

HOW GOOD A DRIVER ARE YOU?

POPULAR MECHANICS

★

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, NO. 410426

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SEE PAGE 538

FLYING FREIGHT TO THE ARCTIC

CAR OWNERS

Guilty

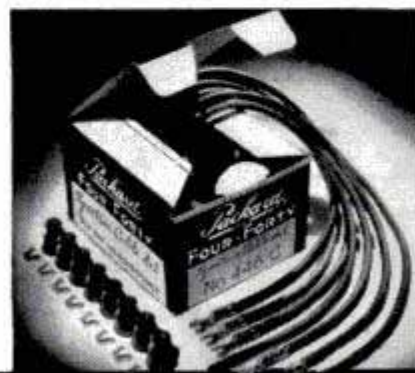
OF NEGLECT



Guilty of neglect . . . sentenced to drive a car that uses too much gas, has no pep, starts slowly, and may even break down completely. All because the punishment taken by those life-giving wires under the hood was overlooked. Here the spark plug wire insulation is cracked by engine heat and outdoor cold; rotted by oil, water and age; worn by abrasion; oxidized by the ozone from corona. The resulting leakage in current causes cross-ignition, fouled spark plugs, wasted gas and poor performance. *When spark plug wires need replacing, nothing else you can do to your car will make it perform satisfactorily.* So don't neglect your spark plug wiring. Replace worn, old and oil-soaked wires with Packard FOUR-FORTY—a new kind of wire—employing a man-made inorganic rubber that provides far greater resistance to heat, cold, oil, moisture, age, abrasion

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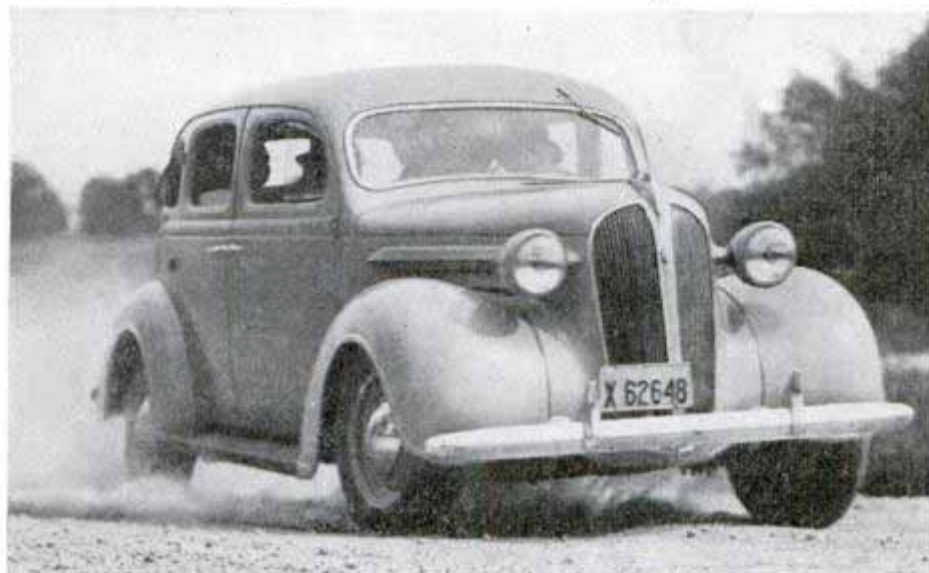
Every Detail Inside the Car Recessed or Padded or Redesigned for Protection of Passengers

HERE'S ONE of the most interesting improvements in 1937 automobiles... the handsome, new interiors of Plymouth cars... designed and planned for safety, as well as beauty.

This has been done, as a result of clinical research, to eliminate minor mishaps inside the car... bruises in case of sudden stops... torn clothing... barked knuckles.



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- ★ **EFFORTLESS STEERING**... responds to a touch... no sway on curves. Driving is really restful; parking's a cinch!
- ★ **NO SWAY ON CURVES**... rigid stabilizer at front end of extra-rigid frame keeps car on even keel... steady on the turns.
- ★ **SAFETY INTERIOR**... every detail carefully styled and designed for greater safety as well as beauty.



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B E L L T E L E P H O N E S Y S T E M



Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

April, 1937

Vol. 67, No. 4

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Why Is Jumbo Like a Lady?

"WHY is an elephant like a lady?" asked Eddie Allen, veteran animal trainer. "Well," we hazarded, "offer an elephant a chew of tobacco and he'll whale the daylights out of you. Offer a lady a chew and—ditto." "Wrong," laughed Eddie. "Elephants love tobacco." After while we tried again. "Here it is, Eddie," we shouted. "Elephants are scared of mice. So are ladies." "Wrong again," chortled Eddie. "Mickey Mouse himself couldn't scare the most timid elephant." So we gave up. And here's Eddie's answer. "Elephants," quoth he, "are like women because the average man doesn't understand either." We suggested that Eddie take his pen in hand and debunk this elephant business. Eddie obliged and his article next month will convince you, too, that "You're Wrong about Elephants."

Next Month

THROUGH our eyes we gain more than eighty-five per cent of our knowledge and control eighty per cent of our actions. Today, with more things to be observed than ever before, we are able for the first time to do some real seeing after sundown. In the May Coloroto section you will find the sequel to the modern lighting article in this issue. It is titled, we think, most appropriately, "—and There Was Light."

Pictures That Click

YOU might have been burned as a witch a few score years ago for producing out of a little black box the startling effects you can achieve with your camera today. An article next month explains some simple tricks of photography which will enable you to achieve unusual picture effects without any costly equipment.

A Bean Makes Good

WHAT is it you can find on the dining table, in a can of paint, on the floor, on the pages of your newspaper and on the soap dish? Give up? The answer is beans—soybeans. Few plants are put to so many uses today as this oriental legume of ancient lineage, and man still has not tapped all its possibilities. Read in the May issue how a humble bean has contributed so much to our comfort and happiness.

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This One



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Promoted—when others were fired!

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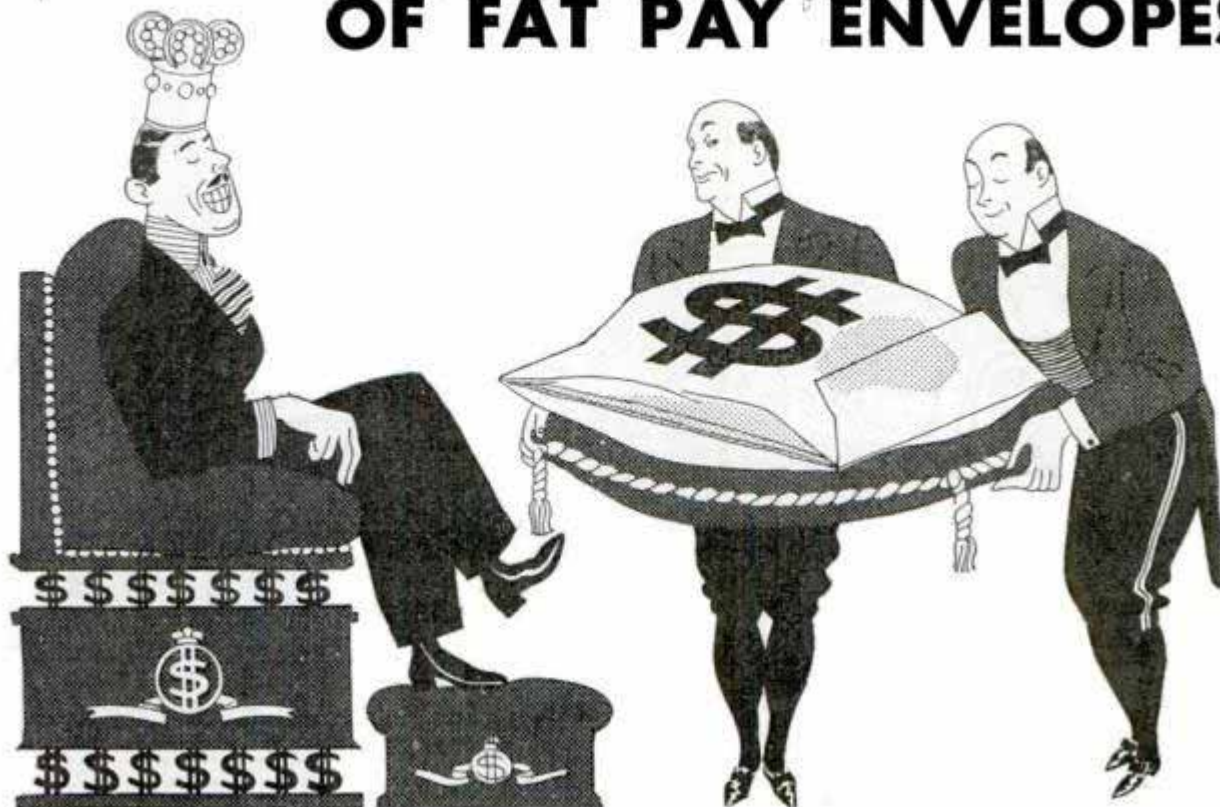
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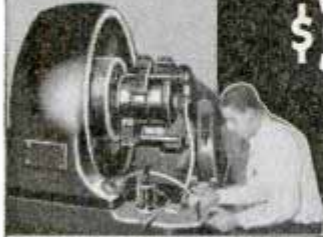
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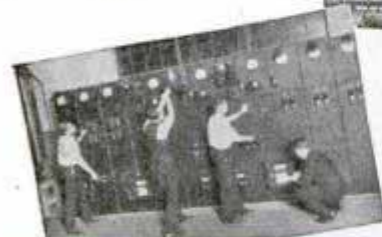
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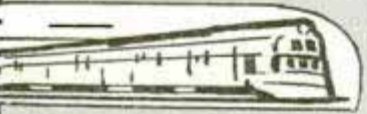
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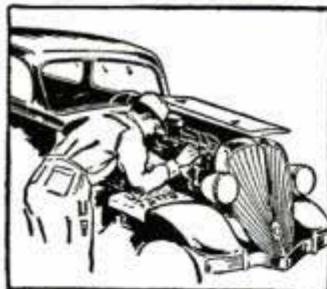
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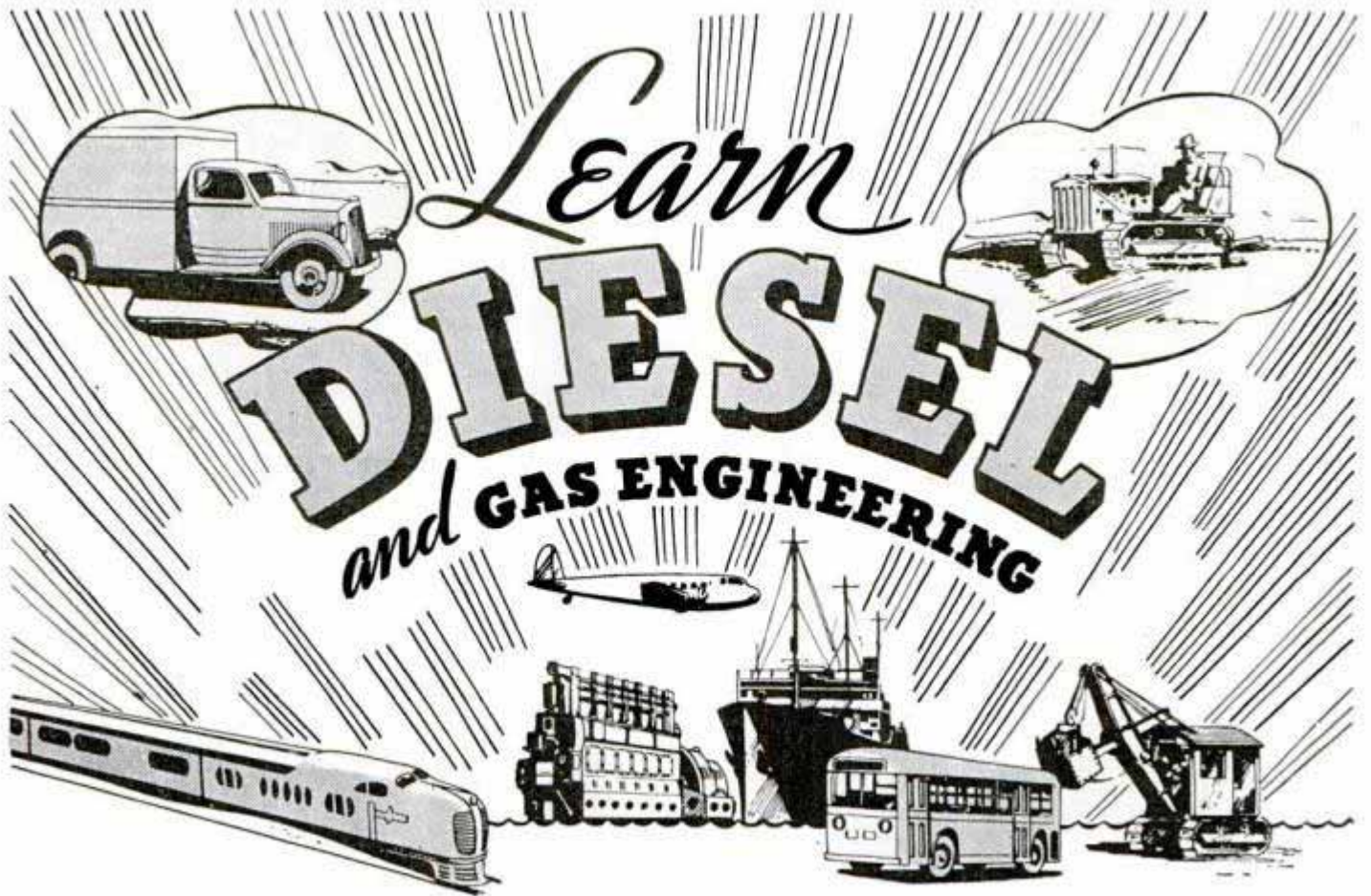
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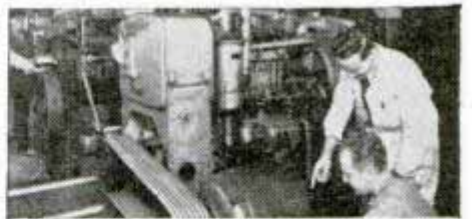
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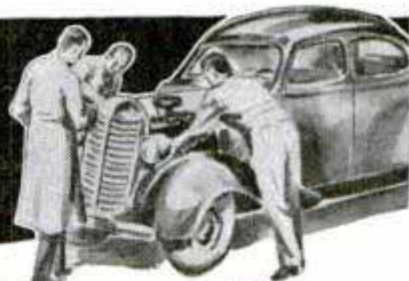
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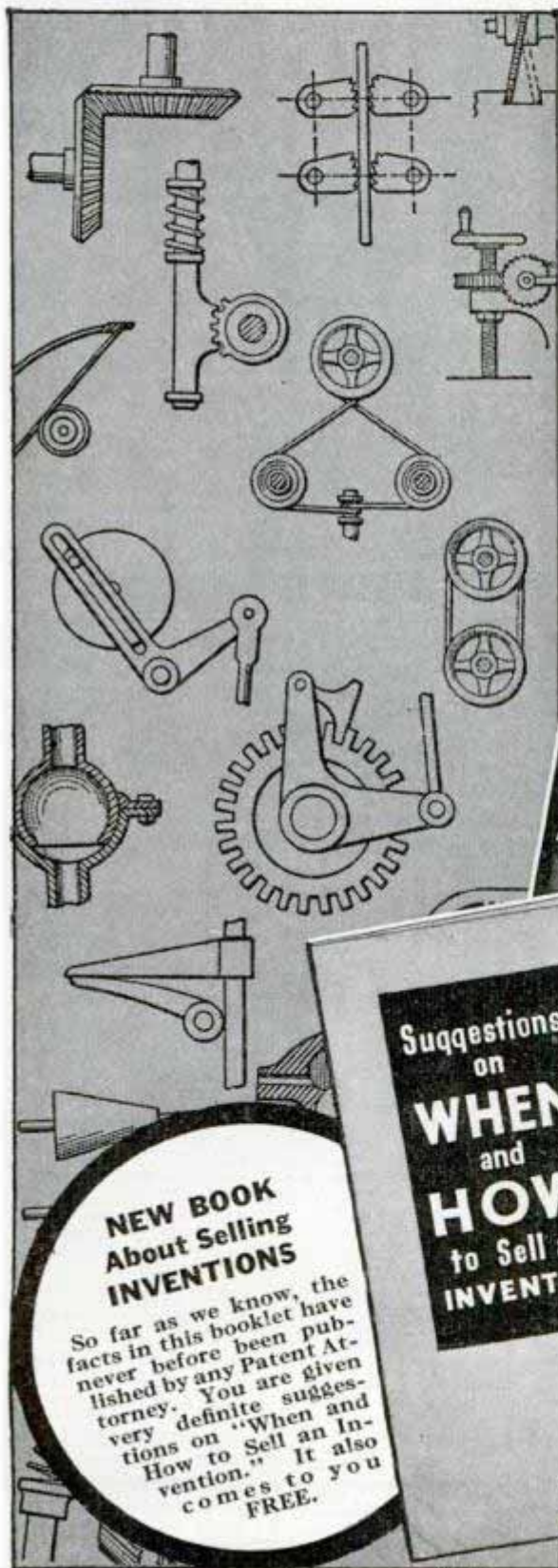
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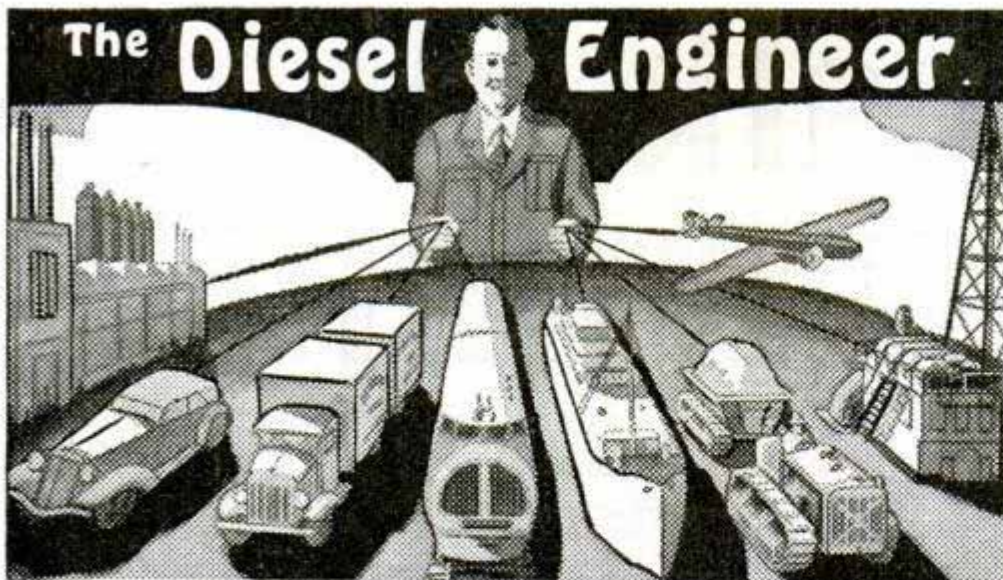
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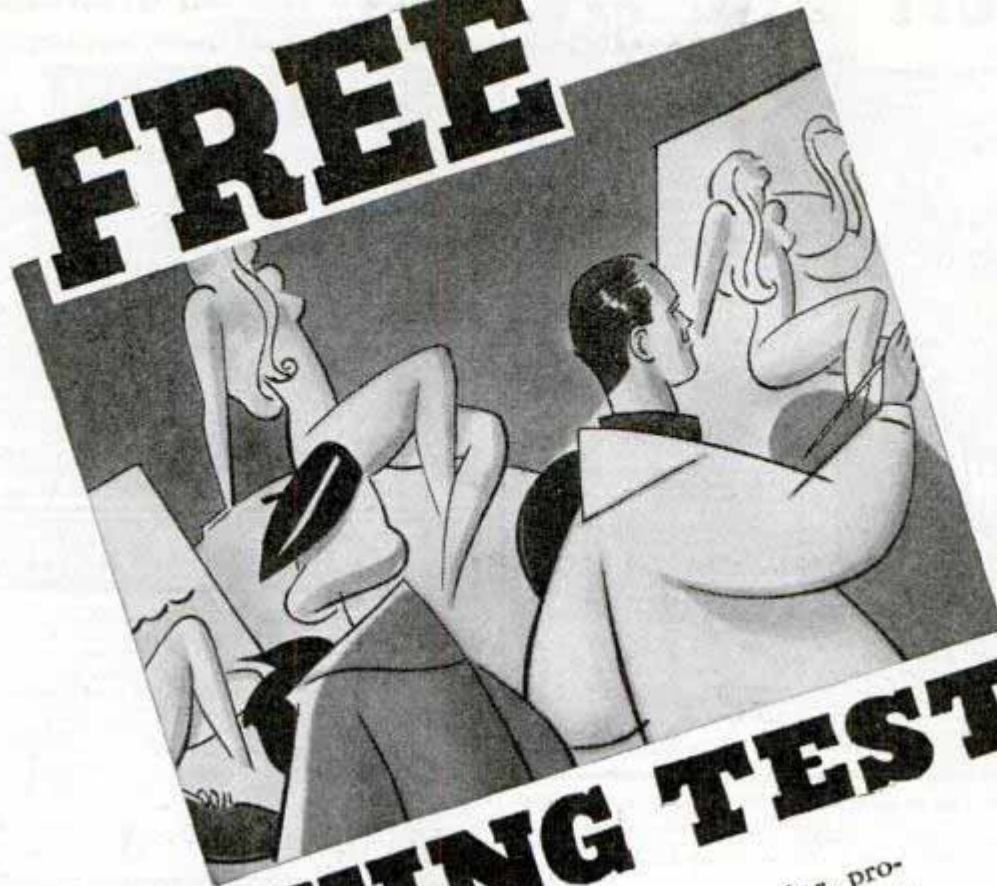
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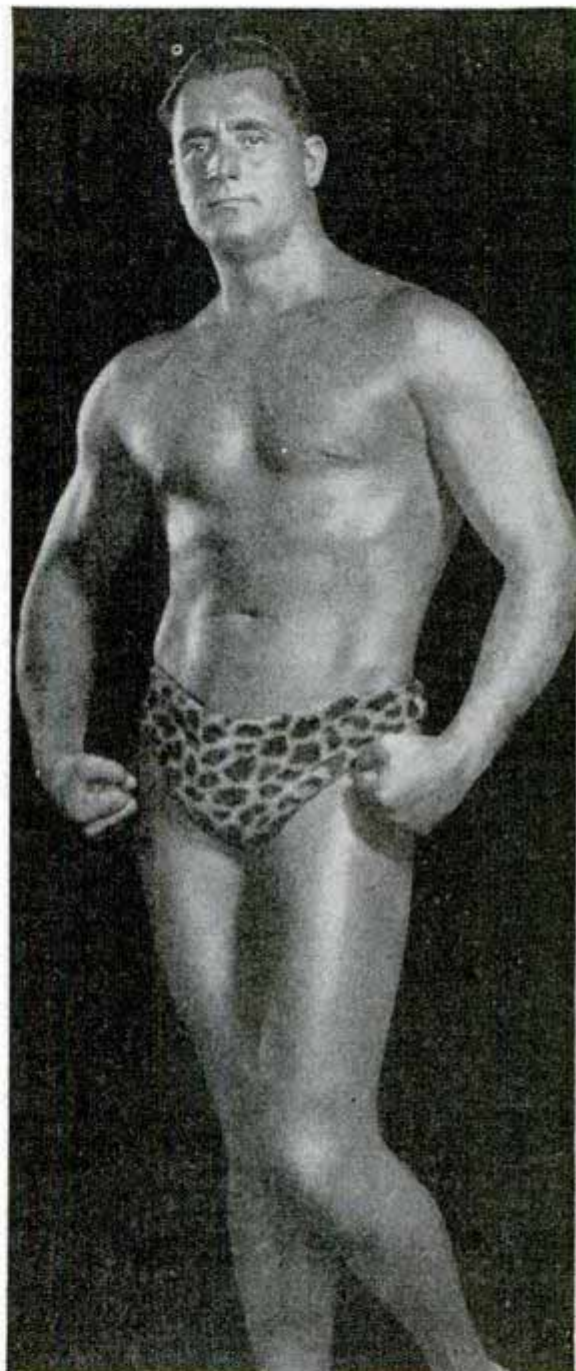
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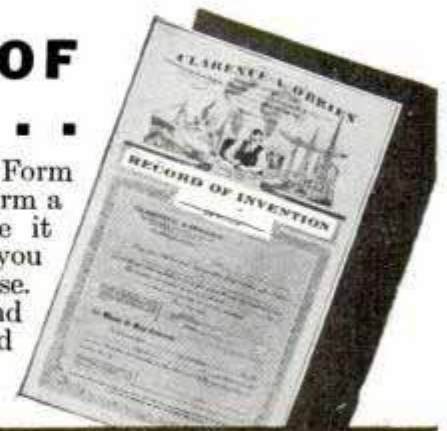
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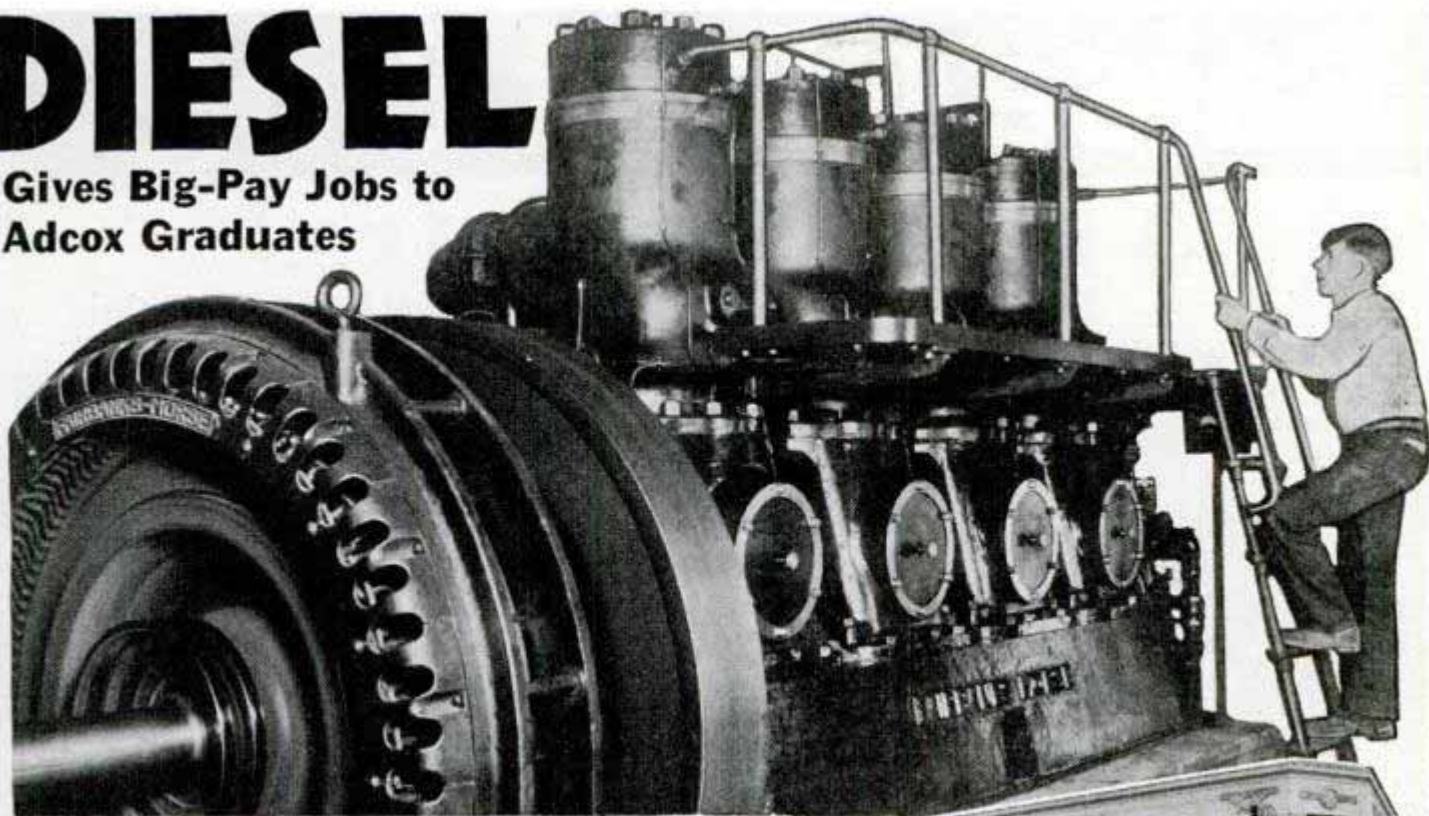


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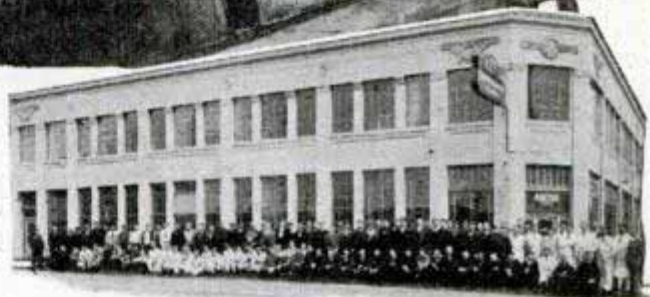
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(Continued to page 41A)

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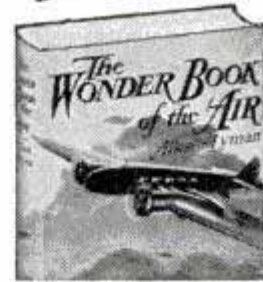
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(Continued from page 38A) *ES 127*

It is not unusual to overprint stamps of a near-by colony with the name of a new region to which postal service is to be extended. Such stamps are provisional and are in use only while the definitive stamps are being prepared. Very often a shortage in a special purpose stamp results in an overprint on the corresponding value of the regular postage stamps. This is especially common in the case of "Postage Due" stamps. There have been very few overprinted United States stamps in its extended postal and revenue history.

The first of the few were the overprinted stamps used in 1898 to provide revenue to finance the Spanish-American war. In 1928 three commemorative stamps were issued which were made by surcharging the regular stamps. These were the two-cent Battle of Monmouth, or Molly Pitcher issue, and the two-cent and five-cent stamps of the Hawaiian sesquicentennial issue. These are rather special overprints for they were made by the bureau of engraving and printing in the same operation which produced the stamps, and before the gum was applied or the perforating accomplished. By some they are looked upon as bicolored rather than overprinted.

In 1929, the United States again resorted to overprinting when the entire set of the regular issues from one-cent to ten-cents was overprinted with the state abbreviation, "Kans." or "Nebr." These overprinted stamps were produced in an endeavor to lessen the facility with which thieves could dispose of stamps procured in postal robberies, and such stamps were not to be accepted in quantity for the prepayment of postage outside the state for which they were overprinted. The idea was never carried beyond the experimental stage in the states named.

Many collectors have horror of surcharged stamps which has been engendered by the carelessness or premeditated viciousness of printers entrusted with overprinting. When the overprinting plates are carefully prepared and made up of electrotypes or stereotypes from a correct master die, and when the printing is in the hands of a watchful inspector, there will be no more trouble than with a regular stamp issue, but when the surcharging plate is typeset, there are varieties without end. Often various fonts and sizes of

(Continued to page 43A)

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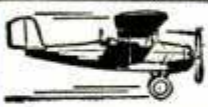
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(Continued from page 41A)

type are used, the alinement may be irregular with letters above or below the line, or letters fall out of the form. All sorts of errors are produced which reached a climax, perhaps, in one variety listed as being with triple surcharge, one inverted and one upon the back of the stamp.

In a few cases stamps have been made available for postage by surcharging them with inscriptions upon the back. Generally the stamps had previously received so many surcharges upon the face that further printing would have made them illegible. The fact that many people refuse to include surcharged stamps in their collections has been responsible for a lessening of the "errors" and varieties which were once foisted upon them, but such collections are not true mirrors of the philatelic history of the country, as many of the most important events of a nation's history are reflected in the stamps which must of necessity be overprinted upon a moment's notice.

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Also shown is one of a set of three stamps issued by Egypt to commemorate the Anglo-Egyptian treaty. There are three values in the set which went on sale last December. It is understood some values were sold out the first day of the sale. Two examples appear of the set of stamps issued by Colombia in connection with the national exposition at Barranquilla, 1936-1937. These show views of the exposition buildings. Two other Colombian stamps are part of a set issued in connection with the national Olympic games being held at Manizales.

(Continued to page 63A)

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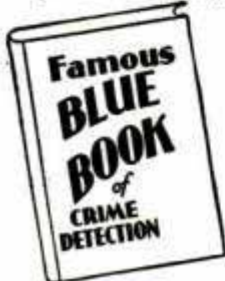
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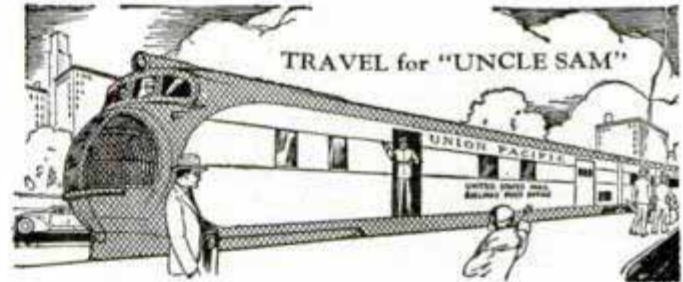
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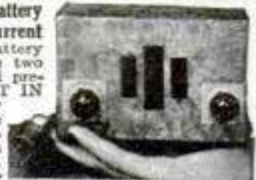
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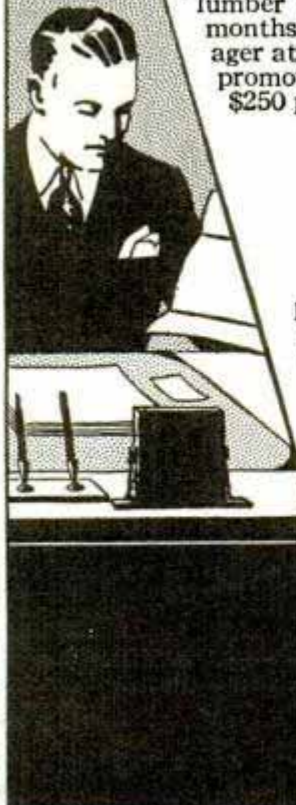
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SEND 25c For new illustrated chemical experiment book with over 300 formulas and tests. Also receive 32 page illustrated catalog of apparatus, microscopes, telescopes and chemicals free. N. Winn, 124 West 23 St., New York.

FREE Chemistry catalogs. Supplies at 5c! Equip complete laboratory. Send 10c (rebatable) for postage and handling. Kemkit Scientific Corp., 135P Johnson Street, Brooklyn, New York.

CHEMICALS. Laboratory glassware, apparatus. Send 3c for catalog CP. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, New York.

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

HELP WANTED

BEFORE You accept any job write for my offer—absolutely free, no obligation. Shows you independent way to make up to \$45 and more in a week. Send no money—just postcard. Address Zanol, 2360 Monmouth, Cincinnati, Ohio. Act quick.

USE \$500.00? Raise canaries for us. Free particulars. Crimmins, 3741-B 60th Street, Woodside, New York.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 24A.

AGENTS WANTED

HOLDS-UM Cement, (dry powder), holds anything, anywhere. Never shrinks, will not deteriorate, fireproof, waterproof. Mixes with water. Easy to use. Package, 20c. Dozen with samples and advertising, \$1.00 postpaid. Literature free. Holds-um Company, Royal Oak, Mich.

CASH Profits every day with America's fastest selling line of men's ties, priced 85c to \$6.00 doz. Over 100% profit. Leather ties, patented Slide-On ties, adjustable bat ties, money-making novelties. Every man buys! Write for catalog and free sample swatches. Boulevard Cravats, 22 West 21st St., Dept. M-35, New York.

BRAND New honey candy product starts national craze. Huge profits, big repeater. Clean up. Samples free. Send quarter covering postage, handling. Hurry! Honey-crisp, 126 W. Kinzie St., Chicago, Ill.

NO Competition. Money saving device. Usually saves customer investment in ninety days. 100% profit. White Electric, 632 Clifford, Lansing, Michigan.

FYLE-KOMB. File carried in comb. Just out. Sells quickly. Best quality. Sample 25c. Literature free. Fyle-Komb Co., Garrison, N. Dak.

SELL Extracts, household needs, dental creams, shaving creams, etc. Send for our special low prices. E. M. Strang and Company, 20 Wood Street, Willoughby, Ohio.

SALESMEN And distributors—Sell to mechanics, machinists, plumbers, metal workers and garages—"Universal Snips." Sale at every call. Write Grobette, 3 Park Place, New York.

500% PROFIT Selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PMM-52, Bradford, Pa.

MAKE More money taking orders: Shirts, ties, hosiery, raincoats, uniforms, dresses. Sales kit free! Experience unnecessary. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

RAZOR Blade conditioners—Smoother shaving, great invention. Bargain sample twenty-five cents. Charlton Corporation, Chicago.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 4-A, 4525 Ravenswood, Chicago.

LADY Friends enthuse over "Yearning" and "Full Moon" perfumes. Each \$1.00. Both \$1.75. Dealers—get prices. Louis Barlevy, 247 West 116th Street, New York, N. Y.

MEN And women make big easy money as our agent. New kind of cosmetics for colored. Free samples. Write Lucky Heart Company, Dept. PM-41, Memphis, Tenn.

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

CHIPPED Glass sign making; mirror re-silvering; metalware replating. Interesting. Profitable. Write Sprinkle, Plater, 128, Marion, Indiana.

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

AGENTS! Dresses 33c, men's suits \$1.50-\$2.00, shirts 46c, ties 6½c, chiffon hose 42c. Amazing prices. Big profits. Catalogue free. Aeme, AB-558W Roosevelt, Chicago.

400% PROFIT In new perfected (1937)—quick action self-starting no-flint cigar lighter. Retail 50c. Sample 25c. Get details quick on wonder seller. New Method Co., Box PM-52, Bradford, Pa.

\$6.85 HOURLY! Amazing No-Flatz fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. P-172, Cincinnati, Ohio.

SELL Social Security booklets. Sample and three way profit plan 10c. Stenger, 901 Bedford Building, Chicago.

450% PROFIT In perfected (1937) quick action automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMG-52, Bradford, Pa.

JOIN New profit sharing Guild Salesmen Association. Canvassers buy household products cheaper. Your own literature, latest premium deals. Paty Co., Dept. B, Somerville, Mass.

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

GOLDEN-GLO Gospel wall mottoes. 200% profit. 25c seller. Ten samples \$1.00. Finnell Co., North Manchester, Ind.

EARN 200% Profit selling Lak-tay, new mystery drink which replaces tea and coffee. Write for free sample offer. Lak-Tay, 1000 Bedford Bldg., Chicago.

SIMPLE Plan sells startling invention! "Vaposeal"—World's finest kitchen utensil! May make you independent! New, novel, different! Write R. Conway, 209 Church, Champaign, Illinois.

NEW Household product. Makes hardest household task easy. Amazing, fast repeating 25c seller. Women rave about it. Opportunity to pocket up to \$60 in a week with marvelous line of money makers. Everything sent on trial; no money risk. Details free. Albert Mills, 2366 Monmouth, Cincinnati, Ohio.

RAZOR Blades, neckties, shoe laces, etc., all big sellers. New bargain list. Heil Premium Co., M9, Gaylord, Minn.

MEXICAN Finest feather pictures, blankets, carved leather. Free particulars. Samples 10c stamps. Gampoco, Apartado 1176, Mexico City.

FREE Offer describes how to earn \$20-\$75 weekly, home-office. John Co., 104 Garfield, Brooklyn, N. Y.

AMAZING Ironing device. Saves electricity! Prevents scorching! Free offer. Iron-So-Ezee Company, Mt. Washington, Ohio.

NEW Discovery "Prevents-Runs" silk hose. Manufacturer, 1700 S. Ogden, Los Angeles.

GREAT Opportunity unique pants hanger. Sample 20c. Garden tool specialties. 1937 breadwinners. Hurry. Diamond Products, 4188 Union Pacific, Los Angeles.

WEBSTER Oil burner—gun type, for furnaces. Very economical. Opportunity for dealers. Webster Oil Burner Co., Barrington, N. J.

NEW Cleaner—Amazes everybody. Cleans everything. Washes clothes snow-white quickly. Spots, stains removed like magic. Startling demonstrator. Free samples make fast sales. Quick repeater. Immense profit. Write quick for "free sample." Super-X Cleaner Co., 11, Berwyn, Illinois.

MANUFACTURER Offers real opportunity. Big daily commissions. Liberal cash bonuses. Complete made to order shirt, neckwear, hosiery, pants line. Direct to consumer. Handsome outfit free. Experience unnecessary. Part or full time. Packard Corp., Dept. S-346, Terre Haute, Ind.

BIG Money selling old books, literature free. Fairmount, 9-11 Hester, New York.

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

WE Have lowest prices on razor blades. Gallen Blade, 8 Hixon St., Rochester, N. Y.

THYDRO-X (Extra miles). Fast seller! 25%-50% increases guaranteed! Tremendous profits! Automotive men—a million dollar market waiting. Particulars free. Thermo-P Works, Peoria, Ill.

PORTRAIT Agents, something new, Hexagon portraits, frames. Lowest prices. Booklet free. Picture-Man Friedman, Dept. 9, 528 Cornelia, Chicago, Ill.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 24A.

625,000 ARTICLES For sale cheap. Lists 10c. Duffy, Covington, Ky.

AGENTS. Start exterminating and sales business. Details free. Sanitary Products Company, Box 768, Waco, Texas.

LAWN Edger for trimming grass or sod from edge sidewalk. Salesmen earn \$10 a day. Send \$1 for sample. Squier Products Co., West Symmes Rd., Hamilton, Ohio.

MAKE Your own products!! Luminous paint formula—\$1.00. (Request needs.) T. Galluzzo, Wilkinsburg, Pennsylvania.

SELL Glas-Glo for windows, windshields. Glas-Glo, Phelps, N. Y.

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

CONSIGN Stores confection product. Sample free. Lorrac Products, Albany, N. Y.

TRANSPARENT Neon-like signs. Cost 4c—retails 25c. 1000 designs. Sample and 1937 catalog free. Lowy, Dept. 707, 8 West Broadway, New York.

AGENTS Get cash hourly. Thrilling new kind guaranteed silk hosiery plan. Start without experience. Full or spare time. Your hosiery free as bonus. Send size. Rush name. Wilknit, Desk 4B37, Greenfield, Ohio.

BIG Money applying gold initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1084 Washington, Boston, Mass.

MAKE Your own products. We sell formulas for highest quality toilet preparations, extracts and household specialties. Catalog free. Scientific Laboratories, 1950-W Broad, Richmond, Va.

ATTENTION Hustlers, clean up. Costs 10c. Sells for \$1.00. For particulars write J. M. Jones, 724 W. Trade St., Charlotte, N. C.

GOLD Reflecting window sign letters. Penny each. Large sizes. Easily applied. New styles. Absolutely beautiful. Free samples. Atlas Sign Works, 7941 Halsted, Chicago, Ill.

SALESBOARD Men—New put and take jars. Details, samples free. Tom Thumb, Dept. PM, Nauvoo, Ill.

MEXICAN Feather pictures. Unusual novelty, 50c (stamps) bring \$2.00 worth samples, details. Refunded if unsatisfied. Mexican Art, Apartado 1593, Mexico City.

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

AGENTS: Smash go prices. Santos coffee 12c lb. 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

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

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

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

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

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

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

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

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

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

COSTS 1c—Sells 25c. Make non-explosive cleaner from benzene crystals. 1c gallon. Sample 10c. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

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

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

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

HIGH-GRADE SALESMEN

NEED a new car? Aggressive salesmen who contact business firms can earn a new car this year with spare time commissions selling Glassarts and Silhouette Advertising. Old established firm. Top notch line. Weekly commissions. Write today, stating experience, territory covered, lines of business usually solicited, etc. Newton Mfg. Co., Box CK, Newton, Iowa.

WANTED—Men for good paying work with a large shoe company. Good pay every day. Free shoes as bonuses to "go-getters." No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. G3, Chippewa Falls, Wis.

LONG Needed invention—proved success. Ready for national distribution. Powerful demonstration. Every home, store, office, school, factory a prospect. Low price—long profit. Exclusive. Get facts quick. Write Barker, Box 604, Littleton, Colorado.

AT Last a new idea in shirts. Rosecliff shirts are worn and endorsed by famous movie stars assuring latest, fastest selling styles. You can make big cash daily. Complete sample outfit free. Write today. Dept. P4, Rosecliff, 1239 Broadway, New York.

SELL Celluloid and cardboard pricing tickets, steel shelf moulding, changeable signs, menu covers. Every store prospect. P. Pricing Press, 124 White St., New York.

CASH In quick. Federal law forces every business to buy—Worthmore 3-in-1 New Improved Social Security pay roll records. 350% profit. Your low cost 22c. Worthmore, 221MH East 20th, Chicago.

BIG Money selling advertising book matches. Amazing low prices. Wonderful full time or sideline. Liberal commissions paid daily. Free elaborate outfit. Regal Match Co., Dept. 54, Hamilton & Gladys, Chicago.

YOU Get paid first. Take orders for 200 home necessities. Pay after you collect. Big profits. Write Ho-Ro-Co, 2786-R Dodier St., St. Louis, Mo.

JAY-WAY Door holder. New. Sensational. Moneymaking. Jay-Way, One East 42nd Street, New York.

SELL Nothing! \$95.00 weekly. \$500,000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C124, 4329 Ravenswood, Chicago.

SELL Rubber renewer to garages, big profit. Liner Co., Canton, N. C.

WANT A better income? Wonderful opportunity ambitious, intelligent men. New federal-state tax laws; social security act compel merchants to keep records, file returns, penalties severe! Two-year simplified system including social security records and tax service \$7.95; lowest commission each sale \$4; leads furnished. Protected territory. Amazing self-seller makes sales for you. Live wires average \$100 weekly commissions. Dept. PM-2, Income Record Publishing, 480 Canal, New York.

MAKE More money taking orders: Shirts, ties, hosiery, raincoats, uniforms, dresses. Sales kit free! Experience unnecessary. Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

APPLICATIONS Now being accepted for sales work with Remington-Rand, Inc., (Portable Typewriter Division). Experience or investment not essential. Apply to M. N. Rand, Remington-Rand, Inc., 315 Fourth Ave., Dept. D-50, New York.

IF You are ambitious you can make good money with a Rawleigh route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Dept. D-2-PPM, Freeport, Ill.

REPRESENT Manufacturer—Automobile specialty. Write National, P4-42 East End, Buffalo.

SALESMEN—Sell 150 letterheads, envelopes, etc., cost 60c. Maloney Sales, 724 Parsells, Rochester, N. Y.

SALESMEN, Distributors: New deal, more profit, exclusive territory. 125 varieties, brushes, mops, specialties. Neway Brush Co., Hartford, Conn.

SELL Complete federal-state social security record. Unusual demand. \$100 weekly. Write immediately. Rimer, Silver Springs, N. Y.

PERMANENT Full time business opportunity for responsible salesmen-distributors, selling our complete line of quality auto accessories to service stations and garages. Merchandise investment necessary. Exclusive territory. W. E. Johnson & Co., Lincoln, Nebraska.

SALESMEN: Sell complete line Hammermill bond business stationery, book matches, business cards, labels, salesbooks, garage forms, etc. Free deals, premiums. 35% comm. daily. Free sales portfolio. Willens, Dept. RV, 2130 Gladys, Chicago.

GENUINE Opportunity representing large advertising book match factory direct. Sell manufacturers, merchants. Full or part time. Big commission. Fast repeats. G. made \$500 in a month. Free kit, samples. Match Corp of America, Dept. E-4, 6041 Grand, Chicago.

SALESMEN: An unusual opportunity. Sell famous Wondercloth cleaning cloth to housewives, department stores, jobbers. Huge profit. Send for particulars. National Guard Equipment Co., 155 East 34th, New York City.

SOMETHING Entirely new! Low voltage soldering iron. Instant heat used from any storage battery, sells on sight, real opportunity to earn good money. \$3.25. Steiner Bros., Dept. O, Long Island City, N. Y.

SALESMEN—Four \$15 sales to stores net you \$40 daily. Sayers Systems, Est. 1895, 2801-123 Sheffield Ave., Chicago, Ill.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

GOOD Long profit side or main line. Exclusive makers radiator stop-leak and flush. Zenith, 3635-S Lyndale, Minneapolis, Minn.

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

WE Need experienced salesmen for a real money making article. Wide sales field with exclusive territory. Richmond Chemical Company, Silver Spring, Maryland.

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

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, N. Y.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

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

EDUCATIONAL AND INSTRUCTION

SHORTHAND Brings opportunities. Free catalogue. Shorthand Institute, 6330b Clayton, St. Louis.

GET \$50 To \$87.50 every pay day on Uncle Sam's payroll. Many appointments expected soon. Our coaching helps qualify you for Social Security, liquor gauger, meat inspector, office clerk, stenographer, typist, customs, postal and many other positions. Write today for free book, list of positions, etc. Patterson School, (Arthur R. Patterson, former Government examiner, Principal), 8 Case Bldg., Rochester, N. Y.

GET 1937 Government jobs. Start \$105-\$175 month. Steady raise. Men-women. Prepare now for next announced examinations. Full particulars—list positions, free. Write today sure. Franklin Institute, Dept. B3, Rochester, N. Y.

GOVERNMENT Job seekers. Attention: civil service, arithmetic, spelling, geography, clerical tests. Questions. Answers. Only \$1.00 complete, postpaid. Free descriptive folio. Merit Publications, Munsey Building, Washington, D. C.

BECOME An Investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM47), Hoboken, N. J.

WRITERS! Public speakers! Take advantage of our distinctive services also new, practical course in journalism. Low rates. Free circulars. Continental Writers' and Speakers' Bureau, 705 Railway Exchange Bldg., Montreal, Canada.

KNOCK 'Em cold. Learn police Jiu Jitsu. 13 secret knockout blows without fists. Illustrated course by world famous instructor. Price 15 cents. S. J. Jorgensen, 402 Maritime Bldg., Seattle, Wash.

OPERATE A collection business. Outstanding opportunity. Quickly learned. Fine income assured. Write Cole Associates, Syracuse, New York.

RITE-IT-RITE, Complete and perfect shorthand. Fifty lessons, fifty hours, fifty cents. Send to McDevitt's, 2079 Sutter, San Francisco.

AMATEUR Cartoonists—Win \$25.00. No drawing ability necessary to win. 26 prizes in all. Rush name on postcard for valuable tips on "How to Make Money With Simple Cartoons," cash prize entry blank and rules. Send no money. Cartoonists' Exchange, Dept. C-94C, Pleasant Hill, Ohio.

WANTED—New writers! Write for magazines, books, newspapers. Free literature! United States School of Writing, 20 West Sixtieth, New York City.

DIESEL! Modern, scientific instruction. Illustrated chart system with comprehensive explanations. Drafted by experts. For limited time 25c (coin). Diesel Institute, Box 1485, Hollywood, California.

CIVIL Service training—City, state, government examinations. Our slogan, "Every Student Must Pass." Chance to earn tuition. Lincoln Institute, 10 Tremont Street, Boston, Mass.

WELDING, Bumping, metal finishing, torch soldering taught. Days, nights. Jobs open. Men from this school getting good jobs right now. Free employment service. Factory Trade School, 8807 Harper, Detroit, Michigan.

AT Last Give yourself a break. Learn forestry at home. Easy. Big salaries. Get new forestry book \$2.75. Wholesale Book Co., Box 305, Altoona, Pa.

AIR Conditioning—Diesel engineering. 1937 course. Write. Free lesson. National, 3943 N. Broad Street, Philadelphia, Pa.

TYPING—Learn in two weeks, complete. \$2. Joseph Mancha, 433 Fairroaks, San Francisco.

OIL Burner installation—Service. Practical homestudy training. Write. National, 3943 Broad Street, Philadelphia.

GOVERNMENT Social security jobs. For men and women, age 18-50. Are you interested in obtaining one? Write immediately for full information and how to pass entrance test, etc. Instruction Service, 101, St. Louis, Mo.

BECOME Business investigator. Earn \$1.00 hourly, upwards—spare time. Experience unnecessary; we teach you. Details free. Business Detective System, 1009 Oak, Elmira, N. Y.

MEN Wanted willing to learn landscape designing and fill big paying position as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 837 Plymouth Bldg., Des Moines, Iowa.

PSYCHICAL Culture Collegium, S-Whitley, Ind. Homestudy doctor degree. Worldwide enrollment.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt College of Arts and Sciences, Chicago.

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

BIG Bargain catalogue educational matter 10c. Handling, Y-799 Broadway, New York.

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

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 601 Lake Street, Chicago.

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

LEARN Latest methods solving arithmetical problems quickly. Frederick A. Smith, 2410 Smalley Court, Chicago.

PLAYS—STORIES—MANUSCRIPTS

CASH Paid for your legends, ballads, poetry, riddles, friendship, humorous, pets, sparetime money-making ideas and other interesting short stories. Contest prizes and up to 4c per word will be paid for acceptable material. Home Life, Berwyn, Illinois.

STORIES Needed for sales department. Commission basis. New sales plan. Crown Service, 917 Shreve Bldg., San Francisco.

WRITERS! Public speakers! Take advantage of our distinctive services, also new, practical course in journalism. Low rates. Free circulars. Continental Writers' & Speakers' Bureau, 705 Railway Exchange Bldg., Montreal, Canada.

POETRY: Revision, instruction, sales suggestions. Anton M. Romatka, 25 W. 3rd Street, New York.

CARTOONING AND COMMERCIAL ART

AMATEUR Cartoonists—Win \$25.00. No drawing ability necessary to win. 26 prizes in all. Rush name on postcard for valuable tips on "How to Make Money With Simple Cartoons," cash prize entry blank and rules. Send no money. Cartoonists' Exchange, Dept. C-94, Pleasant Hill, Ohio.

CARTOONING, Sketching, etc., by Alexander Murray. 46 lessons, 600 illustrations, including practice sheets, pens, pencils, drawings criticized, \$1.00 complete. Slinger Service, 1782 E. 100th, Cleveland, Ohio.

CASH Paid for your sketches, cartoons, illustrations and photographs. Contest prizes and up to \$10 will be paid for acceptable drawings or photos. Home Life, Berwyn, Illinois.

LEARN Lettering \$1 complete course. Northeastern School of Lettering, Bangor, Maine.

CARTOONISTS: Free market guide—with 25c purchase "Money Making Plans." Cartoon Studios, LaCrosse, Wisconsin.

CARTOONING Course \$1.00—30 lessons, over 500 illustrations, with drawing pens and pencils. Scovell Studios, Box 748-P, Hollywood, Calif.

LEARN Modern cartooning—Tom Doerer method—individually taught by recognized master. First lesson free. Send 6c postage only. National Arts Guild, Dept. B, Washington, D. C.

AMATEUR Cartoonists—Sell your work. Write Smith's Service, Wenatchee, Wash.

SIGN Painting. 27 large illustrated lessons, \$1.00! Vocational, 3555 Aberdeen, Alton, Ill.

SELL Drawings. Read Art Advisor Monthly, Parkville, Missouri. Samples 20c.

CHALK Talks. Laugh producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

AMATEUR Cartoonists earn excellent income, spare time, duplicating cartoons for advertisers. 3-M Service, Argyle, Wisconsin.

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

BUSINESS SERVICE

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

INFORMATION Where to buy anything! Correct address of reliable manufacturers, wholesalers, \$1.00. King Buyers' Service, 702 Lakeview, Jamestown, N. Y.

DELAWARE Mail address. Business, personal, representation, forwarding, \$1.00 monthly. Delmaco, 6 East 15th Street, Wilmington.

WANT Branch office nation's capital? Trifling expense for prestige it gives to business or social use; letters forwarded daily. Only \$2.00 monthly. Hawkins Mail Service, 309 Burchell, 817-14th Street, Washington, D. C.

CHICAGO! Business-personal mail address, representation, forwarding; \$1.00 month. Established 1919. General Business Service, 56 West Washington.

ALL International legal matters. Lic. Victores Prieto, Mexican Attorney at Law, P. O. Box 122 M. Juarez, Mexico.

ADVERTISING AGENCIES

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

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4258-C Drexel, Chicago.

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

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

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

FOR ADVERTISERS

ADVERTISE 40 Words display, 75c. 20,000 circulation. Classified 1c word. Joseph Vickers, Missouri Branch, W. Va.

DRAWINGS, Lettering, trademarks, letterheads drawn. Write for prices. Wilford Glatfelter, Springvalley, Ohio.

TELEPHONE Book names, 200—\$1.00. A. Bennett, 2914 Manistique, Detroit, Mich.

ADVERTISE. 30 Words, 25 magazines, \$1.00. Goodall, 742 Market, San Francisco.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Mounted, one-two lines, 25c; three 35c. Signatures \$1.50. Pocket stamp 60c. Stamp Works, 814 Bradley, Peoria, Ill.

NAME, Address. Rubber stamps 35c. Newman, 1825 Ryons, Lincoln, Nebr.

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

2 LINES 25c, 3 Lines 35c. Stamprite, FP13, Springfield, Mass.

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

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, handwriting, draw or trace. Colors. \$19.75 to \$44.00. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Pa.

PRINT-O-PRESS, World's lowest priced rotary stencil letter duplicator \$9.95 complete. Details and samples of work free. Professional Products, Dept. 410, Silverton, Ohio.

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(Continued from page 43A) *es 21*

There is also an example of the set issued by Zanzibar to commemorate the twenty-fifth year of the reigning sultan Calif ben Harub, one example of a set of two stamps issued by Costa Rica to advertise Cocos island and two semi-postal Red Cross stamps issued by Finland. The latter make an interesting addition to a collection of ship stamps. The Chinese stamps are part of a recent set to commemorate the fortieth year of postal service. These stamps show the G. P. O. at Shanghai, a mail boat, and methods of mail communication.

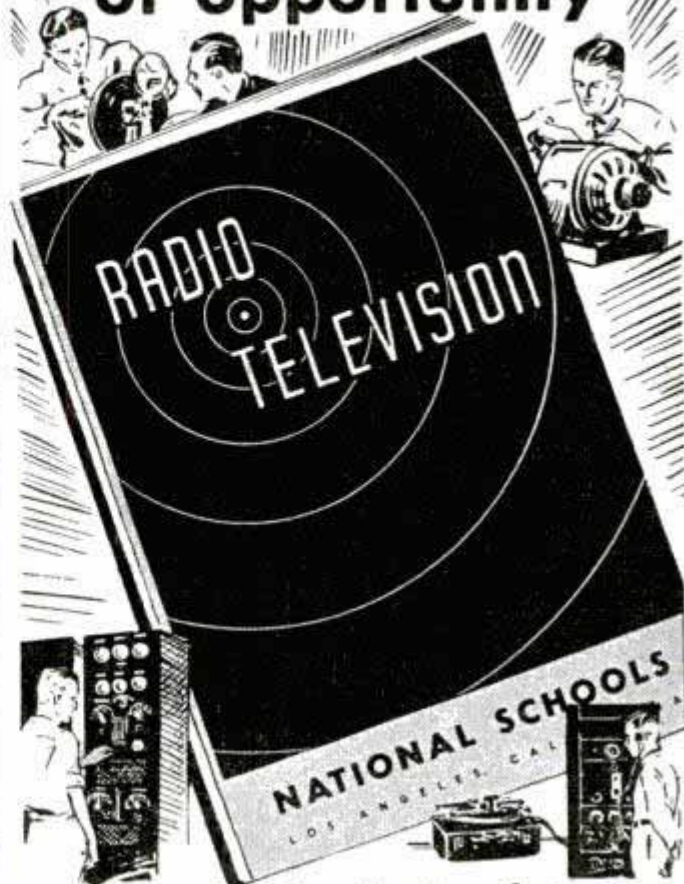
Also illustrated is a new Japanese stamp issued to commemorate thirty years occupation of Kwantung, and another Japanese issue to commemorate the opening of the new Imperial Diet. The Brazilian stamp bearing the inscription "Centenario Farroupilha," was issued last year to commemorate the hundredth anniversary of the "ragged" revolution. *es 21*

The Lesser Gold Coins

Three-dollar gold coins are seldom seen outside a collection. They are all of one design and show the Indian with feather headdress. Coinage was commenced in 1854 at Philadelphia, Dahlonega and New Orleans, and was continued in the first city to 1884 without missing a year. There was no further coinage at Dahlonega and New Orleans, but in 1855 the mint at San Francisco started with this value and continued in 1856, 1857, 1860 and 1870.

The three-dollar pieces issued by Philadelphia in 1854 are most common, with those issued by the same mint in 1878 holding second place. Of the first date about 138,000 were minted and of the second, about 82,000. Of all other varieties, only eight had an issue greater than 7,500 pieces. From 1860 the issue generally ranged from one to four or five thousand, but there were some issues smaller than one thousand, four dates with less than 100 each. Of these latter the 1870 coin of San Francisco holds the low record with two pieces minted. These of course are unobtainable, as also, for that matter, are the coins minted in 1873, 1875 and 1876, which amounted to twenty-five, twenty and forty-five respectively. The 1875 coin has sold for as high as \$500, with 1876 selling at \$200.

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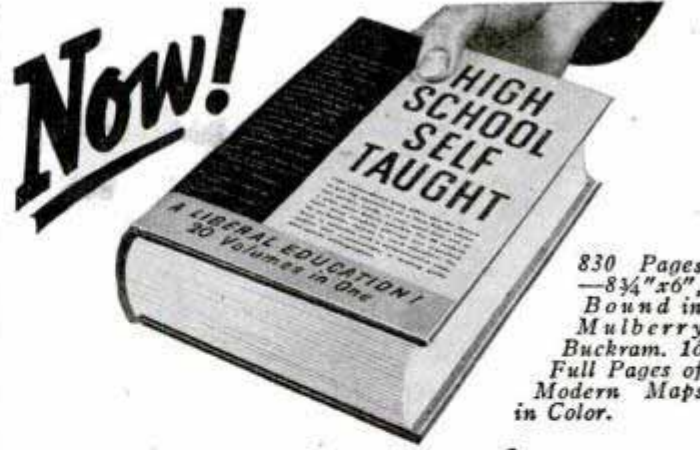
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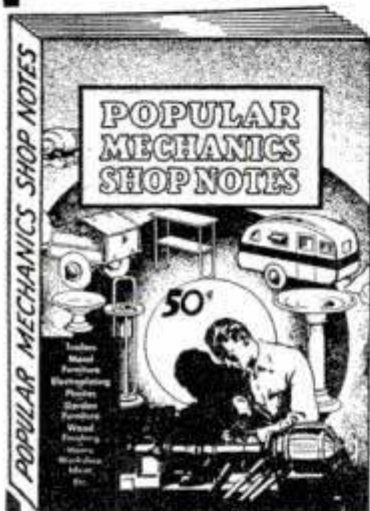
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BOAT! Send boat to 230 South Main.
People are screaming."

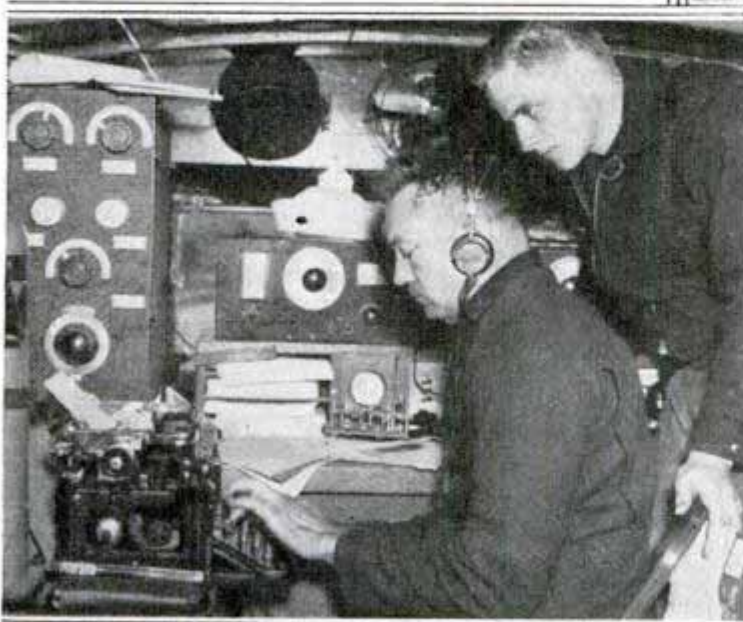
"Warning! Residents of Third and Broadway turn out all fires immediately. Gas escaping from mains."

Boat—save—hurry—urgent—rescue—emergency—attention—help—hour after hour, through dripping days and long, terrifying nights, the air waves of the nation crackled with such words a few weeks ago when the radio, modern miracle conceived by man, concentrated all its facilities in a grim battle with the most disastrous flood in American history. And radio won the fight—won where other relief agencies were helpless.

From Pittsburgh down to Cairo, "the beautiful Ohio" had become a river gone mad, a menacing, raging, relentless force

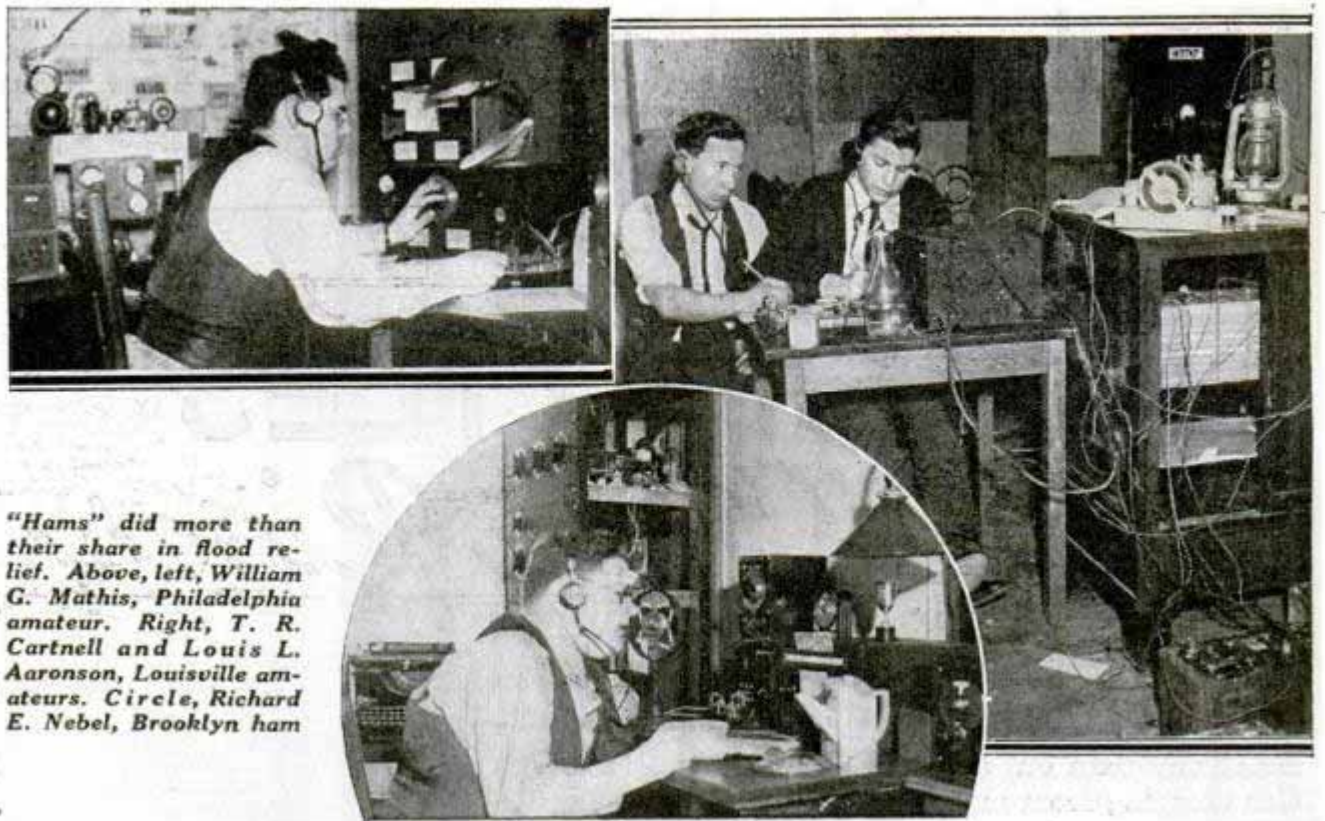


Wide World Photos



Directing boat rescues, above, with portable radio at Louisville. Left, mobile radio outfit set up by government in Memphis to direct flood relief work

which had flooded cities, drowned towns and hamlets, swept over thousands of farms, washed out roads, stopped trains, wrecked telephone and telegraph lines, paralyzed power plants, cut off food, polluted water supplies. Stricken multitudes were homeless and helpless. Thousands were trapped in their homes.



"Hams" did more than their share in flood relief. Above, left, William G. Mathis, Philadelphia amateur. Right, T. R. Cartnell and Louis L. Aaronson, Louisville amateurs. Circle, Richard E. Nebel, Brooklyn ham

Into this situation came radio with all its artillery, big guns and little guns—great national networks, powerful 50,000-watt stations, little 100-watters, "hams" with both code and phone sending sets, police and military short-wave transmitters—all banded together in a work of mercy, directing rescue operations, informing the nation of relief requirements, reuniting separated families, getting messages to alarmed relatives, alleviating human suffering and misery.

Flood waters drowned some little stations, surrounded big ones, dunked power plants, tore down feed lines, cut off the "juice." But an army of engineers, trouble shooters, announcers, radio reporters and just plain hams were equal to the task the river set them. Storage batteries, portable generators, makeshift apparatus and temporary wiring all helped. As the flood assumed record-breaking proportions, stricken cities began filling the air waves with their cries for help. Tragedy, usually mute, was being made articulate for every person with a radio receiver to hear. The situation in Louisville, Ky., was typical. Here hundreds were trapped in their homes. Without help, they faced drowning, sickness from exposure, slow starvation. There were not enough boats to effect all the rescues unless order was

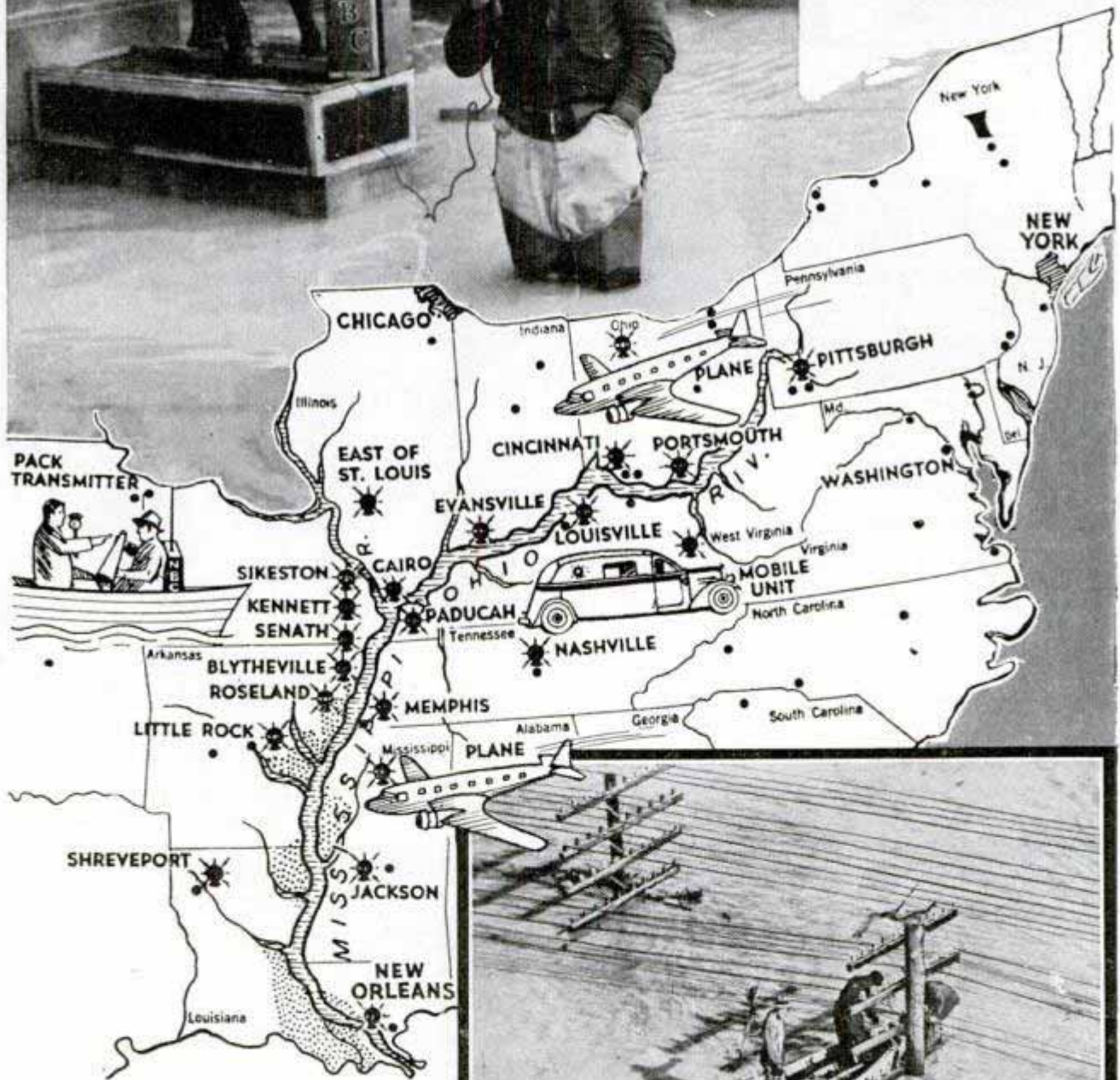
brought out of the confusion by some universal means of communication. Any ordinary communication facilities were crippled or entirely wrecked. All of them except the radio.

Stations WHAS, the Columbia Broadcasting system's outlet at Louisville, and WAVE, the National Broadcasting company's outlet, discarded scheduled programs and blanketed the area with relief and rescue messages until they were drowned out. Then, without power, the Louisville stations were helpless. To the rescue came WSM, the NBC station at Nashville. A wire from the center of the Louisville flood district to WSM enabled announcers at the WHAS microphone in Louisville to relay through WSM in Nashville—two competing stations affiliated with competing networks joining forces to save human lives. More than 16,000 rescue messages were transmitted over WHAS-WSM in this manner.

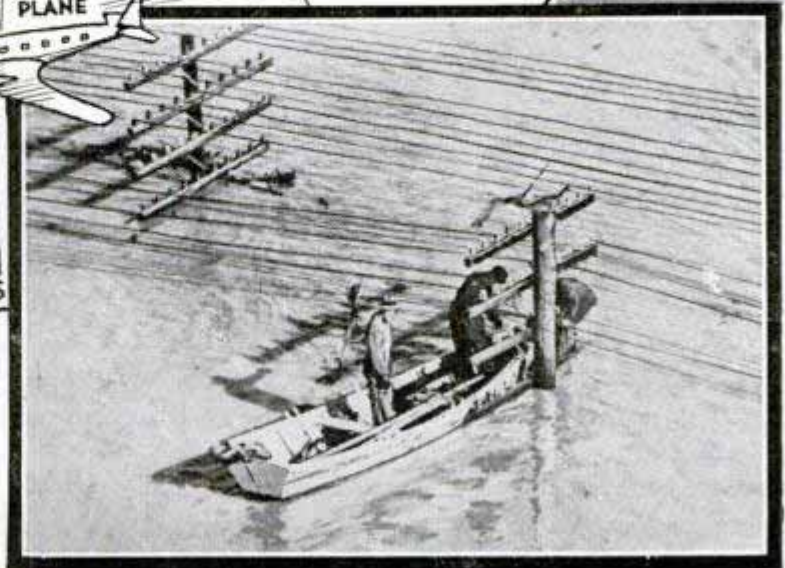
And lives were saved because the WSM broadcast could be picked up by any kind of receiver. Console battery sets were taken from homes and loaded into rescue boats; automobile sets, batteries and all, were used for the same purpose. Thus rescue messages could be heard by all. As soon as a plea for help was received by WHAS from the police, over crippled tel-

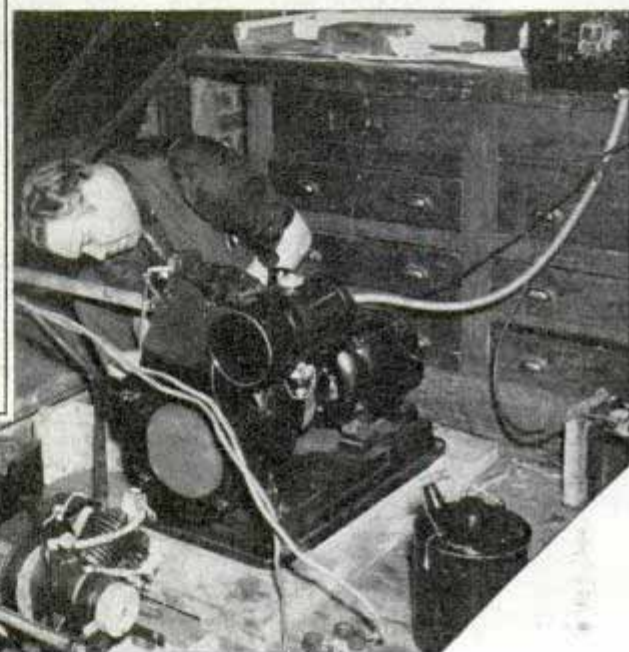


The great national networks sent broadcasting trucks, announcers with pack transmitters and others broadcasting from airplanes into the flooded area to arouse the nation to the emergency by eye-witness accounts of the disaster. Here is a National Broadcasting company field crew operating at Evansville, Ind., and a map showing how NBC covered the flood from various key points



It wasn't necessary for this crew of linemen to climb any poles to mend breaks in the wires caused by Old Man River





Above, left, Don Hancock, WBBM's flying announcer, broadcasting over Cairo, Ill. Above, right, Columbia Broadcasting System's control point in Evansville, Ind. Below, right, using gasoline motor to generate power in flood zone

ephone lines or from some amateur using his short-wave transmitter, it was relayed to the rescuers over WSM. Even boats without radio facilities were directed by radio through three advertising sound trucks which installed receiving sets tuned to the relief broadcasts and cruised continually along the shore line. In this manner appeals for help for persons marooned in buildings could be heard a mile or more over the water.

Soon after WSM began broadcasts over temporary telephone lines from WHAS, many other stations and the networks formed a voluntary inter-city network which extended from New York to California—all relaying the WHAS-WSM transmissions full time or periodically. Hour after hour, day and night, the relief

and rescue messages flowed over the air from Louisville via Nashville to the world until the crisis was past. Both Louisville stations later obtained temporary power from borrowed generators and resumed transmission direct from Louisville.

In like manner, Cincinnati stations devoted themselves to an around-the-clock effort to help city, state and national rescue and relief workers. Although its own power supply was depleted, and it had its own rescue relief messages to carry, WLW also carried the broadcasts of WAVE in Louisville, received by wire, and relayed messages of the mobile transmitting units sent out by itself, the networks and the military and police.

NBC and CBS, along with other networks not only awoke the nation to the



Above, loading a 400-pound, gasoline-driven generator into airplane at Chicago. This generator was flown to Louisville where it enabled Station WAVE to resume operations at the height of the flood. Above, in circle, WHAS staff setup for broadcast of emergency flood relief messages at Louisville

Equipped with short-wave pack transmitters, microphone reporters of the National Broadcasting company are sending out the story of the flood from a boat on a street in Portsmouth, Ohio. Right, when rescue boats were needed at Louisville, the messages went out from this room





Above, operator and stenographer at Chicago amateur station being interviewed while taking flood messages. Left, using portable pack transmitters

crisis by transmitting the pleas for rescue and relief from the stations in the flood district, but sent their own broadcasting trucks and radio reporters with pack transmitters into the flood area to send out eye-witness accounts of the disaster.

Not only did the radio direct the rescue and relief work, but it also disseminated invaluable information to those in the flooded cities and towns. The air was filled with advice—boil your drinking water, tap your downspouts and use rain water, be careful of fire, stay at home if you have a home and are not engaged in relief work, conserve gasoline, return your milk bottles.

While the big broadcasting stations in or near the flood district and the networks bore the brunt of the relief work, they were augmented by police and military short-wave sets, aviation stations, the coast guard, dozens of small broadcasting stations of low power which served their individual communities just as heroically as the big stations served the cities and—last but not least—hundreds of hams, those unsung heroes who stuck to their transmitters sending messages for supplies, pleas for medicine, orders for routing trucks of clothing and bedding and a thou-

sand and one other communications which speeded up relief work. Many small stations used Diesel engines, dug up old generators or strung batteries together for power—any radio man with an important message jammed it through somehow.

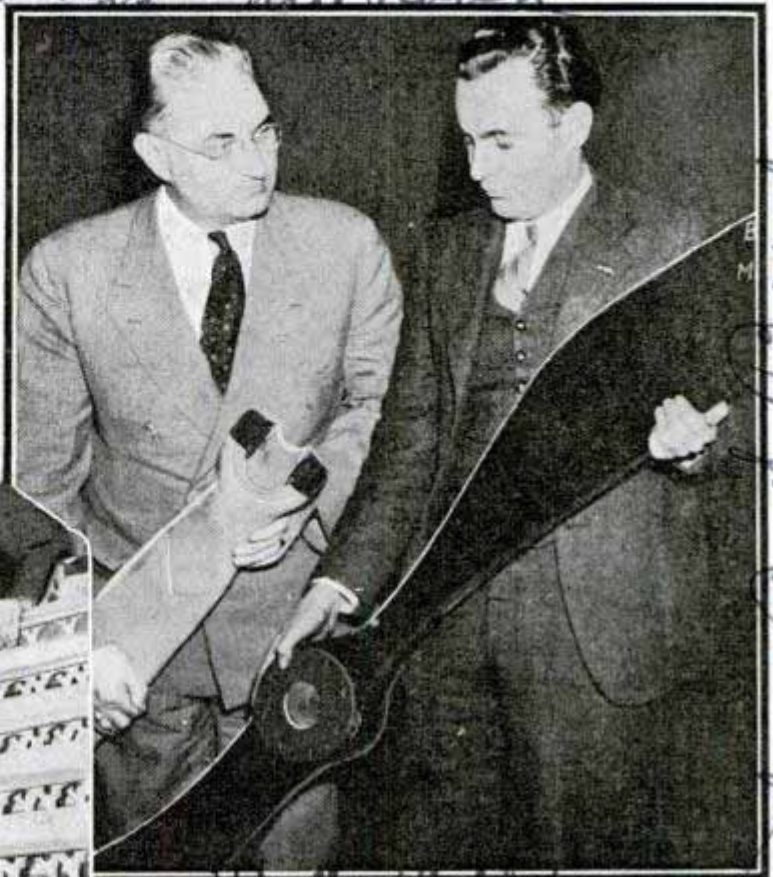
The disaster set many radio precedents. It was the first time that commercial, amateur, aviation, coast guard and police radios ever were coordinated on a large scale for relief in a far-flung emergency. And the merging of all the branches of radio proved effective in the crisis. It was the first time major broadcasting stations were used as a direct and continuous link with relief leaders, police and rescue squads. And that worked too. It was the first time broadcasting stations and networks were on the air twenty-four hours a day, day after day, to help relieve a national emergency. That worked too. And it was the first time a big broadcasting station ever cancelled all its scheduled programs to carry on the relief work of another station, and a competing station at that. And that worked too.

Thus the same radio which brings so much pleasure into our daily lives has proved its ability, when disaster strikes,

(Continued to page 162A)

Aircraft Corp. *c/o Barclay's* Lightweight Metal Wing and 'Prop' Invented *Detroit Wash*

French made one six hubblad
Stronger and lighter than those in use, a new type of wing and a hollow steel propeller are innovations on an all-metal transport plane now under construction. The wing is said to be practically invulnerable to gunfire. The propeller has an inner construction supported by a single steel strut running from tip to tip. It is thirty per cent lighter than wooden propellers. The ship, which will be equipped with the wing and propeller, will have space for eight passengers.



White wood
Top, comparing new lightweight, metal propeller with old wooden type. Bottom, section of wing, said to be almost invulnerable to gunfire.



es 136
Plywood for Walls and Ceilings Applied with Invisible Joints

Plywood paneling made without visible joints or unsightly battens is being manufactured for interior walls and ceilings. Instead of covering the joints with battens, a neat, narrow molding is laid in flush to the surface, breaking the wall into decorative panels. These are available in random or uniform width planks, rectangular or square tile effects. Three-ply Douglas fir is used. The rabbeted edge is nailed to the wall and the molding applied with brads or glue.

Vancouver Plywood and Veneer Co. used

es 107
Linoleum Cutter Helps Novice Do Precision Work

Linoleum laying jobs which only skilled workers formerly could do are made possible for the amateur by a precision cutter recently placed on the market. Blade holders on the tool may be fastened at any point on the compass bar for straight cuts, recess-scribing or wall-scribing. The tool cuts straight lines, arcs, circles and rings with great accuracy. Two blades are employed in cutting rings and straight strips. Adjustable to conform to the thickness of the linoleum being cut, the blades are easily sharpened.



To eliminate headlight glare, amber lights will be required by law on all new cars sold in France after April, 1937, and on all cars after January, 1939.

Armstrong Cork Co. 12/19/36

"Flying Pullman" Offers Air-Travel Luxury



Top, interior of "Flying Pullman," one of fleet placed in service by United Air Lines. Below, liner in flight. Two 1,150-horsepower engines give these planes a speed of 212 miles per hour

Left, individual table set with real silver, china and linens. Below, stewardess preparing meal in galley located at rear of plane's cabin. Hot meals served aloft are another feature of this new air service



Left, playing checkers on magnetized board. Note that the chairs may be swung in any direction. Fourteen or twenty-one passengers may be carried in these ships



Handwritten notes on the left margin:
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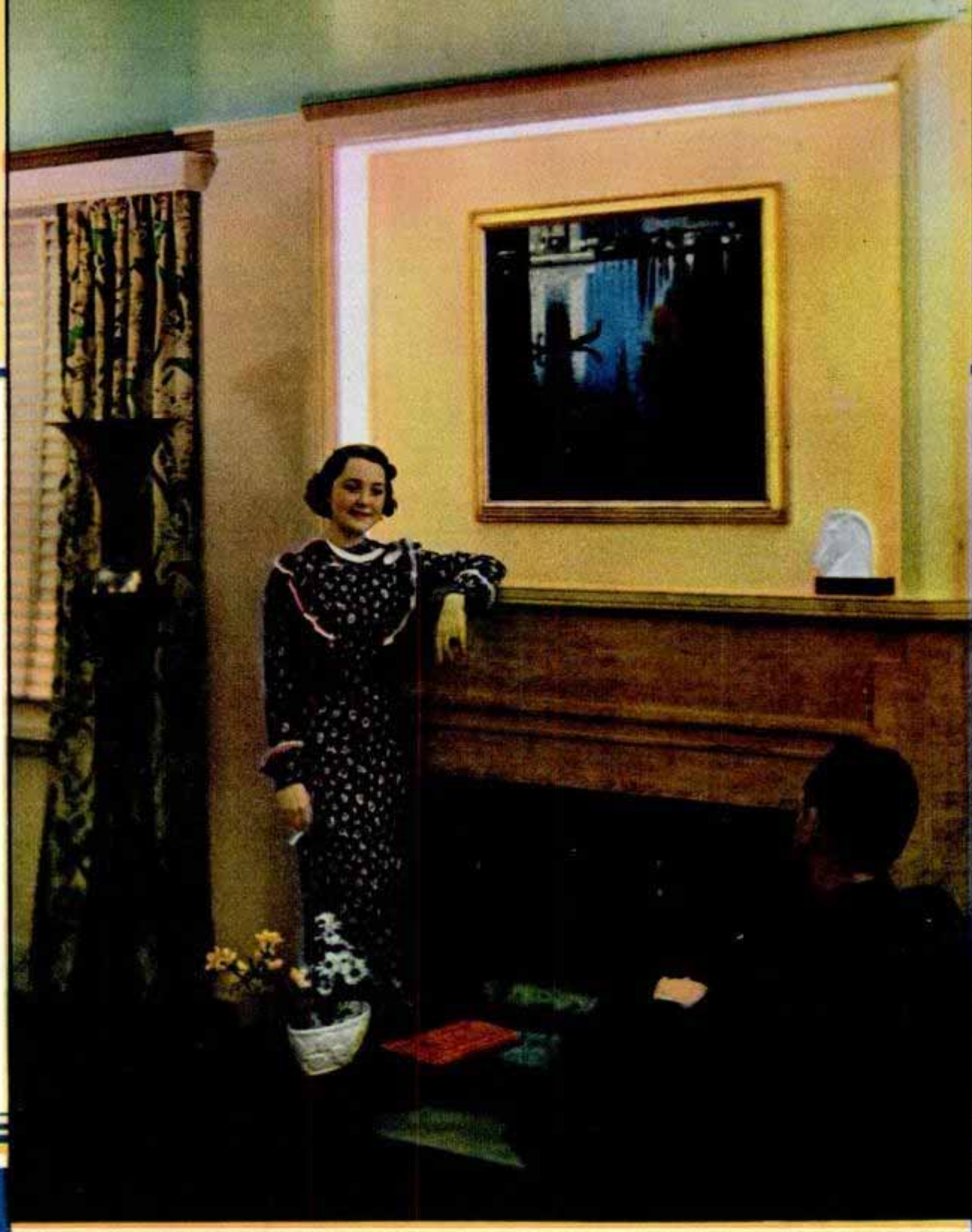
Skylounge

*La Salle. Wacker
 Betty
 Chue*

Handwritten notes at the bottom of the page, including names and dates.

F132

48



Chicago Lighting
 & Hardware, 20 N
 Wacker
 Drive
 Chicago

“ Let There Be Light - ”

CONCEALED tubular lights behind paneling illuminate picture and area above fireplace.

Part I





490

THIS living room is made more attractive by good lighting. Ceiling units and wall brackets are of new plastic materials. Concealed lights are used in bookcase.

General Electric

By H. W. MAGEE

THE story of human progress is a story of man's triumph over failure. Sixty years ago a young inventor began seeking a method of "bottling up" electricity in a vacuum to provide a practical means of electrical illumination.

Conservative men ridiculed his efforts and "proved" it couldn't be done. No combustion can occur in a vacuum, they said. Therefore, you can't make light in a vacuum, so why try? But, indifferent to criticism, the young inventor kept on. For two years he patiently tried one process after another. None worked.

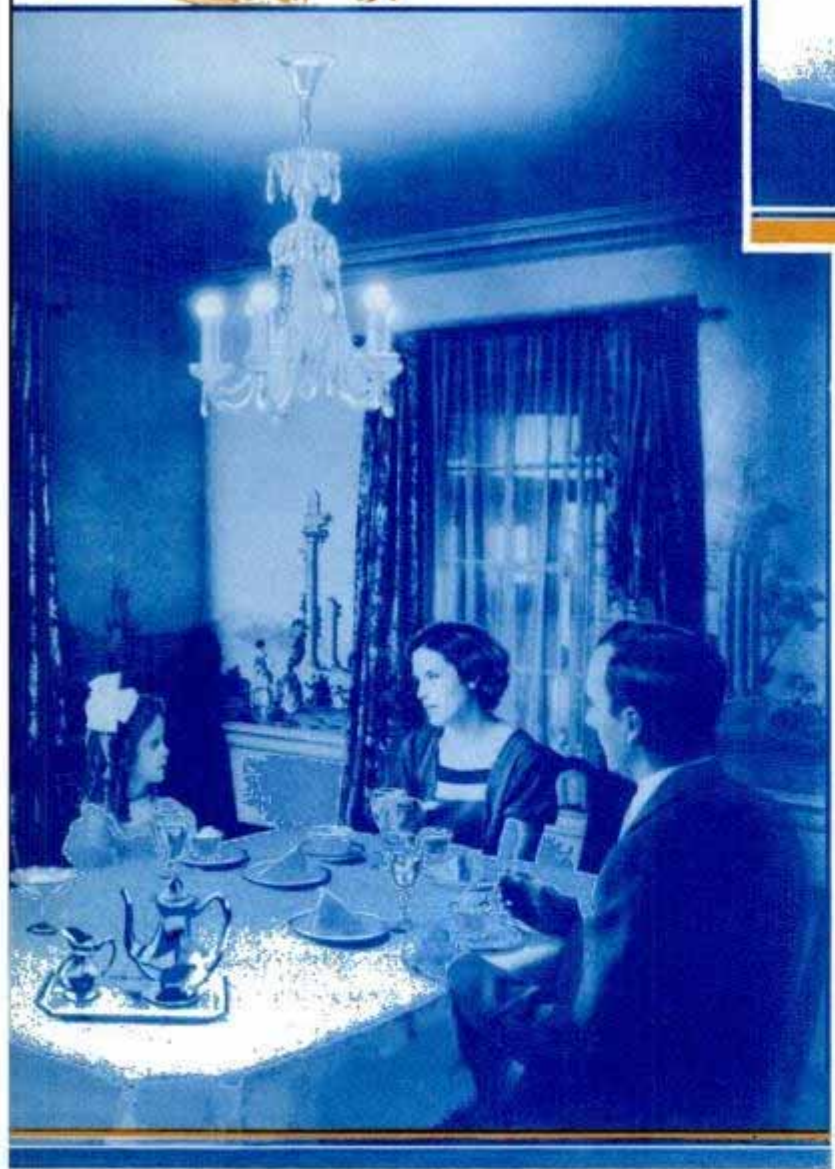
Finally, in 1879, after spending more than \$40,000 in fruitless experiments, he

saturated a cotton thread with a carbon paste and heated it to produce a carbon strand. He looped this inside a glass bulb from which the air was pumped. Then he passed an electric current through the strand. And there was light!

There was light for forty hours, light in a vacuum, light where everyone said no light could be. Thus Thomas A. Edison achieved success through repeated failure and gave to the world the incandescent electric lamp. Today, if an ambassador from Mars visited the earth in search of a typical example of the patience, ingenuity and precision of modern earthly science and industry, he could select no object more fitting to take back than an ordinary electric lamp. For there has been a world of progress in

Carl. Walter E. Burton - 1032 Florida Ave Akron, Ohio

Westinghouse
Electric Corp #1325
E. Pittsburgh, Pa

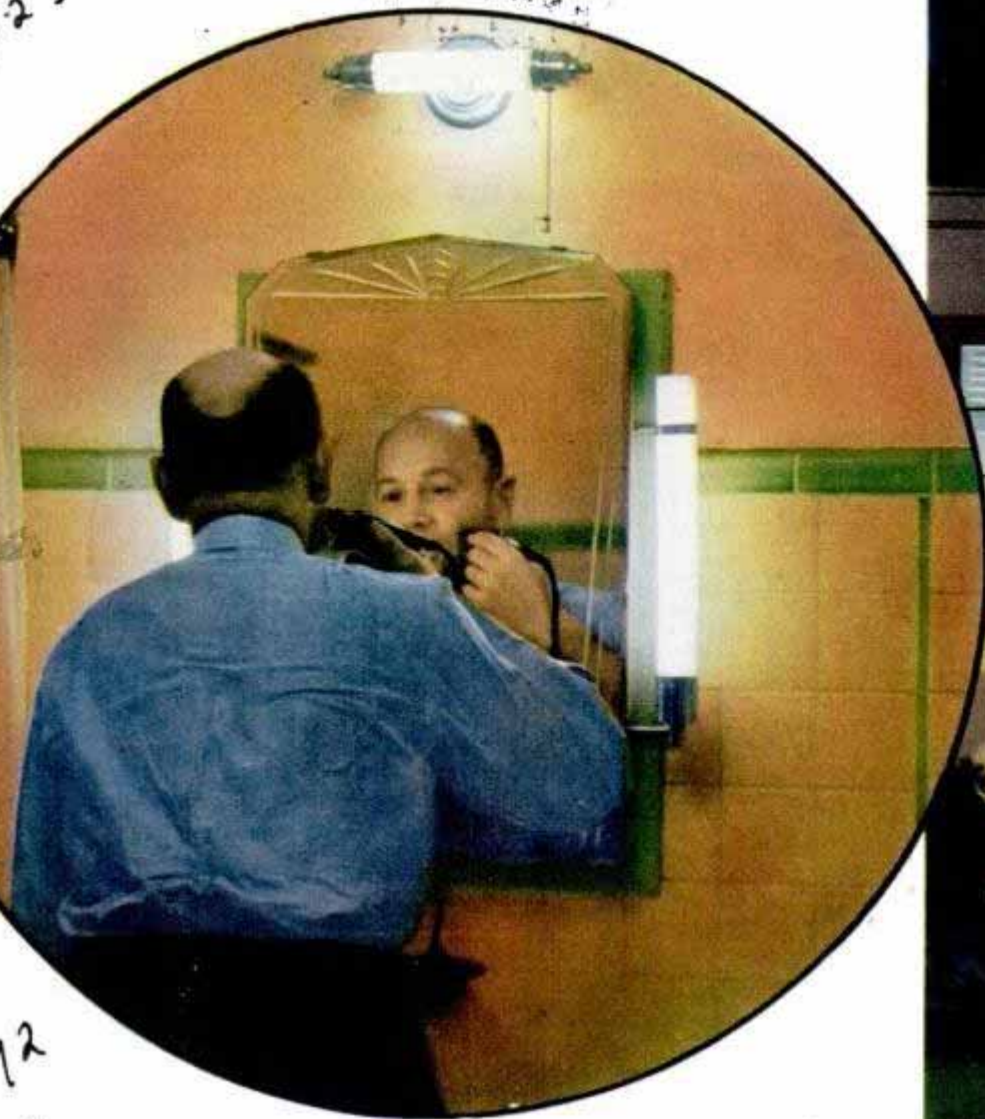


491
DINING room with modern indirect lighting, and same room with old-fashioned fixture. Top, left, 150-watt floor lamp for close visual work.

Chicago Lighting Club
electric lighting since Edison produced his first lamp with nothing more complicated than a piece of cotton thread and a glass bulb.
Almost from the moment when Edison's first light burned out at the end of forty hours, improvements started. Edison himself developed a method of using cardboard instead of a cotton thread, then both gave way to bamboo fiber. The idea was to get more illumination for the current consumed, more efficient light—more lumens per watt. A lumen is a unit of light measure used by lighting engineers. You probably never saw one, but you can make one easily. Place the flame of a standard candle at the exact center of a balloon two feet in diameter. On each square foot of the inside surface

Chicago Lighting Institute
20w. Washburn Ave., Chicago
F1325

492



TUBULAR lights at sides and above bathroom mirror give good illumination for shaving because they cast a uniform light, leaving the face without shadowed or shaded areas.



of the balloon you will find—one lumen.

Edison's first lamp had an efficiency of one and one-half lumens per watt. In 1894, Leigh S. Powell, an Englishman, squirted a mixture of carbon and cellulose through a tiny hole and made a filament. And his squirted-filament lamps developed more than three lumens per watt.

Ten years later, Dr. Willis R. Whitney, later vice-president of the General Electric company, in charge of research, found how to make metallized carbon filaments. Lamps using them developed four lumens. Then a way was found to make tantalum ductile. Tantalum lamps produced five lumens per watt, but could be operated only on direct current. Lumen by lumen, the efficiency of electric lamps was increasing.

Finally, in 1908, Dr. William B. Coolidge made a great discovery. He found how to press together pieces of specially-

treated tungsten and draw them through dies to produce filaments which could be bent and which were ductile when cold. These early tungsten filament lamps produced eight lumens per watt. Tungsten filament lamps today produce from eleven to more than fifteen lumens per watt.

Another step forward was taken when Dr. Irving Langmuir found that a lamp filled with an inert gas like argon, instead of being evacuated, can be operated at a higher filament temperature and thus be made more efficient. At the same time, he developed the coiled filament, greatly superior to the straight-wire type. Today all lamps larger than the thirty-watt size are filled with argon gas and have filaments shaped like screen-door springs.

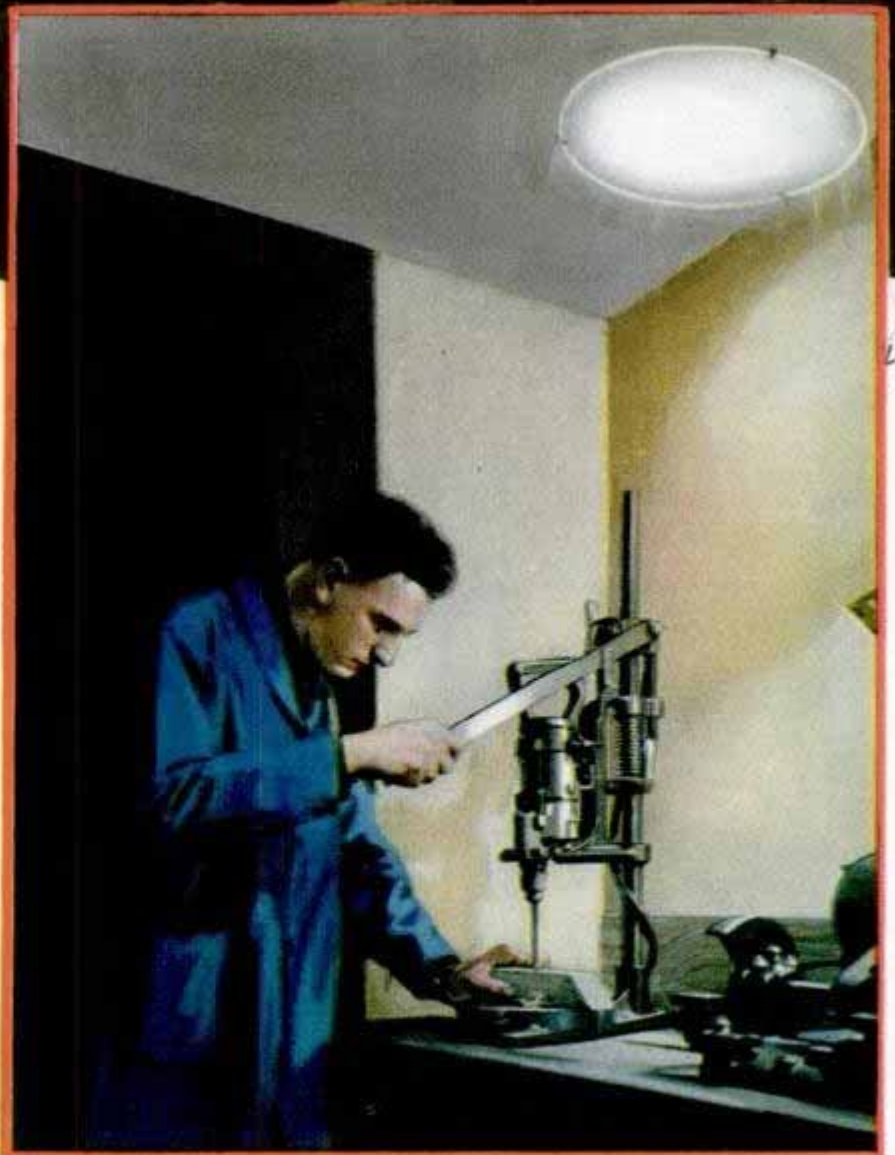
Modern incandescent lamps used in general lighting, which means sizes up to 1,500-watt, develop as high as twenty-two lumens per watt, twenty times as



208 F1325

EFFECTIVE night lighting enhances the beauty of your garden. The parasol is illuminated by an inexpensive "pin-it-up" light and the hose in the foreground is attached to an illuminated spray unit. Right, frosted-glass fixture above workbench provides an excellent light for the home workshop.

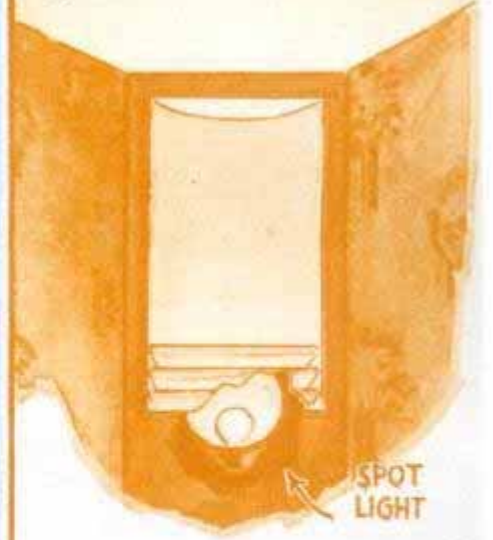
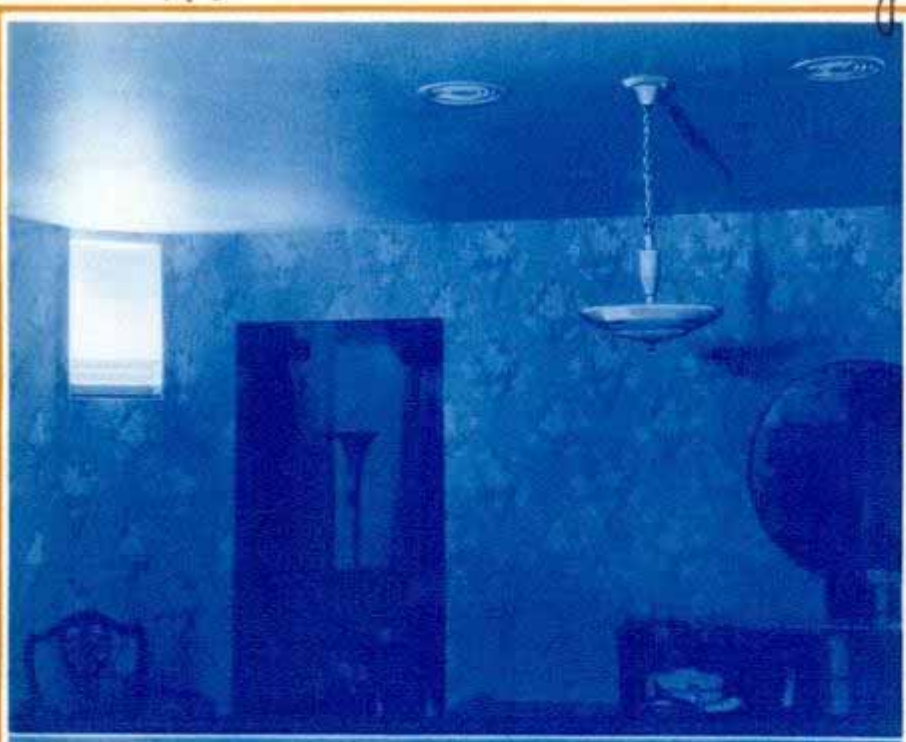
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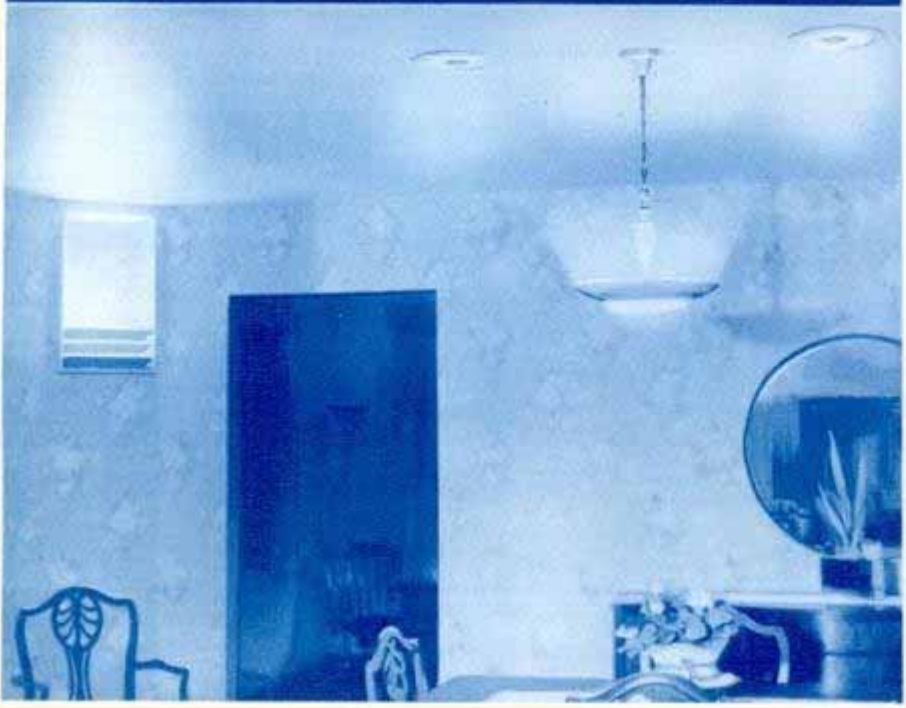
Chicago
Engineering
Institute



THREE lighting effects for dining room. Top, indirect light as illustrated in diagram. Center, spot lights in ceiling. Bottom, indirect ceiling fixture augmented by wall lights and spot lights.



424



much as Edison's first lamp. And they are being made more efficient. As a lamp burns, it blackens slightly, due to condensation of vaporized tungsten from the filament on the glass bulb. The efficiency level throughout lamp life has been raised until today a lamp ready to burn out is about ninety per cent as efficient as when new. And, yet, the incandescent lamp is far from perfect, even today. It is being improved each year and there is room for still further improvement.

While the incandescent lamp consisting of a tungsten filament inclosed in a glass bulb is the standard source of electric light today, there are other sources, some of which show a better lumen score. The mercury-vapor lamp, for example, in which the mercury is subjected to a tremendous pressure while forming an electric arc, develops, in the 250-watt size, thirty lumens per watt, and, in the 400-watt size, forty lumens.

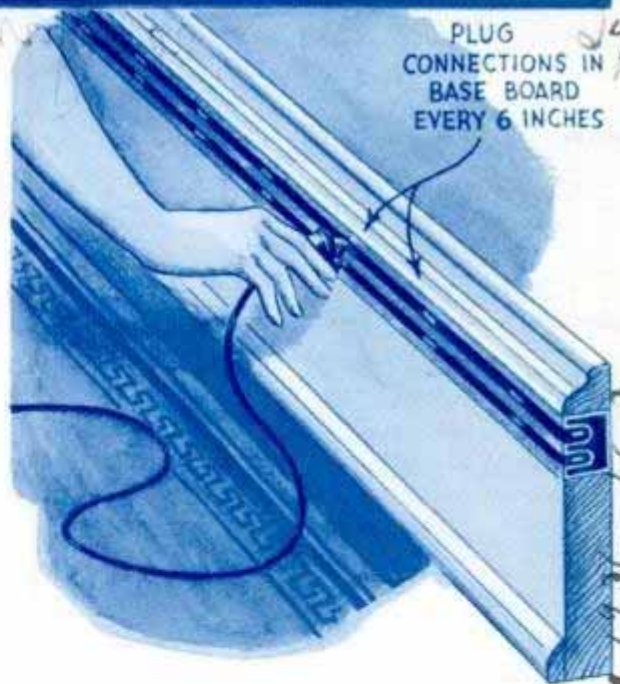
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But the sodium-vapor lamp, used for highway lighting, takes top score in the battle of the lumens. The 10,000-lumen lamp develops fifty-five lumens for every watt of power. Neon tube lights develop an average of about thirteen lumens per watt. Tubular fluorescent lamps, filled with a gas which, under the action of current, produces ultraviolet light which in turn causes an inside coating of fluorescent materials to glow, hold promise as efficient producers of colored light.

Mercury-vapor, sodium and fluorescent lamps operate under one handicap—they require transformers and reactances as auxiliary equipment. The incandescent lamp has a tungsten filament whose resistance to the flow of electricity increases as its temperature goes up. Thus it reaches a point of balance where temperature and current flow are constant. But luminous vapor lamps behave exactly opposite because a gas forming a path for the flow of electricity offers less resistance as it becomes hotter. Thus, if attempts were made to operate such a lamp on a 110-volt line without regulation, more and more current would flow as temperature increased until something gave way. So such lamps usually are equipped with transformers to provide voltage enough to send



PLUG CONNECTIONS IN BASE BOARD EVERY 6 INCHES

CLOSE visual work requires from fifty to 100 foot-candles which can be obtained with a 150-watt bulb in a light like the one pictured. Below, plug-in attachment for the baseboard with receptacles for plugs every six inches provides plenty of outlets for the home without adequate wall plugs.

Commonwealth Edison Co. Wholesale

495
 1136-163
 suggest - Aug 11, 1936
 National Electric 8 W. W. C. Co.



the current from one electrode to the other, and a reactance to limit the current flow.

The dream of producing cold light, like that of the firefly, probably can never be realized because it involves producing light without generating heat. Nevertheless, the struggle for cooler light still goes on. From the standpoint of energy expended, the electric lamp still is rather wasteful. A twenty-five watt vacuum lamp, for instance, converts only seven per cent of the energy going into it into useful light, and a 500-watt gas-filled lamp converts less than twelve per cent of its energy into visible light. The rest is lost as heat.

The search for cooler light really involves compressing into the visible region the spectrum radiated by a lamp in action, including the heat rays and ultraviolet light which today are invisible. The more efficient production of colored light is also being studied hand in hand with cooler light. Just as the squeezing of the lamp spectrum into the visible re-

(Continued on page 132A)

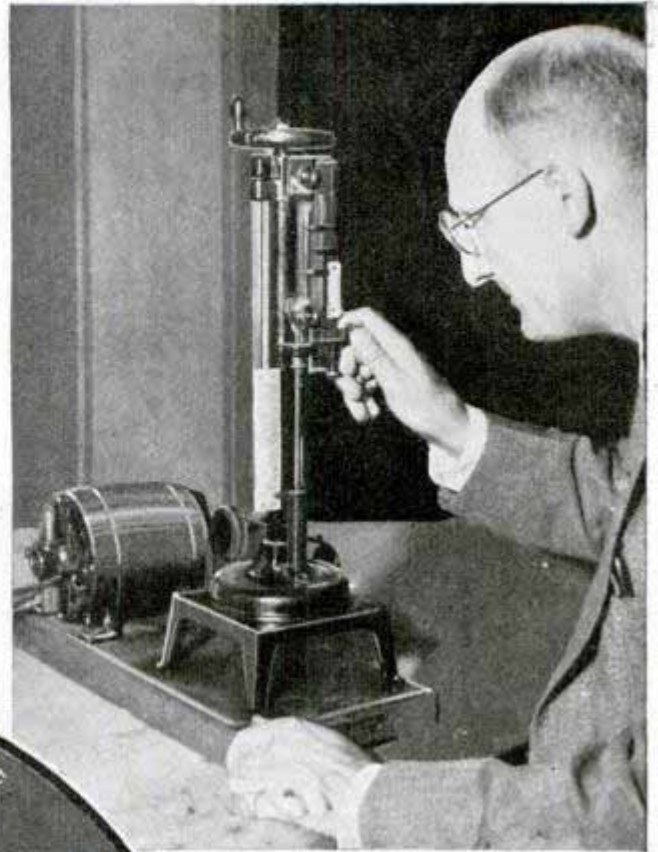
TUBULAR fixtures, as illustrated in the diagram, provide plenty of local light for the kitchen table and stove. They are attached under cupboard.

Es. 50

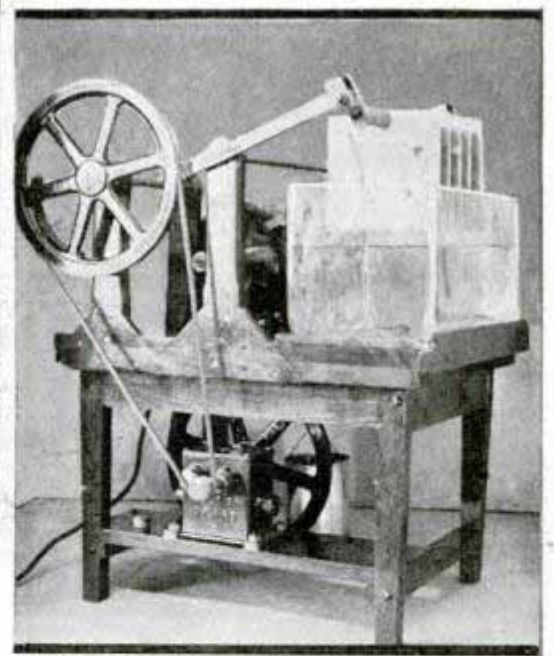
431 W. 60th St.
Terrace, Kansas City, Mo

Man-Made Weather Speeds Up Paint Tests

Durability of paint is tested quickly in laboratories by an accelerated weathering device which manufactures rainstorms, sunlight, heat and cold. Within two weeks the machine will put paint samples through a course of weathering equivalent to a year of ordinary outside exposure. For determining resistance to blistering a special device has been designed. It is a metal cabinet with openings at the top and over these are clamped pieces of siding painted on the outside. Inside the cabinet are two lamps with circular wicks extending into water at the bottom of the cabinet. This creates warmth and humidity on the unpainted side. By putting a sample into a dark cabinet at a temperature of 100 degrees and having the atmos-



The machine is used to test the strength and elasticity of paint. It is a metal cabinet with openings at the top and over these are clamped pieces of siding painted on the outside. Inside the cabinet are two lamps with circular wicks extending into water at the bottom of the cabinet. This creates warmth and humidity on the unpainted side. By putting a sample into a dark cabinet at a temperature of 100 degrees and having the atmos-



Top, W. R. Fuller of Pratt Lambert laboratories using machine to test strength and elasticity of paint. Bottom, left, testing consistency of paint. Right, immersion machine tests seaplane hull metals

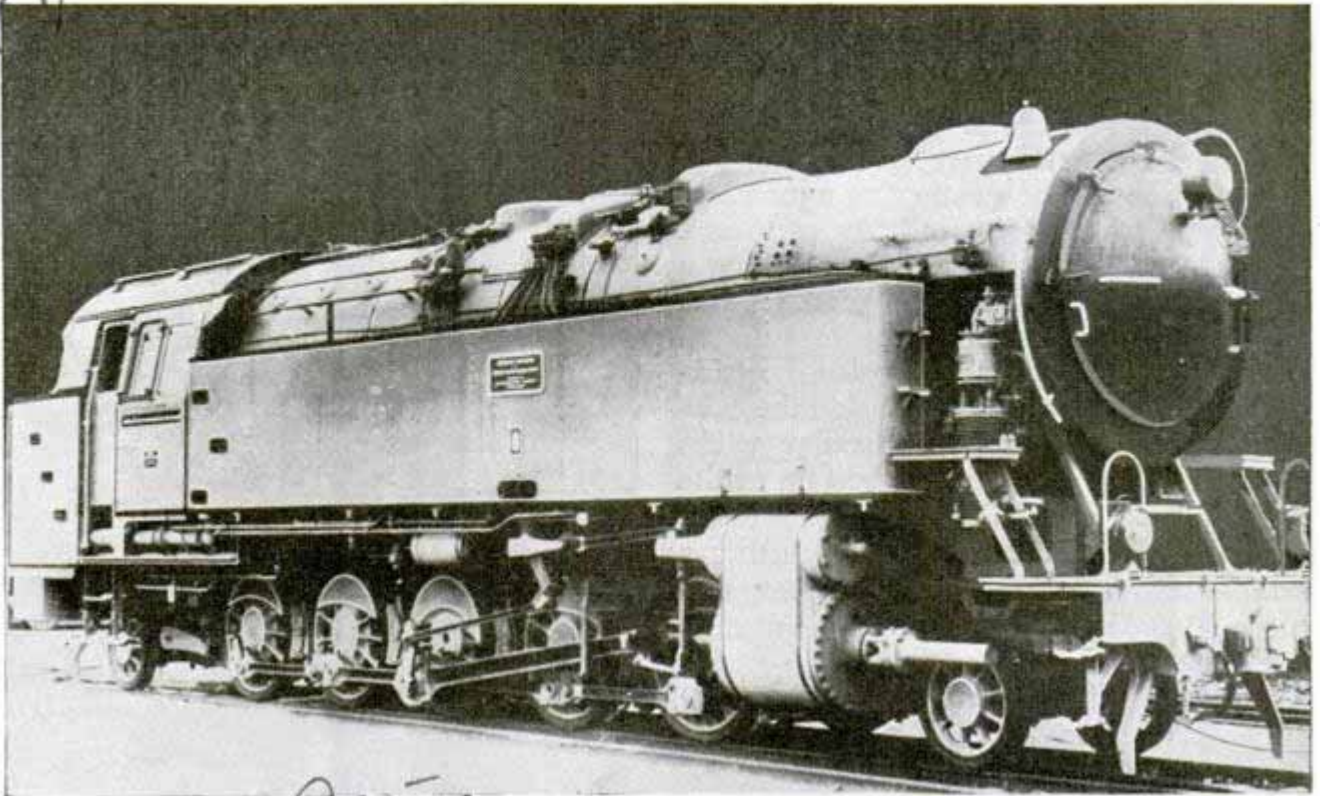
phere saturated with moisture, the laboratory worker quickly finds the extent to which white enamels will yellow in a prescribed period of time. A salt spray cabinet is used for testing the resistance of metals to the corrosive action of seawater. An alternate immersion machine

plunges test panels from seaplane hulls into and out of seawater to determine resistance to the alternate action of salt water and of the air. Properties of varnishes are tested in many ways, from scratching the surface with a penknife to application of strain and stress machines.

*Werhlim and Thomas St.
Buffalo NY*

German Locomotive Has Ten Drive Wheels

Chrysler Corp. Plymouth Div. at Boring Locomotive Works

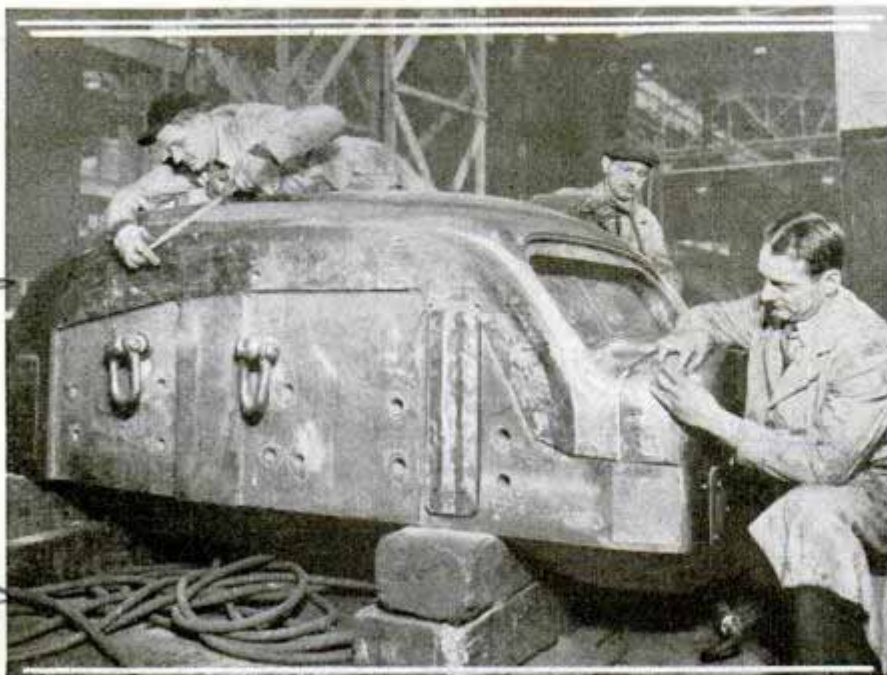


acme
Here is Germany's latest locomotive. Note the small size of the drive wheels, indicative of power rather than speed. Its designers follow the modern practice of streamlining, though in modified form

Said to be the largest tender locomotive ever built in Germany, a giant engine designed especially for work in railroad yards has five small drive wheels on each

side. Since it is not intended for use on the main lines, its wheels are small to give power instead of speed. The locomotive has an axle load of twenty-three tons.

Latest Auto-Top Presses Squeeze Steel to Exact Shape



This is one of the giant dies, weighing several tons, used in the auto-top presses. These workers are polishing the die to exact size

Mammoth machinery, designed to shape sheets of steel into automobile tops at a pressure of 3,000,000 pounds, is handling nine miles of steel per hour, in strips six feet wide. In one large plant the giant presses squeeze the metal into a complete body section including the cowl, windshield frame, top and back panel as far as the trunk, all constructed in one unit from a single sheet of steel. Inside the mouth of each big press are ponderous steel dies, ground and polished with greatest care by experts to at-

all same to auto top presses

tain the exact shape of the automobile top. One set of dies inside such a press weighs about 240,000 pounds. More than forty-five feet high these presses are half-buried in concrete to withstand the tremendous pressure they exert. Instead of bending the metal these machines clamp down on it with such pressure that the cold steel "flows" into the contours desired. One set of dies requires 45,000 man-hours of grinding and smoothing the curved surfaces. As a result of this construction the steel body of the latest automobile withstands strains thirty times more severe than any encountered in actual use. One of the twist tests given the body calls for application of strains of 22,500 pounds, equivalent to loading a single automobile with 150 passengers.

Shaner, Miller & Levon, Pa.
Auto Trailer Built as Kennel
Fig 2 **to Carry Two Hunting Dogs**



Releasing dogs from their special trailer at starting point of a hunting trip. It serves as traveling kennel for two dogs

to 5
Sidewalk Grating Guards Tree and Lets in Food and Water

Rather than kill its beautiful old trees by surrounding them with cement sidewalks, a Washington, D. C., park has built gratings around the trees. The gratings permit moisture, plant food and some sunlight to reach a broad area around the base of the tree and still serve satisfactorily as part of the sidewalk.



Tree in Washington, D. C., protected by grating which serves as sidewalk but allows water, air and light to reach base

Sportsmen can take their dogs on a hunting trip in a specially built trailer kennel. The trailer provides ample room for two dogs. Streamlined to conform with the lines of the automobile, it can be painted to match the car.

ES 104
Forty-Seat Plane to Commute between Paris and London

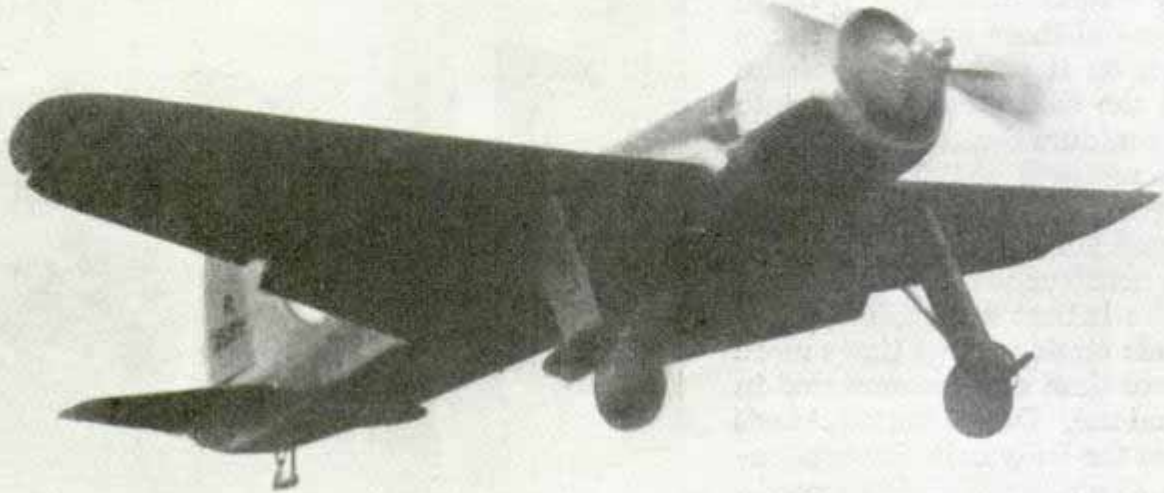
Harnast 22
 Gigantic land planes powered by four 815-horsepower engines soon will be carrying forty passengers and a four-man crew on fast flights across the English channel between Paris and London. Their luxurious appointments include a miniature winter garden in the fore part of the hull, a library and bar. Air France plans to operate the ships on seventy-minute schedules between the two capitals. With a wing span of 116 feet, the ships will be ninety feet long and sixteen feet high, weighing eighteen tons and capable of 220 miles an hour top speed. Equipment includes de-icers on wing edges, automatic pilot, radio direction finder, variable pitch propellers and blind-flying instruments.

Cont. R. E. Hardeman, 1805-20th St. S.W., Washington, D.C.

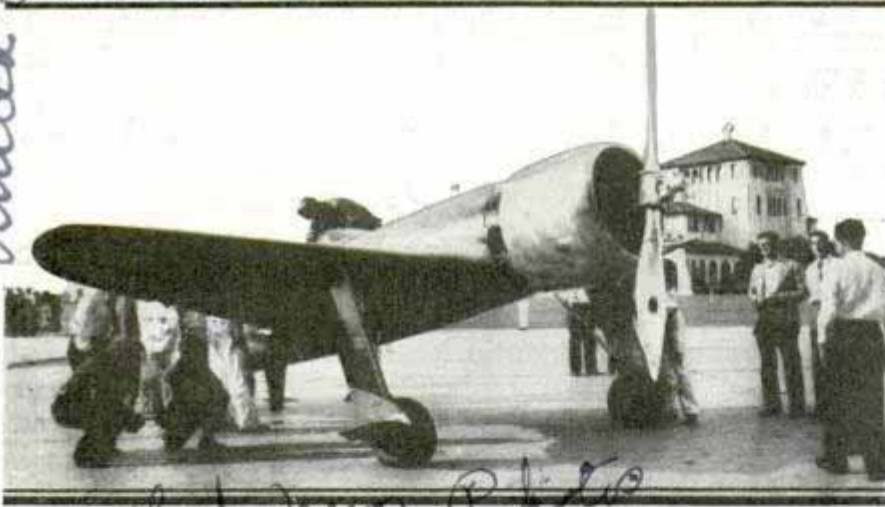
Chicago Tribune 1/13/33

Arms, Idem and Maurice Thompson 1/6/33

How HUGHES



Top photo, courtesy Russell Cole
Hughes' racer landing after test flight and, left, plane with small racing wing before remodeling



Ant. News Photo

LONG months of secret research by a corps of engineers and then more months of building and fitting behind guarded doors—that is the inside story of the mystery monoplane that Howard Hughes flew across the United States in seven hours and twenty-eight minutes in January.

The flight seems like fiction, almost like moving your finger across the map to span a continent. Yet Hughes' associates think he can beat his new record almost any time he desires. A mark of around six hours may be in the offing. For on his latest dash Hughes simply cruised from coast to coast. Mostly he used only fifty

per cent of his power. One of the miracles of the flight is that Hughes used a strictly stock engine that was not "hopped up" for racing. Another is that his airplane is not a freak affair that must be pampered and groomed for a high-speed dash, but a sturdy practical plane that flies safely and easily at the speeds for which it was designed.

Instead of using tremendous power Hughes depended more upon perfect streamlining for his speed. All planes are streamlined to some extent but even on a modern transport the wings are dotted with tiny rivet heads, each of which contributes to resistance. The metal skin of Hughes' fuselage is not riveted in the usual way. Instead all plates are butt-jointed with splice plates underneath, using flush-type rivets to eliminate every vestige of drag. Of course, streamlining is not the whole story. Much of it lies in the months of wind-tunnel research at the

Reference Mr. DeBerk Hughes Aircraft Co. Burbank, Calif. United Airport Burbank, Calif.

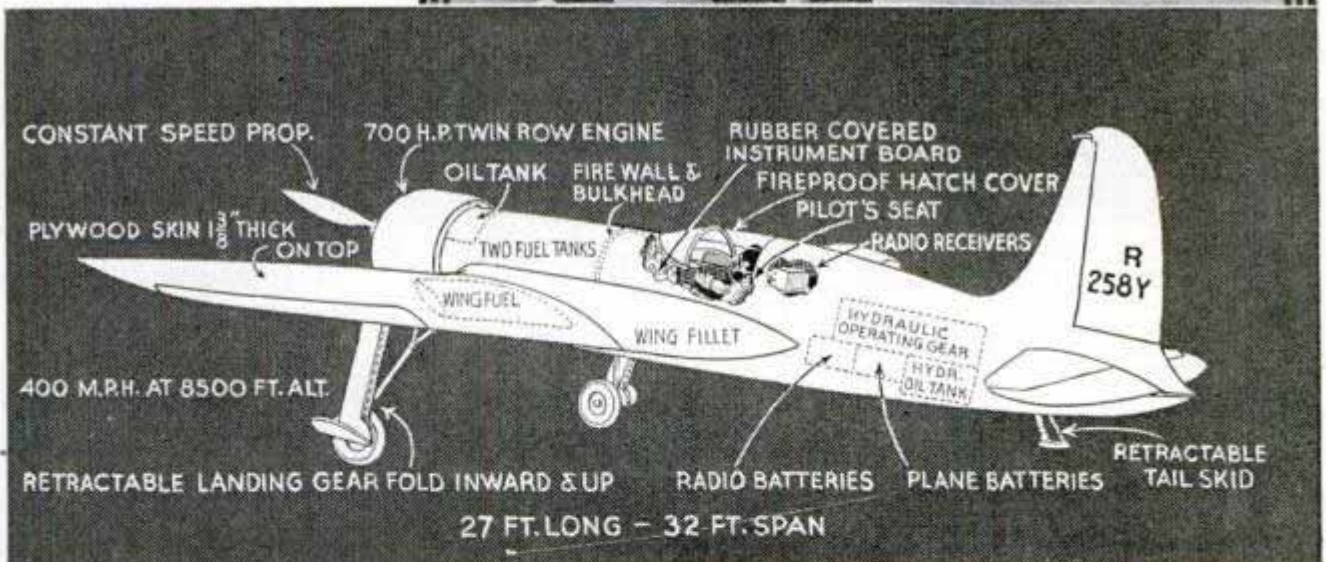
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BROKE *the* RECORD

California Institute of Technology.

"In the wind tunnel we worked with speeds never before seriously studied in this country," says one of Hughes' engineers. "Compressibility of air is different at high speeds and this had to be studied in designing the special wing curve. But the result is a sturdy airplane that can carry a good load at a top speed of around 400 miles per hour at 8,500 feet altitude, with a cruising speed of around 340 miles per hour. At sea level these speeds are somewhat slower."

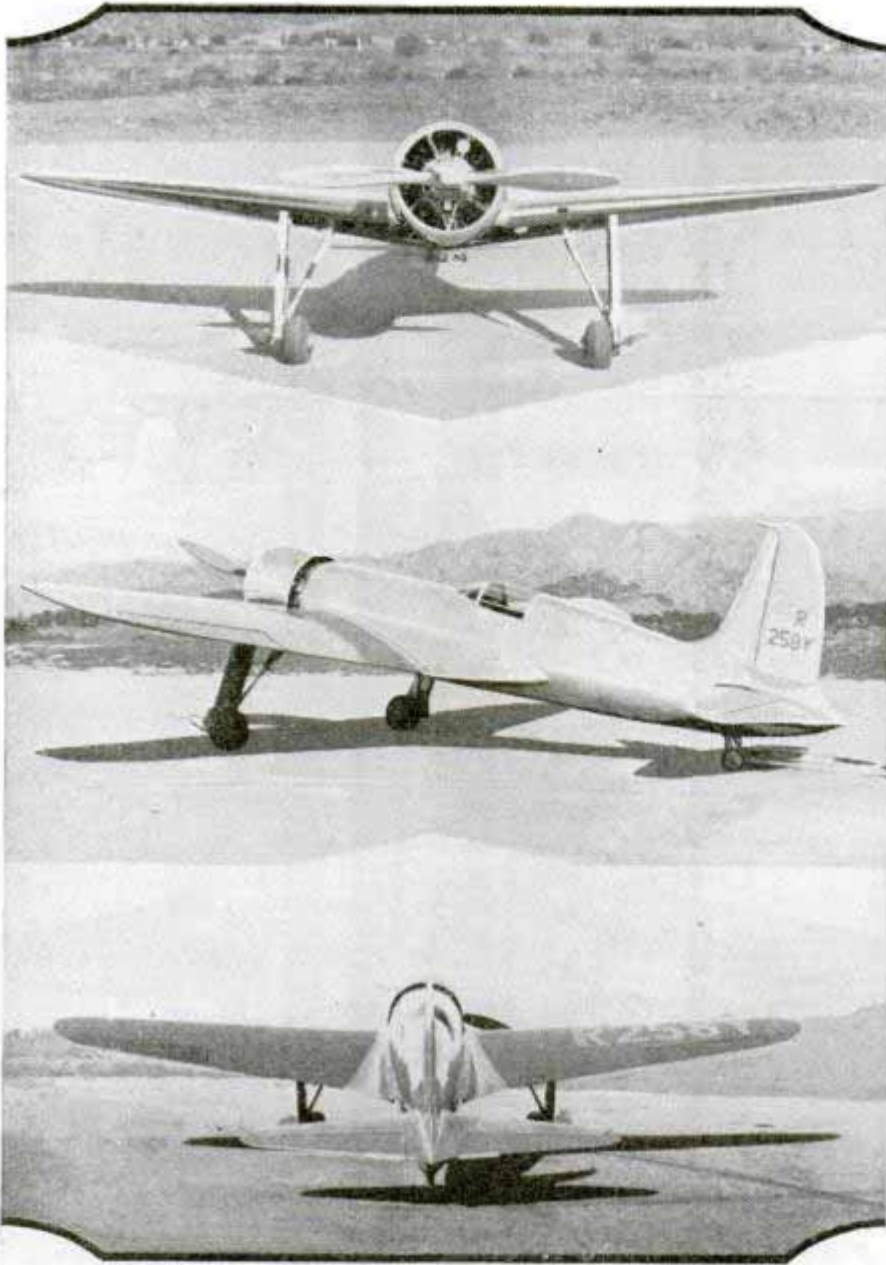
Hughes averaged 332 miles per hour on his transcontinental flight



Howard Hughes who flew from Los Angeles to New York at better than five miles a minute and diagram showing details of his plane

and flew at an average altitude of 15,000 feet except when mountain ranges forced him up. His plane is the same \$125,000 ship with which he established a world record of 352 miles per hour two years ago, except that a number of its parts have been improved. The changes, including a larger wing, increased its speed about twenty miles per hour at all altitudes

In spite of his high top speed Hughes is able to land at seventy miles per hour. "Air brakes" of the split trailing edge type that are mechanically operated help slow him down. Another factor in safe landings is the wide tread of the retractable landing wheels. The wheels are farther apart than usual and, with the retractable tail skid, provide three widely spaced



Three views of Hughes' plane as it appears with new and larger wing after alterations which added to speed

points for landing. Once Hughes blew a tire upon landing after a test hop, an accident that would have wrecked most racing planes, but he brought the monoplane to a stop without damage. The plane is fitted with standard air wheels and conventional brakes. It is twenty-seven feet long and the wing span is thirty-two feet. The wing is ten feet wide at the roots, tapers to a width of four feet at the tips, and is attached to the fuselage with a fillet of unusual design. Wing loading is thirty-five pounds per square inch with full load.

Although the fuselage is of metal, the wood wing is covered with a spruce plywood skin one and three-eighths inches thick on top. This is about an inch thicker

than most plywood wing skins and seems to be a waste of material and weight. But it gives the wing a safety factor of five times at speeds above 600 miles per hour, a speed which the plane is theoretically able to achieve in a dive. The constant speed type of propeller is ten feet long and makes two revolutions to every three revolutions of the engine. Near the nose the fuselage skin is many times thicker than usual and averages three times the thickness used on lower-speed airplanes.

Hughes' motor is a stock air-cooled fourteen-cylinder twin-row radial Pratt & Whitney wasp junior that develops 700 horsepower at 2,500 revolutions per minute at 8,500 feet altitude. The engine has an outside diameter of forty-four and one-eighth inches, a dry weight of 1,060 pounds, and a displacement of 1,535 cubic inches. Compression ratio is 6.7 to one and the supercharger ratio is ten to

one. Carburetion and magneto ignition are stock.

The plane carries 280 gallons of special 100-octane aviation fuel in two tanks aft of the motor and in smaller wing tanks. The engine and fuel compartment in the front of the fuselage is sealed from the cockpit by a heavy fire wall and bulkhead, behind which the instrument board is located. Although the plane is fitted for an automatic pilot, none was used for the last flight as there was not time to install it.

The instrument board contains a complete set of flight, navigational and engine instruments, including directional gyro and artificial horizon. Temperature gauges show the temperature of the outside air, carburetor heat, and head temperatures of

the individual motor cylinders. Radio beam and weather broadcast receivers are located in the fuselage aft of the cockpit, where batteries, hydraulic oil tank, and hydraulic mechanisms for elevating the pilot's seat, operating retractable landing gear and tail skid and moving the windshield and hatch covers are also located.

Elaborate precautions were taken to protect Hughes against every conceivable danger. The large instrument board in front of him is completely covered by a four-inch pad of sponge rubber with holes cut into it to reveal the dials. Fresh air enters the cockpit from an intake on the leading edge of the right wing far away from exhaust fumes. Hughes controls the amount of air by means of a valve and with a similar valve regulates the flow of warm air that passes through a heater after being taken in at the leading edge of the engine cowling. The inflowing air, fresh or heated, puts a slight pressure on the inside of the inclosed cockpit to prevent engine fumes or exhaust gases from leaking in.

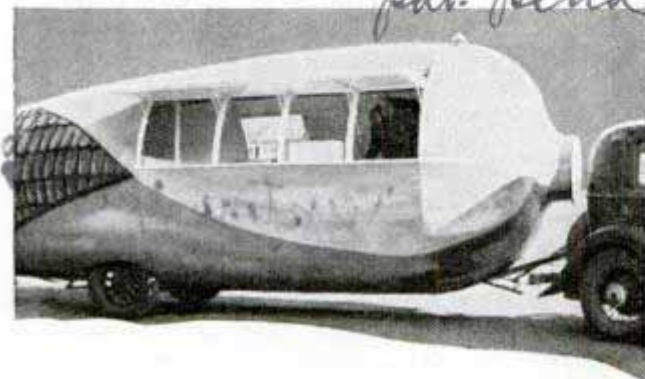
One of the problems was to fit all the gear into the small available space. In the cockpit, instruments and controls take up so much room that there was no place for an oxygen tank for high-altitude flying. The problem was solved by installing the oxygen tank in the right wing above the space into which the retractable landing gear fits. From the tank an aluminum

(Continued to page 160A)

20 43

Trailer Like Giant Ear of Corn Has Restaurant Inside

pat. pend

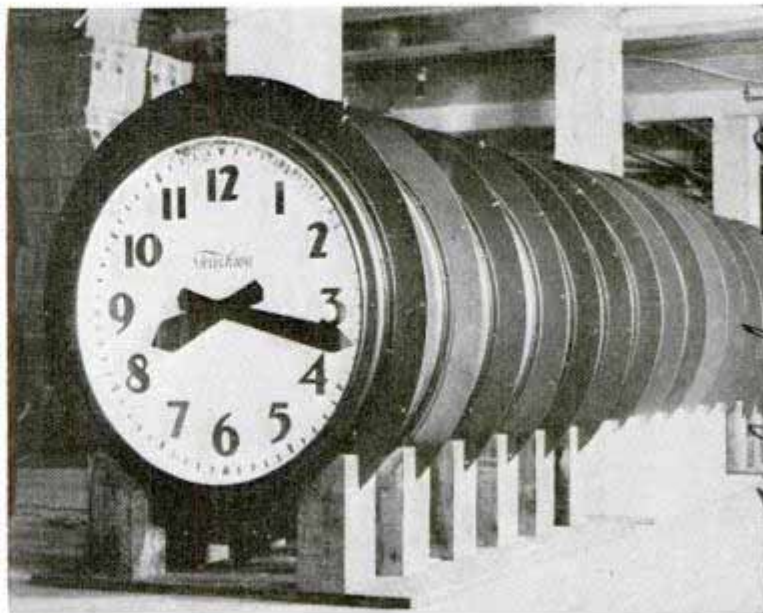


This odd trailer which houses restaurant has space inside for ten diners

Cabilla Corp. des Machines d'ava

20 4.

Big Clocks for Powerhouses Govern Electric Time Pieces



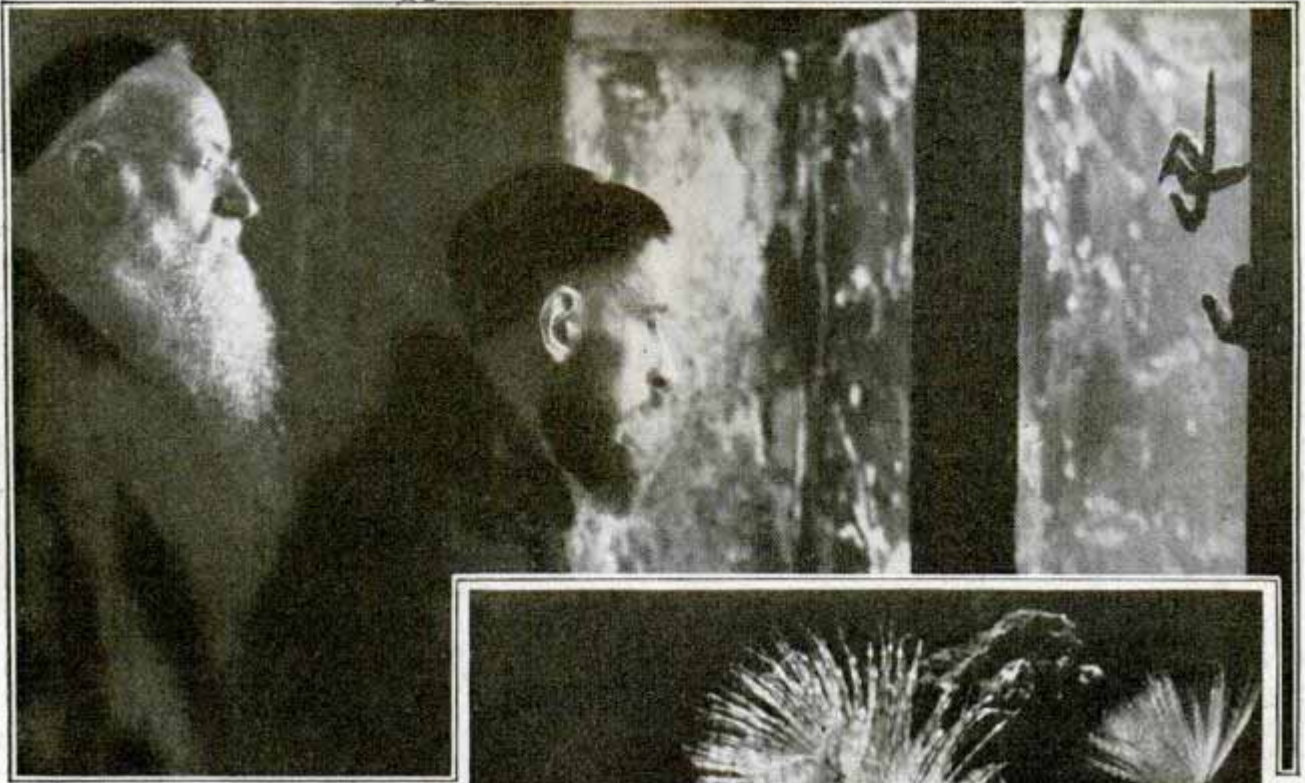
Master clocks for power stations. They hold current alternations uniform so your electric clock keeps time

When synchronous electric clocks which measure time by the cycle change in alternating current first were marketed, it was found they would gain or lose as much as ten minutes a day due to variations in the speed of generators at local powerhouses. This difficulty was corrected by producing giant master clocks for the power stations. These neon-illuminated clocks, now installed in almost every powerhouse, automatically keep current alternations uniform, thus making possible the uncanny accuracy of synchronous electric clocks in the home and office. The master clocks illustrated are in a stockroom awaiting delivery to power stations.

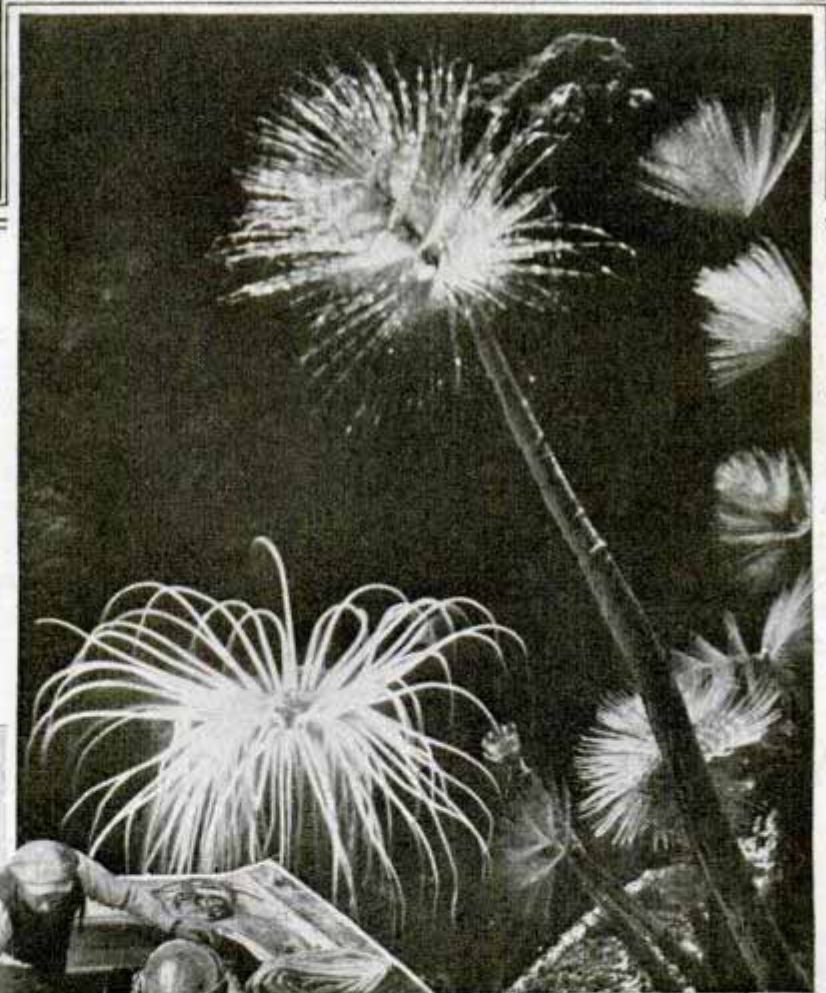
is Warren Telephon Co
W. S. Laird, Manager

Under direction of Professor Johann

Strange UNDERSEA

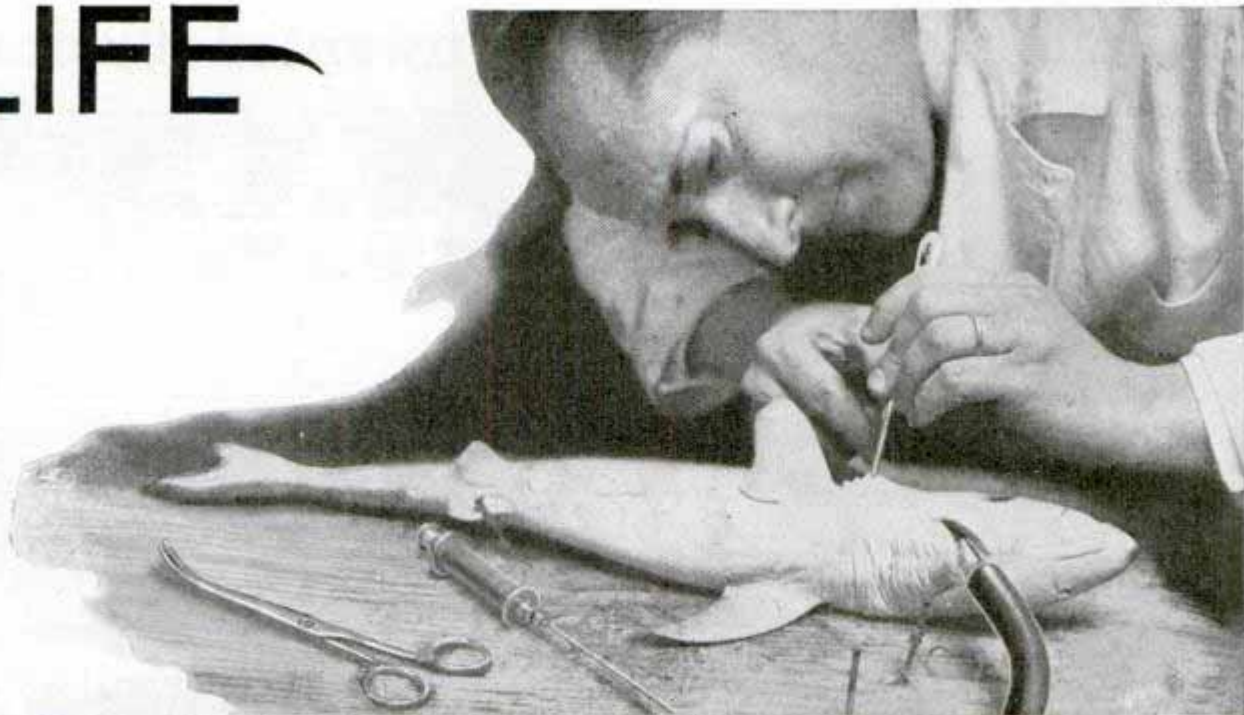


To give the world a glimpse of the weird undersea life of the Mediterranean, German scientists have established a zoological station and an aquarium at Naples, famous for its beauty. Strange animals and marine vegetables are shown there, and to study this life and obtain exhibits from the ocean floor the scientists must remain for days on their research ship and put on diving suits for deep-sea exploration. Top, visitors watching one of the aquarium exhibits



Keystone View
No tropical flowers are those shown above, but Mediterranean sea animals transplanted to the Naples aquarium. Left, scientist goes over the side in diving outfit to hunt on the bottom for salt-sea fish and "flowers"

LIFE



Top, operating on a baby shark. Diseases that have been considered difficult or impossible to deal with are now treated by taking the fish from its tank and operating surgically while fresh sea water is administered by tube



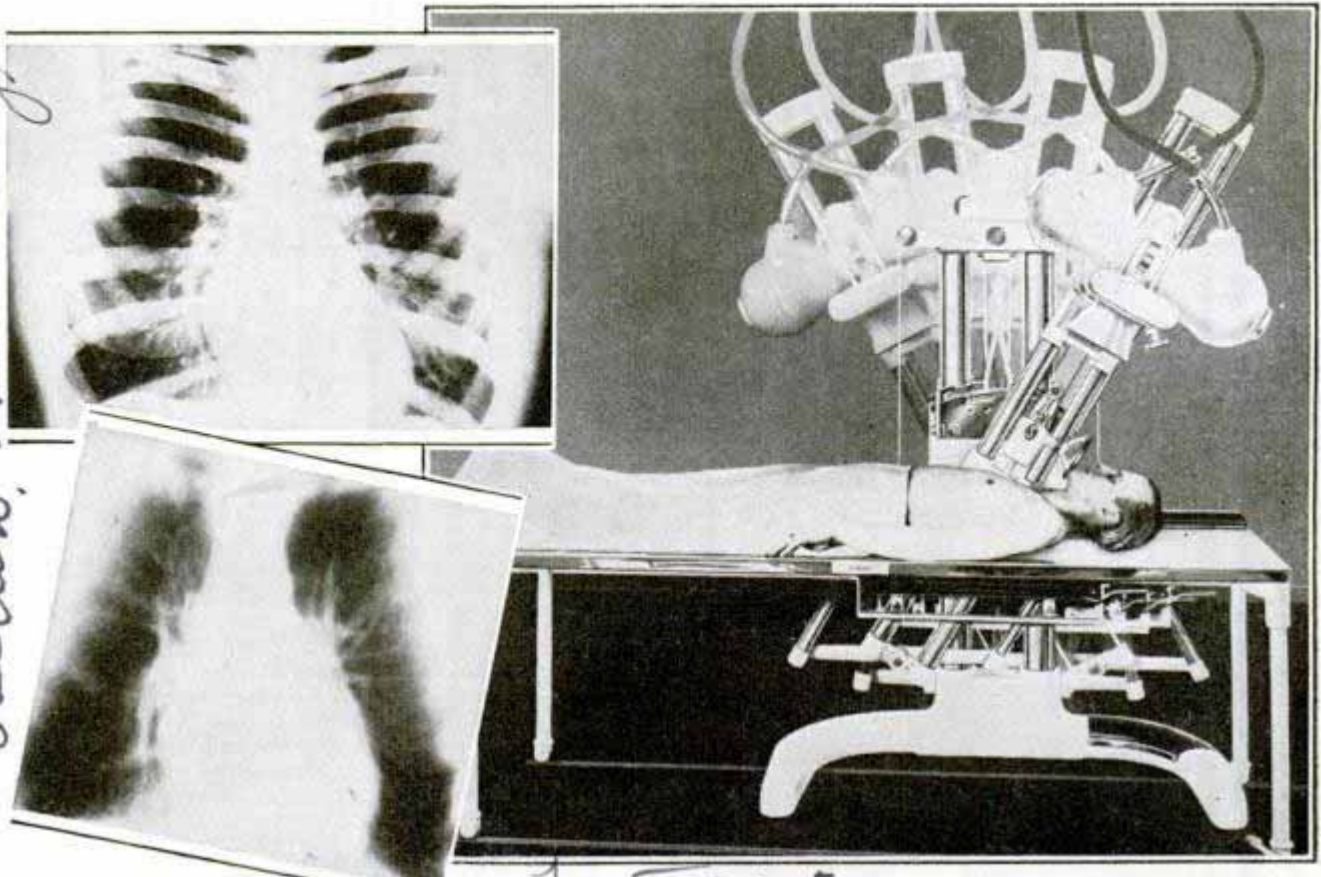
Above, starfish and a visitor pose for silhouette portraits against the submarine background of an exhibit in the Naples aquarium. A day spent in this huge institution, the exterior of which is shown at right, is like a day spent at the bottom of the Mediterranean



es-6

Swinging X-Ray Avoids Unwanted Shadows

Electricitäts-Gesellschaft 'Sautors'
Berlin, Germany



Tomogram

Photo shows how X-ray tube swings above subject while film moves in opposite direction below. X-ray picture above at left was taken in traditional way; that below in new way, eliminating shadows of ribs

X-ray photography has always been hampered somewhat by the inability to cut out unwanted shadows. An X-ray study of the lung would be cluttered up with shadows of the ribs, obscuring parts of the lung the physician desires to examine. This fault has been conquered by a swinging X-ray machine developed in Germany, which excludes undesired portions of the picture. It follows the principle of the time exposure taken at twilight with an ordinary camera, in which a moving person is not recorded in the brief moment when he passes the lens. In the case of the X-ray, it is the X-ray tube and film container which move, swinging as a unit like a pendulum. The X-ray focus moves along the arch of a circle from left to right above the person or object being photographed; it is focused constantly, as it moves, at the particular object of the picture. Meanwhile the film moves below the table from right to left, but always parallel to the table and to the plane of the section being photographed.

Thus every point in the plane of that section always falls on the same point of the film, and other points of the body are at constantly changing points on the film and are therefore underexposed and do not record so clearly. One second is usually sufficient for the moving exposure. Adjustments make it possible to cut out sections of the body from a few millimeters to two centimeters thick for photographic purposes. Thus disease focuses or foreign objects in the body are located exactly.

All Car Doors Locked at Once by Single Handle

Intended for installation on new cars at the factory, a four-door locking system controlled by one handle has been developed. The control handle is located on the right front door. Cars now in use may be locked only by manipulating the handle or locking pin on each door. The new system makes it impossible to leave the key locked in the car and permits entering

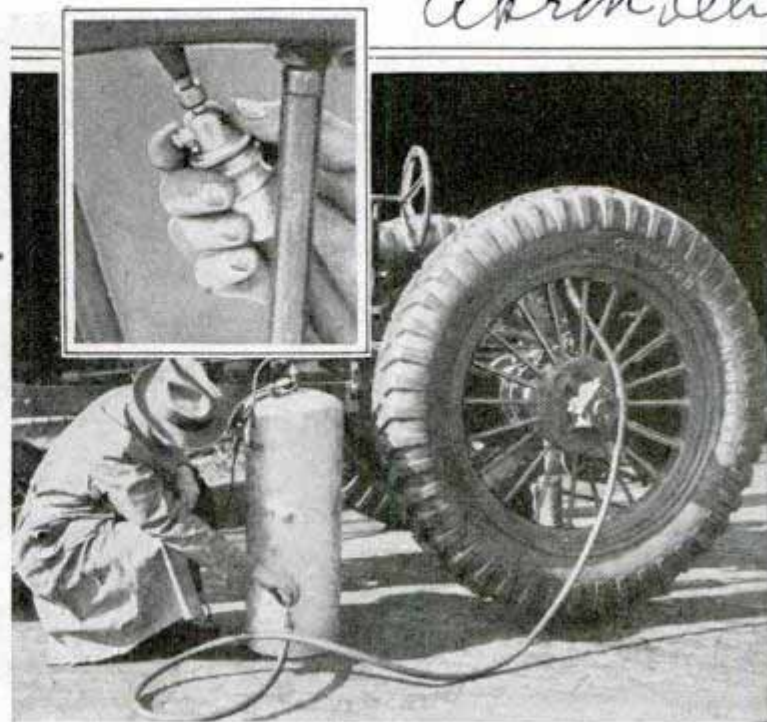
so 79
Hoydville - Hershey
Cars: 2160 & 2300

Electrol, Mech

Sept. of Automobile Press Service 12-3

the car from the left or right side, eliminating the necessity for crawling across the front seat to reach the driver's position. The single locking motion is regarded as a safety factor in prevention of stop-light holdups in which the marauder quickly steps into the car through a door the driver may have forgotten to lock.

B. J. Soodrich
Tires Inflated with Water
Improve Tractor Operation
Abert Blue



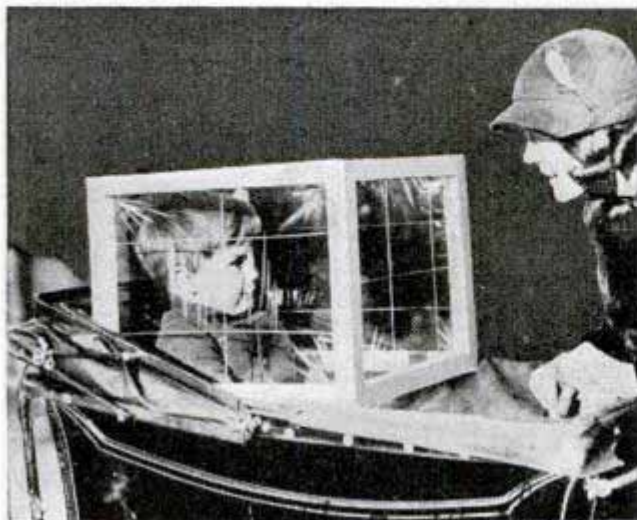
Filling tires with water to improve tractor operation. Inset, water nozzle applied to the tire valve

Es 95
Antelope Refuge Set Apart on Vast Western Tract

In the heart of its native range in southeastern Oregon the government has established a 276,000-acre refuge for the antelope, fleet-footed animal which was widely distributed over the west until civilization, hunters, disease and predatory animals reduced its numbers. Near the new Hart Mountain refuge is a 539,000-acre winter and spring range where the antelope will also be protected. It is estimated there are 10,000 pronghorns in the Nevada-California-Oregon region and 15,000 in Wyoming.

Es 40
Celluloid Top for Baby Buggy Is Put on When It Rains

On windy or rainy days, a homemade "coupe" top which fits over a baby carriage protects an English youngster from the weather. His mother devised a frame with celluloid windows to fit on the buggy.



Celluloid windows in frame make weatherproof top for baby buggy. Child's mother designed it

Water-filled tires may solve many problems of tractor operation. Tests have shown such tires provide a normal cushion that eliminates virtually all sway and rebound on the road, reduce wheel chatter and improve traction. These results are achieved by balancing the tires with the water instead of using expensive metal wheel weights. An adapter which connects to any garden hose may be used for inflating the tires with water. After filling, the tires then are filled with air to the usual pressure. A pressure tank is available for putting the water into the tires. In winter, an anti-freeze solution is used instead of water.

Es 97
"Nesting Poles" Built by Utilities to Keep Birds Off Power Line
Atlantic

Power companies along the seaboard sometimes are forced to erect "nesting poles" for fish hawks to keep the big birds from building nests atop high-voltage power-line poles. The hawks use bits of fish net and rope, old fence wire and sometimes cornstalks to make their nests and this material could "short" the power line and burn the pole.

Wm. W. Jones
 Mrs. A. French
 Cliftonville, Md.
 Eng.

Wm. W. Jones
 346 D. Centre Ave.

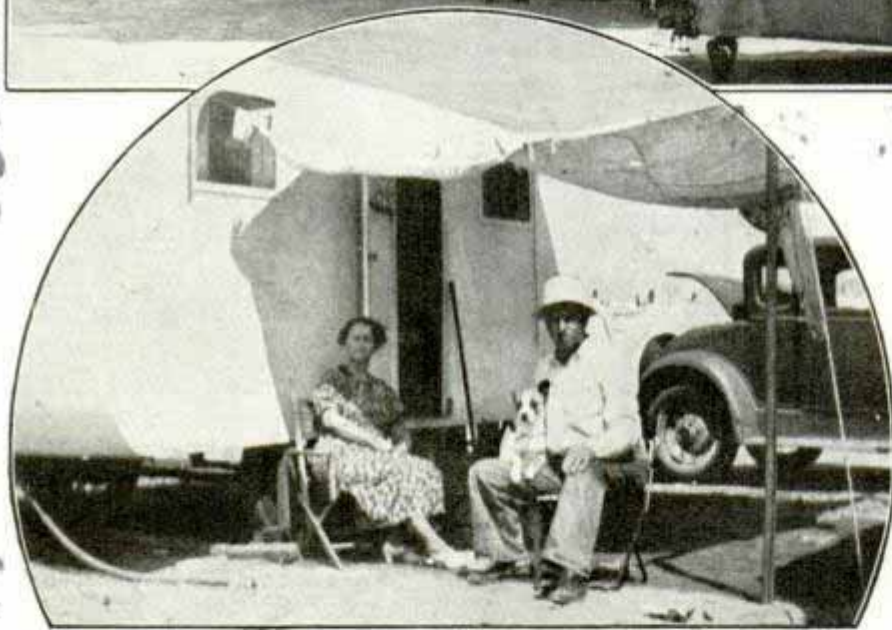
es 8.

Latest **COMFORTS**

James McQuerry 436 W. 60th
 Terrace, Kansas City, Mo.



Modern trailer camp in California, above. Left, trailerites enjoy solid comfort



80,000 trailers. Likewise, home craftsmen everywhere helped swell the year's output. The production mark of recognized builders for 1937 is around 200,000.

This means about 500,000 potential customers for the trailer camp owner. And there is a need for adequate camps in virtually every section of

WOULD you like to go in business for yourself—perhaps get into something requiring only a small amount of capital and promising a reasonable return?

Then start a trailer camp.

The growing need for such camps is apparent to those who have watched the portable home zoom to national popularity in the last three years. There are more than 200,000 trailers in use today. Last year more than 300 companies built about

the country. The average tourist camp cannot accommodate them, the trailer owners say, and the spots in many public parks set aside for their use are not properly laid out, so dusk usually finds the tin-can tourist camped along the highway or in a field. Under these conditions, trailerites must forego the use of electricity and other comforts of their homes on wheels. Some towns and a few individuals have opened trailer camps on well-

As 8

for HOMES on WHEELS

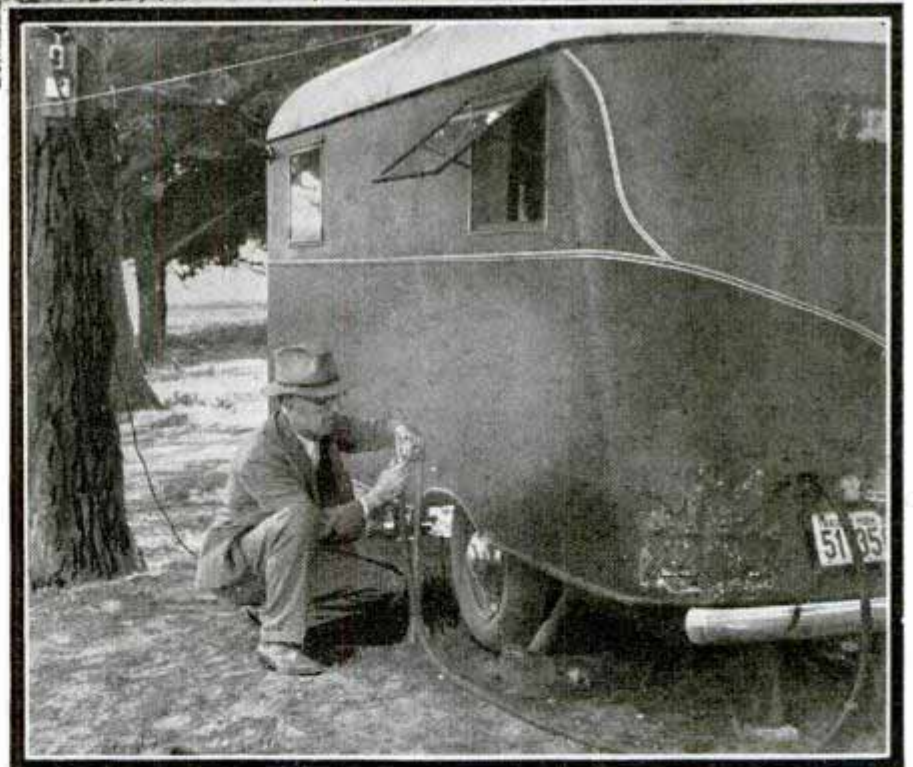
A rolling home in the south and, below, the trailer camp should be equipped with water taps and electric-light sockets which can be connected to the trailer as soon as it is parked



traveled highways, but in the main the field is still wide open.

The portable home owner doesn't like to park at the rear of a tourist camp or a filling station. Neither furnishes the peace and quiet, the pleasant surroundings or the adequate facilities he is willing to pay for. The opportunities in this field may be adduced from the sales reports of trailer makers. The foot-loose and the retired represent a big portion of present trailer owners. They range from those with small pensions or modest savings to the wealthy who follow the sun throughout the year.

Surveys show most trailer owners roll their own homes more than half the time and a considerable number use them continuously. They like to be on the wing—



in Michigan or Minnesota or Maine in the summer, then to Florida, Arizona, or California for the winter. There are stop-overs and side trips along the way. The prospective trailer-camp owner also may find added confidence in the predictions of those who see a great future in portable



Top, Florida trailer park. Below, laundry of trailer camp equipped with coin-operated washing machines and rental irons

homes because of the house shortage, fluctuating employment and high taxation of property.

One of the advantages of going into this business is that no great amount of capital is necessary at the outset. An unimproved camp site may be leased reasonably—frequently for the amount of the taxes, and it can be made to pay its way, improvements and extra features being added as the business becomes established. An example of this method of operation is offered by C. H. Treffenger of Ocean Beach, Calif. Three years ago, he was working in a filling station when a prop-

erty owner offered to lease him three city blocks of vacant lots overlooking the ocean if he would keep up the taxes.

An entrance drive and a restroom were the only improvements the first year. Electricity, showers, and a sewage system connecting with the trailer drains were added later. Owing to his location on the ocean front, Treffenger has accommodated as many as 150 trailers at one time and

he has a regular patronage of around fifty trailers per day, many on a monthly basis. To add to his profit he has built a small grocery store on the premises and the trailerites are supplied with provisions, notions and ice. In starting, this spot was open to both trailers and campers but by degrees the campers have been segregated and now occupy only a small section of the grounds.

In contrast to this camp, Ollie Trout operates a trailer park in Miami, Fla., that represents an investment of \$150,000. A landscaper before entering this business,

(Continued to page 158A)

Farmer-Hunter Plan to Restore Game Birds

Cooperation between farmer and hunter is the key to the Western-Winchester plan for restoration of game birds in areas gradually becoming barren. The plan calls for the farmer to restore natural cover, eliminate animals which prey on the birds and plant and care for food patches. This work is to be done with the financial and advisory assistance of the sportsman. The plan is designed for one hunter and one farmer, or for a group of sportsmen and a group of farmers. It gives the sportsman permission to hunt the lands of the farmer with whom he is



Top, eight-hour old quail on incubator tray. Circle, day-old quail compared to twenty-five cent piece. Bottom, checking temperature of incubator at Western-Winchester experiment farm to insure proper incubation of quail or pheasant eggs. Tests on the farm prove that wild game can be raised with minimum equipment and special handling



working and it compensates the farmer at so much per acre for agricultural land permitted to revert to cover and so much per acre for food patches. Exclusive shooting privileges would be arranged, perhaps through payment of a fixed sum per acre. A lease between farmer and hunter covers the part which each agrees to perform, and provides that the farmer receive some revenue each year for labor and material expended and land employed in the scheme. In an experimental area, the cost to the sportsman per season's bag of fifty birds was \$15.75, a figure believed to represent the average expense under average conditions of field management.

New Radioactive Mineral Found in Wyoming Highway Bed

Workmen excavating for a highway west of Rawlins, Wyo., noticed a strange yellow mineral deposit in the soil but cast it aside as sulphur. When a prospector sent a sample to Portland, Ore., for analysis, it proved to be a hitherto unknown mineral, highly radioactive and possibly of tremendous economic importance. Named dakeite for Prof. H. C. Dake of Portland, who participated in classifying it, the mineral carries a large percentage of uranium and if the Wyoming deposit proves extensive it may become a commercial source of radium. Under ultraviolet lights the material gave a fluorescent reaction quite powerful and different from other minerals of its type. The deposit is in a matrix of gypsite, and it is believed a rich source is located not far below the earth's surface.

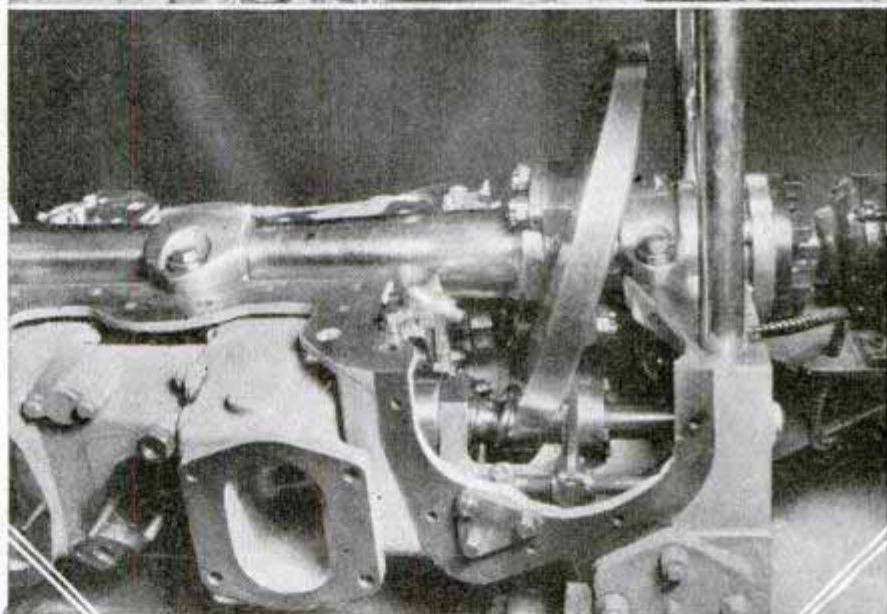
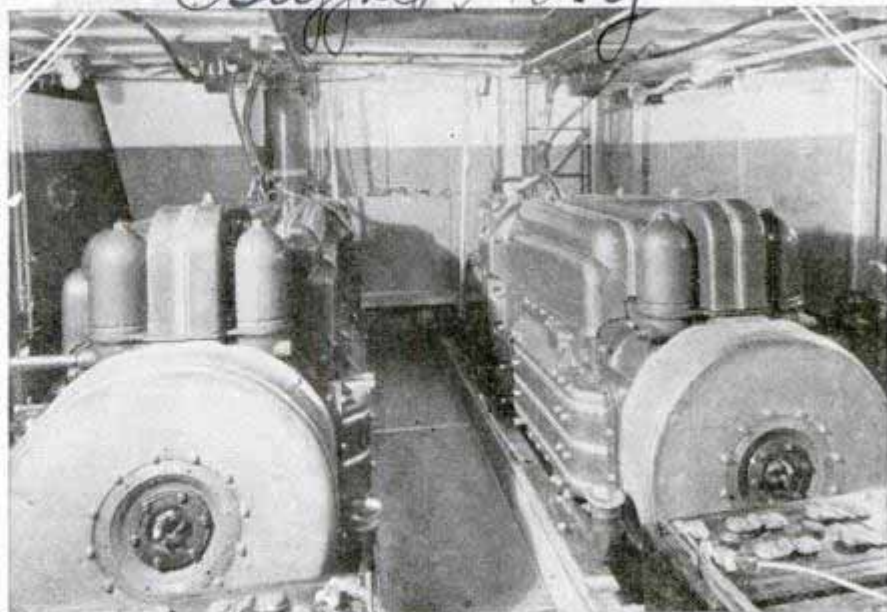
Little Crumbe...
 1/16 9/3
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 POPULAR MECHANICS
 Farmer-Hunter Plan to Restore Game Birds
 Cooperation between farmer and hunter is the key to the Western-Winchester plan for restoration of game birds in areas gradually becoming barren. The plan calls for the farmer to restore natural cover, eliminate animals which prey on the birds and plant and care for food patches. This work is to be done with the financial and advisory assistance of the sportsman. The plan is designed for one hunter and one farmer, or for a group of sportsmen and a group of farmers. It gives the sportsman permission to hunt the lands of the farmer with whom he is working and it compensates the farmer at so much per acre for agricultural land permitted to revert to cover and so much per acre for food patches. Exclusive shooting privileges would be arranged, perhaps through payment of a fixed sum per acre. A lease between farmer and hunter covers the part which each agrees to perform, and provides that the farmer receive some revenue each year for labor and material expended and land employed in the scheme. In an experimental area, the cost to the sportsman per season's bag of fifty birds was \$15.75, a figure believed to represent the average expense under average conditions of field management.

20 111
 Top, eight-hour old quail on incubator tray. Circle, day-old quail compared to twenty-five cent piece. Bottom, checking temperature of incubator at Western-Winchester experiment farm to insure proper incubation of quail or pheasant eggs. Tests on the farm prove that wild game can be raised with minimum equipment and special handling
 New Radioactive Mineral Found in Wyoming Highway Bed
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*129 Niagara
Buffalo N.Y.*

Fast Oil Engine Has Fewer Working Parts

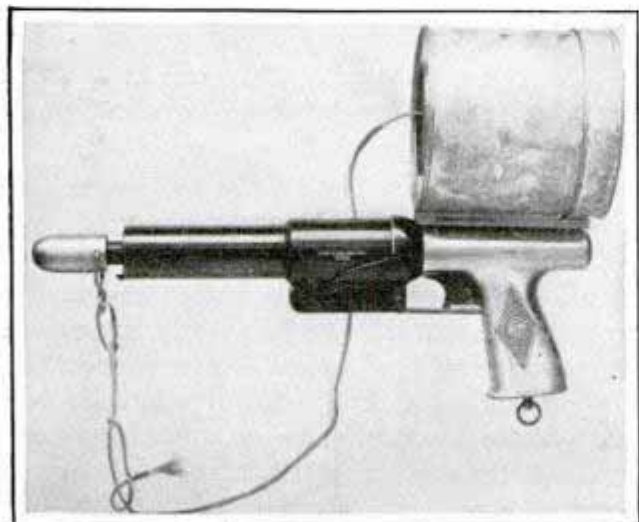
Known as "a crankless, opposed-piston, two-stroke cycle, internal-combustion, oil-burning engine," the latest development in power plants has few working parts. Built for marine use the high-speed engine has no cylinder heads, valves, camshafts, push rods, rocker arms, springs, gaskets nor crankshaft. The plant develops 150 horsepower at 1,200 revolutions per minute. One feature is the absence of electrical ignition. The engine is the compression ignition type, the fuel mixture igniting in the cylinder from the heat of the air compressed therein. The few working parts of the motor are accessible through plates on each side. Great reliability and lower maintenance costs are claimed for the engine.



Top, oil-burning engines installed in large boat. Bottom, close-up of engine showing its compactness

F170

Pistol Shoots Lifesaving Line over Three Hundred Feet



Especially woven line coiled into a container mounted on a new lifesaving pistol can be fired 350 feet. Soft and of tremendous strength, the line is manufactured like a fabric. Folding the line into its container is done in a peculiar manner so that it will pay out at great speed without tangling. The pistol is nine by thirteen inches. A projectile drags the line to the target, perhaps to a foundering boat. There the line may be used to pull a heavy hawser from shore to ship. The pistol also may be employed for firing parachute flares.

Life-line coiled in container on top of pistol is more than three hundred feet long
W. J. Sedgley, Inc.
2311 N. 1st St.

Motor vehicle users paid \$950,971,000 in special state taxes during 1935.

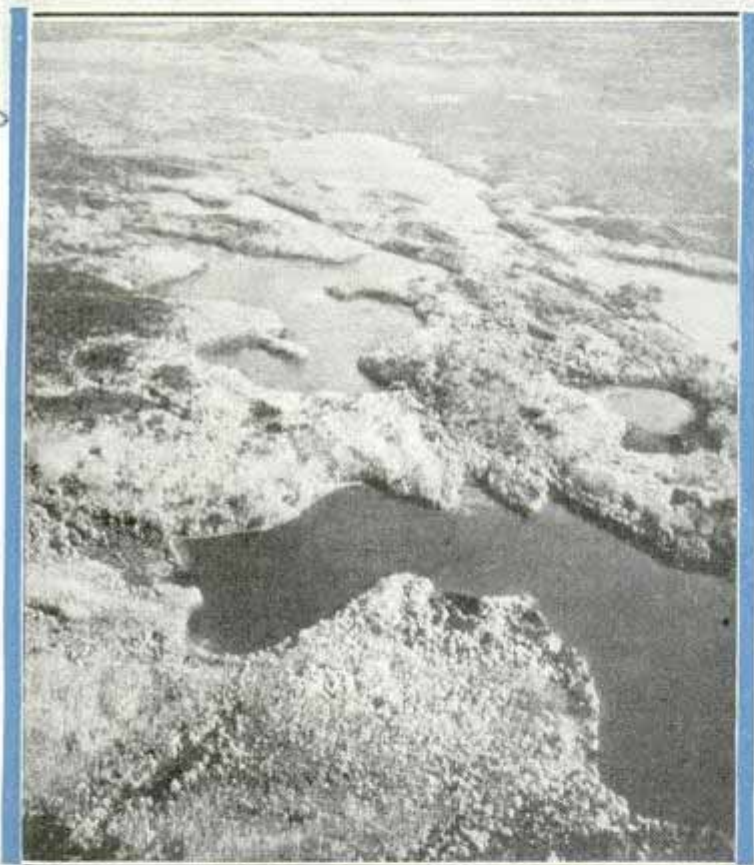
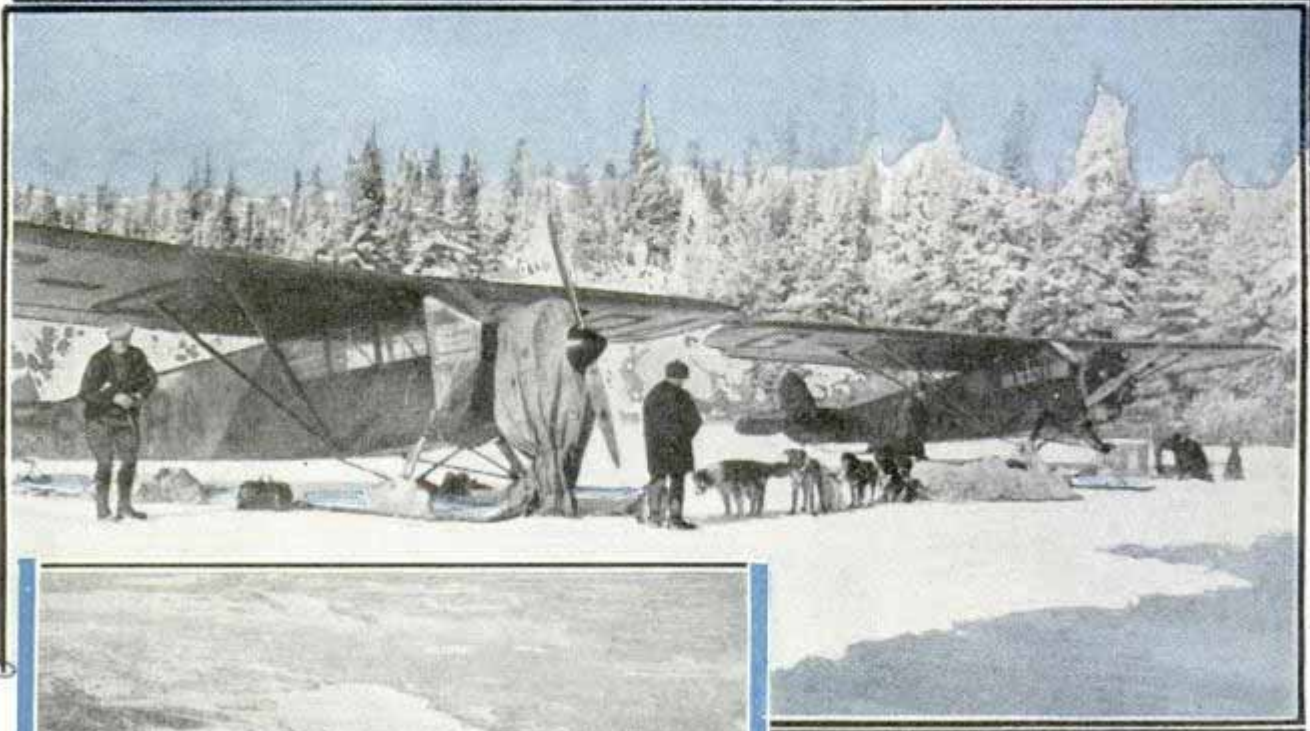
Automotive Industries

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Emb. James Montaguil, 617 Harbor
Commission Bldg. Toronto 2. Ont. Canada

FLYING FREIGHT



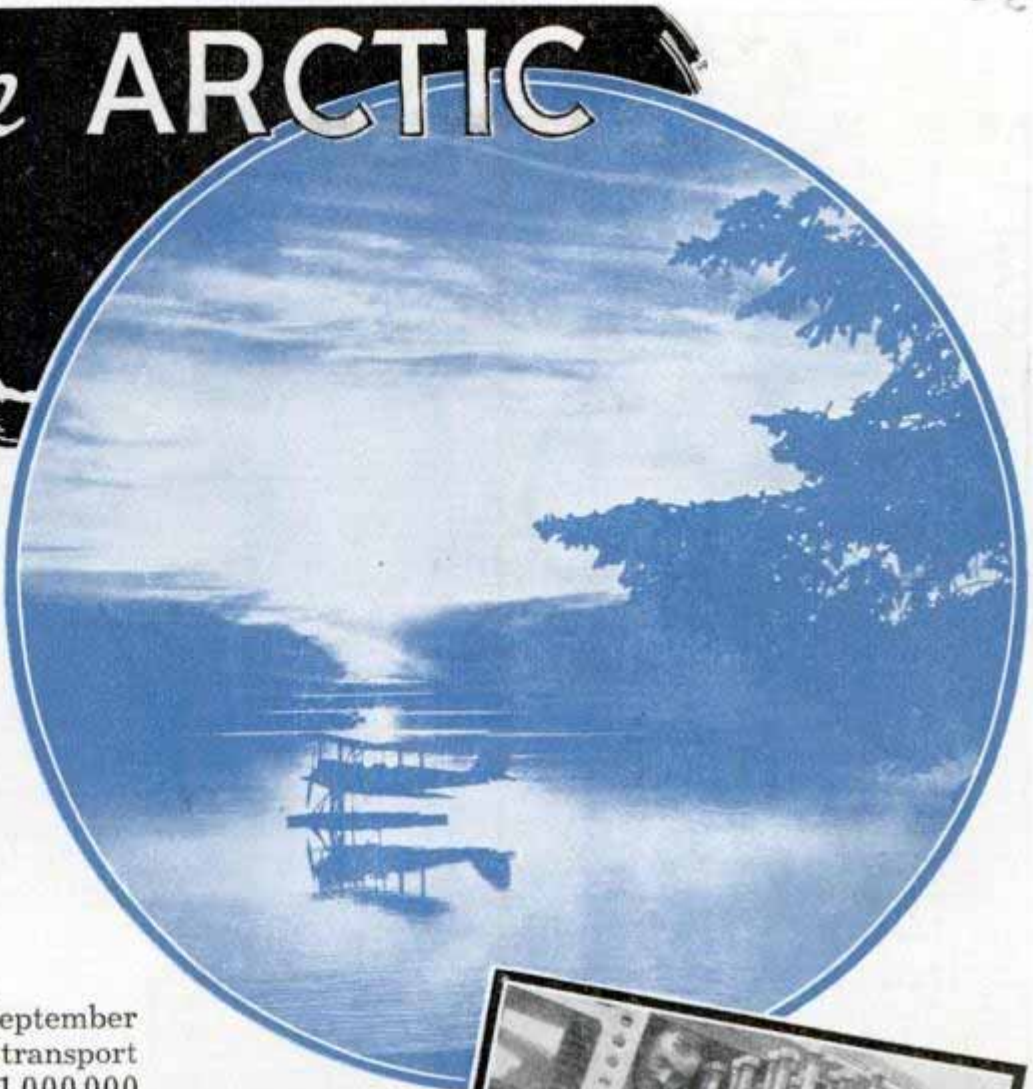
Above, the old and the new—airplanes and dog teams at a Canadian bush camp. Left, typical country over which the aerial freighters fly

CANADA is having a flying gold rush. Gold mines are being opened in territory far north of the railway, country that ten years ago was still unexplored. Last summer one of the largest mines went into operation in northern Ontario, more than 200 miles north of the last railway track. Rivers and lakes flow part way to the mine. The rest is virgin bush grown over glacial formations. Ten years ago the transportation problem would have been

insurmountable. Airplanes solve the problem now. From railway freight cars mining machinery, fuel oil for Diesel engines, lumber for houses and mine shafts and food supplies—hundreds of tons of equipment were loaded on barges and taken about 100 miles to Gold Pines, end of water transportation. Here waited a fleet of seaplanes, the smallest capable of a ton load at a time, the largest taking two and one-half tons. From early June to freeze-up in October those planes flew back and forth. They ate up ten carloads of gasoline and oil. They flew in all weathers. They had no air beacons to guide them. Below was only unsettled bush, with a few small lakes for emergency landings. Only radio weather reports were available at each end of the run. They finished their contract ahead of time. They flew 780 tons of freight into that new mine site. The flying boxcar of the fleet averaged twenty tons a day, often

F 1563
1937

to the ARCTIC

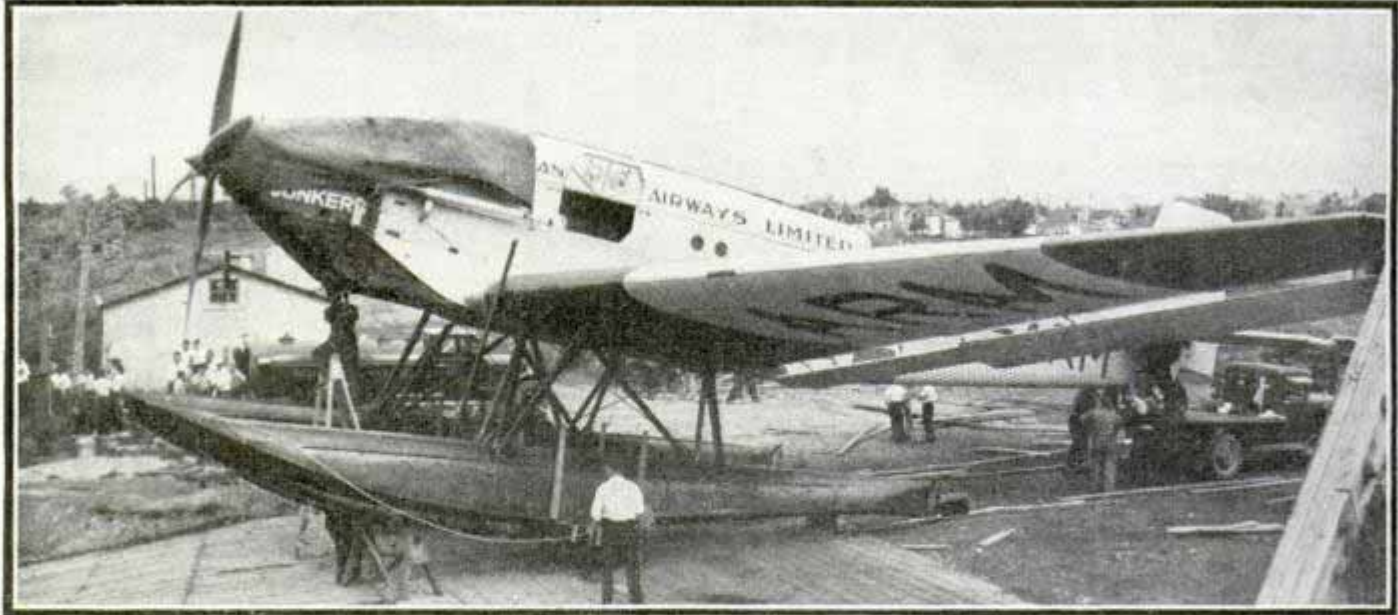


Right, mine executive's light plane at northern mine site. Below, unloading a 1,950-pound Diesel engine from flying freighter, and one of the freighters with its nose in a "nose hangar" to keep engine from freezing

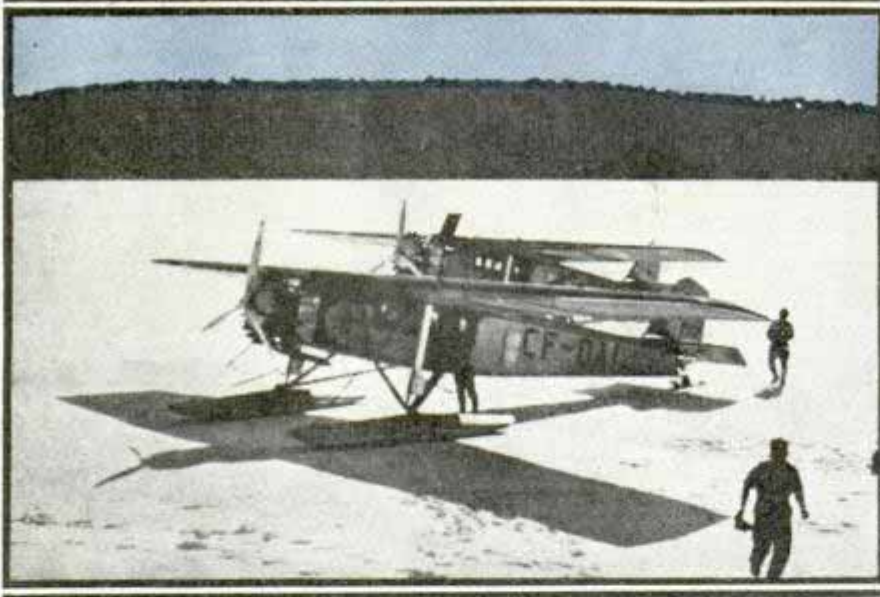
twenty-four. In September one Canadian air-transport company flew 1,000,000 pounds of supplies into the mining areas of Manitoba and Saskatchewan. Canadian air-transport operators have in recent years carried more freight and express than all the other air-transport operators of North and South America combined. In 1935 Canadian air companies flew 13,000 tons of freight and express. And 1936 was ahead of 1935, incomplete figures show.

Mining has become Canada's second





airplane, by doctors, nurses, office workers, scientists, geologists, all traveling on the wing. In 1933 there were but twenty-eight producing gold mines. Government estimates for 1936 show there are now 121 producing mines. In 1933 the production of gold was \$61,000,000. The 1936 figure is more than double, \$135,000,000.



Top, freighter which carries three-ton payload. Center, tractor hauling a barge. Bottom, aerial freighters on Canadian lake

largest industry, and gold mining leads. Aerial prospectors are traveling the farthest reaches of Canada's northland in the search for the yellow metal. They are followed by mining crews flown in by air, by financiers who travel into the bush in city clothes by air, by women and children who form new settlements where their husbands and fathers work, coming in by

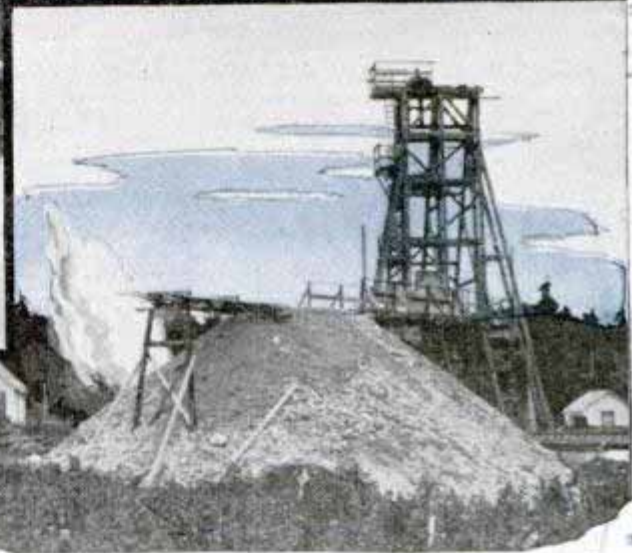
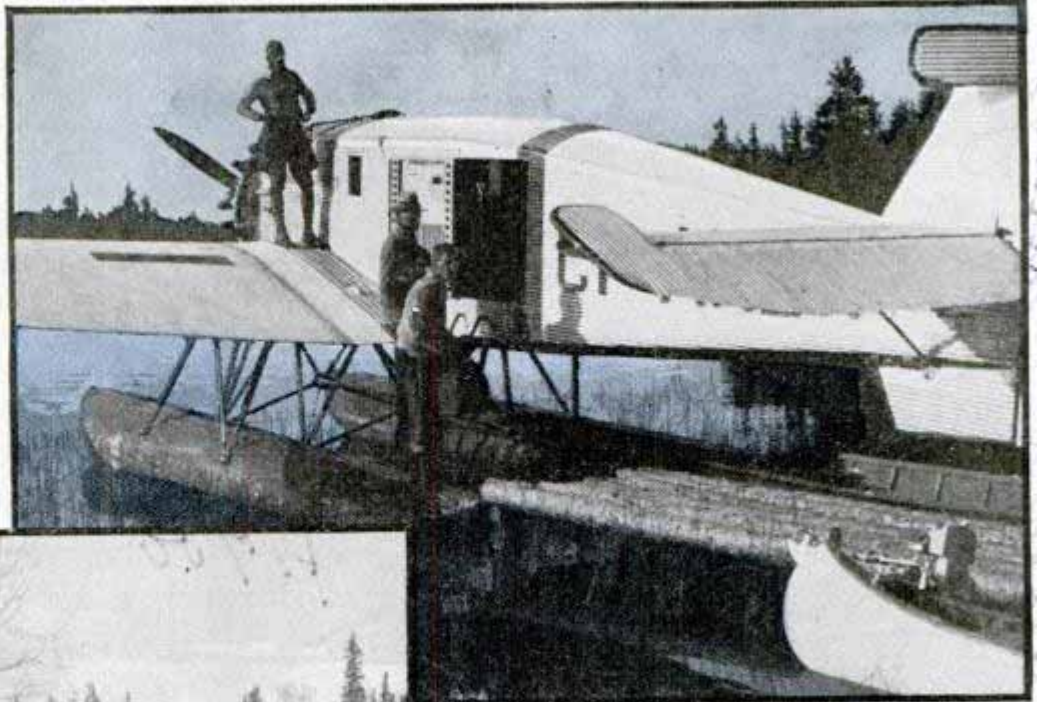
Gold has become the reason for the rapid pushing back of the northern frontier. Gold has resulted in log-cabin towns where a few years ago was wilderness. Gold has meant the pushing of highways farther north, the establishment of navigation lights and aids to mariners on waterways on the Arctic Circle. Ten years ago the first daring prospector used an airplane, a wartime crate. Today the largest Canadian air company has nearly fifty planes plying

the northland, and some thirty other companies operate anywhere from one to a dozen ships. One operator started in northern Ontario with one canoe and forty dollars. Last year his planes transported 2,000,000 pounds of freight for mines.

New gold mines need constant provisions. Typical is the report of one north-

(Continued to page 128A)

Right, freighter at mining camp. Below, left, loading freight for an air trip to a northern mine. Right, a northern mine shaft. All the equipment for this mine was brought in by the flying freighters



Above, a typical tractor train used to haul in equipment too bulky to be loaded on airplanes. Right, a mining town of unpainted lumber and log cabins in northern Canada. Building materials come by air, too



Resealing Tin Can Is Easy as Turning a Crank



Girl at right is sealing a new lid on can of preserves by merely giving the crank a turn

Home canning is made easy and economical by an automatic sealer which re-flanges and reseals the can as easily as turning a crank. It can be adjusted for the four popular sizes of tin cans, and forms a seal that has withstood tests of thirty-five pounds per square inch internal pressure.

Sunken Ship Is Located in Lake Erie by Applying Mathematics

Lost for weeks after it foundered in a gale on Lake Erie the night of last October 17, the lake ship "Sand Merchant" was at length located on the bottom by applying a common mathematical method. Tugs



Map shows how sunken ship was found in triangle formed by plotting observation lines of witnesses

and airplanes had searched the waters near Cleveland nearly two months without success. Finally United States engineers made contact with three persons along the Ohio shore who had seen the boat's distress flares. When the lines of their observations, north by fifty-six degrees east, north by thirty degrees east, and north by two and one-half degrees east, were plotted on a map they crossed to form a small triangle six miles off shore and just east of the area that had been searched. The sunken wreck was found immediately, just inside the eastern edge of the triangle.

Portable Steel "Forts" Guard Miners in Rock Blasting



One of the steel shelters in open mine. Note that it also serves first-aid purposes

Designed so they may be moved by crane from one spot to another, steel "forts" are being used in open-pit mines to protect men from flying rock during blasting operations. Just before explosives are set off in the mine, the crews are ordered into the steel shelters, to remain until the charge has been exploded. Several of the shelters are used in the mine, so that any miner may have protection near at hand.

Clifford E. Ives 2400 W Madison St Chicago

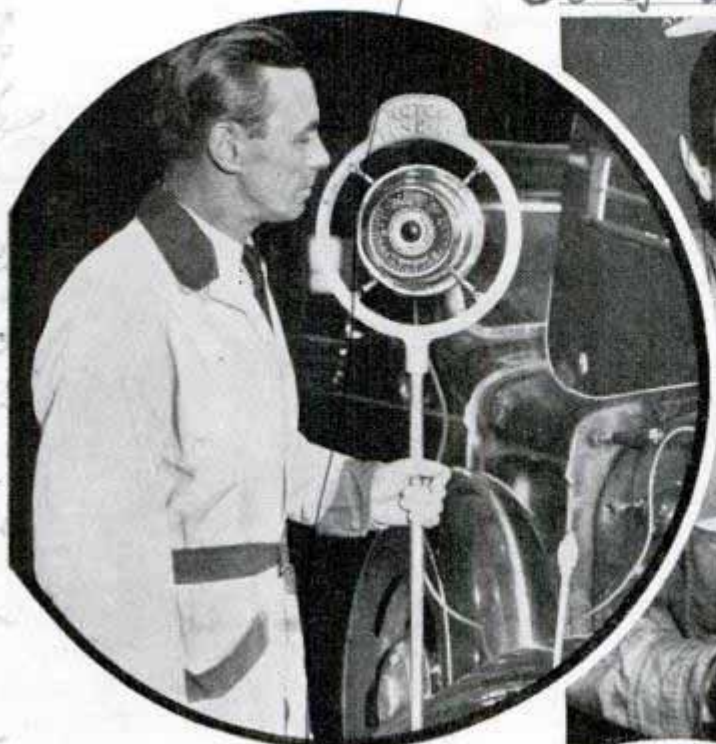
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E.A. Jaqueth, 1515
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Analysts Diagnose Ills of Modern Motor Car

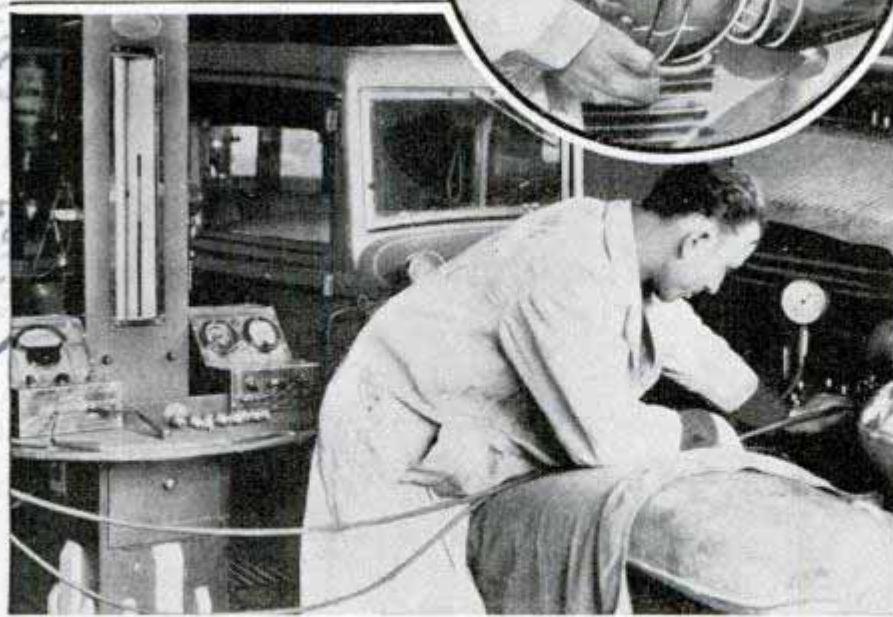
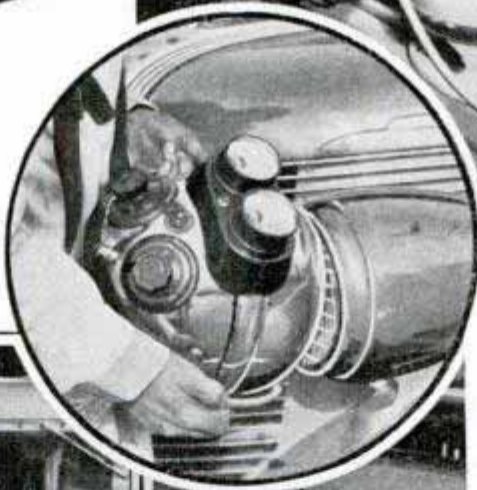
*Microphone type analyzer
motor laboratories, Inc.
504 W. 57th, New York*



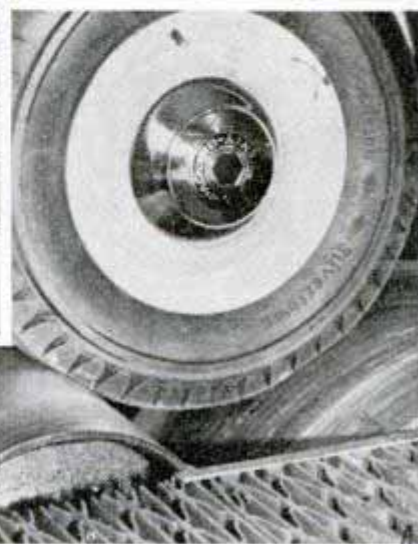
Above, mechanic locating motor trouble by watching small indicator connected to intake manifold by rubber tube. Variations in speed of engine cause the double-dial device to show whether valves are sticking, carburetor out of adjustment or ignition at fault



Above, oscillograph in use for testing and adjusting distributor. Left, headlamp tester which works in daylight. It records intensity of light, shows condition of car battery and reveals dirty reflectors, weak bulbs, poor contacts and other things as the causes of weak, uneven lights. The two knobs shown on the device are compensating controls



Above, variations in motor's vacuum cause mercury in indicator at left to show true condition of power plant. This device is supplemented by electrical analyzers for checking ignition and electrical equipment. Right, testing car under road conditions by means of electric dynamometer. Car's rear wheels cause drums to turn, showing true horsepower



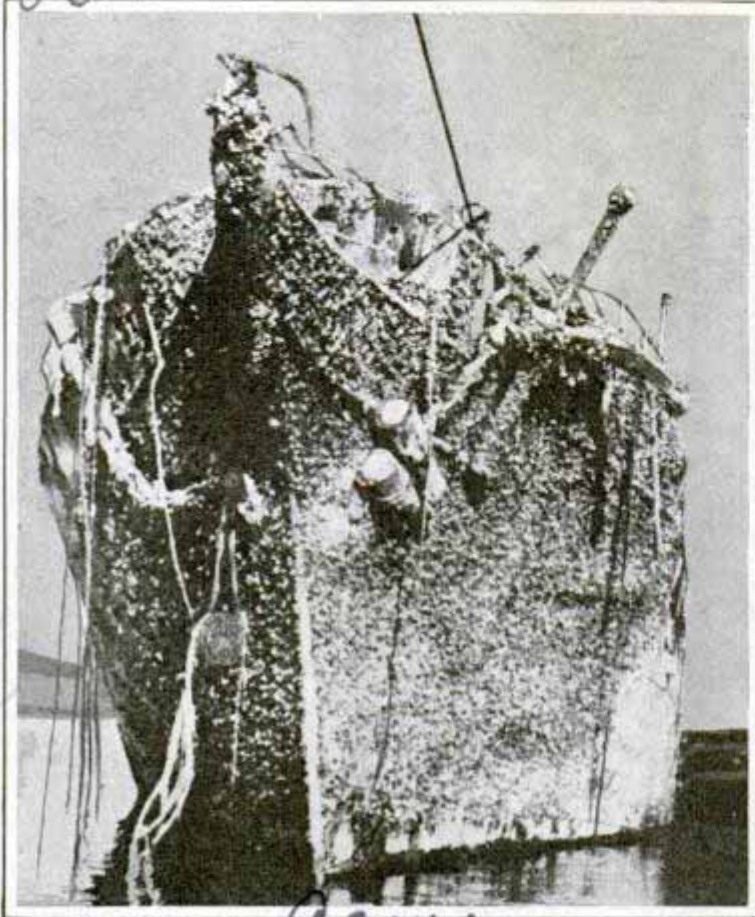
Guide Lamp-C.

504 W. 57th

United Motors Co | Bendix Products Corp

Ship Wrecked in Black Sea Raised After Eighteen Years

F1706



Grizzled hull of the steamer "Doris," covered with barnacles, when it was raised after eighteen years on bottom

Bearded with an eighteen-year growth of barnacles, the wreck of the steamer "Doris" was raised recently from the bottom of the Black sea near Sevastopol on the Crimean coast. The ship foundered in 1918, and late in 1936 Russian divers located and floated the overgrown hulk.

Delivery Box Protects Milk on Cold Mornings



Installed outside the house, a delivery box equipped with a forty-watt electric bulb protects milk and cream from freezing on cold mornings. The box is heavily insulated. When the milkman makes the delivery he turns

on the light and closes the box. The heat from the lamp provides warmth sufficient to keep the milk from freezing. With the electrical fittings removed in summer, the box protects milk from heat, due to the heavy insulation.

Automatic Bootblack Sells Shine for Two Cents

Slot machines are in the shoe-shining business. You shine 'em up, yourself, after dropping two cents in the slot of the automatic vendor. The pennies release the cover of a polish container, and polish is fed out in a limited amount like a grease gun. Dipping a dauber, which is mounted above on a flexible rod, you apply the polish to both shoes by hand and then close the lid of the container. This starts a motor which revolves a brush on another flexible shaft, and you administer a final shine. Replacing the brush handle in its holder prongs stops the motor, but even if it is not hung properly a timing device is arranged to shut off the motor after a reasonable period.



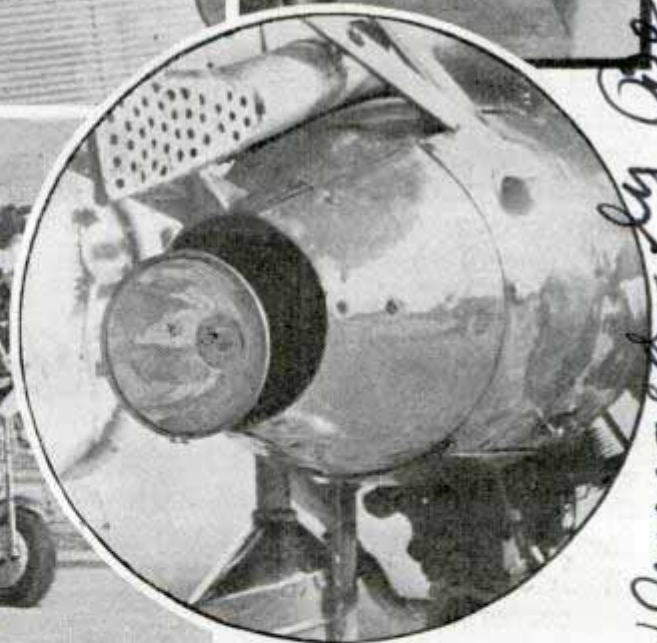
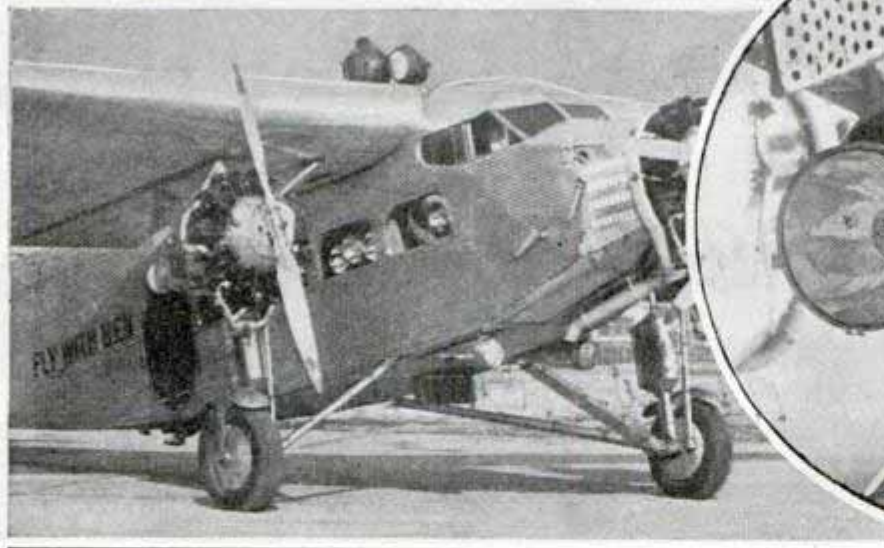
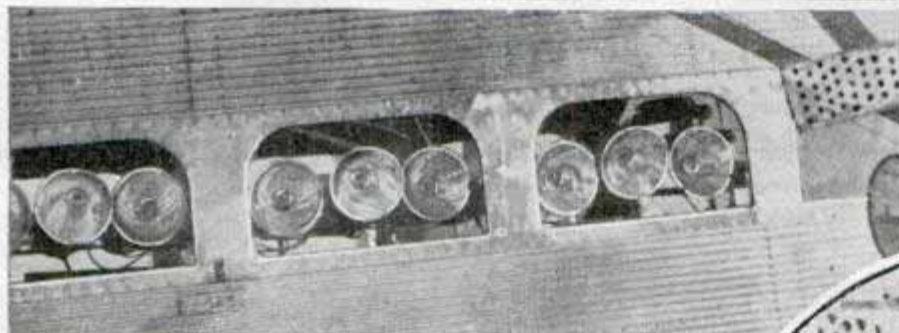
You might call this a shoe-shining "cafeteria." Two cents in slot starts brushes and feeds polish

Alan L. Beckett
350 Springdale Ave.
East Chicago

Louis
201
S. La Salle

"Flying Billboard" Flashes Across Night Sky

Equipped with thirty searchlights and its own plant for generating electricity, a tri-motor airplane recently renovated for use in advertising literally is a flying billboard. On its night flights, rolls of smoke are projected by the ship to serve as background for the lights. More than 50,000,000 candlepower may be turned on the smoke clouds, giving the plane the appearance of a fire rocket flashing across the dark sky. This exhibition attracts attention to the ship, whose operator then switches off the big searchlights and turns on four large neon signs in color to present the advertiser's message. So powerful are the searchlights, one of which



Designed by Owen S. Long, Fairfax Airports
Designed by Owen S. Long, Fairfax Airports

Top, right, control board for operating lights and neon signs. Left, battery of spotlights behind heat-treated glass installed in cabin. Bottom, left and right, views of the "flying billboard"

is 10,000,000 candlepower, that special heat-treated glass is used in the cabin windows. The heat would damage ordinary glass. A twenty-two horsepower gasoline engine and a twelve and one-half kilowatt generator, one of the largest

plants of its kind ever installed in a plane, provide the current. The neon signs under each wing measure five by twenty-five feet and those on the sides of the ship are four by eighteen feet. A special switchboard controls the lights and signs.

es 10.
see Sept 1941 #88



A window-sill herb "garden." These little pots grow the herb requirements of an average kitchen

OURS could be the greatest herb-growing nation in the world, but it isn't. Medicinal plants and herb flavors are an important factor in our \$500,000,000 a year pharmaceutical industry, our \$1,000,000,000 tobacco industry and many great food industries.

Yet we import about eighty-five per cent of all plant flavors and medicinal herbs used, ranging from mints, basis of candy and gum flavors, to licorice, an essential of the tobacco industry, and the common foxglove, the plant source of digitalis, an important pharmaceutical. Herbs are a \$100,000,000 resource which waits all but unnoticed at the gardener's doorstep.

Many important herbs are hardy plants which can be grown successfully in garden corners, along fence rows, in window boxes, or on almost any tillable land.

Nowadays commercial herb growing is largely a garden industry. There are several reasons for this. Demands for most herb crops are not extensive enough to warrant their being major field crops. Since quality and care are the greatest assets in herb marketing, it is usually more profitable to grow and pack a small quantity well than a large quantity care-

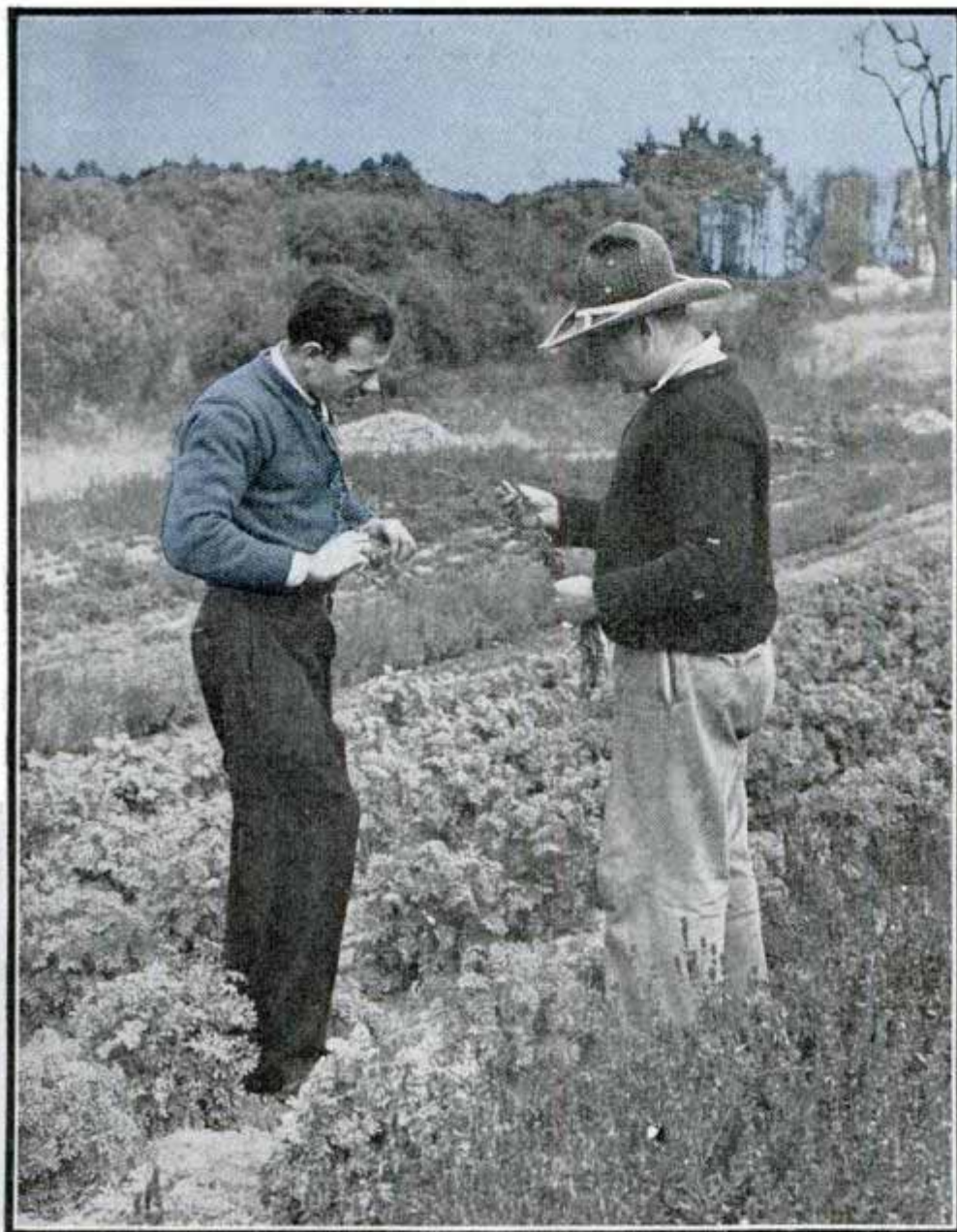


There's MONEY

By Charles Morrow Wilson
114 W. 11th St. New York

lessly. Finally, since there are few set rules for herb growing, it is usually wise for the home gardener to begin by experimenting with small quantities, then improve and correct his methods and develop a sale based upon outstanding quality. Having done this, he can expand as time, space, and markets allow. Drug supply houses frequently let profitable contracts on a basis of the gardener's ability to supply quality wares.

A drive to reawaken herb growing in the United States is now under way in



perts on seeding, cultivation and curing of herbs.

The first step was to locate and recommend twenty-nine varieties of common wild herbs which can profitably be gathered and marketed. This report was published by the state and WPA in a bulletin entitled "Profitable Wild Plants of New Hampshire." Most of the plants described are indigenous to large areas of the United States. The next step was preparation of a bulletin "Herb Plants Which Can Be Cultivated with Profit in New Hampshire," which includes instructions for growing and marketing about fifty-six medicinal plants most of which are potential nation-wide

Herb growers must watch their crop carefully because it must be harvested at just the right time



Medicinal Herb Research

in HERBS

New Hampshire. The undertaking was begun in the vicinity of Concord, where herb gardening has been an important industry in one of the outstanding herb-garden centers of the nation. Growers of the area, aided by the state department of agriculture and the WPA, have completed a survey of the American herb industry and herb markets, which may lay the foundation for extra income to thousands of gardeners throughout the country. A group of jobless chemists and pharmacists first were hired to give expert advice upon drug requirements and market demands. Helping in the survey were a group of ex-

garden crops. Within limits of supply, these publications are available from the New Hampshire department of agriculture at Concord. The U. S. department of agriculture also supplies publications upon the subject of herb gardening.

In addition to garden herbs, the New Hampshire survey includes other sources of possible garden revenue: condiments and perfume plants; flax, the source of linen which is a \$40,000,000-a-year import; and hemp, principal rope and twine fiber, now imported principally from Italy. In general, our profitable herbs can be di-

vided into three groups: the common wild herbs such as ginseng, horehound, henbane, boneset and jimson weed, which anyone can gather, cure, and market without extensive study or complicated instruction; hardy drug plants and flavorings which can be grown indoors or in home gardens, and the more specialized medicinal plants which need be grown and cured under expert advice.

For the beginner the greatest interest lies in the second group and in possibilities for adapting native herbs to garden culture. Native herbs still supply the largest volume of medical materials obtained from plants. Finding and propagation of curative herbs is one of the oldest interests of mankind. In the pioneering era of this nation, the herb garden was a staple part of the frontier farm because medicines had to come from gardens or from the woods and pastures beyond. Cur-

sively in medicine. Seed is sown in early spring, drilled in rows eighteen inches apart, thinned to one plant to the foot. Roots are dug in the fall of the second season after planting, washed clean and dried. Prices for the cured root range from nine to eighteen cents a pound, the yield is around half a ton to the acre and the demand is fairly dependable.

Catnip is a hardy garden herb in commercial demand for leaves and flowering tops. Catnip grows best in sandy soil. Seeds are sown in rows, in late autumn, and after reaching a height of four or five inches, plants are thinned to foot intervals. Flowering tops, including leaves, are harvested when the plant is in full bloom and dried in the shade to preserve the green-gray color. When grown in large quantity, the herb is cut with scythes or mowers, left in swaths until partly dry and curing is finished in small field stacks



Left, leaf herbs must be well spread and turned frequently while drying. Right, looking for beetles and other insect pests which may destroy the leaves

rent research suggests about thirty herb plants likely to be suited to home gardens today and there seems to be a "big twelve" among hardy garden herbs.

First, the well-known dandelion, a foremost lawn pest, is also a herb crop of importance since the roots are used exten-

or under a covered shed. Catnip yields about a ton to the acre and prices range from eight to twenty-five cents a pound.

Lobelia is an important poison herb which thrives in rich loam and grows from seed so small they must be sown upon well-prepared soil. Usually the seeds are

sown in the fall. The plant is harvested in full flower, dried in shade to preserve the green color and stripped of coarser stems. There are record yields of 1,000 pounds to the acre and record prices of eighty-five cents a pound.

Horehound, a hardy leaf herb, grows as a common weed in many parts of the country. It grows well in light, dry soils, even poor soils. Seeds are planted in early spring, covered an inch deep, plants are thinned to row intervals of from six to eighteen inches. Some gardeners



Above, New Hampshire herb garden. Left, drying trays, for herbs, made of loosely woven canvas

start the plants in cold frames and transplant. The herb is harvested just before flowering, cured in the shade. Market requirements prohibit coarse stems. A good yield is a ton to the acre. Prices range from four to ten cents a pound.

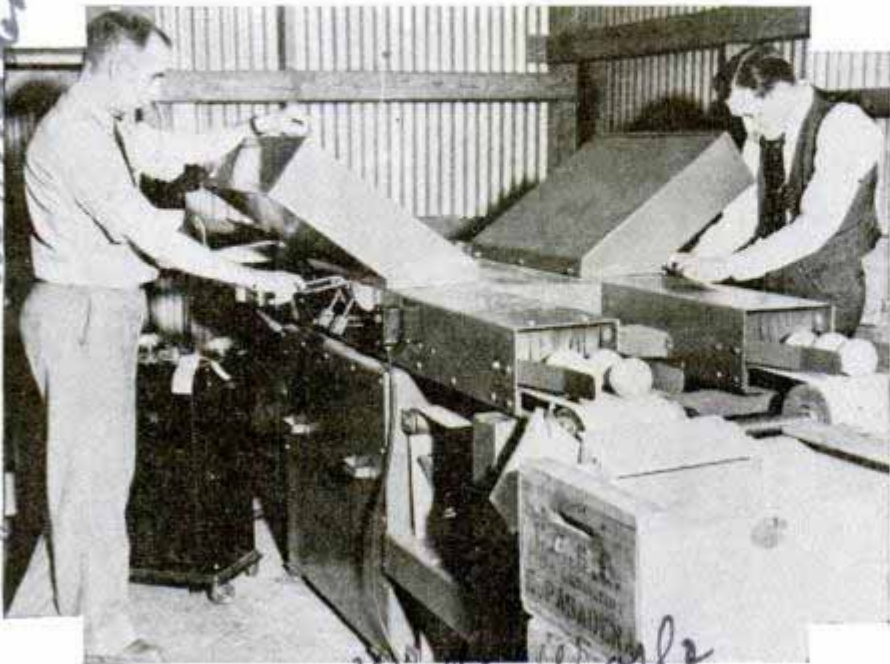
Licorice, candy and medicine flavor and curer of tobaccos, is a dry-weather herb native to California and the far southwest

where it is a weed pest. In sandy loam the plant grows well in various parts of the country. The plant can be grown from seed, but many use cuttings taken from the new roots which are set about eighteen inches apart in rows and cultivated. Roots are harvested at the end of the third year and on good soil yields are as high as 5,000 pounds of cured root to the acre. Prices range from five to twenty cents a pound.

Common sage is a hardy perennial herb and a staple seasoning as well as a basic pharmaceutical. Once planted, it grows for years without reseeding. It will thrive in almost any well-drained soil. Since the value of the plant lies in its leaf, it is best to grow a broad-leaved variety with few blooms. Seeds are sown in early spring in rows two or three feet apart and plants are thinned to foot intervals. Some gardeners use sage as a second crop after early vegetables. Leaves are picked only

(Continued to page 136A)

X-Ray Sees Heart of Orange and Helps Pick Best to Pack



Operator gets X-ray view into heart of oranges as they pass through fluoroscope on moving belt, and ejects imperfect fruit by pressing lever

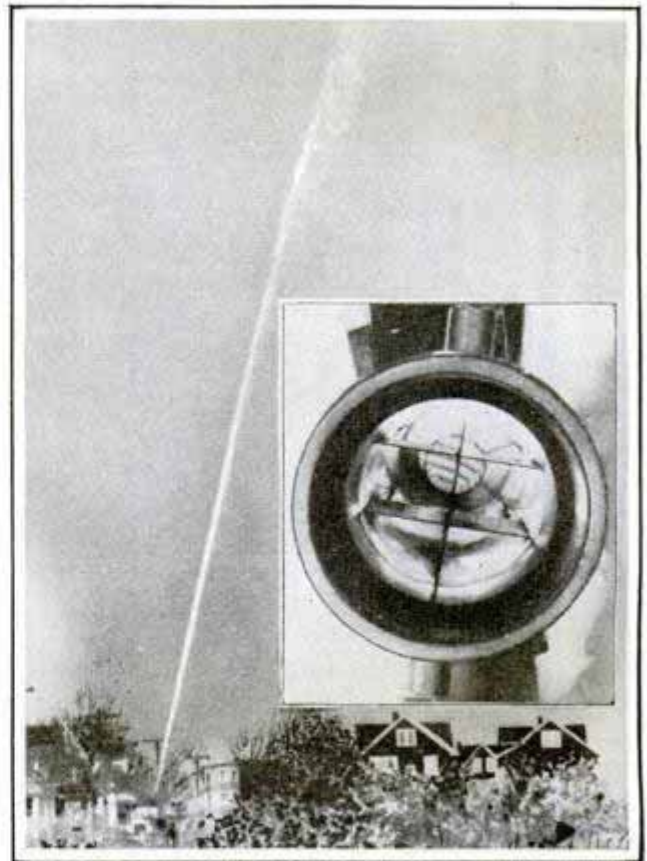
In a darkened room of a fruit-packing house, two men stand peering into the windows of an X-ray machine. Each is looking into the heart of an orange. At the rate of 22,500 an hour, a carload every four hours, the oranges flow along traveling belts through the fluoroscopes. As they cross the path of the X-ray, the operator can tell the quality of the core by the shadow cast, and he can throw out imperfect fruit by pressing a lever. Perfect oranges move on and are fed into packing crates. Faulty grains, dry cells and hollows are detected by the X-ray shadow and even the quality of the juice can be determined. A single X-ray tube serves for two fluoroscopes. The machine is undergoing tests in a laboratory before being adopted for commercial use by a packing organization.

stations to enable persons on yachts in the vicinity of Boston, New York, Miami, Seattle, San Francisco and Los Angeles to connect with phone subscribers on land.

Fins in Nozzle Give Fire Hose Long Stream

Reducing the spiraling course of water under pressure, fins in the latest fire hose nozzle cause the water to go farther before breaking and turning into spray. The increase in efficiency is about twenty-five per cent. Since the water is kept in a solid column longer, there is less tendency for it to turn into

steam as it strikes a hot fire. The nozzle has two sets of fins, one at the mouth and the other at the base.



Testing fire hose equipped with interior-finned nozzle like that shown inset

Radiophones Connect Yachts with Wire System Ashore

Yachtsmen on small pleasure craft along the seaboard can now talk to their homes and offices ashore by telephone. Five-watt and fifty-watt radiotelephone equipment is available for coastal vessels, and telephone companies have established shore

Western Electric Co.
125 Broadway New York
D. W. Hagar Jr.
Parker, Sherman

California
Los Angeles
Fruit growers to change
Calif. Cherry 189
W. H. H. H.

General Electric
X-ray
2012 Jackson Blvd
Chicago

F1687

Wide World

71970

see Oct. 1928
Aug 1928-1929

Super Crops Grown in Tanks Without Soil



Dr. Gericke and wife use a stepladder to harvest tomatoes from plants that yield 217 tons per acre of tank surface, compared to five tons per acre of soil surface. Dr. Gericke harvests 2,465 pounds of potatoes per acre. The tomato plants bear fruit over their entire length



Gardener "planting" corn in shallow tank filled with nutrient salt solution covered with layer of excelsior. Straw or peat moss also may be used. In similar tanks super crops are produced by Dr. W. F. Gericke in experiments at the University of California, Berkeley

Experiment Station



W. F. Gericke



Left, Dr. Gericke almost hidden in tall wheat grown in soil-less tank. Above, the experimenter inspects flower beds planted in tanks. Vegetables, grain and flowers have been produced in startling quantities by this method. Seeds placed on straw, peat moss or excelsior reach down into the salt solution and draw nourishment, growing faster and producing better quality fruit or flowers than soil-grown plants. Electric cables heat the solution. Nothing is left to chance. So successful have been the experiments that two commercial companies are growing vegetables in tanks

9 1/2 ...

Acrobatic Motorcycle Cops Perform Stunts on Crossbar



Balancing on a crossbar above a speeding motorcycle furnishes as much of a thrill to the acrobats on the police force as to the spectators

Perhaps it is a "bicycle built for two," but four can ride it if they know where to hang on. With a crossbar mounted on a mast attached to their motor "bike," four acrobatic police perform thrilling riding tricks at a Los Angeles bicycle show. Two of them balance the bar by hanging from the ends by their knees, a third rides on his stomach at the center, and the fourth takes them for a ride.

Two-Weeks' Weather Forecast Is Goal of Solar-Heat Study

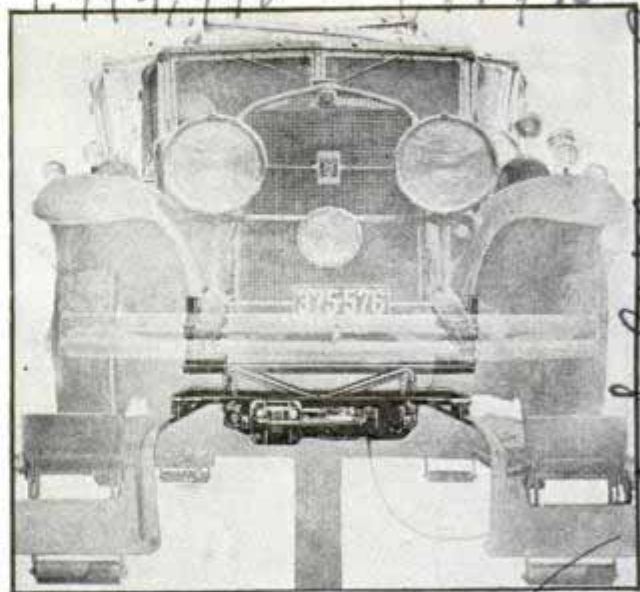
Weather forecasts looking two weeks ahead are foreshadowed by studies now being made of the relation between earthly weather and day-to-day changes in the heat output of the sun. Dr. Charles G. Abbot, secretary of the Smithsonian Institution, appears to have developed proof

Washington, D. C.

that short-interval changes in solar radiation have a definite influence on our weather for the ensuing two weeks, and weather bureau scientists are seeking to use this knowledge in predicting weather conditions ahead.

Rocker for Auto Found an Aid to Lubrication

More efficient lubrication of the automobile is made possible by a motor-driven machine which rocks and sways the car to duplicate road conditions. Thus may be greased those parts which once required use of crowbars and high-pressure grease guns. The machine raises the body of the car off the springs, shackles and king pins and then sways it, revealing squeaks and flexing the spring leaves for oiling. The machine is equipped with electric motor or may be operated by compressed air.



Sway machine, propelled by motor, rocks automobile in this manner to facilitate lubrication

Moto. Sway Corp
of American.

at Vegas me tagler in Stadium
Los Angeles. Calif

Scene Serene 1/4/37

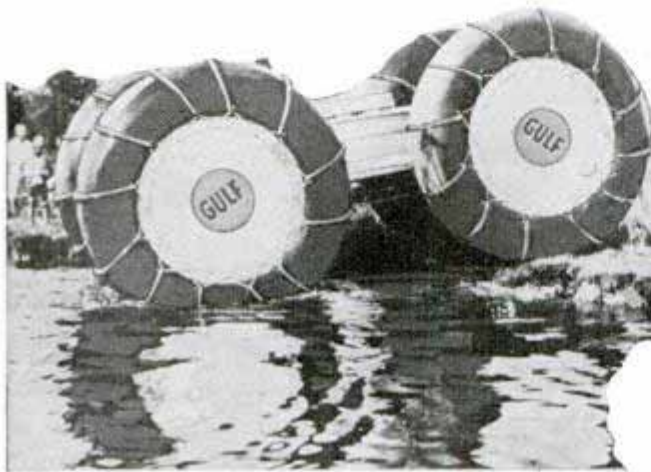
Acme

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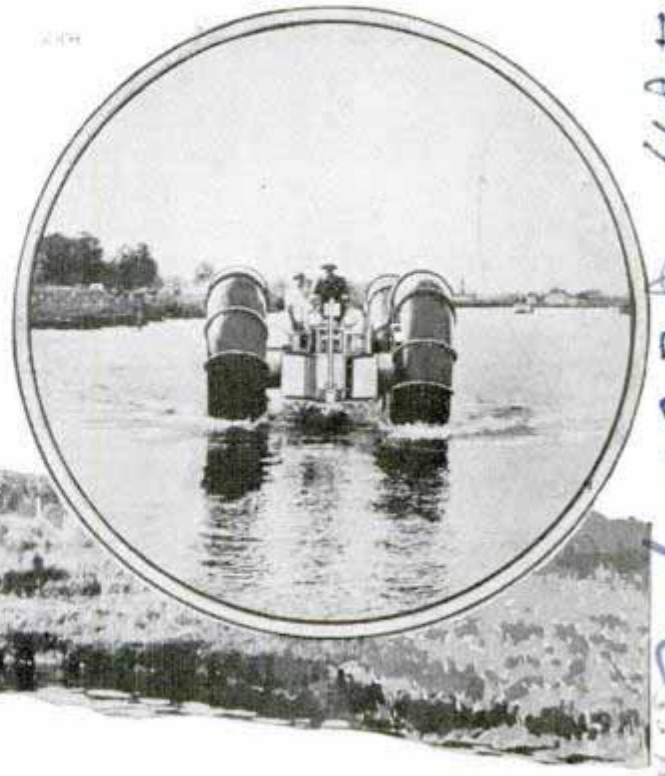
437 d screen, Chevy

Amphibian 'Marsh Buggy' Used to Hunt Oil

Weighing 7,500 pounds and equipped with tires ten feet in diameter and three feet wide, an odd vehicle transports geophysical crews searching for oil-bearing strata in the Louisiana swamps. It runs on land, in waist-deep mire or in deep water. The giant tires have a displacement so great that the vehicle, known as the "marsh buggy," floats with an immer-



sion of less than two feet. If one of the tires becomes punctured a compressor keeps the tube inflated until the repair station is reached. Pressure in the tires never exceeds six pounds per square inch and the buggy's weight is supported by only one-pound pressure. In water or marshes traction is obtained by attaching twelve treads to each wheel. These are made from two-inch rubber hose sealed at the ends and provided with a valve through which they are inflated to a pressure of twenty-five pounds per square inch. Inflation is necessary to keep the



Three views of "marsh buggy" in operation. Top, circle, and bottom, left, the vehicle navigating in deep water. Top, left, the buggy emerging from the water to travel marsh or highway without changes in its equipment

links from flattening under the weight of the buggy. Aluminum alloys were used to keep down the weight of the vehicle. The large aluminum wheels, shaped like huge drums, contain sufficient air to keep the machine afloat even with all four tires deflated. The buggy is powered by a small V-eight engine equipped with an over-size cooling system. Since it frequently operates on inland waterways, the operator of the giant vehicle must carry a marine license. The buggy is equipped with all the running lights and other requirements for Class 1 power boats. On smooth ground, a speed of thirty-five miles per hour is possible, in marshes between ten and twelve miles per hour and in water six knots. The vehicle is operated by the Gulf Refining company.

☐ 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 kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

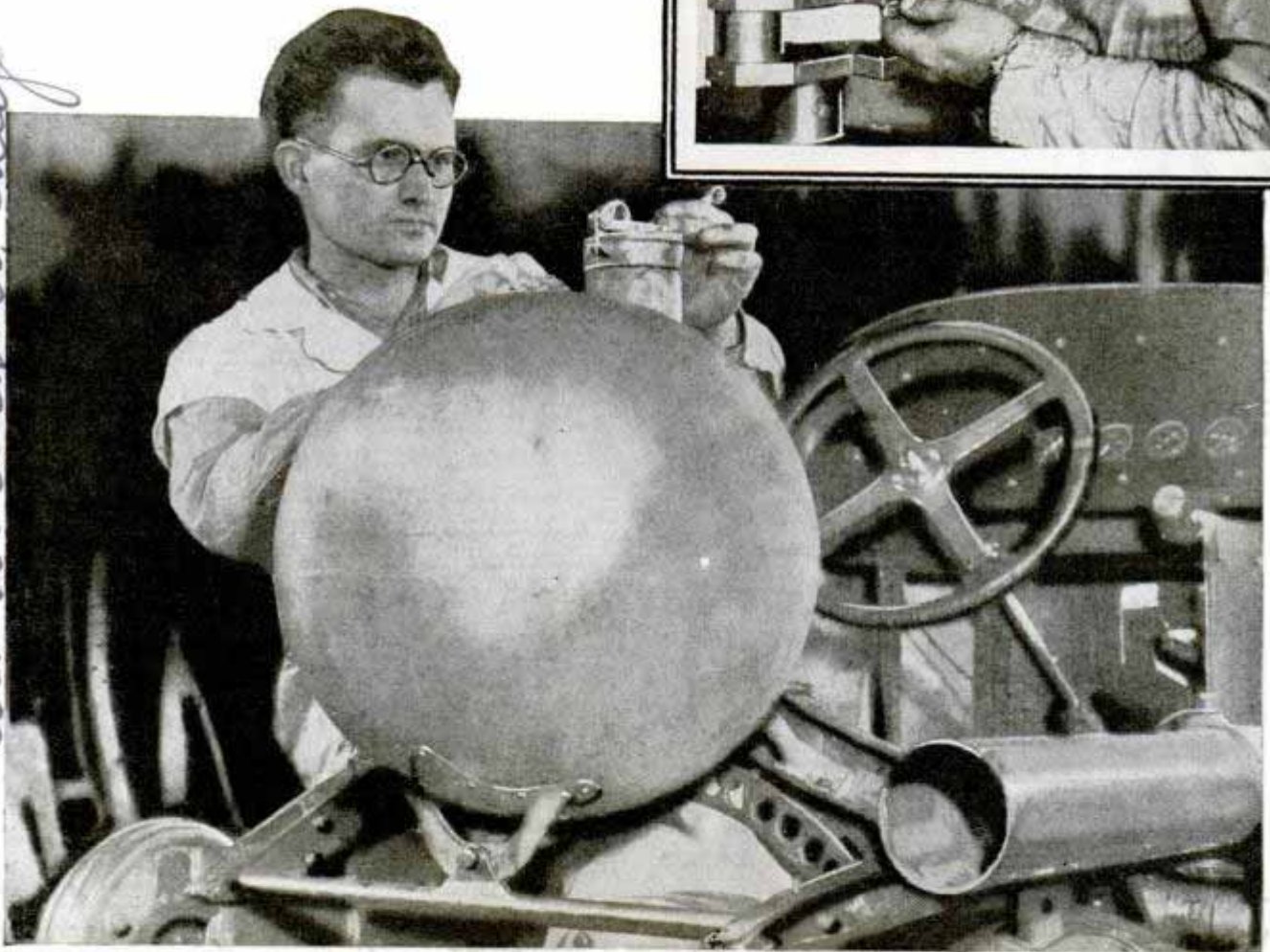
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KINGS *of* SPEED

THE lid is off at Indianapolis this year. Nearly three dozen heavy-footed drivers all with the urge to "get in front and stay in front" will transform the two and one-half mile course into a merry-go-round of speed on Memorial Day.

No one will slow down to conserve fuel. In effect track officials have told the drivers: "Use as much fuel as you want, boys, just so it is a grade any motorist can buy."

Last year each car was limited to thirty-seven and one-half gallons for the 500 miles. The race was a scientific guessing



Spherical gasoline tank in tail of racer, over which streamline body fits. Above, measuring counterbalancing fins on modern four-cylinder racing crankshaft

contest with each driver going as fast as he dared without using too much fuel. The drivers used highly leaded secret compounds of gasoline and employed compression ratios as high as fourteen to one to squeeze the last mile out of every gallon. This year they will use ordinary

high-grade commercial brands. That means compression ratios will be lower. But the engines will be larger and the drivers think the cars will be faster.

"Barring rain or accidents that would slow down the race, the winner this year will probably have to average 112 miles

Emb. Thomas & Stinson Jr. - 10555 Holman Ave Los Angeles Calif.

Los Angeles Calif

GROOM *their* RACERS

25



per hour," says Louie Meyer, who in 1936 won the Indianapolis race for the third time. "That includes pit stops and means the winner will have to drive better than 115 miles per hour all the time he is rolling and 135 miles or more on straightaways.

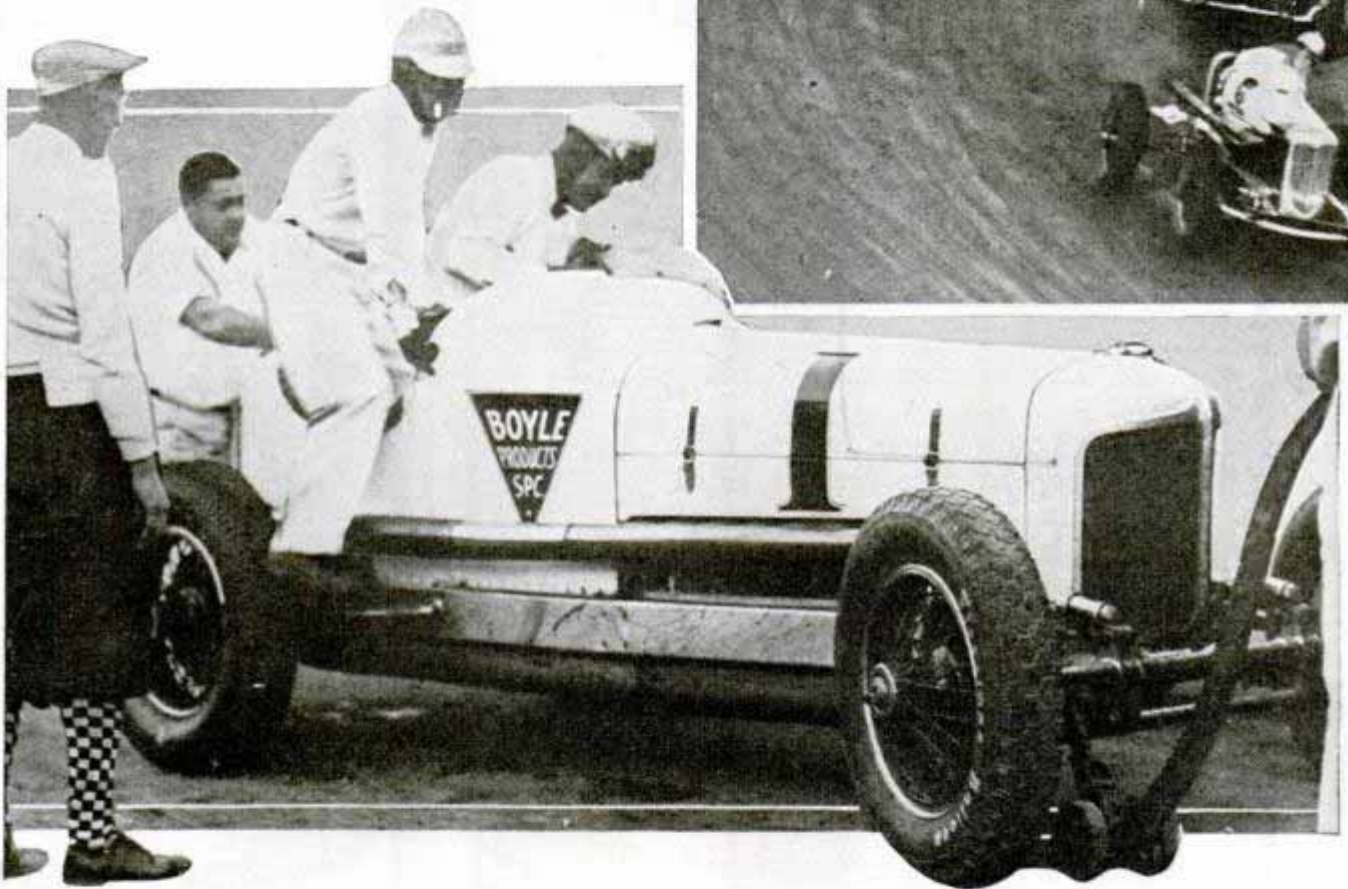
"The best way to win a race is to guess as closely as you can what the speed of the winner will have to be and then drive at that speed consistently. That's what I did last year. We estimated it would take



Top, cars in pits ready for action just before a race. Center, mask worn by mystery driver in one race. Bottom, driver signaling that official has declared a false start

108 miles per hour to win. I drove at about 112 miles per hour for the first half, which allowed time out for pit stops. Later the pit crew found I was using less fuel than we had reckoned so I stepped up to 114 miles per hour. That boosted my average to 109 miles per hour."

Another thing that plays a part in making a fast race is whether the leading drivers are bunched or several laps apart. If one driver can get a lead of three or four laps the race is apt to turn into an endurance contest with the men in second



Half a dozen cars tightly bunched on a turn and, below, driver and mechanic leaping into racer after a hasty pit stop to change a tire

and third maintaining their positions while waiting for the leader to falter. But if the first three are within half a lap or so of each other the leader must drive as fast as he can to hold his position. "Hot shot" drivers who usually drive as fast as they can while their "iron" holds together have taken the tachometers that indicate engine speeds from their instrument boards. The feel of the car tells them when they are approaching dangerously high speeds and they have no time to consult the instruments. The dangerous brick turns on the Indianapolis course have been paved with an oil-absorbing asphalt this year, another

feature that will permit high speeds.

Sometimes the driver who has the worst luck before a contest gets the good breaks while a race is on. Last year Louie Meyer broke three cylinder blocks in practice and got his car assembled just before the starting bomb. Then he went out and won. The year before, Kelly Petillo cut his engine in half when a connecting rod went wild in practice. There was no time to order a new motor so the block was welded and the patched-up job carried him to victory.

There will be few new cars on the track this year. Most drivers are waiting for



1938 when a complete set of new specifications will govern motors and cars. The changes contemplated will be for the purpose of placing American cars more on a par with European racers, thus affording a true competitive basis for international racing. The 1938 specifications will allow the building of cars suitable for road racing as well as speedway racing.

This year most drivers are altering their engines merely by decreasing compression ratios. A racing engine has no head that can be separated from the block, everything above the crankcase being in one piece. To reduce compression the drivers install short "low-compression" pistons that travel not quite so far up in the cylinders. At the same time, the total displacement is increased. Some cars are being equipped with impeller



Above, testing hydraulic connection to brakes of race car. Left, fifty-dollar connecting rod used in racing engine. Below, fitting part of body to a race car chassis



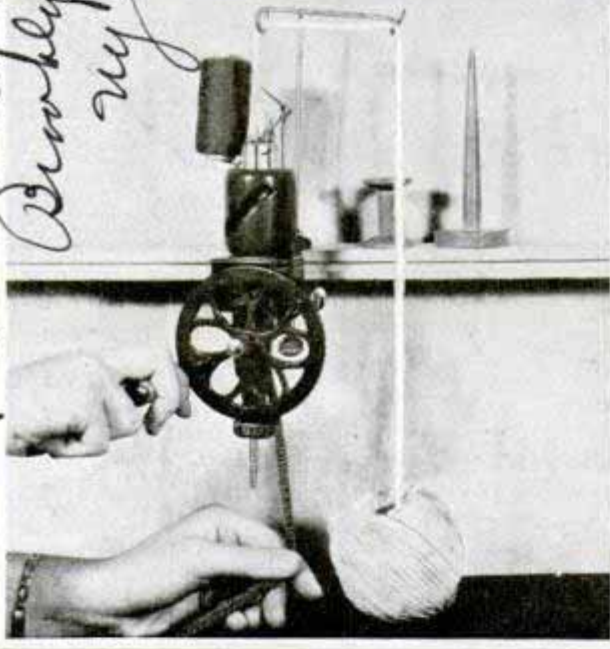
(Continued to page 148A)

Fred Affenhaus, 1935 at 62nd St. Los Angeles, Calif

Professor Schroni

Eight-Needle Knitting Toy Makes Fabric and Cord

Knit-Master



Above are some articles made with the knitter, and below a close-up of the toy knitting machine itself

Both educational and practical, a toy knitting machine which produces knitted fabrics and cord or tubing of various textures has just been introduced. It has eight automatic latch needles like those of the commercial power-driven machines which fabricate sweaters, underwear and knit hosiery, and any number of these needles from one to eight can be used. By introducing a filler for a core, the little hand-operated knitter can turn out a sturdy tubular fabric or cord suitable for making rugs, mats, bags, and similar articles requiring strength and bulk. Silk yarn similarly can be knitted around a

core of inexpensive cotton, lending the appearance of silk with the bulk and economy of cotton. Combination yarns of varying weight and texture can be made by knitting together, for example, worsted and silk strands, using different combinations of needles.

Esq 2

Minerals Live and Suffer Illness Is Belief of Research Men

Evidence that minerals live, suffer communicable diseases and reproduce their kind is reported by research scientists. Microphotographs by a professor at Naples indicate that crystals not only move but exhibit generative processes similar to those of vegetables. German chemists have found an infectious disease called "tin-pest" which attacks tin roofs and may be communicated from one roof to the next. At Calcutta a scientist demonstrated that a mineral can be poisoned.

FIG 91 Parking Mirror Helps Driver Maneuver Close to Curb

Parking close to the curb without scraping tires or fenders is aided by a special mirror just put on the market. It is installed above the right front door of the car, at such an angle that it gives the driver a "periscopic" view of the curb and guides him in parking without having to leave his seat or open the door.

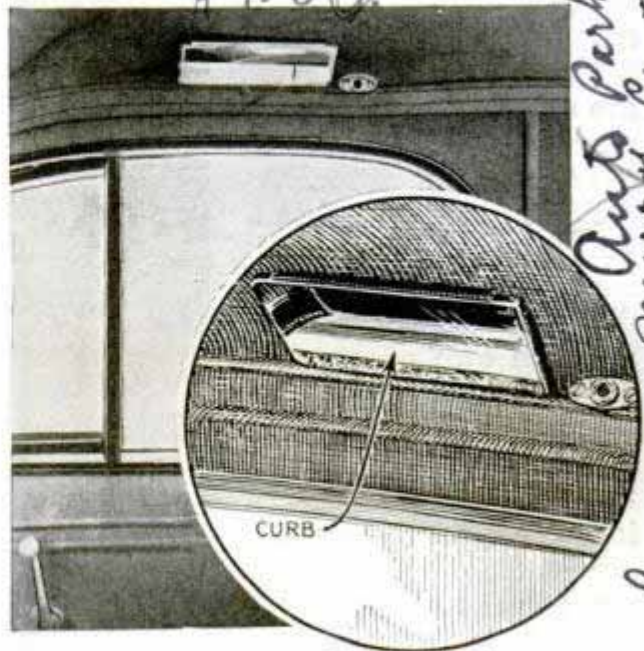


Photo shows mirror mounted above right front door, and inset reveals reflection of curb in mirror

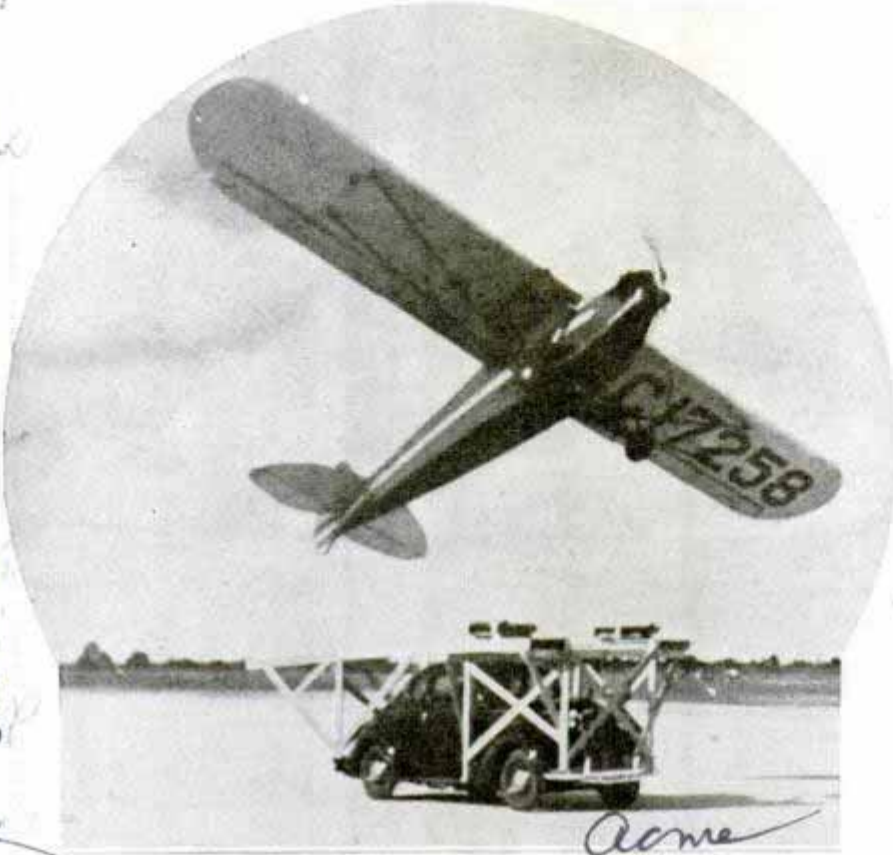
*Rivislie Knitting Machine Co. Inc
740 Island St
Brooklyn NY*

*Auto Parking
Murphy Co 1728 S. Hill
Los Angeles Calif. 11/26/40*

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Plane Takes an Auto Ride Then Hops Off from Roof

Mike Murphy at All American
Auto Races



Monoplane taking off from scaffolding built over automobile, which gave plane a running start at high speed across airport runway at Miami

Using an automobile for a "catapult," an aviator successfully lifted his plane into the air from the car roof as the motorist drove at high speed across a runway of the Miami, Fla., airport. The two-cylinder high-wing monoplane was perched on a special scaffolding built on top of the coupe. With its own motor roaring, the plane waited until the car was traveling at a safe speed before taking off.

es 90

Low Cost Air Conditioning Seen for the Home of Tomorrow

Keeping the house cooler in summer by placing window shades or Venetian blinds outside the window instead of inside is but one of the simple methods being developed by ventilating engineers to cut the cost of home air conditioning. Blower systems cool the house by sucking in night air and forcing out heated air from attic and other hot rooms. Forced-air heating systems which distribute cleaned, heated and moisture-controlled air through small ducts are growing popular, and it is not dif-

Science Service
1/25/37

American Society of Heating and

icult to add refrigeration to this system. Heating engineers are experimenting with water insulation on flat-roofed houses. A two or three inch layer of water on the roof would freeze in winter, insulating against outdoor cold, and in summer would be tied up with the spray system cooling the air-conditioning unit.

Bank Totals Checks by Weight

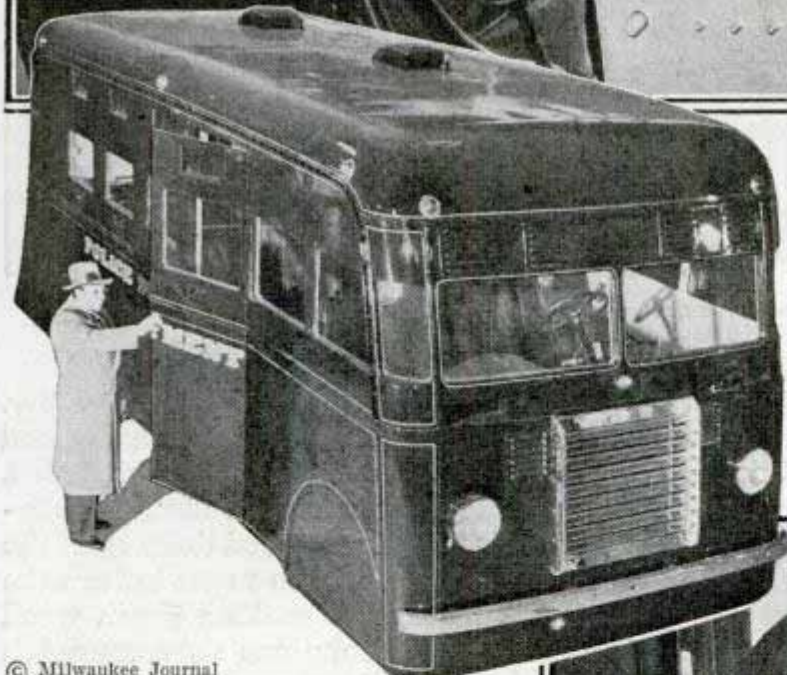
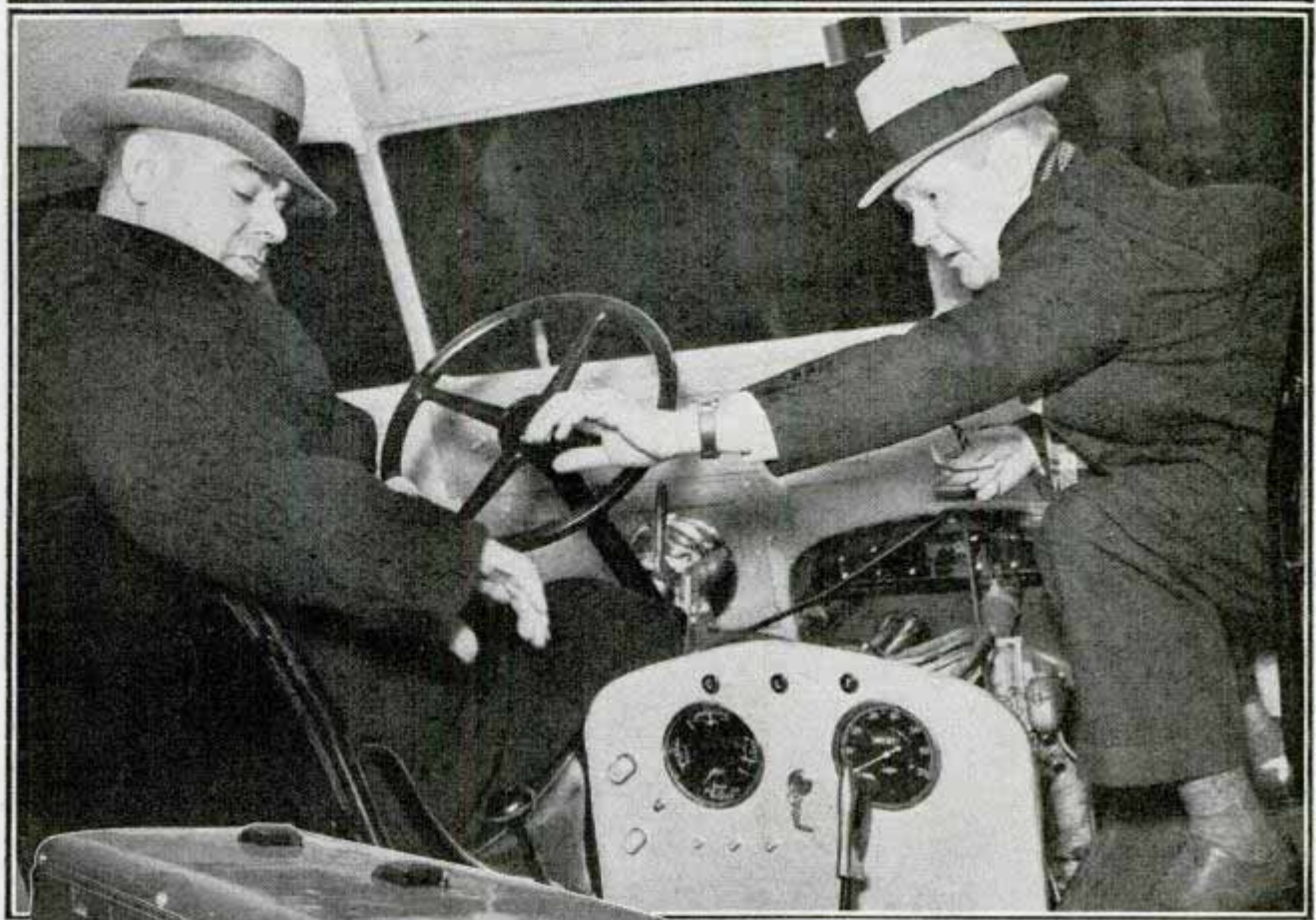
Instead of laboriously counting the thousands of checks which clear through its various offices every day, a western bank counts the checks by weight. If the needle on the scales points to an even ten pounds, the teller knows he has 3,500 checks. They run twenty-two to the ounce, or 350 per pound. This figure was determined by weighing 8,000,000 checks.



"Weighing in" checks at a bank. Figuring them at twenty-two checks per ounce is easier than counting

Com. Andrew R. Boone
1651 S Broadway

Riot Squad Speeds to Action in Steel Fortress



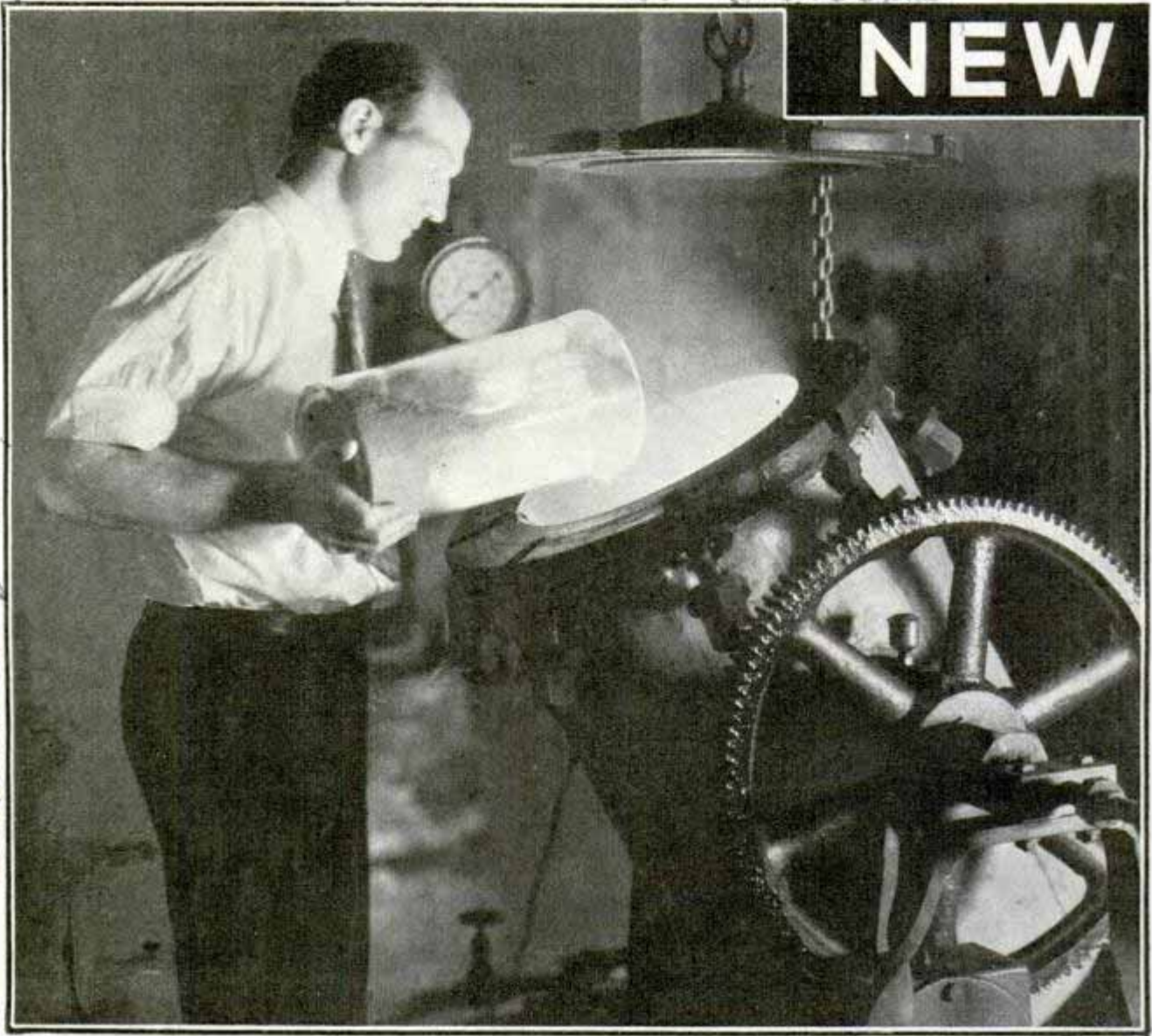
Milwaukee police are ready for action against bandits or rioters in impregnable steel-and-aluminum fortress on wheels with windows one and three-sixteenths inch thick. A machine gun took more than an hour to pierce glass. Steel shields drop to ground to protect tires in battle. Top picture shows engine mounted inside, as are siren, gong and spotlight. Left, and below at right, notice slots above windows for throwing bombs, and gun slots under windows. Bottom, left, officers emerge from car carrying full-length metal shields

© Milwaukee Journal



Experimental Department
61617

Emb. La Pl. Stacy. 4639 Montgomery
Ave Bethesda, Md



Preparing sawdust for conversion into a new plastic molding powder, one way in which science is helping to convert waste into wealth

WOOD, the wonderwork of nature, is being used in new and amazing ways as a result of practical research triumphs of the United States forest products laboratory, Madison, Wis

Added safety and security in frame construction are made possible by impregnating wood with fire-retarding chemicals developed and tested by these national researchers. They have capitalized on the fact that wood inherently is gifted with good insulation and is less apt to buckle, twist and collapse under load at high temperatures than are many structural metals. Treated wood is an effective means of reducing our stupendous annual fire losses, particularly in homes and small commercial buildings.

Previously much wood was wasted because it could not be seasoned without

checking, cracking and splitting badly. Believing chemical seasoning of such wood was possible, the experts experimented. They wanted to reverse the natural method of curing in which wood dries from the outside in. It took three years to turn the trick but finally, by soaking green wood in ordinary salt solutions they caused it to dry from the inside out. The soaking coats the outer surface with salt which has an affinity for water. Such a difference in vapor pressure is developed between the natural water in the core of the wood and the salt-saturated surface that the moisture is drawn to the exterior where it evaporates until the desired degree of seasoning is attained. The experimenters also found the attractive force of wood for water is double that of water for wood. They now are seeking a double treatment

USES *for* WOOD



Top, modernistic wood home of forest products laboratory and, below, inspecting test fence made of plywood panels exposed to determine durability

by which they can chemically season and "fireproof" wood in one operation.

It used to take a year to air dry Douglas fir timbers in southern Wisconsin to a moisture content of fifteen per cent and uncontrollable surface checks cut nearly two inches into the wood. Similar timbers now can be chemically seasoned in thirty-four days, and the very limited checking is restricted to intergrown knots. Southern swamp red oak after soaking a week in the salt solution can be kiln-dried in twenty-eight days. It used to take seven times as long to kiln-dry untreated timber and a prohibitive amount of checking occurred.

Wood radio towers used to be limited to

heights of about 100 feet. Ordinary spike and bolt joints could not withstand the attacks of windstorms at loftier levels. That led the federal wood investigators to test several thousand samples of the eight leading types of metal connectors in southern pine and Douglas fir construction of different kinds. They solved the secrets of safe wooden joints and splices without wasting wood. The former custom was to



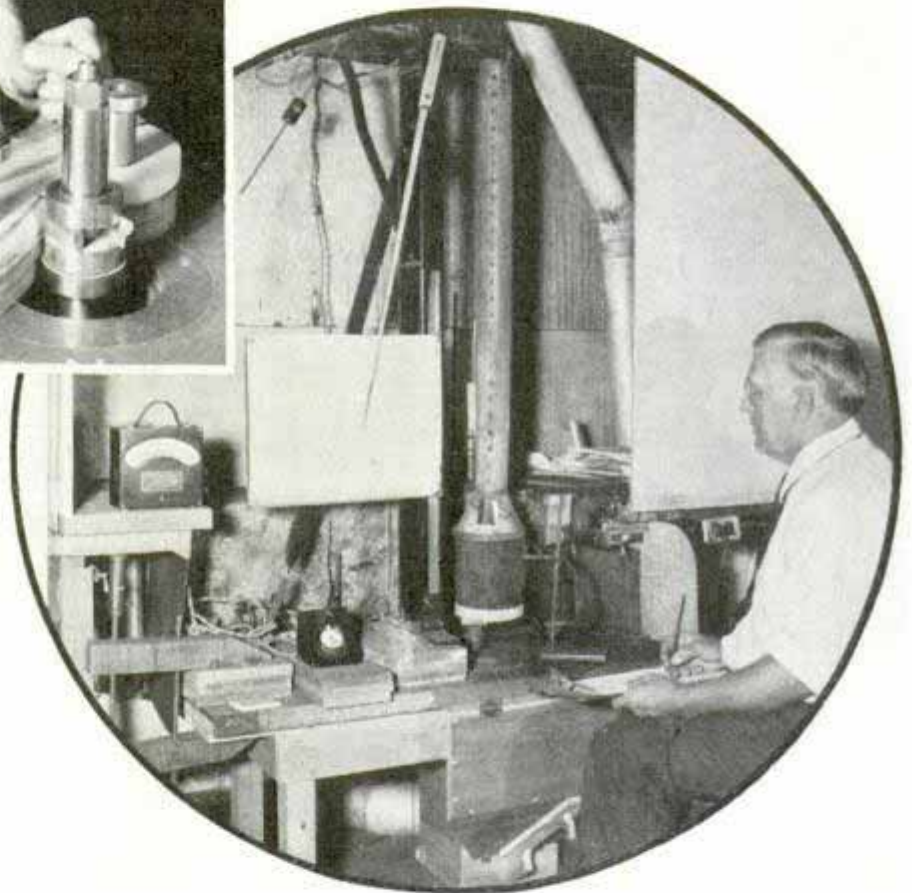
Shaping test, above, for southern hardwoods and, right, testing relative effectiveness of fire-retarding chemicals for wood

use oversize timbers big enough to accommodate the many spikes or bolts needed to produce safe joints. Towering construction with wood was impossible under that practice. The scientists have shifted the set-up by determining the strength values of metal connectors such as split rings, shear plates and ring, dowel and key fasteners under various conditions of load angle and placement in the timbers.

These vital building facts recently have been applied in the construction of wood radio towers 326 feet high, four stories taller than the dome of the capitol in Washington. The insulating and nonmagnetic properties of wood especially adapt it for such purposes. Over Dolan Creek, in California, a 180-foot arched timber bridge has been built of redwood with split rings instead of a superfluity of spikes and bolts. The forest service is now building its highest fire-lookout towers in this

way. Tank towers, railroad sheds, riding halls, auditoriums and hangars also are being built of wood with metal connectors.

The forest products laboratory has completed more than 600,000 mechanical tests of the strength characteristics of some 160 species of native woods. As a result, various woods now are being used for purposes which a few decades ago would have seemed fantastic. For example, the research service building consists of plywood panels mounted upon a substantial framework of glued arches which span a width of forty-six feet. This building, pio-

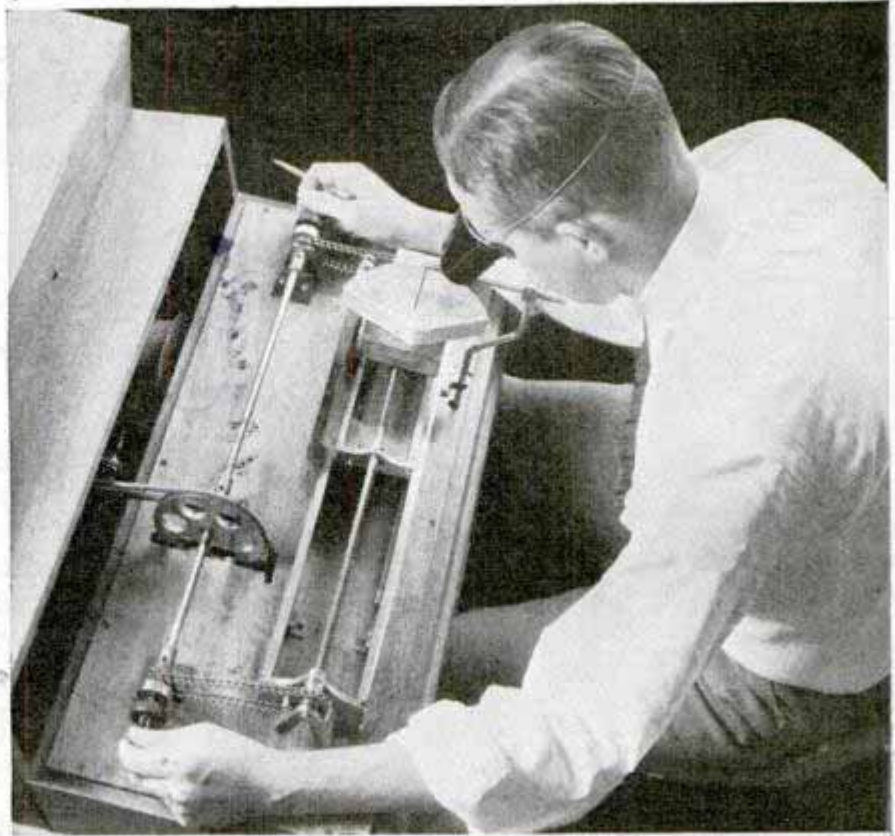


neer of its kind, is prophetic of extensive future use of wood in a new way. The skeleton of the structure is composed of laminated and composite wooden arches made of short-length boards assembled with water-resistant casein glue. Each arch was bent against a model curved form, the clamps remaining in place until the glue in each layer had set. The arches were built up in this fashion until the desired dimensions were attained.

A tier of sandbags forty-five feet long and six feet high, weighing 31,500 pounds, was placed on the roof along the line of one of the arches and remained as an

overload throughout the winter. That burden was fifty per cent heavier than the mythical snow load of thirty pounds per square foot of roof area specified in many building codes. Precise measurements showed a deflection of but 1.04 inches at the peak of the loaded arch and an outward spread of but one-quarter of an inch at each shoulder.

This type of building is extraordinarily strong, economical, attractive, both inside and out, and eliminates the use of obstructive trusses and braces. It is an exemplification of the magic worked by modern glues



Top, measuring comparative amounts of spring and summer wood in specimen. Below, demonstration low-cost, prefabricated, all-wood house covered with panels of glued plywood

as substitutes for the joinery of nature. Detailed tests of the laboratory have placed the design of the wood arch on a sound engineering basis. The use of laminated arches eliminates the warping common in large solid timbers and the built-up arches can be made longer than any solid timbers now procurable.

The laboratory has built a model low-cost pre-fabricated house which stresses the use of built-up plywood panels. Each panel consists of two plywood faces glued to either side of an inner structural frame-

work. In effect the individual panel is really a box girder and is weatherproofed, wired electrically, and insulated against sound, heat and cold. The complete and continuous rigid joint formed by the glue between the plywood faces and joists gives astonishing strength to the panel, making it much stronger than would be possible with nails. The arrangement is such that the joists actually support but one-fourth of the load on the floor of the room. These stressed covering panels are so strong

(Continued to page 144A)

Heater for Airplane Engine Made from Old Oil Drum

vided by a heavy canvas-covered blanket around the cowling. Charcoal and paper kindle the fire, on which is then thrown a shovel or two of coke. This can be fanned into a solid bed of coals.



Simple heater being used to warm compartment surrounding engine of big plane

Inexpensive to construct and operate, a heater for airplane engines has been introduced by Chicago and Southern Air Lines for use at airports subject to low temperatures. This heater warms up an engine in less than twenty minutes, with the outside temperature at fifteen degrees. The heater is constructed by installing a small grate about twelve inches from the bottom of an old thirty-gallon oil drum and then placing a pipe beneath the grate to carry the air current generated by a six-volt auto fan. The pipe from the heater to the engine compartment has three wire screens to prevent sparks or flames from reaching the engine. The heater is attached to the nose cowling behind the propeller and is held in place by a flange extending into the cowling. Made in two sections, the flange is held together by ordinary hood clamps. A deflector forces heat to the bottom of the engine compartment, allowing it to rise around the engine. Additional insulation is pro-

One-Fifth Is Added to Fuel Cost by Five Degrees More Heat

Twenty per cent more fuel is required to raise the temperature of a house from seventy to seventy-five degrees. Tests by government engineers indicate that the cost of moderately high home temperatures is greater than most people suspect. Testing oil burners, the engineers found it cost seven per cent more to heat a house to seventy-two degrees than to seventy.

Electric Fan Cools Off Boxer

F1584 Between Rounds

Replacing the old-fashioned flapping towel, an electric fan has made its debut as a means of cooling off boxers between rounds. The fan is mounted on a frame which extends over the corner where the boxer sits between the rounds.



Electric fan, attached to extension arm, in use to cool off fighter between rounds

Mr. B. E. Oray, operating manager
Lambert-St. Louis Municipal Airport
Robertson

Home Heating #406
Supt. of Documents
11/3/13

U.S. Dept. of Agriculture

Used at Royal
Air Force Depot

Utility and Beauty Mark Modern Furniture

Virginia Lincoln Co. Marion, Va.



Above, quilted maple and mahogany bed of modernistic lines combines beauty and utility. Note matching stand and lamp. Below, easy chair has reading lamp built into the wings. Illumination is supplied by two twenty-five watt bulbs



Left, milady finds this full-length vanity cabinet the ultimate in convenience. It lends itself to conservation of space by folding. The wings contain shelves for many aids to beauty



Right, cabinet resembling radio when closed holds an entire kitchenette. Electric coffee pot, toaster and electric grill are in upper compartment, storage space is in lower left cabinet and an ice box using Dry Ice is in right-hand compartment. It is designed for small apartment or cottage. This and other photos on this page were taken at 1937 American Furniture Mart



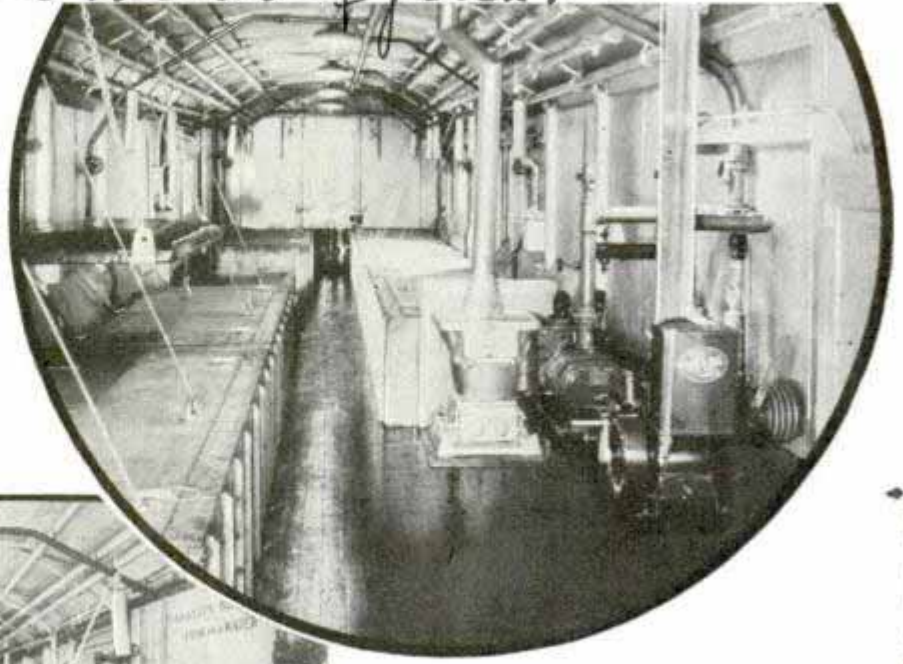
Shower Bros. Co. Bloomington, Ind.

Large Furniture Company - American Furniture Mart

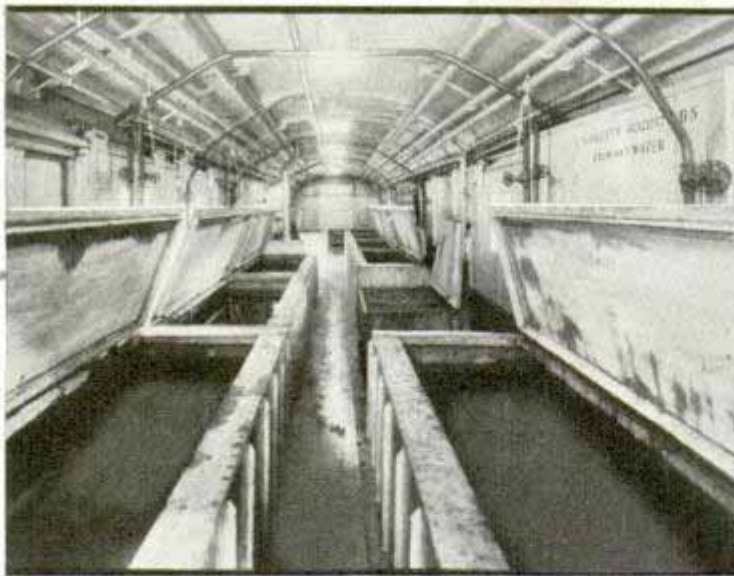
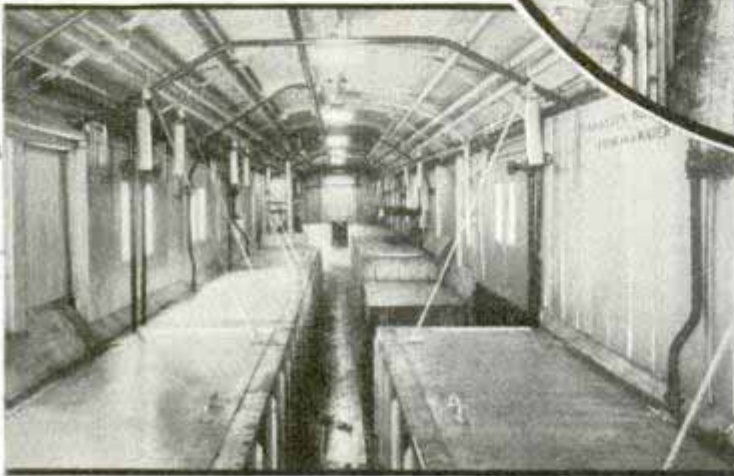
Is 49 J. Isoldstein, Inc. POPULAR MECHANICS 322 Delaware Ave Philadelphia Pa

Fish Go to Town in Air-Conditioned Comfort

Fish are fattened for the market these days on middle western "carp ranches," and are taken for their last ride to town in "air-conditioned" comfort. These fish ranches in Wisconsin, Michigan, Minnesota, Nebraska and the Dakotas sprang from a demand in the big cities for live carp for food. Close to some inland wa-



Above, gas engine in fish car operates blower sending fresh air through the tanks constantly. When train is in motion, steam from locomotive relieves gas engine of work. Left, two views of interior of fish car showing huge tanks closed and open. The fish are not fed during the railway journey to market



from living in waters tainted with motorboat oil or gasoline. Ready for market, the fish average three to eight pounds each and sometimes run up to forty-five pounds. The ride to market must be swift and healthy, so the carp are transferred to huge tanks in a specially built fish car which travels on the fast passenger trains. The water is maintained at the same temperature as the pond, heated if necessary or cooled with ice—sometimes thirteen tons of ice are consumed on the trip to the Atlantic seaboard. The tanks are covered to prevent splashing, and are constantly aerated by a blower operated by steam from the locomotive when attached

ter where carp can be caught with nets, the rancher would flood a low tract of land by damming a small creek. To this artificial pond the carp would be transferred for fattening. Every day they would be fed corn mash, such as chickens are fed, at a bushel of corn per ton of fish. Besides fattening, this period in the pond would serve to cleanse the carp of any oily flavor

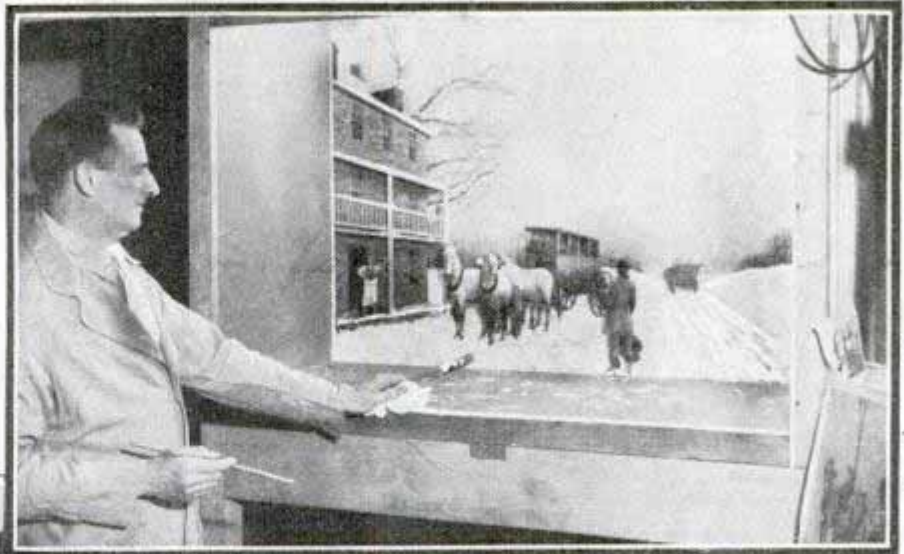
to a train and by a gas engine in the car when detached. There is little loss in transferring these fish from river to pond, to car, and then to warehouse tanks at destination, for carp can live four or five hours when taken out of water, and revive when placed in water again. While in the tank cars on the way to market the fish are given no food.

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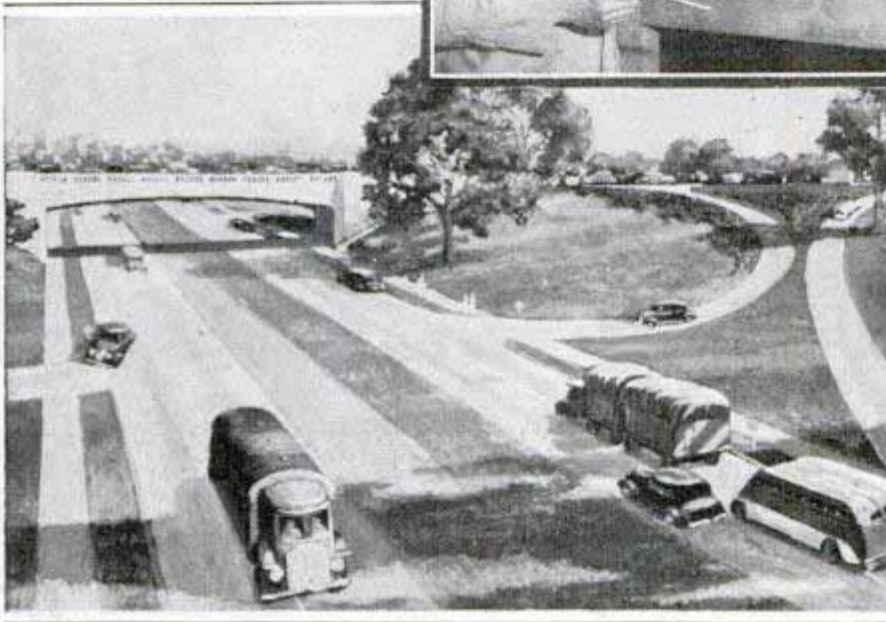
Vertical handwritten notes on the right margin.

Flat Models Given Depth by Knife and Paint

Instead of making models in three dimensions, government designers are imparting the appearance of depth to flat-surface exhibits, simply by skillful use of knife and paintbrush. The exhibits are of the diorama type used so extensively at fairs and expositions for several years, but do not fol-



Top, artist at work on new type of diorama which is only six inches deep but appears to have much greater depth. Left, diorama of super-highway



inating the possibility of distortion. Since the models are made of basswood, the exhibits are lighter in weight, less fragile and easier to crate for shipment than were the original type of diorama, which frequently was made of clay, plaster,

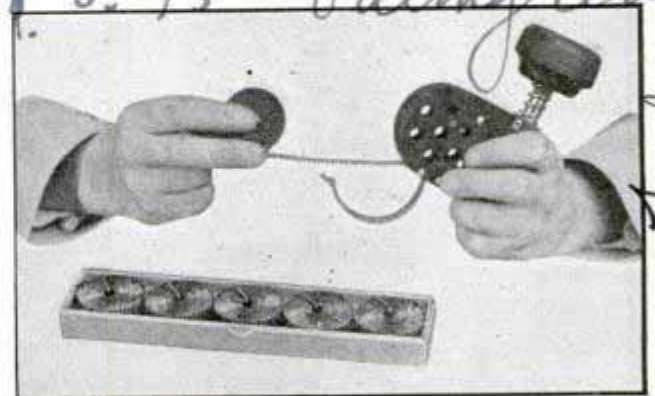
low the traditional formula of being twice as long as deep to achieve perspective. Only six inches deep and provided with flat instead of semicircular backgrounds, the exhibits are so built that the point of view of the spectators is controlled, elim-

bronze, copper, steel and iron. So skillfully do the government's craftsmen shape the models in alto-relief with sharp knives and shade them with appropriate colors of paint that they appear to the spectators as three-dimension figures.

Handy Magazine-Feed Stapler Holds Thousand Staples

With a capacity of 1,000 flat steel staples, a vest-pocket stapling machine designed for use on wood, paper, leather, canvas, felt, fiber and other materials is on the market. It has a magazine feed and is easily loaded. If a defective staple gets into the machine, a few blows on the plunger will cut it up and the pieces will fall through the staple opening.

(Pulverized waste granite can be combined with china clay to make porcelain, the Bureau of Mines has found.



Loading the vest-pocket stapler with roll which carries 1,000 steel staples

Empresses Oil Magazine

Experiments at Osage, Ok.

Chicago Tool & Engineering Co. 8389 S. Chicago Ave. 41 30

7/650

Washington

F1483

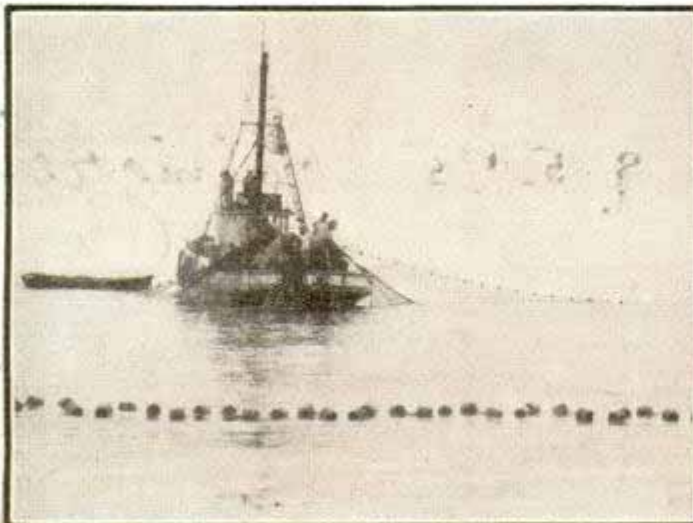
MOONBEAMS *Bulk*



MOOONBEAMS govern a \$20,000,000 American industry. When the moon floats in a clear Pacific sky, a great fishing fleet floats idle at anchor and ten thousand cannery workers idly await a night fog, an overcast heaven or a lunar change. For more than ninety-nine per cent of the annual billion-pound sardine catch of the Pacific is seined by night, in the dark of the moon. Seldom is this fish family seen

by day, never by moonlight. Even starlight is a curse to the fisherfolk.

Paradoxically, the few sardines caught by daylight are found by a dark hue they cast at the surface of the sea, while at night their presence is indicated by a bright glow over the water. So nearly is the glow a twin to moonbeams that the fishermen do not even attempt to seine on clear, moonlit nights.



Photos courtesy California State Fisheries Laboratory
Top, one of the few instances of successful daylight fishing for sardines. The fish are being removed from the net and loaded on two boats. Below, hauling in bag of ring nets

Confession of

789 Castro St.
San Francisco, Calif

71483

the FISHER FOLK

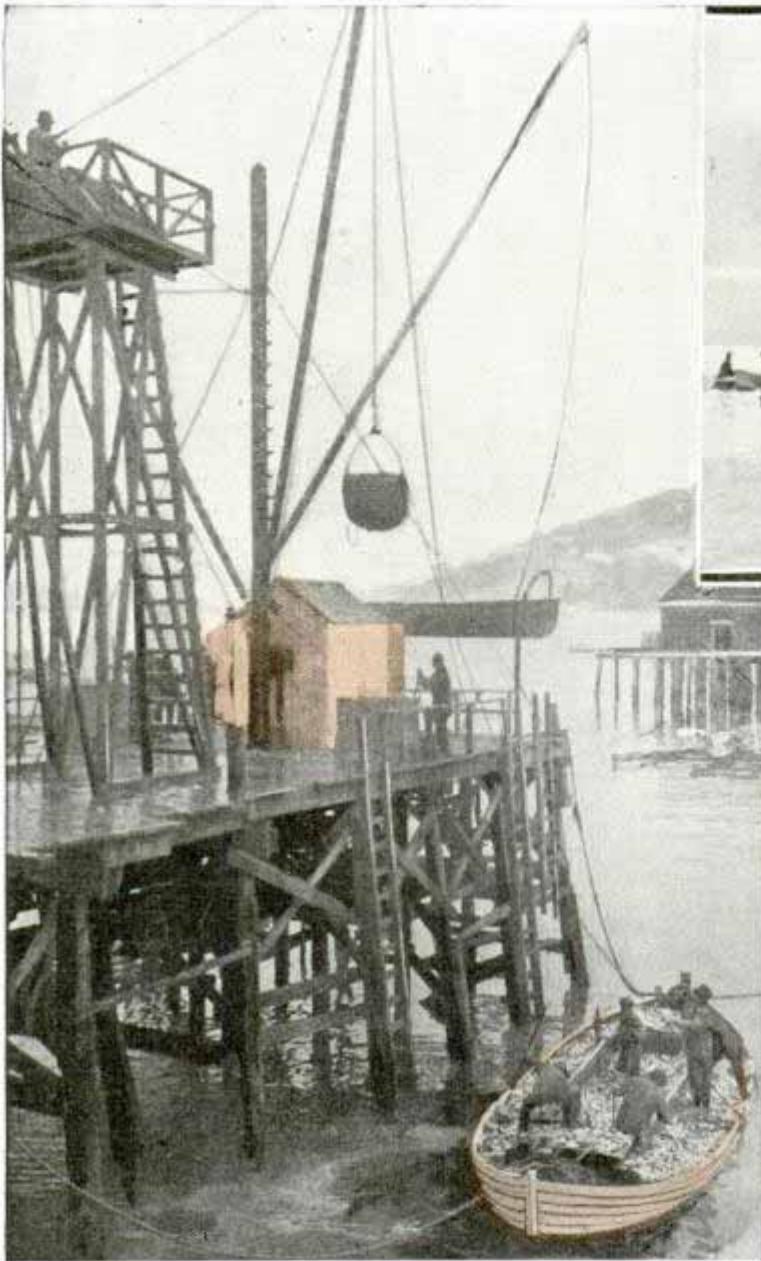
The sardine, like the anchovy, smelt and mackerel, is a surface-feeder, and when dining at night it lights up its table, so to speak, with a white-blue glow that has the appearance of a patch of molten silver floating on the water. The darker the night, the brighter these "fish lamps," and the easier the job of the fishermen.

Each family of night surface-feeders has its own lighting effect, which is easily read by an experienced fisher. Different styles of maneuvers reveal the different kinds of fish, each making a distinctive sign when it darts through the water. Sardines make long, slightly curved lines, like the tails of skyrocket; smelt cut the sea in undulating arcs, leaving a zigzag path. Anchovies squirm in short, angleworm curves, while mackerel make wide, straight paths.

These families of smaller fish feed on billions of almost microscopic crustaceans which float near the surface. When disturbed the tiny creatures



Photos courtesy California State Fisheries Laboratory
Top, striped bass caught in San Francisco bay. Below, left, removing fish from net to boat, one of few daylight pictures ever obtained. Right, taking a net ashore to make repairs after making a heavy haul



Unloading one night's catch in the early morning, and salmon fishermen at mouth of Klamath river



bigger outside the Golden Gate and off the Farallones. Fifteen-inch sardines are caught in Alaska, while twelve inches is the average in canneries on Vancouver island. Scientists are uncertain how far the sardine travels on its northern cruise, and in how many parts of the Pacific it may be found. It appears in tremendous schools in South American waters and south of the equator.

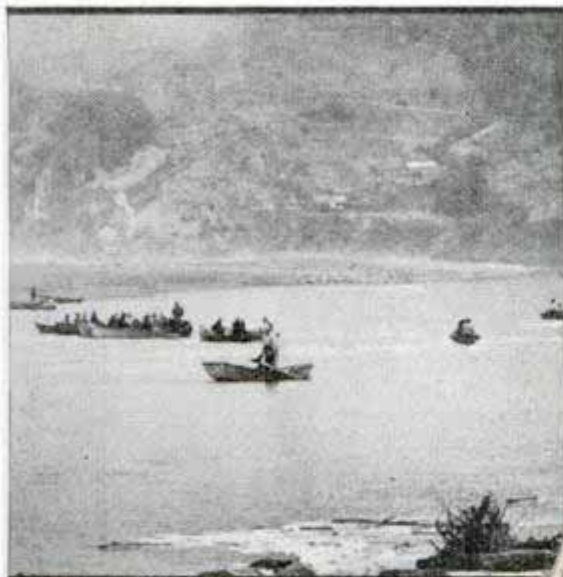
When spawning age is reached by the northern voyagers, the schools head back to the waters of their nativity. Few are seined on the southern spawning run; for the fish then travel in broken schools and seldom stop for food. Although they require more than a year to make the northern trip,

exude a phosphorescent glow that lights up the water and serves as a guide to the seining crews.

Pacific sardine propagation in the North American area is confined to a circular zone, about 200 miles in diameter, off the south coast of California and north coast of Lower California, Mexico. Upon hatching, the little fish start north in vast schools, at first swimming very slowly, then gaining speed with size. They are from five to six inches long and about a year old when they reach San Diego, site of the southernmost American canneries; seven to eight inches when they appear off San Pedro harbor. At Monterey, some 400 miles north of San Pedro, they are from eight to twelve inches, and are only a little

the return is a matter of days. All the hunters of the sea and of the air above the sea prey upon the little travelers. The annual fishboat catch of a billion pounds is only a minor fraction of the toll. Great flocks of gulls swoop down to feast on the fish; droves of sea lions devour tons. An open-mouthed whale, swimming through a sardine school, will swallow two thousand pounds of fish. Nature tried to compensate for this destruction by creating the female sardine with capacity to produce from 100,000 to 300,000 eggs, and by teaching the fish to swim in split schools en route to their spawning waters.

Up to the time of the world war, nearly all west coast sardine seining was carried on from little power boats patterned after









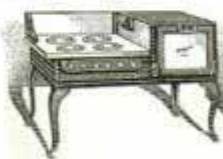





Mediterranean fishboats, the design of which has gone unchanged for 3,000 years. Today's boats are bigger and faster, ranging from thirty-five to seventy feet in length, ten to twenty-five feet beam and three to five feet draft. They are powered with gas and Diesel engines. They are seaworthy, for virtually all seining is done from five

(Continued to page 126A)



Fishermen at the mouth of the Klamath river when the salmon run starts and, above, unloading fish at one of the canneries. This represents only a small part of one night's catch

Research Brings Better Goods at Lower Cost

| | | | | | |
|---|---|--|---|---|--|
| <p>1891</p>  <p>\$3.50
100 candlepower used 310 watts</p> | <p>TODAY</p>  <p>20¢
100 candlepower uses 100 watts</p> | <p>1922</p>  <p>\$200
Nearby stations only. Needed batteries</p> | <p>TODAY</p>  <p>\$30
Long-distance reception. Just plug in</p> | <p>1902</p>  <p>3 lb coal per kw-hr
22 kw per sq ft of floor area</p> | <p>TODAY</p>  <p>1 lb coal per kw-hr
76 kw per sq ft of floor area</p> |
| <p>1927</p>  <p>\$205
Slow No thrift cooker.</p> | <p>TODAY</p>  <p>\$107
Fast Thrift cooker included</p> | <p>1891</p>  <p>1/3 hp \$80
28 lb</p> | <p>TODAY</p>  <p>1/3 hp \$12
28 lb</p> | <p>1926</p>  <p>6-foot box \$295
50 kw-hr per month</p> | <p>TODAY</p>  <p>6-foot box \$165
21 kw-hr per month</p> |

Here is a graphic story of the rapid advance of engineering in recent years, showing side by side the superior products of today and the less efficient ones which cost far more a few years ago

Thanks to inventive research engineers, many of the products of industry today deliver far superior performance at a fraction of their cost a few years back. Your hundred-candlepower lamp in 1891 cost \$3.50 and used 310 watts; today such a lamp can be had for twenty cents and uses 100 watts. A slow-cooking electric stove only ten years ago cost \$205, while today a fast and efficient model lists for \$107. As late as 1921 an electric bulb that sells for fifteen cents now, cost forty-five cents and today's gives eighty per cent more light! Thomas A. Edison's first generating station in 1882 required ten pounds of coal to generate one kilowatt-hour of electricity.

In 1902 it took three pounds of coal. The latest turbine-generator matches every pound of coal with one kilowatt-hour. You paid eighty dollars for a one-third horsepower electric motor in 1891 and you could buy one today for twelve dollars. In ten years the price of a six-foot electric refrigerator has been slashed from \$295 to \$165, and the new one consumes only twenty-one kilowatt-hours per month compared with fifty kilowatt-hours used by the old model. Back in 1922 you bought a \$200 battery-operated radio set that could pick up only near-by stations. Today a thirty dollar set gets distant stations, and you merely plug it into a socket.

Airplane Tire Changed Quickly with Aid of Jack and Vise

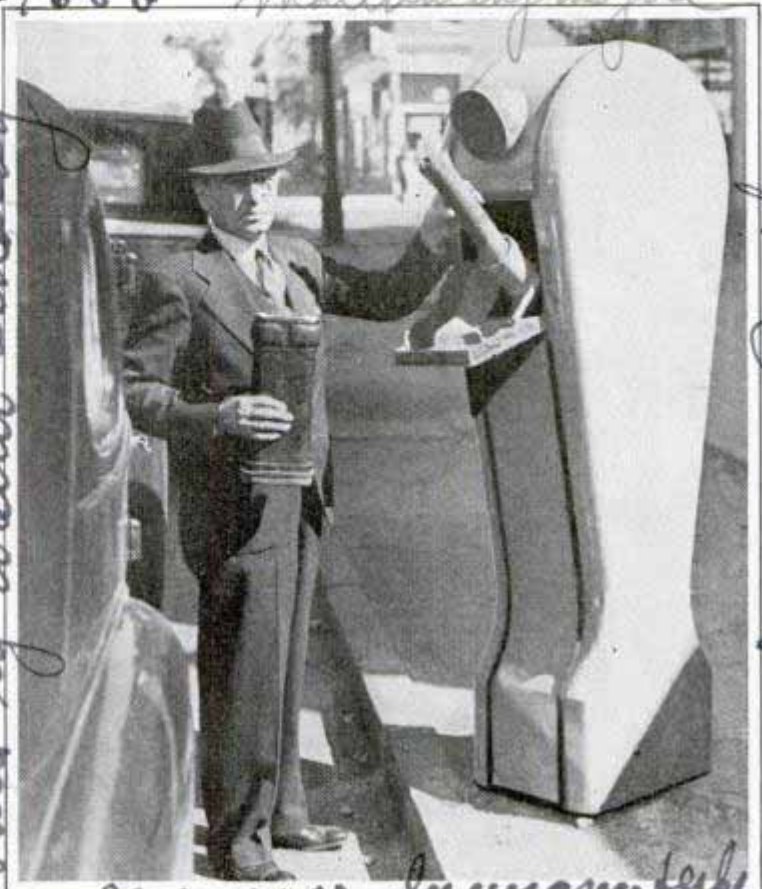


Changing airplane tires was a sixty to ninety minute task until mechanics of United Air Lines at Seattle improvised a jack and vise arrangement which does the job in five minutes. Two parallel pieces of one and one-half inch angle iron are welded on top of a welded steel automobile rim. These support two sections of one-inch pipe on which a hydraulic jack is mounted. To remove a tire from its wheel, it is laid on the floor and deflated, then the auto rim is laid over the inner edge of the tire and the jack is pumped up, with pipes bolted and welded to a hangar

girder supplying the resistance. Steady pressure from the jack breaks the tire loose, this operation being applied to both sides of the tire. Next, to facilitate removal of the tire, a wheel vise was built consisting of a two and one-half inch pipe with a fork to keep the wheel from turning.

Bank Provides Curb Service with Tube from Teller to Car

F1656 material information



Customer making a bank deposit from the curb, sending his money and book to teller by pneumatic tube

Concrete Memorial Shaft Has Marble Luster

F1583

Memorializing the heroes of American wars, a thirty-two foot monument erected recently in Lincoln, Neb., is constructed of sixty tons of concrete and fifteen tons of crushed marble. The marble was added to lend luster. Ten men completed the work in nine months. The memorial consists of a shaft surmounted by a figure, "Victory and War," with four figures at the base, representing soldiers of the American Revolution, the Civil War, the Spanish American War and World War. The base is twenty feet square.

Paid by Walter Anderson

in Antelope Park



This thirty-two foot memorial is constructed of concrete and crushed marble

Carl Everett Rudisil

In a hurry to cash a check? You can get curb service in front of a Denver bank. There is no need to drive around the block looking for a parking space. Just drive up to that streamline metal case at the curb. The teller, watching from his window, recognizes you and presses an electric switch to open a small door which reveals pneumatic dispatch tubes, cylindrical carriers and a telephone. The teller greets you over a loudspeaker above the door. You slip the check or your bank book and deposit slip into a carrier and send it through the underground tube to the teller's desk. If you wish, you can pick up a telephone in the metal case and speak to the banker. Within a minute or two your money or bank book comes back through the dispatch tube and you drive away.

Out of 22,702,000 motor vehicles examined by an insurance organization, three out of every four had some defect. Tires were close to the danger point on half of the cars.

Automotive Industries

Central Savings Bank and Trust Co. 1601 W. Washington Chicago

under direction of E.S. Lee

Pilot Ascends at Midnight to Check Weather



Pilot checks up fastenings of weather instruments before taking off at midnight

through the radiator and, condensing, runs back to a reservoir for further use. Radiator valves are eliminated, 250 pounds of steam can be used safely, and with thermostatic control there is no turning off and on of steam and no fluctuation in heat. Not yet on the market, this alcohol bottle is being tested in heating and air-conditioning plants.

F1641

Big Building Stands on Stilts as Subway Track Is Laid

When the New York Central railroad began digging a tunnel for a subway in New York recently, a large building stood directly in its path. Instead of tearing down the structure at great expense, the railroad and the owners reached an agreement whereby a few of the lower floors were taken out giving the subway workers headroom to work on the tunnel and leaving the building standing on steel stilts. While the work was in progress, the building had the appearance of being under construction from the top down.



Central Station, New York
Here is how building appeared while subway construction was under way

Perhaps the loneliest job in aviation is that of a California pilot who ascends 16,000 feet every night to collect weather data. The flights are made at midnight. His plane carries special equipment, including an aero-meteorograph which records air pressure, temperature and humidity. The pilot makes observations on fog banks, cloud thickness, smoke layers, air currents and other conditions. This information is used by the government weather bureau in making forecasts. The pilot wears a sheep-lined flying suit because he encounters temperatures of fourteen below zero on his flights.

Alcohol Vapor Heats Radiator Instead of Using Steam

Tomorrow's homes may be heated with alcohol vapor. From the laboratories of the General Electric company comes word of an alcohol "bottle" which replaces the valve of a steam radiator. It holds one or two pints of alcohol. Steam is piped to the bottle, but not into the radiator itself; instead, the alcohol readily takes up the full heat of the steam and vaporizes, flowing

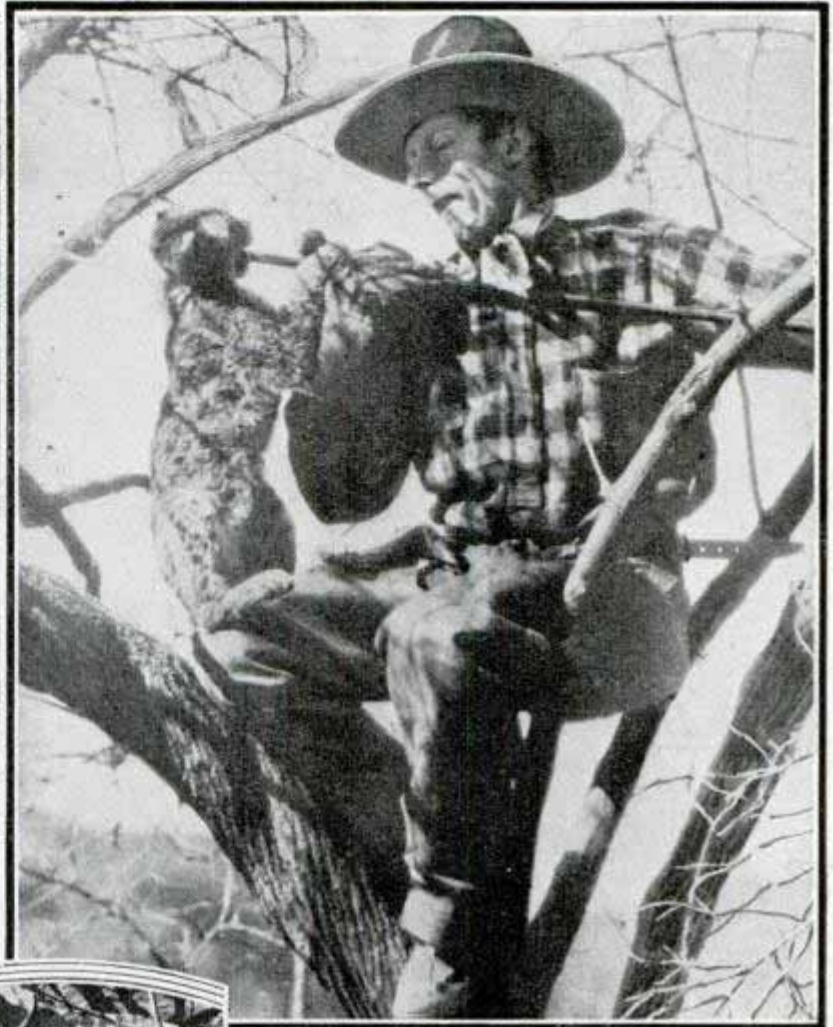
*Chicago Tribune 1/20/37
Alameda, Calif
Johnnie Martin*

not a commercial

Wildcats Captured Alive by Daring Hunter



With wildcat treed by the dogs, the hunter goes after him with chain snare fastened to rod



After hand-to-hand fight the hunter is shown with noose slipped over cat's head



Lowering cat from tree while dogs beg for chance to finish off the quarry. Right, close-up of captured wildcat. These vicious animals, weighing up to thirty-five pounds, are found in the Sierra Madre mountains north of Los Angeles. It takes a daring hunter to bag them



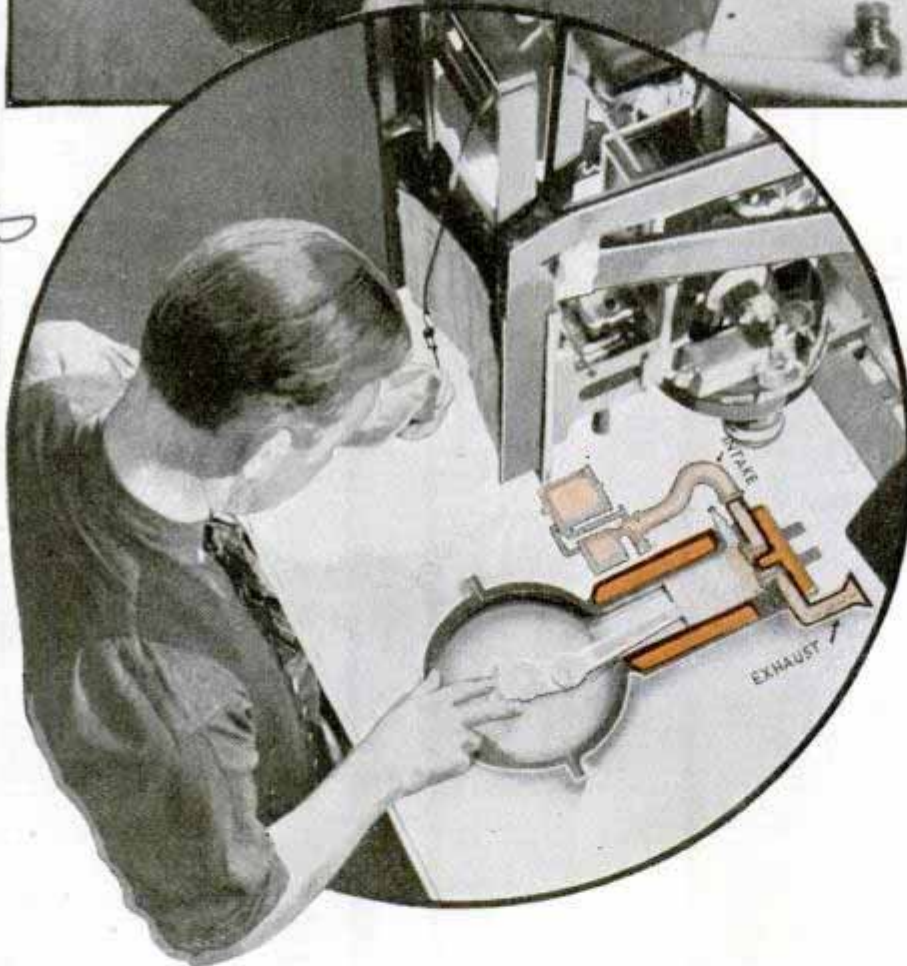
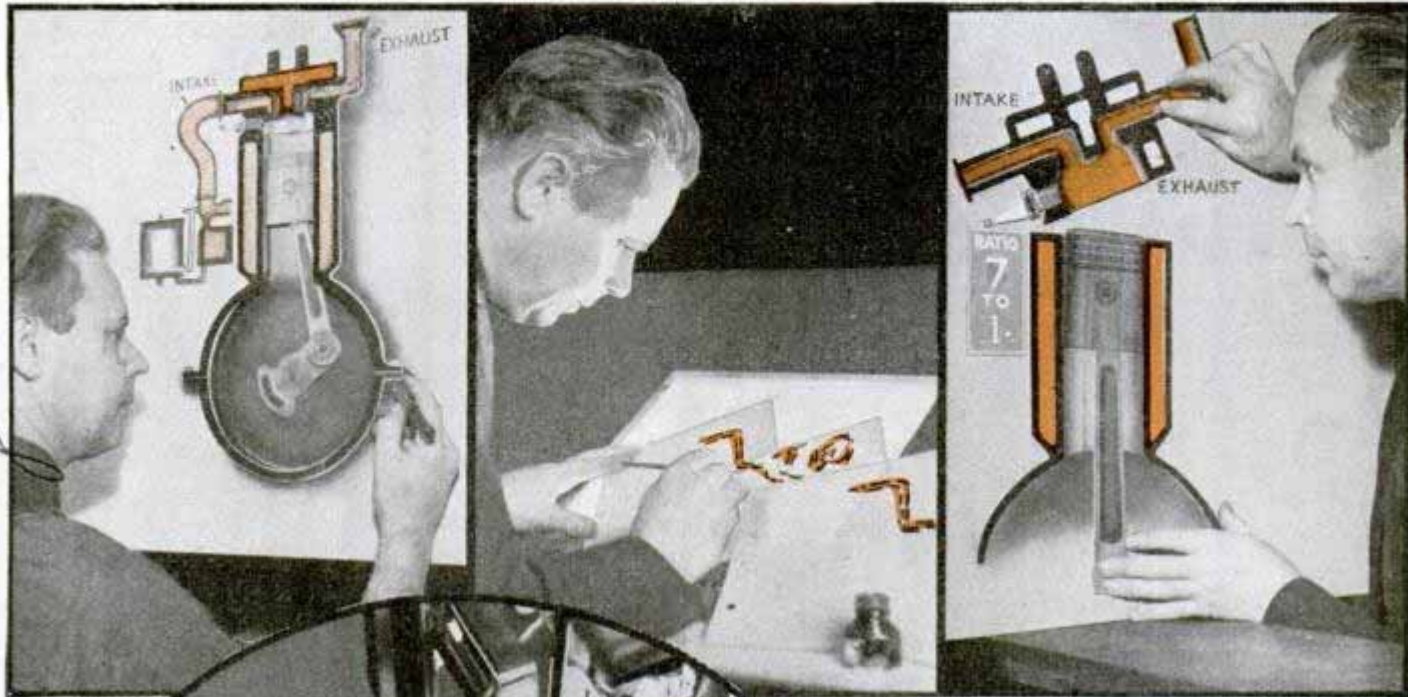
Acme

Weapons

30 minute

MOVIES *that* SHOW *you*

Emb. Thomas E. Timmer Jr. 10555 Hollywood Ave. Los Angeles, Calif.



Above, left to right, painting in details of cutaway engine model for movies, animator preparing drawings to illustrate flow of exhaust gases, and changing cylinder heads on cutaway engine model. Below, overhead movie camera that makes one picture at a time after operator moves engine parts

“Let’s take a movie,” the superintendent suggested, and sent to Hollywood for a trouble shooter.

They did the job over the next day with a cameraman on the sidelines. As usual, the cable snapped. But the oil-well crew had the answer when they saw the “rushes” of the film in slow motion.

Moving at a fraction of normal speed, the pictures showed the cable descending from the crown block into the hole. Then it started to weave and finally kinked over on itself. Then it snapped. Air pressure in the deep hole was slowing up the dropping of the pipe, allowing the cable to slacken. The action was too fast for the eye but the film showed every detail. The crew dropped its

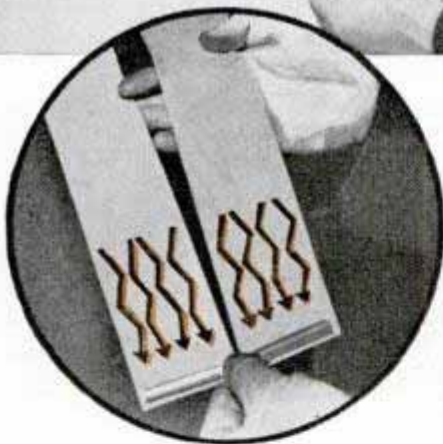
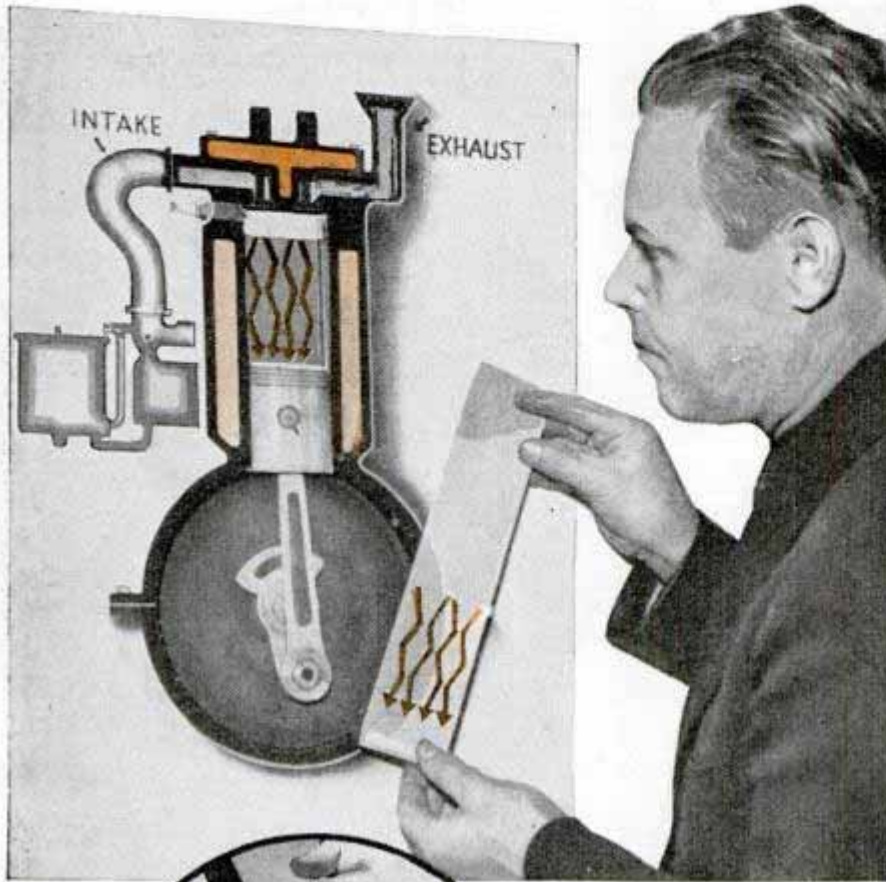
THE heavy wire cable had been tested with a load of twenty tons but the first time it was put to work lowering a string of pipe down an oil well it snapped like a piece of thread. Something was wrong. The load was only a fifth of what the cable should stand. And this was the fourth cable that had snapped.

showed the cable descending from the crown block into the hole. Then it started to weave and finally kinked over on itself. Then it snapped. Air pressure in the deep hole was slowing up the dropping of the pipe, allowing the cable to slacken. The action was too fast for the eye but the film showed every detail. The crew dropped its

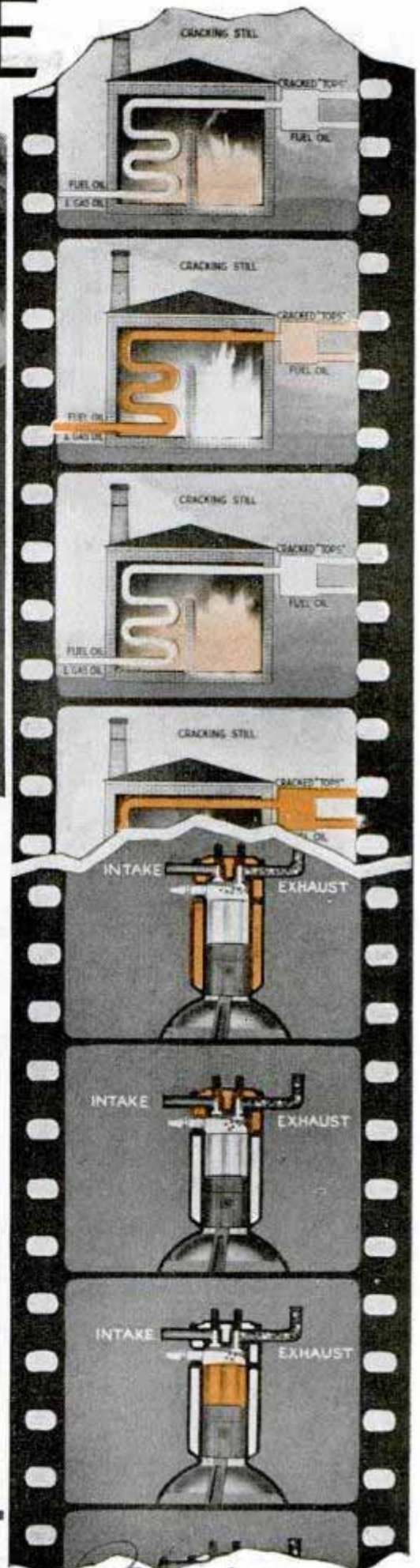
adv. 554 Union Oil Co. Los Angeles

7766/1

the INVISIBLE

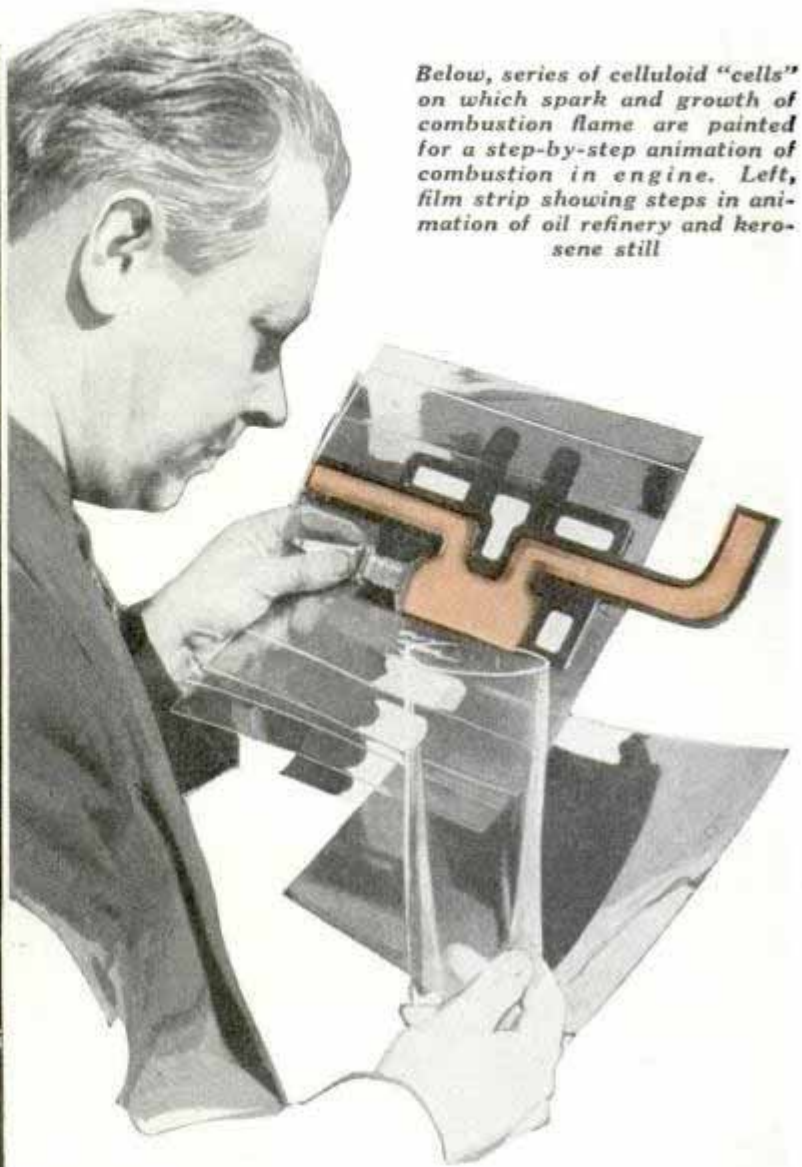
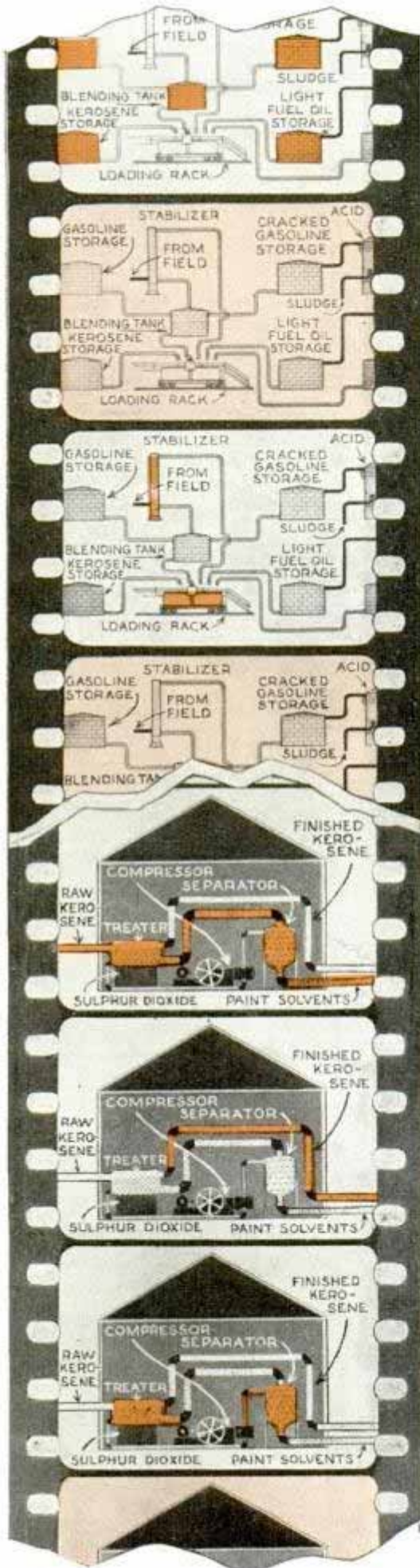


Above, vibrating arrows which indicate drive of power in engine. Left, close-up of arrows showing reversed direction which makes them appear to vibrate. Right, film strip showing animation of flames by use of drawings and progressive steps in animation of engine cylinder



pipe more slowly and its cable troubles were over. Solving industrial problems by "making visible the invisible" is an important task for motion pictures. Many things happen too quickly for the eye but when you put to work a motion-picture camera that can see at any speed, it catches things the eyes overlook. Recently a railroad tested a preliminary design of a new lightweight boxcar by rolling into it an old car loaded with sandbags. The technical men wanted to know where strains developed and what parts buckled first, so they took movies of the crash. Out of the pictures they evolved a design of car that is both light and strong. In the Hollywood studio of F. K. Rockett, cameras are used as detectives to trace down the causes of trouble when things go wrong in indus-

6050 Sunset Blvd
Los Angeles Calif



Below, series of celluloid "cells" on which spark and growth of combustion flame are painted for a step-by-step animation of combustion in engine. Left, film strip showing steps in animation of oil refinery and kerosene still

try. The camera can peer through microscopes and literally look through solid walls.

What goes on inside an automobile engine is a pretty hard thing to photograph but recently an oil company asked Rockett to do just that. The idea was to visualize on the screen the four cycles of combustion. This was a typical case of making visible the invisible and Rockett supplied the answer by building a cutaway model of cardboard, glass, and aluminum parts. In the model a flat aluminum piston slides up and down the cylinder and is connected to a cross section of crankshaft by a replica of a connecting rod. Moving valves and a spark plug were also parts of the model. Building the model was easy. The rest was a long tedious process in "stop motion" that took weeks to finish. It might take a full day to turn out six feet of film that runs on the screen four seconds.

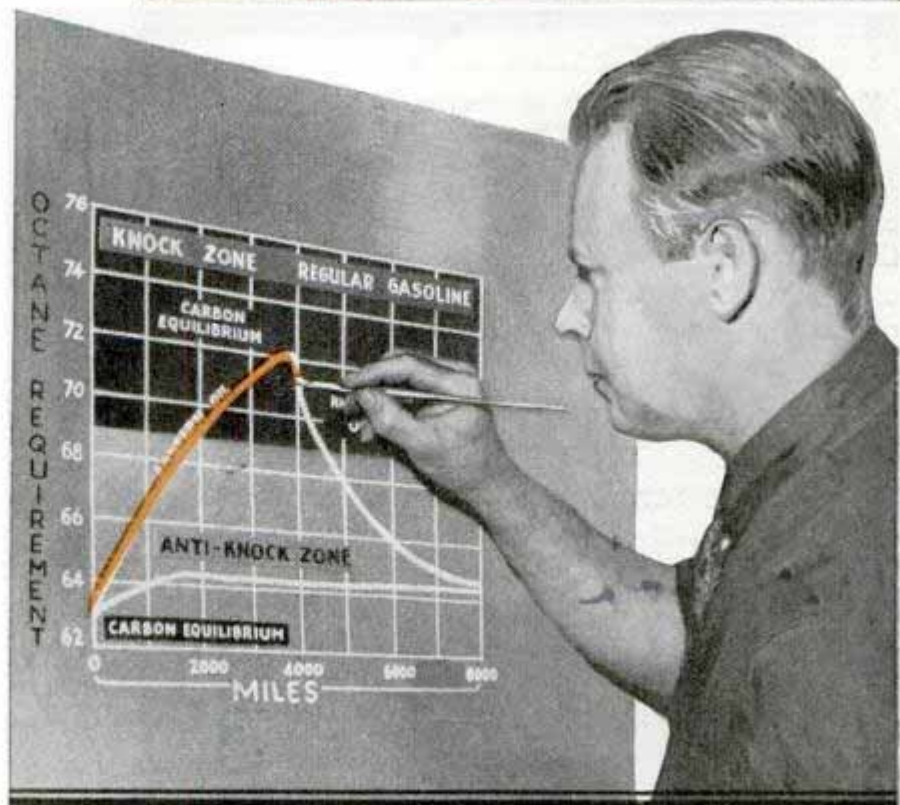
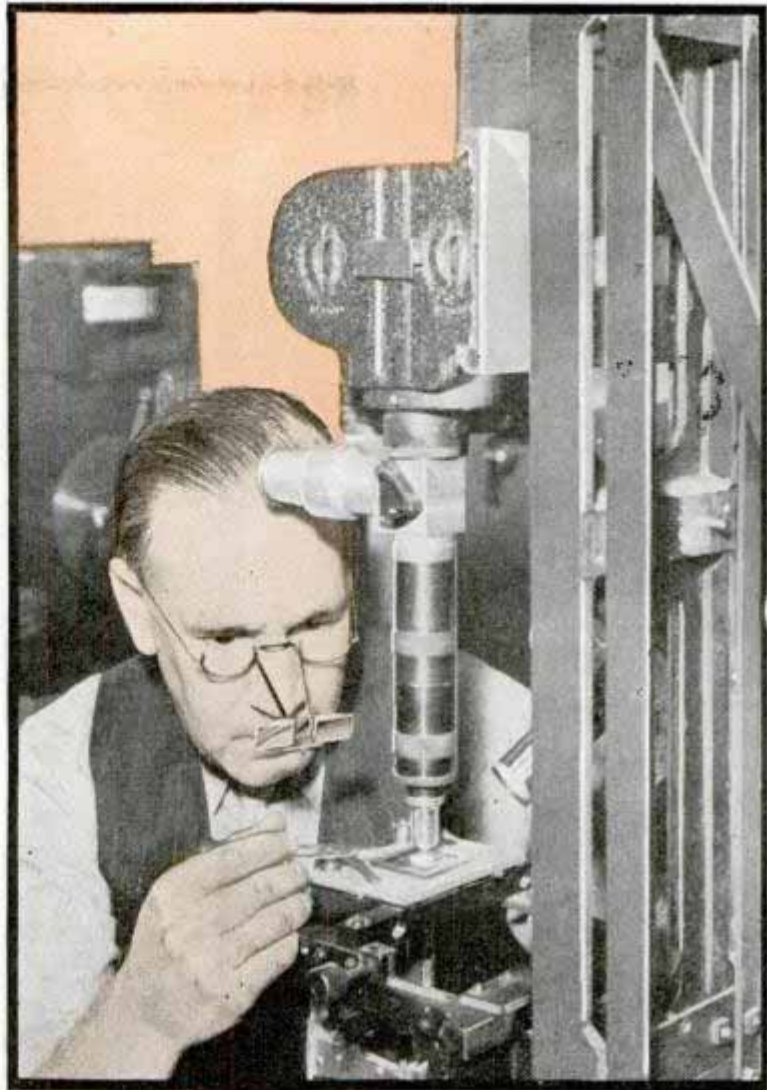
"The first step," Rockett explains, "was to place the model under a vertical motion-picture camera and expose one frame of film in the camera while the piston was at the top of its stroke. Next

the animator moved the piston down a fraction of an inch in the cylinder. Then he opened the intake valve slightly and placed in the combustion chamber a celluloid sheet on which were painted a few dots to represent the incoming fuel charge. Then he was ready to expose one more frame of film. The third frame showed the piston lowered a little more and a larger quantity of fuel on its way in. Just 325 rearrangements of the moving parts were necessary to show the full operation of the engine."

In addition to all this, carbon deposits building up on cylinder head, carbon particles flying out of the exhaust, and arrows representing heat dissipating into the cooling system all had to be represented at each step. One of the requirements was to indicate the fluctuating cylinder head temperatures on a celluloid thermometer placed alongside the model, and to show the power being developed at each stage on a chart beside the thermometer. In the finished picture, with the engine slowly and steadily moving through a complete cycle, temperatures flow up and down the thermometer and the power line on the chart rises and falls in accordance with the stroke.

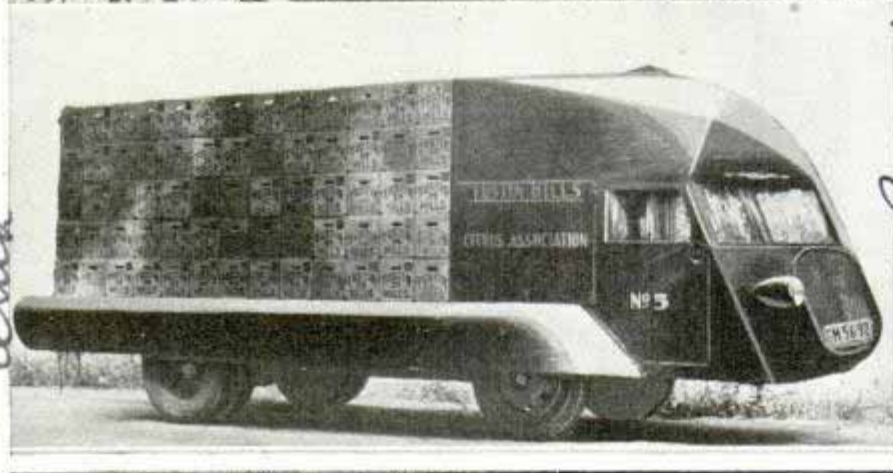
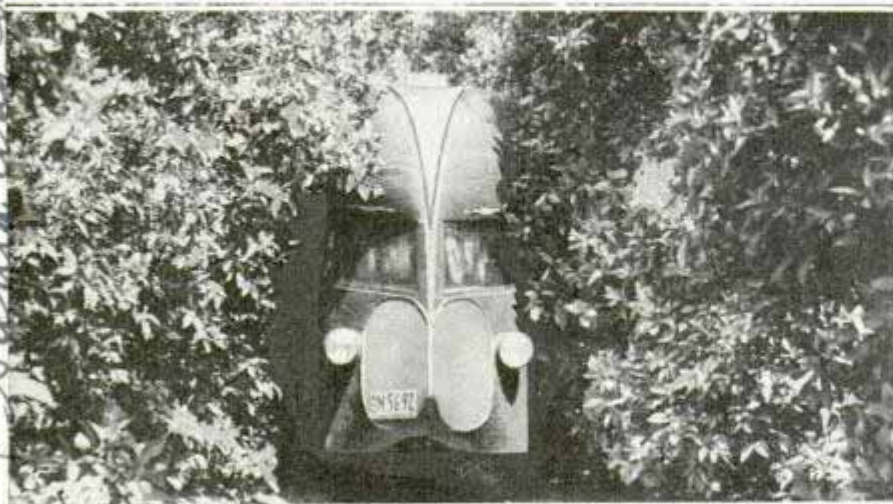
Another part of the same film shows the actual building up of carbon deposits on a cylinder head. To get this, Rockett mounted a camera on a steady support and photographed a cylinder head in clean condition. Then the head was installed on an engine, operated long enough to represent 300 miles of driving, unbolted, and placed in front of the camera again. This time

(Continued to page 116A)



Top, adjusting automatic camera which takes motion pictures through a microscope. Below, completed graph animated by photographing it each time new dot in curves was painted on

Slender Truck Saves Trees from Damage in Fruit Grove



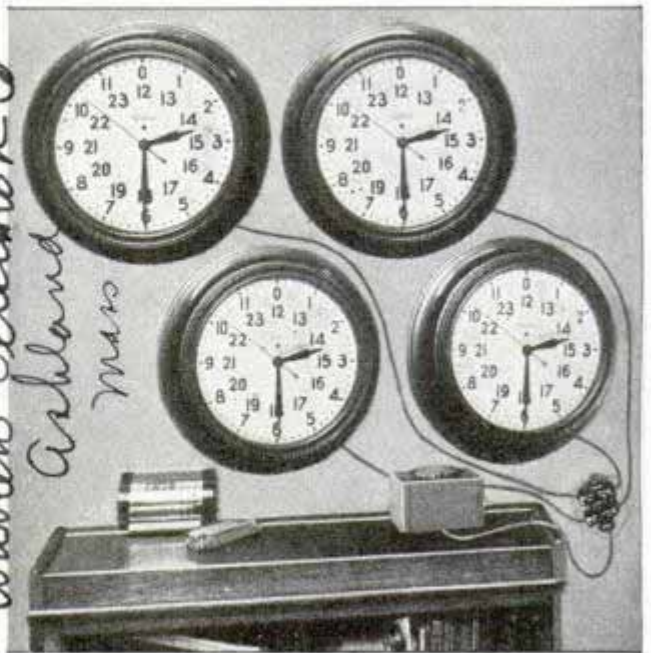
Head-on view of narrow truck constructed to pass between fruit trees. Bottom, on the way to market with a full load

Constant breaking of trees and bruising of fruit by trucks hauling fruit through the groves has been ended by California citrus growers. On the recommendation of automotive engineers they now use a long, slender truck which rolls through the grove without causing damage.

Four-Burner Stove for Trailer Occupies Little Space



There is ample room for four large cooking utensils on a four-burner stove designed for use in trailers, yet the stove requires a space only eight-



Electric clocks keep sidereal time for Mt. Wilson observatory and California Institute of Technology

een by twenty-two by six and three-quarters inches. Regardless of the number of burners in use, the flame is always even. The small gas tank has a built-in pump.

Electric Clocks Tell Sidereal Time for Observatories

Cook a five-minute egg by a sidereal clock and it will boil only four minutes, fifty-nine and 181 thousandths solar seconds. Four of these electric clocks that tell star time have been built for installation at the California Institute of Technology and in the observatory on Mt. Wilson. The sidereal day lasts twenty-three hours, fifty-six minutes and four and ninety-one thousandths seconds in solar time. These electric clocks therefore will gain about one second for every five minutes your kitchen clock runs.

*Body - O. H. Egge
F. Co. 429 W. 5th St
Pasadena, Calif
White Motor Co
84 2 E 79 St Cleveland
Ohio*

Pasadena

*F1664
Safe-J. Cook*

*Warren Telephon Co
Ashland
Mass*

*Midland Steel Products
Co., 6600-Mt. Elliott Cwy, Detroit*

Plane Carries Soldiers Concealed in Wings



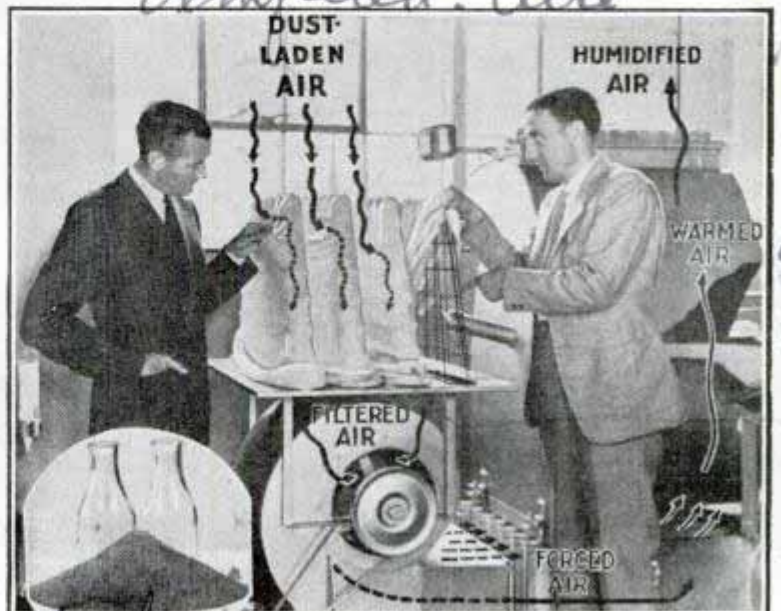
Here is how the latest two-seater plane built in Russia carries fourteen soldiers in the wings. Before taking off the hinged leading edge of the wing is closed, concealing the extra troops

Designed like the conventional two-seater airplane, the latest Soviet ship has space in the wings for fourteen persons, giving it a capacity of sixteen. This feature is regarded as important from a military standpoint, since it would permit

speedy transportation of a large number of soldiers from one point to another in an emergency. Access to the wing compartments is made possible by placing the leading edges of the wings on hinges. In flight, the "doors" cannot be opened.

Cloth Filter Bags Clean Air of Dirt, Dust and Pollen

Two quarts of dirt removed from an air conditioner after one month's operation in a single room prove the efficiency of the cloth filter bags with which one of the latest conditioners is equipped. These bags, which are specially woven, remove bacteria-laden dust, dirt and pollen from polluted air moving through the unit. The cleaned air, pumped by a power blower, then contacts heating surfaces before being humidified and circulated through the rooms of the house. The cloth filter bags may be cleaned in the family washing machine.



*Isar Ward Industries
415 Commercial Ave*

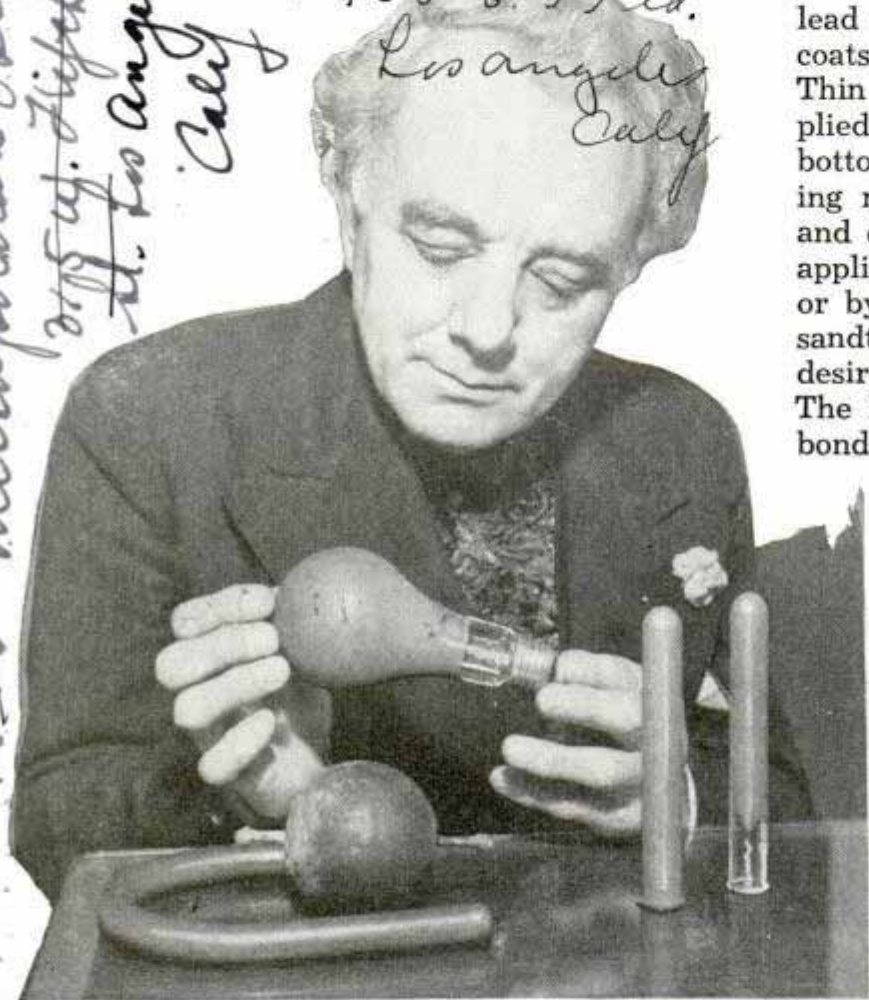
Metals in Liquid Form Are Applied Like Paint

Applicable to almost any surface in cold form like paint, liquefied metals provide excellent protection against corrosion. Liquefied forms of lead, copper, aluminum, chromium, zinc and tin are available, as

well as brass, bronze and other alloys. Unlike galvanizing which is destroyed at welded spots, liquid metal can be painted over welds or cuts. In one case where fumes from a 10,000-gallon tank of hydrochloric acid were destroying metal fixtures in a factory, a thin coat of lead ended the corrosion. Three coats of lead paint will stop X-rays. Thin coats of copper may be applied to shingled roofs, to ships' bottoms or may be used for forming metallic designs on glassware and ceramics. The metals may be applied with brushes or spray guns or by dipping. Coats a few thousandths of an inch thick up to any desired thickness may be applied. The liquefied metals form perfect bonds on such materials as wood, metal, concrete, glass, leather and most other substances.

*Cold Liquid Metals Co.
200 Metropolitan Bldg
205 W. Fifth
H. Los Angeles
Calif*

*Nobs Chemical &
2465 E. 53rd
Los Angeles
Calif*



Glue 'Stronger Than Nails' Holds House Together

More than 3,000 tons of prefabricated buildings, including houses which are glued together instead of being nailed, have been shipped to South Sea islands along the trans-Pacific air line. In the erection of walls, roof and floor, glue, which H. F. Luxford of forest products laboratory describes as "stronger than nails," replaces nails almost entirely. Fir plywood panels are glued to studs, plates and sills throughout. The glue is moistureproof and immune to wood-boring insects.



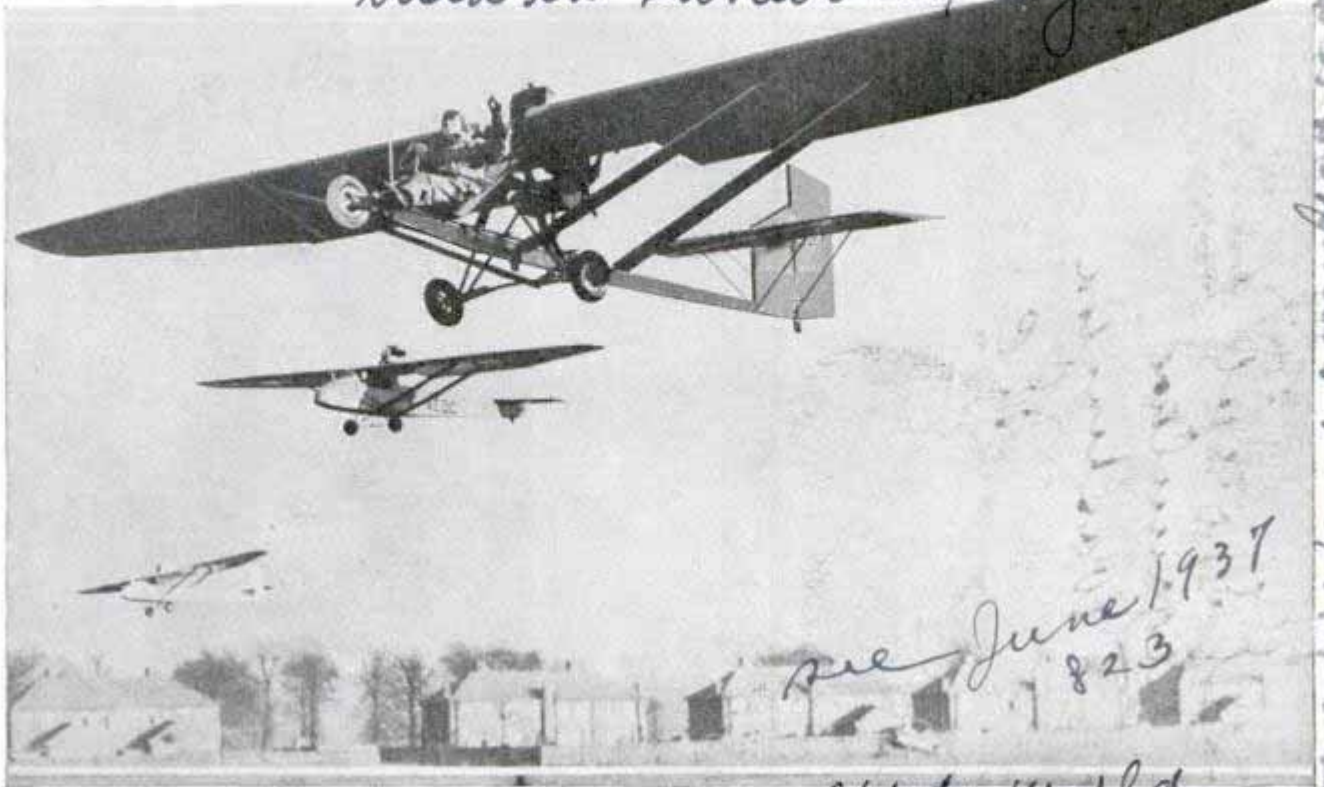
Top, electric-light bulb coated with lead paint shows no scaling after burning twenty-four hours. Copper-coated ball and test tubes after severe tests. Bottom, another example of work with the liquid metal paints

*Madison Wis
37*

*See letter to
engineer*

Ground Training Plane Converted for Flying

used in Hanworth England



Wide World
Student takes off in ground training plane which is converted for flying by replacing its stubby wings with long ones. Thus, the ship serves as ground and air trainer. Note resemblance to glider

Equipped with drone wings for safe training on the ground, the latest plane for teaching flying may be converted for use in the air after the student has com-

pleted his course in ground work. The student sits at the front as in a glider. A pusher-type power plant drives the plane at speeds sufficient for training purposes.

Newsboy Wears a Neon Sign Lighted by Pocket Battery

Newsboys in Philadelphia wear neon signs that flash across their chests the name of the paper they represent. The neon lamp not only has a strong advertising appeal, making it easy to "spot" a newsboy on a crowded street at night, but it protects the boy selling papers in automobile traffic. To be practical, the chest lamp had to be shockproof and operate on a portable battery. The name of the newspaper is made of a single continuous tube of glass, its base imbedded in a plastic substance which protects the tube from shock and breakage. The neon is activated by a battery which gives forty-eight hours service on one cell. A small vibrator changes the direct current to alternating current and a transformer steps up its voltage. Battery, vibrator and transformer are carried in the boy's apron.

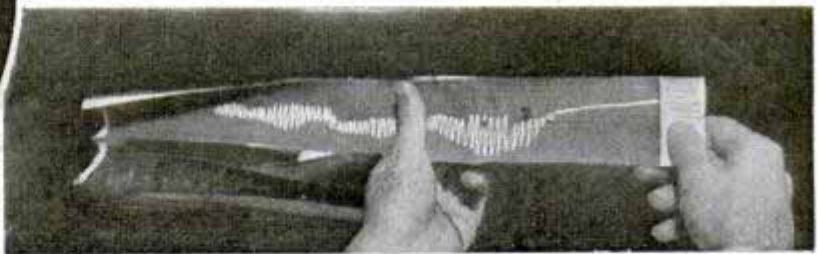
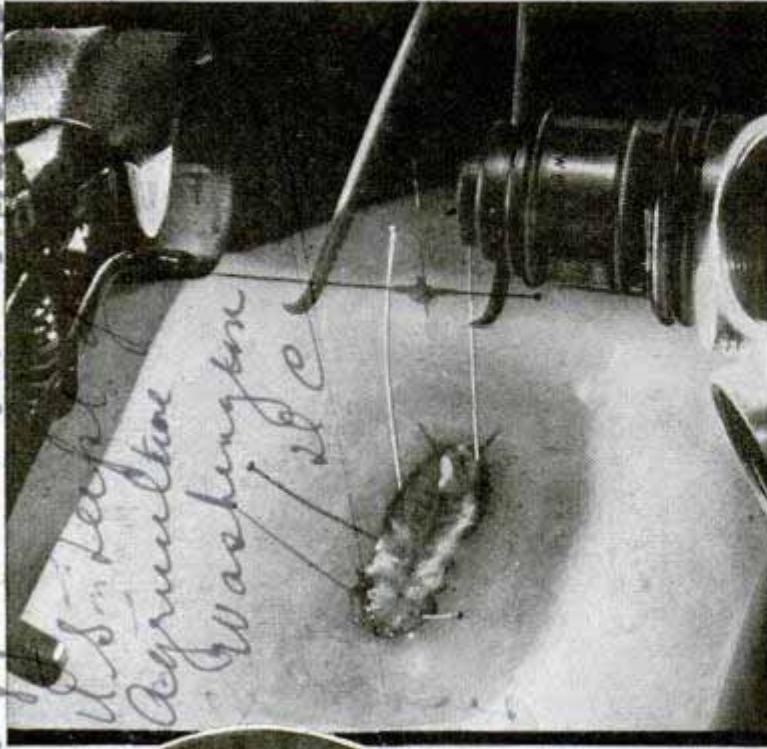


*made and sold by 440 S. Wilton Place, Los Angeles
111 St. Mc Intire*

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Photos of Bug's Heartbeat Help Fight Pests

Mr. James F. Yeager, Chief, Control and Plant Quarantine Division, Bureau of Entomology and Plant Quarantine, U.S. Dept. of Agriculture, Washington, D.C.



Back of insect with heart attached in block of beeswax preparatory to making pictures of heart throbs. At bottom, picture showing the heart action

Pictures of the heart throbs of insects are aiding man in the war on crop pests by serving as a measure of value of various insecticides. Entomologists figured that if they could obtain photographs of the heart action of an insect before and after it is brought in contact with a potential insecticide, they would have a picture of the worth of the insecticide. The first step was to get the heart. Since it is too small to be handled easily, the back with the attached heart is dissected and pinned in a depression in a block of beeswax. Salt solution acts as artificial blood to keep the tissues alive and active. A human hair connects the heart with a tiny

lever which moves with every movement of the heart, the motion being transmitted through the hair. An upright and longer lever arm is stained to make it opaque and a strong beam of light is trained on it. The shadow thus cast is magnified and projected from a microscope into a camera which registers the greatly magnified fluctuations on a moving roll of sensitized paper. The camera is similar to that used by physicians to make electrocardiograms of the electrical currents produced by the contracting heart. Analysis of the heartbeat of a cockroach shows the insect's heart throbs rhythmically, like the human heart, but when nicotine was added to the

Handwritten notes at the bottom of the page, including "The heart of the insect..." and "The heart of the insect..."

salt solution, the heart lost its ability to relax completely at the end of the beat. As more nicotine was added the heart relaxed less, finally remaining contracted.

Tight-Rope Stunts High in Air Require Skill and Nerve

Oil-Can Opener on Car Motor Stops Waste

Attached to the oil intake side of the automobile engine, a new oil-can opener prevents waste and saves time. It is a container slightly larger in diameter than a one-quart can. In the bottom is a sharp point which pierces the can, releasing the lubricant. If only one quart is needed, the cover of the container may be replaced, so the motorist may drive away while the oil is draining into the crankcase. Every drop may be delivered to the motor by leaving the can in the draining position as long as desired. The attachment fits several types of motors.



Here is one of the stunts which a tight-rope artist performs hundreds of feet above the street. A slip would mean death.

It takes iron nerves and unusual skill to perform on a tight rope hundreds of feet in the air. Recently a performer startled Los Angeles crowds by balancing on a rope strung between the wings of a skyscraper hotel. Among his breath-taking stunts is that of lying down on the rope, then getting to his feet again. A slip or misstep would send him plunging to the earth far below.



Inserting unopened oil can into container. Sharp points in bottom cut the can

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

U.S. agent wanted
Isma Lubricants Ltd. Frimbury Circus

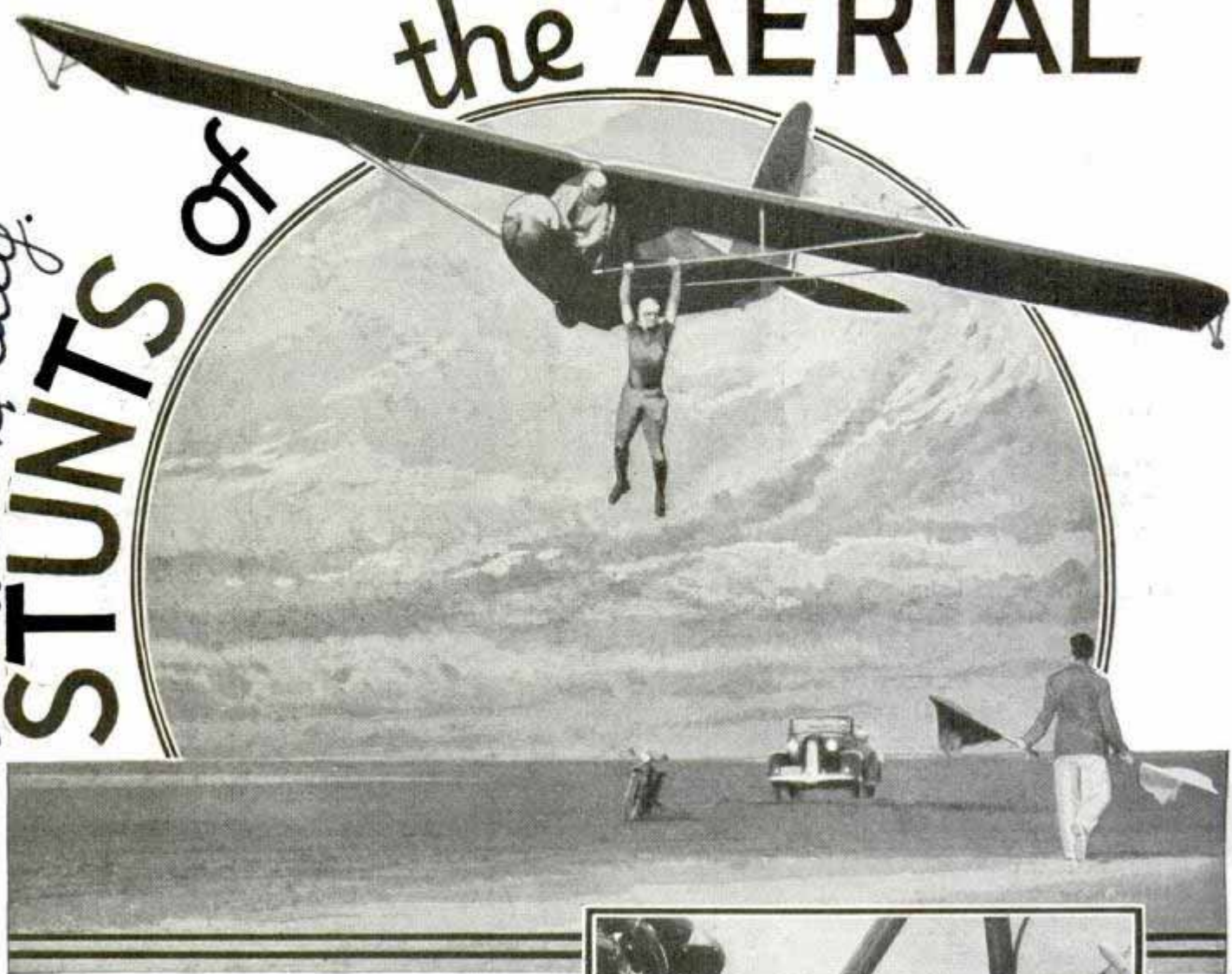
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Train Air Terminal
Berbank, Calif.

STUNTS of



of United Air Service,

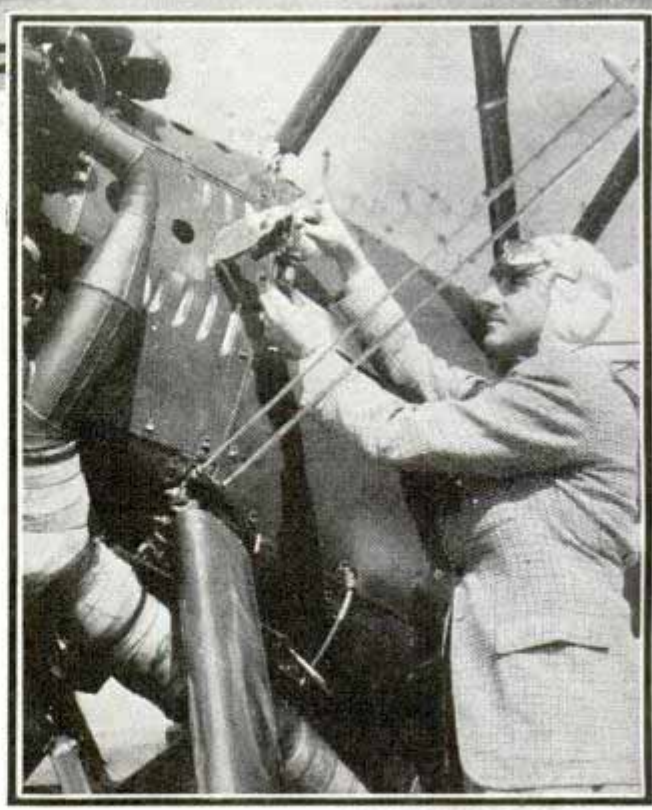
RECENTLY spectators at an air show rose up in horror at something not on the program.

"Look out," they screamed, "that plane is going to hit the other! They've collided in the air!"

Two planes had come together high above the field and were looping with locked wings. They hung together for long seconds and then miraculously one pulled away from the other. Shortly afterward both landed safely.

If the audience had overheard a conversation just before the show started they would have realized the "collision" had been planned to the last inch. While the mechanics were warming up the motors Paul Mantz, leader of the "Hollywood trio," approached Frank Clarke, another motion-picture stunt flyer.

"Let's give them a real thrill, Frank," Mantz said. "At the end of the third event



Stunt man, top, has just transferred from a motorcycle to a towed glider. Below, adjusting wind fan that pumps chemical into exhaust for smoke display

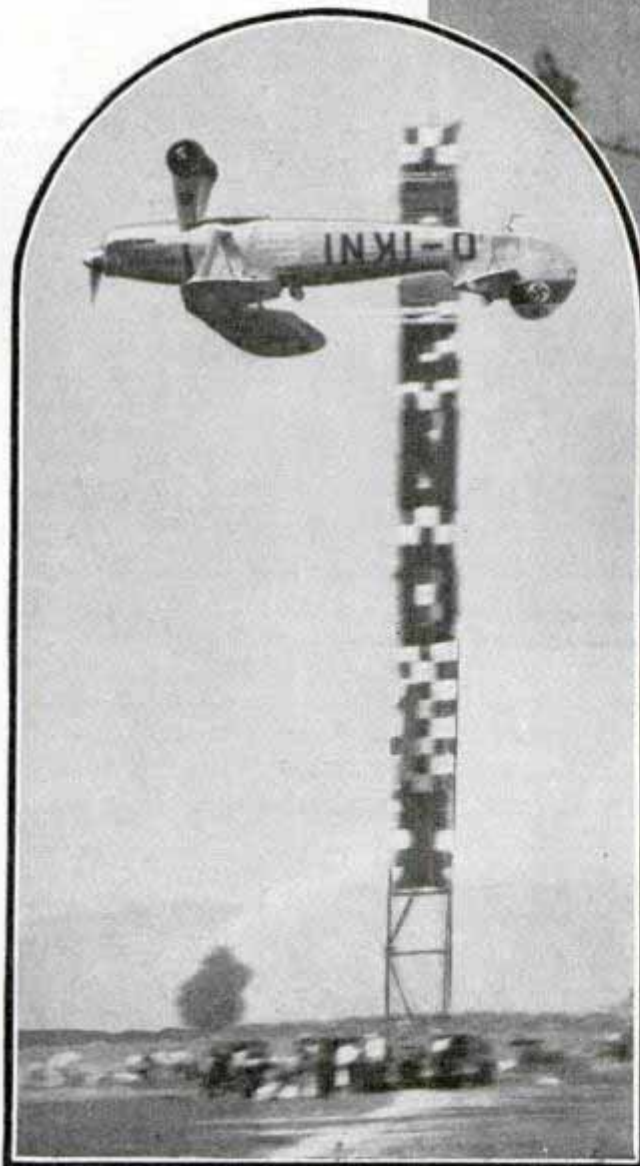
[Handwritten scribbles and signatures at the bottom of the page]

Capt. Thomas G. ...
712 500
Jr. 10555 Holman Ave
Los Angeles Calif

ACROBATS

you dive down on me from behind and lay your upper wing tip on top of my lower wing. Then we'll loop right up and over. But don't scratch my paint!"

That was the secret of the apparent collision. It came off safely because the pilots had flown together for years and each knew just what the other could do. If the slightest thing had gone wrong, the crowd would have seen an actual collision.

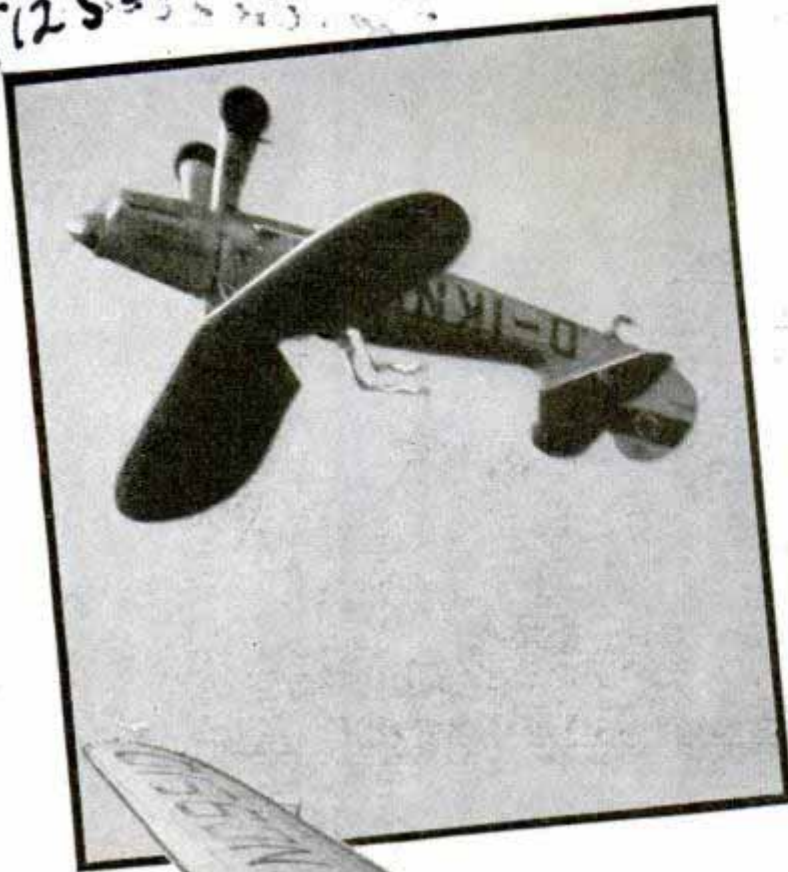


Stunt squadron leader signaling for left turn. Left, stunt pilot flying upside down

These days stunt men and exhibition flyers are thinking up new thrills for the crowds. The loops, barrel rolls, and power dives of half a dozen years ago are still good entertainment but with modern planes and engines, the pilots do things they never dared try before. Still, simple stunts are often the crowd pleasers because most of the spectators are unable to appreciate how difficult some of the new stunts are.

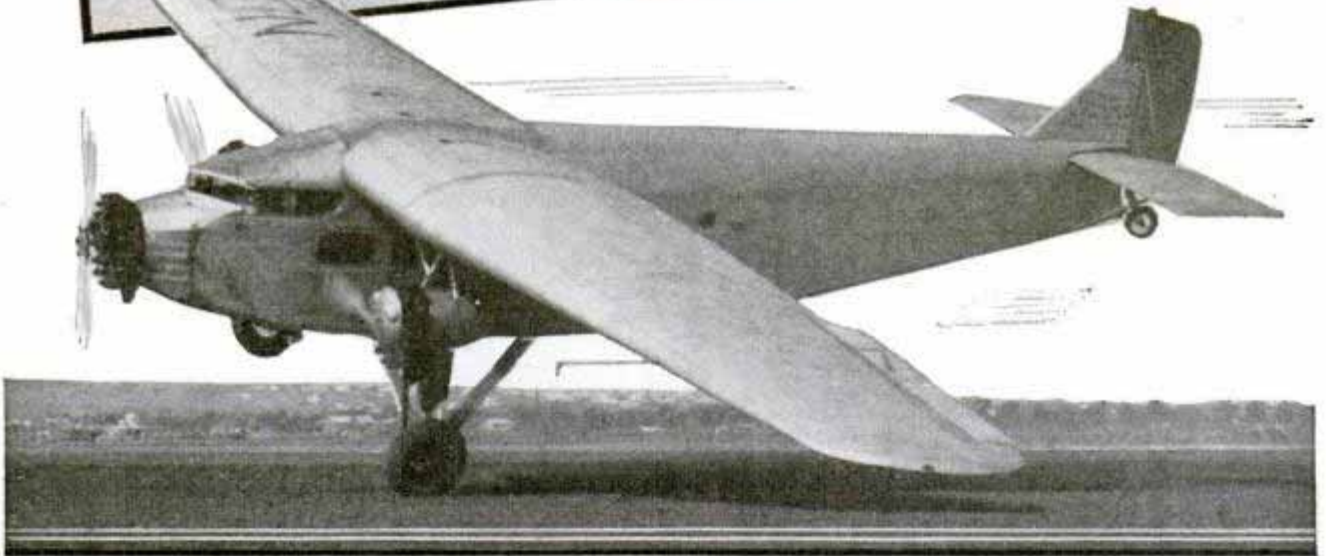
One of Mantz's hardest stunts is a new way of getting off the ground. With the 500-horsepower engine roaring wide open,

F1252



the spin. It's easier but it looks more spectacular.

Frank Clarke does one of the most dangerous stunts. Flying at 2,000 feet, he puts his plane in a vertical dive to gain speed, then pulls up sharply and points his propeller at the sky, barrel rolling the plane as he regains altitude. Clarke leaves the controls locked as the plane loses its speed and falls off into a spin. But instead of pulling out of the spin the flyer lets the plane gyrate straight toward the earth. By this time the spectators are on their feet with anxiety, but Clarke keeps falling. Fifteen or twenty feet above the ground he pulls out of the spin, just a fraction of a second before a fatal crash. Two other stunt men



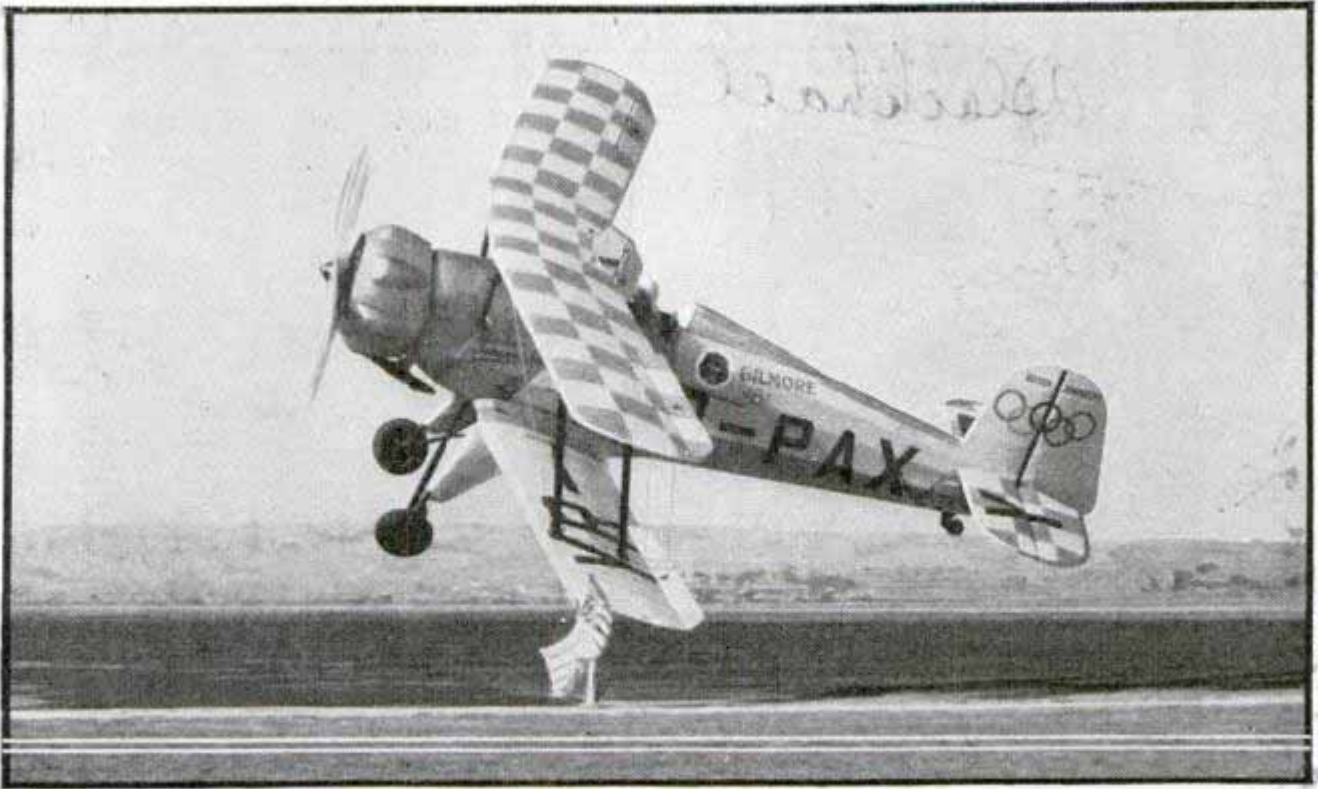
Top, stunt pilot flying upside down and holding streamers from his arms to show his hands are off the controls. Below, "crazy" flyer proceeding down field on one wheel

he gets up flying speed within a few feet of his start. When he gets off the ground, he climbs six or seven feet, rolls the plane on its back, and flies the length of the field with his head only a few feet above the ground. Then he pushes the stick forward to perform half an outside loop. This brings him right side up and headed back along the course.

A stunt like that is extremely dangerous and is hard on plane and pilot, but seemingly the crowds don't understand how difficult it is. Audiences get bigger thrills, Mantz finds, when he spins down a few thousand feet and loops the plane out of

have tried this stunt and both were killed.

One exhibition that looks pretty is painting the sky with smoke. Mantz's trio lays smoke trails through the air, each plane putting out one color of a red, white, and blue smoke screen. The planes maneuver side by side, loop with wing tips almost touching, and crisscross each other's path. For a fleur-de-lis Mantz flies straight ahead and then doubles back in a half loop to put a curl on the end of his smoke trail while his two partners, one on each side, branch away to lay the other trails. The flyers produce the smoke by pumping chemicals into their exhaust pipes, and



their chief concern is to stay clear of the smoke trails so there will be no chance for a collision.

The hardest smoke stunt, one that requires split-second timing, is a chain of interlocking loops. First, Mantz dives at the ground and pulls up into a loop. He starts his smoke a yard or so off the ground and shuts it off when the loop is completed. Then Clarke starts another loop above the top of Mantz's circle, laying a smoke trail that joins the first loop. Easton Noble, third member of the trio, makes the third loop above the others. By this time Mantz has gotten into position to draw the fourth

and final loop in the chain of gigantic smoke rings.

The end of the smoke show is a 10,000-foot terminal velocity dive. Two miles up, Mantz pushes his stick forward and flies wide open straight toward the ground. A trail of smoke as straight as a pencil is left above the plane. The terminal speed is 325 miles per hour and with less than 1,000 feet of altitude left Mantz "horses" back on the stick to pull out of the dive. This is the hard part of the stunt and the flyer keeps an eye on the "G-meter" so as not to pull out too sharply and fold back

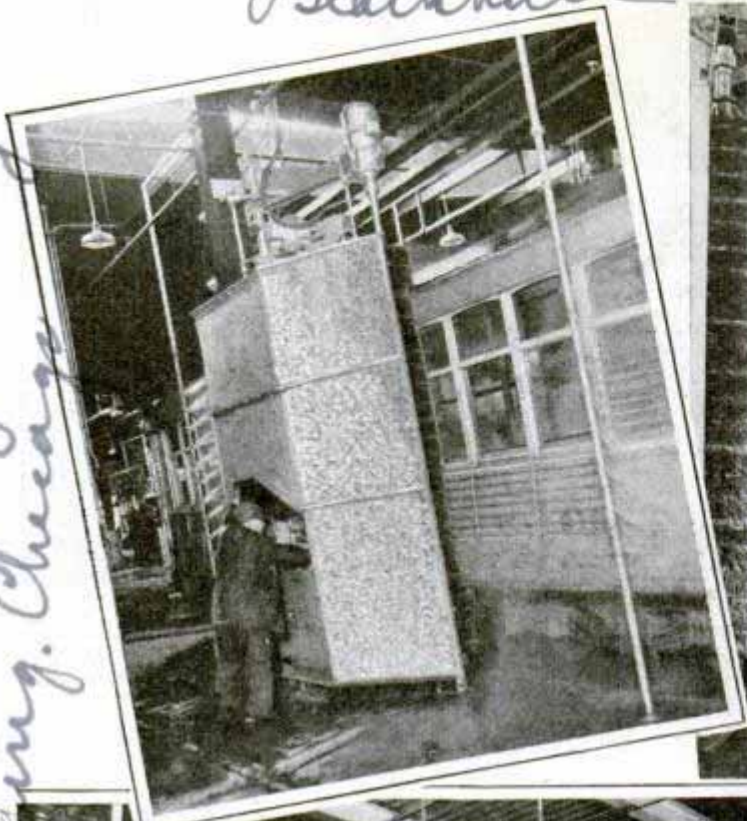
(Continued to page 122A)



Top, pilot picking up flag from ground with hook attached to wing tip. Bottom, stunt pilot flying through scaffolding which represents doors of hangar

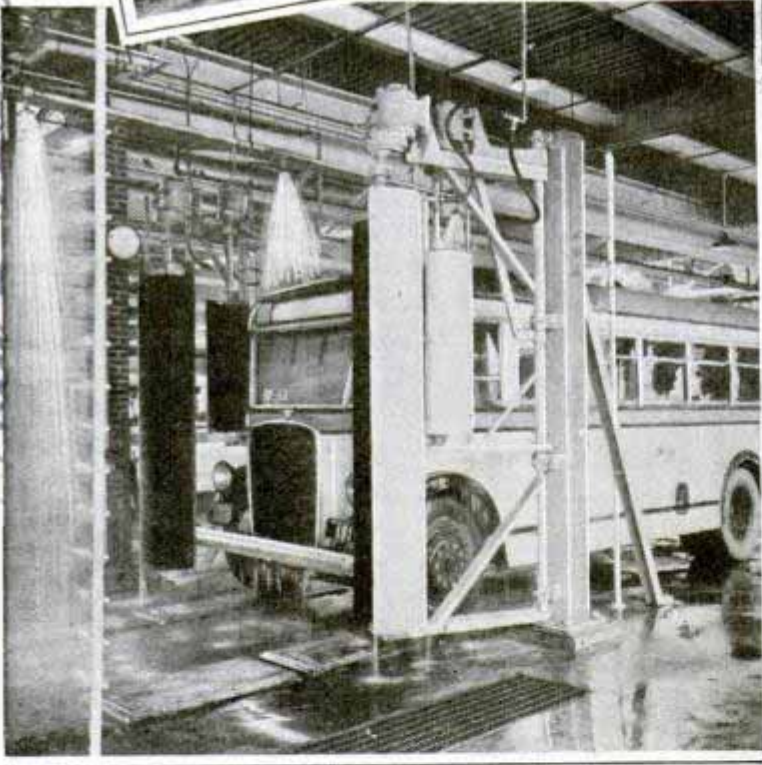
Photocell Starts Bath for Bus and Street Car

Blackhall



Wide World

Top, street car is first sprayed, then passes between two pairs of revolving brushes which scrub it thoroughly. Second pair, at window height, rotates in opposite direction. Below, a bus takes a shower



full-height brush rotating in one direction and a window-height brush rotating in the opposite direction. In this way the bristles reach into every recess and corner, thoroughly scrubbing the car from top to bottom while sprays keep drenching the brushes. Finally the car moves on toward the exit, passes through a rinsing spray and then intercepts another photoelectric cell beam which stops the brush motors and shuts off the water.

2027

Dialing "Taxi" on Telephone Brings Cab Quickly

When anyone in Stockholm, Sweden, wants to call a taxicab, he merely dials "T-A-X-I" on the telephone and a cab quickly reaches the spot. Owners of Stockholm taxicabs are member of an association which has a central control of-

Science Service.

Ross and White Co. Chicago daily News Building. Chicago

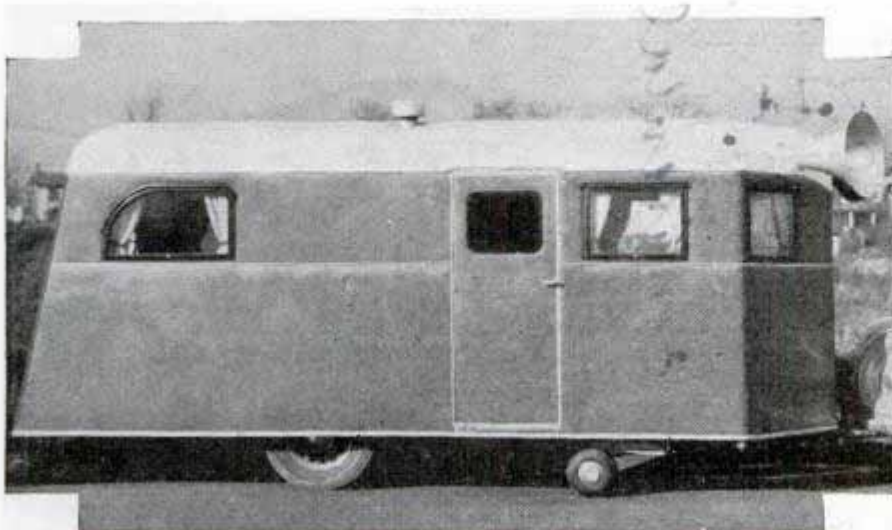
In the up-to-date bathroom for street cars and buses, an "electric eye" turns on the shower as the vehicle approaches its washing stall. No manual attendant is necessary. The car or bus intercepts a light beam and sets in motion a series of sprays and revolving brushes. An initial spray wets the sides. Then the vehicle passes between two pairs of brushes, a

...fice and 187 stations with one-way telephone connections. When a call is received at the control office, it is relayed automatically to the station nearest the address at which service is desired. Stockholm also boasts a weather-forecast service and a time service for telephone subscribers. Both are automatic.

28

Battery Is Charged by Extra Wheel under Trailer

To provide extra current for trailers and trucks, and recharge storage batteries, a special generator operated by a fifth wheel on the trailer is being manufactured. The small auxiliary wheel is fixed by a pivoted casting to the underside of the vehicle, and as it whirls along the highway it develops twenty amperes at twenty-two miles an hour. It is particularly useful on tourist trailers where there is heavy demand for current from lights, and other accessories.



Lights, radio and other outlets on trailer homes tax the battery heavily. The small wheel under this trailer generates current while touring

Plaza Flooded for Skaters in Heart of New York City



Even New York City is not so crowded as to shut out winter sports. The plaza at Rockefeller Center was flooded to create this skating rink

You might call it a million dollar skating pond, this rink on the plaza in Rockefeller Center. For, although it cost little, the ice rink occupies a valuable piece of property in the heart of New York City. It was installed during the holiday season so that skaters could enjoy a bit of winter sports in the shadow of two gigantic Christmas trees.

Iodine, a foreign monopoly until 1932, is now produced in the United States from salt brine and the waters from oil wells at the rate of 276,000 pounds a year, making this country the second largest producer.

General Armature Corp. Industrial and Engineering News
700 Clinton Avenue

330 City 42nd Street
APR 19 1936

Harness Lifts Small Dog over Muddy Places

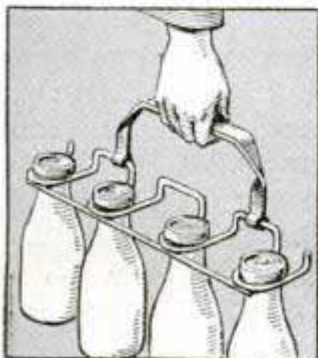
F 1709



Lifting a short-legged dog over muddy places is made easy by this harness

Fashioned so that it will lift the dog without discomfort, a harness introduced recently in Paris is used to carry short-legged canines over muddy ground. The harness is especially handy at street crossings in rainy weather, because it keeps the dog from getting wet and muddy.

Sanitary Milk-Bottle Carrier Protects Hands from Injury



Safe and sanitary, a milk-bottle carrier which obviates any handling of the bottles by the milkman himself has been invented. The carrier grips the bottle by the

lip or rim, and the delivery man need not touch the glass in transferring bottles from case to house. This eliminates the hazard of cuts from nicked bottles.

Is. 3.

Vacuum Scrubber Cleans Floor and Picks Up the Lather

Floors are scrubbed and thoroughly cleaned in one simple operation with the aid of an electrically operated vacuum scrubber which not only does the cleaning but picks up the dirty lather as it moves along. The cleaning solution is fed from a tank through a fifteen-inch revolving brush which distributes the solution evenly and cleans as it moves. A fraction of a second later, a nineteen-inch vacuum nozzle sucks up the used lather and deposits it in an exhaust tank. This prevents the dirty solution from drying into the floor and eliminates any chance of soaking or warping the floor surface. The scrubber works sidewise, as well as backward and forward, with the entire weight of the machine on the brush which is operated by a splash-proof, geared-head motor. The scrubber can be used for shampooing rugs without removing them from the floor, the carpets requiring no rinsing or resizing. The scrubber also can be used for dry vacuuming and can be obtained with or without the vacuum attachment.



Vacuum scrubber which cleans the floor and picks up the dirty lather in one operation

Mr. Charles D. Hoffmann, 206 Hill St. Fairbanks, Pa.

Continental Car. Co. of Pa.

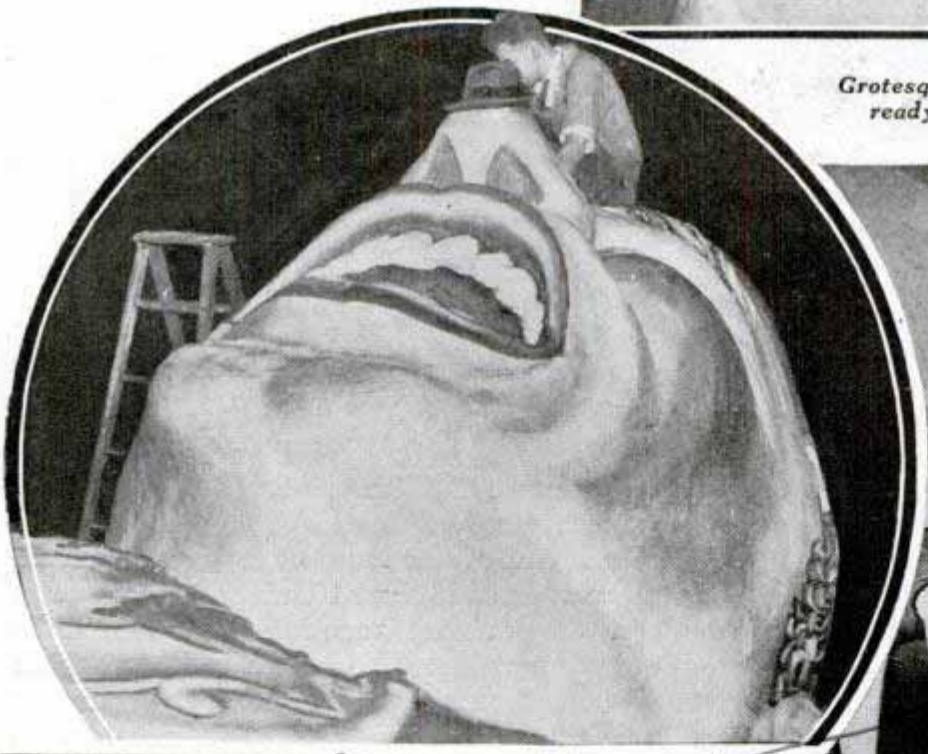
Rubber Monsters Inflated for Gay Parade



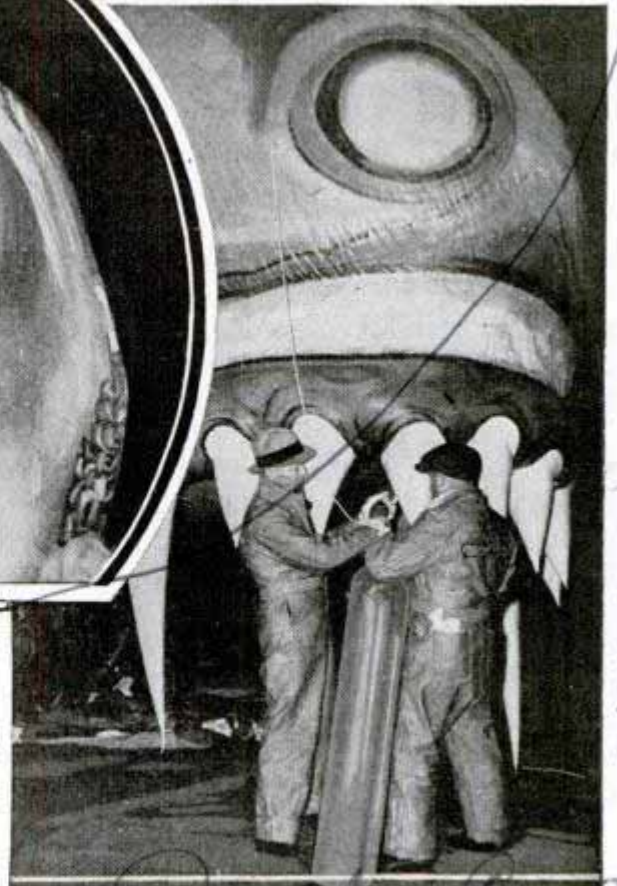
Putting finishing touches on "Snake Charmer" for gay parade down Broadway



Grotesque rubber figures inflated and ready to be carried in the parade



Working on head of rubber giant. Right, inflating with helium a mammoth made of rubber. These monsters were features of Christmas parade down Broadway in New York, an event witnessed by 2,000,000 people. Constructed by a rubber company, the figures were designed like balloons and were handled by "ground crews." One of the giants represented Father Knickerbocker, a sixty-eight foot balloon which peered into sixth floor windows and was held to earth by a crew of thirty-five men



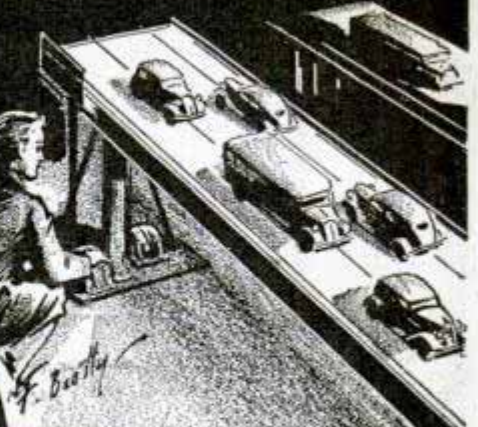
Hoodyear Tree + Rubber Co

*Macy's
34th St
New York
Nov 1934*

71640.
64 Kerbland St.
Cambridge Mass
Bureau of Street Traffic Research
Cambridge, Mass.

Mr. G. S. Jordan
64 Kerbland St.
Cambridge Mass

How GOOD a DRIVER



How do women compare with men in driving ability?
Does your age affect your ability as a driver?
Is a youth of twenty-three with five years of driving experience likely to be a better or worse driver than a man of sixty with forty years of experience?
At fifty miles an hour, how far do you travel while moving your foot from accelerator to brake pedal?
After twenty-five years of driving experience, which would be likely to steer a car best—a man or a woman?
How can you equip your car to compensate for "tunnel vision"—inability to see out of the corner of your eye?

Giving vigilance test which indicates ability to concentrate and act in emergency

HOW good a driver are you, or how good a driver would you make?

How do women compare with men in driving ability?

Has the average man or woman the strength, mental alertness and nervous stability to handle the powerful cars of today at the high speeds now common?

More than 40,000,000 men, women and even children drive 26,000,000 motor vehicles a distance of 400,000,000,000 passenger-miles annually. The automobile has brought happiness, richer opportunities and new horizons to millions, but it also brings sudden death to about 36,000 persons each year. Since we cannot change our individual natural equipment, what can we do to become safer, more efficient drivers?

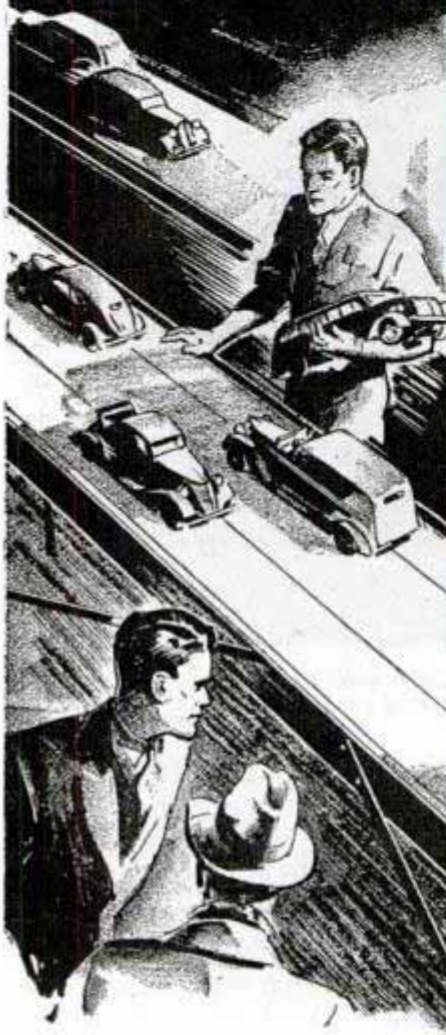
A Harvard scientist, Dr. Harry R. De Silva, can answer these and many other questions about driving with a fair degree

of accuracy. With specially designed instruments and scientific equipment, Dr. De Silva, of the Bureau for Street Traffic Research of Harvard University, has tested the driving reactions of more than 70,000 persons. The results indicate where we excel, where we are poor, and whether we can or cannot correct our weak spots.

Several general findings may be stated immediately. One is that women, on the average, did not do as well as men in the tests. At the risk of stirring a hornets' nest, it must be stated that women, as a whole, did not come up to the men either in the potential or natural abilities which go to make up a good driver or in the acquired skill.

are YOU ?

see Dec. 1936
855



Model of street intersection, above, used to teach safe driving to Chicago high-school students. Below, miniature highway used in driving test

Another observation applicable to the majority of those tested is that youth has much to do with driving ability. The peak of efficiency was found to be about twenty-three. A slow decline in driving efficiency was noted up to the age of sixty or sixty-five, and after that the decline in almost every ability required for motoring was very rapid. As people grow older they slow up in certain reactions. This might seem to justify the law in Massachusetts requiring licensed drivers of sixty-five to pass a new driving examination.

A third discovery is that experience in driving adds greatly to efficiency. This may seem obvious, but it is a challenge to states which do not require any driving license, giving anyone the privilege of op-





Driving school of Lane Technical high school in Chicago where indoor instruction is given. Later the students go to an outdoor driving course and pilot real cars

erating an automobile regardless of training or experience. The tests showed that, up to a certain point, the longer a person has been driving, the better he is. Perhaps the most encouraging finding of all was that the great majority of people have all the potentialities for becoming good and safe drivers. Even when they lack some natural requisites, they can usually compensate for them, as by wearing glasses.

Dr. De Silva's instruments are designed to measure physical characteristics such as eyesight, hearing and the coordination between eyes and hands; mental characteristics such as vigilance, self control in emergencies and other psychological factors, and acquired characteristics such as skill in passing, sense of hazardous situations, attitude toward individual responsibility and conscious allowance for known physical and mental limitations. These devices duplicate certain emergency situations and give more accurate and significant indications of the driver's responses than could be obtained by unaided human observations.

For nearly ten years most of the increase in motor deaths has been due to collisions, so Dr. De Silva tested brake-

reaction time, the time it takes a driver to appreciate danger and start to apply the brakes. The average was found to be .44 of a second, but in this, as in other tests, men on the average did better than women. Reaction times up to a full second were recorded, which means that after seeing danger the driver going fifty miles an hour travels seventy-three feet before the brakes begin to take effect. Then he must allow time for stopping after the brakes are applied.

The ordinary person under forty takes about one-fifth of a second to start to lift his foot from the accelerator and the same or a little longer to move his foot and stamp it on the brake. As people grow older their thinking time remains practically constant, but their foot-movement time slows up.

When the driver is required to stop at the same time he steers, braking time lengthens by about .12 of a second, coming up to about .56 of a second if you are an experienced driver. With the inexperienced driver it lengthens by about .45 of a second, bringing the total braking time to nearly one second. To these figures must be added the time required to bring the

71690

car to a stop after brakes are applied.

Many persons are distracted more easily than others; when out on the road their minds wander. Then their reaction time goes way up. Women were found to be quite fast when all they did was apply the brakes, but much slower than men when steering was added. When people do braking and steering at the same time, the unskilled driver will do both much worse; the driver of some experience will do either poorly, putting his whole attention on one and forgetting the other. The driver of long experience does both only slightly more slowly than when he does them separately.

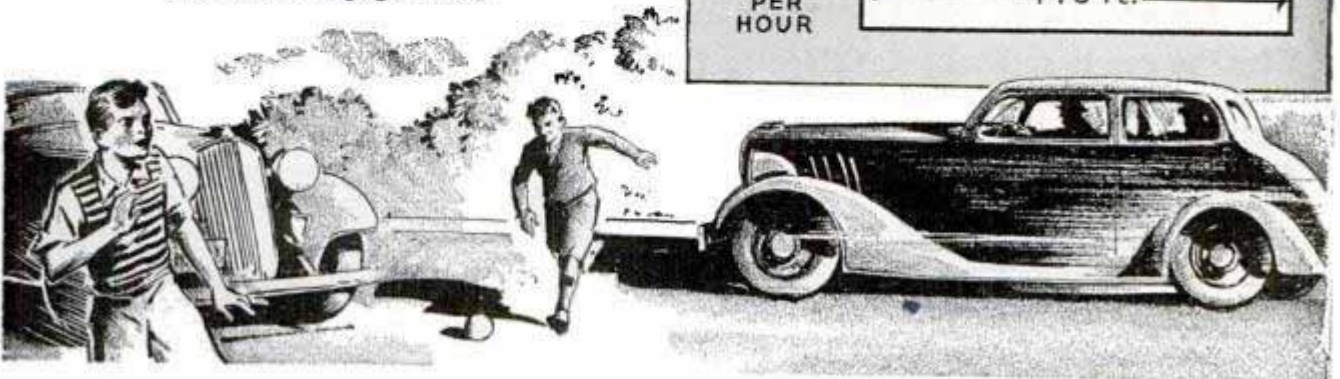
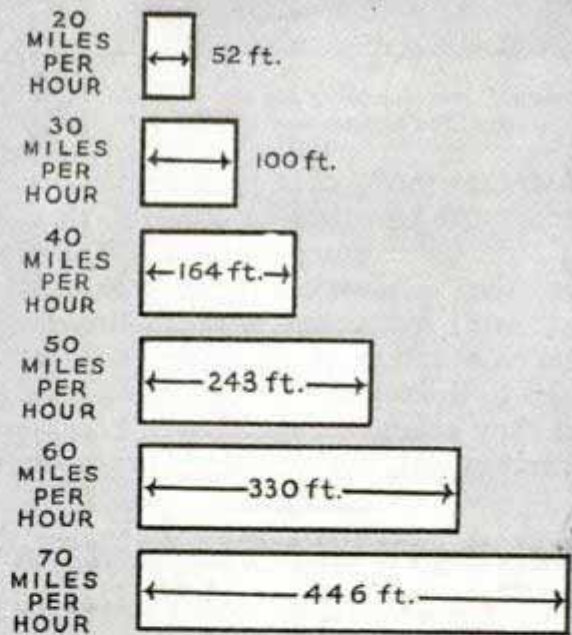
Steering ability alone also varies enormously with the experience of the driver. In this test—essentially one of eye-hand coordination—the group with no driving experience scored below the average for all groups. Those with some learning experience scored close to the average, while those with from one to five years' experience did consistently better.

The high point both for women and men seemed to be reached with a driving experience of from six to ten years, the men's average standing about six per cent higher. However, while the men's steering ability declined steadily with years of experience beyond the tenth year, the women's remained constant up to the twen-

(Continued to page 118A)



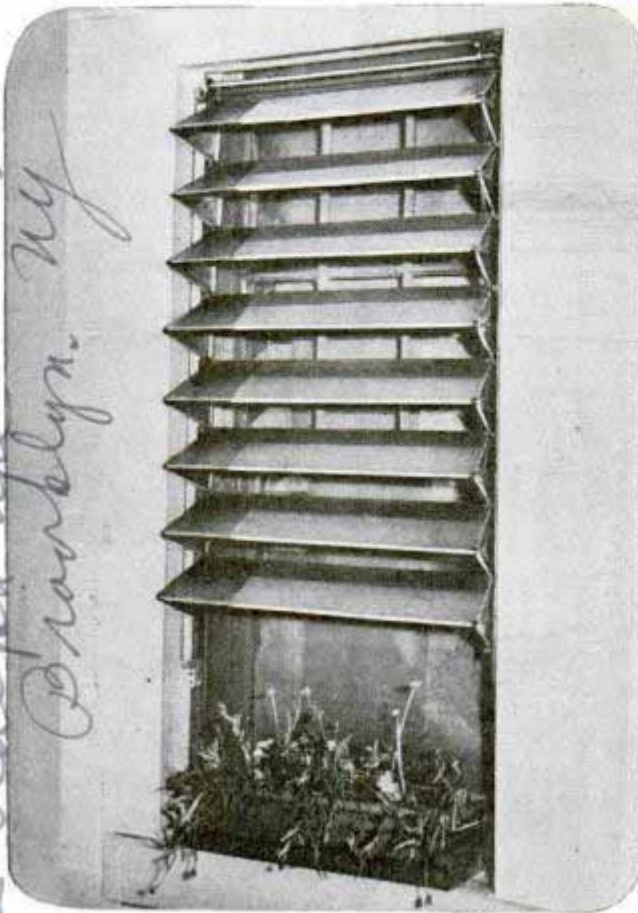
STOPPING DISTANCES OF MOTOR VEHICLES WITH BRAKES IN AVERAGE CONDITION (INCLUDING THINKING TIME)



Driver, above, ready to take reaction test. Below, chart shows how stopping distance goes up with increase in speed. Note difference between thirty and sixty miles an hour

Metal Louvers of Awning Lifted by Turning a Crank

Brins metal Lite Awnings. Inc. 2 Ralph Ave. Brooklyn, N.Y.



Fireproof, metal awning for the home is raised or lowered like the window of your automobile

Awnings made of copper or aluminum louvers can be raised or lowered to control light by turning a crank just as you open the window of your automobile. They are constructed to allow the maximum ventilation at all times, and when raised to the top the louvers are nested so that they occupy but a few inches. Being entirely metal, the awning is fireproof.

Solving Riddle of Light at Sea Brings Improved Vision

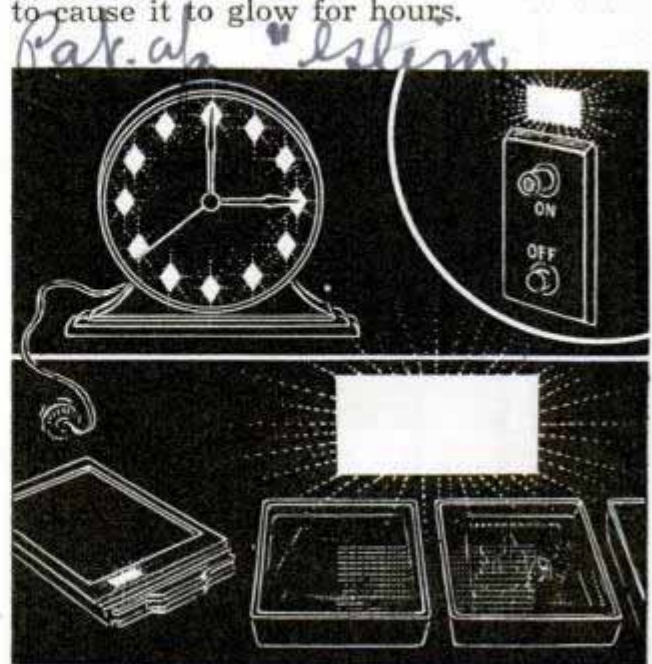
F169 Physicist Science Service

Why the sea is so blue, why ships and cliffs near the horizon sometimes have no reflection in the water and why big black clouds on the rim of vision do not darken the sea until they are high in the sky are some of the old riddles solved recently by Dr. E. O. Hulburt of the Naval Research Laboratory, Washington. As a result of Dr. Hulburt's experiments in this field, there has been developed an optical filter which improves marine vision with binoc-

ulars and sextants. The physicist found that light from the sky reflected off the waves is strongly polarized and the light from the rim of a breezy sea is mainly sky light reflected from a region about twenty-five to thirty-five degrees above the horizon. The reflecting facets of the waves are thus only at an angle of about fifteen degrees from the horizontal. For this reason a ship coming over the horizon may be seen directly without having any reflection in the water. Similarly black clouds do not start to turn the sea black as soon as they come over the horizon, but only do so when they reach an altitude of about twenty-five degrees. Using special polarizing filters on marine binoculars and sextants, Dr. Hulburt was able to cut out much of the polarized glare from the sea's surface and render the horizon more distinct with resulting increased accuracy of navigating sights.

Luminous Paper Used to Light Photographer's Darkroom

Gummed white paper coated with a luminescent compound is being used as a "safe light" for the photographer's darkroom. It emits a pale greenish glow which, properly used, does not affect fast panchromatic emulsions. The salt-compound coating requires activation from time to time by exposure to light, a few seconds exposure to a bright light being sufficient to cause it to glow for hours.



Patches of luminous paper used as guide in photographic darkroom without affecting emulsions

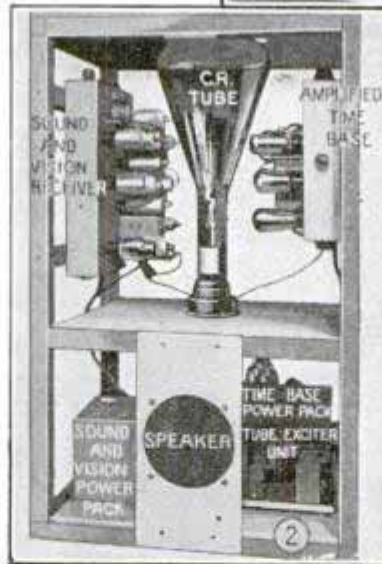
Photo Research, Inc.



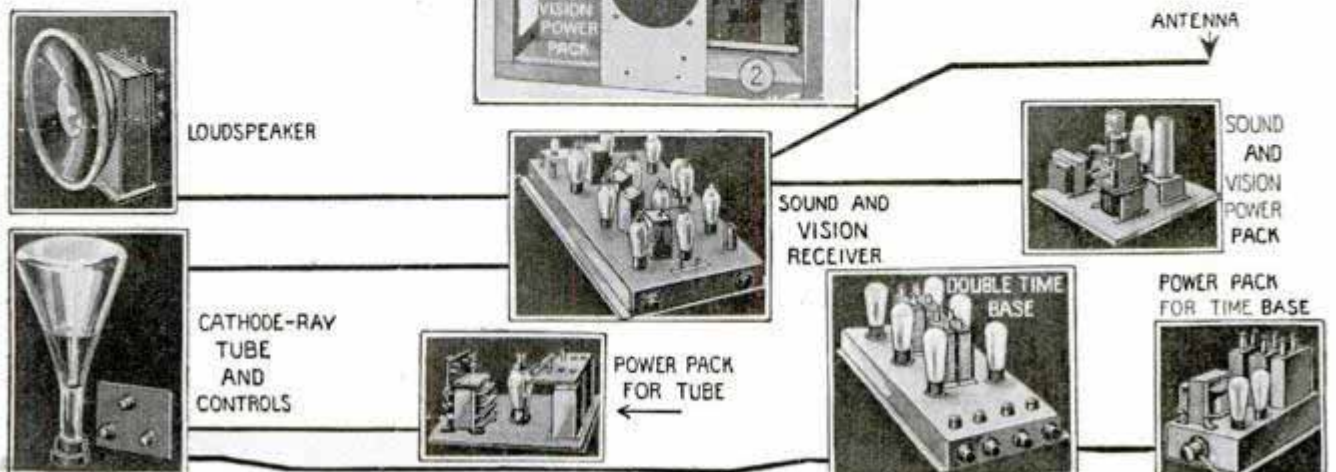
English TELEVISION RECEIVER *for* Home Construction

COMPLETE construction details for a cathode-ray television receiver suitable for tuning in both the Baird and Marconi E.M.I. systems operating in England, have been made available to English amateurs by "Television and Short-Wave World" published in London.

Of low-cost unit construction, it is said to be easy to build and results are guaranteed to compare favorably with those obtained from a high-class commercial television receiver if the builders faithfully follow the instructions in every respect. This high-definition receiver employs a cathode-ray tube having a 10-in. black-



and-white screen. All units are assembled in a simple wooden framework, two photos of which appear in Figs. 1 and 2, a control panel being omitted in order not to obstruct the view. The sketch below shows the relation of the various units used in the receiver.





ONE-TUBE Receiver for

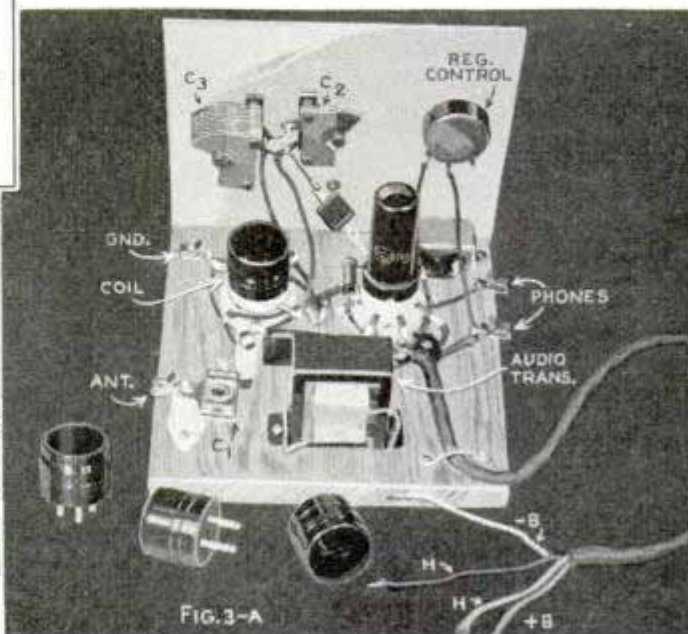
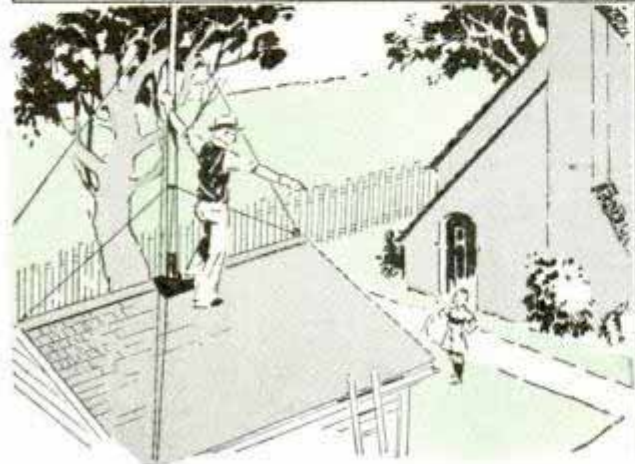
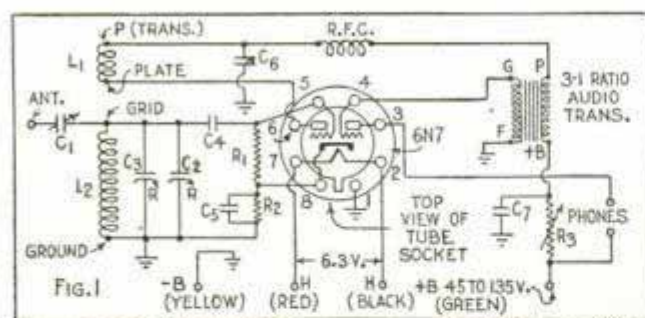
volts, which is easily obtained from either a 6-volt storage battery and B-batteries, or a 6.3-volt transformer and a small well-filtered B-eliminator. Maximum results, however, are obtained with battery operation.

Schematic diagram Fig. 1 shows one triode section of the tube is used as a regenerative detector and the

ONE metal tube does the work of two, in this inexpensive short-wave receiver which demonstrates a "DX getting" ability equal to that of many sets using several tubes. Since its features include band-spread tuning, it is an excellent performer in the crowded amateur bands as well as for foreign and domestic programs on 19 and 31 meters which are of special interest to all short-wave listeners.

This type-6N7 tube has a 6.3-volt heater and requires a B-supply of from 45 to 135

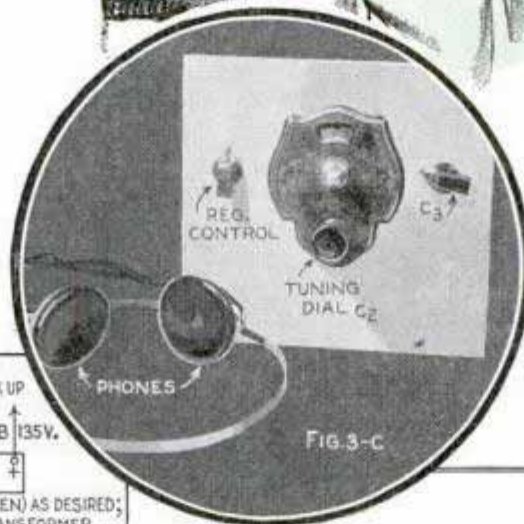
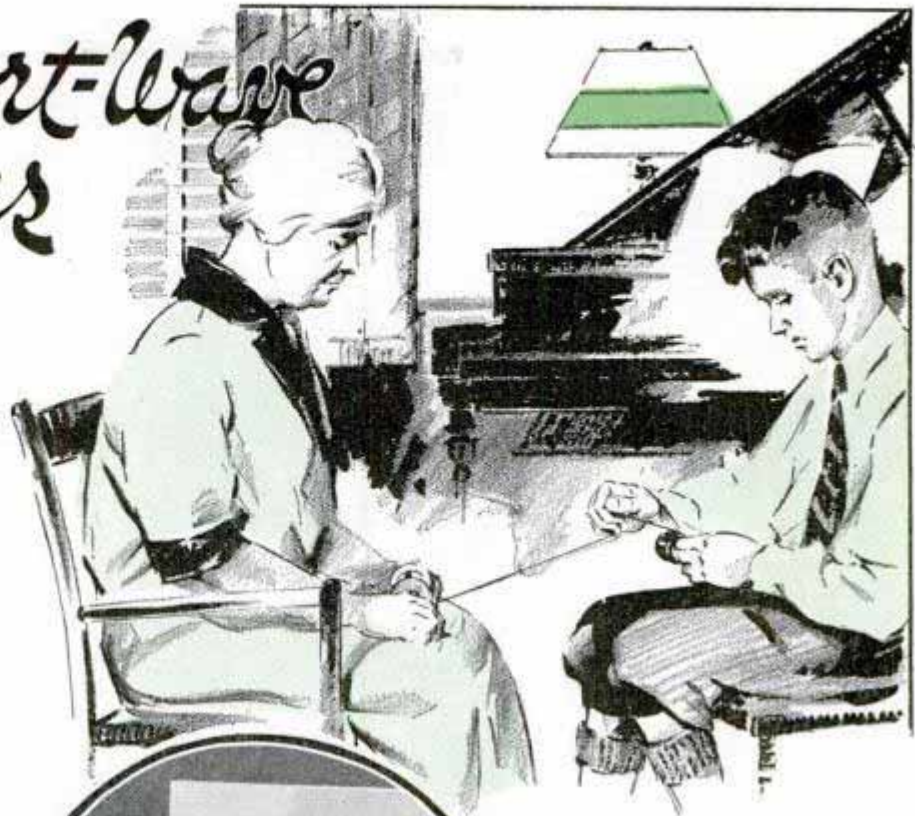
other is employed as an audio amplifier. Midget variable condensers, "C₂" 15 mmfd. and "C₃" 140 mmfd., also variable resistor "R₃," are mounted directly on the aluminum front panel. A stand-off insulator supports the 0 to 30-mmfd. antenna-trimming condenser "C₁," which is adjusted with a small screwdriver for best reception with each plug-in coil. The ½-watt 3-megohm fixed resistor "R₁" is mounted directly on the terminals of the tube socket. Hook-up wire with push-back insulation is used for all connections, which must be soldered carefully with rosin-core solder. Direct short leads are



6N7 Short-Wave Beginners

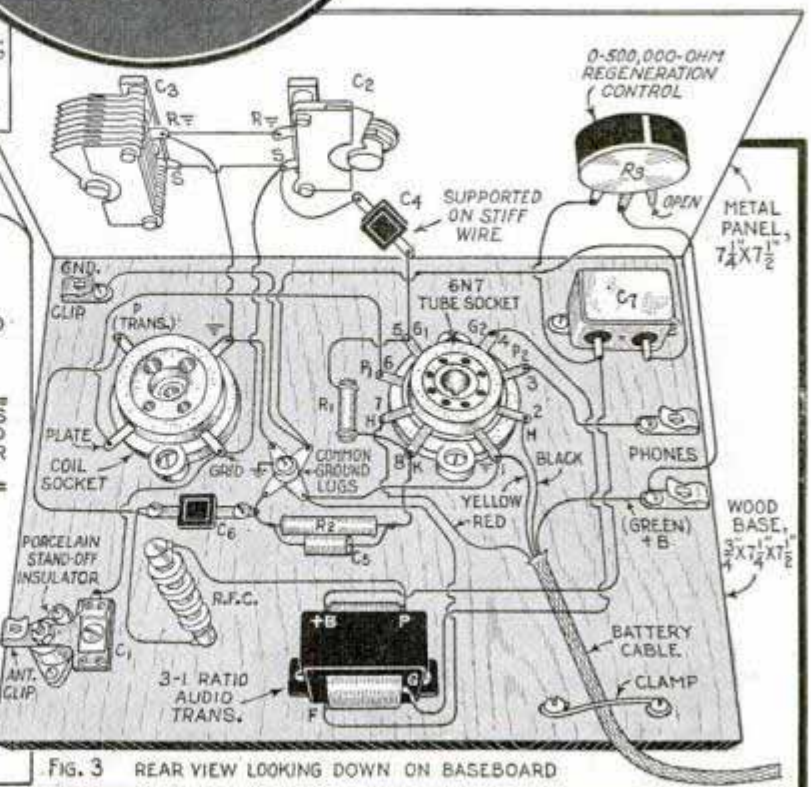
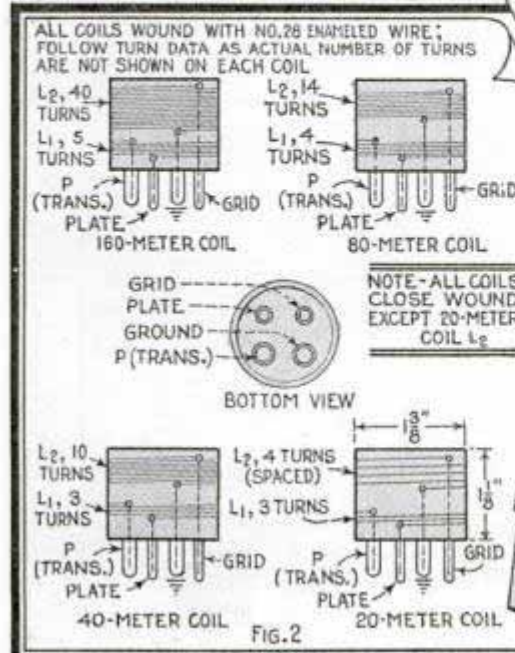
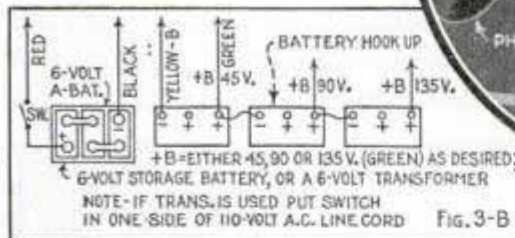
more important than attractive wiring. All ground connections are made to the cluster of soldering lugs.

Any standard 4-prong, plug-in short-wave coils may be used, those shown being of the "tube-base" variety. Proper connections to the coil socket will depend upon the particular set of coils employed. The important thing is that the coil socket be wired so that the coils are "poled" as shown in diagram Fig. 2, which is necessary if the set is to oscillate properly. Following these



coil-winding details, the builder can easily wind his own coils if desired. A complete simplified wiring diagram is shown in Fig. 3 and the battery hook-up in Fig. 3-B; photos, Figs. 3-A, 3-C

(Continued to page 146A)



"Beam" Tube in 40-Meter C.W. Transmitter

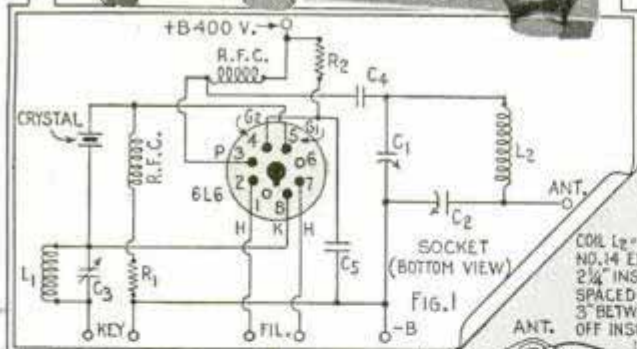
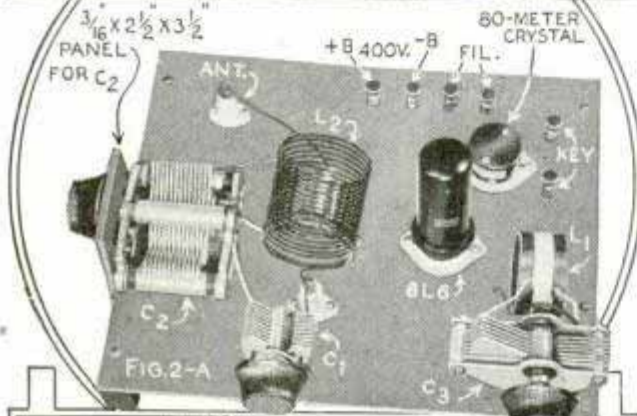


MODERN as the metal tube, this 40-meter crystal-controlled transmitter is especially designed for the beginner. It costs no more than the average 2 or 3-tube short-wave receiver and has a range of about 500 miles.

A single type-6L6 "beam" tube is employed in a highly efficient crystal-controlled circuit, complete with an antenna-matching device for coupling to an easily erected single-wire transmitting antenna. The 6L6 serves as a "tritet" crystal oscillator using an 80-meter crystal and doubling to 40 meters in the plate circuit. Operating the transmitter at a frequency twice that of the crystal insures clean keying and good frequency stability. The tube is such an efficient oscillator that the output is as much when doubling as it is when the plate circuit is tuned to the crystal frequency.

Built in "breadboard" layout fashion, the "Masonite" baseboard is supported on wood cleats and clears the table by about 1 1/4 in. so that some of the small parts may be mounted on the underside. The baseboard material is inexpensive, a good in-

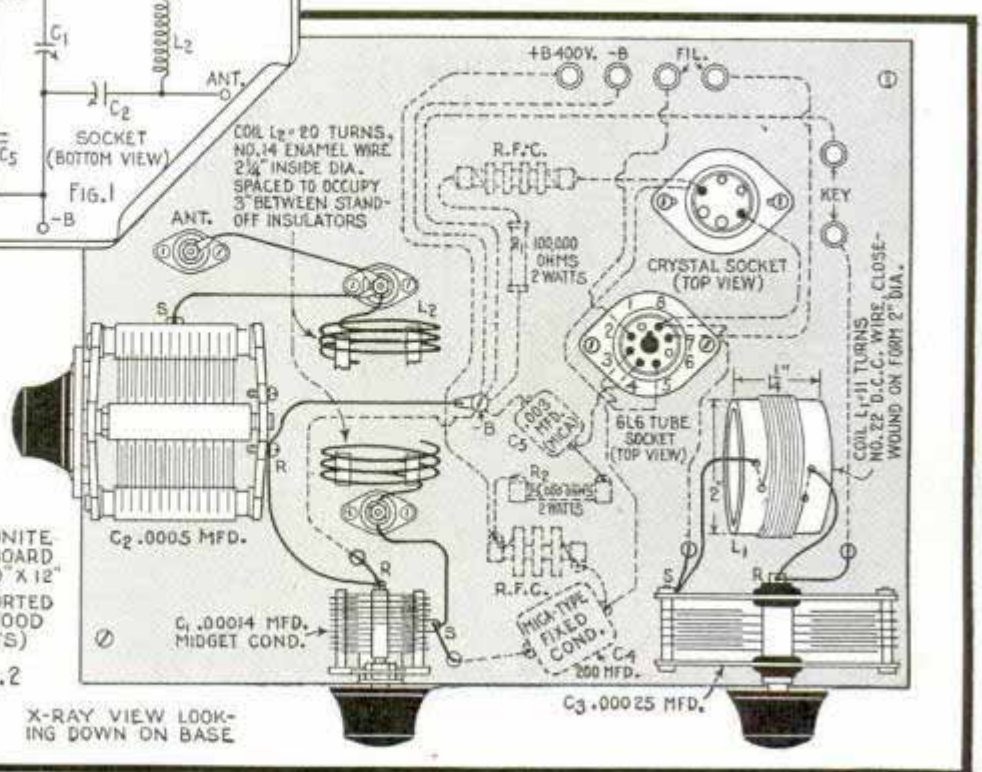
(Continued to page 156A)



MASONITE BASEBOARD
3/8" X 10" X 12"
(SUPPORTED ON WOOD CLEATS)

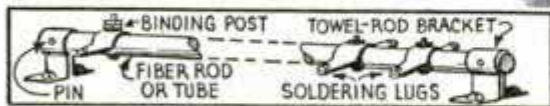
Fig. 2

X-RAY VIEW LOOKING DOWN ON BASE

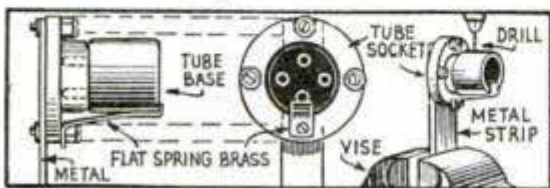


Practical RADIO SUGGESTIONS

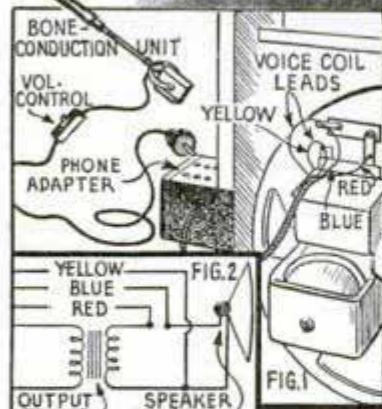
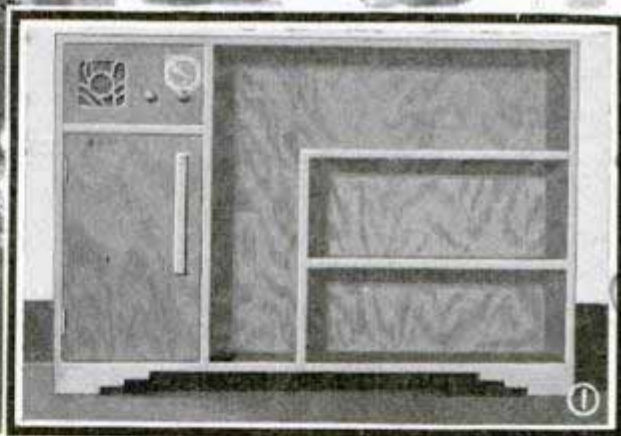
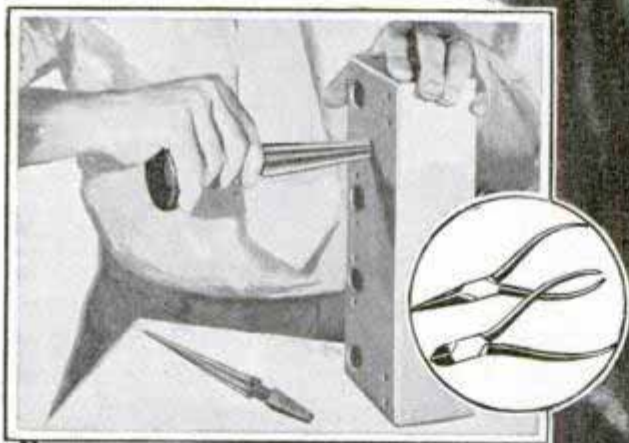
Right, midget receiver built into a modernistic bookcase; almost any small set can be arranged in this manner. Photo No. 1 shows the matched panel assembly made by a reader who merely altered the dial and speaker arrangement of a midget a.c.-d.c. receiver described in a recent issue



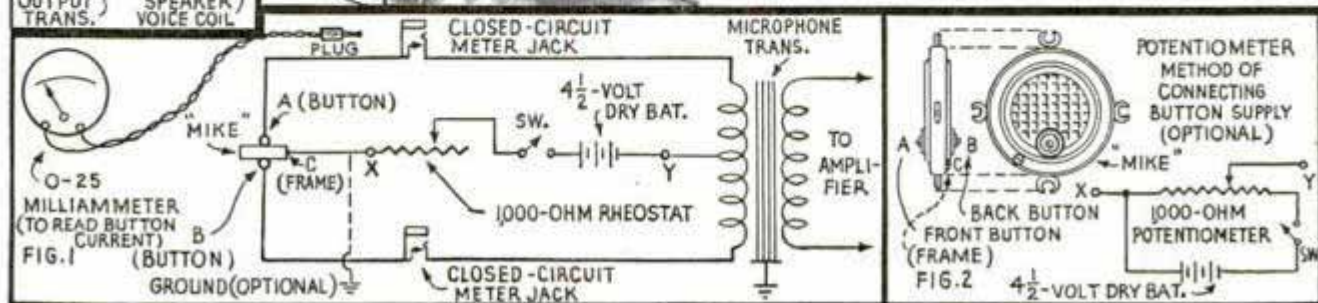
Terminal strip for experimenters. Below, holder for drilling tube-base coil forms



Below, tapered reamers, side-cutting nippers and pliers for radio workers



Left, hearing-aid adapter easily connected to the voice coil of your loudspeaker permits the use of earphones for listeners with sub-normal hearing, or bone-conduction units for those having defective eardrums. Fig. 1 illustrates the method of mounting and connecting the adapter. Fig. 2 is schematic diagram. Below, suggested hook-up diagrams for using a double-button carbon microphone with any audio amplifier. Fig. 1 employs a rheostat to control the button current. A potentiometer may be substituted at X and Y as in Fig. 2



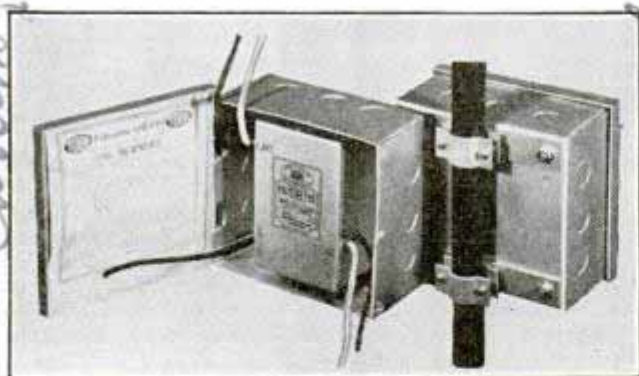
Movie Dial Flashes Call Letters from Motion-Picture Film



Above, dial drum and projector lens. Right, front view of screen and tuning controls

Operating on the principle of a motion-picture projector, enlarged call letters and cities of 130 broadcasting stations in the United States and Canada appear on a ground-glass screen in this all-wave receiver. The dial scale is printed on a strip of film mounted on a drum which rotates with the tuning condenser. Light from a projector lamp passes successively through a condenser lens, the dial film, color filter and a projector lens to a reflecting mirror.

Noise Filter for Oil Burner



Designed to eliminate interference which prevents good reception of broadcast and short-wave programs during the ignition

period of an electrically ignited oil burner, this compact unit offers a simple solution to a troublesome problem. The filter is connected to the oil-burner transformer and the remaining wiring by means of color-coded, insulated, flexible leads so that any serviceman or electrician may install it on all makes of oil burners. Inserted between the primary of the ignition transformer and the other wiring it keeps ignition interference off the power system without in any way affecting the operation of the burner. The rear view shows two detachable mounting brackets by which the unit is fastened to one of the pipe standards supporting the burner assembly.

Rainproof "Umbrella" Speaker



This umbrella-type dynamic speaker, for public address, is suitable for either outdoor or indoor use in parks, auditoriums or dancing pavilions where uniform sound distribution is desired. A single 12-in. speaker does away with the usual horn clusters having beam effects that sometimes cause microphone feed-back. It may be suspended from a ceiling, or supported on a pipe from the ground.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage. Note—Blueprint for the March, 1937, Little Giant Portable 2-Band A.C.-D.C. Receiver is No. R-235.

NEXT MONTH—How to Build a Six-Volt Farm Set for Windcharger Operation. An excellent 4-tube receiver with 6-tube efficiency; uses new low-drain tubes and a single 6-volt storage battery, a real distance getter with good tone and volume. Other features include a **One-Tube Code-Practice Oscillator**, built in a coffee can.

John Deulachman's Coffee can

South Bend cond colorless



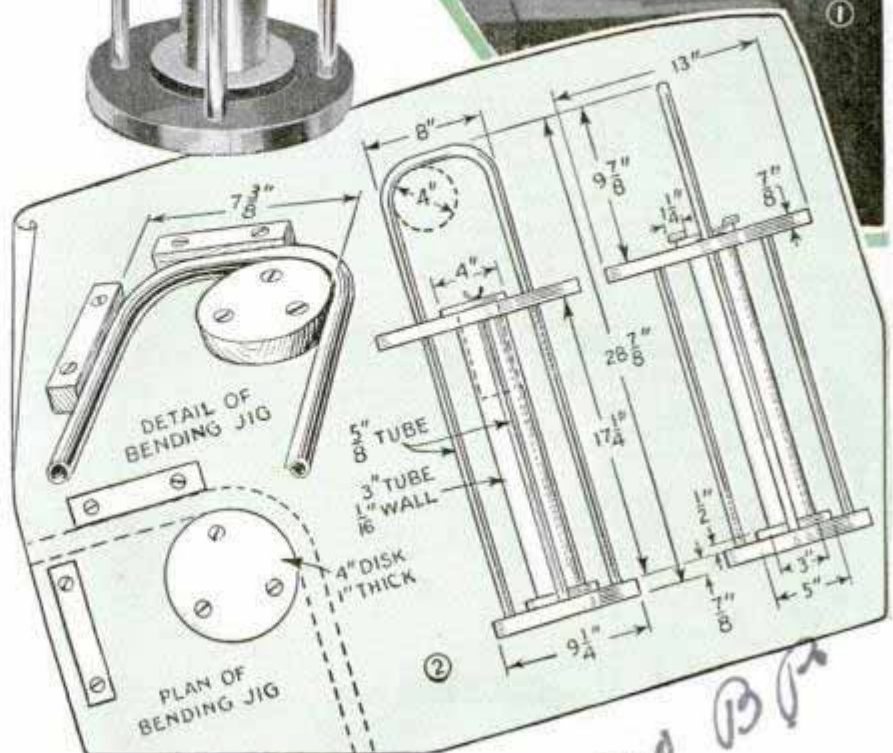
Tubular SMOKING STAND

has large ash well

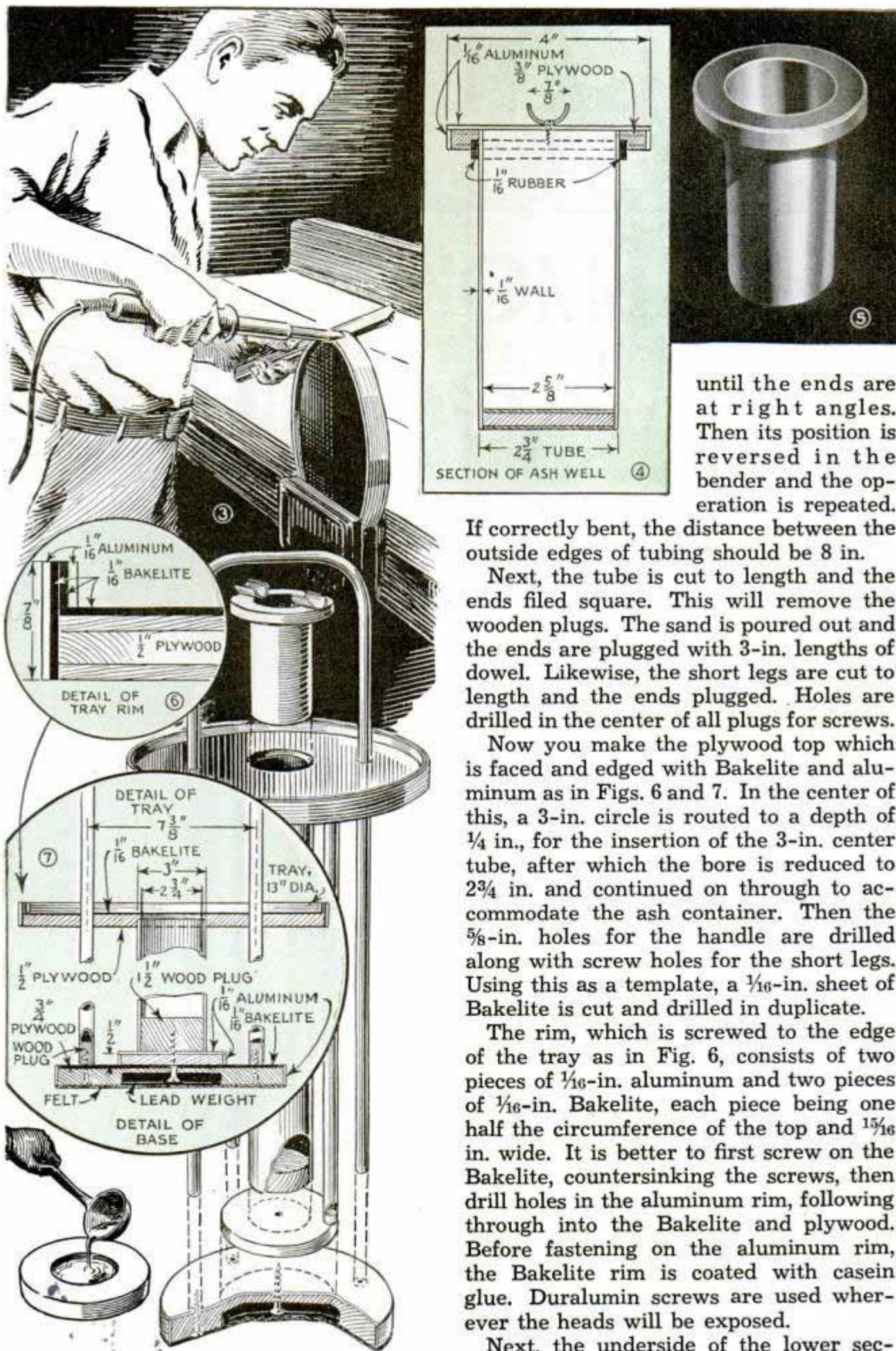
Modern styling combined with simplicity of construction

By Walter T. Warde

THE very latest style with its gleaming metal legs and trim, and polished base, this smoking stand has deep ash well with a Bakelite tray large enough to hold a glass or two. All dimensions are shown in Fig. 2, including the bending jig for the handle. This can be cut from any soft wood of sufficient thickness. Fasten the disk firmly to the workbench with the stops screwed in place as in Fig. 2. Now take a 6-ft. length of $\frac{5}{8}$ -in. aluminum tubing and plug one end tightly with a dowel. Then fill the tube with dry sand, tapping down and filling until the tube is well packed, then plug the open end. It is important that the tube be packed tightly with the sand, otherwise a flattened bend will result. The tube is bent around the disk with a steady, even pull



no B 1/2



until the ends are at right angles. Then its position is reversed in the bender and the operation is repeated.

If correctly bent, the distance between the outside edges of tubing should be 8 in.

Next, the tube is cut to length and the ends filed square. This will remove the wooden plugs. The sand is poured out and the ends are plugged with 3-in. lengths of dowel. Likewise, the short legs are cut to length and the ends plugged. Holes are drilled in the center of all plugs for screws.

Now you make the plywood top which is faced and edged with Bakelite and aluminum as in Figs. 6 and 7. In the center of this, a 3-in. circle is routed to a depth of $\frac{1}{4}$ in., for the insertion of the 3-in. center tube, after which the bore is reduced to $2\frac{3}{4}$ in. and continued on through to accommodate the ash container. Then the $\frac{5}{8}$ -in. holes for the handle are drilled along with screw holes for the short legs. Using this as a template, a $\frac{1}{16}$ -in. sheet of Bakelite is cut and drilled in duplicate.

The rim, which is screwed to the edge of the tray as in Fig. 6, consists of two pieces of $\frac{1}{16}$ -in. aluminum and two pieces of $\frac{1}{16}$ -in. Bakelite, each piece being one half the circumference of the top and $1\frac{5}{16}$ in. wide. It is better to first screw on the Bakelite, countersinking the screws, then drill holes in the aluminum rim, following through into the Bakelite and plywood. Before fastening on the aluminum rim, the Bakelite rim is coated with casein glue. Duralumin screws are used wherever the heads will be exposed.

Next, the underside of the lower sec-

tion of the base is recessed $\frac{3}{8}$ in. deep and 4 in. in diameter for the insertion of a lead weight. For this you use about 3 lbs. of molten lead poured into a sand mold or one made by recessing a disk of soft wood.

Now, you're ready to assemble. First, the 3-in. tube is cut to length and the ends filed square. The lower end is plugged as shown. Then the two portions forming the base and the 3-in. tube are assembled and held firmly together by a 2-in. screw inserted from the underside of the base, through the lead weight and both portions of base, into the wooden plug in the center tube. With this in position, the two short legs are screwed to the base and the top is fastened to these legs, the center tube fitting into the recess routed in the top. Then the Bakelite disk is glued on with the $\frac{5}{8}$ -in. holes in position for passage of the handle. When these legs are in position, contacting the base, they are fastened with 2-in. screws. Now you finish up the rim, Fig. 6. This is made up of $\frac{1}{4}$ -in. strips of $\frac{1}{16}$ -in. aluminum and Bakelite, in two sections, glued to the inner side of the rim. Fill the two joints of the outside aluminum rim with aluminum solder, Fig. 3. When dry, the edges are filed flush and polished with fine steel wool.

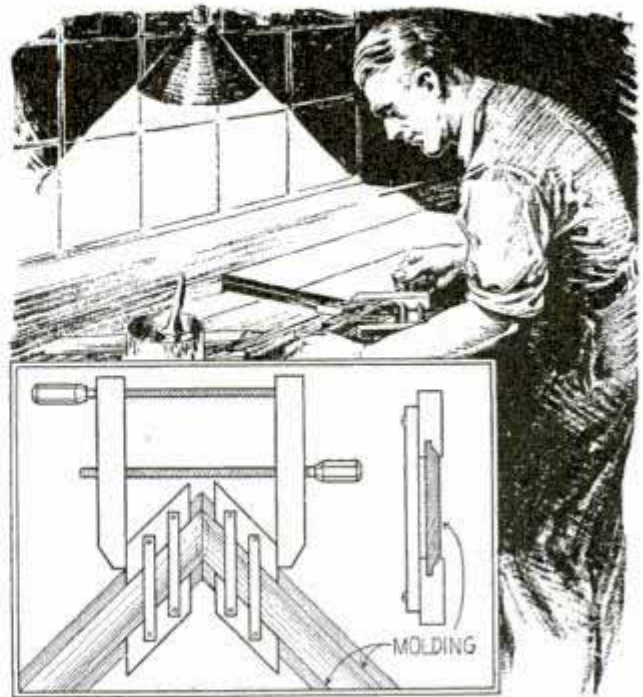
Details of the ash container are shown in Figs. 4 and 5. The wood forming the top of the ash container is routed out on the underside to a depth of $\frac{1}{8}$ in. in a 3-in. diameter and a 2 $\frac{3}{4}$ -in. circle is continued through. When the ash tray is completed, a rubber jar ring is slipped over the tube and fitted into the offset in the wood flange. The rim on the top flange is glued and screwed on, with the screws filed down and polished and the joint filled with solder. Cigarette holders are made from $\frac{7}{8}$ -in. tubing cut in half lengthwise, and screwed to the top of the ash container. After fastening, the screw heads are ground flush with the tube.

Lubricating Plunger of Jig Saw

When the upper plunger of my jig saw became worn so that it let oil pass and drop onto the work, I substituted pressure-gun grease for the regular lubricant. This proved satisfactory as it not only eliminated leakage, but it lubricated the moving parts better than oil.

—Joseph L. Gibbons, Chicago.

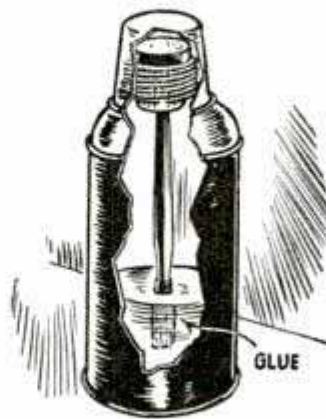
Gluing Mitered Joints with Aid of Friction Clamping Blocks



A few of these clamping blocks take the guesswork out of clamping picture frames and similar work

With these clamping blocks, which hold by friction against the work, you can assemble mitered joints for gluing with ease. Two blocks are needed for each joint and they are made by pivoting small wood blocks together with loosely screwed hardwood strips, the inner edge of each block being shaped to fit the edge of the work. In use, a clamping block is placed on each side of the joint, after which they are drawn together with a hand clamp.

Keeping Gelatine Size Warm



One sign painter has his gelatine size always warm and ready for use on the job, when lettering windows with metal foil, by putting the heated mixture in a small vacuum bottle before he leaves his shop. The handle of the brush is inserted into the bottle cork as shown so that the mixture does not harden on the bristles between jobs.

—A. H. Waychoff, Tempe, Ariz.

Water from Photo Squeegee Drained in Metal Tray



This tray carries water squeegeed from photo prints to a bucket or to the sewer

Made from galvanized sheet iron and mounted on a table or bench under your photo squeegee wringer, this tray will take care of the water as it is squeezed from the prints. The tray is fitted with a drain pipe at one corner which carries the water to a bucket under the table. The detail shows a pattern for the tray, which can be made to the dimensions given or to suit.—E. W. Tock, Santa Ana, Calif.

Holes in Rim of Paint Can Prevent Dripping



Before starting a paint job, punch a few small holes in the rim of the can so that the paint that accumulates in the sunken portion of the rim will run back into the can.

This will keep the paint from running down the outside and spotting your floors

or furniture. Of course, a can with a perforated rim should not be used for storing paint, as it cannot be made airtight.

Whitewashing Tree Trunks

When brushing whitewash on portions of tree trunks to check climbing insects, use a couple of strips of inner tube as shown, and you can do a uniform job that is more attractive than when the brushing is done without a suitable guide. Just wrap the strips around the tree and slip clothespins over the ends.



Concrete Sidewalk Is Built to Resemble Flagstones

The neat flagstone effect of this sidewalk was obtained by dividing the space between the concrete forms with 1-in. strips before pouring the walk. The strips were oiled so that they could be removed easily after the concrete had set. The "cracks" were filled with soil and seeded with grass.

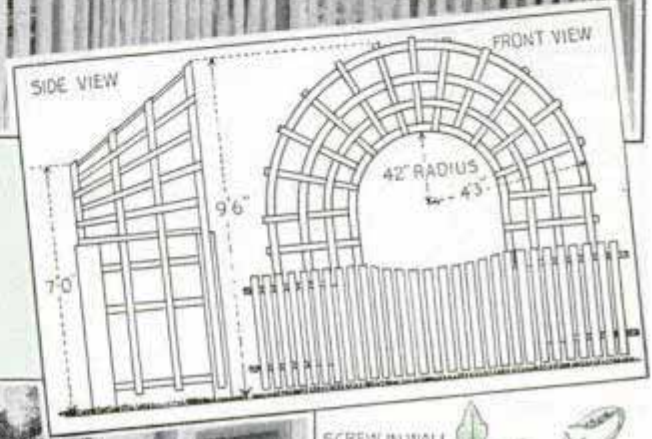
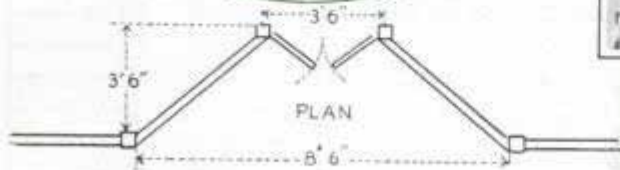
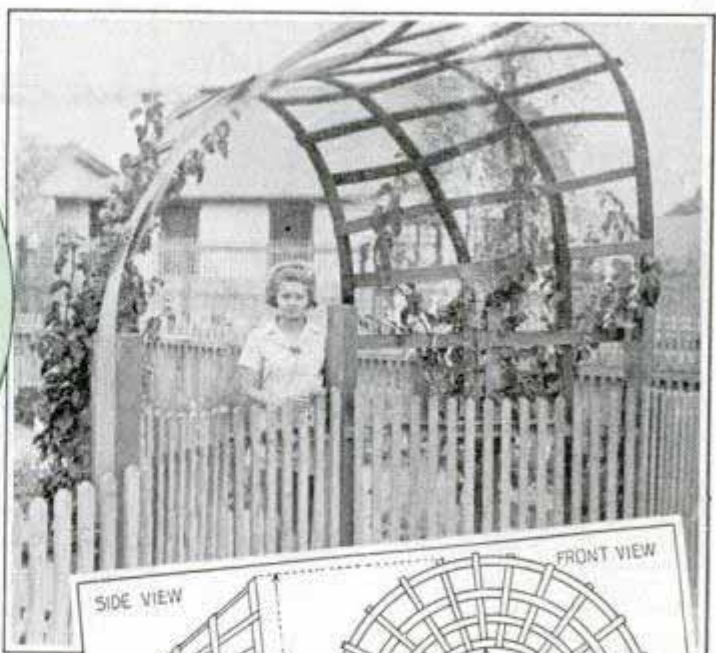
—Harold O. Hayes, Wilmette, Ill.



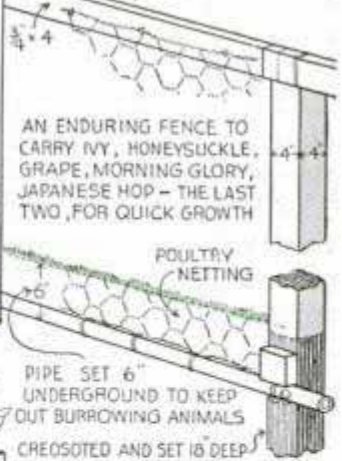
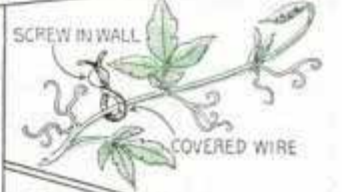
This flagstone sidewalk was made by using dividing strips between the concrete forms

Bronze

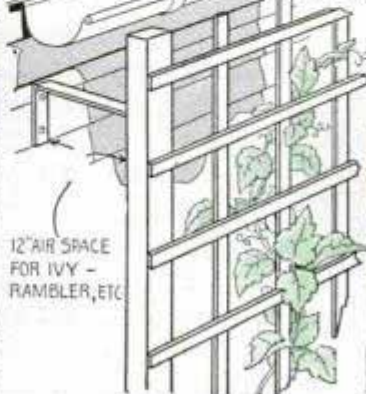
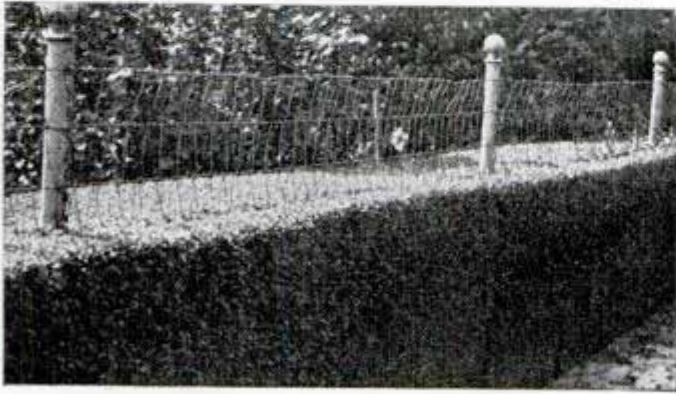
Backyard SCREENS and TRELLIS HEDGES



$\frac{1}{4}$ " x 2" ROUGH BATTENS IN LOOSE BASKET WEAVE



AN ENDURING FENCE TO CARRY IVY, HONEYSUCKLE, GRAPE, MORNING GLORY, JAPANESE HOP - THE LAST TWO, FOR QUICK GROWTH



HEDGE PLANTS SET 12 TO 15\" APART IN A PREPARED TRENCH



Showing of Microscope Specimens Speeded by Disk Slides

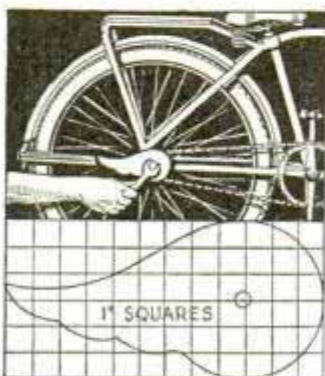


A number of specimens can be viewed in succession rapidly with this disk slide

Have you ever attempted to show friends a series of microscope views, and found them growing disinterested because of the time lost in changing slides? If so, a disk slide of the type shown will solve your problem. The slide consists of a celluloid disk having a paper disk of the same size cemented to it, holes being punched in the paper near the edge to hold the specimens. The disks are pivoted to a sheet-metal arm which is soldered to a large paper clip. The clip holds the assembly to your microscope stage.

—Oliver H. Dennis, Pittsburgh, Pa.

"Speed Wings" Dress Up Bicycle



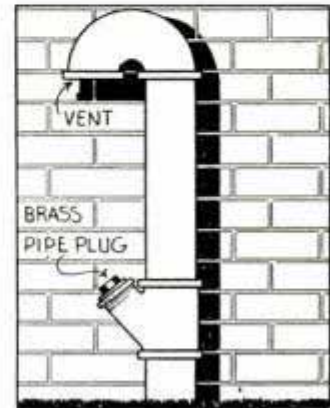
Slipped under the rear spindle nuts, these wings will add considerably to the appearance of your bicycle by covering the hub and brace junctions, and they also offer a suggestion of

speed. Cut from sheet aluminum, the wings are especially effective on streamlined models.

—E. E. Youngkin, Altoona, Pa.

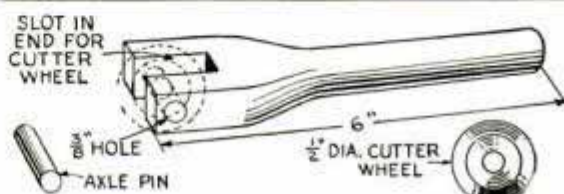
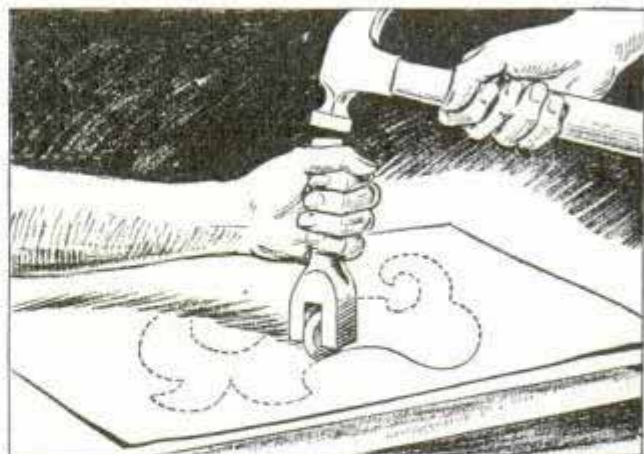
Venting Basement Fuel-Oil Tank

If you have a fuel-oil tank in your basement, here is a good method of providing a vent and a filler opening to the end of the feed pipe outside the building. A short distance above the ground, a Y-fitting is screwed onto the feed pipe so that a nipple and a return elbow can be added. A brass pipe plug in the opening of the fitting keeps out dirt and water. A fine copper screen soldered over the open end of the inverted return elbow keeps out insects, yet allows air to enter the tank as the oil is being used.



Rotary Chisel Cuts Designs in Sheet Metal

For cutting scrolls and similar designs in light sheet metal, where it is difficult to use tinner's shears, this chisel is hard



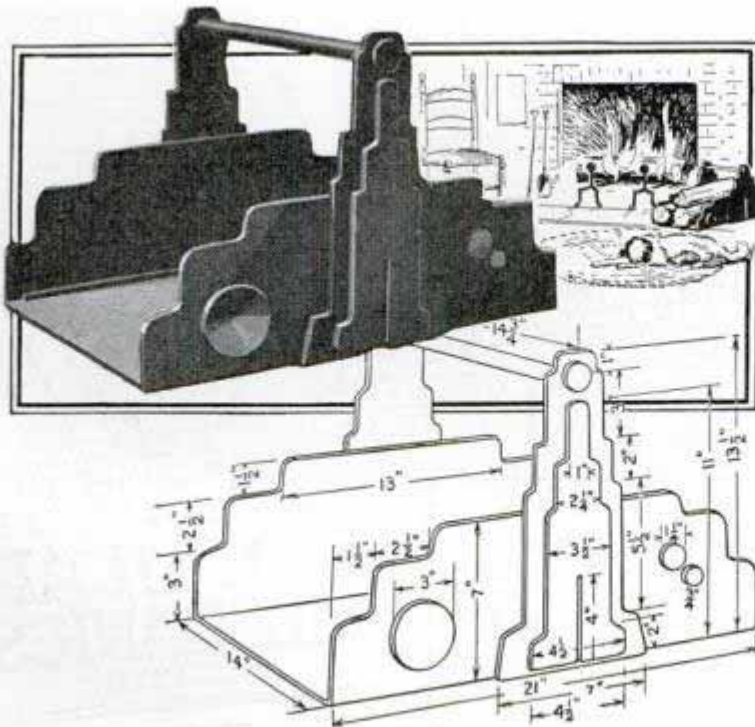
Using this chisel, you can make curved cuts in light sheet metal with ease and accuracy

to beat. It consists of a pipe-cutter wheel pivoted in one end of a short iron or steel handle. In use, the chisel is pushed slowly over the work while the handle is being tapped with light hammer blows in rapid succession. After a little practice you will be able to cut designs of almost any shape neatly and accurately.

A Modern Wood Box for the Fireplace

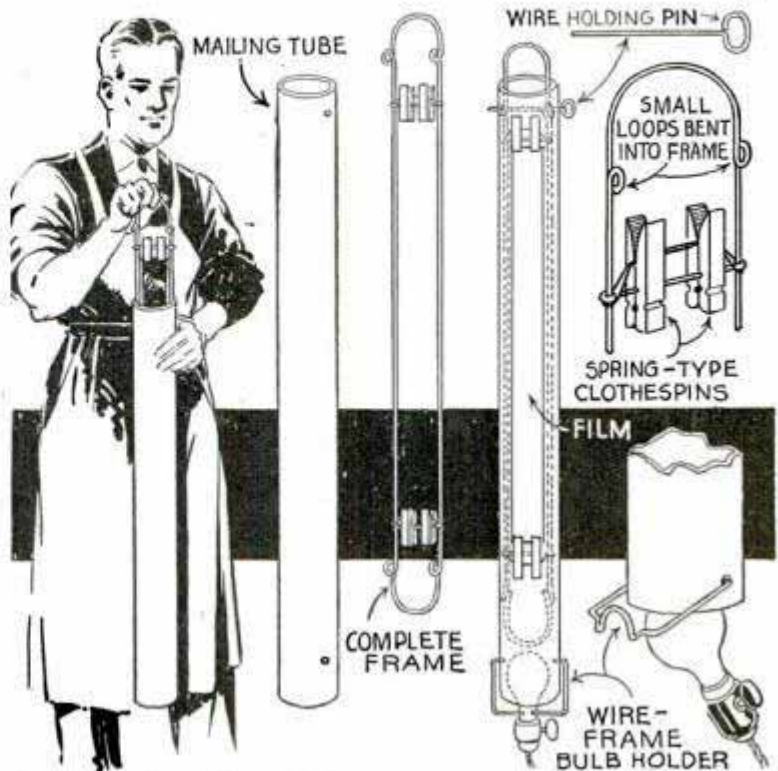
This sturdy, inexpensive fireplace wood box fits in well with the modern trend in interior furnishings. Made entirely of $\frac{3}{8}$ -in. plywood, except the handle, which is a length of broomstick, the box is readily cut out on a scroll saw. Narrow cleats nailed to the bottom, near the front and rear edges, give rigidity to the base and help prevent warping. The circular pieces shown on the sides are plywood disks attached for decorative purposes. The box can be finished as desired, although the original looked very attractive with a red trim on a black background.

—K. R. Edson, Logan, Utah.



Patterned along modern lines, this fireplace wood box is a project that you can turn out in one evening on your scroll saw

Roll Films Dried in Tube Safely with Heat from Electric Lamp



Drier is adjustable to different lengths of roll film by merely sliding the cross wires carrying the clothespins up or down

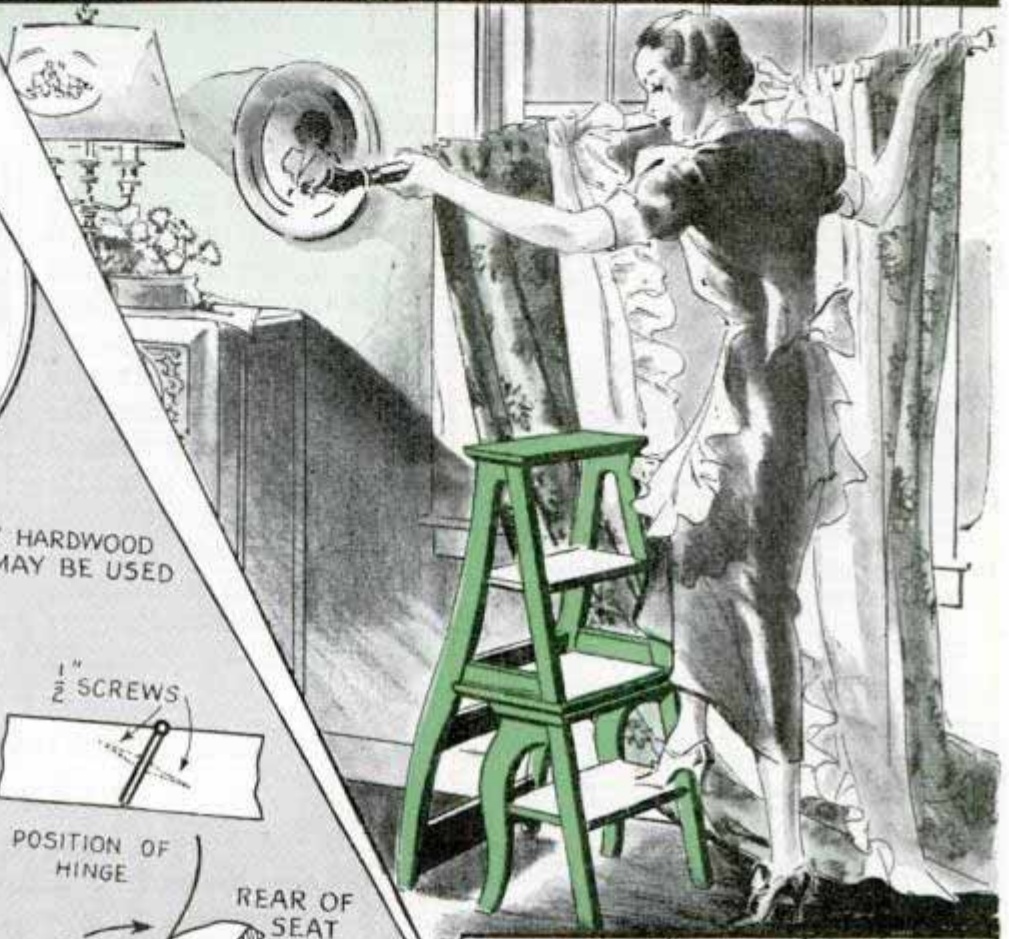
Utilizing a 60-watt electric lamp, this roll-film drier handles negatives without them collecting dust or getting scratched on the emulsion side. The drier consists of a cardboard tube, four spring-type clothespins and a wire frame bent as indicated. Eyes formed near each end of the frame take pins

which hold it inside the tube, and cross wires just below the eyes are threaded through the springs of the clothespins, which hold the ends of the film to be dried. These wires should grip the frame with a snug, sliding fit so that they can be adjusted to suit the length of the film. Another frame of wire at the lower end of the tube holds the lamp in place. The tube should be waterproofed inside and out with two or three coats of shellac. Use a strong tube having an inside diameter an inch or so greater than that of the lamp.

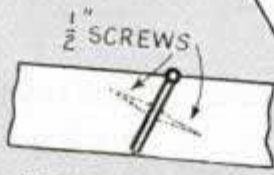
—M. Winterton, Fort Lewis, Wash.

☐ If painted surfaces around a kitchen sink are rubbed with floor wax, it will help prevent the appearance of unsightly water spots on the wall.

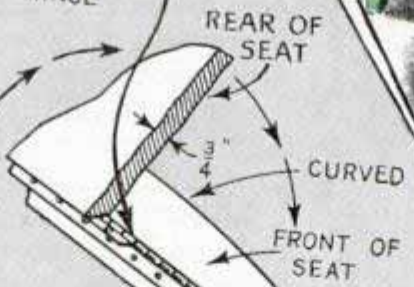
LADDER CHAIR



ANY HARDWOOD
MAY BE USED



POSITION OF
HINGE



REAR OF SEAT

CURVED

FRONT OF SEAT

$\frac{1}{4}$ " x $16\frac{1}{4}$ " CONTINUOUS HINGE



SCREW POCKETS

STEP

ROUNDED

FRONT LEG

DADO

SCREW

FRONT SECTION DETAIL



BLOCKS

BLOCKS ARE
PLACED UNDER
THE CLAMP JAWS
WHEN GLUING

DADO
HEAD

THE GROOVE FOR STEP IS CUT
BEFORE BAND-SAWING TO SHAPE

SHEET NO. 1

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUEPRINT No. SN 960

Sidewalks Reinforced with Wire to Prevent Frost Cracks

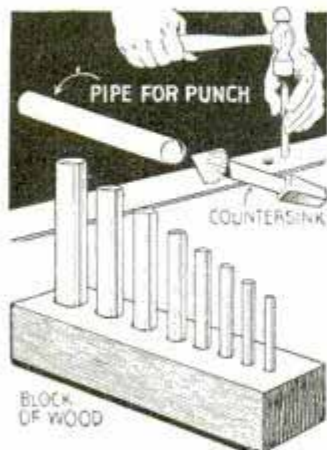


Wire mesh imbedded under expansion joints of sidewalks to avoid uneven raising of the sections

When laying a new sidewalk, it's a good idea to imbed strips of wire mesh in the concrete under the expansion joints, which reinforces the concrete and helps it withstand "heaving" action of the ground underneath when it freezes. If frost causes the walk to crack through at the joints, the wire mesh helps keep a block or section from raising above the surface of the abutting one.

—L. H. Georger, Buffalo, N. Y.

Paper and Leather-Cutting Punch of Pipe or Tubing



To make small punches for cutting paper and leather, select a steel tube or pipe of the required diameter, lock it in a vise and then bevel the inside surface of one end to a sharp edge with a countersink. Be careful to hold the countersink true with the tube so that the bevel will be cut uniformly around the end. It's

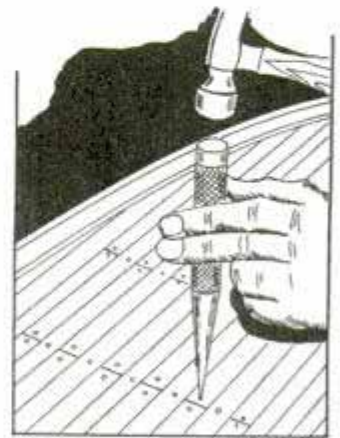
best to place the material over the end of

a wood block when cutting gaskets so that the edge of the punch will not be damaged.

—M. W. Mutschler, Lincoln, Nebr.

Imitating Planks on Ship Models

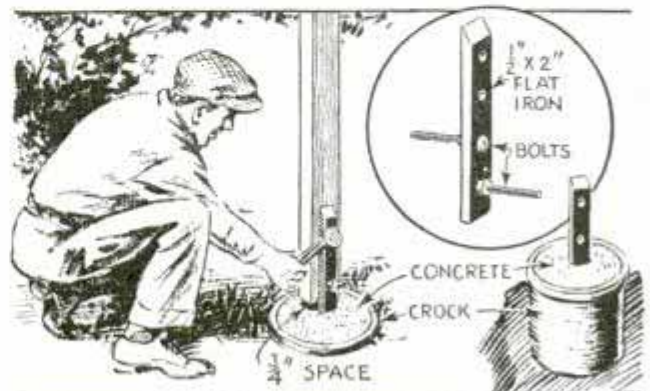
To get a good imitation of a planked deck on a ship model, I cover the deck with a piece of $\frac{1}{8}$ -in. holly wood, score the wood with a pointed instrument and make a few cross scores to simulate joints at the plank ends. Then I make indentations in the wood with a small punch to simulate nail heads and fill these with colored plastic wood, sand them down and rub linseed oil thoroughly over the whole surface.



—C. Arnold Baer, Portland, Ore.

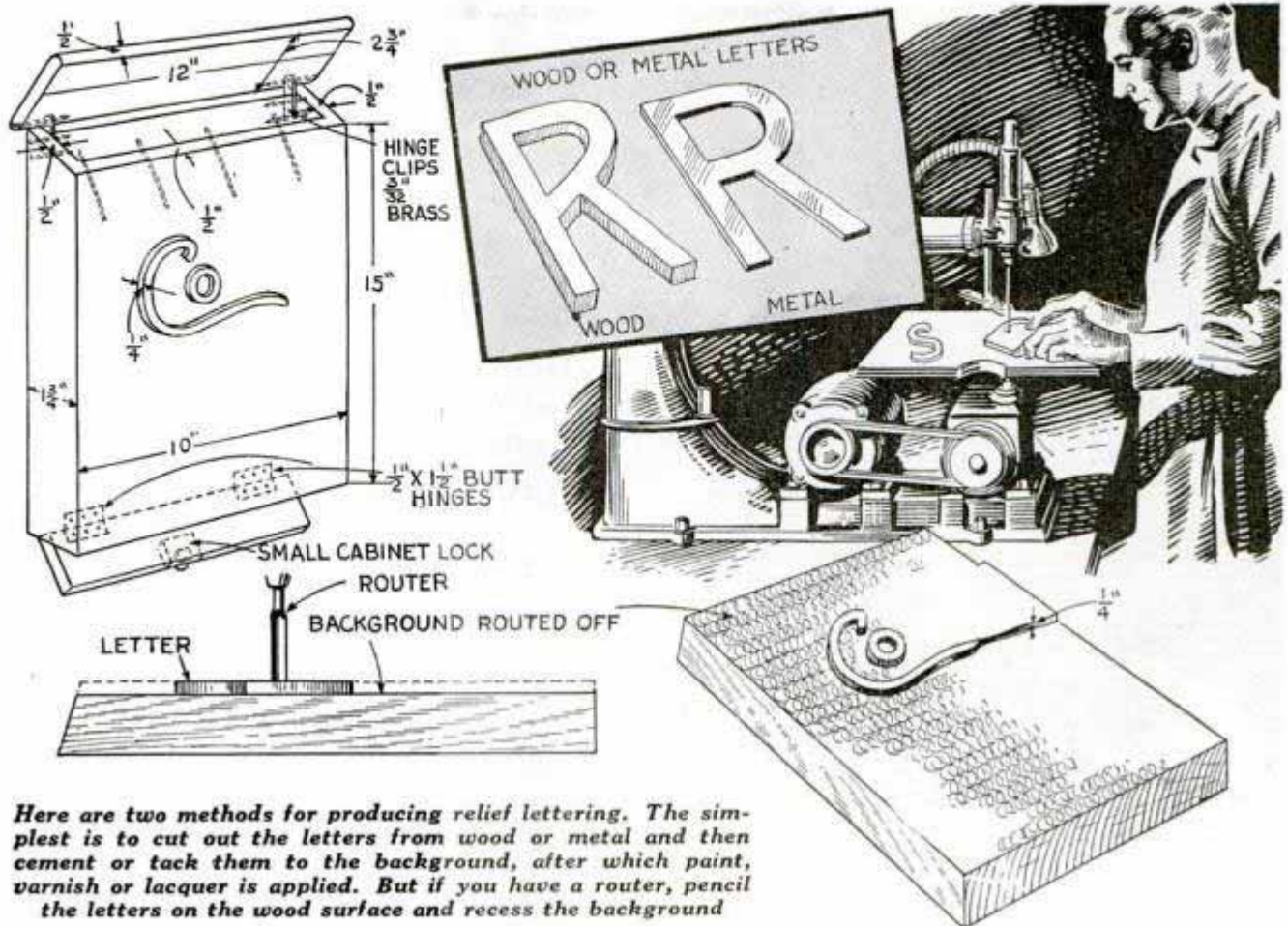
Trellises Set on Concrete Bases to Avoid Rot

When you build arbors or trellises, anchor them in concrete as shown and you need not worry about them rotting off. Just take some old crocks, set them in the ground and fill them with concrete. Then insert a length of flat iron in each one, first drilling four holes in it, two to take bolts for anchoring the iron in the concrete and two for bolting the trellis standards in place. When you drill the standards, it is best to locate the holes so that the ends of the standards will clear the top of the concrete about $\frac{3}{4}$ of an inch.



Here is a method of anchoring your trellises so that they will not rot off at the ground

Relief Lettering Cut on Scroll Saw or Router



Here are two methods for producing relief lettering. The simplest is to cut out the letters from wood or metal and then cement or tack them to the background, after which paint, varnish or lacquer is applied. But if you have a router, pencil the letters on the wood surface and recess the background

Hollow Spindles Set Up in Lathe with Aid of Tapered Plugs

When you have a long, hollow wood spindle to turn, the job of setting up the work in a lathe is done easily by using tapered plugs in the openings in the ends of the stock as shown. By tapering the plugs, they not only center themselves when driven in tightly, but they can be used in openings of different sizes.

—Dale R. VanHorn, Lincoln, Nebr.

T-Square Has Scale on One Edge



An accurate tape measure cemented along the edge of a T-square will enable you to make measurements without having to reach for a ruler each

time. This idea will be found especially handy when laying out advertisements or straight-line drawings.



You can center hollow stock in a lathe accurately by using these tapered plugs which center themselves when driven in tightly



BOATS

How to check a boat quickly for the more common defects.
How to tell if the keel, frames and planking are sound.
How to check a propeller shaft for alinement.
How to judge condition of the ribs by the planking seams.

Inspect the stem closely

By
WALTER E. STEWART

WHETHER you are buying a rowboat or a steam yacht, the most important thing to you is the condition of the hull. Paint and varnish and cabin accommodations and equipment are all eye-catchers, but without the foundation of a sound, seaworthy hull they are worthless. Don't buy a boat that does not have a conventional hull; it may be V-bottom or round bottom, keel or centerboard, but it must be of a shape that years of experience has caused to be accepted as good. Freak hulls are almost never successful; they are either difficult to push through the water, or they are not seaworthy. The second reason is that the market for freak hulls is almost nil, and when you wish to dispose of yours a loss will be in prospect.

The frames or ribs of a boat shape the hull and give it strength. Often in old boats the frames are cracked. This is especially true of steam-bent frames. Look at them carefully. Get a flashlight and a penknife and poke about under the floor

boards until you are satisfied that the hull has not been weakened seriously by cracked frames. Bear in mind that the cracks usually occur on the side of the frame toward the planking. Another way to check up on bad frames is to look carefully at the planking seams on the outside of the hull at the turn of the bilge. Unusually wide seams at this point may indicate weakened ribs. Often the widened seams have been filled in, so it may be necessary to dig a little with a pointed knife to discover them. Also walk far enough away from the hull to be able to sight along it so as to detect any bulges or irregularities due to deformed frames. V-bottom boats often have frames which are bolted together. Make sure that these fastenings have not rusted to the point of failure, or have not chewed out the wood until they are no longer tight. Rot often sets in at the ends of sawed frames, so dig your knife into them to be certain they are sound.

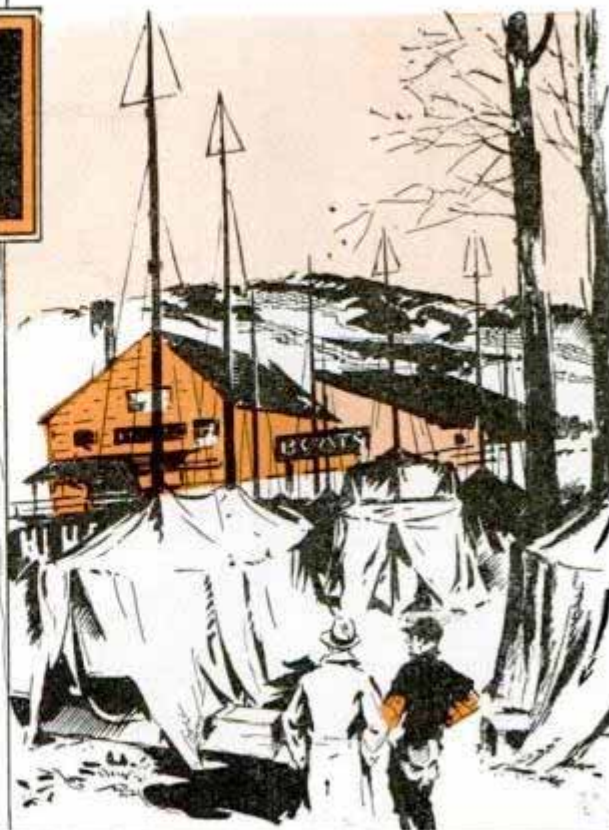
While you are off from the boat, sight along the keel. Many boats have had their keels broken or warped out of true by careless hauling. When this has happened, incurable leaks often result, and the boat almost never sails satisfactorily. Be sure to inspect closely every inch of the bottom of the keel. It is here that teredo

FOR SALE

Check ends of planking



worms often start their work of destruction. The entrance holes of these pests are no larger than pinheads, but once the entrance is made the whole interior of the timber will be eaten out. If you see evidence of worms the only safe thing to do is bore a number of small holes into the keel so that you can inspect the shavings for the white pulverized material with which the teredo lines his cavities. If worms are in the wood the only remedy is to replace it. For this reason many boats have a 1-in. worm strip on the bottom of the keel. This strip is replaced every season so that the teredo may not pass from it into the keel. Unscrupulous boat sellers sometimes plug teredo holes with putty. Therefore, the use of putty on a keel is invariably a bad sign. No matter how sound a keel appears do not conclude your purchase until you have drilled at least one small inspection hole. A sound, old keel will produce tough, dark shavings, and a good, new keel will give tough, white shavings, so regard dark, crumbly shavings as a sure sign of decay. A new keel in an old boat should be subjected to rigorous examination, for in many cases it will be found that these are merely append-



Examine the frames

ages and do not properly support the hull.

Hull fastenings are of vital importance, for to replace them is always a difficult and often an impossible task. If they are copper, brass, or bronze, corrosion will not have affected them, so you will only need to make sure they are tight. Discover this by trying to insert a thin strip of metal between frames and planking at a number of spots. Galvanized iron fastenings require a more thorough investigation. Dig out some of the plugs on the outside of the hull to see if the nails are badly rusted, and try your thin metal feeler in many places to find whether the fastenings have rusted through between planks and frames. A good stunt is to hammer on the outside of the hull over a frame and listen



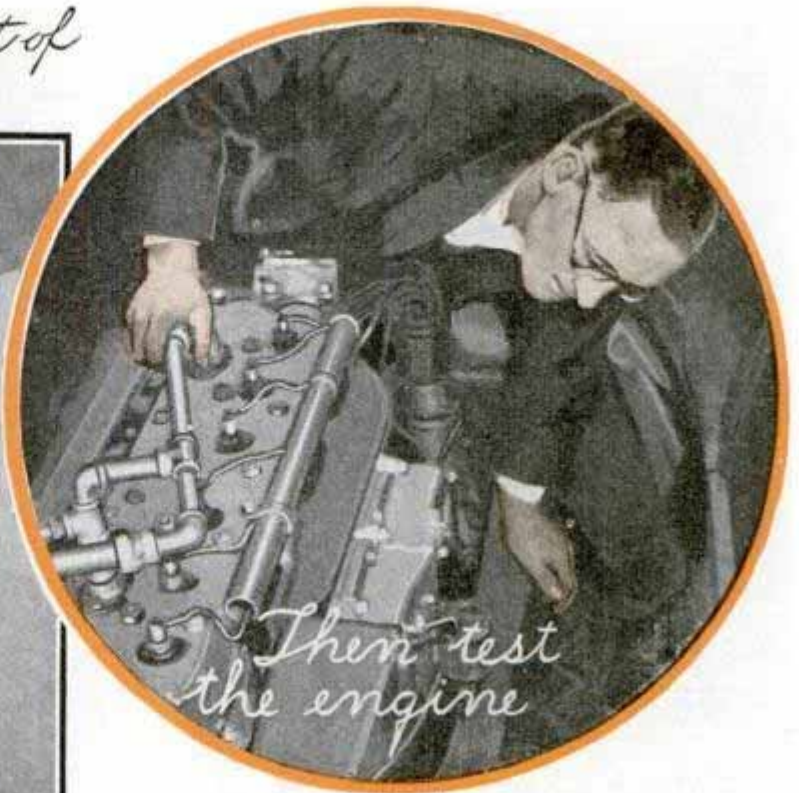
for the hollow sound which would indicate the lack of a fastening.

About the only thing to watch for in the planking, other than obvious holes, warping, or splitting, is rot. Wet rot most often occurs in the garboard strake, that is, in the plank next to the keel. Try to stick the point of your knife into any likely place for rot. No matter how old the boat, sound wood will prevent the point from sinking more than about a quarter inch. Dry rot may occur anywhere, but wood which is alternately wet and dry, is particularly susceptible to it. Use your knife at the joints of planks to stem and to transom or stern post. Pull out the ice box and pry around behind it, for the condensation caused by its coolness often creates rot. Examine carefully all joints of deck beams and frames, and of frames and sheer clamps, for dry rot is an insidious weakness that often leaves an apparently sound exterior.

A leaky boat may yet be a good boat, but be sure that you determine definitely where the leak is and how much trouble it will be to stop. An improperly packed stuffing box on the propeller shaft may cause a serious leak, but it is only a matter of minutes to stop it completely. On the other hand a leak where the centerboard trunk passes through the keel is extremely difficult to stop. A loose seacock at a through hull connection is likewise trivial, but rotten wood around it is a serious matter. Boats which have been out of water for several seasons dry out until the seams are gaping cracks. If the wood is relatively new and "live" it will swell together and close the cracks after launching, but if it is old and has been through many wet and dry cycles it may never close up satisfactorily.

A sturdy, leak-proof deck is almost as important as a sound hull. The deck stringers must be large enough and spaced closely enough to brace the hull adequately, as well as support the deck planking. The top of the cabin should be just as strongly built as the remainder of the deck, for often your entire party will be spread out on it. Dry rot often attacks the under side of deck planks where they join the hull—look for it carefully. The best time to inspect a deck for watertightness is immediately after a heavy

Check the alinement of propeller shaft



Then test the engine

shower. Look inside the cabin and under the decks to see how much water came through, and be sure to locate where it came from so you will know how much of a job will be the repair.

Try turning the propeller by hand with the clutch out. It should turn easily, with no evidence of binding at any part of the revolution. If it seems to stick at some particular point, the shaft perhaps is misaligned or sprung. See that the outboard bearing and stuffing box are in good condition and that the shaft has no play in them. A bent or battered propeller may cause a boat to pound and make little headway. Repairing a damaged propeller is a job for experts who have special equipment for adjusting and testing the blade contours. Rudder, rudder post, bearings, and rudder stuffing box will all require careful examination; solidity being the chief requirement, with water-tightness a close second.

Gasoline motors in boats are susceptible to all the usual wear encountered in auto motors plus that caused by salt water and often improper attention to lubrication. To check up the main bearings, place a crowbar under the flywheel and try to jiggle it. Ability to shift the main shaft indicates loose bearings. Remove spark plugs or open priming cups and turn the motor

over by hand to detect undue stiffness, then try it with plugs replaced, or priming cups closed, to test for compression. Remove a cover plate from the water jacket to see the extent of the corrosion due to salt water. Test the engine bed and fastenings for solidity and tightness. Above all insist upon running the motor under normal operating conditions for at least 30 min. before giving it your approval.

If you are considering a sailboat, bear in mind that spars and rigging and sails are your prime motive power. Examine them just as carefully as you would a motor. The mast step is the socket into which the base of the mast fits. It should be a very heavy, strong timber extending over at least five ribs. The partners are the heavy deck timbers through which the mast passes. They must be sturdy enough to resist the great force exerted by the wedges driven around them to hold the mast in place. Often rain water filters down the mast and saturates both partners and step, causing dry rot to set in. Use a good flashlight and your penknife in your search for it. If a canvas coat covers the wedges at the deck be sure to take it off and see what is underneath.

Longitudinal cracks in a mast have little effect on its strength, and usually are not the seat of dry rot unless some attempt



Look for leaks around the centerboard well



has been made to fill them. Filling such cracks only causes rain water to be trapped in them, and dry rot soon follows. Wire stays, chain plates, bowsprit, and bobstay are additional supports for the mast and must also come in for careful scrutiny. It is essential that boom and gaff be perfectly straight if sails are to set efficiently.

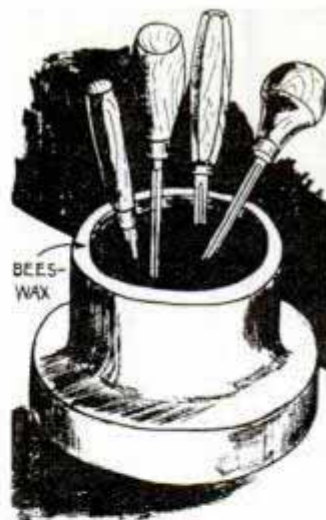
The greatest trouble encountered in sails, other than straight wear, is mildew. The dark little spots of this growth cause weakness and quick failure, even in new sails. As a matter of fact, mildew is more prevalent in new sails than in old, due to the sizing which is retained in new cloth.

Improper use often causes sails to be stretched into misshapen bags or to be pulled out until they are too long for the spars. Insist upon seeing the sails up and full of wind.

The type of boat to buy depends upon what you want, and where you wish to use it. If you are to live aboard during week ends and vacations, a cabin will be required, and if you must handle and care for the boat alone, 30 to 32 ft. is about the practical limit of size. A beginner who wants a sailboat should pick up a small open sloop or cat, say about 16 ft. long, preferably a centerboard type, for such a boat is better than any other for teaching the fundamentals of sailing. Use on a narrow or swift river dictates a motorboat, shallow lakes or bays a motorboat or centerboard sailboat, while open, deep water spells husky motor cruiser or deep-draft sailboat. Be guided by the types of boats already in use on the waters which beckon to you, for usually experience has dictated the types best suited to any particular locality.

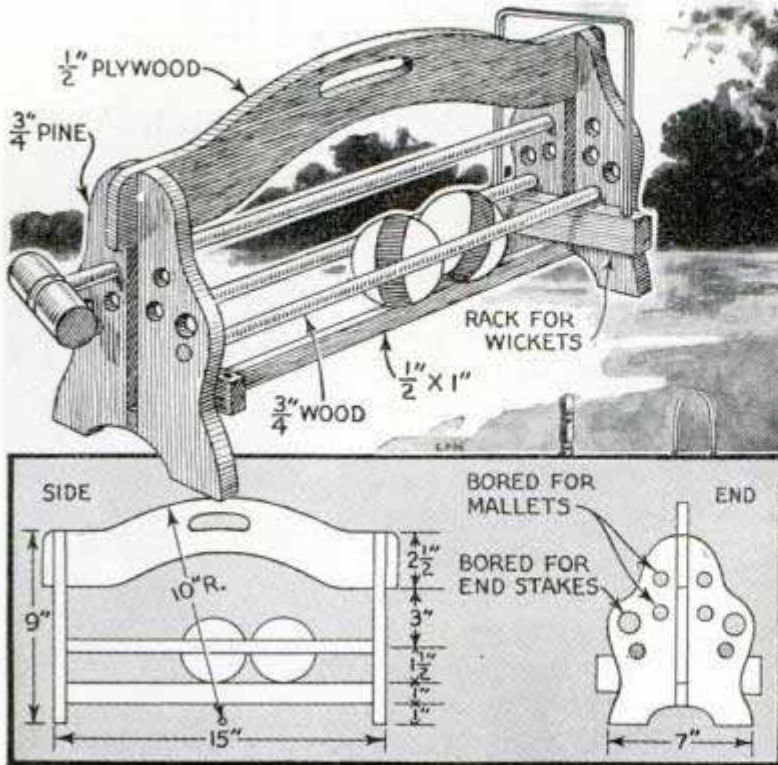
Holder for Sharp-Pointed Tools

For leather workers and others who use sharp-pointed hand tools, a wooden container filled with beeswax is just the thing to hold the tools at hand, besides protecting the ends and preventing rust. Any shallow wooden bowl about 1 in. deep and having a fairly large diameter may be turned of hardwood to the shape shown. It should be filled with melted beeswax. When the latter becomes perforated, a few light taps with a hammer will close the holes again.



☐ After an ice-cream freezer has been properly packed with cracked ice and salt, pour a quart of cold water over it. The water will cause the ice and salt to combine more quickly and freezing will be hastened.

Croquet Equipment Held in Portable Rack



All of your croquet equipment is kept at hand in this simple wooden rack. Holes bored in the divided end members receive the stakes and mallet handles besides two $\frac{3}{4}$ -in. dowel rods for retaining the balls on the lower crosspiece. Cleats across the end members are drilled to hold the wickets and a hand-hole is cut in the upper crosspiece.

Carving Tool for Model Work Has Interchangeable Blades

Using a pin vise as a handle to hold tiny blades or chips broken off a safety-razor blade, you have a handy carving tool for which an almost unlimited supply of interchangeable blades of any shape desired can be made. Chips for general carving are easy to break off by grasping the edge of the razor blade with the tip of a pair of

long-nose pliers, holding them at an angle of 30° to 40° to the blade. Chips for cutting curves are made by holding a narrow strip of the blade in the pliers or vise. If a point is desired, allow a portion of the blade to extend beyond the pliers or vise. With a little practice, you can break off a chip of any shape desired. As small fragments may fly off when breaking the blade, don't fail to protect the eyes with a pair of goggles.

—John S. Wilcox, Los Angeles, Calif.



Drawer Has Handles on Sides for Carrying

If handles are screwed to the inside surfaces of large cabinet or workbench drawers in which odds and ends are kept, they are easily pulled out and carried to the light

when looking for an article. The handles should be located close to the drawer top.



Saw-Blade Marker Simplifies Fitting of House Siding

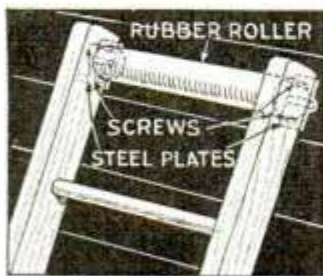


When a siding board is held in place and scored with this marker, it will fit perfectly when sawed

Leaving one hand free to hold the work in position, this simple tool accurately marks siding boards for sawing. It is made from a short length of saw blade, which is screwed to a block cut to the shape shown. The teeth of the blade are filed coarse to a sharp knife edge. In use, the siding board is held in place and scored while the marker is pressed firmly against the corner board, window or door frame.

Long Extension Ladder Improved by Roller on Upper End

You will find that an extension ladder with a rubber roller substituted for the upper rung is easy to raise and lower against the side of the building, as it reduces friction and also helps prevent marring the siding. In addition to this, friction between the



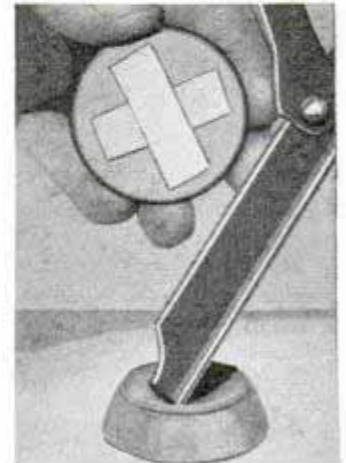
rubber surface of the roller and the side of the building tends to keep the ladder from slipping sideways. An old roller from a clothes wringer is handy for this purpose, and is fastened to the underside

of the ladder rails by means of steel plates, which are bent to form bearings for the roller ends.

—Bob Poulson, Los Angeles, Calif.

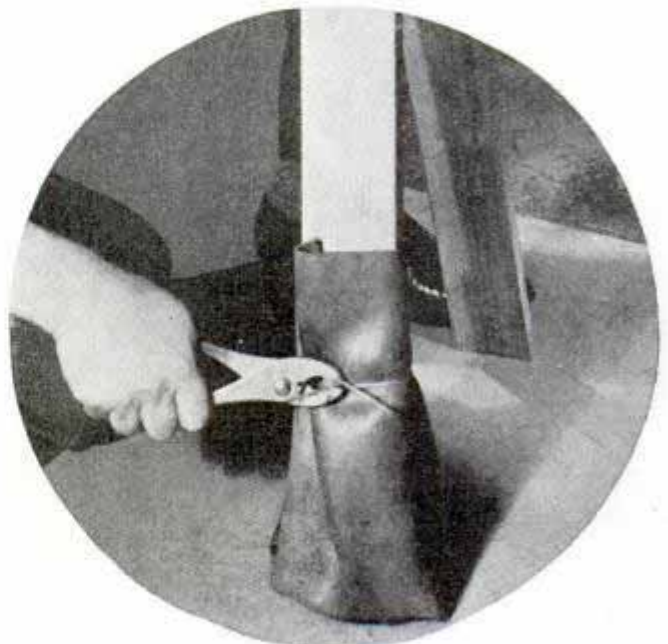
Sled Held Against Porch Wall with Caster Cups

One boy, who kept his sled leaning against the side of the porch wall, when not in use, put rubber caster cups on the floor to take the runner ends so that they would not mar the painted surface. The casters also helped to prevent the sled from slipping. They were taped to the floor, but rubber cement could be used.



Sawhorse Has Rubber "Shoes" to Protect Floor Finish

When it is necessary to use a sawhorse on a finished floor, just take some lengths of inner tube and fold them over the lower ends of the legs. Lengths of wire are twisted around the legs to hold the rubber in place.—W. Skeen, Pawnee Rock, Kan.



A few moments spent to fasten rubber strips over sawhorse legs will prevent marring finished floors

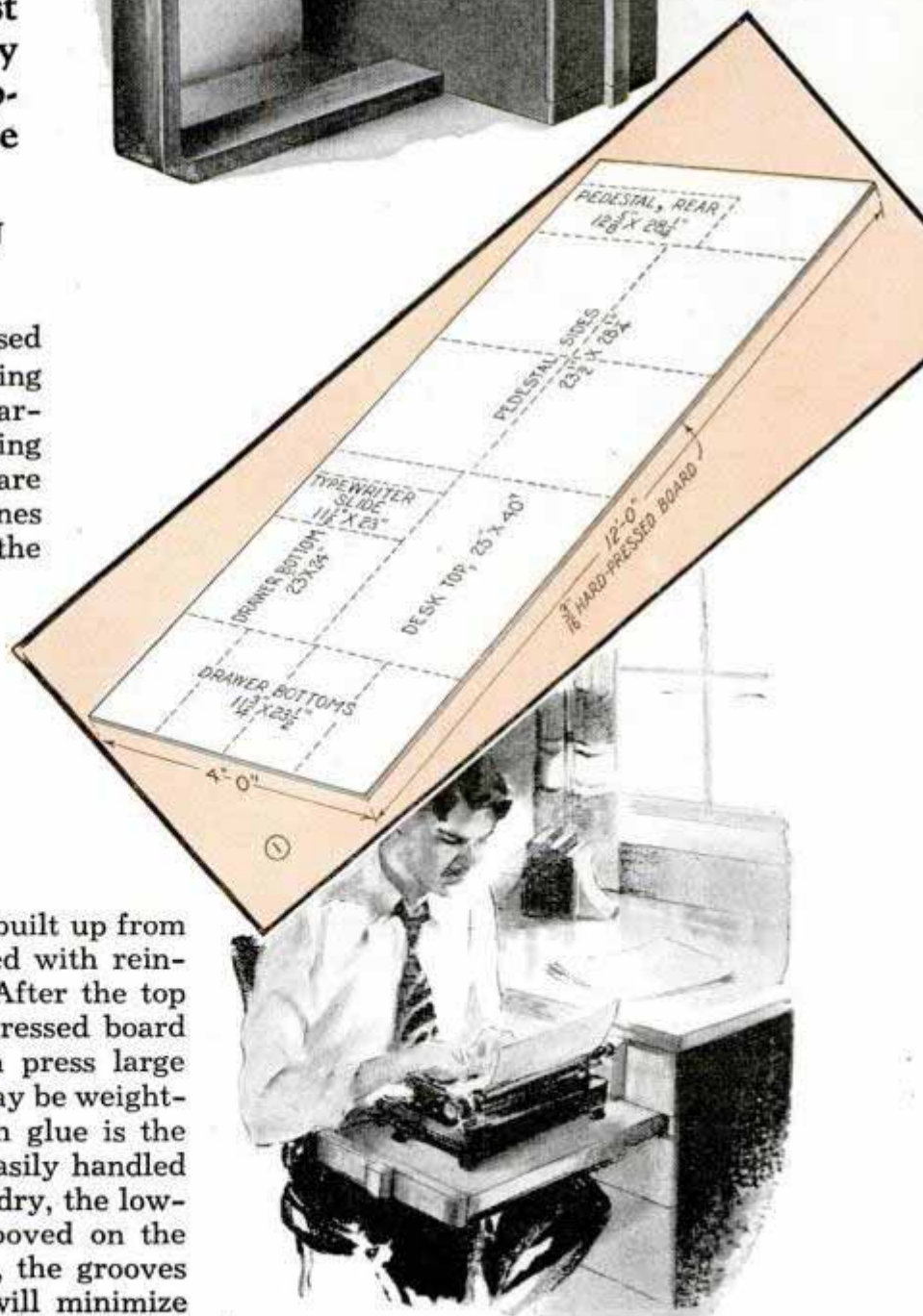
Modern DESK

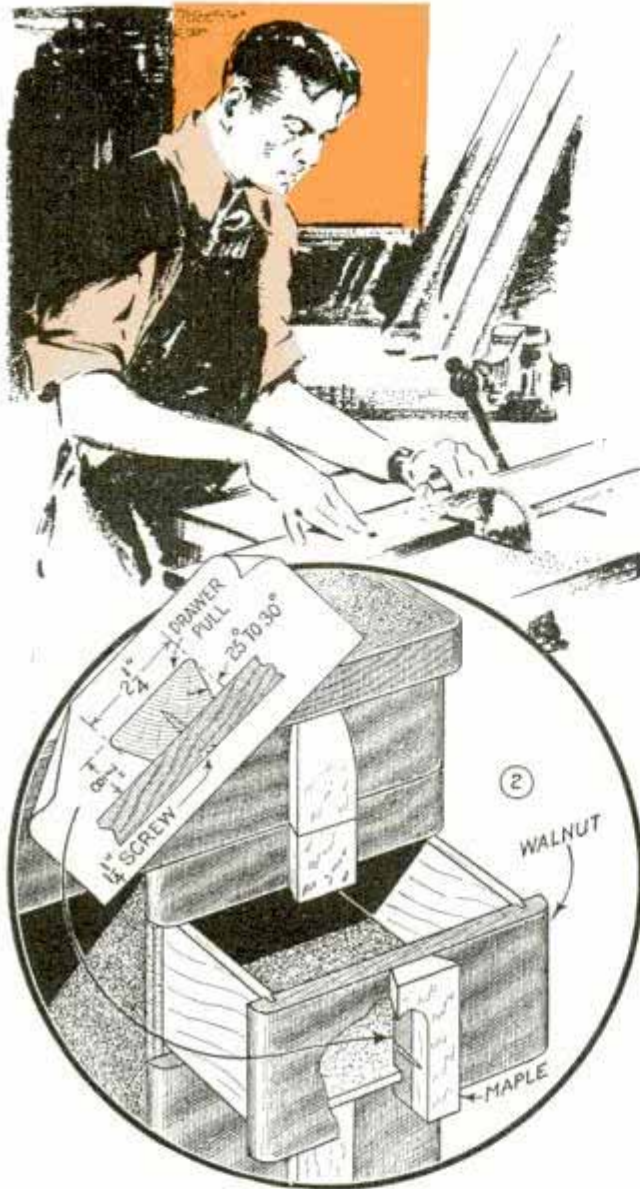
has
pleasing
lines

A typewriter slide at just the right height and plenty of drawer space for supplies and correspondence

By RALPH L. KUNAU

BUILT of walnut and hard-pressed board, this desk has contrasting maple drawer pulls, which are arranged in line vertically, appearing as one piece when the drawers are closed. A curved member combines as a leg and stretcher to support the overhanging top. Hard-pressed board "veneered" over a core built up from soft wood makes an excellent desk top, is ideal for the drawer bottoms, and, in double thickness, is used for the panels of the pedestal as well. Fig. 1 shows how the pieces are cut from a standard 4 by 12-ft. piece of hard-pressed board, $\frac{3}{16}$ in. thick. The core for the top is built up from $1\frac{1}{8}$ -in. pine, edge-glued and fitted with reinforcing end cleats as in Fig. 4. After the top is planed flat, a sheet of $\frac{3}{16}$ -in. pressed board is glued to the upper side. If a press large enough is not at hand the work may be weighted until the glue has set. Casein glue is the thing for this job, as it is more easily handled than the hot cabinet glue. When dry, the lower side of the top should be grooved on the circular saw to a depth of $\frac{1}{2}$ in., the grooves being spaced 3 in. apart. This will minimize





any tendency to warp. The edges are squared and $\frac{5}{8}$ -in. walnut strips are glued to the ends and the front and back. Then the edges are sanded flush and the corners are rounded as in Fig. 4.

Drawers slide on $\frac{3}{4}$ -in. plywood shelves supported by two panels of $\frac{3}{16}$ -in. pressed board, placed with the smooth side in, and screwed to the shelves. A second pair of sides are added with the smooth side out and are held by a line of screws at the edges. In this way the screws supporting the shelves are hidden. After squaring the side panels, lines are scribed to locate the upper edges of the shelves. Holes for the screws are countersunk so the screwheads will be flush. Details in Fig. 4 show the rear corner construction. An apron screwed to the top incloses the sides and back of the wide drawer, which may be supported either by cleats or by a dustproof panel.

Pieces of walnut from which the leg is assembled, as in the detail in Fig. 4, are joined with glue. Notice particularly that the tongue on the horizontal piece is cut off-center, so that the outer corner can be rounded after assembly without weakening the joint. A fillet for the inside corner can be cut by boring a $\frac{1}{2}$ -in. hole in a walnut plank, edgewise, and then sawing out a piece with a right angle, the sides tangent to the hole. The fillet is glued in place and cut to the outside curve. If you have a shaper it's an easy matter to make a suitable fillet. Corners at the top also can be filled with pieces similarly made.

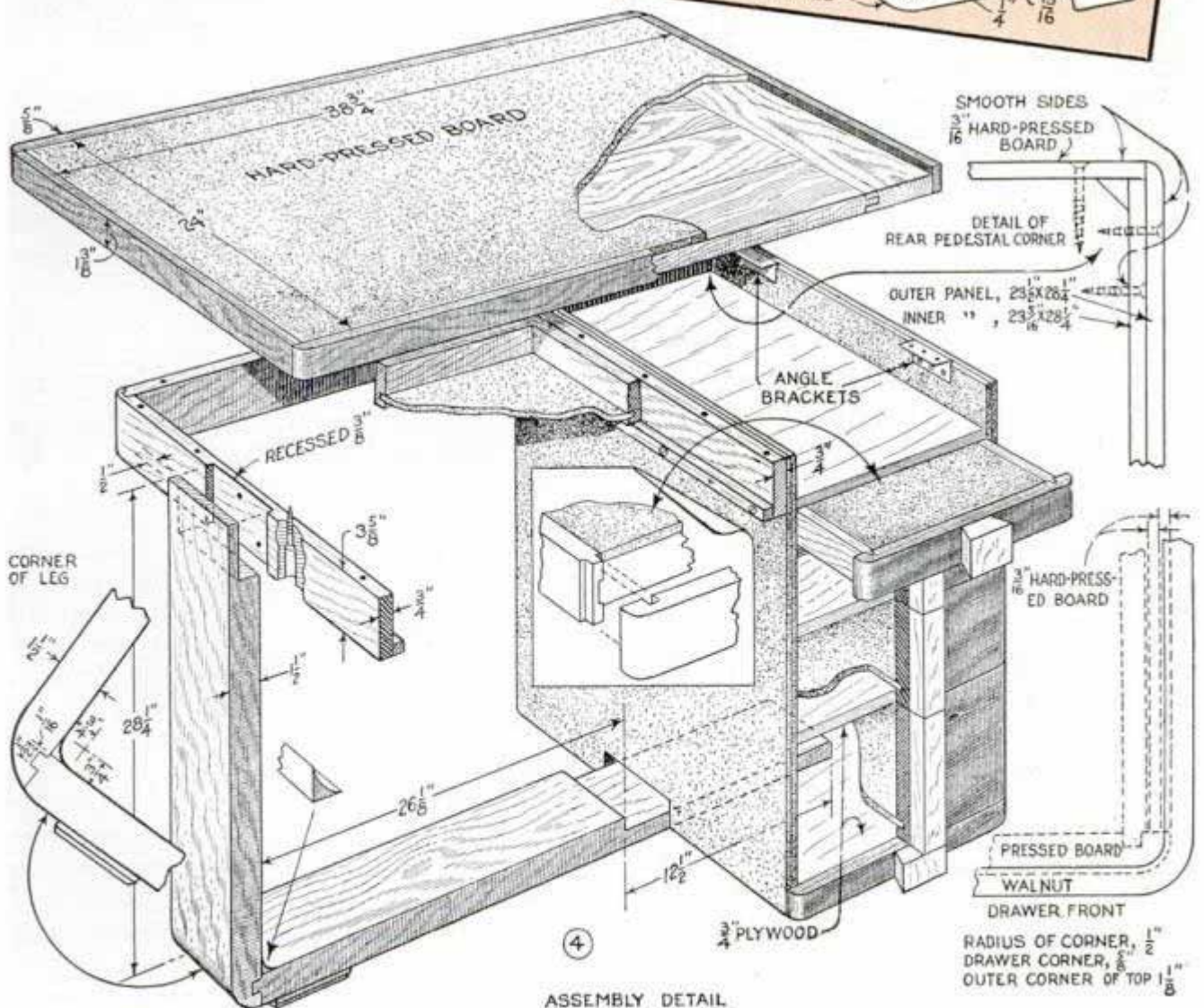
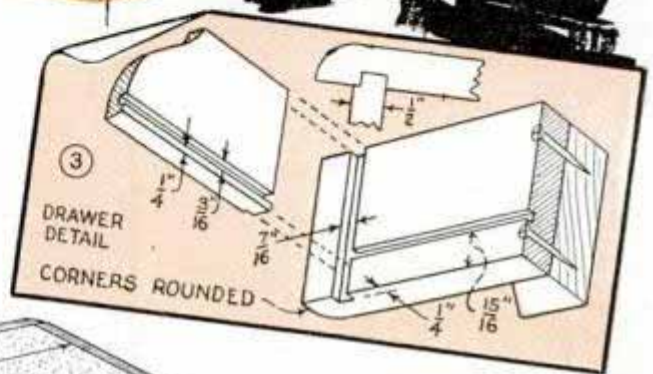
The drawer sides have a shoulder cut

Material List

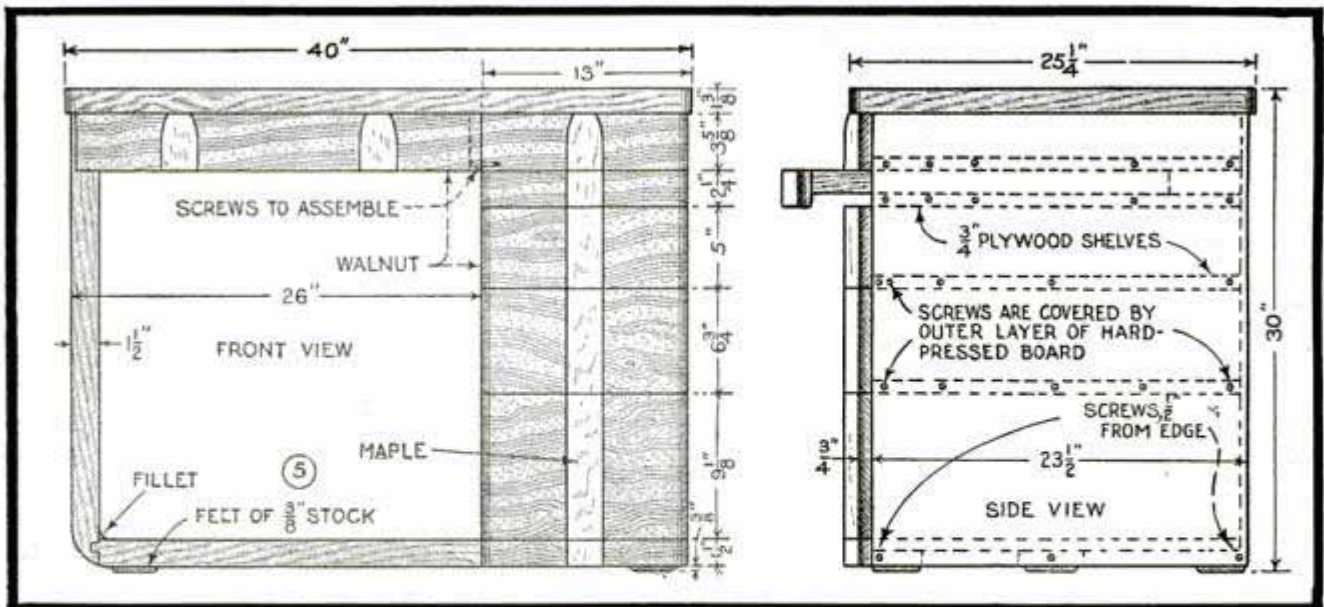
| | | |
|-------------------------------------|--|--------------------------------|
| Edge of top | | |
| 2 pcs. walnut | | 11/16 by 1 1/2 by 40 in. |
| 2 pcs. " | | 11/16 by 1 1/2 by 24 in. |
| Edge of shelf | | |
| 2 pcs. walnut | | 11/16 by 1 1/2 by 24 in. |
| Drawer fronts | | |
| 1 pc. walnut | | 3/4 by 3 3/8 by 40 in. |
| 1 pc. " | | 3/4 by 2 1/4 by 13 in. |
| 1 pc. " | | 3/4 by 5 by 13 in. |
| 1 pc. " | | 3/4 by 6 3/4 by 13 in. |
| 1 pc. " | | 3/4 by 9 1/2 by 13 in. |
| 1 pc. " | | 3/4 by 1 1/2 by 13 in. |
| Leg | | |
| 1 pc. walnut | | 1 1/2 by 5 by 29 in. |
| 1 pc. " | | 1 1/2 by 5 by 38 in. |
| Apron | | |
| 1 pc. walnut | | 3/4 by 3 3/8 by 24 in. |
| 1 pc. " | | 3/4 by 3 3/8 by 26 in. |
| 1 pc. hardwood | | 3/4 by 3 3/8 by 24 in. |
| Cleats for drawer | | |
| 2 pcs. hardwood | | 11/16 by 11/16 by 24 in. |
| Bottom cleats | | |
| 2 pcs. hardwood | | 3/4 by 4 by 12 1/4 in. |
| Feet | | |
| 3 pcs. hardwood | | 3/8 by 3 by 4 in. |
| Drawer sides | | |
| 4 pcs. hardwood | | 1/2 by 3 by 24 in. |
| 2 pcs. " | | 1/2 by 4 3/8 by 24 in. |
| 2 pcs. " | | 1/2 by 6 1/2 by 24 in. |
| 2 pcs. " | | 1/2 by 8 1/2 by 24 in. |
| Drawer rear ends | | |
| 1 pc. hardwood | | 1/2 by 2 1/2 by 24 in. |
| 1 pc. " | | 1/2 by 2 1/2 by 11 3/4 in. |
| 1 pc. " | | 1/2 by 4 by 11 3/4 in. |
| 1 pc. " | | 1/2 by 5 3/8 by 11 3/4 in. |
| 1 pc. " | | 1/2 by 8 by 11 3/4 in. |
| Drawer pulls | | |
| 1 pc. maple | | 7/8 by 2 1/4 by 37 in. |
| Shelves | | |
| 5 plywood or built-up panels | | 11/16 by 12 1/4 by 23 5/16 in. |
| Core | | |
| 1 pine (built-up) top | | 1 1/8 by 24 by 39 in. |
| Shelf | | |
| 1 pc. pine | | 1 1/8 by 12 by 24 in. |
| 1 sheet tempered hard-pressed board | | 3/16 in. by 4 ft. by 12 ft. |

made on the circular saw to fit a dado on the drawer front as shown in Fig. 3. If a dovetail plane is at hand, a vertical dovetail joint is a good construction for this type of drawer. As you will see from Fig. 3, the groove for the drawer bottom does not extend the full length of the front piece as the back is set in a dado and the bottom is slid in after the pulls are attached. The drawers must be made accurately for, owing to the overhang of the front piece, they cannot be planed readily to fit if they should be made too wide. A clearance of $\frac{1}{32}$ in. is sufficient. Should the clearance show up greater than this, a thumbtack can be placed on one or both sides of the opening.

A sliding shelf for a typewriter is built up in the same way as the top. It must be fitted closely and the front piece is not glued on until the drawer pull is attached.



ASSEMBLY DETAIL



After the parts of the drawers are glued and fitted, the fronts are cut to length and the corners rounded to a $\frac{5}{8}$ -in. radius. The adjoining ends of the upper drawers may be left square if desired. Then the fronts are sanded and a line is scribed down the center to locate the screw holes for the pulls. These are made in one piece. Fig. 2 shows a sectional and side view of a pull on the upper drawer. A center line is scribed down the back, the edges are beveled, and the front corners rounded. Registering holes are then drilled through the fronts and the strip from which the pulls are to be cut. Finally, the strip is screwed to one drawer at a time and sawed off. This is done with the drawers in order to assure the grain in the pulls will match. Holes in the drawer fronts are drilled a size larger than the body of the screw so that after the pulls are screwed in place, they may be tapped with a mallet to align the strip perfectly. Note that the upper pulls are curved in from a point $1\frac{1}{4}$ in. from the top end to meet the edge of the desk top.

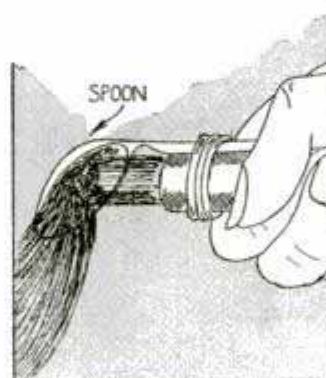
Screws fasten the apron to the leg and left side of the pedestal. The right side of the pedestal is held to the top by brass angles recessed to clear the drawers as in Fig. 4. Three feet, of $\frac{3}{8}$ -in. material, are attached as shown in Fig. 5. This brings the over-all height to just 30 in. All exposed edges are rounded slightly and sanded smooth. Walnut parts of the desk are given two coats of boiled linseed oil to darken the wood. When this is dry it is followed with several coats of wax, each

coat thoroughly polished. The pressed board is simply waxed, without an undercoat, but the maple drawer pulls require a coat of clear lacquer before waxing.

As you will see from the details, considerable variation of the materials used in this design is possible. For example, you can do the whole job in plywood, combining light and dark woods and finishing them in the natural colors. In this construction, the shelves on which the drawers slide would be glued in dadoes cut in the sides of the pedestal. The general appearance may be changed also to suit the surroundings by using the new modern drawer pulls in polished metal.

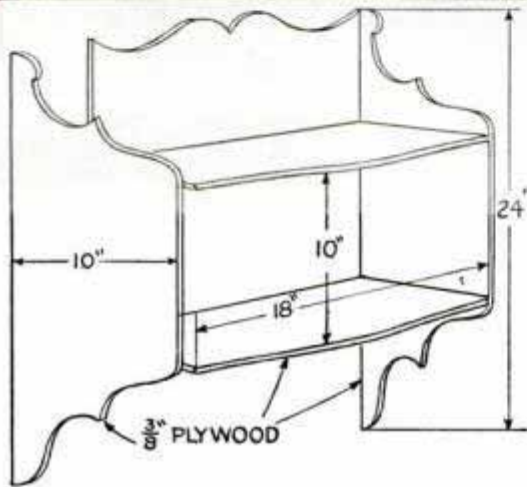
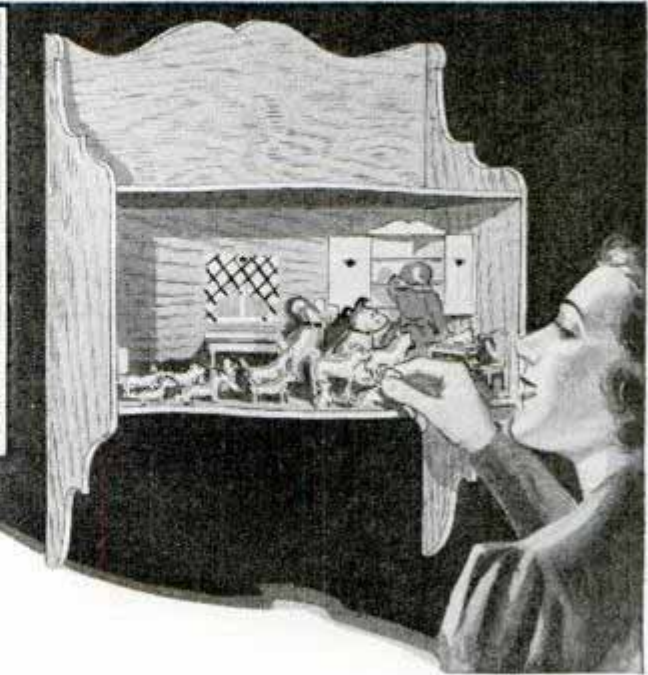
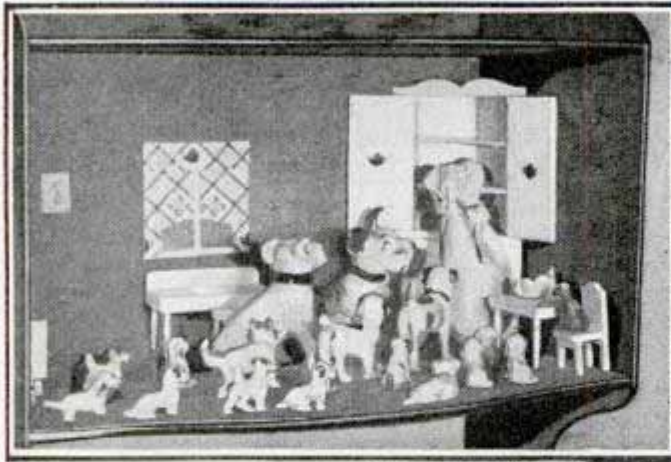
Spoon Makes Spray Nozzle

An old teaspoon lashed to the tip of a hose through which liquids are to be sprayed makes a simple and efficient spraying nozzle which can be adjusted to control direction, degree of diffusion and area to be covered. This is governed by the size and concavity of the spoon, angle of contact, size



of outlet and the volume and pressure of the liquid. With a little experimenting, you can produce a spray that will suit many washing or irrigation requirements.

Miniature China Figures Depict Fairy Tales

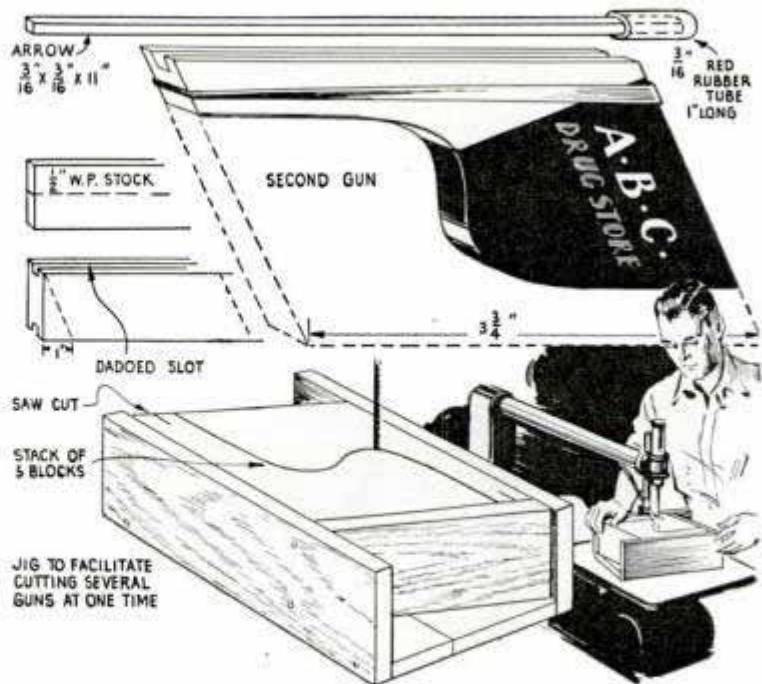


Instead of the usual hodgepodge arrangement of miniature china figures, why not fill out your collection and arrange them to depict some nursery rhyme, fable or fairy tale? This one, for instance, shows Old Mother Hubbard with her kitchen full of dogs, which, of course, amuses everyone. The cabinet may be built of light plywood and, although dimensions of one designed for this particular collection are given, it is best to plan the size and perhaps even its shape to suit the story you have in mind. Painting or staining the cabinet should be done with an eye for obtaining contrast.

Rubber-Band Arrow Guns Are Sawn Out in Quantities

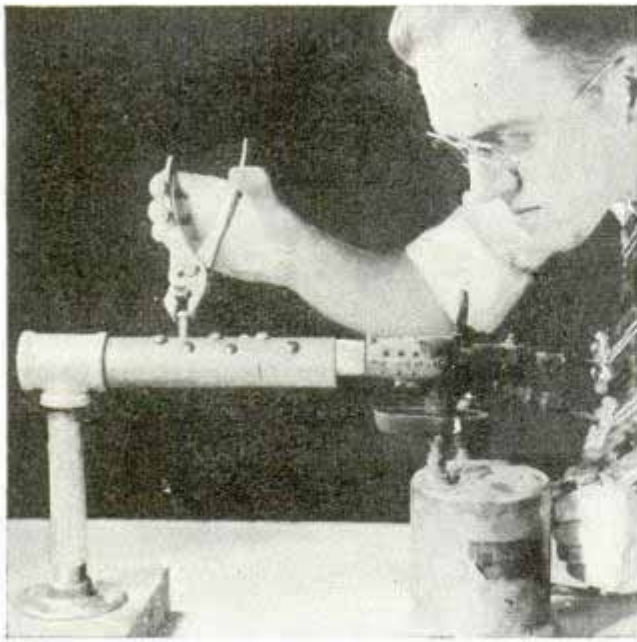
If you are looking for a project to turn out at a profit in your home workshop, these rubber-band arrow guns are just the thing, as they are safe, inexpensive, and have a wide appeal to children. Cut on your band saw in quantities of eight or ten at a time with the jig shown, the guns can be retailed profitably even at a nickel each. Use $\frac{1}{2}$ -in. white pine in 4 or 8-in. widths. Some clear white pine can be bought as low as five cents a foot by specifying mill shorts of random lengths and widths. The arrows are tipped with rubber tubing.

One of the easiest ways of removing feathers from a wild duck, is to dip the fowl in boiling water and then wrap it in a thick towel, which steams the feathers loose.



Retailed directly at five cents each or sold to merchants and manufacturers to be offered as prizes to their trade, these guns bring the home craftsman good spare-time profits as several hundred can be made in one evening

Rivets Heated for Small Jobs by a Blowtorch

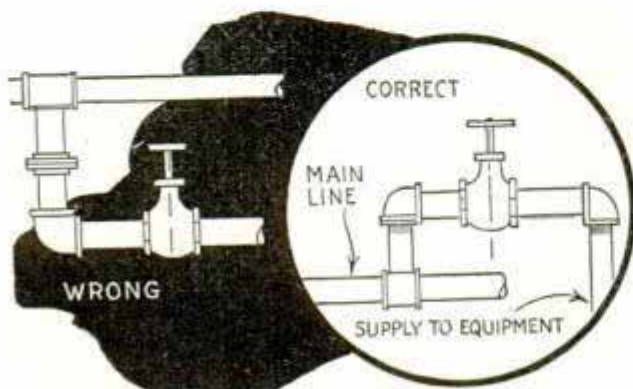


Flame of blowtorch concentrated inside of drilled sleeve which holds the rivets

Consisting of two short lengths of pipe, a tee and a floor flange, this rivet holder is handy when a few rivets must be heated for small jobs. The parts are assembled as shown and screwed to a table or large wood block. The flame of a blowtorch is directed into the end of the horizontal pipe, which is drilled to take the rivets.

A Hint on Branch Line Control for the Amateur Pipe Fitter

The amateur pipe fitter often runs into trouble when he installs a branch line because the control valve is not properly placed. In the detail marked "wrong," the branch line is suspended from the main line, and when the valve is closed, the pipe



How to install the shut-off valve on a branch pipe line to avoid water hammer

on the pressure side fills with water or condensed steam, as the case may be, which surges forward when the valve is opened, causing "water hammer," and often more serious damage. The circular detail shows how to install the valve to prevent this trouble.

Sanding Disks for Model Work from Golf Tees

Using golf tees in the chuck of his hand grinder, one home craftsman has found them ideal for sanding delicate parts in intricate model work. The face of each tee is flattened and to it is glued a tiny disk of sandpaper. Several of the disks kept at hand will allow a new wheel to be inserted instantly as soon as one becomes worn.



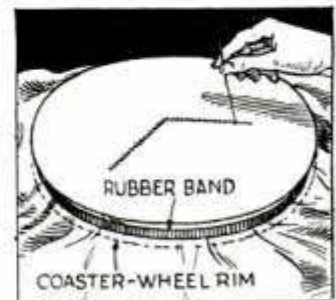
"Nail" Candles to the Holders



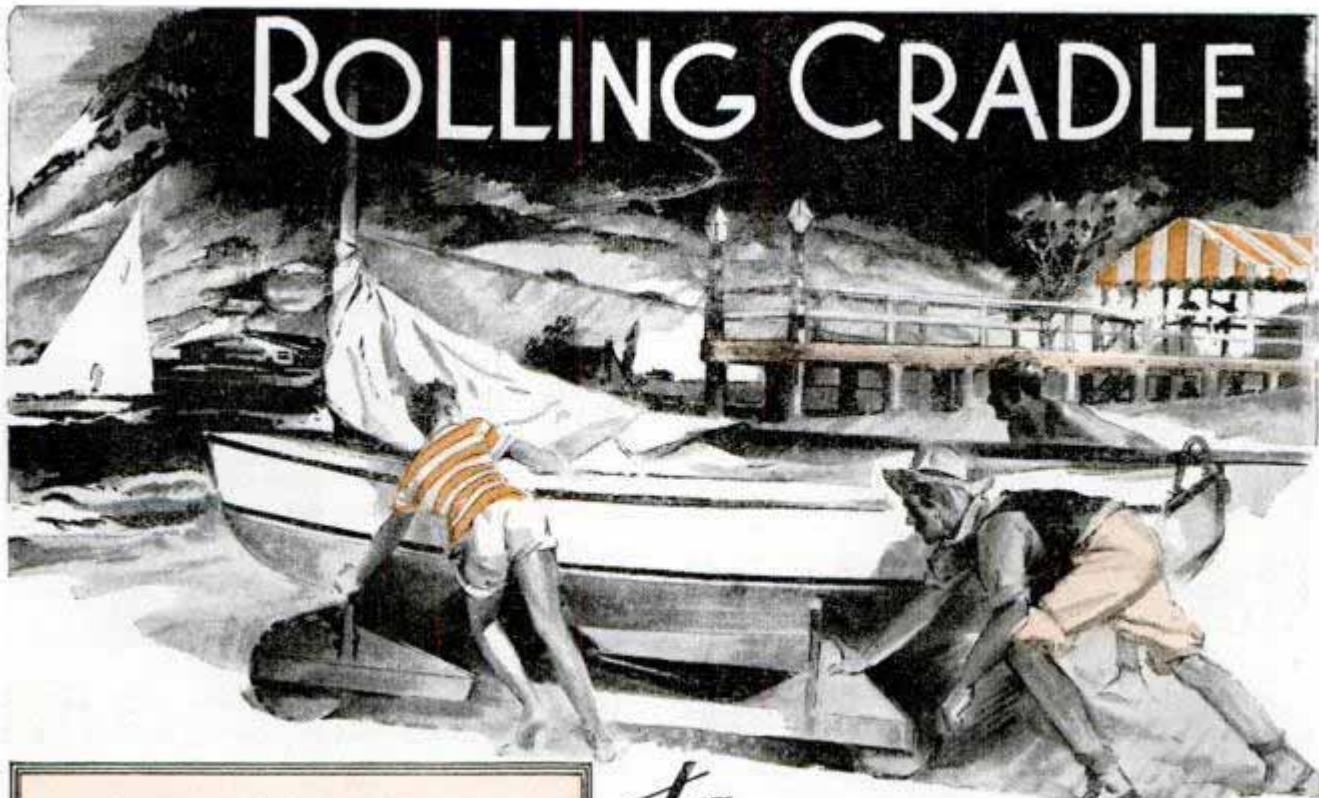
If you have a pair of wooden holders in which it is difficult to keep the candles upright, drill small holes through from the bottom so that nails can be driven to project inside the holders. Then slip the lower ends of the candles over the projecting nails.

'Embroidery Hoop' to Mend Sails

For holding canvas of a sail or tent taut when mending a tear, you can use the rim from a coaster-wagon wheel and a heavy rubber band. Stretch the canvas over the rim, then pull the rubber band over the cloth and rim as shown.



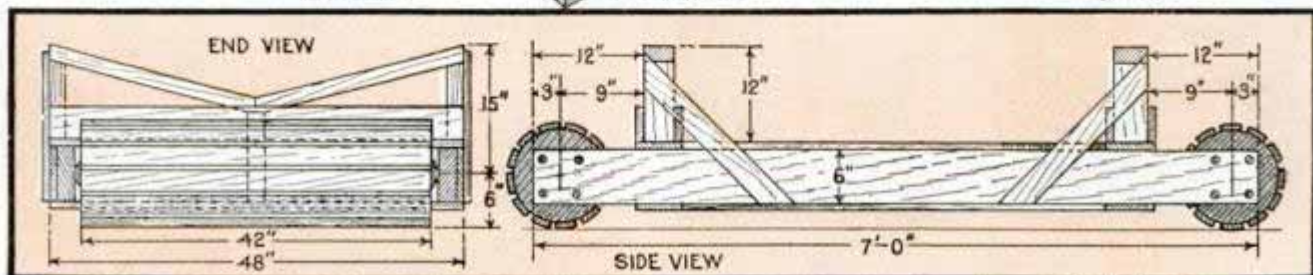
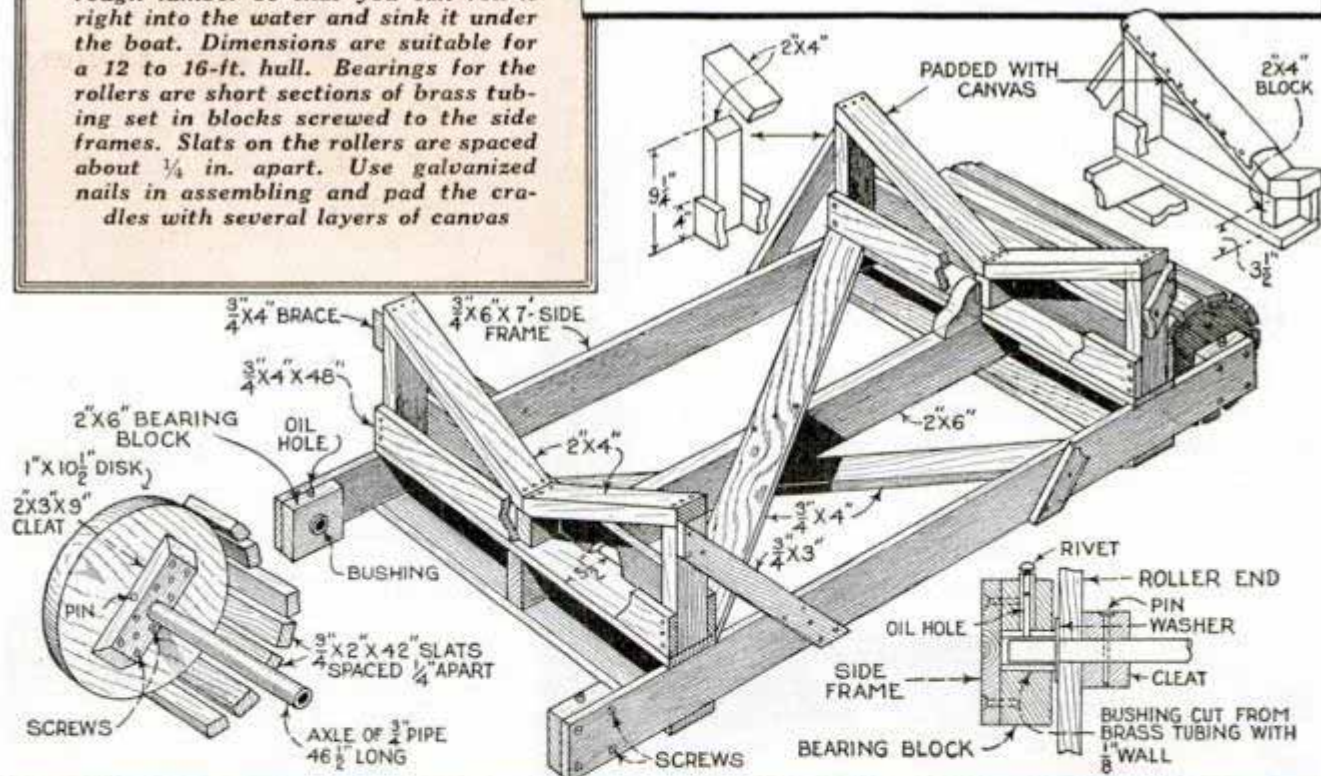
ROLLING CRADLE



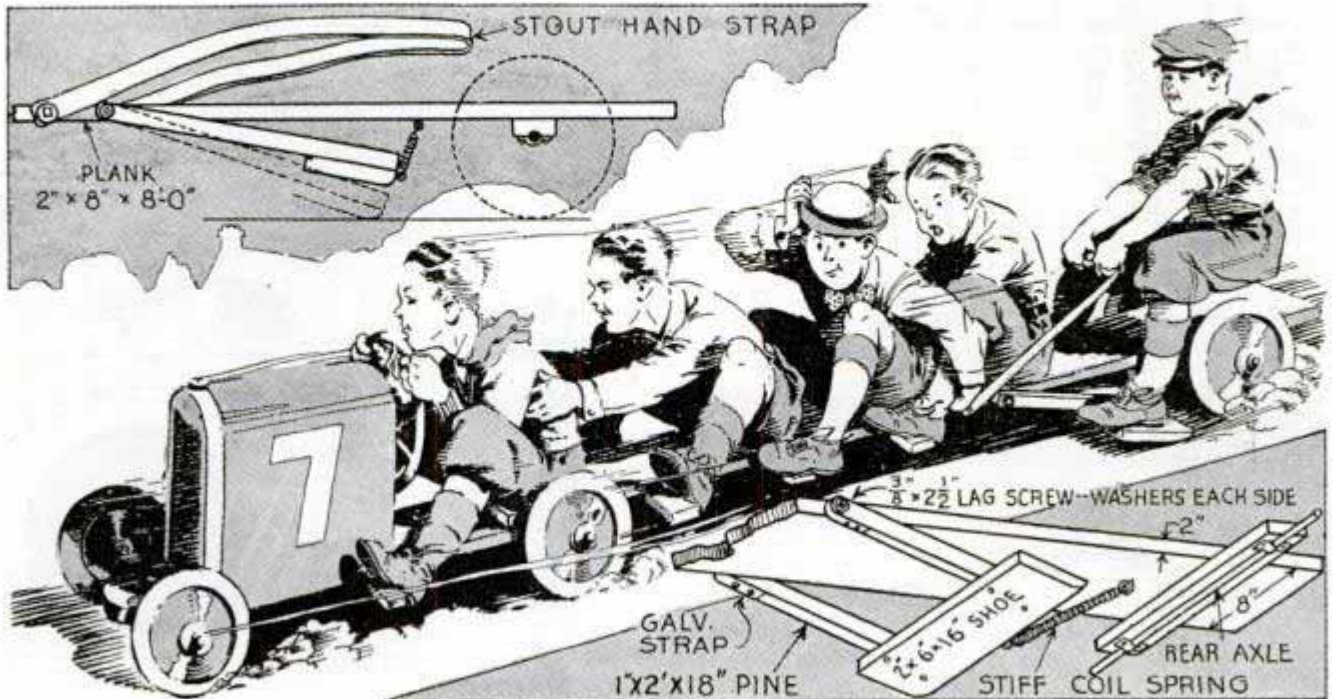
to

beach the sailboat.

"Caterpillar" treads on the rollers enable you to beach a large boat without getting stuck in the deep sand. The whole affair is knocked together out of rough lumber so that you can roll it right into the water and sink it under the boat. Dimensions are suitable for a 12 to 16-ft. hull. Bearings for the rollers are short sections of brass tubing set in blocks screwed to the side frames. Slats on the rollers are spaced about $\frac{1}{4}$ in. apart. Use galvanized nails in assembling and pad the cradles with several layers of canvas



Speedy Coaster Trailer Carries Six Passengers



Piloted by a driver and brakeman, this five or six passenger coaster trailer will give all the thrills of bobsledding, while quick stopping is easy with a powerful friction brake. The trailer consists of a 2-in. plank about 8 in. wide and 8 ft. long, the front end being pivoted to a coaster wagon. Crosspieces for footrests are bolted on the underside, and a pair of sturdy wheels are mounted about a foot from the rear end. The brake unit is attached just in front of rear wheels, and consists of a wood "brake shoe" fastened to the main frame by a pair of wood arms swinging on lag screws. A coil spring keeps the brake off the ground when not in use. To make it work, the brakeman puts his feet on the brake shoe and grasps a stout strap to exert as much pressure on the brake as needed.

Hinged Step in Closet to Reach Articles on High Shelves

Instead of getting a box, stool or chair to reach articles on high shelves of a closet or pantry, this hinged step is much handier and also much safer. It consists of an 8 or 10-in. board cut long enough to fit inside the door frame and is hinged to one side of the frame with strong hinges. A cleat or similar support near the bottom of the other side of the door frame holds the free end of the step when it is lowered. A turnbutton or spring catch holds the end of the step when it is in the raised position.

Paraffin Finish on Turned Work

After a turning in a lathe has been sanded smooth you can give it a finish that will bring out the color and grain of the wood with paraffin. Just hold a cake of the latter against the work as it rotates, then polish the work by holding a piece of cardboard against it.

—Robert D. Krout, Findlay, Ohio.



SPEED RIGGINGS *for*



MOST racing yacht models are fitted with a sliding mast step and jib rack. If you move the mast and sails forward, the boat will not have the same tendency to point up into the wind, while if you move it back, the boat will luff, or point into the wind more. In the 50-in. class there is no restriction on the movement of the mast, but in the International A-class the limit is $\frac{1}{2}$ in. either way from the measured point, which is fixed by trial. Almost the same effect can be obtained by raking (slanting) the mast. The angle at which the shrouds come down to the deck should remain approximately the same. This explains why the chain plates have several holes.

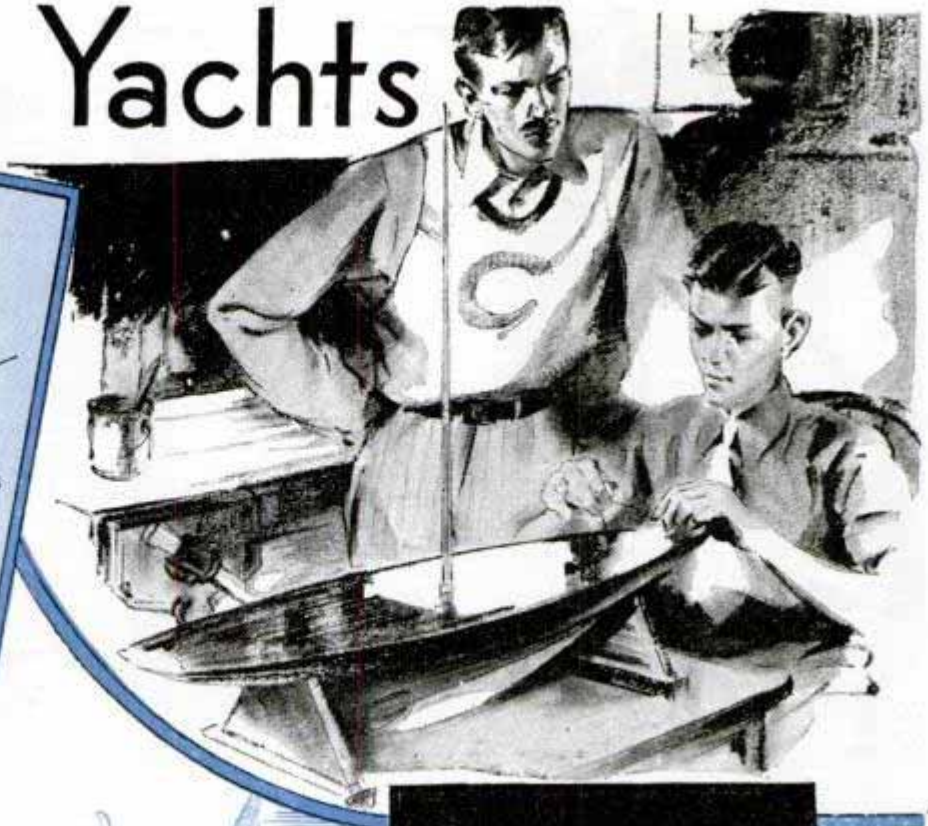
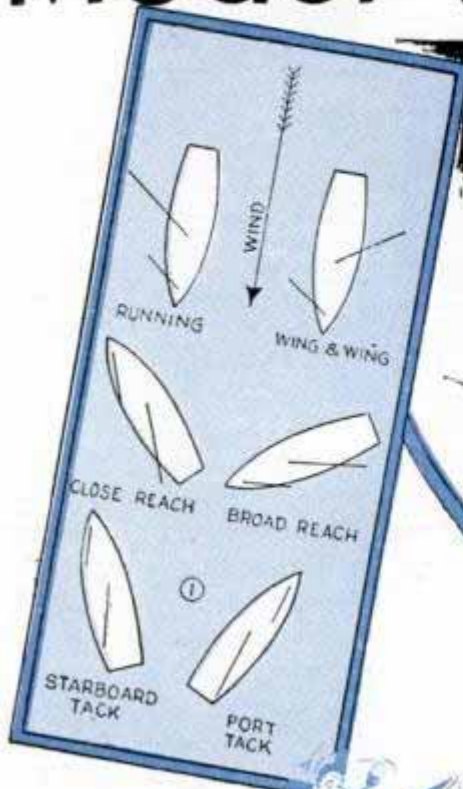
Most model yachtsmen now use a "kicking strap," to prevent the main boom going up while running, causing the sail to wrap around the mast. It consists of a double gooseneck with a stiff-wire kicking strap tightened by a turnbuckle, Fig. 2. The whole thing turns without friction caused by pulling against an outside object. When a boat is beating to windward, the steering sheets are not used, and the rudder is left free. Both jib and mainsail are trimmed in fairly tight, but not right amidships. The angle of both sails with the cen-

Important details on fittings, sails and rigging that make for quick handling during a race when every second counts

ter line of deck should be about the same. Should there be any difference, the jib should be in slightly more, as then the boat will pay off more quickly, in case she should luff up in irons (both sails flapping). If the course is a little more off the wind, say a close reach, Fig. 1, you can use the jib to steer by. Unhook the jib beating sheet and set the bowser on the running sheet on the jib boom to a position which lets it out to the angle required, and set the mainsail to a corresponding angle. The jib steering lines on deck should hook to the holes near the outside edges of the quadrant because there is not so much pull on the jib. Now place the slides in position to allow quadrant to turn a little. It is better to start with them about half way along the slots and just enough tension on the rubber to pull the rudder straight when the strain goes off the sail. Then, if the boat comes ashore you can quickly re-adjust the slide to the tension required. The tension required on the rubber will be found to vary with different wind velocities; the more wind the more tension required, and also the more rudder necessary to keep the boat off the wind.

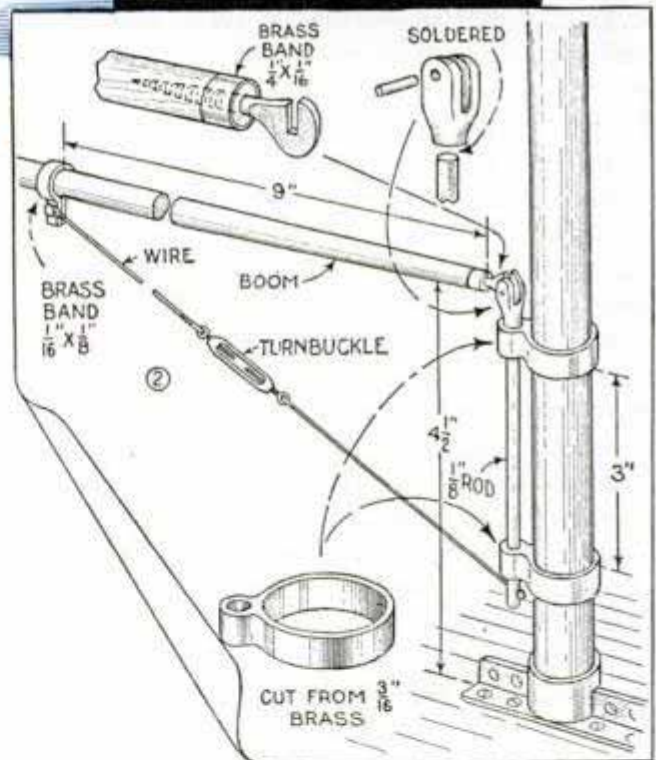
When running true down wind, the main-

Model Yachts

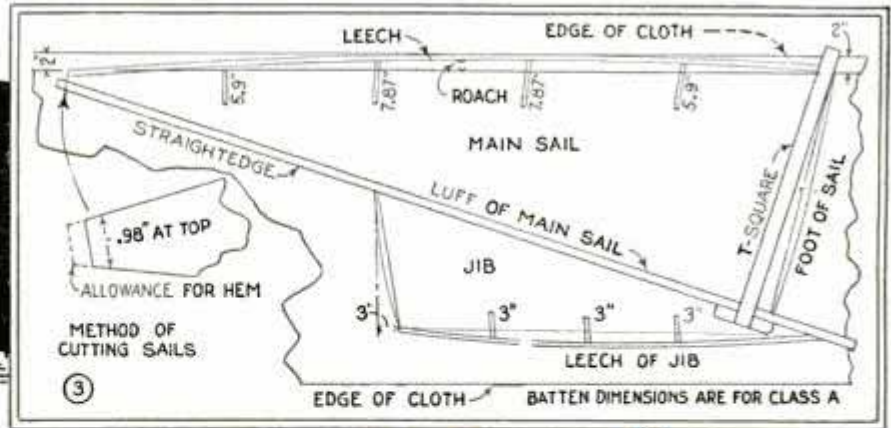


sail should be well out, but not enough for the boom to hang against the stays. The jib should be out at about the same angle. In this position the tendency should be to "jibe," or swing around on the other tack. But the jib would jibe first and at this position, Fig. 4, the jib will be pulling against the mainsail and should prevent it from jibing. If you are not using a spinnaker this method of sailing would be the best if you can get the mainsail and jib to stay on opposite sides. In any case you should be prepared for a jibe and have the other steering sheet set so that she will immediately jibe back, Fig. 5.

Spinnakers are now used in all model-yacht racing. In the A-class the size of spinnaker is limited by the hoist and foot of the jib. The spinnaker boom must not be longer than the distance from the foot of mast to where the luff of the jib cuts the deck, and must not be hauled up higher than where the jib halyard cuts the mast. In the Marblehead class the boom is limited to 12 in. and the hoist the same as the jib. Parachute-type spinnakers can



be made very large. Some are 72 in. along the foot, and are made in four triangular pieces with about 2 1/2-in. curve on each joining edge. They only work well in a good steady breeze. A gooseneck is necessary on the mast for use of the spinnaker boom. The beginner is advised to use a small, fairly flat spinnaker at first, cutting the foot the length of the base of the fore triangle plus half the beam of the

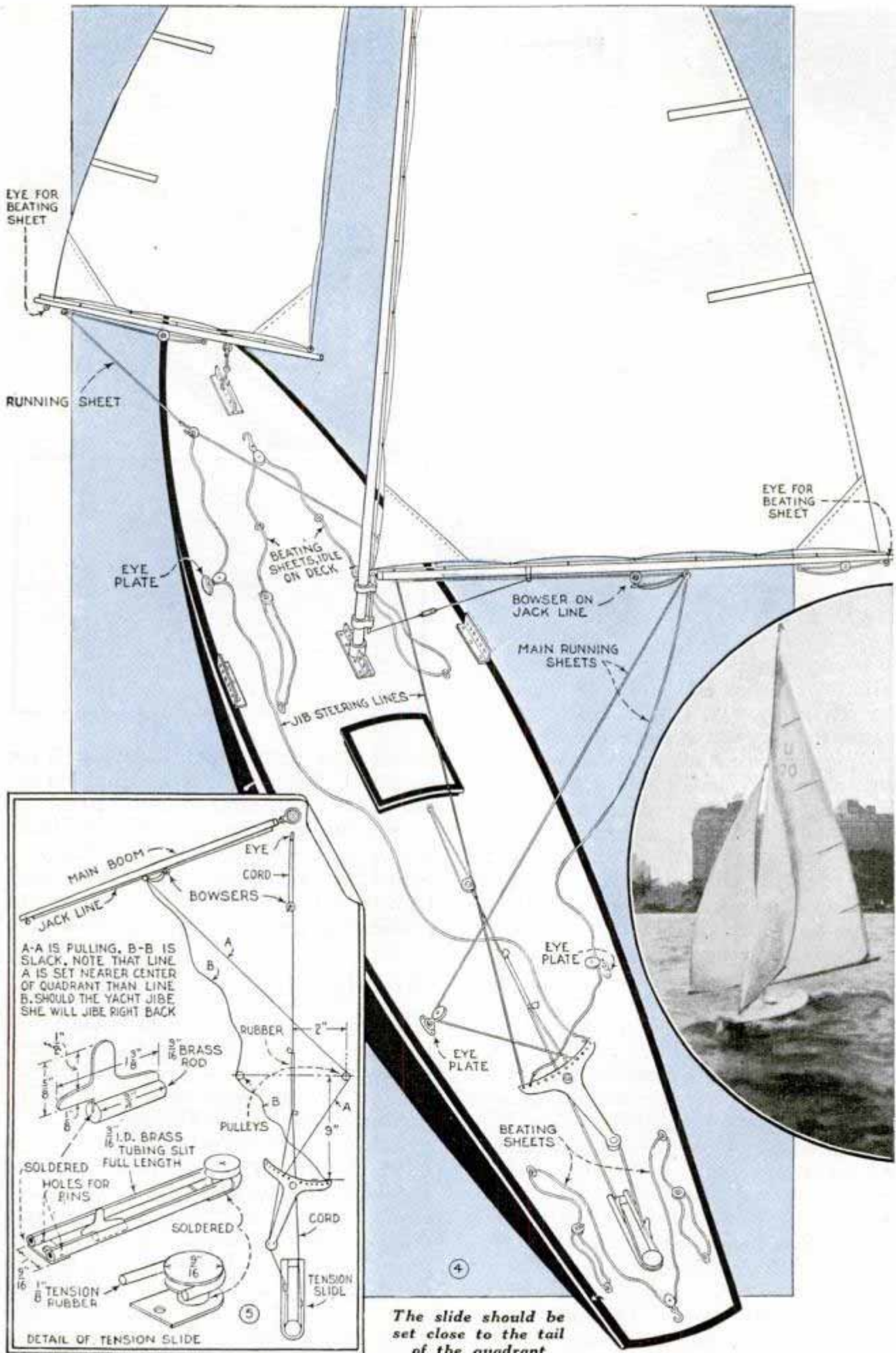


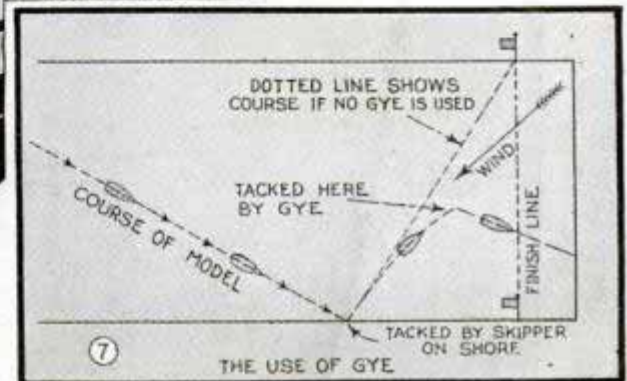
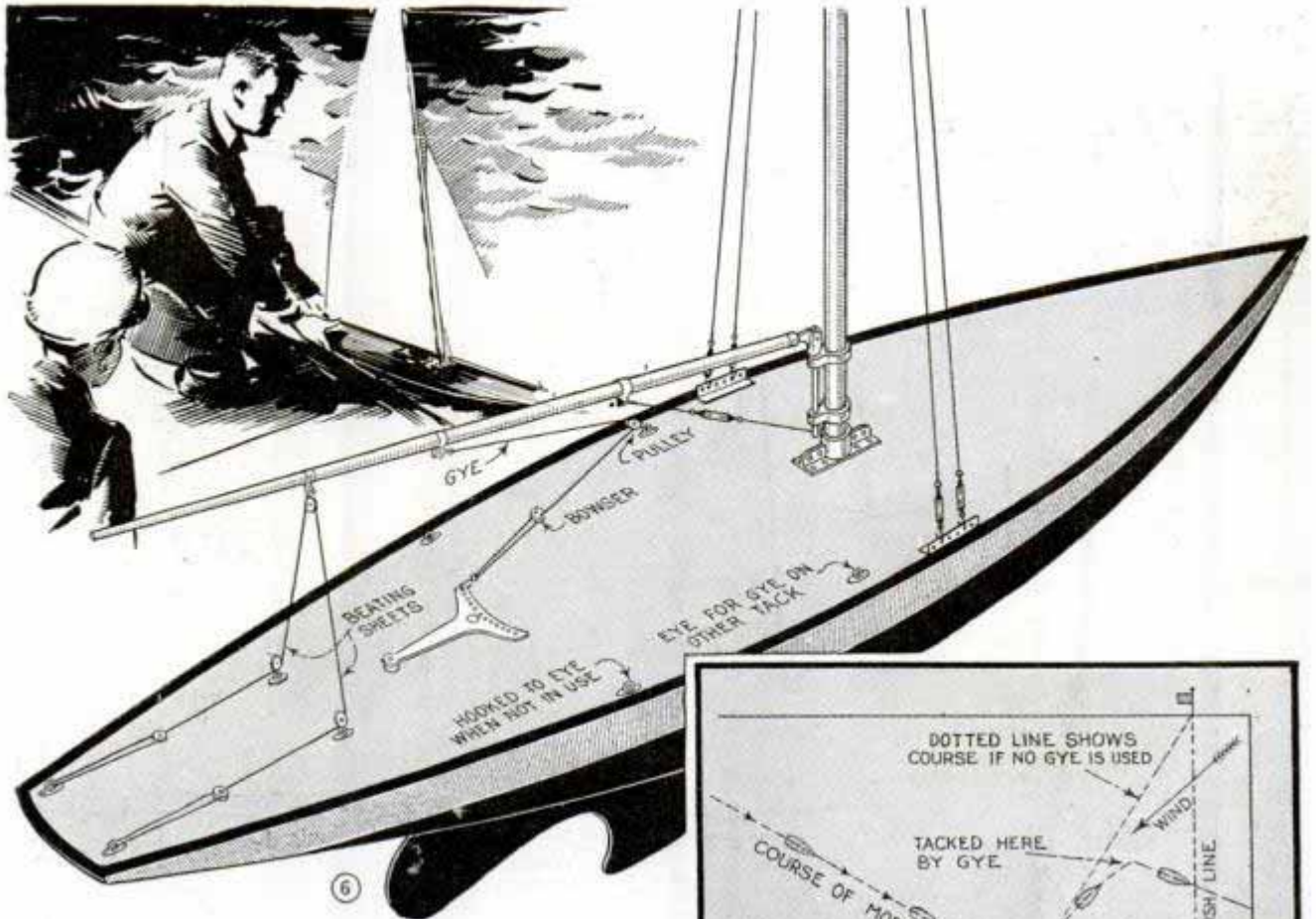
boat at the mast. This sail should be set between the jib and the mast, the sheet fastened aft of the stays on the rail. It is a good plan to have scale markings on the deck where the bowsers are, to enable you to get the same setting each time.

Sails are the most important fittings on a model yacht and if you make them yourself mark them out directly on the cloth, which should be pre-shrunk and pressed. You will need a straightedge about 7 ft. long, a $\frac{1}{4}$ by $\frac{1}{4}$ -in. batten about the same length, a T-square, and weights to hold the straightedge in place. On the straightedge mark a point a distance from one end equal to the length of the luff of the sail. At this point set the T-square and mark on it a distance equal to the length of the foot of the sail as in Fig. 3. Now move both so that the mark on the T-square will come to one end of the cloth about 3 in. from the edge, and the end of the straightedge about the same distance from the edge of the cloth at what will be the top of the sail. Before marking out, check the measurements with the sail plan, making any necessary changes. When you have the corner points correctly located, join with straight pencil lines. Next lay off the curve of the roach, the amount which you can put in depending on the length of battens and stiffness of the cloth. This is limited to 2 in. in the Marblehead class. If you put in too much roach the sail will

not draw. Pencil the curved line of the roach with the batten, using weights to hold it in place, and be sure you have a fair curve running well up above the top batten pocket and below the lower one. There are four batten pockets spaced equal distances apart. Make allowance for the headboard; for the A-class .98 in. and for the 50-in. Marblehead class, .75 in. Without making the sail wider at the foot you can increase it at the top the width of the headboard before adding roach. With the roach correctly located, mark lines on the inside and outside curve of the batten to give a $\frac{1}{4}$ -in. allowance for the hem. The writer prefers a straight luff. The foot of the main sail should have a little fullness, about $\frac{1}{2}$ in. in 36 in. Next, you mark out the jib. As the cloth lies on the bench, the luff of jib will be about parallel to the luff of the mainsail, Fig. 3. The roach in the jib is put in similar to the mainsail, and similar fullness allowed on the foot, in proportion to the length.

The leech of the sails is hemmed first and if corner pieces are used they fit under the hem. Great care must be taken not to stretch the cloth. The other sides should be taped as follows: Take some $\frac{5}{8}$ or $\frac{3}{4}$ -in. tape (linen preferred), wet it and iron it doubled. Fold the tape over one end of the sail and slowly start the machine by hand, taking only two or three stitches. Then pull the tape tight with one hand and feed the cloth into the fold with the other, keeping it straight. When the sail is finished you should be able to put considerable strain on the tape without pulling the sail. In making sails to meas-





urement for classes where restrictions are strictly observed, allowance must be made for stretching, say, 1 in. in height and $\frac{1}{2}$ in. on the foot of the mainsail. The jib is not measured in A-class, but some allowance should be made in 50-in. class. Batten pockets may be made of sail cloth or tape, the latter being easier. The battens can be made out of $\frac{1}{16}$ -in. celluloid, $\frac{1}{4}$ in. wide. Push in the battens, cut to length, then close the pocket with several stitches across the open end. When setting the sails, do not stretch them out the first few days, but let them gradually "bend" into shape. Should they get wet be sure to loosen them at both ends immediately, or in shrinking they will pull out of shape.

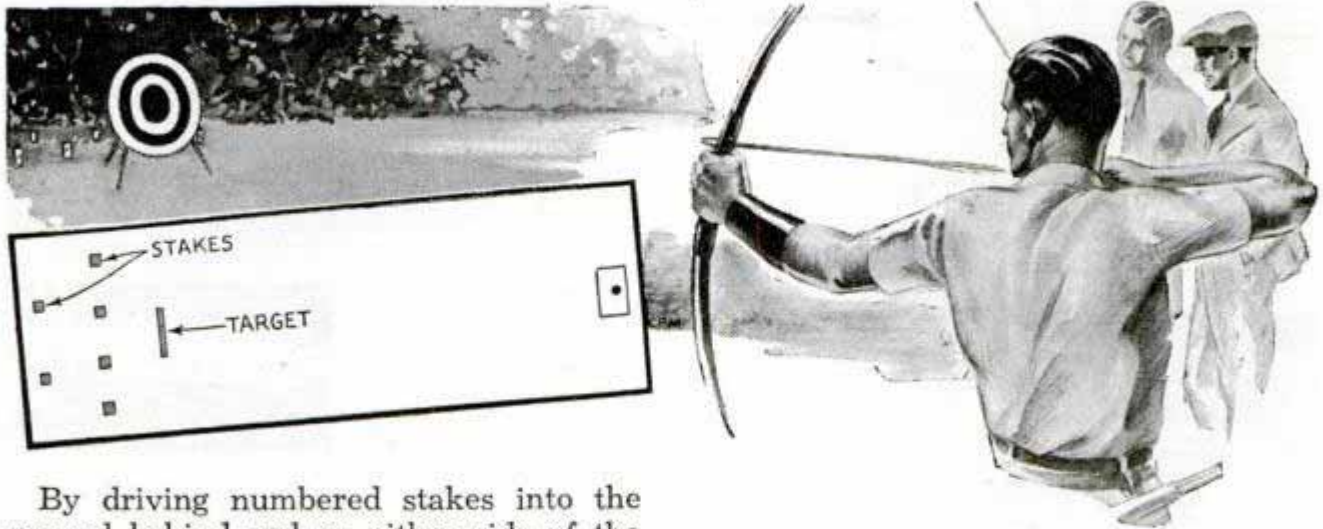
In pond sailing, where the models are handled from the shore, a "gye" is used to tack the boat a few yards off shore as in Figs. 6 and 7. It consists of a cord with a hook at one end, a pulley on a hook at the middle, and a hook and bowser at the other end. The first hook fastens to a ring on the main boom about 18 or 20 in. from the mast. The pulley is hooked to an eye plate on the rail about 1 in. aft of the stays. The other hook is fastened to the quadrant. To adjust the gye, hold the boom amidships and set the bowser so that

the cord is tight and ready to pull the quadrant. The gye is hooked up, but not set to "act" unless required. When the boat is sailing on the tack where the boom and pulley are on the same side, the gye is not pulling. If the boat is put on the other tack the gye should start to pull as the mainsail crosses the center of the deck.

Avoiding Leaks in Garden Pool

If a garden pool leaks and the concrete mix was correct, plastering and cement waterproofing coat properly applied, the trouble may be traced to lack of preparation given the rocks. The pores of rocks picked up in fields, or along streams are often clogged with foreign material and should be scrubbed with a stiff brush and strong soap, followed by a rinsing. Another cause of failure is using dry, porous rocks, which absorb water from the cement, causing it to shrink away from the rock slightly. Before beginning pool construction, pile the rocks and thoroughly drench them, then cover with wet sacks.

Numbered Stakes Mark Path of Lost Arrows



By driving numbered stakes into the ground behind and on either side of the archery target, you'll save both time and arrows when they are lost in the tall grass or shrubs. Remember the stakes marking the path of the missing arrows. When you are in the grass looking for them, place yourself in line with both the point where you were shooting and the point where an

arrow passed certain markers. While walking along in a line thus laid out it will be necessary to look only a few feet on either side of it to locate the arrow. For markers, use shingles painted white with large black numerals on both sides.

—Joseph Scott, Cambridge, Mass.

Pivoted Trough Automatically Fills Two Rain Barrels

If you keep a barrel at one of your downspouts to store rain water, here is a simple method of installing a short trough to automatically carry the water to a second barrel near by when the first one is filled. The trough is pivoted to the edge

of one barrel, as indicated in the detail, with the closed end directly under the spout so that this end hangs downward. A wide block nailed to the underside of the trough at the rear end serves as a float, which raises it as the barrel fills with water. When the barrel is filled, the trough conducts the water to the second barrel.

—A. S. Wurz, Jr., Rockyford, Alta., Can.

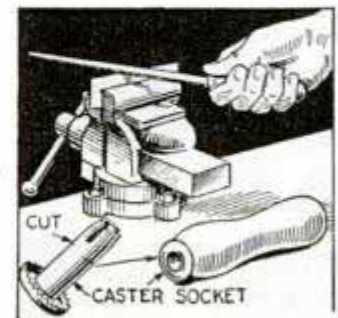


With this automatic arrangement you don't have to run out in the rain to switch the water trough from one barrel to another

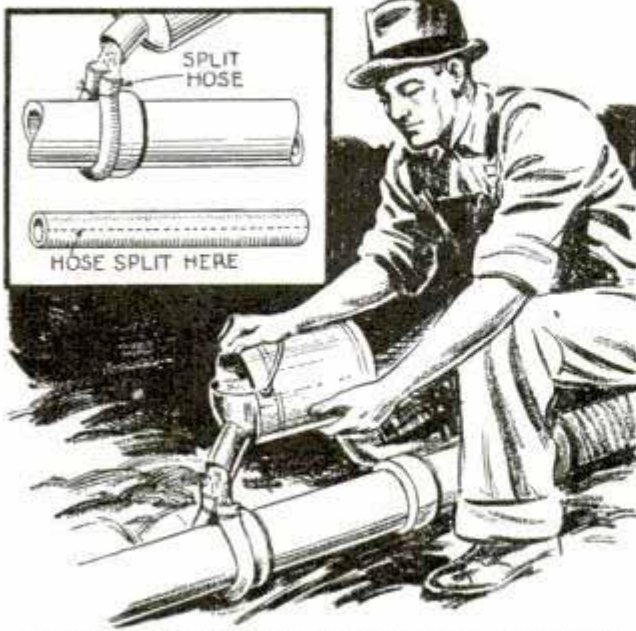
Tool Handles Given Neat Ferrules with Caster Sockets

Needing several ferrules to strengthen his tool handles, one craftsman utilized caster sockets taken from old furniture. The ends of the sockets were cut off to the right

length, after which they were driven firmly into suitable holes bored in the ends of the handles. Besides giving added support to the tools, the sockets gave the handles a neat finished appearance.



Soil-Pipe Joints Are Cemented Neatly with Rubber Forms



Anyone can do a first-class job of cementing soil-pipe joints with these rubber forms

Any inexperienced worker can cement sewer or soil-pipe joints neatly by using rubber-hose forms, which are made by cutting out a strip lengthwise after cutting it in pieces long enough to reach around the pipe. In use, a piece is drawn up around the pipe with the open side butting against the bell end of the pipe, after which the ends are tied together. Be careful not to fold or tie the hose so tightly that it closes. Next, a thin mixture of cement is poured into the hose, lightly tapping it with a hammer at the same time so that the cement will work well into the joint. When the cement has set, the form is removed, leaving a neatly rounded job.—A. H. Waychoff, Tempe, Ariz.

Paint Scraper of Hacksaw Blades



With this scraper, the painter who must remove old paint from a large area can do the job in a short time. It is made from ten or twelve hacksaw blades held parallel in a frame consisting

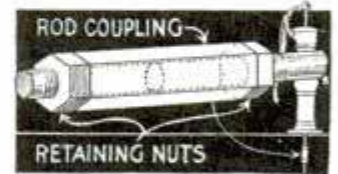
of a length of broom handle and two strips of sheet steel assembled as shown, wash-

ers being used between the blades to space them.

—Paul H. Smith, Charlestown, Mass.

Locking Pump-Rod Couplings

If a coupling on a pump sucker rod has a tendency to loosen, the trouble can be stopped by using lock nuts at each end of the coupling as shown. The nuts are driven on the threaded ends of the rod, after which the coupling is screwed on until the ends of the rod meet. Then the nuts are turned up snugly against the ends of the coupling.



—Don C. Higbee, Cantil, Calif.

Spice Boxes Placed on "Steps" Are Easy to Locate

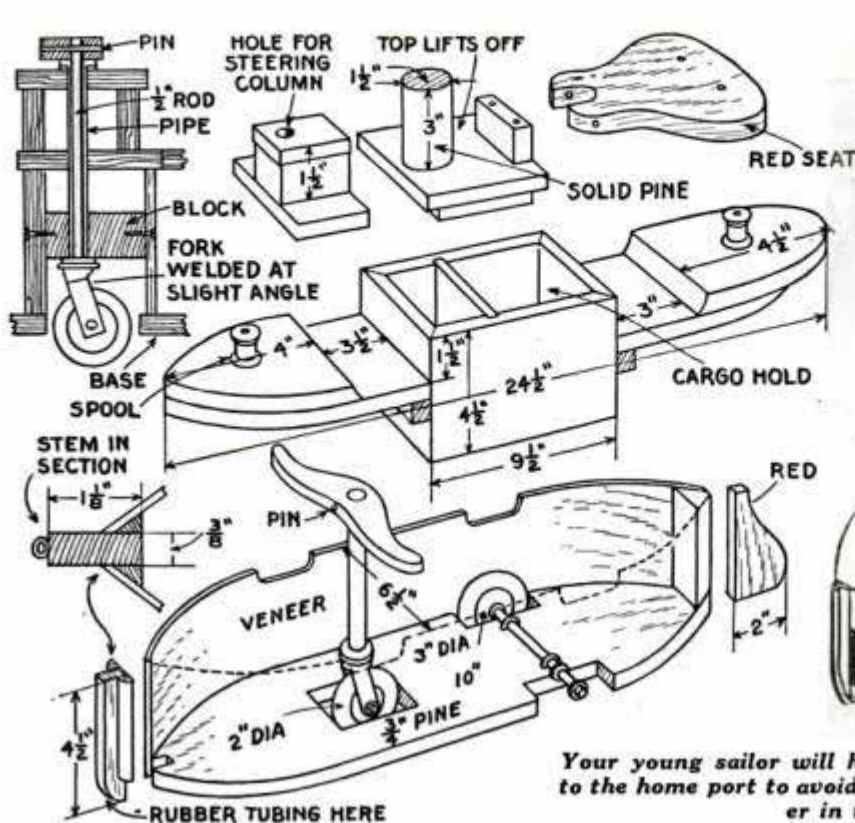
If you keep your spice boxes and similar small containers in a cabinet or cupboard, here is a simple support, shaped like steps, that will raise each row of boxes above the one in front so that any article can be picked out at a glance. Besides this, the support makes it an easy matter to clean the cupboard or cabinet, as all the boxes can be removed at one time.

—M. McElravy, Denver, Colo.



You can pick any spice at a glance if you keep the boxes on this stepped support

Sturdy "Floor Freighter" for Young Skippers

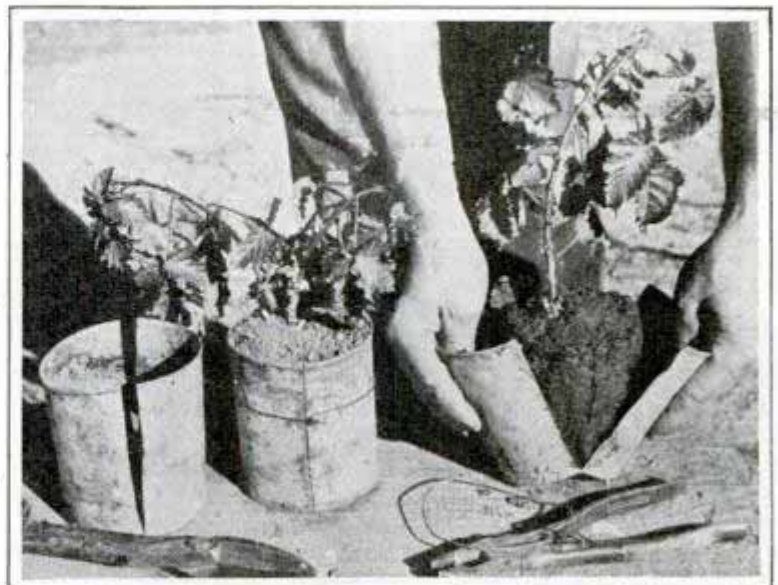


Your young sailor will have a lot of fun beating a sou'wester to the home port to avoid foundering this heavily laden freighter in the living-room sea

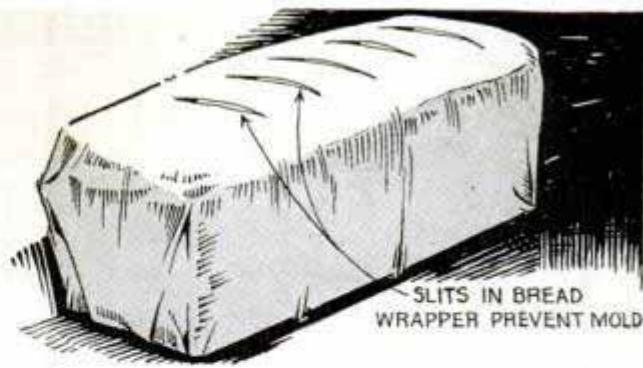
Youngsters will have a lot of fun with this trim "floor freighter" because they can fill the hold with building blocks and other freight, then climb aboard and pilot it to any port in the house. It is sturdily built and provided not only with rubber tires but has $\frac{1}{4}$ -in. rubber tubing along the "water-line" as well as on stem and rudder to prevent marring woodwork or furniture. The ship consists of a base and deck joined with sides of light plywood. A cargo well or hold is built in amidships and the decks are fastened to this by means of cleats. Note that part of the roof of the main cabin, carrying the funnel and seat, lifts off to give access to the cargo hold. The seat straddles the funnel and rests on a supporting block, screws being used for attachment. Steering is by a single small wheel, which is set in an inclined fork, so that in towing with a string tied to the capstan the ship will follow the direction of the pull. The steering post is set in a short section of pipe to serve as a bearing, and the handlebar is attached with a pin.

Removing Plants Potted in Cans

As it is difficult to remove potted plants from cans after they have established their roots, it is a good idea to cut the sides of the cans before potting the plants. After cutting, wire binding is used to hold each can together. When you are ready to remove the plants, simply untwist the wires and open the cans.



Plants may be removed from cans without disturbing the roots if the sides of the can are cut

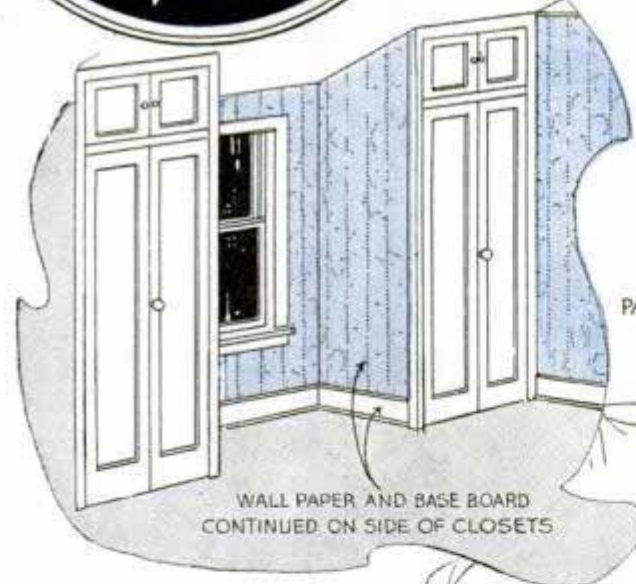


SLITS IN BREAD WRAPPER PREVENT MOLD

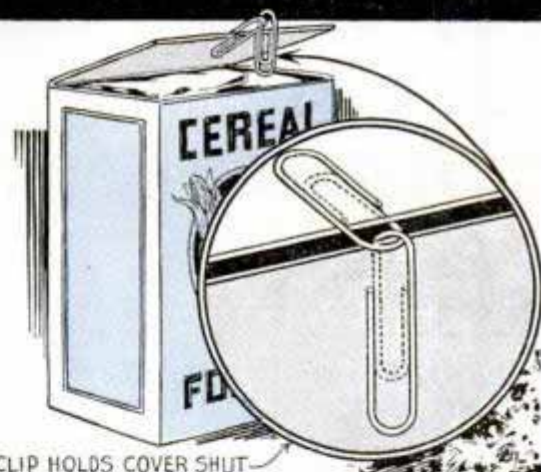
If you keep several loaves of bread on hand, it's a good idea to slit the wrappers as shown above, which will admit just enough air to retard molding. When skirts slip toward one end of a clothes hanger, just bend up the lower portion as shown at the left and pin the skirt to the ends, which will keep it straight and prevent wrinkling

Simple Methods of Solving Your

HOME



WALL PAPER AND BASE BOARD CONTINUED ON SIDE OF CLOSETS



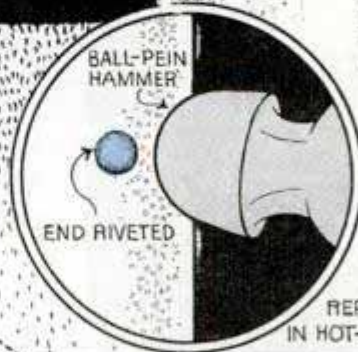
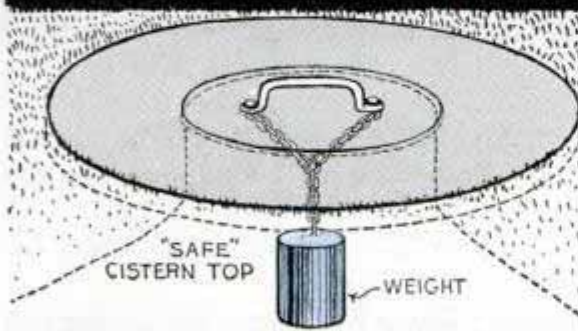
PAPER CLIP HOLDS COVER SHUT



NON-TIPPING CLOTHESLINE PROP

To close a cereal box tight you can use two paper clips as shown at the upper right. Corner closets of a bedroom will appear as part of the room instead of added "boxes" by simply continuing the wall paper and baseboard as shown above. A clothesline prop that won't tip and slide down the line is made easily from three light strips and a brace as shown at right

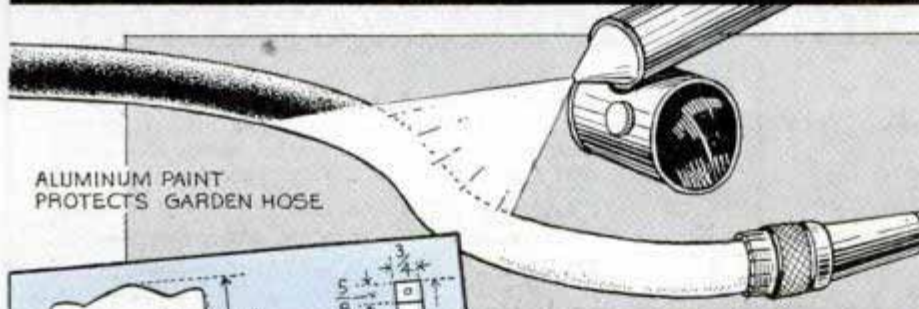
"Pin-hole" leaks in hot-water tanks are repaired by first enlarging the hole with a taper punch and tapping it. Then, after threading a piece of soft copper wire, turn this into the hole and cut it off, leaving a short projection, which is hammered down to expand the wire. Below, a weight fastened to the cistern cover makes it impossible for youngsters to lift the top



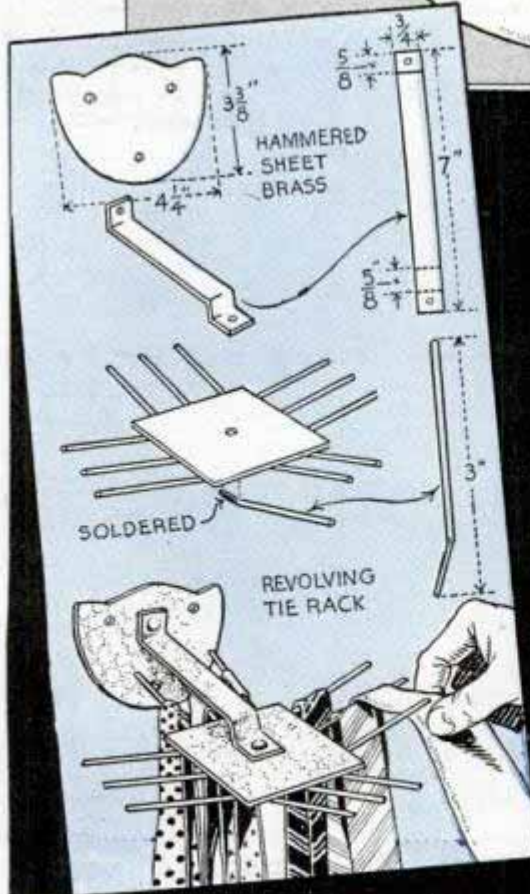
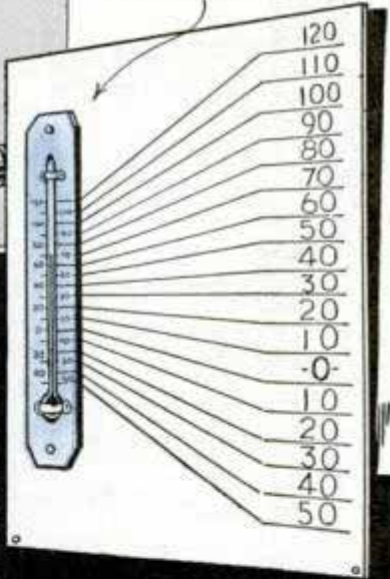
REPAIRING LEAKS IN HOT-WATER TANK



PROBLEMS



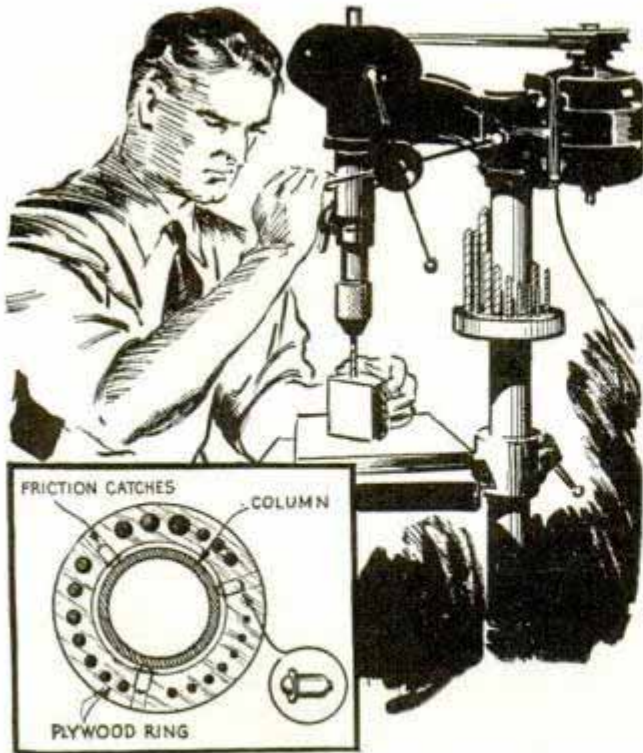
THERMOMETER MADE EASY TO READ



Aluminum paint sprayed on a garden hose reflects heat and keeps the rubber relatively cool. Right, extending and enlarging the temperature graduations of a thermometer on a cardboard mounting. The instrument is glued or riveted to a piece of cardboard. At the left are complete details for making an attractive revolving tie rack in hammered sheet brass



Cellulose tape, 1/2 in. wide, wrapped about the trigger guard of a loaded revolver reduces the danger of having it accidentally discharged if a youngster should happen to find it. The tape can be broken quickly in an emergency



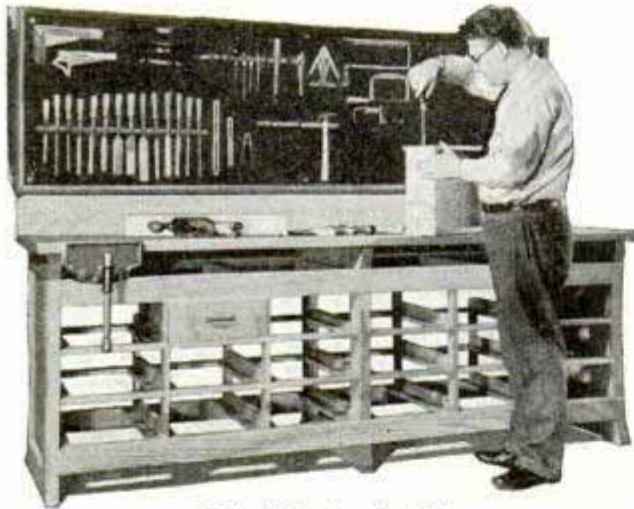
Adjustable Holder for Set of Bits on Drill-Press Column

Fitted with friction catches so that it will "stay put" at any desired height on a drill-press column, this holder consists of a plywood ring in which blind holes of various sizes are bored to take the drill bits. The inner opening of the ring is slightly larger than the column so that the friction catches can be fitted. The catches exert sufficient pressure to keep the holder from slipping, yet permit it to be moved when desired. The drill-press head is removed to slip the tray on the column.

—Wayne C. Leckey, Aurora, Ill.

☐ If large rubber heels are put under the legs of a mechanical refrigerator, they will help absorb vibration and make the machine more silent in operation.

Why Not Start a Home Workshop?



Cabinet Workbench—898

DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

BELT SANDER—579: Heavy-duty type. Angle-iron framework and a 5 by 46-in. belt—25c.

CIRCULAR SAW TABLE—910: Angle-iron frame. 24 by 36-in. table. 10-in. blade—25c.

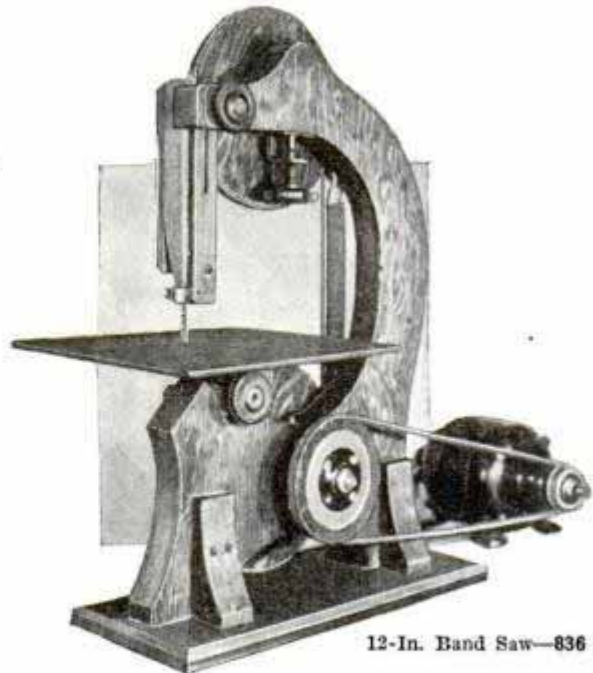
All six blueprints listed above will be sent to you prepaid upon receipt of \$1.00, or separately for 25c each. Also send 15 cents for our 1937 "What to Make" booklet which lists hundreds of other blueprints for practical craftsmen. These include plans for home improvement, furniture, novelties, toys, boats, models, outdoor sports, and many other miscellaneous subjects.

A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.

12-IN. BAND SAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.



12-In. Band Saw—836

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago

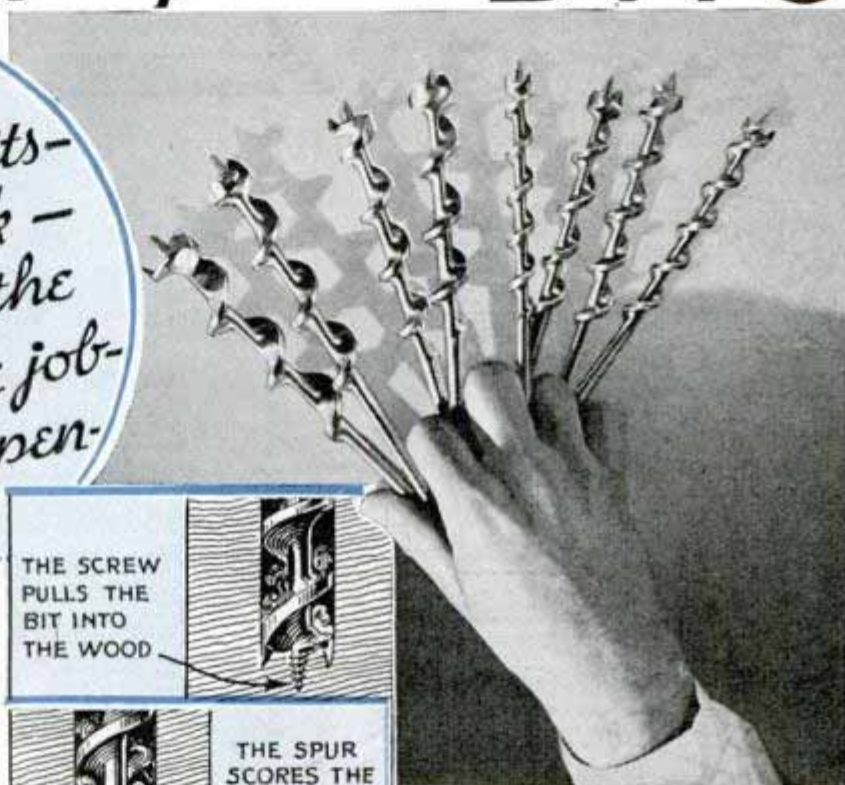
*A run/angle 120 to
Wilmington, Ohio*



KNOW *your* BITS

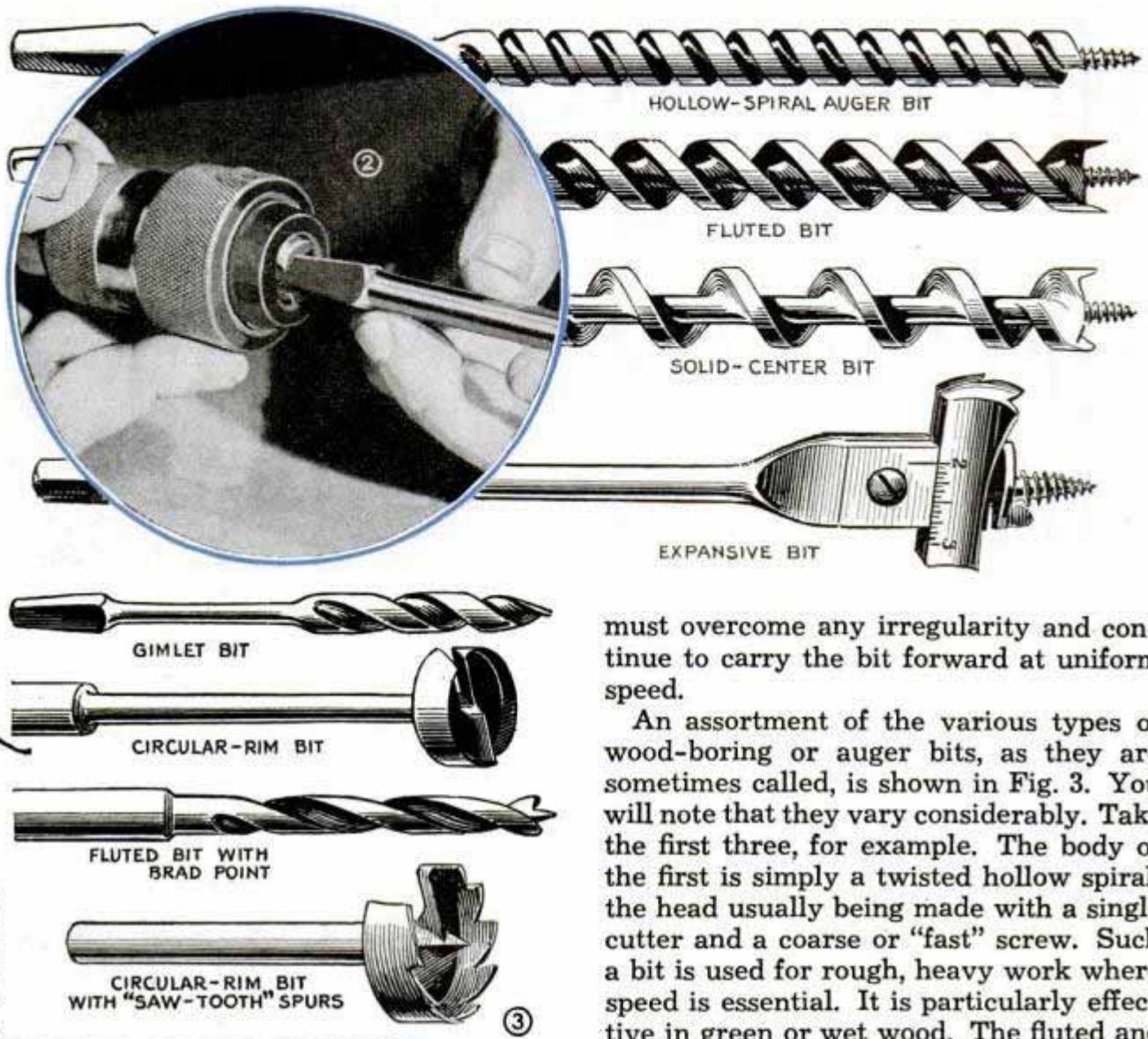
*All about
wood-boring bits—
how they work—
how to select the
right bit for the job—
how to sharpen—
etc.*

IF YOU pick up a wood-boring bit and examine it closely you will see that the head of the bit consists of a number of parts as shown in Fig. 1. Each of these does its own job when the tool is in use. The screw enters the wood first; then the spurs follow and finally the cutters. As soon as the latter strike the wood, the strain of cutting is thrown on the screw. In addition to this, the screw bears the lateral strains set up by the spurs when passing through irregularities of the grain. There is both pull and severe side thrust taken solely by the screw when the bit is passing through the wood. The spurs, it will be seen, function both as guides and cutters and determine the



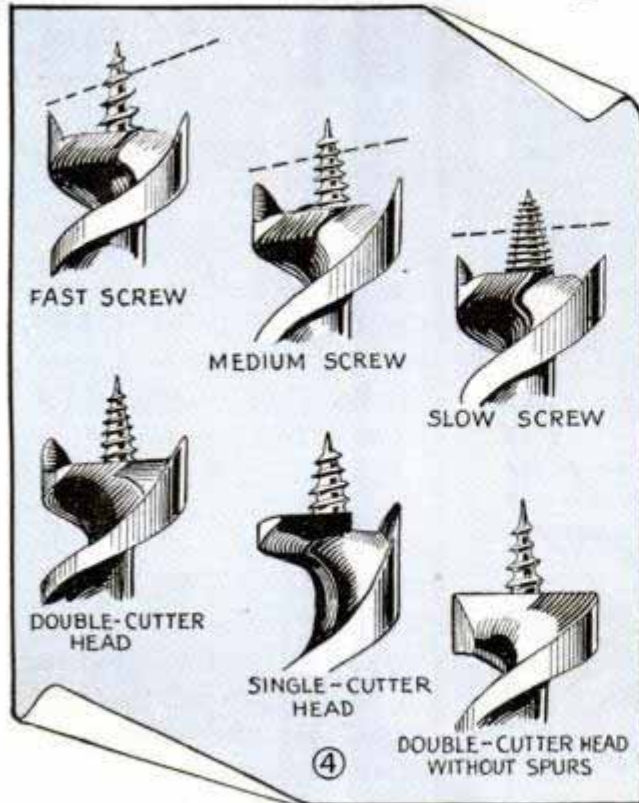
exact diameter of the hole. The leading edge of each spur scores the wood deeply, severing the fibers and forming a V-shaped groove, the outer side of which is vertical. The cutters merely lift the chip into the throat, from which it is carried upward by the flutes. Here is really a double-wedging action with force exerted in opposite directions. The wedging action of the cutters in lifting the chip tends to draw the bit into the wood, but the same action of the spurs tends to force it out. The pull of the screw

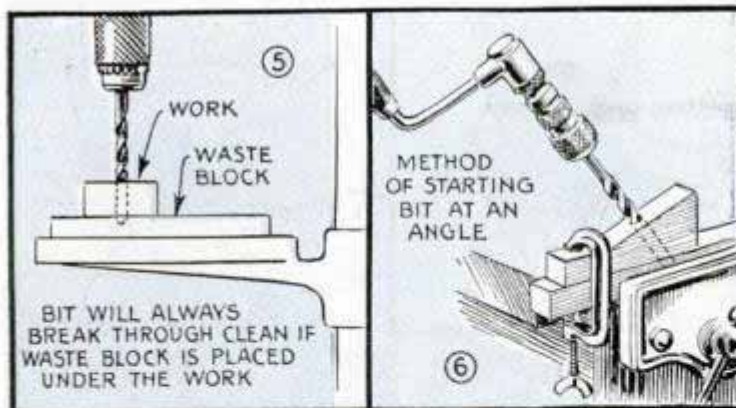
Stebbins Hardware Co
Woodworkers Tool Works



must overcome any irregularity and continue to carry the bit forward at uniform speed.

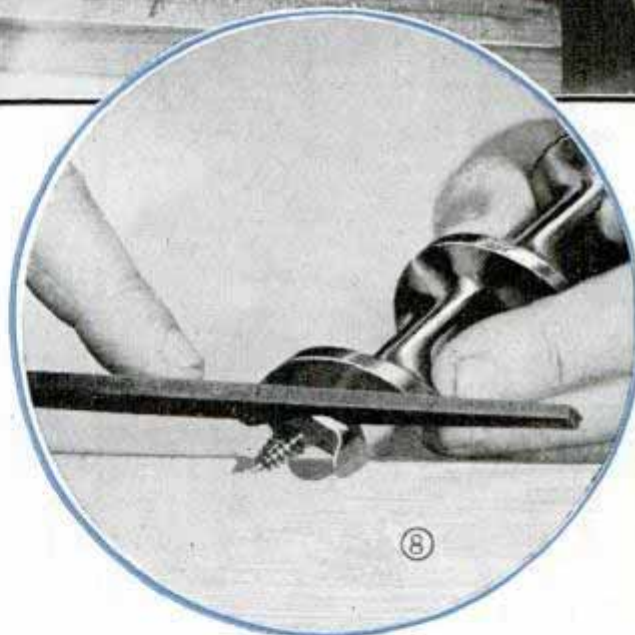
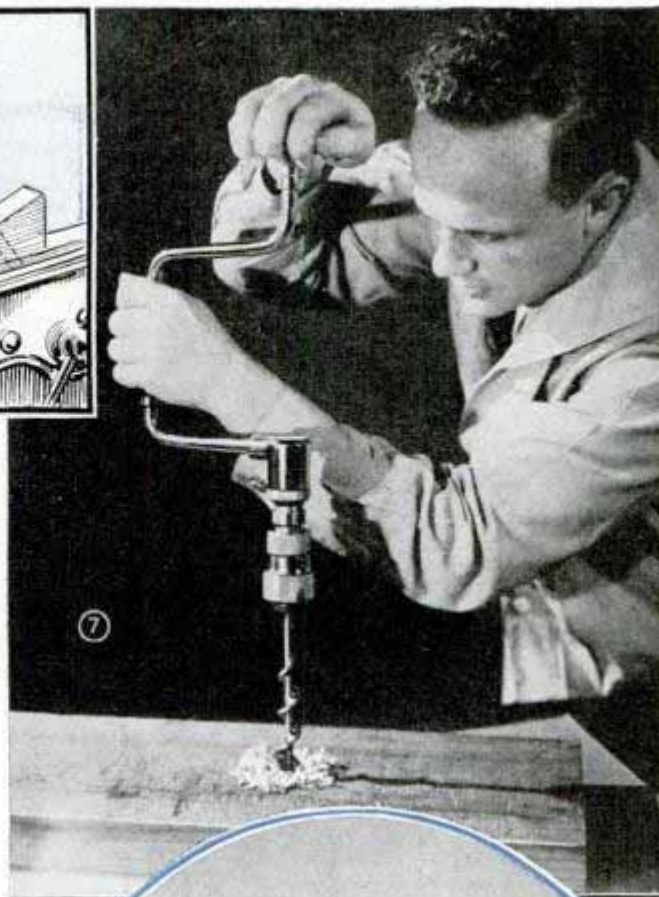
An assortment of the various types of wood-boring or auger bits, as they are sometimes called, is shown in Fig. 3. You will note that they vary considerably. Take the first three, for example. The body of the first is simply a twisted hollow spiral, the head usually being made with a single cutter and a coarse or "fast" screw. Such a bit is used for rough, heavy work where speed is essential. It is particularly effective in green or wet wood. The fluted and solid-center bits are designed for fine work where holes must be bored smooth and to exact diameters. Both types of bits are usually furnished with either a medium or "slow" screw, Fig. 4, and have two spurs and cutters. The characteristics of the expansive bit differ from the others in that there are no flutes along the body, and one cutter and spur are adjustable in a transverse direction so that the bit can be made to bore holes of varying diameters. The expansive bit and the gimlet bit are handy to have, even in the household tool kit, the gimlet being especially useful for boring holes in either hard or soft wood. Two of the remaining three styles shown are designed exclusively for use in a drill press, although any one of them will operate satisfactorily when turned with a brace. Two types of circular rim bits are shown, the first having what is really two continuous spurs, each extending from the cutter around the cir-



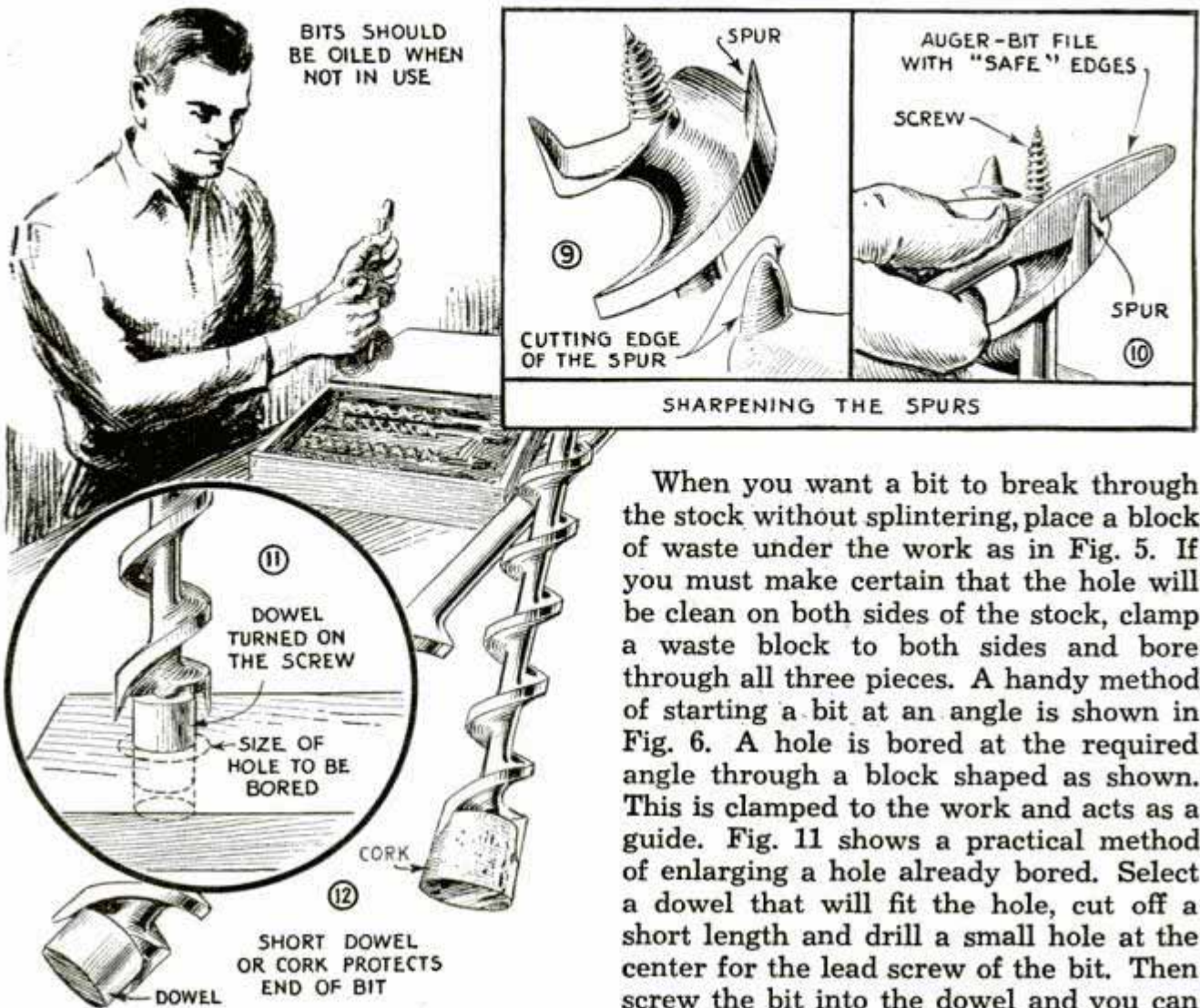


cumference to the chip slot just ahead of the cutter following. There is no screw or brad point, the circular rim acting as a guide. Although this bit bores slowly and, when driven in a drill press, must run at a comparatively slow speed, it is capable of producing the finest and most accurate work. It is supplied with either a straight shank for the drill press, or with a squared and tapered shank for the brace. The second bit of this type shown in Fig. 3 has a single cutter and a continuous saw-tooth spur. It is especially suitable for boring holes in thin wood and is supplied with a straight shank only. The fluted machine bit, Fig. 3, is similar to the metal drill except that it has two cutters, two spurs, and a brad point. It is suitable for high-speed work and is supplied with a straight shank.

One essential step to good work with a wood-boring bit is shown in Fig. 2. The jaws of the better grades of braces are curved and V-grooved and are opened and closed by tapered or beveled rings actuated by the outer threaded sleeve of the chuck. When chucking a bit it is necessary to see that the corners of the square shank are placed in the V-grooves and also that the shank is pushed into the chuck as far as it will go. To assure that the corners of the shank remain in the grooves, the jaws are opened just far enough to admit the shank. When the chuck is tightened, the bit will be straightened and held parallel with the axis of the brace. A bit in good condition will enter the wood and continue to bore with very little downward pressure on the brace, as in Fig. 7. Bits that are well cared for seldom need sharpening, but it is important that this be done properly. Fig. 8 shows how the cutters are sharpened with a special auger-bit file having one smooth or "safe" edge. The



bevels on the cutting edges should be kept just as near the original form as possible. If, for example, the angle of the bevel is shortened, the chip will be curled tightly and the bit will tend to clog. Only the top of the cutter should be filed; never the bottom as this will flatten the clearance angle. When you file the cutters it's a good idea to touch up the spurs also. In filing the spurs, the important thing is to keep the original shape. With care, this can be done with the bit file as in Fig. 10. Notice particularly that the inside face of the spur is convex and that the sharp edge is continuous. It is necessary that the cut-



ting edge be sharpened so that it will cut in either direction. This prevents possible breakage should it be necessary to back the bit out of an unfinished hole. The smooth edge of the file should ride on the bottom of the cutter. The trick in filing is to take off an equal amount from each spur, the greatest care being taken in each filing to avoid reducing the thickness of the spur at the base. Likewise, when filing the cutter, care must be taken to round the end of the bevel at the point where it meets the solid center just above the screw. This can be done with a small round file, taking out the square corner formed by the filing of the bevel. Should this corner be allowed to deepen gradually, it will materially weaken the support of the screw. If you keep your bits in a soft-wood box or in a folding cloth holder they will need very little sharpening. It's a good idea to have an oily cloth handy and turn the bit through a fold of the cloth when you finish using it.

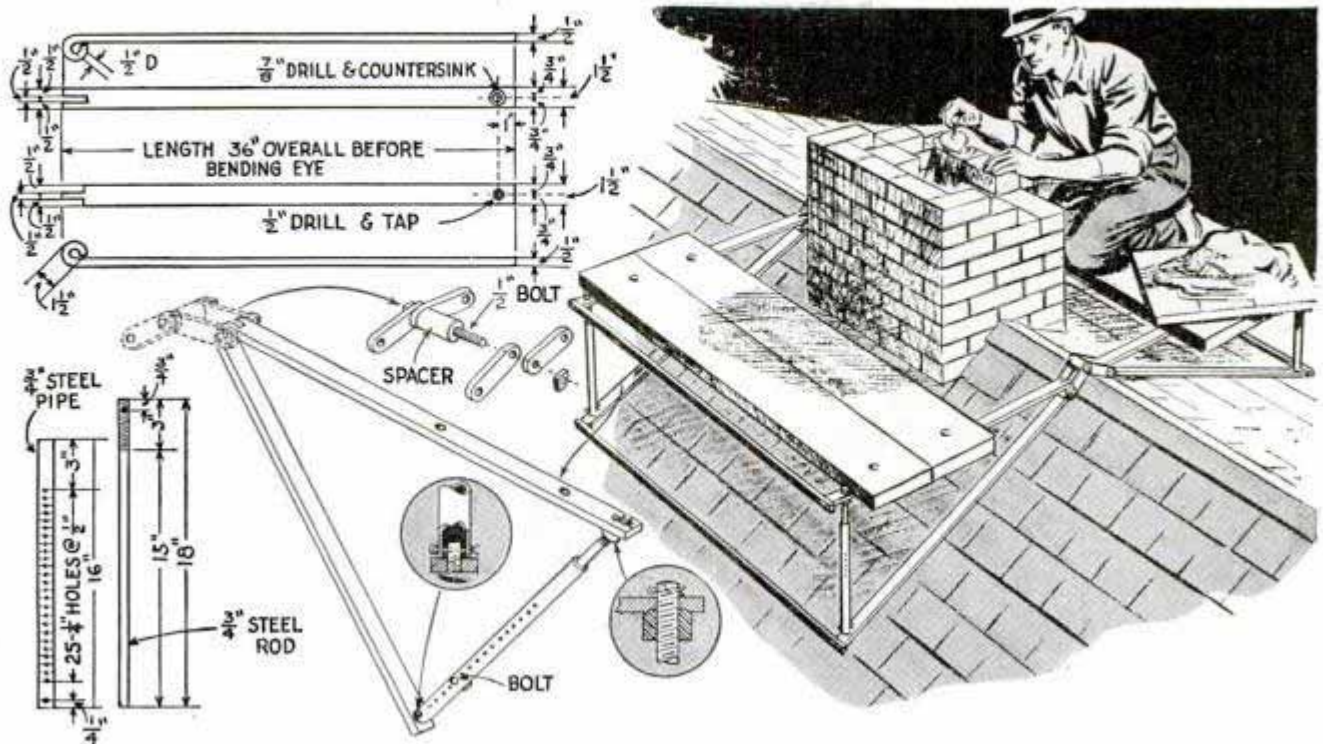
When you want a bit to break through the stock without splintering, place a block of waste under the work as in Fig. 5. If you must make certain that the hole will be clean on both sides of the stock, clamp a waste block to both sides and bore through all three pieces. A handy method of starting a bit at an angle is shown in Fig. 6. A hole is bored at the required angle through a block shaped as shown. This is clamped to the work and acts as a guide. Fig. 11 shows a practical method of enlarging a hole already bored. Select a dowel that will fit the hole, cut off a short length and drill a small hole at the center for the lead screw of the bit. Then screw the bit into the dowel and you can bore the hole easily, the dowel acting as a guide to keep the larger bit in line with the axis of the smaller hole. If you have to carry your bits with other tools, Fig. 12 shows one way of preventing damage to the head. Select a cork or dowel to fit each bit and, as soon as you have finished using the tool, turn the screw into the cork or dowel in the manner shown.

Heating Water in Summer Cottage

In our summer cottage we had running water and a cesspool, but used kerosene for cooking and a fireplace for heating. We also had a shower bath and kitchen sink with only cold-water connections from a spring so cold that the water was unbearable. Getting an old gas-heater coil, I removed the gas burner and substituted a one-burner kerosene stove. Then I connected the coil to a tank. This apparatus heats our water satisfactorily and is inexpensive to install and operate.

—F. Austin Troutman, Fremont, Nebr.

Folding Scaffold Is Adjustable to Roof Pitch



Amplly strong and rigid when set up, this scaffold folds into a small, compact unit for transporting to or from the job. It consists of four triangular members hinged together to support the planking on which the workman stands. The whole thing straddles the gable, the triangular

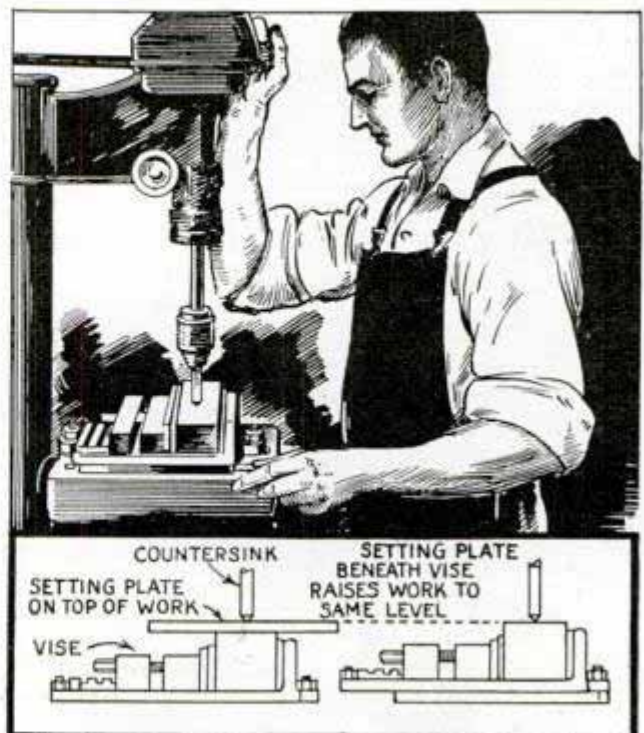
supports being adjusted to bring the planking level. This adjustment is made by sliding a 3/4-in. rod in a length of pipe through which a number of holes are drilled transversely for a pin which is slipped under the end of the rod.

—Paul H. Smith, Charlestown, Mass.

This Countersink "Setting Plate" Assures Accurate Work

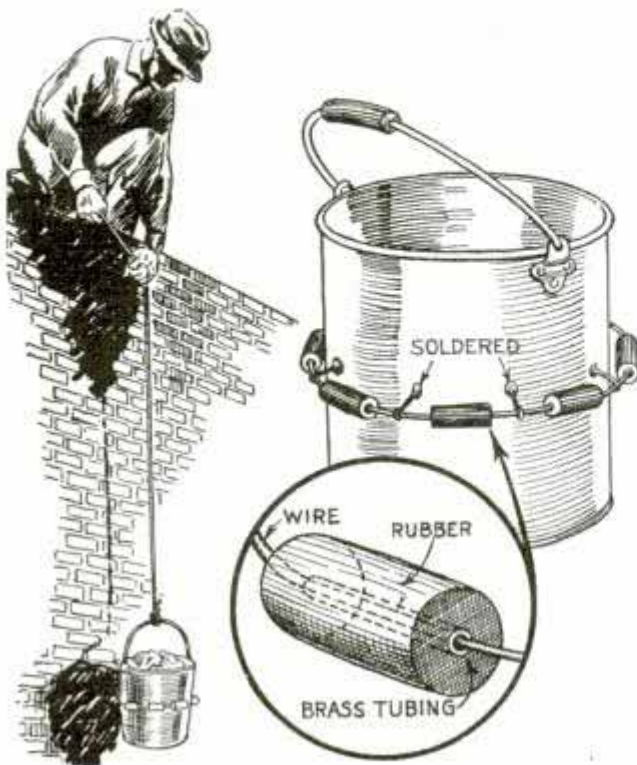
A good way to set a countersink to the correct depth without trial is to use a setting plate as shown. It is a flat piece of steel or cast iron with various sizes of standard countersunk holes in it. To use the plate, lay it on top of the work. Then bring the countersink down into the hole to be duplicated in the work, and tighten the drill-press stop. Then remove the plate and place it under the work, so that the latter will be in the same relative position as the plate was, and the hole in the work will be an exact duplicate of the one in the plate.

—Harry Moore, Hamilton, Ont., Can.



ⓘ Before attempting to grind bronze or aluminum, give the surface of the grinding wheel a liberal application of soft soap, which will help keep the wheel from "loading up" with the soft material.

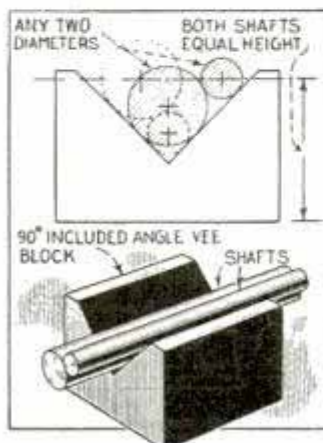
Contractor's Hoisting Bucket Has Rollers on Side



Rubber rollers on side of hoisting bucket keep it from catching on side of building

On a repair job where it is necessary to raise materials to the top of a building in a bucket, one contractor uses a container fitted with rollers around the side so that it will not catch on the wall. They are cut out of solid rubber and are fitted with bearings of brass tubing. The rollers are strung on a heavy wire ring, which is attached to the bucket by short pieces of wire soldered or welded in place as shown. Sections of the wire ring between supports are straight to prevent binding

Holding the Centers of Two Shafts at the Same Height



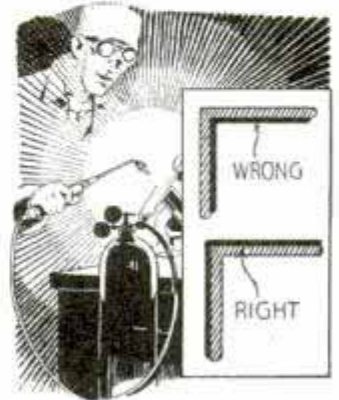
When two shafts of different sizes have to be marked off in the center, and it is necessary that they be held at the same height for testing, but welding or brazing, an easy way to hold them is to use a 90° V-block.

Lay the shafts on one side of it as shown. Then, if the position of the shafts is reversed, the center height of the top shaft will be the same. This holds true for any size work that will lie in the block.

—H. Moore, Hamilton, Ont., Can.

Welding Joints in Angle Iron

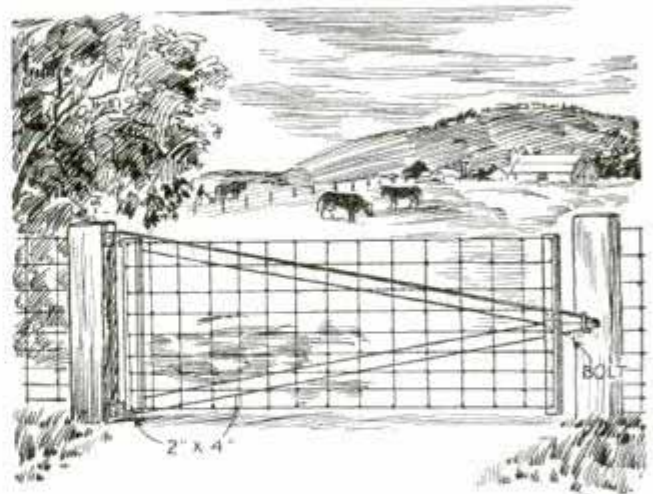
Although angle-iron joints are often welded on the inside surface for the sake of appearance, they will be much stronger if the welding is done on the outside surface where most of the strain is found. The outside weld is especially important if the angle iron is used in machinery or structural work where there is considerable vibration.



—L. H. Georger, Buffalo, N. Y.

Non-Sag Gate for Small Cost Is Easy to Build

Why pull sagging gates around when this one can be made quickly and inexpensively? It is made of only four pieces of 2 by 4-in. stock, yet it is unusually



Here is a gate that you can make and hang in an hour, yet it is as strong as any fence

strong. Woven or barbed wire is stretched tightly between the end pieces, the gate being swung by means of hook and strap hinges.—Denver Jewell, Sullivan, Ind.

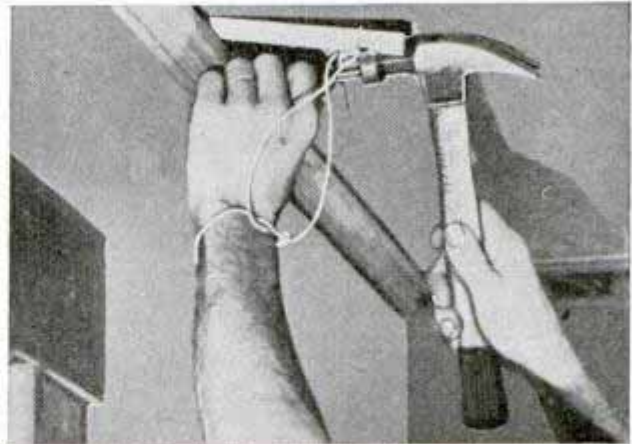
Four Simple Hints That Help the Carpenter

In order to space picture molding uniformly from the ceiling, try this simple gauge block. It is a wedge-shaped piece of wood which you slip between the molding and the ceiling as shown in the upper photo. To keep the block at hand, tie an 8 or 10-in. length of cord to it, the cord being looped to slip over your left wrist. In this way you can use both the wedge and the nailset without the bother of searching your pockets for them.

On a job of building in a corner table or cabinet, where the table top or shelves are to fit closely against the wall, two edges must be cut to conform to the irregularities of the wall while the front edge is kept at a 45° angle. Marking the sides to be fitted is an easy matter if you take a small block of the same shape as the piece to be cut. The block is placed against the wall with one edge parallel to a line drawn at right angles to the front. Then, with the pencil point placed at the edge of the block as shown, a short distance from the wall, the block and pencil are moved together, keeping the latter from slipping out of place. After one side has been marked in this way, the block is reversed and set against the other wall and marking is done in the same way. To compensate for the stock removed, the shelf or table top should be cut slightly oversize.

A nail set will punch its way through the tubular pocket in your overalls and will then slip down below the top where you can't reach it without fumbling and loss of time. Such trouble can be avoided by cutting a 5/8-in. dowel of a convenient length, boring a 3/8-in. hole nearly full length to form a socket, then pushing this into the pocket to serve as a liner.

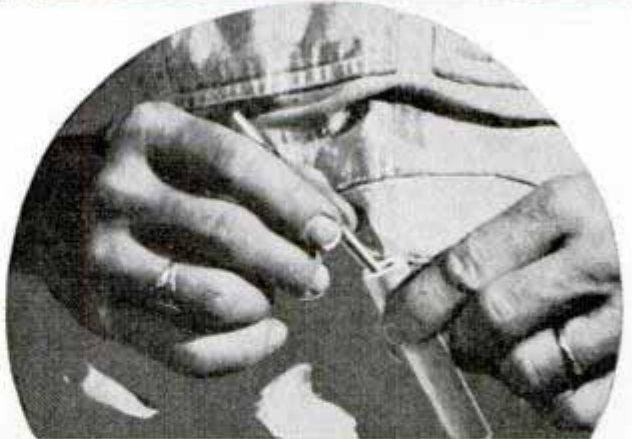
If holes must be bored in the sides of small boxes or cases where there is no room to use a brace to turn the bit, a handy method of getting around this difficulty is to clamp a bit gauge to the body of the bit and use it as a wrench. If you have no bit gauge you can easily make one for this purpose. Using the same bit, bore a hole through a square of hardwood. Then rip it lengthwise through the center. Draw the two pieces together with a screw on each side of the hole, providing a combination clamp and handle.



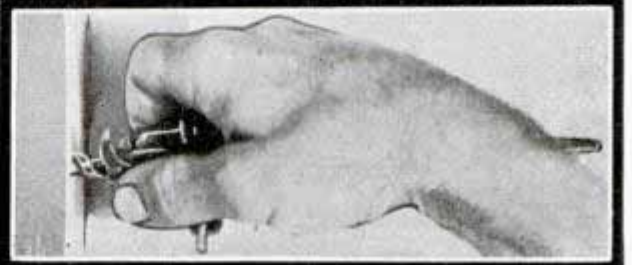
STRING ABOUT WRIST HOLDS GAUGE AND NAILSET



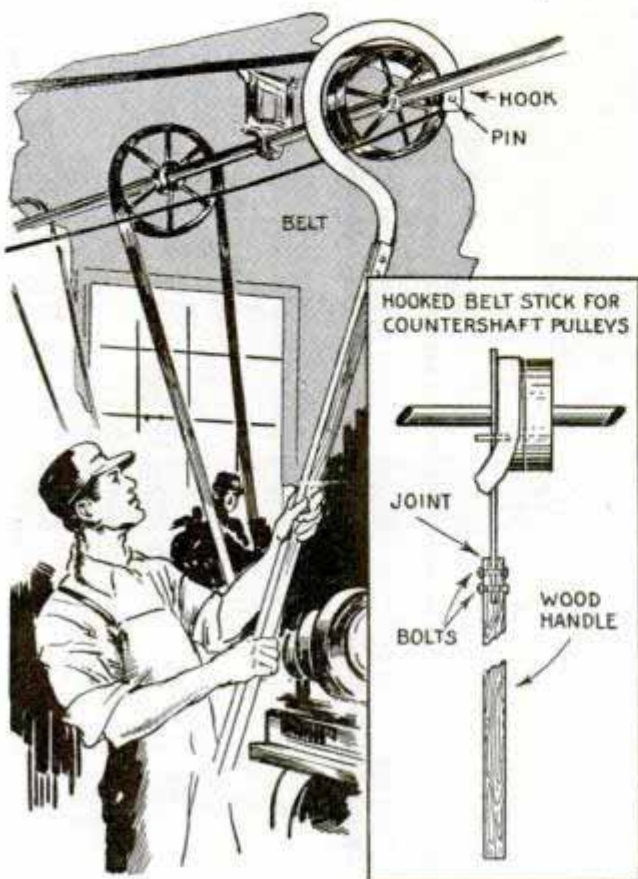
FITTING CABINET INTO CORNER



ABOVE - POCKET HOLDER FOR NAILSET
BELOW - BIT GAUGE SERVES AS A BRACE



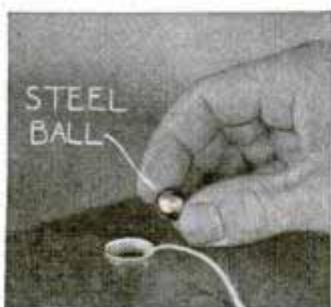
Belt Stick Has Hook on One End for Hard-to-Reach Pulleys



Here is a belt stick that will take care of those pulleys that are too close to a wall to use a straight stick

In places where countershaft pulleys are so close to walls or other obstructions that a straight stick cannot be used to remove the belts, this one will do the trick. It consists of a long handle with a length of flat iron bent to form a large hook, which is bolted to one end. With this stick a belt can be lifted up and placed on a pulley from either side, as a glance will show that the pin controls the belt clear around the pulley while the flat steel, bearing against the part of the belt already on, prevents it from coming off before the belt is in place.

Twine Fed Through Counter

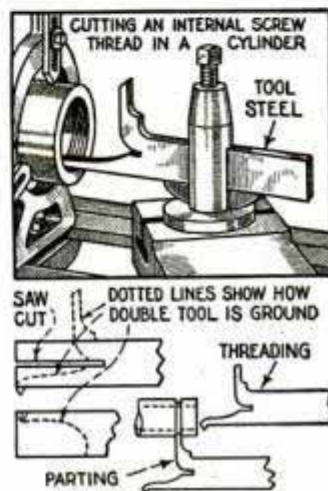


After remodeling his store, one merchant concealed his twine ball by mounting it under the counter and bringing the end of the string up through

a hole. To keep the string from slipping back through the hole, an aluminum thimble, with the closed end sawed off to form a sleeve, was forced into the hole, after which a ball bearing was placed on top of it, the end of the thimble being flared to hold the ball. The bearing acts as a check, permitting the twine to come forth easily, but preventing its return.

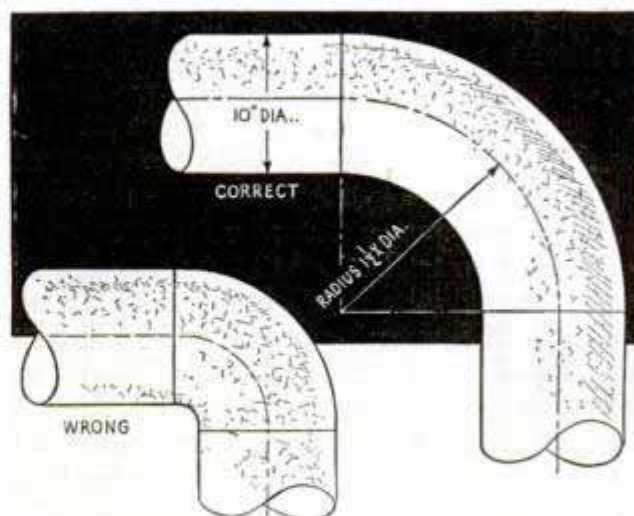
Combination Lathe Parting Tool Speeds Production Jobs

To speed up the work of turning out a quantity of internally threaded collars on a lathe, the foreman of one shop used a combination threading and parting tool. Shaped and ground as indicated, the tool does not have to be



changed in the tool post to perform the two operations. After cutting the threads, the carriage and cross-feed are merely manipulated to bring the parting edge of the tool into contact with the work.

How to Install Sheet-Metal Ducts



Turns in sheet-metal ducts should have a radius one and one-half times the diameter of the ducts

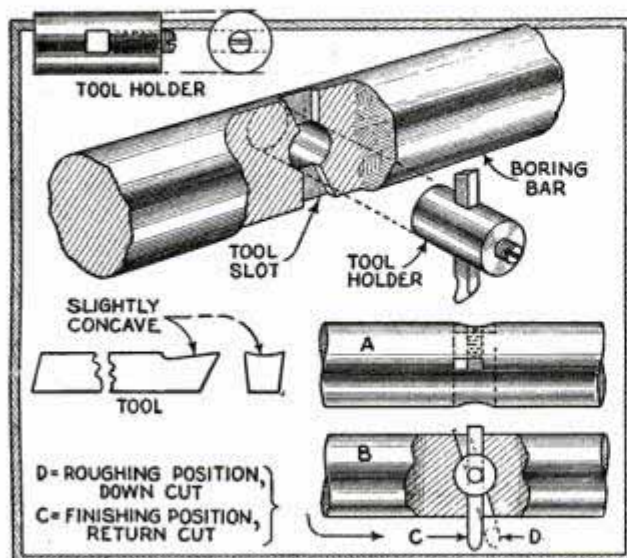
When installing sheet-metal ducts to carry air, it is necessary to avoid right-angle turns as much as possible if best

results are to be had. In the drawing, note the smooth, easy turn of the angle of the upper detail and the sharp, cramped angle of the lower one, which causes a high-velocity turn. In actual tests, it has been found that best results are obtained when the radius of the angle is at least one and one-half times the diameter of the pipe. With this radius, the loss is only 17 per cent in head, while a turn having a radius equal to $\frac{3}{4}$ the diameter of the pipe gives a loss of 37 per cent, and a radius equal to $\frac{1}{2}$ the diameter of the pipe gives a loss of 75 per cent in head.

—L. H. Georger, Buffalo, N. Y.

Boring Tool Makes Both Rough and Finish Cuts

This unusual boring tool is constructed to take advantage of the return feed to finish the bore when used on a radial drill press. The bar is slotted and drilled at right angles to take the cutter as shown at A and B, the slot being so shaped that in the finishing position the tool lies at the extreme point from the center line of the bar. In the roughing position, the cutter is swung slightly back. But once the cutter is set to bore the right diameter, its action is automatic. When the bar is fed down, the cutter is forced against the top end of the slot for the roughing cut. And, when it has passed through the bore, the cutter drops so that when the bar lifts on the return feed, the cutter is forced against the bottom end of the slot.



Used in a radial drill press, this boring tool makes the rough cut as it goes through the work and takes the finish cut as it is returned

Metal Stencils That Have Handles Aid Shipping Clerk

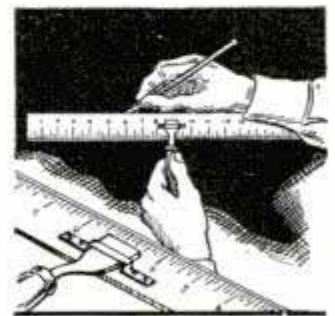


There's no paint on this shipping clerk's hands because his stencils are fitted with handles

Shipping clerks will find that handles soldered or riveted to metal stencils will make them easier to use, and that it will also help to prevent smudged fingers. Handles from discarded kitchen utensils and cutlery are just the thing for this purpose. They should be bent to the shape indicated, and before attempting to solder, all traces of grease must be removed.

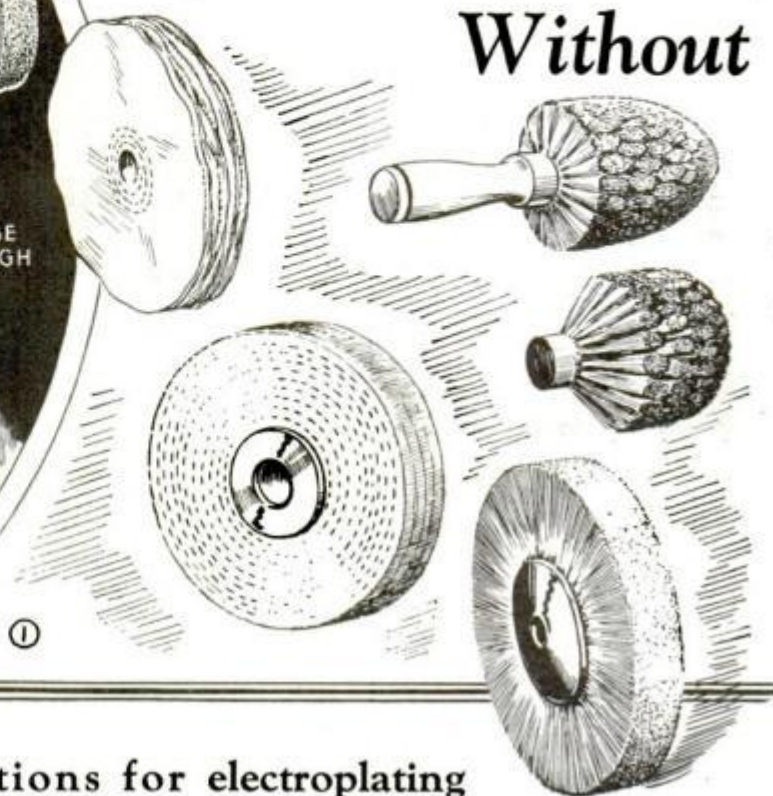
Improving Signwriter's Ruler

Signwriters will find that a handle attached to their rulers makes them easy to hold on flat surfaces, such as doors, windows and walls. The handle is removable and is made to slip into a flat, U-shaped piece of sheet metal screwed or bradded to the ruler as shown. The U-shaped piece should be at least an inch wide and the flattened end of the handle should fit snugly into it so that the rule can be held rigidly.





COPPER *and* Without



New solutions for electroplating copper and nickel—how to prepare work by thorough cleaning procedure, both chemical and electrical

By C. A. CROWLEY

ELECTROPLATING solutions can be made now without the use of poisonous cyanides. By the improved methods, it is also possible to plate zinc castings and zinc-base die castings which have proved so troublesome by other methods.

Polishing the Work: Before electroplating, it is important that the object be buffed and polished carefully to remove all surface imperfections. Flaws in the surface of the work to be plated will show noticeably after the plating and therefore, these must be removed first if a first-class job is to be produced. A buffing wheel treated with any good quality cutting compound is used for this purpose. Simple buffing heads may be equipped with a variety of interchangeable wheels, Fig. 1, for the application of cutting and buffing compounds as required to produce the

final finish. It is advisable to use a separate wheel for each grade of compound to avoid scratches during the final polishing operation with finishing compound.

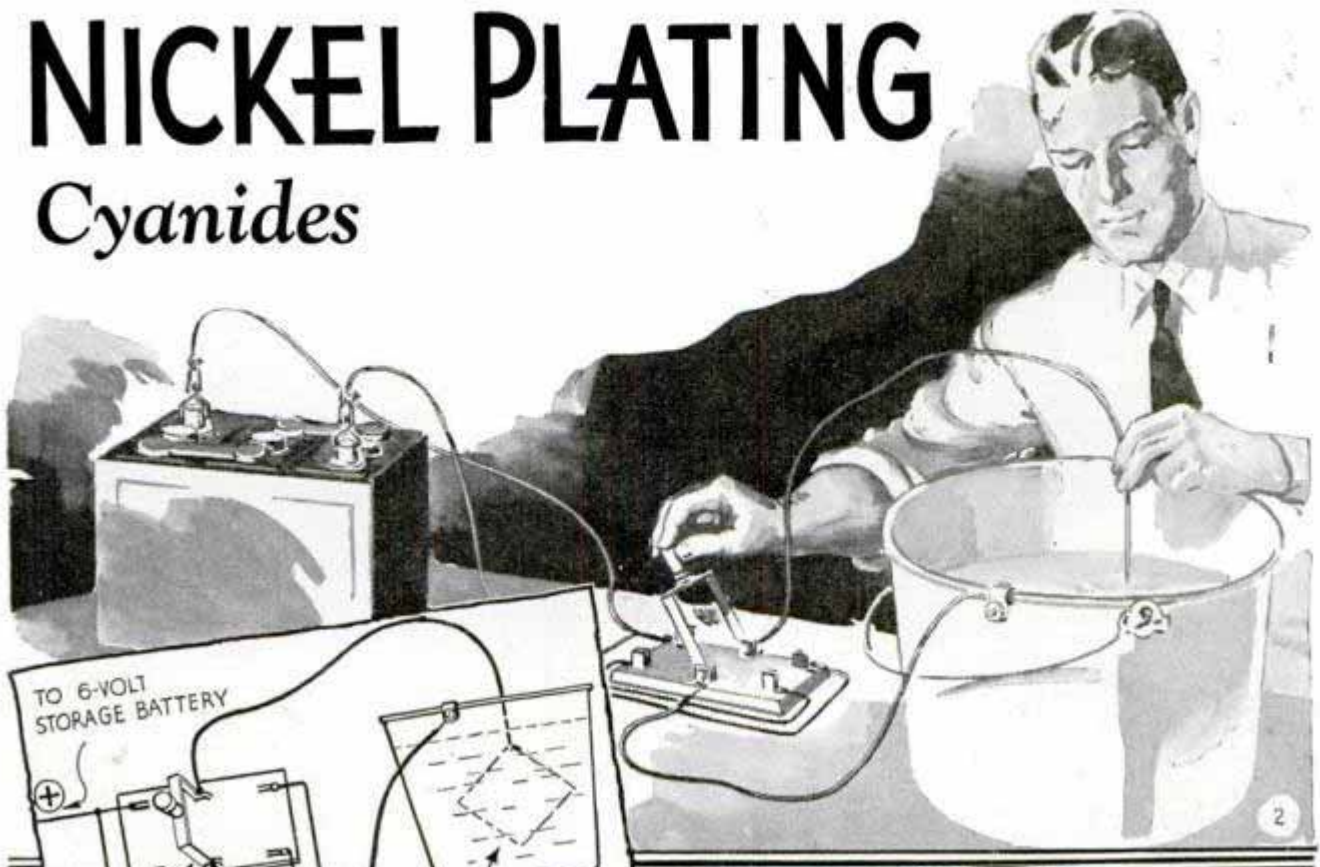
Cleaning Iron and Steel Objects: The type of cleaning operation before electroplating depends upon the metal from which the object is made. After buffing thoroughly, objects made of iron and steel are cleaned by washing in a solvent such as gasoline (not Ethyl), benzene, carbon tetrachloride or xylene. The wash, Fig. 4, removes grease from the surface and prepares the work for the electro-cleaning operation which is next.

An electro-cleaning solution is made by dissolving trisodium phosphate, 13½ oz., and sodium carbonate, 10¾ oz., in enough water to make 1 gal. of cleaning solution. The solution should be placed in an iron

*Mallinckrodt
Chemical Works*

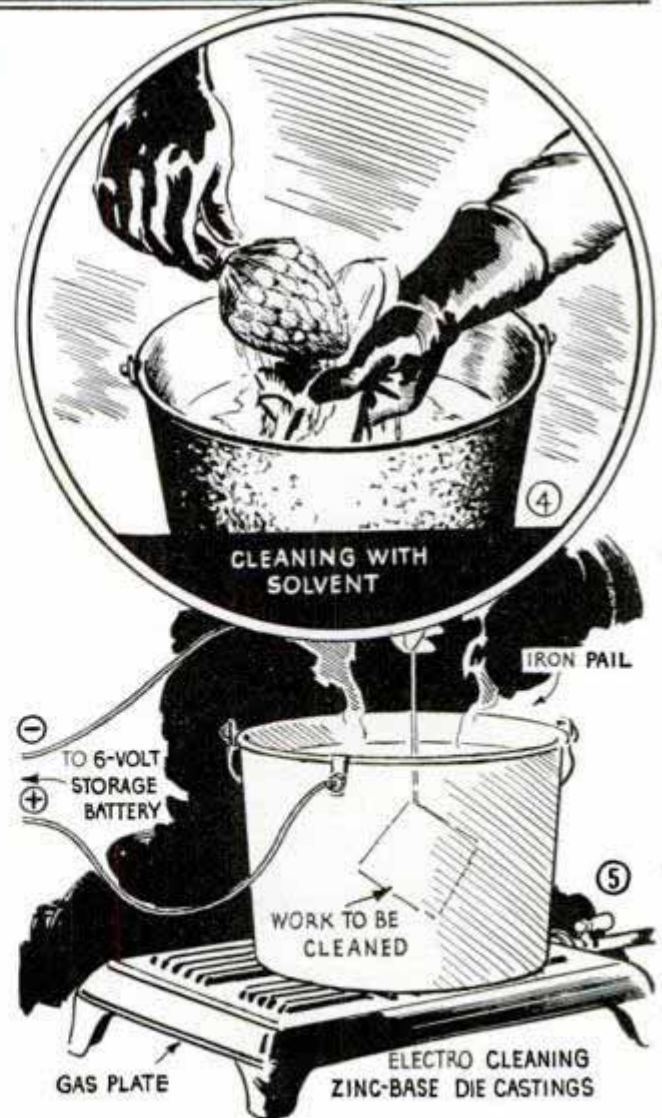
NICKEL PLATING

Cyanides



pail large enough to hold the work without its coming in contact with the container, Fig. 5. For electro-cleaning steel and iron, the pail is connected to the negative pole of a 6-volt storage battery with heavy copper wire, while the work is connected to the positive pole of the battery. The work is suspended in the cleaning solution for 1 or 2 min.—no longer than necessary to remove the dirt film. Bubbling from the surface of the work mechanically tears the dirt away. While electro-cleaning soldered work, the current is reversed by means of a switch as shown in Figs. 2 and 3.

Following the electro-cleaning operation, the work should be rinsed thoroughly in running water as in Fig. 6. Then it is immersed for 1 or 2 min. in a solution made by adding concentrated hydrochloric acid, 1 lb., to water, 7 pts. The acid rinse, Fig. 7, performs the very important function of putting the metal surface into a condition so that electroplate will stick to it. Stoneware vessels are used for all acid solutions. Following the acid treatment,





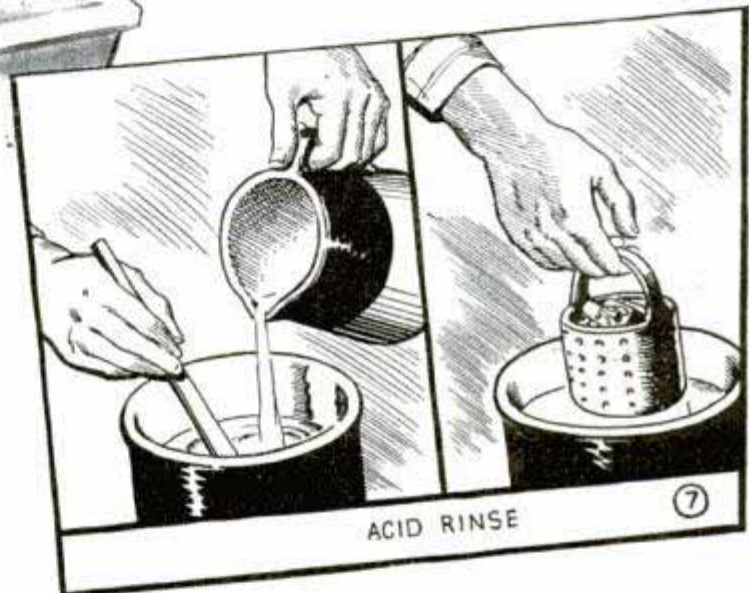
the work is rinsed thoroughly in running water and kept submerged in clean water until it is put in the plating tank.

Cleaning Zinc Objects: Objects made of zinc should be cleaned with solvents as explained for iron to remove excess grease. Following this, the work is scrubbed with soapy water to remove the last trace of foreign matter. Then the work is dipped into a solution made by adding concentrated hydrochloric acid, 1 lb., to water 1 pt. The work should be dipped merely into this solution and not allowed to remain there, or it will become pitted. After the acid dip, the work is rinsed in running water and submerged in clean water until plating.

Cleaning Zinc-Base Die Castings: To plate zinc-base die castings the cleaning operations must be followed with greater than normal care. The well buffed castings are freed from grease by washing in a solvent such as trichlorethylene, benzene, carbon tetrachloride or xylene. The latter will be found the most satisfactory. Then the work is suspended in an electro-cleaning bath made by dissolving trisodium phosphate, 6 oz., in water, 1 gal. This solution is heated and used at the boiling point. It is important to note that the connections shown in Fig. 5 are just the opposite to the connections for elec-

tro-cleaning iron and steel, as already explained. The work should be suspended in the electro-cleaner for only 3 min. at the most, although 2 to 2½ min. is usually sufficient. An immersion longer than 3 min. is likely to cause pitting. Following the electro-cleaning operation, the work is rinsed rapidly in running water and immersed for only 1 min. in a solution made by mixing hydrochloric acid, 1 lb., with water, 4 pts. Following the acid treatment, the work is washed in running water and submerged in clean water until plating.

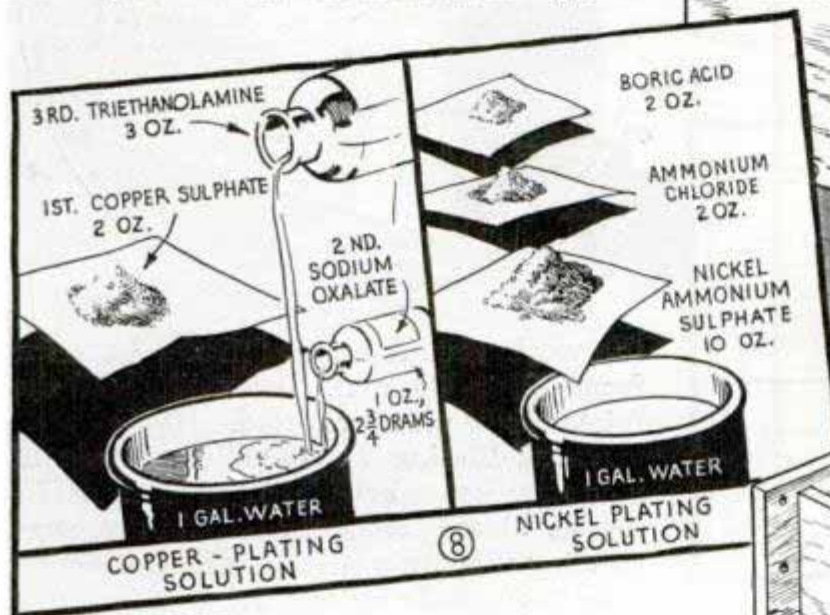
Cleaning Copper and Brass: After buffing and polishing, objects made of copper or brass should be cleaned thoroughly in any of the solvents already mentioned to remove excess grease. An electro-cleaning



bath arranged as shown in Fig. 5 is next. The wires are connected directly to a 6-volt storage battery, the negative line being connected to the work, which is left immersed in this solution from 3 to 5 min.—no longer to avoid pitting. A cleaning solution which has been found exceedingly satisfactory for use with these metals is made by dissolving sodium carbonate, 8 oz., and sodium hydroxide or ordinary lye, 2 oz., in enough water to make 1 gal. of solution. In electro-cleaning objects of copper, brass, and other metals that have been soldered, connections are made to a double-pole, double-throw switch as in Fig 3, to permit reversing the polarity, as the action of the electro-cleaning solution, without reversing the polarity every few seconds, tends to dissolve part of the solder.

Copperplating: A non-poisonous solu-

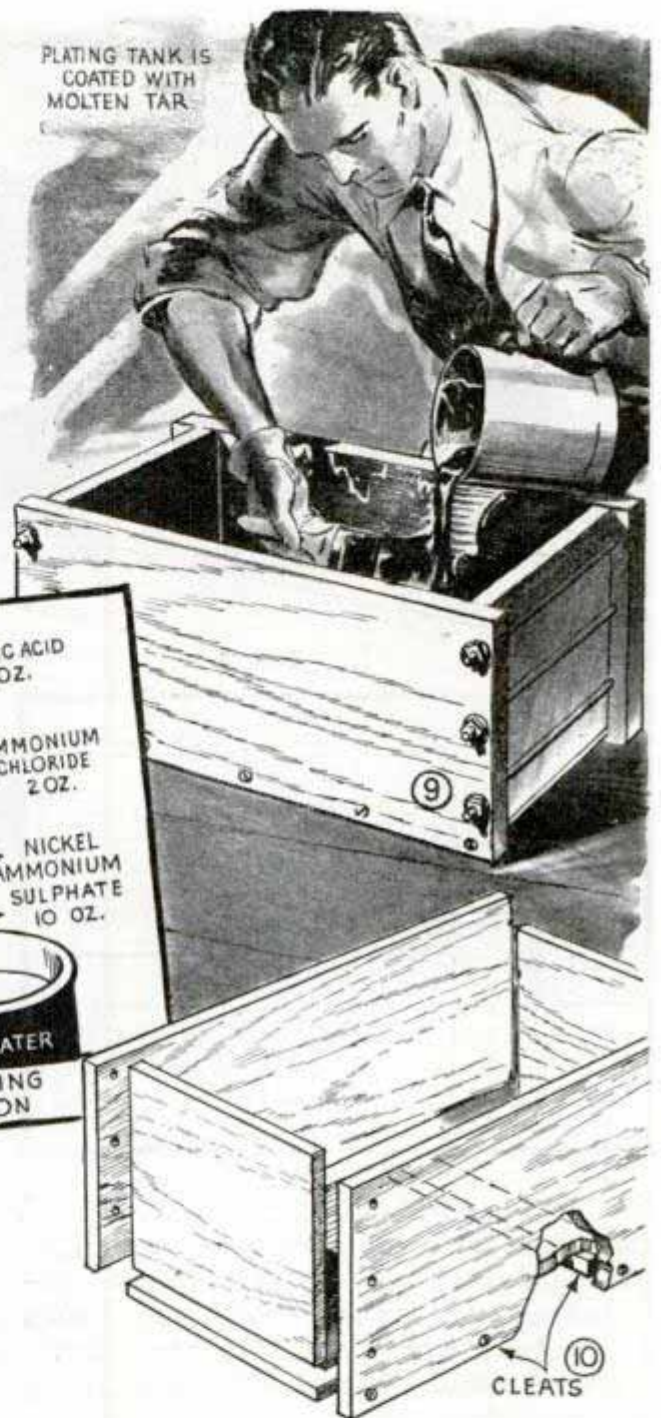
tion for plating copper or iron or other metal is made by dissolving copper sulphate, 2 oz., and sodium oxalate, 1 oz., $2\frac{3}{4}$ drams, in enough water to make 1 gal. of solution. Finally, triethanolamine, 3 fl. oz., is added to this solution and stirred in. See Fig. 8. The solution should be prepared in a stoneware container, preferably the one which is to be used for plating. The solution should be stirred until the precipitate which at first forms is dissolved. After using this solution, a slight sediment may be found but this does not interfere with plating. Connections for plating in a stoneware or other non-conducting container, are made as in Figs. 11



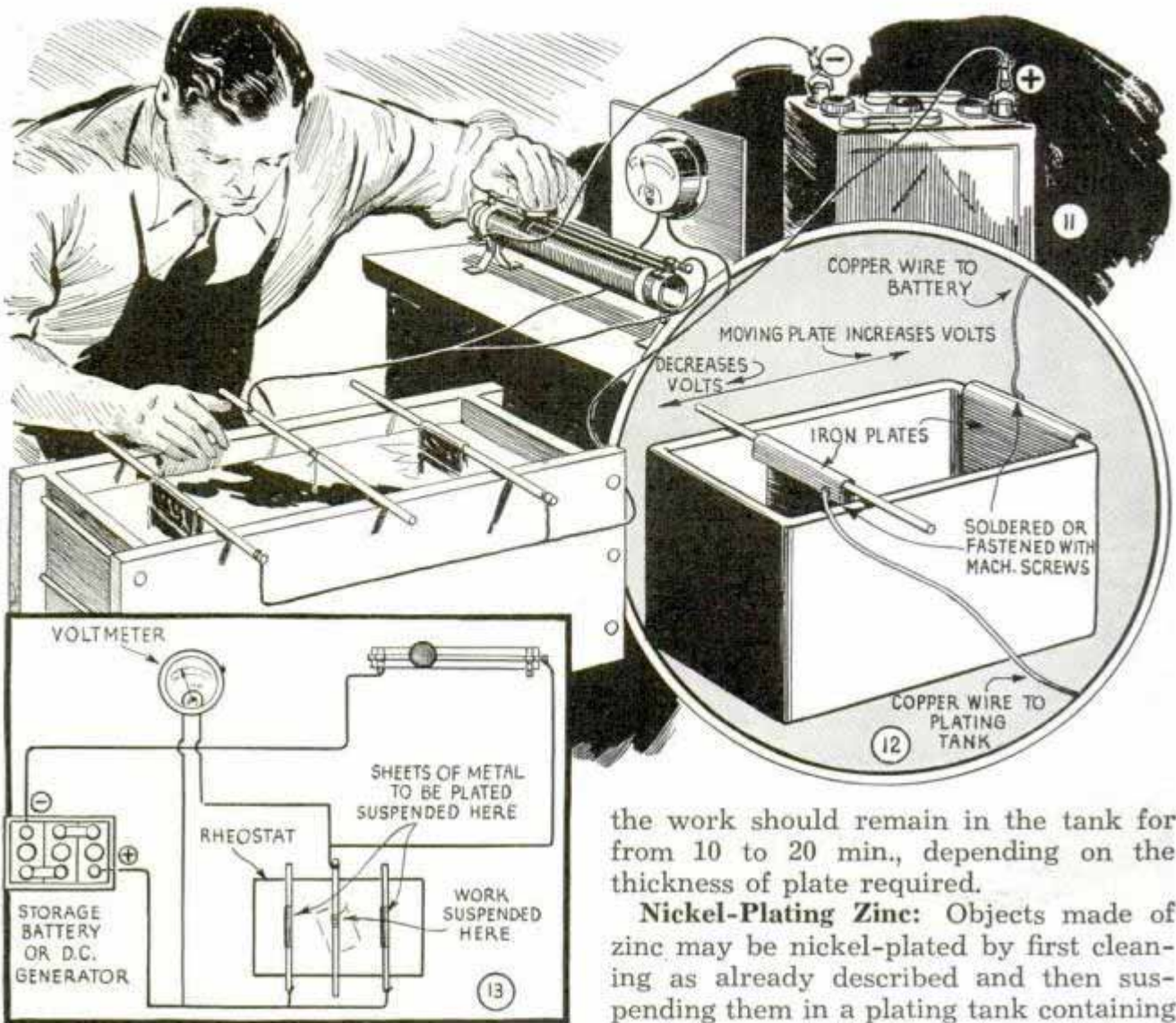
and 13. An old rubber battery box is suitable, or you can make a wooden tank as shown in Figs. 9 and 10. Almost any rheostat will do. If one is not available a substitute may be made as in Fig. 12. It is filled with a solution made by dissolving as much ordinary salt as possible in cold water. A pair of metal plates are inserted into the salt solution. The closer the plates are together, the higher the voltage.

To use the copperplating solution, the work is hung with a copper wire on the middle rod and immersed in the plating solution. Large sheets of copper are attached to the rods which are connected to the positive pole of the battery. With the work immersed, the switch is closed and the rheostat adjusted until the voltmeter reads between $1\frac{1}{2}$ and $2\frac{1}{2}$ volts. The exact voltage will have to be determined by experiment in any particular case to control the brilliancy of the plate, the work

PLATING TANK IS
COATED WITH
MOLTEN TAR.



being lifted from the bath frequently to note the color of the deposit. The rheostat is adjusted until a suitable bright deposit is produced. The work should be left in the plating bath for 3 min. to produce a good durable plate. Where it is necessary to build up a heavy plate of copper, the work, which has been plated for 3 min., is transferred to another plating solution made by dissolving copper sulphate, 22 oz., in water, 1 gal., to which sulphuric acid, $6\frac{1}{2}$ fl. oz., is added slowly. Before transferring the work to this solution, it should be rinsed thoroughly in water to remove all traces of the alkaline triethanolamine. It is then immersed in



the acid copper-sulphate solution and connected in the same way as in the first plating bath. The rheostat is adjusted until the meter reads between $1\frac{1}{2}$ and 3 volts as required to produce the proper color.

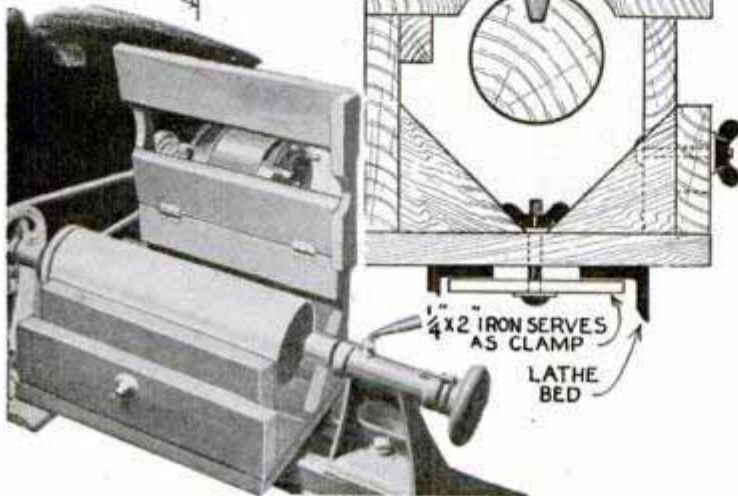
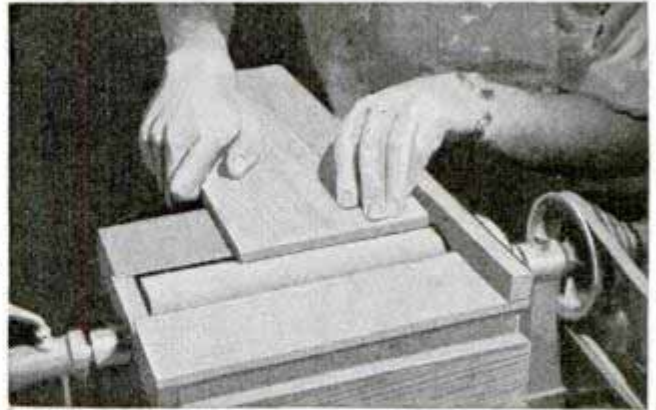
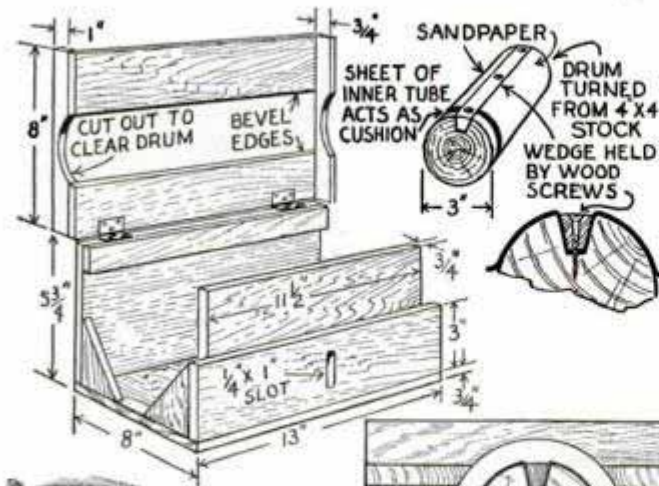
Nickel-Plating Iron: The nickel-plating of iron objects offers material protection against corrosion and the plate will be quite durable if it is applied after the work has been given a 3-min. plate of copper. For plating nickel over copper, a solution made by dissolving nickel ammonium sulphate, 10 oz., ammonium chloride, 2 oz., and boric acid, 2 oz., in water, 1 gal., will give satisfactory results. See Fig. 8. The solution is poured in a clean plating tank connected as before. Strips of sheet nickel are suspended from the outside rods across the plating tank. If the nickel plate is to be used for protective purposes as well as for ornamentation, it should be rather thick. The meter should read between 2 and 3 volts, and

the work should remain in the tank for from 10 to 20 min., depending on the thickness of plate required.

Nickel-Plating Zinc: Objects made of zinc may be nickel-plated by first cleaning as already described and then suspending them in a plating tank containing a solution made by dissolving nickel ammonium sulphate, 11 oz., and nickel sulphate, $5\frac{1}{2}$ oz., in water enough to make 1 gal. When the chemicals have been dissolved in the water, triethanolamine, 23 fl. oz., is added and mixed in thoroughly. The work is hung from the center rod and sheets of nickel from the two outside rods. The voltage should be adjusted to between $1\frac{1}{2}$ and 3 volts. If the nickel-plate is not sufficiently brilliant, a small amount of boric acid may be stirred into the solution.

Nickel-Plating Zinc-Base Die Castings: Zinc-base die castings cleaned as explained are suspended in a plating tank and connected as in Fig. 13. The plating solution is made by dissolving nickel ammonium sulphate, $3\frac{1}{4}$ oz., and nickel chloride, $1\frac{1}{2}$ oz., in water, 1 gal. After the salts are dissolved, triethanolamine, $8\frac{3}{4}$ fl. oz., should be added and stirred in thoroughly. The voltage should read between $1\frac{1}{2}$ and 3. Boric acid, about $\frac{1}{2}$ oz., can be added to this solution to brighten the plate.

Drum Sander on Lathe Has Adjustable Table



It takes only an hour or so to get this drum sander working on almost any wood lathe. The dimensions merely give an idea of the size and you will have to build the unit to suit your own lathe. First, the drum is turned between centers to a uniform diameter of 3 in. Then it is slotted as indicated and a hardwood wedge is cut to fit the groove loosely. The rest is a simple job—much like building a box. Note the loose member at the front, held by a 1/4-in. bolt and wingnut sliding in a slot in the outer piece. This arrangement enables you to set the table to just the right height. The drum is cushioned with a sheet of rubber cut from an inner tube. In placing the sandpaper on the drum be sure the wedge is drawn down tightly so that it does not strike the work

"Gangplanks" to Trucks Hinged on Loading Platform

Hinged to the edge of a loading platform, large sheets of heavy boiler plate provide smooth "gangplanks" to facilitate using hand trucks and rolling heavy barrels. The gangplanks are especially useful when the truck bed is higher or lower than the platform. When not in use, they are swung back so that they lie flat on the platform.

Taxidermist's Lead Arsenate Jelly

Instead of dusting arsenic powder on the bones and skins of animals to preserve them, it is better for the taxidermist to paint them with a lead-arsenate jelly. Arsenic dust in the air may collect in the nose and throat and cause death. The jelly is made by mixing high-grade soap containing carbolic acid, 4 oz., with water, 16 oz., to which is added lead arsenate, 2 oz. Boil the mixture 15 min. and apply with a brush or swab.

—Edward Lopkoff, Denver, Colo.



Heavy steel plates between trucks and loading platform provide smooth surface

Index Tabs on Filing Cards Strengthened by Clips

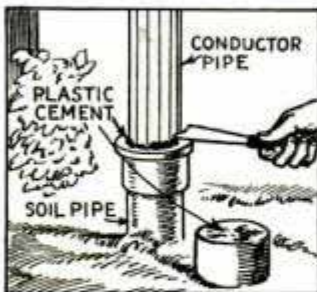


Paper clips slipped over tabs of letter file protect identifying data on division cards

To prevent the index division cards in his filing cabinet from becoming soiled and worn by constant fingering, one stenographer slipped a wire paper clip over the projecting tab of each card. Besides protecting the card against wear, the clip prevents constant bending of the tab and its breaking off.

—Wayne C. Leckey, Aurora, Ill.

Sealing Joint Between Downspout and Soil Pipe



Instead of using cement to seal the joint between the eave downspout and the soil pipe, use a non-hardening plastic. Then, if it is necessary to open the

joint to make repairs, the job is done easily. When hard cement is used, there is a possibility of cracking the soil pipe.

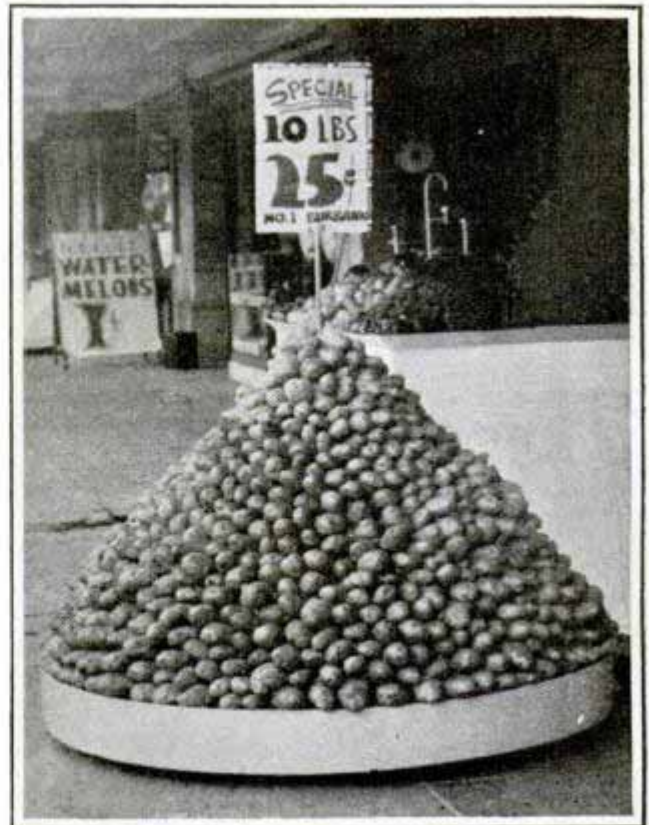
Repairing Small Motor Bearings

Here is a good method of repairing worn bronze bushings in electric motors. First, remove the bearing, split it length-

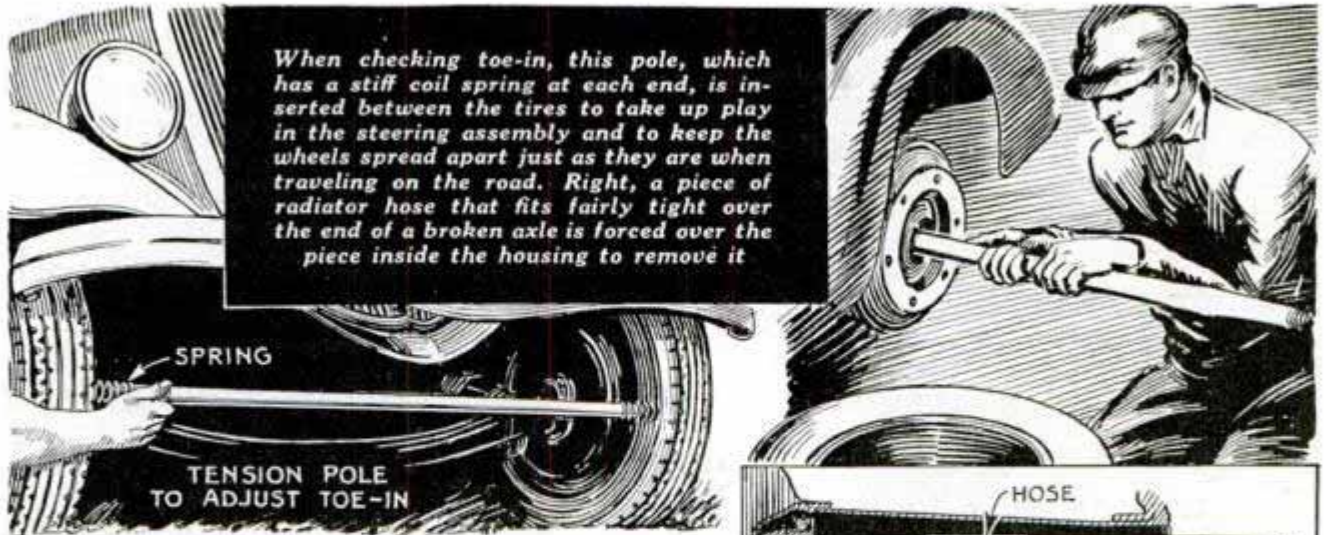
wise along one side with a hack saw, and then press the severed edges together in a vise, shaping it over the shaft. Solder the edges together and tin the outside of the bearing. Another method is to saw a 1/8-in. ring from each end of the bearing, place them on an anvil and tap the inside with a hammer until they fit the shaft snugly. Then place the rings in each end of the bearing cavity and coat the bearing surface of the shaft with white lead. Next, assemble the motor and pour high-speed babbitt into the cavity through the grease cup or oil hole. When the babbitt hardens drill out the oil hole.

Display Rack on Casters Wheeled to Sidewalk

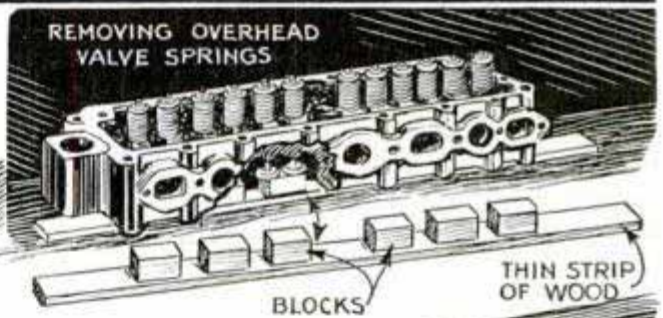
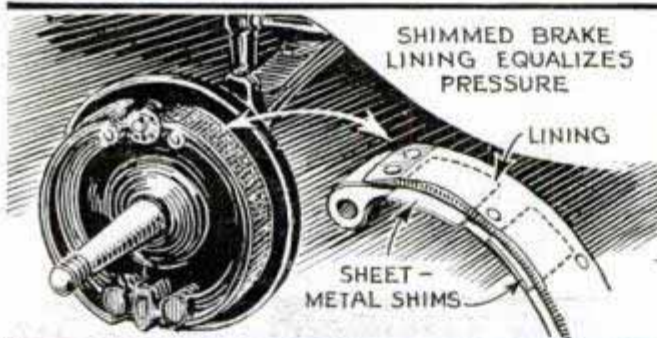
Providing a means of attractively displaying fruit, vegetables, etc., this rack may be moved out on a sidewalk during the day and rolled in at night without disturbing the display. A cross of 2 by 4-in. stock with casters at the ends supports the rack, which is made of either light lumber or metal. A low rim of thin veneer nailed around the bottom keeps the display in place, while a stick or small pipe inserted in the top takes a price tag.



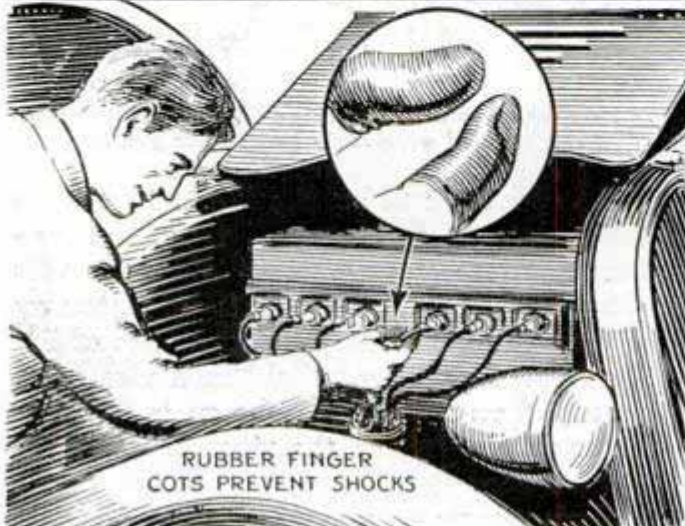
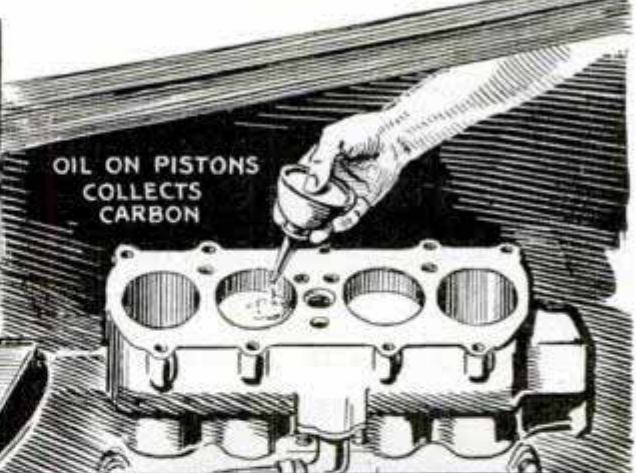
Anyone handy with a hammer and saw can assemble the display in an hour or two



Helps for the AUTO MECHANIC



To utilize the entire surface of the brake lining, when the drums wear and their inside diameter is increased so that only the centers of the shoes touch, shims are sometimes inserted under the lining near the ends of the shoes. Right, small blocks nailed to a thin wood strip hold the valves up in an overhead-valve motor while compressing the springs to remove the retaining keys



Left, rubber finger cots help to avoid shocks when handling "hot" wires to make various checks on the ignition system while the motor is running. Above, if heavy oil is applied liberally to the piston tops before starting to scrape carbon, it will fill the space between the cylinder walls and the tops of the pistons, keeping hard carbon particles from collecting on the upper rings where they may score cylinders when the motor is run. To remove the oil, just crank the motor and wipe off the cylinder walls carefully as the pistons go down

Dog's Basket Hooks over Seat of Your Car



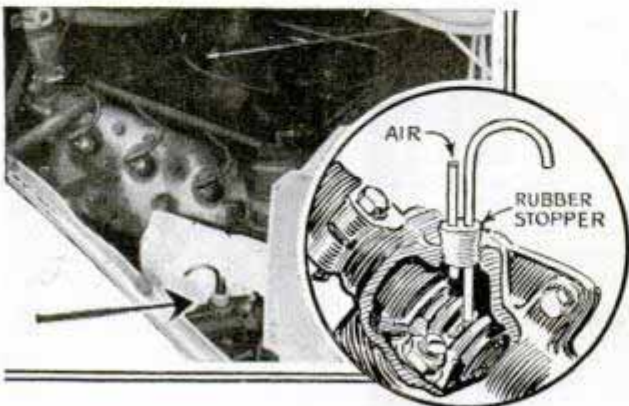
Basket on back of front seat keeps dog off of car cushions and saves the upholstery

To take my small dog in the car without allowing him to get on the seats, I used the basket shown, which hooks over the back of the front seat. It consists of an iron-rod frame and a canvas basket hemmed around the top edges to slip over the rod. If the basket is plenty long and a partition provided, you also have a place to carry packages.

—R. E. Boody, Portland, Ore.

To Remove Grease from Housing of Steering Gear

Stiff steering in winter with its accident hazard can often be overcome by thinning the steering-gear lubricant. Removal of enough old grease to make room in the

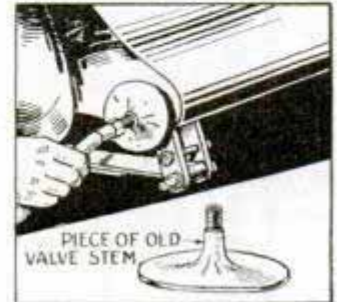


Hard steering avoided by removing some of the grease so that a thinner can be added

housing for the addition of a thinning agent is easy with a simple air-operated grease remover. This is made of copper tubing and a rubber stopper for the filler hole. Assembled as shown, the tubing and stopper are put in the filler hole after which air is forced into the housing through the short tube to force grease out of the long one.

Air Nozzle Handy Around Car

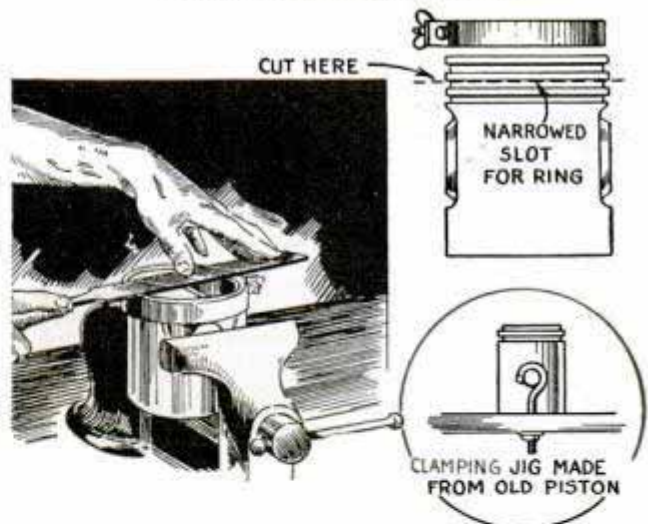
An old rubber valve stem with some of the inner tube attached to it makes a handy nozzle when using compressed air to clean grease fittings, plugged fuel lines, etc. The



valve is also handy for removing dust from hard-to-reach places about the car.

—Paul A. Ruddell, Fort Scott, Kan.

Clamp to Hold Piston Rings When Filing Them

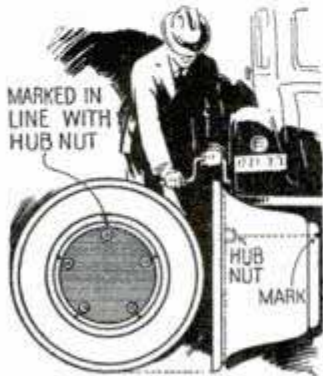


This clamp holds piston rings tightly so that they can be filed accurately to fit their grooves

The problem of holding a piston ring to file off a little from one edge to fit it correctly in its groove, is solved with this simple clamp. Made from an old piston by sawing off its top at the edge of one of the grooves, the clamp is held in a vise or is mounted on a bench as shown in the circular detail. In use, the ring to be filed is placed over the top of the altered piston and clamped tightly in place by means of

a strap-iron band fitted with a bolt and wing nut. The top edge of the ring is allowed to project slightly above the band. Held in this manner, the entire edge of the ring is exposed for rapid, accurate filing.

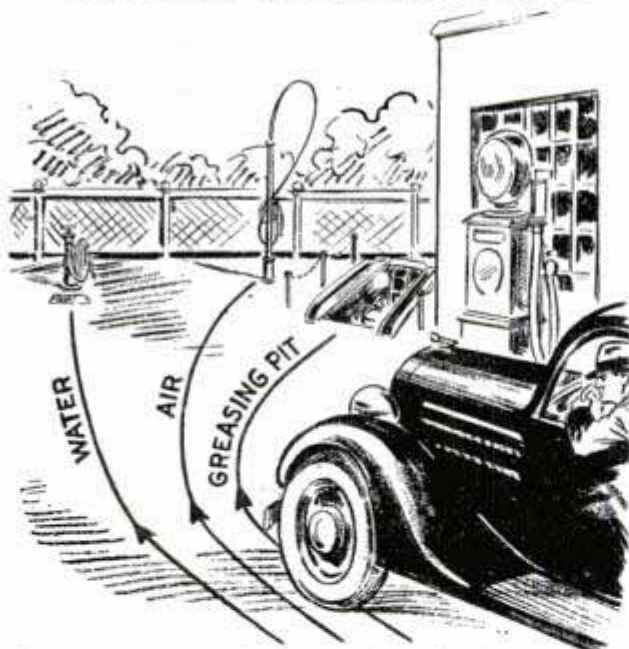
Mark on Hub of Car Wheel Shows Location of Nuts



On car wheels where the retaining nuts are set far back in the hub, you can get the wrench on them without stooping over if marks are made on the edge of the hub in line with the nuts. The marking can be

done with a file or small holes can be made with the end of a drill.

Arrows Guide Filling-Station Customer to Air and Water



Arrows save attendant's time by showing customer location of water, air and greasing pit

As a guide for customers in locating the water and air hose or greasing pit, one filling-station attendant painted arrows on the driveways. The arrows not only saved the attendant's time but they helped increase his lubrication business as they often reminded the customer of an oil change or greasing job.

Differential Housing Assembled Easily with Headless Studs



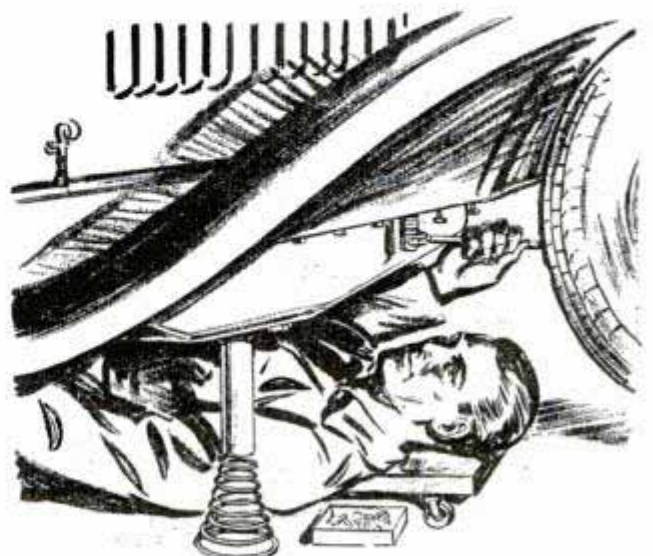
Two headless studs driven into the axle housing serve as guides when installing differential plate

If two short, headless studs are placed at the top of a dismantled differential housing, the plate may be replaced with little trouble. As soon as a few bolts have been started, the studs are removed.

—James W. Clift, Columbus, Ohio.

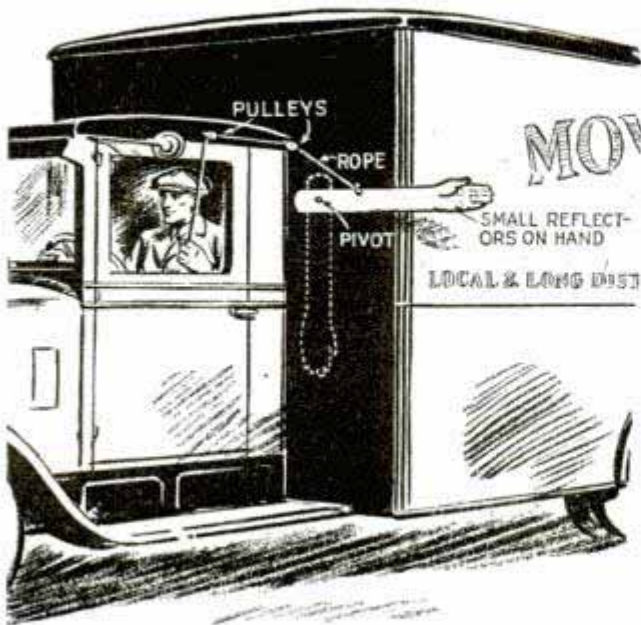
Oil Pan Supported by Spring Jack While Replacing Bolts

For holding an oil pan in place while starting the bolts, this spring jack is handy. It consists of a short length of wood with a seat-cushion spring attached to one end. The jack is slipped under the pan and leaves both hands free to start the bolts.



Oil pans easily installed single-handed by using this spring jack which holds them in place

Wooden Arm Signals for Drivers of Large Trucks



This hand will solve your signaling problems if you cannot see around the body of your truck

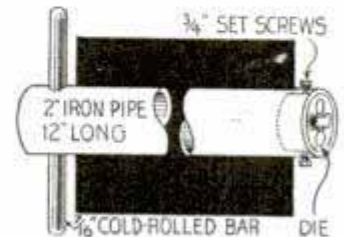
Drivers of trucks having bodies so wide that they cannot use their hands to signal traffic in the rear, will find that this wooden hand solves the problem. It is

pivoted to the front of the body so that it can be actuated by a cord running into the cab, where the driver can raise or lower it to give the signals.

—Philip Chandler, Nashville, Tenn.

Die Stock Improvised from Pipe

Here is a simple die stock that auto mechanics will find handy for cutting new threads or for cleaning up old ones in restricted places where a regular stock cannot be used. It consists of a length of pipe, which is fitted with a handle at one end and has two small holes drilled and tapped near the other end to take set screws to hold a die.



When the lock on your car door turns hard, you can lubricate it by blowing powdered graphite into the keyhole with a soda straw.

The Next Issue

BUILDING THE FAMOUS BILOXI DINGHY

A trim and speedy sailing skiff, seaworthy and stanch, carrying a mast stepped well forward for easy handling. One of the simplest hulls to build that ever went under sail—three frames, transom and stem, two chines and the planking—that's all there is to it.

THE MECHANICS OF METAL-WORKING DRILLS

Tells how to select, grind and care for drills as well as how to drill different materials, lay out work, select drill blocks, determine operating speeds, etc.

CARBON-ARC TORCH GIVES HIGH HEAT

Does all kinds of soldering jobs as well as light brazing and welding work. Produces temperatures high enough to melt small quantities of alloys.

IT'S TIME FOR KITE FLYING

Kites of unusual designs, including the "Dragon," "Big Fish," box type and one to carry a camera. Story also shows how to make various reels.

URN-TOP COLUMNS

Finished in bone-white, these turned columns of wood add a modern touch when used either as flower holders or to get unusual lighting effects.

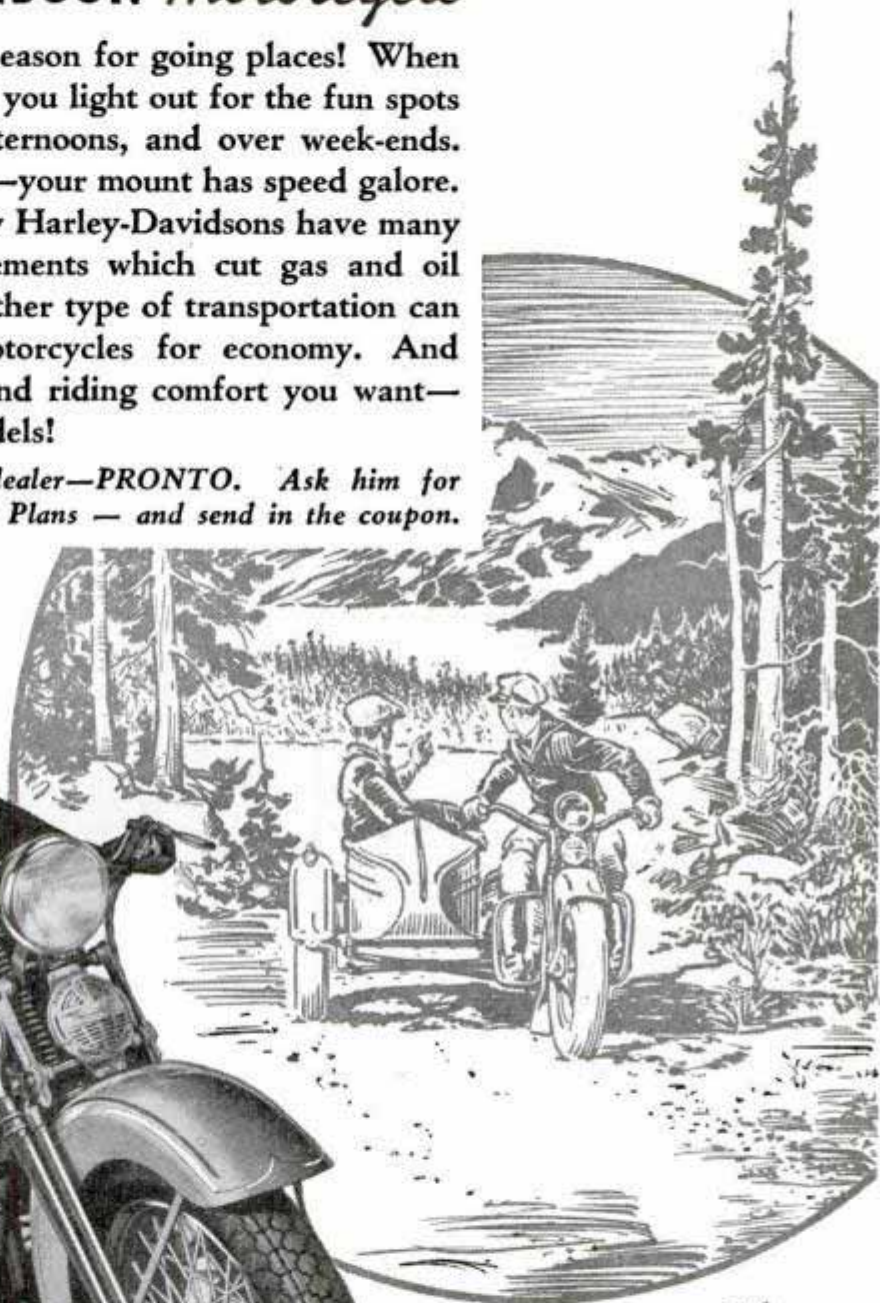
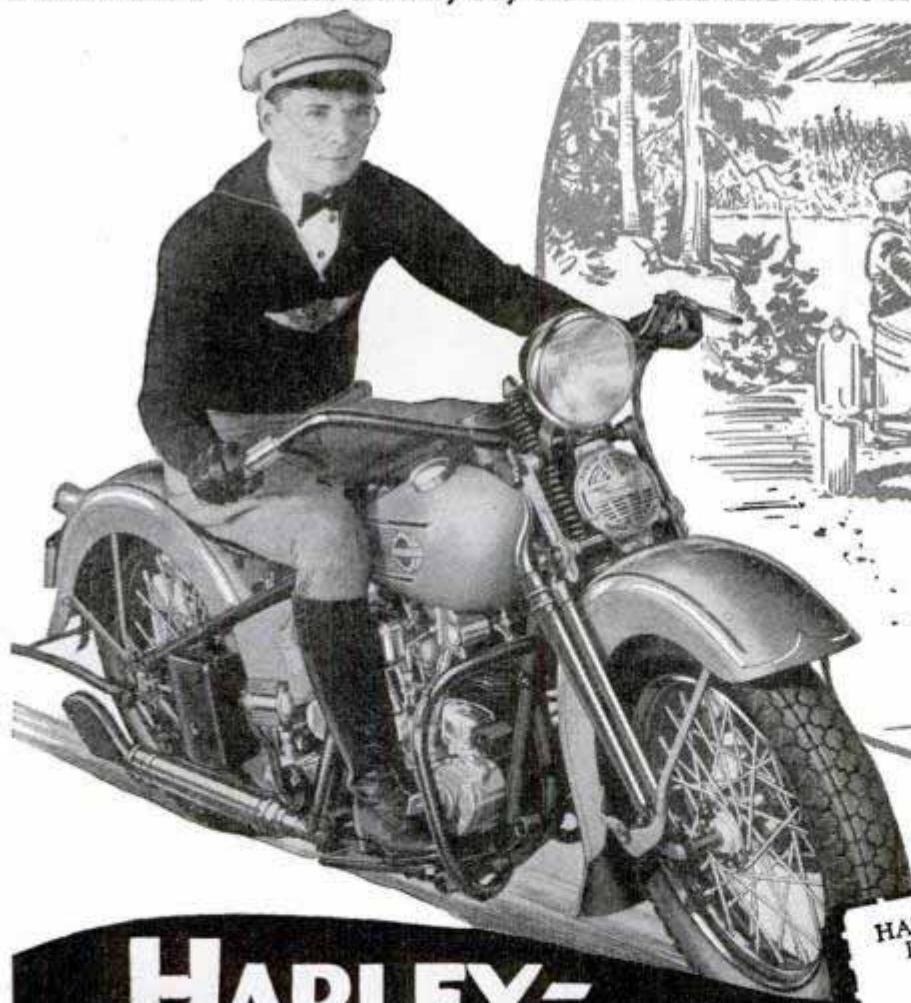
Open Season on

FUN!

Ride a HARLEY-DAVIDSON Motorcycle

It's outdoor time—and the open season for going places! When you own a 1937 Harley-Davidson you light out for the fun spots any time—evenings, Saturday afternoons, and over week-ends. Distant places are brought nearer—your mount has speed galore. Costs are way down low—the new Harley-Davidsons have many new and unusual motor improvements which cut gas and oil consumption tremendously. No other type of transportation can match these up-to-the-minute motorcycles for economy. And say—if it's smart styling, class, and riding comfort you want—get aboard one of these 1937 models!

See your nearest Harley-Davidson dealer—PRONTO. Ask him for a FREE RIDE — about his Easy Pay Plans — and send in the coupon.



HARLEY- DAVIDSON

MAIL THIS COUPON

HARLEY-DAVIDSON MOTOR CO.,
Dept. P, Milwaukee, Wisconsin
Interested in motorcycling. Send il-
lustrated literature. Postage stamp
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Address

My age is 16-19 years, 20-30 years,
 31 years and up, under 16 years.
Check your age group.

HIGH-SCORING HOCKEY ACE

Herb Lewis, of the Detroit Red Wings, says: "I go for Camels in a big way!"

THE lightning-quick camera eye caught *Herb Lewis* {extreme right} in this slashing set-to before the goal. Next split-second he scored! After the game {right}, Herb said: "You bet I enjoy eating. And Camels help me enjoy my food. Smoking Camels with my meals and afterwards eases tension. Camels set me right! And they don't frazzle my nerves."

Camel smokers enjoy smoking to the full. It's Camels for an invigorating "lift." At mealtimes it's Camels again "for digestion's sake." Thanks to Camel's gentle aid, the flow of the digestive fluids—*alkaline* digestive fluids—speeds up. A sense of well-being follows. So make it Camels.



FOR DIGESTION'S

COSTLIER TOBACCOS

Camels are made from finer, **MORE EXPENSIVE TOBACCOS**—Turkish and Domestic—than any other popular brand.



TUNE IN EVERY TUESDAY

Hear "Jack Oakie's College"—a full-hour gala show with Jack Oakie in person! Benny Goodman's "Swing" Band! Hollywood comedians and singing stars. Special college talent every week! Tuesdays—9:30 pm E.S.T., 8:30 pm C.S.T., 7:30 pm M.S.T., 6:30 pm P.S.T., WABC-Columbia Network.

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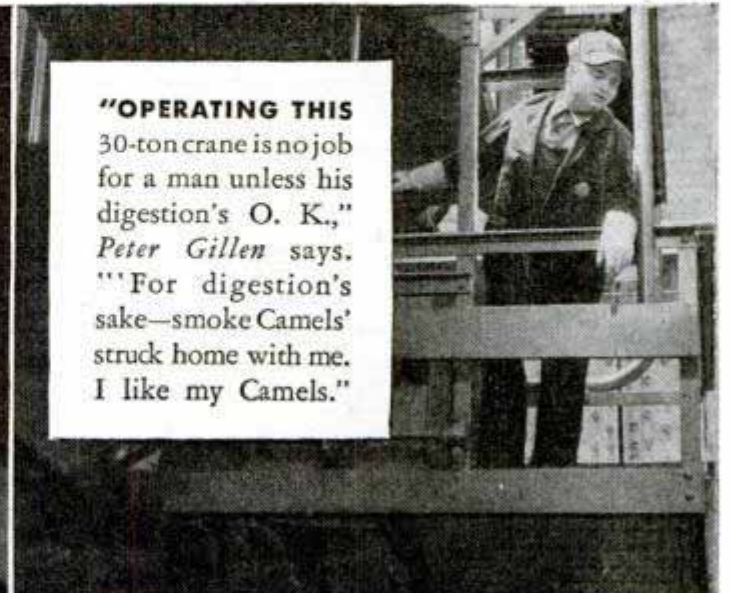
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SAKE — SMOKE CAMELS!



"I'VE SMOKED Camels since they were introduced," says *James Gould*, sports writer. "They help me digest well. Camels are famous as the favorite smoke of athletes."



"OPERATING THIS 30-ton crane is no job for a man unless his digestion's O. K.," *Peter Gillen* says. "'For digestion's sake—smoke Camels' struck home with me. I like my Camels."

When writing to advertisers please mention Popular Mechanics

Movies That Show You the Invisible

(Continued from page 557)

there was a slight deposit of carbon. Step by step the cylinder head was used and then photographed until thousands of miles had elapsed. The result is that on the screen you watch the carbon particles slowly attach themselves to the metal, thicken, and crack under the heat just as if you were actually inside the combustion chamber.

Not all industrial pictures take as long as this one to make. Under good conditions a full motion picture may be made in a week or less. Once Rockett got an order for a film to show several stages in the life of the pineapple. The nearest pineapple field was in Hawaii but this order called for delivery of the finished picture in Chicago seven days from that time. From a film library he rented several hundred feet of film showing a typical pineapple field. This motion picture was thrown on a screen background in front of which fresh pineapples from a fruit stand and characteristic leaves had been planted in a layer of earth. An actor playing the part of a field laborer walked down the row harvesting the fruit while a camera recorded both the foreground and the Hawaiian background. The end of the picture showed a housewife purchasing cans of the fruit from a grocer. This was filmed on a set rushed together in the studio while other parts of the picture were being made.

One client wanted a picture showing the effects of refrigeration on the growth of food molds. By using a microscopic camera the studio was able to demonstrate on the screen the movement of a forestlike growth of fungus spreading across the skin of an orange. A thermometer beside the exhibit indicated the temperatures and showed that mold growth stopped when the temperature dropped, and started when the temperature climbed. Microscopic photography throws into giant proportions on the screen the actions of ants and other small insects.

Producers of industrial motion pictures make vest-pocket visualizations of almost anything. One film re-creates the earth right before your eyes and then in a few minutes takes you step by step through the geological ages. Another may show a

cutaway model of a petroleum refinery with flowing lines and arrows to demonstrate how gasoline is made. Still another may show the earth cut in half and the different strata laid bare, with a dramatized close-up of strata movements in mountain building. By filming models of miniature "props" the producers take you back 250,000,000 years or give you eyes that see right down into the earth.

By means of cutaway animations you are able to watch in detail the invisible forces that operate electric motors. Difficult points are usually made clear by animations purposely exaggerated. For example, most people assume that a shaft that turns inside a bearing remains centered between the bearing surfaces. Actually, the shaft revolves in a slightly eccentric manner, and this can be illustrated clearly on the screen.

One of Rockett's most interesting assignments was to show in natural color the prehistoric eruption of an extinct volcano at the north end of Death Valley. Rockett represented the mountain by a piled-up heap of colored plastic material. Underneath the five-foot miniature was a maze of pipes and electrical leads by which the volcano was made to erupt by remote control. The wires ran to detonating caps buried in the summit. Some of the pipes were for discharging clouds of smoke.

The mountain was first filmed with a few wisps of smoke blowing from the peak. Then cap after cap was exploded in the summit to portray the blasting away of the mountain top. At the same time more smoke was released. Fiery lava began pouring down over the sides of the crater. The lava was compounded of colored paints into which gasoline and sulphur had been mixed, forming colorful blazing streams that were discharged from some of the hidden pipes. Like other pictures filmed in miniature, this scene was photographed at high camera speed so when the film was run off at normal speed the rapid flickering of the small flames and plumes of smoke would be slowed down to imitate the slower motions of great size.

During the last several years more film

(Continued to page 118A)

Here's all there is to making Snapshots at NIGHT

1 Load your camera with Kodak "SS" Film



2 Use 2 or 3 Photoflood Lamps and Reflectors



HATE to lay your camera aside at sundown? Now you can snapshot right around the clock—get instantaneous pictures indoors after dark with your present camera, even if it's a simple Brownie.

Just use Kodak "SS" Film, and two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, and Model B Kodak Handy Reflectors.

If your camera has an *f.6.3* or faster lens, No. 1 Photoflood lamps are powerful enough.

FREE BOOKLET . . . Contains all you need to know about *both kinds* of night pictures—*snapshots* with Photoflood lamps, *fast exposures* with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your camera can be set for "time.") The booklet's pictures and diagrams show how to arrange your lights . . . how to place your subject . . . and it even suggests a variety of picture opportunities! Get a copy at your dealer's . . . Eastman Kodak Company, Rochester, N. Y.



Movies That Show You the Invisible

(Continued from page 116A)

has been used for non-theatrical purposes than has been required by the major studios for making pictures for entertainment. In the non-theatrical class, educational movies, "trouble shooting" films and amateur pictures are each important divisions. Motion pictures also serve as an aid in making sales. One concern found it hard to convince prospective customers that its twelve and one-half pound anchor would hold better than a 200-pound an-

chor of ordinary design. Now the company exhibits a motion picture of a tractor dragging an ordinary anchor all over a beach while with the same pull the improved type just digs in deeper.

Salesmen with motion-picture projectors under their arms are performing such miracles as "making flames forty feet high on the office wall" and "blowing up fifty tons of dynamite in the directors' room" to demonstrate their products.

How Good a Driver Are You?

(Continued from page 575)

tieth year and then became even better! After the twenty-fifth year women, on the average, surpass men in steering ability. Both, nevertheless, definitely decline in general driving efficiency as they get past middle age. The braking and steering test has given many drivers the first indica-

testing instrument shows one car pursuing another at such speed as to overtake it. The person taking the test must judge the distance required by the second car to catch the first, and the moment when the cars come together. Most people had the cars meet too soon; such people tend to allow more leeway than is strictly necessary in passing a car ahead when an oncoming car approaches. Those who did badly on estimating the point at which the cars would meet generally did badly also on estimating the time required.

Driving at night is much more difficult for all drivers, and doubly so for those abnormally sensitive to glare. Such persons need to be more cautious than the rest, yet few are aware of their glare-blindness. In this test, the driver is asked to detect, against the headlights of an oncoming automobile, a miniature pedestrian on the right side of the road. The degree of brightness of his own headlights required to detect the pedestrian indicates the observer's sensitivity to glare. About ten per cent of those examined, Dr. De Silva concludes, should not do any driving at night.

A person lacking in peripheral vision—or ability to see out of the corners of the eyes—cannot see a car approaching from a side road, or one coming around from the rear until it is nearly in front of him. From three to four per cent of those tested had "tunnel vision." They could see little except what was directly in front of them. One way to compensate for this is

(Continued to page 120A)



Speed and timing estimation test which shows whether you can judge clearance in passing

tion that they do not perform this elementary maneuver as well as they should. Practice with a competent instructor should soon correct this.

Inability to judge correctly the speed of other cars and the distance and time required to pass often leads to sideswipes or collisions. In the speed and timing estimation test, great differences were observed among individual drivers. The

Half & Half Makes
ONE Swell Smoke!

In other words, Half & Half and all's swell. Cool as a ticket-line half a block long. Smooth as recalling you bought yours last week. Fragrant, friendly, full-bodied tobacco that won't bite the tongue . . . in a tin that won't bite the fingers. Made by our exclusive modern process including patent No. 1,770,920. Cool and smooth. Smells good. Makes your pipe welcome anywhere. Tastes good. Your password to pleasure!

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No Bite!



No Bite!



Still no Bite!

Not a bit of bite in the tobacco or the Telescope Tin, which gets smaller and smaller as you use up the tobacco. No bitten fingers as you reach for a load, even the last one.

HALF ^{AND} HALF
The Safe Pipe-Tobacco
FOR PIPE OR CIGARETTE

How Good a Driver Are You?

(Continued from page 118A)

to equip your car with good rear-view and side-view mirrors. Another is to turn your eyes in each direction before making a maneuver.

To find how one will act in emergencies, the person being tested sits in a standard automobile seat and pilots an imaginary car on a highway unrolling before him on a screen. In this way he goes through many dangerous situations in about three minutes.

"We have discovered highly emotional individuals who have almost 'gone to pieces' while being thus examined," Dr. De Silva points out. "Several had a tendency to 'freeze up' so they could not move when they found themselves in a tight place. Others gripped the steering wheel so tightly they could not maneuver the car freely."

In special tests of more than 500 "repeaters"—motorists who had frequent accidents—Dr. De Silva found most of them owe their poor records to one or two bad habits or disabilities which they seldom suspect they have, and which in many cases can be corrected. From a study of this group he concludes the foreign born are likely to have more accidents than the native; the very poor and very rich than the middle class economically; the very young and very old than the middle aged, and unmarried men more than married.

"Many repeaters with a foreign background were handicapped in understanding English signs or traffic rules," said Dr. De Silva. "All sorts of visual difficulties, especially shortsightedness, were found in this group. The wealthy repeater seemed to take accidents lightly, since he could foot the repair bills or get legal service when in a jam. The very poor man lacked a sense of responsibility for opposite reasons—he seldom owned his car and was pretty sure his impecuniousness would save him from a suit for damages.

"The very young had little realization of the seriousness of accidents. The very old had a full sense of responsibility, but failed to realize their reactions were slowing down, or they had not improved their driving to cope with the more speedy cars. Marriage seems to make for more careful driving, especially when there are

small children in the family. Relatively few repeaters were married."

Dr De Silva believes the tests are a real help to the driver, since they tell him exactly what his weak points are. It is then up to him to correct his driving habits or to compensate for any natural disabilities.

"If you find you are slow in your braking reaction," he advises, "you should make allowance for this deficiency by starting to apply the brakes farther back and by following other cars less closely. If you are poor at estimating passing distances, allow a greater distance than you have been doing, or do not pass at all if there is a car coming from the opposite direction.

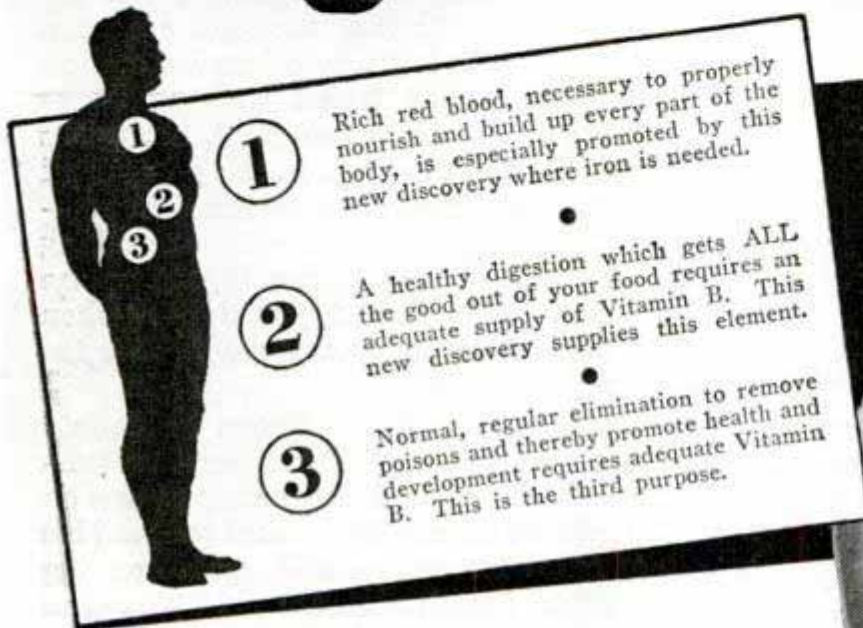
"If you are blinded more than the average person by the glare of headlights, do less driving after dark, or drive very slowly and keep to the extreme right. Since all drivers deteriorate as they grow older, it is necessary for elderly people to compensate for their loss of skill by decreasing their speed and exercising greater caution. Most elderly people drive with greater care, but there are some who have never realized how their lowered physical efficiency has affected their driving."

Dr. De Silva believes only a small minority of the thousands he has tested could justly be denied the privilege of driving because they are mentally or physically feeble or nervously unstable. Such persons are a menace to themselves and to others on the highways. The great majority of drivers—and of people in general—have all the potential abilities to make excellent drivers. All many of them need to become skillful and safe is to have their weaknesses pointed out to them.

"I have found the ordinary driver a pretty good fellow all around," says Dr. De Silva. "Many do certain things wrong and have certain erroneous notions about driving, but generally they are glad to have these pointed out. I have found only a few really 'ornery' motorists, and almost invariably these have done poorly in the tests."

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

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Posed by
professional
model

SKINNY?

New Quick Way Gives Thousands Solid Pounds Fast!

WHEN thousands of formerly skinny, run-down, friendless people have gained pounds of solid, normally good-looking flesh with this new triple-acting treatment, it's a crime for thousands of others to remain thin and unattractive. Actually, with this sensationally quick new body-builder, you may not only gain normal, flattering pounds, but also naturally clear skin, freedom from indigestion and constipation, new pep and popularity.

Doctors now know that the real reason why many find it hard to gain weight is they do not get enough Vitamin B and iron in their food. Without these vital elements you may lack appetite and not get the most body-building good out of what you eat. Now with this new discovery which combines these elements in little concentrated tablets, hosts of people have put on pounds of firm flesh, normal heftiness—in a very short time.

This amazing new product, Ironized Yeast, is made from special imported cultured ale yeast,

one of the richest known sources of Vitamin B. By a new process this special yeast is concentrated 7 times—made 7 times more powerful. Then it is combined with 3 kinds of iron, pasteurized whole yeast and other valuable ingredients in pleasant little tablets.

If you, too, need these vital elements to aid in building you up, get these new "7-power" Ironized Yeast tablets from your druggist today. Note how quickly they increase your appetite and help you get more benefit from the body-building foods that are so essential. Then day after day watch flat chest develop and skinny limbs round out to natural attractiveness. Soon you feel like an entirely different person, with new charm, new personality.

Money-back guarantee

No matter how skinny and rundown you may be from lack of enough Vitamin B and iron, try these new Ironized Yeast tablets just a short time, and note the marvelous change. See if they don't aid in building you up in just a few weeks, as they have helped thousands of others. If you are not delighted with the benefits of the very first package, your money will be instantly refunded.

Special FREE offer!

To start thousands building up their health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out seal on box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 534, Atlanta, Ga.

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Here it is!



TWIN CYLINDER

Indian JUNIOR SCOUT

What a "honey" this Junior Scout is! Only Indian could bring you an engineering triumph like this—a real "twin" at the lowest price in American history!

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Please send me at once, and without obligation, illustrated Folder describing the new Indian Motorcycles and CERTIFICATE of VALUE entitling me to FREE Rider's Helmet and Pin as illustrated when I place my order.

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 16-19 years
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PM4

INDIAN MOTORCYCLE CO., Springfield, Mass.

71252

Stunts of the Aerial Acrobats

(Continued from page 567)

his wings. Military airplanes are tested to nine "G's," which means their wings must stay on when subjected to nine times the normal pull of gravity. Mantz pulls out at a reduced strain.

Upside-down flying is a big part of modern stunting and the engines of stunt planes are rebuilt for inverted flight. No matter in what position a stunt plane is placed, the engine still operates and the instruments still give accurate readings. Flying on your back, held into the cockpit with straps that fasten with a quick-release hook across the chest, multiplies the difficulties of flying. In this position all control movements are reversed in relation to the ground. For instance, pulling back on the stick in normal flight puts the plane in a climb, but if you do this when the plane is on its back it would dive toward the ground.

Flying upside down fifteen or twenty feet above the earth, Mantz must remember this. He must dodge racing pylons on the field, be careful not to skid and lead his two followers astray, and avoid crossing the white deadline on the field placed to protect spectators. At the same time, he must operate the pump that sprays smoke chemical into the exhaust. Finally, he must remember all the details of the maneuvers he is expected to lead.

The leader of a stunt group controls the other planes with a few simple arm movements or nods of his head. Sometimes the leader changes the program while in the air. He calls the other two planes in close for a "conference" while flying on a straight course and shows each pilot what he is to do by outlining the stunt with movements of his hands.

"Crazy flying" is one of the hardest acts in the stunt man's repertoire. The flyer uses a slow old plane in dilapidated condition. If it looks too new, he smears it with oil and partly rips off a few sections of fabric. Then he does every stunt the way it shouldn't be done. He takes off down the field with one wing tip dragging along the ground and wobbles into the air in imminent danger of crashing. Once off the ground his troubles have only started. From the stands it looks like the pilot had never been in the air but before he gets

through you are wondering how he does it. Every maneuver is sloppy and air men know sloppy stunts are close to suicide.

When the "crazy" flyer tries a loop, his power fails on the climb and he falls into a spin. When he gets out of the spin he falls into another. If he tries a barrel roll he gets stuck when the plane is upside down and doesn't seem to be able to complete the roll. He comes across the field in a continuous stall with the plane moving too slowly for safety. When he lands he fishtails sideways until the last possible moment, or sits the plane down with a crash that bounces it twenty feet in the air.

But don't try crazy flying, even if you are a competent pilot. This is definitely precision flying and the pilot doesn't dare relax for a second. A slight misguess at any point would put the plane out of control, and at low altitudes where there isn't room to recover from a spin a plane that gets away from its pilot is almost certain to crash.

In a variation of crazy flying, Mantz acts as a greenhorn pupil with Clarke as instructor. After both have crawled into the plane a bomb explodes, simulating a backfire. Mantz hastily scrambles out. After he has been forced back into the cockpit the plane starts to careen down the field, smashing into a refreshment stand on the sidelines. The stand is constructed of balsa wood and paper for the stunt. Finally, the pupil manages to get the plane in the air and the crazy flying begins.

Wing walking used to be a standard act but that is a thing of the past because modern airplanes are too fast to permit it. At anything except slow speed a wing walker would be blown right off the plane. Airplanes are so streamlined nowadays and have so few places for holding on that a wingwalker can't do such favorite old stunts as hanging by one hand or a foot from the end of a wing. One of Clarke's old stunts was to leave the controls and crawl under the plane on the landing gear, returning to the cockpit by the other side. That's impossible today, as is his old trick of crawling out of the cockpit and straddling the tail, maneuvering the plane by means of ropes attached to the controls.

Clarke used to perform a loop from the

(Continued to page 124A)



Masonite

ENDORSED BY

16 OF 23

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• At the Chicago Automobile Show in November, twenty-three trailer makers exhibited their 1937 models. And sixteen of them — about 70% — used Genuine MASONITE Products for interior, exterior or both surfaces.

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F1252

(Continued from page 123A)

ground as he came in to land and after finishing the loop, climb to a stall. Then he allowed the plane to whip back out of the stall and settle gently to the ground. This whip-stall landing is possible only with very slow airplanes and if a pilot tried it with a high-speed ship his speed would carry him 500 feet or more above the field, far too high for a landing.

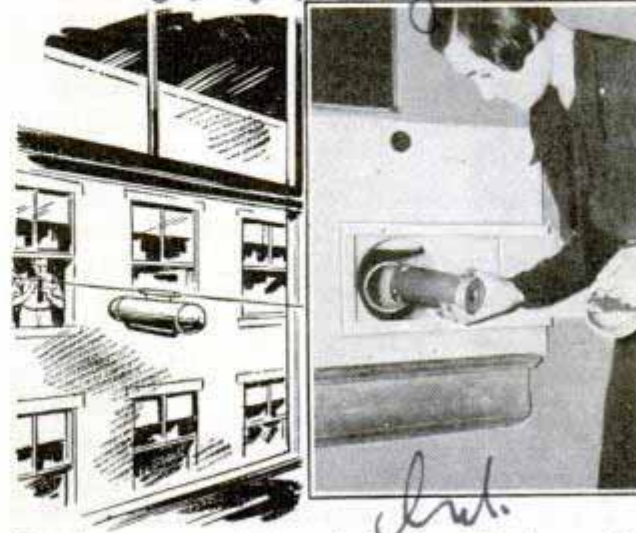
Clarke has flown planes in nearly 100 different motion pictures. Once, with Mantz flying the camera ship right behind him, his job was to corkscrew down a narrow, twisting canyon at full speed. Everything went well until Clarke had to bank around a particularly sharp turn. At that instant he felt a jolt and then discovered that his left wing had partly folded up. He had struck an unseen power line and torn off 500 feet of copper cable which was trailing from the wing. When both planes got back to the field, the cameraman discovered his camera had broken down and the scene had to be shot over.

F1683

Motor-Driven "Carrier Pigeon" Serves Two Buildings

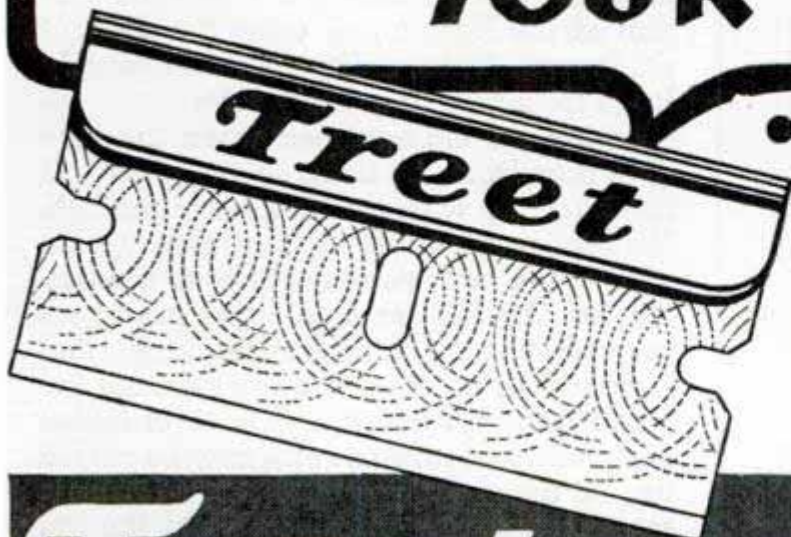
For transporting messages between two buildings at Harvard University, a mechanical "carrier pigeon" is operated back and forth on cables. It is driven by a small motor whose power is shut off when the device reaches either terminal. Communications are placed in an aluminum cylinder for the trip from the laboratory to one of the engineering buildings. A red light indicates that a message is in the cylinder.

Cambridge, Mass



Putting message into cylinder for trip to another building. Left, sketch of the carrier system

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WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

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BUILD THIS 6' YAWL MODEL, ONLY \$1.50

Everything furnished including semi-shaped hull of white pine and mahogany with black water line. All rigging material, airports, pedestal, base, plans and instructions. Mailed postpaid for \$1.50 in U.S.A. \$1.65 Canada. No C.O.D. orders. Our 44 page illustrated catalog listing kits and separate fittings mailed on receipt of 15c.

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Expels
HOOK, TAPE
and ROUND
WORMS



PULVEX WORM CAPSULES

Moonbeams Balk the Fisher Folk

Fly 83 (Continued from page 549)

to twenty miles off shore, often in rough weather. Each boat carries its own tender, tows its own lighter. A lighter is imperative, for piling of cargoes is prohibited by law. The catch is spread out over the bottom of the lighter and upon the deck of the launch. Thus, a fifty-foot boat usually loads from fifty to seventy tons.

Lights are extinguished when the sardine boat starts its hunt, so the glow will not interfere with the watch for the fish. On leaving port the captain takes up his vigil at the bow, peering out over the water for the "Silver Sea." He may pass several schools of anchovies, smelt and mackerel or ignore schools of sardines too small to merit attention. Schools of mixed anchovies and sardines also may be passed up. At times, for an undetermined reason, the fish are very wild, and when the net is cast will sound and escape. That necessitates several casts before a load is obtained. Recasting also is practiced when the quarry is running in broken schools too small to complete a cargo.

On sighting a desirable school, the boat is maneuvered to proper position, and one end of the seine, attached to a buoy, is cast overboard. The lighter's hawser also is fast to the buoy, and is cast off with the first length of seine. The boat then slowly surrounds the school, or segment of the school, moving in a circle as the seine is payed out. When the circle is completed back to the buoy and lighter, the purse of the seine is closed by a winch, and the wings are hauled in by hand.

While this operation is going on, a lighted electric bulb is dropped overboard from the stern of the boat and lowered to deep water under the purse; then moved up and down in jerks to frighten the fish and keep them from sounding before their twine prison closes. This "scare" is ineffective when the game is wild. With the closing of the purse, lights again are turned on, and brailing lights are flashed over the water. The brailer, a huge steel-mesh bucket, is lowered by crane, bringing up a hundred pounds of fish or more.

Boats return to shore in the cold dawn to unload. Cargoes are pumped from decks and lighters to conveyors, which dump them on scales. Then they are sluiced into

(Continued to page 128A)

NEW SCREW FEED LATHE

No. 355-6 x 18-inch METAL TURNING LATHE WITH LONGITUDINAL SCREW FEED. Length overall 30 inches. Machined semi-V ways. Threaded hollow spindle No. **ONLY \$1195**



O MORSE TAPER CENTERS. BRONZE TAPERED TAKE-UP BEARING. 1/2 inch tailstock set-over. Compound carriage travels on semi-V ways gibbed for take-up. Included: Two 60° centers, tool post assembly and 4 inch face plate.—3 inch four jaw chuck \$3.50; 4 inch chuck \$4.50; adaptor bushing 50 cents. Send \$2.00 with order, balance C.O.D. Shipping weight 30 lbs.

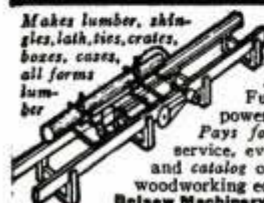
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MAKE GLAZED CONCRETE PRODUCTS

LEARN to make garden vases, jars, birdbaths out of sand and cement without molds or costly tools and glaze them like clayware. Also beautiful, colored, glazed tiles, novelties, walls, etc. Statuary casting, giftware. No experience needed. Money-making employment. Send 10c for booklet, color plate, details.

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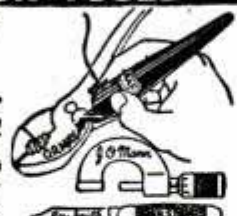
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INVENTORS Be Sure to See Page 23A

BIG 1937 LEADER

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GENUINE LEATHER TIES

NO SALES EXPERIENCE NEEDED. Beautiful 4-in-Hands for Men and Boys, sell on sight, everybody buys. **LOOK LIKE SILK**; cleaned with a damp cloth. Famous Century Bows sell to uniform men, such as policemen, firemen, letter carriers, etc. Write today for our new **FREE DEAL OFFER**, or send 50c for samples, 4-in-Hand and Bow.

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BE YOUR OWN FIXER AND SAVE THE REPAIR MONEY

Typical repairs that can be made perfectly with Smooth-On:—Stopping leaks in steam, water, gas, oil or stove pipes; mending cracks, breaks or leaks in furnaces and boilers, radiators, tanks, sinks, pots and pails; making loose handles tight on umbrellas, knives, hammers, brushes, drawers, etc.; tightening loose screws, hooks, locks, door knobs, etc.

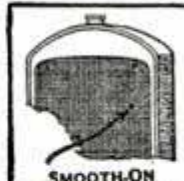
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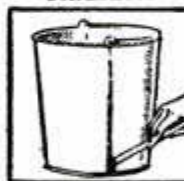
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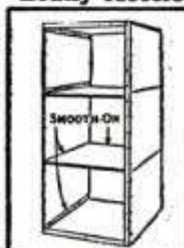
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Leaky Kettle



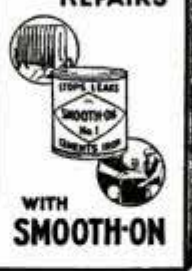
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Stove Pipe



Oil Leaks

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Do it with SMOOTH-ON

When writing please mention Popular Mechanics

F1483 Moonbeams Balk the Fisher Folk

(Continued from page 126A)

revolving cylinders of heavy screen into which jets of cold water are forced at high pressure to remove the scales. Waste water sluices scales to a vat for reduction to fertilizer, while another stream carries scaled fish to cutting and cleaning machines.

Heads and viscera are removed in one process by revolving knives, brushes, augers, gimlets or by vacuum. Heads and offal are sluiced in one direction to reduction tanks; fish in another direction to vats of ice-cold brine to whiten the meat. Then they are carried on conveyors to sorting tables. Bruised fish are sent to reduction vats to be turned into meat and oil.

Before the fish go to the broil, the oven, the fry or the steam cook, they pass through a drier to remove moisture and set the skin. The drier is a long tunnel containing a series of chain belts, staggered one beneath the other. The sardines ride back and forth on the belts until properly hydrated by hot air forced into the tunnel at one end and out the other. Coming out of the driers, the fish fall into wire baskets and are conveyed to fry vats to be submerged in boiling oil. Emerging,

the cooked product passes through a hot-water or steam spray to remove excess oil, is drained, canned and labeled by machines. Broiled and baked sardines go through the same process, except that ovens serve the purpose of hot oil, and the broil or bake is by radiant heat.

The ring net is now used by more Pacific fishboats than any other seine. All nets operate on the same principle. They are closed by ropes through rings at the bottom, forming a purse that imprisons the catch. All are made of tanned webbing, with a central bag or purse of fine mesh, and with wings of coarse webbing and heavier cord. They range from 660 to 1,800 feet long and from 150 to 240 feet deep.

Seines cost from \$1,000 to \$5,000, and are good for from one to three years. They require frequent patching and immersion—tanning—in huge vats of hot oil.

A drove of sea lions trapped with a school of fish will damage a net as much as \$1,000 by tearing holes in the bag. Although sardines rank second to salmon in commercial importance on the west coast, they do not lure the sportsman.

F1563 Flying Freight to the Arctic

(Continued from page 516)

ern Manitoba pilot. "Called at Jackpine bay to pick up grocery order." That afternoon he landed at his base 100 miles to the south, handed the order to the base manager, and that evening the grocery order was piled in the shed waiting aerial transport. If airplanes had not been available

it would have taken more than a week to have gotten those provisions to the mine, and they would not have been fresh. But within twenty-four hours of picking up the order, the pilot had it at the camp, everything fresh. Nearly as fast as if the mine were next door to a city, instead of hundreds of miles from the nearest town.

Planes have actually cut down the cost of living at northern camps. Because of the heavy overhead on overland transport, miners' wives used to buy potatoes at \$10 a bag, canned foods at sixty-five cents a tin, sugar at fifty cents a pound. Today potatoes are \$3 a bag, flour \$4.80 a bag, sugar fifteen cents a pound, and canned fruits thirty cents a tin.

Last spring cakes of ice thirty feet high crashed about the hangars of the air base at McMurray, at the end of steel in Alberta, where planes leave on the Arctic routes. The ice barrage pushed trees and

(Continued to page 130A)



An air base on the shores of a frozen lake in the Canadian northland

STUDEBAKER ANNOUNCES

\$10,000.00 IN CASH PRIZES

Free TO USED CAR BUYERS

ALL you need do to qualify for one of these 452 cash prizes is to buy from an authorized Studebaker dealer a Pledge-backed used car of any make—and then write a letter of 50 words or less stating why you did so. For the best letter, Studebaker will pay \$1,000.00 in cash! For the next best letter, \$500.00 in cash! For the 450 next best letters cash prizes ranging from \$100 to \$10 in cash!

Studebaker is making this sensational offer of \$10,000.00 in cash prizes in order to call attention to the many amazing values in used cars of all makes which Studebaker dealers have taken in trade on new 1937 Studebakers.

2 GOOD REASONS WHY STUDEBAKER DEALERS SELL BETTER USED CARS

1 The famous Used Car Pledge—introduced by Studebaker eleven years ago—assures you honest pricing and fair treatment.

2 You have many makes of cars to select from, including a fine assortment of Studebakers—the make preferred by shrewd used car buyers.

The Studebaker Corporation asked its dealers to take this Pledge eleven years ago.

As years passed, other organizations have fallen in line with varied imitations of this sound policy. But regardless of the wording of the imitations no other organization can match Studebaker dealers in carrying out the spirit as well as the letter of this sound policy.

RULES: Buy a Pledge-backed used car from an authorized Studebaker Dealer (the make of car or amount you pay, however small, makes no difference) and then write a statement of 50 words or less on the entry blank the dealer will give you, sign with your name and address (give street and number as well as city and state) and mail to Studebaker, South Bend, Ind. Your entry must be postmarked not later than midnight March 31, 1937. Employees of Studebaker and Studebaker dealers—or members of their families—are not eligible and duplicate prizes will be awarded in case of ties. No entries will be returned. Paul G. Hoffman, President, Studebaker Corp., and staff will be the final judges. Spelling, grammar and penmanship will not count against you. Just give a statement of 50 words or less as to "why you bought a used car backed by the Studebaker Pledge."

| | |
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| 1st PRIZE, IN CASH | \$1,000.00 |
| 2nd PRIZE, IN CASH | \$500.00 |
| NEXT 10 PRIZES, IN CASH, EACH | \$100.00 |
| NEXT 40 PRIZES, IN CASH, EACH | \$50.00 |
| NEXT 100 PRIZES, IN CASH, EACH | \$25.00 |
| NEXT 300 PRIZES, IN CASH, EACH | \$10.00 |
| 452 CASH PRIZES | \$10,000.00 |
| TOTALING | \$10,000.00 |

Studebaker Dealer's Pledge to the Public on Used Car Sales

1. Every used car is conspicuously marked with its price in plain figures, and that price is rigidly maintained.
2. All automobiles which are sold as **CERTIFIED CARS** have been properly reconditioned and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.
3. Every purchaser of a used car may drive it for five days and then, if not satisfied for any reason, turn it back and apply the money paid as credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)



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WHILE YOU BUY A
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GASOLINE DRIVE
ELECTRIC DRIVE

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Flying Freight to the Arctic

T1563 (Continued from page 128A)

houses before it, jammed the rivers and threatened to smash through the hangars where the aerial freighters stood on skis, waiting to change over to pontoons. Though it looked like suicide, mechanics and pilots hopped into canoes, made their way to the hangars and tied floats to the planes so in case of a crash they could float away with little damage on the flood waters which preceded the ice barrage. Others pushed against the current with dynamite, picks and shovels, to blow that ice jam and its flood waters out of the way.

In the midst of it all the doctor at the settlement called for a plane to take a sick woman to a city hospital, 400 miles to the south. He gave her twelve hours to live without an operation. So a couple of airmen hooked pontoons to a freighter, and took on the sick woman and her nurse. Pilot Archie McMullen decided it was possible to navigate through the ice and take off. And he did, but just as he was leaving the water he hit a submerged piece of drift ice. With that cracked pontoon he took off and landed his patient safely at Edmonton.

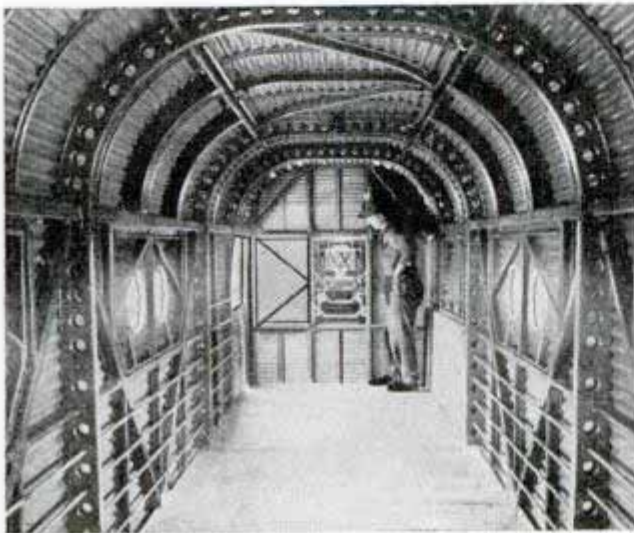
While the trips north are usually well loaded, airway operators have had to find ways of getting full loads back. Some mines ship their ore or bullion out by plane. One mine has its own plane to fly radium-bearing ore 1,000 miles, and it takes hundreds of tons of ore to produce one ounce of radium. But an ounce of Canadian produced radium sells for \$1,000,000, a low price made possible largely by the use of the plane. Prior to the Canadian production, radium mined in the Belgian Congo sold at \$2,000,000 an ounce.

Fur also comes out by plane. A load of white fox valued at \$60,000 is not unusual. Fresh fish make up another cargo for returning planes. One company last year brought 150 tons of fresh caught fish south on its return flights.

Canada's aerial freighters plying the bush and barrens last year flew more than 7,500,000 miles. But not all freight goes in by air. During eight or ten weeks each winter tractors run heavy loads across frozen lakes and deep snow with a hard surface. Extremely heavy loads are carried this way, one mine transporting in eight weeks 20,000 tons of machinery. Sometimes the waters shift under the thick

ice, a slush forms under the top layer and the heavily loaded tractors go crashing through. It is quick jumping for the drivers, and quicker work to put tackle onto those mighty engines. Little time is wasted by tractors near by. A derrick is assembled, steel oil barrels are snubbed together, and the heavy machines pulled out. Airplanes are used by some operators to keep in touch with their tractors on long hauls. Tractors operate far above the Arctic Circle, pulling equipment too big and clumsy to go into a plane.

Canadian air operators will fly anywhere. Scheduled flying is carried out on



The flying boxcar, or the interior of a Canadian express plane carrying three tons

the mail runs, but charter service is more usual than scheduled flying, and pilots often drop in at points on their route for which they have no mail, freight or passengers, just to see if there is anything needed at the mine or any freight to go out. While most freight is moved in summer, planes crisscross the northland all year round. Special means of heating engines in winter, keeping oil from freezing, and making repairs have been devised.

Portable stoves are carried by big planes on remote runs and tarpaulins are part of the emergency equipment, so a pilot can throw a cover over the engine, tack it down to the ice, and put his stove in to heat it up. Repairs have been made in fifty-below-zero weather on the Arctic coast. Portable nose hangars are common on all ice landing fields. Portable stoves keep the engine thawed out overnight in these wooden, tarpaulin or even ice block nose hangars. Thus do Canadian pilots solve the problems of Arctic air service.

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"Let There Be Light"

(Continued from Coloroto Section)

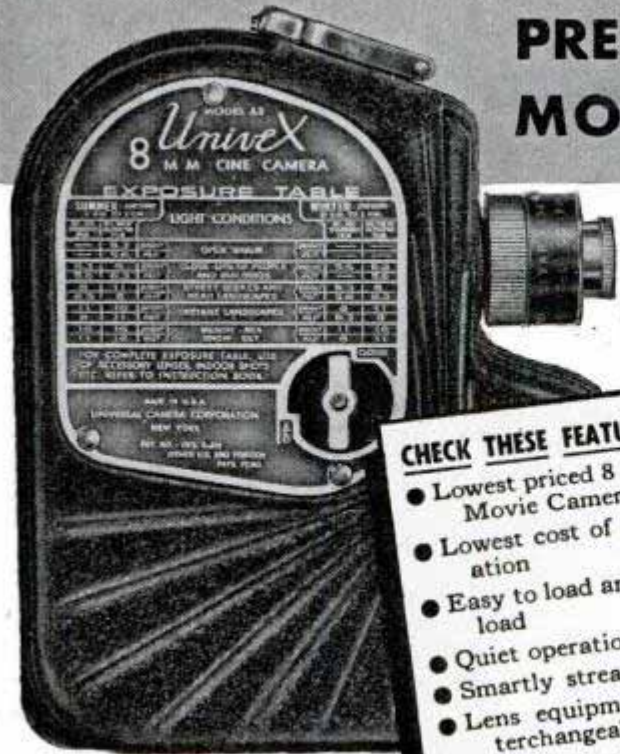
gion is the goal of the white-light searcher, so the narrowing of the spectrum until it lies in a single color region is the objective of colored-lamp development.

The familiar method of placing colored glass or gelatin over an ordinary lamp is a wasteful way of producing colored light because the glass or gelatin must absorb certain colors in order to let others pass through. The absorbed rays are converted into heat and lost. The dream of lamp scientists is to make a colored-light generator which will produce no wave lengths other than those in the color band desired. The sodium lamp is an approach in this direction, as nearly all its light is in the yellow region. So, too, are the fluorescent tubes whose color emission is controlled by the kind of powder with which their inner glass walls are coated. But, until one-color lamps are produced, incandescent lamps with colored glass bulbs will continue in use. Even here, there are problems to solve. Light engineers are searching for purer and more brilliant colors and better ways of putting color on the inside surface of bulbs where it will not rub off.

While lighting specialists constantly are seeking ways to produce better lamps, they have incorporated amazing features in the ordinary brass-capped glass bulbs by whose light you possibly are reading this page. The inside of a good lamp bulb, for instance, is one of the hottest and one of the driest spots on earth. Lamp filaments burn at temperatures of 3,800 to 4,500 degrees Fahrenheit, almost half as great as the surface temperature of the sun. And one drop of water distributed equally among 500,000 lamps would be enough to blacken them early in life. A "getter" is used to remove the last trace of moisture from inside a lamp. It is a chemical which, when heated, enters into combination with water and other undesirable molecules to form harmless compounds.

Your lamp filament in action is a little Vesuvius. Like a volcano, it gives off ashes—tungsten ash which condenses on the glass bulb to cause blackening. The filament of a sixty-watt lamp is about the

(Continued to page 134A)



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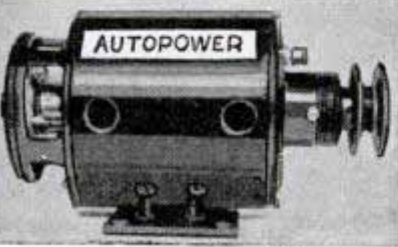
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PEND.

(Continued from page 132A)

size of a human hair. The smallest filament, that used in a three-watt, 110-volt lamp, is one-eighth the size of a human hair. The largest incandescent lamp, rated at 50,000 watts, has a three-pound filament made of tungsten wire coils as large as screen door springs. The smallest filament that can be drawn through a diamond die is about one-fourth the size of a hair. Smaller ones are made by etching them to size with acid.

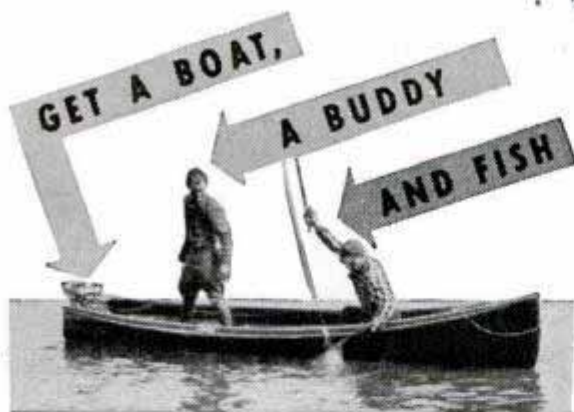
If a filament varies in diameter by only one hundred-thousandth of an inch the life of the lamp may be affected twenty-five per cent, if the mandrel on which a filament is wound is off size one ten-thousandth of an inch, lamp life may be shortened twenty per cent, and an almost imperceptible error in the spacing of filament coils may shorten the life of the lamp by ten per cent.

Because of the extreme precision required to produce a good lamp, it pays you to buy lamps made by a reputable manufacturer. The normal life span of a good lamp is about 1,000 hours. They could be made to burn longer, but their efficiency would fall off so rapidly that they would become highly expensive. For every dollar you spend for new lamps, you probably will pay about nine dollars to operate them during their lives. So if you save ten cents on the dollar by buying so-called "bargain" lamps, your total saving would be less than one per cent of the money you spend for light. And these bargain lamps usually waste current, which makes them very questionable bargains.

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(Concluded next month)

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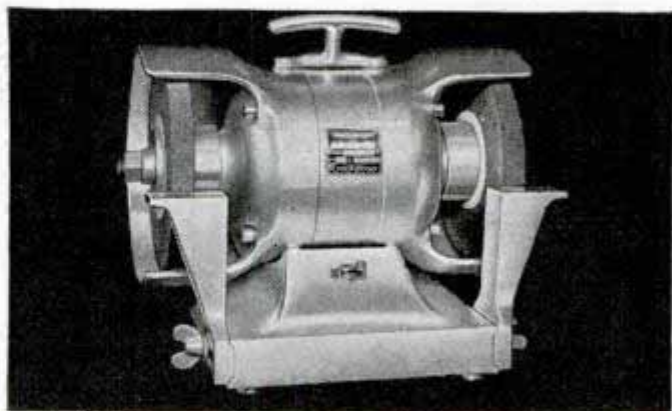
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There's Money in Herbs

(Continued from page 525)

once the first year, two or three times each growing season thereafter. For the best product the leaves should be picked by hand, dried in the shade, and turned frequently to avoid mold. It is best to market the crop promptly, since the dry leaf loses strength with age. On good land sage bears as much as a ton of dry leaf to the acre.

Peppermint, spearmint and wintergreen are the three most valuable of our native mints. Peppermint is a perennial native to moist areas throughout the eastern half of the United States. Its principal product



Bundling catnip for market. The dried leaves are tied tightly and wrapped in burlap

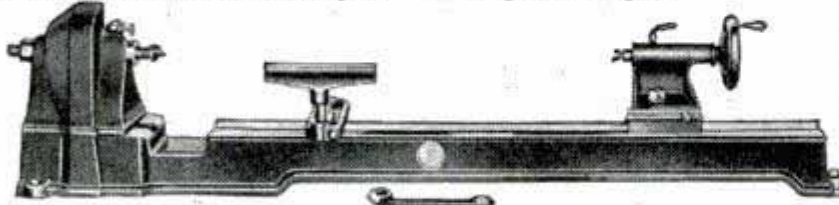
is volatile oil, worth from \$2.50 to \$4.00 a pound, though the crude drug trade also uses the dried leaves and flowering tops. The plant is usually propagated by roots or runners, planted in rows to a depth of about three inches, preferably in moist soil. Commercial growers usually apply garden fertilizer and grow only two or three successive crops. Harvest is in late summer when the herb is in full bloom. The crop is cut like hay. Leaf and flower crops are cured indoors to retain the green color, packed in bales or carton, and sold direct to drug houses. Spearmint is much the same as peppermint in culture and harvest. The dried leaf is worth about the same—from ten to twenty-five cents a pound. Wintergreen, usually the most valuable of native mints, is a low, broad-leaved evergreen with a creeping stem and small red berry. The herb grows best when planted in rich leaf mold under par-

(Continued to page 138A)

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What a wealth of meaning in a single word! Applied to the 1937 Driver Engineered Power Tools, it means long careful study of all the essential requirements for home workshop tools—safety, adaptability, service, appearance—*together with expert planning for their manufacture.* Have your dealer show you

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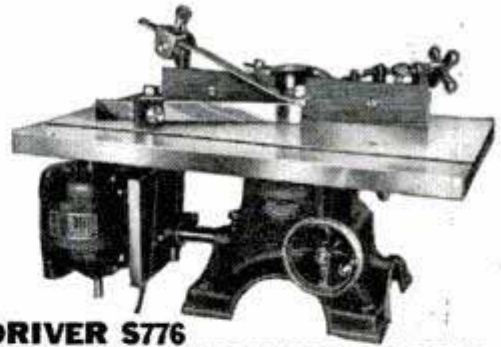


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FOR FLAT BELT
FOR V BELT
TO CARBURETOR LEVER

es 10.

There's Money in Herbs

(Continued from page 136A)

tial shade. The cured herb is usually worth from five to ten cents a pound.

The larkspur is a garden flower which bears a seed used in remedies for external parasites. The flower grows best in rich sand or gravel soil, and when seeds have germinated plants should be thinned to nine inches in the rows. When seed capsules are fairly ripe but not yet brittle enough to shatter, the crop is harvested by collecting the tops, curing the heads in well ventilated sheds, threshing or sifting out the seed when thoroughly dry. It is best to clip the seed heads in early morning, while still damp with dew or rain. Value of the dried seed varies, ranging from fifty to eighty cents a pound.

Burdock, a large biennial, is known as a troublesome weed. Dried roots from first-year growth are the basis of its herb value, though seed and leaf also have medicinal use. On good soil the roots yield as high as a ton an acre, and ten cents a pound is an average price. Seeds are sown in late fall or early spring. The best stand is about six inches apart in rows about two feet apart. At the end of the growing season, tops are cut off, and the roots, sometimes two or three feet long, are dug with long spading forks or plows, washed and dried—preferably with low artificial heat. Large roots are split lengthwise to facilitate drying.

Thyme is a shrublike perennial herb used for seasoning and for oil of thyme, a common pharmaceutical. Seeds are sown early in the spring and plants are thinned to intervals of about eighteen inches in rows two or three feet apart in mellow upland soil and are well cultivated during the growing season. For the dry herb, flowering tops are cut when the plant is in full bloom and dried in the shade. Yields are as high as a ton to the acre. Prices vary from five to twenty-five cents a pound.

Ginseng is the most valuable root herb and one of the most difficult to grow in a home garden. The plant is native to rich soil in partly shaded forests and in garden culture must be shielded from direct sunlight. Leaf mold and fine bone meal are the best fertilizers, but should be applied

(Continued to page 140A)

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**A Pierce
Governor
puts "brains"
into any
gas motor.**

There's Money in Herbs

(Continued from page 138A)

lightly. The seeds are soaked in water for partial germination, then planted in beds and transplanted eight to ten inches apart at the end of two years. A mulch of straw or leaves is necessary for winter protection but should be removed in the spring. Planted from seeds, the roots do not reach marketable size until the sixth or seventh year. When dug they are washed and cured in a well-ventilated shed or loft and stored in a dry airy place until ready for sale. The price ranges from \$4 to \$15 a pound. Culture of goldenseal or seal herb is almost identical to that of ginseng. It is somewhat more hardy and the roots grow to a marketable size in about five years. The dried leaves and stems are also marketable at prices ranging from five to fifty cents a pound. Prices for the dried roots vary from \$3.50 to \$5 a pound.

Lavender, one of the most fragrant of all perfume herbs, is a shrubby perennial which grows on almost any well-drained loam. The plant is usually grown from cuttings or root divisions, placed in rows about a foot apart, heavily mulched during winter, or in cold climates wintered in greenhouses or cold frames. The blossom is the valuable part. Flowering tops are harvested when in full bloom, dried carefully in the shade and the flowers are later stripped from the stems by hand. As a rule one planting produces three crops of flowers. Harvests of flowers when dried usually range from 400 to 800 pounds to the acre. Market value of the dried flowers ranges from twenty-five to fifty-five cents a pound.

Other hardy garden herbs adapted to most parts of the United States east of the Rockies include henbane, fennel, dill, coriander, conium, caraway, anise, belladonna and camomile. Such herbs as arnica, lovage, poppy, seneca, valerian, and wormwood usually grow best in the northern part of the United States, while cannabis and wormseed are better suited to the south. Aletris, or star grass; angelica, a cooking herb; blue flag, a drug root; boneset, calamus or sweet flag, castor bean, digitalis or foxglove, yellow gentian, insect powder flowers, melissa or lemon balm, parsley, pennyroyal, pokeweed, jim-

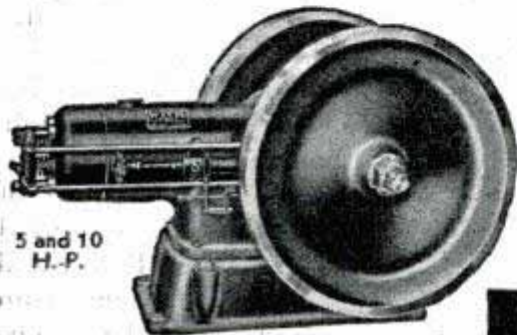
(Continued to page 142A)

DIESELECTRIC PLANTS

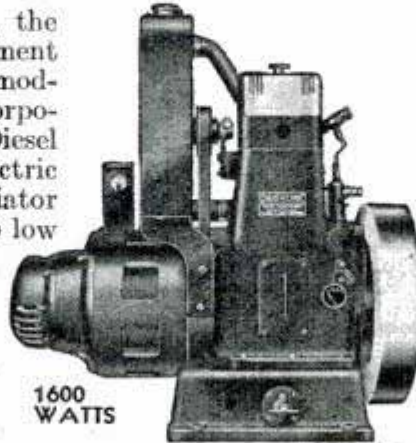
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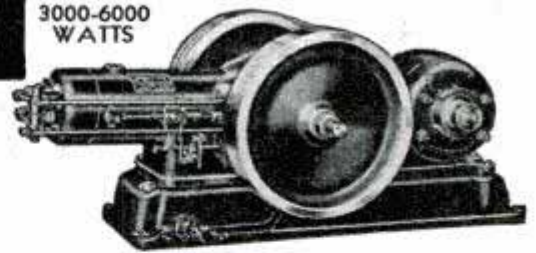


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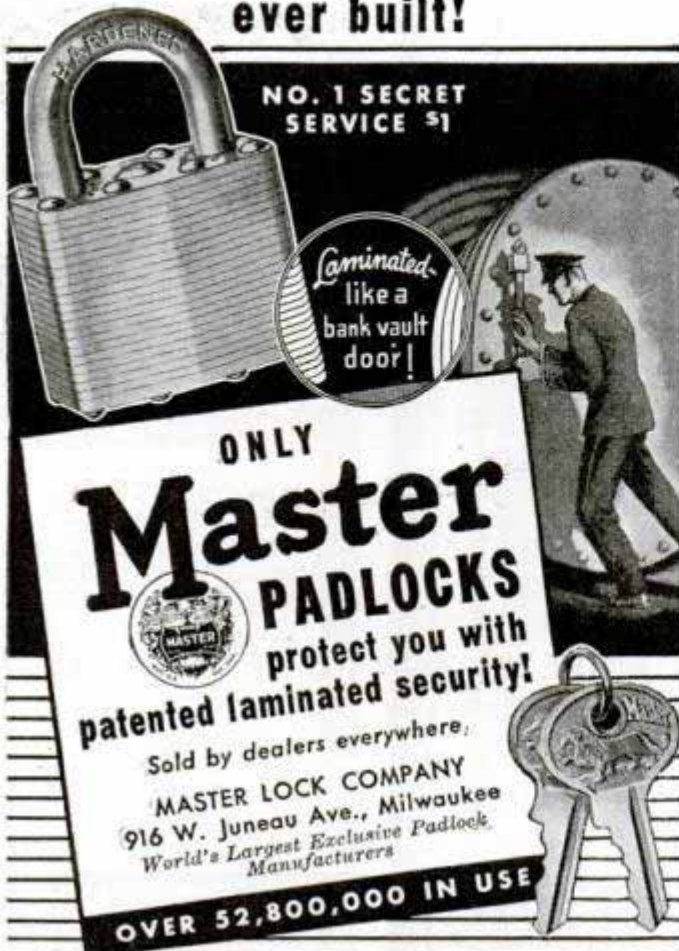
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There's Money in Herbs

(Continued from page 140A)

son weed or stramonium, and wormwood are among other herbs the home gardener can grow. Seed, roots, or planting parts of most garden herbs can be purchased from large nurseries or seed houses. The home gardener probably will do best to begin with a leaf or root which can be cured simply. Extraction of herb oils usually involves a steam-vat process which is likely to require a sizable production in order to be profitable.

In harvesting herbs whose value depends upon flowers and seed, a berry scoop or seed picker frequently saves labor. A homemade picker can be built with a stout wooden box about ten inches wide, fourteen long, and six deep. Remove one end and connect the remaining sides at the top with a stout strip to serve as a handle. Drive long slender nails at quarter-inch intervals through a strip of wood, thus forming a comb, the teeth of which should be about two inches long. This comb is fastened to the bottom of the box so the teeth will project upward through the opening left by the removed end. On swinging this device teeth-forward through the flowers, heads will be snapped off by the comb and will fall into the box.

Where weather permits, most herbs can be cured economically by air-drying. As a rule the root crops, after being washed, can be cured in sunlight. The south slope of a low roof is a good sunning place and vacant hothouses make an ideal curing place. Roots should be turned frequently. Leaf and flower herbs are best cured in the shade, since this keeps them green and betters their appearance. Where heat is applied, temperatures should never go higher than 150 degrees Fahrenheit and should always be applied gradually. Otherwise the herbs may be scorched or shriveled.

There's money in herb growing. And here's betting dollars to doughnuts there will be a great deal more in it within another ten years.

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

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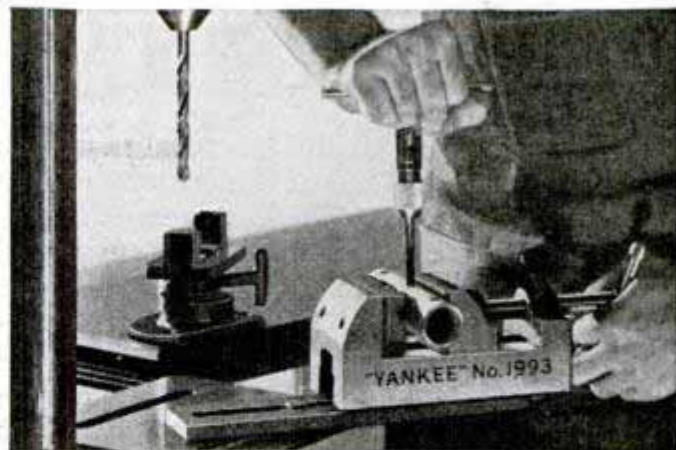
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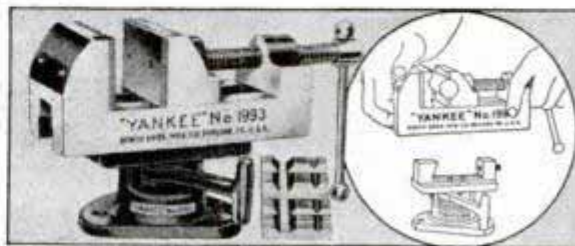
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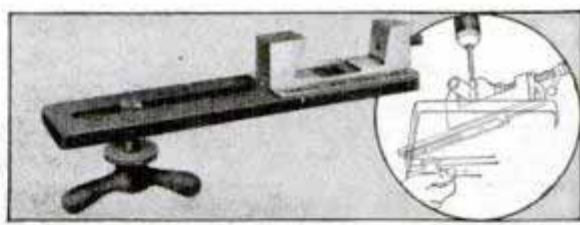
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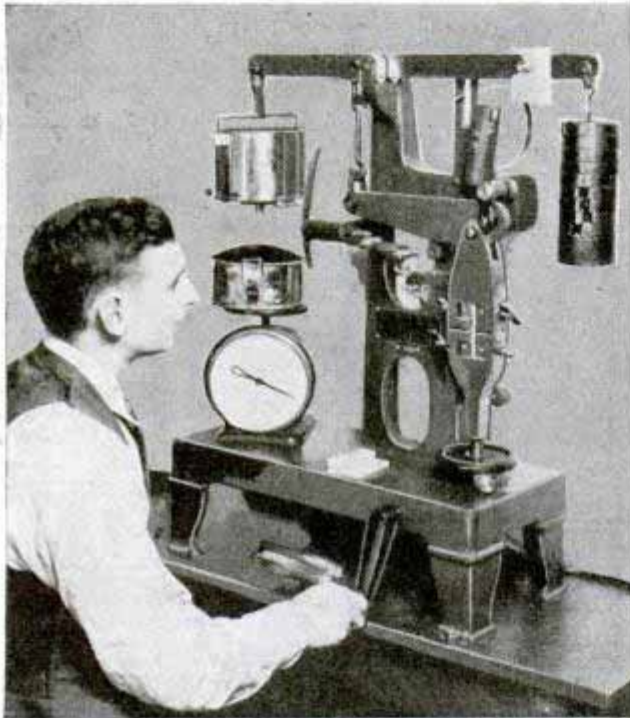
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New Uses for Wood

(Continued from page 541)

that two by six inch structural members can be used instead of the customary two by ten inch joists. The floor panels of this five-room and bath dwelling supported test loads of more than 300 pounds per square foot over a thirteen and one-half-foot span. The wall panels under the attack of a simulated sixty-mile gale developed a fiber stress in the plywood of less than one-third the allowable safe stress.

Speed in assembly is another feature of this prefabricated house. It occupies a



Apparatus used by forest products laboratory to test strength of glued joints of plywood

floor space twenty-one by twenty-nine feet and was put together in twenty-one hours by two carpenters and five helpers. Some estimate this simple, attractive and readily portable home could be sold for under \$3,000 on a mass-production basis.

Engineers can now design heavy-duty beams from thirty to fifty per cent smaller than those formerly used. This is because the experimenters have answered another enigma of wood behavior. Study of the fissures produced in wooden beams during seasoning, supplemented by breaking tests, revealed that a checked or severely sheared beam really functions in service as two beams instead of one. There has also been evolved a process for making a moldable, durable and machineable plas-

tic resembling hard rubber from hardwood sawdust. This plastic possesses high density, a good body and a glossy surface, is strong and water-resistant and can be sold at the price of ordinary lumber.

Wood is composed of cellulose and lignin. To study the fine grains of cellulose in wood, the technologists had to magnify a single fiber to the dimensions of the largest redwood tree. If the tree itself were magnified on a similar scale it would be 4,000 miles high and 300 miles in diameter. Thus enlarged the grain of cellulose is seen to consist of quadruplet parts, clinging together in chains like spider webs, amazingly complex material. New uses for cellulose are being disclosed by such ferreting. Cellulose is already used in the manufacture of paper, Cellophane, rayon, plastics, lacquers and gunpowder. It has other potentialities which are just beginning to be explored.

Lignin is a challenge to both scientific exploration and commercial exploitation. Its efficient utilization remains a conundrum because of its elusive composition although it comprises twenty-five per cent of the volume of wood. The forestry technicians have made progress in isolating this material and predict wonderful economic possibilities will be tapped by ultimate solution of the lignin mystery.

One problem delegated to the research foresters was to evolve a method for determining the twisting strength of airplane wing beams, the members apt to break in forced landings. The scientists found that if a beam of unusual shape is transformed into a hollow pipe with a soap film smeared over the end, inflation would produce a flat bubble whose volume was an accurate index of the twisting strength of the beam. Hence they cut holes—accurate cross sections of the airplane wing beams to be tested—in aluminum plates and then blew soap bubbles through those openings and with a micrometer screw determined the volume of each bubble. But first they had to find a special soap whose bubble film would persist for hours and would not burst even when touched. Many months were spent in experimentation but they found it and soon were blowing bubbles to solve a mystery.

see letter



PRESSURE—600 lbs. per sq. in.!
TEMPERATURE—3000 degrees!

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Each explosion inside a Ford V-8 combustion chamber may exert a pressure of as much as 600 pounds per square inch. The flames from the burning gases reach temperatures as high as 3000 degrees. At such temperatures and pressures, a lot depends upon gaskets. They must keep these hot gases from leaking into the water jackets. They must keep the jacket water from entering the combustion chambers. They must provide as effective a seal between head and block as the metal of these parts themselves.

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FORD MOTOR COMPANY, DEARBORN, MICHIGAN



These rolls clinch the two asbestos sheets to steel core.

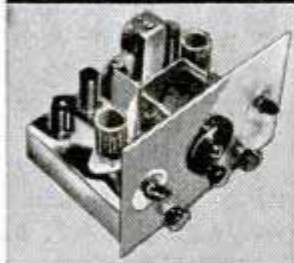


Putting grommets on combustion chamber openings, Ford V-8 Gaskets.



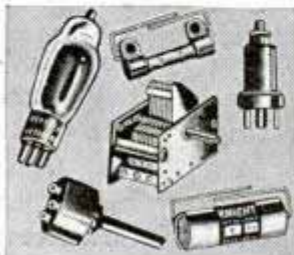
Sizing Ford V-8 Gaskets to correct thickness.

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Rush me your new Spring 1937 ALLIED Radio Catalog.

Send me FREE parts list for.....

Name

Address

City..... State.....

One-Tube Short-Wave Receiver

(Continued from page 579)

and 3-D clearly show all parts. A 4-conductor color-coded cable is used to bring the A and B-voltages to the set.

Fixed condensers "C₄" and "C₆" are .0001 mfd. midget mica types; "C₅" is a .01 mfd. tubular variety and "C₇" is a .5 mfd. shielded, paper by-pass type. A 1-watt 400-ohm fixed resistor is used at "R₂," and the r.f. choke coil is a standard 2½ mh. variety. An original list of all materials, and further information, can be obtained upon application to Popular Mechanics radio department without charge. The blueprint number is R-236.

To tune the set, fasten a 40 or 50-ft. antenna to the clip and adjust "C₃" for the

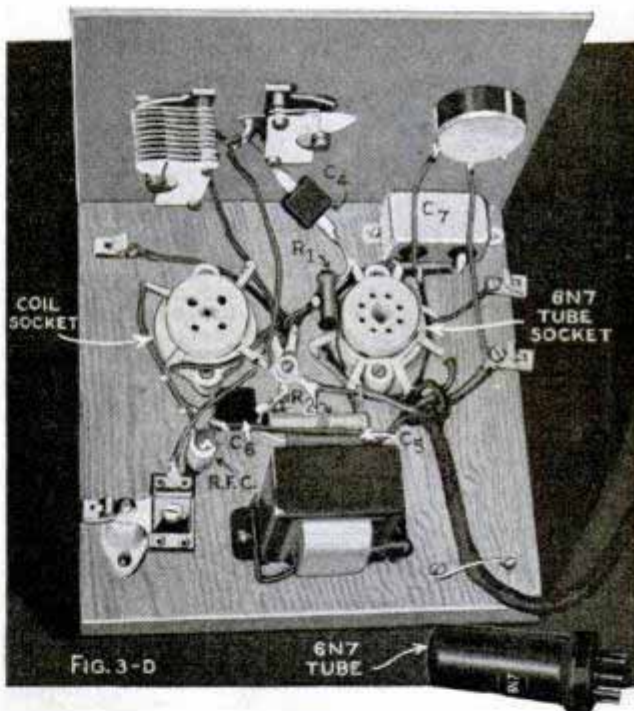
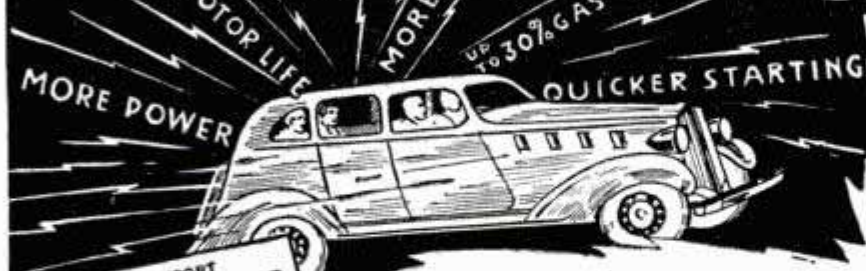


FIG. 3-D

approximate frequency of the stations you wish to hear. All actual tuning is done with the small variable condenser "C₂" which "spreads" the stations over the dial. Tune in stations with the regeneration control "R₃" advanced so that the set is oscillating, a whistle indicating a station, then back off the control until the station is heard clearly. It may be necessary to remove a turn or two from the small "L₁" windings in order to insure smooth regeneration. Turning the adjusting screw in, on "C₁," increases signal strength; however, this adjustment should not be carried too far or the set will refuse to oscillate over certain portions of the dial.

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The self-starter — four wheel brakes — knee action — streamlining... and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you —so practical it will save you many dollars on gas costs.

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"It saves me one gallon a day. I had to buy 3 gallons each day—now only 4 gallons." —L. F. Sweet, Pa.

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Speed Kings Groom Their Racers

(Continued from page 533)

type superchargers to increase horsepower. Among older engines to be in the race is an eight-cylinder in-line engine Meyer plans to drive. It was first used in 1932.

Compared to the popular four-cylinder racing engines, sixes and eights have the disadvantage of more moving parts, which means more parts that might fail. On the other hand, they are smoother and allow steadier driving. They have better pick-



Polishing racer's exhaust pipes which provide whirling motion to gases and reduce pressure

up at high speed, because above ninety miles per hour the driver of a four-cylinder engine is apt to spin his wheels instead of leaping ahead when he pushes on the throttle, due to the greater power jerks.

Among the new cars at Indianapolis in addition to several foreign cars will be a four-cylinder job of 316 cubic inches displacement being built for Bob Swanson. Swanson is the former midget champion who sputtered from forty-fourth to fourth place in twenty-five laps in the Roosevelt race and then lost his position when a fuel line broke. His new engine will have a four and one-half-inch bore and a five-inch stroke, two sets of valves per cylinder, supercharger, one carburetor, and spherical combustion chambers.

The spark plugs of most racing engines do not fire into the combustion chambers. Instead they fire the fuel mixture that is drawn up into a small pre-firing chamber. The flaming gas then expands through a three-eighths-inch hole into the combustion chamber where it ignites the main charge. This system keeps the plugs cooler and prevents them from fouling.

Art Sparks expects to use a six-cylinder motor of 330-cubic-inch displacement, having three and three-quarter-inch bore and four and three-quarter-inch stroke. It will have a compression ratio somewhere between five and one-half to one and eight to one, depending upon what results are obtained with commercial fuel at four pounds per square inch manifold pressure. The four-wheel brakes will be sixteen inches in diameter, larger than usual, and the whole car will weigh 1,850 pounds dry. The body will be thirty-one inches wide, with a 101-inch wheel base and a sixty-inch tread.

Road racing apparently is going to attract more attention during the next few years. The Roosevelt track on Long Island is being improved by straightening some of its twenty-seven turns to permit qualifying speeds of 100 miles per hour instead of under seventy. A similar track is projected for the west coast and others are planned elsewhere. These tracks, together with the new rules, will bring out a flood of new cars next year. The reason is that typical American speedway cars are not suited for road racing, although a good road race car is satisfactory for speedway contests. European cars led the field at Roosevelt last year principally because of better brakes, better springing, and improved transmissions. Motor power compared with the power in American cars although some of the foreign racers used twelve-cylinder engines, an advantage in short races but a feature apt to cause trouble in long grinds.

As the designers see it, road race cars next year will be equipped with four-wheel brakes having drum diameters of sixteen or seventeen inches and will possibly be operated with compressed air. The cars will have lower centers of gravity and will carry torsion bars at the front axles to prevent bending axles when brakes are applied. Road racing also calls for individual spring suspension on all four wheels, a feature that allows a car to squat and hold its traction in a turn, with the driver in perfect control. The present way of going through a turn is to slide the rear end around, extremely dangerous on

(Continued to page 152A)



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"**H**URRY! Your wife is ill!" Constable Stilling, of Philadelphia, leaped into his car. There was no time to spare. 'Faster! Faster!' Then—without warning—BANG! A blow-out! The car leaped out of control like a wildcat—swerved to the left—just missed crashing head-long into a telephone pole.

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HE WAS RUSHING TO
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Rex Beach



Goodrich SAFETY Silvertown

With Life-Saver Golden Ply Blow-Out Protection

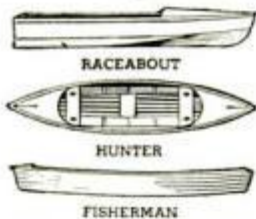
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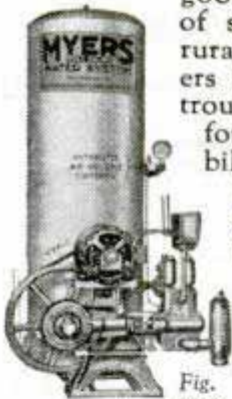
(Continued from page 148A)

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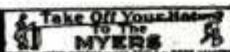
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Send free, information checked and name of your nearest dealer. Water Systems Sump Pump

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(19-7)



the sharper turns of a road race course.

Finally, the new cars will have a pre-selective "electric hand" type shifting mechanism on the transmission. This feature on the Alfa Romeos at Roosevelt last year was a distinct advantage and allowed a driver still on the straightaway to select a lower gear for pulling through a turn at high speed. As he entered the turn he accomplished the shift merely by flicking his foot from the accelerator for a second. Drivers of American cars had to shift gears manually.

The prospects are that the 1938 cars will have four-speed transmissions although some of them probably will be equipped with over-drives or under-drives on the rear axle instead of a full set of gears in



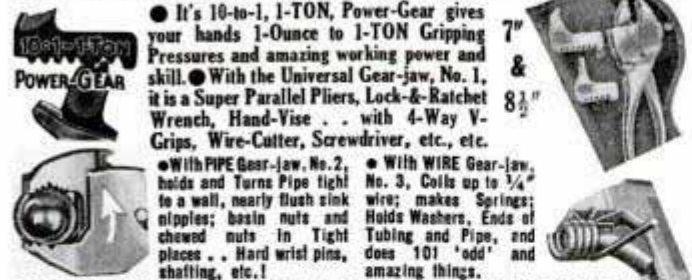
Race car "broadsliding" down track out of control of the driver

the gear box. This would be an improvement even over the electric hand, designers think, since gear changes could be made even more rapidly.

To insure safety, all new drivers at Indianapolis this year are to be given a "driving lesson" at various high speeds under the eyes of a veteran. Before a race all parts of the steering apparatus of each car are given a magneflux test in which the parts are magnetized and then sprinkled with fine steel dust. If tiny surface cracks or even interior flaws are present the dust reveals them by forming around the area.

"Safety on the track these days is mostly just a matter of common sense," remarks Louie Meyer. "That makes it practically the reverse of ordinary highway driving, judging by the dangerous things some motorists insist on doing."

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● It's 10-to-1, 1-TON, Power-Gear gives your hands 1-Ounce to 1-TON Gripping Pressures and amazing working power and skill. ● With the Universal Gear-jaw, No. 1, it is a Super Parallel Pliers, Lock-& Ratchet Wrench, Hand-Vise . . . with 4-Way V-Grips, Wire-Cutter, Screwdriver, etc., etc.

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SMALLER PLANS AND SPEC BY REG. ENGINEER. 11-00 HILL TODAY FOR ALL THREE PLANS TO EASY TO CHANGE LENGTH AND WIDTH. MAIL 11-00 HILL TODAY FOR ALL THREE PLANS TO RITZY CABIN TRAILER. BOX 252X, WAPAKONETA, OHIO

INVENTORS Be Sure to See Page 23A

4 KEYS to SUCCESS in the BUILDING INDUSTRY

The Ideal Combination—Big In Opportunity—High In Earning Power—Timely, Because Building Is Making Greatest Come-Back In History—Protected Because Operated On Franchise Basis.



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This revolutionary production machine and process permits large production—2000 brick per hour of superior quality. With this enormous output day after day, picture your tremendous market with DUNBRIK made at lower cost and with 20% savings in material and weight. Then think of the control this exclusive product would give you over this market and the possibilities for profit and independence that would naturally result.

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In addition to the advantage of 20% saving in materials and low cost production, the Mat Glazing Process makes it possible for you to transform your common DUNBRIK and DUNSTONE into face units of enduring beauty and at low cost. Never before have these three been so effectually combined in a building product.

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6 Inch Jointer. Extra long tables. Very long fence guidance for accuracy. Fence locks rigidly at front, and at rear. Is spring-proof. Cutterhead 3 inch diameter.

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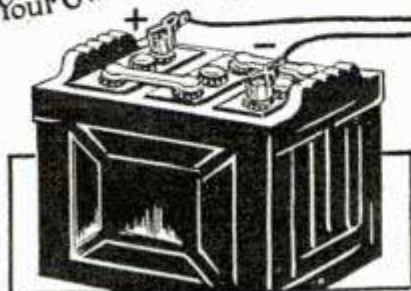
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'Beam' Tube in C. W. Transmitter

(Continued from page 580)

ulator, and easy to cut for mounting the wafer-type sockets. A schematic circuit diagram is given in Fig. 1; in this diagram it will be noted that a bottom view of the tube-socket connections is shown. An "X-ray" top view of the assembly, looking down on the baseboard, is given in Fig. 2. This simplified wiring diagram shows all parts in their relative positions and every connection above and below the baseboard. Photos of the top and underside of the completed transmitter appear in Figs. 2-A and 2-C, a close-up of the 6L6 tube being given in Fig. 2-B.

Exact placement of parts is not important. However, the various leads should be short and direct, with all connections

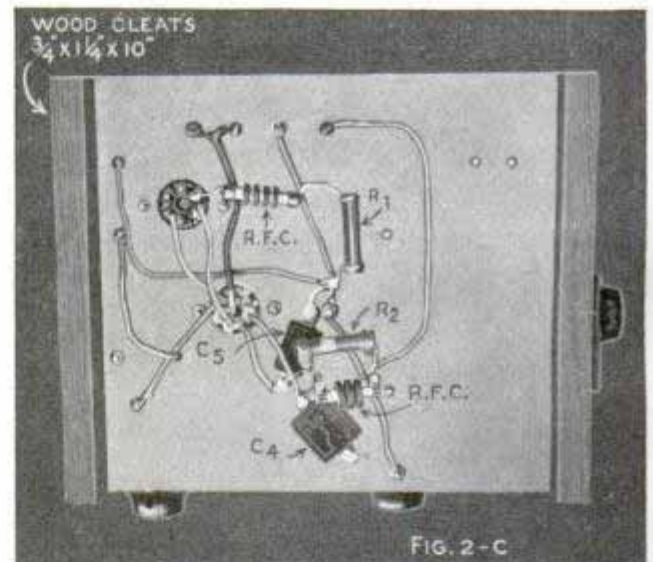


FIG. 2-C

well soldered. A large soldering lug serves as the point to which all r.f. grounds to negative-B are made. No. 14 wire, with push-back insulation, is employed for connections. An original list of all parts used and further operating data, can be obtained upon application to Popular Mechanics radio department, without charge. The blueprint number is R-237. Angle brackets mount variable condensers C₁ and C₃, the antenna tuning condenser C₂ being mounted on a small panel.

Coil L₂ is of the popular low-loss type made with enameled wire, spaced and supported by strips of celluloid. It is easy to wind, as a 2¼-in. cardboard mailing tube may be used for a form.

The power supply should furnish about 400 volts at 100 mils. or more, and should have a 6.3-volt winding for the filament.

New Delta Tools for 1937

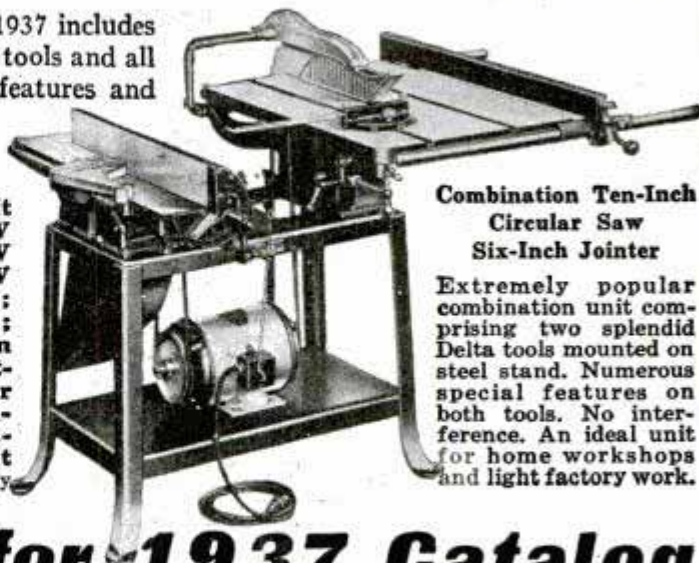
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Comforts for Homes on Wheels

(Continued from page 510)

Trout has transplanted \$30,000 worth of trees and several thousand dollars worth of shrubbery and plants to his eight-acre tract which is covered with Bermuda grass and dotted with palm trees. The grounds have lawn tables, chairs, and umbrellas. At night the park is illuminated by neon lights and the reflection of these on the palms supplies an enchanting effect.

Well-constructed buildings house rest-rooms, laundry, and showers. Clotheslines adjoin the laundry room and ground rules prohibit the drying of clothes elsewhere.



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More than a mile of paved roads have been laid, making each lot convenient to reach. There are also children's playgrounds with swings, seesaws, and sandpits; a commissary with a complete stock of groceries; a filling station and wash-rack; ice and milk deliveries three times daily, and regular distribution of mail. Each lot is equipped with running water that may be attached to trailers if so desired, and drains are installed under sinks.

One requisite for a good trailer camp is ample space so cars with trailers can drive in and out without much backing and maneuvering. The amount of ground allotted to each car can be determined by the topography of the site. If possible, a tract should be selected offering plenty of shade trees and also bathing and fishing facilities, particularly if the owner is to cater to the vacation-minded tourist. The camp should be laid out so there is an electric-light socket for every trailer, water taps at frequent intervals, and a central wash-

(Continued to page 160A)

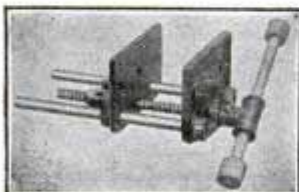
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Trindl ELECTRIC ARC WELDER



**Works Off Any Storage
Battery or Ordinary Light Socket**

This low electric arc welder is made possible by the invention of a low voltage carbon. Auto batteries may be used without removing from car. Uses about same current as four headlight bulbs. Can be used on electric light socket by using a Trindl Converter in place of battery.

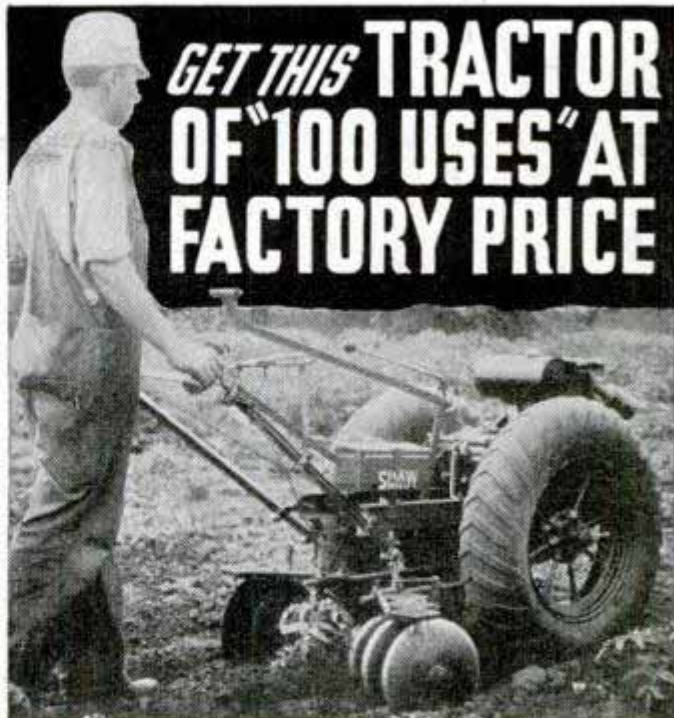
Broken parts are simply melted together by the white hot electric arc, in just few seconds. Produces about 7000 degrees heat. **HOTTEST FLAME KNOWN** Melts iron and steel instantly. Welds fenders, radiators, holes in bodies, milk cans, tanks, brazes broken castings. Works on anything iron, steel, brass, copper, tin or galvanized metal. Permanent repairs made for almost nothing. Used by factories in many operations. Positive money back guarantee by a responsible firm.

AGENTS

Men with cars to sell mechanics, repairmen, farmers, radio and battery shops, factories. Five minute demonstration makes sales. Up to 150% profit. Write today.

TRINDL PRODUCTS

2229-FZ Calumet Av.
CHICAGO, ILL.



GET THIS TRACTOR OF "100 USES" AT FACTORY PRICE

DOES WORK OF MANY MEN OR 2 HORSES!

Here's untiring speed and power—that gets field and belt work done on time! Smallest size does work of many men—saving wages. Larger sizes do work of 2 horses or mules—quicker, cheaper, more efficiently—saving costly animal keep. Runs all day for 33c. Greatest time, labor and money-saver made!

"Tractor of 100 Uses"—Does all field, road, belt work. Plows, discs, harrows, furrows, seeds, cultivates, harvests, mows, rakes, cuts tall weeds, hauls. Runs washing machines, feed grinders, corn shellers, light plants, saws, concrete mixers, water pumps, lathes, other belt machinery. Does deep mold-board plowing, other heavy work. **Amazing money-maker** for farms, truck gardens, nurseries, orchards, suburban homes, golf courses, parks, etc.

SHAW GARDEN TRACTOR

New 1937 Model Has 3 Speeds Forward, and Reverse. Special to Order, 6 Speeds Forward—runs from 1/4 mile to 15 miles per hour. New Power Turn enables Shaw to turn in its tracks with no lifting or pushing. Reverse Gear makes it easy to work among rocks, roots, in close quarters. Tool Attachments for different uses. Convenient Jiffy Hitches. Improved Tool Control gives tools a wider range of movement - - Increases tractor's usefulness. Briggs & Stratton air-cooled, 4-cycle engine. 4 Models, 2 to 5 H. P., Walking and Riding Types. Available With Air or Steel Tires. Air tires save 25% fuel. Enable Shaw to do more work in a day. Provide better traction.

LOW FACTORY PRICE!! Mail Coupon for details of price and terms today!

10-DAY TRIAL FREE BOOK!

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Explains everything about Shaw. Tells what enthusiastic owners say. Shows photos of tractors in use. Gives LOW Factory Prices on 4 different size models—with different attachments. Mail Coupon today!



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Send me FREE information at once about the Shaw "Du-All" Garden Tractor as checked below:

- FREE Book and Low Factory Prices 10-Day Trial Offer Liberal Agent's Proposition

Name.....

Address.....

Town.....State.....

Comforts for Homes on Wheels

(Continued from page 158A)

room. H. P. Palmer, who operates a modern camp at Encinitas, Calif., says the laundry can be made to pay for itself with a coin-operated electric washing machine and irons.

To operate a successful camp, the grounds must be kept free of litter. With the exception of a few lawn tables and chairs for cards and checkers, a horseshoe pitching court, and possibly a swing, no other entertainment features are necessary, as most trailerites spend their time visiting with other trailer owners and prefer peace and quiet after sunset. The method of lighting a camp depends on the layout. In some cases, minimum area lighting is sufficient, the trailers being parked close together. In other camps thirty or thirty-five feet is allotted for each unit. In the more pretentious layouts, however, underground wiring using parkway cables is desirable, with outlets for electrical connections to the trailers.

Some general lighting is usually required so trailers may be parked after dark and so visitors may locate their units without trouble. For general purposes, floodlighting projectors located at strategic points provide the most economical method of lighting. However, when floodlighting is used, it is important that the units be placed high, to reduce glare which

might cause accidents and to reduce the amount of light thrown into the windows of trailers. For a large lot a lighting engineer recommends a minimum mounting height of forty feet for floodlight projectors. Projectors are available for virtually every type of layout; narrow beam projectors where long throw is required, and wide beam ones for short throws. The longer the throw the longer the shadow cast by any obstruction. At a considerable distance from a projector a trailer might throw a shadow of 100 feet or more.

The prices charged for trailer privileges depend on the location and equipment of the camp. An average rate is fifty cents per day or two dollars a week, exclusive of the electric current cost, or a monthly rate of eight dollars including electric lights. For the elaborate camps rates run as high as five dollars per week for two people and fifty cents a week extra for additional guests. This includes electric lights and radio. Where trailers are equipped for electrical cooking, special meters are usually installed and the trailerite is charged the same rate the owner pays the power company. As an added source of revenue many camps have set aside sections for display trailers only. These are offered to manufacturers on a monthly or seasonal basis.

How Hughes Broke the Record

(Continued from page 503)

tube carries the oxygen to the cockpit, where the pilot inhales through a rubber tube. To prevent possible failures the mixing regulator is attached to the tank, eliminating high pressures in the tube, with a shut-off needle valve to control the flow in the cockpit.

For take-offs and landings the pilot's seat is raised hydraulically to increase his scope of vision. The streamlined transparent hatch that covers the cockpit is of fireproof Puralin. Instead of sliding back, the two sides of the hatch slide down into the fuselage skin. The plane was designed by engineers under the direction of Richard Palmer, together with Hughes himself.

"If Hughes desires he might be able to

cut as much as an hour and a half from his present record with the same plane," one of his engineers declares. "He landed in Newark with more than fifty gallons of gasoline. To break his present record he would simply fly faster, since he cruised at half power this last time. To materially break his record, the fuel capacity would have to be increased, or one stop to pick up fuel would be necessary."

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

The Passing of THE WHITTLER



All over the United States in well equipped shops in their homes, intelligent craftsmen are doing difficult jobs, showing rare skill with good tools.

What a difference from the time when men whittled aimlessly to pass the time away.

Helping home craftsmen everywhere are Nicholson Files. Their modern tooth construction makes possible faster filing, better filing, more economical filing.

These files—

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|------------------------|------------------|
| Mill Bastard . . . | 6" 8" 10" |
| Slim Taper . . . | 5" 5 1/2" 6" |
| Extra Slim Taper . . . | 4 1/2" 5" 5 1/2" |
| Round Bastard . . . | 6" 8" 10" |
| Warding Bastard . . . | 4" 6" 8" |
| Flat Bastard . . . | 6" 8" 10" |

are an indispensable part of your home equipment. Let your hardware store or supply dealer take care of your needs. Nicholson File Company, Providence, R. I., U. S. A.



PATENTS PENDING

A FILE FOR EVERY PURPOSE

The Disston Brand On Your Saw

means finest value obtainable. There is a Disston Saw or a Keystone Made-by-Disston, at price you want.



You will take life's-time satisfaction in a Disston De Luxe — finest home workshop saw made.

De Luxe Cross-Cut — Rip — Combination

| | | | |
|----------------------|--------|----------------------------------|--------|
| 6" (1/2" hole) . . . | \$2.40 | 8" (1/2", 5/8", 3/4" hole) . . . | \$3.20 |
| 7" (1/2" hole) . . . | \$2.80 | 10" (5/8", 3/4" hole) | \$4.05 |

De Luxe Hollow Ground Combination

| | | | |
|----------------------|--------|----------------------------------|--------|
| 6" (1/2" hole) . . . | \$3.90 | 8" (1/2", 5/8", 3/4" hole) . . . | \$4.90 |
| 7" (1/2" hole) . . . | \$4.40 | 10" (5/8", 3/4" hole) | \$6.20 |



In the Keystone Made-by-Disston Circular Saws, very little money buys a blade you can depend on.

Keystone Cross-Cut — Rip — Combination

| | | | |
|----------------------|--------|----------------------------------|--------|
| 6" (1/2" hole) . . . | \$1.20 | 8" (1/2", 5/8", 3/4" hole) . . . | \$1.60 |
| 7" (1/2" hole) . . . | \$1.40 | 10" (5/8", 3/4" hole) | \$2.00 |

Keystone Hollow Ground Combination

| | | | |
|----------------------|--------|----------------------------------|--------|
| 6" (1/2" hole) . . . | \$3.00 | 8" (1/2", 5/8", 3/4" hole) . . . | \$4.00 |
| 7" (1/2" hole) . . . | \$3.50 | 10" (5/8", 3/4" hole) | \$5.00 |



"The Saw Most Carpenters Use".—Disston D-8, skew back, \$3.25. D-7, straight back, \$2.90. Disston D-23—Lightweight, straight back, \$3.60. SEE ALSO the Keystone Made-by-Disston Hand Saw. Skew back and straight, Cross-cut and rip. Price, 95c, \$1.10, and up. K-3 "Pacemaker", skew back, full 26" blade \$1.35

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How to Choose and Use Saws—answered in Disston "Saw, Tool and File Manual".

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 Add underwater exhaust, full pivot reverse, synchro-control and 23 other important features and you've got the smash hit of outboard motoring—the new Johnson All-Star model LT! Eight other models, embodying the greatest outboard developments in Johnson history—and priced as low as \$59.50!
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ALL-STAR DE LUXE



TWIN \$130

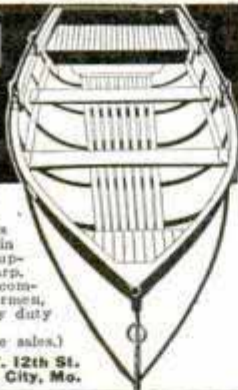
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Light weight, durable, carefully built of toughest galvanized copper bearing steel; low prices. Wood gunwales. Heavy transoms for out-board motors. Two or more built-in air chambers for extra buoyancy in case of upset. Easy to handle. Never leak or warp. Write for Free Boat Booklet and prices of complete metal boat line—knockabouts for fishermen, light weight lively boats for resorts, heavy duty craft for out-board motors.
 (Dealers wanted—who can develop volume sales.)

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BUILD WITH DOENUTS

Build with the original patented low pressure Musselman Doenut cord tires and wheels. They absorb surface obstructions, eliminate jolts and reduce pushing and pulling effort approximately 60%. Tire requires only 12 to 15 lbs. air pressure for loads up to 200 lbs. per wheel. Size 10 in. x 2 1/2 in. Cadmium plated steel disc wheel with adjustable ball bearings and "knockout" type axle. Doenuts are ideal for building hand trucks, midget autos, wheelbarrows, lawn mowers, lawn furniture, portable painting, spraying and greasing equipment or any portable unit under 850 lbs. Write for literature and prices, explaining uses you contemplate.

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VENETIAN BLIND MATERIALS

You can make fine blinds for your own home at low cost, also go into the business. All parts supplied. Send 10c for circular and samples of ladder tape, cord, slats and rails.

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VACUUM CLEANER SERVICE MANUAL

At last the book every vacuum cleaner service man is looking for. Full of practical money-making information on construction and servicing for all makes. Tells you how to check, test, clean, repair and price every job. Covers sources of material, parts, tools, supplies, ball bearing assemblies, armature checking, trouble locating and complete list of cleaners compiled by experienced men. Simple, clear and easy to understand. Illustrated. Durable artificial leather binding. \$1.00 Postpaid. Sold on 1-day trial basis.

SEND FOR THIS BOOK \$1.00

THE ELECTRIC SWEEPER SERVICE CO.
 1878 EAST 18TH STREET, CLEVELAND, OHIO

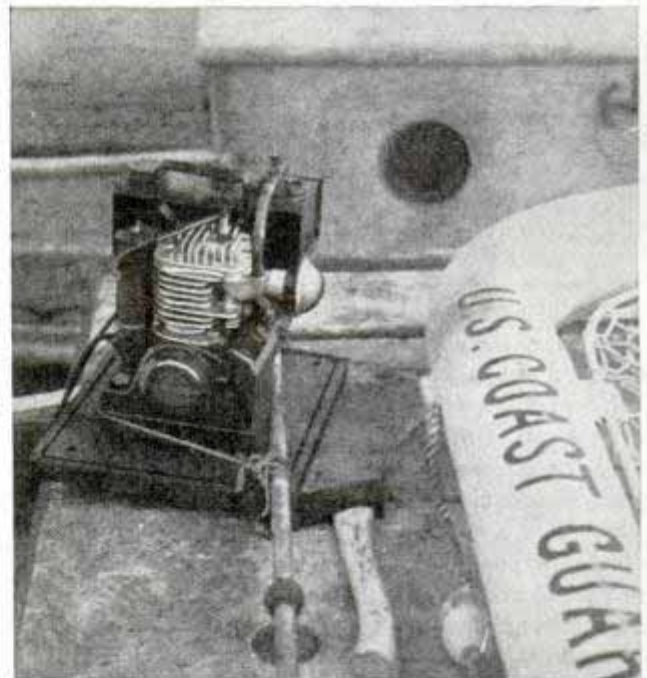
Radio Battles Old Man River

(Continued from page 486)

to cope with emergency, to help save human lives, to alleviate distress and suffering, to hurry relief to those in need. Up and down the Ohio valley today are hundreds of people who owe their lives to the man-made miracle we call radio, the magic carpet which carries man's voice through space, summoning aid to those in distress.

**No Single Cure-All for Floods
 Replanting, Dams and Reservoirs
 All Will Aid in Control**

Great floods, like most great maladies, arise from a combination of causes, and no one medicine is likely to eliminate all the contributing factors. Destruction of trees and grasses has been blamed almost entirely for floods of recent years, but there



Portable generator used by Coast Guard boat to charge batteries for operating automobile radios

were great floods before the forests were stripped away from the hills.

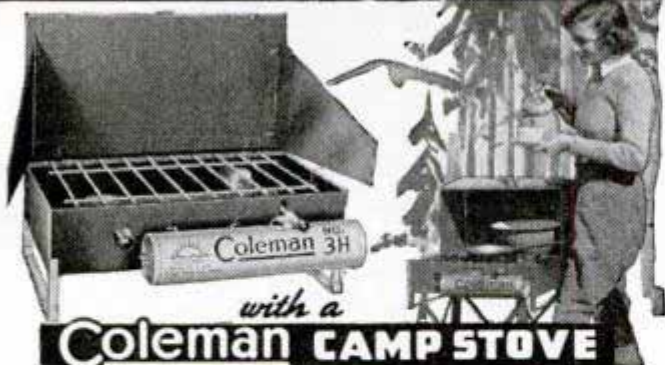
Floods are likely to occur in the future when circumstances are right, regardless of anything man can do, but it is likely man will be able to prevent some floods and to diminish the volume and violence of others through control measures.

A stubbornly unmoving mountain of tropical air off the southeast coast of the United States was the primary cause of

(Continued to page 164A)

BETTER COOKED MEALS

Hunting · Fishing · Touring · Anywhere



MAKES and BURNS OWN GAS • LIGHTS INSTANTLY
 You'll be happier...have more fun...enjoy meals that satisfy big outdoor appetites...if you take a Coleman Camp Stove along on your outing. It makes and burns its own gas from regular gasoline. Speedy, wind-proof burners light instantly. No wood to cut, no smoke. Sturdily built to give years of service. Everdur Metal Fuel Tank won't rust; easily removed for filling. Folds up like a suitcase for easy carrying. Six models, all moderately priced.

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Lifetime, self-controlled, heavy slow speed, "air cooled," direct-drive Generator (no gears). Powerful wide blade Impellers, 1200 and 2400 watt 32-volt sizes. Weights 460 and 680 pounds. Also huge 110-volt sizes. Heavy duty batteries and towers at factory prices. **FREE** literature. **DEALERS**—Write for territory franchises.

\$300.00 AND UP

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produced in your own workshop allow you to design and build your own GASOLINE ENGINES, STEAM ENGINES, STATUARY, ART OBJECTS, SPECIAL TOOLS, NEW INVENTIONS, ETC. You can also make forgings and case harden steel. Your shop is not complete without a **FOUNDRYETTE**. Three sizes are available capable of making bronze castings of 1½, 3, and 6 pounds weight, aluminum, copper, brass, etc., in proportion to specific gravity. Clean scrap metal suitable for use. Domestic gas supply and 110 volt Electric energy required for operation.

| Size | Crucible Capacity | Wt. | Price Complete |
|------|-------------------|---------|-----------------|
| 351 | 6 cu. in. | 25 lbs. | 1½ lbs. \$13.50 |
| 352 | 12 cu. in. | 40 lbs. | 3 lbs. 19.00 |
| 353 | 24 cu. in. | 65 lbs. | 6 lbs. 27.50 |

Above price includes Universal high speed blower. For low speed blower good on 110 volt 60 cycle only, deduct \$4.00. Aluminum Casting Alloy 30¢ per lb. Prices f. o. b. K. C. Check or money order acceptable, express charges C. O. D. Write for circular.

KANSAS CITY SPECIALTIES CO.
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Sharp tools DO A BETTER JOB...FASTER



SHARP tools are the watchword of every good craftsman. He knows that all the skill in the world is wasted with dull chisels and knives. It's best to keep your tools razor-sharp all the time. They'll cut clean and do faster, better work.

Nothing sharpens tools like a Carborundum Brand Combination Stone. One side is coarse grit to remove nicks; the other fine enough to give any tool a razor-sharp, keen cutting edge. Try this stone next time you sharpen your chisel, plane, gouge, or draw knife.



ABOVE—Carborundum Brand Silicon Carbide and Aloxite Brand Aluminum Oxide Grinding Wheels and Sharpening Stones for general metal grinding and tool sharpening. Available in all standard sizes and grits.

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**the Greatest
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 FAMOUS
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At \$49.50 - you simply can't buy more power, speed and downright dependability than in the new Neptune "Single" for 1937.

And for only \$20.00 more - \$69.50 - you can buy the still more powerful and speedy Neptune "Twin". Your most rigid comparison will prove these two motors the outstanding bargains of the new year.

Exclusive Features

Neptunes have . . .

- New type sensational magneto
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Available in 2, 4, 6 and 16 H.P. models.
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FOR DOG OWNERS
33 Monthly Prizes



At last an **easy** letter-writing contest **just for dog owners**. 33 cash prizes each month for letters about Miller's Dog Foods. Get rules and helpful winning suggestions from your dog food dealer or write us for complete information, FREE samples, and FREE Dog Book.

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Draw Fat Weekly Income
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Vending Machine Operators
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This new, double profit vending machine offers you the opportunity of a lifetime in big money making field. Vend candy in one section and peanuts in other. Handles many varieties of candy. Wonderful operation. Very low price. Install in beer parlors, taverns, stores, restaurants, counters, booths, bars, walls, tables. Write **Neko Mfg. Co., Dept. T-74, 1201 S. 3rd St., Minneapolis, Minn.**



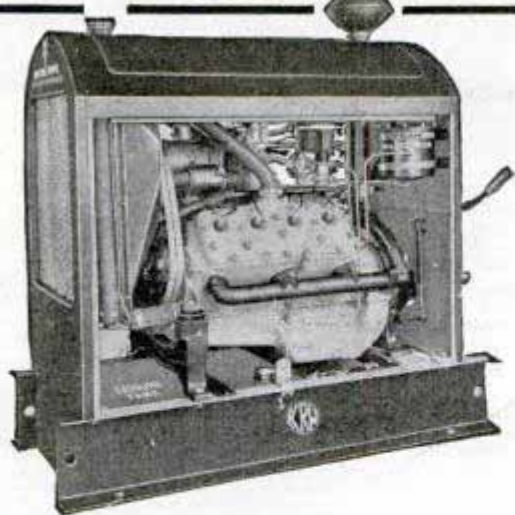
the recent Ohio valley flood, according to the weather bureau. Ordinarily storms from the northwest bring cold weather and the cold holds most of the seasonal precipitation in storage as snow and ice until the spring thaws. But the mountain of air off the coast stopped the midwinter flowing of storms and kept temperatures abnormally warm. Frequent rains saturated the soil and when a whole procession of lows came along and dumped their moisture, there was nowhere for the water to flow but down to the streams.

The extent of the precipitation was enormous. From January 1 to January 25, the clouds poured down on thousands of square miles of land a layer of water that would have been nearly sixteen inches deep if none had run off. A belt extending about fifty miles on each side of the Ohio river and 550 miles long was deluged with more than 60,000,000,000 tons of water. And the losses of top soil reach almost astronomic figures. From the Ohio watershed, it is estimated that the storms carried away 300,000,000 tons of soil. From plowed land the run-off was as much as eight inches, but from comparable areas under grass and trees, the loss was only two inches. This indicates that replanting holds back the soil, but no amount of forestation could have prevented an Ohio river flood in January because rains were falling continuously on already soaked soil, with no more chance of sinking in than they would have on a tin roof.

Government engineers have demonstrated on the Muskingum river in Ohio that floods can be controlled to some extent by a system of dams and reservoirs. The Muskingum meanders through eastern Ohio, draining 8,000 square miles, and enters the Ohio at Marietta. By a system of reservoirs and dams, it is estimated this river can be brought sixty-nine per cent under control sixty miles north of Marietta and that floods there can be reduced more than fifteen feet. It is also estimated that floods on the Ohio at Marietta can be reduced about six feet, three feet at Cincinnati and eighteen inches at Louisville, all by this one project alone. Three feet may not seem much, but even a few inches often is the difference between having electric power and not having it.

(Continued to page 170A)

LOW COST POWER



with this KRW-FORD V-8 unit

Here's dependable, low-cost power up to 60 H.P.—complete, compact, portable. Ideal for line shafts, welders, compressor, hoists, pumps, amusement devices, well drillers, agricultural, oil field and contractors' equipment, etc., etc. The most complete industrial power plant built. Uses gasoline or natural gas.

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Write for complete information, price, and data showing how this unit will pay for itself out of savings in a few weeks, whether operated on gasoline or natural gas. You can buy thru your Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

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Synco JIG SAW

FASTER—SAFER—CLEANER

Astounding performance! Cuts up to 1" or more, with smooth, clean edges. No sanding required. Accurate, sturdy, efficient—a revelation to skilled craftsmen in handling both intricate designs and heavy work. Ideal for cutting light metals, veneers and plastics. Operates on 60 cycle, 110 volt AC, without motor or any reciprocating parts. Requires no oiling. 10" square table; 13 1/2" throat; adjustable guide; variable stroke. Complete with underwriters approved cable and rubber plug. Built for years of continuous service.

Electric Operation

7200 Strokes per Minute



No Motor Required

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SYNCO DEVICES, INC.

511 Boydell Building

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FREE FOLDER

MAN'S PIPE BITES DOG!



... then he switched to the brand of grand aroma



THAT'S news, all right—and a dirty trick on Fido! Pipes need a good Spring cleaning now and then to cure their bite. And for your throat's sake—if not for Fido—try switching from your old hot-and-heavy brand of pipe tobacco to mild Sir Walter Raleigh. It is milder. That's no idle boast—it's a cool-burning, fragrant-smelling, Kentucky Burley fact! 15¢ for two full ounces buys you and Fido a million dollars' worth of fine, full-flavored smoke aroma!



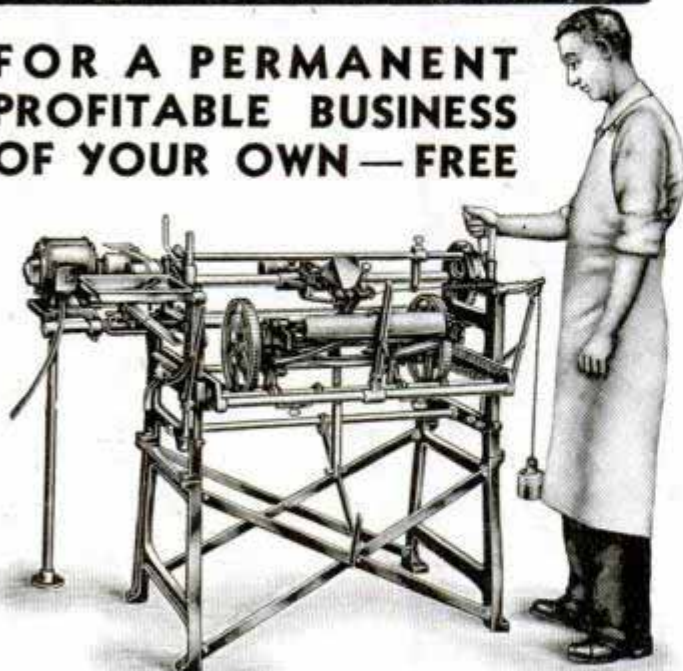
FREE booklet tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. P-74

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Makes your home STAND OUT! Easy to read from street day or night. Operates from door-bell transformer. Tiny 3-CP 6-V bulb. 3c per mo. current. No switch. Neat, durable. Anyone can install easily. Instructions furnished. 2,3 or 4 number complete \$3. Money-back GUARANTEED. Order today. (Send house number.) FREE FOLDER! Unique Mfg. & Mach. Co., 4807-9 N. 31 Ave., Omaha, Nebr.

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Save 75% of the cost by building it yourself. Send 25c for plans sheet, illustrations and details.

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1/8-3-16-1/4 dia. 3 Ft. long 25c Per Doz.
5/16-3-8-7/16 " " " 35c " "
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VISE BUILT**

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All sizes 3 and 5 ply plywood: $\frac{1}{8}$ ", $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $1\frac{1}{16}$ ", $1\frac{1}{4}$ ", $1\frac{1}{2}$ " thickness.

Plain and Fancy Domestic and Imported Veneers

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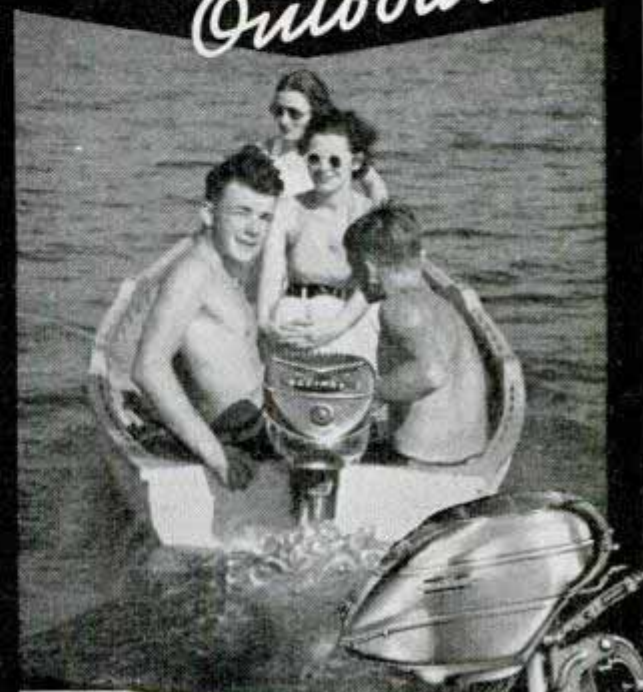
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Easy to build this big roomy trailer. Illustrated book saves you 70% and more when building a trailer. Improve your present trailer at low cost. Book shows where to buy chassis, axles, brakes, hitches, pumps, body materials, cabinets, electric plants. Everything that goes into a trailer. Page after page of valuable information and ideas. This trailer is substantial yet easy for your car to pull. Any size—for two, four or more people. Book is **FREE**. Write for it today—Spring here soon. Be ready for the open road. **New York Trailer Builders' Supply Co., 227 West 58th Street, New York, N. Y.**



When writing please mention Popular Mechanics

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- * New Giant-Spark Aero-type Magneto Ignition by Scintilla!
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Here's a new cartridge that meets the challenge of better rifles! Xpert .22 Long Rifle gives target accuracy at no extra cost! Same components as Super-Match, the sensation of 1936! SMOKELESS! NON-CORROSIVE! Lubricated lead bullets. .22 Short and Long, also. A WINNER! Ask your dealer to stock it. Send for FREE new Handbook.

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An opportunity to earn as much as \$3.50 for a few minutes of your spare time. String your own racket and save money. Tennis players need restringing frequently. Every stringing means profit for you. No experience needed—we teach you how. TOMGUT Equipment makes it easy. Costs practically nothing to start. Easy work. Begin NOW!

FREE Write today and we will send you Free our new low prices of TOMGUT "Court-Tested" Tennis and Badminton Strings, Restringing Equipment and a complete line of Racket Frames.

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TOMGUT "Court-Tested" Tennis & Badminton Strings

Please send, without charge or obligation, the new price list of TOMGUT Tennis and Badminton Strings, Racket Frames, and Restringing Equipment.

Name.....
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MAIL THIS COUPON

"JUNIOR"
Throw-away when empty
Flexophane Model,
about 900 applications.
ON DISPLAY
AND INSTRUCTIONS 30¢
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THE POWDERED LUBRICANT

DIXON'S JUNIOR GRAPH-AIR GUN

30¢ buys the most remarkable lubricating device and lubricant of all time. A puff of dry powdered Microfyne graphite instantly and lastingly takes the "stick", squeak or rattle out of everything—Wonderful in sticky locks, never gums; is water, heat and cold proof.

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| HOMES | Locks. Clocks. Machines. | AUTO-MOBILES | Locks-Door, Switch, Tire, Door Dovetails, Checks, Window Slides. Motor Oil. Cylinders—blow in plug holes or manifold. Gaskets. Springs. Hood. etc. |
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| SPORTS, SEA AIR | Locks. Firearms. Fishing Rod Reels, Ferrules. Pulleys. Gaskets. Packings. Race Boat Bottoms. Airplane Gear Quadrants. Motors—see Auto Uses. etc. | FACTORIES RAILROADS | Locks. Tools. Gaskets and Threaded Joints. Machinery. Bearings. Gears. Chains. Pianos. Coin Devices. Linotypes. Alarm Boxes. Windows. Seats. etc. |
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WITH MICROFYNE POWDERED GRAPHITE

INVESTIGATE OUR OTHER "FAMOUS FIFTY" GRAPHITE PRODUCTS

MAKE YOUR OWN VENETIAN BLINDS

Complete instruction book shows how easy you can make them in your own home shop. Postpaid only 25c. We furnish hardware, ladder-tape and cord at amazing direct-to-you low prices. Cost of book applied against hardware cost (\$5.00 or more) if purchased from us. Write To-day.

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ALL STEEL TRAILER KIT

SAFE—STRONG—EASILY ASSEMBLED—COST UNDER \$300

All steel chassis and body in knock-down kit. Complete with springs, wheels, and tires, hitch, doors and windows. Furnish to suit yourself, and you will have a custom built coach which will last a lifetime. Low freight rates throughout the U. S. Send for free illustrated circular giving specifications and prices.

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"Largest Exclusive Manufacturer of Sectional Steel Buildings"

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The deal of a lifetime! Tremendous earnings possible. Genuine \$10 Clipshave—a nationally advertised product with a sure-fire plan. Appeals to both sexes. No selling! No canvassing! Send for sample sales card. SALESBOARD OPERATORS! Write or wire at once.

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of **STAINLESS STEEL** for

WIND DRIVEN RADIO BATTERY CHARGERS & WIND ELECTRIC PLANTS, 6 volt and 32 volt

HIGH EFFICIENCY EASILY APPLIED LIGHT AND STRONG DEVELOPS MAXIMUM POWER REPLACES WOOD PROPELLER NOT AFFECTED BY WEATHER CONDITIONS

Prices \$5.25 and up. Send for circular to **WIND TURBINE COMPANY, West Chester, Pa.**

Patented Construction

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Potato Chip Business

Greaseless Potato Chips

Here's your opportunity to get into business for yourself. Turn potatoes into cash by making potato chips. I'll show you how with my improved outfit. Makes delicious, crispy, tasty, superior, "greaseless" chips at a surprisingly low cost. Also Doughnuts and Salted Nuts. Very little cash needed. No previous experience required if you follow the instructions and selling plans I furnish. Begin in any location, village, city or suburb. An opportunity is waiting. Steady year 'round business. Groceries, delicatessens, restaurants, taverns do the retailing for you. Merely keep them supplied.



WE HELP START YOU IN BUSINESS

Raw material plentiful and low priced. Simplified process and confidential plans. Profit large—unusually so. Enormous quantities of Potato Chips are bought daily.

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Find out how you can buy equipment on a monthly payment plan. Let us tell you what others say about the Potato Chip business. Get all the facts. Get into this dignified, year 'round business with its money-making opportunity. Send for FREE booklet entitled, "How to Start a Factory." Do this AT ONCE.

LONG-EAKINS COMPANY

428-S High St., Springfield, Ohio

Complete 16-unit outfit includes new type white vitreous enamel ROUND Cooking Vat; Direct-to-fat high speed slicer; centrifugal Grease Extractor; Thermometer—Positively everything necessary to start—all at new low price.

WORLD WIDE ALL WAVE RADIO \$155 POST PAID



A sensational Radio! Thousands now in use. Can actually bring in foreign stations, police calls, aeroplanes, amateurs, etc., as well as local broadcasts! Short and Long Wave. Ace Radios give guaranteed results! For only \$1.55 we send you the complete kit containing an attractive metal chassis panel and every part needed to build a powerful one-tube receiver, AMAZING VALUE! Works for months on two inexpensive dry batteries. Our clear diagrams make it simple to hook up. Not a feeble crystal set!

TWO TUBE KIT (More volume)—\$2.00.
ALL-ELECTRIC two tube house current set. No batteries! Complete kit \$3.00.
 (Sets laboratory assembled and wired 75c extra.)
 Enjoy NEW thrills! Send for your ACE Radio today!
 Ace Radio Laboratories, 70 Barclay St., Dept. P-4, N.Y.C.

Learn BRASS TAPPING FUN and PROFIT!

Get this big new outfit. Learn "raised metal" work. Sell gift and art wares.

COMPLETE OUTFIT \$2.00

Make Bookends, What-Not Backs, Twin Plaques. Equipment includes non-tarnishable jewelers' metals, handcraft hammer, plywood backing-board, noiseless tapping tools, special nails and design patterns. Send \$2.00 money order for outfit complete. State choice Brass or Copper, ("Silver" or "Gold" \$2.50.) FREE CATALOG with outfit or send 3c stamps. Write today.
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OWN A GENUINE ZIRCON

Positively the nearest stone to a diamond!

Gem of Mystery—the rare genuine White Zircon (mined—not synthetic) is equal in fire, brilliancy, and sparkle to the finest diamond, yet costs but a fraction. Many experts cannot distinguish

between the two. Thrill at owning a genuine White Zircon when your friends and jewelry experts believe you possess a valuable diamond. Send name and address for FREE revealing information and price list—no obligations. Courtesy to dealers & agents. SECURITY JEWELRY COMPANY, 742 South Hill Street Over 30 years in Diamond business. LOS ANGELES, CALIF.



THIS WONDERFUL INVENTION



converts any ordinary cook stove into a modern gas range. BLUE BLAZE GAS is made from kerosene and air. Cheaper, cleaner and more efficient than coal. Responsible distributors wanted.

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START BIG PAYING BUSINESS "Simplified" 40 VOLT ARC WELDING

New low prices on modern 40 Volt "Simplified" Arc Welders make this big pay business available to shops that never before could afford it. It opens the doors to the bigger profit jobs. The new Hobart is easier to operate, much faster. This is today's opportunity. Don't miss it.

Build Your Own

Portable Welder with Hobart Generator unit and auto engine or chassis. Lets you operate any place, especially on the profitable outside jobs. Easily saves you \$300 to \$500.

Portable Electric

New low cost on small sizes as well as large. The most profitable arc welder your shop can own. Welds faster, better, easier, saves current.

Easy to Operate

Hobart Welders have "Simplified" operation. This means faster welding—with the right current for every job. Hobart is simplified, so any of your men can weld easily and successfully. The mystery and uncertainty of obtaining correct welding current settings are removed.

60% Extra Capacity

Over old style 25 Volt Welders—necessary for welding with the new coated rods. Automatic reactance lets you handle light welding work without losing the arc. Users don't understand how they got along with the old style welders after using this new Hobart.

Remote Control

at no extra cost with Hobart. Think of being able to control your welder from any working point. Saves time, temper, and eliminates the need for a helper on overhead or concealed work.

"Pays-For-Itself" Terms

Extra earnings and savings make it easy for you to own a Hobart without expense to you. You can even rent a new Hobart—and later purchase it without loss of rent. Check Rental Purchase Plan.

GET THIS VALUABLE MANUAL

Send Free if you will tell us the welding you plan doing.

Earns \$150 to \$300 Extra Profit Monthly Pays for itself

WITHOUT COST TO YOU
 Hobart pays its own way out of profits in a short time, without a cent of cost to you. The Hobart payment plan is the most liberal offer ever made.



30 DAYS TRIAL at Our Risk

to Prove it Pays

Mail Coupon for further Details

HOBART BROS., Box M-47, Troy, Ohio

- Tell me more about—
 Building My Own Portable () Complete Gas Engine Drive Welder () 30 Days' Trial—Easy Terms
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 Rental Plan Privilege of Purchase.
 Send FREE Manual on Welding. Attached letter tells about the work we want to do.

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 Interested in 30 DAYS' TRIAL EASY TERMS



HOBART ONE OF THE WORLD'S LARGEST BUILDERS OF ARC WELDERS



Balance as above with 1-50; 1-20; 2-10; 1-5 and 2-2 gram weights base 6 3/4" x 3 3/4" - \$4.75. Catalog with 3000 illustrations of laboratory apparatus sent for 50c. Catalog listing 10,000 chemicals, drugs, flavors, etc. and 1700 scientific books sent for 25c; Wholesale Price List 1000 Ill. 10c.

Laboratory Materials Company, 639 E. 71st St., Chicago, Ill.

Saw-Filing

Pays Up to \$2 or \$3 an Hour in Spare Time—No Experience

A FOLEY Automatic Saw Filer files hand, circular and band saws better than the best hand strain. Cash business, no canvassing, no eye-strain. Louis W. Wadwick, Ohio, says, "I have filed 764 saws in spare time and have earned \$850.00 in carpenter work due directly to my saw filing contract." Send postcard for FREE PLAN, no obligation.

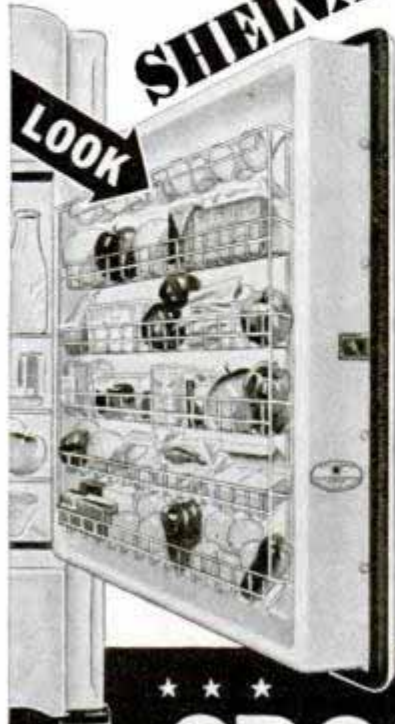


FOLEY MFG. CO., 416-7 Foley Bldg.

11 Main St. N.E., Minneapolis, Minn.

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Exclusively
in a*

SHELVADOR



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**MORE BEAUTY
ECONOMY
CONVENIENCE
USABLE SPACE
ACCESSIBILITY**

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CROSLEY
ELECTRIC REFRIGERATORS

es 1 3 3
(Continued from page 164A)

The Muskingum river flood control plan provides centralized control in one office which can communicate with the various dams, ordering that water be stored or released, according to conditions over the entire drainage basin. The idea is to plan so that neither the capacity of a stream channel nor the storage capacity of any reservoir is exceeded, keeping all river channels filled and storing excess water in the reservoirs as long as possible.

Building such a control system is both costly and slow, almost as slow as reforestation. So, for the immediate future, endurance or avoidance of floods may be the only practicable remedies. Keeping costly economic works away from floods seems only elementary discretion. Much business in flood areas today is organized for a quick getaway when the river comes knocking at the door, and that is another temporary solution. In the meantime, plant trees and grass. They will help.

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

HEY GANG!
DON'T MISS THIS!
Learn the Newest
Dance Steps from
ARTHUR MURRAY
-The World's Greatest
Dancing Instructor-
FREE!



*Start Now
yourself a*



**4 WEEKS
LATER**
BUD
SENDS
FILLED-IN
DANCE
CARD
FOR
BOOK



White Disks on Horse's Legs
Serve as "Taillights"



Write about

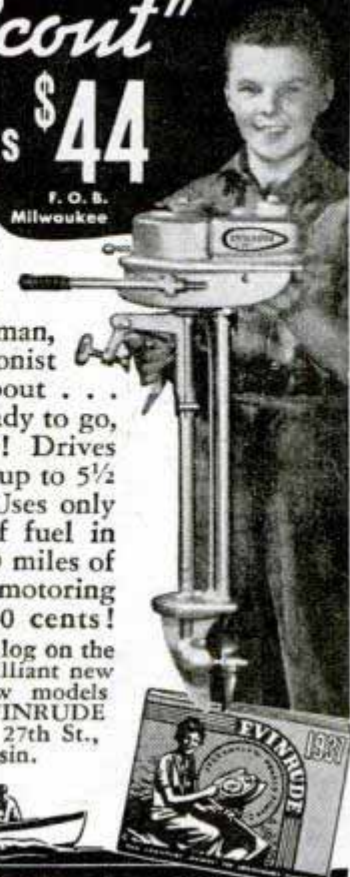
farmer. Kent England

Taking no chances with traffic, a draft horse in England wears "taillights" on his legs. The farmer straps white disks on the animal's hind legs to serve as reflectors for any automobile headlights coming up from the rear.

new EVINRUDE
"Scout"
15 POUNDS \$44

F. O. B. Milwaukee

Here is the lightest, handiest slickest little motor that any fisherman, cottager, vacationist ever dreamed about . . . and, complete, ready to go, it costs only \$44! Drives good sized boats up to 5½ miles an hour! Uses only a single quart of fuel in 1½ hours . . . 100 miles of carefree water motoring for less than 60 cents! Write today for catalog on the 15 lb. Scout and brilliant new Evinrude Streamflow models for 1937. Address, EVINRUDE MOTORS, 5136 N. 27th St., Milwaukee, Wisconsin.



EVINRUDE SEND FOR CATALOG

to Clear up your Skin! Make Good Dancer! WIN POPULARITY!

THEN
BUD
GETS
A
TIP
➔



ASK YOUR GROCER FOR THIS FREE FLEISCHMANN DANCE CARD

Don't miss this CHANCE to get your ARTHUR MURRAY Dance Book. Learn the new steps. Make yourself the best dancer in your crowd! Pictures . . . diagrams make every step easy.

This book is NOT FOR SALE. The ONLY WAY to get it is with Fleischmann Yeast Labels! Paste these on the Fleischmann Dance Card your grocer will give you. Send it in—the dance book is yours!

If there are no Dance Cards at your grocer's, you can still get the book by pasting the 81 yeast labels on a sheet of paper, or putting in an envelope, and mailing with your name and address to Fleischmann's Yeast, 701 Washington St., New York City. (This offer holds good until August 31, 1937.)

(Details of securing Dance Book differ slightly in states West of Denver and in Canada, see newspapers or ask your local grocer.)



"Stick to it—and Fleischmann's Yeast will help to clear up Adolescent Pimples," says Dr. R. E. Lee, well-known physician

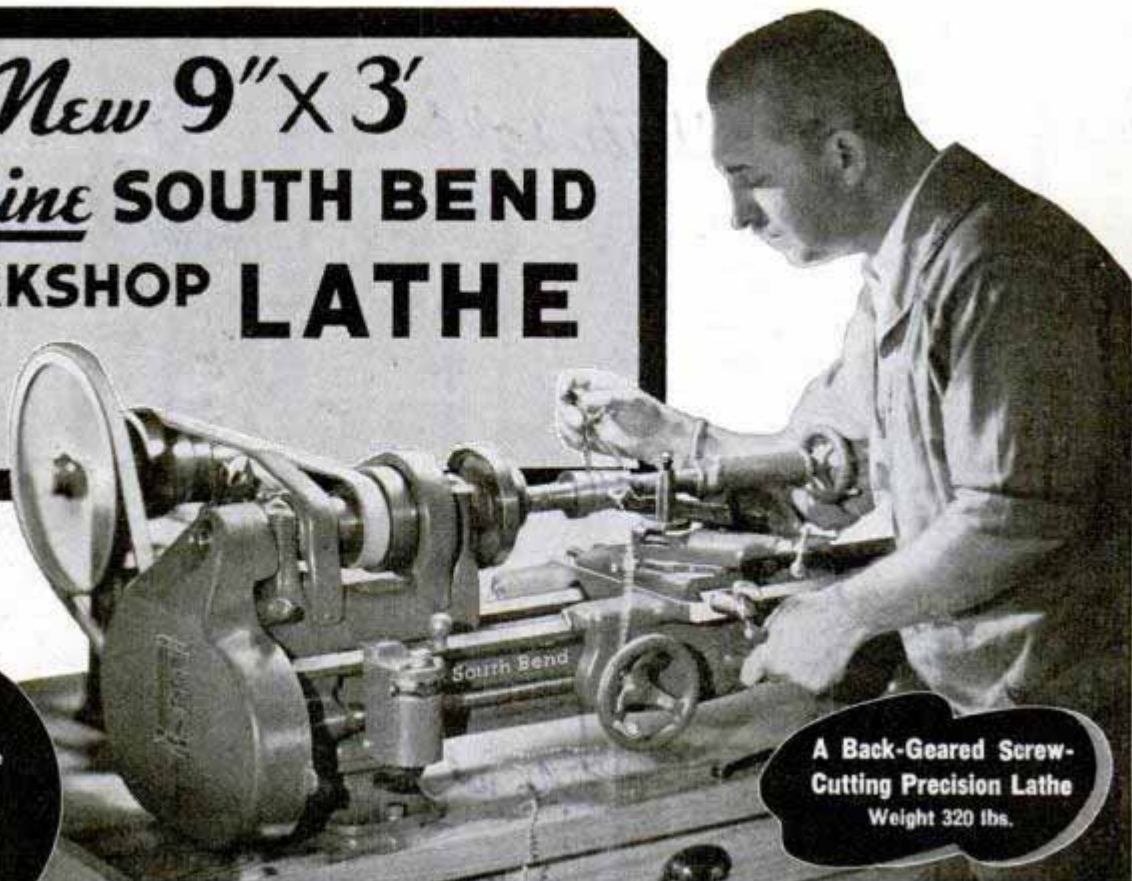
● After the start of adolescence important glands develop. The entire body is disturbed. The skin gets oversensitive. Waste poisons in the blood irritate this sensitive skin—pimples break out! Fleischmann's Yeast helps correct pimples by clearing these skin irritants out of the blood. Eat 3 cakes every day—a cake about ½ hour before meals—plain, or in a little water.

New 9" x 3'
**Genuine SOUTH BEND
 WORKSHOP LATHE**

on
**NEW LOW
 TERMS**

Lathe may be
 operated from any
 ordinary lamp
 socket

\$85⁰⁰
 Less Motor Drive
 —
 Terms as Low as
\$6⁰⁰
 A Month



**A Back-Geared Screw-
 Cutting Precision Lathe**
 Weight 320 lbs.

No. 415-YA 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, 1/4 h.p. Reversing Motor, Switch and belt tension countershaft as shown above. **\$116⁰⁰**
 (\$15.00 Down, \$6.00 a month for 18 months)

THE new 1937 model 9-inch Workshop Precision Lathe is a back-geared Screw Cutting Lathe and is recommended for the finest, most accurate jobs in manufacturing—in the tool room, in home workshops and automotive machine shops. Workmanship and materials used are exactly the same as used in more expensive models of larger size, making it represent the greatest value we have ever offered in 31 years of fine lathe building.

Features include Twin Gear Reverse to lead screw, Ball Thrust Bearing on Spindle, Longitudinal Screw Feed to Carriage, Precision Lead Screw for Cutting screw threads—and scores of other important features. Takes 38 practical attachments for milling, grinding, draw-in collet chuck work, and many other manufacturing jobs.

South Bend Lathe Works

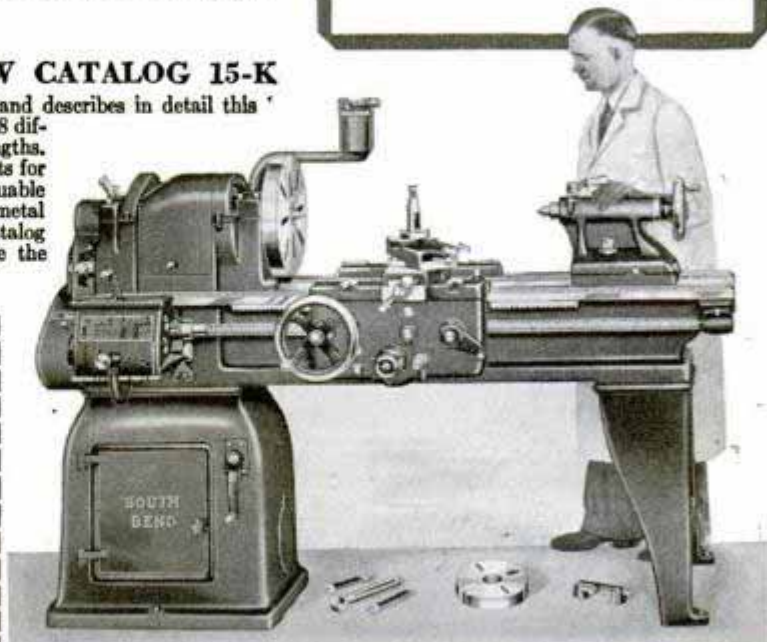
616 E. Madison St., South Bend, Ind., U.S.A.

**5 OTHER SIZES: 9", 11", 13",
 15" and 16" SWING IN ALL BED
 LENGTHS**
PRICED \$97 to \$1200
 Lathe shown below is No. 117-C 16" x 6' Quick Change Gear Underneath Belt Motor Driven Lathe with 1 h.p. motor. Complete as shown. **\$869**
 Weight 2300 lbs.
 (\$87.00 Down, \$38.50 Monthly for 22 Months)



Write FOR NEW CATALOG 15-K

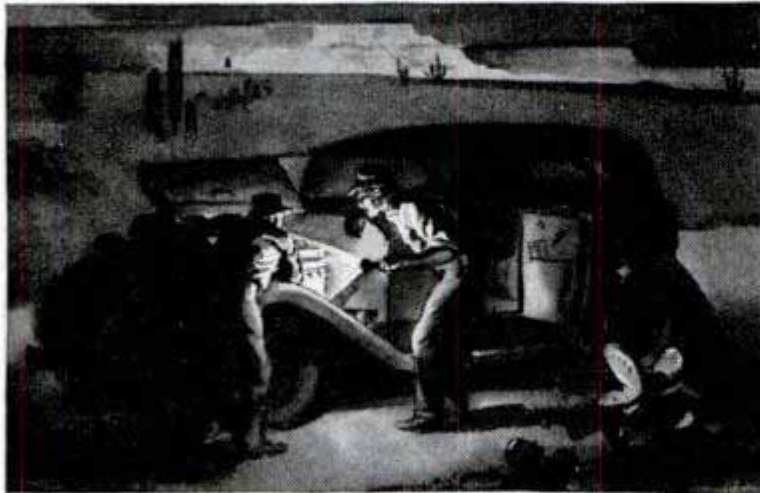
New catalog illustrates and describes in detail this new Workshop Lathe in 8 different drives, 4 bed lengths. Shows the 38 attachments for use with this lathe. A valuable book for all interested in metal working lathes. This catalog sent free, postpaid. Use the coupon shown below.



South Bend Lathe Works,
 616 E. Madison St.,
 South Bend, Ind., U.S.A.
 Please send me your new 1937 Catalog 15-K.
 Size of lathe interested in.....
 Class of work.....
 Name.....
 Address.....
 City..... State.....

SOUTH BEND Precision LATHES

New York to Los Angeles...and BUST!



Battery Goes Dead in Desert!
But Long Island Boy
Drives On Without It

"We had just hit the desert country when the generator gave out...and then, surrounded by empty miles of sand and sagebrush and cactus, the battery went dead and the motor died," writes Ben Feinstein of Blue Point, Long Island.

"There we were, no one to help us, and night coming. My partner got out the flashlights in case we might need them, and I had a wild idea.

"I took the five cells out of my long-range 'Eveready' flashlight, taped them together in series, held a wire from the ignition switch firmly against the positive pole of the top cell, grounded the bottom cell on the emergency brake handle. My companion cranked the motor and she caught ...and those five DATED 'Eveready' batteries



took us over thirty miles of desert that night.*

"Believe me, I know now what it means to be able to buy batteries when they are still fresh—not stale and dried out from standing on a dealer's shelf. And here's telling everybody that 'Eveready' batteries last longer than others.

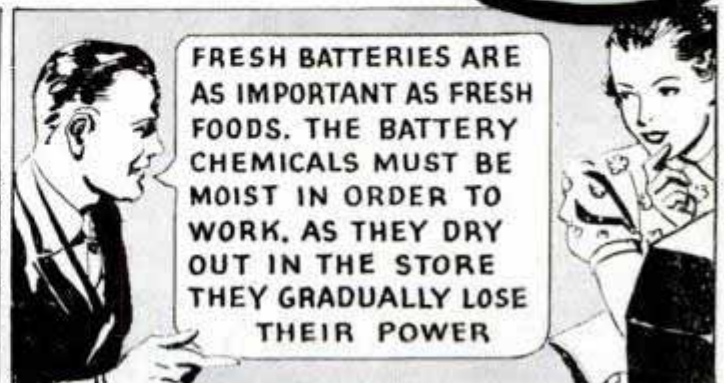
(Signed) *Ben Feinstein*

*For technical explanation, write us; or ask any engineer.

"EVEREADY" BATTERIES ARE FRESH BATTERIES

The **DATE-LINE** guarantees FRESHNESS

NATIONAL CARBON CO., INC., 30 East 42nd Street, New York, N. Y.





You need this throat protection too!

... That only a light smoke offers

The stars of radio have to protect their throats—naturally. But keep in mind that your throat is just as important to you...be sure you have a light smoke. You can be sure Luckies are a

light smoke because the exclusive process, "It's Toasted", expels certain natural impurities harsh to the delicate tissues of your throat. So follow the stars to a clear throat! Choose Luckies.



a light smoke

OF RICH, RIPE-BODIED TOBACCO—"IT'S TOASTED"