

WHAT THE CAMPER SHOULD KNOW

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



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SEE PAGE 180



Mechanics receiving expert instruction in the use of the Laboratory Test Set.

Laboratory *Test Set*

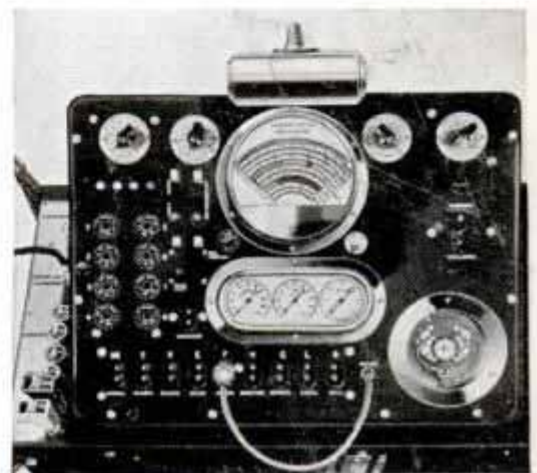
HELPS AUTO MECHANICS

SCIENTIFIC service-station equipment is eliminating trial and error methods in the work of automobile mechanics. One of the most interesting developments in this field is the Ford Laboratory Test Set. For many months it has demonstrated its uncanny accuracy in the shops of Ford dealers and has proved conclusively that it saves time and money for Ford car and truck owners.

Combining a number of sensitive laboratory instruments and gages in one complete unit, this portable Ford Laboratory Test Set can be rolled to the side of the car. It permits the operator to make tests quickly and accurately for every condition that can affect engine performance and the entire electrical system. Further, it enables him to adjust such units as the carburetor and distributor with a high degree of precision. Ignition coils and condensers can be definitely checked. It determines the condition of valves, piston rings and spark plugs. It tests the car radio and tubes in addition to the lighting circuit, generator, starter, fuel pump and other units.

If the type of precision units co-ordinated in this apparatus were to be purchased individually the cost would be so high that only the larger service stations could afford to use them. The Ford Motor Company has made it possible to build and sell the Laboratory Test Set at a price which every Ford dealer can afford.

This is in keeping with the Ford idea of enabling dealers to provide the most efficient service for owners of Ford cars and trucks.



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Master Meter indicates condition of radio tubes.



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BELL TELEPHONE SYSTEM

Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

August, 1935

Vol. 64, No. 2

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Moonbeams Made to Order

A HOLLYWOOD movie director called for a moonbeam along which one hundred girls could dance up into the sky. He got his moonbeam—a husky one which weighed seven tons. Another director needed a bit of Hawaii, including one ocean, several mountains, plenty of rocks, a few islands and a running stream. The scene was ready on the date specified—built to order on a sound stage. An article next month describes how a city skyline or a jungle scene is created on demand by the tools and brains of Hollywood's expert builders of stage settings and "props." Eight pages of Coloroto pictures illustrate the story.

Next Month

EVEN before Columbus discovered America, energetic "golfers" were whacking at a ball made of leather and stuffed with feathers. In the Gay Nineties bewhiskered gentlemen belabored solid rubber pellets which flattened on a hot day and went hopping along like a rabbit with a sprained ankle. Ever since, golfers have been hitting one kind of ball after another. An article next month tells you why it takes eighteen days to make a modern golf ball.

It Can't Be—But It Is

IT'S a topsy-turvy world. Lead is being made to float on water while lighter minerals sink. Portland cement is being pumped through pipes like water. Cold water is being used to thaw gravel beds where steam and hot water failed. In each case someone has found a way to reverse a seemingly infallible law. Read of the feats of these scientific magicians in the September issue.

The Midnight Patrol

TOM, Jim and Jerry are war birds, ace members of Uncle Sam's corps of night-flying pigeons. Don't confuse them with day carrier pigeons. Tom, Jim and Jerry have the night shift and work while other birds sleep. Read next month how the army signal corps trains its night messengers.

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This One



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Chisels, Turning—sharpening, easy method of	304
Class Attendance—record kept with nails	312
Cuspidors—hook for carrying	304
Drafting—eraser in end of brush saves time	316
Dustpan—broom cleaned by row of nails on	310
Electric Lighting—lighting plant for cottage	306
Funnel—powder scooped into bottles with	315
Garage—bracing, rigid, for front end of	305
Gateways—novel, for roadside shop	311
Greenhouse—spacer for setting small plants	310
Lathe	
irregular work, jig used for facing	315
sandpaper, canvas strip reinforces	316
Menu Rack—adjustable curtain rod used as	312
Metal Turning—tool equipment for	301
Micrometer—clamp holds setting	304
Mimeograph—stencils, Cellophane aids in cutting	316
Nails—scored with file will hold better	310
Paint and Painting—spar varnish in oil paint toughens it	305
Pencil, Indelible—dropper bulb over point protects shirt pocket	315
Photographs—cigarette smoke for diffusing light to enlarge	304
Setscrew—tool post, keep oiled to avoid wear	315
Shield—data from invoices copied with help of	305
Smokers' Accessories—smoking stand	313
Soldering—curved surfaces, auto valve used to scrape	312
Tabs, Swinging—depleted stocks of small parts indicated by	310

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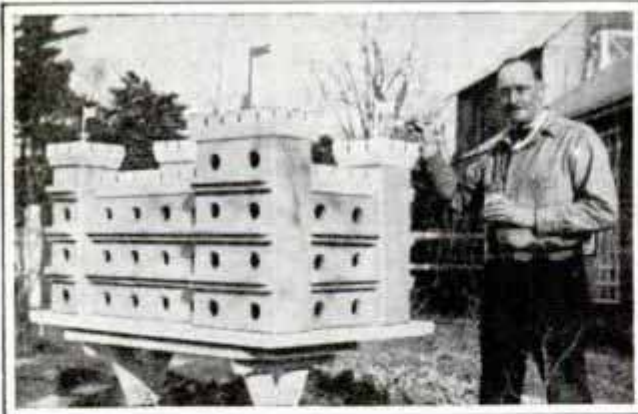


"In view of difficulties color-blind motorists have, I would suggest that the lenses of traffic lights be Circular Red, Star Yellow and Triangular Green. I believe this would be a great help. The

present lights could be used with black paint applied to make the star and triangle."
—C. A. Bilms, Ocean Grove, New Jersey.

Builds Home for Birds

"Am enclosing a picture of the fifty-seven room martin house which my husband built in his electric work shop. Each compartment measures six-by-six-by-six inches, inside. The house weighs about 175



Mr. Lippus and the Bird House

pounds. The birds arrive about the first of April and stay until the first of August and the house was nearly full last year. I greatly enjoy looking through your magazines."
—Mrs. A. W. Lippus, Berlin Heights, Ohio.

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"Some time ago you had a speed boat with a step in the center that was called the Popular Flyer. I had good luck building this boat. My motor was small, but the boat

traveled about thirty-five miles per hour."
—Leo Pozen, Jackson, Michigan.

Unusual Ship Model

When W. M. Hager, of Jefferson City, Mo., started to build a ship model, he looked around for a material that would produce a novel effect. Proof that he found it is shown in the photograph of the builder with the model, which was constructed entirely of pipe stem

cleaners and white cotton thread. The pipe cleaners are obtainable and can be worked into many shapes. How many readers have discovered similar uses for other materials?



We'll Take Note

"Hints and kinks on mechanical drawing and blueprint reading would interest many of your readers."—Joseph Hornak, Jr., Johnson City, New York.

A Model Plane "Fan"

"I am enclosing a photograph of the scale model Ford plane which I built from your plans. I think that you should be commend-

(Continued to page 16A)



Armand Maurer's Model Ship

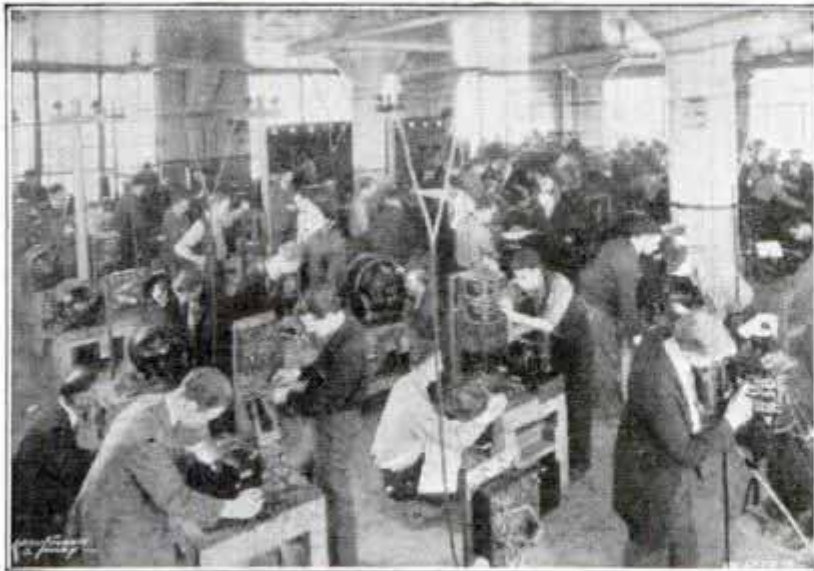
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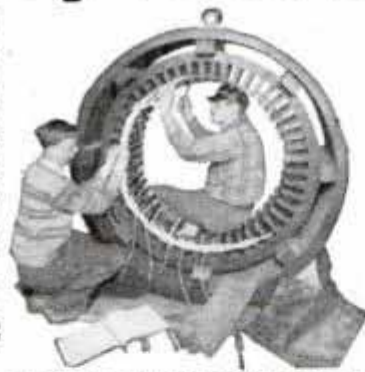
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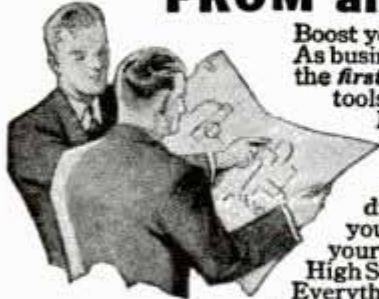
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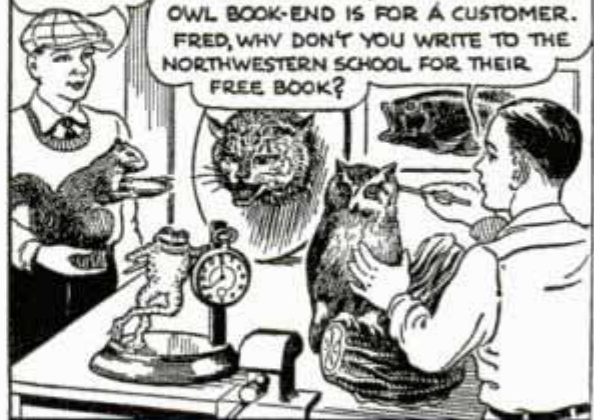
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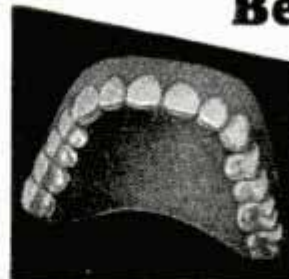
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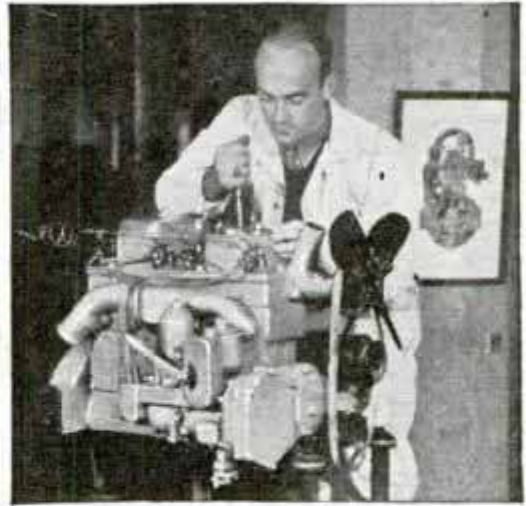
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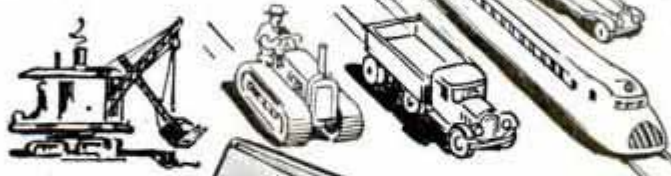
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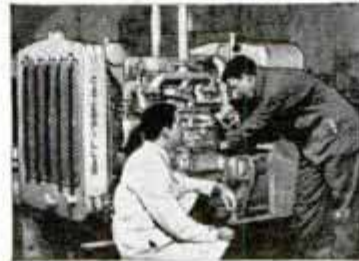
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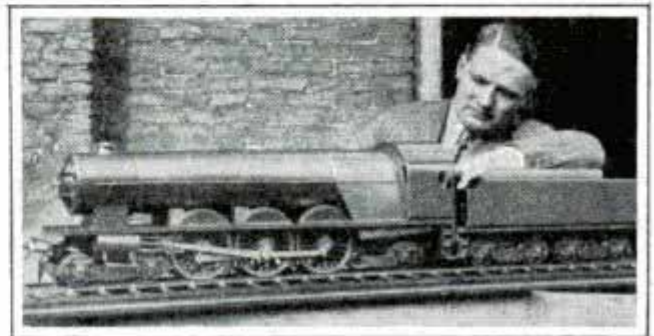
The Editor's Mail Bag

(Continued from page 10A)

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Spare-Time Model Engine

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long and will easily pull about six men, working with a boiler pressure of about ninety pounds per square inch of superheated steam."—*J. W. G. Todd, Amsterdam, Holland.*

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A Novice Builder

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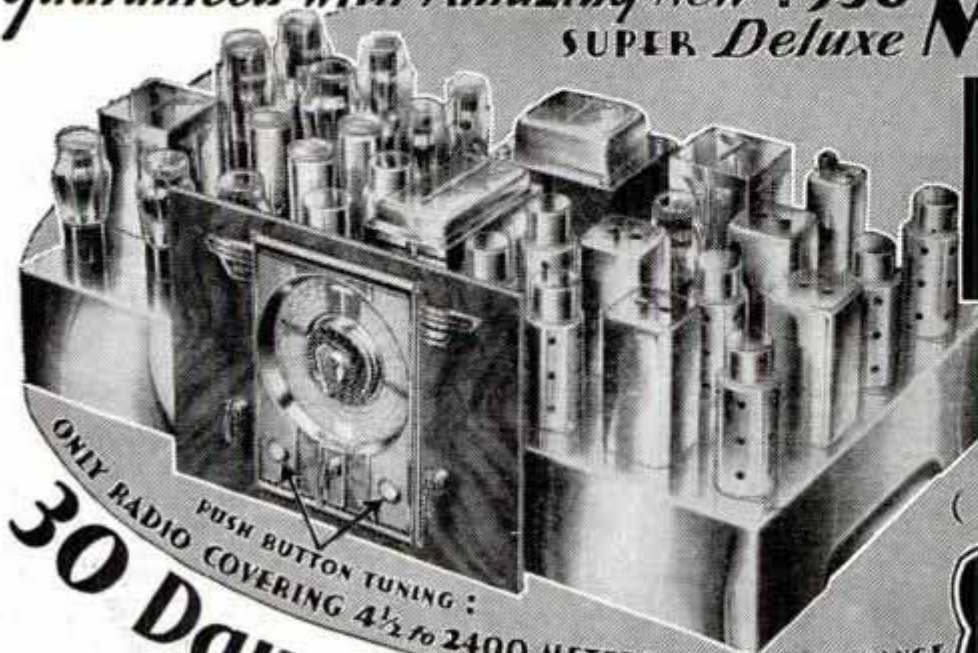
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(Continued to page 22A)

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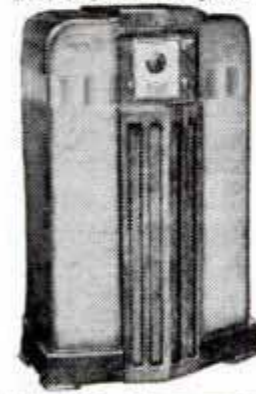
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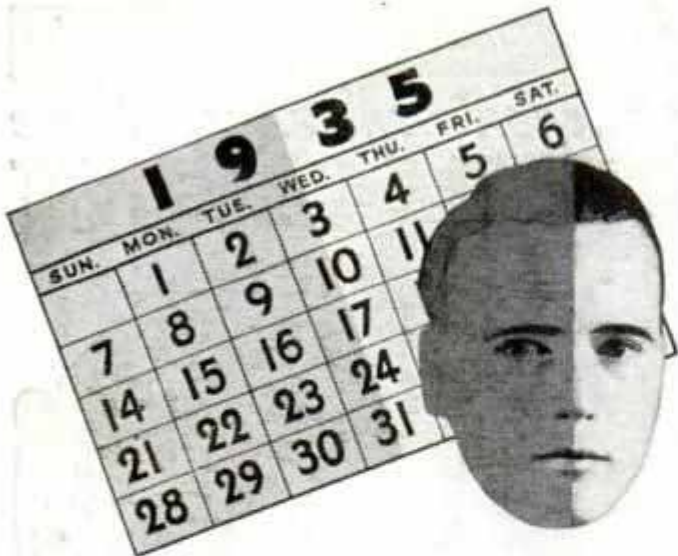
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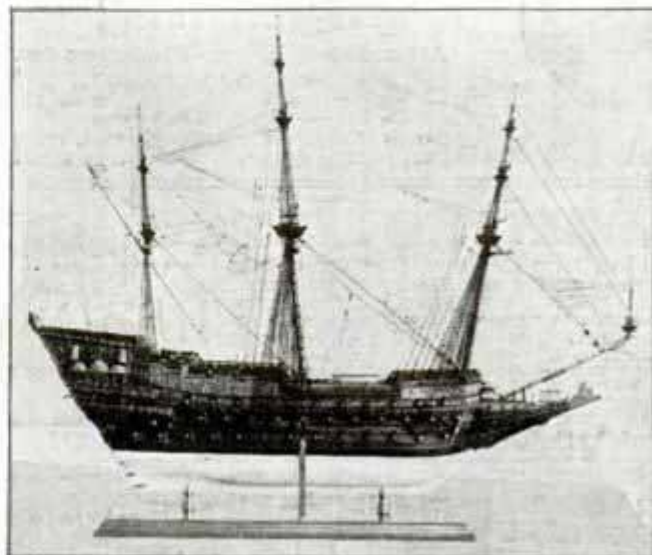


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(Continued from page 16A)

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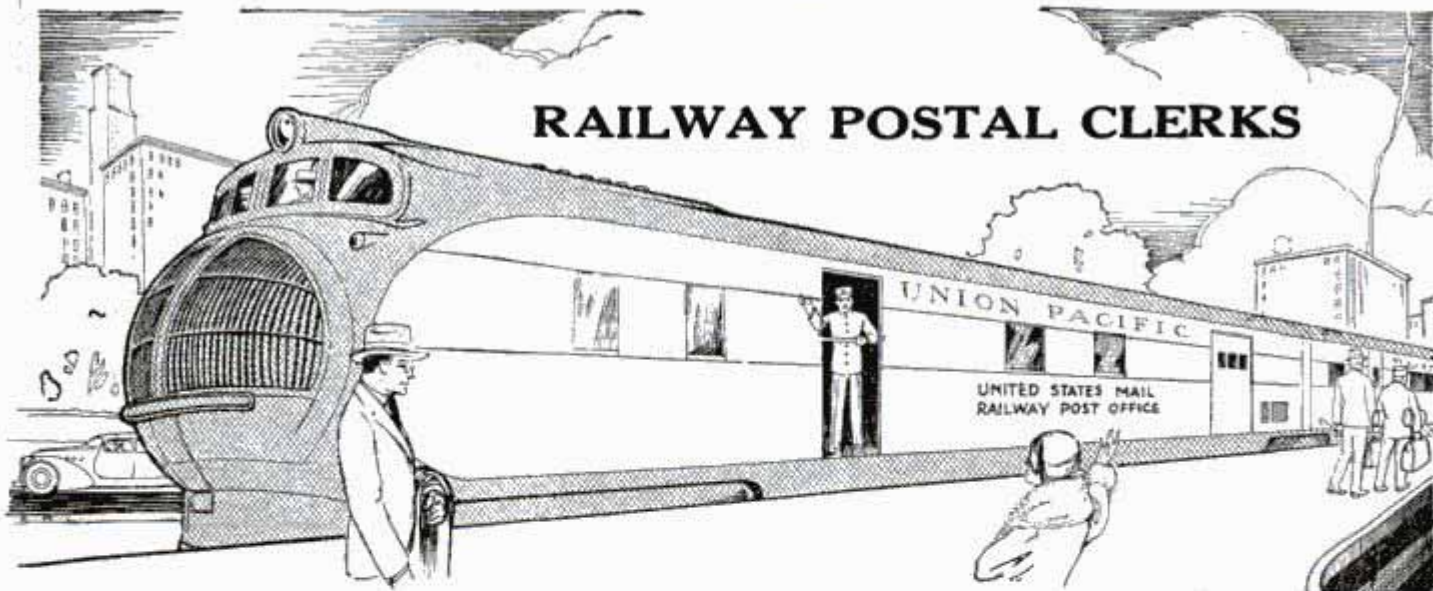
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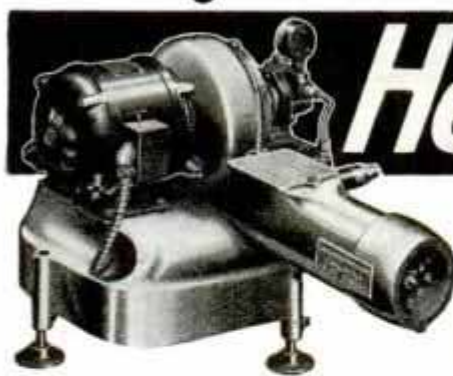
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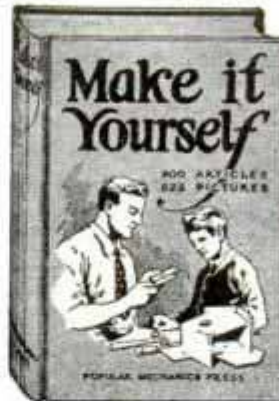
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8-HOUR Service. In at 9 out at 5. Film developed, 8 guaranteed prints, two portrait-like enlargements, 25c. Mid-West Photo, Janesville, Wisconsin.

ALL Size prints 3c. Free 5x7 enlargement with roll. Bay Ridge Photo Store, 5422 - 8 Avenue, Brooklyn, N. Y.

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FILMS Developed 2 prints of each 25c; 20 reprints 25c. Pine Photo, 5134 Nevada, Chicago.

FILM Developed and 8 Super Sheen prints 20c. North Chicago Film Service, North Chicago, Ill.

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SELL Notions, novelties, sundries, cosmetics, blades. Samples, catalog 10c. Eastern City Sales, 8-ES Randolph, Chicago.

NEW Transparent day and night signs; 8"x14"—cost 4c; retail 25c. Sample free. Lowy, Dept. 26 - 8 West Broadway, New York.

SEND Hose size for samples and opportunity for \$20 week job. Just show sensational guaranteed hosiery to friends. Dignified, pleasant, easy work. Everything supplied. Betterknit Hosiery, Outfit J-237, Columbus, Ohio.

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-32, Bradford, Pa.

DOLLARS Daily! Start home! Mail order business. Details. Duffy, Covington, Ky.

REPEAT Business wonderful. \$10.00 day easy. Lowest price duplicator. Sell restaurants, clubs, etc. One school bought 50. Sales outfit \$1.00. Dollar Duplicator, 1405 Eye, Washington, D. C.

SELL To drug trade, athletes foot preparation. Make \$1.20 per order. Box 870, Hollywood, California.

MEXICAN Feather pictures. Great profit. Send 25c (stamps) for \$1.00 worth sample and details. Mexican Art, Apartado 1593, Mexico City.

METAL Polishing cloths, costs 4c each, retail 25c. Free sample. Superior Specialties, Springfield, Ill.

\$10 DAILY Selling adjustable lawn hose support. Newest, fastest 25c seller. Sample quarter. Dozen \$1.35. Gross \$13.20 prepaid. Hester Products Co., Tulsa, Okla.

LARGE Mercantile distributors. Wholesale or retail. Finest shampoos, shaving cream. Interview. Ver-O Products Co., Rochester, Indiana.

SELL Neckwear. 100% profit. Quick sellers. Low wholesale prices. Free catalog. Artstyle Neckwear, Elmira, New York.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 23A.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 8-PM, Chicago.

WONDERFUL Opportunity to make \$240 a month, \$45 first week. Be a grocery dealer. I furnish you complete. No capital needed. Write Albert Mills, 8965 Monmouth, Cincinnati, Ohio.

AGENTS—Engraved name plates, number plates, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

"ELOZONE" Attached to electric bulb perfumes the home, purifies the air, destroys cooking odors. Quick seller. 25c brings outfit. Werner Mfg. Co., Box 9, Station N, New York.

MEN And women: Once before we placed our product with agents. Results were over a million sales. Now we offer again this popular 35c item, for home and office, and include a premium with each sale. Wonderful value. 100% profit. Agents Dep't, 111 East Walnut, Enid, Okla.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 18 West 22nd, New York.

INITIALING Automobiles biggest money maker today. New type requiring no varnish to apply. Write for samples. International Monogram & Transfer Co., Box 6365, Philadelphia, Pa.

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

SENSATIONAL Guaranteed flavoring extracts. Eleven flavors. Assortment worth \$3.50, sells 99c! Cost 49c and less. Free allowances. Freight prepaid. Cosmetics, spices, polishes. Edison Laboratories, Duluth, Minnesota.

PENNY Each. Beautiful gold reflecting letters for store windows. Non-tarnishable. Easily applied. Free samples. Atlas Sign Works, 7941 Halsted, Chicago.

AMAZING Zipper pinless clothline. Instant demonstration. Sure sale every home. Free guarantee sales plan. Dunn Bros., Hempstead, N. Y.

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

SUCCEED With your products. Learn how. Formulas, Processes, Analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

SELLS Like hot cakes. Big profits. New laundry soapflakes, perfumes clothes lastingly when washing. Territory given. Sunset Laboratories, Lynbrook, N. Y.

CALIFORNIA Flower beads sure fire fast sellers. Big profits. Low prices. Catalog free. Mission No. 16, 2328 W. Pico, Los Angeles, Calif.

HIGHEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 45 East Eleventh Street, New York.

FREE Literature describing many money making plans. Belfort, 4042 N. Keefer, Chicago.

CASH Income daily resilvering mirrors; replating metalware; making glass signs. Portable outfit. Sprinkle, Plater, 128, Marion, Ind.

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

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

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

SILVERING Mirrors made easy and 460 other useful articles in Shop Notes, Volume 28—50 cents postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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

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

AGENTS—Opportunity to make money; book containing 87 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

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

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, dyeing glass; heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, laundry work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$7.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

HIGH-GRADE SALESMEN

SALESMEN—Make big profits with this splendid line! Prices slashed on carded aspirin, razor blades, laxatives, notions, etc. Experience unnecessary. Better Products Co., Dept. 2635, Marion, Ind.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 762 Burkhardt, Dayton, Ohio.

DIESEL "Oyl-Gas" generator for automobiles. Extraordinary features of demonstration. Every car owner wants one. The salesman's dream. Send for literature. Panama Oil Co., Berkeley, Calif.

SELL Advertising Record Calendars. Liberal commissions. Quick sellers. Write for proposition. Red Wing Advertising Co., Red Wing, Minn.

AUTO Accessory salesman. Free deal for dealers. Irresistible appeal. Complete line auto accessories priced right. 25% commission daily. Exclusive territory. Outfit free. National, 1910-DB Wentworth, Chicago.

STRANGE Discovery overhauls automobile engines, fraction former rebore costs. Pays in oil, gas savings. Free trial sample unusual money making plan. B. L. Mellinger, 250, Kansas City, Mo.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2634 N. Third St., Milwaukee, Wisconsin.

HERSHEYS, Baby Ruth, Oh Henry! candy deals. 1c—5c display and punch deals. Living scale. Steady employment. Casterline Bros., 1922 Sunnyside, Chicago.

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

SALESMEN For commercial envelopes. Maloney Sales Co., 84 Exchange St., Rochester, N. Y.

100% PROFIT Big seller. New type Emerson electric water heater. Jiffy Electric Company, Hazel Park, Mich.

SUMMER Sensation—Patented, air-cooled auto seat pads and covers. Fit every pocket-book. Amazing dealer proposition. Big salesman margin. Free sample offer. American Cover Corp., 2406 Madison, St. Louis, Missouri.

SALESMEN: Calling on retail merchants. Write for circular describing new Felt Brush for making show cards. Dexter Manufacturing Co., 3225 Ravenswood Ave., Chicago, Ill.

NEW Federal and state tax laws forced, under severe penalties, the keeping of proper business records. Immense demand for our officially approved tax record. Sells at sight. Repeat commissions without callbacks. Men selling 5 to 25 daily. \$3.50 cash profit every sale. Commonwealth Publishing Co., 508 So. Dearborn, Chicago.

NEW, Quick selling specialty to dealers, jobbers. Siltstik, dry lubrication for home, car, office. Packed, counter displays. Real chance, salesmen and distributors. No hokum. An honest, legitimate, lifetime sales opportunity. Rush dime, sample and plans. Earnshaw, Palmer Bldg., Hollywood.

PENNY Each. Beautiful gold reflecting letters for store windows. Non-tarnishable. Easily applied. Free samples. Atlas Sign Works, 7941 Halsted, Chicago.

SELL Stores or homes. Big new line. Over 60 items. Up to 600% profits. Repeats. Superba Co., 8411, Baltimore, Md.

NEW Butchers steak machine. Quick money. Federal Engineering Co., Minneapolis, Minn.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4375 Ravenswood, Chicago.

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

SELL Process embossed printing \$3.95 thousand, with free cut service. Worth \$6.00. Nothing like it! Commission \$1.00, advanced. Experience unnecessary. Outfit free. United Engravers, F-6155 South State, Chicago.

SALESMEN—Sell collection systems, 400% commission. Sayers Systems, 2801-123 Sheffield, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Foyer cleared \$4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

SELL Punchboards direct to dealers from world's leading punchboard factory. Wholesale prices. Enormous profits. Big commissions. Sales kit free. Harlich Co., 1407 Jackson, Chicago.

FREE Booklet describes 87 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SALESMEN—Sell complete line quality printing—All business necessities. Gummed labels—Adv. cards—Salesbooks—Calendars—Hammermill Bond stationery, etc. New features—Large spot cash commissions. Complete sales outfit free. All-Trades Printing Service, Dept. CP, Rockford, Illinois.

OUTDOOR Sports for everyone—Enjoy them all year round with aid of book published by Popular Mechanics. Hundreds of ideas for new and popular sports for every season; complete instruction for making necessary equipment at small cost. 350 pages and 650 illustrations. \$2 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

HELP WANTED

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36MD, 1956 S. Troy, Chicago.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. V-217, 500 Throop, Chicago.

MAN Wanted—Manufacturer established 45 years will finance responsible man with complete stock of guaranteed finest foods, groceries, good health products, toiletries, farm and home necessities—you pay when sold. Mighty attractive plan. Excellent opportunity for good living right from the start with steady increase for industrious man. Pays better than most occupations. Anderson of Utah sold over \$330 and Jack of Wisconsin sold over \$308 in one week. Pleasant work. Experience unnecessary. No slack seasons or layoffs. Write for No-Investment offer. McCannon and Company, Room 66HS, Winoona, Minnesota.

BIG Money growing mushrooms, cellar, idle places. Supplies furnished. We buy. Free book. Mushroom Growers, HJ-433 N. Clark, Chicago.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 352, Toronto, Ont.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 23A.

\$60-A-WEEK Opportunity. Want men to service 200-family grocery routes. No capital required. Everything furnished. Write Albert Mills, 8959 Monmouth, Cincinnati, Ohio.

NEED Cash? Raise patented all-season mushrooms; cellar, shed. Wholesaler (ten branch offices) supplies materials; instructs, buys crops. Details free. United, 3848-A176 Lincoln Ave., Chicago.

TEACHERS: Many vacancies reported to you by new cooperative placement plan. Treweske, 599, Wichita, Kans.

AGENTS—Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 54 Searle Bldg., Rochester, N. Y.

LEARN Air conditioning—America's next big industry. Thousands of opportunities for far seeing men. Get your start with complete new book by E. W. Riesbeck. \$3.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

STUDY Law at home. High grade instruction. Est. 1892. Catalog free. Chicago School of Law, Reaper Block, Chicago.

SHOWCARD Writing. New, easy method. Clearly illustrated. 25c. Roughan, 213A-4th, Jersey City, N. J.

WORK For "Uncle Sam." Start \$105.00 to \$175.00 month. Men-women. Common education usually sufficient. Experience unnecessary. Qualify at once. Full particulars, list positions and sample tests—free. If you are an American citizen, write today. Franklin Institute, Dept. W3, Rochester, New York.

QUALIFY And apply for gasoline station positions, manager, gasoline truck driver, lubrication expert, etc. My complete course teaches you everything concerning this work. Write Filling Station Management Bureau, 1309 P Street, N. W., Washington, D. C.

GET Wise to yourself. "Dynamental"—Complete in 12 lessons. Gives secret of mind power and control, concentration, memory, will-power. Full instructions for contacting sub-conscious. Closely guarded secrets of the author now fully revealed. \$1.00 postpaid. Dynamental Foundation, 9304 Amesbury Ave., Cleveland, Ohio.

SECRET Service. Valuable information free. International Secret Service Institute, PM-85, Hoboken, N. J.

LEARN Fast and correct figuring. Frederick A. Smith, 2410 Smalley Court, Chicago.

PROSPER! Establish business at home. No canvassing. Stamp. Look, D-1613, Palatine, Illinois.

SALESMANSHIP Course, 16 volumes like new. Also electric utility accounting course. Sacrifice for cash. Smith, Box 248, Oklahoma City.

WINDOW Trimming, crepe paper, etc., practical method. Learn and earn in 4 weeks. Division 22, Advance Displays, 1553 Madison, Chicago.

AUTO Instructions simplified; four booklets; driving, trouble-shooting, appraising, master-driving; 25c each, set \$1.00. James Publications, Box 124, San Francisco, Calif.

ARE You seeking employment? "How to Get a Position" benefits everyone. Only \$1.00. Particulars free. Employees Aid, Dept. G, 3518 Park, Kansas City, Mo.

MILWAUKEE Industries desire to contact earnest young men to learn electric arc welding in their laboratories of the school of engineering. Small training fee. For details write President Werwath, 1020-26 N. Broadway, Milwaukee, Wis.

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.

CHIROPODY Taught by correspondence. Evans School of Chiroprody, Montgomery, Alabama.

MIRACULOUS! Want wealth, success? Use The Law, \$1.00. Otis Browne, Box 53, Berwyn, Ill.

MODERN Refrigeration. New industry needs trained men for installing, servicing, repairing. If you seek a new field with larger opportunities get latest book by Althouse and Turnquist. \$4.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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

GET U. S. government job—start \$105-\$175 month. Men-women, age 18-53. Are you eligible for eligibility test? Get our free questionnaire—find out. No obligation whatever. Instruction Bureau, 101, St. Louis, Missouri.

U. S. GOVERNMENT Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

CARTOONING—COMMERCIAL ART

PORTABLE Drafting machines—Eliminate T-square and triangle. Priced low for home, school, office or field work. Complete information. Drafto Company, Dept. E, Cochran, Pa.

MODERN Cartooning methods. \$1. Cooperative Research Company, 132 West 14th Street, New York.

MAKE Money. Sketching. Duplicating. Free information. Paisley, 421-B Kinloch Bldg., St. Louis, Mo.

CARTOONING Lessons. New, quick, easy method. 30 lessons, 125 illustrations complete. 25c postpaid. Lawrence Publications, 143 West 190 St., New York.

CARTOONING Course—30 lessons, 500 illustrations with drawing pens and pencils. \$1.00 complete. Scovell Studios, Box 610-P, Hollywood, Calif.

AMATEUR Cartoonists can earn \$35.00 weekly, spare time, duplicating cartoon advertisements. 3-M Syndicate, Argyle, Wis.

ADVERTISING AGENCIES

LEARN Advertising quickly at home. New easy practical plan. No text books. Interesting booklet free. Page-Davis School of Advertising, 3601 Michigan, Dept. 343-B, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago.

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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.

FOR ADVERTISERS

50 WORDS Displayed \$8.30. Circulation 700,000. Goodall, Box 1592, San Francisco.

FREE Book "How to Write Advertising" with 6-month trial subscription. Send only 50c. American Freeman, Box 1811, Girard, Kansas.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Service Bureau, 4650 Drexel, Chicago.

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INFORMATION Service: interesting bulletin free. Unclaimed moneys. Missing persons. Genealogy, family records. Wilkerson, Anacostia, Washington, D. C.

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

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SALES Letter written \$3. Folder? Bugg, 251 So. 33, Camden, N. J.

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

BRAND New technique in collecting bills. No "system" but modern cash-impeller. Adaptable to any business. Folder free. National Business Systems, 8 S. College, Akron, Ohio.

DELAWARE Charters; fees small; free forms. Chas. G. Guyer, 901 Market St., Wilmington, Del.

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PRINT Your own. Bargain presses, type. List 3c. Exchange D13, 22 Orient, Meriden, Connecticut.

100 LETTERHEADS And envelopes \$1.00, 225, \$2.00. Richards, Stow, Ohio.

MIMEOGRAPHING. Also supplies. Lowest prices. Paisley, 421 Kinloch Bldg., St. Louis, Mo.

1000 CARDS \$1.00. Illustrated printing reasonable. Bradshaw, 3214 Huron, Chicago.

LETTERHEADS, Envelopes, statements, blotters, shipping tags; 250—\$1.00. Parcel-post labels, business cards; 500—\$1.00. Samples? Gladly! VanDorn Dollarpress, Ottawa, Illinois.

500 LETTERHEADS, Envelopes, statements \$1.10 plus postage. Raymonds', Newport, New York.

PRINTING—Catalogs, booklets, color work, broadsides, folders, circulars, price lists, factory forms, office stationery. Complete pressroom and pamphlet bindery under one roof. Established 33 years. Theo. Rozek & Co., 2511-2519 Maypole Ave., Chicago.

1000 CARDS \$1.00. Letterheads, envelopes, billheads \$2.25. 5000 business boosters \$3.50—(prepaid.) United Printing, Pottstown, Pa.

200 EACH, Letterheads, envelopes, \$1.75. Ledlin, 1017 W. Greenfield, Milwaukee.

GUMMED Stickers, 3 lines, 500, 20c; 1,000, 35c; prompt. Seal, 6457 Eggleston, Chicago.

5000 ELEGANT Envelope slips, \$3.90 prepaid. Circulars, stationery, cards, folders, labels, low prices. Samples. Goodprint, Harrisonburg, Va.

ATTRACTIVE Gummed labels, 1000 (your copy) \$1.85. Jobey, 2046 Warren, Chicago.

LETTERHEADS, Envelopes, statements \$2.50 thousand. Ludwig Printing, Terre Haute, Indiana.

"NU-STYLE," 200 Sheets, 100 envelopes, \$1.00. Audrey Press, 249 Pearl, New York.

500 BOND Letterheads, envelopes, statements. Each \$2.00 prepaid. Cash with order. Interstate, Bethany, Missouri.

2000 BUSINESS Cards neatly printed \$1.50. Atlas Distributing Co., 1814 Bedford Ave., Pittsburgh, Pa.

1000 BUSINESS CARDS, card case, \$1.50. Miller, Printer, Ambler, Pa.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.90; job presses, \$11, power \$149. Write for details. Kelsey Co., Y-11, Meriden, Conn.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 48-A, 6 Columbia St., Newark, New Jersey.

PRINTING Presses, supplies, 3c for complete lists. Landis, Richland, Pa.

MAKE Cuts—Easy, cheap, process. Halftones, linetypes, typematter. Andercamco, 12612 Greenwood Ave., Blue Island, Ill.

PRINT Your own circulars, envelopes, with home made press costing less than \$1.00. Illustrated instructions 10c. Carl Edquist, Odessa, Minn.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

BARGAINS Used presses, type. Send stamp. Box 15, Cambridge, Mass.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

LOWEST Price duplicator prints clear as \$100.00 one. Dollar Duplicator, 1405 Eye, Washington, D. C.

TYPEWRITER \$12, Multigraph, mimeograph, and other office machines. Write 816 Pruitt Bldg., 170 North LaSalle, Chicago.

INCREASE Business. "Excellograph" rotary stencil, clay and film duplicators \$3.85 to \$37.50. Prints anything. Typewritten, penned, drawn, traced. Colors. Folder free. Pittsburgh Typewriter Supply, Suite 518, Pittsburgh, Pa.

NEW \$4.75 Automatic adding machine. Fully guaranteed. Bassett, 1458J Hollywood Avenue, Chicago.

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2 LINES 25c, 3 Lines 35c. Rubber Stamp Co., Tunkhannock, Pennsylvania.

SEND 10c For illustrated rubber stamp booklet; special offers. Eskew Stamp Works, Portsmouth, Ohio.

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

PATENT ATTORNEYS

ROBERT E. Sadtler, Attorney at Law (Tenn.), Registered Patent Attorney. Chemical and Metallurgical Patents. 412 West Pine Street, Sellsgrove, Pennsylvania.

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HAVE You an invention? Want to know how to develop them? A novel invention may produce something salable. Secure patent protection. Write today for my free book "Patent Guide for the Inventor." It illustrates scores of inventions, many of them the foundation of commercial success. Clarence A. O'Brien, Registered Patent Attorney, 582 Adams Building, Washington, D. C.

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Turn immediately to page 41A, or Address: Victor J. Evans & Co., Registered Patent Attorneys, 400-J Victor Building, Washington, D. C.

"INVENTOR'S Guide," 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

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L. F. RANDOLPH, 302-B Victor Building, Washington, D. C. Low cost. Book and information free.

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ECONOMY For inventors. Write for booklet. Thos. H. Johnston, 635 F St., N. W., Washington, D. C.

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HAVE You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute, Dept. 4D, Barrister Building, Washington, D. C.

SELL Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. F. W. Johnson, Manager, Classified Advertising, 200 E. Ontario St., Chicago.

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INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Turn immediately to page 41A, or Address: Victor J. Evans & Co., Registered Patent Attorneys, 401-J Victor Building, Washington, D. C.

TO Inventors: We are in the market to purchase a good patent, preferably in the automobile accessory line. Will purchase outright or on royalty basis. Purchasing Agent, 241 Front St., New York, N. Y.

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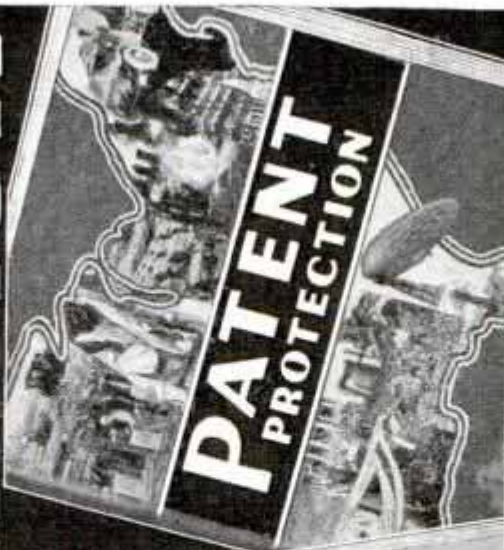
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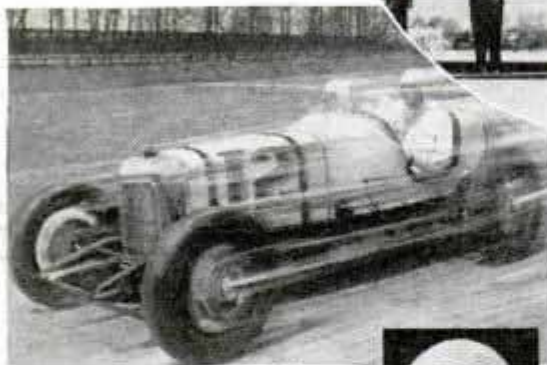
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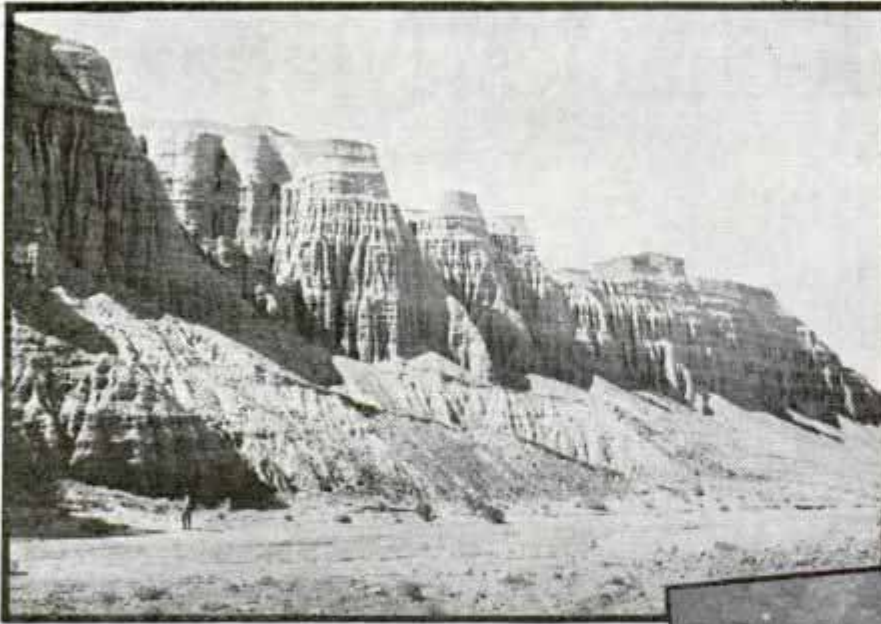
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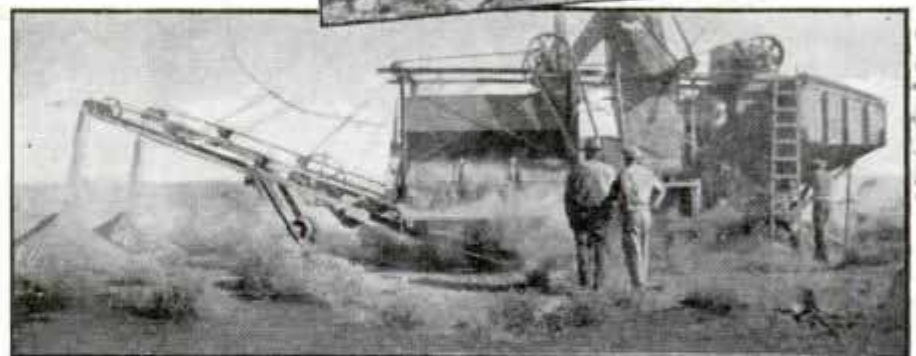
ruins engines and bearings. A third difficulty is that a machine that works fairly well in one kind of soil may not be efficient in another kind. One man who owns 2,000 acres of desert placer estimated to contain more than \$3,000,000 in gold has spent more than \$25,000 so far in unsuccessful attempts to work his ground.

hard-rock gold-mining industry. The inventor who finds such a method can literally name his own reward.

Already some progress is being made. Gold land considered hopeless a decade ago is now yielding a yellow crop. Large gold-harvesting machines are operating in districts where the gold is rich and where other conditions are ideal. These dry dredges, resembling huge wheat threshers and many of them mobile, are expensive, complicated machines that scoop up the dirt with power shovels, break it up, screen and grade it, and pass it over jigs or concentrating tables where the heavy gold flakes are trapped behind riffles. Powerful gasoline and fuel-oil engines operate the endless belts and revolve the cylinders.

One objection to the present machines is that the dirt has to be bone dry in order to leave the gold behind, and even in the deserts some moisture exists a foot below the surface. Drag lines scrape a few inches off the top, then the next layer is removed after it has dried. Air blasting the dried dirt toward the dredge with airplane propellers whirled by engines also has been tried but the cost of drying the dirt often means the difference between profit and loss.

An additional trouble is the cloud of dust that filters through air cleaners and



Top, Dry Canyon Containing Gold but No Water; Center, This Miner Dries His Sand and Runs It through a Dry Washer; Bottom, Gold Dredge Which Works High-Grade Dirt without Water

Many placer claims have yielded easy millions but these were in districts where water could be used to "hydraulic" the dirt and wash it into flumes that trapped the gold. Gigantic dredges eat their way

8678

through the sand along stream beds, floating in their own pools while they remove the gold. Both of these methods are so cheap that earth containing only ten cents worth of gold per cubic yard sometimes can be worked at a profit. Most present types of dry-dredge harvesters cost five times that amount to operate and are not as efficient. It is estimated that in the Mother Lode country of California alone, where water is available, about \$400,000,000 could be taken out by hydraulicking but this method is forbidden now because it silts up stream beds and damages the low lands.

Lately these objections have been overcome by the use of wet plants that require smaller amounts of water and that salvage much of the water used. Such machines can work through thousands of cubic yards a day at costs of about twenty-five cents a yard, and in gravels where the values are richer than that figure the difference is clear profit. The wet washers spill the water and material down slanting flumes in which the heavy gold drops to the bottom and is trapped. Even these machines, however, have not been able to conquer the desert except at the ends of long pipe lines that furnish the vital water.

The Indians in Arizona powder the desert material in buckskin bags, then toss it into the air, allowing the gold flakes to fall to the ground while the wind carries the dust away. The next simplest way, used by prospectors in hunting for rich dry ground, is to "dry pan" the dirt by swirling it in a gold pan until the heavy particles finally reach bottom. An improvement over this is the small dry-washing machine that trickles the dirt down an inclined table, with a bellows to help blow the light material off while the gold settles behind the cross riffles. Hundreds of different kinds of dry-washing devices have been built. Some of them are fakes and others that work in demonstrations are nearly valueless in the field. Often, the larger the dry gold washer or harvester, the less efficient it seems to be, leaving the field still open for some new method of separating gold from dirt that can be used where water is scarce.

8681
"BIG GAME" CUTOUTS TRAIN EYE OF EXPERT ARCHERS



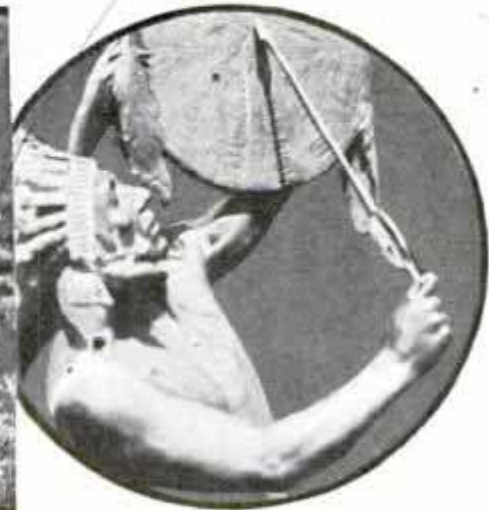
Arrow Shot into "Vital Spot" of These Cardboard Animals Brings Highest Score in Archery Games

Cardboard cutouts of elephants, giraffes and rabbits are used instead of the traditional red, white and blue "bull's-eye" to develop skill with bow and arrow at an eastern college. A heart is painted at the vital spot of the animal and an arrow through the heart brings the highest score.

8625

INDIAN FIGURE FORMS SUNDIAL FOR LARGE ROCK GARDEN

Enhancing the beauty of a large rock garden on a Long Island estate is an Indian figure which forms a sundial. The dial consists of a disk with the Indian's arrow set at the proper angle. The figure is appropriate, since the property once was inhabited by the Algonquins.



Two Views of Indian Statue, with Arrow and Shield Forming Sundial; Right, Closeup Showing the Dial

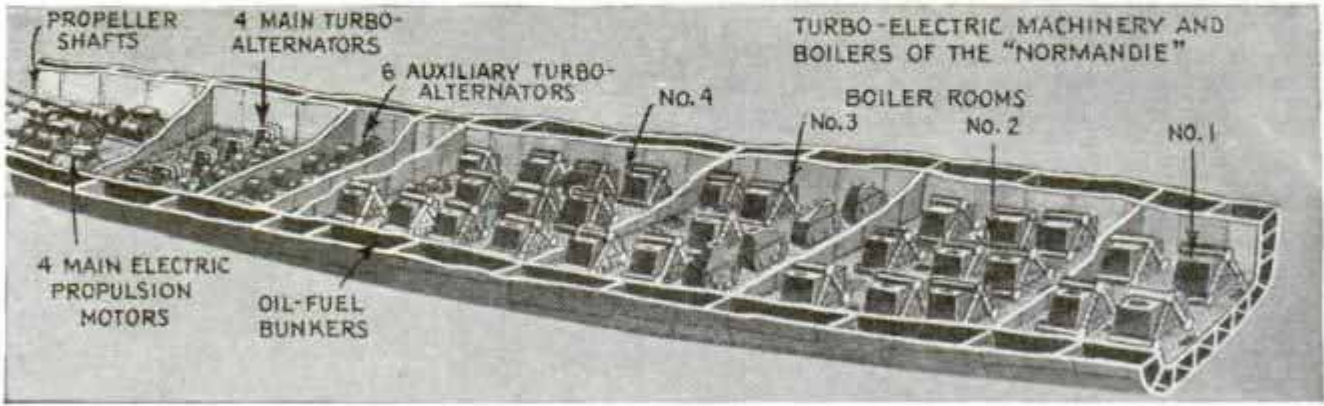
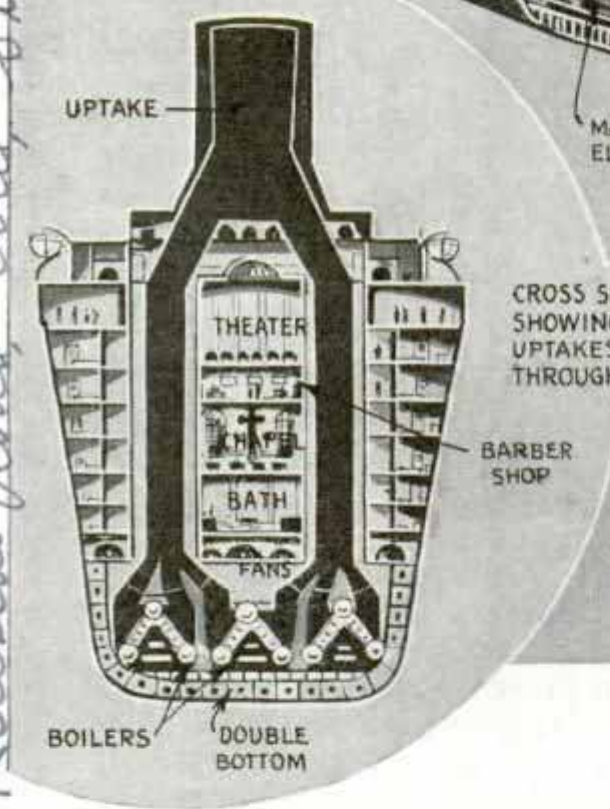
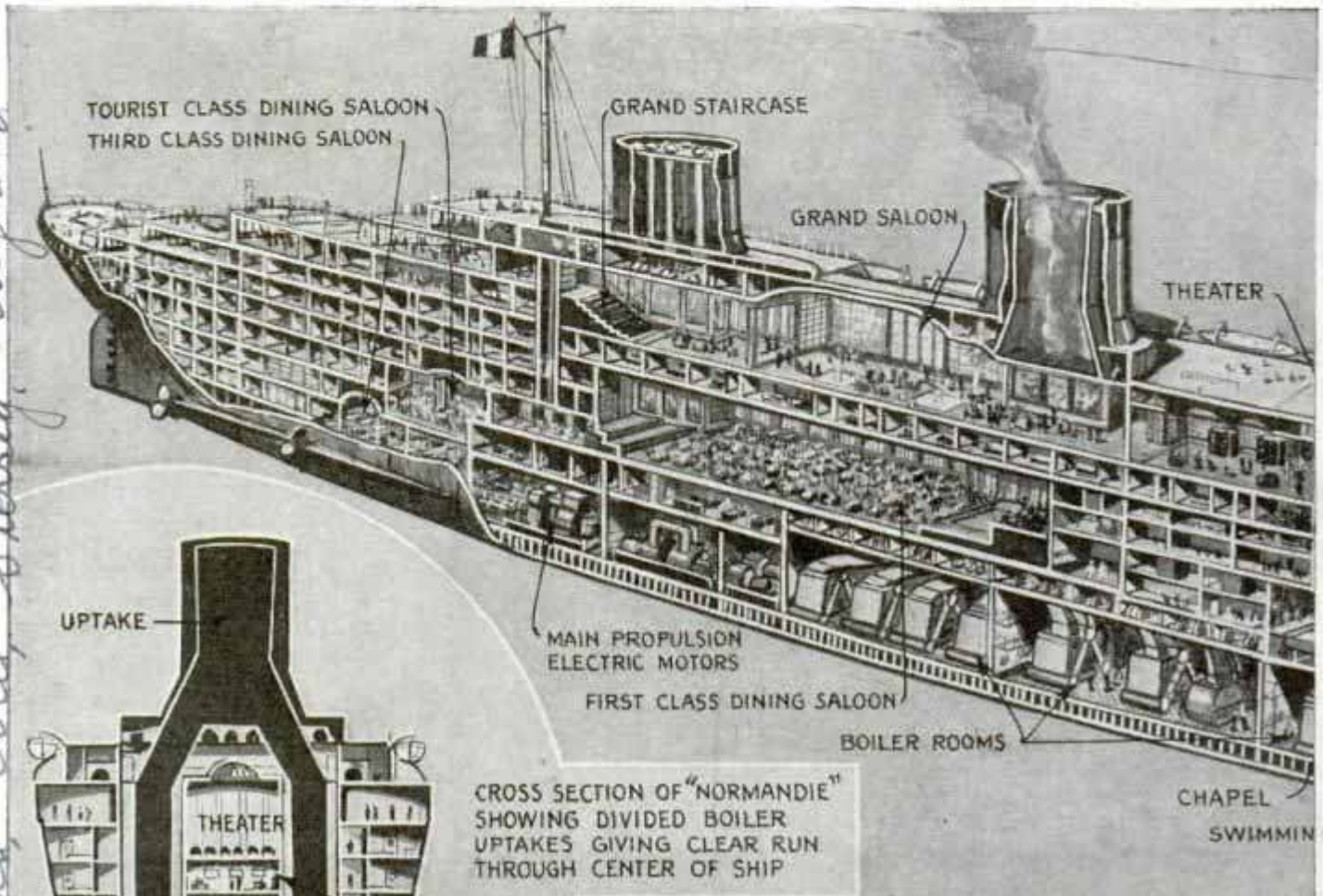
Owner: Mrs. Nicholas

Lawrence College
 Canton, N.Y.

New York

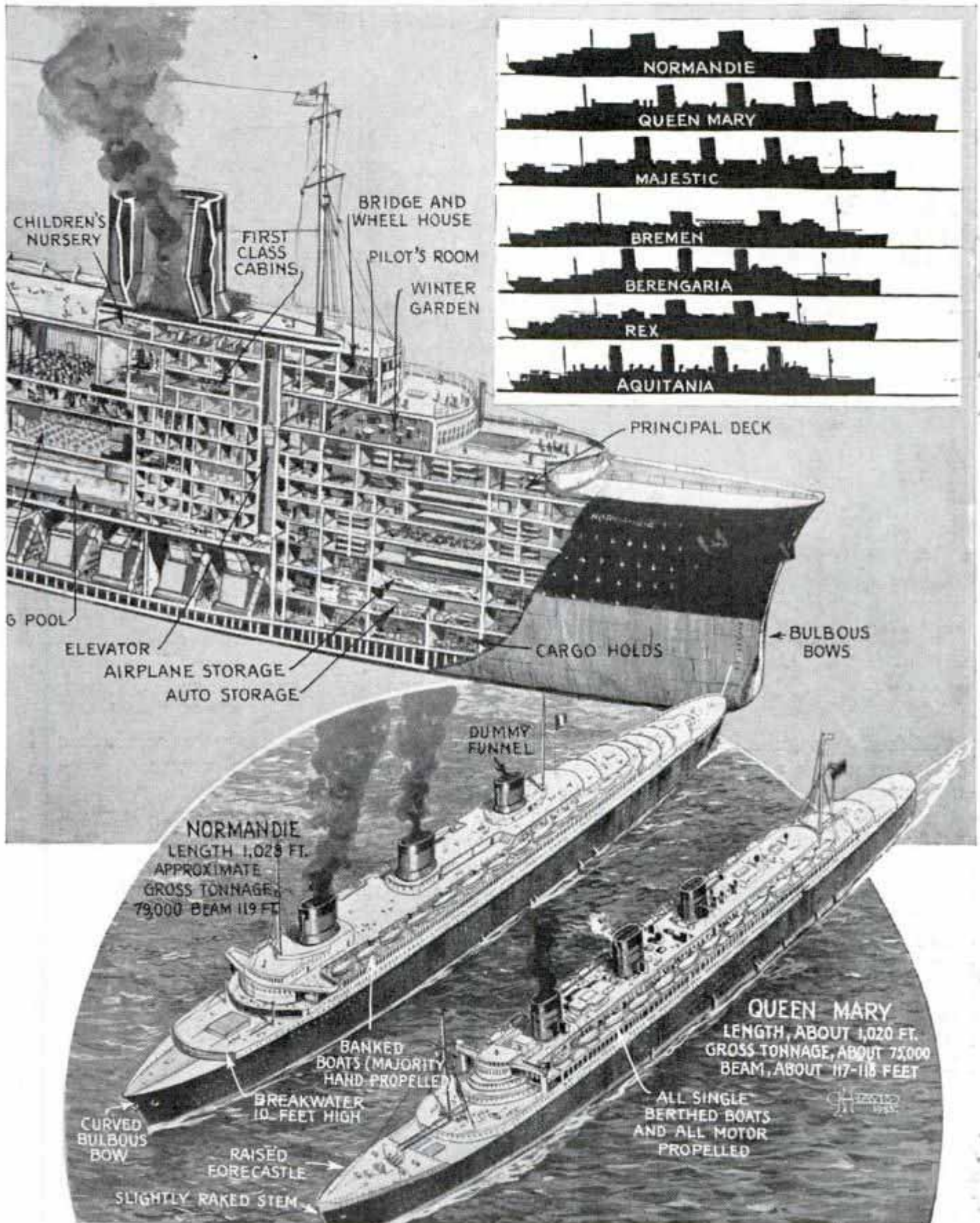
'Normandie' a Marvel in Speed and Comfort

Cont. Es H. Davis, Cap. "Lemmer" England
1 Hillside Road, Ewell, Surrey, England



Top, Cross-Section of the "Normandie," Which Set Speed Records on Both Crossings of the Atlantic; Center, Left, How Boiler Uptake Is Split to Give Clear Run through Center of Ship; Center, Right, and Bottom, Details of Powerful Plant Which Produces 160,000 Horsepower to Give the Luxury Liner Speeds of Thirty to Thirty-Five Knots; "Normandie" Boasts the Utmost in Comfort for Passengers; She Has Fourteen Elevators, a Grand Foyer Three Decks High, the Largest Swimming Pool Afloat, Theater, 1,100 Telephones, Cabins with Private Terraces; Formal Garden and Night Club

Luxury Liner Driven by Giant Electric Motors

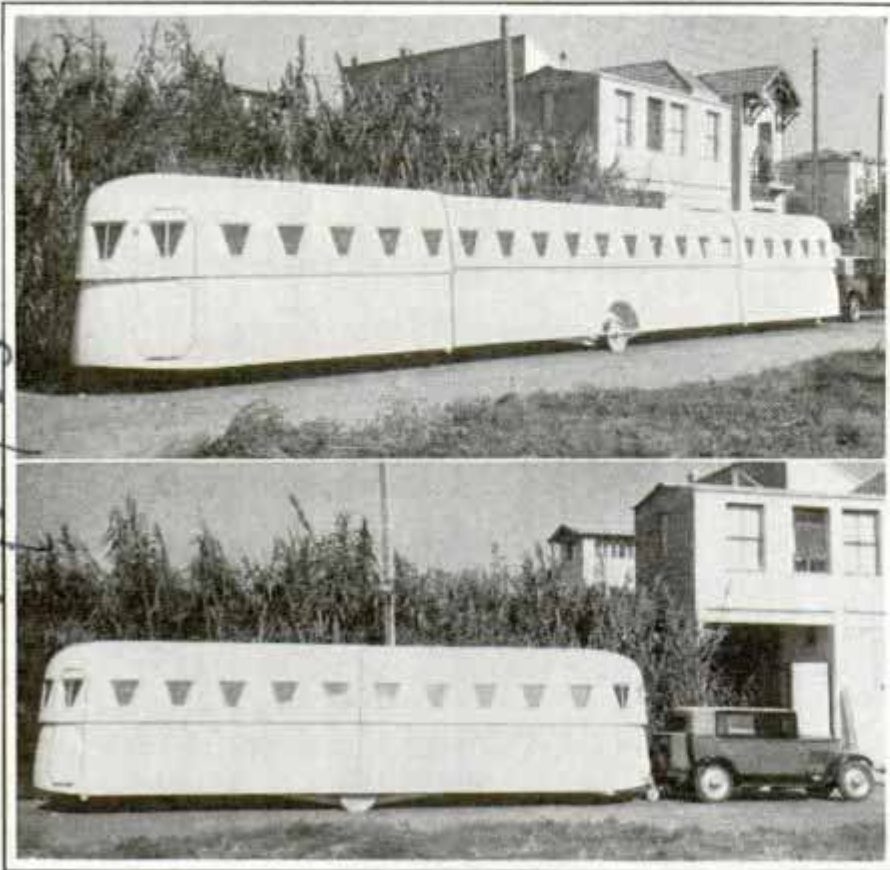


Top, Right, Comparative Sizes of Ocean Liners, with "Normandie" Largest, 1,028 Feet Long; Bottom, Sketch Comparing "Normandie" with "Queen Mary," British Liner Being Groomed for Her Maiden Voyage; Note That "Queen Mary" Is Only Eight Feet Shorter Than "Normandie"; the British Ship Boasts Single-Berthed Lifeboats, All Propelled by Motor, While "Normandie's" Lifeboats Are Banked and Mostly Hand Propelled; an Advantage for "Normandie" Is Claimed in Curved Bulbous Bow, Compared with Slightly Raked Stem of "Queen Mary"; the Ships Are Latest Entries in the Atlantic Speed Race

Newford City

Telescope Trailer Is Extended at Both Ends

No further information
12/25



Top, Trailer Is Stretched to Full Length of Fifty-Five Feet; It Has Forty-Eight Windows; Bottom, Ends Telescope over Center Section

Telescoping ends on an automobile trailer built by a French inventor allow it to stretch out to a length of fifty-five feet from a normal length of thirty-seven feet when contracted. The inventor designed it for a home, workshop and show room. The two ends are extended by a screw-jack which a child can manipulate, and equilibrium is such that, resting on a single axle, the trailer can be towed by an ordinary automobile even when extended its full length. Its total weight is 5,000 pounds. The body was made of 15,000 pieces of wood glued together, covered with light veneer and, for outer dress, varnished linen cloth.

Welded Steel Ferry Is Constructed Like Giant Seaplane

EC27

Strikingly designed after the pattern of a giant seaplane, a streamline ferry with superstructure of welded steel has been built to ply Puget Sound between Seattle and Bremerton, Wash. Named the "Kalakala," Chinook for "flying bird," its upper part glistens with aluminum paint and the flying bridge above the enclosed passenger decks accentuates the impression of a huge airship. The ferry is 276 feet long and fifty-six feet wide, and is almost ninety-eight per cent steel. A 3,000-horsepower Diesel engine is capable of propelling it at eighteen knots per hour. Two thousand passengers and 110 automobiles can be accommodated aboard. Besides the observation rooms and passenger decks there are cabins,

lounges, dining room, taproom, and locker and shower rooms. Bath facilities are provided for Bremerton navy yard workers ferrying to the city. The original hull of the ship was built at Oakland in 1927, and redesigned and rebuilt at the Lake Washington shipyard. The conventional smokestack is missing.

Streamline Ferry Built After Model Below Has Superstructure of Welded Steel Covered with Aluminum Paint; Tapering Lines Toward Stern and Flying Bridge Above Fore Part of Enclosed Passenger Deck Accentuate Effect of Giant Airship

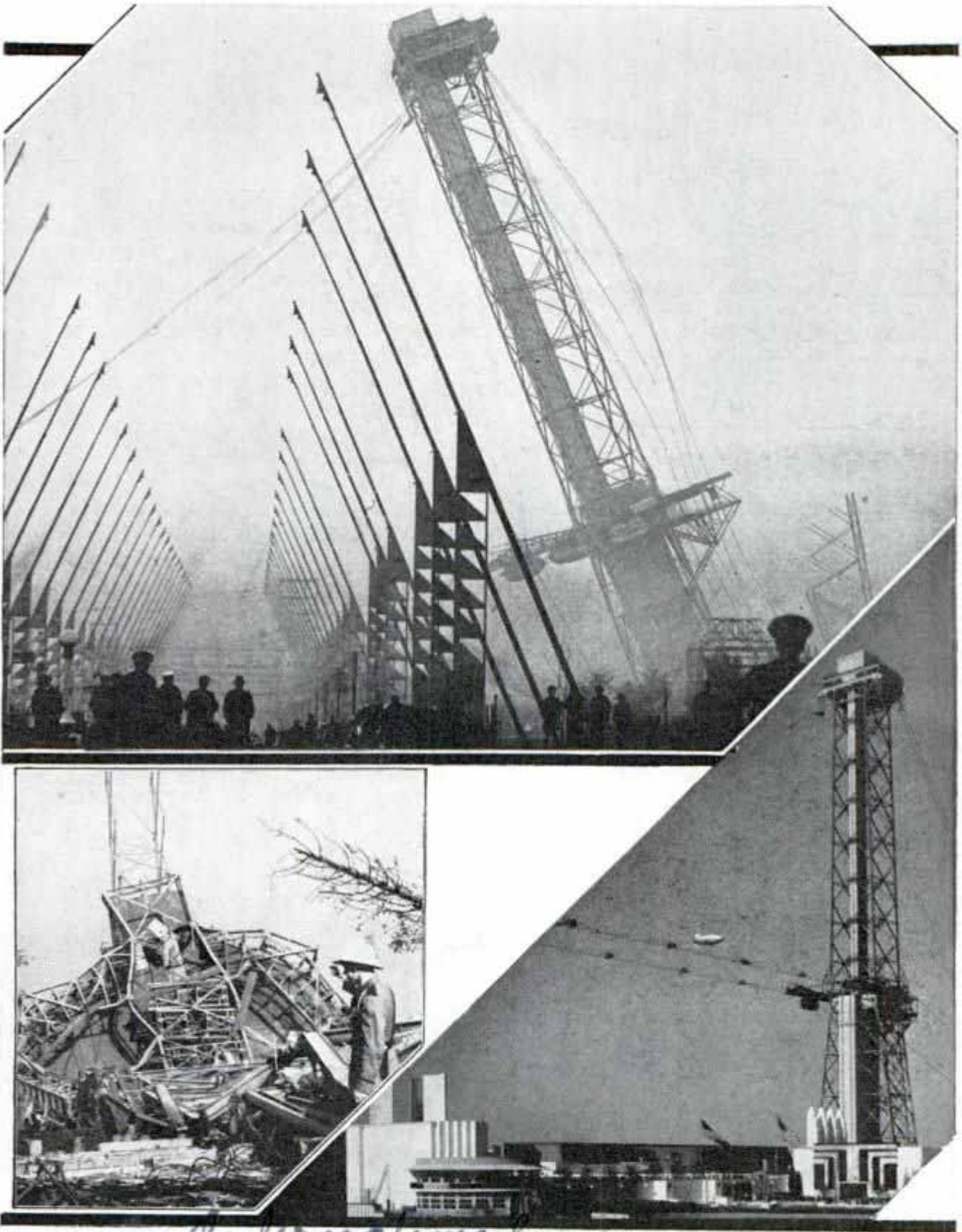
Photo by Asahel Curtis



Emb. C. M. Hind
1422-37
Seattle, Wash.

Puget Sound navigation

Engineers Topple Sky Ride Inches from Mark



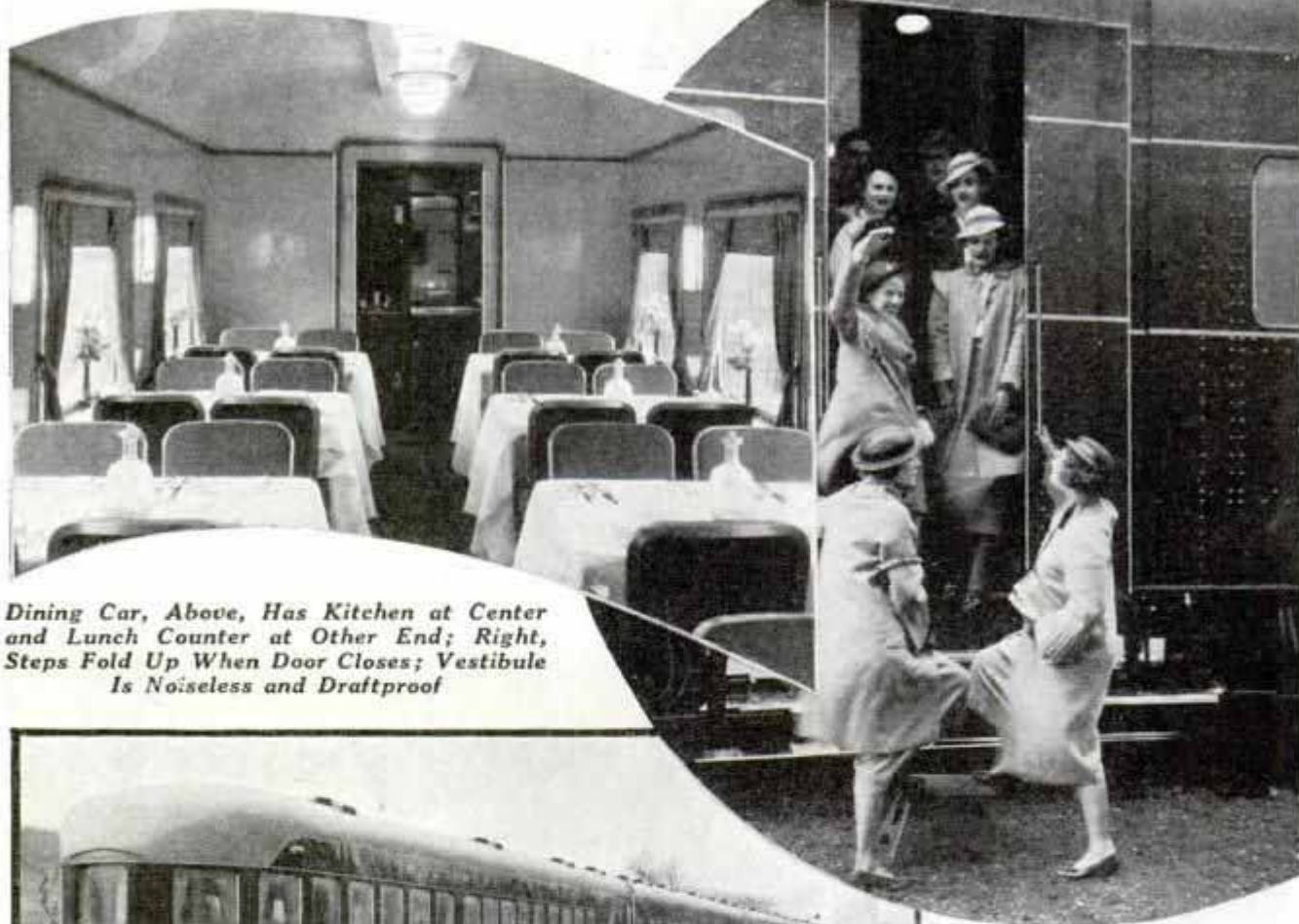
Internationale

Top, West Tower of Sky Ride, Feature Attraction to Which 4,320,000 Visitors Paid Admission at Chicago's Century of Progress Exposition, Toppling to Earth; Left, Wreckage of Observation Platform After 6,200,000-Pound Tower Was Tipped Over to Be Cut into Scrap; Right, Tower as It Stood during Fair; Engineers Blasted Main Supporting Cables from Concrete Anchorage with 120 Pounds of Dynamite and 628-Foot Tower, Toppling Eastward, Parted at 200-Foot Level and Crashed within One Foot of Stakes Marked Out for Fall; between the Twin Steel Towers, 1,850 Feet Apart, Hung a Cable-Way for Passenger Cars, Seen at 200-Foot Loading Platform in Top Picture; Entire Sky Ride Cost \$1,200,000

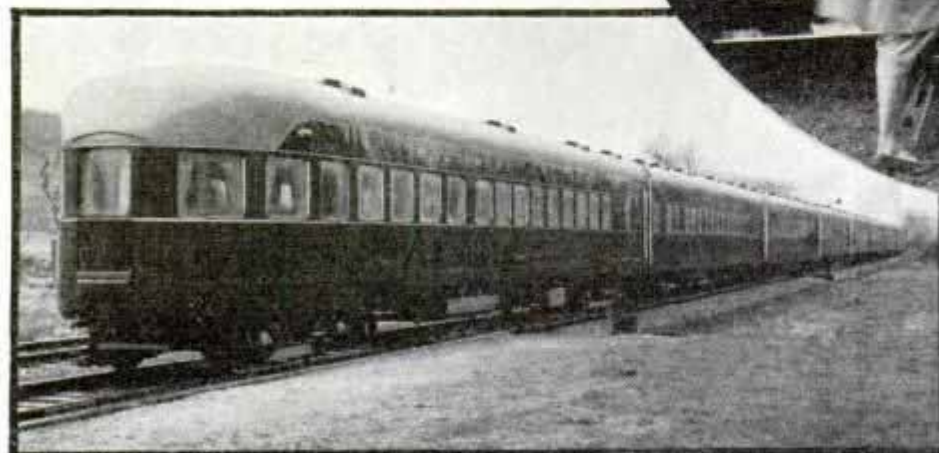
Lower and Wider Train Gives Smoother Ride



One Foot Lower than Ordinary Locomotives, This Baltimore and Ohio Coal-Burner with Seven-Foot Drive Wheels Can Haul Chicago-St. Louis Passenger Trains 100 Miles an Hour; Train Weighs Half the Usual Type



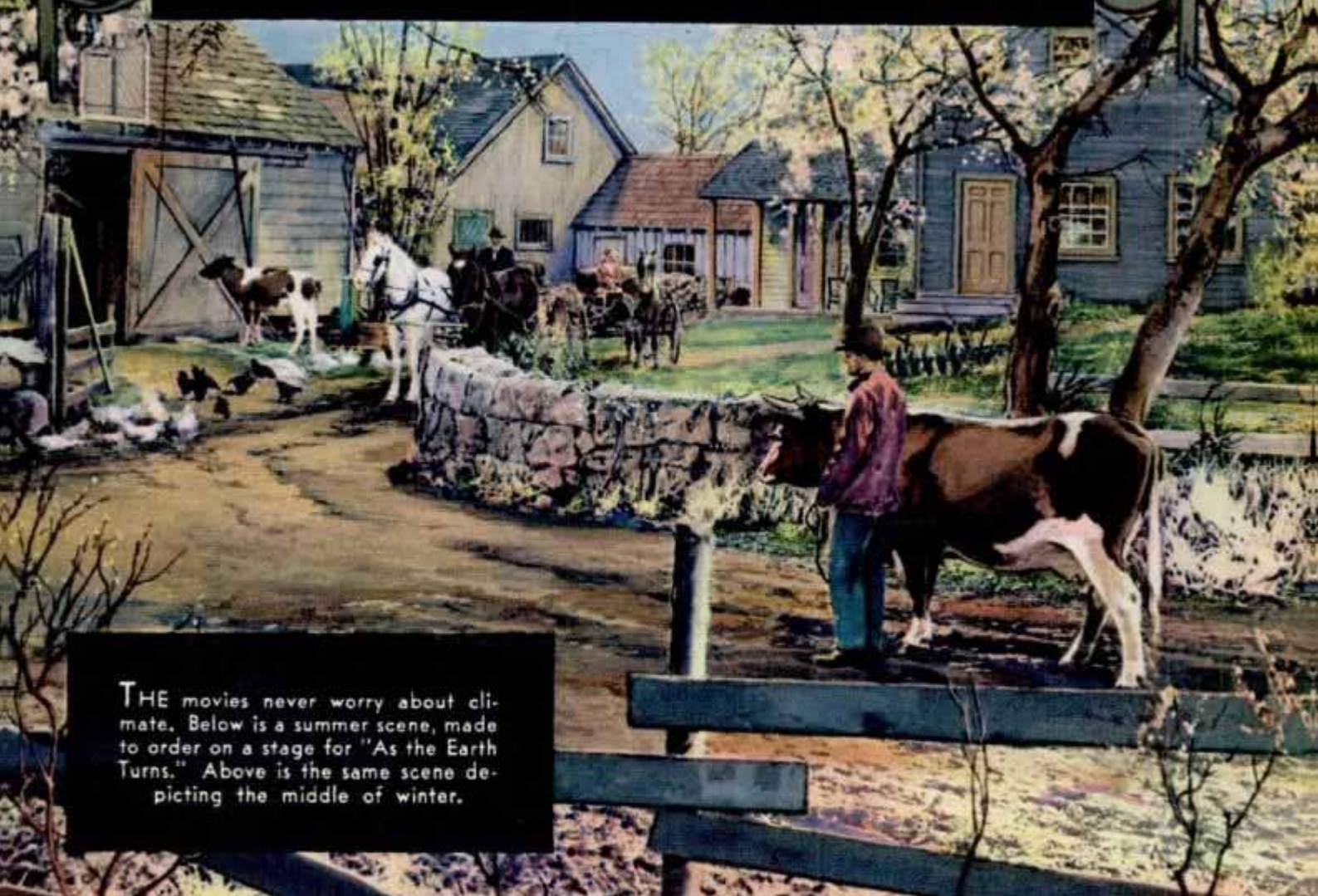
Dining Car, Above, Has Kitchen at Center and Lunch Counter at Other End; Right, Steps Fold Up When Door Closes; Vestibule Is Noiseless and Draftproof



Left, Streamline Rear End; Rigidity Eliminates Slack between Cars and Prevents Jolts; Cars Are Wider and Lower, Cushioned with Rubberized Trucks

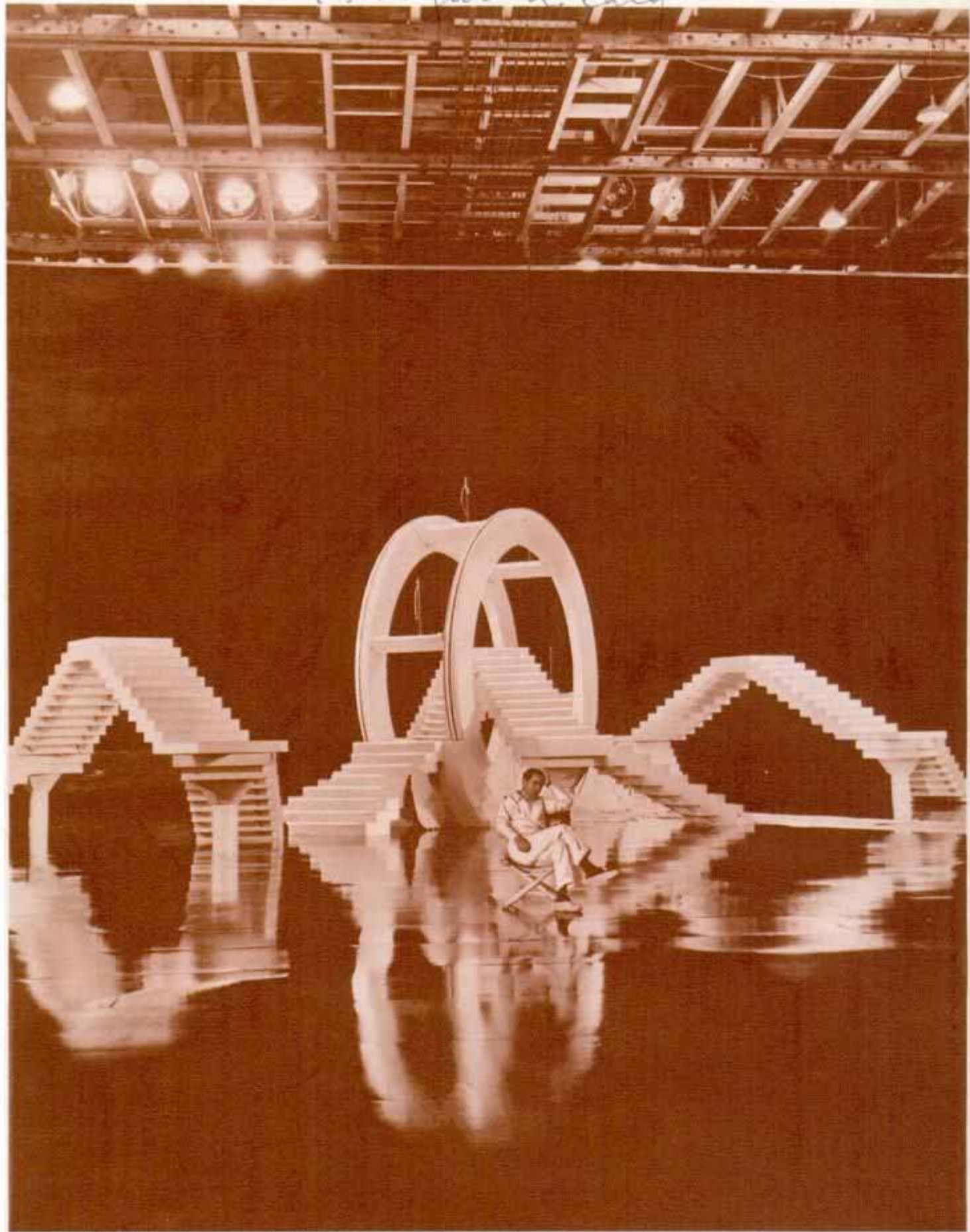


WHAT'S NEW *in the* MOVIES

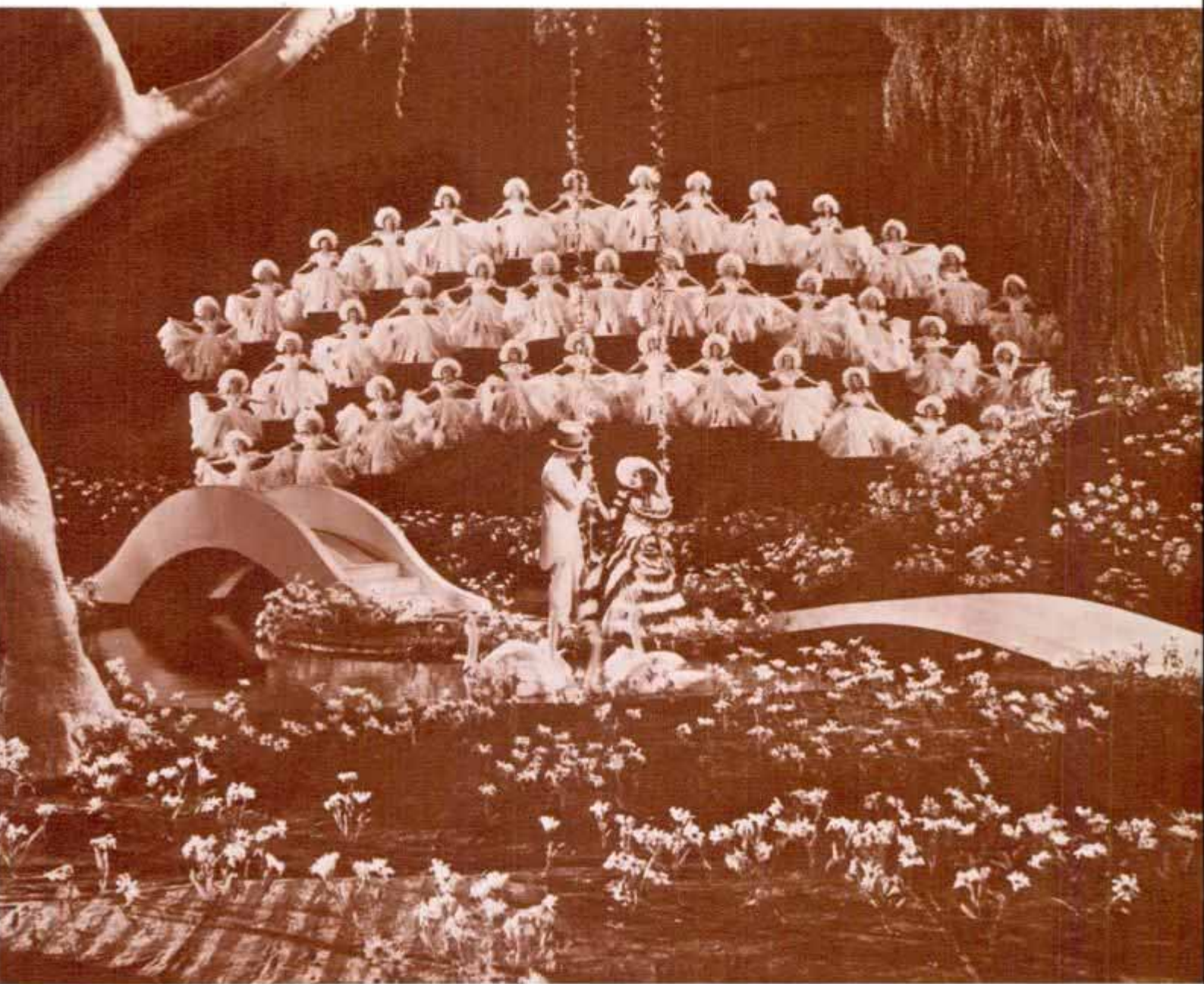


THE movies never worry about climate. Below is a summer scene, made to order on a stage for "As the Earth Turns." Above is the same scene depicting the middle of winter.

Steve, Hollywood, Calif



COMBINATION ferris wheel and automatic stairs used in the picture, "Dames." The stairways revolve on pistons, split at the top and reach over and meet the companion stairs in the center of the ferris wheel as it revolves.



NOTE the intentional artificial mood of this stage setting for "Sweet Adeline," constructed against a black backdrop. The swans and the water are both real.

PART I

YOU may not be able to believe your own eyes and ears when you go to the movies tomorrow, for Hollywood is stepping on its own heels rushing new ideas into pictures. So rapidly are new processes being developed that today's latest accomplishment is likely to be discarded as archaic tomorrow.

Recent developments include a process for making color pictures which is so simple that black and white movies some day may be as rare as silent ones, a method of recording sound which adds richness and the third dimension of depth to the original voice or music, and a new staging

technique which has enabled the movies to move indoors and bring all the outdoors in with them.

Pictures, as well as sound, have been given the third dimension of depth in experimental work and one producer is now busy with a method for bringing movies into your home by television when the equipment and broadcasting facilities become available.

Color now can be brought to the screen in all the hues of the rainbow. "Becky Sharp" is the first full-length picture done in the full color process, which adds blue to the red and green previously used. These three colors, and combinations of them, make up all the hues the human eye sees.



6/4/20

The method for transferring these colors and combinations to the film is simple. The camera contains three negatives. Light entering the lens is divided by a prism so one-third passes straight through and two-thirds is deflected to the side. The one-third of the light goes through a filter passing only green-yellow rays which are registered on the film directly behind. On the side are two more negatives, one behind the other. Two-thirds of the light passes through a red and blue filter, but only the blue is registered. The light then passes through an orange filter and the reds are registered on the second negative. Thus the three negatives carry separately the three colors which make up all visible hues.

Matrices are made from the negatives and on these, the portions affected by the

printing light—that is the shadows—expand in developing, forming relief images. The matrices then are dyed, but instead of dyeing the “green” matrix green, it is treated with magenta dye, a combination of red and blue. Similarly, the “red” matrix is treated with a combination of green and blue and the “blue” negative with yellow. Then a black and white positive is made and one by one the three colors are transferred to it. Then whatever should appear in black and white shows, as well as every color. By overlapping, the colors reproduce the different hues.

This process makes possible the use of colored lights for effects not even attempted with black and white photography. Anger, for instance, can be depicted not only by the actions and expressions of an actor, but by the in-



Photo above by A. L. Schafer,
Columbia Studios

GRACE MOORE singing to the thrumming of harps and the strains of a symphony orchestra in "Love Me Forever," and a throne which was designed, molded and built by the studio which produced Warner Brothers' "Midsummer Night's Dream." Right, sound engineers of Columbia Studios adjusting wax record of Miss Moore's voice.



E420

6-20



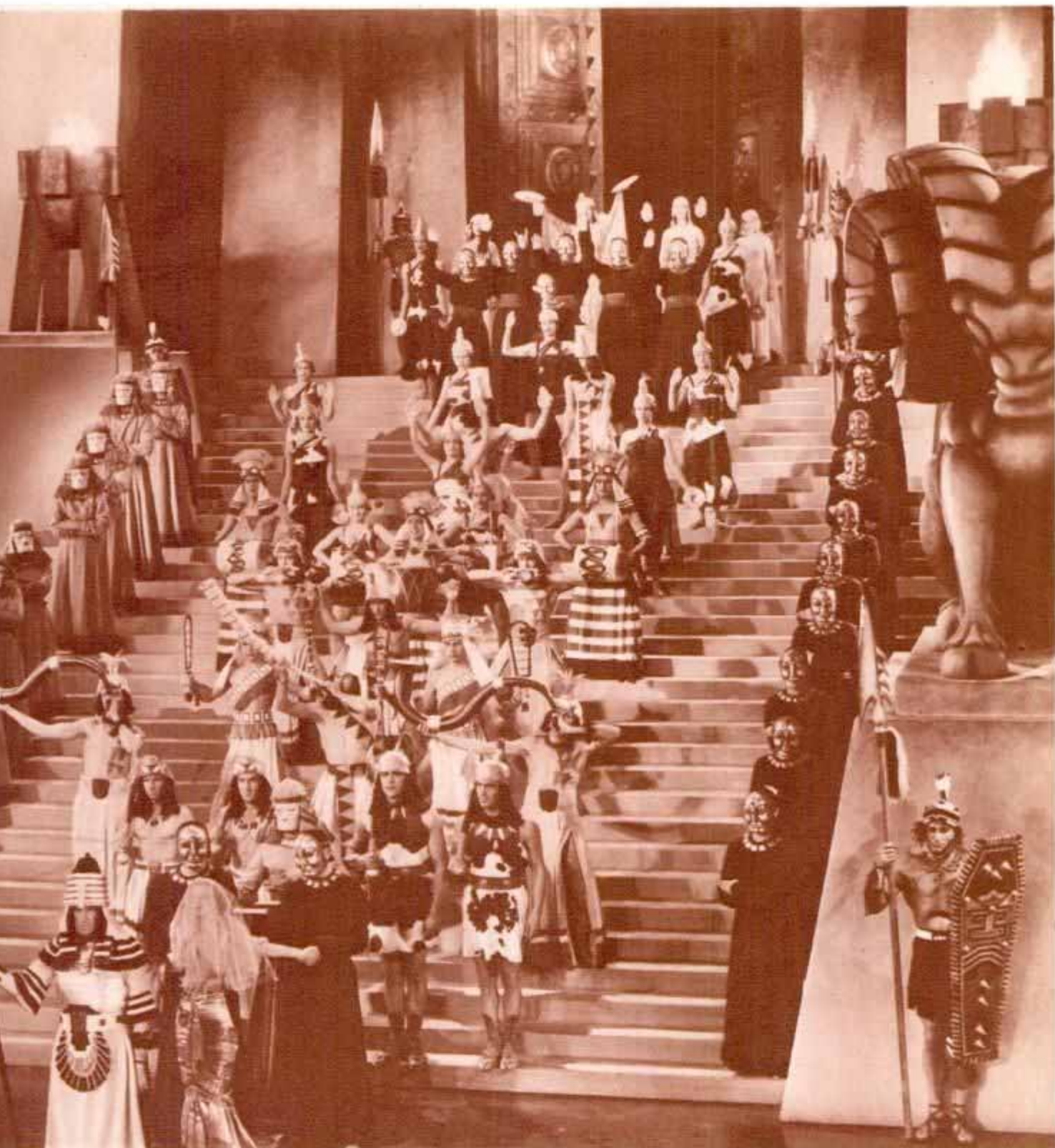
roduction of a deepening red light in the background. In the picture, "Becky Sharp," one of the actresses, was supposed to blush, something not easily accomplished to order. The blush was achieved by throwing a pin point of red light onto her cheek.

Color for "Mickey Mouse" and the "Silly Symphonies" is handled differently. The squares of celluloid or "cells," with their backgrounds, are colored by hand, ordinary water colors being used, with India ink for black. The cells are laid on their background, one by one, and photographed with a color camera. Matrices then are made from the negatives and dyed, after which the colors are transferred to the positive film.

Full color photography, even now, is only in its infancy. One improvement now forecast is the use of a tri-pack negative roll containing three negatives in a row, one behind the other. Tests also are being made with a single negative, combining in itself the color filters and three negative surfaces necessary.

While color technicians are producing rainbow pictures, sound engineers have combined several methods of sound recording into a process which gives back more from the screen than went into the microphone. There are two prin-

STUDYING a model of the great Hall of Kings set for the RKO-Radio picture, "She," prior to the start of production, and one corner of the set when it was finished. Note comparative size of rams on stairway and those at right in model to gain an idea of the actual dimensions of this huge spectacle.



cipal methods of recording sound — by wax and needle, and by film and the photo-electric cell, the latter being generally used in the movies. There are two methods of wax recording, the old type where the needle cuts sidewise, and the "hill and dale" system in which the needle cuts up and down. There also are two methods of film recording, the variable area, in which a line on the film indicates the sound, and variable density in which sound is recorded by the density of the emulsion on the film.

The advantage of the hill and dale system is that volume can be increased without distortion. But the wax record is too fragile for commercial purposes, although its recording is better than any film method yet devised. In making "One Night of Love," featuring Grace Moore, John Livadary, Columbia Studio's sound expert, combined wax recording with film recording to produce the sound effects. He made recordings of Miss Moore's numbers on the extremely sensitive hill and dale wax rec-

6420



THIS shot, seemingly with a rustic background, was taken on a runway extending from a stage to the roof of a building across the street.

ords, then transferred the wax record to film by playing it into the recording device while the sound film was being made or by superimposing it into the microphone.

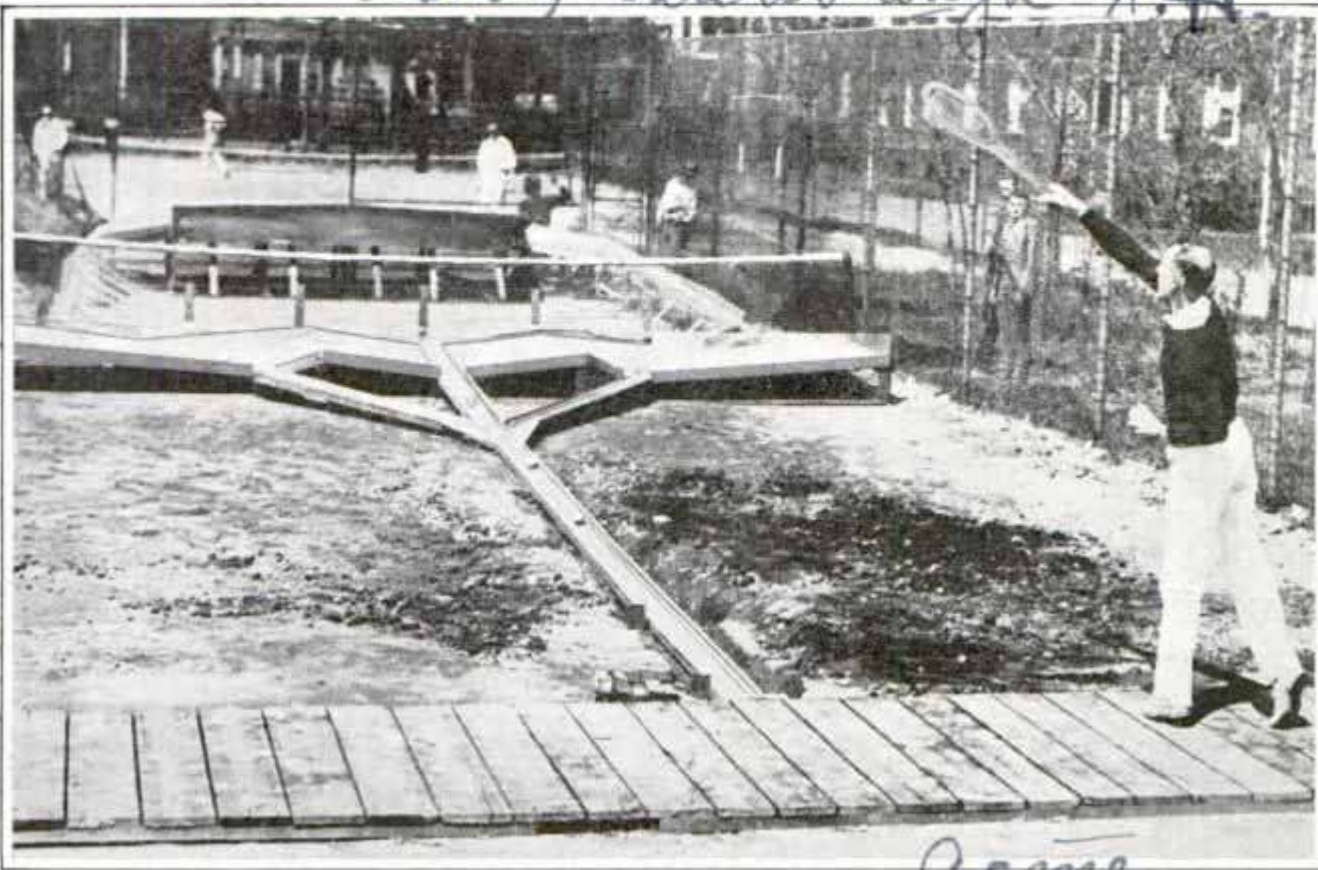
In "Love Me Forever," Miss Moore's new picture, he has gone several steps further. He has combined hill and dale wax recording with the variable density and variable area types and has added a "third dimension" process to give depth to sound. Heretofore distance in sound has been represented by making the

sound loud to indicate it is close up and faint to indicate it is far away. There never had been a sound recording from which anyone could estimate the distance a speaker was standing from the microphone.

To blend all these processes on a single film was a complicated problem because the third dimension sound alone had required two sound tracks, or two films. Because the hill and dale wax record makes the finest recordings and can be amplified with (Continued to page 130A)

Kendall, asst. principal
Kendall Hall School for
Boys, Peterborough N.H.

Tennis Practice Court Relays Ball to Server



Acme

From Net or Any Point of Opposite Court, Tennis Player's Practice Shot Is Returned, Caught by Series of Baffles and Nets and Rolled Back to Starting Point along Central Trough

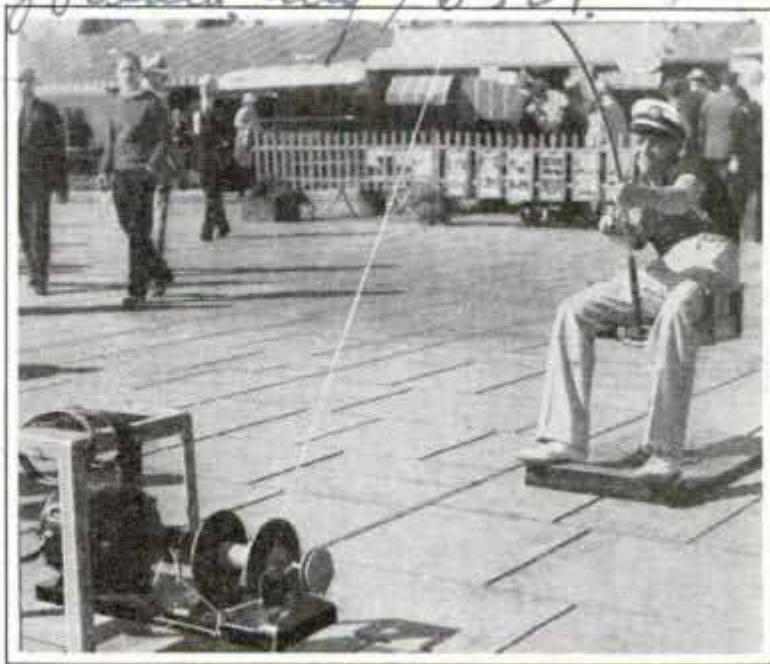
Neither ball boy nor partner is required for tennis practice when the court is equipped with a retriever that rolls the balls back to the player. A New Hamp-

shire man has developed a system of baffles, troughs and nets that returns the ball from the opposite court or the central net to a runway that ends at the server's feet.

Deep-Sea Fisherman Trains with a Robot "Swordfish"

520 E 5th Long Beach Calif 16531

Endowed mechanically with the wily twists and endurance of the deep-sea prize itself, a motor-driven "swordfish" is used by two Los Angeles anglers as a dry-land trainer for this rigorous ocean sport. An electrically operated reel winds and unwinds the tackle, simulating, by a system of brakes and reverse gears, every trick of the embattled swordfish except actual swimming. When line is payed out, the reel takes it on the run. And when the pole is hauled up and back, a lever over which the line passes throws the action in reverse, letting you reel in under tension. Regulation fishing chair and heavy tackle are used in the training sessions.



Motor-Driven Reel Gives This Sportsman a Stiff Workout

Sold by - New York Hardware

From Ray Chapin Photo

main St. Los Angeles Calif.



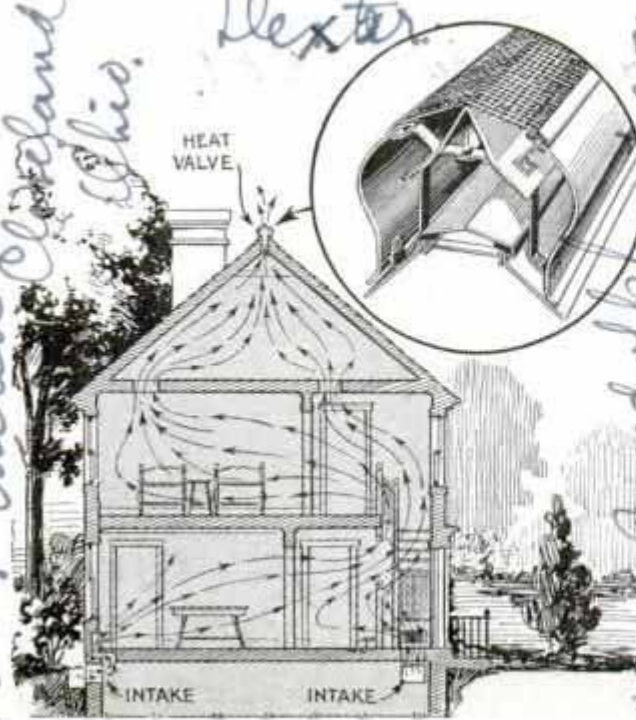
On Your Mark! This Is the Start of a Race on Land-Going Surfboards That Glide on Twin Rollers

LAND SURFBOARD ON ROLLERS IS RUN LIKE A SCOOTER

For the surfboard enthusiast who prefers to stay dry, there is now a sidewalk surfboard. It scoots along on a pair of rollers under human power.

HOME COOLED BY HEAT VALVE ON RIDGE OF ROOF

Installed along the ridge of the roof, an ingenious heat valve may be used to cool the home in summer. In open position, it draws the air from an intake in the basement through the house and out at the



Sketch of Automatic Ventilating System; Inset, Heat-Valve Mechanism

roof, thus providing a steady stream of fresh air during the night. In the early morning, the valve is closed, thus bottling up the cool air during the day. Its operation, save for opening and closing the valve, is automatic and its cost is only a fraction of that involved in installation of the usual mechanical system. Tests show that the valve will keep the interior temperature considerably below that of the outside air.

CHURCH BELL IS TIRE RIM IN LATIN AMERICAN CITY

When they call the people to worship in one Central American city the sexton doesn't merely pull the church bell rope. He hammers an automobile tire rim. Close to the church is a



Two Auto Rims and Ordinary Bell Call Churchgoers and Strike the Hour in Central American City

small tower in which the "chimes" are hung—one ordinary bell and two tire rims of odd sizes. They are used not only as a summons to church but also for striking the hour of the day.

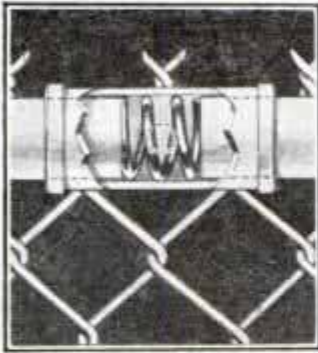
Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

6586
Ann Leolak
acm
E. 578
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18547 Euclid Cleveland Ohio
549 W. Randolph St. Indianapolis, Ind. 46204

Managers
Crescent
McCarney
Cash

Waukegan, Ill. 11455 Shoemaker
 8526 8603 Detroit Mich 179

FENCE EXPANSION CONTROLLED BY SPRING IN TOP RAIL



Expansion of metal fences may be controlled by inserting a spring in the top railing at regular intervals. The spring resists expansion and contraction, thus keeping the railing from buckling, due to heat or cold, and the fence from getting out of alinement.

Expansion of metal fences may be controlled by inserting a spring in the top railing at regular intervals. The spring resists expansion and contraction, thus keeping the railing from buckling, due to heat or cold, and the fence from getting out of alinement.

INJURY TO EYES IS PREVENTED BY NON-REFLECTING LIGHT

Damage to the vision of workers who must face the reflections of an intense overhead light is eliminated by a lighting unit which combines the quality of an indirect light with the principle of direct illumination. The diffused yet brilliant light does not blind the worker with reflected glints from his desk or machine. The light is particularly adapted to use by printers working over shiny metal type faces.



Girl Is Holding Mirror beneath Overhead Light; Notice There Is No Glare Reflected, but Diffused Glow

Chicago Lighting



Working Brake Lever with Left Hand, Operator Listens for Note Indicating Defect

SOUND TEST FOR SPUR GEARS REVEALS ANY DEFECTS

Sound tests to determine whether spur gears have been accurately cut and mated are being used by a Cleveland factory. Gears correctly cut hum an even, musical note in operation. When teeth are not properly matched or depth and contour are imperfect, the skilled inspector can tell something is wrong by the irregular tone he hears. The machine used for the test has two shafts adjustable so that gears connected to each can be properly meshed. An electric motor drives the gears at their regular operating speed, and a band brake set by a lever at the operator's left restrains the lower shaft. By listening at a hole in the machine hood, the inspector can detect faulty gears.

SPATS AND RUBBERS COMBINED IN WASHABLE FABRIC

Spats and rubbers are now being made in a one-piece overshoe of rubber fabric fastening along the side with snaps. The waterproofing duties of rubbers and the neatness and protection of spats are combined. They can be washed with soap and water.



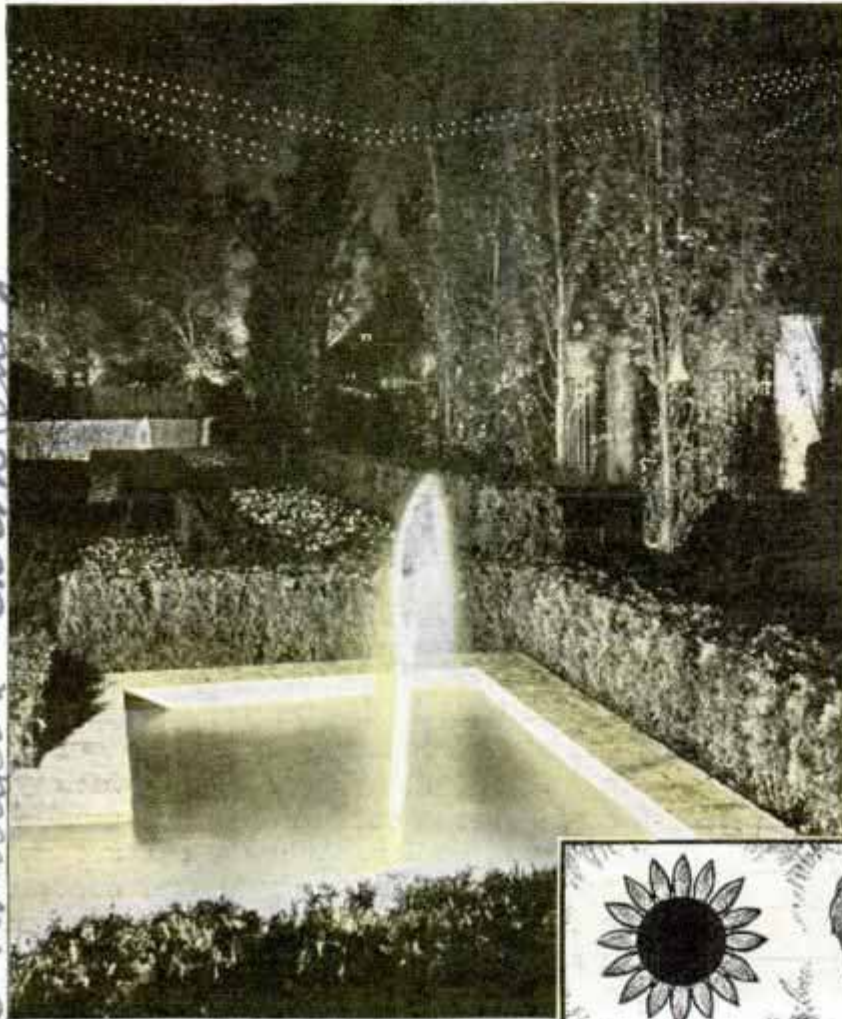
The Ball Co.

Vertical handwritten notes on the right margin, including "8595" and "8565".

8538

Painting Your GARDEN

Com. Walter E. Burton, 1092
Florida Ave. Akron, Ohio



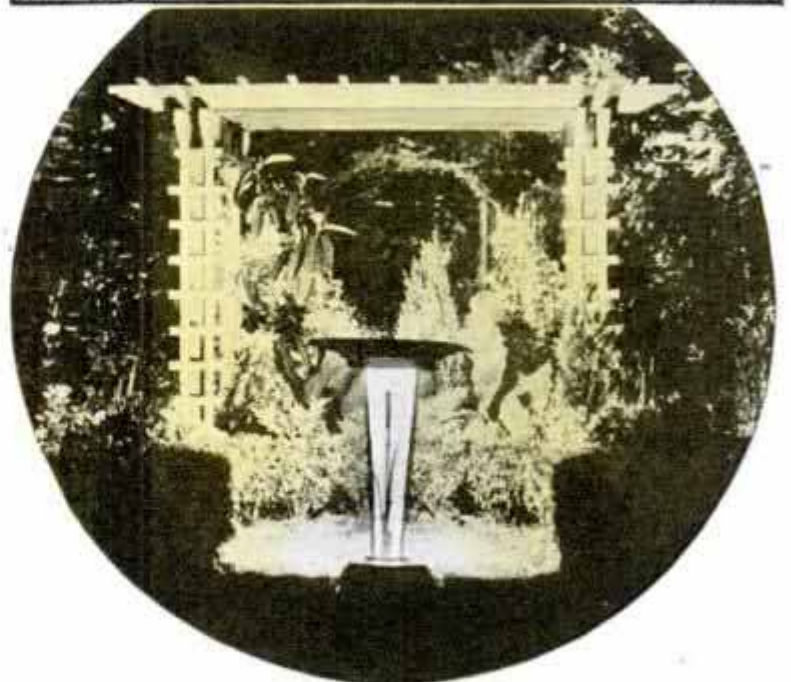
made ornamental to some extent. Place lamps so their rays do not reach the eye directly and have a number of accent points or bright spots of light. Walks and steps should be lighted well enough to be traveled safely.

One new lighting accessory is a piece of tufa rock hollowed out and fitted with a lamp. Tufa rock is a natural material produced by evaporation of spring water heavily laden with minerals. It is not difficult to hollow out one side, paint it white to reflect light, and install a waterproof socket, held in place by a stiff wire. Such a "light rock" can be placed so that it will illu-



THE waving of a magic wand could work no more pleasing transformation than that which the garden owner can produce with a few electric lamps, some wire and inexpensive accessories that you can make or purchase. Even the smallest back-yard garden, when properly illuminated at night, takes on a new charm.

Lighting experts of the General Electric company, at Nela Park, Cleveland, are always busy developing new schemes of garden illumination and improved equipment to carry them out. There are no hard and fast rules for lighting a garden but there are a few things that should and should not be done. Lighting equipment should be concealed both by day and night. If it is impossible to hide the equipment, it should be



Lighted Formal Garden and Bird Bath with Illuminated Pedestal and Battery of Small Reflectors Which Light up the Background

1210 E. 113 St. S. Cleveland, Ohio

also General Electric Supply Co. branches

E538



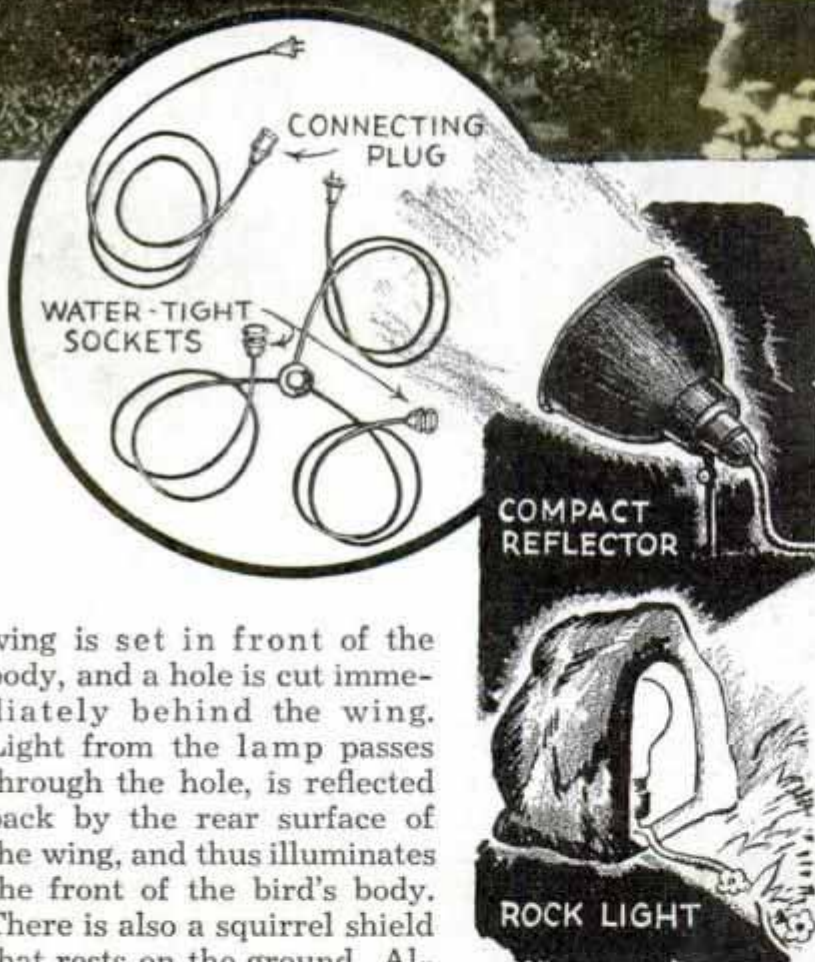
- A 24 FT EXTENSION CORD
- B 3 WAY TERMINAL
- C 2 SOCKET CORD SET
- D 7 SOCKET CORD SET

Illuminated Lily Pool, and Plan for Lighting a Garden

minate walks, steps, or corners of flower beds. The rock eventually will become moss-covered and weathered.

Try a series of ornamental shields intended for use with Christmas-tree strings. A set of seven, with a standard light string, will illuminate a border, or a small bed of flowers. The shields, which can be shaped like tulip or daisy blossoms, are simply pieces of sheet metal mounted on spikes that can be pushed into the ground, and equipped with clips for holding the lamp sockets. Paint them green so they will not be conspicuous by day.

Larger shields, used with standard size bulbs, are for tall plants or for background planting. Some are made like birds. The



wing is set in front of the body, and a hole is cut immediately behind the wing. Light from the lamp passes through the hole, is reflected back by the rear surface of the wing, and thus illuminates the front of the bird's body. There is also a squirrel shield that rests on the ground. Although shields can be purchased, anyone handy with tin snips and paint can fashion them. They are intended to shield a lamp bulb used to illuminate a blossom or group of flowers, so that direct rays do not strike the eye.

The basket light is constructed like two ordinary wicker baskets with their bottoms together. In the lower compartment

are a reflector, socket and bulb. Above is a pot containing growing plants. The basket can be hung from a tree where its rays will illuminate some interesting part of the garden at night, and its growing plants will be attractive during the day.

Many uses are found for an outdoor utility light consisting of a trough-like metal reflector holding two lamps. There is a mounting strip attached to the back. The trough can be placed under eaves, beneath trellises or on upright stakes to illuminate trees and shrubs. An adjustable dome-shaped light can be pushed into the ground anywhere. The iron spike is surmounted by a lamp socket over which is an enameled metal reflector. It is for use above fairly tall plants, flower

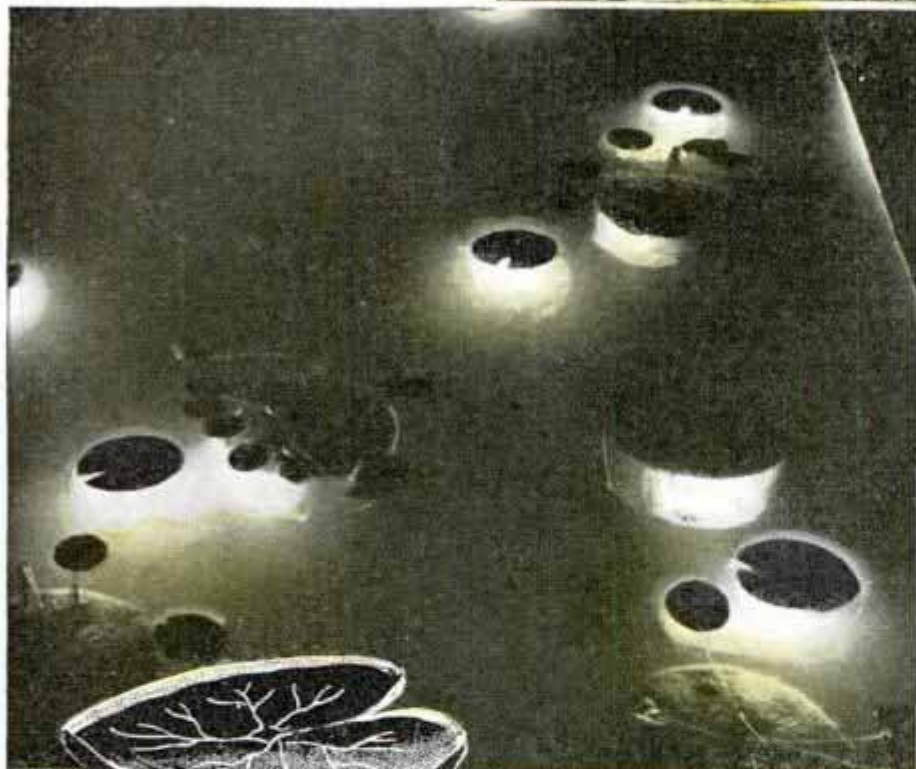
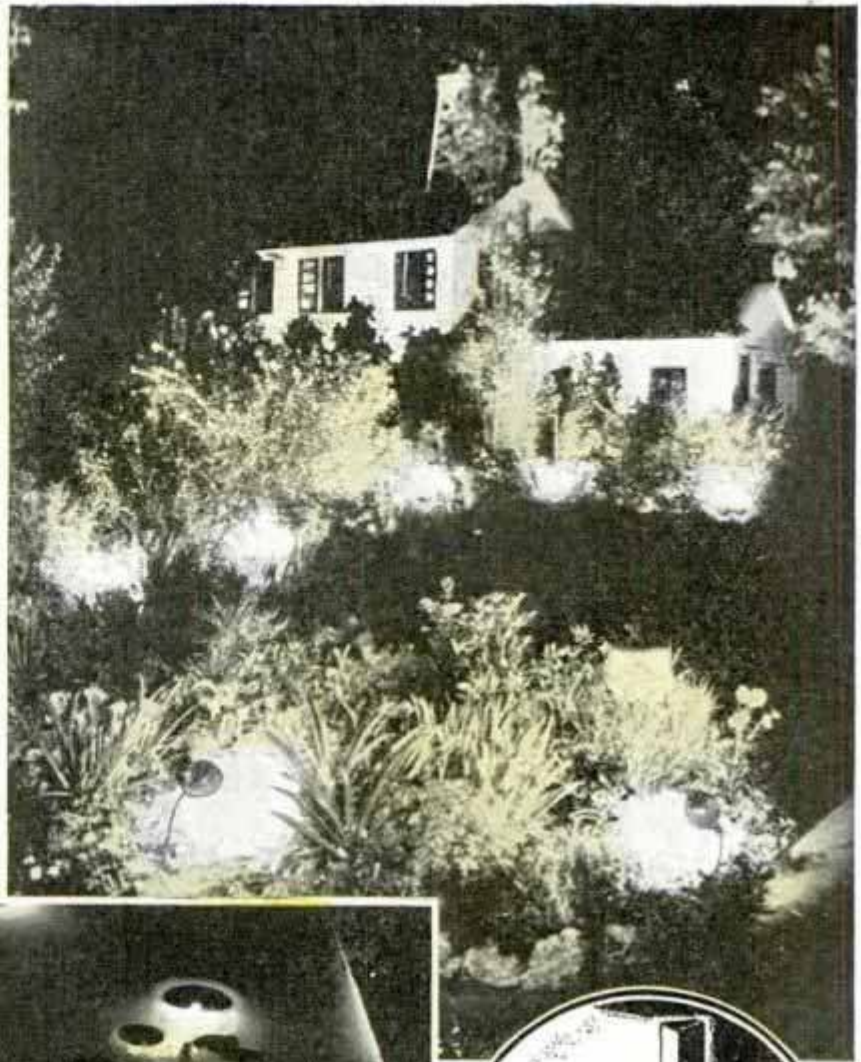
beds that are viewed from all sides and for general illumination.

A big brother of this unit is a portable work light consisting of a 100-watt flood-light unit mounted on an eight-foot metal rod which can be pushed into the ground.

Top, Night Scene Produced Largely by Small Reflectors Concealed behind Flower-pots and Shrubs

This permits gardening operations at night. A new illuminated lily pad has made it easy for the lily-pool owner to enjoy the beauties of underwater lighting. Sheet aluminum is formed and painted to resemble a water lily leaf. On the under side is a clip that attaches to a sixty-watt lamp, which is mounted in a waterproof rubber socket. The unit floats on the surface, and usually cannot be distinguished from a real leaf.

The problem of wiring outdoor lighting systems has been solved by a series of weatherproof wiring accessories. Cords, sockets and plugs are covered with heavy-duty rubber molded into one piece. Rubber



sleeves are provided for connections, to make them water-tight. These accessories can be used successfully under the water.

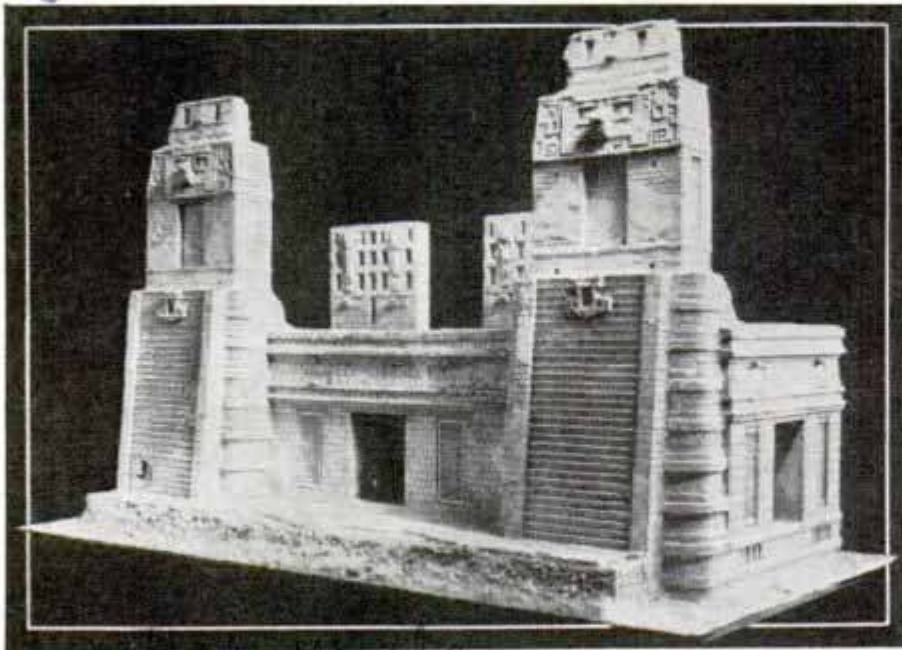
The method used for lighting rock gardens and flower beds depends on

the positions from which they are to be viewed. Thus a bed to be seen from a porch or walk is best illuminated by light rocks, small reflectors concealed among foliage, or by border sets of shields. A flower bed to be viewed from all sides can be illuminated by dome units in the center, in which sixty-watt lamps are used.

(Continued to page 128A)

ILLUMINATED
LILY PAD

Top, Lighting Plan Which Includes the House; Below, Odd Effect Produced by Lighted Lily Pads Floating on a Pool at Night



Wide World
 Miniature Mayan Temple Shown Above Is Exact Reproduction of Twelve-Century Old Ruin Found in Mexican Jungle

MODEL OF OLD MAYAN TEMPLE IS BUILT FOR MUSEUM

Temple "Rio Bec-B," erected by Mayan tribesmen of Mexico in the eighth century, has been reproduced faithfully in a model recently placed on exhibition at the American Museum of Natural History in New York. The original was discovered in the eastern part of the Mexican state of Campeche in 1912.

E 589
FAULTS OF VOICE ARE SHOWN ON WHIRLING SOUND GRAPH

Students of speech and singing can tell what is wrong with their tone by "dictating" into an instrument and watching it translate the sound into sight. University of Iowa scientists developed the electric

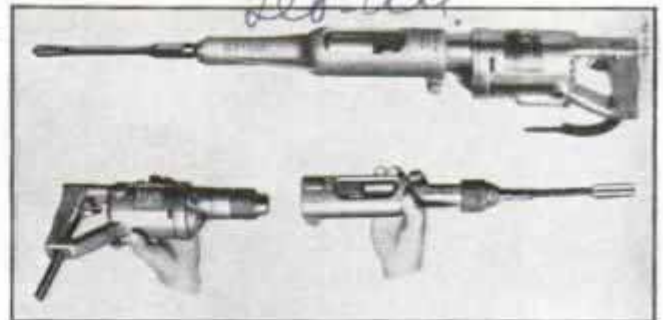


Jonascope
 As Girl Speaks, Voice Waves and Light Are Synchronized and Tone Is Read on Whirling Record

machine to help students obtain proper pitch and modulation. Sound waves of the human voice "read" on paper like lightning flashes, each jagged peak and valley representing a cycle. In a man's speech there are ninety to 350 cycles every second. As the tone analyzer operates, the voice sound waves are synchronized with a flashing neon light and a whirling drum on which variously spaced characters are printed. The light flashes with each cycle of the voice. When the successive

flashes coincide with the characters on any line of the whirling drum, that line appears to be standing still while other lines of characters are a moving blur. Thus the speaker can see whether he has attained the desired pitch.

E 609
ELECTRIC HAMMER-AND-DRILL IN PORTABLE UNIT



Combination Tool Can Be Taken Apart to Fit Attachments for Hammer or Drill Work

Combined in a single tool are an electric hammer and a drill with which light grinding and buffing also may be done. The tool is easily portable. In the hammer mechanism are only two working parts, both made of treated steel to give long life. The motor is the universal type with forced draft ventilation, and it may be plugged into any light socket. By opening the chuck and loosening a cap screw, the tool may be converted into an electric drill with a capacity of three-eighths inch. By using special tools, the outfit will do chipping, chiseling, cutting and vibrating.

Wadack Electric Tool

Com. William H. Marks

METAL DESIGNS IRONED ON CLOTH

Striking Patterns Are Worked in Glass or Fabric at Home

With your home ironing board as a worktable and only a pair of scissors and a hot iron as tools, you can decorate your books and lampshades and even your water pitcher with striking gold and silver patterns. A paper-thin sheet metal now being fabricated for decorative purposes can be worked into any base by pressing for a few moments with an ordinary iron. Actually metal, the material has the limp, pliable quality of thin suede and will stretch, crease and wrinkle without breaking or tearing. Cut from a sheet of gold or silver the trimming for your evening gown and iron it firmly into the cloth. Press silver monograms into your glassware. Decorate bric-a-brac and bottles with designs cut from aluminum or gold sheets. "Iron" your own Christmas cards with bright metal. Leather pocketbooks, book binding, lampshades of parchment all take the metal adornment readily. The adhesive quality is worked into the metal sheet in the manufacturing process, the material does not tarnish and can be washed without harming its luster.



Pictures at Right Show How Metal Patterns Are Cut Out and Ironed into Fabrics

Non-Tipping Float for Children Gives Safety in Water



The Safety Float Supporting Young User

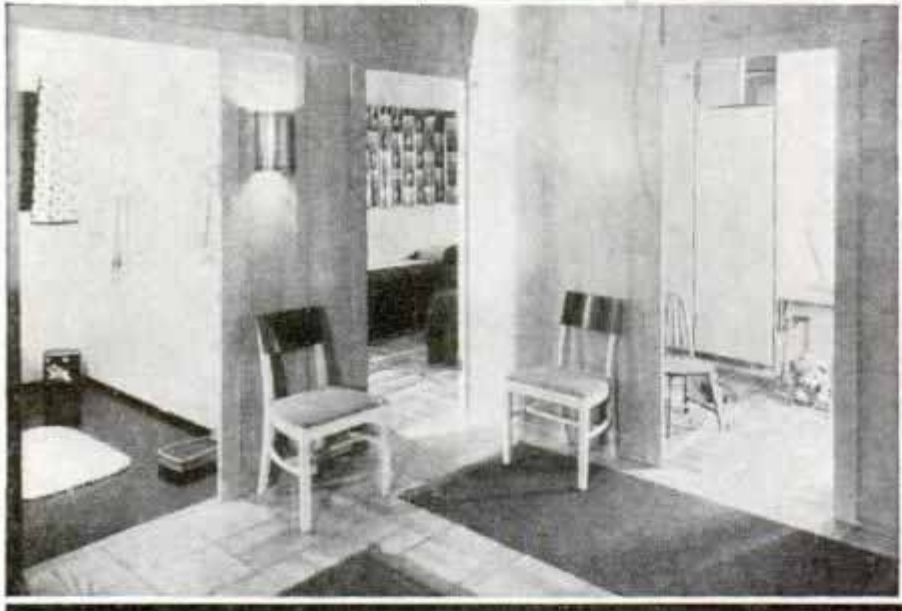
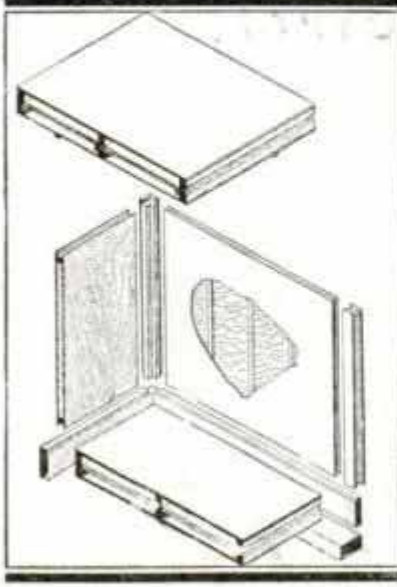
Confidence in the water can be imparted to children by a non-tipping float designed especially for safety. The float is made of white pine board and rubber tubes, either of which will support the weight of the child. It has a rigid seat and strap, with waist bands to prevent large-size children from using it. The float may be used in the treatment of infantile paralysis, since it permits full use of arms and legs without letting the child get overbalanced.

Westinghouse
 An army searchlight with automatic finders to locate aircraft can spot planes fifty miles away.

8596
 6.00
 Chicago Tribune
 May 8, 1935

Water Joy
 C. H. ...

Wood Meets Challenge for Low-Cost Homes



Sections of Roof, Wall and Floor Are Shown at Upper Left; Above, Exterior, and Left, Interior of Model Wood Panel Home

To meet the challenge of the pre-fabricated house of steel or concrete, research engineers have proposed to the lumber industry a house of standardized wooden construction adapted to mass production.

The "stressed covering" principle used in building airplane wings and fuselage was employed in the demonstration house built at the U. S. Forest Products Laboratory at Madison, Wis. Wooden panels to form walls, floors and roof consist of two plywood surfaces fixed with water-resistant glue to an inner skeletal framework. No nails are used. Gluing the panels to the frame creates a complete joint through which weight on one surface is distributed to the other surface. This is the stressed covering principle.

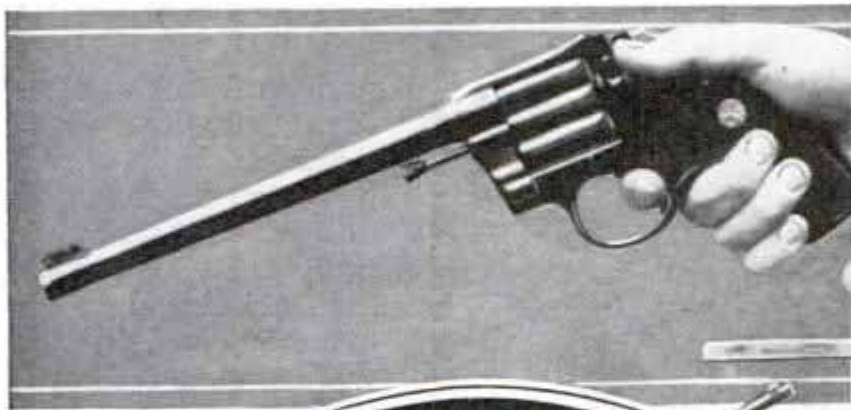
Because of the stress action, lighter woods can be used in the framework than in conventional joists which must support weight of floors, ceiling and walls. Panels could be manufactured any convenient size for transportation. Eight by fourteen feet wall panels made at the laboratory showed little strain under pressure equal to a sixty-mile gale. Sawdust-filled wall panels had fifty per cent greater insulating power than conventional frame construction with lath and plaster walls.

Panels are assembled with grooved uprights and strips which fit into adjoining panels. Wall panels can be painted on one surface and finished for interior walls on the other, with similar treatment being given roof panels.

Seven men erected the demonstration house, comprising four rooms and bath, in twenty-one working hours. Private contractors have estimated it could be built on handicraft plan for slightly more than \$2,000, and mass production of panels by factory methods would reduce this cost to an even lower figure.

*278 Howlands Bldg
12 N. Bed,
Columbus Ohio*

Trick Shot Is Timed by Pulse and Breath



Proper Grips for Revolver and Rifle Expert in Clipping Card Edgewise from Lips

Champion marksmen time the trigger pull with the heart beat, the breath and the hand. You can depend on the gun and bullet. They have been tested in a vise at the factory. The expert rifleman must have the iron grip of the vise and synchronize his shot with the vibrating mechanism of his body. He can shoot a cigaret from the mouth of a person ten or twenty feet away, and cut a piece of ordinary string at the same distance. The "death shot" is similar to the cigaret shot. A playing card is held between the lips of a person perhaps twenty feet distant and the sharpshooter must split the card edgewise with his bullet. If his shot is perfect, the only danger to the person holding the card is from concussion of the explosion at close range. Cot-

ton, or even a cartridge stuffed in the ear, protects the ear drum. Perfect aim is considered merely routine in close shooting. The marksman must time the trigger squeeze so perfectly that the trigger will spring at the exact instant when heart and lungs are motionless.

WOOD WAXED TO VERY CENTER IS GIVEN LASTING FINISH

Permanently waxed floors and furniture are a possibility with a process developed at the government forest laboratories at Madison, Wis. The scientists have found a way to wax wood to the core instead of merely applying it to the surface. It is first given a treatment which renders the wood permeable to melted wax. Then, by forcing wax deep into the grain, the wood is made waterproof and resists warping and cracking indefinitely. Beeswax and stearin have been used, and it was found that rosin, linseed oil and other substances that mix with wax could also be employed

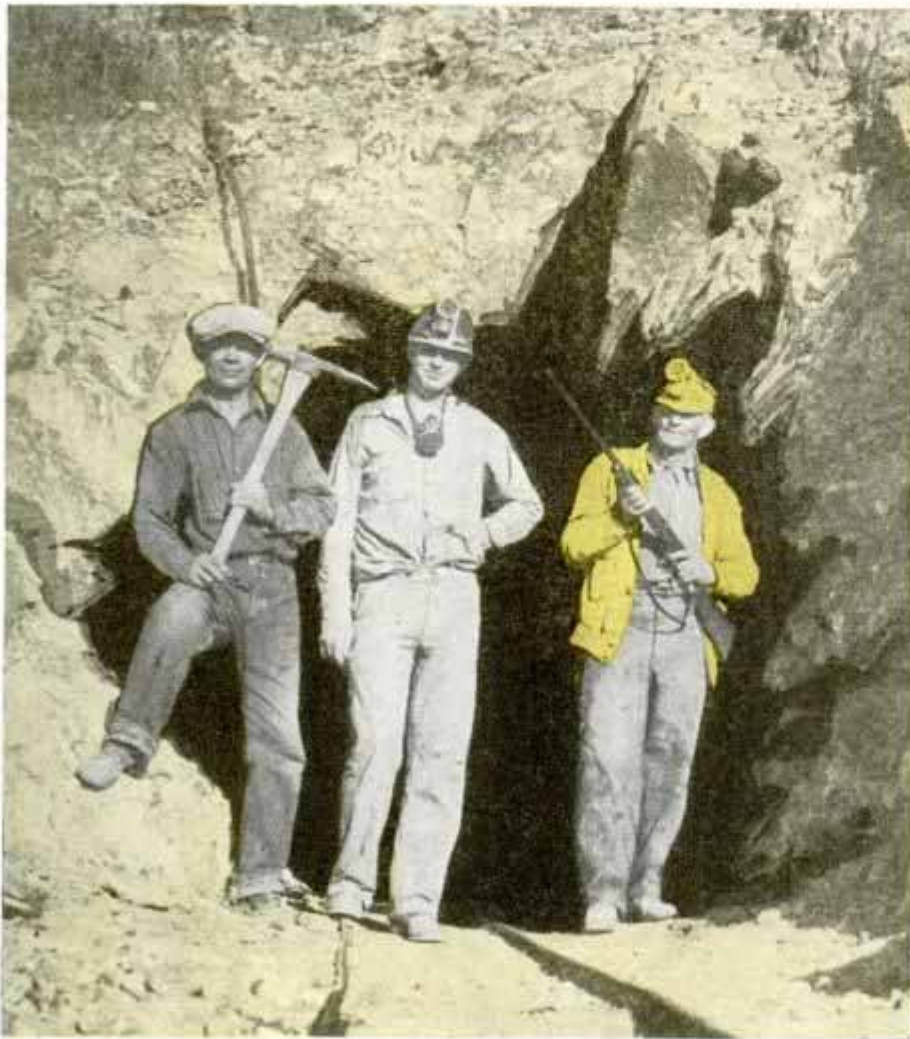
Scene June 5/1935

Bulletin - Manufacturing Shriming and Swelling of Wood by replacing the water with vapor. volatiles June 10 62. H. R. 10 62.

worked out by H. R. 9

Cin. Thomas & Stinson Jr
10555 / Los Angeles Calif

TRICKS of the



Guards at the Entrance to a Gold Mine; the Guards Not Only Keep Intruders Out but Prevent the Miners from Walking Away with the Gold

THE owner of a western gold mine recently was examining a friend's collection of mineral specimens.

"Where did this come from?" he inquired, picking up a rock studded with gleaming kernels of gold.

"Don't you recognize your own ore?" the friend asked. "That came out of your mine. It was given to me by one of your miners."

That was news to the owner, who had never seen such rich rock on his property. Investigation revealed that some of his miners had uncovered a small ledge of valuable ore months before and had carried every bit of it away piecemeal without reporting it. Today armed guards patrol the tunnels and search the miners when they go off duty.

"Highgrading" is as old as gold mining

itself and in the early days it was the cause of a constant battle of wits between miners and owners. Now that mining is on the boom again, highgrading has increased, and in one western state it is estimated that more than \$500,000 in gold is appropriated by the miners every year in spite of the vigilance of guards.

In parts of the Mother Lode district and in Nevada the temptation to make off with some of the gold is especially strong since no one can tell when a miner may discover a small stringer of rich ore or a pocket of pure gold underground. In some Nevada mines the ore is so rich that it must be guarded carefully every inch of the way to the mill.

Many mines prevent heavy losses by install-

ing change houses in which the miners discard their working clothes on one floor, take shower baths in another room, and mount to another level where their ordinary clothes are stored. Such tricks as carrying off an ounce or two of gold in trouser cuffs are forestalled that way. Lunch boxes are always under suspicion since several hundred dollars worth of gold can be stored inside a Thermos bottle. After lunch one man gathers up all the empty boxes at each level and carries them to the surface where they are inspected and laid out for the men to pick up as they leave the change house.

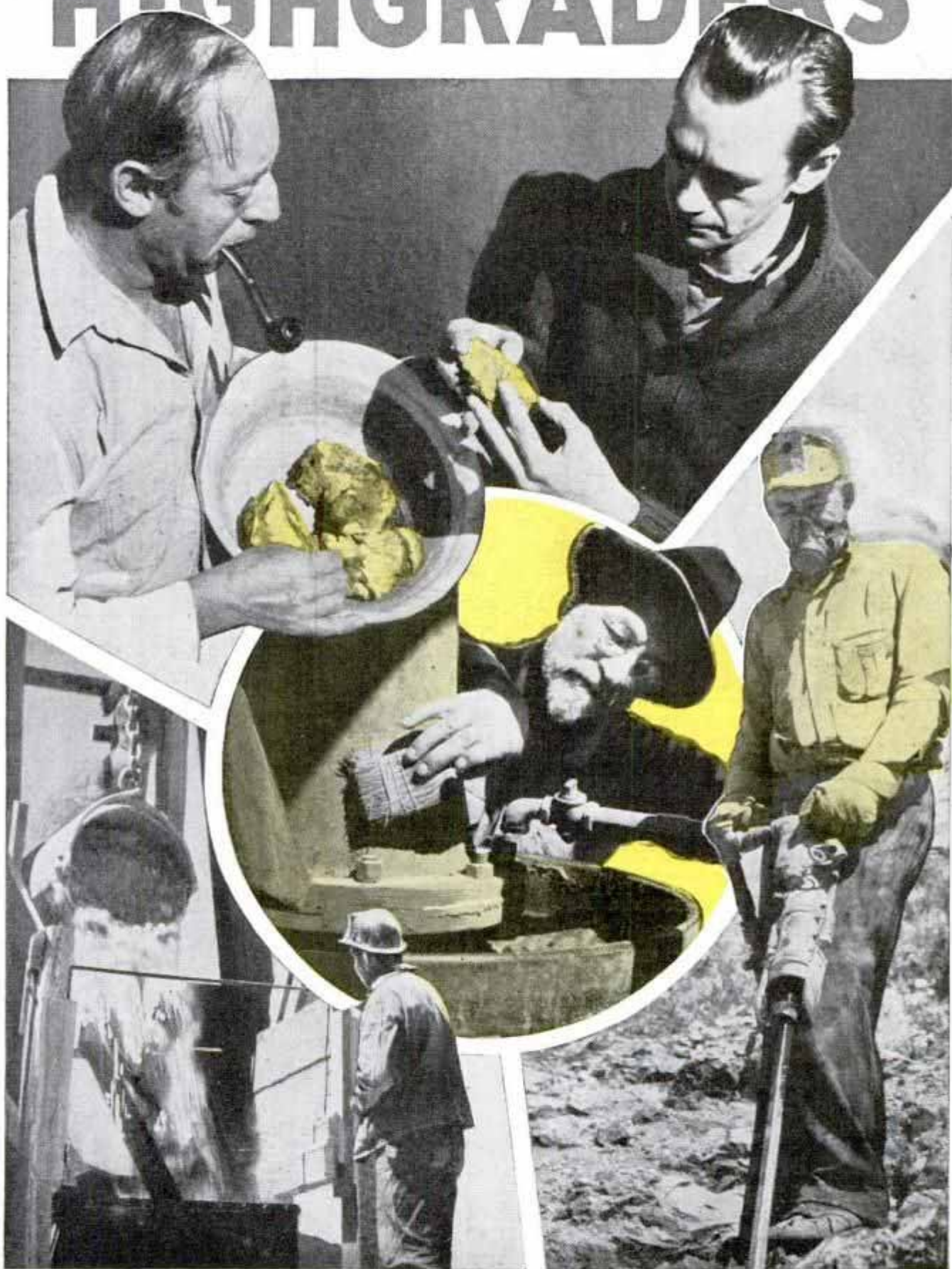
"Because of the guards, unscrupulous miners are constantly scheming new ways to smuggle out gold," one mine owner states. "Hundreds of ounces have been

(Continued to page 118A)

8521

Randsburg, Calif

"HIGHGRADERS"



Top, Examining Specimens of Ore Worth Five Dollars a Pound; Center, Mining with a Whisk Broom by Brushing Down the Dust on a Small Highgrade Mill; Below, Left, Ore from Mine Shaft Being Dumped into Car for Hauling to Mill; Right, Hard-Rock Miner Drilling Dynamite Holes with Compressed-Air Jack Hammer

Chas. S. Jones

*also Feb. 1934
225
implanted by
S. mission, Technician
Experimental
People's Commissariat
for Heavy & school
g. 581*



Acme
L. A. Schmidt
Parachute Jumper Equipped with Wings Which Enable Him to Glide as He Descends; He Opens the Parachute as He Nears the Ground

'CHUTE JUMPER WITH WINGS FLIES HALF A MILE

Wings are being used successfully by a Russian parachute jumper to fly and soar through the air as he descends. Recently the parachutist leaped from an altitude of about 5,000 feet and by sailing on his wings, he flew about 3,000 feet in forty-five seconds. Usually this distance is covered by a parachute jumper in eighteen seconds. After soaring for more than half a mile, he opened his 'chute at 2,000 feet and descended in the conventional manner.

8602

BUTANE DRIVES AUTO FITTED WITH SPECIAL STILL

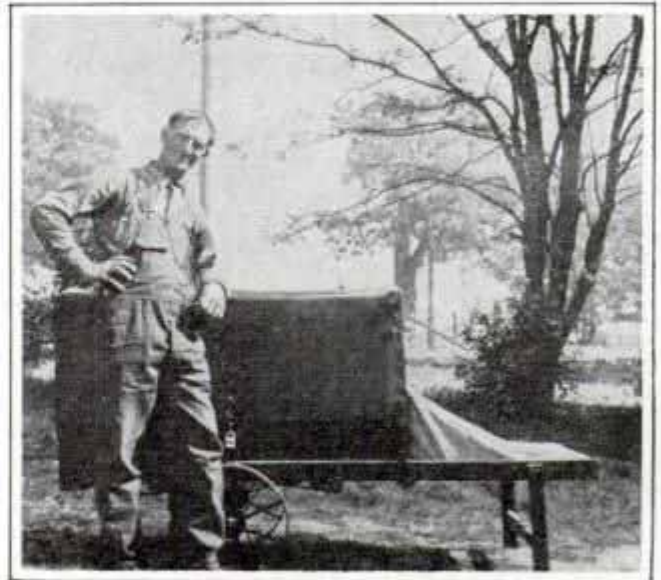
Designed to use butane, a petroleum waste product that sells for a few cents per gallon, an automatic converter has been tested on automobiles and stationary engines. It turns the low-priced butane into fuel that will operate the automobile

efficiently. The equipment includes a double partition tank, one side used for storage of butane, the other to house a generator or still that converts the butane into a gas before it is sucked into the engine. The process requires no more control from the operator than a gasoline-driven machine. The butane device permits use of higher compression heads. Combustion is said to be practically perfect under normal running conditions. The exhaust contains no carbon-monoxide and no carbon deposits are left in the motor.

8577

FOUR-FOOT "HOUSE" ON WHEELS PULLED BY TRAVELER

When one Oregonian goes touring, he takes along his house. Actually, the house is a four-foot compartment mounted on wheels, with a canvas long enough to cover his feet when the traveler stops for the night. The owner pulls it as he makes his way, on foot, from one scenic spot to another. The cart provides storage space.

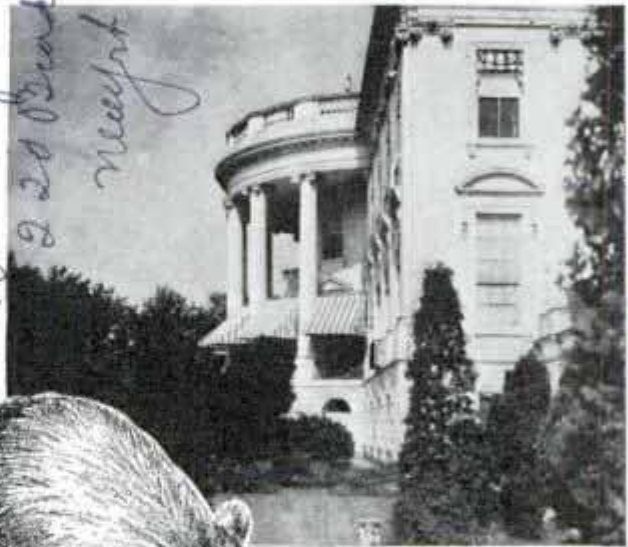


Traveler with "Home" on Wheels; the Cart Is Shown Ready for Sleeping

Texas Mechanical
Owner - Franklin

White House "Pied Piper" Uses Lily Poison

The White House has an official rat catcher in the person of F. N. Jarvis, pest exterminator of the department of agriculture. Instead of the flute of the Pied Piper, Mr. Jarvis employs the poison powder from a lily, which grows on the banks of the Mediterranean, called red squill. For bait he uses a mixture of sixteen parts of meat, fish, or cereal and one part of the poison which is devoid of danger to other animals and humans. The powder is made from red



The White House Where the Official Rat Catcher Kills the Rodents with Lily Poison, and Some of the Red Squills from Which the Poison Is Obtained



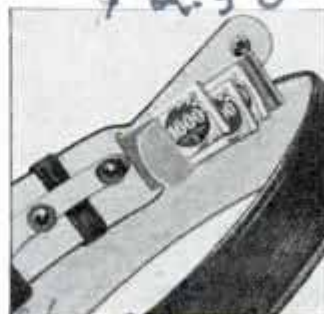
© Underwood and Underwood

squills, or sea onions, a perennial plant belonging to the lily family. The onion-like bulbs occasionally weigh as much as ten or fifteen pounds and the powder is produced by grinding after the bulbs are dried. The plant contains needle-like crystals which, although essentially non-toxic, are irritating to the skin. They also give the squill its acrid taste which is objectionable to most animals, except rats and mice. Mr. Jarvis has learned that it is best to try to destroy all rats about a building with one application of the poison because otherwise the rodents become suspicious and are difficult to dispose of later. Since the tastes of rats vary, he uses a variety of bait. Ground fresh fish or canned fish is used by mixing an ounce of the red squill, to which water has been added to form a paste, with a pound of fish. Fresh ground meat or cereal meal is used in a similar manner. Before tempting the rats with

the poison, all other food sources should be removed, so far as possible. A large number of small baits are more effective than a few large ones. And here is a tip for the housewife or shopkeeper trying to get rid of a few rats—never smoke, wash or sterilize the rat trap. Once a rat or mouse has been caught in a trap, the odor attracts others and hence the very trap itself becomes a bait for the rodents.

SECRET POCKET IN BELT FOILS THE THIEF

Hidden behind the buckle of a trouser belt is a secret pocket in which money can be carried, safe from observation by robber or pickpocket. There is no lengthwise opening or flap to betray the hiding place of your currency. Inside and out, the belt is smooth, unbroken cowhide. The owner, however, can readily unfasten the buckle and draw money from the concealed pocket.



The Halvord Co.

204 5th St. Wash. D.C.
Washington
see May 1931-761
72.50
ad. ad. 1935-1317
Myring
Dep. H-90



Sixty Feet High, This Steel Shell Serves as Headquarters for Information Seekers at the California Pacific International Exposition in San Diego

GIGANTIC STEEL SHELL AT FAIR HOLDS INFORMATION BOOTH

Information at the San Diego world fair is dispensed from a huge shell, sixty feet high and constructed of steel. Its design is symbolic of San Diego's position as a seaside resort. Its giant scale attracts attention throughout the exposition grounds.

WASHING AUTO MADE EASIER BY AIR-PRESSURE NOZZLE

\$13.50



Washing autos, trucks, engines, floors and driveways is made easier by an inexpensive air-and-water pressure nozzle that fits the hand

like a pistol. It weighs only three pounds. The nozzle is attached to the air compressor, but does not interfere with operation of other devices. Its convenient shape saves much time in cleaning under the latest type fender. Special, controlled spray allows tremendous pressure and speedy work without damage to the finish of the car.

DAMAGE TO TREES IS AVOIDED WITH PAINT "TAGS"

Rubber stamps and white paint are being used by woodsmen in a Connecticut forest experiment station to tag trees for identification and study. This method obviates the damage done in nailing metal tags to the trunk, which may split the tree and subject it to frost cracking. Two-man crews, one smoothing the bark and his partner following with paint, can mark from fifty to 125

trees an hour. Greater visibility is another advantage of white paint.



Forester Is Numbering Trees with Rubber Stamp

Handwritten notes:
 2576
 1691-261
 Mrs. Joseph M...
 C. M. Niddarb Equipment Co.
 563
 \$13.50
 Northeastern
 Mrs. Salome Wilds, 59 Morton St. New York
 Mrs. Cmb.

Goats Fight Sickness and Cut Cost of Living

Goats today are helping fight illness and cut the cost of living, replacing cows on many small farms and city lots because they are cheaper to maintain. Even if the goat were not less expensive, its milk still would be in demand because of its health-giving properties. Goat milk possesses qualities which make it excellent for infants and for persons suffering from certain digestive disorders or malnutrition. The milk has no pronounced taste or odor when produced under sanitary conditions. The fat globules are small and do not rise rapidly, so a layer of cream generally does not form although this can be separated with an ordinary separator. Tuberculosis is rare among goats so the milk is generally free from such germs and it is easy to digest. Goats' milk is used extensively by persons suffering from



Top, Milk Goats Become Family Pets; Below and Left, Two Methods of Milking

asthma, hay fever, digestive disturbances or a tubercular condition. The price ranges up to forty cents a quart, so it is less expensive to maintain a goat than to buy the milk. In one section, a goat giving five quarts of milk daily is valued at \$75, and the price ranges from about \$30 upward. Six or seven goats can be kept for about the same cost and trouble as one

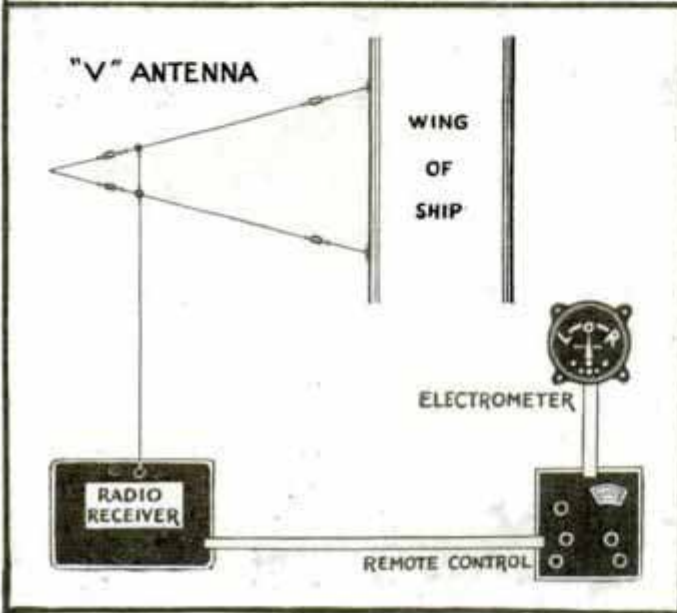
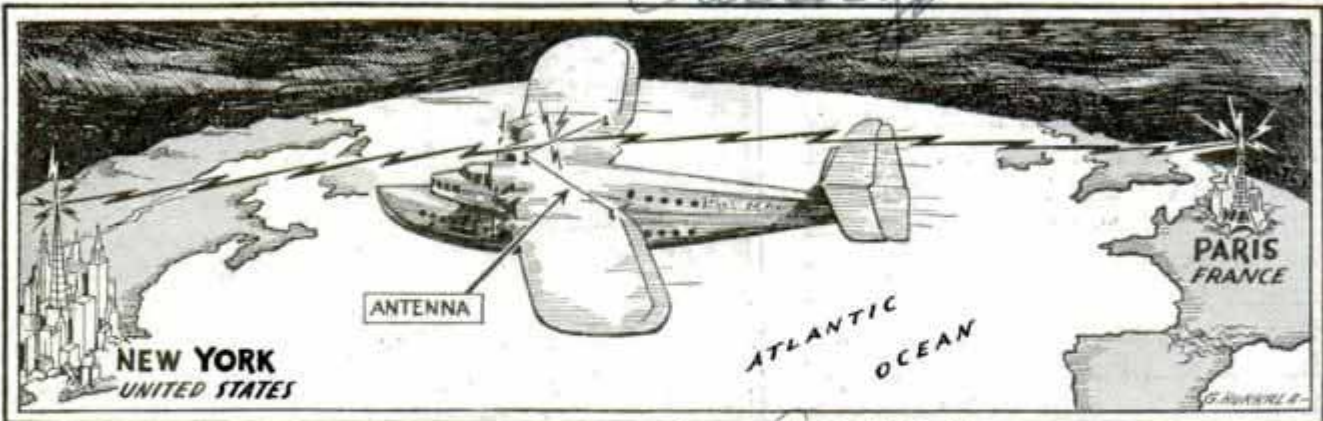
cow. The average goat gives, in proportion to its weight, twice as much milk as a cow, and in a year a goat produces fifteen times its body weight in milk. A goat dairy in or near a city often becomes quite profitable. The milk usually is kept on ice although it can be scalded and then cooled. In its natural form, the milk is relatively germ-free, and keeps well. The female goat has an even temper and usually gets along well with children, so the source of the family milk supply generally becomes a family pet. On small plots, and even in city backyards, goats today solve the milk problem for thousands of families and help thousands of sick persons recover health.

Refer inquiries to "Goat World"

Radio Course Indicator
6431 University Ave
Chicago

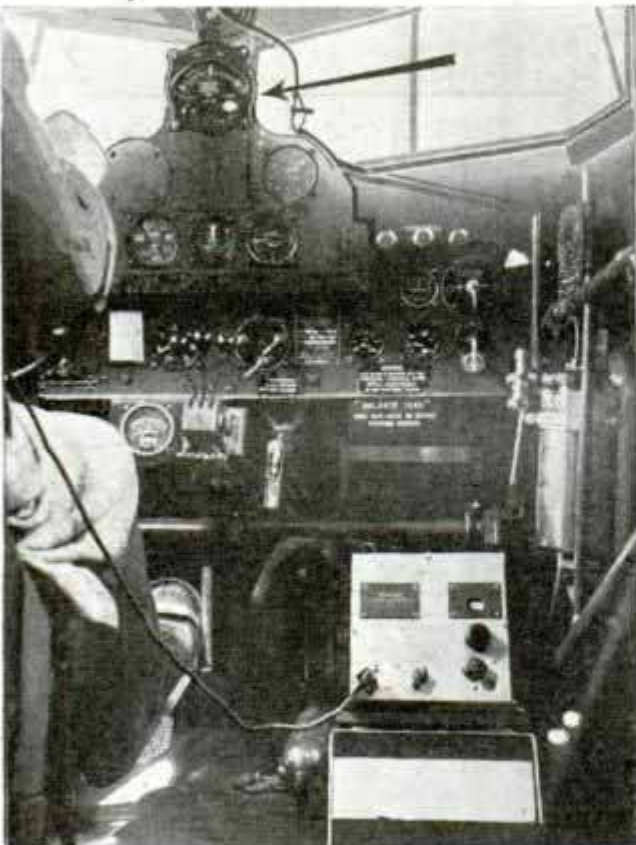
POPULAR MECHANICS

Eighteen-Pound Radio Indicator Guides Pilot



Acme
How Direction Finder, Indicated by Arrow (Bottom), Aids Pilot; Center, Simple Installation

Adjustable to either long or short wave radio reception, a lightweight course indicator for airplanes has been developed and tested successfully. It weighs only eighteen pounds. Installed in any part of the ship, it can be operated by remote control from the pilot's cockpit. For ocean flying, the indicator is adjusted to short-wave reception by turning a small switch, then tuned in on a radio station located where the pilot wishes to go. The pilot simply flies in that direction by steering the plane so the needle on the dial of the indicator is always on zero. Radio waves from broadcast stations can be used in similar manner by switching the instrument to that particular band. In daylight, the indicator has a range of about 1,200 miles. The department of commerce directional beam along established airways in the United States can be followed with the device. A "V" type antenna, instead of the usual shielded loop, is used.



8656

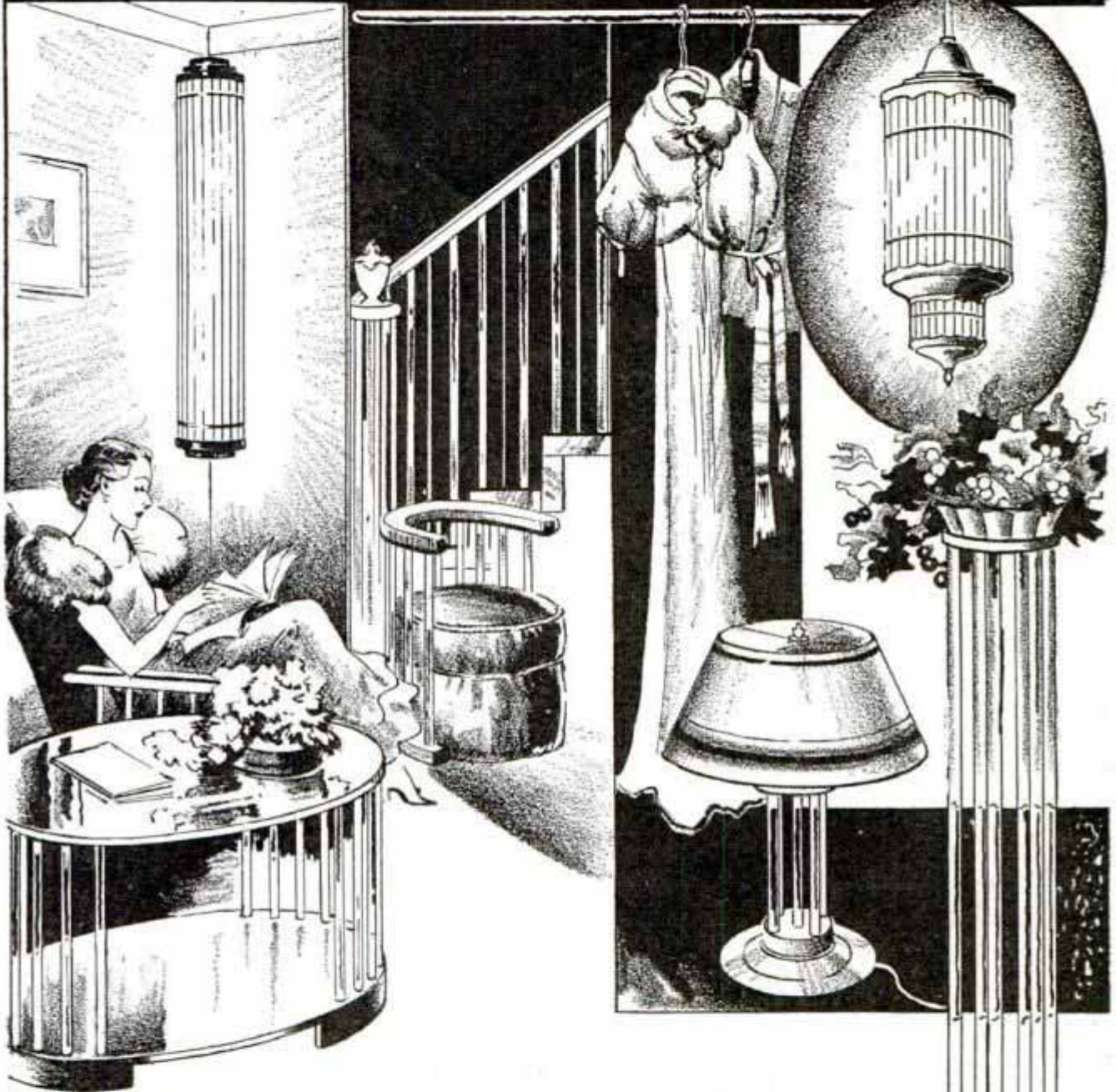
SUGAR IS LESS SWEET TO BEES THAN TO HUMAN TONGUE

Science Service
Bees live on nectar and honey, yet man's taste is more sensitive to sweets than is the bee's. A German professor tried feeding various sugar solutions to bees, and found the lowest concentration they could detect as sweet was two per cent, while man tastes sweetness in sugar solutions only one-fifth as strong. Bees apparently could not taste lactose or milk sugar, found cocaine disagreeable but did not object to quinine, intensely bitter to man.

Prof. Karl von Frisch

Virelondy N.J.
Chicago - 111 N. Canal, Chicago

BEAUTY IN BARS OF GLASS



Pictured Applications of Glass Bars Include: Tables, Stairway Spindles and Balustrade, Flower Pedestal, Corner and Table Lamps and Even Chairs

Many new uses are being found for glass, with the glass rod or bar offering perhaps the greatest possibilities. Crystal clear and light diffusing, the glass bar enhances the beauty of home or office interiors, in addition to being a new medium for the craftsman and decorator. Soft illumination can be provided by masking corner lamps with vertical rows of glass bars; standards for floor and table lamps can be constructed of glass rods to give unusual effects and beautifully designed

electroliers can be fabricated by skillful use of the bars. A stairway of glass-rod spindles and balustrade supported by iron, brass, bronze or chromium fittings is a thing of beauty. Flower pedestals are being made with closely set vertical formations of glass rods, and tables with glass legs or lateral formations of glass bars supporting either crystal or wood tops are on the market.

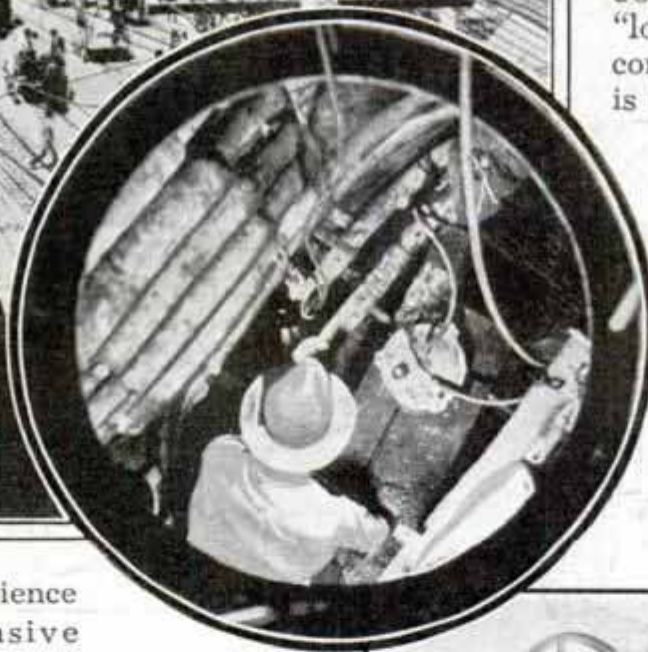


They Call You



world to your door for you can now talk to ninety-three per cent of the world total of 33,275,000 telephones in most of the civilized world and many other sections that are not so civilized.

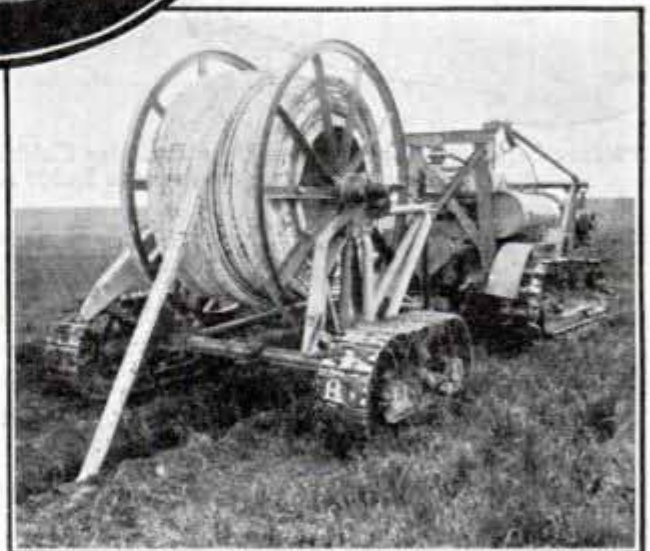
If a friend is traveling in French Indo China, India, Japan, Palestine, Siam or Syria you can probably reach him through one of the 445,000 telephones in those countries with which "long distance" can now connect you. If the friend is in Australia, Nether-



Lower Broadway in New York City as It Appeared in the Eighties with Its Maze of Wires; Underground Cables Have Eliminated the Poles and Lines Today; Left, Looking Down a Cable Duct through a Manhole; in Cities Phone Wires Now Are Buried

WITH the aid of science and the intensive work of many engineers, the ordinary telephone in your house which you may have regarded as merely a modern convenience has suddenly become an important means of communication which brings not only your neighbors but the entire world to your door. It has taken on new and greater significance in the meeting of emergencies which may affect you, and the telephone operator herself has become a modern sleuth in your behalf, calmly executing a great many duties which seem to be possible only to a highly trained detective.

Today the telephone operator can call you any place! The telephone brings the



Laying an Underground Interstate Cable Which Eliminates Poles and Wires across Country

228.69th. New York.

£345

Army Place



land Dutch East Indies, Hawaii or the Philippines, you can probably talk to him through one of the 520,000 telephones in those countries with which you can be connected. Or, if he is on the high seas on one of the larger boats, you may talk to him on board.

It is almost phenomenal how such long-distance conversation has been speeded up past the normal speed of sound. If you happened to be visiting Catalina island off the coast of California and wished to talk to a friend in Sydney, Australia, your voice would travel through the central office on Catalina island, under the Pacific ocean by deep-sea cable to Los Angeles, then to New York by wire. Then it would jump the Atlantic by radio transmission and be picked up in Rugby, England. From there it would go by wire to long-distance headquarters in London, where it would again be sent by radio across Europe and the Orient to Sydney. At Sydney it again would travel along a wire into your friend's office. Then when you talked to him, your questions and his answers over this 18,000-mile circuit would follow one another in but a fraction of a second. On



Overseas Switchboard in New York Which Handles Calls to Europe, and a "Hello" Girl of Years Ago

86 345



Japanese Women Inspecting Transmitting Station at Nazaki, Japan, and Workmen Stringing Telephone Cables

the other hand, if you were able to magnify your voice so its sound would travel from Catalina directly across the Pacific to Sydney, it would take eighteen hours to hear the answering shout of your friend.

A few years ago a transcontinental telephone call meant a wait of twenty minutes at least. Today the call is put through in two minutes. Until the advent of radio

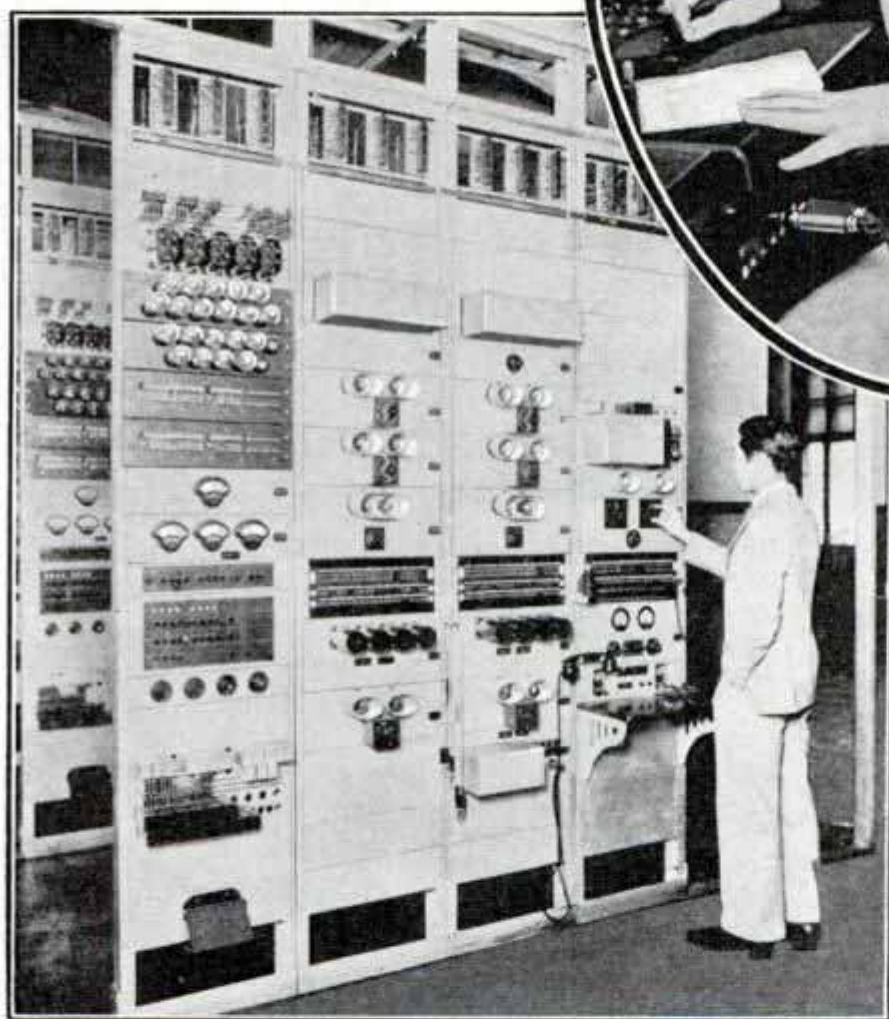
broadcasting and its need for long-distance "pipe lines" the telephone could transmit sound in a range of approximately three octaves. Today it can transmit almost the entire scale as well as overtones which the human ear cannot hear.

In addition to your voice, the telephone also transmits many of those "wired pictures" of important events you see in your newspaper, the sport broadcast that is "piped" to the radio station from the scene of action, the teletyped daily weather reports, and other important data to which you constantly refer. And in the application of these modern accomplishments of telephone science, the telephone operator has developed a sixth sense which aids you in an

emergency and actually sleuths for you. Recently from Moosonee, Ontario's northernmost town, the telephone operator at North Bay, 500 miles to the south, received a message that one of the few white women in that settlement had fractured a leg. Moosonee's only doctor in that deserted region was away and it would be days before he could be reached. The operator at

North Bay met the emergency promptly. She plugged in on a local surgeon and ten minutes later, 500 miles away, a priest and two neighbors were crudely but effectively setting the broken bone as the doctor gave them the necessary directions by telephone.

An alert telephone operator saved the life of a man overcome by carbon-monoxide gas. He tried to summon aid but could not speak after taking the receiver off the hook. When the operator was unable to get a response to the signal



Board in Tokyo through Which Calls to San Francisco Pass, and Tokyo Operator Who Handles Calls Between Japan and America

on her switchboard, she notified the test desk and a repair man was sent to the house. When he called he could not get in. He called the police who found the victim unconscious but got him to a hospital in time to save his life.

Recently when fire destroyed a block of houses at St. James, Minn., at night and threatened the entire business district, the

night operator stuck to her post in the burning building, summoning help from near-by towns. She called fire departments of three towns before she fell unconscious at the switchboard and was carried to safety. As a result of her efforts, the business district of the town was saved from complete destruction.

The telephone company has a special award for those who display gallantry in action in getting your messages through. In the Theodore N. Vail Memorial Fund which is

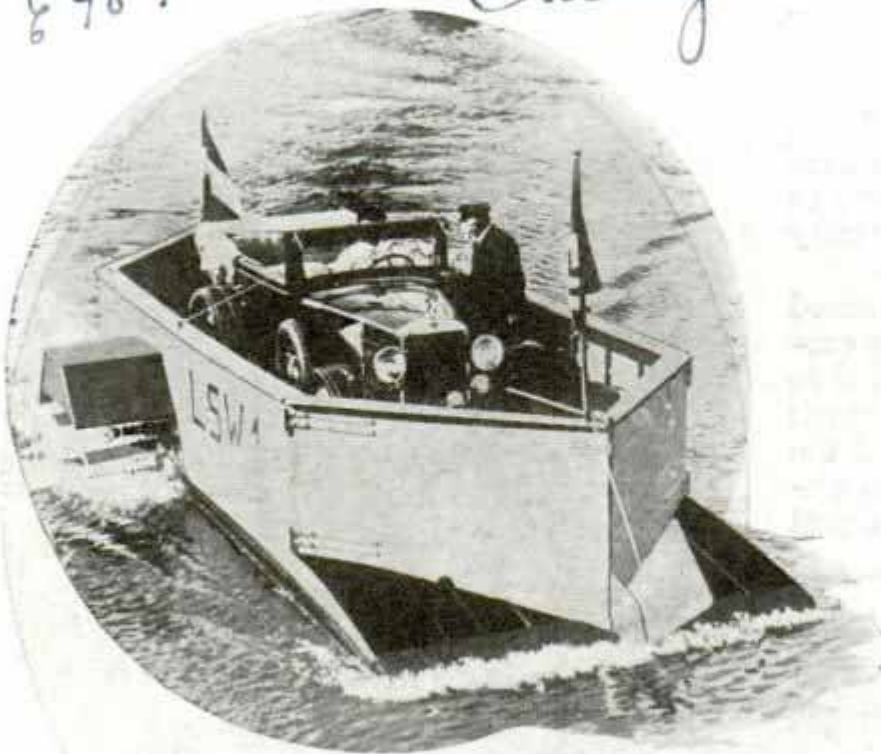
the Legion of Honor of the telephone service, one finds many citations for heroic service each year.

In the field, in all types of weather, the linemen and repairmen are as alert as the operators to help the messages get through. Wires go down in storms, in fire and in flood and must be repaired promptly. A

(Continued to page 139A)

637 S Dearborn
Chicago

8487



Showing Ferry Being Driven by Auto It Carries; Rear Wheels of Car Transmit Power to Paddles to Propel the Craft

FERRY DRIVEN BY EACH AUTO IT TAKES ACROSS RIVER

Power to propel one German ferry is supplied by each auto or truck it transports across the river. The rear wheels of the auto turn rollers that drive paddles, thus propelling the ferry to the opposite side of the stream. The ferry has no motor or other means of operation, so its owner spends nothing on gasoline or fuel oil. It is in service at Utting, Bavaria, Germany.

FLASH LIGHT ON WHEEL POST HANDY FOR MOTORIST

Handy for any emergency during night driving, a flash light can be clamped to the column of the steering wheel on an automobile within easy reach of the driver. There it is always in sight, and you never



need fumble under seats and in pockets after dark to find a light. A hand light is indispensable when tire trouble or other breakdown forces you to "get out and get under" at night. Clamped to the steering

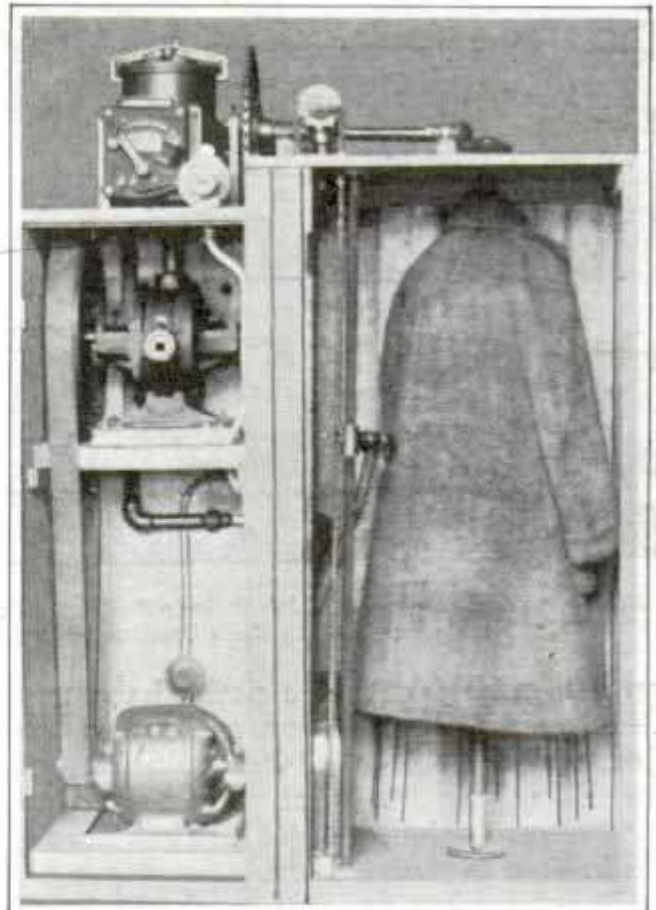
post, it becomes particularly useful in event of sudden failure of the headlights or interior lamps of the car.

8610

FUR-COAT CLEANER IS AUTOMATIC

Self-contained and easily operated, an automatic fur-coat cleaner speeds up work, cleaning a garment in one and one-half to two minutes. It consists of an air-tight closet in which is a frame form to hold the coat. Air under pressure is applied by a traveling nozzle as the form revolves and dust and dirt are removed by suction. The operator has

nothing to do except place the coat on the form, close the door and turn a button control. A one and one-half horsepower motor drives the mechanism.

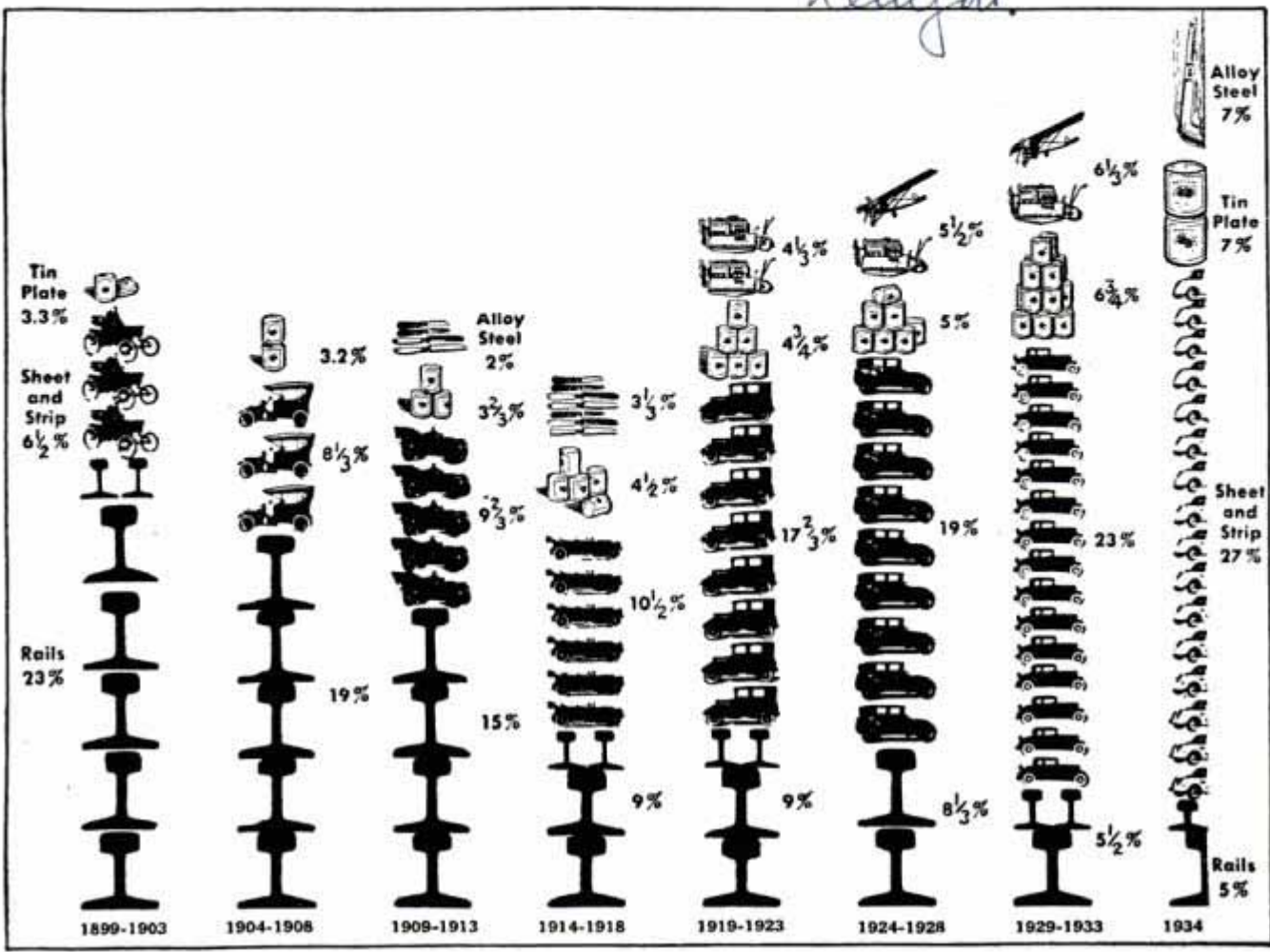


Self-Contained Cleaner with Garment in Cabinet; It Does Job in Two Minutes

National Carbon Co

Leiman Bros Inc.

Steel Demand Reflects New Living Standards



Showing How the Changes in Living Standards Have Been Accompanied by Changes in Demand for Various Kinds of Steel; Remarkable Is the Increase in the Use of Sheet and Strip from 1899 to 1934

Records of the shifting demand for steel products over the last thirty-six years reflect living standards. Outstanding changes have decreased output of railroad materials and increased output of sheets, strips and other products required by the automobile industry. And as the automobile industry has grown, body styles have changed and canned foods have become more popular. Many alloy metals have been developed, some for cutlery and others for more powerful airplane and automobile engines. The rising importance of sheet and strip in the total steel tonnage has been accelerated by the increasing popularity of mechanical refrigerators, steel stoves, steel furniture, washing and ironing machines and other household equipment. In 1899 to 1903, railroads took twenty-three per cent of the total output, automobile factories six and one-half per cent and tin plate, for canned goods, three and three-tenths per cent. In 1934, rail-

road materials represented five per cent of the total, automobile materials twenty-seven per cent, tin plate seven per cent and airplanes, streamline trains and other alloy products, seven per cent.

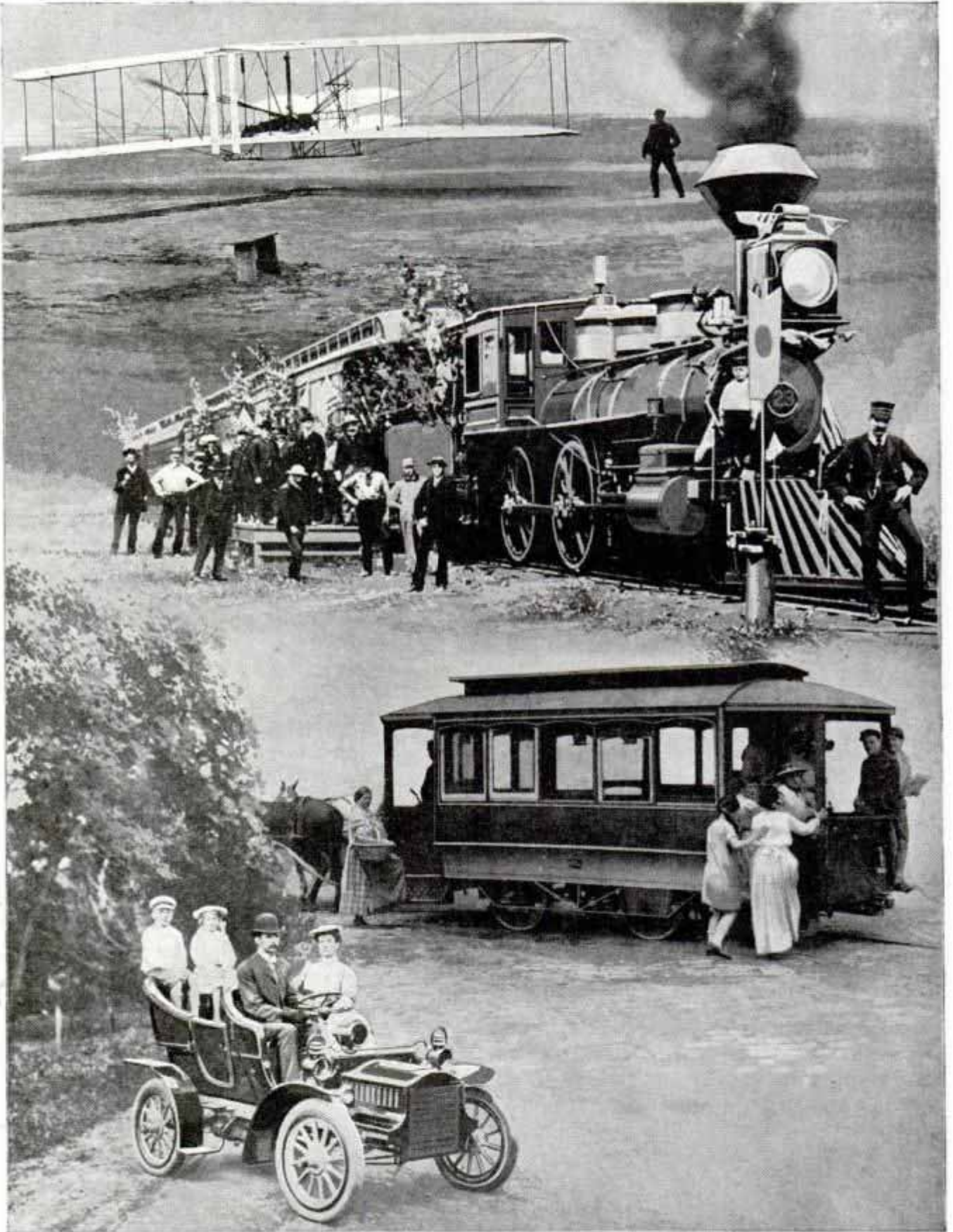
MOVING PICTURE GAINS DEPTH WITH MIRROR FOR SCREEN

Discovery that the use of glass as a motion-picture screen adds depth to the scene has been followed by the opening of a theater in London where movies are projected upon a mirror. A South-African scientist noticed that a picture seen through glass appeared deeper, more stereoscopic than when unframed. The explanation was that two separate images appeared to the human eye, one on the back of the glass and one on the surface. An English mirror factory developed the idea, welding together small mirrors with invisible joints and building the first mirror "screen."

*Wm. R. La. I. mines
 Johannesburg, Transvaal.*

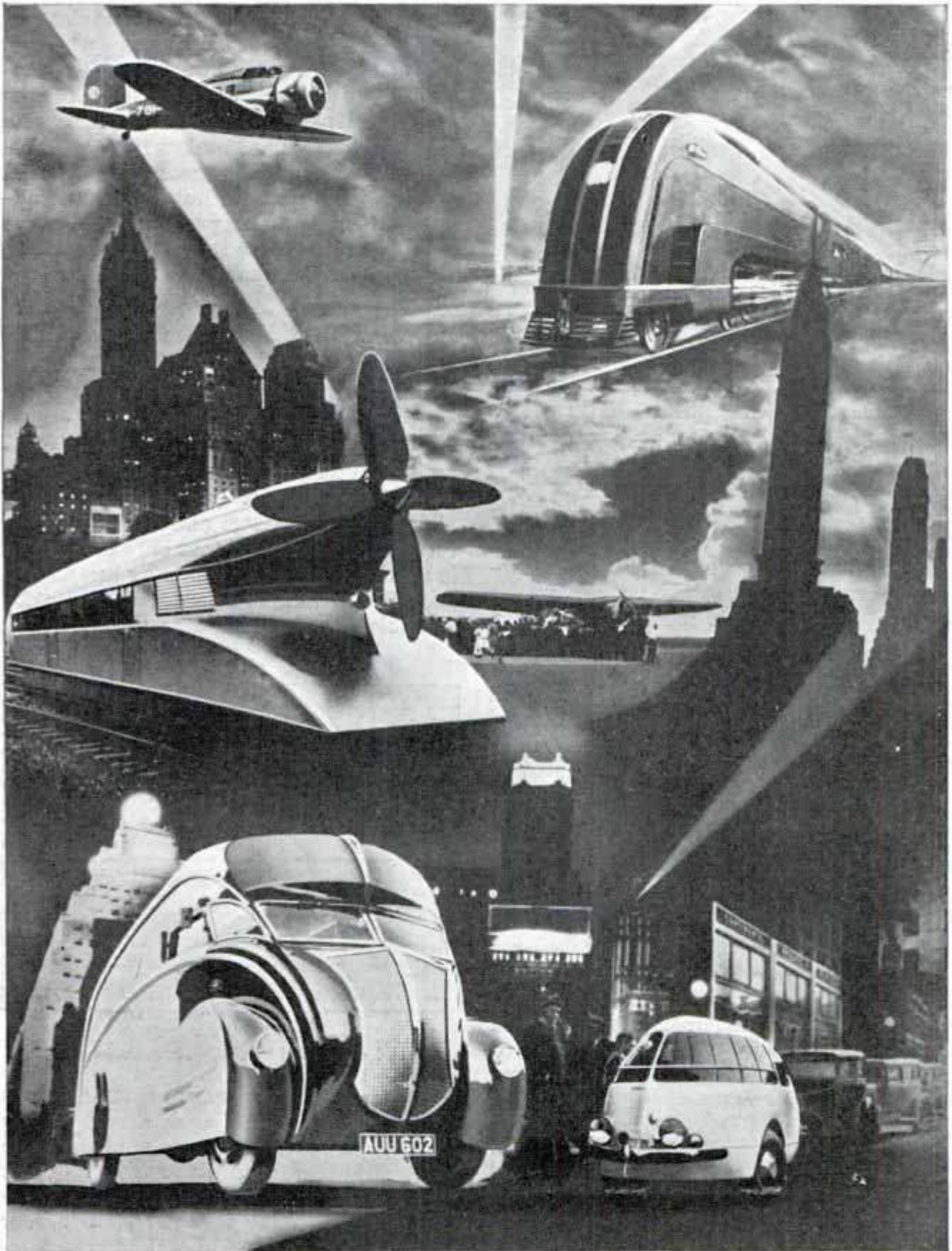
*Messrs. Pelkington,
 11, Pall Mall, London*

Pioneering Achievements in the Age of Speed



Early Results of Man's Desire for Speed: Top, Scene of Orville Wright's First Flight at Kitty Hawk, N. C., in 1903; Second, First Great Northern Train Entering the Frontier Town of Devil's Lake, N. D., as That Railway Extended Its Line toward the West Coast; This Picture Was Made on June 17, 1883; Third, New Yorkers Boarding Horse Car, as They Did in Dim Past, as Feature of Philadelphia Sesqui-centennial Exposition; Bottom, Clarence Chamberlin, the Pilot, with His Sister in Back Seat of Family Car in 1902; It Was First Auto in Their Home Town of Denison, Iowa

Faster and Faster with Aid of Streamlining



Photomontage by Charles Phelps Cushing

As Man Moves through the Age of Speed, He Finds Streamlining an Aid to Faster Travel; Top, Left, the Speedy Airplane with Graceful Birdlike Contours; Right, the Steam Locomotive Shrouded in Hood with Flowing Lines; Center, the Motor Train, with Smooth Surfaces and a Propeller, Giving It Advantages of Both Land and Air Craft; Bottom, Left, a Design for Motor Truck or Passenger-Carrying Coach; and, Right, One Version of the Streamlined Automobile

493 developed at

Harvard Medical School, Cambridge, Mass



Apparatus Registers Electrical Waves Set Up by Changes in the Brain of the Girl Subject

by Dr. Frederic E. Sells

BRAIN WAVES ARE RECORDED IN PATTERNS ON TAPE

Electrical changes which take place in the brain during periods of rest and activity are recorded as a wave pattern on the tape of new scientific mechanism. Sleep, fainting and epileptic seizures have patterns different from those of the normal waking state and the waking patterns can be changed during concentrated mental work. The device has needles which are placed in the subject's ear and scalp to conduct electrical reactions to amplifiers, thence to the pattern-writing pen.

EASILY REMOVED BARREL HEAD IS LOCKED WITH SLAT

There is no need for hammer, chisel and crowbar to pry open the latest type of wooden barrel. A couple of turns with a screwdriver and the barrel head comes off without a splinter or a broken hoop or stave. A small slat screwed to the top un-



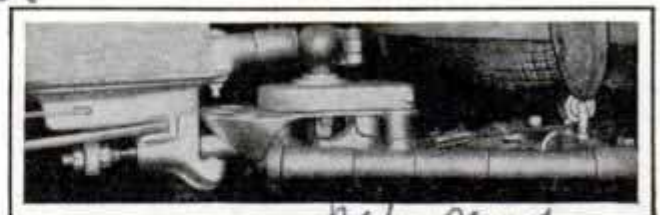
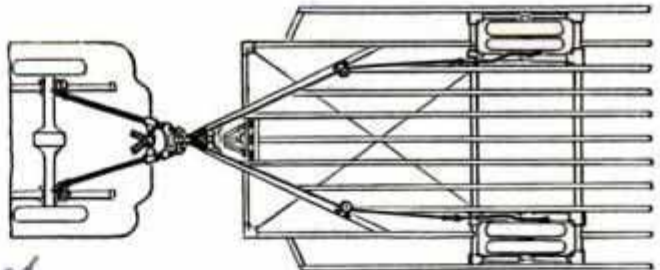
Left, Barrel Head Springs Up with Slat Removed; Right, Slat Screwed at Center Locks Head Tight

der metal bands serves to lock down the two central pieces of the head under tension. Remove two screws, slide the slat out and the two central boards spring up. With the center removed, the other barrel head sections can be slipped toward the center and lifted out. It takes no more skill to reseal the barrel and no special tools are necessary. Two protruding metal hoops at the bilge serve as runners, facilitating rolling without damage to the staves.

624

TOW BAR AND SAFE BRAKE FOR THE TRAILER

New safety and easier operation are introduced to auto and trailer travel by a tow bar and an automatic brake. Installed without drilling a single hole, the tow bar eliminates much of the strain of surge and draft. It is attached to the axle so that only the weight is carried by the car frame by means of a lubricated shackled joint. The bar is detachable. The other aid to trailer travel,



Top, Sketch of Brake Hookup; Bottom, Closeup of Tow Bar and Brake Mechanism

the automatic brake, employs the surge to apply the brakes on each wheel of the trailer. There are no connections to the auto. The instant that the trailer begins to pull back, instead of surging ahead, the brakes release. For parking, a small lever can be set by hand to lock the brake.

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

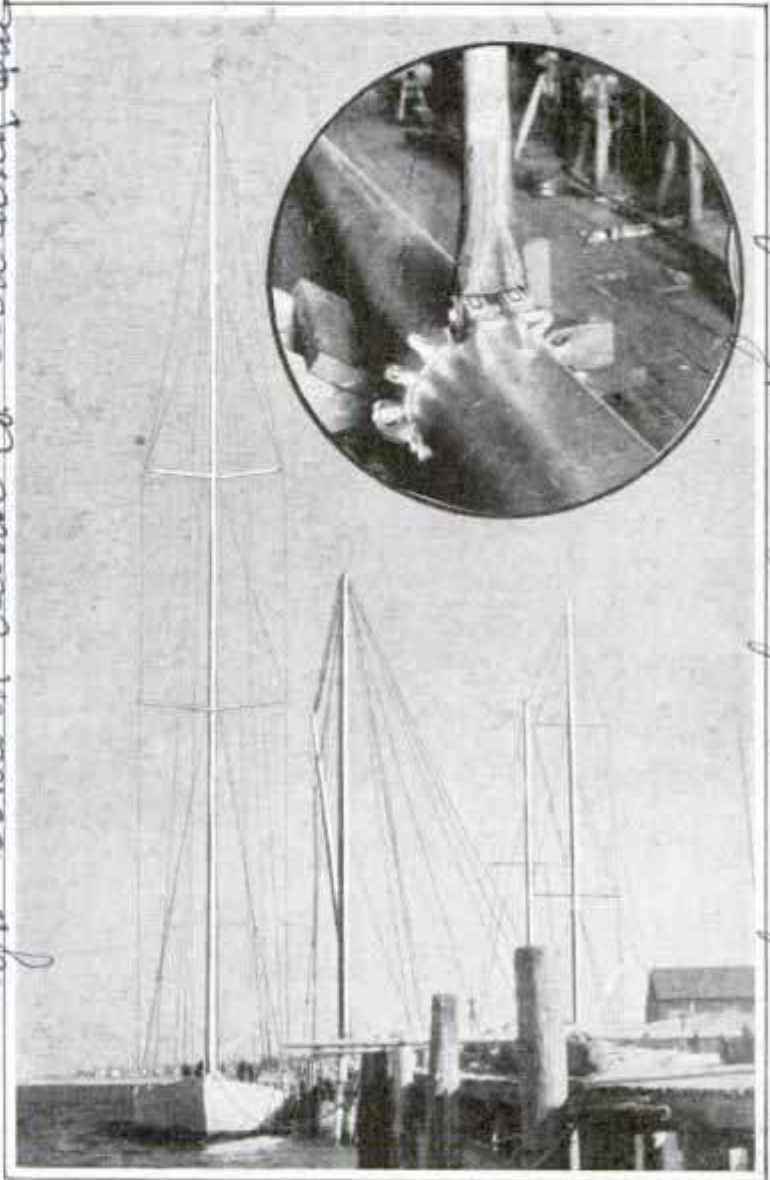
Hammer Blow Tool Co

Demonstration of American Societies for Experimental Biology
Hudson + Sluggler Co
Box 553, Memphis, Tenn.

Welded Steel Mast Decreases Racer's Weight

Replacing the wooden mast of the "Yankee" of Boston with a nickel-steel welded mast that towers 165 feet above the racing sloop has lightened its load by 500 pounds. The new shaft, eighteen inches in diameter at the bottom and tapering to seven inches at the top, was built in four hollow sections. Each section is a single sheet of steel rolled into a cylinder and arc-welded the entire length. The sections then were welded together with a steel ring at the joint and all stays and other rigging fixtures welded in position along the mast. The steel is three-sixteenths of an inch thick at the base and one-eighth inch at the peak. The mast weighs about 5,700 pounds, compared with the 6,200-pound wooden shaft that carried the "Yankee's" rigging in the 1934 America's Cup trials. Besides the saving in weight, the steel mast saves 320 square feet of windage, equivalent to the sail area of a thirty-square-meter or forty-two-foot racing sloop. A special electrode used for the 450 feet of welding provided welds of 85,000 to 100,000 pounds tensile strength per square inch. Under a twelve-knot wind the mast showed no sign of whipping.

Mr. Lincoln Electric Co. Cleveland, Ohio

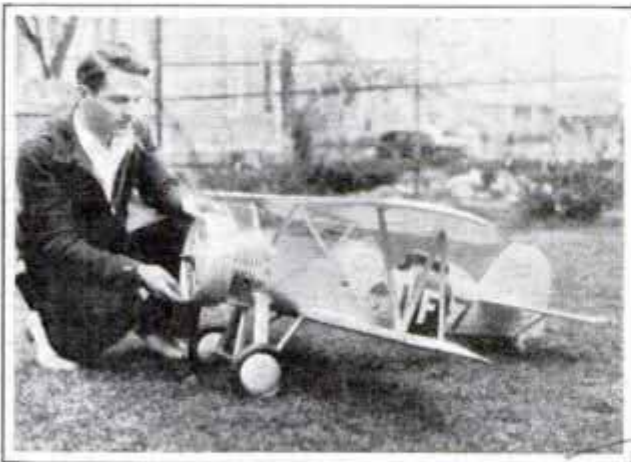


Mast of Hollow Steel 165 Feet Tall Was Welded Entire Length; Inset Shows Welded Joint Where Rigging Is Attached

Mast made by Leo Lawley & Sons Co. Refinished. Mar

Commodore Gerard Lambert, Captain, Yankee

One-Fifth Horsepower Motor Flies Navy Plane Model



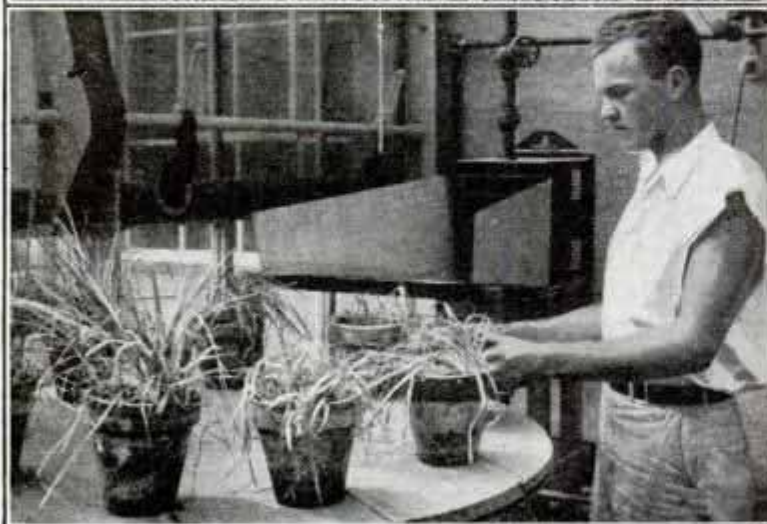
Flying Model Plane Powered by Small Motor Attains Speed of Forty Miles per Hour; Note Its Trim Lines and Accurate Design

Weighing only three and one-half pounds, a flying model airplane with a midget motor has been developed and tested successfully. The one-cylinder motor operates on gasoline to produce one-fifth horsepower, giving the plane a landing speed of fifteen miles per hour and flying speed of thirty to forty miles per hour. The miniature ship, constructed of balsa wood covered with silk, in a special design to stand the strain of the motor, has a sixty-eight inch wing spread. It is a scale model of the Boeing F4b4 navy fighter and is one-fifth the size of the real plane. One filling of the fuel tank flies the craft fifteen minutes.

Miniature Aircraft Co

8501

Pactogan Co
Box 618, Washington, D.C.
What can SCIENCE



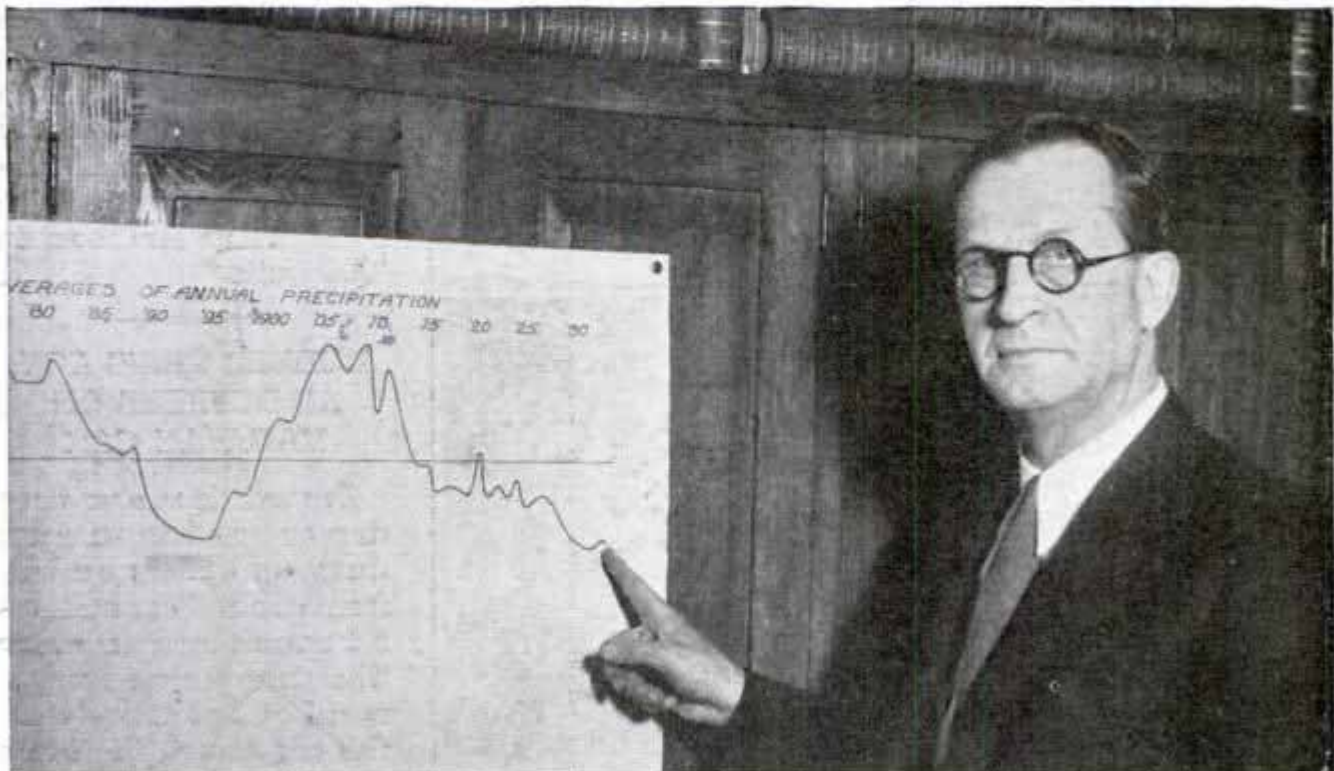
Top, Farmers Hauling Water to Cattle during 1934 Drought and What Was Left of a Wide River Last Summer; Bottom, Testing Varieties of Wheat for Drought Resistance

LAST year's drought cost the American people upwards of five billion dollars, it has been estimated. The government spent millions on relief measures in the drought-stricken areas. Little, however, has been spent on scientific research devoted to preventing or mitigating similar future disasters, though no year goes by in which some country is not scourged by drought.

Suppose our government should create a scientific institution to find a means of protection against drought. How would it go about the job?

It would not be likely to follow the example recently set by Russia and embark upon experiments in rain making. Producing rain on a large scale involves the expenditure of enormous amounts of energy, such as nature herself employs. It has been computed that the energy required to produce a one-inch rainfall over an area of ten square miles is equivalent to 36,000,000 horsepower applied continuously for a week.

Do about DROUGHT?

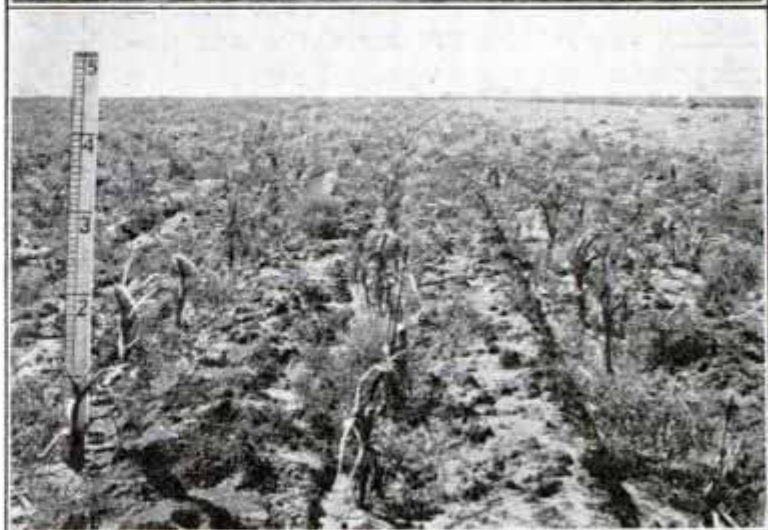


Only when mankind discovers means of controlling corresponding amounts of energy at a cost low enough to make the undertaking worth while will artificial rain making become practical.

Any drought research institute probably will not seek a means of controlling weather, but will try to find how the nation can be made less susceptible to its harmful effects. Perhaps one item on the program will be the establishment of a great chemical research laboratory.

The principal reason the world is vulnerable to drought is that almost everything we eat and wear comes, directly or indirectly, from the vegetable kingdom. Even the things we get from cattle and other animals are really of vegetable origin, since the animals depend upon plants for sustenance.

Plant growth involves a reckless use of water. The permanent substance of the plant is mostly taken from the air, but its elaboration requires a constant stream

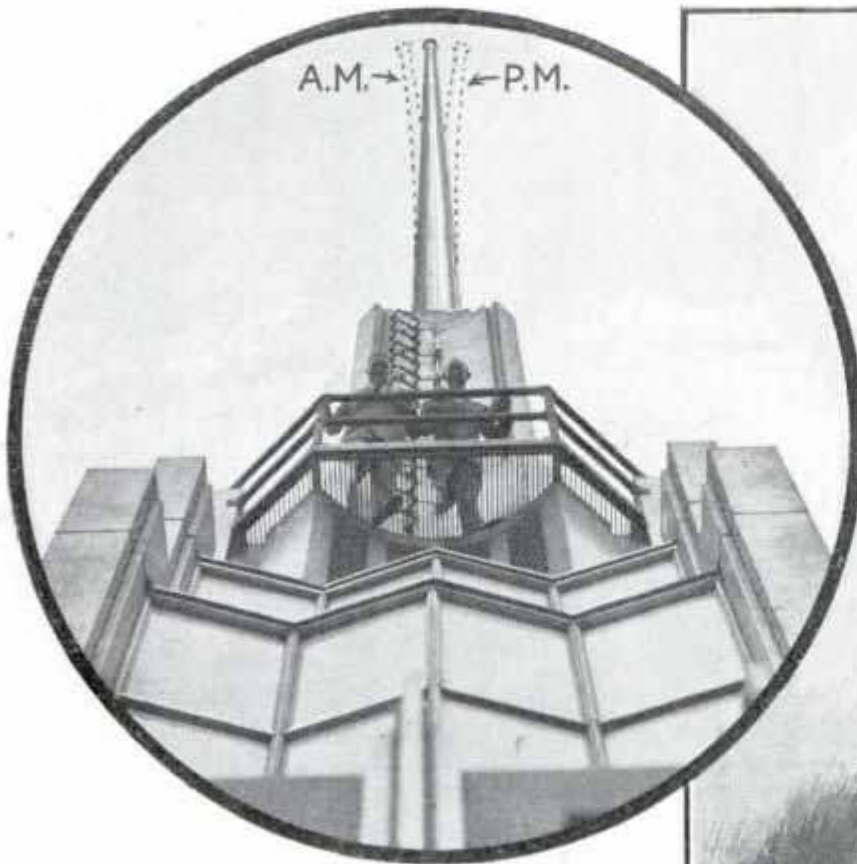


Top, Chart Indicating the "Trend" of Rainfall in the Northern Middle West over Several Years; Center, an Oklahoma Field after a Dust Storm; Bottom, Corn Ruined by Drought

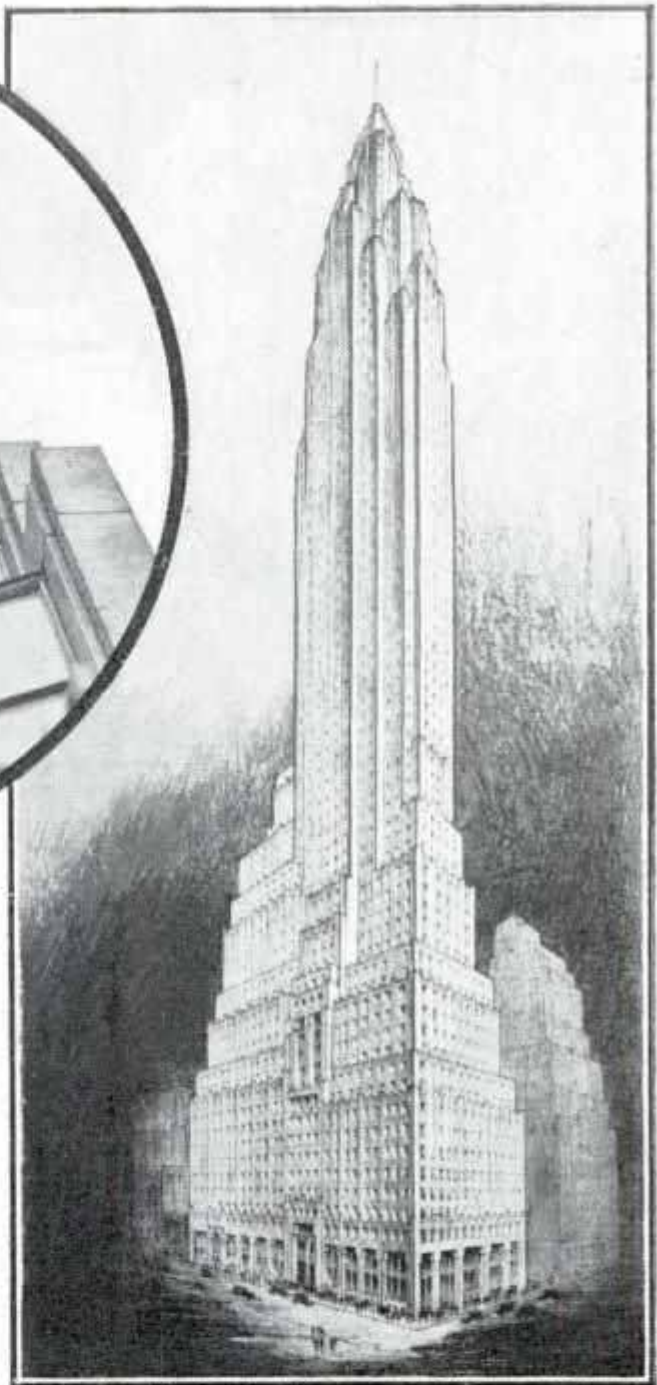
(Continued to page 142A)

As of 195, Bronxville NY

Strange Things About Skyscraper Movements



Left, Looking Upward at Hollow Steel Tube Atop Tower; Dotted Lines Show How Metal Pole Reacts to Sun's Heat; Right, Architect's Drawing of the Skyscraper



That tall buildings expand or contract, according to the weather, has been known, but recent tests at Sixty Wall Tower in New York revealed other strange things. Even with the interior heated, the tower loses one inch in height during the winter. Unheated, the building would lose about eight inches. The area exposed to the wind is 150,000 square feet and in a fifty-mile-an-hour wind, the topmost point of the 981-foot tower moves about two and one-half inches off center. On top of the structure is a hollow stainless steel tube, 125 feet high. Although designed to stand vertical, the mast does so only on cloudy days and at night. When the sun shines, the metal nearest the sun expands and bends the mast away from the source of heat. On a bright sunny day, the top of the mast is six inches out of plumb. At the end of the day the mast resumes its vertical position. If accurately calculated, the position of the mast on such days would be a perfect sundial, because its top naturally describes an arc from sunrise to sunset.

8597
CURRENT FROM ELECTRIC EEL LIGHTS NEON LAMP

When an electric eel "turned on its current" in its New York aquarium tank recently its current lighted a neon lamp bulb. The eel uses electricity to stun its prey. To test its power, aquarium officials placed antenna-like webs in the tank. Every time the six-foot eel swam near the webs it showed traces of agitation and the neon lamp flashed. When an attendant poked the eel, again the bulb lighted. The public demonstration followed four years of experiments by an aquarium official.

C. W. Coates, Battery

Chicago Tribune 5/16/35

8314

Image

MILLION-MILERS



Alva De Garmo, Jack Knight and E. L. Remelin, Three Million-Mile Pilots

Below, One of the Early Mail Planes Used Fifteen Years Ago

PART I

COUNT noses among the 150 expert pilots who daily fly the coast-to-coast route of United Air Lines and you will find forty men who have traveled 1,000,000 miles or more each—a record that cannot be duplicated by any other similar group of flyers in the world.

Each of these men has flown a distance equivalent to two round trips to the moon with enough miles left over for two or more flights around the world. These forty pilots have piled up a total of approximately 50,000,000 miles in the air, a distance equal to 2,000 trips around the world at the equator, or over half the distance of the sun from the earth.

Their air mileage becomes the more impressive when compared with the travel of an average individual on the ground. For instance, if you averaged forty miles per day from the cradle to the grave, you would have covered only a little more than 1,000,000 miles when you reached the Biblical three score and ten years.



These forty men are the real old-timers among transport and mail flyers, yet none of them is old in years because aviation itself is a young industry. Most of them have flown the greater part of their million miles in the past ten years; only a few have been flying longer than twenty years. In civilian clothes these million-milers would pass anywhere for average earth-bound citizens, but a careful observer might detect an alertness of eye and a quickness of manner that would give him a hint of their calling.

To a man, they are a modest crew who abhor boasting. - Ask them to talk of their

36 W. 40th. New York

233

of the AIR

1935



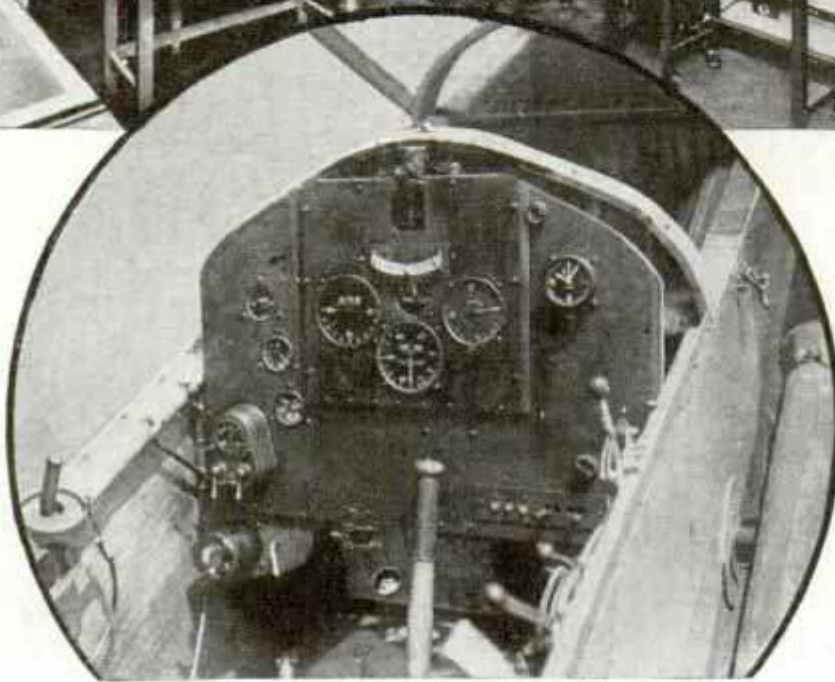
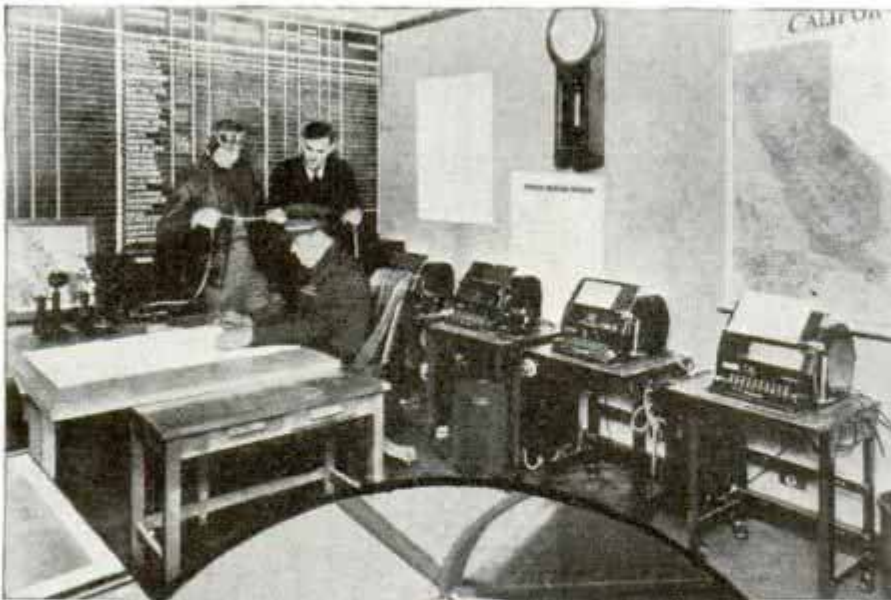
adventures in the air and the dangers they have faced and you will be disappointed. They only smile deprecatingly and answer that they never have had any experiences worth talking about. But dig back into their records and you will find wartime aviators whose exploits helped make history, a man who has flown more miles than any other living pilot, another who has flown mail longer than anyone else, a third whose record reads like an adventure thriller, climaxed by hair-raising service with the Russian army, and a fourth who has flown a distance equal to forty-five times around the world and never so much as scratched the wing of a plane.

One of the oldest of the old-timers in point of service, mileage and hours in the air is Jack Knight who in 1921 participated in the first continuous day-and-night flight from coast to coast with the mail. He flies today be-

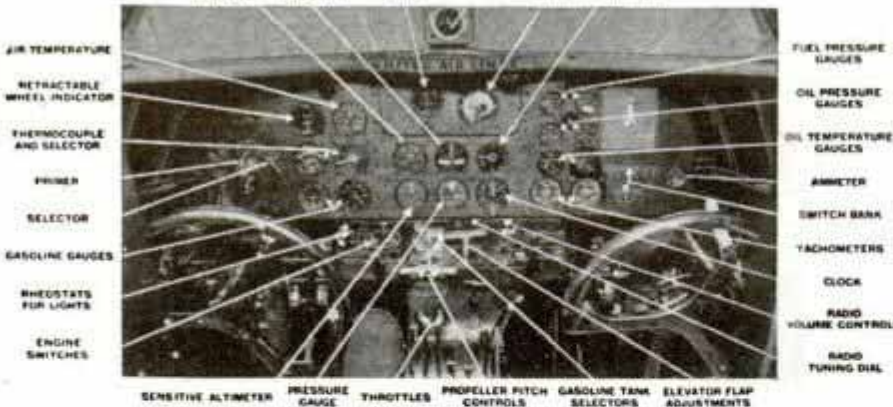
1926



Top, Transport Which Carries Mail Today; Center, E. Hamilton Lee Who Has Flown More Than 1,600,000 Miles; Below, Mail Plane of 1926



AIR SPEED INDICATOR TURN AND BANK INDICATOR DIRECTIONAL GYRO COMPASS ARTIFICIAL HORIZON RATE OF CLIMB INDICATOR



AIR TEMPERATURE
RETRACTABLE WHEEL INDICATOR
THERMOCOUPLE AND SELECTOR
PRIMER
SELECTOR
GASOLINE GAUGES
RHEOSTATS FOR LIGHTS
ENGINE SWITCHES

FUEL PRESSURE GAUGES
OIL PRESSURE GAUGES
OIL TEMPERATURE GAUGES
AMMETER
SWITCH BANK
TACHOMETERS
CLOCK
RADIO VOLUME CONTROLS
RADIO TUNING DIAL

SENSITIVE ALTIMETER PRESSURE GAUGE THROTTLES PROPELLER PITCH CONTROLS GASOLINE TANK SELECTORS ELEVATOR FLAP ADJUSTMENTS

Top, Weather Bureau Office Where Data for Pilots Are Gathered; Below, Instrument Panel of Mail Plane of 1924 Compared with Modern Ship

tween Chicago and Omaha, the identical route over which he piloted the first transcontinental mail plane fourteen years ago. In hundreds of flights over the route, Knight has never found the same thrill or faced the same dangers of that first trip with the mail.

Today light beacons, radio directive beams, the radio telephone, the automatic

pilot, accurate weather information and a dozen other aids speed pilots over the air lanes. On that first night trip, Knight had as guides a few flaming buckets of gasoline, a sputtering railroad fusee, a few flares, and the occasional lights of a sleeping village. The fact that he found Chicago at all was remarkable because he never had made the trip from Omaha to Chicago by either land or air.

Knight had been assigned originally to fly the mail from North Platte to Omaha, a route with which he was familiar. Impatiently he waited while reports came that the mail had started from San Francisco before dawn, that it had been landed at Reno, that it had taken to the air again. All day the air mail raced with the daylight half way across the continent. Clouds at the crest of the Sierras splashed rain on the wings of the mail plane, icy winds across the Continental Divide swept through its struts, but out of the sunset the ship dipped swiftly over the pewter ribbon of the Platte river and came to rest in the gathering dusk.

Half the race was won, but the hardest part—the night flight to the shores of Lake Michigan—still remained. A broken tail

skid delayed his takeoff, and when Knight finally got away it was dark and the moon was almost obscured by clouds. He flew by compass and was guided by an occasional glimpse of the Platte river. Special beacon bonfires lighted at various points in the isolated country aided him, and shortly after midnight he picked up the red electric lights that had been set out

at the Omaha field. On landing, he learned that the westbound ship, supposed to carry the mail from Chicago to Omaha and back to Chicago had been stopped at Chicago by a snowstorm.

They told Knight the flight was off but he would not listen. He maintained he could find his way to Chicago at night despite the fact he had never flown the route. Reluctantly it was finally agreed that he might attempt it. He studied maps for an hour, then climbed back into the cockpit.

"Leave your lights on



Harry Haking, Below, Million-Miler and Jack Knight, Taking over When Army Returned Mail to Private Operators

for one hour," he told the airport manager. "If I get lost, I'll come back." He disappeared into the night and did not return.

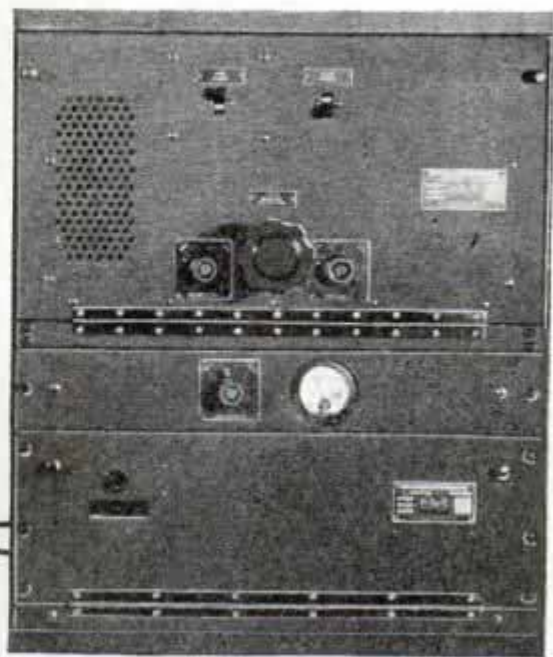
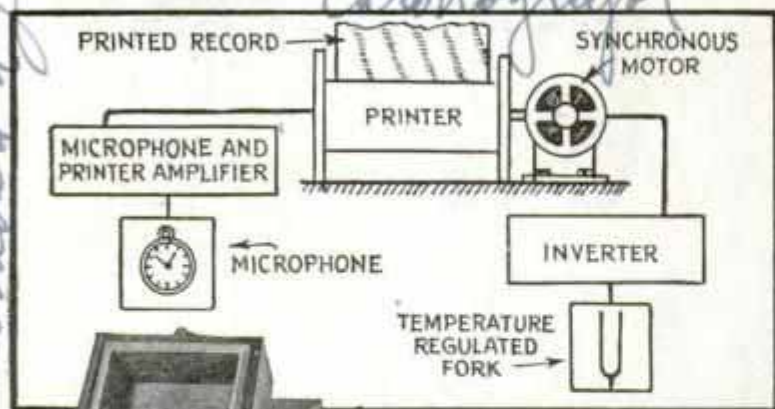
Visibility was poor, the moon was hidden and there was a cross wind, but Knight managed to find Des Moines. Despite the strange territory and the need for vigilance, he was becoming drowsy when something happened to wake him up—he ran into a snowstorm. Quickly he dropped

down as far as he dared and began "hedge-hopping," skimming over tree tops and keeping his eye on the ground. In such fashion he finally located the lights of Iowa City but, with about ten minutes of fuel left in his tank, he couldn't find the airport.

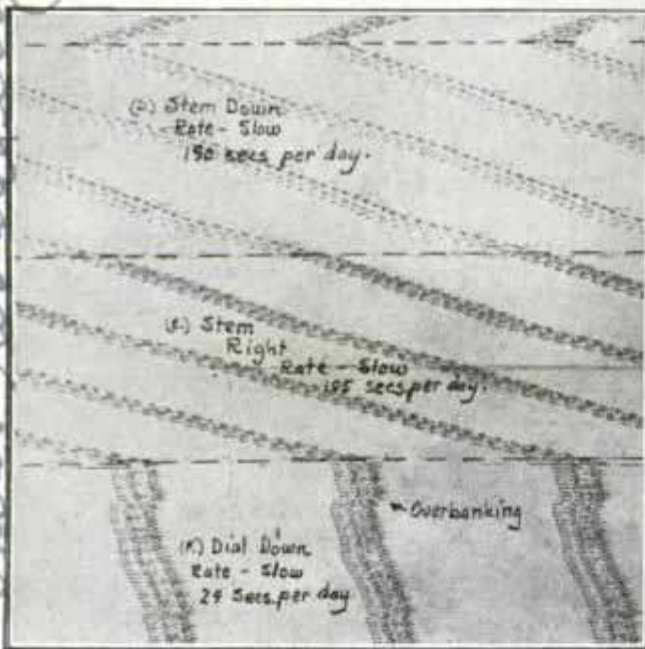
The crew at the field, believing the mail flight had been called off, had gone home, leaving only a few lights burning. Knight, having never been in Iowa City, could not recognize them. Finally, he spotted a red flare which popped up out of the darkness a mile away. Reasoning this had something to do with his own predicament, he aimed at the light and came down—landing right in the middle of the airport. The night watchman had set out a railroad fusee when he heard

(Continued to page 116A)

Electric Graph Tells If Watch Loses a Second



Top, Instruments Ready to Test "Heart-Beat" of Watch; Left, Variation from Right Time Is Shown

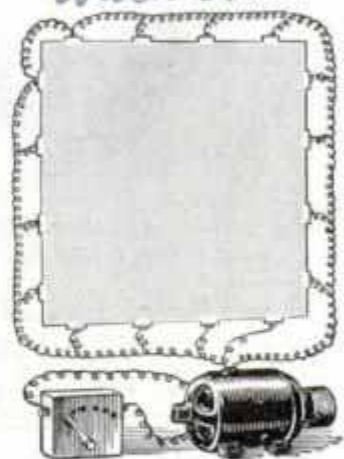


An electric recorder developed by radio engineers can tell, after listening to the "heart-beat" of your watch for a minute, exactly how much it is varying from perfect time. For even greater accuracy, by an eight-minute test an error of one part in a million—gain or loss of a second in eleven days—can be detected. The time-piece is placed in a microphone box and its ticks amplified, actuating a recorder which graphs a "case history." Speed of the driving motor is fixed by a temperature-controlled tuning fork used as a time-frequency standard. By placing the watch in various positions in the box and observing irregularities on the printed

record, ailments in the mechanism can be diagnosed without even opening the case. The recorder can check movement of time-pieces with utmost precision in a few minutes, while existing methods require hours of observation.

ELECTRIC PLATE ON MIRROR KEEPS BRILLIANCE

Permanent protection for the silver deposit on the back of a mirror is afforded by a new process. After the silver has been applied, a continuous sheet of pure copper is electrolytically bonded to the silver film. This hermetically seals in the silver deposit so that water or steam will not damage it, giving the mirror a lasting brilliance. Under the old method of preparing mirrors, the reflecting coating was covered with paint which did not prevent moisture from attacking the silver. Moisture penetration results in discolored, streaked and clouded mirrors.



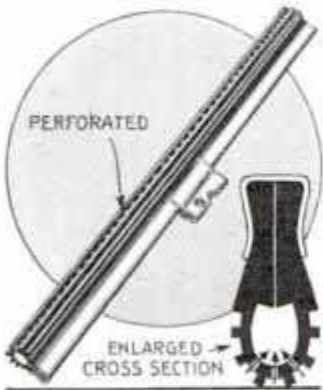
Developed by Charles E. Young and Maurice Artzt, Camden, N.J. Research Engineers

4 W. 103 rd. New York

Simon Bach & Co

WINDSHIELD IS KEPT CLEANER BY TUBULAR WIPER BLADE

Made of soft rubber with a tube running its length, the latest wiper blade keeps the auto windshield cleaner. Water wiped into the tube drips out at the lower end, out of the line of vision. Thus, the blade prevents the same water from being wiped back and forth across the glass. Its construction makes the blade self-cleaning. It is made of stainless steel and carbon-base rubber that will not scratch the windshield.



GIANT REFUSE BURNER MOVED ON TWO BARGES

Weighing seventy tons and measuring eighty feet in height and seventy feet in diameter, a refuse burner recently was moved from Tacoma to Port Ludlow, Wash., a distance of about seventy miles by water. The job was accomplished by loading the giant burner on two barges, lashed together, as they lay on the beach at low tide. When high tide came, the barges floated with the burner and tug boats towed the strange-looking craft to the new location.



Showing Eighty-Foot Refuse Burner on Barges Which Transported It to New Location; Loading Was Accomplished at Low Tide



Pressing the Button Held by Man at Right Starts Phonograph Record and Broadcasts Alarm

BURGLAR ALARM IS BROADCAST FROM PHONOGRAPH RECORD

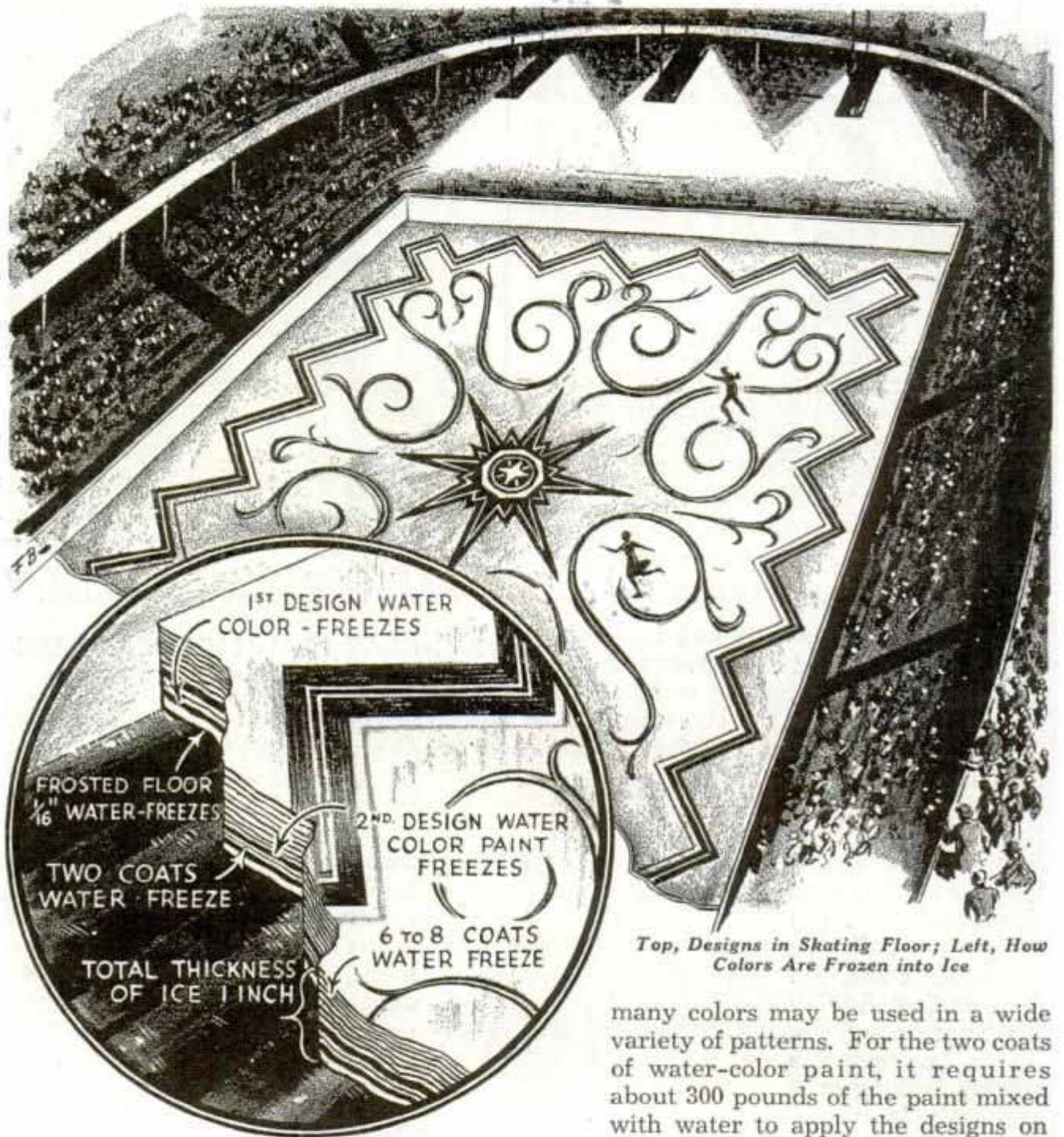
Bank robberies and safe crackings may go "on the air" direct to police headquarters and radio-equipped squad cars by means of a portable radio transmitter connected with a phonograph record. The alarm message is recorded in advance and installed on a phonograph in bank or factory. When a bandit or burglar comes along, an electric circuit is closed either by a handy switch or button, or automatically by the interruption of an "electric eye" beam. The current then starts the phonograph record, the portable transmitter broadcasts the alarm over the waveband to which the local police radio system is tuned, and detective squads are summoned without waiting for an alarm relayed through headquarters.

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

Handy Mackley
Radio Supervisor, Peoria, Ill.

Handled by Seattle

Colors Are Frozen into Ice for Skating Show



Top, Designs in Skating Floor; Left, How Colors Are Frozen into Ice

many colors may be used in a wide variety of patterns. For the two coats of water-color paint, it requires about 300 pounds of the paint mixed with water to apply the designs on the stadium floor which measures approximately 1,600 square feet in area.

PATTERNS BLASTED ON METAL

Delicate patterns may be reproduced upon polished metal by sandblasting against a design superimposed upon the metal slab or panel. Lace, or any similar pattern, is first impregnated with rubber, its threads saturated, then laid on a surface of stainless steel, brass or copper. After sandblasting, the lace is removed and its pattern is found on the metal.

Multi-colored designs skillfully frozen into the ice floor dazzle the eyes of spectators and enhance the beauty of figure-skating carnivals at the Chicago Stadium. First, a layer of water one-sixteenth of an inch thick is frozen on the floor, then the first design in water-color paint is applied and permitted to freeze. Then two more layers of water are frozen, followed by the second design and finally six to eight water layers, frozen one at the time, build the skating surface to a thickness of about one inch. The effect is spectacular, since

2559

nal or market

2222 Sherman Ave
Evanston, Ill.

Training Birds for CANARY CIRCUS

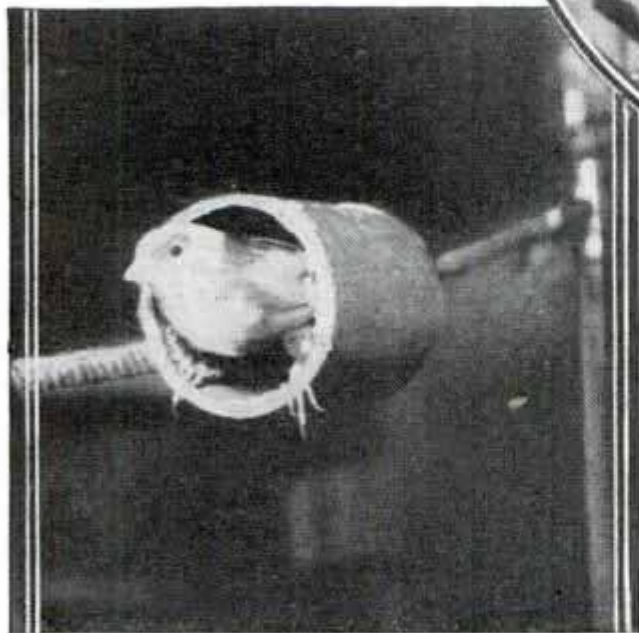
CANARIES are easier to train than dogs, and, with patience and kindness, can be taught a variety of tricks by the average bird owner.

This is the opinion of Howard Fogg, who, for thirty years has been engaged in training, breeding and raising birds. Watching his birds go through their stunts is as much fun as a circus. In fact, it is just that. On a specially constructed oval table, his performers climb ladders, swing on an open trapeze, pull featherweight wagons in harness, and ride on rocket ships with exhausts spewing flint-made sparks.

All types of canaries can be taught tricks, Mr. Fogg says, and the earlier they are started the better performers they become. Naturally, some birds are smarter than others in grasping the fundamentals



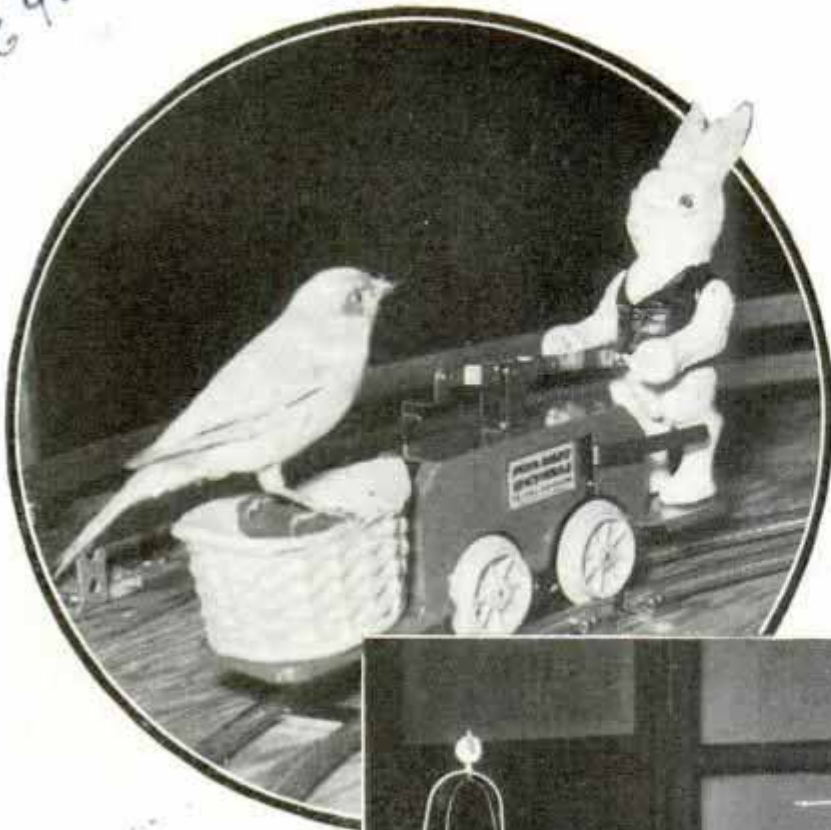
508 S. Dearborn Chicago



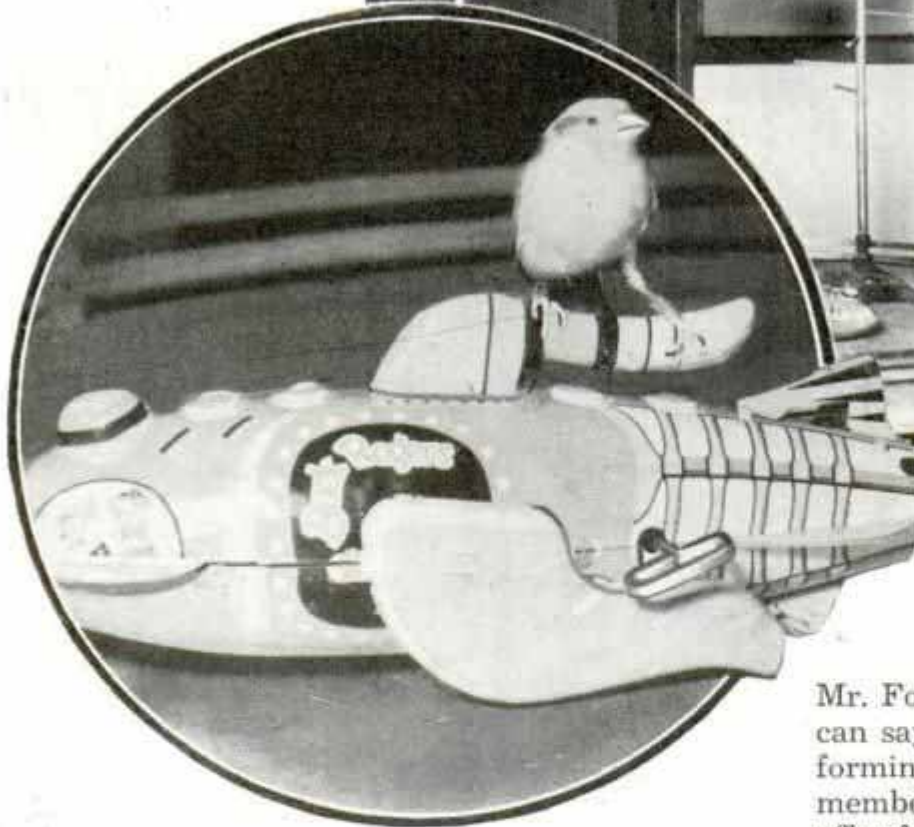
Top, Perched on Training Stick; Center, Going for a Ride; Below, Crawling through a Tube

of a trick, and a few even have a flair for acting. Their docile natures make females better performers than males. If a bird is a good singer it is best not to make a performer of it because canaries can do only one thing well.

Before attempting to train a bird, the owner first must gain its confidence. Despite centuries of cage existence, the canary still possesses the fears and primitive instincts of its wild ancestry. These can be broken down, first by releasing the bird from its cage into the open room and then



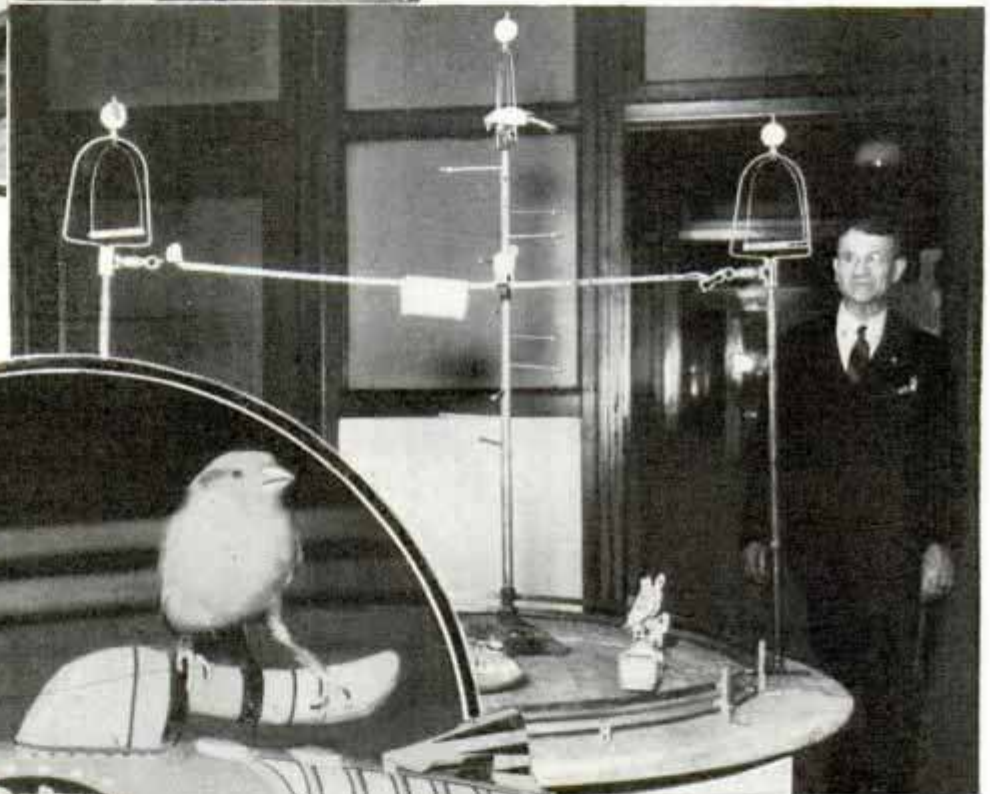
Above, Mechanical Toys Are Especially Suited for Use in Canary Stunts; This Bird Is Riding a Hand Car



Left, Canary Riding a Toy Rocket Which Spits Flint-Made Fire; Above, Oval Table on Which the Birds Do Their Tricks

low the teacher's hand for seed. You can use cracked hemp seed but use it sparingly for it is the canary equivalent of candy. Likewise, the bird may be taught to "kiss" you. Place the seed between your lips and bring the bird close enough so it can reach the seed. After several repetitions, the bird will fly to your mouth and snip the seed, thus giving the effect of kissing you.

"Once a canary learns a trick it won't forget it," says



by hand feeding. The canary should never be picked up by hand or allowed to perch on a finger. A small stick the size of a lead pencil should be used at all times.

First, the bird should be taught to fol-

Mr. Fogg. "That's more than you can say about dogs or other performing animals. Some birds remember routines even after lay-offs of several months."

The canary is all business but the trick must be clearly defined for the bird or the results will not be satisfactory. If, for example, you are trying to teach a bird to

(Continued to page 135A)

Snow Is Melted from Walk by Electric Cables

Electric cables imbedded in the concrete sidewalk or driveway solve snow-shoveling problems for the home owner. After laying the lead-sheathed resistance cable in fresh pavement, all that is necessary to keep the walk clear is to turn an electric switch when the blizzard begins. As the current warms the hidden wires above the freezing temperature, snow and ice melt away. Ice jams beneath garage doors and slippery grades on driveways and walks are thus eliminated.

Cement Is Being Spread over Specially Coated Electric Cables in Sidewalk at Right; When Current Is Switched on, Heat Generated in Wires Melts Snow



OIL SHIP IS EXPLOSION-PROOF WITH FLUE GAS IN TANKS

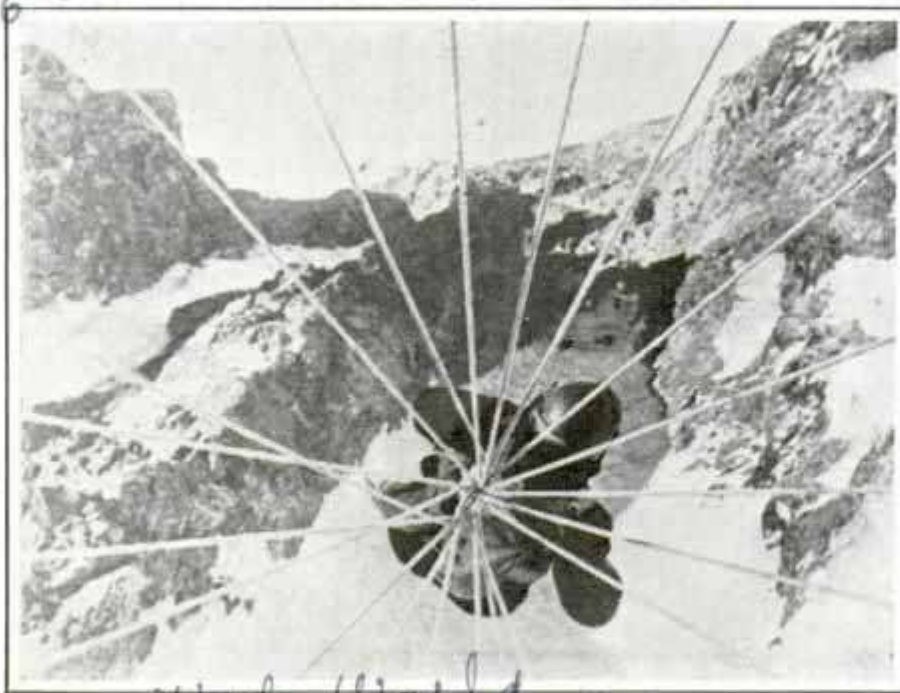
One constant source of peril from explosion and fire at sea has been eliminated by a simple method on the oil-tank fleet of the Standard Oil company of California. Danger of combustion was always present when, in loading or unloading oil,

air was mixed with petroleum vapors in the cargo tanks. The problem was to eliminate oxygen from the picture. Engineers found this could be done by diverting inert, waste gases from the smoke-stack of the ship into the tanks as they were emptied of oil. With the oxygen already burned out of the air by boiler fires, there could be no danger in mixing oil vapors with this flue gas. To prevent any hot gas or incandescent soot from reaching the cargo, it was necessary to divert the waste gas first through tanks of sea water which washed and cooled it. As an added safeguard an automatic valve was installed which would shut off the flow of flue gas if it became hot enough to melt a fusible link, or if pressure on the water-cooler supply line dropped below a certain point.

420-420-420
From Lead Industries
Cincinnati, Ohio

national safety news May 1935 P. 21

202 500 Bush St. San Francisco



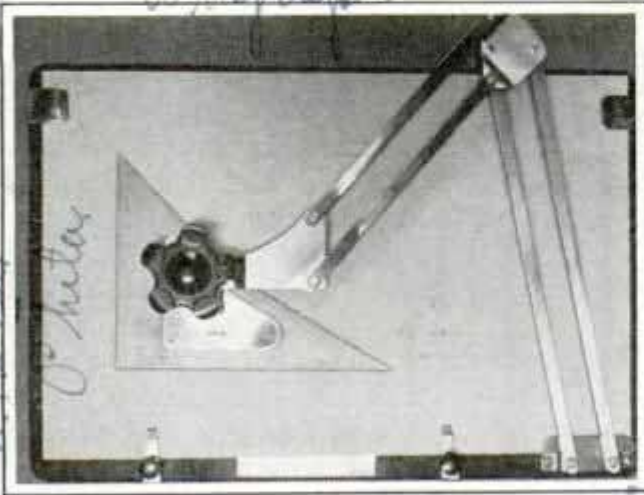
Wide World
This Stunt Flyer Appeared as a Human Spider to Eye of Camera Carried in Roof of Parachute; Automatic Shutter Snapped This Odd View

CAMERA HUNG IN PARACHUTE RECORDS FLYER'S JUMP

An automatic camera attached to the roof of his parachute captured a thrilling view of Ernst Udet, noted German stunt flyer, as he dropped earthward to a rocky landing. To the camera's eye the parachute jumper appeared as a human spider hung from the center of a giant web. Udet made his leap over the mountains for an aerial moving picture.

5.00
SWINGING ARM DOES WORK OF T-SQUARE AND TRIANGLE

Compact and complete in itself, a drafting instrument for the amateur, the engi-



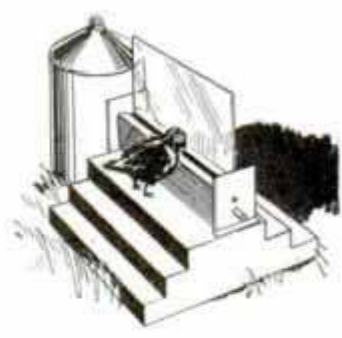
Wingraph
Movable Parallels Swing Triangle across Drawing Board at Fixed Angle When Thumbscrew Is Set

neer and artist combines in a unit the work of T-square, triangle and drawing board. It consists of a board with clamps to hold a sheet or pad of paper, two nickel-plated swinging parallels to one end of which a special thirty-forty-five-sixty-ninety degree triangle is fixed. The small knob holding the triangle in place can be loosened to set the triangle in any desired position. Once set, it can be moved to any part of the sheet to draw lines parallel, perpendicular or at any angle. There are no loose parts. Board, pencil and

compass can be stowed in a brief case for work afield.

2543
STOCK SUPPLIED FRESH WATER BY AUTOMATIC FOUNTAIN

Poultry and live stock can be kept supplied with fresh water by an automatic fountain connected to the domestic system. A float controls the flow of water into a reserve tank and into the trough. Only enough water to fill the trough to a predetermined level is permitted to pass from the reserve tank. As it is consumed, the float acts to fill the trough again. The lower part of the fountain acts as a foundation and as the heating unit in cold weather. A lamp-type heater within the lower compartment supplies sufficient heat to keep the water from freezing, even in extreme climates. The trough is arranged so poultry can climb up two or three steps to reach the water, but a netting prevents roosting above the trough.



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

Chas. Jonathan Haynes

aren Knight Co. 136 9-12-25

Battling Sea Monsters *on the* Bottom



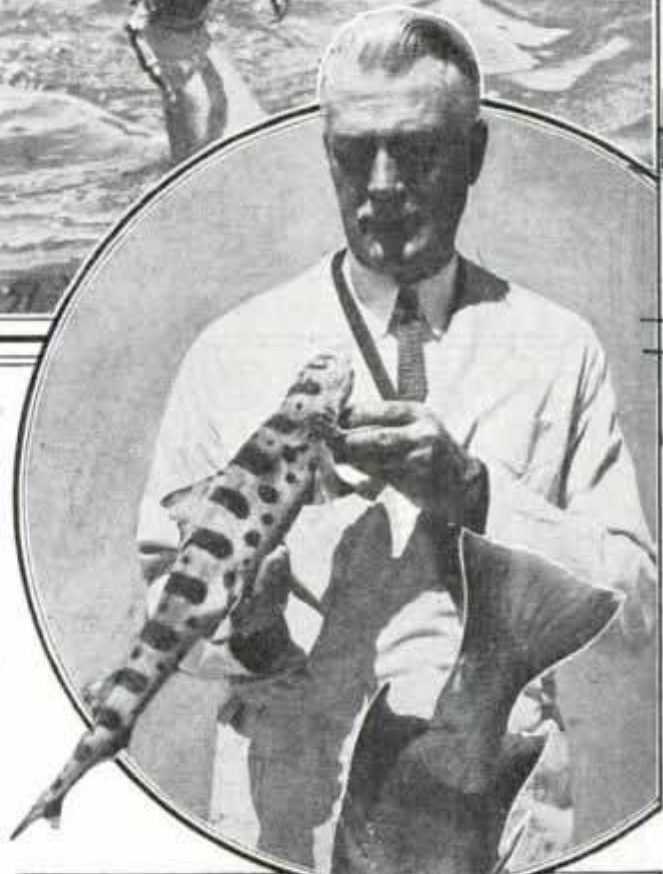
216 J. F. Frenia
Redondo Beach
Calif.
By HOUGHTON RALPH

As told to Thomas E. Stimson, Jr.
10555 Holman Ave

SWIMMING on the bottom hoping to spear a fish for dinner, I suddenly felt myself gripped from behind by sticky arms that clamped around my body. I saw a fat brown tentacle swiftly wrap itself around my right arm and I knew, almost before I looked, that I had been attacked by a giant octopus that had stalked me just as I had been stalking the school of perch.

Fortunately, I was in shallow water that came only to my shoulders and I struggled to my feet. My arms were powerless in the grip of the eight-armed monster and I stumbled ashore before it could wind other tentacles around my legs. The creature measured eight feet across and it took three of us to tear it loose. Had I been in deep water or had there been a rock near by for the octopus to hold to, I would have been drowned.

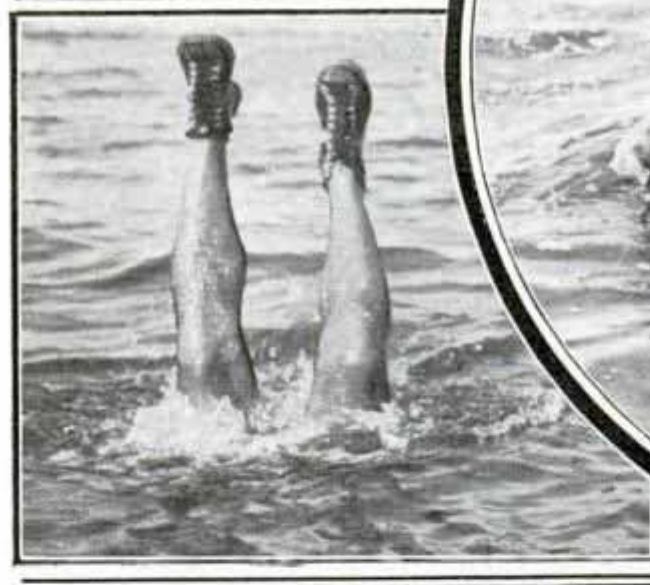
I've had other encounters with the octopus but most of them have been with small timid creatures that eject a cloud of ink and then swim hastily away. Unless very sure of its prey even a small one keeps a few of its arms anchored to a rock and grips you with its others, holding on with



A Spider Crab, a Baby Leopard Shark and a Sheeps-head Speared by the Submarine Fisherman Who Stalks the Fish in Their Own Element

Houghton Ralph 216 J. F. Frenia
Redondo Beach Calif.

Los Angeles, Calif.



Top, Diver Swimming with the Feeler of a Lobster That Got Away; Below, Left, Submarine Fisherman Going to the Bottom; Right, Not Father Neptune but a Deep-Sea Angler

a suction grip so strong that you pull the creature apart in breaking away.

One of the most vicious fish of the sea I have encountered in my hobby of prowling around the floor of the sea dressed in trunks and water glasses is the moray eel that can strike like a snake and is armed with a full set of gleaming teeth turned back into its mouth so it rarely lets go. My fingers were ripped to the bone once when I foolishly inserted my arm among some rocks where a moray was lurking.

Another time while prying abalones from a reef thirty feet below the surface I was attacked by a school of fifteen-pound sheepshead. Normally docile, the sheepshead live on shellfish and this group had been driven into a frenzy by the substance emitted by the abalones as I tore them loose. The fish tried to pull the abalones from me and when I re-

sisted they opened their wide mouths, revealing rows of sharp teeth, and drove at my body. I dropped the abalones then and there and rose hastily to the surface.

Abalones themselves are dangerous if a diver is careless. The edible shellfish has an extremely strong suction muscle with which it grips the rock, its body being protected by a single basin-like shell of mother-of-pearl. To free one from the rock you force the sharp edge of a tire iron under the shell and pry up. If you

E 485
**DARING MOTOR BIKE ACROBATS
ACT ON PARALLEL BARS**

slip and catch a finger under the shell, the abalone clamps you to the rock. Some divers have drowned and others have escaped by cutting off their fingers when this happened.

I have made surface dives down to forty-two feet to free a fouled anchor but swimming only twenty or thirty feet below is more pleasant. The glistening sandy floor, the pale green tinge of the water, and the waving trunks and fronds of an adjacent kelp forest make the floor of the sea along southern California an alluring place. Once on the bottom I stay there by bracing against a rock or by kicking my feet. When in good diving condition a swimmer can go down repeatedly for one and one-half or two minute periods. Skin divers keep their mouths open on the way down to help equalize the pressure on their ears. Most of us dive from the surface by kicking up our feet and swim down instead of carrying a weight. To make a deep dive, take a moderate breath at the surface and then, when you feel that you must come up, exhale part of the air. That helps you to stay down a little longer.

Sometimes, to enjoy the subterranean scenery, I wear a homemade diving hood weighted with seventy-five pounds of lead with which I can sit comfortably on the bottom. The fish swim right up to my faceplate and peer inside at me, and eat right out of my hand when I tear a few clams from the rocks for them. With the hood, supplied with air from above, I've sat on the bottom below a fishing pier and watched the fish nibble at the hooks of expectant fishermen.

When stalking fish I wear Japanese pearl diver's glasses or special glasses made of pyralin clamped over my eyes to prevent distortion. The glasses must be watertight. I also wear tennis shoes and canvas gloves to keep from being scratched on the rocks. The best weapon is a three-pronged spear with the barbed points filed to needle-sharpness, attached to a four or five foot pole.

Fish are extremely curious and that's why I usually bring home a catch even

(Continued to page 132A)



© Planet News
**One of the Many Stunts Performed by This Team of Acrobats;
Note How the Bars Are Attached to the Motorcycle**

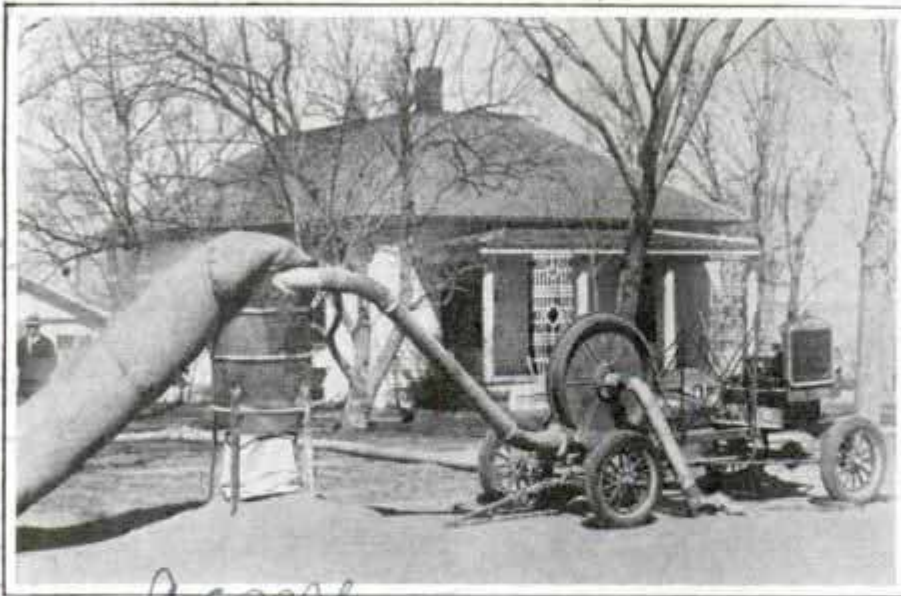
Breath-taking feats at the royal tournament at Olympia, England, include a thriller in which soldier-acrobats do stunts on parallel bars mounted on a speeding motorcycle. While one member of the team operates the motorcycle, two others go through their daring routine, precariously balancing themselves in various positions on the bars.

☐ Clean, white paper can be made from cornstalks but the cost is much greater than in manufacturing it from wood pulp.

H. S. Cover Co., Chippewa Ave. South Bend, Ind.

at Catterick Camp Yorkshire England

no information suggested Paper Section News Bulletin



Acme
This Big Suction Machine Removes Coating of Grit from Grass After Dust Storms; It Works Like a Vacuum Cleaner

DUST-COVERED LAWNS SAVED BY GIANT CLEANER

As a result of the recent dust storms in the western states, a new business has sprung up. Dust settled so thickly on lawns that it threatened to destroy the grass, so two Kansans devised a way to remove the dust-and-sand coating. A giant vacuum cleaner, mounted on an automobile chassis, was rigged up and set to work on the lawns, with good results. The machine has large suction pipes in which the dust and sand are drawn, to be deposited at a central point. The cleaner is easily moved from one lawn to another.

6547
CAUSE OF RADIO ECHO SOUGHT BY MOBILE LABORATORY

Radio waves can be sent spinning, corkscrew fashion, toward a definite target from a portable radio laboratory used by Harvard university scientists. The labora-

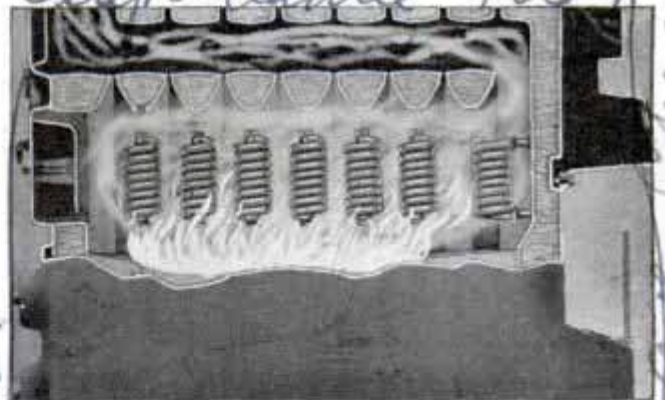


Cambridge, Mass
2637
© Harris & Ewing
This Compact Laboratory on Wheels Is Used by Scientists to Study Cause of Radio "Echoes"

tory is mounted compactly on an automobile chassis for use afield. One of several experiments being conducted with the apparatus concerns radio "echoes," the apparent rebound of radio waves when they strike clouds of electrons about sixty-two miles above the earth.

570
FUEL COSTS SAVED BY COPPER COILS TAPPING BOILER

Designed to increase boiler efficiency in home or industrial furnace, and particularly valuable when converting from coal to oil or gas burner, copper alloy coils which tap the boiler wall can be installed directly in the firebox. Water is led away from the boiler at the base of the coil, heats rapidly and rushes back from the top of the coil to circulate through the



Drawing Shows How Copper Coils Tap Boiler Wall and Lead Water into Firebox for Rapid Heating

boiler again. Coal-burning boilers are built to operate most efficiently around 800 degrees Fahrenheit, and cannot absorb the more intense heat of the gas or oil fire. Instead of replacing the boiler or adding boiler units, the copper coil units can be installed inexpensively. One foot of the alloy surface equals three feet of cast-iron boiler surface. The manufacturer estimates that boilers having forty to fifty per cent heating efficiency can be stepped up to seventy-five or eighty per cent efficiency by this method. Four coils would be required in the average home furnace, paying for themselves in fuel saving.

Heating Efficiency

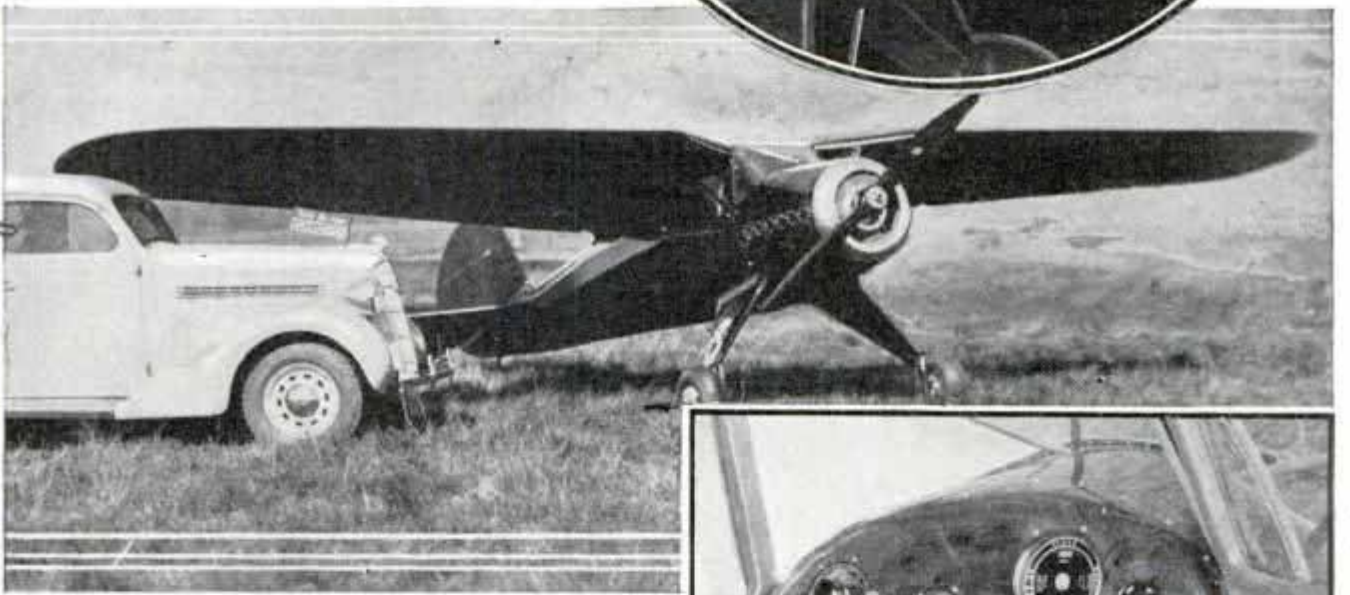
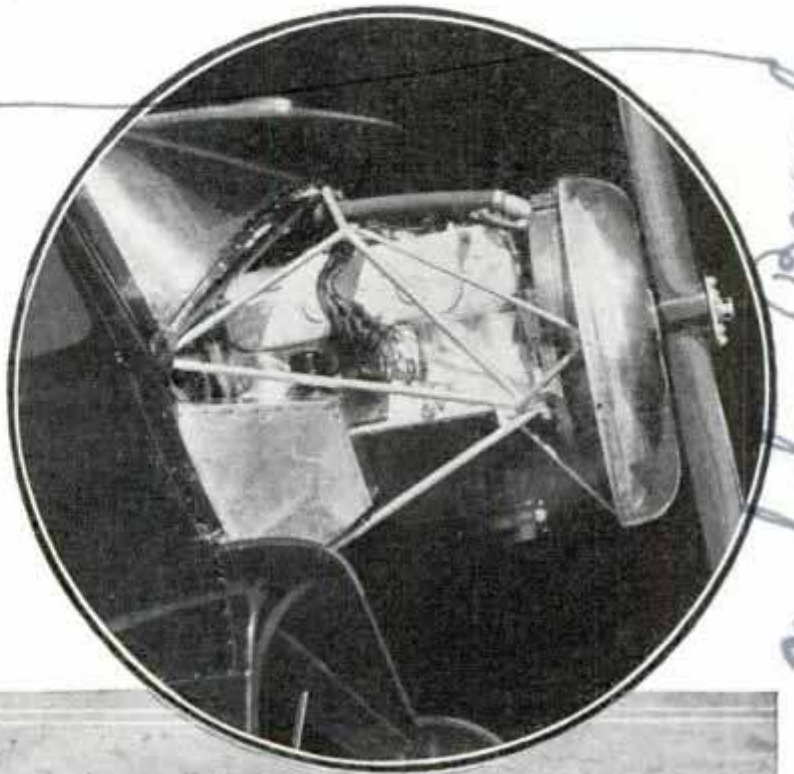
3544
Copper
to

341 Massachusetts
 Detroit, Mich

Built by Fabrik Aircraft Co. Marshall, Mo.

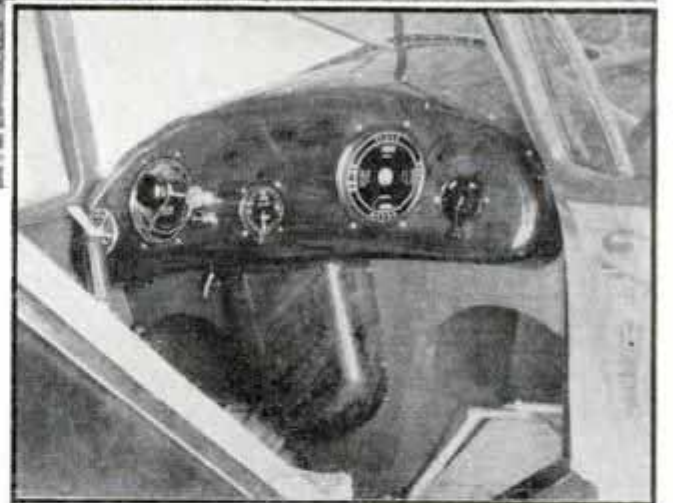
Auto-Engined Airplane Built for Low Price

Powered by a standard, six-cylinder Plymouth engine, a small airplane constructed at low cost has been tested successfully and another ship of the same type has been ordered by the U. S. department of commerce. While no price has been set, the plane will sell at a much lower figure than the average ship now on the market, since its engine can be obtained for approximately \$200. Airplane motors giving the same performance cost three to four times as much. In addition, maintenance and replacement costs will be lower because parts may be obtained from automobile dealers in



Center, Automobile and Light Plane Driven by Similar Engines, both Six-Cylinder; Top, the Plymouth Engine Installed in the Light Plane; Bottom, Auto Instrument Panel Adapted to the Plane

every part of the country. The plane is a two-place, high-wing monoplane with a span of thirty-two feet, and weighs 1,075 pounds empty. The useful load is 536 pounds. It has a maximum speed of 120 miles per hour and a cruising speed of about 100 miles per hour. Climbing speed with only the pilot aboard is 1,000 feet per minute. Landing distance, from the point of touching the ground to stop, is 200 feet, with a rated landing speed of forty-two miles per hour. Fuel consumption is four gallons per hour and its tank holds seventeen gallons of gasoline. Dual controls are



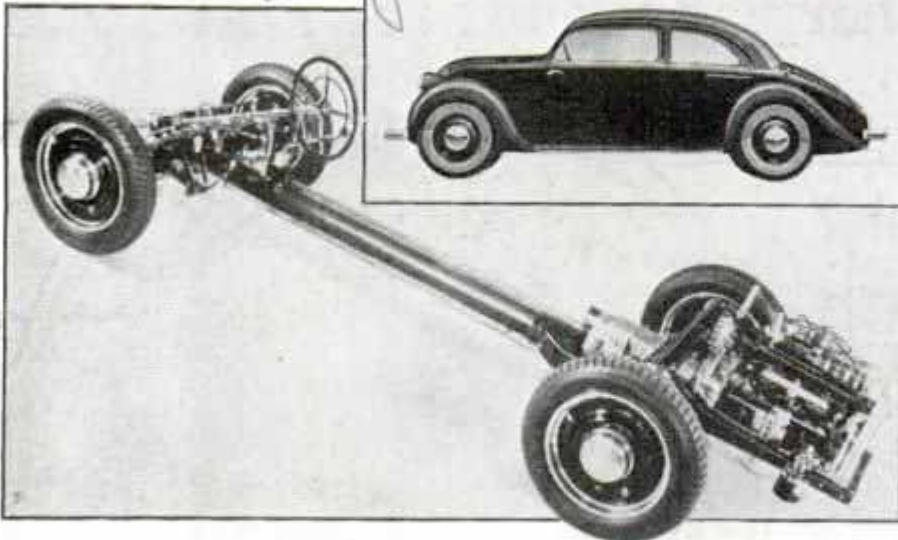
provided for instruction purposes. The ship has an instrument panel from the Plymouth converted to aircraft use.

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.

Includes Dealey
 Automobile Co.

100
 412

Handwritten: Daimler-Benz & 456 Stuttgart-Hinterstuckheim Germany



Auto Chassis Consisting of Hollow Steel Tube through Which Air Flows to Aid in Cooling; Note Rear Engine and Streamline of Body

TUBE FORMS AUTO CHASSIS AND COOLS MOTOR

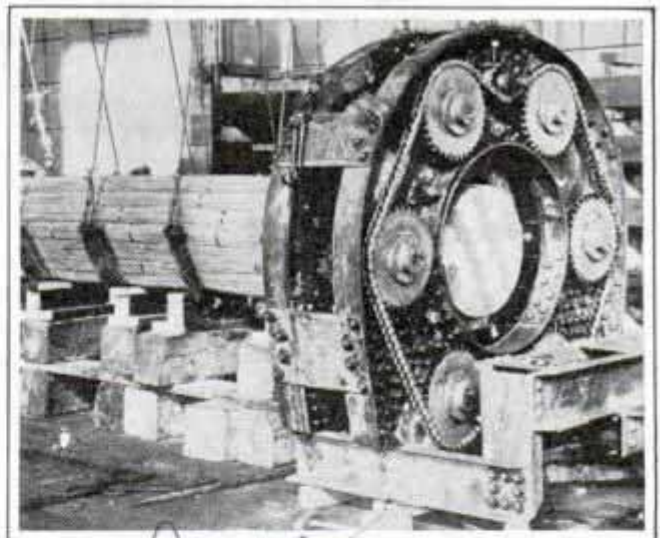
One German car has a chassis consisting of a single strong steel tube connecting the front and rear axle assemblies. At the rear it forks into a "U" extending beyond the axle to form a bed on which the rear-mounted engine rests along with the clutch, rear axle and gear box. Two strong steel cross members, extending out on either side and welded to the tube, help support the body. When the car is in motion a stream of air flows through the pipe to assist in cooling the engine although there are also louvers for that purpose.

motor built on a solid aluminum base develops eighty horsepower at 4,500 revolutions per minute. By using aluminum alloy as a major assembly, this small power plant offsets the handicap of weight that is an obstacle to the conventional high-speed motorboat. It is a four-cylinder, four-cycle engine burning ordinary aviation gasoline without supercharger or overhead valves. Weighing 372 pounds, its weight per horsepower is 4.65

pounds, and it has a 129.93-cubic-inch displacement. The motor has a counterbalanced crankshaft, aluminum pistons and separate cylinder block and base.

8582

BIG BRIDGE CABLES "SQUEEZED" BY POWERFUL JACKS



Reverie
Chain Drive Operates Jacks Which "Squeeze" Together the Wires to Form a Bridge Cable

8550

LIGHTWEIGHT MARINE MOTOR HAS ALUMINUM PARTS

Capable of driving a sixteen-foot speed boat at sixty miles an hour, a lightweight



Four-Cylinder Engine Being Installed in Small Speed Boat Can Drive It Sixty Miles per Hour

After the 17,464 wires which make up one of the suspension cables of the San Francisco-Oakland Bay bridge have been spun, a huge squeezing machine is slipped over the wires. A chain drive then brings six seventy-five-ton jacks to bear on the cable from all sides, compacting the wires into a circular rope less than twenty-nine inches in diameter. The compacting machine travels the full length of the cable, squeezing as it goes, thus giving the finished cable great strength.

Handwritten: Universal Motor Co

of The Sun, 220
Broadway New York

Be your Own Weather Man



PART I

MAKING a hobby of the weather—being your own weather man and able to make accurate forecasts for your own locality—may seem off-hand to be impossible without years of scientific training and a great battery of expensive instruments.

Actually, you need just three things:

Good enough sight to observe the drift of clouds or the shifting of a weather vane.

Knowledge of a few simple facts about general weather behavior.

A reliable barometer for measuring the ever-changing pressure of the air upon the earth.

Requirement number three is the only one that costs anything, and a good aneroid barometer can be bought in almost any instrument shop for less than \$20—even as little as \$12.50 for a business-like, brass-mounted instrument made by a dependable manufacturer. It will not be as accurate to a fine point as a \$250 barometer but it will serve ordinary purposes admirably.

Above, a Modern Barometer and Weather Indicator; Below, Old Mariner's Barometer

After one understands a few general facts about the way weather "works"—for there is nothing haphazard or hit-and-miss about the alternation of good weather and bad, of rain or sunshine or snow or high winds

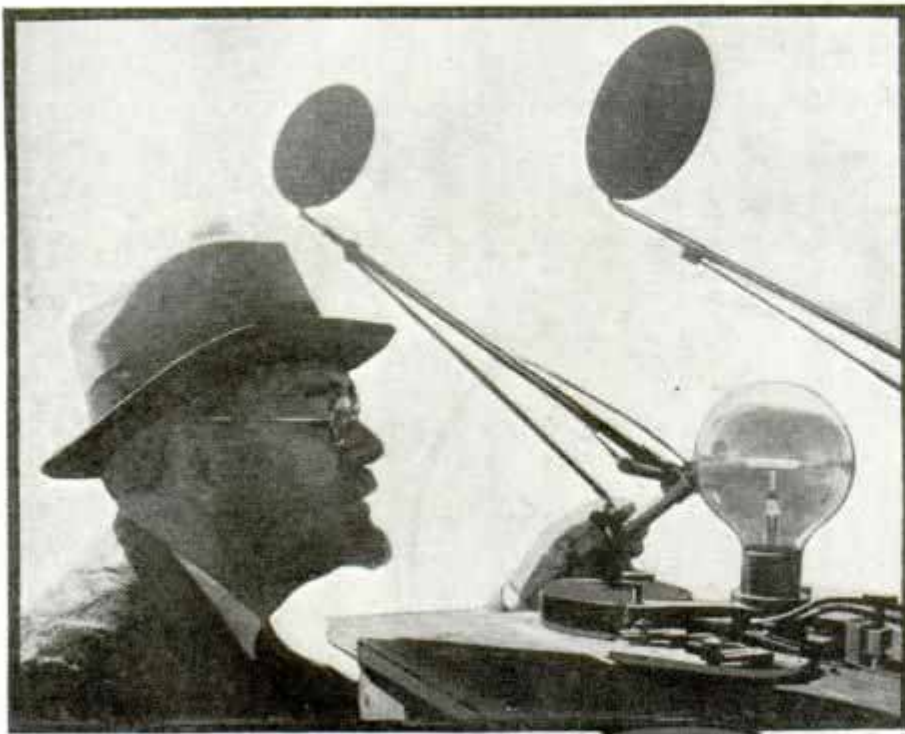
—the atmosphere takes on an entirely new significance. Instead of being just something that happens, a complete mystery, the weather becomes a fascinating laboratory where gigantic forces are always at work in an orderly though sometimes frightfully destructive way. The amateur forecaster, through his knowledge of what is happening and what is likely to happen, is privileged to occupy a choice seat for the observance of these mighty forces at work.

First of all, he must have a knowledge of what is meant by a "barometric high" and a "barometric low," for it is the succession of those so-called pressure areas across the face of the country that causes the changes in the weather.

Broadly speaking, the unequal heating of the face of the earth and the irregularity



Edmund A. Paul & Co



Above, Instrument Which Measures the Energy of Sunshine

of its surface cause the air to pile up in some spots and to become thin in others. A thick spot is, of course, a high, and a thin spot is a low. When the air is piled up, its weight presses on the mercury in a mercury barometer, or on the plates in an aneroid barometer, and is registered on a scale marked in inches. A reading above 30 inches is considered a high; below 30 inches, a low. For accuracy of measurement, most barometers are arranged to read in hundredths of an inch.

Inasmuch as a barometer measures the weight of the air, changing as the weight changes, it will be seen that it is a very important instrument to a forecaster. It tells him when a given pressure area is passing away and being succeeded by another of different kind.

In connection with that information, one must know that the piled-up or the scooped-out air tries to equalize its pressure so that, naturally, it flows spirally out from the center of a high in clockwise fashion, and spirally toward the center of



Releasing Pilot Balloon, and Weather Forecaster Synchronizing Weather Events Reported by Radio

a low, traveling in a direction against the hands of a clock and tending to fill up the shallow spot.

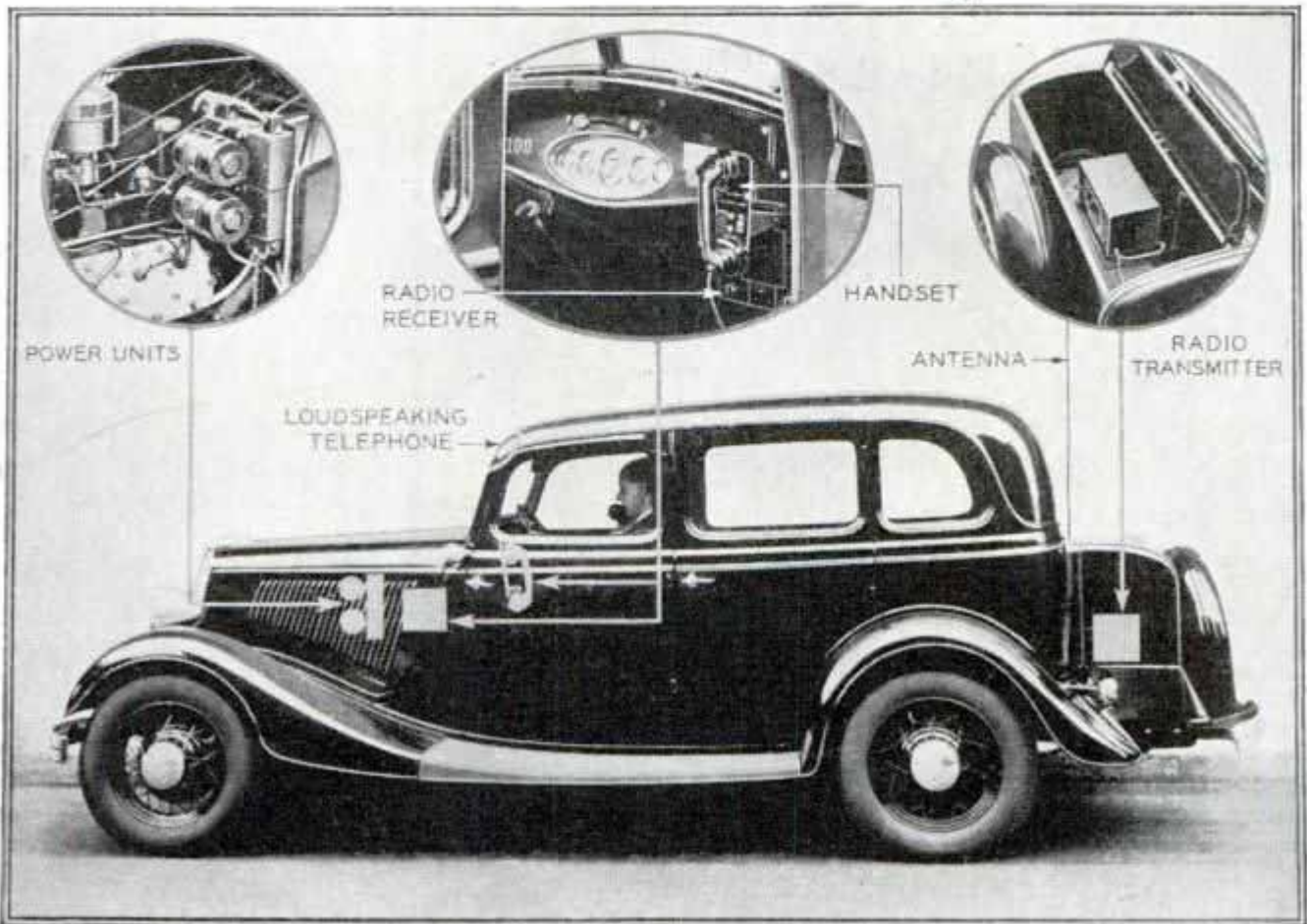
For reasons having to do with the rotation of the earth and several other matters that are extremely technical, these highs and lows normally drift at varying speeds across the United States in a general west-to-east direction. Their paths are not hard and fast—no two weather maps were ever known to be exactly alike—and it is that invariable rule of variety that makes the drama of the weather so fascinating and at times so exciting.

For, even though you watch your barometer faithfully and take regular readings, so that you know exactly whether the pressure is falling or rising, you cannot tell from that fact alone whether the storm center is

(Continued to page 126A)

1950 roadway
newspaper

Two-Way Radiophone Aids Squad-Car Work



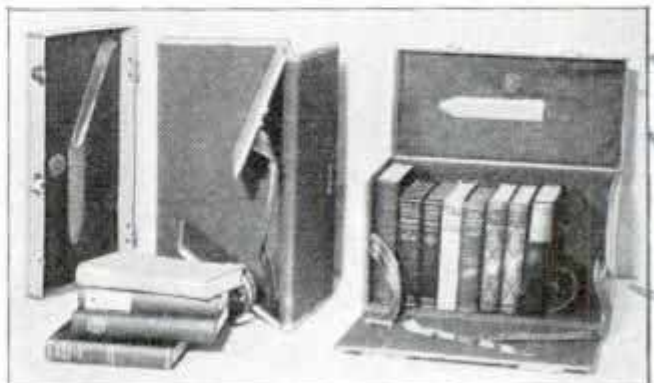
Insets Show Parts of Two-Way Radiophone System and Their Location in Police Car (Below); Note That Transmitter Is Installed in Trunk; Phone Is Located Conveniently on the Instrument Panel

Operating on ultra-high frequency channels, the latest police-car radio system enables the motor patrolman to report to headquarters and to receive orders without leaving the squad car. To carry on a two-way conversation, the patrolman lifts a telephone from the instrument board. The first sound of his voice automatically puts the car's transmitter on the air. When he stops talking, the transmitter switches off. The system, designed by Bell Telephone laboratories, has a transmitting power of five watts and is held accurately to its frequency by a precisely cut crystal. The six-tube receiver is ready at all times to announce messages from headquarters. Police cars at Evansville, Ind., are equipped with the radiophones.

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.

BOOKS HELD FIRM BY SPRING IN COLLAPSIBLE CARRIER

Accommodating one to a dozen books which are always held neatly in place by a spring book end, a collapsible book carrier can be taken apart when not in use. Its five sides tuck away snugly into the cover. The case is of calf leather, and a paper knife is encased in a sheath stitched in the top. No matter how many books are carried, they will remain upright.



When Books Are Removed, Case Folds Up; Note How Spring at Right Holds Books Upright

463 West St.

2599
Chouch & Fitzgerald Co.
400 Madison Ave.

Healing Drug Supplied by a Common Insect

Bureau of Entomology, Dept. of Agriculture, Washington, D.C.

Allantoin, a healing substance useful for treating wounds, can be obtained from the fly, in the maggot stage. Sterile maggots, white little creatures that, in appearance, are unlike the maggot born and raised under everyday conditions, have been used since the World War for healing deep infections that fail to respond to ordinary surgical methods. In seeking better ways of rearing and shipping the sterile maggots, Dr. William Robinson discovered that the creatures were giving off allantoin. The substance is particularly useful for "non-healing" wounds, such as chronic ulcers and severe burns. After a few treatments, pinkish granulation tissue begins to grow and soon the tissues knit together. Another feature is that allantoin will heal a deep wound from the bottom up. The substance, which is bland, odorless and harmless, is

Abbott Laboratories



Top, Healing Substance Produced by Sterile Maggots (Shown in Tube at Center); Bottom, Watching Development of Maggots



found in other insects and in plants. It was used a quarter century ago in England for successful treatment of ulcers.

HELP FOR ASTHMA IS SEEN IN MIXING HELIUM AND OXYGEN

Breathing a mixture of helium and oxygen may bring relief to asthma sufferers. A New York physician has suggested this method, believing that helium, the gas used in navy dirigibles, because of its light weight would be easier to breathe and less tiring to the human respiratory system than nitrogen, seven times heavier. Ordinary air contains twenty per cent oxygen, seventy-nine per cent nitrogen and one per cent of other gases. Helium

2543

1178774 New York

Announced at meeting of American College of Surgeons

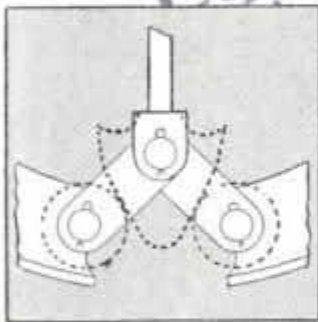
would comprise four-fifths of the blend for the asthma patient and oxygen one-fifth. Deep-sea divers afflicted by the "bends" have used the mixture beneficially.

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

Co. Box 614
San Jose, Calif

BRAKE PRESSURE IS BOOSTED BY TOGGLE JOINT

Front wheel braking efficiency can be stepped up on Fords by a toggle joint arrangement which replaces the usual operating wedge and rollers.



With half the pedal pressure applied to the regulation brake, the braking power can be increased 100 per cent. The effect is

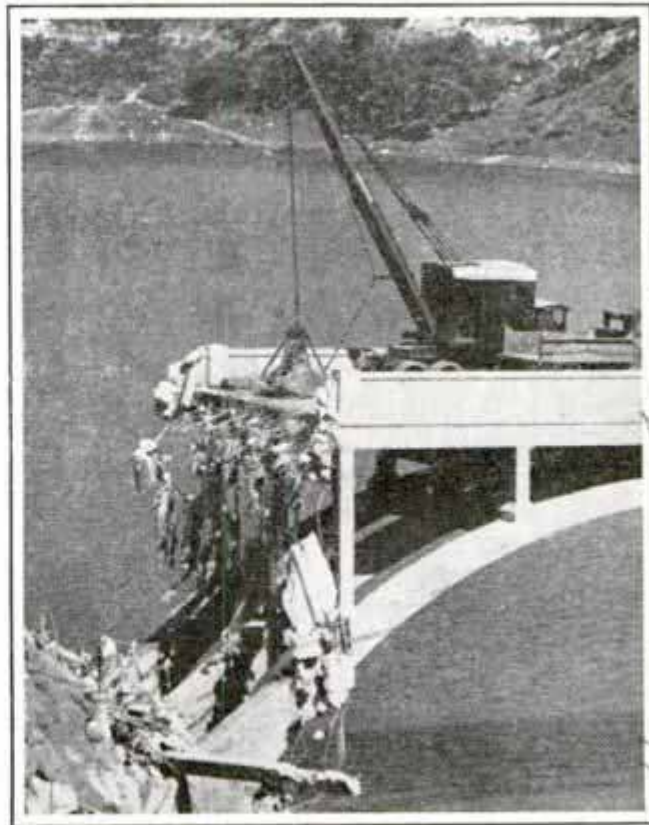
to put sixty per cent of the braking load on the front wheels of the automobile and eliminate any tendency of brakes to groan and chatter.

SHIRT IS KEPT IN PLACE BY RUBBER GRIPS

Shirts that persist in bagging at the waistline can be held down firmly by a pair of elastic grips attached to the inner seam of the trousers at each side. Shaped like the top of the letter "T," the one and one-half inch horizontal rubber band is eight inches wide, and three inches deep at the stubby trunk of the "T." Pins, encased in rubber sheaths, fasten the bands to the trousers. Friction then holds the shirt down smoothly and keeps the trousers up.



Rubber Grip Attached to Band of Trousers Replaces Belt and Keeps Shirt in Place



Wreckers Pounded This Bridge to Pieces and Loaded It into Trucks with a Steam Shovel

BIG SHOVEL USED AS HAMMER IN WRECKING BRIDGE

Pounding the concrete bridge to pieces and then scooping away the debris, a steam shovel did double duty for wreckers tearing down a span over a Southern California dam. The heavy scoop was lifted high and then dropped, jaws gaping upon the bridge. Taking a big bite of broken concrete, the shovel dumped it into trucks.

SIGNS ARE LETTERED QUICKLY WITH PLASTER PUSH-PINS

Inch-thick plaster letters with push-pins for mounting make sign writing a quick job. Alphabets and numerals in various sizes and types are provided. The signboard may be of any fibrous or plasterboard material, or of soft wood which can be made into an attractive background for the white letters by covering it with felt or velour of contrasting color.



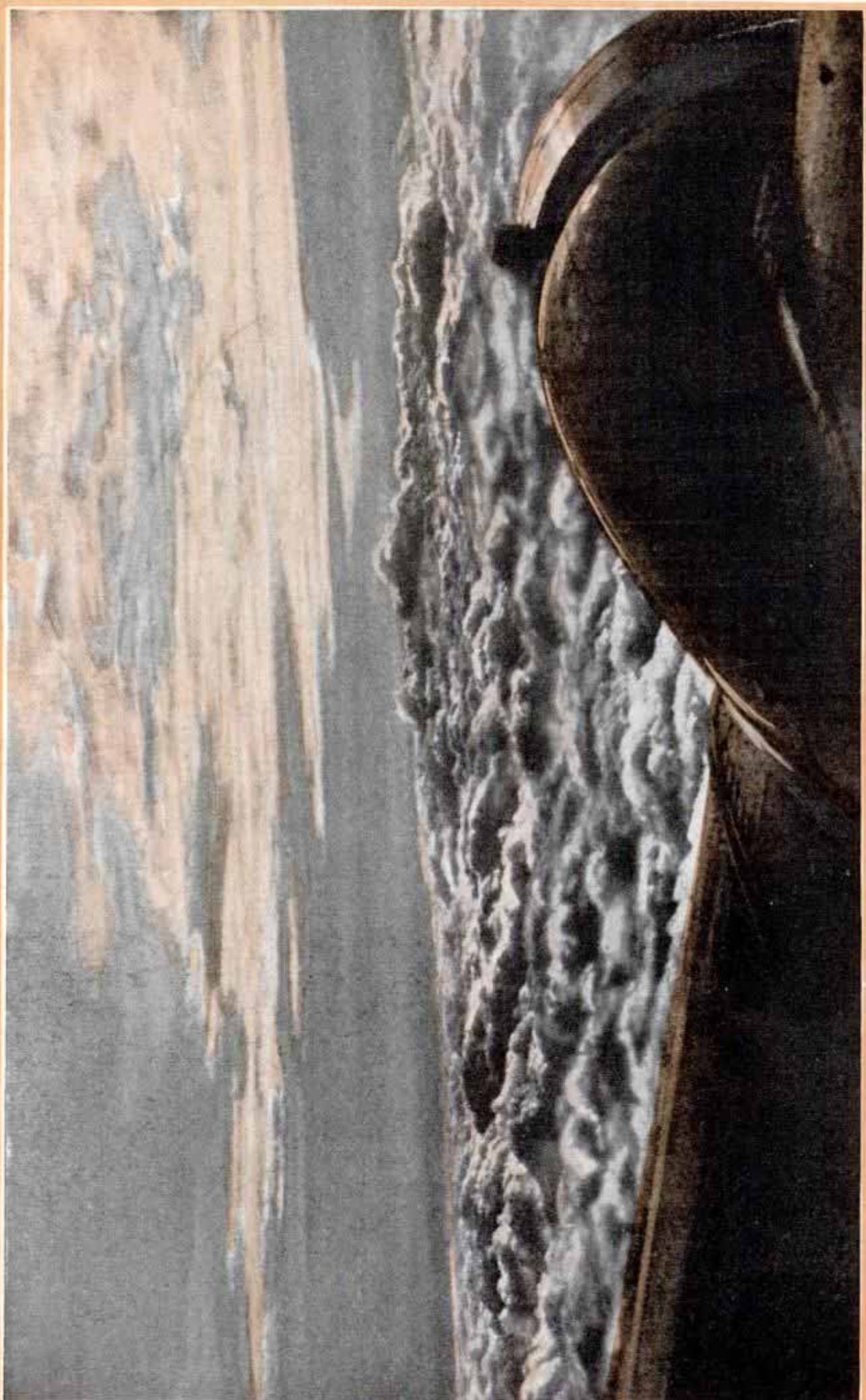
Kindall Ford 1410.
Cedareidge Ave. Los Angeles, Ca

Com.

Los Angeles, Calif

Walter Rustling

L. L. McLogan Sign



Here's the Sub-Stratosphere, a New Avenue of Travel up Above the Clouds Which Throw Obstacles in the Paths of Other Forms of Transportation; the Picture Was Taken from a TWA Douglas Airliner as It Left New York on Its Overnight Flight to Los Angeles



Supercharged AIRPLANE CABINS NEXT

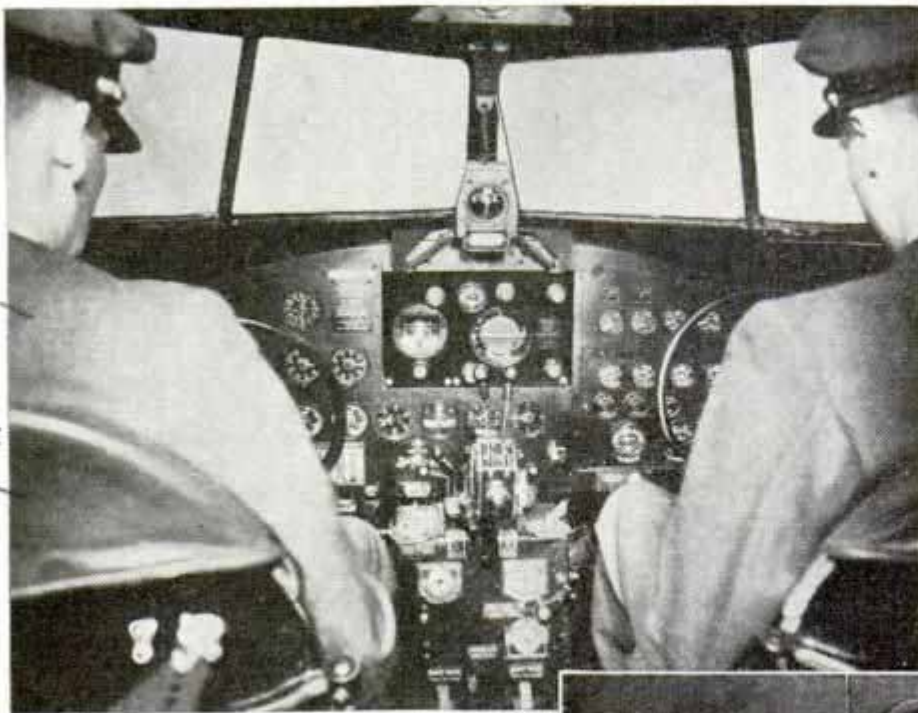
CONVINCED by Wiley Post's high-altitude experiments that commercial flying in the sub-stratosphere is both safe and practical, air transport companies are preparing to boost the ceiling of transport flight from about 12,000 feet to 20,000 or 22,000 feet.

The leading companies are cooperating with the government and aircraft manufacturers in an effort to make scheduled sub-stratosphere flights in the near future. The designs of planes have even been laid down and approved. They are monoplanes of low-frontal area, with retractable undercarriages and larger wing spread than at present. Three and four-bladed controllable-pitch propellers have been made to give efficient performance at various cruising altitudes. When set into low gear or a flat pitch, they give satisfactory takeoff and climb. In high gear they give fast speed at high altitudes.



Top, Cabins Like This Will Soon Be Supercharged; Below, Wiley Post Entering Plane in His Flying Suit

The major problem in stratosphere flying lies in the loss of engine power. In a test with a Curtiss supercharged engine several years ago, it was found all power was lost at an altitude simulating 55,000 feet. But with the latest supercharging



We not only have to supply fresh air, we must also take care of waste air. At 20,000 feet the exhaust port would have to be a pressure-controlled affair, to let the air escape at the same rate at which it comes in.

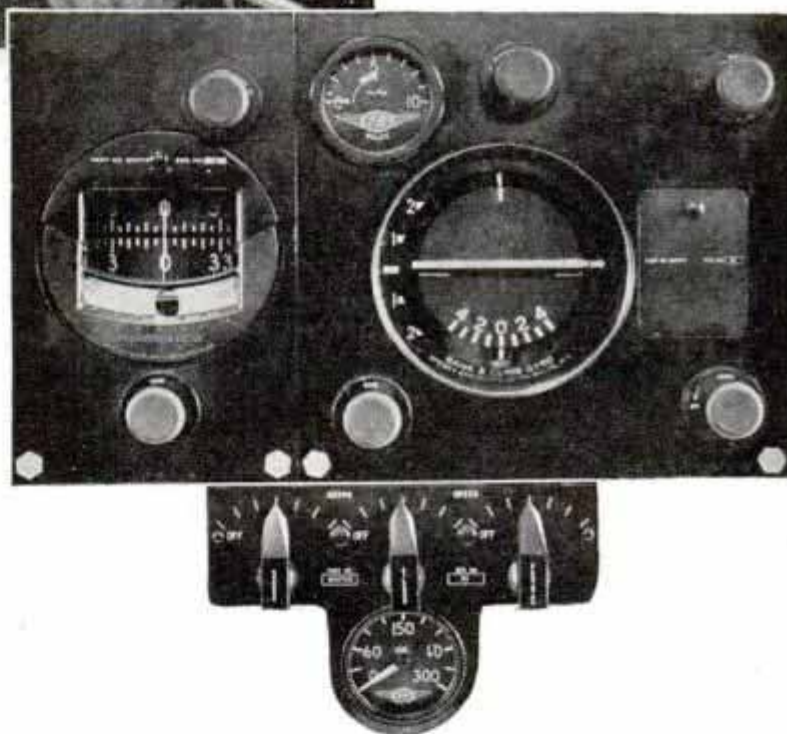
"At present the passengers, not the planes, place the limitations on high-altitude flying. Present-day commercial transports, with fine instruments and supercharged engines, have a service ceiling at 25,000 feet.

devices, doped fuels, and other improvements, the practical ceiling for transport flight is higher than ever before.

The comfort of passengers in the sub-stratosphere involves supplying them with oxygen and equalizing the air pressure. Preston R. Bassett, chief engineer of the Sperry Gyroscope company, declares transport operations between 10,000 and 20,000 feet are hindered at present, not so much by lack of air pressure as by lack of oxygen.

"I don't believe passengers would ride in the sub-stratosphere if they had to take oxygen through a tube," he said. "We must air-condition the whole cabin, and by this method we can build up a pressure equivalent to that which prevails around 10,000 feet without causing the least discomfort. By supercharging the atmosphere, that is, by increasing its density, we automatically increase the amount of oxygen. But if this is insufficient, we can add oxygen from a tank.

"By soundproofing and insulating cabins against noise we have automatically solved many of the problems necessary to supercharging an atmosphere. A supercharged cabin must be very tight. We now know how to make cabins air-proof and water-proof, and these improvements are practical steps toward air-conditioned cabins.



Cockpit of Douglas Soundproofed Transport, and Gyro Pilot Which Takes Much of Work from Human Pilot

Without air-conditioning, however, pilots must be careful with passengers. They can not ascend or descend quickly without causing considerable discomfort. The high-speed transports coming from Florida must begin their gradual descent over Philadelphia in order to land at Newark. This makes it impractical to fly the sub-stratosphere for less than 250 miles."

Research at present concerns the kinds of superchargers which are most efficient for passenger cabins and the amount of air which superchargers can supply at various altitudes. The studies indicate that

(Continued to page 134A)

40, Flatbush Avenue, Brooklyn, N.Y.

Director

PHARAOH PALACES OF BIBLE BELIEVED FOUND IN EGYPT

Study of decorated tiles taken from an Egyptian palace may result in definite location of the places where the Bible stories of Joseph and Moses occurred. The Metropolitan Museum of Art announces that el Kantir, where the tiles were found, in all probability is the city Raamses of the tradition of the oppression. Brick and tiles from the el Kantir palaces bear the names of Egyptian kings, Seti I, Rameses II and others who reigned during the period generally ascribed to the Bible Egyptian record. El Kantir is just beyond the confines of the "land of Goshen" where the Bible says Joseph settled his brethren to have them near him while he dwelt at court. One Biblical passage says, "And they built for Pharaoh treasure cities, Pithom and Raamses. . . . And the Egyptians made the children of Israel to serve with rigor; and they made their lives bitter with hard bondage, in mortar, and in brick."

Service 5/13/35

New York City

REMOTE-CONTROL TOY BOATS GUIDED BY MAGNET

Ocean liners and freighters now sail a toy sea, steer safely past miniature light-houses and shoals and maneuver into port under remote control, with the young master of the playroom as pilot and engineer. Guided and powered by a magnetic control in a boy's hand, the little merchant marine can ply the playroom ocean, put in at sheltered docks for cargo and then ship out for faraway harbors. The pulling force of the power unit is adjustable. Only a half inch of water is needed.

8541

pend.



Boy at Left Is Maneuvering Toy Navy by Means of Magnetic Control Guided under Playroom Port

The Remotrol Co.



Extension Platform in Raised Position for Servicing Electric Lamps on Ceiling

TELESCOPE ELEVATOR WORKS AT TOUCH OF BUTTON

Used in a giant radio broadcast studio, a telescoping elevator rises at the touch of a button to a height of twenty-nine feet or lowers to six feet five inches. This permits it to pass through low doorways. The lifting capacity is 500 pounds, sufficient to carry two men with tools and supplies to the ceiling of the studio to replace burned-out electric bulbs or do other work. Operated by a one-half horsepower reversing electric motor, the platform can be stopped at any height desired. The motor plugs into lighting circuits in the studio without special wiring.

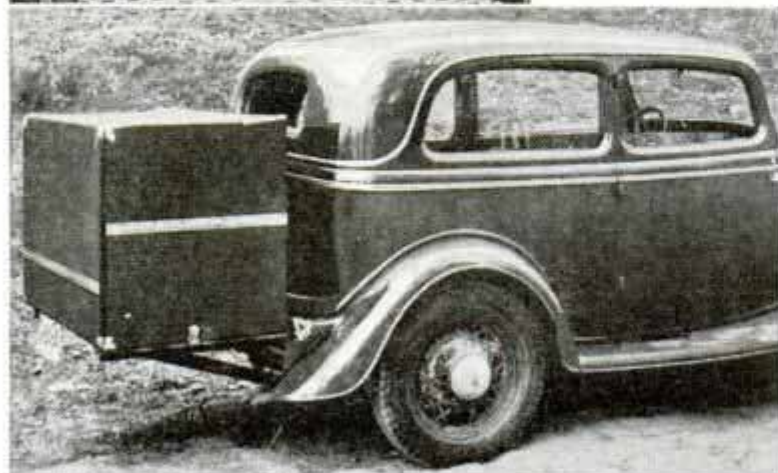
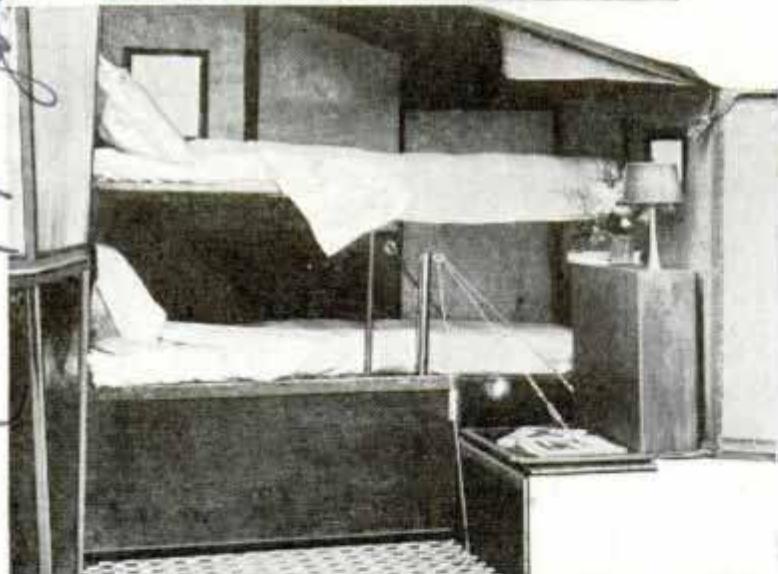
Chicago
206 35 W
J. and S. Search
Economy Engineering Co.
W. J. Search

Hastings, N.Y.

Room with Two Beds Folds in Auto Trunk

Convertible into a room ten times its original size, the latest trunk for the automobile affords sleeping quarters for two persons. The beds are arranged in double-decker fashion, rigidly attached to sup-

porting members. The room is complete to a small reading lamp and mirror. It has a door for protection against rain. When the trunk is closed, it is only slightly larger than similar equipment carried on the racks of automobiles. Extra supporting braces hold it firmly in place, even when it is unfolded and bearing the weight of two persons. The equipment is intended for the tourist who desires a clean and comfortable bed a night, without the expense of hotel accommodations.



8548
**VOICE GIRDLES WORLD
ON LONGEST PHONE
CIRCUIT**

It required just a quarter of a second for a human voice to travel around the world recently in the longest telephone call ever made. Into the mouthpiece in his New York office spoke Walter S. Gifford, president of the American Telephone and Telegraph company. His voice shot across the continent by wire through St. Louis to Los Angeles, then San Francisco and into the short-wave transmitting station at Dixon, Calif. It vaulted the Pacific to the Netherlands Telephone Administration terminal at Bandoeng, Java, 9,000 miles away, and bounded on 7,000 miles farther by radio to Amsterdam. There it dove under the North sea on the submarine cable to London, on to the Rugby radio station of the British post office, stepped into the air again and rode the short waves to Netcong, N. J., and finished the record trip back to New York on telephone lines—23,000 miles in one-fourth of a second. In an office fifty feet away T. G. Miller, vice president in charge of long-distance lines, heard his chief say: "This is another step in the conquest of time and space by man and proves there are no earthly limits to human speech."

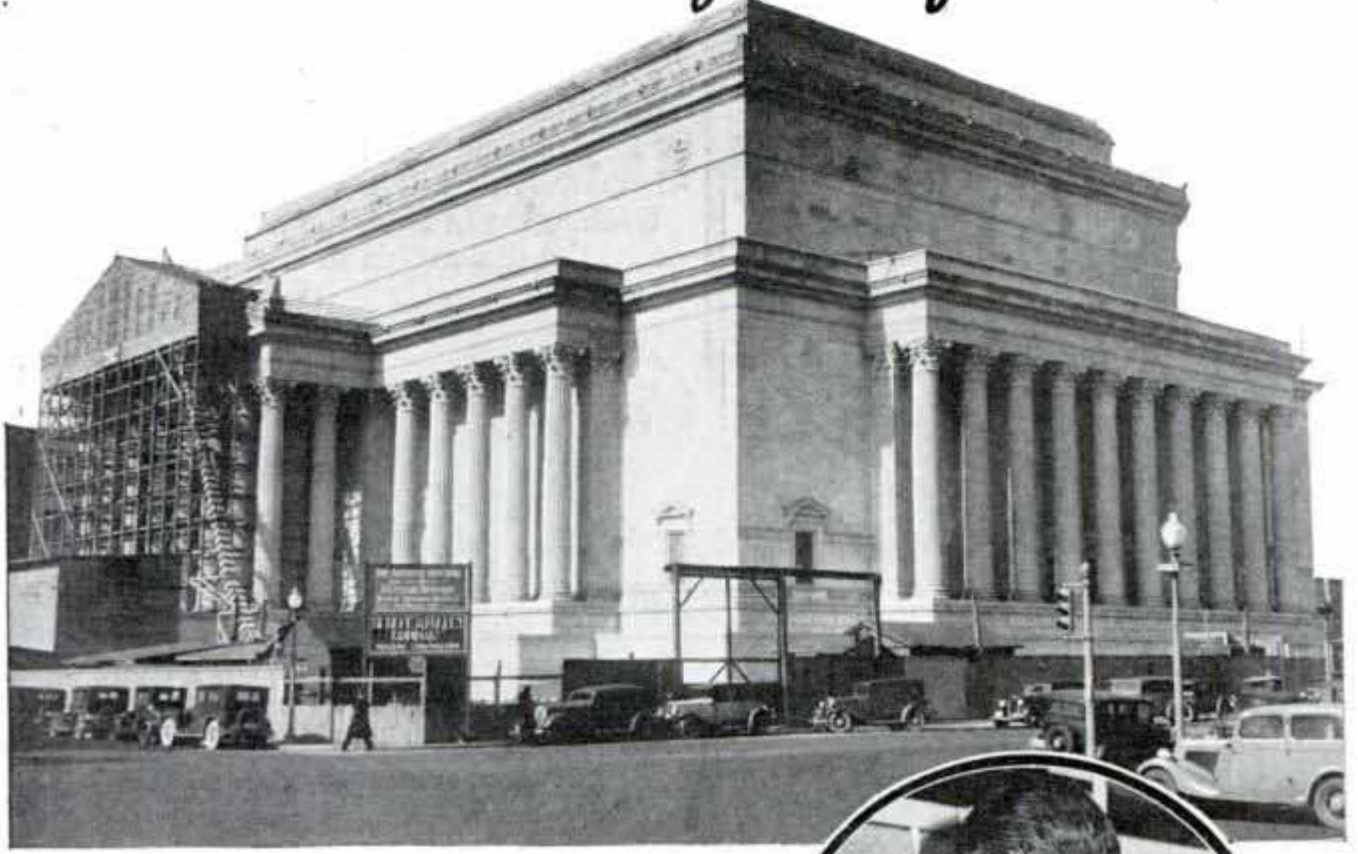
Top, the "House in a Trunk" Unfolded and Ready for the Night; Center, Interior of the House with Double-Decker Beds Made Up; Bottom, the Trunk in Readiness for Travel

maker - Andrew G. Sherrinway Corp. 177 York St. New York

New York 1935

Arlington Hotel
Washington, D.C.

FORTRESS of KNOWLEDGE to DEFY Ravages of Time



WITH the opening of the new National Archives building in Washington this summer, the big task begins of assembling the historic records, treaties, and state papers of the United States under one roof and preserving them for future generations.

Heretofore, these priceless documents have been scattered about in numerous departments and bureaus, some carefully preserved, others more or less exposed to the destroying agencies of nature.

For years one of the most vexing problems facing archivists has been how to preserve the world's records from the ravages of time and the deteriorating effects of heat, cold, smoke, dust and dampness. The Archives building, five stories high and comprising 559,000 square feet of floor space, is expected to solve that problem.

Everything going into the building was tested and recommended by the bureau of standards. The massive exterior walls have few windows, and daylight is excluded altogether from stacks and storage vaults.



Lower Photo © Underwood and Underwood
*The New Archives Building and Volumes Written
in an Ancient Picture Language*



Photos © Underwood and Underwood

Small incandescent lamps supply the necessary illumination there.

An air-treating system capable of handling 330,000 cubic feet of air a minute will insure the purity and proper temperature of the atmosphere. A relative humidity of fifty-five per cent will be maintained in the stacks and storage places, and forty-five per cent in the workrooms. In summer the temperature throughout the building will be eighty degrees, in winter, seventy degrees.

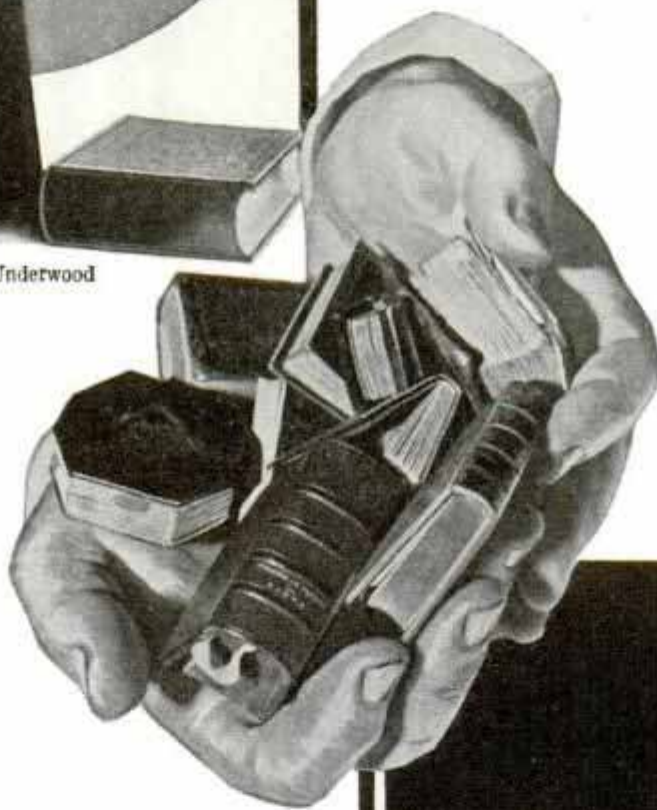
Exhaustive researches show that acid gases, particularly the sulphuric dioxide in smoke, hasten the destruction of paper. To prevent any such acid contamination a new scientific system of washing the air with an alkaline solution is employed. Coated and non-ferrous metals were used wherever metal was necessary, to eliminate dust and the necessity of repainting.

Among the national family papers that will be deposited in this building will be the treaty of Paris, by which Great Britain

recognized the independence of the United States, Lincoln's emancipation proclamation and the resolution of congress declaring war against Germany. There also will be all the original treaties with foreign nations, bearing priceless signatures.

Whether the two most treasured relics, the declaration of independence and the constitution, will be removed to the Archives building rests with the archives council. They are now housed in the library of congress. Both have had several homes. When the British advanced on Washington in 1814, the secretary of state sent the declaration to Leesburg, Va. For many years it was on exhibition at the patent office. It was removed in 1877 to the state department, shortly before the wing where it had been stored was destroyed by fire. On the wall of the state department it was subjected to the peril of fire and deterioration.

(Continued to page 127A)



Lincoln's Family Bible, at Top, and Another Used When He Took Oath of Office; Center, Some of World's Smallest Books, Including Two Miniature Bibles; Bottom, an Ancient Chinese Map

Will Tube-Lighting Supplant Electric Bulb?

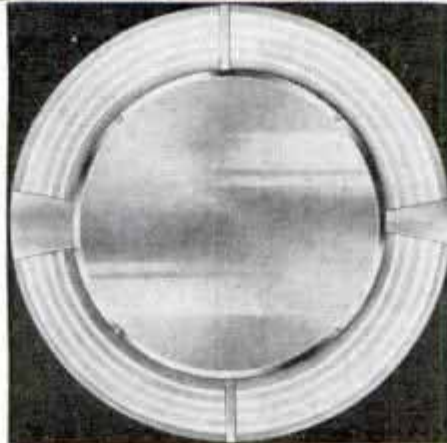
Carls Tex tile Tower
Seattle Wash



Luminaire Tube lighting Co
Seattle Wash

see Sept-1934-401

For years illuminating engineers have been seeking the perfect artificial daylight, a man-made blend of color values that will match those of nature. Good clear daylight, the light that shines down from the north sky on a midsummer noonday, is thirty-two per cent red, thirty-two per cent green, and thirty-six per cent blue. The best that experts have been able to achieve with vari-colored bulbs is twenty-eight per cent blue and thirty-six per cent each of red and green. But now a light has been developed by a new method giving daylight within two points of perfection as defined by the bureau of standards. It is the result of five years of research by Seattle physicists and engineers who began with the knowledge that light generated from pure carbon-dioxide gas possessed the same color proportions as real daylight. High-voltage electric current was sent through a glass tube filled with pure carbon-dioxide gas. The tube shed a clear, smooth glow without distortion or glare. A special electrode was developed which prevented the gas from fading or breaking down. The high



Top, Carbon-Dioxide Lamps Being Assembled; Bottom, Mirror Circled by "Daylight" Tubes Reflects True Color Values

voltage was obtained by a simple transformer such as neon signs require, stepping up the ordinary current used in home and office. The carbon-dioxide tube has no filament to burn out. It does not heat nor crack, and in the laboratory are test units that have been lighted continually for more than five years. The tube has now moved from the laboratory into factory production.

Car Stops If Driver Naps

DEvised to protect drivers if they fall asleep at the wheel, the latest alarm sounds the horn and stops the automobile when the driver relaxes his grip. It consists of a false rim for the steering wheel and is connected to the horn and ignition. Removal of the pressure of the driver's hand on the rim instantly causes the horn to blow and stops the auto by shutting off the ignition. A switch cuts off the device when it is not needed.

Dept of Commerce

Robert Iron Consul

8503

Hamburg, Germany



Customer and Mechanic Watch Mercury Column as Tester Is Applied to Various Parts of Auto Engine

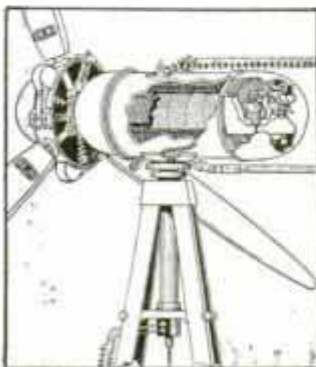
MOTOR TESTER SHOWS OWNER CONDITION OF CAR

Practically anything the owner and mechanic want to know about the condition of the automobile engine is determined by a new testing device called "Pullmotor." One of its features is the fact that readings are visible on opposite side of the tester so the mechanic, working between it and the engine, and the car owner, standing on the other side of the unit, can read the results simultaneously. The tester utilizes the principles of gravity and vacuum, and mercury is used as the standard of measurement. It tests low-speed, high-speed and dual low-speed carburetor adjustments, the fuel line, vacuum booster brakes and vacuum control spark advance and other functions of the auto. Built like a floor lamp, it occupies little space.

8560

FIXED-SPEED WIND GENERATOR HAS VARIABLE PROPELLER

Generating electricity by wind power, an electric plant designed for the farm, summer home or small town residence is equipped with a variable pitch propeller to maintain constant speed. As the wind whirls the three-blade airplane-type propeller at increasing veloc-

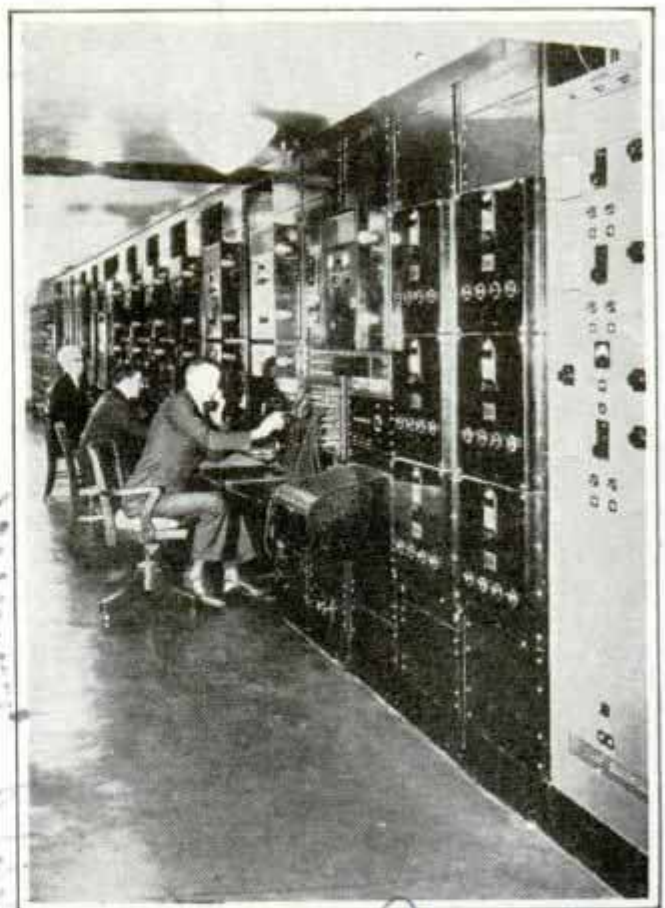


ity, a centrifugal governor operates controls which turn the blades more edgewise into the wind and the rate of revolution remains fixed. It is estimated that such a plant can furnish 200,000 to 300,000 watts a month free of operating expense.

8484

GIANT ALL-WAVE RADIO UNIT SERVES HOTEL

One of the largest all-wave radio receiving systems in the world serves the 2,000 rooms of the Waldorf-Astoria hotel in New York. The elaborate receiving unit has just been enlarged by the addition of equipment especially designed to receive short-wave broadcasts from giant stations in foreign countries. Patrons of the hotel now are offered domestic programs and those from Berlin, Paris, London, Moscow, Tokyo, Australia, South America and Africa. Six programs are available at all times in each room, being selected by the staff which operates the all-wave receiver.



Resembling Large Telephone Switchboard, This Radio Receiver Serves Hotel

Jacobs Wind Electric Co. Wash

Los Angeles Calif

Baled Tin Cans 'Pave' River or Repel Bullets



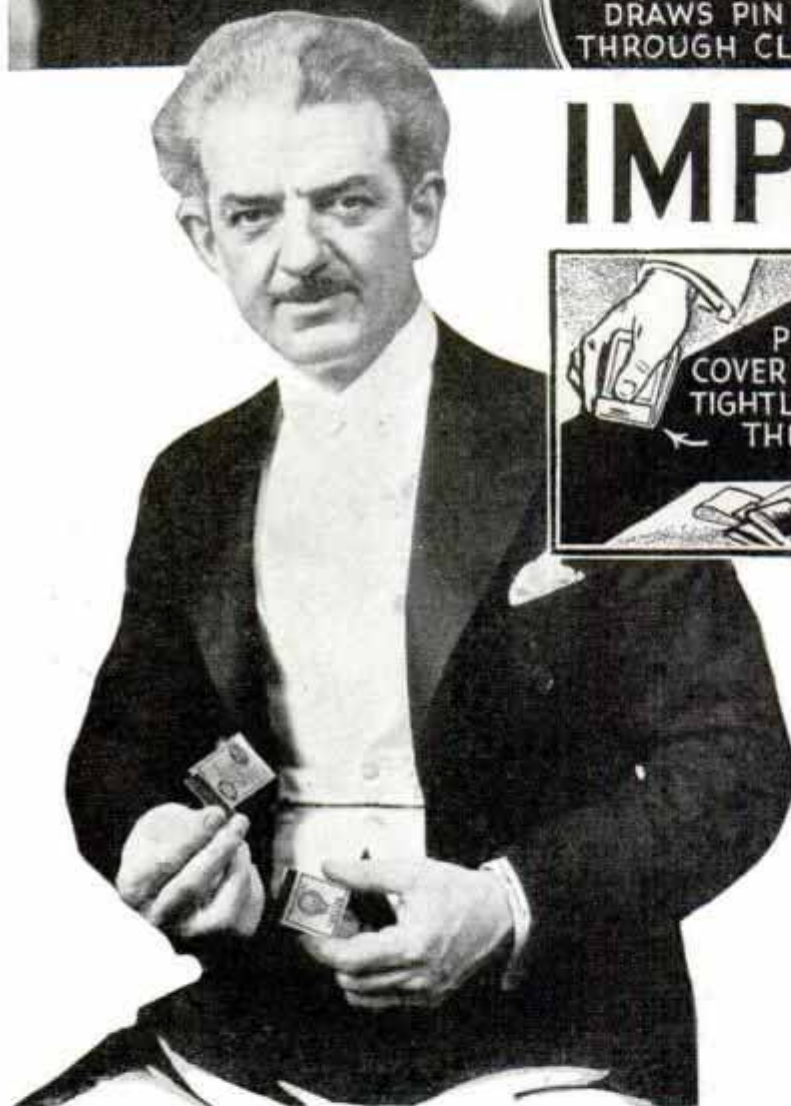
Top and Center, Right, Bullet-Proof Shelters Constructed of Tin-Can Blocks; Center, Left, Mechanical Conveyor Used for Stacking and Unstacking the Blocks; Bottom, Showing How the Metal Bales Were Placed on River Bed to Prevent Current from Undercutting the Banks

Paving the bed of a river is among the unusual uses for tin cans tightly pressed into flat bundles. Holes were bored through each bundle and steel rods inserted to form chains that were half buried in straight lines across the current of the Los Angeles river to prevent undercutting of the banks. In Manchukuo, bullet-proof block houses, built of baled tin cans from the United States, shelter railroad guards

as they protect trains and passengers from bandit raids at remote stations. Preparation of the cans is simple, all dampness being removed by heating and labels eliminated by burning. Nothing but the bare metal is left. Then the cans are crushed by large presses and formed into bundles or bales of the proper size for easy handling. A tin can actually contains only 1.65 per cent tin, the rest being sheet steel.



IMPROMPTU



By **HARRY BLACKSTONE**
Professional Magician



Top, Position of Hands in Safety-Pin Trick; Left, Picking Pack from Which Match Was Taken

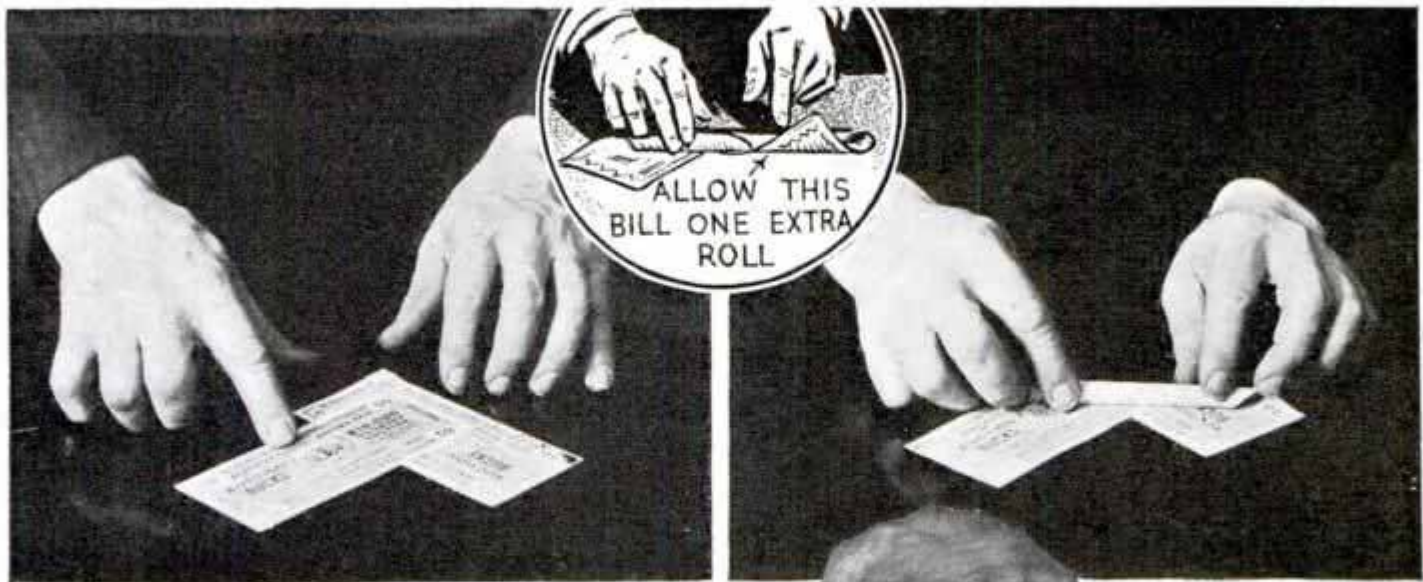
solutely rigid. Twist the lower corner slightly and you can balance the napkin on the tip of a forefinger, letting it twirl slowly about as you move your hand. A most surprising trick for those who attempt to duplicate it because the imitator's napkin will collapse the moment he tries to balance it.

The secret depends upon a simple preliminary procedure. When you hold the paper napkin by opposite corners, pull tightly to stretch the paper in a diagonal direction. The napkin being crepe paper, this gives it the needed rigidity.

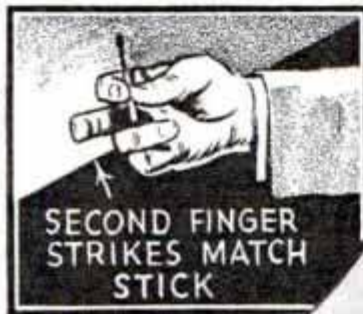
The jumping match is a trick easily learned. The match is laid upon a match box, with the head extending over one end. Hold the box in your left hand and a match between the thumb and forefinger of your right. Touch the head of the second match to that of the match on the box. Instantly, the loose match jumps high in the air. Every time the process is repeated, the result is the same. To do the trick, merely press the tip of the third finger against the lower

THE best impromptu tricks require no special apparatus and may be performed under any ordinary conditions. Balancing a paper napkin is such a stunt.

Take an ordinary paper napkin. Hold it by one corner and raise the opposite corner straight up. The napkin remains ab-



MAGIC ...



Start and Finish of Bill Rolling Stunt; Lopping Off Match Head, and Making Napkin Stand Up

end of the right-hand match. A slight upward flip of the finger causes an unseen impetus that is imparted to the loose match on the box. Hold the box so the head of the loose match is toward your body. Thus the right hand, coming forward, is partially concealed by the left and the finger flip can not be observed.

The story of the Chinaman's head is a trick similar to the jumping match, but



with a different sequel. Strike a match and let it burn until most of the wood is consumed. Then introduce the match as a droopy Chinaman, awaiting decapitation for piracy. Hold the match upright in your right hand, between thumb and forefinger. With your left, pretend to remove a hair from your head and wrap it in coils about



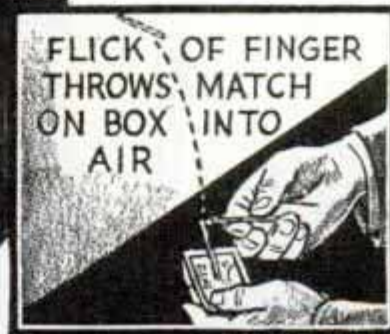
the neck of the match-stick Chinaman. While spectators are straining their eyes, trying to observe the hair, give a quick tug with your left hand. Off pops the Chinaman's head.

The second finger of the right hand does the trick, functioning like the third finger in the jumping-match stunt. A slight inward flip of the second finger against the lower end of the match produces a jolt that causes the burnt head to fly free. In this case, the right hand naturally gives a gesture of its own, and that motion covers the flip of the finger.

The next stunt involves two safety pins. Link the safety pins together and volunteer to take them apart without unclasp- ing them. The trick is done in a fraction of a second. Holding one pin with each hand, swing your hands apart and you have pins separated, ready for examina-

tion by the puzzled spectators. It all depends on how the pins are joined. Close one safety pin and hold it in the left hand, with the loose bar toward the right. Thrust the point of the second pin up between the bars of the first. Clasp the second pin. The solid bar of the upright pin is toward the right. Tilt it back toward your body. Grip the bottom of the first pin with your right thumb and fore- finger; the top of the second pin with your left thumb and fore- finger. Pull easily, but swiftly, with a sliding, horizontal motion, the right hand going to the right; the left hand to the left.

One bar of the second pin is



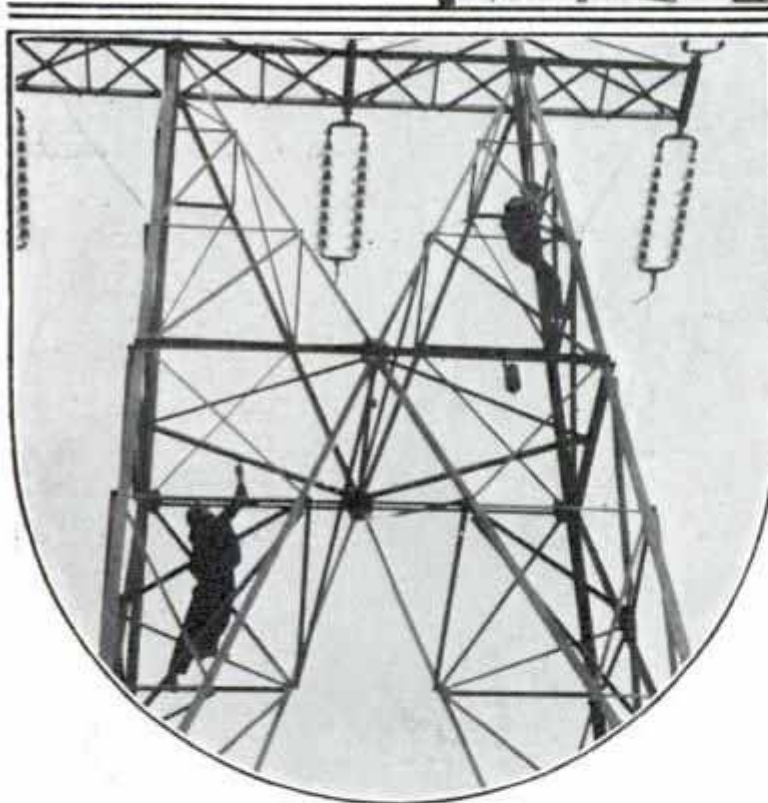
How Matches Are Placed Before Flick of Hidden Finger Shoots Loose Match in Air

drawn right past the point of the first, so rapidly and neatly that the pin does not unclasp. The loose bar merely allows momentary space for the other pin to pass. The impossibility of solid through solid apparently has been accomplished. This trick, once mastered, becomes almost au-

(Continued to page 124A)

It Takes Nerve to Repair "Hot" Power Lines

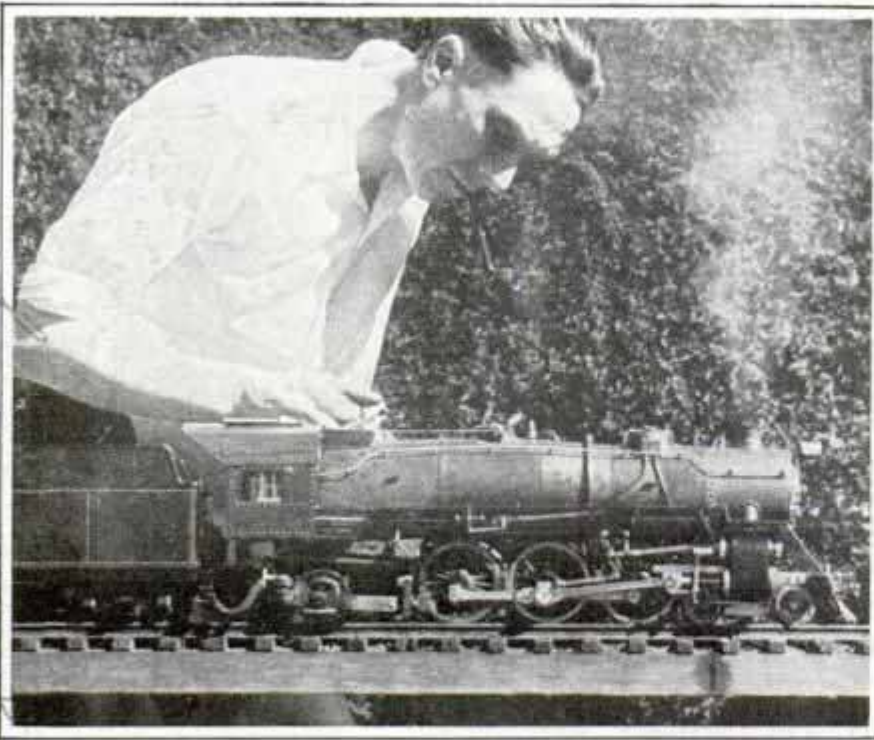
Everything movable was being tossed about as a near-hurricane swept the city. The telephone was ringing constantly at the mechanical department of the electrical company with reports of lines down and interrupted current. Trucks filled with tools, wire, insulators and men rumbled out of the yards and across littered streets to repair the lines carrying light and power. Tom O'Conner was one of these "trouble shooters." His job was that of a "hot" lineman and his call came



Top, Repairing the Wires under Severe Winter Conditions; Bottom, Taking Their Lives in Their Hands on High-Voltage Tower

when the power lines carrying 3,000 to 33,000 volts were sagging dangerously. Not long before this night Tom had been "riding a pole" when it snapped. Tom had fallen thirty feet and had splintered his knee cap, sending him to the hospital. But tonight the wires had to be cared for, regardless of the ice and terrific wind. So up the poles went the men. Checking each

pole along the highway they worked, when seven miles away they found themselves out of needed supplies. That meant walking until they found the truck. Finally the service was established one hundred per cent. But when morning dawned, a service line of heavy voltage was found sagging over a swollen stream. The way to the broken pole was cut off by high water. The "hot" linemen strapped on equipment and jumped into the water wearing spikes, heavy shoes and all. They swam out and repaired the break under dangerous conditions because water is a powerful conductor of electricity. Tom talks little at home about his perilous job. He says, "It's all in the day's work, and I don't want to worry the folks."



Builder with Midget Locomotive Which Is Complete in Every Detail; It Works Just Like the Original from Which It Was Copied

TINY LOCOMOTIVE HAS POWER TO HAUL THREE PERSONS

Only eight and one-half inches high and twenty-four and one-half inches long, a tiny locomotive built by a Californian develops sufficient power to haul three persons on its small cars. Its boiler, fired by coal, carries 100 pounds of steam. More than 1,500 rivets, turned down from escutcheon pins, were used in its construction. The tender is red brass, with aluminum trucks. Cylinder cocks and valves are operated from the engine cab. Three and one-half years of spare time work were spent in building the locomotive, which is registered at picture studios for miniature shots. It is a reproduction of a Baltimore and Ohio locomotive.

PENNY CHANGER FOR SALES TAX ALSO HOLDS STAMPS



Combining the duties of penny changer, stamp box and separate depository for sales tax collections, a six-inch metal box solves the problems besetting retail mer-

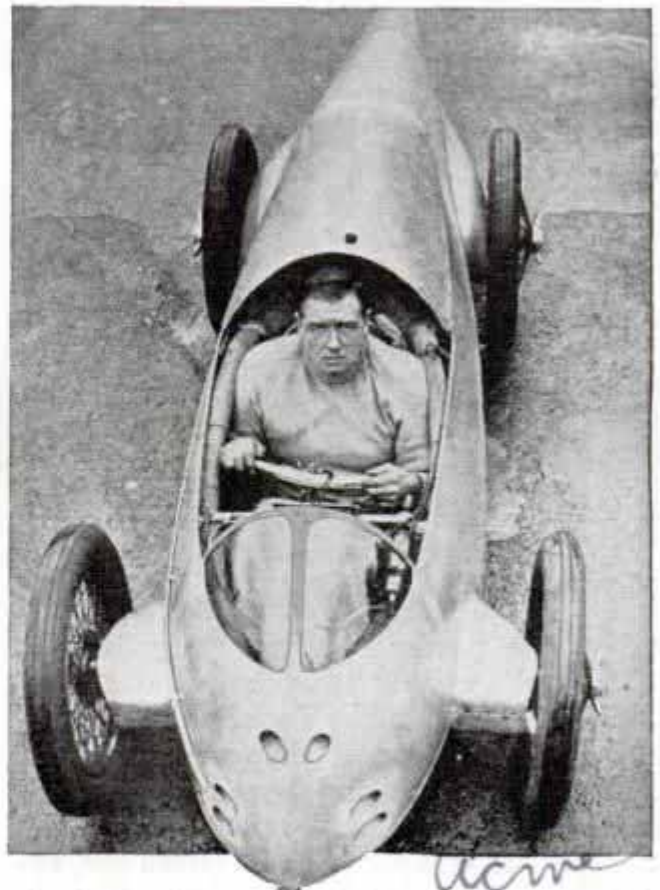
chants where the sales tax is in effect. A slot in the top allows the cashier to keep tax monies apart from company receipts, and the cash box can be locked. In an adjustable holder is space for tax stamps. Press a number on the penny changer and the correct change drops into your hand.

8478

DRIVER IS "FITTED" INTO RACE CAR FOR TRIALS

So small that the driver must be fitted into the seat, a midget racing car is being tested in England. Victor Stafford, the driver, hopes to establish

new records with his four and one-half horsepower car. In trials, Stafford is tucked carefully into the small seat of the car and the cowling replaced around him before the midget auto is sent roaring around the race track.



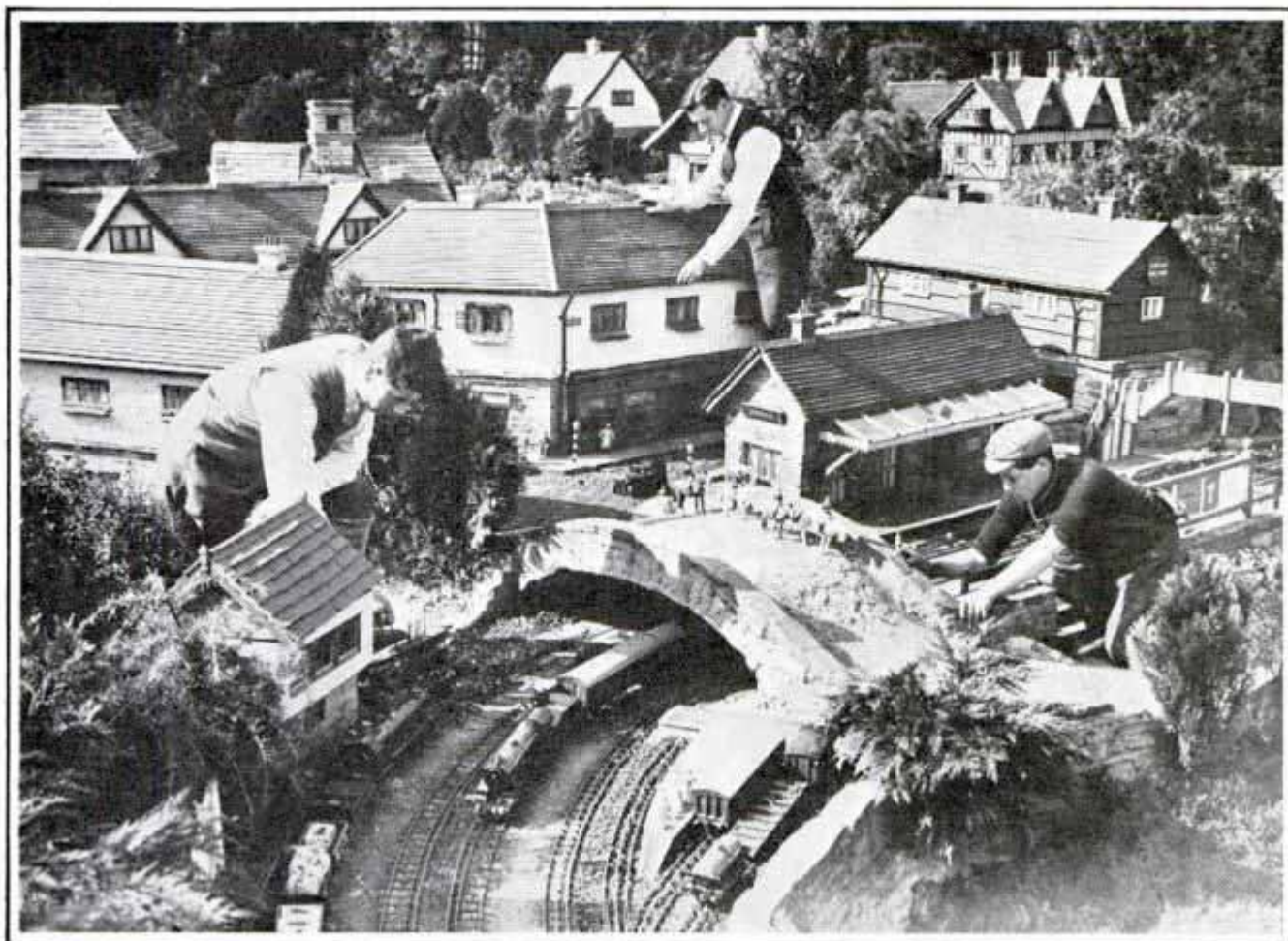
Cowling Had to Be Removed Before Driver Could Wedge Himself into Racing Car

E. K. Freeman 1036 4 Tennessee U.S. Los Angeles Calif

8544

Sim. Pbx Mfg Co

Village in Miniature Even Has Tiny Railroad



© Fox Photos

Model Village Complete Even to Tiny Figures of Its Inhabitants and Animals; Some of the Buildings Are Rather Large; Note One at Center in Comparison with Man Beside It

Built on miniature scale, an ^{England} English village attracts hundreds of visitors each year. It is the hobby of the owner of Chiltern Lodge, Beaconsfield. The model town is complete in every detail, even to a railroad with tiny locomotives, cars and station. There also are small figures afoot and on horseback and automobiles, creating a realistic effect of traffic. "Belisha beacons" which are used to control traffic in England, also are reproduced in miniature. From time to time, more model houses and figures have been added until the village is rather large. Some of the buildings are about three feet high.

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.

Electricity in the Mouth

^{£ 498}
ELECTRIC currents due to alloy fillings and dentures in the mouth have been found to cause irritation of the gums, tongue and cheek tissues and may be a contributing factor in cancer and other diseases. Galvanism of the mouth has been studied by Dr. Raymond J. Nagle and almost 200 cases of suspected galvanic action have been observed. In some cases, satisfactory results have been obtained by removing all fillings, crowns, plates and bridges from the patient's mouth and replacing them with materials that cause no electric action. Gold prepared under uniform conditions from a single casting is used in this replacement.

at Harvard Dental

Cambridge Mass

Science Service
4/20/35

3107-19th St., N.W.,
Washington, D.C.

The FIGHTING TOYS



side—houses, villages, trees, roads. As the canvas moves toward them it is their job to work out on a time-ratio scale the dropping of a bomb on a pre-selected site.

The canvas roll moves at a certain speed in ratio to the speed of a flying plane. From a given starting point it makes a given "end-point" in a certain elapsed time. This is ratioed, say, one foot to twenty-five miles in one-fourth of a minute. In one-quarter of a minute, therefore, the gallery bomber should be able to drop a bomb on the canvas terrain one foot from the starting point. He

"Forty left!"
"Thirty right!"
"Hit!"

Three army flying officers were standing on a small balcony overlooking a painted canvas terrain below. They were peering through individual telescopes at the painted landscape, moving on an endless roll toward them. From each of their stations ran an electrical cord to the under side of the improvised terrain.

Thus do Uncle Sam's warriors play at warfare. They have many toys like this small, moving landscape to teach the intricate problems of timing bomb and shell fire, of bayoneting, pistol shooting, anti-aircraft firing and battle-formation flying.

The three particular officers were taking a lesson in aerial bombing. On the slow revolving roll is painted a typical country-



Above, Working Out Problems of Anti-Aircraft Fire with Moving Target; Below, a Miniature Battery Which Serves to Train Our Future Gunners

of UNCLE SAM

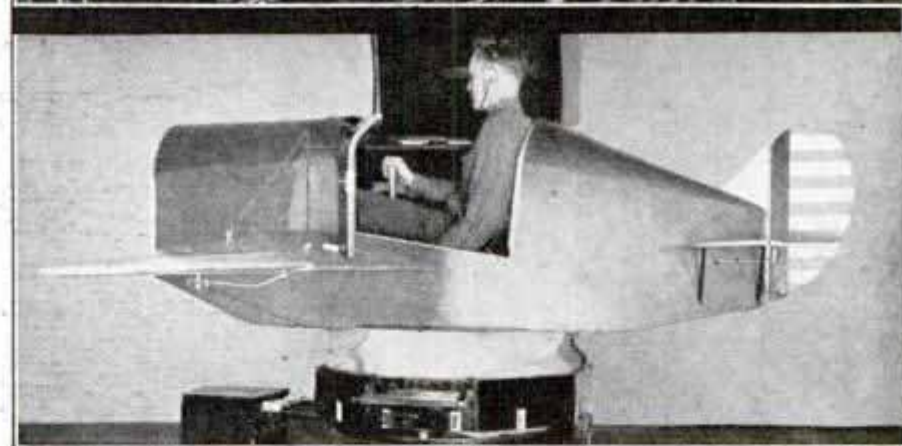
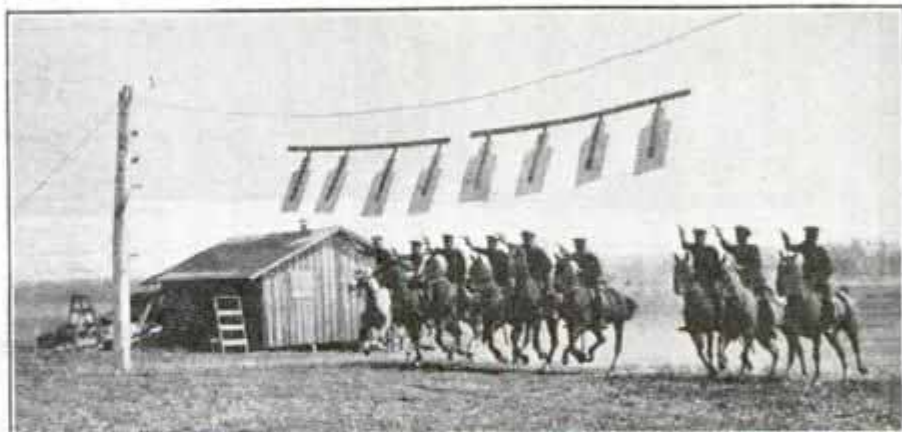
would be, theoretically, flying at a speed of 100 miles per hour.

The "bombing" is accomplished by pressing an electrical switch which flashes a light underneath the canvas, showing where the "bomb" fell. It may be to the right or left of the spot, or it may be a direct hit. It all depends on the accuracy of the eye and the ability of the flyer to estimate the elapsed time of fifteen seconds.

Similar toy landscapes are used by the artillery to teach gunners how to shell positions. These landscapes are of several types. There is the painted square canvas marked off in small squares as to range and deflection. The range lines run perpendicular and the deflection lines parallel. Problems in placing fire in the squares thus formed are given at different distances in thousands of feet. The accuracy of the imaginary shots are later checked and corrections of gun settings are made to conform to the discrepancies.

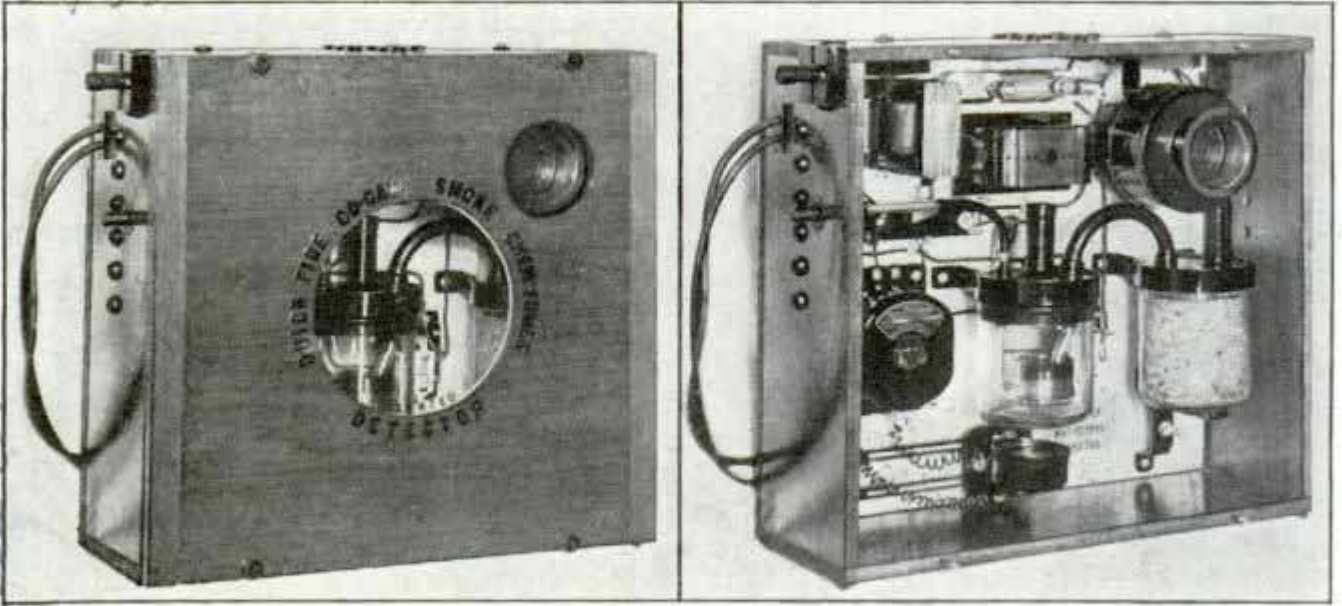
Another valuable toy is the terrain board with a landscape background, augmented by what is called a pantograph, a folding lattice arm that extends underneath the terrain board. Back of the flat terrain board, which is composed of mesh screen wire, raised two

(Continued to page 120A)



Targets for Cavalry; Toy Landscape Used with Small Battery; Plane Used to Teach Blind Flying and Toy Planes Used to Teach Formation Flying

Small Electric Alarm Warns of Gas or Smoke



Exterior and Interior of Compact Alarm Which Warns of the Presence of Carbon-Monoxide Gas, Ammonia Gas, Nitrogen-Peroxide Gas, Dust, Fire and Smoke in the Air

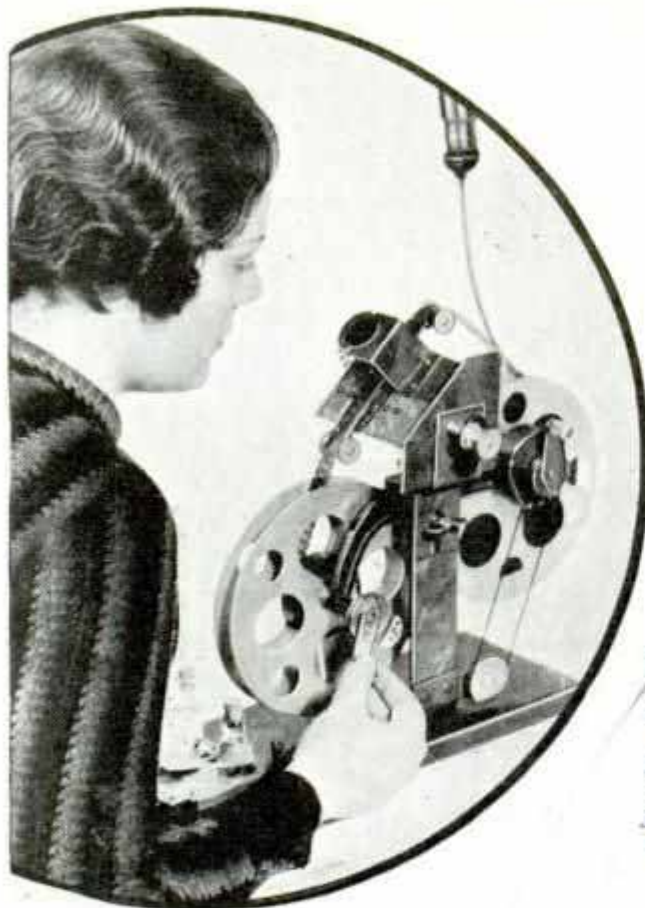
Two Massachusetts inventors have produced a compact alarm which detects the presence of carbon-monoxide gas, ammonia gas, nitrogen-peroxide gas, dust, fire and smoke in the air, at the same time sounding a warning of impending danger.

It is installed on a wall near the top of a room and convenient to a 110-volt alternating-current line. The alarm, a horn or bell, can be placed wherever desired. By means of a centrifugal fan operated by an induction motor, a continuous sample of air is drawn through the detector. When gas or smoke is present, it causes a ray of light shining on a photo-cell to be broken and this in turn causes the alarm to sound. At the same time two fans are set in operation, one drawing air into the room from outdoors and the other sucking air from the room. Thus the constant change in air prevents the gas from concentrating in the room.

£ 3 78

EDITING AMATEUR FILM IS EASY WITH SIMPLE OUTFIT

For making easy the slow and laborious task of editing and rearranging amateur movie film, a simple outfit has been introduced for all eight or sixteen millimeter films. The device also permits rewinding, cleaning and splicing of film. Its features include 1:1 and 4:1 ratio rewind speeds, with a transferable brake to prevent unwinding of free film. When inspecting film, the operator winds the film under a powerful magnifying glass and over an aperture illuminated by a bright light, enlarging the film image. Gummed stickers identify scenes for final cutting.



Apparatus for Examining and Editing Film Makes the Amateur's Work Easier

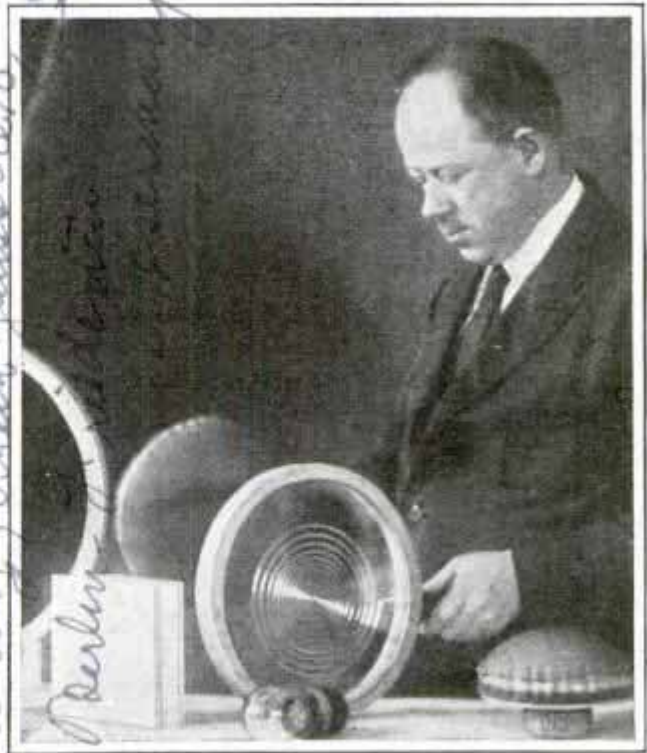
Friday Smoke and Gas Detector

58.50

*Automatic Electrical
1 Lenox Co 3248*

**MOVING-ARROW TURN SIGNAL
ON REAR OF AUTO**

By touching a switch on the dash, the driver can signal right or left turns if his car is equipped with a light that shows fifty arrows per minute. The arrows indicate the direction of the turn. The signal is attached at the rear of the automobile, truck or motor coach. One light serves for right or left turn, the change in direction of the arrows being made by the driver.



Latest Generator, with Inventor Holding "Mushroom" Rubber Bag in Right Hand

**ROAD-TAMPING RAM JUMPS
LIKE A FROG**

Capable of one-man operation, an odd machine has been introduced in Germany for road building. Called the Delmag "Frog," it is a tamping tool that is thrown upward by an internal explosion, then falls to strike the soil a heavy blow. Each time an explosion occurs, the machine moves a short distance ahead, in the manner of a jumping frog. A benzol mixture is used in the tamper to produce about sixty explosions or "jumps" per minute. Heavily weighted, it breaks up and compresses even coarse-clodded soil.

**CURRENT FROM "MUSHROOM"
LIGHTS NEON TUBE**

By rubbing a glass surface with a wood and rubber "mushroom," a Berlin experimenter produces an electric charge that is radiated into the air. Moving a neon gas tube to and fro in front of the electrically charged glass plate causes the tube to glow brightly. When a plate made of a white substance resembling marble is rubbed with the mushroom for five minutes, sufficient electricity is generated to keep a neon tube glowing for eight to twelve hours. The mushroom consists of a wooden disk about twelve inches in diameter, with a handle in its center and a specially prepared rubber bladder attached so as to resemble a mushroom. Experiments have been most successful when conducted in drafts. The material of which the plate is made becomes more efficient with use. Employing the mushroom in treating disease has been suggested.



Operating the Jumping Road Tamping Machine; Internal Explosions Force the Heavy Tamper into the Air, as Shown in Photo

No U.S. agent known

Pat. 2,147,447, 2,147,448, 2,147,449, 2,147,450, 2,147,451, 2,147,452, 2,147,453, 2,147,454, 2,147,455, 2,147,456, 2,147,457, 2,147,458, 2,147,459, 2,147,460, 2,147,461, 2,147,462, 2,147,463, 2,147,464, 2,147,465, 2,147,466, 2,147,467, 2,147,468, 2,147,469, 2,147,470, 2,147,471, 2,147,472, 2,147,473, 2,147,474, 2,147,475, 2,147,476, 2,147,477, 2,147,478, 2,147,479, 2,147,480, 2,147,481, 2,147,482, 2,147,483, 2,147,484, 2,147,485, 2,147,486, 2,147,487, 2,147,488, 2,147,489, 2,147,490, 2,147,491, 2,147,492, 2,147,493, 2,147,494, 2,147,495, 2,147,496, 2,147,497, 2,147,498, 2,147,499, 2,147,500

Paul Breese

Mess. Delmag

2390

What the UP-TO-DATE



By BOB BECKER
Tribune Chicago

WHEN you hear someone tell how he likes to go into the woods and just "camp out by rolling up in a blanket" under a piece of canvas, or travel with just a little "flour and bacon," you can mark that person as a member of the Ananias club or an inexperienced outdoor fan.

Today the smart, up-to-date camper goes afield with the idea of seeing how comfortably he can live in a tent, not how much punishment he can take. In fact, the art of camping is to get the utmost comfort and pleasure in the outdoors with the equipment available. The foundation of sensible camping is to be equipped sensibly. The next step is to acquire a knowledge of a few helpful tricks of the game.

The tent, the bedding and the cooking outfit are the three basic comfort factors.

Above, a Camper's Handy Stove with an Oven Attached; Wood Is the Fuel Commonly Used with It

A more or less permanent camp to which there is easy transportation permits the use of a larger and heavier tent than that which the canoe camper can use. The auto camper figures on a shelter that is adapted to space on the running board or in a trunk. The "go light" camper wants a pup tent or small canoeist's tent. American manufacturers produce tents for all kinds of campers. There are umbrella tents popular with the automobile campers, easy to pack and erect. Some of these tents, with

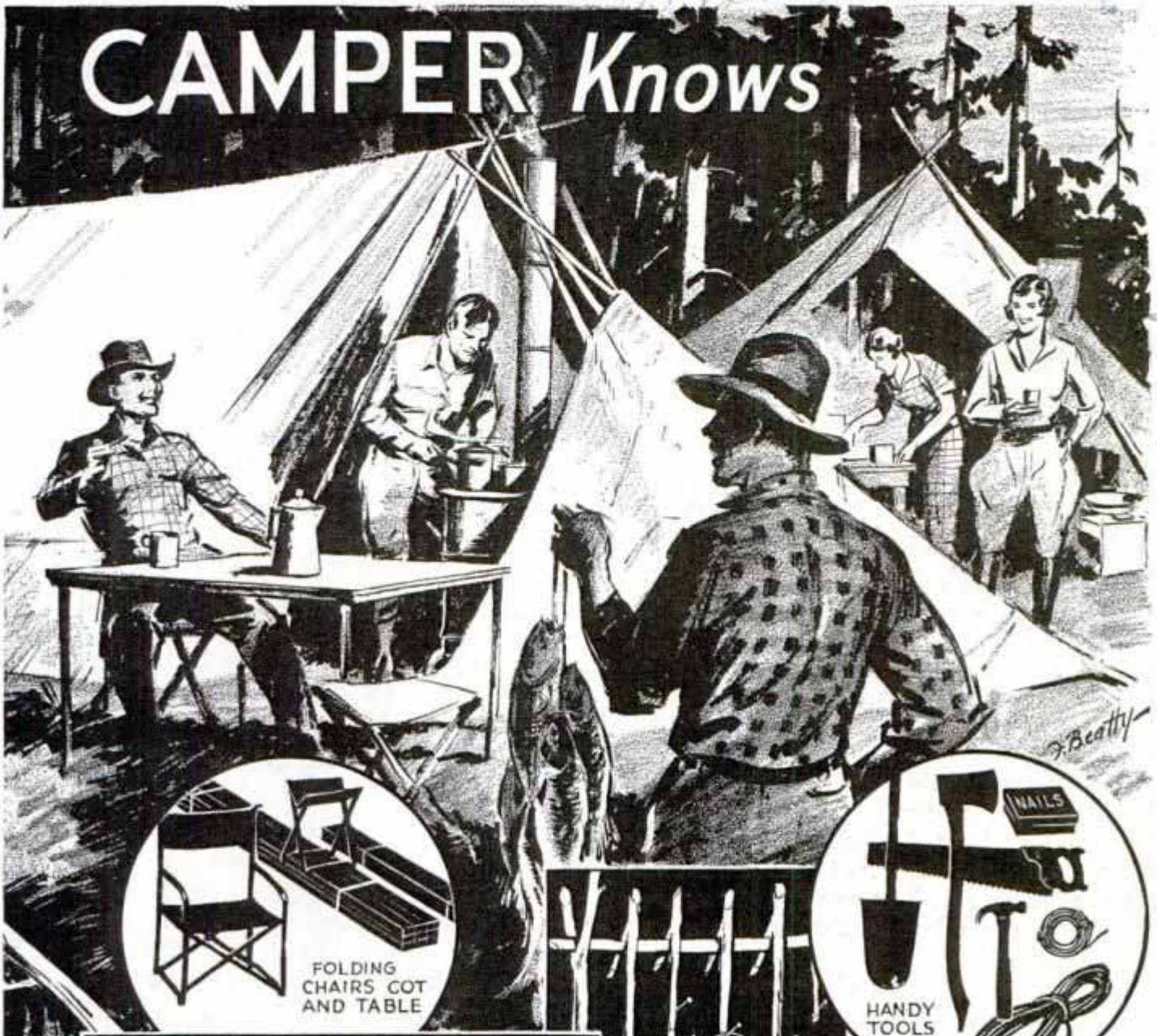
W. W. W. Co.

33 & Wabash,

6 3 90

Always

CAMPER Knows



FOLDING CHAIRS COT AND TABLE



HANDY TOOLS



UTENSIL HOLDERS



Top, Windbreak across Front of Wall Tent; Below, a Handy Camp Table with a Cedar Bark Top Which Is Easy to Construct

telescoping center poles, are both convenient and inexpensive. This type gives you sleeping quarters inside the four walls and an extra room made by a fly stretched from the entrance, plus two poles and curtains which can be attached to the sides.

A tent like this costs no more than a good fishing rod. It will pack nicely and not take up too much space on the running board. Then there are wall tents, always roomy and popular with tenters who expect to stay in one spot. You can get them with nettings to keep out insects. There are other models with high-pitched roofs,

*Wicombie & Fitchy
Madison Ave and 45th St.
New York*

8340



ideal two-man tents for canoe trips or any excursion where you do not need a big shelter. One is ventilated, has a sewed-in floor cloth and a sort of "front porch." Such a shelter is bug-proof and snake-proof—always a feature that makes a big hit with the wife.

Next to the tent, bedding is the most important item. Many a trip is ruined because of uncomfortable beds. Here the camper again has a choice. He can carry folding camp cots, if he has the space. They are handy, do not weigh much and make good beds. A light mattress and blankets can be used on the cot, but you need a lot of cover beneath you or you'll sleep cold. In recent years I have used air mattresses and lightweight sleeping bags for summer or autumn camping trips. Such an outfit takes less space in the car, weighs less, and gives more warmth. The two fit in a waterproof bag.

The air mattress is a great boon to tenters. It is made in full or three-quarters length. You can inflate one in a few minutes but the beginner usually blows up the mattress until it is absolutely full of air. It then is as hard as the ground. The trick is to inflate it just enough so it will yield to your body. You can use either

woolen blankets over the mattress or a lightweight sleeping bag. The sleeping bag is the answer to the prayers of campers who kick off their blankets at night. One that has several layers of covering which can be adjusted to the weather is preferable.

Undoubtedly more camping trips are ruined by struggles around the cooking fire than by any other one feature. It's one thing to turn out good



Above, Erecting Pup Tent with Aid of Canoe Paddles; Below, This Camp Site Is Too Shady

food over a gas range and another trying to cook over an open fire when the wind is blowing or rain is coming down. Although experienced outdoorsmen cook over wood fires, the beginner will get along better if he takes a small camp stove run by liquid fuel. Of course, there are trips in the wilderness where one cannot lug along such an outfit but family camping parties, that travel by automobile and pitch a tent next to a stream or lake, rarely go far from main traveled roads. These stoves can be obtained with small ovens. They give a hot flame, are durable, and easy to operate. No one has to worry about wet firewood if there is a gas stove in camp. I suggest a folding stand for the stove.

If you want to cook over a wood fire, I

advise a combination grill and oven. It is worth its weight in gold. The little oven is so attached that the same fire that is frying fish or boiling potatoes will bake bannock or do other work.

It's surprising how many mistakes are made in choosing the camp site. Look for a site close to a good supply of drinking water, a place not too shady and which gets the benefit of breezes, and a site that won't be visited



by falling trees. I recommend a site that gets sunshine. Too much shade usually means damp sleeping outfits and too many insects. In mosquito country a spot swept by breezes is desirable. If you find a spot beneath a lone big tree, let the other fellow snuggle up to that. It invites lightning.

One big tent fly, two pieces of mosquito netting and a few cut poles and you have a lot of comfort in eating while in camp. This tent also can be used to store food. You can construct a crude table

(Continued to page 122A)

Washstand with Cedar-Bark Top, a Camp Crane, a Square-Umbrella Type of Shelter and a Practical Way to Foil a Strong Wind or Rain

Akron Ohio

Sixty-Ton Statue Is Carved from a Single Slab of Stone



Sixty-Ton Statue of a Gladiator Carved from One Piece of Stone Which Originally Weighed More Than 100 Tons

Weighing more than sixty tons, a giant statue of a gladiator at the entrance of the new archives building in Washington was cut from a single piece of stone. James Earle Fraser carved the statue from a slab of Indiana limestone weighing more than 100 tons. It was brought to Washington on a special low-slung car and even then had to be cut down slightly to get through the tunnels encountered on the trip. Huge derricks were used to put the stone into place for carving.

Rubber company, says that drivers never should jam on the brakes in such circumstances. Instead, the brake should be applied easily, the steady application being continued as long as the car remains under control, but slackening if the car continues to swerve. This method enables the driver to keep his car under control and is a much better procedure than putting full force on the brakes the instant a blowout occurs.

"ACCORDION" DOOR SAVES SPACE WHEN FOLDED

Capable of being opened or closed in the manner of an accordion, a new sliding door occupies little space. It is not necessary to cut a channel in the wall as in the case of the usual sliding door. The new door, introduced in Germany, has one or two panels made of felting, imitation leather or plywood.



Showing Folding Door in Two Positions

BLOWOUT HAZARD IS REDUCED BY BRAKING EASILY

When a tire blows out, the drivers can reduce the danger considerably by applying the brake gently. Paul Faulkner, veteran test driver for the Goodyear Tire and

Emb. Mrs. Frances Shipper, 204 Star Bldg. Washington D.C.

6578

No U.S. Agent known

See... Dued... 12... 11... 10... 9... 8... 7... 6... 5... 4... 3... 2... 1...

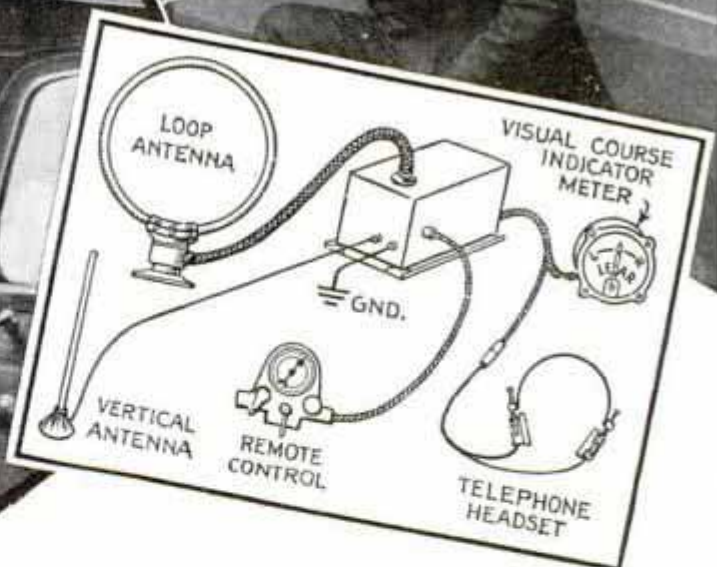
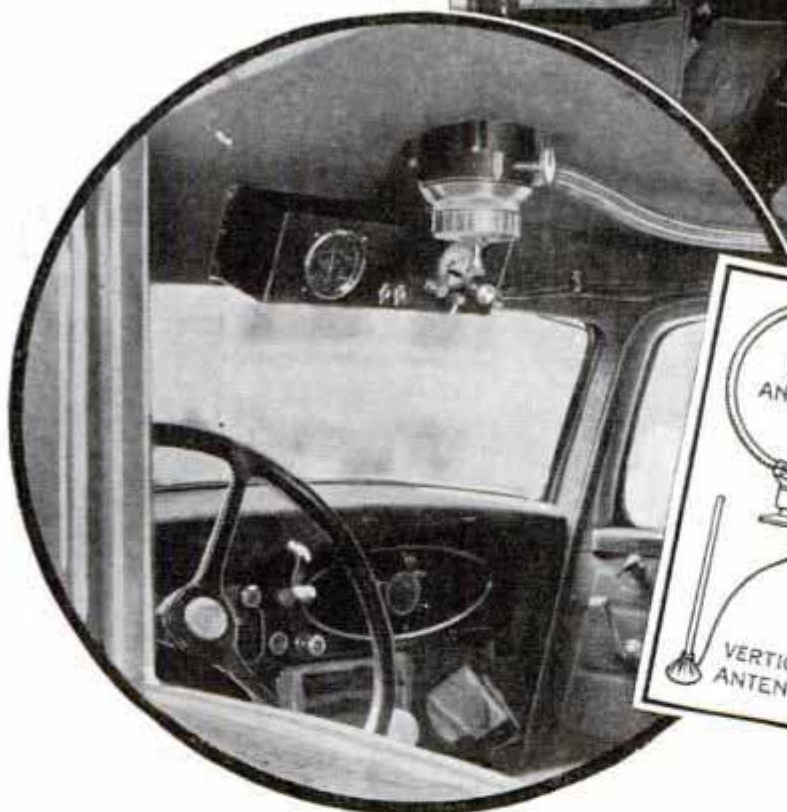
Harmonika

*Chas. 157 Chambers
New York City*

Pilot's Radio Course Indicator Tested in Auto

One of the latest radio course indicators has been tested not only in the air but also on the road. A forty-pound direction finder and homing instrument, invented by William P. Lear, operates on both the air-lane beacons and standard radio broadcast waves. It may be employed as a regular radio receiver with a headset or, by throwing a switch, as a visual type of homing instrument by which

Top, Flying by Course Indicator; Center, Plane with Direction Finder's Loop Antenna; Bottom, Left, Device in Auto; Right, Sketch of the System



a plane may be accurately steered toward a distant station. As a homing instrument, the receiver can be used with headset to listen to the station being used as a directing beacon. Thus, it is no longer necessary to follow the narrow lane of a directional beacon, but instead, any one of the 600 radio stations may be tuned in. Then, by piloting the plane with the aid of the vis-

ual "right-left" indicator, the radio wave coming from a particular station can be followed to its antenna towers. A loop antenna is employed in the normal installation. In the tests, the inventor equipped his automobile with one of the direction finders and followed broadcast radio waves right to their source, in so far as the highways and streets would permit.

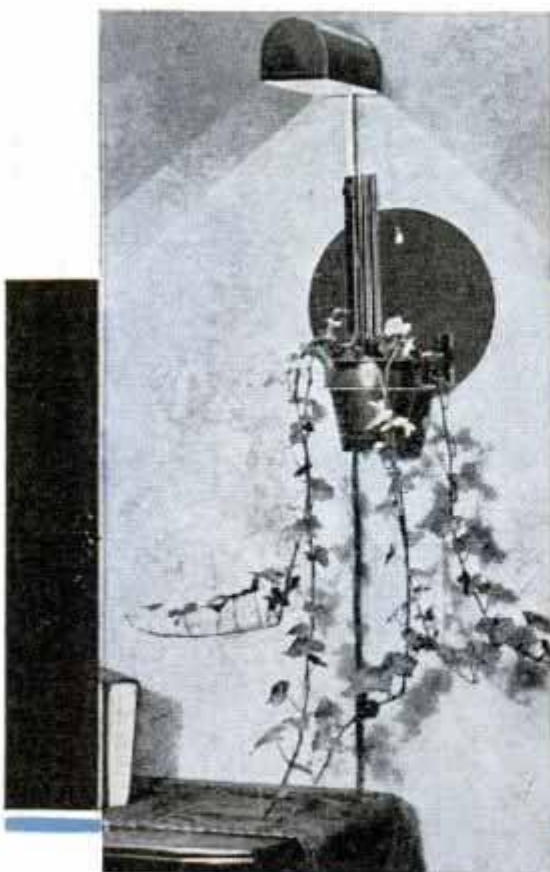
Latest HOME



Top, Left, False Door in Refrigerator Provides Extra Storage Space; Food Is Available without Opening Inner Compartment and Permitting Warm Air to Enter, Thus Saving Electricity; Top, Right, Yarn Holder Shaped Like Ball Has Weighted Base to Hold It in Place When Yarn Is Pulled; Made of Metal, It Fits in Knitting Bag; It Also Holds Ribbon or Twine



Right, Portable Electric Sewing Machine Is So Light It Can Be Held in the Hand; It Sews Backward or Forward, Changing Its Direction While Running



Bottom, Left, Plant-Lite Uses Ordinary Mazda Lamp: It Fastens to the Wall with Push Pin, Making It Possible to Place Plants in Locations Away from Natural Sunlight; Experiments Show This Type of Lighting Stimulates Growth of Many Flowering and Foliage Plants; Reflector Is Adjustable; Bottom, Right, Simple String-Bean Slicer Prepares the Beans for Quick Cooking; It Slices Thin and Removes Strings and Seams; the Tool Is Made of Aluminum Alloy and Cannot Rust; It Is Cleaned Easily by Flushing under Hot-Water Faucet

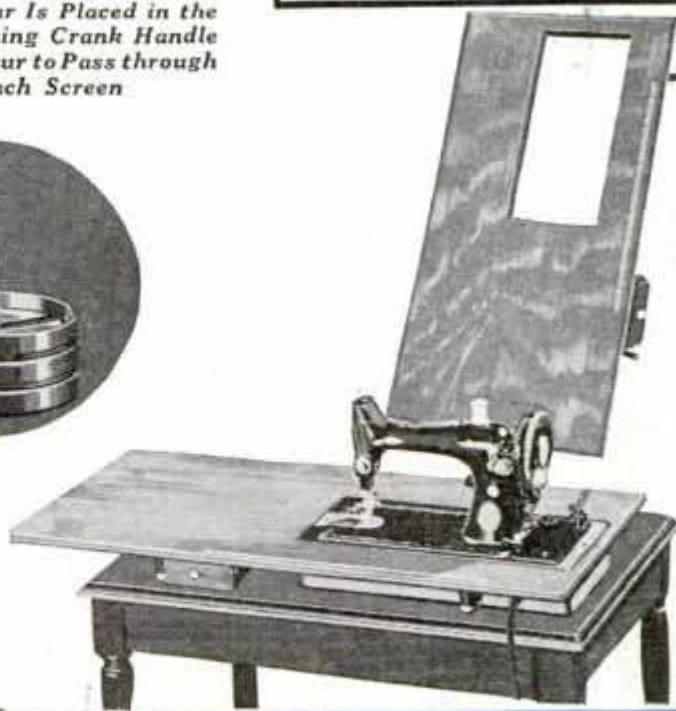
ACCESSORIES



Top, Left, Egg Strainer Makes Easy the Separation of Yolk from White; After Egg Is Broken into Utensil, Tipping Causes White to Drain Off, but Yolk Remains in the Cup; Top, Right, Handy Vegetable Dicer Speeds Up Kitchen Work; It Can Be Used to Prepare Potatoes for French Frying by Cutting Only One Way; Vegetable Is Diced by Second Cut

Bottom, Left, Latest Flour Sifter Contains Three Screens That Sift the Flour Three Times in One Operation; It Can Be Taken Apart Easily for Cleaning; After Flour Is Placed in the Top, Turning Crank Handle Causes Flour to Pass through Each Screen

Bottom, Right, Table Top for Portable Sewing Machine Provides Level Working Surface and Arm Rest; Legs Are Set to Fit on Small Table or Desk; Eighteen-Inch Ruler and Drawer for Accessories Are Placed Conveniently



Unsinkable Hospital Ship Built in Water-tight Units



This Mercy Ship Will Transport Poor Children on Outings; Note How Second Deck Is Enclosed with Glass

Constructed with twenty-five separate water-tight compartments, the latest hospital ship is said to be non-sinkable. If the main hull should be destroyed and every water-tight compartment in the hull flooded, the side compartments still would keep the craft afloat, according to its builders. As an extra measure of safety, however, the all-steel ship is completely equipped with lifeboats, life rafts and life belts.

Launched recently on the Atlantic coast, the ship can carry 1,500 persons. It has three decks. A motion-picture theater on the terraced upper decks has a seating capacity of 1,000 and the 4,000 square feet of deck space may be used for dancing. A ten-foot promenade around the craft is enclosed by glass at the forward end. The babies' nursery occupies the aft end of the upper deck and a milk booth is installed at the forward end. Furniture and all fittings are of steel or aluminum. The ship has an over-all length of 181 feet four inches, a width of forty-nine feet four inches and a draft of eleven feet. It is electrically lighted throughout. Built for the St. John's Guild of New York, the ship will be used to transport poor and sick children on daily outings from the Battery to Sandy Hook, thirty miles. It will be commanded by Peter Johnsen, 74 years old, who has been master of floating hospitals of the guild for twenty-four years. The new all-steel vessel is said to be the only one of its kind.

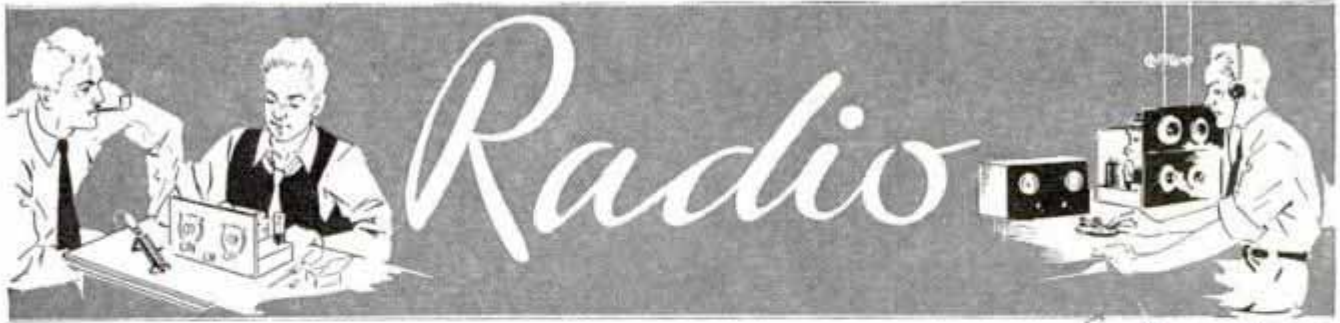
ically lighted throughout. Built for the St. John's Guild of New York, the ship will be used to transport poor and sick children on daily outings from the Battery to Sandy Hook, thirty miles. It will be commanded by Peter Johnsen, 74 years old, who has been master of floating hospitals of the guild for twenty-four years. The new all-steel vessel is said to be the only one of its kind.

Deadly Twin-Barreled Gun to Combat Enemy Airplanes



This Photo Taken Aboard One of England's Warships Shows Gunner Ready for Aerial Gas Attack; the Double-Barreled Gun Is a Powerful Weapon

For fighting off airplanes in time of war, a deadly double-barreled weapon has been developed for use on British battleships. It is a Lewis gun, with two barrels instead of one to direct a stream of bullets at attacking aircraft. During recent maneuvers of the home and Mediterranean British fleets, a gunner aboard H. M. S. "Eagle" manned the twin-barreled gun to demonstrate its efficiency in case of gas or aerial attack.

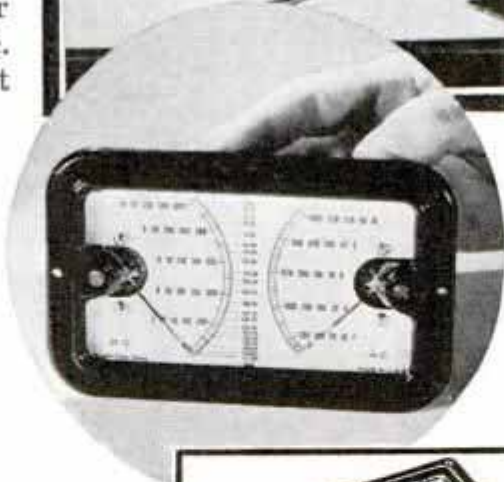
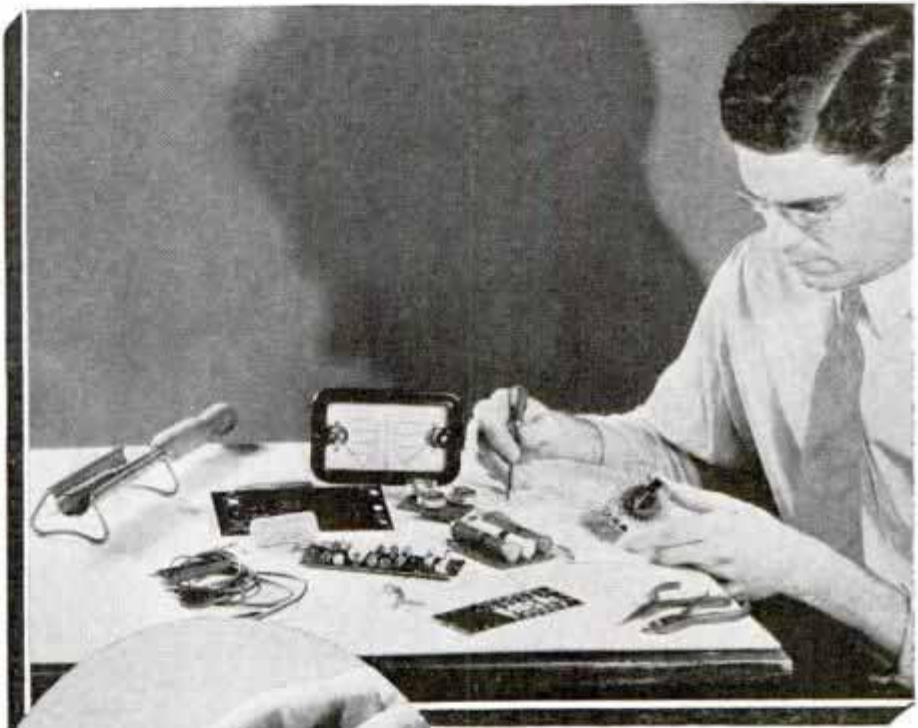


SET TESTER *in Kit Form*

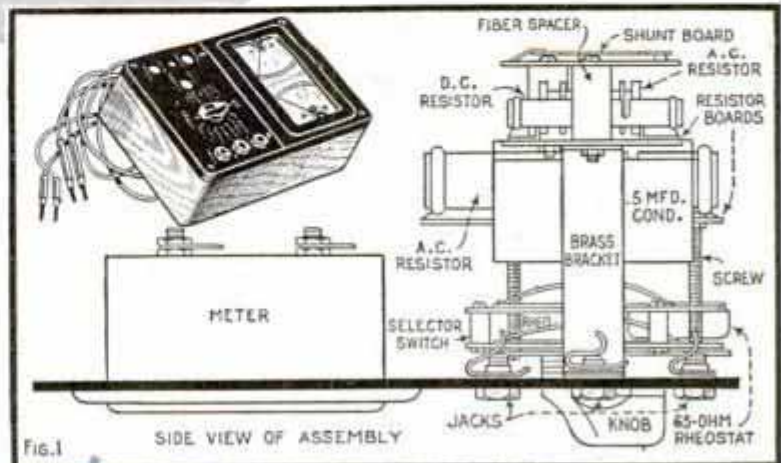
SERVICE men and experimenters who prefer to assemble their own testing and measuring equipment will find this volt-ohm-milliammeter combination well worth while. The unit is built around two meters of the a.c. and d.c. variety which are housed in a single bakelite case.

A handy switching arrangement, on a separate drilled and engraved panel, enables the operator to connect the meter posts for either a.c. or d.c. readings. The current readings and resistance measurement are d.c. Voltage ranges are from 10 to 1,000 volts; 1 milliampere is minimum for current, and resistance may be accurately measured up to 3 megohms.

Detailed layout and wiring diagrams are included with the kit of parts, which consists of test leads, twin meter, condensers, resistors, drilled switch panel and twenty-throw, double-pole switch as shown in the photos. A side view of the assembly and a suggested case installation are illustrated in Fig. 1. The compact unit may be arranged also to fit special space requirements in portable test equipment. One small 22½-



volt battery and a No. 2 flashlight cell are required for operation; tests may be made by the voltage method, also by the point-to-point voltage and resistance method.



The Triplett Electrical

ALL-WAVE Simplifies

By GLENN H. BROWNING

ONLY seven connections to a coil and condenser assembly are necessary in constructing a complete all-wave receiver of advanced design. General interest in world-wide short-wave reception convinced the writer that there was a distinct demand for a compact coil and tuning-condenser unit which would cover efficiently a frequency range from 13.5 to 557 meters. Such a device would enable any-

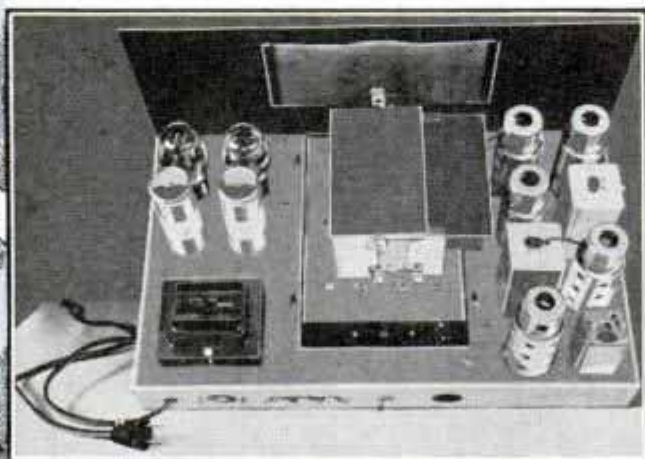
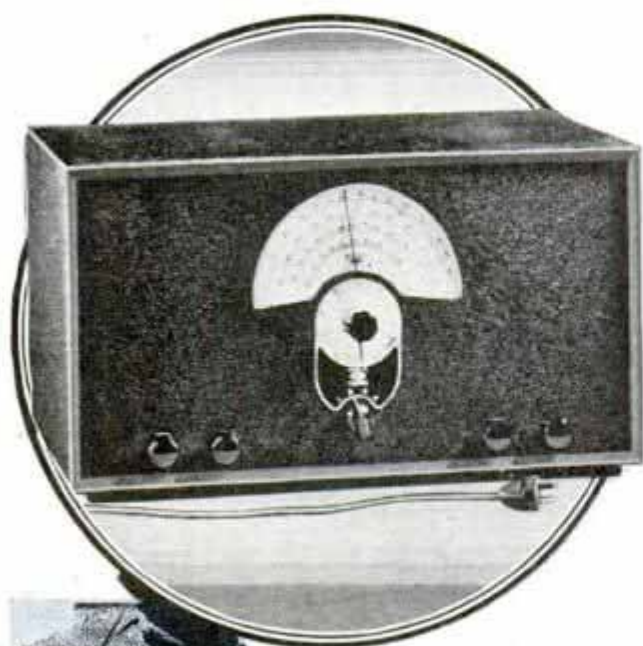
one to assemble their own all-wave, or short-wave, set. Plug-in coils could be done away with and all mechanical and electrical details requiring laboratory precision carefully worked out for obtaining maximum gain and selectivity.

This tuner, or heart unit, is now available in two interchangeable varieties, either of which can be installed in the home-assembled 7-tube chassis arrangement shown in the lower photo. A calibrated dial for the all-wave tuner, as illustrated in Fig. 1, indicates the ranges covered by means of a 4-point switch. A similar tuning unit, employing the same connections, is of the band-spread type and covers the 20, 40, 80 and 160-meter amateur bands only. All coils, trimming and tuning condensers for the antenna, r.f. and oscillator circuits are included in the tuner, the underside of which is outlined in Fig. 2. The device is wired and adjusted at the factory and comes ready for mounting on the main chassis where it is supported by means of rubber-cushion insulators.

Many readers of Popular Mechanics Magazine will remember the Browning-Drake receivers described for home set builders several years ago. This new Browning 35 superheterodyne circuit, designed for use with these tuning units, is quite simple and all parts, including the drilled base and front panel, are available either separately or in kit form from radio parts dealers. Fig. 3 shows the schematic circuit

diagram with the tuner-unit switching points marked. The power transformer is available with 2.5 and 6.3 volt filament windings, therefore the builder has a choice of either type of tube both of which are indicated for each position.

Automatic volume control, which may be switched off or on at the will of the operator, and



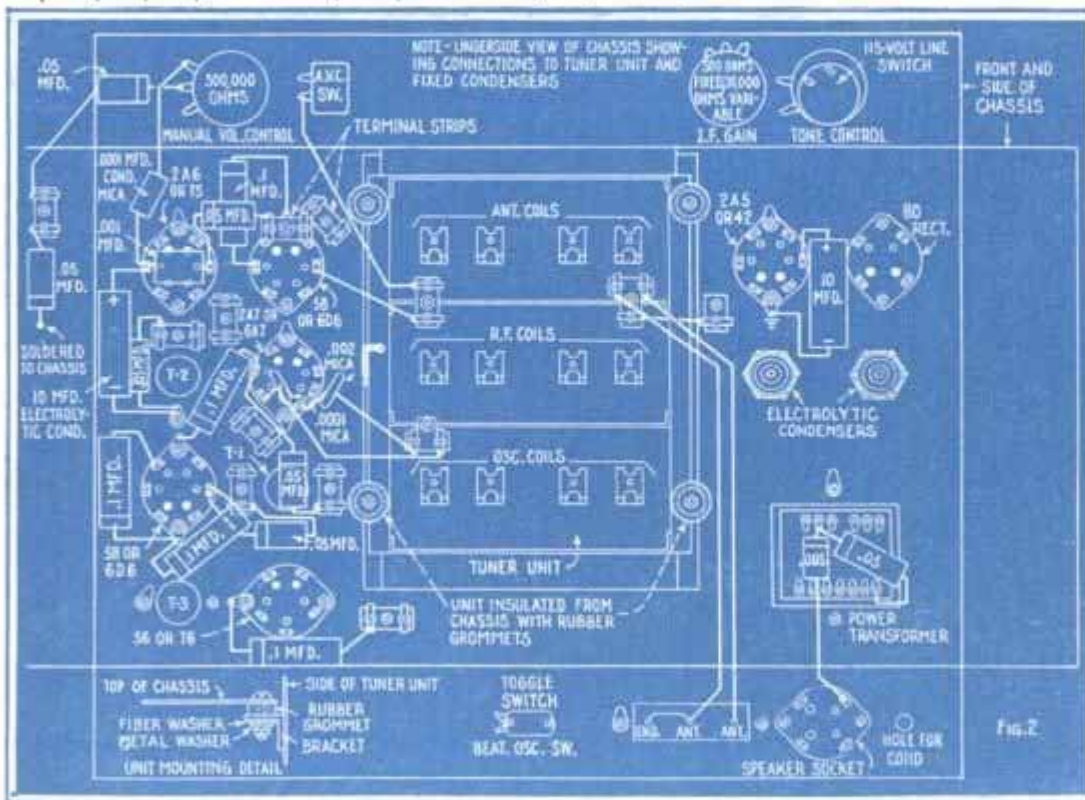
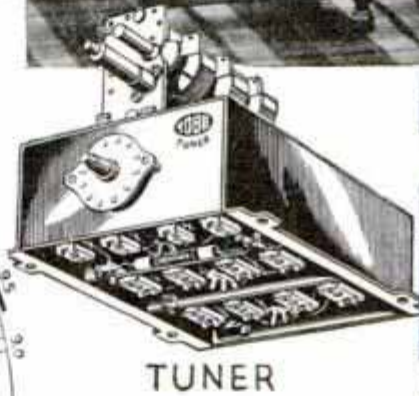
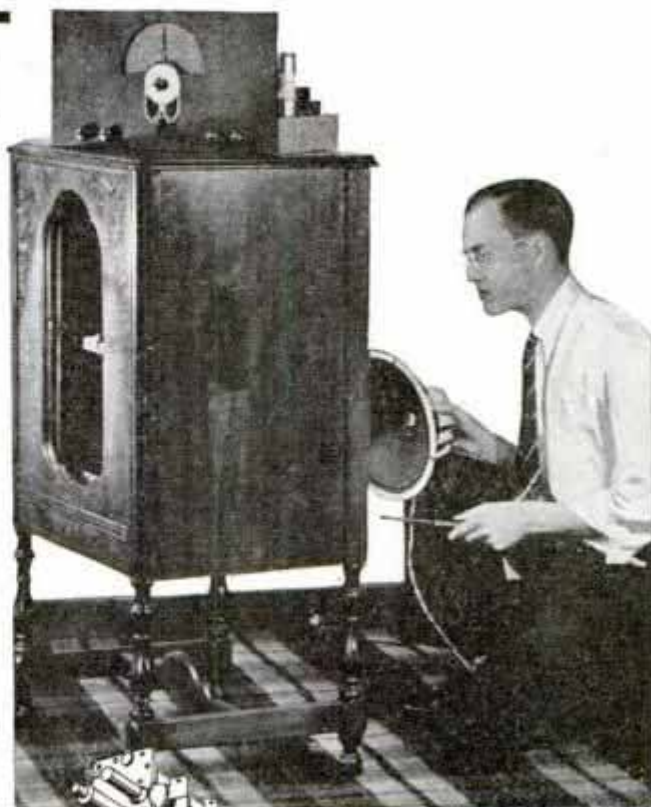
TUNER UNIT

Browning 35

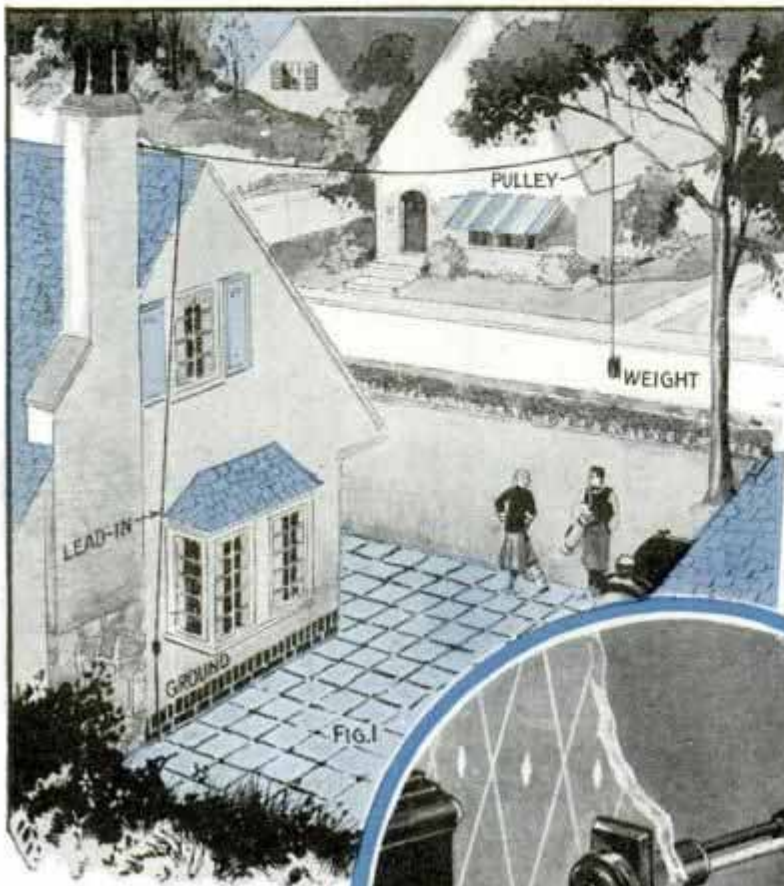
a beat-frequency oscillator for CW reception are features of the circuit. A type 2A7, or 6A7, is used as a mixer tube which electronically couples the oscillator's signal to the incoming signal, thus eliminating interlocking effects between the oscillator and the antenna or r.f. circuits. The result is an all-wave receiver which has a remarkable performance record on foreign reception as testified by the logs of

(Continued to page 136A)

- Mc = Frequency in megacycles. M = Wavelength in meters.
 — = Location of Foreign and American short-wave stations. 4 = Broadcast band.
 - - - = Police bands. 1-2-3 = Short-wave bands.



How to Install a Good Receiving Antenna



By F. L. BRITTIN

PART I

MODERN receivers are designed to operate at maximum efficiency on a carefully constructed outside antenna. Every set owner knows that these sensitive receivers will bring in local stations, and some distant programs, with an antenna consisting of only a few feet of wire dropped on the floor. In some locations fairly good results are obtained with an indoor antenna wire run around behind the picture molding of the room. However, these substitutes should be used only when the installation of a standard length outdoor antenna system is not practical.

Short indoor antennas of any description are entirely within fields of interference caused by electrically operated household appliances. They usually parallel house wiring, and the background noise level is so high that only powerful

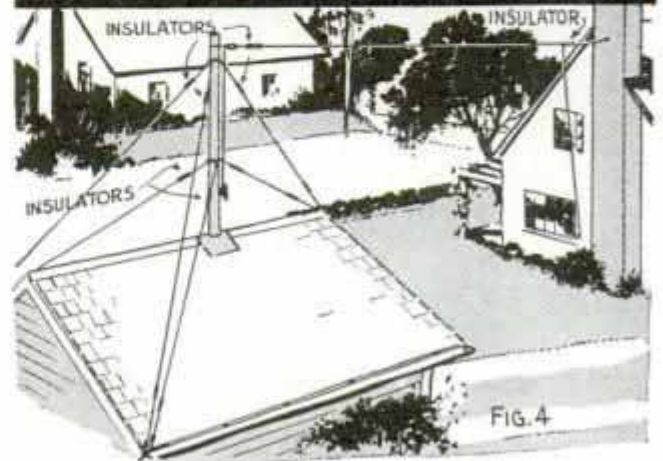
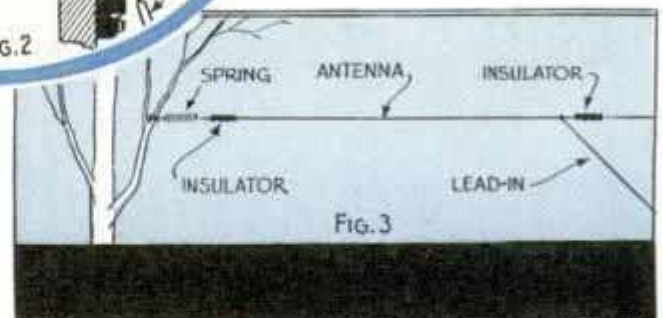
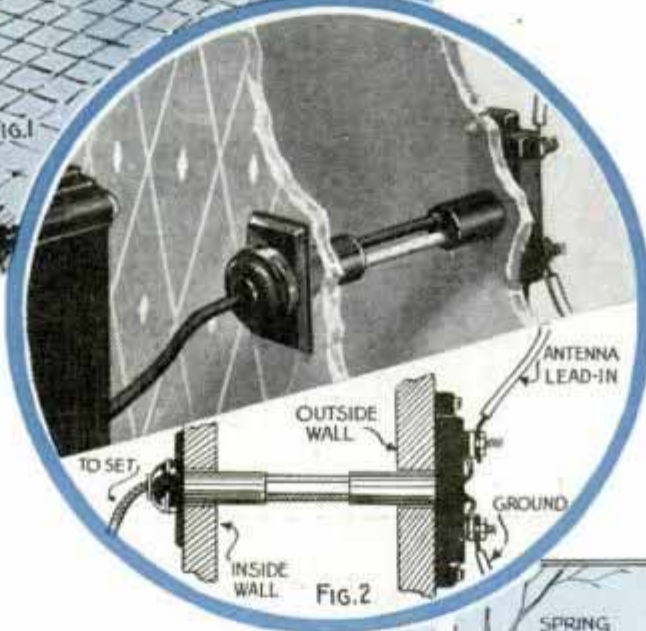
signals have a chance. When nearby stations are tuned in the noise level appears to drop; however, it is still there to handicap the broadcasting station, set manufacturer and listener.

The outside antenna picks up the signals at a point well away from these fields of interference and conducts them, by means of a direct lead-in wire, to the receiver, which should be placed as near as possible to the point of entry to the building. Should a portion of the lead-in pass through an interference area on its way to the set, there are several

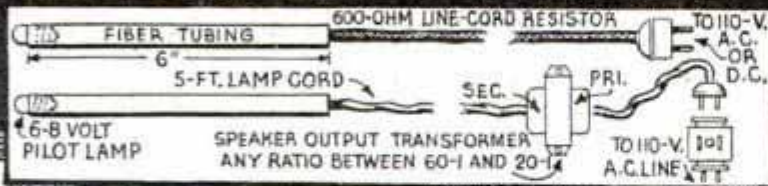
simple methods of shielding whereby such interference pickup may be eliminated.

An ordinary outdoor system, of the inverted L type, illustrated and described in this article, is quite simple and easily installed. It is suitable for use

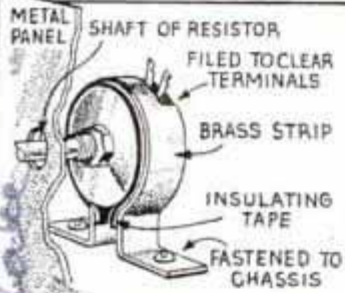
(Continued to page 140A)



PRACTICAL RADIO SUGGESTIONS



Homemade Probing Light for Working in Dark Corners; Construction Details for Two Varieties Are Given Above; the Multiple Plug Permits Operation of Set and Light from the Same Wall Socket



Left, Inexpensive Insulating Mounting for Variable Resistor with Live Shaft; the Shaft Should Clear the Panel Hole; a Strip of Mica or Rubber Tape May Be Used for Insulating the Resistor Unit from the Metal Bracket



Midget Low-Loss Padding and Trimming Condensers; the Air-Tuned Type at Left Maintains Constant Capacity for Fixed Tuning in Plug-In Coils for Short-Wave Receivers



Shielded, Handle-Type Plug-In Coils Which Fit on the Front Panel of the Receiver Instead of Inside the Chassis; Available in Sets of Four, Covering Short-Wave Range from 16 to 217 Meters



Socket for Acorn-Type Tube Has Flat Mounting Surface Which Aids in Holding Down Plates of Specified By-Pass Condensers



Chassis Construction for Experimenters Not Equipped to Bend Sheet Metal; Thin Copper May Be Laid over Wood Base for Shielding



Dr. ... of America
 25 Park ...
 need

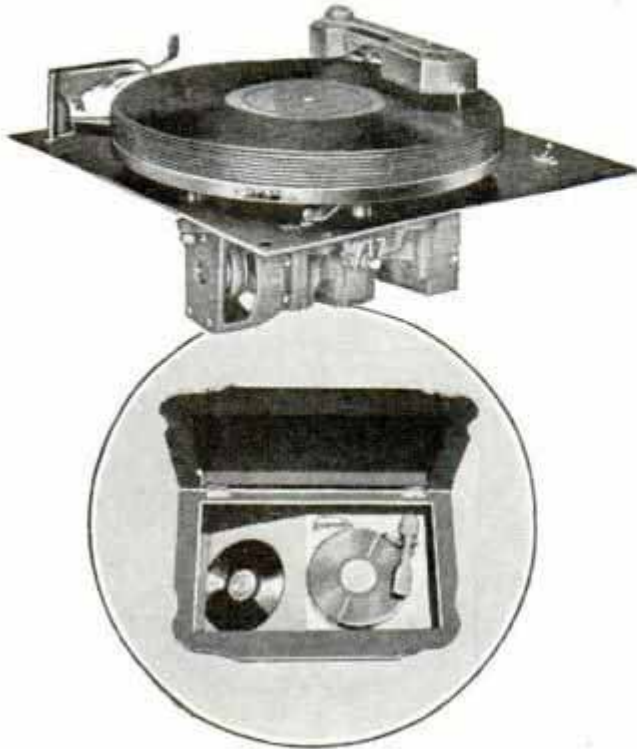
Mfg. Co., #24 U
 33 rd. New York

Alden Mfg. Co. B. rockton, mass

Elyria Ohio

83548

Automatic Changer Plays Eight Records

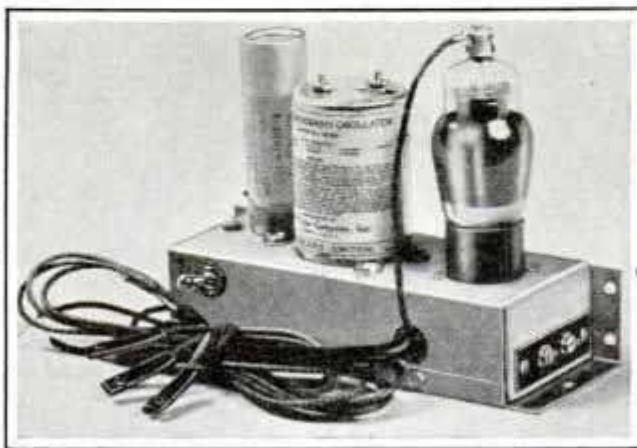


Turntable Assembly with Universal A.C.-D.C. Motor; Below, Top View of Cabinet Installation

Easily mounted in radio console cabinets having hinged tops, this automatic record changer plays eight 10-in. records. Any record may be repeated or rejected. Manual playing is provided for by means of a simple change. The compact unit is also suitable for rack installation in auditorium and public-address amplifiers.

Oscillator Broadcasts Records to Set

The purpose of this oscillator is to insure proper phonograph reproduction through your radio receiver without the usual circuit changes. Coupled to the antenna of the set, it is actually a miniature



Phonograph Oscillator Is Tuned In on the Receiver Just Like Any Broadcasting Station

A.C.A. Victor Co.

broadcasting station modulated with the output of the phonograph pick-up. It is connected easily and may be used with any A.C. receiver.

83541

Hand-Set for Portable Transmitter

This hand-set consists of a microphone transmitter and a telephone receiver. Available with receiver units of either 70 or 2,000 ohms, the 70-ohm variety has a 3-lead cord, one of which is common.



83553

B-Eliminator Operates on Two Volts

Uniform B-power at low cost is now available for operating any 2-volt battery receiver. This compact unit combines a quiet running motor and generator. It is operated from a 2-volt storage battery and



REPLACES 'B' BATTERIES IN RADIO SETS

MOTOR BOAT RADIO
POWER UNIT FOR REPLACING DRY BATTERIES ON AIR-CELL SET

delivers 125 volts to the set with only a 2-ampere drain on the battery. Any 6-volt storage battery can be changed to 2 volts by reversing the center cell connection.

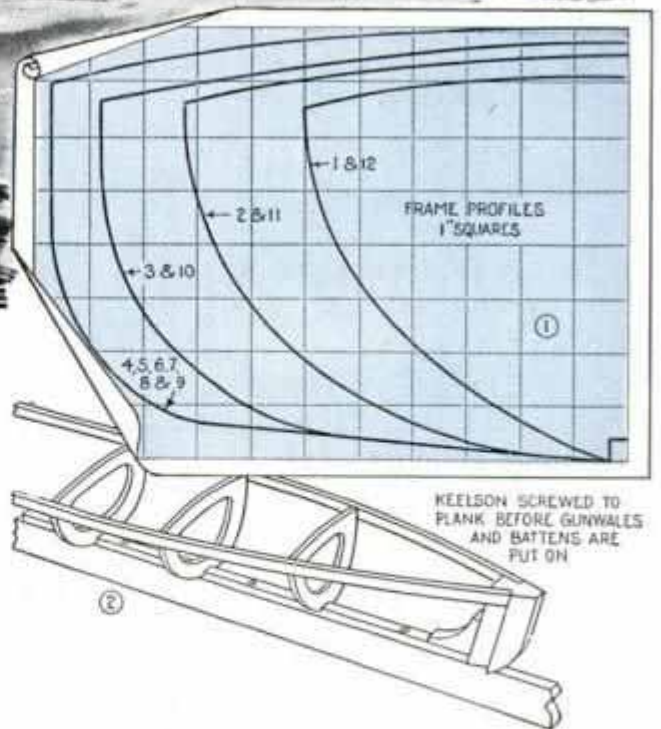
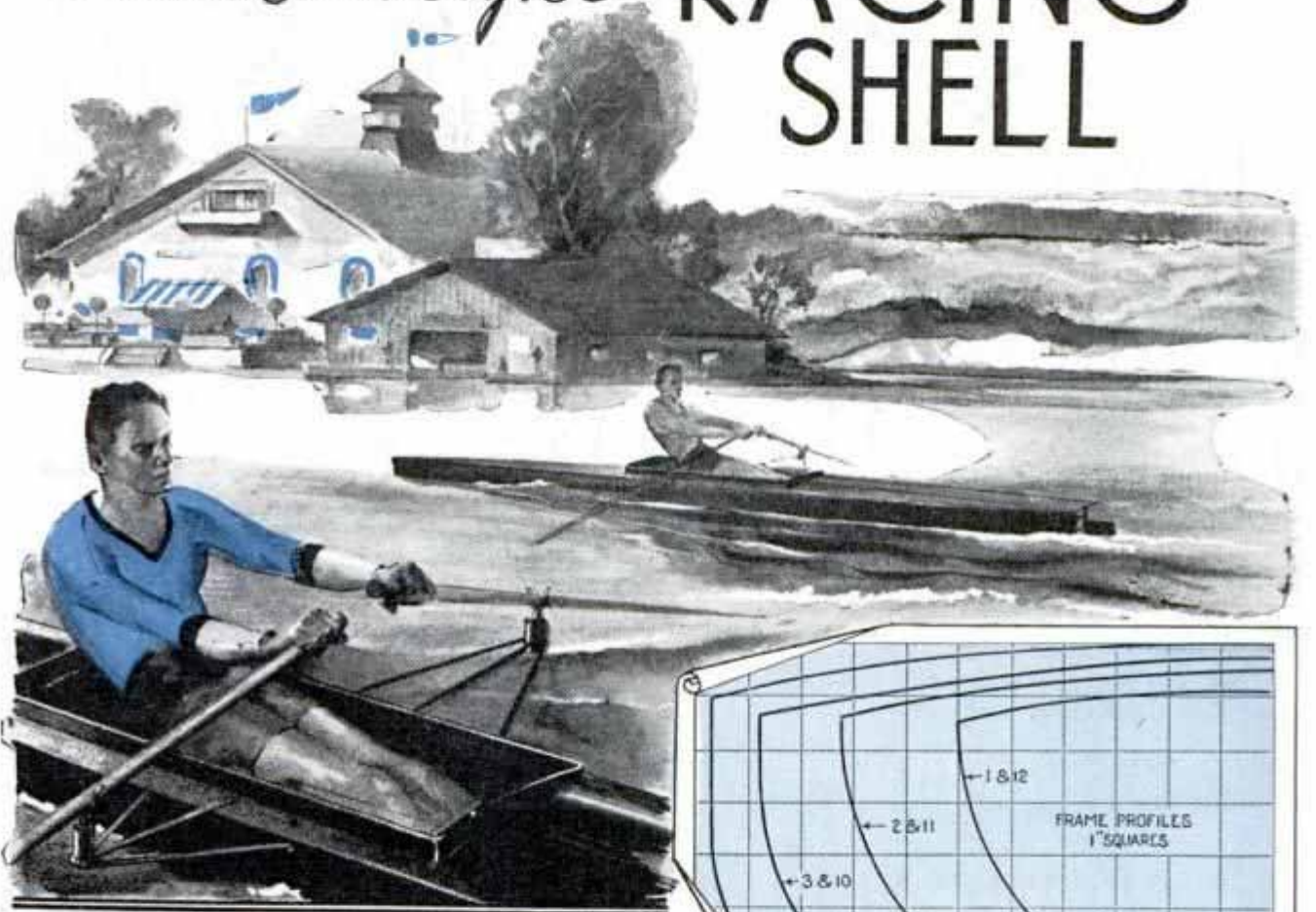
Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles; these are available without charge on receipt of postage.

Chicago 215 W. Pearson

Carter motor 9610. Superior



Featherweight RACING SHELL

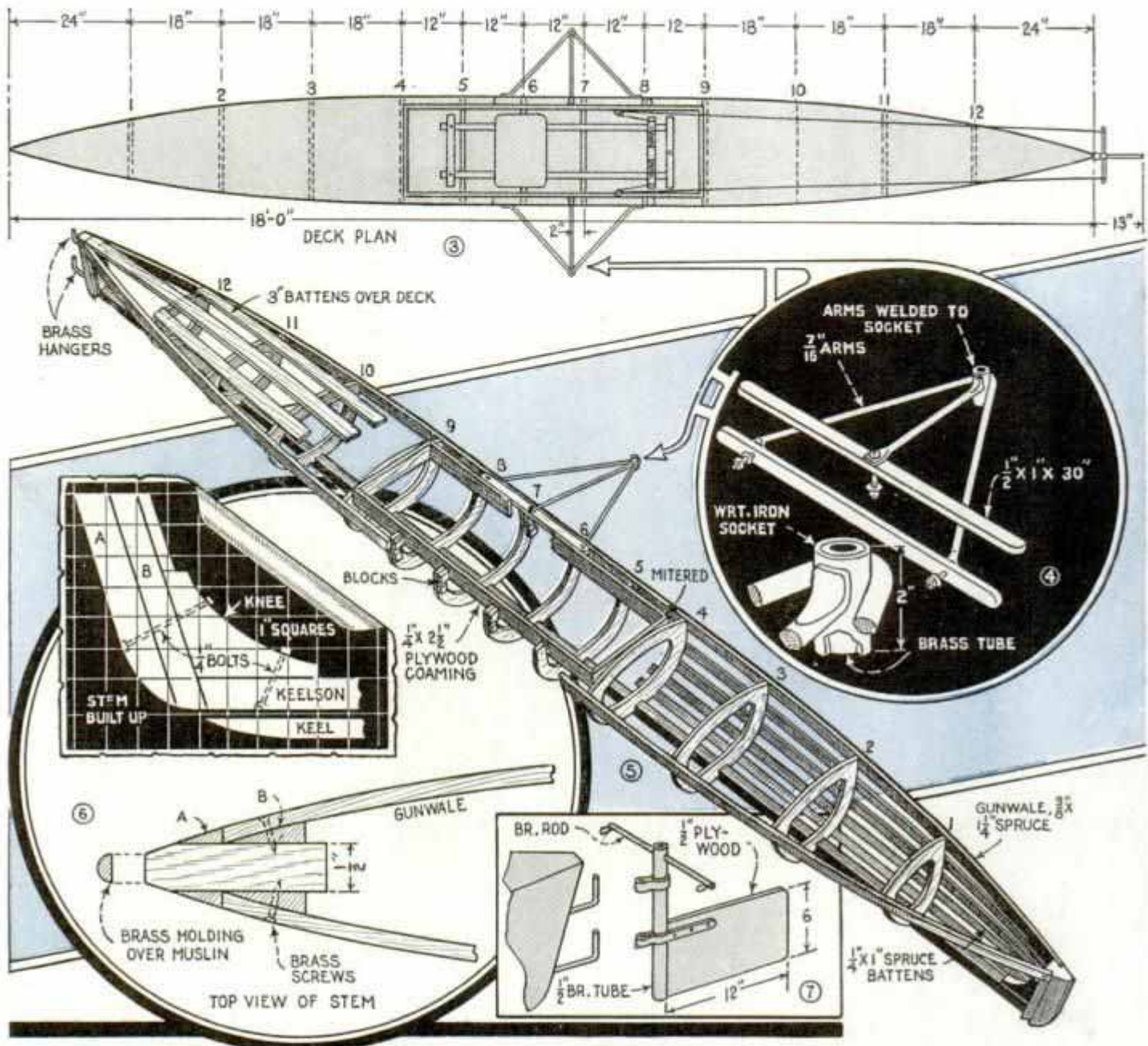


ESPECIALLY designed for the oarsman who wishes to improve his rowing skill, this light racing shell offers healthful exercise, as well as keen, competitive sport. While this model is a one-man design, it can be built to accommodate two or more persons by adding 2 ft. per man to the length, with a corresponding increase in size of the cockpit and seat rails.

To start construction, first prepare a keelson of oak or spruce, 1 in. square and 17 ft. 6 in. long, and then make the stem and stern posts. These are identical, and are built up as in Fig. 6. Tapered blocks A and B are fastened to a piece of 1/2-in. spruce or white pine with marine glue and

finishing nails. The general deck plan is shown in Fig. 3.

Now make the twelve frames, outlines of which are given in Fig. 1. The cockpit frames numbered 4 to 9 are cut from 3/8-

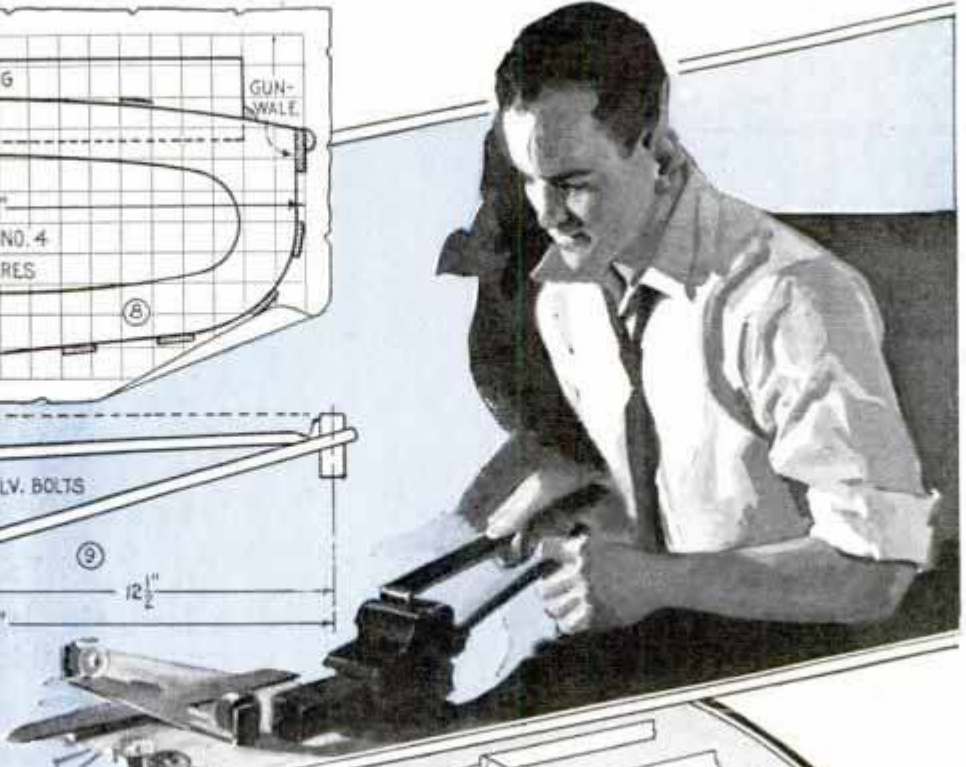
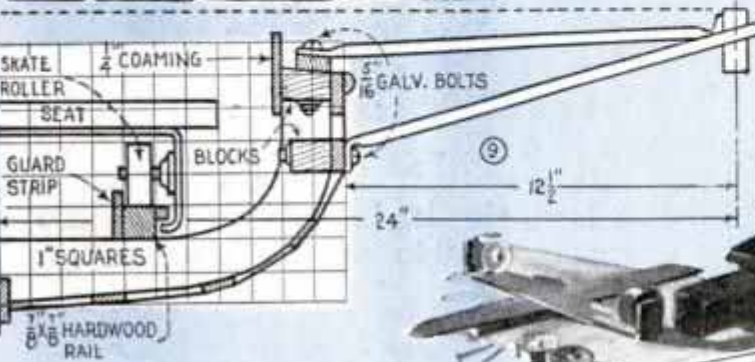
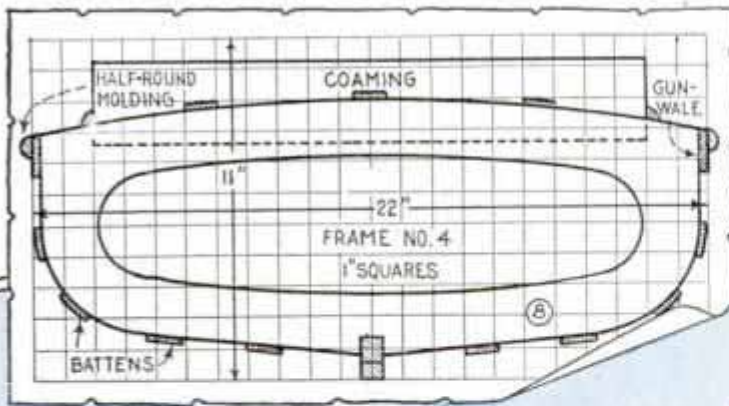


in. plywood, and all others are of $\frac{1}{4}$ -in. plywood. This is a jig-saw job, the central portions being cut away so that the frame is about 2 in. wide all around. Fig. 8 gives the general form of the frames. Frames 5 to 8 have no cross member at the top. Blocks, as in Fig. 9, are fastened on frames 6, 7 and 8 to carry the members to which the oarlocks are bolted.

When the frames have been completed, screw the keelson, with stem and frames assembled, to a plank as in Fig. 2. Each frame is fastened to the keelson with a finishing nail and marine glue. Strips are nailed across the tops of the frames temporarily to hold them in their relative positions until the gunwales and battens are put on. These are fastened to stem, stern and frames 6 and 7 with brass screws, and

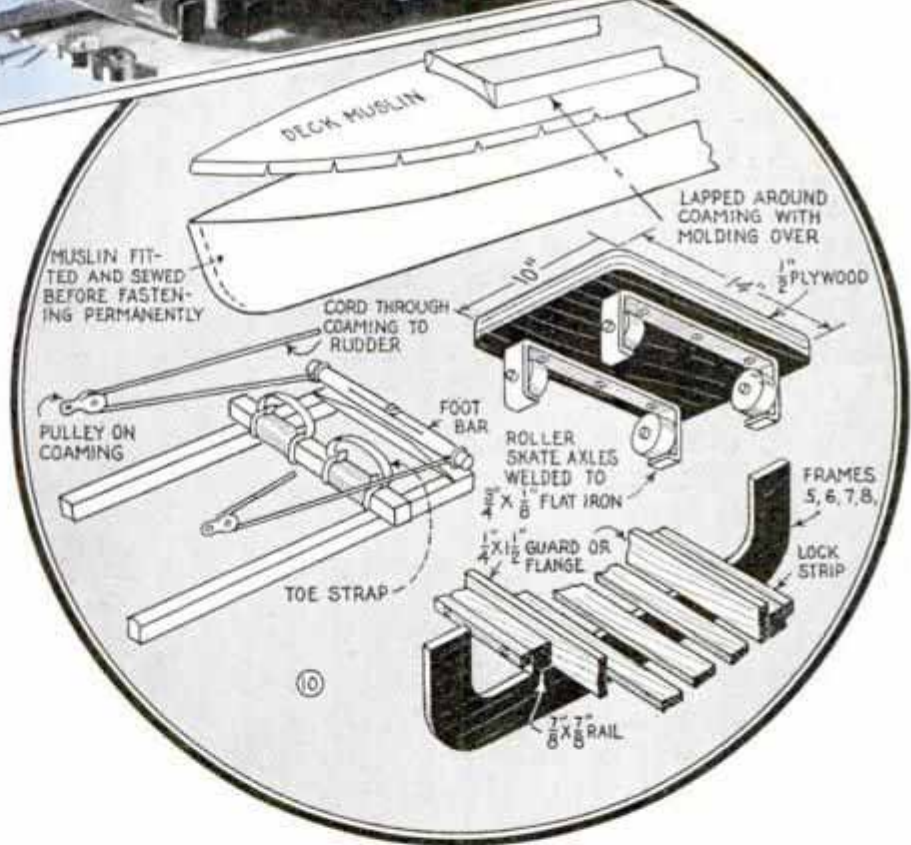
to the other frames with finishing nails, as in Figs. 5 and 6. The coaming is $\frac{1}{4}$ by 2 $\frac{1}{2}$ -in. plywood, mitered at the corners. All plywood, if the waterproof grade is not available, should be thoroughly shellacked before assembling, especially along the edges where moisture might enter and loosen the layers.

The seat travels on a pair of hardwood rails with a flange and a lock strip, Fig. 10. The seat top is $\frac{1}{2}$ -in. plywood mounted on skate rollers which turn on axles welded to flat-iron brackets. A lip below the rollers slides under the lock strip attached to the rail, and prevents the seat from dropping out when the shell is turned upside down. On the after-end of the rails, a foot rest is bolted, with toe straps, and just beyond this is a pivoted foot bar for steering.



Construction of the rudder is simple, as shown in Fig. 7. After completing the frame, two coats of shellac or spar varnish are applied. The coaming and seat top will be more effective if stained walnut or mahogany before varnishing.

For the covering or "skin," use a good grade of unbleached muslin. Put the deck on first. Fit it temporarily, allowing for a lap around the coaming, Fig. 10. Apply marine glue around the gunwales, draw the cloth smooth over the three battens on each deck, and press the edges on the glued gunwales. Next, fit a piece of muslin over the hull snugly, pinning or basting it at the end. Remove and stitch with a double seam at the ends. Apply more marine glue on the gunwales and put the hull fabric on permanently, using copper tacks along the gunwales only. The cloth should not be stretched too tightly, but just enough to remove wrinkles. Two coats of airplane wing dope will make it



drum tight. When the wing dope is dry, give the entire covering a coat of spar varnish. Put on a half-round molding to cover the tacks in the gunwales, also around the coaming to cover the lapped cloth, and then nail a brass molding on both the stem and stern.

Fig. 4 shows construction of the oarlocks which are 48 in. from center to center, although this spacing may be varied to suit. The oarlocks and wood strips are fastened to the hull after the skin is put in place.

Fruit Picked from Thorny Bushes with Tin Can

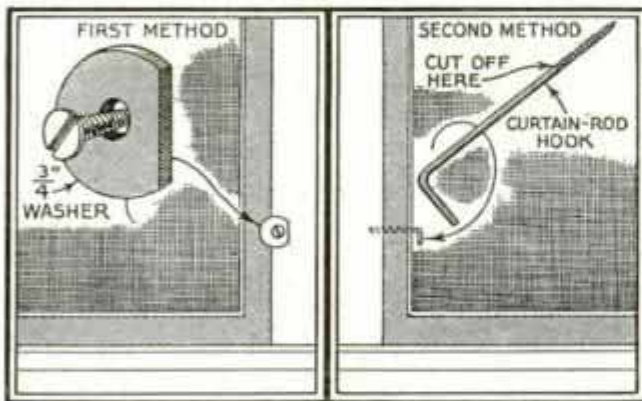


Fruit Picked from Thorny Bushes without Injuring the Hands by Using Can with Serrated Top

To avoid injuring your hands on thorns, when picking currants, gooseberries, etc., take a tin can, cut off the top at an angle and serrate a portion of the edge as shown. Holding the end of a branch with one hand, take the can and strip off the fruit.

Handy Fasteners to Keep Window Screens in Place

Instead of fastening your window screens with nails, screws, or large wooden turn-buttons, use one of the methods shown, which are neat, effective and do not mar the appearance of the windows. One meth-



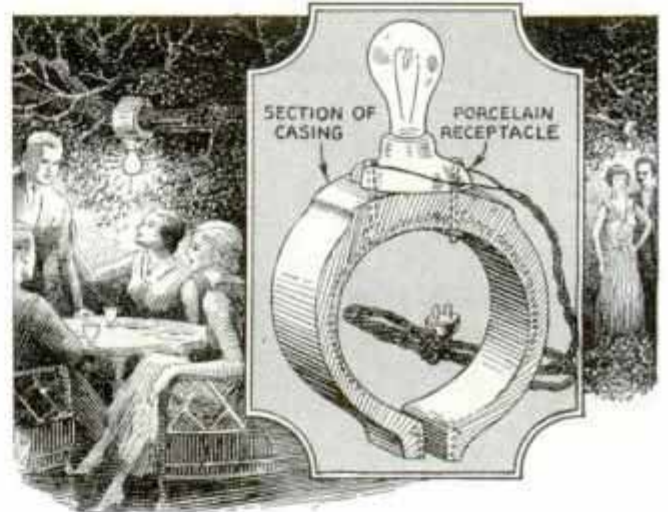
Effective Fasteners Hold Screens in Place without Marring Appearance of the Windows

od consists of screwing metal washers, which have been flattened on one side with a file to form an eccentric, to the window

casing so they can be turned to hold the screens. The other method consists of drilling small holes through the screen frame into the casing to take long curtain-rod hooks as shown.

Sections of Auto Casing Hold Portable Electric Lamps

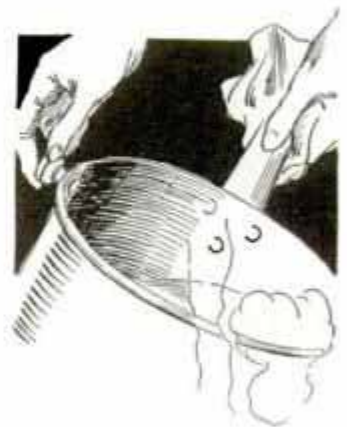
When it is necessary to string electric lamps around the lawn for a party, short sections of old auto casings will be found highly useful as holders for the lamps. They can be clamped easily to tree limbs, posts or other supports, and can be taken down in a jiffy. Porcelain receptacles or sockets are attached to the tire sections with long, slender bolts, after which the lamps are wired in the regular way.



Portable Electric Lamps for Illuminating Lawns, Attached to Trees with Sections of Auto Tires

Repair Knob Aids in Pouring Liquids from Kettle

As an aid in steadying a heavy stew kettle or pan while pouring hot liquids from it, attach a pot-lid repair knob to the side just below the rim. This can be done by simply drilling a small hole through the side of the pan where the knob will not interfere with handling it. A simple precaution of this kind may be the means of saving one from serious scalds or burns.





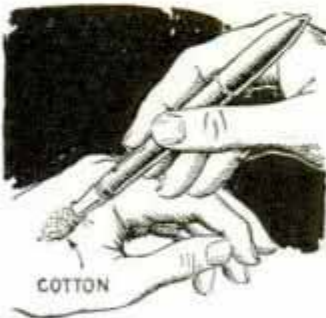
Simple Jig Cut from Tin Can Holds Cloth above Kettle for Straining Fruit Juices

Jig Made from Tin Can to Hold Strainer Cloth on Pots

When straining fruit juices for bottling, or jelly making, the problem of holding the strainer cloth above a pot or kettle is solved with this simple holder, which is made from a large can. The bottom, top and sides of the can are cut out, as indicated by the dotted lines, to leave the holder shown, the legs of which are bent to fit over the rim of the container. Four tabs, cut in the rim of the holder, are bent upward to hold the strainer cloth.

Fountain Pen Applies Remedy for Insect Bites

A fisherman, learning that common ammonia was an excellent remedy for insect bites, but disliking the inconvenience of carrying a bottle, used a cheap fountain pen for the purpose. The pen was filled with the fluid and a small wad of cotton was wrapped around the pen point and fastened with thread. The pen is easily carried in one's pocket in the regular way, and the ammonia applied with the cotton dauber.



Charred Pipe Bowl Sweetens First Smoke

Pipe smokers usually dislike breaking in a new pipe as the wood burning inside of the bowl imparts a bitter and rancid taste to the tobacco smoke. If the bowl of a new pipe is filled with wood alcohol, which is allowed to remain a few moments so that some of it is absorbed by the wood, the pipe may be emptied, and a light applied to the bowl. This will char the inside and will tend to insulate the tobacco against wood fumes.



Resurfacing Face of Golf Club

If the grooved surface of a wooden golf club becomes worn or filled with dried mud, take a short piece of hack-saw blade and pull the toothed side heavily across the club face parallel with the grooves. This will remove the dirt and tend to renew the grooves. The blade used for this purpose should have coarse teeth, and should be fitted with a handle, which can be made by cutting a groove in a wood block to take the smooth edge of the blade tightly.

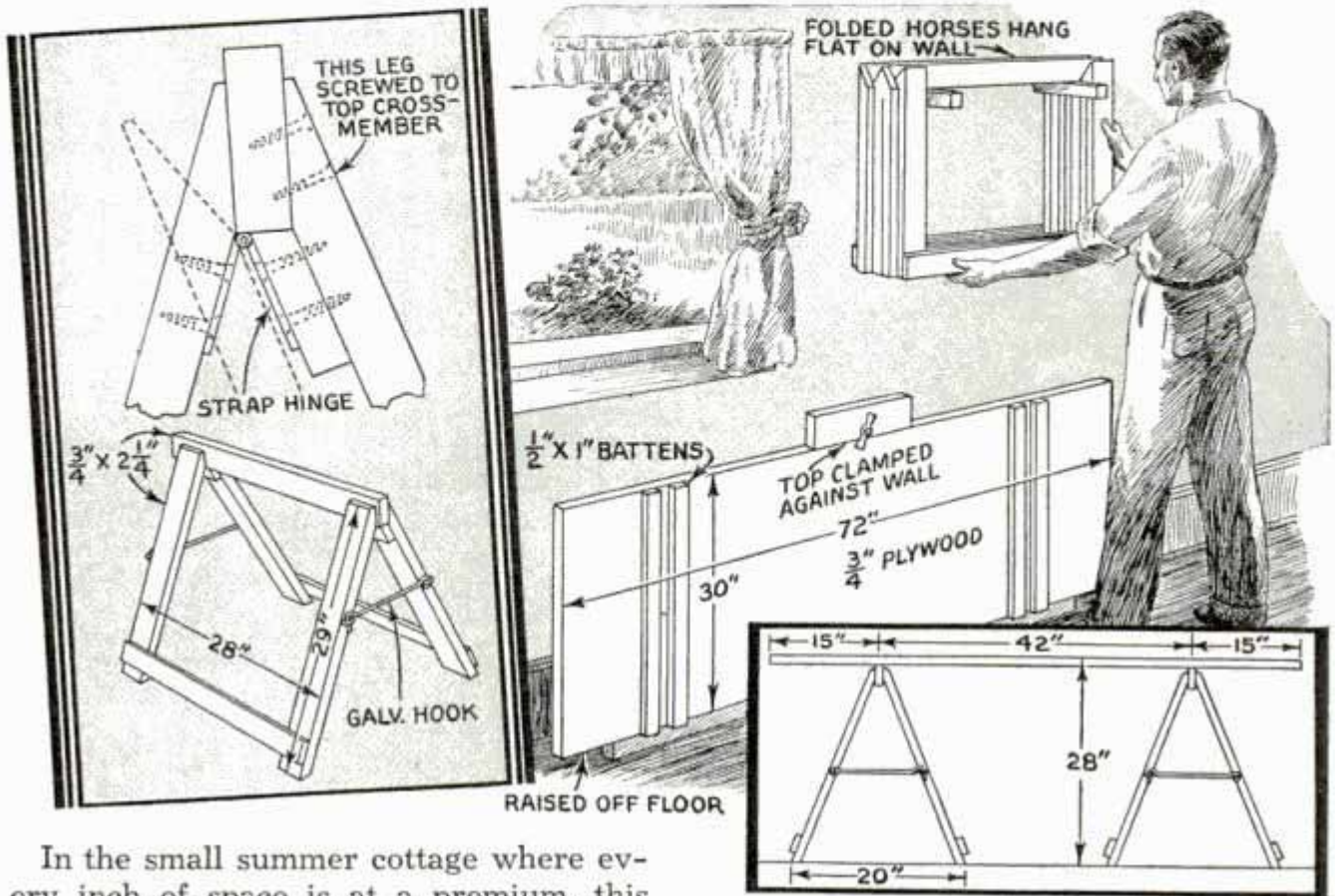


Small Pictures Supported on Mantel with Screw Eyes

Small picture frames that are not provided with a means for supporting them on a shelf or mantel, may be held at any desired angle by long, slender screw eyes, driven into the bottom of each frame. The screw eyes should be covered with tape or crepe rubber if the frames are to be set on a varnished surface.



Space-Saving Table for the Summer Cottage



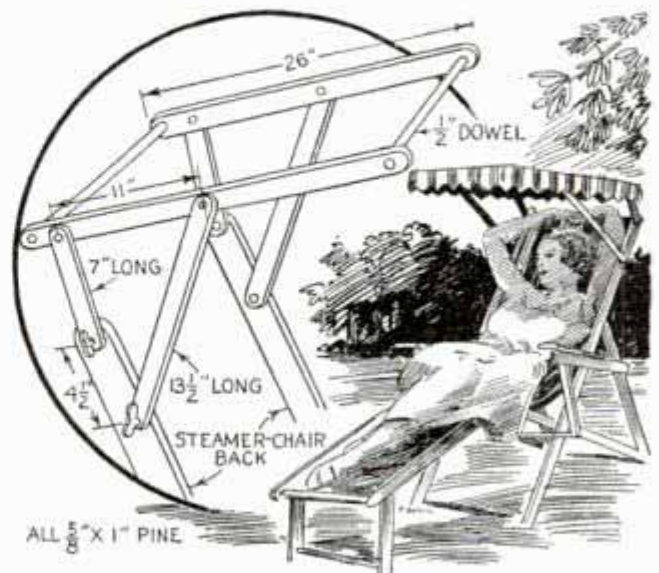
In the small summer cottage where every inch of space is at a premium, this folding table will be found a great convenience as it occupies no appreciable space, and will accommodate six diners comfortably. Two light horses give it a stability not possible with folding legs. The top is a single panel of $\frac{3}{4}$ -in. plywood having two battens nailed crosswise on the

underside, near each end, to keep the horses in position. These are hinged to fold flat against the wall when not in use, one pair of legs being screwed to the top cross member, and the other pair hung on strap hinges. A long galvanized hook keeps the horses from "spraddling."

Attractive Awning for Your Lawn Chair Can Be Adjusted

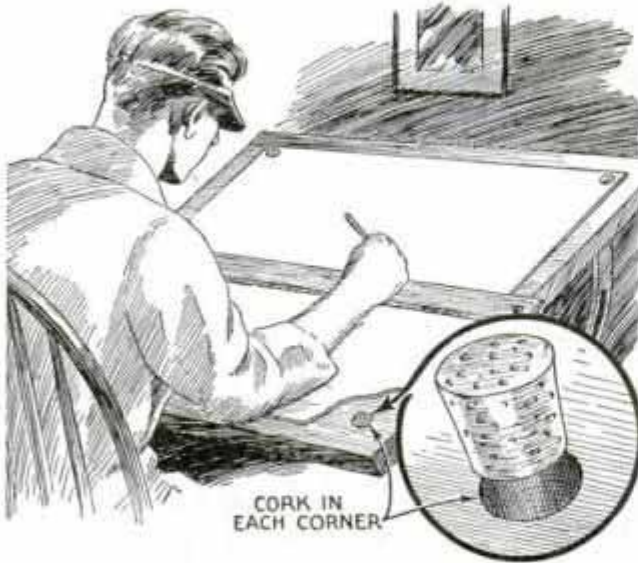
Striped canvas stretched over a light framework provides an attractive awning for a lawn or steamer chair. The awning is attached to the back of the chair with thumbscrews so that it may be tilted forward or backward to give the required shade. Also, the thumbscrews permit the awning to be removed readily. The dimensions of the frame shown may be altered to accommodate your chair.

Cracks in plaster walls and ceilings can be repaired before paint or paper is applied by filling them with a stiff paste consisting of plaster of paris and whiting mixed with water. The paste should be pressed firmly into the cracks with a trowel or putty knife.



Striped Canvas Stretched over Light Framework Provides Adjustable Awning for Your Lawn Chair

Cork Inserts Protect Drawing Board



Removable Cork Inserts Take Thumb Tacks and Help Prevent Marring Surface of Drawing Board

When the same size of paper is used repeatedly on a drawing board, the thumb-tack perforations become so numerous over four small areas that the wood is soon roughened and slivered. To avoid this, one artist drilled large holes through the board at the points where the tacks were usually located and fitted fine-grain corks into them. The corks, when sanded flush with the surface of the board, provided removable inserts to receive the tacks.

Cardboard-Box Corners Used as Display Stands

Having need of a quantity of display stands during a big shoe sale, and not being able to obtain them readily, a merchant



Corners Cut from Cardboard Boxes Used as Stands to Display Shoes in Show Windows

cut the corners from a number of cardboard boxes and used them as substitutes. As may be seen in the drawing, these stands held the shoes at the proper display angle and afforded space for the price.

Glass Tumbler Can Be Used as Chemists' Graduate

A chemist, who needed several glass graduates, made satisfactory substitutes from a measuring stick and glass tumblers of the same size and shape. The stick was marked off to show the correct quantity of liquid when one

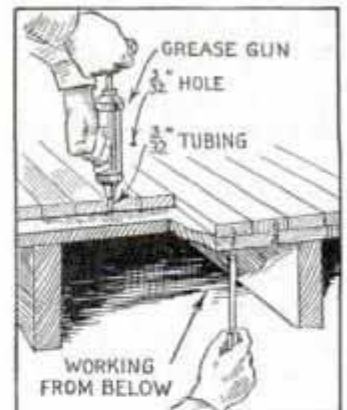


end was rested on the bottom of the glass. The finished stick was dipped into hot paraffin to make it water and chemical proof.

Removing Squeaks from Floors

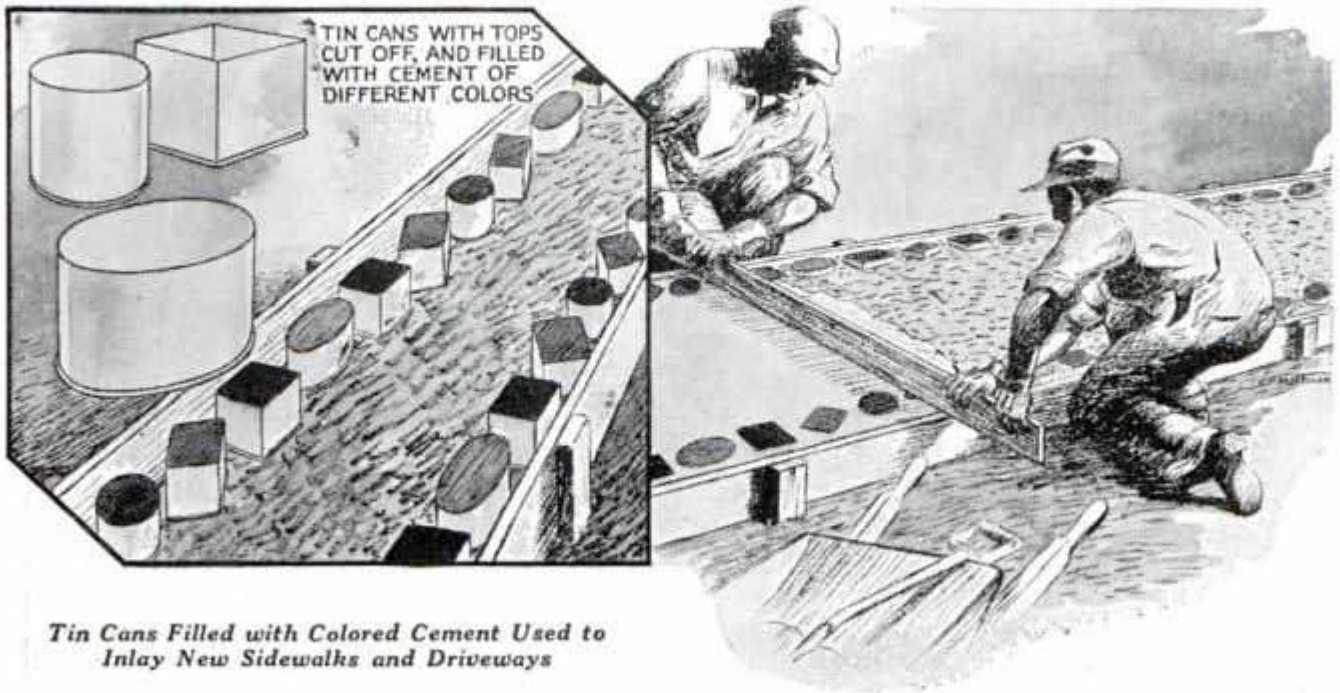
A little glue or a few screws properly placed will often stop squeaks in floors. If the latter are accessible from the underside, have someone walk over the floor to locate the squeak, and then drive two

or three screws through the sub-floor into the finished floor at this point. Draw them up tightly, and take care that they are not long enough to project through the finished floor. For squeaks in upper



floors that are not accessible from the underside, drill a few $\frac{3}{32}$ -in. holes through the finished flooring at the point where the squeaks occur and force a liberal amount of glue between the floor layers with an auto grease gun. An adapter made from small tubing can be used on the gun for this purpose. Before putting the glue in the gun, be sure that all the grease has been washed out with gasoline.

How to Inlay Sidewalks with Colored Cement



When laying a sidewalk or driveway, you can add an interesting touch with spots of colored cement arranged to form a border. To do this, get a number of tin cans, cut off the tops and fill them with colored cement, troweling it flush with the tops of the cans. Then, lay the walk forms, put in the cinders or sand, and set the cement-filled cans inside the forms to make

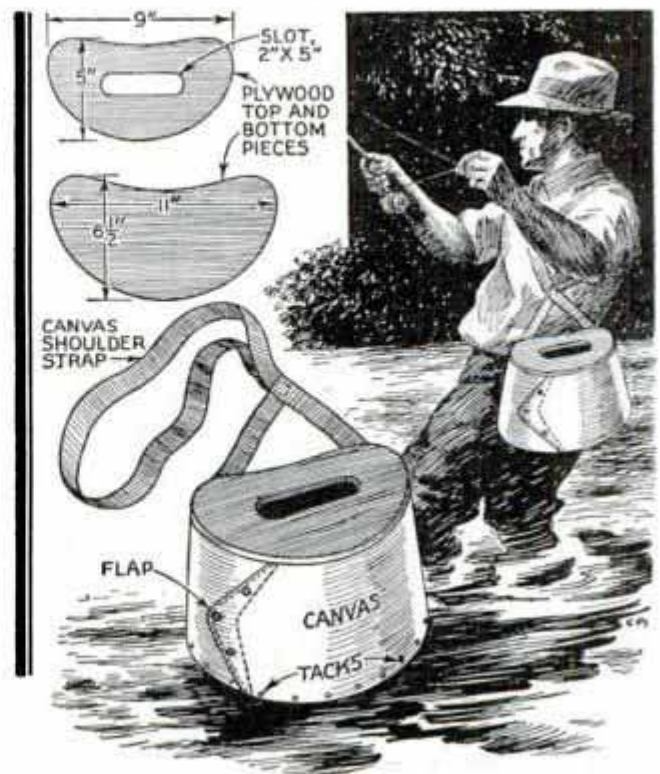
the design you want. Use a straightedge to get the tops of the cans flush with the forms. Then pour the concrete to complete the walk, taking care not to disturb the position of the cans. Trowel the top surface of the wet concrete flush with the tops of the cans. These are left in the walk, the top edges rusting away, thus increasing the effectiveness of the job.

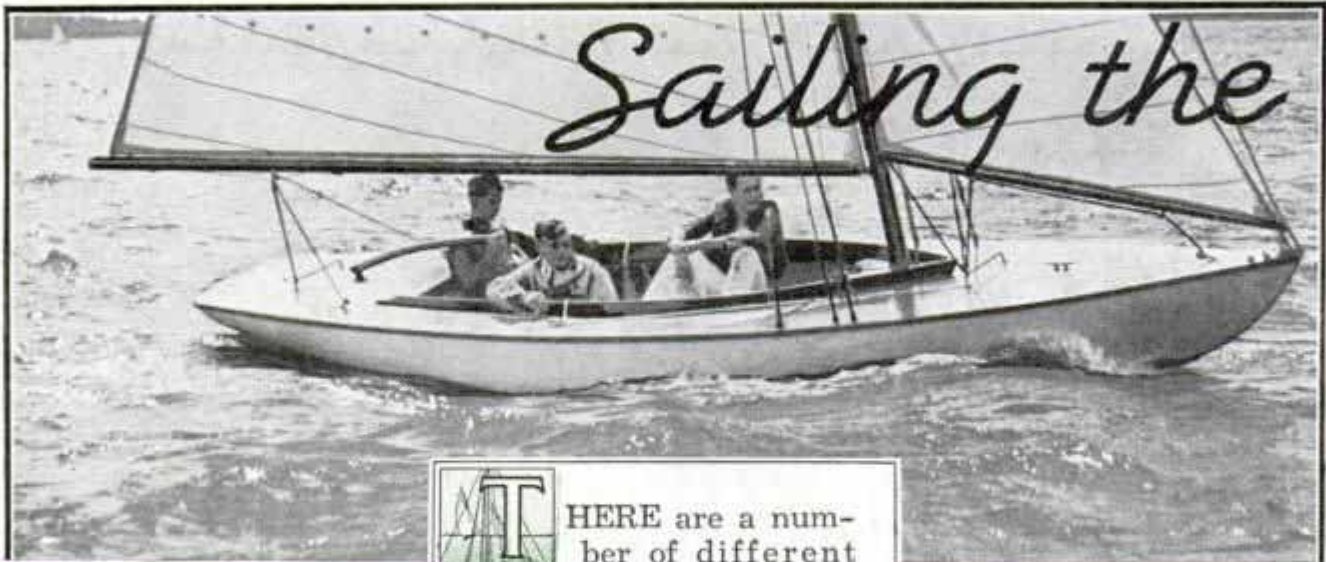
This Collapsible Creel Takes Little Space in Your Luggage

As it can be folded flat, this creel takes little space in your pack, and it can be made inexpensively by anyone. The top and bottom are plywood, and the sides are canvas. The latter is tacked to the underside of the top and to the edges of the bottom. When cutting the canvas, allow enough extra material to make one end a wide V-shape to provide a flap, which is buttoned to the other end to provide an opening for emptying the creel.—G. Everett Van Horn, Lincoln, Nebr.

We Beg Your Pardon

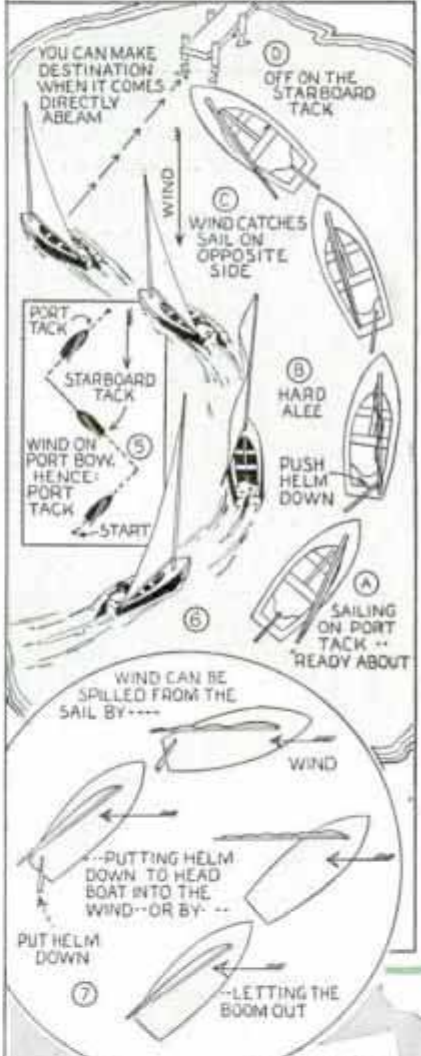
The word "Thermos" is part of a registered trade-mark, which is applied to a manufactured product. For this reason the word "insulated" should have been used for the word "Thermos" in a short article which appeared on page 910 in our June, 1935, issue.





THERE are a number of different courses a sailboat can travel, the general terms for these being shown in Fig. 1. "Running free" is the beginner's first choice. It is not the easiest course to sail, but the mechanics of sailing is at once obvious—the wind is directly astern, and the boom is broad off as a target. The sail can be set to either port or starboard, Fig. 2, but it is best to have the wind a little over the opposite quarter from the side on which the sail is carried, Fig. 3. When you sail "by the lee," Fig. 4, you are in danger of jibbing. This is a dangerous movement when it happens unawares in heavy weather, but it can be done with impunity in light airs.

A sailboat cannot sail directly into the wind, but

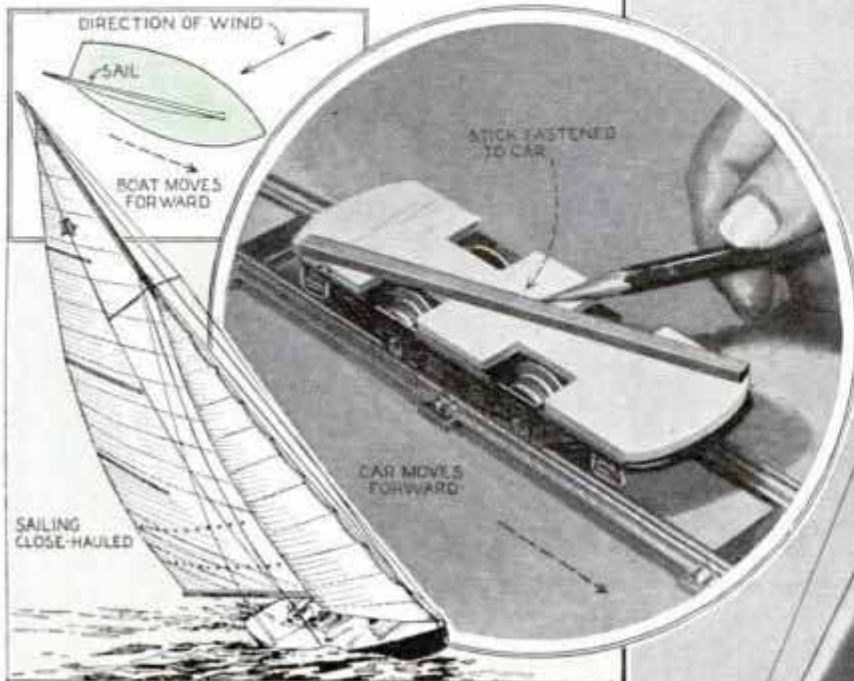


SAILING BEFORE THE WIND—ALSO KNOWN AS RUNNING, SAILING AS RUNNING, SCUDDING, ETC. FREE. THE SAIL IS SET SO THAT AS MUCH OF IT AS POSSIBLE IS AT RIGHT ANGLES TO THE BOAT. NOTICE THAT THIS DOES NOT MEAN THAT THE BOOM IS LET OUT AT RIGHT ANGLES; THIS WOULD CAUSE SAIL TO SAG FORWARD.

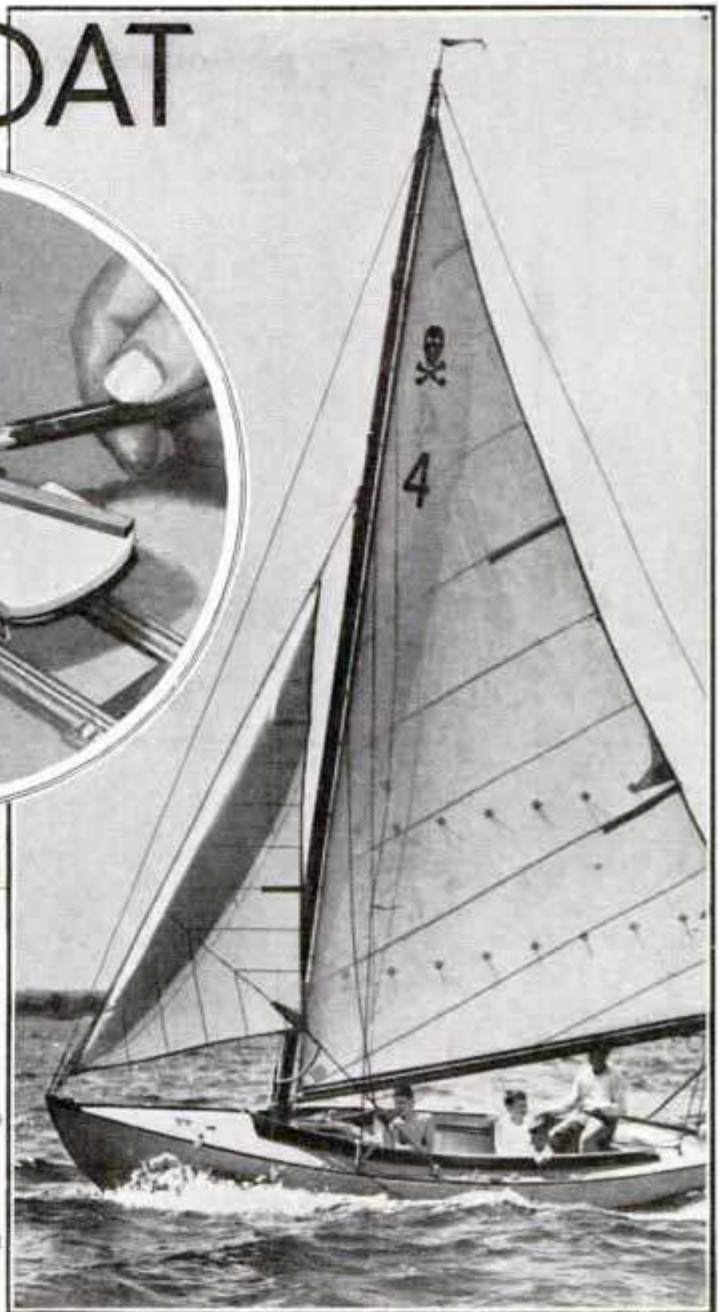
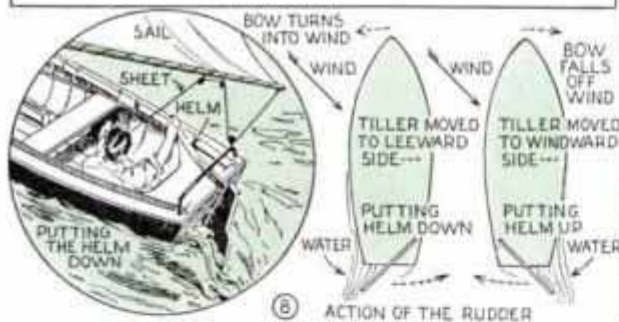
RIGHT. A STAR BOAT IN A KNOCK-DOWN KEEL BOATS USUALLY COME BACK TO THEIR NORMAL SAILING LINE. KNOCK-DOWNS INVAIABLY OCCUR IN PUFFY WEATHER. THE BOAT LOSES A WAY BETWEEN PUFFS AND IS MORE READILY HEELED TO THE DANGER ANGLE.

WHEN IN DANGER FROM A HEAVY PUFF, HEAD THE BOAT INTO THE WIND (THIS IS KNOWN AS LUFFING), AND EASE UP ON THE SHEET.

SMALL BOAT



Boats cannot sail directly into the wind, but can proceed against it at about a 45° angle as illustrated by the pencil and toy car shown above

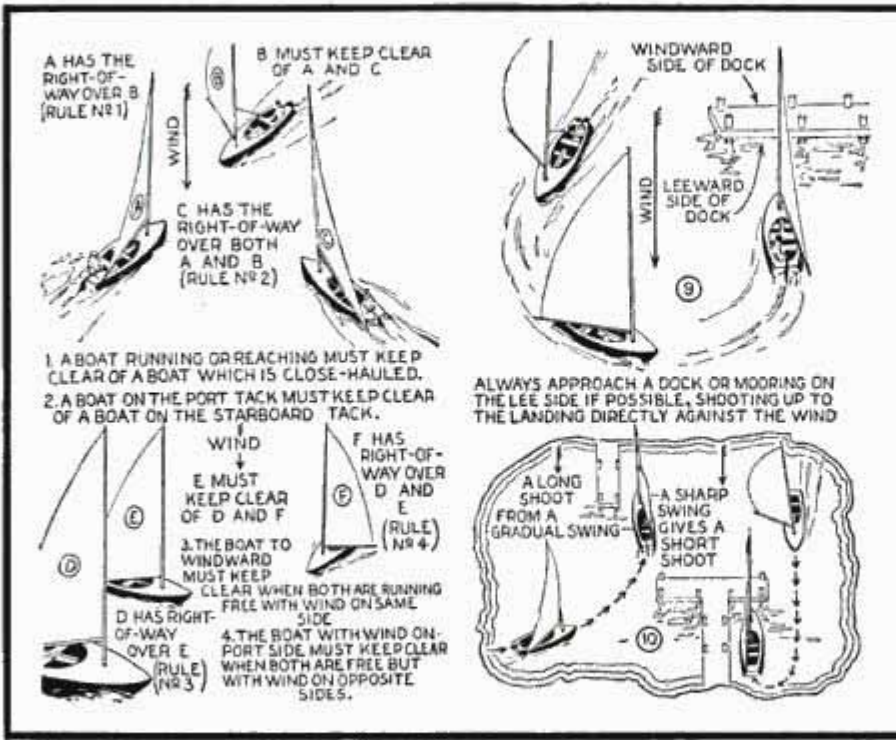


it can travel at about a 45° angle off the wind. Thus, if you wish to sail to a point directly to windward, you would proceed in a series of zigzag courses, as shown in Fig. 5. These courses are known as "tacks," and the whole procedure is known as "tacking." When changing from one tack to another, it is necessary to come about. This is shown in Fig. 6, and is simply a matter of bringing the boat's head up into the wind so that the sail will shift from one side of the hull to the other.

Your boat will tilt over (heel) more sharply when you are sailing to windward than on any other course. Most boats are safe with the water foaming along the leeward gunwale. You must be on guard for strong puffs of winds, parrying these by

heading up into the wind (luffing), or by starting the sheet to let the boom out to a position where the wind can blow on both sides of the sail, Fig. 7. Use the rudder wherever possible, and do not start your sheet unless it becomes absolutely necessary. Knockdowns are very rare when the skipper takes care to luff up to heavy puffs of wind. Keep the boat moving as you are completely at the mercy of the wind when your boat has lost all headway.

Fig. 8 shows the action of the rudder. It is important that you know without thinking just how you will swing when you put the helm up or down. Fig. 9 shows the proper way to approach a dock or mooring. In shooting up into the wind to make



a landing, you must find from experience just how far your boat will travel. Some boats shoot better than others; all boats shoot farther with a long gradual swing than with a short swing, as in Fig. 10.

By all means, learn the "rules of the road." You will save yourself a lot of worry by knowing when and why you have the right of way. Do not, however, insist on your rights when it is apparent that the other boat does not know "what's what."

Attractive Bird Houses Made from Linoleum

Attractive bird houses that add a touch of color to the garden are made easily from scrap pieces of linoleum. This is tacked to a wood disk to form the bottom and walls of the house, while a cone-shaped piece serves as a roof.



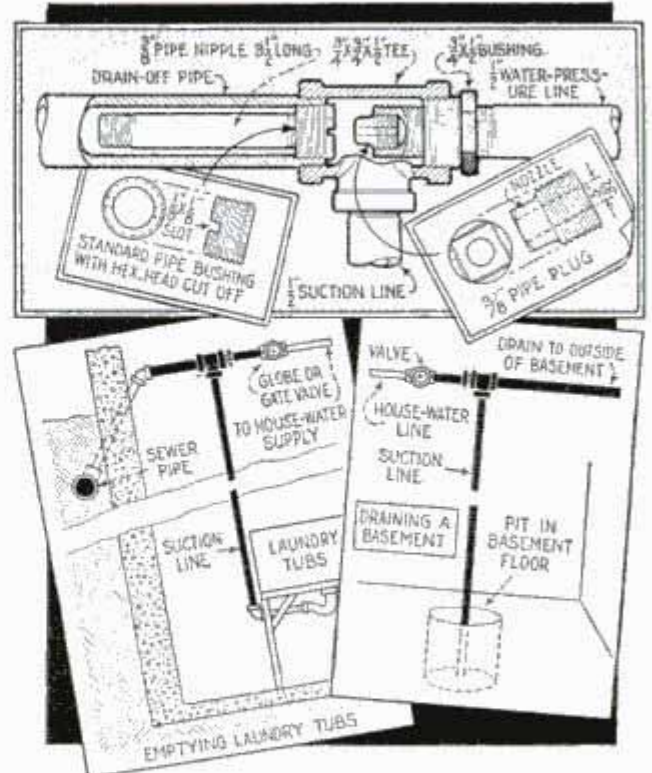
String or wire attached to the side walls, and threaded through the point of the cone, holds the house to a tree branch, while dowels inserted into the house serve as perches in front of the entrance hole, which is cut in the linoleum. It is a

good idea to give the latter two coats of good waterproof varnish followed with a thorough waxing to protect the linoleum.

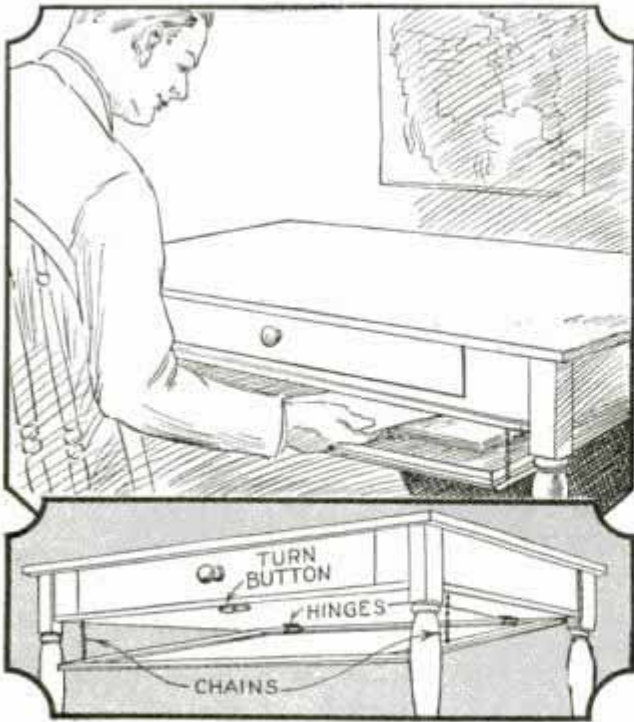
Simple Water Siphon for the Home

Where water is not to be raised over 7 ft., and there is a supply of water under pressure, this siphon will be found handy for draining pools, cisterns, tanks, etc. The siphon will handle 120 gal. per hour when operated under a water pressure of from 40 to 60 lbs. A careful study of the drawing

will show you how the siphon is made, the principal part of which is a jet made from a pipe cap. The clearance between the end of the jet and the pipe nipple, shown in the upper detail, may have to be adjusted for best results owing to variations in water pressure. A distance of 1/4 in. is usually about right. A union installed in the drain-off pipe just in front of the nipple will facilitate making the adjustments.



Made from Pipe and Fittings, This Siphon Is Handy for Draining Basements, Laundry Tubs, Etc.

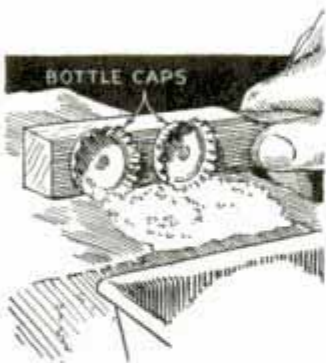


Shallow Tray Hinged to Underside of Writing Desk Keeps Your Stationery Handy

Hinged Tray Keeps Stationery under Writing Desk

To provide ample storage space for stationery in my writing desk, I hinged a shallow tray to the underside between the aprons. The tray is a piece of $\frac{1}{4}$ -in. plywood having narrow strips nailed around the edges, and is hinged to the rear apron, a wood turnbutton being provided at the front to hold the tray closed.—George A. Smith, Quarryville, Pa.

Ice Shaver for Camp Use



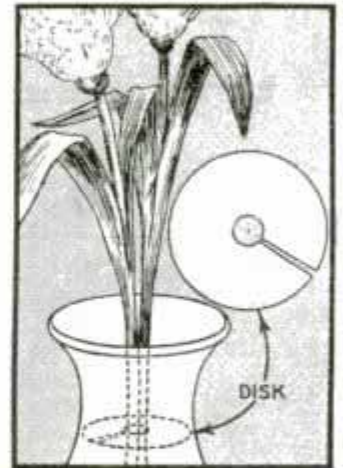
One member of a camping party, in need of a tool to shave ice for refreshments, found that two or three bottle caps tacked to a stout stick would serve the purpose nicely.

If the caps are attached to the stick with small screws, the latter may be loosened and the caps turned when the cutting edges become dulled.

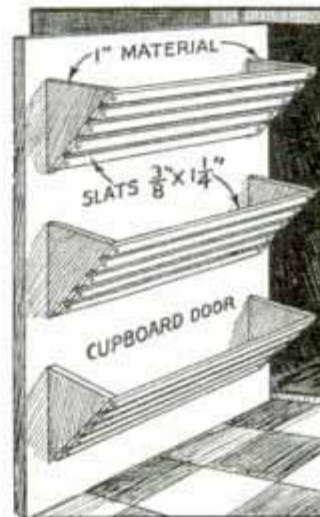
Small articles, such as nuts and screws, that have fallen into some inaccessible place, can often be picked up by means of chewing gum stuck on the end of a stick.

Cardboard Disk Holds Flowers Neatly in Vase

When two or three flowers are put in a vase, it is often rather difficult to keep them from falling to one side unless they are held in position. For this purpose, cut a cardboard disk to fit snugly in the vase neck as shown.



Vegetable Bins on Inside of Cabinet Door Save Space

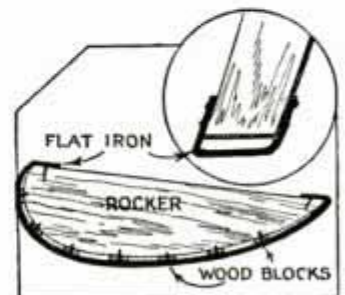


Mounted on the inside surface of a cupboard door, these vegetable bins are hidden from view, are easy to get at and utilize space that is ordinarily wasted. Triangular blocks are screwed to the door, and wood strips nailed to their outer edges as shown.

Iron Shoes Help Prevent Legs of Lawn Furniture from Splitting

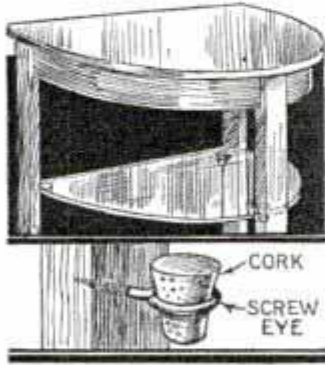
One of the best means of preventing rockers and legs of lawn furniture from splitting, due to absorption of moisture through the end grain of the wood, is to keep them from coming in direct contact with the ground. This is done by putting

flat-iron strips over the ends of the legs and rockers as shown, spacing the iron about $\frac{1}{2}$ in. from the wood by means of small blocks. These may be screwed to the legs and rockers before the iron is put in place.—Rollin H. Wampler, Roanoke, Va.



Screw Eyes Support Glass Shelf

Screw eyes and corks make practical supports for an extra glass shelf under a table or in a china or bric-a-brac cupboard. The screw eyes are driven into the frame of the cupboard and tapered corks are inserted into them as shown. If the shelf is not level, one or more of the corks can be forced down into the screw eyes until the glass rests firmly at all points. —Lester P. Young, Culver, Ind.



Notched Boards Prevent Slipping of Hammock Ropes

When a hammock is suspended between two trees, and the ropes have a tendency to slip down, notch one end of two boards or stakes and set them under the ropes, as shown, to hold them in place. The edges



Boards Notched at Ends and Set under Hammock Ropes Keep Them from Slipping

of the notches should be rounded to prevent wear on the ropes when the hammock is in motion. Or, still better, nail a piece of auto tire in the notch.

☐ A convenient bench knife can be made from the broken blade of a jackknife by flattening one end of a piece of brass tube of suitable diameter and soldering the blade into the flattened end.



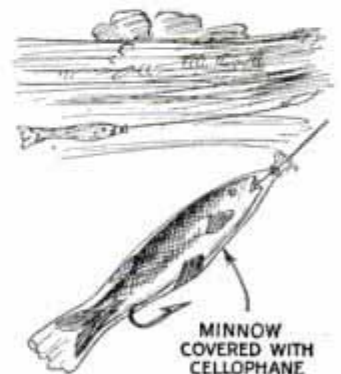
Spool Notched at One End Serves as a Depth Gauge on Knife When Opening Cardboard Boxes

Spool Gauge on Jackknife to Open Cardboard Boxes

To avoid damage when opening cardboard boxes of merchandise, you can improvise a depth gauge on a knife as shown. It consists of a spool, one end of which is notched to fit over the box edge. The hole through the spool should be just a trifle smaller in diameter than the width of the knife blade so that the gauge will be held securely when the blade is forced through it.

"Cellophane" Keeps Water from Washing Bait Off Fishhook

Minnows used as bait, when fishing in swift water, are often washed from the hook. By wrapping and tying a piece of Cellophane around the line and sliding it down so that it covers the minnow on the hook, as shown, the bait will be preserved without affecting its efficiency as a lure. This idea may be used to protect other bait such as worms and grasshoppers. —G. E. Hendrickson, Argyle, Wis.



Small Gas Engine Runs

By FLOYD M. MIX



A small $\frac{1}{2}$ or $\frac{3}{4}$ -h.p. gas engine, of the washing-machine type, drives this midget car 25 or 30 miles on a quart of fuel, at a speed of 15 to 20 m.p.h. Operation of both clutch and brake by one lever makes control easy, while pneumatic tires and long, soft springs assure a smooth ride. Construction is simplified by using old auto parts

WITH this midget car you can have plenty of fun at a safe speed. Its simplified control mechanism makes starting and stopping both easy and positive, while its size—58-in. wheelbase and $28\frac{1}{2}$ -in. tread—will allow sufficient room for you to be seated comfortably.

The car can be built with ordinary hand tools, and there is no machine work. Only a few parts call for brazing, which can be done at your local machine shop. The frame is the logical place to start. By referring to Fig. 1, you will find that two 61-in. lengths of $\frac{1}{8}$ by 2-in. angle iron are needed. The lower right-hand detail shows how one half of the angle iron is cut away, bent and brazed to form the front cross member of the frame. Another piece of angle iron is bolted or brazed on to form the rear cross member. The sides, which are parallel at the rear, have a slight bend as indicated so that they taper toward the front. In drilling holes in the framework, take care to get the dimensions accurate. The frame cross members come next. Note that a $\frac{5}{8}$ -in. bushing is brazed to the center member. This is used to hold the brake mechanism. Next, a $\frac{3}{4}$ -in. shaft and the cams for tilting the motor are installed,

which should be done before the frame crosspieces are bolted in place; otherwise you will have trouble in getting these parts assembled. Spring steel $1\frac{1}{2}$ in. wide and $\frac{1}{4}$ in. thick is used for the spring leaves. In the detail drawings, Figs. 1 and 2, you will note there are two bends in each leaf. The springs are not curved uniformly throughout the length. One simple method of making the bends is to heat the metal with a blowtorch just at the point of the bend. After the metal is brought to a dull red, lock it in a vise and quickly bend it to the required radius. Use the same procedure in making all the bends. It is also necessary to draw the temper at the points where the holes are to be drilled. To harden, re-heat at all points and quench in cold water. This method is not orthodox but will serve the purpose. You can save time and insure a true temper by having the job done at a shop equipped for handling work of this kind.

For the front axle and steering gear, Fig. 4, you will need a model-T Ford steering column, brake rods to be used for drag and tie rods, and a couple of brake clevises

this MIDGET CAR



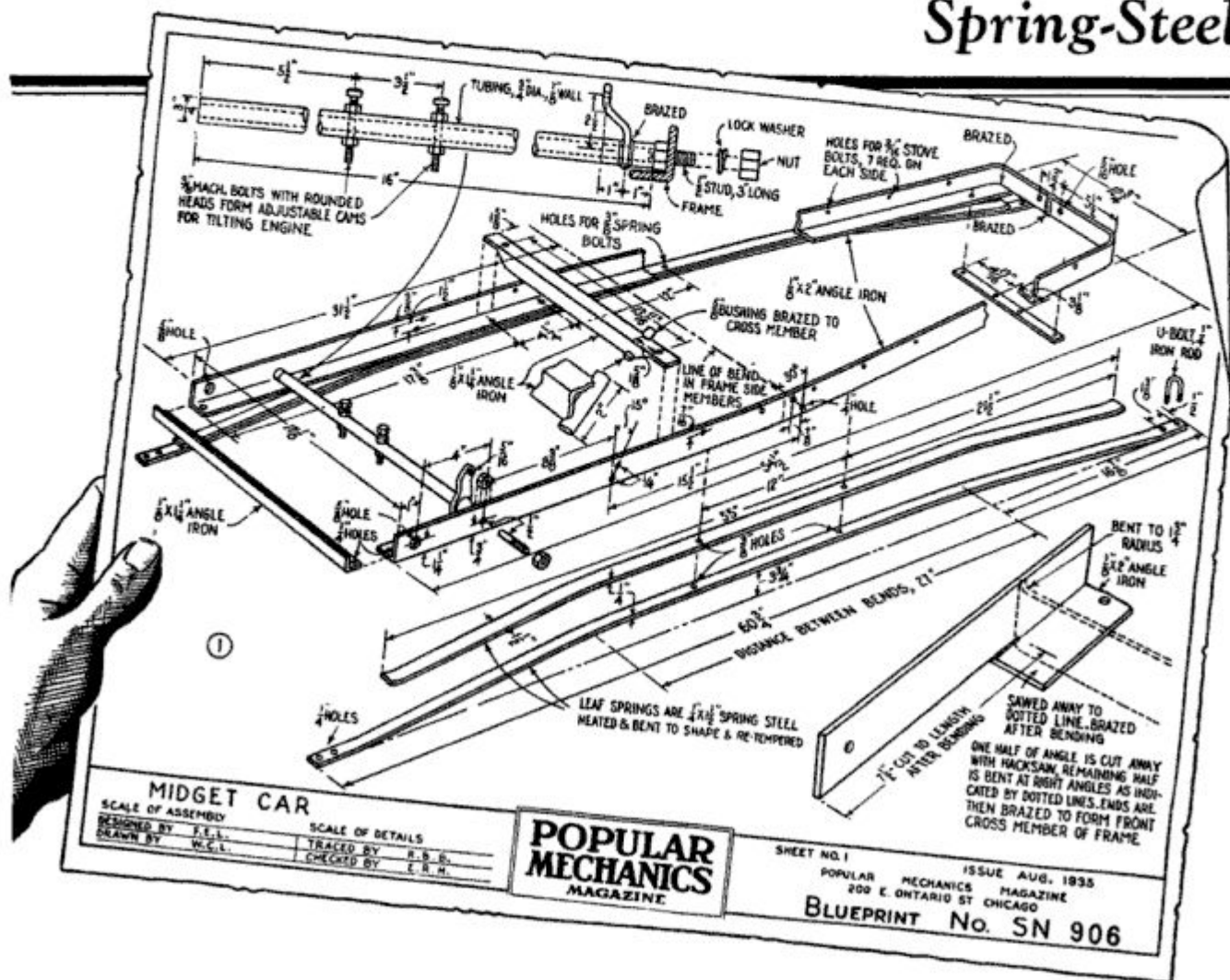
from a four-cylinder Dodge. These parts are usually available at auto-wrecking yards. Steering knuckles are bent from $\frac{3}{8}$ -in. malleable iron, to dimensions given. Wheel spindles, cut from $\frac{5}{8}$ -in. cold-rolled steel shafting, are brazed to the knuckles and the axle yokes are brazed into $\frac{3}{4}$ -in. iron-pipe housing. The steering-wheel housing is shortened to $22\frac{3}{4}$ in. and the steering rod is sawed off accordingly. In making the installation, the column is inverted and the flange is bent to a right angle. Wheels which are recommended for this car are equipped with ball bearings and 2.50 x 12.75-in. pneumatic tires. Two and four-ply tires are available.

Next comes the rear-wheel assembly. Only one wheel serves as a driver as indicated in Fig. 5. This method eliminates a complicated differential, and numerous tests have proved it to be entirely satisfactory. Great care must be taken in drilling holes in the hardwood disk so that the bicycle sprocket will be concentric with

the disk. Both rear wheels run loosely on a $\frac{5}{8}$ -in. axle, cut from cold-rolled steel shafting. They are held by the axle housing on the inside, and castellated nuts, which have been properly keyed, on the outside. Details of the control lever and braking mechanism are given in Figs. 2 and 3. When the lever is pushed forward the motor is tilted upward to tighten the drive belt and the car moves ahead. When the lever is pulled back the belt is slackened and the brake applied. To hold the drive shaft in place, you will need two brackets, as dimensioned in the upper left detail of Fig. 2. These can be cast from small patterns, or something suitable may be picked up at an auto junk yard. The idea is to provide good bearings for the $\frac{5}{8}$ -in. shaft. While you are at the junk yard, get a $4\frac{5}{8}$ -in. Dodge fan pulley and a model-T Ford brake band. Fig. 3 shows clearly how these parts should be assembled on the drive shaft.

For the floor pan, you will need a piece

Spring-Steel

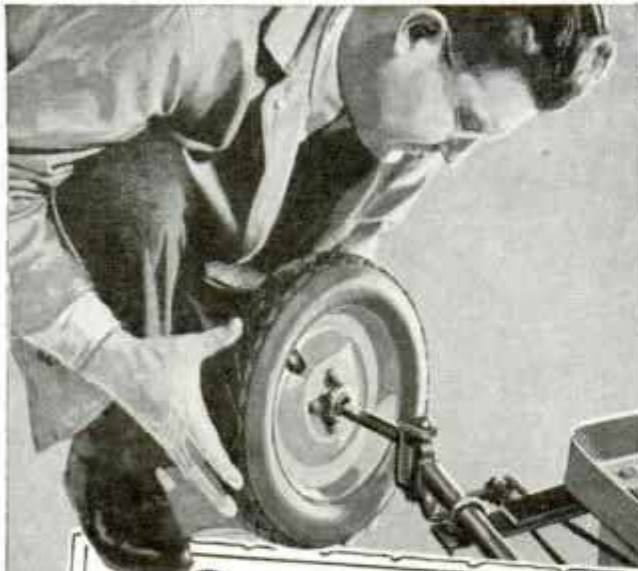


of No. 22-ga. sheet iron 24 in. wide and about 44 in. long. Bend it to shape as indicated in one of the details, Fig. 2. Place the metal in position on the inside of the frame and drill holes to take $\frac{3}{16}$ -in. stove bolts. Before going further, it is a good idea to braze the corner seams, as this tends to strengthen the floor. Now put in the stove bolts, using a small lock washer on each to prevent loosening. When the chassis has been completed, the engine is installed so you can take it around the block a few times before going ahead with the body. The base to which the engine is bolted may be made of $1\frac{1}{2}$ -in. hardwood. Drill the piece edgewise at one end to take the $\frac{5}{8}$ -in. shaft on which the engine is pivoted, as in Fig. 2. This arrangement permits the engine to tilt easily, yet is sufficiently rigid to prevent vibration. Another method of making such a base is to cut a suitable piece of fairly heavy sheet metal wide enough to permit two opposite edges to be bent over at right angles and drilled to fit the shaft. Slide the engine on the

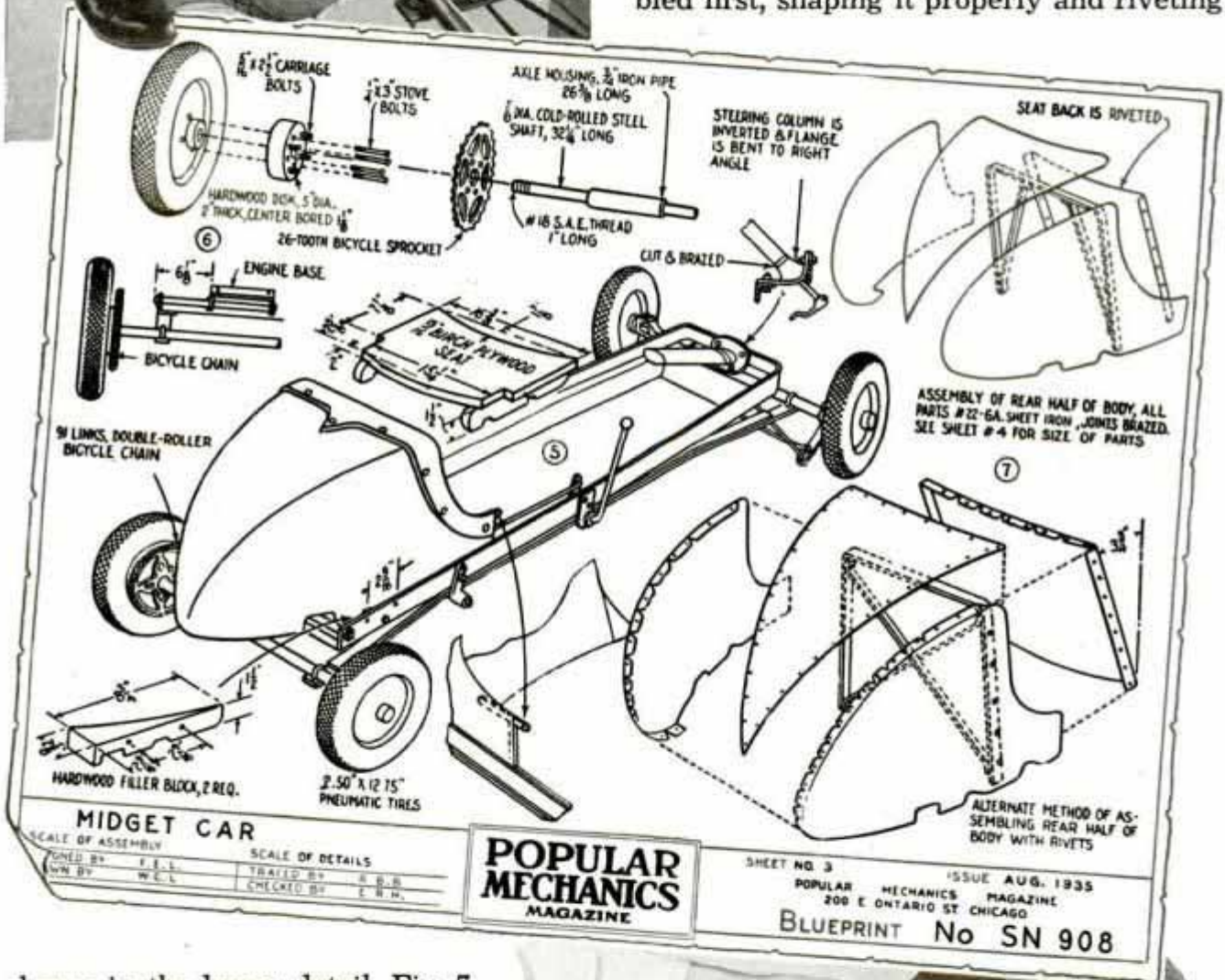
shaft until the pulley aligns with the drive-shaft pulley, mark on each side and drill for cotter keys, which hold the engine in place. A small rectangular-shaped gas tank is installed just ahead of the second frame cross member, as indicated in Fig. 2. It is important that this be slung low enough to fit under the seat, dimensioned in Fig. 5. Start up the engine and do the necessary experimenting and adjusting to get the various parts lined up. A gas-control lever is not required as the speed of the engine is automatically taken care of by an adjustable governor.

When tests prove that everything works satisfactorily, you can start on the body. This is built in two parts, and, as there are alternate designs, you can use either a metal or cloth covering. The cloth-covered body is perhaps the easiest to build, although it is not as desirable as a sheet-metal body, which can be finished up to make the car look like a real racer. On the metal body, Figs. 7 to 9, it is advisable to build up the rear section first. Before

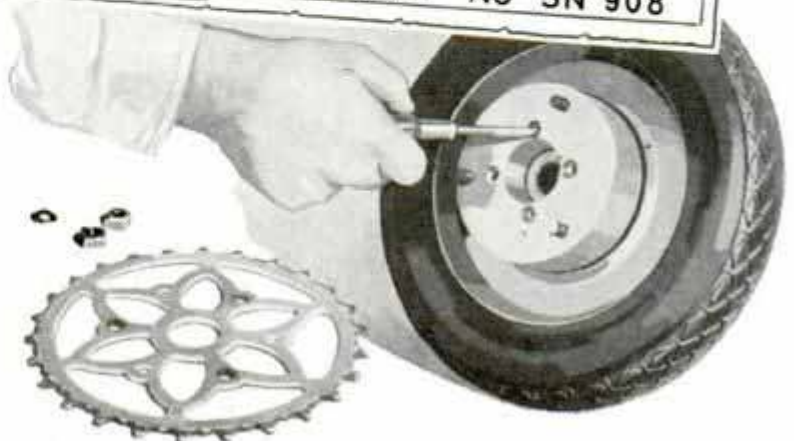
Your Choice of Three

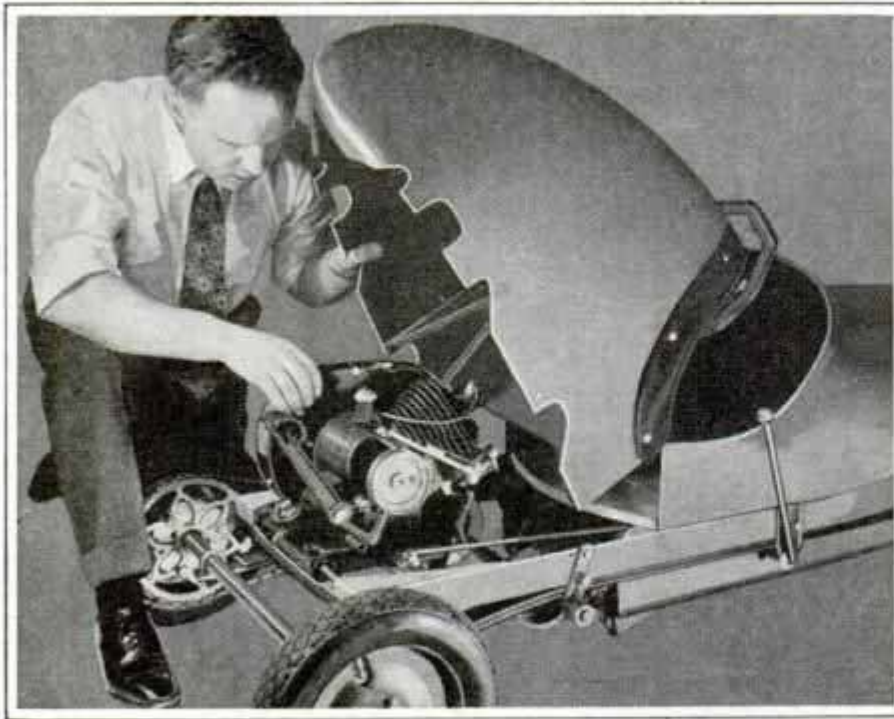


your local garage. During the shaping process, the metal should be annealed at intervals by heating to a dull red with a blowtorch and allowing it to cool slowly. It is a good idea to practice on some rough stock in order to get the experience necessary to do a good job on this part. Use the same general procedure on the front half of the body, Fig. 9. As suggested in the drawing, the lower part should be assembled first, shaping it properly and riveting



shown in the lower detail, Fig. 7, allow an extra inch of metal on the side pieces to take the rivets. In either case, it is necessary that the three pieces, which comprise the rear half of the body, be shaped as much as possible to the final form before brazing or riveting. A set of fender-straightening irons will help you greatly in doing this work. Perhaps you can borrow a set of these tools from





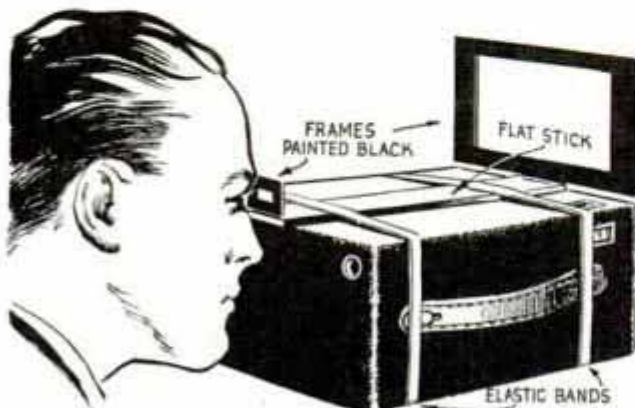
Rear Half of Body Is Lifted to Start and Adjust Motor; Strong Air Current from Built-In Flywheel-Type Fan Keeps Motor Cool

small box camera. Thus the view to be included in the picture can be seen through the frame. To make the view finder, cut out a rectangular frame of thin, stiff sheet metal, making the opening about the same size as the picture the camera takes. Then cut out a smaller frame of metal with an opening about $\frac{1}{4}$ in. square. Mount the frames vertically at the ends of a thin strip of wood of the same length as the camera. Paint the frames dull black and then bind the assembly on the camera with elastic bands.

store. If you wish to use a wood frame and canvas covering, follow constructional details given in Fig. 10. Make sure that the frame pieces are long enough to clear the motor. All joints should be fastened securely with waterproof glue and screws. Although not shown on the drawings, it is possible to cover the wood frame with light sheet metal. For this, No. 26-ga. sheet metal is sufficiently heavy. Because of its simplicity, this method is favored by many midget-car builders.

View Finder for Small Box Camera

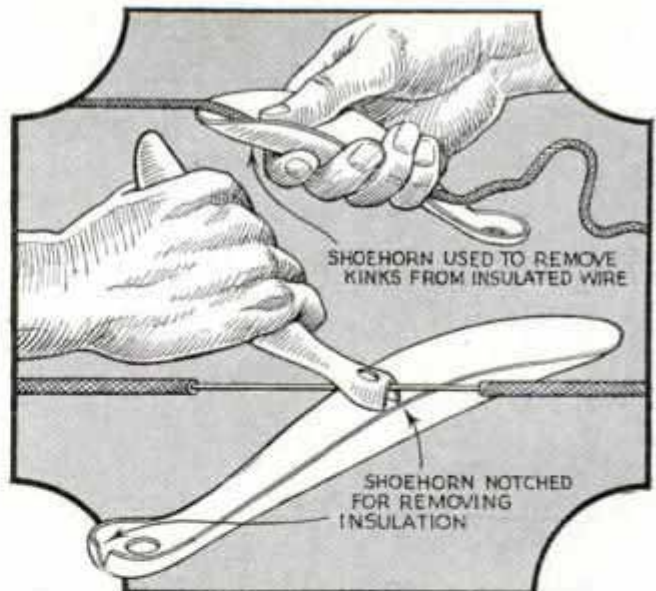
A "visual" view finder similar to that now used on many folding hand cameras, which consists of a wire frame the size of the picture and a peep hole to which the user places one eye, is easily made for a



Homemade View Finder for Box Camera Enables You to See Full-Size View of Scene

Shoehorn Is Useful When Handling Insulated Wire

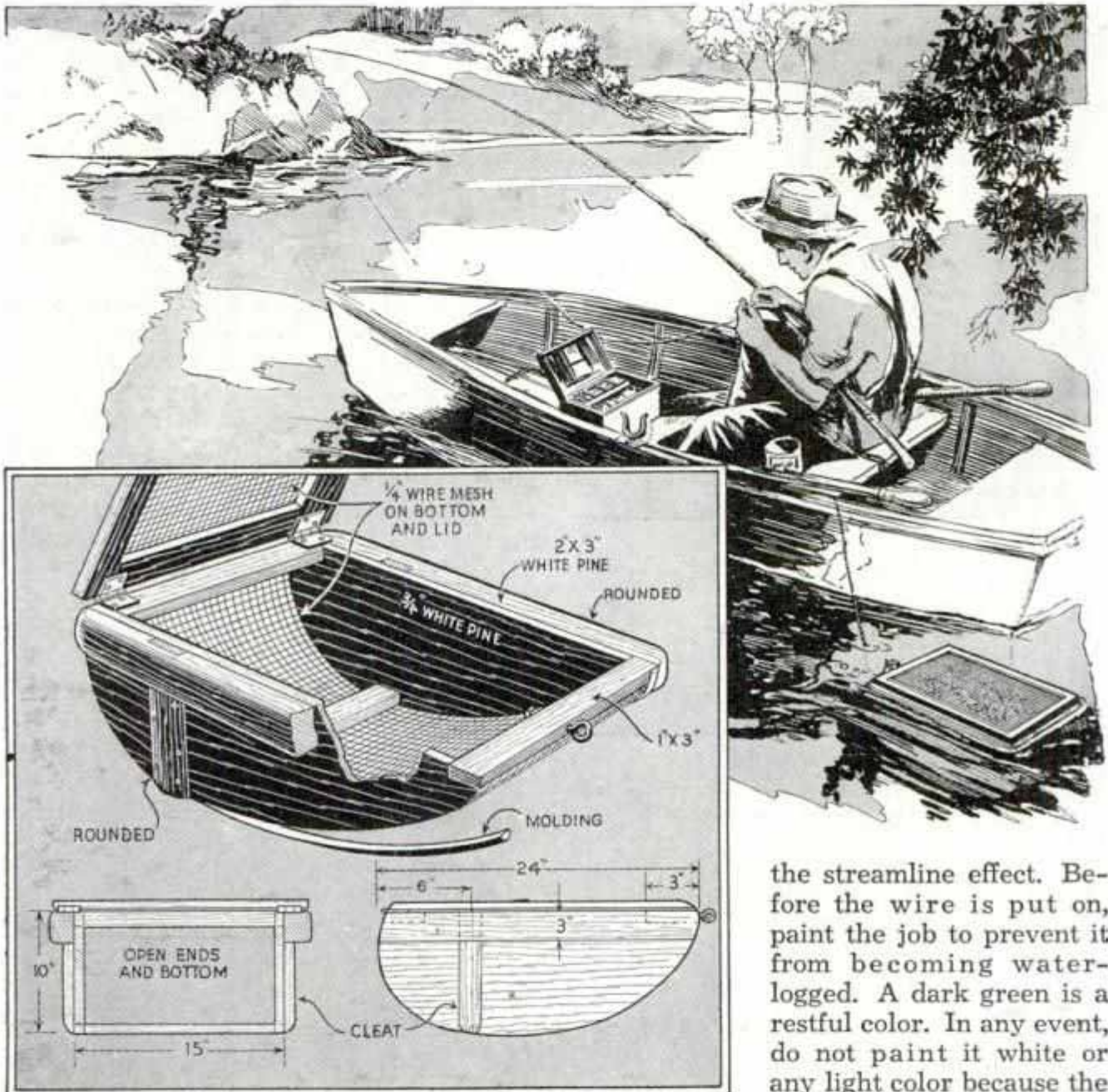
An ordinary metal shoehorn will be found a useful tool when doing odd jobs



A Metal Shoehorn Will Be Found Handy When Doing Odd Wiring Jobs around the Home

of electrical wiring around your home. Kinked wire can be straightened by pulling it over the rounded trough of the horn as shown in the upper detail, while bared wire can be scraped for soldering if a V-notch is cut in the other end of the horn. If the edges of the notch are sharpened with a file, the notch will be helpful in removing insulation from the wire.

This Streamlined Live-Bait Box Easily Towed



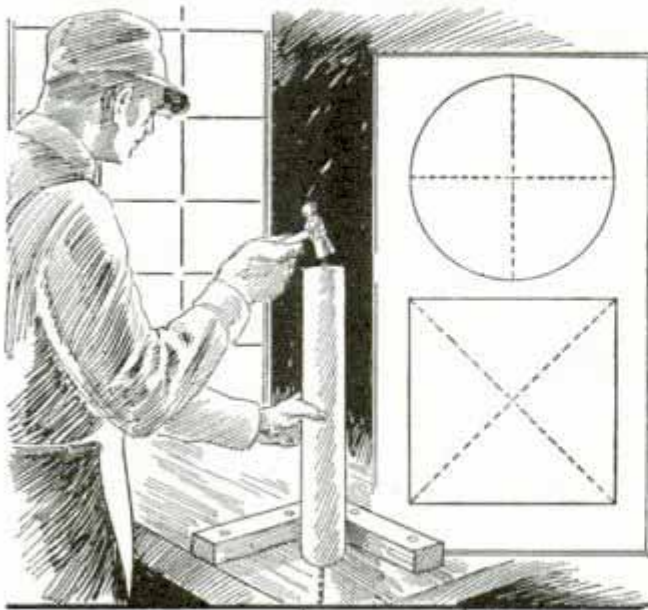
the streamline effect. Before the wire is put on, paint the job to prevent it from becoming water-logged. A dark green is a restful color. In any event, do not paint it white or any light color because the glare reflected light is

In this day of aerodynamics even the live-bait boxes are going in for streamline. Of course, the water resistance eliminated is not really a great factor, but a bait box of this design is easier to handle than the old-style rectangular job. The sides are wood with screen wire on the bottom. The wire is covered with molding along the edges so that it does not catch in weeds, clothing, etc. If available, use white pine, because this wood is strong as well as very buoyant, and it is easily cut with a keyhole or coping saw. The 2 by 3-in. side members, which serve as floats, should be of the same material. All corners should be rounded, as well as edges, to carry out

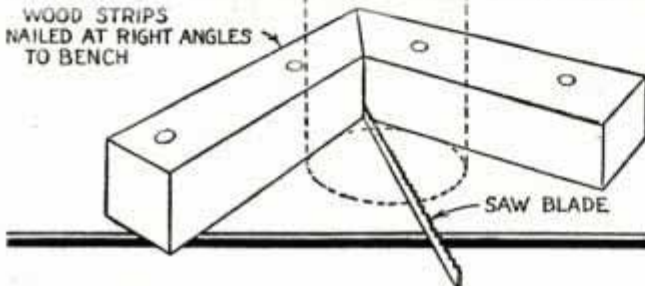
harmful to the minnows. Before putting the molding over the edges of the screen wire, soak or steam it thoroughly so that it will bend readily. Brass screws used on this job will make it much more durable. Note that the box is also large enough to keep your catch alive. It is big enough for the largest black bass you are likely to catch, not to mention a few dozen crappies, perch, bluegills or rock bass.

One of the cheapest and most versatile of mahogany stains is a solution of permanganate of potash and epsom salts in water; the depth of color is regulated by the strength of the solution.

Combined Center and Marking Gauge Made from Saw Blade



WOOD STRIPS
NAILED AT RIGHT ANGLES
TO BENCH

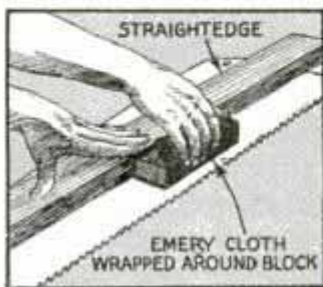


Simple Homemade Gauge for Centering Round or Square Work to Be Turned in a Lathe

Of the many devices and methods used to locate centers in square or round work, the one shown will meet universal approval due to its simplicity and positive operation. Two wood strips are nailed at right angles on a bench, and a slot is cut in the bench top in line to bisect the angle. In this slot, a piece of hack-saw blade is wedged to expose the points of the teeth. In use, the work to be centered is set over the saw blade and the upper end is tapped lightly with a hammer to sink the teeth into the work.

Polish Your Tools Neatly

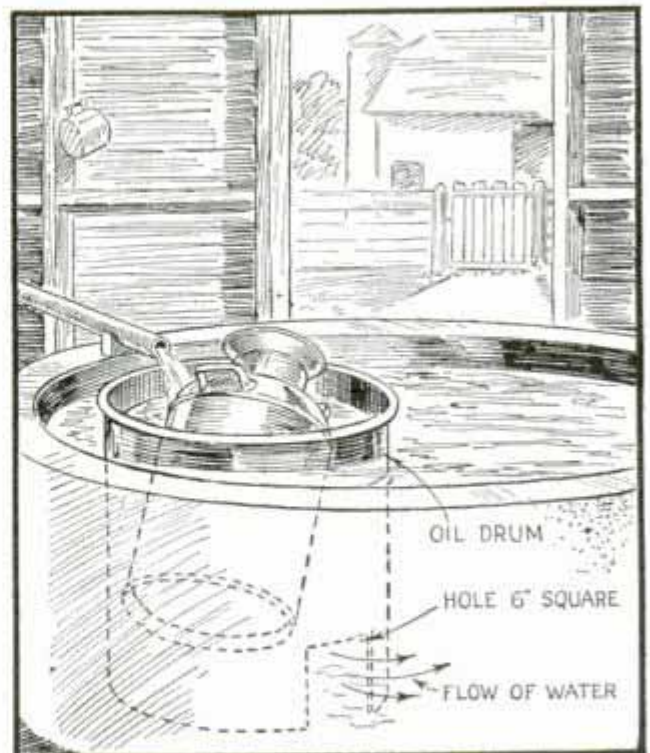
The man who is particular about the appearance of his tools will find he can give tarnished and rusted spots a straight-grain factory polish with a block and fine emery cloth. In the case of handsaws, plane bottoms and



other flat surfaces, the job can be done with the aid of a straightedge to guide the block and help keep the scratched lines parallel in the metal. In many instances, when a straight grain is not desired, the tool may be "clock burnished" with a dowel rod chucked in a drill press. The rod is squared at one end and charged with fine emery powder, after which it is brought up and down on the work as it rotates. This finish is found on many of the better grades of tools. Also, the above methods may be used nicely in finishing metal handicraft work. Old copper, brass, aluminum, or other metals may be given a straight-grain rub followed by a thin coat of clear lacquer to make them suitable for use in the finest work, while the clock finish is especially suited to steel or other silvery metals. It is easy to vary the fineness of the finishes with different grades of emery.—L. Kolze, Bensenville, Ill.

Oil Drum Keeps Milk Can Upright in Cooling Tank

A dairyman who cooled his milk in a watering tank found that he could prevent the partly filled cans from tipping by placing them inside of oil drums set in the tank. The top and bottom were removed from each drum and a small hole was cut in one side near the bottom.



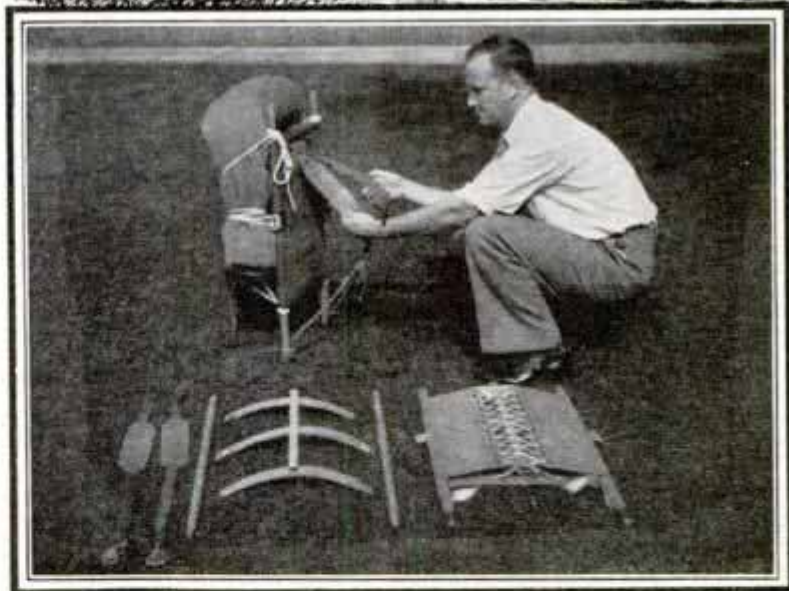
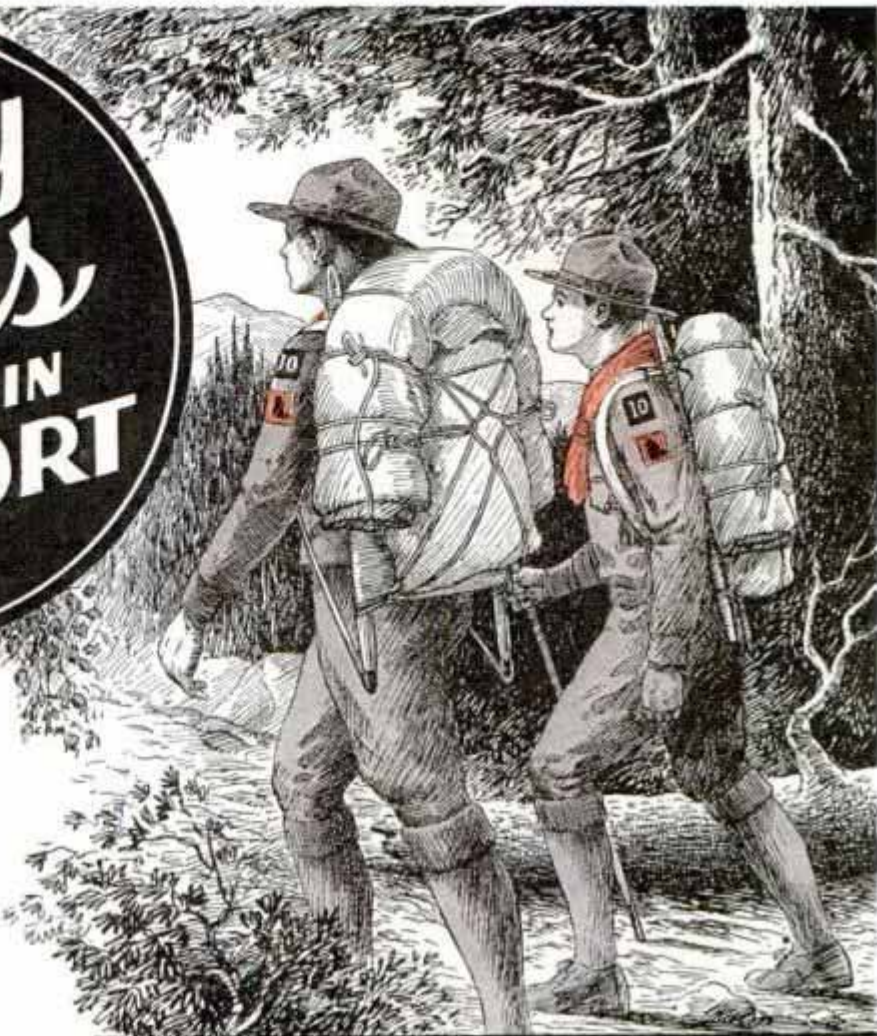
Oil Drum with Top and Bottom Removed Keeps Milk Can from Tipping over in Cooling Tank

Heavy Packs CARRIED IN COMFORT

by John Cornell

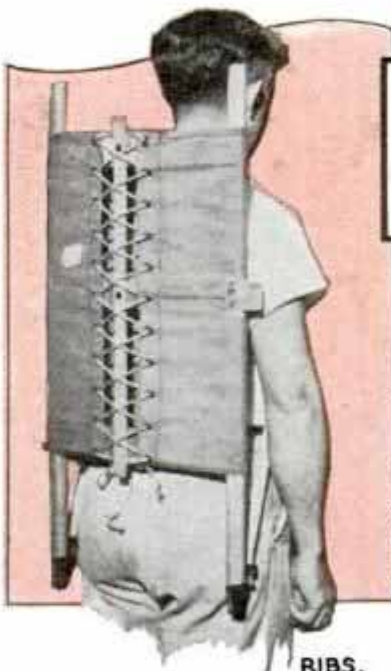
A PACK, which will enable you to carry heavy or bulky burdens with a minimum of strain and discomfort, consists of a curved wooden framework, over which canvas is stretched. A smooth canvas surface is all that ever touches the wearer's back, and any load can be lashed on so that the weight is evenly distributed. An additional feature of the pack is the air space between the load and the wearer's back; it acts as a cooling system.

The frame is made from five pieces of ash or other stout wood. The two upright posts are $\frac{7}{8}$ by 1 by 33 in. The top and bottom cross ribs measure $\frac{1}{4}$ by $1\frac{5}{8}$ by $16\frac{1}{2}$ in., while the center rib is 3 in. longer and projects through the upright posts and through the canvas skirt to provide a place around which to tie a line when lashing the load on. (A diamond hitch is usually used in lashing the load to the pack.) The cross ribs are best when mortised into the uprights as in the drawing, but they may also be set into the surface of the uprights and riveted with $\frac{3}{4}$ -in. copper rivets. If mortised, a shoulder should be left on the ribs to prevent their working into the upright posts. A

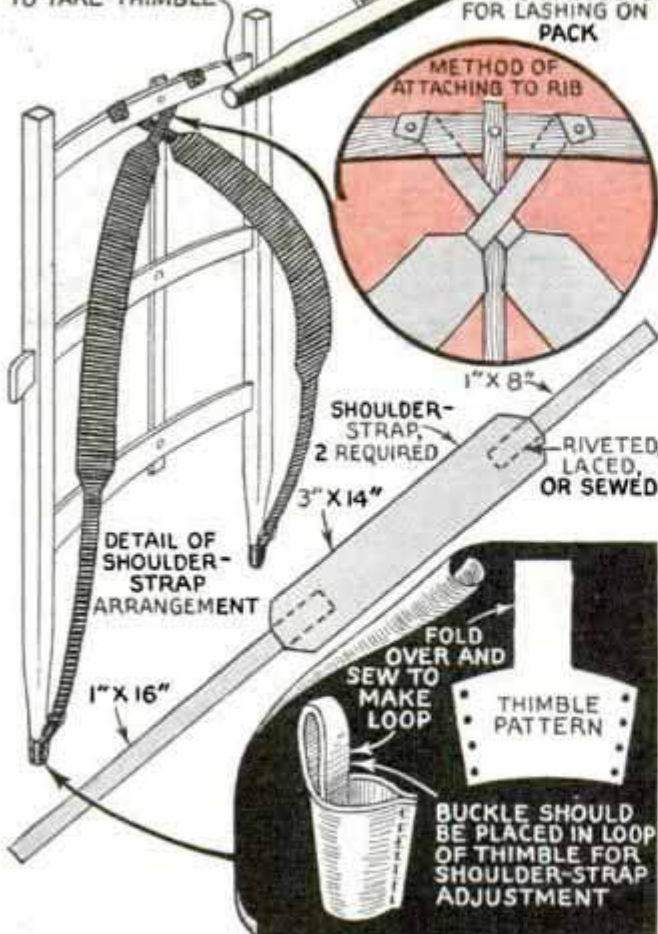
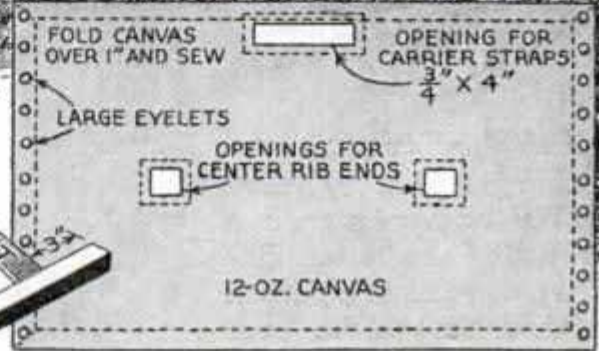
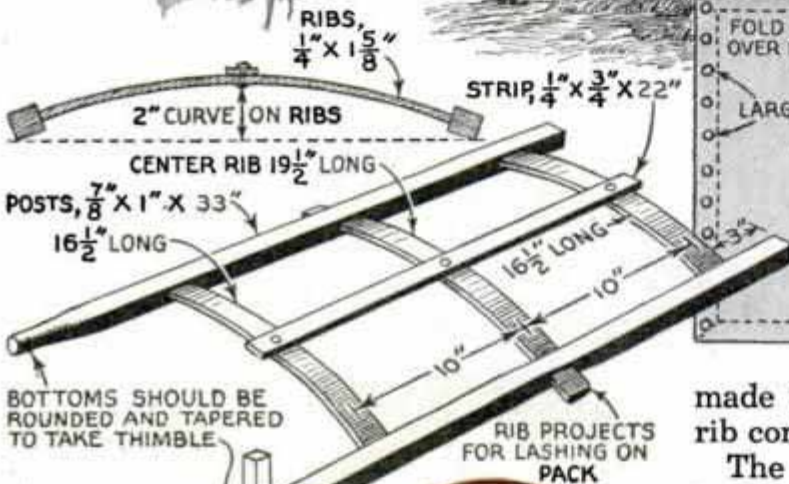


pine strip, $\frac{1}{4}$ by $\frac{3}{4}$ by 22 in., is riveted down the center for reinforcement.

The skirt is made from a 22 by 36-in. piece of 12-oz. canvas. A 1-in. hem should be sewed all around the canvas, and a dozen large eyelets placed along the hem on each of the short sides. A vent, $\frac{3}{4}$ by 4 in., must be cut in the center near the top to allow the shoulder straps to come through. Two other small openings are



An Air-Cooled Pack That Will Not Chafe Your Back When Making a Long Hike with a Heavy Load

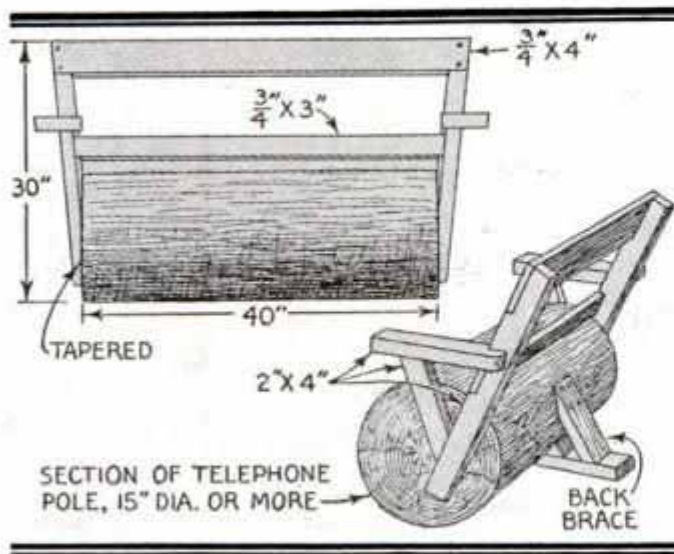


made where the projecting middle cross rib comes through.

The shoulder straps, which are riveted to the top rib on one end and attached by leather thimbles to the bottoms of the uprights at the other, can be made of leather or canvas. The heavy sections which touch the shoulders should be 3 in. wide and 14 in. long. Attached to these by sewing or riveting are 1 by 8-in. lengths, which are fastened to the top rib, and 1 by 16-in. pieces, which lead to the leather thimbles slipped over the ends of the upright posts. This lower connection is made through 1-in. belt buckles attached to the thimbles, and it is here that shoulder-strap adjustments can be made. The thimbles can be cut out of leather and sewed together as shown.

The dimensions given here are for an average pack for an average size individual. Heavier wood can be used in the framework if extraordinary loads are to be carried, and the length or width of the frame can be varied, if necessary, to fit anyone's back. A 6-ft. leather thong or strong cord for lacing the skirt on completes the pack.

Comfortable Seat from Old Telephone Pole

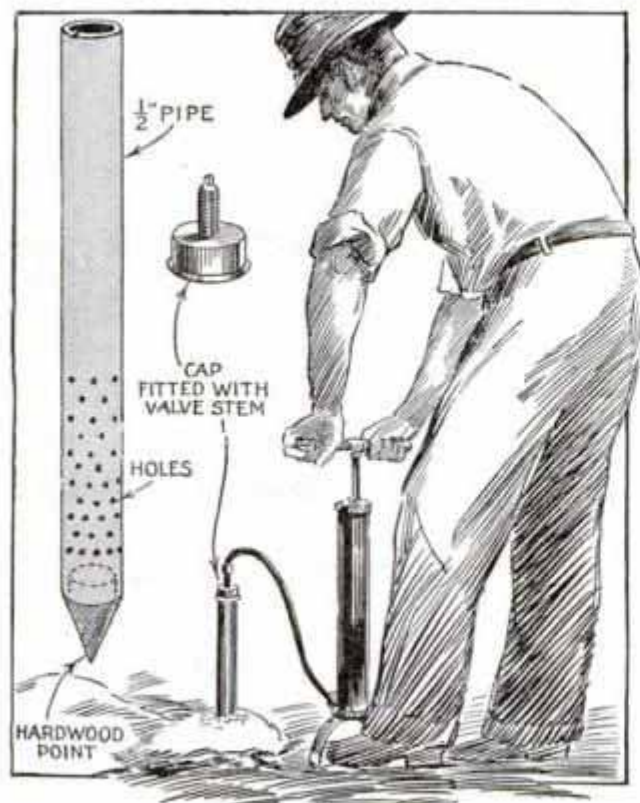


Equipped with back and arms, a section cut from the large end of an old telephone pole or log makes a surprisingly comfortable garden seat. The back and arm supports, and a back brace, to prevent rolling, are made of 2 by 4-in. stock. This seat is

not too heavy to be moved about and can be left outdoors during winter as weathering will have little effect on it. If desired, however, the weather cracks in the log may be filled and the seat painted to match other garden furniture.

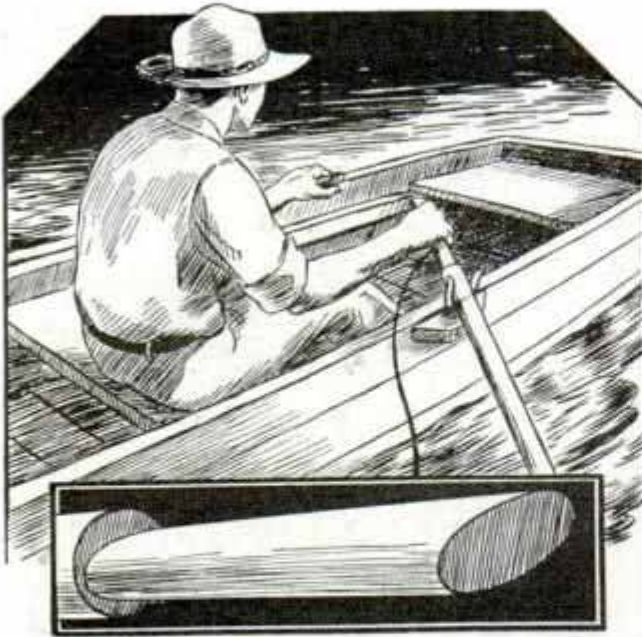
"Sure-Shot" Ant Exterminator Gets the Eggs and Larvae

With the ant killer shown, I successfully exterminated seven ant hills that we had been trying to destroy for three years, using various types of traps and poisons. Many of these would kill the ants, but did



not destroy the eggs, which were deposited in pockets at the ends of the runways, with the result that the hills were soon filled with ants again. To reach the eggs with the poison, I took a 2-ft. length of 1/2-in. pipe, closed one end with a pointed hardwood plug, and drilled small holes through the pipe for a distance of about 1 ft. from the pointed end. The other end was fitted with a cap, which was sealed with white lead, and an old tire valve was fitted in the cap, as shown, so that a pump could be used to force the poison into the ground. In use, the pointed end of the pipe is pushed into the hill, after which it is filled with a mixture consisting of a can of lye dissolved in a gallon of water. This mixture is forced into the runways and egg pockets. Also, carbon bisulphide or gasoline has been found effective. Besides doing a good job of exterminating the ants, this method can be used without killing the grass, which is an objection to surface application of some chemicals.—A. H. Waychoff, Tempe, Ariz.

☐ Carbide can be kept indefinitely by sprinkling it with kerosene.



By Flattening the Hand Grips, You Can Use Oars without Having Them Twist in Your Hands

Flattened Grips Make Oars Easy to Handle

Boat oars that are not permanently hinged in their locks often make tiresome work for the amateur, as they frequently twist in one's hands and turn the blades at the wrong angle. To avoid this, the handles of the oars should be flattened at right angles to the oar blades. Then, by gripping them naturally with the hands, the blades will remain in vertical position.

Umbrella Shades Fish Pool

Shallow backyard fish pools, when exposed to the heat of the sun, soon grow warm and speed algæ growth. To offset this and provide ample shade in hot

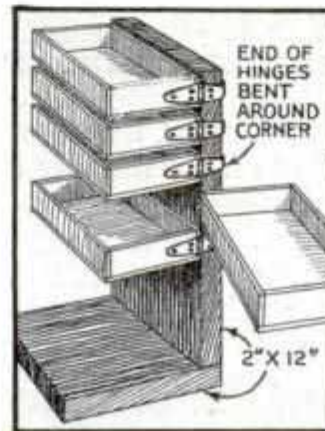


Old Umbrella Set in Drain Pipe Shades Fish Pool from Hot Sun

weather, simply remove the handle from an old discarded umbrella and insert it in the overflow or drain pipe. The umbrella may be placed vertically in the pipe or moved about at any angle.

Small-Parts Cabinet Has Hinged Trays

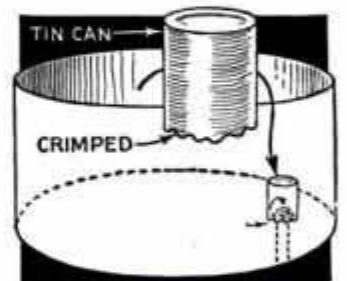
Instead of building the usual type of small-parts cabinet with drawers, try one of the type shown, which has hinged trays that swing outward. You will find that this type has an advantage over the drawer cabinet in that the entire tray is accessible to the hand when swung out. It is best



to attach the trays with strap hinges, which can be bent around the edge of the vertical board to provide a strong support for the trays. The latter should be of very rigid construction as they are supported at one corner only.

Draining Water Tanks That Have Elevated Outlets

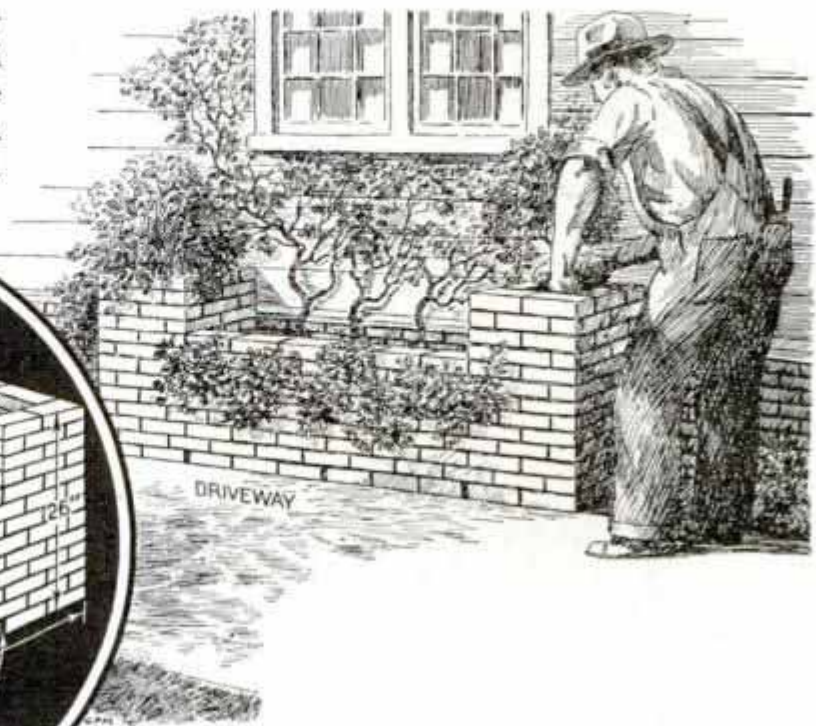
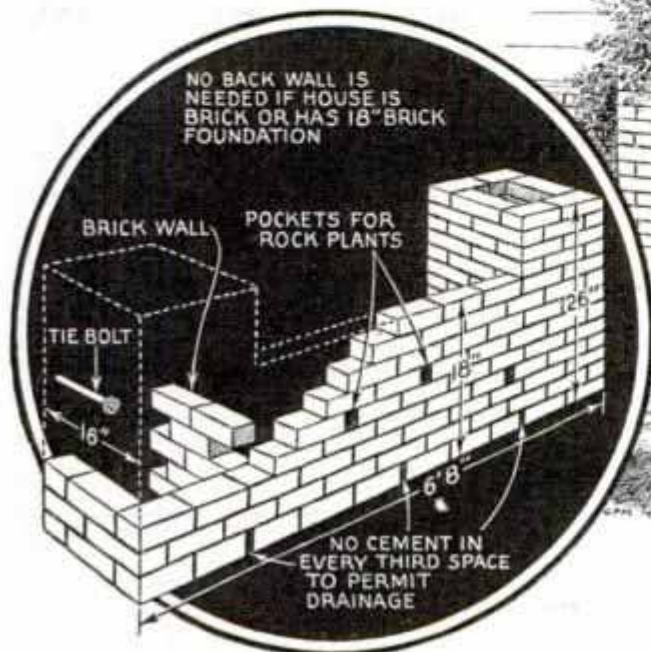
Attic water tanks often have an outlet that projects slightly above the bottom, which makes it necessary to dip or mop up the water that remains in the tank when draining it for cleaning or repairs. To eliminate this work, a plumber crimped the top rim of a tin can, as shown, and inverted it over the outlet opening before all the water had run out, thus providing a siphon to drain out the water almost to the bottom. Water running out of the outlet creates a vacuum inside the can and causes the water to continue to run until it is low enough to allow air to enter the can through the crimped serrations.



It is better to cut paint from glass with a sharp knife than it is to scrape it off.

Growing Plants on Your Concrete Driveway

It often happens that on narrow lots the driveway is cemented right up to the foundation of the house, leaving no space between them in which to plant shrubbery.



In such cases, the barren appearance on this side of the house may be greatly improved by building a brick flower box or plant bed directly upon the concrete adjoining the foundation. The drawings illustrate how to go about building one. If your house is of brick, or has a brick foundation 18 in. high, no back wall is required except for the raised "chimneys" at the ends. Only 160 common bricks are required for the job, and they should be

put together with cement, not mortar. Six parts of clean dry sand to one of Portland cement will give a satisfactory mixture. Note that the bricks are laid the long way, in a single tier, and that on the bottom course, every third space is left without cement to permit drainage. Higher up, and at irregular intervals, pockets are formed by breaking off about 2 in. of the brick. In these, rock plants are set. When completed, pile a handful or two of gravel against the uncemented crevices on the bottom course so that dirt will not wash out, and then fill with a rich loam composed of top dirt, leaf mold and manure.

Rubber Bumper on Dock Protects Boat When Landing It

On several occasions while driving a motor boat, I coasted into a landing too fast and bumped into the end of the dock, which, of course, jarred both the boat and the passengers. To avoid this, a heavy inner tube was stretched between two posts at the end of the dock to serve as a bumper. A large harness snap at one end of the tube permitted the bumper to be unfastened so that the boat could be pulled up to the end of the dock. The tube should be nailed in place at the other end to prevent it from being carried away.—Forrest Jones, Pottersville, N. Y.





There's Charm in

Refinishing old furniture in white, ivory and antiqued ivory, brings it up to date and gives your home a new charm and cheerfulness. The process is quite simple and can be done by anyone. Knowing the proper methods of removing old varnish, if the pieces are badly scarred, taking pains to do the work with care and applying the new finish with correct technique, are the only requisites for good results. A little practice on small, old pieces soon gives you sufficient mastery of details so that you can do expert work on the more choice pieces.



To Remove Surfaces for Painting, First Wash Them Thoroughly to Remove All Traces of Dirt, Greasy Film and Wax

PERHAPS you, like myself, have just about all the furniture your home will accommodate. Though you would like something different, you feel that the most of it is too good to discard. I solved this problem by painting some of the older pieces in the new colors, white, ivory and

antiqued ivory. Many large stores are featuring these colors on the latest furniture.

On the older pieces it was decided to remove the original finish due to a badly checked condition which made it impossible to obtain the necessary smooth surface for refinishing. In this, the procedure depends on whether the original finish is enamel or varnish and also whether the imperfections are in the finish alone or in both the wood and the finish. If you have the latter condition to deal with, the old finish should be removed entirely. As a rule this is accomplished best on the larger surfaces with a common hand floor scraper. A good paint or varnish remover can be used to better advantage on the small surfaces and on turned and fluted legs. In using the floor scraper, the trick is to get under the old finish with each stroke, otherwise the scraper edge

will dull quickly. The scraper should be started at the edge of a large surface and the cut should be about half the width of the blade with each stroke. When you get the finish off, run a light scraping cut over the surface with a newly sharpened blade to remove the fiber raised by the heavy

White

by
Robert McQuire



scraping cuts. Dents, deep scratches, digs or cracks that show up on the bared wood must be filled before applying the finishing materials. Shellac in stick form is best for this purpose. You simply clean out the depression and run in the shellac with a heated soldering iron to a level slightly above the surrounding surface.

I have found that it is not advisable to use steel wool to smooth an open-grained wood after scraping off the old finish as the steel wool will remove the original filler, making it necessary to again build up a smooth surface by re-filling and sanding. On the other hand, fine steel wool is excellent for this purpose on a close-grained wood. Steel wool can be used also to remove the varnish residue from the turnings after it has been cut with the prepared remover. After you apply the remover allow at least 5 min. before attempting to clean off the residue. On turnings, this is best done with a stiff-bristle brush, followed with a cloth saturated with alcohol, then finally cleaning up with fine steel wool. In cleaning up turned and fluted legs and beaded or molded edges, use a sharp-pointed soft-wood pick to remove the varnish residue from the V-grooves.

In final preparation of the surfaces for refinishing, I used successively, Nos. 2-0, 4-0 and 6-0 sandpaper for smoothing, and Nos. ½ and 1 to cut down the high spots. I kept a dusting brush handy and thoroughly dusted off the work after each sanding. The quality of the finish is direct-



ly dependent on the quality and smoothness of the surface you produce. No amount of work will smooth up a finish after application if the surface over which it is applied is rough or uneven.

When I found the piece to be refinishing in good condition to begin with, the procedure was much more simple. As a first step, I washed it carefully to remove all traces of dirt, grease and wax. Soiled pieces were simply washed with soap and water and thoroughly rinsed, while those pieces with a wax finish were washed with a solution made by dissolving floor-cleaning



compound, 2 tablespoonfuls, in hot water, 1 gal. The work was then washed several times with clean water to remove all traces of the alkali deposit left by the cleaner. This should be done very carefully and thoroughly as any alkali left on the work will ruin the paint job. In washing, it is also well to be particular not to flood the work with water; use as little water as possible and see that none of the washing solution runs into the drawers or into joints where there is unfinished wood exposed. Where the paint or varnish was in such condition that it need only be cleaned to prepare it for painting, I used fine steel wool for smoothing the surface after washing. Steel wool is much better than sandpaper for smoothing up the original finish, particularly a painted surface. Some small pieces require very little preparation. For example, I found a magazine rack which was in excellent condition except for a decalomania transfer which had checked and was beginning to peel. This I removed with sandpaper and the piece was ready for the new paint. On certain types of chairs I found that a very strong solution of floor cleaner and hot water cut the old finish in a few minutes and left very little residue to clean off. The one disadvantage of the floor cleaner was the inconvenience of handling, as it must be applied with a swab. On one particular chair that I decided to refinish, I laid on two applications of floor-cleaner solution at intervals of 15 min. A light scouring with No. 1 steel wool then removed the old paint down to the bare wood on the more even surfaces, while on the carved legs an old stiff-bristle scrubbing brush proved very effective. After the old finish was removed, I washed the chairs several times with clean water to remove all traces of alkali, and when thoroughly dry, sandpapered them.

After all of the preparatory work was done, I proceeded to apply the first coat of paint. White enamel undercoater was used because this material is non-porous, covers well and makes an excellent foundation for succeeding coats. A 2½-in. high-quality brush was used as I found that good work cannot be done with cheap brushes. Before the painting was started, the paint was stirred thoroughly to an even consistency. This was important, otherwise some pieces would have re-

ceived a coat of paint that was too thin, while on others it would have been too thick. A three-shelf bookcase was first. It was turned upside down and the legs painted, after which it was righted and painted from the top edge down, leaving the top until last for a hand rest to steady the case while painting. This same procedure, legs first, then from top edge down with top last, was followed with each piece of furniture, making it unnecessary to handle a painted section while finishing the piece.

The paint in each case was applied evenly and smoothly, being careful to avoid brush marks. When the pieces were absolutely dry, they were sanded lightly with No. 00 sandpaper and dusted carefully, after which they were ready for the second coat. This time extraordinary care was taken to see that no brush marks appeared, so the final coat would look clear white or ivory. When the second coat was dry it was sanded with No. 00 sandpaper and dusted carefully in the same manner.

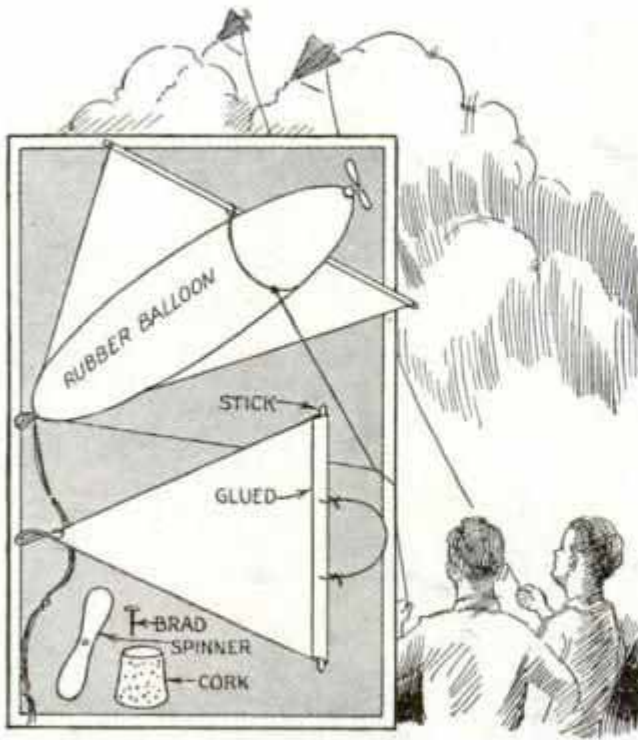
The final coat was semi-gloss enamel—some pieces finished in white and others in ivory. The enamel was thoroughly stirred, and applied like the previous coats except for the brushing. I found that for best results, and to prevent sags and runs, it was necessary to apply the enamel in one direction, horizontally, and then brush it in the opposite direction, vertically. If a run or sag developed it was eliminated while wet by brushing first one way, then the other, with a comparatively dry brush.

After all pieces were dry, we selected the ones which were to be antiqued. I tinted some glazing compound with burnt umber, an oil color which is supplied by paint stores. The color was worked into the liquid a little at a time until a deep, rich brown was obtained. This mixture was applied in streaks, with a cloth, over the entire surface of the piece to be antiqued, a little at a time, using another clean cloth to wipe off the surplus. The upper cloth was used to apply the material and the lower one to wipe it off. When completed a beautiful antique finish was the result.

Those who desire a darker antique effect instead of one with a rich brown overtone, may substitute raw umber for burnt umber as a tinting medium.



Above, Removing the Old Varnish from a Chair with Strong Solution of Floor Cleaner and Steel Wool; Below, Tinted Glazing Compound Brushed on in Streaks with a Cloth over Entire Surface



Dirigible Kite Flies Easily

A five-cent rubber balloon and some heavy wrapping paper are all you need to make this unusual kite. First inflate the balloon, tie the mouth securely, and then cut a triangle piece of the paper equal to about two-thirds the length of the balloon. Fold and glue one edge of the paper to take a stout stick, and glue a cord loop to the other end to fit over the closed mouth of the balloon. Fasten the stick to the balloon with rubber bands and attach the flying cords to the bands and to the mouth. The tail, as with all kites, must be adjusted in length and weight by trial flights. To give the kite further appearance of a dirigible, a small cork may be glued to the tip of the balloon, and a tin spinner attached to this with a small brad.

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"WHAT TO MAKE"

This 80-page Craftsman's Guide is just crammed full of practical information and valuable reference data for the home workshop. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get materials. Will be sent postpaid on receipt of 12c.



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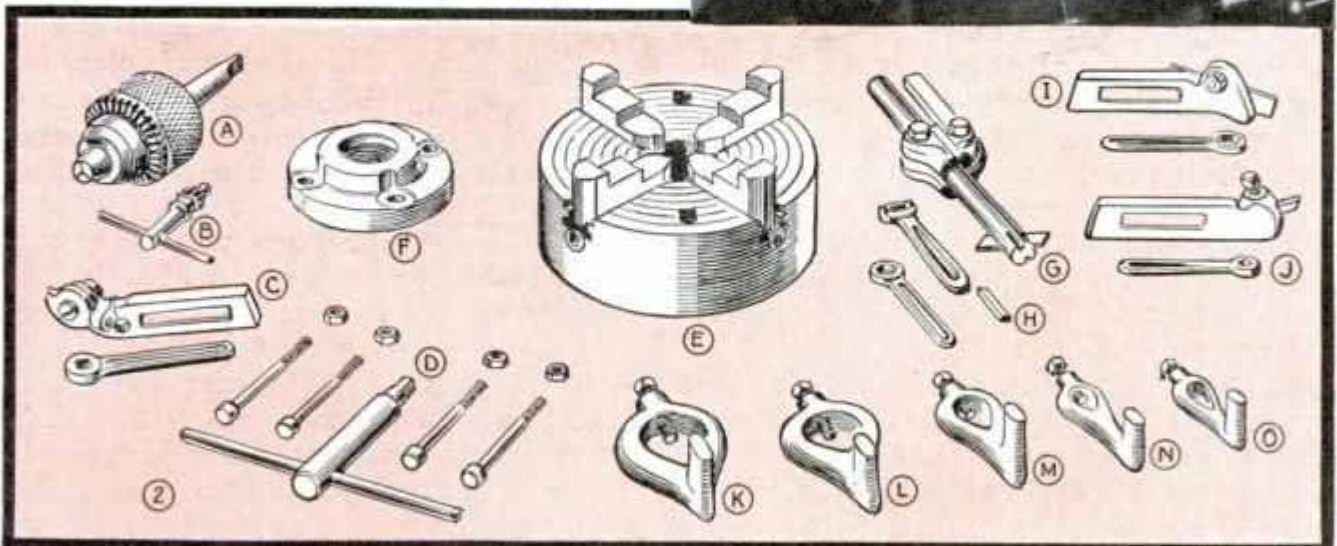
METAL-TURNING

Tool Equipment

by W. Clyde Lammey

WHEN you add a small metal-turning lathe to your home workshop equipment you may purchase the tools and accessories as you need them or you may buy a complete set to cover both immediate and future requirements. Accessories for the smallest lathes range in cost from a few cents to several hundred dollars each. Selecting a tool assortment for the home workshop metal-turning job means economy in initial cost, and at the same time the selection should be suited to a considerable variety of the more common operations.

The lathe comes to you with a faceplate and tool post only. The centers and the countershaft or motor-drive arrangement are regular equipment. For the more com-



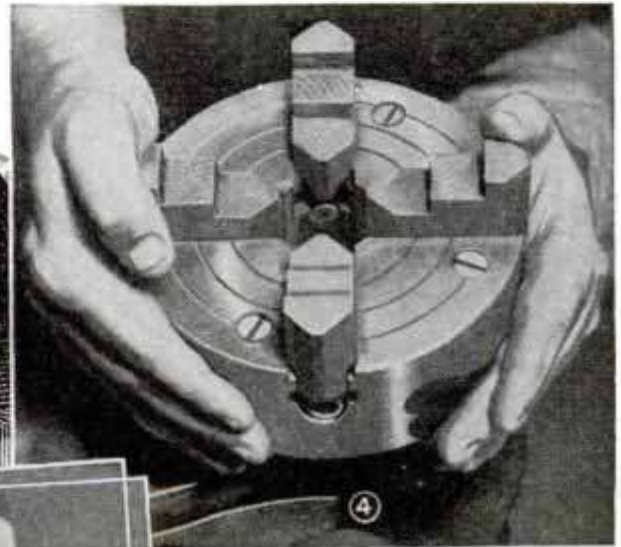
A, Precision Geared Chuck of $\frac{1}{2}$ -In. Capacity; B, Geared-Chuck Wrench; C, Adjustable Threading Tool with Holder and Wrench; D, Chuck Wrench and Bolts for Bolting Chuck Plate F to Four-Jaw Chuck E; K to O Incl., Lathe Dogs Ranging in Size from $\frac{1}{4}$ to $1\frac{1}{4}$ In.; G, Complete Boring Tool; H, Boring-Tool Cutter and Wrenches; I, Cutting-Off Tool Complete with Holder and Wrench; J, Turning Tool



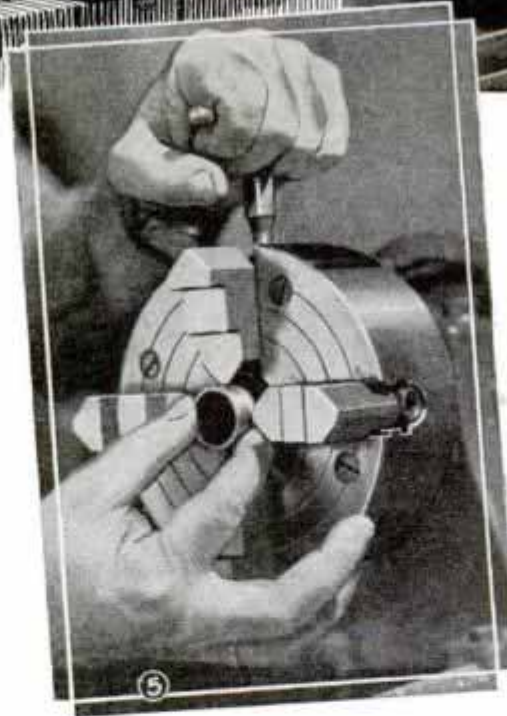
Spring Calipers May Be Used for Checking Diameters on Practically All Ordinary Work; a Light, Delicate Touch Is Necessary for Accurate Measurements

the step chuck are handy and extremely accurate where it is necessary to center and duplicate machine operations on a large number of small parts.

Very accurate drilling and reaming is possible with the metal lathe due to the fact that the drill or reamer is held stationary while the work revolves. Hence a high-grade drill chuck mounted on a tapered arbor to fit the tailstock quill is a good investment. Such a chuck in your tool assortment makes it possible to use the fine accuracy of the lathe in centering



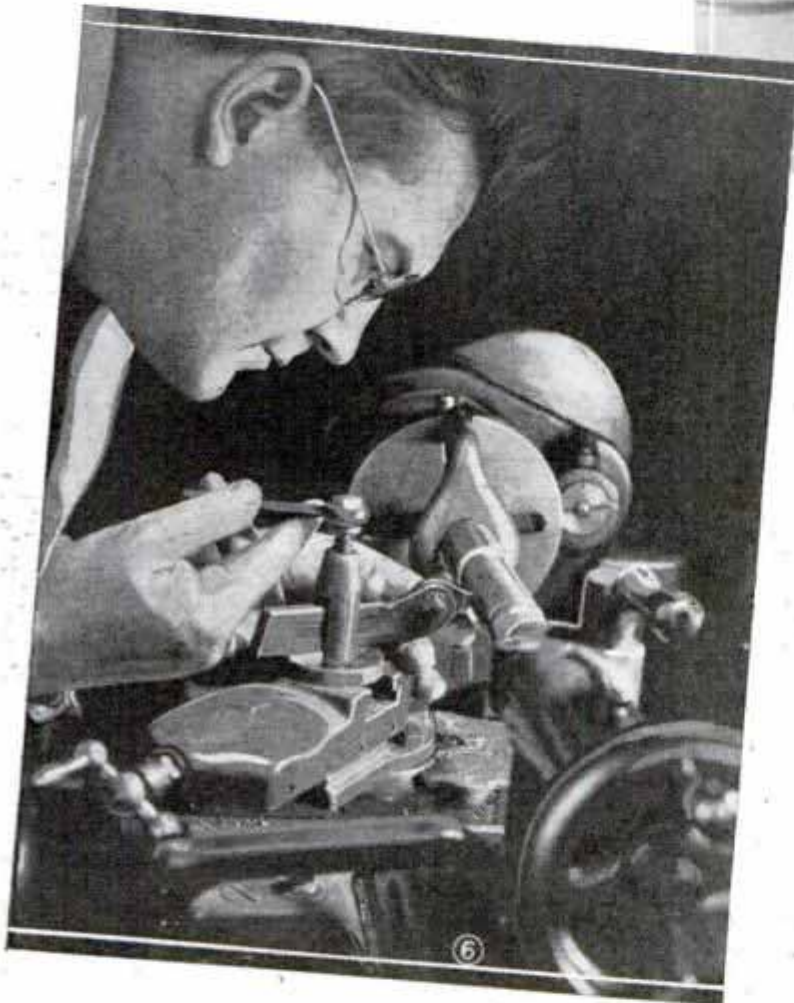
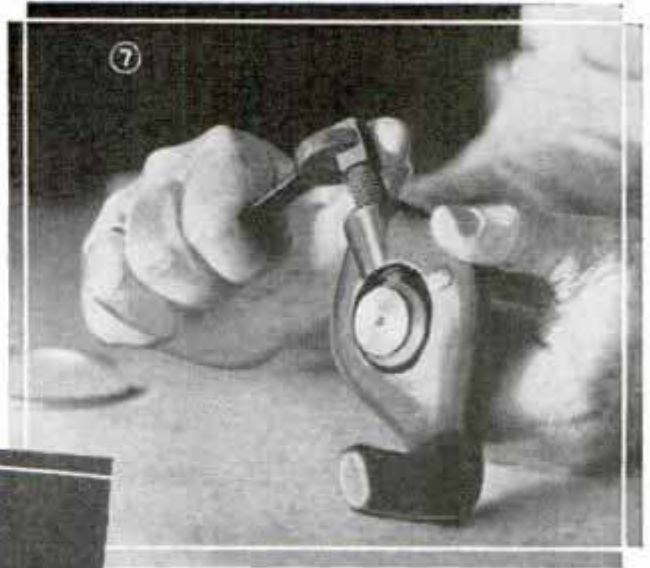
mon operations in metal lathe work you will need the tool assortment shown in Fig. 2, and in addition a few other small tools such as drills, a combination countersink for centering work, and one or two pairs of calipers for taking simple measurements, as in Fig. 3. For turning and boring either round or irregular flat work you will need a chuck of the independent four-jaw type. This accessory ranges in price from \$5 to \$50 for the more common makes of small lathes. The purchase of a chuck should be governed by the kind of work. If you do model work in metal, a four-jaw independent chuck, Figs. 2, 4 and 5, is advisable as it can be adapted to the greatest range of work. The hand-operated scroll and spindle collet chucks and also



holes through various types of flat work, and also for holding short rods of small diameter when it is necessary to run back a shoulder cut or turn a taper on a rod $\frac{1}{8}$ in. in diameter or less. To do this the chuck is placed in the headstock spindle. Certain drilling operations can also be done with this setup using a steel drill pad in the tailstock as in Fig. 1. The drill chuck is limited to work or drill bits up to

$\frac{1}{2}$ in. in diameter. For machining true holes above this diameter it is necessary to use a boring tool which is designed to clamp in the tool post of the lathe. The boring tool is made in several sizes for small lathes and as the cost is very reasonable the tool kit should include two, one for light, delicate work and another for the

occasional heavy jobs. A special type of boring tool now on the market differs slightly from the common design using a bar with a separate cutter. This tool consists of a holder similar to the conventional tool holder. The cutter is held directly in the holder by means of a set screw. This construction gives the advantage of bringing the assembly in a straight line, there being no offset between the holder and the



cutter. The elimination of overhang tends to steady the cutter and at the same time permits working in a very small opening, such as is often necessary when making small parts for models.

The mandrel or arbor, as it is sometimes called, is a handy accessory for use in finishing a model-engine flywheel or a miniature locomotive drive wheel, in fact, any work of similar size and kind. Mandrels are machined and ground to a very slight taper in a given diameter, so that when the work is center-drilled to $\frac{1}{4}$ in. for example, a mandrel of corresponding size is used. The work to be machined is pressed tightly on the body of the mandrel and the whole is then mounted between centers

and driven by a dog tightened on the end of the mandrel as in Fig. 7. In this way very small work can be finished easily all over with extreme accuracy.

If you intend to do considerable thread cutting, the adjustable threading tool, Figs. 2 and 6, will save a great deal of time. The cutter requires grinding only on the top face. When you have only an occasional job of thread-cutting this tool may be omitted from the kit. Likewise the knurling tool is not essential in the small shop though there may be certain types of work on which a knurled surface would be desirable.

A micrometer reading in thousandths of an inch is a practical tool for use in measuring work requiring a high degree of accuracy, but for average close fitting ordi-

nary calipers of the screw-adjusting type will give a sufficiently accurate measurement. Likewise, milling attachments, center and follower rests, turrets, taper attachments and other fittings may be classed as necessities only where the work is more or less standardized and the volume is sufficiently large to warrant the expenditure. Many owners of small lathes have only a large slotted faceplate and by fitting this with various improvised jaws and clamping devices, make it serve very well as a chuck. Similarly, you can set up a straight reamer between centers and make it serve for light milling operations on work of such size that it can be clamped to the tool-post saddle.



Smoke Blown between Lens and Printing Paper Gives Delicate Diffusion for Enlarging Photos

Diffusing Light to Enlarge Photos with Cigarette Smoke

Enlarged photographs can be given a delicate, easily controlled diffusion if smoke is blown into the path of light, between the lens and paper, during projection of the negative. The diffusion is finer than that obtained by using silk cloth.

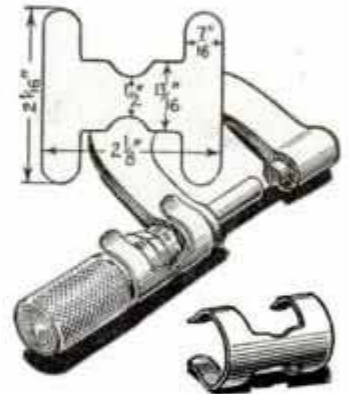
Hook to Carry Cuspidors

A janitor who had several cuspidors to empty and clean each day, and disliked picking them up with his hands, simplified the task of carrying them back and forth to the cleaning room by using two hooks of the type shown. These were bent from heavy wire or small iron rods, and have a handle at one end, and a hook at the other which is slipped easily around the neck of the cuspidor as shown in the drawing.



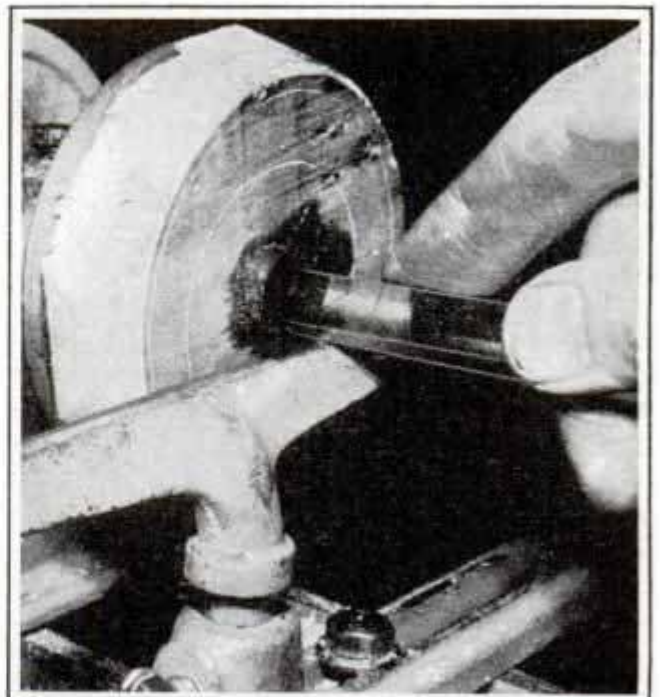
Clamp Holds Micrometer Setting

Machinists who experience difficulty in keeping their micrometers set accurately will find that a clamp of the type shown will help solve the problem. The clamp is cut from spring steel or brass, and is bent around the micrometer as shown. The steel can be shaped with the aid of a file and a hack saw, and it should be formed around a rod of smaller diameter than that of the knurled handle of the micrometer.—Herman Seifert, Hamilton, Ohio.



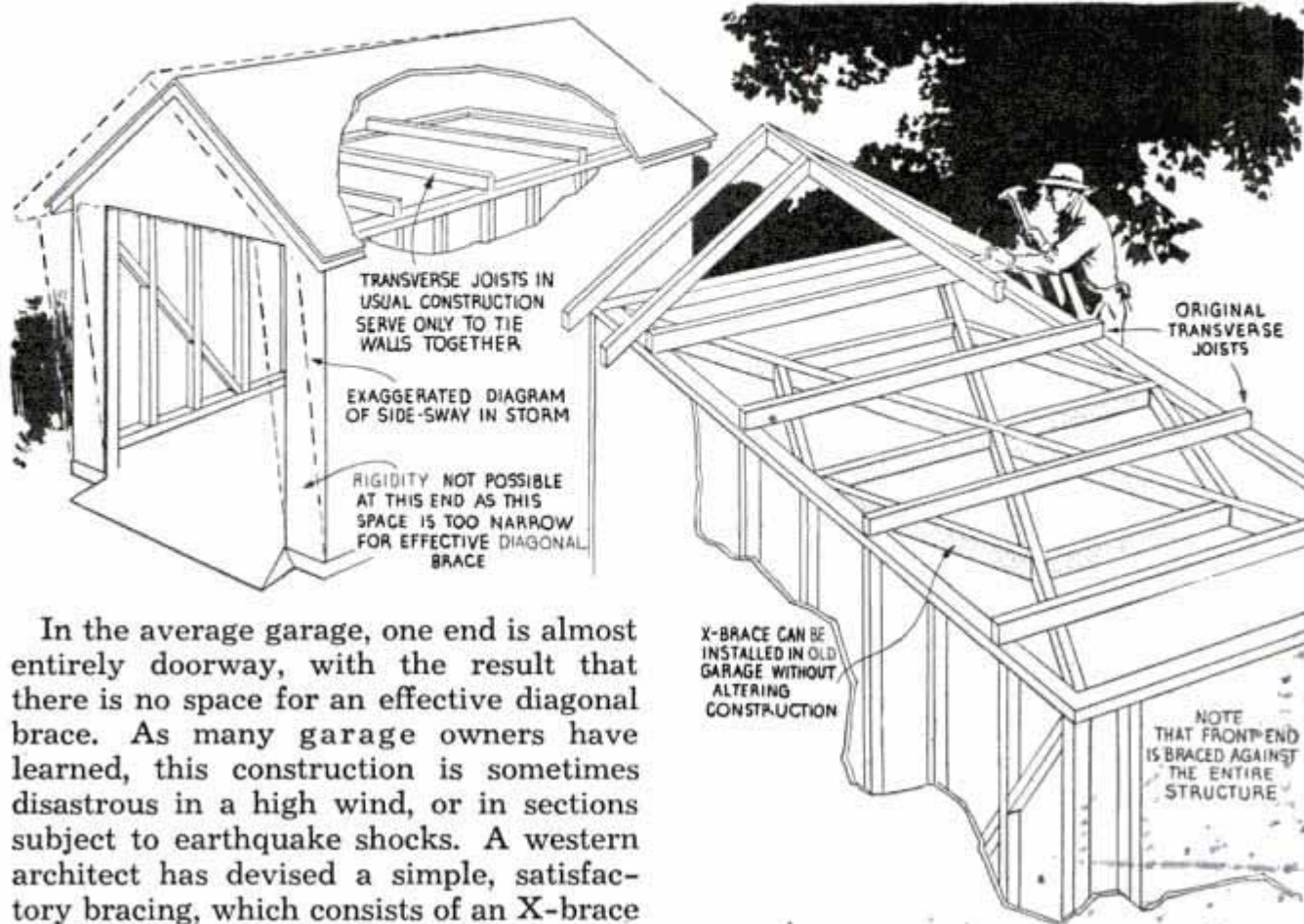
Easy Method of Sharpening Turning Chisels

Round-pointed turning chisels and gouges may be sharpened very easily by holding them in a tapered hole made in a wood disk, which is fastened to a faceplate and rotated in a lathe. The hole is filled with extra fine valve-grinding abrasive, and the tool rest is set to support the chisel as shown. To grind a tool, it is moved slowly in and out of the hole as the disk is rotated.



Chisels Sharpened on Edge of Hole Drilled in a Wood Disk, Rotated on a Lathe Headstock

Rigid Bracing for the Front End of a Garage



In the average garage, one end is almost entirely doorway, with the result that there is no space for an effective diagonal brace. As many garage owners have learned, this construction is sometimes disastrous in a high wind, or in sections subject to earthquake shocks. A western architect has devised a simple, satisfactory bracing, which consists of an X-brace installed in the ceiling just under the joists. For small garages already built 2 by 4-in. stock will be satisfactory; in new garages and especially in double ones, it is

better to use 2 by 6 or 2 by 8-in. stock. Large spikes should be used in the bracing, and all members should be fitted snugly.

Shield Helps in Copying Data from Number of Invoices

Office workers whose job is to copy portions of bills, invoices or other papers, will find that this shield helps to reduce eyestrain and avoid errors. It is a piece of sheet aluminum having sections cut out to expose only the data to be copied. A shield similar to the one shown was used by a clerk who cut stencils for addressing merchandise. In use, the papers containing the data are stacked and the shield is placed on top of them. When the desired data have been copied from the upper one, a quick jerk with the hand removes it from under the shield to expose the next paper. A knob fastened to the center of the shield with a small bolt will facilitate handling.—Sylvester Hojnicky, Chicago.

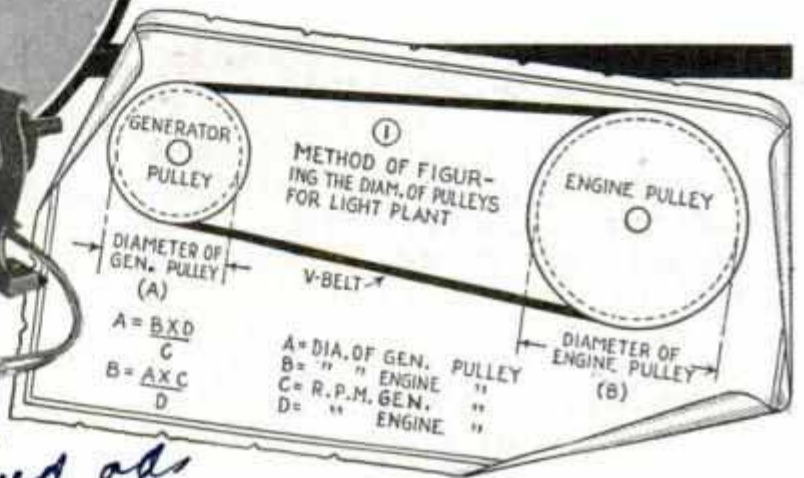


☞ A little spar varnish in exterior oil paint will toughen it and increase its luster.

ELECTRIC LIGHT *in*



may be belted to the engine to run in the same direction. If a new motor is used, it should be connected to a source of direct current and allowed to run for an hour to magnetize the poles so that it will start generating when driven by the engine. If this detail is overlooked, difficulty may be encountered after the light plant is assembled. The engine selected should be of at least 1/2 hp. An



see Classified ads

USING a second-hand electric motor and a small gasoline engine of the washing-machine type, you can build an efficient electric-lighting plant that will be found a great convenience in your cottage. In this article two plants are described, one furnishing 110-volt a.c. and the other 6-volt d.c. Both are designed so that it is only necessary to crank the engine to put them into instant operation.

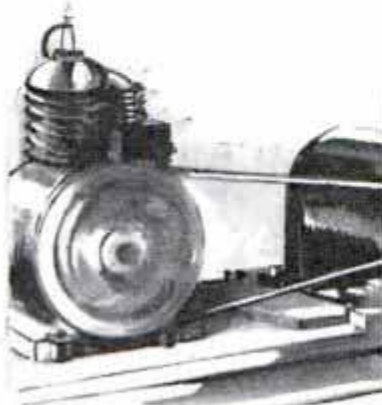
On the 110-volt plant, which furnishes sufficient current to light six 30-watt bulbs, there are no batteries to deteriorate during the months that the cottage is not in use. A 1/4-hp., 110-volt d.c. compound-wound motor should be used as a generator, although a shunt-wound motor will do, but it will not be as satisfactory as the former. Be sure not to get a series-wound motor for this purpose. If a second-hand motor is used, it should be demonstrated to be in good working order by connecting it to a 110-volt d.c. line and allowing it to run for an hour or so. While the motor is running, the direction in which it rotates should be marked with an arrow so that it

engine with a governor to control the speed is best, as this will eliminate adjustments when lights are switched on and off. If this type of engine is not available, almost any kind may be used provided it can be coupled readily to the generator with an endless V-belt.

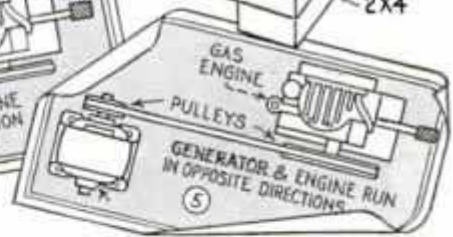
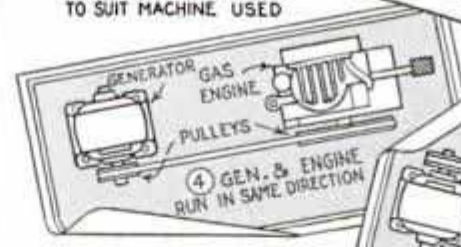
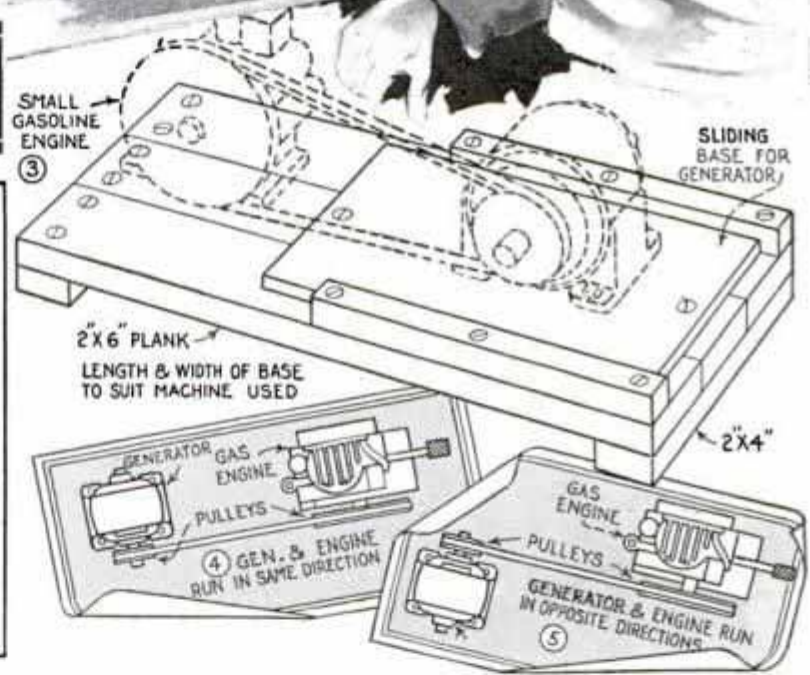
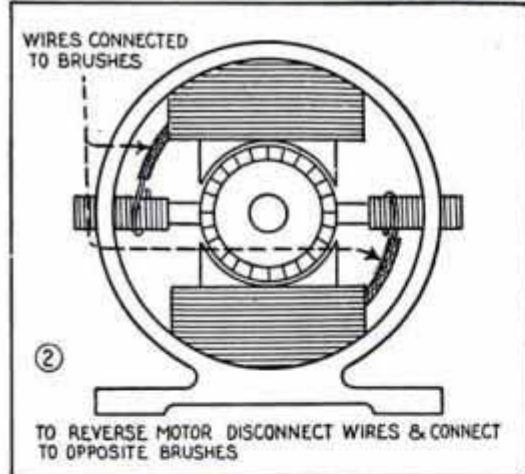
Fig. 3 shows a simple method of mounting the generator and engine on a substantial wooden base. The engine is mounted rigidly with bolts, and the motor is set so that it may be slid back and forth to tighten the belt. In locating the units on the base, the engine must be so set that it will drive the generator in the same direction as it ran when operated as a motor, Fig. 4. In the event the motor and engine run in opposite directions, the arrangement shown in Fig. 5 must be used. If this arrangement is undesirable, the motor may be reversed by interchanging the connections to the brushes as shown in Fig. 2. After reversing the direction of the motor, it must be operated on a 110-volt line for an hour or so to assure proper magnetization of the field.

Schman motor works Associated Mfrs. Co. 500 Mullain, Waterlor
 900 N. 2nd St. Lincoln Neb. Day minute Mfrs. Co. Newton I. Swob.

Your COTTAGE

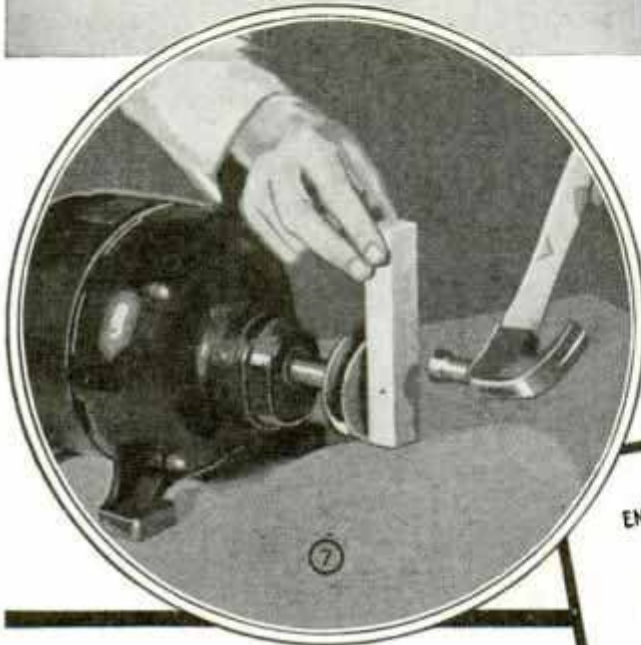
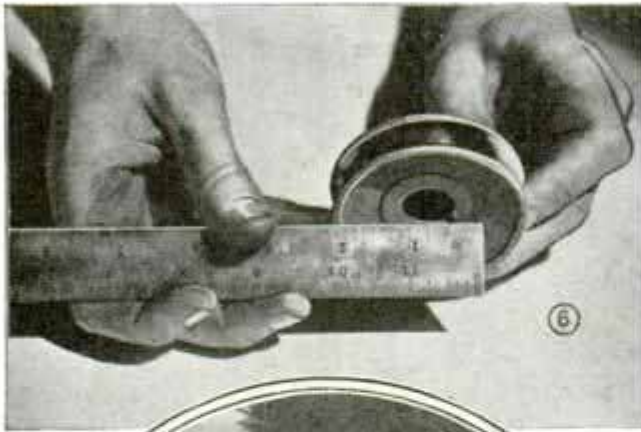


by C.A. CROWLEY



Pulleys for the motor and generator should be selected so that the generator will be turned over at the proper number of r.p.m. When using a motor as a generator the speed must be increased above the r.p.m. value given on the name plate in order to get 110 volts. To find the proper speed to drive the motor, multiply the given speed of the motor by 1.3. As an example, suppose the motor is rated at 1,725 r.p.m. Multiplying this value by 1.3 will give 2,242 r.p.m. as the proper speed for the machine when operated as a generator. Engines are usually equipped with large pulleys, and accordingly the simplest method of getting the proper speed is to purchase or make a pulley having the

proper diameter for the generator. Before figuring this, it will be necessary to determine the speed of the engine either with a speed counter or from its name plate. With this information, the diameter in inches of the pulley required for the generator is found by multiplying the diameter of the engine pulley by the r.p.m. at which the engine runs, and then dividing this by the r.p.m. at which the generator must run, as figured above. As an example, if the engine runs at 1,100 r.p.m. and has a 10-in. pulley on its flywheel, the pulley size required for the generator will be found by multiplying 10 by 1,100, which would give 11,000, and then dividing this by 2,242, which would give 4.9 in. as the proper diameter

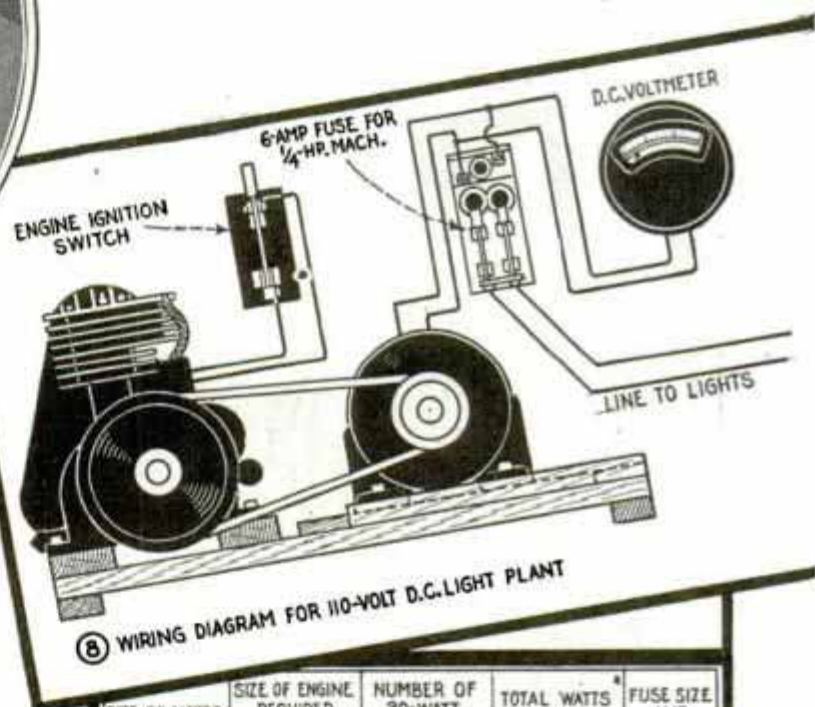


for the generator pulley. If the speed of the engine can be controlled slightly, either a $4\frac{1}{2}$ or a 5-in. pulley may be used, and the engine throttle adjusted accordingly to give exactly 110 volts with the machine in operation. Measurements of V-type pulleys are made from the bottom of the belt slot as shown in Fig. 6. When driving a pulley on a motor shaft, use a hardwood block as shown in Fig. 8. To make this easy to figure in all cases, follow the method given in Fig. 1.

With these values determined, you are ready to mount the machines on the base and connect them for running. Fig. 8 shows how the connections are made. All wiring should be done with flexible metal-covered cable, or by the usual knob-and-tube method commonly used for temporary wiring. The wire used in the installation should not be less than No. 14, preferably larger. All wires should be run as direct as possible to keep the lines short. The fuse block and cut-out switch should be enclosed and equipped with 6-amp. fuses to protect the generator against short cir-

cuits. The voltmeter should have a scale reading up to 150 volts d.c.

To put the plant in operation, open the fuse switch and start the engine. See that the machines are lined up, the belt tight enough to pull the generator, and that the bearings are all well lubricated. The throttle should next be adjusted so that the voltmeter reads about 120 volts. If it does not register and the connections are made correctly, turn on one small light bulb and watch for the voltage to slowly build up. If the engine has the proper amount of power to keep the speed of the generator constant, as many as six 30-watt, 110-volt lamps may be turned on without the voltage dropping below 110, when using a $\frac{1}{4}$ -hp. motor as the generator. No more load



⑧ WIRING DIAGRAM FOR 110-VOLT D.C. LIGHT PLANT

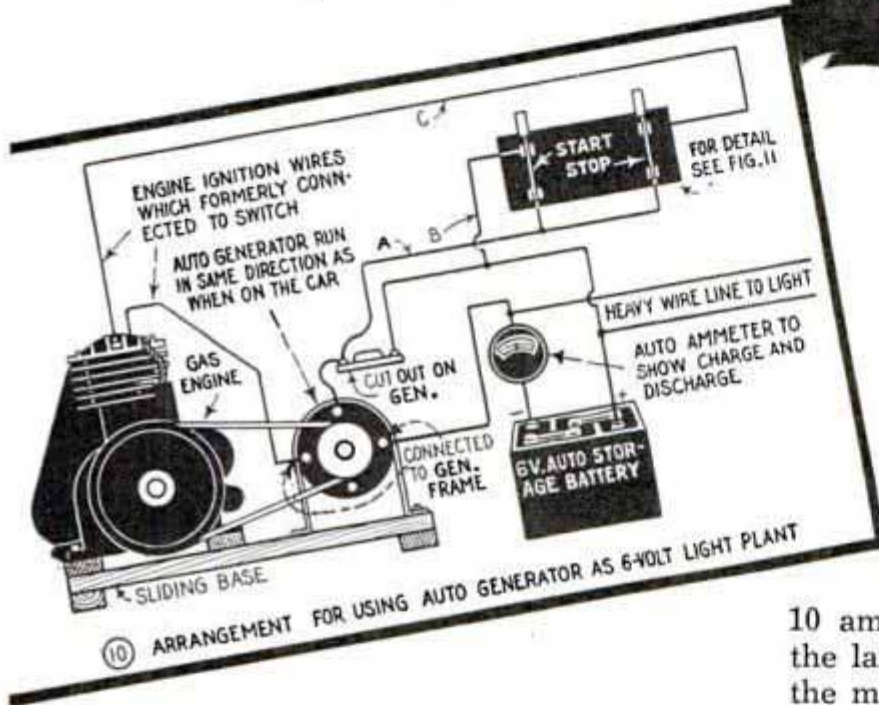
SIZE OF MOTOR H. P.	SIZE OF ENGINE REQUIRED H. P.	NUMBER OF 30-WATT LAMPS	TOTAL WATTS OUTPUT	FUSE SIZE AMP.
$\frac{1}{4}$	$\frac{1}{2}$	6	180	6
$\frac{1}{2}$	1	12	360	6
$\frac{2}{3}$	1	8	240	6
$\frac{3}{4}$	$1\frac{1}{2}$	18	540	6
1	2	24	720	10

⑨ SIZE OF ENGINE, REQUIRED & OUTPUT OF VARIOUS SIZES OF MOTORS WHEN USED AS GENERATORS

than this should be used with this size machine. If the generator is defective or of poor quality, the voltage may drop to a lower value. If a shunt generator is used, it will invariably drop to a lower voltage as more lights are turned on, and thus cause the lights to become dimmer. If the speed of the engine is not controlled by a governor, it will be necessary to adjust

the voltage to 110 volts by throttling the engine whenever lights are turned on or off, unless the slight dimming or brightening is not objectionable. Fig. 9 gives the engine size, number of lights, and total watts produced by larger size motors. A 1/4-hp. outfit will operate a small electric fan but an electric iron should not be connected to it as the latter requires entirely too much wattage.

Fig. 10 shows a method of connecting an automobile generator and its cutout to an engine so that the unit may be operated as a simple 6-volt light plant. In this case a 6-volt storage battery has been included

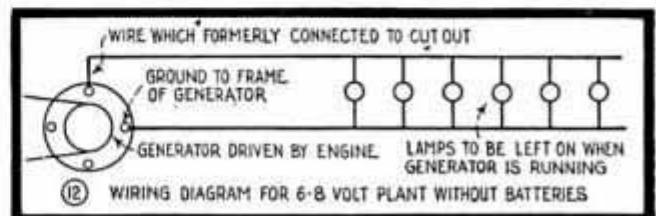
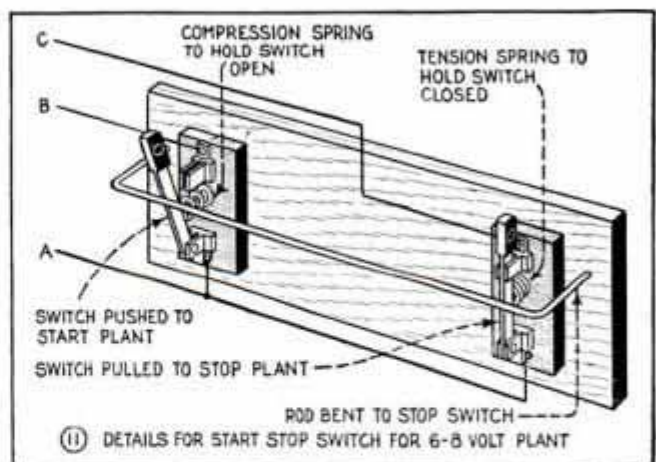


to give the plant larger capacity. The starting switch, detailed in Fig. 11, is used as an automatic start-stop controller, and may be located at any point not too far away from the generator. With this outfit the auto generator acts as a motor when the switch is momentarily closed, and cranks the engine, after which it acts as a generator to charge the battery and furnish current for standard 6-volt automobile lamps. The cutout prevents discharging the battery should the engine stop. The stop lever is pressed momentarily to shut off the engine. Fig. 12 shows method of connecting a 6-volt outfit without a battery. With this outfit, only about a half dozen auto-headlight bulbs may be used, while with the previously described arrangement any number up to twenty may be connected to the line, provided the engine is allowed to operate part of the

day to keep the battery charged.

When using the 6-volt light plant, all wiring should be made as heavy as possible. The wires running from the plant to the bulbs should not be smaller than No. 8, and then the lines should not be much over 100 feet long if bright lights are to be had. With the 6-volt outfit, described first, the speed of the engine is adjusted with the throttle until the voltage is correct to give good light, or to charge the battery at about

10 amp. On the plant without batteries the lamps should not be turned off while the machine is operating, otherwise there is danger of burning out the generator.



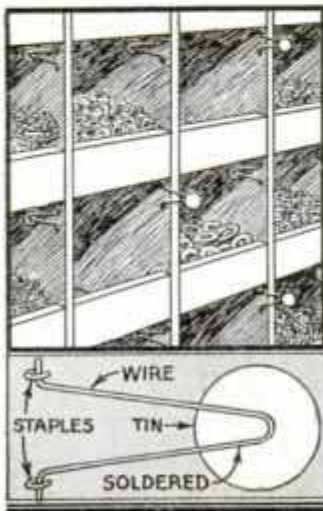
Spacer for Setting Small Plants in Greenhouse



Wire Frame with Equally Spaced Cross Wires Serves as Guide for Setting Plants in a Greenhouse

When small plants are removed from the starting beds and transplanted to cold frames, it is desirable to set them in uniform rows for care and cultivation. To do this rapidly without using lines, make a frame of heavy wire and solder cross wires to it as shown. By placing this frame in one corner of the bed, the holes to receive the plants may be punched in the soil evenly, after which the frame is moved to the next corresponding position as the work progresses.

Swinging Tabs to Indicate Depleted Stocks of Small Parts

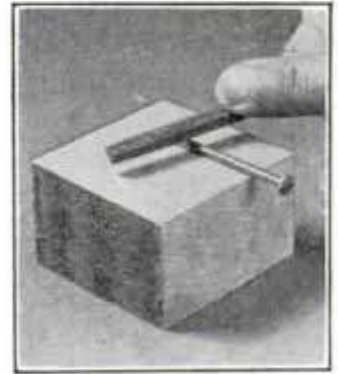


In a factory stock room where depleted stocks of small parts were often overlooked by order clerks, with the result that a new supply was not ordered, swinging tabs were pivoted to each bin. When the supply of any particular part got

low, the tabs were swung out to remind the clerks to order a new supply. The tabs were tin disks soldered to lengths of spring wire, which were pivoted to the bins with staples as shown in the detail.

Scored Nails Hold Firmly

Nails that are to be driven into wood will hold better if they are first scored with a file. This can be done readily by laying each nail on a wood block, as shown, and rolling it with the edge of a three-cornered file, using considerable pressure. Start the rolling at one end of the nail, and, by holding the file at an angle, a spiral score will be made the length of the nail.



Row of Nails on Dustpan Cleans Broom When Sweeping Shop

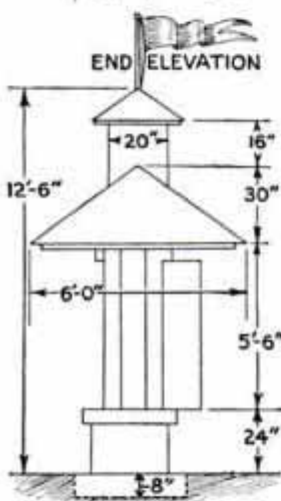
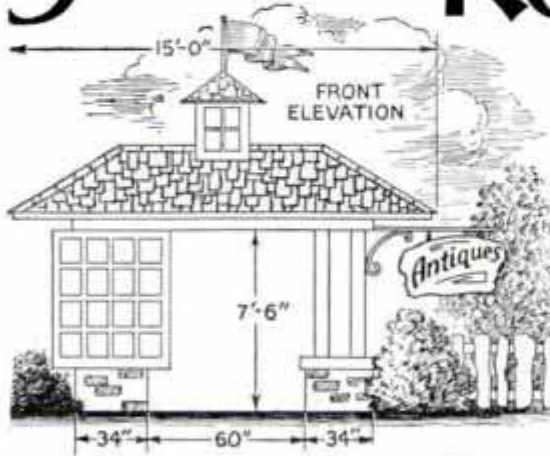
Difficulty often experienced in a machine shop by having metal shavings, bits of wire, etc., cling to a broom may be overcome by soldering a row of nails across the back of the dustpan. By drawing the broom or brush over the nails, the clinging pieces are quickly removed.



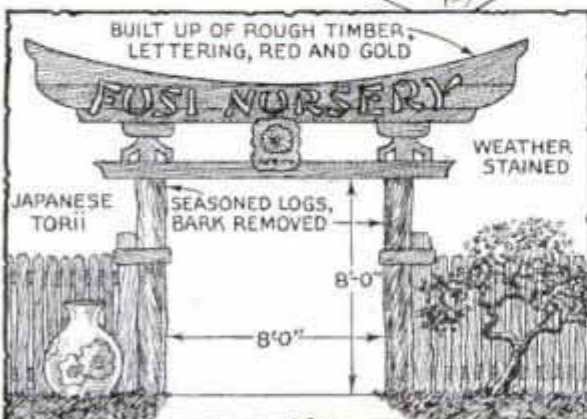
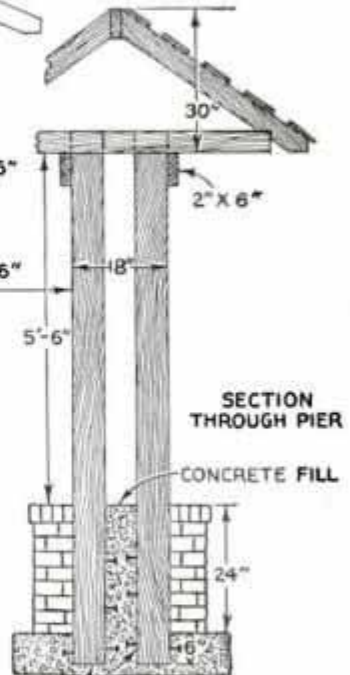
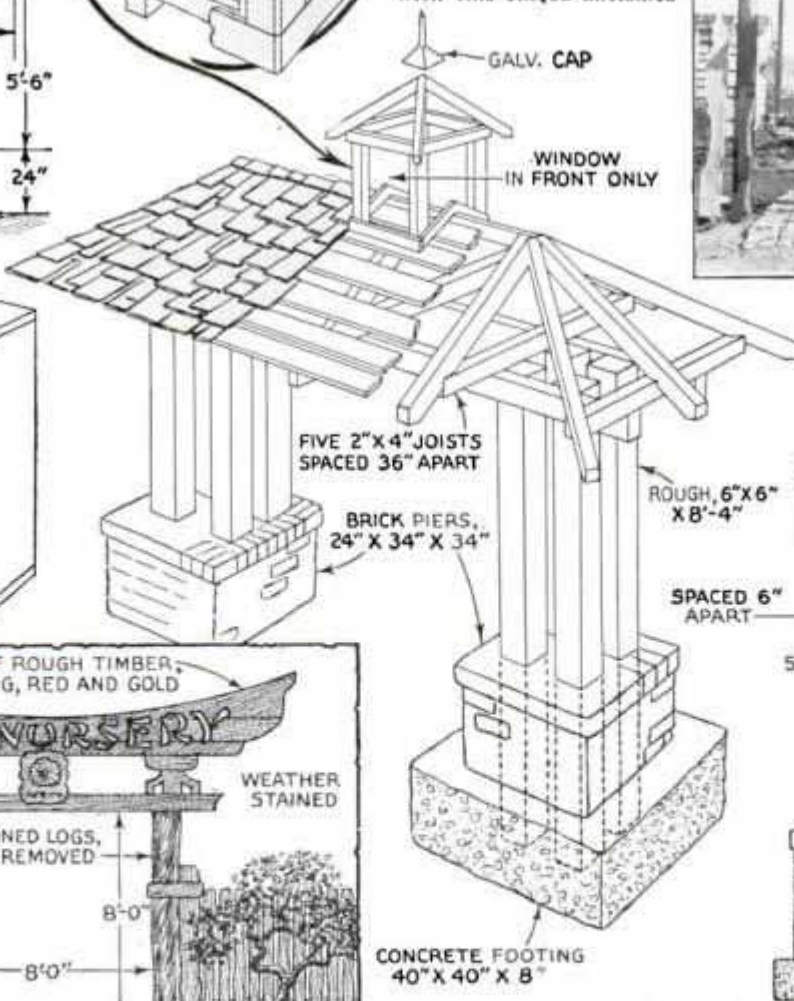
Broom Pulled over Row of Nails Soldered to Dustpan to Remove Metal Shavings

NOVEL GATEWAYS

for the Roadside Shop

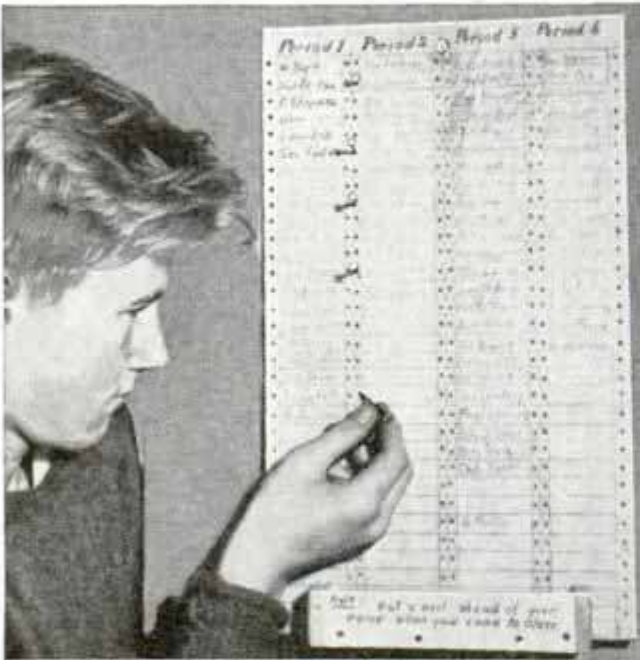


THIS INVITING GATEWAY SERVES ALSO AS A DISPLAY WINDOW FOR A POTTER AND A WEAVER AT LAGUNA BEACH, CALIFORNIA. AT RIGHT, AN OPEN-AIR TEA-ROOM ARRESTS ATTENTION WITH THIS UNIQUE ENTRANCE



CREOSOTE ENDS OF POSTS AND DRIVE IN SPIKES

Class-Attendance Record Kept with Nails



Students Keep Class-Attendance Record by Placing Nails Opposite Their Names, on a Board

To save time and to prevent interruption in class rooms, a vocational instructor in the Costa Mesa, Calif., junior high school uses a novel method of calling the roll. A board, which has the students' names written on it and a hole drilled at the end of each one, is kept at the door. Then, as each student enters the room, he places a nail in the hole opposite his name.

Adjustable Curtain Rod Used as Menu Rack

Screwed to a wall just above a table in a restaurant, a telescoping curtain rod will provide a neat menu rack. The rod is

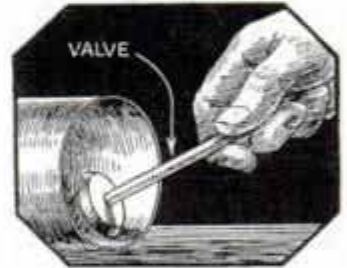


Telescoping Curtain Rod Screwed to Wall Makes Neat Menu Rack in Restaurant

adjustable to suit most requirements for this purpose, and, if necessary, it may be plated with nickel or chromium to match the other furnishings.

Auto Valve Used to Scrape Curved Surfaces before Soldering

When it is necessary to clean a curved surface, such as an eave trough or a milk can, for a soldering job, an old auto valve will serve nicely as a scraper. The beveled side of the valve head should be ground to a sharp edge for this purpose.



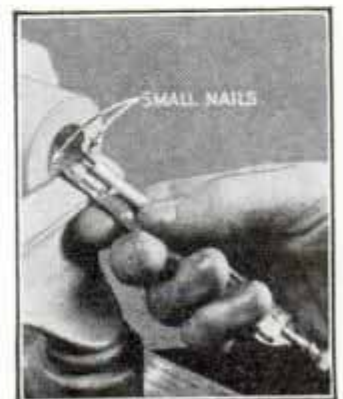
Twisting Flat Belt to Square the Ends

When shortening a length of flat belting, without the use of a square to mark the ends, one is apt to make the cuts on a slight bias and find further trimming necessary. If the belt is given a twist, once over, before placing the ends in a vise or clamp for cutting, they will match for lacing snugly.



Inside Calipers Made from Compass

In an emergency, an ordinary ruling compass may be used as inside calipers. To do this, bend two small nails at right angles. Insert one of them into the lead holder of the compass and drive the other one into a small dowel, which is plugged into the other leg. By changing the direction of the nail points, the compass can be used as outside calipers for small work.



Design by Paul locate anything like it on market

Automatic Dispensing SMOKING STAND

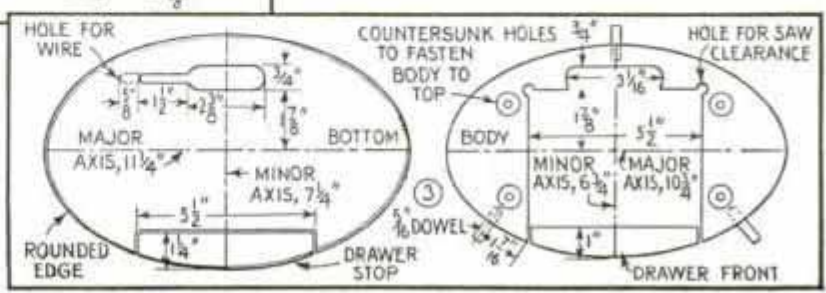
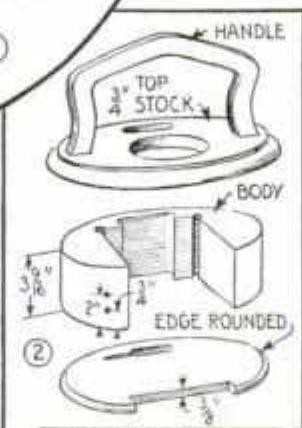
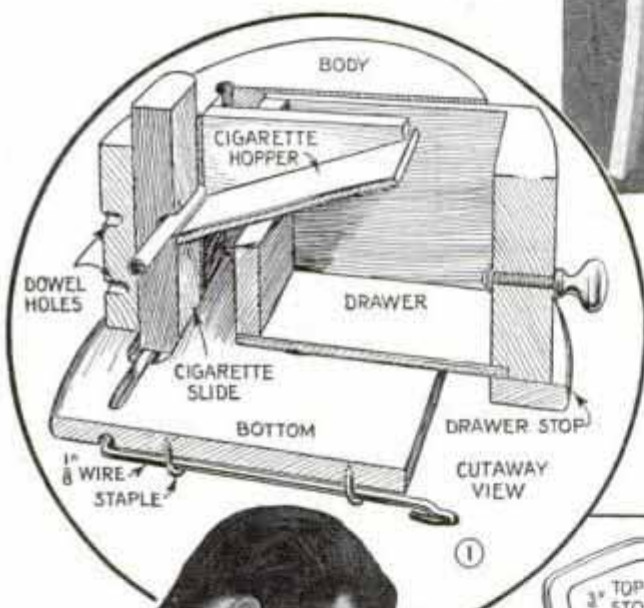


SIMPLE to build, and attractive when finished in two-tone lacquer, this novel smoking stand offers the added feature of a built-in cigarette dispenser. The stand can be constructed without the dispenser if you do not care for this feature. As shown in Fig. 1, the dispensing unit is simply a slide worked by means of a lever, which is fitted to the underside of the main body. A flip of the lever projects the slide above the top of the stand, delivering one cigarette.



Start construction by making the main body. The general assembly can be seen in the cutaway view, Fig. 1, while Figs. 2, 3, 4 and 5 give the necessary dimensions for the various parts. As the finish is to be lacquer, the heavy center portion of the body may be glued up from two or more pieces of wood to the required thickness. The elliptical shape of all the body pieces can be constructed by using any of the conventional methods, or simply sketched in freehand by drawing a quarter-section and repeating the curve for the other sections. The cutout on the main body is best sawed on the band saw after first drilling suitable holes to permit turning of the blade at the corners. You will notice that the front portion of this cutout is to be saved for the

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Dropper Bulb Protects Shirt Pocket from Indelible Pencil

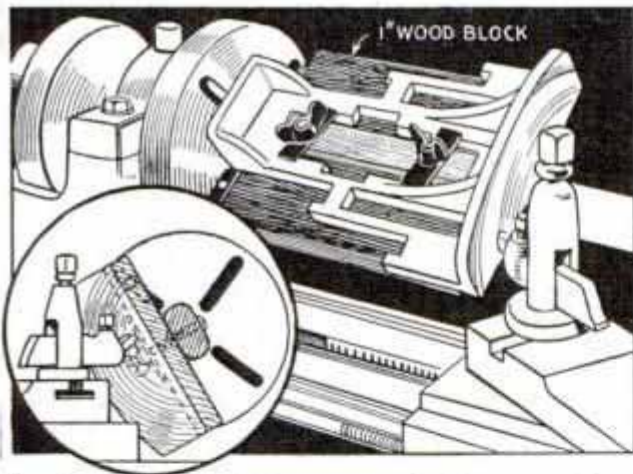


Carrying an indelible pencil unprotected in your shirt pocket often causes stains that are difficult to remove. If a rubber bulb from a medicine dropper is

slipped over the point of the pencil, the pocket will be protected. The bulb may be removed and placed on the other end of the pencil when the latter is in use.

Facing Irregular Work in a Lathe

Having a number of castings to face, and only a lathe on which to do the job, I rigged up the jig shown to hold the work between centers. It is a hardwood block, 4 in. wide and 1 in. shorter than the work, screwed to two short steel rods, which are center-drilled at the ends to take the lathe



Hardwood Jig Used between Lathe Centers to Face Castings and Other Irregular Work

centers. On this particular job, the castings had openings in their centers, and a wood block was screwed to the jig to fit the openings and keep the work alined, bolts and wing nuts being used in connection with short steel strips to clamp the work in place on a mandrel. A large wood screw, driven into one end of the jig to engage a slot in the faceplate, was used to drive the work.—J. Carroll Tobias, Bethlehem, Pa.

☐ Keep the contact point of the tool post setscrew oiled, to avoid wear and prevent the point of the screw from bushing out.



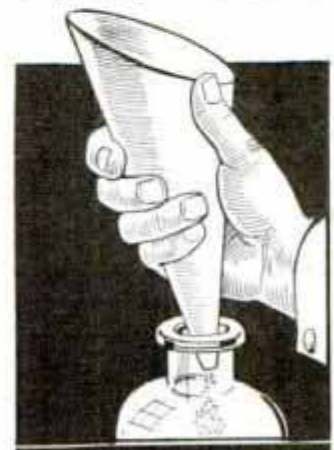
Screen-Wire Shield Helps to Protect Workman's Face from Heat of Forge

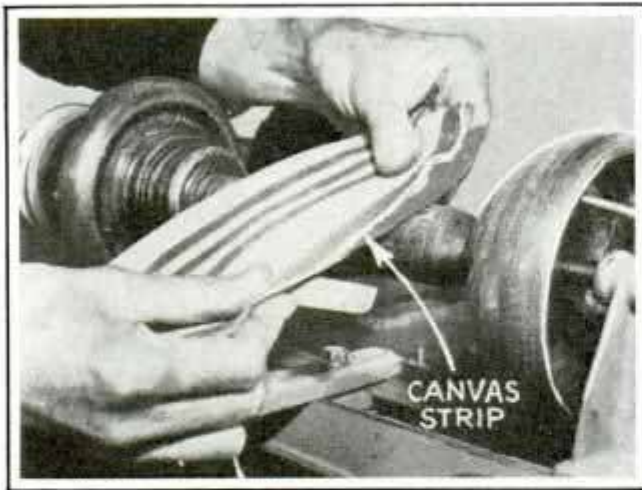
Swinging Screen Shields Blacksmith from Heat of Forge

Prolonged work at a forge to melt quantities of metal for machine bearings, prompted one blacksmith to erect a swinging screen to protect his face and eyes from the intense heat. Screen wire was fastened to a frame made from a 1/4-in. iron rod, which was hinged onto one side of the forge as shown in the above illustration. When not in use, the screen swings to one side where it is out of the way.—G. E. Hendrickson, Argyle, Wis.

Funnel Scoop Fills Bottles with Powder

When necessary to fill a number of bottles with powder or crystals, this funnel will be found a time saver as the powder may be scooped up with the large end and directed into the bottles in the manner indicated. The funnel is made of heavy paper, or if one is needed frequently, it can be made of metal.





Strip of Canvas Held over Back of Sandpaper Reinforces It and Helps Protect the Hands from Heat

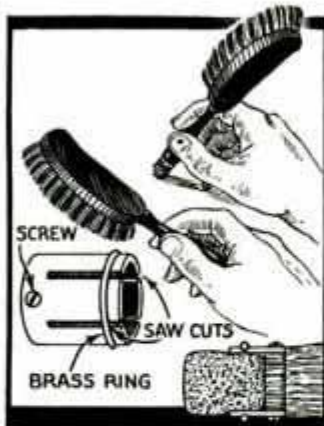
Canvas Strip Backs Sandpaper for Lathe Work

When smoothing spindle turnings or faceplate work with sandpaper, the latter can be reinforced with a piece of canvas so that it will not tear easily. The canvas also acts as a hand shield and protects the fingers from frictional heat.—Ray J. Maran, Kansas City, Mo.

Eraser in End of Draftsman's Brush Handle Saves Time

Artists, draftsmen and designers will find that an eraser fixed in the end of a small brush handle, as shown, is a convenience and a timesaver. After using the eraser, a flip of the fingers brings the brush in position

for sweeping away the dirt and erasings. The end of the brush handle is turned down to take a short length of small brass tubing, which has four equally spaced saw cuts made in it to permit spreading the end to take the eraser.



A small wood screw holds the tube to the handle, while a brass ring slipped over the tube compresses it to hold the eraser securely.—L. N. Olsen, Philadelphia, Pa.

☐ Transparent celluloid, dissolved in acetone, makes a good lacquer for silver.

Auto Service Hints That Save You Money

If you have an old car that is badly in need of repair, and you would like to get another season's use from it, but do not feel that the car warrants the expense of a reconditioning job, here are a few hints on repairs that you can make. Worn cylinder walls and pistons usually result in piston slap. In the case of cast-iron pistons, a simple repair is to plate the skirts with tin, building up a coating .010 to .012 in. in thickness. An expander under the lower ring will help. Also, it will tend to check "oil pumping." While you have the piston out of the motor, check the piston pin for play. This can be taken up temporarily by expanding the bushing with a couple short pieces of pipe as shown. After repairing the piston assemblies as best you can, take a look at the valves. They will probably need reseating and regrinding. Before doing this, remove the glazed surface from the seats with a disk of emery cloth slipped over the pilot of the reseating tool. If this is not done, the glazed surface will dull the cutting teeth on the tool. At the same time, test the valve stems for play in their guides. Wear here will let air be sucked into the cylinders and cause the motor to "gallop," especially at low speeds. A remedy for this is to counterbore the lower ends of the guides and install asbestos-graphite cord packing. A small coil spring slipped over the valve stem will hold the packing in place.

"Cellophane" Aids in Cutting Mimeograph Stencils

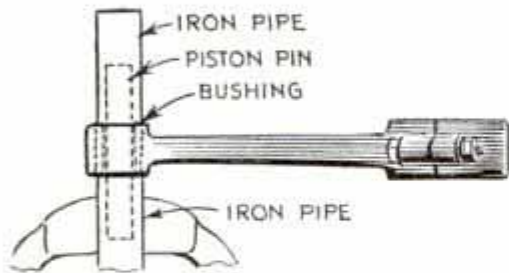
By placing a piece of thin Cellophane over a mimeograph stencil, a stylus may be used freely in writing or drawing without any possibility of fraying or tearing the lines that cross or run close together. The Cellophane wrapper from a cigar will be

just the right size to use when placing a signature on a stencil. Sufficient pressure may be used safely to cut the stencil clearly, thereby assuring a clear copy.—G. Smith, Quarryville, Pa.



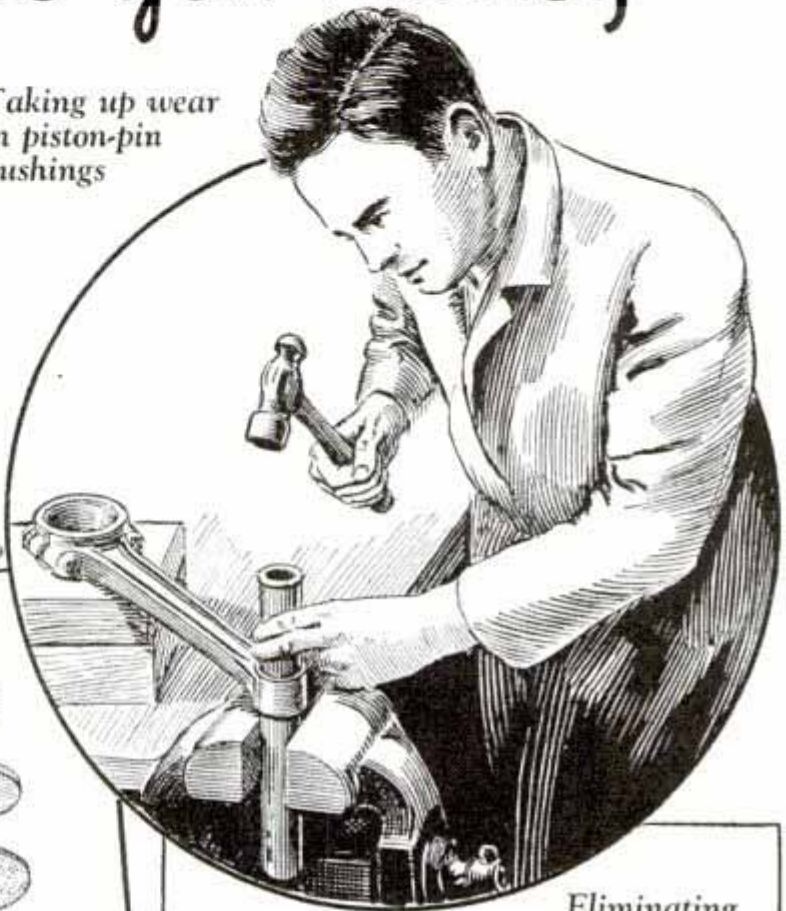
AUTO SERVICE HINTS

That Save You Money

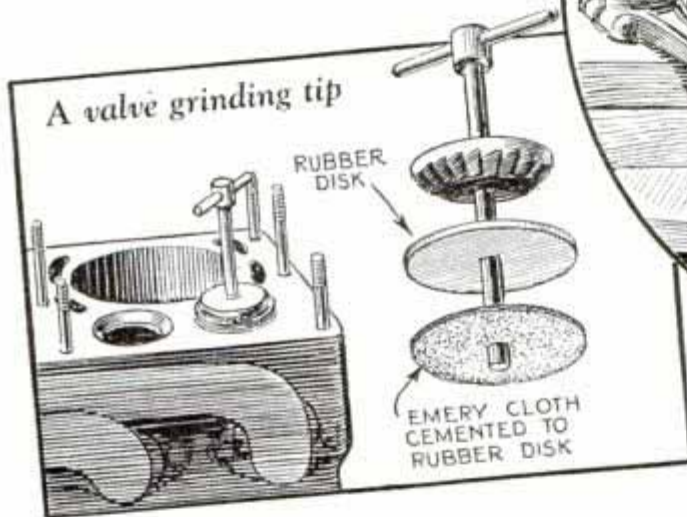


Taking up wear in piston-pin bushings

Above, expanding piston-pin bushings to take up play. This is done with two pieces of pipe held against the ends of the bushing. Below, glazed surface removed from valve seat with emery cloth prevents dulling the reseating tool



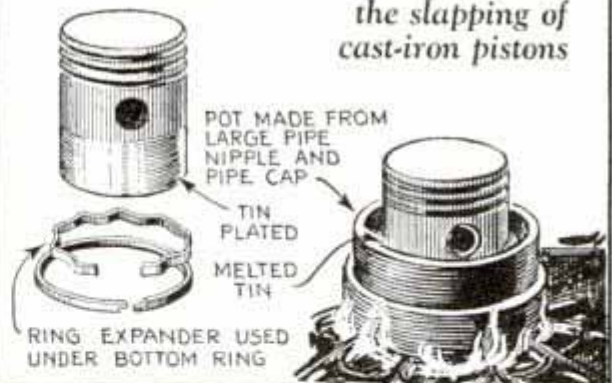
Eliminating the slapping of cast-iron pistons



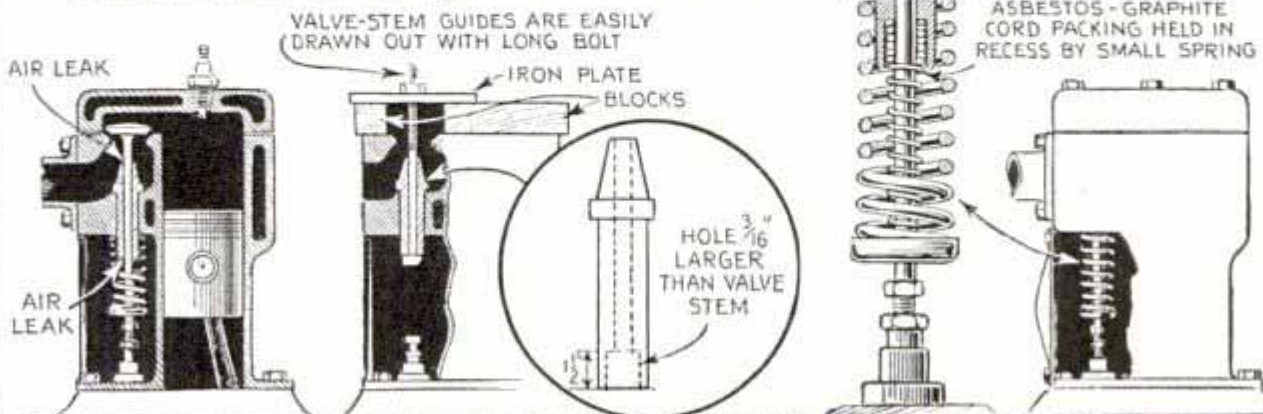
A valve grinding tip

RUBBER DISK
EMERY CLOTH CEMENTED TO RUBBER DISK

Right, tin-plating skirts of cast-iron pistons to compensate for wear and help to prevent piston slap. In the case of alloy pistons, marcel-type expanders are often used under the bottom ring. Below, a frequent cause of a "galloping motor," and sluggish "pick up" is air leakage around the inlet-valve stems. This can be remedied with asbestos-graphite packing installed in the valve guides as shown



How to remedy air leakage around valve stems



Gear Puller Made from Jaws of a Pipe Wrench



Made from Two Pipe-Wrench Jaws, This Puller Is Adjusted Quickly to Fit Various Gears

Utilizing the jaws from a couple of pipe wrenches, this adjustable gear puller will handle fairly heavy work. To make it, a piece of bar steel is drilled and tapped in the center for a large bolt, which should be pointed on the end. Half way between this hole and the ends of the steel bar, two holes are drilled to take the wrench jaws, which fit over the rear side of the gear when pulling it. As the regular wrench nuts are used on the jaws, they can be adjusted for length as required.—Herbert E. Hawkins, Rogers, Ark.

An Aid in Grinding Ford Valves

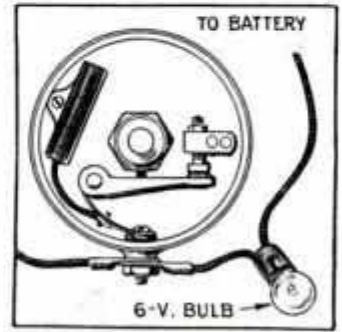
When grinding the valves on a model-A Ford, much time can be saved if a light compression spring is slipped over the valve stem, and the valve guide is installed upside down as shown. Then, a rubber band slipped around the guide will hold it together so that the entire assembly can be pulled out when removing the valve to check



the grinding job. The spring will tend to force the guide in position when replacing the assembly for further grinding.

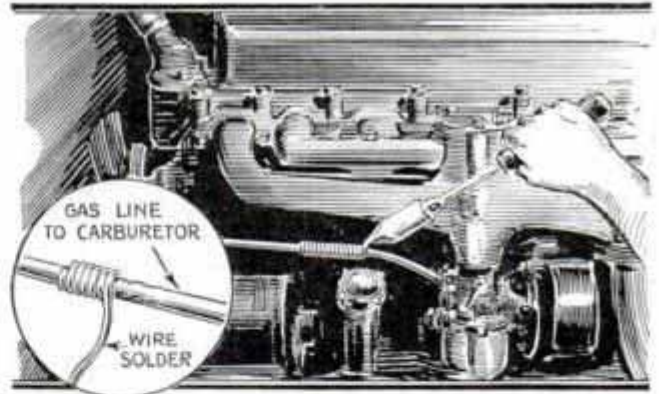
Synchronizing Car Ignition

To synchronize the ignition timing on your car motor, the only tools required are a few feet of wire and a 6-volt bulb and socket. Connect one wire to the ignition wire at the side of the distributor and the other to the battery. Then set No. 1 piston on dead center or with the timing mark on the flywheel. The distributor points should be ready



now to open, at which time the light will go out. If it does not, set the distributor so that the light will go out as soon as the flywheel marks correspond.

Wire Solder Prevents Breakage of Worn Gas Line

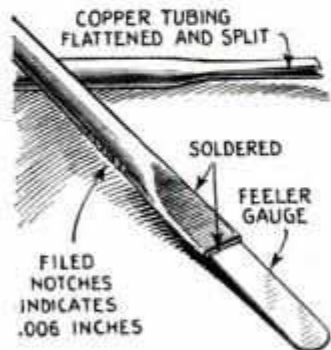


Wire Solder Strengthens Kinked or Worn Gas Line and Prevents It from Breaking

If the gas line on your car becomes worn or kinked so that it may be broken easily, the worn spot may be in such a position that a complete soldering job is almost impossible at the time. In such a case, straighten the tubing as much as you can without damaging it and wrap it tightly with wire solder. It is a good idea to apply a soldering iron to fasten each end of the coil; or wrap the tubing at each end of the solder with friction tape to prevent it from sliding. Such a repair will keep the line from kinking again at that point.

Long-Handle Thickness Gauge Prevents Burned Hands

If tappet clearances are checked properly, the work should be done while the motor is hot. This often results in burning the hands or arms on the exhaust

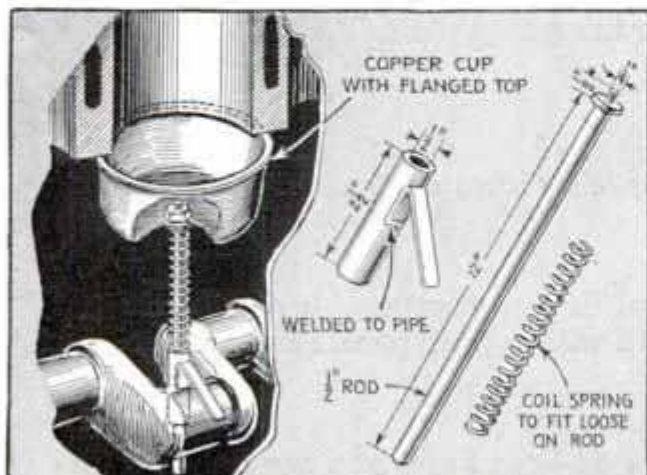


manifold when inserting the thickness gauge. To avoid such injury, one mechanic uses long-handle gauges. He buys the stock in 12-in. lengths, cuts off 4-in. pieces and solders them in the flattened, split

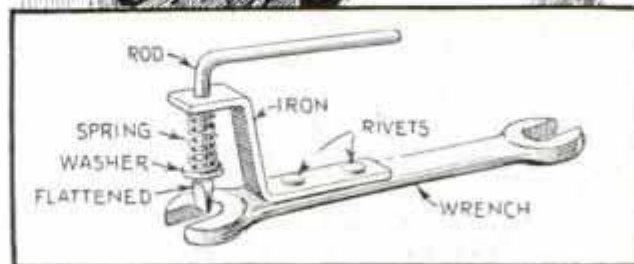
ends of 8-in. lengths of copper tubing. Notches filed in the handles indicate the thickness of the various gauges.—Spencer A. Jones, Belleville, N. J.

Cup Collects Used Abrasive When Honing Auto Cylinders

To collect abrasive material used in honing auto cylinders, the cup shown has been found handy. It has a flanged rim around the top, which fits snugly over the bottom of the cylinder where it is held by a compression-spring assembly. This rests on the crankshaft, which is turned to compress the spring and hold the cup tightly against the cylinder. A rod is attached to the bottom of the cup with two nuts, a compression spring being slipped over the rod between the cup and a loose-fitting pipe sleeve, which has an iron bracket welded to it to fit over the crankshaft.



Cup Held against Bottom of Cylinder by Spring to Collect Abrasive When Honing Motor Cylinders



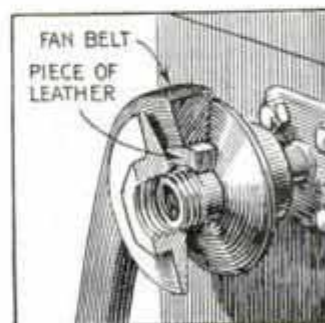
Tool Combines Wrench and Screwdriver for Adjusting Tappets on Car Motor Having Overhead Valves

Overhead-Valve Tool Saves Time in Adjusting Tappets

For the auto mechanic or the man who does his own repairing, this overhead-valve tool combines a wrench and screwdriver and greatly facilitates the adjustment of tappets. An end wrench, which fits the lock nut on the rocker-arm assembly, is fitted with a flat iron bracket as shown, the latter being drilled at the upper end to take a short rod. This is flattened at one end like a screwdriver, and is bent at right angles at the other end to form a handle. In use, the lock nut on the rocker arm is loosened with the wrench, after which the tappet is adjusted by turning the handle of the screwdriver.—Ralph T. Moore, Elyria, Ohio.

Leather Aids in Replacing Fan-Pulley Flange

When a new V-belt is put on a fan pulley, which has a screw-type flange, and the belt is too wide to get the flange started on the threads of the hub, put a strip of leather around the hub as shown, and roll the belt over it. This will raise the belt enough to get the flange started on the hub threads.



Shock Absorbers Filled Easily with Pressure Can



*Difficulty in Filling Shock Absorbers Is Eliminated
with This Homemade Pressure Can*

Refilling hydraulic shock absorbers is usually a difficult job for the car owner or the mechanic in a small shop where the proper equipment is not available. With this in mind, I made up the pressure can shown. It is a quart container with a tire valve soldered in one side and a length of

$\frac{3}{16}$ -in. copper tubing soldered in the top. The tubing should extend to within $\frac{1}{8}$ in. of the bottom of the can, and it should have a pet cock to control the flow of fluid. After half filling the can with shock-absorber fluid, and turning down the screw cap tightly, a few strokes with the tire pump will provide sufficient pressure to force the fluid into the shock absorbers regardless of their positions on the car.—Milton M. Flanders, Washington, D. C.

Leaks in Fuel-Pump Diaphragm Cause Oil Dilution

Excessive oil dilution, sometimes accompanied by crankcase explosions, may be caused by slight leakages of gas through small holes in the fuel-pump diaphragm. These pinholes, as they are generally called, may not be large enough to cause a complete pump failure; hence the only indication of leakage may be the explosions or the excessive thinning of the engine oil. Installation of a new diaphragm is the best remedy for the trouble.

The Next Issue

HOW TO DESIGN AND BUILD ELECTROMAGNETS

Simple methods of designing and building small electromagnets of all kinds. Information on how to figure the core size, the amount of wire needed, the type best suited to your purpose and the amount of current it will consume.

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SAM HOWARD, the high-diving champion: "I can smoke Camels all I want to and keep in perfect 'condition.' Camels are so mild. They never get my wind."

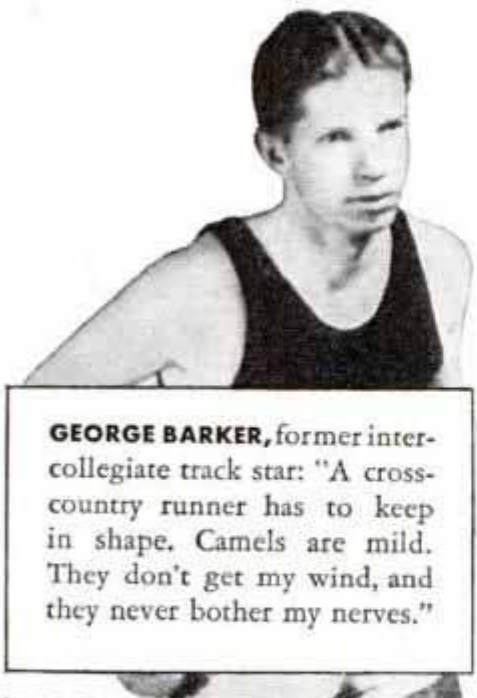
SUSAN VILAS, the free-style swimming champion, comments: "I've discovered that Camels are mild. They don't cut down my wind. Camels are full of rich, smooth taste!"

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CARL HUBBELL, a Camel smoker for many years, caught on the diamond! He says: "Camels have flavor, plus mildness—a rare combination. 'I'd walk a mile for a Camel!'"



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Winston-Salem, N. C.

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Million-Milers of the Air

(Continued from page 213)

Knight's engine overhead. Knight refueled and arrived in Chicago soon after daylight. There the mail was transferred to another ship and reached New York a little more than thirty-three hours after leaving San Francisco. Completion of the trip caused air-mail officials to predict cautiously that it might be possible to establish a coast-to-coast air-mail service on a schedule of thirty-six to forty hours. Today the air lines run schedules in half that time.

That first attempt at a continuous flight across the continent with the mail would not have been successful, except for Knight's determination to keep going after he had completed his own part of the schedule. But he sees nothing particularly laudable about the feat.

"Any pilot in the air mail would have done the same thing that night," he explains. "I just happened to be there at the right time. Any of the fellows would have insisted on going ahead if they had been in my shoes."

E. Hamilton Lee, who flies the Omaha to Cheyenne route, is the veteran of veterans. Since he learned to fly in 1913 he has logged more than 14,000 hours in the air. That is equivalent to more than 1,600,000 miles—three round trips to the moon. "Ham" wore knee pants when he rode a bicycle down the streets of Minneapolis and all but collided with a truck hauling an airplane. Instantly he lost all interest in bicycles. He got a job—without pay—washing the plane after it had been assembled. A week of arduous scrubbing and polishing won him a ride. Before the year was finished he had learned to fly. He began barnstorming, then came the war and he was an instructor in the army air corps. In 1918 he became a mail pilot and has flown nearly every division of the coast-to-coast airway. In 1,600,000 miles of flying he has never had an accident, never lost an air-mail letter, never so much as jolted a passenger. His record is remarkable simply because of the lack of a single thrilling incident. Today he has a son who is starting flying lessons.

"He may become quite a pilot some day," opines the father, "but he will not know as much as his old man until he has logged 14,000 hours."

One of the youngest of the million-milers is Edmund Matucha who, despite his years, is one of the oldest pilots in point of service with United. He flew the first mail from Chicago to Kansas City and still is on the same route. He had his training in the army air corps and had quite an experience over Illinois one morning when an engine dropped from a trimotor ship as he was nearing Chicago. But that did not bother Matucha. He brought the plane in on its two engines and made a perfect landing. Other pilots have received medals for landing under like circumstances.

In his barnstorming days Matucha "enjoyed" another thrill—flying with a blind pilot. He was putting on an aerial fireworks display at an Iowa fair. Another pilot, a friend of Matucha's, asked to fly the plane one evening to revive memories of his night bombing flights during the war. Matucha agreed and went along as passenger. Everything went all right until the last flare was released. It was a big one and the intense brightness blinded the man at the controls who happened to look directly at it as it exploded. There sat Matucha, a passenger in his own plane, with a man temporarily blind and helpless at the controls. Matucha shouted directions to his friend until the latter's eyes overcame the dazzling shock and he was able to land.

(Concluded next month)

ROTARY VALVE SEEN AS SOURCE OF MORE POWER FOR AUTO

That a rotary valve system holds the promise of more power and elimination of a large number of parts is pointed out by Joseph A. Anglada, consulting engineer, who has designed such a system. The rotary is intended to replace the poppet valve with which an overlapping of the opening of intake and exhaust valves is necessary. This compromise timing results in loss of power. With the rotary system, overlap would not be required, resulting in better performance at low speed and an increase of about twenty-five per cent in power. Three manufacturers are said to be developing engines with rotary valves.

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Tricks of the "Highgraders"

(Continued from page 188)

carried away by men who picked up small chunks of pure metal and placed them in their mouths like chewing tobacco. Now and then you hear tales of one-legged miners who hide gold in their false legs. One miner wore a beard and blew powdered gold into his whiskers by standing over a compressed-air line. Later he would wash as much as an ounce of gold out of his beard. Men in mines that are producing sylvanite and other brittle tellurides of gold have let their finger nails grow long so they could carry away five or ten dollars worth of powdered ore under them."

Not long ago some miners working in a low-grade ledge tamped home the sticks of dynamite, ignited the fuses, and retired from their day's work. Minutes later the mine rocked from the explosions. Before the next shift went to work, a timberman entered the tunnel to shore up its sides and roof. His lamp showed a rich pocket of ore the dynamite had uncovered. Working swiftly, he sacked the loosened ore and carried it to an unused tunnel. Later he was caught while sliding the sacks down the dump. There were only a few hundred pounds in the sacks but the rock contained \$22,000 worth of gold.

Sometimes miners try to throw away carloads of rich ore instead of routing them to the mill, marking the spot where the ore slides down so they can return at night and salvage it from the dump. At some mines such a practice is prevented by training searchlights on the dumps at night. After they have gotten ore away from the mine some highgraders stake out a claim close by, dig a "coyote hole," and dump the stolen ore down their own shaft. From there they can move it openly to a mill or smelter and explain that it came from their own diggings. Nine tons of high-grade ore worth a dollar a pound were once stolen from a California mine, moved to the coast in laundry wagons, and transported to an abandoned mine on an island, where the metal was extracted.

When some unscrupulous miners uncover a ledge of rich rock, they hastily cover it with waste and eventually report to the owner that the mine is worked out. Then, after it is shut down, the highgraders lease it on a profit-sharing basis and

go to work on the rich vein they "accidentally" discover. A cook on a placer dredge thought he had worked out a fool-proof way of extracting gold. The sluice boxes were in a compartment fenced off with steel lattice but the cook bored a hole through the roof of the galley and into one of the sluice boxes, and hung a bucket under the hole to catch the gold dust and nuggets that trickled down. His scheme was discovered when the superintendent found that some of the mercury used to catch the gold in the sluice boxes was disappearing.

In the early days, a silver mine that refined its metal on the spot was repeatedly robbed by bandits who swooped down and carried off the small bars. Finally the miners cast their metal into one large ball that grew in size each time new silver was melted. On the next raid the bandits met with no resistance but they found the silver ball was so heavy that they couldn't carry it away. Mill owners today usually cast their gold and silver into bars too heavy to be transported easily, as one precaution against robbery. One operator keeps a heavy bar of brass that looks like gold in his safe and hides the real treasure bar in a corner of the tool house.

One legend of the west is that during the days of the gold rush Chinese laundrymen washed miners' shirts free because of the gold they could pan from the dirt in the bottom of their washtubs. Similar care not to lose a grain of gold is taken at the mills. Floor sweepings are worth real money. The slag found on top of the refined metal when it is melted down for casting is carefully crushed and panned out for the small beads of gold that bubble up from the bottom of the crucible. Cyanide solutions and "slime" are run through the vats and agitator tanks time after time to make sure that all recoverable gold has been extracted.

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BETTER OILS FROM THE GROUND UP!

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8377 The Fighting Toys of Uncle Sam

(Continued from page 249)

or three feet off a table, indented and raised by long and short supports underneath, is an upright landscape background. This gives the illusion, when the horizontal mesh terrain has been painted an earth color and tiny houses and trees have been placed on it, of a far-distant field and sky behind it.

Underneath the horizontal mesh terrain extends the folding pantograph, like a series of scissors joined together. It is pivoted, at the center, to the bottom framework of the upright canvas, which lacks about two inches of resting on the table. The forward end of the pantograph, extending under the mesh terrain, carries a small flash; the tip of the other end moves over a map on the table behind the screen.

In operating this miniature firing range, the observer sits in front of it. His line of vision is about four inches above it. He uses field glasses to simulate field conditions. Here a firing problem is given him including a target. He plots his shot on the terrain and fires, theoretically. The flash gives him visual record of his fire while, the "gun sheet," placed over the map on the table rear, records his fire. The observer then corrects his fire on instructions from his teacher.

One of the cleverest toys used by the army is the Link airplane trainer. This resembles a miniature plane mounted on a huge box. It is equipped with a full-size hood and operates by electrical power. It tilts from side to side and backward and forward and the student is required to keep it on even keel solely by the aid of instruments on the panel in the cockpit. In reality it is not a flying trainer but a toy to give instruction in radio flying. It teaches the pilot to fly blind.

At a table near the pilot sits a radio operator. On the table is a "mike" and several switches. These are hooked up with the pilot in the miniature plane, who wears headphones. A map is used to plot the course of the flyer, who is given the job of flying at a certain speed between certain cities by radio alone. He flies at a certain speed ratio as to time and as he leaves the radio beam of one air field he is taught how to pick up that of the one he is approaching. The flyer has no way of

knowing what he is doing, what progress he is making, except through the radio equipment.

Other toys include planes painted on canvas, or spots, resembling plane surfaces, that move on tiny cars pulled by a cord. Here problems in firing at aircraft are worked out with anti-aircraft guns. Ratios are used so that, under actual warfare conditions, it is only necessary to cast aside the ratios to get real conditions.

Baby guns roar along a 100-foot front, duplicating at each shot on toy houses and barns, the actual fire of French seventy-fives. These guns are nothing more than sawed off .22-caliber rifles that spit out small steel bearing balls, but their accuracy is deadly.

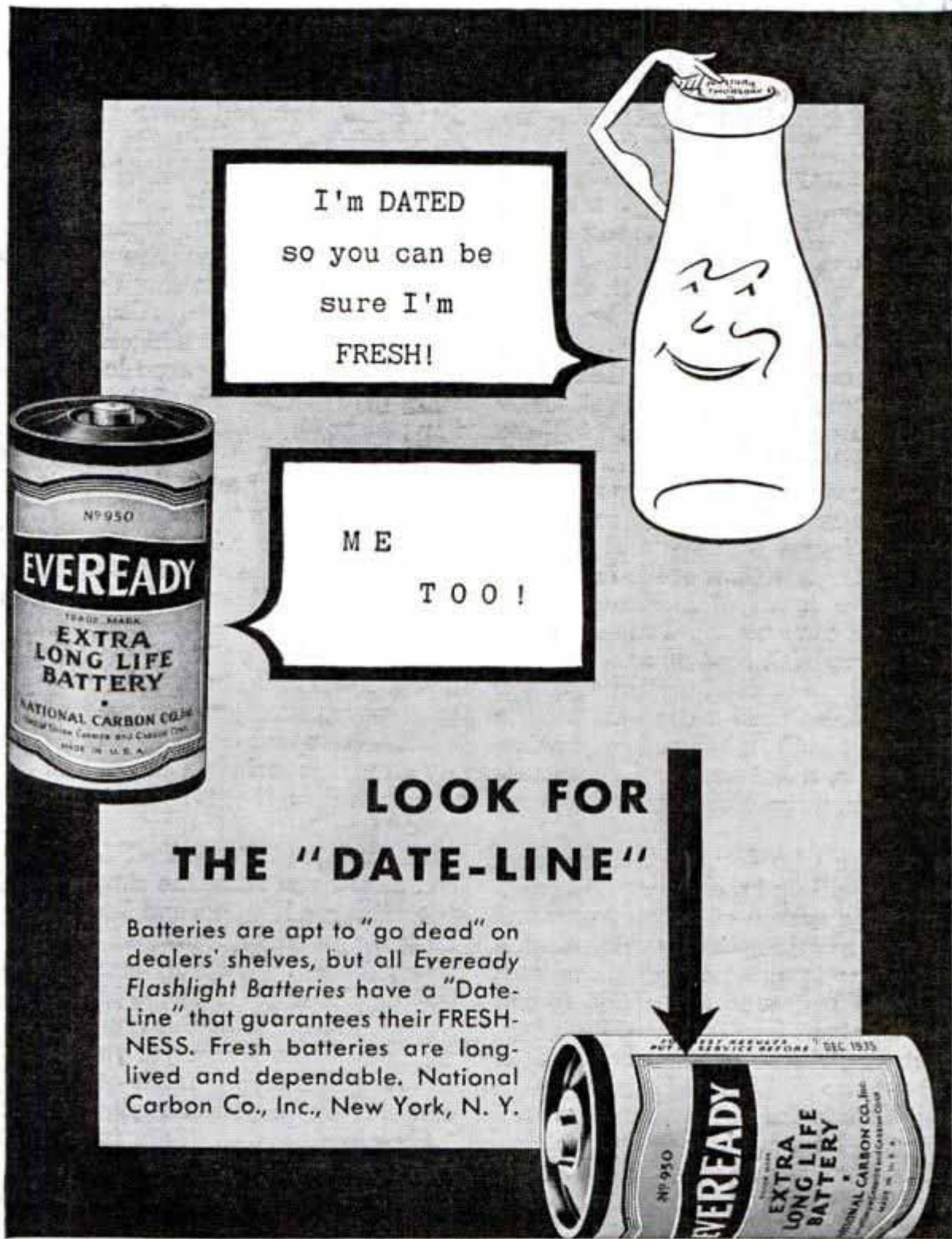
Toy planes are used by the air corps to teach formation flying. These are scarcely more than two inches long and through their grouping the training pilot learns his lesson of tactical formation flying. Pistol practice for the cavalry is aided by stringing up on a long wire painted cardboards of half men. The cavalrymen charge firing at their cardboard enemies.

The purpose of all this toy warfare is to avoid the expenditure of great sums of money in actual field conditions. This does not mean that actual field conditions are eliminated from army war practice, only that a large portion of the necessary training is accomplished indoors before actual field conditions are undertaken.

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What the Up-to-Date Camper Knows

(Continued from page 255)

in this tent or carry lightweight folding tables and collapsible chairs.

Here is the way to carry and index food supplies. First, get acquainted with the waterproof food bags found in most sporting goods stores. They are made of durable material with cords to tie at the top. These are ideal for carrying sugar, salt, rice, and other dry foodstuffs. Mark the side of each one with indelible ink or tie a tag on the sack. When you want something it is easy to find. In addition to these sacks, use friction top food tins. These are round, waterproof and of various sizes. By using the sacks and the metal containers the camper has a sanitary and efficient method of carrying most of his foodstuffs.

The camper needs a small tool kit to make himself comfortable. I usually carry a coil of heavy sash cord or one-quarter-inch rope. Rope or cord always comes in handy. You also need a good ax, a large belt or pocket knife, a ball of heavy twine, a small spade, a hammer and an assortment of nails, a spool of wire and a small saw.

The camper who does his cooking over a wood fire will find a camp crane handy. It is merely a system of hanging pots and kettles over a cooking fire by using natural woods. Here is the way to make one. Drive into the ground two thick, forked sticks each about four feet long and about five feet apart. Across these lay a green pole about two and one-half inches in diameter. This is the support for the cooking utensils. Now cut four or five crotched branches from small trees. These should be of different lengths. Notch each one of them near the small end. Turn the crotches upside down and hang them on the horizontal pole and you're ready to put the pots and kettles over the fire. If you want to boil potatoes quickly, use a long hook to place the pot close to the fire. If you want a pot to simmer slowly, use a short stick which will hold it well above the flames.

I find a small table next to the cooking fire is indispensable. Also a utensil rack. For the table take four fairly heavy sticks with Y-shaped forks at the top and drive them into the ground. Lay short green sticks across the Y's, a few more across

this framework and cover with slabs of cedar bark. A neater table can be made by eliminating the Y-shaped supports and nailing the framework.

In a more or less permanent camp a washstand is a convenience and it can be made quickly by following the method of constructing the table. Also, it's a good idea to rig up clothes hangers in the tent. In a wall tent I string cord loops from the ridge pole at the back of the tent. Here I hang socks and other clothing. If there is no floor cloth I drive two forked sticks into the ground beside the bed and lay a small pole across these.

It also pays to take along a little first-aid kit. The list may include zinc oxide, tape, gauze, an ointment for burns, an antiseptic for cuts or minor wounds, an ointment for stings or bites, mosquito dope, and a few drugs for simple ailments. In poison-ivy country I carry alcohol to swab the infection and ordinary ferric chloride. By all means include a can of anti-fly and mosquito dope that is sprayed into the air to kill insects.

The range of equipment for lighting a camp may run from the simple candle to powerful gas lanterns and flashlights. The lanterns require little liquid fuel and give a bright light. However, there is need for a flashlight and it is a good idea to carry a few candles. One of the crudest yet most efficient candle holders, if you do not use the lowly tin can, is made out of a green branch. Cut a young sapling about two inches in diameter. Trim it so that one end is pointed and then cut it to a length of two or two and one-half feet. Drive it in the ground. Then gash the top with your clasp knife or ax. Cut a piece of birch bark or take a piece of heavy paper, loop it and wedge it into the stick. This will act as a vise to hold the bark or paper, which in turn pinches the candle.

By utilizing these and similar tricks, life in the open can be a lot of fun.

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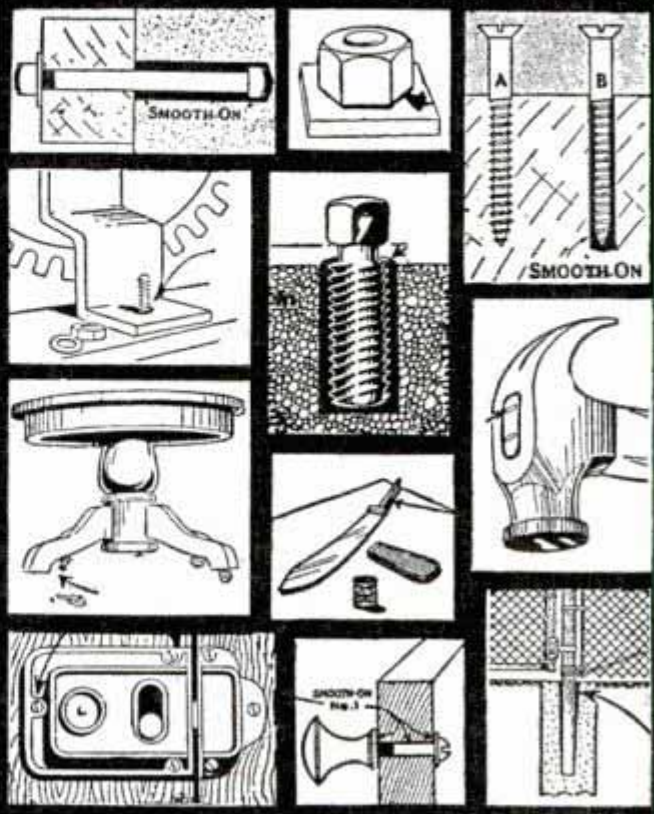
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E 370

Impromptu Magic

(Continued from page 244)

omatic. It can be done so rapidly no observer will guess how to duplicate it.

The next trick is one of the most perplexing of all impromptu feats. Best of all, it takes virtually no skill whatever. Two bills are required, of different denominations, perhaps a five and a one. Place the five-dollar bill on the table, laying it so it points leftward, at an angle of forty-five degrees. Lay the one-dollar bill upon the five, but point the one-dollar bill to the right, its inner end covering the inner end of the five. The two bills form a letter "V." Lay stress upon the fact that the one overlaps the five.

Starting from the point of the "V," bend in the corners of both bills. Slowly, begin to roll the bills into a tight cylinder, moving toward the points of the "V." This proves more than ever that the one is topping the five. When the rolling is half completed, ask someone to place his forefinger upon the one-dollar bill, then roll the bills an inch further. With the spectator still pressing the one-dollar note, slowly unroll the bills. The one no longer covers the five. Instead, the five is over the one!

The trick is accomplished when the bills are almost fully rolled. At that point, while the spectator is pressing the visible corner of the one, cover the rolled five with your left hand. With a slight sliding motion of your left fingers, push the upper layer of the five-dollar bill away from you, drawing the corner around with it. By this maneuver, you actually unroll the five-spot to the extent of a single turn, while the one-dollar bill is motionless. The movement is slow and deliberate, fully hidden by the left hand. But when the bills are unrolled together, the impossible has been accomplished. The five-dollar bill will overlap the one-dollar bill. This trick is surprising even to the person who tries it for the first time.

Divination tricks are a welcome branch of impromptu magic, and here is one that has puzzled even the magicians. You need several packs of paper matches. Open each pack to show that the number of matches varies in each one. Closing each pack, toss it on the table, until you have half a dozen or more. All the packs should be different in printing, so there are no duplicates.

Turning your back, ask a spectator to choose any pack, open it and remove a single match; then close the pack and replace it with the others. The spectator may mix the packs about on the table. You undertake to guess the pack from which the match was taken, without opening any of them. Lift the packs one by one, holding each to your forehead. After gaining this psychic impression, push aside all the packs except one. This is the one from which the match was removed.

The success of this trick is assured almost at the outset. As you lay each pack on the table, press the flap firmly with your thumb, jamming it tightly shut. You will be surprised how firmly these flaps can be wedged into place. Keep your thumb toward yourself, so no one will notice the simple action. When a spectator opens a pack, he necessarily loosens the jammed flap. In closing the pack, he will never press it as tightly as the others. When you hold each pack to your forehead, simply pull the flap a trifle.

Only one flap will "give" to this light pressure. The yielding flap tells you that you have come to the pack which the spectator opened. Occasionally, a pack is too old and flabby to press tightly. When this occurs, simply toss the pack aside, stating you already have enough for the trick. You can also use eight or nine packs, all of the same type. In this case, the spectators open and remove matches from a certain number of the packs. Your task is to tell how many packs were thus chosen.

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Transferring a photograph to a document so permanently that it cannot be removed without damaging the paper is possible by a secret process developed in Germany. The principle calls for making a small part of the document sensitive to light, then transferring the photo to the document from the negative by using heat and mechanical pressure. The process is one means of protecting letters of credit, or similar documents, from loss of the photograph, which usually is attached with mucilage or metal clips.

Report from Consul.
H. K. Ramsay

News 5/10/35
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The economy of good oil is even more apparent today than heretofore, because the wearing surfaces of the new motors have been fitted much more closely together and require a lighter oil to reach these confined spaces. And this light oil is subjected to greater *punishment* than ever before. As a result—the lighter the oil is, *the better it must be*.

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BE YOUR OWN WEATHER MAN

(Continued from page 228)

traveling straight toward your district, or passing to the north or south, east or west of it. And, of course, the path of the pressure area in relation to your particular district makes a big difference in the weather you are going to get because the winds are flowing in exactly opposite directions on opposite sides of the high or low center. Whereas one side might whirl warm air from the south in your direction as the wind spun counter-clockwise around a low, you would be likely to get wind from another direction—perhaps cold or otherwise quite different—if the center passed on the other side of you.

And that is where requirement number one comes in. You need a good pair of eyes.

A barometer will tell you what kind of a pressure area is over your vicinity and frequent readings—once every two hours is often enough, unless a hurricane is coming and the pressure areas are moving extremely fast—will keep you informed of the intensity of it. But you need to know the direction of the wind to tell the direction the pressure area is moving.

In the country, that is simple enough. With no obstructions such as tall buildings and canyon streets to break up the sweep of the air, a weather vane or smoke from a chimney is generally pretty accurate. In the city these cannot be depended upon, and you will have to take an occasional peep at the clouds and note which way they are drifting.

If your barometer tells you that the pressure is steadily falling—that a low is approaching, in other words—your general knowledge of lows informs you that the winds are flowing around it in a direction against the hands of a clock, and turning in toward the center.

Your eyes, fixed on the clouds, or smoke, or a weather vane outside your own little "weather bureau" tell you that the wind is blowing from, let us say, the northeast.

Figuring that it is blowing in toward the center of the low, that would mean that the storm is approaching you from the southwest. And it is a weather rule that its center will pass to the south of you within twelve to twenty-four hours with the wind shifting to the northwest by way of north.

(Concluded next month)

FORTRESS OF KNOWLEDGE

(Continued from page 238)

The constitution was on public view at the state department for some time after 1877, but for the last decade both documents have rested in a marble shrine in the library of congress. There they are protected against damage by air and light. To prevent their disintegrating both are covered with crepeline, a translucent silk material used to preserve papers.

Experts of the government printing office are skilled in repairing rare old documents. In recent years they have been detailed to the library of congress and the state department and have saved manuscripts valued at hundreds of thousands of dollars. They will carry on their work in the new Archives building.

The library of congress, with its airtight, fire and burglar proof vaults, also will continue to be the storehouse for highly valuable records. Wear and tear caused by handling books and manuscripts is a special problem and the library has its own binding department. There utilitarian buckram supplants morocco and calf bindings. It is contended it will outlast acid-tanned leather, and will even wear longer than the old, hand-prepared acid-free leathers. Investigations have shown that mineral acids, now used extensively in place of oak and sumac in tanning, cause bindings to decay. Acid-free leather is still used, but only for rare books.

Many of the world's most priceless records are preserved by the library of congress. Protected from the deteriorating effects of nature is the famous Gutenberg bible, one of the only three complete copies in vellum, worth more than \$1,500,000, and in virtually as good condition as when it came from the press in 1445. There is also the Chinese encyclopedia antedating the Gutenberg bible by 1,000 years.

This rare material, worth the ransom of a dozen kings, is housed in a veritable fortress of steel and concrete. Few banks or storehouses have a vault one half as strong. There the valuable treasures are offered the best scientific protection possible. The destructive forces of heat, cold, smoke, dust and dampness are completely shut out, as well as human enemies. Besides holding valuable records, the Archives building is to be a storehouse for a great collection of movie and sound films.

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LUCKY TIGER

PAINTING YOUR GARDEN

(Continued from page 183)

Very short plants can be lighted by small reflectors tilted so the light catches the tops of the blossoms. Short-stemmed flowers are best lighted with border sets of shields and Christmas-tree strings.

Small floodlights equipped with spikes for pushing into the ground, or with brackets for mounting in trees, can be used for illuminating rock gardens and flower beds. To avoid flatness, more than one unit should be used, the lights being arranged so their rays come from different angles. The floodlight is more useful for bringing out the background of the garden. Without it, garden illumination is likely to be too harsh. Special bird baths and other pieces of garden equipment can be built so a lighting system is incorporated, and placed so light will be directed on near-by flower beds. Usually small floodlights are concealed in the structure.

Trees, frequently a single tree, can give a lighted garden the necessary background. Simply take two or three floodlights into the yard, and experiment until you get the best effect.

Don't try to simulate daylight effects and don't light a tree from one direction only. It may look flat and uninteresting. Don't try to use colored lighting; it is likely to become bizarre. If you use color, pale green is the safest, but you can use blue to imitate moonlight.

For tree lighting, two floodlight units are available. One uses a 100-watt lamp, and the other a forty-watt. Try placing a reflector high in the branches, where it will illuminate a single branch and cast its shadow on the ground.

Garden paths and steps should be illuminated for safety and to add to the beauty of the lighting scheme. A light rock can be placed at the top and tilted downward at such an angle that its rays will not shine into the eyes of persons going up. The small reflector on a spike is useful also for lighting walks and paths. Light-colored gravel or other material for walks helps from an illumination standpoint.

Hedges and flowering borders form boundary lines that tie the whole composition together when properly lighted. Furthermore, the lighting of a border keeps strolling feet on the walks where they be-

(Continued to page 130A)

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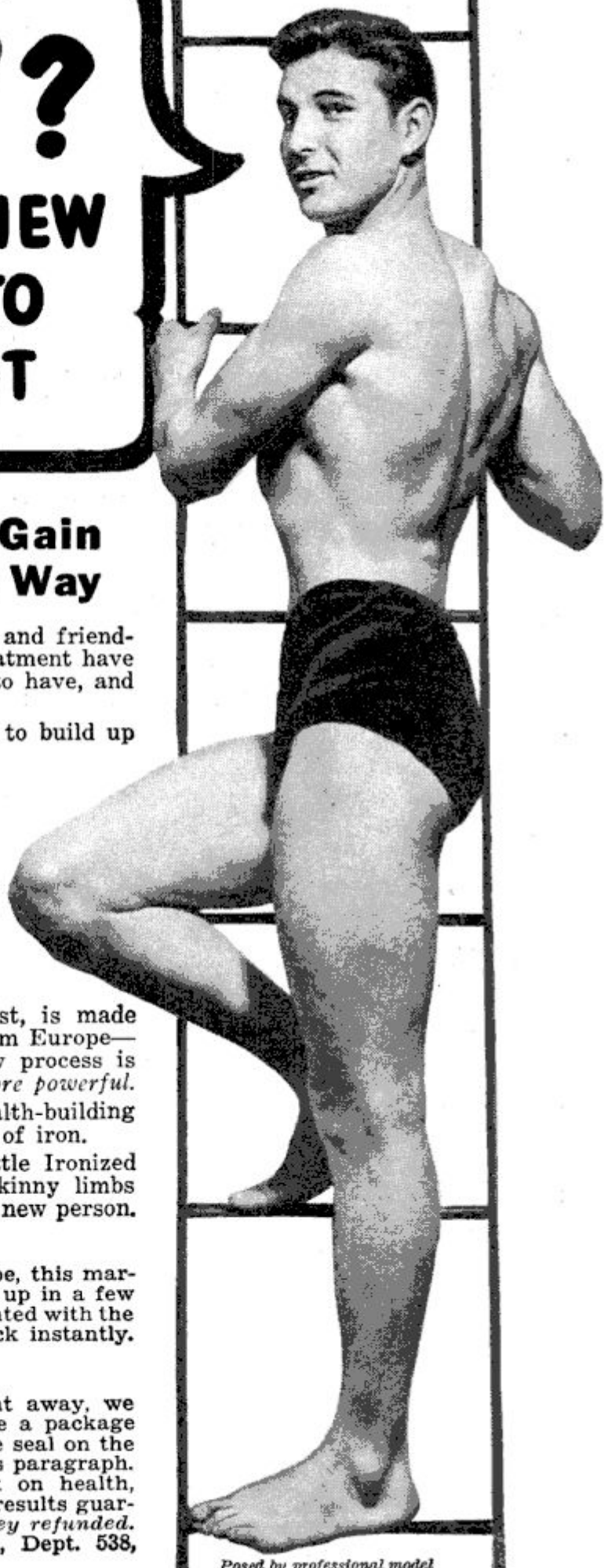
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WHAT'S NEW IN THE MOVIES

(Continued from Coloroto Section)

least distortion, Miss Moore's songs were put on wax and at the same time a reverberation or "distance" record was made on variable-density film. A variable-density film also carried the dialogue while a third and fourth reel of the same type carried the effects, such as footsteps.

In the variable-density system, recorded sound can be increased or decreased in volume by printing the film dark or light, so any sound can be stepped up or cut down as desired. So the various sound tracks were put into dubbing machines and "piped" to a mixing table, several dubbing machines and one hill and dale reproducer being connected to the table through dial controls. By manipulating the dials, any part of any sound track can be mixed into the one output, and so recorded on the single film.

Watching the picture the sound engineer mixed his various sound tracks while other sound men listened and made notes for later changes. When Miss Moore sang with a chorus, one sound track carried the best recording of the chorus, another the best recording of the orchestra, a third the reverberation and three others the sound effects. Frequently the machine was stopped and changed from variable density to variable area where it was desired to alter the strength of the tone range.

When the hill and dale wax recording of Miss Moore's voice was turned on, the sound from it blended with the sounds from the six film tracks. The combined result was recorded on a single film. This single film later was reprinted to correct volume and some was recorded again to correct other faults. In the end the single film included the result of all the types of recording, plus third dimension or depth.

The "shadow box" also was first used in this picture. It looks like an old-fashioned square loud speaker. A microphone in the small end picks up only the sounds directly in front of it. By using three such boxes it is possible to separate each component part of a duet with an orchestra, registering the soprano on one microphone and sound track, the tenor on another and the orchestra on a third, while an open microphone hung within range of all records the reverberation track.

(Concluded next month)

8 538

PAINTING YOUR GARDEN

(Continued from page 128A)

long. One convenient way is to use Christmas-tree strings and the small shields. Another way of lighting a row of flowers placed along a fence or in front of a house is to illuminate the wall with small reflectors on spikes, placed at intervals and concealed from direct view by foliage. The wall, if it is light in color, will reflect enough light to illuminate the border.

A single illuminated lily pad with a sixty-watt lamp, will illuminate a pool from six to ten feet in diameter. Colored bulbs, while reducing light intensity, lend charm. Goldfish in the pool produce a constantly moving underwater picture. A statue near the edge of a pool can be made attractive by a forty-watt lamp placed behind it, where the light will illuminate near-by plants and throw the statue into relief. The lamp is housed in a small reflector. Reflectors concealed at the edge of a pool accentuate fountains or near-by shrubbery.

A garden party calls for a carnival atmosphere. Illumination can be stepped up by employing larger lamps or more of them. Conventional Japanese lanterns can be supplemented by lighted rubber balloons. To make a balloon cluster, obtain a Christmas-tree string fitted with clear bulbs. Blow up the balloons, dip the bulbs into water, and insert them into the balloons until the sockets are well inside, where heat will not break the rubber.

Another effective stunt for parties is outlining garden trellises with rows of lamps. Tubular bulbs are suitable for this. Interesting silhouette effects can be obtained by stretching a sheet of muslin over porch lattice and placing lamps behind it. Trailing vines add to their effectiveness.

Lighted pylons, pillar-like structures having translucent sides, also are suitable for garden decoration. Temporary pylons are made by covering a light wood frame with muslin, and installing lamps inside. For permanent installation, use an upright piece of plywood, about fourteen by forty-eight inches, painted white. Cut-out ornaments on the front of this panel serve as shields behind which are fastened colored lamps. The back of the panel can carry small reflectors holding forty-watt inside frosted lamps, which illuminate plants or other objects behind the pylon.



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E 397

BATTLING SEA MONSTERS

(Continued from page 223)

when they aren't biting on regular baits and lures. Sometimes I scare them on my dive but the shining points of the spear attract their attention and back they come for a closer look. A jab through the head or the front part of the body usually kills a fish at once.

Recently I speared a seven-foot shark sluggishly churning through some kelp. I struck it right behind the dorsal fin and the jab killed it. But the safest rule is to regard any large fish as dangerous because if it decides to take a bite of you, you won't have much chance. While swimming on the surface once I noticed the fin of a large shark bearing down on me and I struck out for the boat as fast as I could. I haven't any doubt that it would have eaten me because the twelve-foot monster was so hungry it chewed up every bait and hook we set for it until it was finally caught.

I have watched giant lobsters five and six feet long peering out of their caves in the rocks on the bottom. I laid hold of one heavy "bug" one time and after a fierce tug of war dragged it to the top to measure. It was too big to hoist into the skiff and I swam to the beach towing it by a feeler. On the way it chewed a hole in my wrist, not with its pincers, but with a pair of wide teeth at the entrance to its mouth. Straightened out, it measured sixty-three inches, and weighed twenty-three pounds.

One of my worst scares came when diving in murky water. Just before reaching bottom I saw the shadowy wings of a giant sting ray waving right below me. Sting rays carry poisonous barbs in their tails and a jab might easily cause death. I rose to the surface at once. Another dangerous fish is the sluggish and evil-looking mottled sculpin that lays among the rocks. Its spines and jagged fins seem to be coated with poison. Some varieties of jellyfish that are almost transparent in the water are also troublesome and I have received painful burns from brushing against them.

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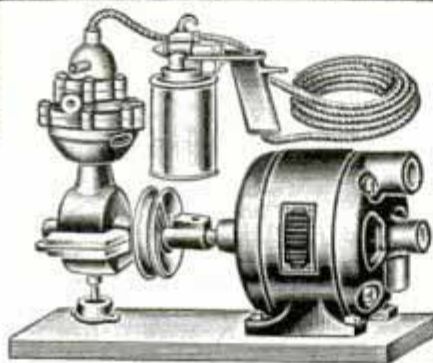
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SUPERCHARGED AIRPLANE CABINS

8343 (Continued from page 234)

supercharging a cabin will require comparatively little power. Passengers in supercharged cabins will care little how fast they come down, since the pressure on their bodies will remain relatively constant. When the Italian pilot Renato Donati made his last record altitude flight, he bound his body in tape to equalize pressure. Wiley Post flies at high altitudes in a supercharged suit.

"Stratosphere flying is certainly coming," said Mr. Bassett, "but we can't take it all in one step. The first transport operations were between sea level and 2,000 feet; at present they are between 10,000 and 15,000 feet. Our next step will probably be between 20,000 and 25,000 feet. The public still thinks of transports in terms of tri-motors. But they are obsolete. We still have single-engine planes, but the large ships have power plants in even numbers, two, four, and six."

Some engineers believe that for flying above 30,000 feet the internal-combustion engine may be displaced by steam-power plants. The great advantage of steam is that the engine's power remains practically constant with increase in altitude. Of course, at sea-level pressures, the steam plant weighs far too much per horsepower for efficient operation. Engineers believe that weight can be reduced to five pounds per horsepower as compared with one and two-tenths pounds per horsepower for the internal-combustion engine. But considering its retention of power, the steam engine, in high altitudes, has a lower weight-per-horsepower ratio than the gasoline engine. The refinement of Diesels may also be of considerable value to stratosphere flying. The loss in power with Diesels at high altitudes is considerably less than with spark-ignition engines.

At present about thirty per cent of scheduled flights are flown with blind instruments, but these instruments will be necessary about seventy per cent of the time above 20,000 feet. Combining radio and blind-flying instruments, the pilot can land with zero visibility. Transport operators and government officials have worked out a procedure for blind flying, and equipment is being installed to enable transport pilots to fly blind in practically any section of the United States.

TRAINING CANARY BIRDS

(Continued from page 218) *8421*

ride on a wind-up toy motor car, you must remember the bird knows nothing of the mechanism or its purpose. Consequently, it should be permitted to become acclimated on the car's perch before the toy is set in motion. The bird will fly off several times before it gets the idea of the stunt. The same will be true when the car starts moving around the circle but by the same method the whole routine can be mastered. Similar methods should be followed in teaching canaries to ride on vest-pocket merry-go-rounds, seesaw, walk tight rope, and other simple feats.

The most difficult trick ever taught a canary was the somersault. This was done by Mr. Fogg a few years ago.

"The secret," he relates, "was that I slapped my hand just before the bird started the turn. The stunt first was practiced on a pillow and I would smack the table with one hand and help the bird over with the other. After repeating the trick for several months, the bird began to turn the somersault without any aid as soon as it heard the cue.

"Canaries can be taught only one trick at a time. And they have all the temperament of stage and operatic stars. There's no art in teaching a bird tricks. Just be sure it understands what's expected of it and the rest is mechanical. The trick should be repeated until it becomes second nature to the bird. Canaries are like horses and mules—it's patience and kindness that train them."

Birds can be taught to whistle regular tunes, too, Mr. Fogg says. Birds trained by amateurs can sing a whole verse and chorus without missing a single note or slipping off key. The best results are obtained from stock bred for this purpose. The young bird should be placed in darkened quarters where it can give its undivided attention to the song the trainer is whistling. The bird will learn the song, note by note, provided it hears it a sufficient number of times. Special phonograph records are now being issued to expedite this tedious method.

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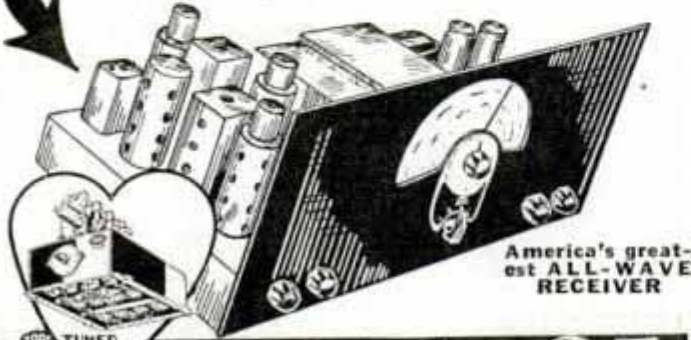
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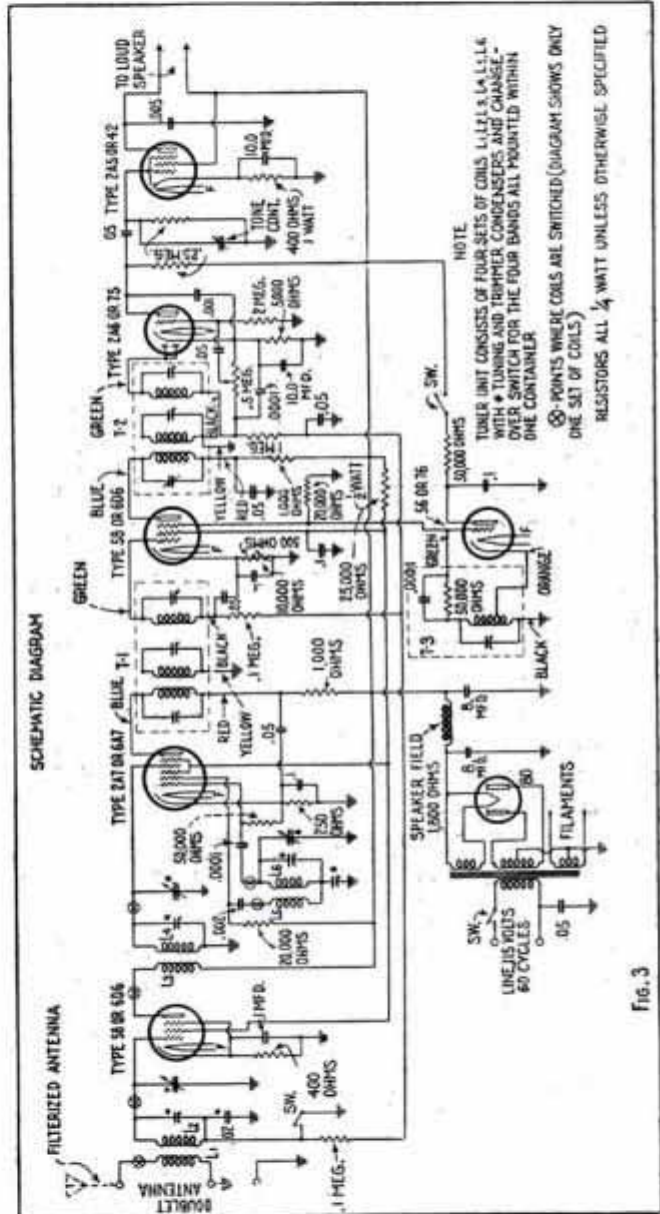
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(Continued from page 263)

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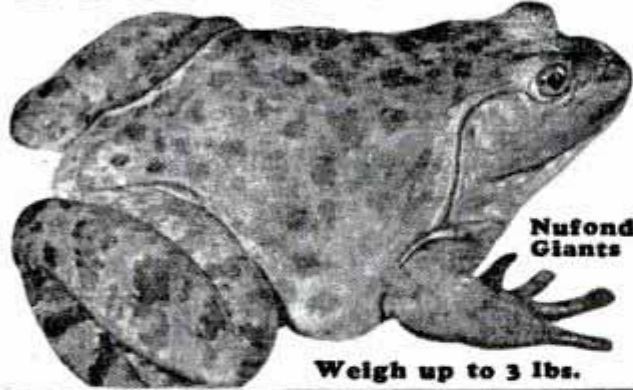


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(Continued to page 138A)

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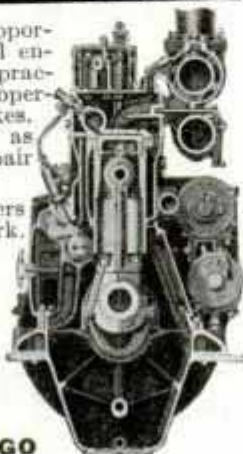
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ALL-WAVE TUNER UNIT

(Continued from page 136A)

plug which is inserted in a socket mounted in the rear of the metal chassis. This base is 10¼ in. deep, 17¼ in. long and 2¼ in. high. All mounting holes are drilled and a cutout section for the tuner unit is provided. The drilled metal front panel, which has a black crackled finish, is ⅛ in. thick, 9¼ in. high and 17⅜ in. long. An inexpensive metal cabinet, finished in the same manner, is available for the usual table installation. In this case, the speaker may be mounted on a baffleboard or in a separate speaker cabinet. Both methods of housing the receiver are illustrated in the photos at the head of the article.

Five diagram sheets and a construction booklet are supplied with the kit. Owing to lack of space only one of these progressive layout diagrams and the schematic circuit diagram are shown in this article. Further information regarding the Brown-ing 35 receiver and a complete list of parts are available from Popular Mechanics radio department upon application without charge.

A straight conventional antenna system may be used, or the doublet is preferred in noisy localities. The Tobe type-34 antenna is employed by the writer as it is a high impedance variety designed to work with this receiver and may be used either as a doublet or straight installation.

A few suggestions on tuning the Brown-ing 35 all-wave receiver may be pertinent at this time. Let us first consider the broadcast band. The receiver is extremely sensitive on this band and may be operated with good satisfaction on a short antenna except when trying for very distant stations. In tuning for short-wave stations, either American or foreign, the positions of which are marked on the dial, it is necessary to turn even the micro-vernier adjustment knob slowly, otherwise the stations will be passed by. In the case of tuning on the two short-wave bands, Nos. 1 and 2, it is well to use the auxiliary volume control with the 10,000-ohm variable resistance, as it will usually give sufficient control of signals with a minimum of background noise. Do not expect to get short-wave stations at frequencies higher than 10 megacycles at night. However, stations operating on these high frequencies come in very well in the daytime.

THEY CALL YOU ANY PLACE

(Continued from page 199)

new type of telephone cable which will function even when torn from its poles, recently has been developed. This cable also makes possible fewer telephone wires, as a cable three inches in diameter is taking the place of eight or ten pole lines.

Sometimes sleuthing in which life and death are involved is done by the telephone operator. A mother, after having a prescription compounded for her baby in an upstate New York pharmacy, started to motor to New York City. After she left the druggist discovered he had mixed a poisonous ingredient by mistake. Through the help of the telephone operator who in turn got in touch with the state police, the mother was intercepted before she gave her baby the medicine.

The operators regard such cases simply as a matter of routine in the more than 2,000,000 long-distance calls made daily.

Last December transpacific radio-telephone service to Japan was inaugurated over a direct circuit from the Bell System's Pacific coast stations. Another transpacific radio-telephone circuit established last year affords direct contact with Java which previously was reached through London and Amsterdam. Only three countries in the world with more than 100,000 telephones each—Russia, China and New Zealand—cannot be reached from the United States.

A new telephone instrument which includes in the base of the telephone itself the bell and other equipment hitherto mounted in a separate box is undergoing service trial. This arrangement has been accomplished as a result of research work which has made it possible to reduce the size and increase the efficiency of the different pieces of apparatus. An entirely new automatic central-office switching system for use in large cities has been developed and a radically new form of transmission cable, adaptable for use either overhead or underground on heavy traffic toll or long-distance routes has reached the stage where a large trial installation is to be made. In this new form the cable is a small and simple structure. It is equipped with many intermediate amplifiers and provides a large number of independent circuits. It also is expected to be suitable for television purposes.



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HOW TO INSTALL A GOOD ANTENNA

(Continued from page 264)

in any location where a clear stretch of from 75 to 100 feet or more is available. The flat top, or horizontal-wire section, of the L should not be less than 35 nor more than 100 ft. long. The length will, of course, depend upon the clear space available. Fig. 1 shows an installation of this description where a tree offered a handy means for supporting the far end of the antenna. In this case some provision must be made to keep the antenna wire taut and at the same time allow for the tree swaying in high winds.

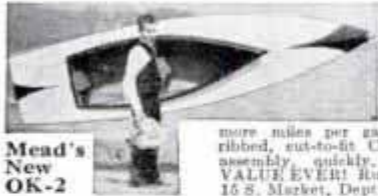
A glass or porcelain insulator is fastened to the end of the antenna wire and a length of rope is run through a small pulley which is secured to a limb of the tree. A weight is then fastened to the free end of the rope. In Fig. 3, a fairly heavy spring replaces the pulley and weight. In Fig. 4, a mast erected on the roof of a garage provides a sturdy support.

Now that we have this part of the installation completed, the next step is to support the insulated building end of the flat top with a rope, or wire, in a position where it is possible to bring the lead-in, or vertical, wire down to the set as directly as possible. In some cases a chimney offers good anchorage, in others it will be necessary to erect a mast of sufficient height to enable the lead-in to clear the building. The flat-top wire portion of the antenna must be kept clear of leaves and branches and as far above the building as possible. The lead-in wire may be a continuation of the flat top if desired. In this case the antenna wire is threaded through the end of the insulator and the down lead is given a turn or two around the horizontal section to fasten it securely. Care should be taken that the lead-in is long enough to reach the entering point and does not touch the building on its way down to the window. If necessary, porcelain stand-off insulators may be fastened to the side of the building to make sure that the lead-in is well insulated throughout its entire length. A good permanent lead-in installation may be made with the manufactured unit illustrated in Fig. 2, and used in Fig. 1. This unit includes an antenna and ground lead, lightning arrester, outlet plate and attachment plug.

(To be continued)

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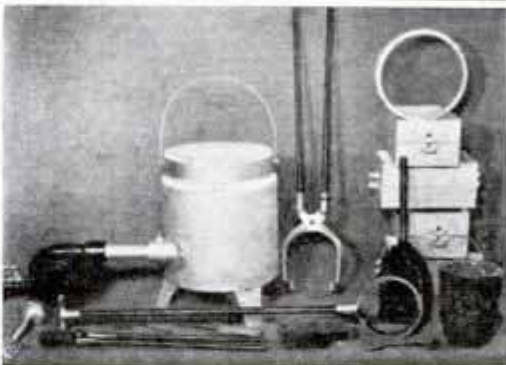
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SCIENCE AND THE DROUGHT

2501 (Continued from page 207)

of water drawn up from the ground below and evaporated into the air above. It takes, for example, 500,000 gallons of water to raise an acre of cabbages.

The ideal solution would be to abolish agriculture and stock raising entirely and substitute more economical and reliable methods. Until about 1890 the raising of the indigo plant was an important industry in the tropics. Indigo now is made from coal tar. Once this dye cost four dollars a pound. It now costs about fifteen cents. Many other products formerly obtained from the vegetable and animal kingdoms, or substitutes for them, are now manufactured by methods of synthetic chemistry.

There are now probably more than 10,000 rain gauges in use in the United States, but their distribution is very uneven and a majority of the records are short. On the other hand, there are only about 100 places where evaporation is regularly measured, although this is almost as important a factor in drought as rain itself.

Though the farmer is now the principal sufferer in a drought, it also has disastrous effects on municipal water supplies, inland navigation, power production and many other interests. If it lasts so long that the soil water is greatly depleted, the natural vegetation dies and the top soil blows away in dust storms. To many meteorologists, long-range forecasting of droughts does not seem so hopeless as it did. There is evidence that the rainfall of many regions tends to increase irregularly for a number of years and then to decrease for a number of years.

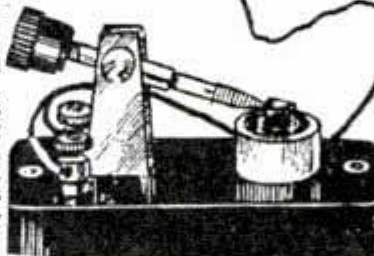
Although these rainfall "trends" are irregular, some believe they involve definite cycles, masked by being variously combined with one another, but capable of being detected by mathematical analysis. A vast amount of labor has been devoted to the search for cycles in rainfall and other weather elements, but the results have been disappointing as applied to long-range forecasting.

A more promising method of forecasting the general character of coming seasons is founded upon the discovery of numerous more or less close relationships between weather phenomena occurring, with fairly long intervals between them, in different portions of the world.

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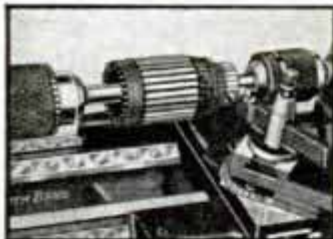
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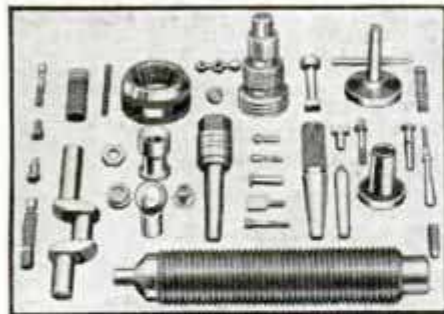
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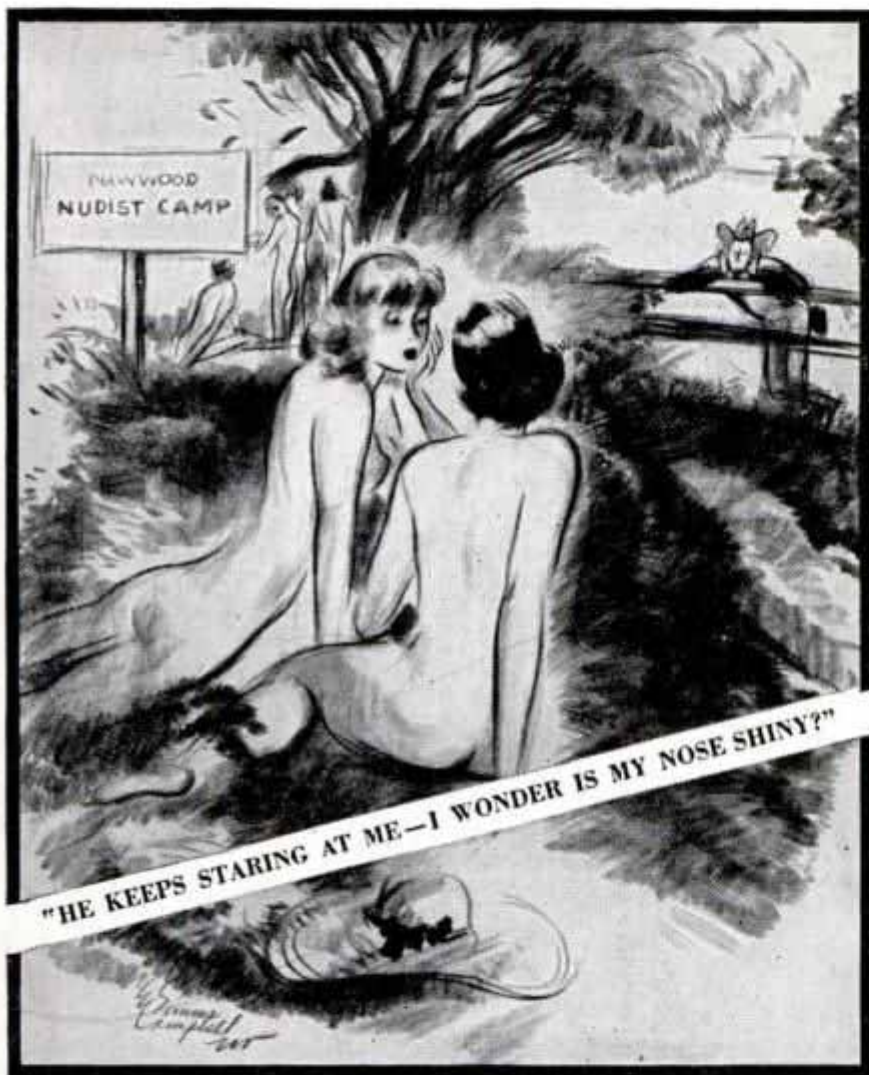


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was not much fun
When 'twas my sole
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But now I smoke
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