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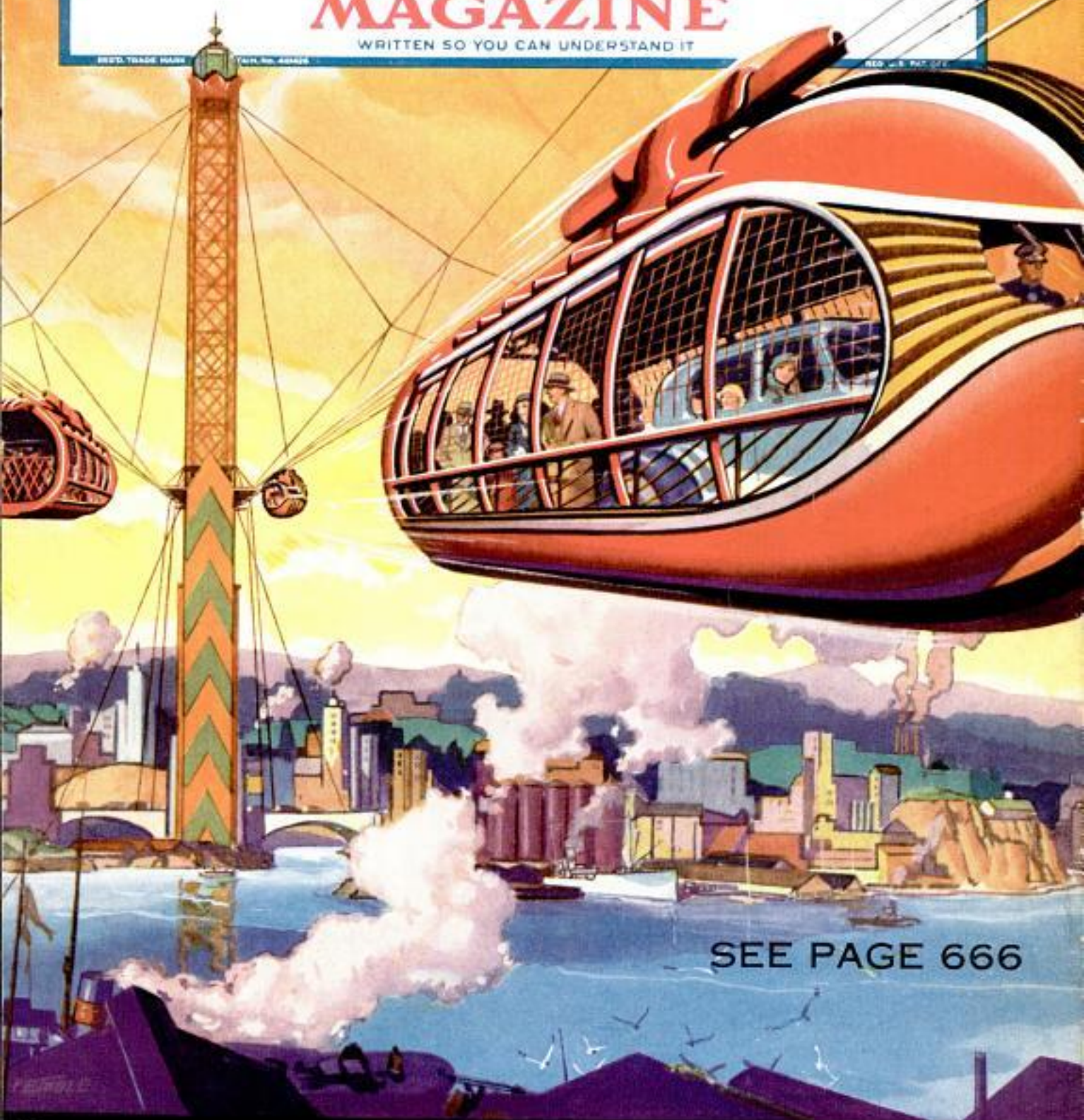
MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 666

The **WORLD'S FAIR** in Pictures *Page 689*

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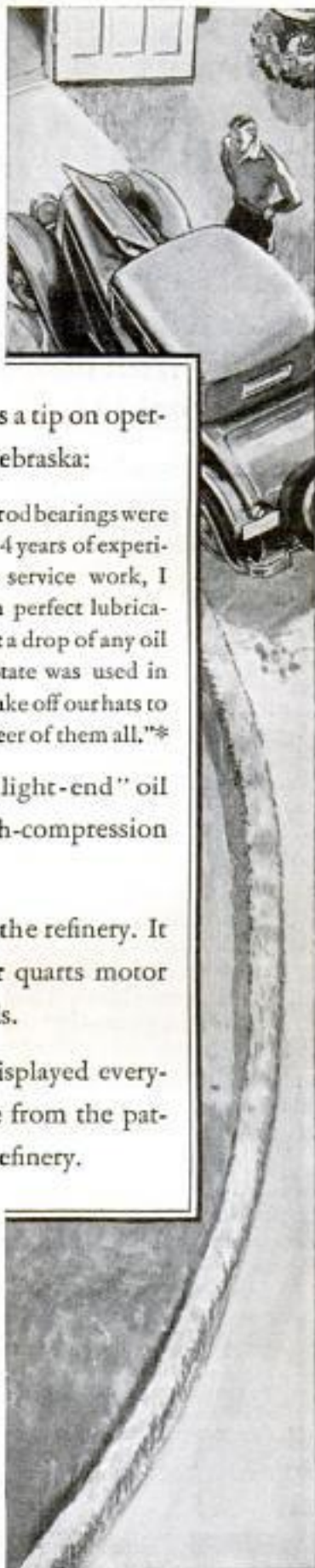
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May, 1933

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30-WORD Ad in 200 mail order magazines—\$3.75. Fallon's Advertising Service, 619 So. Crawford, Chicago.

YOUR 24-Word ad. Monthly-weekly combination \$4.98. Magazine free. Darnell, 730 Hays, Jackson, Tenn.

ADVERTISE 33 Magazines, 3 months, \$5.00 incl. List, special offers, free. Evans King Co., Box 672P, Wilmington, Delaware.

MAILING LISTS

200 MARCH 1933 Cash remitters 20c (coin). Buco-service, 217 E. 33rd, New York.

INFORMATION

ANY Information desired 25c coin and up. Fred Klotz, Reading, Pa.

AUTOMOBILES

AUTOMOBILE Racing book. How to build dirt track racers championship racers, fast road cars. New, 10 chapters, 137 illustrations, track records, winning drivers, contest rules, speed, "revs," balance—Postpaid \$1.00. Ray Kuns, Dept. B, Madisonville, Cincinnati, Ohio.

AUTOMOBILE SUPPLIES

GASOLINE Saver! Anyone can install. Tapping and drilling unnecessary. \$2.00 prepaid. S. Wallace, 4710 Irving Park, Chicago.

CATALOGUE Of camp trailer plans now available. Enclose 10c to cover mailing cost. Toellen Trailer Service, Box 25, College Park Sta., Detroit, Mich.

EIGHT Semi-spiral expansion reamers \$13.45. Catalog. W. Barnitz, 1701 N-Thrd, Harrisburg, Penna.

NICKEL-PLATE Your auto, faucets, tools without removing parts. Outfit connects to your battery, \$3.00 prepaid. Plating powder plates heavy by rubbing. Half pint \$1.00 prepaid. Gunmetal Co., Ave. J, Decatur, Ill.

AUTOMOBILE SERVICE EQUIPMENT

BARGAINS—Compressors, 8-hour charger, test bench, also air welder. Terms—30 day trial. Ken's Equipment Exchange, Box 31-331, Troy, Ohio.

MOTORCYCLES, BICYCLES AND SUPPLIES

AMERICA'S Only all motorcycle magazine, The Motorcyclist, is the official publication of the American Motorcycle Association, featuring sports, pictorial news, club news, mechanics, travel and fiction. Subscription \$1.00 per year, Canada \$1.85. Sample copy free, 708 Union League Bldg., Los Angeles, Calif.

MOTORCYCLE Bargains, lowest prices, bargain sheet for stamp, motorcycle accessories, largest line in America, lowest prices. Largest motorcycle mail order house in the United States, Rochester Harley Davidson Corporation, 129 West Main St., Rochester, N. Y.

HENDERSON, Excelsior, Harley, Indian, used parts, alloy pistons, catalogue and wings pin 10c. Ballak, 100 N. 12th, St. Louis, Mo.

PARTS—New and used, for Indian, Harley, Ace, Henderson. Cut prices on chain, speedometers, batteries. Send dime for catalogue of rebuilt motorcycles, tires, accessories, new and used parts, for all motorcycles. Bootz, 622 E. Grand, Des Moines, Iowa.

SEND 15c For illustrated used Motorcycle catalog. Large stock. Bargains. Indian parts. Accessories. Indian Motorcycle Sales, Kansas City, Mo.

100 GUARANTEED Used Harley-Davidsons. Prices reduced 25% to 50%. Send 6c for new bulletin. Knuth's, 2525 Fond du Lac Ave., Milwaukee, Wis.

REPAIR With good used parts, save 1/2 or more, state parts needed, no lists. J. B. Dahl, 3461 Archer Ave., Chicago, Ill.

BATTERIES

EDISON Storage batteries for all type farm lighting systems. Non-acid. Non-sulphating. Five year unconditional notarized guarantee. 15 year life. Free illustrated literature. See Jay Battery Company, 82 Sterling Avenue, Yonkers, New York.

AVIATION

MEN Wanted for good positions as airplane mechanics and pilots after taking necessary training in government approved school. We qualify you for good positions paying \$150.00 to \$500.00. Lincoln Flying School, 2093 Aircraft Building, Lincoln, Nebraska.

WANTED: Reliable representative in each section of the country to assist large airline operator in the sale of surplus aircraft, engines and equipment. To an experienced man we believe that we can offer a unique and profitable proposition. Room 105, 5c Popular Mechanics Magazine, Chicago, Ill.

USED Airplanes \$50 and up. Literature 10c. Federal Equipment Co., Deerpark, O.

PROPELLERS—Designed for boats, sleds and planes. State your need. The J. B. S. Propeller, Ltd., Pa.

BETTER Propellers, Harleys, \$1.50; Henderson, \$3.98; Forda, \$9.98. Hibbs, Ft. Worth, Texas.

DON'T Buy anything until you get Ort's 1933 aviation material catalogue. Prices are lower. Send one thin dime today. Karl Ort, 673 W. Poplar St., York, Pa.

BIG New catalog of lowest prices on model airplanes. Materials, supplies, 5c. Ideal Company, 19 West 18th Street, New York.

BOATS, OUTBOARD MOTORS, ETC.

BOATS!!! Build your own boat now, taking advantage of your spare time and save two-thirds regular builders cost using our ready-cut semi-assembled materials. Cruisers, runabouts, outboards, sail and row, 38 designs as well as complete assortment fittings. Send 10c for catalog. Brooks Boat Co., Inc., Box P-20, Saginaw West Side, Michigan.

15 FOOT Family outboard boat. Plans April and May Buzzer, price 70c. Complete boatbuilding catalog free. Buzzer, 15 Murray Street, New York.

LATEST Boat sensation—The 18 lb. Mead "Ki Yak." Snappiest thing afloat. Complete kit of all parts cut to fit \$11.75. You can assemble it in 3 days. Send 10c for circular. Mead Gliders, Dept. B-5, 12 So. Market St., Chicago.

PROPELLERS, Gear pumps, stuffing boxes, rowboat blueprints, etc. Wm. Baker, Pond St., Quincy, Mass.

CARTOONING

SELL Your cartoons to merchants. Plans \$1.00. Cartoonist's Service, Franklin, Ky.

BOOKS On a great variety of practical subjects. Send for our free catalog "A Billion Ideas," describing over 5,000 different books, Popular Mechanics Press, 200 E. Ontario St., Chicago.

CHALK TALKS

LAUGH Producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

BOOKS AND PERIODICALS

"PLEASURE Islands" is the adventure book sensation of 1933. It's the true story of the private life of an American beach-comber who found a real paradise on a glorious South Sea Isle where he lived the life of Riley for years. A moneyless, crimeless, workless Eden populated by a lovable, happy people whose only laws are peace, freedom and love. This 30,000 word book—with plenty of pictures—direct from publisher, postpaid, for 65 cents, a big saving. Or C.O.D. if you wish to pay postman a few cents more for delivery charges. Islands Pub. Co., No. 747 S. Hill St., Los Angeles, California.

3 LETTER Words, 8-page printed list 25c. DeLong Press, Lafayette, Ind.

MAP Of moon 20c. Twenty clever parlor tricks 20c. Heat treating steel 50c. Arthur Ihlen, 3984 Drexel, Pittsburgh, Pa.

GAMES, ENTERTAINMENTS AND PLAYS

PLAYS, Operettas, musical comedies and minstrels, comedy and talking songs, black-face skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 11, Chicago.

PUZZLES

ONE 15c Puzzle, one 25c puzzle, both postpaid 10c. Western Puzzle Works, St. Paul, Minnesota.

CHECKERBOARD Puzzle—price 15c. \$50.00 cash prizes. Foss Printing Co., 208 Niagara St., Niagara Falls, N. Y.

MAGIC TRICKS, BOOKS AND JOKER NOVELTIES

JOHN International Magicians, Mount Morris, Illinois. Free tricks! Monthly magazine.

20c BRINGS Big novelty package. Spaulding Novelty, 3250 Evergreen, Chicago.

HINDOO Magic wire trick 10c. Catalogue free. Reeder, 733 - 4th Ave., Clinton, Iowa.

ILLUSTRATED Magic catalog 10c. Davis Co., 2609 East Allegheny Ave., Philadelphia, Pennsylvania.

MAGIC Catalog 20c. Lynn, 105 Beach, Dept. 3, Jersey City, N. J.

SPHINX, Magicians' magazine, 35c. Large illustrated catalog of magic, 25c. Holden, 235 W. 42nd St., N. Y.

MAGIC Catalogue. Wonderful knockout cardtrick, 10c. Singer, 553, Hancock, Wis.

JIG-SAW PUZZLES

PICTURES For jigsaw puzzles, 19 unusual prints from 10"x13" to 12"x16" sent prepaid for \$1. Money cheerfully refunded if dissatisfied. Sennet Freres, Dept. E 3, 404 Fourth Ave., New York City.

40 DIFFERENT Highly colored jig-saw puzzle pictures. Exclusive copyrighted subjects, sizes 7x10 up to 16x20 inches. Postpaid for one dollar, Buffalo Art Works, Box 44, Buffalo, N. Y.

5x7" JIG-SAW Puzzle of yourself from camera negative (film) only 50c. Larson's Studio, M-3410 North Ave., Chicago.

WONDERFUL Puzzle blades 30c dozen. Sample mounted picture and complete price list 25c. Round Jigsaw blades, very clever, 25c dozen. Puzzle Picture People, Escanaba, Michigan.

LIBERIA Snake triangle, two other triangles in our packet 53 different stamps, 5c. Crowder Company, Druid, Baltimore, Md.

CANADA Conference 2 values free with 39 different Canada or 25 different airmails, either packet 15c; both for 25c. Lists free. Specials: 500 diff. 25c; 1000 diff. 75c; 2000 diff. \$2.00; approval selection with each order. Victoria Stamp Company, London 4, Canada.

SCARCE Belgian airmail, pocket album, commemorative set, 40 more stamps from South Sea Islands, Africa, Asia, Canada, South America, etc., for 5c to approval applicants. Glendale Stamp Co., 1342P Linden, Glendale, Calif.

ONLY 5c. 33 Different stamps including scarce Latvian triangular airmail stamps, 10 airmail, 12 United States (early issues, commemoratives, etc.) and 10 Canada. Approvals and illustrated price list sent with each order. Curhan Stamp Company, Gloucester, Mass.

24 VARIETIES Cuban stamps, 10 cents. List of stamps free. Chambers Stamp Co., 111P Nassau, New York City, N. Y.

READ THIS. Intl. Gwalior, Cyprus, French Colonials, 53 all different. Also stamp wallet, hinges. All 5c to approval applicants. United Pacific Philatelists, Dept. M, Box 25, Ventura, California.

1000 UNIVERSAL Hinges 10c; Lists free. Harvey Teeple, Decatur, Indiana.

FREE Dollar packet to one-cent approval applicants, Harlan, 5307 S. Marshfield Ave., Chicago, Illinois.

105 (CHINA, Etc.) 2c. Album (500 illustrations) 3c. Ballard, 446 Tremont, Boston.

BEST One-cent approvals in America. P. Hand, 1117 So. 60th St., Philadelphia.

200 DIFFERENT, including triangle, airmail, etc., 10c. H. H. Carlton, 1040 So. Broadway, Los Angeles, Calif.

RARE COINS

18 DATES Large cents \$1.00, 5000 unsorted stamps \$1.00, 75 different foreign coins \$1.00. Bargain list 25c. Romanocoin-shop, Springfield, Mass.

10 DIFFERENT Coins 25c, 60 different \$1.00. Coin Exchange, Box 634, Kansas City, Missouri.

UNITED STATES white cent and bargain selling price list 10c. Arcy, Box 483, Muskogee, Okla.

GENUINE Silver coins, 5 different notes and bargain catalogue 10c. Lester White, West Newton, Mass.

FOREIGN Silver, 10c size coin, 4 crisp notes and catalog 10c. George Best, Cedar Rapids, Iowa.

CALIFORNIA Gold quarter size, 27c; 3/4 size, 53c; 3c piece and catalogue, 10c. Norman Shultz, Salt Lake, Utah.

GET Profit and pleasure in collecting old coins. Send 10c for 48-page illustrated coin catalog. You'll be delighted with it. Send for it now. It's free. H. Max Mehl, Numismatist, Mehl Bldg., Dept. P, Fort Worth, Texas. Largest rare coin firm in U. S.

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SEND 10c For 5 different coins and catalog or 50c for 25 different. Troyer Coin Co., La Fontaine, Ind.

\$5 TO \$500 Each paid for old coins. Many very valuable. Keep all old money. Get posted. Send 10 cents for illustrated coin value book, 42c. Guaranteed prices. We buy and sell. Coin Exchange, Box 5, Le Roy, N. Y.

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AN Income from your camera instead of expense. Low cost home study course in Journalistic Photography teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money, right where you live; delightful spare time occupation. Write for free book today. Universal Photographers Corporation, Dept. 104, 10 West 33rd St., New York.

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CAREFUL Photo finishing. Wholesale catalog. Sterling Photo Service, Sterling, Illinois.

SAVE 50%—3 1/2x4 1/2 Graflex camera. Regular price \$80.00, only \$39.50. 2 1/2x4 1/2 Eastman series 111 kodak, f:5.6 lens. Regular price \$32, only \$15.75. A \$60 Eastman 3A (3 1/2x5 1/2) kodak special, with f:3.3 lens, only \$29.50. All are like new and sold on ten days trial guarantee or money back. Ask for our bargain book. Central Camera Company, 239 South Wabash Avenue, Dept. PM-50B, Chicago, Ill.

SURPRISE Package photo novelties, five attractive items 10c. Worth 25c. National View, PM-151, Winona, Minn.

SOMETHING New, At last an inexpensive Stereo camera called The Puck, using 2 1/2x3 1/2 roll film, producing life like pictures, for only \$7.50. Brand new. Sold on ten days trial. Ask for our bargain book. Central Camera Company, 239 South Wabash Avenue, Dept. PM-50A, Chicago, Ill.

SPECIAL Trial offer: Developing any size roll 5 cents; prints 3 cents each. Beautiful 7 inch enlargement 20 cents. Send for special bargain list. Roanoke Photo Finishing Company, 209 Bell Avenue, Roanoke, Virginia.

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FILMS Developed, 2 prints of each negative and enlargement offer 25c. 25 reprints 30c. Summers, Unionville, Mo.

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WATCH Cameras, twenty exposures, every tick a picture. Complete outfit—\$3.98 post paid. Send for economy list—cameras and supplies. Gonnert, Inc., 20 W. 22nd St., New York, N. Y.

YOUR Favorite kodak picture enlarged, size 5x7, 10c. Three for quarter, coin. Send best negative (film) today. Address Darmer Photo Lab., 221 Securities Bldg., Des Moines, Iowa.

MAKE Money in photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 2432, 3601 Michigan Avenue, Chicago.

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\$1,250 FOR Original photoplay story. Our sales department sold unknown author's first story for above amount. We revise copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 306 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

BARGAINS. Used theatre projectors, soundheads, turntables, amplifiers, horns. Catalog mailed. S.O.S. Corp., 1600 Broadway, New York.

16MM FILM. List and supplies, including beautiful weather barometer 10c. Helmtz Film Service, Box 5, Jamaica, New York.

16MM FILM 2c Foot—Travel, educational, etc. Art 3c. Cameras, sound, silent projectors. Free: 1933 bargain catalog, library membership. Mogul Bros., 1944 Boston Road, New York City.

FREE 16mm Bargain lists. Home Movies, Box 32, Easton Penna.

100 FT., 16MM. Library films, \$1.95. Send dime for big catalogue and usable souvenir films. Eastin Films, Galesburg, Ill.

WORLD'S Greatest "Passion Play" 16 MM. (new) 5 reels. Rent or purchase. Write Hemenway Film Co., 37 Church Street, Boston, Mass.

BARGAIN Lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

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THE American Toy Exchange offers opportunities for an independent and profitable business manufacturing American-Made-Toys. If you have a small space to use as a workshop and are interested in toys and novelties you can with a small outlay start in this new line which, in spite of hard times, offers an exceptional chance to the right man. For free advice and information apply by writing to American Toy Exchange, 41 East 42nd Street, New York.

LEARN Marbleizing. Our scientific composition poured into molds, or brushed on wood, concrete, wallboard, anything, resembles polished marble. Sets quickly, wonderful. Our plastic flexible mold formula, allows plenty undercut. For novelties, statues, spindles, columns, etc. If interested send dime for sample plastic material, and send with directions to use. Address: Cowell Institute, Grayling, Mich.

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PROFITS on your own goods. Make, sell them yourself. Formulas, sales secrets, leads. Valuable information free. Gibson Chemist, 4702 N. Racine, Chicago.

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10c BRINGS "40 Astounding-money-making and mail order revelations." Tompert Company, 214-P Cambridge, Dayton, Ohio.

TRADE! Sell! Buy! Anything! Anywhere! Year's subscription, and 20 words once—25c. Traders-Exchange, Fort Pierre, South Dakota.

MAKE 100% Profit assembling 18 lb. Mead "Kl-Yak," latest boat sensation. Complete "cut-to-fit" kit, \$11.75 (\$8.50 starts you!) Rush 10c for agent's offer, circular. Dept. B-35, 12 So. Market, Chicago.

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MAIL Order business is fascinating. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. I have had over 30 years experience; will help you make success. Send 25c for two valuable booklets. R. Brenner, 257 South 21st, Philadelphia.

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SELL Something no one can live without. New corporation representing combined manufacturing experience of 250 years. 150 food and cosmetic products. New plan, exclusive territory, marvelous opportunity. Act quick. Bulite, Inc., 445-457 West 31st Street, New York City.

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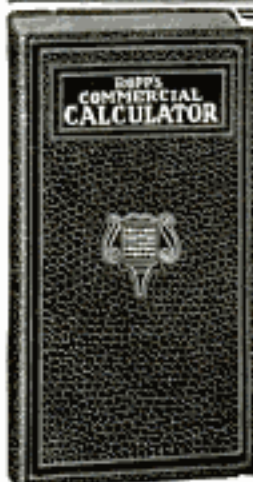
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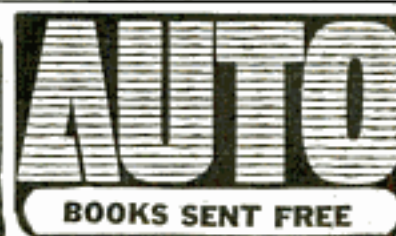
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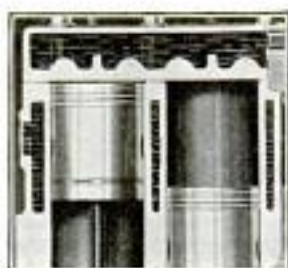
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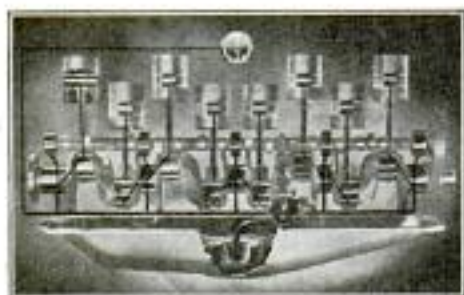
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Pontiac's Straight 8 has the longest engine built with $3\frac{3}{16}$ " bore



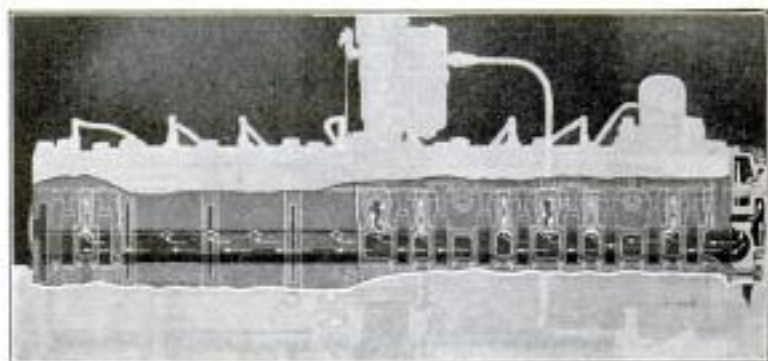
Being longer, Pontiac's cylinder block is cast with larger water space around each cylinder barrel. No danger of filling up in casting. Each cylinder is completely and always surrounded by water. This uniform cooling eliminates loss of compression and consequent loss of power, due to uneven wear from unequal expansion.



Pontiac is the most thoroughly and efficiently lubricated engine in the industry. Oil is forced under pressure to all main, connecting rod and camshaft bearings and timing chain, and through rifle-drilled passages in the connecting rods to piston pin bushings. Oil, thrown in sheets from the crankpins, drenches cylinder walls, pistons and distributor drive gears. The oil control piston ring is located beneath the piston pin—3 compression rings above.



By extending the crankcase $2\frac{1}{4}$ inches below the center line of the crankshaft, the engine structure is immeasurably strengthened, while the oil pan flange also becomes the same height along all four edges. This permits an oil-tight seal at front and rear bearings. The cylinder block and crankcase are cast in one piece; five sturdy cross-wise webs on the inside strengthen the crankcase and support the five main bearings. Two heavy outside ribs running lengthwise on each side of the crankcase eliminate all possibility of crankcase distortion.



A water distributing tube running the full length of the water jacket between cylinder barrels and valve ports has holes located opposite each exhaust valve port. Cool water from the pump is circulated through this tube and delivered directly against each exhaust port. From these points it circulates around the intake valve ports, cylinders and combustion chambers and then forward through the thermostatically controlled valve into the radiator. This water distributing tube delivers water simultaneously to eleven points along the entire length of the engine. A variation of temperature of not more than three degrees between front and rear end of engine is thus assured. Separate exhaust valve ports permit circulation of water around each valve seat.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 59

MAY, 1933

No. 5

C 395



COMPETING air lines this year are engaged in a battle for faster schedules, and three new types of transport ships already are entered in the race for speed laurels. Regardless of which finally is victor, air travelers are going to fly from here to there faster than they ever flew before.

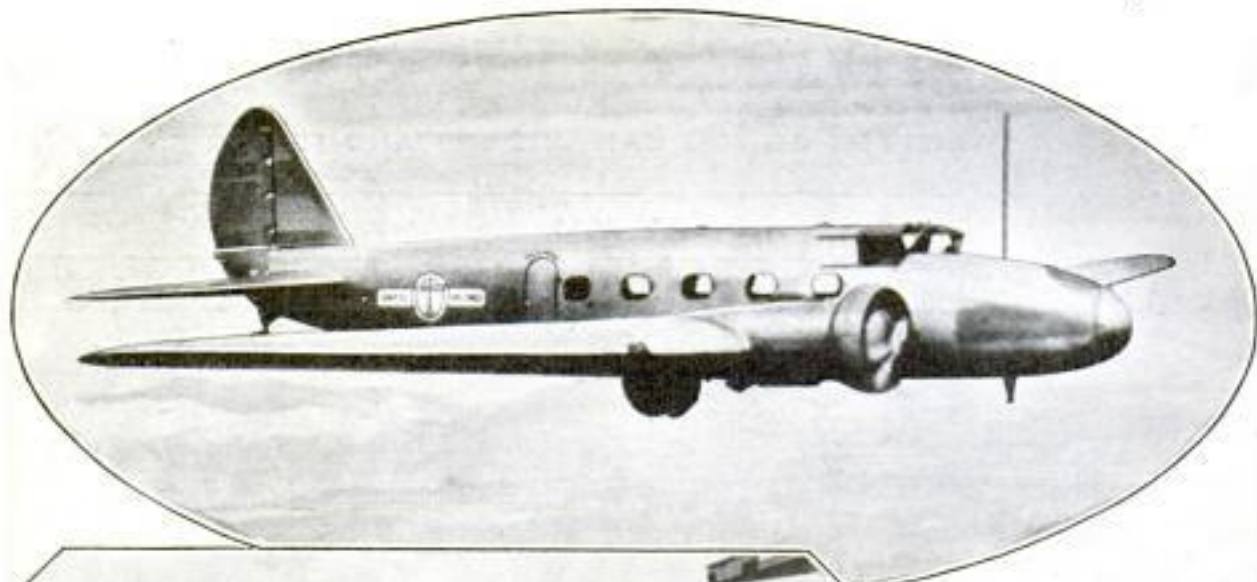
All three of the competing ships, in preliminary tests, have developed higher top speeds and higher cruising speeds than those now in service. Aside from speed, the new planes have two other common qualities—more comfort and greater safety.

So fast have the planes proved that some air-line officials vision a dawn-to-dusk

schedule from coast to coast—a daily race with the sun from the Atlantic to the Pacific. It is virtually certain that new schedules will reduce the flying time eastbound from the Pacific to the Atlantic to considerably under twenty hours. Some companies are considering eighteen-hour coast-to-coast schedules, including all stops, and the more optimistic are thinking of sixteen-hour trips.

These ships will be a far cry from the noisy cabins with cramped quarters into which passengers clambered a few years ago. Spacious seats, quieter cabins and more luxurious fittings are common to all,

Capt. Robt. Johnson, United Air Lines
221 N. La Salle, Chicago



Two Views of Boeing Plane; Note Retractable Landing Gear

pounds. They are powered by two 700-horsepower nine-cylinder Wright "Cyclone" engines and are expected to develop 145 miles or more while cruising, with a top speed of 170 miles.

They are called "silent" liners because the motors have been geared to drive the three-blade screws at very low speed, thus eliminating much of the

as are also numerous modern safety features and equipment.

The United Air Lines is launching sixty Boeing low-wing metal monoplanes, each carrying ten passengers and mail-cargo of 600 pounds. This ship's two supercharged "Wasp" engines develop 550 horsepower each and tests have indicated a top speed of more than 185 miles an hour and a cruising speed of better than 160 miles an hour with a ceiling, or altitude limit, of 26,000 feet.

Other features of the Boeings are retractable landing gear, engines located forward of the leading edge of the wing, all-metal construction and patented flaps in the trailing edge of rudder and elevators for easy handling.

Eastern Air Transport and American Airways are bringing out nine fifteen-passenger Curtiss-Wright "Condor" biplanes, each carrying a total payload of 3,200

objectionable noise. In addition, the cabin is well insulated and the engine exhaust is run under the lower wing.

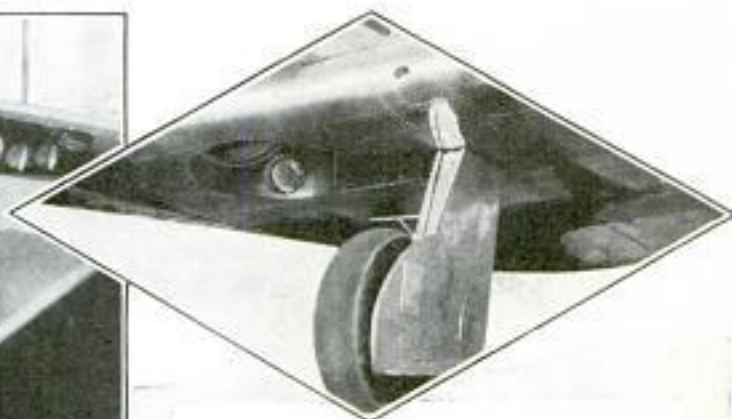
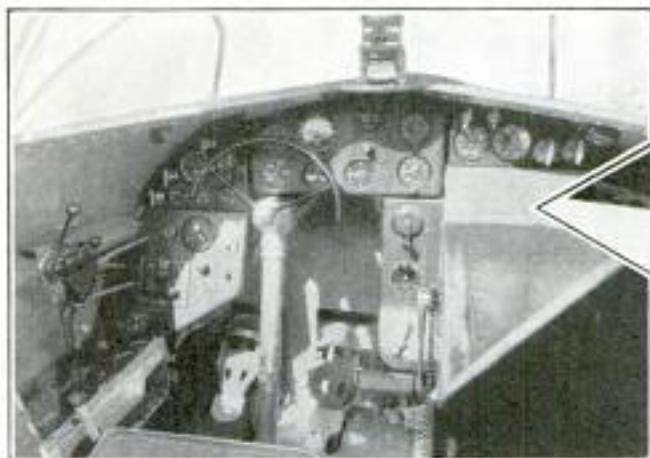
The Airplane Development corporation is building for American Airways a number of fast all-metal, low-wing monoplanes, each carrying eight passengers and powered with a Wright "Cyclone" 700-horsepower radial engine. A top speed of 225 miles an hour and a cruising speed of 195 miles are claims for this craft. This ship has an electrically operated retractable landing gear, capable of raising the wheels in thirteen seconds and dropping them in seven seconds. Flaps in elevators and rudder take care of stabilizer adjustment, and the shielded cabin reduces noise.

With such ships, five-hour schedules between Chicago and New York should soon be common, and the coast-to-coast time probably less than that now required from Los Angeles to Chicago.

Subsidiary of Cord

Faster Air Transports Span Continent in Day

Right, Front-to-Rear View of the "Condor's" Cabin; Fifteen Passengers Are Accommodated in the Five Rows of Three Seats Each; Aisle Divides the Cabin So That There Are Five Single Seats; Insulation against Noise Makes It Possible for Passengers to Converse without Raising Their Voices; in Photo Below, Note Absence of Motor in Nose of Plane; These Factors, Plus the Arrangement for Carrying Exhaust Pipes under the Wings, Make the "Condor" an Almost "Silent" Air Liner; It Offers Easy and Fast Transportation



Left, Pilot's Compartment of 200-Mile-an-Hour Transport; Right, Close-Up of Retractable Landing Gear; Bottom, the Plane in Flight; Note Ultra-Streamlining; the Ship Has Only One Motor and Carries Eight Passengers



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Here Is Artist's Conception of Fountain of Motion; Note Various Mechanical Movements Imbedded in Each Panel

LIGHTED FOUNTAIN OF MOTION HAS UNUSUAL MOVEMENTS

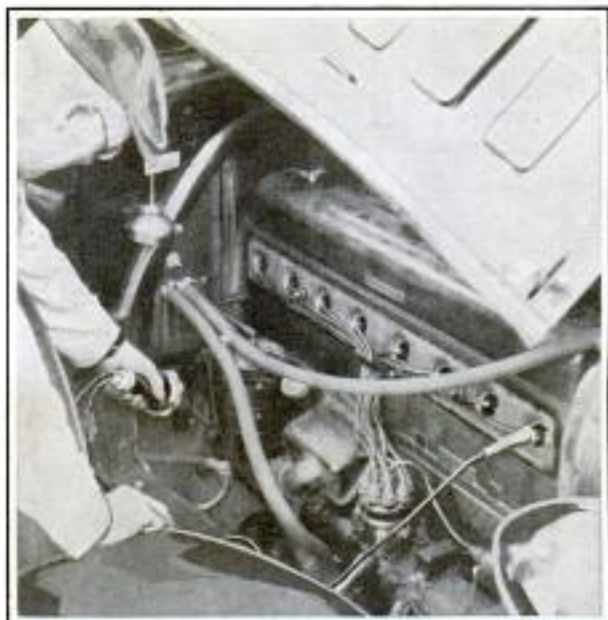
Twenty-four different mechanical movements, some so unusual as to appear almost impossible, will be demonstrated at the 1933 Century of Progress exposition by an illuminated fountain of motion. The fountain, twelve feet high and topped by a fog beacon, consists of three panels revolving on a base of wood and metal. Each panel will contain eight mechanical movements, all in motion. The end of each panel will have two sections, the upper divided into three slots which will act as reflectors for varicolored lights, and the lower consisting of a sheet of highly polished stainless steel. Lights in the base will shine upward to illuminate the movements, while a floodlight above will play on the entire exhibit. Springs, bolts, metal rods, gears and other small mechanical parts will be imbedded in the stationary

base. To attract visitors entering the exhibition hall, a fog beacon will flash its beam at eye level. Square gears, variable-speed gears, Scotch yoke-and-chain drive are some of the mechanical movements which will be demonstrated.

C 374

LIGHT TEST FOR TIMING AUTO ENGINE GIVES ACCURATE CHECK

Accurate testing of automobile-engine timing is made easy by a "synchroscope" that resembles a flashlight. In the reflector end is a neon tube which produces a white beam of light when proper electrical contacts are made. The device is connected to the No. 1 spark plug in tests and aimed at the timing hole, indicated by marking in white those lines on flywheel and its housing which are used in checking the timing. With the motor running, the light flashes so rapidly that the white lines appear to stand still. If the white marks line up, the timing is correct. If not, adjustments should be made. The synchroscope eliminates guesswork in checking timing, wiring leakage, wear in timing gears, uniform cylinder explosions, and backlash or defect in spark advance.



Testing Timing of Auto with Device That Flashes When Spark Plug Fires

Niagara Searchlight Co
Niagara Falls, N.Y.

"Multitask"

Annapolis, Md.



Top, Casting Is Easy in Boat Controlled and Propelled by Foot-Operated Oars; Bottom, Pedal Oars Folded for Carrying, and Close-Up of Arrangement in Boat, Showing Pedals and Means of Turning the Propeller

PEDAL OAR FOR SMALL BOATS LEAVES HANDS FREE

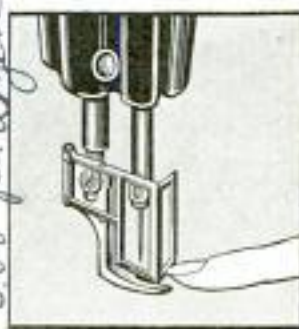
Operated by the feet, a pedal oar for small boats gives the fisherman or hunter complete control while he faces forward with both hands free for casting or shooting. The device has a regular outboard-motor propeller. One thrust of the legs carries the boat forward like one stroke of the oars. By advancing the left foot, the boat is turned right. Controls are arranged so the boat may be turned completely around on its own axis. The oar weighs only twenty-nine pounds and can be folded for easy carrying.

PLASTIC FELT HATS WILL FIT ANY HEAD WHEN HEATED

Felt hats which can be made to fit any size of head are being offered in England. They are made of felt which is sufficiently plastic, when heated, to conform to the

shape of the wearer's head. The felt becomes firm after cooling and retains the shape of the head to which it was fitted.

NEEDLE GUARD PROTECTS USER OF SEWING MACHINE C-391



Protection for operators of sewing machines is provided by a needle guard that is easily attached. A slight pressure of the finger throws back the shield for rethreading or re-

moving the needle. The device does not interfere with normal operation.

Cellophane greenhouses are being used by gardeners.

Christian Science Monitor 2/18/33

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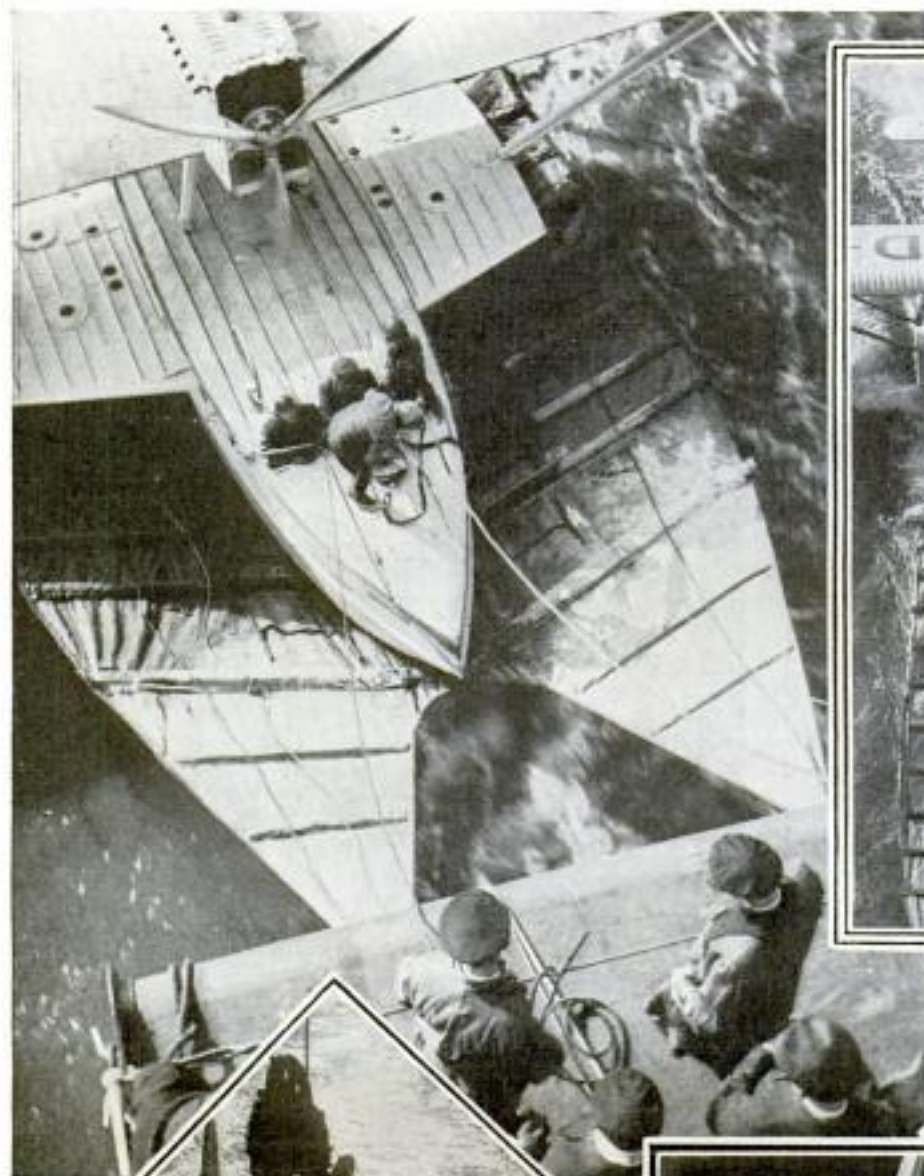
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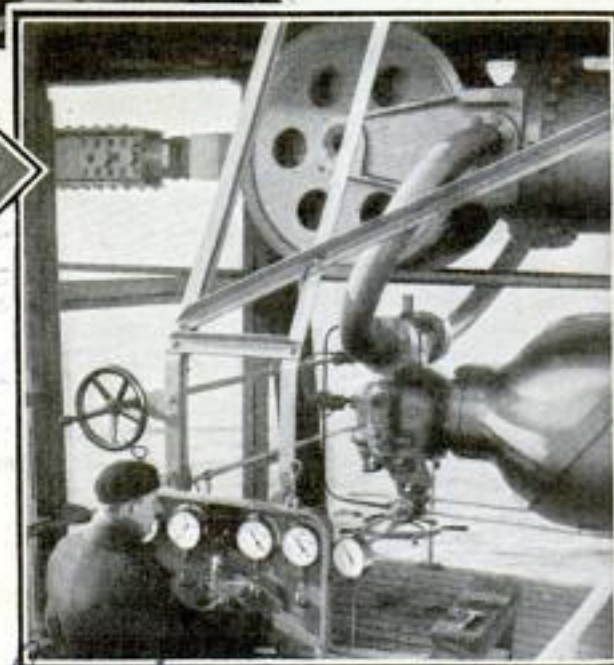
Mark Wethington New York 40 World St.

Science Service Shorts Feb 6, 1933 experiment in school of gardening

Steamer Is Floating Airport for Flying Boats



Above, Flying Boats Landing on the Floating Cradle Trailing at Rear of Vessel; Left, Flying Boat Being Towed into Cradle behind Mother Ship



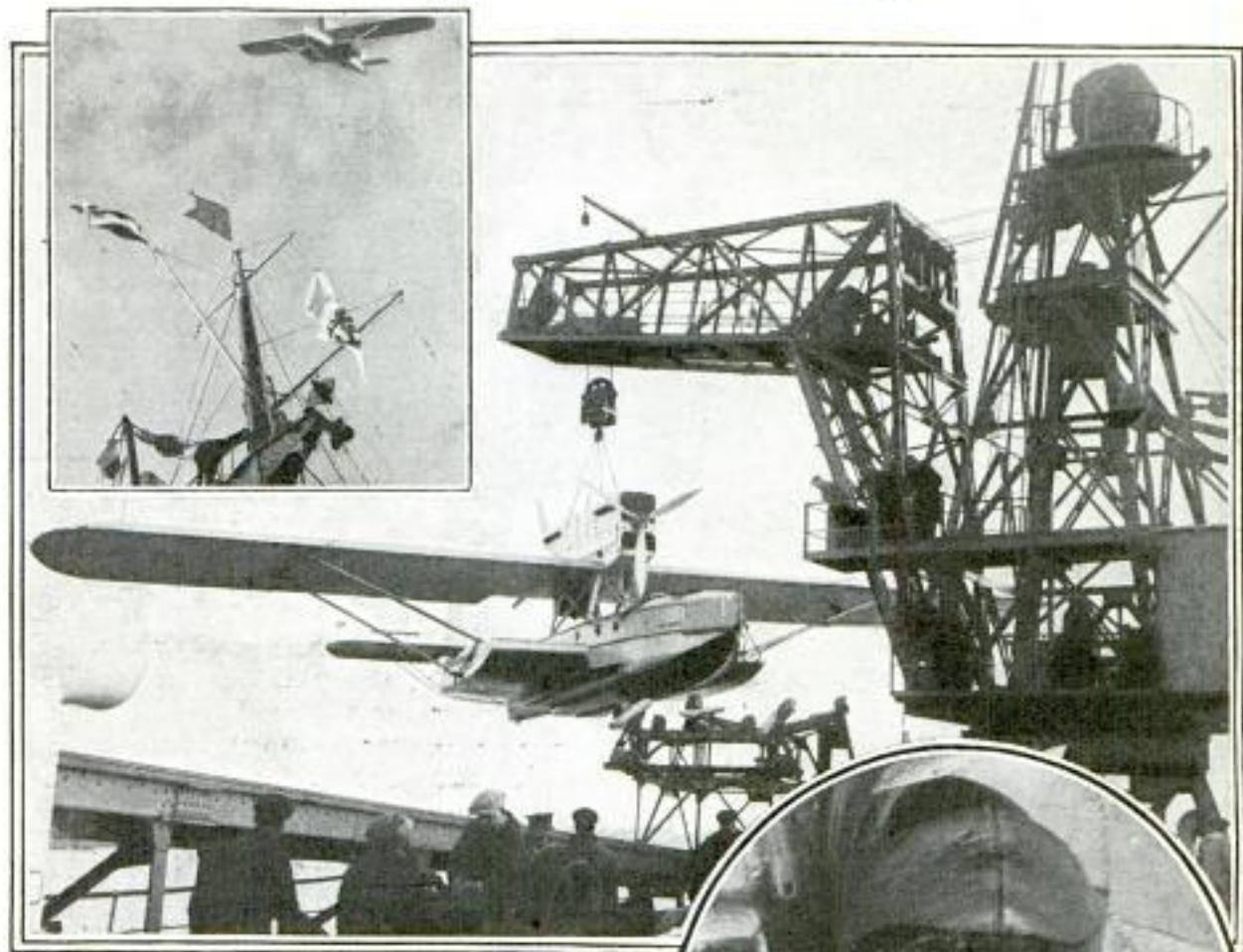
The German Steamship "Westphalen" Has Been Converted into a Floating "Island" on Which Transatlantic Flying Boats Can Land and from Which They Can Take Off: at Right, Operator Manipulating Crane Which Lifts Boats to Ship from Floating Cradle on Which They Alight

Used by Lserman Luftansa Co

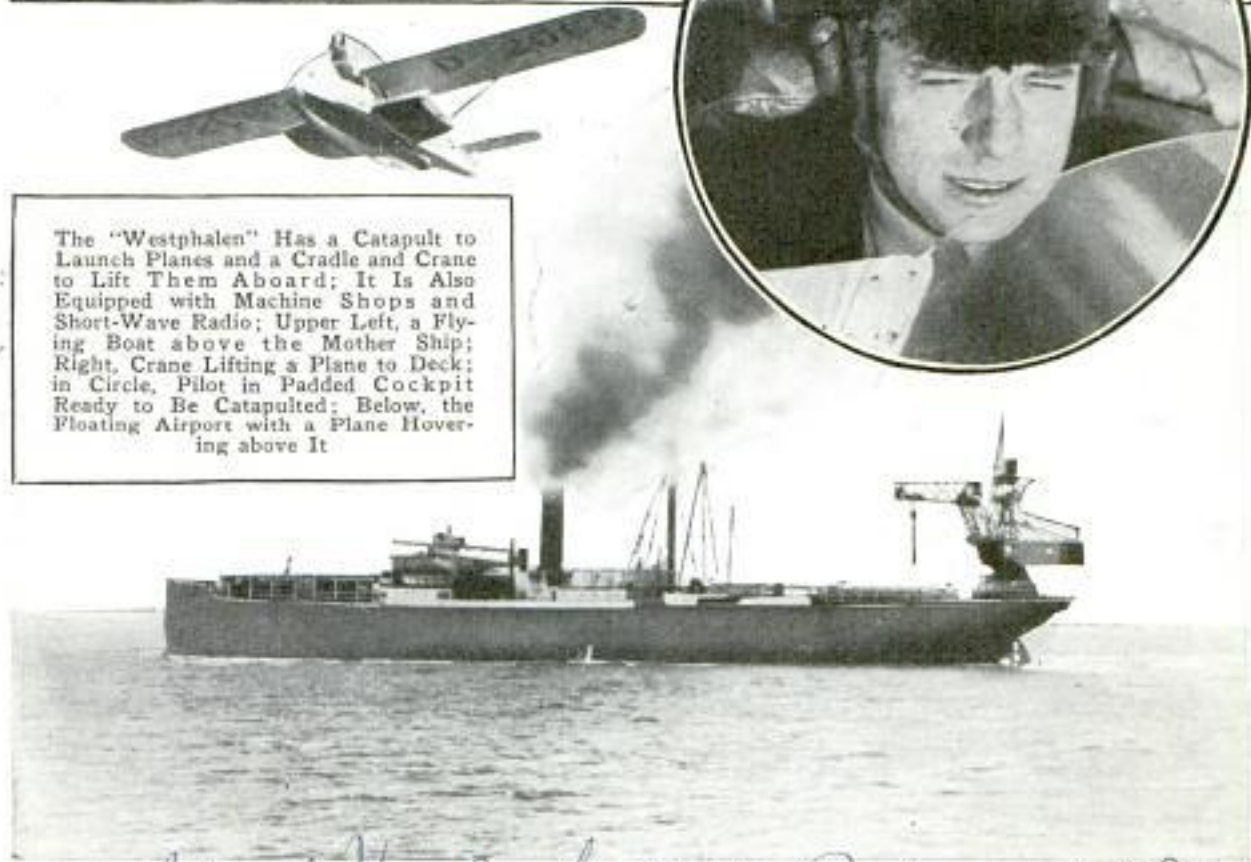
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Cradle and Catapult Aid Landing and Takeoff

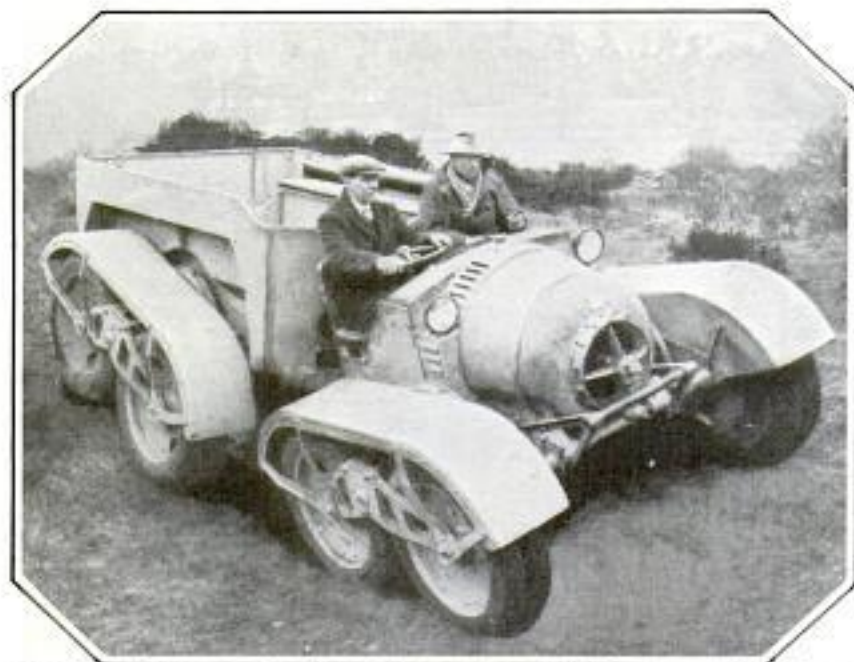


The "Westphalen" Has a Catapult to Launch Planes and a Cradle and Crane to Lift Them Aboard; It Is Also Equipped with Machine Shops and Short-Wave Radio; Upper Left, a Flying Boat above the Mother Ship; Right, Crane Lifting a Plane to Deck; in Circle, Pilot in Padded Cockpit Ready to Be Catapulted; Below, the Floating Airport with a Plane Hovering above It



Fotohuel

Lomb H. Enckeste 1; Berlin, W. 68
Germany.



British Army Truck with Eight Wheels, Each of Which Automatically Seeks Its Own Level and Carries Its Own Share of Load in Rough Travel

EIGHT WHEELS ON ARMY TRUCK EACH FIND OWN LEVEL

Great ^{was safe} Britain has recently tested an eight-wheeled army truck intended for very rough terrain, each wheel automatically finding its own level and always supporting its share of the load. The wheel trains, both front and rear, are articulated like some types of tractors. The two four-wheeled sections, with independent suspension, are centrally articulated in a cross direction so that they can be inclined at sharp angles in relation to each other when the vehicle is in motion. By this means, the wheel trains remain in constant contact with the ground. For steering and control, a mainspring guides the one set of wheels in relation to the movements of the others. All wheels are drive-wheels, and a shaft unites the bridges of the motors.

X-RAY SHOWS LIFE OF BATTERY BY CAMERA ANALYSIS

Forecasting the life span of a storage battery is made possible by the X-ray camera. By correlating X-ray pictures of the cell with its electrical or mechanical characteristics, such predictions can be made, according to Charles S. Barrett, of the Carnegie Institute of Technology. However, such a correlation might be different for different makes of batteries. The

X-ray takes a picture of what actually goes on inside a lead-acid battery. In one instance, it was found that a submarine storage battery had failed because of puncturing of the separator, and not through excessive formation of lead sulphate.

C 325 PHONOGRAPH USED TO WARN MINE WORKERS

Miners at a South Wales colliery are given final advice before entering the pit by means of a phonograph and records. As the workers are about to begin work, a bell

rings and the phonograph is started, a record carrying the manager's voice saying, "Hello, manager calling! Safety first. Search your pockets for matches before going down the pit. Don't carry tools and blocks of timber in the cage with you. Take care of safety lamps; hang them up in a safe position. Don't walk the engine plank when ropes are in motion. Don't go in front of trams when the gradient is over three inches per yard. You must not work under overhanging coal or ground unless it is securely 'spragged.' Haulers, don't abuse your horses."



Group of Miners Listening to Phonograph Warnings before Starting Work in Coal Pit

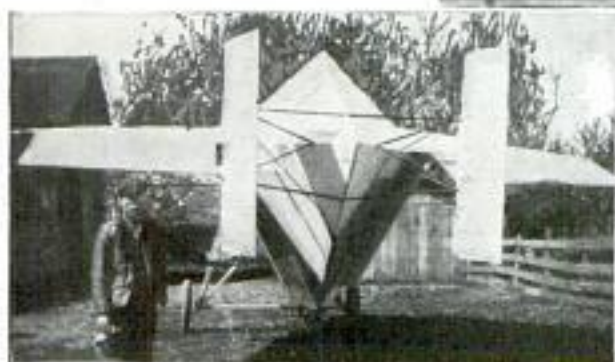
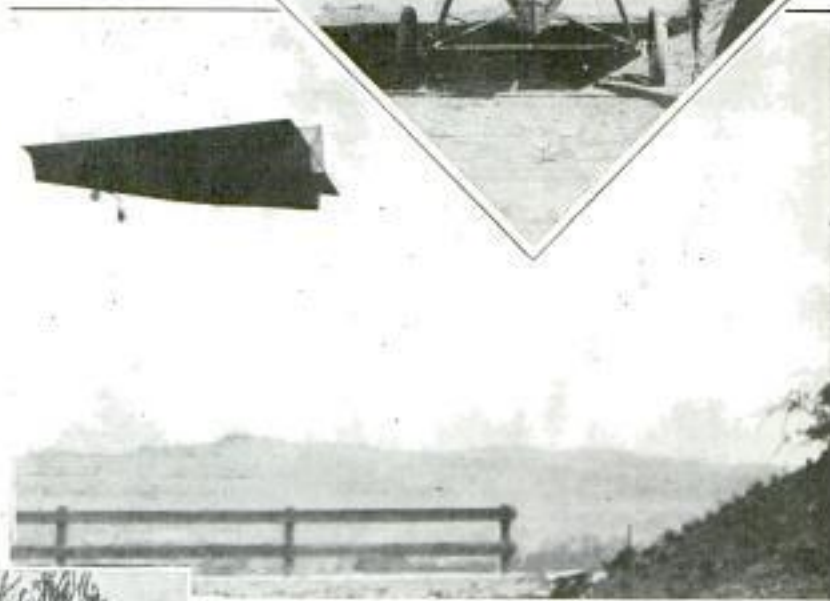
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Airplane Like Dart Has Lengthwise Wings

Shaped like a boy's paper dart, a new type airplane is almost wingless, only narrow lifting surfaces being attached lengthwise to the body. In test flights, the ship has been able to leave the ground on short hops. The plane is twenty-six feet long, with a six-foot width at front, which is the narrowest part. Twenty feet back, the craft widens to eighteen feet, in the shape of a dart. Extremely light weight is one feature, the ship weighing less than 1,000 pounds with a lifting surface of 350 square feet. Conventional ships weigh about seven pounds per square foot of lift surface. Fabric is used to cover the all-steel tubing of the frame. The makers claim that the craft cannot side-slip or spin, while a stall merely throws it into a gliding position, due to the unusual shape. The body



Top and Bottom, Views of Plane Shaped Like a Paper Dart; Center, the Craft in Flight

and narrow wings provide all the lifting surface. Streamlining is employed to make the plane pierce the air. It is estimated that this construction, which is said to be less expensive than the conventional type, will result in greater motor efficiency, less fuel consumption and high speeds. A ninety-horsepower engine drives the craft.

C406

DISCOVERY OF HEAVIER WATER MAY UPSET STANDARDS

Discovery of a new kind of water that is ten per cent heavier than the kind in

Prof Gilbert N. Lewis
 Dean of College of Chemistry
 U. of Calif Berkeley

everyday usage may upset international standards of weights and measures. The new water runs out of the faucet and is good for washing clothes, although it is far denser than sea water. It is composed of one atom of oxygen and two atoms of hydrogen, like common water, but the hydrogen atoms belong to a new class known as "isotopes," which are twice as heavy as ordinary atoms of hydrogen.

Christian Science Monitor 3/7/33

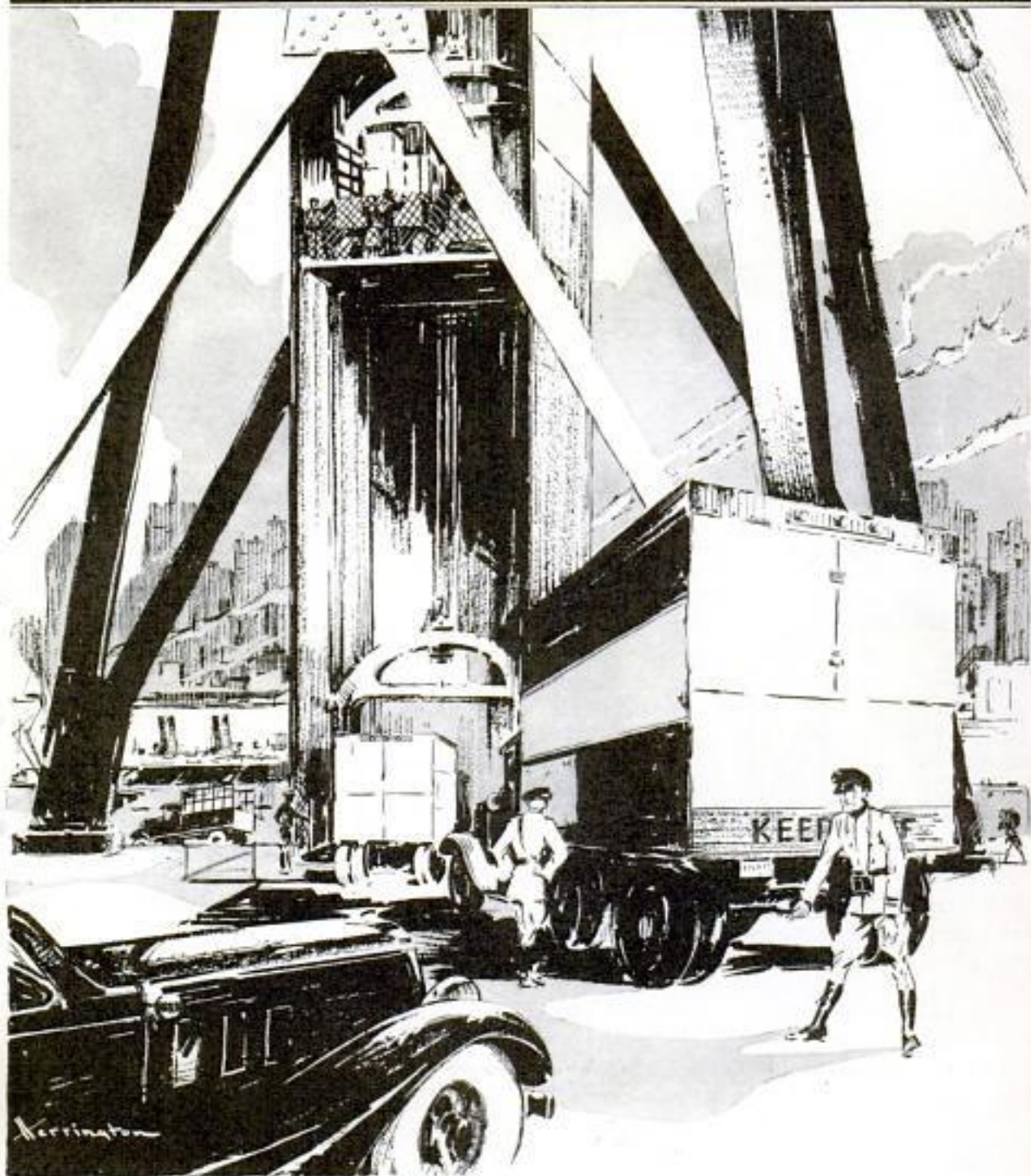
GLASS SURFACE FOR HIGHWAY RESISTS HARD WEAR

C419

Automobile roads coated with cement and powdered glass have been constructed in Czechoslovakia. Under extensive tests, the glass surface has resisted hard wear, being undamaged by heavy motor trucks. The foundation is laid in the usual manner. While the rough concrete bed is still wet, the cement and glass mixture is added and worked into shape. Then the road is flushed with water glass to produce a smooth surface.

Illustrierte Technik
 2/20/33 P. 14

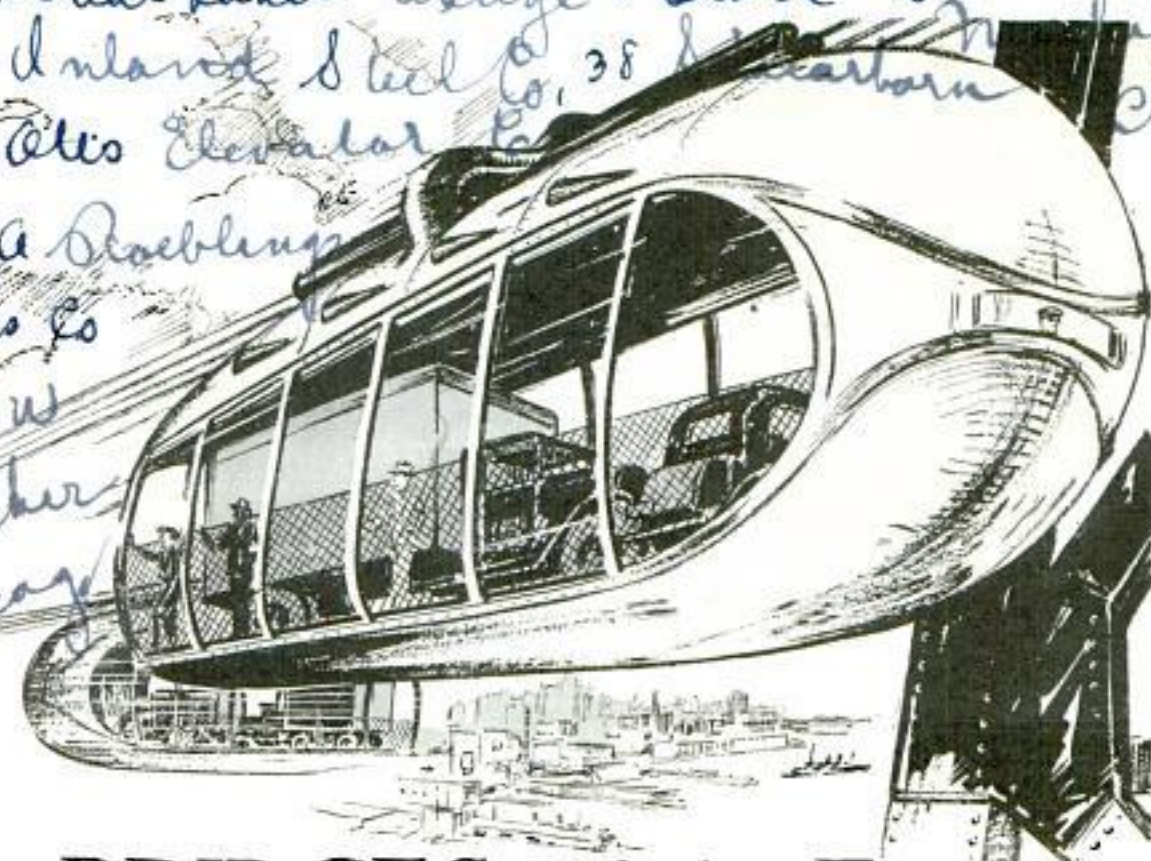
AERIAL FERRIES -



The "Sky-Ride" Erected for the Chicago World's Fair Is Hailed as the Forerunner of the Future Bridge, and Above Is a Drawing Showing Cars Being Loaded on Elevator of an Aerial Ferry; on the Opposite Page, One of the Cable Cars Carrying Autos and Trucks

Mississippi Valley Structural C 288
 Steel Co., 20 N. Wacker Drive, Chicago
 Great Lakes Bridge & Dock Co. 104 S
 Inland Steel Co. 38 S Dearborn
 Otis Elevator Co. Chicago

John A. Roebling
 Sons Co
 205 W
 Wacker
 Drive



the BRIDGES of the Future

By H. W. MAGEE

TWIN towers of steel, 628 feet high and 2,000 feet apart, rear their graceful tips into the clouds. Inside each tower illuminated elevators in glass-walled shafts race up and down with their cargoes of humanity. Between these towers, double-deck rocket cars are whisked on steel cables, carrying more than 4,000 passengers an hour to and fro 200 feet above the earth.

Such is the million-dollar thrill awaiting visitors to Chicago's World's Fair. The Paris exposition had its Eiffel tower, the Columbian exposition its Ferris wheel, and the Century of Progress in Chicago will have its "Sky-Ride," costing \$1,200,000.

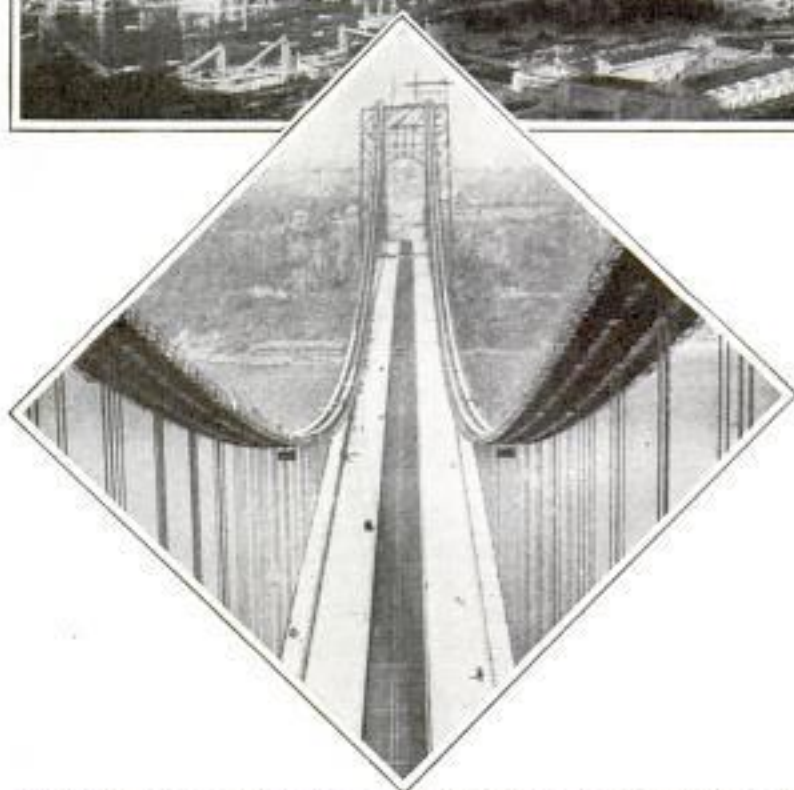
To the 50,000,000 people the fair hopes to attract, this sky-ride will be merely a gigantic amusement enterprise. But to the five big industrial concerns which pooled their resources to erect it, the structure represents a public utility—the forerunner of the suspension bridge of the future. And to the little group of engineers and designers who had the courage and vision to plan the structure, this sky-ride is just

a million-dollar toy—a full-size working model of a future bridge built as an experiment to prove the practicability of replacing modern costly bridges with inexpensive aerial ferries which would swing vehicular traffic across rivers or canyons in mid-air at high speed.

Bridge designers have long realized that the cost of present types of spans is making them prohibitive, because national and local governments are no longer able to provide the huge sums to build the giant structures of steel and concrete which present design dictates. Builders of the sky-ride estimate that an aerial ferry of similar design costing \$5,000,000 could serve the same purpose as a bridge of standard design costing \$50,000,000.

Thus this movement, pointing the way for progress in future suspension-bridge design, is likely to have a tremendous influence on American industrial life and provide new outlets for labor and materials. That it is not nebulous and ephemeral is proved by the fact that the design-

engineer- Joshua L. Espisto 667
 400 W. Madison Chicago



Above, Drawing of Sky-Ride at Night; Below, George Washington Bridge over Hudson, Only Bridge in This Country with a Greater Span than the Sky-Ride

ers of this sky-ride have already been asked to draw plans for two similar structures to span rivers in England.

To understand how structures like this amusement thriller may carry us across rivers a few years hence, it is only necessary to study the design. The skyway consists of the two towers, spaced 1,850 feet center to center, one on the mainland and the other on a man-made island in Lake Michigan. Between the towers is a cable system made up of horizontal track ropes

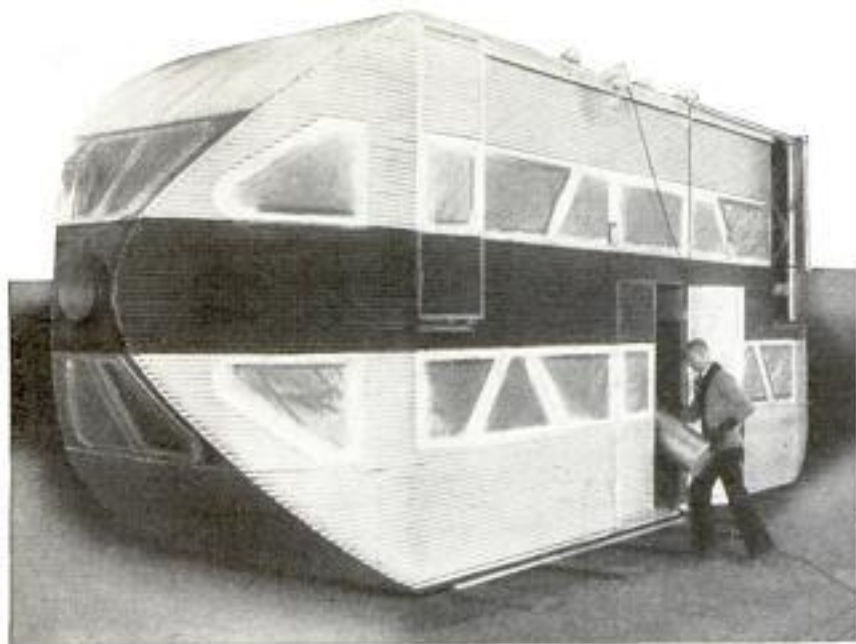
at the 200-foot level, supported every 100 feet by wire ropes under tension.

Four elevators in glass shafts in each tower will carry 4,800 persons per hour to the 200-foot level, or onto observation platforms at the tops, higher than the Washington monument or the tallest Chicago skyscraper. From these vantage points, visitors will look into four states and obtain a panoramic view of Lake Michigan, Chicago and the exposition itself.

The ten rocket cars with double-deck seats, each accommodating thirty-six passengers and the pilot, will travel on the cable tracks between the towers, circling

each tower to loading platforms on each trip. To add to the spectacular effects, towers and glass-encased elevators will be illuminated at night and searchlights will play on the rocket ships which will emit colored vapor through exhaust pipes at the rear.

So much for the ride as an amusement. When its construction is considered, its utility as a bridge becomes apparent. For instance, the actual span between tower centers, 1,850 feet, is greater than that of



panies, steel producers and elevator manufacturers were required to plan and erect this revolutionary suspension bridge which is expected to contribute as much to the field of engineering as the construction methods for fair buildings will contribute to the field of architecture.

Those sharing the work and expense include such

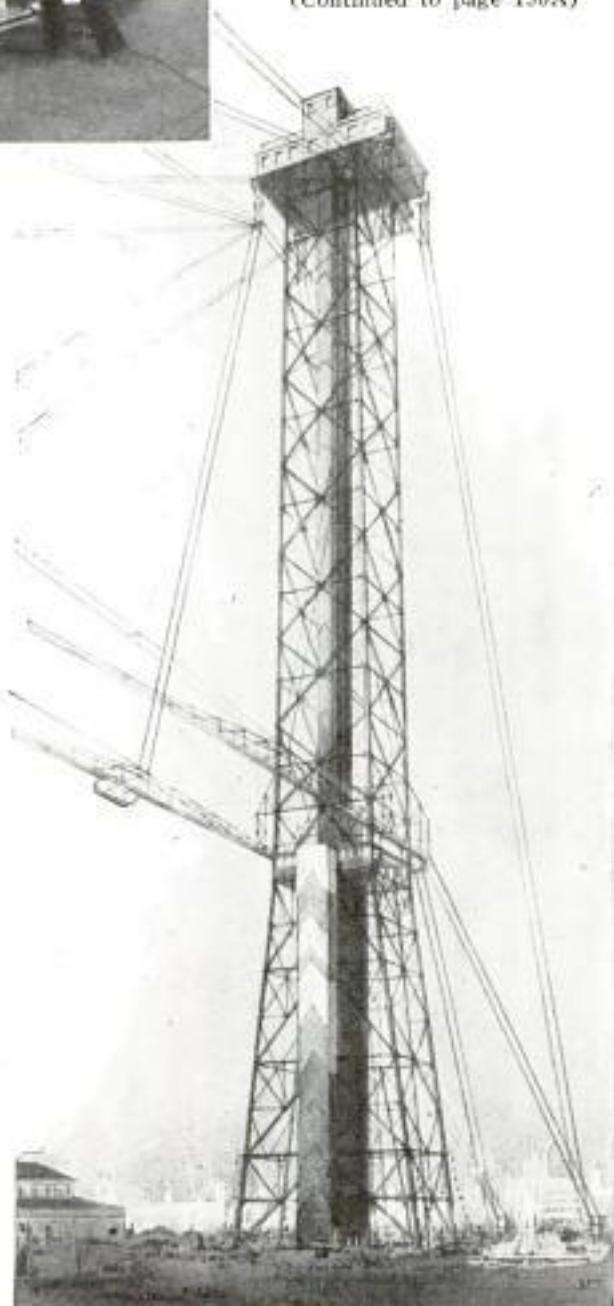
(Continued to page 130A)

any suspension bridge in this country except the George Washington bridge over the Hudson river. Four steel cables support each rocket ship, and these are anchored to 500-ton floating counterweights to compensate for changes in cable length due to temperature.

The sky cars operate on four tracks and are suspended from an overhead carriage which rides the aerial trackway. This carriage is made up of four light trucks, each having two wheels. A moving traction cable propels the cars across the span, a gripper connecting the carriage of the car with the traction line. This gripper is disengaged as the car approaches a tower, and it travels into the loading terminal under its own power, provided by two small motors mounted on the trucks and controlled by the pilot. A loaded car weighs about 14,000 pounds.

If the cables were enlarged, the elevators replaced by larger lifts, some adjustments were made in the gripper system and the rocket cars were designed to accommodate vehicles, the entire system immediately would become an aerial ferry which the designers claim would not only be capable of carrying loaded trucks and automobiles, but even street or railroad cars. The sky-ride cars will travel at the leisurely pace of five miles an hour, but the speed can be regulated to the needs of traffic for an aerial bridge.

The combined efforts of bridge builders, structural engineers, docking com-



Above, One of Rocket Cars for the Sky-Ride; Below, One of the Two Sky-Ride Towers



Rubber Dishes Which Take High Gloss and Do Not Break When Dropped; Right, Some of the Granulated Rubber

DISHES OF GLASSLIKE RUBBER DO NOT BREAK EASILY

One of the nearest practical approaches to a form of transparent rubber is embodied in a rubber-molding compound in granular form which lends itself to many uses, including the making of odorless dishes and the production of radio-tube bases with superior electrical properties. A dish made of this material has neither odor nor taste and can be given a gloss equal to that of glass or porcelain. The article does not scratch easily, is not brittle and is more resistant to breaking than ordinary dinnerware. The natural color of articles made of this compound is a light amber, but fillers and pigments can be mixed with it to produce any color or combination of hues desired. By varying the molding operations, different pattern effects can be created from the same batch of raw materials. This compound is unlike the more familiar hard rubber because it does not contain sulphur and requires no vulcanizing. Although it is unlike acetate products used in making toilet articles and novelties, it can be made in trans-

parent, translucent and opaque forms. It is resistant to heat, has good physical strength, low water absorption, will not discolor from the action of light, has a low specific gravity, is not attacked by alkalis and is resistant to most acids except nitric. A rubber dish will support the weight of a man, and can be dropped to the floor without breaking. This rubber also can be used for impregnating paper or fabric and can be converted into rod or tube form. In making the material, the best grade of pale-crepe rubber is dissolved to produce a thick liquid, and is then heated with chemicals to cause the mass to become more fluid. The solvent is evaporated and the granular residue can be

molded by applying pressure and heat.

RACE DRIVER USES GAS MASK TO GUARD AGAINST FUMES

Strapped in the cockpit of his racing car, an English driver wears a gas mask for protection against carbon-monoxide fumes. The driving compartment is closed during races, with the driver controlling his car from a sort of conning tower.



Race Driver in Closed Compartment Wearing Gas Mask as Protection against Carbon-Monoxide Fumes

Copyrighted material
Capt. George Eyston
at Montlhéry Track, France

C 373

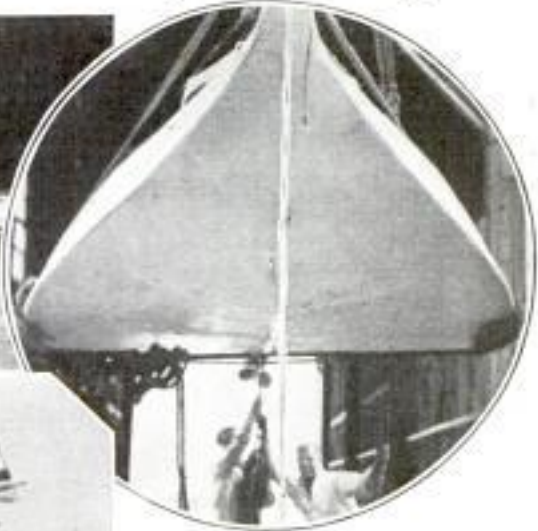
Brig. William C. Burgess
403 Idaho Ave.

POPULAR MECHANICS

671

Boat Built Like Plane Has Forty-Mile Speed

Air Reserve Santa Monica Calif Squadron



Views of Boat Built Like a Plane and Capable of High Speed; Note the Airplane Type of Rudder and the Wide, Flat Bottom Which Reduces Water Resistance



Half boat and half airplane, an unusual-looking craft has been tested for a trip from California to Hawaii. It is built of plywood and is completely inclosed. An airplane-type rudder, mounted so that two-thirds of its length is out of water, is used in steering in connection with a mechanical pilot that handles the boat while the human pilot rests. The craft has a seventy-two inch beam. Complete radio-receiving and transmitting equipment and an automatic fire extinguisher are features. A 225-pound Universal forty-seven-horsepower motor drives it at forty miles per hour.

prevent damage to double-edged blades. Cranking back and forth, reversing the direction each time the blade reaches the slot, will sharpen the blade in from twenty to thirty seconds, it

is claimed. A coil spring regulates pressure on the stop.

WATER TAKES PAINT OFF SKIN COVERED BY SOAP FILM

Paint can be washed off hands, arms or face with water if the skin is protected by a water-soluble film or coating. Before starting work with paint, lacquer, grease or acid, the user rubs the soaplike compound over the skin. When the hands are washed in water, the protective coating comes off, together with the paint or oil, leaving the skin clean.

ROTARY STROPPER WITH SLOT QUICKLY SHARPENS BLADES

Sharpening a dull razor blade can be speeded up by using a new type stropper

that is operated in a manner similar to the barber's method of stropping a straight-edge razor. A roller, which has a slot or opening for reversing the blade, is turned by hand. The blade is inserted in a special holder that has a felt lining to



FOOD OILS MAY BE KEPT FRESH BY ACID TREATMENT

Maleic acid, an inexpensive compound, will keep edible oils and fats fresh three times longer than when they are untreated. The acid is added in a proportion of one part to 10,000 of the oil to be preserved. Butter fat, butter, lard, the oils of cottonseed, peanuts, corn and sesame, milk powder and pie crust have been subjected to tests with satisfactory results. The acid may be useful also in preserving cereal products.

*Shield Products Co
Toledo, Ohio*

*Science News Letter
3/11/30*

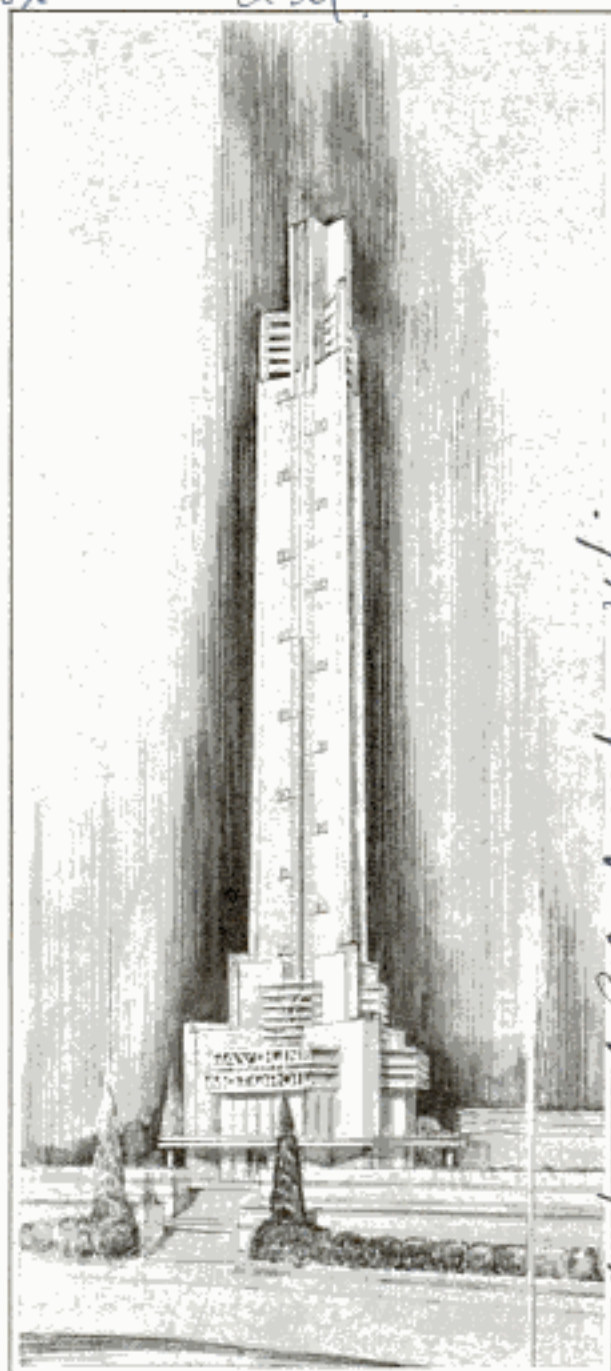
*J. E. Hawthorne
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Columbus, Ohio*

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Washington, D.C.*

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 Pleasant, Mich

POPULAR MECHANICS



Over 200 Feet High, This Thermometer Will Flash Temperature Changes at World's Fair

GIANT THERMOMETER IN SHAFT TWENTY-ONE STORIES HIGH

Temperatures at the Century of Progress exposition in Chicago will be flashed to visitors by a giant thermometer. The "temple of temperature" will be 218 feet high, constructed of steel and sheet metal, with a 150-foot column of neon-light tubes to represent the mercury. This column will be made of tubes coupled in sections representing one degree of temperature. As temperature changes are recorded by a master thermometer, the tubes will light

up or darken progressively. The "mercury," marked by ten-foot numerals, will be legible at long distance. The base of the tower will be landscaped and will house the products of an oil refinery.

PATTERN FOR ARTISTIC GARDEN AIDS IN PLANTING

Artistic gardens can be grown by using a method which utilizes a heavy, black paper that is marked for planting. This paper, known as mulch paper, has markings for a flower bed twelve feet long and eighteen, twenty-four or thirty-six inches wide, properly arranged for color harmony, size and height. Each division calling for a certain variety of flower is numbered. Packages of seeds of corresponding numbers are supplied with the paper plan. Holes in the paper establish the correct distance between plants and allow sunshine to nourish the flowers. On the other hand, the mulch paper keeps weed seeds and light from intervening spaces, preventing troublesome weed growth. During the early period of growth, the paper protects the ground against cold and helps to retain moisture. Everything, including fertilizer and instructions, is supplied with the pattern.

SELF-FILLING DESK PEN HOLDS ENOUGH INK FOR A DAY

Although it is not in any sense a fountain pen, a desk pen is now offered which, when dipped in the well, automatically fills itself with enough ink for a day's use. There is no mechanism to manipulate, no rubber sack to deteriorate and no channel to clog, but the pen does utilize the feeding feature of a fountain pen. The stainless-steel point rests against a hard-rubber ink feed, and when the pen is dipped, the groove in the rubber feed secures a certain amount of ink, usually sufficient for signing letters for a business day. The ink in the pen is kept in fluid state in a desk holder and is always available.



Clearing & Mulch Paper Co Milwaukee, Wis
 385
 Sengbusch

International Paper Co 208 42nd
 New York

The Burrus Brothers Co
 633 Euclid Ave
 Cleveland, Ohio

Em. Charles P. A. main c 130
1110 Puget Sound
Bank Bldg. Tacoma
POPULAR MECHANICS
Corning Glass Works
Corning NY
 673

c 317

**LATEST ELECTRIC LOCOMOTIVE
 HAULS MILE-LONG TRAINS**

Mile-long freight trains can be hauled over mountain grades by the latest giant electric locomotive, developed by the Chicago, Milwaukee and St. Paul railroad in its Tacoma, Wash., shops. Almost 5,500 horsepower is developed by the engine, which can start and haul a 6,000-ton train up a 2.2-per-cent grade at fifteen to twenty miles per hour. Then, by means of regenerative braking, the train can be eased downhill. The brakes return to the transmission line seventy per cent of the total power used in pulling a train uphill, by converting the engine into a rolling power house. In this way, the train is braked without the use of air. The locomotive has twenty-four wheels and twelve motors.

c 232

**BOY'S WAGON IS CONVERTIBLE
 INTO MANY OTHER TOYS**

Fifteen wheel toys can be constructed from the parts in a boy's wagon. The set is supplied in knockdown form, with fourteen pieces of wood, four wheels, a handle, front and rear assemblies, braces, bolts, washers, nuts, hub caps, twin axle and cotter pins. Only a wrench is necessary in building the fifteen models. Some of the toys which can be constructed, by following the book of instructions, are an express wagon, flat-top wagon, wheel monoplane, biplane and racing models.



How Tests Are Made of Liquids Carried in Glass Pipes, Like That at the Left

**GLASS PIPES TO AID INDUSTRY
 IN HANDLING MANY PRODUCTS**

Many products, including milk, fruit juices, chemicals and semiliquid food-stuffs, can be handled efficiently in glass-pipe systems now being manufactured for industrial use. As much as eighteen miles of glass tubing is installed in one plant. Made of materials similar to those used in producing glass dishes for cooking purposes, the tubing can be subjected with safety to sudden and extreme changes of temperature without cracking or breaking, even when hot liquids are sent through while the piping is cold. In addition, the glass system actually is a giant test tube, since it is possible to watch the behavior of the contents—the rate of flow, the color, the viscosity and the amount of sediment—at any desired point. The system is cleaned easily by flushing with steam, a matter of importance in handling products for human consumption.

More than 15,000,000,000 tons of earth were lifted in dust clouds and redeposited during a storm on the steppes of Russia in 1928.



Two of the Vehicles That Can Be Made from Parts Supplied for Boy's Wagon

*Out of business
 5/26/33*

*Adaptocar Co. Ltd
 58 Wellington St. E
 Toronto, Ont. Canada*

*Scene Berno Shark
 Copyrighted material
 Dec 1932*

Compressed Oct Jan. 1933

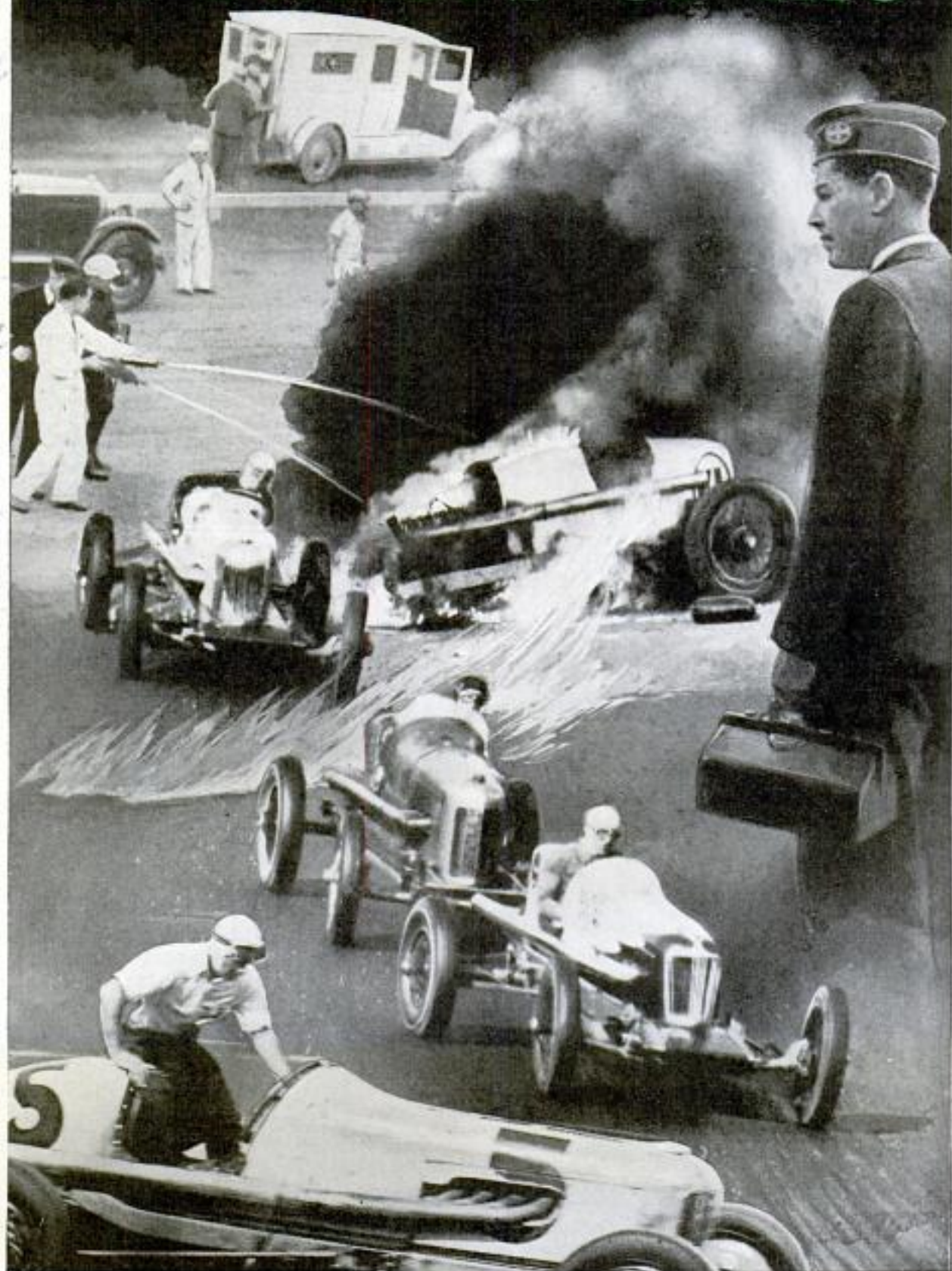
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Cont. Thomas E. Stinson, Jr.

145 S Spring St

Los Angeles Calif

The Killers of the

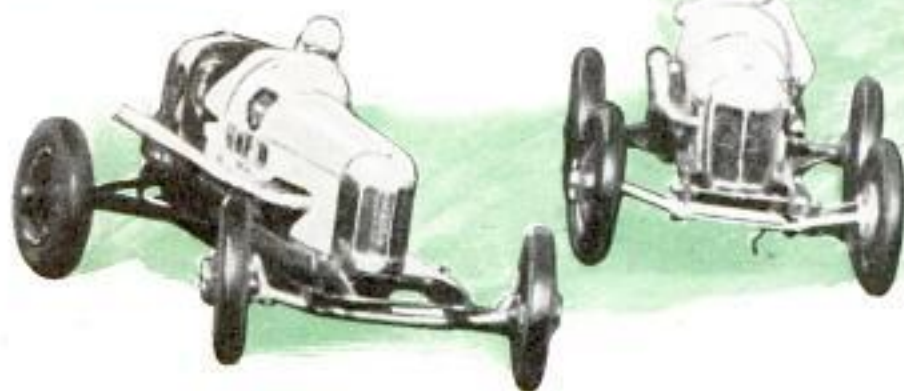


copy of photo
6/1/27

Top, Race-Track Accident with Attendants Extinguishing Flames and with Ambulance Standing By; Center, Cars Following Each Other at High Speed; Bottom, Driver Frees Himself as Car Starts to Crash

Roaring Road

THE car was a killer. To look at it, sleek and shining beside the pit, you would never know it. But last month it had killed a driver. In three races two drivers and a mechanic had lost their lives. Once it had turned over; another time it skidded into a fence. Each time it was something different. Still, the car had been rebuilt, and the mechanics believed they had cured the trouble. Now the engine was being tuned for a test run.



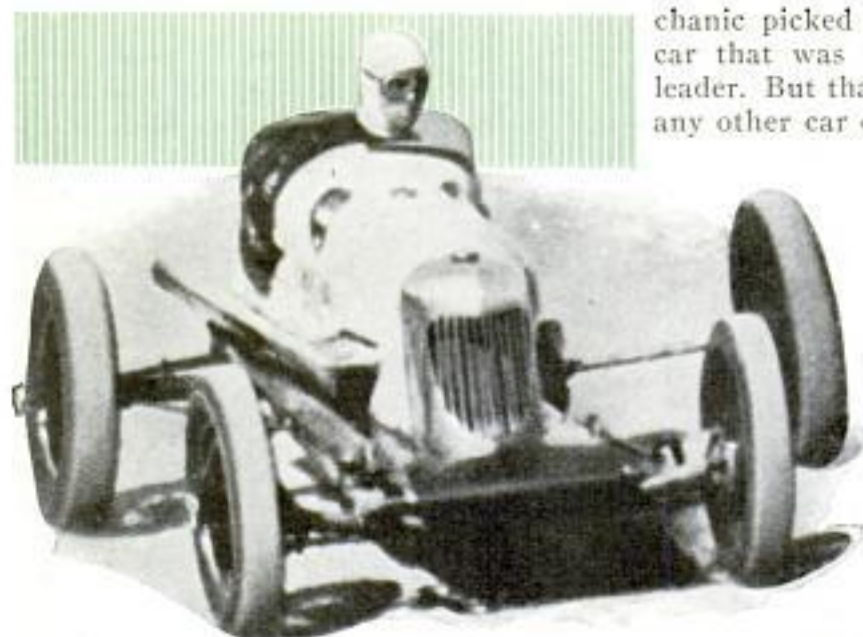
Cars skidding as they come out of a turn, because front ends are too light; misplaced weight is a not uncommon fault.

To the driver the world became a blur of track. Throttle down, up for the turn, down throttle again. At 115 miles an hour, the driver straightened himself, his whole body trying to sense any peculiarity in his mount. Does it drift upward on the turns? Does it float going into the stretch? What had made it turn over? The car was handling perfectly. Whatever the jinx was, it seemed to have been eliminated. After a dozen laps, the driver was satisfied and he slowed to a stop. "She seems all right now," he told the anxious mechanics. "I'll drive her next week."

Every now and then the racing shops produce a bad one. Each new speedway car is an experiment in automotive engineering in which innumerable forces must be made to work together. Dozens of different metals and alloys must move and slide as a perfect unit. Sometimes a small detail of design, sometimes a minor change in assembly, upsets the harmony of the machine. When this happens, a lack of balance or a vibration period that is not apparent at eighty or ninety miles an hour

may suddenly disclose itself when the speed goes above the century mark. Then the driver finds himself handling a car with different characteristics. His driving technique must be altered on the instant, or the car goes out of control.

Talk to the drivers idling around the pits on practice days, and you will be told that this car, or that car, is a hoodoo. May be it's a killer, like the one that killed its mechanic and injured its driver in practice at Indianapolis one year, after having killed both driver and mechanic in practice at the same track the year before. Both times the car was moving slowly. Or may be the car seems to have an "inferiority complex." In practice, it will wind up with the best of the field, but in competition, no matter how often the drivers are changed, something goes wrong. It will be taken out with mechanical trouble or flagged down long after the winners have finished. Some cars seem to break down so regularly that the fans despair of seeing them finish and lay bets on what lap they will quit. Other cars give a



Here Is a Hoodoo Car Losing a Rear Wheel After the Axle Had Cracked; Photo Caught the Car Before Axle Dropped to the Track

sense of insecurity to the drivers. Racing mechanics have many theories on the jinxes that seem to attach to these cars. Most of them agree that minor vibrations and unbalanced parts are the root of the trouble. Some small part that is under unusual strain may cause failure in other parts without itself breaking down. When the pit crew is smart enough to locate and correct the real cause, the hoodoo car is tamed. But although mechanics can trouble-shoot a racing car for most faults with their eyes closed, they cannot always discover a hidden defect. Eventually the drivers turn to other cars, relegating the hoodoo to dead storage.

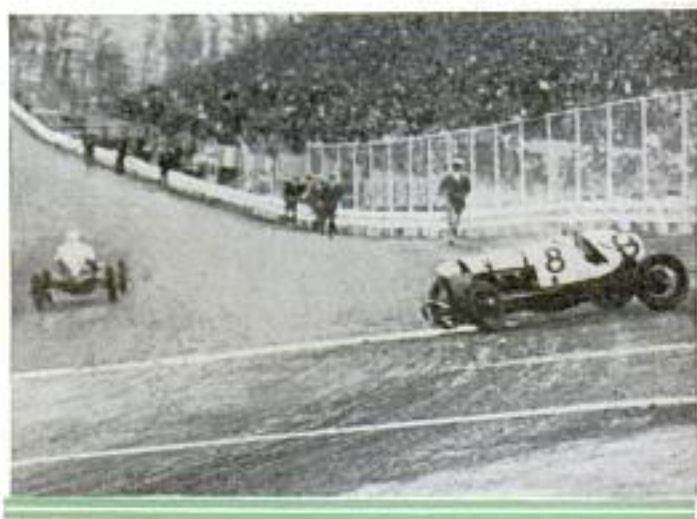
If race-car builders could be sure beforehand that their creations would perform according to design, the high-speed problem would be greatly simplified. But they never know exactly what a car will do until they try it out. Not even cars that are twins down to the last thousandth of an inch will perform alike. Racing drivers know this. Take Harry Hartz, whose career as a driver until he was seriously injured in 1927, and as an owner-designer since, has been influenced by the individual characteristics of his cars.

"I recall two special instances," he says, "that will show you what I mean. Back in 1923, we were building up a five-car team. The parts of the cars were machined out of the same stock, at the same time and to the same dimensions. Then the head me-

chanic picked out the best parts for the car that was to be driven by the team leader. But that car was miles slower than any other car on the team. We never did find the jinx that held it back.

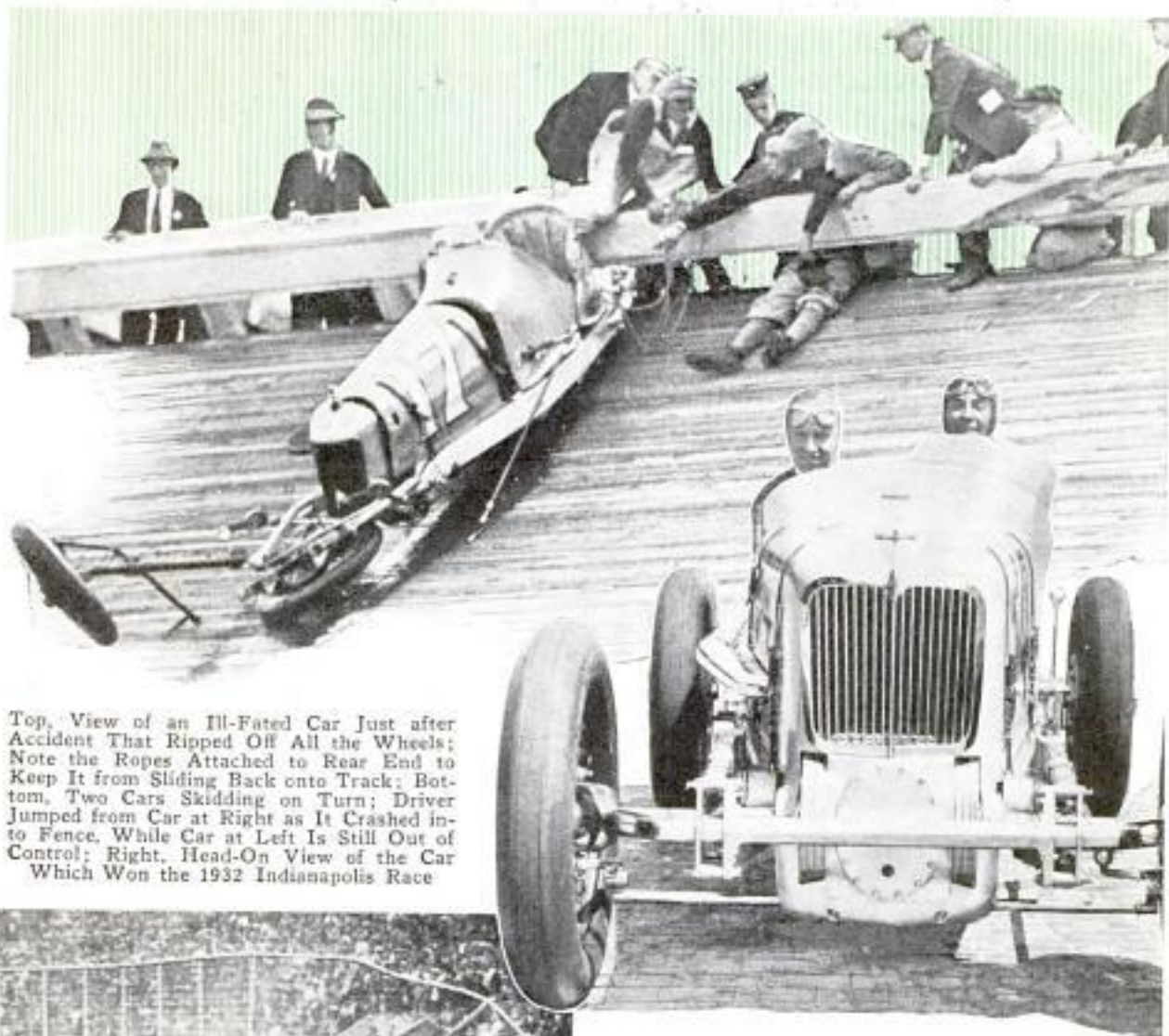
"Several years ago Harry Miller constructed identical parts for seven race jobs. The first men on the ground selected what seemed to be the best machines. The last car out of the shop was assembled from parts that had been rejected by everyone else. But that car was faster than the rest. It defeated the others and won that year's Indianapolis race."

When other things are equal, the car that has the best mechanic will win, Hartz says. "A good mechanic develops what he calls a 'combination' that he keeps a dead secret. He works over the car for a couple of weeks, trying out different piston and valve clearances to learn which are best.

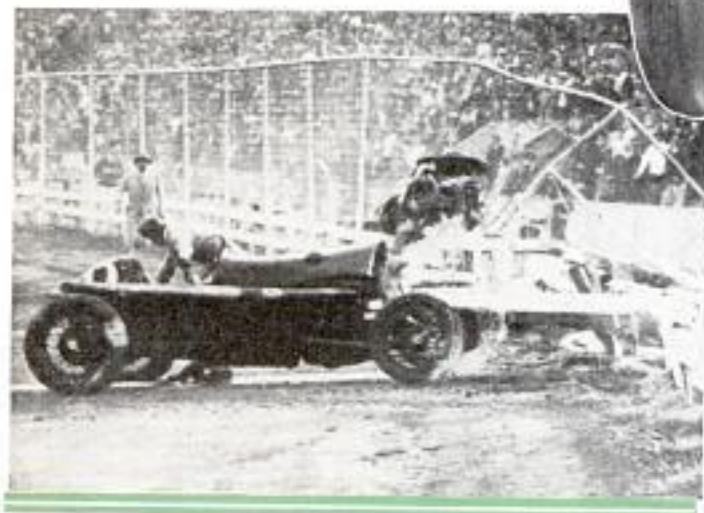


Then he experiments with the valve timing and with the spark setting and carburetor. Eventually he works up a combination of adjustments that brings out the best the car has. If even one adjustment is slightly off, the whole combination is spoiled. One mechanic can get several miles an hour more out of a car than another just because he has been able to strike upon a better combination of adjustments.

511 N. Sycamore St
Los Angeles, Calif



Top, View of an Ill-Fated Car Just after Accident That Ripped Off All the Wheels; Note the Ropes Attached to Rear End to Keep It from Sliding Back onto Track; Bottom, Two Cars Skidding on Turn; Driver Jumped from Car at Right as It Crashed into Fence, While Car at Left Is Still Out of Control; Right, Head-On View of the Car Which Won the 1932 Indianapolis Race



"Then there are last-minute changes that the mechanic decides upon, depending on the conditions of the race. If it is a hot day, the carburetor setting is changed and the air pressure in the tires is decreased a few pounds to give full traction. If the track is a short one, where acceleration is more important than top speed, the mechanic adjusts the carburetor to give better pick-up."

Hartz attributes a win to equal propor-

tions of good preparation, good driving and good luck. He was one of the most consistent drivers of the last decade, winning one Indianapolis race and placing second three times. He won the 1926 national A.A.A. speedway championship by finishing first five times and second eight times out of seventeen starts. He recently disclosed the driving system that brought him his championship and that has since been so valuable to the drivers of the Hartz-Miller specials. His strategy is simple and successful.

"Before I entered a race," he explained, "I studied the time that was made by the winners of previous races at that track. Then I considered whether the cars in the present race were any hotter, and from that I could predict very closely the speed that would be made by the car that wins."

"When the wild-eyed boys with their feet pushed down to the floor went by, it

(Continued to page 122A)

King Edward's Hospital Fund for London and the Voluntary Hospital

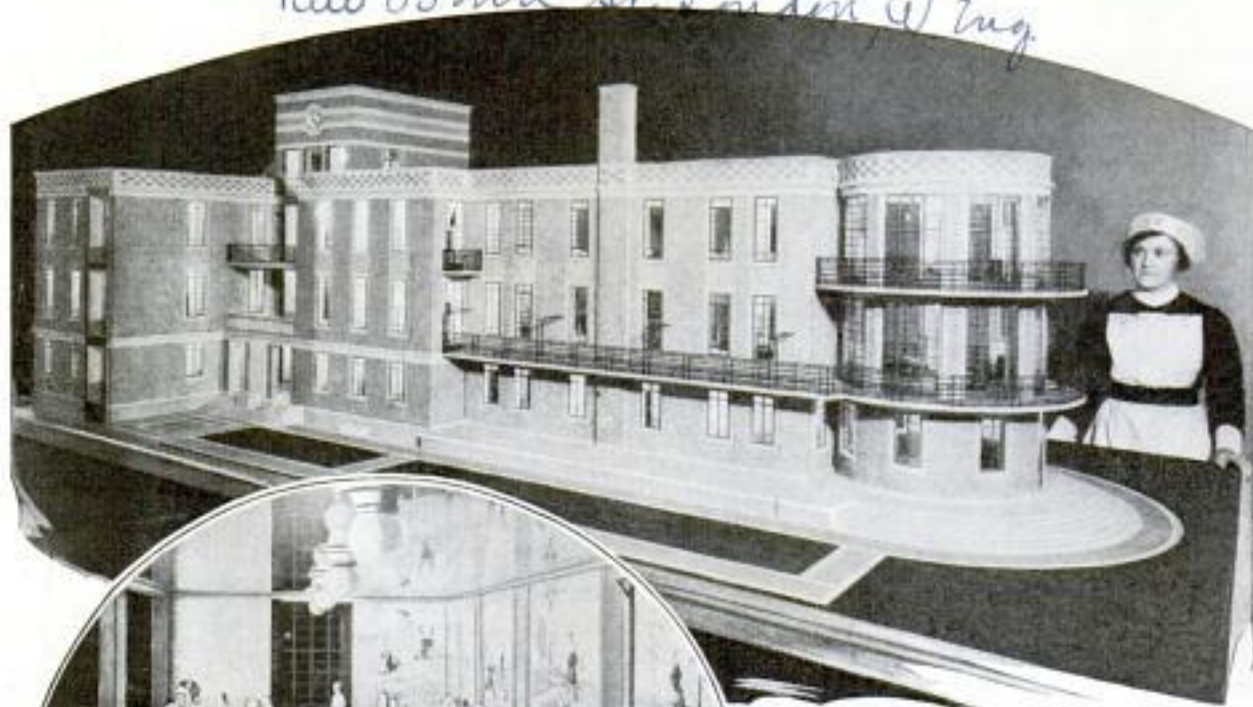
678

POPULAR MECHANICS

Model of Hospital Complete in All Details

at London Building Centre

new 63rd St. London, Eng.



Top, Miniature Hospital with Nurse Near By to Contrast Size; Bottom, Children's Ward in the Model Building

Complete in every detail, even to an electric elevator that works, a scale model of a modern hospital has been produced in London to show the public how patients are cared for in a well-equipped institution. The miniature building has all the essential parts, wards, operating theaters, kitchen, solarium, garden, X-ray equipment and the like. Doctors and nurses are shown attending patients. Members of England's royal family presented lace handkerchiefs to the builders for use as bedspreads in the hospital.

BRAKE LINING MADE OIL-PROOF TO GIVE LONGER SERVICE

Longer service is claimed for a new brake lining that is oil, grease and waterproof. Carbon gas black is used as a basic material instead of asbestos to give the lining better wear-resisting qualities. Under ordinary conditions, the surface of the lining will clean itself of accumulated oil or grease. Under extreme conditions, the wheel may have to be pulled and the grease washed off with gasoline, but the lining is left undamaged. The individual

particles in the lining are so small that there is no danger of scoring the brake drum. Instead, these particles have a noticeable polishing effect, eliminating that period of careful use which many linings require for the glazing effect necessary for long service.

ASPIRIN MADE INTO SECRET INK

German prisoners during the world war sent out censored letters which were later found to contain valuable information not apparent to the censors. The prisoners

Fred G. Inc. Chicago

3013 Ohio

Per. Hide Inc. East Brady, Pa.

Eckhardt

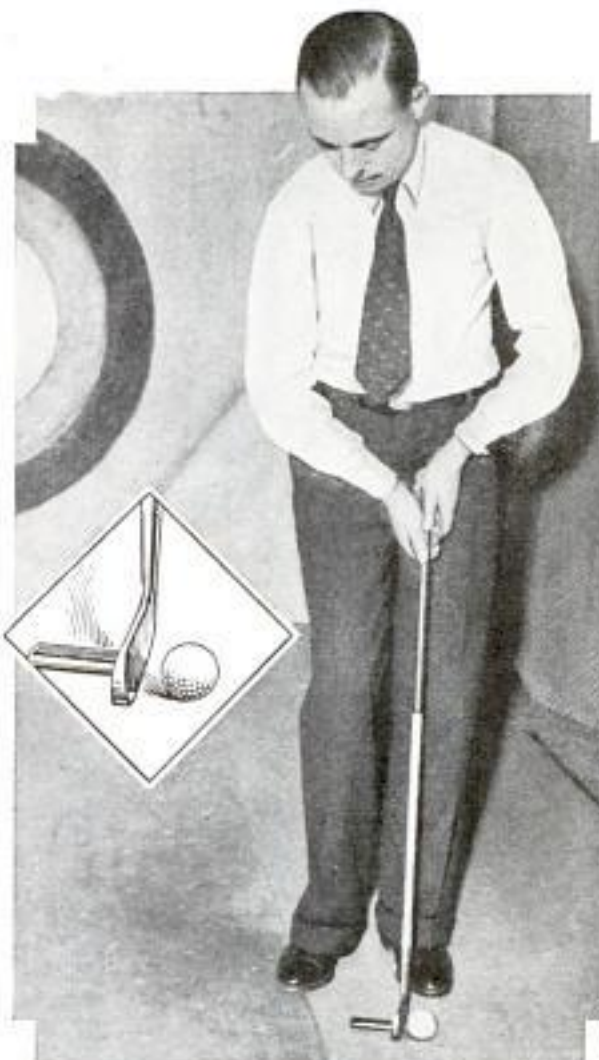
had no chemicals or invisible inks available, and it was revealed recently that the secret lay in aspirin tablets to which the Germans had access. When dissolved in water, aspirin makes an ink invisible to the eye, but when placed under a violet-ray light, the words show up plainly.

SIGNS DONE IN LIGHT COLORS ON DARK BACKGROUND *0154*

Improved materials have been produced to simplify the painting of signs in light colors on dark background. For ordinary paper-sign or card making, rubber stamps may be used, the only difference being the necessity of using the specially prepared paper or cards and the new liquids in place of stamp inks. Anything desired in color combinations can be carried out, although the paper and cards are prepared so that all parts where the liquid is applied will be the same color. By going over these parts with a second liquid, white is produced and on these white letters, sketches or designs, any changes in color can be made. In one sample, six colors were used. Where two colors are required, there are a number of combinations: red on dark violet background, light blue, orange, light brown, light purple, white, etc., on dark blue; light green or light yellow on dark green, and others. The texture of the papers and cards produces the appearance of handwork, even when made with rubber-stamp letters.



Stamp and Special Liquids for Producing Light-Color Signs on Dark-Colored Backgrounds



Flange on Putter Strikes Ground if Stroke Is Made Improperly; Inset Shows Construction

PUTTER IMPROVES GOLF GAME BY TEACHING ACCURACY

Designed to increase accuracy in putting, a golf club with a flange extending horizontally from the back of the blade has been produced by a Chicago professional. In general make-up, the club is a standard straight-blade putter, plus the flange. If the putting stroke is not properly made, the flange strikes the ground, indicating that while the line on the hole may have been drawn perfectly, the player must have relaxed his grip slightly or allowed his wrists to sag just before hitting the ball. Practice with the new club is expected to produce more accurate play on the greens.

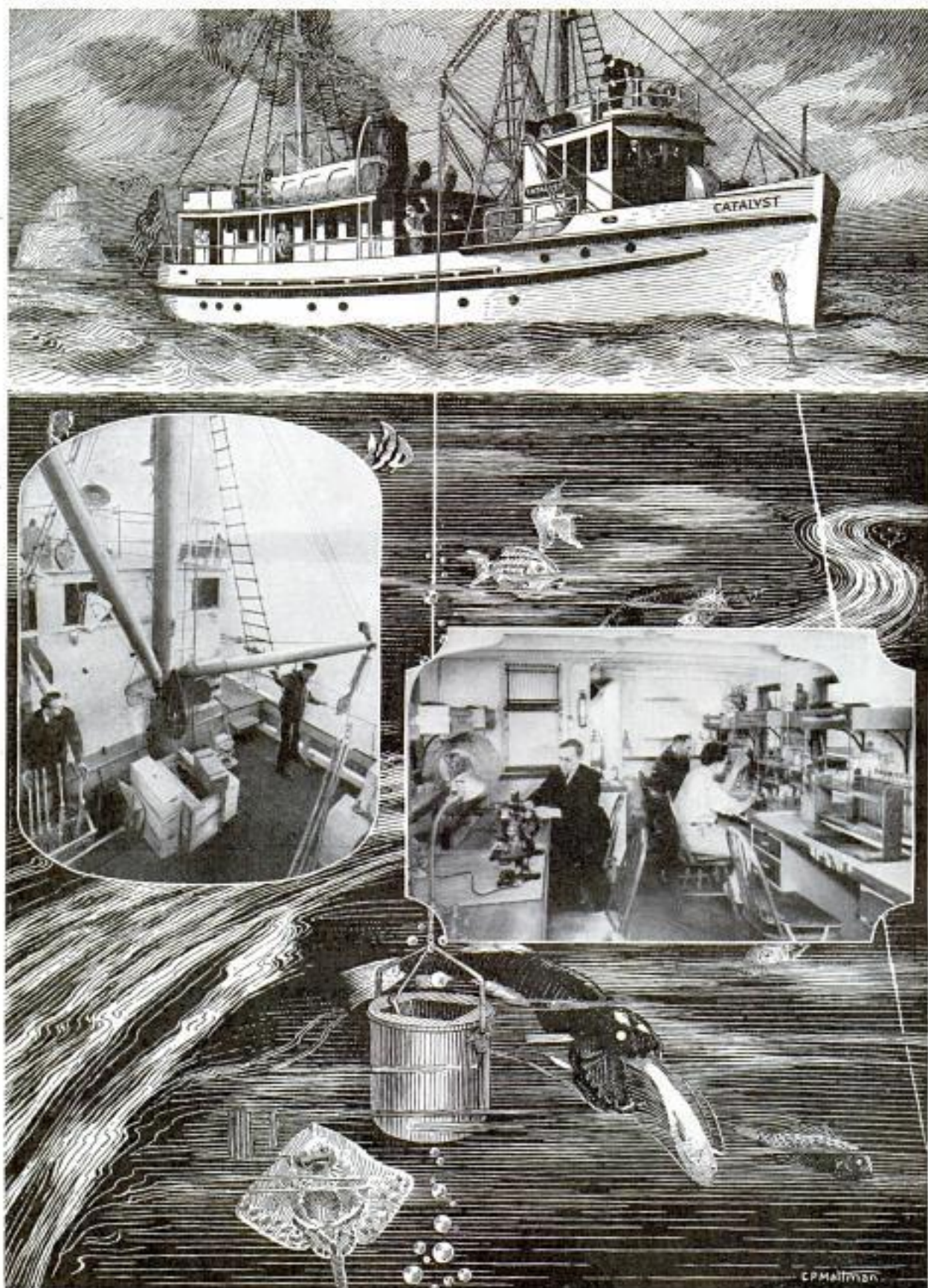
Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, enclosing return postage.

Frank Brady, Toledo Wild Country Club, Flossmoor, Chicago

*Herbert C. Hearne
95 Maple dell St. Springfield
Mass*

B2234

Floating Laboratory Explores Ocean Depths



Drawing Illustrating How the "Catalyst," University of Washington Seagoing Laboratory, Obtains Specimens from Ocean's Depths for Scientific Study and Analysis; Left Insert, Modern Machinery Used to Obtain Specimens; Right, Laboratory on Ship Where Scientists Work

Cont. J. M. White
Box 44, Alameda
Calif

HUNT FOR SECRETS OF THE SEA TO AID LAND INDUSTRIES

Mysteries of the sea are being studied by ten scientists in a floating laboratory, in order to obtain information of importance to farmers, fruit growers and others whose success or failure depends on climatic conditions. In addition, the expedition, by examining animal and plant life and ocean currents in the North Pacific, expects to solve many submarine problems for the fisherman and the navigator. A seventy-five-foot boat, the "Catalyst," used as the laboratory, is fitted with special bilge keels to reduce rolling and is driven by a powerful engine that gives a cruising range of 2,500 miles. Nets with extremely fine mesh for capturing specimens are a part of the equipment. Photoelectric cells on long cables are used to find the limits at which light from different portions of the spectrum are blocked out, aiding the study of how the penetration of sunlight affects submarine life. Eight workers may assemble in the laboratory, which has outlets for electricity, compressed air and bottled gas. A pipe line of acid-resisting metal carries off noxious discharges after each experiment. On deck are two wire drums, one holding a 15,000-foot cable for taking samples of water and the other containing a 2,000-foot cable for dredging or trolling for samples of submarine life. Numerous other researches are undertaken by the scientists.

BUDS OF LOTUS FLOWER TALK WHEN THEY OPEN c66

Known as the talking flower, the American lotus, largest water lily on this continent, grows so fast that its buds open in the early morning with an audible "pop" and "plup." Indians and wild ducks feed on lotus seeds in this country, but in the Orient the flower is not only a religious symbol, but is also more widely utilized than here. The roots are dug from the thick mud and eaten, the leaves and stalks are used for fuel, and the acorn-shaped seeds are sold as nuts and made into confections. Nearly all lakes and tributaries of the Mississippi river provide shelter for this remarkable flower. Leaves, two feet in diameter, rise above the shallow water, and on warm nights, when the buds are



Boy Using the Pad of a Lotus Flower for an Umbrella; He Appears Small by Comparison

waiting to open, the stalks seem charged with electric energy. With the first streaks of dawn, the buds begin to burst and the talking of the lotus flowers may be heard across the pond.

PADDLE WHEELS KEEP OIL OUT OF YACHT HARBOR c114

Seriously troubled by oil floating into a mooring basin and fouling bottoms and sides of boats, the Oakland, Calif., yacht club rigged up two paddle wheels to keep the harbor free of both oil and debris. The wheels are mounted on a float and rotated by a two-horsepower motor through a worm gear. The whole assembly is secured to piling on one side of the twenty-foot entrance to the basin and sets up an outgoing current strong enough to keep out oil and drift.



Paddle Wheels Mounted on Float Keep Oil and Drift Out of Yacht Harbor

Cont. W. W. Smith
431 Hawthorne Court
Madison, Wis.

Cont. E. H. Perry,
Box 245, Oakland, Calif.

031903

Cmt. Thos E. Sturmer Jr.
 145 S. Spring St
 Los Angeles, Calif

KEEPING SHIPS

from



ONCE again the American merchant marine is turning the bows of its vessels toward the Pacific. Fifteen new express liners, aggregating close to \$100,000,000, are being placed in western service. In shipping offices that trace their history back to the days of the square-riggers, clerks are dispatching messages west instead of east and are tabulating manifests once more filled with the strange names of Oriental ports and cargoes.

Ninety years ago, when dwindling commerce threatened the nation's maritime prosperity, sea captains ushered in the greatest era in American shipping by rounding Cape Stiff and pioneering trade routes to the Far East. Today, in similar circumstances, American vessels are setting out again, but they bear no resemblance to their predecessors.

Getting a China clipper ready for the sea was an arduous task. Tugs shoved it through San Francisco's Golden Gate. Then, under the captain's personal orders to the mate, it took the crew a good two hours of hauling and pulling to clothe the spars with a full suit of thirty different pieces of canvas.

Today, Capt. William R. Meyer, of the modern "Mariposa," accomplishes the beginning of the same voyage with a motion of his hand and a few words of command.

Left, Executive Officer of the "Mariposa," Thomas F. McManus, Locking Water-Tight Doors in Hold; Red and Green Lights Show Which Doors Are Open

Standing on the sheltered bridge, he swings the engine-room telegraph to full speed ahead. "Your course is 256 degrees," he tells the quartermaster at the wheel. "Change over to the 'metal mike' as soon as she's steady." A few minutes later the quartermaster shifts a lever that locks in the automatic pilot and walks away from the wheel. Except for a glance now and then at the gyro-compass repeater, he will pay no further attention to the helm until the course is changed.

From the minute the "Mariposa" picks her way past the last harbor buoy, one question is at the back of Captain Meyer's mind. Safety on the sea depends upon a continual string of answers to the query,

Getting "LOST"



would have another chance to shoot the sun. But the captain of a modern ship, that runs as far in one night as a sailing ship logged in thirty-six hours, must know his location on the water almost to the last foot. Even a small compass error will set him miles off his course in a few hours.

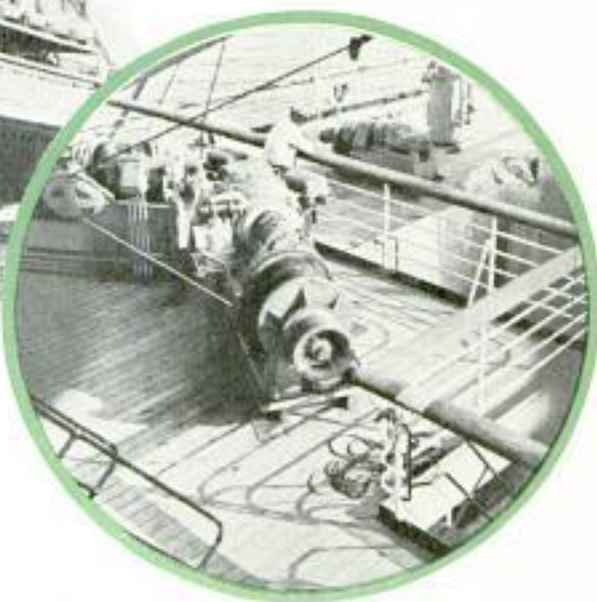
The eternal vigilance begins long before the land fades away. "Take a four-point bearing on that island," the



Top, Quartermaster Prepares to Turn Ship Over to Automatic Pilot; Center, the "Pennsylvania"; Bottom, Electric Winches Handle Cargo

"Where am I?" The many instruments intended to ease the work of navigators only add to their duties, for instead of adopting one system to keep on his course, a careful captain uses them all to check on one another.

Years ago a sailing master was content if he was within fifty miles of his estimated position. The day after, or the next, he



captain orders, and a junior squints through the sights of a polaris, set up on a compass bowl. Then, as soon as the is-



Taking Cross-Bearing on the "Mariposa's" Radio Direction Finder

land is abeam, another bearing is taken, the time and ship's speed noted, and the position marked down. Two hours later the watch officer glances at the dials of the pitometer log and the gyro compass, and steps into the chart room. "Distance run, forty-one miles; course, 256 degrees," he muses. With parallel rulers and a compass he works on the chart, finally making a dot with his pencil. "That's where we are by dead reckoning. Let's get a radio bear-

ing." In the corner of the chart room is the direction finder, supporting a column that reaches through the ceiling to the loop aerial on the flying bridge. Turning the column until the continuous signals from the San Francisco station are loud, the officer notes the bearing of the pointer arm, then changes the circuit to bring in the station at Point Arguello. With two bearings, he traces a triangle, one point of which coincides with the dot representing the ship's position. "Right on our course," he announces.

Later, when he turns the bridge over to his relief, he repeats the latest position, which the relieving officer immediately checks. "Orders are to change the course to 255½ degrees at nine o'clock. Call the captain if the visibility is reduced." Ships on great-circle courses steer for their destination by means of a curved track, and the more frequently the course is changed, the

shorter is the path of the ship. At an order from the officer, the quartermaster disconnects the automatic steering gear, brings the ship over to the new course, and again puts the helm under the accurate control of the metal mike.



Quadrant Gravity Davits Operated by One Man Swing the Lifeboats Clear on New Vessels Operating in Pacific Service

Several days out, beyond the range of the shore radio beacons, the question "Where am I?" still persists. Winds and currents are continuously at work and their effect on dead reckoning cannot be accurately measured. At least once every four-hour watch the position is checked, by the sun in the daytime and by the stars at night. Even if the sky is obscured, dead reckoning is no longer used alone. At the first hint of thick weather the captain takes charge of the bridge. Within a few hours he calls the radio operator. "See if you can pick up any ships in



Top, Old Sailor Inspects Fathometer That Replaces Lead-Heaving in Determining Depth; Left, the "Mariposa's" Gyro-Compass Repeater and the Polaris

clear weather that have just gotten their positions." In a few minutes the operator makes his report. "The 'Green Cypress,' 800 miles north, sir, and the 'Kenyon Maru,' 500 miles west." "Good. Ask them to transmit until we get their bearings. And get me the latest weather report." The storm area into which the ship is entering has its center 500 miles to the southwest and is moving east. The captain estimates the point at which he would encounter the storm and plots a course to dodge its center.

Passengers on the Pacific are receiving the impression that the intense storms that formerly lashed shipping no longer occur, since

(Continued to page 123A)



Lane. Wells Co. 4439 Santa Fe Ave.

POPULAR MECHANICS

Los Angeles, Calif

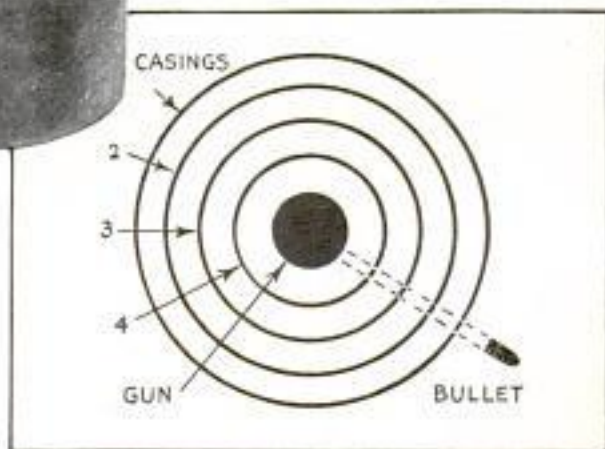
Oil-Well Gun Perforates Casing a Mile Deep



casing prohibited the use of mechanically operated devices capable of effecting lateral perforation, hence a special gun, with a barrel so short as to be contained in a casing less than five inches in diameter, was developed. This gun is composed of a number of sections, threaded together, each section containing removable breech blocks and barrels. It was also necessary to develop special ammunition to meet the extraordinary conditions encountered in subterranean gun fire. The explosive charges must be kept dry, must fire at depths as great as 10,000 feet, and submerged in water, oil and mud, since the well casings cannot be emptied of liquid as they would then collapse under external pressure. As a result, the guns are fired under hydrostatic pressure of thousands of pounds per square inch. Despite such handicaps, the guns are able to penetrate as many as four concentric rings of casing and cement at one time. The explosive charges can only be fired by electric current, contact being

Top, Withdrawing Gun after Firing Charge Far Below Surface; Center, Bullet Holes in Four Casings Encircled in White; Bottom Diagram Shows How One Bullet Penetrated Four Casings

Production problems in the oil fields are now being solved by a specially developed gun which shoots a bullet through four thicknesses of casing and cement one mile underground. Often, in drilling, a well is continued to a great depth to tap a known producing sand, while other more or less productive sands encountered on the way are sealed off by the casing and its surrounding wall of cement. When the productivity of the lower zone becomes depleted, the sands at upper levels would yield oil if it could penetrate the cement and casing. The small diameter of the



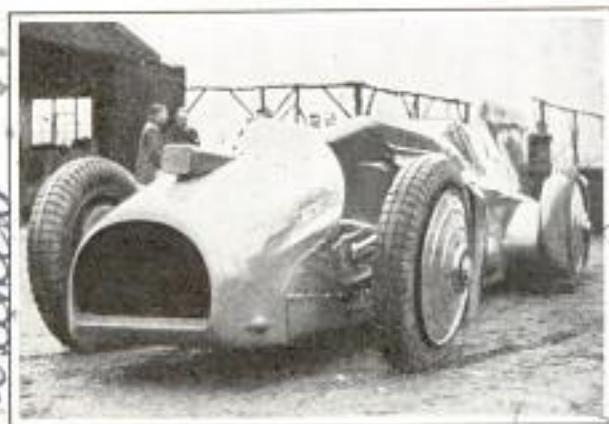
Patd April 27, 1916. d.W. Davis
Pat. # 1,582,184.

686
40

made at the surface after the gun has been lowered to the correct depth. Premature or accidental discharge is impossible, since the charges are so isolated within the gun body as not to be subject to explosion from heat or from jar in handling. A thermal element, imbedded in each charge, is rendered incandescent by electrical energy, generated on a service truck at the mouth of the well and transmitted to the gun through an armored cable from which the gun is suspended.

C 209
'GUN' AIR INTAKE ON 'BLUEBIRD' SERVES SUPERCHARGER

For supplying the supercharger on Malcolm Campbell's racing car, the "Bluebird," a "gun" air intake has been mounted on the front of the auto. When the car is moving at high speed, air is forced into the mouth of the gun at the rate of over 260 miles an hour. The speed of the car thus raises the supercharger pressure so that an increase in speed of about five miles per hour results. The supercharger takes the form of a large fan rotating 30,000 times a minute and injecting air and gasoline into the 2,500-horsepower engines. So high is the air pressure at speeds of five miles per minute that the gun in-



© London Daily Mail
Large Air Intake on the "Bluebird" That Helps Increase Its Speed Five Miles per Hour.

take must be made of very tough metal, to prevent the pressure from tearing it from the car. The roar of the engines is so great that the driver wears gun servers' earmuffs to protect his eardrums.

■ A platinum nugget weighing over thirteen pounds was found in the Ural mountains.



This Picture Is "Painted" with Colored Sand and Mounted in Glass-Covered Box

PAINTING WITH COLORED SAND IS UNUSUAL ART

Colored sands are used by an Iowa farmer-artist in producing unusual paintings. The natural sands for the pictures are taken from Pictured Rocks, near the artist's home. The sand paintings are mounted in boxes or bottles.

PAPER X-RAY TUBE STRONGER THAN GLASS TYPE

X-ray tubes made of laminated paper have been found stronger than those of glass and capable of withstanding higher voltages. In experiments to develop X-ray tubes for the 10,000,000-volt static-electricity generator being built at Round Hill, Mass., a paper tube that withstands 300,000 volts without a puncture has been produced. This voltage has been the limit for glass tubes of similar size, while 400,000 volts will break any glass tube. The paper tube is cylindrical in shape, four feet long. One feature is an India-ink line drawn in a spiral on the outside of the cylinder from one end to the other. This line strengthens resistance to puncture by the high voltages inside and also prevents sparks from forming on the outside.

Built at Palmer Physical Laboratory, Princeton, N.J. by C. L. Van Atta and A. J.

near Mc Gregor, Iowa

Cont. Without

announced in Physical Review

Van de Graaff at M.I.T.



Cluster of Dials That Help to Operate a Modern Cruiser: Photo Shows Part of the Control Board of the "Indianapolis"

BOILER CONTROLS ARE "NERVES" OF MODERN CRUISER

In the boiler room of the modern cruiser, the "nerves" of the fighting craft terminate in a maze of dials on the boiler control board. The control board shown is that of the U. S. S. "Indianapolis," the first of two \$12,000,000 light cruisers built for the navy. The craft, weighing 10,000 tons, was authorized by congress several years ago in a program calling for fifteen such boats.

RAW SUGAR MADE FROM WOOD IS PLANNED IN SWEDEN

Production of raw sugar from wood on a commercial scale is planned in Sweden, the result of chemists' reports. One million metric, or long, tons of wood sugar could be produced annually. Of this amount, the chemists suggest exportation of 660,000 tons of sugar to England and Denmark for refining. A new method makes it possible to extract about sixty pounds of sugar from 100 pounds of wood. This raw sugar may be used as cattle feed, material for yeast production and for alcohol distillation, but is not intended for human consumption without refining. Immediate use of the sugar would be in pro-

ducing alcohol, because of the expected increase in demand if the Swedish government makes it compulsory to mix imported gasoline with alcohol, in the proportion of three to one, for use in motor vehicles.

C 212 PREHEATER MAKES PLANE START EASILY

Starting and warming up the airplane engine on cold days has been made easy by a simple method devised at the Chicago terminal of Braniff airways. The nose of the plane is placed two or three feet from a steam heater of the blower type,

which is attached to an inside wall of the hangar at about the height of the plane. A tarpaulin is fixed around the heater, extending around the cowling of the motor and is laced together at the bottom. In about forty-five minutes, the engine is warm enough for quick starting. This results in a substantial saving, since the warming-up time is reduced to only a few minutes, and the plane is ready to take off soon after the engine has been started.



Hood Covering Plane's Nose Helps to Transmit Warmth from Wall Heater to Aid in Starting

Report to Commerce Dept. from Commerce Attache S.O. Wood, C 212 Swedish Forest Commission

Chicago are Chicago 736 N. Lang

C 315 Chicago Architectural Photographing Co. 904 Mather Tower
758 Wacker Drive Chicago

What You'll SEE at the WORLD'S FAIR



Night View of Front of Administration Building, Showing How Lighting Is to Be Used for Decoration; This Is One of the Few Permanent Structures Built for the Fair

NEARLY every world's fair leaves its architectural imprint on the following generation, and this promises to be true particularly of the Century of Progress, opening in Chicago in June. Visitors will find the exposition buildings constructed of entirely new materials and they will also find new applications of old materials. Welded or bolted steel frames and the use of wallboard, or other inexpensive materials, have made possible a simplicity of design and construction heretofore not associated with huge structures like the great halls, where will be portrayed the dramatic story of man's achievements during the past century. The materials in nearly all the buildings are to be salvaged when the fair ends, hence the structures are entirely lacking in the "gingerbread" ornamentation usually considered essential for decorative purposes. Instead, lights and bright-hued paints are to supply the "trimmings" for the buildings, and the fair if it does nothing else, is likely to demonstrate the practical value of exterior and interior illumination for decorative purposes, and to

show the practicality of simplified construction as applied not only to large buildings, but to small homes as well. In one other respect, the Chicago exposition also will be unique. It is not a skyscraper fair, but depends on mass, rather than height, for its appeal. Its great groups of buildings stand on about 350 acres of man-made land reclaimed from Lake Michigan, and, except for towers, none of these structures is 100 feet tall. Even the loftiest tower is less than 200 feet high, so visitors will be faced with an exposition three miles long and less than 100 feet in height. Taller points will be accentuated with lights and color, however, to give the illusion of height. The thousands of exhibits telling the story of the strides of science and industry will also be different from ordinary displays, since most of them will be rendered more effective by actual or simulated motion. Hence visitors will not see human progress portrayed in numberless lifeless exhibits, but will learn the story from displays involving motion and dynamic action. The following pages present a pre-view of the fair.

C 315



Left, Tower of the Hall of Science; Above, General Motors Building Where This Company's Products Will Be Displayed; Below, Circular Wall of Electrical Group; Colored Light Will Give Effect of Water Cascade Here



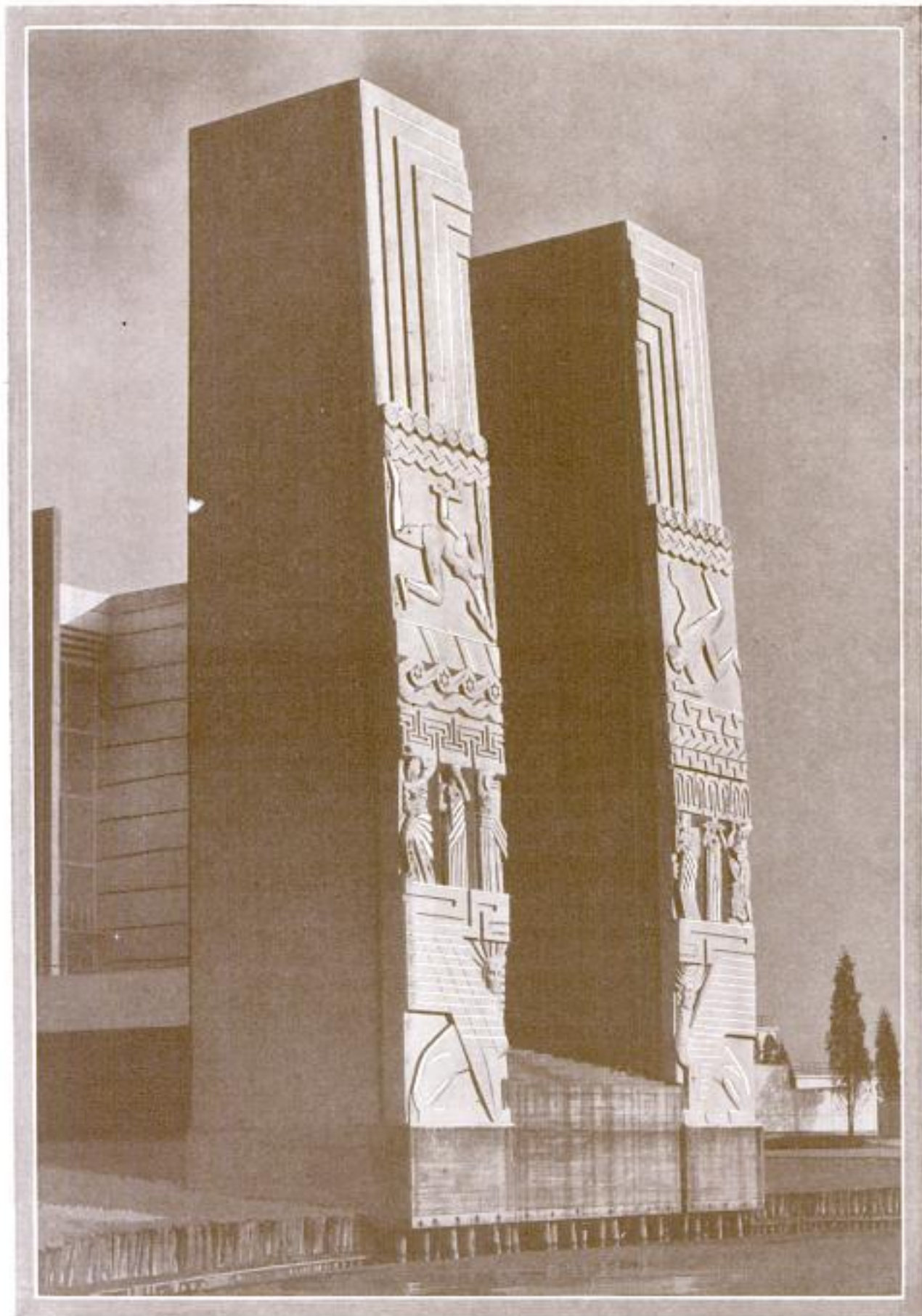
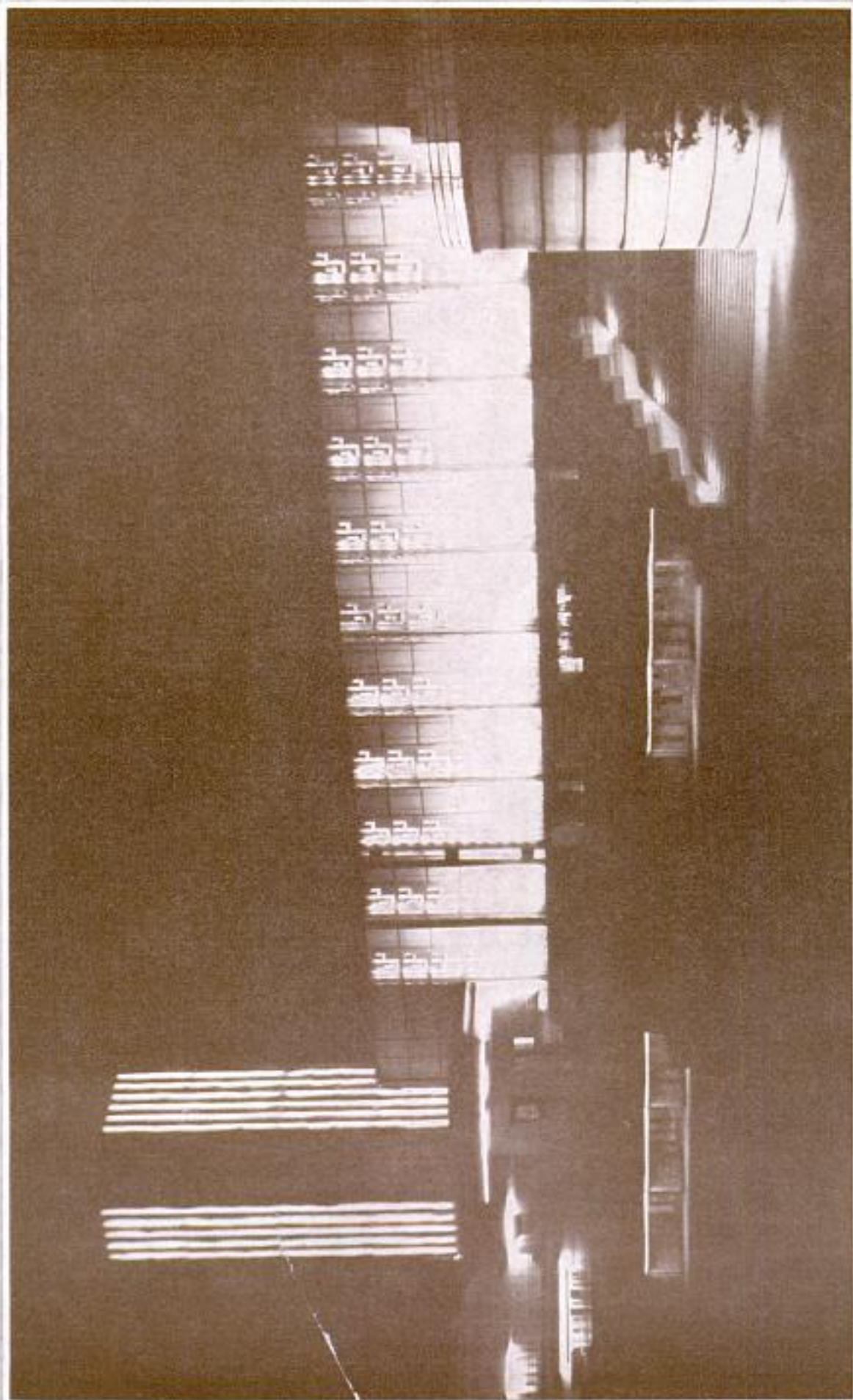


Photo by Chicago Architectural Photo Co.

Close-Up of One of the Many Striking Architectural Effects; These Twin Pylons Guard the Water Gate to the Electrical Building; the Figures Represent the Forces of Electricity

C 315



Night View of the Hall of Science, Showing How Lights Are to Be Used for Decorative Purposes; Neon Tubing and Floodlights Concealed in Wall Troughs Are Employed; Changing Colors Will Add to the Effectiveness of the Lighting Scheme, and at Night the Exposition Will Be a Blaze of Light and Color



Top, Corner of Administration Building, a Striking Example of the New Methods of Building with Its Bolted Steel Frame, Walls of Asbestos Wallboard and Ground Newspapers and Cornstalks as Insulating Materials; Center, Transportation Building Which Has Roof Suspended by Cables; Left, Ferro-Enamel House, One of the Many Modern Homes Visitors Will See at the Exposition

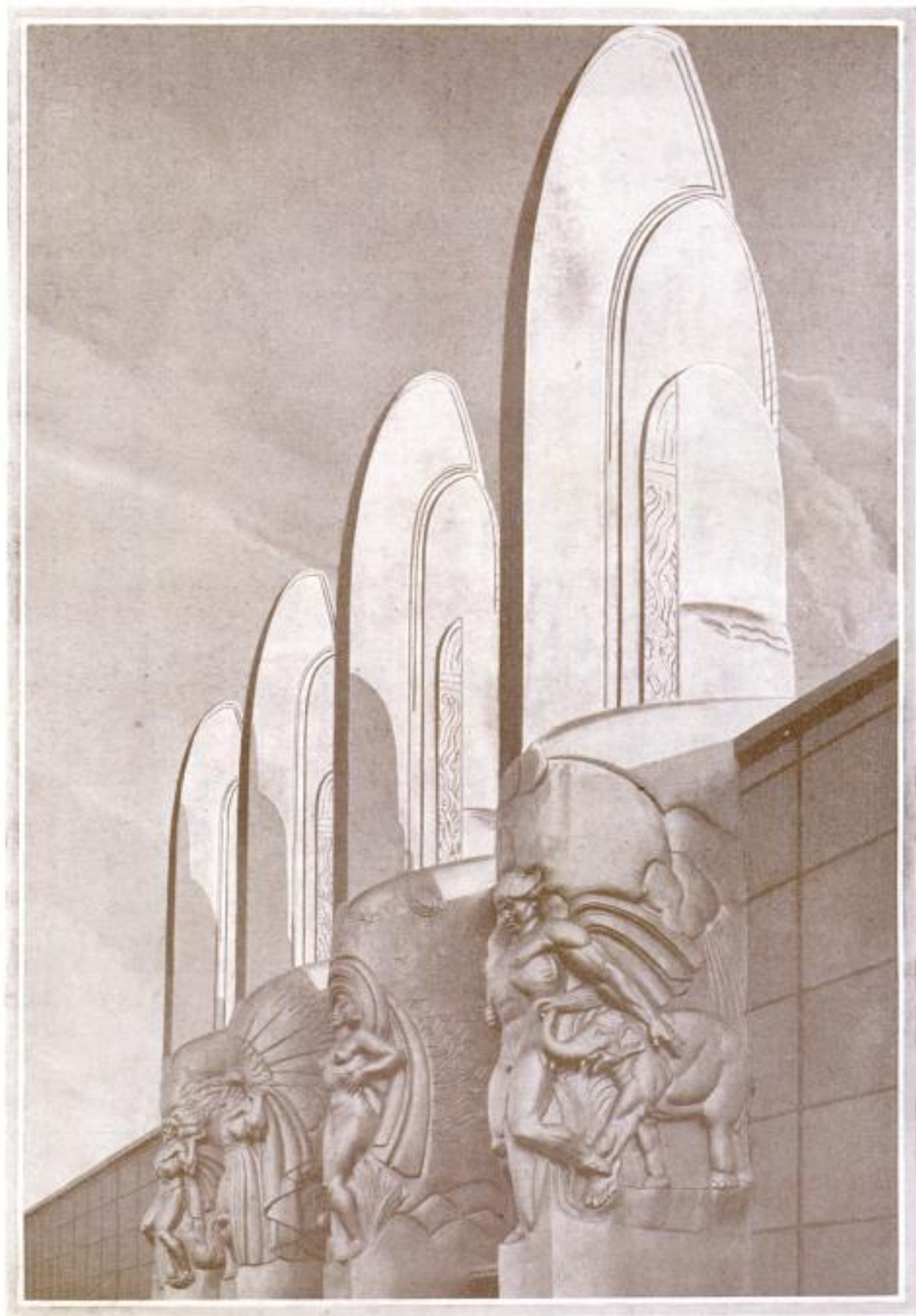
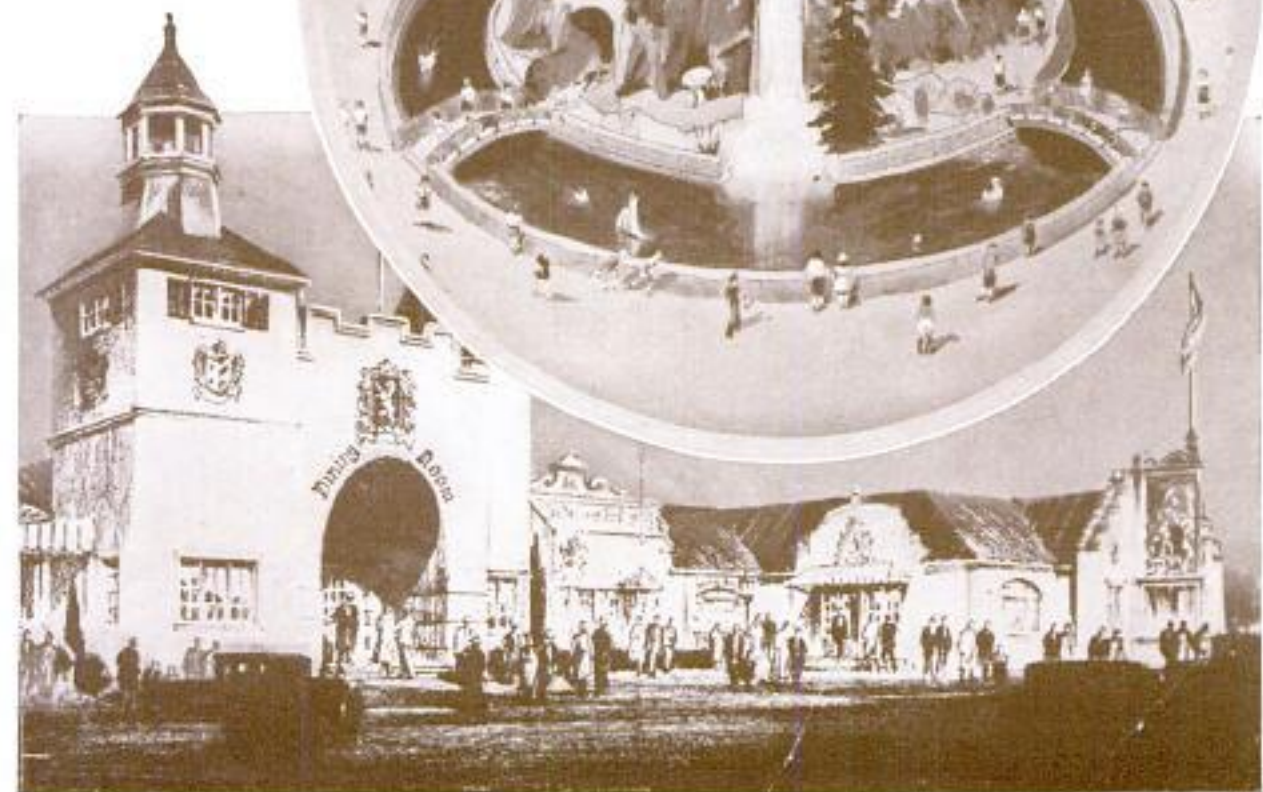
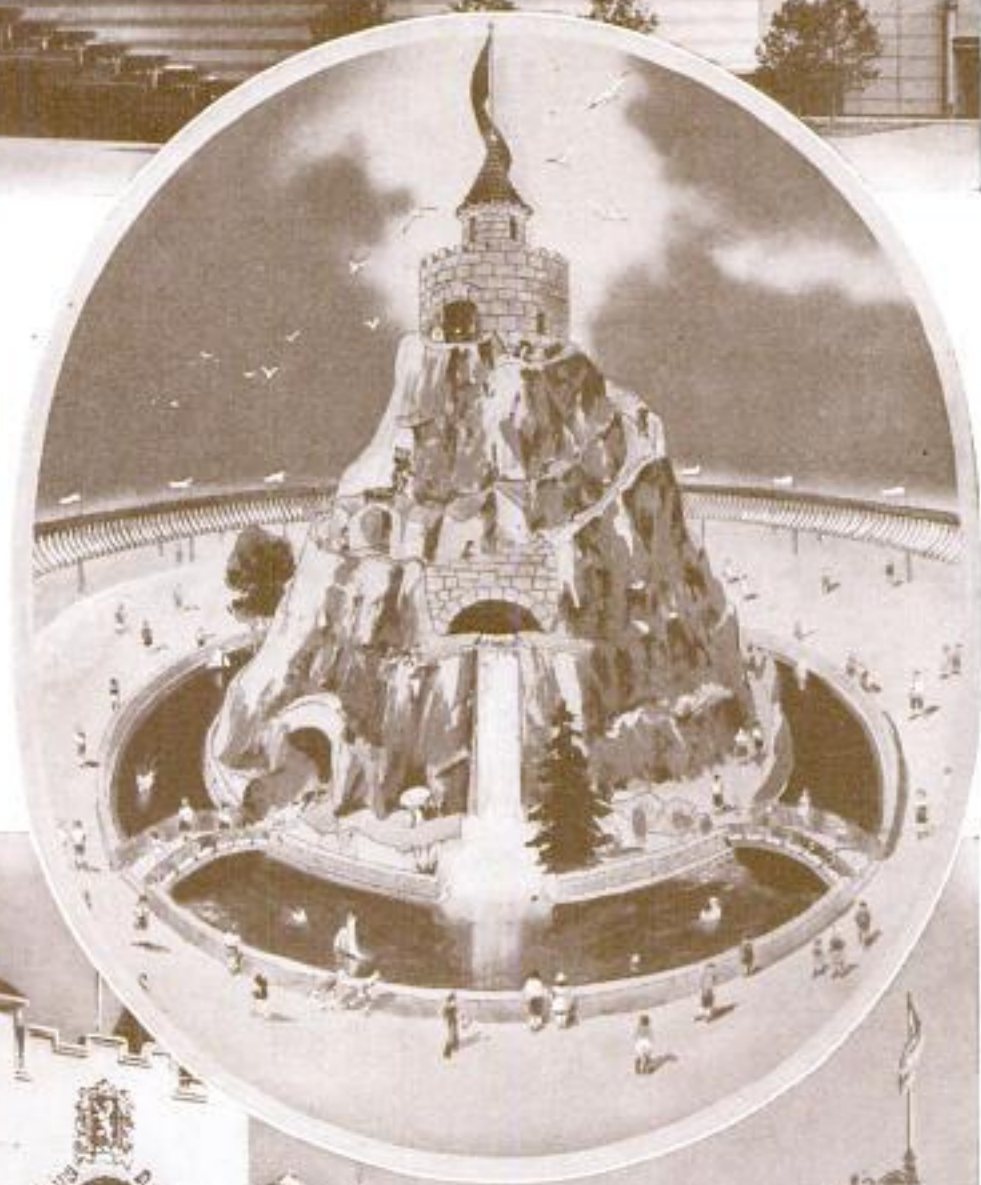


Photo by Chicago Architectural Photo Co.
Modernistic Sculpturing over the Entrance to the Hall of Social Science; the Full Effect of Designs Such as
This Is Seen at Night When Indirect Lighting Enhances the Lines

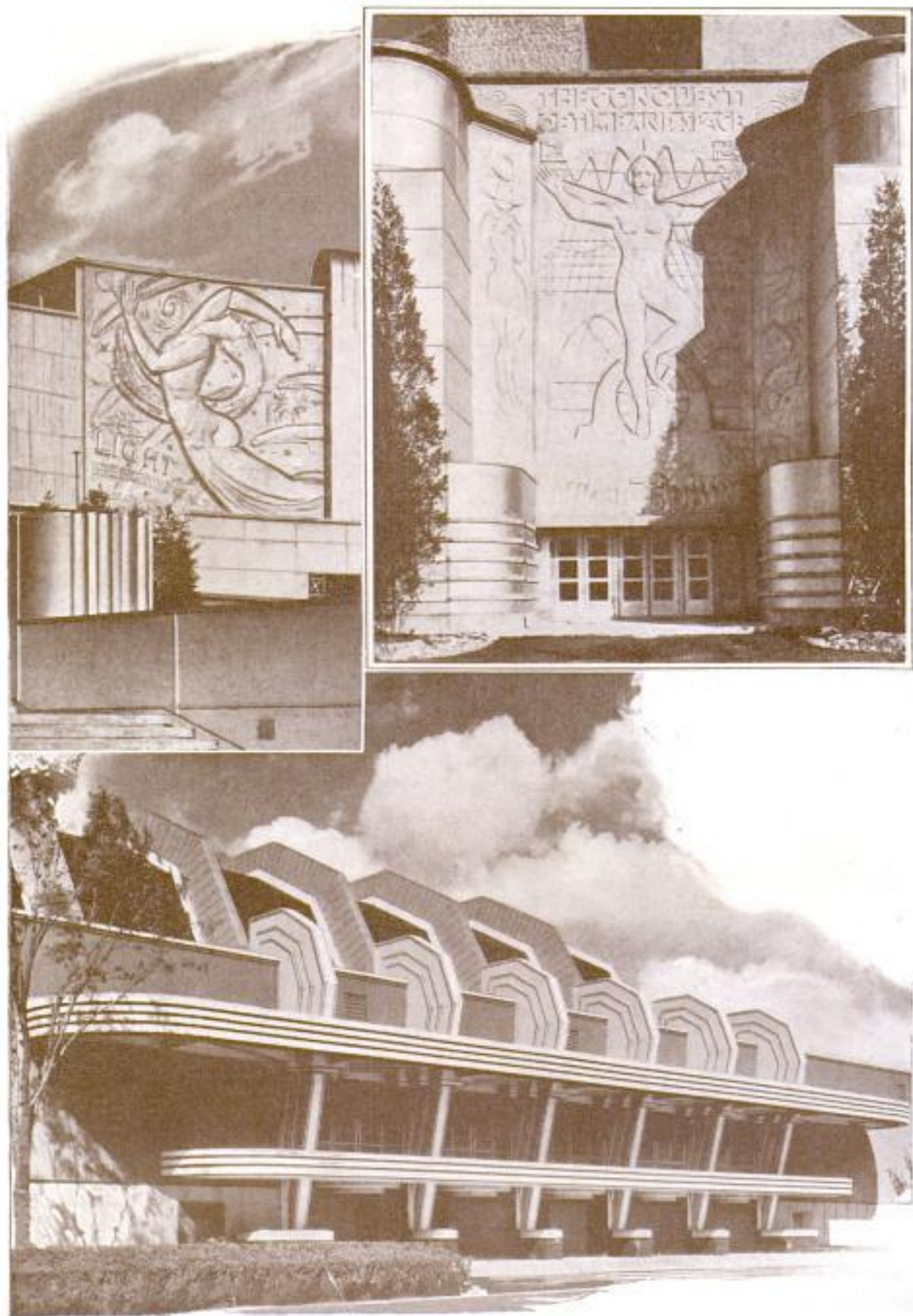
C315



Above, One of Exposition Groups Showing Unusual Effects Obtained by Juxtaposition of Masses and the Use of Horizontal Planes and Angles; Right, the Magic Mountain on the Enchanted Island, the Children's Project Being Built by Architect George W. Buckley; Below, Old Heidelberg Inn, One of the Attractive Dining Places

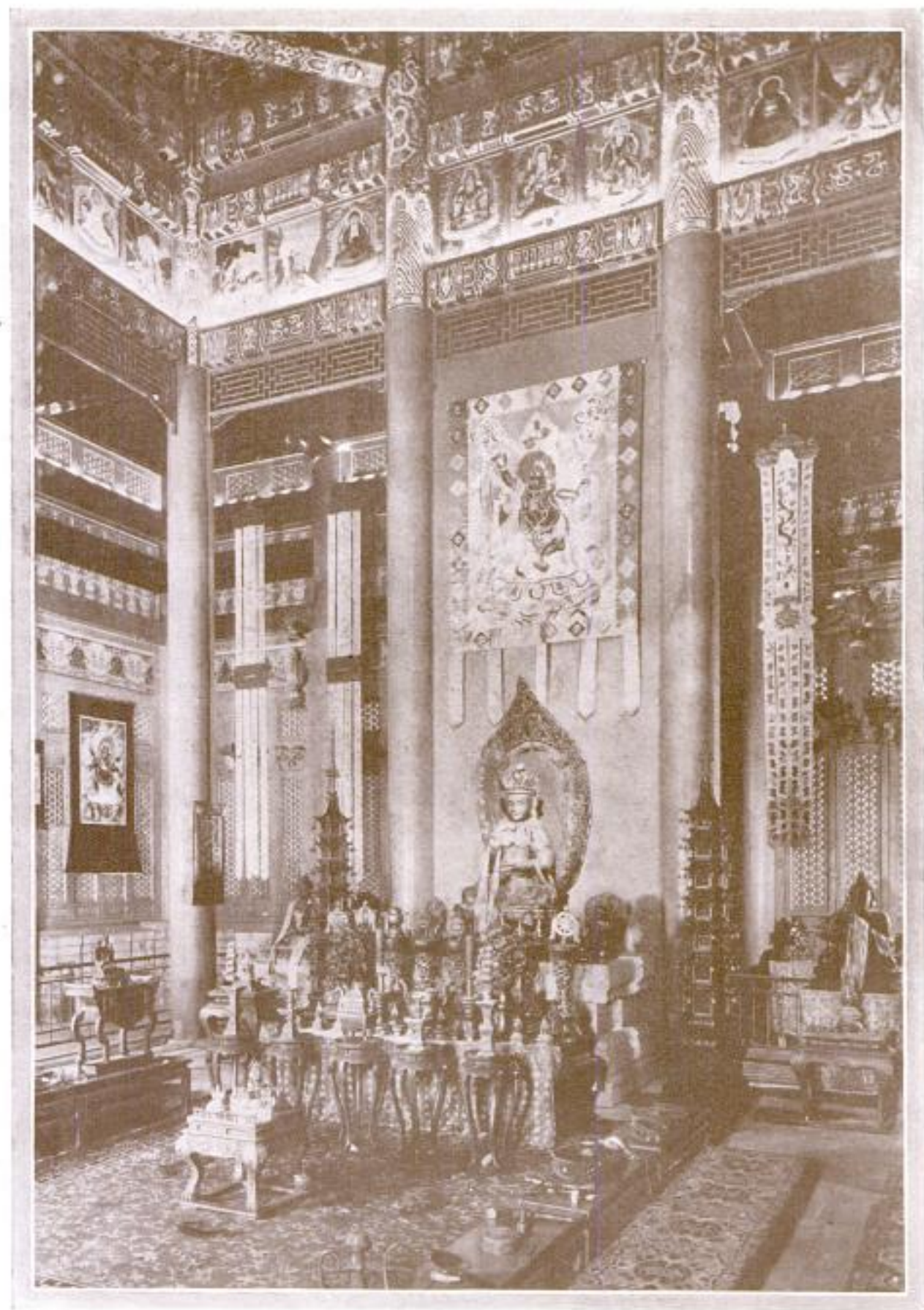


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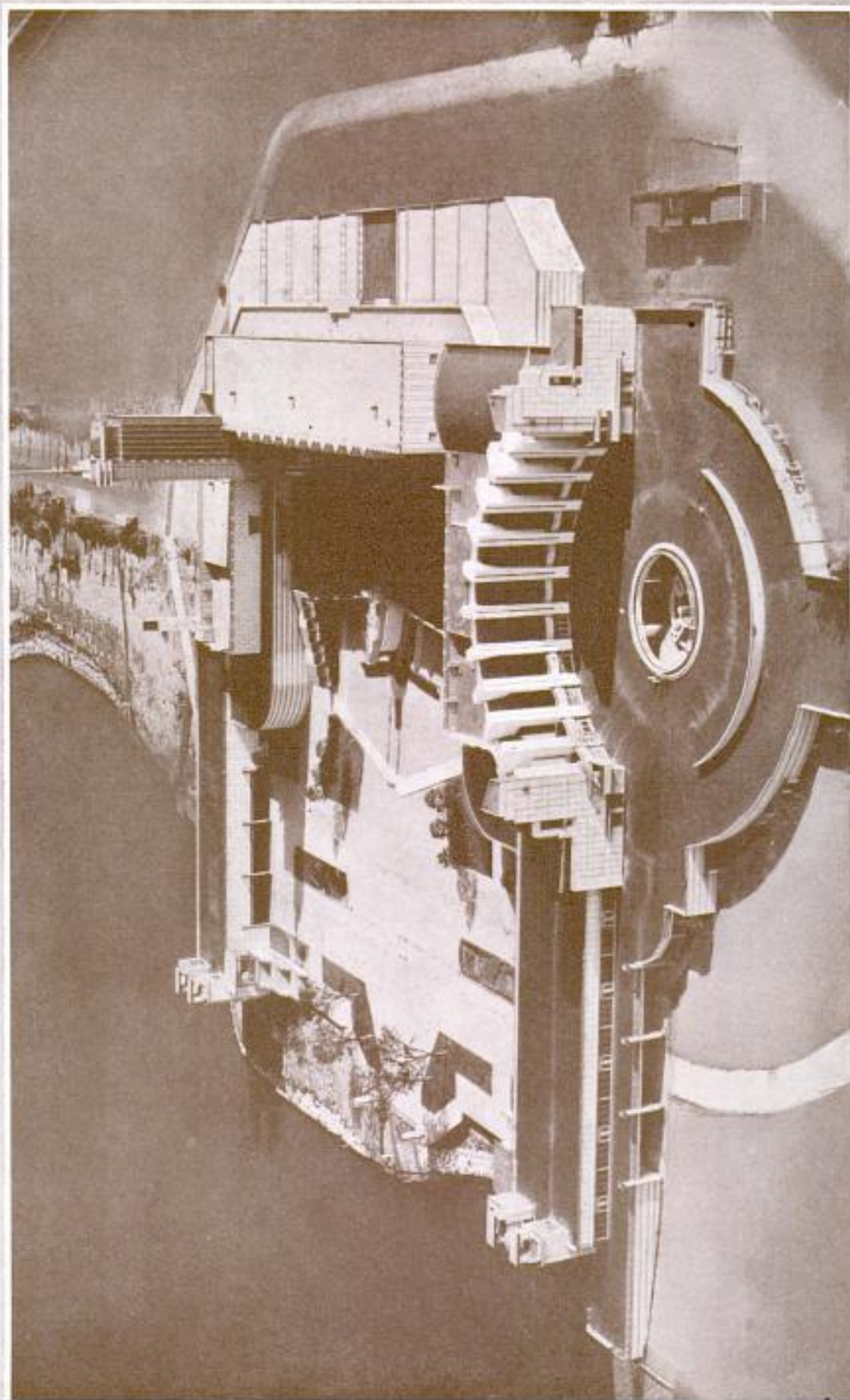
Left Top and Bottom Photos by Chicago Architectural Photo Co.

Above, Bas-Reliefs on Walls of the Electrical Group, One Depicting Light and the Other the Conquest of Time and Space; Below, a Section of the Travel and Transport Building

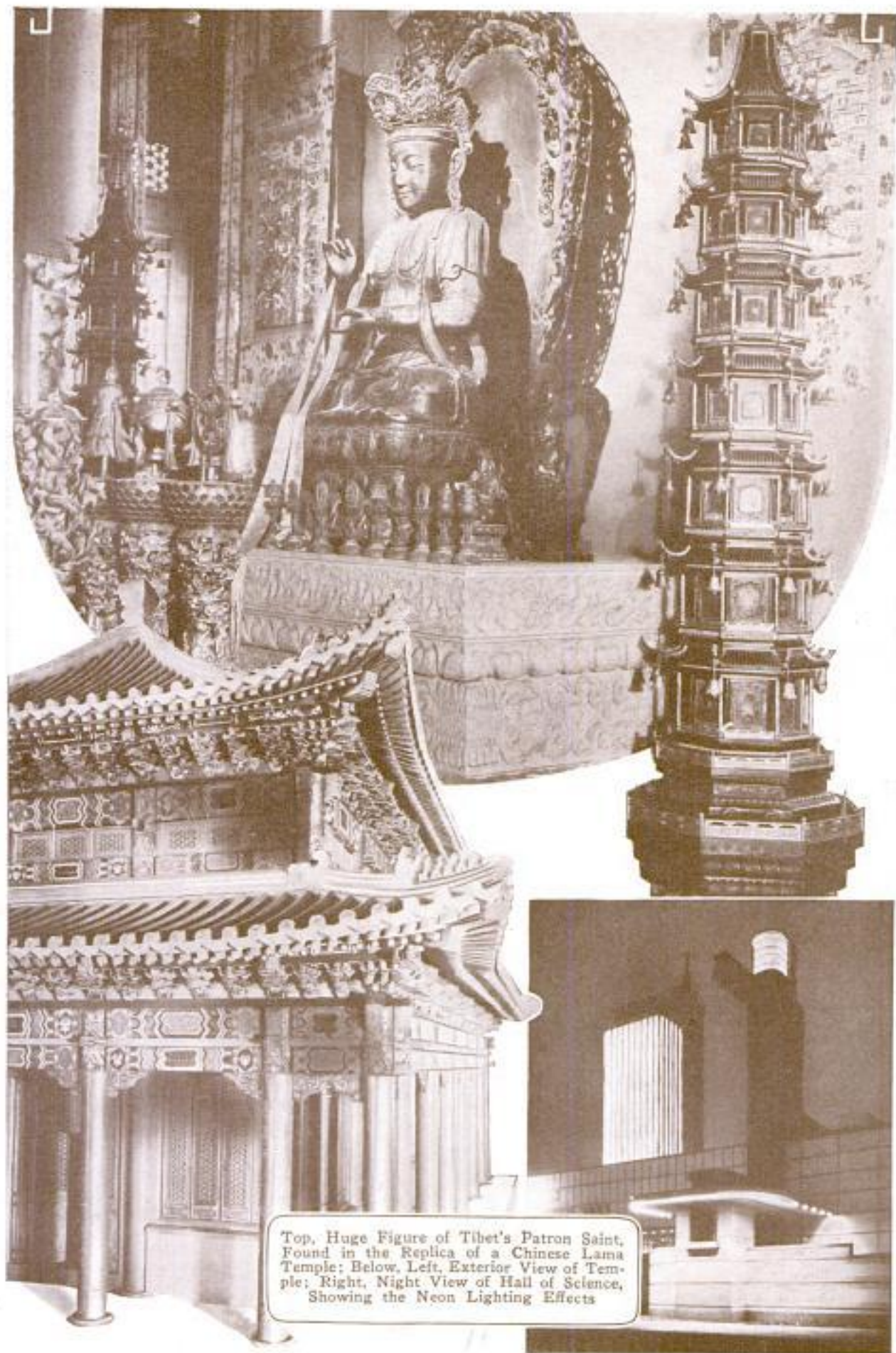


Interior View of Replica of Golden Pavilion of Jehol, Housing Treasures from the Lama Temples of China; the Structure Was Brought to the Fair from China in 28,000 Parts; the Original of This Magnificent Temple Was Built in 1767 at Jehol, the Summer Home of the Manchu Emperors

C 315



Air View of the Hall of Science, Giving a General Idea of the Architectural Effects the Exposition Will Present; the Tower in the Background Is 176 Feet High and Will Be Illuminated at Night; Here Will Be Displays Showing Scientific Advancement during the Past Century



Top, Huge Figure of Tibet's Patron Saint, Found in the Replica of a Chinese Lama Temple; Below, Left, Exterior View of Temple; Right, Night View of Hall of Science, Showing the Neon Lighting Effects

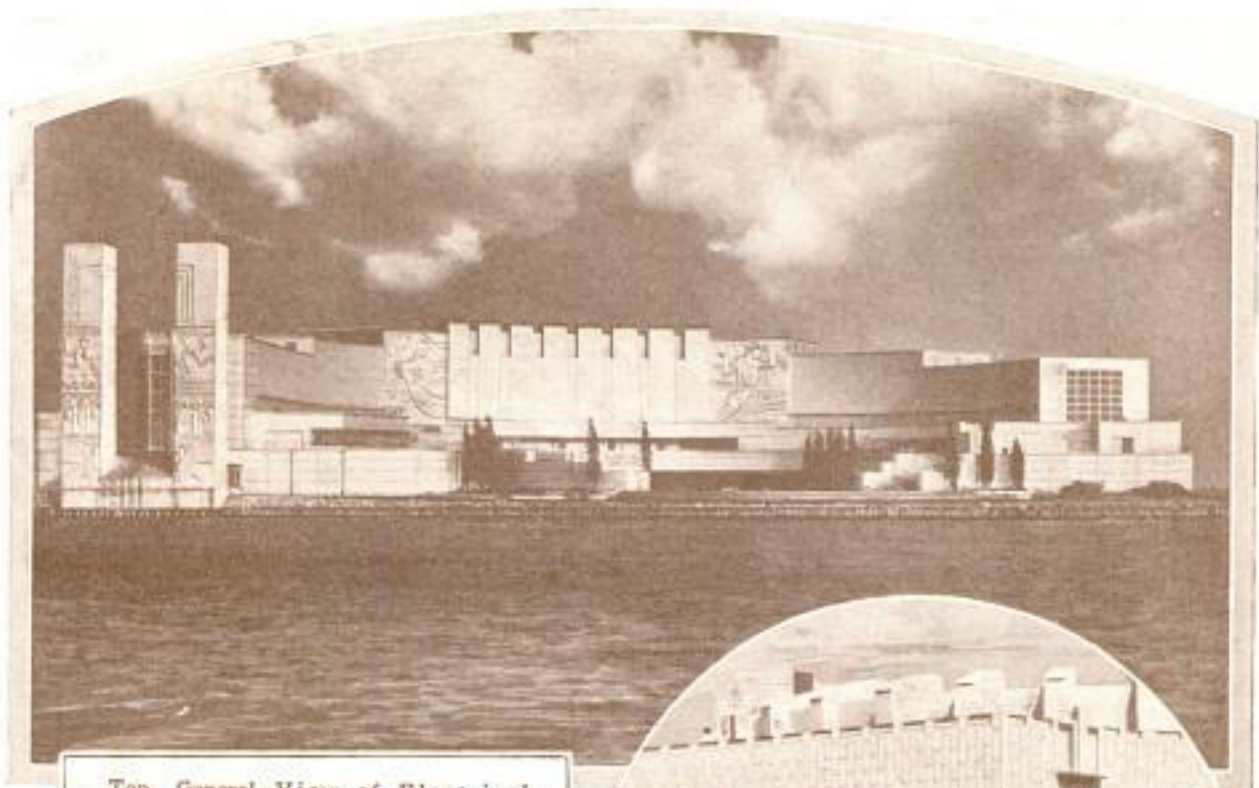
C 315

700

POPULAR MECHANICS

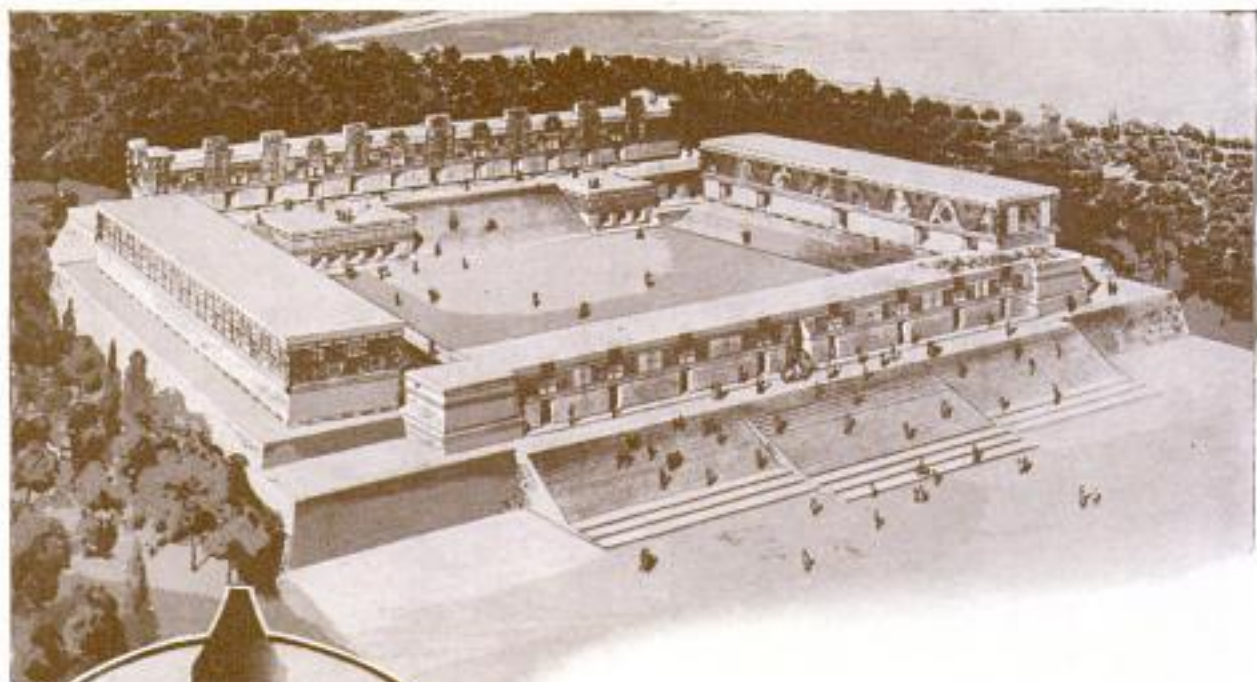


A Striking Comparison between the Ancient and the Modern; in Circle Is a Replica of Abraham Lincoln's Birthplace in the Fair's Lincoln Group; Below, Illuminated Exposition Building

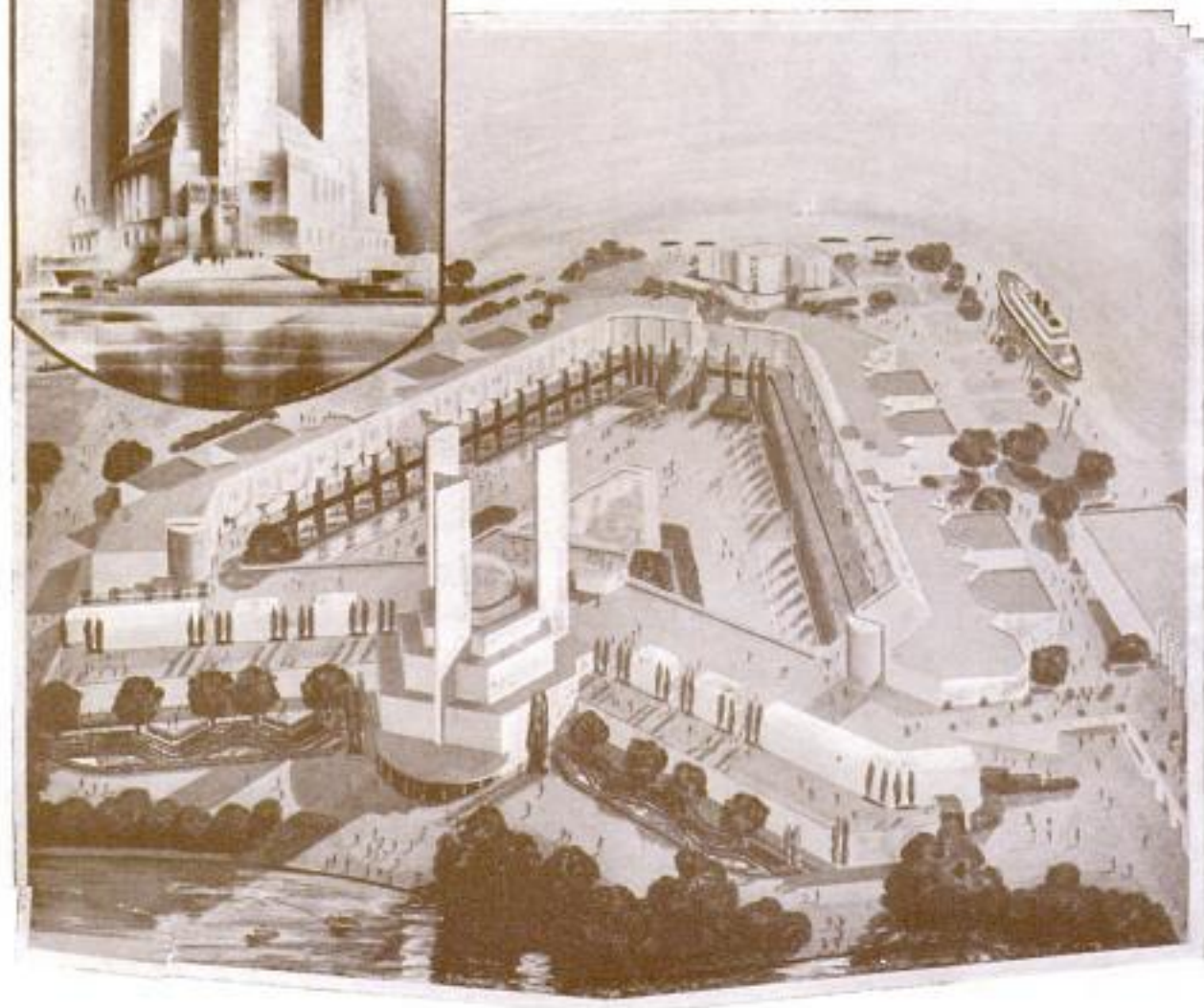


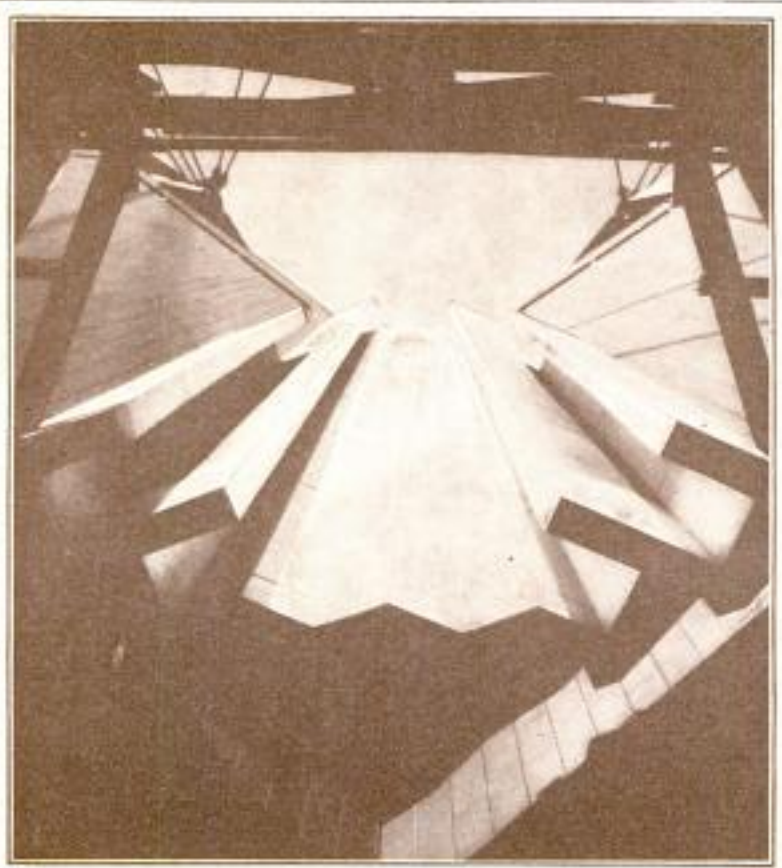
Top, General View of Electrical Group; Right, One of Long Coaches That Will Carry Visitors on Sightseeing Tours; Below, North Facade of Hall of Science; at Night the Pylons, Arranged in a Semicircle about an Electric Fountain, Are Illuminated in Red, and the Tower Behind in Blue.





Above, View of the Maya Temple; Left, Towers about Dome of Federal Building Representing the Three Branches of Government; They Will Be Silhouetted at Night by Unusual Lighting Effects; Below, the Hall of the States and Federal Building





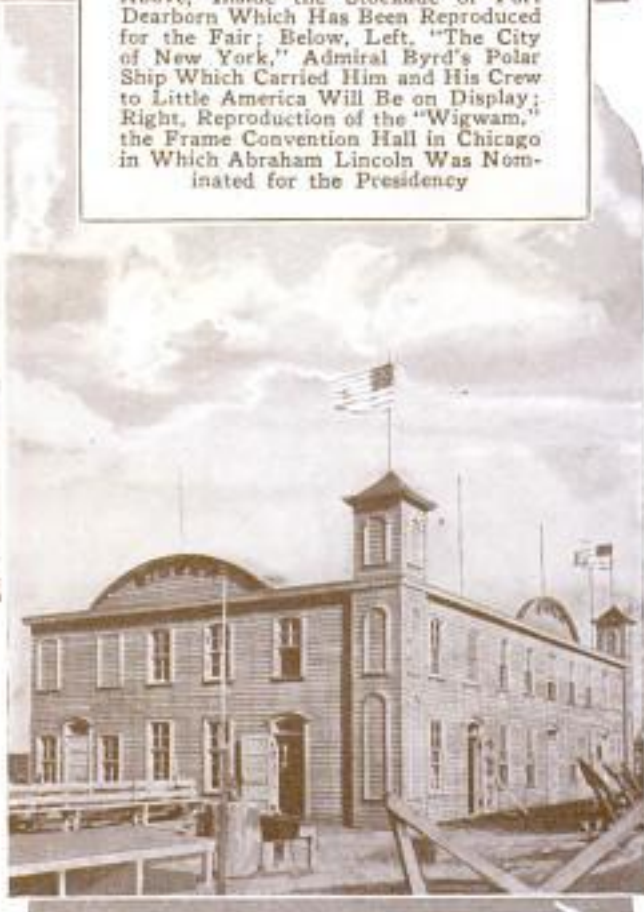
Above, the Photographer Tilted His Camera Vertically to Obtain This Unusual View Looking Skyward through a Light Trough in the Dome of the Travel and Transport Building; Below, Entrance to Agricultural Group Where the Story of the Evolution of Farming from the Cradle and Flail to the Tractor and Combine Will Be Shown in Dramatic Form



C 315



Above, Inside the Stockade of Fort Dearborn Which Has Been Reproduced for the Fair; Below, Left, "The City of New York," Admiral Byrd's Polar Ship Which Carried Him and His Crew to Little America Will Be on Display; Right, Reproduction of the "Wigwam," the Frame Convention Hall in Chicago in Which Abraham Lincoln Was Nominated for the Presidency



Top Photo by Chicago Architectural Photo Co.

Scene New Letter 2/18/33

ELECTRIC EYE GUARDS WATER TO KEEP IT PURE

C 390

Purity of drinking water requires careful watch, so the photo-electric cell, or electric eye, has been assigned the duties of regulating the amount of chlorine liberated into the water supply to destroy germs. Action of the cell is prompted by color changes. Engineers of the Westinghouse Electric and Manufacturing company have developed the automatic water watchman, which compares a sample containing the right amount of chemical with a sample of water taken from the mains. This comparison is done with light. If the sample from the mains does not transmit light properly, chlorine sufficient to correct this condition is placed in the water.

RENEWABLE PAD FOR SANDING GIVES LONGER SERVICE

C 331

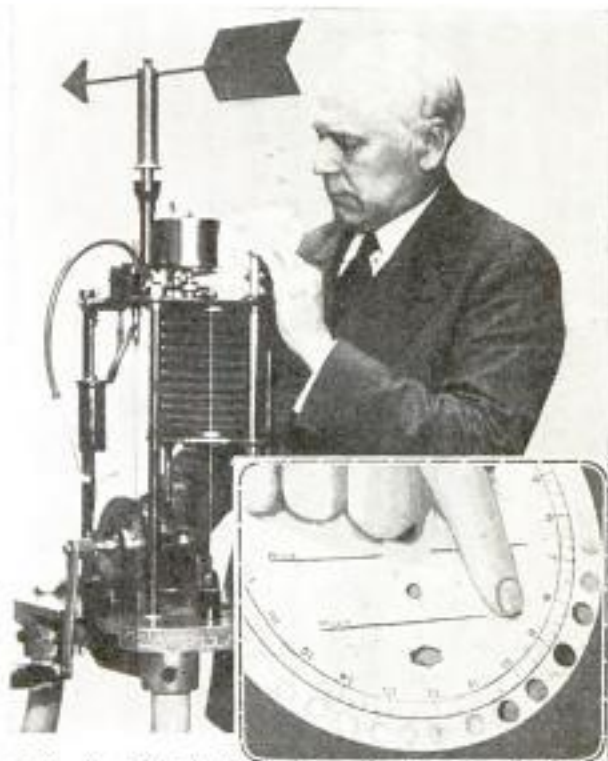
By fitting the sanding machine with a new pad or disk that can be resurfaced at low cost, the operator is assured of fast cutting and longer service. The pad is a substitute for the fiber and paper disks which often are destroyed by sharp edges. Seven ounces of abrasive are used on the renewable pad, which is felt-backed and flexible. Any-size pad can be obtained, and the operator may do his own resurfacing. One disk has been resurfaced twenty times without wearing out.



New Sanding Pad in Use, and Flexible Abrasive-Surfaced Disk

Deely 1511

Re. No Sanding Pad Co., 2400 W. Madison, Chicago



© The London Daily Mail
Recording Air Conditions; Inset, Dark Spots on Edge of Disk Warn of Approaching Fog

FOG IS DETECTED BY AIR FILTER TO AID POWER STATIONS

Warning of the approach of fog, which would increase the demand for electric lights, is given London power stations by a new signaling device. A disk, rotating on a turntable, filters a measured volume of air, hour by hour. Variations in the amount of impurities in the atmosphere are registered on the edge of the disk, which is divided into twenty-four sections, with subdivisions for every fifteen minutes. The blacker spots on the disk show when the air is most polluted by soot and dirt causing fog, and indicate the approach of murky weather.

IODINE FROM OIL-WELL BRINE CAN SUPPLY U. S. NEEDS

C 387

Iodine extracted from California oil-well brine can be produced in sufficient quantities to supply all of America's needs. A chemical plant at Los Angeles already is extracting several hundred pounds of iodine per day and it can expand to produce 350 tons per day, the present consumption of the United States. Operation of the plant has caused a reduction in price by the Chilean nitrate corporation.

Scene New Letter

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C 353

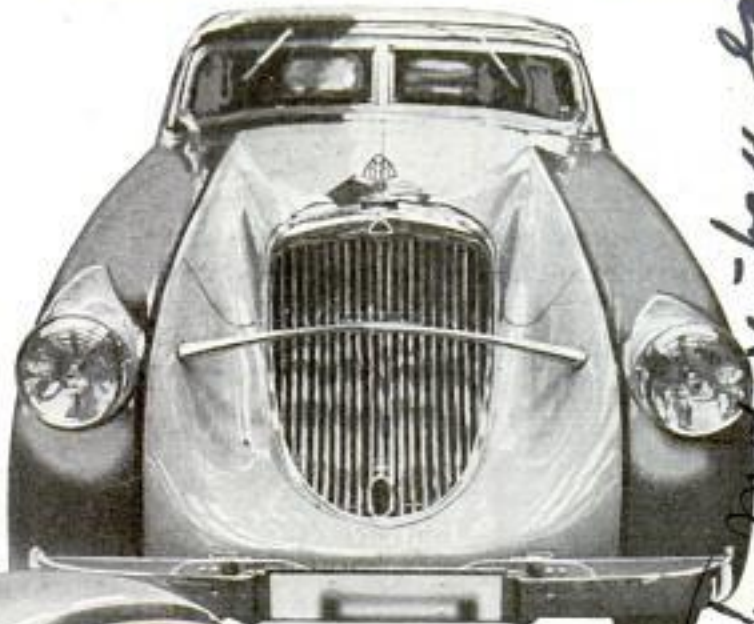
res. St. Paul R. 502

537 S Dearborn
POPULAR MECHANICS

Chicago

Foreign Cars Offer Striking Shapes and Lines

*Argie Werk Co.
Manufacturing Press Shop
706*

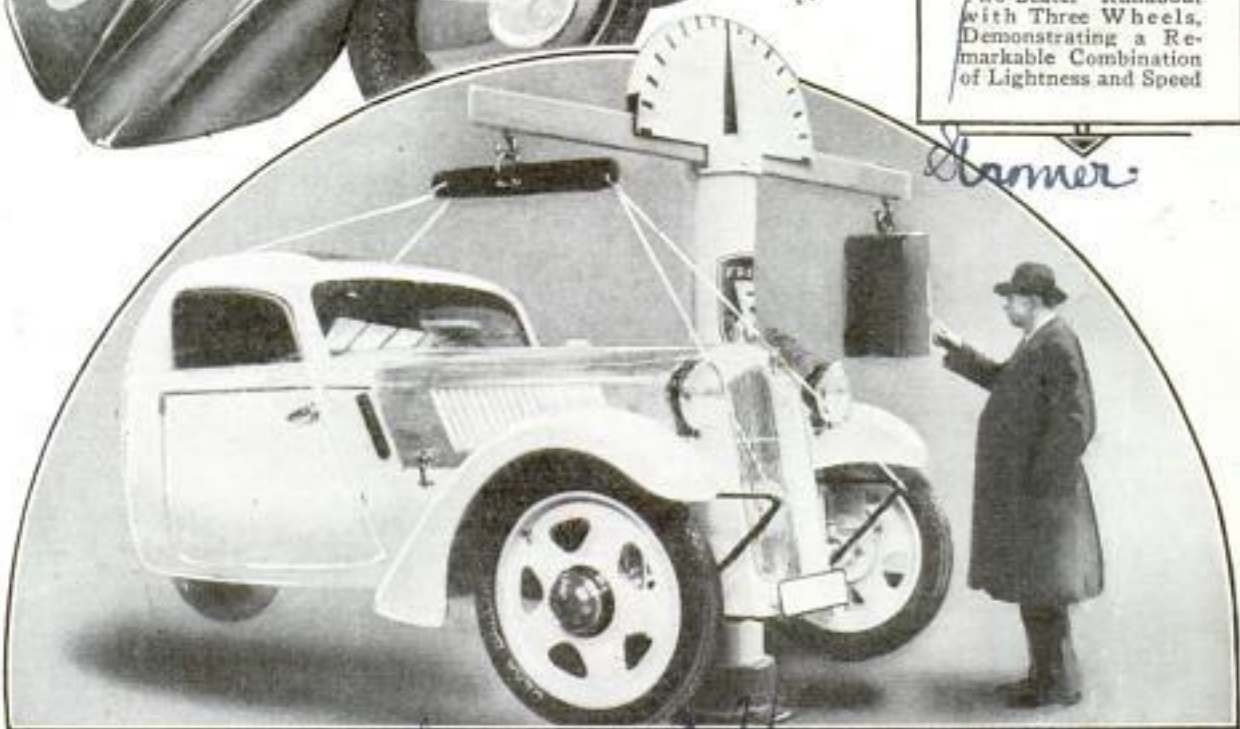


Striking Designs in Streamlined Cars Featured the Recent Berlin Motor Show Which Also Indicated Three-Wheeled Vehicles Are Becoming Popular; Top, Motorcycle with a Map Case, to Keep the Rider from Getting Lost, and Head-On View of the Streamlined Maybach "Zeppelin"; Left, Motorcycle with an Ultra-Streamlined Sidecar; Below, Lightweight Two-Seater Runabout with Three Wheels, Demonstrating a Remarkable Combination of Lightness and Speed

*Maybach Motorwagen Land H.
H. Mehlhachafen A. 1000.*

Zeppelin

Hammer



*Fraine-Werke Es sub H.
Frankenberg (Sa.)*

India Rubber World 3/1/33

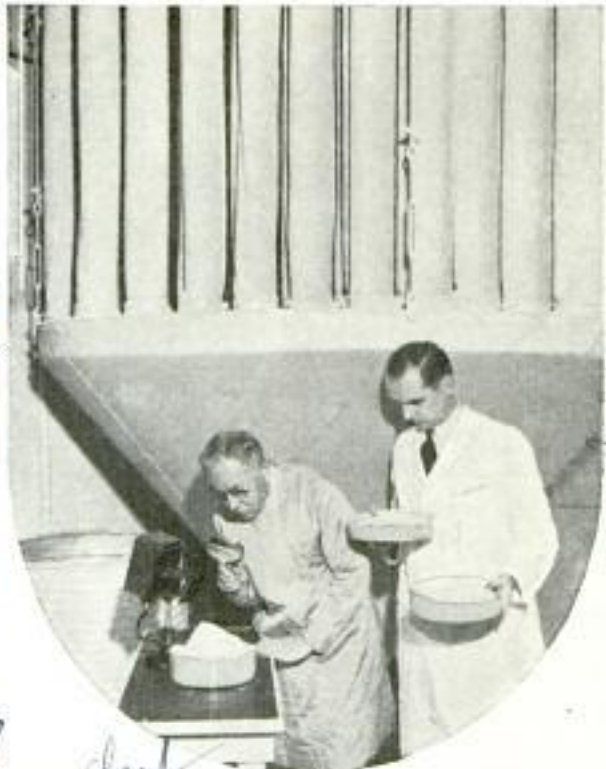
Dr. W. Dr. H. Jäger
Augustastrasse 11
Hagen Germany

C 30

POPULAR MECHANICS

RUBBER COVERING FOR FLOORS SURVIVES LONG WEAR

Possessing most of the characteristics of linoleum, a floor covering now is being made of wood flour with rubber as a binder. The process of manufacture from the raw materials to the finished product requires only twenty-four hours, and the method of treatment is about the same as for linoleum. Owing to the large amount of fibrous fillers, the characteristic properties of the pure rubber are suppressed, and the material assumes a leatherlike character. The soft rubber used as binding agent is well vulcanized with an adequate percentage of sulphur and accelerator. Tests have shown the material is very durable and is proof even against dampness. It keeps its position when laid, will not distort and can be produced in plain colors or marbled.



Air-Cooled Filtering Machine through Which Face Powder Passes after Being Ground

Hollywood, Los Angeles, Calif

BAR OF INK IN BOX SAVES HANDS IN MIXING WRITING FLUID

Soiling the hands in preparing writing fluids is eliminated by a new type of bar ink that comes in a tubular box. Slight pressure on the sides of the box causes the bar to loosen and drop into the water with which a quart bottle has been filled. The bar produces a writing fluid that is said to be comparable in effectiveness to prepared liquid inks.



American Crayon Co
2002 Haged Ave
Sandusky Ohio

C 327

BIG FILTER FOR FACE POWDER LOOKS LIKE PIPE ORGAN

Resembling a pipe organ in appearance, a giant filter containing fifty large tubes is used in the making of talcum powder. The powder, after being heated in ovens and ground to the proper texture, passes through this air-cooled filtering machine, being blown through the tubes at the rate of 1,500,000 cans a year.

LAWN EDGER LIFTS OUT TURF WHILE IT CUTS

Trimming the lawn is made easier by an improved edging tool that lifts out the turf to the walk as it cuts. A child can use the tool because there is nothing complicated in its operation. The cutting section is made of carbon-treated steel that can be sharpened to a knifelike edge, while the roller is ball-bearing. The tool can be adjusted to the desired depth.



Superior

PLANTS BUILD MORE ISLANDS THAN DO CORAL ANIMALS

Plants, not coral animals, do the lion's share of building up the so-called coral islands and atolls. Dr. Marshall A. Howe, of the New York Botanical Garden, has found that on one South Sea island, two lime-secreting weeds are responsible for most of the lime construction, with third place going to a group of one-celled animals. The corals were fourth.

C 388

Science News Letter
2/4/33

Superior Metal Spinning
40630 2nd Road, Solid, A

ANYTHING LEFT

Thomson Research Laboratory (Eds & J)
Lynn, Mass



Professor Thomson with Disk of Fused Quartz
to Be Ground into Telescope Mirror

By GEORGE W. GRAY

THE future of invention? I brought up this question with Prof. Elihu Thomson, the practical genius who founded the great electrical works at Lynn, Mass., out of which, and by merger with the Edison company, grew the worldwide business of the General Electric. He smiled indulgently when I suggested that perhaps the fundamental discoveries and inventions have already been made, and the next generations will have to content themselves with gleanings.

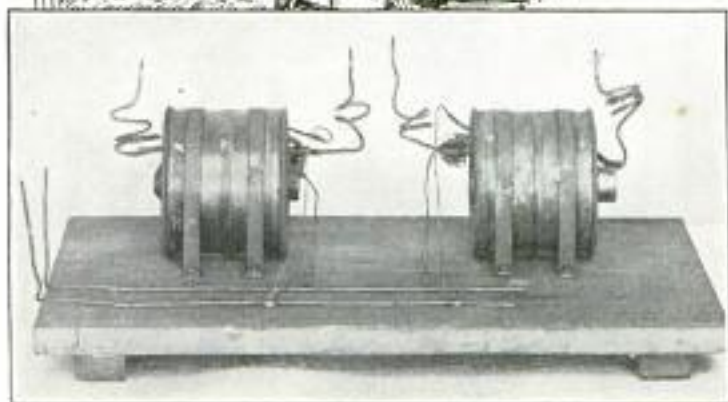
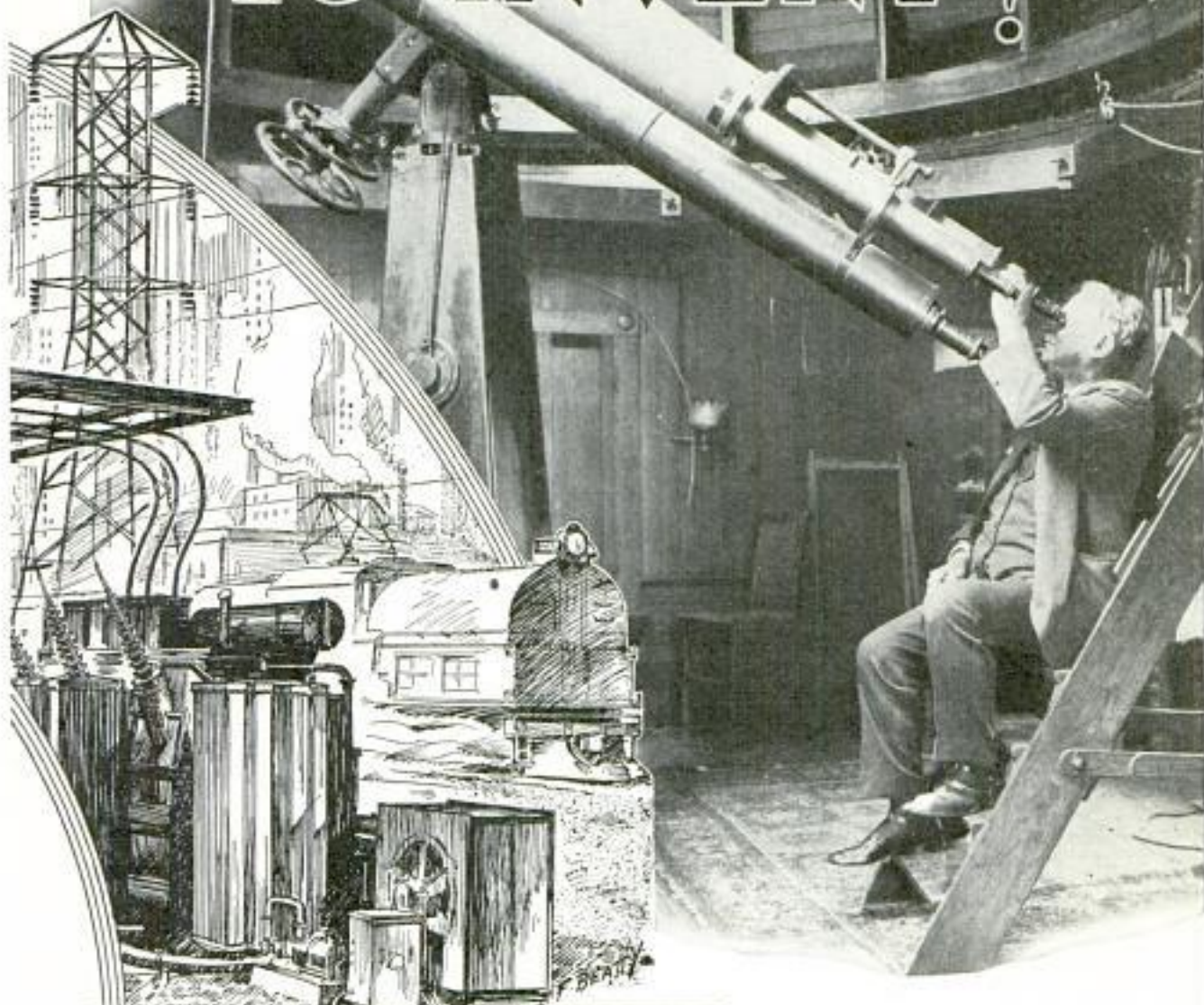
Doctor Thomson shook his iron-gray head. "I have no doubt," he said, picking up a typewritten sheet from his desk, "that a machine can be made to read this text and pronounce its words aloud, if that is something that needs to be done. There is no limit to the possibilities of science and invention. Your wildest dreams will be commonplace actualities some day, provided they relate to things that enough

people want, to justify their development."

We were sitting in the Thomson research laboratory at Lynn. Downstairs was a giant apparatus for spraying molten quartz at a temperature of 3,900 degrees Fahrenheit—one of the latest in the long list of marvels that have come out of this prolific hatchery of science. That machine was designed to develop the method which would be used in making the 200-inch mirror of the telescope planned for erection on the Pacific coast—the giant eye which will quadruple the light-gathering power of the great Mount Wilson reflector and enable us to peer some billions of miles deeper into our universe.

In the room, on the table before us, was another machine of different caliber and different age—a seemingly crude contraption in which a crank turned a wine bottle with a silk band around it against a frictional rubber, thereby generating electric-

TO INVENT?



Above, Professor Thomson in His Private Observatory; Below, Forerunner of Electrical Transformer, a Thomson Invention

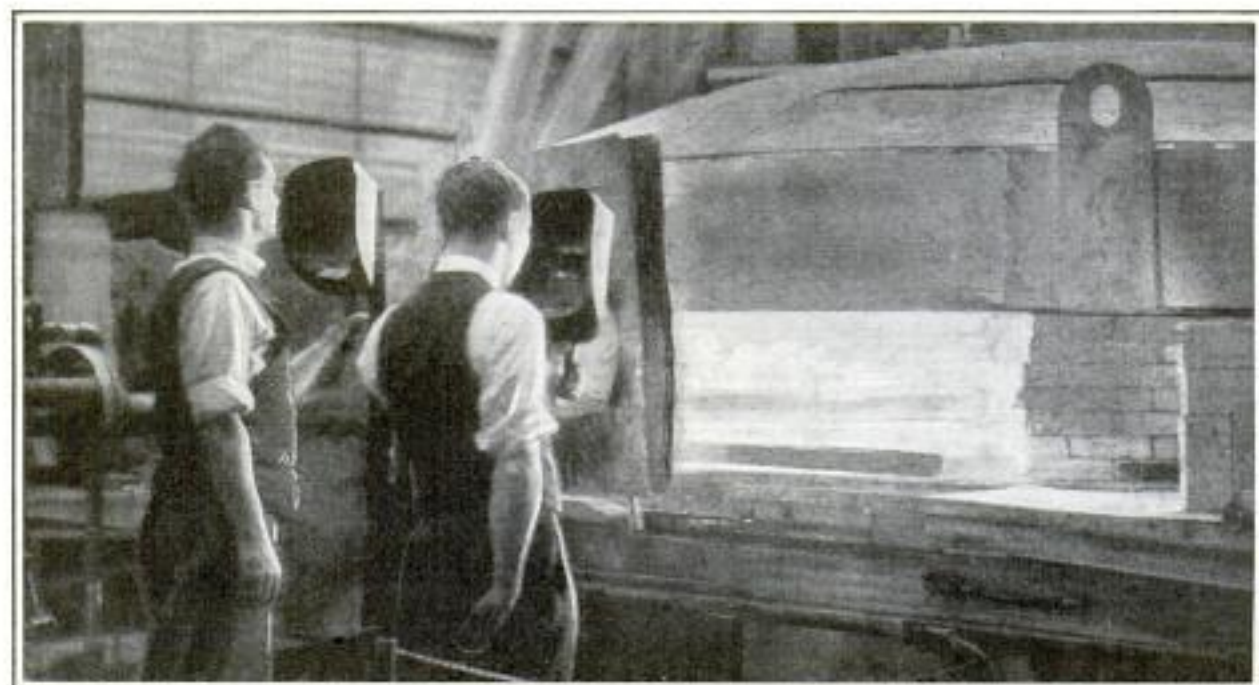
ity which crackled into discharge as sparks. The boy Thomson, in 1864, at the age of eleven years, built this machine. He wanted to see a flash of "electric fire" such as

he had read about, so he built this apparatus and with it introduced himself to the mystery of electricity.

Between that wine-bottle electric machine and the fiery quartz sprayer are 700 patents taken out by Professor Thomson in the United States—patents for dynamos, motors, arc lamps, electric air drills, electric railway control, a centrifugal cream separator, a gas-engine muffler, X-ray photography and for an improved steam engine. There is hardly a field of engineering in which he has not pioneered, a trail blazer of science.

"Every invention opens the door to

C 250



Watching the Operation of the Fused-Quartz Sprayer during the Spraying of the First Sixty-Inch Blank; This Development Has Aided in the Making of Mirrors for Large Telescopes

more possibilities," said Professor Thomson. "In its present stage radio is probably crude compared to what it will be; and, of course, there is the annoying interruption by static and other atmospheric interferences.

"I have thought of the possibility of 'keyed radio,' in which the signals would be broadcast on two separate wavelengths, and could not be recognized unless both were received." At this Doctor Thomson pulled a key from his pocket, and pointed to its slotted pattern. "Then you'd have something in radio comparable to the tumblers in a lock—and the thing would not work unless all tumblers were turned. You'd have a selective radio, a secret radio, and the combination of wavelengths would also iron out most of the static trouble, I think.

"Now," concluded the inventor, "there's an opportunity for some bright ingenious mind. The fellow who applies that idea has got something the world wants and will pay for."

The world wants television, and will get it. "In another generation or two," suggested Doctor Thomson, "people won't have to make long pilgrimages to some particular spot to see a solar eclipse, as thousands traveled to New England last August. In the future, television transmitters will be set up in the path of total-

ity, and millions of people sitting in their homes will see the eclipse as it is flashed around the world by perfected television instruments."

And when will this perfected television arrive? Professor Thomson does not know, but many capable experimenters are now at work on the problem. When it is



understood that to transmit a recognizable image of a man's face requires about fifty times the communication channel required to transmit his voice, one realizes that the problem is more than just an extension of radio. "But it will come," said Doctor Thomson. "Eventually television will transmit sights even more realistically than the radio of 1933 transmits sounds."

Another thing the world needs is a more



Left, Professor Thomson's Home, with His Observatory on Right and His Laboratory at Left; Above, Wine-Bottle Electrical Machine, Made by Inventor When He Was Eleven Years Old

efficient heat engine. Doctor Thomson made an important contribution by his invention

of a fluid-pressure engine, generally known as the "uniflow" engine, in which power is generated by a system in which the steam continually flows forward, never turning back on the heated surfaces, greatly increasing its economy of operation over that of ordinary engines.

While there is plenty of room and a myriad of opportunities for inventors, invention itself is becoming more profes-

sional, as science grows more complicated and more exact. But this does not mean that the individual inventor is ruled out, that the great research laboratories are to do all of our future inventing.

"No," said the man who has taken out 700 patents, and is still, at the age of eighty, busy in his laboratory every day; "you cannot standardize the creative spark of invention. It isn't so much the elaborately equipped laboratory that counts for success here, as it is the original idea. And it is the individual still who creates the original idea.

"By an original idea," explained Doctor Thomson, "I do not mean some suggestion, some general impression that a certain innovation or improvement is needed, but the practical working out of a problem.

"Anybody, for example, can see that we need a more efficient heat engine; that we need a television system that will economize transmission channels and project a sharp, well-defined image of large dimensions; that we need a radio which is not subject to the whims of the atmosphere. But mentioning these needs is not supplying them. Invention is the exercise of the imagination as much as the creation of

(Continued to page 119A)

C184

Wilkins

712

POPULAR MECHANICS

Serranus Road, Eastbourne

M. Coffyn, Eng. Sales Manager, California Hot Air Body Builders



Luggage Is Carried in This Car in Compartments in the Fenders Provided with Doors; Note Open Top

LUGGAGE FITS IN AUTO FENDER DESIGNED TO SAVE SPACE

By producing fenders with built-in luggage compartments, an English inventor has made it possible for the light automobile to carry more baggage without discomfort to driver and passengers. The fenders are fitted with suitcases, which may be inspected or removed by opening a door in the side of the fender. Space for more luggage is available behind the seats.

ASBESTOS COATING SAVES BUDS OF TREES FROM FROST

By spraying a coating of asbestos on fruit-tree buds, orchard owners expect to reduce losses from killing frost. The coating, or "pajamas," is made of powdered asbestos sprayed on the trees simultaneously with an adhesive liquid. It is sufficiently porous to let air through, yet

Mr. C. H. Hunsaker
501 *Purdue Ave*
University City Mo

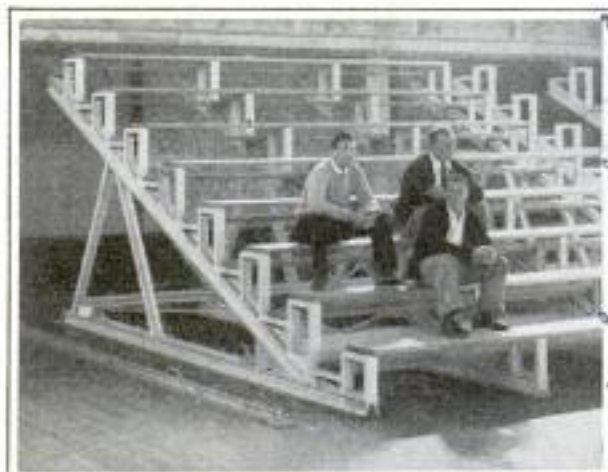
heavy enough to keep out cold. The pajamas will remain on the trees at least four months in any weather, tests have shown. Before trying the asbestos spray in orchards, tests were made with roses and potted peach and orange trees. These were placed in freezing temperatures after being sprayed. Later, in greenhouses, or under natural growing conditions, the pajama-clad plants bloomed and made a normal growth, while unsprayed plants died or showed severe frost injury. Ordinary spray equipment can be adapted to this use.

C335

ARENA SEATS ON ROLLERS INCREASE CAPACITY

Capacity of a California gymnasium can be increased one-third within an hour by means of seat sections mounted on rollers. The seats are moved easily into place on all four sides of the auditorium. Tripping the rollers holds the sections in place. To remove the extra seats, the units are pushed backward so that the rollers take the weight. The roller wheels have double flanges that fit over lightweight steel rails of standard design. Each rail section is mounted on a hard wood plank to prevent marring the playing floor. When not in use, the sections are moved under the fixed gallery seats, hidden from view by drop curtains.

Alameda, Calif.
1934
Mr. Tom White



Portable Seat Sections for Athletic Field or Gymnasium; the Sections Are Mounted on Rollers

University of California
Berkeley, Calif.

"Mayflower of the Air" Ready for President



© U. & U.
 Big Amphibian Monoplane in Which the President May Make Business or Pleasure Trips; It Can Alight on Land or Water and Has a Cruising Range of about 650 Miles

Elaborately outfitted in secret, a super-amphibian monoplane has been delivered to the naval air station, Anacostia, D. C., for the use of President Roosevelt. While navy officials said the plane had been purchased to transport official personnel on government business, it bears the presidential insignia, and if the president travels by air it will replace the yacht "Mayflower," used by former executives. As a mobile business office, the snug cabin contains a desk, well-equipped secretariat and instant two-way radiophone communication with official Washington. As a pleasure craft, the plane has richly upholstered seats for four passengers and a comfortable lounge that may be utilized for sleeping quarters. The interior is luxuriously appointed, paneled in colors. Leaving Washington from Anacostia or Bolling field at the close of office hours, the president would be able to speed to a New York dinner or fill some important engagement and still return to the White House for a good night's rest. En route he could dictate to a stenographer, hold conferences or rehearse a vital message to congress. The plane is twin-engined, mounted on a superstructure above the high wing. The hull is of duralumin construction, divided by bulkheads into six water-tight compartments easily accessible. The bow compartment, in the event of being rammed or punctured, is separated from the forward baggage compartment by a bulkhead. An anchor and a buoy are carried in the forward compartment, which has a capacity of fifty cubic feet. The ship, able to alight on land or

water, has a high speed of about 136 miles per hour and a cruising speed of 108 miles with a range of 650 miles. The cabin is insulated against cold and noise, unusual quietness being obtained by distance from the motor and the intervening wing.

c333
**LIBRARY OF STAMP-SIZE BOOKS
 COLLECTED BY STUDENT**

More than 6,000 volumes are in an unusual library which contains many books about the size of a postage stamp. Some of the miniature volumes in the collection, which is owned by Robert L. Henderson,



Some of the Hundreds of Tiny Volumes in the Miniature Library Collected by a Massachusetts Man

Massachusetts student, are the Bible, the autobiography of Calvin Coolidge, address of Abraham Lincoln, inauguration address of Herbert Hoover and "Facts of the Candidate" by Theodore Roosevelt.

Exhibited at Linthrop House Library, Harvard

Brookline, Mass.
 University Cambridge, Mass.

Carl Thomas E. Stumey Jr
 145 S Spring St
 Los Angeles Calif

New Jobs



Here Are Two Unusual Ways of Making a Living, Each Idea Being Originated by a Woman; Left, Putting the Finishing Touches on a Painted Leather Chair; Below, Gathering the Seeds from California Date Palms



CONSTANT progress in the arts and industries is creating jobs for those who recognize their opportunities. Nearly every day someone originates new and unusual work.

A former hospital interne has made a job for himself by becoming a professional pollen gatherer, collecting weed and flower pollen for manufacturing hay-fever vaccines. A sheet-metal worker saw his opportunity in the new stainless steels and alloys, and now has a steady market for attractive showcases made of glass, stainless steel and aluminum. The proprietor of a small metal-etching shop, instead of going out of business when trade fell off, turned his attention to brass costume jewelry. Now he is busier than ever.

"Make a job for yourself instead of hunting for one," is the sage advice of one veteran employment manager. "Many of the large industrial organizations started as one-man affairs. Business history shows that many men get their real starts in

times of slack business when payrolls are reduced. Thrown on their own resources, they make jobs for themselves. Then, as the tide turns, they are able to expand their operations until they are running large concerns. This has happened time after time.

"What to turn to is sometimes a problem. It is best to stay in a field in which you have had experience, adapting your

for Old



Left, Filling an Order for Specimen Butterflies at a Butterfly Farm Conducted at a Profit; Right, This Man Makes a Living by Adjusting Radio Sets to Receive Short-Wave Broadcasts

knowledge to new conditions. For instance, a number of men are applying the idea of manufactured weather to residences. Homes are usually too cold in winter and too warm in summer. A St. Louis carpenter is insulating homes in his neighborhood against the weather by pouring a three-inch layer of fluffy gypsum between the joists of the attics. The material is cheap, non-inflammable and light. It stops fifty per cent of the heat loss through the roof and insulates against the sun in summer. By estimating the amount of material needed and doing the job on a contract basis, the carpenter is able to make a profit above his wages.

"A former plumber is also capitalizing on the demand for comfortable buildings. He installs perforated pipes on the roofs so that fine sprays of water may be turned on during hot days. Evaporation lowers the temperature in the rooms below as much as fifteen degrees. Apartment houses and hotels are his best prospects, for the

gain in satisfied renters on the top floor during the summer offsets the cost of the cooling system several times over."

One man in Alabama worked up a profitable business by repairing house gutters and cleaning out the leaves and debris. Leaking cellars furnished an opportunity to a concrete worker who carries a supply of waterproofing compound with him to plaster up cracks and leaks. With this as a start, he is building up a business laying concrete walks, adding to basements and erecting retaining walls. Window shades wear out, and this led a carpenter into the business of being a "blind man." He patches the shades, turns them, repairs the rollers and puts on new cords. Frequently he sells new shades from samples. An unemployed electrician is solving his difficulties by installing wall plugs in homes that have too few electrical outlets. A radio worker is making and selling inexpensive short-wave converters for old radio sets, and another is manufacturing cheap mi-



Top, Weaving Straw Hats; Below, Making Hand of Puppet to Be Used in Puppet Show; Right, Shipping Room of Angletworm Farm

crophone systems for nurseries. Any outcry in the baby's room is broadcast to the mother from a loud speaker.

One clock repairman, knowing that most people put off carrying their bulky clocks to the repair shop, repairs them in the home. Even shoeblacks have built up profitable routes by driving slowly along residential streets, ringing loud bells. Many men are busy in the late summer and fall, gathering cones and seed pods in the parks and forests. Nearly every variety of tree seed is in demand, and the large seed

houses pay from ten cents to several dollars an ounce for healthy seeds. Other people earn money collecting wild medicinal herbs or buying and selling grown trees. Landscape gardeners and architects sometimes pay five or six hundred dollars for certain varieties.

Farming is not the usual conception of an easy way to riches, but some crops are unusual and valuable. Last year 22,000,000 goldfish, worth \$1,000,000, were raised in the United States. A Chicagoan uses an old canal to grow water fleas, which



he sells to aquarium owners as fish food. A farmer in Oregon provides young trout and game fish from his fenced-in creeks to state fisheries and to sportsmen's clubs. In California, an enterprising man raises trout bait on his flourishing two-acre angletworm farm. His product is shipped all over the country in tin boxes in which the worms live for three months.

Iowa and California are the homes of

butterfly farms selling specimens to collectors and museums. One Cedar Rapids farmer grows thirty rare varieties in a screened-in garden. The farms find a ready market for decoration of tea trays and wall panels in which butterfly wings are mounted under glass.

One man who designs his own trout flies is making a good living by selling them to sporting-goods houses. Others who formerly made rods and reels for their own enjoyment are selling them to sportsmen. Several amateur telescope makers grind lenses and mirrors for their friends who lack the patience or time. A geology "bug" furnishes labeled trays of mineral specimens to schools and prospectors. A woman has steady employment making attractive models of homes for architects and owners. The models are made to scale from the architects' plans and are painted with water colors.



Above, Wood and Cardboard Model of Garden Structure; Left, Growing Snails to Keep the Aquarium Clean; Center, Fancy Fowls Raised on Breeding Farm



A camera is frequently the source of income. Newspapers, picture services and magazines are always looking for good pictures. A young Los Angeles photographer solicits all the engineering and building contractors to take progress pictures of the work for office records. He makes additional sales to construction magazines and to the men on the job. Another camera owner mounts pictures of garden scenes on



lamp shades and sells them to the owners.

Ways of making money are almost endless. In each issue of Popular Mechanics Magazine are plans and instructions for making objects that have commercial value. Several readers who have woodworking tools are turning out toys that have a ready market.

"An hour of planning is worth a day trying out a new scheme," says a responsible business man who started at the bottom. "There are more than enough jobs to go around. Figure out something that people want and offer it to them at a reasonable cost."

Outstanding Art Products Co.
 8562 La Muña Blvd

718

POPULAR MECHANICS

Hollywood Calif

C177

Art Silhouettes Etched through Thin Metal



Samples of New Art Showing That Extremely Thin Metal Can Be Etched in Intricate Designs

Etching through thin metal sheets to produce artistic decorations for a number of industries is a new trade developed in California. The decorations are produced by transferring designs or drawings on the metal, then etching away the unwanted metal. A backing is used under the metal to prevent damage to the reverse side. In some cases, tiny picture silhouettes etched on brass, only two-thousandths of an inch thick, are produced. The lines of metal in these small scenes and portraits are as slender as spiderwebs. "Super-delicate" tiny metal signature stencils are used by photographers in placing their name imprints by air brush on films and plates. The silhouette and stencils are useful to manufacturers of plumbing fixtures, furniture, handkerchiefs, stamped dies, light globes, residence decorations, toys, cosmetic packages, window signs, tobacco humidors, picture frames, lamp shades,

vanity cases, candy boxes, badges, novelties and other lines. In contrast to the small decorative pieces are the distinctive copper apartment-house signs in silhouette, four and five feet long and made of heavy metal. "Poems in metalcraft," which contain inspiring thoughts from the best minds of all time, are produced in brass and cheaper metals by processes involving photography and the use of power-driven etchers. Then the poems are sprayed with fine bronze and mounted under glass with colorful

backgrounds. There are more than forty-five different designs in thin metal backed by wings of tropical butterflies, used by a company making picture goods,

C248

HEAT-PROOF AUTO-VALVE SEAT SOLVES EXHAUST PROBLEM

Solving an important problem in engine maintenance, an alloy exhaust-valve seat for the automobile is not affected by the heat to which it is subjected. The alloy, a compound of cobalt and chromium, is so hard that engines operated at high speed for 40,000 to 50,000 miles show no need of regrinding or refinishing. This allows higher engine speeds, opening the way for use of smaller engines and a saving in



View of Auto Valve Seat That Resists Heat; Special Alloy Eliminates Frequent Regrinding

fuel. The alloy ring is welded to a steel ring which is locked into the motor block.

White Motor Co.
 842 E 79th
 Cleveland Ohio

Mrs. L. H. Parker

Science News Letter 2/16/33

in nature, London

RAW WEATHER CAUSES ACHES BY TIGHTENING TISSUES

Damp, cold weather causes aches and pains in persons suffering from rheumatism because it tightens up the tissues. Sir Leonard Hill, British physiologist, says that cold, moist air has a heat conductivity greater than that of cold dry air, that it produces a "raw" feeling that excites the nerve endings, causing a tightening up. This, in turn, causes aches. Heat expands and softens the tissues, bringing more blood and lymph into the parts, while cold tightens them up. The change, it is suggested, is what actually gives rise to rheumatic pains.

WATERTIGHT LINING FOR POOL REPLACES CONCRETE

Replacing concrete construction, a watertight lining has been produced to aid in building lily pools for rock gardens. The lining is a heavy fabric, chemically treated to make it waterproof. In building the pool, the home owner only has to dig a hole, line it with the material and border



How Waterproof Lining Is Installed After Pool Has Been Dug in Garden or Yard

it with rocks, which serve as ornaments and as anchors for the lining. The fabric is made in one piece large enough to form a pool seven feet long by four feet wide. It is claimed that freezing weather does not damage the lining.

Walter J. Tucker, Chgo. Saddle Creek, Ill. Independence, Ohio



These Devices Tell How Much Sunlight May Be Expected in Any Room of Your Home

BEST PLACE IN SUN FOR HOME IS FOUND BY EXPERTS

Where to build your house so that it will be most benefited by sunlight is a question which English architects are studying and answering by means of unusual instruments. Among the devices is one that determines the amount and duration of sunshine at all seasons of the year. Model houses are used in the experiments. In addition, these experts can tell you how much light a wall or a room will get in a year and how much window space will be necessary. Flat roofs, damp walls, paint and concrete also are being studied in order that buildings may be constructed along more scientific lines.

COSMIC RAY SHOWN IN ACTION

Cosmic rays totaling billions of volts, the most concentrated blasts of energy ever seen, have been observed at Cavendish laboratory in England, where Dr. P. M. S. Blackett, at Cambridge, has obtained a number of photographs showing large groups of cosmic-ray tracks radiating from a piece of lead at the same instant. Sometimes there are as many as thirty tracks in a group, and since the energy in each track is generally above 100,000,000 volts, the total energy runs into billions of volts.

Science News Letter 2/25/33

at building school Dept. of Scientific and Industrial Research Harrogate, England

c170

c289

c312

Mr. A. Pool

\$14.50

c382

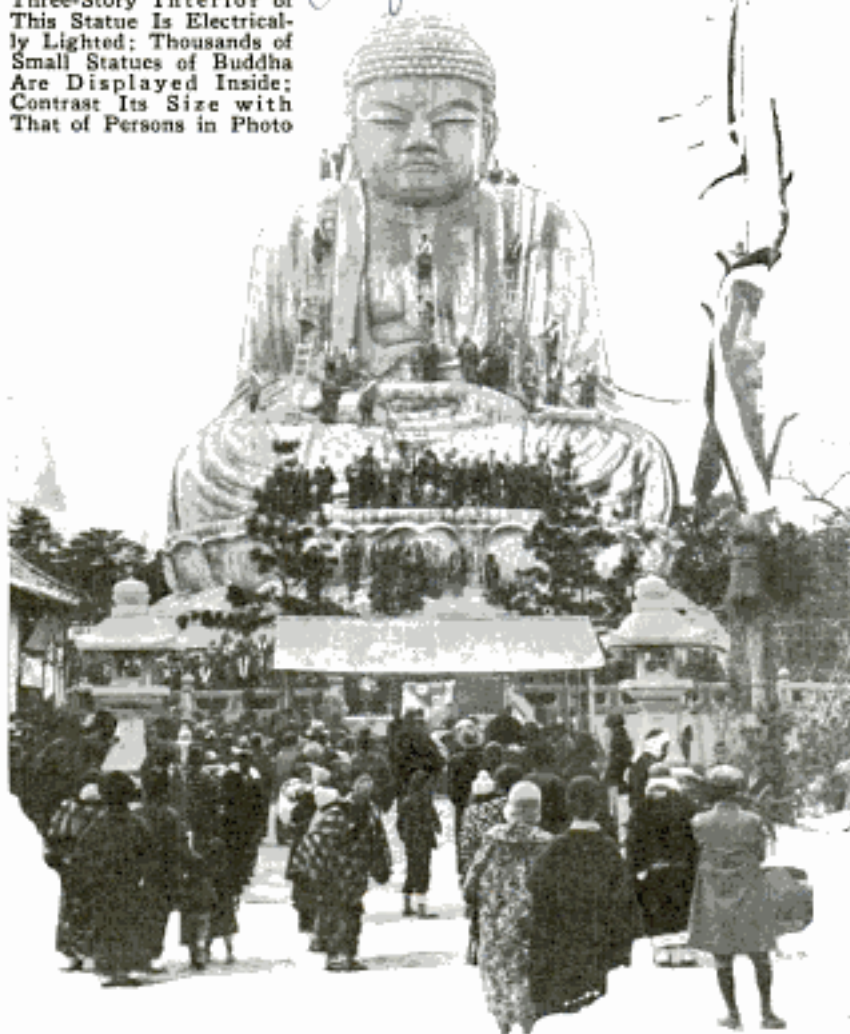
material

Cont. Nippon Tilia Shoh. Sha. Inc.
Box 1007, Sannomeya,

720

C 313 Kobe, Japan

Three-Story Interior of This Statue Is Electrically Lighted; Thousands of Small Statues of Buddha Are Displayed Inside; Contrast Its Size with That of Persons in Photo



GIGANTIC BUDDHA OF CONCRETE IS LIGHTED INSIDE

With its three-story interior illuminated by electricity, a giant statue of Buddha has been constructed of reinforced concrete in Japan. The figure is 150 feet high, the head sixty-three feet in circumference and the face is twenty-four by nineteen feet. Thousands of small Buddhas have been placed inside the great figure.

PLANTS MIGHT SPEED GROWTH WITH MORE CARBON DIOXIDE

Wheat plants are steady workers, but they could produce much more if they had enough essential raw materials to match the available sunlight energy. Studies at the Smithsonian Institution have shown that wheat plants start up gradually in the morning, reach their maximum efficiency as manufacturers of plant material early in the day and keep steadily at this rate

Washington D.C.

until twilight. They do not make carbohydrates any faster at full noon than early in the morning or late in the afternoon. This, it is believed, is due to the limited amount of carbon dioxide in the air. Green plants use this gas, present in the air in the proportion of about 350 parts in a million, in the manufacture of carbohydrates, capturing the energy of sunlight to do the work. Wheat plants get enough sun energy to use up all available carbon dioxide by the time the light has reached one-fourth of its average daylight intensity, so all added energy after that is wasted. There is no way of knowing how much of the added carbohydrates that might be produced by the wheat plant if it had more carbon dioxide would go into useful grain, and how much into leaves and

stalks of relatively little value. It is also true that the figures for wheat do not necessarily hold for any other plant, for each species must have its efficiency determined separately.

STEEL NAIL WITH LEAD HEAD RESISTS WATER AND ACID

Resistance to water and acid is offered by steel nails with lead heads. When these nails are driven in, there is little distortion of the lead head, due to the shape of the underlying steel on which the lead cap is placed. Where the climate is wet and where acid fumes may be found, the lead protects the steel from rust and other deterioration.



The F. J. Littell Machine Co. 4127 Ravenswood Chicago

C 384
Science News
2/25/22

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c201. *Leandra Carlson Oslo*

c246

TINY SPRAYER ON BRUSH
HELPS CLEAN TEETH

Toothbrushes fitted with mouthwash atomizers are now being produced to aid in cleansing the oral cavity more thoroughly. To the brush is attached an atomizer so constructed that when finger pressure is applied, a mixture of water and carbon dioxide passes through a rubber tube into the handle of the brush and out through the bristles. Thus the teeth are not only brushed, but the liquid blown between them aids in the cleaning process.

Dept. of Commerce

Patents owned by Messrs. Arnding & Co. Oslo, Norway.

TRAP SPRUNG ONLY BY
BIG ANIMALS

B2195

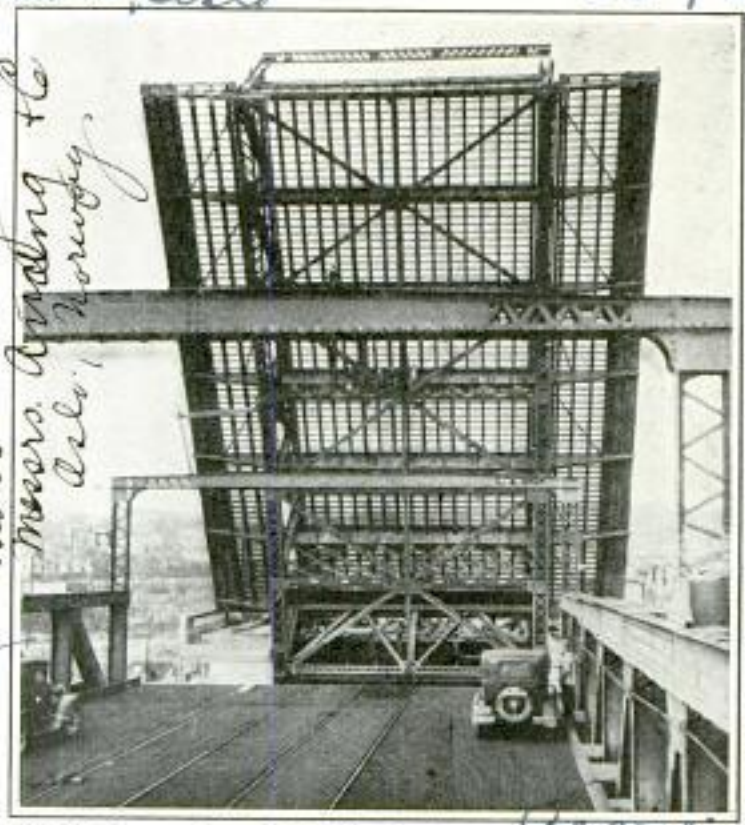
Only large animals may be caught in a trap fitted with a spring that weighs the prey before snapping shut. When the spring is set at the tension limit, a weight of about five pounds is necessary to release the trap. Since an animal puts one-third of its weight on one foot when walking, the trap at this adjustment will bag only animals weighing fifteen or more pounds. This arrangement will enable hunters to trap wolves, coyotes, bobcats or other "killers of the range" more quickly, since small animals will not spring the trap.

To be given to public



This Trap Rejects Small Animals, Snapping Only When a Certain Weight Is Put on the Spring

*Dr. Albert M. Day
U.S. Dept. Agriculture*



Substituting an Open-Mesh Flooring for the Solid Type Reduces the Weight; Span Is Shown Open

STEEL-MESH FLOOR ON BRIDGE
DECREASES WEIGHT

thru reverse
When engineers started to widen a bridge at Seattle, Wash., they found the supports would not safely carry the additional weight of concrete-floored spans, so they devised a flooring of heavy steel mesh. This serves well for automobiles, although some claim it is not suitable for horses because the calks of their shoes catch in the grating.

ANNOUNCING NAMES OF STORES
IN STREET CAR PLANNED

Names of business establishments along the route of street cars in the Netherlands would be announced by conductors, under a plan reported to the U. S. department of commerce. This service would be in addition to the usual announcement of street names. A fee for the service would be paid to operators of the street-car lines, who reserve the right to reject undesirable announcements.

*c295
Commercial news 2-17/53*

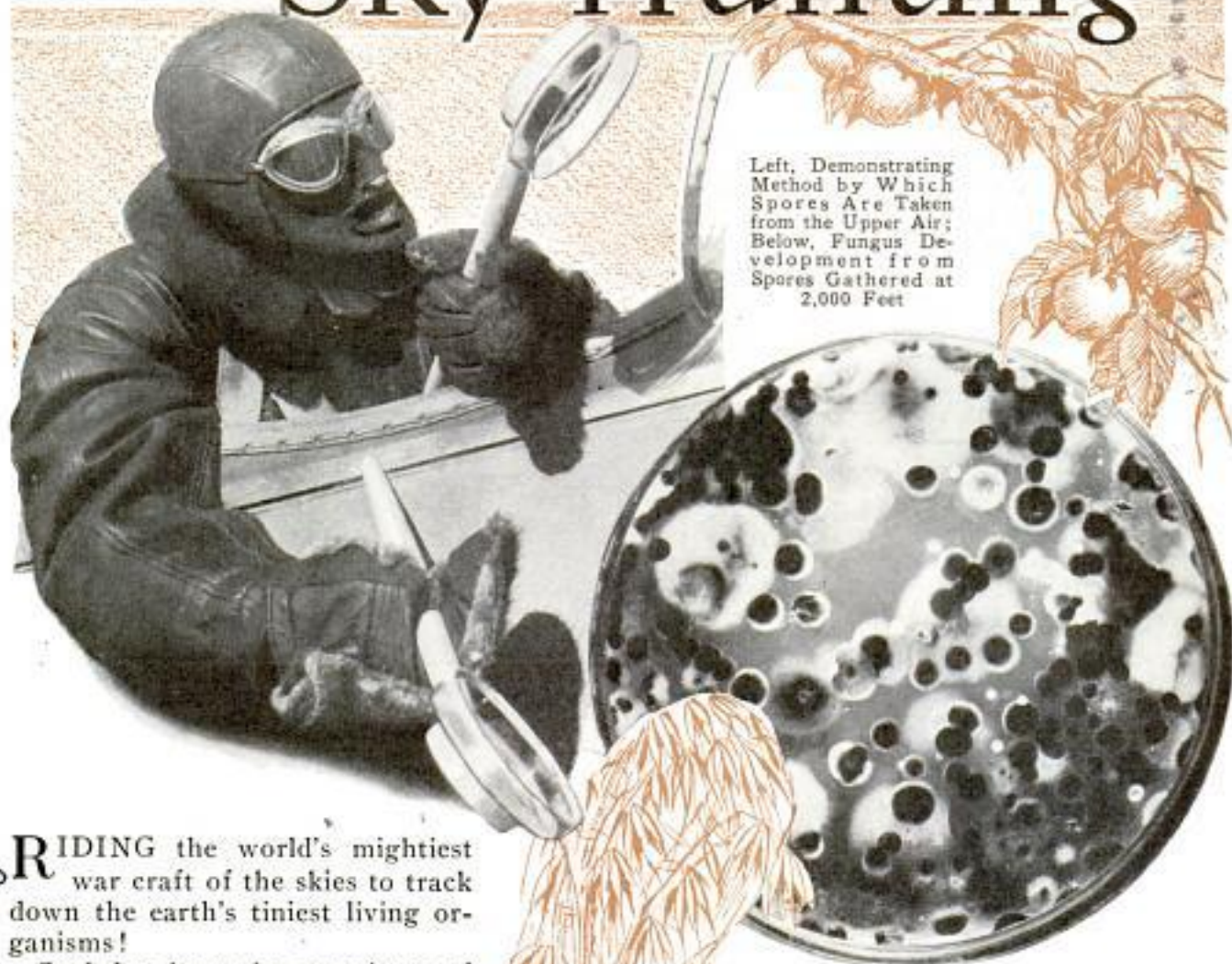
More than half the fires in the national forests of Oregon and Washington are caused by lightning.

Science Service Short

Nov. 14, 1932

Reported by Commercial Culture Jesse Van Wickel, The Hague.

Sky Hunting



Left, Demonstrating Method by Which Spores Are Taken from the Upper Air; Below, Fungus Development from Spores Gathered at 2,000 Feet

RIDING the world's mightiest war craft of the skies to track down the earth's tiniest living organisms!

Such has been the experience of F. C. Meier, plant pathologist of the department of agriculture, who has recently completed air voyages in the giant dirigible "Los Angeles," and in planes of the army, navy and coast guard, seeking plant spores in the sky. The experiment was made to study the aerial travels of these invisible seedlike bodies of the fungi and bacteria which cause rot and decay in fruits and vegetables.

In trapping the spores, Mr. Meier used open culture dishes which had been sterilized and contained potato extract mixed with agar, a delectable food for the spores. These dishes, about six inches in diameter, were taped around their circumference at the beginning of the flight to prevent any possibility of spores getting into them. To further reduce the possibility of con-

tamination from spores which might be carried up by the ship, before the dishes were opened for the "catch," the plane ascended to the flight ceiling. This permits airwashing of the equipment and ship.

When ready to trap the spores, the culture dishes are removed from their sterilized paper wrappings and tape, and the individual halves are placed in wooden ladles with short handles. This permits them to be projected from the side of the ship at a distance from the operator where they are held from one to five minutes in the air stream. The dishes are then drawn back into the cockpit, retaped and returned to their sterilized wrappers, ready for the laboratory. Within a day or so after the

098

for Plant Diseases



plates have been kept at room temperature in the laboratory, the colonies of fungi and bacteria begin to appear. These are isolated in individual sterile tubes where they may be grown for future study.

Elevations at which spores were taken approximated 2,000, 4,000, 8,000 and 18,000 feet. Above 8,000 feet spores grow less. Between 2,000 and 4,000 feet there is, often, no perceptible reduction of spores caught on the plates, although spore content at all altitudes depends on atmospheric conditions.

Among the spores so far collected and studied, are types from fungi known to attack small grains, potatoes, tobacco, celery, lettuce, tomatoes, melons and certain other fruits. By isolating and culturing individual colonies of fungi grown from spores collected, the type of fungus can be determined, and by making inoculation studies on various crops known to be attacked by the particular type of organism, it is easy to determine whether the particular spore which has been caught is from

Left, Fungus Development from Spores Gathered at 8,000 Feet; Right, Examining Culture Dish of Spores Taken from the Upper Air

a plant-disease producing fungus. Spores get into the air through dust whirls which may carry up leaves upon which spores are being developed. Many fungi discharge their spores into the air in unbelievably large numbers. It has been stated that every large wild mushroom which develops normally, liberates upward of 10,000,000,000 spores, and one of the common cultivated mushrooms, some three and one-half inches in diameter, was estimated to have produced 18,218,687,000 spores.

The organisms are found over water to some extent. This was discovered by research on the "Los Angeles." How far out they may extend has not yet been determined. On land, however, there is rea-

c 98



and animals. In fact, they are helpful because some are the agents which cause decay in plant and animal matter. Among the helpful organisms are the yeasts and other fungi and bacteria useful in processing food.

The fungi produced by the spores affect our food supply from beginning to end. By studying them, plant pathology has made it possible for fresh fruits and vegetables to be had daily in the city markets. It has been only a short time since waste in car-loads of fruit and veg-

Top, Ready to Take Off with Disk-Culture Dishes to Pick Up Spores; Right, Transferring Fungi from Culture Dish to Individual Tubes for Growth

son to believe that spores of the stem rust, which attack wheat, oats, barley and rye, travel, in some years, from northern Mexico to the northern part of the United States. Favorable weather conditions and continuous winds from the south which occasionally occur carry these spores with them.

As spores are carried higher in the air they become subjected to low temperatures, intense light and rarefied atmosphere fatal to some types. Many of them, commonly found around us and in the upper air, are quite harmless both to plants

and vegetables was charged by distributors to spots and rots. But by finding the specific cause of a given rot there is a chance of doing something about it. In this connection, it is estimated that the known parasitic fungi, attacking the economic plants of the world, at present total over 14,000, of which at least 5,000 are to be found in the United States.

The direct benefit to consumers from the investiga-



tions of plant pathologists is illustrated by the success of preservative treatments in prolonging the life of timber used out of doors. Methods of treatment as well as types of preservatives have been improved in recent years, but even those available twenty years ago were of measurable benefit. When the history of a large number of treated and untreated poles was studied recently, it was found that, at the end of nineteen years, practically all of the untreated poles had been replaced, while half of those having the best treatment were still in service.

C109
CLOCK IN LAMP STARTS RADIO AT PREDETERMINED TIME

One German inventor has made a lamp which not only provides electric light, but also keeps time and runs the radio. The lamp shade carries numerals corresponding to those on the face of a clock. If the owner desires to listen to a certain radio program, but would like to read or take a nap until time for it, he simply sets the dial on the lamp for the hour, attaches a cord to the radio and forgets about the matter. When the time comes, the combined clock and lamp automatically turns on the radio.



Top, How Strawberries Are Wrapped; Bottom, the Finished Product, Ready for Inspection by Purchaser

BERRIES IN CELLOPHANE PACK ARE VISIBLE TO BUYER

Cellophane packing for strawberries has been tested successfully by growers seeking to make the fruit visible to prospective purchasers, as well as to keep the berries fresh over long periods between picking and consumption. A four-leaved packing device is used. The leaves are spread out, a sheet of cellophane placed over them with a layer of berries on top, and the four leaves are lifted to form a container. Enough berries then are poured in to fill the space and the cellophane is drawn securely about the fruit and folded. The moisture of the fruit seals the wrapping, making the package air-tight. After packing, the berries are placed in wooden cups ordinarily used to insure safe handling. When a pint of strawberries is wrapped in cellophane, practically all the fruit becomes visible to the buyer, who can examine the berries not only at the top but at the bottom and sides as well simply by turning the package over.



Lamp Shade Can Be Set at Hour Desired for Starting Radio; Clock in Base Keeps Time

Wade Wall
Mason unknown

Elkins & Hall
Ret. ap for. Sampson Fla.

C92 Inv. Theodore R. Bohn,
5646 N. Kenmore Ave
726
POPULAR MECHANICS
Chicago

Flying Projector Casts Words on Sky Screen



How Messages Are Flashed on Artificial Clouds from an Airplane; One Plane Creates a Screen of Smoke or Chemical Vapor, While, Below, a Second Ship, Equipped with a Powerful Projector, Throws the Words Upward onto the Trailing Screen

New York Times 2/16/33

Designed by Sir Joseph
Isherwood

c242 Stewart-Warner
Corp. 128 Riverside
727
Parkway
Chicago

POPULAR MECHANICS

naval architect

SHIP WITH BARREL-LIKE HULL
CARRIES ONE-FOURTH MORE

Twenty-five per cent more cargo can be carried in a new type British ship whose displacement is no greater than that of existing freight vessels. The secret lies in the shaping of the middle hull, which is like a barrel. At the same time, operating costs will be thirty per cent lower, since the ship will burn less coal. The arch-form hull was tested thoroughly with models in an experimental tank. Orders have been placed for several of the new freighters, but the purchasers were not permitted to see the design, as it was considered advisable to guard the secret.

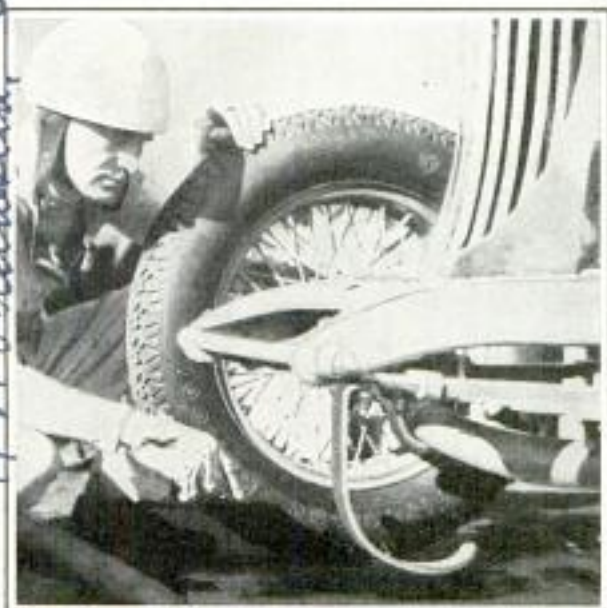
c263

BUMPER SUPPORTS RACING CAR
IF WHEEL COMES OFF

c258

Designed to remove one of the hazards of automobile racing, a heavy hook-shaped steel bumper has been installed under the front axle of a Pacific coast driver's car. Its purpose is to support the car and to act as a sled runner if the right front wheel comes off. The bumper has a narrow contact surface which the driver expects to help him control the car through manipulation of the other wheel. The spring steel also is expected to act as a shock absorber. The right front wheel, due to strain on curves, is believed more likely to collapse in races than any of the other wheels.

Cent. Howard W. along The P. M. Enquirer
1931 Franklyn, Decker



Spring Extending Downward Will Support Right Front Axle of Racing Car if Wheel Comes Off

Used by Wilbur Shaw, racing driver



Companion Set

Opening One of These "Books," You Find a Midget Radio That Fits on Library Shelf

RADIO SET LIKE PAIR OF BOOKS
IS HOME DECORATION

Resembling a pair of books with rich leather bindings and gold-stamped decorations, a new midget radio receiver makes an attractive addition to the library table or bookshelf. A special circuit with the latest type tubes may be operated on alternating or direct current. The sets also are furnished with special adapter cords for use on motorboats, Pullman cars, farm-lighting systems, steamships and in foreign countries. The danger of overheating, common to many midget radio receivers, has been eliminated by a special plug-in cord. When the set is operated, only the cord becomes slightly warm, preventing the breaking down of condensers. The sets are available in seven "editions," in addition to an all-metal model. All are equipped with an improved reproducer that has an excellent tone.

The first patent granted on this continent was to Samuel Winslow, by the general court of Massachusetts in 1641, for a method of making salt.

Scene Service Chart
Nov. 14, 1932
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AIRPLANES X-RAYED TO LOCATE DEFECTIVE PARTS



© Wide World

Top and Center, Making X-Ray Pictures of Plane's Motor and Structure; Bottom, Examining Photos for Defective Parts



Airplanes at the German airdrome at Hamburg are X-rayed at regular intervals in order to find any defective parts which otherwise might be invisible. For this purpose a portable apparatus is used which is carried in a trailer attached to an automobile. X-ray photographs of propellers, motors and other parts are taken and developed on the field, for the apparatus used can be operated in the open, and neither the high tension nor the rays themselves are dangerous, the portable machine being constructed to obviate these hazards.

BRICKS OF STONE-PROOF GLASS USED FOR BUILDING

Glass bricks which are stone-proof have been developed for building purposes. The brick is a five-sided glass box with a lid, sealed to make it airtight. In experimental buildings, surfaces of the bricks in con-

tact with the mortar are coated with a colored cement to make the mortar stick, to give the glass blocks suction and to prevent water from penetrating the wall. Light reflected from the cement paint gives the effect of tinted, light-colored glass, although the bricks are clear. The range of colors is limited to cobalt-blue, light blue, emerald-green, light green, amber and rose. The glass blocks are translucent but not transparent. Diffusion of light through the glass wall has been found unusually good. Direct sunlight on the glass does not cause



shadows inside, because the light is reflected by the mortar joints in many directions, giving a soft, restful light throughout the building.

With new forests being found and old ones reproducing themselves, the supply of mahogany is being maintained.

*Covers - & More
Co. Columbus, Ohio*

*Science Service Dept.
Dec 12, 1922*

Anaha World Herald 1/22/23

Lincoln Heber

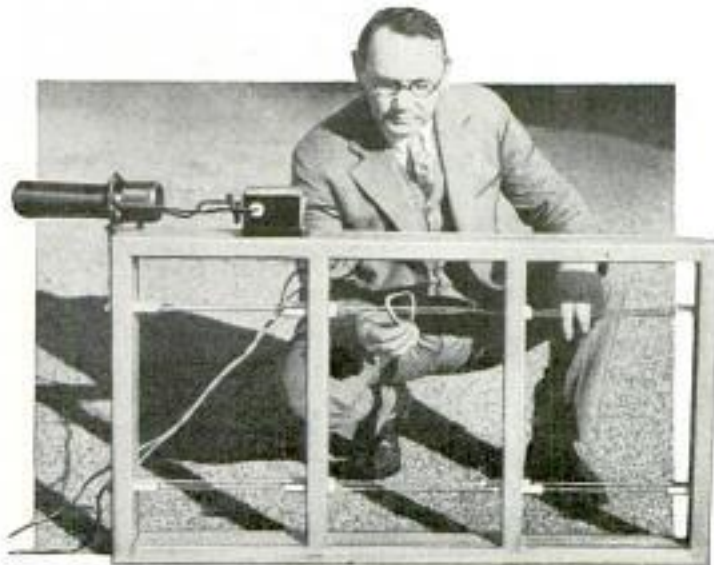
C 278

ELECTRICITY TRIED ON PLANTS IN FIGHTING DISEASE *c 202*

Experiments in which electric waves are used in fighting plant diseases are being conducted by L. J. Gier, of the University of Nebraska. He is attempting to kill bacteria and fungi that infect plants by employing electric waves vibrating at high frequencies. If this can be done without destroying the plant, science will have a powerful weapon at its command. The work is being done with a battery, a few tubes, two parallel copper plates and other equipment. Mr. Gier believes there is one specific vibration frequency to which each kind of living organism will respond and that cells hit by waves of the right frequency will vibrate in harmony with the electric waves, causing disintegration of the protoplasm and killing the cells.

FIRE ALARM SET OFF BY HEAT WHEN LEAD WIRES MELT *c 180*

For protecting homes, factories or office buildings from fire, a California inventor has evolved an automatic-alarm system which blows a horn or sounds a bell when the heat becomes intense enough to melt a lead wire. Two electric wires of extremely low voltage are run through the framework of the building. Over them, at intervals, triangular pieces of steel are suspended on a lead wire. When the heat melts the lead wire, the steel triangle is dropped across the electric wires, forming a connection which sounds the alarm.



Steel Triangle Causes Fire Alarm to Sound When Lead Wires Are Melted by Heat from Flames

H. A. Hildebrand
Oakland, Calif.



Butcher-Shop Attendant Standing on the Foot Pad Which Is Heated by Electricity

FOOT-WARMING ELECTRIC MAT USES LITTLE CURRENT

No more current than is necessary for a flat-iron would be required for an electric mat that warms the feet of persons working where no heat is available or permitted. A German inventor has produced a mat that keeps the feet of the butcher, the subway ticket clerk or the newsstand operator warm when the weather is cold and wet.

c 316

DIAMOND OIL-BURNER NOZZLE LASTS LONGER

Diamonds are used in an improved oil-burner nozzle to give longer and more efficient service. By fitting the nozzle with a diamond orifice, it has been found that at least five years of service can be expected, after which the diamond can be reset at a fraction of the original cost. Extreme hardness, resistance to acids and heat and the ability to hold its shape without appreciable wear make the diamond orifice almost ideal for this use.

U.S. Industrial Diamonds
Corp., 475-5th Ave
New York

Hans Lindner, Falkenstein
Vogelard Germany

HIGH *or* LOW-



By ^{Dr.} CORLEY McDARMENT,

Langley Field
Va.

TO fly high and freeze or low and probably burn is the question confronting the aerial fighting squadrons of all countries. Changes in the performance of airplanes, motors and guns have been made so fast that nobody seems to know the best altitude for practical military purposes.

One group of aviators believes that 25,000 to 35,000 feet is the proper place for fighting planes, while another group favors altitudes under 1,000 feet, preferably below 500 feet. The intermediate altitude is considered a "hot spot" because of the advance in anti-aircraft guns and the speed with which protecting airplanes can reach hostile machines flying in this easy area.

Most attack pilots favor the low altitude, skimming the tree tops, while pursuit pilots fly highest.

Much money and technical skill have been expended on getting more powerful motors and developing superchargers to pull airplanes to great heights. Planes have been considered in which a pilot would ascend into the stratosphere where he would have



Top, Pursuit Planes in Good Formation at High Altitude; Bottom, Low-Flying Planes Give Gunners Little Time to Swing Their Guns and Fire, Especially if Gas or Smoke Screen Is Dropped

to be sealed in a glass ball. It was argued that he could drop his bombs from such heights by electric control and be immune from gun fire from the ground. The mat-

Warfare in the SKY



Top, Showing How Easy It Is to See Target through Smoke Screen When Looking Down; Center, Pilot in High-Flying Equipment; Bottom, Pursuit Ships Diving at Bombers

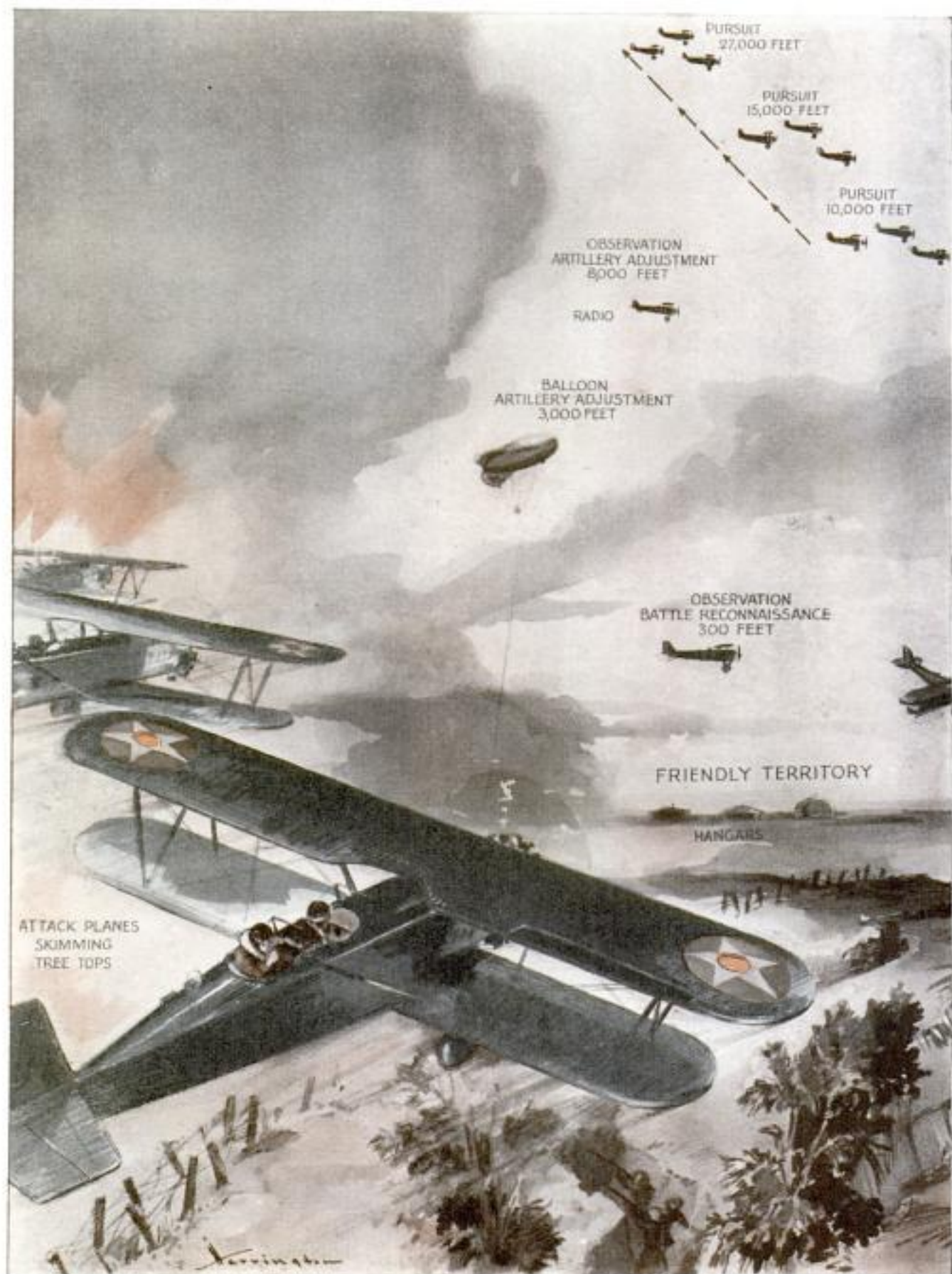
ter of a temperature of seventy degrees below zero would be taken care of by electric heaters.

Planes flying at such heights probably

would be immune to ground fire for a long time. But with powerful field-glasses being developed and the memory of the German "Big Bertha" guns, whose shells went twenty-five miles high in their trajectory, it is easily conceivable that ground batteries of anti-aircraft guns could be developed to meet the new need. An altitude of 60,000 feet is only about twelve miles. And bombing at such altitudes with ever-changing air currents could never be anything but

a hit-or-miss business—most likely miss. For the past two years, pursuit pilots in America have been going up with their

(Continued to page 124A)



Artist's Drawing and Diagram Showing Heights at Which Various Kinds of Fighting Planes Operate; Note Attack Ships Flying Low and Fast, Giving the Enemy Little Time to Prepare Anti-Aircraft Guns; at the Other Extreme Are Pursuit Planes Up 27,000 Feet

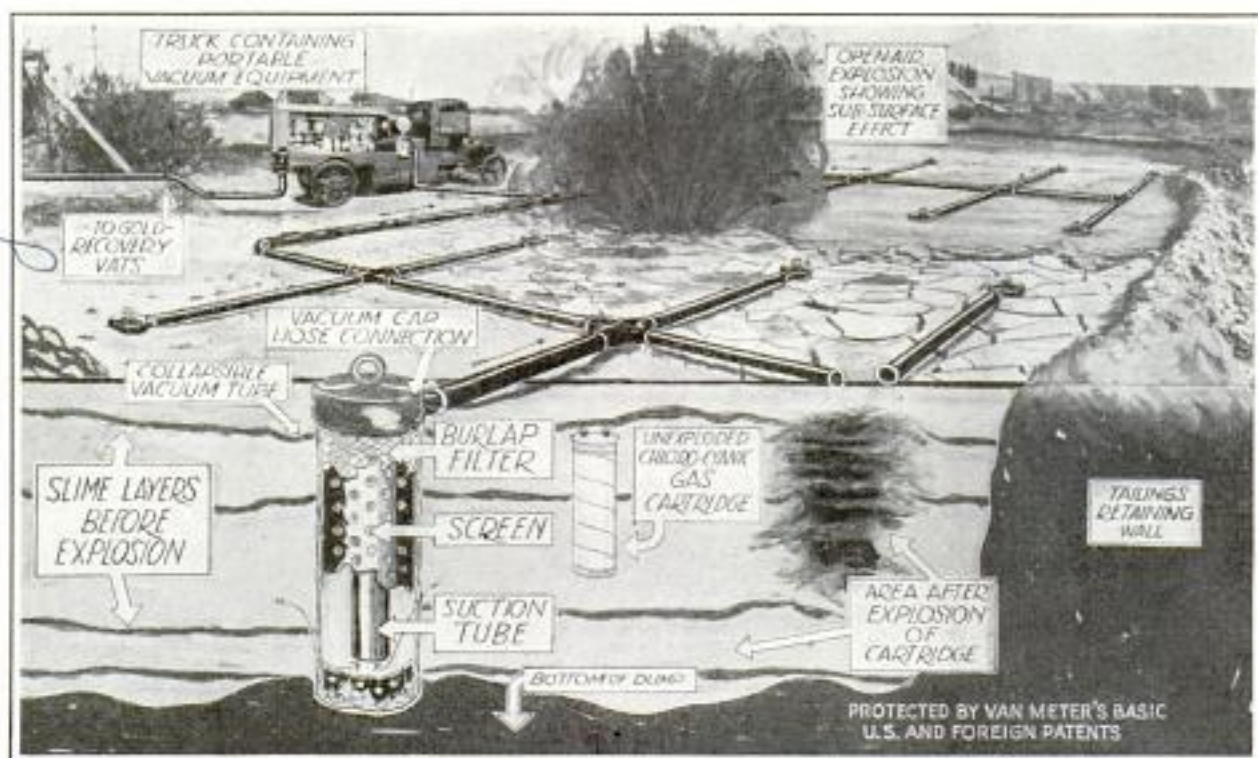


In This Diagram, Attack and Bombing Planes Are Flying Low over Battle Area; Note How Planes Vary Altitude When on Day and Night Duty, Dropping Thousands of Feet as Darkness Falls; Long-Distance Reconnaissance and Photo Pilot at 25,000 Feet

c 77

Gases Used to Extract Gold from Ore Dumps

101 North St. Andrews Place, Los Angeles, Calif.



How Explosion of Cartridge Digs Hole in Discarded Ore, Permitting Gases to Make Mineral Elements Soluble; Flooding and Removal by Vacuum to Gold-Recovery Plant Complete the Process

Gold, and other precious metals, are being extracted from old ore dumps, without handling the material, by a recently developed metallurgical process which utilizes gases to make the gold or other minerals soluble in water. This method, known as the chlorocyanic-gas process, was developed by James W. Van Meter, an authority on gases who pioneered the oil-fotation process, and makes profitable the working of the millions of tons of low-grade gold ore which was discarded by mines years ago. The method, which makes it possible to recover gold from dumps without the use of tanks or expensive construction, consists in checkerboarding an area of dump surface with drill holes about four feet apart. These holes extend downward to a point about a foot beneath the surface of the earth on which the dump rests. Perforated collapsible sheet-iron tubes, wrapped with burlap, are inserted in the holes, and in the center of the checkerboarded area other holes are drilled to receive the explosive gas-producing cartridges. These are electrically connected and all are exploded simultaneously, the intense heat developed by the blasts vaporizing the inert chemical in-

redients within the cartridges and creating a gaseous vapor which is disseminated throughout the mass, attacking the mineral elements in the dump and making them soluble in water. The area then is saturated with water which takes up the gold in solution. After this, the water is withdrawn by a vacuum pump through a series of rubber tubes to a vat, where the gold is recovered from the solution electrolytically. The ease and rapidity with which the collapsible tubes can be removed and inserted in a new area make it possible to treat a large tonnage at comparatively low cost. "Millions of tons of low-grade gold ore on the Pacific coast can now be treated in large dumps in place, and the gold content recovered without the aid of any stationary equipment," said Mr. Van Meter. "The progress made by the United States bureau of mines in using gases in the shattering of minerals as a substitute for ore crushing is worthy of note and opens an unprecedented field in the crushing of minerals."

☐The largest lake wholly in the United States is Lake Michigan, and Great Salt Lake is second.

Service Service Sheet
 No. 14. 1932

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**LARGER AND FASTER AUTOGIRO
 TO CARRY FIVE PERSONS**

Construction of a five-place autogiro with a 500-horsepower engine is planned by a British company. This closely follows the christening of a four-passenger cabin autogiro in the United States. The British ship will have a top cruising speed of 160 miles per hour, a cruising speed of 130 miles, and a minimum air speed of twenty miles. An autogiro of this size and power would be able to take off after a run of seventy yards, while landing can be made in a smaller space. The largest engine previously used in an autogiro had 300 horsepower.

memo 1/24/33

**HOUSE NUMBER VISIBLE IN DARK
 PLUGS IN LIGHT CIRCUIT**

Clearly visible at night, an illuminated house number operates at low cost on alternating current of standard voltage. No costly wiring or unsightly fixture is required. To all appearances, the number is just a piece of glass behind the window pane or front-door glass, obstructing no light or view during the day. At night, the evenly lighted digits stand out distinctly. Installation is as simple as plugging in any other electrical appliance. The connecting cord is concealed along the edges of the woodwork. Operating costs are less than ten cents per month.

C 235



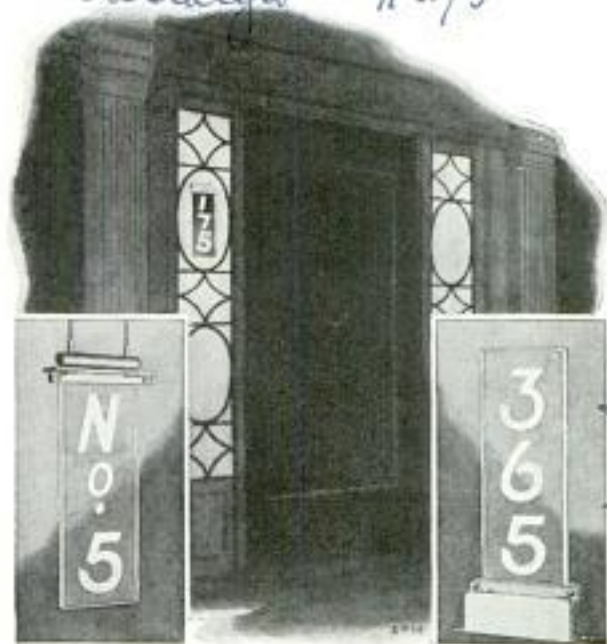
Resembling Cakes in a Pantry,
 Samples of Roads Are Filed for
 Reference and Tests

**ROAD SAMPLES HELP DEVELOP
 BETTER TYPES OF PAVING**

Samples of roads from all parts of the world have been gathered for study at a good-roads laboratory in Boston. Non-skid surfaces, cheap roads to get the farmer out of the mud, city pavements and super-highway surfaces are all stored for reference, testing and file purposes in the scientific development of enduring paving. The various samples are kept on shelves, and the collection looks like a pantry with its shelves loaded with layer cakes containing assortments of nuts and icings.

**MOVIES HELP CATCH FUGITIVES
 IN GREAT BRITAIN**

Scotland Yard is now using moving pictures to trace criminals. One of the most intensive man hunts ever instigated in England was carried on with the aid of the movies in a search for a man wanted for murder. Films giving a police description and pictures of the suspect were shown in nearly all theaters with an appeal to the public to supply any information. The film was introduced on the screen by the sound of police whistles, and pictures of the fugitive were followed by a short verbal description and instructions for notifying the authorities if the man were recognized.



Illuminated House Number Is Easier to Read; Inset,
 Hanging and Standing Types

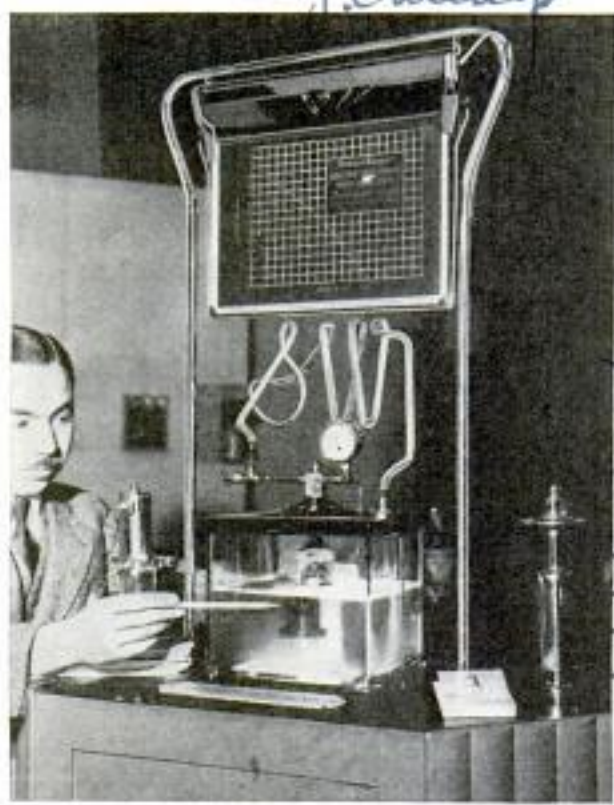
memo 2/3/33

Copley Appliance Co.
 402 to 410
 Boston, Mass

Great Britain reported
 by Trade Commissioner

Martin B. Kennedy Motion
 Picture
 London
 1111 Broadway
 New York

c 261 Stewart Warner at Paramount Studios
 1828 Jersey
 736 Parkway Chicago
 POPULAR MECHANICS



This Shows How Electric Fuel Pump Supplies Steady Stream of Gasoline to Auto Engine

ELECTRICAL AUTO-FUEL PUMP USES LITTLE CURRENT

Found dependable and economical after extensive tests, an improved electric fuel pump for motor vehicles delivers as much as twenty-five gallons of fuel per hour to the engine. Less current is consumed—three-eighths of one ampere in average service—than by other types. When the engine turns, the pump delivers the gasoline, facilitating starting in cold weather. The pump is said to be the only prime mover, double-acting piston type on the market. It operates independent of any other moving parts. There are no contact points, diaphragms or bellows.

CURVES CHANGED INTO CHORDS BY PROFILE CONVERTER

Making vision audible, a device called a "phonodeik" transforms the curves of a profile into sound waves, thus detecting every defect or nicety of human features. In a test, the curves of a former screen actress' face were converted into a perfectly attuned major chord, thus demonstrating the purity of the profile. The device was invented by Dr. Dayton C. Miller, of Cleveland.

Prof of Physics Case School of Applied Science

CAMERA AND TRIPOD IMPROVED TO STOP ACCIDENTS

Improvements in the motion-picture camera and in its tripod are expected to reduce costly and dangerous accidents. A self-stopper, or automatic electrical cut-out that will halt a motor-driven camera when the film buckles, will result in a large saving on repairs. In the past, buckling of the film often damaged the delicate camera mechanism. Until recently, the big tripods used for heavy soundproof cameras contained, in each leg, a large coiled spring under great tension. These springs sometimes crystallized and exploded, bits of flying steel endangering the lives of workers near by. By making the spring of a double-acting cylindrical design and with an improved housing, the movie makers have eliminated this hazard.

MOVING SCREEN IN EXTRACTOR STRAINS FRUIT JUICES

Improved straining of fruit juices during the process of extraction is provided by an oscillating screen that is a feature of a new extractor. The screen takes extra juice from the usually discarded pulp and also strains the juice so clear that it may be taken through a straw. The fruit reamer is turned by hand crank, while a rod fastened to the crank oscillates the screen.



New Fruit Juicer Has Moving Screen, as Pictured in Inset, to Aid in Straining

Herbert Fromm
 Hamburg, Wis

ny June 26/1932

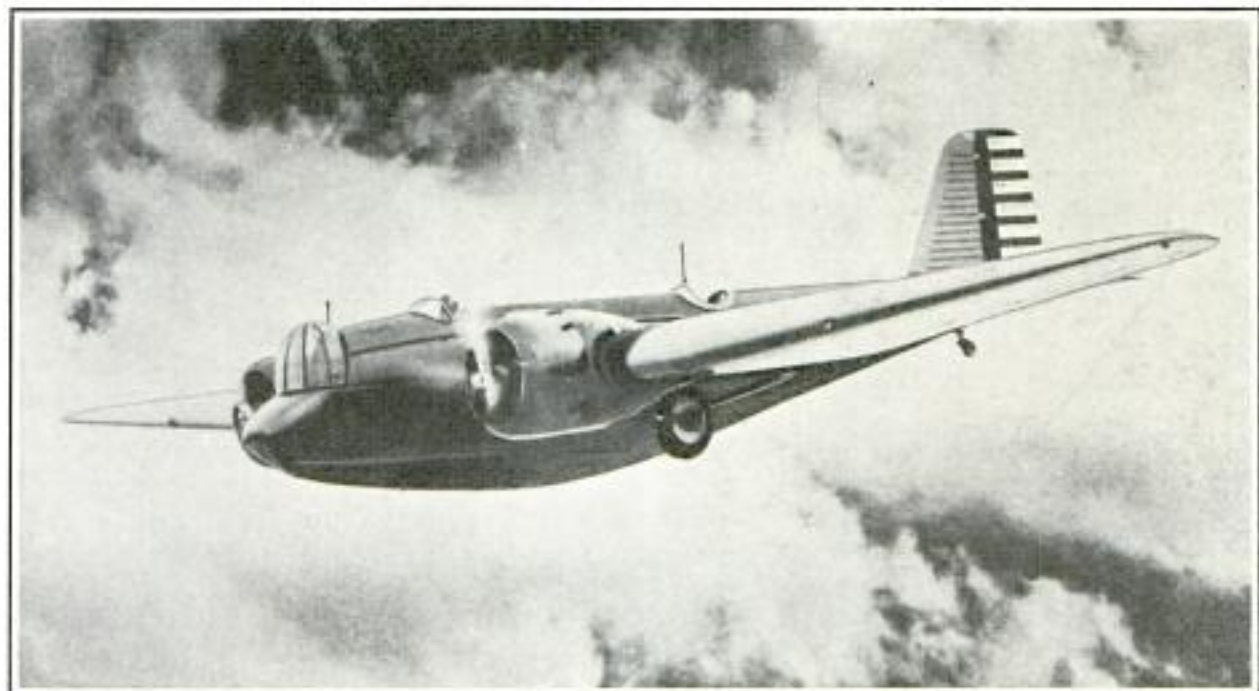
only Willy Walter \$30

c 459

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C 30 4

Latest Army Bomber Has Glass Gun Turret



Here's the "Mystery Bomber" of the United States Army; It Is Fast and Carries Big Load of Explosives; Note the Dome-Shaped Glass Compartment on the Nose Where the Machine Gunner Sits

Capable of speeding ^{B-10} 200 miles an hour, the latest bombing plane of the United States army carries 2,000 pounds of explosives. The front gunner is inclosed in a revolving glass turret. Retractable landing gear and a wing spread of sixty-two feet are other features of the craft.

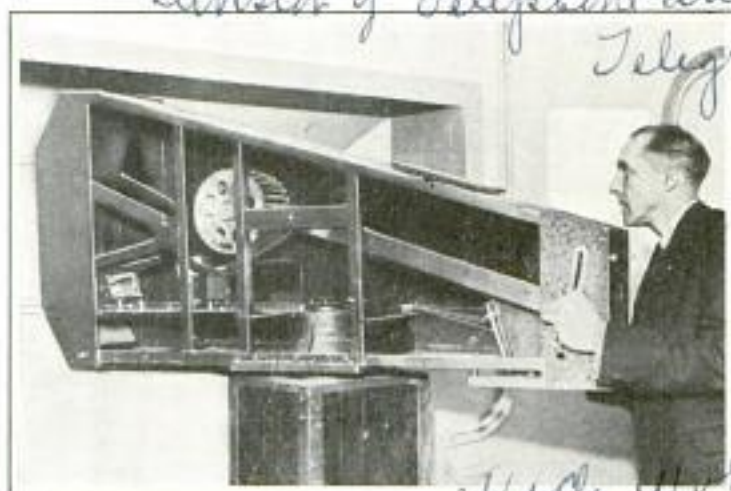
any, but other rare woods may be used. All the panels are prefabricated and numbered to fit into a predetermined plan.

FIRE-RESISTING WOOD PANELS DECORATE THEATER ^{C 324}

Decorative panels of fire-resisting wood combine beauty and safety in a theater in Rockefeller Center, New York City. The panels are of sheet steel faced with thin plywood, a combination that gives all the structural advantages of steel and the beauty of rare woods. In addition, the plywood is treated with chemicals that make it highly fire-resistant. The steel not only provides fire protection but makes for ease of fastening the panel to the building, by means of small Z-bars, welded to the back of the panels. In building the walls, these bars are clipped or wedged into locking parts anchored to the steel frame of the theater. The face or outer face ply is a figured mahog-

FRENCH WORK ON TELEVISION FOR COMMERCIAL USE ^{C 30 7}

Intensive experiments with television apparatus are being conducted by scientists of the French government in an effort to make it a commercial success. Equipment of many shapes and sizes is being tested by expert operators who are devoting their entire time to the task.



This Strange Apparatus Is Used by French Experimenters Seeking the Secret of Commercial Television

Ornamental Haskelite

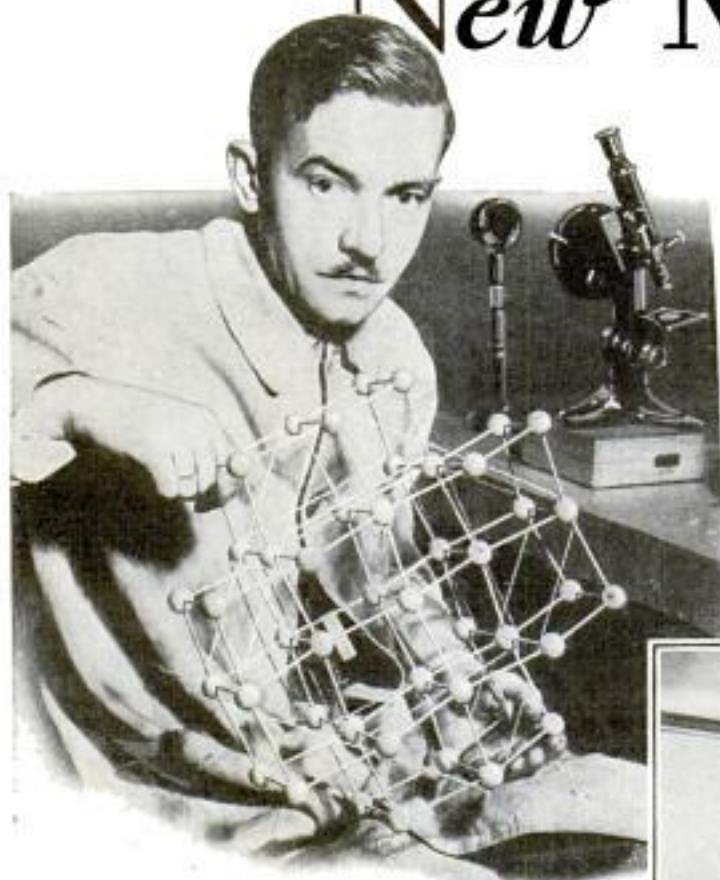
*Haskelite Mfg. Corp.
120 S. La Salle
Chicago*

Division of Telephone and Telegraph

Wide World

C186 Cmt. Mel Wharton
1144 Grandview St
Los Angeles, Calif

New METALS



Left, Prof. Goetz Holding a Model of a Tin Crystal; This Is a Practical Demonstration of the Arrangement of Atoms; Every Metal Has a Different Atomic Structure That May Be Rearranged for Strength and Lightness.



Compressor Unit in the "Cold" Laboratory at California Institute of Technology Applies Pressure of 8,000 Pounds per Square Inch; Gases So Compressed Are Explosive, so Electric Switches Are Sealed in Glass to Prevent Sparks from Escaping

TRAVEL through the stratosphere at speeds of more than 500 miles per hour will be made possible by building airplanes of metals of almost unbelievable lightness and strength.

That is the prediction of Prof. Alexander Goetz, of the California Institute of Technology, whose research in metals has won him the name of "the wizard of crystal structure." Recent laboratory creation of such metals opens a new era of industry, Professor Goetz says, because metals of these unusual characteristics will find utilization for purposes not now suspected.

"From what has been found out about crystals, metals and alloys from ten to 100 times the strength of our present products can be manufactured," explains Professor Goetz, who is an associate of Dr. Robert A. Millikan, physicist and discoverer of cosmic radiation.

"Airplane flight has been restricted commercially to comparatively low ceilings because of the great weight of machine that must be lifted. But with the knowledge of how to make very light, but enor-

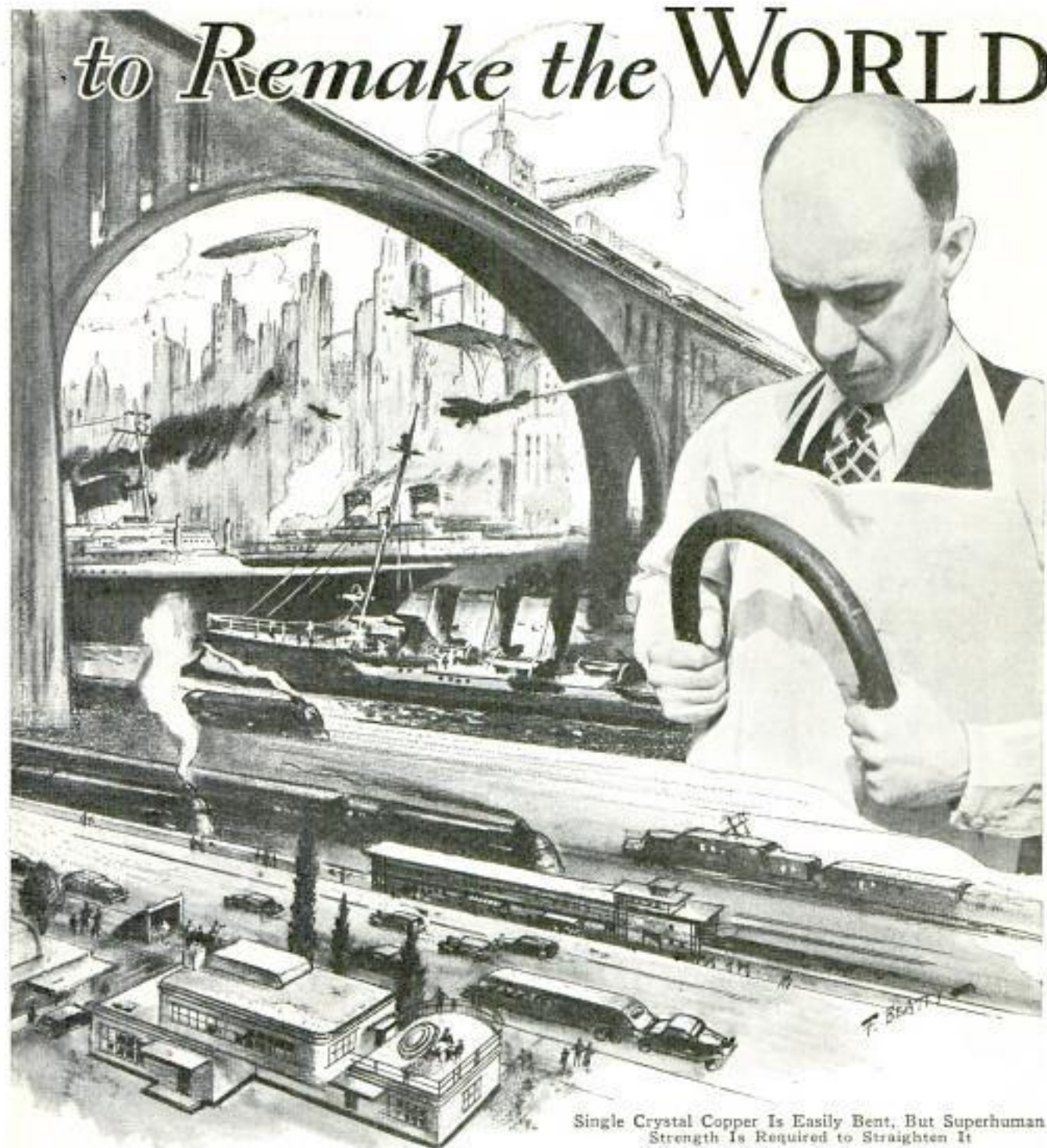
mously strong, metals we may expect not only much faster flight, but an increase of pay loads in a way to greatly boost commodity transportation by air. We may look forward to increases of pay-weight of the order of more than fifty per cent by use of better metals alone."

We can picture, too, he claims, the automobile of the future, zigzagging in and out of traffic, carrying only a small portion of its present weight, yet structurally as strong as its bulkier and more clumsy predecessor. Considerable economies in gas and tires likewise should be possible.

The creation of new metals is possible because science has learned to make crys-

Pasadena, Calif

to Remake the WORLD



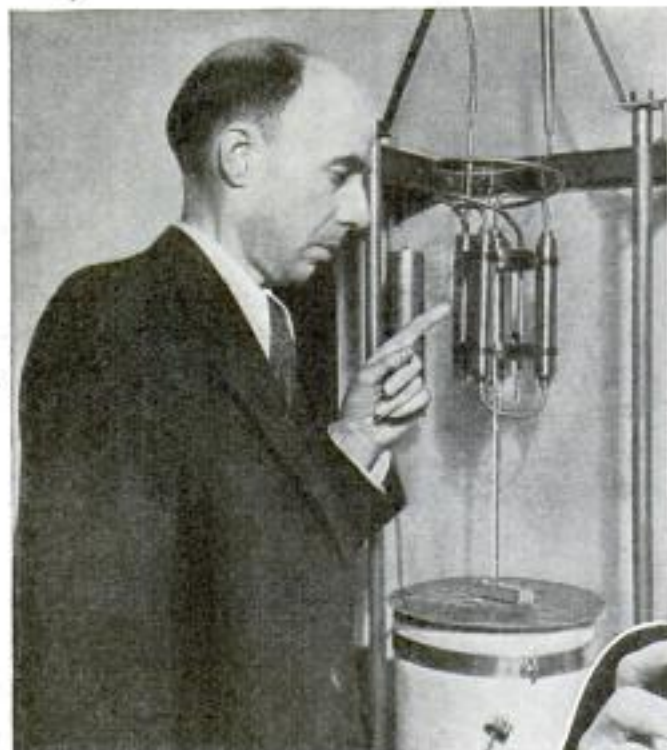
Single Crystal Copper Is Easily Bent, But Superhuman Strength Is Required to Straighten It

tals perform its bidding like soldiers on parade. Professor Goetz can line up crystals in rows as straight as ten-pin alleys, edge to edge, in perfect order. This development of uniform structure allows the manufacture of metals of tensile strengths hitherto unknown, permitting vast reductions in weight to gain identical results.

That metallurgy has been predicated upon the use of "bad" crystals, is the contention of Professor Goetz. Asked to give

a definition of what "good" crystals are, he declared them to be those capable of being maneuvered in metals to meet specific requirements.

Professor Goetz went even farther. He declared that when science learns how to juggle atoms in crystals as well as the crystals themselves, there is no practical limit to the marvels that can be performed with metals—even to the manufacture of metals 100 times stronger than those in use today.



Top, Apparatus for Purifying Gases for Use in Producing Intense Cold; in Circle, Metal Ring, Electrically Charged by Induction and Shipped in Insulated Box Containing Helium, Loses No Power in Transit

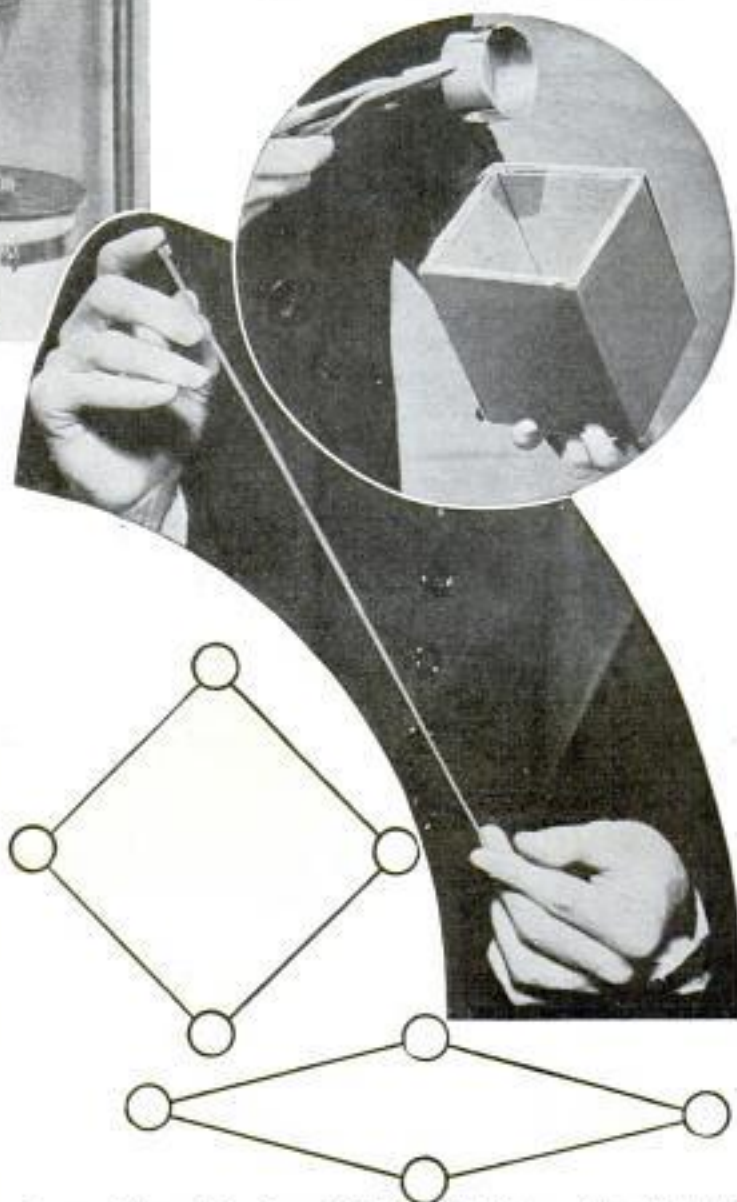
Each metal has its own individual crystal structure just as every element has a definite atomic set-up different from every other element. It is the arrangement of those crystals and atoms in relation to one another that determines the characteristics of a product or element. Heretofore we have had to work with crystals and atoms just as nature gave them to us.

Single crystals of metal several feet long have been successfully manufactured by Professor Goetz in his experimental laboratory. He has been able to produce single crystals of bismuth and other metals, of microscopic fineness, more than 300 feet in length.

This is done by subjecting the metal, when in the fluid state, to great strains in an intense electromagnetic field. This magnetic stress draws the crystals as they are cooling. By changing the angle of this magnetic stress, Professor Goetz can maneuver the crystals like men on a chessboard and obtain metals of such varied characteristics that

he asserts science will soon be able to produce at will metals of any predetermined structure.

Another metallic wonder is the manufacture of a single crystal of copper a foot long and more than an inch in diameter. A child can bend this copper-crystal bar double. But once bent, some queer freak of reaction occurs. Not even the strength of a giant can straighten it out again. A splendid



Center, Fifteen-Inch Crystal of Bismuth; Bottom, Left, Model of Metal Crystal; Right, Same Crystal Under Pressure

stunt for a magician. What has happened to the copper crystal? While no one knows, the theory is that the crystal is broken, destroying the pattern and preventing return to its original condition.

(Continued to page 129A)

Com. Walter Wainwright
Araraquara, Estado de

C129

Sao Paulo, Brazil
**SILHOUETTE LIGHT FOR AUTOS
URGED AS DRIVING AID**

342
Safer driving conditions would result from use of the silhouette light, suggested to auto-accessory manufacturers as a solution of the problem of night lighting. This device would consist of a light attached beneath the auto so that the whole outline of the car would be visible to oncoming motorists. At the same time, the light would illuminate the side of the road opposite that on which the auto moved. The effect would be similar to that resulting from two cars moving in the same direction at night. Although the first car may have bright lights, the approaching driver is not blinded or confused, because the lights of the second car outline the first car, in addition to illuminating the offside of the road. The wheels and lower parts of the first auto stand out in silhouette, showing the oncoming driver the exact condition of the road at that point. The silhouette light would accomplish the same thing. It would not be visible to the approaching motorist, but it would spread illumination over the roadway just as would a two-car combination. It could be placed beneath the body, protected from pebbles thrown aside by the wheels, and operated by the dimmer or regular light switch.



Garden Heated by Furnace Ovens, the Heat Passing through Tile Laid beneath the Surface

E. B. Johnson, Muskogee, Okla.

**LIGHT FOR HEATING AQUARIUM
ILLUMINATES WATER**

229
Light and heat for a home aquarium are supplied by an electric bulb attached inside the top. Electrical cord and plug for attaching to wall outlets are provided.



**GARDEN HEATED WITH FURNACE
GROWS CROPS IN WINTER**

Winter-chilled soil is warmed to grow spring vegetables the year round in a furnace-heated garden operated by an Oklahoma man. He laid parallel lines of tile in the ground three feet apart, attaching one end of each pipe to a furnace oven and erecting a chimney over the other end.

To equalize the temperature over the warmed area and to insure a draft, the tile at the ovens is buried two feet underground, slanting upward to the chimneys where it is only five inches beneath the soil. One such plot is thirty-seven feet long, thirty feet wide and uses ten chimneys. In heating a seed bed, an inch of dirt and four inches of sawdust are placed over the garden, the latter being removed when the weather moderates in the spring.

**BLADE HOLDER FOR STROPPING
MAKES JOB EASIER**

277
Stropping double-edged razor blades is made easy by a holder that is supplied with a specially treated leather strop. The holder enables the user to grip the blade firmly while renewing the edge by ordinary stropping in five to ten strokes. The strop is neither a hone nor an abrasive, but a piece of cowhide.



I. W. Silverman
604 Birchaw Bldg
Pittsburgh, Pa

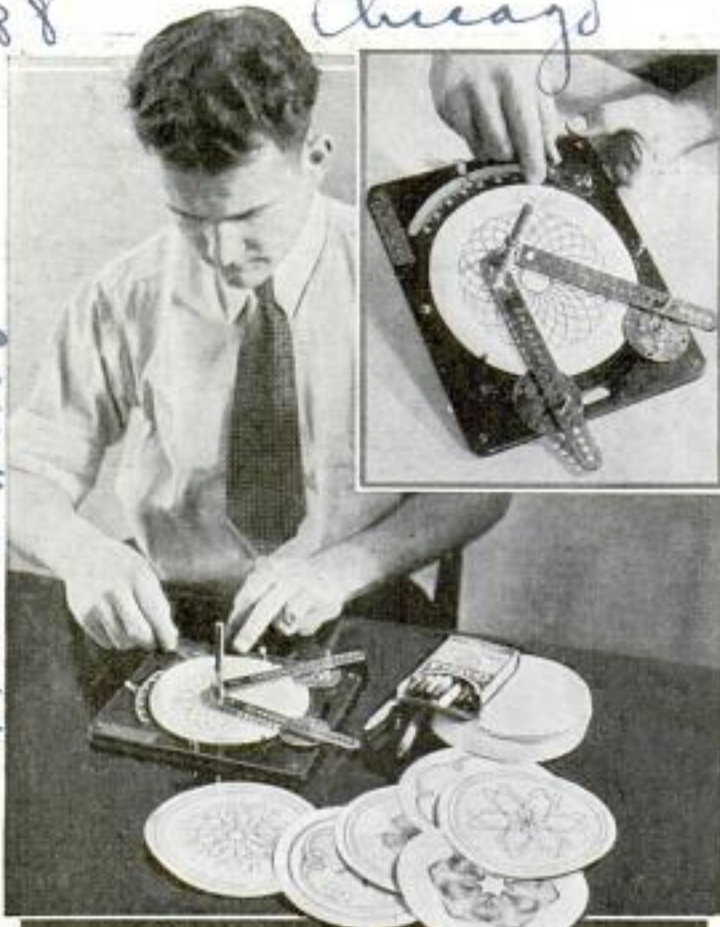
Perkins, Campbell Co
1309 Ethman Ave
Cincinnati, O.

Howard B. Jones
 2300 Wabanssee
 POPULAR MECHANICS
 Chicago

742

c88

Wood turning part of
 \$1.00 to \$2.00



Precision Drawing Toy with Variable Adjustments Which Enable User to Create Thousands of Intricate Designs

DRAWING TOY MAKES DESIGNS IN THOUSANDS OF SHAPES

Symmetrical designs in thousands of shapes are formed by a drawing toy through the simple process of changing the settings and turning a crank. The instrument consists of a base containing a metal disk, revolved by the crank, on which the paper rests. There are also two crank disks, each containing eight holes in which pins may be inserted. One of the disks can be manipulated to various positions by a lever. Two pencil arms, fitting over the crank pins on the disks, have eighteen adjustments each. For drawing circles there are two studs for the pencil arms. All these adjustable parts give an infinite variety of designs, each symmetrical, but differing from any other design each time one or more of the adjustments are changed. Any drawing can be duplicated simply by logging the settings of the adjustments which produced it, as each adjustable part is either lettered or numbered. A stylographic pen can also be used instead of a pencil, and the symmet-

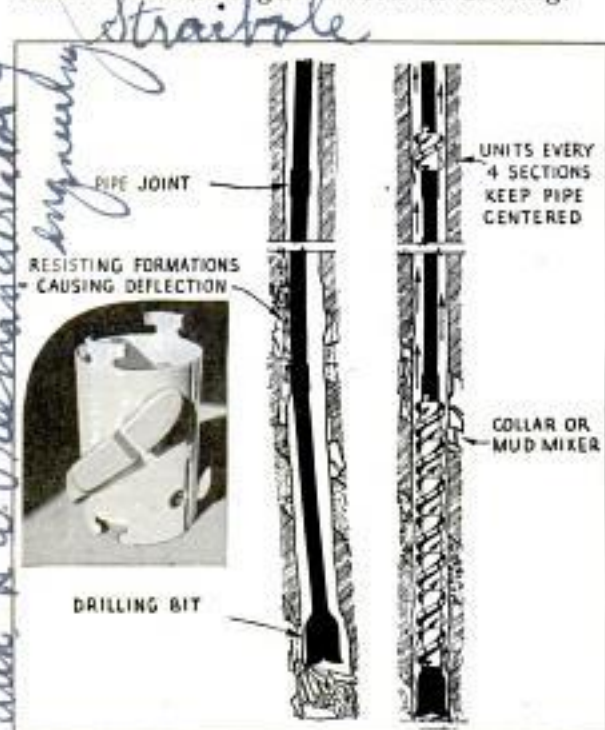
rical designs can be colored with crayons. The instrument also has a practical use, as it can be employed in making patterns for fancy work, lamp shades, etc.

c216

STRAIGHT OIL WELLS DRILLED BY AID OF GUIDE ON PIPE

Straight drilling of oil wells, for many years the dream of the industry, can be done by attaching a steel and rubber collar to the drill pipe a short distance above the bit. Two slotted steel plates are coupled around the pipe, with rubber flanges protruding from each half. Each flange is held in position by vacuum created by countersunk lettering. When the drill pipe is rotated, the collar produces an effect like that of a high-speed water screw. The whirling motion creates a lift, forcing water and muck upward and increasing drilling efficiency. In an eastern Texas test, five days and six nights of continuous drill-

ing with the device enabled the operators to touch bottom in a 3,780-foot hole. The collar eliminates guesswork in drilling.



Left, Collar for Drill Pipe; Drawings Illustrate Improved Drilling Method

Kennedy Oil Field
 Hences Co 6100
 Manchester Ave. St Louis Mo

C 29 B



Wood World

The Novice Class in British Riding School; Note That Wooden Horses Are Used Instead of Real Mounts

RECRUITS RIDE DUMMY HORSES TO GAIN CONFIDENCE

Dummy horses of wood are used in training recruits at a British school. By riding such mounts, newcomers gain confidence in addition to saving horses from the strain of bearing unskilled riders.

C 32 B

DIAMONDS MINED BY GIANT FAN BLOWING COMPRESSED AIR

Mining by compressed air has entered the diamond field in South Africa. At the Kleinzee diggings in Namaqualand, a giant fan blows jets of air under a pressure of forty pounds to the square inch, exerting a force that loosens the earth and blows out thousands of precious stones. The fan resembles the vacuum cleaner and is so arranged that nozzles of various shapes can be attached. An acre of ground can be covered in one day by a crew equipped with one fan.

C 81

CHURCH IS BUILT TO HOUSE HALF TON BIBLE

After working for two years making and printing what he believes to be

the world's largest Bible, a Los Angeles man found his home was not large enough to display it properly and built a church around the huge book. This Bible contains 8,048 pages and weighs 1,094 pounds. Opened, it measures eighty-two inches across and each page is forty-three and one-half inches long. When closed, the book is nearly three feet thick. It is printed with hand-stamping rubber type, and a person with good eyesight can read it from a distance of fifty feet. The maker of the Bible also built the church single-handed, the edifice seating more than 100 persons and containing a special alcove for the Bible. Services are held there regularly



Huge Bible Containing More Than 8,000 Pages and Weighing Over 1,000 Pounds; It Can Be Read from a Distance of Fifty Feet

Cont. W.L. Spangley, 120 Klough St. Cape Town, S.A.

Louis Wayman Temple of Truth, Los Angeles, Calif.

Wood World

by Cape Coast Exploration Co

C260

744

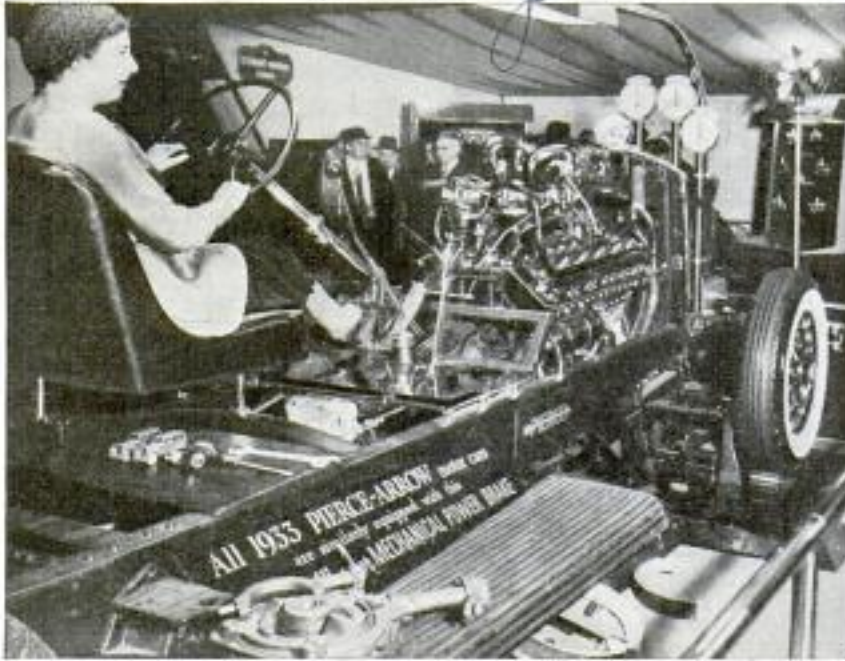
Stewart. Warner Corp
1828 Glenview Parkway

POPULAR MECHANICS
Chicago

Light Rifle

C318

Emil Chas. To A. Magnuson, Tacoma Wash
and 13 and 13 1/2



Demonstration of Ease with Which Mechanical Power Brake Is Applied; Brake Pedal Is Shaped Like Accelerator to Speed Operation

QUICK-ACTING POWER BRAKES ARE EASILY APPLIED

Easily operated even by a child, mechanical power brakes have been produced and installed on one of the latest model automobiles. Braking force is applied by the power unit, which is located on the driveshaft beneath the car and harnesses the car's momentum. The brakes respond accurately to the slightest pedal pressure, so that small women can stop heavy cars as quickly and as safely as men drivers. The brake pedal simply controls the degree of braking force actually applied by the power unit, making unnecessary any lunging pedal action. Since the brake pedal is set at the same height as the accelerator pedal, it is necessary only to rotate the foot from one to the other. A pedal movement so slight that it would not start ordinary brakes is sufficient to apply sixty per cent of full braking power. Automatically, braking force is distributed uniformly to all four wheels, enabling the driver to stop the car in a straight line, even on slippery pavements. Mileage of 10,000 to 20,000 can be traveled before adjustment is required, and then the job can be done with a screwdriver and a wrench.

Glacier national park is the southern limit for many plants of Canada, and the eastern limit for some Pacific coast plants.

By growing telephone poles as a crop, the city of Tacoma, Wash., is assured of a perpetual supply that will return a profit to its taxpayers. Rich soil in the basin of Lake Cushman, which was created by development of the municipal power project, speeds the growth of young cedar trees. Almost ideal weather is another factor, causing some of the young trees to grow as much as ten feet in one year. In 1932, the city government had 30,000 trees planted in the basin, while another 30,000 will be planted this year. The cedars reach a height of fifty feet in about thirty years, promising a large supply of forty-foot telephone poles. Unemployed citizens do the planting.

RIFLE FIRING BULLET OF LIGHT AIDS ARMY RECRUITS

Nervousness, and other ill effects of the noise and fumes of the rifle range, will be eliminated for the British army recruit by a gun that fires a bullet of light. When the



Resembling the Regulation Army Rifle, This Gun Shoots Light Beam That Registers on Target

recruit pulls the trigger, an ingenious arrangement causes a black spot to form on a luminous target, recording his accuracy. In this way, the recruit becomes accustomed to the rifle and range-firing methods before starting practice with actual weapons.

Holder, Isleson & Co. Ltd

Pierce Arrow

Service shorts
Nov. 14, 1932

Copyrighted material

C245

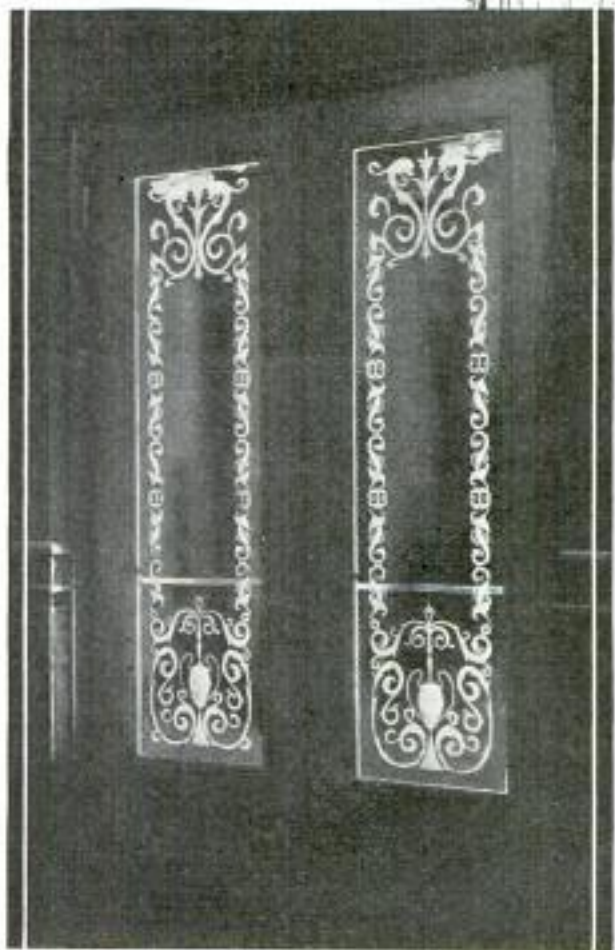
Cont. C. E. Axery, 2455
Herdman St.

see July 1931-99 Seattle Wash

Beauty in SAND-BLASTING

SINCE man first discovered that nature reshaped its rocks and mountains with sand and wind, he has devised ways and means of accomplishing the same results, decoratively, on various mediums, principally glass and wood. Today, store fronts, show windows, mirrors and lighting fixtures are embellished by the addition of designs cut into glass.

Glass is prepared for decoration by first covering it with a plastic, abrasive-resistant material called "dope," or "resist."



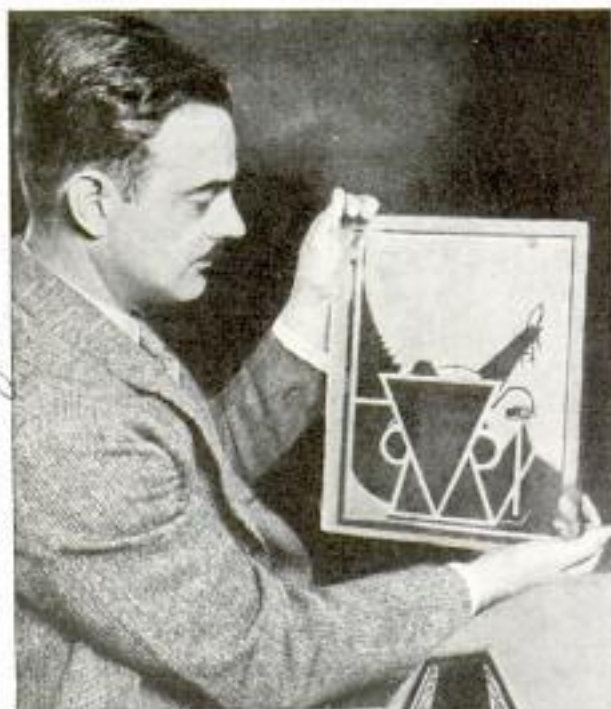
Above, Operator Using High-Pressure Sand Blast on Wood Door; Below, Sand-Blasted Plate-Glass Doors

Its chief ingredients are glue, glycerine and water. Brushed on the glass while hot, then dried or cured for several hours, it adheres firmly to the surface. The design to be used is then transferred to the resilient, resistant surface. Skilled workers cut along the lines of the pattern with sharp knives, pulling out the portion to be exposed to the sand blast.

Process work, where several depths are blasted into the glass, goes through the same treatment; each successive depth is cut in the pattern at one time, but only the resist over the deepest part is removed at first. This part is sand-blasted to about half the required depth. When the next, shallower depth is sand-blasted, the first depth, still exposed, naturally is blasted deeper into the glass. Several depths can thus be formed. Contrasting tones in the finished piece result in modeled effects in the glass. Window glass, flashed glass, plate glass and opaque, colored vitreous materials of other types all are treated in the same manner.

C 245
746

Louis Schneider, 294 Market, Newark, N.J.



only about forty pounds' pressure, but produce finer work. A gun, similar to a paint sprayer, controls the air pressure and sand flow by means of the trigger. Hard metal nozzles, lasting hundreds of hours, have replaced the cast-iron type.

Architects, builders and store owners use sand-blasted glass to decorate transoms, and store window valances. Office partitions, skylights and doors are obscured with plain and fancy designs; bankers replace expensive metal grills on counter screens with sand-blasted glass; illuminated glass clock dials are ornamented. Builders of homes use it on ceiling and wall lighting panels, glass bathroom walls

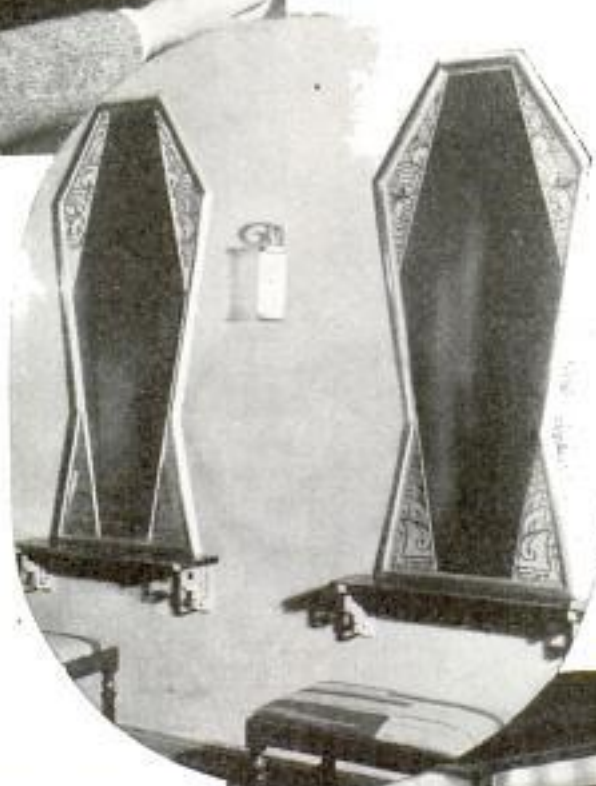
and shower doors, windows, desk and table tops. Signs of all kinds are made this way.

Sand-blasted art novelties, formerly imported from France, Germany and Czechoslovakia are now made in the United States. Mirrors, desk sets, ash trays, vases and many other articles of glass are beautifully decorated by this method of man-made erosion.

If the same design is used many times and sharpness of line is not required, a stencil cut from hard-rubber sheeting, metal, wood or paper is used as a resist. The sand blaster works in a steel-walled room from which the thick dust is removed by forced ventilation. He wears protective gloves and clothing and a headpiece similar to a diver's helmet through which he receives fresh air from the air line.

Compressed air forces sand through his blasting machine. He sprays the glass before him in much the same manner as a painter applies paint with a spray gun. When he is finished, the resist is removed, heated and used again.

High-pressure sand-blast tanks, delivering thirty to 150 pounds of pressure, are used for production work, antiquing large areas on wood or frosting glass. Induction or gravity-type sand blasts develop



Examples of Sand-Blasting; Top, Modernistic Pictures; Center, Plate-Glass Mirrors; Below, a Finished Entrance

Western Sand Blast Co
1458 W. Kinzie, Chicago

Copyrighted material

My Times
2/25/33

C 332

LENS TO FOCUS COSMIC RAYS C 346

Cosmic rays with 100,000,000 volts of energy will be focused, or concentrated, by a new lens that requires application of 100,000 volts of electricity. The instrument will provide a source of radiation of convenient strength for use in scientific experiments. Dr. W. F. G. Swann, director of the Bartol Research Foundation, Franklin Institute, says that it will be possible to focus the various kinds of cosmic rays that rain down on the earth from all directions in space in accordance with their different intensities, which are known to vary from 100,000,000 to 10,000,000,000 volts. The lens involves the use of two vertical concentric tubes, between which a potential difference is maintained. Two Geiger counters, used as cosmic-ray nets, are placed along the axis of the tube, one above and the other below. It is then possible to focus the rays passing through one counter so as to pass through the other.



Puzzles within Puzzles Are Produced in This Factory Which Gives Work to Many Unemployed Artists; Here Is Section of Workroom

Wide World

ELABORATE JIGSAW PUZZLES GIVE IDLE ARTISTS A JOB

Idle artists, once employed in the motion-picture studios of Hollywood, are finding work in a California jigsaw-puzzle factory. The fad for elaborate games has created a demand for puzzles containing from 15,000 to 20,000 pieces. Actually, these are puzzles within puzzles. Instead of the usual curlicues and triangles, the puzzles contain parts representing certain figures in the scene. These figures, after being pieced together, are fitted into the larger puzzle. Constructing these games calls for the best artistic talent.

Stendahl Art Galleries
Hollywood

KNOB FOR GEAR SHIFT SHOWS WHEN TO CHANGE OIL C 29

To remind the motorist when to change oil, a mileage record is contained in a dial set in a gear-shift knob, which replaces the regular knob on the shift lever. The knob contains a removable tube which has several dials to be adjusted to show the mileage when oil is to be changed next.



A special thermometer is being used to check the temperature of grain in bins forty feet deep, so danger of overheating can be averted.

REFLECTORS FOR WHEEL RIMS GUIDE PASSING AUTOS C 281

Two small reflectors, attached on the left wheels of automobiles, guide approaching drivers at night by picking up the light from meeting cars. When the wheels turn, they form two luminous circles.



Scene Service Shorts
Dec. 19, 1932

St. mails Sales Service
Ch. Warren
Copyrighted material
R. S. C.

Oilmeter Sales Corp. 7-204
First National Bank Building
Parsippany, N. J.

Developed by marketing specialist V. D. Agnew

c 64.

Herbert C. Hearne,
Third National Bank Bldg.

748

POPULAR MECHANICS

1387 Main St
Springfield, Mass

95 Maple St.



Top, Equipment for Copying Photographs and Drawings; Left, Copy from a Book; Right, Case for Carrying the Apparatus

PHOTO COPYING MADE EASY WITHOUT A CAMERA

Camera and dark room are eliminated by a new process for photographing any flat object and for copying photographs. A specially prepared paper is placed above or below the object, a light in the machine is switched on, two liquids are spread on the paper, which is then washed and rinsed, producing the picture. In copying, the special paper is merely laid over the original. An automatic cut-off at the proper time is provided for the light in the device. This machine, which can make reproductions as large as twenty by twenty-four inches, weighs only twenty pounds. It is portable and so arranged that it resembles a suitcase when closed. No space other than that occupied by an open suitcase is required. Copies from tracings can be made in less than one minute, while reproductions require a slightly longer time, depending on subject material. Drawings, writing, printing, tracings, sketches, illustrations, photographs, patterns, and

the like, can be copied or reproduced by this process. The cost of a photographic print, letter-size, is only five or six cents. Since no knowledge of photography is necessary and the device may be operated in any light, it is especially adapted to business-office use. The material on which copies are made is suitable for coloring, as well as for pen or pencil work. It is possible to produce copies that show white on black background or black on white background.

WALL CORNER AIDS PAPER HANGER

As an aid to the paper hanger, a wall corner has been produced for uniting canvas on side and end walls and ceilings. The corner is made of metal and comes in three-foot lengths. A strip of

canvas, two feet wide, is held tightly by the corner, which is nailed to the wall. This prevents pulling and sagging. The canvas is stretched from the corner and tacked. By using a good grade of canvas, repapering is more economical. Its makers claim that the device saves much labor and reduces tacking to a minimum.



IMPROVED ROADS LOWER COST OF OPERATING AUTOS

It costs about one cent a mile less to operate an average car over a gravel road than over an earth road, and about one cent less to operate over a smooth pavement than on gravel. These figures were presented to a recent meeting of the Mich-

Sander-Gray
582 Main St.
Batesville, Ark.

Copyrighted material

Unid. of Michigan
New Dissemination
Service
2/15/33

C 300
d.w. Chas L. Jolly

POPULAR MECHANICS

Venice Calif 749

igan highway conference
by Prof. R. L. Morrison.
If a gravel road, used by
1,000 cars a day, is re-
placed by a pavement, the
saving to motorists per
mile in operating costs is
\$3,650 a year. The annual
cost of the road itself in-
cludes depreciation, in-
terest and maintenance.
If the annual cost of a
gravel road is \$1,200 a
mile and that of the pave-
ment is \$1,750, the added
cost of the pavement is
\$550 but, subtracting this
from the gross operating
saving, there is still a net
saving of \$3,100 per mile
per year, or \$31,000 a year
if the road is ten miles
long. On this basis, if the
ten-mile gravel stretch
were replaced by con-
crete, the decreased cost to users would
pay the cost of the pavement and yield a
net profit of \$31,000 a year.



Beach Umbrellas Like Old-Fashioned Buggy Tops; They Form a Windbreak or Two Can Be Used Together to Make a Dressing Room

**BUGGY-TOP BEACH UMBRELLAS
FOLD INTO COMPACT UNITS**

Beach umbrellas shaped like old-fashioned buggy tops are being used in California. They fold into compact units easily carried on the tire rack of an auto and, when opened, form an excellent windbreak. Two can be joined together to form a beach dressing room, or they can be mounted on poles like ordinary umbrellas.

C 229
**GARDEN CULTIVATOR ENGINE
DRIVES SCOOTER CAR**

Powered by the engine from a garden cultivator, a scooter has been converted by its boy owner into a car capable of twenty-five miles per hour. The scooter-mobile has front-wheel drive and rear-wheel steering.

This Homemade Car for
Two Is Driven by Motor
Taken from the Garden
Cultivator; It Has Rear-Wheel
Steering Arrangement



John Little
363 Dials Ave.
Cynwud, Pa.

C 32
**COPPER FABRIC FOR AUTO
GIVES LONG SERVICE**

Marmet
Longer service is claimed for a new roofing material for automobiles. It consists of a thin sheet of copper bonded to a strong water-proof cotton fabric with a special flexible adhesive which allows for normal contraction and expansion of both the metal and the fabric. A decking of this material has decorative value and can be sprayed like other parts of the motor car.

Left-handedness in twins is more common than in single-born children, psychologists have found.

Science Service-Shorts
New York, 1932

2750 New York
Wilmar, Calif.
Standard
Textile Products Co. 320 Broadway New York

c128 L. J. Heardorff & Sons
453 Racine Ave
Chicago

Engineering
Laboratory
Science Bldg
ny

750

POPULAR MECHANICS



Photographing an Object at an Angle Is Made Easier by This Camera Mount That Has Numerous Adjustments

MOUNT HELPS FOCUS CAMERA ON OBJECT AT ANY ANGLE

Focusing a camera from any angle is made possible by an adjustable mount that can be swung in a complete circle. It is especially useful in taking photographs of objects from above, or from an angle that will bring out a particular feature. The mount consists of a base to which are attached two parallel bars in upright position. These bars support the camera mounting, which can be moved up or down within a range of eight feet. In addition, the mounting can be tilted at any angle or swung all the way over. The camera may be attached to the mounting at different points by means of fixtures like those used on the ordinary tripod. While the camera stand weighs 350 pounds, ball-bearing rollers make it easy to move.

Those wishing further information on anything described in our editorial pages can obtain it by addressing Bureau of Information; please inclose return postage.

PADDED CELL AIDS NOISE TEST OF ELECTRIC EQUIPMENT

Within a room in which there are no reflections, motors, fans and other electrical equipment are tested by the General Electric company to determine the degree and type of noise produced by each piece of apparatus. The test room is really a padded cell, a room within a room, of such construction that outside sounds and even building rumbles cannot enter. The outer wall is of sound-absorbing plaster. Within that is hollow tile, then an air space, a layer of felt, another wall of sound-absorbing plaster, more air space, sheet iron, air space, lath-work and finally a thick layer of cotton waste. Ceiling and floor are of similar construction.

WOOD CARVING IS DONE BY SAND BLASTING

Sand under pressure is used in carving wood, leaving a very smooth finish. The panel to be carved is covered with a rubber stencil and then subjected to the terrific cutting force of sand under 150-pound pressure. The sand eats away the wood not protected by the stencil, producing an excellent carving much faster than is possible by other methods. A helmet is worn by the operator for protection against dust.

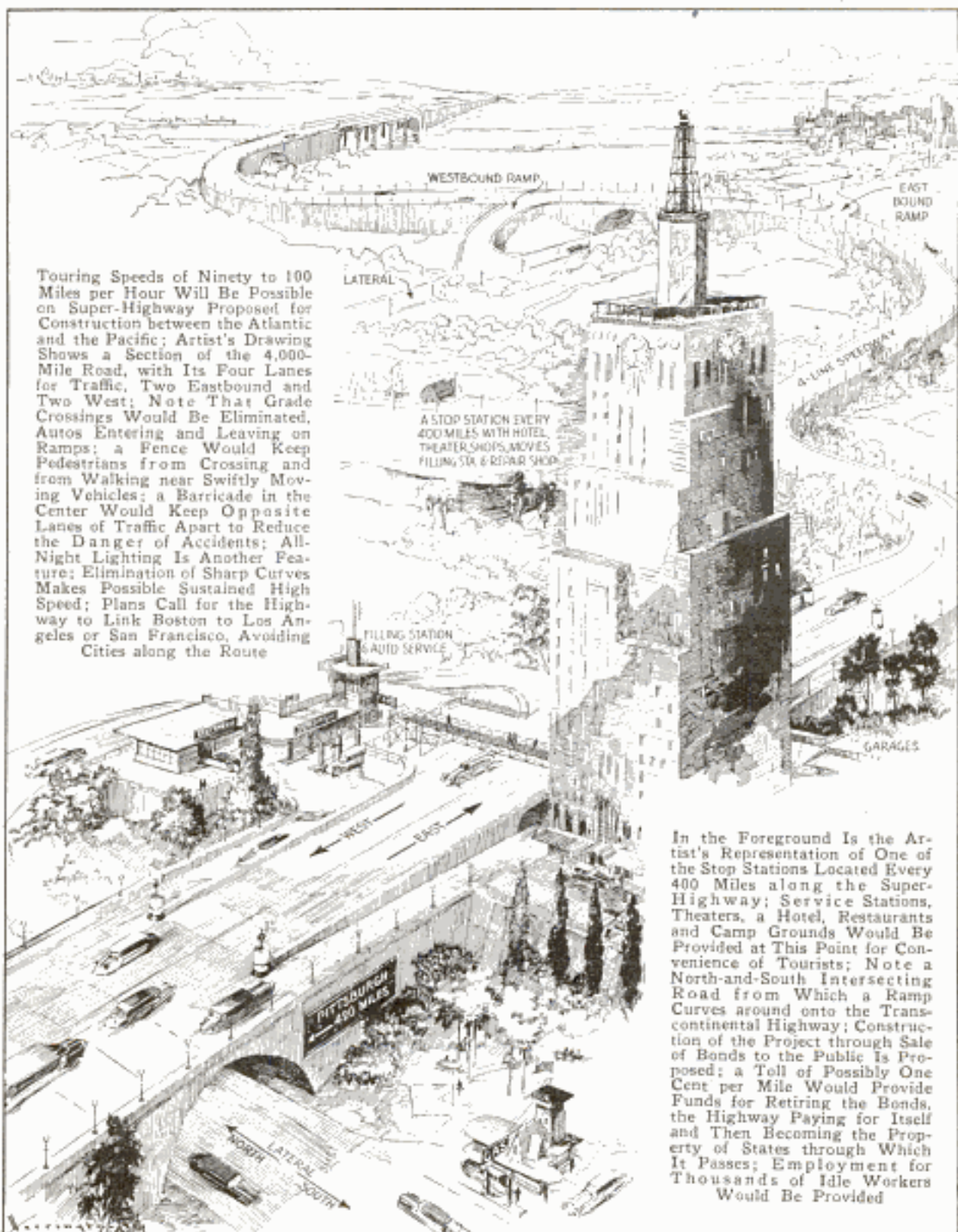


Designs Are Easily Cut in Wood by Using a Rubber Stencil and Sand-Blasting Equipment

clark
see 445

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High-Speed Road Planned to Span Continent



Touring Speeds of Ninety to 100 Miles per Hour Will Be Possible on Super-Highway Proposed for Construction between the Atlantic and the Pacific; Artist's Drawing Shows a Section of the 4,000-Mile Road, with Its Four Lanes for Traffic, Two Eastbound and Two West; Note That Grade Crossings Would Be Eliminated, Autos Entering and Leaving on Ramps; a Fence Would Keep Pedestrians from Crossing and from Walking near Swiftly Moving Vehicles; a Barricade in the Center Would Keep Opposite Lanes of Traffic Apart to Reduce the Danger of Accidents; All-Night Lighting Is Another Feature; Elimination of Sharp Curves Makes Possible Sustained High Speed; Plans Call for the Highway to Link Boston to Los Angeles or San Francisco, Avoiding Cities along the Route

In the Foreground Is the Artist's Representation of One of the Stop Stations Located Every 400 Miles along the Super-Highway; Service Stations, Theaters, a Hotel, Restaurants and Camp Grounds Would Be Provided at This Point for Convenience of Tourists; Note a North-and-South Intersecting Road from Which a Ramp Curves around onto the Transcontinental Highway; Construction of the Project through Sale of Bonds to the Public Is Proposed; a Toll of Possibly One Cent per Mile Would Provide Funds for Retiring the Bonds, the Highway Paying for Itself and Then Becoming the Property of States through Which It Passes; Employment for Thousands of Idle Workers Would Be Provided



America's Institute of Steel
 New York Construction, 200 Madison Ave

C113. Wind Turbine Co
East Miner St.

752

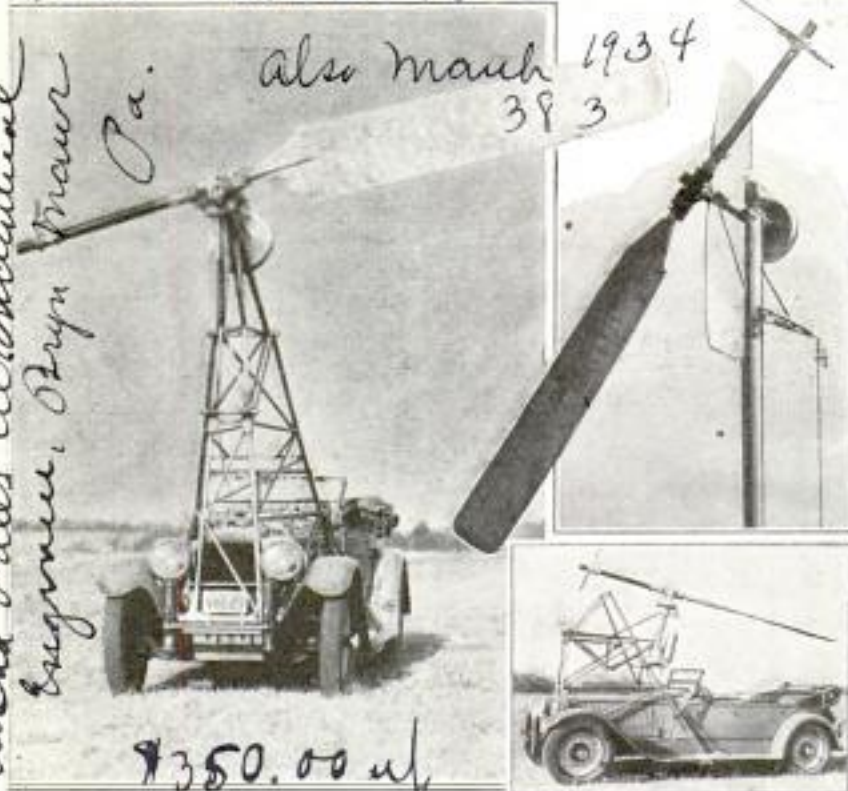
POPULAR MECHANICS

and Pennsylvania Co

Wind Turbine Generates Electricity for Farm

West Chester, Pa

Mr. Robert W. Meeks, electrical engineer.
474 N. Market St. West Chester, Pa
Elisha Fales Aeronautical
Engineer, Bryn Mawr
Pa.



also made 1934
383

\$350.00 up

Left, View of Wind Turbine Mounted on Auto; Right, Close-Up of the Single Blade, and Side View of the Auto Mounting

erates successfully in both low and high winds. The hollow blade, produced by a new process of welding stainless steel, resembles half of an airplane propeller and is shaped like an airplane wing. If the wind reaches high velocity, the blade is so designed that it spills the surplus, making possible a constant operating speed. A pivoted hub eliminates vibration. Storage batteries are used in connection with the turbine. Even in low winds, the plant produces sufficient energy to keep the battery fully charged. Only in case of extreme calm is it necessary to use the full capacity of the battery to turn the turbine. Thus, power and light are assured whether

Electricity for the farm can be generated at low cost by a wind turbine plant that has been found economical and substantial in tests. A feature of the unit is a self-adjusting variable-pitch blade, which op-

erates successfully in both low and high winds. The average farmer uses about 1,500 kilowatt-hours of electricity per year, the amount produced by a two-horsepower turbine with average wind conditions.

C348 SINGLE RADIO ANTENNA SERVES THREE THOUSAND RECEIVERS

As many as 3,000 radio receivers can be operated from the same antenna in a system recently designed by the Bell Telephone laboratories for the Western Electric company. The system, which frees a city's roofs from the fire hazard and the unsightly tangle of innumerable antennas, is arranged to serve each receiver independently without interference. Since few apartment buildings contain as many as 3,000 radios, the one antenna can serve the receivers in several buildings at the same time, greatly reducing costs. A feature of the system is the special cable in which a braid of woven copper surrounds the transmission line and carries off interference static, which usually is picked up by

ordinary lead-in wires from elevator motors and other electrical equipment in the building.

KEYLESS LOCK SET BY OWNER AT ANY COMBINATION



One of 1,000 possible combinations may be set by owners of a new mid-get keyless lock. In addition, the combination may be changed at will without the use of tools. The lock has three dials. Several types are available, including the shackle, bolt and other forms for ignition switches, tire racks, brief cases and the like.

50 Church St
New York

The Desainee Co
Hartford, Conn

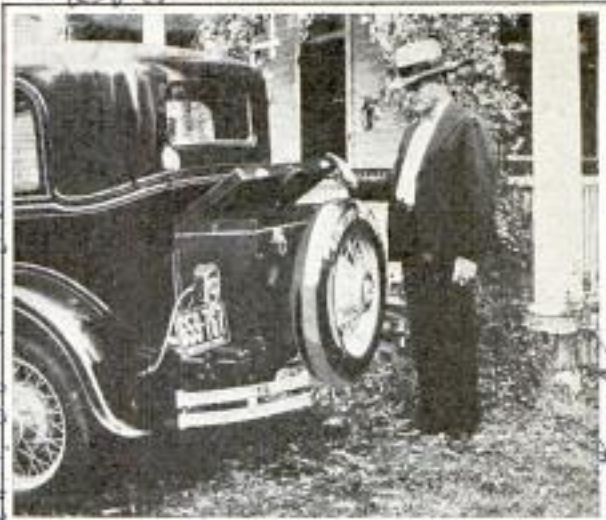
Fireproof Fabric Sales Corp. 2846 Emerald St Philadelphia Pa

Mid. West Steel Products Co., Carriage. Mo 753

POPULAR MECHANICS

FIRE-RESISTING COTTON FABRIC HAS MANY USES

Fireproof cotton fabric has been developed by a process that is said to produce safety cloth more cheaply than any other methods. Exposure to rain and weather does not affect its fire resistance. The process also protects canvas from destructive fumes, greatly prolonging the life of locomotive-cab curtains, boat covers, hatch covers, deck awnings, and the like. Applicable to all cotton fabrics, from the lightest airplane cloth to the heaviest duck, the process has an important place in the tarpaulin field. Great savings in dead weight can be effected through its use in coverings for large motor trucks without sacrificing any of the protection from fire and water afforded by heavy, expensive covers. The treated fabric also may be used for fire blankets, for roofing purposes and for floor coverings in places subject to fire hazard. Tents made of this material also afford protection against carelessly discarded cigarets or matches.



Trunk and Spare-Tire Carrier Closed, and, Below, Extended to Give More Space

Ans. M. L. King

CHAIR USED INSTEAD OF SADDLE MAKES RIDING EASIER

Easier riding for tourists, unaccustomed to long hours on horseback, has been provided by substituting a comfortable chair for the saddle. The equipment is used on sight-seeing trips in Ontario, Canada. Made of wicker, the chair is attached to the horse's back like the howdah used in riding elephants.



Chair Strapped to Horse's Back Provides Comfortable Seat for Tourist

Licensed by Fred Brewster, Jasper

EXTENSION AUTO TRUNK HOLDS SPARE WHEEL AND TIRE

For the motorist who frequently needs large space for baggage, an extension trunk and a rack for spare wheel and tire have been combined in one compact unit. In the trunk position, this unit can be used for all purposes for which an ordinary trunk is employed, since it has a top lid and locks. The trunk proper rests in brackets, attached to the trunk rack or car frame, and is held rigidly in position by bolts and thumbnuts on each side. To change from trunk to carrier, the thumbnuts are loosened and the trunk is extended, its rear becoming the bottom of the extended section, and the spare wheel and tire being moved from a vertical to a horizontal position under the extended section. The lid folds against one section and is held by a spring latch.

An electric coffee grinder for the home kitchen is being produced.

Electric Service Shops

*Webb Trunk Machine Co
York, Pa.*

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EASIER WAYS



Home Aquarium Fitted with Electric Heating Element in the Bottom, as Shown at Left; There Is Also a Thermostat Keeping Water at Any Desired Temperature to Protect the Fish



Device for Making One Cup of Coffee by Drip Method; Below, Rust-proof Water Softener Attached to Faucet



Below, Left, Steel Teeter-Totter for Baby Has Spring Adjustable to Weight and Folds for Carrying; Seat with Toy Tray Is Removable for Carrying



Left, Portable Playhouse for the Children Can Be Easily and Quickly Changed from One Style to Another with a Wrench and Screwdriver; by Changing the Front Panels, It Can Be Converted into a Sun Parlor, Tea Room, Garage, Bedroom, Workshop, Grocery or Other Buildings to Teach the Child the Fundamentals of Construction; the Playhouse Is Made of Durable Plywood; It Is Six Feet Long, Five Feet Two Inches Wide and Six Feet Two Inches High; It Weighs 450 Pounds, Heavy Enough to Withstand Rough Handling

of DOING IT



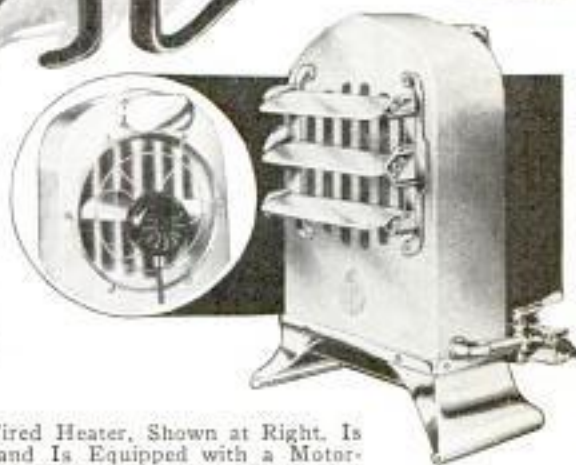
Duck Sewing Basket Is Made of Wood; Scissors Can Be Inserted through the Head as Bill; Back Is Padded for Pins and Needles; Drawer Holds Buttons.



Above, New Style Chair Made of Bumper Steel Glides under the Weight of the Person Sitting in It Because of Its High Resiliency; the Weight Causes a Gentle Motion.

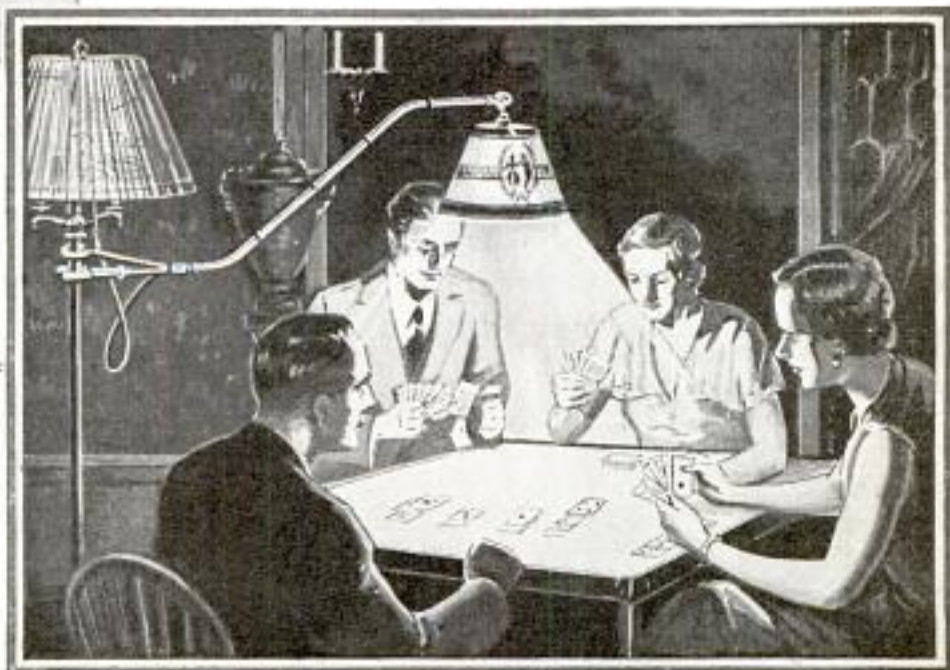


Above, Carbide Sharpener for Stainless-Steel Knives Is Used Like a File; Only the Edge Is Sharpened, Preventing Scratches on the Sides of the Blade; Handle Is Made in Several Colors to Match the Kitchen Scheme.



Portable Gas-Fired Heater, Shown at Right, Is of Aluminum and Is Equipped with a Motor-Driven Fan That Keeps Warm Air Circulating through the Office or Home; Adjustable Deflector Plates Control the Movement of Air in Any Direction.

How to Illuminate the Bridge Table without Purchasing Expensive Equipment Is a Problem That Can Be Solved by the Extension Lamp at the Right; It Can Be Attached to Any Floor Lamp at Any Height, and Is Also Useful for Lighting Tables for Reading, Writing and the Like.



C 42

National Steel Homes
1019 Esuaranty Bldg
Hollywood
CALIF

756

POPULAR MECHANICS

Chas. Harley & Boddley



iron, copper, aluminum or other metal of equivalent strength can be used for the walls. The ceiling construction consists of metal joists designed to accept insulation board panels, on top of which three inches of loose-fill insulation is applied. Windows are made up as a unit at the factory, and consist of frame, screen and sash complete with all hardware. Two sheets

of glass with a dead-air space between them form the windows, and all windows and doors are lined with rubber refrigerator gaskets to keep out dust as well as heat or cold. Several types of roof are offered, each using metal panels. The inside wall covering is composed of elastic paint, applied to muslin tacked to the insulation boards. An inexpensive electric heating and cooling system is installed in each unit along with a simple air-conditioning unit. Some of the homes include such features as electric refrigerator, electric stove, electric or gas water heater, wall bed, and bathroom accessories.

Top, Steel House; Bottom, Construction Features That Make It Easy to Heat or Cool

INEXPENSIVE HOMES OF STEEL BUILT LIKE REFRIGERATORS

Insulated steel homes constructed like refrigerators, so that heating and cooling is greatly simplified, are now being offered in standard designs ready for assembling and at moderate prices as compared with other forms of construction. Such a home stands on a concrete foundation and is constructed of tubular steel studs, filled with concrete and so made as to accept standard metal vertical panels for exterior wall surfaces and insulation-board panels for interior walls. This leaves an air space between the walls for pipes and conduits, and this space is later filled with loose insulation material. The studs are set into pockets in the concrete foundation, and exterior walls may be treated with various forms of metal paint or with a special paint mixed with concrete. Galvanized

C 236
AUTOMATIC CONTROL FOR AUTO ENDS GEAR-SHIFT WORRY

Simplified operation of the automobile is attained by use of an automatic control that eliminates the cumbersome gear-shift lever. The driver only has to steer, step on one pedal to go and on another pedal to stop. A master button, located within the accelerator pedal, gives the driver control of all normally automatic operations. The button projects slightly above the surface of the accelerator. If the driver wants to free-wheel at fifty miles per hour, he merely moves his foot so the control button is free. Replacing his foot on the button, re-engages the engine. This arrangement enables speeding up of the motor, while the car is in gear and remaining station-



Automatic Cars
1236 Maccahelo Bldg
Detroit Mich

ary, without unexpected starting. The automatic control is simple. After starting the motor, the car is set in motion by stepping on the accelerator. When the car reaches the speed at which the driver normally would shift to second, he raises his foot from the pedal and the shift is made automatically. And then into high gear. All shifting is silent. If the driver wishes to shift back to second or low, he raises his foot from the accelerator when the car has slowed down to a speed where the shift would be made normally, and the shift is made. However, the car remains in high gear until the driver removes his foot from the accelerator. In addition, the driver is able to cut out automatic control and take up manual operation simply by pulling a button. The manual control is made possible by a miniature gear-shift lever located near the steering column. This lever can be operated with one finger.

B2241

SELF-GENERATING GAS TORCH FOR ELECTRICAL WORK

Using regular or high-test gasoline, a self-generating gasoline torch produces an intensely hot blue flame and is particularly suited for radio and electrical work. There are one-half and one-fourth-pint sizes, and the torches are of brass with enameled steel handles supported by brass rings, to make them sturdy and heat-resisting.



New-Style Gasoline Torch in Use; It Is Especially Adapted to Electrical Work



Arrangement of Irons and Statue for Invisible-Ray Photograph; Bottom, Finished Picture

PHOTOGRAPH IS TAKEN BY HEAT FROM ELECTRIC IRONS

In a totally dark room, a photograph was made recently by heat, the "illumination" being provided by two electric irons. A bust was set up in front of a camera in the research laboratories of the Eastman Kodak company with two electric irons facing it. The irons were heated, but since they do not glow, there was no visible illumination. However, the invisible infra-red rays are associated with heat, and these rays were radiated from the irons. An emulsion, very sensitive to infra-red, was able to record these rays after an hour's exposure, and thus to produce a photograph by heat. Some months ago a group picture of several persons was made in the dark at the laboratory in one second, but in that case the room was actually flooded with infra-red rays from a battery of sixteen 1,000-watt lights covered by a filter which permitted only the invisible infra-red rays to pass.

*Scovill Mfg Co
Waterbury, Conn.*

Rochester, N.Y.
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C 26 Heywood-Wakefield
174 Portland St
Boston, Mass



Modern Baby Carriage with Air-Filled Tires, Brake and Easy Springs; Right, Two Models of Earlier Date

**BABY CAB KEEPS UP WITH CAR
IN MARCH OF PROGRESS**

Baby carriages are keeping pace with automobiles in improved design and more luxurious equipment. Mothers of about 1870 used a basket mounted on wheels and called it a baby buggy. When baby went riding, it either sat up or lay in a cramped position. One of the unusual features, however, was the three-point suspension of the basket. Later fancy wicker cabs were widely used since they afforded more room for the infant. These cabs look like early car models when compared with the 1933 carriage with its air-filled tires, positive brake, easy springs, highly polished finish and even a rain visor.

**CIGARET PACKAGE IS SEALED
BY SUGAR COATING**

Coating packages of cigarets in a recently developed sugar solution makes them water, air and dustproof. Unlike materials that must be wrapped about the package, the coating is applied by dipping the package into the solution. A hermetically sealed wrapper is formed, without joints or opening. This can be torn off when the package is opened. Another use for sugar is in the manufacture of shatter-proof glass. A

coating of a transparent sugar derivative is placed between two sheets of glass, just as celluloid previously has been used. Economy in manufacture and better visibility are claimed for this glass.

**B 2244
GRAVITY CENTER IS
DETERMINED
BY SCALES**

Scales that show the center of gravity of connecting rods are being used in the manufacture of one automobile. A weight boss is cast at the bottom of the connecting-rod main bearing. Two more are cast on each side of the rod just above the bearing. The bottom boss controls the center of gravity. The scales weigh the rod, indicating how much metal must be cut off the bottom boss to establish the center of gravity. A machine then chips off the metal until the chips, falling into a pan, equal the indicated weight to be removed. The pan then drops, operating a switch that stops the machine. A similar process is followed in obtaining the correct over-all weight. In this way, replacements in the motor will be exactly like the original parts.



How Scales Are Used in Manufacturing Auto Connecting Rods; Bottom, the Finished Product

Am. Eckhardt

Announced by Dr. Gerald
J. Cox, Mellon Institute
Pittsburgh, Pa.

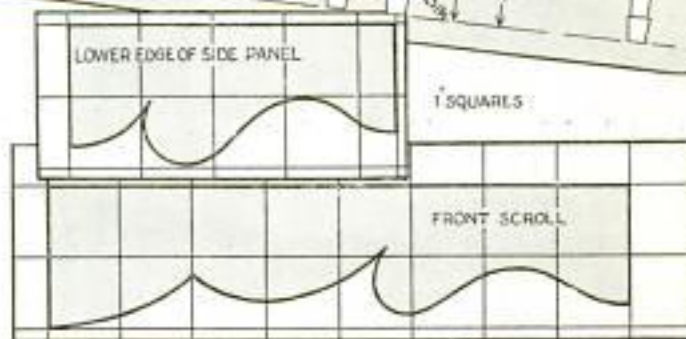
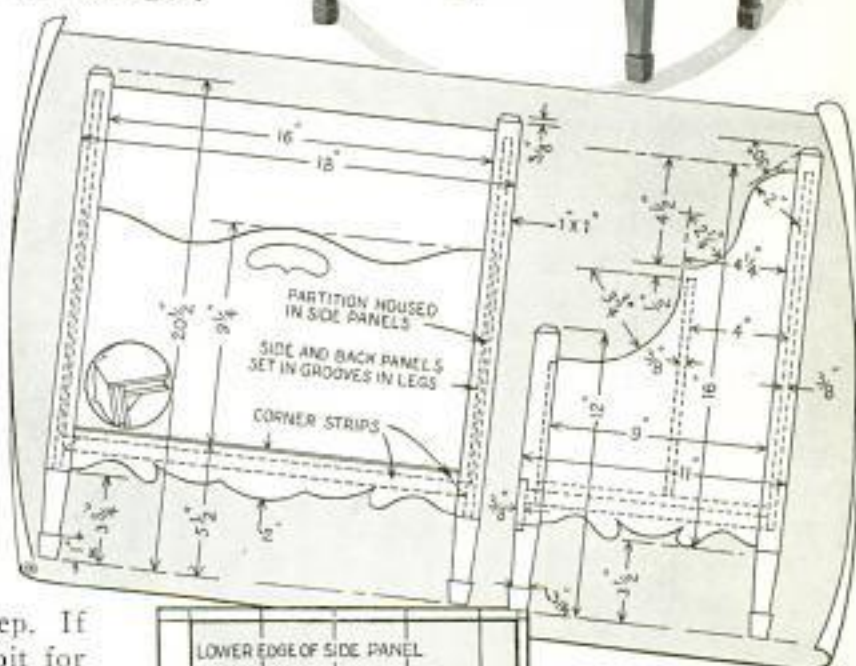


Attractive BOOK & MAGAZINE RACK

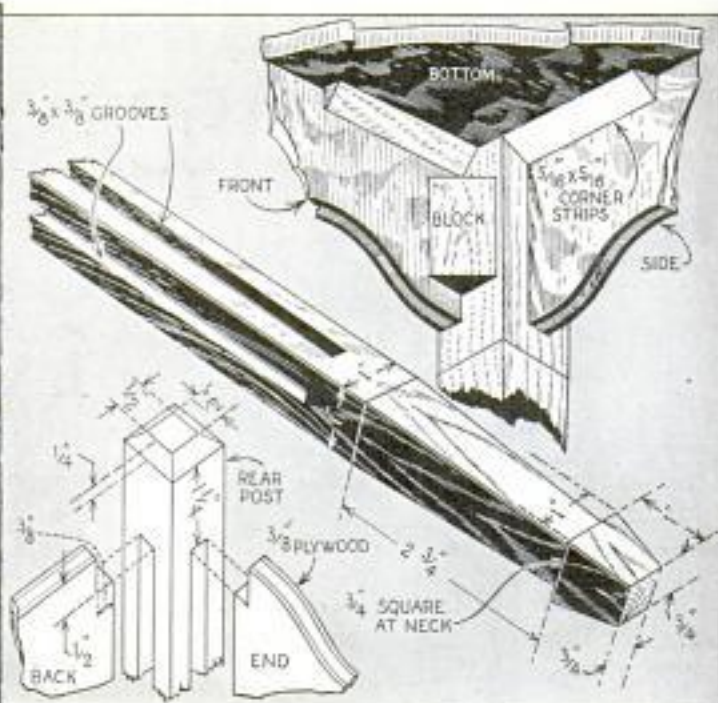
By R. O. BUCK
Lane Technical
High School, Chicago

THIS unusually attractive rack holds your current magazines besides a dozen favorite books. It stands on the floor, against the wall, where it is out of the way, but can be moved about the room, if desired, by means of the convenient hand-hole in the center partition. Plywood panels, veneered with walnut or mahogany on both sides, are used for all parts except the legs. As this material comes sanded and ready for use, considerable time and work are saved by its use, without additional cost. The legs may be made of gum instead of walnut or mahogany, for economy.

The legs, which are 1 in. square, are chamfered on the top and have "spade feet," an attractive type of foot frequently seen on antique furniture. The grooves in the legs should be about $\frac{7}{16}$ in. deep. If you have a $\frac{3}{8}$ -in. routing bit for your drillpress, it is the logical machine to use, as you can start and stop the groove just where you want. An alternative method is to use the circular saw and chisel or just the chisel. All the remaining pieces are made of $\frac{3}{8}$ -in. plywood. Half patterns of the scrolls to be cut on the front and side-pieces are shown in the squared details.



A paper pattern should be made to copy them onto the stock. A jig, band or even



a coping saw may be used to cut the various scrolls and curves. The partition piece, which has the handhole cut into it, may be fastened in place either by grooving the sidepieces or by driving nails through the sides. The heads, of course, are set and the holes filled. As the rack is lifted by the handle in this piece, it must be well fastened, both to the sides and bottom, or the weight of the books and magazines will tear it loose. A small sanding drum, attached to your saw arbor, drillpress or lathe, is especially convenient for smoothing the curved edges. The legs should also be well sanded by hand, using a block and sandpaper.

When all pieces have been made, the stand is ready for a trial assembly. The narrow front scroll is fitted into a rabbet along the front edge of the bottom piece. This cut is made just below the top layer, or ply, of veneer, so that only the walnut or mahogany, as the case may be, will show. The bottom is fitted, and the corners marked for notching while the structure is assembled. When the work is ready to be glued, the sidepieces are assembled and glued first. After the glue has set, the back, bottom and front scroll are added, and the work clamped again. The front piece does not fit into a groove, but is held by means of the rabbet at the top and by triangular blocks at the ends. Corner

strips of triangular section are also used to reinforce the sides and back at the bottom. Both brads and glue should be used for these strips. The problem of finishing the edges of the plywood is solved by first smoothing them well, filling the grain with wood filler, or with plastic wood if the end grain is very open, then enameling or lacquering them black. The remaining surface is finished brown.

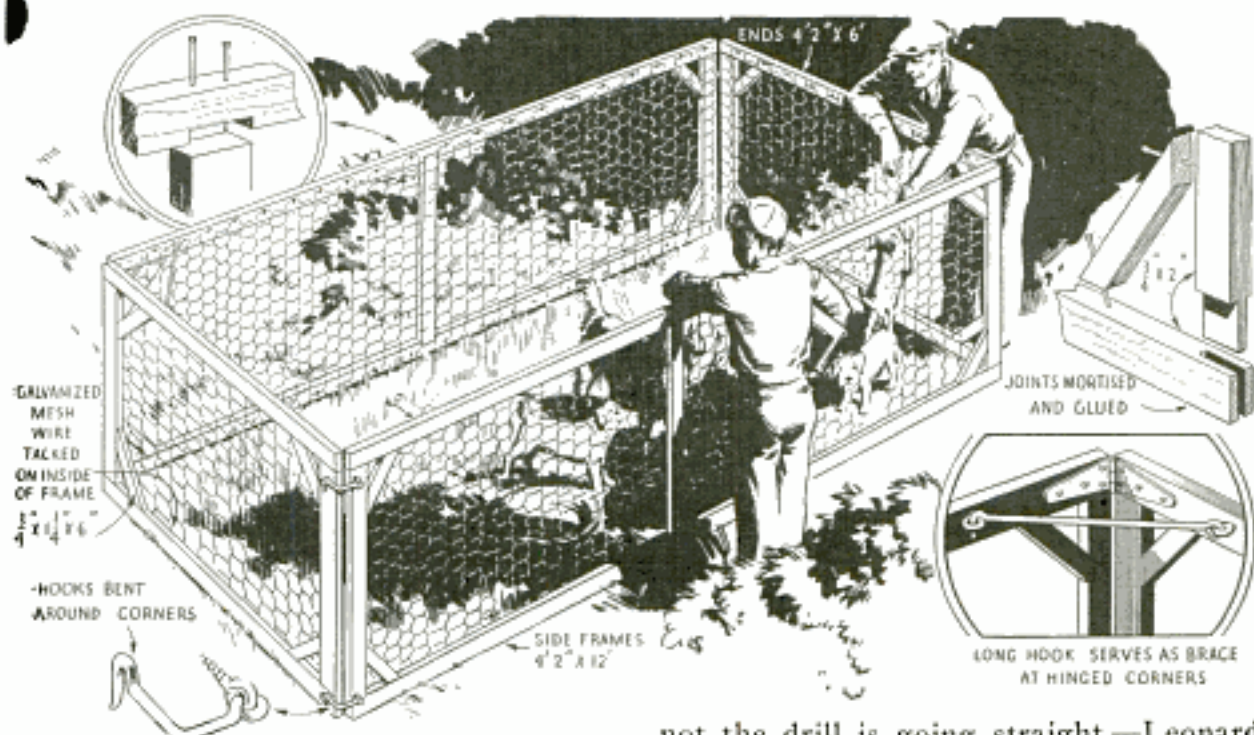
Paper Holder Helps Start Brads



Brads can be held in position for driving without risk of hitting one's fingers with the hammer by using this paper holder. The brad is stuck through the end of a paper strip and the other end is folded over to stiffen it, as shown. Modelmakers will appreciate this when nailing tiny parts together with short pieces of pins.—Laurence Scheid, Teaneck, N. J.

☐ Fine wire mesh, soldered over the mouth of a faucet, will prevent the water from splashing in a sink.

Your Dog Can Exercise in This Portable Pen



This portable pen will provide a safe place for your dog to exercise without danger of being run over in a street. Four frames are made to take standard 48-in. wire mesh, the joints being suitably braced at each corner. The pen is made in two units, each comprising one side and one end, which are hinged together. Hooks and screweyes are used to join the two units when the pen is set up, while large hooks serve as braces across the hinged corners as shown. When not in use, the inclosure can be unhooked and folded for storage in a small space.

Washer Helps Drill Straight Holes

Slipped over the bit, an iron washer will help in drilling horizontal holes straight.



If the end of the brace is raised or lowered from a true horizontal position, the washer will gradually work toward the lower end of the bit as it is turned, enabling the workman to see at a glance whether or

not the drill is going straight.—Leonard Schoff, San Rafael, Calif.

Aluminum Strip Keeps Trousers Cuff in Shape

Bent oblong and placed in the fold of a trouser cuff, a narrow strip of aluminum will hold it in shape. The strip cannot be seen, and is easily removed before cleaning and pressing.



Correction on Article Suggesting Oil on Piano Strings

In our March issue, a short article was published entitled "Oil Protects Piano against Moisture," and the application of a thin, non-gumming oil was recommended on all exposed metal parts. This practice should, however, not be followed on the strings and tuning pegs, as oil applied at these points would gradually seep along the pins into the wrest plank and thus reduce the friction needed to keep the pegs from slipping. A piano with oil at these points cannot be kept in tune.

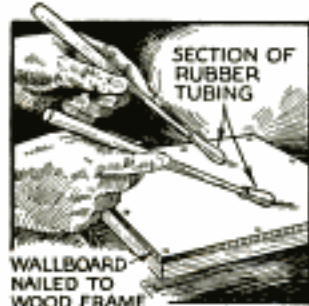


Newspaper over Front Car Window Keeps Sun from Blinding Driver

Paper Makes Temporary Shade in Car Window

For temporary use, a newspaper hung in the front window of a car will do service as a shade. The window is lowered slightly, and the edge of the paper is placed over it, after which the window is closed to hold the paper in place.—H. E. Benson, Denver, Colo.

An Improvised Practice Drum



Those learning to play a snare-drum can practice without annoying the neighbors by using this improvised instrument. It is made by nailing a piece of wallboard over a wood frame, as shown. If the ends of the drum sticks are covered with rubber tubing, the sound will be deadened.

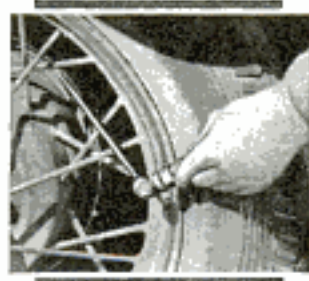
Polished Jet-Black Finish for Soft Wood

A hard, glossy black finish may be produced on soft wood by painting it with a solution of tannic acid, $2\frac{1}{2}$ oz., dissolved in 1 gal. of water. After this coat has dried, the surface should be sanded smooth with fine sandpaper and a second coat, made by dissolving iron sulphate, 5 oz., in water, 1 gal., applied. The latter coat will darken the finish considerably after drying overnight, and may be repeated

after sanding the surface, if a still darker finish is desired. Two applications, however, are usually sufficient. To complete the finish, apply a coat of good varnish, and after it has dried, smooth the surface with fine garnet paper. Three or four coats of varnish with rubbing down between them will produce a beautiful finish. The last coat should be rubbed with fine pumicestone and paraffin oil. A flannel pad, moistened with water, may be used for the final rubbing and removal of the oil and pumice. After wiping the surface dry, it should be waxed, or polished with oil.

Cleaning Dust Out of Car Brakes

Internal brakes on cars collect dust, which combines with moisture and grease and forms a paste that often interferes with their proper action. This trouble can be avoided by blowing out the dust at regular intervals. To do this, flatten one end of a piece of brass tubing, so that it can be inserted between the brake drum and the wheel hub as shown. Then attach a compressed-air hose and all dust can be blown out.



A Measuring Scale on Your Scissors

Soldered to the blade of a pair of scissors, a piece of a steel tape provides a means of measuring material as it is cut. The nickel plate should be filed from the blade, after which it is thoroughly cleaned and tinned, using a flux made by cutting muriatic acid with pieces of zinc taken from an old dry cell. The blade and tape can then be sweated together. Or a scale may be etched in the blade, which can be done with nitric acid, after the surface has been coated with melted paraffin and a sharp scriber used to mark off the portions to be etched.

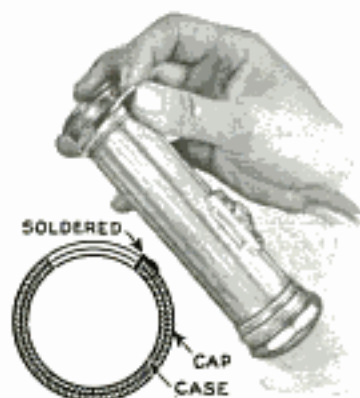


Rubber Strips Substituted for Spring in Shade Roller

When the spring in a shade roller breaks, rubber strips cut from an old inner tube can be used instead. First trim about $\frac{3}{4}$ in. from the edge of the shade to make room for the rubber at each end of the roller. Then tack one end of each strip to each end of the roller and tack the other end to the casement above the roller. In this way, when the shade is pulled down, the rubber winds around the roller which provides the required tension.—A. H. Waychoff, Phoenix, Ariz.

Coin Bank from Flashlight Case

Novel coin banks are easily made from discarded flashlight cases. The reflector is removed and the lens-retaining ring, with the lens in place, is soldered permanently in position. A slot to take the coins is cut through both the cap and the case. A piece of stiff steel wire is bent at right angles and soldered to the cap at one end of the slot, so that the arm points down to keep the coins from falling out of the bank. When a coin is inserted, the cap is turned to the left. The contents are removed by melting the solder and removing the wire.—W. C. White, Hornsby, Ill.



Extra Valve Improves Gasoline Stove

Shut-off valves on pressure-operated gasoline stoves are often ruined because of the intense heat, which softens the metal at the valve point and seat so that it is easily scored when closing the valve. To eliminate this trouble, I installed a shut-off valve in the feed line, using the regular valve only for regulating the flame. Stoves of kitchen size have an additional valve at the pressure tank, which should be used for shutting off the stove instead of the valve at the generator.—Ralph W. McPherson, Lincoln, Nebr.



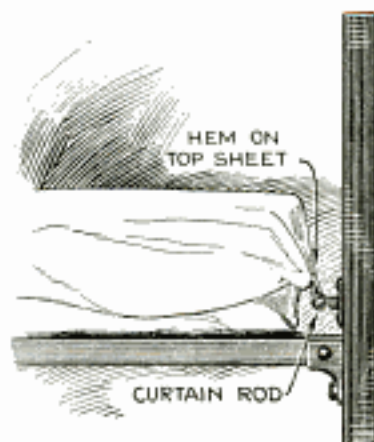
Auto Skid Chains Suspended from Floor Joists Support Shelves in Basement

Old Skid Chains Support Shelves in Basement

Old auto skid chains make good supports for shelves in a basement. The chains are suspended from bolts in the floor joists, and the shelves are placed on the cross chains as shown. All links should be inspected to see that they are in good condition so that they will not break if the shelves are loaded heavily.—Joseph Farkas, Joliet, Ill.

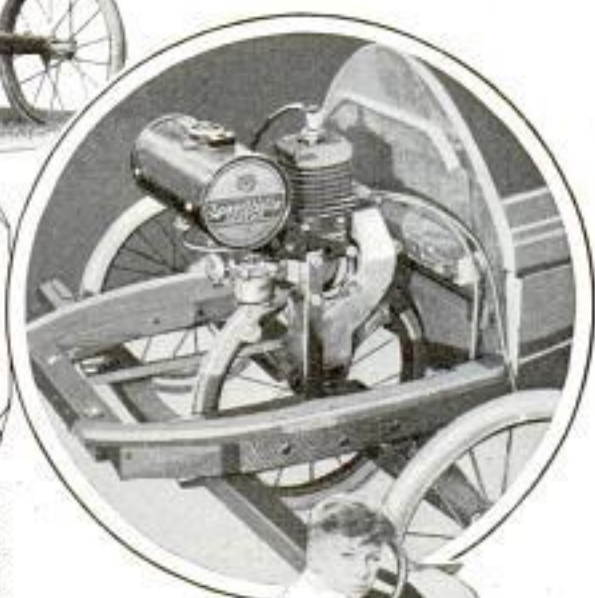
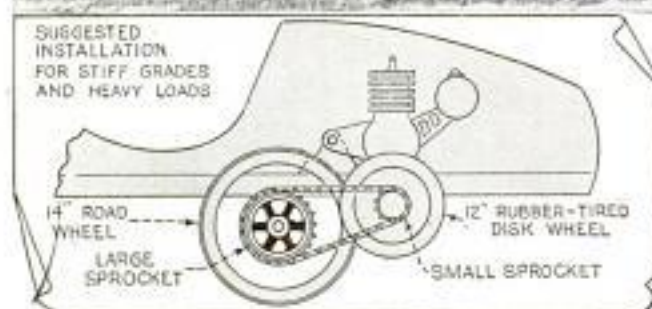
Curtain Rod Holds Sheet at Foot of Bed

Those troubled in having the sheet pull up from the foot of the bed will find that a curtain rod can be used to good advantage for keeping the sheet in position. The rod is run through the hem of the top sheet, and, of course, none of the other clothes are pulled up as they are on top of the sheet.—Norman V. Davidson, San Diego, Calif.



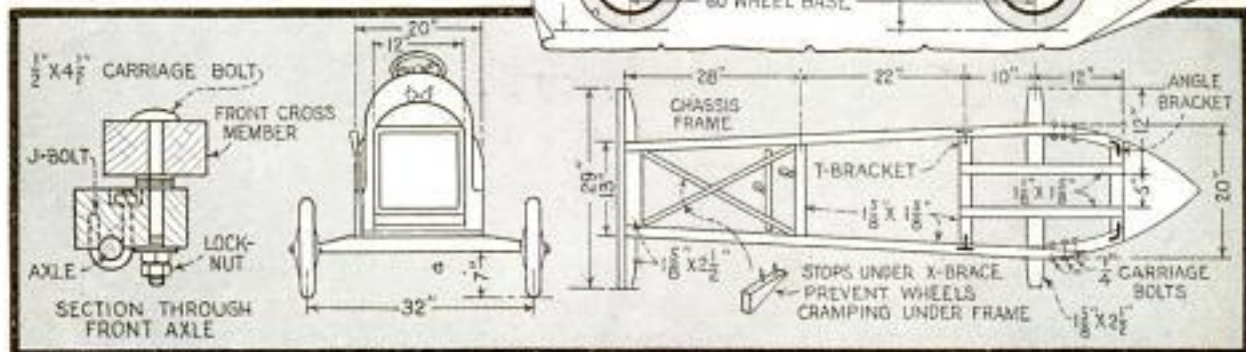
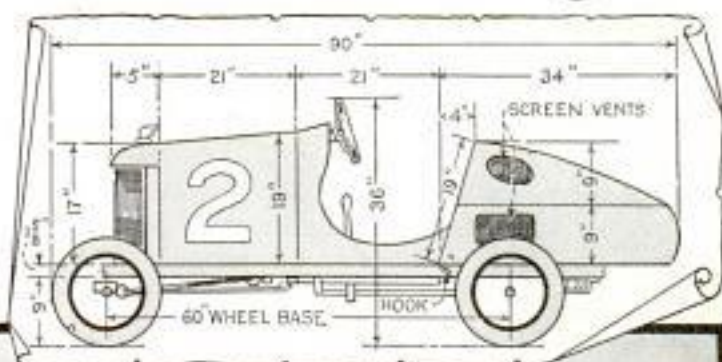


BICYCLE *Runs* MIDGET



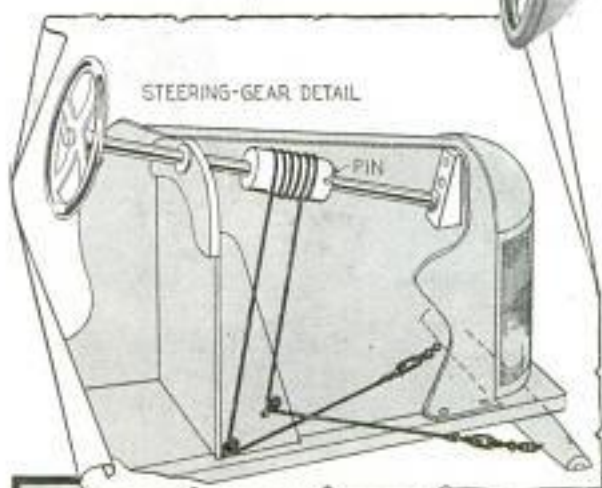
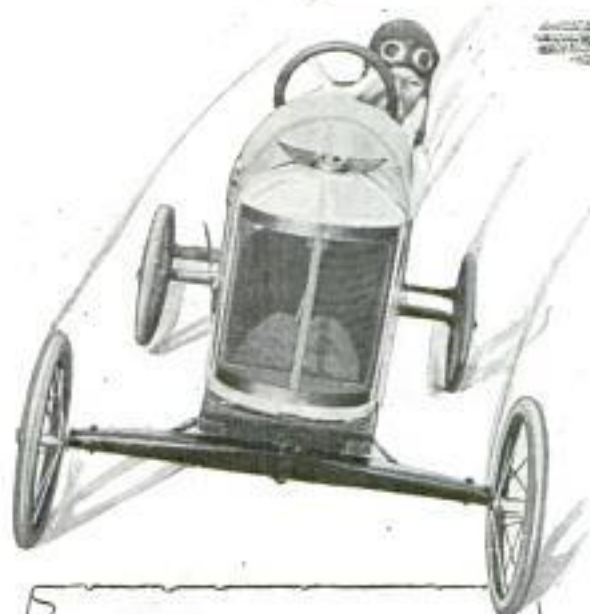
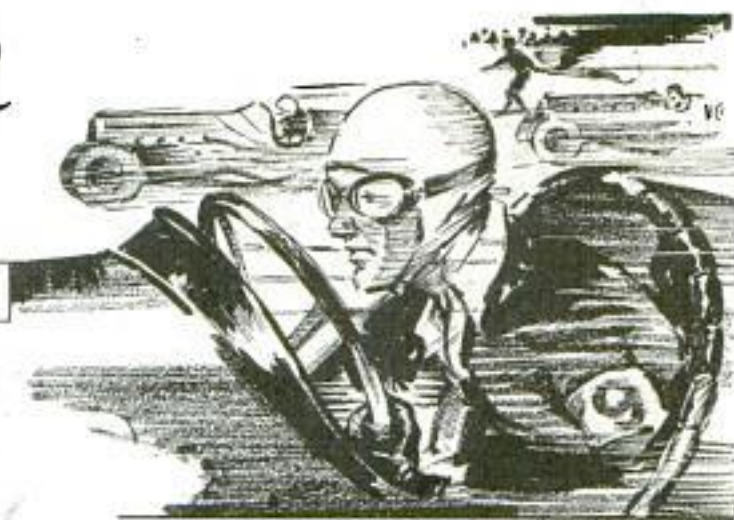
THIS trim little car is built so strong and light that a 2-hp. bicycle motor drives it over 20 miles an hour on a smooth, level pavement. The drive is direct, every bit of power being applied to the road through an independent fifth wheel behind the seat, not visible to the casual observer. The usual differential problem is thus simply solved. Standard 14-in. tricycle wheels with ball bearings, taking a $\frac{7}{16}$ -in. axle, may be used, and they are fitted with solid tires or $2\frac{1}{2}$ by $12\frac{3}{4}$ -in. wire wheels, with balloon tires, are available. The drivewheel, however, should, in either case, have a pneumatic tire.

The sizes of various frame members are net, that is, a sill of $1\frac{5}{8}$ by $1\frac{5}{8}$ -in. actual size is a surfaced two-by-two, and the wood axles would be two-by-threes when a section is actually only $1\frac{5}{8}$ by $2\frac{1}{2}$ in. Where indicated, be sure to mortise joints, applying casein



MOTOR RACER

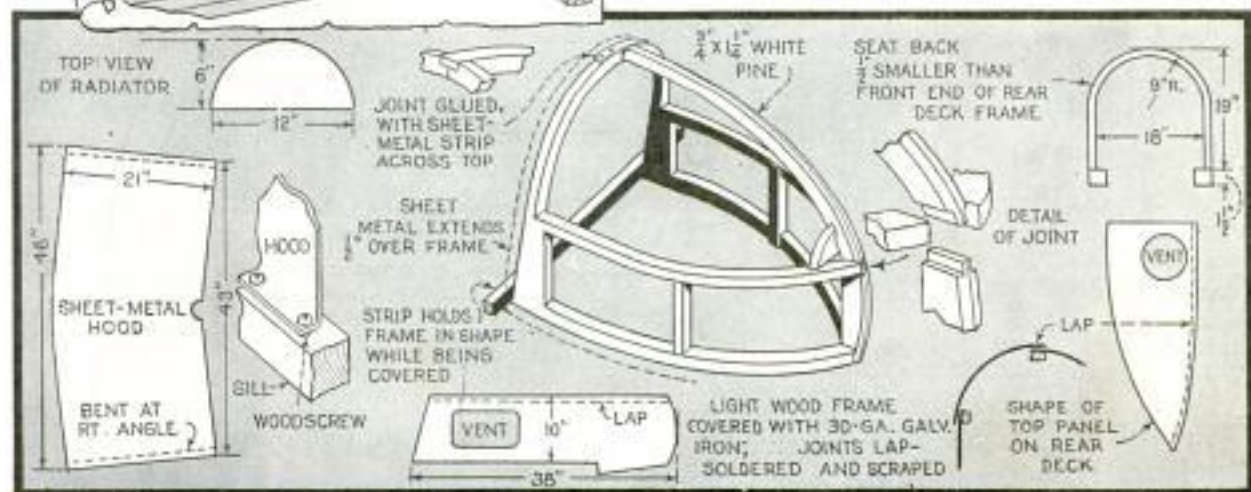
By HI SIBLEY

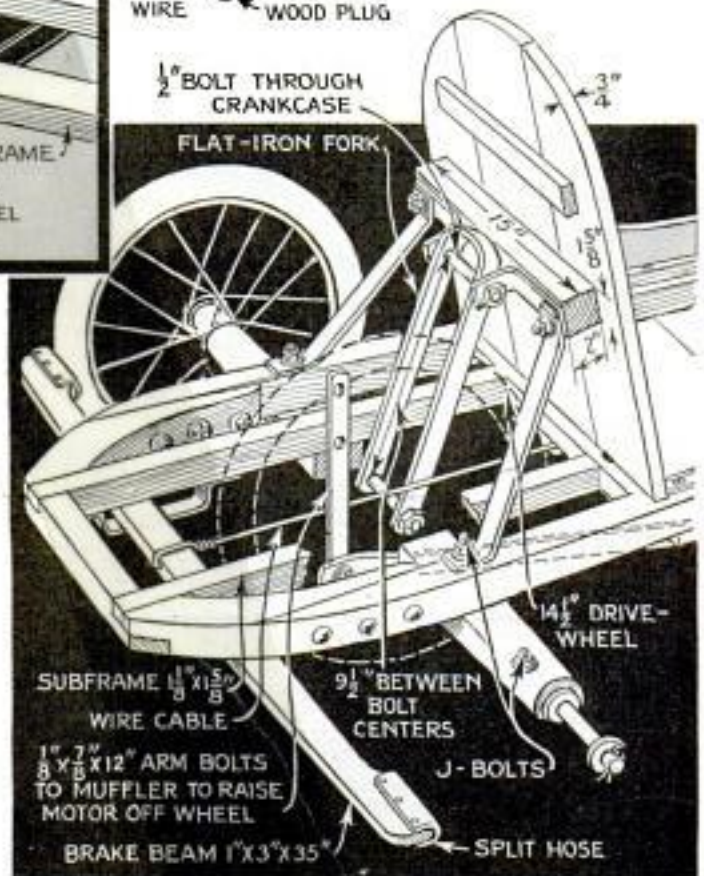
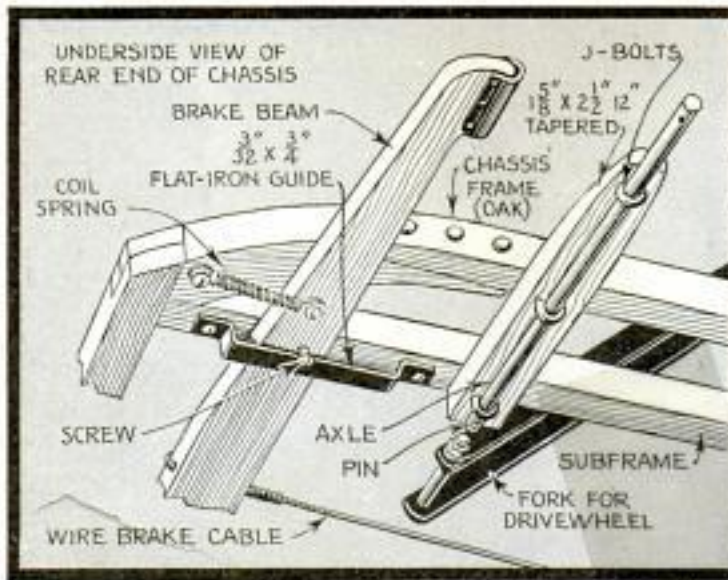


glue and drawing the joints tight with $\frac{1}{4}$ -in. carriage bolts. The X-frame at the front end of the chassis is important to keep it rigid. A sectional view of the front axle shows how the kingpin is offset so that it will not interfere with the axle. A $\frac{1}{2}$ -in. bolt is used, with locknuts on the bottom. The $\frac{3}{16}$ -in. steel axles are clamped in a groove in the wood axle by means of J-bolts, made from $\frac{1}{4}$ -in. carriage bolts.

The rounded part of the radiator top is built up of four pieces of $\frac{3}{4}$ -in. stock glued together, with a fifth piece slightly smaller on the underside. The corners are rounded with drawshave, plane, rasp and sandpaper, then given a coat of filler and paint. The bottom consists of two pieces of wood, with a dowel-brace near the front of the curve and a pair of triangular supports at the back. When the car is assembled and painted, a heavy brass screen is tacked around the curves. A radiator cap from a wrecking yard completes the job.

After searching vainly for a 12-in. steer-

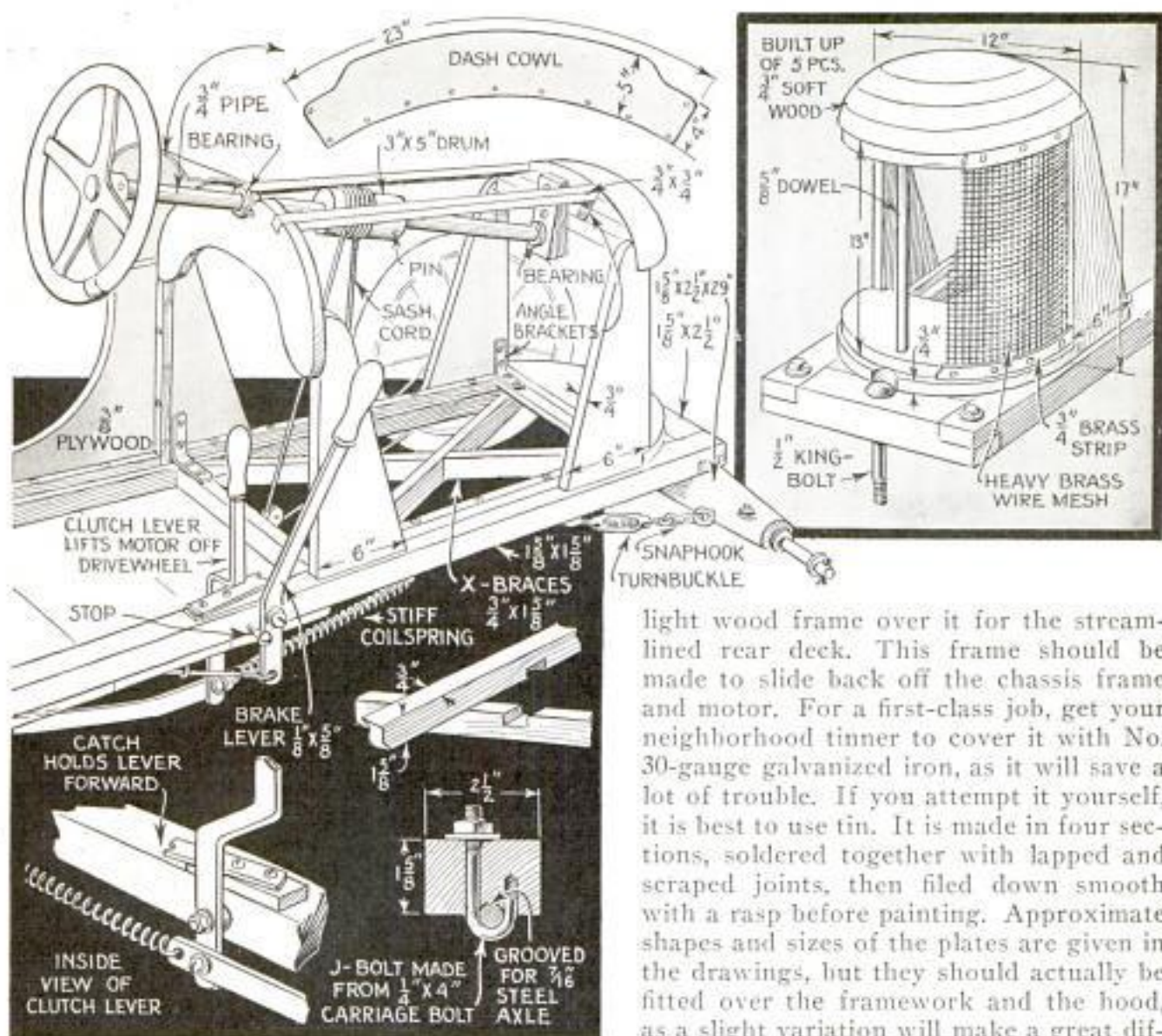




ing wheel (15-in. wheels are too large), we decided to make one. We sawed off the spider arms of a 15-in. wheel, made a rim of garden hose, and fastened it by means of a heavy wire and a wooden plug, plus casein glue and friction tape. The hose is slotted and a strip of the rubber removed for each arm. For a shaft, use 3/4-in. (outside diameter) galvanized pipe, with a pin through the hub of the steering wheel. At the forward end, use an oversize pipe cap for a bearing, and on the dash use a ring, with a shoulder if possible, to fit in a notch in the top of the dash. The ring may be held in place by two screws over the edge. The dash should be strengthened by four cleats on the inside to prevent splitting, for it must be arched to admit the knees of the pilot. The drum on the steering column is of wood, 3 in. in diameter and 5 in. long, and is pinned to the shaft with a spike. A good grade of sash cord is used for the cable and is first stretched by towing some load behind a car. The cables should leave the drum at right angles to the axle, or they will climb one way or another and bunch up. The pulleys can be located to give desired results, and also so that the driver can slide his legs on either side of the cords. Fasten the ends to heavy screweyes in the wood axle, each 9 in. from the kingpin. On one cable end, install a stiff coil tension spring, and on the other a snaphook and turnbuckle.

The original job is powered with a standard bicycle motor, which has a friction pulley that rides on the tire. The installa-

tion is very simple, the motor being applied in the same manner as on the bicycle. A heavy cleat is fastened to the back of the seat with carriage bolts, and is further braced by two heavy flat-iron bars to the chassis frame. A stout iron fork swings in a yoke just the right size to receive the motor, which is supported by a bolt through the forward end of the crankcase. The drivewheel also rides in this fork, which is held only by the bolt through the upper end and thus rides all irregularities of the road entirely independent of the car. A vertical arm is bolted to the side of the muffler of this motor, connected at the bottom to a tie-rod, running to the clutch lever which lifts the motor off the wheel when stopping, idling or warming up. No alterations or machine work are necessary to install the motor. The fork



which carries the drivewheel is, however, special and should be made to specifications to insure rigidity. The so-called clutch lever is provided with a catch. A heavy coil spring on this lever holds the motor down on the wheel and prevents bouncing. To start the car, the pilot simply pushes it, with the clutch engaged, a few feet, then lifts off the motor and climbs in. Of course, one should not expect to start up grades or on rough roads in this manner.

Here is a very simple braking arrangement which will lock rear wheels with little effort. The shoes are split sections of garden hose nailed to a wood beam held away from the wheels by a pair of coil springs. A wire cable, guided through screweyes to a brake lever, completes it.

After the motor is installed, build the

light wood frame over it for the streamlined rear deck. This frame should be made to slide back off the chassis frame and motor. For a first-class job, get your neighborhood tinner to cover it with No. 30-gauge galvanized iron, as it will save a lot of trouble. If you attempt it yourself, it is best to use tin. It is made in four sections, soldered together with lapped and scraped joints, then filed down smooth with a rasp before painting. Approximate shapes and sizes of the plates are given in the drawings, but they should actually be fitted over the framework and the hood, as a slight variation will make a great difference in sheet-metal work. The open panels in the rear deck have galvanized fly screen soldered on the inside. Aluminum would make a nice light job but is more expensive and difficult to solder.

In case you expect to carry heavier loads than the average, or negotiate stiff grades or rough roads, a suggestion is shown for a geared-down ratio, wherein the motor drives the road wheel indirectly through a friction wheel plus sprockets and chain. In this case you will not attain as high speed as in direct drive, and it may be necessary to install a small cooling fan on the motor. Another means of increasing the power ratio is to substitute a smaller friction pulley on the motor. The standard pulley is 3 in. in diameter, but a 2½ or 2¼-in. pulley would greatly increase its pulling ability. This, of course, would be a special machine job.

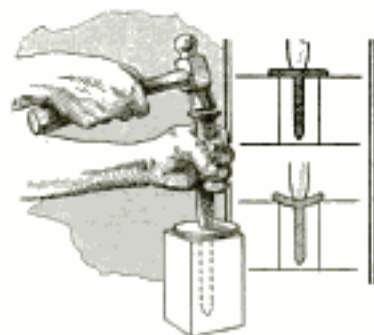


This Screen-Door Hook Can Be Locked or Unlocked from Either Inside or Outside

Hook Operated from Both Sides of Screen Door

Here is a screen-door hook that is handy in homes where there are small children, as it can be operated from either side of the door. It consists simply of a short length of No. 9 wire, inserted through a hole drilled in the door frame and bent at right angles, forming a hook on one end, while the other end is left straight to form a handle. A few turns of friction tape on the latter provides a good grip. It is a good idea to provide a sheet-metal bearing or short length of brass tubing for the wire where it passes through the frame, to prevent wear on the wood.—Frederick Gehlmann, Oak Park, Ill.

Roofing Nails Make Good Golf Tees



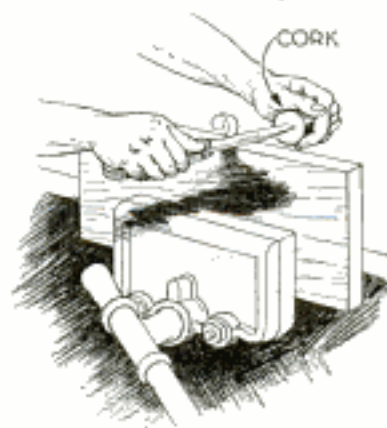
Golf tees that last indefinitely can be made from large roofing nails. Drill a $\frac{5}{8}$ -in. hole in a metal block and place the nail in it as shown. Then, with a hammer and punch, make the head of the nail concave to hold the ball.—Irving S. Schrod, Chicago.

Stoplight Helps in Backing Auto

When backing an auto at night where it is difficult to see what is behind you, turn off the lights and gently press the brake pedal to turn on the stoplight. This will furnish enough light to back up as there is no longer any illumination in front of the car. Of course, it may take a few seconds for your eyes to become accustomed to the darkness, before you will find that the stoplight is actually helpful.—Chas. D. Jarrett, Fillmore, Calif.

Drawshave Improvised from Jackknife

For emergency work, a jackknife may be used as a drawshave. The handle is used as one grip and the point of the blade is stuck into a large cork, which serves as a grip for the other hand. As a knife is not ground in the same way as the blade of a drawshave, it is a good idea to make a few practice cuts on a scrap piece to determine the correct angle at which to hold the blade before doing regular work.

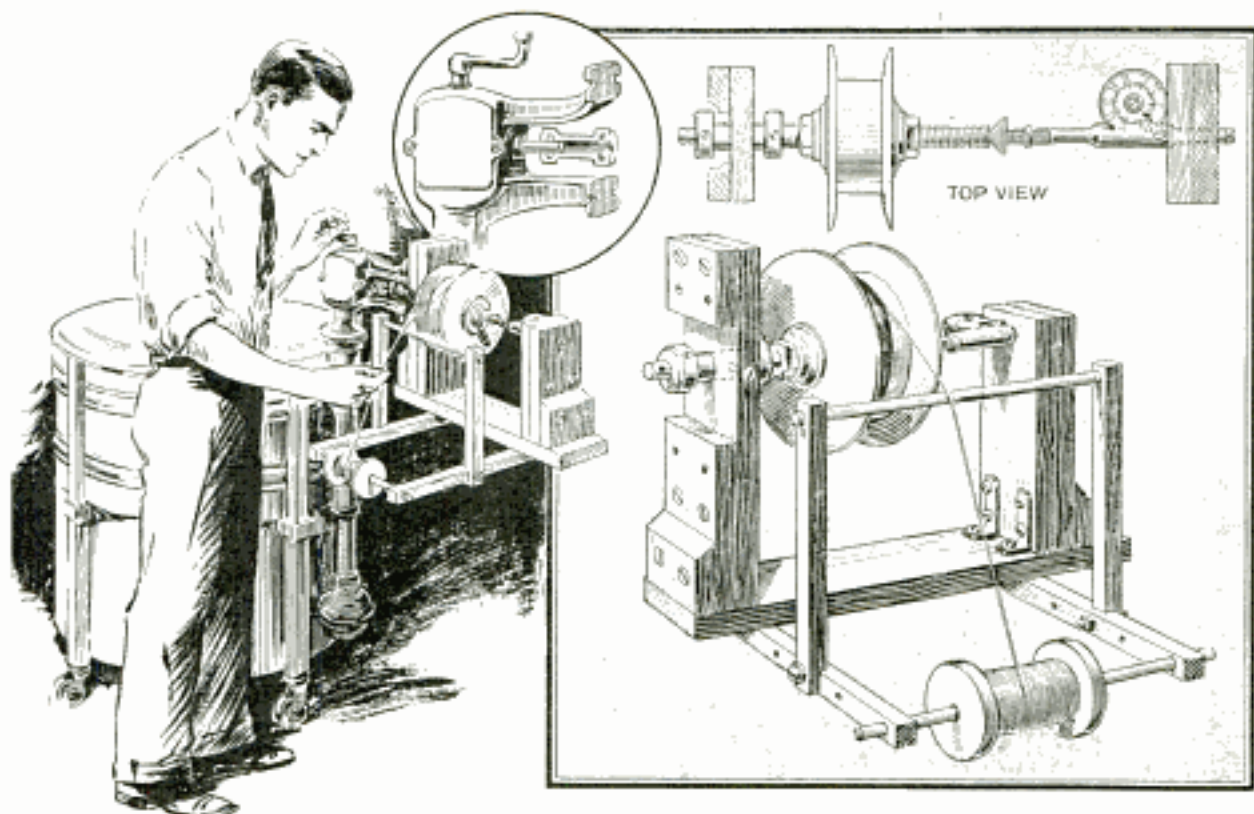


Free-Rolling Wheels Improve Sewing Machine

By replacing the small floor wheels on a sewing machine with wire wheels fitted with rubber tires, it can be easily pushed over floors without marring them. These wheels should not be mounted on the same axle as the casters, as the machine would be raised too high. A piece of steel channel is bolted to the outside of each leg. The axles for the larger wheels are bolts turned into nuts welded to the channel. Four wheels are not always needed on a machine, as they may allow it to move too easily when in use. A pair at one end suffices in such cases.

☛ A wooden chopping bowl makes a good receptacle in which to crack ice without damage to the pick point.

Washing-Machine Motor Runs Coil Winder



Power for this coil winder is obtained by substituting it for the wringer on a motor-driven washing machine, and use is made of a speed indicator for registering the number of turns of the coil. In making the frame, a slight deviation from the method shown may be necessary to adapt the winder to your particular machine. A bearing for the shaft is fitted in the end of the frame, and a collar and setscrew at each end of the bearing hold the shaft in position, the latter being threaded for nuts to hold the coil form. Attachment of the shaft to the wringer head is accomplished by means of a universal joint. The outer end of the winder shaft is centered to take the tapered end of the speed indicator, which is attached to the frame by removing the handle and using the long screw as a clamp through the frame.

Assembling an Electric Motor

When an induction motor is disassembled, it is often difficult to replace the housing that covers the brushes as they must be lifted before it can be replaced. An easy way to do this is to wind a few turns of cord around the brushes so that

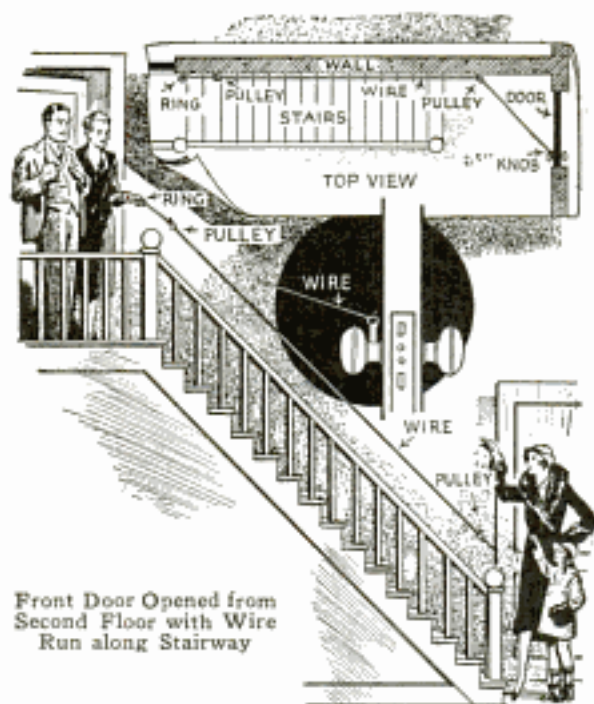
they can be lifted as one unit. The housing can then be adjusted. To remove the cord, it must be cut with a pair of scissors inserted through one of the air ducts and pulled out with long-nosed pliers. Before reassembling a motor of this type, see that there is no oil on the commutator as this often causes arcking when starting.

Holder for Pot Lid Hooks over Edge

Bent as shown in the detail, a piece of wire makes a good lid holder that can be hooked over the edge of a pot. It leaves both hands free for stirring the contents, and holds the lid in a vertical position when the stove top is crowded.—F. W. Schneider, Towaco, New Jersey.



☐ A moist blotter, cut to fit the top of a fruit jar, will convert it into an efficient tobacco humidor.



Front Door Opened from Second Floor with Wire Run along Stairway

Opening Front Door from Second Floor

Here is a simple installation for opening a front door from the second floor in homes and apartment houses not equipped with buzzer-type locks. A wire cable, such as used for radio aerials, is run from the second-floor landing through screweyes along the wall to the door, at which point the wire is fastened to a short piece of iron rod, threaded and substituted for the screw that holds the knob on the lock as shown in the detail. A pull on the wire from the second floor will turn the knob and open the door.

Wire across Top of Paint Can Wipes Brush

Stretched across the top of a paint can and attached by inserting it through holes punched in the sides, a piece of wire makes a good wiper for removing surplus paint from the brush.



This is better than the usual method of wiping the brush against the edge of the can because the paint drops back inside of the can instead of running down the outside where it is wasted.

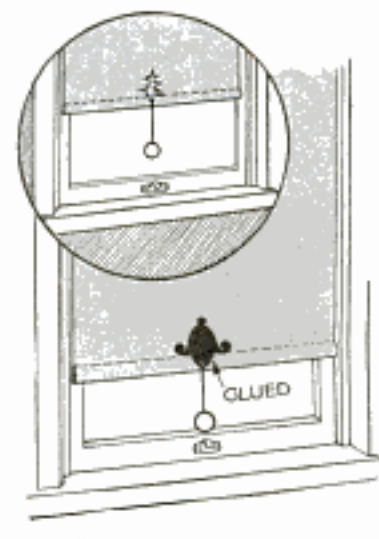
Cellophane Cover for Car Distributor

While walking along the street on my tour of duty, I came upon a car with a radiator leak where the water was being thrown by the fan back over the motor which caused a short circuit in the distributor. After drying the wires, I took the cellophane wrapping from a package of cigarets and placed it around the distributor, tying it together at the top. This kept the water from the distributor so that the car was able to proceed without further repairs. The same method may be used for keeping coils dry.—F. C. Holtom, Hempstead, L. I., New York.

Repair for Torn Window Shade

Window shades that have been torn as indicated in the detail, may be repaired by pasting identical designs over the torn part on both sides of the shade. Material similar to that from which the shade is made may be used, or a design may be cut from a contrasting cloth. One side of each

piece is coated with rubber cement, or any other adhesive that does not dry brittle. It will resist rough usage, and if neat designs are used, will have a pleasing effect.—R. G. Bullard, Monterey Park, California.



Wire Mesh Improves Pipe

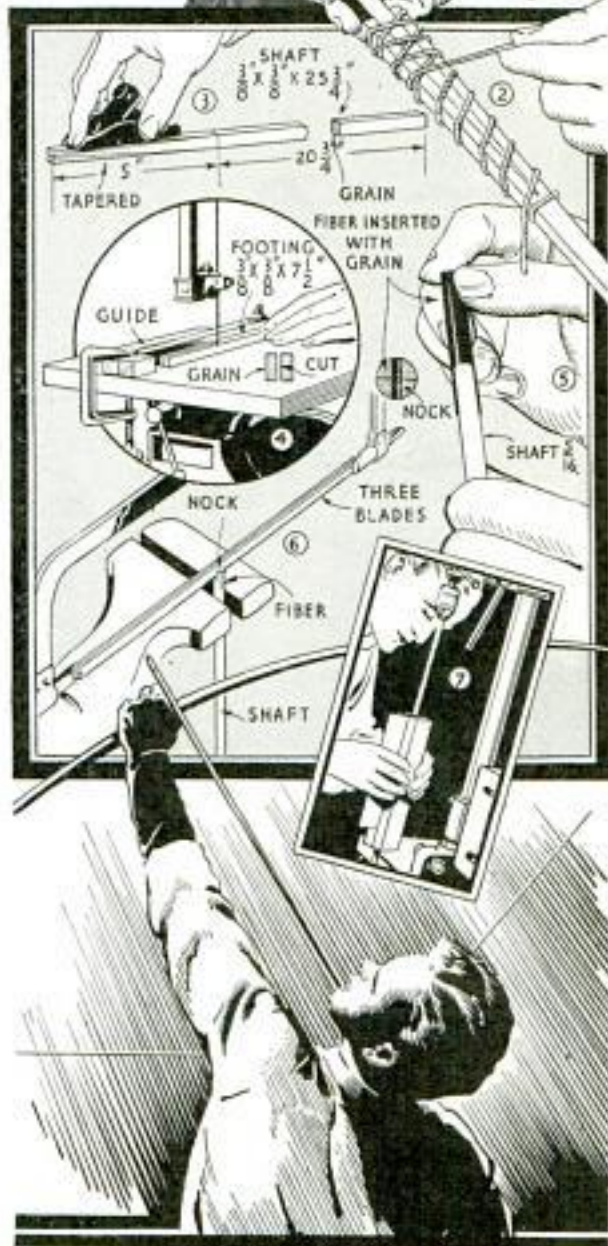
To keep condensation and small particles of tobacco from fouling your pipe stem, place a small disk of wire mesh or a wad of steel wool in the bottom of the bowl. This will last a long time and is easily replaced when burned or clogged.

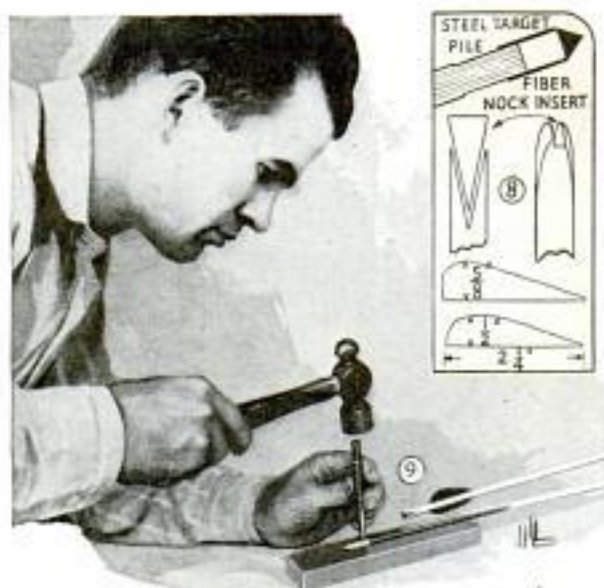
☛ Pots and pans that have been burned may be cleaned by filling them with a solution of baking soda, 1 teaspoonful in 1 qt. of hot water; leave the solution in the pans until it has cooled.



A RROWS, generally 28 in. long and $\frac{5}{16}$ in. in diameter, can be either in one piece (a "self" arrow) or in two (a "footed" arrow), the latter type being shown in Figs. 1, 3 and 4. The shaft is tapered to fit a corresponding saw cut in the footing, which is glued and lashed on securely as in Fig. 2. For the shaft you can use cedar, fir or white pine, but beefwood, amaranth, lemonwood and walnut for the footing. After rounding the shaft, sandpaper is used to finish it as in Fig. 7. Insert a piece of fiber into a 1-in. cut in the end of the shaft as in Fig. 5, and cut the nock across this with three hacksaw blades about $\frac{1}{4}$ in. deep, as in Fig. 6. The fiber is inserted with the grain, while the nock is cut directly across it. Fitting an insert nock of hardwood is shown in Fig. 8. This detail also shows the method of fitting the steel target heads, which should be tapped lightly on either side with a punch, as in Fig. 9, to hold securely.

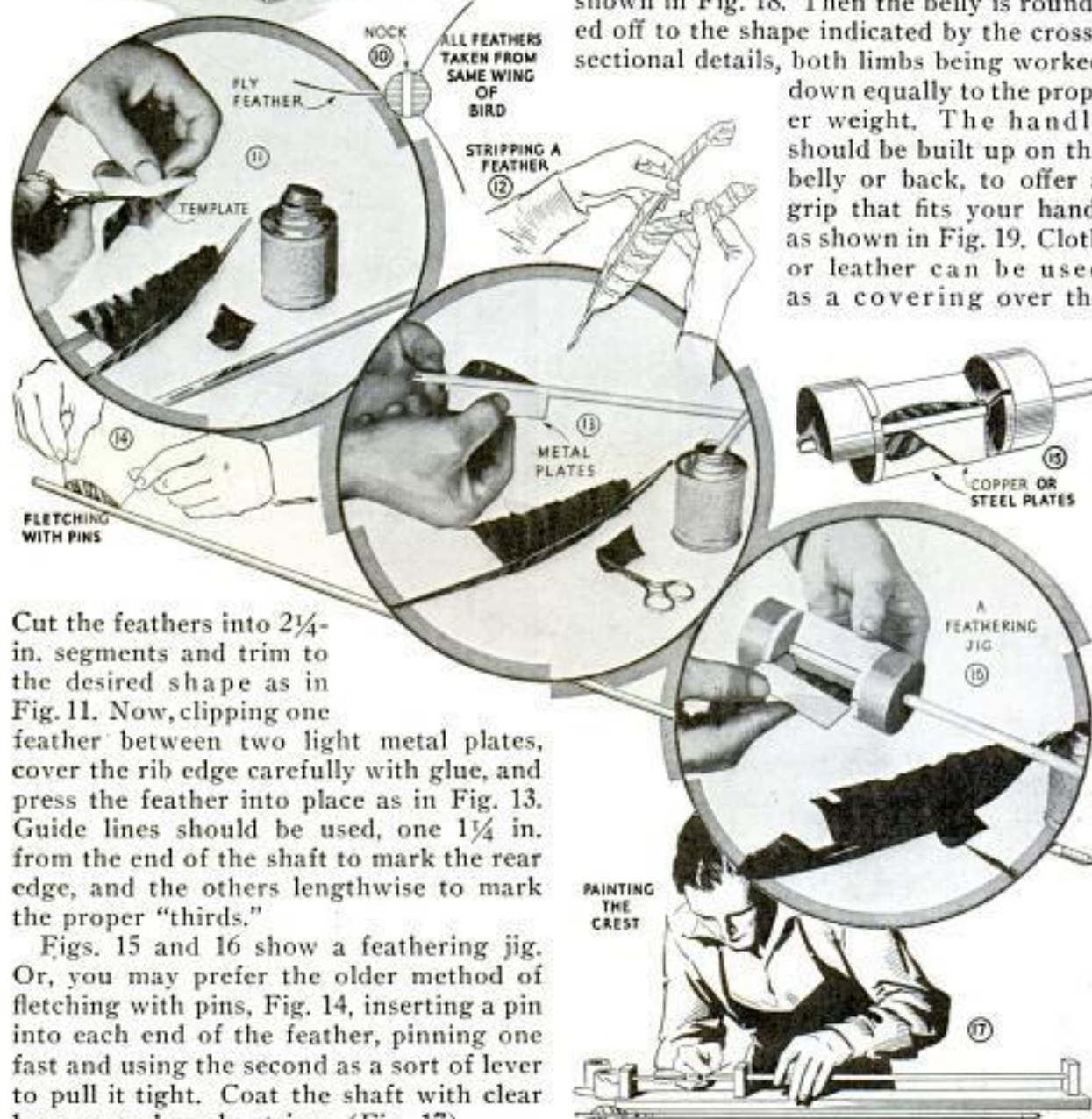
Fig. 10 shows the general arrangement of feathering—equal thirds—with the fly feather at right angles to the nock. Turkey feathers are used, and any pair (three is an archer's pair) should be from the same wing of the bird so that they will curve in the same direction. Strip the feathers by grasping the vane at the top and pulling outward, as in Fig. 12. This will remove the vane from the rib neatly, a thin slice of the rib tegument remaining attached.





Now for a few words in general on arrow making: If you buy the shafting, specify "spine-tested," so that every stick has the same "backbone" in stiffness and springiness. When producing arrows in matched sets of six, strive for exact weights with no more than a 10-grain variation, obtained by shaving down the feather end of the shaft. Each arrow of a set should balance at the same point, 1 in. or more ahead of the exact center. Each shaft should be as straight as possible. The first bow should be made from lemonwood or hickory. Staves of these woods, $1\frac{1}{8}$ in. square and 6 ft. long, are readily obtained and easily worked. Sawing this out roughly, with the required taper at the ends, is shown in Fig. 18. Then the belly is rounded off to the shape indicated by the cross-sectional details, both limbs being worked

down equally to the proper weight. The handle should be built up on the belly or back, to offer a grip that fits your hand, as shown in Fig. 19. Cloth or leather can be used as a covering over the

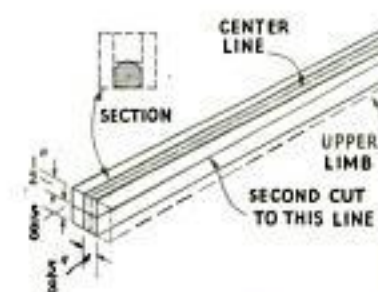


Cut the feathers into $2\frac{1}{4}$ -in. segments and trim to the desired shape as in Fig. 11. Now, clipping one feather between two light metal plates, cover the rib edge carefully with glue, and press the feather into place as in Fig. 13. Guide lines should be used, one $1\frac{1}{4}$ in. from the end of the shaft to mark the rear edge, and the others lengthwise to mark the proper "thirds."

Figs. 15 and 16 show a feathering jig. Or, you may prefer the older method of fletching with pins, Fig. 14, inserting a pin into each end of the feather, pinning one fast and using the second as a sort of lever to pull it tight. Coat the shaft with clear lacquer and apply stripes (Fig. 17).

shimmed-up handle. Fig. 20 shows how the nocks are cut in at each end of the bow. Use a round file for this, cutting in on the belly and sides of the bow, but not on the back except where the cut comes down at the edges. Horn racks can be fitted if desired, in which case you should work the wood down carefully to make a good fit.

Much has been said about laying up bow strings from so and so many strands of linen thread for each pound of weight. For average use you will find that the better grade of four-strand upholsterer's twine will do quite nicely. Eyes can be spliced into one or both



ends to fit the nocks, or you can use the simpler method indicated in Fig. 21, simply untwisting the twine, inserting the free end through and tying an overhand or the more ornate wall knot. Fig. 22 shows the bow being braced for testing, an operation which should be done many times as you work the wood down. A valuable adjunct to this is the "tillering" process,

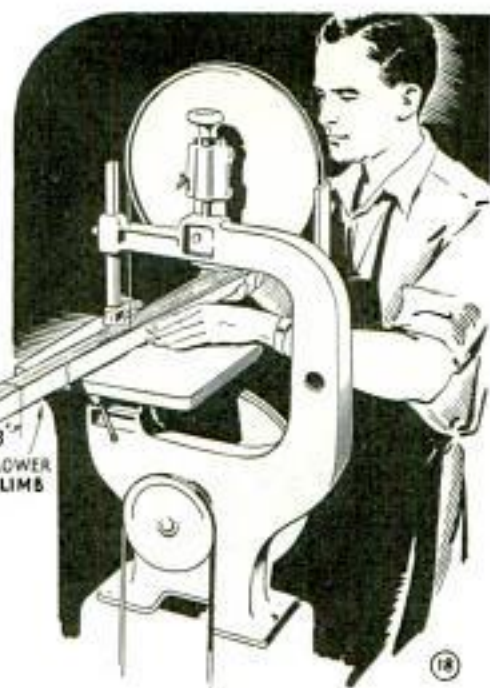
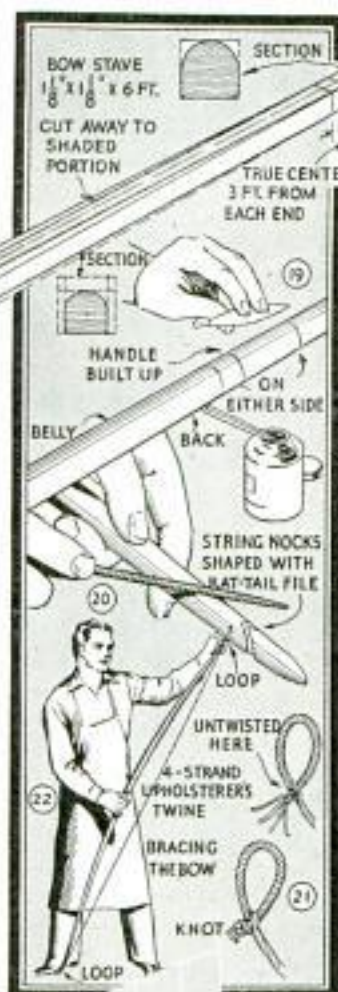
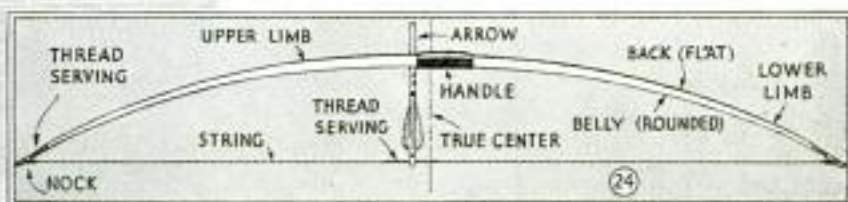
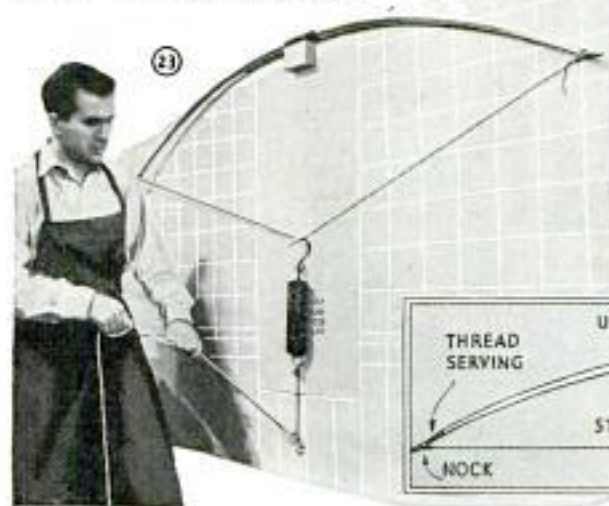
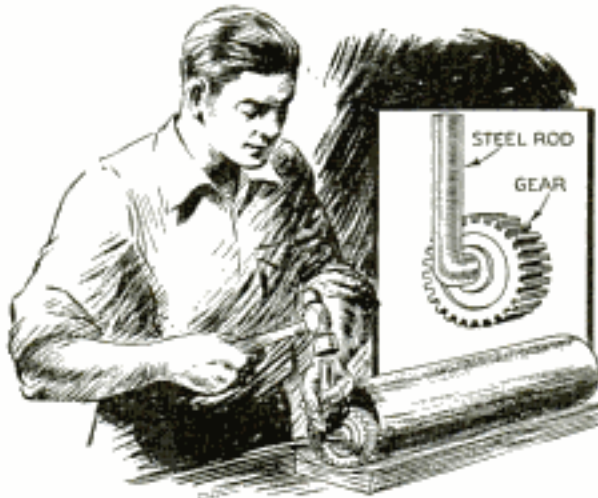


Fig. 23, which checks the bend of each limb by means of the ruled squares on the walls, while the weight of the bow is read by pulling the bowstring the required 28 in. and reading the scale. Fig. 24 shows the various parts of a bow and the position where the arrow is engaged.

When shooting with a bow and arrow one must learn to make allowance for "windage," that is, the strength of the wind throwing the arrow off its course, which naturally varies. With customary precautions observed when shooting, you will find archery one of the few outdoor sports that gives you fresh air without strenuous exercise. The twang of the string and the "pluck" of the arrow, when it hits the mark, have a fascination and you can be assured that you will develop just as much skill with a homemade outfit, provided it is carefully and accurately made, as you will with expensive equipment that is purchased.



Homemade Tool Crimps End of Stovepipe



End of Stovepipe Crimped with Tool Made by Riveting Steel Rod in Fine-Toothed Gear

For crimping the end of stovepipe, a tool can be made from a piece of steel rod and a fine-toothed gear. The rod is bent at right angles at one end, which is then riveted into the hole in the gear. In use, the pipe is placed on a soft-wood block, and the tool is placed inside the end of the pipe and struck with a hammer.

Forecasting Weather Is Easy with a Barometer

Forecasting the weather with an aneroid barometer is easy once the instrument is understood. First find out the height above sea level of your location and mark the number on the barometer. Then for every 100 ft. above sea level add one-tenth of an inch to the reading. To make a weather prediction, note whether or not the last reading you took was less or greater than the present one to determine if the barometer is rising or falling. If the reading is 29.8 or below, and is increasing rapidly with the wind blowing from the east, clear, cold weather may be expected. The same reading decreasing with an east or north wind indicates heavy rain or snow followed by a cold wave. A south or east wind with a barometer falling denotes severe storms followed by clear weather, and colder if it is in the winter time. A reading of 30 or below, slowly decreasing, with a southeast or northeast wind blowing, indicates rain to continue for one or two days. If it is falling rapidly, it means rain and high winds followed by clear weather. A south or east wind with the

barometer dropping rapidly indicates a severe storm. If the barometer rises slowly clear weather will prevail. A reading of 30.1 and above, when the reading is decreasing, indicates rain or snow. If the barometer reads between 30.1 and 30.2 and its reading is decreasing, rain, and probably increasing wind, may be expected. The same reading, holding steadily, shows that fair weather will prevail. If this reading starts increasing rapidly, rain may follow in a day or two. A stationary reading of 30.2 and above indicates continued fair weather with no decided temperature change. If the reading is slowly decreasing, warmer weather may follow. A day-to-day record of observations and a little practice will enable you to predict the weather in your locality closely enough to surprise you.

Indicator Shows When Full Page Is Typed

By using this indicator, a typist can tell at a glance when a page is written. The indicator is a piece of flat iron screwed to the paper guide on the machine and has a white stripe painted across it so that the end of the paper comes parallel to the stripe when the last line is typed.



Holding Cork Tightly in Bottle

A cork can be made to fit tightly in the mouth of a bottle by using two washers, a bolt and a wingnut. The bolt is inserted into a hole drilled in the center of the cork, washers being placed at each end. After the cork is placed in the bottle, the wingnut is turned down, expanding the cork against the neck.—H. C. Thomas, Royal Oak, Mich.



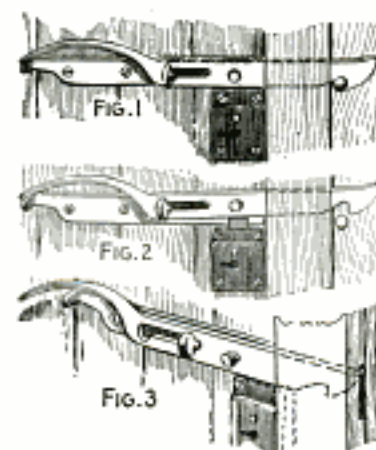
Slanting Smoke Pipe Produces Good Draft

When a smoke pipe is led into a chimney on a horizontal level, the smoke strikes directly against the lining of the chimney opposite the opening, which sets up a disturbance in the flow of the smoke and reduces the draft. If the pipe is set at an upward slant, the smoke will pass up with practically no disturbance. An elbow with a 45° angle should be fitted in the pipe to give it the slant required. The chimney opening can be made to accommodate the slanting pipe by knocking out some of the bricks to make it fit properly and then sealing the edges of the hole with mortar. —John H. D. Blanke, Barrington, Ill.

Effective Latch for Sliding Door

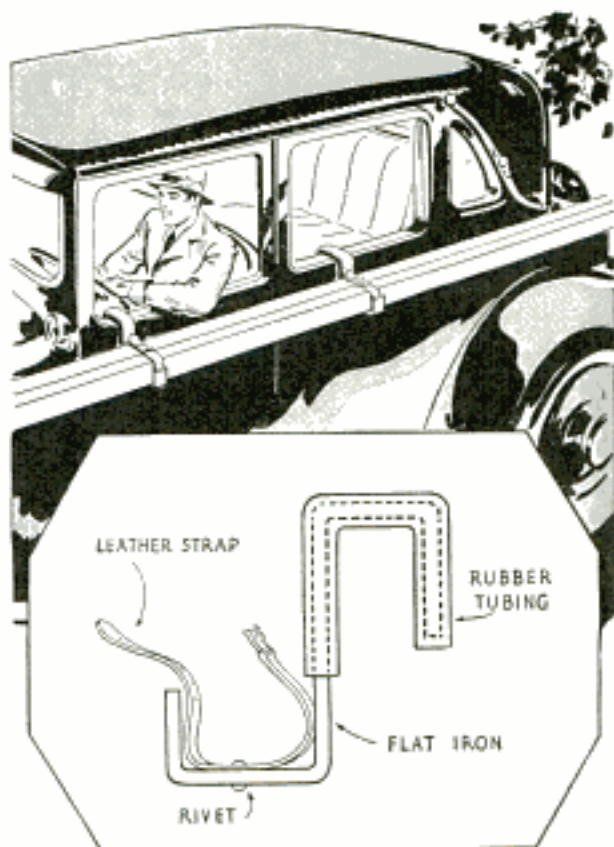
This latch automatically locks when the door is closed and is unlocked from the outside with a key. The latch is made from two pieces of iron, one of which is screwed to the side of the door, while the other is pivoted to it by means of a pin, the pivot working in a slot cut in the latch proper. This is notched at the outer end to fit over a pin in the door casing, while the other end is tapered and bent in a semicircle to produce a spring, which rests on the bent end of the rigid piece. A tumbler lock, or a common bar lock, is screwed to the door underneath the pivoted piece,

and raises it above the pin when the door is unlocked. In Fig. 1, the latch is shown in locked position, while Fig. 2 shows it unlocked, and in Fig. 3, the latch is pulled back, the pin sliding in the slot in



the pivot piece, to make the lock ineffective.—P. B. Bacheller, Mt. Vernon, Me.

☞ To prevent drying of cheese, wrap it in a soft cloth moistened with vinegar, and keep it in an earthen jar, leaving the cover slightly raised.



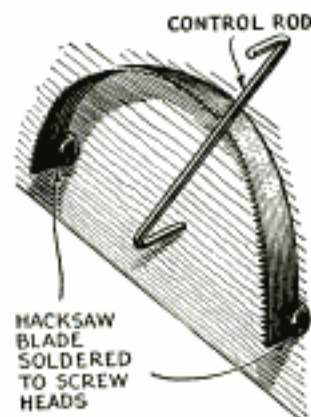
Flat-Iron Hooks. Placed over Edge of Windows, Support Long Objects on Outside of Car

Hooks Support Lumber on Closed Car

Long objects, such as ladders or lumber, can be carried on the outside of a closed car by using hooks such as shown here. They are made from lengths of flat iron, bent to the shape shown, and rubber tubing is fitted over the upper bend to protect the car finish. Each hook is provided with a leather strap and buckle, for fastening the load.

Quadrant from Old Hacksaw Blade

An efficient quadrant, for holding small control rods, is easily made from a piece of a hacksaw. Dull the points of the teeth with a file so that they will not cut, and solder the ends to the heads of screws that have been driven into a base and spaced so that the blade will be bent into a half circle.





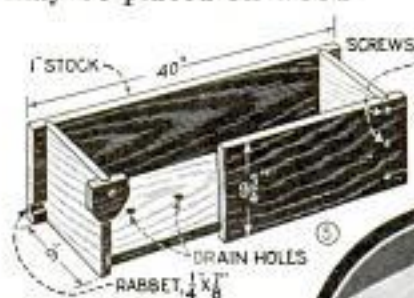
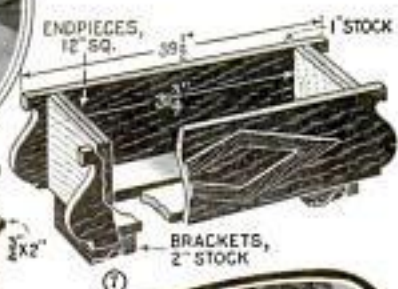
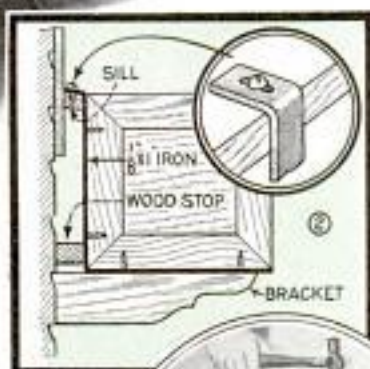
WINDOW

or metal brackets as in Figs. 2 and 3, flat-metal hooks being used to hold the unit in place. Another method is to suspend the box with chains as in Fig. 4. Figs. 5, 6 and 7 show how rectangular boxes are constructed. These may be lined with sheet metal to prevent decay, but this is unnecessary if cypress stock is used and it is well painted.

Drainage is provided for by holes drilled through the bottom or by a $\frac{3}{8}$ -in. slot between the bottom pieces, as shown in Fig. 6. Drain openings should be covered with bits of broken pottery to prevent loss of soil.

One should not assume that any kind of soil will do. A good combination is indicated

PRACTICAL flower boxes should not be less than 6 in. deep, and, to be in good proportion, the width should be somewhat greater than the depth. The length of a window box should be equal to, or a few inches longer than, the sill. Also, two or three short boxes look better than one huge box on a very large window or on a porch railing. For a permanent mounting, the box can be screwed directly to the window sill, as in Fig. 1, or it may be placed on wood



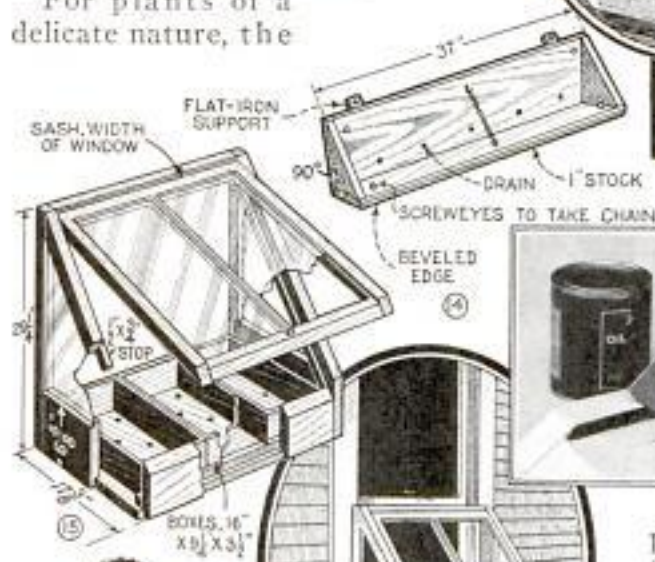
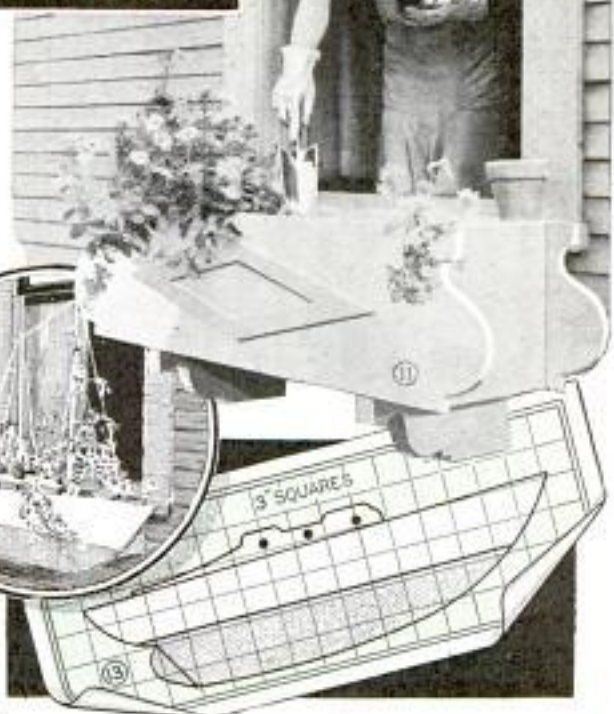
General Construction of Rectangular Flower Boxes; Drainage Is Essential and Is Provided by Drilling Holes or Cutting a Long, Narrow Slot in the Bottom

GARDENS



in Fig. 8, with a 1-in. layer of pebbles to facilitate drainage and to prevent souring. If the box is large or has slanting sides, it is advisable to fit simple wire braces, as shown in Fig. 9, to prevent the weight of the earth from pressing the wood outward. Simple boxes can be ornamented by using wooden cut-outs as facers, as in Figs. 11, 12 and 13. Triangular boxes, as shown in Fig. 14, take less lumber than rectangular ones, but in this case wire braces are necessary to prevent the sides from spreading.

For plants of a delicate nature, the



greenhouse box shown in Figs. 15 and 16 is recommended. It should be made to fit snugly within the window opening. The installation of an electric-heating element will make such a box a good hotbed for growing rare specimens from seed. An important feature in connection with any flower box is proper painting. The box should be the same as, or a harmonizing color with, either the house or the trim, thus providing a subdued background for the more brilliant flower colors. For the shaded box, plant periwinkle, foliage geraniums, English ivy, ferns and coleus; for the sunny side, use German ivy, dusty miller, coleus, petunias, and French marigolds. For best results, dark-colored flowers should be used against a light-colored house and bright colors against a dark or neutral background.



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☛ Dish towels will be fresh and sanitary if dried in the sun.

Cardboard Mailing Tubes Hold Large Papers under Desk



Drawings and Blueprints Neatly Filed in Mailing Tubes Tacked to Underside of Desk

Several mailing tubes, fastened to the bottom of a desk between the legs, provide a convenient place for filing large papers, such as drawings and blueprints. A large tack at each end of the tube will hold it in place.—James Hennessy, San Francisco, Calif.

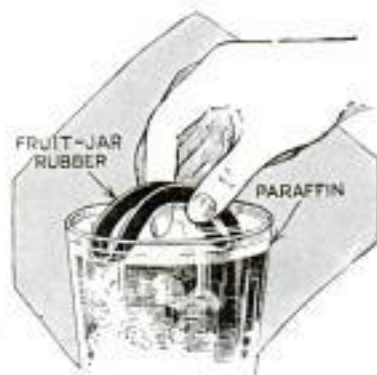
How You Can Do Amusing Stunts with Secret Inks

Invisible ink can be made by dissolving cobalt chloride, 15 gr., in water, $\frac{1}{3}$ oz. After the chloride has dissolved, add 3 minims of glycerine. This ink is used with an ordinary pen, and when dry, the writing can be made visible by holding it in front of a fire. Another method is to prepare a solution of potassium ferrocyanide (poison) in water and using it as ink, which is made visible by sponging the writing with a solution of ferric chloride in water. If easier to procure, potassium ferricyanide (poison) may be used as ink. In this case, develop the writing with a solution of ferrous sulphate. Any of the above inks may be made free-flowing by dissolving a small quantity of gum arabic in the water before dissolving the chemicals. The gum should not be used in the developing solutions. When paper is painted with a solution of ferrous sulphate and allowed to dry, writing on it done

with potassium ferricyanide will be blue. Paper of the same kind and appearance will show no sign of the writing. To make the stunt more baffling, you can take the untreated paper on which the writing was attempted and sponge it with water in which ferrous sulphate has been dissolved. The writing will then appear. A method of proving that your guest writes backward consists in going through the last named procedure except that the potassium-ferricyanide ink must also contain gum arabic as previously described. After the guest has attempted to write unsuccessfully, take his paper and place it face down on a piece of plain paper, which has been previously moistened. While talking to distract attention, rub the papers together firmly with the palm of the hand without letting them slip. This is to transfer the invisible ink to the damp sheet in reverse. Next, turn over the two papers and hold the one with the transferred ink to the light and note that it is hard to prove that he wrote anything. During the laugh at your failure, sponge the sheet with the ferrous-sulphate water, which will make the writing appear in reverse. While the guests are looking at the reversed writing, develop the original, and, at the first opportunity, substitute it for the reversed copy, making sure that you leave a blank piece of paper in sight and get rid of the reversed copy.

Rubber Lifts for Wax Seals on Jelly Glasses

When jelly glasses are sealed with paraffin, it is often difficult to remove the wax without breaking it into small pieces. To overcome this trouble, an old fruit-jar rubber can be folded, and the ends inserted in the paraffin before it hardens. In this way, a handle is provided for lifting up the wax seal when the glass is opened.—G. E. Hendrickson, Argyle, Wis.

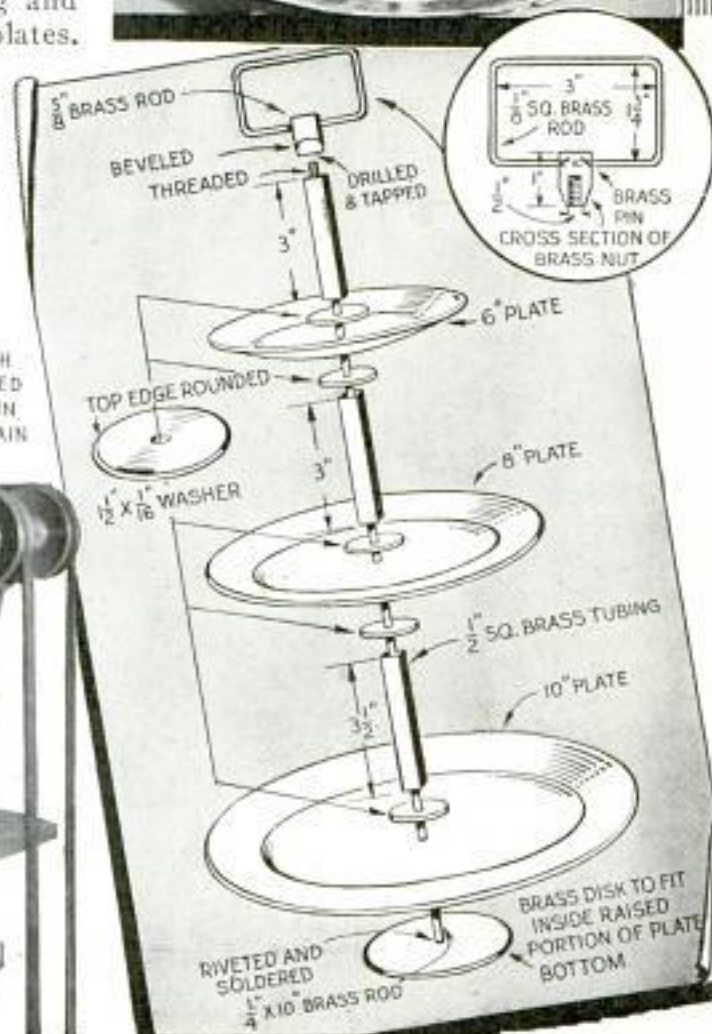
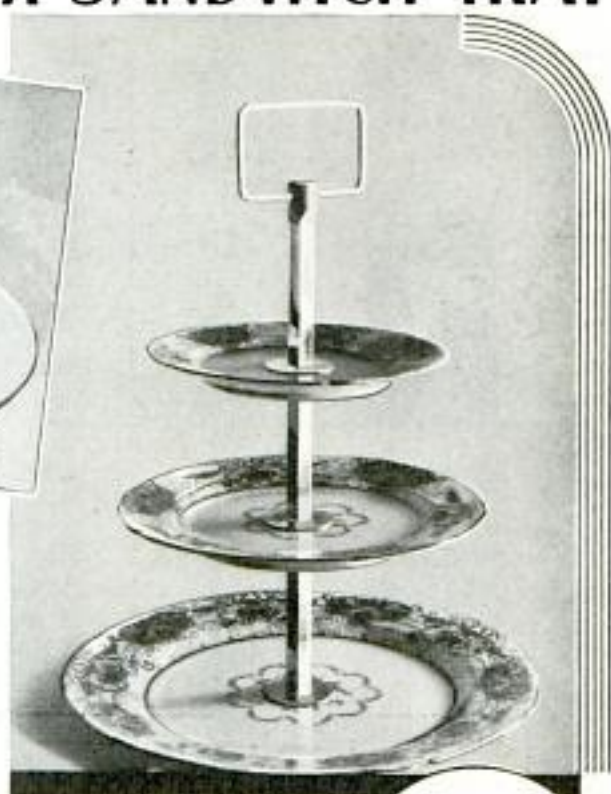


Make this *Three-Deck* SANDWICH TRAY



By JAMES R. WARD

RIGID three-deck sandwich trays cost comparatively little when made from brass stock and china plates. Holes are drilled through the plates so they can be slipped over a brass rod, turpentine and emery powder being used as a cutting fluid. Pieces of square brass tubing and brass washers are used to space the plates. The rod is threaded at the upper end, while the other end is riveted and soldered to a brass disk, on which the bottom plate rests. A handle is pinned to a round brass nut, which fits the threaded end of the rod. The brass should be polished and lacquered.



Bending Wood with Aid of Heat



Board Dampened with Water Is Easily Bent When Held Close to Fire

Bending a board to a curve is a simple matter when the following method is used: First build a fire and place the outside of the piece to be bent toward the heat, supporting it with a clip made from heavy wire. The outside of the wood can be determined by the end grain as shown in the detail. Then, with a paintbrush, dampen both sides of the work with water, repeating the operation every 30 seconds until the wood has been bent to the desired shape.

Clogged Gas Burners Opened with Pipe Cleaner



Common pipe cleaners can be used to open the tiny holes in the burners of an oil or gas stove when they become clogged. The wire in the cleaners is stiff enough to be pushed through the encrusted holes, and the fine bristles wipe away any grease accumulations.

Increasing the Profits of Your Peach Crop

A New Hampshire peach grower is getting more money for his fruit by marketing it a little out of season. Instead of buying expensive fertilizers to push his

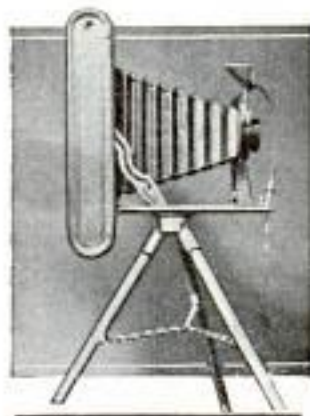
crop so as to have peaches a few days before his neighbors, he planted about one third of the orchard with pine trees. These retard the ripening of the peaches three or four weeks, and they also lessen the risk of the fruit being destroyed by early frosts.—W. H. Fitts, Haverhill, Mass.

Repairing Auto-Door Pockets

Elastic in the side pockets of automobile doors often decays after a short period and allows the pockets to sag. One driver repaired them by removing the rubber and attaching "zippers" such as are used on wearing apparel. One edge of the zipper is sewed to the door lining and the other to the upper edge of the pocket.

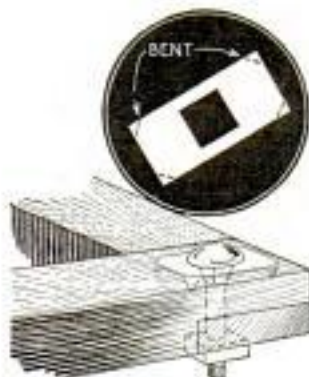
Chain Keeps Tripod from Collapsing

To keep a camera tripod from collapsing when one of the legs is kicked by accident, or when the tripod is used on smooth tile or wooden floors, solder the ends of three equal lengths of chain together and then attach the free ends to the tripod legs. If small chain is used and a neat soldering job is done, this arrangement will not interfere with the folding of the tripod.



Keeping Carriage Bolts from Turning

To keep carriage-bolt heads from turning when used in wood, cut a square hole in a piece of sheet metal to fit the shoulder on the bolt. Bend down the corners of the metal and drive them into the wood over the hole. This method applies particularly when the bolts are used in wood work where frequent tightening and loosening of the nuts are necessary.



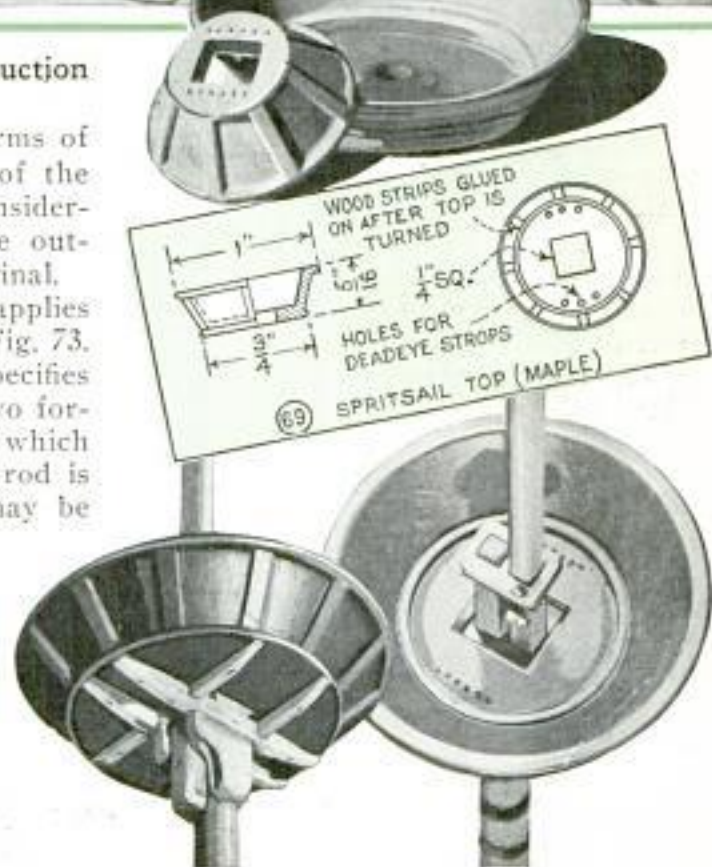
Sovereign of the Seas

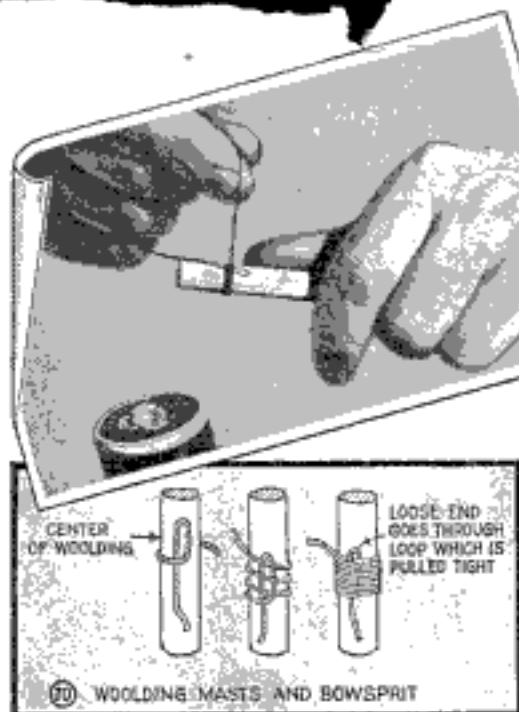


PART VII—Details of Mast Construction

UNLIKE the more simplified forms of ship-model masts, the masts of the "Sovereign" are carried out in considerable detail to simulate closely the outstanding characteristics of the original.

The same general construction applies to both main and foremasts. See Fig. 73. The table headed "Lower Masts" specifies the lengths and diameters of the two forward masts, as well as the mizzen, which will be treated separately. Dowel rod is used to make the masts. They may be chucked in a drillpress and tapered first with coarse and then fine sandpaper, as in Fig. 75, or a block-plane can be used to shave the masts to an octagonal tapered section, after which they can be rounded by hand-sandpapering. This done, the mastheads must be squared off at the upper, smaller ends, to receive the trestletrees, crosstrees

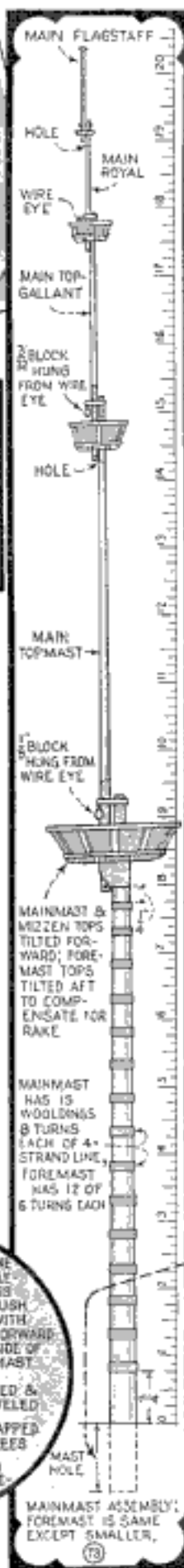
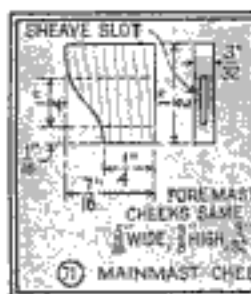




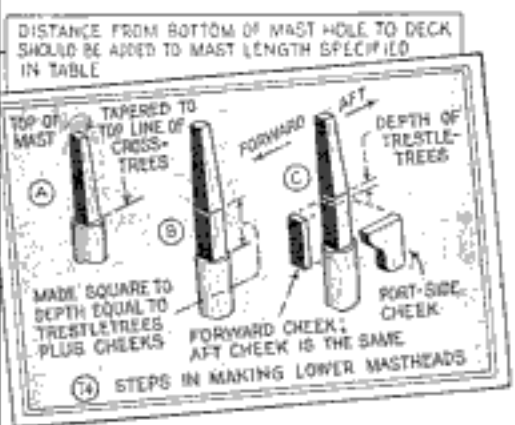
and cheeks. Fig. 74, details A, B and C, shows the three steps required to make the mastheads. The taper extends downward to the top edge of the trestletrees, and the squared sections below this point have vertical sides.

Next the cheeks are fitted. Those for the sides of the masts are made as in Fig. 71. They can be made with a simple slot for a sheave hole, or they may be slightly thicker to provide a wider slot, into which a very thin sheave pulley can be fitted. Cheeks on the forward and after sides are thin wooden strips glued to the masts between the side cheeks; their thickness must not exceed the diameter of the round mast section below. Note detail C, Fig. 74.

The sizes of trestletrees (fore and aft) and crosstrees

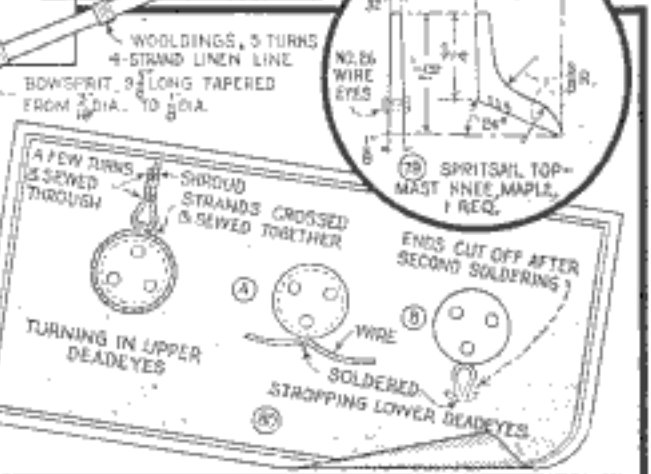
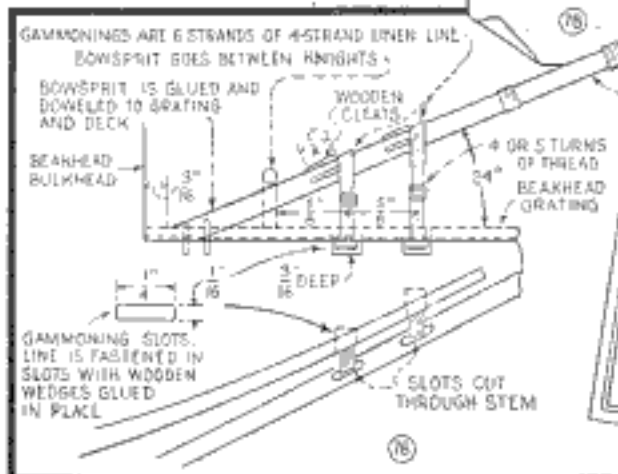
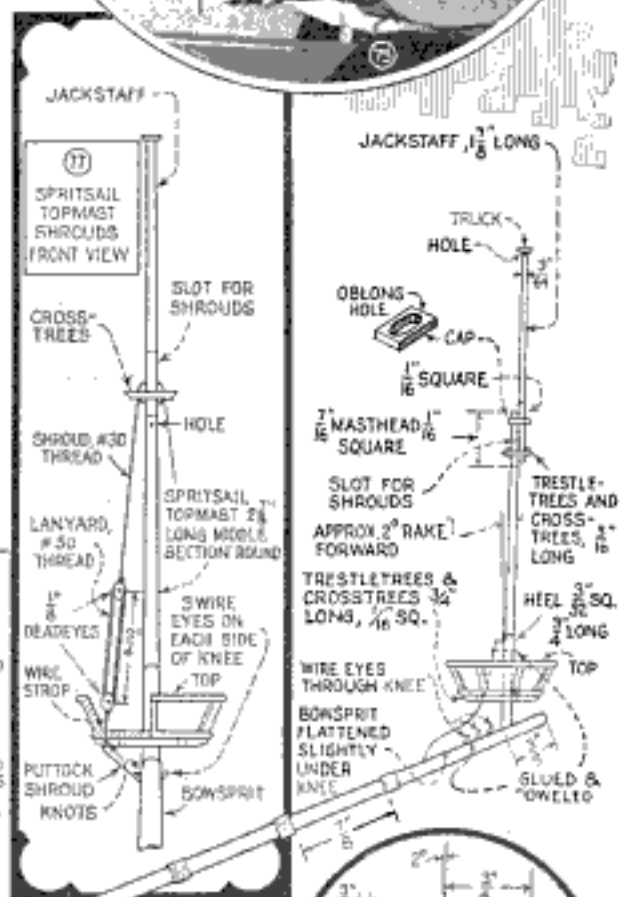


(athwartships) are given with the respective masts to which they are attached. Their lower edges are tapered from about half the depth to one-quarter of their lengths from the ends inward. Those for the lower and topmasts have the crosstrees half-lapped into the trestletrees; topgallant and royal crosstrees are thinner in proportion and rest in notches filed into their trestletrees to receive them. See Fig. 72. Be sure that the center line of the trestletrees is flush with the forward side of the mast, to provide a square opening for the heel (lower end) of the mast above. This should be a loose fit, as certain rigging lines must also pass through the same opening as the upper mast. The top surfaces of trestle and crosstrees are flush, or nearly so, to seat the tops which rest upon them. The upper mast trestle and crosstrees are glued in place; the larger, lower trees should also be doweled with bamboo splints to make them more secure. No cheeks are required on the upper masts, their squared sections being satisfactory for attachment of the trestletrees. We can dispose of the mizzenmast by noting its exceptions to the first two. Its masthead is simply "padded out" with rectangular wooden strips on all four sides, similar to the forward cheek shown at C, Fig. 74. Just below its masthead, a sheave slot passes fore and aft through the mast itself. And, unlike the other two masts, the miz-



zen is not wooded. Reference to Figs. 70 and 73 shows the method and locations of the woodings on the bowsprit, fore and mainmasts. Manufacturers' numbers vary for the same diameter linen line used for woodings. However, the correct diameter is that which will pass cleanly through a No. 69 drilled hole. Beeswax is rubbed on the line before turning it on the mast, after which the woodings are covered with a coating of thinned orange shellac.

The masthead caps are all made similar to that for the spritsail topmast, Fig. 76. Their respective sizes are given in the mast tables. The smaller caps for the upper masts may be made from several thicknesses of matchbox wood glued together and sanded to the correct thickness. This prevents them from splitting. Also, make these caps about double length and width, drill holes through them to take their mastheads and upper masts, and glue in place. When dry, they can be filed and sanded down to size on the mast. As shown in Fig. 73, the lower, top and topgallant mast caps are fitted at their forward ends, on both sides, with small wire eyes. The royal caps need not be so fitted. In the starboard eyes, only, of the lower and topmast caps, single blocks are hung. Their sizes for the three mast assemblies are given in Fig. 73. The diameters and depths of all tops, given in the mast tables, are made similar to the spritsail top, Fig. 69, with the exception of the number of holes for deadeye strops, which will be given later when they are rigged. The rectangular hole in the bottom of





each top (except the spritsail top) is wider than its fore-and-aft dimension. It should extend outboard beyond the outside of the trestletrees, to provide a free slot about as wide as half the trestletree thickness, through which the shrouds will be rove later.

The lower masts are sanded to an easy sliding fit in the mast holes, the clearance permitting a slight side-to-side adjustment.

Details of the bowsprit mast are given in Figs. 76 to 80. Rig the shrouds before permanently installing the bowsprit on the model. Six three-hole, 1/8-in. black deadeyes are required. Fig. 80 shows how to attach the shrouds to the upper deadeyes. The wire strops for the lower deadeyes must pass through the floor of the top and provide an eye for the puttock shrouds below. The shrouds are paired, those to starboard going on first. The odd third shroud is simply turned once around the masthead and seized to the paired shrouds on both sides. See Fig. 78. Note also, that the center strand of the lanyard between upper and lower deadeyes is longest. Fig. 76 shows how gammonings on an actual ship may be simulated, the

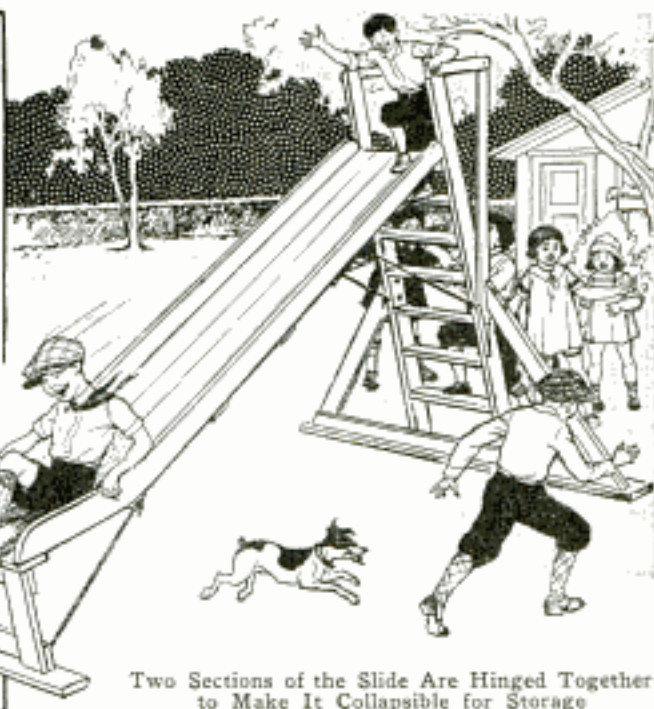
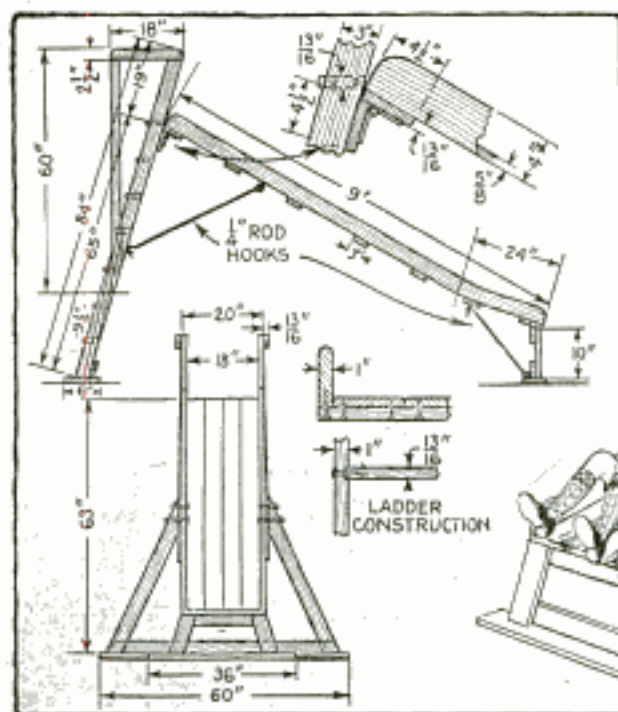


slots through the stem alining with the gammoning lines above. Three wooden cleats are glued to prevent the upper gammoning lines from slipping aft. The bowsprit is glued and doweled to the beakhead grating so that it appears to pass into the hull. The gammoning lines are then wedged into their slots and the whole is glued in position. Be sure not to spring the bowsprit downward by having the gammoning too tight as only a firm, easy strain is required.

UPPER MASTS			
Name of Part or Section	Mainmast Assembly	Foremast Assembly	Mizzen Assembly
Topmast	7 1/2" Long, 3/4" Dia. Bot. 3/4" Dia. Top	4 3/4" Long, 3/4" Dia. Bot. 3/4" Dia. Top	4 3/4" Long, 3/4" Dia. Bot. 3/4" Dia. Top
Toppallant	3 1/2" Long, 3/4" Dia. Bot. 3/4" Dia. Top	3 1/2" Long, 3/4" Dia. Bot. 3/4" Dia. Top	2 3/4" Long, 3/4" Dia. Bot. 3/4" + Top
Royal	1 3/4" Long, 3/4" Dia. Bot. 3/4" Dia. Top	1 3/4" Long, 3/4" Dia. Bot. 3/4" + Dia. Top	Has None
Flagstaff	1 1/4" Long, 3/4" Dia. Full Length	1 1/4" Long, 3/4" + Dia. Full Length	1 1/4" Long, 3/4" + Dia. Full Length
Stern (Ensign) Flagstaff—4" Long, 3/4" Dia. Bot., 3/4" Dia. Top			
Main Topmast		Main Toppallant	Main Royal
Trestletrees	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Cap	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Top	1" Dia. Top, 3/4" Dia. Bot. 3/4" Deep	3/4" Dia. Top, 3/4" Dia. Bot. 3/4" Deep	Has None
Length of Masthead Taper	3/4"	3/4"	3/4"
Fore Topmast		Fore Toppallant	Fore Royal
Trestletrees	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Cap	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Top	3/4" Dia. Top, 3/4" Dia. Bot. 3/4" Deep	3/4" Dia. Top, 3/4" Dia. Bot. 3/4" Deep	Has None
Length of Masthead Taper	3/4"	3/4"	3/4"
Mizzen Topmast		Mizzen Toppallant	
Trestletrees	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	
Size of Cap	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	
Size of Top	3/4" Dia. Top, 3/4" Dia. Bot. 3/4" Deep	Has No Top	
Length of Masthead Taper	3/4"	3/4"	
LOWER MASTS			
Name of Part or Section	Mainmast	Foremast	Mizzen
Over-All Length from Deck Surface	"9 1/4"	"8 3/4"	"7 3/4"
Diameter at Deck	3/4"	3/4"	3/4"
Diameter under Trestletrees	3/4"	3/4"	3/4"
Square at Cap	3/4"	3/4"	3/4"
Size of Cap	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Trestletrees (Cross-trees are same)	1 1/2" Long, 3/4" Wide, 3/4" Thick	1 1/2" Long, 3/4" Wide, 3/4" Thick	3/4" Long, 3/4" Wide, 3/4" Thick
Size of Top	2 1/4" Dia. Top, 1 1/2" Dia. Bot. 3/4" Deep	1 1/2" Dia. Top, 1 1/4" Dia. Bot. 3/4" Deep	3/4" Dia. Top, 3/4" Dia. Bot. 3/4" Deep
Length of Masthead Taper (to Bottom of Trestletrees)	1"	3/4"	3/4"

* To this length must be added length of mast that goes into mast hole

Playground Slide Keeps Children at Home

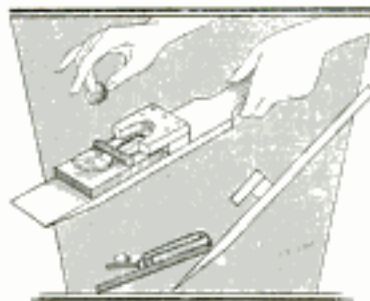


Two Sections of the Slide Are Hinged Together to Make It Collapsible for Storage

Set up in the backyard, this slide will enable your children to entertain themselves and their friends at home. The slide consists of two sections, hinged together, and should be made of quarter-sawed oak, which is less likely to splinter than plain sawed woods. Maple or birch may be used, but all open-grain woods should be avoided. Also the grain of the boards used in the chute part should point downward to avoid any possibility of injury from splinters. The chute, handrails and all other parts, with which the children are likely to come in contact, should be well sanded and given at least two coats of spar varnish every year to protect the wood.

Safety Device for Setting Rat Traps

This simple device will keep a rat trap from being accidentally sprung or catching your fingers while setting it. It may be made from three pieces of lath nailed together as shown. In use, the trap is opened and placed on the board with the snap held be-



neath the projecting fork. This leaves the trigger mechanism free so that the trap can be set.

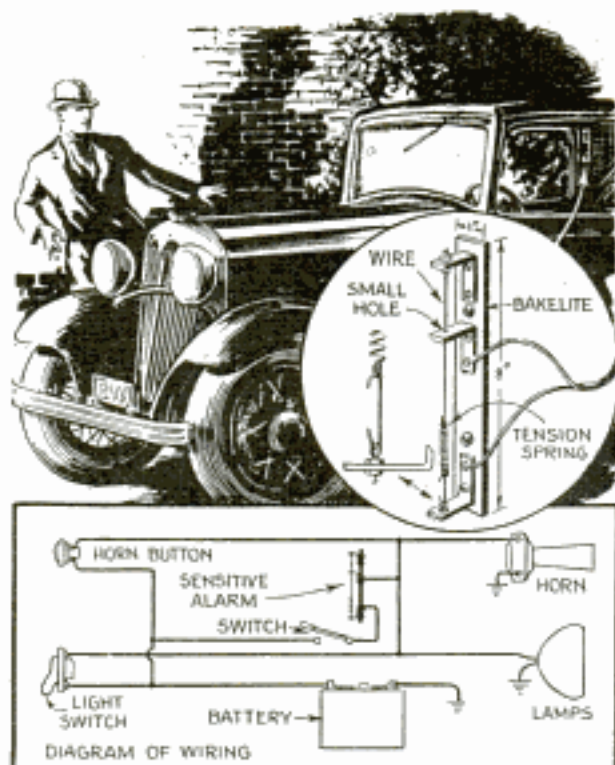
Soldering-Iron Holder from Piston

A soldering-iron holder and a flux container can be made by cutting an old piston in two through the center of the wristpin hole. The shank of the iron is laid in the remaining portion of the wristpin holes as shown, and in this position it is not easily knocked off the holder.



Waterproofing Solution for Boots

You can waterproof boots without injury to the leather by applying several coats of a solution consisting of turpentine, neat's-foot oil and vulcanizing rubber. Rub each application well into the leather with a cloth, allowing about 36 hours between coats. The solution is made by cutting the rubber into small pieces, which are left in a jar of turpentine until dissolved. About 2 in. of dissolved rubber in the bottom of the container will do. To this solution add 4 oz. of the oil.



Vibration of Tight Wire in This Alarm Causes Horn to Blow and Headlights to Flicker

Sensitive Burglar Alarm for Your Car

Mounted inside a car near the top, this sensitive alarm will cause the lights to flicker and the horn to blow at the slightest movement of the car body. Three metal brackets are mounted on a piece of bakelite, one at each end and the third near the center. The two end brackets support a small wire that runs through a hole in the third bracket. A tension spring holds the wire tight and the slightest movement causes it to vibrate against the sides of the hole in the center bracket,

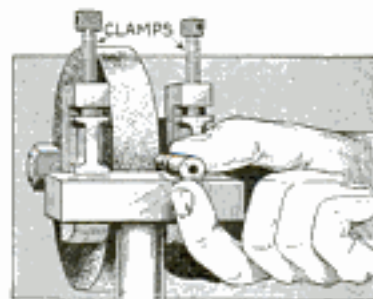
which closes the electrical circuit. The lower and center brackets are wired in the horn and headlight circuits, as shown in the lower detail. A switch should be provided to cut out the alarm when not in use.

Film-Pack Holder Altered for Smaller Films

You can reduce the cost of photographic films by adapting the film-pack holder of your camera to take a smaller pack. Make a small wooden frame, the outside of which should be the exact size of the smaller pack that is to be used. Stain the frame black and glue some thin black felt to the inside so that the pack will fit snugly to keep out light. The top of the frame should, of course, be slightly thinner than the other sides.

C-Clamps Used as Grinder Guards

Clamped to the work rest on each side of an emery wheel, two C-clamps make good guards to keep the work from slipping off the edge of the face, when grinding small pieces such as pins and screws. The guards permit the entire surface of the wheel to be used, as shown, and help to prevent the center from being grooved.





Craftmats and Blueprints on

"SOVEREIGN OF THE SEAS"

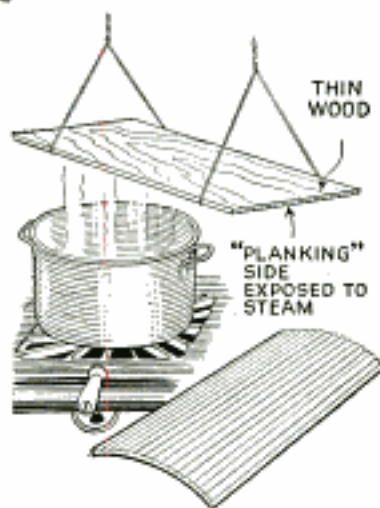
A Craftmat of the stern and lower-hull carvings will be sent upon receipt of 50 cents. Craftmat No. 2, of the carvings to go on sides of upper works, 35 cents. Seven blueprints on the "Sovereign" are available for \$1.25. A free list of 380 practical projects will be sent upon request. Also, a sample print with forty illustrations of finished projects available for 10 cents. Address Blueprint Department.

Caring for Ink Rollers

Press operators will find that after cleaning rollers with gasoline or benzine, it is a good idea to wash them with soap and warm water, which removes the glazed coating formed by the gasoline. This procedure is highly recommended when changing from a dark to a lighter ink. To prevent rollers from becoming flat-surfaced or dust-eaten, store them in a cabinet, which is easily made from the shipping case in which they come.—T. R. Rice, Walla Walla, Wash.

Curving Shipmodel Decks with Steam

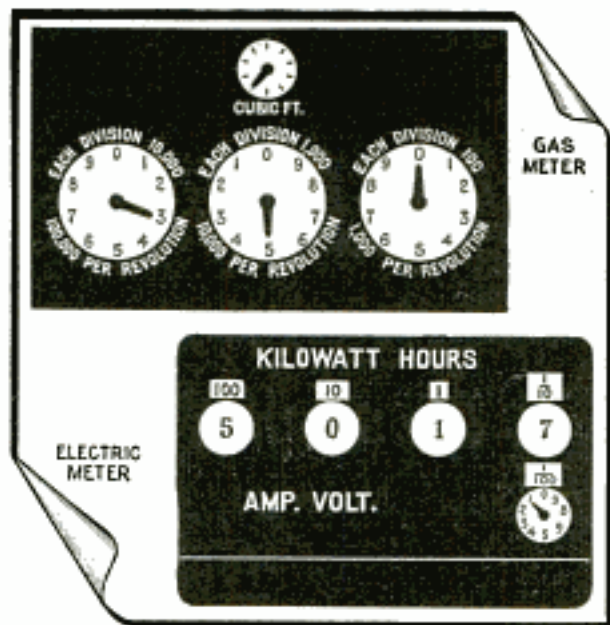
Slightly curved decks, made by steaming a thin board, give shipmodels a realistic effect. First groove or score a thin deck piece to represent planking, which can be done with a V-chisel or sharp-pointed nail. Then suspend the piece, planking side down, above a kettle of boiling water. The rising steam will cause the edges of the piece to warp upward and produce a curve. After the desired shape



has been obtained, remove the work and allow it to dry for about 5 minutes, after which it is glued in place. The raised fibers caused by steaming can be smoothed down with fine sandpaper after the glue has dried.

Reading Gas and Electric Meters

Gas and electric meters are easily read once they are understood. The dials on a gas meter, shown in the upper detail, are pointing at the figures 3, 5 and zero, registering 35,000. Supposing the last reading on your gas bill was 30,500, the difference represents the gas consumption for the month, or 4,500 cu. ft. One revolution of the small dial at the top indicates that 1 cu. ft. of gas has passed through the meter. With this dial you can determine



You Can Easily Learn to Read Gas and Electric Meters to Determine the Amount of Consumption

the amount of gas used by a given appliance, or if a leak is suspected, it can be verified by watching the dial. An electric meter is also easy to read, the consumption being given in actual figures. This is read on the three dials to the left, the others being used for test purposes only. In the lower detail the meter is registering 501 kilowatt-hours. If the last reading on your bill was 404 kilowatt-hours, you will find the amount of electricity consumed, 97 kilowatt-hours, by subtraction.

Notched Box Covers Poisoned Rat Food

To prevent chickens and animals from eating poisoned food prepared for rats and mice, the poisoned-food container can be covered with a wooden box, of which the edges have been notched as illustrated. The notches should be cut in all four sides of the box so that the rodents will have easy access to the bait. If the poison is mixed as a fluid or it is anchored so it cannot be carried away from under the box, there will be little danger to other animals in the place.



PICTURE PUZZLES

By FLOYD M. MIX

You Can Buy Colored Prints for Picture Puzzles



Use Short-Bristle Brush to Spread Thin Film of Casein Glue Evenly on $\frac{1}{8}$ -In. Three-Ply Basswood Panel



Apply Print to Glue-Covered Plywood, Tamp and Rub with Clean Cloth from the Center toward the Sides Until the Entire Surface Is Perfectly Flat



Powdered Casein Glue Is Mixed in Cold Water, According to Instructions on the Package, Being Careful to Eliminate All Lumps, Which Might Set under the Print and Cause Blisters; Spread Out the Glue in a Thin Even Film with Strong Even Strokes of the Brush and Make Sure That Every Spot Is Covered without Allowing the Glue to Run Over the Edges; in Five Minutes, When the Glue Has Become Tacky or Semi-dry, the Print Is Applied Immediately after Using the Brush; It Should Be Cleaned of All Traces of Glue, Which Is Done by Washing Thoroughly in a Strong Solution of Ordinary Washing Powder and Water, After Which It Is Rinsed with Clean Water

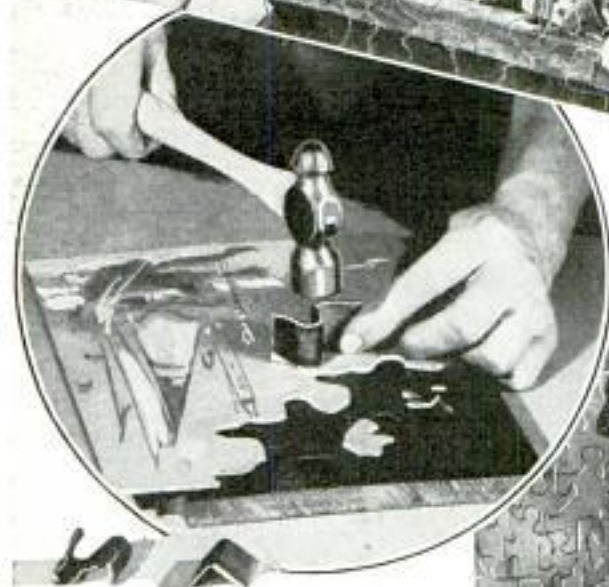
Novel and Personal Touches Can Be Added to Picture Puzzles by Cutting Out Appropriate Lettering and Designs; to Do This, First Apply the Picture to the Plywood with Casein Glue, as Shown in the Photos Above, and Then Attach Strips of Plain Paper That Carry the Designs with Rubber Cement, Which Will Enable Removal of the Paper Pieces after Sawing Out the Puzzle, as Shown in the Circular Detail



To Hold a Design on the Picture Temporarily, Apply Rubber Cement Sparingly to Both Contacting Surfaces, Spread It Evenly, Allow the Cement to Dry for a Minute or So, and Then Press the Coated Surfaces Together

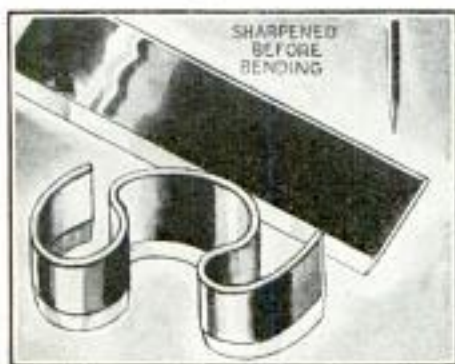
for FUN and PROFIT

Photos of Your Friends or Yourself, at Work or Play,
May Be Substituted for Colored Prints
on the Picture Puzzles

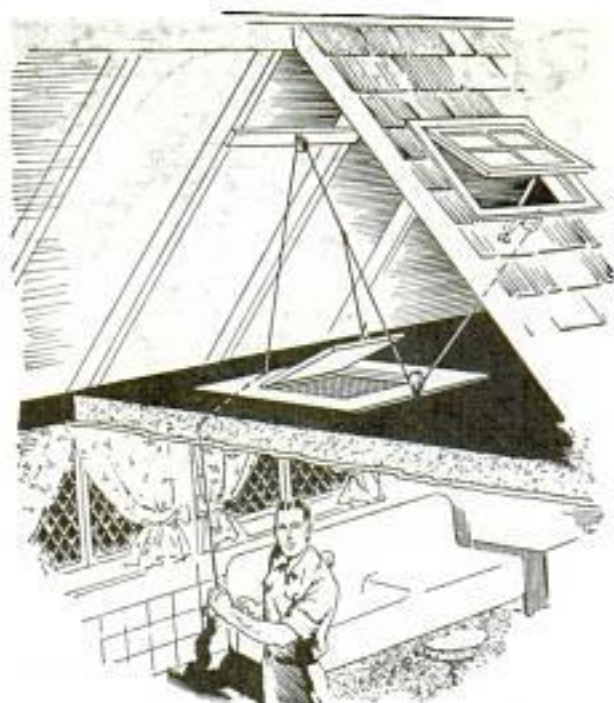


A High-Speed Motor-Driven Scroll saw, Fitted with a Special Fine-Tooth Blade That Gives Ample Clearance, Enables You to Cut Out the Puzzles Easily, Leaving Smooth Edges without Tearing the Paper

Here Is a Simple Method of Hand-Punching Picture Puzzles Out of Cardboard Instead of Plywood, for Those Who Have No Scroll saw; Glue the Picture to the Cardboard and Drive a Metal Strip, Well-Sharpened and Bent as Shown Below, through the Work, Using a Hammer and a Hardwood Block; or Better Still, Use a Large Vise, as the Pressure Can Be Applied Slowly and Evenly to Make a Clean Cut



Interlocking Plywood Puzzles, Which, When Assembled, Can Readily Be Picked Up from the Table, Are Made by First Sawing Out Strips across the Length and Then across the Width, Keeping the Assembly Together While Sawing; the Detail Above Shows the Method Followed in Making the Cuts So That Each Piece Interlocks with the Adjacent Ones on Three or Four Sides



Skylight in Roof and Trapdoor in Ceiling, Opened by Rope, Quickly Ventilate Attic

Simple Method of Ventilating Attic from Kitchen

By installing a skylight in the roof and a grill-covered trapdoor in the ceiling, you can provide a simple means of ventilating your attic. The drawing illustrates how this can be done by opening the skylight and trapdoor from your kitchen simultaneously by means of a rope and pulleys. In this way, a draft is created which quickly changes the air in the attic. This is especially handy in summer to help cool the rooms below.—E. Raymond, New Bedford, Mass.

Phonograph Spring Clamps Ash Tray to Chair Arm



Ash trays can be fastened to chair arms by using a piece of a phonograph spring. The center of the spring is annealed and drilled for a paper clip or a rivet with which the tray is attached,

and the ends are bent slightly outward so they will not tear the chair covering. The clamp will grip the arm so that the tray cannot be accidentally knocked off.

Cure for Noisy Water Pipes

Noise in water pipes is sometimes caused by fluctuating pressure in the city mains, and has but one local cure. Remove a section of pipe, about 2 ft. long. Thread the two ends of the remaining pipe and attach hose couplings to them. Then take a length of high-grade garden hose of the proper size and substitute it for the pipe removed by attaching it to the couplings. This will eliminate the water hammer and will last for several years.

Ruling Pen Used to Stripe Car

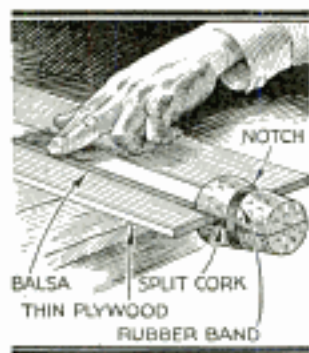
A pen type of drawing compass can be used effectively for striping the body of a car. Solder a small buckshot to the point that is usually used as the center. To do this, bend the point so that the tip faces the opposite leg of the pen. Lay a piece of wet blotting paper on the pen leg, hold the buckshot in place on the paper and press the point into the lead. Then, holding the lead against the blotting paper so the shot cannot slip off, solder the point to the shot by running the solder down the steel point. The wet blotting paper keeps the shot from melting. When using the pen, the hinge should be tightened as much as possible. As the straightness of the stripe depends on the straightness of the molding, which is used as a guide, be sure no bumps of rust or paint are in the way. Lacquer can be used for striping, but it softens the undercoats and cannot be readily wiped off if a mistake is made, and for this reason, it is best to use a fast-drying enamel of the desired color.



Rubber Cement for Wallpaper

When wallpaper has a tendency of constantly coming loose near radiators or on wall space over a chimney, the paper can be made to stick by fastening it with rubber cement. The cement is diluted with benzine until its consistency is quite thin and it is then spread over the wall and the surface of the paper without using much care if it laps over. After applying the cement allow it to dry until tacky, and then press the paper firmly on the wall. When dry, the cement that may have run outside the edges can be removed by rubbing it with a cloth.—B. L. Gilbert, Chicago.

Balsa Clamp Made from a Cork



A clamp that will hold thin strips of balsa against a stiff back, for sanding and trimming, is quickly made from a cork. It is split in half and notched to take a heavy rubber band with

which it is attached to the work. The cork is soft and will not mar the surface of the wood.

Making a Temporary Dark Room

If photographic developing and finishing must be done in a room that cannot be permanently darkened, fit the windows with extra screen frames covered on both sides with heavy building paper. The frames should fit snugly and the paper on the outer side should overlap the window casing.

Anti-Skids for the Iron Holder

To keep a metal stand for an electric iron from slipping off the ironing board, insert small corks in the holes found in the bottom of holders of this type. The friction between the board and the corks keeps the stand from sliding.



Lengths of Garden Hose Slipped over Swing Rope Protect Child's Hands

Hose on Swing Protects Hands

Slipped over the rope of a swing as shown, two lengths of garden hose will protect a child's hands from chafing. The hose should be long enough to extend 2 or 3 ft. above the swing seat.—Altamont Cole, Centerdale, R. I.

Half Flowerpots Beautify Walls

Bare walls and unsightly corners can be beautified by growing flowers in half flowerpots, which are wired to a board and hung in position as shown. The pots are sawed in half with an ordinary handsaw, beginning the cut at the bottom to prevent chipping. Old stumps and other objects may be made into gardens by hanging around them several such pots with flowers.



Keeping Chamois Skins Pliable

After using chamois skins for washing windows and automobiles they should be rinsed and left in a bucket of clear water. By this treatment the skins will last longer and always be soft. If the skins are not used frequently, put fresh water on them occasionally.

B 3240 Electronic Laboratory Inc.
122 W. New York St
Indianapolis, Ind



B-BATTERY ELIMINATOR

UNLIKE the ordinary B-eliminator, that operates from a 110-volt a.c. house-lighting line, the eliminator for an auto receiver must depend on the 6-volt car battery for its supply. This means that some method is necessary for changing the d.c. storage-battery current into something approaching alternating current, which can be stepped up to high voltage. Once this a.c. current is made available, the eliminator design is quite simple. Tests during the past few months have shown that some of the B-battery eliminators, designed for use in cars, add noises to those already present in the ig-

nitiation system, while others are very quiet and satisfactory.

In this article is described a B-eliminator designed for those who wish to assemble their own unit at minimum cost. The special relays, vibrator and other parts form the compact unit shown in Fig. 1. This metal container is $7\frac{3}{8}$ in. long, 6 in. deep and $2\frac{5}{8}$ in. high. Shielded in this manner, r.f. interference is avoided, and the various parts are well protected.

Figure 2 gives the simplified layout and wiring diagram and shows the parts in their relative positions within the container. The automatic relay operates when the auto receiver is turned on. The 6-volt battery current is fed to the vibrator, and its pulsating-current output goes to the primary of the power transformer. The high voltage a.c. current from this transformer is then used and rectified, by the rectifier tube, in the same manner as the usual B-eliminator or a.c. power unit. This small rectifier tube changes the current into d.c., which



Fig. 1

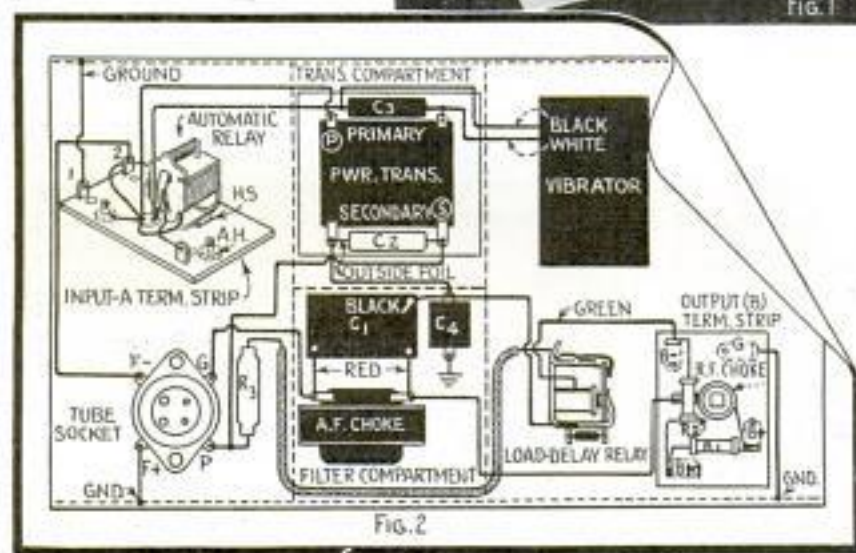


Fig. 2



for Your Auto Receiver



passes through the output filter and choke assembly.

An automatic load-delay relay gives full protection to the rectifier tube and the vibrator, or "interrupter." Its purpose is to place across the transformer a dummy load, similar to that of a radio receiver, until the set tubes have reached their normal temperature and have placed the actual load on the unit. When this takes place, the relay, which is in series with the output, opens and removes the dummy load from the transformer.

The filter condenser unit, C_1 , is an electrolytic type consisting of two 8-mfd. sections; C_2 a .02-mfd. buffer condenser; C_3 , a 5-mfd. by-pass condenser, and C_4 a 10-mfd. by-pass condenser. The voltage-divider resistors, R_1 and R_2 , are 20,000 and 75,000 ohms respectively. This eliminator will produce 35 milliamp. at 180 volts from a 6-volt storage battery with a drain of approximately only 2 amp. Recent developments in small full-wave mercury-vapor

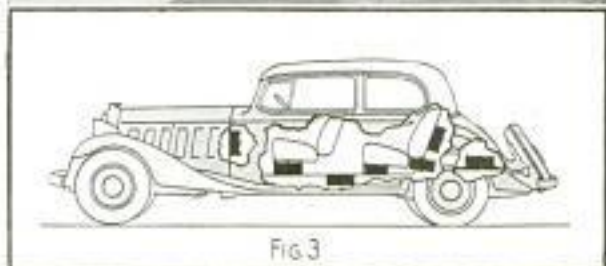
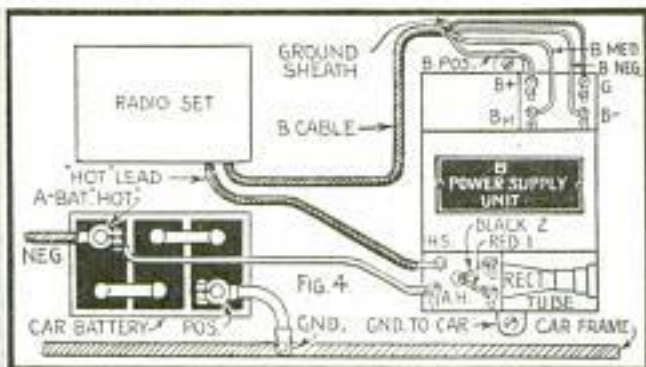


FIG 3

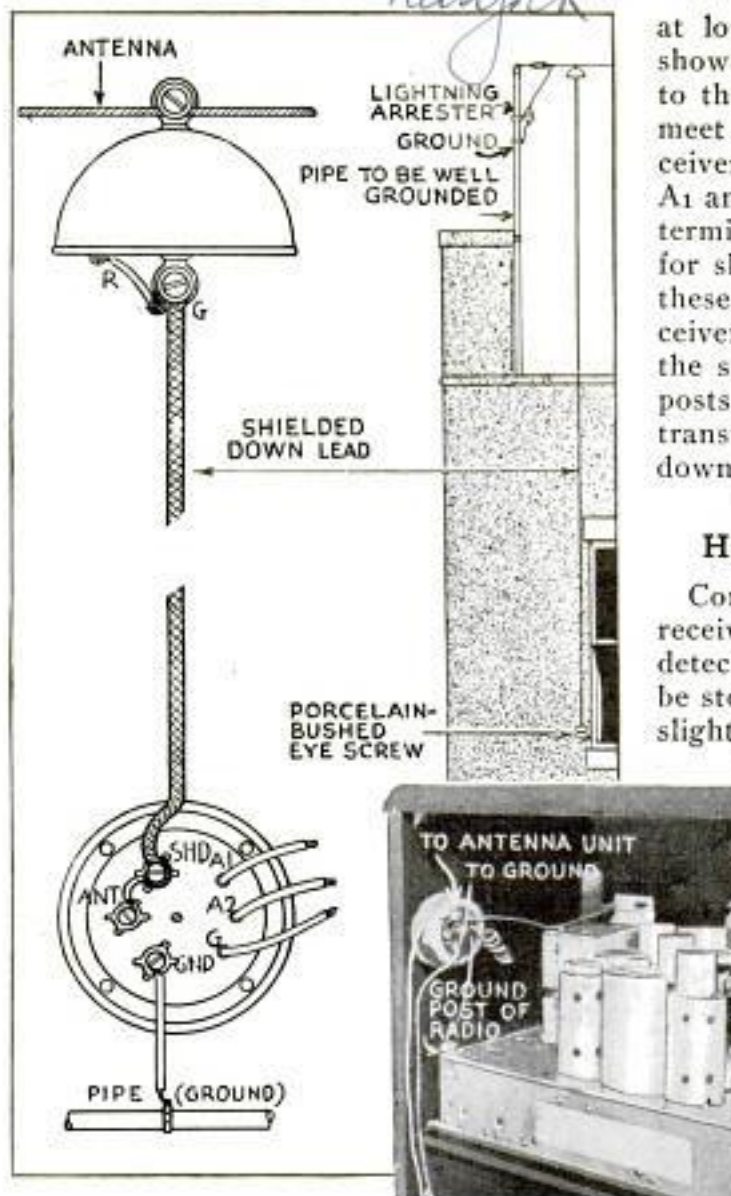
rectifier tubes make possible even greater efficiency in this type of auto-radio B-eliminator with very little change in the wiring.

As for the installation of the eliminator, it may be placed in any of the small spaces indicated in Fig. 3. The connections from the eliminator to the receiver and car battery are shown in Fig. 4. Some makes of cars have the negative side of the battery connected to ground on the frame, while

(Continued to page 116A)



c4504 Amy. Aceres - King
11 W. 42nd St
New York



Filtered Antenna for One or More Receivers

A noise-reducing antenna system is easily installed and enables the owner of an apartment building to serve as many as four tenants from a single antenna. The parts necessary for the single-set installation, shown in the sketch and photo, consist of the antenna transformer, shown above, and the set transformer, below, together with a shielded down lead. No tools other than an ordinary screwdriver are required. The dome-shaped metal casting contains the antenna down-lead impedance-matching unit. The connections R and G are for the receiver down lead and its grounded metal sheath. The set transformer is fastened by a single screw to the inside of the radio cabinet, as shown

at lower right. The sketch at the left shows the connections. Terminal G goes to the receiver ground post. In order to meet the antenna requirements of all receivers, it is necessary to try both leads, A₁ and A₂, on the set antenna post to determine the best position. Lead A₂ is best for short-wave receivers. Three more of these set transformers, to serve other receivers, may be connected by continuing the same type of down-lead cable to the posts marked SHD and ANT on each transformer. Or, if preferred, separate down leads may be run direct.

Hint for Battery-Receiver Owners

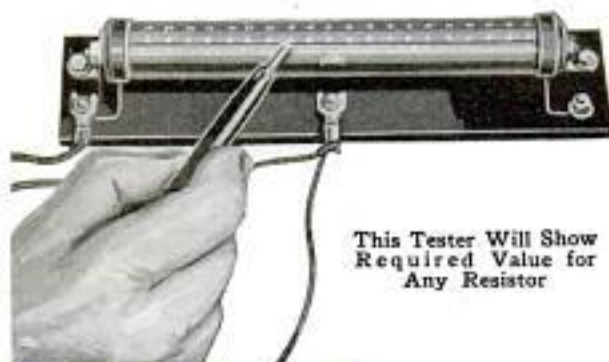
Continuous squeals in battery-operated receivers are often noticed when a new detector tube is inserted. This squeal may be stopped if the detector-plate voltage is slightly reduced. If 67½ volts are specified, start with 45 volts for a test, and readjust the detector for best volume on a distant station. Individual tubes vary as to the amount of B-battery required for clearest reception and best distance. This readjustment of plate voltage may also be applied to the r.f. amplifier stages.

C 4513

Vest-Pocket Resistance Indicator

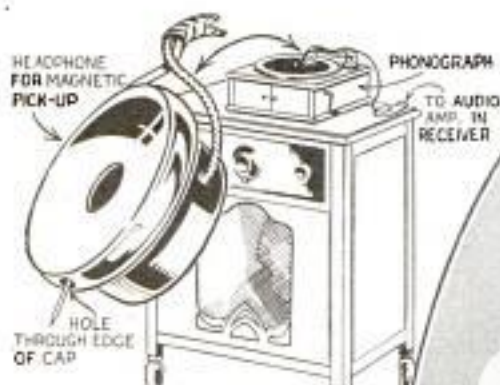
This calibrated resistance indicator enables the experimenter to determine quickly the necessary value of resistance required for any purpose in the circuit. It may also be used as a temporary voltage divider for tapping off fixed voltages from a power supply. When necessary to replace a defective or burned-out resistor, the indicator will immediately

(Continued to page 118A)

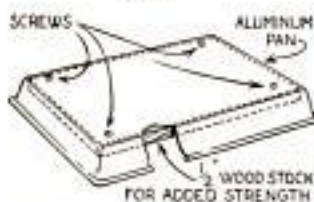


International
Resistance Copy 2006 material
Chestnut, Phila

Practical Radio Suggestions



Phonograph Needle Soldered to Edge of Metal Diaphragm in Old Headphone to Reproduce Phonograph Records through Audio Amplifier; Rubber Bands Hold Pick-Up to Arm



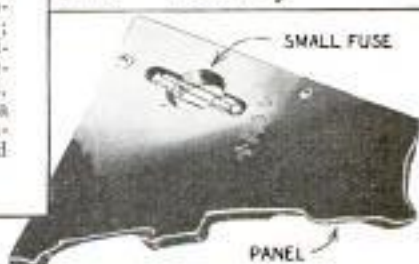
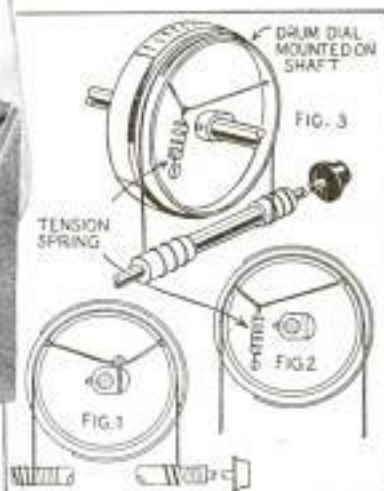
Cabinet for Storing Extra Plug-In Coils Used with Short-Wave Receiver; the Two Halves Fit Together Forming a Compact Unit; Left, Wood Support under Aluminum Pan for Power-Unit Base; Below, Old Dial, with Knob Removed, Is Fastened to Panel, Providing a Tuning Scale for Midget Condensers That Employ a Knob and Pointer on Small Shaft



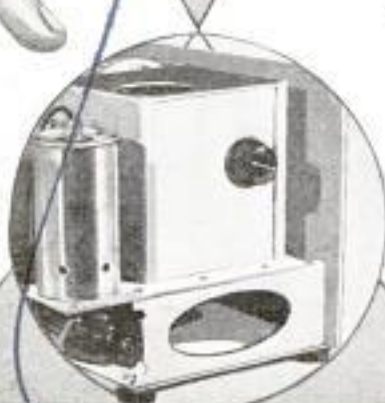
Notched Screwdriver Is Useful for Looping Wires around Small Setscrews That Are Often Located in Difficult Positions under Receiver Chassis and in Shielded Radio Stages



Above, Piano Hinge Handy for Constructing Metal Receiver Cabinets; When Adjusting Screw in Fig. 1, Below, Will No Longer Take Up Slack in Drum-Dial Cable, a Hole May Be Drilled near Outer Edge of Drum to Mount a Tension Spring, as Shown in Figs. 2 and 3



Above, Protective Fuse in B-Positive Lead Is Easily Replaced if Mounted behind Cut-Out in Bakelite Front Panel of Receiver or Test Set; Left, a Metal Panel Is Placed below the Aluminum End Brackets in This Experimental Short-Wave Receiver for Added Shielding and to Protect Under-chassis Wiring; Sub-Panel Brackets Are 2 1/2 In. High; Rubber Feet under Corners Protect Table





Celluloid Shield behind Control Knobs Protects Panel from Fingernail Scratches

Protecting Radio Panels

Polished-wood radio panels soon show scratches and scars around the various control knobs. This may be prevented by mounting a sheet of transparent celluloid under them as shown in the photo. The knobs are removed and a piece of paper, pressed over the projecting shafts, will provide a template for cutting the holes in the shield. The edges are trimmed to suitable shape, after which the shield is mounted and the knobs replaced.

Tuning A.C. Short-Wave Receivers

Fluctuating line voltage often prevents the owner of a short-wave receiver, or converter, from tuning in and holding faint signals from foreign stations. If a regenerative detector is employed, it is usually pushed to the limit and at this point it will spill over and go into oscillation unless a steady voltage supply is maintained. Line-voltage fluctuations can be avoided by the use of a self-adjusting line control, or amperite, inserted in one lead of the power cord to the set. This regulates the voltage to the transformer.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge upon receipt of return postage.

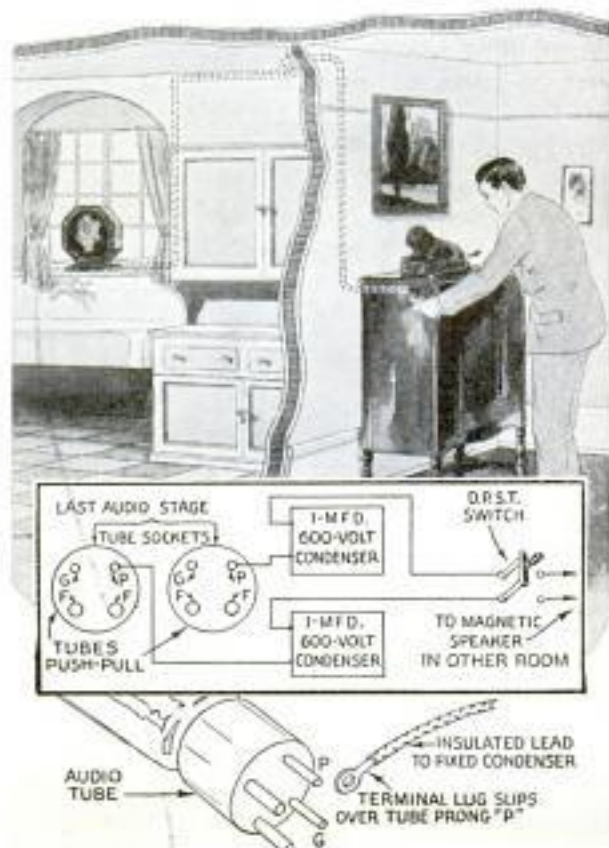
Pepping Up Old Battery-Set Tubes

Tubes of the 201A type, that have been in service for some time, may be rejuvenated by a simple method that does not require the use of a booster. All that is necessary is a standard four-prong tube socket and a 22½-volt B-battery. This battery is connected to the filament posts of the socket, and the tube is inserted and left for 45 seconds. It is then removed and placed in the receiver from which the regular B-batteries have been disconnected. The receiver filament rheostat is then turned full on for 10 minutes without the plate voltage. Tubes boosted in this manner will often give good service for several months.

Adding a Remote Speaker

A magnetic speaker, for use in an adjoining room, may be easily added to your receiver without disturbing the set wiring. The extra speaker may be turned on or off, or operated in conjunction with the set speaker as desired. Lampcord may be used to connect the distant speaker to a

(Continued to page 120A)



Top, Remote Speaker Connected to Receiver in Adjoining Room; Below, Hookup Diagram for the Average Broadcast Set

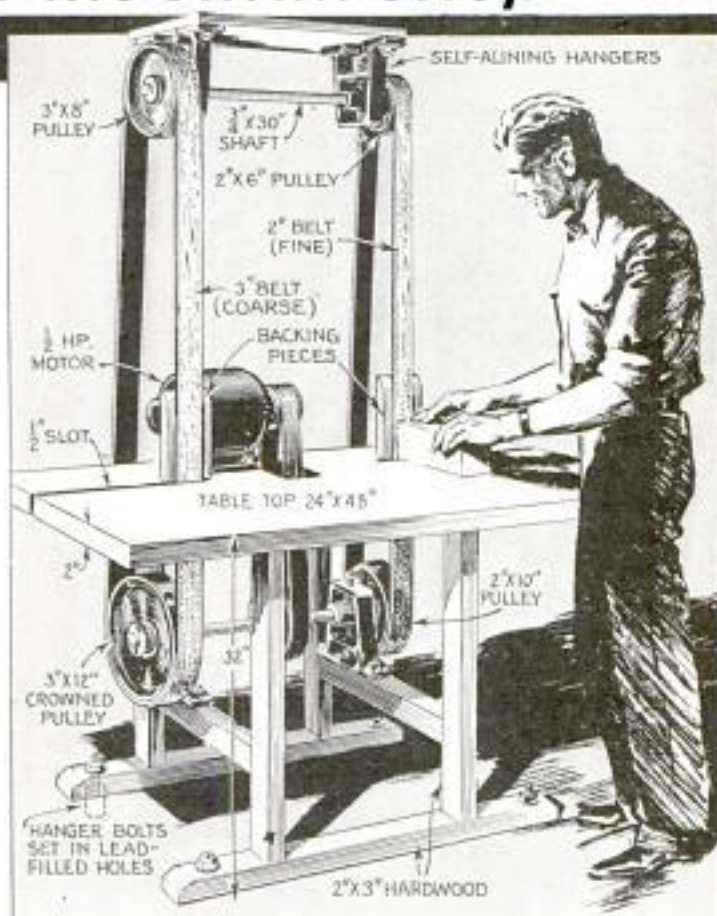


Motor-Driven

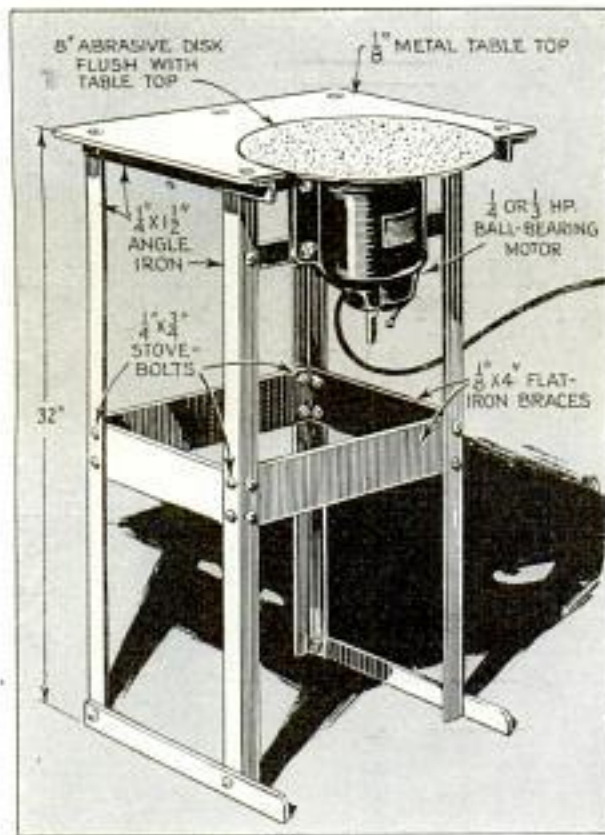
SANDING MACHINES for the Small Shop

THIS sanding machine, assembled from self-aligning shaft hangers, two 30-in. lengths of $\frac{3}{4}$ -in. steel shafting, four iron pulleys and a hardwood table, is easily set up in the basement workshop. It has two abrasive belts, one fine and one coarse, and can be used for innumerable finishing operations on curved, angular or flat work. The high speed of the belts leaves a smooth finish with the grain, and most important of all, sharp, clean edges and corners on square or rectangular work. By fitting metal inserts in the table to provide accurate surface plates and using special abrasive belts, the machine may be used for various lapping and fine grinding operations on metal.

In making the machine it is best to have the belts at hand so that the pulleys can be properly placed and aligned. Belts of any size can be obtained from manufacturers of abrasives and similar materials. As can be seen from the illustration, the machine is set up in the basement or in any room where the ceiling is sufficiently rigid to carry the upper pulley assembly, which is bolted directly to the joists. The work table is made up of hardwood, slotted to take the belts and permit their removal. The legs are carefully anchored to the floor so that the pulleys aline properly. The adjustable hangers provide a means of tensioning and tracking the belts. The motor is mounted



on the table top between the belts and it drives the lower-shaft assembly with a 2-in. flat leather belt. The speed of the lower shaft should not exceed 1,000 r.p.m. Dimensions of the machine can be altered to suit the location, and the belt or pulley sizes, too, are variable. Also, the backing pieces of hardwood can be made with either a convex, concave, or flat surface to adapt them to work of any form, as the belt will conform to any of these surfaces when the work is pressed against it. Only light pressure is used in sanding as the



high speed of the belts causes the abrasive to cut very fast. A $\frac{1}{2}$ -hp. motor is suitable for lighter work but for continuous operation on heavier work either a $\frac{3}{4}$ or 1-hp. motor should be used. If a motor of either of the latter sizes is used, special wiring is necessary as it is not safe to throw such a heavy load directly on the house-lighting circuit.

Now for the sanding disk: You will need a $\frac{1}{4}$ or $\frac{1}{3}$ -hp. ball-bearing motor, an 8-in. sanding disk, a few pieces of flat iron and angle iron besides a metal plate 16 or 18 in. square. Due to the horizontal position of the disk, the machine is adapted to a greater variety of operations than the ordinary type having a vertical grinding surface. Various guides and fences for special work are easily attached to the metal table. In addition to surfacing work on small parts of either metal or wood, the machine is particularly useful in sharpening edge tools. With a sheet of fine emery cloth glued to the disk it is possible to produce an edge on plane irons, chisels and similar tools obtainable in no other way. The blade may be held at the correct bevel and the edge is then automatically ground square across, a necessity if the tool is to work properly. The base is

made of angle iron with flat-iron braces to make it sufficiently rigid. The table is cut out to receive about one-half of the disk, and the table is bolted to the angle-iron frame with flat-head cap screws.

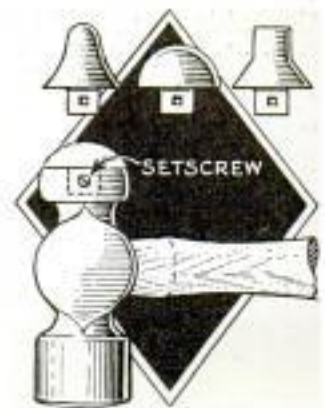
When mounting the motor, see that the surface of the disk is flush with the top of the table. This may be done accurately by clamping a straightedge to the table top. The added thickness of the abrasive disk brings the grinding surface above the table sufficiently to engage the work. Grinding is always done between the center and the edge of the disk. Work to be surfaced should never cover more than half of the disk as the cutting action in two directions will leave scratches. The grinding pressure should always be light to avoid scratching and burning.

Cutting Drill Rod and Tool Steel with Hacksaw

A saving in time and blades will result if you use a cutting oil when sawing tool steel or drill rod with a hand hacksaw. The blade should be drawn its full length across the material being cut. With proper handling of the saw, one blade should cut 12 to 15 pieces of 1-in. drill rod.—Emery F. Bull, Chicago.

Interchangeable Heads for Hammer

Machinists can increase the usefulness of their hammers by altering them for interchangeable heads. The peen of the hammer is flattened and then drilled and fitted with a setscrew, to take the various heads. The shanks of the heads are also drilled to take the setscrew, as shown.—G. H. Hill, Willimasset, Mass.



By magnetizing the top of a bottle capper with an old Ford magneto magnet, it can be made to hold tin caps in place while capping; only the steel type of capper can be used in this way.

Counterweighted Sash Improves the Hotbed

Paul S. Davis of Bath, Ohio, found that the lifting of his hotbed sash involved considerable work, so he devised a counterweight system that enables him to raise the sash with very little effort. At the back, he erected two uprights, made by nailing two 5½-in. by 12-ft. boards to



Hotbed Sash Is More Easily Handled by Using Counterweights That Slide in U-Shaped Posts Centered behind the Beds

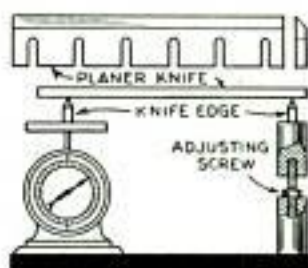


the edges of 2-by-4-in. pieces, so that a hollow post, with one side open, was formed. These were braced as shown, with

the uprights centered behind the sash. Near the tops he mounted window-sash pulleys through which a rope was passed, fastening one end of the rope to the front edge of the frame and the other to a sash weight, so that the latter could move up and down in the post channel. Two additional pulleys are fastened halfway down the front of the post to keep the ropes out of the way, but these could be omitted. Friction of pulleys and hinges was found to be sufficient to take care of any differences in weight of the moving parts, and to hold the sash in any desired position.

Balancing Planer Knives

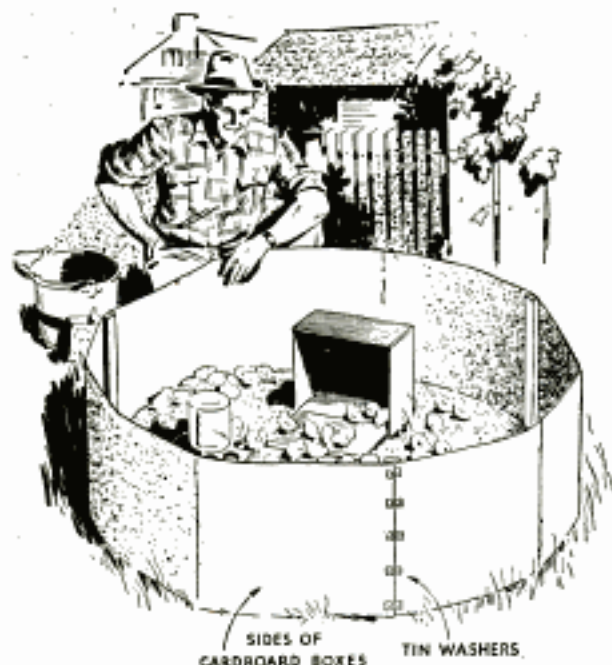
Wood-planer knives should be balanced to prevent vibration at high speeds. This can be done on a sensitive scale as shown in the drawing. A knife-edge is placed on the scale and another is set on the bench near the scale. The planer knife is then placed on the edges and each end



is weighed. If one end weighs more than the other, some of the metal can be ground away until both ends balance.

Preventing Bubbles When Painting Damp Surfaces

When it is necessary to paint a damp surface, the formation of bubbles or blisters can usually be prevented on the work by mixing water, 1 tablespoonful, to each gallon of paint. Treated in this manner, the paint will flow on the surface evenly.



Baby Chicks Kept Safely in Portable Pen Made from Old Cardboard Boxes

Portable Cardboard Pen for Chicks

A portable pen for chicks can be made from three or four cardboard boxes. The one shown is made from three large boxes and can house 150 chicks. The tops and bottoms of the boxes are cut away and one corner is split down, after which they are fastened together by nailing the ends to 1 by 2-in. boards, using tin washers under the nails to keep them from pulling through the cardboard.—W. C. Wilhite, Hornsby, Ill.

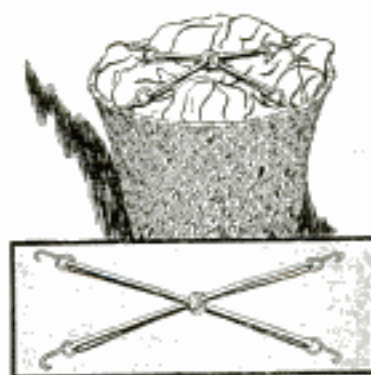
Jig for Bending Copper Tubing

Copper tubing may be bent without collapsing by using a hardwood jig. A piece of wood of a thickness equal to the outside diameter of the tubing is turned to a diameter corresponding to the desired bend, and then mounted centrally on a square base upon which diagonals have been drawn. Bolts should be used for mounting. A block of wood, several inches wide and of a thickness equal to the diameter of the tubing, is squared at one end and screwed or bolted to the base with the square end even with one of the diagonals. The block should be spaced just far enough from the wood disk to allow the tubing to pass between them. A $\frac{3}{8}$ -in. hole is next drilled through the center of the disk and the base. One end of a $\frac{3}{4}$ -in. strip of wood, about 2 in. wide, is bolted loosely in

the center hole. On the underside of this moving arm, and at a distance from the disk equal to the diameter of the tubing, is screwed a strip of wood of the same width and of a thickness equal to the diameter of the tubing. To use the jig, turn the arm against the block and insert the tubing, moving the arm around the circle to make the bend. Complete U-bends, small angles and spiral coils may be made from thin-walled tubing. To make spirals, bend a complete circle of tubing, spring it upward slightly and move the tubing forward in the jig the distance required to make the next coil.

Elastic Binder Prevents Dropping Contents of Waste Basket

To keep the contents of waste baskets from being dropped when gathering them from the offices, one janitor made a number of detachable binders, one of which is attached to each basket as it is picked up. Four rubber bands, cut from inner tubes, were knotted together as indicated, and wire hooks were attached to the free ends so that they could be fastened across the top of the baskets.—G. E. Hendrickson, Argyle, Wis.



Cotter Key Keeps Oilcan Spout from Clogging

A small cotter key, or a piece of light wire bent to the proper shape and inserted into the end of an oilcan spout, will keep it from becoming clogged by dirt or heavy grease. This arrangement does not interfere with the flow of oil and is useful in garages where it is often necessary to push an oilcan spout into a grease-clogged oil hole.



Copperplating with a Paintbrush

Large and irregular-shaped objects that are difficult to electroplate or dip plate, may be given a thin, adherent coat of copper by first painting the cleaned surface with a solution of lye, 1 lb., dissolved in 1 gal. of water. Immediately after painting the surface with the lye solution, go over it with another brush that has been dipped in a saturated copper-sulphate solution made by placing copper-sulphate crystals in a jar of water until no more will dissolve. Different brushes must be used in the two solutions, and they should be thoroughly washed in running water after use to prevent deterioration. Battery jars or stoneware crocks are the best containers for the solutions, which may be preserved in bottles for future use. In plating by this process, only go over the surface once with the copper-sulphate solution, and avoid brush laps as much as possible. The work may be cleaned by washing it with gasoline or carbon tetrachloride, and corrosion may be removed with steel wool or emery paper.

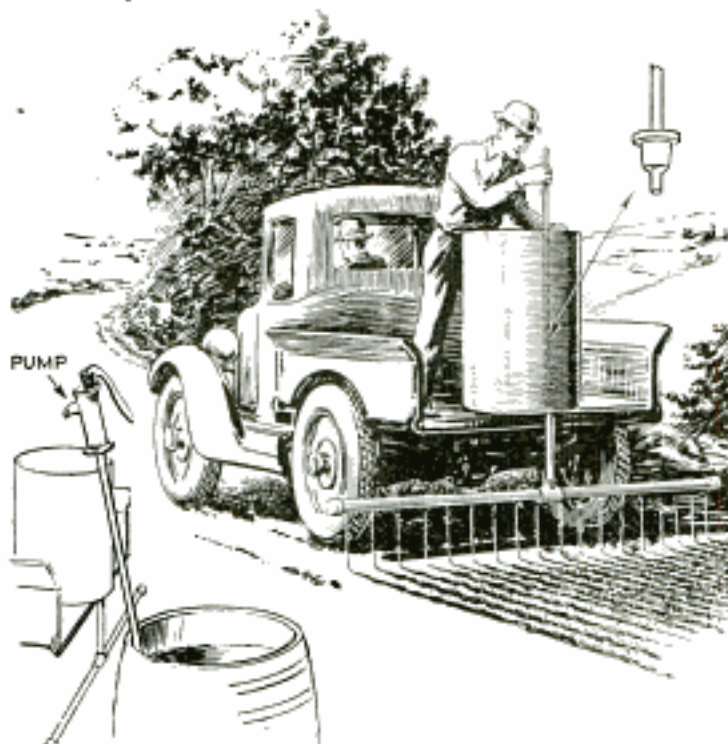
Water Kept from Running Down Arm by Rubber Disk



When washing walls, ceilings or windows, a rubber disk slipped over your arm will keep the water from running down the sleeve. An oval hole is cut in the center to fit the arm. The rubber should be heavy enough to keep it from bending over.

Road Oiler Carried on Truck

Small towns and rural communities that have no paved roads and streets will find this portable oiler inexpensive as it is made from an old oil drum and pipe and fittings. Remove one end of the drum and



Road Oiler Hauled on Truck Is Made from Old Oil Drum and Pipe Fittings

screw a short pipe into the bung in the other end. Then attach the spraying nozzle to this pipe. The nozzle consists of two 3-ft. lengths of pipe perforated on the lower side for the distribution of oil and screwed into a tee, which is in turn screwed into the short vertical pipe. The outer ends of the nozzle are fitted with caps. In use, the drum is set on a truck, and a stopper with a long handle is provided for the bung. The barrel is then filled with oil by means of a pitcher pump as shown.—L. E. Kramien, Shirley, Ind.

Wire Mesh Protects Signs on Trees

Landowners who tack paper signs on trees can protect them from being defaced or torn off by stapling fine wire mesh over the signs, as shown in the photo. This makes it impossible to get at the sign without first removing the wire, which is rather difficult if it has been well stapled.—J. R. Parker, Hartford, Ct.



What You Can Do

By W. CLYDE LAMMEY

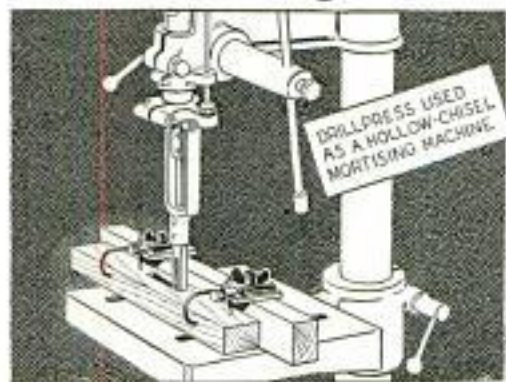


YOU can now use your drillpress for many other operations besides drilling. In some cases, the extra fittings are merely improvised jigs, while, in others, special attachments, furnished by the manufacturer, are required. The floor-type press shown here, can be fitted with a simple attachment for mortising with a hollow chisel, which leaves the corners of the mortise perfectly square, a decided aid in fitting the tenon. Where very accurate work is not highly important, a router bit can be used instead of the chisel. After the work is laid out, a bit of the correct size is placed in the drill chuck, and the spindle stops are set so that the bit will cut to the required depth. Holes are drilled to remove as much waste as possible, after which the work is placed against a fence clamped on the drill table, the revolving bit is lowered into the mortise and the remaining waste is cleaned out.

In cutting grooves for inlaying, a drillpress can be used for both curved and straight work. A small router bit, $\frac{1}{16}$ or $\frac{1}{8}$ in. in diameter, is used, and straight work is placed against the fence clamped to the table. Then, taking light cuts, the work is moved slowly along the fence. In routing fine grooves in curved work, a large plywood table is clamped to the table of the press. Into this is driven a small pin just behind the bit, to serve as a guide. By holding the curved edge of the work against the pin, the bit will follow the contour of the edge.

Accurate grinding and fine lapping can be done by using a $\frac{3}{8}$ -in. spindle, about 2 in. long, threaded onto a brass disk, $\frac{1}{4}$ in. thick. It is best to have this trued up on a lathe after assembling, so that it will run true. A disk of fine emery, or crocus cloth, is then glued to the face of the brass disk. The spindle is locked in the chuck, and the work

with a DRILLPRESS



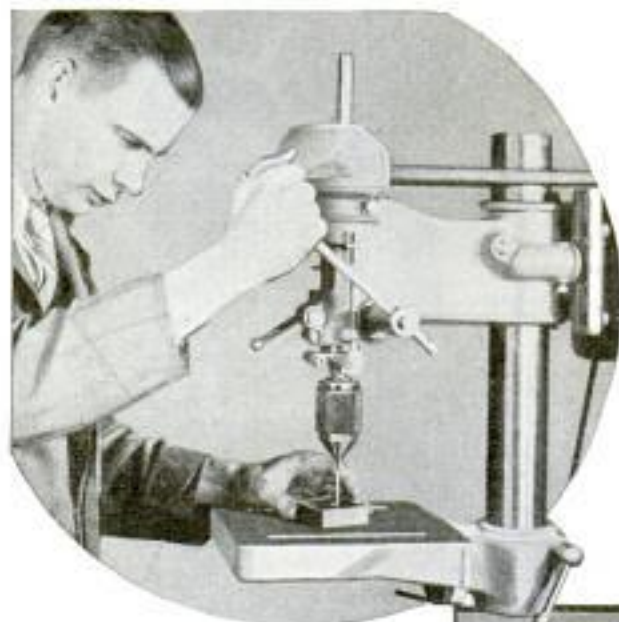
is held in a drill vise so that the grinding is done between the center and rim of the disk. Only light pressure is required for a fine finish.

A tool, known as a hole or circle saw, is useful for a number of operations in both metal and wood, in sawing out disks or in forming irregular-shaped blocks, as is often necessary. The tool consists of a small center bit, which drills a pilot hole in the work, and a cylindrical saw, concentrically mounted, with teeth on its lower edge. These saws are made in various sizes to fit a common spindle and can be used for either metal or wood.

Paint mixing with the drillpress may be a bit out of the ordinary, but can be done much quicker than by hand. All that is necessary is a stirring paddle made of heavy wire, as shown in one of the drawings. This is locked in the chuck, the pail containing the paint to be mixed is placed on the table, and the paddle is lowered into it. The spindle should be run at the lowest speed, otherwise the paint is likely to be thrown out of the pail. The press can be similarly used to mix or stir other solutions.

The drillpress, inverted, also makes a convenient spindle sander. The sanding drum may be a 4-in. length of 1-in. maple, drilled lengthwise in the exact center to fit a length of $\frac{1}{4}$ -in. iron rod. The latter is threaded along 5 in. of its length and is then slipped through the drum, after which a nut and washer are run down against each end of the drum. The assembly is then mounted in a lathe and the





drum turned down. Sandpaper is glued to the drum, and the projecting end of the rod is tightened in the chuck so that it projects above the table. The spindle is run at high speed to produce a smooth finish. With the head in the same position, the machine can be used for shaping on either straight or curved work, employing a short spindle to hold a wing cutter of the type now sold at what is a practically nominal cost.

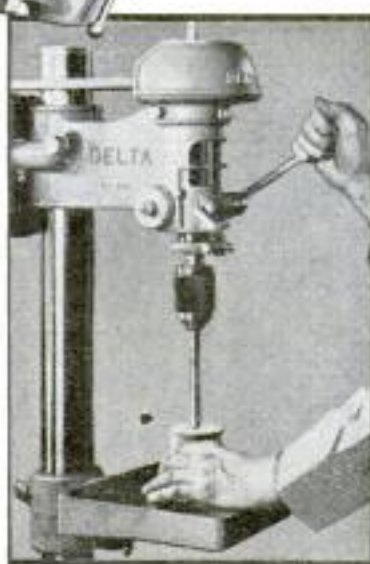
With the head back in the normal position, the press can be used effectively for filing. A round file is wrapped with heavy paper and locked securely in the chuck, the paper protecting the chuck jaws from the file teeth and at the same time providing a better hold. In this way, the press can be used for both external and internal filing operations by running the spindle at high speed and moving the file up and down as it revolves.

Using a piece of thin brass tubing of the required diameter, with one end plugged with a piece of dowel so that it will not spring under pressure of the chuck jaws, you can drill holes in glass. Emery powder is mixed with oil to form a thin paste, which is applied to the surface of the glass where the hole is to be drilled. Then the end of the tube is brought in contact with the surface, and the cutting end of the

tube is kept flooded with the abrasive paste. With care, it takes but a minute or so to drill through ordinary plate glass by this method. Still another adaptation of a drillpress, fitted with a spindle lock, is clamping light glued work that must be kept under a slight pressure.

"Corking" Improves Potato Crop

According to experiments carried on by government experts, seed potatoes, cut two weeks before planting and kept under the right conditions to "cork over," germinate earlier, and have an even growth and increased yield. Keeping the seed at a temperature of 60° F., with a relative humidity of 87, gives the best results. To keep the air moist, put several wet burlap bags on the floor or hang them from rafters, while an oil heater can be used to hold the temperature at the right point. After cutting the potatoes, they should be placed in barrels or sacks.



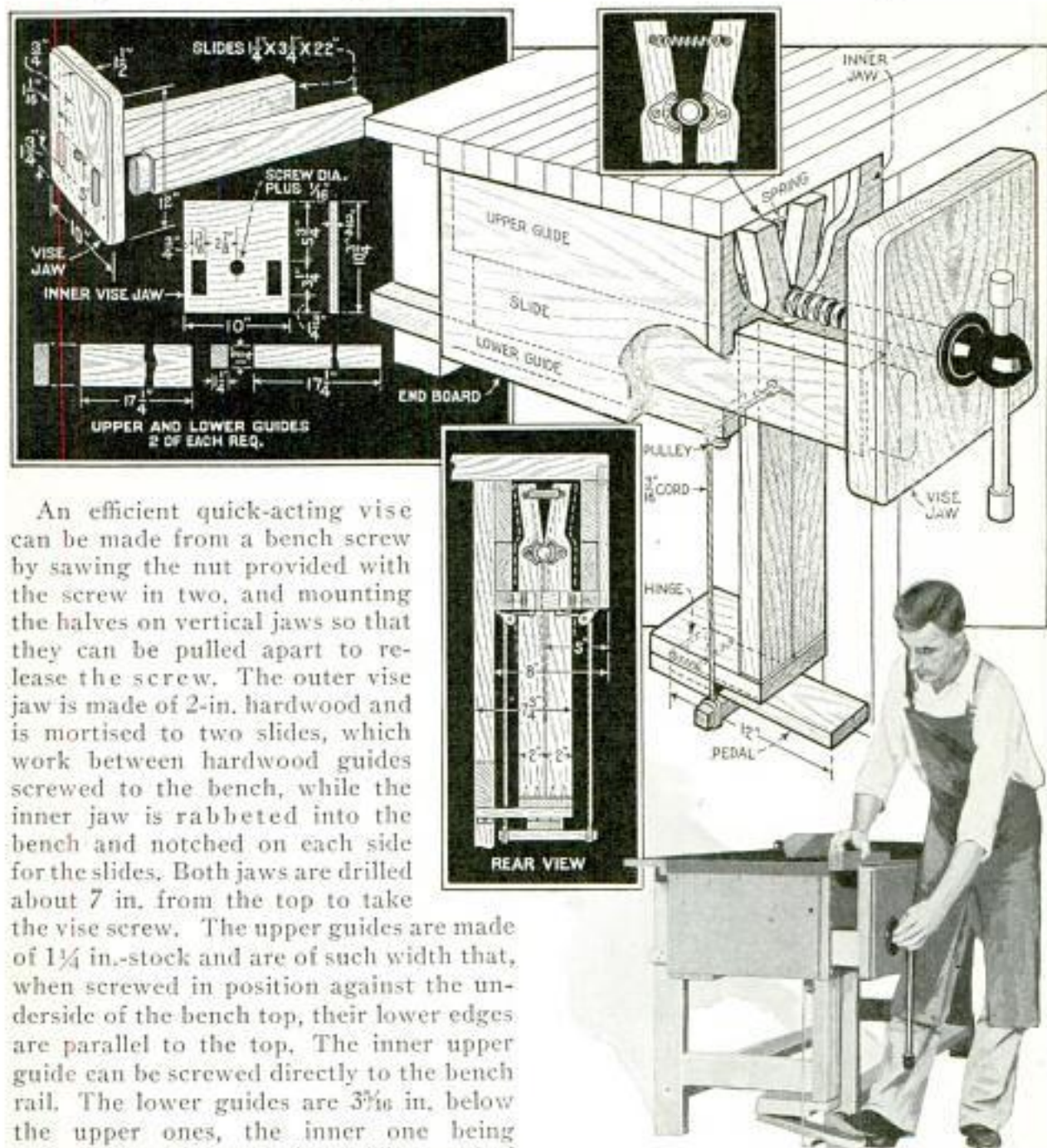
Homemade Pipe Wrench from Generator Chain

A short piece of generator-drive chain, attached to a pair of pivoted handles as shown, makes a good pipe wrench. The pins in the ends of the chain are inserted in holes drilled in the ends of the handles. While it is necessary to have such a wrench for each size of pipe handled, the cost is so small that you can make several of these wrenches for the price of one pipe wrench. If the smooth side of the chain is placed against the work, a wrench of this type may be used for compressing piston rings.—L. Strosnider, Havensville, Kans.



Ⓞ Bushings can sometimes be forced out by half filling them with heavy grease and driving a snug-fitting shaft into them.

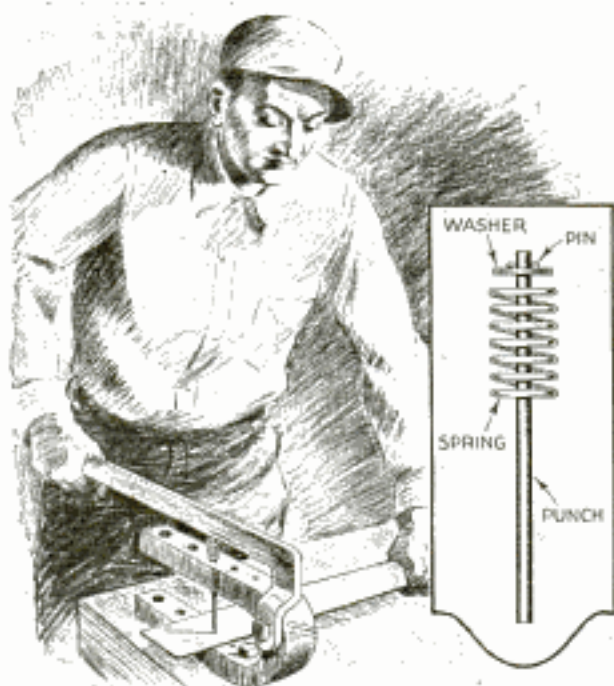
A Quick-Acting Vise That Is Foot-Operated



An efficient quick-acting vise can be made from a bench screw by sawing the nut provided with the screw in two, and mounting the halves on vertical jaws so that they can be pulled apart to release the screw. The outer vise jaw is made of 2-in. hardwood and is mortised to two slides, which work between hardwood guides screwed to the bench, while the inner jaw is rabbeted into the bench and notched on each side for the slides. Both jaws are drilled about 7 in. from the top to take the vise screw. The upper guides are made of 1 1/4 in.-stock and are of such width that, when screwed in position against the underside of the bench top, their lower edges are parallel to the top. The inner upper guide can be screwed directly to the bench rail. The lower guides are 3 7/16 in. below the upper ones, the inner one being screwed to the bench legs. The vertical jaws, which clamp the screw, are hinged together at the lower ends and at the top joined by means of a coil spring. Recess one side of each of these jaws to take halves of the nut. To prepare the screw nut, saw out two sectors of about 60° each, directly opposite each other. This removes the horizontal parts of the threads and eases the release and clutch action of the nut. The flange of the nut is placed at the back. A platform to support the vertical jaws is supported by a cleat screwed

to the under edge of the lower bench rail. The pedal, with which the grip of the split nut is released from the screw, is hinged to the rear edge of the platform, and a cleat is screwed across the lower side of the platform to take cords operating the vertical jaws. To use the vise, release the screw nut and slide the jaw against the work; then release the pedal. This allows the nut to grip the screw, after which a turn of the handle will tighten the vise on the work.

Punchpress Made from Magnet



Large Horseshoe Magnet Makes Speedy Punchpress for Light Metals

Made from a large horseshoe magnet, this punchpress can be used for fast work on light metals. A number of holes ranging in size are drilled through the legs of the magnet and a punch is made to fit each hole. A handle is pivoted as shown and the magnet is bolted to a bench or suitable base. A compression spring, slipped over the top of the punch and held by a washer and a pin, provides a recoil.

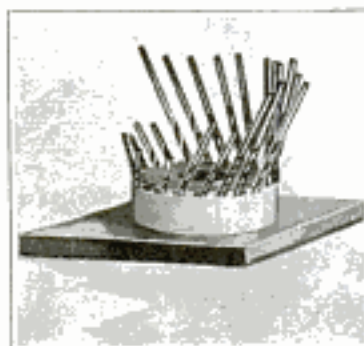
Repairing Motor Blocks by Bronze Welding

Most cracked motor blocks can be permanently repaired without removing the damaged part, and without preheating, by bronze welding. A weld made with an oxyacetylene torch and bronze welding rod is stronger than the original cast iron. Before starting the weld, thoroughly clean all grease and dirt from the crack and remove any accessories or parts that might be damaged by the heat. Parts not readily removed may be protected from the heat by covering them with wet asbestos. With a cold chisel, groove the crack to an angle of about 90° and to a depth of at least $\frac{3}{16}$ in. The rough, chipped surface left by the chisel helps make a strong weld. Before welding, the surface of the cleaned crack should be thoroughly coated with the

bronze welding rod. To do this, heat the crack to a cherry-red with the torch and then apply a generous quantity of bronze-welding flux; also heat the rod and dip it into the flux. While the fluxed surface is still red, apply the rod, rubbing it over the surfaces to be coated. Care should be taken not to overheat the rod, as this will make the welding almost impossible. When the bronze looks wet as it flows from the rod to the iron surface, the heat is satisfactory. A thin, smooth coating is all that is required for the operation. In filling the crack, use as little heat as possible, making only a portion of the weld at one heating, to prevent any possibility of cracking the block. It is a good idea to weld about 1 in. at a time, alternating from one end to the other to allow the completed parts to cool.

Drill Holder from a Timing Gear

Holders for drills can be made by fastening an old fiber timing gear to a wooden base and fitting a metal band around the outside of the gear to form receptacles for the drills between the teeth. The drill sizes may be marked on either the gear or the band opposite each receptacle. The type of gear shown holds the drills in an oblique position, while a bevel gear will hold them vertically.



Repair for a Broken Saw Handle

Broken or split saw handles can often be repaired with a bicycle spoke. A small hole is drilled through the handle as shown, to take the spoke. The top of the hole is recessed to take the bent end of the spoke, while the lower end is countersunk for the special nut with which these spokes are fitted.—Clarence Myers, Winchester, Ky.





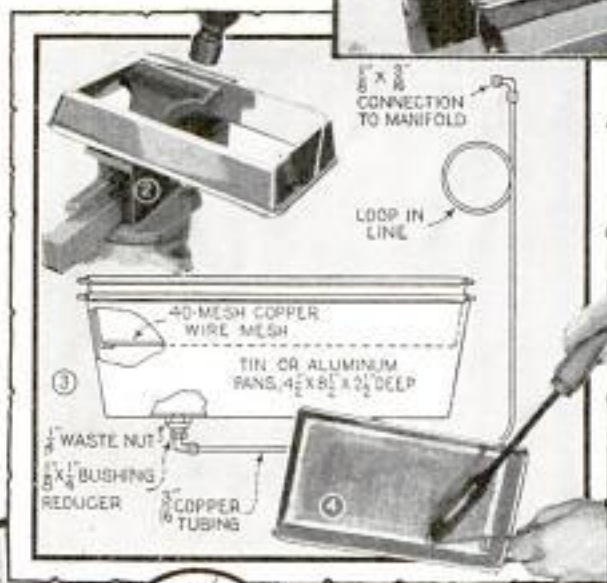
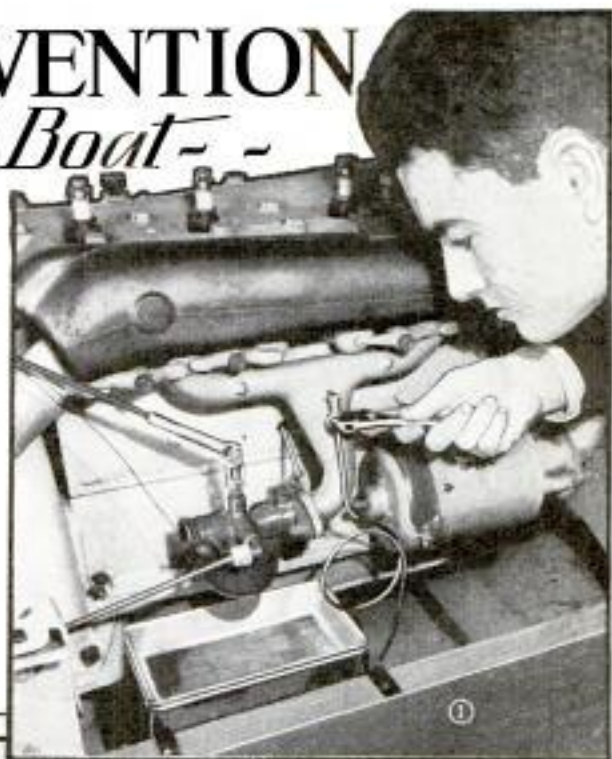
FIRE PREVENTION

On the Small Boat

WITH proper precautions, many boat fires can be prevented. Fire-insurance regulations demand that the point of greatest danger—at the carburetor—be adequately protected with a drip pan and flame arrester.

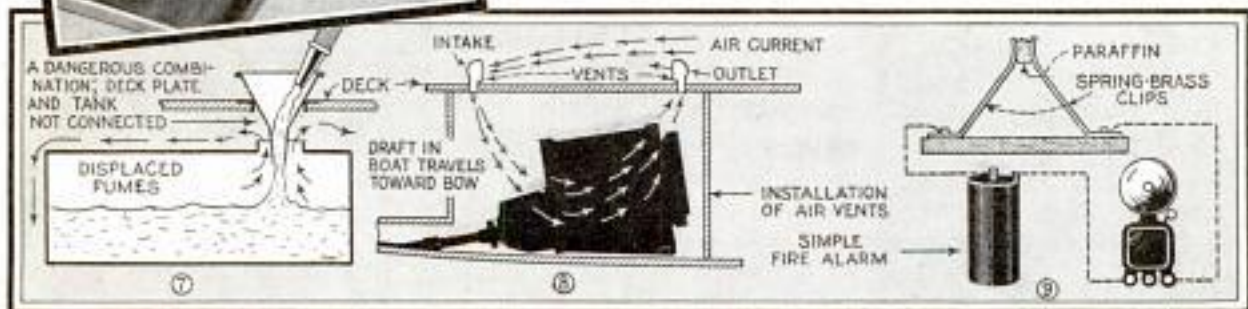
For the converted motor, a simple home unit, consisting of two cake pans, shown in Figs. 1 to 4, inclusively, is effective. The copper tubing is attached with 90° connections, tapping the free end into the intake manifold. Installation can be by means of metal clips to the motor bed. The pan outlet should be aft.

The gas tank should be properly fitted with a connection to the deck plate. One of the most dangerous combinations possible results when the tank and deck plate are not connected, as in Fig. 7. Whenever the tank is filled, displaced



fumes have nowhere to go but into the bilge where they are often ignited by a turn of the starting motor. Some fumes, of course, are certain to settle in the bilge, and it is therefore necessary to provide some effective method of ventilation. Contrary to the ideas of the novice, vents are usually

placed to circulate air from the after end of the boat forward, as in Fig. 8, and it is only in very fast hulls that the straight-in, straight-out arrangement should be used. Simple fire alarms, Fig. 9, should be installed on a cabin boat; one or two over the galley and in the engine room.





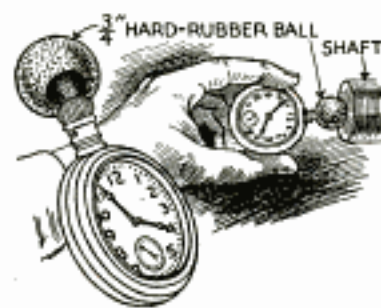
Pivoted between Sides of Wheelbarrow, This Rack Keeps Wind from Scattering Load of Light Material

Rack Holds Load on Wheelbarrow

To keep light material from being blown off his wheelbarrow, one gardener pivoted a rack between the sideboards so that it could be turned down over the load and fastened under a catch screwed to the front end of the barrow. The rack was made by nailing short pieces of lath across a long lath, one of the crosspieces being rounded at the ends to pivot loosely in holes drilled through the sideboards.

Watch Used as Speed Indicator

An old dollar watch can be converted into a speed indicator by attaching a $\frac{3}{4}$ -in. hard-rubber ball to the winding stem to fit a shaft. First find out how many turns



the winding stem makes for each complete turn of both the hour and minute hands. Wind the watch and set it at exactly 12 o'clock with the second hand at 60. Hold the ball on the stem against the center of the rotating shaft and count the rotations of either hand on

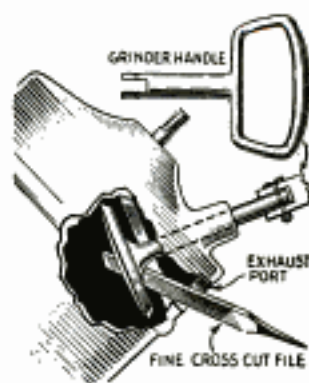
the watch for a period of 1 minute as indicated by the second hand. Then multiply this by the number of rotations the winding stem makes in turning the given hand once, which gives you the shaft speed.

Fine Work Illuminated with Small Magnifying Glass

When doing fine work by the aid of a magnifying glass under artificial light, a second and smaller glass can be used effectively for reflecting the light directly on the work. A piece of stiff wire is attached to the small glass and the wire is wrapped around the handle of the larger one, so that it holds the reflector at an angle directing the light on the work.

Facing Valves in Airplane Motor without Removing Cylinder

To eliminate pulling a cylinder in order to face and grind valves on one type of aviation motor, the following short cut can be used: A strong grinder handle is keyed to the valve stem, and a fine double-cut file is inserted through the port between the valve and the seat. Then, holding the file firmly at the proper angle, turn the valve in one direction, being careful not to exert too much pressure until burned spots are removed. The job is then smoothed up with grinding compound to make a good seat.



Adjusting Automobile Brakes

When adjusting automobile brakes of the type having an external wedge on the outside of the brake housing, it is often found that, when the wedge is turned one notch, the brake drags, but when the pedal is pressed down, the brake is not effective. This is caused by the pins that rest on the wedge not returning to their former position until the pedal is pressed. For this reason, the pedal should be pressed down after the wedge is turned one notch.

Detector to Find Grounded Wire of Lighting Circuit

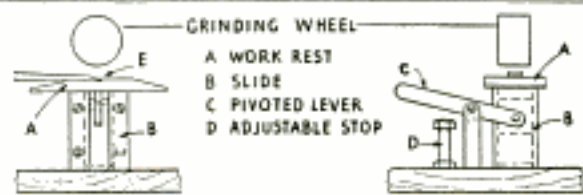
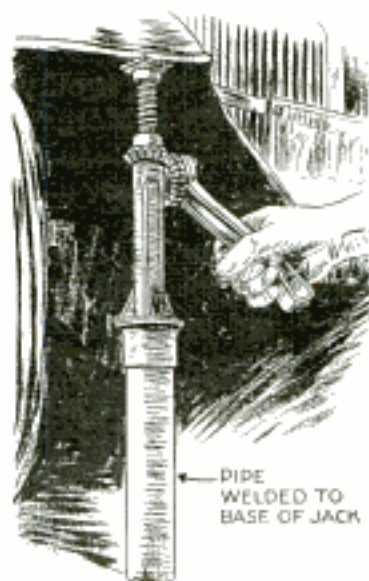
One wire of the 110-volt current delivered in most cities is grounded, and in doing any type of wiring, the wire that is not grounded should be the one which is opened by the switch. For this reason, one can use the following apparatus for determining which wire is grounded: A prong is attached to one terminal of a .1-mfd. condenser or larger, and a pair of headphones is attached to the other terminal and to the ground. When the test prong touches the wire that is not grounded, the headphones produce a hum.

Destroying Wood-Eating Ants

An effective method of destroying termites, wood-eating ants, in porch supports and joists, is to drill several $\frac{1}{2}$ -in. holes at a downward slant above and below the infected wood. Then, with an auto grease gun, a mixture of creosote or a specially prepared insect destroyer can be squirted into the holes. If plain creosote is used, it should be mixed with a small amount of gasoline, so that the liquid will quickly penetrate the wood. Repeated injections of the mixture should be continued until the wood is saturated. The holes can be sealed with corks after filling.

Extension Jack for Repairing Fenders

Repairing car fenders usually requires an extension jack for holding the work as nearly as possible in its normal position. A tool for this purpose can be made by welding a piece of 2-in. steel tubing to the base of an ordinary car jack. In order to adapt the tool to different heights, varying lengths of smaller pipe may be provided to slip inside.



Attachment Screwed to Table under Wheel Helps in Grinding Screwdriver Blades at Correct Angle

Attachment for Grinding Screwdrivers

Mechanics and others whose work requires an extensive use of a screwdriver, will find this attachment a timesaver in grinding the blades. It is mounted on the table directly under the center of the grinder wheel as shown, and consists of two vertical pieces, between which a block or rest slides, an adjustable stop, and a lever for holding the work against the wheel. The lever is pivoted to a fulcrum and to the sliding rest, and the stop is set under the lever as shown. In use, the blade is held on the rest, which is raised against the wheel with the levers.

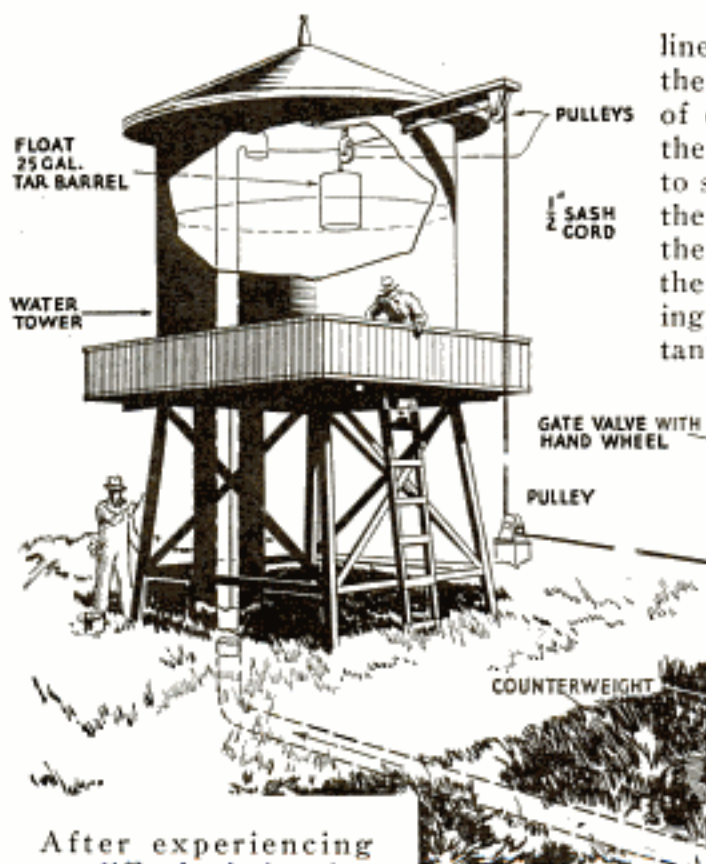
Lead Heats Soldering Iron

When it is necessary to do a soldering job where it is impractical or unsafe to use a gasoline torch, a pot of melted lead may be used for heating the soldering iron and covering it with solder at the same time. A fair-sized pot of molten lead will retain its heat for quite a while.

Floating Power for Outboard Boat

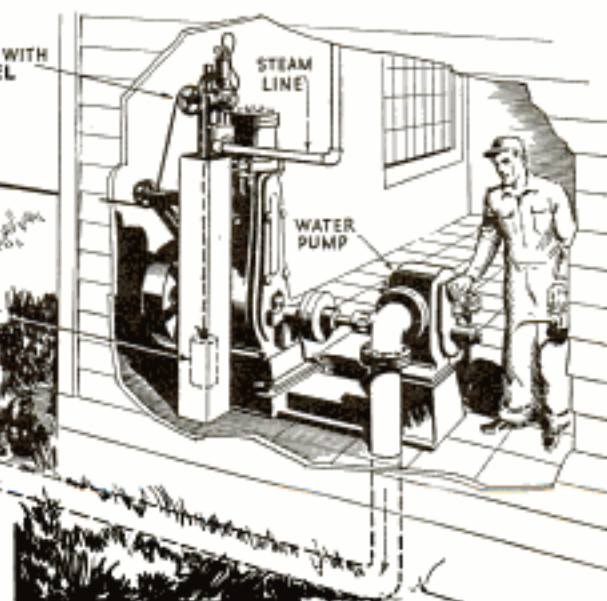
By using sponge rubber under the mounting bracket and clamp of a small outboard motor, vibration will be reduced to a minimum. Unless the sternboard of your boat is unusually thin, some alteration in the clamps may be necessary.

Automatic Control for Steam-Operated Pump



After experiencing some difficulty in keeping a large water tank filled without constant attention of an operator at a steam pump, one power company installed an automatic control as shown. A float was made from a 25-gal. tar barrel, and a sash cord was run from the float over four pulleys and a handwheel on the gate valve in the steam

line, a counterweight being provided at the end. The rim of the handwheel was, of course, grooved to take the cord, and the counterweight should be heavy enough to shut off the valve, but not to overcome the weight of the float. When the float in the tank dropped, it pulled the cord over the handwheel and opened the valve, starting the pump, while water rising in the tank raised the float and permitted the



counterweight to pull the cord over the handwheel in the opposite direction to close the valve, which stopped the pump. —P. F. Backus, Delphos, Ohio.

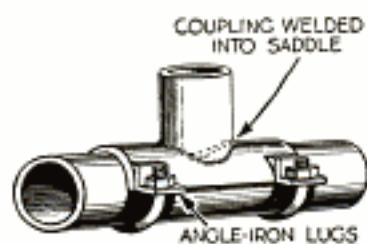
Preventing Press Trouble from Static and Cold Ink

To eliminate trouble often experienced on cold mornings in printing shops by having stiff ink pull the printing plates loose, spread a small amount of oil of wintergreen on them and run the machine for a couple of minutes before feeding the paper into it. This stops the pull of the ink and does not interfere with the printing. Crude carbolic acid will keep the ink from pulling, but is objectionable because of its odor. The acid will also cut dried ink, and if a few drops are applied to the plates and the press run a minute or two before shutting down at night, it will keep the ink from drying on the plates. If trouble is experienced with static-charged paper on the second run, rub a little glycerin on the

tympan and wipe it off with a clean cloth. —Dick Clayton, Morgan, Utah.

Improvised Tee Connection on Pipe

The following emergency method of making a tee connection was used on a large pipe line: A short section of pipe of



the same size was cut in half lengthwise, and angle-iron lugs were welded to the corners of one piece. A hole was then cut in this piece, and a short coupling welded into it so that it came directly over a simi-

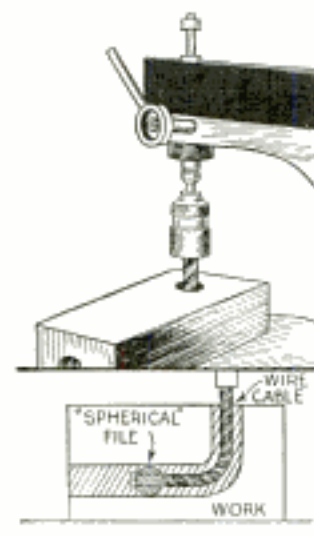
lar hole cut in the pipe line. After placing asbestos packing between this improvised saddle and the pipe, U-bolts were bent to fit the contour of the pipe and bolted to the lugs as shown. This connection is airtight and has been in use for a long time.

Gaskets from Paper and Lead Foil

Gaskets for steam-pipe unions and flange joints, etc., can be made by cementing lead foil to both sides of a piece of heavy wrapping paper. The gasket should be painted with a mixture of powdered graphite and boiled oil before it is used. Scrap tin or lead foil makes an equally effective packing for stuffing boxes. Roll the foil tightly around a boot lace, which has been impregnated with paraffin, and then use it in the ordinary way. For large boxes, roll the foil around an insulated wire, treated in the same manner as the lace.

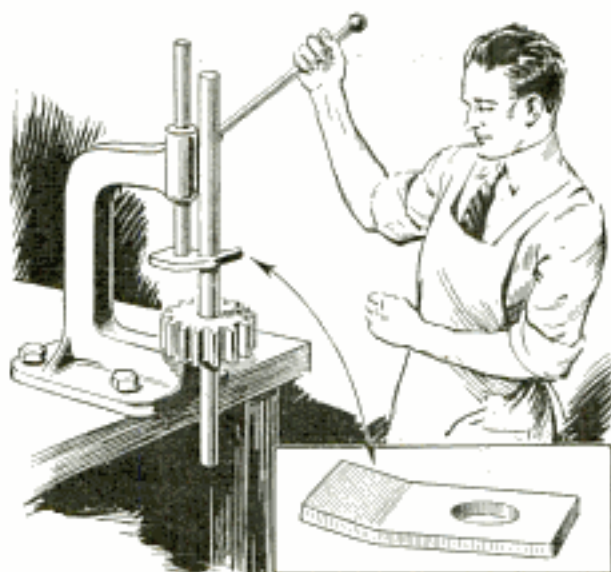
"Spherical" File Puts Smooth Finish on Curved Hole

Recently I had to smooth the surface of a curved hole cast in an iron block. To do



this, a steel ball was annealed and teeth were cut in its surface to simulate a file, after which it was drilled to take the end of a piece of wire cable. The ball was then hardened, and the cable soldered in the hole. The shank of an old drill was soldered to the other end of the cable, so that it could be chucked in a drillpress, which was started and the ball fed into the hole. A high polish was put on the surface of the hole by using a brass ball in the same manner.—Charles Kugler, Philadelphia.

☛The brilliance of kerosene lamps can be improved by boiling the wicks in vinegar; this treatment will remove the greasy substance that collects on them and causes them to burn with a dull yellow flame.



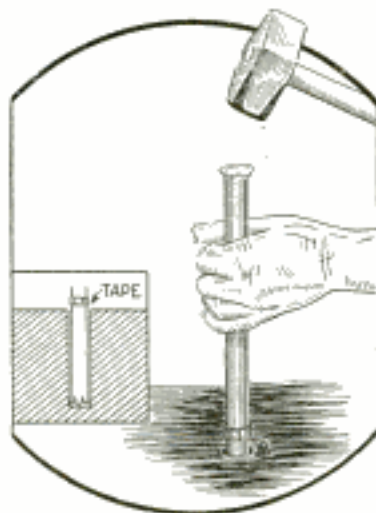
Capacity of Small Arbor Press Increased by Using Short Pieces of Flat Stock

Simple Attachment to Increase Capacity of Arbor Press

Capacity of an arbor press can be increased by using the illustrated attachment. A piece of heavy flat stock is drilled slightly larger than the shaft of the work, and the corners are rounded to avoid marring its surface. The piece is then slipped over the shaft of the work, and the arbor-press spindle is brought down on it as shown. The one-sided pressure causes the bar to grip the shaft tightly. If the work is of small diameter, the bar should be held close to the pulley and moved from time to time to avoid bending the shaft.

Depth Gauge for Star Drill

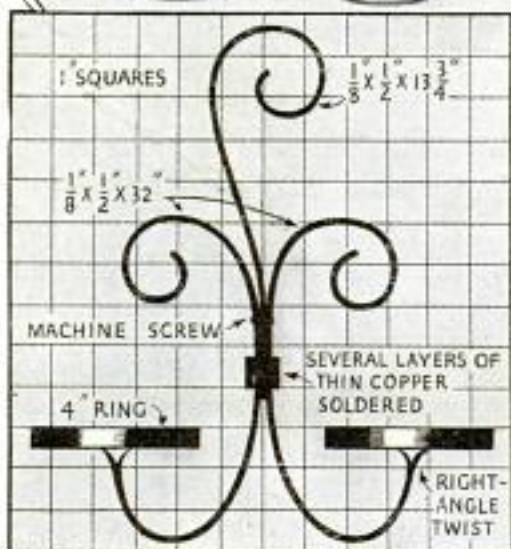
Wrapping a few turns of friction tape at a predetermined point on the shank will provide a depth gauge on a star drill. The tape is easily removed and re-adjusted for different depths of holes. If the greater part of the shank is wound with tape, a better grip is provided.



Bent-Iron FLOWER



Only Three Pieces Are Needed for the Wall Flower Rack at the Left; the Pieces Are Held Together by Wrapping with a Thin Copper Strip, Which Is Soldered; Above, Curls Are Formed by Bending Flat Iron in the Slotted End of a Piece of Pipe, While Spirals Are Made by Holding the Work in a Vise and Twisting It with a Wrench



Above and Center, Front Views of Wall and Table Racks; It Is Helpful to Lay Out the Curves on Paper Ruled in 1-In. Squares, to Check When Bending the Pieces of Iron

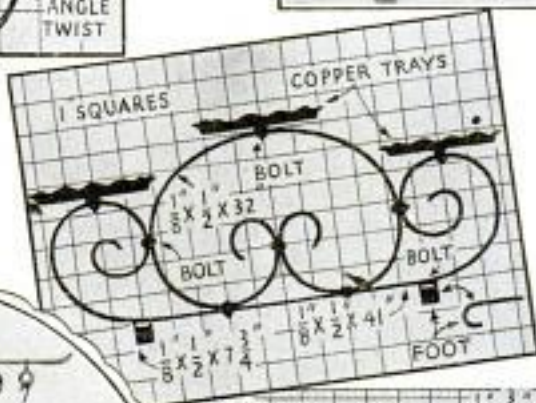
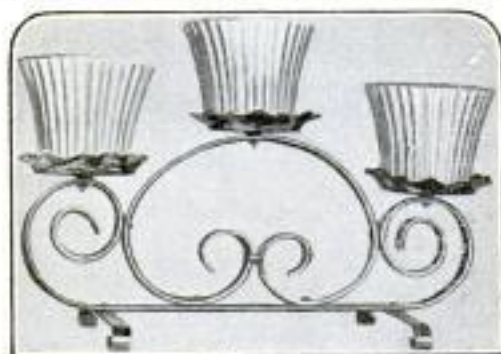
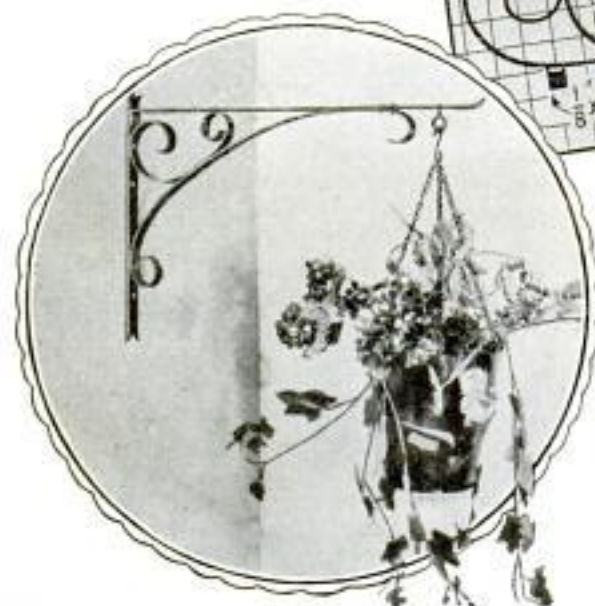
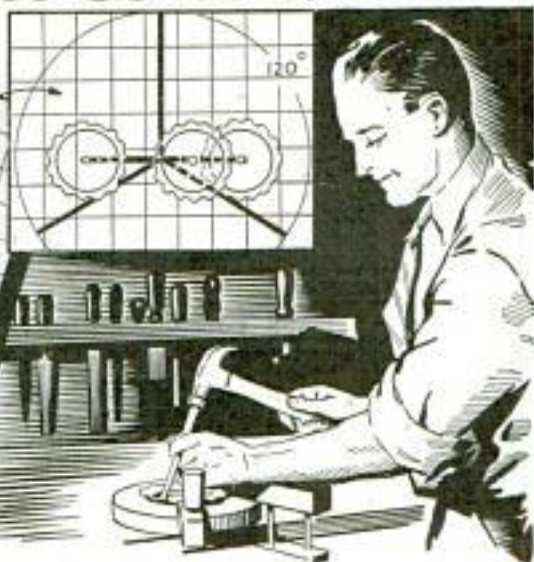
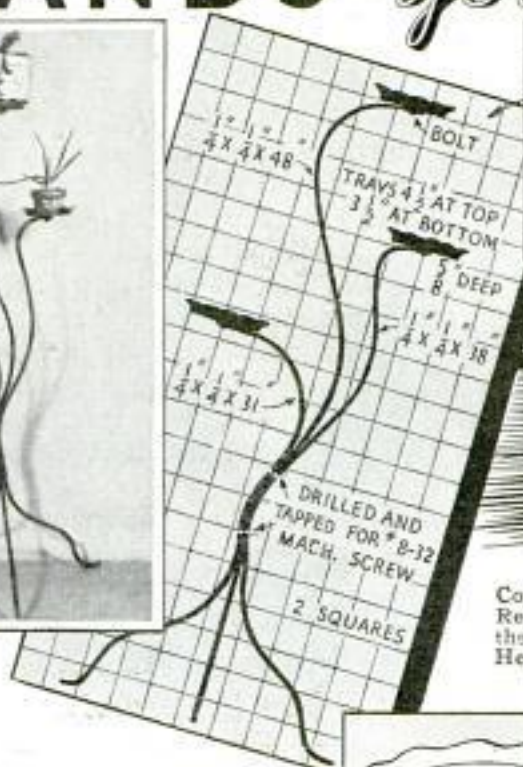


Table Rack That Holds Three Flowerpots Is Attractive in Verdigris Speckled with Black, after Which a Coat of Clear Lacquer Is Applied; the Trays, of Hammered Copper, Are Bolted to the Iron Supports; Ornamental Pots Greatly Improve This Simple Design



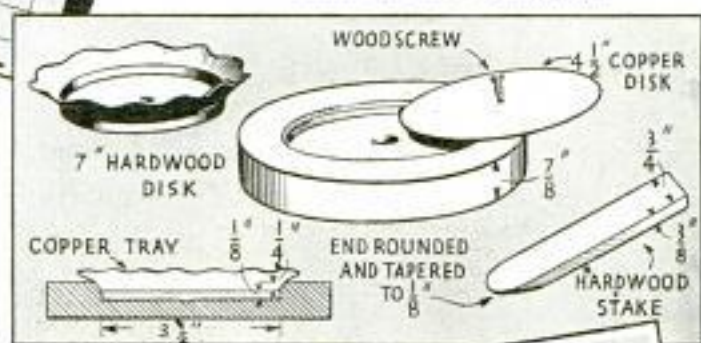
Wall "Crane," Which Can Be Used to Hang a Large Pot or a Bird Cage, Is Especially Suitable for an Inclosed Porch or Sun Room; Rivets May Be Substituted for the Bolts at the Points Indicated; Two Curved Braces between the Horizontal and Vertical Pieces Furnish Sufficient Reinforcement, and a 3/4-In. Screweye Serves as a Swivel for Attaching the Pot or Cage

STANDS *you can Sell*

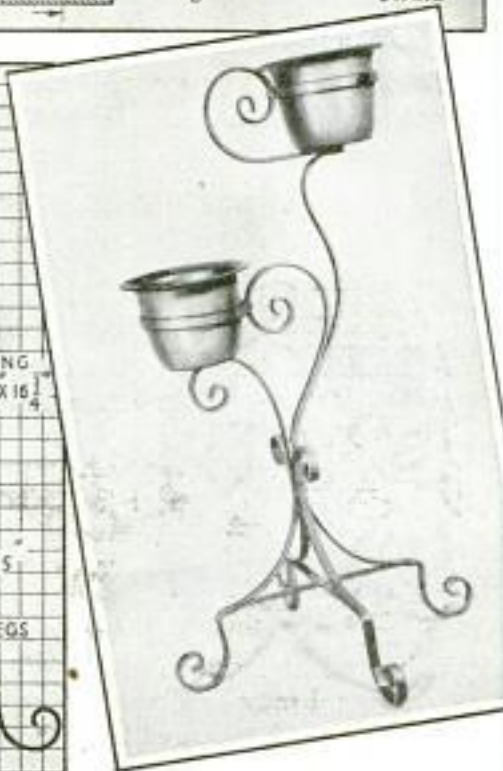
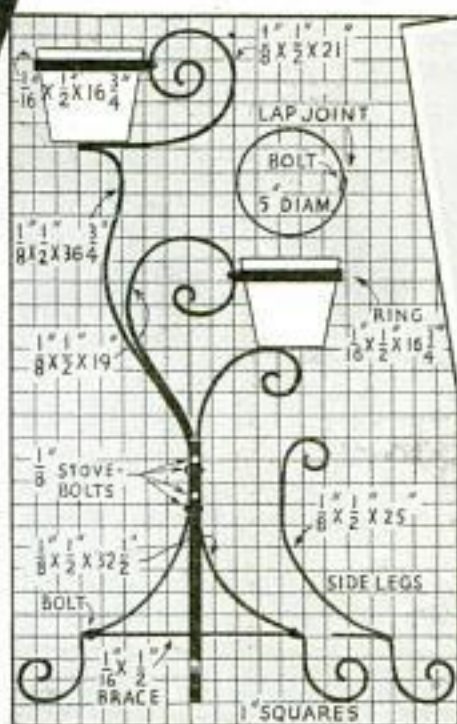


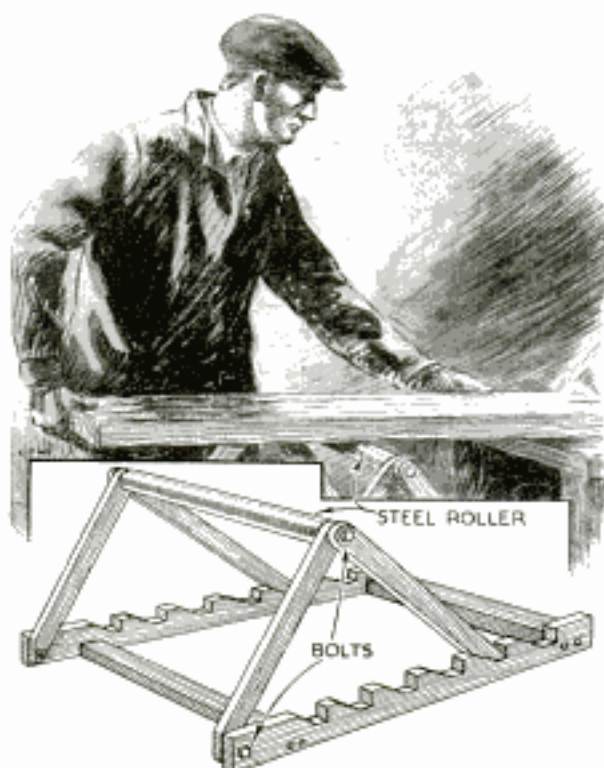
Copper Trays Are Formed on a Hardwood Block, Recessed to the Desired Depth on a Lathe; When the Metal Begins to Get Brittle from Hammering, Heat It to a Cherry-Red and Plunge into Water to Soften It before Continuing

The Square Legs of This Graceful Plant Stand Are Bent on the Horn of a Vise with a Heavy Hammer; the Copper Trays That Hold the Flowerpots Have Neat but Irregularly Scalloped and Crimped Edges, and Should Be Located on the Center Line



Smooth, Graceful Curves and Neatness of Proportions Make a Four-Legged Stand of the Type Shown Here an Especially Attractive Project for Those Who Desire a Little More Advanced Work; the Pottery or Metal Jardinieres Should Be Purchased in Advance So That the Rings to Hold Them May Be Made to Fit Properly; If Desired, All Joints Where Bolts Are Suggested to Hold the Parts Together, May Be Welded





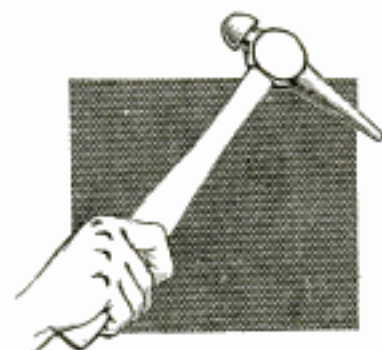
One End of Long Work Supported on Adjustable Standard, Fitted with Roller, Makes Sawing Easier

Adjustable Standard Supports Long Work While Sawing

Equipped with a steel roller, this adjustable standard is handy for supporting one end of long work while ripping it with a saw. The lower rails are dented to take the free ends of the roller supports, which act like pawls and serve to adjust the height of the roller.

Tool for Repairing Car Bodies Made from Machinist's Hammer

Made from a machinist's hammer, this tool is handy for removing small dents from the fenders and body of a car. The large end of the hammer is heated to a cherry-red and drawn out to the length and shape desired, after which it is again heated and quenched in oil. If desired, the tool may be ground down on an emery wheel and polished to give it a neat, finished appearance.



Improved Sanding Disks and Drums for Small Work

Small motor-driven sanding disks and drums for delicate internal finishing may be improvised from pipe fittings. They can be made by facing flanges and gluing abrasive paper to them, while drum sanders may be made by gluing the paper to a nipple, which is attached to the motor shaft with a coupling. To facilitate this, a $\frac{1}{8}$ or $\frac{1}{4}$ -in. nipple is threaded and pressed on the end of the motor shaft. By keeping an assortment of reducers and couplings on hand, you can quickly attach almost any size of sander needed for the job. For work where a portable hand-operated unit is desired, small motors, such as used on electric fans or toys, may be used.

Brass Rifle Shell Helps in Soldering Wire Splices

Screwed to the copper of a soldering iron, a .38-caliber brass shell will hold molten lead for soldering open-end wire splices. In use, the shell is half filled with solder, and the splice is dipped into it as shown. The iron will keep the solder hot as long as desired, and when finished, the shell may be removed so that it will not interfere when the soldering iron is being used for other work.



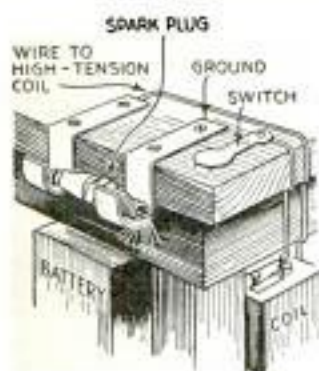
Testing Auto Cylinder-Wall Lubrication

Sometimes too much oil is removed from the cylinder walls of an automobile engine by the installation of unknown types of oil rings. This is apparent in excessive wear of pistons, piston rings and the cylinder walls. If this trouble is suspected, it may be verified by a simple test. Drive the car until the motor is as hot as it ever gets. Remove the spark plugs to eliminate compression, and with the hand crank, turn the motor several times to determine the actual friction. Then pour a quantity of oil into each cylinder and crank the motor with the starter to distribute the

oil. Now, again turn the motor with the hand crank, and see if there is less friction than before applying the oil. If there is no difference in the effort needed to crank the motor, then insufficient oil is being distributed over the walls, and the trouble should be remedied immediately.

Electric Lighter for Welding Torch

This simple lighter is made from a Ford coil, a spark plug, battery and two strips of copper. The ends of the latter are bent to hold the spark plug and are screwed to a bench top, one strip being wired to the high-tension terminal of the coil and the other to a ground. The primary terminals of the coil are run to the battery, a switch being connected into one of them. This lighter is safer than matches, and is a timesaver when used frequently.

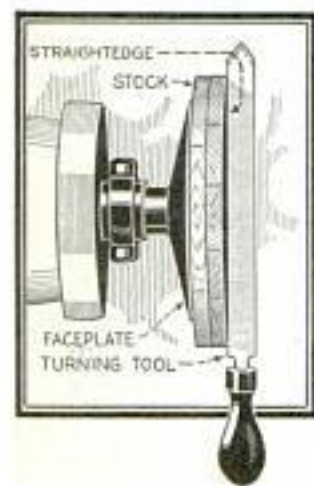


of the coil are run to the battery, a switch being connected into one of them. This lighter is safer than matches, and is a timesaver when used frequently.

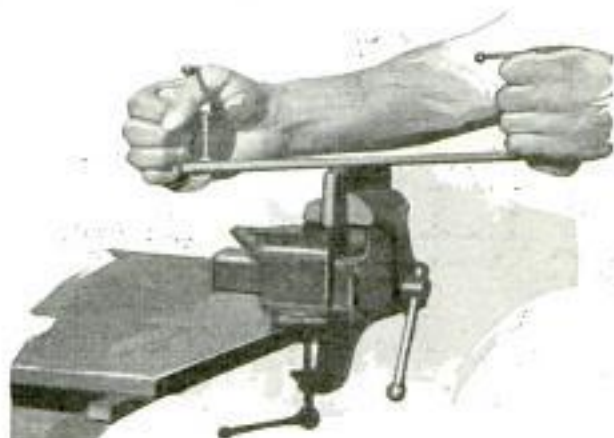
Using Hollow Chisel to Cut Mortises

Small mortises may be cut with a hollow chisel fitted with a handle and having its outside slightly tapered by grinding it back from the end. Most of the waste stock is first removed by drilling several overlapping holes in the work, after which the remaining material is removed by driving the hollow chisel into the mortise while the stock is held in a vise.

Turning Tool Used as Straightedge



By squaring one edge of a wood-turning tool, you will have a good straightedge for truing faceplate work. This will not interfere with the regular use of the tool, but eliminates the necessity of picking it up each time you wish to test the work.



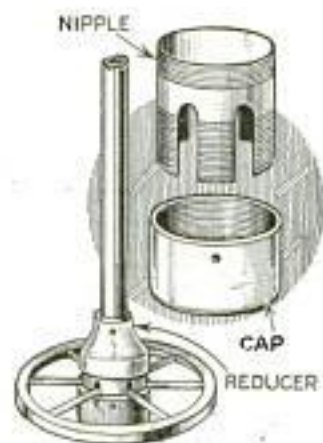
C-Clamps on Ends of File Keep Workman's Hands from Striking against Work

C-Clamps Used as File Handles

Filing is made easy with handles improvised from two C-clamps. They are screwed to the ends of the file as shown, so that the workman's fingers are not injured by knocking them against the vise or the work.—Leonard Mitchell, San Francisco, Calif.

Extending Handwheel Stem

Handwheel stems are easily extended by using a pipe reducer, nipple and cap. The nipple is slotted to fit over the spokes of the wheel, and is driven into the reducer, which has been screwed onto the end of the stem. The cap is then screwed onto the end of the nipple over the wheel and locked with a pin through a hole drilled through both the reducer and nipple.—Chas. H. Willey, Penacook, N. H.



Reflectors Identify Dock in Dark

To identify your dock in the dark, reflectors, such as are used on the rear and sides of trucks will prove useful. The illumination from a search or flashlight is sufficient to make them show at a considerable distance. In case more than one owner desires to use this method of identifying docks that are close together, different-colored reflectors may be used.

"YES," said the cheerful one, telling of a harrowing experience, "we had reached the place where we had eaten the last dog."

"It must have been terrible!" exclaimed the fair listener.

"It was," he said; "they didn't even have mustard to put on it, and it was at least twenty miles to the next stand."

"You ask high wages for a man without experience."
"Well, sir, it's harder when you don't know anything about it."

Hubby and friend wife were going over the family budget. Frequently he ran across an item "H. O. K. \$3.00," another "H. O. K. \$7.00."

"My dear," he said, "what is this H. O. K.?"
"Heaven Only Knows," she replied.

"My brother and I are so much alike our own mother cannot tell us apart," said the Prize Liar. "In school my brother would throw spitballs and the teacher would whip me. Of course, she didn't know any better, but I did. My brother got into a fight and the judge fined me \$500. Of course, he didn't know any better, but I did. I was supposed to get married last Sunday, but my brother got there first and married the girl. She didn't know the difference, but I did. However, I got even with my brother. I died last Monday and they buried him."

"Defendant, before your trial starts, you have a right to challenge any member of the jury."

"Well, your honor, I'd like to fight the little shrimp on the end."

A woman entered a grocer's shop and asked for some good cheese. The grocer showed her some which did not please her. She wanted some particularly "lively" cheese. He showed her the remainder of his stock, but she wasn't satisfied. She wanted it still more "lively."

At last the grocer, losing patience, called sarcastically to his assistant:

"John, unchain number seven and let it walk in."

St. Peter (to applicant)—"Where are you from?"
Applicant—"From California."

St. Peter—"Come on up, but I don't think you'll like it."

A proud young father wired the news of his happiness to his brother in these words:

"A handsome boy has come to my house and claims to be your nephew. We are doing our best to give him a proper welcome."

The brother, however, failed to see the point, and wired back:

"I have no nephew. The young man is an impostor."

"Did you see in the paper that they already caught that burglar?"

"Fine work—and yet a lot of people call the police inefficient. How did it happen?"

"He parked on the wrong side of the street."

A dear old lady was shocked at the lurid language of two electricians who were working in her house, and complained to the company. In due course the two men were sent for and asked for an explanation.

"Well, sir," said one, "it was like this. I was up the ladder and I let the hot lead fall on Bill. It went down his neck. And Bill, he said to me, 'You really will have to be more careful, Jack.'"

Willie was having trouble with arithmetic.

Said teacher: "How many do daddy and mother and baby make?"

"Two and one to carry," said little blockhead Willie.

"What's this?" said the editor. "Mr. Longbow is lying at death's door. Make that read 'laying'."

"What?" exclaimed the young reporter, in surprise. "That's not correct."

"No," replied the editor, "but it's better to make a grammatical error than offend Longbow's relatives. His reputation for veracity is notoriously bad."

Cop: "Hey there, don't jam up traffic! Why don't you use your noodle?"

Lady: "I didn't know the car had one."

The Sunday morning visitor to the navy yard approached a sentry.

"Can you direct me to the U.S.S. Satan?" he asked.

"Never heard of it," said the sentry.

"That's odd," said the stranger, as he reached in his pocket for a newspaper clipping. It read: "Next Sunday the navy yard chaplain will preach on Satan, the great destroyer."

Beginner: "Now, my man, I want to hire a horse. How long can I have it out?"

Groom: "Well, sir, we usually leave that to the horse."

"What is your occupation?"

"It isn't an occupation, it's a pursuit. I'm a bill collector."

A lady who had invited three others for an evening's bridge received a telephone message at the last moment that one of her guests could not come. So she asked her husband

if he would not make the fourth. "All right, dear," he said, "just wait till I dress."

"But you're already dressed, darling."

"No," he said, "I've still got to put on my shin-guards."

Social Worker: "What's your name, my man?"

Convict: "No. 888."

S. W.: "Oh, but that's not your real name."

Convict: "No—just my pen name."

"Why is it that you never see that boy Alfred—with the same girl twice running?"

"Well, the minister preached a sermon once which made a great impression on him. It was on the text 'Love one another'—but Alfred thought it was 'Love one and then another.'"

"I weigh my words before I speak."

"Well, no one could accuse you of giving short weight."

"Well, judge," said the waiter. "What'll you-all have for breakfast? Has you ebber tried enny ob ouah boiled eggs, sah?"

"Yes," responded the judge, "and I found them guilty."

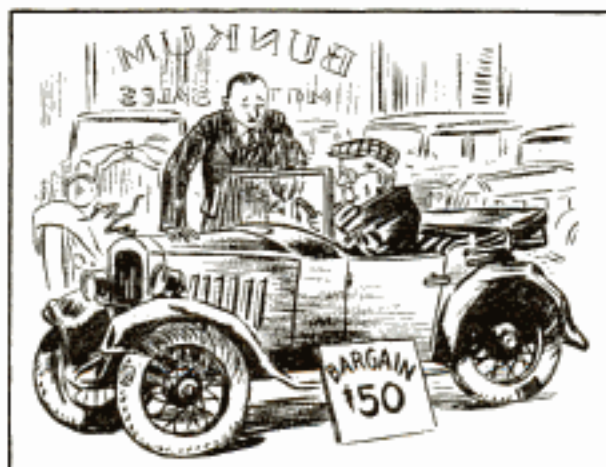
"Si, I've got a mule with distemper. What did you give that one of yours when he had it?"

"Turpentine. Giddap."

A week later they met again.

"Say Si, I gave my mule turpentine and it killed him."

"It killed mine, too. Giddap."



"You start the engine, sir, by pressing the horn button. You see, the previous owner did all his own repairs"

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The result is a longer-lasting, "oilier," *Tough-Film* oil that cuts operating costs in three ways. It cuts repair bills. It saves on gasoline. And it saves on oil—every filling lasts hundreds of miles longer.



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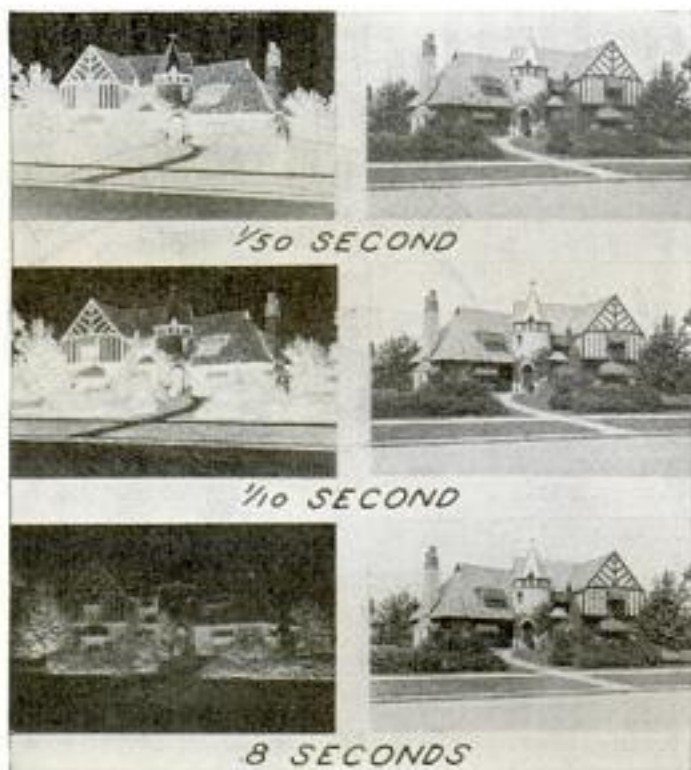
MAY, 1933, PUBLISHED BY



SPERM OIL COSTS 100 TIMES AS MUCH as the oil ordinarily used in movie cameras, yet the driving spring in the new Ciné-Kodak Eight is cased and sealed in this expensive oil—an instance of the extreme care taken to insure long life and perfect operation of your movie camera. Note the sprocket teeth on the spring casing. Ingenious telescoping of the spring in the drive wheel allows the use of the largest possible motor in this compact camera.



CINÉ-KODAK TITLER. With this simple device you can make regular or trick titles from typed or lettered cards, snapshots, magazine illustrations, etc. Use the film occasionally left over in your camera to keep your titling up-to-date. Adjustable to both 8 mm. and 16 mm. Ciné-Kodaks. Complete with 100 blank title cards—\$6.50. Send coupon for booklet describing complete 8 mm. film editing equipment.



A DEMONSTRATION OF FILM LATITUDE. The three pairs of negatives and prints above show the amazing exposure latitude of Kodak Verichrome Film. Although the second negative was given 5 times and the third 400 times as much exposure as the first, all three made satisfactory prints. This extraordinary exposure range, provided by the two-speed emulsion coating, is one reason why amateurs get better pictures on Kodak Verichrome Film.

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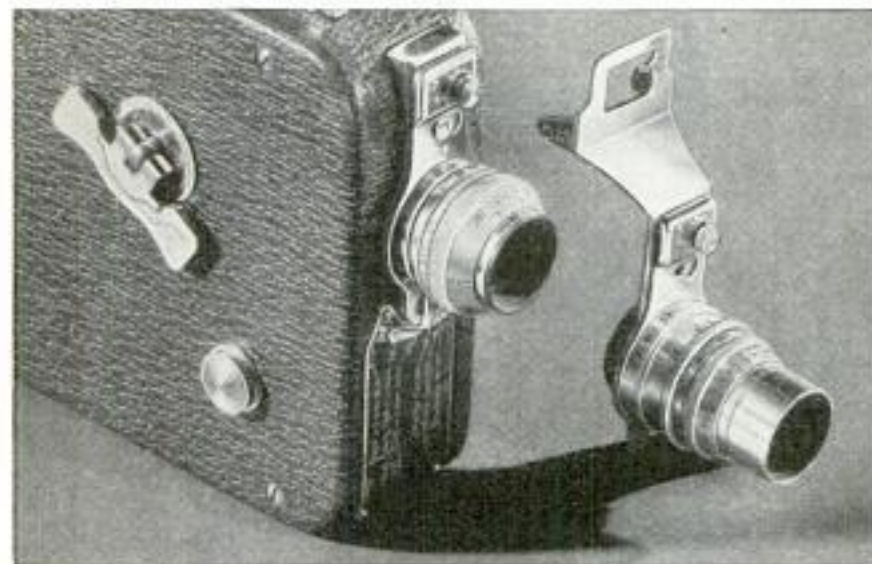
WITHOUT CHANGING the camera from picture-taking position you can adjust the focus and choose the shutter speed of the Kodaks Six-16 and Six-20. Secondary scales visible from the top of the camera provide this added convenience (upper right illustration). See these new Kodaks at your dealer's. They are unusually compact cameras taking $2\frac{1}{2} \times 4\frac{1}{4}$ and $2\frac{1}{4} \times 3\frac{1}{4}$ pictures and are remarkable for their beauty, precision, and operating simplicity. Kodak Six-16 ($2\frac{1}{2} \times 4\frac{1}{4}$), with $f.4.5$ lens, \$30; with $f.6.3$ lens, \$17; with doublet lens, \$13. Kodak Six-20 ($2\frac{1}{4} \times 3\frac{1}{4}$), with $f.4.5$ lens, \$28; with $f.6.3$ lens, \$15; with doublet lens, \$12.

YOU'RE IN THE PICTURE when you use the Kodak Self Timer. Let this simple device take your place at the camera and make your group pictures complete. When attached to the cable release, it automatically trips the shutter after any desired interval from $\frac{1}{2}$ second to 1 minute. Price, \$1.25, at your Kodak dealer's.



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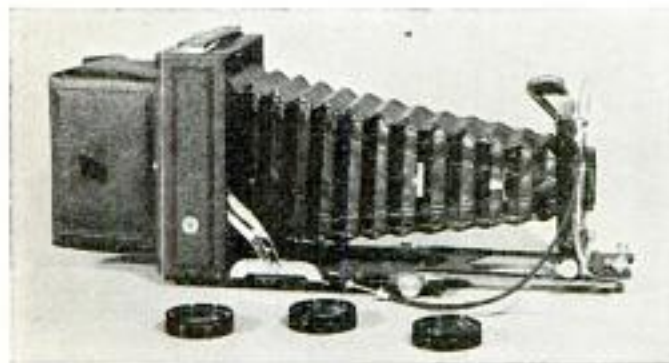
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SCREEN PICTURES 30,000 TIMES the area of the tiny 8 mm. film images are still clear and brilliant when projected with the Kodascope Eight, Model 60, which gives illumination adequate for a screen 22 x 30 inches. This fine projector has a lamp rheostat, automatic room-light switch, high-speed automatic rewind and still picture device. Price, \$75, with case.



A VERSATILE CAMERA. Besides permitting close-up work with the regular lens (see above at right), the long bellows of the Kodak Recomar makes possible the use of inexpensive auxiliary lenses for telephoto effects. With a short focus auxiliary lens, the Recomar will take an extremely wide angle view or picture small objects almost twice natural size. Other Kodak Recomar features are the focusing hood, direct and indirect finders, 8-speed Compur shutter, and adjustable front. Recomar 33 ($3\frac{1}{4} \times 4\frac{3}{4}$), \$48; Recomar 18 ($2\frac{1}{4} \times 3\frac{3}{4}$), \$40. Auxiliary lenses, \$3.50 each.

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LONG BELLOWS BRINGS SUBJECTS CLOSER. How Kodak Recomar close-ups compare with ordinary camera close-ups is shown in the toy-dog pictures at the right. The upper represents an ordinary camera close-up (4 ft.)—the lower a Recomar close-up (1 ft.). Kodak Recomar's advantage lies in its long bellows which permits picturing small objects up to natural size with the regular lens.



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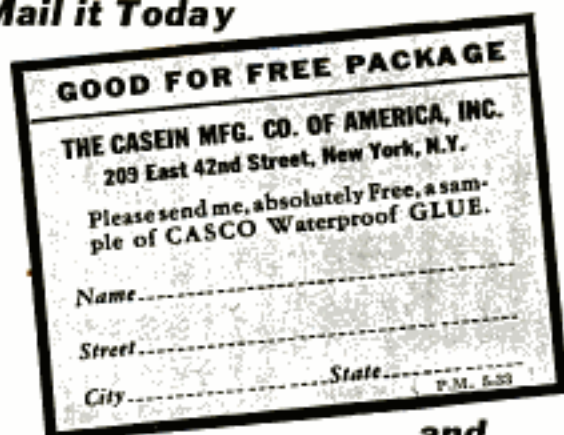


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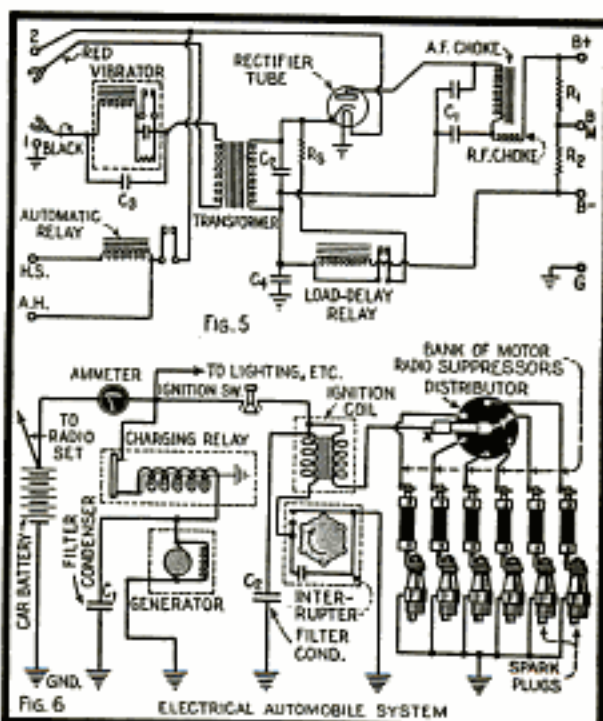
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B-ELIMINATOR FOR YOUR AUTO RECEIVER

(Continued from page 793)

others have the positive side of the battery grounded. The "hot" lead is the ungrounded one in either case. The connecting cables are shielded, and the metal



sheath of the B-eliminator output cable is grounded. It is necessary that the eliminator case be securely grounded to the frame or any other grounded metal part of the car.

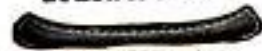
The hot set lead goes to the H.S. terminal of the eliminator and the hot battery lead to the A.H. input terminal of the eliminator. If the hot side of the battery is positive, the flexible red lead, indicated in the circuit diagram Fig. 5, goes to terminal No. 2 on the input A-terminal strip. If the hot side is negative, the red lead goes to terminal No. 1. In either case the black lead goes to the remaining input terminal.

The negative radio-set lead goes to the B-negative terminal of the eliminator, and the positive to the B-positive terminal. If the radio receiver has an intermediate voltage tap, it is to be connected to the BM 90-volt terminal on the eliminator. The post marked G is for the cable-sheath ground. Some auto radio receivers have only one B-lead which is positive, the neg-

(Continued to page 125A)

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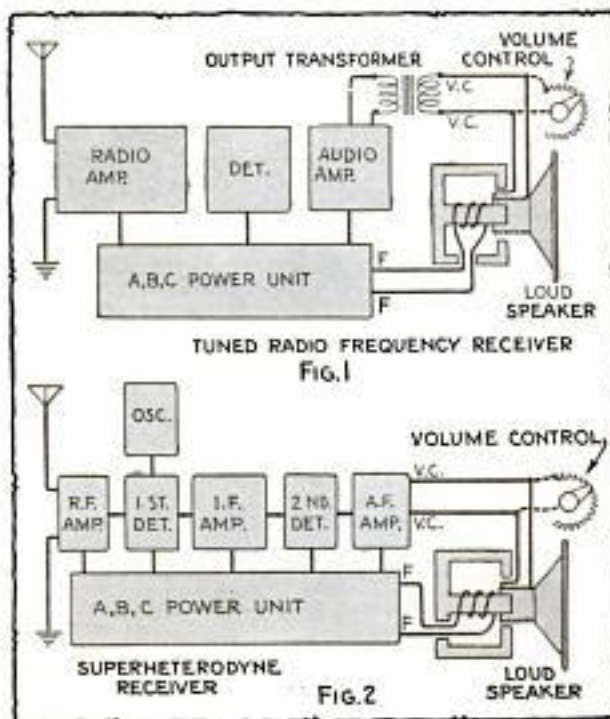
Vest-Pocket Resistance Indicator

(Continued from page 794)

ly show the required value for replacement. It consists of a 100,000-ohm variable wire-wound resistor with a calibrated scale. The useful range may be extended by adding fixed resistors of known value in series with it.

Added Volume Control Reduces Hum

Most a.c. receivers, especially those built a year or so ago, have an objectionable hum when the set is operated at low volume. The usual volume control operates



on the antenna or r.f. circuits and the hum in the set has a fixed level. An additional volume control, that may be easily installed to work with any dynamic speaker, will reduce the hum level in proportion as the volume of the signal is reduced. The new volume control consists of a 25-ohm variable resistor connected across the voice coil as indicated by the dotted lines. The voice-coil leads are easily traced as they go directly to the diaphragm, or cone, of the speaker. These wires are usually color coded. Diagram Fig. 1 applies to all sets where the output transformer is not in the audio amplifier and Fig. 2 shows the voice-coil leads coming direct from the audio amplifier. The control may be mounted under the console at front by means of an angle bracket.

ANYTHING LEFT TO INVENT?

(Continued from page 711) *C250*

poetry is. It is conceiving the solution of a problem in your mind. The inventor must be able to visualize his idea, see it before it takes shape materially."

Sometimes the original idea comes as a flash, quite by accident and without any conscious effort on the part of the inventor. Doctor Thomson told how he discovered the principle of electric welding by chance.

He was lecturing before the Franklin Institute, in Philadelphia, and had set up apparatus to demonstrate that all forms of electricity listed in the textbooks are essentially the same in nature. During the experiment, and following a discharge of high tension from a series of Leyden jars, Professor Thomson found that the ends of the primary wires through which the current had been discharged were welded together, so firmly indeed that it took considerable force to pull them apart.

"From that moment," he related, "I understood how an apparatus could be made to weld metal electrically. I kept the matter in mind, and at the first opportunity, a few years later, I built the apparatus itself, and the original is now in the National Museum in Washington."

Another of Doctor Thomson's epochal inventions—the discovery of the principle of the electric transformer—came as incidental to a lecture. It was while he was a teacher in the Boys Central high school in Philadelphia that he hit upon a combination that would step up electrical currents from one pressure or voltage to another, and this device has become fundamental in all our long-distance transmission of electric power. Without it, our modern lighting systems could hardly function.

The successful inventor of today needs to be highly trained, and tomorrow's inventor must be even more so. The garret genius still has a chance, but he must know his stuff. "In particular he needs chemistry, physics and mathematics," explained Doctor Thomson. "These three are now so interwoven that it is difficult for one to grasp even superficial aspects of the physical sciences without them. Discoveries will continue to be made by accident, and inventions will continue to

(Continued to page 121A)



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Adding a Remote Speaker

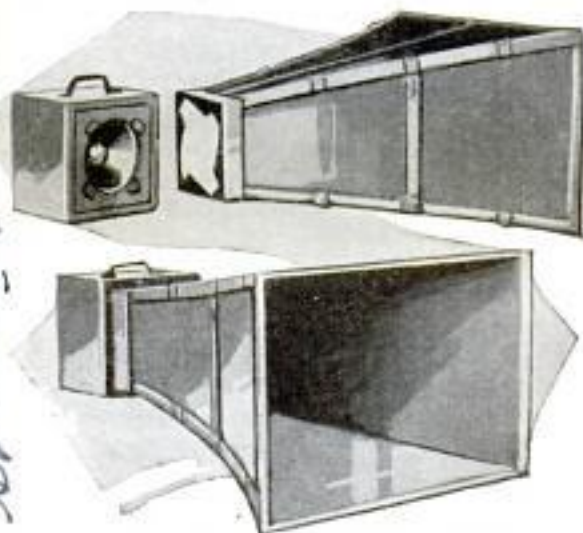
(Continued from page 796)

small d.p.s.t. switch mounted at a convenient point on the console. Flexible insulated leads are run from this switch, as shown in the hookup diagram, to two fixed condensers, inside the cabinet near the output tubes. A lead from the remaining terminal of each condenser goes to the plate prong of the push-pull output tubes. These leads terminate in round-hole soldering lugs that slip over the prongs, after which the tubes are inserted firmly in their respective sockets. Regardless of the type of output tubes employed in the set, all that is necessary is to locate the plate prong indicated at P in the lower sketch. The fixed condensers may, or may not, be required to protect the magnetic speaker. If they cut down the volume of this speaker, remove first one, and then the other if necessary. This hookup will not injure the receiver or decrease its volume.

B 3091-A

Portable Horn Packs in Small Space

A dynamic cone-type unit and portable horn is now available for public-address purposes. Weighing only 41 pounds, it may be easily handled and hung in posi-



Portable Demountable Horn and Speaker Unit for Use in Public Addresses

tion by fastening a wire to eyelets on the horn and the handle of the speaker-unit housing. It is claimed to operate on 1 watt and is powerful enough to handle up to 9 watts. The unit housing is detachable from the horn and can be easily removed without the use of tools, thus permitting the nesting of horns in transportation. A wire screen protects the cone.

Wright, De Coiter
Inc. 2233
Amesbury

2233 Amesbury Ave. Portland, Me.

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ANYTHING LEFT TO INVENT?

(Continued from page 119A) *c260*

come through impulse; but when they occur, one must be able to recognize the fortunate accident and to see the significance of the vision."

It was Professor Thomson's knowledge of chemistry, for example, that enabled him to sense the necessity of using pure silver—instead of the more convenient and available coin silver—in his electric meter. This one detail spelled success in an invention for which many other inventors were competing.

"One of the developments that lies ahead," thinks Doctor Thomson, "is the application of electricity in fighting diseases. Drugs will become less valued as man discovers the hidden electrical properties of the process we call life, and as he finds electrical means of righting disorders in these living electrical systems. The recent application of high-frequency electrical fields to induce fevers and to cause other changes in bodily condition, is only the beginning of a whole new science of medicine."

It is well known that few people can hear sounds of a frequency exceeding 10,000 vibrations per second, and similarly few experience any electric shock from a current of 10,000 cycles. When such an electric current is circulated between the thumb and forefinger of one hand, Professor Thomson pointed out, that portion of the hand becomes insensible or numb. A knife may be used to cut the flesh without any particular pain or sensation. Thus the rapidly oscillating current acts as a local anæsthetic. The effect is already applied in certain delicate surgical operations.

Doctor Thomson feels that the inventor of the future will not be a single-track specialist; but broad-gauged, not only acquainted with many fields of science, but with interests also beyond science. Certainly Thomson himself exemplifies this type: he is an artist, with some paintings in oil to his credit; he is a musician, who not only plays, but makes his own musical instruments, including a pipe organ; for many years he has been an exceedingly skilled photographer.

Thomson conforms to the inventor type also in being an optimist. He believes in the future. And believes in the future of science.



How he got the oilstoning idea in

"WE had a big order for radio cabinets to be filled in four days. I took on nine new men because the mortised edges on the veneer panels were not clean mill work. Hand work with chisels was needed to make perfect joints. I gave every man an *oilstone*."

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"Well—it worked! I am inclined to believe that half the dubs are poor workmen because they never got onto the Big Truth about *oilstoning*."

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KILLERS OF THE ROARING ROAD

(Continued from page 677)

didn't worry me. I just kept going around at the average speed that I figured would win. The law of averages showed that anyone who went faster than I did was flirting with mechanical trouble. At last year's Indianapolis race, only fourteen of the forty cars that started were able to finish. The system doesn't work out every time, but over a number of races it is sure to bring you into the money."

Every time a change is made in the design of a racing car, the driver must modify his style to fit the change. Front-wheel-drive cars handle differently from rear-wheel drivers. The four-wheel machines, too, handle differently. Highly streamlined bodies present an unexpected problem, Hartz says, for, with the air resistance so drastically reduced, the car seems to free-wheel when the driver takes his foot off the accelerator. "Stubby" Stubblefield, who drove the only thoroughly streamlined car in the 1932 Indianapolis race, was forced to shut off far back on the stretch to keep from entering the turns at too dangerous a speed.

What tips can a race driver give to increase the performance of the average car? Not as many as in the past, Hartz believes, because the factories are now turning out cars already adjusted for maximum performance.

"The main thing," he says, "is to maintain the engine in good condition, properly tuned up. Keep the carbon down and see that the ignition points and spark plugs are clean. It is usually possible to lean down the carburetor mixture for economy without impairing performance. Never let the engine detonate. With the spark adjusted for maximum power, you should use a gasoline that doesn't knock at that spark setting. But that's about all you can do. The factories are building such superior cars these days, that I think the day is approaching when stock cars will be used almost exclusively in the major races."

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

KEEPING SHIPS FROM GETTING "LOST"

(Continued from page 685)

nearly every voyage is smooth. The storms are still present, but navigators have learned to outwit them. "Storm strategy" has become a practical science. A comprehensive weather-reporting system between ships and shore stations enables meteorologists to rapidly determine the size and movement of a storm center. Captains, acting on this information, can "make their own weather." Even a detour of 500 miles to dodge a typhoon is preferable to exposing a ship to the hazard of plowing through it.

Hyper-accuracy of navigation almost brought about a mid-ocean disaster a year ago. Once a month, a ship bound for Honolulu crossed the track of another en route for Australia. Trip after trip, so accurate was each captain's navigation, the vessels passed within two miles of each other. Eventually, one foggy morning, each sighted the other only in time to sheer off to avoid collision. Now, for hours before they meet, each ship takes radio bearings of the other to avoid too close a crossing.

Unlike the Atlantic, where every reef has been accurately charted, little is known about great areas of the Pacific. Only the largest South Sea islands appear on the charts. Vessels that leave the beaten steamer tracks must proceed cautiously to avoid submerged rocks. Between the Aleutian islands in the north and New Zealand in the south, there are areas where charts only a few years old are out of date. Captains find that depths of water have changed. Occasionally an island disappears beneath the waves or a new body of land rises.

In order to bridge the long distances that separate the eastern and western shores of the Pacific, American naval architects have evolved a new type of vessel that compares with the tremendous transatlantic liners as a swift cruiser compares with a ponderous battleship. The "President Coolidge," one of the new Dollar liners, has the privilege of carrying a broom at her masthead to signify that she sweeps the seas, having made the run from Yokohama to San Francisco in the record time of twelve days. New Zealand is now only

(Continued to page 128A)

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HIGH OR LOW WARFARE IN SKY

(Continued from page 731)

electric flying suits, face masks and oxygen tanks and flying formations at altitudes between 25,000 and 30,000 feet. Squadrons have vied with one another in getting a few hundred feet higher with their supercharged motors and in the closeness of the formations they could hold in the thin atmosphere.

Another reason for high-altitude flying is the element of surprise. Planes are supposed to be able to slip over places at great altitudes without being detected until it is too late, and by so doing they will get the "power of position." This was a great thing during the war, the highest plane holding an advantage on all lower ones.

In those days pursuit planes would get altitude, make a long dive straight at enemy planes at high speed and, during the few seconds of close approach, empty their machine guns. When the burst of fire was over, the pursuers swerved and kept on diving to avoid the fire from the enemy planes. This was especially the practice if the enemy planes happened to be a superior force. If the forces were about equal, a big "dog fight" would ensue, and the planes would circle and maneuver until they got close to the ground. They always lost altitude in these fights, but the plane which got in the first burst of fire always had the advantage at the start. It was up to the "under dog" to shake off the pilot higher up, who usually clung to his opponent's tail and put in pot shots every few seconds.

But those days of losing altitude in maneuvers seem to be gone forever. Planes now can stand on their "props." They can gain altitude on loops, barrel rolls, Immelmann turns and wing-overs. For this reason, proponents of low flying claim that the idea of gaining great height for a better fighting position is all wrong. Planes now circle and maneuver faster than the human system can withstand. Most of the modern pursuit planes must be throttled down for ordinary maneuvers. A snap roll in one of the fastest pursuit planes at full speed probably would mean a snapped neck for the pilot.

On account of machine-gun batteries carried on modern bombing planes and the resulting superiority of fire, advocates of

(Continued to page 126A)

B-ELIMINATOR FOR YOUR AUTO RECEIVER

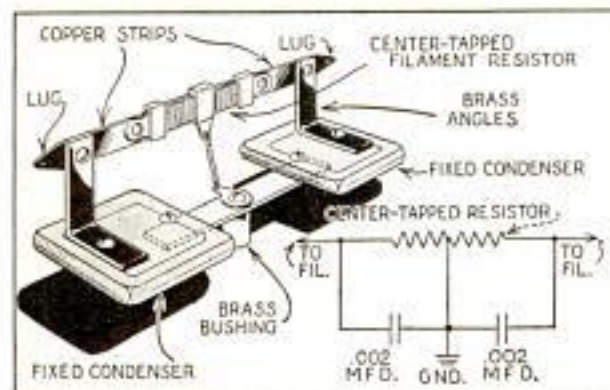
(Continued from page 116A)

ative lead being the metal shielding. In this case, the shielding should be connected to the B-negative terminal and also to the G-terminal of the eliminator. The parts for B-battery eliminators of this description are available in kit form, and this is desirable as they are of special design at this time and must be just as specified.

Suppression of electrical noises caused by the ignition system of the car may well be taken into consideration at the time the auto receiver and B-battery eliminator are installed. The necessary suppressor-resistor units for inserting in the spark-plug leads and in the main distributor head are shown in the photo at the lower left on page 793. The usual electrical automobile system is shown in Fig. 6 with the suppressor-resistors in position. The resistor held in the hand, as shown in the photo and indicated by X in the diagram, is for the distributor head. Condenser C₁ in this diagram is a 1-mfd. heavy-duty type connected across the generator. For best results, this condenser should be located as close to the generator as convenient. Condenser C₂, connected from one terminal of the ignition-coil primary to ground, is also a 1-mfd. heavy-duty type.

Compact Resistor-Condenser Assembly

When necessary to use a center-tapped filament resistor and by-pass condensers, the assembly should be as compact and rigid as possible. The method indicated in the illustration is self-explanatory, and



the hookup is given at the right. The ground connection is made at the brass mounting bushing.

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1843 No. Pitcher St.
KALAMAZOO, MICH.



HIGH OR LOW WARFARE IN SKY

(Continued from page 124A)

low flying, as well as the bombing pilots, claim that it is almost suicidal for pursuit planes to dive at bombers in close formation. They consider the most effective way to bring down bombers is to get beneath, zoom up and, while hanging on the "prop" with their powerful motors, riddle the big bombers. Bombing planes have machine guns which shoot downward, but most of the batteries are arranged to shoot upward, on the theory that pursuit must dive at its target.

During the last days of the world war, bombing and observation planes used to get close to the ground to foil the attacking pursuers. Sometimes they would get behind a tree, literally, to escape. With planes flying low, pursuers must circle and fire like Indians around a wagon train in the old Wild West.

Photographing planes, using cameras with telephoto lenses, can afford to fly high so the pilot and photographer may work at leisure. Pilots could ride in a sealed ball if desired.

But bombers which ascend to great heights must have motors with expensive, delicate and dangerous superchargers. And a large percentage of the weight-carrying capacity is cut down when high altitude is attained.

Low-altitude proponents claim that, by skimming the tree tops over a chosen route, only a few people see and hear the planes on their way to the target. At intermediate heights, all the countryside can see a formation of planes and mark its course. Another advantage of low flying by bombers is in the accuracy of hits.

While planes offer a bigger target when flying low, ground guns have only a few seconds in which to fire. The bigger anti-aircraft guns cannot be swung around fast enough to get accurate aim, and gunners are demoralized by bombs bursting on all sides. Rifle fire is the most effective weapon against low flyers.

Low-flying bombing planes shooting gas shells ahead can lay their smoke screen down a few seconds before they arrive over the target. And it is in these few seconds that the work of bombing is done. It is much easier to see objects on the ground in a smoke or haze from the air

(Continued to page 128A)

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HIGH OR LOW WARFARE IN SKY

(Continued from page 126A)

than looking upward through it. Many excellent pilots have ceiling limits just as motors. If a pilot makes "AA" in his oxygen test, it means that he can fly up to 20,000 or 25,000 feet—when he is properly toned up. This is supposed to be the highest anybody can go without taking oxygen. Many pilots have entries on their medical records showing that they are not supposed to fly over 5,000, 8,000 or 10,000 feet. Medical officers warn them of the danger in exceeding their physical limit.

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(Continued from page 123A)

sixteen days away from Los Angeles. The new vessels average 25,000 tons apiece, are 500 to 650 feet long, and cruise at twenty-one knots. Among those recently launched or placed in service are the "Santa Paula," "Santa Rosa," "Santa Elena," and "Santa Lucia" of the Panama Mail; the "President Coolidge" and the "President Hoover" of the Dollar Lines; the Matson liners "Mariposa," "Monterey," and "Lurline"; and the "Chiriqui," "Talamanca," and "Antigua" of the United Fruit fleet. Since these new merchant cruisers are built to specifications approved by the navy, they can be transformed into long-distance commercial raiders or shifted to transport duty almost overnight.

Certain parts of each ship have been strengthened in accordance with navy practice, under the provision of the merchant-marine act, and foundations for heavy armament built in. Engine-room crews enter the boiler rooms through air locks, as the atmosphere is kept under pressure to maintain a forced draft.

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NEW METALS TO REMAKE THE WORLD

(Continued from page 740) *286*

Since the dawn of man's history, heat has been all-important in metal working. Now, however, it is known that metals act queerly under intense cold. Many secrets may be revealed if the reaction of crystals to abnormally low temperatures can be watched. Under the direction of Professor Goetz, a cryogenic (cold) laboratory has been completed. Here, by successively liquefying nitrogen, hydrogen and helium, a temperature of 453 degrees Fahrenheit below zero is attained. Only a thimbleful of liquid helium is manufactured, but it is enough to hold this "out-of-sight" temperature, the lowest ever attained by man, and only one degree Centigrade from absolute zero.

Electrical resistance, the opposition to the passage of electrical current through a substance, ceases when a metal becomes intensely cold. This phenomenon is called "super-inductance." At low temperatures, atoms tend to draw closer together, thinks Professor Goetz. Then, the ability of the metal to transmit electrical current increases until it approaches instantaneousness. Even such normally poor conductors as lead and tin, at temperatures of minus 350 degrees Fahrenheit and below, are equal to the best conductors known.

Science has taken advantage of this ability to ship current by parcel post.

It's like this: Electricity is induced into a ring of lead which has been chilled to a very low temperature. This ring is then packed in a well-insulated box with a bit of liquid helium to help maintain the inner cold. Thus packed, the ring can be shipped and the receiver can use the electricity it contains. And what is also important, providing the cold in the shipping parcel is maintained, there is no loss of electrical energy in transit!

It is predicted that the time is near when the trapper in his hut in the far north, the miner away from civilization, and the farmer isolated from power lines will receive regular supplies of electricity by post. In fact, Doctor Goetz believes that, through the study of metals, crystals and atoms at extreme cold temperatures, may be wrought as many wonders as have been attained by man's previous work with heat.

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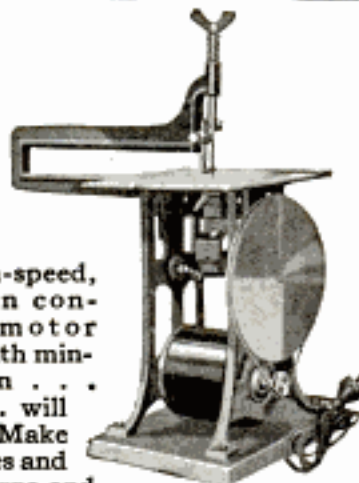
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AERIAL FERRIES—THE BRIDGES OF THE FUTURE

Key units in American industrial life as John A. Roebling's Sons company, builders of Brooklyn bridge; the Great Lakes Dredge and Dock company, which reclaimed from Lake Michigan all the land on which the exposition stands; the Otis Elevator company, which installed the elevators in the Eiffel tower; the Inland Steel company and the Mississippi Valley Structural Steel company. Robinson and Steinman, designers and engineers for the sky-ride, were the designers of both the Manhattan and Delaware bridges.

Dr. D. B. Steinman of the latter concern expressed his vision of the future for this type of structure in these words:

"This structure will mark the opening of a new era in bridge designing. It is much cheaper to erect; it can be built faster; it will enable us to build longer spans, and it will be just as practical as the standard-type bridge now generally used. It demonstrates for the first time that steel is most efficient when it is at tension, and that the cables used have four times the strength of steel members.

"These are the highest steel towers in the world in which welding is employed exclusively in the fabrication, and this use, to date, is the most important advance in the development of welding processes. The span is 1,850 feet long and it would require only more time and material to make one ten times as long—in other words, more than three miles."

C. C. Sunderland, chief engineer of the bridge division of John A. Roebling's Sons company, and his assistant, Capt. Charles M. Jones, confirm this opinion in the following statement:

"While ostensibly an amusement attraction de luxe, to those of us who have been closely associated with its conception, design and erection, this sky-ride is far more. The stupendous cost of present-day long-span bridges, coupled with the fact that on rare occasions only are they used to capacity, brings to mind the question as to whether or not this lighter and cheaper type of structure cannot be erected in localities whose traffic demands do not warrant the expenditure required for construction of a long-span bridge. The sky-

(Continued to next page)

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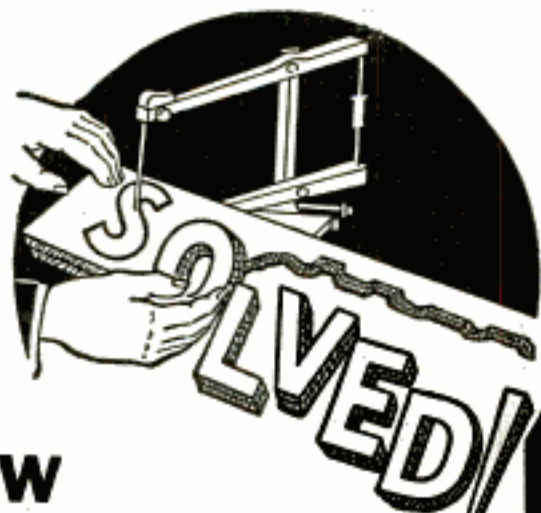
ride is a step in that direction. These sky-ride cars, fully loaded, weigh approximately 14,000 pounds, about one-third of which is pay load. For utility purposes only, the ratio of pay load to gross load can be substantially increased, and, of course, cable sizes can be increased should greater loads require it. The sky-ride cars are to be dispatched at one-minute intervals, but this too can be varied to suit the traffic demands. It is evident that this novel method of long-span transportation has possibilities, the realization of which only the future can demonstrate."

The goal at which these men, who are making a giant amusement out of a colossal idea, are really aiming is summed up by Joshua D'Esposito, chief engineer of construction.

"The cost of an aerial ferry," says Mr. D'Esposito, "would be about one-tenth the cost of an ordinary bridge with a similar span. The capacity of a standard-type bridge is seldom used, yet it costs just as much to build a bridge for one car as it does for 10,000 cars. The sky-ride is simpler than a bridge in design, although it presents many different problems.

"The matter of ultimate cost is going to be the deciding factor in future public improvements. There are many locations now sadly in need of bridging, but no money, or insufficient money, is available for such work. With this new design, engineers can offer capable bridging at low cost. We are entering an entirely new field in bridge construction, and the towers of this sky-ride will stand in the minds of bridge engineers as a monument to a new principle."

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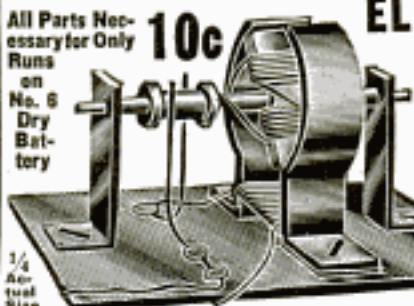
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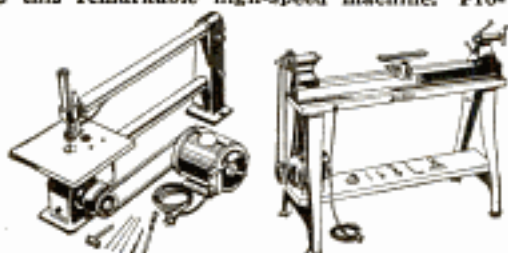
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ILLUSION:

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EXPLANATION:

Heat rises. When Chabert entered the oven he hung the steaks *above* the fire, then dropped to the floor at the *side*, covering his head with a hood made from his shirt. He breathed through small air holes in the floor.

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