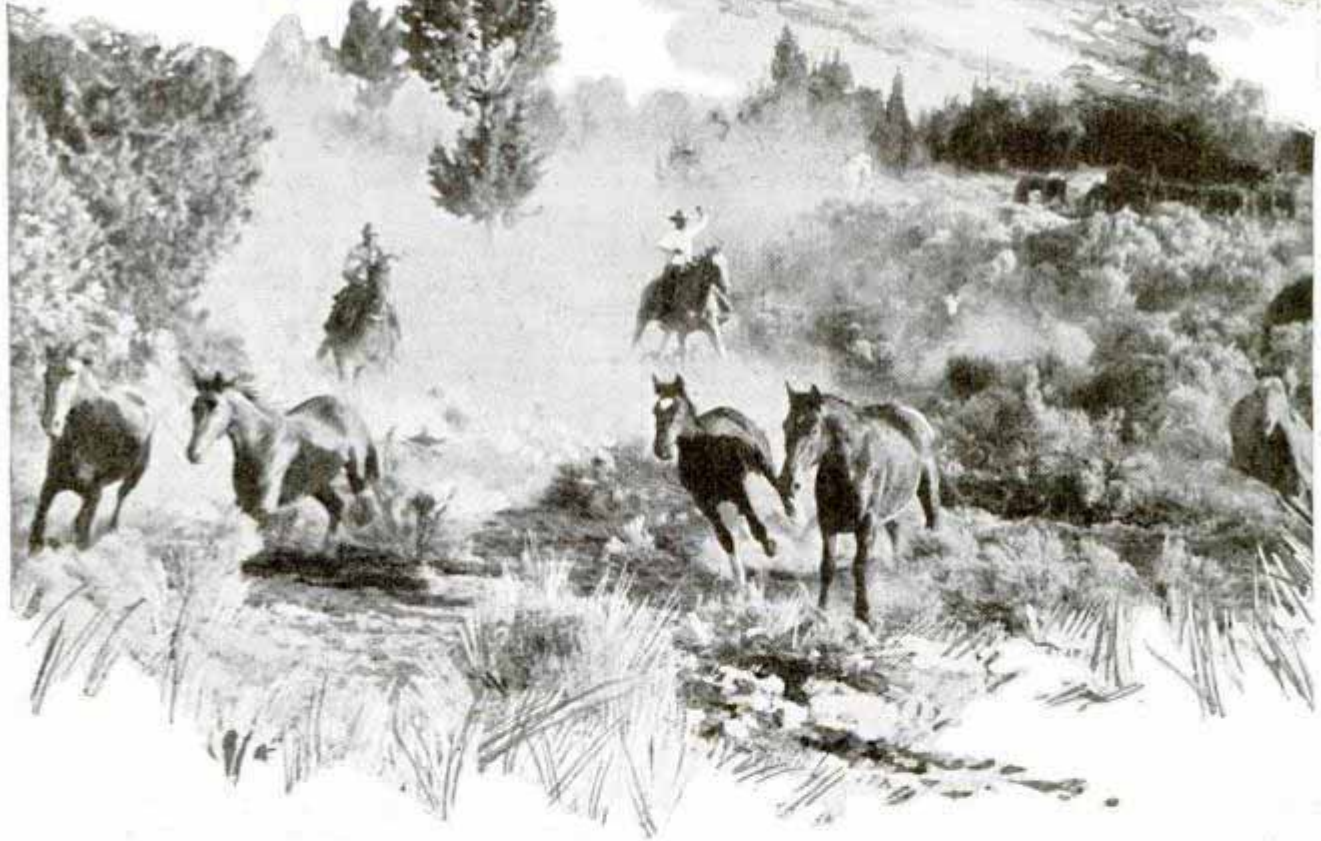
1520.

Wild Horses Corralled from Air

By Jeff Sparks

W O W Agency Staff 1440 Pyramid Nevada

Sutcliffe Nevada
Floyd Hanson, right, aerial cowboy, and the plane he uses to round up wild mustangs, a quicker and more profitable method than that illustrated below



SUTCLIFFE, Nev., they call it. It fringes old "ghost" mining towns of gold-rush days which remain as the prospectors left them. Our ranchouse is high up in the Sierra Nevadas, on the bank of Pyramid lake.

While dozing, one summer afternoon, I was startled by a strange, screaming whistle. I hopped to my feet and peered out the cabin window. An airplane—out here—diving right at me—well, near enough.

Down it came and landed in a clearing. I ambled over to the small open cockpit job, and a tall, gangling, cheerful fellow climbed out. The flier introduced himself as Floyd Hanson, aerial horse wrangler. He used the plane, he explained, to hunt and capture wild mustangs. And pretty soon I was eye witness to as risky a business as ever broke a neck.

It all started, it seems, in 1936 when a contractor got a crazy idea. If he could



Routing wild horses from some mountain canyon like this is the first task of the aerial cowboy. After that, he drives them into a natural corral formed by converging cliffs

find someone capable of using a plane to round up mustangs, there was money to be made. Wrangling from the air had been tried before without much success but Hanson decided to have a try at it anyhow. Wild horses are rounded up, "broken" to the saddle and sold to riding academies and other markets for from twelve to fifty dollars each. Hitherto, mustangs have been caught in tedious style. Twelve or fifteen cowboys might spend two months or more on the job and end with a total "catch" of about six head.

But suppose you could catch sixty or eighty horses per day. Then five dollars for each horse captured was a pretty good proposition. About twenty mustangs in a herd; say—four herds a day—that meant \$400. There was only one hitch. Hanson didn't know a thing about horses. But—he did know planes. So he became an aerial cowboy.

Here is his two-seater warming up. So let's have a look-in on this wild horse "ketchin" business:

Take-off is set for just before sunup—3:45. Our camp is at the edge of the horse country. We head toward the feeding and watering grounds. Then I solved the mys-

tery of that curdling whistle which awakened me the first time Hanson dropped in on me. Attached to the ship's fuselage is a siren, used to startle the quarry, to make them run. Once in the open, they can be cornered. Frequently, the animals must be coaxed out of mountain canyons. Treacherous air currents guard the approach to the domain of King Mustang. But the little one-motor job darts in and out of tiny cracks and crevices in the very bosom of the hills.

Then we spy mustangs up ahead. They detect our motor and siren three miles away and as we catch up they're on the run. Hanson picks out the best looking bunch and starts a dive. Instinctively, they make for their feeding and watering places. This is in the opposite direction from the corral where he is trying to steer them. The plane shoots down on their tails to head them off. The mustangs are puzzled and frantic. But they are game. They struggle desperately and give every inch of ground grudgingly. Another dive. The wheels almost touch the backs of the fleeing horses. Hanson skims over them and flips into an upward loop. They keep running from us, but gradually they're being

edged toward the corral. Another dive—another slide over the galloping pack—and up into another loop. And again. Ten long trying miles of this. Suppose the motor were to go dead. Suppose we were to fall into the midst of these berserk animals. Better not think about this.

The herd has been run to the verge of exhaustion. Their most heroic defense just can't match the "bird that never tires." Foaming flanks and wearied gait excite your sympathy. Suddenly, they seem to be giving up the fight and are running without resistance where the flier wants them. The plane drops back a half mile—a mile—but in wide circles. At last, the objective is in sight. But our troubles aren't over.

The tough job is to get the horses into a natural corral created by two towering rock walls. The enclosure is effected by blocking off one end and erecting a gate at the other. Hanson must drive the herd into this trap. Then cowboys will jump from their lookout post and slam the gate.

The mustangs are jittery; they sense the presence of humans. So far, they've been jousting with a huge eagle. Now they get wind of the buckaroos in hiding. In the next instant, seeming to realize that they've been tricked, the animals turn about in a frenzy. Hanson dives, darts and sideslips the plane, trying to coax them into the corral. It's a stubborn duel all over again. A moment stretches into a minute—five minutes—ten minutes—a half hour. At last they decide it's a losing game and take the trail into captivity.

But the prize isn't safe yet. To drive them deeper into the corral, Hanson drives straight down between the precipitous walls. It is vitally necessary to gain sufficient altitude before attempting this maneuver. Shooting down from less than 1,000 feet would be suicidal. There would be insufficient momentum to carry the plane back over the top. Yet the higher the starting point, the more difficult to hit the opening and avoid the walls. It's a matter of inches.

Below us, the herd keeps running. We start a power dive. Down we go into the stone alley—wing-tips scarcely clearing the sides. When dangerously near the ground, Hanson pulls the stick back into

(Continued to page 120A)

Leakless Wall Made of Brick with Rounded Corners

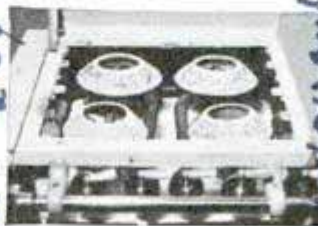


Garden wall being constructed with rounded-corner brick. Note reinforcing bars

Strong, waterproof walls for house and garden may be constructed with rounded-corner brick and steel reinforcing bars. The round corners of the bricks permit an easier flow of concrete grout between brick and steel bars, resulting in a bond which resists severe fire tests.

Asbestos Attachment on Burner Cuts Down the Gas Bill

Asbestos attachments which form a collar around the burner on the kitchen stove are said by the manufacturer to reduce gas bills on an average of thirty per cent. The asbestos ring extends down to the under grate and is one-eighth to one-fourth inch thick. It prevents outside air currents from dissipating the heat, and intensifies the flame.



12520

A 749

In Angeles
Carick Co. 8th and 100th Ave

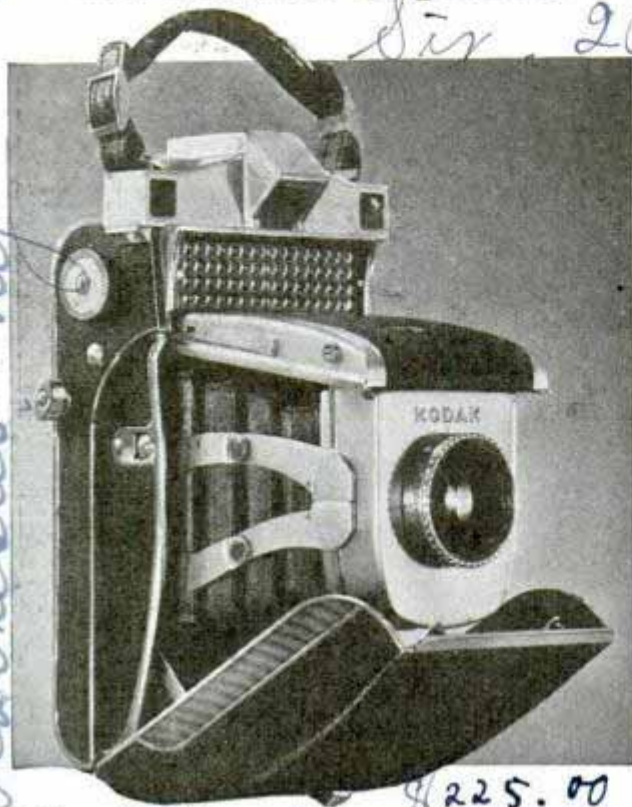
same. 250 plus postage

14751

Eureka Economy Co.
727 E. 213th St.
Astoria, Ore.

Eureka Economy Co.
727 E. 213th St.
Astoria, Ore.

Automatic Camera Sets Self for Correct Exposure



Photocell which controls automatic setting of diaphragm is behind multiple lens near top of camera

\$225.00

Here is a camera that thinks for itself. Focus on your subject, set the shutter speed according to the action, and the camera itself will automatically adjust its own diaphragm to the proper opening according to the light conditions at the moment. Eastman technicians accomplished this feat in the new camera by coupling the diaphragm with a photoelectric cell. Perfect exposure at snapshot shutter speeds from one twenty-fifth to one two-hundredth second is thus assured. The light-sensitive cell is located behind a multiple collective lens which covers the exact field of the camera lens, so that the photocell reacts only to light within the scene being photographed. At the split second the shutter is tripped, the photocell actuates a galvanometer and causes the diaphragm to open or close to the proper aperture according to the shutter speed in use. Double exposure is prevented by a device which makes it necessary to operate the film-winding lever before the shutter can be tripped again, and a red warning dot shows in the window of the shutter speed scale to indicate that the film must be wound. The built-in range finder has a

triangular split field making it easy to focus from four feet to infinity on horizontal or vertical lines without tilting the camera. The picture size is two and one-quarter by three and one-quarter inches, the camera carrying a roll of eight. The f.3.5 lens closes down to f.22. The shutter is adjustable for speeds of one-tenth to one second besides the snapshot speeds, and a self-timer permits a delayed shutter release of about twelve seconds. For special effects, the automatic feature can be thrown out by a lever, converting the camera to the conventional focusing type.

#827

Safety Window-Washing Seat Handy for the Home

Designed to make window washing less hazardous in home or office building, a safety seat now ready for the market clamps on the sill. The user sits comfortably and safely in the seat, with feet inside the window, while he washes the outside panes of the windows, both top and bottom. Made of plywood and aluminum, the seat will support 1,000 pounds.



Two views of the window washer's safety seat for use in home or office building

C. M. Thompson
6432 N. Lakewood

Eastman Kodak Co. Rochester, N.Y.

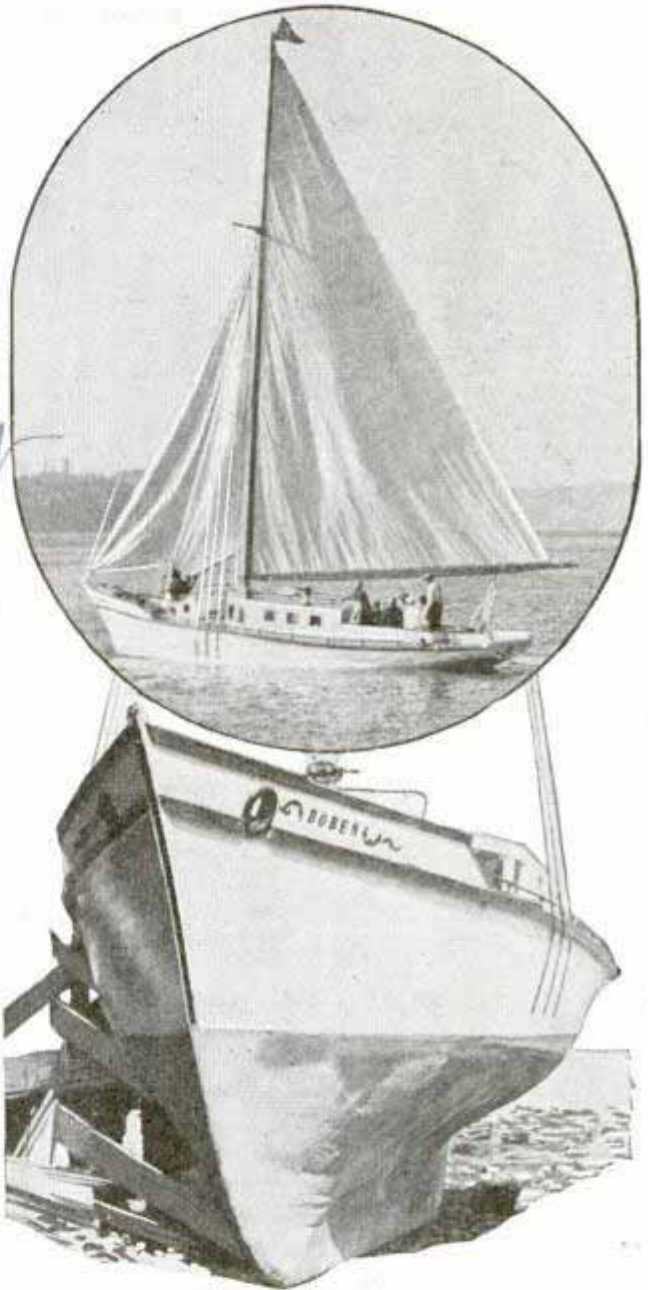
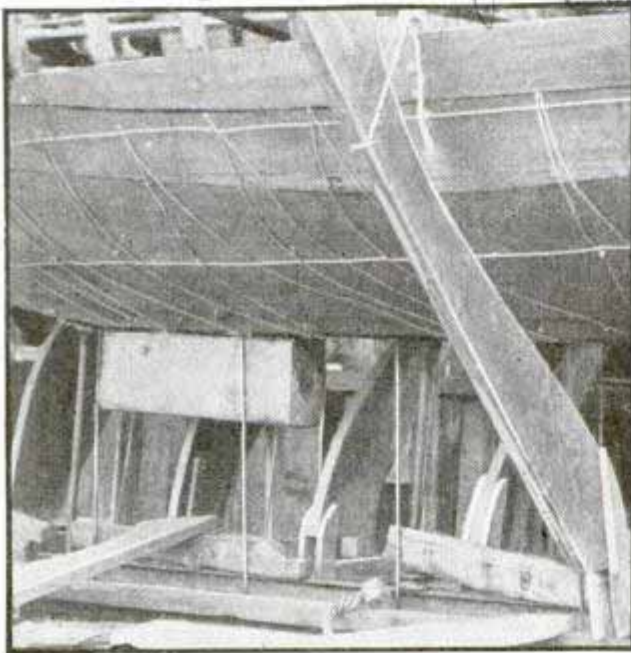
4139

H 674 Com. James Washington
 3416 N. 31st St. 545
 Tacoma, Wash.

Cement-Hulled Sloop Wears Ballast Outside

Breaking from the conventional method of placing cement inside the boat for ballast, a Tacoma, Wash., yachtsman has built a sloop with its ballast outside. The lower part of the "Boren's" hull is made of cement, joined to a conventional upper hull section of wood. The sloop is thirty-eight feet long with a twelve-foot beam. On trial runs the cement-bottomed craft performed in a highly satisfactory manner. Its owner, C. E. Hogberg, prefers comfort to speed on the water.

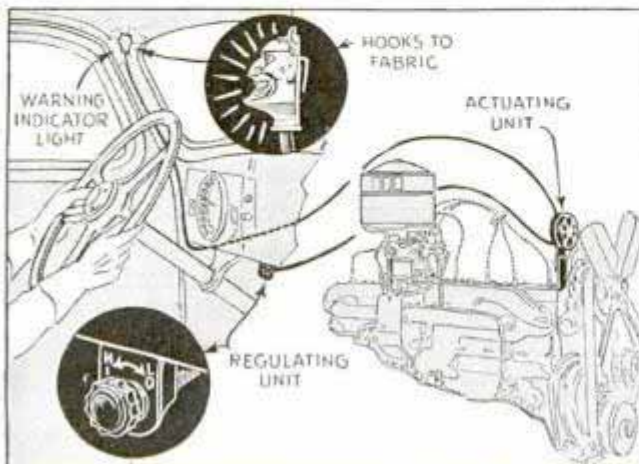
Tacoma Yacht Club



Above, building the cement-hulled "Boren." Right, the sloop ready for launching, showing where upper hull of wood is joined to cement undersection; above at right, the owner makes a satisfactory trial cruise

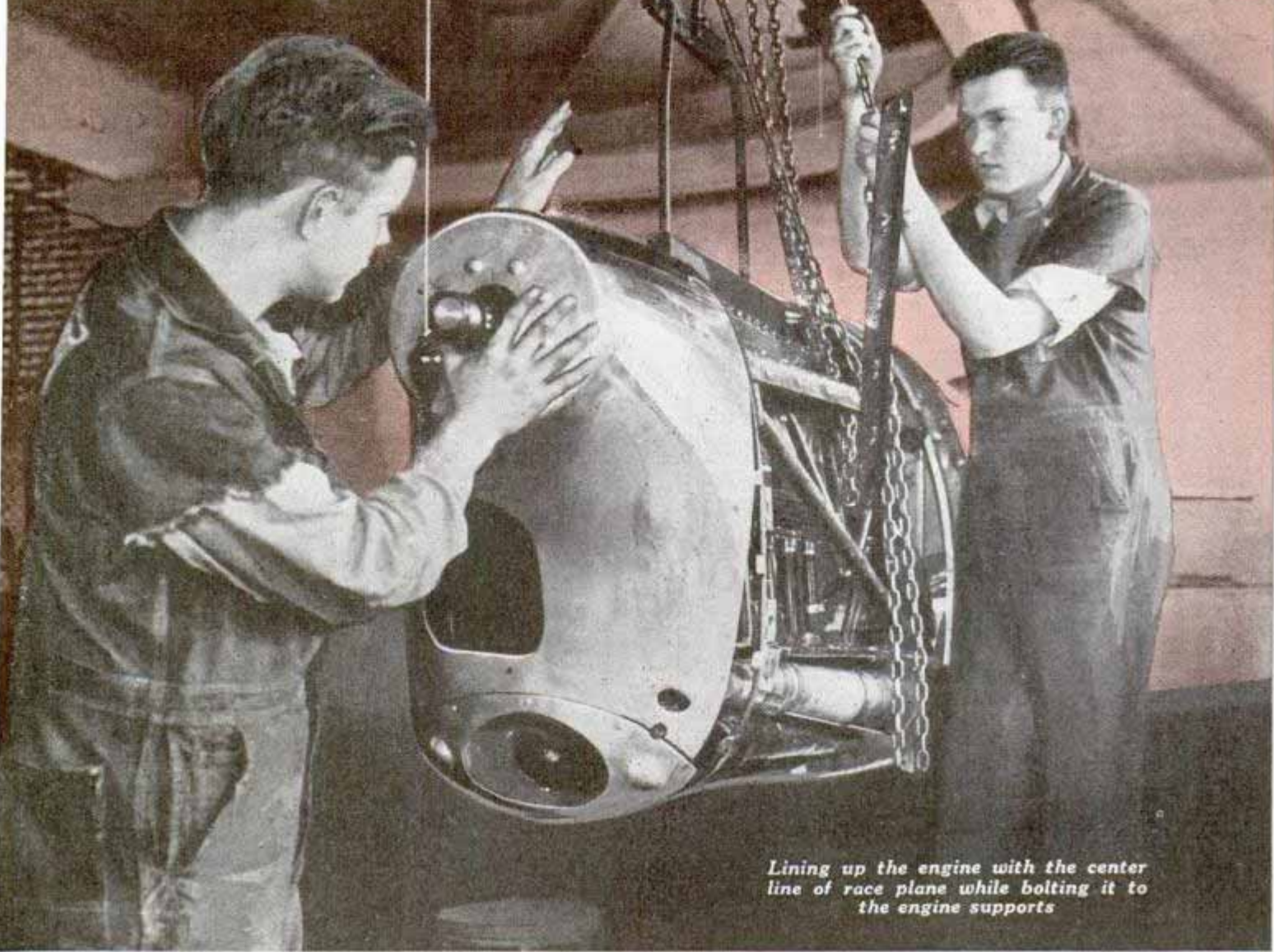
H 705

Speed Indicator Warns Driver by Flashing Red Light



When the automobile exceeds a predetermined speed, a new indicator flashes a red light to warn the driver. The indicator, made in the form of a devil's head, is red. Inside it is a light which is turned on when electrical contact is established by a metal disk actuated by air current from the automobile's fan. The air current fluctuates in relation to the motor speed. Tension of the disk may be adjusted by means of a regulator on the dash. The indicator is small and may be hooked to the fabric in the top of the car, at the driver's left.

Casco Products Corp.
 100 Ridgely St. Conn.



Lining up the engine with the center line of race plane while bolting it to the engine supports

FLYING *the* WINGED

1528
2500 w. 7 Blvd
H. Los Angeles

ONE mile and a half from shore and only fifty feet above the water, the crankcase of Art Chester's tiny racing plane suddenly burst and vibration almost shook the wings off before Chester could cut the switch.

The pilot didn't have a parachute, nor altitude to use one. Yet a minute later, instead of crashing into the water at 250 miles per hour, he was setting his wheels down on the airport at the edge of the lake. Sheer speed had saved his life. Traveling close to five miles per minute when the engine failed, Chester automatically pulled back on the stick while he was fumbling for the switch, and momentum had swung him up nearly 1,000 feet above the water. From that altitude he was able to glide safely to the field.

"You can always tell, during a race, when someone gets into trouble," Chester

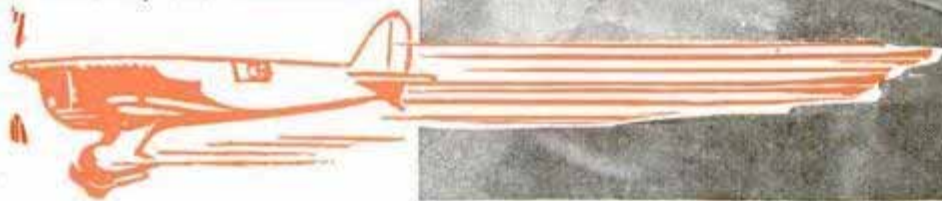
says. "The planes will be roaring along in level flight and then suddenly you notice that one of them has started to skyrocket. When something happens, the smart thing is to zoom as high as your speed will carry you, giving time to get your wheels down and a chance to pick out the best landing area within a mile or so."

Modern race planes are unbelievably small, no larger than is necessary to get the engine, pilot, and fuel supply off the ground and still permit good maneuverability. Small as the wings are, the pilots would cut them smaller if most races were not held around closed courses. If the wings are too small the plane mashes sideways when making a vertical turn around a pylon, while another plane whose wings "stick" better in the air can whip around the marker and make off at once on the next leg of the course.

*Cent. Thomas & Hinman, Pasadena, Calif. H 528.
 10555 Holman Ave
 Los Angeles 186/8 Malibu Road Pacific Palms*

This year, with more planes than ever being groomed for the races, new American speed records are anticipated. Straightaway speeds of 300 miles per hour, and averages of 275 miles per hour around closed courses will be surpassed, the pilots think. More than a score of competitive speed planes were built during the spring and competition will be hotter than ever, due to the larger prizes offered. More than \$100,000 will be posted for winners of the National Air Races, an increase of 30 per cent above prizes in the past.

Fast as they will be, however, the American

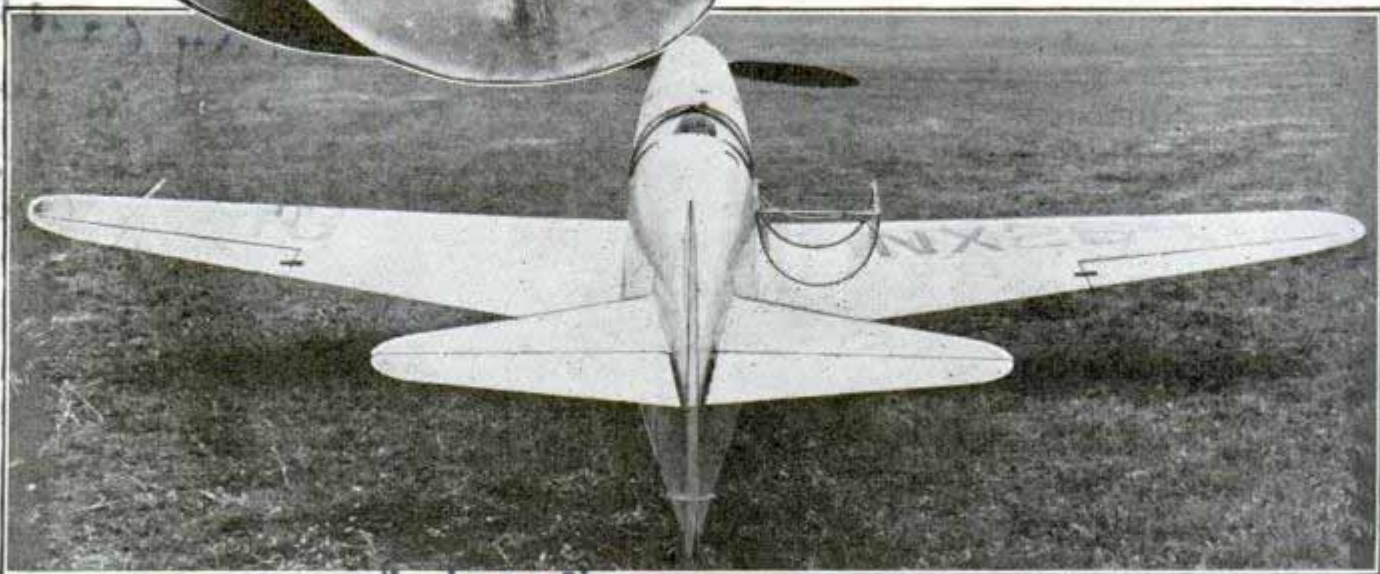
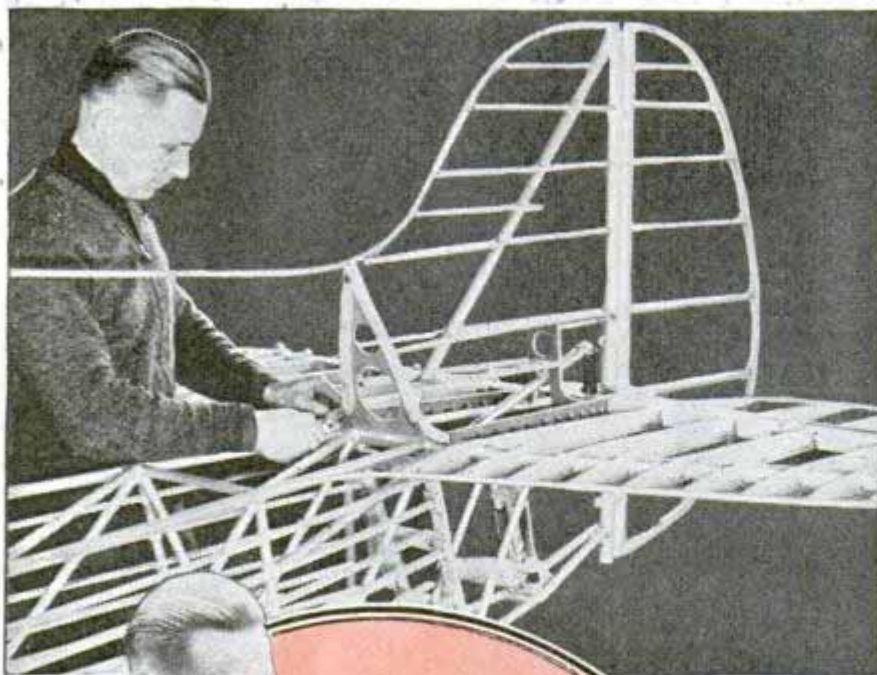


BULLETS

Top, closing cockpit hatch which completes streamlining of racing plane. Hole in transparent cowling enables pilot to signal the starter. Bottom, putting on parachute before testing new speed plane

*Harry Crosby
 915 N. Hollywood
 Burbank, Calif*





ships probably will set few international records. Each American speed pilot has to create his airplane at his own expense. With no racing engines available, the pilots use stock commercial engines worked over for greater speed. The average American pilot may spend \$8,000 to build a plane for the 550-cubic-inch class, while many times as much goes into each subsidized foreign speed creation built to uphold national prestige by smashing records.

Pilots like Art Chester and S. J. Whitman, who finance, build and fly their own race planes, know exactly what they need to fly much faster, but a special racing engine of 1,000 horsepower or more, for instance, would cost a fortune to design and build. Another thing the racing fraternity needs is a variable pitch propeller, not now available in the small sizes suitable for racing planes. A fast propeller ideal for high-speed racing has small diameter and extremely high pitch, but such a propeller would not develop enough thrust to pull the

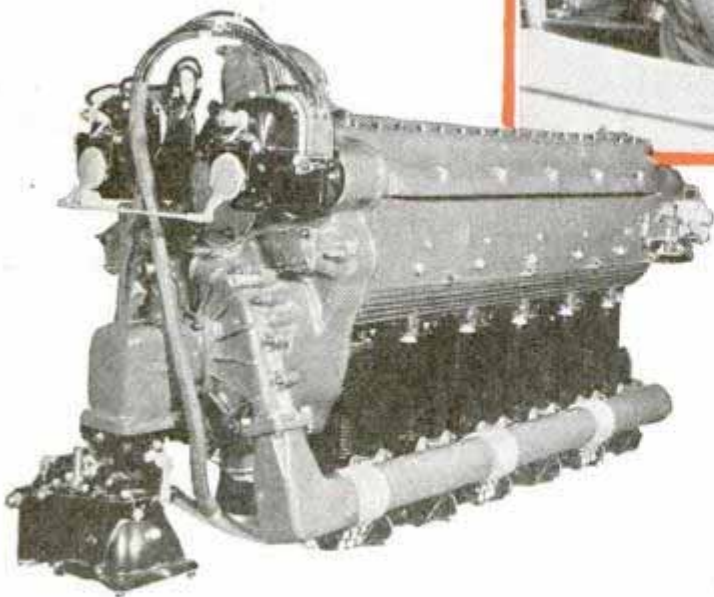
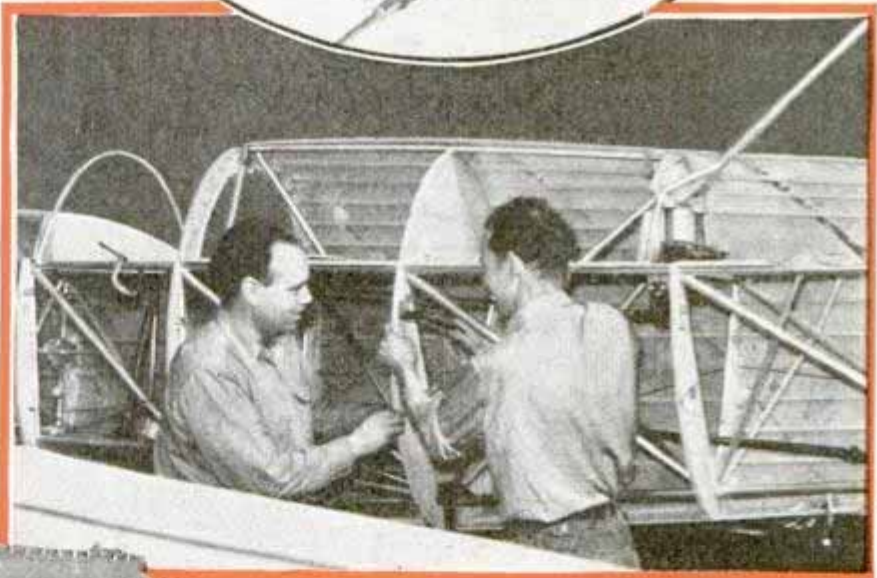
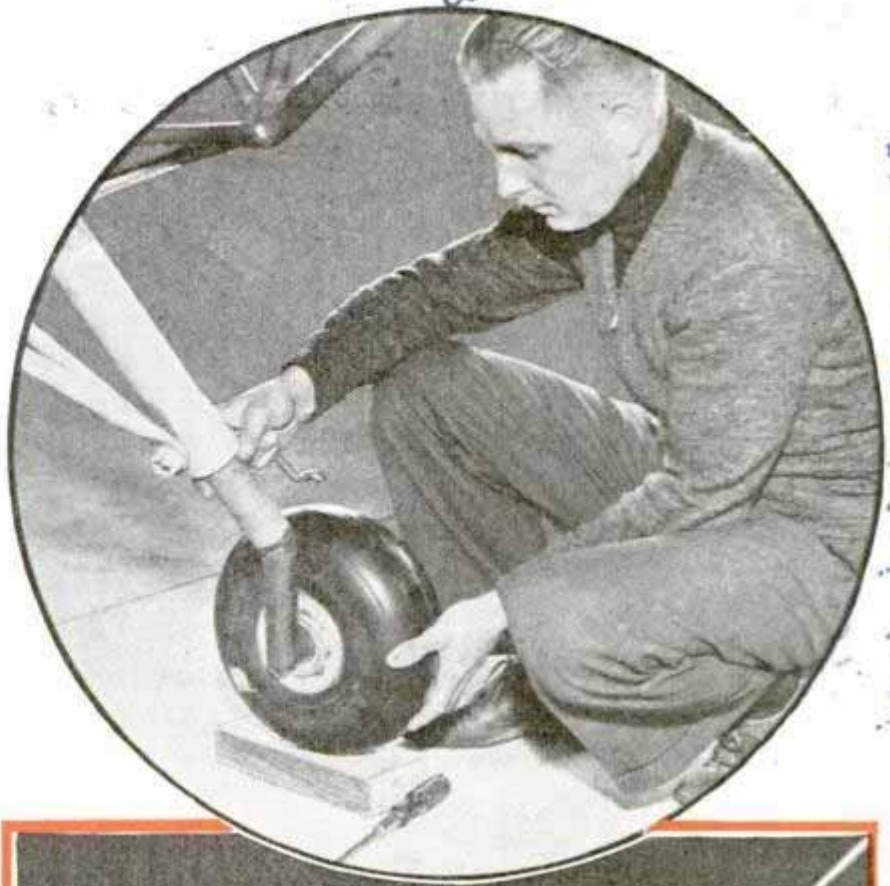
Top, working on tail assembly of new racing plane. Center, odd-shaped fuel tank fits into fuselage behind cockpit. It is designed to take advantage of every cubic inch of space. Bottom, rear view shows streamlining of racing ship. The fuselage is just wide enough to accommodate the in-line engine

18520 Art Chester

55000

plane off the ground and get it into the air. Present racing propellers are a compromise, with the diameter and pitch suitable for getting the plane off the ground, and with still enough pitch to the blades to develop fairly high speeds in the air.

"In many respects, airplane racing today is similar to automobile racing," one of the pilots says. "Both the airplanes and cars used in competition are built by individuals or by small syndicates that have no money to waste. The big difference has been that in the past there was far less prize money to be won in aviation, and a successful pilot could hardly gross more than his expenses and the cost of his plane during a racing season. Most of our best racing planes are backyard jobs, built in private garages and the corners of hangars, and financed on shoestrings."



Top, fitting tiny air wheel on retractable landing gear of a racing plane. Center, attaching plywood skin to steel tubing fuselage. Bottom, 260-horsepower air-cooled in-line engine which pilots "soup up" to deliver 500 horsepower for racing

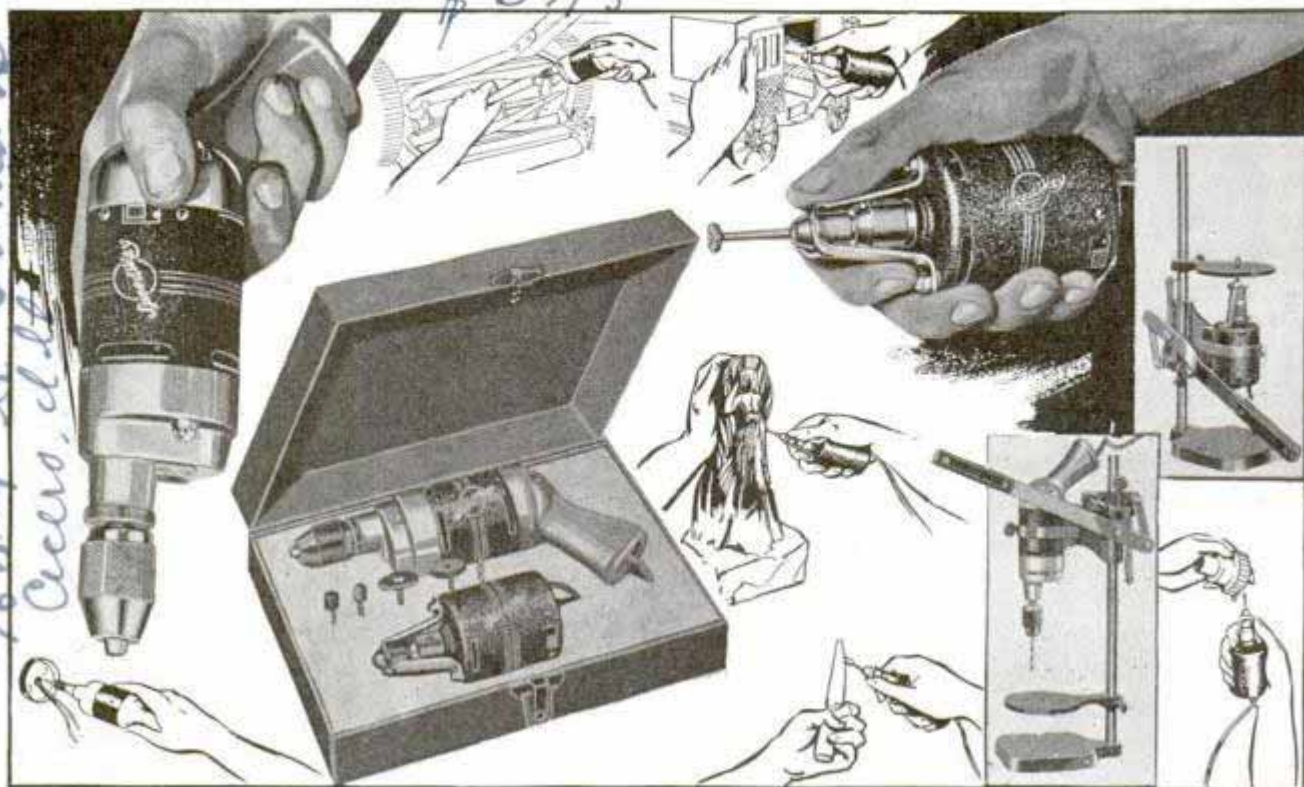
In spite of their lack of proper engines and propellers, American speed planes are steadily drawing closer to the marks set by European racers. Many of the improvements in radial and in-line engines during the last few years have resulted from knowledge learned on the race courses.

There are two principal classes in racing, one limited to planes powered with engines of 550-cubic-inch displacement or less, and the other the so-called "unlimited" class in which any airplane having an engine of 1,875-cubic-inch displacement or less may compete. Most of the

(Continued to page 118A)

*menaced
inserted*

Grinder and Drill Have Stand for Lever Feed



Drill at left and grinder, upper right, are available in steel kit. Some of their uses are sketched. At right the tools are mounted on stand with lever feed for upright and inverted use

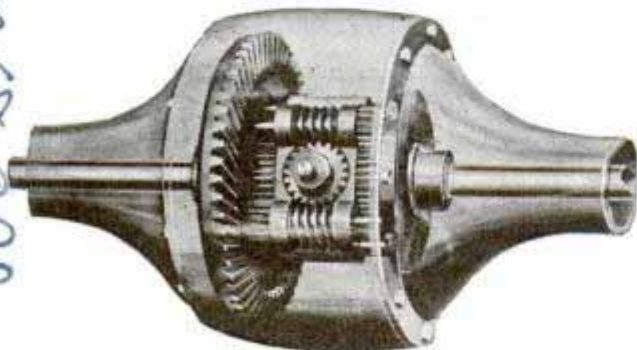
Offered in a kit with steel case and five accessories, a combination electric grinder and drill is a rugged and efficient tool for various jobs in the workshop or laboratory. The grinder operates at the extreme high speed of 20,000 revolutions per minute, the

drill at 1,000 revolutions, the latter handling up to one-fourth inch steel. The tools fit the hand easily, but for precise work where accurate drilling and routing are required there is a stand on which drill or grinder can be mounted for lever feed.

Safety Drive Distributes Power to Both Rear Wheels

One rear wheel of a truck, bus or automobile cannot spin, independent of its mate, if the vehicle is equipped with a spur gear type of differential which transmits all the power exerted at the ring gear to both wheels, whether the car is on a straightaway, turn or curve. The differ-

ential action of this drive is positively locked or static except on a turn or curve, a worm and worm gear forming the locking members. When the car is steered to left or right, the gear train goes into action and the increase in speed of the outside rear wheel is in exact proportion to the decrease in speed of the inside wheel. Thus on a straightaway both rear wheels move together in a positive locked position, always rotating at exactly the same speed, while on a turn or curve, the increase in speed of the outside rear wheel is compensated for automatically by the decrease in speed of the mate. Tests of this novel drive, its makers state, have shown that the distribution of power to both rear wheels at all times not only greatly increases traction and gasoline mileage but



Differential which transmits power to both rear wheels whether car is on straightaway or curve

Speedway Mfg. Co.
 1634 St. Paul
 Cicero, Ill.
 4713
 Coniell Ltd.
 606 Wabash, Chicago

makes braking easier since both wheels are retarded equally. It is also claimed that this drive prevents side sway, increases tire life and eliminates the danger of one wheel spinning on a slippery surface, thus minimizing the skidding hazard. There are no springs or keys in the drive, nor is there anything to lock or unlock, cam or uncarn, gear in or gear out, open or close. The action is entirely automatic and it is both unnecessary and impossible to cause the clutch to slip. If one axle should break, which the makers say is unlikely with power equally distributed, the other axle would still have power. Because power is brought to both wheels simultaneously and none is dissipated back of the ring gear, it is claimed that the engines of cars equipped with this differential can be one-third smaller in horsepower than the motors of cars with conventional drives and still deliver as much or more useful power to the rear wheels.

H 733

Odd House with Eight Sides Turned into Museum

So well planned that there is virtually no wasted space, an odd eight-sided house at Watertown, Wis., has been turned into a museum. A circular staircase permits visitors to reach the top story. Although it is eighty-five years old, the house has not settled on any part of its foundations.



Octagonal house in which museum is now located has virtually no waste space

Collecting Poison Spiders Becomes a Business



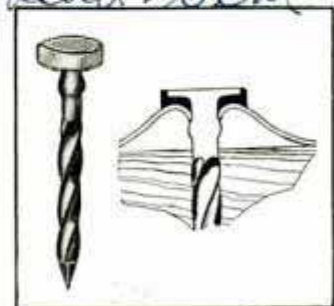
Collector catching a poisonous insect for which he has obtained an order

Starting as a hobby, collection of poisonous insects is now returning a profit to a Californian who is receiving orders for black widow spiders, tarantulas, scorpions and similar creatures usually avoided by the average man. Scientific laboratories and pet stores send in most of the orders. The collector does not regard his business as dangerous; he never has been bitten by any of the insects for which he finds a market.

H 753

Lead-Head Nail Seals Hole and Locks Steel Roofing

Designed for use in laying sheet-steel roofing, a lead-head nail now on the market locks the nail, the lead and the sheet together. When the nail is driven, the roofing sheet springs up over a bump on the shank, locking the nail in the sheet. The lead head also seals the hole, preventing leakage.



The Illustion Co
4856 S. Western Ave

W. D. ... Calif

... order ...

Wide World

E. Schulerberg (clutch)
vanemism line patrolman

H 638

General Electric Co
Schulerberg. 29

RIDING HERD on

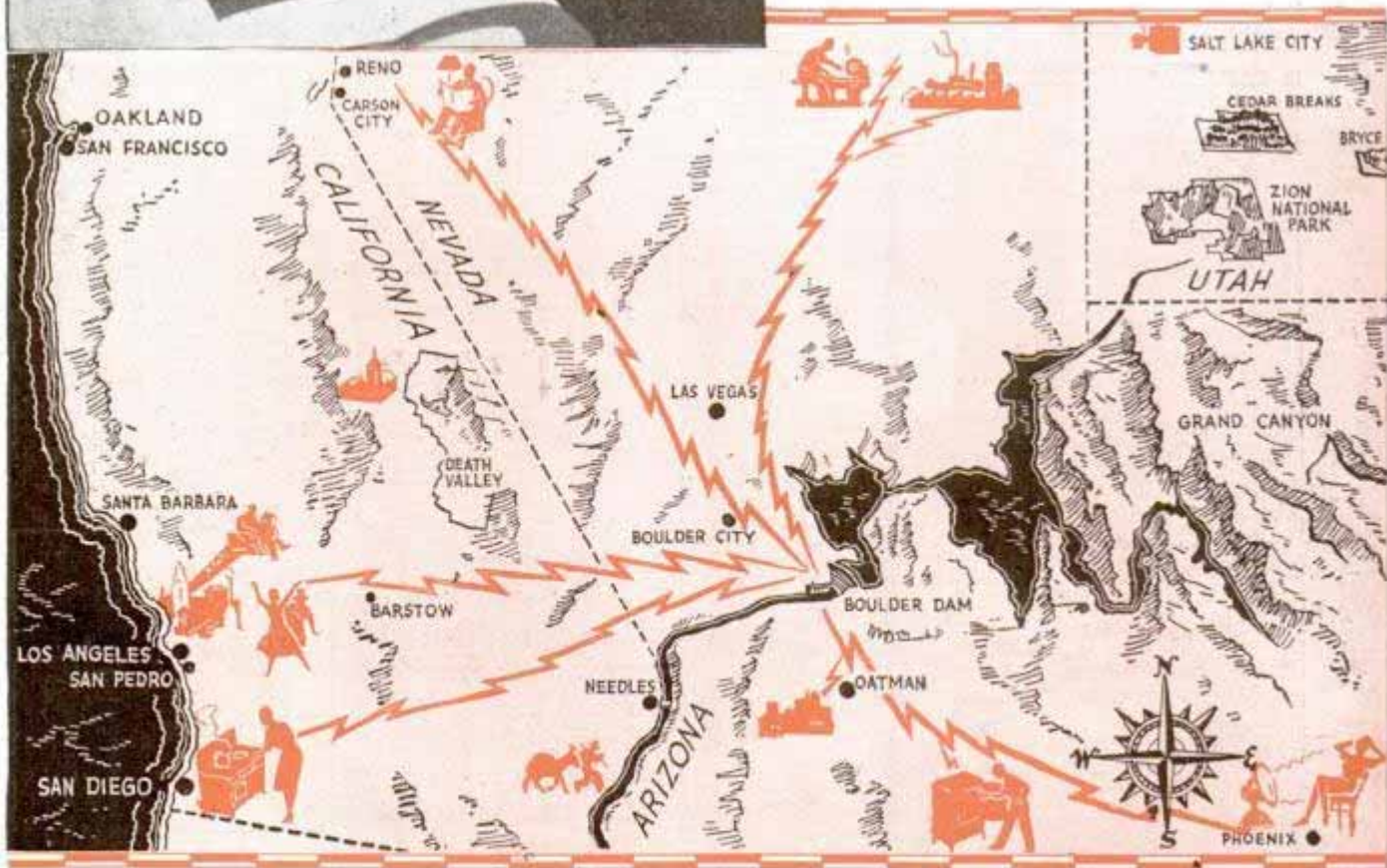


By Charles M. Ripley
Publicly kept.

MAN cannot stop earthquakes or bolts of lightning, but he does something today which is almost as remarkable. He stops an amount of current which normally represents 2,000,000 horsepower in just one-twentieth of a second!

And because he has learned how to halt this tremendous energy in the wink of an eye when an emergency occurs, thousands of tons of falling water at Boulder dam supply a smooth flow of power to Los Angeles, 270 miles distant.

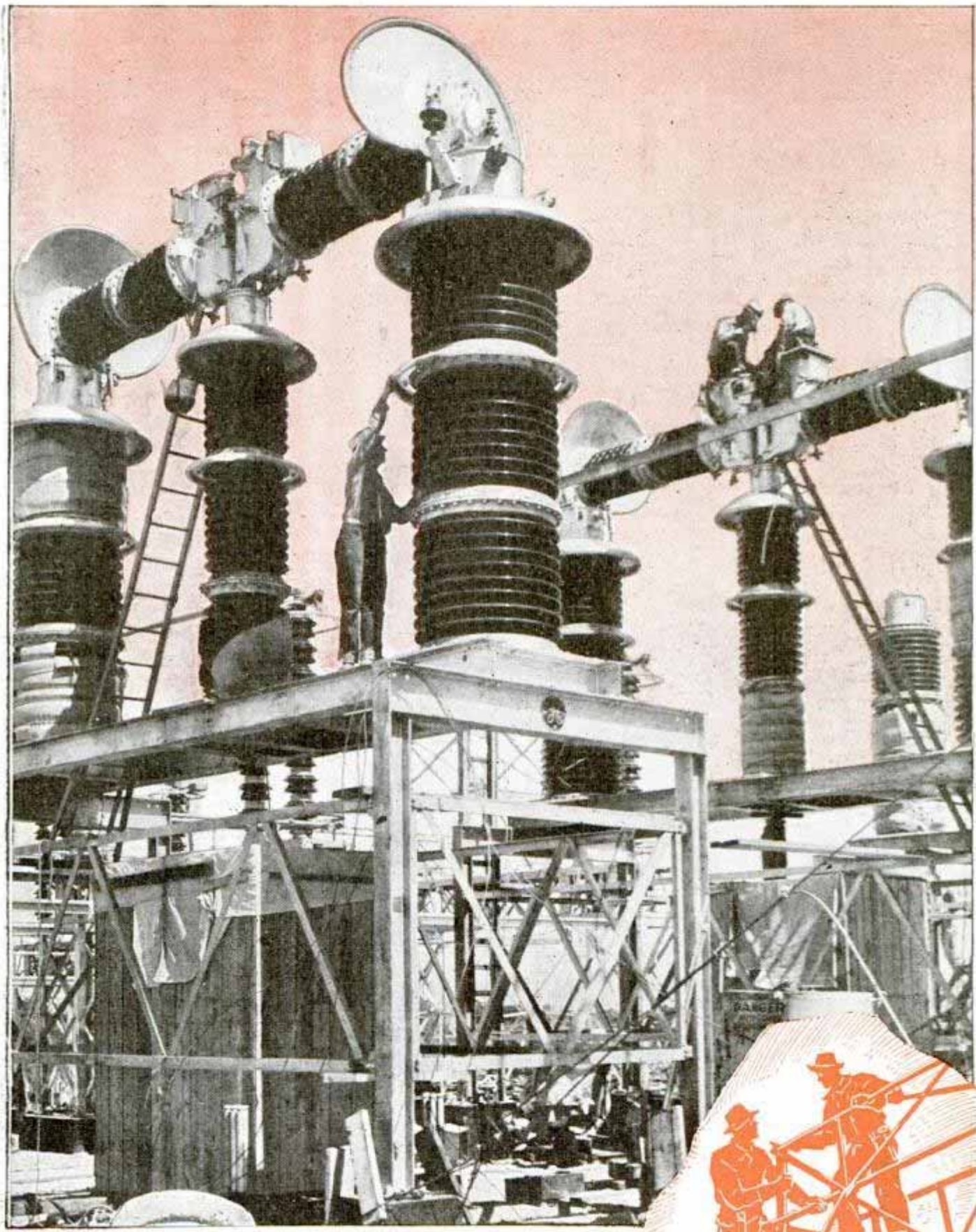
If you could safely stop a sixty-horsepower car traveling sixty miles an hour within two feet two inches, you would be able to stop in about one-twentieth of a second. But you wouldn't stop 2,000,000 horsepower, which is



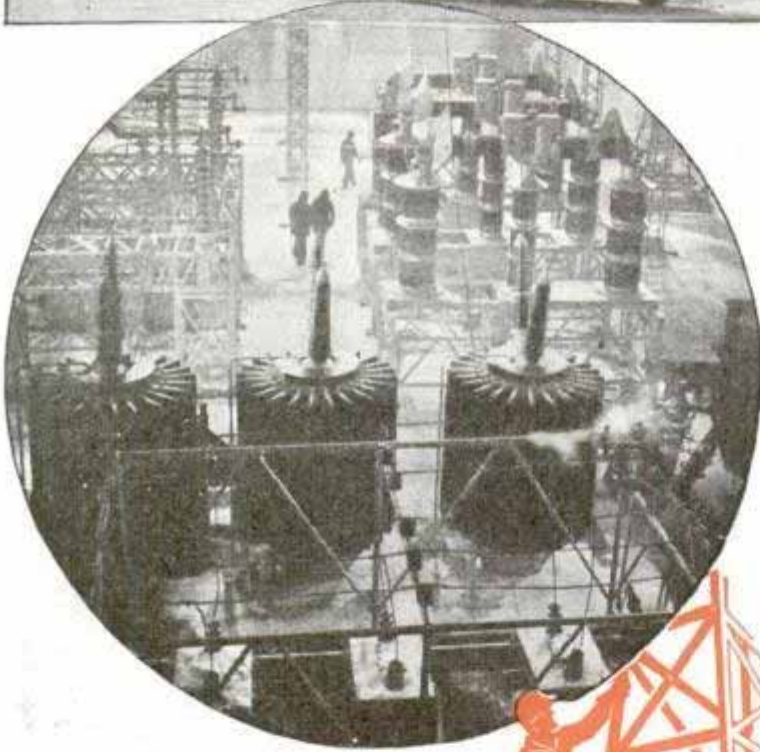
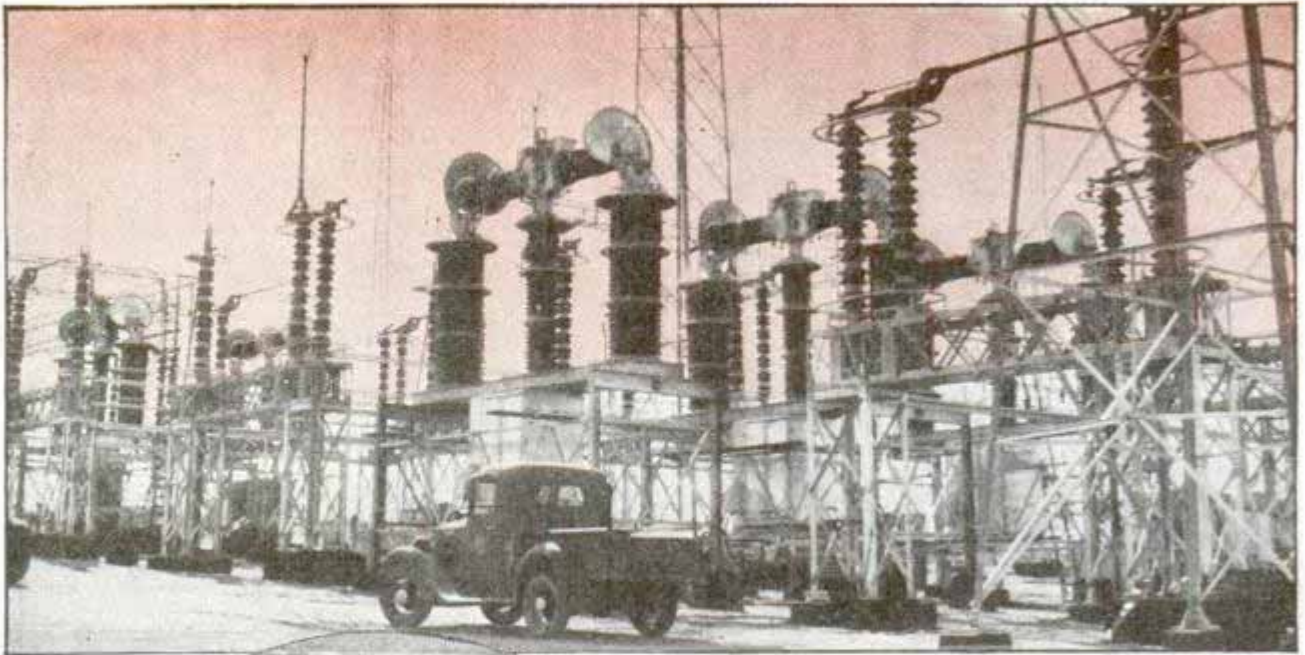
Map shows terrain traversed by transmission lines carrying electric power from Boulder dam to Los Angeles and other cities. One of line patrolmen, top, in specially equipped car, ready to ride herd on 2,000,000 electrical "horses"

8238

2,000,000 "HORSES"



General Electric impulse oil circuit breaker at Boulder dam. This is the "strong-arm guy" which halts a great surge of electrical energy in a split-second



Swift-acting circuit breakers like these protect the high-voltage power lines emanating from Boulder dam from damage when an emergency occurs



more power than most people have ever seen at work.

Four hundred of our biggest locomotives of 5,000 horsepower each, pulling 400-mile-long loaded freight trains at fifty miles per hour, would represent 2,000,000 horsepower in action. These trains could not be braked to a stop in one-twentieth of a sec-

ond or even in several seconds.

The power which man stops in a split-second is, of course, not the momentum of a moving body like a train or automobile, but the electrical energy surging through two of the most wonderful transmission lines in the world. These twin lines of the Los Angeles Bureau of Power and Light linking Boulder dam and Los Angeles, are remarkable not only because of their length, but also because of the very high voltage, the large amount of power transmitted, the unusual terrain they traverse, and the automatic safety features which prevent interruption to service and damage to the system when trouble occurs.

They can convey 300,000 kilowatts, or 400,000 horsepower, for a distance of 270 miles and the transmitting voltage is the highest in the world in regular service—287,000 volts. The three wires of each line are hollow, almost one and one-half inches in diameter

and large enough so that if an emergency occurs in any section, the other line in that section can carry all the power. Normally, however, half the power flows over each line.

In thousand-foot steps these lines stride across the Mojave desert, hopping from one steel tower to another more than 100

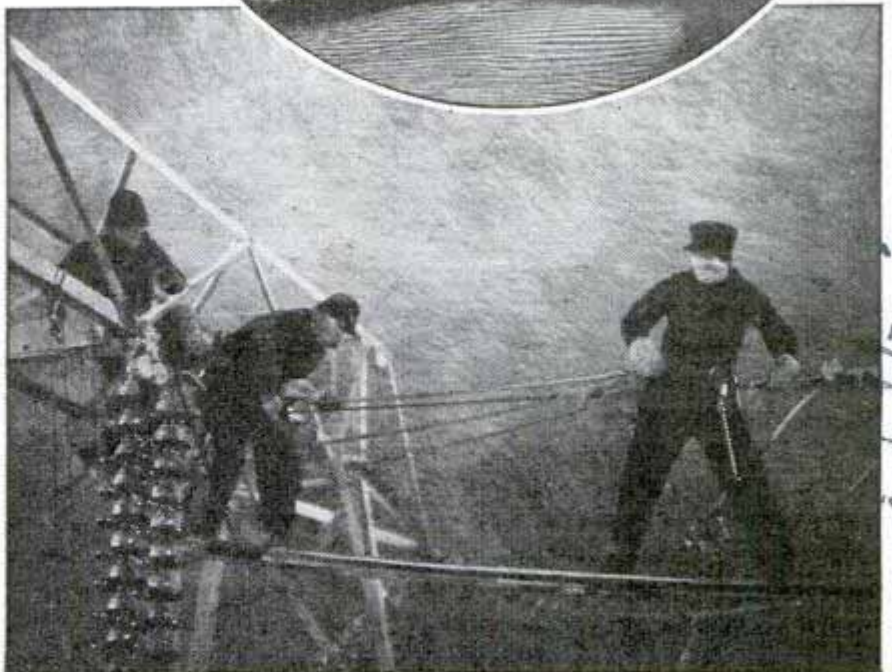
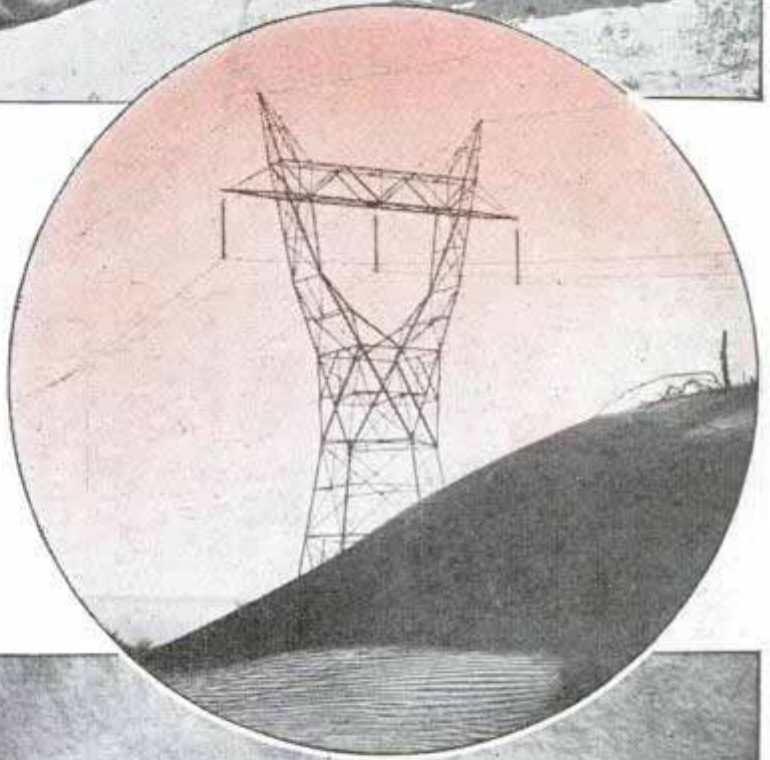
feet above the ground. They are 800 feet above sea level when they skirt the entrance to Death Valley. Then they climb 4,800 feet to cross the Sierra Madre mountains. Although mostly in desert country, the lines are often exposed to storms, floods and lightning. The days may be blistering hot, the nights cold.

Maintenance crews patrol the lines by following a single road adjacent to them in specially equipped cars. These patrol cars are equipped with big tires to battle the shifting dunes, and contain radios tuned in on the high-frequency carrier current sent over the power wires. So, when within 1,000 feet of the lines, the men can receive messages from headquarters at the dam or at Los Angeles. Sometimes their progress is hampered by high winds, powdered alkali, sand and dust storms, cactus, sagebrush, mesquite and the ever shifting dunes. In such a barren wasteland, the system must be virtually independent of the human element, almost automatic in operation. And it is.

For safeguarding these costly lines, and preventing destructive damage to them, two desert "switching stations" have been built, one ninety miles from the dam and the other 180 miles out. A few patrolmen live near these stations to maintain the equipment, but for the most part the operations are automatic and can avert disaster in a fraction of a second.

At each switching station four electromechanical marvels called circuit

(Continued to page 122A)

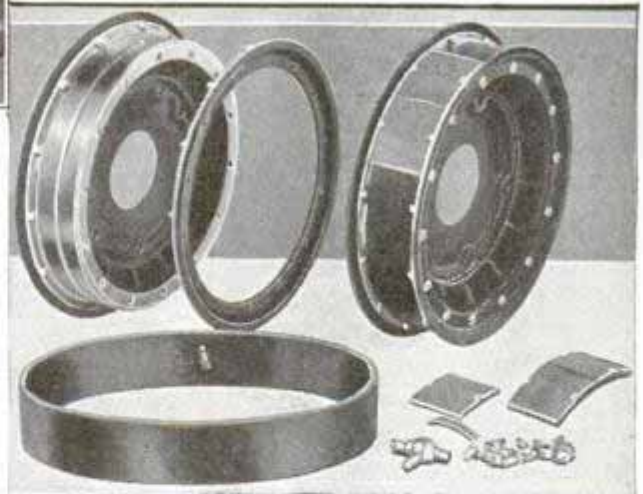
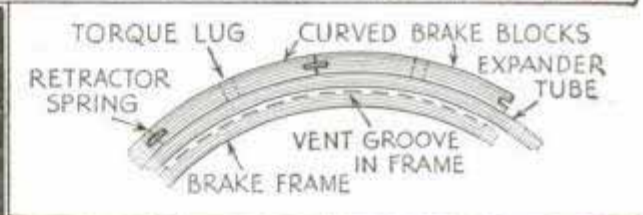
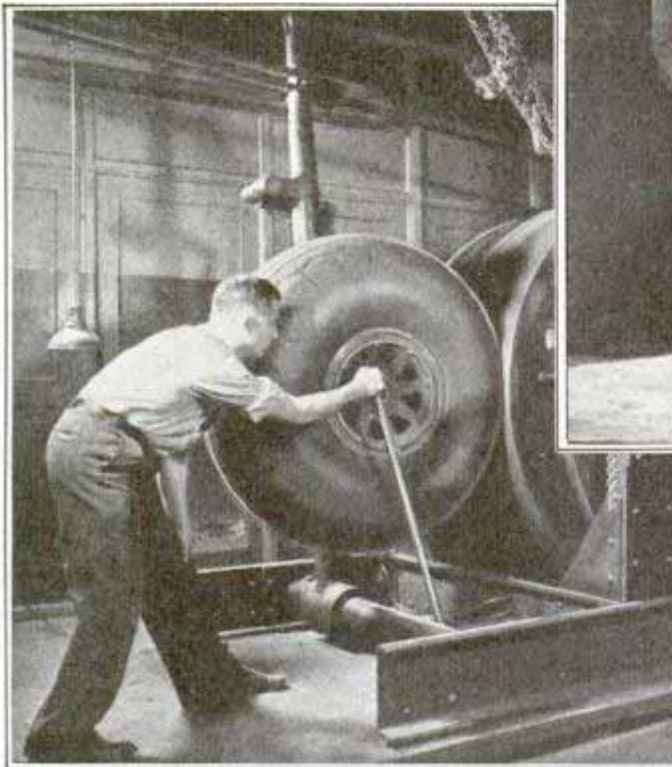


Trouble car, top, servicing radio patrol car along Boulder dam transmission line. Bottom, transmission line tower, and linemen at work

more slim.

'Plate-Lifter' Brake Is the Latest for Airplanes

THAT gadget known as a plate lifter, consisting of a rubber bulb, several feet of tubing and a deflated rubber balloon on the other end, with which practical jokers cause dinner plates to do flip-flops at unexpected moments by pressing the bulb after putting the balloon under the plate, supplied the basic principle for one



Above, testing new brake. Right, giant air liner equipped with brake. Center, sketch of brake. Bottom, parts of brake, demonstrating its simplicity

of the most effective and simplest airplane wheel brakes ever developed, the new Goodrich expander tube brake. The brake has a full circle of braking surface consisting of a series of curved brake blocks which are pushed outward by a flattened, expansible tube into which the brake fluid is forced. Each block slides between a pair of lugs through which the brake torque is transmitted to the frame, which acts as a brake shoe, torque plate and fairing plate combined. Because the forces are distributed equally throughout a full 360 degrees, this frame can be made of lightweight metal such as magnesium alloy or, more economically, of light steel stampings. The brake is being made in various sizes rang-

ing from five-inch diameter to twenty-five-inch, and some of the larger units are duplex, with two rows of blocks. The heart of the brake is the expander tube. Essentially it is a single-tube tire held in a flattened position, for it has an inner tube, fabric-reinforcing structure, and an outer "tread" to withstand service conditions. If the brake is to be operated by a mineral

B. F. Goodrich & Akron, Ohio

Outboard Racing-Boat Trailer Has Living Quarters for Crew

oil, the inner tube is made of a special Neoprene compound that will not be affected by oil. Otherwise a rubber compound is used. The fabric structure is so designed that it is not subjected to excessive strain when the tube is fully expanded. The outer surface and edges of the tube are covered with heat-resisting compound. The tube is put on the brake under tension, which helps to squeeze the fluid out when braking pressure is released. The tube does little work even when great hydraulic pressure is applied to the brake, its chief function being to confine the fluid, which does all the

work. The tube will withstand enormous pressure, because it is surrounded on three sides by the metal frame and on the fourth by the brake block assembly, which moves outward only a small fraction of an inch. The brake tube nozzle may be connected to the piping of the airplane hydraulic system through a standard swivel fitting equipped with a bleeder unit. The brake can be taken apart or assembled with only a screwdriver and wrench. Edges of the blocks provide a wiping action that helps break films of moisture between lining and drum, thus maintaining efficiency when brakes are wet. Among planes on which the brake has been installed are the 65,000-pound, four-engined Douglas "DC-4" and the giant four-engined Boeing "Flying Fortress." A special brake, designed to operate under salt water, is being used extensively on the beaching gear of navy flying boats. Development of the new brake was made possible by a testing machine with which practically all conditions encountered in actual operation can be duplicated in the laboratory, and their effects on brake and tire action recorded with instruments, to be studied exhaustively by engineers. The machine consists essentially of a giant flywheel against which an airplane tire wheel and brake assembly can be forced or "landed."



Unloading outboard racer from trailer designed especially for transporting the water speedsters between race courses

Designed for carrying outboard racing boats and motors, a dual-wheel trailer introduced recently has living quarters for the boat crew. It has a streamline roof. Two racing shells are carried in the rear of the trailer. The roof may be raised and the doors swung outward to permit removal of boats. The new trailer provides complete protection of the boats, motors, extra propellers and other equipment from the weather. Living quarters in the front of the trailer include kitchen galley, a dav- enport which opens out into a double bed, wardrobe space and a lavatory.

Air Intake and Exhaust in Roof Ventilate Cab of Truck

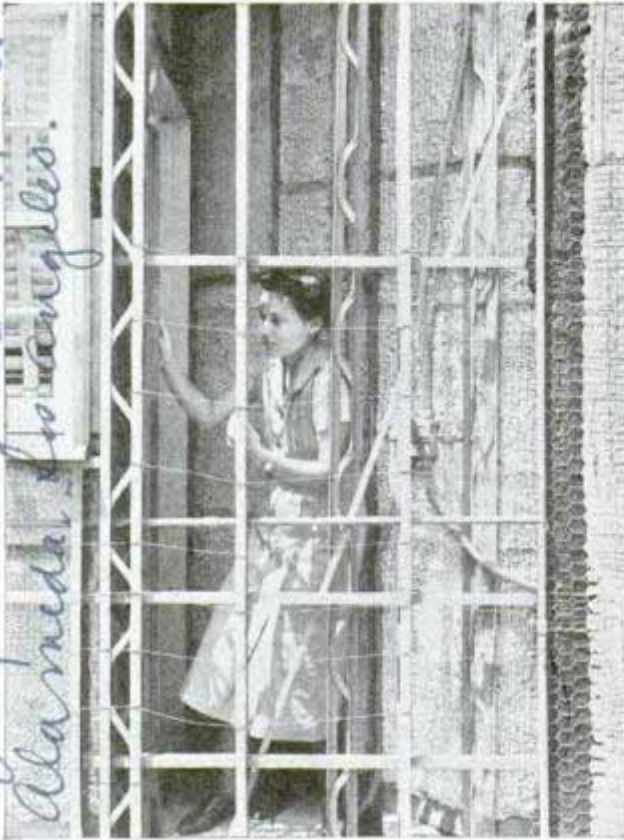
Continuous ventilation even when the truck is standing still is provided by a unit installed in the ceiling of the cab. It has both intake and exhaust vents, each controlled by the driver. Incoming air can be directed toward the windshield or the driver, while the exhaust draws out foul air and gas fumes.



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Steel Framework for Plaster Strengthens the House



Showing how steel framework is arranged before plaster is applied to structure

Lending permanency and rigidity to house construction, a new steel framework method of building calls for tying metal lath to the frame with metal wires. Plaster is applied in the usual manner.

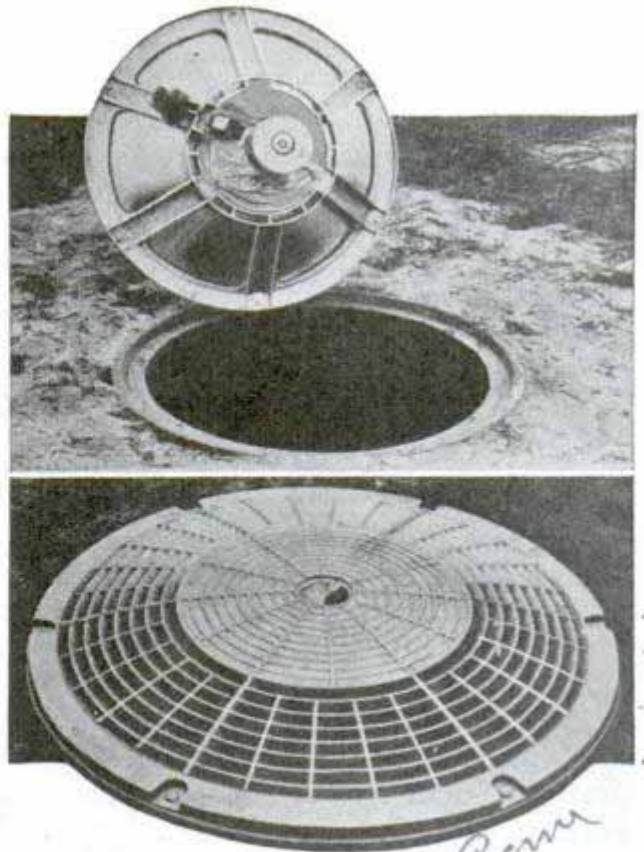
Garden Made a Bird Sanctuary by Planned Planting

If you want birds to make your garden their home, plant the flowers, shrubs, trees and grasses that attract them. You don't need acres of meadow—the average home with a little land around it can be made an attractive garden and bird sanctuary if planned with that in mind. Some birds want seed plants: grasses, asters, poppies, sunflowers. Others prefer pulpy fruits such as cherries, mulberries and the like. More than seventy desirable bird families like wild grapes, among them the cardinal, catbird, brown thrasher, bluebird and quail. Elderberry, a good background shrub, is a favorite of the olive-backed thrush, grosbeak, catbird and a hundred others. To bring the goldfinches, white-throated spar-

rows, chickadees and juncos into your yard, plant forget-me-nots, asters, California poppies—best of all, sunflowers, whose seed is a favorite food; sunflowers, too, fill up corners and hide fences well. The decorative mulberry brings the red-headed woodpecker, thrush, robin, oriole and mockingbird. The flowering honeysuckle is good for nesting and produces a midsummer berry attractive to birds. Sumac is beautiful, and furnishes lunch for chewink and wood thrush, robin, bluebird, downy woodpecker and others. Then there are the mountain ash, hawthorn and dogwood, pokeberry, holly and snowberry, all of which pay dividends in making your garden a stopping place for songsters.

Loudspeaker in a "Manhole" Directs Athletes in Drill

Mass athletic drills on the great sports field at Breslau, Germany, are directed by commands over a loudspeaker in a "manhole." The speaker is set in the ground at the center of the arena, and its ornamental circular grille is shaped to radiate the sound outward in all directions. It was first used in a big gymnastic festival.



Above, the under side of ground loudspeaker, Below, notice how grille radiates sound in all directions

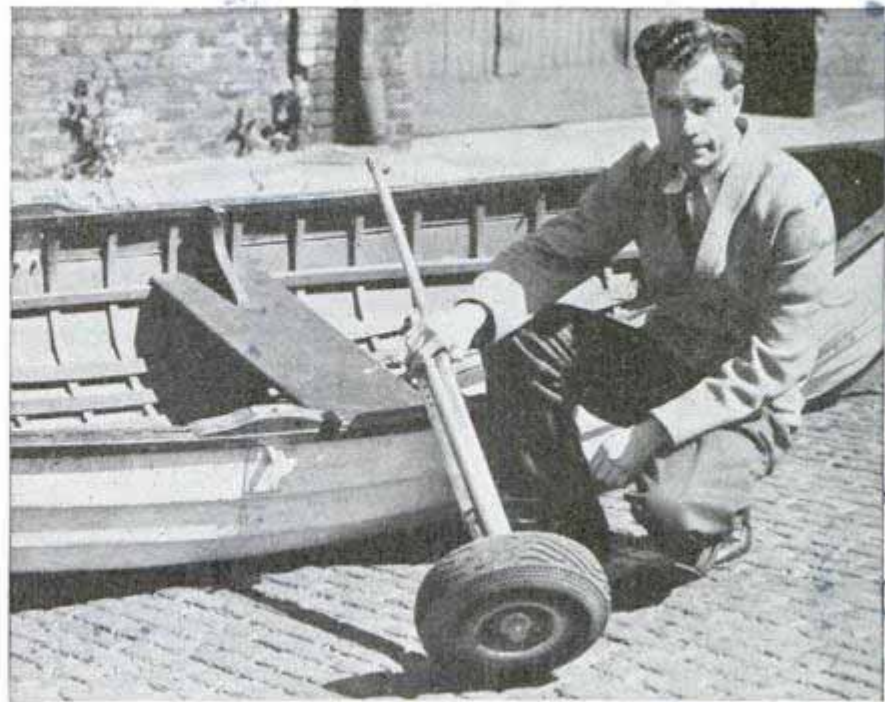
Since all work and equipment Co 6811/10 d. Alameda, So Angeles.

8 769

F1364 by Planned Planting
Cyril Q de Becker
Lecture 1934

Wheeled Tripods Form Trailer to Carry Boat

How to get his boat to fishing grounds was solved by one angler who devised a trailer device. It consists of two tripods, each with a pneumatic-tired wheel. Two of the arms of the tripod are attached to small castings on the boat's keel, while the third snaps on a casting on the gunwale. The third arm is made of two tubes, one slipping inside the other, with a coil spring taking up shock of rough spots on the road. The bow of the boat is hooked to the auto bumper with ball-and-socket hitch. The whole trailer weighs only thirty pounds and may be thrown into the back of the auto when not in use.

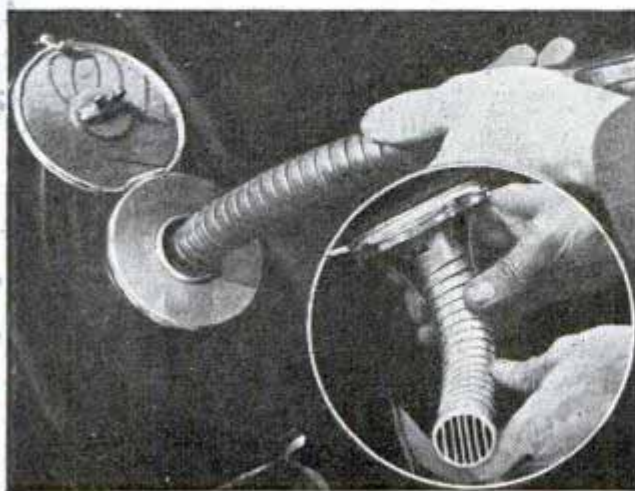


Top, right, wheel ready to be clamped on boat to form handy trailer. Bottom, boat on wheels and hooked to tow car.

H 742

Cont. B. W. Brinitally
914 J. Airneworth Ave

Theftproof Gasoline Tank Cap Stops Siphoning or Spilling



Flexible spout fits into neck of gas tank and prevents either siphoning or spilling when tank is filled

Theft or loss of gasoline from the automobile tank can be checked by a keyless tank cap. Its flexible spout is installed inside the neck of the tank, being designed to fit all automobiles. Siphoning is impossible, and the cap eliminates spilling caused by a "blow-back" of air when the tank is being filled. The cap is hinged.

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

Sullivan Automotive Equipment Co.
5708 1/2 Fountain Ave. Hollywood, Ca.

Wall Washer Saves Paint and Reduces Work



Cleaning walls with aid of machine which closely resembles modern radio receiver

Taking the drudgery and mess out of washing walls, a new machine uses a tested cleaning fluid which does not injure the paint. Carrying buckets of water and soap, wringing out cloths and similar work are eliminated. The machine is portable. One man using the washer can do the work ordinarily done by five washing by hand.

Vapor-Lock Eliminator Adjusts Faulty Fuel Pumps



Vapor lock and its attendant troubles of stalled motors, backfiring, starving of carburetor and hard starting can be checked by installing a vapor-lock eliminator now available. It is a

metallic filler mounted under the diaphragm of the pump to increase the vacuum and capacity of the pump by bringing the diaphragm stroke to normal.

Rubber Springs Absorb Shocks of Big Industrial Machines

Huge industrial machines are being mounted on rubber springs to absorb shock and vibration. They are not mere pads, but real springs made of specially compounded rubber. Great punch presses delivering blows to their foundations of twenty-five to thirty-five per cent of their own weight are cushioned on these rubber springs and ninety per cent of their impact on the floor is absorbed by the rubber. New methods of bonding rubber on metal also permit the use of rubber-covered metal springs.

Tarnishproof "Skin" for Metal Protects Color and Polish

To protect metal surfaces from tarnish or rust and to preserve their true color, a transparent seal has been developed. It forms a film over the metal and keeps it bright. Intended for use instead of lacquers, varnishes and paints, it can be applied to streamline trains or airplanes, boats, tools, kitchen equipment, machinery and similar products.



Dressing a streamliner in transparent film which preserves shiny appearance of metal

Von Schuder mit G. Bly. 6090 Racine, Wis.

406 S. Grand Ave. Los Angeles

Manufacturers Products Co. 406 S. Grand Ave. Los Angeles

Chicago metal & allied products 510 N. Dearborn

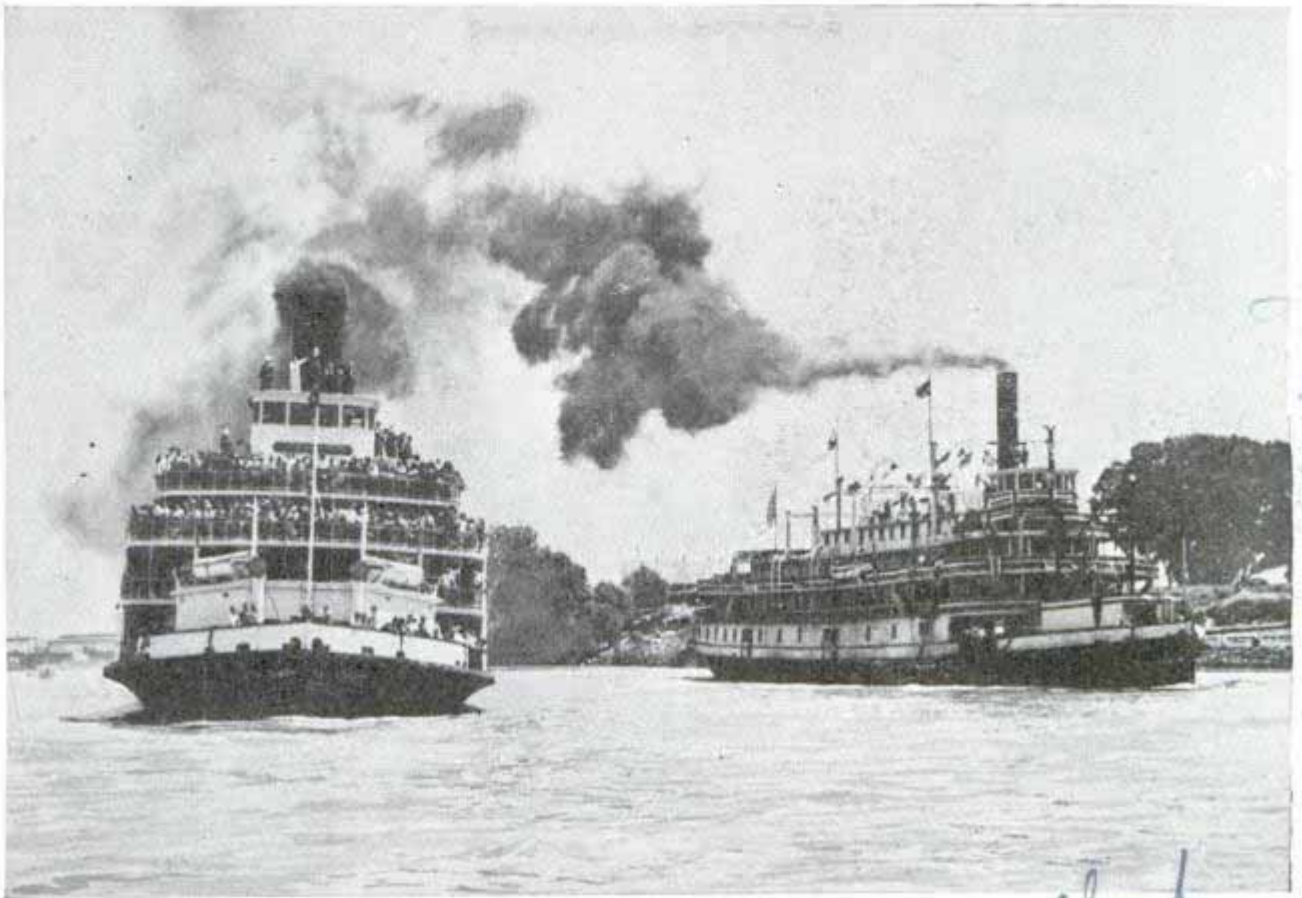
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Manufacturers Products Co. 1406 S. Grand Ave. Los Angeles

11-995

Old Rivalry Is Revived in Race of River Boats



It wasn't exactly an even race because one boat was loaded with passengers and the other carried only its crew, so they called it a draw when "Delta Queen" finished a length behind the "Port of Stockton"

club.

Reminiscent of early days on the Sacramento river, two passenger boats revived old-time rivalry recently in a twenty-six mile race from Sacramento to the Freeport bridge and return. At the end of two hours and forty-five minutes the two river boats

crossed the finish line a length apart, "Port of Stockton" leading the blunt-nosed, paddle-sweeper "Delta Queen." The latter, however, carried 1,000 passengers and the former was unencumbered so the judges called it a draw.

H 806

"Tourist" Trailer for Youngsters Is Towed by a Tricycle

Touring the seashore at Venice, Calif., is a streamline trailer towed by a streamline tricycle. Tiny as it is, the miniature trailer is big enough for two little girls to "keep house" in as they play on the beach. Their grandfather built the two-wheel trailer.



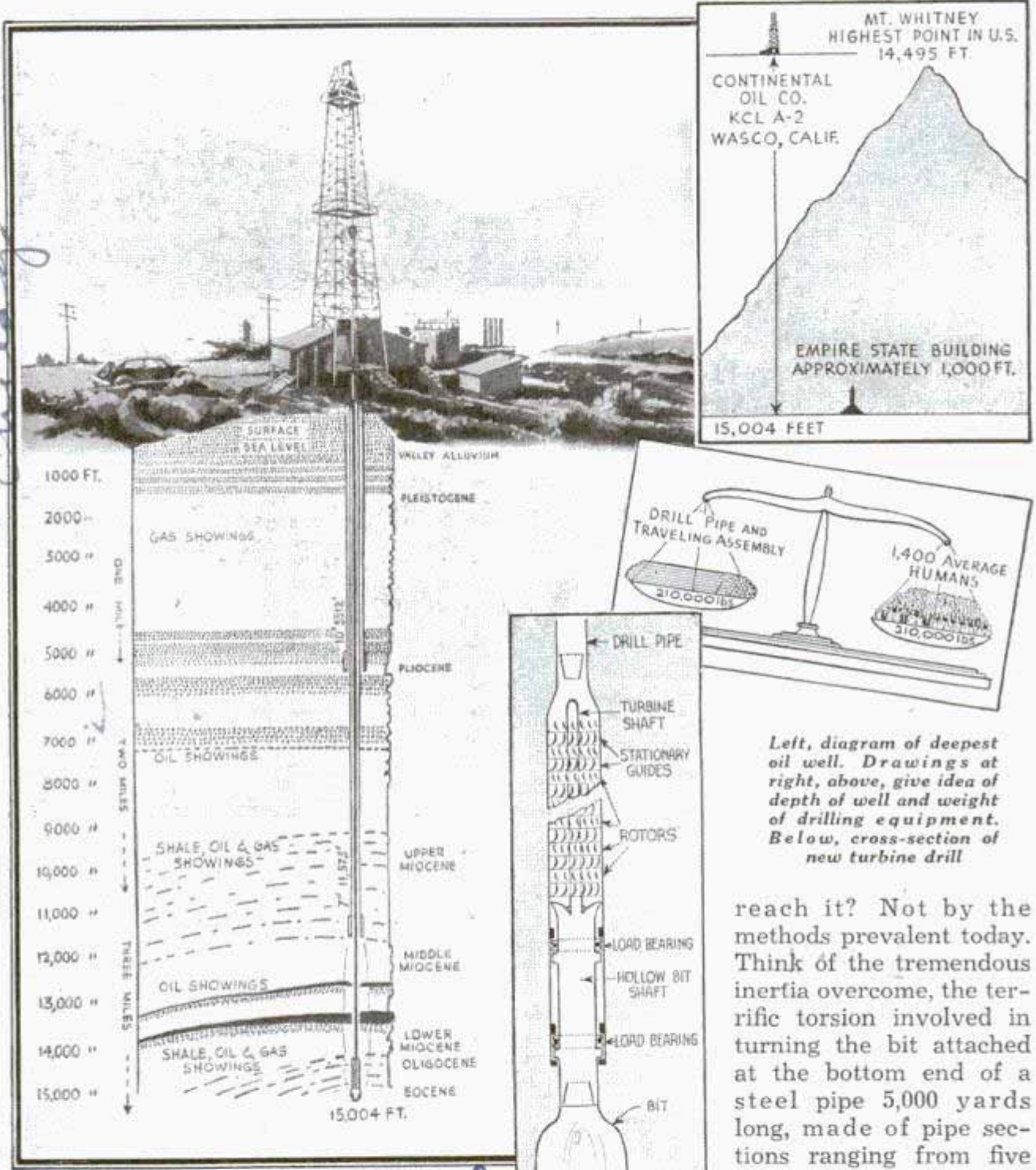
Two sisters tour a California beach with a tricycle and a miniature trailer built by their grandfather

*aim
Ely
Sisters, Elaine
and Shirley, Venice, Calif.*

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New Drills Promise to Bore Miles into Earth

R. W. Small, 1888 Delaware St.



Continental Oil Co

Fresh from the achievement of sinking a bit by traditional methods to a record depth of 15,004 feet in the earth, engineers are working today with revolutionary types of drills that may bore oil wells miles deep. Deepest hole in the earth is the one which was completed last April near Wasco, Calif.; yet seismographic studies indicate there is oil thirty-five miles down in the crust of the earth. How can man ever

reach it? Not by the methods prevalent today. Think of the tremendous inertia overcome, the terrific torsion involved in turning the bit attached at the bottom end of a steel pipe 5,000 yards long, made of pipe sections ranging from five and nine-sixteenths inches down to three and one-half inches, screwed together into one long rod. It is like twisting an elongated screwdriver whose tip is fitted in the slot of a screwhead some fifty city blocks away. The engineers believe they have reached a limit of drilling by the conventional method of applying power at the top of the rod; to go deeper, they must apply the power at the bit. One of the two revolutionary methods which may make over the drilling

Left, diagram of deepest oil well. Drawings at right, above, give idea of depth of well and weight of drilling equipment. Below, cross-section of new turbine drill

Francis W. Woods

Forest Patrol Radio Phone
Has 500-Mile Range

825

industry is the use of electric cable to carry power down the hole to be applied directly to the bit; this plan awaits certain refinements by the manufacturer of the equipment. The second method is the use of a twenty-five foot turbine attached to the bit. Drilling fluid impinges on rotors inside the tube and turns the bit at 600 revolutions per minute, thrice as fast as ordinary rotary drilling speed. Higher speed permits lighter weight bits and faster drilling. The fluid pressing down against the rotors develops seventy-five horsepower in normal operating conditions. On sight, it would appear that the traditional method which bored a hole nearly three miles deep in California involves a crude waste of power: imagine the twisting force required at the top of a rod weighing more than 200,000 pounds and higher than the loftiest mountain in North America! The engineers, too, must meet new problems of cave-ins and high temperatures as they bore to new depths. The Wasco well needed a steel casing weighing between 500,000 and 750,000 pounds to protect the well from caving in as it deepened. A temperature of 260 degrees was encountered long before the three-mile bottom was reached and engineers say deeper drilling will call for more heat-resistant tools.

14768

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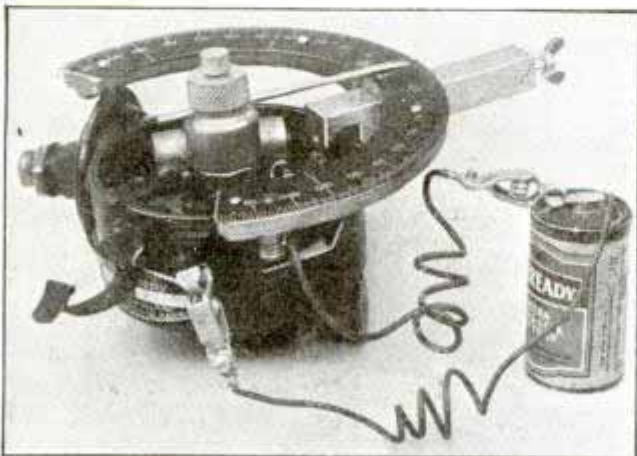


Forest rangers are aided in fighting wilderness fires by radio set built for long-range communication

engineer in charge of radio control
U.S. Forest Service
assist. radio technician

Electric Cam Angle Protractor Synchronizes Distributor

Operated by a single dry cell, a cam angle protractor for garage men takes the "ping" out of motors due to improper setting of the engines. It is used to set contact points and synchronize distributors.



Battery-operated cam angle protractor helps garage men tune engines by synchronizing distributors

Fire fighters of the U. S. Forest Service are being equipped with two-way radio sets that use the regular short waves instead of the ultra-high frequencies assigned to police squad cars, and so obtain a greater communication range than the extreme high frequencies. The transmitter sends at least twenty-five miles under adverse conditions, and in ordinary conditions can be heard 250 to 500 miles away. The antenna is a seven-foot metal fishpole costing about sixty cents. The set has high efficiency in transfer of energy from transmitter to antenna and from antenna to receiver.

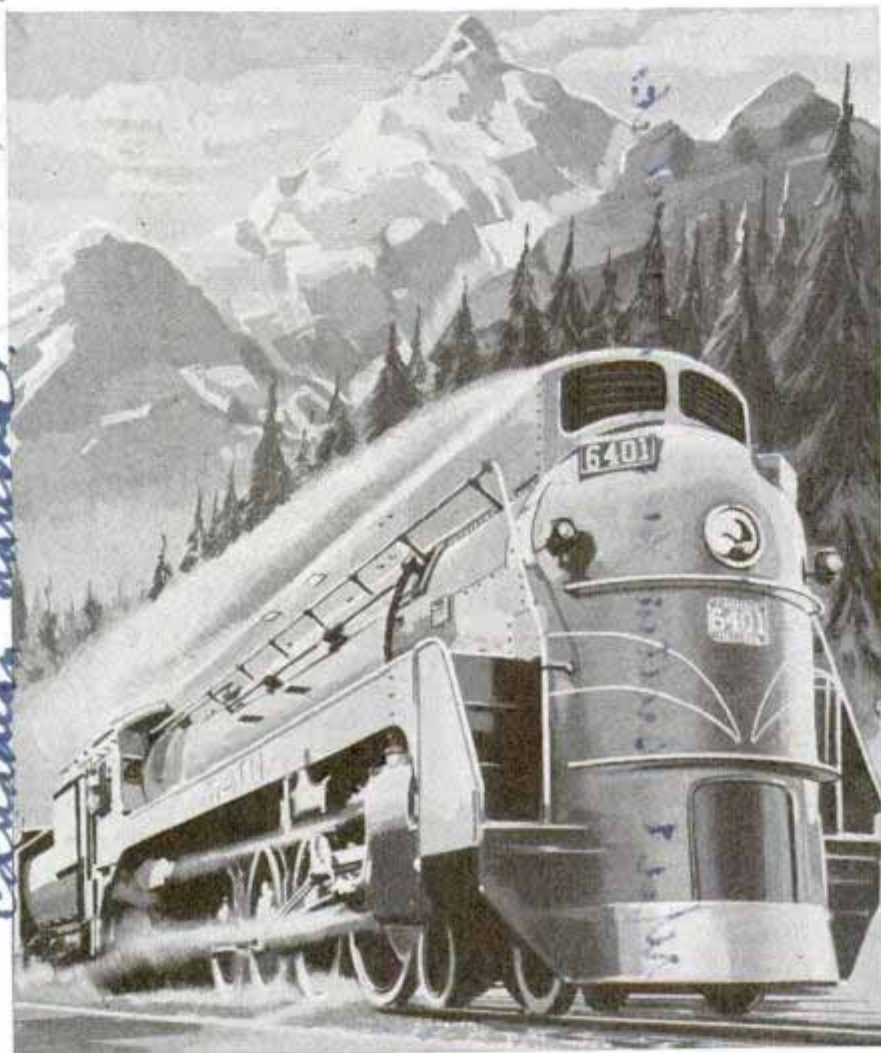
Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Lunagan ana Hoke, chie.
1638 - 40 W. Tunling Park Ave.

72594 cont. Frederick M Westcott,
Webster, NY

The ROMANCE

Continental Ltd
Canadian National



Stephenson did not invent the steam locomotive or construct the first one. But this English mine engineer who turned locomotive builder contributed much to railroading because in his "Rocket" he combined in one engine all the primary elements of a successful locomotive.

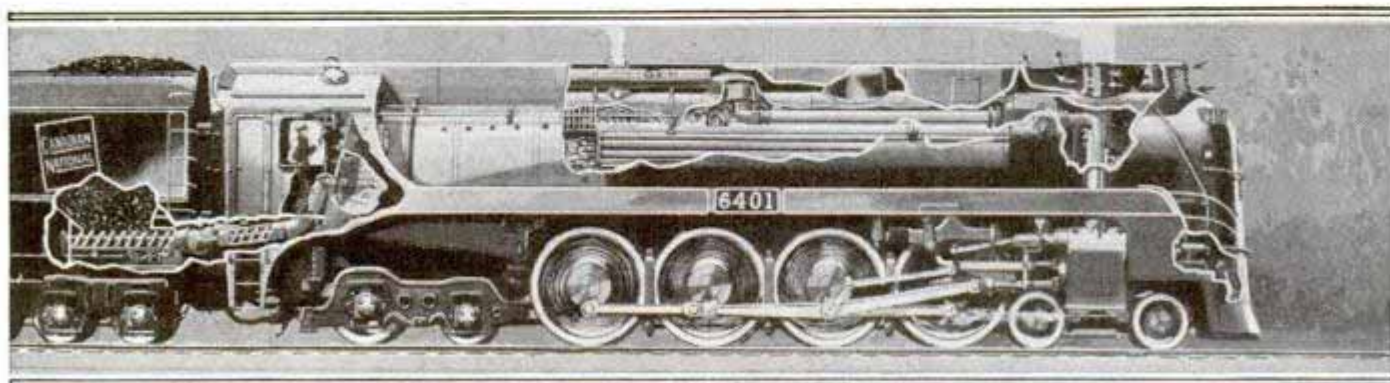
The biggest, fastest and most economical modern steam locomotives are but refined and enlarged "Rockets." Thousands of locomotives have been built since the advent of this little pacemaker, and all of them have succeeded or failed as they have adhered to, or departed from, the basic design of the "Rocket."

Stephenson's achievement is all the more remarkable because he applied knowledge which had been available to

STEAM power, ruler of the rails for more than a century, today is being challenged by Diesel. Basically, this struggle for supremacy is a contest between the internal combustion engine and the principles which George Stephenson embodied in the "Rocket" more than 100 years ago.

others for years. Long before the Christian era, Hero of Alexandria wrote of the expansive force of steam and described most of the basic elements of a steam engine. But it was not until late in the seventeenth century that steam was put to work.

At that time Thomas Savery, an Eng-

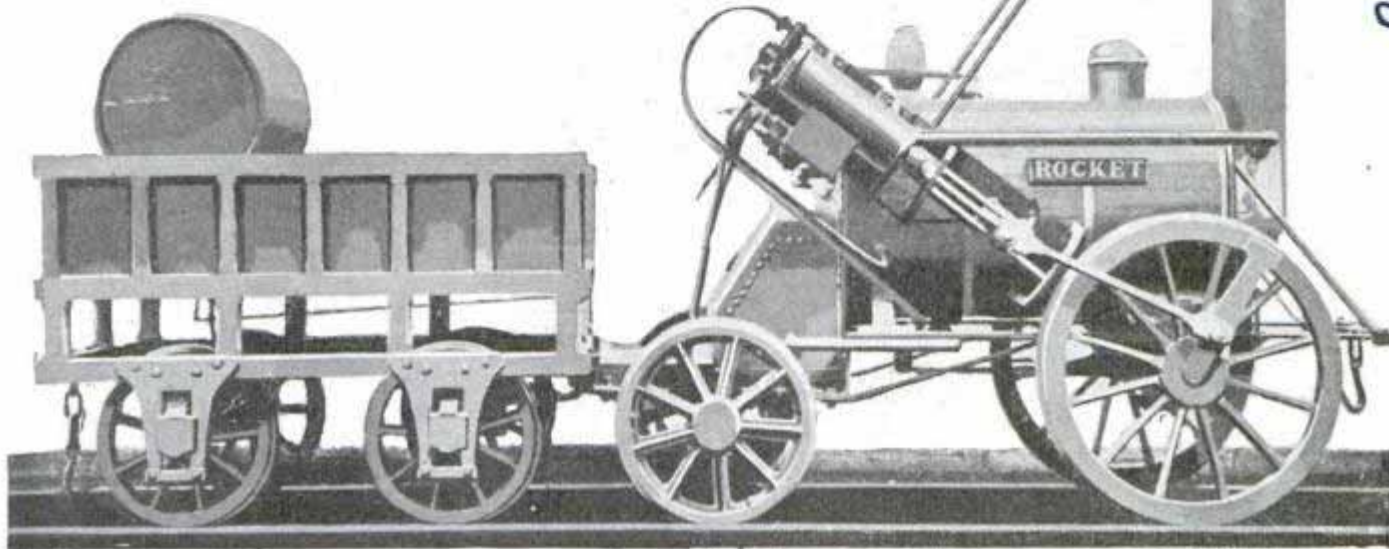


Action shot and cross-sectional view of modified streamliner of the Canadian National Railways. It is more than ninety-four feet long. Note automatic stoker

of the LOCOMOTIVE

lishman, made a steam-operated device to raise water from coal mines, a task previously performed by horsepower. It embodied none of the elements of the steam engine, however. Its sole application was in moving water and it is used today in about the same form.

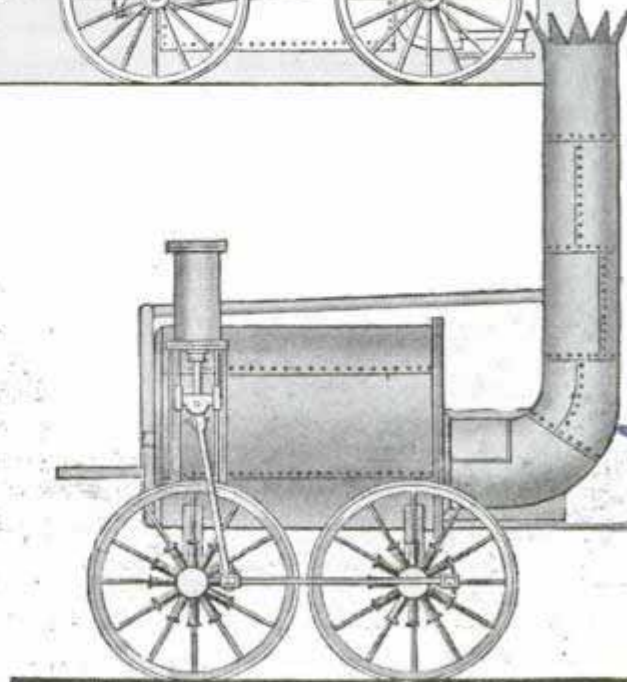
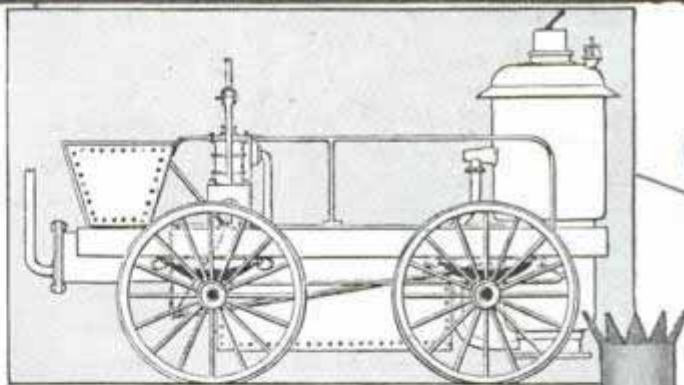
Stephenson's "Rocket," forerunner of the modern locomotive, and two of her unsuccessful competitors, the "Novelty" and "Sanspareil"



A few years later, Thomas Newcomen, an English blacksmith, built a steam engine operated by atmospheric pressure. His idea was to produce a vacuum on one side of a piston in a cylinder, utilizing the air pressure on the other side to do the work. He accomplished this by filling the space below the piston in an upright cylinder with low-pressure steam which was condensed by injecting cold water.

Newcomen's engine had a twenty-inch cylinder nearly eight feet long. It made twelve strokes per minute and was used to lift water from a coal mine, raising fifty gallons per minute from a depth of 156 feet. Early engines of this sort were used and gave good service until quite recent times.

It has been claimed that a boy was hired to operate the valves of Newcomen's engine. The lad was lazy, so the story goes, and devised a system of ropes to do the work for him. A copper-plate engraving of the engine, however, shows the valves were operated by mechanically actuated tappets.



1829
Braithwaite and Ericsson

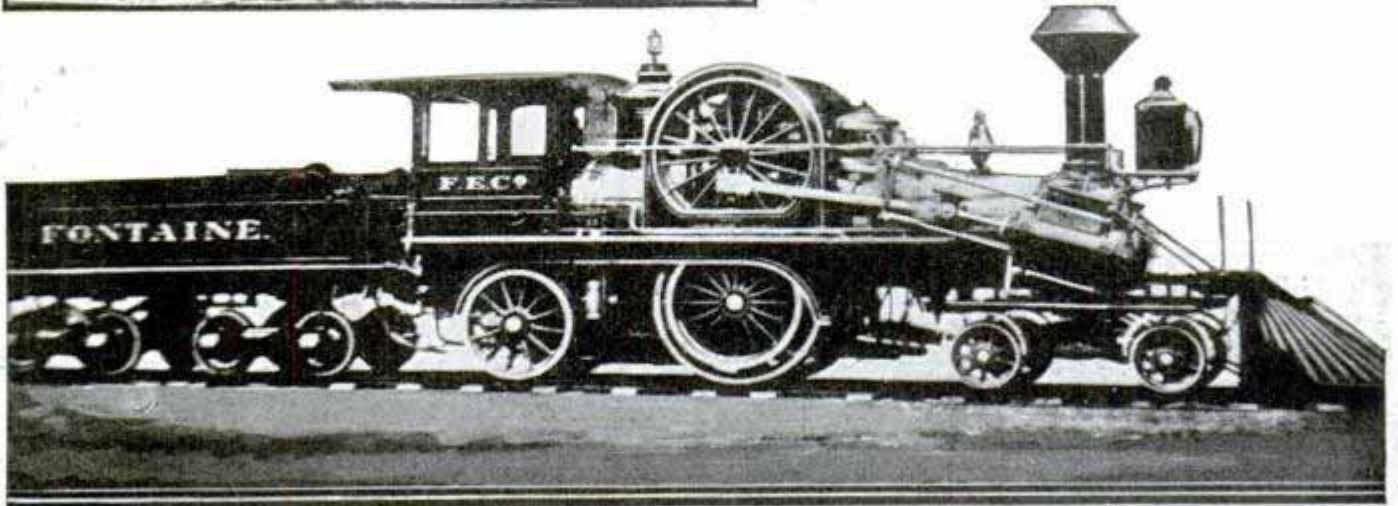
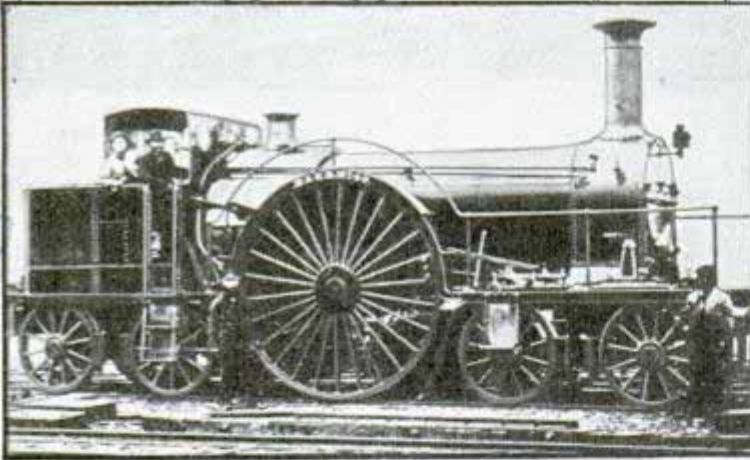
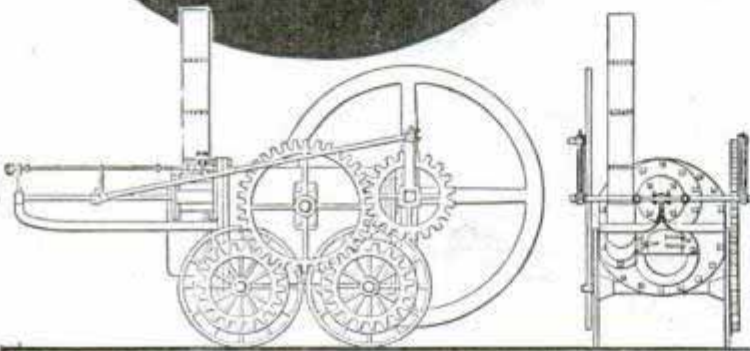
Hacheco
1829



Another myth is that James Watt conceived the idea for his steam engine after watching steam raise the lid of a teakettle. Watt examined one of Newcomen's engines and from it got the idea for increasing the steam pressure to a point greater than atmospheric pressure and making the steam do the work, then condensing the exhaust steam in a separate vessel. Watt contributed much to human progress but little to the locomotive. His ponderous, slow-moving engines worked at pressures little above that of the atmosphere.

The first real attempt at steam locomotion was made, not upon one of the many mine tramways then in use, but on a country road. A French military engineer, Nicholas Joseph Cugnot, built a steam-propelled gun carriage which carried four passengers at two and one-fourth miles an hour. News of this invention eventually reached Richard Trevithick, a talented, ingenious Englishman who has been called the "father of the locomotive."

Trevithick, convinced that Watt's system of low pressure and condensation could be improved upon, had designed and built engines and boilers, some of which used the then unprecedented pressure of 145 pounds per square inch. He had discussed the steam-propelled gun carriage with a friend and this friend, sensing the possibilities, made a bet of 500 guineas that ten tons of iron could



Richard Trevithick and his "Tram Wagon," first steam-propelled locomotive to run on rails. Bottom, Pearson's "Bogie Tank" and the "Fontaine" which had speed, but little else

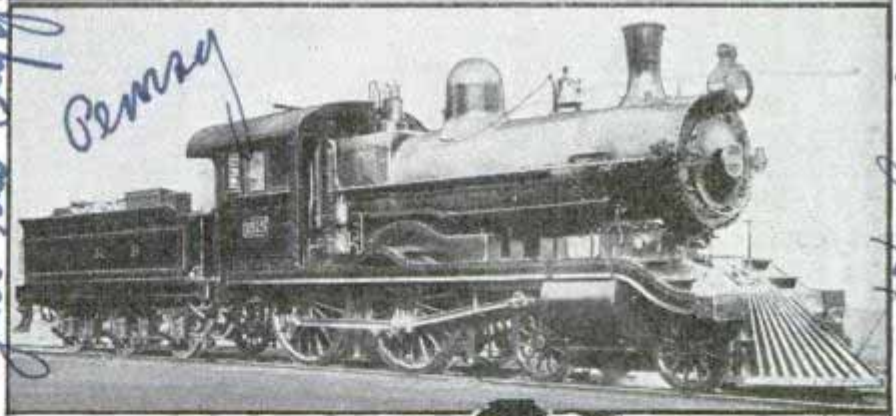
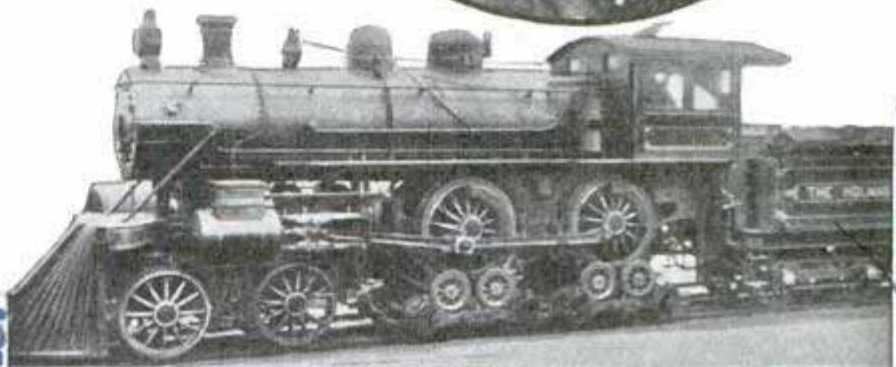
Crampton



be hauled nine and three-fourths miles by steam power alone. Then he asked the inventor to help win the bet.

In trying to aid his friend, Trevithick built his "tram wagon," a steam engine and five cars or "wagons" to be operated over a mine tramway. The test was made in 1804. Ten tons of iron and seventy men were hauled over the distance specified in four hours and five minutes. The engine attained a speed of five miles an hour but was delayed, Trevithick wrote, because "we had to cut down some trees and

(Continued to page 135A)

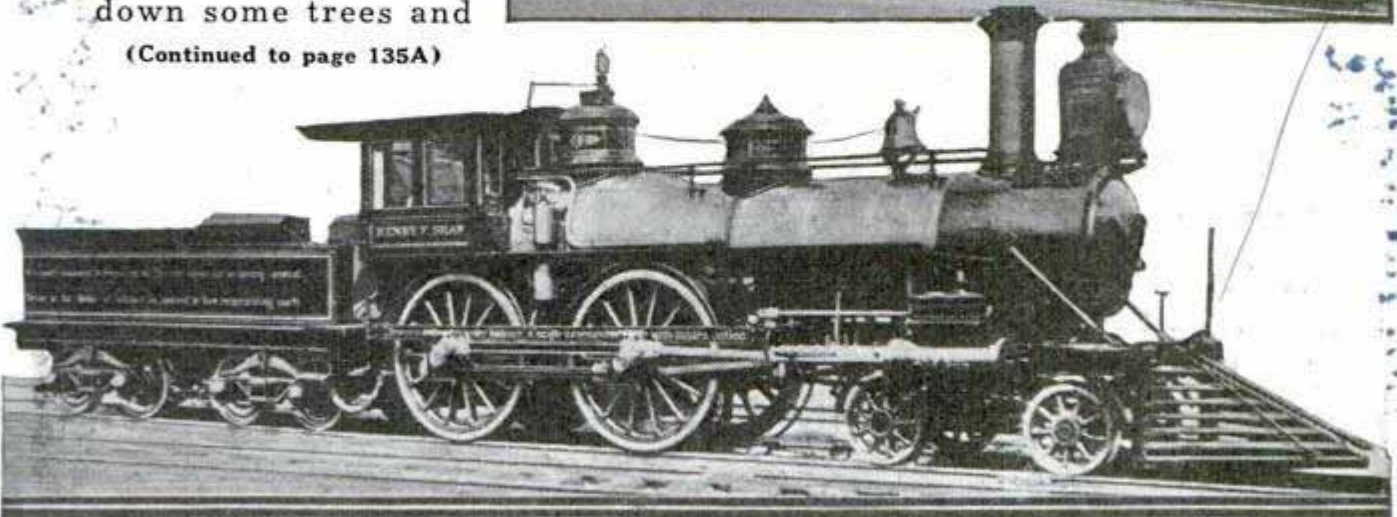


Pemsey

Just the Crampton

Stephenson

Hydraulic



Stephenson and some unsuccessful locomotives which did not follow principles of his "Rocket." Top to bottom, a "Crampton," the "Speeding Truck," compound engine and so-called "balanced" locomotive

Canalen and Anby

72594

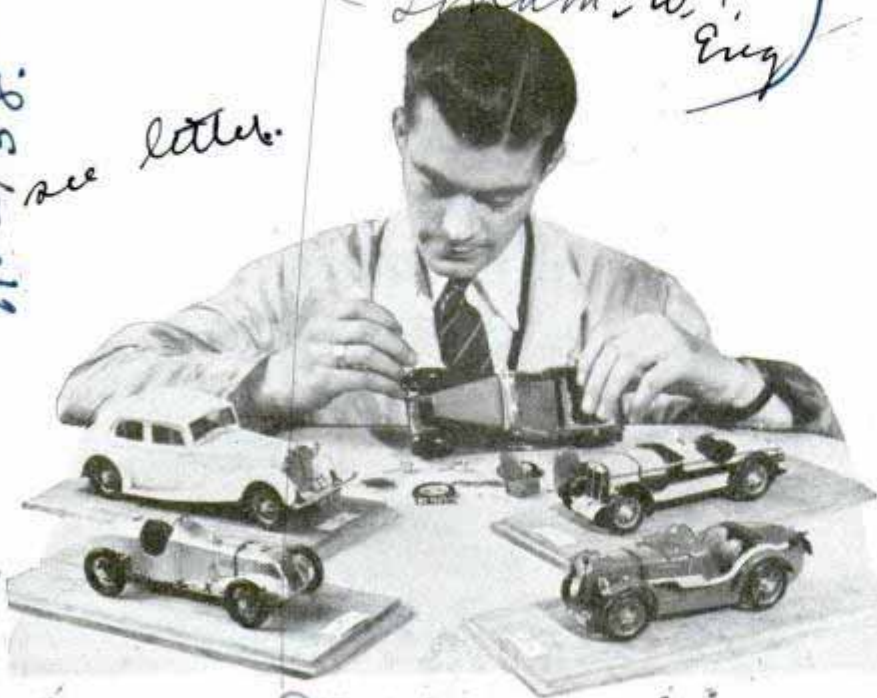
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Auto Racer Turns to Models First for Fun, Then Business

Revell - Glanes
and March Ltd.

28 Berkeley St.
London, W. 1.
Eng

March models Ltd.
discontinued.
9/22/38.
see letter.



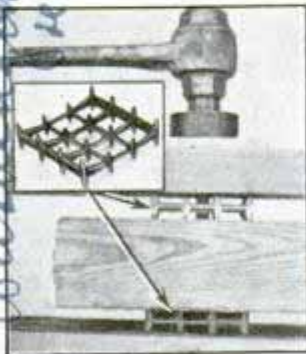
© Planet News, Ltd.

These miniatures, built to scale from photographs and drawings of real automobiles, are produced by a company formed by one-time racing driver

reduces the sizes, and thus the weight and cost, of members required to carry a given load. Made from malleable iron or sheet steel, the connectors come in various sizes and shapes. A spiked grid connector, shaped in the form of a grid, has sixteen sharp spikes projecting from each face. It is placed between timbers to be connected and is embedded in the wood by high pressure to such an extent that the grid is not visible when the joint has been completed, virtually making the joined timbers as strong as if in one piece. Pressure can be applied by means of a special bolt and wrench arrangement or by a hydraulic jack.

Once a mechanic in a racing-car factory and later a racing driver himself, the English Duke of Richmond and Gordon started making miniature automobiles as a hobby in his spare time. Finding a good market for scale models, he started building them as a business. The company turns out exact copies made from photographs and drawings of the original cars, and builds all kinds of models for manufacturers.

Wood Buildings Made Stronger by Timber Connectors

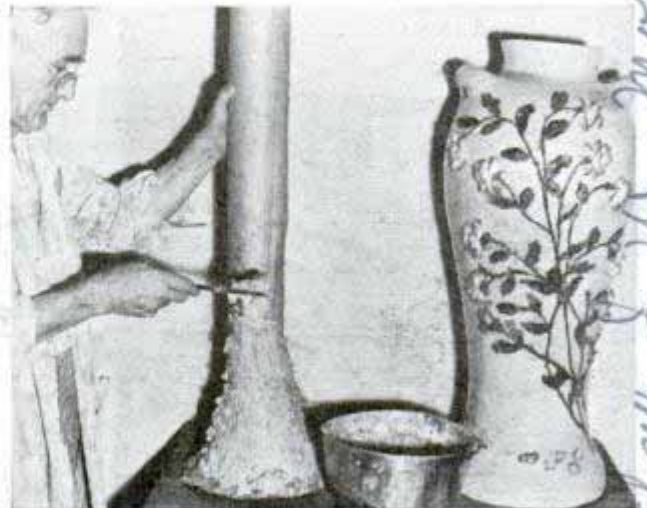


Increasing the load-bearing capacity of wooden structures from fifty to 100 per cent by strengthening the joints, simple timber connectors are creating a new designing technique, making it possible for architects to use inexpensive timbers in many places where it formerly was thought necessary to specify steel. Use of the connectors also

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"Clay" Made from Newspapers Is Molded into Pottery

Old newspapers are transformed into pretty vases by a secret process just patented. The inventor strips the waste paper into shreds and treats the pulp chemically, turning it into a plastic, lightweight "clay." From this he shapes vases, plaques and similar bric-a-brac that are described as virtually unbreakable when dry. Ornamental designs such as the flowers on the



Even the flowers on this "paper" vase are shaped from clay made of chemically treated waste paper

Timber Engineering Co. N.W.
1337 Connecticut Ave. N.W.
17783

W. Morgan
714 St. Albans
W. 11

see June 1941
10-1941

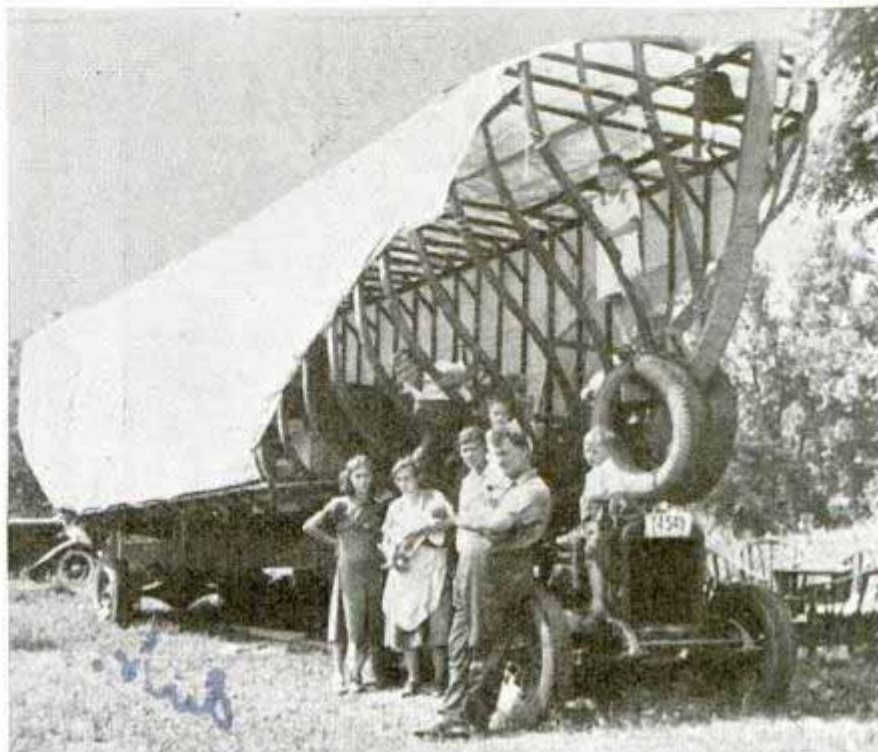
vase pictured here are finger-shaped from the clay. Such a vase weighs less than half as much as a similar ceramic clay piece. The clay is ninety per cent paper.

HP 32

Family Tours in Boat Frame Made into a Covered Wagon

Engineer's Drawing Projected on Desk from Microfilm

Engineering plans of a Detroit company are all reduced for storage and record purposes to photographic films, a drawing thirty-three by forty-four inches occupying a single frame of thirty-five-millimeter film. To make this miniature film readily available for the engineer's use, a special projection desk was developed. When he wants to consult a certain drawing, the engineer inserts the negative in the desk, depresses a foot treadle and views the drawing, illuminated, at its full original size.



Forty-foot boat frame is home for family of ten crossing states; when they reach Pacific, boat will be completed to take them to new Alaska home.

In a sea-going "covered wagon" a family of ten is headed from Richmond, Va., for Alaska in search of a new home. Across the states their boat rides the truck; up the coast to Alaska the truck will ride the boat. Head of this migrating family is an unemployed iron welder. With his wife and eight children ranging from a few weeks to seventeen years old he lives in a traveling home made in the canvas-covered skeleton of a boat. The frame is of iron, forty feet long, eight feet wide and twelve and one-half feet high. He drives from within, controlling brakes, transmission and accelerator with cables and levers. The car can make forty miles an hour.

Non-Petroleum "Oil" for Rubber Stops Chassis Squeaks

Chemists have developed a non-petroleum lubricant which takes the squeak out of rubber parts or metal-to-metal chassis bearings of automobiles and trucks. The new product resulted from a search for a lubricant harmless to rubber. It is not intended for use in crankcase or transmission nor where it would come in contact with the car body finish.



Engineer's plans reduced to thirty-five-millimeter film for storage are projected full size on this desk

Recordak Corp. 350 Madison Ave

Neufel

Paul Sakko
to rings
L. D. du Pont de Nemours & Co.
Washington, D.C.

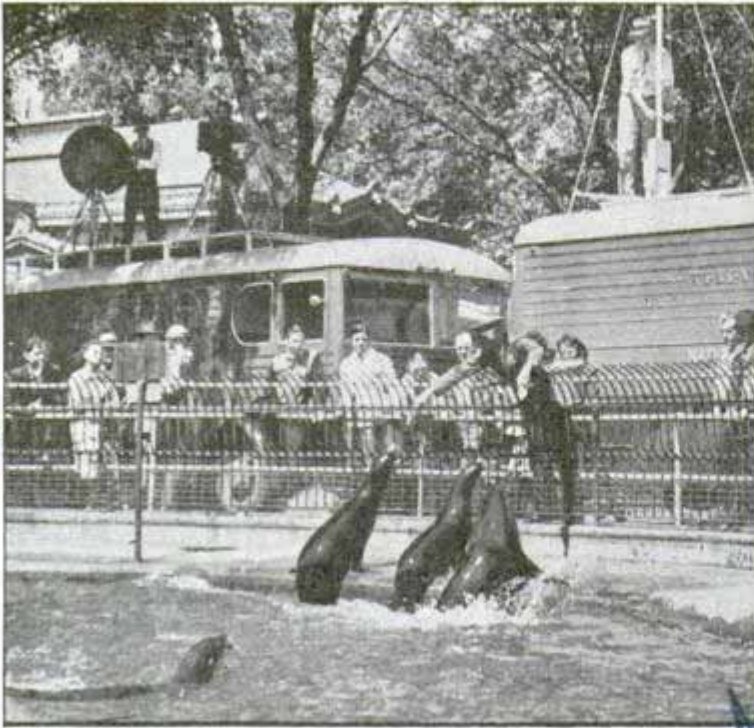
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Clrel

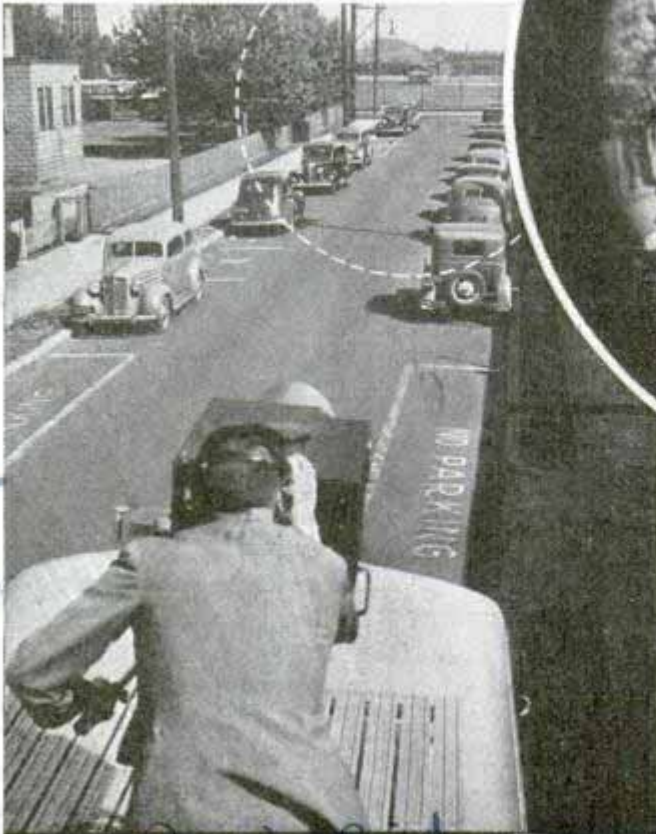
made in U.S.A.

camera technician
R. W. Richard
Television field supervisor
Harold P. Lee

Television Goes on Road in Twin Van Studio



Television has gone on the road. A mobile studio, two ten-ton motor vans containing pick-up and transmitting apparatus, is bringing television through experimental stages to reality: "shooting" outdoor events, sending picture and sound to New York NBC transmitter. Above at left, camera and parabolic "mike" on left truck pick up zoo scene; collapsible antenna on companion van is being erected at right



At left, the iconoscope camera technician focuses television eye from catwalk atop mobile studio. In circle above is the scene he recorded as it appeared on distant viewing screen. Truck housing pick-up equipment includes also a control room where engineers see picture transmitted. Second van is connected to first by 500 feet of coaxial cable when in operation, and houses all the apparatus for transmitting picture and accompanying sound on frequency of 177,000 kilocycles to television studio of NBC atop Empire State building, from which program is rebroadcast

R. W. Richard

National Broadcasting
Co., 30 Rockefeller
Plaza New York

Empire State Building
NBC
New York

collapsible antenna
pick-up truck

Kinoscope

H 5/5. 22. St. Brown Editorial Service Sept.

PICTURE YOUR PETS

Eastman Kodak Co. Rochester NY

Character study of cat portrays lordliness; pony picture will be cherished in family album. Alert pose of dog adds much to snapshot against sky



STALK that new litter of kittens, ambush them with your camera. Trap your pup or pony for the family album. Shoot those rabbits with a lens. If there are pets in the family, they belong in a snapshot book of their own.

Photo-cartoons of sad-eyed bloodhounds, tough-mugged bulldogs, playful or disdainful cats and laughing horses earn places in the roto pages every day. And portraits of pets, humorous shots, "play" pictures of the antics of both pets and children, all these should be earning places in the family history book.

With some pets, particularly those that have silky or woolly coats, you can experiment with lighting effects. With any pet that is active, you can find opportunity for "story telling" pictures. Animals with a definite character—whether lordly Persian cats or wistful-eyed nondescript mongrel dogs—are splendid material for





experiments in portraiture. A clever picture book may be built around one pet, around a group of pets, around an unusual friendship between two pets, or the companionship between a child and a dog, pony, or other animal friend. Such albums can include both humor and sentiment, and titles suggest their possibilities. "Travels of a Dog," "The Troubles of Pedro the Pup," "Kitten on Tour," "Whiskers: The

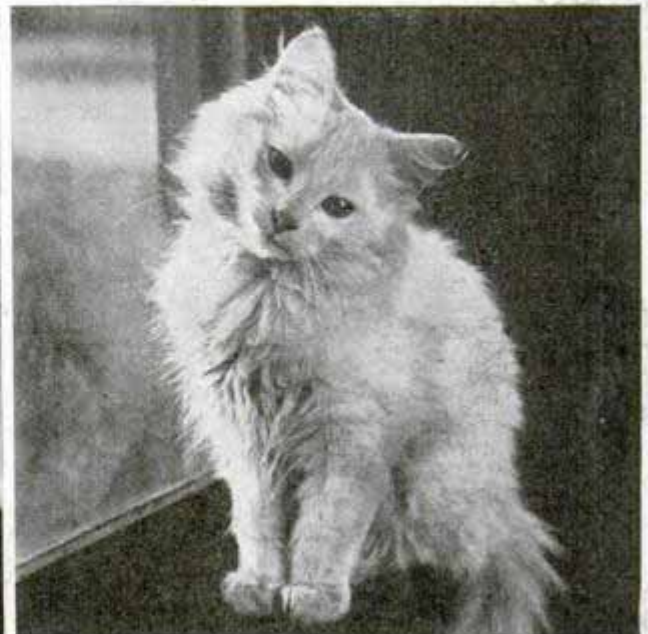
Biography of a Cat," and "Pony Girl" are a few titles that tease the imagination—you can think of others to fit the "scenario" of your own pets.

Children delight in being pictured with their pets and few gifts are more acceptable to a child than an attractive picture book built around that association. Keep a picture record of your daughter's summer fun with her pony, or your son's excursions with his dog, and the children will have something to treasure for years.

The majority of pet pictures should be close-ups. Restlessness of a pet may bother you at first, but you quickly learn to anticipate the moves, and to catch an interesting bit of action or expression in a flash.

Any camera can be used. However, you are less limited if you have a fast lens and speedy shutter, permitting a higher shutter speed when the pet is active and moving and a large lens opening when light is bad. The better cameras also have focusing adjustments which enable you to make close-ups of pets without placing a portrait attachment over the lens.

In taking close-up pictures, accurate judgment of distance from camera to sub-



Youngster and pup are caught experimenting in humorous shot at top. Silhouette tells story of comrades, while cat picture is "made" by tilt of head, lighting, and dark background

ject is necessary. There is less "depth of field" or range of sharpness when a camera is close to the subject and if you err, the subject will appear fuzzy and out of focus in your picture. The best practice is to select a standard distance for close-ups—say, three and one-half or four feet for smaller pets—and train your eye to judge this distance accurately.

For increased depth, use as small a lens opening as the light will permit. An extremely small lens opening, with high shutter speeds, will give you underexposed pictures; but in good sunlight, if the pet is reasonably still, f.8 and $\frac{1}{50}$ second, or f.11 and $\frac{1}{25}$ second will yield good negatives.

Alertness and the ability to snap a picture the moment an opportunity appears, are factors that make for appealing animal snapshots. Expressions are fleeting and often the momentary cock of an ear, loll of a tongue, gleam of interest in an eye, give the added "spark" that lifts a



picture out of the "ordinary" class. Learn to recognize the small points that add liveliness and meaning to the picture—and train yourself to snap the shutter before opportunity passes.

Look for story-telling picture chances but don't pass up an expression or bit of action because a "picture idea" is not im-

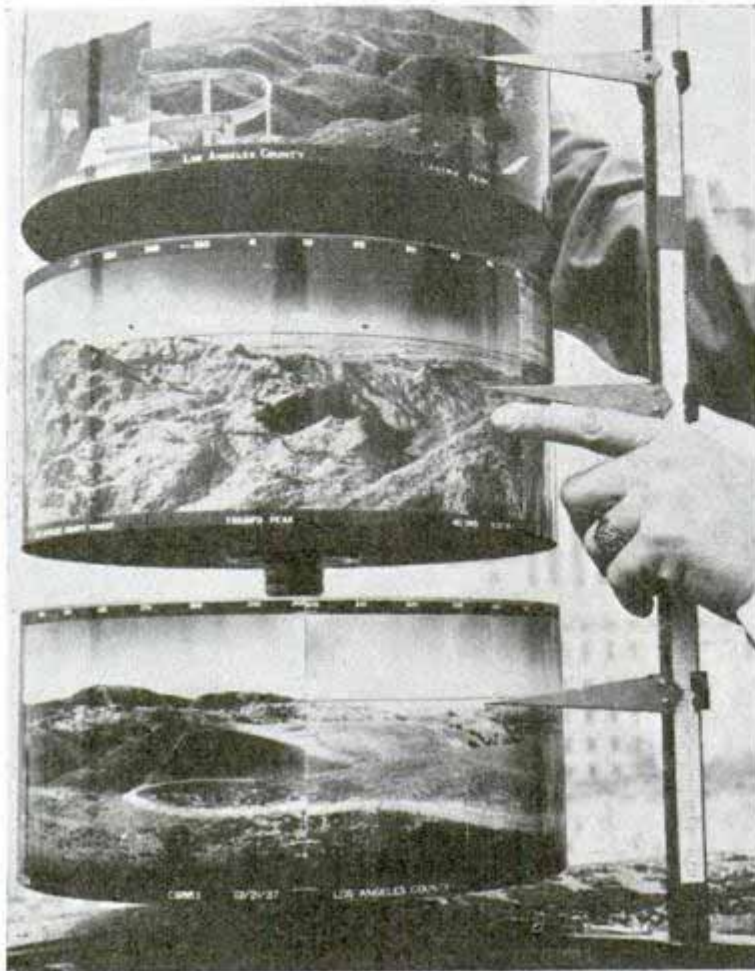
(Continued to page 114A)



There's always action—comedy, too, in dog's bath. Snapshot of child with pigeons is easily made and appealing. Contrast between baby and dog makes "luncheon for two" effective

Rotary Fire-Finder's Photos Help Spot Flames in Forest

San Bernardino National Forest



Pointing to fire-finder. Note photos mounted on rollers so they may be revolved in locating a forest blaze

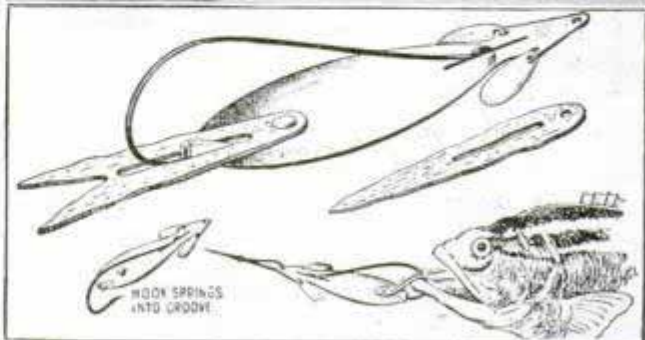
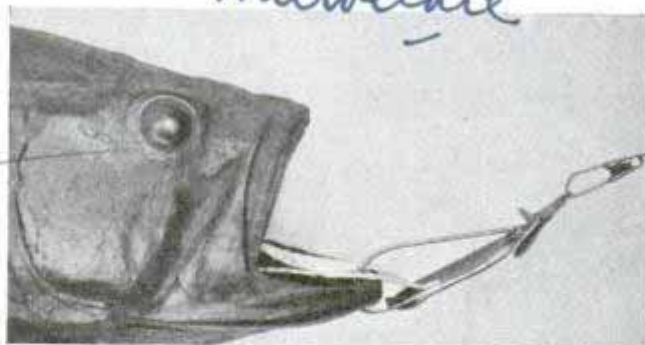
By consulting photographs mounted on rollers, forest lookouts now may spot fires by pointing a finger at the pictured location. They employ a rotary fire-finder invented by a California forestry officer. It consists of a rack containing panoramic pictures taken from four different towers whose coverages are composite. Four adjustable pointers, one for each drum, indicate both the direction and elevation of a fire anywhere in the district.

tive spiral bi-metallic thermostatic element operates the valve, and once the adjustment handle—located conveniently outside the valve—is set for the right temperature, the water is exactly mixed. Water pressure and variation in the hot or cold supply do not affect its operation.

Weedless Fishing Lure Has Barbless Hook

Fully weedless and equipped with a barbless hook, a new lure is available for the fisherman. No wire weed guard is used. The hook is directed downward, its sharp point resting in a protecting pocket which is pressed out of its main metal body. The fish does not have to bite up and above the whole body of the lure. A slight snap at its rear portion forces the hook down and through the cartilage of the lower jaw and resprings into its protecting pocket, thus forming a closed loop from which the fish cannot free itself. The lure is a lifelike wiggler, with two teardrop spinners which strikingly resemble the actions of gills and front fins of a live minnow.

marvelous



Barbless and weedless fish lure. Above, how lure catches the fish and holds it

Tempering Valve Mixes Water to Desired Temperature



Steady flow of water at any desired temperature is assured by a thermostatic tempering valve. An extremely sensi-

12824
All Heat Utilities Co.
118 E 28th New York

Advance Lures Co.
2847 Milwaukee Ave

Paris Sees "Loch Ness Monsters" on Parade



Parisians are "seeing things" on the Seine. Fantastic creatures of the sea parade in a river carnival planned as part of the entertainment for King and Queen of England during their visit to France

Monsters of the sea seldom get to Paris, but this year Parisians watched a whole school of "Loch Ness monsters" on the

Seine. The parade was arranged as part of a river carnival in honor of the state visit by the British king and queen to France.

4826 Bike Trailer Hauls Surfboard from Home to Seashore

Getting his heavy surfboard from his home to the beach more than a mile away was simplified by a California youth who hitched a trailer to his bicycle. It was built of two rubber-tired wheels from a discarded toy wagon, a ten-foot length of narrow board, and a strap-iron gooseneck to hook on the saddle of the bicycle. Even with the weight of the surfboard, it rolls easily.



Living some distance from the beach, this Californian built a trailer to haul his heavy surfboard behind his bicycle

Chester Orrell Newport Beach Calif

H 762

Handle for Miniature Camera Helps Steady the Grip

\$1.00 per pend

*Mini camera 1309 Third St
St. Petersburg Fla*



Handle screwed into tripod socket of miniature camera is attached at other end of neck strap

Miniature camera fans find it possible to steady the camera by using a special handle which screws into the tripod socket. Shaped to fit the hand, it is attached to a neck strap and can be carried conveniently around the neck or in the pocket.

Engine Uses Half Its Power to Buck Wind at Seventy

*New Service Bureau
1327 49th St. Dayton
Ohio*

Streamlining in automobiles was the artist's idea—not the engineer's. It began with the search for more graceful lines, not with the intent to save power. Air resistance didn't mean much when cars were driven at a top speed of around forty-five miles an hour, but at the high speeds prevalent today streamlining is "first aid" to the motor. In the conventional automobile running at seventy miles an hour, about half the indicated engine output is used to overcome air resistance! Streamlining is no new discovery. It was put to work long before the modern airplane brought it to sudden perfection. As early as forty years ago railroads in France and England fitted their locomotives with wind-cleaving devices such as conical boiler fronts and V-shaped cabs, some of which have sur-

vived. Scientific streamlining, however, only reached the railroads within the last five years. Wind-tunnel tests on model locomotives at Ottawa, Ont., indicated a forty-three per cent reduction in air resistance could be achieved if it were possible to streamline a locomotive completely, but limitations are set by the necessity for access to the running gear, interference with the draft to the firebox, and safety requirements which prevent concealing steps and handholds. The firebox draft problem is eliminated, of course, in the Diesel-electric engines. While it may seem strange that streamlining quickly reached its highest perfection in the newest industry—airplane and airship transportation—while automobiles and railroads lagged, the answer is that airplanes reached high speed long before cars and trains, and air resistance is unimportant below forty or fifty miles an hour.

Twin Propellers of Army Ship Spin in Opposite Directions

Tandem propellers are being tried on army planes on the theory that they make more efficient use of power. Mounted on concentric shafts and geared to a single engine, the two blades revolve in opposite directions. Engineers say advantages are elimination of torque and increased power without adding to propeller diameter.

*Curtis pursuit plane
at Wright field.*



More power and less torque is result of single engine driving twin propellers in opposite directions

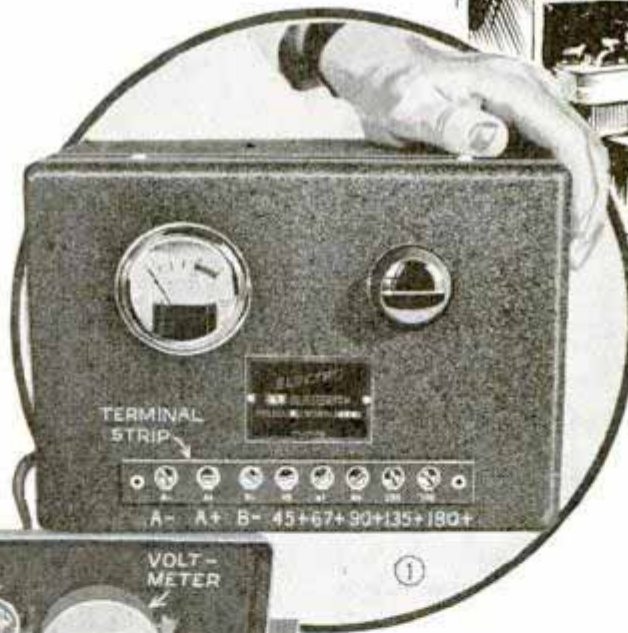
R a d i o



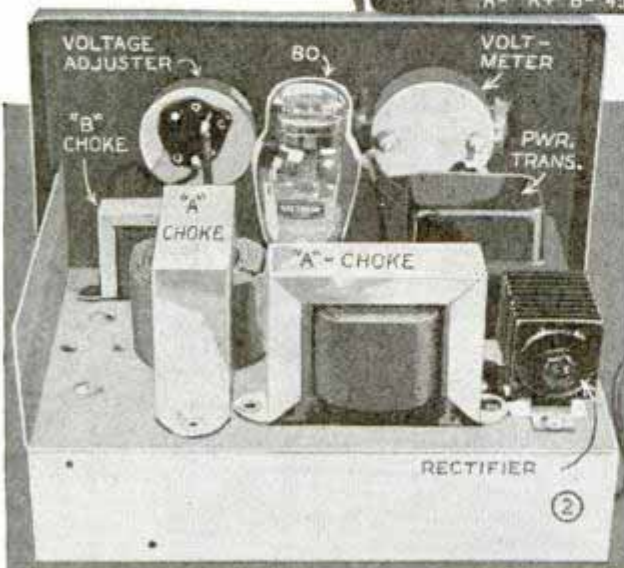
A-B Eliminator for TWO-VOLT FARM SETS

WHEN your new power line is in, radio battery expense is over. However, don't throw away your battery receiver, merely substitute a good A and B-battery eliminator specially designed to supply the same hum-free operating voltages directly from the new 110-volt a.c. line.

The unit shown in photos Figs. 1 and 2 furnishes well filtered, steady direct current for any type radio receiver which operates on 2 volts filament A supply and B-battery voltages up to a total of 180 volts, equal to that obtained from four 45-volt B-batteries. Another model recently developed provides a maximum of $3\frac{1}{4}$ amperes at 6-volts direct



current for 6-volt farm sets which employ a vibrator B-voltage supply system. The A-B eliminator unit will power any battery-operated



receiver using up to eleven tubes.

All A and B terminals are plainly marked. It is impossible to burn out the tube filaments, because a potentiometer connection limits voltage to that indicated on the voltmeter, shown at upper left in Fig. 1. The voltage-adjusting knob, right, includes switch and potentiometer, whereby first rotation movement of the knob switches power on the eliminator and further rotation increases voltage output from the A-power source.

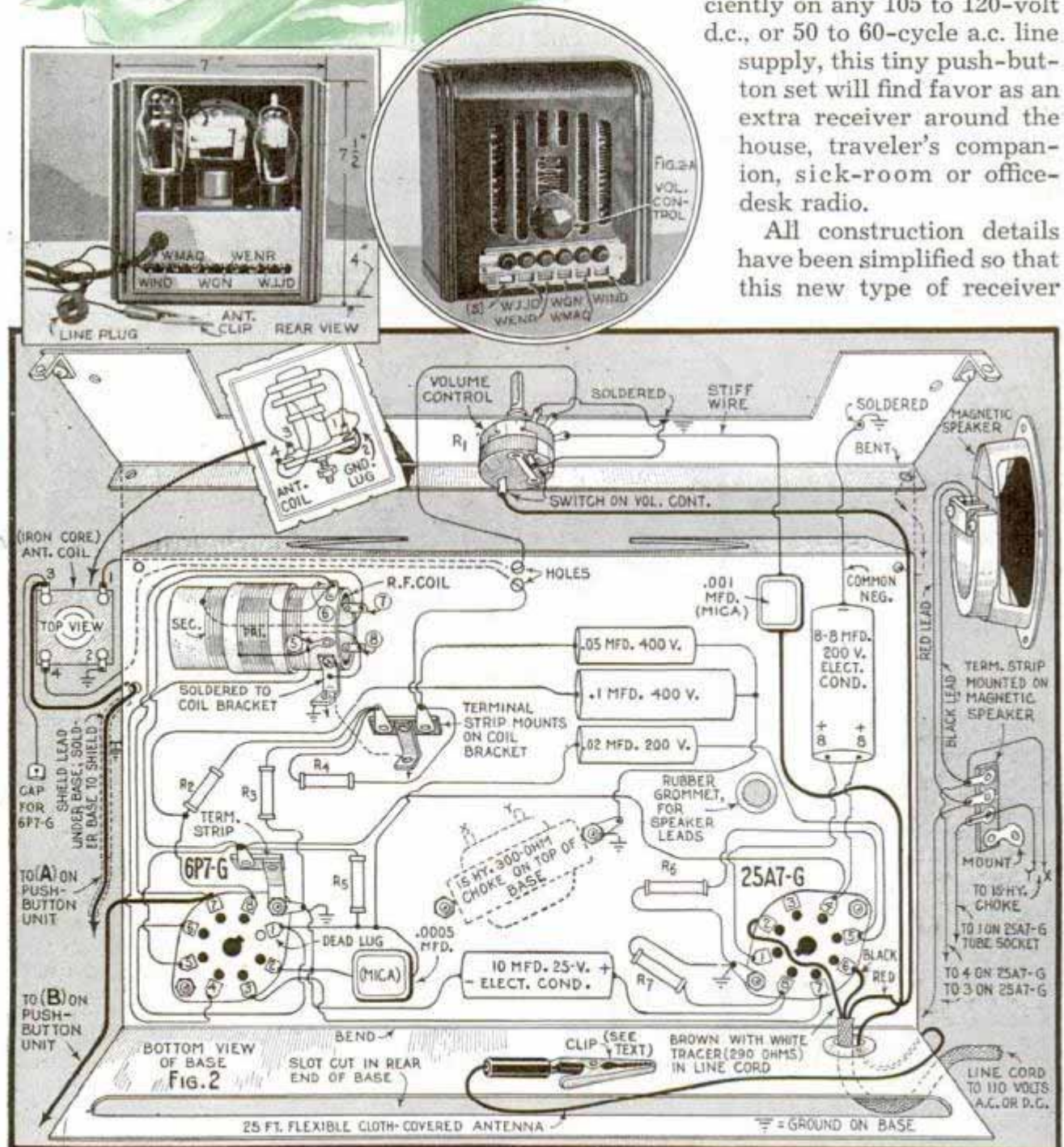
Electro Products Laboratories, Inc. Chicago 166

Portable TWO-TUBE A.C.-D.C.

By G. C. Crose

MERELY by pushing a button, any one of your five local broadcasting stations can be received with good volume and clarity on this simple and compact 2-tube receiver. Using the latest dual-function tubes, and designed to operate efficiently on any 105 to 120-volt d.c., or 50 to 60-cycle a.c. line supply, this tiny push-button set will find favor as an extra receiver around the house, traveler's companion, sick-room or office-desk radio.

All construction details have been simplified so that this new type of receiver



PUSH-BUTTON Receiver

can be assembled by any radio experimenter. It differs from the usual midget set in several respects. However, all parts are inexpensive, standard and easily obtained. The sheet-metal chassis base is detailed in Fig. 1; this base can be made in the home workshop or purchased formed and drilled.

The simplified wiring diagram, Fig. 2, shows all parts and connections under the base and also clearly indicates every lead to the speaker, volume-control, antenna coil and push-button unit. This unit comes assembled and wired ready for use, as illustrated in the photo opposite Fig. 2. It is mounted under the base, in the position shown, by means of two short machine screws through holes drilled near the small angle brackets in the separate base-supporting panel, after all of the set wiring has been completed. There are only four soldered connections to be made to the push-button unit and two of these are grounds to the metal base. Connections A and B are made to terminal lugs on top and bottom of unit, connecting the two groups of trimmer condensers in the circuit. Woven-wire metal shielding should be used on the portion of lead (A) that runs under the panel from terminal 3 on the antenna coil; this shield should be grounded on the metal base as indicated.

(Continued to page 130A)

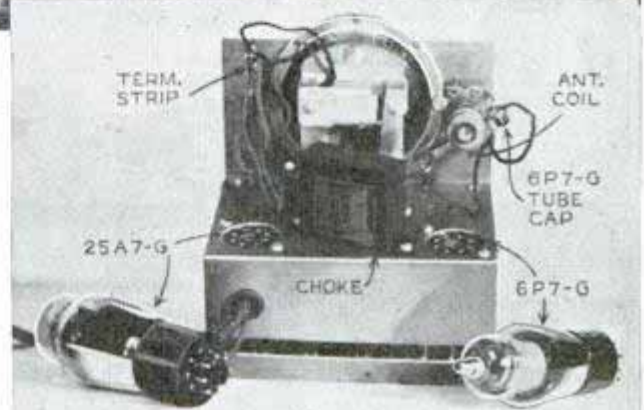


FIG. 2-B

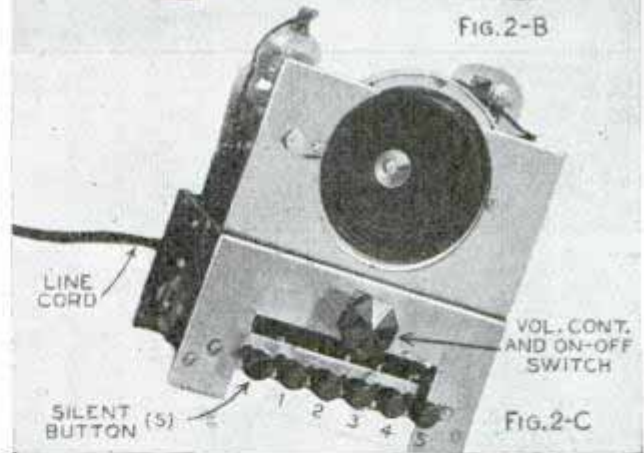


FIG. 2-C

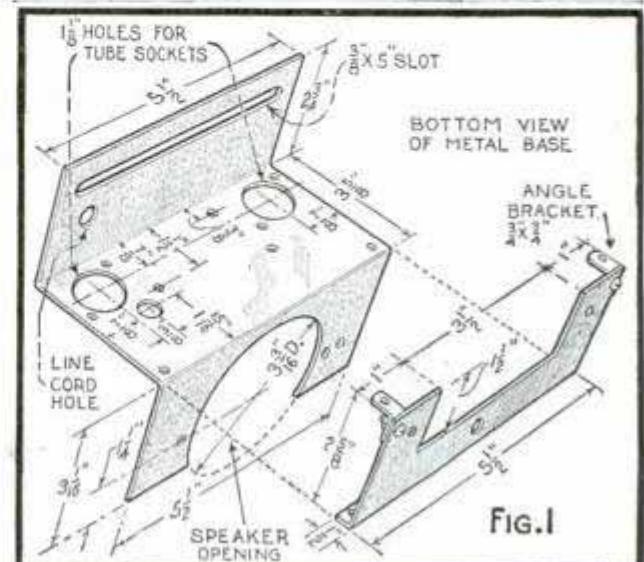
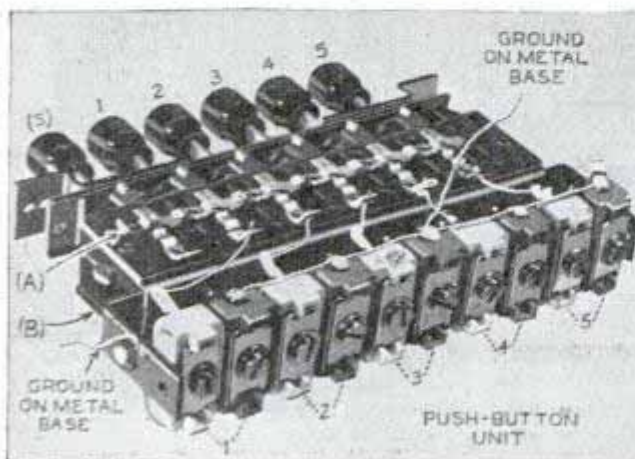


FIG. 1

Handy Portable Junk Box for Radio Workers



EVERY radio experimenter and serviceman knows that much unnecessary and valuable time is wasted in searching for various small parts and tools. This simple and easily made box can be opened on the worktable, placing all materials for set building and repair within easy reach.

Compartments are provided for tools, various radio parts, tube manuals, blueprints and magazines. Removable glass jars, with screw-top lids bolted to the top of the box, serve as containers for machine screws, nuts, washers, bushings and other small hardware. Ordinary screw-top jam jars may be used for the purpose.

Although the arrangement can be altered to suit the individual needs of the builder, general construction details are shown in Fig. 1. The first step is to make a wood frame, each of the inside dimensions of which measures 14 inches. This frame is constructed with 1-in. white pine and the ends are closed with plywood panels. The box is then sawed in two in order to form halves that will fit properly. These halves are hinged and padlock hasps serve as loops for the removable leather handle. Figs. 2 and 2-A show completed assembly.

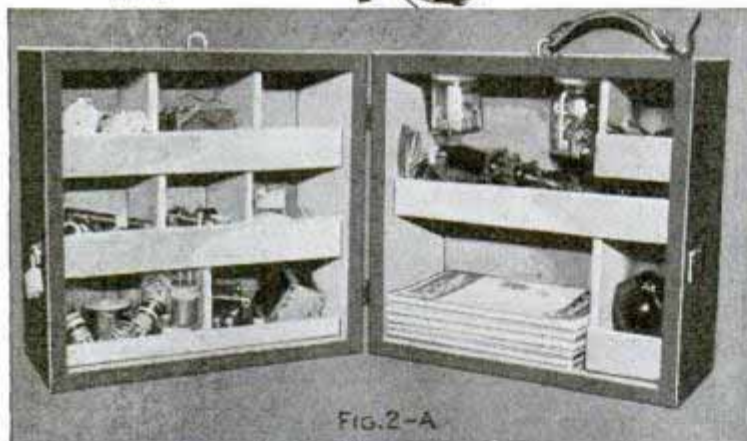
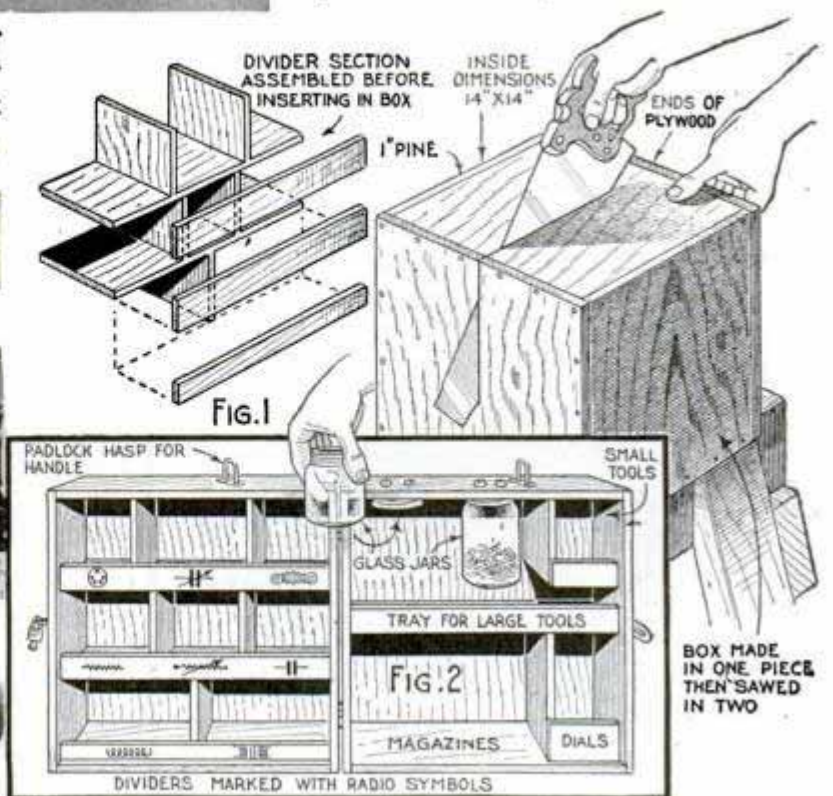
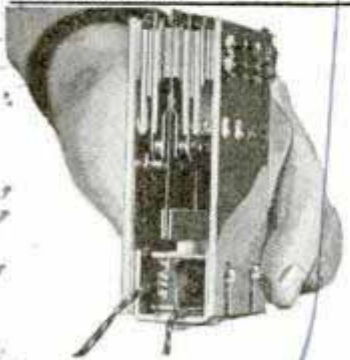
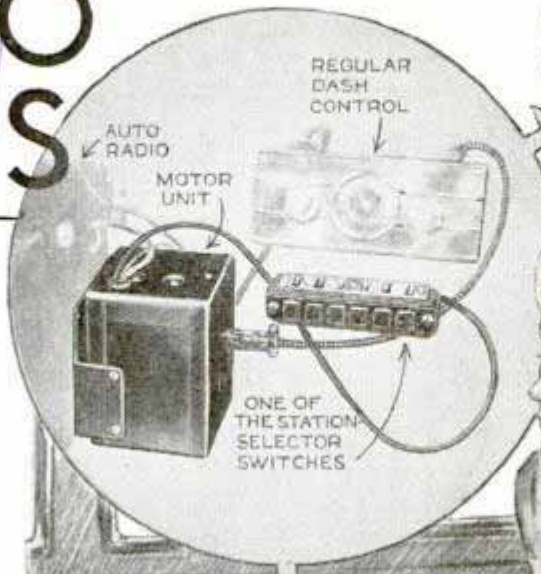


FIG. 2-A

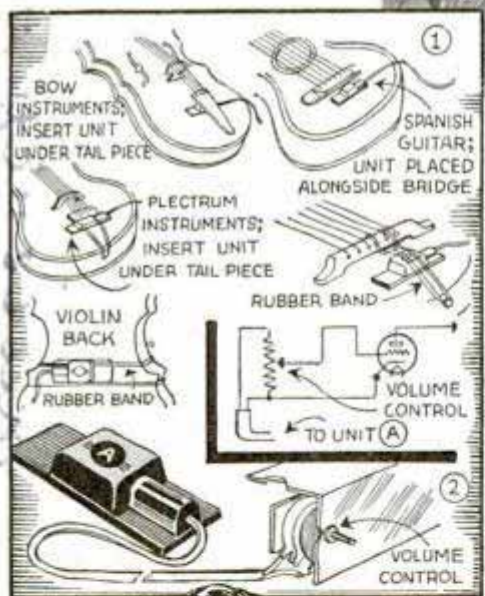


*Electronic Laboratories
122 W. New York St.
Indianapolis
Ind.*

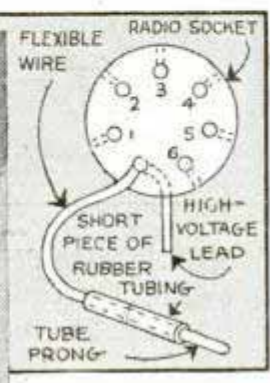
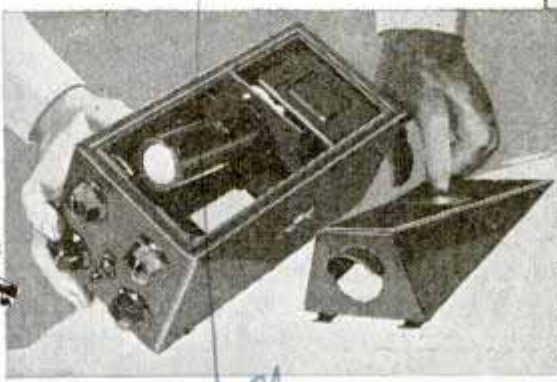
PRACTICAL RADIO HINTS



Above, 500-watt vibrator unit has 20 contact points; designed for use in 6-volt converter to supply high-voltage d.c. for portable amplifiers and transceivers



Above, motor-driven tuning unit, easily connected to any auto radio, provides 6-station push-button tuning from both front and rear seats. No tools are required to set push buttons for a new group of stations. Left, Fig. 1, suggested methods for using a contact-type microphone to reproduce vibrations of various musical instruments for amplification. Operating on the magnetic induction principle, it can be attached to all stringed instruments including a piano. Fig. 2 shows connection to volume control of a radio receiver, the set taking the place of special amplifier and speaker equipment. Below, compact cathode-ray oscilloscope in steel cabinet 4½ by 6½ by 8 in.; employs a 1-in. screen RCA 913 tube with 6X5 rectifier. Right, multi-tap plug-in switch made with tube socket



*Crowe Radio & Supply Co.
701 Riverside Drive
New York 27, N.Y.*

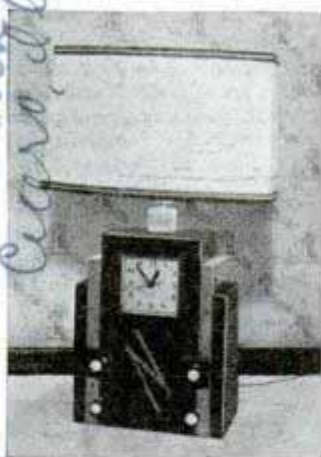
*The Acapelite
561 Broadway*

Phototube Relay in Kit Form



Suitable for experimental or research work, for educational problems or lecture demonstrations, this photoelectric relay unit is furnished as a kit for student assembly, or, completely assembled and ready for use. It may be adapted for controlling liquid levels, signals from moving devices, or starting and stopping apparatus. Employed as a sensitive electronic relay, only 1 or 2 microamperes need be controlled in the input circuit to control a 100-watt load by the relay. This makes the device useful for regulating constant temperature baths with a mercury thermostat.

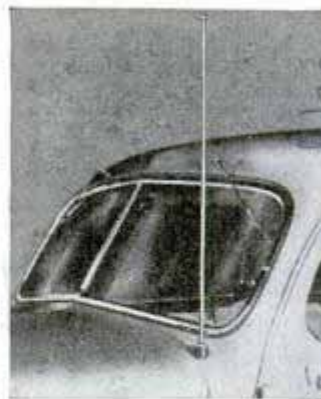
Lamp, Clock and Radio Cabinet



This combination boudoir lamp, clock and radio cabinet was designed and built by Mr. I. H. Harder to house the 3-tube Little Giant "Pup" a.c.-d.c. receiver described in the July, 1937, issue of Popular Mechanics Magazine. The cabinet is made of 1/4-in. plywood. The a.c. type clock is mounted directly over the speaker.

Vacuum Operated Auto Antenna

Out of sight when not in use, this adjustable auto antenna may be raised or lowered and stopped at any desired position by merely pushing a button on the instrument panel.



Push-Button Remote Control

No tools are required to install this push-button remote-control unit that connects to the antenna and ground posts only of any radio receiver. Eight push buttons provide a choice of seven stations or dial tuning; remote volume control is included.



Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build an All-Purpose Power Supply for Either Battery or A.C. Operation. Three separate units, one of which is a filter and voltage divider. Supplies B-voltages from 22½ to 300 volts from either a 6-volt storage battery or 110-volt a.c. line. Also—An A.C. Operated Volt-Ohmmeter

Es. M. Laboratories
1731 Detroit
9201 1900...
Primary plan...
521...
Electrical...
Harder
1508 & 1509...
measuring...
mt. Carmel, I.D.



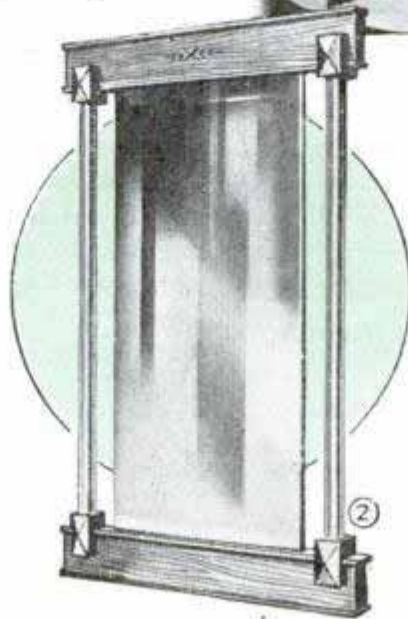
MODERN MIRRORS

... you can build

By WAYNE C. LECKEY

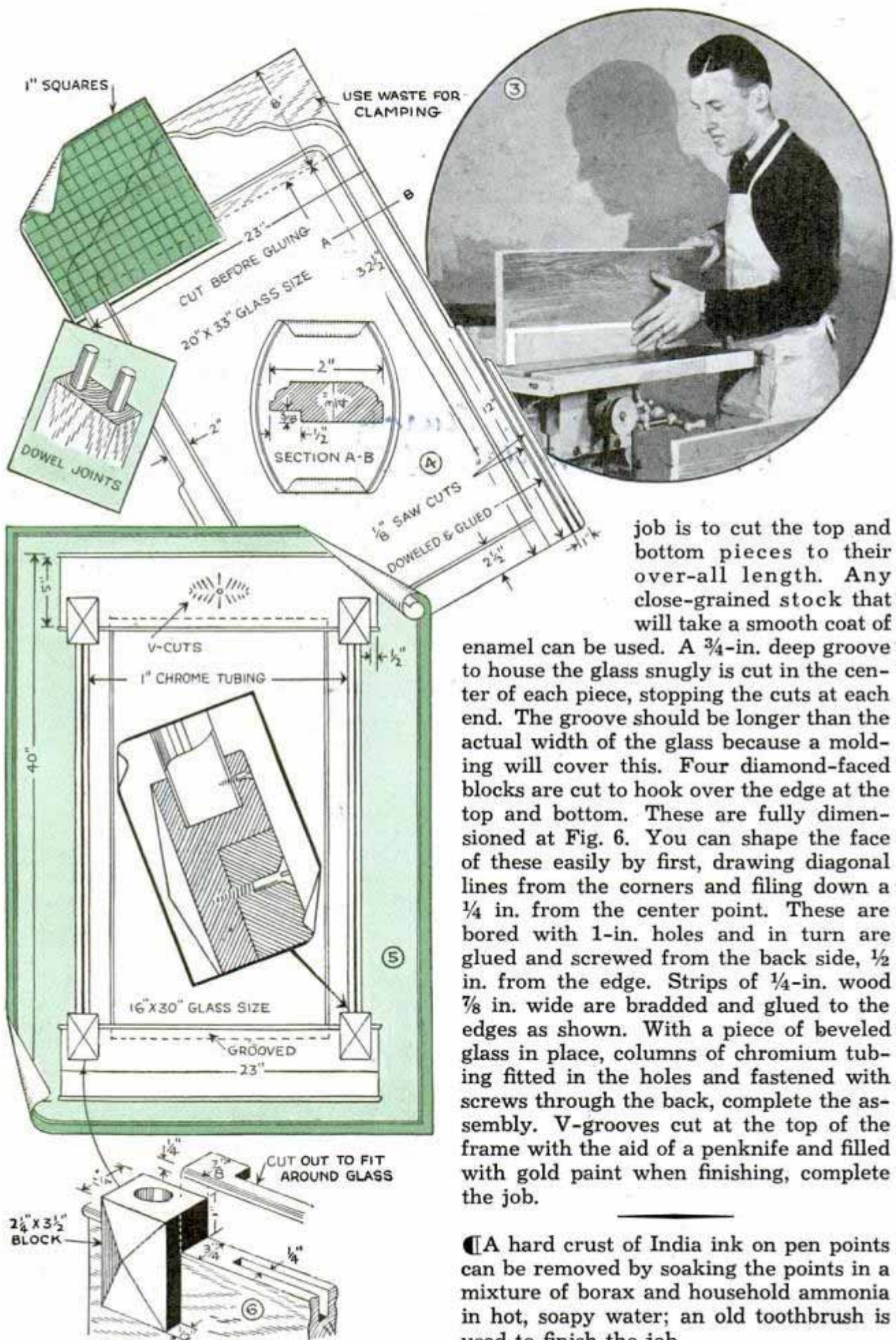
*Aurora
453 West 10th Ave
d l l*

EITHER one of these distinctive mirror frames shows a careful selection in good taste and they can be made right in your home workshop, inexpensively, from very little material. The frame shown in Fig. 1 will go well among conservative furnishings, while the one in Fig. 2, with its gleaming tubing and natural-wood or bone-white finish, is for a strictly modern setting. While the frame in Fig. 1 is more or less of a shaper job, it can be made without such a tool by rounding the edges by hand and ripping the rabbet for the glass before assembling. First, the four side pieces are ripped to size according to the dimensions given at Fig. 4. Butt joints are used and these are strengthened by means of dowels. The top piece of the frame should be bandsawed to shape before gluing, using the waste to form a square corner for clamping. The bottom rail is glued and clamped to the sides first, then the top piece. After the glue has dried, the rabbet is cut for the glass with a straight-face cutter on the shaper spindle and a collar bearing against the work. You can square up the corners with a chisel. Before shaping the face edges of the frame, 1-in. pieces, scored $\frac{1}{8}$ in. deep on the saw, are doweled and glued to the sides. A ready-made fiber



overlay is purchased, centered, and glued to the top of the frame. After a thorough sanding with progressively finer sandpapers, carefully apply a varnish, wax or oil finish.

The frame shown at Fig. 5 is very simple to make. Except the cutting of the grooves for the glass, which is done on a circular saw as shown in Fig. 3, the whole thing can be made with hand tools. Your first

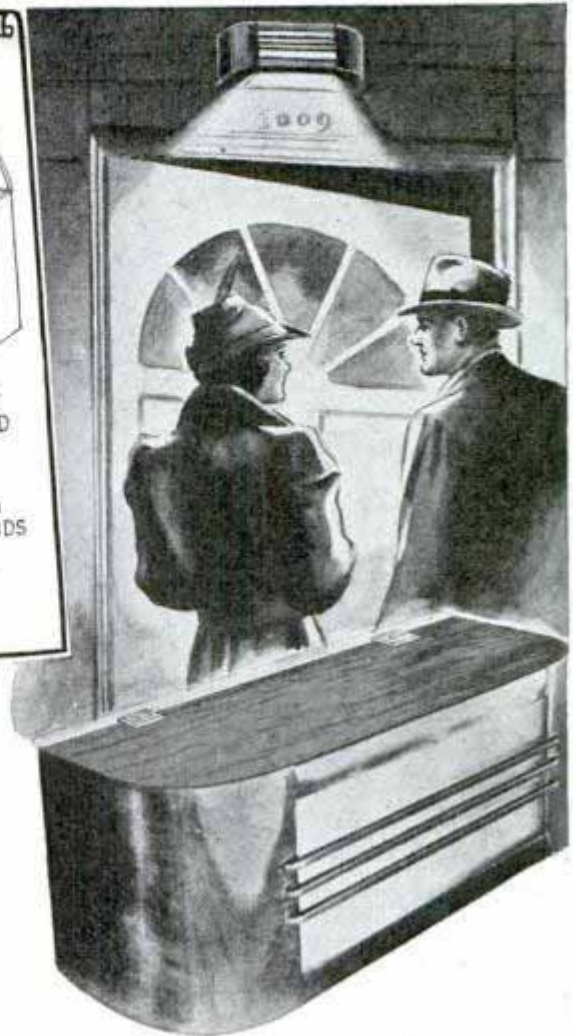
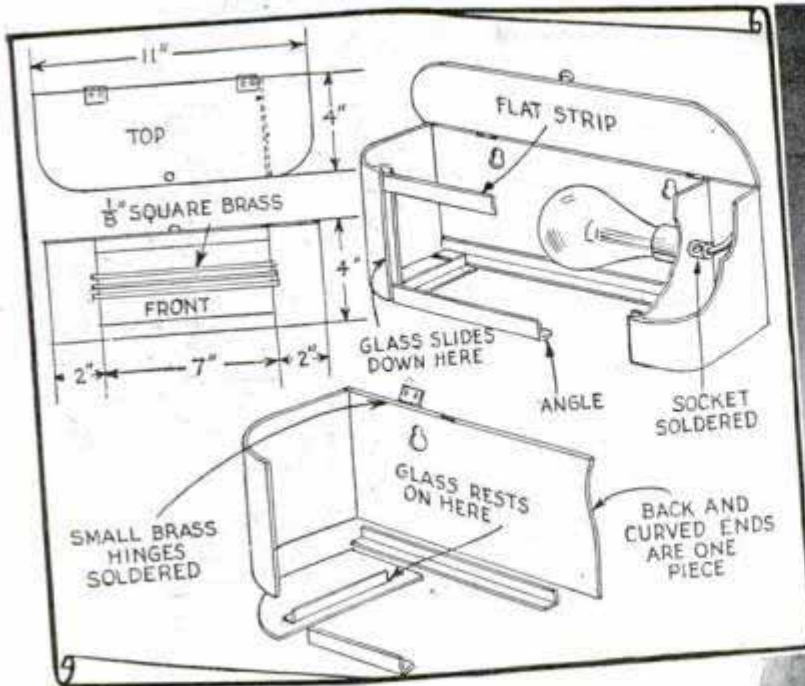


job is to cut the top and bottom pieces to their over-all length. Any close-grained stock that will take a smooth coat of

enamel can be used. A $\frac{3}{4}$ -in. deep groove to house the glass snugly is cut in the center of each piece, stopping the cuts at each end. The groove should be longer than the actual width of the glass because a molding will cover this. Four diamond-faced blocks are cut to hook over the edge at the top and bottom. These are fully dimensioned at Fig. 6. You can shape the face of these easily by first, drawing diagonal lines from the corners and filing down a $\frac{1}{4}$ in. from the center point. These are bored with 1-in. holes and in turn are glued and screwed from the back side, $\frac{1}{2}$ in. from the edge. Strips of $\frac{1}{4}$ -in. wood $\frac{7}{8}$ in. wide are bradded and glued to the edges as shown. With a piece of beveled glass in place, columns of chromium tubing fitted in the holes and fastened with screws through the back, complete the assembly. V-grooves cut at the top of the frame with the aid of a penknife and filled with gold paint when finishing, complete the job.

☞ A hard crust of India ink on pen points can be removed by soaking the points in a mixture of borax and household ammonia in hot, soapy water; an old toothbrush is used to finish the job.

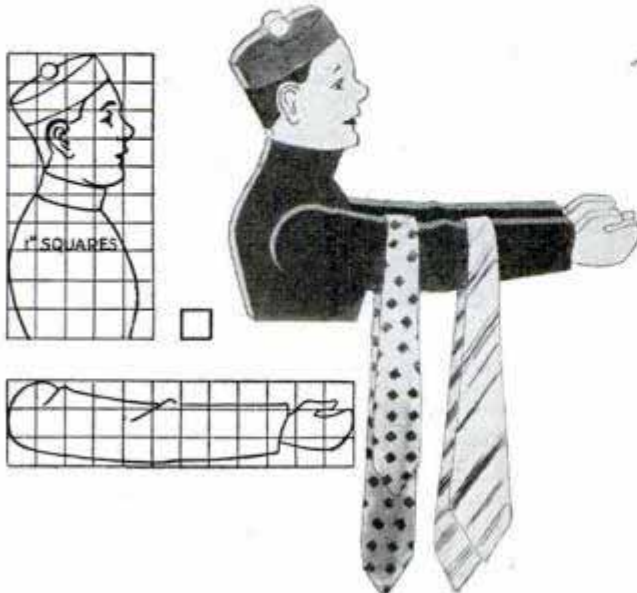
A Distinctive Porch Light in Polished Brass



So simple in construction that you can practically build it complete in one evening, this new porch light gives a soft, diffused light over a wide area. The frame and hinged top are of sheet brass, polished and lacquered to prevent tarnishing. Ground-glass panels are fitted in the front and bottom openings and are held in place with short lengths of brass angle. The latter should be sweat-soldered in place.

Neckties Hung on Outstretched Arms of This Silent Valet

Fastened to the wall in your bedroom or to the inside of the closet door if you prefer to keep it out of sight, this silent valet which is designed to hold neckties, is some-

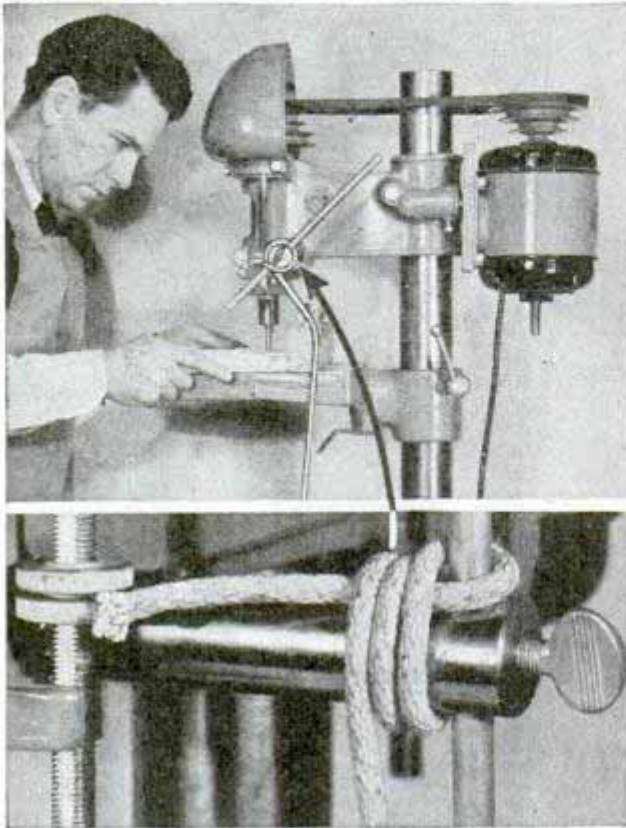


thing different from the usual necktie holder. It can be varied in color to be complementary to the furnishings and color scheme of the room. To make it, you can use regular stock such as poplar, running the grain of each piece lengthwise, or you can use $\frac{1}{4}$ or $\frac{3}{8}$ -in. plywood. The wood should be well filled in at the edges by applying a couple of coats of shellac and then paint. Previous to painting, all edges should be sanded to render them smooth so it won't be possible to damage the neckties as they are slipped on or off the arms when you're in a hurry.

—H. F. Showalter, Davenport, Nebr.

☞ When stringing beads that have very small holes, first twist the cord tightly, then dip the end into household cement or glue. When the cord is dry, it will pass through the holes easily.

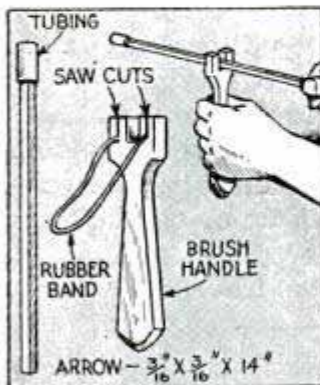
Foot Feed on Drill-Press Spindle Is Handy When Routing



Drill-press feed operated by foot when routing, leaves both hands free to manipulate the work

Routing jobs on a drill press often can be speeded up considerably by controlling the spindle with your foot so that both hands are free. This can be done with a length of sash cord, one end of which is wrapped around the drill-press feed as indicated in the lower detail, the other end terminating in a loop for the foot about 2 in. above the floor.

Arrow Gun from Paintbrush



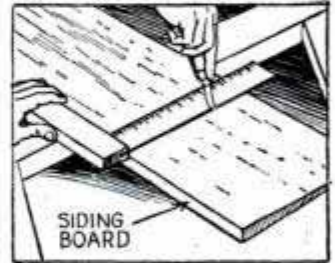
To make an arrow-shooting gun from an old paintbrush, just remove the ferrule and bristles and cut out a section of wood in the center of the handle as indicated, running two saw cuts beside the cut-out

portion to hold the ends of a rubber band. Arrows, which should be about 14 in. long, can be made from dowel or any small stock

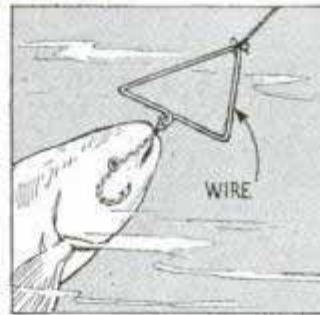
that you may have at hand. For safety's sake, it's a good idea to slip a short piece of rubber tubing or a penny eraser over the end of each one.

House Siding Should Be Scored Before Sawing

Carpenters who are particular about fitting siding board claim that no saw is sharp enough to cut it without leaving a ragged edge, which is hard to fit neatly. A sharp knife should be used to score the boards before sawing them. This breaks the outside grain of the wood with a smooth end which need not be destroyed with the saw.



Fish Can't Swallow This Hook



Fish of the bull-head, perch and sunfish variety have such voracious appetites that they often swallow the hook before the fisherman knows that they have begun

to nibble. To prevent this, one fisherman attaches the hook to the line with a piece of wire bent as indicated. The wire also serves as a sinker.

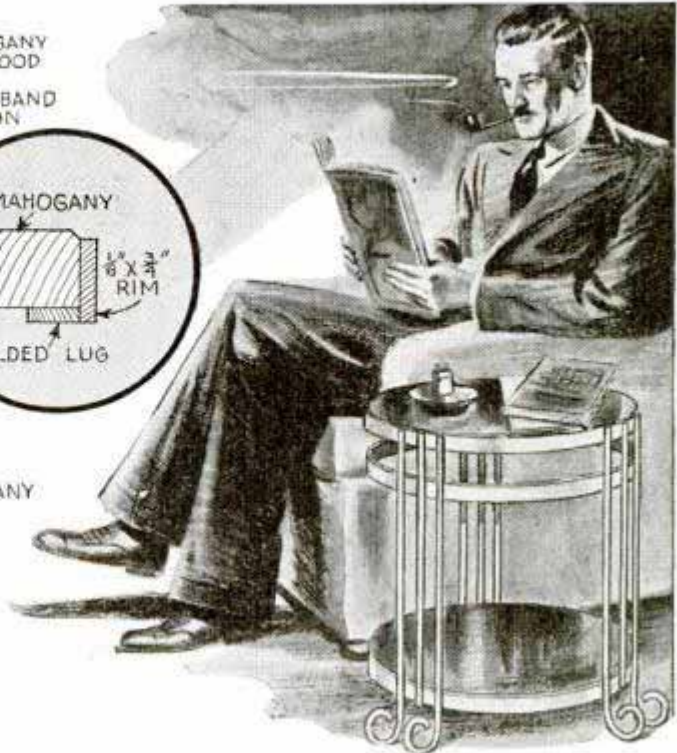
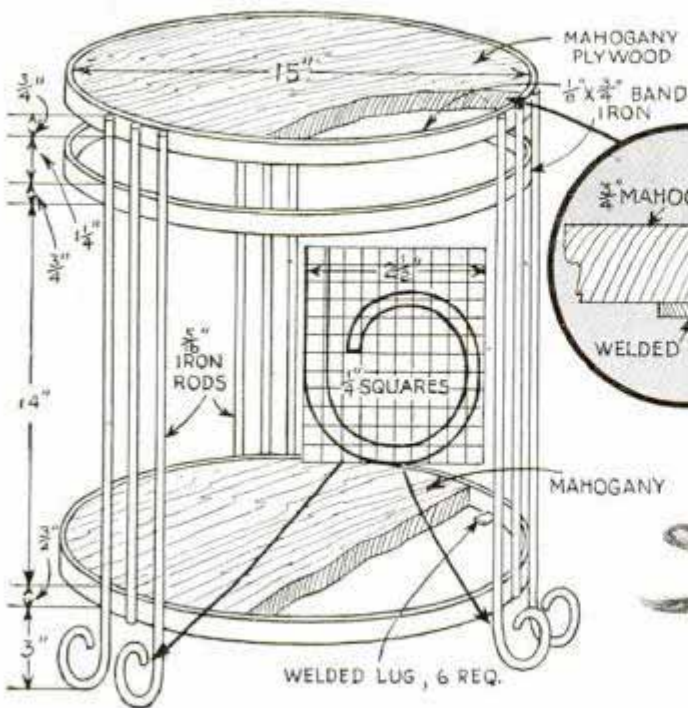
Golf Balls Stored in Airtight Can Do Not Dry Out

When you store golf balls for the winter, put them in an airtight can and they are less likely to dry out and lose their resiliency. This is an especially good idea if the balls are kept in houses heated with hot water or steam where the humidity is usually very low.



—Joseph P. Driscoll, Buffalo, N. Y.

Ironwork Adds Charm to Chairside Table

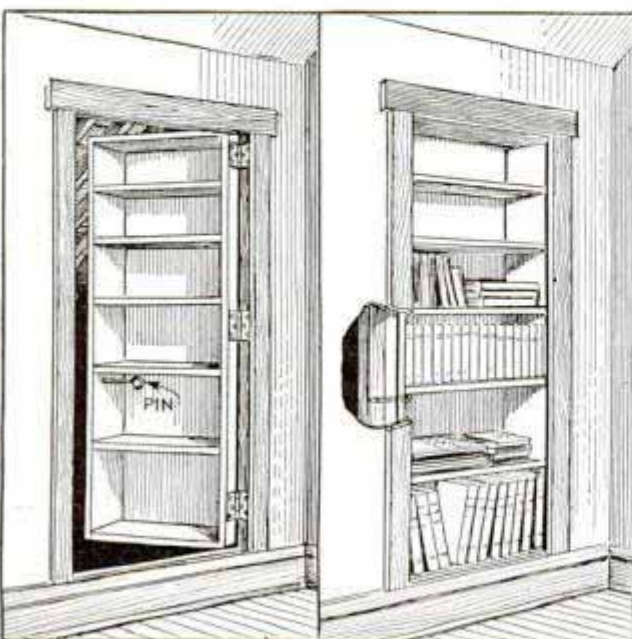


Polished mahogany or glass combines with the white iron framework of this sturdy little table, producing a distinctly modern effect. While welding is best to assemble the iron parts, it is possible to drill the pieces and use iron rivets. If the holes are countersunk, it is possible to

peen the rivets down to fit so they will not be noticeable, especially if dressed down flush with a file. In case you wish to build this table without welding, you may be able to use pins to support the shelf and top, the pins being threaded to fit tapped holes in the rims.

Door to Attic Storage Space Forms Built-In Bookcase

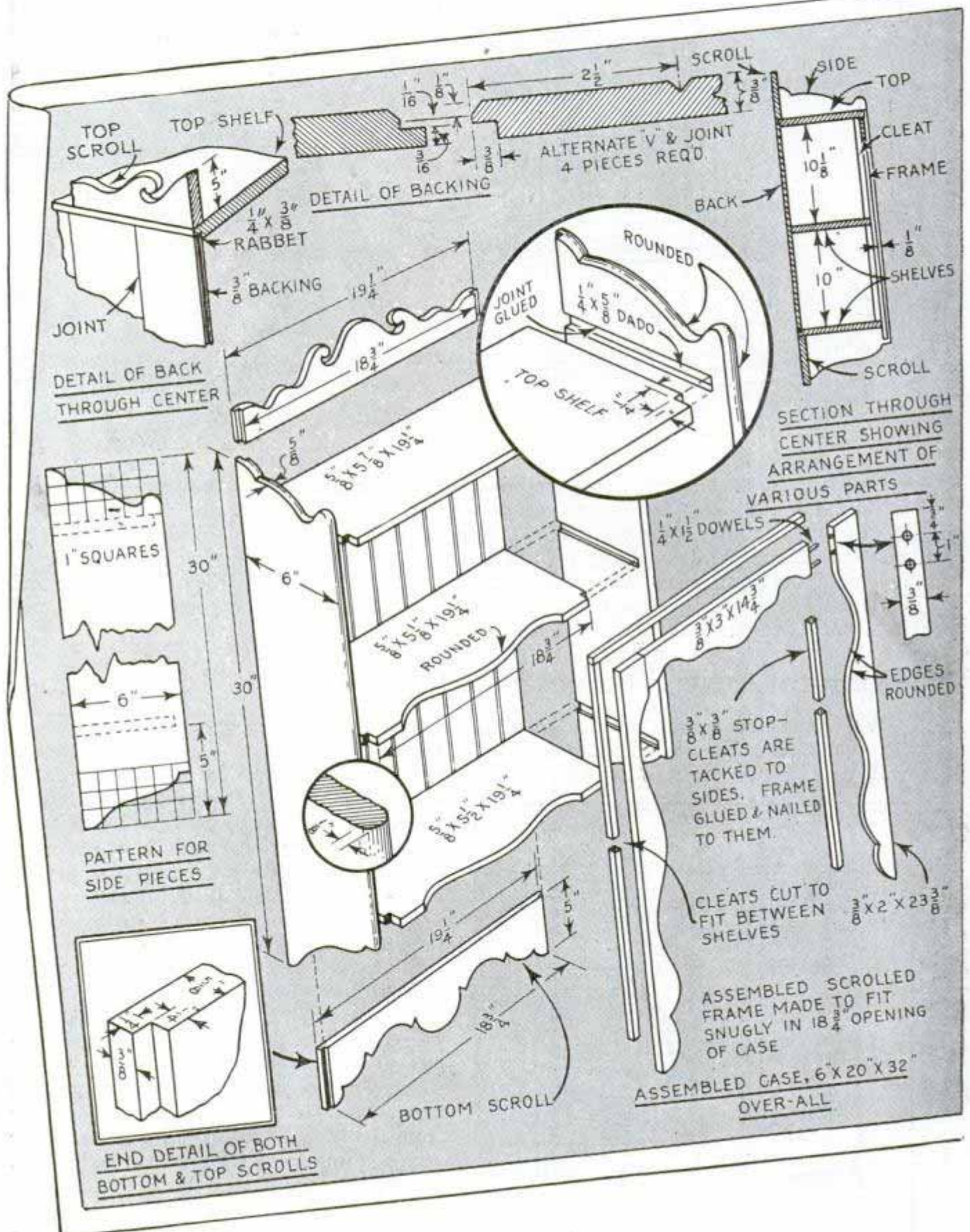
When extra rooms are built in an attic, it's a good idea to leave an opening in the wall so that the space extending to the



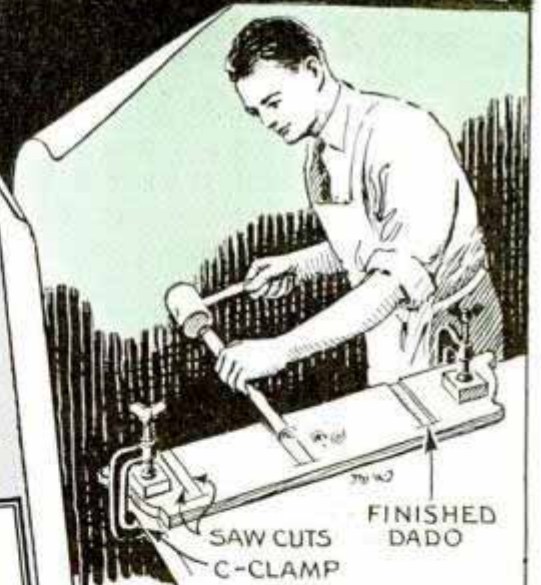
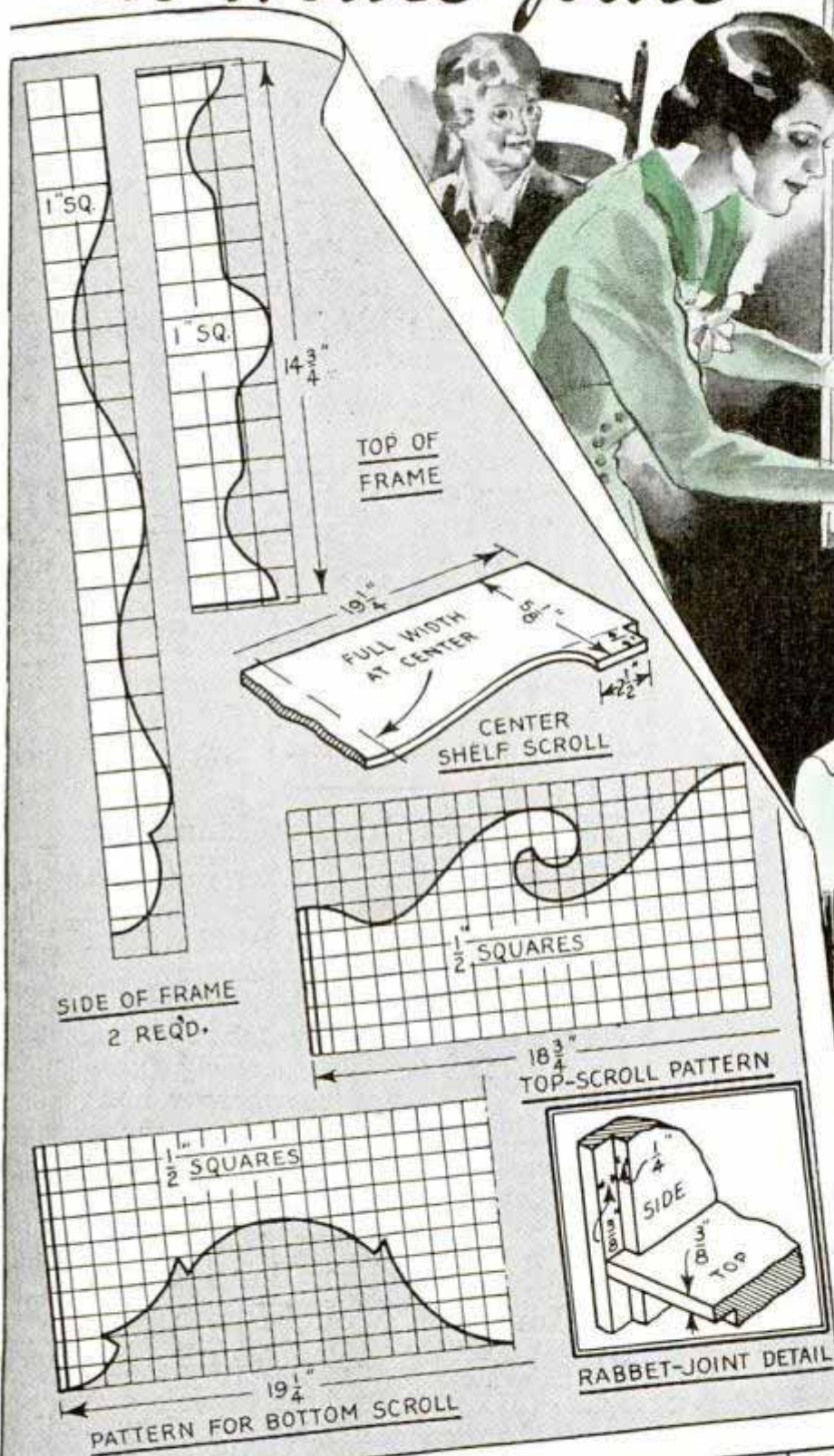
eaves may be utilized for storage purposes. However, a small door will accentuate the usual low ceiling of an attic room, which makes the room look squatty. Therefore, instead of an ordinary door, built-in shelving may be hung on hinges from a stud of the partition. This serves both as a door and as a convenient place to store a few books, magazines or other items. After hinging the bookcase, it is pulled firmly shut against the casings, and a short pin is pushed through one side into a stud to lock it in place. This also helps to make the presence of the door still more inconspicuous. It will be advisable to use very little space for books because the weight of many books will cause the case to tear from the hinges. A small wheel or caster attached under the case near the edge that swings open, will carry the weight and reduce strain on the hinged side.

—Chester W. Colburn, North Weare, N. H.

Colonial Wall Shelf



in white pine

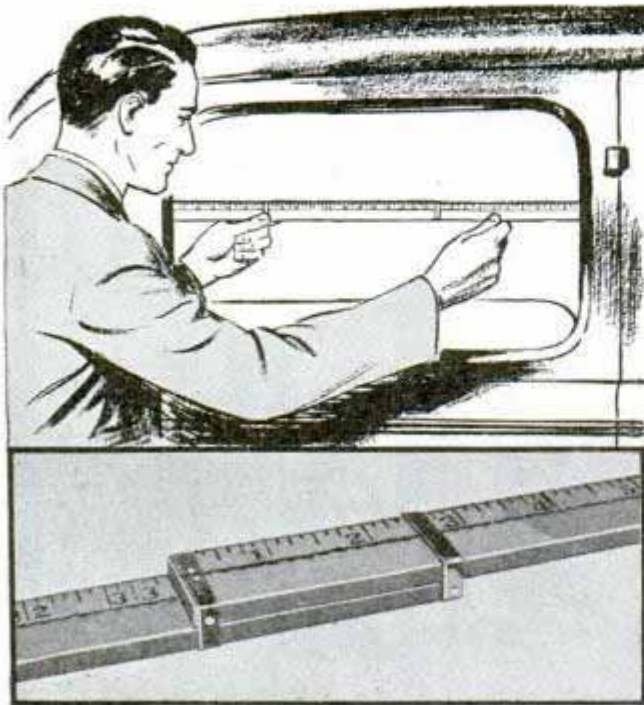


DADOS ARE SAWS AS FAR AS POSSIBLE THEN FINISHED WITH CHISEL

- BILL OF MATERIALS**
- 2 SIDES - $\frac{5}{8}$ " X 6" X 30"
 - 1 TOP SHELF $\frac{5}{8}$ " X $5\frac{7}{8}$ " X $19\frac{1}{4}$ "
 - 1 CENTER SHELF $\frac{5}{8}$ " X $5\frac{1}{8}$ " X $19\frac{1}{4}$ "
 - 1 BOTTOM SHELF $\frac{5}{8}$ " X $5\frac{1}{2}$ " X $19\frac{1}{4}$ "
 - 2 SCROLLS $\frac{5}{8}$ " X 5" X $19\frac{1}{4}$ "
 - 2 FRAME SIDES $\frac{3}{8}$ " X 2" X $23\frac{3}{8}$ "
 - 1 FRAME TOP $\frac{3}{8}$ " X 3" X $14\frac{3}{4}$ "
 - 4 PCS. BACKING $\frac{3}{8}$ " X $5\frac{1}{4}$ " X $21\frac{1}{2}$ "
 - 1 TOP CLEAT $\frac{3}{8}$ " X $\frac{3}{8}$ " X $18\frac{3}{4}$ "
 - 2 SIDE CLEATS $\frac{3}{8}$ " X $\frac{3}{8}$ " X $20\frac{1}{4}$ " *
- *ALLOWANCE FOR JOINT FITTING.

For the kitchen, den or living room, this pleasing wall shelf distinctly shows colonial influence, the graceful scrollwork and the V-grooves in the back lending quiet dignity. The shelves are sturdily housed into the side pieces, the back is set into a rabbet and the whole case is stiffened by the back. Use dark brown stain and apply rubbed-effect varnish, or merely wax the surface

Telescoping Yardstick Is Handy for Inside Measurements



Yardstick cut in half and provided with brass strips forms a telescoping rule

Here is a rule for taking inside measurements such as of windows. It is just a yardstick cut in half, the two halves being held together by brass bands allowing the pieces to slide. Attach the bands at the end of each half bearing the number "1".

Give Your Photos Background of Gold or Silver

The appearance of your prized photographs can be enhanced further by applying gold or silver leaf to the background. To do this, make a transparency by print-

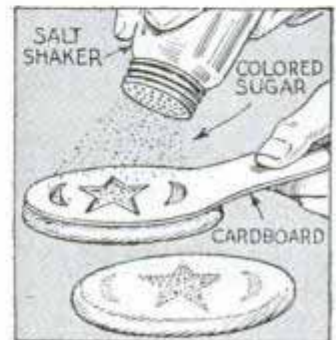


Prized pictures enhanced by applying gold or silver leaf over background

ing the negative on a slow film, and, after fixing, harden the emulsion in a 5-percent Formalin solution. After the film has been washed and dried, coat the emulsion side with a thin gum-arabic solution; then gently press the gold or silver leaf in place. Burnish it with a wad of cotton, and allow the gum to dry for several hours before mounting the picture.

Mask Helps Decorate Pastry with Colored Sugar

When colored sugar is used to decorate frosted cookies or cakes, you can do the work quickly, and outline the design uniformly, by using a cardboard mask. When cutting the mask, leave a suitable length of the cardboard to serve as a handle, and apply the sugar by sifting it from a salt shaker.



Wool Socks Dried on Hanger



After you wash wool socks, they can be kept from shrinking by slipping them on this stretcher to dry. It is simply a wire coat hanger bent to the shape indicated. The hook of the hanger enables you to hang the stretcher on a nail or clothesline.

Graphite on Rubber-Band Motor Improves Model Plane

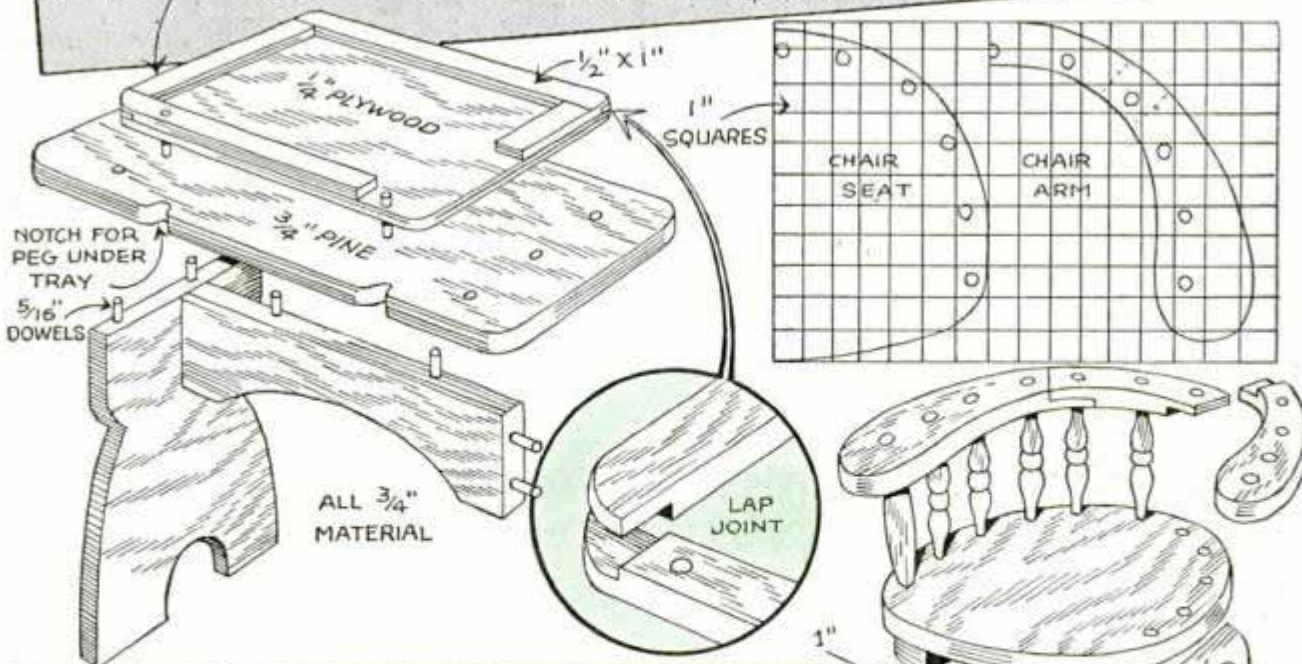
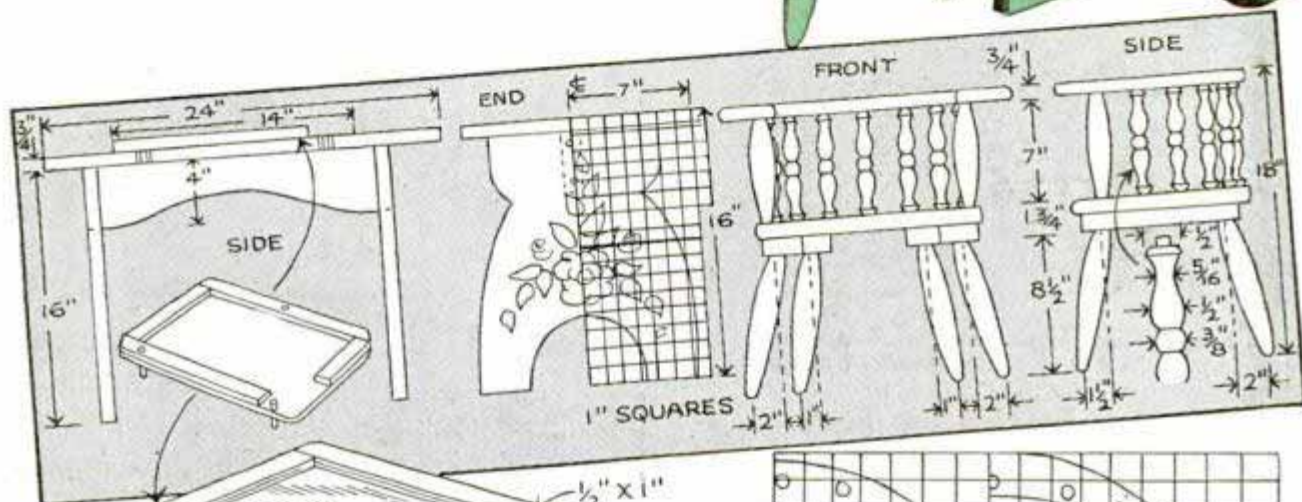
Longer flights may be had from model airplanes driven by rubber-band motors if the rubber strands are dusted thoroughly with finely powdered graphite. The graphite lessens friction and lets the strands slip among one another freely, not only avoiding breakage but also giving more winds which means more power and longer flights.

—Chauncey Burrows, McKee's Rocks, Pa.

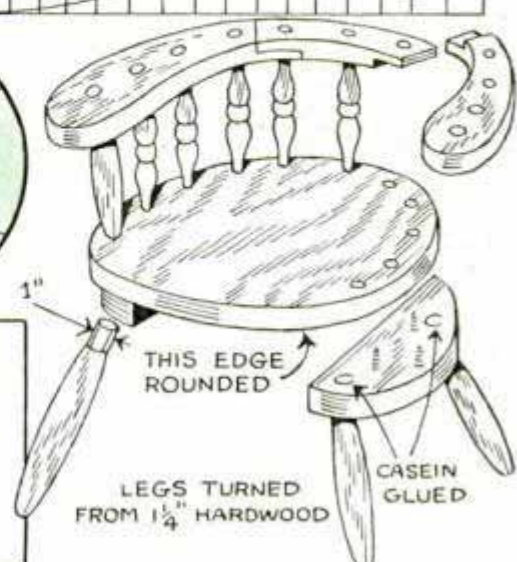
Tot's Own DINING SET

replaces high chair

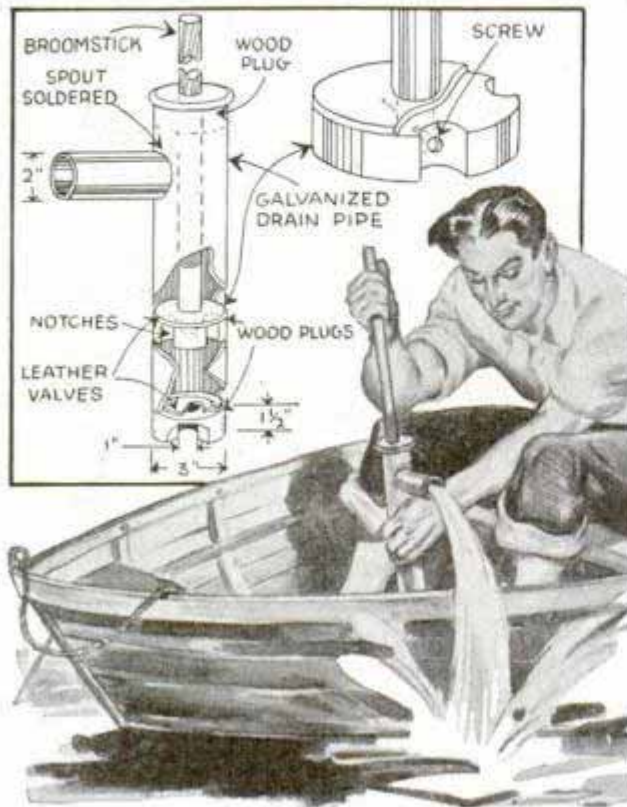
Just the right size for sturdy, active youngsters of nursery age, this tiny dining set is patterned after the Dutch Colonial designs of long ago. If you wish it to match other juvenile furniture of the Early American type, make it of hardwood which will take stain well. Or, if it must be enameled in bright, cheery colors, pine, poplar or birch will do. When the set is to be painted most parts of the table can be made of plywood, but if stained, it's best to use solid stock. The top of the table is a two-part affair with a removable tray held in place with dowels, the ends of which drop into notches cut into the edge of the top proper.



You'll find the construction easier because most of the parts to be made are duplicates. Once you get set up it's a simple matter to make these rapidly by completing one set of duplicates before starting another. There are no mortised joints; only dowels and glue are used. Turn down 1/2-in. dowels to make the chair spindles. Sand all parts smooth before finishing.



Bilge Pump from Scrap Parts Drains Boat Quickly



Boats, shallow basements and sump holes are rapidly drained with this improvised pump

Suitable for pumping out boats, basements, or sump holes, this pump is constructed from a piece of eave downspout. The plunger is a broomstick or other round rod, with a wood plug on the end which is a snug sliding fit in the pipe. Four notches are cut as shown and a round piece of leather is put on top. It is held down at the center by a shoulder on the broomstick, which allows the edges to act as a valve, opening and closing the notches. At the bottom is a tight plug with a 1-in. hole drilled in center and covered with a leather flap, which also acts as a valve. The pump is completed by adding a guide at top and a spout at the side.

Sink Plug Good for Scouring

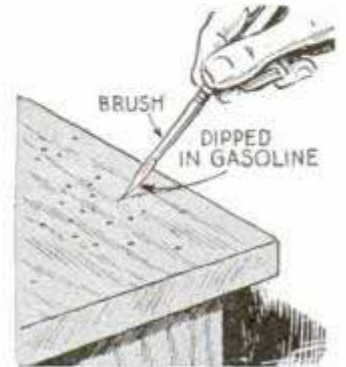


Charged with any good scouring compound, a rubber plug from your sink provides a dandy polisher for kitchen utensils. The plug makes a

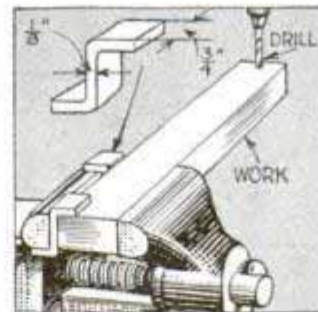
firm contact with the utensil, and as the scouring powder accumulates in the hollow center, all foreign matter is scrubbed from the surface. The plug is especially handy for removing stubborn deposits which accumulate in photographic developing trays.—J. G. Roberts, Chicago, Ill.

Bubbles Removed from Varnish with Gasoline and Brush

If bubbles appear in freshly varnished surfaces after the latter have dried too much to permit removal by repeated brushing, dip a camel's-hair brush in gasoline or naphtha, and touch the bubbles lightly with this. The gasoline will dissolve the bubble film and allow the air to escape.



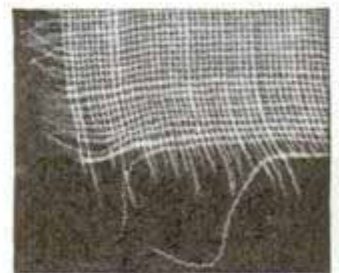
Hooks Hold Bar Stock in Vise



With an assortment of these S-shaped hooks, any thickness of bar iron may be gripped in a vise, and hammered, drilled or otherwise worked on at its extreme end with less tendency to slip. The hooks are made from pieces of steel $\frac{1}{8}$ in. by $\frac{3}{4}$ in.
—Burl Knutson, Bismarck, N. Dak.

Producing Microscopic Effects

When you want to experiment with a microscope, and none is at hand, you can secure low-power effects in a pinch simply by using a photo enlarger. Place the specimen in the same position as an ordinary negative so that light passing through the object casts an image on the sensitized



paper held in the enlarging easel. For best results, a contrasting enlarging paper should be employed. Leaves, insect wings and other flat, semi-transparencies are probably best fitted for camera study in the enlarger, and some startling effects can be obtained with a little experimentation. In the photograph, a fringed corner of a silk handkerchief was enlarged several times. Although closely woven, the cloth under enlargement shows glaring irregularities, such as thread size differences, not noticeable ordinarily to the human eye.

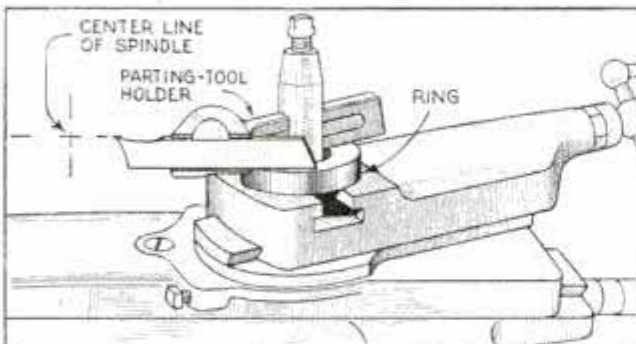
Defleaing Your Dog

An effective method of applying de-fleaing solution to your dog, especially if it has long hair, is to use the nipple of a baby's nursing bottle on a screw-top can as an applicator. Slightly enlarge the holes of the nipple and use as a brush, parting the hair as you go. Having applied the liquid in this manner, thoroughly massage the animal lightly, working the solution into the pores of the skin.

—David E. Anderson, Alhambra, Calif.

Lathe Parting Tool Supported to Prevent Chatter

Lathe operators who have trouble with a parting tool, which chatters against the work because the regular ring and wedge do not hold it rigidly enough, will find that this support stops the trouble. It consists of a large steel ring, which is machined to

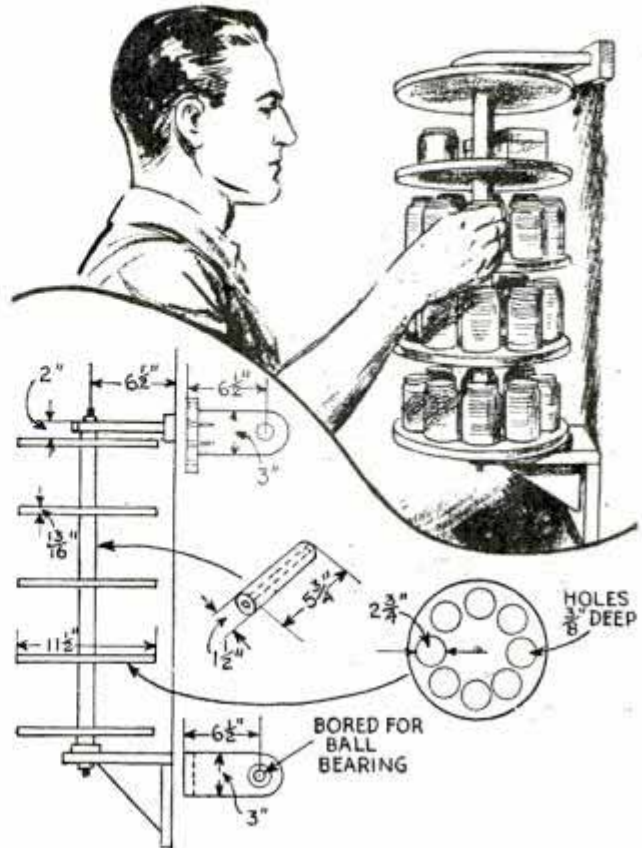


Large ring substituted for regular ring and wedge on tool-post holder supports parting tool rigidly

just the right thickness to raise the tool at the correct height. The ring is used in place of the regular ring and wedge of the tool post.

—E. E. Brown, Berkeley, Calif.

Rotating Shelves in Workshop Hold Small-Parts Jar



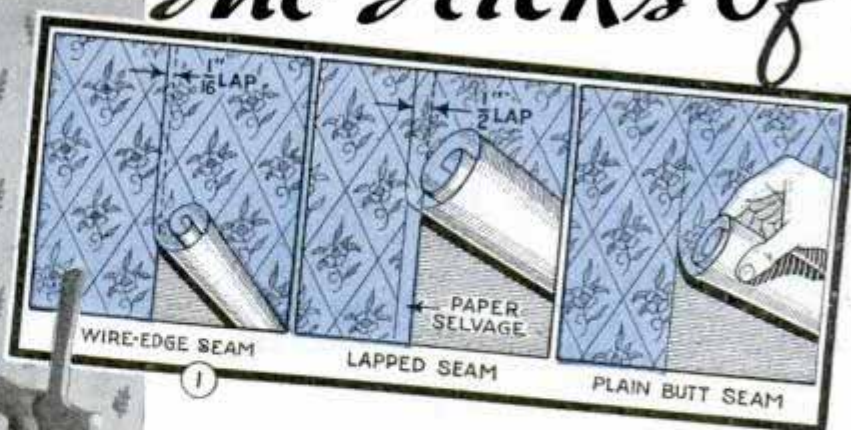
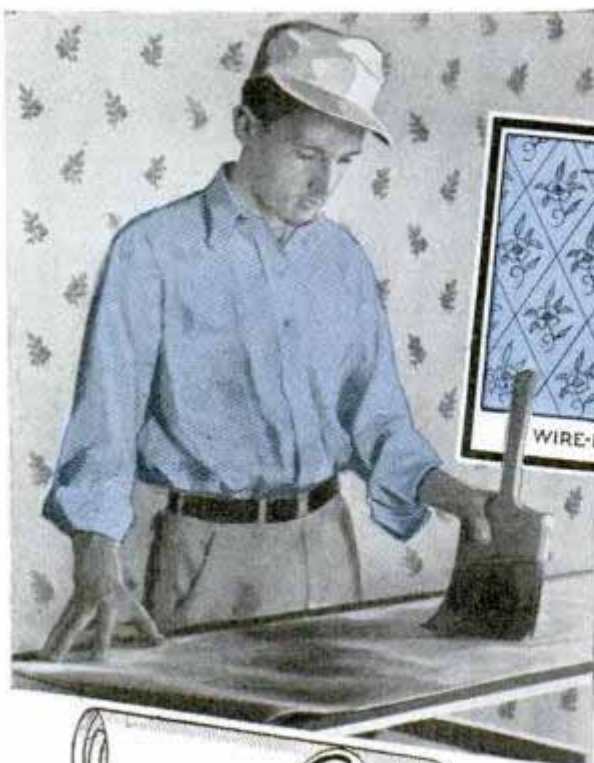
The right size nails or screws are located easily if the containers are set on these rotating shelves

These rotating shelves are just the thing for the home workshop owner who likes to keep screws, nails and other small parts in glass jars. The shelves are plywood disks drilled through the centers for a long iron rod. Pipe, cut to short lengths, is used to space the shelves. If desired, shallow holes or depressions can be formed in the upper surfaces of the shelves to take the jars so they cannot slip off when the shelf is turned. The assembly is mounted on a wall between two wood brackets, the lower one of which contains a simple ball thrust bearing as indicated. This permits the shelves to be rotated easily when they are heavily loaded.

—Clayton C. Jackson, Ft. Wayne, Ind.

¶ If you have an idea that might be used for a short article in these pages, send it to the Homecraft Editor. Inclose a snapshot or drawing and give all the necessary information in as few words as possible. To be accepted, material must be of general interest and different from any we have published previously.

The Tricks of



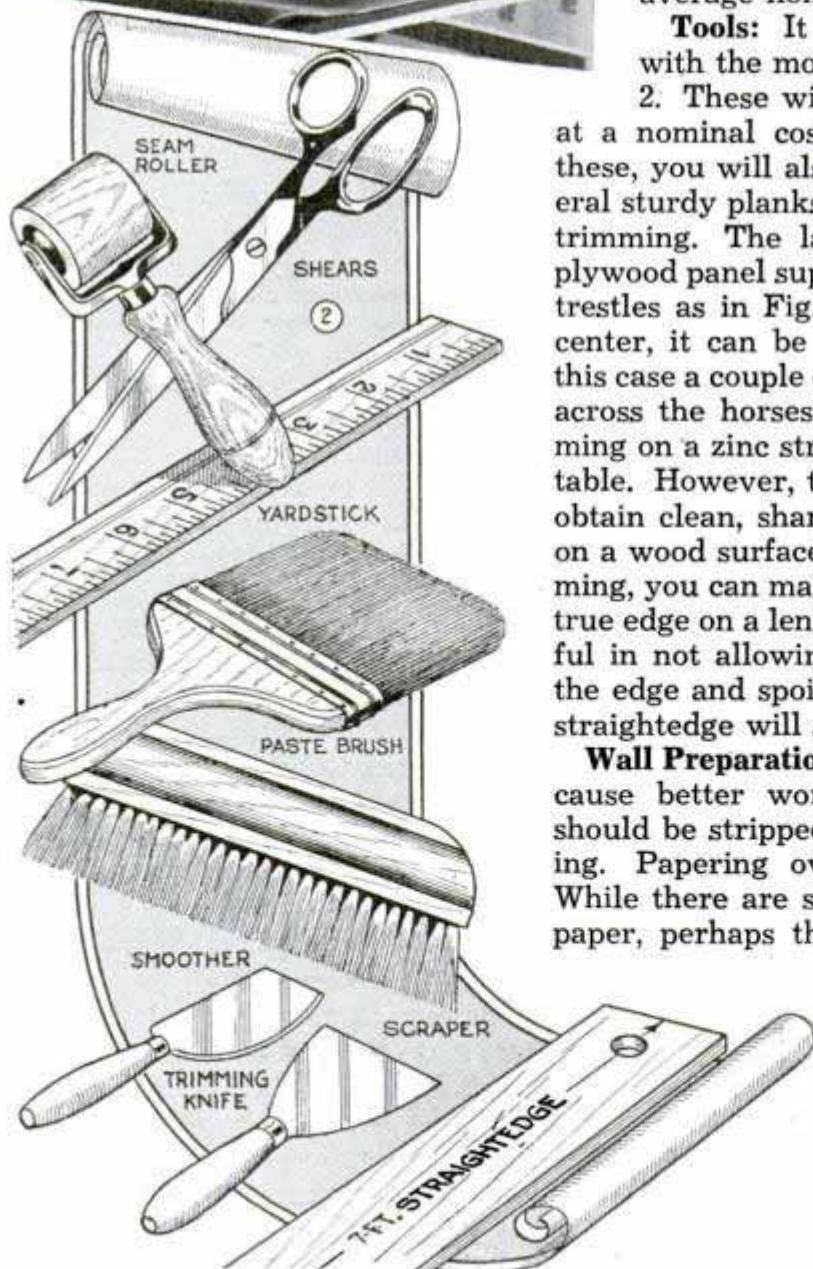
ONCE the tricks of paper hanging are fully understood, decorating with the many beautiful papers available is something the average home mechanic can master easily.

Tools: It is possible to do excellent work with the most ordinary and simple tools, Fig. 2. These will be found available in kit form

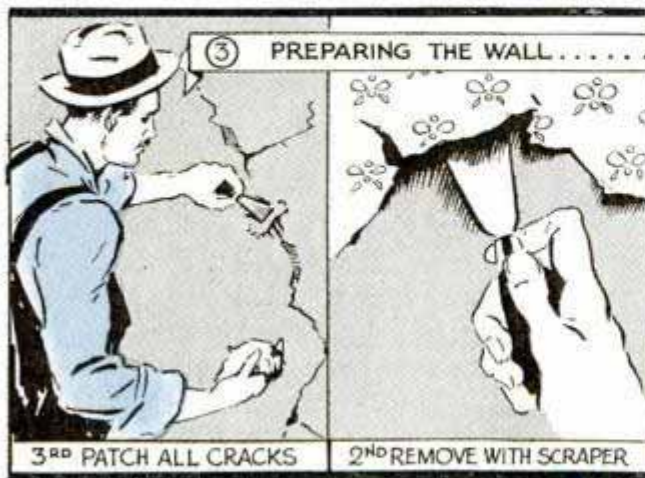
at a nominal cost at most paint stores. Besides these, you will also need a stepladder or two, several sturdy planks and a light table for pasting and trimming. The latter can be improvised from a plywood panel supported on a couple of lightweight trestles as in Fig. 9. By hinging the panel in the center, it can be stored easily for future use. In this case a couple of 2 by 4-in. stringers are first laid across the horses. Some prefer to do their trimming on a zinc strip fastened along one edge of the table. However, this is optional as it is possible to obtain clean, sharp edges on the paper by cutting on a wood surface. As for a straightedge for trimming, you can make a serviceable one by jointing a true edge on a length of hardwood. If you are careful in not allowing the knife to slip and cut into the edge and spoil its trueness when using, such a straightedge will serve the purpose admirably.

Wall Preparations: For sanitary reasons and because better work can be done, all old paper should be stripped from the walls before repapering. Papering over old paper is poor practice. While there are several ways of removing the old paper, perhaps the most effectual and commonly

used method is by soaking. Take a pail of hot water and a whitewash brush and go around the entire room, Fig. 3, wetting the paper until it will absorb no more water. The work will go much faster than if small patches are done here and there. Oftentimes a little



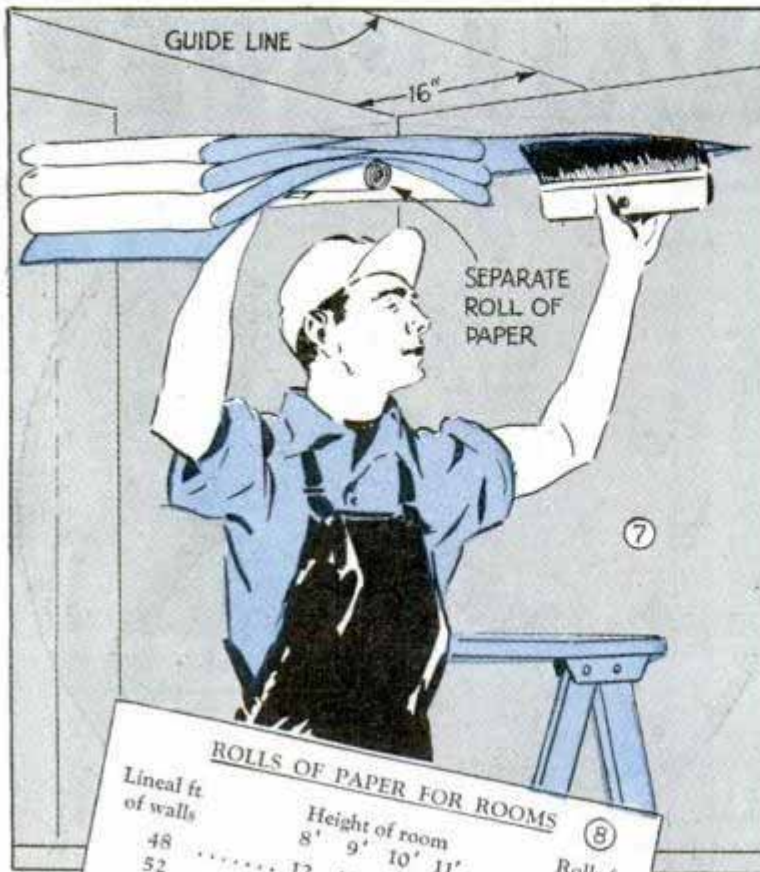
Hangings WALLPAPER



baking soda, sal soda, borax or ammonia added to the water will aid in softening up the old paste. By the time you have finished soaking, the paper where you first started should be loose enough so that it can be taken off in sheets with a scraper blade. When all the old paper has been removed, wash down the walls with a sponge and let dry. A little carbolic acid added to the clear water will make a sanitary job of it. Any defects or cracks in the walls, of course, should be filled smoothly with a prepared patching compound. Porous plaster as well as new plaster should be glue-sized preparatory to papering. The size should be rather thin and applied hot in a warm room, using a large brush to apply it quickly before it jells, Fig. 5. As a rule, one coat will suffice.



If the walls you intend to paper have been painted previously, it will be necessary, in order to make the paste stick, to kill the gloss and oil in the paint by first sanding with rough paper and then washing with a weak solution of sal soda and water, Fig. 4. Follow this with a size of plain vinegar. In the case of particularly rough walls such as a sand finish, you must first cover with a lining paper available especially for the purpose or, if you should have a number of odd rolls of paper you wish to use up, you can use this instead, placing the figure of the paper next to the wall. For lining papers the paste should be fairly stiff. Use a wide, stiff, smoother



ROLLS OF PAPER FOR ROOMS (8)

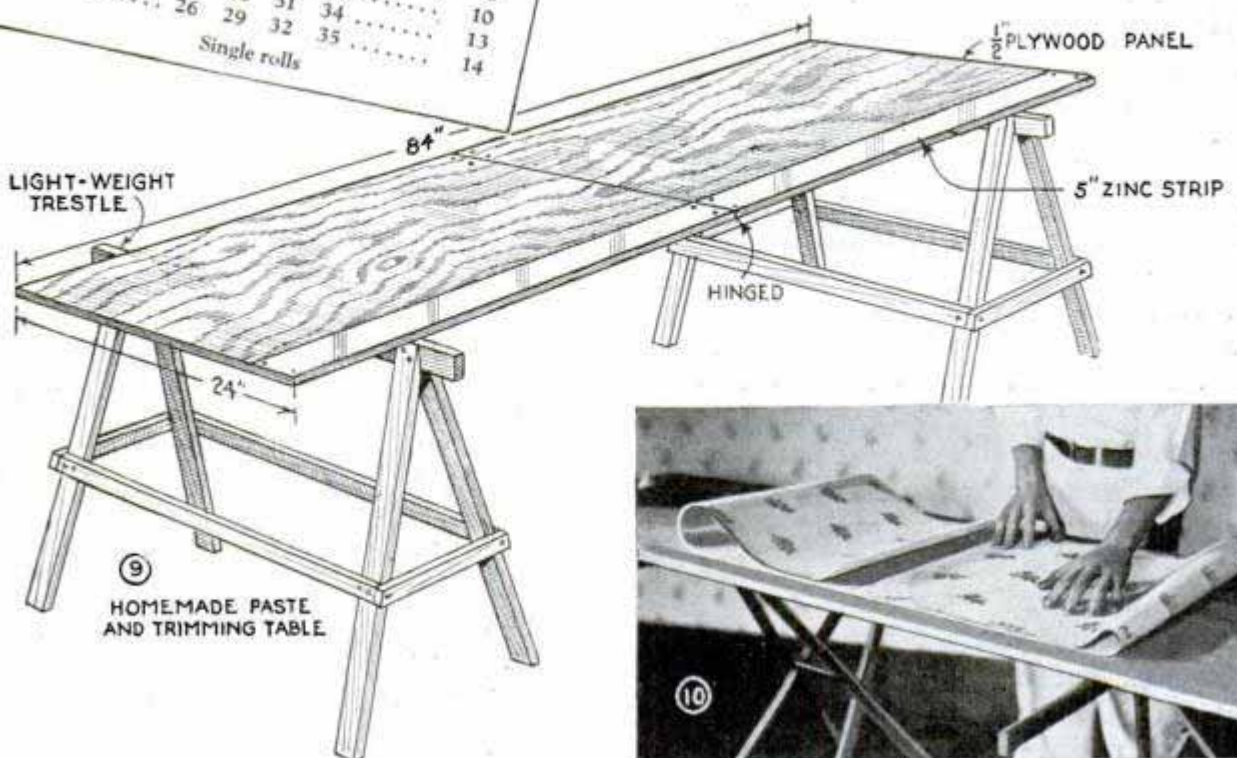
Lineal ft of walls	Height of room				Rolls for ceiling
	8'	9'	10'	11'	
48	12	13	15	16	2
52	13	15	16	18	3
56	14	16	17	19	3
60	15	17	19	20	3
64	16	18	20	22	3
68	17	19	21	23	3
72	18	20	22	24	3
76	19	21	23	26	4
80	20	22	25	27	4
84	21	23	26	28	4
88	22	24	27	30	4
92	23	26	28	31	4
96	24	27	30	32	8
100	25	28	31	34	10
104	26	29	32	35	13
					14

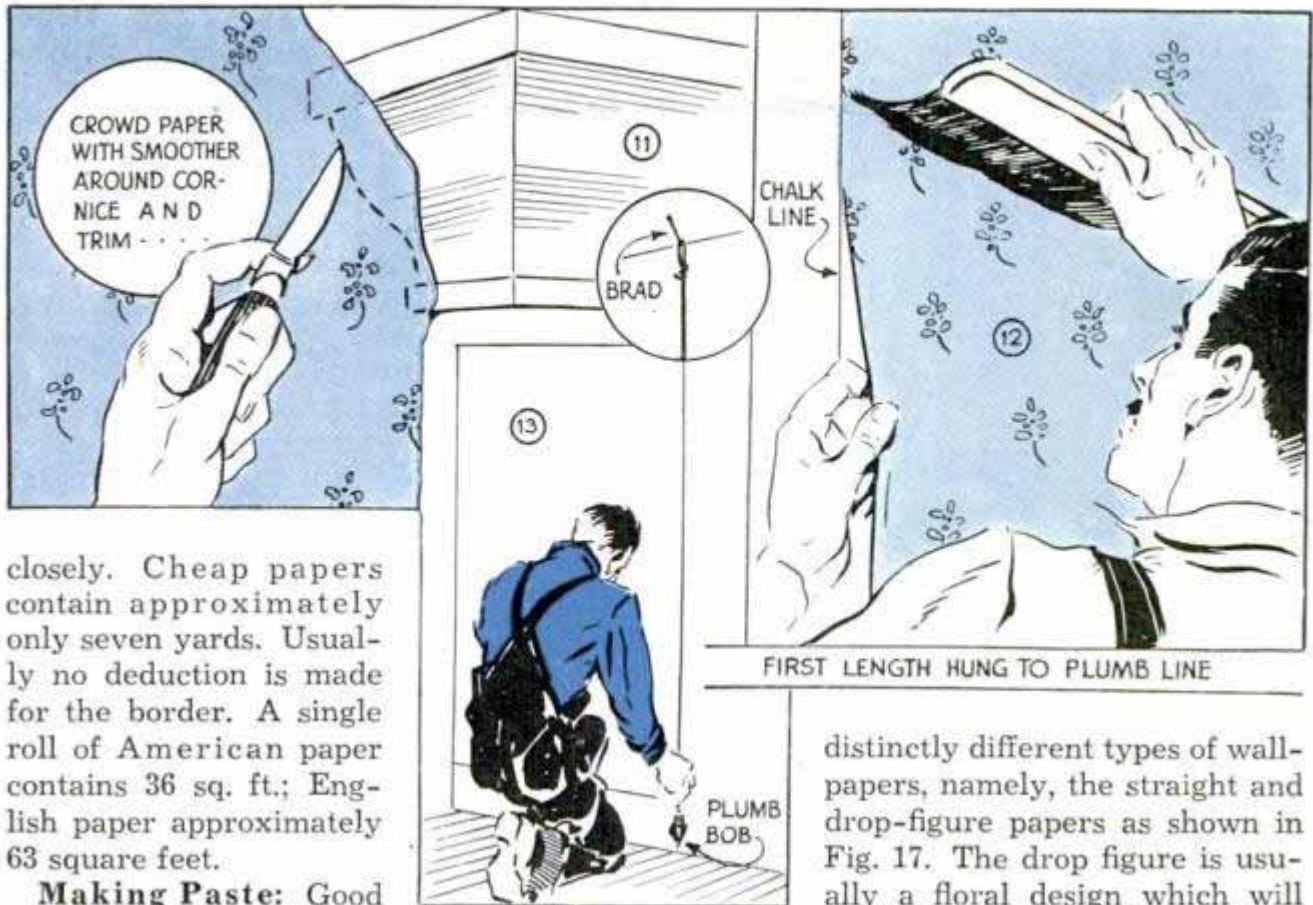
Single rolls

brush and brush the paper down hard to assure a firm bond to the sand particles.

Estimating Material: The prepared table of estimates in Fig. 8 gives the number of rolls required for both ceiling and walls of various sized rooms. These figures are based on the standard single roll of 8 yds. length. Since nearly all papers are now put up in double rolls, you need purchase only half of the specified amount. In figuring individual requirements not covered in the given table, one of the simplest methods is to multiply the running feet of the walls by 12 and divide by 18 which gives you the required number of strips around the room, running from ceiling to baseboard. For example, if the room is 8 ft. high, you will be able to get three strips from a single roll (which contains approximately 8 yds.) or six strips from a double roll. This, of course,

figures the room as a solid with no deductions made for openings, unless they are exceptionally large such as double doors, etc. In such cases, you will be safe in deducting one-half single roll for each. Other openings are figured to take care of the waste consumed in cutting and matching and it is always best not to figure too





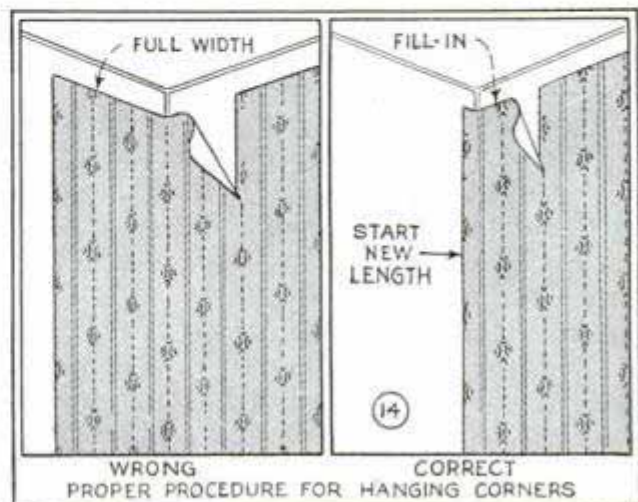
closely. Cheap papers contain approximately only seven yards. Usually no deduction is made for the border. A single roll of American paper contains 36 sq. ft.; English paper approximately 63 square feet.

Making Paste: Good paste is not difficult to make, yet it requires some pains. The worker can use either a commercial ready-made paste sold in 5-lb. packages or he can make his own, following the formula given in Fig. 6. Mix your flour with cold water until it has the consistency of thick cream. Be thorough in beating the batter smooth. Any lumps present in the mixture can be removed by straining through a fine sieve. The addition of alum makes the paste firmer; preserves it from spoiling and makes it easier to spread. Place the mass over a flame and boil, stirring continuously; then remove and add cold water until about like cream. Let the paste stand until perfectly cold before using. A tablespoonful of Venice turpentine to a pail of paste, added while the mixture is hot, will increase its adhesiveness considerably. The proper consistency of the paste, of course, depends upon the quality of the paper to be hung. If delicate, lightweight paper is to be used, make the paste fairly thin, while with heavier material use the paste quite stiff.

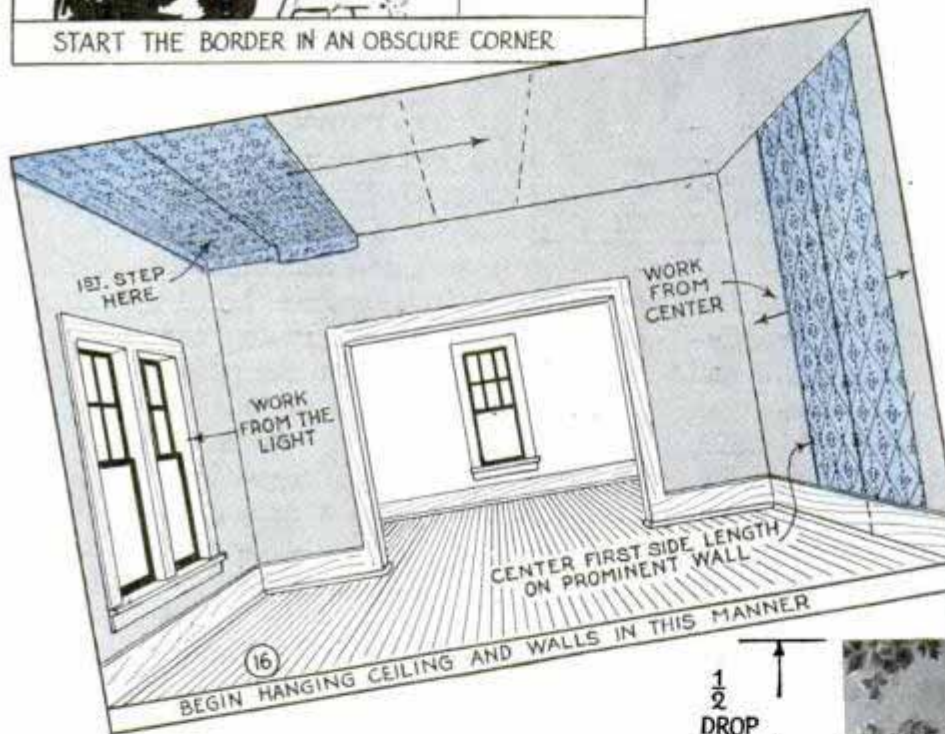
Cutting the Paper: Prior to cutting the paper to length, you must first examine and study the pattern to be able to cut it with the least waste. You will find two

distinctly different types of wallpapers, namely, the straight and drop-figure papers as shown in Fig. 17. The drop figure is usually a floral design which will not match immediately opposite

and consequently must be dropped or moved downward to match the adjacent strip. This drop measures one-half of the full figure and must be cut accordingly. For example, if your pattern is 18 in. long, the opposite length of paper must be lowered 9 in. Along the margin of commercial papers you will find equally spaced markings which indicate where the pattern should be cut. This makes it simple for the worker as he will cut one strip the required length by cutting on the "join here" mark of the paper and the next strip he will cut half-way between the "join



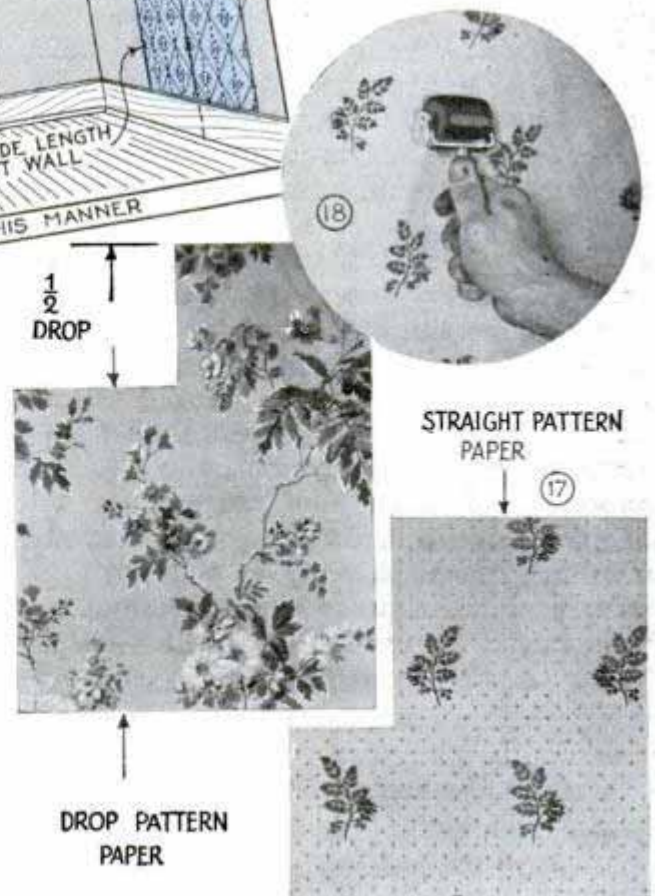
WRONG CORRECT
PROPER PROCEDURE FOR HANGING CORNERS



here" marks. You should cut from two rolls of paper in case of a drop-figure pattern, cutting on the marks from one roll and between the marks from the other roll.

The straight-figure paper, however, does match immediately opposite and all lengths are cut on the marks. If you notice your particular pattern has half figures on the margin of the paper, this is also termed a straight-figure pattern, and it, too, can be cut on the marks. In measuring the length of strips for a 9-ft. ceiling, there is no need of cutting the paper full 9 ft. long as you have a border at the top and a baseboard at the bottom. For a 9-ft. room, cut the paper in $8\frac{1}{2}$ -ft. lengths.

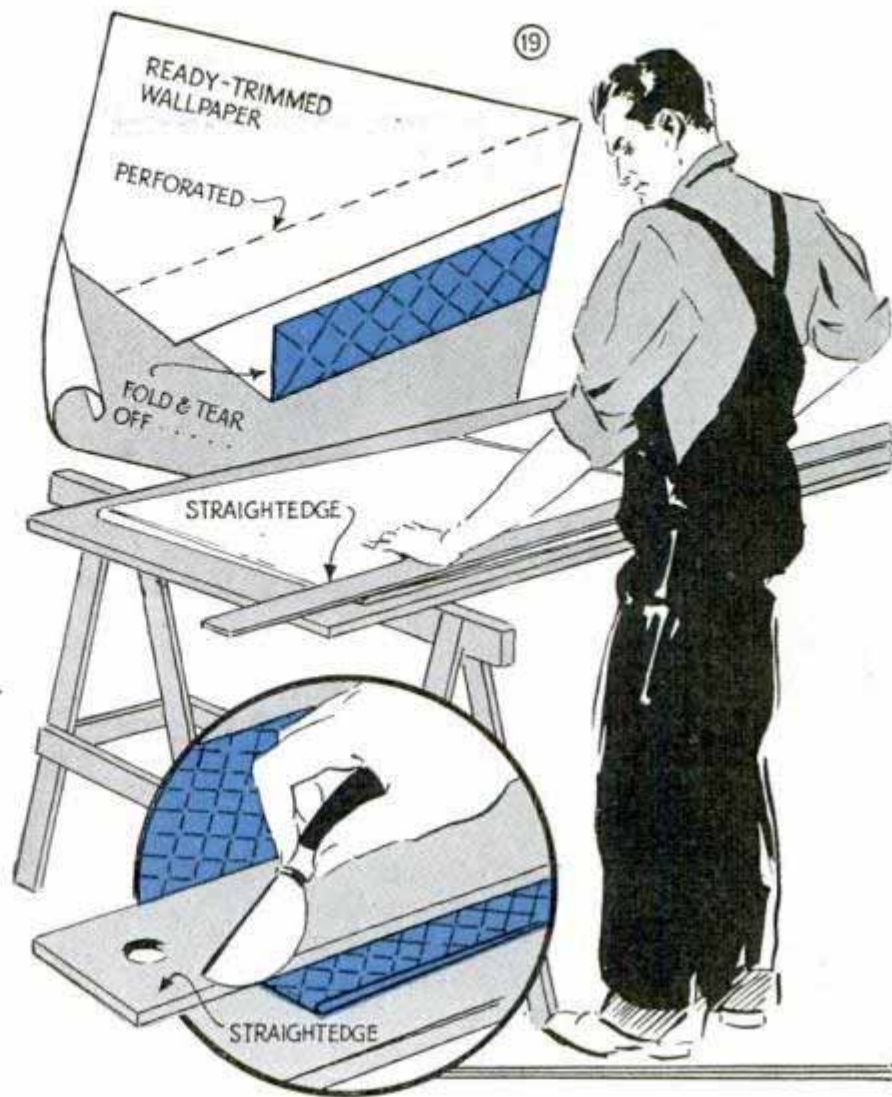
Pasting and Trimming: Fig. 2 shows three types of joints or seams which can be used; namely, the butt, lap and wire edge. Of the three, the lapped seam is the simplest, requiring only the trimming of one edge. On some papers the edge is trimmed, that is, the edge is perforated so that it can be folded over and torn off. A ready-trimmed edge is only suitable for a lapped seam. For a butt seam both edges of the paper must be trimmed by hand regardless of whether it may be ready-trimmed. This type of joint is preferable as the seam is visible only upon close inspection and therefore makes a neater job. The wire-edge seam is more or less a lapped joint, which resembles a butt joint with less skill required in keeping the joint closed. Trimming is done after the length has been pasted. Here the pasted ends of the paper are temporarily folded over midway as shown in Fig. 10, keeping the edges perfectly even, after which the straight edge is laid parallel to the edge of



the paper to guide the knife in trimming the selvage (Fig. 19). When only one edge of the paper is to be trimmed, first make sure you are trimming the correct edge. In pasting thin and delicate papers you will have to work a little faster as the paper will become overly wet and if left too long it is apt to tear while hanging. Also, above all, get the habit of wiping your paste board off each time. Otherwise you will have some objectionable stains on your finished paper.

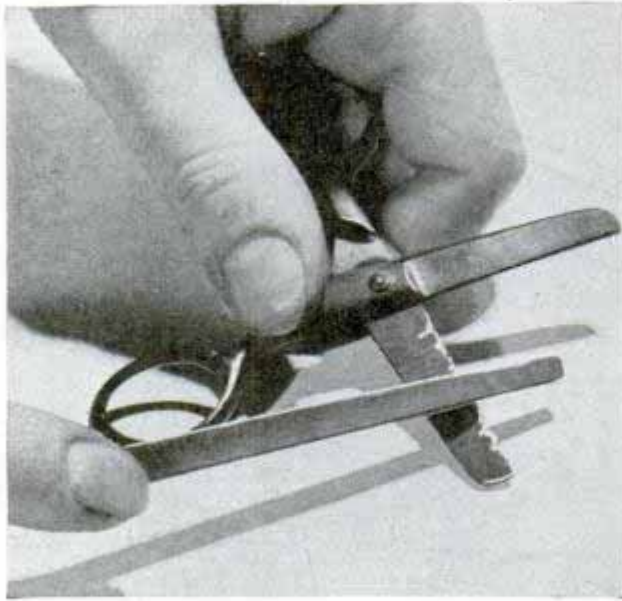
Hanging the Paper:

Papering the ceiling is looked upon by many as the most difficult part of the whole job but, through actual experience, you will find this to be easier than fitting paper around window and door cornices, fixtures, etc. The whole secret of the job is the manner in which the paper is prepared prior to hanging. With a butt-type seam it makes little difference whether the paper is run the length or width of the room. But with a lap seam, it is important to work from the lighted side of the room, as shown in Fig. 16, for the reason that if not done, shadows will be cast from each seam, making the ceiling very noticeable upon entering the room. As the length of paper is gradually pasted, it is folded back and forth in loose folds as shown in Fig. 7 and is carried up on the scaffold with a roll stick or an odd roll of wallpaper. If the angle of the ceiling is not true, you first strike a guide line about 16 in. from the wall and hang to this. "Tack" the end of the strip in place with the smoother brush, allowing it to extend down the side wall about $\frac{1}{2}$ in. As you continue across the room, the paper will unfold. Brush it out smoothly and avoid blisters. Follow this strip with succeeding ones. The seams are rolled down firmly as shown in Fig. 18. After the ceiling has been completed, the



first consideration in hanging the first side wall strip is having it plumb. Select a prominent wall on which to center the strip, Fig. 16. A plumb line from the ceiling to the baseboard is snapped as shown in Fig. 13. The starting length of paper is hung to this line as in Fig. 12, working each way from this center strip. If a lap seam is employed, it is not necessary to trim either edge of this first strip. In entering a corner, do not continue a full width strip around the angle as shown in the left detail of Fig. 14. Instead, cut a "fill-in" strip of the proper width as shown on the right. Use your trimming knife in cutting the paper to length at the baseboard. At window and door cornices, crowd the paper around the molding with the smoother and trim carefully with a knife as in Fig. 11. Finally the border is hung, starting in an obscure corner of the room, Fig. 15. Keep the pasted side off of the lower side wall while hanging to avoid staining.

Scissors Have Irregular Notches to Cut Deckle Edges



Cheap pair of scissors with notches filed in blades to cut deckle edges on photos

Attractive deckle edges, popular on photographs, stationery, etc., can be made with an ordinary pair of cheap scissors. These are first heated to a red heat over the flame of a gas stove. When they have cooled, irregular and unequal notches are filed in the blade as shown. The more irregular the notches the more attractive will be the cut. Filing is continued until the scissors produce the desired rough edge on the paper.

Rubber Guard on Edge of Door Protects Baby's Fingers

Unless some precaution is taken to prevent a baby from putting its fingers between the casing and the door when the

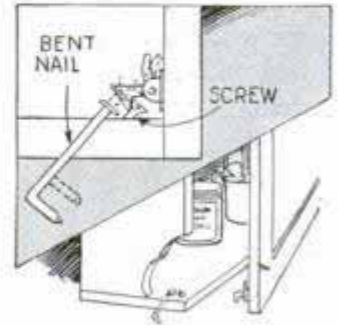


A small child cannot stick its finger in crack between door and casing if this guard is used

latter is open, a badly crushed finger may result. To avoid this, just tack or cement a strip of rubber or canvas over the edge of door and casing as indicated.

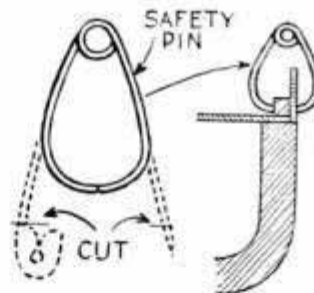
Secret Latch on Medicine Cabinet Is Hidden from Children

Here's a secret latch for your medicine cabinet that is not likely to be opened by children. A bent nail, which is the secret trigger of your lock, is below the eye line and is not detected easily. If the door of the cabinet does not swing open when unlatched, it may be well to install a spring between it and one of the shelves.



—Palmer Back, Fort Apache, Ariz.

Modelmaker's Safety-Pin Clamp



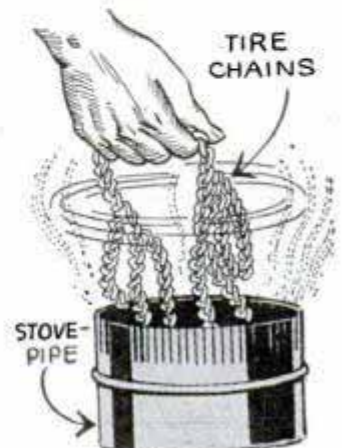
A tiny clamp for use in holding small parts of a model together while glue dries—is made in a jiffy from a safety pin. Just cut off the head and point of

the pin and bend the severed ends as indicated. The coiled end of the pin causes the severed ends to grip tightly the small work held between them.

—Edw. Hartel, Jamaica Plain, Mass.

Skid Chains Clean Stovepipe

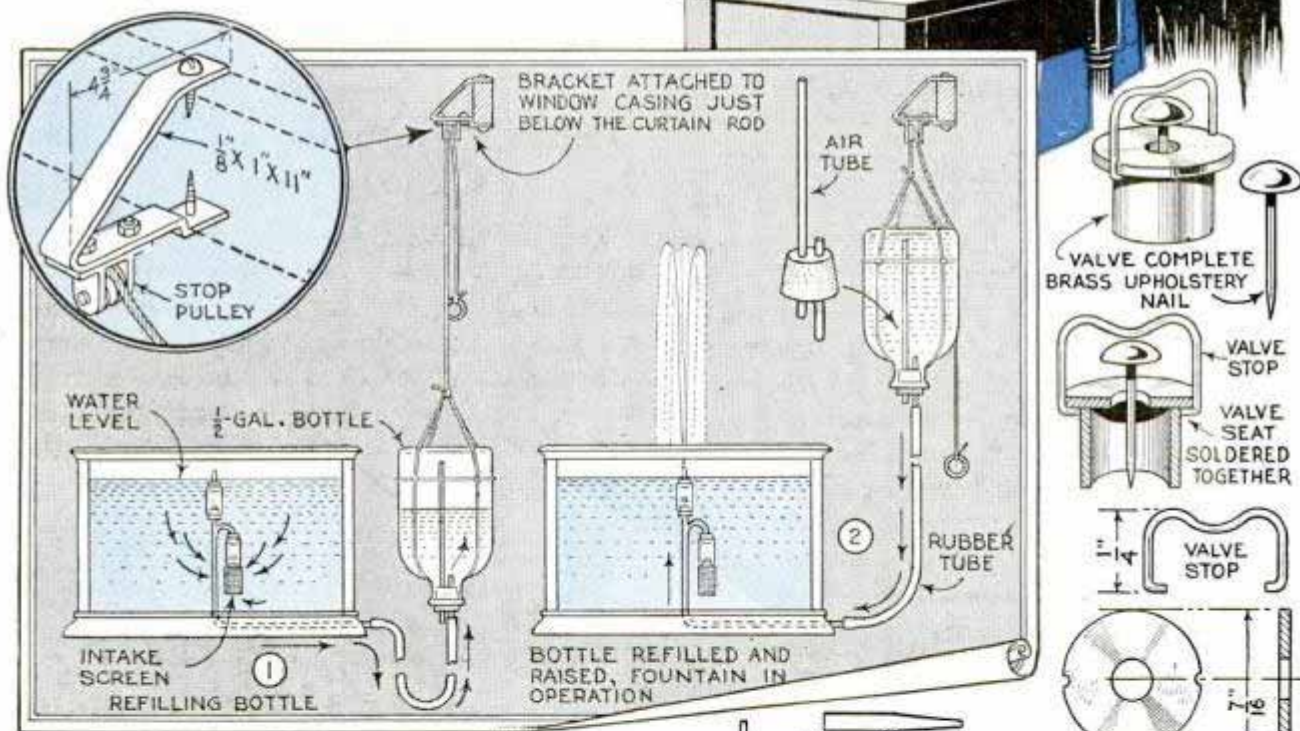
Instead of pounding stovepipes with a board or paddle to remove the accumulation of soot, try using a discarded auto skid chain inside of the pipe as indicated. By whirling the chain in the pipe, the soot will be loosened.



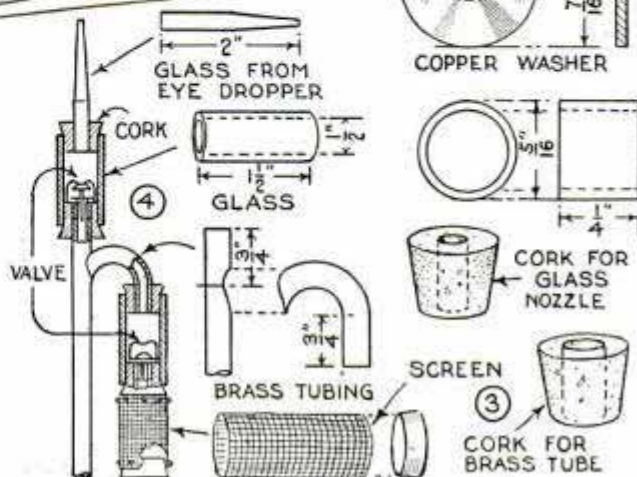
AQUARIUM FOUNTAIN

has no water connection

THIS novel little fountain adds to the attractiveness of any small aquarium and at the same time takes care of the aeration problem. In looking over the details, Figs. 1 and 2, you will see readily how it works. When lowered from its position behind a curtain to the level of the aquarium, the bottle picks up its supply of water through a system of simple check valves. When raised it will empty in 8 or 10 minutes. In Fig. 3 are details of both valves and in Fig. 4 you see how they are assembled. Bend the brass tubing before you solder the parts together. The jet is



formed from the tip of a medicine dropper. Heat this until the glass softens and then draw out the tip so that the opening is about the size of a sewing needle. Holes through the corks can be drilled with a short length of thin-walled steel tubing, one end of which is sharpened to a cutting edge. Drill a hole through the glass bottom of the aquarium with the same piece of tubing and valve-grinding compound. The tube can be driven either with a drill press or a hand drill.



"Watchful Bunny" Letter Holder for the Home Desk

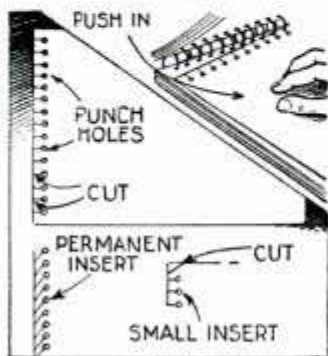


Just the thing for the children's desk, this letter holder can be sawed out and assembled quickly

Patiently holding letters or memos, this bunny cutout is just the thing for the home, especially if the children have a desk. Walnut or mahogany is ideal for the cutout, although any wood can be used if it is painted. A 3½-in. brass clip, known as a banker's clasp, is nailed behind the bunny's head to hold the letters, and a crossbar set in the bottom keeps it from tipping. A wood strip will do for this, although a metal bar is better as it adds weight.

—Lester P. Young, Culver, Ind.

Inserting Extra Pages Easily in Spiral-Bound Book



It's a simple matter to insert extra pages in a spiral-bound book or catalogue by punching the required number of holes in line at the edge of the paper and then cutting a slit from each hole

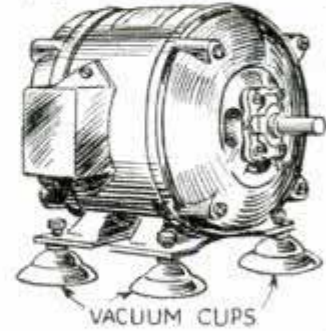
to the edge of the paper. If the paper is to be inserted temporarily, the slits can be made straight from the hole to the edge of

the paper, but if the page is to be inserted permanently, it will stay in place better if the slits are cut at an angle as shown in the lower left detail.—S. Ware, Chicago.

Vibration of Motor Is Absorbed by Rubber Vacuum Cups

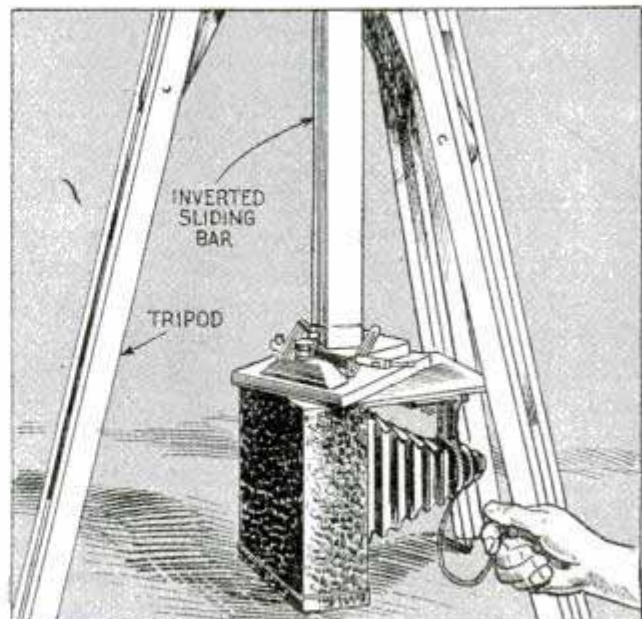
Vibration of small motors and the resulting noise can be deadened usually by supporting the motors on vacuum cups. These should be of the type that are fitted with small stove bolts, which can be picked up at almost any ten-cent store. Just insert the bolts into the mounting-screw holes on the legs of the motor and tighten up the nuts.

—R. S. Detlor, Montreal, Que., Can.



Tripod Adjusted to Take Photos Close to Ground

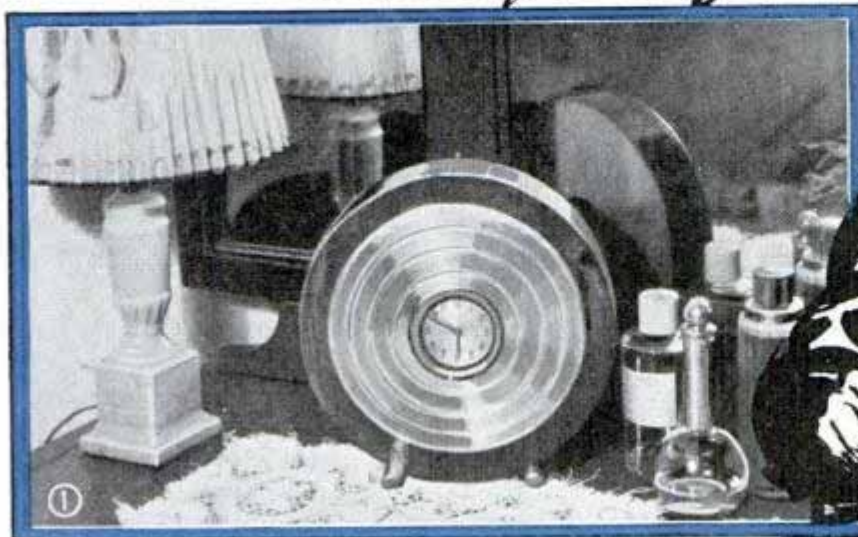
Tripods that have sliding center camera supports are easily converted to take a photo with the camera close to the ground. All you have to do is to remove the support and insert it from the underside. Then attach the camera in the regular way. Be sure that it is turned so that one of the tripod legs is not in the way.



Photos taken with camera close to ground by inverting sliding support in tripod

Turned CLOCK CASE

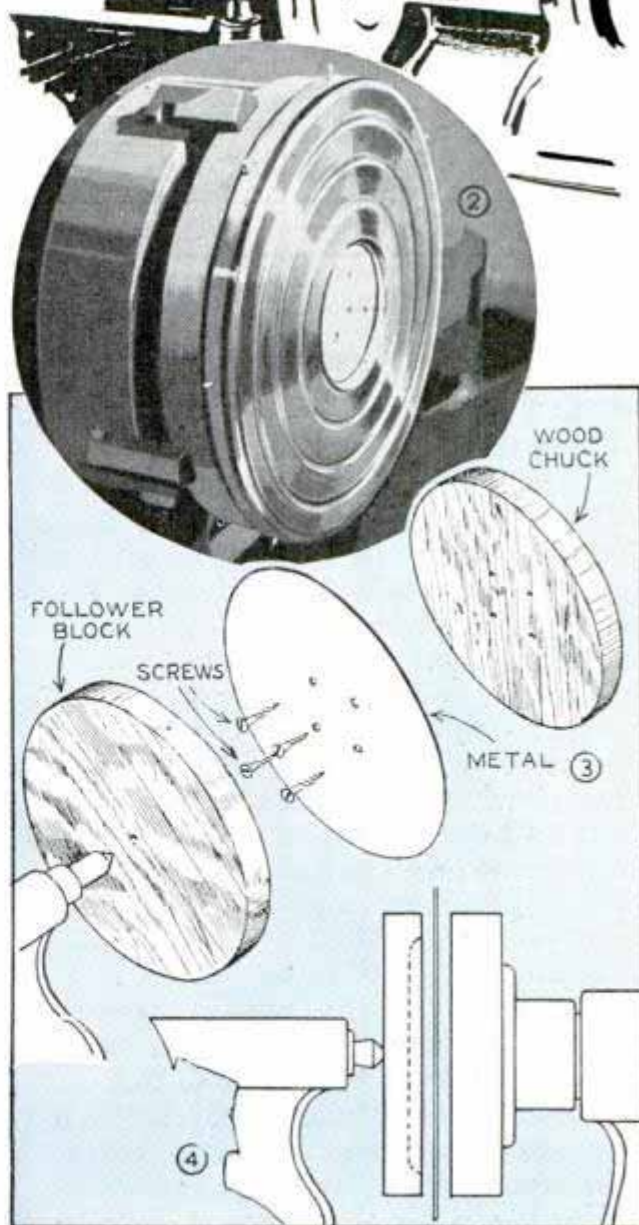
has spun face

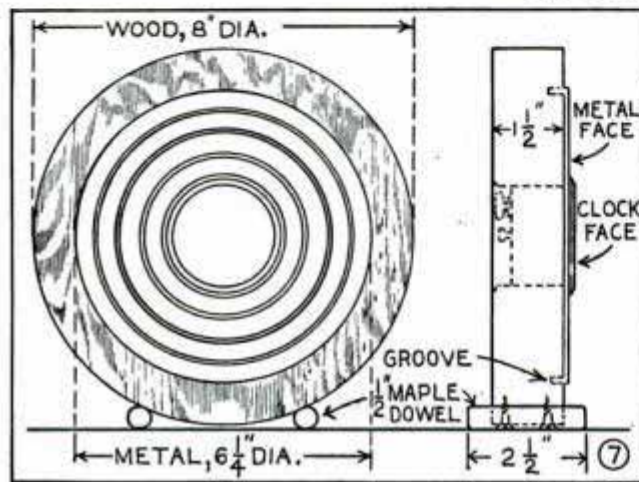
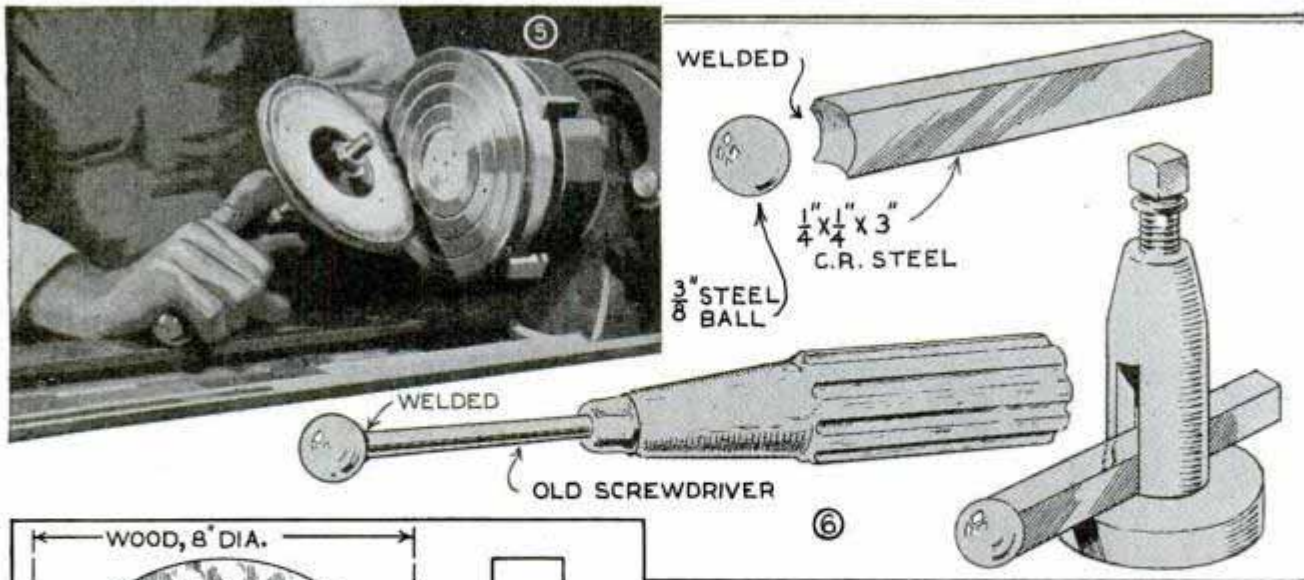


HERE'S a dandy two-evening lathe project that combines the simplest wood turning with metal spinning and finishes up into a novel clock case for either a spring-wound or electric movement as in Fig. 1.

In spinning the metal face the first step is to turn out a backing block or chuck of 1½-in. pine, to 6¼ in. diameter. Then, from the same material a follower block of equal diameter and cupped about ¼ in. on the inside face. See Figs. 3 and 4. If you use walnut or gumwood for the turned portion of the case, ⅛-in. soft aluminum makes a pleasing contrast. Spun copper is also very attractive. Scribe a 7-in. circle on a sheet of either metal, cut out the disk and locate the exact center. Scribe a circle on the metal about the center which is the same diameter as the clock face, and locate holes for four small screws inside the circle. Then screw the disk to the wood chuck and mount in the lathe as in Figs. 2 and 3. Run up the follower block against the metal disk and you are ready to turn over the edge of the metal.

If you don't have metal-spinning tools you can easily improvise them as in Fig. 6, using either a square of cold-rolled steel or an old screwdriver with a steel ball welded to the end as shown. Take several minutes to spin over the edge and keep oil or grease on the track of the ball to prevent cutting. When the metal has been





turned over, drive several small brads through the extreme edge of this turned-over portion to lock the disk in place as in Fig. 2. Then back away the follower block.

Cover the face of the metal with grease and score it concentrically with the steel ball as indicated. Press one groove lightly, then the next and so on. When all three have been indented slightly, repeat, forcing each one a little deeper. This prevents undue strain on the sheet. Then speed up the lathe, wipe off the free grease with a cloth, and polish with No. 000 steel wool. This polishing can be speeded up by using a flexible shaft and cloth buff as in Fig. 5. To cut off the rim waste, set a small cold chisel in the tool post so it won't rub at the lower corner, and score the rim deeply, $\frac{1}{4}$ in. from the front. Instead of cutting clear through, leave at this point, and in the same way, score an opening in the center of the disk just large enough to take the clock works to be used. Cut this clear out, then pull the brads and remove the rim waste with a pair of pliers.

So much for the metal spinning. The walnut block, Fig. 7, is turned down to 8

in. in diameter and $1\frac{1}{2}$ in. thick and sanded. With a file tang, a groove $\frac{3}{8}$ in. deep is cut the same diameter as the metal face rim and a hole turned out in the center just large enough to take the clock works but only half way through.

Fill and finish the rim and face to the groove with clear lacquer, white shellac or spar varnish. When dry, rub lightly with No. 000 steel wool, then a rag and finally apply wax. To remove the waste from the center, reverse the block in the lathe and continue the groove from the back side, making the final cut with a knife point, turning the lathe by hand.

Two maple dowels, $\frac{1}{2}$ in. in diameter and $2\frac{1}{2}$ in. long with two holes in each and each reamed out slightly to take the screw heads, form the two clock feet. These are fastened to the bottom just far enough apart to hold the lowest part of the wood disk from touching the table or mantel.

Storing Vegetables for Winter

Keeping vegetables in good condition while in storage is mostly a matter of maintaining the proper temperature and humidity. With but few exceptions, vegetables will keep best at a temperature of 35 to 38 deg. Fahr. Root crops and leafy vegetables need a high degree of humidity. Requirements of some commonly stored vegetables are as follows: Cool and dry, dry beans and onions; warm and dry, pumpkins, squashes, sweet potatoes; cool and moist, carrots, beets, turnips; cool and moderately moist, potatoes and cabbage.

How to Clean Your Gun

Guns may be cleaned with a mixture consisting of machine oil, 2 parts, dissolved in benzine, 1 part. Rust may be removed from the inside of the gun barrels by scouring them with a piece of oakum attached to the cleaning rod and saturated with a compound made by mixing paraffin oil, 4 oz., in turpentine, 1 oz., and benzine, 1 oz. Swabbing with the rust remover should be repeated until the last trace of rust has disappeared. The barrel next should be washed with a swab saturated with a solution made by dissolving caustic potash, $\frac{1}{2}$ oz., in water, 1 qt. After this treatment the barrel must be well rinsed with water and dried with cotton. To prevent rusting, it should be oiled thoroughly with any good grade of gun oil. In using the caustic potash solution, care should be taken to keep it away from other parts of the gun.

Check Protected Against Altering in Your Typewriter

If you have access to a typewriter, it's a simple matter to protect your personal check so that it cannot be altered. The check is first written and then inserted in the typewriter with a blotter behind it to

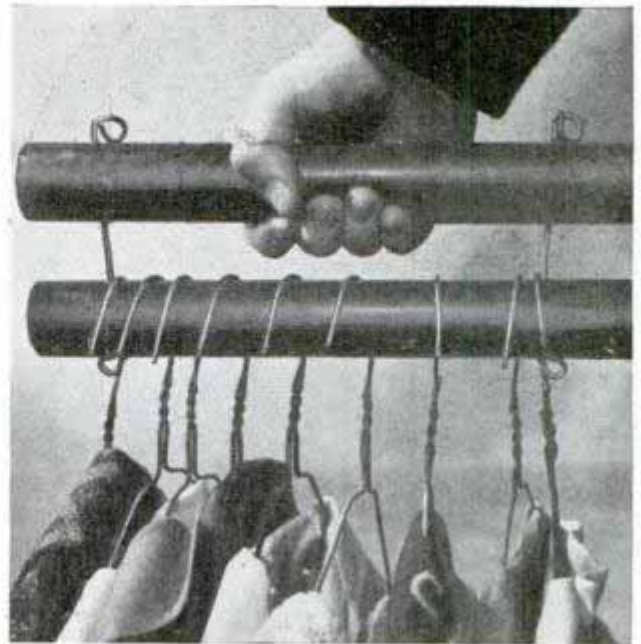


Check protected against alteration by perforating it with apostrophe or quotation mark on typewriter

serve as an impression sheet. It is necessary, of course, to lock the ribbon so that the writing is not blurred. Striking the key of the quotation mark or an apostrophe will perforate the paper.

Small brushes in which oil color has hardened can be cleaned with acetone.

Handy Rack to Carry Garments on Coat Hangers

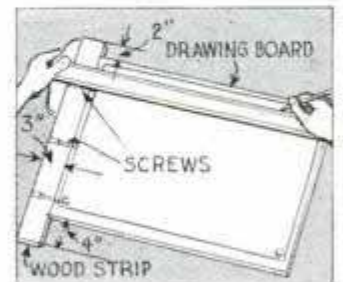


You can carry several garments on hangers at one time with this simple handle

Few loads are so clumsy as garments on hangers. But with the device shown it is a simple matter to carry ten or more. Two wood rods are wired together as shown in the photograph. The top rod serves as a handle and the bottom one holds the hooks on which the garments are hung. The wire is twisted at the ends to hold the two bars far enough apart so that the hand does not touch the lower bar.

Strip at End of Drawing Board Gives T-Square Good Bearing

As some of the drawings that I make are almost as wide as the drawing board, it is necessary to provide some means of giving the T-square a good bearing when it is used near the top of the drawing. To do this, I screwed a 3-in. strip to the end of the board so that it projected 2 in. beyond it at the top and 4 in. at the bottom. This enabled me to use the T-square at the extreme top or bottom without any possibility of it twisting out of line.



—Harold Larison, Elwood, Ind.

HUGO the HOUND



STUCK UP



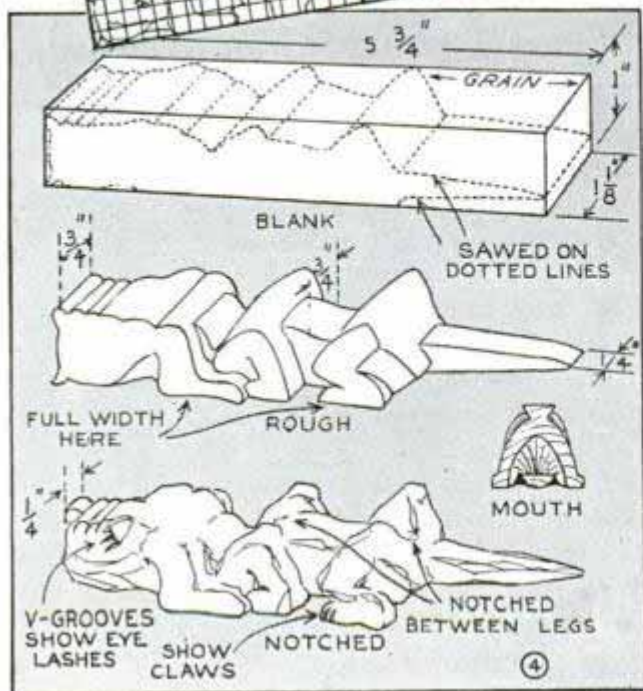
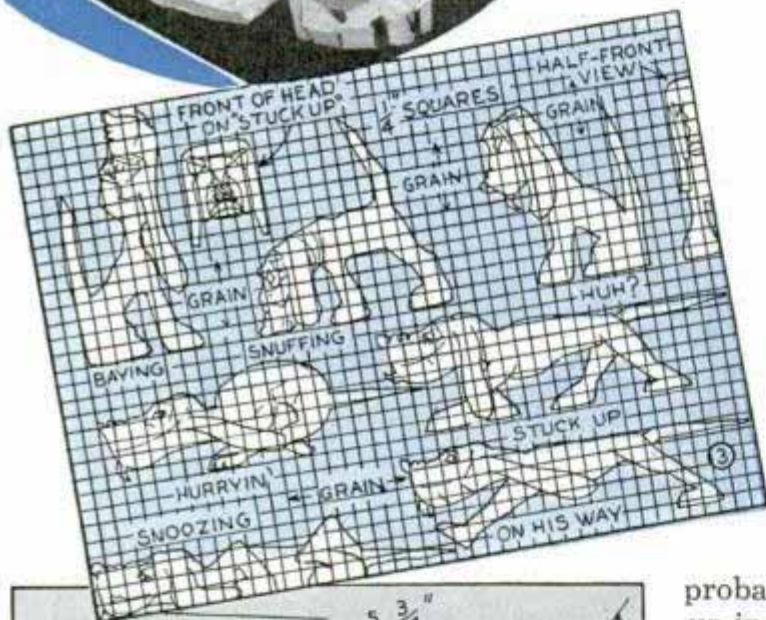
ON HIS WAY

By E. J. TANGERMAN

JUST seven acts of a long and lanky "houn" dog expressed in wood with a pocketknife and a few careful daubs of brown or black paint—that's Hugo. In Figs. 1, 2, 5, and again over in Fig. 8 he's posing for you and doing it very casually and credibly as you see, but there are several details that he's fussy about. Notice, for example, his wrinkled nose, a personal characteristic that he is

probably rather jealous of because it shows up in all his poses. Hugo's body is angular, very much so, and being a good model he takes pains to emphasize it. In doing this he's really trying his best to make it easy for you to carve his likeness because rough cutting of a sawed profile block gives just the body characteristics needed. Hugo has huge feet and what's more he's proud of them. You won't have to look far in the details to see that. Another reason Hugo has posed specially for his pictures is to show you that his tail is just as much a part of his personality as is his wrinkled nose.

Whittlers usually have their own preferences as to the type and size of pocket or pen knife to use for this particular work and also their own ideas about sharpening the blade of the knife. However, it vir-



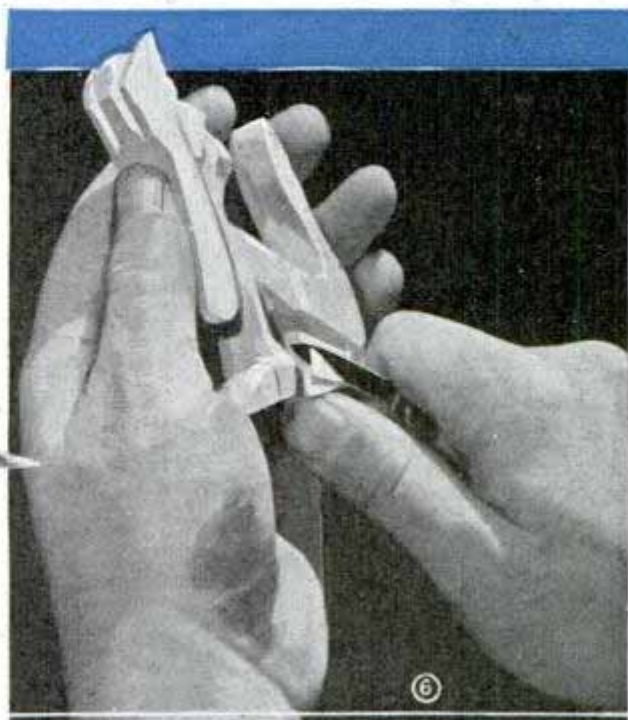
WHITTLED in SEVEN POSES



HURRYIN'

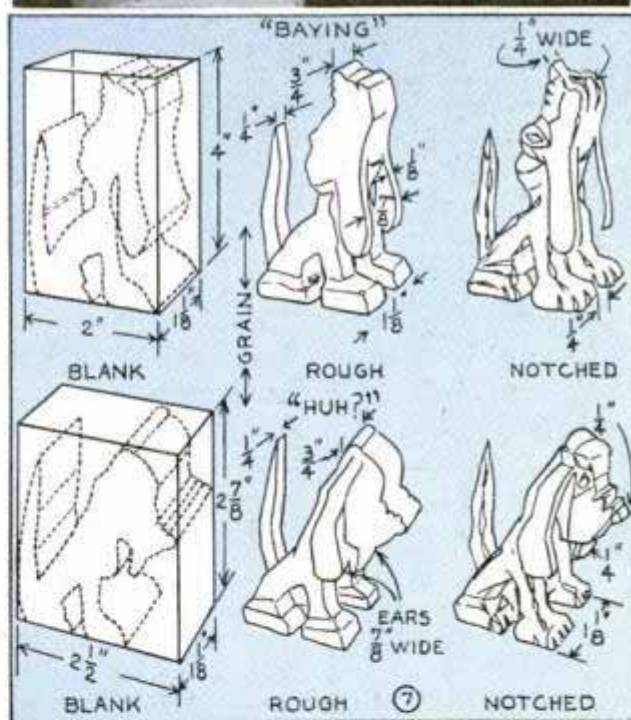


SNOOZING ⑤

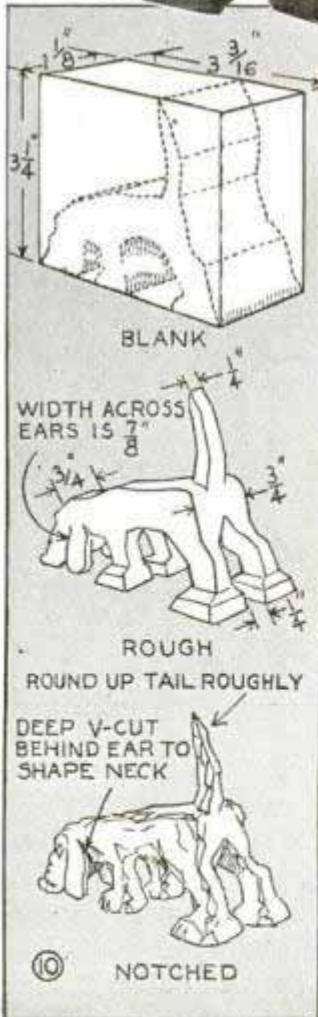
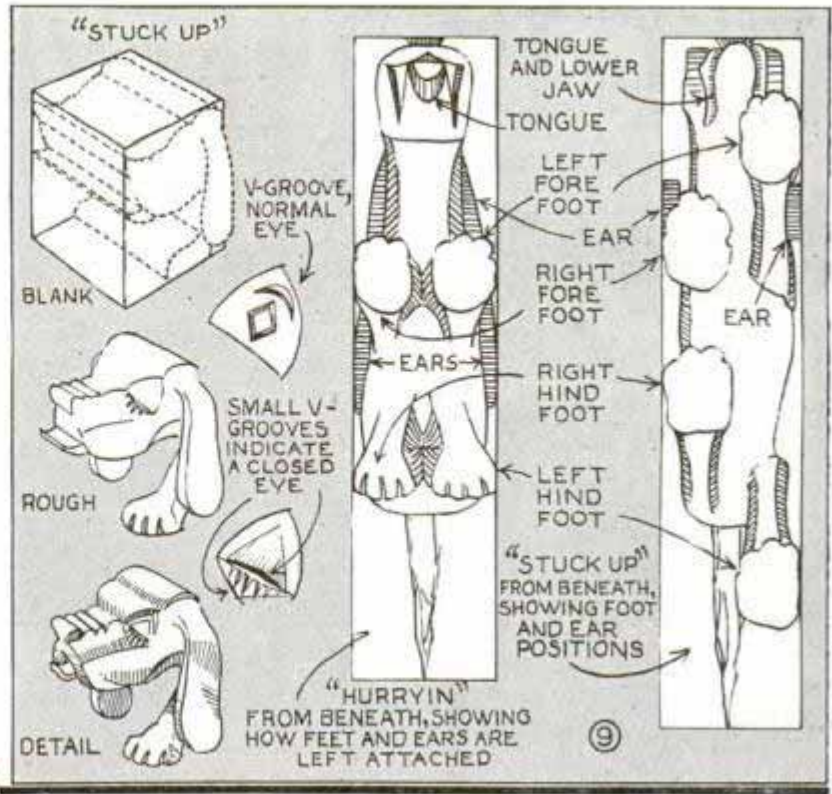


tually goes without saying that the knife you use must be top quality, otherwise you can't get a suitable edge on the blade. The handle must be of a size and shape that suits your hand individually and the blade will have to be selected for proper length, otherwise your hand and wrist will tire quickly. As an example, if you have long fingers you will probably find a fairly long blade comfortable to use, for you can manipulate it more readily and it won't cramp your hand. To work satisfactorily in white pine, where it must cut in all directions with equal facility regardless of the direction of grain, the blade must have a fine, smooth edge without the slightest waviness or nicks. If the edge is wavy, that is, indented even very slightly, you will have trouble making a shearing cut such as is necessary at certain points. Although it takes longer, it's best to sharpen the blade on a very fine oilstone and finish on a leather strop. A section of an old razor strop tacked to a block is just the thing. When properly sharpened, the edge will slip through the wood with a smooth, velvety feel and the chip will lift steadily away from the uncut portion, leaving a glass-smooth surface, Fig. 6.

Now as you see in Figs. 3, 4 and 7 all the poses are just variations, the variables being the ear position and general body shape. Whittle any one from 1 1/8-in. straight-grained white pine or basswood. Just see that Hugo's tail points in the direction of the grain. Starting with Fig. 4,



draw 1/4-in. squares on one flat face of the block, and transfer the pattern from Fig. 3, square by square. Saw out the blank on the dotted lines in Fig. 4 to get the profile. Then just follow through the three steps shown. Any other pose can be done the same way. "Hurryin'," "Stuck Up," and "On His Way" are not sketched in body detail because they are so very similar to the others. However, Fig. 9 shows the ar-



Use a fine-toothed blade to saw out the profile

arrangement of the feet on "Hurryin'," the foot arrangement on "Stuck Up," and details of the face. Note that here, as on "Snoozing," Fig. 4, the eye is not a complete diamond but just a straight line at the base of the flat surface on which the eye is carved.

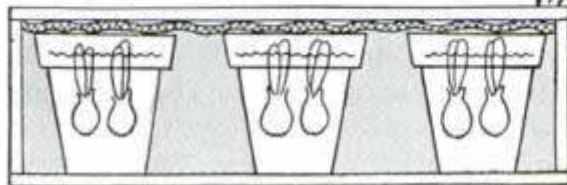
As shown in the details, particularly in Fig. 10, the full width of the block is always used for Hugo's huge feet. The body should be between $\frac{3}{4}$ and $\frac{7}{8}$ in. thick, the head $\frac{3}{4}$ in., which allows $\frac{1}{16}$ in. on each side for the ears to project from the head. Thin the neck down to $\frac{3}{8}$ in. or even a little less to make the head appear larger. Cut large V-notches to break up the flat surfaces and indicate the joints—don't use small notches because they'll make Hugo look like he has a shaggy coat. And, don't smooth the edges; whittle them crudely, and leave them that way. Notches also indicate Hugo's claws and his wrinkled nose.

Paint on Hugo's spots or not, as you will—then use him for a desk ornament, mantel, knickknack corner, coffee table, dresser, book-end or for any of the dozens of other things that will suggest themselves to you. If you want Hugo bigger, choose a larger block and make your original squares larger— $\frac{1}{2}$ -in. squares make Hugo twice as big. And if you want to polish him, use mahogany, walnut, or maple instead of pine. But in any case, don't sandpaper Hugo—you'll round off all his character.

Chemical Kindling Ignites Campfires Quickly

Campers will find these kindlers convenient in starting fires, especially when the wood is damp. To make them, melt rosin, 3 lbs., and tar, 1 qt., together, and while cooling, work in as much sawdust and charcoal as possible. After the mixture has cooled, break it into pieces the size of an egg. These kindlers will ignite from the flame of a match.—Roy Tichenor, Cincinnati, Ohio.

Flowering Bulbs Grown Successfully Indoors



Almost any bulbs can be grown successfully in the house during winter. You begin with a box in the garage. Build a box large enough to hold a dozen pots and fit it with a tight cover. Pot the bulbs as shown and place them in the box early in the fall. Cover with burlap, then close the box and water every three weeks. Keep them there until January when they may be brought into a cool basement. The bulbs should continue to grow in the dark until

they are about 6 in. tall and the flower bud is well out of the bulb. Then gradually bring them into a warmer place in the basement. Hyacinths, tulips and daffodils will all blossom in the house if so treated, for it gives them an excellent root growth. In about two weeks after they are brought upstairs in the light, they will blossom. The one necessity is regular watering.

Holder Keeps Thin Stock from Turning on Drill Press Table

Have you ever had real thin work twist suddenly on a drill press when the drill broke through resulting in injury to your

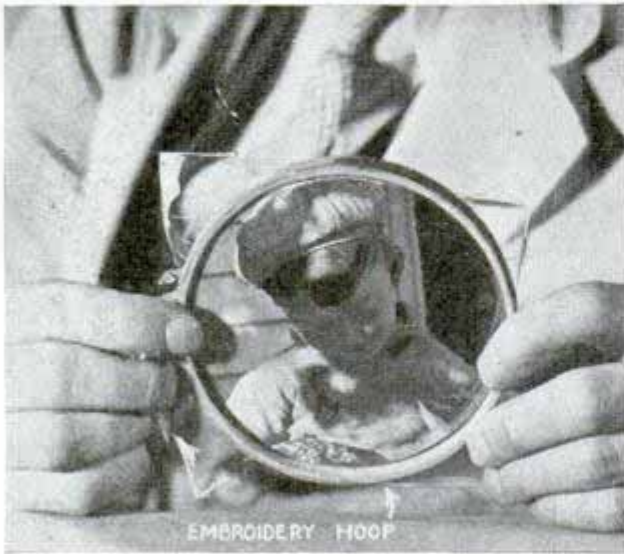
hands? If so, this simple holder will help to avoid this trouble. It is shaped from a wood block and has four bolts and wing nuts, which slide in slots to permit adjusting them to clamp the work effectively. A large hole in the center of the holder allows the drill to pass through, while one end of the block is whittled down to form a handle.



Warm Hands in Wet Gloves

Here's a way to keep your hands dry and warm during winter when working with gloves that constantly become wet. First slip on a pair of thin, cloth or leather gloves, then a pair of rubber gloves and over these the work gloves.

Small Photos Are Framed Easily with Embroidery Hoops

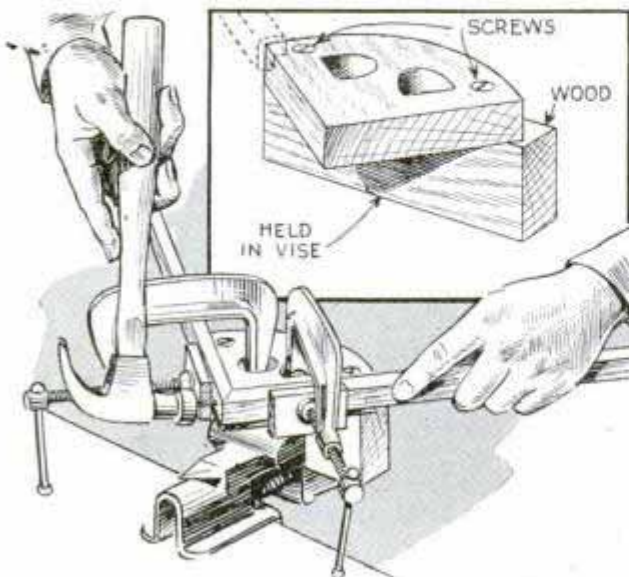


Embroidery hoops are obtainable in a number of sizes and cost very little

A quick and simple method of framing a small photograph is to use a pair of embroidery hoops, which may be waxed or stained if desired. Cut the picture to the size of the inside hoop, cover it with a piece of plain or colored Cellophane, and slip the larger hoop over both. Trim the excess Cellophane from the back.

Framing Vise from Wood Block

Fastening mitered joints such as picture frames is rather difficult without a suitable clamp to hold the pieces together. For this purpose the jig shown can be made in a jiffy. A small hardwood block with two



Picture frames are held accurately with this simple jig, for gluing the mitered joints

sides at right angles is screwed to the edge of another block which is clamped in a vise. Before screwing the pieces together holes are bored to take C-clamps.

Partition in Laundry Hamper Separates Clothes

Instead of putting all of your soiled clothes together in a hamper, why not partition it so that the colored garments can be kept on one side and the white ones on the other? This saves the job

of sorting them on wash day. The partition is a piece of $\frac{1}{4}$ -in. plywood cut to shape to fit snugly inside the hamper.



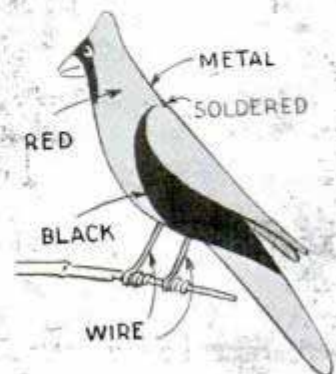
Hand Pad Helps in Chiseling



Carvers and others who often use small chisels and tap them on the ends of the handles with the palms of their hands, will find this pad handy. It is merely a square piece of leather, or it may be a disk, to fit in the palm, and it is provided with a wide rubber band or piece of elastic to slip over the hand.

Realistic Wings for Bird Cutout

This metal cut-out of a bird has been given a realistic appearance by adding metal wings. These are soldered to each side of the bird, and are spread slightly to simulate the action of a live bird on a hot day. Proper coloring and shading add much to the effect.

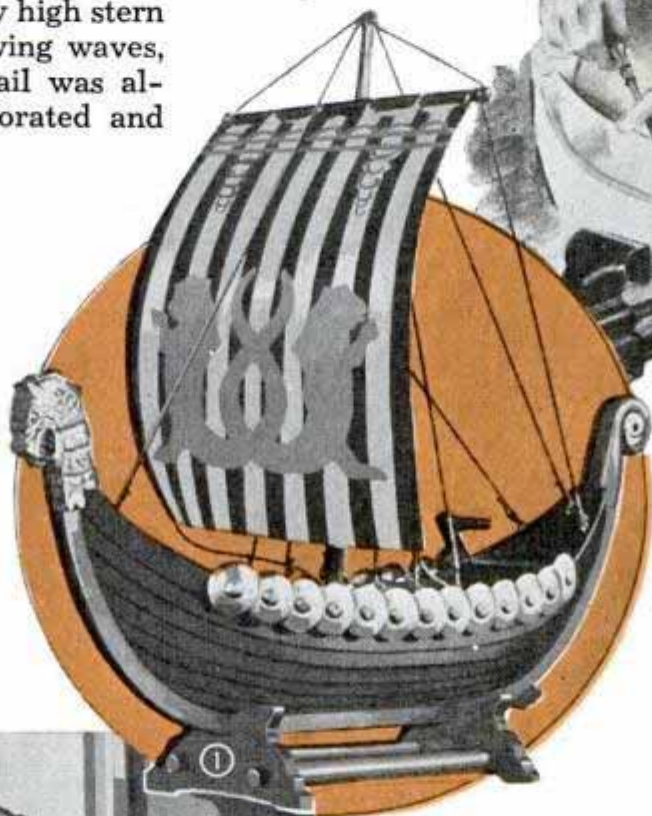
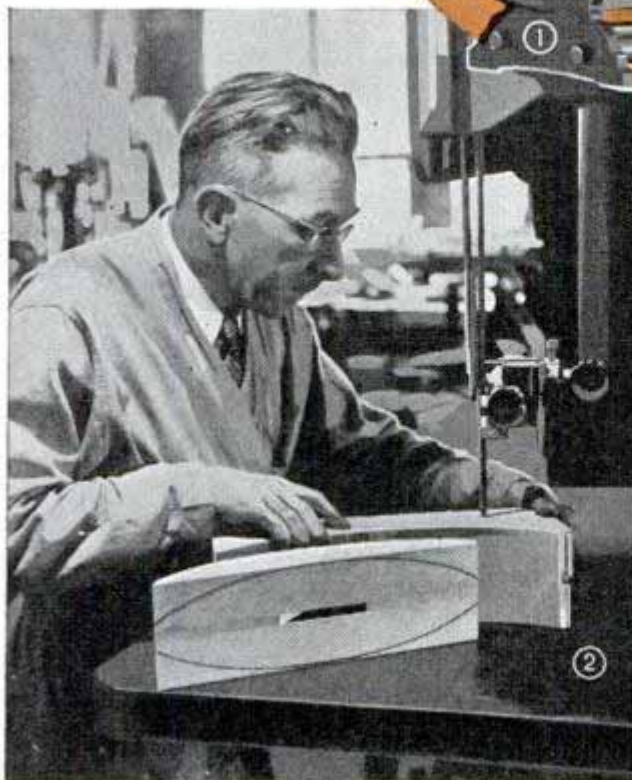


Modeling a VIKING SHIP

By A. JORGENSEN

THIS Viking ship is patterned after what was generally known as the "Dragon-ship" type, built in lengths up to one hundred feet, with a high bow for protection against oncoming seas and a correspondingly high stern to fend off the following waves, Fig. 1. The single sail was always a brightly decorated and embroidered affair and was used only on long voyages, the oars being relied upon for maneuvering the ship in battle or in a calm.

The first step in the construction is to get out the rough blocks from which the hull is shaped. There are two of these, as you see in Fig. 5, with a $\frac{3}{8}$ -in. filler between them.



Note particularly that this filler is dimensioned to leave a $\frac{1}{4}$ by $\frac{3}{8}$ -in. groove for the keel when the blocks are glued together. Although they are not shown, it's a good idea to use two $\frac{1}{4}$ -in. dowels to strengthen the

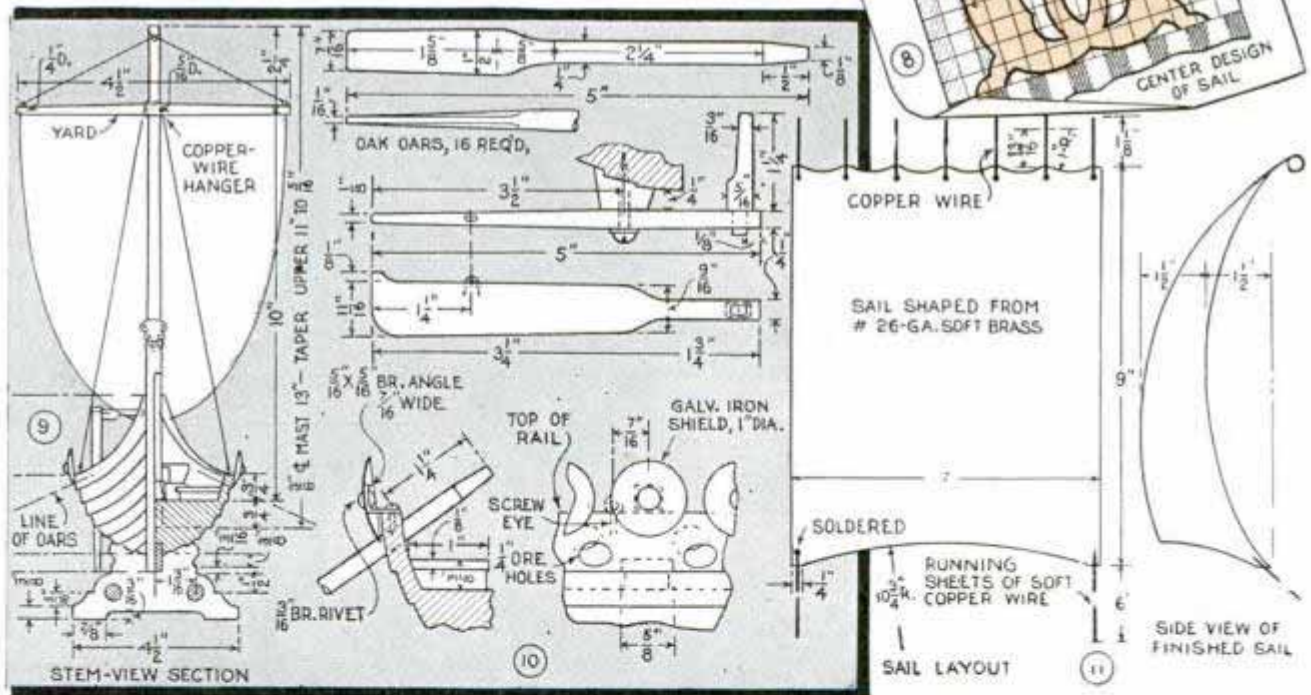
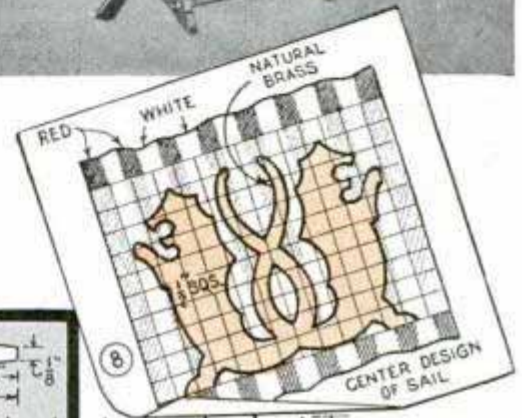
joint. When the glue is dry you draw a full-size profile from the crosshatched section, Fig. 6. The curves are the same at both ends. Once you have the profile laid out on the block, saw it to the rough size as in Fig. 2, keeping the blade outside the lines in the waste. Save the waste pieces and tack them back in place so that you can saw the top profile, as in the deck plan, Fig. 6. It's well to saw the deck curves to a regular radius, although when finished the curves sharpen a trifle before meeting the stem and stern posts. Because of the regularity of the curves no station lines are used.

Now the carving, taking the inside of the hull first. The dotted line in the side view, Fig. 6, gives the contour of the main and poop decks and the fo'c'sle, and the deck

with another. Make the oars and fasten in place with a spot of glue. Follow with the keel, the carved dragon head and tail. Then the rudder, rowing benches, and stand.

Now you're ready to set up the mast and rigging, Figs. 7 and 9. Run the center shrouds through a small hole drilled in the mast. Knot the ends. Tie the lower ends to small screw eyes in the rails. The fore and back stays tie to screw eyes in the deck.

Although the sail may be made of silk or linen it can be shaped easier if made of soft sheet brass as in Fig. 11. Fig. 8 shows the decoration which is an overlay of sheet brass and sweat-soldered in place. Paint the sail with red and white stripes as in Fig. 1. Tie the two guy ropes from the ends of the yard to screw eyes in the rail near the stern. Now to finish up, give all the exposed wood a coat of weathered oak stain. Allow this to dry thoroughly, then apply two coats of varnish. If you desire, you may omit the oars and overlap the shields as is shown in Fig. 1. This will

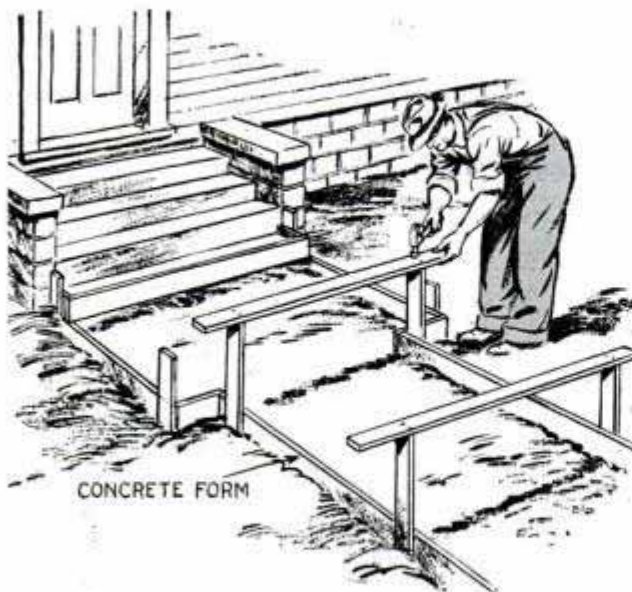


vary the spacing of the shields from that given in Fig. 10. In Fig. 1 the shields are spaced $1\frac{3}{16}$ in. on centers and overlap from front to rear, as you see. The forward edge of each shield is tilted inward slightly. Enamel the shields a bright yellow.

Another way of finishing the hull is to use a Vandyke brown color pigment ground in oil. Thin with turpentine to

make it brush easily and draw out smoothly. If you're careful in applying it a neat job is sure to result. Use an artist's brush with sable bristles. The trick is to get the color on evenly, without piling or overlapping and with as little brushing as possible. Of course, the wood will have to be sanded carefully to a uniformly smooth surface before applying the finish.

Concrete Forms Braced Overhead Assure Straight Sidewalks



CONCRETE FORM

Tying concrete sidewalk forms across the top so that the edges will be straight

Instead of bracing the stakes that hold the forms for pouring concrete sidewalks, try the method shown. Use long stakes and tie the tops with cleats as indicated. This will assure straight, square walks with no chance for the weight of the concrete to force any portion of the form out of line.

Using Double-Filament Lamps in Single-Contact Sockets

If the running lights on a boat are fitted with double-contact sockets, disconnect one of the wires and solder it to the frame of the lamp, and get double-filament bulbs. Then, if a light burns out, just raise the bulb and turn it halfway around, and replace in the socket and the other filament will light.—John Hohner, Elizabeth, N. J.

Connecting Tubing to Faucet



PENCIL FERRULE

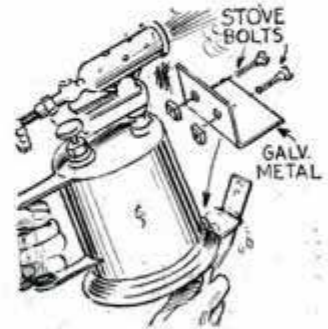
When you want to attach a length of small rubber tubing to a water faucet, such as in your darkroom, a rubber spark-plug protector will slip tightly over most faucets. A lead-pencil ferrule is

just the right size to fit snugly into both the tubing and the small end of the protector for connecting them together.

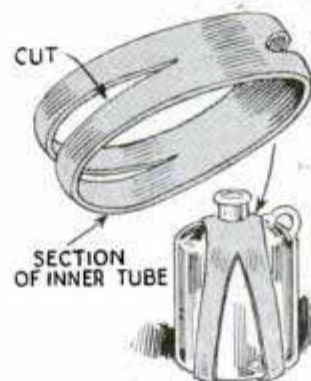
—Frank Bentley, Clinton, Ia.

Scraper on Torch Cleans Knife When Burning Off Paint

Bolted to the bottom rim of a blowtorch, an angle of heavy galvanized sheet iron provides a good scraper for cleaning the putty knife when burning off paint. This saves time because you do not have to set down the blowtorch and pick up a scraper—merely pull the knife across the scraper.



Protector for Glass or Stone Jug



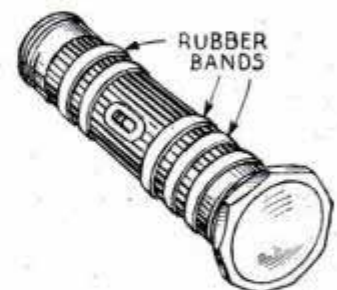
the jug so that two strips cross the bottom.

Glass or stone jugs may be protected against accidental breakage, when placed on a cement floor, by fitting them with a harness cut from a large inner tube. This is snapped over and around

Rubber Grip for Flashlight

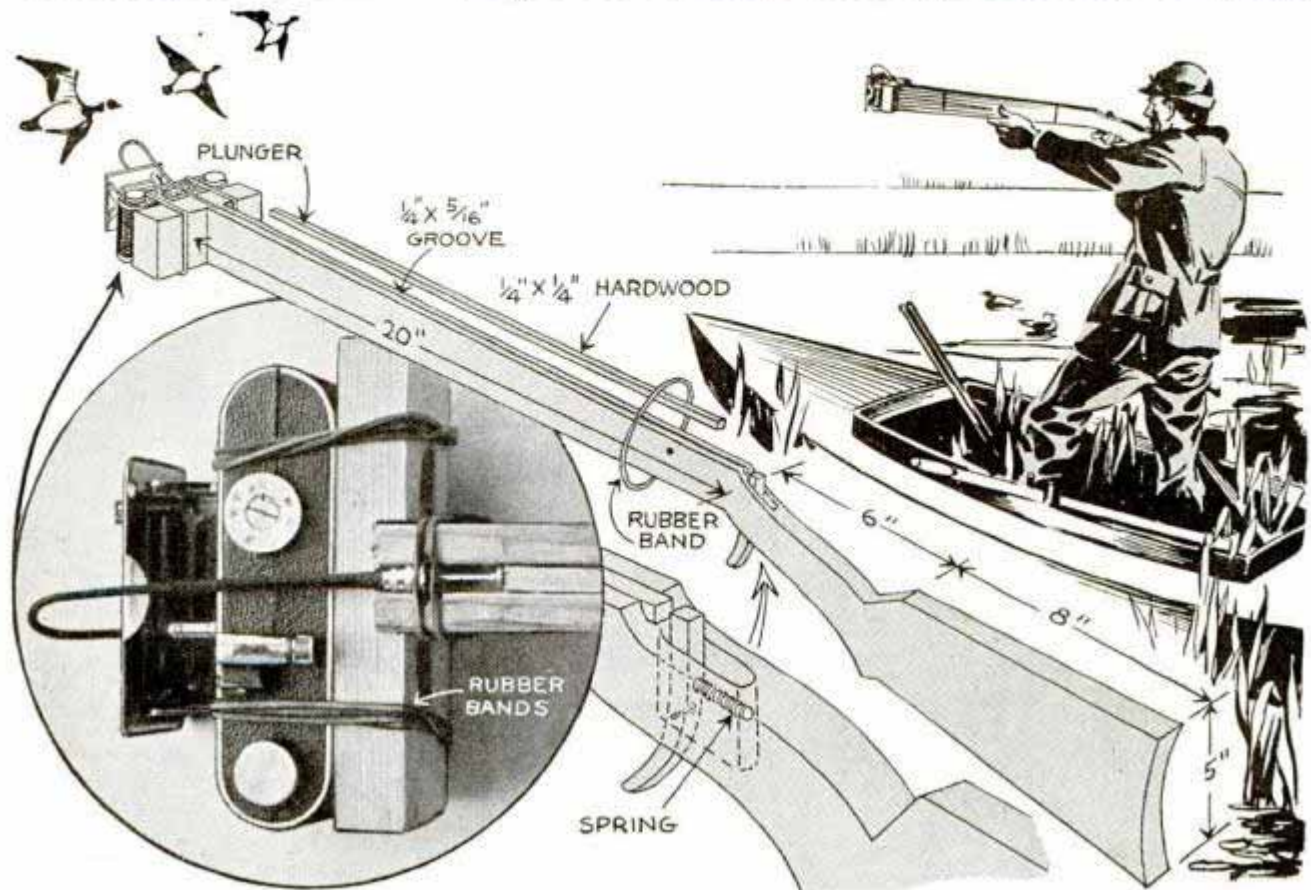
A good grip for the ordinary tubular flashlight can be had by slipping a number of rubber bands over the outside. Wide bands are best for this purpose, as they will stand more handling than the narrow ones and do not tend to roll on the surface of the flashlight.

—E. T. Gunderson, Jr., Humboldt, Ia.



☐ An eraser hung on a wire hook attached to your typewriter will always be at hand.

Camera Gun Helps to Take Fast Action Shots



In shooting fast action photos, such as birds on the wing, it's rather difficult to catch the scene quickly through the view finder of a miniature camera because the sighting radius is practically zero. With this contrivance you aim the camera in much the same fashion as you would a shotgun. Pulling the trigger trips the shut-

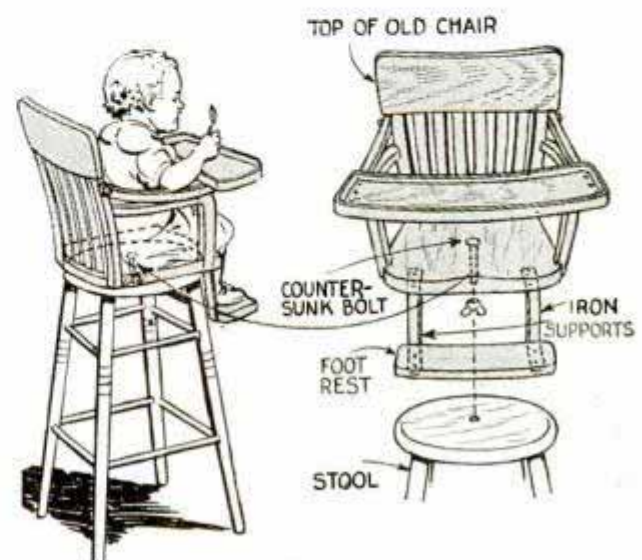
ter. Be sure that the block supporting the camera is exactly at right angles to the stock. Before you chance any critical shots take a few test photos to make certain that any object which is in the line of sight over the gun is included in the field of the camera lens.

—Claude W. Clifford, Salem, Ore.

Baby's Seat Bolted on Kitchen Stool Becomes High Chair

If you have occasional use for a baby's high chair when friends visit, it is not necessary to keep a regular high chair around when you can convert your kitchen stool into one at a moment's notice. The top and seat, minus the legs, of a regular high chair are used and are fastened to the top of the stool by means of a bolt and wing nut as indicated, the head of the bolt being countersunk in the seat. It takes only a moment to attach or remove the high-chair seat when needed.

☐ Wearing a rubber finger tab while developing cut films in a tray makes separation of the films easy.



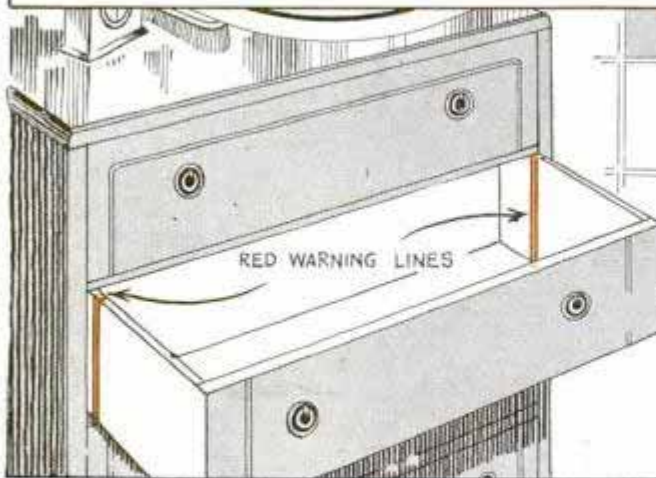
Solving HOME



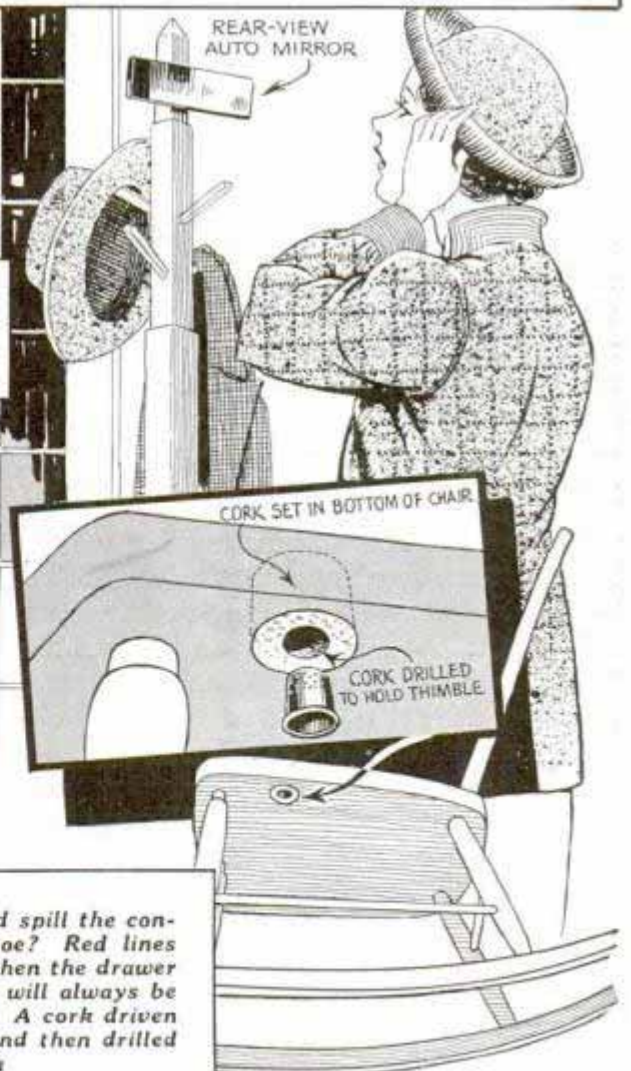
Instead of scattering moth balls through clothing in a trunk, attach them to the underside of the tray with a strip of screen wire as above. Tape the edges of the wire and then tack it in place. Where there's a lady's hat, there should be a mirror. So why not put one on the costumer as shown below? An auto rear-view mirror is just the thing for this purpose as it is small and inconspicuous, and can be tipped or moved sideways to catch the light



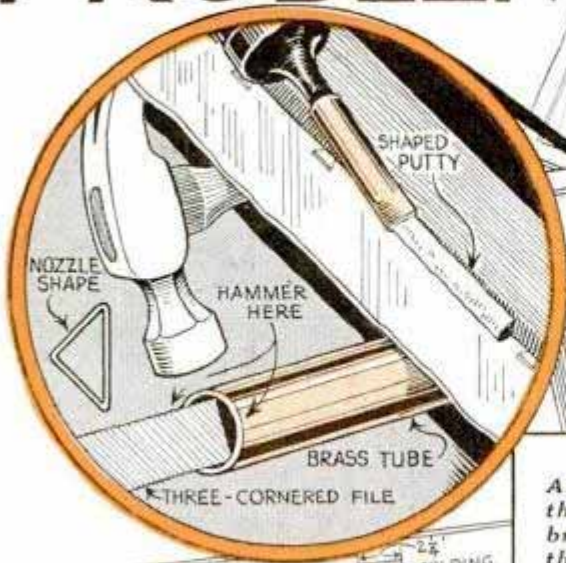
Why "freeze" your hands inside rubber gloves when hanging out the wash during cold weather? Just slip the gloves over a pair of woolen ones



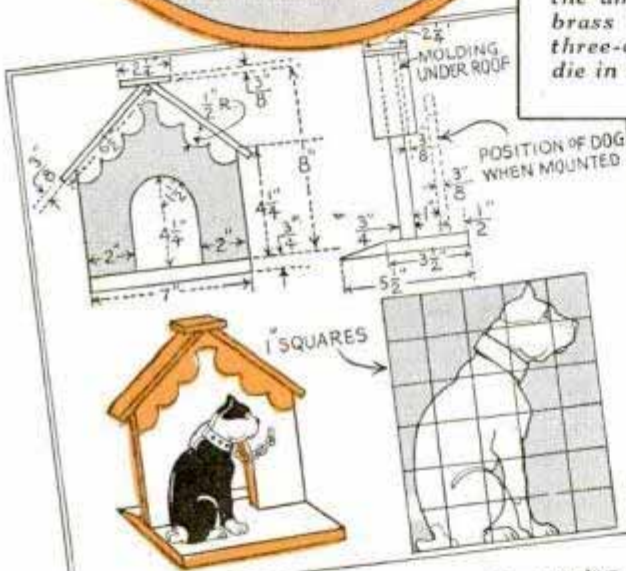
Did you ever accidentally pull out a drawer too far and spill the contents—or maybe crack your shin bone or injure a toe? Red lines painted on the sides of the drawer as above will show when the drawer has been pulled out almost to the limit. Your thimble will always be at hand if it is stored in the chair seat as at the right. A cork driven tightly into a blind hole in the underside of the seat and then drilled to take the thimble snugly does the trick



PROBLEMS



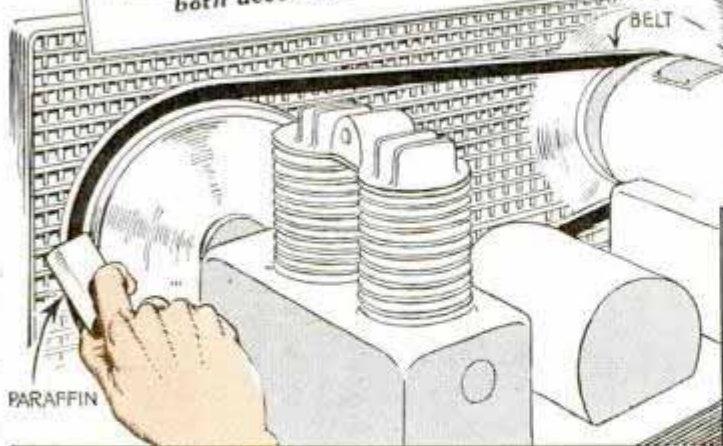
An Alemite grease gun fitted with a special nozzle will aid the amateur glazier in puttying windows. The nozzle is a brass tube threaded at one end to screw on the gun. A three-cornered file inserted into the other end serves as a die in forming the end to a triangular shape with a hammer



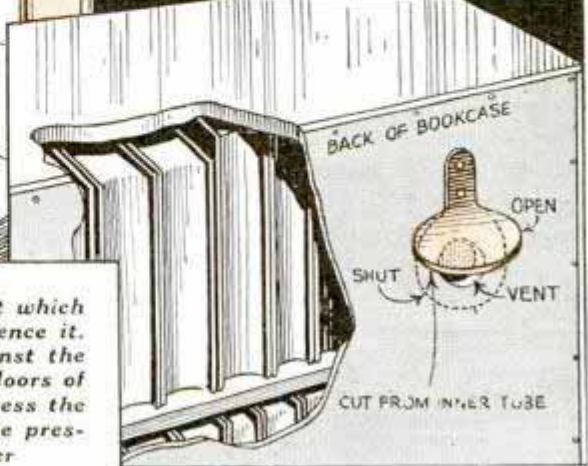
Depicting in miniature a watch dog sitting in front of his kennel, this unusual doorstop is both decorative and highly effective



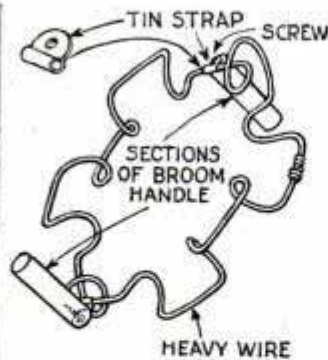
Put these traps in the eave troughs in front of each downspout and you'll keep a lot of dirt from entering your cistern. The trap is a 1-ft. length of downspout with a tight-fitting cap over the lower end. Clean the traps once each year



If the compressor of your refrigerator is driven by a belt which seems to be unduly noisy, a coating of paraffin may silence it. While the motor is running hold a cake of paraffin against the surfaces of the belt that contact the pulleys. When the doors of a bookcase are hard to close because they tend to compress the air inside, a vent of the type at the right will release the pressure. The flap over the vent can be cut from rubber



Reels for Use Around Your Home Bent from Stiff Wire



Wire reels you can make for winding rope and wire around the home

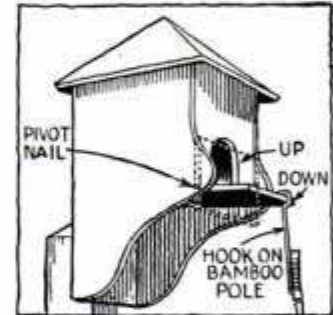
Reels in which to wind rope, wire, etc., around the home or farm, are easily bent to shape from stiff wire. Two short pieces of broom handle attached to opposite sides

of the reel provide good grips, which are attached by means of clamps shaped from strips of tin or sheet metal.

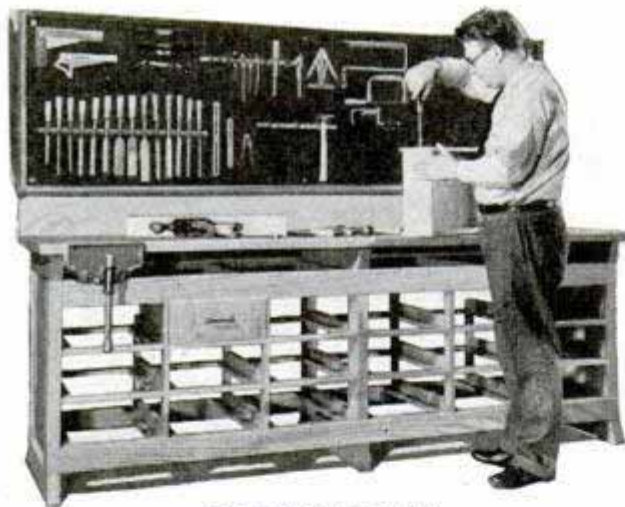
—Dale R. Van Horn, Lincoln, Neb.

Sparrow-Proof Martin House

If you want to keep sparrows out of a martin house between the time the martins leave in the fall and return in the spring, substitute a pivoted shelf for the regular perch as indicated. Then the perch is tipped up against the opening and left there until it is time for the birds to return in the spring.



Why Not Start a Home Workshop?



Cabinet Workbench—898

12-IN. BAND SAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.

DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

BELT SANDER—579: Heavy-duty type. Angle-iron framework and a 5 by 46-in. belt—25c.

CIRCULAR SAW TABLE—910: Angle-iron frame. 24 by 36-in. table. 10-in. blade—25c.

CARPENTERS' TOOLBOX—824: $8\frac{1}{4}$ by $13\frac{3}{4}$ by $31\frac{1}{4}$ in. in size. Has special rack for auger bits—25c.

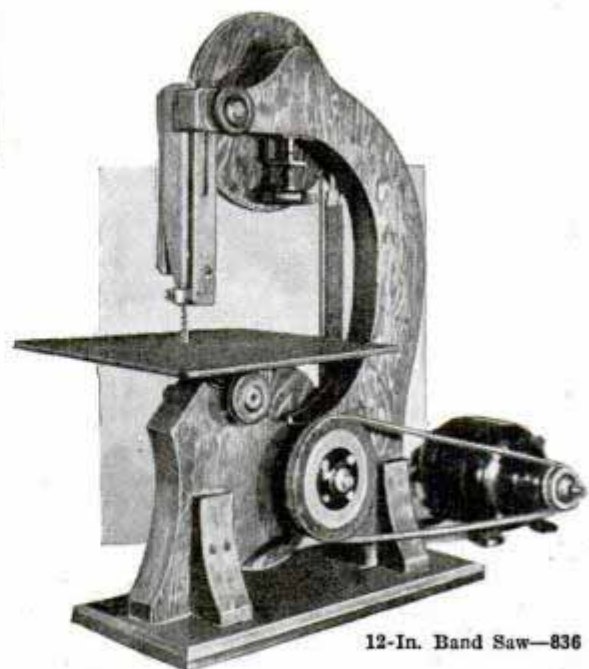
Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00

A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

THREE EASILY MADE WORKBENCHES—896 and 897: Designs that are applicable to benches of various sizes. Two prints 50c.

22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.



12-In. Band Saw—836

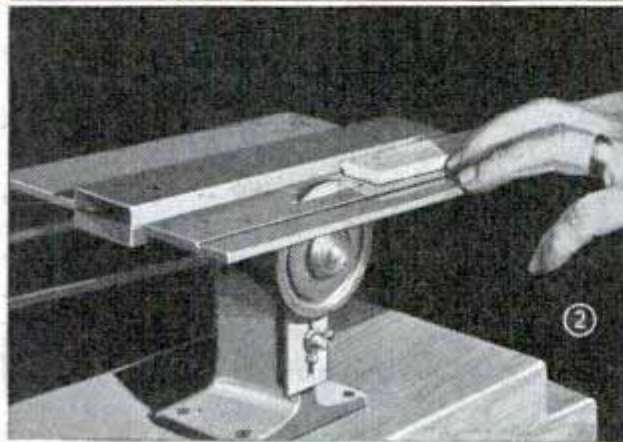
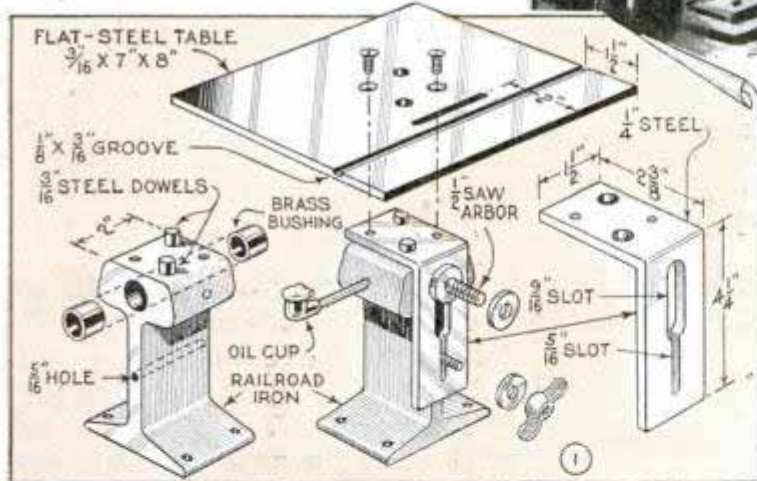
Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



SHOP NOTES

MIDGET CIRCULAR SAW *for precision work*

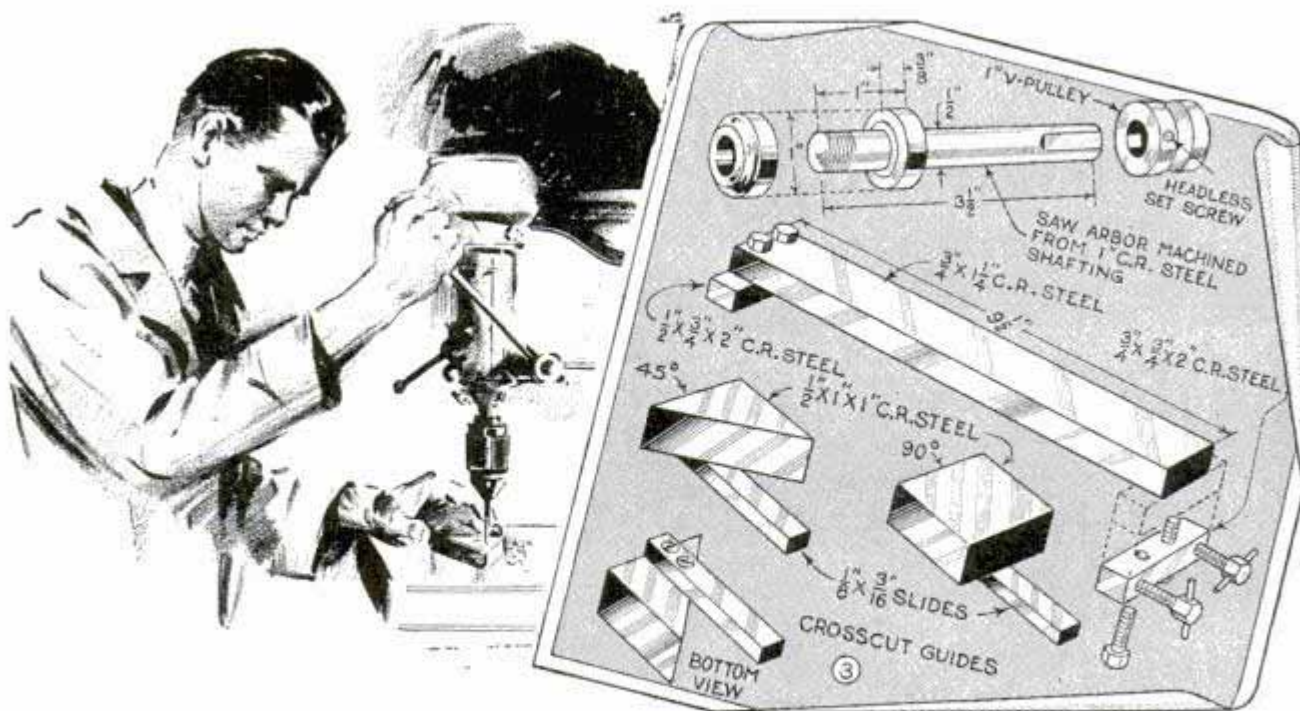
DID you ever wish you had a tiny precision saw for close work in getting out small, delicate model parts? Then here it is; a homemade affair carrying a 2 $\frac{3}{4}$ -in. blade that is just right for most small jobs. As you will see from Figs. 1 and 2, the base is made from a 1 $\frac{7}{8}$ -in. length of rail, preferably a section cut from one of the older, smaller sizes of rail. A hole is drilled and reamed lengthwise through the tread to take the spindle



bushings, another through the web to take the bolt holding the L-shaped slide and four small holes through the foot of the rail for screws attaching the machine to a bench. The slide is made of 1/4-in. angle steel, which is slotted as shown by drilling a series of adjacent holes and finishing up with a file. The table is cut from 3/16-in. cold-rolled steel. These parts are taken to your local machine shop where the

top and one end of the base are milled flat to a 90-degree angle. Also, both legs of the slide should be milled flat on both sides and to a 90-degree angle. Lastly, the table is grooved and slotted as indicated. The length of the slot is not given as this will have to be determined from the size blade you expect to use. The slot should be just wide enough to clear the saw; no more, for otherwise it is difficult to handle fine work.

Unless you have facilities for turning out the arbor as in Fig. 3, it may be best to



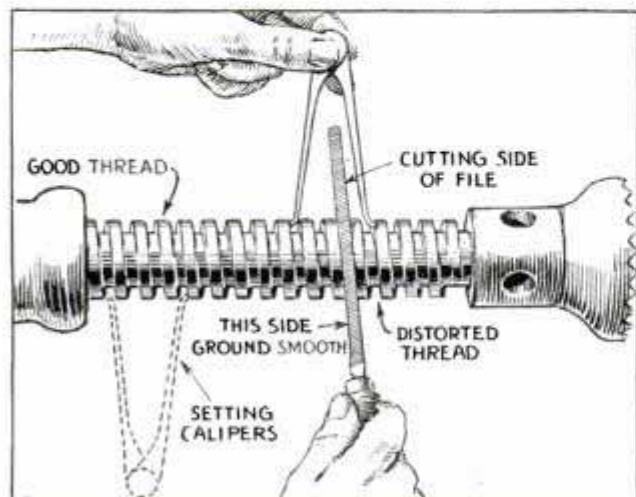
have the machine shop do this job also. Then you're ready to assemble the parts as in Fig. 1. Note that there are four holes drilled in the table and four in one leg of the slide. These must register exactly so it's best to make a jig. Two diagonal holes in the top are countersunk for capscrews, which turn into tapped holes in the slide. The remaining two holes in the top take the ends of steel dowels which are a drive fit in holes drilled in the slide as shown in Fig. 1.

Ripping and crosscut guides are easily

made from squares and flats of cold-rolled steel. You can get out the parts with a hacksaw and file or have them milled to size. Although you can use regular wood-cutting blades the best for this particular purpose is the metal-slitting type of circular blade. Usually you can get a used one from a machine shop and have the teeth reground and reshaped for cutting wood. This type of blade cuts extremely smooth when driven at a speed of from 4,000 to 5,000 r.p.m. When driven at this speed a light oil is applied to the spindle.

Distorted Box Threads on Screw Jack Trued Up with a File

After the threads on a screw jack had been distorted by a sudden overload, due

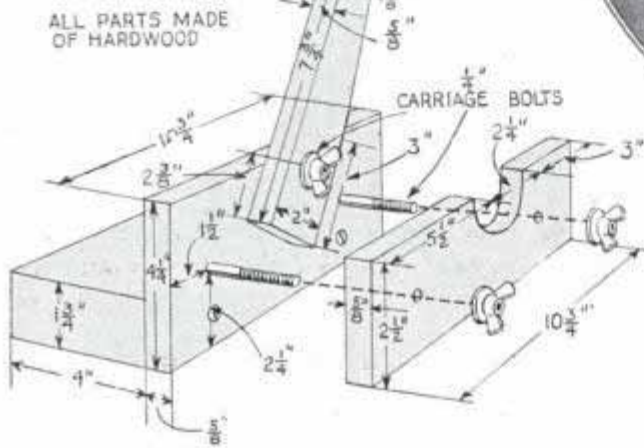
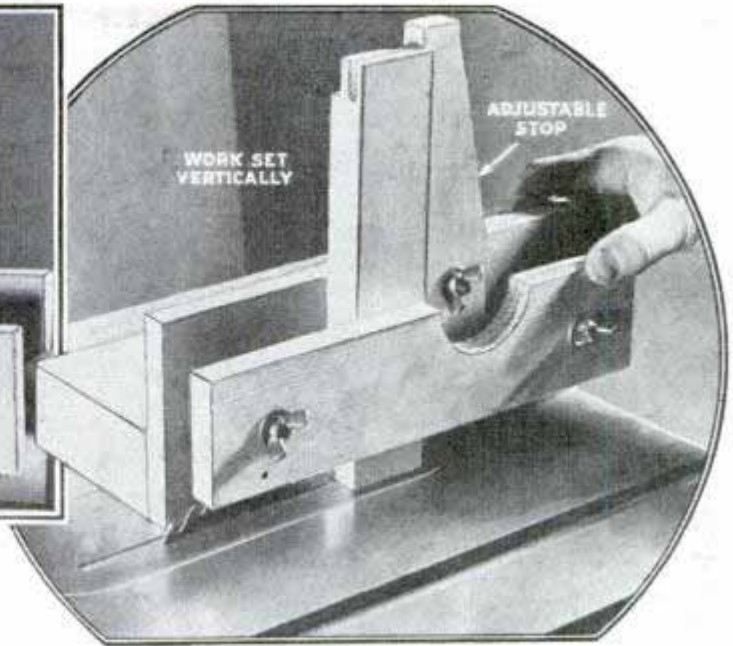
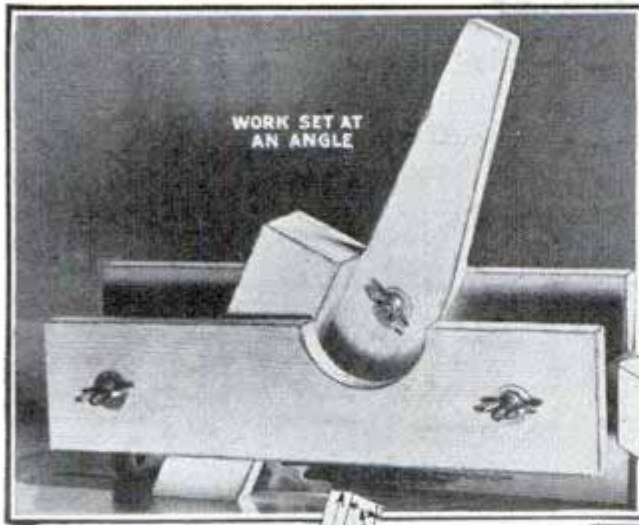


Distorted threads on screw jack trued up with a file which is smooth on one side

to another jack tipping over, the threads were trued up with a file as follows: The direction and extent of the distortion were first found by setting a pair of inside calipers to the top side of a good thread and the bottom of another good one some distance farther up the screw, as indicated by the dotted lines. The calipers were then tried up and down the screw to locate the distorted threads. After this had been done, one side of a file was ground away until it would pass between the threads, after which a little filing at exactly the right place reduced the distortion until the screw would pass through the female thread in the base. Then some grinding paste was applied and a few turns in and out finished the job.

—Earl Pagett, Coffeyville, Kans.

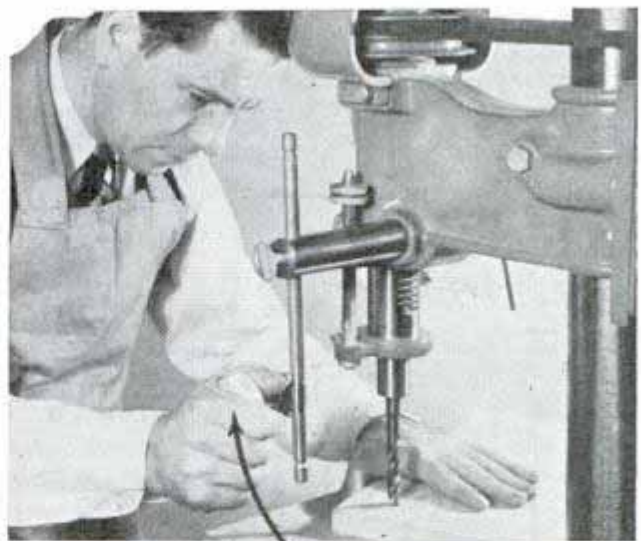
Tenoning Jig Clamps Work at Various Angles



Cutting tenons anywhere from the vertical to a 45-degree angle, is something you can do with the aid of this simple jig. After adjusting the extending arm or stop to the angle desired, you lay the work against it and then tighten the outer piece to clamp the work securely. The jig is slid along the ripping fence, which was previously set for the cut.

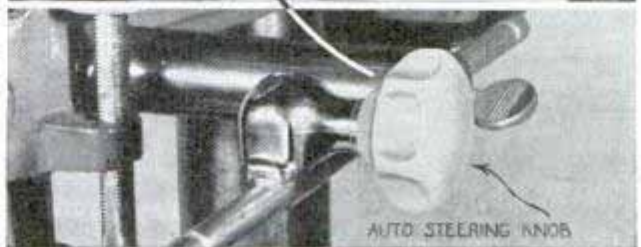
Drill-Press Lever Improved by Adding Auto Steering Knob

When confronted with the task of drilling holes through fairly thick material, either wood or metal, you require an unusually delicate control of the drill-press feed lever. This is especially true where the thickness of the work makes it necessary to swing the feed lever through a semicircle, as you may have to shift your grip just before the drill breaks through. However, by attaching an auto steering-wheel knob to the feed lever as shown you can apply uniform movement and pressure.

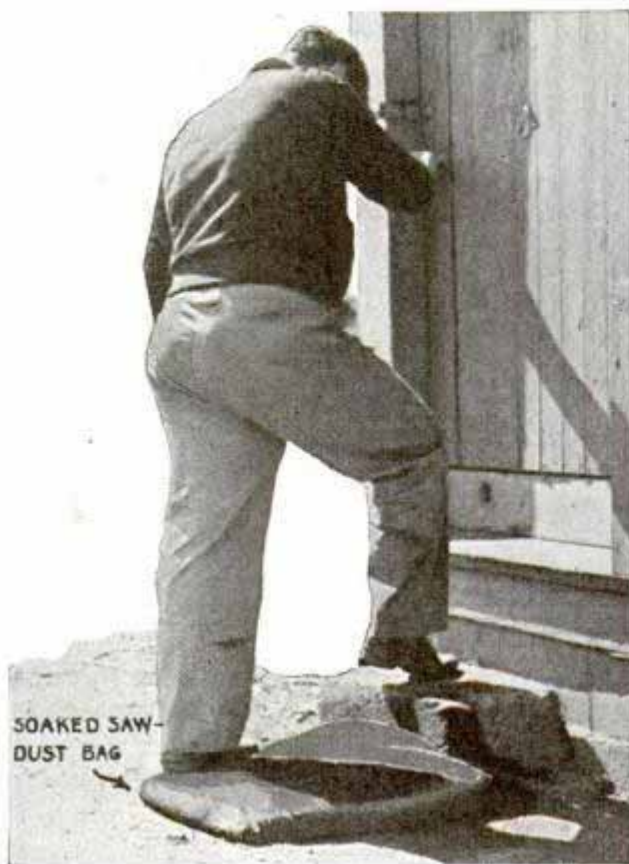


Removing Fish Odor from Dishes

It's a simple matter to remove the strong, objectionable odor from dishes that have been used for fish. Just give them a thorough washing in hot soapsuds to which a liberal quantity of baking soda has been added. For a panful of water, a couple of teaspoonfuls of soda should be sufficient.



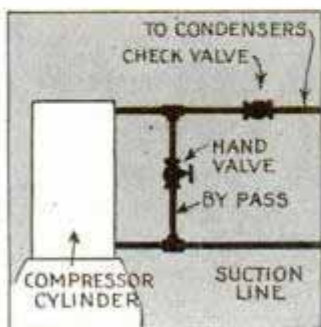
Carrying of Poultry Diseases Prevented by Sawdust Bag



Workers wipe shoes on disinfected sawdust bags when entering and when leaving poultry houses

On one large poultry farm, the danger of carrying disease germs from one house to another on the shoes of workers was minimized by sawdust bags soaked in disinfectant. These were placed on the ground in front of the doors. Before entering, and when leaving a building, workers wiped their shoe soles on the bags.

Compressors Are Started Easily by Using By-Pass



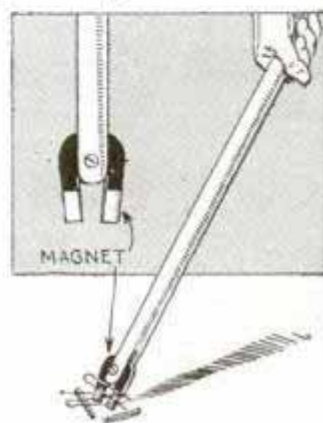
Instead of using a friction clutch to start ammonia compressors on ice and refrigerating machines, I install by-passes between the suction and discharge lines as indicated. Also, I place check valves in the discharge lines between the by-passes and the condensers, locating them on their side to prevent

check hammer. To start the compressor, have by-pass, suction and discharge valves open. When the machine is ready to be put into service, close the by-pass valve. Pressure will open the check valve at the correct time. The check valve will also afford protection should anything happen to the machine to relieve the pressure, such as a lost head or bursted pipe.

—W. C. Drake, Dallas, Tex.

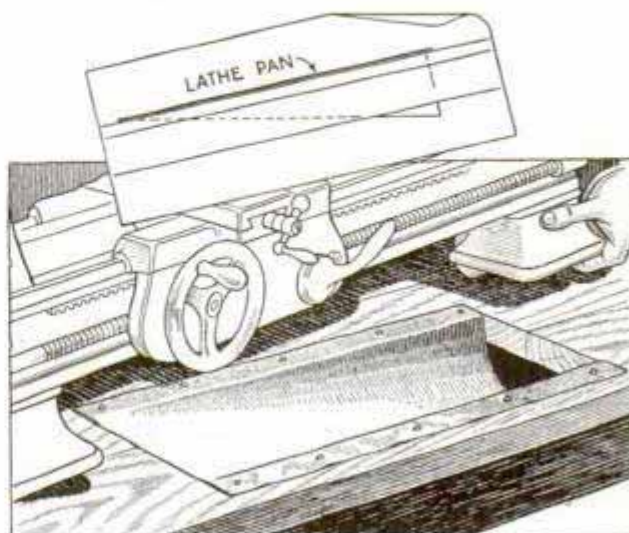
'Magnetic Broom' in Beauty Shop Picks Up Hairpins

To pick up hairpins dropped on the floor of a beauty parlor, one operator suggests a small magnet fitted in the end of the broom handle. With this, the pins may be recovered from the floor without stooping.



Sunken Metal Pan under Lathe Keeps Bench Clean

The operator of a bench lathe disposes of chips and dripping oil quite easily with this sheet-metal tray, which is set in a well cut in the bench top so that it slopes toward one end. Chips collect in it and can be removed as necessary, but the oil drains out at the lower end into a container set underneath it.



Pan in bench top under lathe drains off waste oil and collects metal chips, which are removed as necessary

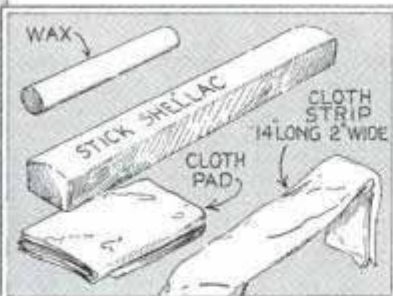
Spun FINISHES for Lathe Projects

Wood turnings can be finished quickly and neatly in a lathe with wax, stick shellac or French polish. This enables you to produce a high polish with little labor by simply holding a cloth against the work as it rotates, the lathe being driven in second speed. Wax gives a soft, satiny finish, stick shellac an eggshell gloss, and French polish a high luster. Wax and stick-shellac polishing can be done in one operation. The French polish requires six or seven thin coats with one hour of drying time between them. All of these finishes work to best advantage on hard, close-grained woods, such as maple, birch and cherry



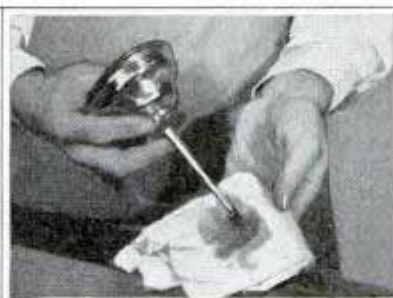
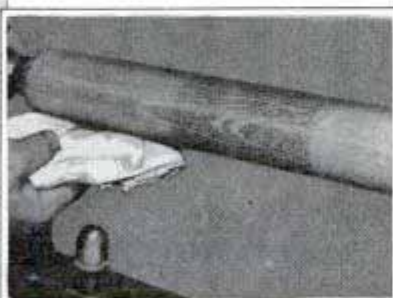
Wax

Prepared furniture wax can be used, or one can be made by shaving beeswax into a glass and covering it overnight with turpentine. The wax is applied with the fingers, cloth or brush to the stationary work. Allow it to dry for 15 min., and then polish with a soft cloth



Stick Shellac

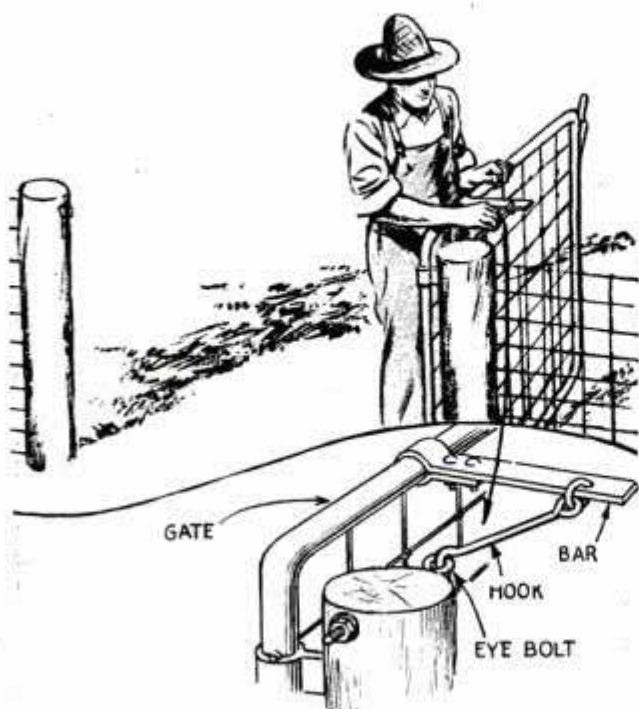
Stick shellac or wax is available in a variety of colors. Press the stick to the rotating work and hold a pad below to catch drippings as it melts due to frictional heat. Polish the ridges of shellac with a cloth until they flow out smoothly. One coat is usually sufficient



French Polish

Dilute white shellac, 1 part, with denatured alcohol, 4 parts, and apply with a cloth pad, running the lathe in second speed. Keep the pad moving and add more shellac as the pad dries. Two or three drops of linseed oil will keep the pad from sticking to the work. Use a clean cloth and pure alcohol to finish. The pad should be barely moist

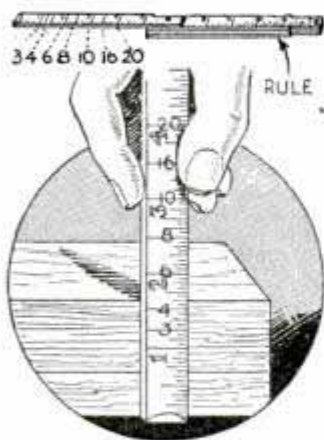
Farm Gate Is Easy to Hold Open at Hinged End



Large farm gate kept open by hook which slips into eye bolt in post to which gate is hinged

Instead of swinging a farm gate open and then walking around to prop it, or fasten it to a stake, use this simple hook arrangement. When you unlatch the gate, swing it and walk across to the other post and slip the hook into an eye bolt, thus saving many steps. The hook is attached to a bar clamped on the gate.

Gauge for Selecting Right Nail Marked on End of Rule

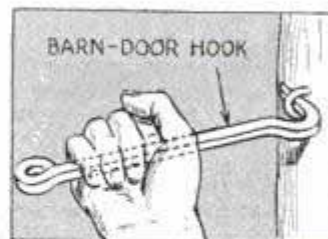


If a nail is to give its best holding power, it should lack just a fraction of an inch of passing through the work. In order to select quickly the nail having the right length, one carpenter scribed a nail gauge on his rule so that all he had to do was to hold it against the edge of the work into which the nail was to be driven. When scribing the gauge, the heads of nails of known sizes were held flush with the end of the rule and a line scribed

across it at the pointed end of the nail, after which a figure indicating the nail size was marked at the line.

Barn-Door Hook Pulls Staples

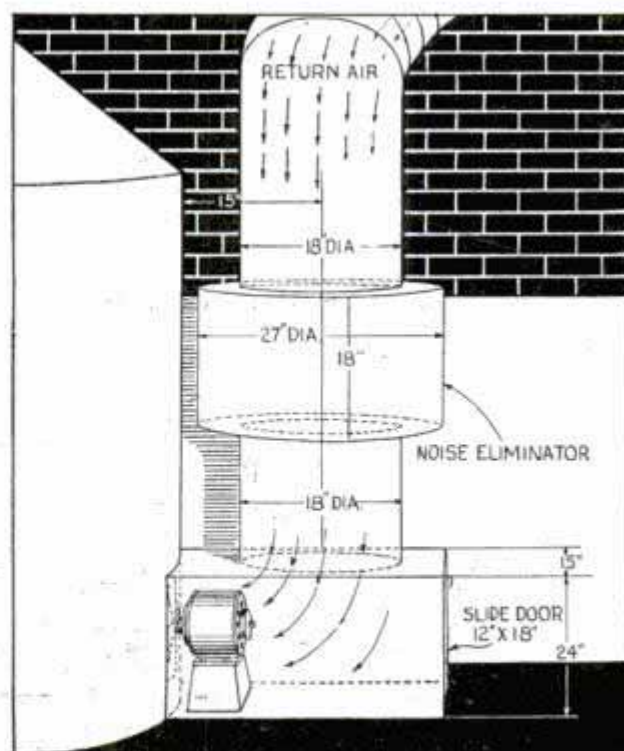
A barn-door hook of the type shown, is a good staple puller. Grind the end of the hook to a chisel shape, and then start it under the staple by tapping it lightly with a hammer. It is then easy to pry out the staple by turning the hook to one side.



Reducing Noise in Heating Plant Caused by Fan and Motor

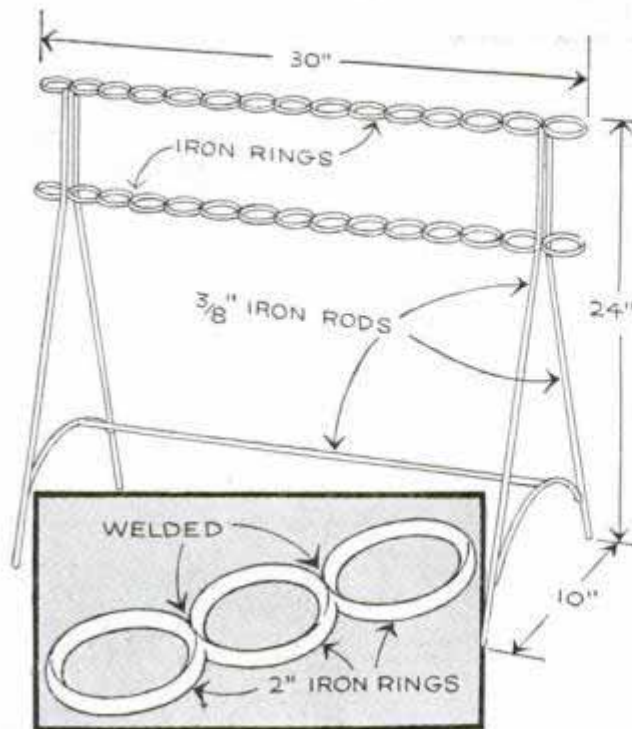
It is claimed that transmission of noise from a fan and motor on a forced-air heating plant to the floors above can be reduced to a minimum by enlarging a short section of the cold-air return duct. The enlarged portion changes the intensity, or produces a loss of energy in the sound waves traveling up the duct so that very little noise issues from the registers.

—L. H. Georger, Buffalo, N. Y.

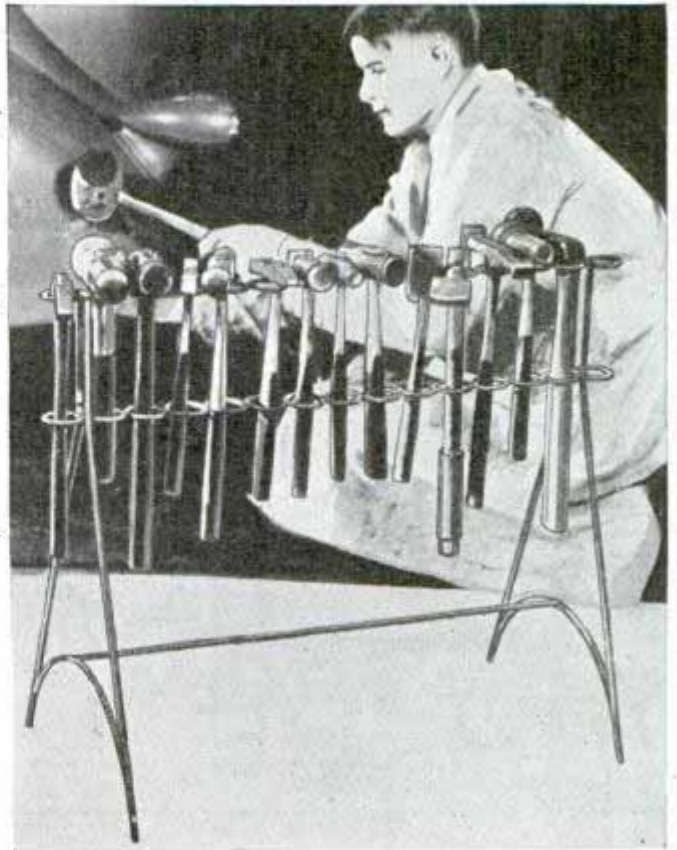


Enlarging section of cold-air return duct of forced-air heating plant reduces transmission of noise

Fender-Straightening Tools Grouped in Rack



The little work required to assemble this rack is worth-while because it saves time often wasted in hunting over the shop for tools whenever a dent has to be removed from a car fender

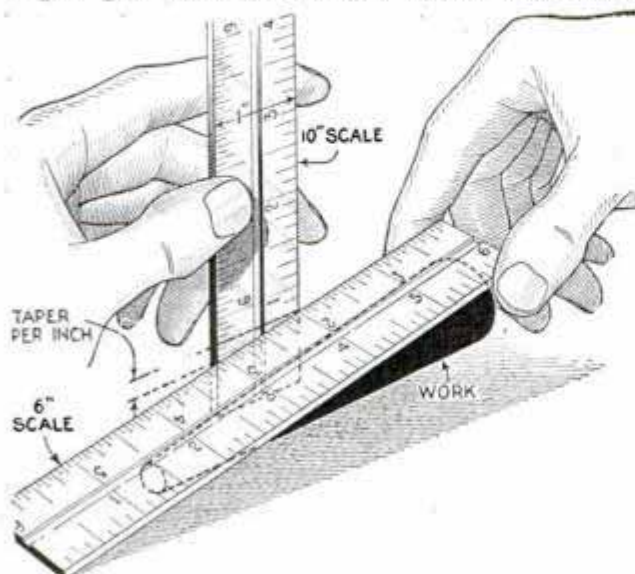


When stored in this portable rack, hammers and other tools needed to remove dents from car fenders are always together, so that the entire set can be carried right to the job without walking around the shop to collect them. The rack con-

sists of a number of standard-size iron rings welded together to form two rows, which are then welded to end supports shaped as indicated. A brace near the bottom keeps the supports from spreading. The tool handles are inserted into the rings.

Tapers on Round Stock Measured with Aid of Two Scales

Here's a simple method of measuring the taper per inch on round work when the



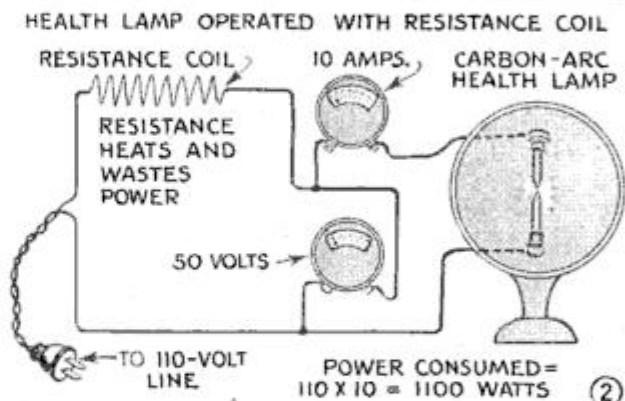
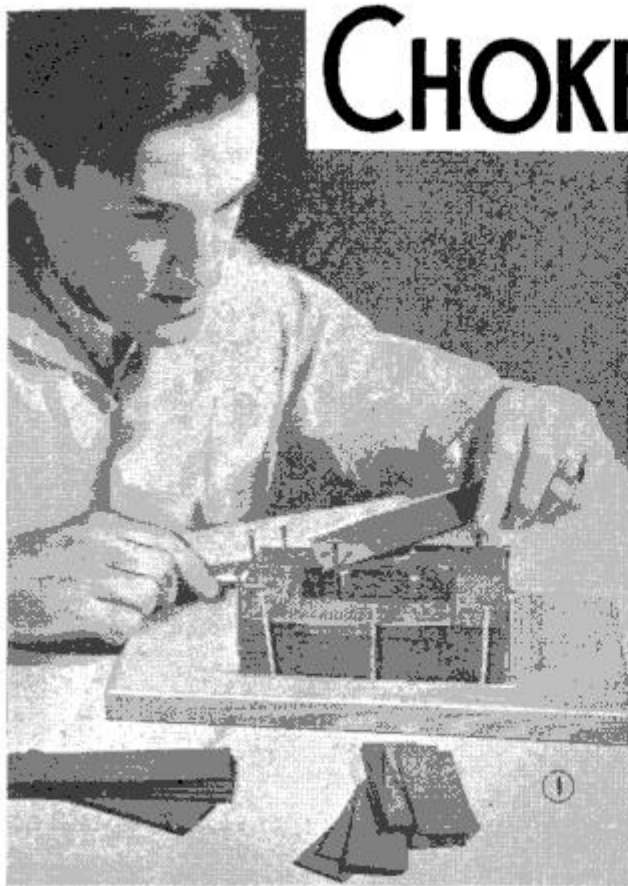
Two steel scales used to measure taper per inch on round work when measurements are not critical

measurement is not too critical. The work is laid on a surface plate and one scale, laid on top, is slid down the taper until the end touches the plate. Combination set scales are nearly always exactly 1 in. wide and, if one of these is held upright touching the edge of the first scale, the taper per inch can be seen at a glance. To facilitate the reading, the upright scale should be moved along until an even scale mark at one side coincides with the edge of the first scale, the difference, or taper per inch, can then be seen on the other side.

Removing Odor from Bottle

A pinch of dry mustard added to cold water will remove odor from a bottle. The mixture should be allowed to stand in the bottle at least an hour before it is rinsed.

CHOKE COILS *Control*



By C. A. CROWLEY

FOR controlling devices that operate on a.c. lines, the use of choke coils is often preferable to the use of resistance coils, because the former accomplish the same object with much less waste of electric power as is indicated in Figs. 2 and 3. All that a choke coil consists of is a coil of wire wound on a laminated iron core. It is connected in series with the apparatus it is to control. While resistance coils work on both a.c. and d.c., choke coils work on a.c. only. It is obvious that various types of apparatus, which differ in the amount of voltage and amperage required, must have specially designed choke coils to suit their requirements and control them efficiently.

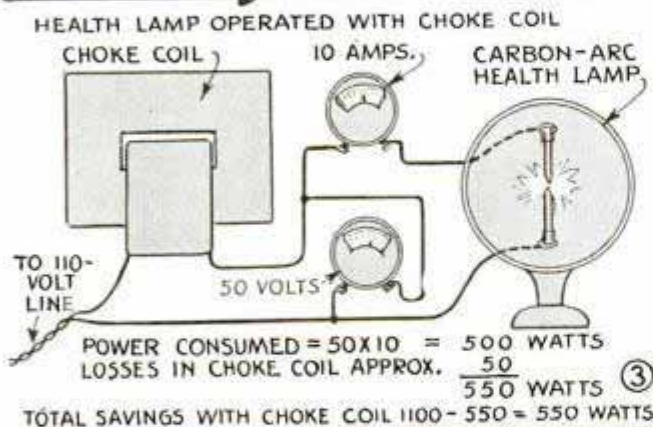
A summary of step-by-step directions for choke-coil design is given in Table I. To make these directions clear, we will go through the design of a coil to control a sun lamp.

Step I: The first step is to find how much current must flow in the apparatus and what voltage is required across the apparatus. Let us assume that our sun lamp requires 10 amperes and 50 volts. These values often can be found on the name plate of the apparatus or by testing with a voltmeter and ammeter. In some cases when ei-

TABLE I
STEPS IN DESIGNING A CHOKE COIL

Procedure	Example
I. Determine current and voltage required for apparatus	Voltage required equals 50 volts Current required equals 10 amps. Line voltage equals 110 volts Line frequency equals 60 cycles
II. Find frequency number corresponding to voltage required (Curve I)	Use the 110-volt, 50-133 cycle curve (Curve I). Frequency number for 50 volts equals 1.48
III. Find current factor (Table II). Core area equals frequency number times current factor	Current factor for 10 amps. equals 3.16. Core area equals 1.48 times 3.16 equals 4.68 square inches
IV. Number of turns of wire equals 555 times core area divided by current	Number of turns of wire equals 555 times 4.68 divided by 10 equals 260 turns
V. Wire size required. Continuous operation: Circular mils equals 1000 times current Intermittent operation: Circular mils equals 750 times current Find corresponding gauge number from Table III	Intermittent use: 750 times 10 equals 7,500 circ. mils. From Table III, No. 11 wire is 8234 circ. mils and No. 12 is 6530 circ. mils. Use No. 11 D.C.C. wire
VI. Window area equals 1.25 times number of turns divided by turns per square inch	Turns per sq. in. for No. 11 D.C.C. equals 97.5 (Table III.) Window area equals 1.25 times 260 divided by 97.5 equals 3.34 sq. in.
VII. Find width of core laminations and dimensions of core parts from Table IV	W equals 2¼ in. (Table IV). Long pieces (A) 5¾ in. times 2¼ in. (Table IV). Short pieces (B) 3¾ in. times 2¼ in. (Table IV)
VIII. Thickness of core equals area of core divided by width of core	Thickness of core equals 4.68 divided by 2.25 equals 2.08 in.

Voltage in A.C. APPARATUS

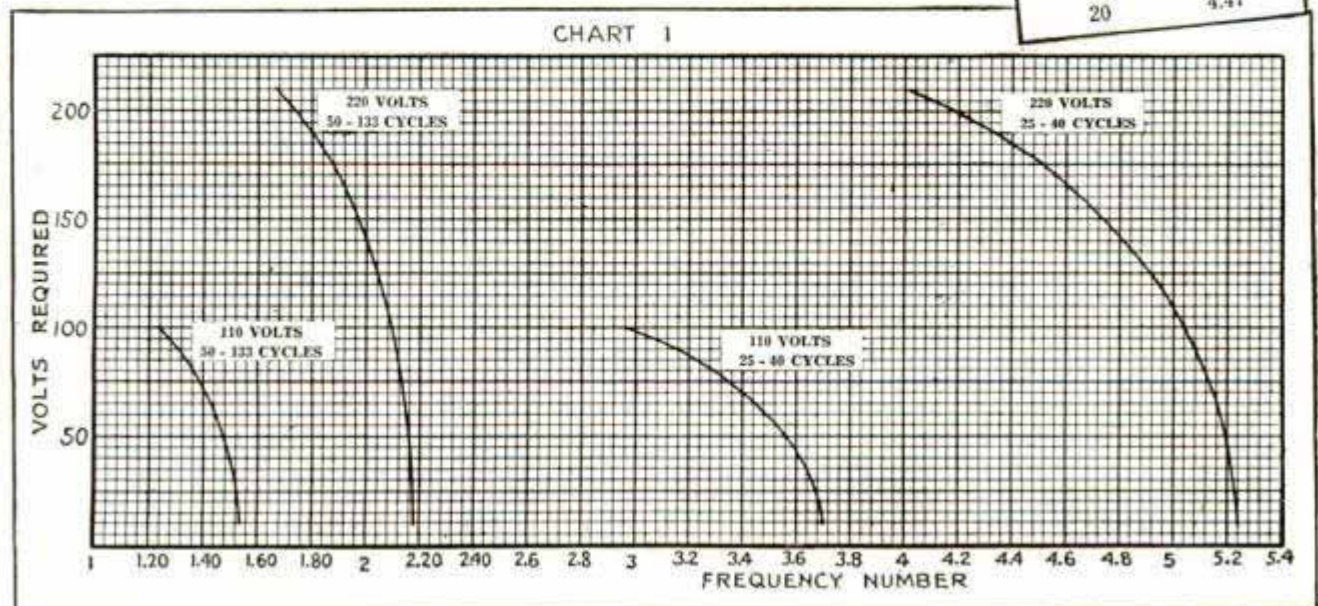


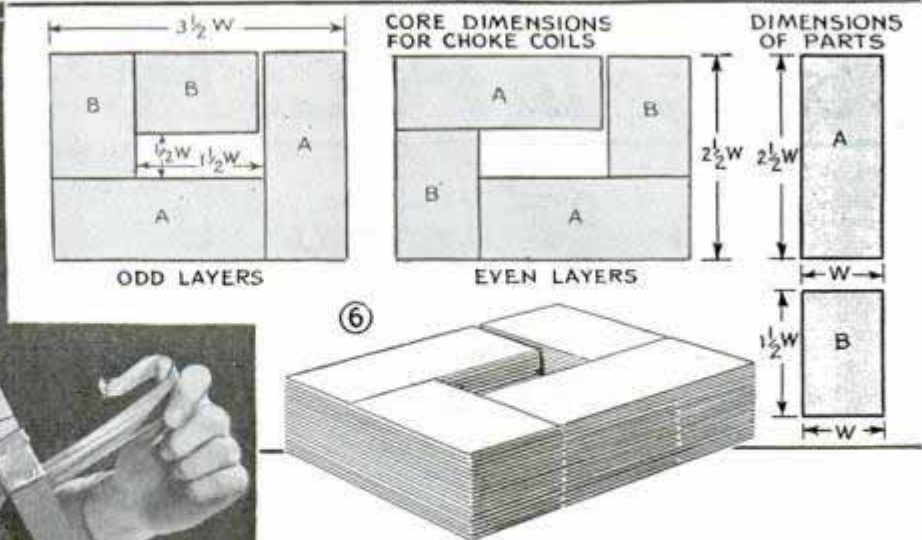
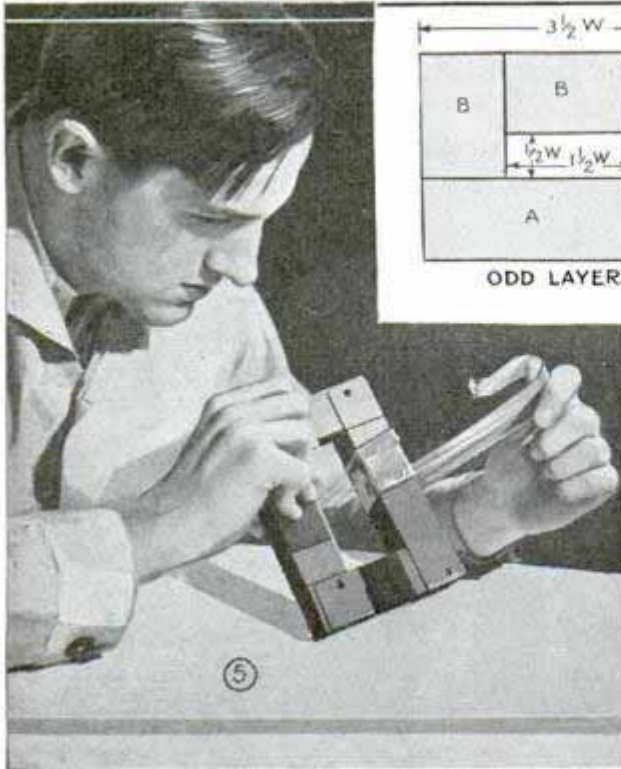
ther the current or the voltage is unknown, the power consumption or the resistance of the apparatus may be known. The current or the voltage, whichever is required, can then be found by means of one of the following relations:

(1) Voltage equals current times resistance; (2) Current equals power divided by voltage; (3) Voltage equals power divided by current; (4) Current equals voltage divided by resistance. It is also necessary to know the line voltage and frequency supplied. We will assume that the supply is 110 volts and 60 cycles.

Step II: We now refer to Chart I to find the frequency number. This is simply a number that enables us to find the dimensions of the choke. On Chart I there are four lines, corresponding to 110 volts, 25 to 40, and 50 to 133 cycles, and 220 volts, 25 to 40, and 50 to 133 cycles. To find the frequency number, locate the voltage required (50 volts in this case), move straight across to the proper curve (labeled 110-volt, 50

Current Required	Current Factor
1	1.00
2	1.41
3	1.73
4	2.00
5	2.24
6	2.45
7	2.64
8	2.83
9	3.00
10	3.16
12	3.46
14	3.74
16	4.00
18	4.24
20	4.47





to 133 cycles), and read off the frequency number directly below on the bottom of the chart. In our example the frequency number is 1.48.

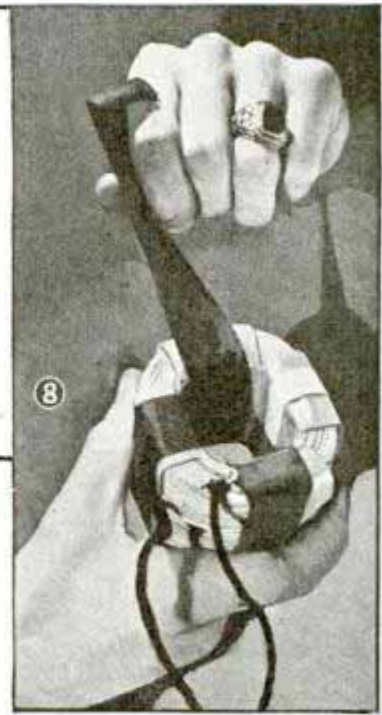
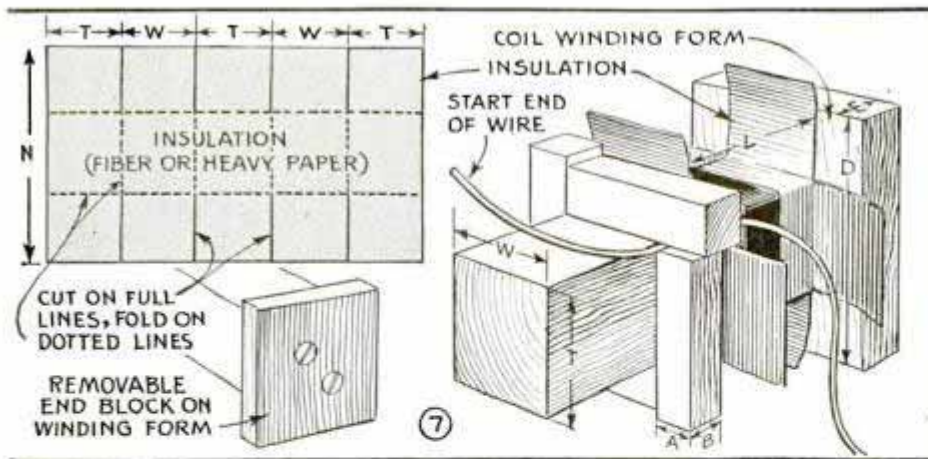
Step III: Next, from Table II we find the current factor for the current required. If the current required is not given in the table, use the next larger value. In our case, the current is 10 amps. and the current factor is found to be 3.16. The core area is then found by multiplying the frequency number by the current factor, or 1.48 times 3.16 which equals 4.68 sq. in., as the core area.

Step IV: Multiplying the core area by 555 and dividing this answer by the current will give the number of turns of wire required, or 4.68 times 555 gives 2,597. Dividing by 10 amp., we get 259.7 or 260 as the number of turns.

Step V: If the coil will be used continuously, the area of the wire in circular mils should be 1,000 times the amps. For intermittent use, a wire size in circular mils 750 times the amps. will be large enough. To find the gauge number corresponding to the calculated circular-mil area, refer to the first and second column of Table III. As our choke coil will

be used intermittently, the cross-sectional area of the wire required will be 750 times 10 or 7,500 circ. mils. According to Table III, this comes between No. 11 (8,234 circ. mils) and No. 12 (6,530 circ. mils). In such a case, one should always use the larger size, or No. 11 double-cotton-covered (d.c.c.) wire. In case a wire larger than that given in the table is required, use two or three smaller wires wound together. Thus, for 20,000 circ. mils use two No. 10 wires, which total 20,760 circ. mils.

B.&S. or A.W.G. No.	Circular Mils	Turns per Sq. In.			Lbs. of Copper per Cu. In.		
		Enamel Cov- ered	S.C.C. or D.S.C.	Double Cotton Covered	Enamel Cov- ered	S.C.C. or D.S.C.	Double Cotton Covered
10	10380	92.2	87.5	80	.241	.228	.209
11	8234	116	110	97.5	.241	.228	.202
12	6530	146	136	121	.241	.225	.199
13	5178	184	170	150	.241	.222	.196
14	4107	232	211	183	.241	.218	.189
15	3257	293	262	223	.241	.215	.183
16	2583	365	321	271	.238	.209	.177
17	2048	460	397	329	.238	.206	.170
18	1624	572	493	399	.234	.202	.164
19	1288	718	592	479	.231	.193	.154
20	1022	912	775	625	.234	.199	.161
21	810	1150	940	754	.234	.193	.154
22	642	1430	1150	910	.231	.186	.148
23	510	1780	1400	1080	.228	.180	.138
24	404	2240	1700	1260	.228	.173	.128
25	320	2820	2060	1510	.228	.167	.122
26	254	3560	2500	1750	.228	.161	.112
27	202	4420	3030	2020	.225	.154	.103
28	160	5580	3670	2310	.225	.148	.092
29	127	6900	4300	2700	.222	.138	.087
30	101	8700	5040	3020	.222	.128	.077
31	80	10700	5920		.215	.119	
32	63	13500	7060		.215	.112	
33	50	17000	8120		.215	.103	
34	40	21100	9600		.212	.096	
35	32	26300	10900		.209	.086	
36	25	32000	12200		.202	.077	



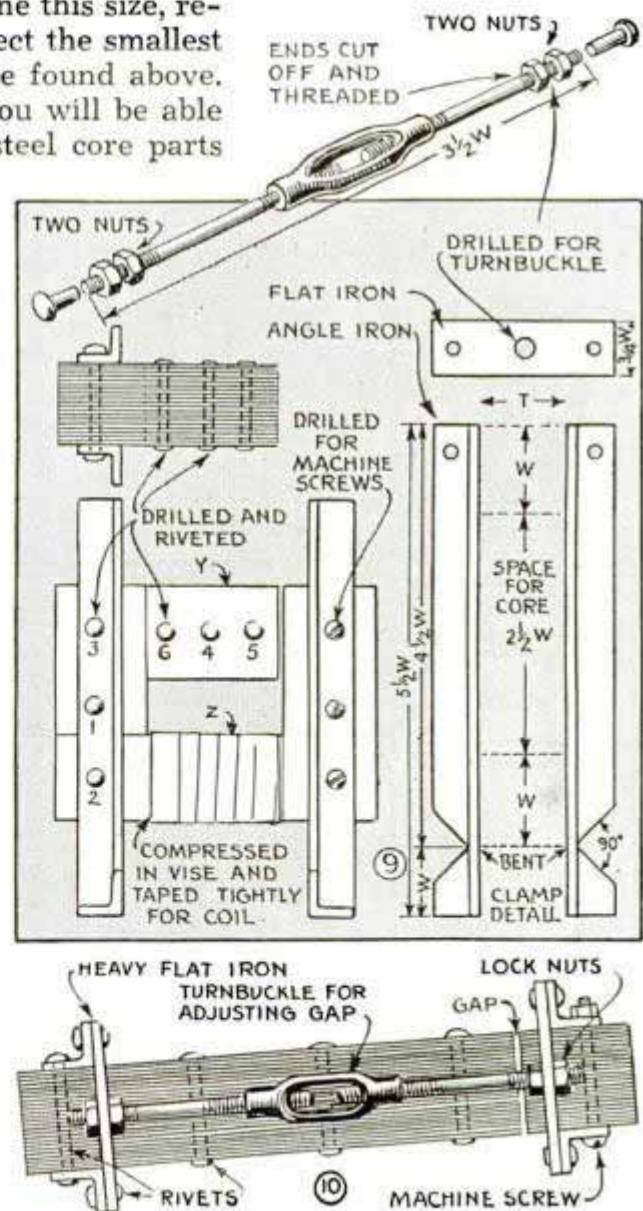
Step VI: To find the window area which is the open space enclosed by the silicon-steel core, multiply the number of turns of wire by 1.25, and divide the product by the number of turns per sq. in. as found in Table III. No. 11 d.c.c. wire winds 97.5 turns per sq. in. The window area, therefore, is 260 times 1.25 divided by 97.5, which equals 3.34 sq. in.

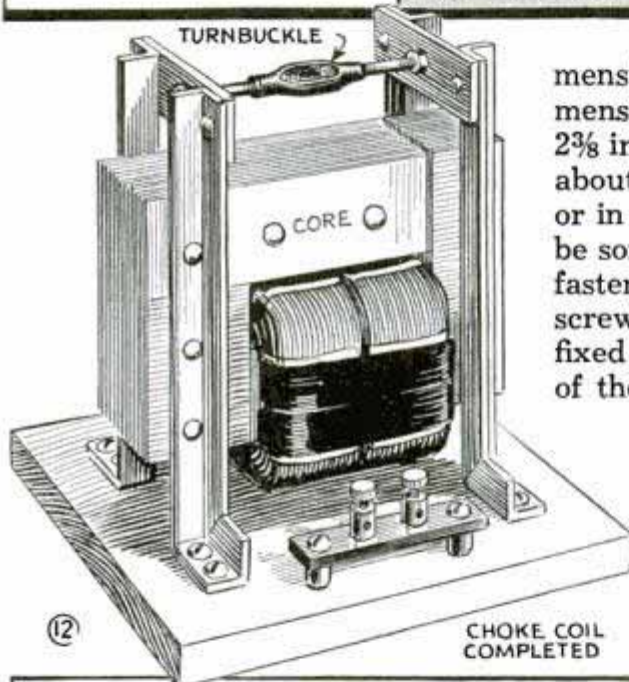
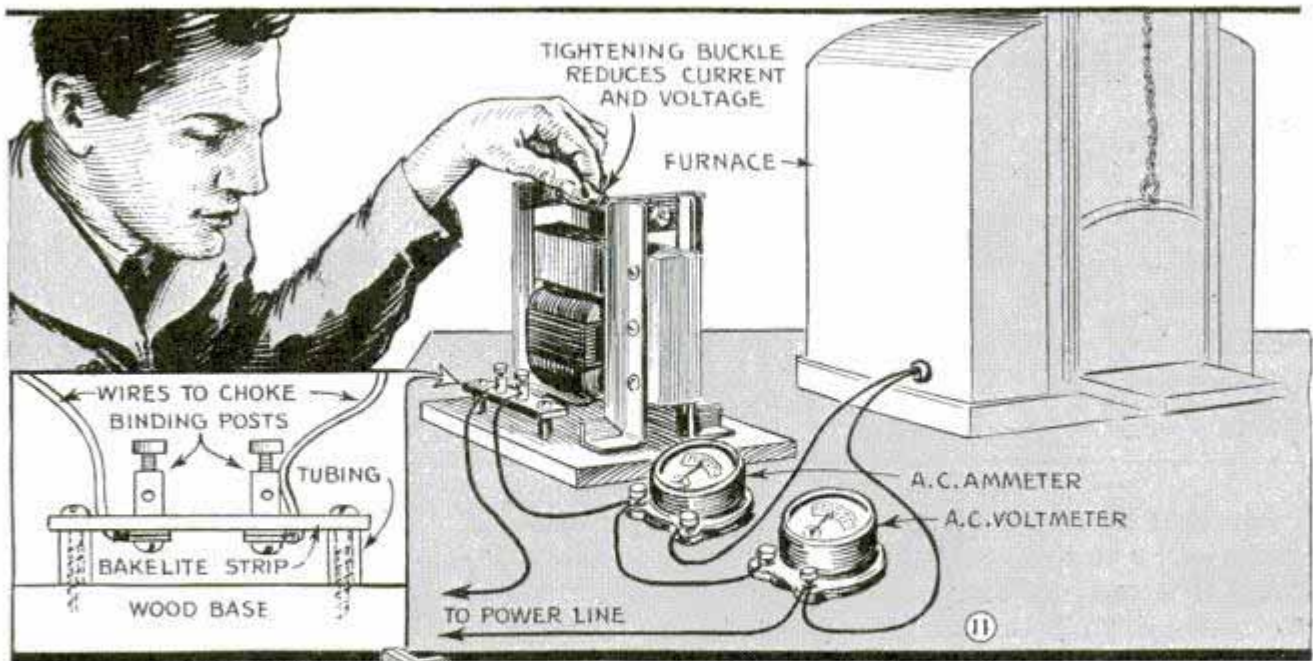
Step VII: The core size which should be used depends upon the window area required. To determine this size, refer to the third column of Table IV, and select the smallest window area which is larger than the value found above. From the corresponding line of the table, you will be able to read off the dimensions for the silicon steel core parts required. All dimensions are expressed in terms of the width of the core laminations, W , and the thickness of the core, T . In the example, this is 3.81 sq. in., which is designated as a size J core. The width of the laminations for this size core is $2\frac{1}{4}$ in.; also the "A" or long core pieces will be $5\frac{5}{8}$ in. long and the "B" or short pieces will be $3\frac{3}{8}$ in. long.

Step VIII: The thickness of the core is found by dividing the core area from Step III by the width W from Step VII, or 4.68 divided by 2.25 which equals 2.08 in. ($2\frac{3}{32}$ in.) which is T or the core thickness.

Cutting the Core: We now have all the design data necessary for building the choke. The laminations are cut from No. 28-ga. or thinner silicon steel to the dimensions found in Step VII. Cut enough pieces of each size to make two piles, each the thickness of the required core when compressed in a vise. No. 28-ga. steel will stack between 60 and 65 laminations per inch. Therefore, for our core, $2\frac{3}{32}$ or 2.08 in. thick, we need about 2 times 2.08 times 65 which equals 266 pieces of each size.

Winding the Coil: The coil is conveniently wound on a wooden form as shown in Figs. 4 and 7. Dimensions W and T are slightly greater than the corresponding di-





dimensions of the core. Allowing $\frac{1}{8}$ in. for each dimension, we will make the wood core $2\frac{1}{4}$ plus $\frac{1}{8}$ or $2\frac{3}{8}$ in. by $2\frac{3}{32}$ plus $\frac{1}{8}$ or $2\frac{7}{32}$ in. The form should be about 1 ft. long so that it can be held in the hand or in a lathe while winding. The end block should be somewhat larger than the completed coil, and is fastened to the end of the form with two wood screws. The distance between the removable and fixed blocks should be a little less than the length of the winding space. Since our winding space is $1\frac{1}{2}$ times $2\frac{1}{4}$ or $3\frac{3}{8}$ in. long, we will set the blocks $3\frac{3}{8}$ or $3\frac{1}{8}$ in. apart. Before starting to wind the coil, a sheet of heavy paper or cardboard is cut as shown in detail of Fig. 7 and laid in the winding space as shown. The coil should be wound very carefully in tight, even layers. Damaged insulation should be repaired at once with brown paper, or with oiled paper for fine wire. Paper is laid over each layer of winding, or if space is lacking for that, a layer of paper is used over every other or every third layer. The completed coil is wrapped with two layers of brown paper and cotton tape is tied around it. The end block is slipped off and the coil is removed from the form. Next the coil is permanently bound in four places only with bands of friction tape as shown in Fig. 8. Covering the whole coil with tape would cause overheating. The coil is soaked in shellac or air-drying insulating compound until saturated, and dried thoroughly in the air.

Core Assembly: The core assembly pattern shown in Fig. 6, is different from that used for transformers and must be fol-

TABLE IV
CORE DIMENSIONS

Size	Width of Laminations in Inches	Window Area in Sq. In.	Length of "A" Pieces in Inches	Length of "B" Pieces in Inches
A	1	.750	$2\frac{1}{2}$	$1\frac{1}{2}$
B	$1\frac{1}{8}$.95	$2\frac{3}{16}$	$1\frac{1}{16}$
C	$1\frac{1}{4}$	1.17	$3\frac{1}{8}$	$1\frac{7}{8}$
D	$1\frac{3}{8}$	1.42	$3\frac{7}{16}$	$2\frac{1}{16}$
E	$1\frac{1}{2}$	1.68	$3\frac{3}{4}$	$2\frac{1}{4}$
F	$1\frac{5}{8}$	1.98	$4\frac{1}{16}$	$2\frac{7}{16}$
G	$1\frac{3}{4}$	2.30	$4\frac{3}{8}$	$2\frac{5}{8}$
H	$1\frac{7}{8}$	2.64	$4\frac{11}{16}$	$2\frac{3}{16}$
I	2	3.00	5	3
J	$2\frac{1}{4}$	3.81	$5\frac{5}{8}$	$3\frac{3}{8}$
K	$2\frac{1}{2}$	4.68	$6\frac{1}{4}$	$3\frac{3}{4}$
L	$2\frac{3}{4}$	5.68	$6\frac{7}{8}$	$4\frac{1}{8}$
M	3	6.75	$7\frac{1}{2}$	$4\frac{1}{2}$
N	$3\frac{1}{2}$	9.18	$8\frac{3}{4}$	$5\frac{1}{4}$
O	4	12.00	10	6

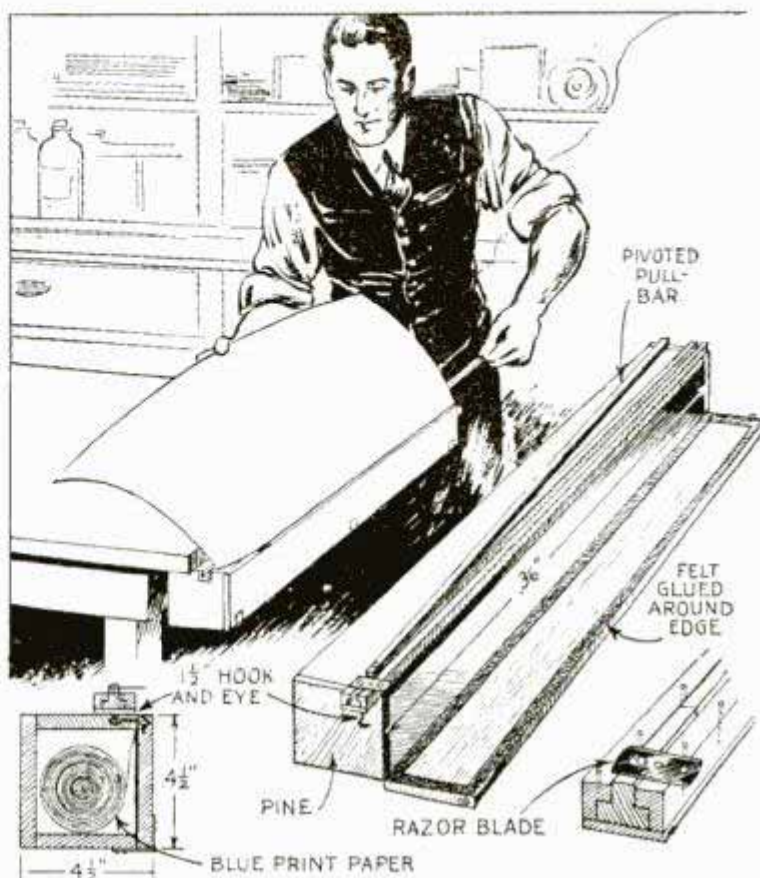
lowed carefully. Note that there is an air gap at one point. After stacking the core, in a simple jig, Fig. 1, and taping the winding leg, Fig. 5, two pairs of clamps are cut from angle iron to the pattern shown in Fig. 9 and drilled as shown, the two parts of each clamp not being drilled alike.

The clamp is placed around the leg as shown in Fig. 9 and clamped tightly in position. Starting from the three holes in one part of the clamp (1, 2 and 3), drill completely through the core and the other clamp in the order indicated in Fig. 9. As each hole is completed, the core and clamps are riveted together. When this leg is finished, clamp the leg marked "Y" in Fig. 6 between two pieces of heavy metal and drill and rivet the laminations in three places. The leg marked "Z" is tightly taped and the laminations of the fourth leg are removed from the core. Then the coil is slipped over the taped leg and the laminations of the fourth leg are woven back in place exactly as they were originally. A piece of cardboard or similar material $\frac{1}{16}$ to $\frac{1}{8}$ in. thick is placed in the air gap and the remaining pair of clamps are put in position. This leg is drilled and fastened with machine screws.

Adjusting Device: The adjusting mechanism is shown clearly in Fig. 10. The ends of a $\frac{1}{4}$ -in. turnbuckle are cut off and threaded as shown in the detail. The turnbuckle is mounted between the clamps as shown in Figs. 10 and 12. The coil can be mounted on a wooden base as suggested in Fig. 12. If it is to be permanently mounted in a circuit, the leads from the coil can be connected to the desired apparatus. If not, the leads are connected to binding posts mounted on a short length of Bakelite.

Adjustment: To adjust the coil to produce the proper current and voltage for the particular apparatus, remove the cardboard from the air gap and connect the coil in the circuit as shown in Fig. 11. Then the turnbuckle is tightened until the required current flows, as indicated by an ammeter, Fig. 11, or until the apparatus operates satisfactorily.

Dispenser for Blueprint Paper Is Equipped with Cutter

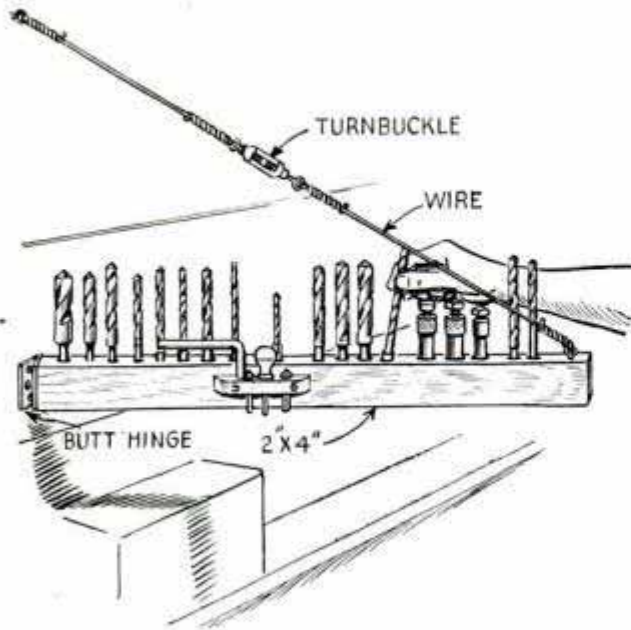


This dispenser handles sensitized paper with practically no waste from exposure to light

Here is a dispenser for handling blueprint and other sensitized paper that speeds cutting to length and at the same time prevents the paper from being exposed to light. It consists of a rectangular box $4\frac{1}{2}$ by 36 in. inside dimensions, with a hinged side, and a felt gasket, which keeps light out and permits the paper to be drawn through smoothly. Fastened to the top of the box is a razor blade which cuts the paper quickly and evenly. Only a small strip about $\frac{1}{2}$ in. wide is left exposed to the light. The box may be nailed up out of $\frac{1}{2}$ by $4\frac{1}{2}$ -in. pine and the guide for the cutter out of two small strips rabbeted on the edge and nailed to a piece of $\frac{1}{4}$ -in. plywood. The whole assembly can be fastened to the underside of a table and the paper may be drawn out over the top and cut to size with a minimum of waste. By changing the dimensions, the design easily may be made for any size roll. The same type of dispenser is also useful in handling tracing and drawing paper.

—J. M. Elliott, Rome, Ga.

Drill Rack Used by Two Workmen Swings Between Them



In tight places, several racks can be mounted above each other by eliminating the brace wires

Mounted on a wall by means of a butt hinge and a diagonal wire brace to the outer end, a length of 2 by 4-in. stock with holes spaced along one edge throughout its length, provides a convenient holder for twist drills and similar tools in places where one set serves two machines or benches. The rack is swung around like a door, to the desired position. Several such holders can be mounted one above the other, to be swung out one at a time, where space is at a premium. If more than one rack is installed, it's best to use hinges strong enough to support the assembly without need of brace wires.

Bottle Converted into Funnel



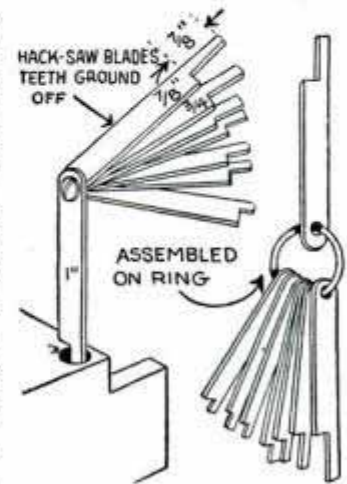
of course, not to break the glass. Such a funnel is especially handy where a metal

An old bottle can be converted into a combination scoop and funnel by cutting off the bottom to the angle indicated in the drawing. The edges should be smoothed down with a fine file or on a grinding wheel, taking care,

scoop or funnel is not desirable. You can scoop up material with it, using the bottle neck as a handle, and then turn it over to let the contents run into a small-mouthed container.

Pocket Depth or Shoulder Gauges

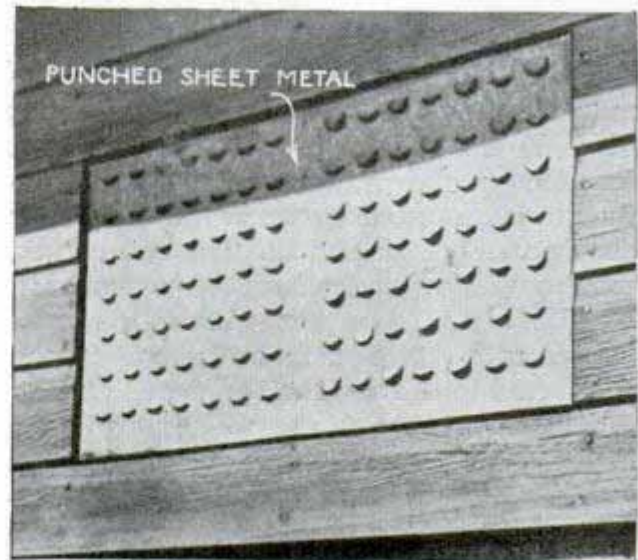
Old hack-saw blades can be converted into a pocket depth gauge that will have many uses. Grind the teeth off the edge of the blades and then grind shoulders on the ends, varying the depths of them as desired. Usually a variation of $\frac{1}{8}$



in. will be about right. The blades can be assembled on a ring or, if preferred, they can be assembled with a friction screw as shown.—Chas. H. Willey, Penacook, N. H.

Ventilator for Poultry Houses

Vents in a wall of a poultry house to let air escape slowly in winter or summer, even when the doors are closed, are made by punching a piece of sheet metal as in-

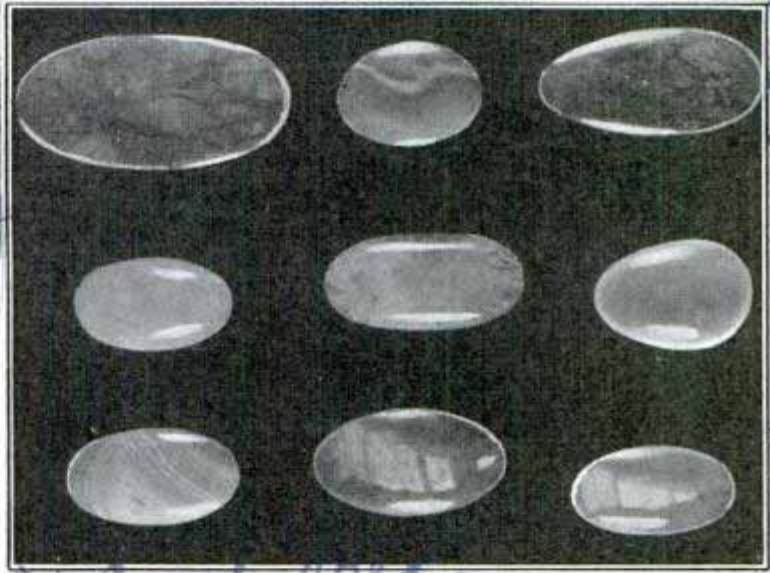
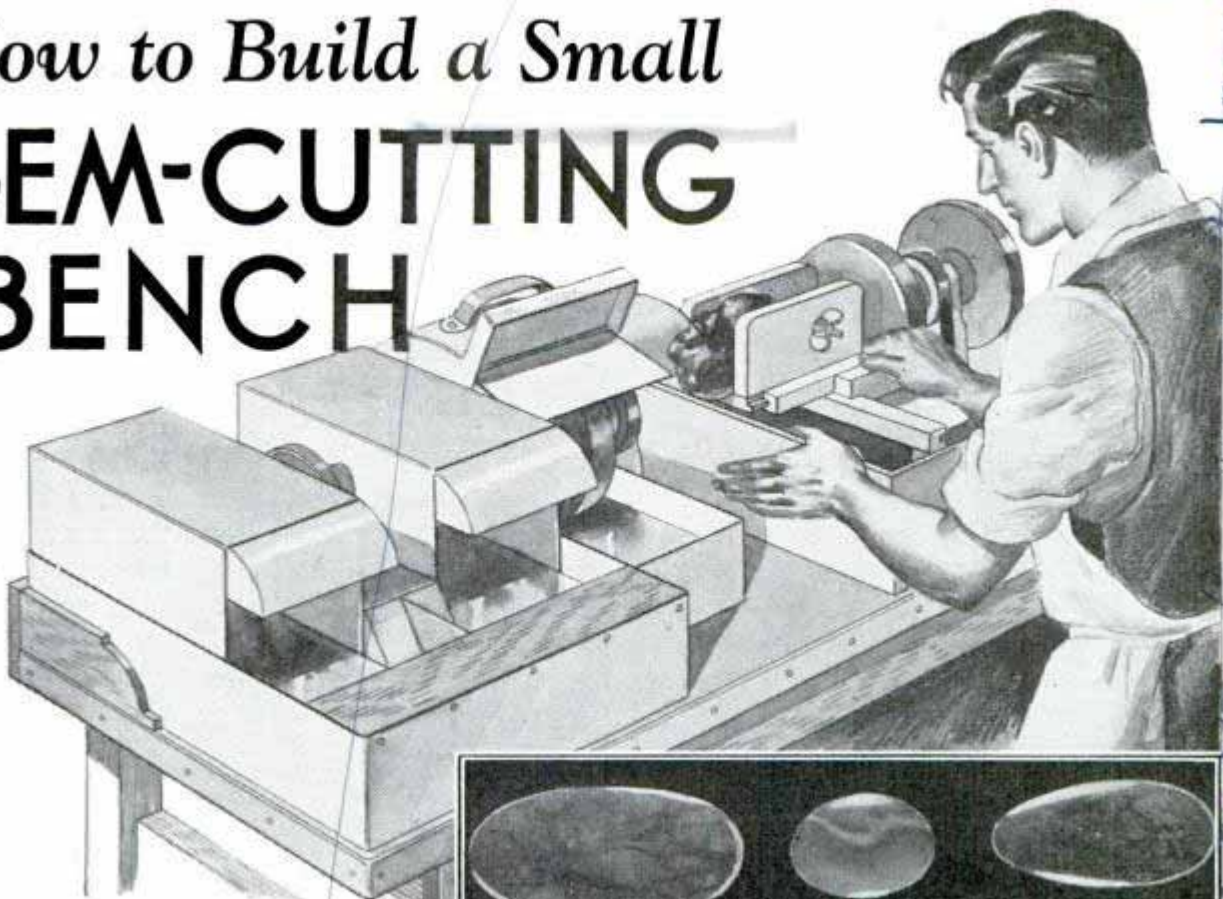


Punched sheet metal nailed over opening of poultry house provides good ventilator

indicated in the photo. Sharpen the end of a piece of pipe at an angle and use it as a punch to perforate the sheet metal, which is laid on the end grain of a wood block.

Rep. 222 # 72 Walker Plainfield, N.J.

How to Build a Small GEM-CUTTING BENCH



By **FRED S. YOUNG**
c/o The Mineralogist

SPARKLING gems can be cut and polished from rough gem stones with this outfit, a complete cutting, grinding and polishing machine mounted on one bench and driven by a single motor. Except for the mechanical units, the motor and grinding heads, you can easily make the whole thing yourself. Rough materials suitable for working into beautiful and often valuable gems are widely distributed and comparatively easy to find. The lower illustration on this page gives you a good idea of the appearance and general contour of the finished gems. These are of the cabochon style, which means that they are convex and highly polished, but not faceted. Although it is possible to purchase the rough, unworked stones from supply houses at a very nominal outlay, prospecting afield for the raw material is not only recreational, but also a part of the whole fascinating hobby of gem cutting.

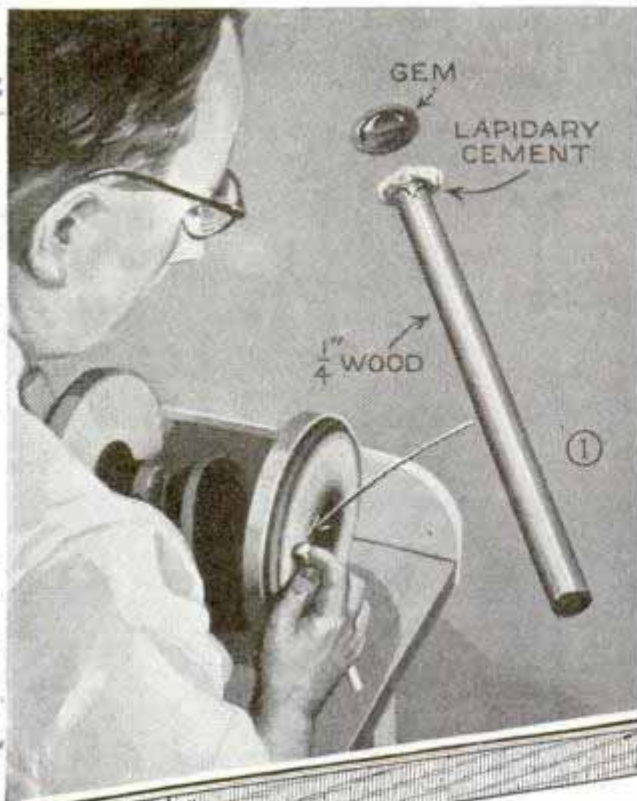
The bench: The work of building up the equipment begins with the bench detailed in Fig. 2. While the dimensions are not critical they have been worked out to suit

a well-known make of small bench grinding head, three of which are used as you see in Fig. 5. If you use grinding heads with somewhat different base sizes, it is well to check up on the bench dimensions before you cut stock. Hardwood is best to use throughout in the construction of the bench and you should take pains to get sound, tight-fitting joints so that you finish up with a rigid structure. It's well to be rather particular about the top also. Join a number of narrow strips of 1¼-in. stock edge to edge with dowels and glue to make sure that it does not warp. As the top is covered with galvanized sheet iron, clear white pine will do very well. Paint or varnish all the wood parts.

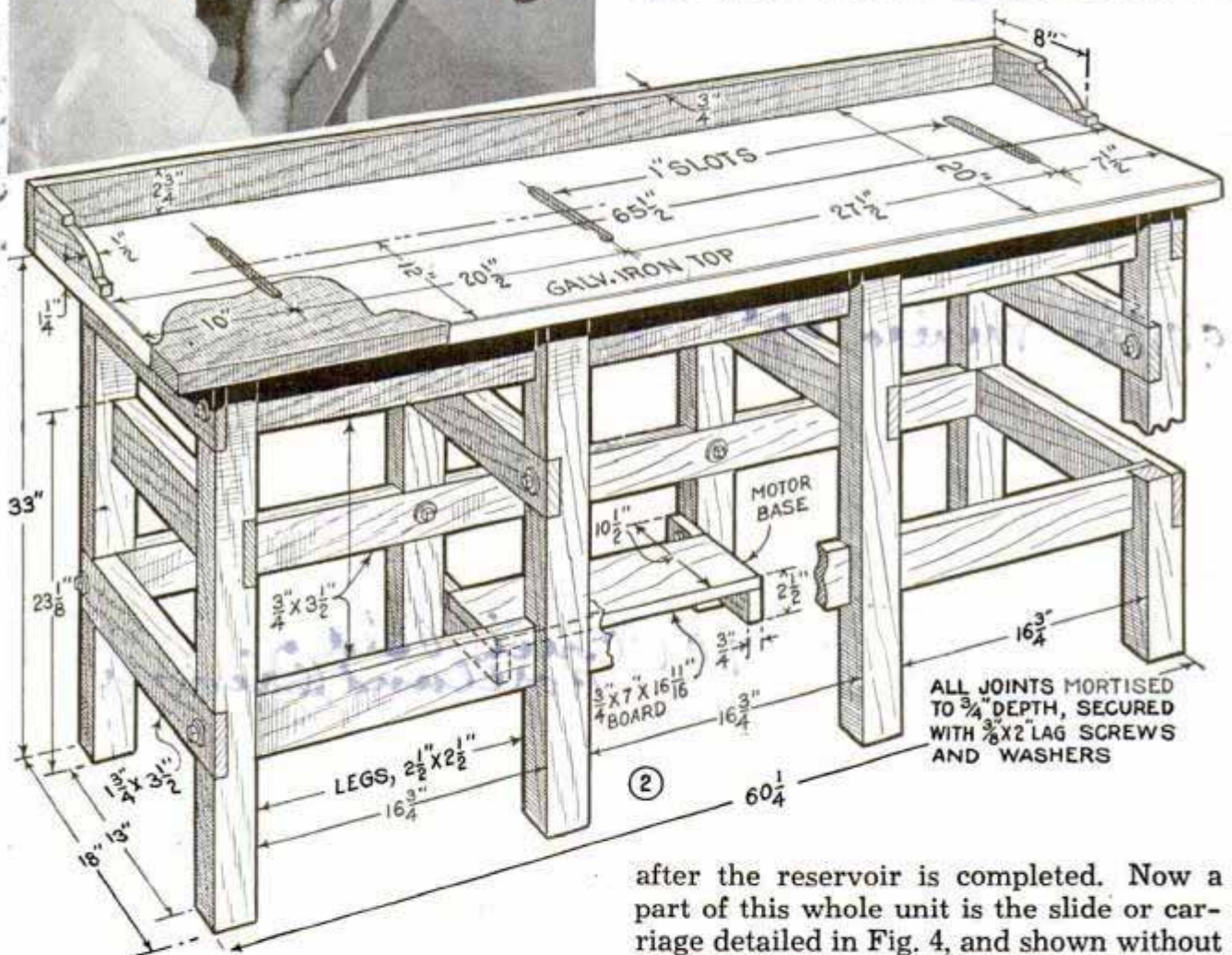
After you have the bench completed,

Worcester Mass. Abrasive Norton Co. Carbonium Co. Plainfield, N.J. Robert J. Abraham. Davis Creek, Calif.

Smiths Agate Shop, Portland, Ore.



slightly to adapt the fittings to the heads you intend to use. Notice in Fig. 5 that there are three guards or hoods. The principal purpose of two of these is to catch the water and oil thrown off the grinding wheels and saw, and return them to the pans. Note especially the variation in construction of the hood in the upper left and upper right details in Fig. 5. The first consists of two hoods (only one of which is shown) and two pans for water. The second comprises a single hood and the saw carriage detailed in Fig. 4. The oil reservoir in the latter is small, only 2 in. deep and 8 in. long as shown back of the cut-away portion, Fig. 5. The bottom is a separate piece of sheet metal soldered on



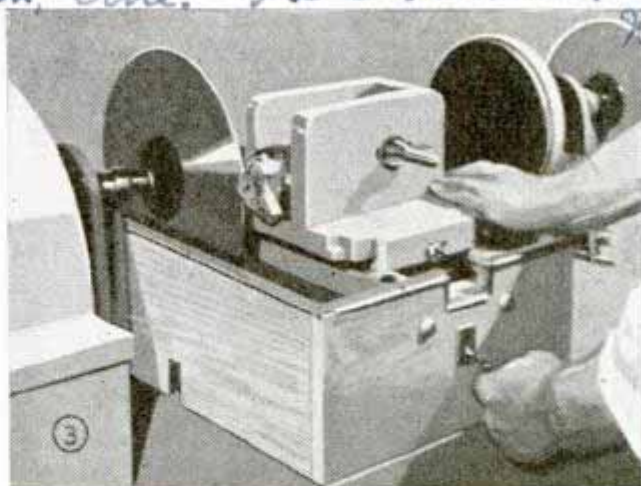
the two really important details are the diamond-saw carriage shown in Figs. 3 and 4, and the water and oil pans and wheel guards in Fig. 5. The latter are made of galvanized sheet iron. A tinsmith can help you out when making these, or if you have good soldering equipment you can make them yourself. Again the dimensions given may have to be changed

after the reservoir is completed. Now a part of this whole unit is the slide or carriage detailed in Fig. 4, and shown without the hood in Fig. 3. The work is held in a clamp or vise and is fed to the saw by means of a spring with an adjustable tension device. Carefully made of hardwood, this arrangement works very nicely. The diameters of pulleys on both the countershaft and the heads are given in Fig. 5. Driven by a 1,750 r.p.m. motor these pulleys give the correct spindle speeds for this work. If the pulleys on the heads you are

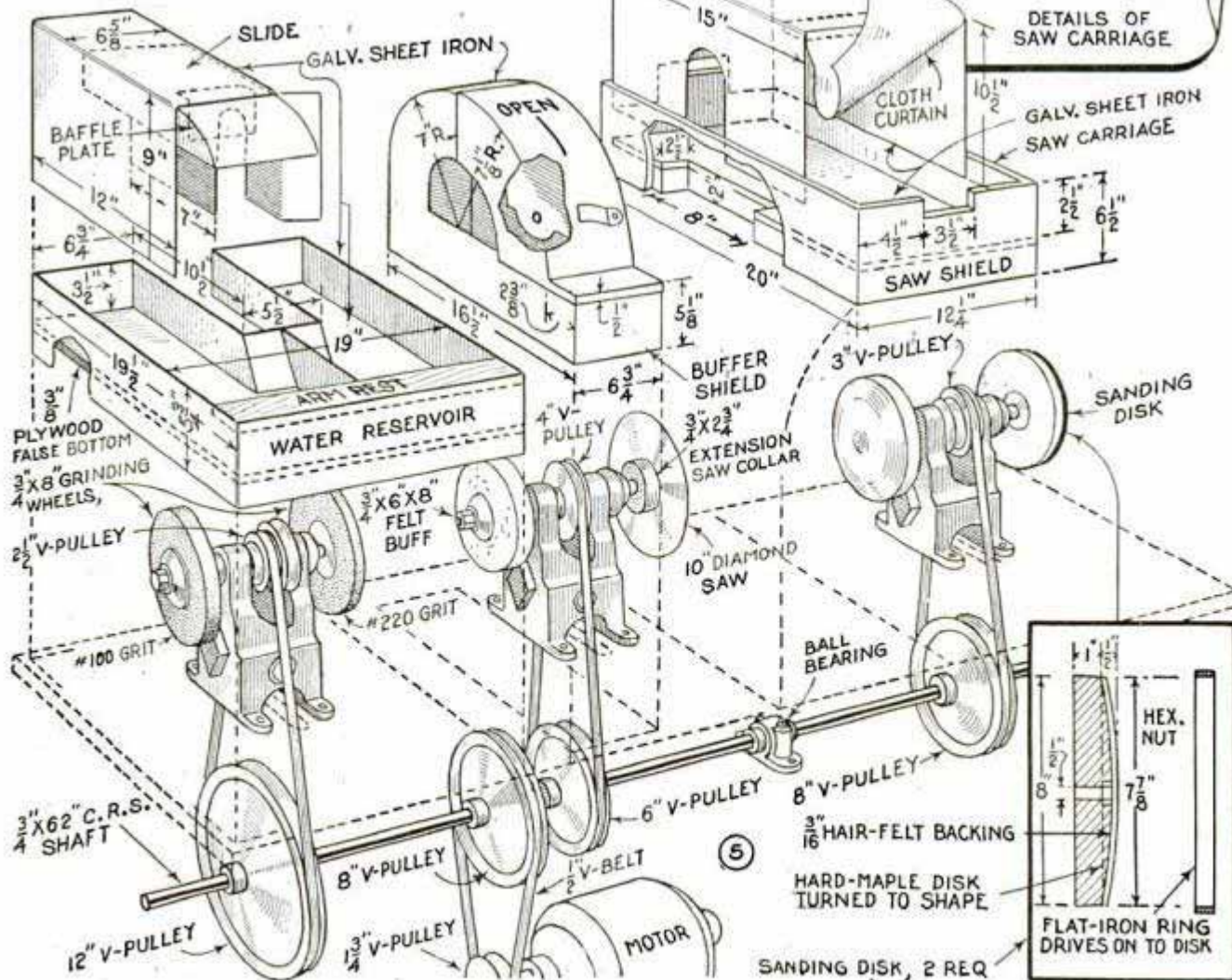
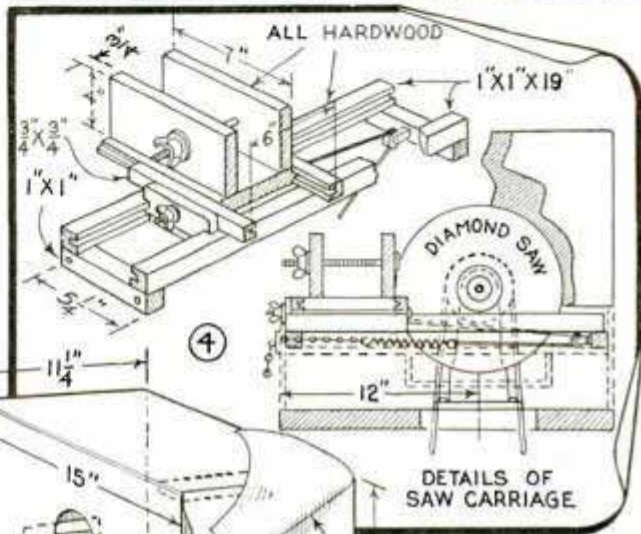
William H. Dyer, Inc. 32 E. Kinross

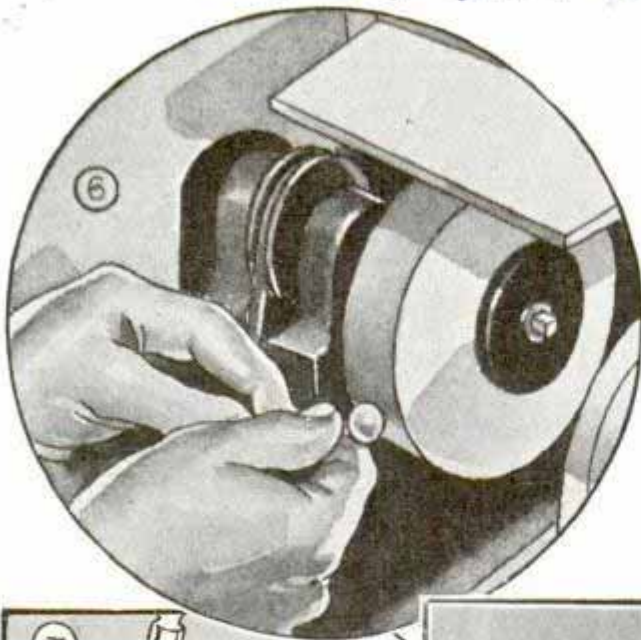
to use differ from those given you can easily get the correct speeds by varying pulley diameters on the countershaft. Use four ball-bearing pillow blocks on the countershaft as shown in Fig. 8.

Sawing: Small-sized fragments of gem stone can be shaped directly on the grinding wheels, but more often larger specimens must be reduced to proper size by the diamond-charged saw. The latter is simply a metal disk, made of No. 20-ga. steel. Small notches are cut in the edge of the saw with a cold chisel as in the upper detail in Fig. 7, and crushed diamond bort mixed with a small amount of vaseline is applied to the notches. By hammering lightly and rolling with a case-hardened steel roller as in the lower detail, Fig. 7, the notches are closed, thus embedding the diamond fragments in the metal and giving each side of the blade a "set." About 1 carat of diamond bort (value about \$2.00) will charge an 8-in. saw. A properly charged saw will section a great many pieces of very hard gem materials before recharging. It must be remembered



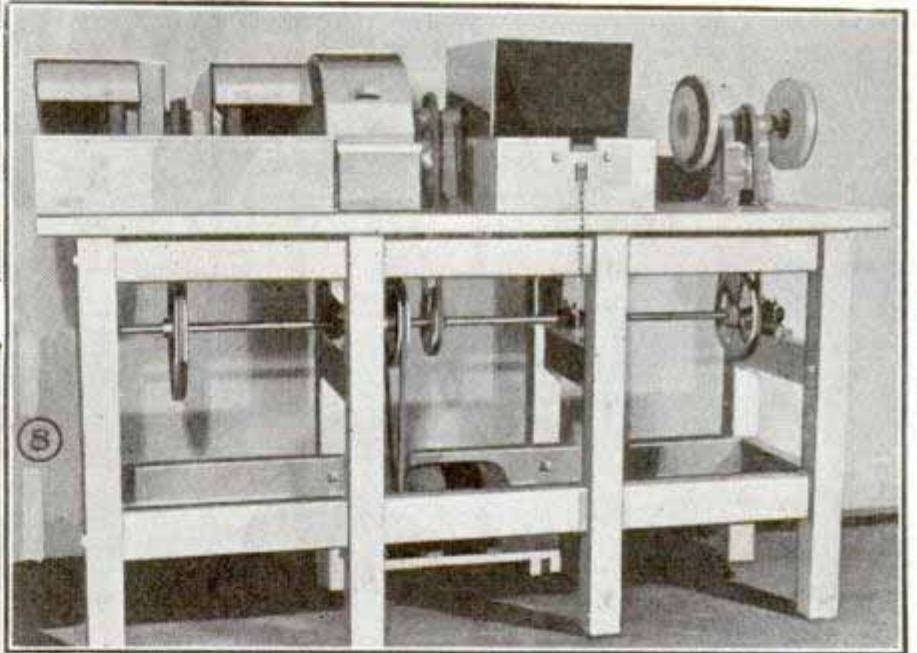
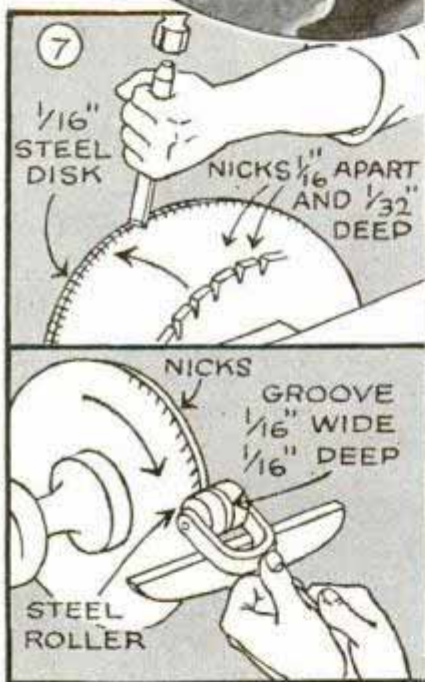
Marking





With the fingers, work the cement around the sides, leaving the upper portion of the stone exposed.

Grinding: Silicon-carbide wheels are used to cut and shape the cabochon gem to proper size. A very large stone can be held and worked against the wheels by hand, but the ordinary sizes should be dopped as described above. Two grinding wheels are mounted on the bench grinder head as shown at the left in Fig. 5. The wheels should be No. 100 or No. 120 and No. 220 grit respectively. The "J" or "K" bonded wheels are suitable for gem cutting. After the gem stone has been properly shaped to size and all excess or in-



that semi-precious gem minerals like agate are harder than the best tool steel, and can be cut satisfactorily only with the diamond saw. In operation the 8-in. diamond saw is run at approximately 600 r.p.m., and is kept lubricated by running with the edge in a mixture of equal parts kerosene and crankcase oil.

"Dopping" the Gem: After the material has been cut roughly to shape it will be advisable to cement—"dop"—the stone to a short length of dowel to facilitate handling, Figs. 1 and 6. Special lapidary cement is used for this purpose. This is usually a mixture of sealing wax, 3 parts, and flake shellac, 1 part. To dop the gem, first warm the stone until quite warm to touch. Apply a small amount of cement to the dowel, melt, and press the gem into it.

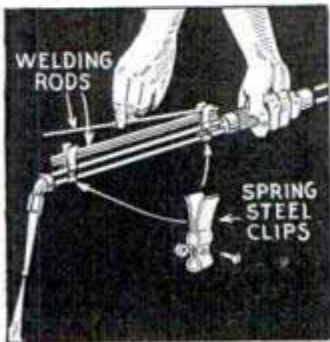
ferior material ground away, it is then "sanded" to remove all deep scratches left by grinding wheels.

Sanding: The sanding wheel is a wooden disk, crowned on one face as in the lower-right detail in Fig. 5. Two disks are required. The working face of each is covered with silicon-carbide cloth of No. 220 grit, held in place with a metal band or ring as shown. The deep scratches are removed from the gem stone by holding against the abrasive cloth. This operation is run dry and the disks need not be shielded. The work should be moved about to avoid undue heating and to reach all parts of the gem.

Polishing: The final high glossy polish is given to a gem stone (cabochon style) by the use of a hard-felt buff. Tripoli, tin

oxide, and various other commercial polishing agents are used. The polishing powder is mixed with water and applied to the buff with a small stiff brush. The buff is operated at the same speed as the saw and is therefore attached to the same arbor. No attempt should be made at polishing until all deep scratches are first removed on the sander. Polishing will not prove a long, tedious operation if the stone is properly prepared.

Extra Welding Rods at Hand



When welding tanks and when working on a scaffold or ladder, one welder finds it convenient to carry a supply of welding rods right on the torch. These are held between a couple of spring-steel clips which are attached to the shank of the torch by means of stove bolts.

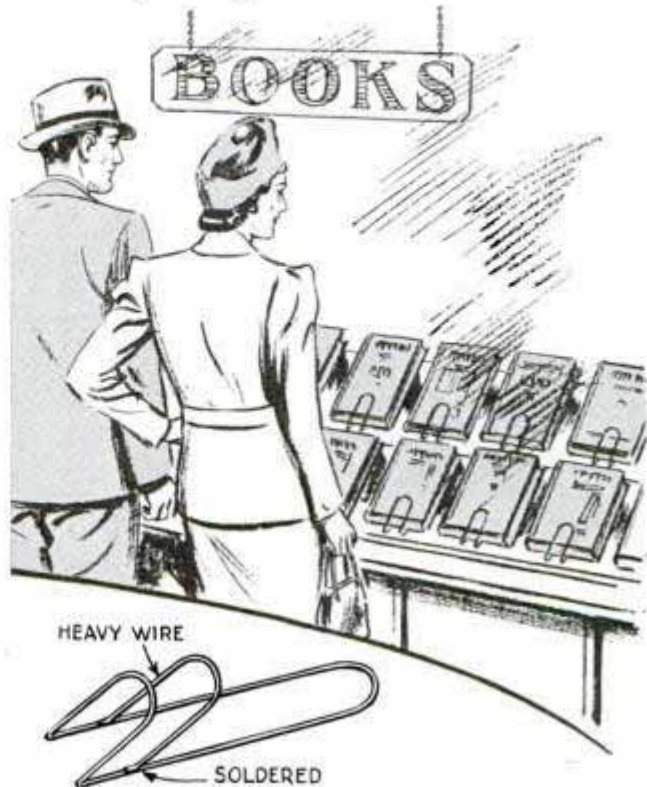
Auto Rim Supports End of Gate to Prevent Sagging

Heavy, wooden field gates sag on their hinges so that it is difficult to fasten them with the hooks or latches installed when the gate was erected. If half of an auto-wheel rim is set in the ground at the foot of the latch post, the free end of the gate will be supported permanently when closed so that sagging will be avoided.



HALF OF OLD AUTO RIM
Weight at free end of gate supported on wheel rim when closed

Books Held at Angle in Window by Simple Wire Stands

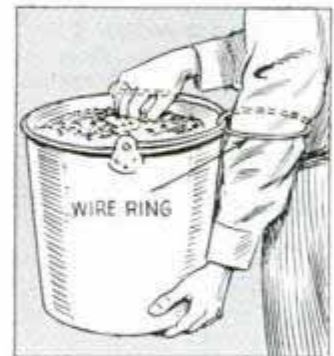


Books supported neatly at angle in show window so that titles can be seen clearly

When books are placed in a show window, they are usually laid flat which makes it difficult to read the titles. The wire supports shown will hold the books at the right angle so that people passing by will be able to read the titles easily. Each support is bent from heavy wire as indicated in the lower detail.

Wire Ring Holds Bucket on Arm While Feeding Poultry

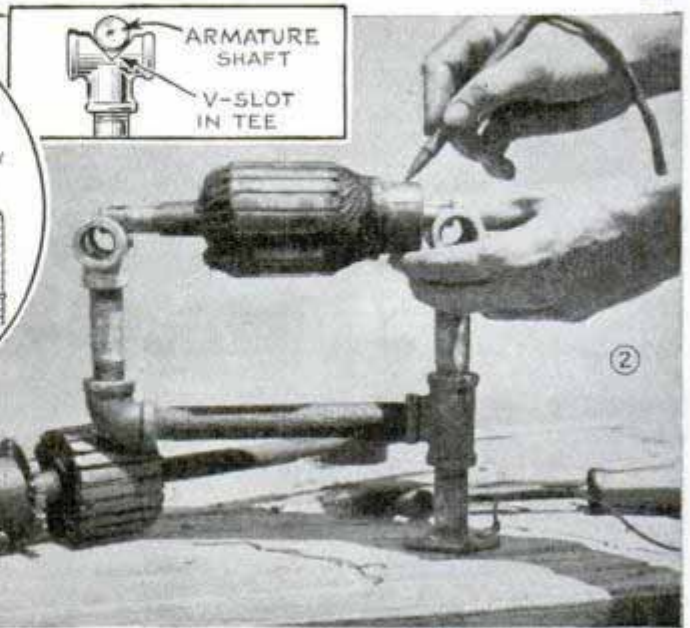
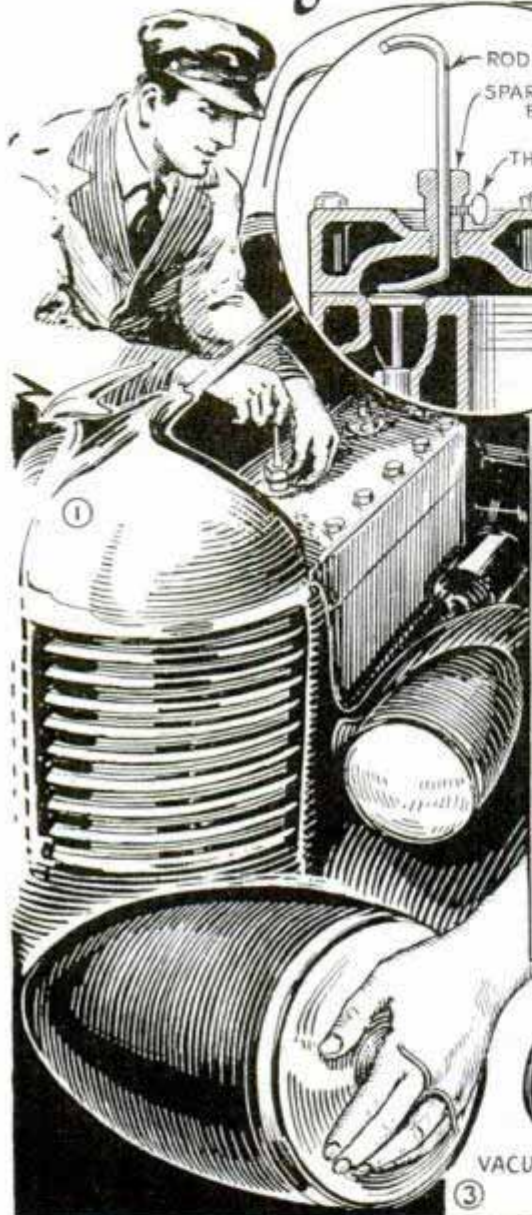
To support a feed pail conveniently with one hand when scattering grain for poultry, attach a wire ring to the bail as indicated. By slipping the arm through the ring the pail may



be supported with one hand while the other one is free to do the scattering.

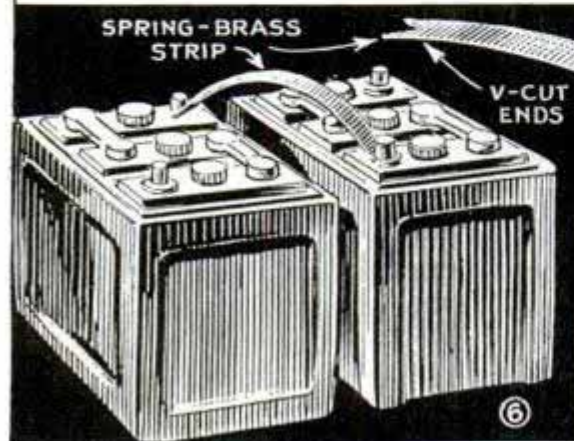
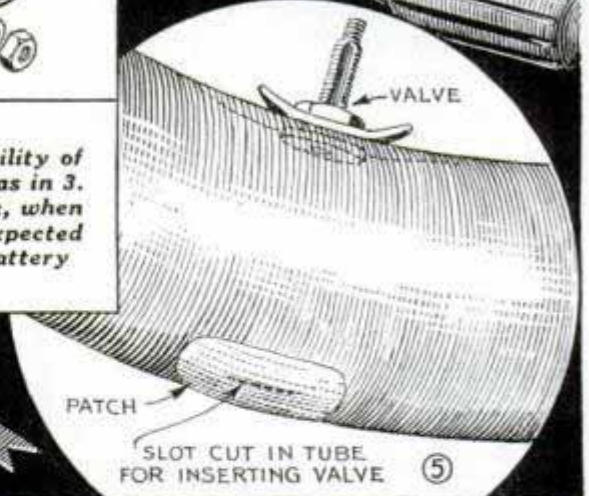
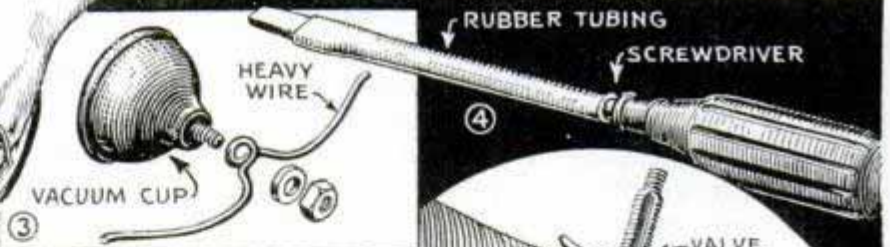
Small rubber bands slipped over each end of a ruler will prevent it from slipping when ruling lines or cutting glass.

HELPS *for the* AUTO MECHANIC



By using the tool in 1 to hold down a valve, you can replace a broken spring in a few minutes without removing the cylinder head. A spark-plug base babbitted to take a rod and tapped for a thumbscrew is all you need. The rod is bent as indicated, and is flattened at the lower end. Assembled from pipe and supported by a single floor flange on the bench, the armature rack shown in 2 allows free access to all parts of the armature, and it swivels to any convenient angle. It can be unscrewed from the bench and removed when not needed

When you remove a headlight lens, there's slight possibility of dropping it accidentally if you apply a vacuum-cup grip as in 3. 4 shows a rubber tube slipped over a screwdriver shank, when working on an electrical system, to prevent those unexpected "shorts" which are hard on the nerves and drain the battery



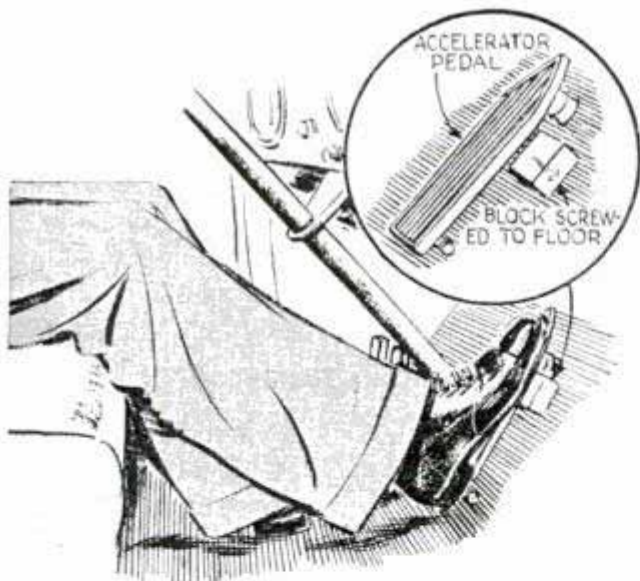
One of the simplest methods of replacing a damaged valve stem is to slit the tube opposite the valve as in 5, so that it can be pulled out. A patch repairs the slit. Spring-brass strips with V-notches cut in the ends, 6, are handy to connect batteries when charging them. Rocking the strips, after placing the ends against the battery posts, assures good electrical contact

Clean Crankcase Ventilator Often

Regardless of the type of air cleaner or crankcase ventilator on your car, the need for a periodic cleaning of both cannot be overemphasized. The length of time between the cleaning periods depends upon the type of roads where the car is used. A dust-fouled filter element cuts down the free flow of air, and the lessened volume of air that does go through travels with increased velocity, which has a tendency to break off chunks of the caked dust around the filter openings, eventually carrying this abrasive dust inside the motor.

How Fleet Operator Saves Gas

Finding that the new type gasoline accelerator pedals were costing him money by wasting gasoline, the operator of a fleet of light cars screwed wooden blocks to the floor boards at the right of the pedals, to steady the drivers' feet. As all modern carburetors have accelerator pumps, which force fuel into the manifold every time the

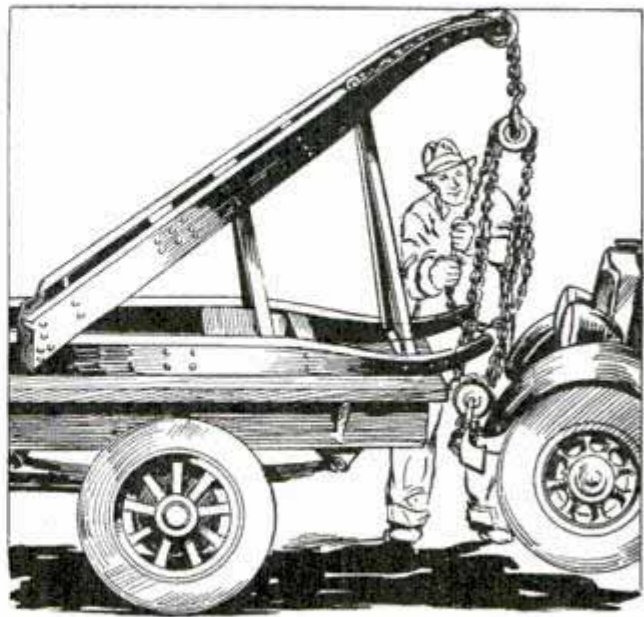


Wood footrest permits driver to control operation of accelerator without over-feeding motor

throttle is moved, this steadier control of the latter increased mileage up to three miles to the gallon. By fitting the wooden block at a height level with the pedal when the speed is about 20 m.p.h., it is easy to get any speed by merely rocking the foot, thus avoiding jerky driving.

☐ When reassembling ball or roller bearings of the cageless type, and no thick grease is available, soft soap can be used.

Inexpensive Hoist for Tow Truck Assembled from Car Frames



Strong enough to lift one end of a car, this hoist is moved about easily by one man

Serving a number of purposes around a garage or wrecking yard, this hoist is assembled inexpensively from old auto frames bolted and welded together. It can be pulled around in a garage or wrecking yard by one man, and it is light enough to be lifted onto a tow truck easily for hoisting the end of a car.

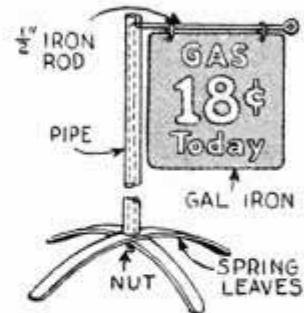
Jos. C. Coyle, Tucson, Ariz.

Portable Sidewalk Sign of Pipe and Auto-Spring Leaves

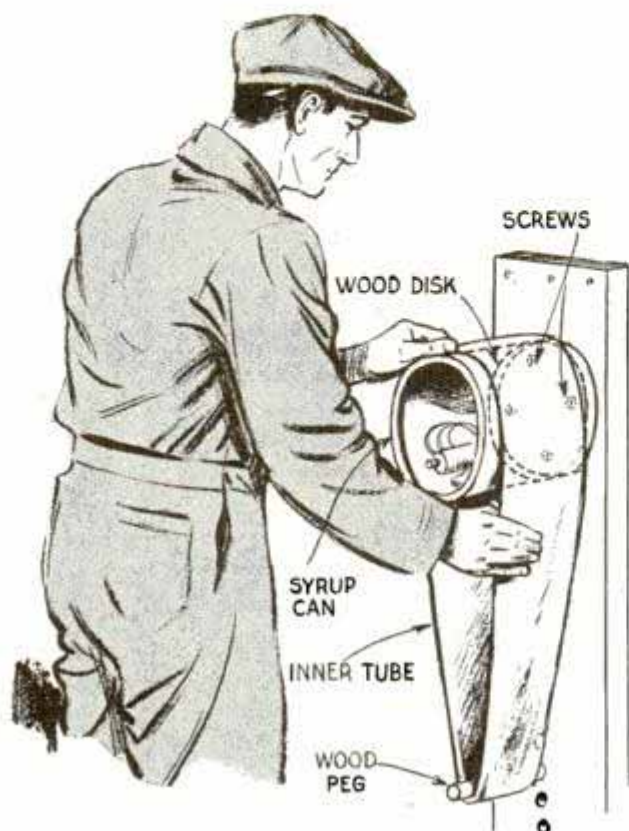
A filling-station proprietor, having need of several portable signs to advertise his products, constructed them from lengths of pipe and auto-spring leaves.

Each support consisted of a 1/2-in. iron rod bent at right angles to rest in a notch cut in the upper end of the pipe and extending down through the spring leaves to receive a lock nut on the threaded end, thus holding the assembled parts firmly together. The sign itself is a piece of sheet iron which is given a coat of blackboard paint so that the wording may be lettered in chalk.

—G. E. Hendrickson, Argyle, Wis.



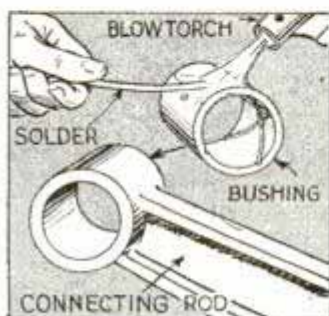
"Bench" to Repair Inner Tubes from Tin Pail



Tin syrup pail attached to garage bench, post or wall for repairing inner tubes

A handy bracket or bench to support inner tubes while repairing them in the home garage is provided by nailing a tin syrup pail to a stud or post in the garage. It's a good idea to insert a wooden disk in the bottom of the pail and drive the screws through the wood. This will keep the heads of the screws from pulling through the pail bottom. Repair cement, roller and other incidentals may be kept inside of the pail. Stretching the tube to hold it more securely may be done by placing one foot in the lower loop, or using a wood peg which fits any one of several holes drilled in the upright.

Fitting Oversize Piston Pins



On jobs of fitting connecting rods with oversize piston pins, where one or two of the pins fit too loosely in the bushings, I eliminate the trouble as follows:

Press the bushing out of the rod and clean the outside surface with fine emery cloth. Then take a small torch and acid-core solder and tin the outer surface of the bushing. Put it back in the rod, being careful to have the oil hole in the right position. This will shrink a bushing from .001 to .002 in. which is usually sufficient.

—T. E. Bordner, Willard, Ohio.

Horn Button on Gear-Shift Lever to Avoid Short Circuits

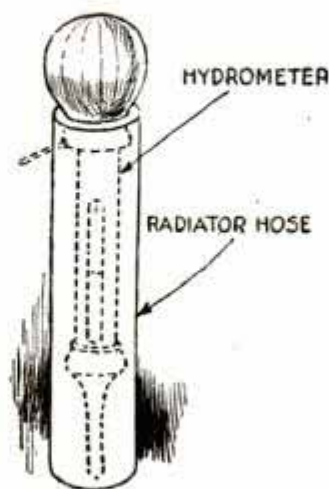
After the horn wires of my car had short-circuited several times at the lower end of the steering column, where accumulations of grease had damaged the insulation, I moved them to the gear-shifting lever. A push button was taped



to the lever near the upper end, after which the wires were run down along the lever and through the floor. Fiber or rubber insulating sleeves should be used at this point to avoid chafing the insulation.

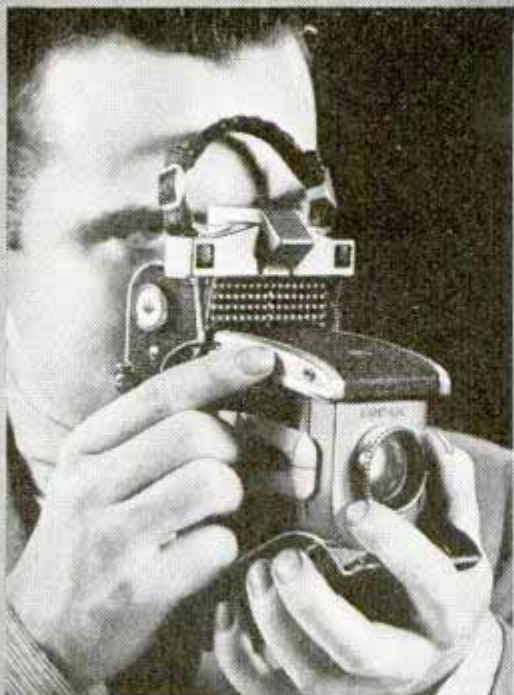
—Burnard Sanders, Shelbyville, Tenn.

Battery Hydrometer Kept in Hose Is Protected Against Breakage



Nailed to the wall of your garage in a convenient place, a length of radiator hose provides a safe place to store a hydrometer. The hose should be large enough to take the glass tube of the hydrometer freely, but not large enough to let

the rubber bulb drop through. Besides protecting the hydrometer from breakage, the hose also protects the wall and saves your clothes from drops of battery acid.



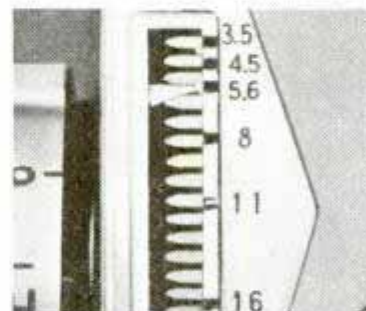
The photoelectric cell, mounted behind multiple collective lenses, automatically preselects proper aperture for the picture.

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The camera with the "electric eye"



One lever sets the shutter, actuates the window cover, advances the film.



This automatic scale shows the aperture at which the exposure will be made.

● Built-in photoelectric cell measures light and sets camera at correct "stop" for any hand-held shutter speed. Built-in range finder. Double-exposure prevention device. Shutter

set by film-winding lever. Has Kodak Anastigmat Special $f.3.5$ lens, 1/200 shutter, fine-camera equipment throughout. Pictures, $2\frac{1}{4} \times 3\frac{1}{4}$ inches. Price . . . **\$225**

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Kodak Bantam Special has extra-fast, super-corrected lens, Kodak Anastigmat EKTAR $f.2.0$, 1/500-second Compur-Rapid shutter. Built-in coupled range finder, split-field military type. Film-centering device. New low price includes field case.

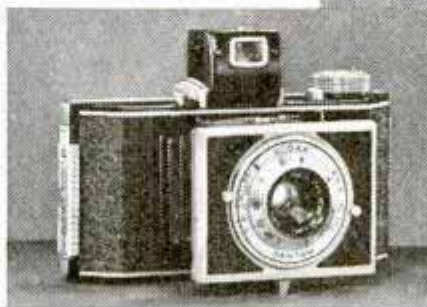
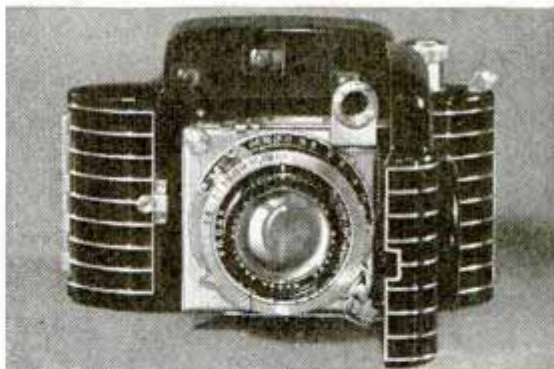
KODAK BANTAM SPECIAL, \$87.50

NEW KODAK BANTAM ($f.4.5$)

(right) Kodak Anastigmat Special $f.4.5$ lens. 1/200-second shutter. Plunger-type body shutter release helps minimize camera movement. Folding optical eye-level finder. Automatic film-centering mechanism. \$27.50.

NEW KODAK BANTAM ($f.5.6$)

(not illustrated) Palm size. Kodak Anastigmat $f.5.6$ lens. Shutter has speeds of 1/25, 1/50, and 1/100 second. Eye-level finder. Film-centering mechanism. \$16.50.



Lower priced Kodak Bantams, for black-and-white pictures only, include the $f.6.3$ model at \$9.50 and the $f.8$ model at \$4.75. See these and other up-to-the-minute Kodaks at your dealer's . . . Eastman Kodak Company, Rochester, N.Y.

Only EASTMAN makes the KODAK

Picture Your Pets

(Continued from page 573)

mediately apparent. Clever captions and titles in your picture book can make "story" pictures out of almost any snapshot in which the pet wears an interesting expression. Such captions can be used also to weave individual pictures into a connected series that tells a story of its own.

Try this: collect a group of expressions of one pet and caption each with a direct quotation, as if the pet were speaking. Let him voice his own thoughts—the things he might be thinking in that particular picture. Such captions will add human quality and character to the animal snapshots.

As an aid in getting natural, unposed pictures of the children, try snapping them at play with the pets. They won't look at



Puppies are always amusing, but this picture was helped by good arrangement and a plain background

the camera, finding the kittens and puppies more interesting. At the same time, the pets add an extra touch of appeal to the child pictures.

Viewpoint is important in any animal picture. Sometimes, when you are portraying the pet as an individual with expression and character of his own, you will want to hold the camera at the level of his eyes. Such a camera viewpoint produces pictures that show the pet's own view of things about him. At other times, you will want to have the camera at the usual eye level or waist level. In some story-telling pictures—as of the kitten on the floor, tangled in a skein of yarn—an angle shot is best, with the camera pointed downward toward the subject.

Another case where an angle shot would be best is a picture of a cat perched on a

high mantelpiece, ready to jump. Here, the camera could be pointed upward to emphasize the height of the mantel.

It's fun to play with "effect" lightings for pictures of pets—when the pet will "stay put" for you. Try picturing a white cat with backlighting—for instance, on the sill of a sunny window—so that the fur is converted into a bright, silken halo. A white, woolly pet lamb can be pictured effectively in the same fashion, with sunlight coming from above and slightly behind it, instead of from the front.

To get the best pet pictures, take the color of the pet into account in figuring your exposure and arrangement. A white cat can be backlit but a black Scotty or spaniel should be pictured from the sunny side—for from the shady side, he will photograph as a mere mass of black.

Choice of film depends partly on the colors of the pets. Chrome-type film serves nicely in most cases. But if you are picturing such subjects as brightly colored parrots, or dogs and kittens with unusual coloring, try film of the supersensitive panchromatic type. A light yellow color filter (the Wratten K-1, for example) will help render colors still more naturally, and will also help add sky tone in your outdoor pet pictures. Be sure, when using any filter, to increase exposure according to the instructions that come with it.

Some people think the best way to take pet pictures is to dress up the animal, or (especially in the case of a puppy or kitten) stuff it into a vase or old shoe with only the head sticking out. This may be all very well if you like that sort of thing, but it probably strikes the pet as pretty silly—and most observers are likely to have the same reaction. The best animal pictures present the animal naturally—as an individual, a personality, a member of the family. Make yours that way and you will like them better and enjoy them longer.

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your first taste
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the smile's too big
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*Velvet packs easy in a pipe
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Who says automobile waxing is a tough job? Not the man who has tried the new Du Pont Speedy Wax (liquid). He knows it waxes cars

in half the time, because it cuts out the preliminary cleaning operation. Speedy Wax cleans as it waxes! And it gives beauty and protection to your car finish! It's easy! And it's quick!

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Du Pont No. 7 Polish, the world's most popular auto polish, has now been made even better. Works faster and easier. Try it!



Always ask for
DU PONT POLISH

H 626

Millions for Movie Ideas

(Continued from page 517)

phy methods, new lighting, sound recording, and improvements made in cameras and in negative and print developing.

About 2,000 regular employes at Paramount receive salaries ranging from those of rough labor to sums several times that paid the President. Nearly every profession is represented. Air-conditioning engineers, foundry workers, and carpenters are as necessary as cameramen. Painters,



Switchboard in sound laboratory through which sounds from different stages are switched to proper recording machines

draftsmen, truck drivers and machinists all have jobs and from them come many ideas which make pictures better.

Frequently amazing developments are achieved by the technical departments between pictures. During the filming of "If I Were King" at Paramount, we had a new type of perambulating "mike" boom which was not available during the making of "Wells Fargo" a few months before. Three-wheeled and rubber-tired, with variable tread, it is highly mobile and maneuverable. Using it in crowd scenes, the sound-recording crew is able to move in and out and obtain more lifelike recordings. It is constructed of lightweight metal and one man can handle it easily.

Similarly, we discovered an air-gun artist on this picture. He is "Scotty," standby painter, otherwise called Joseph McIlroy. The new high-speed film we are using

H 626

makes possible very fine photographic effects with low key lighting but the drab, Middle Age interiors of the picture were inclined to register almost solid black. "Scotty" changed all that by painting in highlights at a moment's notice. He covered up the old ones and created new ones with every change of camera angle.

They say the chance of becoming a star in Hollywood is about one in 10,000. The number of people who rise to the top behind the scenes is nearly in the same proportion. Why? You can find one answer in the application cards filled out in the studio employment offices. Three out of four applicants, when answering the query, "Type of work desired," say they don't know or don't care.

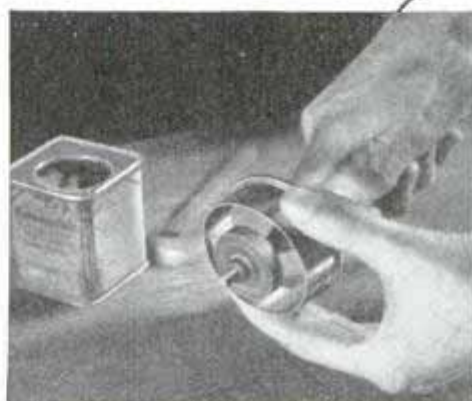
Making motion pictures is one of the most highly specialized professions. The pace is fast and you have to be good to keep up. Yet the average person who applies for work doesn't even know what he would like to do. And even knowing what you would like to do isn't enough these days. The studios have their pick of experts. When a job is open the man with the best training and ability gets it. That's the kind of competition faced by those whose only qualification is a desire to work in the movies.

Even when you have ability there still is no guarantee that you can get the job. In some cases, ambitious people who wanted to be actors or writers started working in other departments until they could get a chance to prove themselves. Right now even this loophole is pretty small because there are more people qualified for jobs than there are jobs.

Still, Hollywood is full of success stories of people who started at the bottom. Grover Jones, the writer, began as a scenery painter. Mervyn LeRoy, the producer, and Charles Barton, the director, each got his start as an office boy. Many heads of technical departments, people just as important to pictures as the stars, have risen from the ranks.

That's the history of Hollywood. Five or ten years hence, reviewing some film created in 1938, we will take for granted all the improvements made after 1938. How those improvements will be made, no one knows, and no one knows the names of those, inside and outside the industry, who will contribute the improvements.

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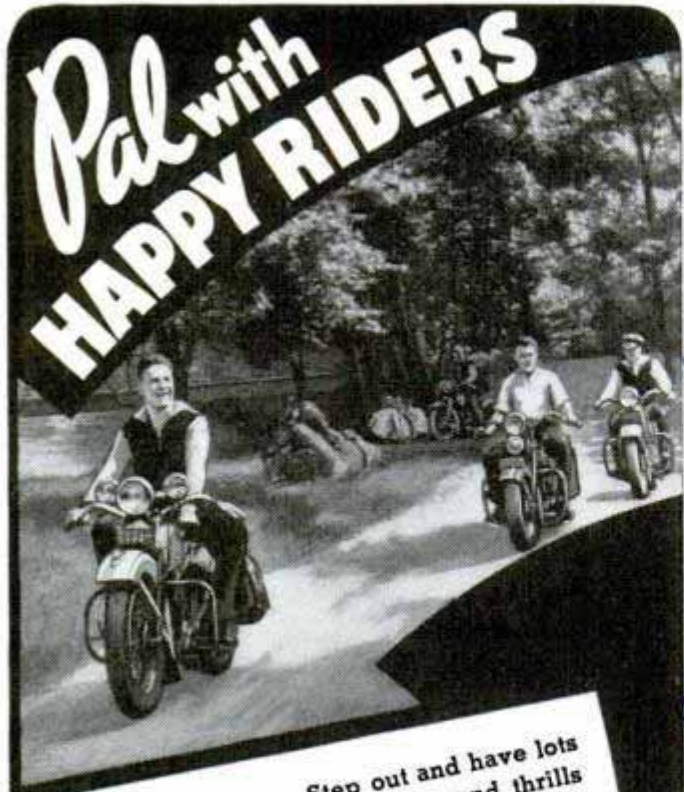
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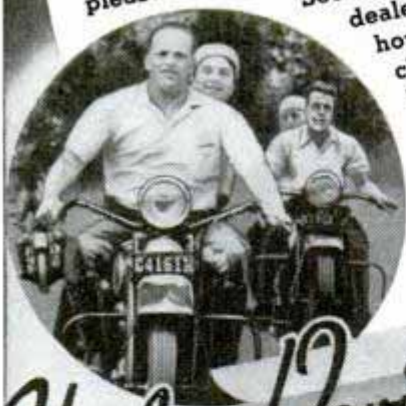
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Flying the Winged Bullets

(Continued from page 549)

planes in the unlimited class have been powered with radial engines in the past but now many pilots think that the day of the radial engine is about over in racing. Last year's Thompson Trophy race was won by a tiny plane powered with a stock

Lars. Olin



The tiny ten-inch landing wheels retract into the low wing of this racing plane

260-horsepower in-line engine, that beat radial engines of as much as 1,000 horsepower to win. The better streamlining allowed by the smaller frontal area of an in-line engine more than compensated for its low power.

Most of the planes in the 550-cubic-inch displacement class are powered with a stock-inverted in-line air-cooled six-cylinder engine rated at 260 horsepower. Some pilots extract nearly twice the rated power from these engines by increasing the compression ratio and supercharging ratio, changing the valve timing, and turning them up to 2,900 revolutions per minute. To some extent the pilot who is the best engine mechanic has the most successful racing season. Likewise, he needs nerve to fly the "souped up" engine wide open in the air, and luck enough for the engine to hold together through each race.

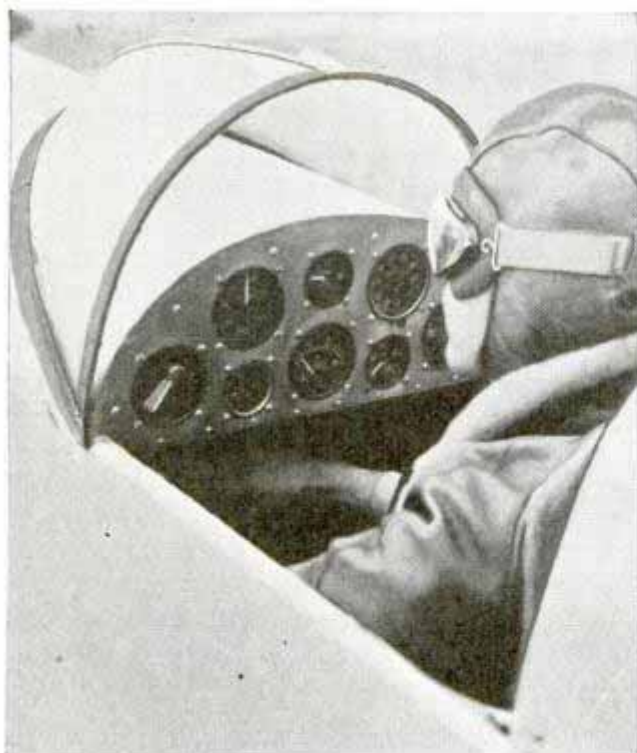
A number of the pilots have re-built and re-engined their planes for this summer's competition, but more than half a dozen brand new race planes have also been built. Art Chester is flying a 550-cubic-inch class full cantilever low-wing monoplane equipped with flaps and retractable landing gear and tail skid. The

9716 Burbank 14528
 wing, with a span of eighteen and one-half feet, has only sixty-six square feet of surface, and is plywood-covered for better streamlining and increased strength.

Harry Crosby's new 550-cubic-inch racer is an all-metal full cantilever low-wing monoplane with a special wing curve, retractable landing gear, flaps, and a span of sixteen feet and a length of twenty-one and one-half feet. He has a one-piece transparent cover for the cockpit, an adjustable seat that raises six inches to provide better visibility for taking off and landing, and a fresh-air intake under the wing to ventilate the cockpit.

Just the opposite from the construction standpoint is the new all-wood racer in the same class built by Keith Rider. It is a full cantilever low-wing monoplane, with a twenty-two-foot span and a length of twenty feet, equipped with retractable gear, flaps, and brakes. Molded plywood covering permits complete streamlining.

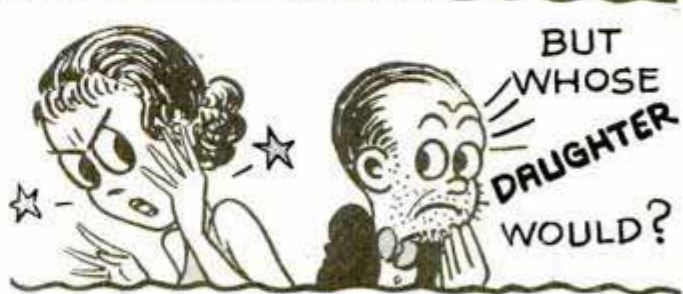
In the unlimited class, Lee Williams will fly a new high midwing monoplane powered with a "souped up" liquid-cooled V-type Curtiss Conqueror, rated at 625



Pilot in cockpit. The instrument board contains the conventional instruments

horsepower, that delivers close to 800 horsepower at full throttle. Some of the other racers built this year are being held under wraps until their pilots learn exactly how fast they will fly.

Treet Topics

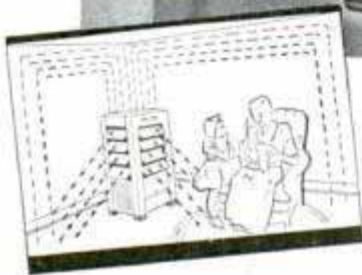
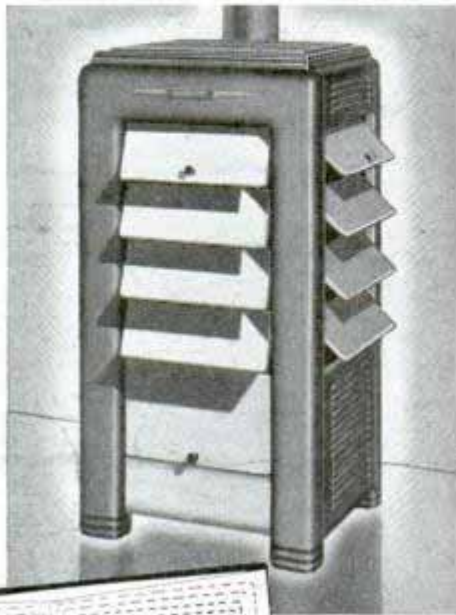


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Wild Horses Corralled from Air

(Continued from page 543)

another upward circle. I begin praying for the motor to carry enough "kick" to clear the height. Zoom! we're over—and out of the canyon. But there go some stragglers. Down we plummet—then up. And back again for another plunge. This time, going into the canyon further than before, we run up against an extremely small passage—too narrow to accommodate the wing-spread. By piloting that makes my hair stand on end, Hanson caroms through like a skidding billiard ball. We're flying sideways! Now up into an almost impossible "chandelle" and out into the sky again. The last horse is inside the corral. A buckaroo jumps from his hiding place, shuts the gate, and there are twenty blooded mustangs rounded up—the hard way.

The actual capture isn't the end of a wrangler's troubles. A wild horse will bite a man with diabolical emphasis. And recently, while trying to transport a load of mustangs by truck, the vehicle was kicked to pieces by its unwilling passengers.

Something that smacks of fiction happened to Hanson not long ago. He was flying his "dawn patrol." Straight ahead loomed a cloud of desert dust; a wild herd. A formation of mustangs is something to see. Each group, or "family," travels by itself, commanded by a leader, the senior stallion. A military column was never more orderly or precise. The animals move in single file, led by the "boss hoss."

In a few minutes, the plane caught up with the running troop. The flier felt rather sorry for the big white mustang lagging far behind and figured the beast would collapse before it could catch up. An hour passed and the herd had been driven to within eyeshot of the corral. Suddenly, the trailing stallion turned—stood on hind legs—pawed the air—and was off like a streak, in the opposite direction, the entire herd following. A surprise break! It meant the loss of many hard won horses, but defeat was not so bitter when it came from a mustang with the resourcefulness of a field general.

But when Hanson landed, the cow-punchers ran over, shouting, "You big stiff! That was 'Silver King!'"

"Silver King" was almost a legend, a pure white stallion, handsome, intelligent,

12520

elusive. For twelve years, every rancher in the territory had tried to capture him but none could lay hand on him. Hanson kicked himself. Then he decided to go after "Silver King."

Early next morning, he packed into his "Flying Bronco" and was off on the search. Lady Luck was riding along. Soon he sighted the herd he sought. And there—in the rear guard position again—was "Silver King."

Motor open wide and siren screaming, Hanson came down and started a see-saw duel which lasted an hour and a half and seemed like a day and a night. "Silver" called on every wile he knew. But no use. An earthbound horse can't fight a feelingless Pegasus.

"Silver King" was bagged. But Floyd Hanson kept the prize of a decade in the corral just long enough for the boys to come and look—and then, nonchalantly walked over and opened the restraining gate. The great piece of wild-horse flesh galloped out like a thunderbolt and in twenty seconds disappeared behind the snaky mountain pass. For all his wiry nerve, I think this flying cowboy is as sentimental as a poet in the moonlight.

"Say, Floyd," I said, "mind my telling about all this? Since you're the only fellow in the world rounding up horses with a plane, it might wake up some competition."

"If someone else wants to have a try," drawled Hanson, "he has my blessings and my sympathy."

H-840

Scraper Attached to Blowtorch Speeds Paint Removal

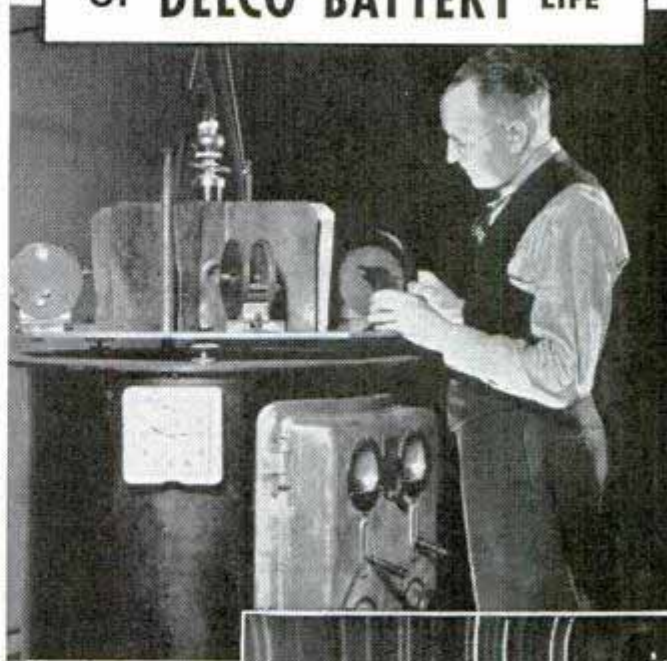


For quick removal of paint, a manufacturer offers a blowtorch with scraper attached. Only one hand is needed to operate it, leaving the other free to steady the ladder or scaffold. As the

torch softens the paint, the scraper follows it and skims off the paint with the same stroke. Blades of several shapes are available for use in difficult places.

Lashin Mfg Co
 1117 W. Westwood Ave. Baltimore

THE X-RAY TELLS THE STORY OF DELCO BATTERY LIFE



This powerful X-ray Spectroscope is used in the Delco-Remy laboratory to examine and check the chemical action that takes place inside the Delco battery . . . The small picture is an X-ray Spectrogram showing how finely divided metallic lead appears on the X-ray film.

NOT satisfied with the knowledge obtained through chemical and microscopic analyses alone, Delco-Remy battery engineers turn to a powerful, especially designed X-ray Spectroscope to study the changes in physical form and chemical composition that occur within a Delco battery in actual use. Raw materials that go into Delco batteries . . . new batteries just off the production line . . . old batteries that have given months and years of service . . . batteries at every stage of charge and discharge are subjected to minute X-ray examinations to show the changes that occur in the active material and grids. Delco-Remy battery engineers always have a clear picture of what goes on inside the battery under all conditions to guide them in designing and building better Delco batteries. As a result of this X-ray research—as well as of tests and inspections at every stage of manufacture—Delco batteries have exceptionally quick cold-weather starting ability and long-lasting qualities.



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I THINK THAT ALKA-SELTZER MUST HAVE DONE THE TRICK.

I NEVER KNEW A HEADACHE TO DISAPPEAR SO QUICK.



MORNING AFTER



UPSET STOMACH



HEADACHE

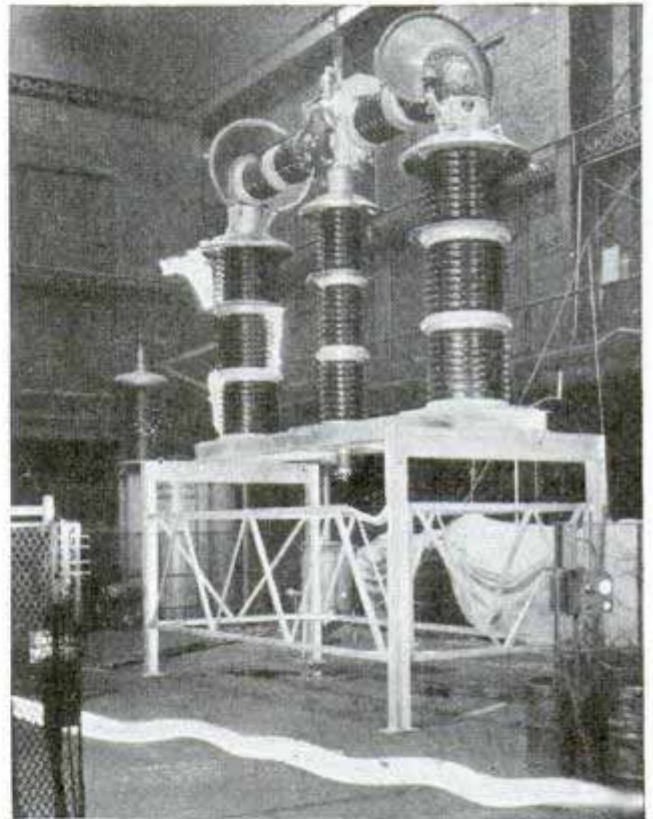
Alkalize with Alka-Seltzer AT ALL DRUGGISTS

DO YOU WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

Riding Herd on 2,000,000 'Horses'

(Continued from page 555)

breakers tower thirty feet above the sand. "Thinking" instruments, known as relays, pull the triggers of these General Electric circuit breakers, which are like eight-barreled oil guns. These breakers are the strong-arm guys that cut loose the damaged wires, stop the rush of electricity and switch the load to other wires, all in the twinkling of an eye. At the same instant, these relays flash an order to circuit breakers at the other end of the damaged line and those breakers disconnect that end. They all act in unison and at the same instant, although ninety miles apart. And



Picture of oil circuit breaker snapped as flashover was occurring at end of column

they act so fast that people in Los Angeles don't know the difference—their lights don't even blink.

It sounds simple to say that circuit breakers "open" to interrupt the flow of current, but it is not as easy as it sounds. To interrupt a damaged electrical circuit of high voltage means stopping not the normal flow of current, but a rush of many times normal. Speed in cutting loose a disturbed section is absolutely essential if interruption of service and damage to the system are to be prevented. Electrical accidents can do a lot of damage in a fraction

of a second because the current has the power of thousands of tons of falling water behind it.

So, instead of "breaking" or stopping a normal flow of 400,000 horsepower, or 300,000 kilowatts, the breakers in an emergency may be called upon to halt an abnormal current flow representing as much as 2,000,000 horsepower. The breakers actually can stop 3,350,000 electrical horsepower, and do the job in one-twentieth of a second, but so severe a duty is seldom imposed.

While the circuit breakers are the big bruisers that catch and throw and tie up the runaway electrical horses when a line is damaged, the relays do the thinking and order the breakers to go into action. An array of instruments in a little box about the size of a suitcase constitutes the all-seeing, high-speed relay which is a detective, judge and diagnostician, all in one, for it detects every disturbance, determines the cause of the trouble and prescribes the proper remedy.

Ordinarily lightning bolts which may strike the line are harmlessly conducted to earth. But should an unusually heavy bolt strike the line and cause flashover of an insulator, the relays act within one-sixtieth of a second, ordering the circuit breakers to cut loose the disturbed section from the rest of the system. Each triple-pole circuit breaker is like three oil guns, all loaded and cocked. The relays have their fingers on the triggers and, when real trouble occurs, they instantly pull the triggers of the proper guns and the breakers go into action. On the damaged line, they separate their contacts which are connected with each of the three wires. They do this under oil, inside the circuit breaker.

This sounds easy, but 287,000 volts don't give up without a struggle. Electricity, like a speeding train or car, has momentum and wants to keep on flowing. So after the contacts have been separated, the current keeps on flowing, now through the oil in the space between the contacts. The heat turns the oil into gas, chiefly hydrogen, and the current still keeps on flowing—now through the gas in the form of an arc. And arc temperatures mount so rapidly they are virtual explosions.

But while the current has been struggling to keep on flowing, first through oil

(Continued to page 124A)

REMINDE ME TO
GIVE YOU SOME
SANI-FLUSH
FOR THAT RADIATOR!



It's more than annoying, when a radiator overheats. It's dangerous. It robs your car of power. It threatens damage to the pistons and cylinders. An overheated radiator is an unnecessary waste. Clean out the cooling system of your own car for 10c (25c for the largest truck or tractor). SANI-FLUSH does it, in a few minutes.

Just pour this harmless powder in the radiator. (Directions on the can.) Run the engine. Drain, flush and refill with clean water. The job is done! SANI-FLUSH removes rust and scale. It cleans out clogging sediment. Motors run cool and safe. It cannot hurt the motor or fittings because it's not caustic. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

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HAGERSTOWN,
MD.

(Continued from page 123A)

and then through gas, the mighty circuit breaker has not been idle. Even before the arc could start, a spring-actuated piston began driving fresh oil through the arc path, shooting about 100 gallons of cool oil straight up through openings about as large as the muzzle of a double-barreled shotgun. This oil is under pressure of 100 pounds per square inch and moves 128 feet per second. This oil under pressure blows away the gas, the arc is destroyed, and the current flow is stopped—all within one-twentieth of a second.

Alternating current changes direction like a swinging pendulum and just at the moment of change in direction, there is no current for an instant. The breakers are designed to take advantage of this weak moment. Just at the precise moment when the current is changing direction from plus to minus, the oil blast is under full headway. An instant later the voltage comes up from zero to full strength but it's too late. The arc has been destroyed.

The contacts under oil are separated, not at one place only, but at eight different places in a row. Thus in each of the three phases of the circuit, eight oil blasts, instead of one, are blowing out the eight arcs. As these eight gas bubbles, each containing an arc, are shot upward by the oil, they meet partitions which divide each bubble into two parts. So there are really sixteen gaps in a row where rapidly moving oil blocks any further passage of electricity. It would seem that the terrific arc temperatures might damage the enclosing structure of the breakers in the brief instant they exist. Actually the cool oil protects the breaker parts from the arc.

While the breakers do the spectacular strong-arm work in protecting the system when 2,000,000 wild horses cut loose, the little relays do the real brain work. Faithful sentinels which never sleep, these "thinking" instruments observe, reason and make decisions, their fingers always resting on the triggers of the oil-gun circuit breakers, ready to fire these Big Berthas and stop 2,000,000 wild electrical horses dead in their tracks in the twinkling of an eye.

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

Toys for Men Only

(Continued from page 523)

decided to make the mounting in the form of a huge hollow yoke which would be welded into a single piece and to float the mounting in oil under pressure to prevent vibration. But not a piece of metal could be machined until it was determined just how the telescope would operate.

So the engineers began building models. One after another was constructed and discarded. Finally a satisfactory model was constructed of celluloid. To measure the tiny movements of the celluloid parts an electrified micrometer connected to a bell was used so the builders could tell the instant the micrometer screw touched a part being measured. The celluloid pieces were actually welded into place just as their larger counterparts are to be welded, but the "welding" was done with acetone.

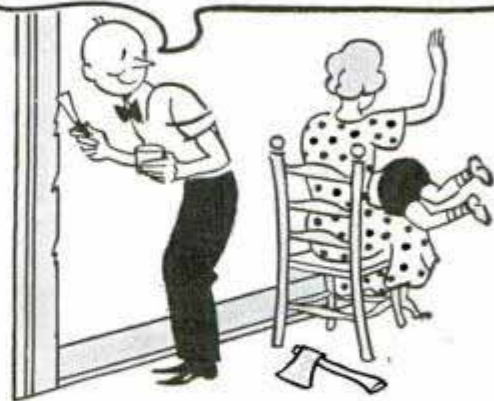
Experiments with celluloid models have solved many welding problems, incidentally, because celluloid warps like steel as a result of heating and cooling. For this reason, and because it is transparent, models of steam turbines often are made of celluloid. Engineers can watch the operation of moving parts in celluloid turbine models and the behavior of celluloid when supporting a weight can be translated into the behavior of a full-size turbine. Recently a celluloid model of a propeller-type blower was operated at a speed of 6,000 revolutions per minute. By studying the model, engineers determined the capacity, rate of flow of air and other characteristics of the real machine before it was built.

At the Westinghouse plant in East Pittsburgh, a \$550,000 flood-control system of steel gates and pumps has been erected to keep the flood waters of a creek from backing up a valley. Before a shovelful of dirt was turned, the builders knew just how much water could be pumped through three tunnels around the sides of the flood gates because they had built a model and pumped water through it.

The robot or mechanical man is a laboratory scarecrow turned out by the research engineers when they want to demonstrate dramatically some of their devices which perform difficult or tedious jobs better than humans. Dressed to simulate the actions and appearance of a man, such

(Continued to page 126A)

**CANNED WOOD WILL
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SO DON'T SPANK HIM ANY MORE**



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Featherweight Model



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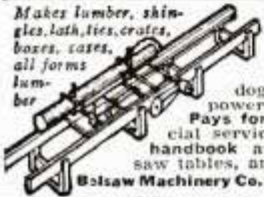


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DEPT. V-108 WEST ALLIS, WIS.

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LOW COST AMMUNITION**

Grooves inside barrel make the Crosman a real rifle with all the hair-splitting accuracy this term implies. Shoots bullet (pell) same diameter as .22 powder rifle, but silently, powerfully, with no recoil, using the terrific force of compressed air—same force U. S. Navy uses to drive 2000 lb. torpedoes. Marvelous for target, small game. New features. Single and 20 shot repeater models. No license required.

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Containing important target and game shooting facts; also Crosman Catalog. Write, Ask Your Dealer to Show You a Crosman.

CROSMAN ARMS CO., Inc., 387 St. Paul St., Rochester, N. Y.

(Continued from page 125A)

a robot may sing, talk after a fashion, answer the telephone, smoke, laugh, cry and perform other amazing feats.

Such a toy is Willie Vocalite, a sturdy metal man born in a Westinghouse research laboratory. Willie can taste with an "electric palate," talk, smoke and, when spoken to, will get up out of his chair. His voice and actions are controlled by photoelectric tubes while his taster is an "electrynx," so sensitive that it records the acidity of fruits by registering the action of one-millionth of an ampere. That's about one-tenth the "wing power" of a house fly.

The latest toy to attract attention in many laboratories is a tiny sun-driven motor, the electromotive power being supplied by four very sensitive photoelectric cells. Their light-sensitive surfaces are covered by a film of platinum so thin as to be semi-transparent. This film increases the cell's sensitivity to light. The cells convert light energy directly into electric energy and the motor, with jewel bearings, is connected directly to the cells. The speed at which the motor turns depends on the amount of light the cells receive. Direct sunlight whirls the motor at about 400 revolutions per minute. As yet, no practical application has been found for the sun-driven motor which is rated at about four ten-millionths of a horsepower, a bit less than one flea-power.

Another laboratory toy which has not yet been put to work is the radiometer. It has four small vanes balanced on a jeweled pivot in a partly evacuated bulb. One side of each vane is polished and the other is black, the black side of one vane facing the polished side of the next. When heat rays from the sun or some artificial source fall on the vanes, they move in the direction of the polished sides.

The reason given is that the black sides absorb more radiation than the polished ones. When the molecules of gas remaining in the bulb are set in motion, they collide with the vanes but they bounce off the black, or warmer sides with greater force than they bounce off the polished sides, thus driving the vanes around.

Perhaps some day ways will be found to produce large amounts of power by applying the principles of the sun-driven motor or the radiometer. Then two more toys will grow up and go to work—and we shall get power direct from the sun!

**AMAZING LOW PRICED
FOG-LITE INVENTION**



**Strange New Material
SNAPS ON HEADLAMPS**

KNOCKOUT SELLER. Turns headlamps into AMBER FOG-LITES. Pierce's Fog, Snow, Sleet and Rain. Prevents "blind driving." Cuts glare. Helps save life, property. Low priced. Gripping demonstration. Agents wanted everywhere. Phenomenal profits.

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AGENTS!
Make Big Money! NEW EASY PLAN! Write quick for territory and Outfit Offer.

474

The Age of Color

(Continued from Coloroto Section)

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If you're selling against heavy competition, there's no need to let sales costs eat your profit. For Wiggins Vellotype cuts business card costs—yet nobody loses prestige in using it.

Sales managers of hardware, machine tool, industrial supply, and electrical firms use it and **SAVE MONEY.**

Prominent inventors and small manufacturers exploiting their own products, **USE NOTHING ELSE.**

How about *you*? Is your business so good that you don't have to save money?



SEND FOR SAMPLES
Compare your present business cards in cost and quality, with Vellotype.

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Over 1,300,000 Satisfied Users
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Write for **FREE CATALOG**

to make synthetic indigo, the most widely used textile color today. Almost as much time and money were spent in developing other colors. Germany made the most rapid progress in solving the secrets of coal tar and, until the World War, much of the dyes used in this country were imported from there.

With the war, dye imports were cut off and America faced a color famine. Out of this acute need eventually developed the American dye industry and the wealth of color we enjoy today, but it was a slow and costly development. E. I. du Pont de Nemours and Company alone spent \$40,000,000 in research and experimental and plant equipment in five years before making a penny from any dyestuffs.

Today du Pont makes hundreds of dyes, each of a different chemical structure. There are, all told, about 2,000 separate colors commercially available from all sources, nearly all of them made in America.

But this is not the limit of shades by any means. By combining or blending any two or more of these 2,000 colors, many more thousands are possible. But instead of trying to make more colors, dye men today are struggling to limit the number. To do that they must develop colors which are very fast, very brilliant and not too expensive.

One step in this direction, insofar as pigments are concerned, has been taken with the commercial development by du Pont of an insoluble coloring material yielding strikingly brilliant shades of blue. It is known as "Monastral" Fast Blue and is so close to a pure blue that it is hailed as almost a miracle, a wonder color. Blues hitherto obtainable have all possessed some faults which interfered not only with the production of pure blue hues but also affected the other colors in which blues were used.

This new blue pigment is virtually fade-proof. It is not only very fast to light but is also fast to other color-destroying agents like acids and alkalies. The products to which it can be applied include almost everything into which pigments enter—printing inks, paints, varnishes, enamels, nitrocellulose lacquers, carbon paper, wall-

Organic Chemicals Dept. Wiggins Co. Chicago

H 74
paper, coated and colored papers, coated textiles, linoleum and cement.

The general use of "Monastral" Fast Blue eventually may give faster and more brilliant color to everything from your magazine to your automobile. It is, however, a pigment and not a dye. Dyes cannot be mixed indiscriminately as the artist mixes pigments. And dyes cannot be used at random on any fabric.

A dye must have an "affinity" for the material it colors and since materials differ in physical and chemical structure, there is as yet no universally applicable dye. This is one reason so many dyes are needed. One which can be used to color an animal fiber like wool may not work at all on a vegetable fiber such as cotton. Even the physical properties of fibers influence the choice of dyes to color them.

Dye chemists classify the colors they produce into groups such as acid, basic, chrome, developed, direct, vat, sulphur and acetate dyes. These group names are derived from the manner in which the colors are applied to material or from the chemical structure of the dyestuff.

Vat dyes are the aristocrats in the field of fast color. These dyes are imprisoned in the fiber and will last as long as the fabric, often becoming brighter and deeper in shade after repeated laundering. At the other end of the scale are the sulphur colors, the cheapest of all, which color the great rank and file of inexpensive cotton goods.

The cost of all this beauty and color which we enjoy today is almost negligible when compared with the cost of the products which the color decorates. The dye in a man's work shirt, for example, may cost four or five cents, and in his blue serge suit there may be a quarter's worth of dye.

But that quarter's worth of dye probably sold the blue serge to the man who wanted that particular shade just as color today sells everything from cars and carpets to clothes and kitchenware.

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

Here's the \$1⁰⁰ anti-freeze

**YOU CAN PUT
IN THIS
VERY DAY**



**FIFTY CENTS' WORTH NOW KEEPS MOST
CARS SAFE DOWN TO 10° ABOVE ZERO**

MAYBE this is an "Indian Summer" day, when you're not even thinking of anti-freeze. But you *know* a cold snap will come. Set your mind at ease now. Drive in to your dealer or service station today and have a couple of quarts of Du Pont "Zerone" Anti-Freeze put in your car.

Check the radiator solution from time to time. When winter gets down to real business, add enough "Zerone" for lower temperatures. Scientific tests prove that radiator losses are chiefly mechanical, and even then you lose a solution of "Zerone" and water—not one or the other alone. And remember, "Zerone" costs only \$1.00 a gallon, 25c a quart! With "Zerone" you get improved engine performance, due to better heat dissipation, and more pep and efficiency, through prevention of rust and corrosion in a clean cooling system.

Only \$1⁰⁰ a gallon
Made by **DU PONT**

**SAVE MONEY
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BRAND NEW
FREE
RADIO CATALOG!**



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OF SUPER
VALUES**

**1939
EDITION**

Valu-Bill Says:

This book is full of bargains in:

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The 1939 Super Value number of the greatest catalog in radio is ready! Send for your **FREE** copy today. It makes no difference how many catalogs you have. You won't want to miss this one. New television kits, over 50,000 parts, public address equipment, "ham" apparatus, cameras plus the new 1939 line of LAFAYETTE receivers. Here's a book that brings you up-to-date and saves you big money. It's **FREE!** Mail the coupon today.

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Rush **FREE** 1939 Catalog No. 73-7K8

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**YES!
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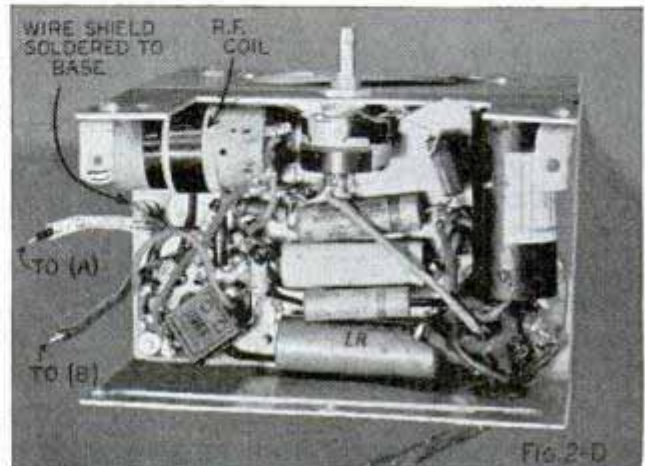
PASTE COUPON ON PENNY POSTCARD

Portable Two-Tube Receiver

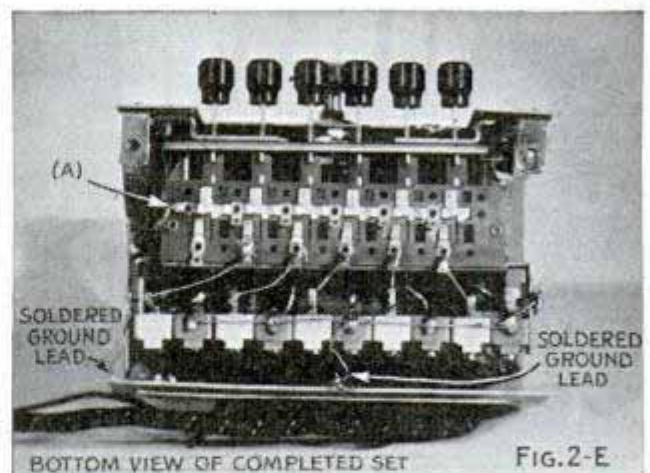
(Continued from page 579)

These A and B leads should be as short and direct as possible.

It will be noted that the antenna is coupled to the receiver through a fixed condenser. This eliminates any possibility of shorts, and no external ground is used. The flexible antenna may be extended to full length, or, it can be partially rolled up



and clipped to a radiator for convenient portable operation. Photos Figs. 2-A, 2-B, 2-C, 2-D and 2-E show various views of the construction steps and the completed receiver; schematic circuit diagram appears in Fig. 3. Although the various parts are not expensive they should be of good quality and just as specified. A material list of the original parts and additional



data, can be obtained from Popular Mechanics radio department without charge. The blueprint number is R-258.

The heart of this little receiver is the high-gain r.f. circuit developed around the type 6P7-G tube, the r.f. pentode section

(Continued to page 132A)

You'll Call It Marvelous . . .
WE CALL IT—



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\$5.95
PRICES SLIGHTLY HIGHER OUTSIDE U.S.A.
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DURO HEAVY DUTY GRINDER

WE'VE GOT SOMETHING HERE! An apt expression by one of the Duro Organization after the first tests had been run on the new Heavy Duty Grinder.

How true this is can only be realized by using this new tool.—The amazing power and high speed, the compact streamline design with weight enough to assure rigidity, the coolness and quiet performance on continuous operation and many other features will prove that we really have something here.—"An outstanding Hand Grinder regardless of price."

BUT THEN IT SHOULD BE GOOD—We are using the finest materials with precision machine fits. General Electric Motors and New Departure Ball Bearings.

Furthermore, General Electric and New Departure engineers have worked in close harmony with Duro engineers, adding their knowledge to our own vast experience as manufacturers of Woodworking, Electric and Automotive Tools, in designing this Hand Grinder.

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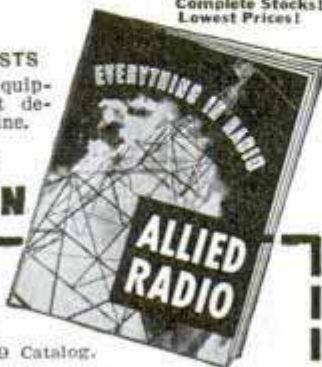
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Name

Address

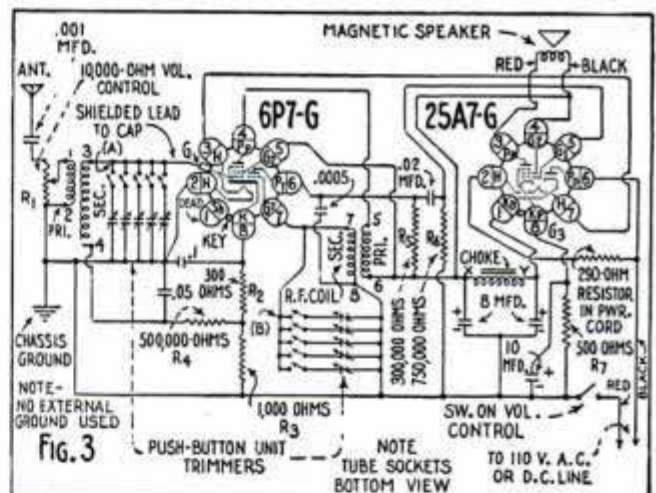
City..... State.....



(Continued from page 130A)

being coupled back to the triode section which serves as a power detector. This is resistance-coupled to the pentode output section of the 25A7-G tube. Plenty of volume is thus obtained to drive the 3-in. magnetic speaker. Both tube heaters (H) are wired in series and the 290-ohm line-cord resistor reduces the line voltage to the required value.

All tuning is done by means of the push-button unit which employs adjustable trimmer condensers. There are 5 trimmers used in connection with the antenna coil and 5 for the r.f. coil. The push buttons and their corresponding trimmers are numbered on the photo of the push-button unit. Button S is for silencing the set temporarily between programs without turning off the line switch. Be sure the line main switch is turned off when set is not in use. Looking at the push-button unit in the position shown, it will be noted



that the large-capacity trimmer condensers, those with the thickest insulation, are at the right end of the unit. These are for the low-frequency stations. Turn on the set by advancing the volume-control knob, and push down button No. 5. Now beginning at the right-hand side, looking at the slot in the rear of the receiver base, insert a small screwdriver and adjust trimmers No. 5 for the lowest frequency, longest wave-length, local station wanted. When this station comes in with maximum volume, the same adjustment is made on button No. 4 and trimmers No. 4 for the local station having the next lowest frequency, and, so on for the other buttons and trimmers. A sheet of gummed labels for all U. S. broadcasting stations is supplied for the escutcheon of the push-button unit.

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Without risking a penny prove—right in your own home—that a Royal will help you—whatever your business or profession—help you to set down your ideas and reports *legibly, impressively*. Prove too, that it will help the children with their homework . . . *help every member of your family with their writing!*

READ WHAT ROYAL GIVES YOU! Standard, full-sized keyboard. Easy, effortless action, Touch Control, Finger Comfort Keys, Genuine Dust Protection, Automatic Paper Lock, Touch-set Tabulator and many other office typewriter features. Tested, proved, guaranteed!

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The Romance of the Locomotive

(Continued from page 567)

move some large rocks out of the road." Such was the first trip of the first steam-operated locomotive to run on rails.

Stephenson, whose life had been spent operating mine machinery, saw a second engine built by Trevithick, decided he could build a better one and began trying. Some of his locomotives were used in mines and on a short railway, but the attempts of Stephenson and others, up to this time, to solve the problems of steam locomotion with little six-ton creations, burdened with upright cylinders, walking beams, cog wheels and chain drives, and with steam pressures often as low as ten pounds, were almost pathetic.

About this time the merchants of Liverpool and Manchester decided to build a railway between the two cities to avoid the high rates and delays imposed by canal shipping. No one gave much thought to the power to be employed until the road was almost finished. Then Stephenson, who had established a locomotive building shop at Newcastle, urged the adoption of steam locomotives. Every prominent engineer was against him. Finally, however, he built one locomotive which was used in the final stages of the construction project.

Meanwhile the directors were deluged with plans for drawing trains along the line by water power, hydrogen, carbonic-acid gas and atmospheric pressure. They inspected locomotives in use at Newcastle but could not agree. Two engineers hired to report on the best kind of power suggested stationary engines and cable traction, involving the building of twenty-one fixed engines, with cables and machinery.

The harried directors objected to the expense. At last they offered a prize of 500 English pounds for the best locomotive for the purpose. The engine was to cost not more than 550 pounds and was to rest on six wheels if of the maximum weight of six tons. A lighter engine was preferred, so the rules specified that if it did not weigh more than four and one-half tons, it could rest on four wheels. If of maximum weight, the engine must be able to draw a weight of twenty tons, including the tender, at ten miles per hour and steam pressure was not to exceed fifty pounds per square inch.

(Continued to page 136A)

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(Continued from page 135A)

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Engine and tender were to be mounted on springs, the "chimney" was not to exceed fifteen feet in height, and the engine was to "effectually consume its own smoke" because many declared that if locomotives came into general use, the sun would be obscured most of the time.

A straight stretch of track near Liverpool was selected as the testing ground. The length of the test run was to be one and one-half miles. Each engine was to travel the distance forty times, pulling on twenty runs in one direction and pushing on twenty in the opposite direction.

As the time for the test approached, four engines were nearing completion, among them Stephenson's "Rocket" which made her historic test run on October 8, 1829. Stephenson had learned from previous mistakes, and instead of upright cylinders, those on the "Rocket" were in an inclined position and applied the power direct to the drive wheels.

The multitubular boiler contained twenty-five copper tubes three inches in diameter, and the engine, being of the lesser weight prescribed, rested on four wheels. With the boiler full of water, the "Rocket" weighed 8,500 pounds, exclusive of the tender which weighed 6,400 pounds. On her test run, the "Rocket" hauled two "wagons," the total weight of engine, tender and train being seventeen tons.

The first twenty to-and-fro runs, totaling thirty miles, were made in two hours and fourteen minutes. The last twenty required only two hours and six minutes, an average of more than fourteen miles an hour. The quickest run was made in three minutes and forty-four seconds, equivalent to twenty-four miles an hour. Fourteen years later the "Rocket" attained a speed of sixty miles an hour. Two other engines eventually competed for the prize. One was the "Novelty," a "tank" engine which carried fuel and water on its own frame. The other was the "Sanspareil" with upright cylinders and return flue boiler. Both broke down during test runs, and the prize went to the "Rocket."

Thus George Stephenson, who did not invent the locomotive or any essential part of it, triumphed where others had failed. His happy combination of the multitubular boiler with the power of two cylinders applied directly to the drive wheels, and a

11594

proper relation between cylinder size and drive-wheel diameter established a principle which, after the lapse of more than a century, still holds good. To Trevithick, however, must go the credit for inventing what has been called "the greatest civilizing force of all time." He built and operated the first locomotive to run on rails and broke through Watt's system of condensation and low pressure.

Railroad history is filled with freaks which ignored the principles established by Stephenson. When the seven-foot gauge Great Western Railway was built in England, many innovations were tried out. One, the "Hurricane," had two ten-foot driving wheels and the boiler on a separate carriage from the locomotive proper. She hit 100 miles an hour when running light, but could not pull even a light train.

Passenger engines with nine-foot drivers were designed for the seven-foot gauge Bristol and Exeter Railway and ran for some years, but the design was not perpetuated. About the middle of the last century, the London and Northwestern Railway produced the "Liverpool" which developed high speed but had little hauling capacity. Similar engines were built in this country and later discarded.

The "Fontaine" locomotive employed the principle of the large and small pulley to obtain a high rate of revolution for the drive wheels. One such engine reached a speed, with two light coaches, of a mile in thirty-two seconds, a record for many years. When hooked to a heavy train, however, the "Fontaine" failed to deliver.

The return flue boiler, favored by many early designers, was revived in improved form several years ago. Theoretically, the return flue type saves fuel but higher cost of manufacture and upkeep more than offset this. Elimination of the "hammer blow" of the drivers on the rails at high speed was claimed for the "Henry Shaw," called a "balanced" locomotive. There were four cylinders and connecting rods but the remedy was worse than the disease.

Near the close of the last century, the compound locomotive was hailed as the engine of the future. Then came superheated steam with its greater economy and the compound engine disappeared—leaving the simple, two-cylinder locomotive first designed by George Stephenson again in possession of the field.



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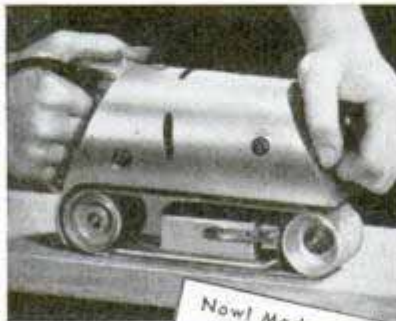
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Steel Carves a Waterway

(Continued from page 509)

Of all the lake boats, the largest is the "Lemoyne," a Canadian craft. It can carry 571,885 bushels of wheat. This would make a train of 211 cars, or more than two miles. Putting such a load on board is a delicate task as it must be distributed evenly the length of the keel and built up gradually. Taking it out, the process must be reversed. This is all done by machine. The ship runs alongside an elevator, spouts swing down to the open hatches and an operator directs the flow of grain. Between breakfast and lunch the entire load is taken aboard. At the other end the load is sucked out by a long-nosed conveyor which looks like a giant mosquito.

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All of the "yo ho and heave" tactics still common in seaports are absent. There is no excitement, very little noise and even with coal the dirt is kept down by sprinkling the cargo as it comes aboard. Lake ships are as well kept as yachts and take pride in their glistening white cabins. Anyone who smudges any of the bright work is instantly out of favor. Port workers know this and refrain from leaning against cabins in dirty overalls.

(Continued to page 141A)

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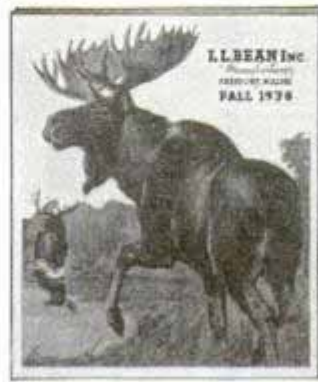
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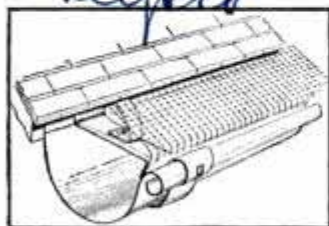
(Continued from page 138A)

Of all the specialized craft, none is more independent than the self-unloaders. There are now sixty-five of these and they carry coal, sand, crushed stone, cement and coke. On the deck of each is a long boom containing a conveyor belt. The ship ties up to a dock, the boom is swung over the shore, and as the machinery turns the cargo is lifted out and neatly deposited in a pile. One self-unloader, the "Huron," from April to December carried fifty-seven cargoes of crushed limestone and seventy-three of soft coal, a total of 922,833 tons of payload in one season. This would fill a freight train 185 miles long. A self-unloader can work a third faster than a vessel depending on dock facilities.

In one year more than 100,000,000 tons are carried on the lakes. This is more than that passing through the Panama and Suez canals combined, making the Great Lakes the busiest waterway in the world. Once every twenty minutes, day and night, a ship passes Detroit and another goes through the Soo canal. Fifty years ago there were no giant freighters, the Soo canal was an experiment and every sailor took his life in his hands when he stepped on board. Today an endless stream of red and black vessels slips silently past, protected by all the safeguards known to science, equipped with all the comforts and luxuries of the finest hotels, each a floating community by itself. Complete in every particular, they handle the transportation problem of the leading industries of America and Canada, and do it so quietly and efficiently nobody pays any attention to them.

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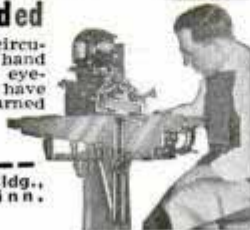
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Setting Traps for Fire Bugs

(Continued from page 501)

14862
accidentally ignited a dress, and every-
thing in the closet had burned, usually in-
cluding a fur coat. The catch is that fur
coats are hard to burn so completely that
no identifiable parts remain. If we did find
remnants of a coat, the microscope might
prove it to be rabbit instead of the seal on
which an insurance claim was made.

Pyromaniacs are a hard problem because
this form of insanity leads to firing the
houses of innocent people. An unusually
helpful spectator or one lurking in the
background is often the guilty party and
many "pyros" have been caught because
arson squads keep an eye out for spectators
who act suspiciously at a fire. Once a py-
romaniac is caught we keep track of him
after he has been freed, checking regularly
to make sure he starts no more fires.

Not long ago we picked up a combina-
tion fire bug and burglar who had worked
out what he thought was a foolproof stunt.
He waited until after dark, set fire to a
garage behind a home, then rushed to the
house and breathlessly informed the peo-
ple their garage was on fire. In the con-
fusion that followed, he prowled through
the house. He left his fingerprints on some
silverware on one job. We caught him the
same night, recovered \$10,000 worth of
watches and jewelry, and started him on a
fifty-year sentence.

In Los Angeles, the arson squad gets the
jump on the fire bugs by answering alarms
with the firemen. Two arson squad inves-
tigators accompany the firemen to every
blaze in the business district and in the
residential areas the fire detectives dash
out as soon as a fireman phones that the
damage will be greater than \$100. With
the detectives go a photographer. Photo-
graphs taken at the scene, showing evi-
dence the arson squad has found, are pret-
ty convincing in court.

There is always a reason for a fire and
the arson squad works right alongside the
firemen. If the fire seems to have started
mysteriously, the investigators stay on the
job until they find the true cause. The re-
sult is that "torch" rings have been broken
up. Steady work by the arson squads is
taking the profit out of incendiarism and
the number of "mystery" fires is being re-
duced every year.

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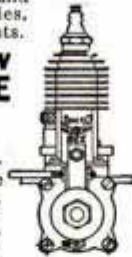


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Underground Railways

(Continued from page 533)

prevents the expansion joints from taking up the slack. The dispatcher also must be careful about forcing light oil at too high a pressure behind a shipment of sluggish heavy oil. Light oil can travel fast but if the pumps force it too rapidly the heavy oil ahead plugs the line and breaks the pipe."

A pull-apart causes an immediate fall on the pressure gauges at adjoining pumping stations. Pumps are shut down to minimize the loss and a line-riding crew sets



Pumpman drawing sample from line to check end of one shipment and beginning of another

out in a light truck that carries electric and acetylene welding outfits and short sections of pipe. In many cases the buried pipe parallels a highway and the trouble crew rides at full speed, keeping a sharp lookout for a telltale discolored area in the dirt above the line. The worst kind of break is one that occurs at the bottom of a dip between two ranges of hills. In such a case the oil may drain out of the pipe from both directions, flooding the surrounding area and wasting a shipment worth thousands of dollars.

Crews cover every inch of the lines every week even if there are no suggestions of leaks. Vigilance spots many a small leak before it becomes serious. Black oil flooding a highway can cause complicated traffic accidents and leaking gasoline near a highway can be even worse. Once when

such a break had been discovered and flagmen had been posted to halt traffic, one driver decided to go through. He roared past the flagman and got half way through the pool of gasoline when an exhaust spark touched off the fumes. What was left of car and driver were removed after the fire.

Stealing oil and gasoline from buried pipes used to be tried by some people who knew how to tap a main line and lead off part of the flow in their own buried pipe. Thefts are uncommon now because they can be detected almost at once. Receipts are checked against transmission every hour on a major system. If the figures show a leak the line riders haven't been able to find, the pumping plants put a "squeeze" on the line with the exhaust end of the pipe blanked off. Under this heavy pressure the oil will flow faster through any natural leak. If no leak still is found, the line riders get out a theft detector, an electrical exploring coil which they carry along the pipe, listening for a signal in the earphones that gives away the presence of a buried pipe running from the main line.

One of the worst kind of leaks is an electrolytic corrosion caused by an electrical battery action between a buried pipe line and various soils. Heavy moist clays are anodic to sandy soils having an excess of oxygen and when a pipe line passes through adjoining districts it acts as a conductor for the current, corroding away in the negative area at the rate of twenty pounds of metal per ampere per year. Similar battery effects are apt to occur in swampy ground and mineralized districts.

This kind of corrosion is counteracted now by reversing the current, making the pipe act as the cathode in circuits set up in areas where corrosion is troublesome. As much as fifty amperes of current may be used to protect ten miles of pipe, with the negative side of the circuit attached to the pipe and with lines from the positive pole grounded at different points in the soil. Unattended windmills generate the current for fighting electrical corrosion when winds are fairly constant.

Periodic cleaning of the black-oil lines is necessary because the heavy waxy crudes build up deposits. Cleaning is done with a "go-devil," a traveling semi-flexible carriage consisting of a number of

(Continued to page 146A)

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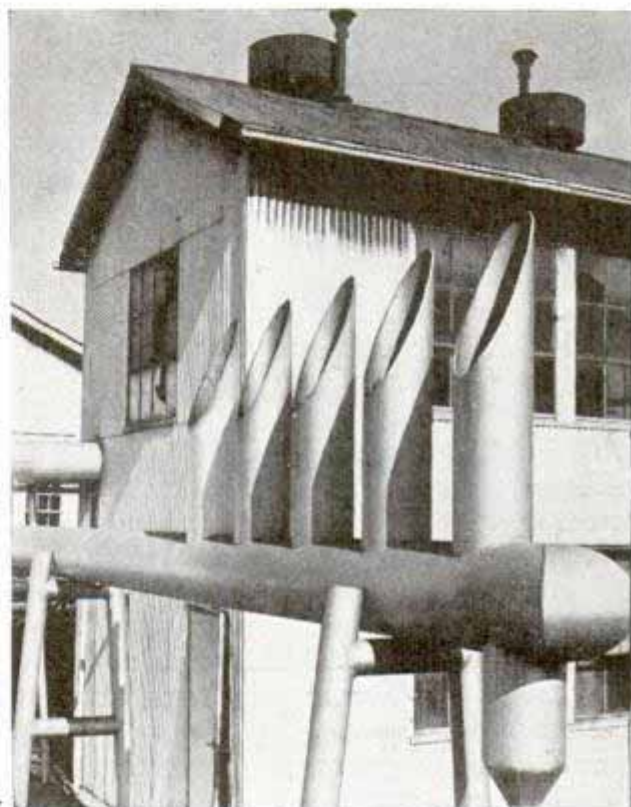
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(Continued from page 145A)

scraping fins and several leather washers. When the go-devil is placed in the line the washers plug the pipe so the oncoming oil forces the go-devil along ahead of it. Occasionally a go-devil gets stuck. Then another is put in behind it to force it free. Lines with turns so sharp the traveling carriage can't get around the curves are cleaned with large wax plugs placed in the moving streams of oil.

Pipe lines even more extensive than those used for carrying liquid petroleum products are used for moving natural gas.



Heater house at pumping plant where heavy oils are warmed to make them flow more freely

In the early days "icicles" of welding metal frequently dripped into the pipe and impeded the flow of oil but now all welding is done against interior rings at the joints that keep the hot metal from trickling inside. On some lines today, shipments are moved by self-priming electrical pumping plants that automatically operate as long as flowing oil reaches them. Steam, however, is still used on many systems because it is needed for heating heavy oils as well as turning the pumps.

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

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K-R-O won't kill Livestock, Pets or Poultry, Gets Rats Every Time. K-R-O is made from Red Squill, a raticide recommended by U.S. Dept. Agr. (Bul. 1533). Ready-Mixed, for homes, 35¢ and \$1.00; Powder, for farms, 75¢. All Drug and Seed Stores. Damage each rat does costs you \$2.00 a year. K-R-O Co., Springfield, O.

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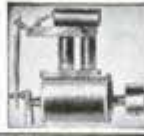
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SLIDE-VALVE STEAM ENGINE

model SE-3, for small boat models. A complete power plant, ready to run, with two-cylinder engine (as illustrated), boiler, safety valve, dematured alcohol burner and propeller rig. Price \$3.00. Postage extra, shipping wt. 1 1/2 lb.

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When writing please mention Popular Mechanics

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Renew old buildings. Make new construction more permanent and attractive. Plastic Colorcrete is waterproofed. It fuses with any masonry surface. It fills all cracks. It can be applied in any thickness and in 30 colors. Fully proven by over 12 years' actual use under all conditions and every climate.

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MIN-I-SCALE MODELS "0" GAUGE

KITS { Locomotives. \$47.50
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Perfect, die cast scale models, accurate to the smallest detail. Absolute scale accuracy. Sturdy construction. Precision workmanship. All locomotives "run-in" under power. Locomotive, 25 1/4"; Pullman, Baggage and Day Coach, 22"; Box car, Hopper, Tank, 11 1/2". Kits assembled easily without drilling or machining. Write today for full information.

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AS LITTLE AS \$20 Monthly puts it in your shop

Start a POTATO CHIP BUSINESS

IN YOUR KITCHEN *and* MAKE MONEY!

Buy Potatoes for **2c A POUND**

Sell Them as Vita-Seald Chips for **35c A POUND**

THERE'S big money in potato chips for any man or woman who wants a business capable of paying big daily profits from the very start. Just think of it. You can install the wonderful new machine in your kitchen—just manufacture and sack a sensational new kind of "Greaseless" Potato Chip—and let the stores sell them for you. Only \$2.50 invested in raw materials brings back \$10.00 in cash.



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DON'T BUY ANYTHING Just send your name and address on a post-card for all this Free information including the "Secret of Making Greaseless Potato Chips." No obligation but hurry and you may become independent as so many others have done with these fast selling new "Greaseless" Chips. Address your card to

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12" x 4" Capacity Thickness Planer

Finished lumber from low cost rough stock in your own shop with a B-C 12"x4" Thickness Planer. Save planing cost and waiting at the mill. Pays for itself. E-Z Terms. Also, B-C Saws, Jointers, Sanders, Shapers, Band and Jig Saws.

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Send 10c for Catalog

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New Sensation!

Gas-Powered MODEL

\$3.95
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AIRPLANE MODEL KITS . . . world's champion Bassett's new 48-in. gas-powered crackup-proof Sensation. Finish prop., many ready-made parts, rubber wheels, \$3.95 plus 20c postage. Also new—Giant Fillers with motor-hum device, \$1.00 up.



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SHIPS . . . carved hulls, many ready-made parts, complete plans and materials. HIS-PANIOLA (Treasure Island), XEBEC (Robinson Crusoe), BEAR OF OAKLAND (Adm. Byrd), ARABELLA (Capt. Blood) and others, \$2.00 plus postage.

HO GAUGE MODEL RAILROADS, Freight Cars, etc. Send 5c post. for complete illus. Catalog of model kits, ready-made parts and supplies for all model-crafters.

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New, powerful 6-volt electric lantern. 80-100 hours light. 700 ft. beam. Unbreakable lens. 4½ in. reflector.

Buy ONE OF THESE "BIG LITE" DELTAS

\$1.50 LESS BATTERY

POWERLITE
6-volt. Deluxe electric lantern. 800 ft. beam. 80 to 100 hours light. 2 reflectors, front, spot beam; top, floodlight. Unbreakable lens. At DELTA ELECTRIC COMPANY, Marion, Indiana, Dept. 300

Mr. Motorist, you wouldn't drive your car with the brakes dragging, would you? Then why drive a motor dragging with gummy valve guides, carbon, etc.

NEW INVENTION Permanently removes gum, eliminates motor trouble, saves gas, repair bills, increases motor efficiency, softens carbon. Large fleet owners getting sensational, money-saving results. **BIG MONEY-MAKER** for distributors. Nothing like it. Regular \$5.99 seller. **OCTOBER INTRODUCTORY OFFER, \$3. ORDER TODAY** on our **MONEY-BACK GUARANTEE**. Specify year and make of car. Write for proof and distributor's liberal plan.

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PISTOL GRIP SOLDERING IRON with 3 degrees of heat!



Hold it like a pistol. Get into any inaccessible place with this pistol grip adjustable-point soldering iron. You do in seconds the jobs that would ordinarily require minutes of your time. Gives three degrees of heat. Interchangeable soldering points. Sturdy construction. Guaranteed. Act now. Get one at a bargain price. Shipped prepaid on receipt of remittance. On C. O. D. shipments send deposit of \$1.00. **\$3.00** Postpaid

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minnows, eels, minn, muskrat with our folding galvanized Steel Wire Traps. Greer Patent Lever Hooks are so constructed that when a fish gives the slightest pull on the bait the upper hook reaches down and gets a hold that lands him. 3 for 50c. Write for descriptive catalog of Traps, Hooks, Lures, and other specialties. **Walton Supply Co., 3507B Junata St., St. Louis, Mo.**

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See **REBUILT BY**

WOODSTOCK BUILDER

Used to win most International Commercial School Contests

EASY TERMS—FREE TRIAL
WRITE FOR LITERATURE DEPT. B-47

WOODSTOCK TYPEWRITER CO., WOODSTOCK, ILL.

Poor Boy Still Makes Good

(Continued from page 484)

man relation the complete knowledge of how to go from one place to another without signposts or beacons to guide him. That, we might say, is one respect in which Douglas Corrigan was helped by luck. But how many others have turned such luck to such good account?

This was an important part of Corrigan's background, but by no means the most important. Most valuable of all was his mechanical aptitude plus his devotion to it. From that we come to the indispensable possession of character. After ten hours of work—or even eight or six—most men, particularly young men, are willing to call it a day, and devote the rest of their waking hours to recreation. Corrigan found his recreation by improving himself in his craft. After the whistle blew at the factory he went to work tinkering with machinery, taking down, reassembling, finding new methods of making an engine run more smoothly. While others went to the movies, Corrigan read books and periodicals on mechanical science.

The legend runs today that Lindbergh became Corrigan's inspiration. It seems a fair enough deduction, since it is known that Corrigan was working at the Ryan Airplane factory while Lindy's plane, "Spirit of St. Louis," was being built there and he was one of those who helped put together that famous craft. So even if the legend is not true, it might well be and, in fact, should be.

Corrigan's flight to Dublin took only twenty-eight hours and a few minutes. But it took years to lead up to the factual accomplishment, years to perfect himself in his craft, and to save up, nickel by nickel and dollar by dollar, the \$900 it cost him to buy the "old crate" that newspapers have described so often and scornfully. But Douglas had acquired the skill to make that old crate as fine a piece of aircraft as its vintage would allow. He worked long evening hours on it, replacing worn parts with stout ones, then did a canny bit of "horse-trading" to acquire two used motors and made out of them one as good as new. Other hours were spent experimenting, testing, perfecting, studying, learning, memorizing maps.

(Continued to page 151A)

WORLD'S GREATEST all around ELECTRIC TOOL



- DRILLS
- GRINDS
- SANDS
- SAWS
- POLISHES
- SHARPENS

The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals-Woods-Alloys - Plastics - Glass - Steel etc. Saves time. Eliminates tedious labor. Plug into any socket AC or DC, 110 volts. Chuck 1/4" capacity. Ball bearing thrust. Powerful, triple-gear motor. "Worth its weight in gold," to a mechanic or handy man. STANDARD MODEL with Normal Speed (uses 30 different accessories, instantly interchangeable). Special Introductory Price for a limited time, only \$6.95.

FREE Accessory outfit (Value \$2) includes set of drills, mounted brush, polishing wheel, sanding discs, cutting wheels, mounted brush, polishing wheel, carving bur, etc. FREE with each outfit ordered NOW. We pay postage. Will send C.O.D. if desired.

10-DAY TRIAL—MONEY BACK GUARANTEE. Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$8.95 complete, with same accessory outfit (value \$2) FREE.

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POCKET SLIDE RULE



Save time and mental effort with this mighty midget! Has A-B-C-D Scales. Multiplies, divides, squares, takes square root, finds circumference and area of circles. 6 inches long—thin construction. NO WOOD OR CELLULOID. Fits in vest pocket. Send \$1.00 (\$1.25 Canada and foreign countries) and receive slide rule in genuine leather case with instructions. Postage paid. **INDECO SALES** STRATFORD, CONN.

Earn BIG MONEY MAKING ELECTRIC RAZORS at home!

BUY ALL PARTS READY FOR INSTANT ASSEMBLY NO TOOLS NEEDED
Make \$5 or More on Every Razor Sold

Just think, a complete \$15 type razor for \$1.95 or less. You can make \$5 or more for fifteen minutes of your spare time. Start AT ONCE, big or small—with one unit or 100—make your own electric razor or sell to others—you can profit both ways!



Costs \$1.95 in lots of 3 SAMPLES \$2.25 EACH
Make your own electric razor just like the ones selling in the high price brackets. Earn money assembling electric razors for others in your spare time or full time. Buy parts from us complete matched units. Every part standardized precision-built made by the most popular together to make one of the most popular standard super-quality Electric Razors. (The same high quality parts now used in Shavers selling for much higher prices.)
Write for information or order your first unit at once and prove the money-making possibilities to your own satisfaction.
SIMMONS MFG. CO.
128 W. North Ave., Chicago



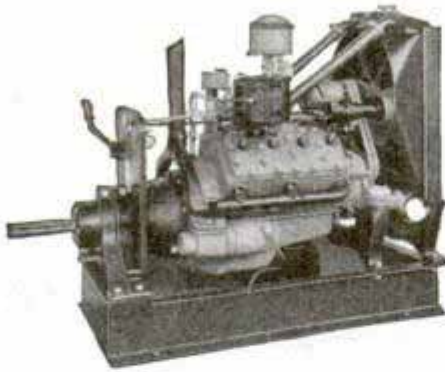
FREE
Screwdriver and instructions with order for first unit. You need no other tools... no soldering equipment.

SIMMONS MFG. CO.
128 W. North Ave., Chicago
 Send C.O.D. 1 sample razor kit for which I will pay postman \$2.25 plus a few cents postage.
 Enclosed find \$..... for..... Electric Dry Shaver Kits including free instruction, tools and money making plans.

Name.....
Address.....

CAN YOU BEAT THESE POWER COSTS?

Save up to **\$293⁸⁰** Per Month on power costs



with a KRW FORD V8 Unit

50 H. P. with KRW V8 Unit using natural gas (1125 BTU) @ 30c per 1000 cu. ft. \$ 46.80 per month
 50 H. P. with KRW V8 Unit using gasoline @ 10c per gal. (no tax) \$140.40 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—20 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks out of actual savings!

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc. New KRW "GUARDIAN" automatically stops engine in case of cooling or lubrication failure.

Write for new bulletin just off the press—packed with useful information, engineering data, etc. You can buy through your local Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

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Women ARE GOING WILD ABOUT THIS New WRIST ACTION CORD:

Here is no ordinary new product. This new Wrist-Action Plug is one of the most remarkable new devices ever offered! You never saw anything like it. Housewives are fascinated—held spellbound by the instant demonstration you can give with this new electric iron cord that swings freely in any direction. Ends kinking and twisting—prevents broken wires, burned fuses. Swivel action plug spins round and round—swings from side to side—keeps cord out of the way—no wonder housewives say, "Just what I want," as soon as they lay eyes on it!

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FOR SCHOOL OR HOME WORK SHOPS

COMPLETE OUTFIT FOR CASTING AND HEAT TREATING

These outfits consist of Gas Furnace, Electric Motor Blower, operating on 110 Volt, AC or DC current. Crucibles, tongs, moulding sand, flask, hose, etc., including full instructions for use. There is fun and profit casting models, jewelry, statues, art objects, shop equipment tools, etc., out of aluminum, copper, bronze, silver, brass and alloy. Practical for forging, case hardening, heat treating steel and for developing new alloys and new materials and plastic, out of glass, borax, wax, etc. Price of complete Foundryette as follows:

Size	Crucible Capacity	Price
351	6 cubic inches	\$13.50
352	12 cubic inches	19.00
353	24 cubic inches	27.50

Check or M. O. Acceptable Express Charges C. O. D.



Write for **FREE CIRCULAR**
KANSAS CITY SPECIALTIES CO.
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Car Owners! Meet **MASTER GLAZE**—the sensationally different luster for new and used cars!

Not a wax—not an oil polish—not a paint—nothing that "smears" over the surface. A creamy liquid—quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster—beautiful, sparkling clean and brilliant! Doesn't fingermark—doesn't smear! Seals the pores—protects! Nothing like it!

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GRANDFATHER'S CLOCK, LOWER PRICED



Our newest offering, at an unheard of price for a faithful reproduction of a real Grandfather's Clock. Scroll top, narrow waist, like picture. Shipped Knock Down. Cleverly designed. Easy to assemble. Others even cheaper. Plans 10c, Catalogue **FREE**.

AMERICAN CHIME CLOCK CO.
 1674 Ruffner St. (Established 1877) Philadelphia, Pa.

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For garden or lawn. Easy to build. Easy to sell. Detailed Blueprints Model B-25 Dutch Windmill 39c; Model OM-60 Old Mill, 85c. Lawn Figure Patterns—Sunbonnet Girl, Dutch Boy, Tulip Girl, Holland Pair, 35c each, all 4—\$1.00. Catalog illustrating many models, send 10c, today.

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There's a big demand for the many hand-tooled articles you can make with the Exact Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores or order direct and pay postman on arrival. \$2.50 outside U. S.

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\$150 TO \$300 PROFIT MONTHLY WITH Simplified ARC WELDING

BUILD A PAYING BUSINESS OF YOUR OWN

New low prices on modern 40 Volt Simplified Welder opens big profit opportunities even to the smallest shop.

FREE BOOK "NEW PROFITS FOR WELDING SHOPS" Write for it!

ONLY \$20 MONTHLY will put it in your shop

New Hobart Welder insures easier, faster operation. Extra earnings from new work lets you own without expense to you. 30 Days Trial, at our risk, before you buy. Write today for complete details, no obligation to you. Pay out of increased profits.

30 DAY'S TRIAL at our risk to PROVE it is Profitable

HOBART BROS., Box M-108, TROY, OHIO

(Continued from page 149A)

4897

Douglas Corrigan had no press agent, no manager to relieve him of business details. As a matter of fact, he had no business details. He wasn't after any record, could see no reason to enlist a syndicate to finance him. I thoroughly believe he had no thought of publicity whatsoever. No man who wanted fame would have timed his flight to coincide with the record-breaking around-the-world hop of Howard Hughes, a \$350,000 enterprise under the combined spotlights of all the channels of publicity in the entire world.

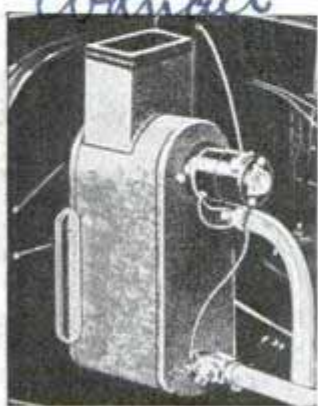
The young Californian couldn't even obtain official permission for his journey. He knew it would be useless to apply. The Brahmins would have asked: "Have you a \$100,000 plane? Or even a \$25,000 one?" The answer would have been: "No, sir." "Have you an earth-inductor compass? An altimeter? A barograph? An engine thermostat? An oil temperature thermometer? A sextant? Retractable landing wheels? And, above all, a radio?" Answer: "No, no and again no." "Then what you propose cannot be done."

Said Douglas Corrigan, most respectfully: "Probably you are right, sir." But his tongue must have been in his Irish cheek. For he went ahead, gave the Brahmins the slip, and did it.

All honor to the officials of the Air Commerce Bureau. After Douglas had accomplished the impossible they acknowledged the fact and took it in good part. They realized that once again the mechanical mind had shown the stuff of which it is made.

H 841

Heater Mounted under the Hood "Air-Conditions" Auto



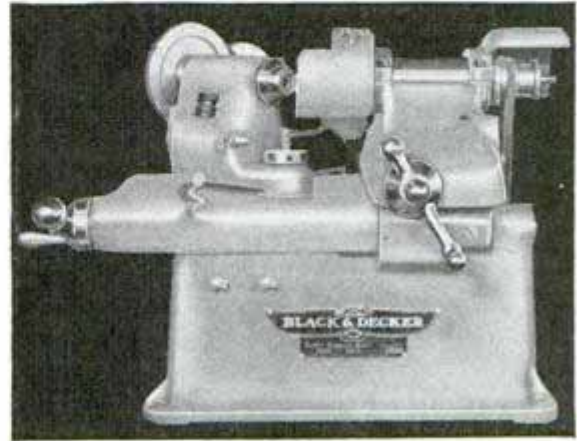
Fresh, filtered air for the motorist is provided by a heater that is mounted under the hood of the automobile, allowing additional leg room in the front seat. It draws outside air through a louver in the hood, filters and warms it, then distributes the "conditioned" air inside the car. The direction of flow can be adjusted by a crank.

Select model

Evans Products Co

Evans Products Co

And Now PERFECT VALVE GRINDING with this new BLACK & DECKER WET GRINDING VALVE REFAKER



Newer, Faster, Better Finish—that's the story of Black & Decker's new Super-Service WET-grinding Valve Refacer. Here's the perfected method that motorists have been waiting for—that gives quicker and better results—that makes the shop that owns one the best-equipped shop in town.

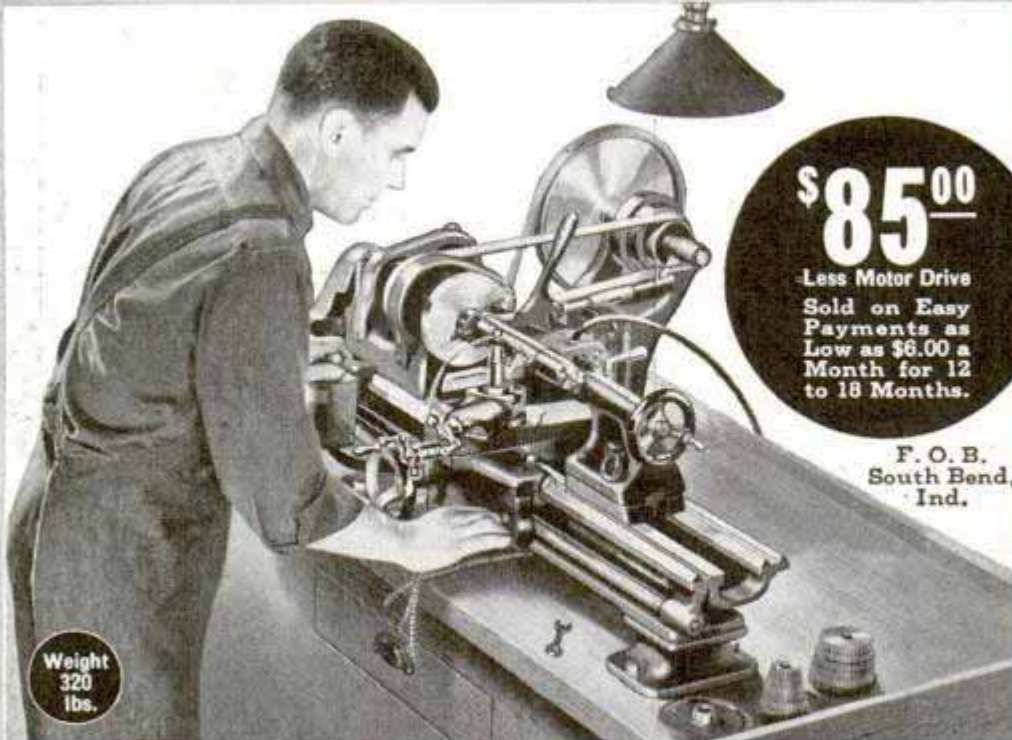
Perfected WET-grinding—available only in this new Black & Decker machine—reduces grinding heat, prevents valve face burns and gives a *mirror-like, tool-room finish!* Yes-sir, this new refacer does a perfect job and does it *faster*. That's important to both the motorist and shop owner.

Don't put it off—send today for complete details about this new valve refacer. Sold by leading jobbers. The Black & Decker Mfg. Co., 610 Penna. Ave., Towson, Md.

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World's Largest Manufacturer of
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\$85.00
 Less Motor Drive
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 Month for 12
 to 18 Months.

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 Ind.

Weight
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No. 415-YA. 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Driven Adjustable Countershaft, 1/4 h.p. Reversing Motor, Switch and Belts. **\$117.00**
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 PRECISION LATHE**

This 9-inch South Bend Lathe used by:
**MANUFACTURERS
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- Automotive
- Electrical
- Gun Smiths

**U. S. GOVERNMENT
 SCHOOLS
 HOME WORK
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The 9" x 3' South Bend Precision Lathe does these operations:

- TURNS—BORES**
- CUTS SCREW THREADS—FACES**
- DOES MILLING, CHUCKING, REAMING, DRILLING, FILING AND HUNDREDS OF OPERATIONS IN STEEL, IRON AND OTHER METALS.**

There are 5 sizes of South Bend Lathes—9", 11", 13", 15" and 16" swing with bed lengths 3' to 12'. In motor or countershaft drives. Priced \$85 to \$1500.

**INVALUABLE TO INDUSTRIES
 EVERYWHERE FOR HANDLING
 PRECISION OPERATIONS . . .**

WELL-KNOWN industries everywhere are using the 9-inch Workshop South Bend Lathe—and finding it a most profitable investment. Workmanship and features insure speed, accuracy, and versatility. Industry finds it cannot afford to overlook this remarkable tool.

Features: Hand-scraped V-ways on Lathe bed, Twin Gear Reverse to Lead Screw, Ball Thrust Bearing on Spindle, Cuts screw threads 4 to 112 per inch, 3/4" Spindle Hole for Collets up to 1/2". 38 attachments for milling, grinding, draw-in collet chuck work, taper work and other manufacturing jobs. 3', 3 1/2', 4', and 4 1/2' bed lengths.

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- Houston, Texas—Wessendorff, Nelms & Co., 317 Preston Ave.
- Los Angeles, Cal.—Eccles & Davies Mchy., 1910 Santa Fe
- Milwaukee, Wis.—W. A. Voell Mchy. Co., 1533 N. 16th St.
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- Rochester, N. Y.—Ogden R. Adams Mchy. Co., 266 State St.
- St. Louis, Mo.—Colcord-Wright Mchy., 1223 No. Broadway
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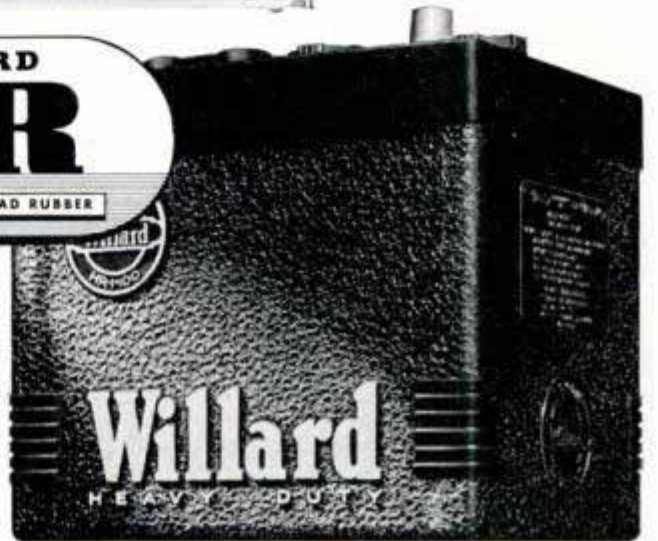


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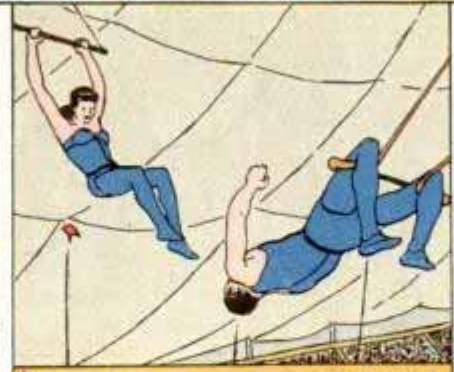
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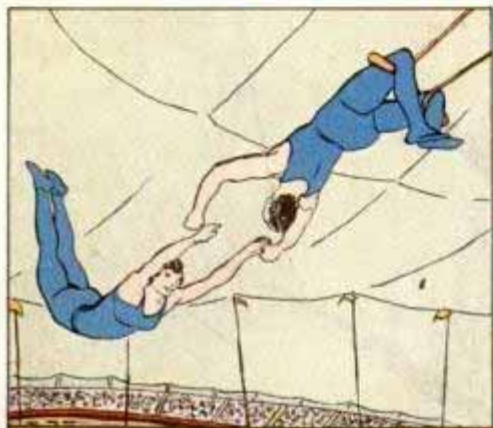
MISS CONCELLO, HOW ARE CHANCES FOR A STORY ON YOUR BIGGEST THRILL AS AN AERIALIST?

TONY, TELL HIM ABOUT YOUR FIRST TRIPLE SOMERSAULT IN THE AIR.



"NO WOMAN, TO MY KNOWLEDGE, HAD EVER EXECUTED A TRIPLE MID-AIR SOMERSAULT. I HAD TO DEPEND ALMOST ENTIRELY ON AUTOMATIC TIMING..."

"... BUT AS I WHIRLED OFF INTO SPACE... ONCE... TWICE... FOR A SPLIT-SECOND I PRACTICALLY LOST CONSCIOUSNESS..."



"...THREE TIMES... AND... I MADE IT! THRILLED AND SAFE!"

TERRELL, TELL HIM ABOUT THE TIME SPARKY, OVER THERE, ALMOST FINISHED YOU



"I HAD ALMOST COMPLETED MY ACT WITH 25 LIONS, WHEN SPARKY AND ANOTHER MALE WENT FOR EACH OTHER..."



"TRYING TO BREAK IT UP, I WAS KNOCKED DOWN AND SPARKY TURNED ON ME. THINGS LOOKED PRETTY BAD..."

"BUT I GOT THE UPPER HAND. BEFORE I LEFT THE CAGE, EVERY LION WAS BACK IN PLACE."



AFTER A TURN IN THE BIG CAGE, I NEED A 'LIFT' IN ENERGY, AND I GET IT FROM A CAMEL. I'VE SMOKED CAMELS FOR 16 YEARS. HAVE ONE, TONY?

YOU BET, TERRELL, THERE'S A BIG DIFFERENCE BETWEEN CAMELS AND OTHER KINDS - IN MILDNESS - IN SO MANY WAYS!



One Smoker tells another...
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