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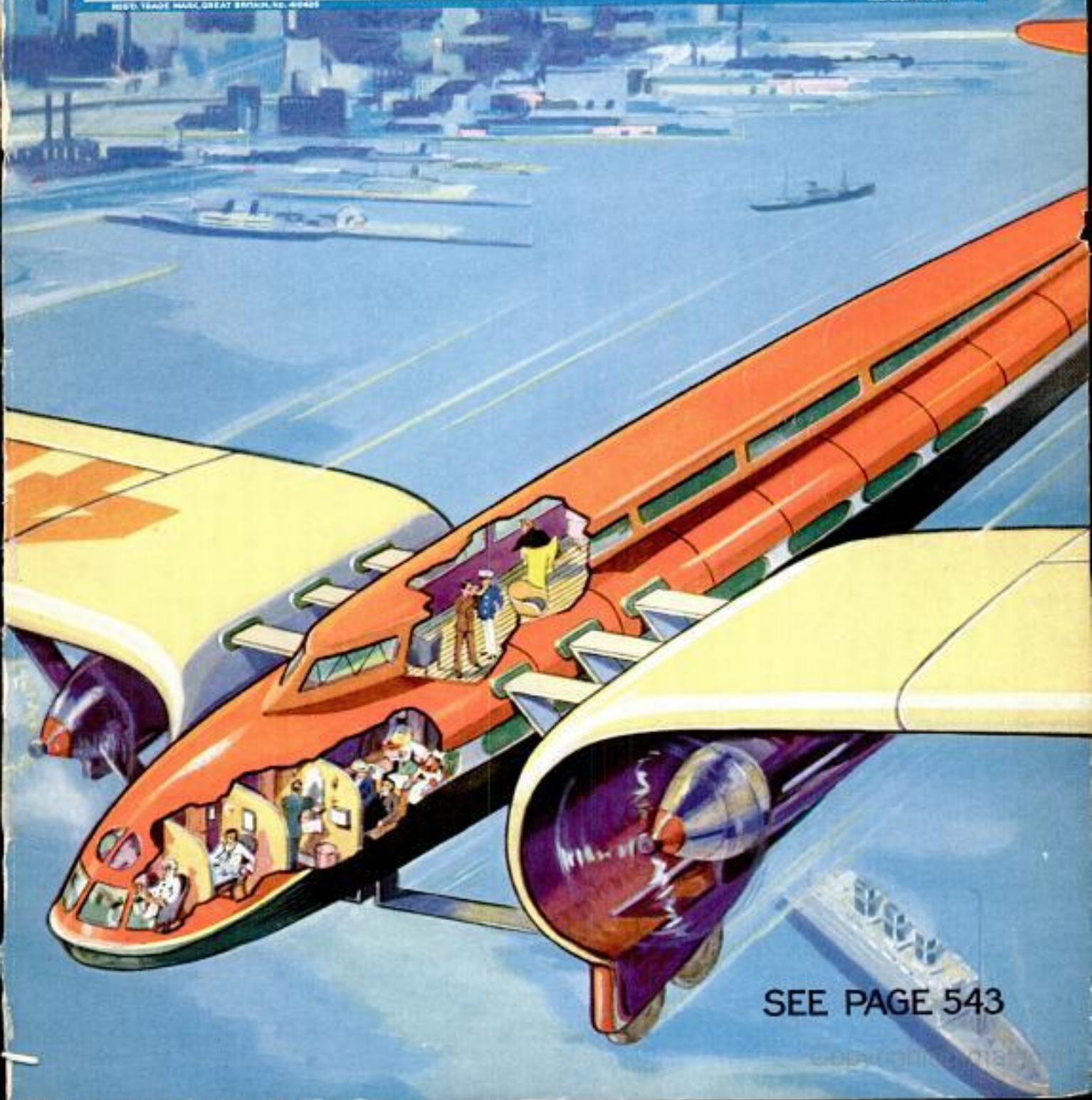
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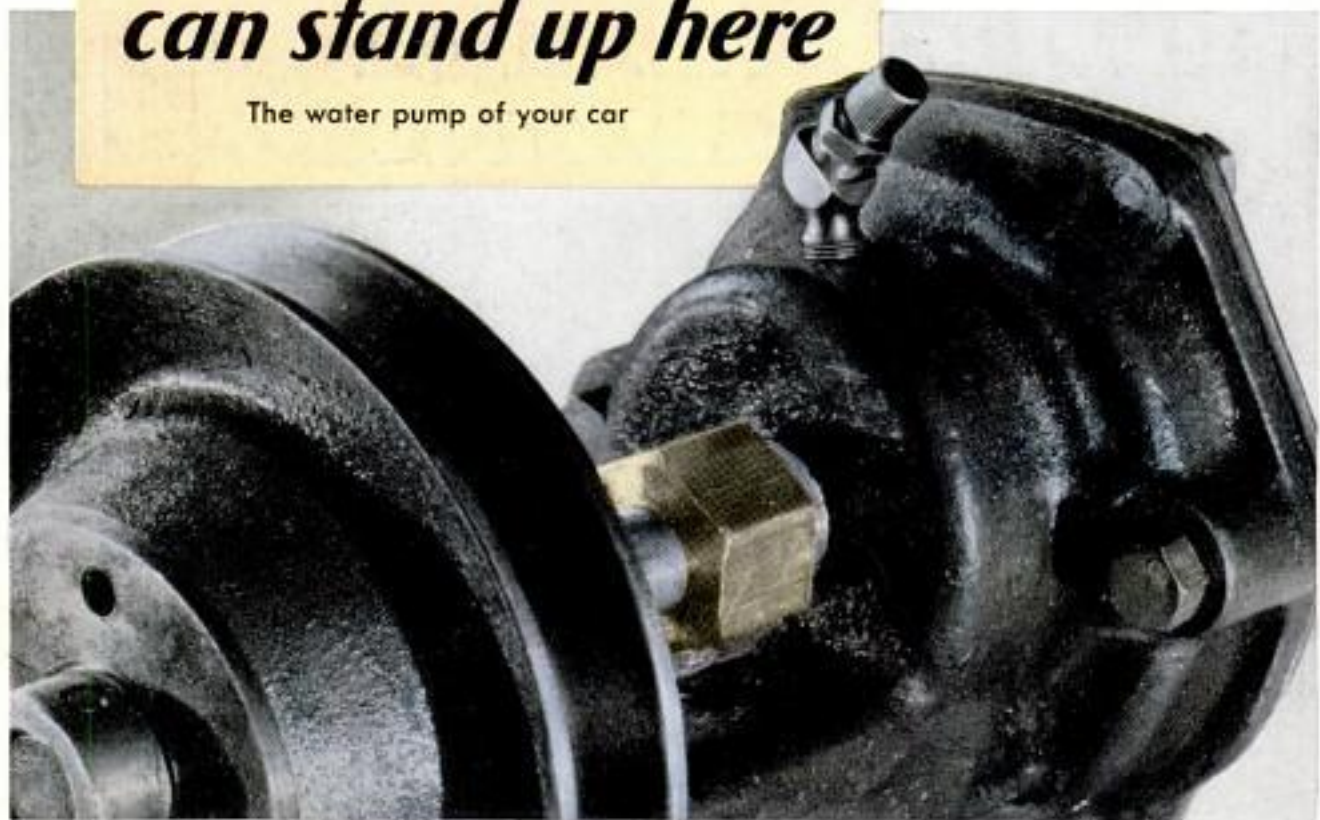
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SEE PAGE 543

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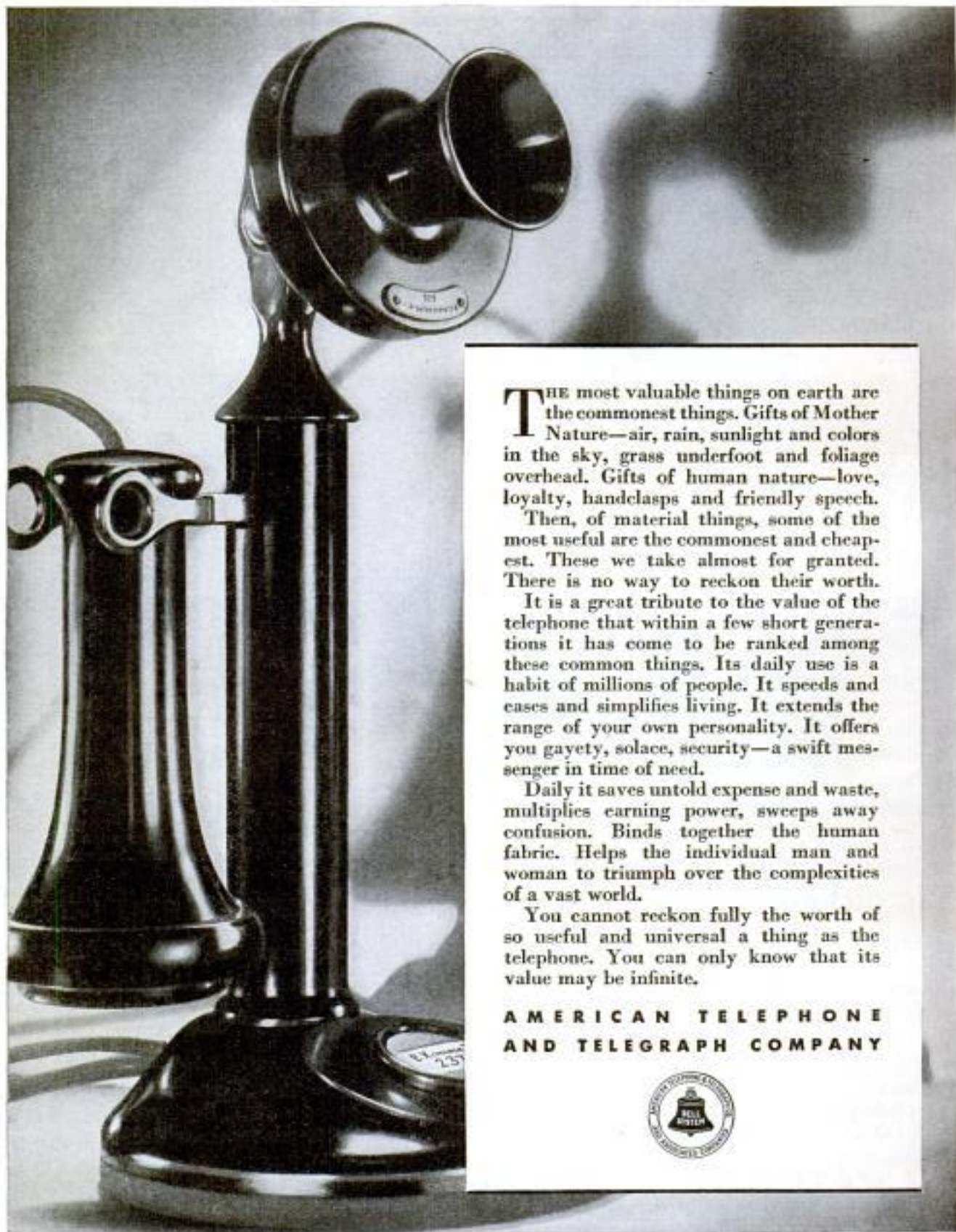
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Vol. 59

April, 1933

No. 4

Special Features

<u>Can You Better Your Luck?</u>	<u>514</u>
<u>Docking an Air Liner by Radio</u>	<u>521</u>
<u>The Riddle of Mars</u>	<u>548</u>
<u>What to Look For in Buying a Boat</u>	<u>563</u>
<u>Can We Change the Weather?</u>	<u>570</u>
<u>Back to Babylon</u>	<u>579</u>
<u>The Latest Movie Magic</u>	<u>586</u>

<u>Air Conditioner—resembles radiator</u>	<u>589</u>	<u>Fire Fighting—hose throws mistlike spray</u>	<u>562</u>
<u>Airplanes</u>		<u>Fish and Fishing—bat band fly book</u>	<u>574</u>
<u>dive bombing at targets for accuracy</u>	<u>561</u>	<u>Football—electrical game</u>	<u>547</u>
<u>glycol compound used to heat cabins</u>	<u>518</u>	<u>Fuel—garbage turned into</u>	<u>595</u>
<u>Automobiles</u>		<u>Furniture—chair collapses when spring is pulled</u>	<u>583</u>
<u>lock to stop theft of fuel</u>	<u>519</u>	<u>Garage—saw in half to double size</u>	<u>590</u>
<u>most out of repair and dangerous</u>	<u>524</u>	<u>Garages—staggered save turning</u>	<u>569</u>
<u>testing lubricants for</u>	<u>518</u>	<u>Gold</u>	
<u>Automobiles, Design—streamlining, fuel saved by</u>	<u>534</u>	<u>floating aids recovery</u>	<u>577</u>
<u>Automobiles, Driving</u>		<u>magnets help find buried</u>	<u>591</u>
<u>reflectors in curb help in fog</u>	<u>598</u>	<u>veins hunted with electrical devices</u>	<u>599</u>
<u>skidding avoided by reducing speed</u>	<u>528</u>	<u>Grain—storage system reduces losses</u>	<u>568</u>
<u>Automobiles, Fuel</u>		<u>Grain Elevator—eighty-foot, hauled forty miles</u>	<u>585</u>
<u>bottled gas</u>	<u>592</u>	<u>Greenhouse—midget for home</u>	<u>523</u>
<u>coal gas made as car runs</u>	<u>525</u>	<u>Highways</u>	
<u>Automobiles, Lubrication—signal on dash, warns of</u>		<u>banked curves for safer driving</u>	<u>547</u>
<u>oil pressure</u>	<u>589</u>	<u>rock spreader, two-man</u>	<u>543</u>
<u>Automobiles, Tires—underinflated, warn by buzzer</u>	<u>578</u>	<u>Household Devices</u>	
<u>Battery—terminal, non-corrosive</u>	<u>523</u>	<u>Humidifier, Electric—air conditioned without ducts</u>	<u>560</u>
<u>Bird Shop—traveling store</u>	<u>577</u>	<u>Jack—trees pushed over by</u>	<u>560</u>
<u>Boats and Boating</u>		<u>Lightning—generator to produce</u>	<u>594</u>
<u>air-propeller driven, for shallow streams</u>	<u>577</u>	<u>Light Rays—treasures and art guarded by invisible</u>	<u>556</u>
<u>craft shaped like plane wing</u>	<u>573</u>	<u>Locomotives—double-trak wheels on</u>	<u>568</u>
<u>disk slows outboard motor</u>	<u>584</u>	<u>Magic Lantern—throws 15-mile beam</u>	<u>555</u>
<u>rowboat, portable folding</u>	<u>518</u>	<u>Masks, Gas—police learn how to use</u>	<u>599</u>
<u>Building Construction—steel frame incased in brick</u>	<u>584</u>	<u>Metal</u>	
<u>Camera, Aerial—eighty-five-pound, mounting for</u>	<u>545</u>	<u>detector for buried</u>	<u>576</u>
<u>Capitol—fountain floodlighted</u>	<u>524</u>	<u>fluid iron at earth's core</u>	<u>513</u>
<u>Castle—Death Valley Scotty's</u>	<u>526</u>	<u>working on sewing machine</u>	<u>552</u>
<u>Clamp—non-slipping for handling metal plates</u>	<u>520</u>	<u>Microphone—strapped against throat picks up whisper</u>	<u>590</u>
<u>Die—hinged for rethreading</u>	<u>573</u>	<u>Milk—cellulose bottles for</u>	<u>519</u>
<u>Drawings, Colored—blueprints replaced by</u>	<u>520</u>	<u>Mines and Mining—city moved to make room for</u>	<u>582</u>
<u>Electricity</u>		<u>Models</u>	
<u>generating by heat</u>	<u>561</u>	<u>coffee shop, house on truck advertises</u>	<u>547</u>
<u>plug and outlet automatically lock</u>	<u>553</u>	<u>monastery carved with knife</u>	<u>560</u>
<u>Emotions—pneumograph registers</u>	<u>581</u>	<u>Munster cathedral on cart</u>	<u>513</u>
<u>Exploration—"forbidden land," Martin Johnsons to visit</u>	<u>574</u>	<u>Motorcycle—guard protects rider</u>	<u>553</u>

Draw. subrail
outboard 563 [Continued on Page 4]

Living room desk 574

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[Contents—Continued]

Moving Pictures	
dance scene filmed on wheeled platform	559
film, replaces store ledger	552
ship built on stage	573
title writer for home	576
Musical Instruments—radio piano like whole orchestra	568
Organ, Electric—produces music from light	578
Paintings—restoration, ultraviolet ray aids	554
Paints and Painting—concrete floor sealed against moisture	567
Pen, Draftsman's—non-spill tube for filling	593
Photography	
printing on charred paper deciphered by photo	578
thief takes own picture	583
Plants—metal supports for	520
Post Offices—without clerks in English streets	598
Puzzles—answers to	656
Radio	
buzzer set for code practice	604
dancing robot	606
electronic musical instrument	604
practical ideas	603
recorder, portable	606
Radio, Loud Speakers—headlights of car used for	595
Radio, Receivers	
controlled from any room	603
power supply for a.c. short-wave	602
three selective crystal	600
Radio, Tubes	
hints on	606
without filament tested	545
Railroads	
fence, electric, warns against slides	598
freight losses from vibration reduced	562
Razor—electric stropper sharpens	524
Razor, Safety—cuts at an angle	581
Refrigerator—rubber band shows operation of	560
Rubber—"electroplated" wears longer	558
Safety Devices and Measures—"lighthouses" as safety islands	558
Searchlight—air raids made harmless by	559
Shoe—repair shop in shape of	583
Skates—offer ski training	567
Sports—yacht race, timing board	593
Sports, Winter—grandstands in Switzerland heated	525
Statue—Vulcan, given a bath	569
Street Car—perfect sought	546
Teeter Board—doll on and amuses child	595
Temple, Siamese—broken porcelain decorates	528
Tools	
putty knife, scraper and glazing tool in one	558
screwdriver and hammer in one	555
Trap, Mosquito—hums like insect	584
Twine—cut and measured at same time	523
Wall Paper—electric brush removes	592
Window Bars—burglar-proof	562
Glass—emery wheel for finishing edges	610
Glass Tubing—cork jaws hold in vise	625
Gloves—stretcher for drying	630
Gun—rubber band, shoots BB shot	630
Hose, Silk—rubber strip on chair protects	618
Inhaler—paper bag confines volatile vapors	618
Ink—marble in inkwell prevents evaporation of	618
Kites—cellophane as covering for	609
Lathe—auto crankshaft furnishes foot power for	623
Liquid Mixer—bicycle chain used for	610
Lock, Door—loose pin improves	612
Lock, Window—hinge used to make	616
Locks	
hinges make hasps for locking double doors	630
improved lock for garage door	636
Metals	
brass, imitation sand-blast finish on	612
inlaying in celluloid	632
verdigris finish on steel, brass or copper	636
Models—"Sovereign of the Seas"	619
Nutcracker—screw-top cans opened with	632
Oil Heater—gas burner substituted to use gas	625
Paints and Painting	
metal lacquers, making	618
shellac troubles cured	610
Pipe, Hot-Water—insulating board applied to	625
Pipe, Tobacco—siphon breaks in new	612
Pliers—grinding cutting edge on	625
Plaster of Paris—rubber soap tray used to mix	635
Rifle—training for shooting moving objects	635
Room and Museum—boy's own	617
Siphon, Water—automatic cut-off for	623
Sports—spin a rope	626
Stairs—riser extends to hold railing post	636
Thermostat—switch made from scrap parts	629
Tools	
auger, large, small hole makes cut faster	623
hammers, soft, for delicate work	616
rack for, revolving	615
Wagon, Boy's—handle for pushing	625
Watch, Wrist—paper fastener keeps strap from splitting	632
Window Sash—screweyes help lower upper	632
SHOP NOTES	
Agricultural Implements—garden tractor, how to build	650
Automobile—pumping water with	655
Automobiles	
overload springs for	649
rope reel from auto tire	648
spreader for oiling car springs	640
Belt—pipe improves shifting finger	655
Carburetor Float—solder for repairing	639
Cement—crucibles repaired with	649
Chemistry—corks keep test tubes upright	645
Crane, Foundry—control system for	646
Crankcase—special studs help in replacing	649
Drafting—paper clip as rule handle	648
Drilling	
bent hole in copper	649
V-block guides for round stock	639
Furniture—sewing cabinet, Martha Washington	643
Glass—cutting non-shattering	646
Lamp Stand—flexible support for magnifying glass	645
Lathe—block for raising toolpost	640
Machinery—car transmission as clutch on power unit	641
Magnet, Horseshoe—extension leg on	640
Metal—punch and die to bend	649
Metals	
brass plating without electricity	642
plating copper and brass with cobalt	648
Pail—bracket pivoted to wall under bench holds	642
Photography—machinery, lime on floor for picture of	655
Pipe—cut and welded joints	642
Poultry—eggs tested in incubator	645
Roofing—plastic compound flashed to wall	642
Sawhorse—help in selecting one	647
Saws and Sawing—bandsaw for workshop, homemade	637
Screws—tap-wrench handle aids in driving large	654
Smoke House—oil drum and milk can make	639
Tank, Wooden—leak repaired with wedge	655
Tool—marks equidistant holes	639
Tools—rubber strip keeps on top of ladder	646
Trammel Points—casement-window adjuster makes	645
Valve Stem—jig for filing	648
V-Block—adjustable holder for	646
Wrench, Pipe—chain increases capacity of	649
Wrenches, Socket—wristpins used to make	640
AMATEUR MECHANICS	
Agriculture—garden marker from test tube	630
Automobiles	
coach seat, quick-change rod for	612
metal stop to check speed limit	616
model-T Ford coil used as temporary coil	610
mounting tire on drop-center rim	628
switch, foot-operated	622
Birds—wren houses, six unusual	607
Boats and Boating	
anchor made from connecting rod	632
outdoor building, an aid to	636
steering device for model sailboats	628
Bottle—dropper for made of glass pushpin	609
Cigaret Box—smokes distributed at table by	633
Door, Screen—shelf brackets brace	628
Drawers, Portable—silverware of church kept in	616
Electrical Experiments—coils made from resistance wire for	624
Faucet—water hose held to by device	610
Fish and Fishing—flies made of cellophane	623
Furnace	
dampener chain prevented from enlarging hole	635
diameter measured with weighted string	624
felt strip on register prevents soiled wall	623
Furniture	
card table and chairs to match	613
dresser set, three piece	631
shoe cabinets of simple designs	611
wardrobe, wall, for child	635

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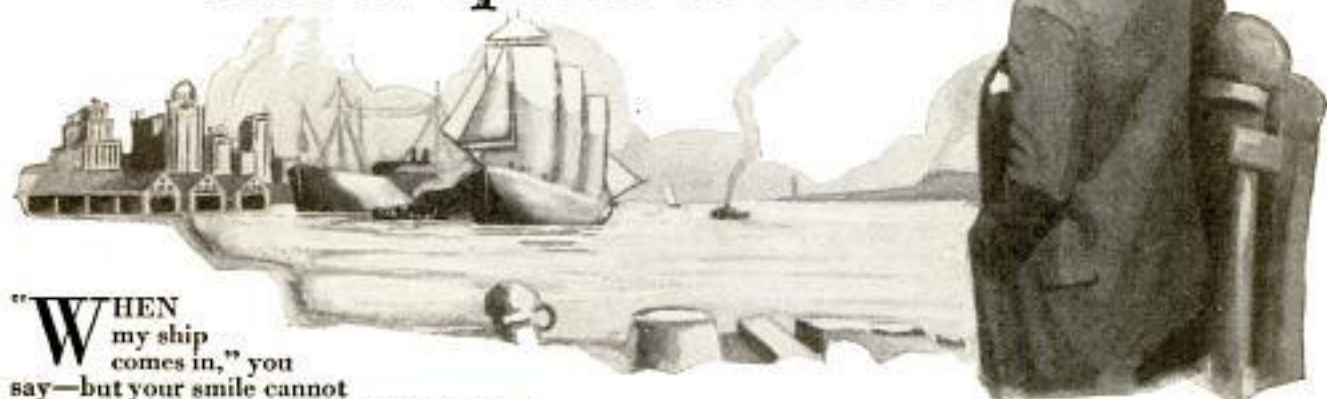
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1. Make drawing of girl about 6½ inches high, on paper 7 inches high by 5 inches wide. Draw only the girl and not the lettering.
2. Use only pencil or pen.
3. No drawings will be returned.
4. Write your name, address, age and occupation on back of drawing.
5. All drawings must be received in Minneapolis by March 25, 1933. Prizes will be awarded for drawings best in proportion and neatness by Federal Schools Faculty.

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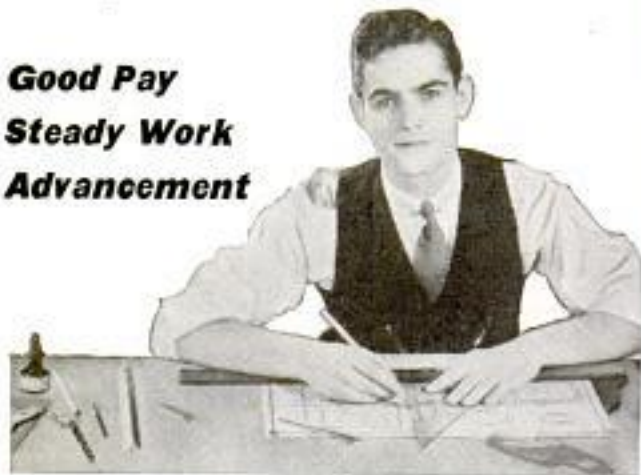
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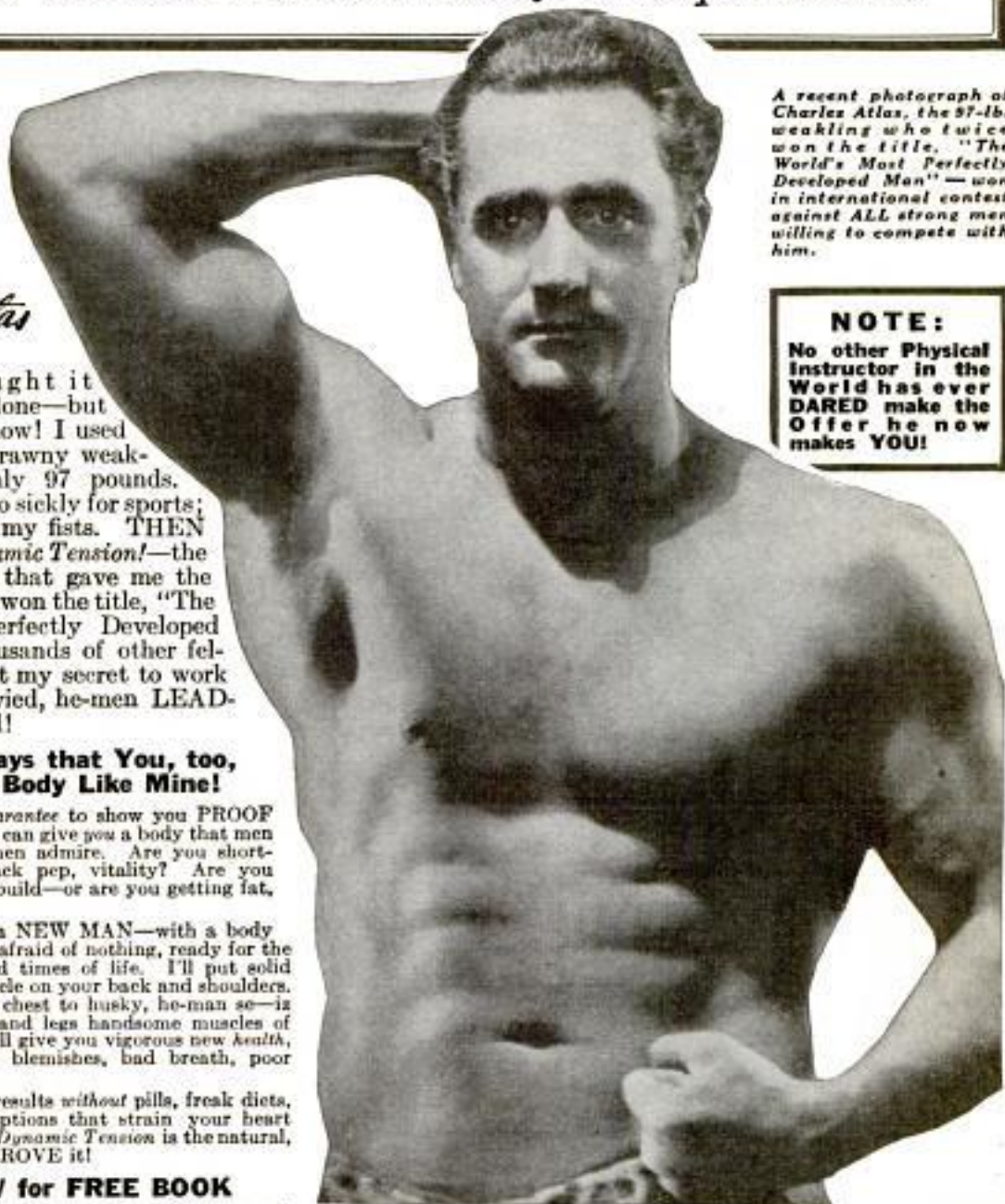
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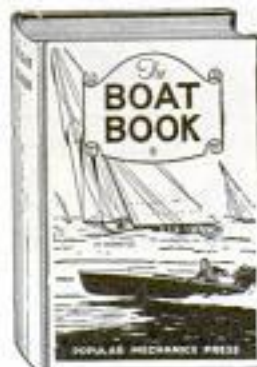
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MEDICAL authorities now say that millions of men over 40 suffer from disorder of one of the most important male glands—the prostate. After age 50, says one important writer, the chances are 2 to 1 that you have some prostate derangement.

This gland disorder is seldom mentioned, by laymen, but millions will recognize the symptoms. When prostate "hypertrophy" is present the victim usually suffers broken sleep—he has to get up 2 to 10 times a night; he has other "bladder" symptoms; frequently complains of aching feet, legs and back; and often suffers unexplained "blues" and loss of strength and ambition.

If you are suffering from this gland weakness you should write at once for the sensational book "Why Many Men Are Old At 40." It is now being given away, free, by the institution which recently perfected a marvelously simple drugless relief for this gland disorder. This method, called Thermalaid, has already been tested by over 100,000 men. Thousands upon thousands have already written grateful letters describing their quick and often seemingly permanent relief from prostate symptoms.

Do not hesitate. Send for this book now. You will also learn of a generous test offer now being made by the manufacturers of Thermalaid, to prostate gland sufferers. This test will prove the merit of Thermalaid in seven days, or you pay nothing! No obligation—just write today to **W. J. Kirk, President, The Electro Thermal Company, 2164 Morris Ave., Steubenville, Ohio. Western Address: Dept. 21-U, 500 Wm. Fox Bldg., Los Angeles, Calif.**

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WE BUY WHAT YOU RAISE—HIGHEST PRICES PAID—Established 19 years. Illustrated book, catalog and Fur Farming Magazine, also Monthly Market Bulletin showing prices we pay. All for 15c. Two large rabbits, address and nearest you.
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Make money breeding PR Royal WK Squabs, cream of poultry, getting double chicken prices. Raised in 4 weeks. Send four cent stamps for postage on free big 68-page book, how to breed and profit 1933. Our 534 year. See how our Racing Homers are winning.

Plymouth Rock Squab Co., 634 H St., Melrose, Massachusetts



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A complete guide to profitable poultry and squab raising. Low prices on 40 varieties chicks, 66 breeding stock and pigeons. Also ALL-PULPET CHICKS. Send 5c for postage.
FRANK FOY, Box 13, CLINTON, IOWA

When writing please mention Popular Mechanics

Classified Advertisements

WORLD'S BEST WANT AD MEDIUM

Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance
To be inserted under proper classification in May issue, copy should be in our office March 18th

ADVERTISING AGENCIES

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

ADVERTISE in rural weeklies. Lists free. Meyer Agency, 4112 Hartford, St. Louis, Missouri.

FREE—New 1933 Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 R. Dearborn, Chicago.

FOR ADVERTISERS

INCH Display, 20 magazines, circulation 15,000, 3 months, \$2.50. Sample copy, list 10c. Midwest Service, Moulton, Iowa.

SAVE Money on your advertising. Send for our big combination offers. Bucknam, 177A State Street, Boston, Mass.

ADVERTISE With blotters. 250 printed to order \$2.00. Van Allen, 1218 Capital, Utica, N. Y.

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

ADVERTISE 53 Magazines, 3 months, \$6.00 incl. List, special offers, free. Evans King Co., Box 672P, Wilmington, Delaware.

AGENCIES WANTED

SOLE African agencies wanted. Patents, novelties. Samples; literature essential. American Patent Distributors, Box 7451, Johannesburg, South Africa.

MAILING LISTS

AGENTS—Opportunity seekers directory, 500 names, 15c (coin). Midwest Service, Moulton, Iowa.

WRITERS SERVICE

STORY Ideas for talking pictures, magazines, accepted any form for revision, copyright and submission to markets. Established 1917. We know market requirements. Free booklet gives full particulars. Universal Scenario Company, 416 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

SALES PROMOTION

LETTERS Prepared to sell your goods, \$10 each. \$5 with order, balance when results satisfy you. Jed Scarborough, Manlewood, N. J.

MEN Wanted at once to call on stores with newest line self-selling 5c and 10c necessities. Strong, original counter displays. Aspirin, mercurochrome, razor blades, household cement, etc. Automatic sellers. Many new items. Up to 125% profit. Big catalog free. Procpax, Dept. 36-D, 1956 S. Troy, Chicago.

INFORMATION

INFORMATION Any subject, 25c (coin). Midwest Service, Moulton, Iowa.

AUTOMOBILES

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

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58X, Adams Building, Washington, D. C. See page 129A.

AUTO Fans—Beautiful moulded streamlined coupe. Useful and ornamental desk accessory. Dollar value, only 25c. Engineering Studio, 8445 Curzon, Cincinnati, Ohio.

AUTOMOBILE SUPPLIES

AMAZING Invention protects cars from theft in three ways. Representatives wanted. Agent's sample, \$1.25. Free particulars, P. Miller, Boylston Ave., Newark, Ohio.

BUILD It yourself—"Conifr Camp Car" trailer, take your house with you—cook, eat, sleep anywhere. Comfortable, attractive. Photo 10c. Blueprint \$1.00. R. M. Cummins, 1738 Manchester Rd., Akron, Ohio.

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

AUTOMOBILE SERVICE EQUIPMENT

BARGAINS—Compressors, 8-hour charger, test bench, also are welder. Terms—30 day trial. Ken's Equipment Exchange, Box M-431, Troy, Ohio.

MOTORCYCLES, BICYCLES AND SUPPLIES

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

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

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

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

REPAIR With good used parts, save 3/4 or more, state parts needed, no lists. J. B. Dahl, 3661 Archer Ave., Chicago, Ill.

BATTERIES

EDISON Lighting plant storage batteries. Non-acid, non-sulphating. Odorless. Guaranteed. 15 year life. Lowest prices. Lighting plant, motor bargains. Interesting literature. B. Hawley Smith, 22 Washington Ave., Danbury, Conn.

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

AVIATION

MEN Wanted for good positions as airplane mechanics and pilots after taking necessary training in government approved school. We qualify you for good positions paying \$179.00 to \$500.00. Lincoln Flying School, 2003 Aircraft Building, Lincoln, Nebraska.

MOST Complete lightplane parts catalogue in America, dime, 1933 Heath, \$100.00, photo dime, Kama Aircraft Company, 819 Fifteenth St., Oshkosh, Wis.

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

PATENTS—Small ideas may have large commercial possibilities. Write immediately for free book, "How to Obtain a Patent" and "Record of Invention" form. Delays are dangerous in patent matters. Free information on how to proceed. Clarence A. O'Brien, 58X, Adams Building, Washington, D. C. See page 129A.

WOODEN Propellers. Carry them yourself from our patterns. Blueprint, showing relative propeller-motor dimensions 10 cents. Rauff Company, 562 Vedder, Chicago.

USED Airplanes \$50.00 and up. Easy payments. Catalog 10c. Federal Equipment Co., Deerpark, Ohio.

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

MODEL AIRPLANES

15c **RUSHES** Big Lockheed Orion blueprints. Viking Aircraft, Hamilton, Ohio.

PRIZE Contest, particulars. Atlas Model Propeller, 408 Spencer Ave., Carrick, Pa.

BOATS, OUTBOARD MOTORS, ETC.

MAKE 12' Rowboat, blueprint, 30c. Weesho-Uro, B75, Detroit, Michigan.

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

MAKE Canoe, blueprint, 30c. Weesho-Uro, B75, Detroit, Michigan.

BUILD Your own boat and save 2/3 the completed cost by using our complete frames and materials. Tell us what you want and let us quote you. Anything from a small runabout to a 75-foot cruiser, work or sailboat. 60 designs and sizes. Bay City Boats, 152 Adams, Bay City, Michigan.

COMPLETE Building plans 29 ft. cruiser in The Rudder, February and March—price \$7.50—Free boat catalog. Rudder, 15 Murray Street, New York, N. Y.

MAKE 16' Rowboat, Blueprints, 30c. Weesho-Uro, B75, Detroit, Michigan.

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

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BUILD Five-foot model transatlantic steamship, complete kit \$2.50 postpaid. Bildon Company, 711 Wenonah, Oak Park, Ill.

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BUILD Your own juvenile playboat. Six feet long. Philippine mahogany. Side paddle wheels with steel cranks hand operated. Loads of fun. Shipped knocked down complete with all materials and directions for assembly. Write for details. Waterhouse Company, Webster, Mass.

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

CARTOONING

AMATEUR Cartoonists: Sell your work. Write Smith's Service, PCI194, Wenatchee, Washington.

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DEATH Of a thousand cuts! Actual photographs, Chinese tortures, executions, Japanese invasion. Samples and list, 20c coin. Oriental Studio-A, Box 3149, Honolulu, Hawaii.

GAMES, ENTERTAINMENTS AND PLAYS

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

McINTYRE Checkerboard makes checkers different. Sample 15c postpaid. Review, Sidney, British Columbia.

200 DIFFERENT Stamps, and catalogue United States and foreign stamps, 10c. Norman Shultz, Salt Lake, Utah.

1,000 ASSORTED U. S., 25c. Commemoratives, precancels, etc. Auburn Stamp Co., Syracuse, N. Y.

GIVEN: Diamond shape stamp with packet including Roman (reprints) catalogue \$5. Airmail, U. S.—5c to approval applicants. Imperial Stamps, Fontana, California.

\$1.50 CATALOG Value of United States for 25c. (Postage extra.) Order up to 4 packets, and each one will be different. Hollywood Stamp Company, Box 1966, Hollywood, Calif.

NEW—1933 Georgia, commemorative first day cover 15 cents, New U. S. commemorative packet, 18 different 1932 (used) 35 cents. LaRoche Studios, Morris Heights Station, N. Y. City.

25 GERMAN Bills, 10c, with approvals. Paul Summers, Sageron, Texas.

UNITED States—50 different 25c. Fred Oaken, 630 79th St., Brooklyn, N. Y.

UNITED States stamps—\$1, \$2, \$5 and other to approval applicants for 10c. References required. Drisco, 882 C 57th, Brooklyn, N. Y.

100 U. S. Stamps, lists, 10c. Box 457, Newark New Jersey.

FREE! U. S. \$3.00 due with year's subscription: 10c! "Stampist," Hyndman, Pa.

COLONIAL Stamps: Eritrea, Kenya, Caroline Islands, New Guinea, Samoa, Togo, Marshall Islands, Spanish Morocco, 48 different only 5c with 8 page price list to applicants for penny approvals. Belmont Stamp Co., 1451 Belmont Ave., Chicago, Ill.

NEW Low tariff. Approvals that make your fingers tingle. W. A. Whiting, Birmingham-Southern College, Birmingham, Ala.

300 DIFFERENT 6c. Approvals sent. George Morris, 811 N. Laverne, Chicago.

FREE!!! 103 Different—Macao, Azerbaijan, etc., 6c postage. Approvals, Dunco, 4312-M Madison, Gary, Ind.

FREE!!! 15 French Colonies. Postage 3c. F. Roberts, 901 Fourth, Bay City, Mich.

CAICOS Islands—Also early United States, Uganda, Lourenzmarques, Congo's Salvador, Monte Carlo, Prince Island, Canada, Ubangi—"Countries collectors haven't got"—Free for 5c postage. Hurry! For yours, now. Empire Stamp Company, Toronto, Canada.

FREE Barriarian Railway set. J. Atwood, 804 McMillan Ave., Birmingham, Ala.

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SUPERB Approvals net prices. Stamps 1/2 to 1/4 catalogue. P. G. Beals, 170 A Tremont St., Boston, Mass.

WORTHWHILE Penny approvals. Unparalleled sets. Elyria Stamp Company, Elyria, Ohio.

PHILATELIC Portrait Julius Caesar. Hundred unused. Five cents to approval applicants while they last. Oakwood Stamp Co., Arlington, N. J.

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EXTRA! Packet of Egypt, Siam, Japan, etc., given with 100 different to approval applicants enclosing 3c postage. Florian Stamp Market, (P1), Downers Grove, Ill.

QUALITY Packet, over 20 different better grade foreign stamps, catalogue value over \$1.00, only 5 cents to approval applicants. Arnold Woodward, Box 44, West Newton, Massachusetts.

UNITED States—11 commemoratives, 12 postage, 6c. Approvals. Dennie, Lenox, Michigan.

CANNON! Set of stamps showing cannon, cavalry charge, battleship, firing squad, airplane, and 100 other different stamps only 10c to approval applicants. Paramount Stamp Co., 5529 Pershing, St. Louis, Mo.

FIVE Gigantic Spain 5c. Approvals. Yakima Stamps, R6, Yakima, Wash.

FINLAND Or Russia, 100 different—52c. Shenitz, Box 990P, City Hall Annex, New York.

FREE: 25 Stamps and price lists. Halay & Herrigan, 452 West 58th St., New York.

GRAVEYARD Mixture. Remains of collections and approvals, damaged rare stamps, 100 for ten cents. Approvals. Gasper, 948 West 27, Indianapolis, Ind.

100 DIFFERENT For this Ad and 3c to approval applicants. Evanston Stamp Shop, 2412 Noyes, Evanston, Ill.

UNITED States all different, 55—15c; 125—50c; 200—\$1.00; thousand assorted 35c, to approval customers. Illinois Stamps, Rockford, Ill.

FREE! Two U. S. \$1.00 stamps! 3c postage. Vanvorhis, Hyndman, Pennsylvania.

TRIANGLE From Costa Rica commemorating Philatelic Exhibition, and packet containing grotesque Afghanistan, Brunel, weird Corea, Surinam and genuine Baden. Also dandy set N. Y. stock transfers. Everything—only 5c to those requesting our famous approvals! Yiking Stamp Co., Sheepshead Bay Station, Brooklyn, N. Y.

SCARCE Airmail and triangle. Beautiful Uruguay "flying horse" airmail and scarce Guatemala triangle (smallest in the world) are included in our big packet of 60 different stamps from Abouites, Grand Liban, Venezuela, British and French Colonies, etc. All for 5c to approval applicants. Big illustrated lists free with each order. Write today! Mystic Stamp Co., (Dept. 80), Camden, New York.

FREE! U. S. 30c, 50c, \$1.00 postage dues (cat. 45c!), and 40 other beauties, to approval applicants sending 3c postage. Pricelists free. Tatham Stamps, (D125), W. Springfield, Mass.

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120 DIFFERENT United States 60c. 200 different \$1.00. Approvals. Tricity Stamps, Berk Island, Ill.

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10 DIFFERENT U. S. commemoratives, 8 used, 2 unused—all for 10c. Highlander Brothers, Orange, Va.

WONDERFUL Approvals! Free prizes! Big discounts! Box 637, Minneapolis, Minn.

STAMPS Sent on approval at 70% discount. Reference required. Emory Renoll, Hanover, Pa.

125 DIFFERENT, 15 Countries, 6c to approval applicants. Stamps, 8429 Island Drive, Seattle, Wash.

UNITED States stamps on approval. Huber, 4515 Bryant St., Minneapolis, Minn.

500 STAMPS For 12c! Giant packet 500 mixed stamps including Afghanistan, Latakia, Inini, Andorra, Epirus, etc. Only 12c to approval applicants. Send today! Afrimton Stamp Company, Box 81, St. Johns Place, Brooklyn, N. Y.

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FREE! Complete mint set to all approval applicants sending 3c stamp for return postage. KenMare Stamp Co., Kenmore, N. Y.

50 DIFFERENT Stamps cataloging over \$1.00 only 10c to approval applicants. 20,000 different stamps of prices ranging from 1/2c up. All stamps guaranteed genuine and fine selection of U. S. revenues at 1c and up. Address F. G. Stein, Dept. 123, 7360 N. Secley Ave., Chicago.

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FORTY Different United States and price list 10c. Seidenberg, Baroda, Mich.

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

CANADA Conference 2 values free with 30 different Canada or 25 different airmails, either packet 15c; both for 25c. Lists free. Specials: 500 diff. 25c; 1000 diff. 75c; 2000 diff. \$2.00; approval selection with each order. Victoria Stamp Company, London 4, Canada.

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

EARN Cash, stamps, album. Sell my nickel stamps packets. Ellison, 2841 West 34th Street, Brooklyn, New York.

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

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

READ This. Inini, Gwalior, Cyprus, French Colonials, 55 all different. Also stamp wallet, hinges. All 5c to approval applicants. United Pacific Philatelists, Dept. M, Box 25, Ventura, California.

FREE! Loose leaf postage stamp album at rate of 8 pages each month given with subscription to monthly journal. Send 3c stamp for prospectus. United Stamp Co., Marquette Bldg., Chicago, Ill.

1000 UNIVERSAL Hinges 10c; lists free. Harvey Teagle, Decatur, Indiana.

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

U. S. 25 Diff. air mails, commemoratives, revenues; 10 South America; all 5c with approvals. Hudson & Co., Plainfield, N. J.

UNPICKED Stamps from foreign missions, \$1 per pound or 25c per sample thousand. Approvals sent unless forbidden. Elmer, 192A Washington Street, Boston.

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

PACKET 52 Different from Abouites, Lebanon, Siam, etc., also watermark detector and rare old Hawaiian stamp—all for only 5c to approval applicants. Highland Stamp Co., Newton Highlands, Mass.

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

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

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SPECIAL Prices on United States commemorative half dollars; Columbian 60c; Stone Mountain 85c; Monroe 90c; Pilgrim 90c; White cent and bargain selling price list 10c. Arcy, Box 483, Muskogee, Okla.

20 ASSORTED Foreign coins 25c. Oddeben, Box 681, Kansas City, Mo.

UNITED States. Large cent, two-cent bronze, three-cent nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George P. Coffin, Augusta, Maine.

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

50,000 COINS, Medals, paper money. Catalogue free. Nagy, 8P South 18th, Philadelphia, Pa.

OLD Money wanted. Will pay fifty dollars for nickel of 1913 with Liberty head (no buffalo). We pay cash premiums for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. H, Ft. Worth, Texas.

30 LARGE Cents \$1.00, 5 50c before 1840 \$1.00, 45 Confederate bills \$1.00, 150 foreign coins \$1.00. Romanocoinshop, Springfield, Mass.

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CALIFORNIA Gold quarter size, 25c; 3/4 size, 33c; 3c piece and catalogue, 10c. Norman Shultz, Salt Lake, Utah.

CUBAN Bill and new price, list. 5c. Druiz Coloco, Saranac Lake, N. Y.

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

RARE United States, foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colorado.

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

\$5 TO \$500 Each paid for old coins. Many very valuable. Keep all old money. Get posted. Send 10 cents for illustrated coin value book, 48c. Guaranteed prices. We buy and sell. Coin Exchange, Box 5, Le Roy, N. Y.

7 DIFFERENT Coins, 11 bills and catalogue, 25c. Creamer's, 1112 Somerset, Baltimore, Maryland.

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SAVE 50%—3 1/4 x 4 1/4 Graflex camera. Regular price \$89.00, only \$39.50. 3 1/2 x 4 1/4 Eastman series III kodak, f:5.6 lens. Regular price \$32, only \$15.75. A \$60 Eastman 3A (3 1/4 x 5 1/4) kodak special, with f:6.3 lens, only \$29.50. All are like new and sold on ten days trial guarantee or money back. Ask for our bargain book. Central Camera Company, 230 South Wabash Avenue, Dept. PM-40R, Chicago, Ill.

SPECIAL Trial offer: Developing any size roll 5 cents; prints 3 cents each. Beautiful 7 inch enlargement 20 cents. Send for special bargain list. Roanoke Photo Finishing Company, 299 Bell Avenue, Roanoke, Virginia.

CASH Paid for good snapshots. Write for information. D. Bliss, Box 43, Racine, Wis.

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

SOMETHING New. At last an inexpensive Stereo camera called The Puck, using 2 1/2 x 3 1/4 roll film, producing life like pictures, for only \$7.50. Brand new. Sold on ten days trial. Ask for our bargain book. Central Camera Company, 330 South Wabash Avenue, Dept. PM-46A, Chicago, Ill.

10c BRINGS Surprise package photo novelties, five items, including artistic calendar. National View, PM-454, Winona, Minn.

BIG Money coloring photos. Details, sample, 10c. Orbert, LaFeria, Texas.

SMALL Used cameras wanted. Aurora Photo Engraving School, Aurora, Mo.

DEPRESSION Offer—Beautiful 8x10 enlargement 25c. Send best negatives. Detroit Photo Co., 4493 Field, Detroit, Mich.

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

TRIAL Offer. Developing roll 5c, prints 3c each. Beautiful 10-inch enlargement 25c. Young Photo Service, 465 Bertha St., Albany, N. Y.

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

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

MAKE Money in photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 3432, 2601 Michigan Avenue, Chicago.

HAVE You a camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 115 Camera House, Boston, 17, Mass.

IF You are interested in photography see pages 114A and 115A this issue.

MOTION PICTURES AND SOUND EQUIPMENT

THE Secret of making money! Saving money is making money. Bass Bargaingram No. 210 does that. Book—"How to Make Your Own Motion Picture Plays." 40c; 16mm. automatic cameras from \$22.50; 400 ft. Peko 16mm. motor driven projector, brand new, \$15.95; automatic DeVry Standard 35mm. camera, F-3.5 lens, \$175.00 value at \$35.00; Cello 35mm. projector, motor driven, at \$16.50; Victor Animatophone 16mm. sound projector and amplifier, list \$159.00, complete like new at \$132.50; fresh motion picture film at cut prices. Send 5c in stamps for four section Bass Bargaingram No. 210. Covers 16mm., 35 mm., still cameras and text books. Bass Camera Company, 179 West Madison St., Chicago, Ill.

\$12.50 FOR Original photoplay story. Our sales department sold unknown author's first story for above amount. We revise copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 206 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

TALKIES—Silents—Lists. Western comedies sacrificed. Metropolis Films, Celina, Ohio.

35-MM FILMS, Projectors. Stamp for lists. Box 6, Rosedale, Kans.

SPECIAL. Sixteen millimeter camera, 100 foot capacity, spring drive, fifteen dollars. One hundred feet odd for one dollar. Milton Mendelwager, 192 Ave B, Bayonne, N. J.

16MM PROJECTORS \$3.95. 16mm films 35c up. Free lists. Home Movies, Box 32, Easton, Penna.

16MM FILM—Travel, educational, etc., 2c foot. Art. 3c. Cameras, sound, silent projectors. Bargains, 1933 catalogue and membership. Silent, Sound, Library film. Mosquill Bros., 1944 J. Boston Road, New York City.

16MM HOME Movies—New prints Life Christ Jesus Nazareth \$100, comedy valid 800 ft. jungle \$12.50, 100 ft. comedy western \$2.00, 100 ft. Mickey mouse \$2.00. Excelsior Films, Box 524, Cincinnati.

WE Can supply anything new in 16mm line at factory price. Write for prices on your wants. No catalogues. R. Jones, Shamokin, Pa.

100 FEET 16MM \$1.00. Stamp list. Savarese, 15 Brickell, Westwood, N. J.

READ The message to you on pages 114A and 115A this issue.

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

LEARN The motion picture theatre business at home. Free catalog. Theatre Managers Institute, Elmira, New York.

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

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

TRADE AND TECHNICAL SCHOOLS

LEARN Watch repairing. Hiles School, 5320 Mission St., San Francisco.

BUSINESS OPPORTUNITIES

HUSTLERS With clean records can make themselves independent quickly as distributors for a new system of illumination that is revolutionizing industrial and commercial lighting fields. Saves from 25% to 50% on electric light bills, and maintains equal illumination with better diffusion. This can be proven by demonstration. Agents and distributors are making big money. Ideal to sell in hard times because it saves the buyer money. Small investment necessary, and best references required. Exclusive territories. Write today for information. Light Conservation Bureau, 510 S. Marenzo Ave., Alhambra, Calif.

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"BULLFROG Raising!"—Pays big money! Investigate this (new industry). Valuable book "Fortune in Bullfrogs"—free. American Bullfrog Industries, 109-88, Fremont, Ohio.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for big 1933 business now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1065 Washington Ave., New York.

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

"PRESENT Day Opportunities," new self help book, 25c. "Home Industries" magazine, Irington, Nebraska, copy 5c. Typewriter ribbons wholesale 25c. Ribbon renewing fluid applicator 10c. Catalog free.

SELL Through new endless chains. Directions, 15c. International Agency, Cincinnati.

WHOLESALE Directory, nearly half million articles, 10c. International Agency, Cincinnati.

RAISE Frogs! "French Frog Farming" tells how. \$1.00. Lee Publishers, Monterey, California.

MEN, Women—Earn money spare time. Unusual opportunity. Details for stamp. Neuro, 206 Russell Bldg., Lubbock, Texas.

EARN Money at home. Start your own spray-finishing business. Make from \$5.00 to \$8.00 per day. We tell you how to get jobs, what to charge, etc. We furnish full instructions and professional auto-power spray outfit, complete, for \$6.95 postpaid. Ironclad money back guarantee. Home Industries, 1152 South Bonnie Brae, Los Angeles.

"FIRE Alarms" automatic electric. Remote controlled, easily installed with batteries. Vinco Herr, Collinsville, Ill.

MAKE Advertising signs—liquor, beer, wine. One order cleared \$300.00. No brush skill. Particulars. Merritype Signs, So. Berkeley, Calif.

A NEW Money maker. No products to sell. Plans one dollar. Service Company, 21870 Ball Ave., Euclid, O.

SALES Managers, salesmen and operators wanted for dry cleaning plants, instructions furnished. Pektter Manufacturing & Supply Co., Box 1045, St. Louis, Mo.

MAIL Order drug store. Let us supply your drug store wants. Information given; stamp appreciated. Meqnon Drug Store, Thiensville, Wis.

EARN Up to \$25 weekly or more growing mushrooms in your cellar or shed. Illustrated booklet free. American Mushroom Industries, Ltd., Dept. 712, Toronto, Ont.

AGENTS—Distributors. Write for 10 day free trial—Money refunded if not satisfied. Antiflare fog penetrating autolight reflectors. Retail 75c—3 sample pair \$1.00 postage prepaid. Flood-Lite Reflector, Dept. C, Racine, Wis.

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TWELVE New successful money-makers. K. Home, 3919 Metropolitan, Chicago.

MIRROR Resilvering nets you quick profit! Permanent business plating autoplasts, tableware, etc. Write Sprinkle, Plater, 127, Marion, Ind.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N, Decatur, Ill.

LATEST Money-Making plan with trial subscription, Winner Mail Order Digest, 25 cents. Winn, 124 W. 23, New York.

MONEY-MAKING Hints, well bound. Sample copy 25 cents. Winn, 124 W. 23, New York.

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

GROW Mushrooms from seed. Particulars free. Frederick Robson, 246 Berry Gardens, St. James, Manitoba, Canada.

MANUFACTURER Wants salesmen. Whole time or side line. Call on merchants with live line. Beardley's, Rock Island, Ill.

BARGAINS—Paint spray outfit, gasoline engine drive. Terms—trial. Helmick Paint Spray Exchange, Box M-432, Troy, Ohio.

ARTIFICIAL Marble sanitary flooring, instructions covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost. Ornamental casting, concrete plaster paper-mache decorations, garden furniture, statuary, flexible molds, particulars and illustrations free. Chris. Mahler, Elmout, N. Y.

MEN! Boys! Make money silver-plating. Material complete with instructions \$1.00. J. Bessa, 148-16 112th Ave., Jamaica, N. Y.

MAKE Concrete pottery, birdbaths, vases, etc. Easy, guaranteed system. No molds used. 2,500 designs. Full range colors. Highest quality at fraction cost by other methods. 500% profit. Book free. National Potteries Company, Minneapolis, Minn.

700 MONEY Making secrets will help you start a business of your own. Write Illinois Universal, 800 N. Central Ave., Chicago.

CHEMICAL Expert furnishes manufacturing formulas with complete working directions. Reliable individual service. Charges reasonable. Dr. VanHoesdonk, 4721 Lakepark, Chicago.

QUALITY Vanilla concentrate, \$1.00 trial makes gallon—sixteen \$1.90 bottles, standard strength. Formula, labels free. Livesays, 410 Columbus, Peoria, Ill.

MAKE Your own flexible molds with Rubberite composition. Flexible like rubber. Inexpensive. Anyone can make them. Send dime for sample. Cowell Institute, Grayling, Michigan.

CAPITAL Seekers—Option your securities to 200 key-men, new deal basis, cost trifling. Details free. Amster Leonard, East Orange, New Jersey.

FREE—36 Page booklet "The Key to Business Opportunities"—mailed on request. Publishing Co., 20 E. Jackson, Chicago, Ill.

MANUFACTURE Chipped glass home numbers. Beveridge, 160-22 Locust, Jamaica, New York.

NEW Original, different exclusive mail order business for you. Practical, proved profitable. Very small capital. Details free. Bucknam, 177 State Street, Boston, Mass.

FREE Book. Start little mail order business; home employment evenings. Hadwell, 2A-72 Cortlandt Street, N. Y.

POPCORN Machines—Crispette—Carmelcrisp. Long Eakins, 1960 High St., Springfield, Ohio.

MAKE Products yourself. Tested formulas. Catalog free! Grinstead Laboratory, Edwardsville, Illinois.

SELL By mail—New fast selling merchandise, circulars supplied, write, Superior Specialties, Springfield, Ill.

MAKE Money quickly operating collection business. Easily learned. Write Hartwell Cole, Pres., Tower Building, Syracuse, N. Y.

START 1933 Right! Making successful products from guaranteed formulas. No machinery needed. Profits great! Metallic cold solder; Water Wax; Plaster; Polish-plaster; Oilcater; Dry Anti-freeze; latest advertised specialties, all lines. Get my 36th unexcelled free anniversary offer. Miller, Chemist, 1706BP, Tampa, Florida.

GERHART Of Pa. cleared \$772.46 from one idea. Send dime for publication containing opportunities galore and distributors proposition. Pruitt Press-A, Elburn, Ill.

MAKE Artificial marble, colorful glossy tiles, no polishing; rather unsealing. Novelties, tabletops, bookends, floors, whetstones, Hard, inexpensive, fireproof, enamels wood. Secret cement methods. Amazing samples 3c. John A. Payn, 945 Grande Vista Drive, Los Angeles, Calif.

SUCCEED With your own products. Make sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxly Company, Washington, D. C.

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CHEMICAL Experimenters' Handbook, hundreds of experiments, illustrated, 35c postpaid. Experiment booklet 15c. Chemical catalogue 10c. General Chemical Co., Reading, Penna.

SEND 25 Cents for chemistry experiment book; 207 tests and formulas. Free catalog. Winn, 124 W. 23, New York.

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SHOE Resoler: Resoles old shoes waterproof overnight; outwears leather. Rebuilds auto tires, etc. Metallic Liquid Solder repairs anything. Guaranteed formulas 50c each. Formulas for every product, name yours. Wilbert Murazars, 11397 Washington, Rockawaypark, N. Y.

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THAXLY Formulas are used by successful manufacturers. Catalog free. B. Thaxly Company, Washington, D. C.

GUARANTEED Formulas—Trade secrets—Expert analysis. Catalog free. Industrial Institute, A-4, 602 Centre Street, Newton, Massachusetts.

FORMULAS—All kinds—low prices, absolute money back guarantee. Stamp for dollar auto formula and big list. Electro-Thermic Works, Peoria, Ill.

FOR Better formulas write Linko Bros., 4606 E. 198 St., Cleveland, Ohio.

METALLIC Liquid solder formula \$1.00. Literature free. Farrand Chemical Company, Tyrone, Pa.

"MYSTERIOUS" Prosperity plant formula! Beautify your home. Sell instructions to others. Silver quarter brings it. Davis, 1208 Broadway, Cincinnati, Ohio.

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

BUY Auto formulas where you can get samples of finished products. Geo. E. Cook, Box 281, Oyster Bay, N. Y.

"RECONDITIONING Lubricating Oil." Dime. Laboratories, 859 Jessamine, Fort Worth, Texas.

FORMULA Almost anything, quarter coin. Kessel Formula Co., 787 Genesee Park Boulevard, Rochester, N. Y.

POLISH. Auto formula complete. Five dollars. Four Square Laboratories, Hartford, Connecticut.

TESTED Formulas, Newest—guaranteed, Catalog free. Grinstead Laboratory, Edwardsville, Ill.

FORMULAS, Business plans. Interesting literature free. Belfort, 4042 N. Keeler, Chicago.

1100 SELECT Formulas, 30th anniversary offer, free materials for specialties worth \$47.00. Valuable selling systems, all free! Stamp brings amazing offer!! Miller, Chemist, 1706BP, Tampa, Florida.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1930 W. Broad, Richmond, Va.

500 FORMULAS And big illustrated catalog 25c. Ideal Book Shop, Park Ridge, Ill.

FORMULAS, All kinds. Guaranteed. Catalog free. Kemler, 31, Parkridge, Ill.

AGENTS WANTED

STRANGE Invention. Backed by written guarantee. Cuts gas bills 25% to 50%! Territory now being assigned on new amazing simple device that fits around gas range burners. For natural or manufactured gas. Furnishes full heating power in about half time. Prevents discoloring of roasting utensils; protects flames from overflow of liquids and against drafts. Homes, apartment houses, restaurants want them, buy on sight. Men needed at once to bring this amazing invention to the bill-burdened consumer. No competition. No sales resistance. Earnings up to \$5 to \$7 an hour. Write quick. Economy Appliances, 1213 Van Buren, Dept. A-21, Chicago.

SEALS Like hot cakes, big profits, new laundry soap flakes, perfumes clothes lastingly when washing; canvassers to homes, etc. Summit Laboratories, Lynbrook, N. Y.

CLEVER Invention. Self-lacking clothes line holder. Every home a prospect. Demonstration means sale. Big profits. Sample 15c. O-K Line Lock Company, Toledo, O.

EVERYBODY Needs Han-Dee Cloth. Polishes all metals quickly. Sells easily. Profits large. Representatives enthusiastic. Demonstration sample free. Huskin Company, 1501 Euclid, Cleveland.

BIG Profit catalogue—Home specialties, extracts, soaps, perfumes, foods, razor blades, remedies, portraits, cracklives, moth exterminators. James C. Bailey Co., Station C, Chicago.

FLAVORING Extract sensation \$1.00, Lemon \$1.00, Vanilla 60c, Mandle 60c. Almond and sample imitation ice cream sell 99c. Lowest price in the country. Crema Foods, St. Paul, Minn.

LAUGH At unemployment. Earn money, home propositions. No canvassing. Hetzel, 802 Garden, Hartford, Conn.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-223 Broadway, New York.

WOMEN Need reducing salts. Agents wanted. Write Globab, Goddard Street, Providence, R. I.

1000 BARGAINS—Undersell stores. Men's raincoats 47c, boys' shirts 25c, children's bloomers 5c, ladies' rayon hose 10c, men's hose 5c. Free catalogue. Jobbers, 390-B Van Buren, Chicago.

FREE. Extraordinary value proposition plan. Hancock, 21 Howard, New York.

AGENTS Selling comb cleaners on new plan get the money. Postcard brings particulars. Miller Co., 504 East 175 St., Bronx, New York.

WANT Something different—Something sells easily? Then sell razor blades, all makes, under your own name, retail, wholesale, through agents and by mail. The Ann Arbor Blade Co., Ann Arbor, Mich.

AGENTS! District managers! Saleswomen! 40% commissions; drawing account; selling hosiery, lingerie, shirts. Undersell stores. "Puresilk" Agents, 321 Broadway, New York.

AGENTS: Make 600% profit. Selling cleaner, polish, shampoo, vanilla, tonic laxative, metal polishing cloth, spot remover, etc. Your name on labels. Free sample. Standant Chemical Company, Dept. K, Dayton, O.

NEW—"Jar Opener." Opens—seals, all sizes. Sells 35c. Costs 12c. Get free sample offer. Bestever, 4317-W Irving Park, Chicago.

AGENTS—Distributors. People buy millions of moth cakes, paks, blowizers, crystals, metallic cement. New items. Large profits. Patterson Co., 4111 University Ave., Des Moines, Iowa.

QUICK Sales! Big profits: Hundreds of items, quality products, low price; men, women, dealers everywhere sure prospects. Repeat orders. Write for free catalogue. Park Specialty Co., 122 Fifth Ave., New York.

MEN Or women! Look after local coffee and tea route. Call on homes with 200 highest quality necessities. Spare or full time. No investment. Permanent. Good starting pay. Rapid promotion. Blair Laboratories, Dept. D-4, Lynchburg, Va.

SILVER Plate brass auto parts, faucets, etc. Guaranteed. 75c. Agents wanted. Dixon Mfg. Co., 912 West 48, Kansas City, Missouri.

RADIATOR Shields keep walls clean. Make them at home. (Not metal.) Experience unnecessary; information free. 1315 Lockwood, Kirkwood, Mo.

DISTRIBUTORS—Capable organizing women crews. New remarkable necessity. Women buy on sight. Sensational profits. No competition. Tekhon, Dept. KC 13, 103 Park Ave., New York.

JUST Out and it's hot. Sensational new "Lustrite" perfumed furniture and auto polishing cloth. Perfumes while polishing like magic. Retail 25c—up to 200% profit. Absolutely no competition. Send 25c for two full size samples or \$1.00 for dozen. Big catalogue free. Write today. A. Duvel Products Co., 24 E. 28th St., New York.

METALLIC Mender, powdered form. Met-alsoal, 281 S. Alma, Los Angeles, Calif.

SELL Fade-A-Way, household necessity. Good profit, repeat sales, open territory. Coming season. Write Fade-A-Way Co., Dept. 1, Mt. Vernon, Ohio.

MAKE Money applying initials, monograms, on automobiles, suitcases, etc. Quick easy profits. No experience needed. Free samples. "Balco," 1084 Washington, Boston, Mass.

SUEDE Raincoats, jackets. Lowest ever priced. Selling fast. Commission advanced. Experience unnecessary. Outfit free. Good-year, 712-A Roosevelt, Chicago.

SURE Fire quick sellers. Hurry—Get real surprise. Needed in every home. Particulars free. Mission Factory, P. 2328W Pico, Los Angeles.

LIQUID Wood—New invention, flows, brushes, moulds. Sample 25c. Synthetic Liquid Wood Co., Providence, R. I.

KWIK-KUT Food chopper, amazing seller. Extraordinary profit. Sample 25c cash. Domestic Distributors, Mohawk, N. Y.

DOUBLE-EYED Self-threading needle packages, size 3/8. Blind people thread them. Invaluable for falling sight. Samples, particulars 25c. Agents wanted. Wm. Oglesby, Vandalia, Ill.

AGENTS To sell reseating sets—reset old faucets. Big money maker. Write, Chicago Mfg., 332 North Western Avenue, Chicago.

AGENTS Making 100% Profit—New automobile accessory \$2.50 sale. Defender Products, 2522 Cottage Grove, Chicago, Ill.

100% MYSTERY Clear lighter. No flint or friction. What makes it light? No wind can blow it out. Retail 50c. Sample and sales plan 25c. New Method Co., Desk PM-4, Bradford, Pa.

300% PROFIT Selling new "20-in-1" kitchen utensil. Retail \$2c. Costs you \$1.00 a dozen. Sample 10c. New Method Co., Desk P.M.M.-4, Bradford, Pa.

NEW! Wanda, "Sweet." 25c sample free. Wanda Mfg. Co., A-3377 N. 39th St., Milwaukee, Wis.

MEN—Mechanically inclined. We will start limited number in profitable full or part time business sharpening lawn-mowers. Write for full instructions and free generous sample of our patented material. If you find you can make money you will be expected to buy material in the future. Zip Abrasive Co., Cleveland, Ohio.

DISTRIBUTORS—We make cosmetics. Your label. Big discounts. Free outfit tells all. Chemist, 2540 E. Wabash, Chicago.

LATEX Bandage distributors—Agents cleaning up. New fast seller. Quick re-peat. Best proposition. Lowest prices. Neway Products, 3813-L Harrison, Chicago.

JUST Invented hat and parcel holder for automobiles and buses. Fast seller. Good profit. Territory protected. Send \$1.00 for four. J. H. Masdin, P. O. Box 251, Fort Worth, Texas.

BIG Money taking orders, shirts, ties, underwear, dresses, hoodies, raincoats, coveralls, pants, uniforms, playsuits. Outfit free! Nimrod Co., Dept. 8, 4922-28 Lincoln Ave., Chicago.

MIRROR Resilvering nets you quick profit! Permanent business plating autops, tableware, etc. Write Sprinkle, Plater, 128, Marion, Ind.

SEND Me your name and address and I'll mail you absolutely free full details of a successful money-making plan that is bringing others \$10 to \$25 a day. Albert Mills, 3776 Monmouth, Cincinnati, O.

STRANGE Chemical sponge washes windows without work. Banishes cleaning drudgery. Housewives amazed. Agents cleaning up. Outfit free. Kristee Mfg. Co., Box 1434, Akron, Ohio.

NEW Neonlike electric signs \$1.00; neonlike slogans 8"x14", 3c. Retail \$2c; sample 15c. Fastest selling signs. Dept. 31, Lorr, 8 West Broadway, New York.

WE Start you without a dollar. Summer drinks, food products, household necessities. Experience unnecessary. Carnation Co., P.O. St. Louis, Mo.

EVERY Home needs Bowl-Filter, sensational bathroom deodorizer. Phenomenal sales—automatic repeats, pay up to \$12—\$15 daily. Postcard brings full size free sample and proof of extraordinary earnings. Address Puro, Dept. D-2042, 3107 Pine, St. Louis, Missouri.

BEST, Quick money-maker; sell "Lend-a-Hand Cleaner. New, different. Easily removes grease, oil, battery stains; even printers' ink. Big profit. Great repeater. Effective selling plan builds business fast. Details and sample free. Ivo-San Laboratory, 4612 St. Clair, Dept. D-55, Cleveland, Ohio.

LAUGH At depression—100% profit selling Cosmo Razor Blade Holder. Makes world's sharpest knife. Everyone a prospect. No previous sales experience necessary. Sample 25c refunded on first order. Cosmo Co., Box 480, Omaha, Neb.

AGENTS, Wholesale or retail, everywhere! For fast-selling world's fair items. Samples free, 20c postage. Gothic Novelty Company, 812 Van Buren, Chicago.

GUARANTEED Hosiery. Men's, dozen 80c-\$1.00; ladies' fine-fashioned, dozen \$1.63-\$2.50. Catalog free. Superior Hosiery, Dept. 21, New Haven, Conn.

NEW Gas tank lock. Low priced. Stops gas and car thieves. Every autoist needs one. 150% profit. Sample furnished. National, 600-H North Albany, Chicago.

SELL New 2000 light gas lighter—Lights all kinds of gas. Retail \$2c. Costs you \$1.00 doz.; \$9.00 gross. Sample 10c. Square Deal Mfg. Co., Desk P.M.M.-4, Bradford, Pa.

CASH Paid for butterflies, insects. See Sincilar Display Advertisement on page 8A.

124 PAGE Directory containing wholesale supply sources for thousands of items. Retail for dollar. Agents sample and distributors offer 25c. Pruitt Press-D, Elburn, Ill.

REPLATE Brass worn-off bath fixtures, reflectors, spoons, forks, etc., with pure silver. U-Kan-Plate polish, \$1.80 ounce bottle. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Company, Philadelphia.

NEW Invention. Attachment for electric bulb perfumes home. Appeals to everyone. 25c brings outfit. Werner Mfg. Co., Brooklyn, New York.

NAME Plates, number plates, signs, etc., hand engraved, easily sold with large profit. Brett Bros., Winthrop, Mass.

NULUSTRE Metal polishing cloth brightens all metals instantly and Nulustre furniture cloth waxes, polishes furniture like magic; unbeatable 25c sellers; enormous profits, samples free. Shef. D. Mfg., Union City, N. J.

PENNY Each, any size! Non-tarnishable window sign letters. 2500% profit! Free working equipment. Samples. Record Breaking offer. Atlas Sign Works, 7911 Halsted, Chicago.

CUT Me out. I'll make you big money. Christy's polishing cloth, tremendous seller. Wonderful demonstration. Free sample. Write Christy, 7167 Lakeway, Newark, New York.

METALLIC Liquid: Solders, repairs, metal, wood, glass, without heat. Sells 25c, costs 6c. Sample free. Bestever, 4317PM Irving Park, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1050W Broad, Richmond, Va.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thasly Company, Washington, D. C.

START 1933 Right! Free valuable formula information for making best selling specialties. All lines. 300-750% more profit. See my advertisements—Business Opportunities—Formulas columns. Miller, Chemist, 1166AP, Tampa, Florida.

AGENTS For Handic: Powdered hand-soap. Approved Good Housekeeping. Everybody a customer. Fine opportunity. Sample free. Solar Products, J-2144 So. Troy, Chicago.

POLMET Polishing cloth removes tarnish from all metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retail \$2c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Massachusetts.

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., 428-B North Clark, Chicago.

FAST Mail seller—Free sample. Plans, Circulars furnished. Seewagon, 2328 West Pico, Los Angeles, Calif.

FREE "Booklet of money making opportunities." New ideas, original plans, money making secrets and other valuable information. None require peddling or outfits. Elite Co., 214 Grand St., New York.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Masul Company, Tribune Bldg., New York, N. Y.

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, Deratur, Ill.

AGENTS Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filter Co., 553 Broadway, 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 samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS—Opportunity to make money: book containing 37 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

SELL Men's neckwear—wonderful proposition. Astor M. 39 East 28th, N. Y.

FLAVORING Extracts—Bottle yourself! Labels furnished. 600% profits! Whirlwind money-makers! Repeaters! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

HIGH-GRADE SALESMEN WANTED

SALESMEN-DISTRIBUTORS. New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100%. Up to 300% to dealers. Easy seller. Exclusive territory. Economy Rubber, 619 Burkhardt, Dayton, Ohio.

SELL 2-Pants suits \$18.50. Virgin wool—\$5 profit. Finest workmanship. Backed by \$25,000 guarantee bond. Fastest selling line out. 6 1/2"x26" double samples free. Actual leads furnished. Bonus sample suit. Williams Bros., 879 Broadway, Dept. M-56, New York.

WANTED: Man in each county who will be satisfied with \$25 to \$35 a week earnings at the start doing service work and demonstrating new automatic fire alarm in schools, homes, hotels, theatres, public buildings, etc. Write quick for county appointment. Fire-Cry Company, Dept. 616, Dayton, Ohio.

\$18 TO \$25 Daily; biggest selling line of men's suits. Meets present day conditions. Amazing values at \$11.95, \$14.50, \$16.95, \$18.95. Also raincoats, slickers, topcoats and boys' suits. Biggest commission paid in advance. Liberal bonus. Free outfit. State age and selling experience. "Jim" Foster, Inc., Dept. 24, 2250 South Spaulding Ave., Chicago.

OLD Reliable manufacturer offers men calling on industrial trade slide line that sells today. No high pressure bunk. No investment. Speedway, 52nd Ave., Cleveo, Ill.

BRUSH Salesmen with successful records. We have something new for you. Write today, stating experience and qualifications. Northridge Brushes, Freeport, Ill.

GARNEB Wants distributors, able to finance your own sales, to sell cigarette-paper holders which fit into the lid of the tobacco tin. Sample for retail price of two bits. Garner & Company, Burns, Oregon.

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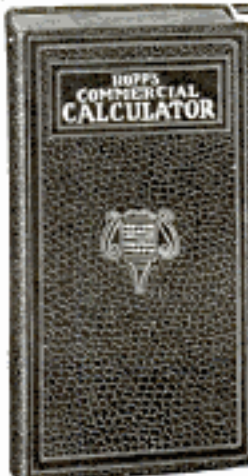
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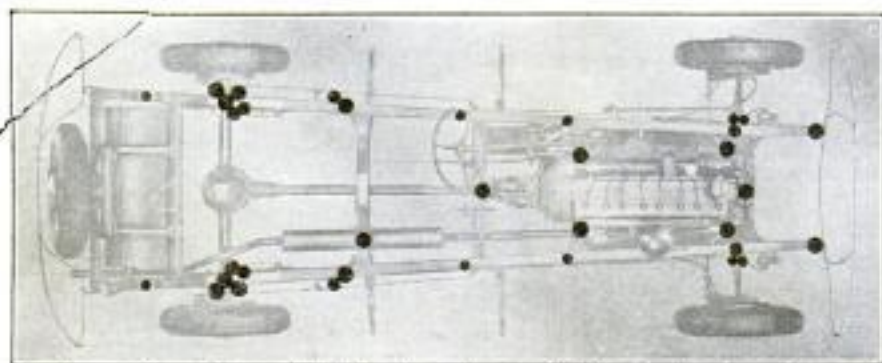
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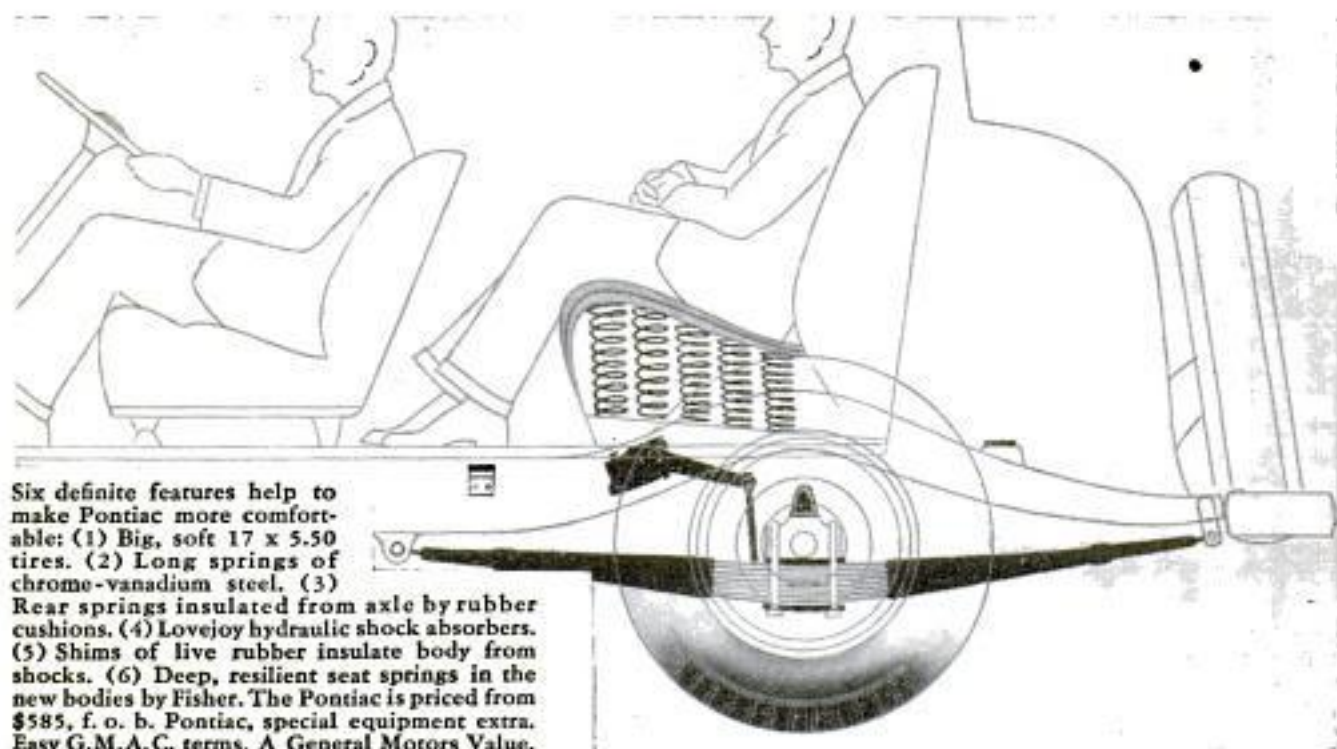


This is one of the three types of steel-encased live-rubber engine mountings used on the Pontiac Straight Eight to eliminate every trace of vibration in Pontiac's big engine.

Fisher No Draft Ventilation makes it possible for driver and passengers alike to regulate individually the exact amount of draftless ventilation preferred.



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Six definite features help to make Pontiac more comfortable: (1) Big, soft 17 x 5.50 tires. (2) Long springs of chrome-vanadium steel. (3) Rear springs insulated from axle by rubber cushions. (4) Lovejoy hydraulic shock absorbers. (5) Shims of live rubber insulate body from shocks. (6) Deep, resilient seat springs in the new bodies by Fisher. The Pontiac is priced from \$585, f. o. b. Pontiac, special equipment extra. Easy G.M.A.C. terms. A General Motors Value.

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Vol. 59

APRIL, 1933

No. 4

C-197 The RADIO ROBOT of - - the AIRWAYS - -

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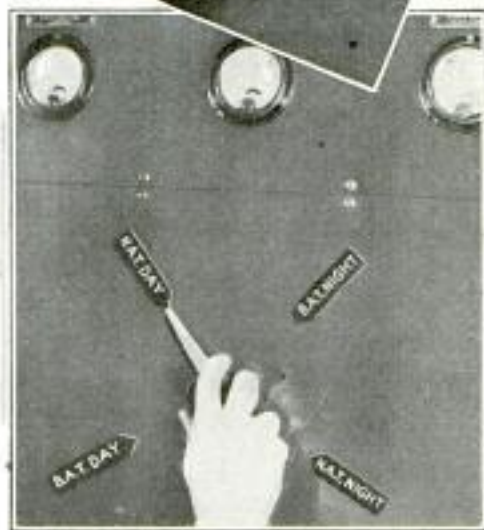
A FEW months ago the head of the radio laboratory of an air-transport company had a grouch and didn't care who knew it.

"They want us to make an automatic frequency changer," he grumbled. "Might as well ask us to build a mechanical man able to play the piano by ear."

"What you going to do about it?" asked his assistant.

"Do?" echoed the engineer. "The same as always—waste a lot of time thinking of reasons why it can't be done then go ahead and make it."

And that is exactly what happened, just as it usually happens in the radio department of the air companies. They found a dozen good reasons why the thing was impossible, then went ahead and did it. As a result every ground station of the United Air lines and every ship on its airways



Top, Operating Automatic Frequency Changer in Tail of Transport Plane; the Control Will Soon Be in Pilot's Cockpit; Below, Turning Knob to Change Frequency of Ground Station.



will soon be equipped with an apparatus so complicated that its makers, at a loss to describe it, dubbed it the "Rube Goldberg." At the turn of a little knob, it performs seven complicated operations simultaneously, then checks on its work, changing the frequency of a short-wave station and making all the delicate adjustments this necessitates—and doing a better job of it than an expert radio man could.

But why change frequencies? Why not operate the air-line radios on planes and on the ground at a constant frequency like the long-wave broadcasting stations? You must go 200 miles above the earth to find the answer.

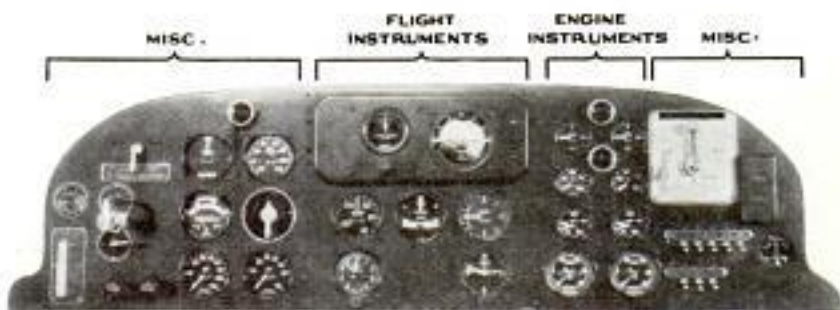
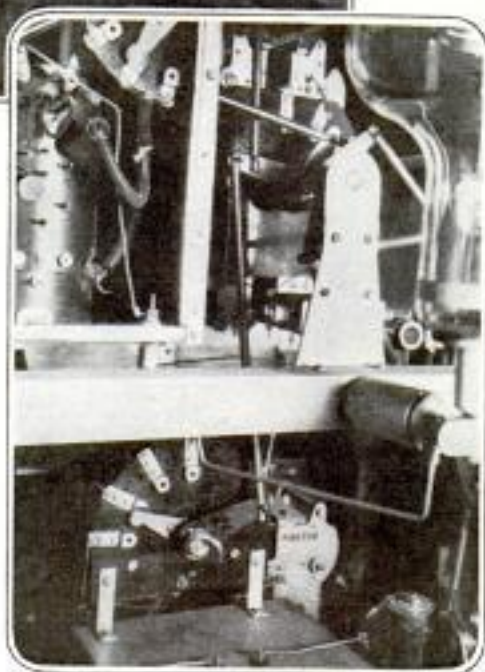
All air-transport ships are equipped with radio receivers and transmitters over which the pilots in the air report regularly by telephone to ground stations spaced at intervals of about 200 miles along the air routes. The pilots in turn receive from the ground stations weather data, orders and other information. This communication system between ground stations and ships operates on short waves, and short waves possess peculiar characteristics.

For instance, a signal transmitted from a ground station to a ship in flight does not proceed direct from station to plane except when the plane is so near the station it receives a ground wave signal. Otherwise the wave strikes the Kennelly-Heaviside layer of

ionized gas high above the earth, "bounces" off and is reflected back to the ship much as though the wave were a ray of light and the Heaviside layer a mirror.

If this Heaviside layer remained at a constant height above the earth, there would be no need for a Rube Goldberg. Unfortunately it does not. In the daytime when the sun is shining, it moves down to about 150 or 200 miles above us; at night it moves upward to a height of 500 miles or more. This shifting changes the an-

(Continued to page 140A)



Top, Radio Operator Changing Frequency; Center, Some of Levers Which Make Automatic Change Possible; Below, the New Instrument Panel of Late Boeing Plane

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C 262

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Driver Pushing Button in Car Top to Lower the Curtain over Back Window; Device Is Aid in Night Driving

REAR CURTAIN IS CONTROLLED FROM DRIVER'S SEAT

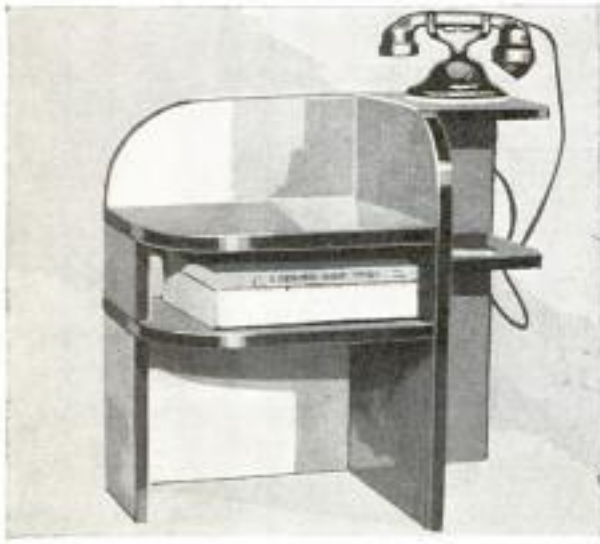
Controlled by a button just above the front door, the rear curtain of a current model automobile can be raised or lowered at the driver's will. Pushing the button one way rolls down the curtain, enabling the driver to eliminate the glare from auto lights behind him, and reverse action rolls it up. The arrangement solves a serious problem in night driving.

ROAD MADE OF STEEL GRATING NEEDS LITTLE MAINTENANCE

Austria is experimenting with a zigzag steel-grating road which costs about fifteen cents a square foot and requires little maintenance for twenty years, it is claimed. The zigzag strips, about one inch wide, are electrically welded or bolted two inches apart in upright position to bed strips of steel at the factory, the units ranging from thirty-two to forty-eight square feet and weighing approximately three pounds per square foot. This type of road is particularly suited for surface improvements where it is desired to repair a worn road to stand heavy traffic. The steel-ribbed surface does not settle on a properly graded foundation, it is claimed, and the sections, laid in place and bolted together, are covered with a fine gravel or other similar mixture having a bituminous binder to prevent oxidation of the strips. The filler is worked in by traffic.

TELEPHONE STAND WITH SEAT SERVES SMALL HOME

Constructed for the small home or apartment, a combination telephone stand and seat has been produced. The piece of furniture is twenty-three inches high, twenty-three wide and thirteen deep. Telephone and directory are in sight, easy of access.



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Camera-Transit for Making Photo Records



How Fire May Be Located by Meter Card, and, Inset, How Records Are Produced by the Camera-Transit

automatically on the negative, which also shows a level line. By sliding a card, called the photo-transit meter, to the position on the photo from which a reading is desired, it is possible to make readings which never vary more than two minutes. In the

Combination of the panorama camera and the surveyor's transit has resulted in a device that produces photographic records of wide areas. As many as 1,000 readings can be made from some of these photographs, enabling the United States forestry department to locate fires more rapidly. The camera, which is mounted on the legs of a transit, does not revolve like the panorama camera. Instead, the lens rotates. The film or negative is arc-shaped. In making photographs, a 120-degree arc is recorded at a time, three exposures being necessary to complete the 360-degree circle. Each exposure is made with the camera in a different position. The degrees are marked

forestry service, photographs of what a lookout sees are filed at the nearest forestry station. When the lookout locates a fire with his transit, he phones the readings to the nearest station. From this information, the location of the fire is found by referring to the marked photos of that particular area, giving the foresters an idea of the topography and enabling them to make plans for combating the flames.

ROTATING STEP PLATE ON AUTO SAVES RUNNING BOARD

Much wear on automobile running boards can be eliminated by installing a new step plate that revolves under pressure of the foot. When entering the car, the motorist steps on the running board with the ball of the foot resting on the plate. This results in a smooth, gliding motion instead



of twist and wear on both running board and shoe sole. The plate, seven and one-half inches in diameter, is covered with thick rubber and rotates noiselessly and smoothly on a fixed base.

WINTER'S AIR TO WARM HOME BY REVERSE REFRIGERATION

Tests of a method for reversed refrigeration indicate to engineers of the Westinghouse Electric and Manufacturing company that it is possible to use outside air for heating the home on cold days. In the electric refrigerator in the home, heat

Capt. H. Miller 3302 1/2 Ave
Staten C. Portland, Ore

C213

C220

26 M. Rogers
711 Pine Ave. Pacific
Escondido, Calif.

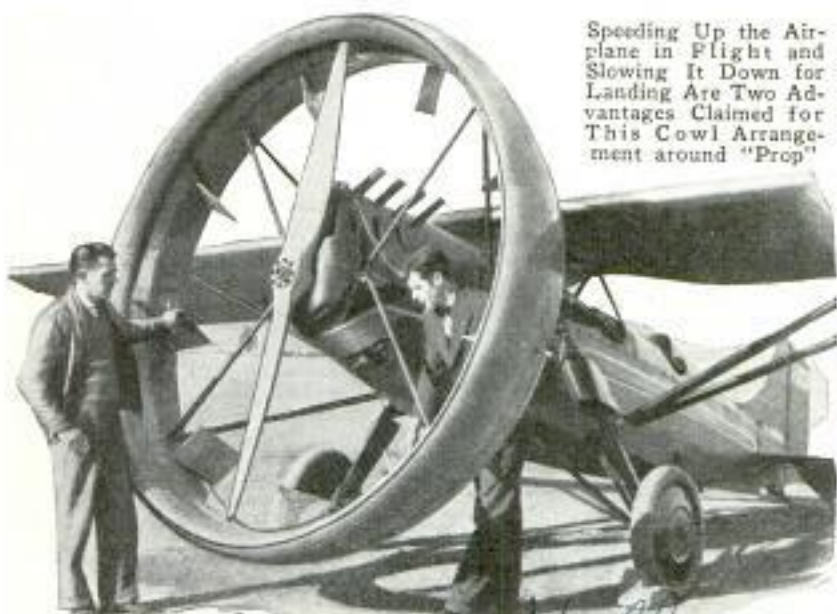
E. Pittsburgh Pa

copyrighted material

which finds its way into the compartment is absorbed by the refrigerating mechanism and discharged into the room slightly above room temperature. The same process can be used to heat a house in cold weather, the heat being taken from the outside air and liberated within the house at a temperature sufficient to warm it. There is real economy in the process, since the energy consumed in mechanical refrigeration represents only a fraction of the heat energy delivered. One test home was heated successfully by Westinghouse engineers using experimental equipment. The arrangement can be used for cooling in summer, also.

RING COWLING FOR PROPELLER MAKES PLANE SAFER.

Increasing the safety factor for airplanes by permitting landing at slower speeds, a ringlike cowling for propellers has been tested successfully. The device is said to speed up planes from thirty-nine to 140 per cent in flight and to slow them down as much as desired for landing. The cowling, which is a ring several inches wide around the air screw, straightens out the blast of air from the propeller, creating a partial vacuum around the fuselage and thus increasing air speed. In landing, deflectors inside the cowling are adjusted from the cockpit to serve as brakes against the wind, slowing down the plane and increasing safety. The device can be used on all types of planes.



Speeding Up the Airplane in Flight and Slowing It Down for Landing Are Two Advantages Claimed for This Cowl Arrangement around "Prop"

Inv. { Carl J. Hall
 { Frank C. Nixon } Compton, Calif.
 Lett. Pat. No. 1,720,000



Ladder with Adjustable Paper Tape Which Aids in Learning Musical Scale and Chords

MUSIC LADDER TEACHES SCALE AND CHORDS QUICKLY

By means of an adjustable paper tape, a "music ladder" is being used to teach scales, chords and other fundamentals of music in a short time. The tape is turned with a small crank so it moves up or down past eight rungs in the ladder, which can be set by the user to any scale desired. On the rungs are printed the terms of the common scale, so that, when a letter on

the tape is turned opposite the first rung of the ladder, that letter denotes the key which the scale is in. Thus the student immediately sees before him the number of sharps or flats for any scale by merely turning the crank. Likewise, scale construction, interval measuring and chord building are visualized by adjusting the paper tape or changing the position of scale rungs. The ladder can be obtained in sizes for individual use, and also larger for the classroom.

Cherley Mills. 825 Lacey St. San Francisco, Calif.

C. 17 2.

Colson C. Elyria, Ohio



Wide World

How Mail Is Distributed in One Factory; Two-Wheel Letter and Package Carrier Replaces the Front Wheel of Bicycle

MAIL DELIVERED ON TRICYCLES BY GIRLS IN BIG PLANT

Mail is distributed through the East Pittsburgh plant of the Westinghouse Electric and Manufacturing company by girl messengers operating tricycles. Two front wheels support a box for carrying letters and packages, while the rear wheel is for propulsion, arranged like a bicycle. The tricycle squad handles 5,000 pieces of mail daily and covers 20,000 miles per year.

been produced by the new method, it has been estimated that the solid could be produced at not more than \$25 a ton, varying with the cost of natural gas. In a plant designed to operate on flue gas from other industrial operations, the first cost of the gas would vanish, the only expense being its purification and subsequent processes.

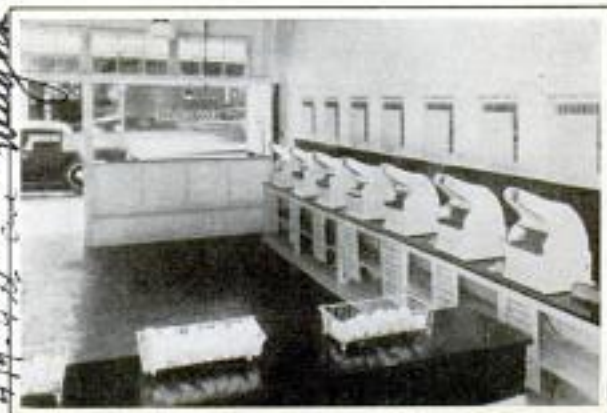
C-54 BUYER CAN LOOK THROUGH EGGS ERE HE PAYS

Housewives who ask for fresh eggs now can be sure of getting them if

their grocer has an "egg-o-scope" which enables them to see through a carton of a dozen eggs at a glance. In effect, it is an "X-ray" machine for eggs and somewhat resembles a cash register in appearance. Under the carton of eggs is a strong light which is passed through a screen and broken up so that the infra-red rays are released. This infra-red filtration and automatic ray control cause the materials and gases in the eggs to reflect certain definite colors. Fresh eggs have a clear golden color and varying stages of decomposition show up from red to green or purple, and in extreme cases, black. By slipping a carton in the device, the purchaser is able to examine each individual egg and be certain that every one of the dozen is fresh before paying for them.

C-23 REFRIGERANT FROM FLUE GAS UTILIZES WASTE PRODUCT

Manufacture of a valuable refrigerant from flue gas, which now drifts into the air as waste, has been made practical, as the result of experiments begun by Prof. Hamilton P. Cady at the University of Kansas. Until this development, manufacture of this refrigerant, solid carbon dioxide, had been confined to natural gas containing not less than seventeen per cent of carbon dioxide. Flue gases contain from eight to twelve per cent carbon dioxide. After a series of experiments, a method was found for eliminating most impurities from the combustion chamber, and the flue gas, which is virtually colorless before compression, was turned into solid carbon dioxide. Although commercial quantities of the refrigerant have not



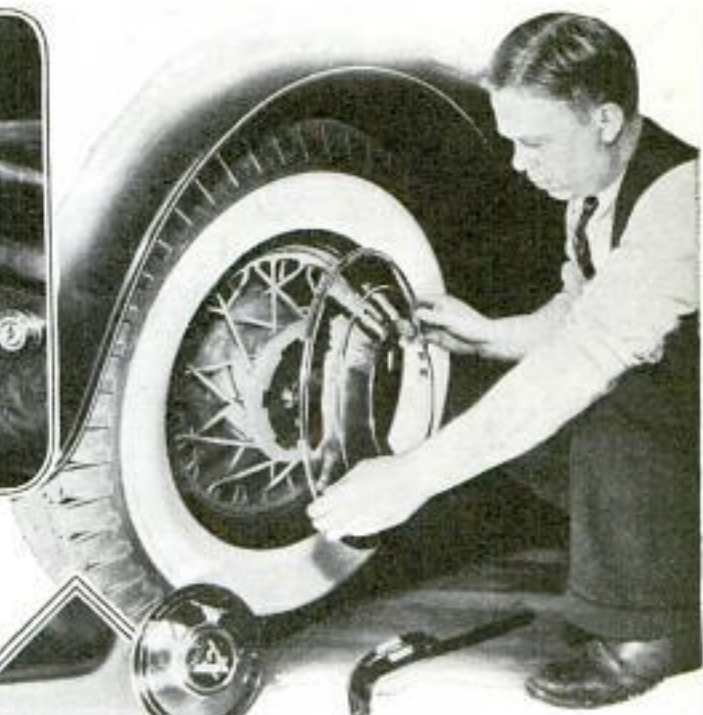
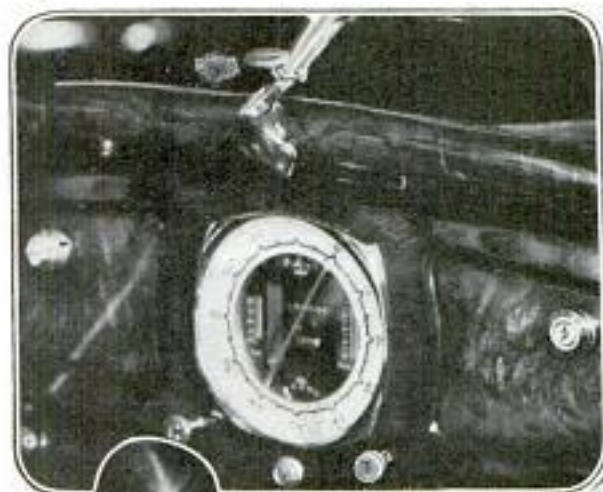
Egg Testers Which Enable Customers to See through Cartons of Eggs before Buying Them

Dr. W. H. Lasser 1211 W. Flagler St. Miami, Fla.

Univ. of Colorado Boulder, Colo

Boxes made from 1/16" steel by Westinghouse
Announced by Dr. Frank C. E. Reynolds by rector of Westinghouse and not Chemist
University of Colorado Boulder, Colo

Comfort and Beauty Features of Latest Autos



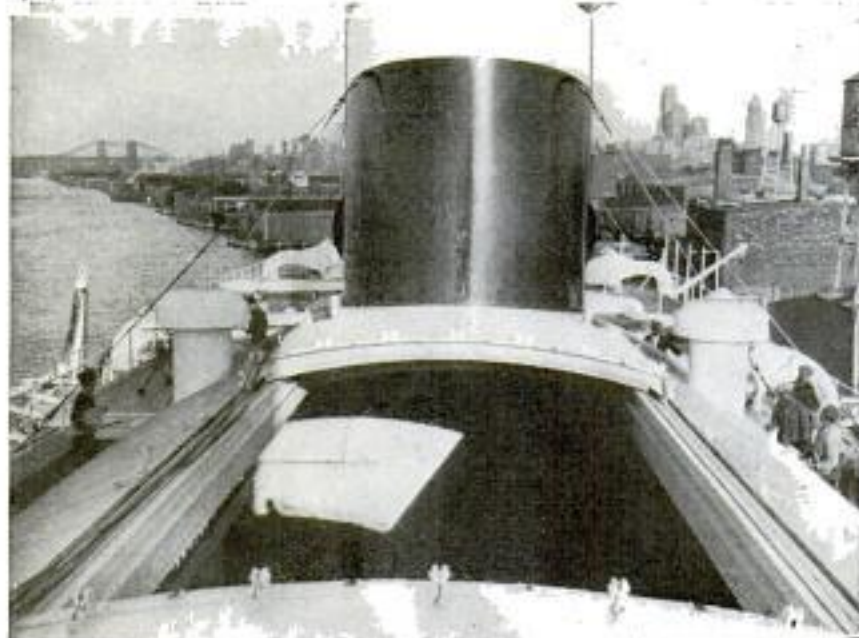
Top, Left, Simplified Dash of the Graham; Large Dial Includes Speedometer, Ammeter, Gasoline Gauge, Oil Gauge and Water Thermometer; Top, Right, Wire Wheels of the Cadillac Can Be Converted into Disks by Attaching Cover; Center, Left, Blocks Built into Rear of the Graham Make It Easy to Jack Up Car; Center, Right, Container for Paper Towels on the Hudson Is Adaptable to Other Autos



Above, "Straight Through" View of the Pillarless DeSoto; Note That Center Columns Have Been Eliminated; Door Catches and Locks Are at Top and Bottom of Body; Right, Pointing to Divided Bumper at Front of the Graham; This Innovation Makes the Bumper Conform to Flowing Lines of the Modern Auto, Adding to Its Beauty without Loss of Strength



C-41



Acme
Above, Sliding Roof of Dining Room of "Santa Paula";
Right, Dining Room with Roof Rolled Back

SLIDING ROOF FOR DINING ROOM GIVES LINER OUTDOOR CAFE

One of the luxurious features of the recently launched Grace liner, "Santa Paula," is a sliding dome which covers the main dining room. When this roof is rolled back, the passengers are offered the effect of an outdoor cafe in good weather. In inclement weather the roof is as weather-proof as though it were fixed permanently in position.

GAS-SAVING ENGINE FOR AUTOS HAS UNUSUAL DESIGN

002159
Ans
Intended to reduce gasoline consumption fifty per cent in operation of automobiles, an engine constructed on unusual lines has been patented. A new cycle of operation developed by Prof. Hamilton Johnson, of Baton Rouge, La., is the basis for the engine. In the Otto-cycle engine, almost universally used in automobiles, a combustion space of fixed volume is provided. Into this the charge of air-and-fuel mixture is compressed before ignition. An inlet valve closes at a fixed point in the compression stroke of the piston. Professor Johnson's engine is arranged so the volume of the combustion chamber and the time of closing the inlet valve during the compression stroke may be varied while the car is in motion. A piston which

moves up or down in the cylinder to increase or decrease the volume of the combustion chamber, is operated by a small electric motor. A switch on the dash permits the driver to increase his speed by starting the mechanism which moves the regulating pistons up, increasing the energy output of the engine. At the desired rate of speed, the switch is released and the car continues at its new rate. Reversing the mechanism decreases the



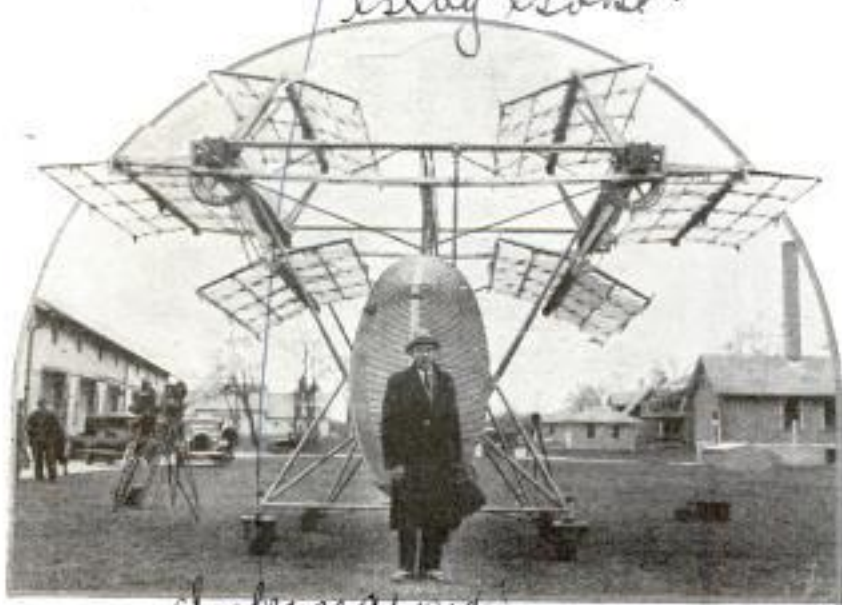
auto's speed. It takes about five seconds to change from twenty miles per hour to sixty, the throttle valve remaining wide open at all speeds. In the Johnson engine, the compression pressure, the air-fuel ratio, the explosion pressure and the percentage of dilution of the fresh charge with burned-out gases from the previous stroke, all remain constant, regardless of the speed of the car. In the Otto cycle, all these factors change as the speed decreases and each changes in such a way as to lower the fuel economy of the en-

002134

gine. Professor Johnson points out that the Otto-cycle engine gives excellent efficiency and fuel economy when operated with wide-open throttle. But at speeds of twenty to fifty-five miles per hour, only twenty to fifty per cent of the engine's maximum energy is used, resulting in a falling off of fuel economy. Professor Johnson estimates that his new engine will deliver an average mileage per gallon of gasoline twice as great as is obtained from engines now in use.

C 116
**PLANE WITH WINGS LIKE BIRD
 UTILIZES ROTARY MOTION**

After making a study for several years of the principles of aerial propulsion utilized by birds, a New Jersey inventor has made an airplane with wings which he claims applies the same idea. His ship is equipped with three wings on each side but they rotate instead of flapping, the revolving blades giving a balanced action, or flywheel effect. The valves in the wings open on the upstroke and close on the downstroke, thus functioning like the feathers in a bird's wing. The power impulse on the downstroke, when the valves are closed, is a lifting action, thus keeping the ship in the air. In vertical ascent and descent, the wings are maintained at a neutral angle. In forward flight they are tilted into a negative, or gliding angle, while revolving. Altitude is regulated by the degree of rotation.



Invention
 Airplane with Rotating Wings; the Valves Close on Downstroke and Open on Upstroke, Like Feathers of Bird's Wing

*Jonathan E. Caldwell
 Madison, N.J.*



Two Filler Holes Make It Easy to Care for This Improved Air-Cell Battery

**IMPROVED AIR-CELL A-BATTERY
 FOR RADIO ON FARM**

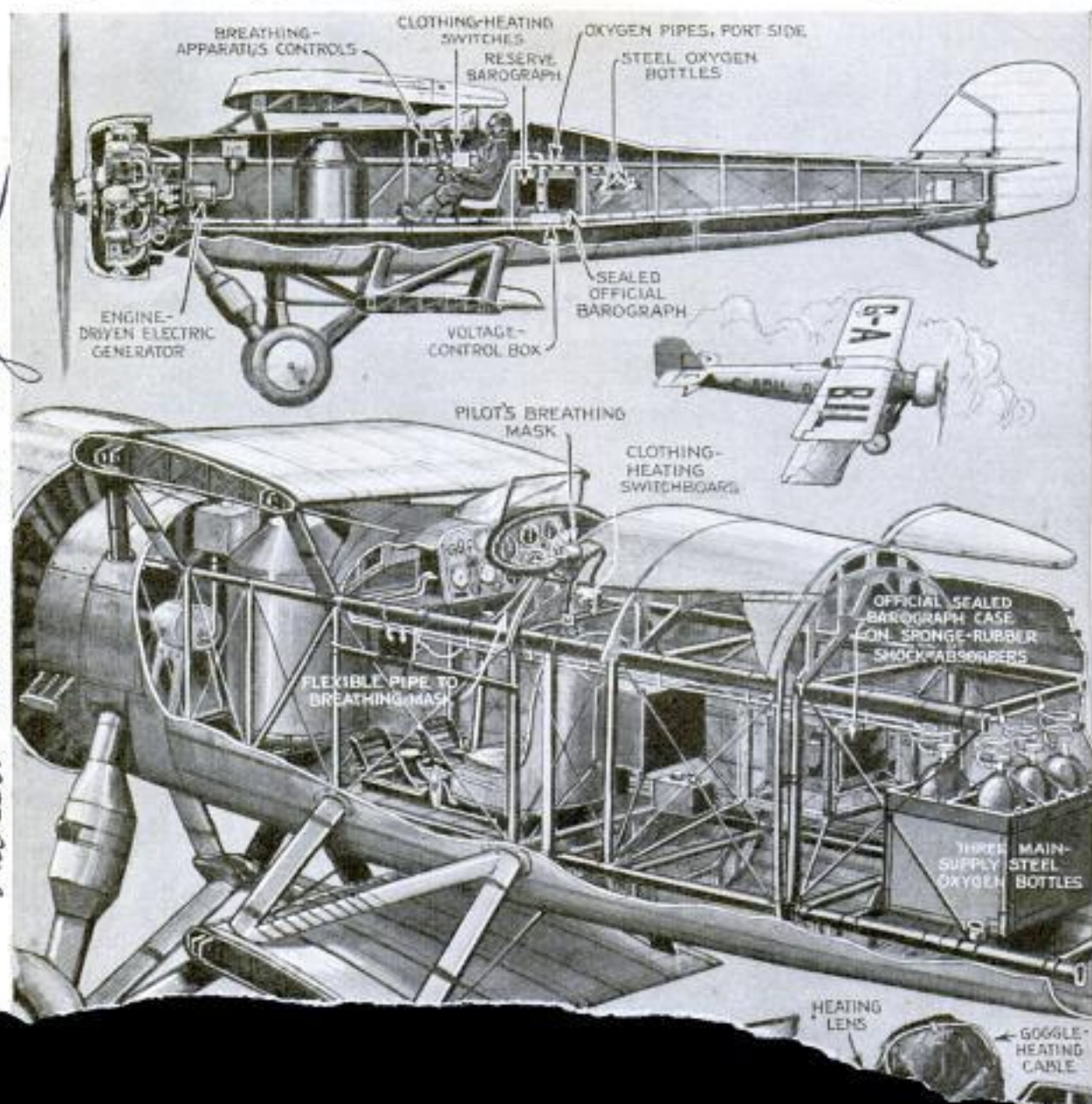
For operation of radios on farms not served by electrical power lines, an improved air-cell A-battery has been produced. A second filling of water to put the battery into service has been eliminated, thus avoiding the occasional premature failure which occurred in earlier air-cell batteries, resulting from neglect to add water four hours after the first filling. By placing a reservoir over each of the two

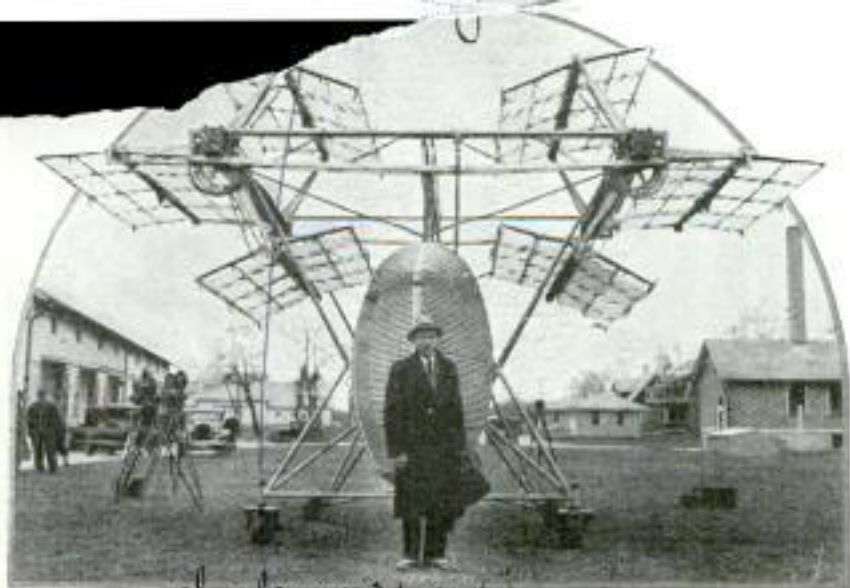
cells, extra water space has been provided, compensating for the settling which takes place as the solid chemicals dissolve. So the improved battery goes into service after one filling with the solution at the correct level. Filler holes are located near the front edge, accessible for the monthly inspection and for periodic addition of water without removing the battery from the receiver. The battery is shipped dry, hermetically sealed, and may be placed in service any time after manufacture.

*National Carbon
 Co. Inc. 19 E. Material
 41 St. New York*

Supercharged Engine Lifts Plane Eight Miles

Air Ministry, Bristol Aeroplane Co
Vickers Aviation Co. England





International
Airplane with Rotating Wings; the Valves Close on Downstroke and Open on Upstroke, Like Feathers of Bird's Wing

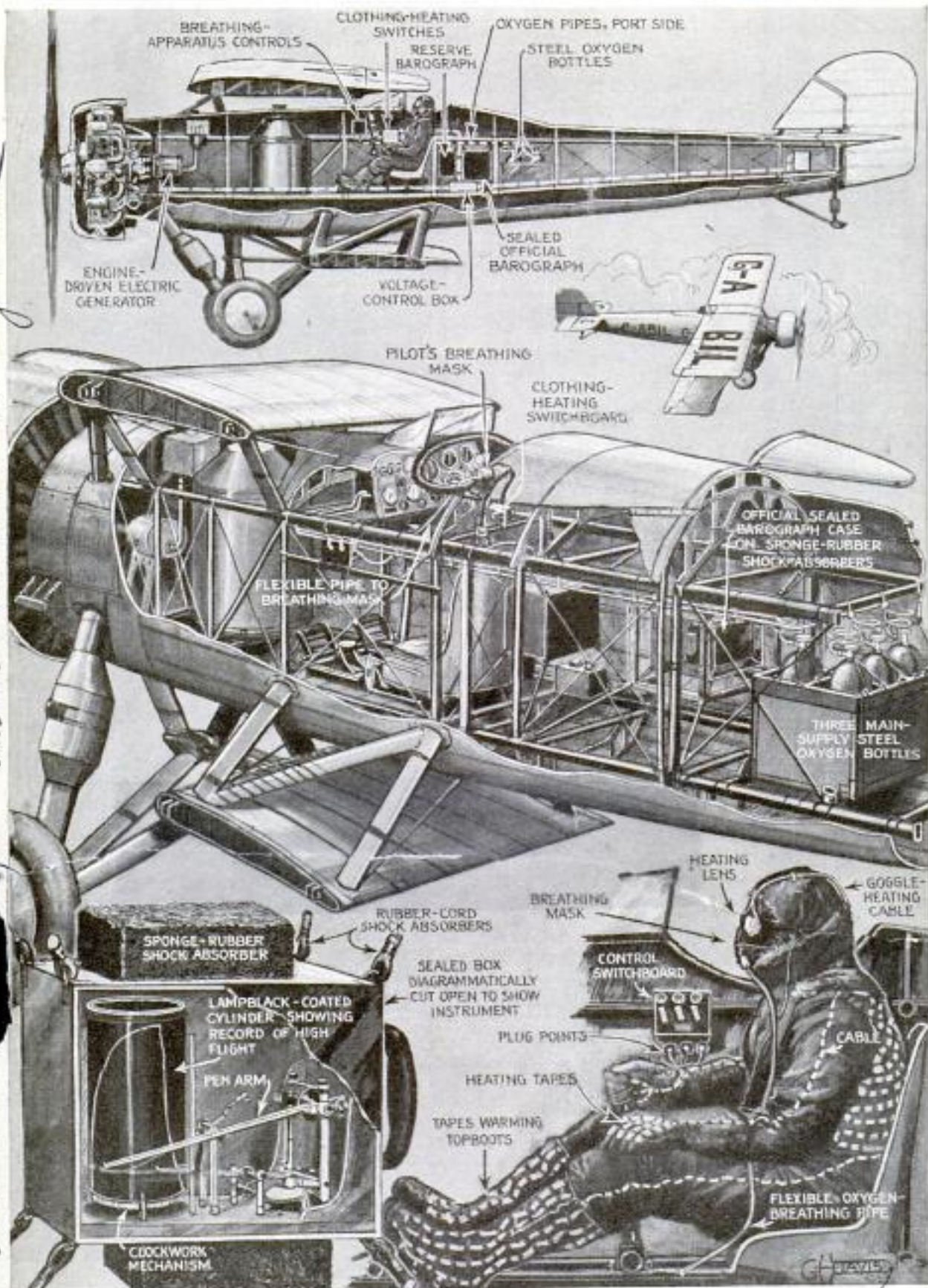
Jonathan & Caldwell
Madison, N.J.

has been provided, compensating for the settling which takes place as the solid chemicals dissolve. So the improved battery goes into service after one filling with the solution at the correct level. Filler holes are located near the front edge, accessible for the monthly inspection and for periodic addition of water without removing the battery from the receiver. The battery is shipped dry, hermetically sealed, and may be placed in service any time after manufacture.

International Carbon
Co. Inc. 1908
41 St. New York

Supercharged Engine Lifts Plane Eight Miles

Air Ministry, Bristol Aeroplane Co. England
Vickers Aviation Co. England



Diagrams of the High-Flying Vickers Biplane, Showing Alterations Made in Stock Ship Which Enabled It to Ascend Over Eight Miles; Note Oxygen Mask Worn by Pilot and Electrically Heated Clothing

*Leimners, Hillside Road,
Ewell, Surrey*

PILOT IN HEATED SUIT CLIMBS TO NEW ALTITUDE RECORD

When Capt. C. F. Uwins, British aviator, recently climbed to a height of 43,976 feet above the earth, he not only established a new altitude record for airplanes, but accomplished the remarkable feat in a stock plane in which few alterations had been made in preparation for the attempt. The ship was a Vickers two-seater biplane with 576-square-foot wing area, and the power plant was a supercharged Bristol radial air-cooled engine. The craft was converted into a single seater, the pilot being placed in the rear seat and a cylindrical fuel tank in the front compartment, the regular wing tank being removed. The compression ratio of the engine, taken from ordinary production, was changed from three to one to seven to one, the diameter of the impeller of the supercharger was enlarged, and a new motor mounting was installed. Driven off the engine, rated at 525 horsepower at 11,000 feet at 2,000 revolutions per minute, was a generator to furnish current for electrically heating the pilot's clothing, the lenses of his goggles and the regulating valves of his oxygen-breathing apparatus. If the generator failed, a twelve-volt battery could be installed to furnish this heat. Four cylinders of oxygen were carried in a special compartment behind the pilot's seat, controls and plugs to the various tanks being placed at the pilot's side. A sealed barograph was carried in a special frame protected by rubber shock absorbers, and a spare barograph was installed in the rear. The pilot took off at Bristol, climbed steadily for 103 minutes and landed two hours and three minutes after the take-off. His instruments revealed that his ship was still climbing when he decided to descend, and that the climb was rapid to 20,000 feet and then slowed as the atmosphere became more and more rarefied. The flyer reported he was comfortable throughout the experience, being kept warm by his electrically heated clothing and obtaining air through his oxygen supply. He broke the record of 43,166 feet made in 1930 by Lieut. Apollo Soucek, of the United States navy.



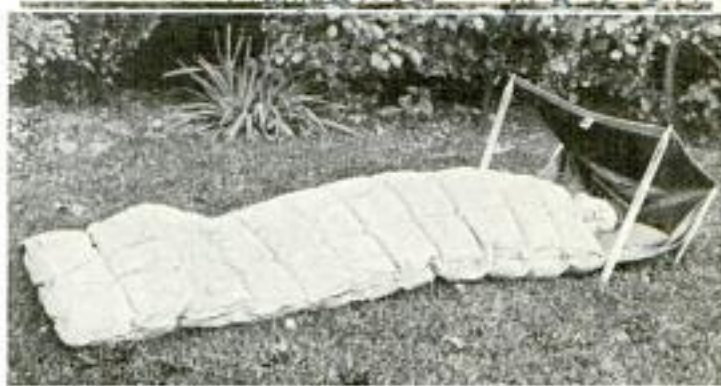
Vending Machine Which Sells Railroad Tickets to London Commuters and Makes Change

COIN-IN-SLOT RAILROAD 'AGENT' SELLS SEASON TICKETS

London commuters who use the underground railway now purchase their weekly tickets from vending machines. They deliver the ticket, test the coins, give the correct change, stamp the ticket with date and register the price paid.

WATERPROOFED SLEEPING BAG HAS SHELTER FOR HEAD

By applying a rubber coating to the inside of a cloth sleeping bag, a waterproof garment for the outdoors has been produced. In addition, the bag has a four-foot extension at the top to shelter the wearer's head.



Weatherproof Bag with Flap for Head Protects Outdoor Sleeper

The American Pad & Textile Co. Greenfield Ohio

Source News Bulletin 1/14/33
 Europe Berlin, 17, Chronographische
 Therapie 11-14, Germanische
 Vereinigung der Naturforschenden
 Freunde in Berlin 17, Chronographische
 Vereinigung

Dr. W. H. Harris, Spanner
 Berlin, N. 4, Chaussee, 17
 POPULAR MECHANICS
 see Dec. 1931 P. 929 Germany

508
 178



Tubelike Electric Lamp Which Utilizes Mercury-Vapor Arc Instead of a Filament

VAPOR USED IN ELECTRIC LAMP INSTEAD OF FILAMENT

Instead of a filament, an electric lamp invented by a German derives its brilliant light from the generation of a high-pressure mercury-vapor arc. It consists of a compact glass tube with two electrodes and is mounted on a standard screw socket. It has a new type of activated cathode and gives off a light containing an abundance of the beneficial ultraviolet rays. The lamp dispenses with a transformer or other auxiliaries, and it is claimed it produces about three times the candlepower of tungsten-filament lamp and burns about four times as long.

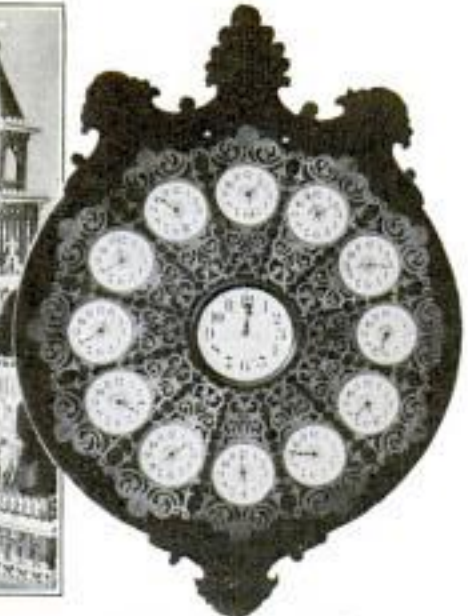
IS CHLOROPHYL SOURCE OF ENERGY?

Chlorophyl, the substance that makes plants green, is being studied in the latest attempt to uncover the secrets of the source of energy. Chlorophyl is the means of capturing radiant energy from sunlight. In one experiment, green clover leaves were ground to a fine pulp and filtered through close-meshed cloth to remove all

living cells, leaving nothing but the chlorophyl and the once-living cell contents in a mixed and fluid condition. Light under various conditions of temperatures was turned on the mixture. Luminous bacteria, that shine when oxygen strikes them, were used as sensitive detectors of chemical activity of the chlorophyl mixture. Their shining showed that the mixture, though certainly dead by all common criteria, was still able to work with light to produce the raw materials of food and fuel. Chlorophyl is known to speed the production of corn in proportion to its concentration in the leaves. And the more chlorophyl the whole plant has, the more it produces in both grain and stalk.

THIRTEEN CLOCKS IN ONE TELL TIME AROUND THE WORLD

One large dial and twelve smaller ones are contained in an electric clock, made by a Nebraska priest and so arranged that each dial gives the time in a different part of the world. He has also made a cathedral model which is electrically operated. Above the twelve-hour mark is a lever which turns on a mechanism when the minute hand strikes it. This causes chimes to tinkle and bells to ring at even hours and floods the interior with light. A small door also opens and figures representing the apostles parade slowly along the base and depart through another door.



Left, Electrically Operated Cathedral Clock; Right, Electric Clock with Thirteen Dials Tells Time around World

at meeting American Assn. for Advancement of Science

Rev. Father Joseph Macourek, Rahonia, Neb

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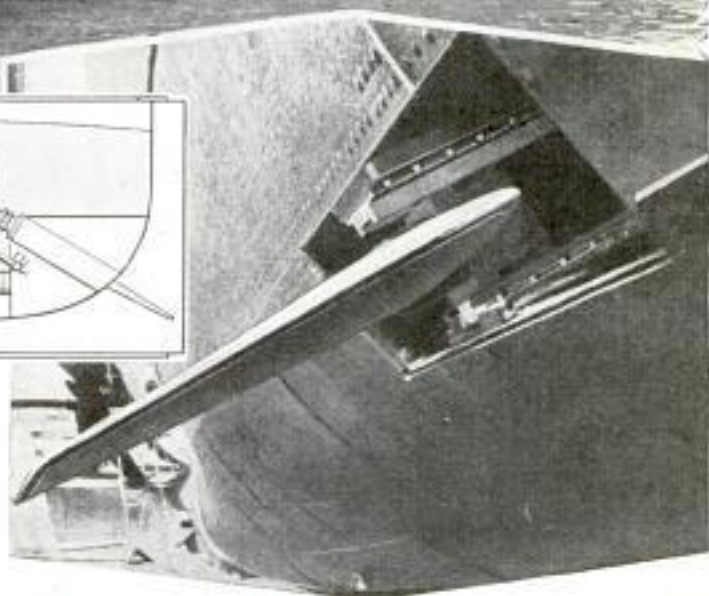
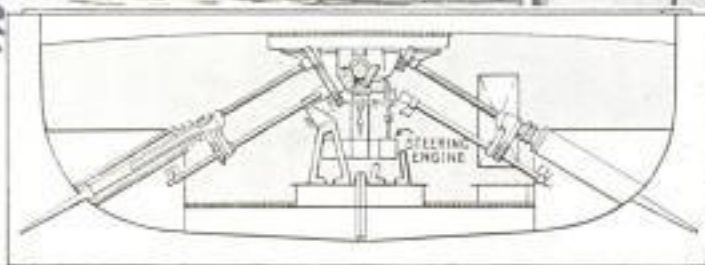
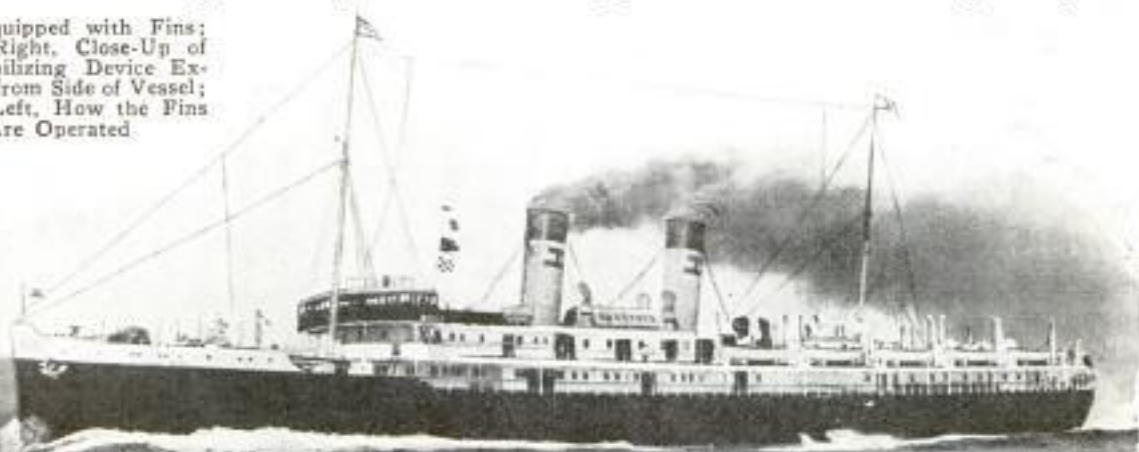
C 185 d m. Japanese engineer,
Mr. S. Motoia.

POPULAR MECHANICS

509

Fins to Stop Ship's Rolling Governed by Gyro

Ship Equipped with Fins;
Lower Right, Close-Up of
the Stabilizing Device Ex-
tending from Side of Vessel;
Lower Left, How the Fins
Are Operated.



Fins projecting outside the hull are in use as a means of preventing a steamship from rolling in rough seas. A special steering gear, which has a small gyroscope as its nerve center, controls the fins. When the ship rolls, the leading edge of the fin on one side of the hull rises, while the edge of the fin on the other side descends. The forward motion of the ship causes the water to exert an upward force on the uptilted fin on the descending side and a downward force on the tilted-down fin on the ascending side. This creates a force, known as a couple, that counteracts the rolling. The gyroscope sets in

motion the fin controls by operating electrical relays. The fins, located about midships, can be withdrawn into the hull when not in use in clear weather. If the ship heels over, it can be brought upright by setting the fins at a fixed angle of tilt. The fins, which act in a manner similar to that of ailerons on an airplane, are particularly adapted for use on small vessels.

C 254

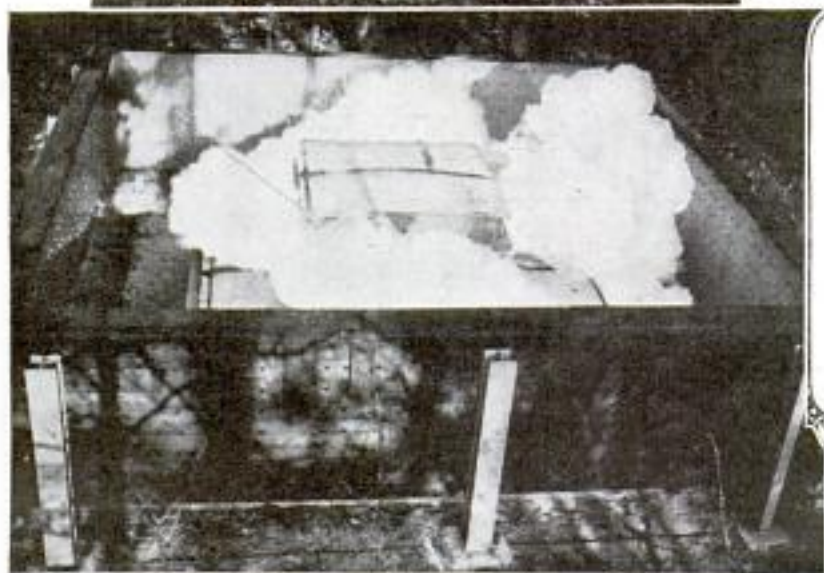
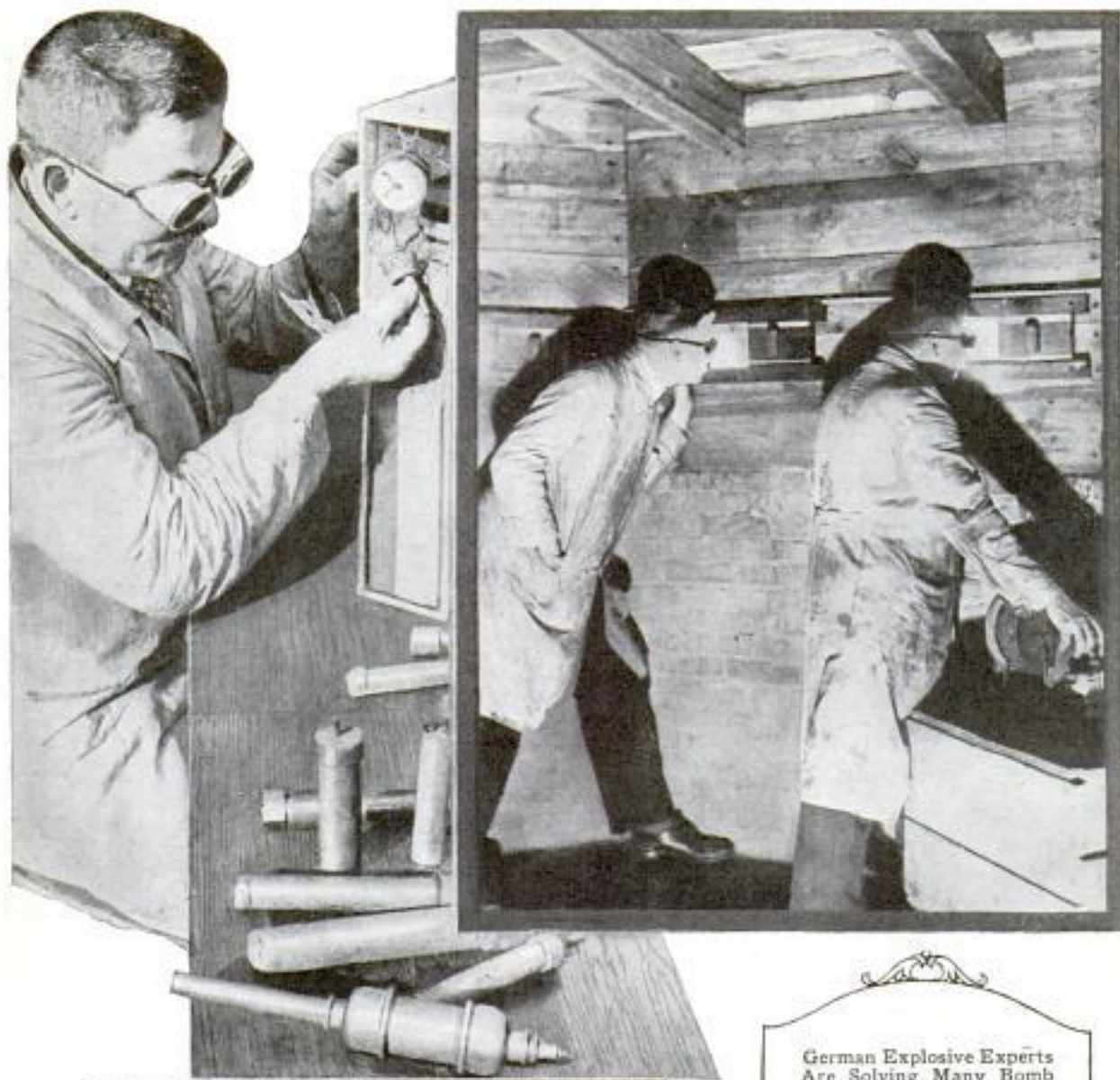
OLD TIN CANS ARE CONVERTED INTO HOUSEHOLD ARTICLES

Useful domestic articles are being made in Guatemala from a variety of second-hand or waste products. Native sandals are being made from used automobile tires, and old inner tubes are converted into waterproof covers for horses and mules and into collars and ox yokes. Kerosene cans are flattened into roofing ma-

terial, hammered into pie plates and molds for bread and cakes, pierced for coal braziers, used for water buckets, flowerpots, lard cans and for storing grain. Smaller tin cans are made into dippers, and old metal drums are turned into water containers, tanks for shower baths, troughs for watering cattle, culverts under bridges and roads, conduits for farm-water supply and, filled with rocks, they are used as caissons in underwater construction.

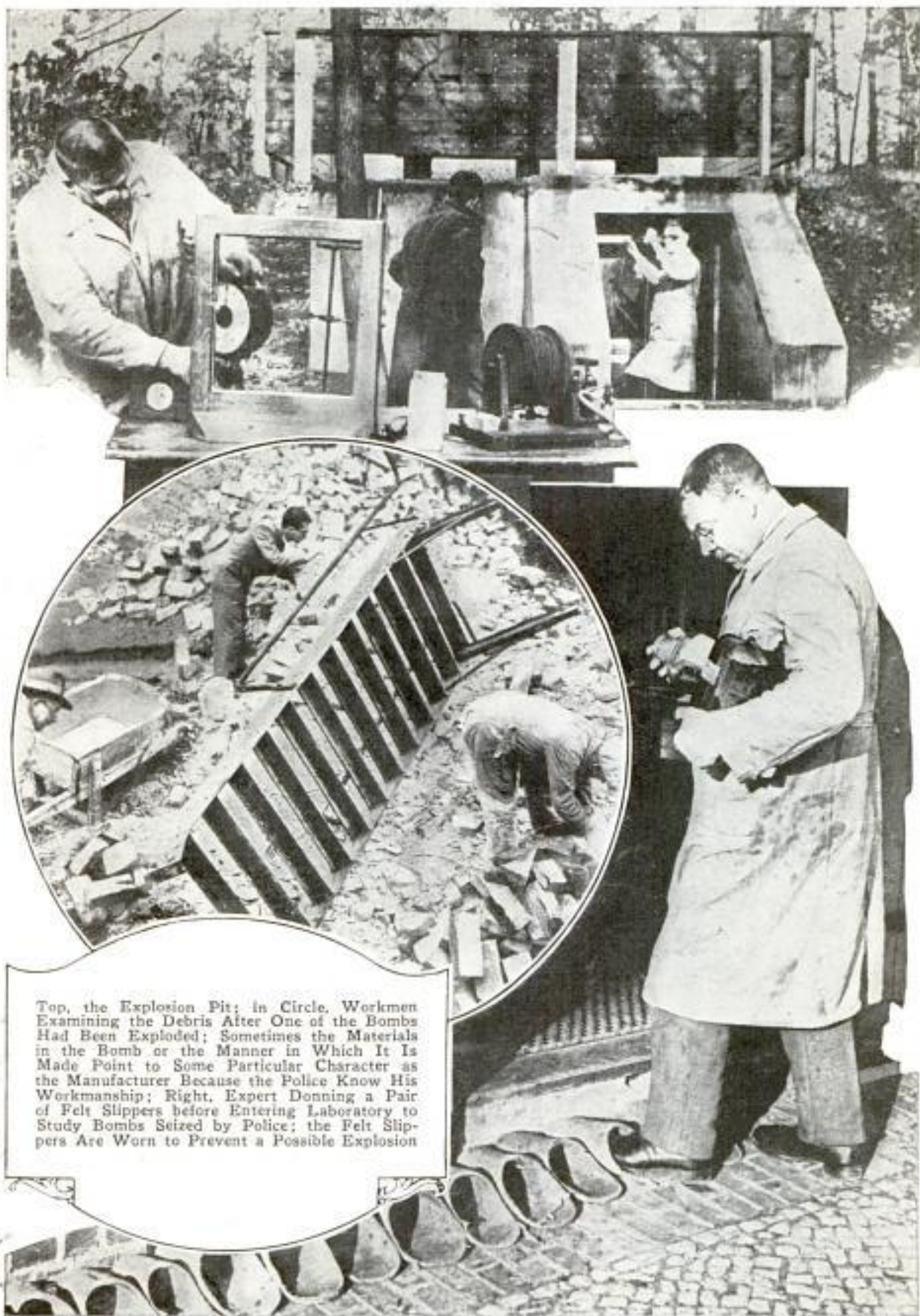
Reported by W. E. Clark, Guatemala City office. Dept. of Commerce. 2/1/33

Experts 'Pull Teeth' of Bombs in Armored Pit



German Explosive Experts Are Solving Many Bomb Outrages by Making a Thorough Study of Every Bombing and a Close Examination of the Missile Itself; When Bombs Are Seized before Explosion, They Are Carefully Examined. Then Made Harmless by Setting Them Off in an Armored Pit Equipped for the Purpose; Above, at Left, Is a Collection of Time Bombs Gathered for Analytical Study; Right, Technicians Watching Bomb Explosion in Armored Pit from Their Dugout; Below, Exploding Bombs in Pit Where Several Can Be Set Off at One Time by the Experts from the Safety of Their Dugout

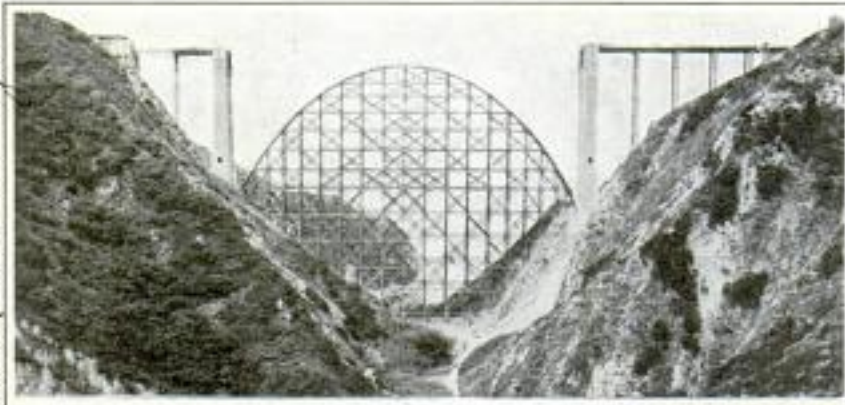
Study of Explosives Helps Catch Criminals



Top, the Explosion Pit; in Circle, Workmen Examining the Debris After One of the Bombs Had Been Exploded; Sometimes the Materials in the Bomb or the Manner in Which It Is Made Point to Some Particular Character as the Manufacturer Because the Police Know His Workmanship; Right, Expert Donning a Pair of Felt Slippers before Entering Laboratory to Study Bombs Seized by Police; the Felt Slippers Are Worn to Prevent a Possible Explosion

Concrete Arch Bridges California Canyon

Reader says this should be called "Redwood Highway" in Calif. Roosevelt in Oregon



One of the outstanding examples of modern concrete-arch construction in this country is found in the recently completed Bixby-creek bridge on the Roosevelt highway in California. This structure is 714 feet long, with a center arch of 342 feet, and carries the roadway 270 feet above the ocean which the coast road parallels. The arch rests on concrete abutments anchored in rock on precipitous slopes of the canyon, 140 feet above the creek. The arch ribs are five feet thick at the crown, nine feet at the springing line and four and one-half feet wide. More than 6,600 cubic yards of concrete and 600,000 pounds of reinforcing steel were used.

PLANES TAKE MINE MACHINERY OVER MOUNTAINS

Thousands of tons of mining machinery are being carried over mountain ranges and jungles in airplanes to gold mines almost inaccessible by other means of transportation. A 4,000-ton dredge recently was carried by plane into the interior of New Guinea, crossing three mountain ranges. This method was employed to get early delivery, to escape ambush by natives and to avoid the expense of building a railroad into the interior. In one instance, a stamp mill was carried from Canada to the arctic circle.

Successive Stages in Construction of Concrete-Arch Bridge on Roosevelt Highway; the 714-Foot Structure Has an Arch of 342 Feet and Carries the Roadway 270 Feet above the Ocean

W. H. Rastall
Chief of Machinery material
1/24/03
W. H. Rastall, Inc.

Cambridge, Mass

FLUID IRON AT EARTH'S CORE BENEATH THICK CRUST

032280

That the earth's interior is a mass of molten iron is the theory of American scientists. Prof. Reginald A. Daly, of Harvard University, pictures the earth as being capped with a crust about forty miles thick, then sections of a sort of glassy rock more rigid than steel, and finally, at a depth of 1,800 miles, a core of molten iron. More than ninety-seven per cent of the earth is too hot to crystallize, due to extremely high temperatures existing at the core. Consequently Professor Daly believes the true strength of the earth is confined almost entirely to the crust, which is so thin, relatively speaking, that it must bend if it becomes loaded with glacial ice, ocean water or deposits of sand and mud. And, the professor says, it must bend in the opposite direction if widely extended loads of such materials are removed. This theory accounts for some of the major disturbances on this planet. It seems best to account for the continued existence of dry land, for the origin of chains of high mountains, for the rise of lava into the crust or all the way to the earth's surface, and for the great chemical variety of the world's lavas.

Model of Munster Cathedral Mounted on a Cart for Exhibition Purposes; the Model Contains 25,000 Pieces of Laminated Wood and 17,000 Pieces of Tiling; Two Men Spent Eight Months Building It



Cologne

MODEL OF CATHEDRAL ON CART EARNS LIVING FOR MAKERS

Reichardt Bros

Two German cabinetmakers who were out of work constructed a model of the famous Munster cathedral, three feet wide, nine and one-half feet high and eight feet long. They used 25,000 pieces of laminated wood, 17,000 pieces of tiling, and spent eight months in building the cathedral, then found they could not sell it. As a result, they mounted the model on a home-made hand-drawn cart and today are making a living by trundling the edifice over Europe, selling picture post cards to those who come to view it. The model contains a complete set of tiny bells which ring the hours, quarter and half hours.

my Ideal of Invention 12/29/32



Diagram of Scientific Theory about Earth's Composition; Note Relative Thinness of Crust

MILK STORED IN FROZEN BLOCKS

Milk is being frozen for storage in India by utilizing a quick-freezing process for liquids invented by a Russian. The fluid is frozen into large blocks and placed in storage for some time. Tests have shown that it does not deteriorate.

includes according to report of Trade Com. of India. Richards, Bombay. + Commerce Dept.

B2249

Carl. E. Schürmacher, 22 869 u
St. Neuf!



The Gold Miners and the "Flying Family" Put into Action the "Lucky Feeling" We All Possess

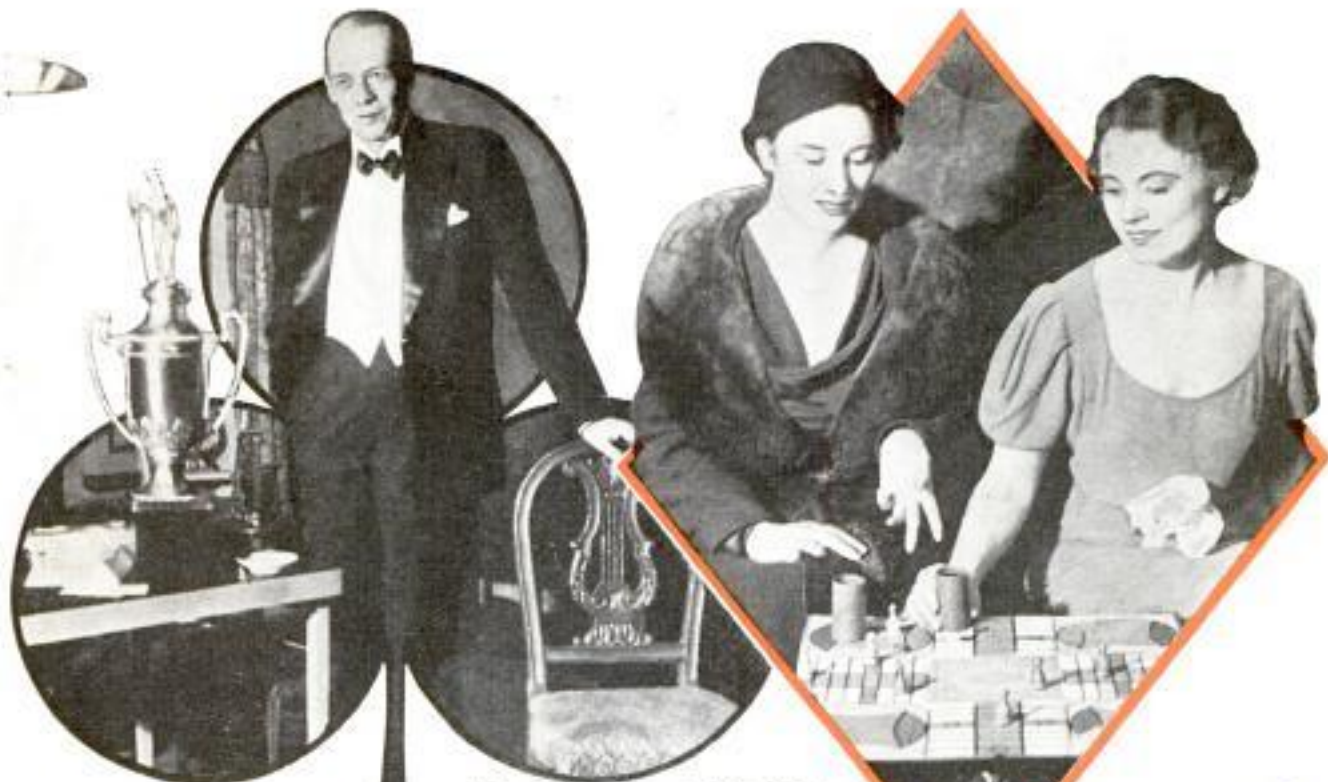
Can YOU



aged along certain lines. This gambling trait when manifested in gambling for money, despite the fact that you may feel lucky, is apt to prove your undoing, a fact that mathematicians have proved by computing averages in chance play. When, however, the lucky feeling is diverted to your occupation or profession, it gives you a better chance of making good, especially if you are of a shy type or lack confidence in what you are doing.

THOUGH laws may be passed against gambling, and teaching strive to suppress it, science has discovered that you have in you a gambling trait, a take-a-chance feeling that is deeply ingrained. Scientifically directed along proper channels by yourself or others, this instinct may even make you famous, while, if allowed to remain uncontrolled, it may take the wrong course and strip you of all you possess. While gambling itself is frequently a vice, possession of a take-a-chance feeling is not and should even be encour-

A survey of the wrong type of gambling for money during the past year shows that, either openly, or under cover, nearly \$1,000,000,000 was spent on various devices and games of chance by people who thought they were lucky. This great sum was placed on a wide variety of bets and games. In San Francisco alone, where the Chinese lottery is popular, the weekly take for the past year has been estimated in the millions. In Chicago and New York, where the policy game is in favor, especially in the colored sections, the amount wagered weekly also ran into seven figures.



The Bridge Expert, Left, Makes the Most of His Cards; Club Parchesi Player, Right, Relies More on Luck

Better your Luck?

"The country seems to have gone lottery-mad," says Solicitor Horace J. Donnelly, of the post office department, who has been examining the gambling and lottery situation as it pertains to the mails. The craze for such gambling has been greater in the past two years than in any period since Postmaster-General John Wanamaker sent the Louisiana state lottery into exile. During the past two years no less than a billion dollars has been kept from going out of this country in support of foreign lotteries.

"The old-fashioned Louisiana and other



world-famous lotteries which brought about the enactment of our stringent federal anti-lottery statutes were mere pygmies in comparison with the colossal games of chance now being launched with individual prizes of around \$2,000,000 each, aggregate prizes of \$10,000,000 and gross subscriptions of \$15,000,000 in just one single sweepstake. The gambler has but one chance in six million of winning the big stake.

"Most of the alleged lotteries we encounter in the mails are not lotteries at all but straight-out frauds. The promoter simply pockets every dollar received. In a lottery that really takes place, the adventurer is just as often duped. Counterfeit tickets are sold and the purchaser has no means of knowing whether he holds a fake ticket or the real article."

In this modern age, although you may actually have no intention of gambling for money, you are confronted on every hand by a maze of gambling devices and lures which bring the take-a-chance feeling fre-



Top, Paying Election Bet by Delivering Ton of Coal by Plane; Right, Who Is "Lucky" Here—the Answer Is "Nobody"



quently to mind. On certain nights your movie may offer prizes to the holders of lucky tickets. At fraternal meetings, merchandise is raffled for the benefit of charity. Some stores offer prizes for lucky coupons bearing winning numbers and you may win a prize if you guess the number of beans in a jar.

Do you feel lucky in some of these gambling devices or games and unlucky in others? Do you have a particularly lucky chair, or lucky day in the week or month in the year? Just what do we mean by luck, anyway?

After making exhaustive tests, scientists, psychologists and mathematicians have come to the conclusion that there is no such thing as luck as we commonly think of it. They have computed the chances you have of winning in certain mechanical games or devices in which the constant factors are known.

There is, however, no way of making you win in the allotted number of chances, no matter how lucky you may feel when playing.

If you play in a game in which there are sixty chances out of 1,000 to win, there is no guarantee that those sixty chances will occur if you play 1,000 times. Those sixty chances may not occur even if you play 3,000 times. Over a vast number of times, however, the average will be sixty in a

thousand. For this reason, people who devise and play systems in roulette or any other game generally go broke.

When you gamble on a horse race, a football game or the possible election of a politician, you do so with a more or less definitely formulated opinion or with some knowledge which prompts you to make your selection. However, when you gamble on a slot machine, in a lottery or with dice, you do so purely on instinct, feeling that certain colors, combinations or numbers are lucky for you. In gambling of this nature science declares that, for the time being, you give up your intellectual for your instinctive life.

Every gambling game has at least two sides, the winning and the losing one. Luck favors no one. You may win or lose. If



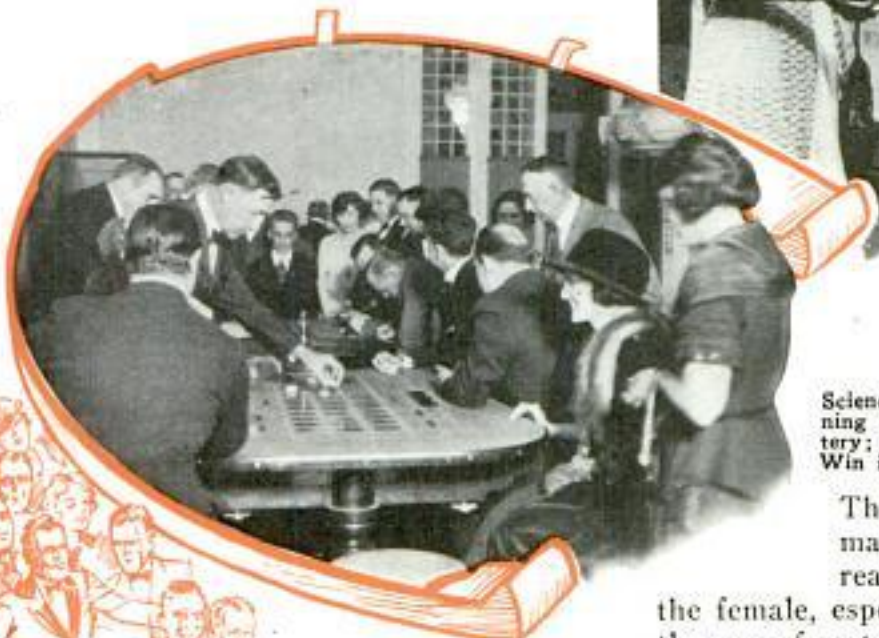
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you win twice in succession, it is a coincidence. If you win twenty times in succession, it is still a coincidence, and you will find that, if you continue to play long enough, you are tempting your luck, meaning that the mathematical law of averages will make itself felt.

One of the greatest fallacies of the present day is that the financial return involved is the prime reason why a gambler plays. Every human being is, in a meas-



Science Knows Your Chances of Winning at the Gaming Table or in a Lottery; There Is No Way of Making You Win in the Allotted Number of Chances



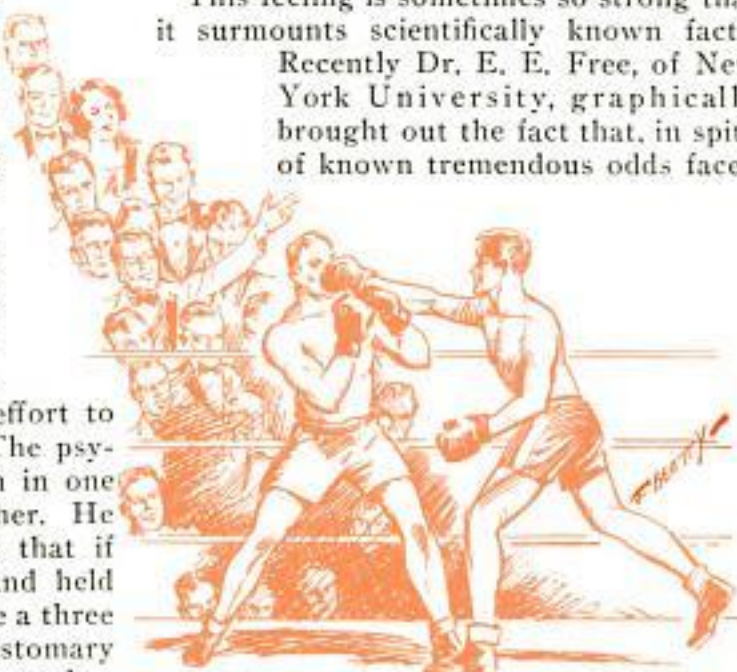
The result showed that the male pupils were much more ready to take the chance than the female, especially as they approached the age of maturity. The adult male was found to be the one with the strongest lucky feeling.

This feeling is sometimes so strong that it surmounts scientifically known facts.

Recently Dr. E. E. Free, of New York University, graphically brought out the fact that, in spite of known tremendous odds faced

ure, a gambler, from the farmer who gambles his seed and labor against drouth and the elements, to the medical scientist who inoculates himself with a newly discovered antitoxin, gambling his scientific training and belief against death.

The lucky or venturesome trait has been charted by psychologists as a result of many tests, one of which was conducted with 776 pupils of both sexes varying in age from ten to twenty-two, in an effort to find the type that felt luckiest. The psychologist concealed a long match in one hand and a short one in the other. He then told the pupils individually that if they correctly guessed which hand held the long match, they would receive a three days' vacation instead of the customary two. If they guessed wrong, however, they would only be given a one-day vacation.



(Continued to page 118A)

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518

Hammond Lumber Co
Los Angeles, Calif
2118 S Alameda.

POPULAR MECHANICS



Collapsible Rowboat Consisting of Four Boards, Two Forming the Bottom and Two the Sides; Canvas Strips Hinge the Boards

PORTABLE FOLDING ROWBOAT MADE OF FOUR BOARDS

Made almost entirely of lumber, a portable rowboat folds flat for easy carrying. The craft consists of four boards, two forming the bottom and the other two the sides. Waterproof canvas strips hinge these boards to each other. Seats, end boards and braces are held in place by hooks. To collapse the boat, the seats and rear end are removed, the two boards composing the bottom are folded upward and the sides fold in against the bottom boards. Seats and end board are inserted between the folds, the oars placed along the top edge, and the whole is bound together with two straps.

more heat from a given radiator size, and the system is also protected against freezing if the ship stands out of doors in cold weather.

LUBRICANT STUDIED IN TESTER GIVING ROAD CONDITIONS

Auto lubricants can be tested under conditions closely resembling those of the open road by an unusual laboratory machine.



Lubrication of wheel bearings, universal joints, spring shackles and transmission is studied as the machine is driven at variable speeds in a room with temperatures as low as thirty degrees below zero or as high as 140

degrees above. Vibration and shocks similar to those on the road are obtained by bolting a cleat on the driving drum. The shackles can be run dry or under a shower of water. Loading of the wheel bearings

ANTI-FREEZE SOLUTION HEATS CABINS OF AIRPLANES

Prestone

On account of its high boiling point, a glycol compound commonly used as an anti-freeze solution for automobile radiators is now being utilized instead of water in the cabin radiators used to heat some of the latest transport airplanes. The liquid is heated in coils in the engine exhaust stacks and is then circulated by an engine-driven pump through small radiators in the cabin. Electric fans force air through the radiator cores and then distribute it throughout the cabin. The high temperature at which it operates provides

C157

Carbide and Carbon
Chemicals Corp.
198 H St. New York

Standard Oil Co
910 S. Michigan Ave
Chicago



Wilson Fold-Flat

Wooden Boat. Fold in one minute. Carry on running board. 10 foot, weight 80 lbs., \$39 f.o.b. Los Angeles; 8 ft., 60 lbs., \$36. Slightly higher f.o.b. New York or Chicago. Send for circular. **Hammond Lumber Co., 430 Arcade Station, Los Angeles, Calif.**

POPULAR MECHANICS

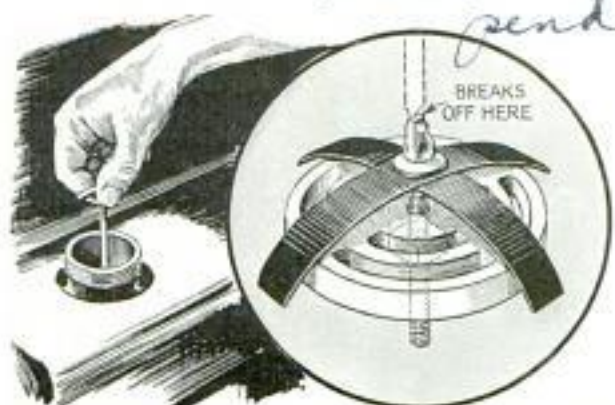
ing the tension are made when with springs, ions, is hooked nts are studied up. Transmission by coupling a regulation transmission to the device. Among the observations at desired intervals are: amount of leakage of lubricant from wheel bearings under normal and high temperatures; evidence of lubrication on wheel bearings at low temperatures; amount of leakage from and degree of lubrication in universal joints; condition of shackles as to wear and lasting properties of the lubricant.

C-50

LOCK INSIDE GAS TANK TO STOP THEFT OF FUEL

Installed in less than a minute without any tools, an effective gas-tank lock which fits inside the neck of the tank prevents the theft of fuel by making it impossible to insert a hose in the container far enough to reach the gasoline. The lock consists of a metal base to which four spring ends are attached by a screw. This is inserted into the neck of the tank by means of a wire handle. Turning the handle causes the springs to expand until they are tight against the sides. The wire handle, which is filed near the lock, is then broken off and discarded and the lock does not interfere with use of the regular gas cap.

50 cents



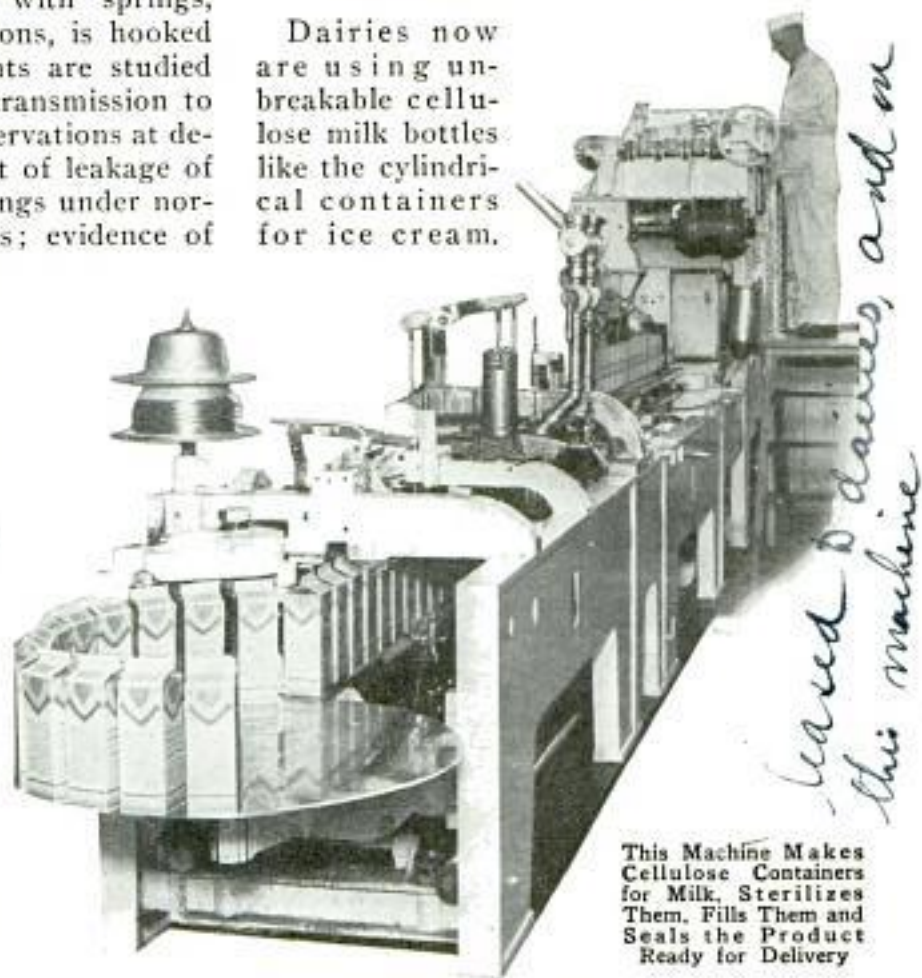
Simple Lock That Can Be Installed in Auto Gas Tank without Tools

Adams Mfg Co. 569 East - Electric Bldg Denver, Colo

B2130 American Paper Bottle Co Toledo, Ohio

MILK "BOTTLES" OF CELLULOSE DISCARDED WHEN EMPTY

Dairies now are using unbreakable cellulose milk bottles like the cylindrical containers for ice cream.



learned dairies, and on this machine

This Machine Makes Cellulose Containers for Milk. Sterilizes Them. Fills Them and Seals the Product Ready for Delivery

The machine which makes these containers also sterilizes them, fills them with milk and seals them ready for delivery. After the containers are formed, they pass automatically to a paraffin bath, then over a refrigerating coil, thence to the filling unit and finally to the point where the tops are sealed. The bottles are packed in corrugated-paper cartons which are used as cases for handling and distributing. No hand touches bottle or milk at any time in the packing process, and the machine has a capacity of twenty-five bottles a minute. It has been found the cellulose bottles do not transmit heat readily, and they are discarded when empty. When a lip at the top is drawn out, the bottle becomes a handy pitcher. The container can carry the trade-mark of the dairy handling it, and dating dies stencil each bottle as it is sealed.

Some transport planes consume 2,500 gallons of gas on a coast-to-coast trip.

Science Service Copyrighted material Nov. 14, 1932

001733

Robert C. Kremer

1730 Columbus Ave

POPULAR MECHANICS

520

Duluth, Minn



Adjustable Metal Supports for Vegetables and Small Fruits; They Are Easier to Adjust Than Poles or Stakes

METAL SUPPORTS FOR PLANTS REPLACE POLES OR STAKES

Production of various vegetables and small fruits is being increased by the use of metal supports instead of the poles and stakes ordinarily employed. The device consists of a steel post, seven feet long, with five wire rings of varying diameter attached about twelve inches apart. Each ring is supported by three hooks which can be attached to or detached from the flanges of the post, and each succeeding ring is larger than the one below it in order to take care of the natural increase in a plant's growth. The support can be used for peas, beans, cucumbers, tomatoes, grapes, raspberries, and in new fruit and nut groves where the trees require support in their early stages. A special base enables the support to be turned upside down and used as a display rack.

DRAWINGS PRINTED IN COLORS REPLACE BLUEPRINTS

Tracings of mechanical drawings may be reproduced in various colors to replace blueprints by a new process. Red lines on white background, black lines on green, yellow or rose and other combinations are

Eric Seimers 2312 City
State Bank Bldg. Chicago

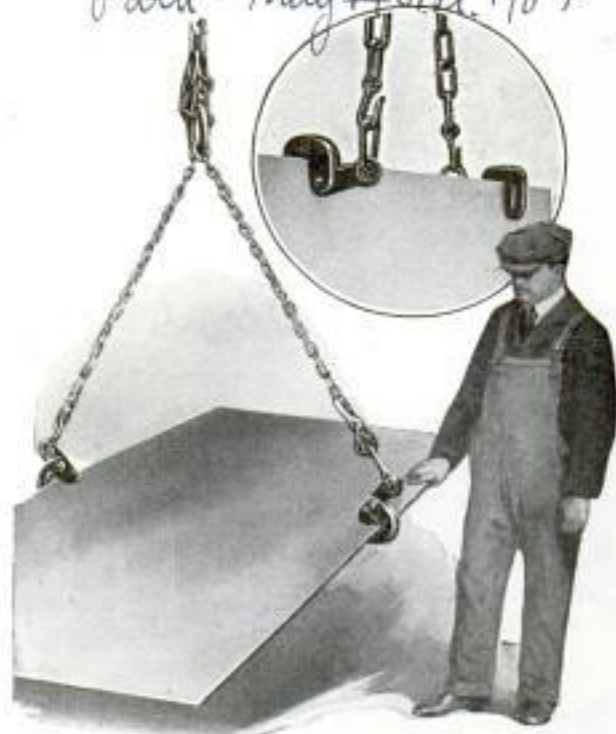
available. By printing from a positive tracing instead of a negative, these color relations are reversed, securing white lines on red, green lines on black, yellow lines on black or rose lines on black. Since the paper on which this work is done is never wet, the time of drying prints is saved for busy drafting rooms. After exposure, the papers are rolled loosely and placed in a glass case, at the bottom of which is a vessel of ammonia. Development may be observed through the glass.

02104

NON-SLIPPING CLAMP FOR SAFE HANDLING OF SHEET METAL

Protection of workers handling boiler plate or sheet metal is provided by a never-slip clamp. The crotch of the clamp hook, usually the first part to break, is made very strong, in order to enable it to stand sudden changes in load. It is easily attached. A number of plates of the same width may be lifted at the same time, while round plates can be handled by attaching three of the safety hooks.

Patd May 31st 1904



How Never-Slip Clamp Protects the Worker by Safe Handling of Sheet Metal

never Slip Safety
Clamp Co. 51
42nd New York

DOCKING *an* AIR LINER

by **RADIO**

By H. W. MAGEE

IN his little coop under the roof of a hangar at the Chicago municipal airport, a United Air Lines radio operator gazes out the window into the murky haze of a raw winter night, then glances at a clock above his desk. The clock, circled with letter combinations representing planes, instead of numerals, indicates it is time for the pilot of an eastbound plane to report, and the operator speaks into the transmitter of a two-way radio phone.

"WUCG, Chicago, calling Johnson in 232; WUCG, Chicago, calling Johnson in 232," he repeats. "Go ahead, Johnny."

Forty miles west, and high above the clouds, the message sputters in the earphones of Pilot Johnson at the controls of 232 as the trimotored transport roars toward Chicago at 120 miles an hour with its load of passengers, mail and express.

"Johnson in 232, Johnson in 232," replies the pilot. "About twenty minutes west of Chicago at 2,000 flying the beam. What's your weather and barometer?"

"Chicago to Johnson in 232," comes the instant answer, "ceiling 500, visibility, one and one-half; wind, northeast, ten; ba-



Above, Trimotored Passenger Plane; Below, Radio Operator on Roof of Hangar at Chicago Municipal Airport, Using Radio Telephone to Aid a Pilot above the Field to Land in Bad Weather

rometer, 29.92. I'll be on the roof looking for you."

"Johnson in 232," retorts the flyer, "O.K., keep radio range in continuous operation. That's all."

This conversation between a pilot in the air and a radio man on the ground at the



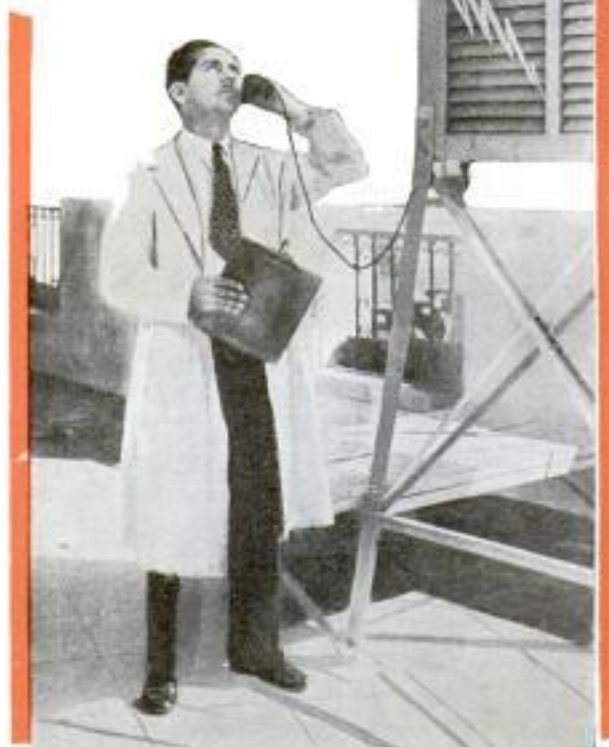
last scheduled report and this is what has just been heard. He told the operator that he was about twenty minutes from the landing field, flying at an altitude of 2,000 feet and following his radio beam to bring him to the airport. In turn, he asked the operator for conditions over the field, and also requested that the beam be kept working continuous to direct him until he landed.

The operator has told the pilot that the ceiling or altitude from which the field is visible, is 500 feet; that horizontal visibility is one and one-half miles; that there is a northeast

plane's cloud-obscured destination marks the beginning of a period of twenty minutes of close teamwork between pilot and operator during which the latter acts as ears and eyes for the flyer in bringing down the ship. To the layman the exchange of messages may sound unintelligible, so let us see what they were talking about.

When Pilot Johnson left Des Moines, he had weather reports from Chicago indicating that the vicinity of the airport was covered by low-hanging clouds. He has not found this hard to believe because he has encountered clouds and fog as he sped eastward. However, he has outwitted the weather by climbing above the haze and depending on the directional radio beam to keep him on his course, rather than the flashing signal beacons on the ground. By telephone he has been reporting his progress each few minutes to ground stations.

Forty miles out of Chicago, he made his



Using Radio Telephone on Ground to Talk with Pilots Overhead, and a Modern Passenger Transport

wind, and has given him the barometer reading. He has also delivered one additional message which heartens the pilot flying above a "blind" field—"I'll be on the roof looking for you."

The flyer knows that after arriving at the field, he must descend to an altitude of 500 feet above it before he can see the airport. He is expecting the radio operator to guide him down through the "soup" by listening to his motor and advising him of his location until he gets low enough so his own eyes can penetrate the haze.

The operator dons a heavy coat, gloves and cap, picks up an extension phone and climbs a ladder to the roof of the hangar, where he opens a box, plugs into the extension jack and listens. Soon, over to the west he hears the drone of the trimotor. The pilot has ridden the beam until he reaches the "zone of silence," which indicates to him he is almost over the field. Now the pilot wants the eyes and ears of the radio man, and calls for his aid.

"Johnson in 232 over the field in Chicago going north," he tells the operator. "I'll let down coming south on the beam."

On the roof, the radio man gets the message as the ship roars overhead and answers. "Chicago to Johnson in 232," he says, gazing into the haze. "O.K. Johnny. I can hear you over the field. Weather is the same. Ceiling, 500; visibility, one and one-half; wind northeast, ten. Floodlights are turned on. No other planes in flight."

This message means much to the pilot as he acknowledges it. His own idea of exactly where he is has been verified, he has the present weather condition, he knows no other ships are in the way—and he hears the field beneath him is "lit up like a Christmas tree," as he would express it. So he circles and comes back, meantime losing altitude. Immediately comes the voice of his unseen aid again.

"Chicago to Johnson in 232," says the operator. "Hello, Johnny. I hear you, now you're over the north side of the field. Everything fine down here. Lights on and nothing on the field. Now you're just above No. 2 hangar. I can see the schoolhouse across the field. I just saw you, Johnny. Turn and fly north."

This message has given the pilot con-

(Continued to page 124A)

C-12 Used by Brown.

Saltman

Upholstery Co 1828 N

main St
Los Angeles
Calif



Eleven Strands of Twine Are Cut at Same Time after Being Measured on Device

TWINE IS MEASURED AND CUT ELEVEN TIMES FASTER

Speeding up the upholstering of furniture, a wheel with protruding prongs is used for measuring and cutting eleven pieces of twine at a time. Formerly, only one length of twine was cut at once. Certain lengths of twine are used extensively in upholstering, so the measuring device can be adjusted for lengths of thirty-four inches up to three and a half yards.

NON-CORROSIVE BATTERY POST IS EASILY INSTALLED C-84

Non-corrosive and easily installed, an improved battery terminal has been produced. It consists of a round section of lead, shaped on one side to fit the battery post, with a lead ring to encircle the post. It also is hollowed from the same end to take a lead plug, also fitting the battery post. A small coiled spring, inserted ahead of



the plug, automatically keeps the device tight on the post. The battery cable is inserted into another lead projection and tightened with a small setscrew.

Sanders Garage 737
Grand Ave. Phoenix
Ariz

East Pittsburgh Pa



Night View of Illuminated Fountain on Capitol Grounds in Washington with Dome of Capitol in Background; Changing Colors Add to the Effect

MANY COLORS LIGHT FOUNTAIN ON CAPITOL GROUNDS

One of the world's most spectacular fountain-lighting systems is now in operation in Washington, D. C., where a terrace fountain at the Capitol grounds has been equipped by the Westinghouse Electric and Manufacturing company for night illumination. From the standpoint of electric power and equipment used, the system is one of the largest now in operation, the water in the fountain and terrace playing over a combination of six colors.

MOST AUTOS SO OUT OF REPAIR AS TO BE DANGEROUS

Seventy-nine per cent of all automobiles in operation are so out of repair as to be dangerous on the highways. This interpretation might be placed on the results of an examination of 2,134 cars voluntarily submitted to Prof. R. A. Moyer, highway engineer at Iowa state college. These cars had an average age of about three years and an average of about 30,000 miles

on speedometers. The most common fault was in distribution of braking power. Of 1,686 cars failing to pass the test, forty-five per cent had this defect. Cars were rejected when there was a variance of forty per cent or more between braking power of the front or of the rear wheels. Bad headlights were found on forty-two per cent of the total, twenty-three per cent had no stop lights, or a light not in working order, headlights on eighteen per cent were out of focus, and twelve per cent had no light dimmers. Front wheels of thirteen per cent were out of line, and rear wheels were out of alinement in two per cent. Seven per cent of the cars tested had no parking lights and tail lights did not work on six per cent. No wind-

shield wipers were found on four per cent, steering gears were loose on three per cent, horns were missing or did not work on two per cent, headlight power was weak on two per cent, tires were worn smooth on two per cent, and two per cent had no rear-vision mirrors.

C. 85 ELECTRIC STROPPER SHARPENS SAFETY-RAZOR BLADES

Safety-razor blades are sharpened easily with an electric stropper which gives a



wafer blade a keen edge in less than a minute. The stropper consists of a metal box, the lower half of which contains a small motor which drives a set of four rollers covered with spiral strips of stropping material.

A double-edged blade, when dropped over two pins projecting between oppo-

several. Electric Co Schenectady NY

Ames Service C. 70
11/10/33

Ames, Iowa,

site pairs of rollers, comes to rest with its edges on the lower spirals. When the hinged box lid is closed, the upper rollers are pressed inward so they touch the upper edge of the blade, and at the same time a switch closes and starts the motor.

SEATS OF GRANDSTAND HEATED BY ELECTRIC CABLES C123

Grandstands for the accommodation of winter-sport enthusiasts in Switzerland are now being heated electrically. In one such stand, insulated cables are placed in rows of three under the seats. Tin strips radiate a uniform heat and only a short time is required to heat the entire stand in this manner. In order to avoid short circuits, every cable length is grounded through an automatic switch which immediately disconnects the endangered section. The current is supplied by the same power plant which makes the artificial ice for the skating rink or other sport.

COAL GAS FOR OPERATING AUTO IS MADE AS CAR RUNS C87

Coal gas, generated as the car runs, can be used for operating an automobile. At the rear of the car is a burner that consumes anthracite coal. The gas is carried directly to the motor, which is adapted to use of this fuel. Under test, one filling of 250 pounds of coal was sufficient to drive the automobile 300 miles over English highways.



Filling Up Burner of Auto That Runs on Coal Gas; Inset, Pipes Carrying Gas to Engine



Top, Planting Time for the Miniature Greenhouse; Bottom, Growth after Only a Few Days

MIDGET GREENHOUSE FOR HOME AIDS PLANT GROWTH

Seeds can be germinated and growth started quickly in a miniature greenhouse for the home. Peat moss in a muslin bag is the growing base. The bag is permitted to soak in water, then is placed in the greenhouse. A blotter is laid over the wet bag, two small benches giving the effect of flower beds are installed, and the seeds are placed on the blotter. Eight tiny flower pots also are provided, to be filled with earth and planted with seeds or slips. Plants can be set into other pots when they outgrow the greenhouse, which is five-by-six-by-twelve inches, and a second planting started by washing off the bag and using another blotter. Six different kinds of seed are supplied with each greenhouse, enough for six plantings. Made of glass and a metal frame, the greenhouse is decorative for the home or apartment. Complete planting instructions are furnished with each unit.

Commerce memo. 1/12/32

C-139. \$1.25
 Patd 18, 48 219

The Green. O. Water Co
 3711 S. Ashland Ave. Chicago

demonstrated in London
 by inventor J. A. Mac Donald, Kenya, Africa
 Copyrighted material

C127

526

Death Valley Scotty

and his partner

POPULAR MECHANICS

A. M. Johnson, Chevy

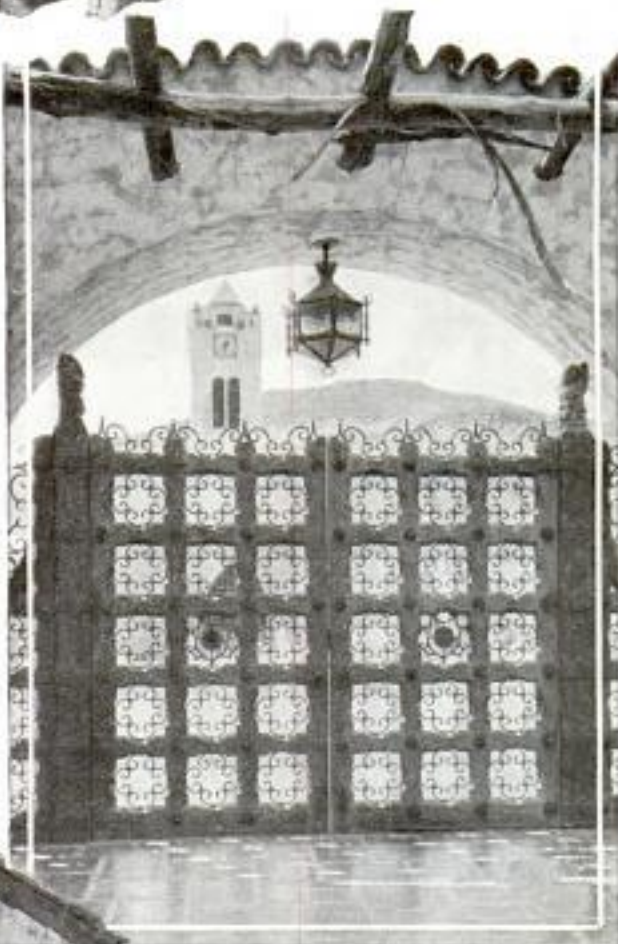
Death Valley Scotty's Castle in the Desert

Cont. Iron Black, Publicity Dept. United Air Line, Burbank Calif.



Above, Walter Scott, Known as Death Valley Scotty, Greeting Visitors to His \$2,000,000 Castle in Death Valley, Calif., Known as the Hottest and Lowest Spot in This Country; Five Years Were Spent in Building This Desert "Shack," as Scotty Calls It, and Materials Were Hauled by Truck and Wagon More Than 100 Miles from the Nearest Railroad; the Ranch Resembles a Baronial Estate

Below, One of Turrets of Castle; Right, Baronial Gateway to Castle; There Are Nine Spanish - Moorish Dwellings, Connected by Mysterious Underground Passages



Top Photo © Frasier

Copyrighted material

Two-Million-Dollar 'Shack' Resembles Palace



Above, Living Room of Castle; Walls of the Structure Are Three Feet Thick and Elaborately Insulated against 130 Degrees of Summer Heat; There Is an Underground Cave House with Kitchens, and Subterranean Tunnels Flank an Enormous Tiled Swimming Pool, so Visitors Can View the Antics of Swimmers under Water



Two Views of the Castle; It Is Filled with Costly Furnishings, Including a \$50,000 Pipe Organ; There Is Also a Set of Electrical Chimes

C 95. *Carl Wynmar S. Smith*
431 *Hawthorne Court*
POPULAR MECHANICS
Madison Wis

528

Broken Porcelain Beautifies Siamese Temple

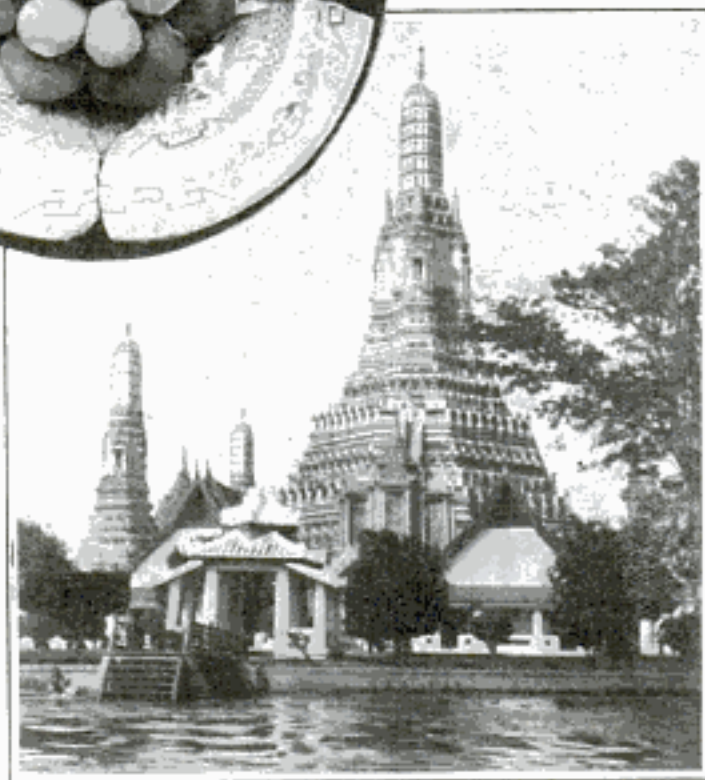


Top and Bottom Views of the Wat-Chen, Temple Which Is Decorated with Broken Dishes, Like That in Center Photo

Thousands of bits of broken dishes help to make the greatest temple in Siam, the Wat-Chen, more beautiful. From a distance, the spires and rising terraces of the structure seem to sparkle with sunlight, while the tropical moon is reflected in tiny lights that make the temple appear studded with gems. All kinds of dishes were used in placing the final bits of ornaments. Along the sloping backsteps of the temple, a multitude of flowerlike designs made from dish chips is set. Blue, pink, yellow, coral and almost every other color known to the porcelain and china industry were used, some of the pieces from dishes that still are favorite patterns.



against skidding than to try to stop the car after it starts sliding. The best protection is to cut down the average rate of speed under conditions that tend to make the automobile skid. In addition, a further reduction of speed is advised on hills, curves, at intersections, in congested traffic and at any place where a necessity of stopping may arise. The driver can add to his safety by taking more time to begin to stop, by staying on the alert, by keeping his brakes in correct adjustment and by observing the surface of the roadway and cutting down his speed accordingly. A new kind of skid has come in this day of rapid acceleration



SKIDDING BEST AVOIDED BY REDUCING SPEED

While much advice is given on what to do when your automobile skids, experts agree that it is better to take precautions and powerful engines. It is the power skid, resulting from racing to be the first away when the traffic light changes to green.

Milwaukee Journal 11/27/32

00212

C265 S. J. Meriman Clark
Chicago Daily News
Chicago

COMMENT AND REVIEW

IT is little cause for wonder that youth as it surveys its world today experiences a sense of bewilderment which in many instances breeds discouragement. Young manhood has energy, ambition, dreams. It wants to make a life that will be worth living, but, for the moment, there appear to be many obstacles in the path and more closed doors than open. And yet there probably never was a time when need for what youth can contribute was greater than it is now, and need constitutes opportunity. We are passing through a period of transition, of readjustment in our world. Such periods are always perplexing; but they are also challenging. Nor is it the folks who stand around waiting for a break, as they call it, who

*Doors Open
to Youth*

realize on the possibilities of such times as these. On the contrary, it is the folks who prepare themselves by developing knowledge and skill; who use their heads to think of new services and new methods to whom the world answers with rewards. Too many young people, seeking jobs, are seeking merely a connection with the payroll. In slack times such applicants are quickly turned down. It is the fellow who comes to an employer with some intelligent understanding of the work he asks to do, with some display of initiative, some promise of a mind interested in the job itself, who gets serious attention. For such young people closed doors open.



WE have sometimes thought it would be an excellent thing if the First of April, by long tradition dedicated to All Fools, should be redeemed from its trivial and tricky celebration and rededicated, seriously and honorably, to those pioneers of civilization whose contemporaries called them fools, but to whom posterity has erected monuments. There was Christopher Columbus, derided by the smartly self-conceited because he believed that by sailing beyond the horizon—the world's edge as many thought it—he could find a new continent; there was James Watt, who dreamed of power as he beheld the steam lifting the lid of the kettle; there was Charles Darwin, chided as a dunce by his school-teachers because he took more interest in toads and grasshoppers than in his Latin grammar; there were the Wright brothers, evoking skeptical grins by efforts to fly. Those are but a few. A long list could be compiled. It has been the habit of the crowd to shout "Fool!" at any man whose keener vision and enterprising spirit carried him out of the ruts of the commonplace to explore untrodden paths and attempt what smaller minds regarded as impossible. It takes courage to advance in the face of ridicule. All honor, then, to the Glorious Company of Fools.

*An April
Celebration*

IT was Louis Pasteur who said toward the end of his notable career as a scientist and servant of humanity, "Science has extended the frontiers of life." Never was the significance of that statement more evident than today. The old frontiers that were geographical have almost ceased to be. Even the icy barrier of the Antarctic Pole has been penetrated. But new frontiers of the human mind and spirit have developed. In the realm of the physical and social sciences we are exploring untrodden territory. That is why there is urgent need today for trained minds, for minds trained to be observant, to be analytical, to be expert in following trails and applying facts to useful ends. More than ordinary leisure exists today for mental training, and few there be, who, having the will, cannot find the opportunity to employ that leisure to advantage. No mind need lie fallow



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*The New
Frontiers*

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c265

C. F. Burgess
Laboratories
Madison, Wis

because its owner cannot go to college. Instructive books are cheaper than at any time in history—and better written. Correspondence schools of high standard are offering special inducements. Public libraries will provide courses in reading. The home student has advantages that the college student lacks. To the ambitious student there is a big stimulus in being thrown on his own resources. In college there are many parasites who get by through picking the brains of their more diligent companions. Trained minds are not made that way. The disciplined mind is the result of personal digging and problem solving.



SPRING is coming in the dooryard. Crocuses are in bloom in sections of the country where the snow but lately spread its crystal carpet on earth's floor. The annual miracle of a world made new is being wrought before our eyes. Much

that is old and cherished will be repeated, and we would not have it otherwise. Life would lose its meaning were it not for those renewed experiences which sustain its sense of continuity. But always tomorrow has its surprises. Man's dominion continually is being extended, and fresh discoveries await him. He is promised, for example, airplanes that will travel at 1,000 miles an hour. He has breached the stratosphere—the outer suburbs of earth's atmosphere—and its exploration is now

possible. Millikan and Compton are pursuing the secret of the cosmic ray. The harnessing of mightier forces than even the superpower engineers have conceived, is a dream toward the realization of which the race advances. New materials for man's buildings and garments—floating bricks and creaseless fabrics, paper-thin copper sheathing and dress material lighter, stronger, more durable than silk or linen—are among recent wonders. Remote control of factory processes; machines that type the message of the voice; newspapers set by wire—such things are on their way. Radio and television have yet to combine forces for the world's greater enlightenment. It is a marvelous age in which to be alive, and in the heart of him who retains his capacity for hope and wonder, whatever the season, it is always spring.



THIS thing of economy is not so simple a matter as it seems. No one questions the urgent need for it. The popular cry that has risen for reduction of governmental expenditures echoes only the painful necessity that most of us have

experienced in our own affairs. Unquestionably there has been inexcusable extravagance in the use of public funds. But when, in the dying session of the last congress, Representative LaGuardia, of New York, halted a slashing attack on research appropriations for the department of agriculture, he raised a question as to the real nature of economy which demands consideration. There are so-called economizers who think only in terms of saving dollars, and not at all in those of conserving

values that come from the expenditure of dollars on productive enterprises. Cutting out expenditures is only one phase of economy, and the least important. Another, and vastly more important, phase is the wise expenditure of dollars. Often it is more economical to spend than to save. For example, it is more economical to spend what is necessary to mend a leaky roof, than to save the money and let the leak grow and the rain ruin costly walls and furnishings. It is more economical to spend money on education and research, than to save it and lose in precious opportunity and discovery. Last year, the University of Illinois saved the industries and citizens of that state \$124,000,000 as a result of its research work—more than the total receipts of the state treasury. Consider what folly it would be to cut appropriations for such service as a measure of economy.

*Spring and
a New
World*

*Looking at
Economy*

TAKE a spiral spring and set it perpendicularly on a table. Now begin at the bottom and follow its convolutions with your finger. You will note that in pursuing the wire coils you seem to be retracing your movements, going backward as it were. But you will note also that you are steadily rising to higher levels, that the reverse into which the coil throws you is part of the climbing process. The progress of civilization is like that. A hasty review of history through the receding centuries will show you many a time when it seemed as if civilization were in reverse; as if mankind were going backward instead of forward. But the long-range view will also show you that always, in spite of such times, mankind

*Progress
Is Spiral*

came out on a higher level of knowledge and experience. So we can have confidence that presently we shall emerge from the present twist of the spiral on higher ground, with broader horizons for vision and bigger opportunities for living. Men who know tell us that we are on the edge of amazing applications of science to the doing of the world's work and the enrichment of its life. The pages of this magazine amply testify to that fact. Creative and constructive thought has not stagnated. It is still the mightiest power in the world. Get in tune with it.



PROFESSOR James H. Breasted, of the University of Chicago, world-famous oriental scholar and archaeologist, declares that man "stands now at the beginning of a new exploration. . . . The country that he is just crossing into is the

*Right
and
Wrong*

kingdom of the mind and the spirit," and then, delving into the rich lore of the remote past, shows us how in the earliest beginnings of human progress, man, the "most wonderful creation in the universe," discerned the realm of moral values, and defined, with marvelous insight, the difference between right and wrong. In his new exploration man may well be guided by that definition, embodying an eternal principle. Before the days of Moses, from whom came the decalog, an Ethiopian king discovered the definition written on a worm-eaten papyrus, and carved it on imperishable stone: "The God decrees death to him who doeth what is hated, and life to him who doeth things that are loved." So it reads, as vital in significance today as when it came fresh minted from the mind of a thinker in the world's dawn. Much confusion as to right and wrong would be saved us could we get hold of that principle. The thing that is hated is the thing that does injustice and injury to others, and the things that are loved are those that contribute to the happiness and security and welfare of others—and so to our own. In the kingdom of the mind and the spirit, that is the law by which the highest possibilities of humanity may be served.

C253

METAL TAGS ON MARKED FISH RECOVERED WITH MAGNETS

Identification tags placed on Alaska herring in an effort to work out a conservation program for this species of fish are being recovered by the use of electromagnets. In most cases, numbered tags placed on fish to trace their wanderings are collected as the fish are cleaned, but only a small percentage of the herring catch is

handled by hand, the rest being converted into meal and oil. The nickel tags are collected by the magnets from the herring meal as it passes through drying troughs. As the localities where the fish are tagged, and also where they are caught, are known, it is an easy matter for experimenters of the bureau of fisheries to determine the extent of migration and the amount of intermingling which goes on between various known schools of Alaska herring.

*Denny O'Malley
Bureau of Fisheries*

*8/10/12
Summer*

*Experiments made by George A. Rounsefell
and Edwin H. Shalgren, junior aquarist*

biologists

The Mountaineer Boy

By Frazier Hunt



RESTLESS America! That's what America seems when you study the thrilling, moving lives of her successful sons. They are restless men—ambitious men—doers and dreamers, who are never quite satisfied.

Take "Mel" Traylor. What an adventurous, spirited, American life has been his! And what an example of how far the imagination to do things, and the integrity to do them well, and the determination to keep on doing them, can carry a man! In some ways I think that Mel Traylor is just about the most inspiring American I have ever met.

On the face of it, he didn't have a chance as a boy. He was born on a hill farm in the mountains of southern Kentucky. His father's family had for a hundred years settled back in those forgotten hills, while the rest of the world was moving forward. It took a lot of intelligence and energy even to earn a living in this limestone hill country. Mel's father was industrious and hard-working, but had had no advantages whatsoever, nor any education. He raised a little tobacco and corn, and a few hogs and sheep. At the end of a year, if he had garnered \$200 in money, it was a pretty good year. Of course, practically every-

thing the family ate was raised right on the farm—and to a considerable extent it was self-sustaining.

A couple of miles away was a little country school that opened in July and ran until corn-shucking time in early October. When Mel was about ten years old, the term was extended to five months, but always one or another of the Traylor boys had to stay home part of each week to help with the farm work. The nearest

Who Went Places

railroad was some forty miles away and the closest town of any size was Columbia, the county seat, which was sixteen miles by a winding trail that led out of the narrow valleys of these Kentucky hills.

It was the trail that was to lead this mountain boy up to the mighty places of the world—from a mountain hut to the presidency of the great First National bank of Chicago, and the position of one of the real leaders in American life. And all done within forty-seven years from the day he was born.

Follow that winding trail and you will learn what gives this restless country of ours her real greatness.



There are hundreds of points in this fascinating Traylor road to success that are charged with high dramatic interest, but of them all, the one that is most appealing was a summer day in the little foothill town of Hodgeville, Ky., when this boy was nineteen years old. A few



days before, he had bought the exclusive rights to sell a trick monkey wrench in the county adjoining his own Adair

county, and on horseback he had jogged over the clay roads and trails, unsuccessfully canvassing the hard-fisted hill farmers. He had never been in this part of the world before, and it was a great adventure to turn his horse's head toward Hodgeville.

Suddenly he heard a whistle blow—it was a strange noise, the first whistle he had ever heard. Then there was a puffing, a clanging and a great rattle and bang, and while his horse tried to run away, a train rolled by.

It was the first railroad train Mel Traylor had ever seen and it gave him ideas—lots of them. This train was the way out into the great beckoning world. It was the iron trail that he was going to follow. The restless urge had caught him.

He could hardly wait to get home and



tell his father and mother about the great sight he had seen and the dream that he had had. His father was never to see a railroad train, and it wasn't until twelve years later, when Mel came back from Texas to bring his mother to his new home, that she experienced the thrilling sight.

That following year he passed examinations for a teacher's certificate, and for two years taught school for the five months' term at \$30 a month. The rest of the months, he worked on the farm and in spare moments read Blackstone. Over at the county seat, sturdy old General Garnett had become interested in the boy and had loaned him law books.

But that puffing, roaring train that led off into the world was too much competition for even the law. So one day, with \$60 he had saved, he rode on horseback to Columbia and then he took the stage to Campbellsville, thirty miles away. Down in Hillsboro, Tex., was a relative, and Mel figured that would be as good a place as anywhere else to start his restless adventure.

From that minute on this mountaineer boy's life is a moving-picture film, full of action and color, and endless struggle. For a while he was a grocery clerk; then he found out that by joining the fire department, he could have a cot in the room above the fire engines. Then, by working as a night clerk in a hotel, he could get his meals free, and by sweeping out a law office, he could read law for two or three hours in the late afternoon.

And then—a summer or two later—he felt the restless urge again, and a hog buyer gave him a pass to Los Angeles with two

carloads of hogs. When he got ready to come back, the promised return ticket did not materialize. But he remembered a cousin who had a ranch in San Joaquin valley, and by one means and another, he got up there and worked on one of the first combination harvesters in the west.

His total schooling to date had been what would equal the sixth or seventh grade in a modern school, and here in California he figured he'd have to have more. When fall came, he paid his own fare back to Hillsboro and entered the Patterson institute, working for what he believed was his board and tuition. But at Christmas time, when he was presented with a bill

(Continued to page 127A)

*Ans. Mr. Louis Hage C102. Magu Case Mfg Co
San Jose, Calif 4284 Coggers Ave
St. Louis, Mo. 535*

Christmas Science Invents 1/21/33

FOOT CONTROL SPEEDS WORK ON ADDING MACHINE

C-227

Making possible the manipulation of an adding machine with the foot, a new device speeds up the work of clerks in service yourself groceries and markets. A magnetic control box, with electrified magnets to strike the keys, is installed over the figures of the adding machine. This control box is connected by cable to a foot control that operates in a semicircle. By swinging the pedal from left to right, the various numbers are added. An arrow points to figures from one to nine on the adding machine, showing the operator whether he is adding correctly.

STEEL GUARDS TO FIT BUMPER PROTECT AUTO FENDERS

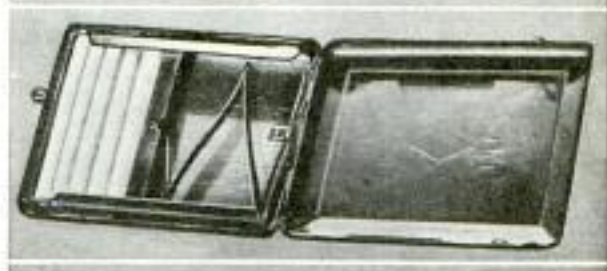
C-193

Protection for fenders, radiator, headlights, trunk and tire carrier is afforded by steel guards that fit on the front and rear automobile bumpers. Made for both single and double-bar bumpers, the guards are attached so that they extend vertically above and below the bumper, preventing the bumper of another car from passing or interlocking, and saving damage to fenders and other parts. Easily clamped on without changes to primary equipment, the guards or stops withstand practically the same pressure and thrust as the bumper itself. The guards fit accurately and are heavily chromiumplated.

\$3.00 for



Bumper Stops Installed; Insets, How the Guards Prevent Accidents by Equalizing Bumpers



Automatic Cigaret Case Which Ejects and Lights the Smoke; It Is Operated with One Hand

CIGARET EJECTED AND LIGHTED BY AUTOMATIC CASE

Life is made simpler for the cigarette smoker by an automatic carrying case which ejects and lights a cigarette when a button is pressed. The button is at the top of the case and pressure on it pushes a cigarette through an opening in the side, which is placed between the lips while still in the case. As the button is pushed farther in, it causes a shutter to fly back and shoots a spark to the wick of a lighter contained in one corner of the case. One or two puffs lights the cigarette and the case is snapped shut, this action causing another cigarette to take its place in the ejector. The case has space for seventeen cigarettes and is particularly handy for motorists, since a driver can remove the case from his pocket, eject a cigarette and light it, using only one hand for the operation.

☛The wild ancestor of Europe's domestic cattle is still unknown.

Science Service

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*6 Tel. Maremont Hwy Co
S. Ashland and 17th. Chicago
Inglehead 748*

*Benjamin Spring Corp
5058 Broadway, Chicago*

415 Lexington Ave New York



Top, Hotel Resembling Tower of Medieval Castle; Bottom, Looking Down the Well; Ramp Is Used Instead of Stairway

TOWER HOTEL LIKE A CYLINDER GIVES VIEW OF ALPS

Resembling the tower of an Italian castle of the Middle Ages, a hotel shaped like a cylinder gives its guests an excellent view of glaciers and skiing fields of the Alps, in which it stands on top of an 8,800-foot mountain. The tower is made of concrete, in the form of two cylinders, the outer shell being separated from the inner one by a twelve-inch air space. Arranged around ten turns of a spiral ramp are 163 small cubicles, twenty-two service rooms and elevators. Eleven tiers of small loophole windows give the hotel its re-

semblance to an ancient castle. An open gallery on the 184-foot structure enables guests to obtain remarkable views. On an underground floor are ten bathrooms, a first-aid station and lockers for skis and other winter-sports equipment. Cable cars are available to take visitors to the tops of two mountain peaks.

IMPROVED AUTO DESIGN URGED FOR COMFORT AND ECONOMY

C191

Improvement in automobile design for economy and comfort could be accomplished without time-consuming research, according to Herbert Chase, consulting engineer of New York, who charges that the modern car is too rough-riding, too low-down, too heavy and too dangerous. Three-point chassis suspension would solve the rough-riding problem, in addition to overcoming many steering difficulties, Mr. Chase says. Building the cowl so that the driver could see more of the road is another suggestion. The engineer also urges that waste space be converted into load-carrying area, reducing the total size of the vehicle. Here are some of Mr. Chase's recommendations: Eliminate fenders, stow engine below decks or in rear, recess wheels and fair headlights into the body to get better streamlin-

ing; use improved two-stroke-cycle engine to get more power for given weight and high economy at light loads; simplified lubrication; substitution of heat and noise-insulating synthetic materials for steel and glass in body; narrower pillars and larger rear windows for better vision; elimination or padding of top bows over passengers' heads, and sloping windshield and window glasses to reduce reflection.

(Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be furnished by our Bureau of Information on request accompanied by return postage.

Sestriere, Piedmont, Italy

Scene from 12/13

C198

Dr. Joseph Stephen
and Leon R. Ludwig

Lead Pencil Puts Huge Electric Arc to Work

Huge current-carrying arcs can be controlled by minute currents in a lead pencil, or "igniter." This is comparable to controlling, by the flip of a small wall switch in the home, the enormous quantity of current that would be required by all the homes and industries of a city five times as large as New York. Two engineers of the Westinghouse Electric and Manufacturing company discovered this means of controlling the arc. A small pencil lead is dipped into mercury contained in a vessel. The mercury is charged with electricity which will flow if a path is provided. When a tiny current is applied to the pencil lead, an arc capable of carrying currents a million times greater leaps to an overhead terminal and puts the electricity to work. The new control can start an arc in less than five-millionths of a second. It also can start



an arc sixty times a second and at any precise instant of the one-sixtieth of a second interval. Thus, the operator can pass huge electric currents either in jolts or in a steady stream, just as a machine gunner can fire either in bursts or continuously. Wear on the pencil leads is negligible, several starting

more than 1,400,000,000 arcs in nine months without showing wear. This equipment is regarded as vastly superior to present control apparatus.

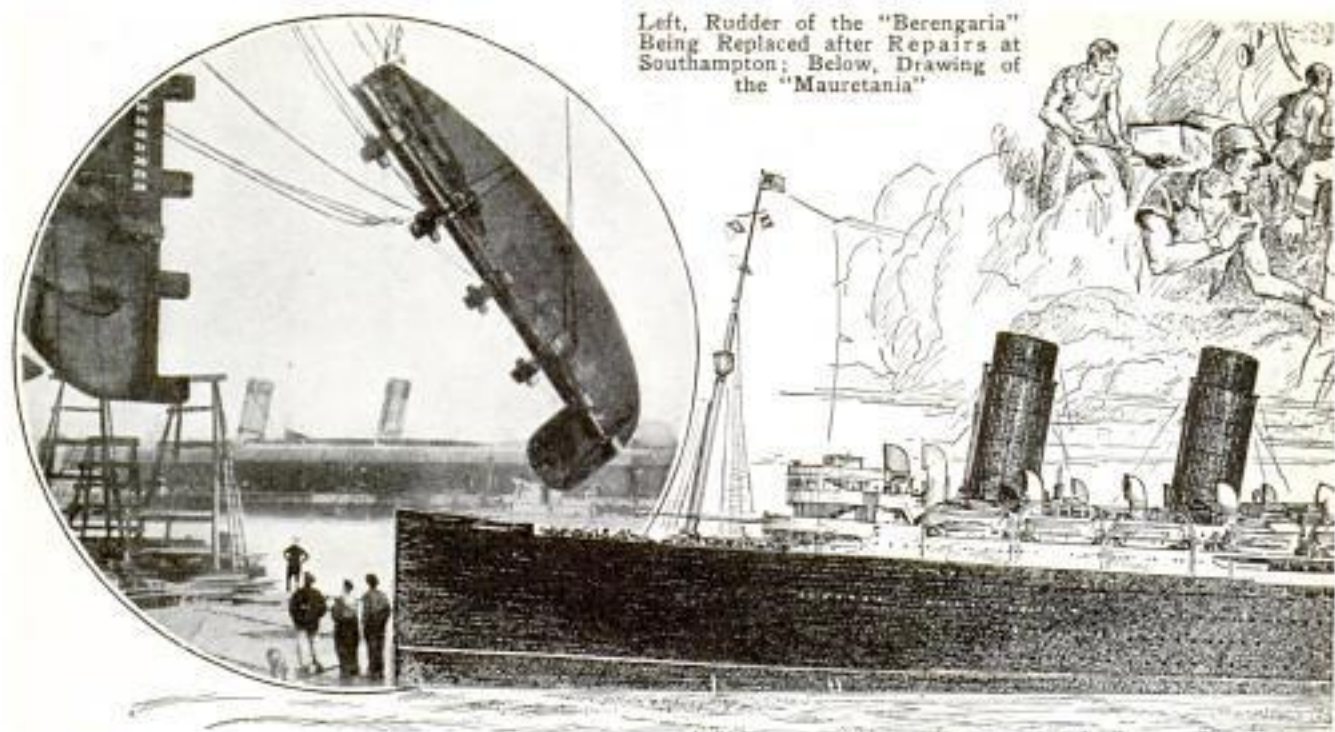


CORWEB ON A TELEGRAPH LINE CAUSES SHORT CIRCUIT C208

When trouble developed on a telegraph line between Detroit and Chicago, testers located it near Kalamazoo, but found the line seemingly in perfect condition as there were no broken insulators or other apparent defects. Finally one man noticed an ancient cobweb, stretching from one bare wire to another. Heavy with dust, the cobweb absorbed moisture at night and caused a leak. In daytime, the sun dried out the moisture and the leak stopped. The cobweb was removed, and the line functioned properly. Heavy fog sometimes causes a similar leak if a wire hangs on a wooden crossarm.

Top and Center, Views of Mercury Tube in Which a Tiny Current Controls Electricity a Million Times Greater; Bottom, Demonstration of Pencil-Lead Control for Powerful Electrical Arc

cmd. Clyde P. Davis
11850 Promenade Ave
Detroit Mich



Left, Rudder of the "Berengaria" Being Replaced after Repairs at Southampton; Below, Drawing of the "Mauretania"

Racing Seagoing

By

BOYDEN SPARKES

108 40th St / New York City

A SAVAGE winter storm had been raging on the Atlantic for days. The fishing fleet had scuttled back to ports, rusty little tramps were wirelessly nervous owners and big liners were struggling toward New York two days and more behind schedule. But not the "Mauretania!"

Right on the dot, she came steaming proudly up Ambrose channel, her black prow cleaving the water with disdain, for storms are next to nothing in her life. She docked next to the "Lancastria," and soon Edward Barton, chief engineer of the "Mauretania," was comparing notes with Jock Campbell, chief of the "Lancastria."

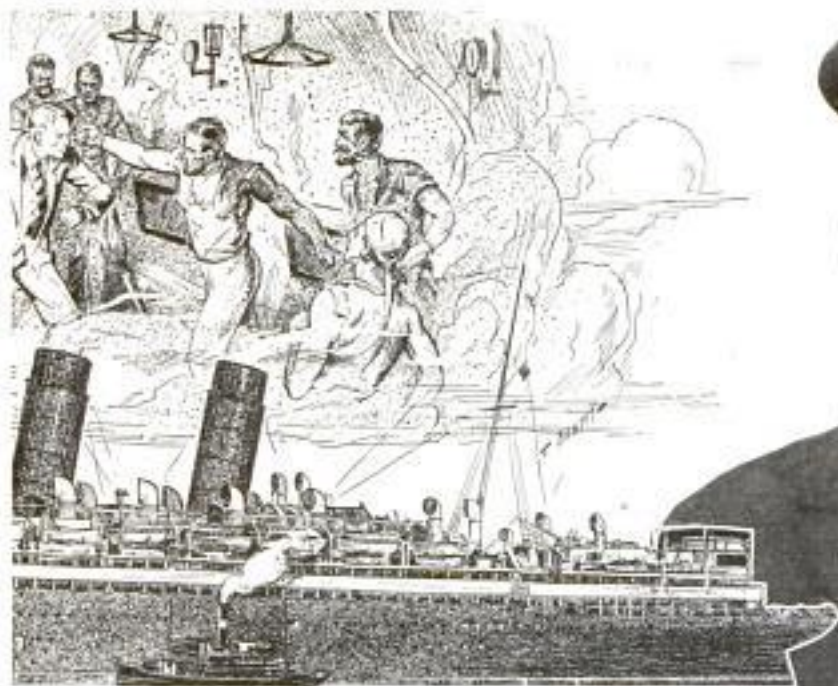
"Storm?" echoed Barton. "This one was as bad as any. I thought the windows would be stove in by the waves. The electric-light wires outside were carried away. When she'd pitch her propellers clear, the engines would race. Remem-

ber how we used to be ready on the instant to see that power was shifted from the blades out of water to those still submerged. It's automatic now; in the old days a man had to stand there and make the shift when he felt the vibration. Aye, it would have been much worse in the old days."

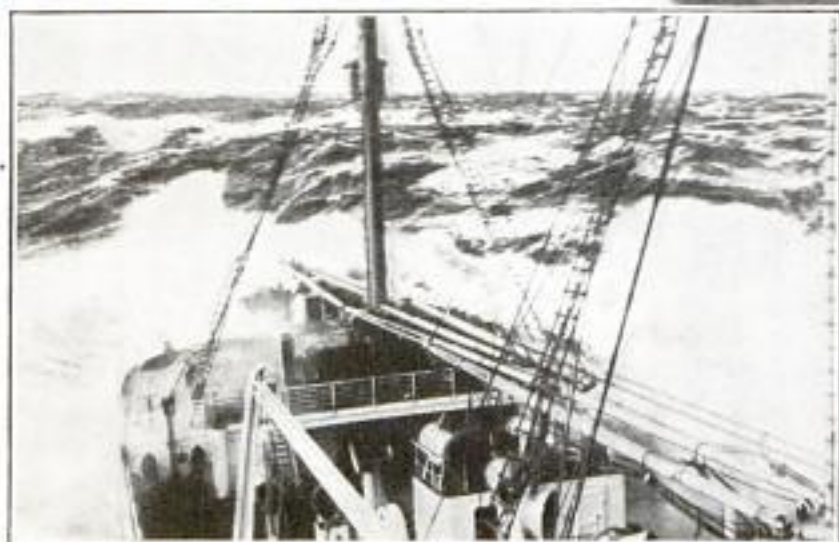
"When we burned coal, yes," Jock Campbell said. "Burning oil makes a big differ-



View of Part of the Boiler Room of the "Aquitania"



Hotels



Top, Chief Engineer E. Barton of the "Mauretania"; Below, German Liner Being Buffeted by Severe Storm in Mid-Ocean

ence. Remember in the coal days how we'd have to form the black gang into a bucket brigade to bail water? The strainers would get choked with coal and the pumps could not take the water away. There'd be tons of it washing to and fro. Then the plates would fill up and put the fires out. That was when we'd have to form a chain gang of firemen to bail and pass the buckets from hand to hand, from section to section. It used to be awful in

in four days, twenty-one hours and forty-four minutes, then attempted to explain how a ship, more than twenty-five years old, could step out and better her old record and come near to beating the time of the new and bigger "Bremen."

"There's 70,000 horsepower there," he said. "And it was well put together at the time. The horsepower and fine line of hull and tonnage. She was built to last. I'm just about

a storm in the old days."

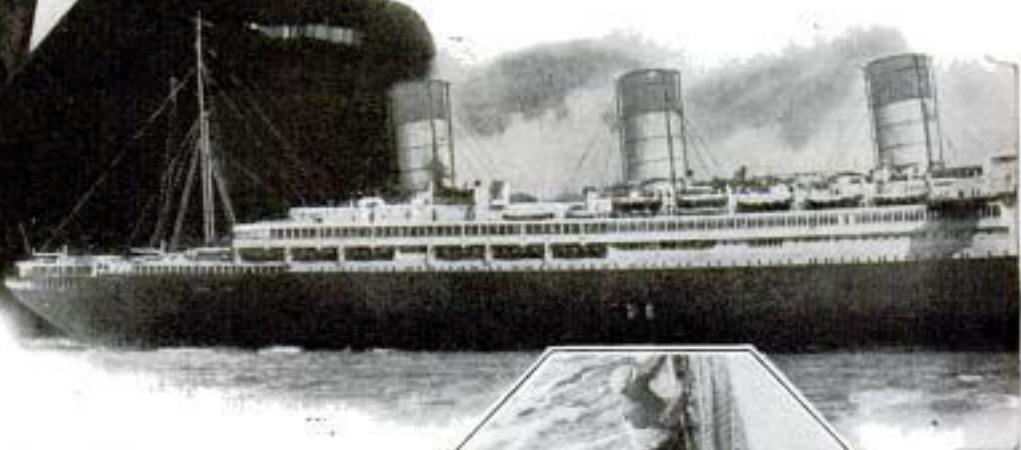
Engineers of these racing greyhounds of the sea take a justifiable pride in the performance of the huge floating hotels, complaining bitterly that the "deck" gets all the credit while they preside over "the real works of the ship." Chief Barton proudly exhibited the log-book of the "Mauretania" for August, 1929, when she broke her own record by crossing the Atlantic

cl 119
540



"I was senior second on this ship after the big overhaul when they were planning to break the 'Bremen's' record," said Campbell. "The boss, Austin White, came across with us. He pointed to the gauge which registers the pressure on the boilers. Ordinarily we carry 150 pounds per square inch, but during a record run it's run up to 180 or 190 pounds. 'See that gauge?' he said. 'You're the senior second. Don't take it off the mark.' Going from Plymouth to Cherbourg we made twenty-eight and a quarter knots. We had her opened up and went a lot faster than the 'Bremen' ever will go."

There had been plenty of work before



a good job of shipbuilding. She's as good as she ever was. Better, I dare say. She'll last indefinitely. Against our 70,000, the 'Bremen' has 140,000 horsepower; against our 31,000 she's only 40,000 tons. The 'Bremen' has the speed record but we're not far behind. Only four hours.

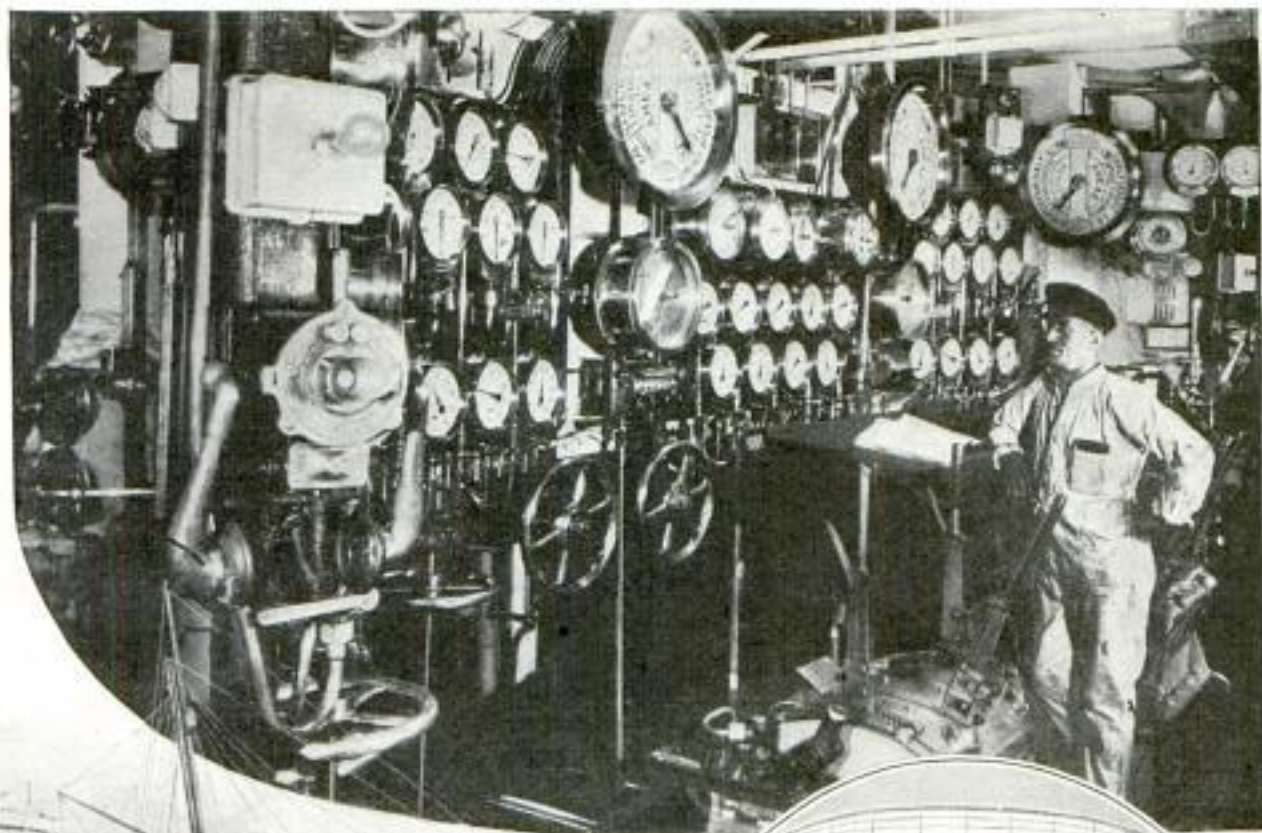
"It's expensive breaking records. When she burned coal, there would be a lot of rivalry between the three shifts. They measured themselves by revolutions per minute. Men shoveled her across in those days. With oil it's easier, but still costly. Twenty-five knots is the ordinary speed. At that rate, we burn 700 tons of oil a day; to get the extra two knots an hour takes another 200 tons of oil—900 tons a day.

"We haven't had her wide open since she made the record. They might try it again. I don't know. Usually they keep it dark when they're trying."

This rivalry was a thing; imagine a race across the ocean in a gigantic seagoing...



Top, Chief Engineer Campbell of the "Lancastria"; Center, the "Berengaria"; Bottom, Rescue of Freighter "Scheldestad's" Crew



Top, Engine Room of the "Aquitania"; Right, the "Mauretania" in Drydock

that amazingly swift run from England to France. Propeller blades had been made as clean as a debutante's teeth. Her turbine engine had been adjusted as carefully as a dispatcher's watch. Feed pumps—all the auxiliary machinery—had been gone over with extreme care. The ship's thirty-eight engineers, plus 126 others of the engineering department, boiler makers, electricians, plumbers and an army of artisans of the shore staff, had examined and tested every valve, pipe and wire of the intricate mechanism until they were sure that in every detail she was as good as a new ship; better, in fact, for new ships are uncertain because they are new.

"Aye, it's a lot simpler and cleaner nowadays with oil," said Mr. Barton. "There are 192 fires to keep going in this ship. One man feeds oil to twelve; with coal there was a man to each three fires. We used to have 392 men—and what devils



they were! Now we have a different class altogether; mostly naval pensioners, fine fellows, but they would not last one voyage of coal burning. Mostly fighting Liverpool Irish in the old black gangs."

"Black was the word," said Campbell. "We'd come off watch looking like nigger imps, with grotesque white patches around our eyes when the goggles came off. I sometimes wonder if we'd be alive today

(Continued to page 136A)

B2247 Annual Congress
British Institute of
Radiology POPULAR MECHANICS
and Roentgen Society.

London
Eng.



How Radium Needle Filler Is Protected; Only His Hands Enter the Lead-Lined Case

HERE'S MOST DANGEROUS JOB FILLING RADIUM NEEDLES

Probably the most dangerous job in the world is that of filling radium needles. Radium in the form of a salt must be packed into small needles for hospital use. To perform this task, the filler works with his hands inside a lead-lined case that protects his body from the powerful rays. After three months on the job, the needle filler is required to take a three-months vacation in order that his body may not suffer from overexposure to the radium emanations.

MOTOR DEATHS IN U. S. DECLINE THIRTEEN PER CENT IN YEAR

Based on reports from twenty-three states and the District of Columbia, an estimate of motor-vehicle deaths in the United States during 1932 reveals a decline of thirteen per cent from the 1931 figures. The area from which the reports were taken has a population of 64,000,000. The total motor deaths are estimated at 29,500, as compared with 33,740 in 1931. North Dakota, with 8.8 per 100,000 population, had the lowest rate, with Mississippi

NY Herald Tribune
1/30/33

reporting 10.1 ranking next, Nevada, on the other hand, had a rate of 56.7, California 39.9 and Delaware 35. Railroad-crossing fatalities for 1932 dropped about nineteen per cent from 1931. Cities of more than 500,000 population had a fatality decline of about ten per cent in 1932, while smaller cities reported a drop of more than fifteen per cent. For 1932, all accidental deaths are estimated at 90,500, compared with 100,240 for 1931. This establishes a new death rate of 70.5 fatalities per 100,000 population, the lowest in ten years. The estimates are based on a survey made by the National Safety council.

"FIZZ" DRINKS ARE KEPT FRESH BY HANDY DISPENSER

Carbonated liquids in bottles may be opened, part of the contents used and the remainder kept fresh and sparkling by use of a new dispenser. The bottle is inverted and pressed into the holder which automatically perforates the cap but maintains an airtight connection. Giving the bottle a half turn to the left starts the flow. After the desired quantity is drawn, the bottle is sealed by turning it back to its first position. The container will eliminate considerable waste, since the contents will remain fresh indefinitely.



This Device Prevents Escape of Gas from Carbonated Liquids; It Facilitates Drink Mixing

Isadgets, Inc.
206 W. Spring St.
Los Angeles, Calif.

C226

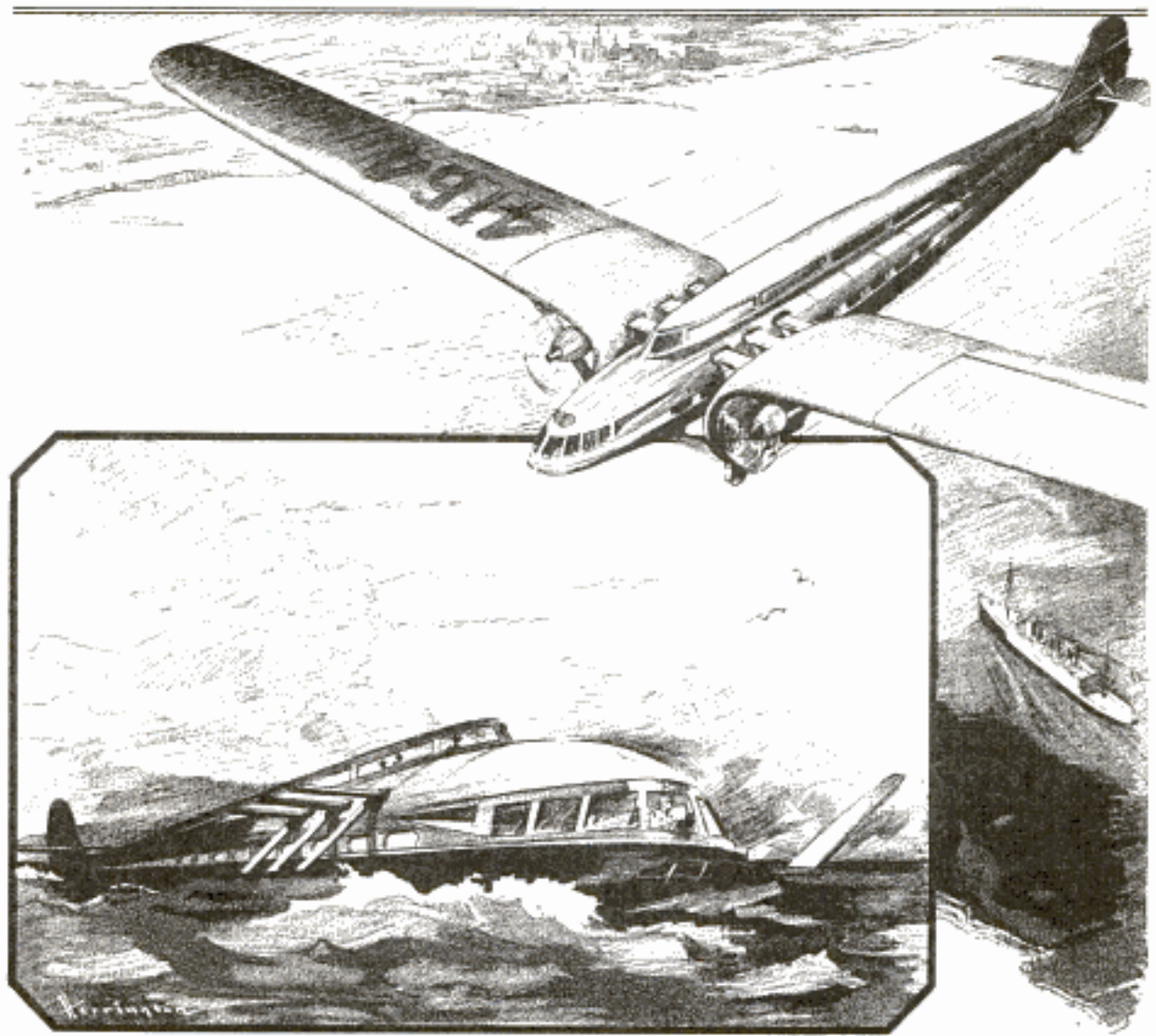
Psychic. Paris

16

C. 89

Cont. H. J. Welkins, Esq. Colchester
29. Beau Road, Berley Heath
in London, Eng

Plane for Air or Water Has Promenade Deck



© W. Bigby
Above, Plane Designed for Long Trips over Water; Note Promenade Deck on Top of Fuselage; Below, Ship Forced Down in Sea Proceeding with Aid of Water Propellers in Tail

For long-distance flights over water, an airplane with some of the features of an ocean liner has been designed by a London maker of model planes. A fresh-air promenade, for instance, would extend along the top of the fuselage and form an upper deck where passengers might enjoy a view of sky, sea and land, yet be protected from the elements. The two engines would be installed on either side of the nose, the propellers being shielded by arched wing roots, so air disturbance would not affect the upper promenade deck. In addition to the air propellers, the craft would be equipped with water propellers fitted under the tail. If the ship were forced down on water, the wings would be discarded and the craft would

taxi over the water by means of these rear propellers.

GERMS OF TYPHOID ARE KILLED BY HIGH FREQUENCIES

High-frequency currents sent out from an oscillator, similar to those used by short-wave radio amateurs, are deadly to germs in the typhoid group. As proof, F. W. Fabian and H. T. Graham, of Michigan state college, water-cooled the germs so that artificial fever produced by the radio waves could not kill them. When the current was turned on, growth of the bacteria slowed down, and as it was increased, the growth stopped entirely, while extra power killed the germs in large numbers.

W. Bigby, 45
Valleyfield Road, Breathara,

Lausung, Mich
Copyright material

C126

Dr. W. Michael Murray
Chief of Police
POPULAR MECHANICS
Indianapolis
Ind.

544



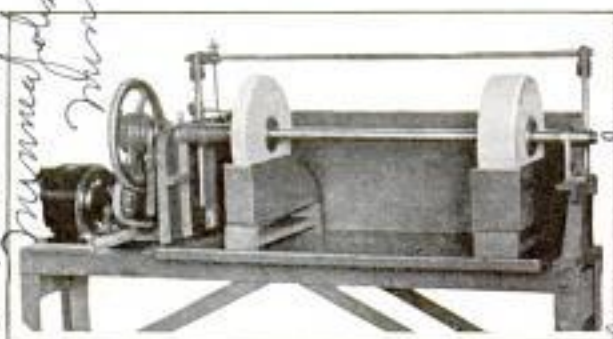
Left, Policeman Subdues Prisoner with Hard-Rubber "Slapper"; Right, Holding Slapper in One Hand and Billy, Which It Replaces, in the Other; Inset, the Weapon, Showing Handhold for Firm Grip

"SLAPPERS" INSTEAD OF CLUBS USED AS POLICE WEAPONS

Indianapolis police have substituted slapping for clubbing, and are now equipped with rubber slappers invented by their chief, instead of the usual night sticks. The rubber mace is a flat piece of hard rubber, rectangular in shape, and contains a slot through which the fingers are slipped to obtain a firm grip. The slapper bestows a stunning blow which subdues without bloodletting and does not leave any disfiguring marks.

MOWER SHARPENER IS FITTED TO GRIND OTHER TOOLS

Other tools may be sharpened by a grindstone attachment for a lawnmower grinder. The device is a shaft on which are two eight-inch grindstones, one coarse



Shaft with Two Grindstones, Connected to Lawn-Mower Sharpener, Grinds Many Tools

and the other fine, with water troughs, permitting the shaft to be inserted into the mower sharpener. Knives, axes, hatchets, scythes, sickles and other tools can be sharpened on the attachment.

PURPLE GOLD OF THE ANCIENTS IS FOUND IRON MIXTURE

Beautiful purple surface films on golden sequins, found in the tomb of Tutankhamen, are due to the presence of iron in the gold. Prof. R. W. Wood, of the Johns Hopkins University, has stripped off the film by coating the ornaments with celluloid varnish and then peeling off the varnish, leaving the underlying gold of a bright yellow color. Subjected to microscopic examination, the stripped-off film proved to be principally iron, probably an iron oxide. When one of the sequins from which the purple film had been removed was suspended between the poles of a strong electromagnet, it was attracted to one of the poles, proving the presence of iron in the gold. After learning these facts, Professor Wood duplicated the purple gold of the ancients by mixing gold and iron and subjecting the mixture to high temperature after hammering it into shape. One of Professor Wood's modern purple-gold sequins has been sent to the Cairo museum to be displayed with the originals found in the tomb.

B 2267

Science Service 12/2/32

Baltimore, Ind. Copyrighted material

Doley Mfg. Co
11-15 Main St. Ind.
Indianapolis
Ind.

C145 drw. Lbr.
August 1945

C 75

Research Engineers
**RADIO TUBE LACKING FILAMENT
IS SUCCESSFUL IN TEST**

Wired Radio due to
Radio tubes without filaments have been tested successfully in reception of broadcast programs. Before the Institute of Radio Engineers in New York, a four-tube set reproduced music from local stations loud enough to be heard clearly throughout a large hall. In experiments leading to the filamentless tube, more than 900 different bulbs, none having filaments like ordinary vacuum tubes, have been produced. All normal operations, and many unusual for the vacuum tube, are performed by these tubes. Some have been operated continuously for more than 1,200 hours. The bulbs are made in a wide variety of shapes and sizes. Inside each, when in operation, a purple glow is evident.

*subsidary - hold
American Co*

**ROCK SPREADER FOR HIGHWAY
SPEEDS ROAD MAKING**

Road making is being speeded up in the laying of crushed stone, gravel, and various types of hot or cold mixed asphalt, by the use of a rock spreader which does the work of several men in a fraction of the time required to spread the material by hand. It can be regulated for variable widths from one to fifteen feet, and less than three minutes is required to attach it to a truck, spread a ten-ton load of stone



Rock Spreader Operated by Two Men; It Handles over 1,000 Tons of Material a Day

and detach it. This gives the machine a capacity of more than 1,000 tons for an ordinary working day. Two men handle the spreader and do all the necessary work on the stone previous to rolling.

*Peterson & Heville
365 Rochester Ave
Boston, Mass*



Mounting Makes It Possible to Turn Aerial Camera in Any Direction without Endangering Operator

**MOUNTING FOR AERIAL CAMERA
AIDS PHOTOGRAPHER**

Eliminating many of the hazards to which the aerial photographer is exposed, a mounting for the eighty-five-pound camera used in taking pictures from the air has been produced. The mounting also dampens motor vibration to prevent blurring of pictures. The device consists of a loop of flexible fabric and rubber cord suspended in a U-shaped metal frame. It is installed on the machine-gun mounting that is standard equipment on U. S. army observation planes. The camera cone is inserted in the flexible loop and locked by attachment of the removable cone handle. This loop allows the camera to be swung quickly in all directions, in addition to reducing vibration. Before the mounting was designed by Serg. Alfred W. Poole, of the air corps photo division, the aerial cameraman was forced to take oblique photographs by standing on the seat in the rear cockpit with his body exposed to the slipstream of the propeller. Usually, the photographer discarded safety belt and parachute to obtain greater freedom of movement, so there was a great risk of losing both photographer and camera if the plane struck a violent bump.

*rights assigned
& War Dept*

*119th Photo Section,
44th Division Aviation*

"Perfect" Street Car Sought by Jolting Rider

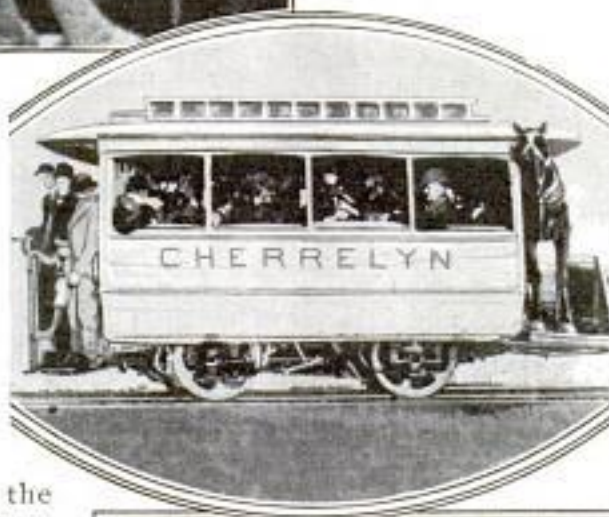


Testing a Subject on a Moving Platform; Right, on an Old Denver Line, the Horse Pulled Car up a Hill, Then Rode Down on Rear Platform; Below, Man in Chair is Experiencing Jolts of Riding Street Car

Street-car companies of the country have spent half a million dollars in the past three years in experiments to find what constitutes the perfect trolley car from the standpoint of both passengers and owners. During that period, hundreds of persons have allowed themselves to be jolted and bounced about on testing machines, then have related their sensations to the experts engaged in developing a more comfortable trolley. Three testing laboratories were established, one at Purdue University, a second at the University of Michigan, and the other at a street-car terminal in Brooklyn with half a mile of test track. At Purdue, stu-

dents were placed on seats geared to machinery which simulated all the shakes and jolts a car might be subjected to. Later persons of all ages took similar tests and described their sensations. From an analysis of these experiments, the experts gleaned important facts on what constituted the best kind of seat and what jolts and jars were most objectionable. At the University of Michigan, similar tests were conducted, except that the straphangers were the subjects. They stood on a wheeled platform controlled by cables and wires as it was moved over 200 yards of track, and had no idea what sudden movement or lurch was to come. Sudden lurches in starting sometimes all but threw them off their feet, and from these tests much was done to improve the starting

and pick-up of street cars. Motion pictures of persons on the platform were taken, and their every movement was studied as the cables and wires manipulated it. At Brooklyn, the subjects of the tests were sandbags representing passengers. Cars of improved design were



sent over the test track, loaded with sandbags, observers with delicate instruments

Tests made by Charles F. Kitchfield, Detroit, Mich.
for American Electric Railway Assn.

Milwaukee Journal 1/15/33

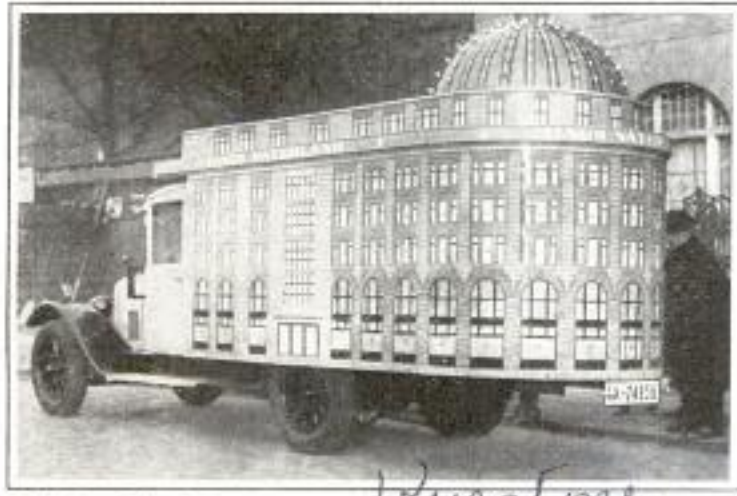
noting how the cars acted under actual service conditions. As a result of all this research, several cars have been constructed along somewhat diverging lines and are undergoing prolonged traffic runs.

BANKED CURVES ON HIGHWAYS MAKE DRIVING SAFER C108

Prevention of between 2,000 and 3,000 automobile fatalities annually and other thousands of injuries and accidents could be accomplished by banking all highway curves sufficiently. This is the conclusion of W. B. Potter, former railway expert for an electric manufacturing company, who points out that banking is standard practice on railways while many roads, including some special automobile highways, either have flat turns or curves which actually tilt outward and thus encourage skidding and running off the road. About 5,000 persons are said to have been killed on highway curves in 1930 and 1931. The danger of unbanked curves results from centrifugal force. At forty miles, this force on a curve of 300-foot radius amounts to nearly thirty-six per cent of the weight of the auto.

MODEL HOUSE BUILT ON TRUCK ADVERTISES COFFEE SHOP C76

Through the streets of Berlin a truck passes daily bearing a model of a six-story building, the original of which houses a coffee shop and recreation facilities. One side of the model building is open to expose the interior.



© Keystone View Co.
Model of a Six-Story Building Mounted on a Truck; One Side of the Model Is Open to Expose Interior



How Electric Football Game Is Played; Lists of Plays Are Shown on Sides of Board

ELECTRICAL FOOTBALL GAME OFFERS MANY PLAYS

Offering a wide choice of plays, an electrically controlled football game is available. The board on which the game is played is lined off like a football field and at each end are seven legends designating the kinds of plays that may be chosen. These include end run, spinner, line, off-tackle and lateral pass plays, and punt, drop and placement kicks. Along each side of the board are two vertical lines of metal electrical terminals with legends designating the results of plays. In making a play, a small metal football is placed in one of the 1,040 holes on the board, vertically according to the distance the player has made along the field and horizontally according to the kind of play he is going to attempt. Placing the football is the first step in an electrical connection. In order to ascertain the result of the play, the defensive player touches with a small metal rod one of the series of terminals at the side of the board. When the rod touches the particular terminal that is the result of the play, a buzzer sounds. Regular rules govern the game.

Arthur Sibbold
Hamilton Bank
Challanwoya Tenn
12/5/33

B1805

Ernstard W. Wynne Cook
Wynnewood, Pa.
Ruslyn House Observatory

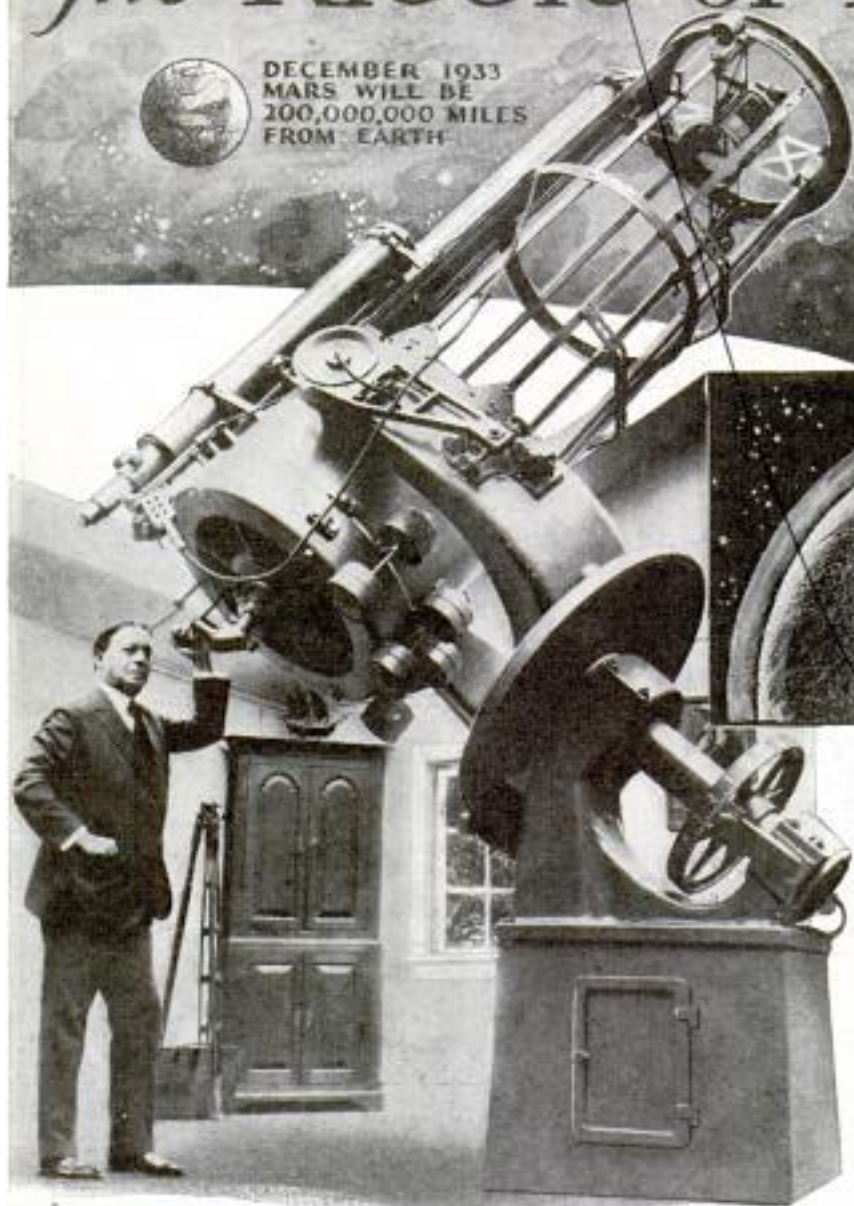
The Riddle of MARS



DECEMBER 1933
MARS WILL BE
200,000,000 MILES
FROM EARTH



MARCH 1933
MARS WILL BE
63,000,000 MILES
FROM EARTH



Four-Ton Telescope Installed by Amateur in Pennsylvania; Above, Color-Sensitive Photo Indicates Atmosphere Surrounds Mars Sixty Miles Up

brightest objects in the heavens. It was watched, sketched and photographed by astronomers who hope that analysis of their observations will result in revealing many of its secrets.

Its principal secret, of course, is the question of its habitability, whether or not conditions are such as to favor the existence of life, and if so, what

By **GEORGE W. GRAY**

Sparkhill, N.Y.

SCORES of telescopes were focussed on Mars during March when that strange wanderer of the skies made its appearance opposite the sun and became one of the

kind of life. For centuries men have dreamed that Mars is a living world, some have even interpreted markings on the planet as evidence of canals and other en-

KNOWN FACTS ABOUT MARS

It is a globe about 4,215 miles in diameter; weight about one-tenth that of the earth.
Its distance from the sun is about one and one-half times that of the earth; it receives only about four-ninths as much sunlight per square mile.
It has four seasons, but these are about twice as long as our seasons on earth, because the year on Mars is 687 days.

The day on Mars is twenty-four hours, thirty-seven minutes and twenty-two and one-half seconds.
Mars has polar ice caps which melt under sunlight; therefore it has liquid water, but no seas.
It has an atmosphere which consists of oxygen and water vapor.
Mars has two moons; Phobos, diameter ten miles; Deimos, diameter five miles.



IT IS HARDLY PROBABLE THAT LIFE AS WE KNOW IT EXISTS ON THE . . . PLANET MARS



1939 MARS WILL BE STILL NEARER THE EARTH

MARS HAS TWO MOONS: ONE 5 MILES IN DIAMETER, THE OTHER 10 MILES

The EARTH

gineering works, but modern science has been very skeptical of that theory. Ten years ago the prevailing attitude of astronomers was to doubt the whole idea of life on Mars simply because, so far as they could judge, life as we know it could not exist there. Mars, they said, was too far from the sun, too cold, too arid, too small to hold the necessary atmosphere, and therefore uninhabitable, probably dead.

They don't say that any more. Recent results have proved that Mars has an atmosphere; that its temperature, while below zero at night, rises at noon to fifty-five or sixty degrees Fahrenheit; that clouds float in its skies and rains probably water its lands, and that life of some kind is possible there.

These results were obtained by new refinements in equipment. The measurement of Martian temperature was made possible by an extremely delicate electrical device, the thermocouple, so sensitive it can measure the heat of a candle 100 miles distant.

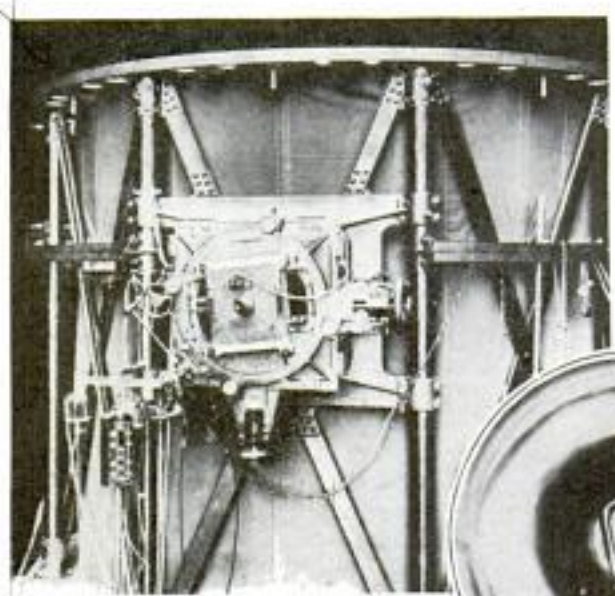
Another refinement, color-sensitive pho-



One Astronomer Believes Such Creatures as May Be on Mars Are without Backbones Because There Are No Swift Streams and Lower Forms of Life Would Not Need to Develop Spines

B31805

Star Thermometer from Mt. Wilson Observatory



ago. These are the plates that take photographs in the dark without any visible light at all. Already astronomy has made important use of the new plates. At the Harvard station in Maine, last August, a photograph of the eclipsed sun, taken with heat rays, showed one solar streamer stretching 2,500,000 miles into space—the longest extension of the sun's atmosphere reported by any of the expeditions.

What the new plates may reveal as to Mars is of course highly speculative. It may be that they will show a greater surface detail than any of the earlier exposures,

Above, Thermocouple on Telescope Ready to Take Temperature of Star; from Chicago. It Could Measure Heat of Candle in Milwaukee; in Circle, Eye of Star Thermometer; Right, Mars as Photographed in Light of Different Colors



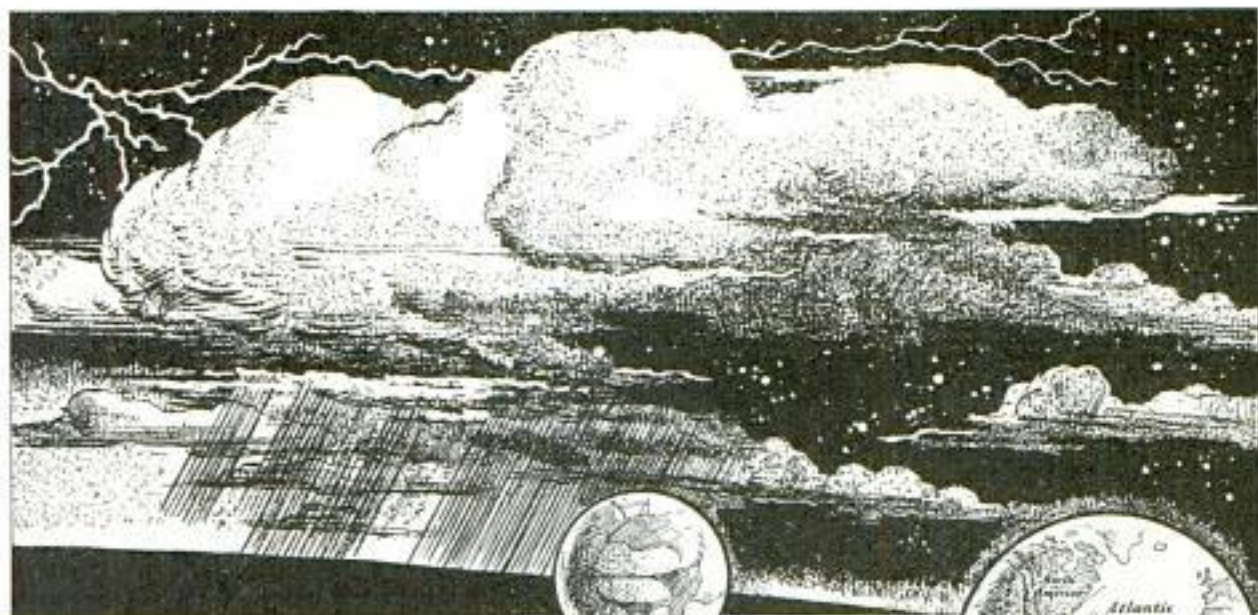
tography, enabled Dr. W. H. Wright, of the Lick observatory, to photograph the atmosphere of Mars. It was a notable achievement. First Doctor Wright made a picture of the planet in infra-red; it showed the face of Mars splotted over with irregular areas of dark and light. Then he photographed Mars in ultraviolet. The resulting image was hazy, none of the surface markings showed, obviously it was a photograph of the blue sky surrounding the planet in a shell of air to whose light the ultraviolet plate was sensitive. When the astronomer compared the two plates he found that the ultraviolet image was larger than the infra-red. The difference when figured for the actual size of the planet was sixty miles—which apparently means that an atmosphere surrounds Mars to a height of sixty miles at least.

for the long-wave rays to which these plates are sensitive are able to pierce through fogs or clouds that sometimes haze certain areas of the planet. Also because of their sensitivity to heat rays, it may be that the plates will provide an additional means



of gauging temperatures on Mars, or perhaps measuring differences in temperature between contrasting regions.

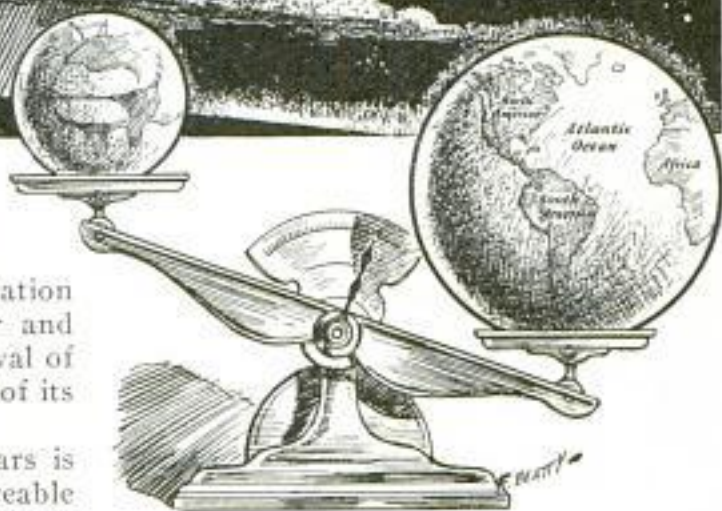
On the fifteenth, Mars was only about 63,000,000 miles away, riding the roof of the world straight overhead at midnight. Thereafter, the planet began moving farther and farther away from our part of space, and by Christmas will be nearly 200,000,000 miles distant from the earth, soon to disappear from our night sky on the other side of the sun. In 1939 it will be back for a still nearer approach. By then Mars may be viewed through a great 200-inch telescope, and that larger eye



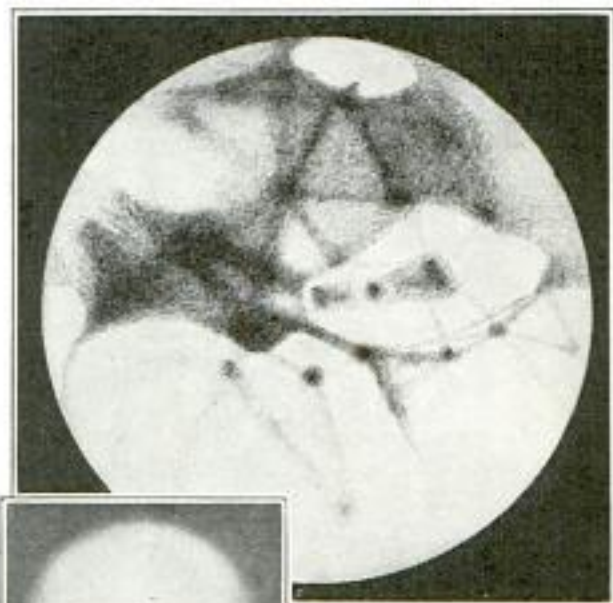
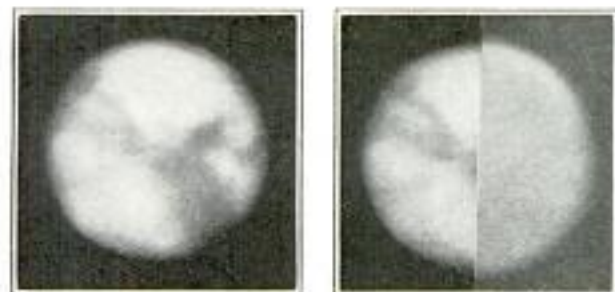
should be able to see in more detail those mysterious dark areas that change with the season, that seem to be vast stretches of vegetation dying down in the Martian winter and springing into new life with the arrival of the Martian spring and the melting of its polar snow cap.

Perhaps the whole mystery of Mars is wrapped up in those dark and changeable areas. If we could penetrate to their meaning we might be able to say what life on Mars is, and settle one of the greatest controversies in astronomy. For while scientists now are agreed that there is life on Mars, they by no means agree as to what kind of life.

There are some, like the late Prof. Percival Lowell, who believe that the dark areas, or at least some of them, are cultivated lands, farms or plantations watered by irrigation systems so constructed as to bring water from the melting polar snows



Top, Some Scientists Believe Temporary Canals Seen on Mars Are Paths of Great Rainstorms; Below, Mars Weighs About One-Tenth as Much as the Earth



Above, Drawing of Mars Made by R. J. Trumpler; Left, Infra-Red and Ultraviolet Photos of Mars; Difference in Size Is Believed to Represent Shell of Atmosphere

down to the farms. But if there are farms, there must be farmers, and if there are irrigation systems, there must be engineers

(Continued to page 133A)

Lick Observatory Photo
Copyrighted material

Metal Working on Sewing Machine New Art



Top, Metal Working on Sewing Machine; Below, Left, Some of the Dies; Right, Close-Up Showing How Work Is Done

Stamping and perforating decorative designs on sheet brass, copper and other soft metals can be done on a sewing machine. Steel dies that fit into the needle socket of the machine have been produced for high-speed operations, up to 900 revolutions per minute. The process is simple. The designs are drawn or traced on the sheet metal. Then the operator follows the design, changing to different dies as the work demands. Ten different types of dies are available. Finished products are similar in beauty to art objects hammered out 2,500 years ago by the East Indian metal workers. Lamp shades, fire screens, picture frames, ash trays, jewel chests and

cigaret boxes are some of the things particularly adaptable to this work. Applications of the new art are limited only by the uses to which the softer metals may be put and by the operator's skill.

C 173 MOVIE-FILM SALES RECORD REPLACES STORE LEDGER

Photographic copies of customers' bills are recorded on small-size motion-picture film in a Philadelphia department store, replacing the detailed ledger system in common use. The machine which so simplifies billing operations was produced by a subsidiary of the Eastman Kodak company to make miniature photographs of business papers as rapidly as they could be fed into a 'hopper. Not even pressing a button is required. Dropping a bill of sale into the hopper causes two cameras inside a small cabinet to take pictures on two rolls of film. The customer gets the original bill, leaving the film rolls as the store's only record. One roll goes to the adjustment counter and the other to a safe, as a substitute for large carbon copies of bills. The saving in space is considerable, since 4,000 bills can be recorded on a film that occupies a space four inches wide, four inches high and one inch thick. The machine operates somewhat like the high-speed movie camera. The film, moving with the belt that carries the bills in front of the two camera lenses, registers continuous pictures as it passes a narrow slit in each camera. Instead of snapping pictures, the slit causes a picture to be recorded on the moving film.

Recordak Corp.
350 Madison Ave
New York City

Herald and Examiner 12/28/32
B2271

Russell & Stoll Co, Inc
53 Ave St
Everlake New York

BUTTERFLIES CAN SEE COLORS INVISIBLE TO HUMANS

Butterflies and moths, as seen by each other, are very different from the way they appear to human beings, because they see ultraviolet radiations and reflections beyond the range of the eye of man. Dr. Frank E. Lutz, of the American Museum of Natural History, has demonstrated this by taking photographs of butterflies, moths and flowers in which only the ultraviolet patterns were visible. It was found, for instance, that all patches and spots on butterflies and moths which appear to be Chinese white to the human eye were in reality a deep ultraviolet in hue. Other white shades were also found to be ultraviolet when seen by the insects.

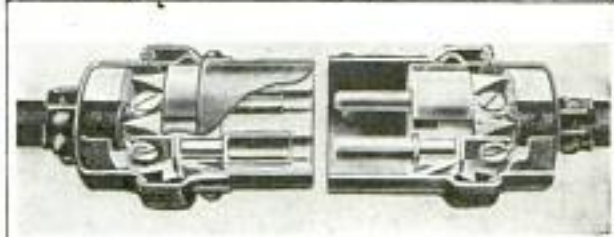


New York City

STEEL GUARD ON MOTORCYCLE PROTECTS THE RIDER

Steel guards to protect the rider have been produced for the motorcycle. Made of heat-treated tubular steel, the guards are attached to the front of the frame, offering maximum protection to the operator and the vehicle in side-swipes and spills. In tests, the steel tubes guarded the rider from what seemed to be certain injury and prevented damage to tanks, engine and other parts of the motorcycle.

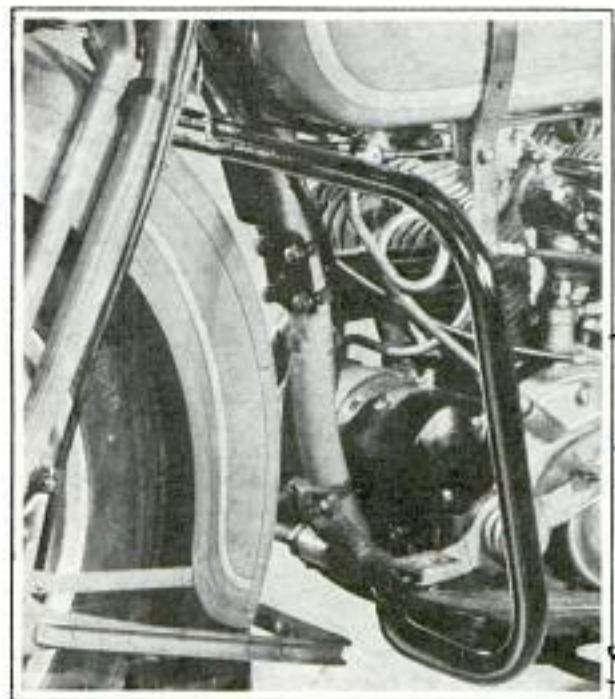
B2219



Electrical Arrangement at Bottom Makes Connection That Prevents Accident Like That at Top

ELECTRIC OUTLET LOCKS PLUG INTO SAFER CONNECTION

Protection against cross connection is found in an electric outlet and plug which automatically lock, making the plug casing mechanically fast to the connector, and thus relieving strain on the electrical contacts. To disconnect the plug, it is necessary to give it a reverse twist to bring it into position for pulling out. A spring holds the plug in place until removal is desired. The connection between outlet and plug is dustproof. All connections are inclosed, eliminating accidental short circuits and tampering by inexperienced persons. Plugs can be inserted into the outlet in only one position.



Bar Extending from Side of Motorcycle Guards Rider in Case of Accident

SULPHURIC ACID KILLS WEEDS IN WHEAT FIELDS C120

Sulphuric acid is being used extensively by French farmers to destroy weeds in wheat fields. Solutions varying from eight to fourteen per cent have been found effective on a large variety of weeds and also against smut. Action of the acid in weed eradication is not as a poison but as a dehydrating agent. The soil appears to be benefited by the acid.

Dept. of Commerce, Paris

Harley Davidson
Motor Co. 370 Juneyau Ave
Milwaukee, Wis

Reported by Asst. Trade Comm.
E.C. Taylor, Paris
France

material

Ultraviolet Rays Test Art to Aid Restoration



who recently made a direct measure of this resistance of a car on the road under actual operating conditions. Professor Lay made a "floating" body and mounted it delicately on ball bearings so that slight air pressure would shove it back. This force was restrained only by a piano wire and was measured by a drawbar dynamometer. The floating body did not have the conventional outlines of an automobile, but was rectangular in shape with rounded edges and corners, and looked more like a box car. The edges were made of wire mesh fastened over a light frame covered with airplane fabric, the frame itself being supported by steel tubing. Tests

were run over a four-mile course of concrete. A miniature weather station measured the velocity of the wind, its direction, and the temperature, pressure and humidity of the air. Air resistance on the body was found to vary between six and 140 pounds according to the speed.



Academy of Art
Wide World
Improved methods of restoring valuable paintings have been made possible through the use of X-ray and ultraviolet-ray machines. Vienna scientists, by subjecting art to exhaustive tests under the various rays, have found ways to prevent damaging a painting while restoration is in progress. In addition, it now is possible to detect a forged or falsified painting by examining it with these special machines. Experts are able to ascribe a certain masterpiece to a certain artist with a large degree of certainty, due to these scientific tests.

STREAMLINING AUTOS TO SAVE HALF OF FUEL NOW USED

One gallon of gasoline should drive properly streamlined automobiles with suitable gear ratio twice as far as it carries the conventional car of today. This is the opinion of Prof. W. E. Lay, of the University of Michigan, a leader in the study of air resistance of automobiles,



Top, Restored Painting; Bottom, Same Painting before Restoration; Center, the Laboratory

Scene Service 1/24/33
Ann Arbor Mich

**WEATHERPROOF
 CLOTH FOR
 CHILDREN**

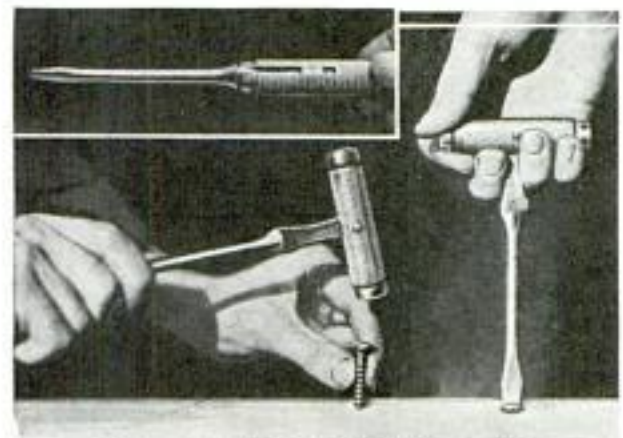
For the protection of children playing outdoors, a weatherproof cloth has been produced. American cotton is used in manufacturing a finely woven cloth that becomes wind and shower-proof through chemical treatment. The problem was production of cloth heavy enough to be weatherproof, yet sufficiently light to cause child wearers no discomfort. The work was done in the textile division of the U. S. department of agriculture.

Miss Ruth O'Brien Chief

**SCREWDRIVER IS
 ALSO USABLE
 AS HAMMER**

Two tools in one are contained in an all-steel screwdriver with a grip which can be used in either a parallel or right-angle position. In the latter position, the tool can be used as a hammer and increased leverage is given in loosening old and rusted screws, or starting large screws in hard wood. A high-tension spring and plunger inside the grip holds the handle firmly in either position.

C 149



Screwdriver with T-Handle Which Can Be Used as Hammer When in Right-Angle Position

*Crescent Tool Co
 Jamestown, N.Y.*



This Huge Projector Puts a Second Moon in Sky by Throwing Picture on Clouds; the Beam Has a Range of Fifteen Miles

**FIFTEEN-MILE BEAM OF LIGHT
 PAINTS SKY PICTURES**

Projecting a beam of light more than fifteen miles into the sky, a giant magic lantern is being used to cast pictures on clouds over London. The machine has a barrel with larger gauge than the huge guns on British warships, yet it is lighter than a machine gun. It can be swung in a circle by electrical apparatus in search of clouds on which pictures hundreds of miles in extent can be projected. In one test, the semblance of a second moon was produced by focusing the beam on a suitable cloud formation.

☞ Silks are sometimes treated to five baths of tin chloride and disodium phosphate, the resulting material being about half silk and half metallic salts.

Scientific Service No. 14, 1932.

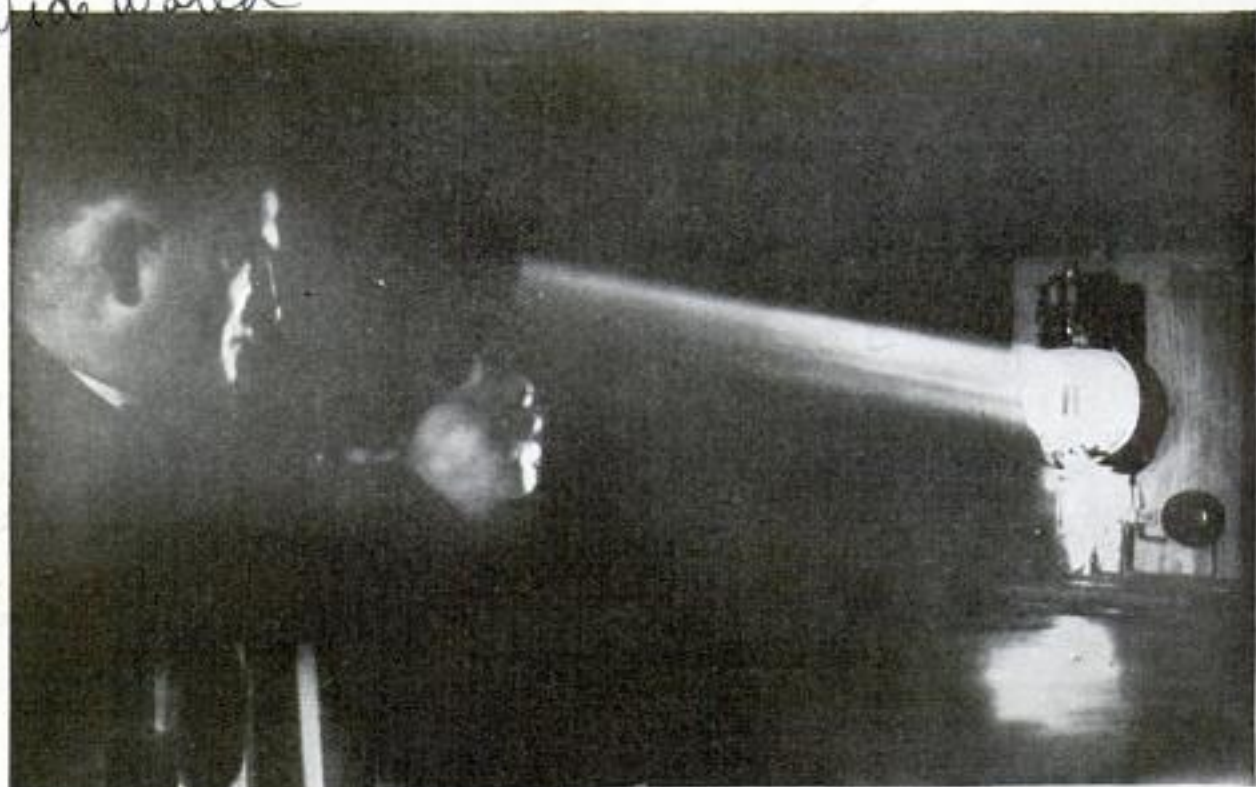
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searchlight projector sold by London Electric Firm Brighton Road, Croydon, Eng.

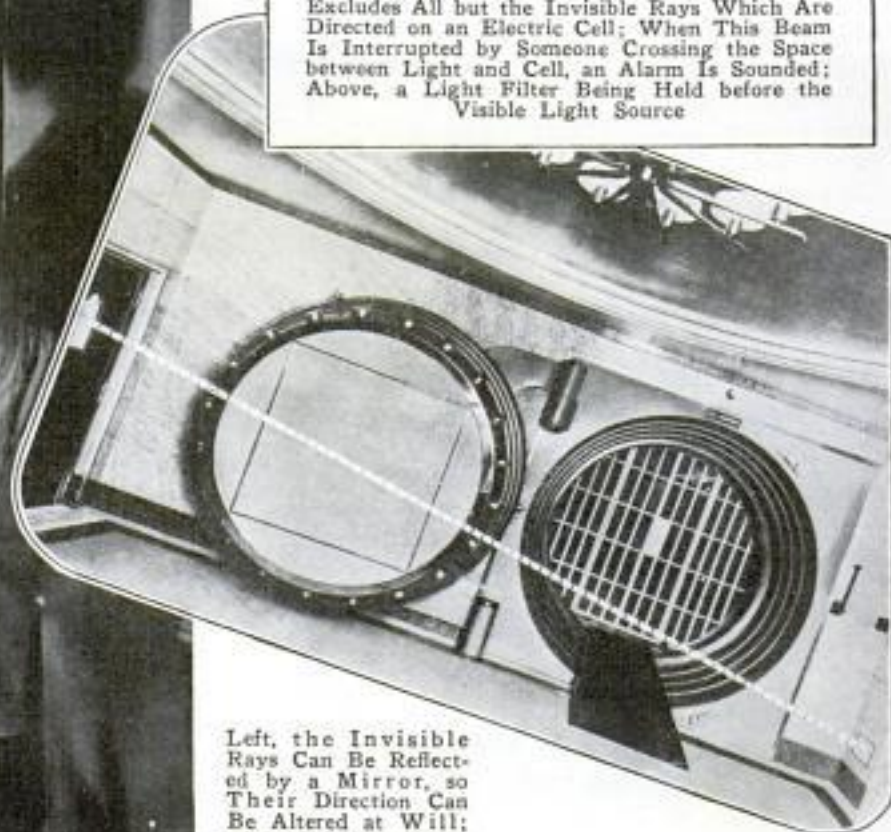
001868

Invisible Light Rays Guard Treasures and Art

World War
Germany
Bank Vaults
Museums



Invisible Rays Are Used in Germany to Guard Bank Vaults and the Treasures in Art Galleries and Museums; a Filter over a Light Source Excludes All but the Invisible Rays Which Are Directed on an Electric Cell; When This Beam Is Interrupted by Someone Crossing the Space between Light and Cell, an Alarm Is Sounded; Above, a Light Filter Being Held before the Visible Light Source

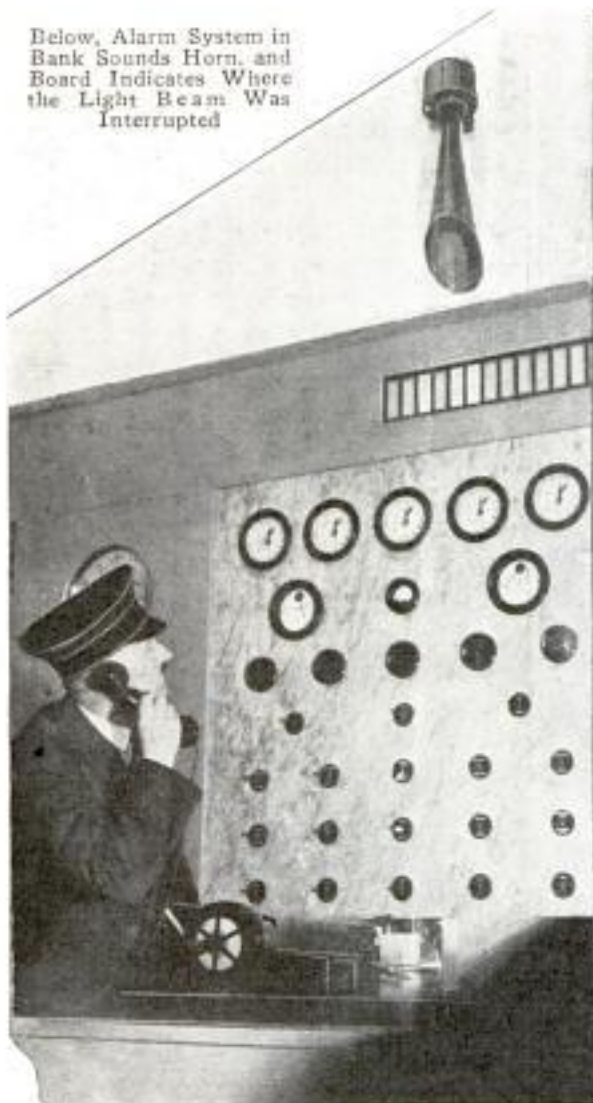


Left, the Invisible Rays Can Be Reflected by a Mirror, so Their Direction Can Be Altered at Will; Above, Line Indicates Path of Rays Guarding Bank Vault

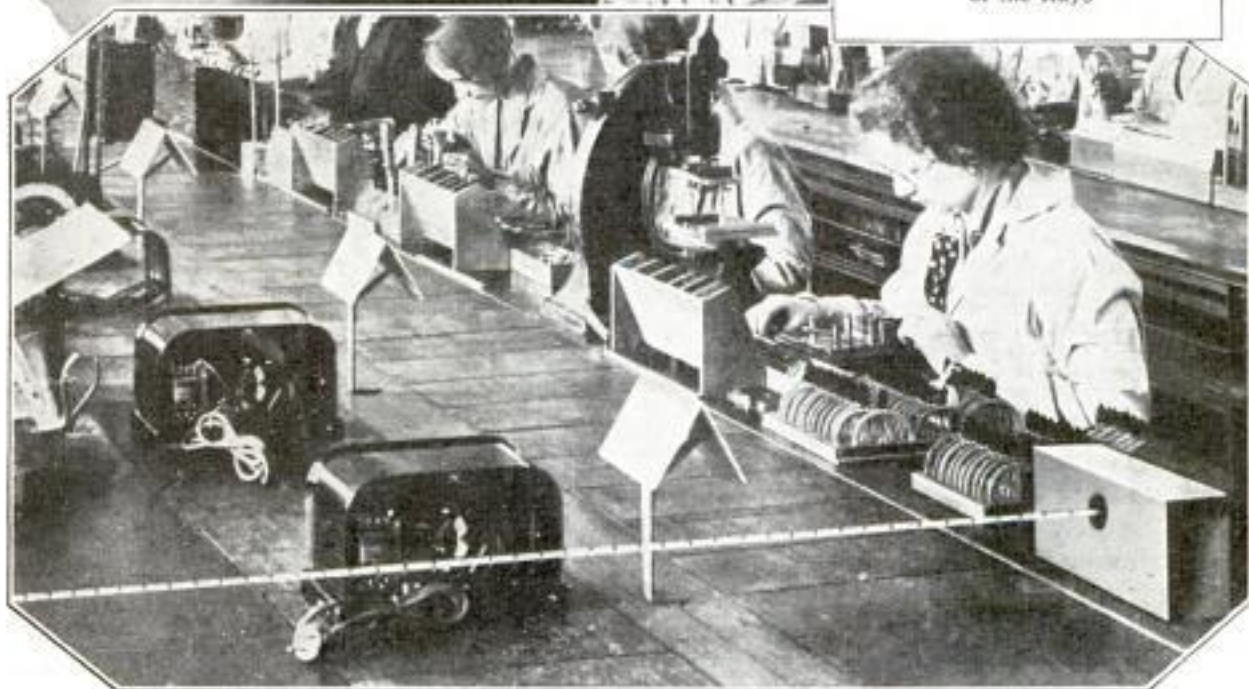
B/1868

Electric Eye Calls Aid if Deadline Is Crossed

Below, Alarm System in Bank Sounds Horn, and Board Indicates Where the Light Beam Was Interrupted



Above, Placing Filter over the Light Source Stops All Visible Light but Allows the Invisible Rays to Pass Through and Fall on the Electric Cell; Below, Invisible Rays Making Contact with a Tachometer; the White Line Marks the Path of the Rays



P 2 28 7

on the Thames Embankment

Latex. Herron & Meyer, 82 Beaver New York

558

POPULAR MECHANICS

Charing Cross

Lighthouse Safety Island in London Street Which Illuminates Both the Road and the Traffic Officer



© Keystone View Co.

"LIGHTHOUSES" PLACED IN ROAD SERVE AS SAFETY ISLANDS

London is experimenting with lighthouses installed on safety islands in the middle of busy streets to make the islands more visible at night, and hence safer for both pedestrians and motorists. Each lighthouse consists of an illuminated enameled pillar which lights both the road and the safety island as well as a traffic officer when one is on duty at the tower.

"ELECTROPLATING" OF RUBBER MAKES IT WEAR LONGER

Latex, a liquid from which rubber is made, is composed of tiny particles, each carrying a minute negative charge of electricity. Rubber-compounding material and vulcanizing agents are given a similar negative charge and added to the latex. When the mixture is given a positive charge, rubber forms at the positive pole, called the anode. If the anode is shaped like a

glove, the rubber takes the form of a glove. This process is being used successfully in producing what the trade knows as anode-rubber gloves. Rubber formed in this way is said to be tough, resistant to abrasion and capable of retaining its original properties and freshness much longer than that worked by other processes. Latex can be shipped in tank steamers after being treated with a preservative that prevents it from turning sour, just as cow's milk when exposed to the air and warm temperatures.

PUTTY KNIFE COMBINED WITH SCRAPER AND GLAZING TOOL

Three tools are combined in a putty knife which can also be used as a scraper and for glazing. One side of the tool resembles the ordinary putty knife, but the other has a sharpened offset. In using it as a scraper to remove old paper or paint, the offset protects the knuckles of the user from injury, and the same is true when it is used to clean out the overhang-

ing top of a putty or paint can. Old putty can be removed from a window sash without injury to the sash itself, and at the same time the hand is kept away from the work. It can also be used for cleaning out cracks, for getting wall paper out of cor-



Putty Knife with Sharpened Offset on Side; It is Also Useful as Scraper and for Glazing

ners and for trimming it off when the paper is newly hung.

Sand's Level + Tool Co. are copyright material 86 31 Saratoga Street

Part are Phila C 56
Coul. Sec. Eckhardt 2647 h.
Jr. Rym. Vol. 5
Co. Pittsburgh, Pa. 7097 1/2 Wood St.

The Laboratory, No. 5, Fisher Scientific Co., Pittsburgh, Pa.

Institution of
Electrical Engineers, Savoy

C 39

112. POPULAR MECHANICS
Place, Uelous Embankment,

SYNTHETIC-JEWEL BEARINGS ARE HARD AS REAL

London W.C.2. Eng
Improvement in manufacturing processes has resulted in production of synthetic jewels that are as hard as natural stones, more uniform and much cheaper for use as bearings in precision instruments. The synthetic ruby has been adopted for watch bearings, while synthetic corundum is gaining ground, being hard, susceptible to high polish and incorrodible by chemicals. Numerous tests have shown that the crystal structure of artificial corundum is the same as that of the natural stone. In producing synthetic-jewel bearings, the manufactured stone is split, then cut into planes by high-speed copper disks.

L. S. Sandimer



Paramount

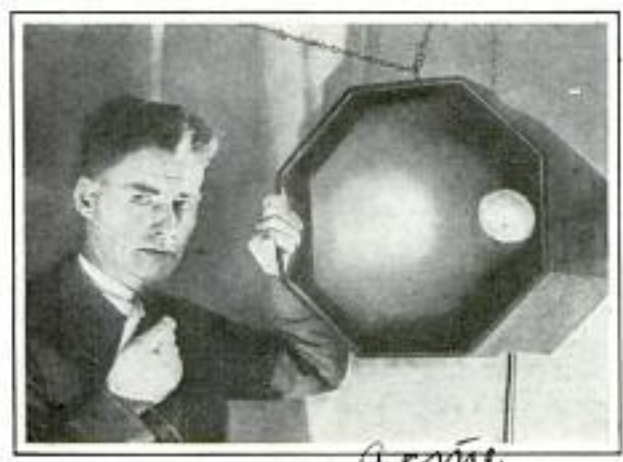
Couple on Platform on Which Camera and Sound Equipment Are Set Up Pushing Platform Produces Effect of Dancing through Crowd

Sary Cooper, Sylvia Sydney
HOW DANCE SCENE IS FILMED ON WHEELED PLATFORM
City Streets

Photographing a dance scene has been a serious problem for motion-picture producers, due to the difficulty of keeping the dancers always exactly in focus and of maintaining the microphone at the correct distance to receive their speech clearly. Usually, expensive retakes were necessary in attempting to follow the actors along a crowded dance floor. Until recently, the course of selected dancers was traced on the floor with chalk of a color that would not record on film. As the couples moved, the camera and microphone on their wheeled tripods were pushed along. Now the problem has been solved. A very low platform on wheels is used, with the camera and microphone mounted at one end. The dancers are given a place to stand on the platform and the camera is focused on them, but high enough so none of the platform is photographed. When the scene starts, the platform is pushed through the crowd of dancers while the couple directly in front of the camera moves in rhythm to the music, but never off the space assigned to them.

LIGHT RAYS COMBAT AIR RAIDS BY BLINDING PILOTS

British air-ministry officials are testing a searchlight invented by an English elec-



Searchlight Intended to Blind Pilot of a Bomber and Make Air Raids Harmless in Time of War

trical engineer and intended to render air raids harmless in time of war. The invention consists of an arrangement of light rays which, it is claimed, will blind the pilot of a bomber so effectively as to cause him to crash eventually after losing his sense of direction.

L. S. Toplis

□ An electrical operating device for awnings affords rapid three-position adjustment.

Cannot locate maker
Copyrighted material

*same device
Nov. 14, 1932*

C1581 C-6

Ant. Landberg
West Caldwell
N.J.

Exhibit by John Carda, Hollywood, Calif. Built by Walden B. Ludwig his daughter Penelope Coppage. 59.9 Carvings San Francisco



Monastery at Santa Maria, Spain; It Was Carved with a Jackknife and Contains over 18,000 Pieces

CHURCH CARVED WITH A KNIFE HAS THOUSANDS OF PARTS

Using only a jackknife for the work, a Hollywood, Calif., man has carved a large model of the famous monastery at Santa Maria, Spain. More than 18,000 pieces were used in the construction, and all the rooms are equipped with tiny furniture, rugs have been placed on the floors, and little hangings are found on the walls.

ELECTRIC HUMIDIFIER IN HOME CONDITIONS AIR CHEAPLY

Air is filtered, humidified and circulated without the use of a duct system by a humidifier developed by the General Electric company, that will serve an entire home. Electricity is used at the same rate as a single incandescent lamp. A complete change of air in the lower part of a house is effected in forty minutes. The filtering capacity serves a home of six to eight rooms on the first floor. Circulation of the conditioned air is produced by a motor-driven fan. Installed on the first floor, the humidifier takes air from the basement, removes the dust by passing it through a filter and then sends it through the water cham-

ber to pick up moisture. The air then is forced out the discharge grill by the fan and returns to the basement through a grill at the opposite side of the house.

RUBBER BAND ACTS LIKE A REFRIGERATOR

Nothing more than a wide elastic band is needed to illustrate how a mechanical refrigerator operates. First, hold it loosely between the fingers and touch it to the upper lip to judge the temperature. Then stretch it quickly as far as possible without breaking and note that the rubber is noticeably warmer. With the band still stretched tightly, vibrate it gently to radiate away the heat, then allow it to contract suddenly and at once test the temperature.

You will note it is noticeably colder. The alternate compression and expansion duplicates the cycles in a refrigerator.

TREES PUSHED OVER BY A JACK MANNED BY TWO PERSONS

Small trees can be uprooted quickly with a jack manned by only two persons. The roots on one side are severed and the jack is braced against the trunk. A long handle gives a powerful leverage and, if the jack is set firmly at the base, two persons can push a tree over and at the same time pull out most of the roots.



Jack with Long Leverage Which Pushes over Small Trees Easily

Used in England

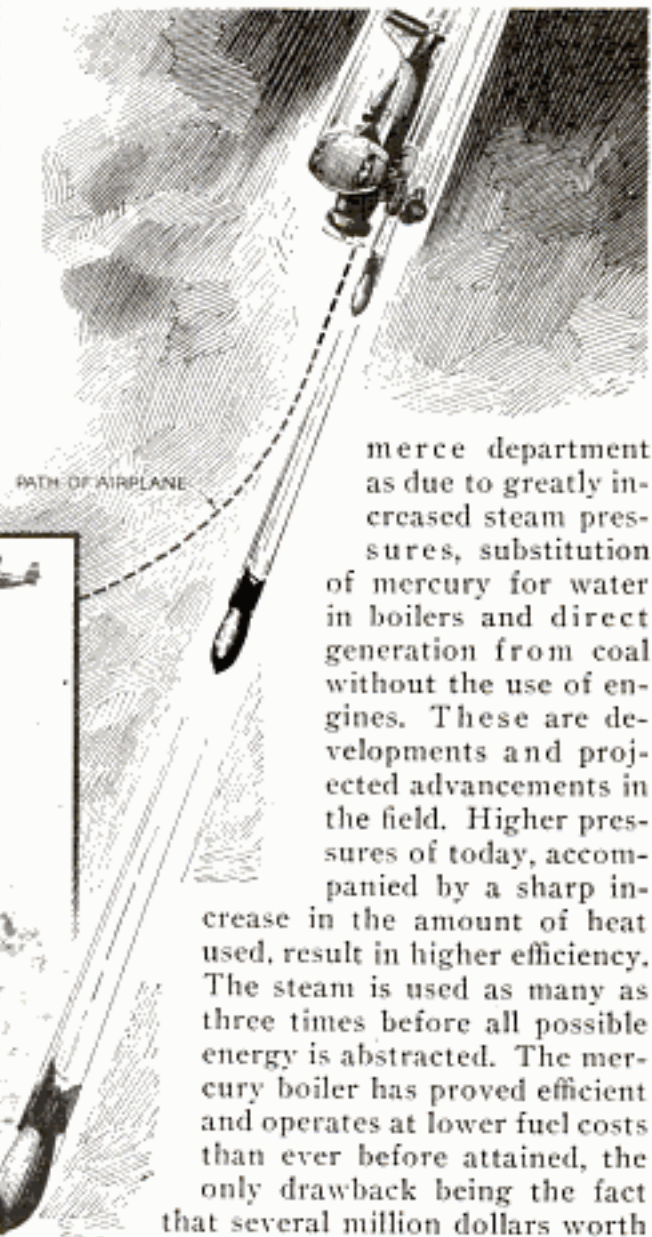
Schenectady, N.Y.

Copyrighted material

cont. H. J. Wilbur, Lt. H. W. Ferguson, Randolph Field Texas 561

Dive Bombing at Targets Assures Accuracy

Bombs released from an airplane do not drop nose down until after they have fallen for several thousand feet. Owing to their forward speed when released, they drop horizontally at first and then gradually nose over. If they are dropped from a low altitude, the missiles are likely to strike on their sides and in many cases fail to explode. To overcome this difficulty, particularly in low-altitude bombing, the pilots dive their planes at the target, thus pointing the nose of the projectile toward the earth when it is released and causing it to hit with the fuse end first so it will surely explode.



merce department as due to greatly increased steam pressures, substitution of mercury for water in boilers and direct generation from coal without the use of engines. These are developments and projected advancements in the field. Higher pressures of today, accompanied by a sharp increase in the amount of heat used, result in higher efficiency. The steam is used as many as three times before all possible energy is abstracted. The mercury boiler has proved efficient and operates at lower fuel costs than ever before attained, the only drawback being the fact

that several million dollars worth of mercury is necessary to fill one boiler. The mercury is heated to a vapor and used in the same manner as steam, then returned to a liquid. It can be used over and over with practically no loss. The latest claim for generating electricity directly from coal is advanced by a Czech scientist, who says electricity can be generated as well by the reaction resulting from a combination of oxygen and carbon as from acid and zinc. This would be a sort of "hot cell," a complicated arrangement that would correspond to building a coal fire to generate electricity for lighting the home.

memo 1/10/33



Drawings Showing Why It Is Necessary to Dive a Bomber at Target When Releasing Missiles at Low Altitude

HEAT AS ELECTRICITY SOURCE GAINS IN EFFICIENCY

Improved efficiency in generating electricity by heat is reported by the com-

H. E. Way, Commerce Dept's, Electrical Equipment Division

B 931

Marshall W. Broyles, 201 S Harrison St. Alexandria, Ind.

(A. S. & S. F. H. Co.)

American Steel Industries

562

Harrison St. Alexandria, Ind.

POPULAR MECHANICS

410 Wrigley Bldg Chicago



Bars Appear as Window Is Raised and Slide into Holes as Window Closes

DISAPPEARING WINDOW BARS KEEP OUT INTRUDERS

Protection of the home against burglars and kidnapers is provided by a set of bars that appear when windows are opened and that disappear when the windows are closed. Set six inches apart, the bars are attached to the top of the upper window sash and to the bottom of the lower. When the window is closed, the bars are concealed in holes drilled in the sills and walls. Opening the sashes brings the bars into view. The operation is noiseless. Each bar is made of steel, about thirty inches long. Windows fitted with unbreakable glass and the disappearing bars are virtually burglar-proof.

STOPPING VIBRATION OF TRAINS REDUCES FREIGHT LOSSES

How to reduce losses on freight damaged by vibration of trains running at high speed is the subject of tests by railroads and private car lines. A rebound snubber has been devised for application to the trucks of freight cars now in use, while

complete new trucks with elliptical and coil springs have been produced. Meat is shipped in refrigerator cars, being hung on hooks. Often, at the end of the journey, more meat would be found on the floor than on the hooks, due to vibration. The refrigerator-car trains carrying perishable foodstuffs are operated on passenger-train schedules and in practice attain speeds of seventy miles per hour. Adoption of car trucks that absorb or counterbalance vibration has solved the meat-shipping problem. An observer noticed that tile in an ordinary freight car bounced two inches off the floor when the car ran over rail joints. This caused chipping and breaking of the tile, and resulted in damage claims. Application of four snubbers to cars resulted in elimination of vibration so that tile can be shipped safely.

B 2285

FIRE HOSE TOSSES FINE SPRAY TO EXTINGUISH BLAZE

Germany is producing a fire nozzle which can shoot a regular stream or, by means of a special nozzle fitting, can throw a finely divided mistlike spray. Such a spray, it is claimed, effectively excludes combustion-supporting air and therefore will quench even an oil fire.



Fire Hose Which Throws a Fine Spray, Thus Smothering a Blaze by Excluding Air from It

C 150

Cardwell Westinghouse Co. 332 S. Michigan Chicago

Heint Rheinmetall A. G. Dusseldorf, Germany

Copyright by Heint Rheinmetall A. G. Dusseldorf, Germany

© 1111 Sam Brown, 151 Carlhart St
Marion, Ohio

WHAT TO LOOK FOR IN BUYING A BOAT

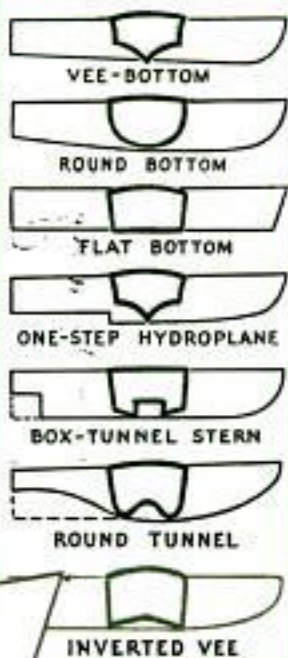
TWELVE years ago there were less than 100,000 motorboats on federal waterways. Today the figure is well over 250,000 with triple that number on inland lakes. The advent of the outboard motor, together with better boats at lower prices, has made this great advance possible.

And yet the average boat buyer of today knows no more about boats than he did ten years ago. Nevertheless, the whole thing is quite simple. First, boats are either work craft or pleasure craft. The pleasure craft is either a runabout, a speedster, a utility boat or a cruiser. Any of these boats can be obtained in as many as a dozen distinct hull designs. Seven of these designs are shown on this page.

If you want speed, trim lines, and if you have plenty of deep water to work in, the vee-bottom becomes a logical choice. If you want greater seaworthiness for



THE
OUTBOARD
MAKES BOATING
POSSIBLE
TO
THOUSANDS



deep-water cruising, you will do best with a round bottom. If you want simple construction, and, consequently, low cost, you will pick the flat bottom. A mania for speed points out the step hydroplane. The box-tunnel stern is the simplest, while the round tunnel and inverted-vee bottom offer speed and seaworthiness.

From an entirely different angle, you will select a tunnel stern or inverted-vee hull if the boat is to be used in shallow water. In these types, the propeller is more or less protected. Beaching becomes quite simple, and submerged obstacles can do very little damage. Akin to the flat bottom, the box-tunnel stern is the simplest, while the round tunnel and inverted-vee bottom offer speed and seaworthiness.

What about the power plant? For low cost, easy transportation and beaching, you will naturally pick an outboard. For the ulti-

mate, you will select an inboard-outboard drive.

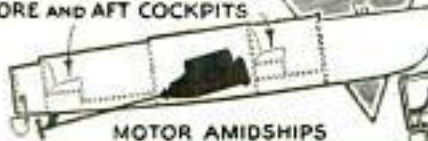


THE
INBOARD IS
FIRST CHOICE
FOR SMARTNESS
AND
RELIABILITY

PASSENGER SPACE IN
FORE AND AFT COCKPITS

DRIVE IS FORWARD
TO GEAR BOX
AND AFT

DRIVE IS STRAIGHT BACK
TO GEAR BOX



MOTOR AMIDSHIPS



MOTOR AT STERN



INBOARD-OUTBOARD DRIVE

563
Columbia Bronze Corp
208 9th main st
Prepared by L. T. Haysford



BOTH 16 FT. LONG YET NOTICE THE DIFFERENCE

performance. Until recently, the accepted position for the inboard motor was amidships, dividing the passenger space into two cockpits. Of late, the trend has been to stern installation, as shown in the diagram, using a vee-drive or a special outboard unit. The whole thing is

mate in smartness and reliability, you will do best with an inboard power plant. The outboard motor has but one logical place in the boat—on or near the sternboard. Refinements in the way of wells that partially or wholly inclose the motor add greatly to the appearance of the finished craft but are not essential for good



FRAMES SHOULD NOT BE SPACED OVER 24 INCHES APART



WOOD PLUGS ARE PREFERABLE TO PUTTY OR EXPOSED FASTENINGS

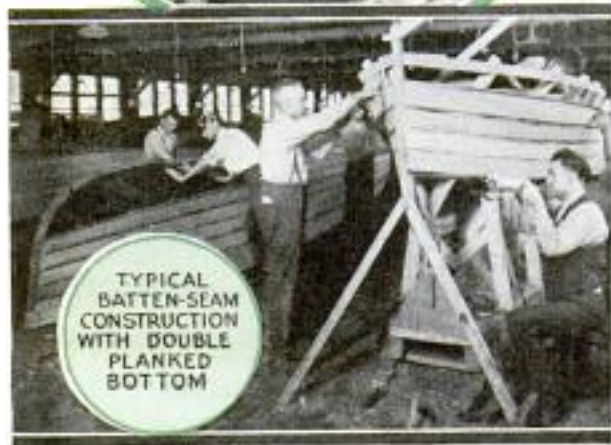
largely a matter of personal taste.



SOME FORM OF FASTENING SHOULD BE USED EVERY 3 INCHES

Many people think of a hull as having but one dimension—

length. Beam and freeboard are rarely given the consideration they deserve. Pick the small-bodied boat if you like, but do it knowingly. If you want a comfortable rough-water boat in fifteen to twenty-one feet, see to it that the beam approximates one-third the length, and the freeboard one-third the beam, as shown in the diagram.



TYPICAL BATTEN-SEAM CONSTRUCTION WITH DOUBLE PLANKED BOTTOM

Sound construction is the basic feature of any boat. Since construction governs to a large extent the price of the finished boat, it is wise to see that "bargain boats" are not offered at the expense of inferior lumber and poor fastenings. Frames should be of white oak, elm, mahogany or other durable and tough wood, and should be well fastened with bolts or riv-



Above, Yachting Tender, a Fast Boat When Powered by Motors of from Twelve to Eighteen Horsepower, and Very Comfortable and Seaworthy; Below, Cross Section of a Single-Cabin Thirty-Foot Cruiser; Note the Immense Amount of Usable Space on This Boat, Due to Well-Planned Interior Arrangement



DOUBLE-CABIN CRUISER



SINGLE-CABIN CRUISER



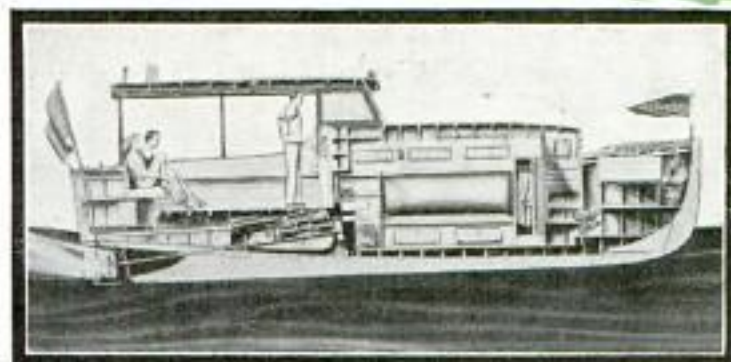
TRUNK-CABIN CRUISER



DAY CRUISER



AFT-CABIN EXPRESS CRUISER



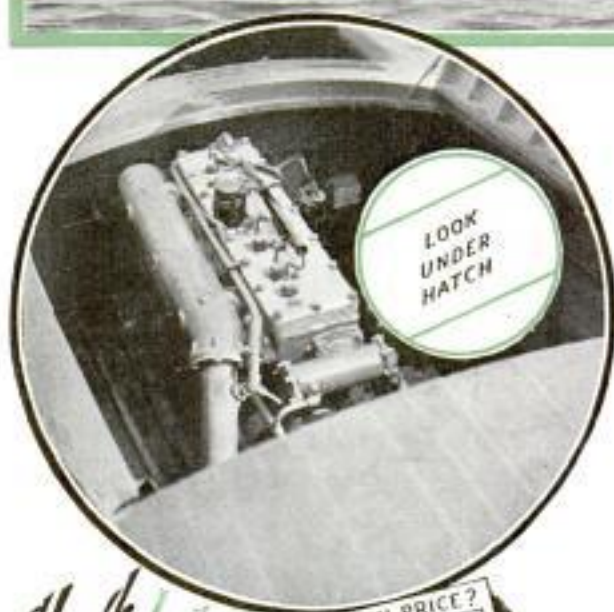
ets. Planking should be in narrow widths in order to eliminate warping.

Plank fastenings should be spaced not over three inches apart for full strength. These will be either copper nails riveted on burrs, brass screws, chisel-point copper or galvanized boat nails or galvanized cut nails, and they can be rated as to value in about the order given. Fastenings countersunk and plugged with matched wood plugs should be given first choice. This is no reflection, however, on exposed fastenings, especially if the planking is too thin to allow of their use.

You can buy three distinct types of construction—batten seam, clinker or lap-strake, and carvel or smooth-skinned. In

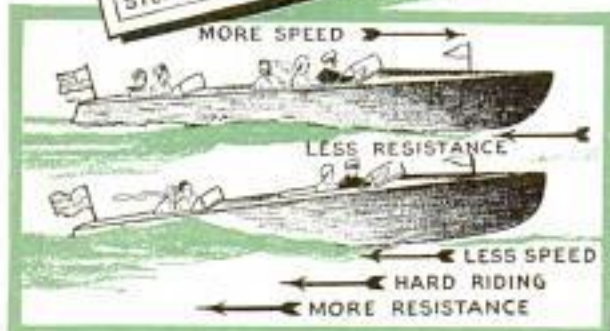
batten-seam construction, each plank is backed with a suitable length of wood which runs the full length of the seam. Hulls with batten seams are tight without calking, and the outer surface of the planking is perfectly smooth. Lap-strake construction is simply what it sounds like—the strakes or planks are slightly overlapped. You get strong construction with a minimum of weight. There is no calking.

Carvel planking is extensively used on large boats. In this form, each plank is simply butted against the previous one, and the whole is made watertight by calking. There is no choice beyond personal taste, since one type is as good as the other if the construction is properly done.



Check

IS EQUIPMENT INCLUDED IN PRICE?	
REQUIRED BY LAW	NECESSARY
LIFE PRESERVERS	CLEATS & CHOCKS
HORN	WINDSHIELD
FIRE EXTINGUISHER	CUSHIONS
COMB. LIGHT	BAILER
STERN LIGHT	DARS-ANCHOR



HAS THE BOAT AN EFFICIENT PLANING ANGLE?

Mahogany makes an ideal planking wood but most people are surprised to find there are different grades of "mahogany." The real mahogany is either Mexican or Honduras, fine-textured, impervious to water, beautiful in finish. A cheaper grade is

African mahogany which is a trifle coarser. Philippine mahogany, forty to fifty per cent cheaper than Honduras, is not a mahogany at all, botanically speaking, but merely Philippine hardwood. All are good boat woods. White cedar, white pine and cypress are used extensively and can be rated "Grade A" with a paint finish. Inspect white cedar closely for knots and imperfections; do not buy white pine for hard use in barnacle-infested waters; watch cypress for poor grain which often shows through either paint or varnish.

You can look for the same features in the largest cruiser, be it a small trunk-cabin boat with an outboard motor or an express commuter driven with 400 horsepower through twin screws. An added feature, which must be carefully checked is interior finish and fittings. Make certain you are getting what you want in speed and comfort before buying. A purchase of this-size boat should follow only after careful investigation and an actual demonstration.

Even with the smaller runabout or utility boat, it is always wise to take a trial "spin" if possible. In this manner, you get the "feel" of the boat; excessive vibrations are instantly noted; check can be made on the speed, planing angle and general performance. Be inquisitive. You lift the hood on the motor car you buy; why not lift the hatch on your motorboat? Make certain that the motor is not a type long off the market. Are the engine beds well and truly made? Has provision been made for the maintenance of the proper shaft alinement? Can you get at the motor without a lot of gymnastics? Is the gas

Samuel Gordon, Curator of Mineralogy, Academy of Natural Science, Philadelphia

POPULAR MECHANICS

tank installed as recommended by the fire underwriters?

Check again on the equipment. You are getting no bargain in a cheap boat if you must spend an extra hundred dollars in making it safe and comfortable.

also see B2297
AUTO FINISH GETS ITS LUSTER FROM FISH OR ALUMINUM

Aluminum dust or herring scales are responsible for that sleek appearance on high-priced automobiles, because one of the two gives the paint a peculiar luster that has not been obtained through use of other substances. From beneath the herring scales is taken guanine, the same substance that gives the pearl its beautiful luster. Guanine is manufactured into "pearl essence," which gives a lustrous finish to automobile bodies when mixed with finishing paint. A process whereby aluminum dust floats on the paint has been developed, resulting in a mixture that gives a beautiful finish with a "grain" added to the luster.

Echardt

PAINT SEALS CONCRETE FLOOR AGAINST MOISTURE

Walls and floors of brick, concrete, stone, tile or cement-block structure are sealed against seeping water by a special paint which is both attractive and durable. Cracks and holes are first filled with a cement preparation to provide a base for the waterproofing paint, which is then applied with a brush. Two colors, aluminum or black, are available, and the paint is also used for treating the inside of aquaria, swimming pools or acid and alkali tanks.

C. 34



Covering a Concrete Floor with a Special Paint Which Seals the Surface against Moisture

Adaptive Products, Inc. Toledo, Ohio

Buckeye Paint & Varnish Co. 716 15th St. Toledo, Ohio

"SKATES" WITH LARGE WHEELS OFFER SKI TRAINING

B2286
 Elongated Skates Equipped with Wheels Instead of Runners to Enable Ski Enthusiasts to Practice the Sport in Summer as Well as Winter



W. Schurmann, Essent, Germany

To enable those who like *Key Stone* to practice the sport in summer, a German engineer has invented what looks like a cross between skis and a pair of roller skates. The "skates" are equipped with large wheels and the rolling-ski riders shove themselves along with sticks similar to those used by skiers.

AVIATION HELPS POULTRY MEN FIND NEW MARKETS

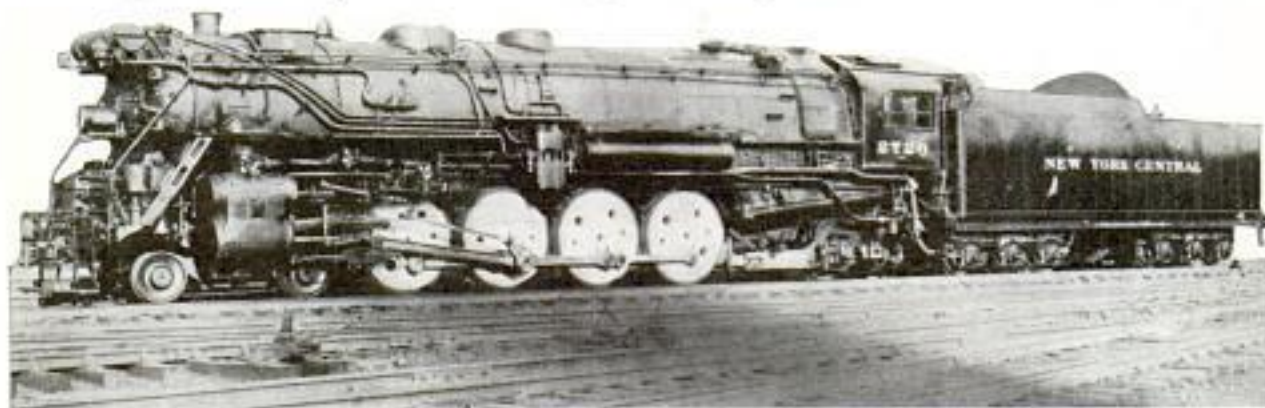
Aviation is helping the poultry industry to find new markets, making it possible to export young chickens to the countries south of the United States. Yet the cost is not prohibitive, and most of the shipments by air express are made without the loss of a fowl. Recently, more than 10,000 have been shipped by plane from Miami, Fla., to British colonies and Latin American countries in the Caribbean area. Approximately 3,000 future egg layers were imported by Trinidad poultry raisers, 2,000 went to Jamaica and about 1,000 each to Panama, Antigua, Santa Lucia, and British Guiana.

Cont. E. W. Sudlow, 2952 Merrick Road, Coral Gables, Fla.

DISK WHEELS ON LOCOMOTIVE ARE CHEAP AND LIGHT

Cheaper and substantially lighter than the old type, double-disk wheels are being

them to radio equipment which strengthens or softens or holds a note like an organ. By simple manipulation of two small levers on the keyboard and by footwork on the pedals, the instrument can be made



Here Is How a Great Locomotive Looks When Equipped with Disk Wheels; Wear on the Rails Is Reduced, Due to the Lighter Wheels, Thus Saving Money for the Railroad; Tests Have Been Successful

fitted on locomotives of the New York Central lines. The reduction in weight reduces the impact of the wheels on the rails. Double-disk centers are used, with an ordinary locomotive tire on the edge.

PIANO LIKE WHOLE ORCHESTRA IS MUSICAL WONDER

Sounds like those from any instrument in an orchestra can be reproduced by an electrical radio piano in which tiny microphones replace the sounding board. Small hammers strike the strings when the keys are touched. Eighteen miniature microphones pick up the vibrations and carry

to sound like an orchestra with drum, saxophone, harp, mandolin and piano. By a slight turn of a lever, the operator can make the instrument play as an ordinary piano, with the music coming from the loud speaker; or the student may wear earphones and listen to his practice music without anyone else hearing the sound. There also is a phonograph arrangement on which a record may be played while the pianist supplies the accompaniment as a test of skill. Or, a radio program may be tuned in on a set inside the instrument, and the player may accompany the incoming broadcast music on his electrical piano, called the "harmonium."

Many novel effects are possible, including the sound of surging water when "Ole Man River," or similar numbers, are played. One remarkable feature is that the player has control of the notes for fifty-six seconds after the keys are struck, so new effects can be produced.



This Instrument Is More Radio Than Piano; It Has Microphones, Amplifiers and Even a Receiving Set in the Case

BETTER GRAIN STORAGE C. 63 REDUCES LOSSES

Improvement in the system of storing grain has been developed in Sweden, reducing loss from mildew and minimizing the danger of elevator explosions. The system is based on blowing air in short blasts through stored grain at intervals of one or two hours.

*Chas. John Hays Hammond, Jr. Invented.
Mr. J. W. Herrick, Berlin physicist*

Wide World

Sept. 1933

Hammond Bechstein instrument used by Roxey in Radio City theatre.

Swedish engineer

Reported by Vice Consul
Edward P. Malloch
Stockholm, Sweden

B2048

Commerce memo 1/3/37

Cold air is effective. Experiments have shown that drying and airing are speeded up, and that grain may be stored in a smaller space. Thus, it is believed, the full height of storehouses may be used instead of spreading grain over floors at a thickness of not more than twelve inches. Grain stored immediately after harvesting dries as satisfactorily in the silo as in the open, when the new system is used. The only expense is that of installation and electricity to operate the blowers.

Vulcan, with His Great Anvil, Is Shown as a Fifty-Foot Statue of Iron Which Has Stood for Years in the Fair Grounds at Birmingham, Ala.; the Metal Giant Is Pictured Getting His Annual Scrubbing



Comd. George W. Watson, Southern
New Service, Box 2489, Birmingham,
Ala.

B2007
**SLANTING GARAGES
SAVE TURNING
IN ALLEYS**

Faced with the problem of building nine garages along a narrow alley not wide enough to permit turning, one Hollywood apartment-building owner solved the matter by constructing each at an angle. The "staggered" garages are all easily accessible without maneuvering cars, and when inside them, autos stand exactly as they would along a street permitting diagonal parking. In the yard, the sawtooth spaces are filled with shrubs which are protected from the wind and have grown as high as the garage roofs.



Nine Garages, Built at an Angle along a Narrow Alley, Permit Easy Access without Maneuvering the Cars

**IRON VULCAN FIFTY FEET HIGH
IS GIVEN A BATH**

Fifty feet high and weighing 120,000 pounds, an iron statue of the ancient god of fire and metal working, Vulcan, has been given a bath. The fire department of Birmingham, Ala., where the iron giant stands, supplied a ladder for the young women who did the work. The statue was exhibited at the St. Louis exposition in 1904 as proof of Alabama's iron resources. After that it was moved to the grounds of the Alabama state fair and there erected.

☐ An astronomer says if the chirps of a cricket in thirteen seconds are counted, and forty-two is added to the total, the result will be the temperature of the place where the cricket is singing.

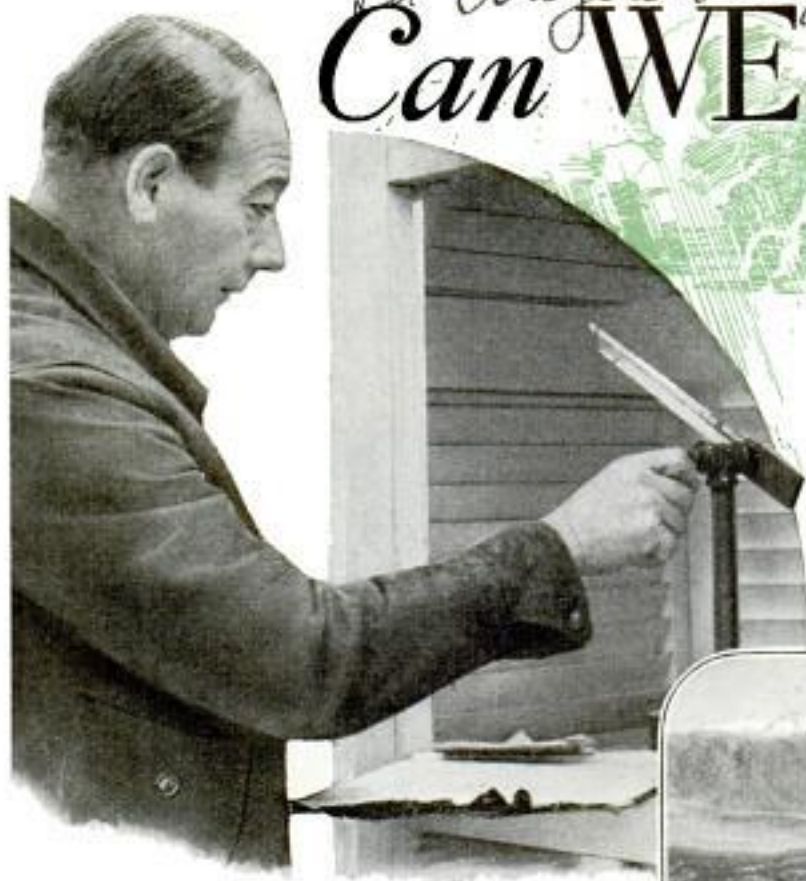
Comd. Lee Mc Crae, 1691 N.
Hill Ave. Pasadena, Calif

Science Service
Nov 14, 1937

B 2224

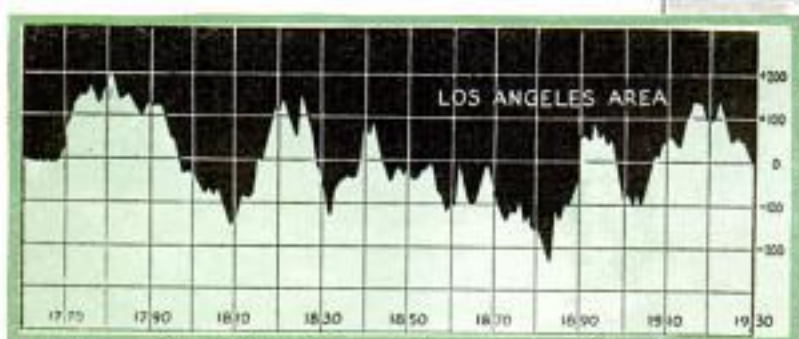
Com. Thomas E. Stinson, Jr.
145 S Spring St
Los Angeles, Calif

Can WE Change



three months, and he collected his money. But in each case the weather bureau had predicted the storm from meteorological data. It was going to rain anyway.
Rain priests in ancient In-

WHEN Arizona crops were threatened by a long drouth several years ago, members of an Indian tribe held a traditional rain ceremony. Not a cloud obscured the sky when the dance began, but after a while clouds began to pile up in the west, and finally a heavy rain poured down. The tourist spectators, who had



Top, Measuring Moisture in Air; Right, Some of the Forty Per Cent of United States Classified as Desert; Below, Chart of Los Angeles Area Showing How Weather Runs in Cycles, from Cycles of Years with Heavy Rainfall to Groups with Light Rainfall; Zero Indicates Normal

dia rubbed a black horse with a black cloth when rain was needed. Today, in Europe, the peasants fire huge mortars and ring bells to create rain, and erect crosses and metal-tipped poles to ward off hail. In the United States, experimenters sprinkle chemical mixtures from platforms or

hardly expected such a concrete demonstration, were drenched.

Recently a western community posted several thousand dollars for a "rainmaker" who promised to bring down two inches of rain. A few days after he had started work, rain fell for the first time in

scatter chemicals and electrified sand from airplanes. Scarcely a month passes without some new proposal for controlling the weather. But so far, chemicals and electricity have been as impotent as the rituals of less cultured civilizations. Although different kinds of weather can be manu-

the WEATHER?

factured in the laboratory, no rainmaking out of doors has been recognized as a success.

In one attempt, zinc plates in open pans of sulphuric acid were exposed to the air in the belief that the resulting gas would create whirls as it rose through the atmosphere. Attempts to precipitate wa-

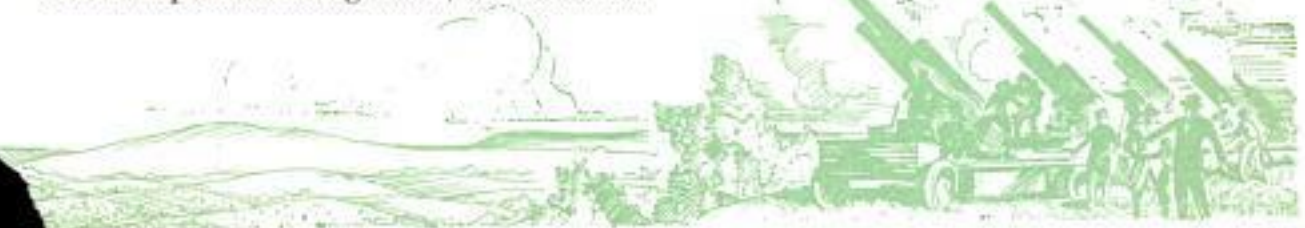


California Redwoods Known as "Rain Trees" Due to Moisture Dripping from Upper Branches; Right, Spirit Doctor of Dutch Borneo Beseeching Rain Gods

ter vapor out of the air by electrical discharges from wires have been made, although the high-tension lines of power companies have had no such effect. Others have tried sprinkling liquid carbon dioxide from airplanes, expecting to reduce the temperature of the air. It hasn't worked. Huge barriers of refrigerating pipes to condense moisture out of the wind have been suggested, as has the building of long lines of bonfires.

Many ingenious suggestions also have been offered for clearing away the fog above airplane landing fields, but none has

proved practical so far. One proposal, that of sprinkling the fog with sand or water from above to precipitate the moisture, would require a fleet of airplanes always at work. A suggestion to evaporate the fog by heating overlooks the terrific expense involved. In any event, it would be a constant battle to reduce the additional fog rolling in from the sides of the airport.





More effort has been devoted to dissipating hail storms, but here again success is lacking. In Europe hail cannon and "electric Niagaras," consisting of long rows of lightning rods, are still depended upon, although hail has been observed to shower on the rods as impartially as on the farm lands. In the United States attempts have been made to break up tornadoes. Boxes of explosives mounted on tall poles have been detonated without effect.

"Rainmakers and weather experimenters fail to appreciate the magnitude of the forces they are working against," says one meteorologist. "The trouble is that any effect they might create would be limited to an acre or two of ground, and that the expense involved would be out of all proportion to the benefit. Manufactured rain would literally cost its weight in gold.

Plausible in theory, but prohibitive in cost, are plans for creating huge updrafts of cool air. Some of these plans, ranging from immense vertical tubes to groups of airplane propellers, are on file at the patent office. Theoretically, blasts of cool air would be projected into moisture-laden atmosphere above the earth, condensing the water vapor and causing it to fall as rain. There is a definite parallel between these suggestions and the updrafts of cool air in nature which frequently produce rain, according to meteorologists who question whether man will ever be able to control the weather. Within limits they concede

(Continued to page 120A)



Top, Measuring Rainfall; Center, Smudge Pots in a Citrus Orchard; Below, "Rainmakers" Erecting Platform from Which Chemicals Are to Be Exposed to Air

B2201 *Inv. Victor W. Scrode*

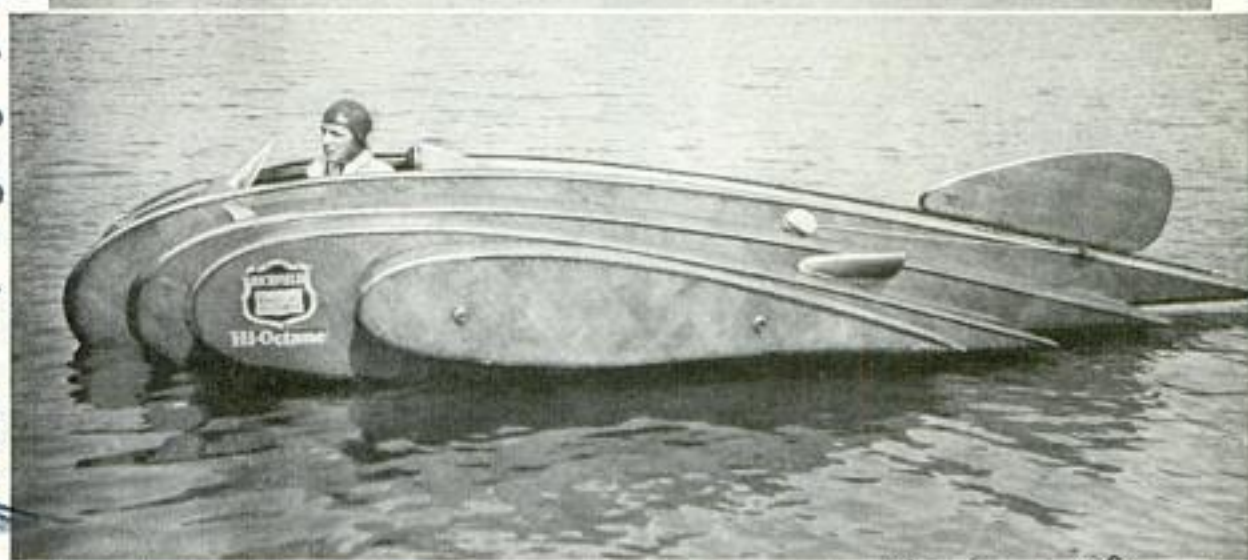
Portland, Ore
POPULAR MECHANICS

573

867 Kelly St.

Boat Like Plane Wing Swims on Air Cushion

reprints 1935-5-33



see Oct 1936-519
This Strange-Looking Craft Attains High Speed without the Bumping Effect Common to Racing Boats; as Speed Increases the Boat Rises Until Only Part of the Main Hull Touches the Water

Shaped somewhat like the wing of an airplane, a boat of unusual design literally swims on a compressed-air cushion just above the surface of the water. The hull, constructed on aerodynamic lines, is composed of a series of sections of airfoil shape, stepped up and down uniformly from a center section. This arrangement is said to provide lift efficiency, having the effect of lightening the weight of the hull as the related sections act as a wing surface. When the boat is at rest, the center and one or more side sections are in contact with the water. As the hull starts moving and gains sufficient speed, the sec-

tions gradually are carried out of the water until the entire hull rises almost clear. This, of course, decreases water and air resistance, resulting in minimum drag from friction. Water mass density is used only for traction. The jogging, spanking effect characteristic of the conventional racing boat is absent, there remaining a smooth, constant action. The propeller is located about one-third of the way back from the bow, while an air rudder provides for directional control at high speed. An auxiliary water rudder is used for moderate travel. Unusual stability has been revealed by tests of the craft.

HINGED DIE FOR RETHREADING IS EASY TO OPERATE *097*

Starting a die on a worn thread is made easy with a rethreading die which resembles the ordinary round kind except that it has been cut in half, the two pieces being held together by a flat spring.



To use, it is only necessary to pull the two halves apart, slip the die over the

clean, unbruised portion of the thread, drop a special ratchet stock over the die, tighten the screws and back it off over the worn threads which usually are at the end of a bolt. This eliminates the need of starting the die on the damaged end as must be done with solid ones. Sizes are offered to fit any thread from one-quarter inch to one and one-eighth inches.

Names and addresses of manufacturers and dealers in articles described in the magazine, and any other details in our possession, will be furnished by our Bureau of Information upon request accompanied by return postage.

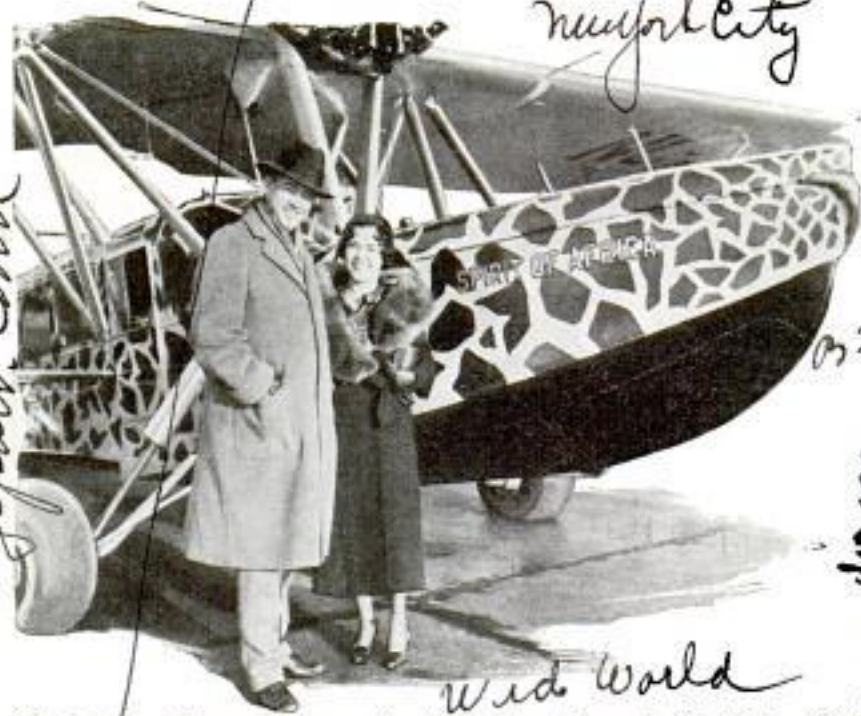
Eschenfeldt Tap & Die Corp
Eschenfeldt Mass

B 2266

574

American Museum
Natural History
POPULAR MECHANICS
New York City

at Sikorsky Airplane Plant
Bridgeport Conn



The Martin Johnsons, Famous Explorers, Are Shown beside Flying Boat Which Will Carry Them into Africa's "Forbidden Land"

FLYING EXPEDITION TO AFRICA TO VISIT "FORBIDDEN" AREA

Two planes, one a twelve-passenger amphibian, will be used in exploring the "forbidden land" in Africa. Mr. and Mrs. Martin Johnson expect to penetrate regions hitherto closed to exploration by inaccessibility of the country and the hostile attitude of the natives. A two-year journey will take the Johnsons and five assistants into the swamps and mountains of Abyssinia. Both of the expedition's planes are equipped with camera bases and crow's nests, making it possible to take pictures from almost any angle. Much of the flying from the base will be at an altitude of 4,000 to 9,000 feet above sea level, so the engines are equipped with superchargers. Seven thousand gallons of special gasoline with high octane rating will be used. The larger plane has sleeping quarters for three, and the smaller ship, with a passenger capacity of five, can be used for living quarters for two in an emergency. The Johnsons decided to make wide use of planes, especially amphibians, because they believed that the only method of penetrating this dangerous country. In a region studded with many lakes, landings can be made with less danger of sudden attacks by the natives. Also, it is hoped that the planes will make possible a camera record of forms of wild life that

would be missed by an expedition on foot. The trip will start from Capetown and go northwards

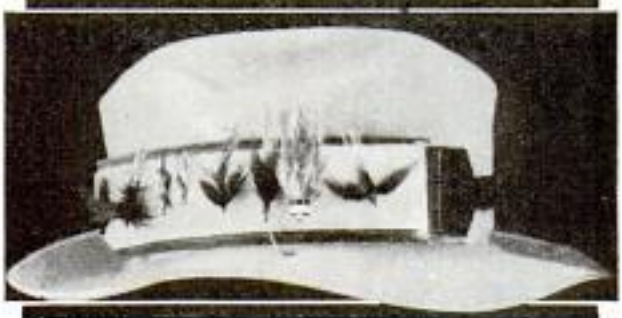
"MENTAL TEST" OF LIVING ROOM RATES HOME

By giving the living room a mental test, a reliable index to social status may be obtained. Dr. F. Stuart Chapin, of the University of Minnesota, says that the test takes account of the presence or absence of such objects as chairs, pictures, pianos, radios and the like in the living room. It requires but ten minutes.

Study of more than 1,000 American homes indicates reliability of the test. A close relation was found between scores on this test and education of the parents, their occupation and their participation in community affairs. Better-class residences had scores from 129 to 165 points, while other homes rated as low as forty-two.

HAT BAND FLY BOOK PRESERVES ANGLER'S ARTIFICIAL BAIT

Artificial bait of all kinds can be carried safely by the fisherman in a fly book which is worn about the hat like a band. The fly or hook is pulled into the band and is held securely, thus eliminating insertion of the hooks into hats or clothing. Both dry and wet flies are preserved in this manner, and the band can even be worn about the head without a hat if desired.



Fly Book Worn as a Hat Band Is Always Easily Accessible to the Angler

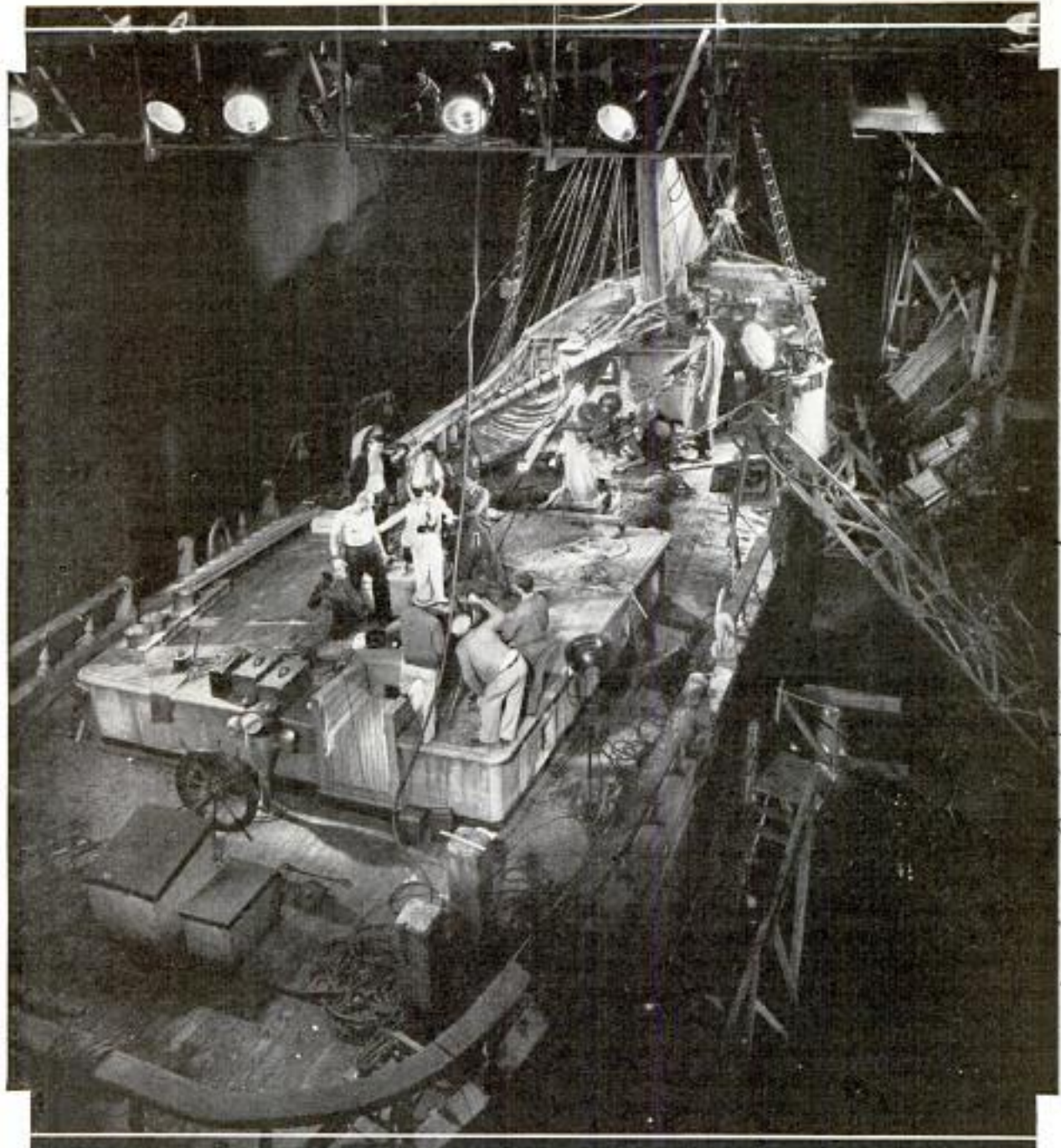
Harrison Specialty Co
609 Continental Bldg.
Oklahoma City Okla

B 2263
Henry Jones
Science Service
12/22/33

C15

Universal Studios

Ship Built on Movie Stage to Film Sea Picture



Cont. John C. Clenchard, 944 Magnificent Dr.,
 Los Angeles, Calif.

Making a Movie Scene on a Ship Which Was Erected on a Sound Stage; Synchronized Jacks under the Vessel Rocked the Eighty-Ton Craft during the Filming of a Storm at Sea

Weighing eighty tons and costing \$50,000, a big ship was erected on a sound stage in Hollywood recently preparatory to filming a sea picture. The vessel, a replica of the "Prince Rupert," was finished in seven days and was constructed entirely from photographs, no blueprints being used. To give it an appearance of age, the boat was sprayed with a special lead pigment, and all iron parts were rusted synthetically. Provision was made for pro-

ducing a violent storm on the sound stage, and this was a feat in itself. Thousands of gallons of water were released from huge vats and dashed against the sides of the vessel, which was mounted on hydraulic jacks. These jacks were synchronized, so the ship could be rocked fore and aft or across beam as required. Fire hoses were played into six wind machines to produce spray, and a cyclorama around the stage gave the necessary leaden skies and fog.

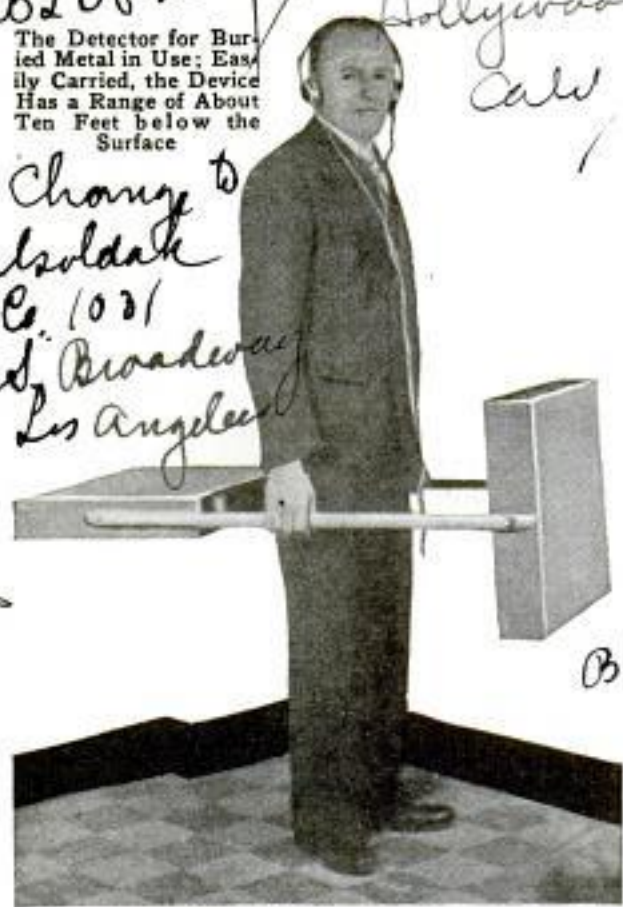
Liverpool

Erhard O. Fisher
 Palmer Bldg 6328 Hollywood Blvd
 576 POPULAR MECHANICS
 B2082
 Hollywood
 Call

The Detector for Buried Metal in Use: Easily Carried, the Device Has a Range of About Ten Feet below the Surface

Metalloroscope \$85.00 flat
 Metalloroscope Sales Co
 6040 S. Broadway
 Los Angeles, Calif.

Change to
 Soldak
 Co. 1021
 S. Broadway
 Los Angeles



**DETECTOR FOR BURIED METAL
 SIMPLE TO OPERATE**

Simple operation and easy replacement of parts are advantages claimed for a detector that is said to reveal the presence of metals buried underground or in several feet of water. The device, which employs several stages of radio-frequency amplifications to assure sensitivity, is designed for locating coins, metal, pipe lines and other conductors at a distance of ten feet, depending on the size of the object. Weighing twenty-two pounds, the detector is carried in a balanced position to keep the operator from tiring. Only the "on" and "off" switch is manipulated.

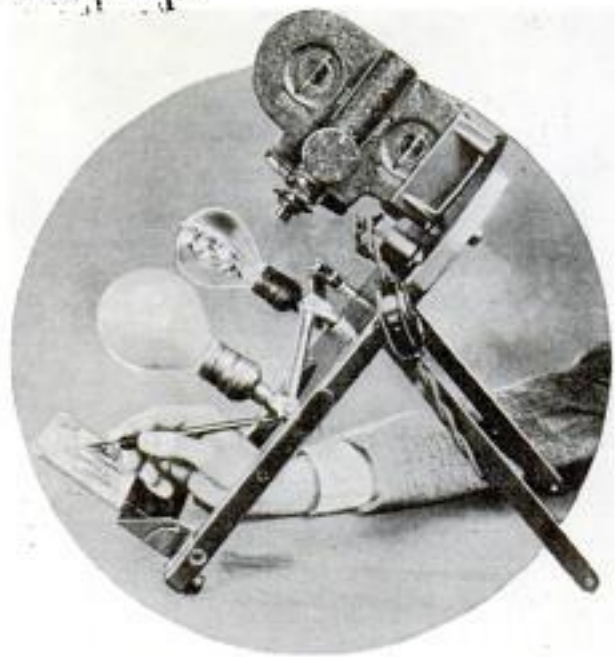
**NOISE REDUCED IN PLANE RADIO
 BY ANTENNA AT REAR**

Noise in the airplane radio can be reduced by shifting the position of the antenna. A patent issued to C. F. Jenkins calls for the antenna to be unreeled and permitted to fly aft from the plane's tail structure. A small celluloid ball, or balsa-wood "fish," is attached to the end to keep the antenna taut. After studying the causes of interference in airplane radios,

the inventor found a zone just behind the plane that was free from electrical high-tension radiation from the engine-ignition system. By arranging for the antenna to float in this interference-free zone, Mr. Jenkins reduced radio noises considerably. This invention makes unnecessary the costly shielding of magnetos and spark plugs, as well as use of high-tension leads. Ordinarily, the antenna has been either suspended under the plane or fastened to a vertical mast, but ignition noises resulting from such an arrangement seriously interfered with voice and code reception aboard the plane.

**TITLE WRITER AIDS AMATEUR
 MAKING HOME MOVIES**

For the amateur movie maker who wants to produce professional-like film titles, including the tricky animated ones, a title writer has been developed. The machine may be used in a vertical position for making the movable-letter animated titles. The letters may be moved at will on the horizontal card. Two 100-watt, 110-115 volt lamps are used, silvered on one side so as to provide their own reflectors. The writer also can be used in the horizontal position for filming ordinary titles, and at angles for titles which show the hand as it writes. Interesting shadow effects can be obtained from three-dimensional letters.



With This Title Writer the Amateur Movie Maker Produces Work Like That of Professionals

Scene Service
 1/17/33

1519 Connecticut Ave
 Washington, D.C.

Bell & Howell Co
 1801 Larchmont Ave
 Chicago

031919

Developed by W. F. Davies,
Huddley
England

POPULAR MECHANICS

577



Boat for Use in Very Shallow Water; It Is Driven by an Air Propeller Powered by a Small Auto Engine

BOAT FOR SHALLOW STREAMS RUN BY AIR PROPELLER

Good speed in extremely shallow water is made with an English boat which is driven by an airplane propeller deriving its power from a small automobile engine. The craft has only a three-inch draft, and since the propeller is above water, it can proceed at full speed in shallow pools.

GOLD RECOVERED BY FLOATING TINY FLAKES IN WATER

Recovery of fine gold particles from river sands by flotation has been found possible in tests at the University of Idaho. The process is said to be 97.3-per-cent efficient in some cases. Millions of dollars worth of the "flour" gold await application of the process to sands already worked by more or less haphazard panning and sluicing methods. Fine gold can be made to float on water, although it normally sinks unless the water is in rapid motion. By the flotation process, the gold-bearing sand is placed in a vessel filled with water. A small amount of reagents, chemicals like sodium carbonate, is added. The gold particles collect these reagents and thereby acquire a "dry" tendency toward water, like paraffin. Bubbles then are introduced and the mixture is stirred. The dried gold particles attach themselves to the bubbles because they tend to repel the

water. Some foaming agent, like pine oil, is added to produce an intense froth. The rising bubbles discharge their burdens of gold particles in the froth, which is skimmed off and dried.

BIRD SHOP ON WHEELS BRINGS CANARIES TO CUSTOMERS

Believing people would buy canaries, and other bird pets, if these were brought to them, a California man has equipped an old sightseeing bus as a combination aviary and sales room and covers a regular route along the Pacific coast. The moving bird shop is equipped with twenty bird cages suspended from the roof, several



Old Bus Which Has Been Transformed into a Traveling Aviary and Bird Store

built-in compartments for storing seed and supplies, heating apparatus, electric lights and special facilities for cleaning.

Christian Science Monitor 1/19/33

A. W. Fahrenwald
Professor of Metallurgy

Charles W. Brewster
3032 Roslyn St.
Los Angeles, Calif.

Box 62, Santa Ana, Calif.

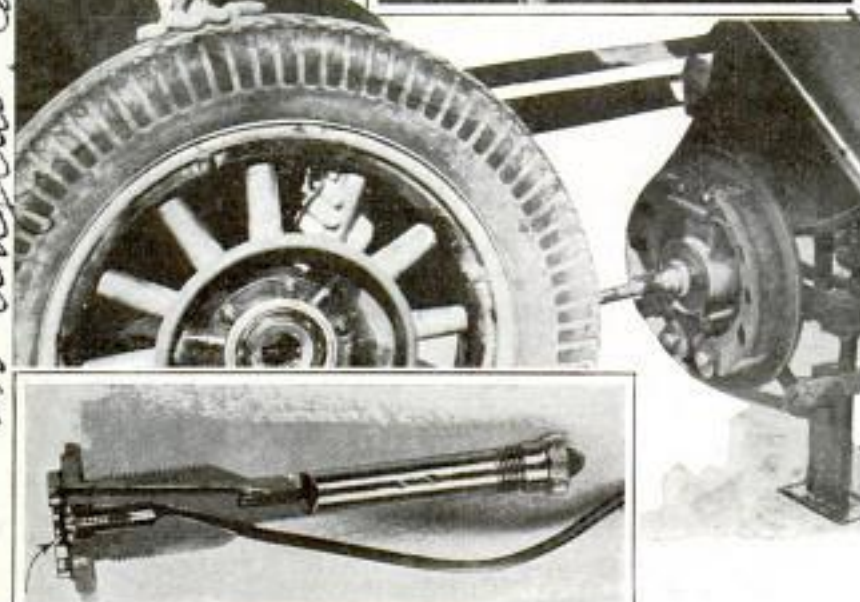
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Ing. F. Stan
Hollard
Chamber of
Commerce
Compton
Calif.

U.S. Bureau of Standards
Scientific Paper 454
Fugitives Wanted by police
the usual way, revealing
that the charred paper
has blackened the plate,
but that the lines of writing
or printing ink have
left it unaffected. This
makes the charred letter
or record easy to read.
More time is required if
film is used instead of
plates.

readily recoverable
by rubbing again



When Tire Is Underinflated, Arrangement at Bottom Causes Buzzer and Light on Dash, Shown at Top, to Signal the Driver

UNDERINFLATED TIRE WARNS AUTOIST BY BUZZER

When an automobile tire becomes underinflated, the driver is warned by a buzzer and red light on the dash if his car is equipped with a new indicator. Low pressure in the tire permits an electric current to operate a buzzer and to light up one of four red signals on the dash, showing the driver which tire needs air. The valve may be regulated for any air pressure. The regular lighting system is utilized in operating the automatic device. A switch enables the driver to shut off the buzzer, if desired.

HOW PHOTO OF CHARRED PAPER HELPS DECIPHER WRITING

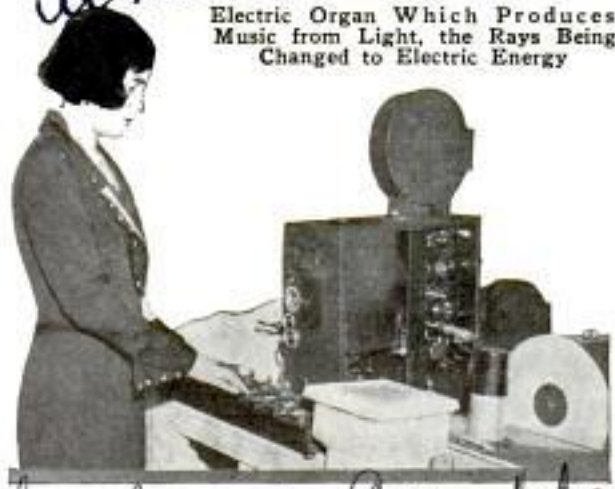
Deciphering writing or printing on charred paper is made possible by a simple photographic process. The charred papers are placed in contact with the emulsion side of fast photographic plates and kept there in total darkness for one or two weeks. Then the plates are developed in

MUSIC IS PRODUCED OUT OF LIGHT BY ELECTRIC ORGAN

Music is produced from lights by an apparatus known as a phonic electric organ which bears little resemblance to the ordinary pipe instrument. It consists of a revolving disk perforated with eight concentric circles to intercept beams from small flashlight bulbs. The lights are operated from switches arranged like a keyboard, and the number and spacing of the holes on the disk throw light pulsations, equivalent to the diatonic scale of an organ on the sensitized cathode of a photo-electric cell, or electric eye. This converts the light energy into electrical energy which, in turn, is amplified sufficiently to be delivered to a resonator where it will become sound, or it can be broadcast. The disk is offset from the center to render the tremolo effect of a pipe organ.

Acme

Electric Organ Which Produces Music from Light, the Rays Being Changed to Electric Energy



Chas. George Reynolds
R.C.A. Instruments
75 Park Ave. New York

Comd. Mel Wharton, 1144 Grand View St., Los Angeles, Calif.

C125

Jane
Huff

Pneumatic Indicator
Co 1117 Golden Ave
Compton, Calif.

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B2116 Cmt. Elmer Eklassman, 55 W 86th
New York City



Back to BABYLON

The Story of Permanent Concrete

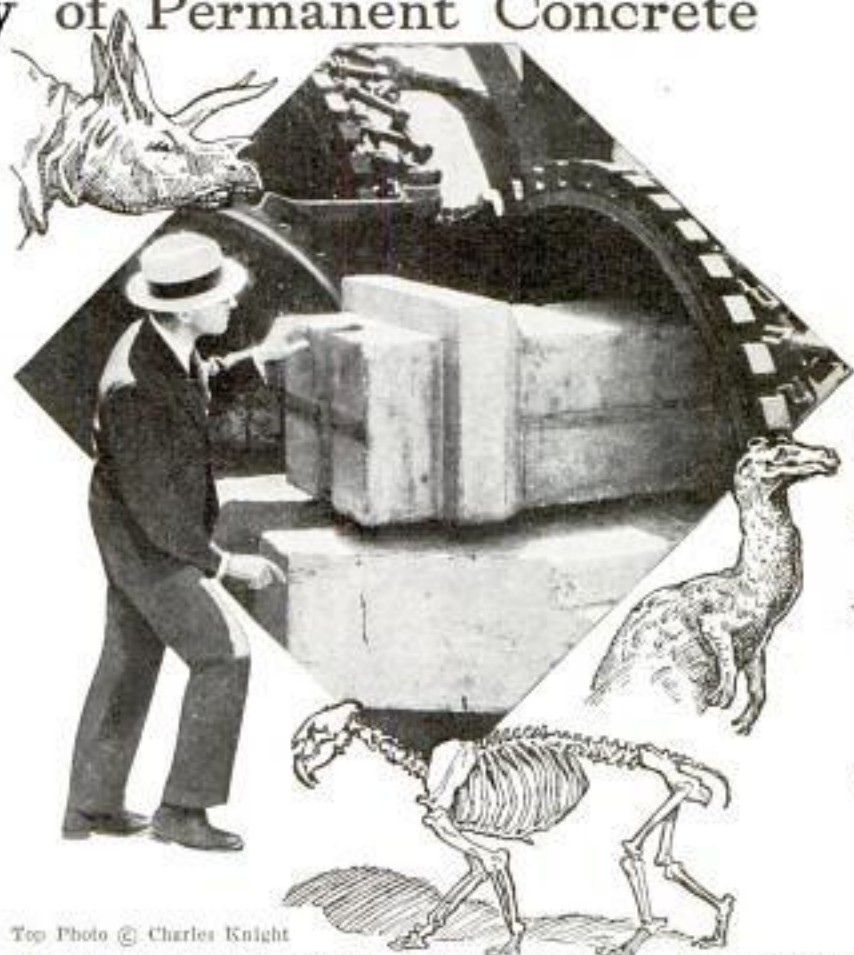
IF YOU were to move a building from old Babylon to Hollywood, it would be like carrying coal to Newcastle. That's the engineering, not the moving-picture, point of view.

Hollywood is now world-famous for the Berea bone pits, a great prehistoric graveyard where saber-tooth tigers, mammoth elephants, giant wolves, bears and sloths left the remains of their respective species.

But what has that to do with engineering? Here's the story:

A chemist, while engaged in investigating the failure of concrete in sea water, was also active in excavating the bones of prehistoric beasts from Hollywood's bone pits. Their excellent state of preservation aroused wide interest. Museums all over the world begged for sample skeletons. But what interested the chemist most was the preservative—asphalt.

Asphalt from the great deposit in Lake Trinidad, on the South American island of the same name, is used on modern road-



Top Photo © Charles Knight

Top, Painting by Charles Knight, Noted Muralist, Showing Tigers, Vultures and Wolves Attracted by Carcass Mired in an Asphalt Pool; Below, Placing Concrete Piling in a Retort for Impregnation with Asphalt

ways everywhere. And the old Babylonian engineers had learned from observation of natural phenomena to employ asphalt for cementing bricks and pavements.

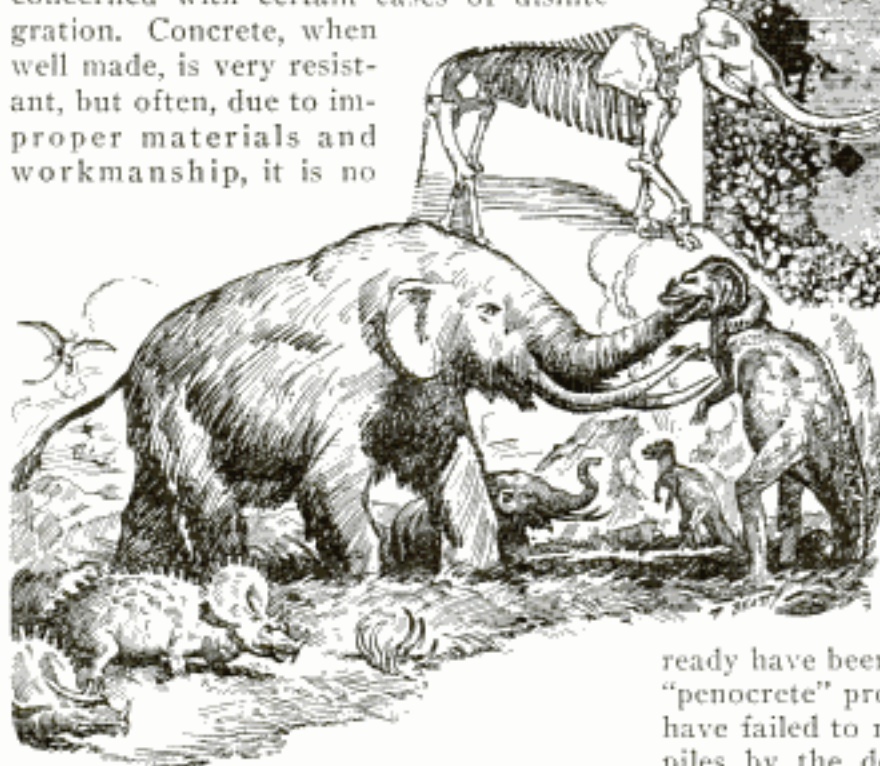
Here was a strong hint from ancient man and nature, which modern man and his great laboratory facilities had over-

at Rancho La Brea asphalt pools near Los Angeles

(Raymond Osborne) Eng. & Portland Cement Association
33 W. Grand Street



looked. Ever since concrete construction became standard, engineers have been concerned with certain cases of disintegration. Concrete, when well made, is very resistant, but often, due to improper materials and workmanship, it is no

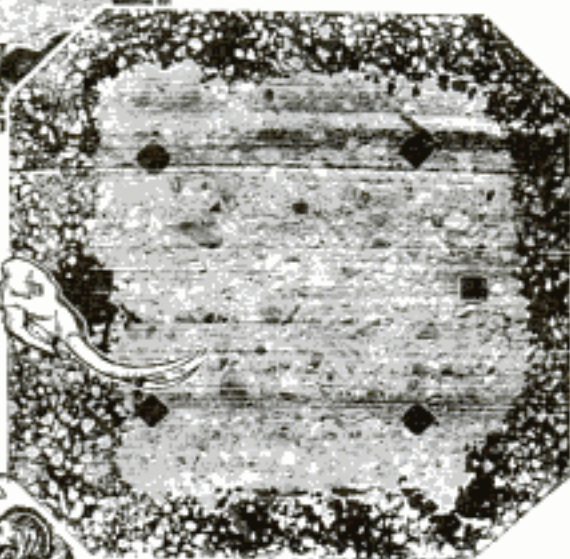


Top, Removing Bones of Ancient Animals from Tar Pit; Right, Section of "Penocrete" Protected Pile

harder or more compact than the porous bone of a bear. But if you preserve a bear's bones in asphalt, they last indefinitely. And if you cement bricks with asphalt, the building they make will also last indefinitely. The chemist went back to his laboratory and announced he would apply asphalt to concrete. Many aqueducts, sea walls and dams, and particular-

ly concrete piles of slender section were exhibiting various degrees of destruction due to the violent attack of chemical and mechanical agents. If these conditions were not remedied in time, the cost of replacements would be a heavy burden on the interests concerned.

As a result of this discovery, a new method of



making concrete structures has been developed, intended particularly for construction of harbor works or for soils having an alkali action. More than 800,000 linear feet of asphalt-impregnated piles al-

ready have been manufactured by the new "penocrete" process. The most rigid tests have failed to reveal any damage to these piles by the destructive elements. After seven years of immersion in sea water, the penocrete is still impervious and rigid.

At first, chemists were faced with huge difficulties when it came to finding a method of impregnating the concrete. Man's battle with the destructive effects of sea water pre-dates even the Babylonians. The teredo attacks and destroys all unprotected wood immersed in salt water. Copper sheathing around ship hulls affords some protection, but copper is costly. With

C153 Dr. Sumner Lee
Crawley, Associate
581
Professor of Psychology

concrete, engineers defeated the sea worms, but they still had strong chemical and mechanical forces to contend with. Many great harbor works have crumbled because of failure to realize the severity of these forces and to provide the proper safeguards.

Even if concrete is mixed and placed in accordance with best practices, it is not permanent under some conditions of exposure unless insulated from the destructive agents. If sea water reaches the reinforcing steel, rusting begins, and, as is well known, rust expands to about thirteen times the original bulk of the metal, and in expanding exerts a pressure of 4,700 pounds per square inch, which is capable of bursting the concrete surrounding the metal. Salt water has a powerful chemical action on porous concrete.

Discovering a method of forcing asphalt into the tiny pores of fresh concrete was no small problem. In the early tests, hot asphalt was applied to the surface, but it did not stick. Then they tried boiling the concrete in asphalt at temperatures from 450 to 500 degrees Fahrenheit, for twenty-four hours, but these temperatures proved harmful.

Finally, a combined vacuum and pressure process was developed, similar to that used in creosoting lumber. First, the concrete, after curing, is subjected to dry-air treatment. The temperature is increased at a predetermined rate until it reaches 240 degrees Fahrenheit. It remains thus for about four hours, after which the concrete slabs are moved into a cylinder, which has been preheated and dehydrated under a vacuum to rid the slab of free water and create a vacuum in its small pores. Then the asphalt is released into the treating chamber at a temperature of 250 degrees Fahrenheit. When the chamber has been filled with asphalt, pressure is applied. These conditions are maintained for fourteen hours. The concrete is then allowed to cool at a regular rate.

This process impregnates the concrete to a depth of about one and one-half inches. In manufacturing two-inch concrete "boards," it is now possible to reach complete impregnation. Large foundations and harbor works are covered with peno-concrete slabs that fit together like boards in a floor and offer permanent protection.



Changes in Pulse and Heartbeat, Accompanying Mirth, Are Being Registered on This Recorder

RECORDS OF EMOTION CHANGES REGISTERED ON CHART

Fluctuations of pulse and heart beats which accompany changes in emotions when registering joy, fear and disgust are shown clearly on an instrument known as a "pneumograph." The recorder is being used at Cleveland college to show on a chart breathing curves of the subject as various emotions are experienced.

Cleveland Ohio

SAFETY RAZOR CUTS AT ANGLE WHEN HELD STRAIGHT

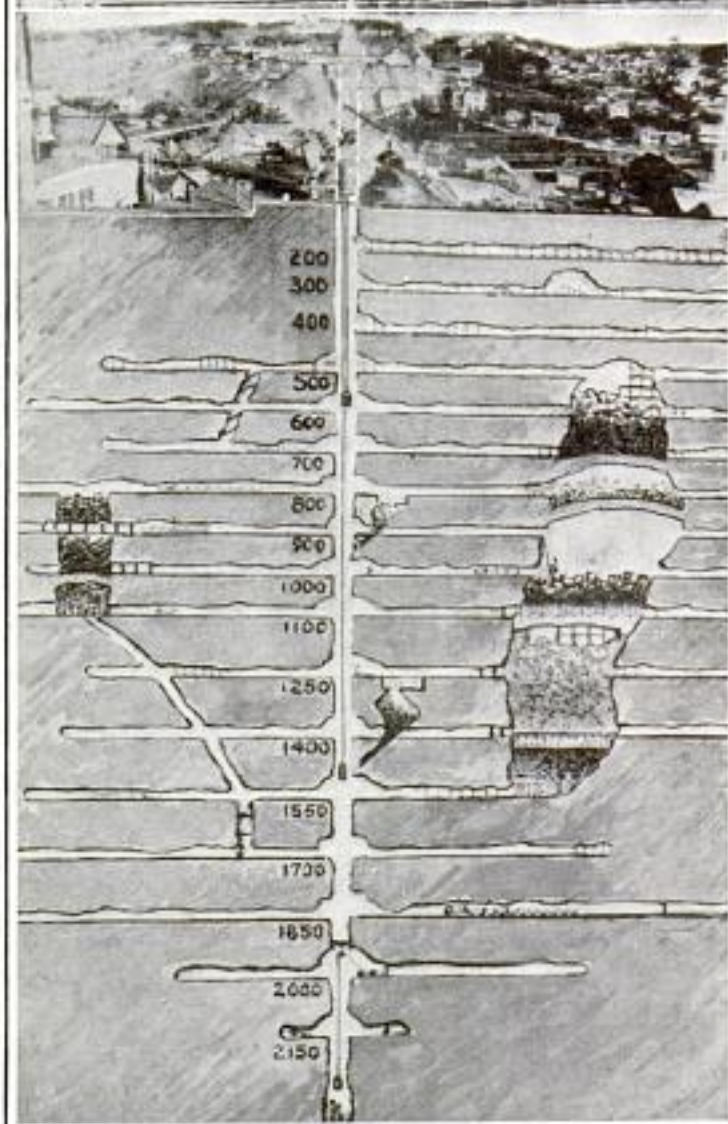
Scraping, chafing and cutting are avoided with a safety razor which cuts in a sliding, diagonal stroke regardless of the position in which it is held. The razor accommodates any double-edge wafer blade, and the blade is set in the razor at an angle, thus providing a real "barber" stroke even when the razor is drawn straight down.



The expense of running the average automobile is about 6.4 cents a mile, including depreciation and insurance, a study at Iowa state college shows.

Stroke Razor Corp
183 W. Washington
Chicago
June Spruce
Dec. 19, 1932

City Moved to Make Room for a Gold Mine



Because its streets are underlaid with gold, the city of Lead, S. Dak., is being moved up a mountain from its location in a canyon in the heart of the Black Hills. The great Homestake mine which has produced more than \$270,000,000 in gold in fifty years tunneled under the streets of Lead until the town was faced with the danger of sinking out of sight if the tunnels collapsed, or being ruined by a cave-in of an open cut to the north which has been growing more menacing as more and more ore was removed. Already some of the city's largest structures and many of its homes have fallen before the onslaught of the wreckers, and farther up the canyon, new buildings are replacing them. At the first sign of a sinking city several years ago, the big mills and shops of the mine were moved across the gulch. Later, part of the blacksmith shops suddenly disappeared from view one day, being swallowed by a cave-in. The shops vanished at the noon hour, so there was no loss of life. The undermining has been going on for

Top, Homestake Mine Buildings after Being Moved; Below, How the City of Lead Was Undermined by Tunneling

B2216 *Inv. Charles Esarrabranch Livingston, N.J.*

years, and the streets have been gradually sinking as timbering collapsed in the tunnels, some of them 3,000 feet beneath the surface. Residents became accustomed to dipping sidewalks and the occasional crash of a plate-glass window, and even when orders were given to abandon certain homes, many sold the buildings to the mining company, but continued to live in them at their own risk. Finally, the sinking began to progress at an alarming rate, and the wholesale pilgrimage of a city up a mountain was decided on. Meanwhile, a new danger had developed to the north, the site of the open cut, a great depression in the side of the mountain which made possible open-air mining, workmen swinging on cables attached to their waists and prying loose the rich ore. Hundreds of thousands of tons of ore were sent crashing down to the chutes, and the cut finally penetrated within a few hundred feet of the main street. Sidewalks bowed, windows crashed and bricks toppled until it became necessary to stop work in the cut, pending the moving of that section of the town. Mining officials say it may even be necessary eventually to reroute a national highway passing through the town to avoid the sinking areas.



Box Camera in Wall Opposite Money Drawer Which Took Picture of Thief as He Opened Drawer

THIEF TAKES HIS OWN PICTURE AS HE OPENS DRAWER

After a thief had broken into a New Jersey filling station repeatedly, the proprietor arranged an inexpensive trap by which the prowler took his own picture as he pulled open the money drawer. At a point in the wall opposite the drawer a small box camera was focused and in a socket in the desk facing the thief a flashlight bulb was placed. Through a magnet arrangement connected with camera lever and flash bulb, both were operated simultaneously when the drawer was opened. Unfortunately, the picture of the thief, snapped on his next visit, did not show the face but the negative was found a valuable clue in the search for him.

Cont. Jacob Blechstein, 1510 Jessup Ave, New York City

REPAIR SHOP IN SHAPE OF SHOE IS FIFTY-TWO FEET LONG

C 162

Shaped like a shoe, a building fifty-two feet long, sixteen wide and twenty-five high houses a shoe-repair shop. There are three large rooms, two on the first floor and one on the second. The shoe is complete, even to laces.



A Shoe Big Enough to Live In; It Houses a Repair Shop with Three Large Rooms

CHICKEN'S HEART STILL BEATS AFTER TWENTY-ONE YEARS

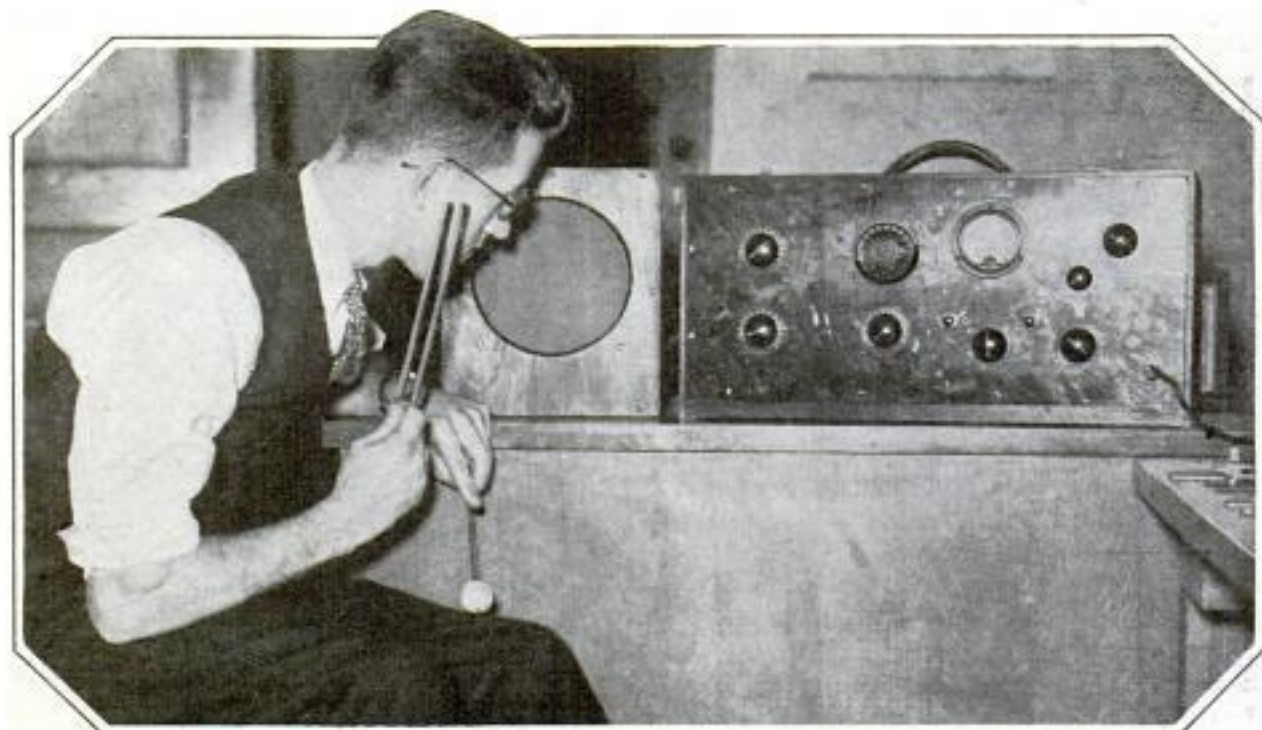
C 168

Twenty-one years ago Dr. Alexis Carrel cut a fragment from the heart of a chicken embryo and placed it in a test tube at the Rockefeller Institute in New York where it has been kept alive ever since. Doctor Carrel believes that it can live on perpetually, and that human beings likewise could have immortality if it were not for the fact that the brain and the nervous system cannot be renewed. Continually nourished and drained artificially, the increasing bulk of the chicken's heart is kept within bounds by cutting away the excess tissue.

Cont. Hy Miller, Box 2, Shelburne, Ore.

Unique Shoe Repair Co. Portland, Ore.

Cont. Jacob Blechstein, 1510 Jessup Ave, New York City



© U. & U.

Mosquito Trap Being Tested; It Produces Hum Similar to That Made by the Insect; Tuning Fork Helps in Adjusting the Tone

ELECTRIC TRAP FOR MOSQUITO TO AID MALARIA FIGHT

Trapping mosquitoes by electricity is expected to aid in malaria prevention. The United States public-health service is experimenting with an electric trap in which different-colored lights and differing musical notes are used to attract the mosquito. A suction fan draws the insect into the trap when it flies too close. Apparatus to produce a sound like the hum of a mosquito also is under study.

frames usually are designed to carry the entire weight of the building above them, no allowance being made for the added strength which brick incasement may give.

DISK SLOWS OUTBOARD MOTOR TO PERMIT TROLLING

C172

Slowing down the boat for trolling while the outboard motor continues to turn fast enough for efficient cooling, a disk attachment has been produced to meet the needs of fishermen. The regular

STEEL FRAME MADE STRONGER BY INCASING IN BRICK

C124

When steel frames are incased in brick, their strength is increased seventy-five per cent. In tests, the bureau of standards has found that bare steel columns fail by bending in the middle, while brickwork prevents such failure until the load is great enough to cause failure of the unincased steel at the end. Measurements show that steel incased in brick is stressed, or strained, less than one-fifth as much as bare steel subjected to the same load. The result of these tests, showing how brickwork strengthens steel columns, may lead to considerable economy without sacrificing safety in steel-frame building construction. Columns in buildings with steel

Richardson Marine Co



factory propeller nut is replaced by a special nut on which the disk is placed when trolling is desired. Speeds as low as one mile per hour are possible. The disk does not affect starting of the motor and does not increase vibration. Instant

changing is another advantage. Propellers are shielded by the disk, preventing fish-lines from becoming entangled. The attachment can be fitted to any size or make of outboard, simply by using different sizes of disks.

Dept. of Commerce 1/11/33

(Inv. Avery Richardson, 928 Commerce Tacoma Wash

Mrs. Malinda W. Brooks C 26 J. H. Fisch
 Berkeley, Calif. Co. Inc. 585
 POPULAR MECHANIC

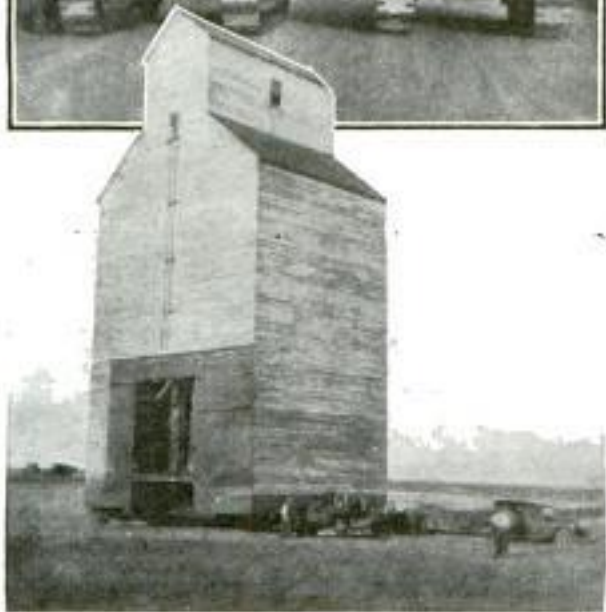
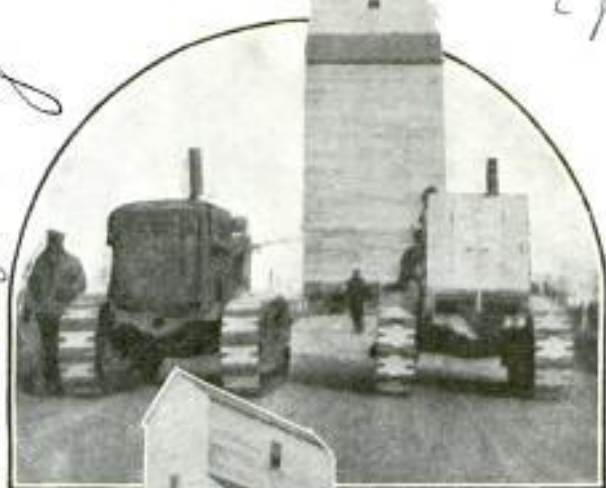
Barnesville,
 Minn

DYE CONQUERS DEADLY POISON OF CARBON MONOXIDE

One of the workers in a biological laboratory at the University of California who used a common dye, methylene blue, to show germs under the microscope decided that the dye might be useful as an antidote in cases of poisoning from carbon monoxide and from cyanides. Prompt utilization of the dye by the San Francisco director of public health saved one carbon-monoxide victim and one victim of cyanide poisoning. Many lives are lost annually by these two poisons, particularly the carbon-monoxide emanating from automobile exhausts, and it is hoped that methylene blue will save many victims.

Scene Service 1/14/37

C 109
 W. C. Deane



Top, How Grain Elevator Was Moved along Highway; Bottom, Elevator at New Location

EIGHTY-FOOT GRAIN ELEVATOR HAULED FORTY MILES

Hauling a grain elevator, eighty feet high, from one North Dakota town to another forty miles away, is the feat of an expert crew of movers. The structure, twenty-eight by thirty-five feet at the base, made the trip on four endless treads, being pulled along the highway by two tractors. Three railroad crossings, a bridge and several ravines were among the difficulties overcome. At one point, high-tension power lines had to be cut and then replaced as the elevator moved along. At another, it became necessary to build up the shoulders of the road, which was too narrow. Fifteen days were required for the moving operation.

ⓘ A fully charged battery loses effectiveness, sometimes more than thirty per cent, if allowed to remain in the automobile overnight at zero temperature.

FOLDING CHAIR MADE OF WOOD OFFERS MORE COMFORT

More comfort than is usual in ordinary types of collapsible chairs is offered in a folding wooden chair suitable for the card table. When in use, the chair is as substantial and as neat in appearance as a dining-room chair, or any other similar type of furniture. It is folded by pulling a spring under the front of the seat and lifting the seat against the back, and can be opened merely by pushing the seat downward, causing hinged parts to lock.



This Wooden Chair Collapses When Spring Is Pulled

Fort Massac Chair Co
 Metropolis, Ill.

Scene Service
 Dec. 19, 1937

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B2117 Wide World Photos, Inc.
229 W. 43rd.
New York



The Latest MOVIE



Photos © Wide World
Top, Left to Right, Action Scene in Studio; Background Taken
in Switzerland, and Combined Pictures as Shown on Screen; Be-
low, Selecting Background for a Scene

THE movie actor was shown strolling along a Paris boulevard.

Nothing very difficult in making that shot, you might say, if asked to explain it—until you learned the actor never had visited Paris in his life.

A few years ago, there were just two ways of making such a scene—both of

them expensive. One would have been to load the actor and a cameraman on an ocean liner, go to Paris, order the actor to walk down the street while the camera clicked, come back home and turn in the expense account. Another method would have been to duplicate the Paris boulevard in Hollywood, something very costly for just one shot.

Today, instead of sending the actor to the Paris boulevard, the boulevard is brought to him in a little roll of film. Then, on another film the actor is pictured taking a walk. But when you see him, he appears to be walking in Paris.

Hundreds of "location" scenes like this are being filmed by this method, known as the Dunning process, which was devised by an eighteen-year-old boy whose father spent two years convincing the patent office that the idea would work. The process, in brief, is one by which actors may be

shown in places where they never were, and it is the invention of Dodge Dunning. Today it is being used in both Germany and England, as well as in this country.

If you make a red mark on a piece of white paper, then look at it through a red-tinted glass, the mark is invisible because the glass absorbs the complementary col-

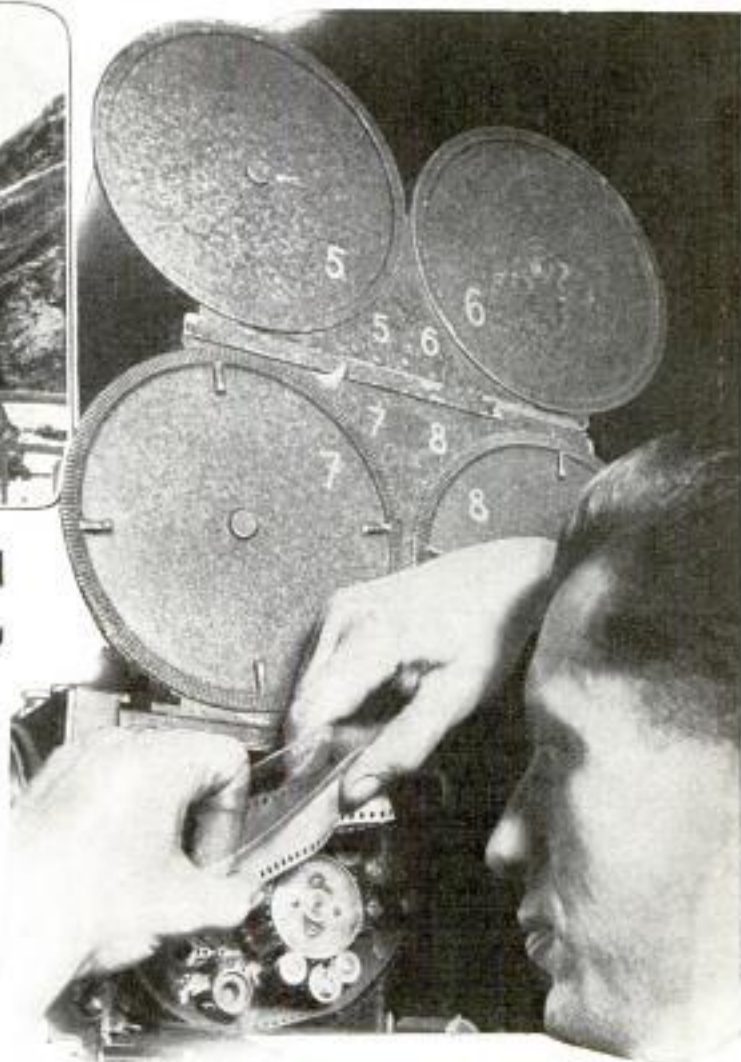
Hollywood Calif
Copyrighted material



MAGIC

ors. This illustration helps a bit in understanding the complicated Dunning process which utilizes colored lights to illuminate a scene and film which is more sensitive to certain colors than to others.

For instance, the Paris street scene might be shot, then bathed in chemicals during development



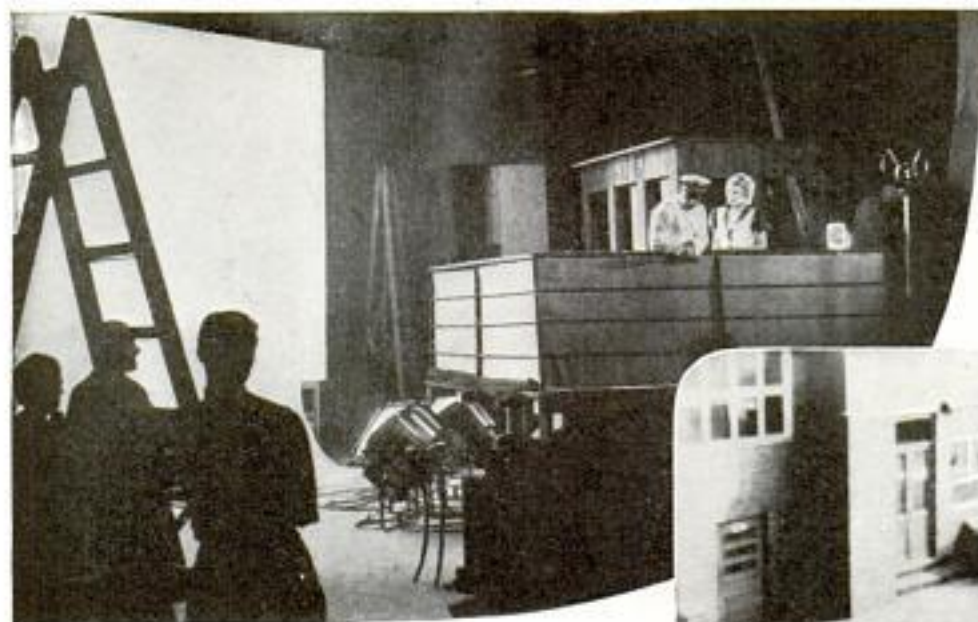
so that it becomes invisible except against a deep-blue background. Then, if you knew the process, you might run this film and an unexposed one through the camera together when the actor in Hollywood took his walk. But the actor would be lighted with orange or some other color which would not conflict with the color of the original film. When this second film was developed, both scenes would be found registered on it in their proper relations.

Life and movement in foreground and background are not restricted in any way. There are eighteen different dye baths involved in the process which enables action staged in a studio to be built up on an animated and authentic background shot in Africa or Siberia. A piece of orange film employed in making such pictures may appear entirely blank when held to the light. Yet, if viewed through blue glasses, a scene on Broadway might be visible.

The method has saved movie companies



Top, at Right, Arranging Background Film and Blank One to Run through Camera Simultaneously; Below, Arranging Light Filter for Studio Scene



Left, Filming a Ship in Mid-ocean with All the Action Taking Place in the Studio in Front of an Invisible Background; the Sea and Sky Background, Taken Separately, Is Combined with This Scene to Make a Realistic Picture

millions of dollars in making location pictures, and it has also probably saved lives since many dangerous situations are no longer necessary. The process was used, for instance, in filming the shooting up of a cafe. Real machine guns and real bullets were used and real plate-glass windows were shattered, but without risk to the actors. The shooting was done on an empty set. Then another scene, perfectly synchronized with the first, was filmed and showed the actors diving under tables to escape imaginary machine guns.

But that is not all. By utilizing such a method to the full extent of its possibilities, the action of a western thriller might be filmed and a sound recording made with American actors. Then the actors might step out and the same scenes could be shot for a foreign version. Copies of that might be sent to Germany, France and Italy, and actors of those nations might step into the same background and talk the language of their own country.

Or all the scenes for a picture might be shot in Hollywood, sent to Vienna and a Viennese actor might take the leading role there, enacting the part played by an American star in this country, appearing in the same scenes and against the same background.

Until this process was developed, the movies followed Mohammed's solution of a similar problem—they went to the mountains because the mountains would not come to the studios. Now they are able to move the mountains.



Top, a Scene Taken on Location; Center, Action Scene Which Was Filmed in the Studio; Below, Combined Scenes as They Appeared on Screen

Science Service
1/17/33

C 36 Westinghouse
Electric & Mfg Co
589
East Pittsburgh, Pa

HEAT RAYS AFFECT NOSE
CAUSING STUFFINESS

C 147
Certain heat or infra-red rays cause the nostrils to contract, interfering with breathing and resulting in a feeling of stuffiness experienced in an overheated room. Sir Leonard Hill, English physiologist, says this effect is not due to a direct action of the heat upon the nostrils, but that it is a reflex effect from the sensory nerves of the skin. This action is especially marked in persons whose breathing already is partially obstructed. The effect of these rays, which the physiologist calls "nose shutters," can be neutralized by fanning the skin of the face or by action of certain other rays given off by luminous sources of heat. Water vapor also absorbs the nose-shutter rays explaining why a bowl of water placed in front of a heater relieves the stuffiness of a room. In experiments at Bedford college, London, sixty per cent of persons examined were found to experience difficulty in breathing when exposed to heaters giving off rays from dark or dull-red sources of heat.



© Westinghouse Electric & Mfg. Co.
This Conditioner Maintains the Air in a Single Room at the Proper Temperature and Humidity

SINGLE-ROOM AIR CONDITIONER
RESEMBLES RADIATOR

Proper conditioning of the air in one room is attained through use of a compact unit that resembles the familiar steam radiator. A turn of the switch starts the conditioner.

C 146
LAUNDERING OF SOIL RESTORES
MOST OF ITS PRODUCTIVITY

Thousands of acres of otherwise fertile land upon which the accumulated salts prohibit the growth of plants are being restored to productivity in California by washing, or leeching. In the Imperial valley, miles of land which appears waste today was once productive, but was ruined by excessive irrigation without proper drainage. The water table gradually rose until it stood within a few inches of the surface, and the evaporation of moisture caused a heavy deposit of salts. Some of these minerals were found to be common table salt or Glauber's salt and these can be leached out readily by the application of pure water on the surface. Percolating through the soil, the water dissolves the salt and then both salt and water are carried away through drainage canals. By such processes, areas of land are being reclaimed in about six months.

C 174
OIL-PRESSURE SIGNAL ON DASH
WARNS AUTO DRIVER

If the oiling system of his automobile fails, the driver is warned by a signal light produced for installation on the instrument panel. As long as adequate pressure is maintained in the system, a light on the dash burns, but if the light goes out while the motor is running, the driver should



Arrow Points to Signal That Tells Driver When Something Goes Wrong in Auto's Oiling System

look for the trouble, which may be lack of oil, clogged oil pump, burned-out bulb in signal, or the like.

King-Seeley Corp
Ann Arbor, Mich

Science Service 12/19/32
More people are injured by mules in the United States than by airplanes.

E. Thomas, associate chemist
Citrus Experiment Station

Christian Science number 11/33
University of California
Berkeley, Calif.
Berkeley, Calif.

B 2 185

Lorenzweg
Tempelhof
Germany



One-Car Garage Was Made to Accommodate Two Autos by Sawing It in Half and Extending Sides

SIZE OF THIS GARAGE DOUBLED BY SAWING IT IN HALF

When a resident of Long Island decided to transform his one-car garage into one large enough to hold two autos, he did it with a minimum of labor and material by sawing the building in half. Each half constituted one wall and part of the roof of the new building which was completed by extending the roof, providing a back wall and installing an extra door.

CRASH-RESISTANT FUEL TANKS SOUGHT FOR AIRCRAFT

Fuel tanks which will withstand the effects of accidents are being sought by the aeronautics branch of the U. S. department of commerce. Latest tests indicate steady progress toward production of

crash-resistant tanks for airplanes, without the great increase in weight common to earlier types. "Thiokol," an elastic material which is not attacked by gasoline or benzol, has been molded into a fuel container to fit inside a metal tank. When filled with water and dropped twenty feet to a concrete surface, this tank with the flexible lining showed unusual crash-resisting properties. Such containers weigh about one and one-fourth pounds per gallon capacity, twenty-five per cent less than tanks previously developed. The weight depends to a great extent upon the kind of metal used for the outside shell. Among the problems to be solved is elimination of porosity and large cavities created by air trapped in the thiokol in the molding process. Also, a better design of mold is necessary to prevent distortion. The aeronautics branch reports that additional experiments are necessary.

MICROPHONE STRAPPED TO THROAT PICKS UP A WHISPER

For use in airplanes, noisy factories or wherever a special aid to hearing is needed, a tiny microphone which is strapped against the larynx and connected to earphones is now offered. Placing the "mike" against the larynx is said to make it more effective in picking up speech than if it were in the usual position against the upper jawbone. Even whispered conversations are heard.



Microphone That Is Strapped against Throat for Use of Aviators or in Noisy Factories

Air Commerce Bulletin 1/16/33
Aeronautics Branch, Dept. of Commerce

Lorenz Aktin
Berlin, Tempelhof
Germany

J. Lee
W. A. ...
C. ...

C-6 *Askanie Werke & Co.*

Petroleum Bldg.

POPULAR MECHANICS

591

Houston, Texas

Finding Buried Gold with the Aid of Magnets

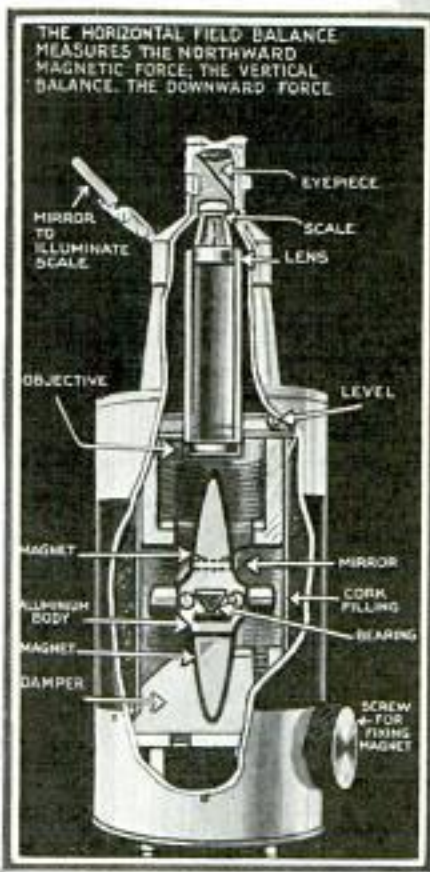
809 Merchant and Manufacturers Bldg.

sell used instrument also



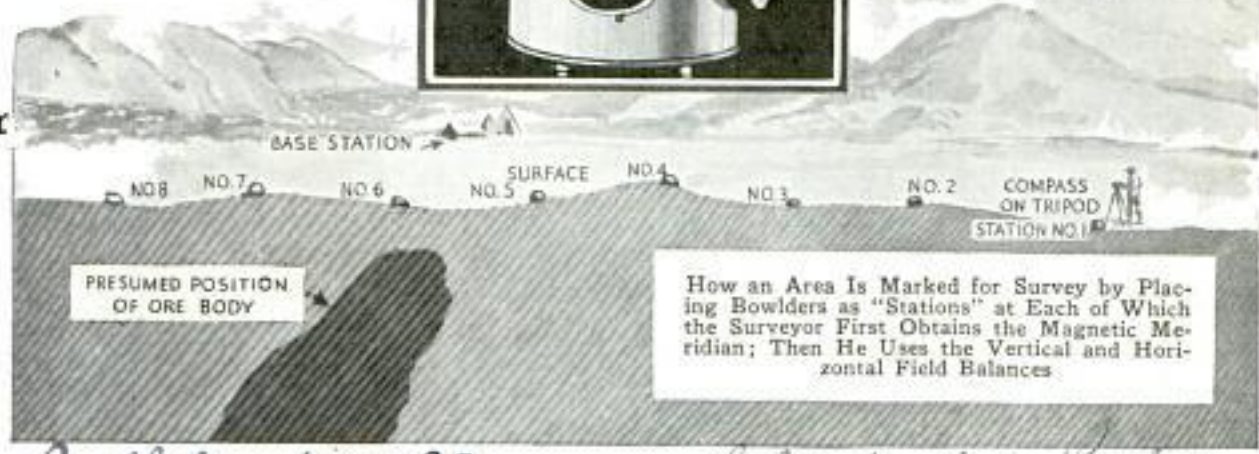
HORIZONTAL FIELD BALANCE

Hidden Magnetic Masses Likely to Contain Gold Are Located Accurately without Boring or Digging with Instruments Known as Magnetic Field Balances, Invented by a German Scientist; Gold Does Not Attract Magnets, but Is Found with Certain Magnetic Rocks, and the Balances Locate This Ore; Operation Is Governed by Movement of Magnet Within Vertical Instrument Which Dips as It Comes over a Magnetic Mass; the Dipping Is Infinitesimal, but Is Magnified by Mirror Fixed to Instrument, so It Can Be Read on a Scale; Surveyor in Field Is Assisted by Another Man with a Fixed Instrument; Field Man Notes on His Balances Variation in Terrestrial Magnetism and Takes Readings Simultaneously with Man at Fixed Instrument; Readings Also Are Taken with Horizontal Field Balance for Magnetic Variations, and the Resultant Figures Are Made into a Graph; Investigators Can Then Guess Roughly at Shape of Hidden Ore Body and Calculate Graphs to Match Those Made from the Instrument Readings, Until One Is Found to Correspond with an Instrument Figure; Then They Can Tell the Position of Magnetic Material, and Estimate Its Depth and Size; after That It Only Remains to Dig for Samples and Determine if Gold Is Present



THE HORIZONTAL FIELD BALANCE MEASURES THE NORTHWARD MAGNETIC FORCE; THE VERTICAL BALANCE, THE DOWNWARD FORCE

Above, Using a Horizontal Field Balance to Obtain Records of the Magnetic Variation at Each Station in an Area Being Checked for Gold; the Horizontal Balance Is Employed by the Surveyor After He Has Used a Vertical Balance to Measure the Downward Force Exerted by the Hidden Mass; a Graph of the Combined Readings Enables the Surveyors to Locate the Ore by Mathematical Calculations; Left, a Cross-Section of the Horizontal Field Balance; Note the Ingenious Optical System Incorporated in the Instrument for Reading Extremely Small Deflections



How an Area Is Marked for Survey by Placing Boulders as "Stations" at Each of Which the Surveyor First Obtains the Magnetic Meridian; Then He Uses the Vertical and Horizontal Field Balances

Askanie's Book 'Directions for Use of Torsion Balance' \$3.35.

also

Bulletin 22092.

Illustrated London News

Copyright 1902

B 21 20
592
Lead
Inventors'
Association

Paul Richards
3939 W. Madison
Chicago

POPULAR MECHANICS

Developed by Industrial
Research Laboratories, Permining-
ham Corp. as a test.
Under direction of Mr. C. M. Walter
found moderately successful in silencing
the exhaust, while the variable-pitch pro-
peller is considered promising as a solu-
tion to a more quiet operation of this part.
Soundproof cabins for passengers is an-
other line along which engineers hope to
arrive at the silent aircraft.

Illustrated Features
Electric Motor Carried on Operator's Back Runs This
Brush for Removing Wall Paper

Charlotte Sunday Observer
1/15/03



Illustrated Features
Electric Motor Carried on Operator's Back Runs This
Brush for Removing Wall Paper

WALL PAPER EASILY REMOVED WITH ELECTRIC BRUSH

Old wall paper, paint or varnish can be removed quickly by means of a portable electric brush powered by a small motor carried on the operator's back. Three revolving brushes are mounted in a protective steel housing, and are run from the motor through a flexible steel shaft. One of them is set at a slight angle, giving the device a tendency to climb slightly on a wall, thus relieving the user of some of the weight. For different kinds of work, heavy or light brushes are used. The apparatus also will scrub floors.

TASK OF REDUCING PLANE NOISE MOVES AT SLOW PACE

Reduction of noise produced by an airplane is a task on which science is making little progress, due to the fact that to decrease the noise by ten per cent, the energy producing it must be decreased ninety per cent. That is the conclusion of Maj. F. H. Coleman, of the army air corps, in describing experiments designed to silence the airplane. Principal sources of noise are the engine exhaust and the propeller, with the tip speed of the latter the biggest factor. A muffler combining back-pressure and tortuous-passage principles has been

AUTO DRIVEN BY BOTTLED GAS PRODUCED FROM COAL

Successful tests have been conducted with artificial gas as a fuel for automobiles and trucks. The gas, like that used for lighting and cooking, is compressed into steel cylinders, each holding 350 cubic feet at atmospheric pressure. An air-gas mixer feeds four parts of air to one part of gas into the engine, producing a power efficiency of 92.8 per cent of the maximum available with gasoline. This fuel is adapted to high-compression engines, more so than ordinary gasoline. It also produces good results in supercharged engines. In a truck, the engine is smooth-running, tractable and unusually quiet when the artificial gas is used. Operation costs are low. Disadvantages include the necessity of carrying heavier equipment, since sev-



View Showing How Bottled Gas Is Used as Auto Fuel; Below, Carburetor Connections

eral of the steel cylinders must be stored under the auto or truck at a time, due to the scarcity of compression stations.

Chief of Equipment Branch
Material Division

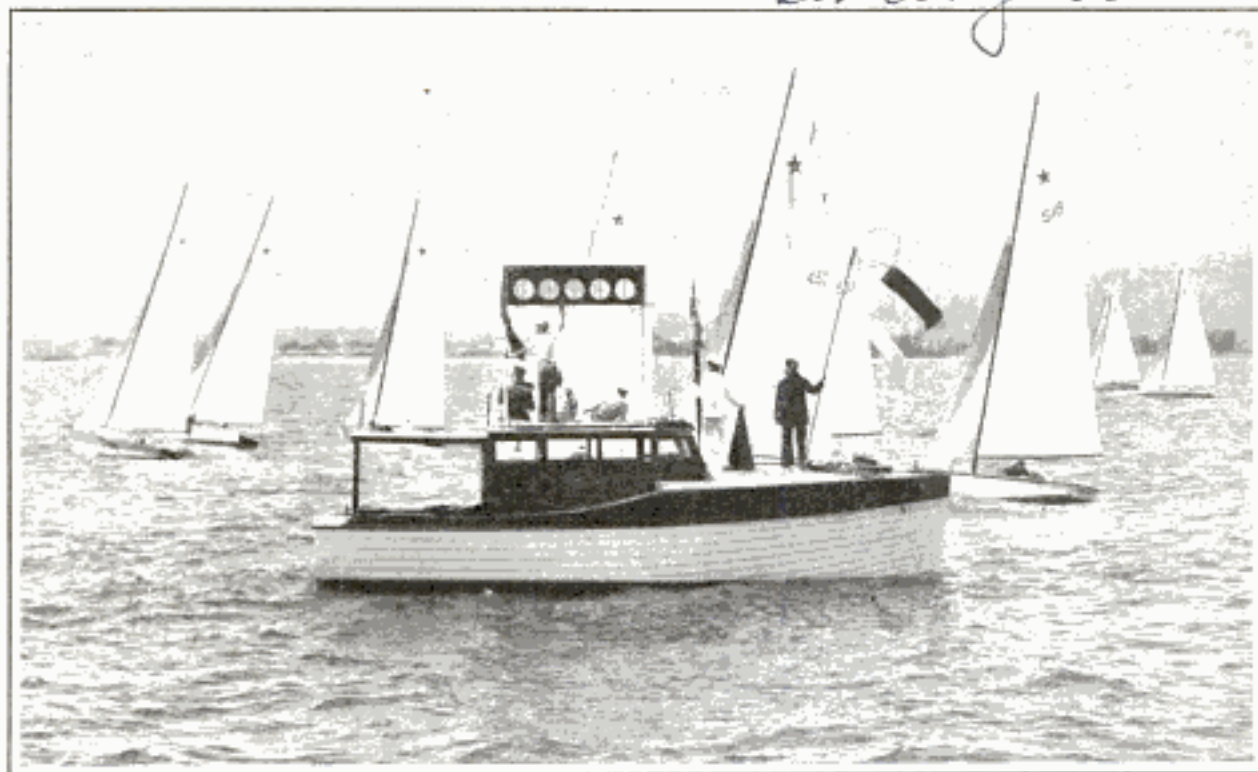
The Motor
12/27/32 P 951
Copyrighted Material

03 19 77 Col. Chester E. Matson

431 W. 9th St

POPULAR MECHANICS

Los Angeles Cal 593



Just before Start of Race, White Disks on Board of Committee Boat Are Turned, One by One, Until All Are Black; That Signifies Starting Time to Waiting Skippers

TIMING BOARD FOR YACHT RACE AIDS IN STARTING

Use of a time-signal board for yacht races has been found of benefit to officials and to skippers on the Pacific coast. The device, which is mounted on the cabin of the committee boat at one end of the starting line, shows the time between preparatory and starting signals. The board is plainly visible to the yachtsmen jockeying for the preferred windward position as they watch the passing of the last five minutes before the start. One side of the board is black, the other white, while there are five disks, each white on one side and black on the other. As the preparatory gun is fired, all disks are the same color as the board. As each minute passes, a disk is turned so that it is the opposite color from the board. When all disks are turned, it is time for the starting gun.

RADIO AMATEUR SAVES A MAN TEN THOUSAND MILES OFF

Saving a man 10,000 miles away is the feat of an amateur radio operator in New Zealand. While in communication with a man in Teller, Alaska, he noticed that the other operator's signals suddenly slack-

ened and stopped. Sensing that something was wrong, the New Zealand operator began flashing: "Any Pacific coast amateur—please answer—emergency." Col. Claire Foster of Carmel, Calif., replied and learned that the Alaskan amateur was one of his friends. Colonel Foster called an operator at Teller and told him of the communication, which thus resulted in the rescue of the man from a cabin filled with fumes from a gasoline heater.

INK FED TO DRAFTSMAN'S PEN BY NON-SPILL TUBE



Ink is fed into the draftsman's pen without danger of spilling by a hard-rubber container that lets only a measured quantity enter the pen. A rubber ball on the tube must be pressed before the ink is released. The container also keeps the drawing fluid from drying.

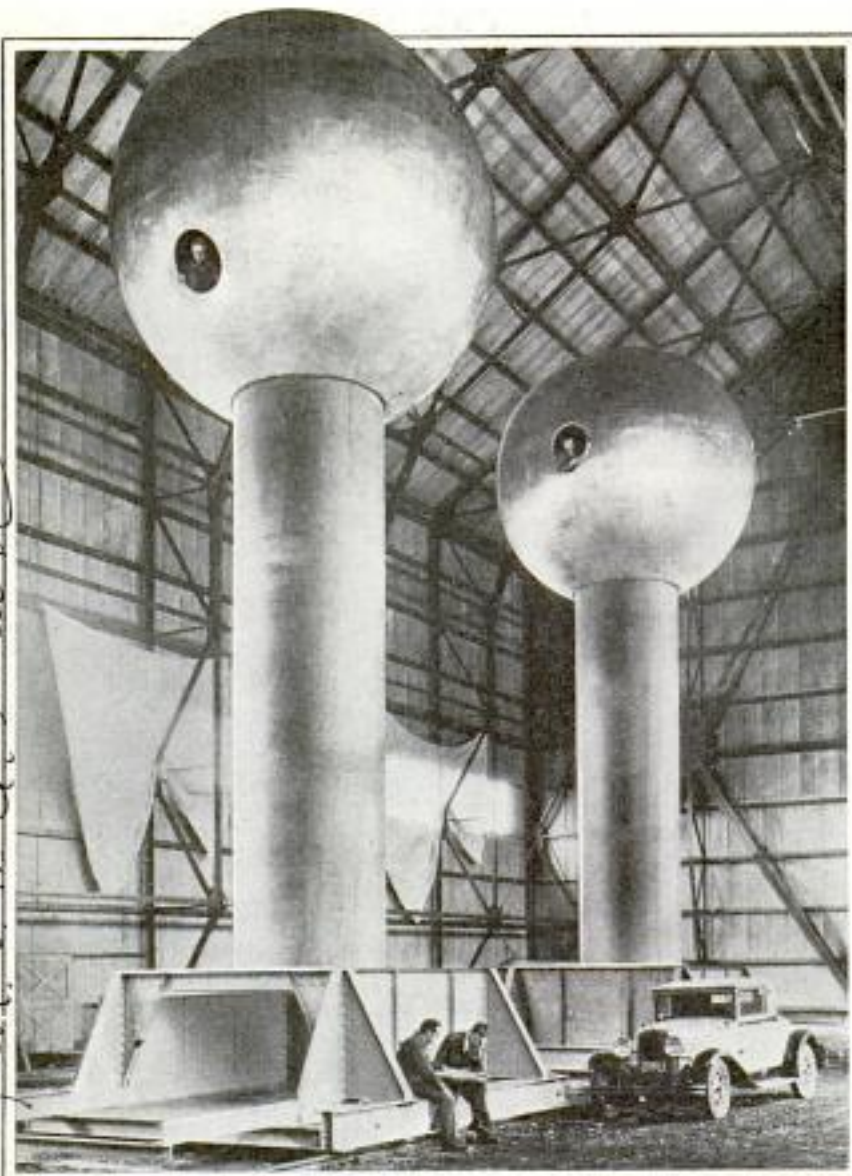
No. 40 agent known

N.Y. Herald Tribune

1/10/33

Leuther Wagner

Hannover, Germany



Note Men in Ports of Giant Electrodes of Generator; Powerful Bolts of Man-Made Lightning Will Be Produced to Aid Research

TEN-MILLION-VOLT GENERATOR WEIGHS OVER THREE TONS

Lightning flashes of ten-million voltage will be discharged between electrodes of a giant generator erected for research work at Round Hill, Mass. The two spherical aluminum electrodes, weighing one and one-half tons each, are fifteen feet in diameter and rise high into the air. The hollow columns, topped by the electrodes, dwarf men working at the base, and the discharge port in one of the electrodes is large enough to admit a man's body. The interior of the large globes will contain a compact laboratory. Production of power by the generator is accomplished by means of endless silk belts operating inside the hollow columns. Electrical charges sprayed on the belts at the base are carried through

the column to a point within the spheres, the charge accumulating on the outside. One charge is positive, of course, and that on the other sphere is negative. When each charge reaches a specific potential, or previously determined voltage, it discharges between the terminals like a bolt of lightning. The giant generator will be used in study of the atom and the X-ray.

BREAKING IN AUTOS IS QUICKER WITH LOOSE BEARINGS

Reduction in time required to "break in" a new automobile will be attained by designing loose instead of tight bearings. The tedious process, which involves holding down speed for 2,000 miles, may be eliminated entirely, if experiments at the state college of Pennsylvania are successful. Investigators have found that high-speed shafts suck oil into the bearings until it is

compressed as much as 2,000 pounds per square inch. Because of this pressure, a complete oil film is established, the shaft actually being floated on oil, eliminating wear and reducing friction to that of the internal friction of the lubricant. To establish this film, which is capable of carrying 500 pounds per square inch without metallic contact, bearings should be designed loose instead of tight. When the shape is correct, that part of the spinning shaft which tries, by reason of the load, to run against the metal bearing, sucks up and compresses enough oil to lift itself clear of all metal-to-metal contact. Prof. Louis J. Bradford, of the college, says that the initial clearance given bearings may well be increased above that in common use, thus shortening, or perhaps eliminating the necessity for careful run-in.

Pennsylvania State College, State Pa

assembled on a car hub back Mt. Ives road station
in estate of Col. & H. A. Green

Michigan & Ohio
New Fuel Co.

729 Superior St. Toledo, Ohio
POPULAR MECHANICS
GARBAGE IS TURNED INTO
FUEL FOR HOMES C 22.

595
B 2058

Conversion of garbage into fuel is accomplished by a process that mixes waste with coal dust and compresses them into pieces resembling bricks. The finished fuel is called garbage briquettes. In manufacturing the fuel, loads of garbage, street and house sweepings, paper, leaves and other combustible material are dumped into a vat and sprayed with deodorizing and disinfecting chemicals, such as creosote. A magnetic separator removes metal objects, while the conveyor on which the garbage is removed from the vat is so shaped that bottles and bones roll off. The conveyor discharges into a hammer mill that reduces the garbage to a pulp. Then the waste materials are mixed with coal dust, a waste product of mines, and dumped into a mixer. Pitch or asphalt is added, and the mixture is discharged into a molding machine that compresses it into briquettes. Drying in air or kiln completes the process. The briquettes are practically odorless in combustion and smoke very little unless made with soft-coal dust.

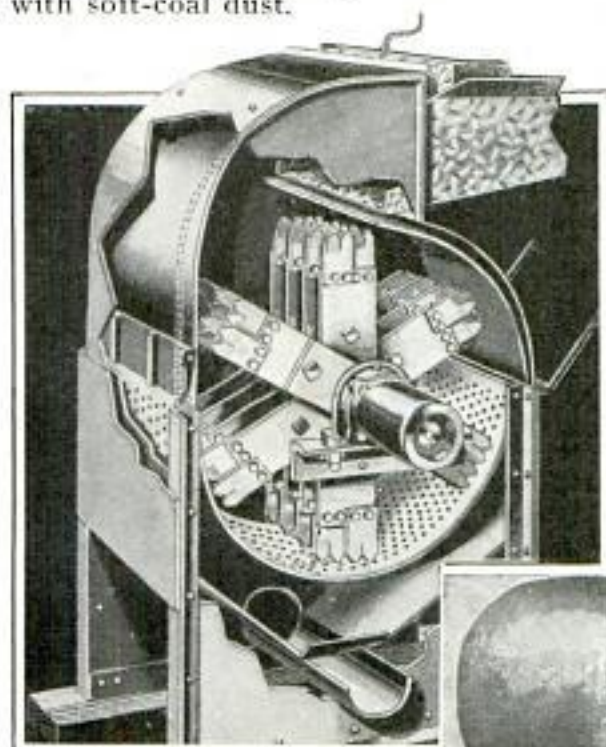


Doll on End of Teeter Board Keeps the Child Rider Amused While She Exercises; Treated Lumber Makes Board Springy

TEETER HAS DOLL ON ONE END TO AMUSE CHILD RIDER

Designed to keep the child amused during the exercise period, a teeter board has a doll that bobs up and down with every move. Light and easily portable, the board is sturdy enough to support a weight of 100 pounds. Specially treated lumber gives a lively spring action.

Schultz Bros. Co. 614 N. Carpenter, Chicago



Top, Machine for Chopping Garbage; Right, Briquette Useful as Fuel

LOUD SPEAKERS IN AUTO LAMPS ELIMINATE LARGE HORNS C 23

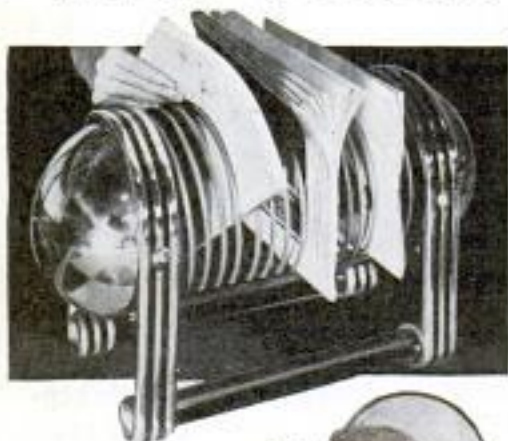
Instead of carrying the usual loud horns mounted on the roof, a western man, who has equipped his car as a mobile public-address unit, has utilized the headlights of the car for loud speakers. He removed the glass and reflectors and in their stead installed a dynamic speaker in each lamp. The inside of the light was lined with felt to prevent distortion, and a copper screen was placed in front of each light to keep out dirt and gravel. The speakers can be heard for about two blocks ahead of the car. In place of the headlamps, two ordinary road lights were installed on the fenders and give illumination for night driving.

Cont. Robert Bretton
125 S. 28th St.
Lincoln, Nebr

New CONVENIENCES



Combined Desk and Chest of Drawers for Small Apartments; Front of One Drawer Opens to Form Desk Space; Below, Rotary Dish Washer Attached to Faucet; It Has a Soap Compartment That Permits Proper Mixture; One Brush Remains Stationary While Another, Set Inside, Rotates Rapidly When the Water Is Turned On; Additional Attachments Adapt the Washer to Hot and Cold-Water Faucets with Separate Outlets



Top, Holder with Coil Spring for Magazines and Newspapers; Right, Teeter Chair for Baby Made of Spring Steel; It May Be Used in Home or Auto



Bag Keeps Contents Twenty Degrees Cooler than Outside Temperature by Evaporation; Right, Fork with Bent Tines Helps Mix Cake Ingredients, Etc.



for YOUR HOME

Left, Footstool Has Drawer for Slippers; Set on Resilient Bearings, Drawer Slides Open Easily, but Cannot Come Out Entirely; Right and Below, Baby Carriage Has Detachable Body That Can Be Carried Easily and Used in Auto or in the Home as Swinging Crib; Body Is Metal and Fabric



Right, Attachment for Electric Bulb Perfumes the Home; Ten Minutes After Light Is Turned On, Heat from Bulb Begins to Vaporize the Perfume, Spreading a Pleasing Odor



Left, Self-Wringing Mop Keeps Housewife's Hands Out of Water; Twin Revolving Sleeves Expel the Water from Mop



Electric Cooker for Deep Frying Is Large Enough for Three Chickens at a Time; Frying a Chicken Requires Only Seven to Nine Minutes; Chops and Cutlets, Seven Minutes, and Potatoes, Four Minutes; Holds One Gallon of Oil or Fat; Made of Aluminum and Rustless Steel with Rock-Wool Insulation to Hold Heat; Also Can Be Used for Roasting

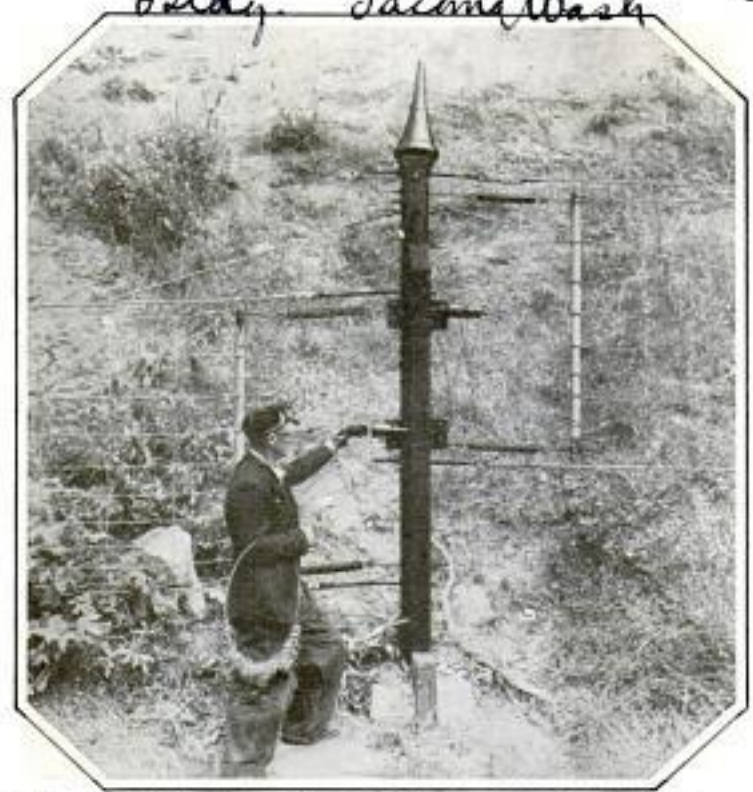
B1855

Cont. Chas. F. A. Mann
1110 Budget Found, Wash
POPULAR MECHANICS
1934

The Motor 1/3/33

598

Engineers of Great Northern Railroad



When Landslides Exert Too Much Pressure on Fence, Trains on Track Below Are Warned by Automatic Signals

ELECTRIC FENCE FOR RAILWAY GUARDS AGAINST SLIDES

Designed to prevent trains from crashing into snow or landslides, an electric fence stands guard along the tracks of western railways passing through mountainous country. When a slide occurs, the detector fence automatically stops trains on either side by flashing the red signal and informs the nearest dispatcher. Heavy galvanized wire with top and bottom steel cables, anchored securely to steel posts set in concrete, is mounted on springs. A four-way circuit-breaker electric plug is attached to each end of 200-foot sections. When rocks or snow pile against the fence, the springs give gradually until, at a certain load, the fence plugs are pulled out. This breaks the circuit and flashes a warning that the railroad is covered with an obstruction at that point. Red signals on each side are set to halt oncoming trains, preventing serious accidents. Not until all debris is removed and the plugs are reset in the fence, does the signal system turn back to clear or green position.

Vegetables which have been quick-frozen cook in half the time required for fresh vegetables, tests have shown.

Lucie Berner
12/19/1932

CURB LIGHT REFLECTORS HELP AUTOISTS IN FOG

Red reflectors set into the curbing help the automobile driver to keep close to his own side of the road in foggy or murky weather. Such an arrangement has been designed in England to promote safety. The reflectors are installed at one-foot intervals in curbstones built in three-foot lengths. Sockets at each end of the curbstones facilitate installation. Being set at an angle, the reflectors throw back the beams of the auto headlights, showing the driver how close he is to the side of the road.

B2254 CLERKLESS POST OFFICES IN ENGLISH STREETS

Clerkless post offices have been installed in the streets of London and other English cities. Containing a telephone and resembling a telephone booth, the post offices have mail boxes and machines that sell stamps. Service is available day and night, the vending machines and letter boxes being illuminated. The British post office operates a telephone system in addition to mails and telegraph, making practical the combination booths.



Clerkless Post Office with Stamp-Vending Machines and Mail Boxes Stands in London Street

Engineer in Chief
London Post Office
London England

Gas Attacks Teach Police How to Use Masks



Above, Police Recruits in Masks Running through Gas Barrage; Right, Rookie Rescuing a Comrade

Police recruits in eastern cities are taught, among other things, how to use tear gas effectively in combating crime, and also how to wear gas masks for protection in case the bombs are turned against them. Rookies not only practice hurling the bombs at imaginary foes, but also don masks and run through a gas barrage and make rescues.

83
**ELECTRICITY HELPS HUNT GOLD
 HIDDEN IN QUARTZ VEINS**

By manipulating electrical devices on the surface, the geophysicist is able to tell where wealth is likely to be found far underground. Improved instruments aid the search for gold-bearing quartz veins, according to Sherwin F. Kelly, consulting geologist. Heretofore, variations in the electrical resistance of rock and soil above suspected quartz have masked the very slight differences in resistance between quartz veins and the inclosing rock. Im-



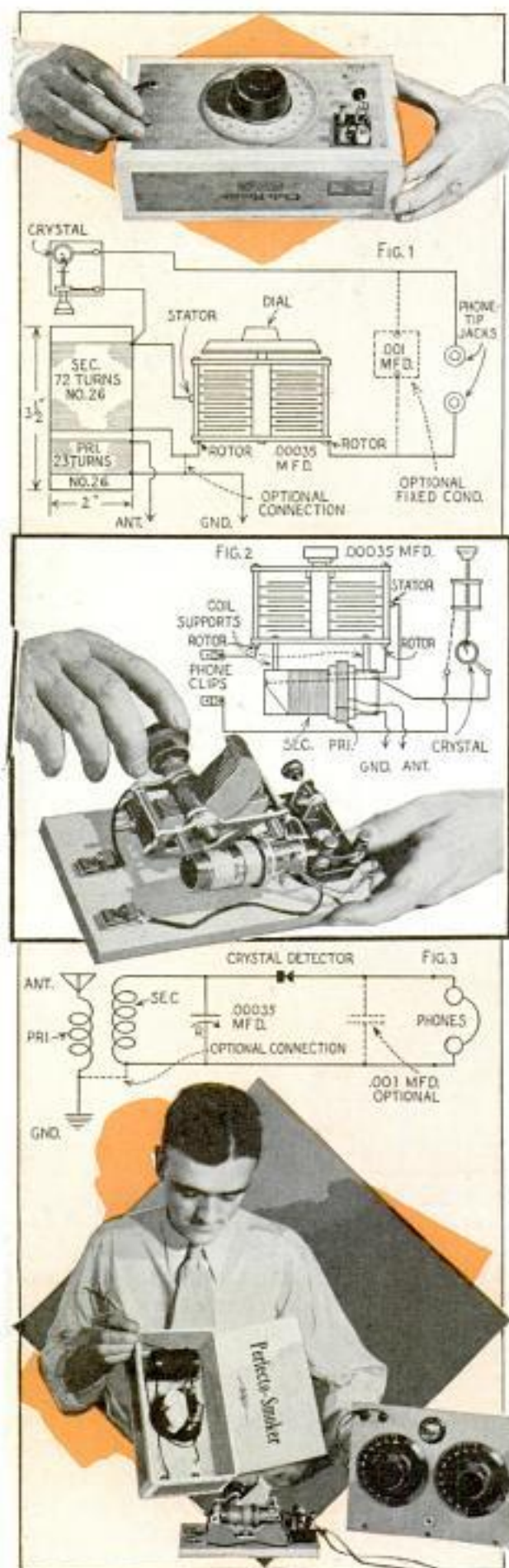
provements now make it possible to eliminate these surface variations and thus unmask the slight differences in electrical effect of the underlying material. But, Mr. Kelly warns, it still is impossible to tell whether the quartz contains gold. The method should be applied only in regions where quartz veins are known to be gold-bearing. Placer deposits of gold are found magnetically because they often are accompanied by so-called black sands, consisting of particles of magnetic iron ore.

and geophysicist. see metal detection for
 82 W. 12th St. N.Y.C. Miss. file
 One Cedar St.

La. 330 Bay St
 J. J. J. Anti-Corrupt

see 1/11/33

Three Selective



FOR a few cents, anyone can build a selective crystal receiver that will bring in the programs from local stations in metropolitan localities. The only additional apparatus necessary is a pair of 2,000-ohm headphones that need not cost more than \$1.50.

In some crowded areas, the receiver must be more selective than the older types that most of us are familiar with. However, all three of the receivers described in this article were tested in Chicago, and the results were entirely satisfactory. The parts may be found in chain stores or salvaged from old broadcast receivers of almost any description. The crystal detector is merely a piece of galena, a mineral easily obtained, in a suitable holder. This holder may be made from anything that will form a small metal cup, the end of an empty shotgun shell being usable for this purpose. The crystal is held tightly in the cup by means of set-screws, solder or pot metal. Mounted crystals, however, cost but a few cents. One of the circuit leads goes to the crystal cup and the other to an adjustable wire known as a "catwhisker." The complete crystal detector, shown in Figs. 1 and 2, cost 35 cents.

The .00035-mfd. variable condenser is an ordinary 17-plate tuning instrument. The schematic diagram, Fig. 3, is the same for both Figs. 1 and 2. In Fig. 1 a homemade antenna coil, wound on a piece of cardboard mailing tube, is shown; all dimensions are given together with the number of turns for the primary and secondary. No. 26 s.c. or c.c. magnet wire is used, and both coils are wound in the same direction. This coil may be taken from an old receiver, provided it was originally tuned with a .00035-mfd. condenser. The cigar box, shown in the upper and lower photos, houses this receiver. The coil and variable condenser are mounted inside, and the dial, crystal detector and pin jacks for the phone cords on the bottom. Two small angle brackets support the coil, and short machine screws hold the tuning condenser in position. The ro-

CRYSTAL RECEIVERS

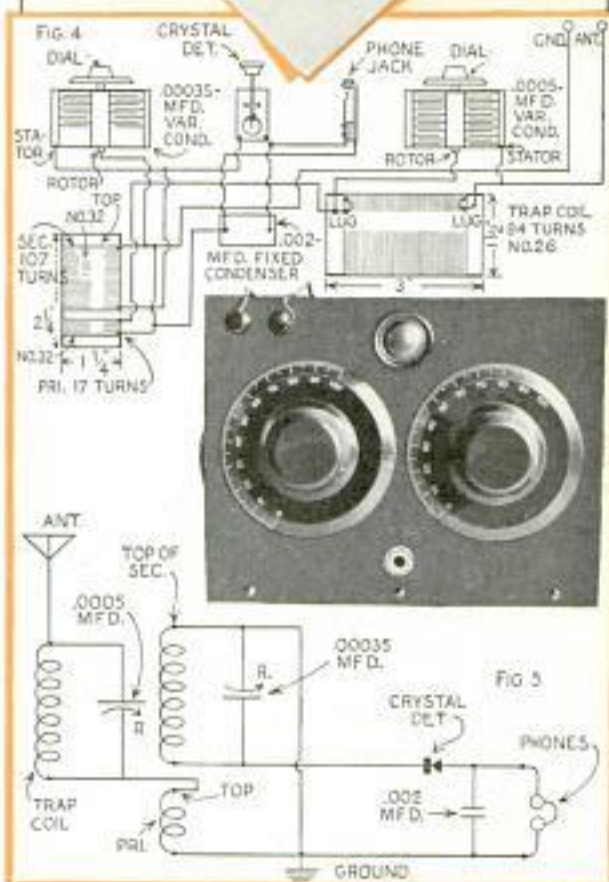
tor plates are usually common with the condenser frame, and the stationary plates are insulated from the frame, so that these terminals are easily located.

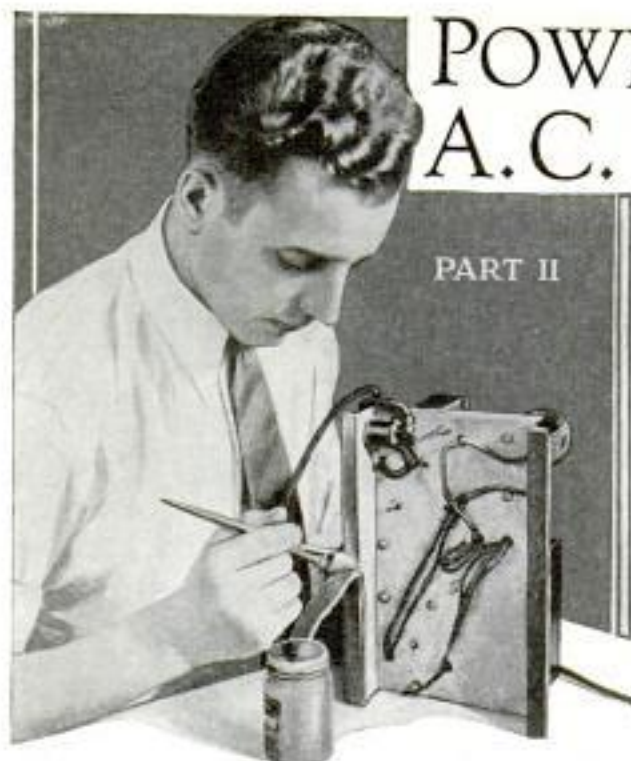
The optional fixed condenser across the phones as well as the optional connection from the primary to the secondary coil may, or may not, be necessary for best results. It is a good idea, however, to try both methods. To tie the primary and secondary together, all that is necessary is to connect the ground lead from the coil to the rotor of the condenser where the lower end of the secondary is connected, and then continue the lead to ground. The antenna connection, from the upper end of the primary and the ground lead may be connected to binding posts on the side of the box, or run direct to antenna and ground as preferred.

Although the same hookup is used in Fig. 2, the coil is a modern Litz-wire antenna coil that can be bought from radio-supply dealers for 55 cents. This makes a more sensitive receiver. The connections are easily traced, as the primary is wound on a cardboard tube that fits over the secondary. This set is mounted on a 1/2 by 4 by 7-in. baseboard, the tuning condenser being supported by two angle brackets. The coil has two insulated bushings which are screwed directly to the variable condenser frame, as shown in Fig. 2. Two Fahnestock clips, used for the phone connections, are screwed to the baseboard at the left. Flexible antenna and ground leads are soldered directly to the primary-coil lugs on the form. In this receiver, it was not necessary to use either of the optional ideas indicated in Fig. 1.

A more elaborate and highly selective crystal receiver is shown in Figs. 4 and 5. The simplified wiring diagram, Fig. 4, is self-explanatory, and in this set both coils are homemade. The circuit consists of a wave trap and crystal receiver combined. The .0005-mfd. condenser for tuning the

(Continued to page 126A)





POWER SUPPLY for the A.C. SHORT-WAVE RECEIVER

By HARRY D. PICKETT

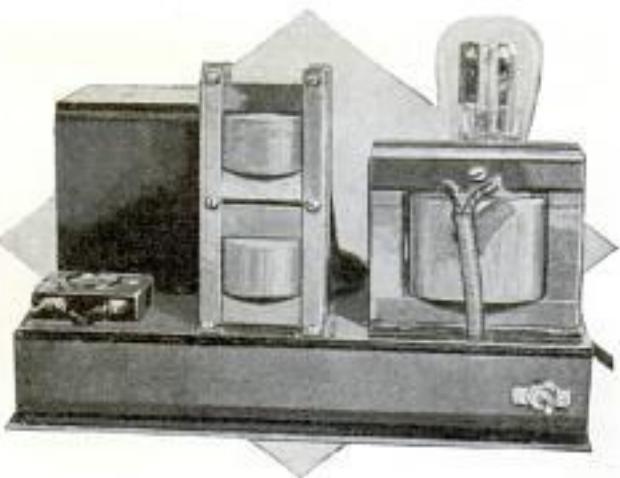
THIS power unit, although designed for the a.c. short-wave receiver described in the March issue, may be used as an inexpensive source of filament and plate voltage for practically any 4 or 5-tube homemade a.c. receiver. In this case, the tapped resistor unit, commonly known as the voltage divider, would be mounted under the base of the power unit instead of in the receiver, as described in Part I. The power-cable plug and socket would probably have to provide for several more leads, but this would be easy now that six and even seven-prong tube bases and sockets are available.

The builder can use much of the material he already has on hand, but the parts are not expensive and this particular unit was built for \$3.60. The metal base detailed in Fig. 1 cost 15 cents; the power transformer was purchased from a radio-supply house for \$1.85, and the rectifier tube cost 65 cents. The sockets and other parts figured up to the total mentioned. The condenser block, filter choke, power cable and switch were salvaged from an old B-supply unit. These can often be picked up for a few cents from radio-repair shops. The condenser-block terminals are seldom marked for capacity values, but the connections and the approximate value of each condenser unit is easily found by using an a.c. voltmeter as shown

in the circuit given in Fig. 4. By comparing the readings taken across the unknown condensers with a reading taken of a known condenser, the approximate value is quickly determined. A 2-mfd. filter condenser was used for the known capacity.

The simplified wiring diagram is given in Fig. 2. All grounds are taken to a common terminal mounted directly on the metal base. In the usual condenser block, there is but one grounded terminal for the various condenser units. This hookup is clearly shown in the schematic diagram, Fig. 3. The various parts are fastened to the base by means of machine screws, and all wiring connections are made on the underside. The unit output consists of 2.5 volts a.c., for the filaments of the tubes in the receiver, and 250 volts for the plate supply, which is divided by the tapped resistor in the set. The insulated toggle switch, in the primary lead, is mounted on the side of the base.

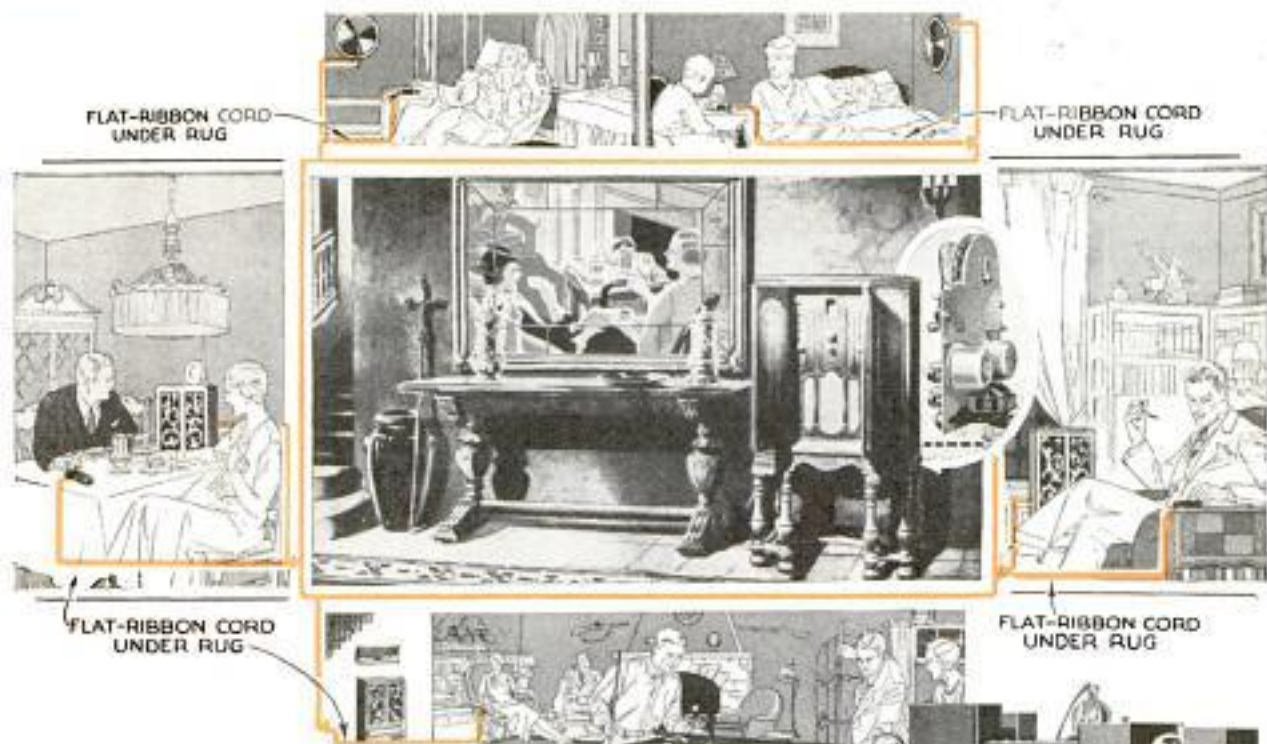
The connecting cable, from the power unit to the receiver, should be about 5 ft.



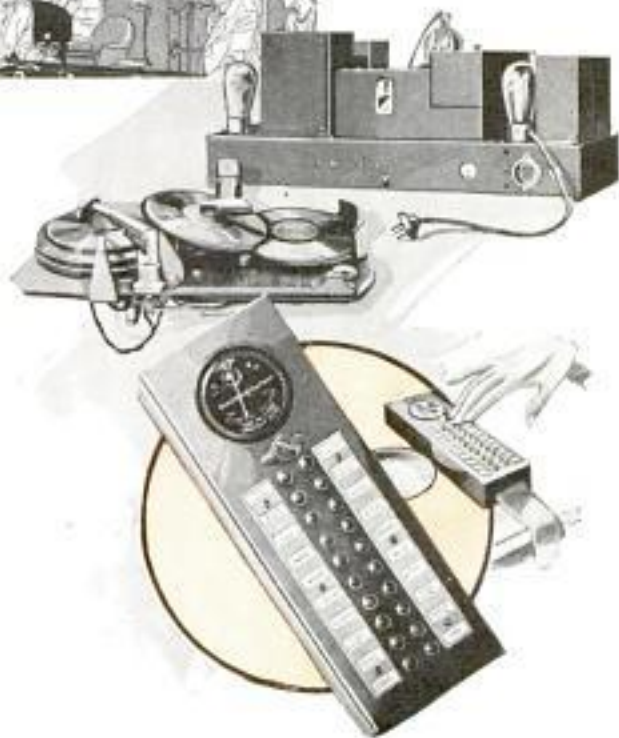
long so as to keep the two units well separated. The receiver and power supply now completed, you are ready to check up the various adjustable taps on the voltage

(Continued to page 132A)

Radio or Record Controlled from Any Room



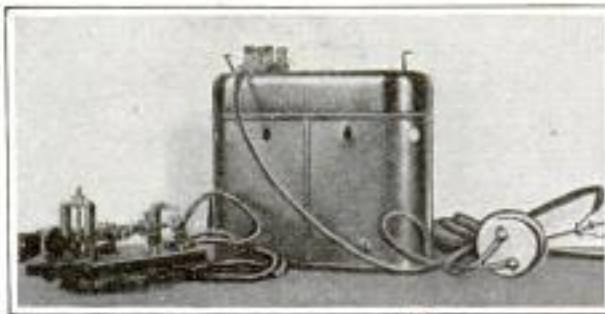
A complete remote-control system enables the owner of this combination radio receiver to operate the set from any room in the house. Small control boxes and suitable speakers are installed at convenient points in the various rooms. A ribbon cord, under the rugs, connects the system as indicated in the illustration. From each control position, the operator can start or stop the receiver or phonograph. Furthermore he can switch as many as four of the loud speakers on or off, as well as silently and automatically tune to eight favorite stations. Visual meter tuning is also provided in each control box for all other stations. If the radio phonograph includes an automatic record-shifting device, this mechanism can be started or stopped, shifted back and forth from radio to recorded music, and the volume controlled from any of the remote positions. The "teletor" motor unit, or electrical brain, shown in the insert, is mounted at the rear of the receiver chassis. With this system it is practical to conceal the amplifier and radio receiver in the attic or other similar location. Suitable steel cabinets are available for the purpose. In this case, the automatic record-changing phonograph is installed in a small endtable cabinet in the living room, and the entire installation is



under remote control as before. This installation can also be used to carry your voice to other rooms as well as distribute the sound parts of talking movies and television.

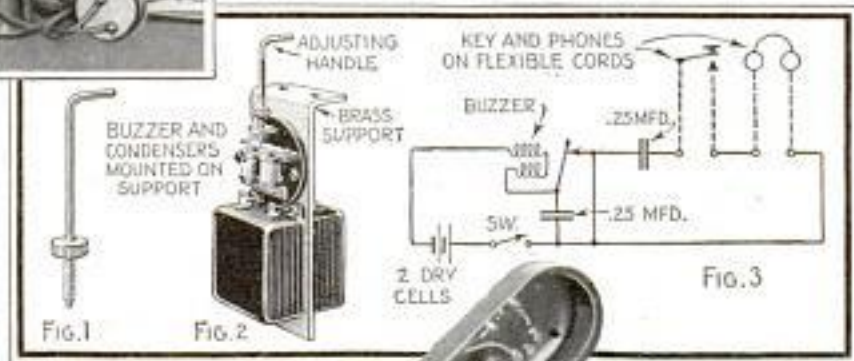
Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge upon receipt of return postage.

Buzzer Set for Code Practice

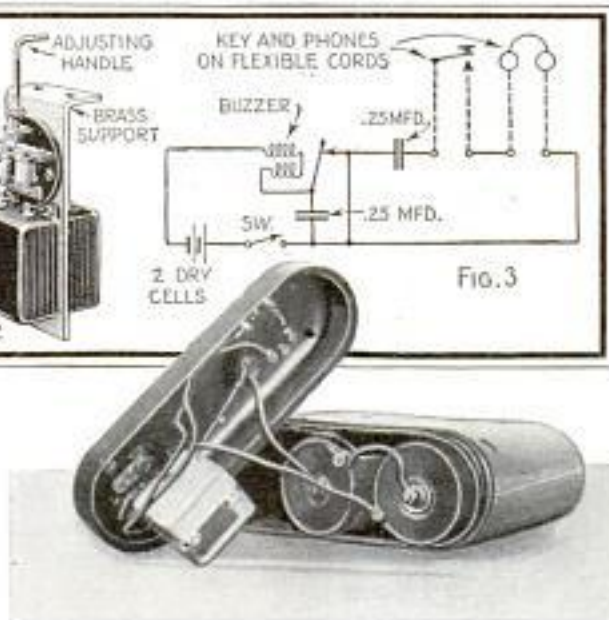


Above, Completed Code Set Showing Key and Phones Connected; Lower Photo Shows Arrangement within the Box

A doorbell buzzer and a few odds and ends may be assembled as shown in the accompanying photos and diagrams, to make an inexpensive and compact code-practice set. A good note is secured as the buzzer runs constantly when the battery switch is closed. The adjusting screw, detailed in Fig. 1, is turned down just far enough to give a pleasing note when the key is pressed. The brass support for the two fixed condensers and buzzer is shown in Fig. 2, and the wiring diagram in Fig. 3. The dimensions of the support and adjust-



ing screw are not given, as they will depend on the size of the container used. The entire unit was housed in a small metal box used in certain telephone installations but any similar box will do. Binding posts for the phones and key are mounted on the top of the box together with the battery switch and adjusting



screw. Two No. 6 dry cells are used.—
Ross J. Plaisted, Brecksville, Ohio.

224
You Can Play This Radio Instrument

An instrument that looks like a miniature piano may be connected directly to



Electronic Musical Instrument Used in Connection with the Radio Receiver

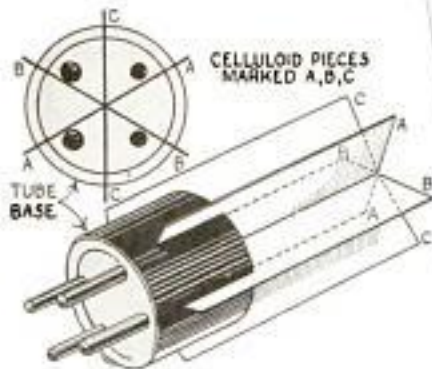
the audio stage of any radio receiver and is said to produce electronic music of excellent quality. The instrument is of the "solo" type, having a keyboard of 32 keys arranged according to the standard musical scale. By simply turning a button, the tone quality may be varied from that of a string instrument to that of brass or reed instruments. The installation consists of an audio oscillator of the gas-discharge type, with the keys making contact in series with the main circuit through resistors of the proper value to produce each note. By the use of a potentiometer as a tuning button, the pitch of the instrument may be raised or lowered over a range of five full notes thus enabling the player to tune to correct pitch for accompanying radio programs.

Ⓞ A short inside antenna will give better results than an outside type in some localities, especially in crowded districts near electrically powered apparatus.

*Aerovox Wireless Corp.
70 Washington St
Brooklyn, N.Y.*

Practical

RADIO IDEAS



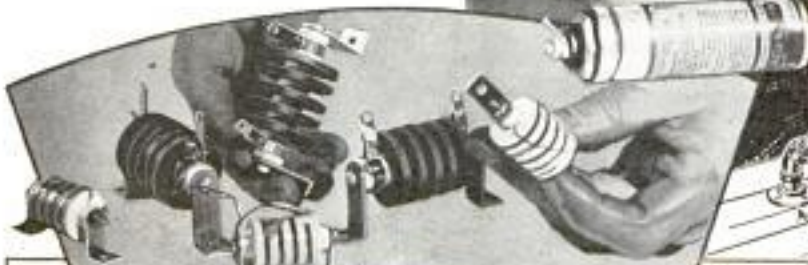
Low-Loss Coil Form: Cellulosid Pieces Are 3 by 1 3/4 In.; B and C Are Slotted 2 1/4 In. from One End, and A, 3/4 In. from Both Ends



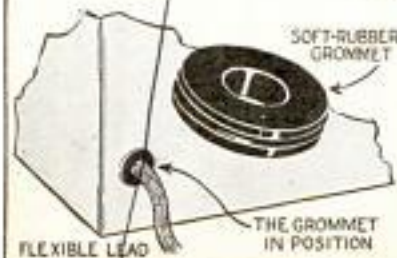
Homemade Choke Coil on Tube Base; Busbar Soldered in Prong for Easy Cut-and-Try Connection to Determine Correct Number of Turns



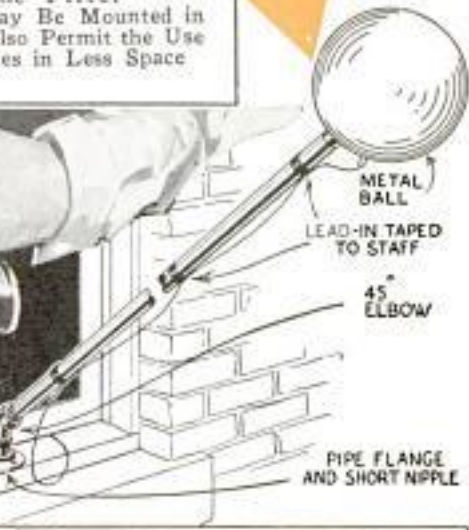
Above, Sixteen Sockets Are Provided in This Tube Checker to Include the New Tubes; Below, Dry-Electrolytic Filter Condensers That May Be Mounted in Any Position and Also Permit the Use of Higher Capacities in Less Space



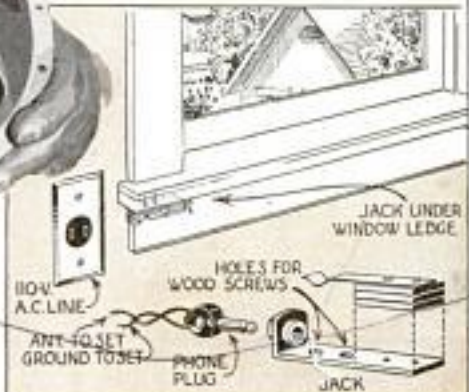
Above, Low-Loss R.F. Choke Coils for Short-Wave Receivers and Transmitters; the Smaller Is a Grid Choke and the Other a Heavy-Duty Plate Type



Left, Rubber Grommets Prevent Shorts to Metal Chassis; Above, Small Plug-In Dynamic Speaker for Experimental Receivers; Right, Jack for Quick Antenna and Ground Connections in Several Rooms



Ball-Antenna Installation for Apartment Dwellers; Pipe Flange Is Fastened to Window Sill, and a 6-Ft. Pole Is Screwed into the Elbow



Western Electrical Instrument Corp. Newark N.J.

*Wah Radio Products Co
1737 Michigan
Chicago*

*Hammarlund Inc.
424 W. 33rd St. New York*

B 3285

606



This Dancing Figure Responds to Voice or Radio Music Picked Up by a Miniature Microphone

Dancing Robot Keeps Time to Music

This is "Sam the Microphone Man," a dancing toy that is operated by means of sound waves. The necessary dry batteries and relays are housed in the base. When the "mike" is spoken into or placed near a radio receiver or phonograph, the dancing figure responds immediately. There are no strings to pull or springs to wind, and the microphone current is controlled by a switch located in the base.

Tube Hints for Radio Owners

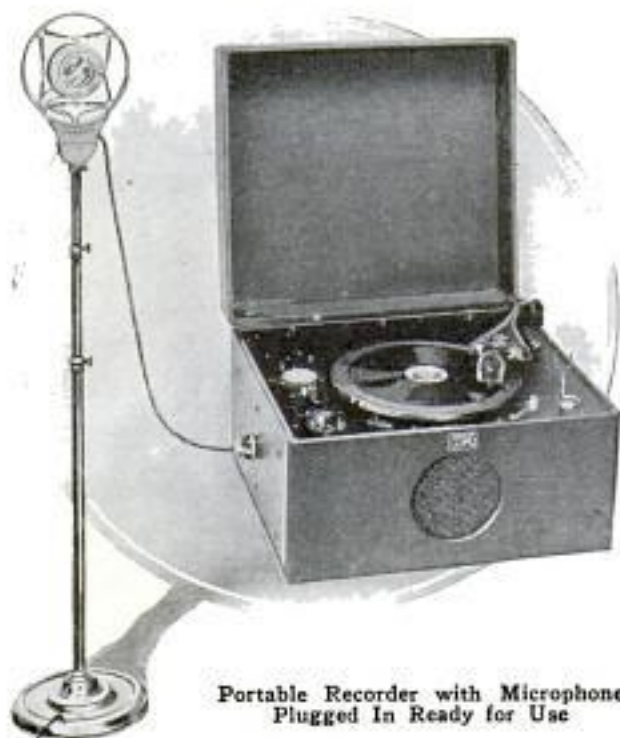
When changing tubes in any a.c.-operated receiver, the safe plan is to first disconnect the set from the wall socket. This will often save expensive repairs as well as the loss of favorite programs. The filaments of several tubes in these sets are usually connected in parallel on a single winding of the power transformer. Thus, when one tube is removed from the circuit, the voltage applied to the filaments of the other tubes is excessive. Small gummed stickers are handy for dating new tubes, and the cartons should be saved for carrying purposes. One defective tube in any receiver will cause poor performance; therefore it is a good idea to have the

tubes checked at regular intervals by a reliable dealer. If the cabinet is subject to vibration, a slightly microphonic tube will sometimes cause a howl in the speaker. The defective tube can be quickly located by touching the glass bulb of each tube with the finger while the set is in operation. In some localities where passing traffic causes excessive vibration, it will help to put soft rubber pads under each leg of the cabinet.

B 3227

Many Uses for Portable Recorder

This compact portable recording unit, with the plug-in microphone and stand, enables anyone to record permanently conversations or speeches made at banquets or other affairs. It is also used by police departments for recording conversations or examinations of suspects. The case measures 20 by 20 in., and not only records the voice, but also plays back the record when a switch is thrown. The intensity of the tone is controlled by means of a visual level meter.



Portable Recorder with Microphone Plugged In Ready for Use

Toggle or knife switches should always be mounted so that they will close the circuit when thrown up instead of down.

Radio Receptor Co.
 106-7th Ave. New York



AMATEUR MECHANICS



Six Unusual

WREN HOUSES

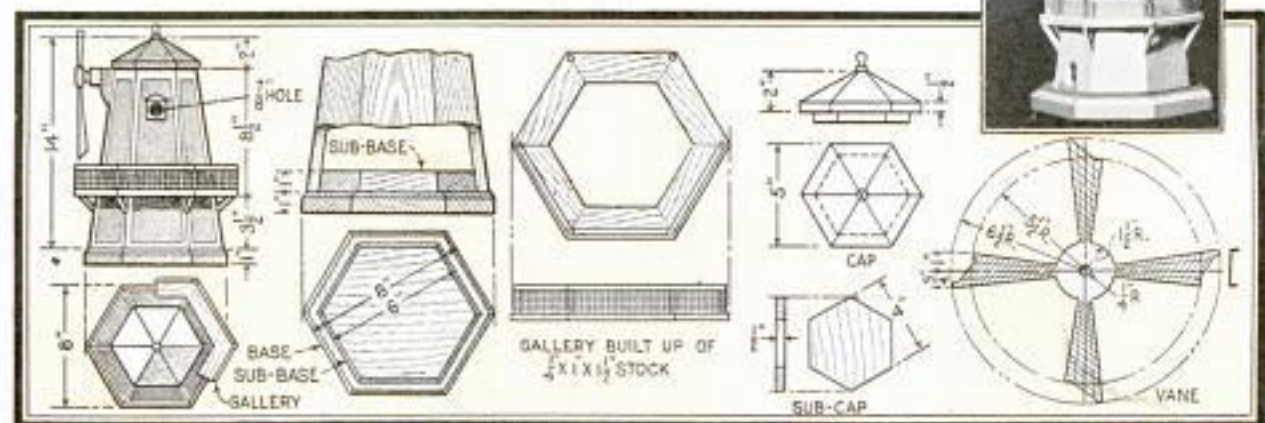
By E. J. TANGERMAN

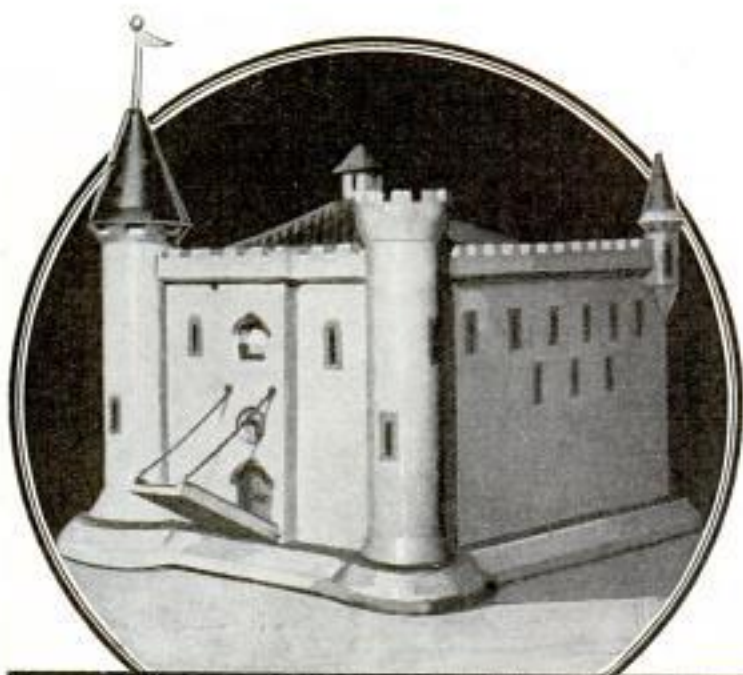
ALL the wren houses illustrated in this article were prize winners and have proved their worth by being occupied during the entire season. One of the simplest homes for a wren can be made from a coconut shell. The top is cut off, holes are drilled for three wires, which are twisted together and slipped through a hole in the top, and a $\frac{7}{8}$ -in. hole is cut in the side. The shell may be painted or left plain, as you desire, and hung up on one of the lower branches of a tree.

Just below the picture of the coconut shell, is one of a home built to resemble a Dutch windmill. This one is particularly adapted for use on a shelf, for hanging

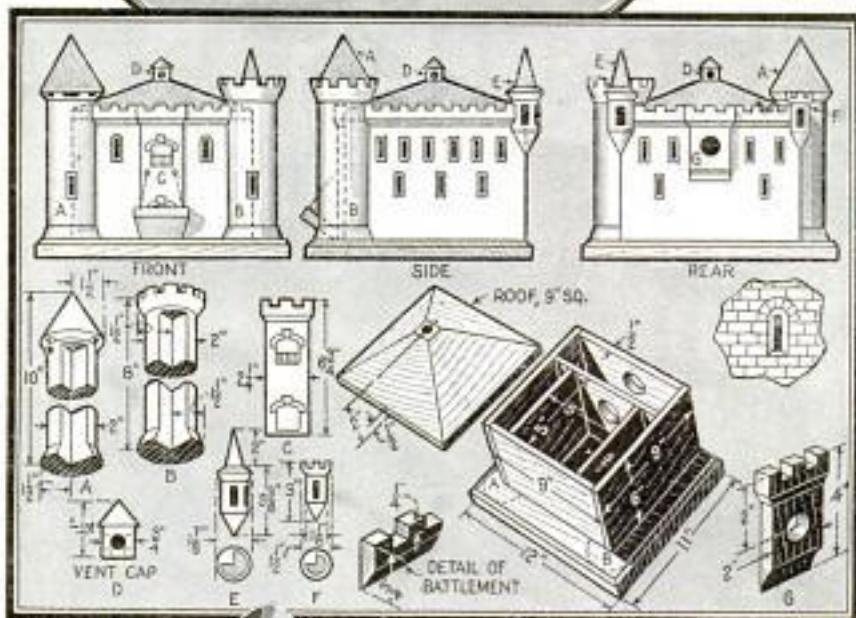


Large Coconut with Hole Drilled through Side and Suspended from Tree Branch Provides House That Appeals to Jenny Wren





from the edge of the roof, or for mounting on a pole in your garden. The details of making this type are given in the lower illustration, $\frac{1}{4}$ -in. stock being used. A small gallery is fitted around the walls, $3\frac{1}{2}$ in. from the base. Small split dowels are set at each corner to support the railing, which is a 1-in. width of wire mesh, having a narrow band of tin crimped around its top to form the upper rail. The base consists of two pieces, one extending beyond the edges of the house and the other tapered to fit inside the nesting space. A hinge and hook and eye hold the base, which is removable for the purpose of cleaning.

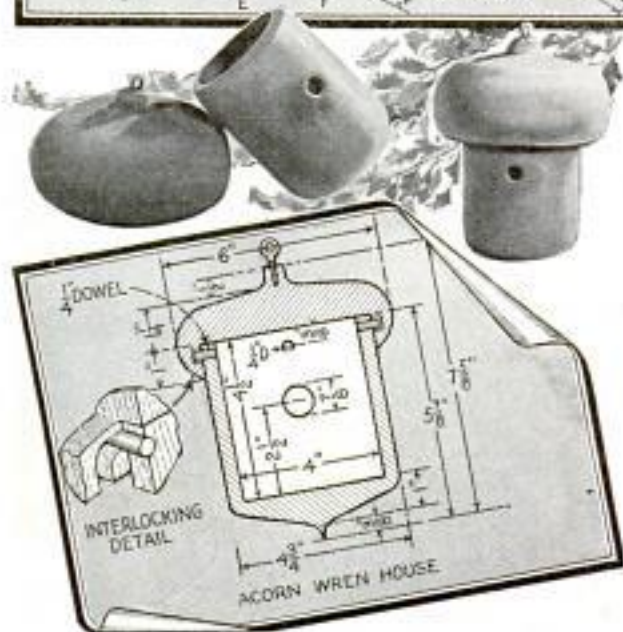


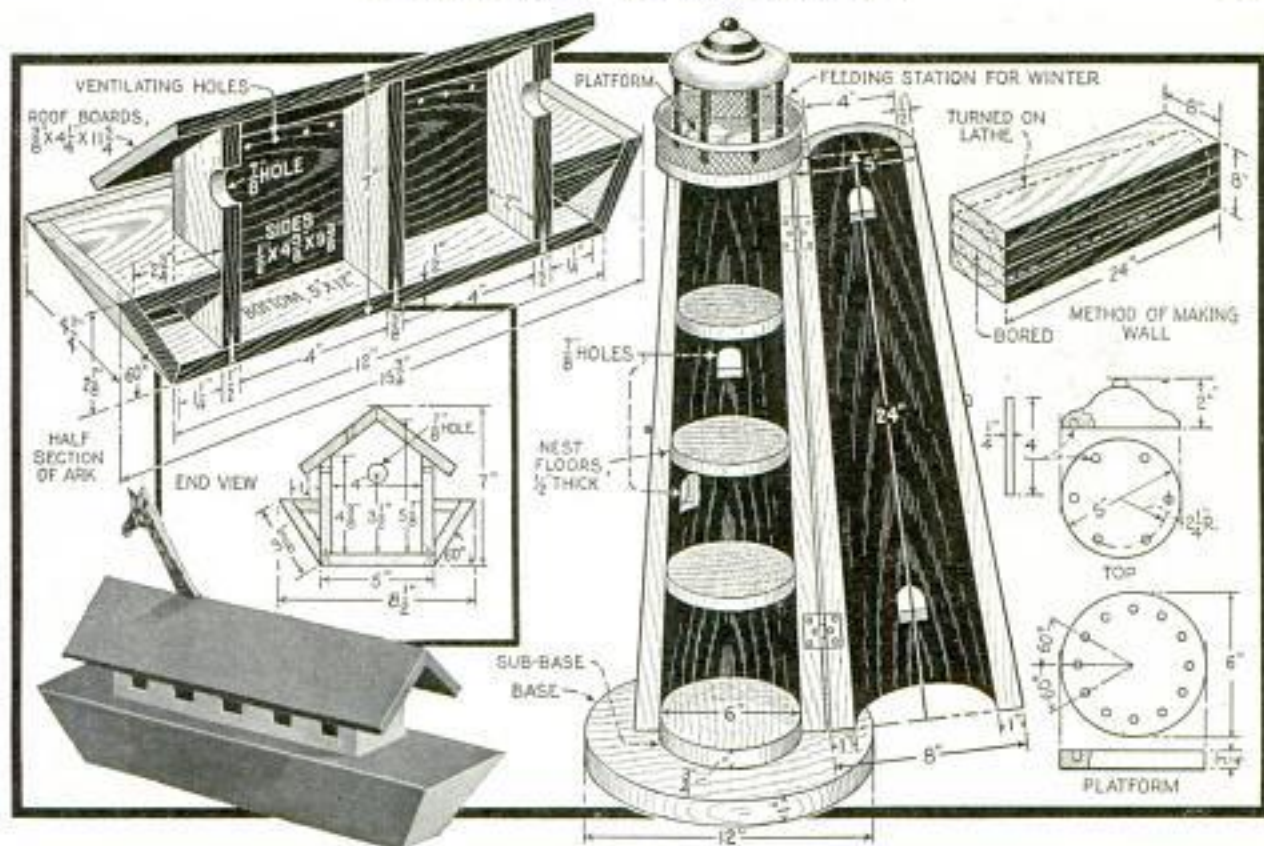
Another pleasing type is one made to represent a castle. It is essentially a box, 8 in. square, the bottom projecting beyond the sides and the interior having partitions as shown, which provide insulating air spaces around the nesting place. The roof is made from a block, and the towers are turned to shape and then grooved to fit the corners of the box. A drawbridge may be made from striping, grooved to simulate the side rails and fastened to the entrance by means of small screweyes and

chains. The actual doorway is cut through a small tower rising at the center of the back.

Below the castle is shown an acorn house, which is suspended from a tree branch or the eaves of a building by means of a screweye through the top. If a lathe is available, the project can be turned and the nesting place bored out. The inside of the cap is grooved to take dowels, which hold the body and cap together.

Two families of wrens can occupy the house made to represent Noah's ark, which has the head and neck of a giraffe projecting above the roof. The bottom is screwed to the sides so that it can be removed for cleaning the interior. A gro-





tesque effect may be created by cutting out animal heads and placing them so they appear to be peering over the sides. If added, they should be dull in color, without sharp points or shiny spots, and not in too great profusion, or the birds will not use the house.

The lighthouse, detailed at the right of Noah's ark, differs from the other houses in that it contains four nesting spaces with doorways staggered. A winter-feeding station is provided at the top and resembles the lamp of a lighthouse. It can be turned and bored out on a lathe by first gluing four pieces of 2 by 8-in. stock together, or it can be made with hand tools by gluing two pieces together separately and gouging out their centers, after which they are hinged together as shown. In either case, the house should be made in two sections to permit cleaning.

Kites Covered with Cellophane

Cellophane in various colors makes a novel covering for kites, and if the transparent variety is used, the kite becomes almost invisible when in the air. Apply the cellophane in the same way as tissue paper, allowing about $\frac{1}{2}$ -in. overlap on the edges for pasting, being careful to

avoid sharp corners. Ordinary flour-and-water paste will serve for this purpose, or you may use cellophane household cement. It is best to put a bit of adhesive tape over the ends of the frame before covering it, in order to provide a smooth surface at the corners. If the cellophane is pierced for a belly band, reinforce the hole with a small ring of tough paper.

Glass Pushpin Makes Dropper

Droppers for bottles not equipped with one can be made by inserting an ordinary glass pushpin in the cork as shown. While stoppers made in this way are not long enough to reach the bottom of the bottle, they can be made to work satisfactorily by tipping or shaking the container before removing the cork.



☛ An inexpensive rubber-stamp printing outfit is handy for labeling preserve jars.



Old Model-T Ford Coil Temporarily Substituted for Regular Coil on Car

Temporary Coil for Auto Ignition

By carrying an old model-T Ford coil in your car, a good substitute is always at hand to get you to a garage should the regular coil suddenly go bad. To prepare the coil so it can be used on other cars, solder a suitable length of wire to each terminal. In use, the coil is wired as shown in the drawing. It may be attached to the dash of the car, or suspended from the radiator tie-rods.—Raymond Kilbourne, Hudson, Ohio.

Mixer from Bicycle Chain

For stirring liquids in large-mouth bottles, and other similar containers, a mixer can be made by riveting a short piece of bicycle chain to the end of a steel rod. The



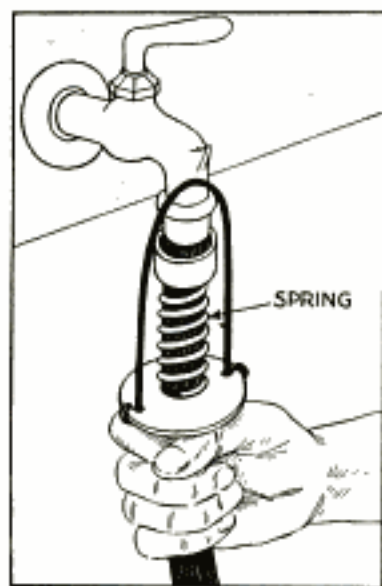
mixer is easily inserted and removed through the mouth of the container, and it automatically shapes itself to the contour of the sides and bottom. If a suitable grip is provided on the other end of the rod, the mixer will be easier to manipulate.

Glass Finished with Emery Wheel

Edges of glass may be finished on an emery wheel if the glass is held rigidly, but resiliently, between heavy rubber pads. A pair of rubber heels with the flat sides placed next to the glass are satisfactory for this purpose. In grinding, keep the rubber close to the edge being ground, and grip it firmly. To grind glass with irregular edges, shape the rubber pads to the contour desired, which is easily done by using a sharp knife moistened with a solution of a few crystals of washing soda in a cupful of water.

Simple Device Holds Water Hose to Faucet

This device will save considerable time in small garages and workshops where frequent removal of a water hose from a faucet is necessary. The threads inside of the hose coupling and on the end of the faucet are ground off, after which a compression spring and a large washer, fitted with a wire bail, are slipped over the hose from the opposite end. The assembly is then pulled up against the coupling so that it will be held tight when the bail is hooked over the faucet.

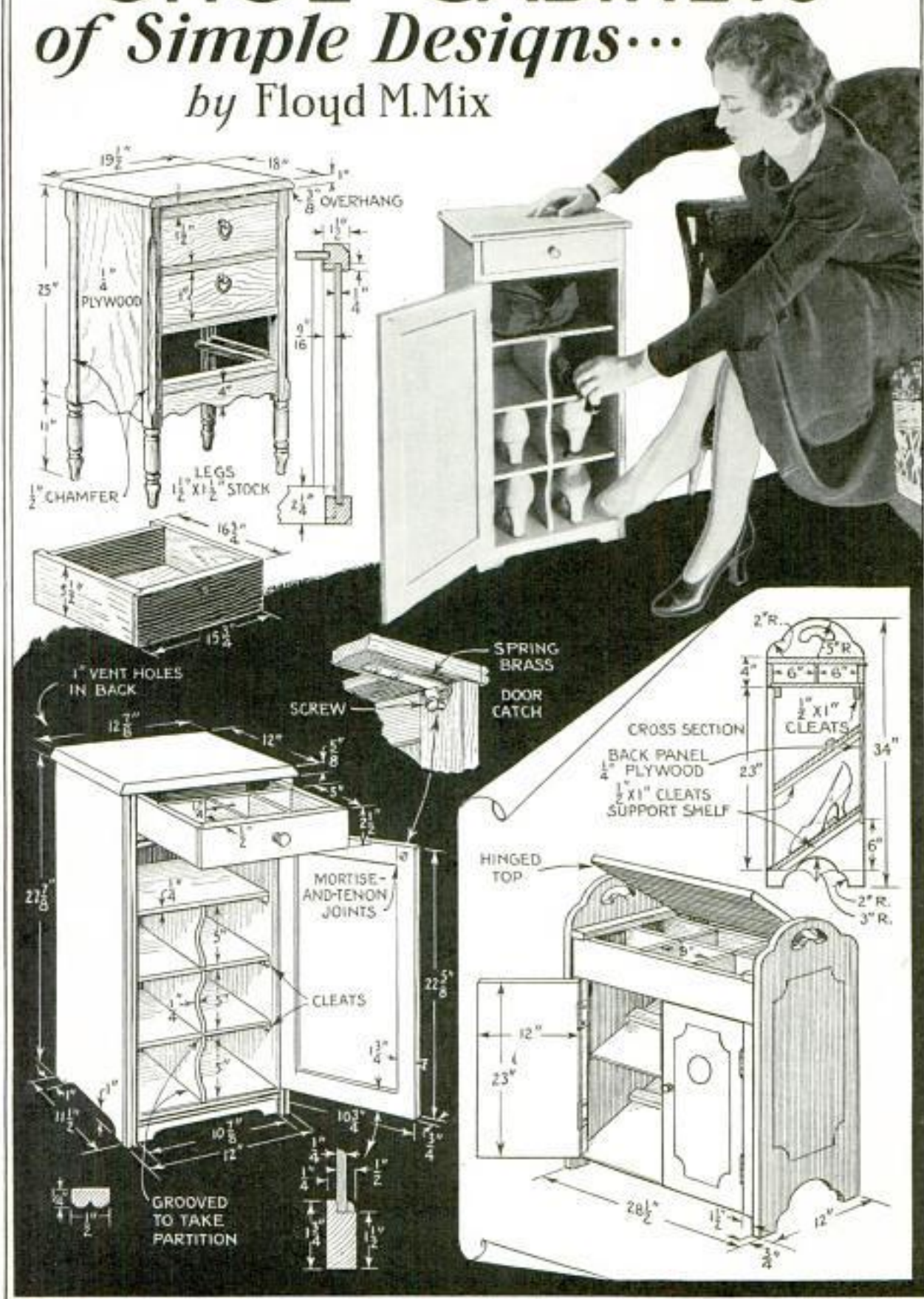


Curing Shellac Troubles

When shellac, after being diluted with denatured alcohol, persistently leaves brush marks and is slow, or will not harden, the trouble is probably due to the denaturing agents used in the alcohol. Ordinary radiator alcohol, and several other varieties, contain oils or kerosene and other substances which cause this trouble. The proper grade of alcohol to use is one that has been denatured with wood alcohol. This grade is the only one suitable.

SHOE CABINETS

of Simple Designs...
by Floyd M. Mix





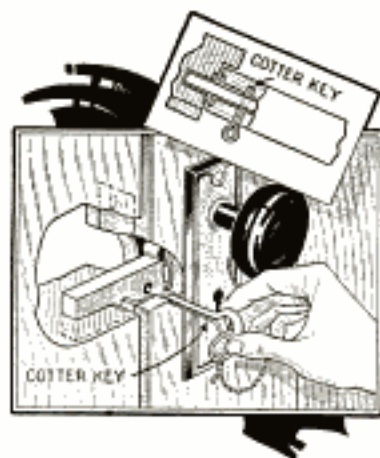
Front Seat in Coach-Model Car Easily Removed by Substituting Rod for Pins

Quick-Change Rod for Coach Seat

The right front seat in a coach-model car can be changed so that it is easily removed for handling large parcels. A steel rod of suitable size is bent at right angles at one end and is substituted for the regular pins in the seat brackets. The bent end of the rod drops to the floor, and the door sill prevents the rod from slipping out of the brackets.—E. T. Gunderson, Humboldt, Iowa.

Loose Pin Improves Door Lock

Door locks of the type shown can be made practically theft-proof by inserting a large cotter key into a hole drilled through the inside of the door and half-way through the bolt. This method is, of course, only suitable for locking doors from the inside. Another method, which serves for vacant houses, is to drill a hole entirely through the door and bolt, insert a loose pin, and then conceal the hole on the outside with a screw. This may be removed and the pin pushed out to open the door.

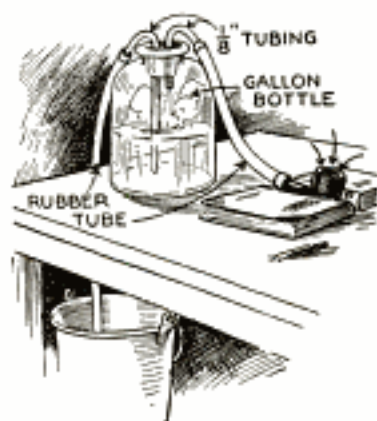


Imitation Sand-Blast Finish on Brass

Imitation sand-blast finish on brass may be produced by immersing it in a solution of zinc, $\frac{1}{2}$ lb., dissolved in nitric acid, 2 lb. After the zinc has dissolved, slowly pour sulphuric acid, $1\frac{1}{2}$ lb., into the solution. Before dipping in the bath, clean the work thoroughly by washing away grease with gasoline, after which it is boiled in lye water. The solutions used are corrosive and should be contained in stone jars. Immediately after dipping the work, rinse it thoroughly in running water to remove the acid. Next dip the work, for a few seconds, in a mixture made by cautiously pouring sulphuric acid, $\frac{1}{2}$ lb., and nitric acid, $\frac{1}{2}$ lb., into $\frac{1}{2}$ gal. of water and adding 1 tablespoonful of salt. The work should be again rinsed after the dipping. If the finish produced is too bright, or has too fine a frosted appearance, dissolve more zinc in nitric acid and add this solution to the frosting bath. If the finish is too coarse, add more nitric acid. With a little practice, it is possible to produce a variety of finishes.

Siphon Breaks in New Pipe

New pipes can be broken in without scorching the tongue by using a siphon. Rig up your apparatus as shown, using a gallon jug filled with water. Insert two glass tubes through holes drilled in a rubber stopper so that one tube just comes through, and the other reaches almost to the bottom of the jug. Then slip a length of rubber tubing over each tube, fastening one to the pipe and allowing the other to terminate in a bucket set on the floor. As the water is siphoned out of the jug a vacuum is formed inside, which draws the smoke through the pipe.



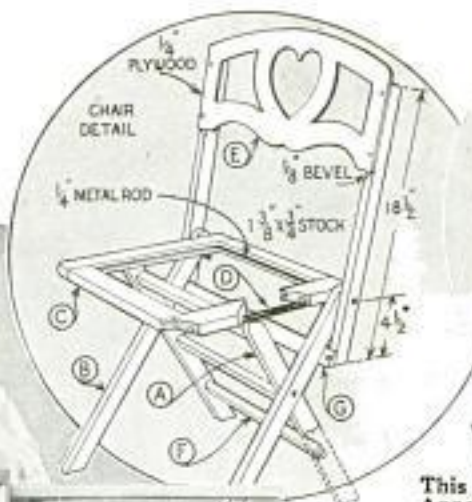
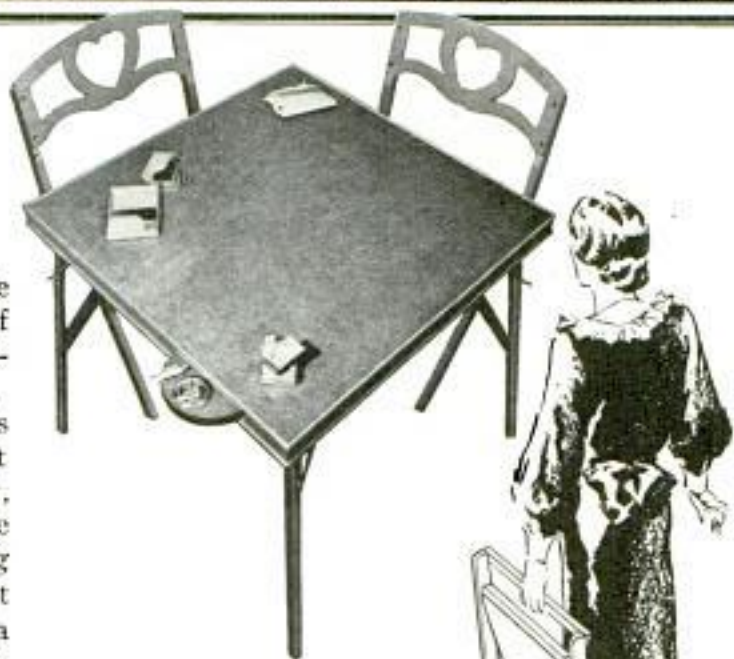
☛ A coating of melted paraffin will keep the stopper of a mucilage bottle from sticking.

plans 912

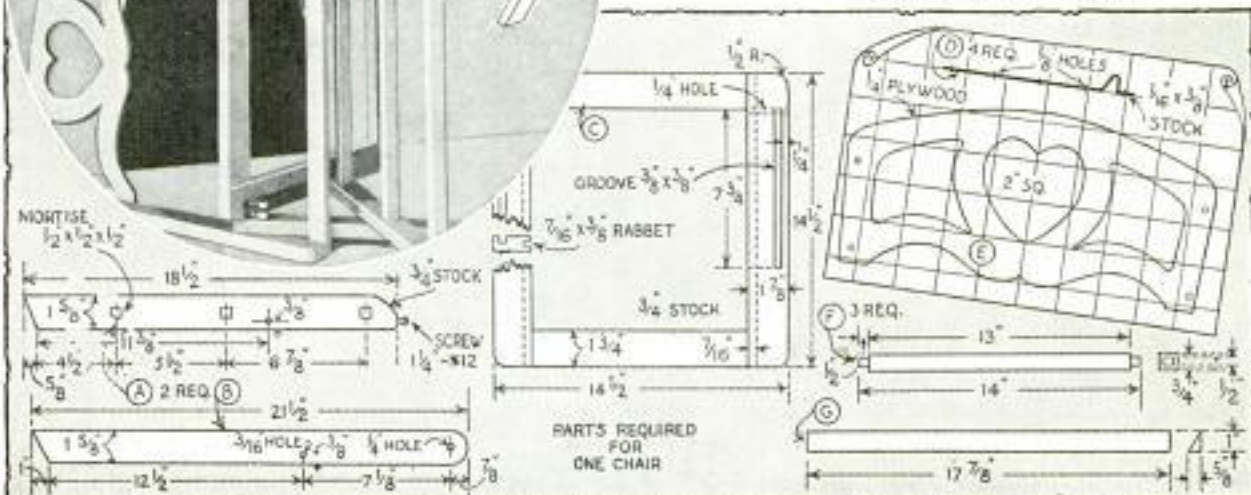
CARD TABLE *with CHAIRS to match*

STURDY, portable and convenient, this card table with matching chairs should appeal to the home craftsman for its straight-line simplicity. With a little modification, one of the four ash trays could be enlarged to house the playing cards and score pads if such a feature is considered desirable.

On this page, you will find details on the chair construction. The seat frame is the logical starting point, after which the metal slides can be fitted into place and the remaining pieces added in order. The cut-out back piece should be bent to show a curve of about 1½ in. over its length. Using the ¼-in. plywood specified, the material can be bent cold between suitably curved pieces of heavier wood, and the curvature can be fixed



This Card Table with Matching Chairs Should Appeal to the Home Craftsman Looking for a Practical Workshop Project



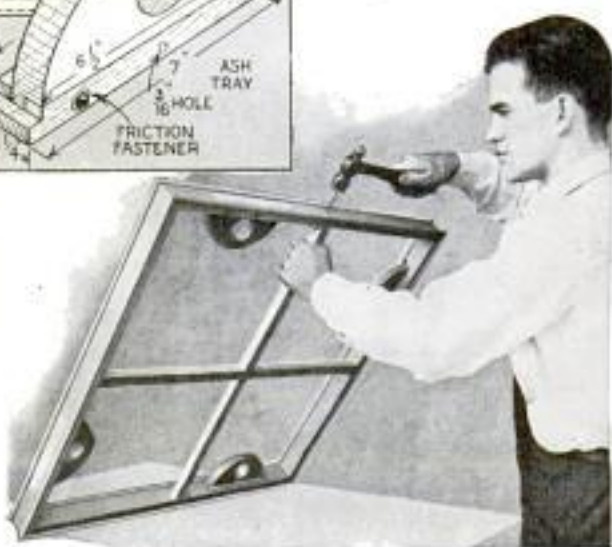
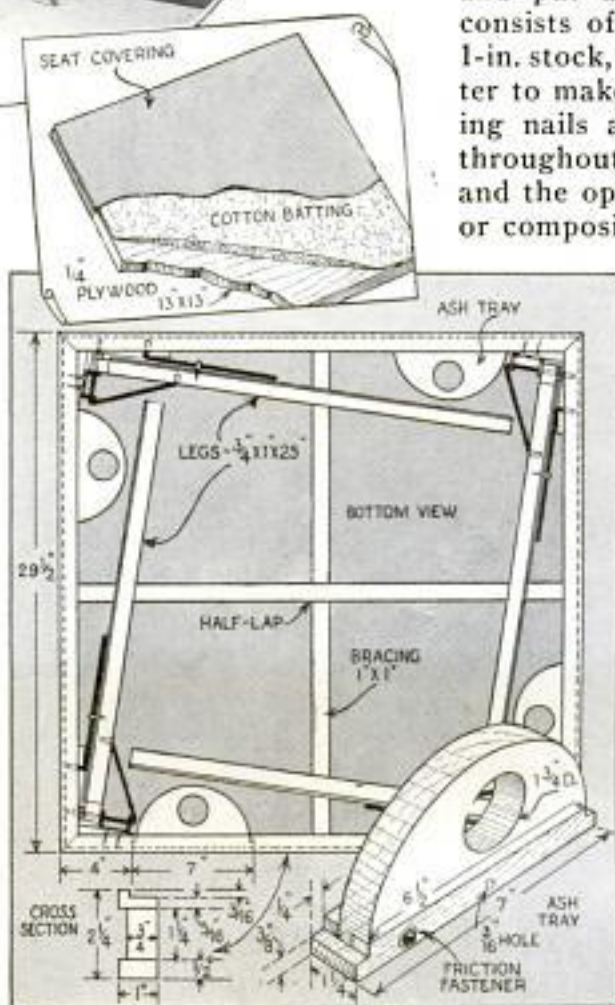


by sprinkling the plywood with water and warming for a short time in the kitchen oven. The $\frac{1}{4}$ -in. metal rod, which furnishes the pivot for the seat, can best be riveted by first drilling a $\frac{1}{8}$ -in. hole in the end and then spreading the metal with a center punch, as pictured. An ordinary pad seat, covered with material to suit your taste, is used. This is screwed from the underside of the seat frame. The manner in which the chair folds is obvious, the heavy screw heads in the ends of the legs sliding up and down in the seat groove and being retained by the metal slides. To insure proper working, care should be used in fitting the slides, and joining pivoting surfaces should be separated by washers.

You will notice that the legs of the card table turn in slightly to accommodate the four circular ash trays. Construction on the table is best started by making the

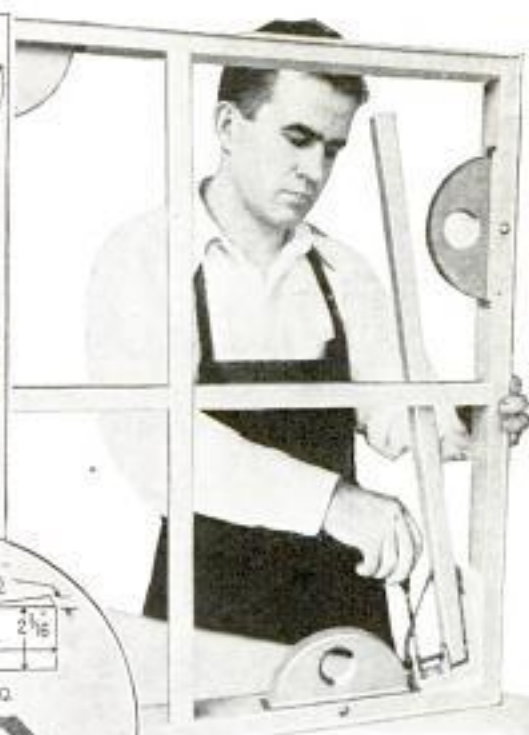
wooden framework. This will measure $29\frac{1}{2}$ in. square on the outside, and should be built up from three separate layers, as shown by the cross-sectional view. Portions of the central layer, 7 in. long, are cut away at a slight bevel to make the openings for the ash trays. Each tray is made from two pieces of $\frac{3}{4}$ -in. stock. The size of the central opening, which is to take the actual ash tray, will vary according to what kind of receptacle you can get at the "five and ten." In any case, the trays should be fairly deep so that they will not drop out when the table is folded and put away. The framework consists of cross bracing of 1 by 1-in. stock, half-lapped at the center to make a flush joint. Finishing nails are used for fastening throughout, the heads being set and the opening filled with putty or composition-wood filler. Suit-

able lengths of $\frac{1}{4}$ -in. steel rod and a few small fittings, made from $\frac{1}{8}$ -in. flat stock, compose the folding-leg feature. The first step is to mount the triangular blocks in the corners. Then, the leg, with the rod A and the U-piece B attached, can be screwed in place. Notice, in the small detail, how the head of each leg is offset



$\frac{1}{8}$ in. on three sides so that the leg will swing out squarely. When the leg is almost completely open, the steel rod, D, comes in contact with the shoulder on the wooden block, E. To open the leg completely, the steel rod must be slightly sprung against the wooden shoulder, and this bit of tension causes the stop notch in the rod to snap over the screw-eye on the leg. Closing the leg is simply a matter of snapping the rod out of the eye and pushing the leg down. The pivot point of the leg should be a tight fit, made more so by bending the piece B slightly into the wood, so that, when the leg is folded, it will wedge tightly and stay in that position.

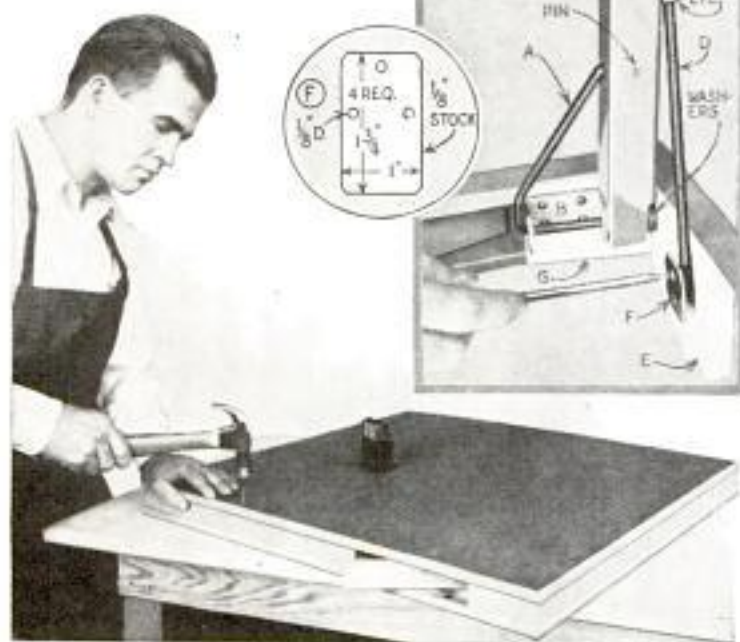
The card table shown in the drawing was intended for a paint finish, and therefore the fastenings are merely brads inserted through the wood fiberboard top. Where it is desired to cover the top with cloth or leather,



the material would, of course, be neatly glued into place. Then the board should be glued to the rabbeted ledge in the framework. Lacquer makes an excellent finish where color is desired, while flat-rubbed varnish is the natural choice for a more subdued set.

Revolving Rack for Small Tools

A revolving rack that will hold a variety of small tools can be made from pipe and fittings and a hardwood disk. First mount a $1\frac{1}{2}$ -in. pipe flange with an 18-in. length of pipe in a vertical position on the bench and then fasten another flange and a 6-in. length of smaller pipe that will fit inside the larger one, in the center of the wood disk, which should be about 15 in. in diameter, or larger if desired. Circles are next drawn on the disk and holes are drilled to receive the tools. The cutting edges of chisels and similar tools are less likely to be damaged if they are stored in a rack of this type, while woodturning chisels may be kept handy if the rack is located beside the lathe.





Silverware for Many Guests Is Quickly Laid Out on Table When Kept in Separate Portable Drawers

Portable Drawers Help in Setting Large Tables

Considerable time was saved in the community kitchen of a large church, when laying out the silverware, by keeping the various articles separated in portable trays. In this way, they can be stacked on small carts and wheeled into the dining room where they are quickly laid out.—Clementine Paddleford, New York City.

An Aid in Driving New Cars

New cars are sometimes damaged by driving them at a greater speed than that recommended by the manufacturer. To



avoid this possibility, a sheet-metal stop can be clamped around the stem of the foot accelerator so that it comes in contact with the floorboard when the speed limit is reached.

Soft Hammers for Delicate Work

Soft hammers, for assembling delicate parts and for removing dents from sheet metal without marring, can be readily made by turning the heads from brass, copper, fiber, rubber, bakelite, wood or other suitable materials. For general purposes, a head 3 in. long and 1 in. in diameter is convenient. Handles may be made by screwing 11-in. lengths of 1/2-in. steel rod into the threaded eyes of the hammer heads. A grip is made by threading the handle for a distance of about 6 in. from the outer end and clamping leather, fiber or rubber washers over the projecting threaded section between two nuts. To complete the job, either carve or turn the washers to shape for a comfortable grip, and file or turn the nuts to eliminate sharp edges. The end of the handle should be expanded with a center punch to prevent the nut from working off. If washers are not available, square pieces of leather may be punched

centrally to slip over the handle and the edges trimmed. Screwdrivers and other hand tools can be made from tool steel and equipped with handles of this type.

Window Lock Made from Hinge

Effective window-sash locks can be made from ordinary butt hinges that have removable pins. One-half of the hinge is screwed to each



sash as shown, so that, when the window is closed, the pin can be inserted. It is a good idea to fasten the pin to the sash with a string so that it may not be accidentally mislaid when the window is opened.—H. C. Thomas, Detroit, Mich.

☛ An application of vinegar to the hands and work after using liquid bleaches, will remove all traces of them; the vinegar is then washed off with water.

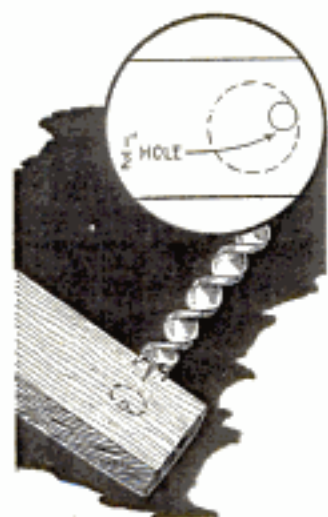
Automatic Cut-Off for Water Siphon

In rural districts where the water supply is siphoned from a spring on a hillside, the water level often becomes so low that air gets into the pipe and stops the siphon. To prevent this, place a common foot valve on the end of the pipe in an inverted position, and fasten a float from a flush tank to the flapper with a piece of wire or chain. When the water has reached a low point, the slackened wire will cause the flapper to close, letting the supply rise in the spring and yet permit the siphon to start again after the rising water has tightened the pull on the flapper.

Trout Flies Made of Cellophane

Cellophane can be used to make good trout flies. A small piece cut to the shape of an insect's wing, some thread, and a small fish hook are used in making the fly. Cellophane is waterproof, buoyant and reflects light on a sunny day, which makes it effective in attracting trout.

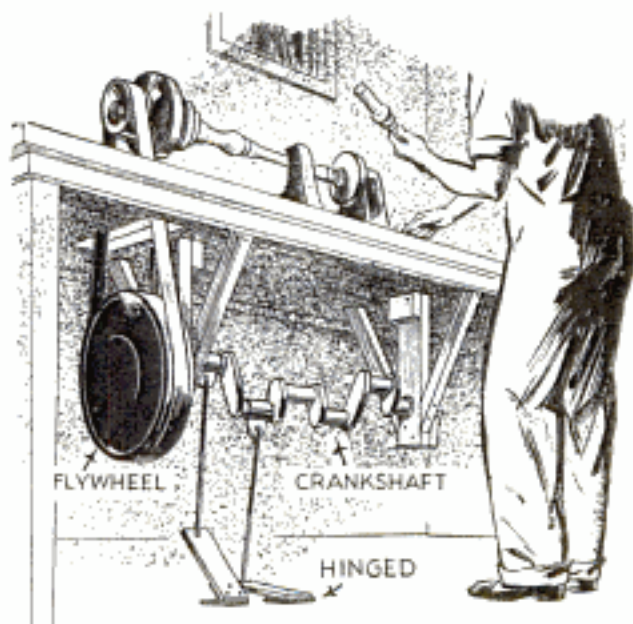
Small Hole Makes Large Auger Cut Faster



Threaded points on large augers sometimes become worn so that they will not feed the cutting lips into the work, especially when drilling in end grain of hardwood. If this occurs, first drill a small hole just within the edge of the large hole to be drilled so that the two circumferences touch. This provides an opening in the wood so that the lips of the auger can get a bite each time they pass over the hole.

Auto Crankshaft Adapts Lathe for Foot Power

Utilizing an old auto-engine crankshaft and flywheel, one home-workshop owner rigged up a foot-power outfit for driving his lathe. The crankshaft was hung from

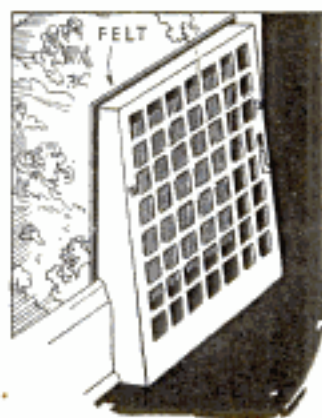


Old Crankshaft Mounted under Bench and Operated by Pedal Furnishes Power for Lathe

the underside of the bench top as shown, and two pedals, hinged to the floor, were fastened to the shaft by means of small rods attached to strap-iron bearings. If desired, friction can be reduced by using four main-bearing caps at the ends of the shaft and the regular connecting-rod bearings instead of the strap-iron bearings for the pedals. This can be done by sawing the connecting rods in two, close to the bearing, and then drilling them to take the pedal rods. In use, the tool is belted to the flywheel, which, due to its weight, provides a surprising amount of power.

Felt Prevents Dust from Soiling Wall around Hot-Air Register

Walls around hot-air registers are often soiled by dust that circulates through the heating system and comes through a crack between the wall and register. If the latter is removed and a felt strip shelved to the back of it as shown, the trouble will be eliminated.—K. E. Smith, Evansville, Indiana.

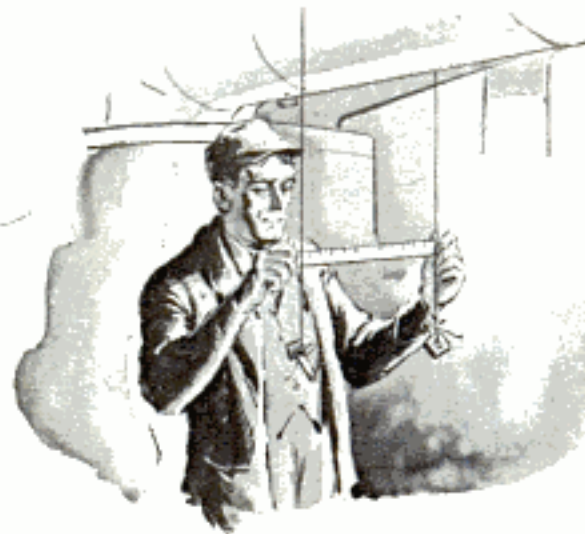


Mr. Harris Co
Harrison, N.J.

MECHANICS
in supply Co

3947 Chicago

Coils can be made from a standard resistance wire, which is readily available. Advance wire, in size No. 10, has a resistance of .028 ohm per foot, and is useful for making coils to carry as much as 6 or 7 amp. By dividing the resistance in ohms wanted by .028, you will get the exact number of feet of wire needed to make the coil. Resistance coils for experimental work and for electrical measurements should be wound on wood, bakelite or fiber spools. First measure out the exact length of wire needed and add 1/2 in. Then double it and start the winding from this point and continue with the two ends, keeping them together as if they were one wire. This makes the coils non-inductive. When the winding is completed, tie the ends of the wires with thread, leaving enough extending so they can be soldered to heavy binding posts. If exactly 1/4 in. of wire is soldered in contact with the posts, the wire in the coil will be of the proper length to give the correct resistance. Coils that are intended for making measurements, and for use in finding the resistance of other coils, should be carefully housed in a tight box with the binding posts on a bakelite panel, which is used as the top. A number of coils, having several different values of known resistance, are handy for experiments, and they may be housed together in an instrument box if preferred. Smaller sizes of the same kind of wire will not carry so much current; however, they are better for high values of resistance. No. 20 wire has a resistance of .287 ohm per foot; No. 30 wire, 2.94 ohms per foot,



Diameter of Large Furnace Pipe Measured with Aid of Weighted String

String Helps in Measuring Diameter of Furnace Pipe

Recently I had to determine the diameter of a furnace pipe while the furnace was in operation. This was done by tying two small weights on the end of a piece of string, which was slung over the pipe. The distance between the ends of the string was then measured, which equaled the outside diameter of the pipe.—M. L. Wendel, Lockport, N. Y.

Making Standard Resistance Coils for Electrical Experiments

Coils that have a resistance in ohms accurate enough for most experimental pur-

Craftmats and Blueprints on

“SOVEREIGN OF THE SEAS”



A Craftmat of the stern and lower-hull carvings will be sent upon receipt of 50 cents. Craftmat No. 2, of the carvings to go on sides of upper works, 35 cents. Six blueprints on the “Sovereign” are available for \$1.00. A free list of 350 practical projects will be sent upon request. Also, a sample print with forty illustrations of finished projects available for 10 cents. Address Blueprint Department.

Sovereign of the Seas

By HAROLD T. BODKIN

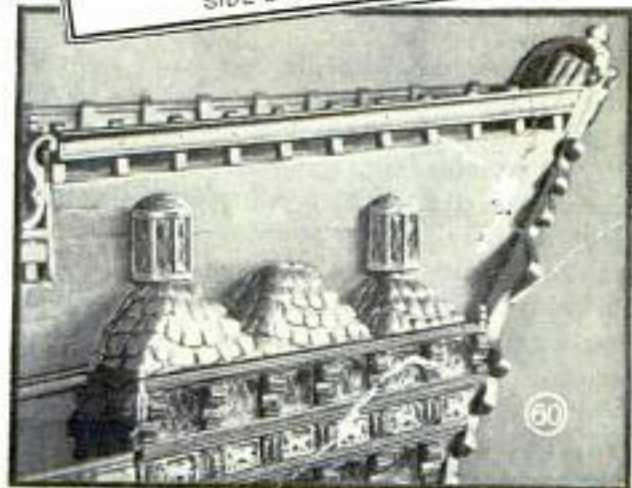
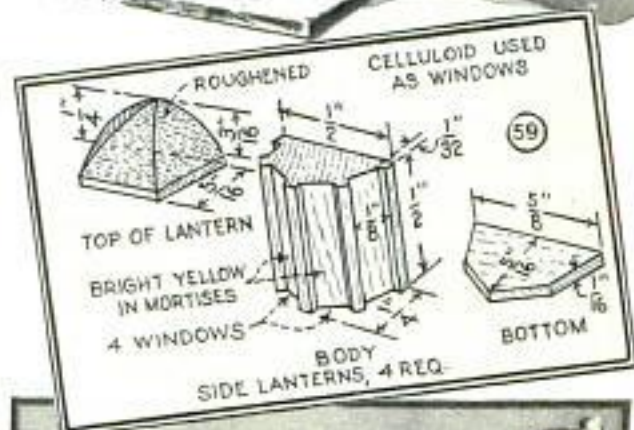


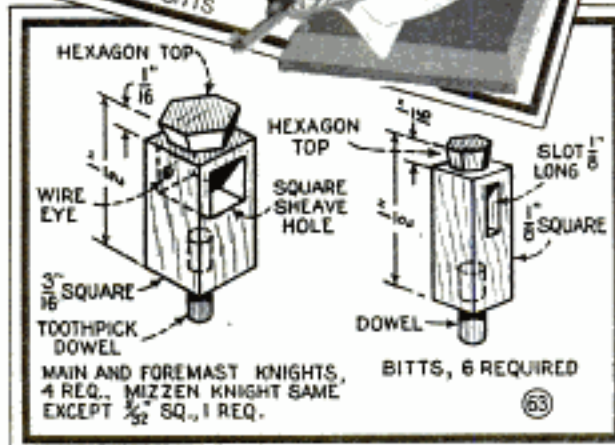
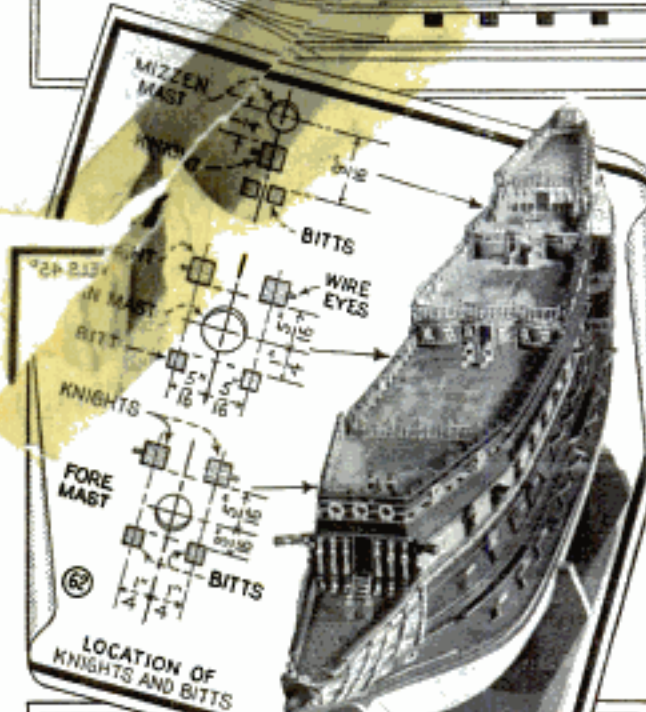
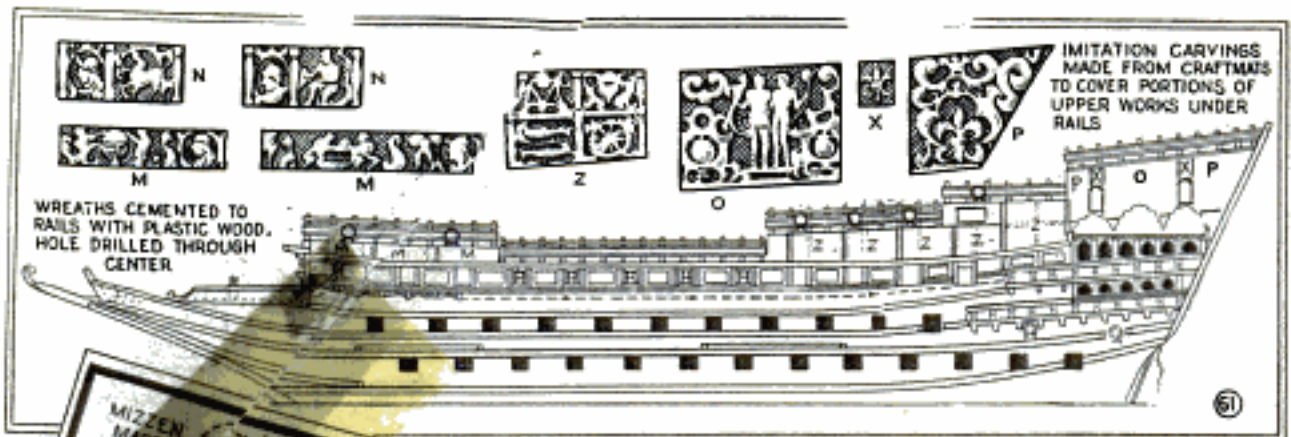
PART VI

Carvings, Lanterns,
Knights, Bitts and
Painting

EXCEPT for the figurehead, which is to be made later, we can now add the final carvings on the "Sovereign" for which purpose a second craftmat is obtained. These carvings, lettered M, N, O, P, X and Z, are glued to the hull in the positions indicated in Fig. 61. Fifteen more gunport wreaths, the same as those previously made for the hull, must also be attached to the outer rails. Three of these are on the forward forecastle rail, as shown in the title illustration, the others being placed six on a side as in Fig. 61. All can first be cemented on with plastic wood, clamping them down with a spring clothespin until dry. For added security, however, bamboo splints used as dowels can be inserted through the wreaths and at the top and bottom of each wreath, holes being made with a pin vise and drill, or with a red-hot needle.

66 gives full details on the construction of the stern lantern, which is maple except for the celluloid or windows. Before applying the win-





dows, draw diagonal lines, closely spaced, with India ink on the material, to represent leaded glass panes, as in Fig. 64. When assembling, have the ink lines on the inside. After the windows are in place, glue thin strips of wood over the celluloid at the corners of the lantern body, to more suitably frame the windows. Triangular molding strips are glued horizontally around the top and bottom sides, aft of the sternboard, as shown in Figs. 65 and 66. A square section, the exact size of the lantern body, is taken cut from the top of

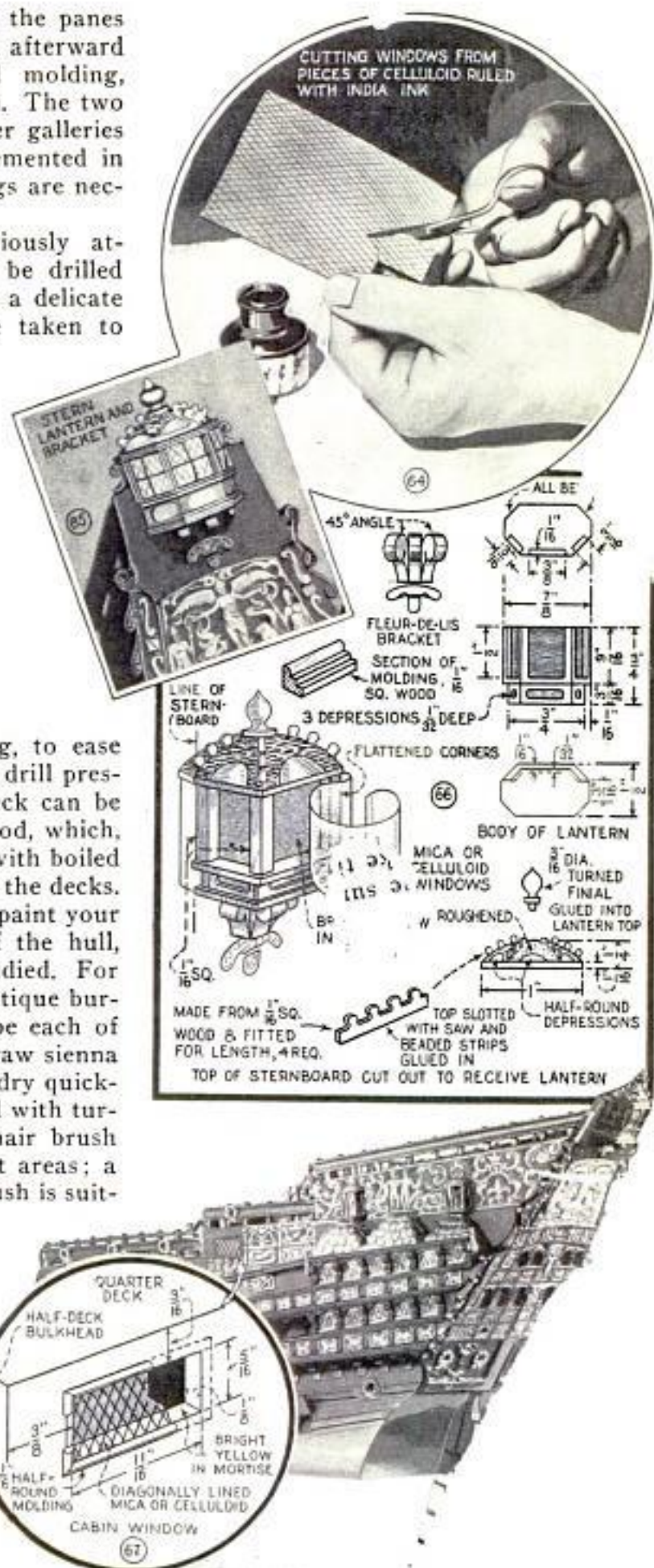
the sternboard downward and the lantern is glued in place. Also, the fleur-de-lis bracket is glued to the sternboard so that its top fits snugly against the underside of the lantern body. Two flat scrolls, the thickness of the sternboard, should be glued against the lantern and on the top edge of the sternboard, as in Fig. 65. If you desire, you may fit light wire guards over the windows, the ends of the guards being inserted in small holes drilled in the window frames. Four side lanterns, two on each side, are required for the tops of the outside gallery domes, as in Fig. 60. These are made to the dimensions in Fig. 59 and are fitted with windows the same as the stern lantern. The vertical wooden strips are required over the window sides, but the tops and bottoms project far enough outside of the lantern bodies proper to require no additional moldings as is the case with the stern lantern. The side lanterns are glued in place and the carvings cut and fitted around them.

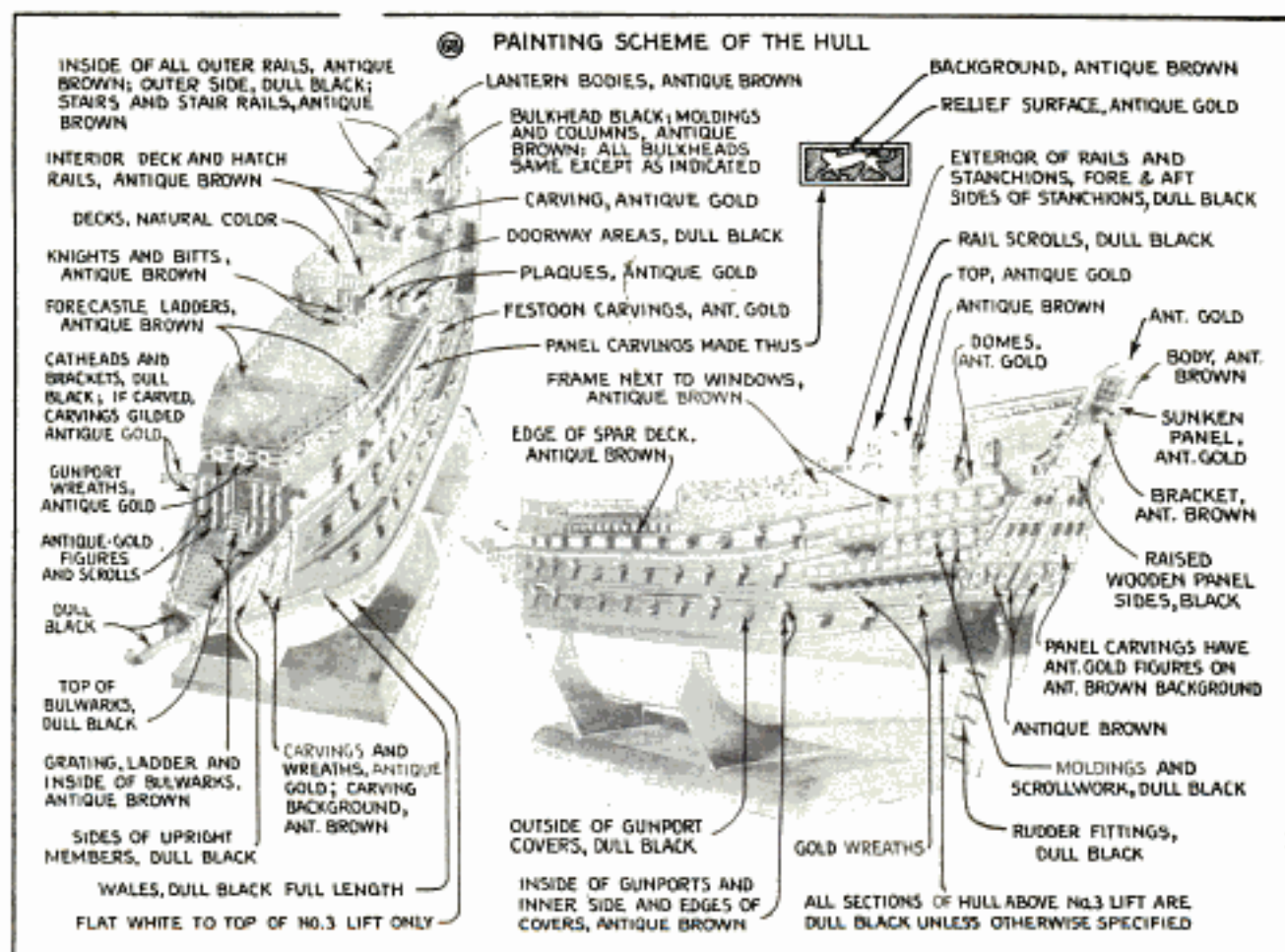
A set of knights and bitts must now be made for each of the three masts. Two knights and two bitts are needed for the main and foremasts while one knight and two bitts are required for the mizzenmast. They are made of maple to the dimensions given in Fig. 63. Note that the mizzen knight is slightly smaller than those required for the other two masts, and that it is located forward of its mast. Lay out the holes in the decks to receive the dowels of these pieces in their respective locations, shown in Fig. 62, and glue the knights and bitts solidly in place. Fig. 67 shows the cabin windows, which are cut into the hull, one on each side, just below the edge of the quarter-deck and aft of the half-deck bulkhead. These windows are covered with the diagonally lined cellu-

loid, the same as the lanterns, the panes being cemented to the hull and afterward reinforced with a half-round molding, placed over the edges as shown. The two rows of windows in the quarter galleries are made similarly, and are cemented in place as in Fig. 60. No moldings are necessary for these.

The gunport wreaths previously attached to the rails must now be drilled through their centers. This is a delicate job and utmost care must be taken to avoid splitting the rails or breaking away pieces of the wreaths themselves. Make sure that they are solidly attached and then, using a light hand drill, make a $\frac{1}{16}$ -in. hole through the exact centers of the wreaths. This done, change to a $\frac{1}{8}$ -in. drill, or a small reamer, and carefully enlarge the holes to this size. It will help, if you lightly tack a block of soft wood to the side of the rails before drilling, to ease the strain on the rails from the drill pressure. The tack holes in the deck can be filled afterward with plastic wood, which, when dry, may be touched up with boiled linseed oil to match the color of the decks.

Before beginning to gild and paint your model, the painting scheme of the hull, Fig. 68, should be carefully studied. For finishing, you will need some antique burnishing bronze powder, one tube each of white, black, ultramarine blue, raw sienna and burnt sienna. Japan paints dry quickly to a flat finish and are thinned with turpentine. A $\frac{1}{2}$ -in. flat camel's-hair brush should be used on the large flat areas; a medium pointed camel's-hair brush is suitable both for the gilding and fine paint work. If these materials are not obtainable in your locality, they can be ordered through art-supply stores in the larger cities. Antique brown, to represent aged wood, is mixed as follows: Squeeze one part of raw sienna, one part of burnt sienna and one-quarter part ultramarine blue into a mortar and mix. Turpentine is





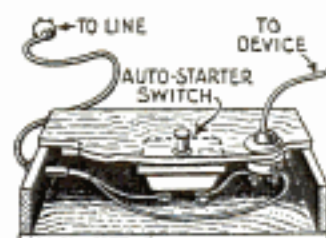
added to produce a fairly thick, but easy-flowing consistency. All parts indicated as antique brown, Fig. 68, are given two coats. Note that the sunken surfaces of all panel carvings take this color, which, if carefully applied, may be used to sharpen the edges of the gilded portions. The black and white paints are handled in the same way, two coats being used for each. If a semi-antique effect is desired, merely leave the paint finish exposed, and atmospheric conditions will, in time, soften the surface. If a soft gloss is wanted, a thin, clear varnish coat may be applied and thoroughly rubbed down with rottenstone.

For gold-burnishing the raised portions of carvings, you will need a small can of clay and a small sheet of rabbit-skin glue. To prepare the clay, soak a small amount in water for a couple of days until it becomes soft. Then put the clay in a shallow dish with warm water and rabbit-skin glue has been entirely dissolved. The mixture is then added to the clay until a firm mixture is obtained. The gilded portions are first given two coats of shellac, which is al-

lowed to dry, and then the clay mixture, just described, is applied with a camel's-hair brush. The fine gold bronze is next mixed with a little alcohol, and the mixture is then poured into another dish of thin glue water, after which it is applied to the raised portions of the carvings. Burnishing is later done by gently rubbing a smooth, rounded metal surface, such as the handle of a small spoon, over the gilded portions.

Foot-Operated Switch for Home Use

An old auto-starter switch can be used to good advantage as a foot-operated switch. It is mounted in a shallow wooden box and connected to one wire of an electrical cord as shown. A switch of this type will carry ordinary house current and it is especially useful for machines in the home workshop.



and No. 40, 30.593 ohms per foot. Rheostats for dimming lights, controlling the speed of small motors, and similar purposes, can be made from nichrome resistance wire, as accuracy is not so important. To find the amount of nichrome wire needed to make a rheostat of known ohms, the resistance as given above may be multiplied by 2.3 to find the resistance per foot of the same size.

Insulating Board Applied to Hot Water Pipe

Having a piece of insulating board left over from some work, I used it to cover a short hot-water pipe in my basement. To do this, I cut two strips to the same width as the diameter of the pipe, and two more the same width plus twice the thickness of the insulation. The pieces were then nailed together to make a box-shaped form around the pipe. This made a more economical insulation than that usually used for this purpose.—Forrest Bezanson, Arlington, Mass.

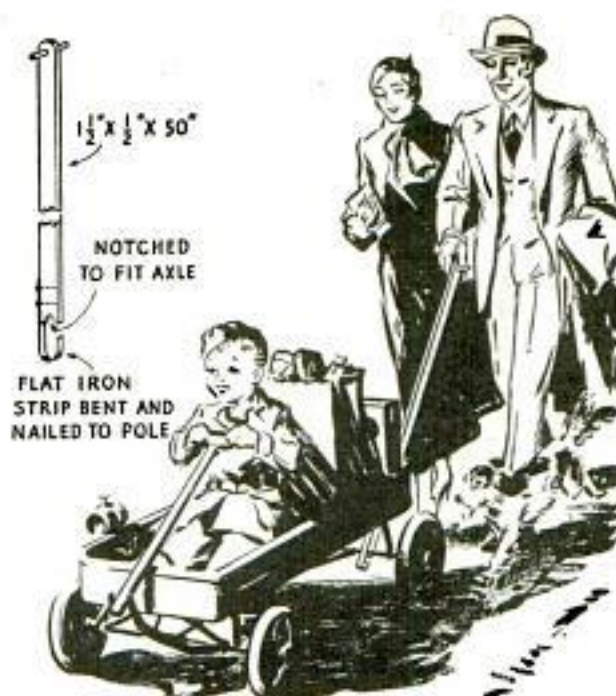
Cork Jaws for Holding Glass in Vise



Clamped between two pieces of cork, glass tubing can be held in a vise without breaking. Two sides of the cork should be grooved to fit the glass, while the other sides are shaped to fit the vise jaws. In cutting the cork, it is best to first rough it out with a sharp knife and then finish with sandpaper. A coat of paint on the cork will provide a protective surface and help reduce crumbling.

Grinding Cutting Edges on Pliers

The cutting edges on a pair of pliers can easily be sharpened with a silicon-carbide stone. First draw the stone back and forth across the edges horizontally to remove nicks. Then sharpen them by using the point of the stone in a manner similar to filing. Care should be taken to hold it at the proper angle.



Handle Eliminates Stooping to Push Boy's Wagon While He Steers It

Handle for Pushing Boy's Wagon

Consisting of a length of 1½-in. stock, this handle is convenient for pushing a small boy's wagon while he steers it. The lower end of the piece is notched to fit over the wagon axle and is fitted with a strip of flat iron, bent as shown. The upper end is provided with a rod as a grip for the hands.—J. N. Stody, Kenosha, Wisconsin.

Oil Heater Adapted to Gas

A portable oil heater of the type shown, is easily converted for use of gas by removing the burner from the base and substituting a gas burner. A small gap is cut in the edge of the heater hood to fit over the shank of the unit, which may be connected to the gas supply with a flexible tube, which should be gas-tight.



☐ Tea and coffee stains on chinaware are easily removed by rubbing them with a soft cloth dipped in dry table salt.

SPIN A ROPE



FOR a suitable rope get 30 ft. of $\frac{3}{8}$ -in. braided No. 12 cotton cord, and cut it into two 12 and 18-ft. lengths. Bend one end of each back to form an eye, or "honda," about 3 in. long, and wrap it with copper wire, as in Fig. 1.

Take the short rope and get set for the flat



spin, as in Fig. 2. The noose is not full size, the free end of the rope extending over to the left hand. This end is not turned back over the honda, but runs directly through it. Fig. 3 shows the hands

and the honda brought closely together in order to illustrate the proper way of holding. Keeping the left hand nearly still, flop the noose over with the right and at the same time give it a spin from right to left. This spin should be a full arm movement, your hand describing a circle about as large as the spinning noose. Then it is all wrist motion, as in Fig. 4. Having mastered this, run the spinning loop around your body, switching from one hand to the other—the "merry-go-round"—as in Fig. 5.

Jumping into the flat spin demands good timing, done just as the stem is coming toward you, Fig. 6, so that, after you have made the forward step, the rope will be around and out of your way, Fig. 7. Once inside the loop, lift your spinning hand overhead and go into the body spin, Fig. 8. It will help to have a little weight on the honda. Split a length of copper tubing, as in Fig. 9, and loop the rope around this, as in Fig. 10.

You will probably



FOR FUN

learn the body spin, Fig. 11, before you master jumping in. You are using the long rope, the honda is almost to the ground and the stem extends to the right hand only. Keep the left hand fairly low and swing the right up and over your head as in Fig. 12. Let go of the noose, holding onto the stem, and keep the circle going with a wrist motion, as in Fig. 8. Try it with both hands. Then, hunching your shoulder up and down, get the loop spinning slightly up and down. Smoothly, now, but quickly, lift your spinning hand high overhead, as in Fig. 13, slap the rope to the ground, then immediately pick it up and go



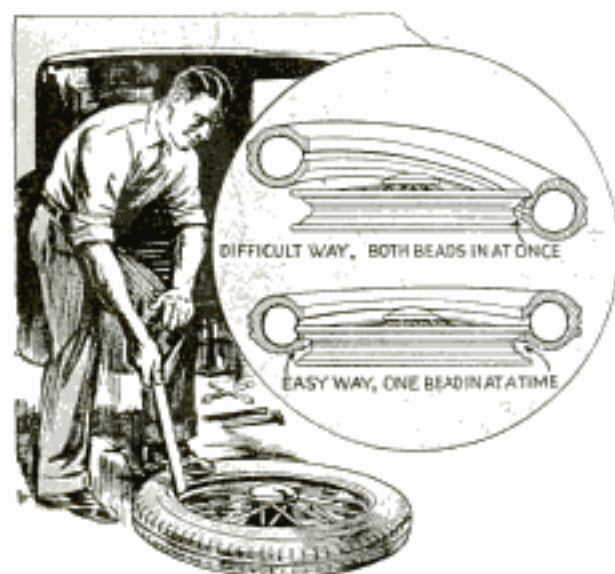
into the flat spin. Hand-shaking is a little variation of the body spin, and consists in dropping the loop close to the ground, keeping it going by changing the stem from one hand to the other. Fig. 14 shows this in action.

Now to tie some knots which begin from the same key position. Start as in Fig. 15, then snap the rope up and over your hand as in Fig. 17. If you merely flip the honda through the loop formed, you will get an



overhand knot, Fig. 16. If you can get the honda through from the outside of the loop, as shown by the dotted lines in Fig. 17, you will have the famous pretzel, Fig. 18. With the same movement, and jerking the knot quickly, you can get the figure eight, Fig. 19. The whole movement must be done quickly.

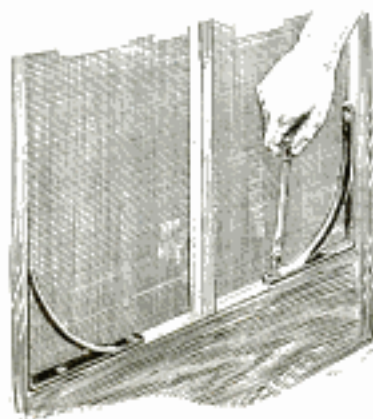
Easy Method of Mounting Tires on Drop-Center Rims



Tires Mounted on Drop-Center Rims by Forcing the Beads into Position Separately

The difficult task of mounting a tire on a drop-center rim is easily done as follows: Instead of forcing both beads of the tire over the rim at once, force one bead into position and then the other as shown. Thus, only one bead is stretched at a time.—H. E. Benson, Denver, Colo.

Shelf Brackets Brace Screen Door



the door with woodscrews.—Ray J. Maran, Kansas City, Mo.

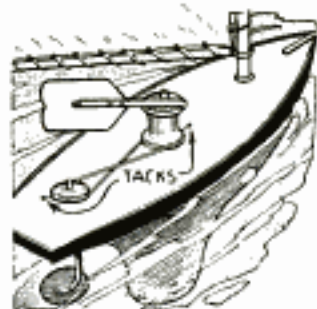
Four shelf brackets can be used to brace a sagging screen door so that it will be rigid without marring its appearance. The brackets are attached to

Repairing Oil-Stove Burners

Oil-stove burners of the wick type sometimes give trouble due to the failure of the wick-operating mechanism, usually caused either by an accumulation of dirt in the bottom of the wick chamber, or by corrosion on the metal sides of the chamber. This causes excess friction which overloads the mechanism and bends the teeth on the small pinions that mesh with the perforated metal wick holder. There is no provision for the removal of these gears, but by filing away the end of the rounded housing, that incloses them, this can be done easily. If new gears are not available, the old ones may be taken out and the teeth straightened. The corrosion and dirt are best removed by boiling in a strong solution of caustic potash and water, after which the burner should be thoroughly rinsed in hot water. After assembling the mechanism, a piece of sheet brass may be soldered over the hole cut in the housing.

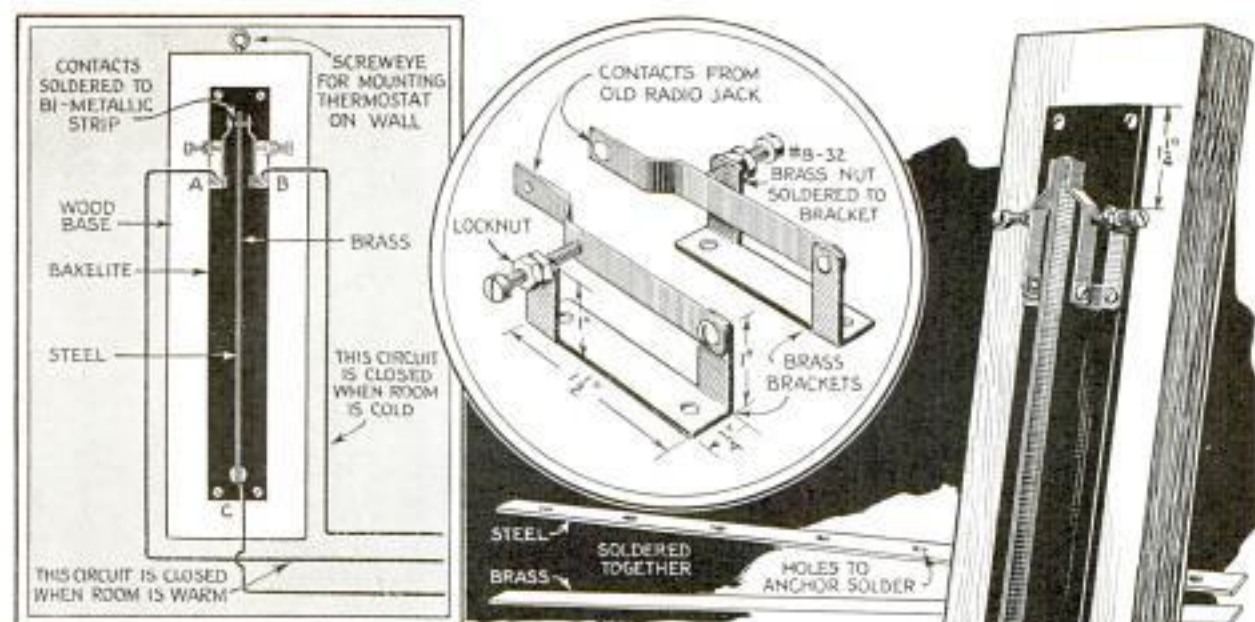
Automatic Steering Device for Model Sailboats

To keep his model boat on the right tack regardless of wind changes, one enthusiast rigged his boat with a vane-operated rudder. The vane is mounted on a spool, which pivots loosely on a pin in the deck. A groove around the lower edge of the spool takes a cord, which runs as a belt over a small wooden disk, also grooved, and rigidly fastened to the top of the rudder shaft. When sailing the boat, it is headed in the sailing direction, the vane set with the wind, with the rudder turned to steer the boat straight ahead. The string or belt is then tied to tacks in both the spool and the rudder disk. In this way the vane steers the rudder to keep the boat on its course.—Art McLeary, Toledo, Ohio.



☞ In cleaning garments of mud, most of it can be removed by brushing with the warp, but not by brushing against it.

Thermostatic Switch Made from Scrap Parts



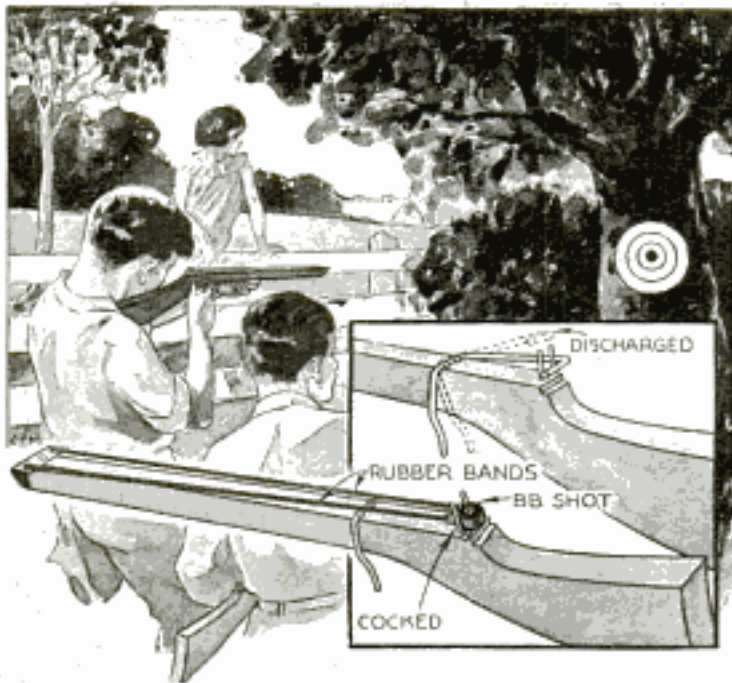
Sensitive thermostats for controlling furnace dampers and many other purposes, where either heat or cold is to open or close a circuit, can be built from materials found in any workshop scrap box. The dimensions given will produce a good reliable instrument although they may be varied to suit conditions. The only requisite is that a strip of sheet brass and a similar piece of steel or galvanized iron are soldered together to make the bimetallic element. Brass expands more than steel, and therefore an increase in temperature will cause the element to bend in the direction of the steel. The longer the element, the more sensitive it will be. However, if it is made too long, it is likely to vibrate and thus become less positive in action. In building thermostats, it is important to equip them with good electrical contacts, such as can be obtained from old Ford spark coils, and radio jacks or relays. Solder will not stick to these contacts, but a section of the old mounting containing the contact can be soldered on if it is difficult to remove the contact and rivet it in place. If the current to be controlled is large, the thermostat should be connected to a relay that is capable of handling the heavier current. When the thermostat has been completed, hang it on the wall, wire it into the circuit, and adjust the screws in the contact arms until the instrument makes contact at the desired temperature. Thermostats of this

type are sensitive and should therefore be mounted on a solid wall. If the contacts spark when the thermostat acts, this may mean that the circuit being controlled is too heavy for the contacts. In many cases, sparking can be reduced or prevented by placing a condenser across the contacts. Connect one side of the condenser to the wire leading to the bimetallic arm, and the other to the wire leading to the contact arm. The size of the condenser needed depends upon the circuit being controlled and may be determined by experiment, although a .01-mfd. condenser will usually serve the purpose.

Dough for Cleaning Wallpaper

Wallpaper cleaner can be made by mixing flour, 2 cups; soda, 1 teaspoonful, and ammonia, 2 tablespoonfuls. Stir in enough water to make a medium-stiff dough and steam it in a double boiler for one hour. A few minutes' kneading makes the dough ready for use. In cleaning the paper, a piece of the dough is rubbed over the wall with a circular motion.

washing soda copyrighted material



Rubber-Band Gun Shoots BB Shot at Velocity Almost Equal to That of Air Rifle

Rubber-Band Gun Shoots BB Shot

Here is a rubber-band gun that will shoot BB shot at a velocity almost equal to that of an air rifle. The stock and barrel may be cut in one piece, or they may be made separately and glued together. Two headless nails are driven into the stock end of the barrel, about $\frac{1}{8}$ in. apart, to form a catch for a leather sling, cut from an old shoe top. A trigger of heavy wire, bent to the shape shown, is pivoted in a notch cut on the top of the barrel in front of the pins. Two holes are drilled in a triangular piece of sheet metal, which is then bent at right angles and tacked over the muzzle end of the barrel to hold the ends of rubber bands. The edges of the holes should be filed smooth so they will not chafe the bands. To load the gun, place a shot in the sling, which is then grasped between the thumb and forefinger and pulled back and inserted between the two pins on the barrel. Pressure on the trigger raises the leather sling upward far enough to clear the pins and release the rubber bands.—Ralph Doner, Auburn, Alabama.

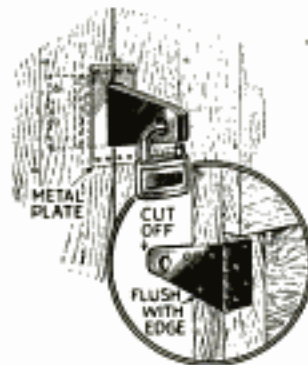
Ⓞ Nuts on broken bolts can sometimes be removed by placing two pieces of iron rod against the broken section and clamping the assembly in a vise, backing the nut off with a wrench.

Garden Markers from Test Tubes

Good markers showing the name of the seed planted are easily made from small test tubes. The name of the plant is printed on a strip of paper which is placed inside the tube. A round stick, inserted into the end of the tube and sealed with wax, provides a means of pushing the marker into the ground.

Locking Double Doors Securely with Hinges

Hinges of the type shown in the detail can be used to make hasps for locking double doors with a padlock. A portion of the long side of the hinge is cut off, and a hole is drilled through it to take the lock. The edge of the door is then recessed to take the projecting end of the hinge when the short side has been



screwed to the inside of the door. Metal plates screwed to the doors around the hasps will improve the appearance. As the screws are not accessible from the outside, this method of installation makes it difficult to unscrew them or pry off the hasps.—Thomas Moore, Detroit, Mich.

Stretcher Made from Clothes Hanger for Drying Gloves

Bent to the contour and size to fit your gloves, a wire clothes hanger makes a good stretcher for drying them. Loops are formed on the ends of the wire to take a nail, which is bent to the shape of a hook for hanging the stretcher.



Three Piece

DRESSER SET

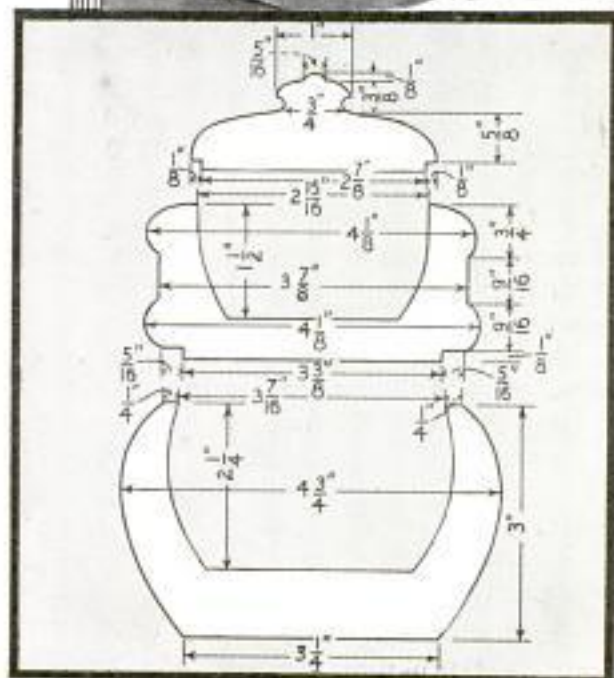
By GEORGE A. SMITH



A Single Unit



HERE is a useful and attractive article turned out on your lathe. It is a dresser set of the double-deck type and can be used as a unit or as two individual pieces. The wood should be walnut or mahogany to match the furniture on which the pieces are to be set. The parts are turned out from glued-up blocks of $\frac{3}{4}$ -in. wood. Care should be exercised in gluing the boards together so that the grain pattern will be attractive and the joints sound. After the glue has dried thoroughly, remove the pressure and saw the block into three sections having lengths of $2\frac{1}{2}$, 3 and 5 in., respectively. Turn out the lid on the end of the wood and accurately place the offset on the bottom of the lid. Sand out all the tool marks and cut off with the parting tool. Next turn out the middle section. When cutting out the center of the bowl, use particular care to turn the diameter of the opening to form a good fit with the lid. In a like manner fit the offset of the middle section into the large bowl.





Screweyes Driven into Sash Serve as Fingerholds for Raising and Lowering Upper Window Sash

Screweyes Help Lower Upper Window Sash

Two screweyes, driven at an angle into the stiles of a sash, will serve as fingerholds in raising and lowering an upper window. The eyes should be as large as possible without interfering with the bottom sash when the window is lowered.—Hector V. Lough, Plainfield, N. J.

Nutcracker Opens Screw-Top Cans



It is easy to get just the right amount of pressure to grip the top without denting it, as often happens when a pair of pliers or a pipe wrench is used for this purpose.—Ray J. Marran, Kansas City, Mo.

Screw tops on small cans that cannot be loosened with the hands can be quickly unscrewed by using a nutcracker as a wrench. It is

Inlaying Metal in Celluloid

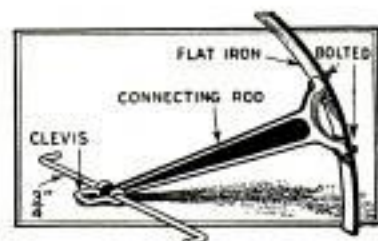
Celluloid may be inlaid with thin pieces of metal if the surface of the celluloid is first softened by repeatedly painting it with acetone. Place the metal pieces in

position and press them in firmly with a clamp or vise. The work should be left clamped until the acetone has evaporated, after which it is dressed down smooth. Fine files can be used on the metal, and a sharp knife, razor blade or a piece of glass will do for smoothing the surface of the celluloid. If much of this work is done, a tight box should be used to hold the celluloid while it is being softened with the acetone, doing the work in a cold room. Care should be taken to keep fire away from the work, as the vapors from acetone and the celluloid are highly inflammable.

Anchor Made from Connecting Rod

Anchors for small boats can easily be made from a length of flat iron, bent to the proper curvature and bolted to the end of a connecting rod.

If flat iron is not available, a spring leaf may be used. A clevis, to take the anchor chain or



rope, is fastened to the other end with a 20-in. length of iron rod driven into the wristpin hole, the ends of the rod being bent at right angles as indicated. The crosspiece helps to keep the end of the anchor from sinking into the mud on the lake bed.

Paper Fastener Improves Strap on Wrist Watch

A paper fastener, clipped to the end of a wrist-watch strap, as shown, will keep it from splitting or rolling up so that it becomes difficult to insert it through the buckle. The folded end of the fastener should be shaped to the contour of the strap end by first bending it over a wire about the thickness of the strap.



☐ A serviceable storm door can be made by nailing tar paper over a screen door.

CIGARET BOX

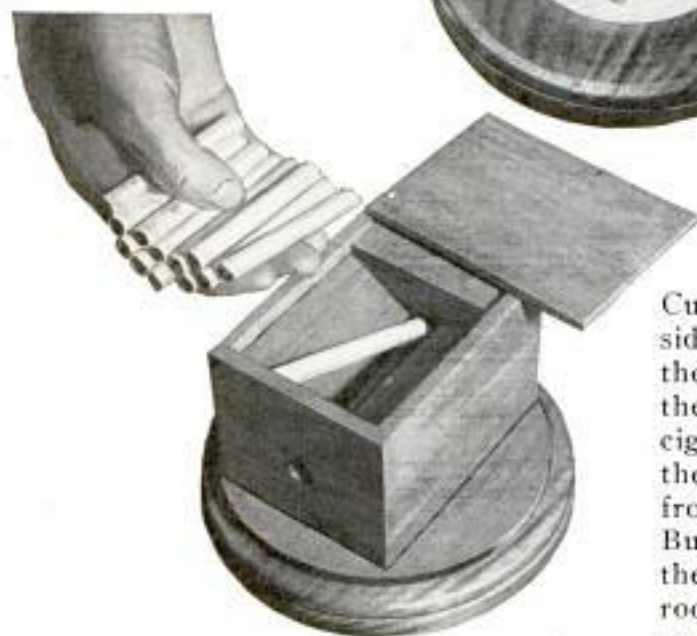
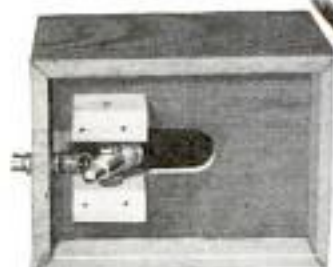
Works like a

Machine Gun



THIS cigaret dispenser is particularly useful for distributing smokes to the players at a bridge table. It consists of a container that can be rotated on its base, each revolution delivering four cigarets at equal intervals.

The box includes a spring-operated trigger controlled by a plywood cam set in the base. First make the base by turning out a 6-in. disk. In the center cut a

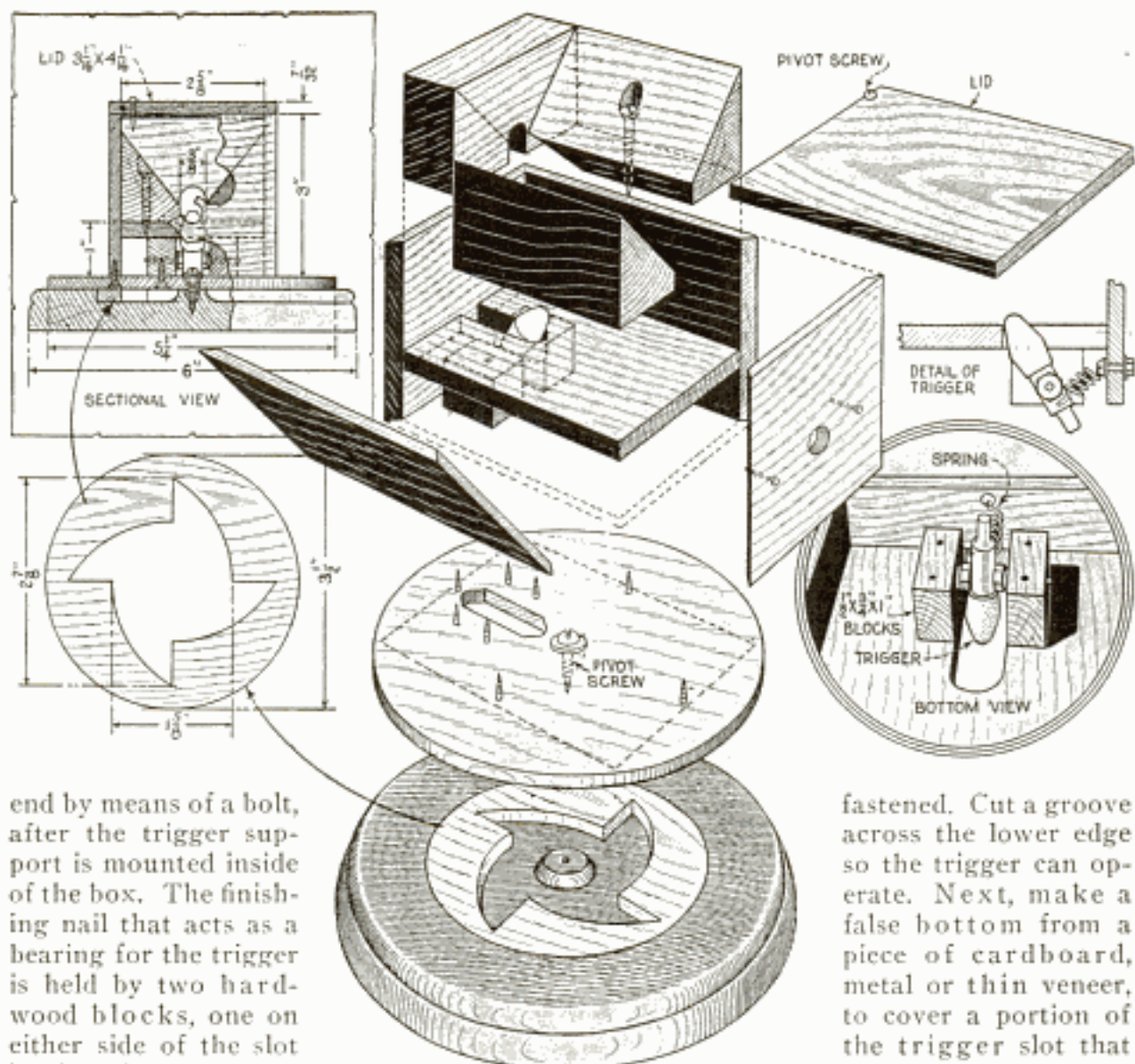


plywood cut a disk $5\frac{1}{4}$ in. in diameter. This is a sub-base, supporting the cigaret hopper. Drill a hole in the center to receive a wood screw on which the disk is to rotate, and cut a slot measuring $\frac{3}{8}$ by 1 in., so that the longer dimension lies along a radius of the disk, and one end is $\frac{3}{8}$ in. from the center of the center hole. The trigger projects through this slot and engages the cam inserted in the real base.

inserted in the real base.

The box, made of plywood and mitered at the corners, measures $2\frac{5}{8}$ by $3\frac{1}{2}$ in. inside and is 3 in. deep. Cut a piece of plywood to fit snugly inside the box, like a bottom. This supports the trigger and has a slot through which the trigger operates to strike the end of a cigaret. This support is mounted inside of the box so that its upper surface is 1 in. from the bottom edge of the container. But before mounting this piece, attach the trigger, which is made of steel or brass rod, about $1\frac{3}{4}$ in. long and $\frac{3}{8}$ in. at its greatest width. One end is turned or filed down to a diameter of $\frac{3}{16}$ in. A rubber tip in the form of a slip-over pencil eraser may be provided on the trigger. Drill two parallel holes through the side of the trigger, one in the center to serve as a bearing, and one about halfway between the center and the small end, to receive one end of the trigger spring. The other end of this spring—a $\frac{1}{4}$ -in. coil spring that is not too powerful—is attached to the box

ring-shaped recess, $3\frac{1}{2}$ in. in diameter and $\frac{1}{4}$ in. deep. Leave a $\frac{3}{4}$ -in. button in the center. This recess is to receive the cam that is cut from $\frac{7}{32}$ or $\frac{1}{4}$ -in. plywood. The circular outer edge of the cam just fits the recess, and has a star-shaped opening in the center. As it is desired to deliver four cigarets at a turn, there are four points to this star. The exact shape of the cam is shown in the illustrations. From



end by means of a bolt, after the trigger support is mounted inside of the box. The finishing nail that acts as a bearing for the trigger is held by two hardwood blocks, one on either side of the slot in the plywood support. Locate the holes in these blocks so that the trigger, when mounted, will project about $\frac{1}{4}$ in. through the sub-base, and its small end will engage the cam. Fasten the trigger board inside of the box by driving small brads through the sides, and then attach the box to the sub-base by means of small wood screws with heads countersunk into the lower surface of the sub-base. Next mount the sub-base on the real base by a single wood screw through the center hole, being sure that the trigger end engages the cam. You probably will have to adjust the spring tension and perhaps the position of the trigger itself before everything works well. A rubber covering for the bottom of the base will keep it from slipping on the table. Because the box is longer inside than a standard cigarette, you will have to insert a block at the trigger end. It need not be

fastened. Cut a groove across the lower edge so the trigger can operate. Next, make a false bottom from a piece of cardboard, metal or thin veneer, to cover a portion of the trigger slot that was extended past the

center to enable the screw through the center of the sub-base to be reached. If this false bottom is not used, cigarettes will tend to fall into the slot. The hopper is made by inserting blocks at the sides. Determine exactly the position of a cigarette resting at the bottom of the hopper, and drill a $\frac{3}{16}$ -in. hole so that, when the trigger strikes one end of the cigarette, the latter will be forced out through this hole. The spring tension should be such that the cigarette is thrown about 6 in. from the box. Finally, provide a lid for the hopper, pivoting it as shown, or mounting it on butt hinges and providing some kind of catch. If desired, you can extract cigarettes singly by moving the box clockwise on its base for about one-fifth turn, and then backing up as far as it will go. The trigger will push a cigarette far enough to enable you to pull it out.

Learning to Shoot Moving Objects

Here is an effective method of training the eye and finger for shooting swiftly moving objects with a rifle. First locate a steep, heavily sodded hillside where there is either a stone fence or a slope opposite it to serve as a safe background. Then get a number of round stones 10 to 12 in. in diameter, preferably sandstone, and after loading the gun, start one of them rolling down the hill. The course may be straight down in front of the marksman, or at an angle along the hillside. In either case, the stone usually curves in its course, making the aim difficult. As soon as the rock is released, raise the rifle to your shoulder with a smooth easy movement so that your right hand clasps the grip, and bring the cheek down to the stock. The secret of quick, accurate shooting at moving objects is in getting the head down so that the cheek rests firmly on the stock at the comb.

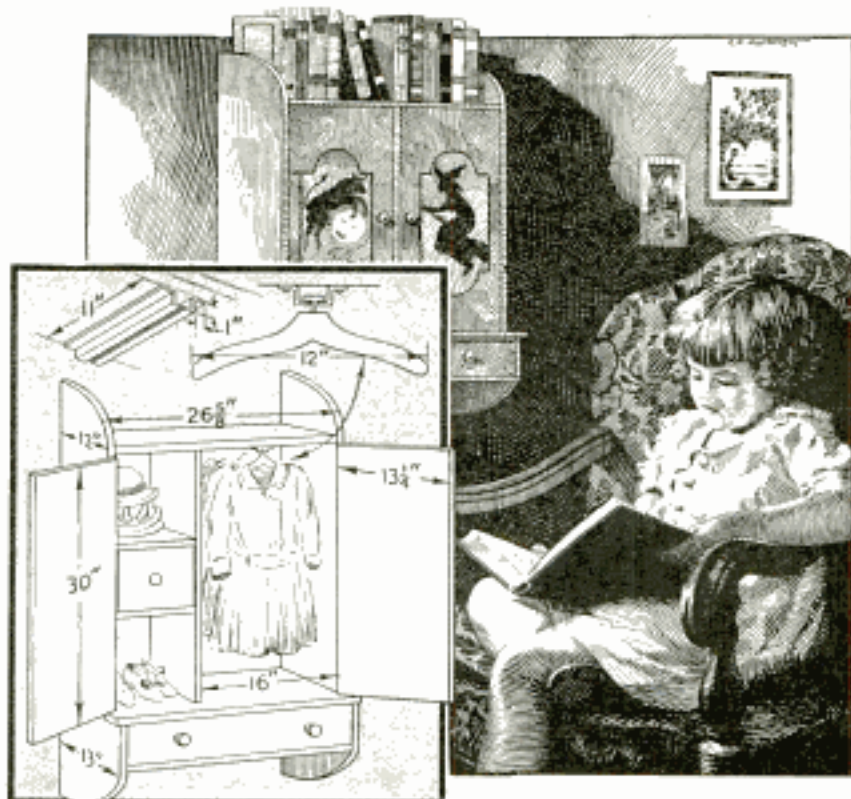
Plaster Mixed in Rubber Soap Tray



An ordinary rubber soap tray will be found handy for mixing plaster of paris, and no matter how hard the plaster gets, the tray can be bent and the contents removed with ease. The small ridges on the bottom of the tray can be shaved off with a safety-razor blade.

Wall Wardrobe for Child's Room

Hung on the wall, this wardrobe will appeal to the small child. It has compartments for hats, shoes and other clothes, two drawers, while the top serves as a bookshelf. Two pieces of sheet metal are



This Wall Wardrobe for a Child Has Two Drawers and Other Compartments for Clothes, One Being Fitted with Sliding Clothes Hangers

bent and screwed to the ceiling of one compartment to provide a track for sliding hangers, a piece of T-stock being substituted for the usual wire hook on the hanger. If desired, the doors may be paneled with plywood and suitable pictures painted on them. The wardrobe may either be screwed directly to the wall, or metal hangers can be fastened to the back and slipped over screweyes driven into the wall.—H. J. Belcher, Algiers, La.

Film-Spool Flange Prevents Chain from Enlarging Hole

While making alterations on a furnace-operating mechanism, it was necessary to run one of the damper chains through a wooden partition. In order to keep the chain from wearing on the wood, two metal ends from a camera film spool were removed and tacked over the hole. This protected the wood and allowed the chain to slide freely.





Stakes Driven into Ground Hold Struts and Frames Rigid When Building Boat Outdoors

An Aid in Building Boats Outdoors

Those who build boats outdoors will find this kink helpful in holding the frames rigid. The boat is set up on a large horse in the usual way. The struts, which are used to aline the frames and normally rest on the floor when building inside, are nailed to stakes driven into the ground directly under the frames. The stakes should be driven deeply into the ground at an angle, so that any thrust or pull on the strut will impart a side pressure on the stake. Level ground is not necessary with this type of a set-up.—William R. Bell, Lily, Wisconsin.

Verdigris Finish on Steel, Brass or Copper

Steel, brass or copper objects can be given a verdigris finish by painting them with a solution made by adding 20-percent acetic acid, 10 oz., and sal ammoniac, 1½ oz., to a saturated solution of copper nitrate, 1 oz. The latter solution is made by dissolving as many copper-nitrate crystals in water as possible. The solution should be contained in a glass bottle and should be shaken at frequent intervals to hasten the saturation. If there are crystals remaining in the bottom of the bottle after it has stood for a few hours, the solution is suitable for use in the above for-

mula. Brush the solution on the cleaned copper and allow it to act for about one day, and then repeat the operation as many times as necessary to produce the desired effect. After the desired color has been produced, the work should be rinsed with water, dried and then given a thin coat of colorless lacquer to prevent further action. Iron and steel articles may be given the same finish if they are first copperplated. To do this, boil the work in a solution of lye and water for a few minutes, then rinse in clean water and dip it in a solution made by dissolving a handful of copper sulphate in water, contained in a small enameled pan, and adding sulphuric acid, 1 oz., after the copper sulphate has been dissolved.

Improving Garage-Door Lock

When garage doors are locked by using a wooden crossbeam, thieves can enter by

inserting a saw between the doors and cutting the beam in two. This can be prevented by screwing pieces of sheet metal or angle iron over the corners of the beam, as shown, where the doors come together.



Extended Riser Holds Railing Post

When building stairs on the outside of a building, it is a good idea to extend the riser, on the second step from the bottom, about 4 in. beyond the side of the stairs. By this means there is provided a place to which the lower railing posts can be nailed to hold them rigidly in a vertical position.



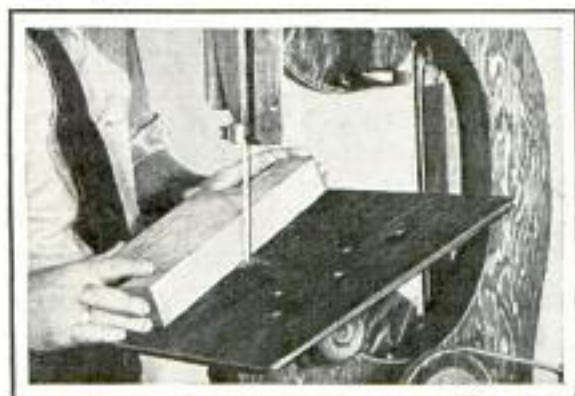
ⒸA pail of water set in a newly painted room will absorb most of the fumes by the time the paint has dried.



Homemade BANDSAW

for your Workshop

B P 836

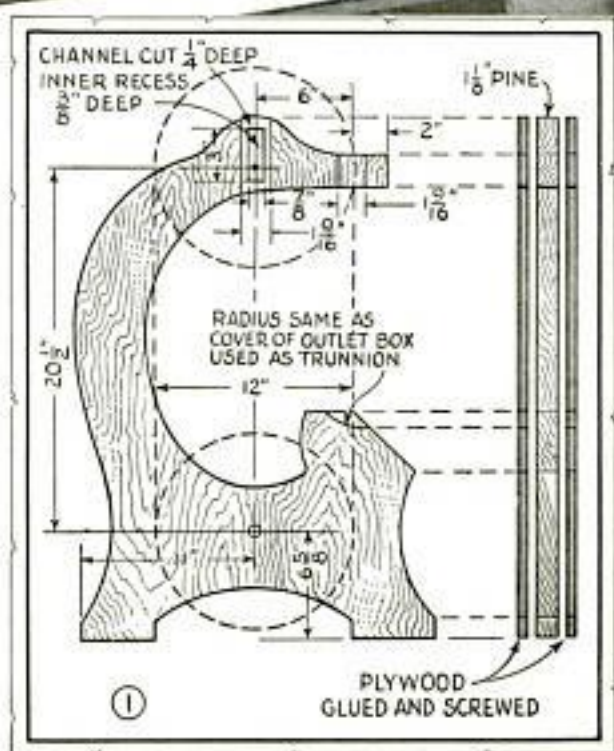


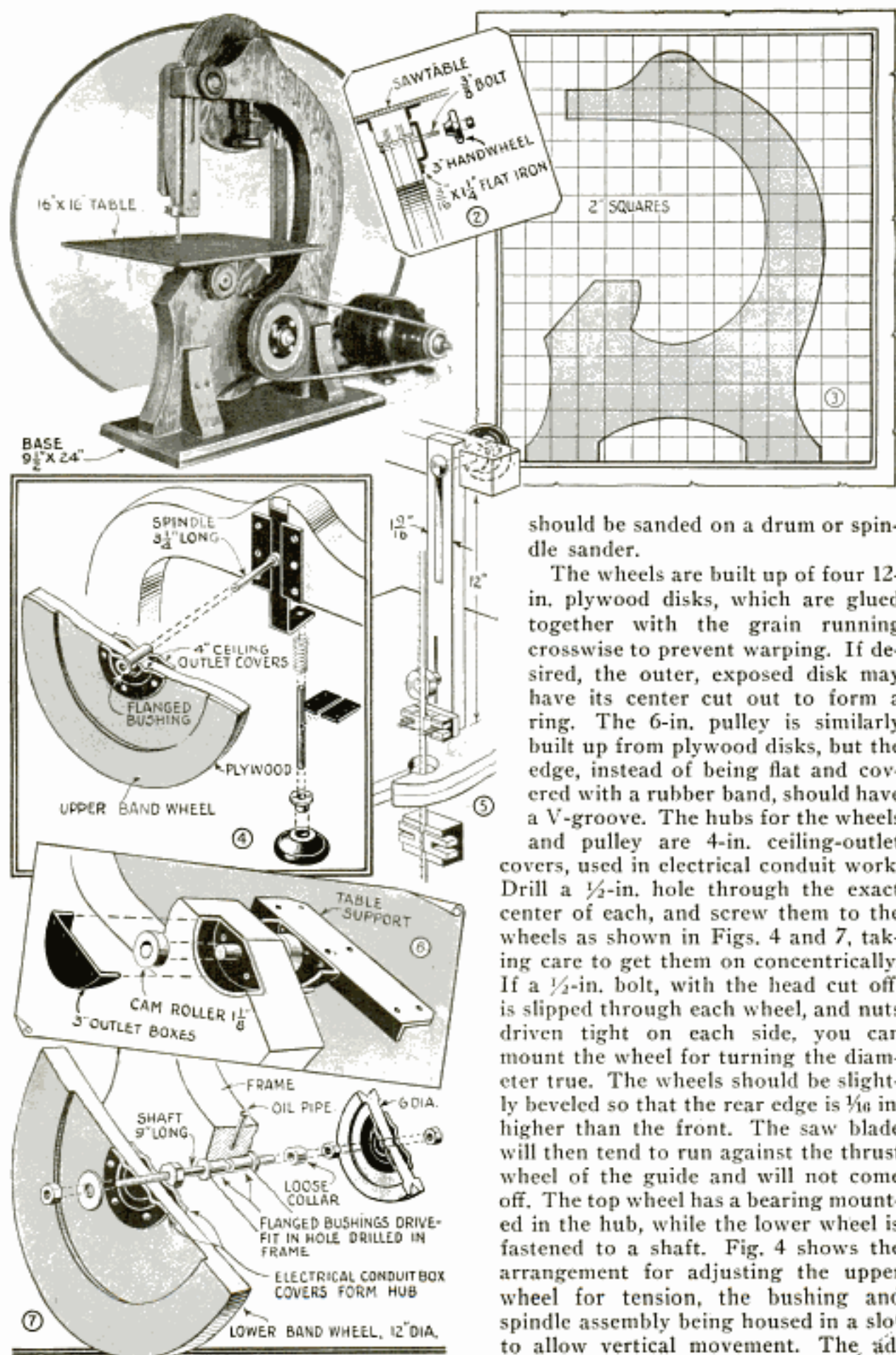
By
T. Kasmerchak



THIS bandsaw, made largely of $\frac{1}{4}$ -in. fir plywood, has a 12-in. swing, a tilting table and cuts 2-in. stock with ease and accuracy. If it is carefully constructed, so that both wheels are in perfect alignment, you will have no trouble with the saw blade running off. The cost of building the original saw from which these plans were taken was four dollars.

For the base and core of the vertical frame piece, Fig. 1, $1\frac{1}{8}$ -in. yellow pine is used. The pattern for this part is laid out on a piece of heavy wrapping paper, as in Fig. 3. Cut the piece about $\frac{1}{8}$ in. oversize, to leave enough stock for finishing. The plywood sides are then cut to size and glued to the core, using casein glue, after which additional strength at the edges is obtained by driving in wood screws. After the glue has dried, the edges of the frame





should be sanded on a drum or spindle sander.

The wheels are built up of four 12-in. plywood disks, which are glued together with the grain running crosswise to prevent warping. If desired, the outer, exposed disk may have its center cut out to form a ring. The 6-in. pulley is similarly built up from plywood disks, but the edge, instead of being flat and covered with a rubber band, should have a V-groove. The hubs for the wheels and pulley are 4-in. ceiling-outlet covers, used in electrical conduit work. Drill a $\frac{1}{2}$ -in. hole through the exact center of each, and screw them to the wheels as shown in Figs. 4 and 7, taking care to get them on concentrically. If a $\frac{1}{2}$ -in. bolt, with the head cut off, is slipped through each wheel, and nuts driven tight on each side, you can mount the wheel for turning the diameter true. The wheels should be slightly beveled so that the rear edge is $\frac{1}{16}$ in. higher than the front. The saw blade will then tend to run against the thrust wheel of the guide and will not come off. The top wheel has a bearing mounted in the hub, while the lower wheel is fastened to a shaft. Fig. 4 shows the arrangement for adjusting the upper wheel for tension, the bushing and spindle assembly being housed in a slot to allow vertical movement. The ad-

justable hardwood saw-guide and guard assembly is illustrated in Fig. 5, while the arrangement to make the table tilt is shown in Fig. 6. Three-inch electrical outlet boxes, cut as indicated, are used for this purpose. Fig. 2 shows how a 3-in. handwheel is turned against a strip of flat iron to hold the saw table in position.

Repairing a Leaky Carburetor Float

Leaks in a carburetor float are easily repaired with solder. First evaporate the gasoline that may have entered the float by heating it over a low flame. The float should be turned while it is heated to prevent melting any solder ballast that may have been put on at the factory. A small area around the spot where the leak occurs is cleaned and a tiny drop of solder applied, removing the surplus with fine emery cloth. This is important, as too much solder will unbalance the float. Care should be taken to see that none of the solder penetrates into the float. If the leak cannot be found with the naked eye, it is best to immerse the float in hot water and watch for bubbles.

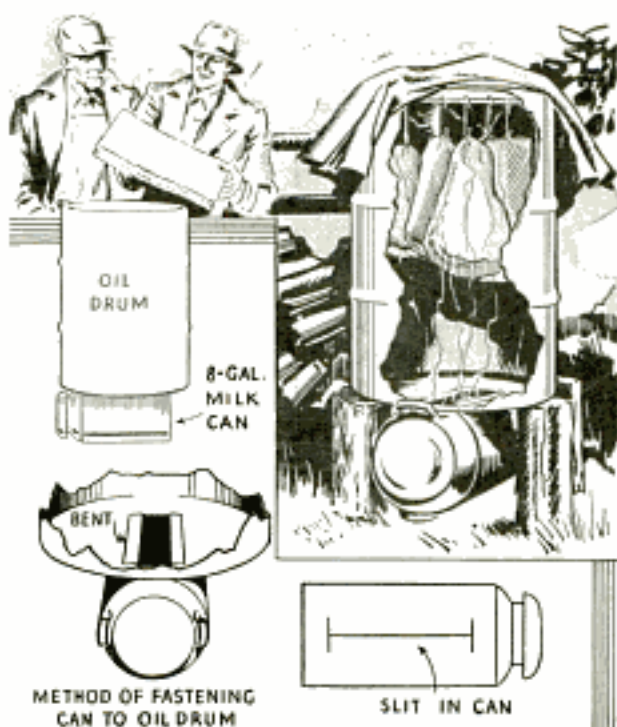
Tool for Marking Equidistant Holes



A handy tool for laying off equidistant holes can be made from a scribe and a center punch. The scribe is bent at right angles and is inserted in a hole drilled through the center of the punch. Another hole is drilled and tapped on the opposite side of the punch to take a thumbscrew for holding the scribe in position. In use, the first punch mark is made, the scribe point is set in it and the tool is then adjusted so that all the remaining holes will be an equal distance apart.

Smoke House Improvised from Old Oil Drum and Milk Can

Small quantities of meat are quickly cured in this improvised smoke house. A large slot is cut in the bottom of an old oil drum and a corresponding slit is made

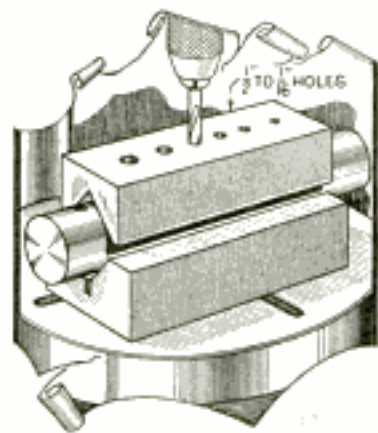


Meat Quickly Cured in Smoke House Improvised from Oil Drum and Milk Can

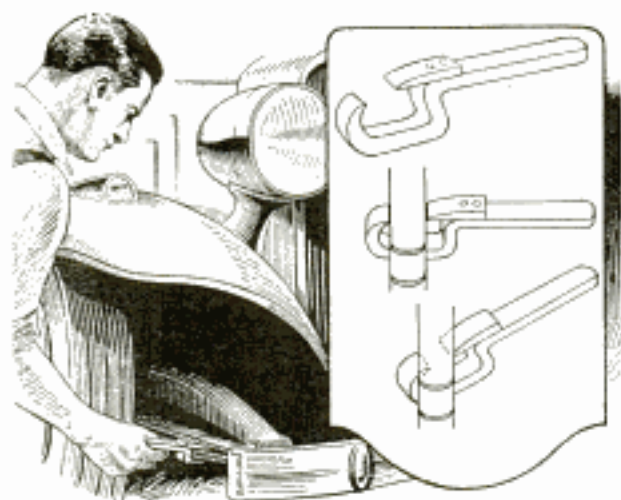
in the side of a milk can, which is then fitted to the bottom of the drum, the edges of the slit being bent over the sides of the slot in the drum as shown in the detail. In use, the drum is set on short posts, and the meat is suspended from rods placed across the top of the barrel, which is then covered with a heavy cloth and a fire is built in the can.—Angus Banting, Alliston, Ont., Canada.

V-Block Guides Help in Drilling Round Stock

Two V-blocks can be used to advantage in drilling through the center of round stock. Holes are drilled in one block to serve as guides for the drill. In use, the stock is placed in the lower block and the drilled block is inverted over it as shown.



Articles of white leather can be cleaned by rubbing them with an art-gum eraser.



With This Homemade Tool You Can Quickly Spread Car-Spring Leaves for Oiling

Spreader for Oiling Car Springs

Leaves on car springs are easily spread for oiling with this tool, which consists of a length of bar iron, bent to fit over the width of the spring, as shown, the end of the jaw being flattened so it can be forced between the leaves. A wedge-shaped jaw is screwed to the handle, the holes being slotted to enable adjustment to different springs. In use, the tool is placed over the spring and turned to either side, which forces the jaws between the leaves and spreads them.—A. H. Waychoff, Phoenix, Arizona.

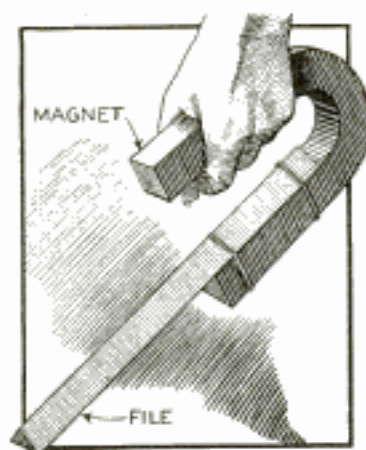
Durable Socket Wrenches from Wristpins

Socket wrenches are easily formed from old automobile wristpins. The high-grade alloy steel used in these pins is case-hardened and will stand usage beyond ordinary requirements. First make dies from tool steel, or thread a setscrew having a suitable head into the end of a steel rod to serve as the die. To form a socket, heat the wristpin to a dull red and drive the die into one end. If cooling is too rapid, it may be necessary to reheat the pin to complete the job. Sockets may be formed in each end of the pin, which is then cut in two and welded to a tee, ell or other conveniently shaped handle. The socket end of the completed wrench should be hardened before it is put into service. To do this, heat the steel until a horseshoe magnet will no longer adhere to it, and quickly plunge the work into water. Small socket wrenches suitable for screws of generators, etc., may be made by the same

method from seamless steel tubing. Wooden handles can be used on the smaller sizes or a loose T-handle may be made by drilling the shaft of the wrench and inserting a piece of drill rod.

Extension Leg on Horseshoe Magnet

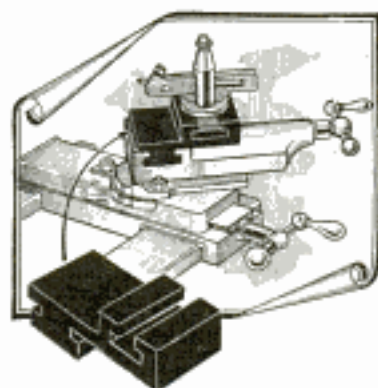
To make a horseshoe magnet more useful for picking up small pieces of metal in places that cannot be reached with the magnet in its original shape, attach a three-cornered file, or better still, a narrow piece of soft iron to one leg as shown. The contacting surfaces of the metal should be sanded bright, and the joint



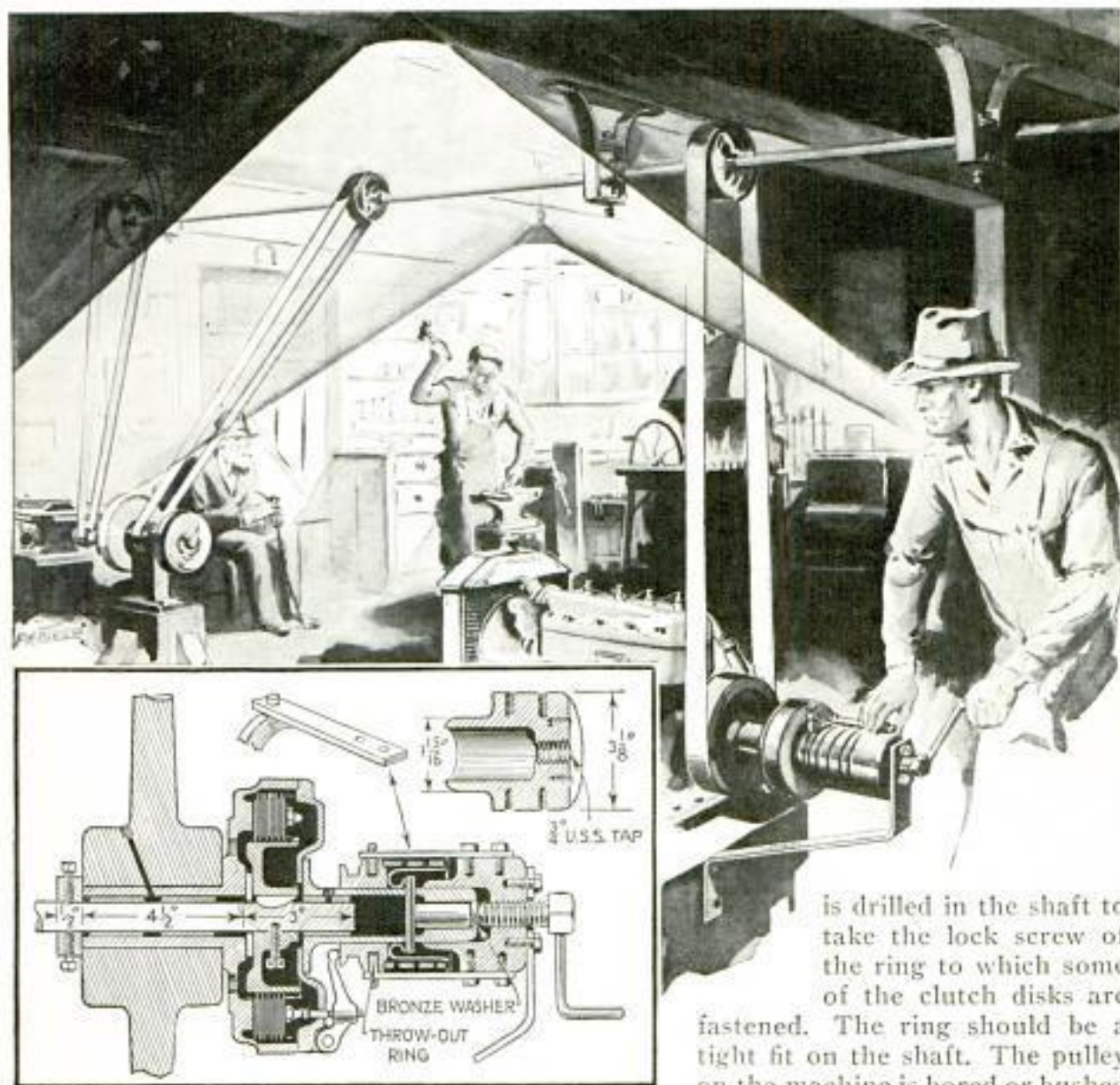
should be bound with wire. The stronger the magnet, the greater will be the attracting power at the end of the extra leg.—Jas. F. Goodman, Stockbridge, Michigan.

Block for Raising Toolpost

When using raising blocks on a screw-cutting lathe, an additional block in the compound rest to raise the toolpost will be helpful. This eliminates the necessity of raising the saddle and permits the use of various attachments in connection with the automatic crossfeed. The block is made from a piece of steel and is shaped at one end to fit the toolpost slide in the compound, while the other is made to take the toolpost. If it is necessary to have the tool close to the work, the block may be reversed, which causes the end holding the toolpost to project over the end of the compound.—F. Sever, Cusick, Wash.



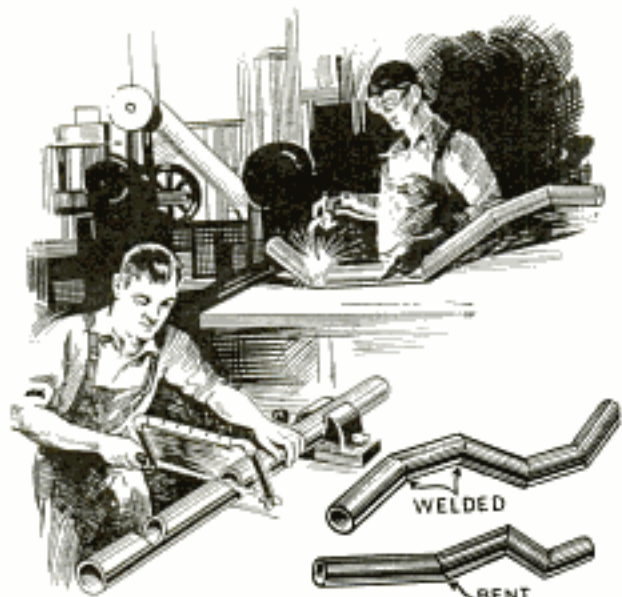
Car Transmission as Clutch on Power Unit



An old transmission from a model-T Ford is easily adapted to serve as a clutch on a small power unit on farms and in shops where the source of power is a gasoline engine. The transmission is mounted directly on the shaft of the machine. When engaged, the clutch, with the exception of the shifting mechanism, revolves as a unit with the shaft and pulley. The shaft on the machine is turned down to the size given, and should have an extension past the machine bearing of at least 7 in. The extension may be a rod of the same diameter as the shaft and is fitted snugly to the latter by means of a sleeve, pins being driven through both. A hole

is drilled in the shaft to take the lock screw of the ring to which some of the clutch disks are fastened. The ring should be a tight fit on the shaft. The pulley on the machine is bored or bushed to suit, and is tightly fitted with setscrews to the hollow shaft on the clutch assembly, taking the place of the low and reverse drums. The throw-out device consists of a steel cap over the end of the shaft and is kept from revolving by a length of flat iron screwed to the frame of the machine or to the floor. The cap is tapped for a $\frac{3}{4}$ -in. screw, the head of which is drilled for a $\frac{1}{4}$ -in. rod bent to form a handle or crank. A short piece of $\frac{3}{4}$ -in. steel is loosely fitted in the universal-joint socket so that it rests against the spring-retainer pin. Two pieces of flat iron are fastened to the sides of the cap and drilled to receive the ears of the original throw-out ring.

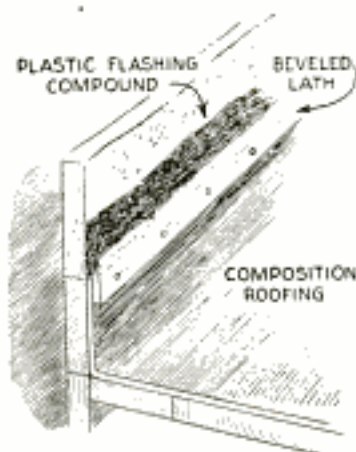
Cut and Welded Pipe Joints



Special Bends Made in Heavy Pipe by Sawing Out Small Pieces and Then Welding the Joints

A hacksaw and a welding torch can often be used to make bends and offsets in heavy pipe for special installations where standard fittings are not available. V-shaped saw cuts are made almost through the body of the pipe, but not far enough to sever the opposite wall. The piece of metal removed in this way permits the two adjoining surfaces of the pipe to be bent until they meet, after which the joint is welded. Care should be taken in sawing at the proper angle, as this determines the degree of bend in the pipe. Mechanics in mines and railroad shops have found this method effective in installing special jobs requiring unusual bends.—Rodger L. Simons, St. Paul, Minn.

Simple Method of Flashing Roofing to Wall



When flashing composition roofing to a wall, a watertight joint can be made by using a lath and some plastic flashing compound. Bevel the top inside edge of the lath and nail it along the upper edge

of the roofing, which has been turned up against the wall. Then fill the groove formed by the bevel with the plastic compound, taking care that it is packed in tightly and that it is rounded up against the wall above the lath.—W. W. Wheatly, Fresno, Calif.

Brass-Plating without Electricity

Iron hardware, screws and small machine parts may be brass-plated without the use of electricity by boiling them in an aluminum pan containing a solution made by dissolving copper sulphate, $\frac{1}{4}$ oz., zinc sulphate, $\frac{3}{4}$ oz., and lye, 1 oz., in $\frac{1}{2}$ gal. of water. To this mixture, add sodium cyanide (poison), $\frac{1}{2}$ oz., and stir with a stick or glass rod. This solution is very poisonous and every caution should be used to prevent dangerous results. It should be mixed and used in front of an open window or outdoors. Acids of all kinds, including vinegar, should be kept away from the solution. After use, pour it into a sewer, rinsing with large quantities of water. A good scrubbing with hot, soapy water will usually clean the work sufficiently. Rubber gloves will prevent the poisonous solution from being absorbed by the skin on the hands.

Pivoted Bracket Holds Gasoline Pail under Bench

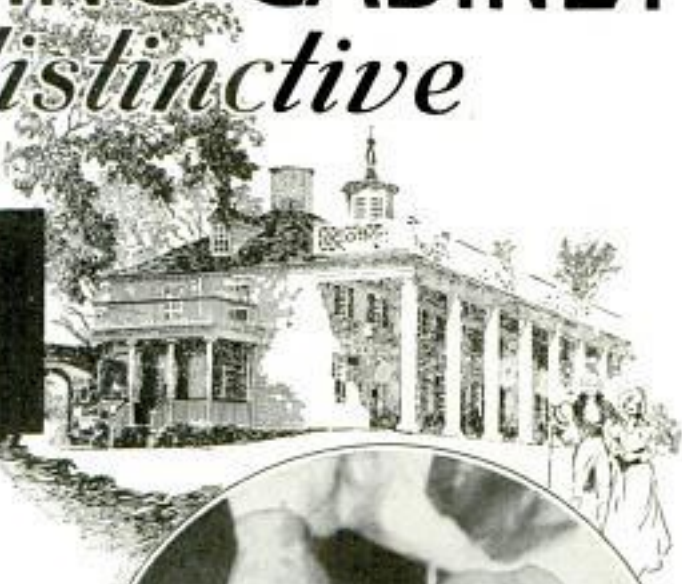
A swinging bracket, pivoted to the wall under a workbench, is handy for holding a gasoline pail, in which small parts can be washed. An iron rod, reaching from the bench top to the floor, serves as a pivot for the bracket, which consists of two looped rods welded together to fit the contour of the bucket. Eyes are bent at the ends of the rods to take the pivot, and a washer is welded to the pivot rod just below the lower one, to keep them from slipping down. A brace rod welded between the two arms helps stiffen the bracket.



498
Martha Washington

SEWING CABINET

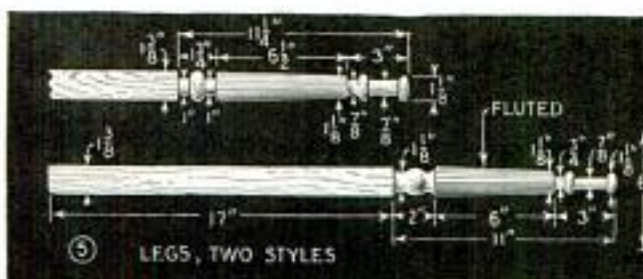
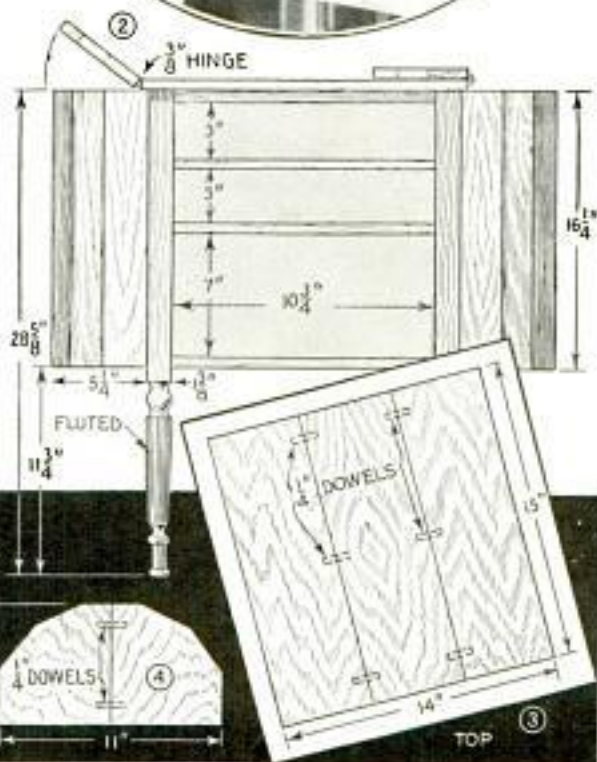
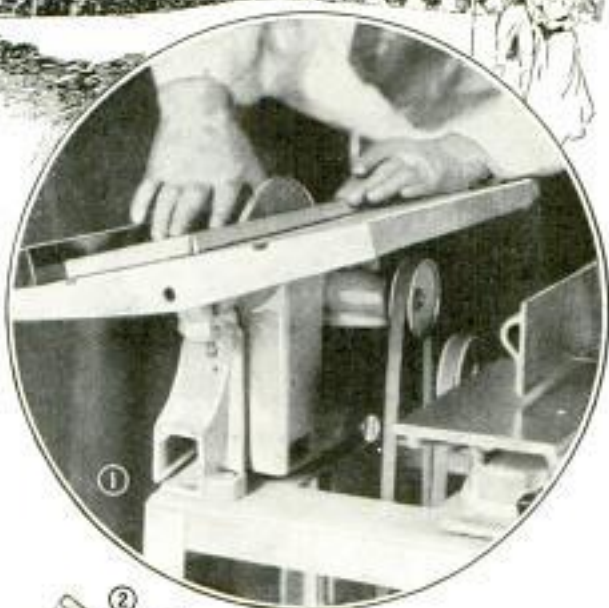
is distinctive

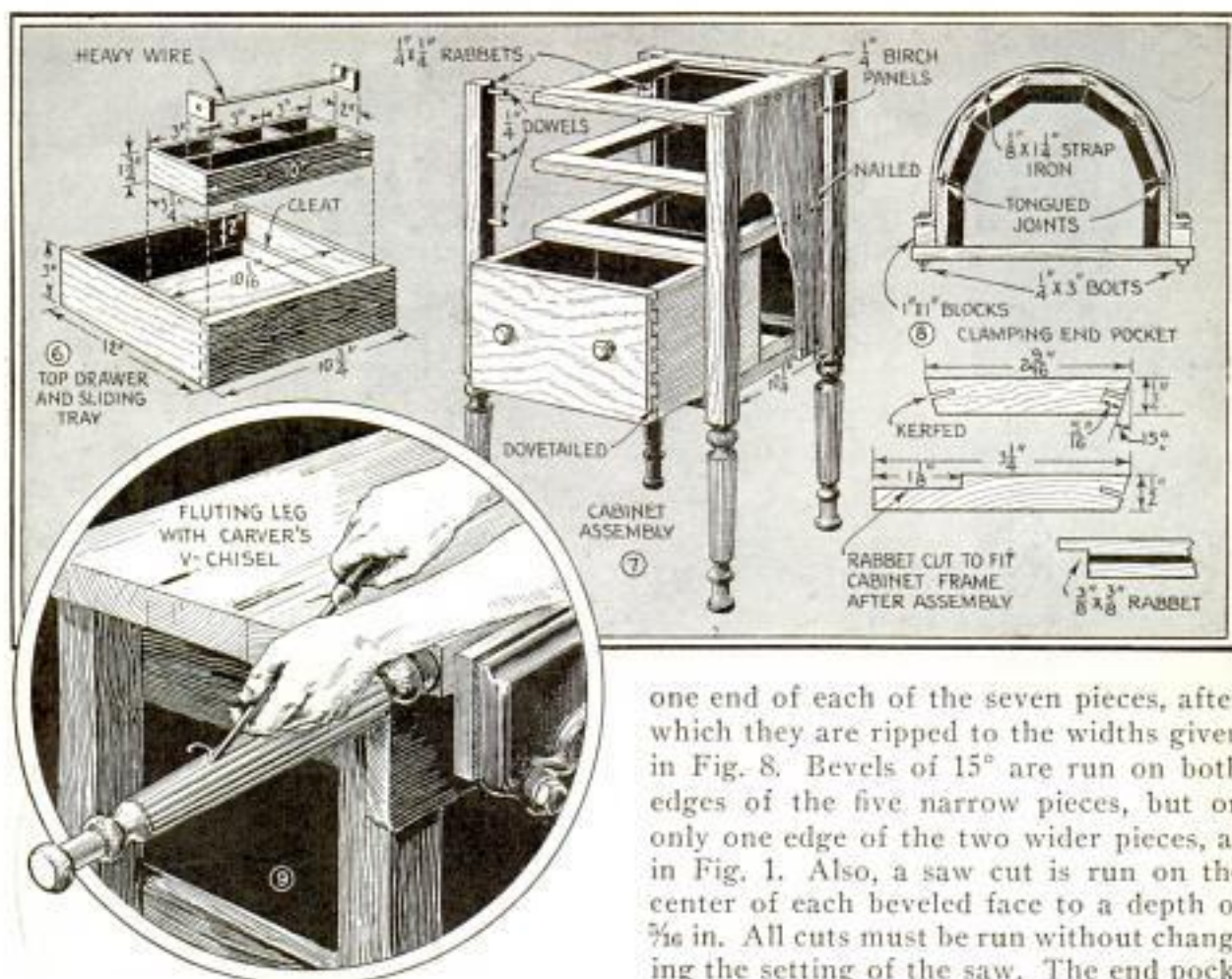


By W. CLYDE LAMMEY

A NOTABLE example of early American furniture design is the Martha Washington sewing cabinet, which is highly popular even today.

Building this cabinet begins with the legs, which are planed from rough-sawed square stock to the sizes in Fig. 5. The wood may be maple, walnut or mahogany. After planing, the legs are turned to either of the two designs in Fig. 5, which may be fluted if you desire. The stock for the drawer rails is ripped to $1\frac{3}{8}$ -in. width and cut to $10\frac{3}{4}$ -in. length. The four front rails should be of the same wood as the external parts of the cabinet, but the four at the back may be of any sound scraps of hardwood of the same thickness. All the rails are grooved $\frac{1}{4}$ by $\frac{1}{4}$ in. on one edge. The runners are ripped $1\frac{1}{4}$ in. wide from stock of the same thickness as the rails, and are tongued $\frac{1}{4}$ by $\frac{1}{4}$ in. on each end. Care must be taken that all the pieces are the same length. Before assembling





the frame, $\frac{1}{4}$ by $\frac{1}{4}$ -in. rabbets are cut on one corner of each leg, the rabbet being stopped just before it reaches the upper end of the turned portion. Grooves of the same size are also cut on one face of each back leg, the groove centering $\frac{3}{16}$ in. from the edge. It will be seen from Fig. 2, that the rabbets take the side panels, while the grooves take the back panel.

The frame is assembled as in Fig. 7, the drawer rails being doweled to the legs with the tongued ends of the runners glued in the grooved edges of the rails. The outer edges of the runners are fitted flush with the legs, so that the side panels will drop in place. The assembly is held together with bar clamps until the glue is thoroughly dry, after which the panels are cut from $\frac{1}{4}$ -in. birch plywood and planed to size. The panels are simply tacked to the rails and runners with small brads. To make the seven-sided end pockets, the stock is first squared to exact length. This should be done with care, as it is difficult to true the ends of the assembly after gluing. A $\frac{3}{8}$ by $\frac{3}{8}$ -in. rabbet is cut across

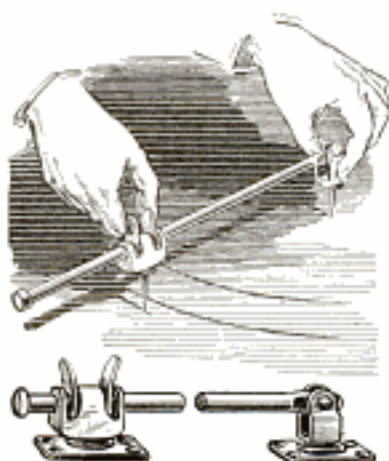
one end of each of the seven pieces, after which they are ripped to the widths given in Fig. 8. Bevels of 15° are run on both edges of the five narrow pieces, but on only one edge of the two wider pieces, as in Fig. 1. Also, a saw cut is run on the center of each beveled face to a depth of $\frac{3}{16}$ in. All cuts must be run without changing the setting of the saw. The end pockets are glued up in a clamp made as in Fig. 8, consisting of four sections, each from a length of hardwood, two small blocks and a piece of strap iron. To get the correct size of the clamp sections and the length of the strap iron, the work is set up temporarily by pressing the joints firmly together. The single section of the clamp is then set over the work and the iron band measured for length by bending it around the assembly and allowing for drawing tight with the bolts. It is necessary, before gluing, to make sure that all joints of the pocket fit properly, and that, when assembled, the pocket fits the cabinet frame. Some slight alteration may be necessary to assure this. The wide rabbets on the two endpieces of each pocket are cut after the assembly is glued up. Both pockets are made the same size and in the same way, and are attached to the cabinet frame with small screws and glue. The bottom piece of each pocket is glued and bradded in place. The remainder of the assembly, consisting of the top and drawers, is shown in Figs. 2, 3 and 6. The three parts of the top are built up by dow-

eling together a number of narrow pieces of $\frac{5}{8}$ -in. stock, to make the required width. The parts are made oversize and then trimmed to fit after gluing. The wood should be carefully selected for grain so that, when finished, it will be attractive. The end-pocket covers are hinged to the main top with invisible hinges. The corners of the drawers may be joined with a dovetail or plain rabbet joint as desired, the dovetail joint being preferable in a cabinet of this type. The sides and backs of all drawers are made from $\frac{1}{4}$ -in. hardwood, and the bottoms are cut from $\frac{1}{4}$ -in. birch or mahogany plywood. The spool and needle tray is made from $\frac{1}{4}$ -in. hardwood and is fitted in the top drawer on runners.

If the cabinet is made of maple, it may be given an attractive finish with golden-oak oil stain. The wood is first sanded smooth, and the stain is applied with a brush over a considerable area and allowed to dry for several minutes, after which the excess is wiped off with a clean, dry cloth. When the staining is completed, the dry surface is given a thin coat of white shellac, which is smoothed with No. 00 steel wool, waxed and then rubbed down in the regular way. Walnut is first given a coat of raw linseed oil to bring up the grain, after which the wood is filled, sanded and waxed over a thin coat of white shellac. Mahogany must be stained to the desired shade before filling and waxing. A brown-mahogany oil stain should be used in finishing this wood.

Improved Trammel Points

Trammel points can be made from a casement-window adjuster. All that is necessary is to



is to drill a hole in the end of the rivets or studs that hold the attachment plates to the adjuster for a steel pin, which is pointed at one end. —Geo. G. McVicker, North Bend, Nebr.



Flexible Desk-Lamp Stand Holds Magnifying Glass, Leaving Artist's Hands Free

Flexible Support for Magnifying Glass

Artists will find a magnifying glass attached to the flexible arm of a desk lamp a handy addition to their equipment. The base should be clamped to the drawing board to keep it from tipping over.

Corks Keep Test Tubes Upright



Flasks, test tubes and other round-bottom containers can be supported in a vertical position on a base with corks. These are spaced according to the containers they are to support and then

nailed to a shelf or bench, as shown. Chemists will find this method handy.

Testing Eggs in Incubator

To test eggs without removing them from the incubator tray, take the tray out of the machine and place it on a table with a block under each corner to raise it about 10 in. Then take a 50 or 60-watt electric lamp, attached to a drop cord, and pass it under each egg with one hand, turning the egg with the other. The lamp need not be hooded, as the brightest part is held directly under the egg. This method eliminates all handling of the eggs except turning and minor shifting.

Cutting Non-Shattering Glass



Hot Wire Softens Binding Substance in Non-Shattering Glass so It Can Be Easily Parted

Difficulty often experienced in cutting non-shattering glass can be overcome by using the illustrated device. It consists of a suitable board for a base upon which are mounted two binding posts. A length of No. 24 Nichrome wire is stretched between the posts and a piece of sheet asbestos is placed under it to protect the base. A drop cord is fastened to each binding post. A heater element should be connected in parallel with the wire to serve as a resistance, and a switch can be mounted on the base if desired. In use, the glass is scored on both sides with a cutter, and the scored portion is then placed directly over the Nichrome wire and the current is turned on. After a few minutes, the hot wire will soften the binding substance between the layers of glass, so that it can be broken in the usual way. The edges of the parted glass should be smoothed with a dry stone, and coated with shellac to keep out moisture.—Ivan Grosvenor, Richmond, Ind.

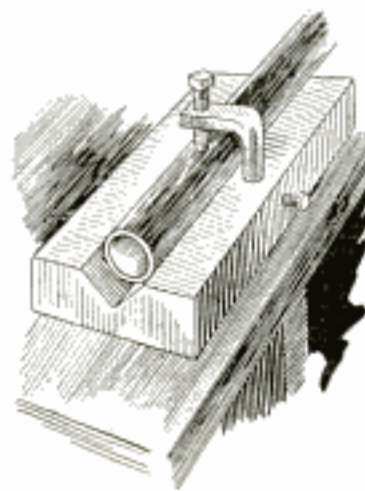
Control System for Foundry Crane

When pouring hot metal with a jib crane, the machine can be controlled from the ladle handles by installing electric controls as follows: A motor is mounted on the mast of the crane, and the control cables are threaded through two double pulleys well up to the mast, so that a counterweight, attached at this point,

takes up any slack in the cables where they are run along the boom. At the end of the boom, the cables enter a housing of pipe, extending about 4 ft. to one side of the boom and then down to a point just above the operator's head. From here to about waist height, they are inclosed in rubber hose. About 4 ft. of each cable projects from the hose, and each has a two-button control switch at the end, one handling the blocks vertically and the other horizontally. A metal fork is brazed to each control housing to fit snugly over the ladle handle so that the worker has one control at each hand as the pouring proceeds. When not in use, the switches are hung up on a double-forked hanger, attached to the pipe housing.

Adjustable Holder on V-Block

This V-block is fitted with a holder that clamps the work rigidly in the groove.



The holder is a steel rod, bent at right angles at the top and fitted with a setscrew for adjustment to the work. Another setscrew in the side of the block permits the holder to be raised or lowered.

Rubber Strip Keeps Tools on Ladder

Electricians and sign writers who use a stepladder in their work can prevent round tools and parts from rolling off the top by nailing a strip of inner tube around it as shown. The rubber should project above the top so that it forms a shallow tray. This will not interfere with the use of the ladder.

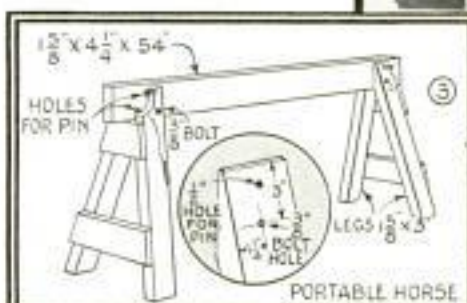


A HORSE

for every
PURPOSE

ALMOST every shop needs a pair of good sawhorses. The exact type for you depends largely upon the kind of work done, and the suggestions pictured on this page will be of help in selecting a suitable one for your purpose.

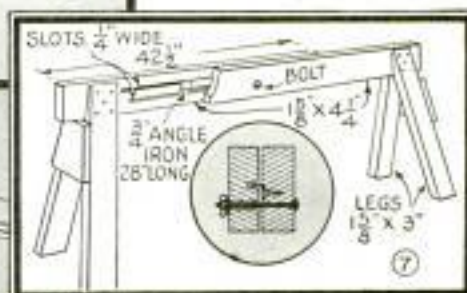
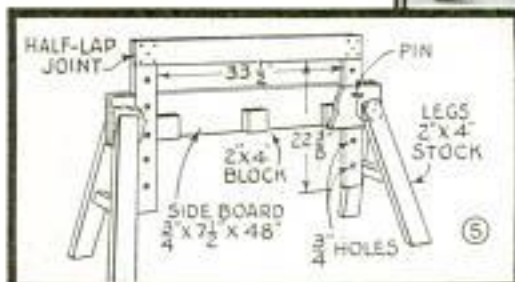
The one shown in Figs. 1, 2 and 3 is portable and easily slipped into the back of the car. Construction here is simple, with only the manner in which the legs pivot out of the ordinary, so that they can be held securely, either opened or closed, by means of wooden pins. The vertical-extension horse, Figs. 4 and 5, is familiar. Made to the size indicated, it is ideal



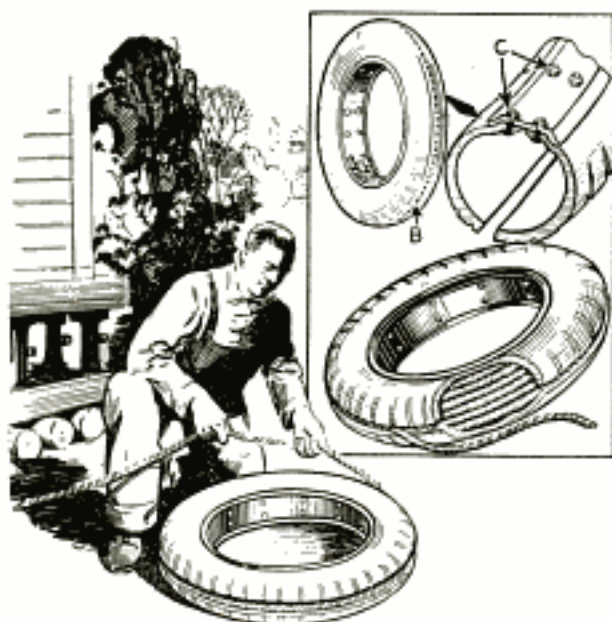
for painting and paper-hanging, and for odd jobs around the shop. When closed, the extension bar fits flush within the side boards, making the horse suitable for average work.

Figs. 6 and 7 show a horse of the horizontal-extension type. The two top members are slotted and half-slotted to make the slide and form the track for the 3/4-in. angle iron used. Carriage bolts with wing-nuts hold the width securely fixed at any setting.

Finally, the rip horse, Fig. 8: The support bar made from two pieces with an opening between, makes this trestle invaluable for doing many jobs, particularly those calling for the ripping or boring of long pieces.



Rope Reel from Old Auto Tire



Old Auto Casing Bolted to Rim and Split in Center Makes Good Reel for Rope

An old auto tire and rim can be utilized to make a rope reel. The casing is mounted on the rim and several holes are drilled, through the rim and the beading on the tire, for bolts which hold the casing rigidly in position. The tire is then split in the center and a small strip removed so that the rope can be wound inside. This reel keeps the rope covered and neatly coiled.

Simple Process of Plating with Cobalt

A protective coating of cobalt can be applied to small articles of copper or brass without the use of electricity. You will need a flowerpot and a glass jar slightly larger than the pot. Close the hole in the bottom of the latter with pitch or wax. Set the pot in the jar and insert a tall cylinder of zinc between them, resting a copper or brass rod across the cylinder from which to suspend the work with a copper wire. The bar should make a good contact with the zinc. To make the plating solution, dissolve cobalt chloride, $2\frac{1}{2}$ oz., in as little water as possible. In a separate container, dissolve Rochelle salts, $\frac{1}{2}$ lb., in as small a quantity of water as possible. Then carefully pour the latter solution into the cobalt solution until the precipitate that forms has almost dissolved; then filter the solution through a tuft of cotton. It is now ready to be poured into the flowerpot. The space between the jar and the pot is to be filled with a strong solution of ordi-

nary salt and water. Do not allow the two solutions to mix. Allow the "cell" to stand for 30 or 40 minutes before use so that the pot will become thoroughly soaked. Work suspended in the cobalt solution will acquire a fairly durable plating of cobalt in 2 hours, if the work has first been thoroughly cleaned. Boiling the work in a solution of washing soda and water will free it of grease and dirt, while rust and corrosion may be removed by immersing the article in dilute sulphuric acid to which a small quantity of nitric acid has been added. In diluting sulphuric acid, slowly pour it into the water. This pickling solution should be kept in a stoneware container and may be used repeatedly until exhausted. The plating solution will also keep if kept in a tightly corked bottle. The flowerpot should be washed after use and if kept wet, it will always be ready for use without soaking.

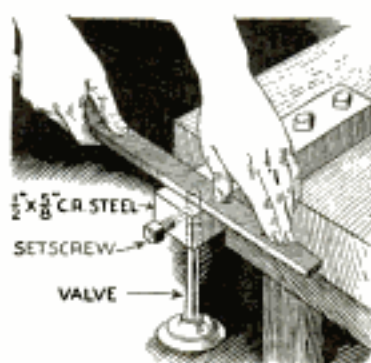
Paper Clip Used as Rule Handle



Draftsmen will save time by attaching a common paper clip to one side of their rules opposite the scale being used. The clip serves as a handle, lets the rule lie flat on one side only and helps finding the scale.

Jig for Filing Valve Stems

When equipment for clamping and holding a valve stem while filing the end is not at hand, a jig can be made from a steel block. One end is bolted to a bench and the other is drilled to take the valve stem, which is held in position with a setscrew in the end of the block.—H. L. Wheeler, Springfield, Vt.



Cement for Repairing Crucibles

A strong heat-resisting cement for repairing crucibles, or vitreous ware that is exposed to high temperatures, can be made by mixing fine brickdust and powdered fire clay. The proportions of these constituents may be varied to suit the job. However, equal proportions will produce a good all-purpose cement. Water may be mixed with the ingredients to produce a cement for a temporary job, but for permanency, it is best to reduce it to a thick consistency with a saturated solution of borax and water. When borax is used, heat converts the cement into a strong, impervious vitreous mass which has great durability.

Chain Increases Capacity of Pipe Wrench

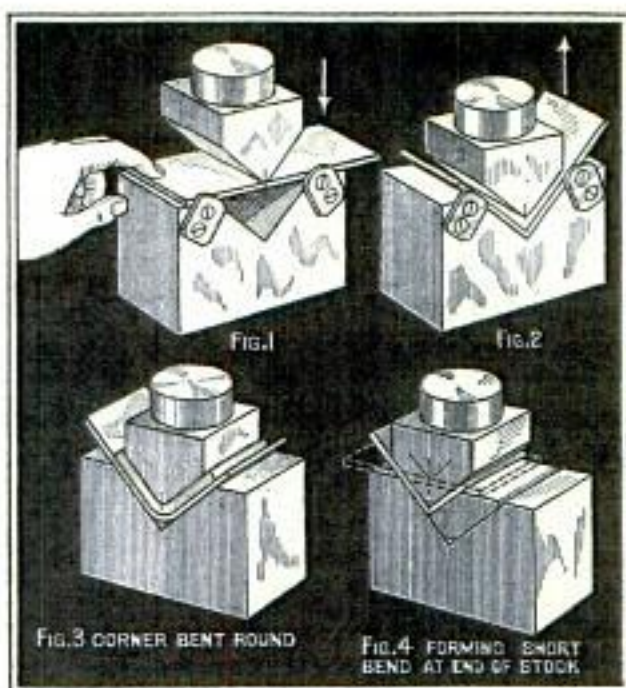
When a large pipe wrench is needed but none is available, one can be quickly improvised by using a small one in connection with a chain as shown.



The chain is wrapped around the pipe, one end is gripped in the jaws of the wrench, and the other is held in the hand. Pulling on the wrench tightens the chain so that the pipe can be turned.

Punch and Die to Bend Sheet Metal

Made from a good grade of steel, this punch and die are handy for bending flat or round iron in a press. The die is made by notching a steel block as shown, and then fitting one side with small guides for lining the work. In Fig. 1, the work is lined up for bending, while Fig. 2 shows the punch pressed down to make the bend. Fig. 3 illustrates the method used for bending work to a given radius. A piece of steel, equal in thickness to the radius, is first bent and then used underneath the punch as a pattern to get the required radius in the work. For short bends, where

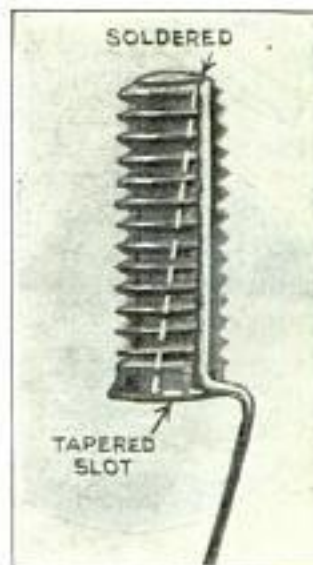


A Few Simple Dies and Punches for Bending Sheet Metal in a Press

the work does not reach across the slot, a piece is made up and placed in the die as shown in Fig. 4.—Walt Wells, Newark, New Jersey.

Special Studs Help in Replacing Crankcase on Motor

Difficulty experienced in starting the first studs in their holes, when replacing a crankcase on a motor, can be overcome by using three or four studs specially prepared for this purpose. First, cut off the head and then saw a tapered slot in the stud, lengthwise, to take a piece of piano wire, bent to the shape shown and soldered to the upper end. When these studs are screwed into holes in the motor block, the crankcase is slipped over them and is held by the wire until the studs can be started.



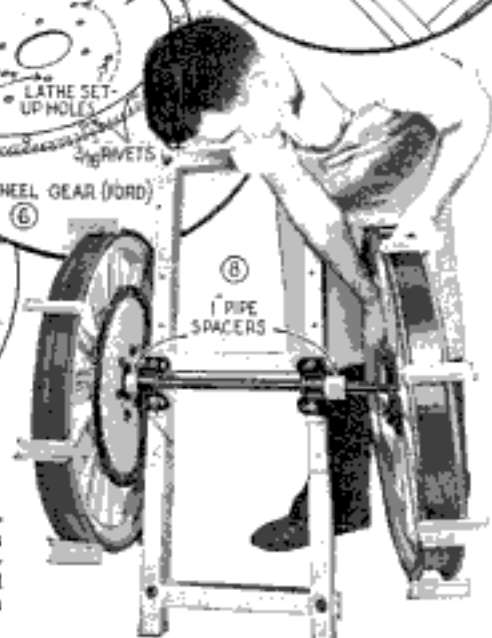
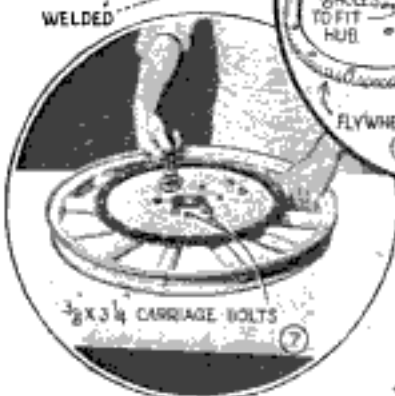
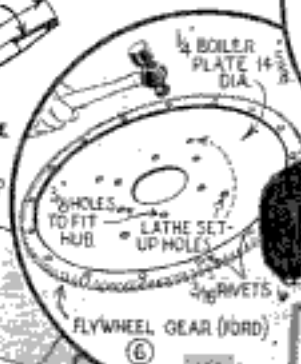
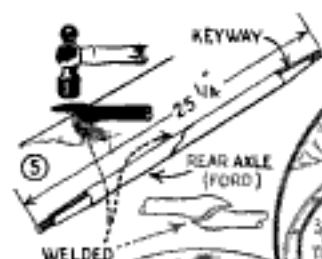
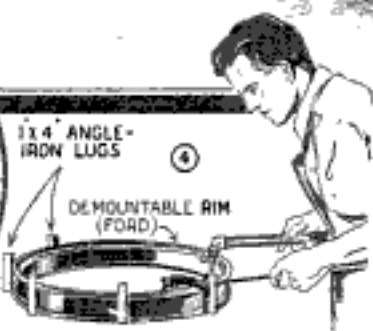
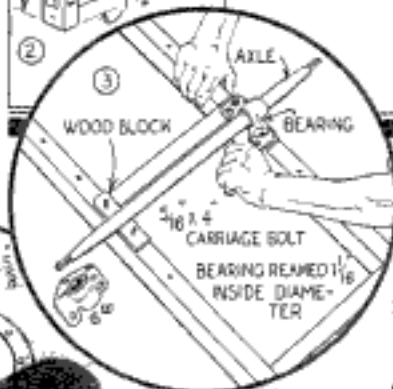
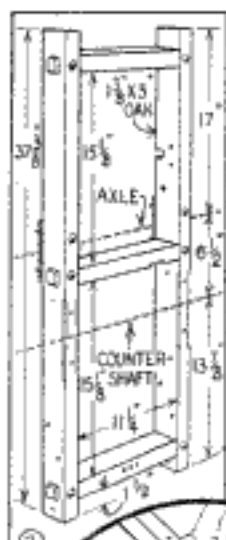
Marking the exposure time on the edge of negatives with a fountain pen will save time and paper when making reprints.



BUILD THIS SIMPLE

POWERED with a single-cylinder motorcycle engine or any motor of 2 or 3 hp., this tractor is ideal for the small truck garden. Built as shown, it is essentially a cultivator, but other units can readily be added to meet existing conditions.

Start by making the wooden frame, as shown in Fig. 2, fitting the axle to the underside by means of two bearings or spring-shackle brackets drilled to a neat fit. The axle itself is a standard Ford rear axle, welded to measure $25\frac{1}{4}$ in. long, as shown in Fig. 5. You will need a Ford flywheel gear, which is to be riveted to a disk of $\frac{1}{4}$ -in. boiler plate, inserting the rivets through the original ring-gear holes, as in Fig. 6. The plate, in turn, is bolted to a Ford rear wheel, again locating the fastenings to match the original holes, as in Fig. 7. The wheel rims should be of the demountable type, each being fitted with eight metal cleats welded into place equidistantly around the circumference, as in Fig. 4. Fig. 8 pictures the first step of the as-

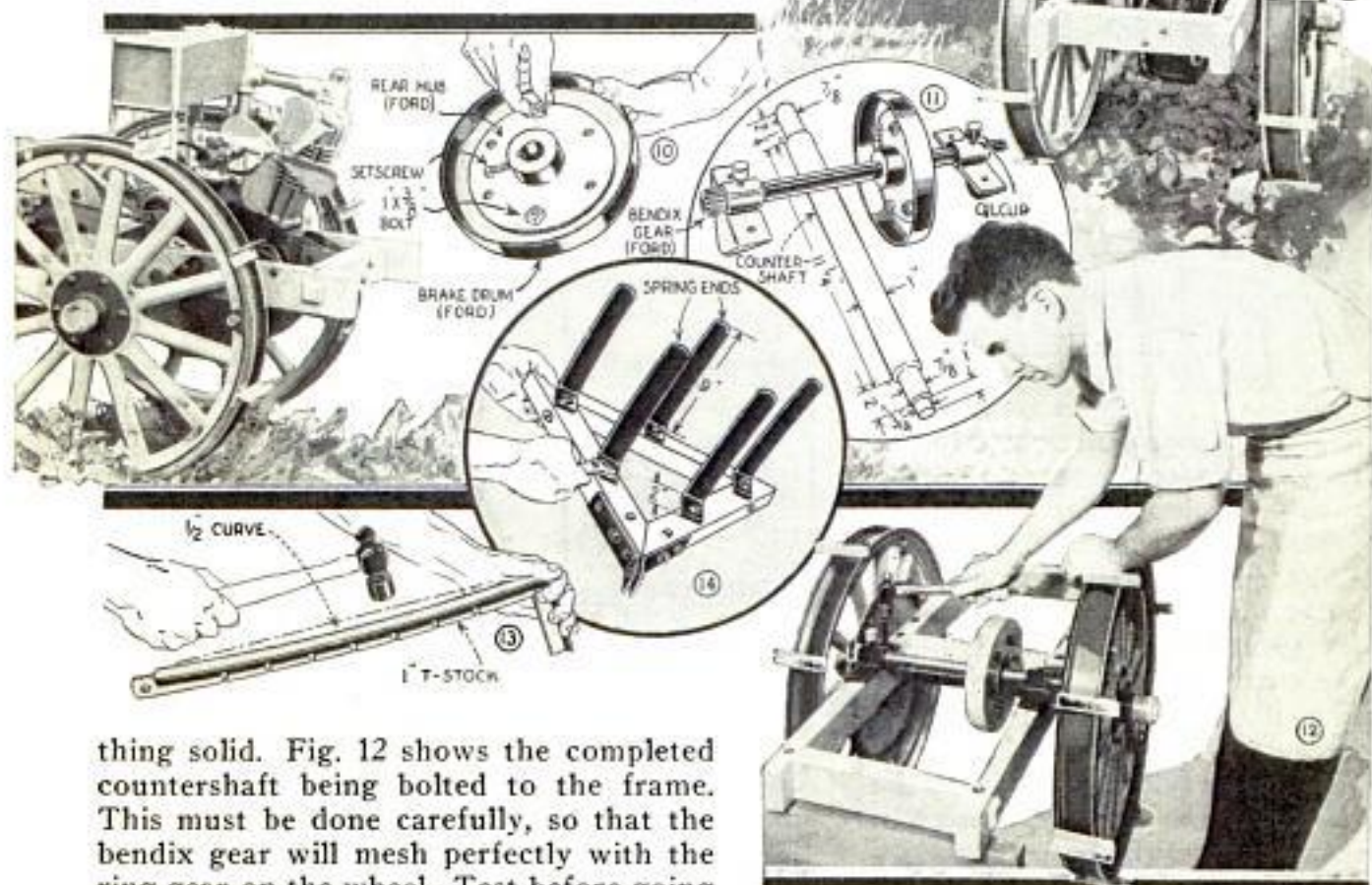


sembly. The two wheels, minus the brake drums, are fitted and keyed to the Ford axle as in the original, 1-in. pipe sections, 1 in. long, being used for spreaders, as indicated in the photograph. The next thing is the countershaft. This is turned from a Ford drive-shaft, to the dimensions given in Fig. 11. The end of the shaft, which is to take the Ford bendix gear, must be turned just a trifle oversize, so that the gear can be heated

Ford Parts and a Motorcycle Engine Are Used in Making This Simple Garden Tractor; the Manner of Fitting the Axle and Wheels to the Frame Is Shown Above

GARDEN TRACTOR..

and shrunk on. Because of the greater speed of the countershaft, it is advisable to fit grease cups on the bearings. A suitable size can be obtained from the Ford driveshaft and tapped into place. The countershaft pulley is made up according to Fig. 10, using a Ford rear hub and a Ford brake drum. Bore the hub so that it will fit tightly over the countershaft and tap for a setscrew in order to make every-

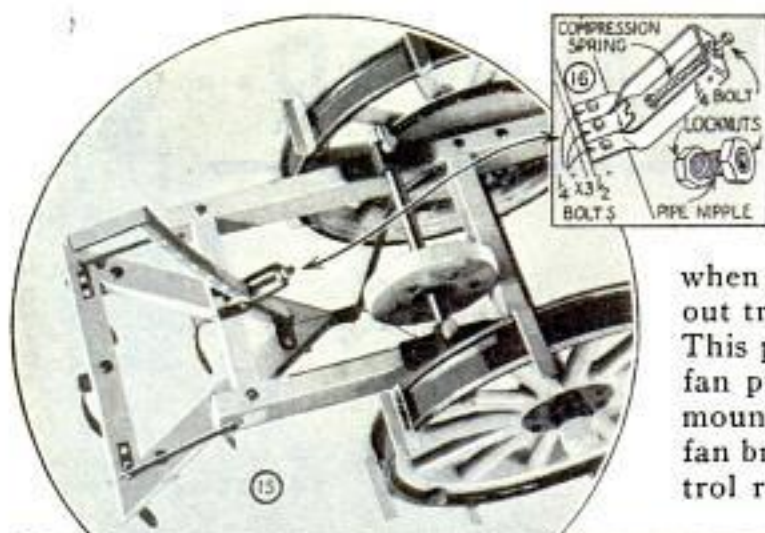


thing solid. Fig. 12 shows the completed countershaft being bolted to the frame. This must be done carefully, so that the bendix gear will mesh perfectly with the ring gear on the wheel. Test before going further by pushing the partly finished tractor backward and forward across the floor.

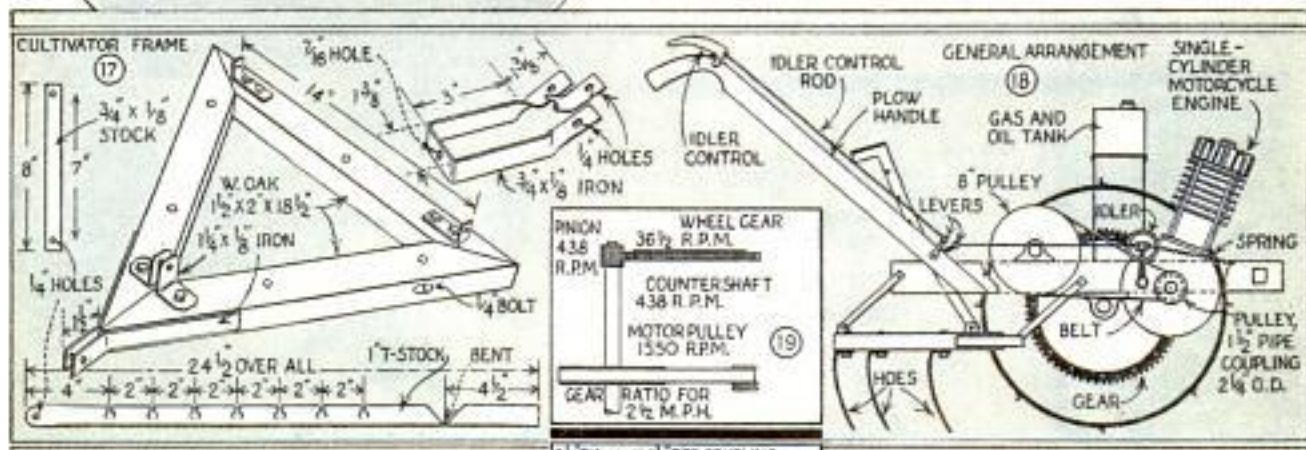
The cultivator selected is a five-tooth arrangement, intended principally for work between rows. The general details of the construction are given in Figs. 15, 16 and 17. The control arms, which regulate the depth of the cut, must be slightly curved, as in Fig. 13, in order to slide freely. The ends, cut to fit and allow bolting, the holes

forward so that each hoe will have a tendency to drag straight back when the tractor is in use. One important point here: You will notice that the cultivator is supported by two strap-iron arms at the rear and by a V-shaped hanger at the front. Be sure that these are parallel, as can be seen in Fig. 18. Otherwise, either the front or rear steels will dig in at various depths.

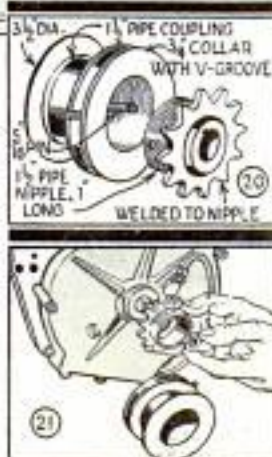
Now we come to the motor. You can get fairly good results from a $\frac{3}{4}$ -hp. motor although one of 2 or 3 hp. is prefer-



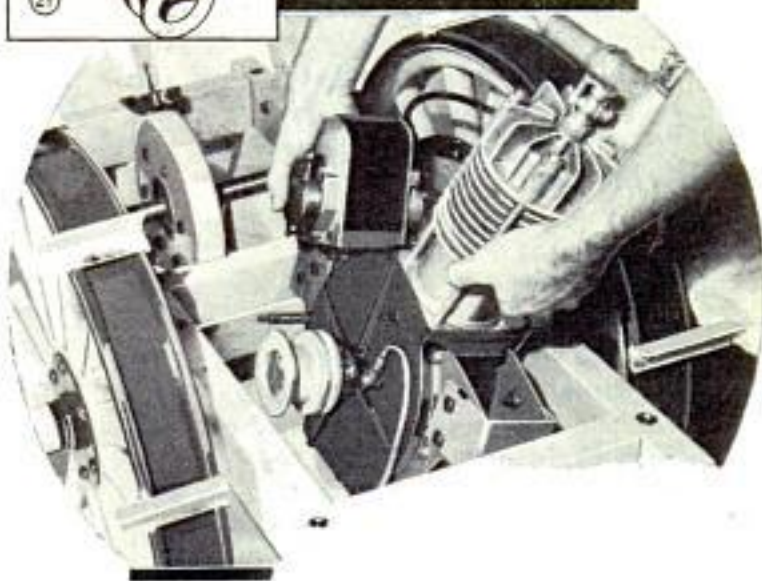
motor is mounted. Various engines will differ here, but in any case the metal support brackets should offer no difficulties. As there is no clutch on this tractor, it is evident that control must be through an idler pulley, which, when released, will let the motor run without transferring the energy to the wheels. This part of the unit is made from a Ford fan pulley, as shown in Fig. 24, and the mounting is by means of the original Ford fan bracket, as shown in Fig. 25. The control rod runs back to an L-shaped lever,



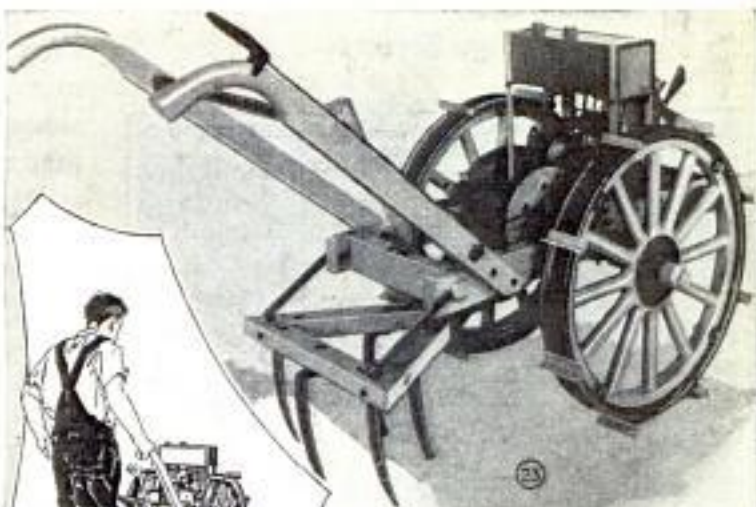
able. The motor shown here is a single-cylinder motorcycle engine, capable of developing 3 hp. and a peak speed of about 3,500 r.p.m. Thus, running at half speed, this outfit would develop a good tractor speed of 2½ miles per hour, the gearing being as shown in Fig. 19, and based on a 2¼-in. pulley at the motor end. Inasmuch as a motorcycle engine will be the choice of the average builder, a detail on how the pulley is adapted is given in Figs. 20 and 21. The original sprocket is removed and a 1-in. length of 1½-in. pipe nipple is brazed into place. This is turned into a length of 1½-in. pipe coupling, which, with the flanges shown in Fig. 20, make the actual pulley. The V-groove on the heavier flange makes the take-off to the air-circulating fan. In mounting the completed pulley, the original shaft key and nut are used as before, as shown in Fig. 21. Fig. 22 details how the



made from automobile gas-control fittings, and then up the plow handle to another lever taken from an automobile emergency brake. In use, a spring holds the idler clear, motive power being obtained by depressing the control lever so that the idler is forced



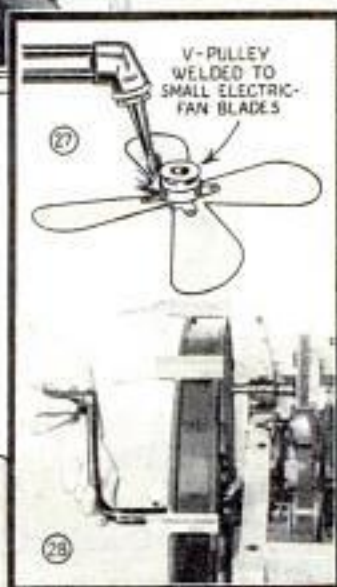
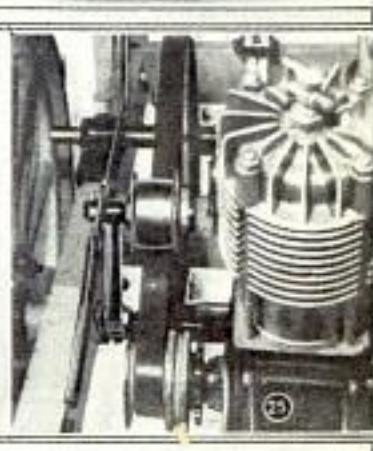
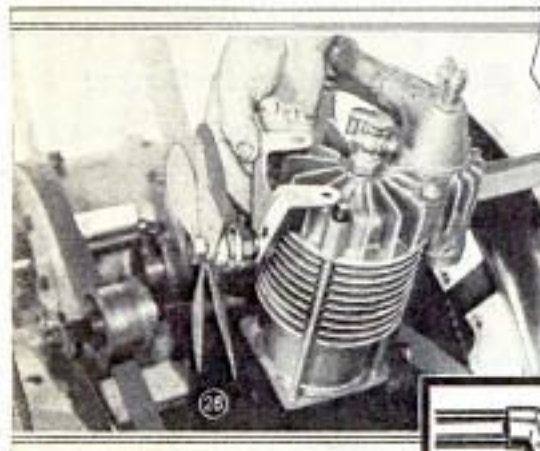
against the belt. Notice, in Fig. 27, that the circulating fan is simply a small electric fan coupled with a small V-pulley. The whole unit is held with a suitable bracket from No. 16-gauge metal stock clamped to the top of the cylinder, as in Fig. 26. Starting is done by inserting the crank between the spokes of the wheel to engage the pin inside the motor pulley, as shown in Fig. 28. The gas and oil supply is carried in a small tank mounted with flat-iron stock, as



FAN PULLEY (FORD)



SHOULDER MACHINED OFF TO MAKE IDLER PULLEY

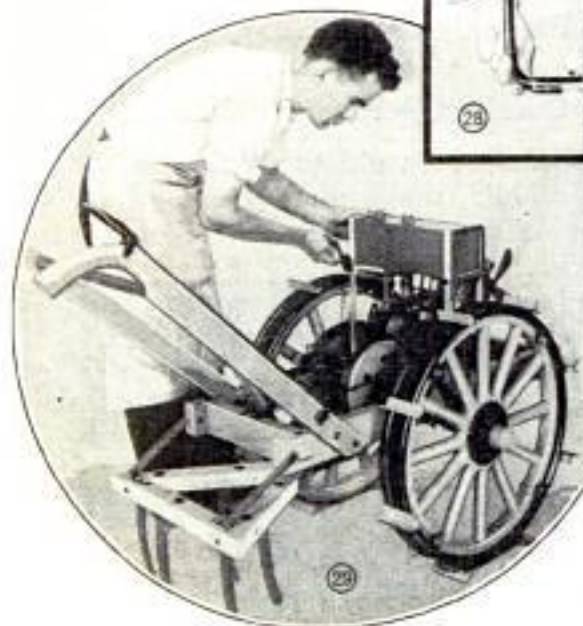


V-PULLEY WELDED TO SMALL ELECTRIC-FAN BLADES

shown in Fig. 29. This can be made from galvanized stock to fit, or any small tank can be adapted for the purpose. Don't forget the paint. Of course, it doesn't make the thing run any better,

but it does stamp your work as well done.

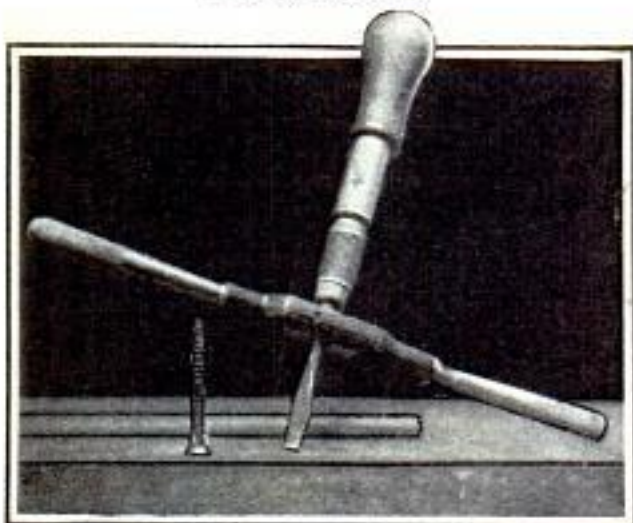
In constructing this garden tractor, it is advisable to follow the instructions in all details, using the various parts that have been recommended. Where these are not available, other similar parts may have to be substituted and, in this case, it may be necessary to deviate from the exact mounting arrangement shown.



MATERIAL LIST

- | | |
|---|---|
| 1. 10 ft., 1½ by 3-in. Wh. Oak, for frame | 16. ½-in. Pipe Nipple |
| 2. One Axle (Ford rear) | 17. Two ½-in. Locknuts |
| 3. Four Spring-Shackle Brackets | 18. 5 ft., 1½ by 2-in., Oak |
| 4. Two Wheels (Ford rear) | 19. One Fan Pulley (Ford) with Bracket |
| 5. 7 ft., 1-in. Angle Iron | 20. Small Electric Fan |
| 6. ¼-in. Boiler Plate, 15 in. square | 21. Small V-Pulley |
| 7. Ring Gear (Ford) | 22. Two Gas Control Levers (from any car) |
| 8. One Rear Hub (Ford) | 23. 5 ft., ½-in. Rod |
| 9. One 8-in. Brake Drum (Ford) | 24. Emergency Brake Handle (from any car) |
| 10. One Driveshaft (Ford) | 25. Two Plow Handles |
| 11. Three Spring Leaves (1½ in. wide) | 26. One Bendix Gear (Ford) |
| 12. Strap Stock for Cultivator | 27. Motor, Motor Mount, Fastenings and Small Items to Complete Assembly |
| 13. 25 in., 1-in. T-Stock | |
| 14. 1½-in. Pipe Coupling | |
| 15. ½-in. Pipe Nipple | |

Tap-Wrench Handle Aids in Driving Large Screws



Driving Large Screws Is an Easy Task with a Tap-Wrench Handle and Ratchet Screwdriver

To drive large screws more easily, use a tap-wrench handle on a ratchet screwdriver, the shank of which is squared about 2 in. from the point so the handle will hold. An ordinary screwdriver will do for this purpose, but is not as convenient as one with a ratchet attachment.—W. C. Wilhite, Hornsby, Ill.

How to Reline and Fit Brakes

A neat job of relining internal-expanding brake bands can be done by measuring the length of lining required and then adding enough to allow for riveting the ends together to form a band, which is then forced tightly over the brake shoe like stretching a tire over a clincher rim. When the lining is properly located on the band, riveting is done in the usual way, after which the ends of the lining are cut off flush with the ends of the shoe. For external-contracting brakes, the lining is cut a little longer than the actual measurement of the shoe. The extra length needed will be about $\frac{1}{4}$ in. for each foot of the lining used. The ends are riveted in their proper positions flush with each end of the shoe. This is done by allowing a loop to form in the lining, which is hammered outward against the steel band so that the lining will hug the band tightly at all points, eliminating sagging spots between the rivets. After relining the shoes, they may be fitted to the exact curvature of the drum by laying the wheel down with the brake drum uppermost, and contract-

ing the band, if an external one, around the drum by hand. The high spots are removed by laying the band, with the lining side up, across two parallel bars and hammering directly on the lining. The low spots are made to touch the drum by either hammering lightly against the band while it is held in place on the drum, or by laying the band across a narrow block of wood clamped in a vise and flattening the band slightly as needed. An internal-expanding band may be fitted in a similar manner, expanding the band by hand or by the use of some suitable tool on the inside of the drum.

Drilling Bent Hole in Copper

On a job where a bent hole was to be drilled through a piece of copper, the operation was done as follows: The copper was heated and then bent to the shape shown in the upper detail, after which the



hole was drilled halfway through from each end. Sand was next packed in the hole, and the two ends plugged with capscrews. Then, the copper was reheated and bent back to its original shape, after which the capscrews and

sand were removed, leaving a crooked hole of the shape shown.—Charles Kugler, Philadelphia.

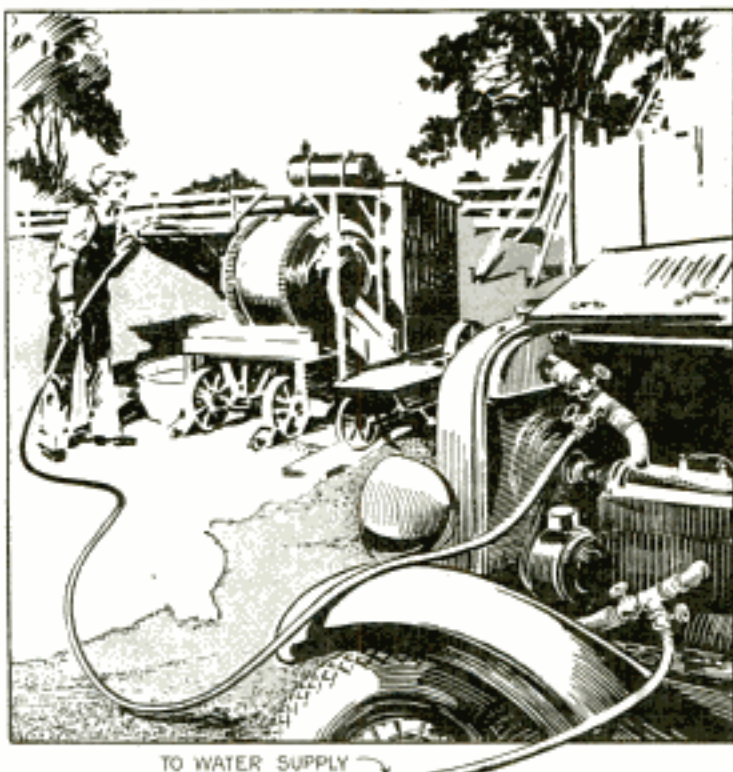
Overload Springs for Auto Truck

Leaves of an old car spring, broken in the middle, make good overload springs when attached to the frame of a small truck. The end of the longest leaf should project over the axle housing, on which a metal plate is welded to take the wear. Two U-bolts are used to attach the spring to the frame.



Lime on Floor Improves Photos

Commercial photographers who take pictures of machinery for manufacturers can increase the appeal of their work by using lime on the floor in order to produce a contrast against the dark parts and bring out the details of the machine better. After the background and machine have been placed, spread the lime evenly over the floor, covering the entire range of the lenses. This is best done with a broom, being careful to cover all bare spots and to walk ahead of the broom while you are brushing the lime. After the floor has been covered, lightly sweep all the excess lime to one side. If the floor is oily, the treatment is the same excepting that more lime is used. In some cases it may be advisable to have the camera set before applying the lime to an oily floor and take the photo as soon afterward as possible.—Melvin Kennard, Gasport, N. Y.



Installing Shut-Off Valves in Radiator Hose Lines Permits Car to Be Used for Occasional Pumping Jobs

Pumping Water with Automobile

Your automobile water pump can be used for small jobs, such as supplying water for a concrete mixer, draining flooded basements, etc. Connect two shut-off valves and an outlet in each water hose on the car, as shown. In use, a garden hose is connected to each outlet, the valves are closed to stop circulation through the radiator, and the valves to the outlets are opened. While this arrangement would be too costly for continuous work, it is a good installation for occasional use when regular equipment is not available.

Leak in Wooden Tank Repaired with Wedge

Leaks in wooden tanks, caused by rotted staves, can often be repaired with soft-wood wedges.

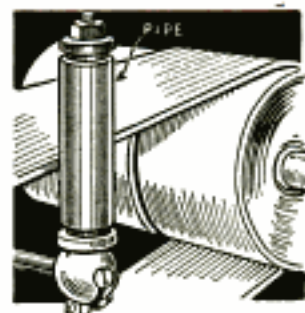


A chisel is first driven into the stave close to the leak, to spread the wood so the wedge can be started. Driving the wedge into the stave closes the leak. More than one wedge may be required if a large portion

of the stave is decayed.—N. R. Baker, Westport, Ind.

Pipe Improves Belt-Shifting Finger

Belt-shifting fingers soon become grooved from the rubbing of the belt. This trouble can be eliminated by fitting a short section of pipe loosely over the finger, to provide



an anti-friction roller for the belt. Oiling at frequent intervals will farther reduce friction and increase the life of the roller.

Plaster-of-paris articles can be given a glossy, hard finish by painting them with water glass in an equal amount of water.

A CLASS in English was given the task of writing four lines of dramatic poetry. One boy wrote:

"A boy was walking down the track,
The train was coming fast.
The boy stepped off the railroad track
To let the train go past."

The effort was returned with the comment that there was no drama; it was too commonplace. After long concentration our author submitted the following:

"A boy was walking down the track,
The train was coming fast.
The train jumped off the railroad track
To let the boy go past."

"Mother," asked little Jack, "is it correct to say that you 'water a horse' when he is thirsty?"

"Yes, dear," replied his mother.
"Well, then," said Jack, picking up a saucer, "I'm going to milk the cat."

The captain of an American negro company said that he needed a good bugler, and that if there were any in the company they should step one pace forward. One wizened little fellow shuffled to the front.

"Are you a good bugler?" asked the captain.

"No, suh, I'se no bugler," the private declared, as if he'd been insulted.

"Well, for the love of the army and navy, why did you step forward?"

"Well, suh," grinned the little fellow, "I thought you said burglar."

Card in Florida paper: "Thursday I lost a gold watch I valued very highly. Immediately I inserted an ad in your lost and found column and waited. Yesterday I went home and found the watch in the pocket of another suit. God bless your paper."

After carefully inspecting the car the prospective purchaser shook his head. "I'm afraid your make of car doesn't suit us," he told the salesman. "My fiancée cannot reach the brake and the steering-wheel at the same time."
"But the car is perfect, sir," said the salesman. "Why not try a new girl?"

Saleslady: "This is the last word in millinery."
Mr. Knagg: "If it's the last word my wife will have it."

Boy (at zoo): "Why has the giraffe such a long neck?"
Sister: "Because his head is so far away."

George: "Delancey tried to make me believe he'd driven the same car for five years and never paid a cent for repairs. Do you believe it?"

Garageman: "Yes, I'm the fellow who made all the repairs."

"Is it true that the famous equilibrist and slack-wire performer has gone insane?"
"Yes, he tried to balance his household budget."

Father: "What, you paid \$3 for an old laying hen?"
Boy: "Yes, father, I wanted one that was experienced."

Professor: "Yes, my dear young lady, but do you realize that Christopher Columbus went 2,000 miles on a galleon?"

Girl: "Well, I dare say—but I don't believe all the tales I hear about these American cars!"

An Aberdonian had been visited on several occasions by the doctor. In due course he received the bill. On paying it he demurred over the amount.

"It's right enough," said the doctor. "I paid seven visits to your home."

"I ken that," was the reply, "but on the last visit I cam oot tae the front gate when ye arrived."

The young man had just proposed.

"No!" she replied. "A thousand times, no!"

"Well, don't rub it in," he retorted. "I only asked you once."

"Do you know," said the little man, "that your great big hulking brute of a bulldog killed my wife's dear little unoffending pet poodle?"

"And what about it?" asked the big man, defiantly.

"Well," said the little man, looking around carefully to see that nobody was spying, "would you be offended if I presented your dog with a new collar?"

"Now see if you can laugh that off," said the fat man's wife as she finished sewing the new button on his vest.

Would-be Suicide: "Don't pull me out; I want to die."
Rescuer: "And I want a medal. You'll have to let your dying go until tomorrow."



"Doctor, do you think I'll get better?"
"Yes, you have only a high fever, but that doesn't worry me."
"Well, if you had a high fever, it wouldn't worry me."

ANSWERS TO LAST MONTH'S PUZZLES

Since a brick balances evenly with nine-tenths of a brick and eight-tenths of a pound, it is evident that one-tenth of a brick weighs eight-tenths of a pound, and a whole brick, eight pounds. Calling the number of bricks in a hoil X, we deduce the following equation: $4X + 4 + 26 = 6X + 6$, which, solved, gives 12 as the number of bricks in a hoil.

The baseball player went from home to first in $5\frac{1}{4}$ seconds; from first to second in $8\frac{1}{4}$ seconds; from second to third in $7\frac{3}{4}$ seconds, and from third to home in $9\frac{1}{4}$ seconds. Whatever difference existed between the first three-quarters and last three-quarters of the run, must have been due to difference in time between the run to first and the run from third to home. Since this difference was 4 seconds, we will call the time from home to first, X seconds, and the time from third to home, $X + 4$ seconds. The time from second to third would be represented by $X + 2$ seconds, since it was

2 seconds slower than from home to first. First to second, being one second faster than from third to home, would be $X + 3$ seconds. The time of the round trip, 30 seconds, thus equals $4X + 9$ seconds, so the time in going from home to first, X seconds, must have been $5\frac{3}{4}$ seconds.

Let us call John Smart's original capital X. After the first race he had left, $X - \$324$. Losing one-third of his balance on the second race, left him with two-thirds of $X - \$324$, or $2X - \$648$, divided by 3. Losing one-fourth of his cash in hand on the third race, left him with three-quarters of $2X - \$648$, divided by 3, or $6X - \$1,944$, divided by 12. He wagered his entire balance on the fourth race at 4 to 1, and won, which restored his original capital. Since four times the balance, plus the balance, equaled the original bankroll, we can set down the equation: $30X - \$9,720 = 12X$, or $X = \$540$, the sum with which he started.

c 190

Sam Loyd 153 Halsey St. Brooklyn NY

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EASTMAN NEWS BULLETIN FOR THE

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A 4-MINUTE MOVIE IN THE HOLLOW OF YOUR HAND. Photograph at left shows the remarkably small size of the 25-foot Ciné-Kodak Eight movie film roll. Equal in running time to a full 100 feet of usual amateur movie film, this compact, convenient roll can be stowed away in a watch pocket. And it produces clear, flickerless movies of startlingly realistic quality. New in principle, new in price, this 25-foot roll at \$2.25 makes two dozen or more movie scenes, averaging as long as those you see in standard theatre productions, at a cost of less than 10 cents a shot.

A new Eastman movie camera—the Ciné-Kodak Eight—makes this economy possible. The film is run through the camera twice, pictures being taken on but half the width of the film each time. The 25-foot 16 mm. film is then processed by Eastman without further cost, slit and spliced, and returned to you as a 50-foot 8 mm. film ready to project. The extremely fine grain emulsion of the new Ciné-Kodak Eight film holds fine detail in the tiny images and makes possible clear, brilliant movies of adequate size for the ordinary living room.

FINDERS INTEGRAL WITH HANDLE. Flip up the handle, the finders automatically jump into place. One of the many ingenious features you'll find only on Ciné-Kodak Eight, shown at right. High-grade finder lenses produce a clear, brilliant image to guide your shots. You sight at eye-level, the most convenient way to follow fast action. With this \$29.50 camera and its low-cost film you can make excellent movies at little expense.



MINIATURE MASTER OF LIGHT AND SPEED. Kodak Pupille (below) makes sixteen exceptionally sharp negatives, capable of great enlargement, on a roll of Kodak No. 127 (Vest Pocket) Film. The Pupille's lens is the ultra-fast Schneider Xenon $f.2$ Anastigmat; its shutter is an 8-speed Compur. A detachable range finder shows distance to object. A revolving scale (below, right) indicates the depth of focus obtained at any distance with different lens openings. Price of Kodak Pupille, complete with leather case, range finder, and 2 color filters, \$75.



NOTE HOW EASY TO THREAD. The Kodascope Eight projects the movies you make with the Ciné-Kodak Eight and the new film described above. Note the small size of the reels (only 5 inches in diameter) which run for more than 16 minutes. Easy threading, brilliant, steady projection, and rapid rewinding are features of the Kodascope Eight. Model 25 (illustrated), \$34.50. Other Kodascope Eight models, \$22.50 and \$75. A booklet describing these new projectors and other 8 mm. equipment will be sent you on request.

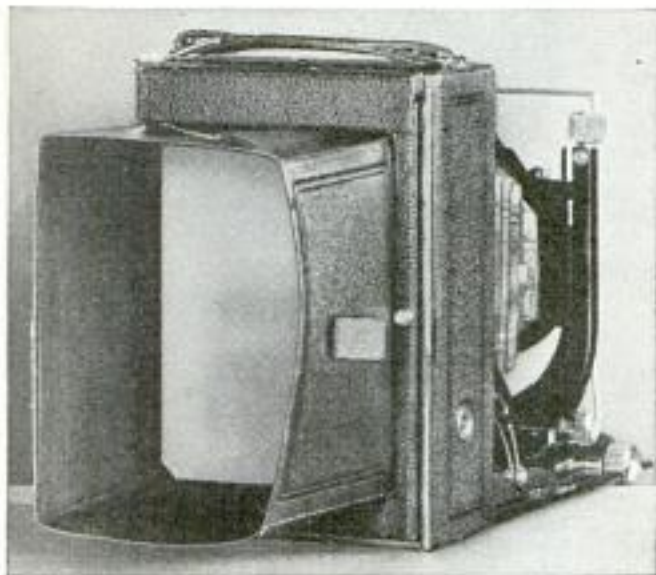


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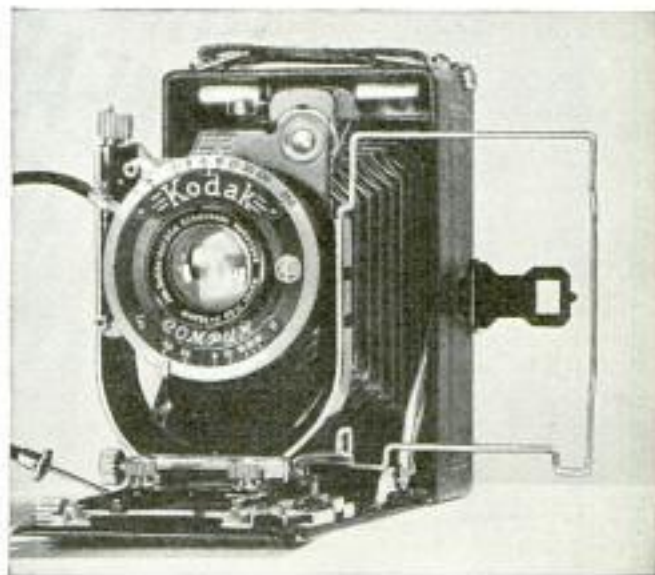
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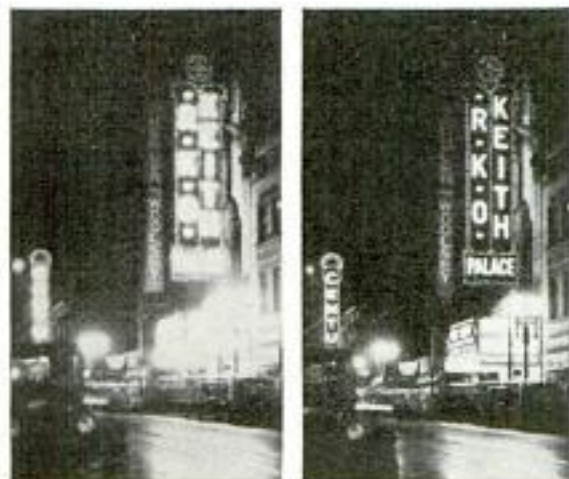
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WHAT A DIFFERENCE FILM MAKES! Here's a graphic demonstration of what superior film can accomplish. Note the absence of halation in the night picture at the right above, made on Kodak Verichrome Film. Compare it with the picture at the left, made on ordinary film. The difference is due to Verichrome's special non-halation backing which absorbs stray reflected light that causes the halation blur. This same freedom from halation is found in the highlights of Verichrome pictures made in daylight, especially in bright sun. Not only are highlight outlines made sharper, but tone contrasts throughout the picture are improved by Kodak Verichrome's color sensitivity and exposure latitude, which hold more detail in highlights and shadows.

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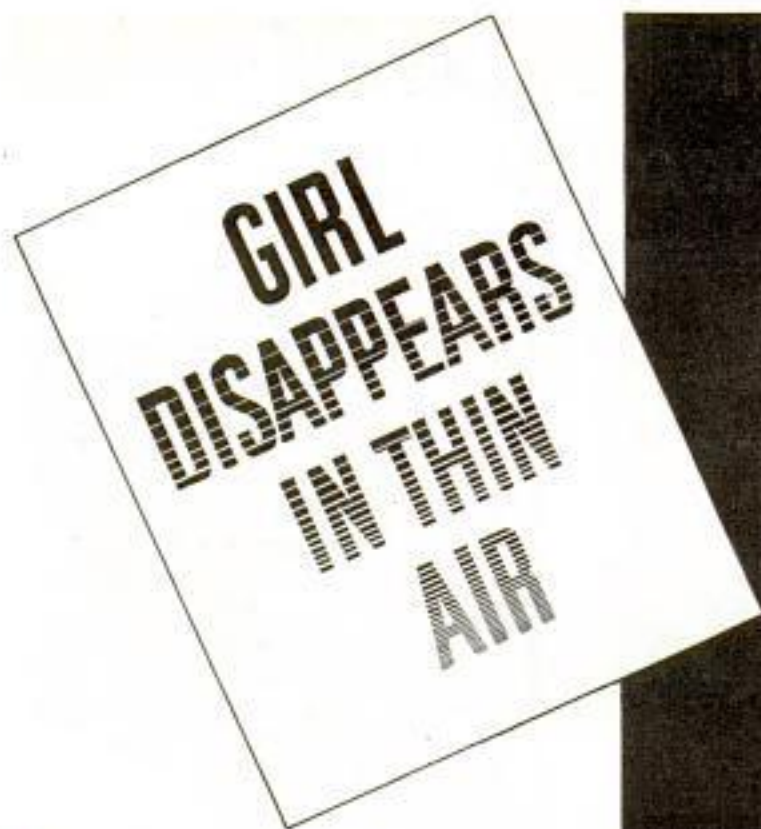
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The Oriental girl reclines on a sheet of plate glass supported by two slaves. The magician waves a white sheet in front of the pretty maiden...pronounces a few magic words...Presto! She has *disappeared* in thin air.

EXPLANATION:

One of the "slaves" is a *hollow dummy*. When the magician holds up the sheet the lithe little lady disappears completely...into the convenient figure of the dummy.

**IT'S FUN TO BE**

There is also a trick of cigarette advertising, whereby a few magic words are used to create the *illusion* of "Coolness."

EXPLANATION: Coolness is determined by the speed of burning. *Fresh* cigarettes, retaining their full moisture, burn more slowly... smoke cooler. Parched, dry cigarettes burn fast. They taste *hot*.



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fresh cigarette, made from *costlier* tobaccos.

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Try Camels...give your taste a chance to sense the difference. You'll appreciate it!

CAMELS

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TOBACCOS

IN A MATCHLESS BLEND

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**Try This New Kind of Wood That
Does Everything Glue or Putty
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You can do almost anything with this new kind of wood that handles like soft putty and quickly hardens into wood—waterproof, weatherproof wood you can carve, turn, paint—wood that takes and holds nails and screws

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Even if your fingers are all thumbs you can do an expert job with PLASTIC WOOD—seal cracks, hide nicks, mend breaks, anything that glue or putty used to be



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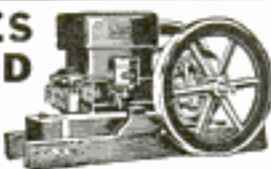


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**WITTE
ENGINE WORKS**

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Kansas City, Mo.

CAN YOU BETTER YOUR LUCK?

(Continued from page 517)

by the venturesome one, if he feels lucky, he will continue to play.

Doctor Free took apart a slot machine bit by bit, demonstrating the laws of probability in averages in connection with it. He found that the chances of winning a jackpot were one in a thousand, and he tabulated all other possible winning chances from the jackpot to the two-slug payout which averaged sixty times in each one thousand times played.

In spite of this demonstration a survey conducted afterward at the university disclosed that eighty per cent of the male students questioned would continue to play, thirty-five per cent of them believing that in spite of the 1,000-to-1 chance, they would be lucky enough to win the jackpot. Of the women students questioned, fifty per cent admitted that they had tried the machines previously, but after hearing the reports, only ten per cent of them said that they would try the machine again.

If the desire for personal financial gain does not always influence you to gamble, then what does? Two other human traits have been found, either or both of which contribute to your gambling habits. The first is associated with the desire to dramatize yourself or to humiliate your fellows. Today it is in evidence in many ways, from the ordinary parlor game, which you do not play for money, to the freak bet which you make at election time. The other trait is the desire to experience the exhilaration of successful conquest. A sailor making a successful, though dangerous cruise; an explorer discovering a new land, or a statesman putting through a treaty, all are greatly motivated by this.

The fact that you feel lucky in a game shows that you possess a degree of aggressiveness and venturesomeness which may be lacking in your daily business life although it is revealed in your play. Science has established the fact that, when you have this lucky feeling, you are prepared to face great odds. Instead of stifling your lucky feeling, or wasting it in games of chance the law of averages proves you cannot win, you should divert it into more profitable and constructive channels. When you combine this take-a-chance instinct with proper training in your chosen profession, you can use it with your lucky feeling in really bettering your luck.



Spring Oil-Change?

■ Do you want to save money on repair-bills? Get long-term mileage? Let an engineer tell you the importance of proper lubrication:

"Because of the outcome of a series of tests made during the war for the purpose of selecting oils that were suitable for airplane engines, I have been a constant user of Quaker State.

"My guide to motor lubrication is the speedometer. Every thousand miles, I change oil. I never add any between changes. Spring and Fall, I change the grade from and to Cold Test. That's all.

"My 1925 Cadillac, speedometer reading 65,000 miles approximately, has never had any engine repairs. I also drive a 1929 La Salle, speedometer reading 36,000 miles approximately. Both engines run smoothly and quietly, pick up quickly, and climb the hills in high. Up-to-date I have not spent a cent on either engine, and I attribute this trouble-free performance to Quaker State and methodical lubrication.

"There is so much confusion in the minds of the public about motor oils

that I thought perhaps you would like to have the actual experience of a real long-time user."*

When you give your motor its Spring clean-up, change to Quaker State Motor Oil and stick to it. It's a money-saver.

Avoid common oil. Every gallon averages about 3 quarts of motor lubricant and 1 quart "light-end" oil. This light-end oil burns up in high-speed, high-compression cylinders after a hundred miles or so.

Quaker State takes out this light-end material... at the refinery. You get 4 quarts motor lubricant per gallon, net. After a hundred miles or so, you still have 4 quarts.

Look for the Quaker State sign. Most places now supply Quaker State from the patented green-and-white drum... double-sealed at the refinery.

QUAKER STATE MOTOR OILS and Superfine Greases

*What's your experience? Write us.
Quaker State Oil Refining Co., Oil City, Pa.

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Whether water is choppy or glassy-smooth, an Old Town glides on an even keel . . . banks beautifully on the turns. Get a free catalog. See the many models for every use. Sporting boats. Big, fast, all-wood seaworthy types for family use. All kinds of canoes; rowboats; dinghies. Lower prices. Write today. Old Town Canoe Co., 444 Main St., Old Town, Maine.

"Old Town Boats"

\$2.00

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You can turn candlesticks, lamp bases, cigar holders, spindles, vases, etc., etc., on "The Giftmaker" 2-speed wood lathe. Runs from your treadle or fractional H. P. motor. Fits used for its expensive, smooth running lathe. Both face plate and driving dog attachments included; also list of 30 articles possible to turn on "The Giftmaker." Sent postpaid for \$2.00. C.O.D., \$2.25; outside U.S.A., \$2.50.

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CAN WE CHANGE THE WEATHER?

(Continued from page 572)

that climate may be influenced by the absence or presence of vegetation. Broadly speaking, trees cause lower temperatures and increase precipitation.

Have you ever noticed the drop in temperature on driving past a green golf course? Or observed, on a hot, windless afternoon, that it is always cooler and there is always a little breeze in a group of trees? The constant evaporation on leaf surfaces has a cooling effect on the atmosphere. The temperature is always lower over forests than over desert lands. Aviators flying low at slow speeds experience definite bumps with every change of greenery below them.

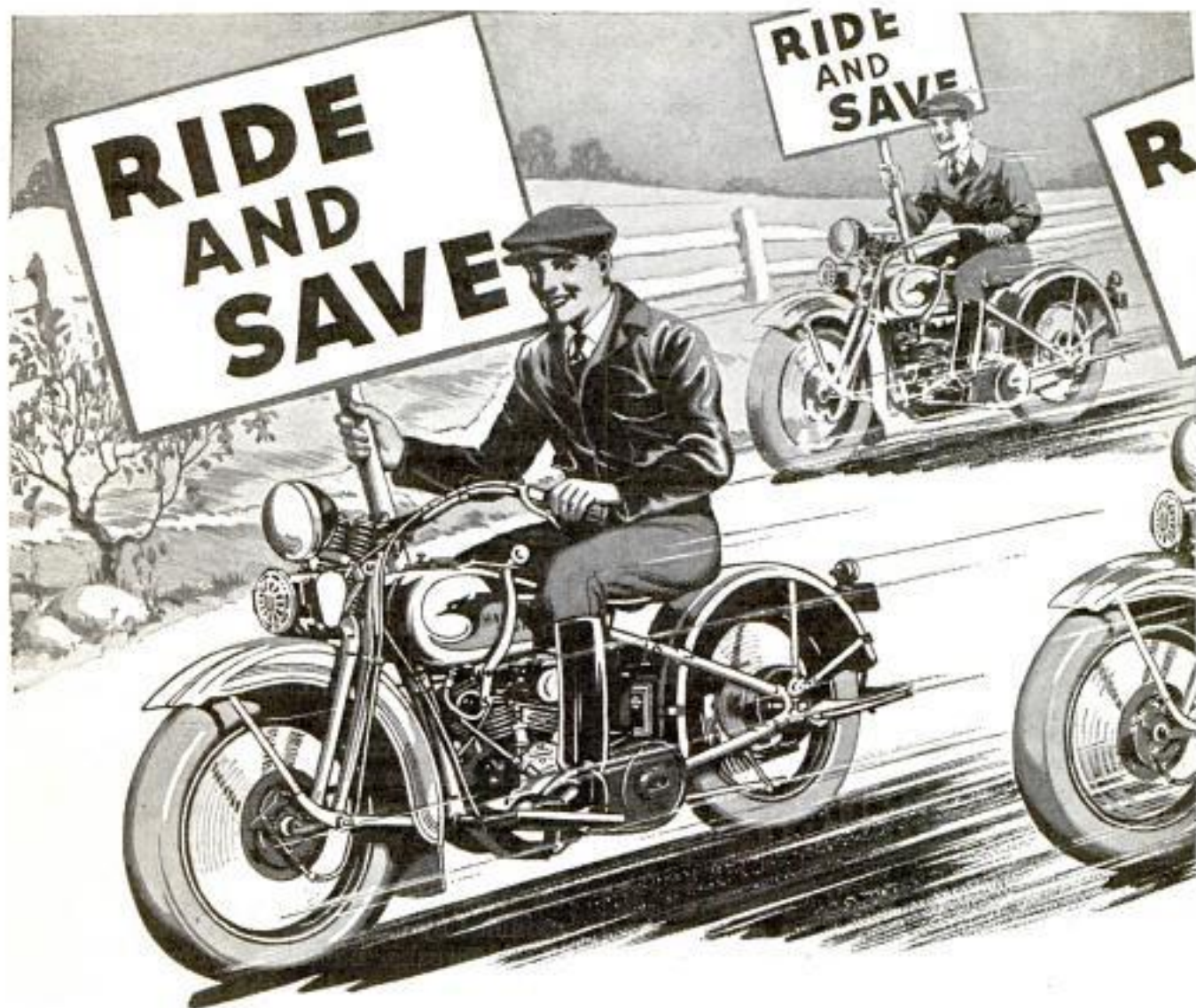
Not only do trees transmit water vapor into the air, but they attract it. In the office of George H. Barnes, chairman of the American Green Cross, are some interesting records of what trees, or the lack of them, have done to climate.

"A few years ago," says Mr. Barnes, "an American rubber company cleared 300,000 acres in the tropics for a huge rubber plantation. Crews of natives were put to work, and the whole region was denuded. But the rubber trees that were planted never matured, for the rainfall suddenly diminished to a fraction of its former volume. When the jungle was cut down, evaporation ceased and the atmosphere became warmer. Since warm air can normally hold more moisture than cool air, clouds that were blown into the area retained their moisture and hardly any rain fell. More experienced planters in the same area, having learned this to their cost, clear and plant one small grove at a time so that the general atmospheric conditions are not affected."

Long-period observations in Europe indicate that rainfall is always heavier at the edges of forests than on cleared areas, and that the precipitation in the interior of forests is greater still. At some stations the forest rainfall exceeds the rainfall on cleared regions by twenty-five per cent. In Russia, 5,000 acres of barren steppes were planted to trees, after which the local rainfall increased five inches a year.

The degree to which vegetation reduces temperature is seen in a graphic example from the west. "Twenty years ago," says

(Continued to page 122A)



RIDE A MOTORCYCLE—because it's wonderful sport—because it's healthful and sensible—because it saves money, saves time, saves energy.

Join the Jolly Riders in their evening spins, club runs, and glorious vacations. Harley-Davidson enthusiasts all, eager to welcome you into their fraternity of sport. Nobody has a better time—and it costs so little!

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FREE CATALOG

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Fully illustrated, showing footwear and clothing for camping and fishing. Also other specialties for camper and fisherman.

L. L. BEAN

217 Main St., Freeport, Maine

CAN WE CHANGE THE WEATHER?

(Continued from page 120A)

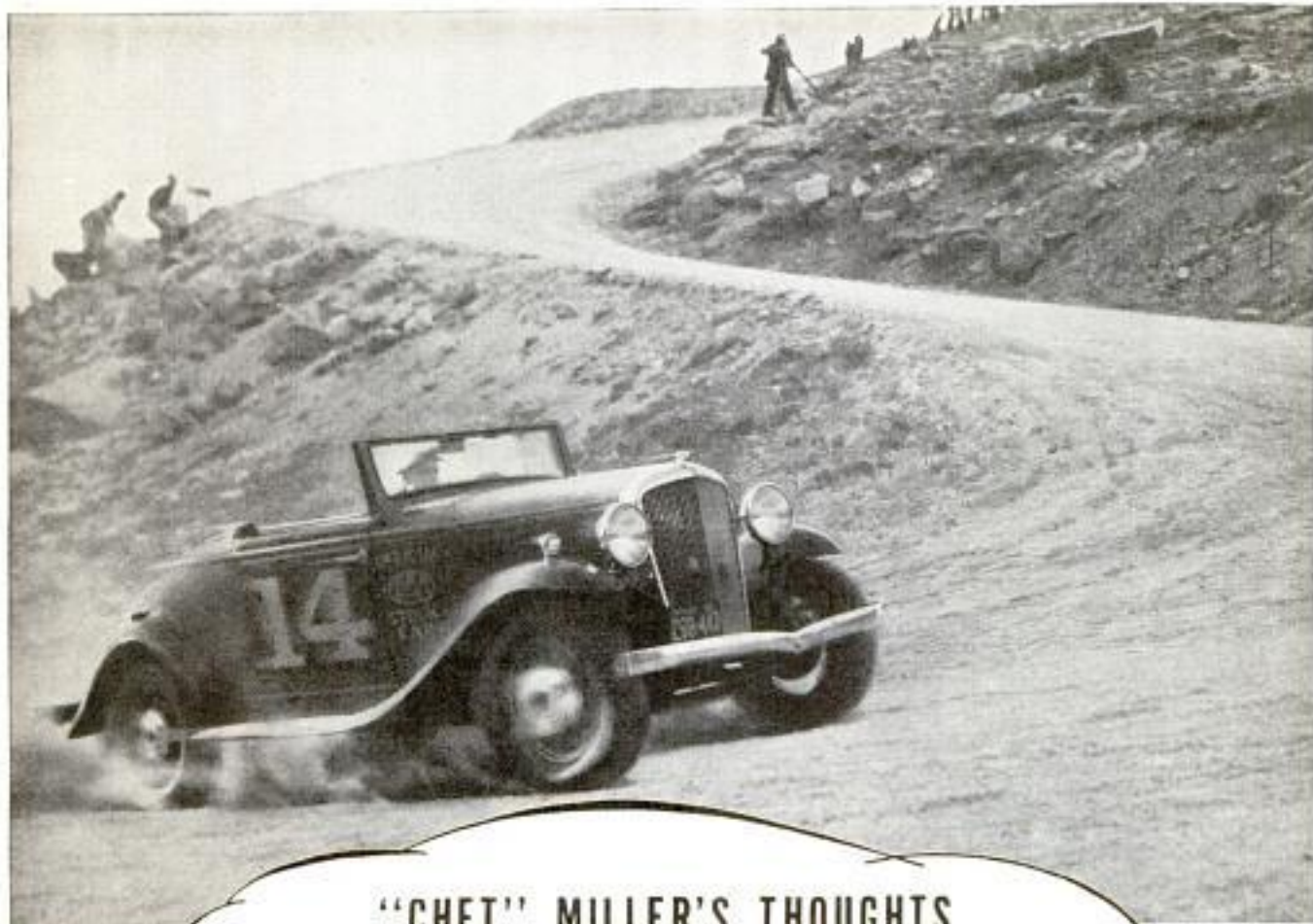
Mr. Barnes, "real-estate operators purchased a tract of desert. Records indicated that the land was frostless. Irrigating water was piped from the mountains and large orchards were planted. Within a few winters heavy frosts became the rule rather than the exception. Evaporation from the trees had reduced the temperature on winter nights below the critical point, although the land on either side of the orchard belt remained frostless."

To date, it has not been proved that climate can actually be controlled by vegetation, although it has been established that vegetation exerts an important influence. The average rainfall in the United States has not decreased materially in the last hundred years in spite of a reduction in the forest area. New tree growths springing up and the increasing area given to agriculture counterbalance the destruction of the trees.

So far, there are only a few ways by which climate can actually be influenced. Frosts are prevented by orchard heaters and smudge pots which raise the temperature of the air as much as fifteen degrees on cold nights. Destructive winds are modified by long rows of trees in the form of windbreaks. Thousands of miles of trees have been planted in the middle west to break the force of the wind. Groves of trees around a house reduce the temperature as much as ten degrees on hot afternoons.

In their study of climate, meteorologists have exploded the belief that the oceans are the sole source of rain. If this were true, rain would be most plentiful only on the shores of continents, leaving the interiors arid deserts. Actually, seven-ninths of the rain that falls on land consists of water that evaporates from trees and plants. Only two-ninths of the rainfall comes from the oceans. It is estimated that during one year an acre of beech trees transpires nearly 1,000 tons of water, equal to a rainfall of ten inches. Other estimates show that an acre of turnips delivers as much as 3,000 tons of water vapor into the air during the growing season. The rising water vapor may be carried several hundred or several thousand miles before it is precipitated in the form of rain.

(Continued to page 124A)



“CHET” MILLER’S THOUGHTS
WHILE SCALING PIKE’S PEAK IN RECORD TIME
• • IN A TERRAPLANE SIX • •

“They tell me Terraplaning’s next to airplaning . . . all right, baby, you’ve got to live up to that name . . . the *gun* . . . boy . . . feel those Champion Spark Plugs bite into that mixture . . . no wonder all these hellbenders around here use ‘em . . . up we go . . . there’s more driving in this 9000 foot climb than in 100 miles at Indianapolis . . . Champions have all the records there, so we’ve got to break this one . . . I’ll throw her into this curve hard . . . what a murderous test of a car this is . . . here’s that wicked switch-back . . . bend yourself around this one . . . air’s a little thin . . . guess those Champions would fire any mixture, though . . . not a sputter or a split second miss . . . we’re almost



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EXTRA-RANGE
SPARK PLUGS

Mr. S. G. Baits, Chief Engineer of the Hudson Motor Car Company, says of Champion Spark Plugs: “We have selected Champion Spark Plugs for Hudson-Essex cars because of their outstanding record for better performance and dependability.”



there Terraplane . . . the top’s in sight . . . fire away Champions . . . another wicked turn . . . the flag . . . we’re over the top . . . with Champion plugs this car climbs like a mountain goat . . . what’s my time? . . . What? . . . 21 minutes, 20.9 seconds . . . whoopee, a new all time stock car record for Hudson. And another record for Champion . . . here boy, take a wire to the Champion Spark Plug Company.” . . . Champion Spark Plug Company, Toledo, Ohio; Windsor, Ontario.

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17" span weight 1oz. Flying scale model de luxe equipped with aluminum pilot's seat, turned balsa cow, celluloid wheels, insignia, detail drawings, etc. Flies 400 feet. Const. set \$1.00. Model air and gas motors. Illustrated catalogue 10c.

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BUILD THIS Ocean Cargo Steamer

Popular scale model of old time tramp steamer, from shipbuilder's plans. Only one of many models covered in our new 20-page catalog of blueprints, construction sets and fittings. Send 15c for this catalog today. A. J. Fisher, 10924 Etowah Ave., Royal Oak, Mich.

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Home woodworking book—color illustrations—inlay bandings—scroll patterns—blue prints—various wood grains, crotch, butt, quartered, burl, saddleback, plain sawn, etc.—tells how to finish woods natural—foreign woods—17 blue prints of articles you can make—desks, tables, book shelves, etc. Send for it today—only 10c, or FREE with \$1.00 or more order.

CRAFTSMAN WOOD SERVICE COMPANY
7364 Vincennes Ave. Chicago, Ill.

DOCKING AN AIR LINER

(Continued from page 521)

fidence. He knows where the schoolhouse is with relation to the field, and if the radio man can see it, he knows visibility is about one and one-half miles. He knows the field is ready for him, and he knows he is low enough so the radio man caught a glimpse of his plane through rolling clouds, although the flyer himself could not see the ground. So he circles and comes back. At once, the radio man starts up again.

"Chicago to Johnson in 232," he says, "hi Johnny. I hear you coming north. You're nearly over the field. Come on down. I see your lights. I see you. O.K., Johnny, you're down."

Pilot Johnson is not on the ground, but he is "down" as far as the radio man is concerned, for the operator knows the ship is low enough so that the pilot sees the field below. It is up to the flyer to finish the job, and this Pilot Johnson does as the operator watches, bringing the nine-ton transport to a graceful three-point landing and taxiing up to the hangar.

Under the glare of the lights the pilot leans out and waves to the man on the roof.

"Hi, kid," he greets him. "Nice work. How about sinkers and coffee?"

"O.K. Johnny; I hear you," retorts the radio man, his head disappearing through the opening in the roof.

CAN WE CHANGE THE WEATHER?

(Continued from page 122A)

The popular theory that the general climate is changing and that the "old-fashioned winters" have gone for ever has failed to receive scientific support. Weather varies from year to year, but charts at nearly every weather station show that cycles of heavy rainfall are offset by cycles in which the rainfall is deficient. From a study of the rings of ancient trees, climatologists have determined that for the last several thousand years the weather has been remarkably constant.

Those wishing further information on anything described in our editorial pages can obtain it by addressing Bureau of Information; please do not fail to inclose return postage.

WANT A GOOD JOB?

SHARPEN LAWNMOWERS AND EARN GOOD MONEY

THE IDEAL LAWNMOWER SHARPENER

The Ideal Lawnmower Sharpener is a model of simplicity. It grinds the blades of a lawnmower with amazing speed and accuracy without removing wheels or ratchets. It employs the same method of sharpening as used by the lawnmower manufacturers themselves. To get a perfect job it is absolutely necessary to sharpen a dull lawnmower on a grinding wheel, the method used by the Ideal Sharpener. It takes only about fifteen minutes to put a lawnmower in perfect condition and you get from \$1.00 to \$1.50 per mower.

Makes Mowers Cut Like New

When a lawnmower is sharpened on the Ideal Sharpener it cuts just like the day it came out of the factory. The blades are ground to fit the straight blade thus assuring a perfect cutting edge. Ideal sharpened mowers stay sharp longer because the correct method of sharpening (grinding the blades) is used.

Special Attachments Make It An All Around Machine

Not only can the Ideal Sharpener be used for sharpening lawnmowers, but attachments can be furnished which convert it into a year 'round machine sharpening skates, grass shears, hedge shears, sickles, scythes, gumming saws, etc.

Now Is the Time to Start

The time to get started is now. It pays to get your Ideal Sharpener installed early. It is not a bit too early to solicit lawnmower sharpening business.

NEW PEERLESS JR. SHARPENER

Just out this year. Grinds all makes of Power Mowers, Tractor Units and Putting Green Mowers, as well as Hand Lawnmowers. Make additional money sharpening for Golf Clubs, Parks, Cemeteries, Schools and Private Estates.

NEW, LOWER PRICES

This year we are offering not only a still better line of Mower Sharpeners but at new, lower prices. Write for prices and new free catalog today.



YOU CAN DO WHAT THESE MEN HAVE DONE

John Del Zoppo, Hollywood, Cal., writes: "We are running an average of 35 to 50 sharpening jobs per day, all of which are done on the Ideal Sharpener." Glenn R. Knick, Troy, Ohio, writes: "From the first of April to the middle of May I sharpened 140 mowers." J. W. Bures, Cuyahoga Falls, Ohio, writes: "I am building through satisfaction a wonderful future business and have the promise of over 100 mowers already for next year." Niles C. Race, Rochester, N. Y., writes: "I have to date sharpened 785 mowers at \$1.00 apiece. I started in my cellar but the place was too large enough so I had to rent a place a week after I got my Ideal." Wm. Seduski, Watervliet, N. Y., writes: "The Ideal Sharpener is a wonder. No one can turn out a bad job on it." Thomas West, Lynn, Mass., writes: "I do not know of another machine that will do better work or turn out \$100 quicker or easier than the Ideal Sharpener." W. C. Fink, Pittsburgh, Pa., writes: "I turned out 604 jobs and my standard price is and always has been \$2.00 per mower."

NO TRAINING NECESSARY No training is necessary to do a good job on the Ideal Sharpener. Just attach it to a light socket or to line shaft or gasoline engine and start to sharpen. There are hundreds of dull lawnmowers in your vicinity waiting to be sharpened.

MAKE \$40 TO \$50 PER WEEK Any one who will earnestly go into the lawnmower sharpening business can make from \$40 to \$50 per week their first season. Many men have made more than this in their spare time alone. And the Ideal Sharpener does such excellent work that each year your business will increase because once you secure a customer he will not only tell his friends about your service but will himself come back again and again.



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"I am making \$79 a week. I started in the kitchen in spare time. Sell to grocers and restaurants," reports V. A. Simmons, Illinois.

"We have people selling for us. We average in profits \$40 a day which divided, means a living for 10 small families," writes J. N. Brice, Calif. "We made from \$30 to \$40 a week," says Mrs. Powell, Ohio. In many parts of the country, men and women are making good steady incomes.

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FREE PLANS show how easy it is to start making money immediately. Don't lose valuable time. Send postcard for full information today. No salesman will call.

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Plus Set of Adapters

and 12 Assorted Jewelers' Blades from .006" to .012" in thickness.

Adapters enable you to use the finest jewelers' blades specially designed for puzzle making.

Saw has V-pulley for your treadle or motor. All metal construction, 15" long, 9" high, 6 1/2" table. Sent postpaid on receipt of \$1.49; C. O. D. \$1.74, outside U. S. A. \$1.84. FREE booklet "Make Your Own Jig Saw Puzzles" with every saw.

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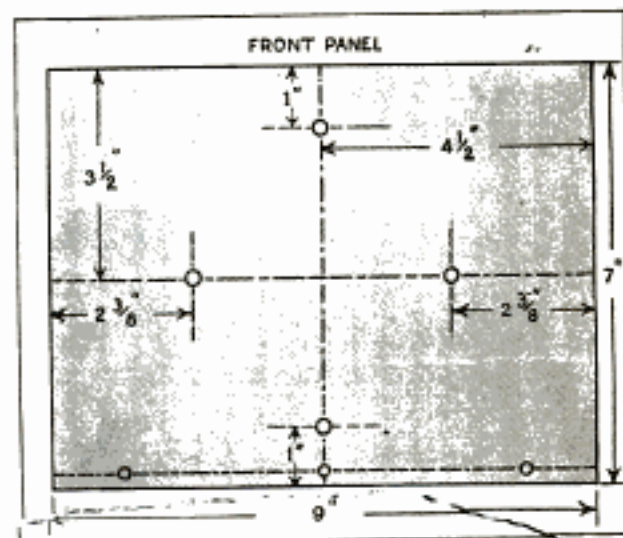
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THREE SELECTIVE CRYSTAL SETS

(Continued from page 601)

trap is an ordinary 23-plate type, and the other condenser is as previously described. All coil data are given in Fig. 4, and the phone jack is an ordinary open-circuit type. The panel and baseboard arrangement, shown in the photos, is optional with the builder, who may change it around to suit himself. A crystal detector of the panel-mounting variety is located near the top of the bakelite front panel, the drilling template for which is given. The wood baseboard is 1/2 by 5 by 9 in.

When tuning this set, if another station happens to interfere, turn the wave-trap dial until the interfering station is tuned



out. Some practice will be necessary to accomplish this. Enlarged diagrams of these crystal receivers are available for those who wish them.

The antenna for a crystal receiver should be a good long single-wire outside type. The flat top should be 100 feet long, or longer if possible, and No. 14 enameled-copper wire may be used for this. An insulator is connected at each end in the usual manner. The lead-in may be a continuation of the flat top, or the enamel may be scraped away from a spot near the set end, and a length of stranded rubber-covered wire soldered to it for the lead-in. This wire should not touch the building and is brought directly down to the usual lightning arrester and the set. When the crystal receiver is not in use, it is advisable to lift the catwhisker from the crystal. Crystals should not be handled unnecessarily and should be cleaned occasionally with a little naphtha on a bit of cloth.

THE MOUNTAINEER BOY WHO WENT PLACES

(Continued from page 514)

he thought he could get along without the extra education—and resigned. Back in his grocery store, and fire-engine house and hotel, he bent his back now over his law books. Then he was made captain of the fire department, and pretty soon was elected city clerk at \$75 a month. Then he passed the bar examination and was made assistant county attorney. Then there was a political upset, and he was slid out of his berth and had to open his own law office.

And now this restless man made a brave and most impressive new move. He walked over to the Citizens National bank of Hillsboro and asked for a job. He told them that the law wasn't paying very well—and he wasn't excited about it anyway—and he wanted to be a banker. When they told him there was no job, he said he'd work for nothing. The cashier looked him over; he was twenty-seven, popular, had a profession, and yet he was willing to embark on a brand-new career without pay.

"The bookkeeper's going away on a vacation," the cashier told him. "Come on in and we'll see how it works out."

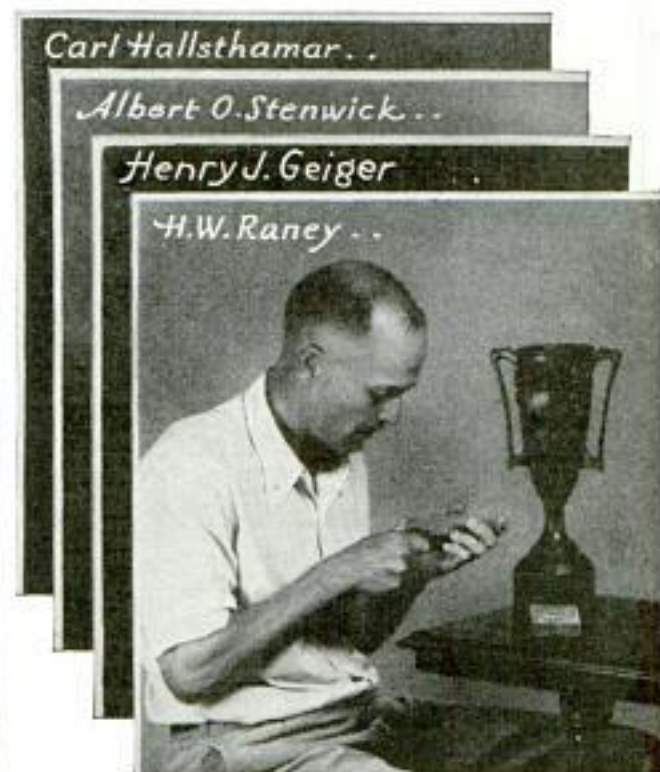
That was Mel Traylor's start in the banking business. In a few months, he was running a little half-defunct bank in the crossroad town of Malone, Tex. He salvaged the bank, and a year or two later he was sent into a bigger institution. Here he saved what looked like a disastrous situation. Pretty soon his fame began to spread.

And within twenty years after he had walked into the Hillsboro bank and started to work for nothing, he had moved up from Texas to St. Louis, to the Live Stock bank in Chicago, and to the presidency of the First National bank of Chicago; and then on to a high post as one of the two American representatives in organizing in Basle the Bank for International Settlements.

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(Continued to page 128A)

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THE MOUNTAINEER BOY WHO WENT PLACES

(Continued from page 127A)

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Aerial Cars on Cables Carrying Passengers and Freight between Peaks of the Andes Mountains

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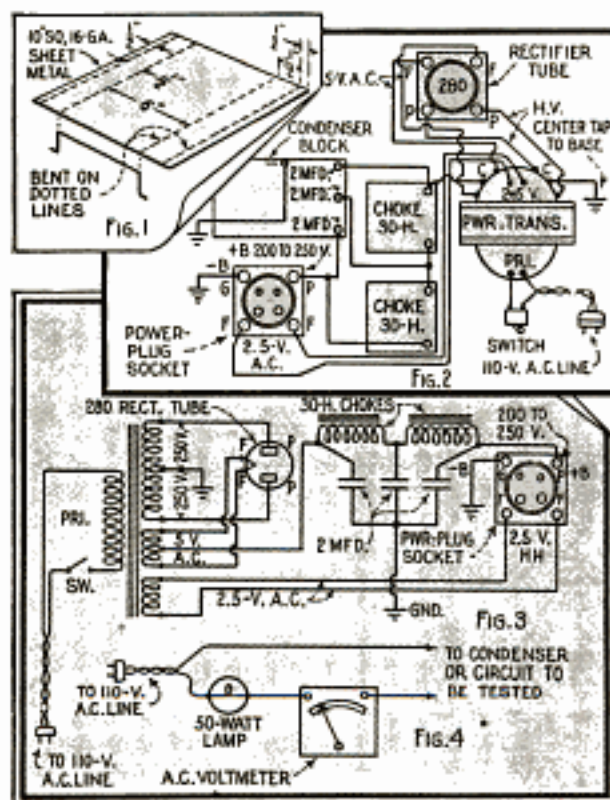
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(Continued from page 602)

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Using the coils without the band-spread feature, the 40-meter band covers about 15 divisions on the dial, and the 20-meter band about 10 divisions. The coil-winding data given in Part I will vary slightly with different receivers. The two stages were made to track across the whole dial by the spacing of the turns on L_2 and L_3 . This is done with the trimmer condenser C_2 set halfway in. Spacing the turns on L_2 will increase the inductance of L_3 and lower the frequency. Spacing the turns on L_3 will decrease the inductance of L_3 and raise the frequency. Very little trouble was experienced in getting the stages to track. The only time the trimmer condenser C_2 need be used is when the coils are changed from one band to another, the condenser being reset for each pair of coils. Volume is controlled by varying the screen-grid voltage on the r.f. amplifiers, and regeneration by varying the screen-grid voltage on the detector tube.

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THE RIDDLE OF MARS

(Continued from page 551)

to plan and build and supervise them. Doctor Lowell therefore assumed that Mars was inhabited by intelligent beings.

At the opposite extreme are those who see in the mottled planet nothing living but a wild vegetation. Dr. W. W. Cobbentz, of the bureau of standards, has suggested that the dark areas may be a sort of prairie grass. Dr. E. E. Free thinks that animals as well as plants may exist there, but he does not believe animals have evolved above the stage of crustaceans. He reasons that, since there are no mountains on Mars, there can be no swift-running streams, therefore, the fishes and other primitive life would have no rapids or strong currents to swim against, and would have no reason to develop backbones. Creatures like lobsters are his idea of Martians.

Dr. Harlow Shapley, of the Harvard observatory, also rates the level of life on Mars rather low. He suggests that those who try to signal the supposed inhabitants of Mars should first practice communicating with carrots and jellyfish. "If they succeed in establishing relations in that field," he says, "they may have some luck with the Martians."

Dr. Frank Schlesinger, of the Yale observatory, thinks it entirely possible that animals may exist on Mars, even intelligent animals, but doubts any of them would look familiar to us. "The chances are extremely great that not one of the animals of the earth is represented on Mars," he suggested. "If there are intelligent beings, the chances are not one in a million that they are formed like us. It is possible to imagine animals without heads—without bones. I have no doubt that one of the most horrible sights that we could possibly see would be a collection of animals from Mars—if there are any."

Prof. William H. Pickering, the American astronomer now resident in the island of Jamaica, thinks it probable that there are intelligent Martians—and his reasons for this judgment are found in certain of the dark markings or so-called "canals."

"My study of the dark lines marking the surface of Mars convinces me that no one explanation will account for them all," said Professor Pickering. "When the Ital-

(Continued to page 134A)

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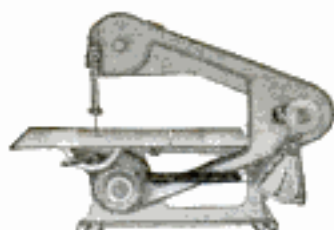
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THE RIDDLE OF MARS

(Continued from page 133A)

ian astronomer Schiaparelli, in 1877, first saw these lines connecting dark areas, he named the lines 'canali' because he thought they were straits or water channels connecting the seas. But now we know that the dark areas are not seas. Indeed, there are no large bodies of water on Mars; it is all land except for the polar coverings of ice and snow and the great marshes which border them when the ice caps melt.

"Moreover, the canals measure anywhere from twenty to 200 miles in width and many of them are thousands of miles long. Watercourses of such size could hardly exist naturally on a planet so small and so dry and it seems inconceivable that canals, 200 miles wide and 2,000 miles long, could be dug and maintained artificially. Astronomers are agreed that the markings are not water but are stretches of vegetation, though of course there must be water from some source to support the vegetation. With this understanding of the meaning of canal, we continue to use the word.

"Anyone who will carefully study the more than 400 canals that have been mapped on Mars, will see at once that they are not all alike. There are some that change their position by as much as 100 miles. Some canals appear suddenly, and after a few days are gone. These phenomena cannot be explained by the flow of water through irrigating ditches."

Professor Pickering accounts for these curved and temporary canals as the tracks of great rainstorms. Because of its lack of oceans, Mars has less erratic and more dependable weather than the earth, he thinks. "The Martian winds that carry the rains travel in fairly fixed courses," he explained. "I have watched the behavior of clouds traveling from the polar regions, and have mapped five regular wind tracks in the southern hemisphere and one in the northern. If there are intelligent Martians, they would naturally plant their crops in the paths of these recurring rainstorms.

"But there are other canals that cannot be explained as rainstorm tracks. They are straight and permanent markings. There is one, known in our maps as Bathys, which crosses the great pear-shaped desert

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60 ASSORTED PICTURES for JIGSAW PUZZLES \$3.00

Special Introductory Offer!

Here is what you get for... \$3

... sixty pictures... 6 each of the following sizes:

6x8	12x16
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8x10	13x16
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NOW! ... an unusual, original collection of 60 beautiful lithographed pictures ranging in size from 6"x8" up to and including 16"x20", at the ridiculously low price of \$3. Assortment consists of Old Masters, Landscapes, Coachings, Ship Pictures and Huntings.

Each Picture A Masterpiece
Each one our own publication

This special introductory offer will be available for a short time only. We issue no catalogue. Send your Order TODAY! enclosing \$3. We pay postage! Money back if dissatisfied.

MORRIS & BENDIN, INC.

30 West 24th Street, Dept. A2

New York City

(Continued to next page)

known as Thaumasia. In 1924, when Mars came closer than it will for the next 100 years, and the seeing was extremely good, I saw a narrow, very dark line threading the center of one of the dark areas crossed by Bathys. I am convinced that this dark line indicated the location of an irrigation channel. It was about five miles wide. Dark areas spread out on each side of it, vegetation watered perhaps by side ditches too narrow to be seen. But the straightness of Bathys between the bends was remarkable. The whole system is 1,600 miles long. I cannot imagine a river flowing for that distance as straight and uniformly as this marking indicates. It must be of artificial construction—though it may originally have been a river or series of rivers straightened and connected to carry the water by means of gravity quickly and economically to the agricultural areas. There are several canals of this type—too symmetrical to be natural occurrences; they must have been planned and built.”

There is still a third type of canal on Mars. Mostly it is seen in the northern hemisphere where the deserts that give Mars its characteristic red color predominate. “These desert markings are all faint and temporary, but are fairly long and wide and are clearly distinguishable,” said Professor Pickering. “I think they represent desert crops planted to make use of such water as falls during the semiannual rainy season.”

Thus, on the evidence of the straight and narrow canals, Professor Pickering thinks it reasonable to admit the possibility of intelligent Martians. But there is an astronomer in France who denies the existence of any straight-line markings on Mars. The canals are an optical illusion, perhaps based on a few surface cracks, rifts, or spots, says Dr. E. M. Antoniadi, of the Meudon observatory, or they may result from an accidental arrangement of silver granules in the film.

Dr. R. J. Trumpler, of the Lick observatory, says there can be no question that most of the canals represent real features on the surface of Mars. But he sees nothing artificial about them, and interprets them as depressions in the crust.

So Mars is still a riddle. And if any of the amateurs, who have acquired a telescope, are looking for a fascinating puzzle to turn their tubes on, here is one right at hand—only some 63,000,000 miles away.

THE WORLD'S LEADING .22 AUTOLOADING RIFLE...

Remington

Model

24



WHEN you have shot this Model 24 Remington you'll never be satisfied with any other. You can make shots at moving targets or running game and pests that you never thought possible. It's so fast that you can get in many more shots than with the ordinary repeating rifle.

A miss shows you how to correct your aim and you just keep pulling the trigger till you connect.

Beautifully finished; so well balanced that it seems to point itself; dependable in operation; simple in construction, and accurate as only Remington can make 'em. See the Model 24 at your dealer's and write us for descriptive circulars. Remington Arms Company, Inc. Bridgeport, Conn.

ALWAYS SHOOT

Remington
KLEANBORE
.22 CARTRIDGES

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4764

START to PLAY Very First Day!

YOU CAN PLAY THE XYLOIMBA

Extra Money—Hosts of Friends—Loads of Fun Within Your Reach



Fame and Money Broadcasting



Center of Attraction Gatherings



Big Money at Dances

HAPPY DAYS are in store for you if you will only act on this suggestion! Cheery evenings playing catchy music alone or with sweetheart, wife or sister; proud moments as center of interest at gatherings; nights of joy making \$5 to \$25 for work that is "play."

The Deagan Xyloimba is your Opportunity! Wonderful for home, in demand at dances and entertainments, yet easiest of all instruments to play. No teacher necessary—you actually play simple melodies the very first day even if you cannot read a note of music right now!

Earns \$60 a Week—Ralph Smith, Chicago, says: "Played 20 minutes at wedding. Received \$25." L. E. Hallmann, Reading, Pa., writes: "Made \$300 in 5 weeks, spare time. Had never played instrument before."

SEND FOR BIG FREE BOOK! Our new book tells all about the delightful lessons furnished with each instrument; the five-day trial that removes risk; the wonderful Deagan, easy-payment plan. No obligation—simply fill in and mail the coupon.

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Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xyloimba.

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CUTS IN ANY DIRECTION **SPECIAL OFFER 35¢**

6 FT. BLADE AND ADAPTORS
ADAPTORS FIT ALL STRAIGHT END BLADES

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Your old razor blades are still good for many, many more smooth, easy, clean shaves. The ZIP Strop, with Holder for blade, sharpens them dozens of times, over and over, perfectly, in a few seconds. ZIP is made of genuine, high quality, selected cowhide from our own tannery, treated by a special secret process we discovered after years of laboratory research and experience. Absolute Money-Back Guarantee. Send price, 15 cents coin or stamps, with order. We mail ZIP postpaid. If not satisfied, we will refund your money without question. By spending 15 cents you save dollars. Order now.

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EARN GOOD MONEY STRING TENNIS RACKETS

Easy and interesting work. Tremendous demand for men to restring and repair tennis rackets. We TEACH you how to DO restringing, and equip you for it. We show you how to get business! String your friends' rackets to start with. String 3 rackets in 2 hours—make \$7.50! You can do it! Get started now—it is not a bit too early to get restringing business!

WRITE FOR FREE 24-PAGE BOOK "Earning Money Stringing Tennis Rackets"

FREE BOOK OF PROFITS

Thompson Manufacturing Company
Manufacturers of TOMGUT "Court-Tested" Tennis Strings
4335 Packers Av. U. S. Yards Chicago, Ill.

RACING SEAGOING HOTELS

(Continued from page 541)

if we were burning coal. Naturally we snuffed a lot of black dust into our lungs but strangely there was no consumption."

"Yes," said Barton, "it used to be regular murder down in the stokeholes. We'd burn about a thousand tons a day; that meant, too, the handling of many tons of ashes. Solid masses of clinker like big hunks of iron would be hauled from the fire boxes. Sometimes a lump would be so big one man couldn't lift it. They were wheeled to the ash ejector where a gang worked constantly breaking them up and feeding them into the hoppers to be spewed into the sea. There must be a cinder path along the floor of the ocean from New York to Plymouth. The men used to have terrific fights among themselves. They were powerfully made but one of the qualifications of an engineer officer in those days was that he be able to lick any man in the black gang.

"We used to work 'em with gongs. When the automatic gong sounded, they'd open the fires. You could set the electric control to sound at such intervals as were necessary to keep up steam. In a four-hour watch each man would have to shovel about ten tons of coal into his fires. It was frightful work. But we had to have steam.

"New men would have such broken blistered hands we'd have to deal out rags to 'em to ease the pain. The old hands had heavy calluses on their hands, and back muscles that writhed like pythons when they shoveled. They always came aboard drunk.

"When we had negroes, they'd desert in batches of fifty and then we'd have to round up anything on two legs. That way we'd sometimes have men who merely wanted to work their passage across. We'd play the hose on them when they fainted from weariness or seasickness. But we had to have steam. Every man was needed.

"I sometimes wonder what has become of those firemen. We rarely see them hanging around the docks anymore. Most of them probably were killed off in the war. They were grand fighters."

"You're right," said Campbell. "I remember when I was junior second we had five passage workers one voyage. There was a college man among them. He begged for

a chance and then got seasick first thing. He would not work. The firemen were asking for coal and where there should have been mounds of it on the plates in front of the fires there was none. I found this blighter in his bunk, slung him on my shoulder, carried him into the engine room and laid him on the plates. Then I tossed a bucket of water on him. He went to work all right."

Nowadays it's a much more complicated job running the mechanisms of a giant of the "Mauretania's" proportions than driving an automobile.

"Take one of these rescues at sea," challenged Jock Campbell. "Who ever hears of the engine room then? It's the deck that gets the medals but what could they do without engineers? They give the signals and we do the work. After one of these rescues it is 'Captain this' and 'Captain that,' but who ever mentions the chief engineer?"

"Remember the Swedish freighter, 'Ovidia,' a couple of years ago?" asked Barton. "She was foundering 1,047 miles east of the Ambrose channel lightship when the 'Mauretania' picked up her SOS. We were 220 miles away. That was a time when we used all our speed. We went slashing through the heaviest kind of a sea at twenty-seven knots, squeezing into the boilers every inch of steam they'd hold. We hove to half a mile from the sinking ship. She had a bad list and clearly was doomed, but we dared not go closer, for she was out of control and might drift into us.

"We stood by for an hour and a half until the captain of the sinking ship concluded she was past hope. They came off in two boats, twenty-seven men and the captain's wife.

"Below, at such a time, it is much more complicated work than ordinarily. The ship must be maneuvered constantly. From the bridge by telegraph come a succession of commands, 'slow down,' 'full speed ahead,' 'full speed astern,' 'stop,' 'half speed,' 'stand by'—oh, you get everything on the dial during a rescue, especially when it's stormy—as it usually is. Those orders have to be carried out instantly. The very life of the ship depends on the alertness of the men topside and below."

"Well," said Campbell, "we could manage without the deck, but they could not

(Continued to page 138A)

THE twelve page bulletin shown above is one of ten Service Bulletins describing and illustrating the latest and most practical methods for servicing autos, trucks, buses and tractors. Shows how to do the work. Check Bulletins below which interest you and mail ad.

Factory Rebuilt Lathes—a few at bargain prices. Sizes from 9" swing to 18" swing. Countershaft and Motor Drive. Write for list.

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Not the ordinary hunt and catch scenes. We have Currier and Ives, Pickwick, Historical Gay Nineties, and other good colorful subjects, on right paper for gluing on plywood. All sizes from 6x8 in. to 30x40 in.

Send \$2.00 for BARGAIN LOT of PUZZLE PICTURES. State sizes preferred. We Guarantee Satisfaction or Money refunded.

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Make things spin, buzz, shoot, flash, mystify with electricity! Book of 200 stunts with 110 volts. Postpaid, \$1. CUTTING & SONS, 43-N-St., Campbell, Calif.

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Don't Throw Away That Coat and Vest!

Let us match your coat and vest with new trousers tailored to your measure. Save the price of a new suit. Over 100,000 patterns. Mail sample of suit, or your vest which will be returned with FREE Sample for your approval.

Match Pants Co., 29 W. Jackson Blvd., Room 1107, Chicago

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MAGIC WORDS—that are bringing big profits to Webb Salesmen! The Webb Portable Water Softener brings to every homewife, soft water in an endless flow for washing dishes, laundry, bath, shampoo and every home purpose. Softens hardest water instantly at the turn of the faucet. Sells complete only \$12.

AGENTS NEW SALES PLAN FREE

Quick easy sale—with good profit—simple home demonstration sells it instantly! Write today for free literature and full details of the Webb NO RISK TEST OFFER and FREE Sales Plan.



NO RISK TEST OFFER!

WEBB MFG. CO., Dept. 116, 1705 Baltimore Ave., Kansas City, Mo.

CHANGE ATTACHMENTS*Instantly***CARVE, DISC,
DRILL, GRIND,
POLISH****A REAL TOOL—
Not a Toy****MASTER BENCH HEAD BUILT TO LAST
A LIFETIME**

Each attachment is mounted on a mandrel and is in perfect alignment. To change attachments, merely loosen handwheel and slip into draw-in collet. List price \$4.00.

Special Offer: Send \$3.00 for Master Bench Head postpaid or C. O. D. We will send you FREE one 4" x 3/4" all-purpose grinding wheel and 4" buff mounted on separate mandrels. Write for booklet.**WISCONSIN ABRASIVE COMPANY**
Dept. 8544 Station A Milwaukee, Wis.**Hand-ee Grinder****Aids in the repair
of firearms.**

Useful to touch off rivets, brazes, welds, solder, remove burrs, take out nicks, sharpen

tools, etc. Speeds up wood carving when fitted with cutters.

Operates on A.C. or D.C. 110 volts. 10,000 R.P.M. Fits the hand. Press button control. Just plug in and grind or cut.

\$10.00 Direct or from your suppliers**Money-back guarantee. 5-day trial.
Three wheel shapes free. Order today.****Chicago Wheel & Mfg. Co., 108 S. Aberdeen St., Chicago, Ill.****100 SHAPES AVAILABLE****STRING YOUR OWN RACQUET**Same Quality String
As in Expensive RacquetsOutfit Complete with
string, tools and directions**\$1.65**

Easy to restring racquets—better than new. Saves real money. Send for this professional outfit today. Good profits made restringing other players' racquets, 32 ft. string. Colors Purple, Green, Red or White, with length of contrasting color in silk cord trim, axis, illustrated easy directions. Money back guarantee.

MAKE MONEY! Send check or Money Order \$1.65 which includes Postage and Insurance. Sent C.O.D., if desired.
Pro Tennis String Co., Dept. L, Harmon, N. Y.**Home Automatic Cigarette Machine
Amazing Invention**Put tobacco and block of papers in machine, TURN THE CRANK, and PRESTO CIGARETTES. Easy—single. All metal construction. Guaranteed. No cloth ribbons; no special tube or gummed papers required. Automatically feeds and seals papers. Saves 2-3 the cost of ready made cigarettes. ASK FOR FREE ILLUSTRATED FOLDER. PRICE \$1.85 Postpaid. Tobacco and papers included. (Formerly \$2.50.) Agents: Big demand. Thousands in use.
AUTOMATIC CIGARETTE MACHINE WEB,
Dept. P. M. 1055-1057 Sheridan Rd., Chicago, Ill.**AGENTS Make \$380 Monthly**selling 10 Carter Window Washers daily. Cleans, dries, polishes. No muss. Good Housekeeping approval. Restricted territory. Write today.
CARTER PRODUCTS CORP., 940 Front Ave., Cleveland, O.**CRESCENT**
20" BAND SAW
\$100.00
(Belt Drive)There's profit and satisfaction in working with this scientifically designed, extra well built band saw, embodying all the improvements and advantages of big production machines. Just the band saw for business or pleasure; for pattern shops, cabinet makers, schools, contractors, and amateur use. Ball bearings; takes power from light socket; tilting table; spring tension keeps saw correctly adjusted; fully guarded. Satisfaction guaranteed, or money refunded. We make an extensive line of portable and heavy wood working machines.
THE CRESCENT MACHINE CO.
23 Columbia Street Leetonia, Ohio**Send for FREE BULLETINS****RACING SEAGOING HOTELS**

(Continued from page 137A)

do without us. I could learn the deck stuff in three months, I think." He winked at Barton who slyly winked back. This is an old feud between the engineers and the deck officers.

"In the Bay of Biscay," he continued, "when the 'Lancastria' took twenty-two men from a Danish ship, the 'Scheldestad,' I went to the captain and said: 'If the engines were to break down now, how would you save this crew and get all the publicity?' Well, that time we put our ship across in a heavy sea and that's not easy to do. But did anybody mention the engineers? Not in my hearing."

"Navigation is the same from any deck," said Mr. Barton, "but the insides of one ship are never quite like another's. The skipper can come aboard a new ship the night before she sails on her maiden voyage, but the chief engineer must stand by while the ship is being built. He has to be familiar with everything that's built into her; power, lights, steering apparatus, ventilation, water supply—it's all under the chief engineer.

"Now I did not feel so very strange when I first came aboard this one, but I had been in her sister ship, the 'Lusitania,' and that helped. But if you go along the Clyde today, wherever there's a new one on the ways you can find the man who's going to sea in her as chief close by, which probably is the reason for the engineer's chant:

'When in doubt, when in fear,
Always send for the chief engineer.'

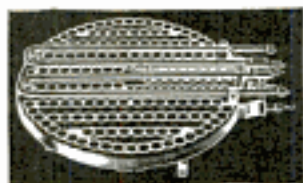
**LICENSE NUMBERS SHOW DAYS
AUTOS OPERATE IN GREECE**

Automobiles with even tag numbers operate in Greece only on certain weekdays, while those with odd numbers use the streets on other days under a recent government ruling designed to reduce the imports of gasoline into Greece. All classes of passenger cars and privately owned automobiles are affected by the decree, but not ambulances or official cars used by government departments or the diplomatic corps. Some persons have met the situation by owning two cars, one with even numbers, the other with an odd-number license plate.

*Asst. Commercial Attache
Ralph Curren, Athens*

CASH IN NOW — BIG DEMAND

Non-Competitive
Low Cost THERMO-GAS Burners



CUTS GAS BILLS 75%

New burner created especially for Tailors — Barbers — Restaurants — Factories and Homes. Operates at 1/3 cost of city gas, a big reduction in overhead. Gas bills formerly running \$10.00 to \$25.00 monthly now slashed to from \$2.50 to \$6.50.

Full and complete line of Pressure, Blue Flame Burners for

all purposes. For Heaters, Cook Stoves and Gas Fired Boilers. New, improved generator with needle valve control converts ordinary oil into hot blue flame gas. Starts instantly. Regulates like gas.

Agents and dealers write for full particulars. Franchise given to exclusive distributors in protected territories.

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COMPLETE ELECTRIC PLANT

ELECTRIC LIGHTS ANYWHERE
READY TO RUN
110 Volt Direct Current. \$99
Operates electrical appliances
Fine for Lake Cottages,
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Also complete line A. G. PLANTS, 300 to 10,000 watts. Easy to install. Write—

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BALL JOINT

CAN'T LET GO!

MOST PRACTICAL HITCH MADE!

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ECONOMICAL — PROFITABLE — FASCINATING

CUTTING a jig-saw puzzle is more fascinating than putting it together. Literally thousands are making their own puzzles—making several for less than it costs to buy one. Many make the puzzles to sell or rent. It's profitable. You can do it too, with a Boice-Crane Jig-Saw. They are better and cost less. Make Jig-Saw Puzzles Yourself.



Titled Arbor Saw

Build Other Things, Too

You'll enjoy building furniture for home and garden, screens, toys, and occasional pieces of your own design. As a hobby or money-earner it will pay you to buy accurate, dependable Boice-Crane Tools—especially at the present reduced prices. Write for the BIG BOICE-CRANE CATALOGUE describing Saw Tables, Joiners, Lathes, Jig-Saws, Band Saws, Shapers, and Sanders. IT'S FREE!

W. & J. BOICE, DEPT. 41, TOLEDO, O.



ONLY \$69.75
Buys Newest Type
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EXTRAORDINARY value! New-type powerful light motor has gearless Rotary Valve (never before offered on motors at near this price), Underwater Silencer, Carburetor, Silencer, Flash-Start Primer, One-Lever Control, Certified Horse-

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Write for free Evinrude and Elto catalogs and we'll include Comparison Charts that enable you to check the comparative values of all makes. Get the most for your boating dollars! Address, Outboard Motors Corporation, 5500 N. 26th St., Milwaukee.



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FREE TRIAL

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Just name and address. We will ship Calculator immediately. On delivery, pay postman \$2.50 (plus few cents postage). (If outside U. S. send cash.) No additional in Leacherville Case. If not satisfied after 10 days' trial you get your money back. THOUSANDS OF SATISFIED USERS. Write for Agents' Proposition. BABY CALCULATOR MACHINE CO., (Mfrs.) P. O. Box 1118, Dept. 31, CHICAGO, ILLINOIS

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Adds, Subtracts, Multiplies, Divides. Does work of \$200 machine. Not a toy. Million dollar capacity. Simple and accurate. Guaranteed 3 years.

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Simplified construction makes these new 11-in. flyers the only satisfactory small models. They look better, fly further, keep rise of ground, fly 150 ft. or more. Sets include ready-made propeller, struts, nose-block, wheels, special rubber motor, etc.



with clear building and flying directions. No tools needed. Either set, safely included, only \$6.00 postpaid. Canada \$6. Order one or both today!

MIDLAND MODEL WORKS
Dept. 5 Chillicothe, Ohio
(No stamps. No C.O.D.'s. No catalogue)



Boeing Fighter

IT'S EASY TO MAKE JIG SAW PUZZLES!

ECONOMICAL — PROFITABLE — FASCINATING

CUTTING a jig-saw puzzle is more fascinating than putting it together. Literally thousands are making their own puzzles—making several for less than it costs to buy one. Many make the puzzles to sell or rent. It's profitable. You can do it too, with a Boice-Crane Jig-Saw. They are better and cost less. Make Jig-Saw Puzzles Yourself.



Titled Arbor Saw

Build Other Things, Too

You'll enjoy building furniture for home and garden, screens, toys, and occasional pieces of your own design. As a hobby or money-earner it will pay you to buy accurate, dependable Boice-Crane Tools—especially at the present reduced prices. Write for the BIG BOICE-CRANE CATALOGUE describing Saw Tables, Joiners, Lathes, Jig-Saws, Band Saws, Shapers, and Sanders. IT'S FREE!

W. & J. BOICE, DEPT. 41, TOLEDO, O.

The Jig Saw of 1934

The 24 in. by 5 in. Jig-Saw does band saw work, too. Saws 5 in. stock smoothly. Takes fine, heavy, long, and short blades. Has adjustable tension, slide-back table. Rips, bevels, cuts curves, sands, and files. Cuts metal, fiber and many materials. An ideal all-purpose machine!



Puzzle Kit

Consists of 1 doz. fine blades, 6 selected pictures 7 in. by 10 1/2 in., 6 wood panels, and 1 pt. special glue.....\$1.75

NEW 10' JIG SAW

The smoothest running, lowest priced Jig-Saw ever offered with vertical stroke and spring tension. A sturdy 14-posted machine. Not a toy.

\$4.50

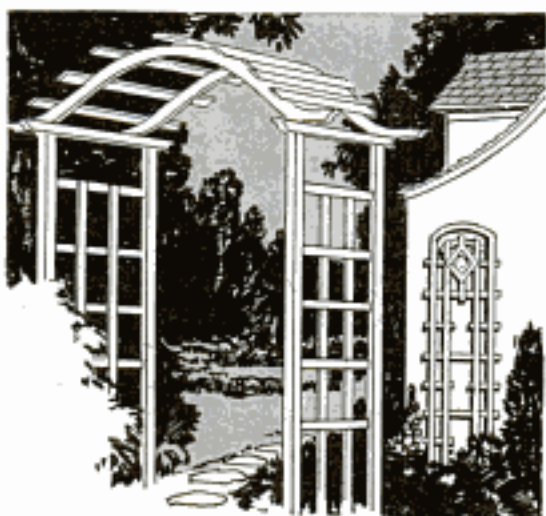
Cast iron frame. Tilting table. Brass bearings. Cuts 1 1/2 in. thick material. Takes fine or heavy blades. Cuts rapidly and accurately. Woodwork is formable machine. A REAL BARGAIN! Send \$1.00, pay postman balance on arrival



EASY to BUILD

this ARBOR and TRELLIS

AT HOME



FREE PLANS with

**IRWIN'S
BLUWIN
BIT**

GOOD woodworking craftsmen must have good tools. That's fundamental. And the "Irwin" Bluwin Bit is made to meet the most exacting requirements by a factory that has been making bits for over 40 years. The cutting head is scientifically made and heat-treated so as to bore cleanly thru the toughest of wood. The shank is strong and will not bend under heavy pressure.

Make this test yourself. Lay an "Irwin" Bluwin across the palm of your hand. Run your fingers over its satiny finish. Observe carefully its perfect cutting head. You need go no further, for its performance possibilities will be immediately apparent.

INTRODUCTORY OFFER

There is a blue and orange tag attached to every "Irwin" Bluwin Bit. Send this tag to The Irwin Auger Bit Company, Wilmington, Ohio, with your name and address and receive free of charge a complete set of working drawings of the arbor and trellis pictured above. "Irwin" Bluwin Bits for sale in all sizes by your hardware dealer, or write direct.

THE IRWIN AUGER BIT CO., Wilmington, Ohio

IRWIN
WOOD BORING TOOLS
CUTS TRUE—CLEAR THRU

THE RADIO ROBOT OF THE AIRWAYS

(Continued from page 498)

gles at which the waves strike the layer and are reflected back. Hence, to obtain uniform results day and night, the frequency for each radio set on the ground and in the air must be changed to conform to the movement of this ionized-gas layer.

Changing the frequencies of all radio sets at regular intervals meant that every ground station must close down for fifteen or twenty minutes twice daily while experts regulated half a dozen dials, changed crystals and antennæ, and checked results. But more important still, it meant that every ship in flight must land to have these adjustments made. This might be avoided if the operations were automatic. But making a robot to do the work at first seemed a hopeless task. Here are some of the things such a robot would need to do:

Change the crystal which in turn changed the wavelength; tune the crystal-oscillator circuit; tune the doubler circuit; tune the power-amplifier plate circuit; tune the power-amplifier grid-input circuit; neutralize the power-amplifier circuit; change the antenna, and, finally, check up on the result.

Engineers shook their heads and said these operations required a trained human brain. But they began to experiment and found it would not be so very difficult to change crystals automatically. They kept on experimenting. They built queer-looking levers, gears and cams and hooked them up to the parts to be adjusted.

At last, they were able to adjust each part individually by some mechanical means. Then they correlated the individual controls until the hodgepodge of gears, levers, wheels and pulleys terminated at a shaft inserted through the control panel. They removed all the dials and placed a knob on the end of the shaft. At one side of the knob they printed the word "day." Opposite it, they placed the word "night." Then they turned the knob to operate all the attachments fastened to the shaft—and it worked.

At present the automatic control is in the tail of transport ships. Soon it will be on the instrument panel. Instead of landing, or sending a mate back to make the change, the pilot then will merely reach over and turn a knob.

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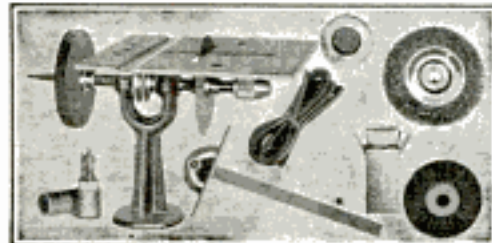
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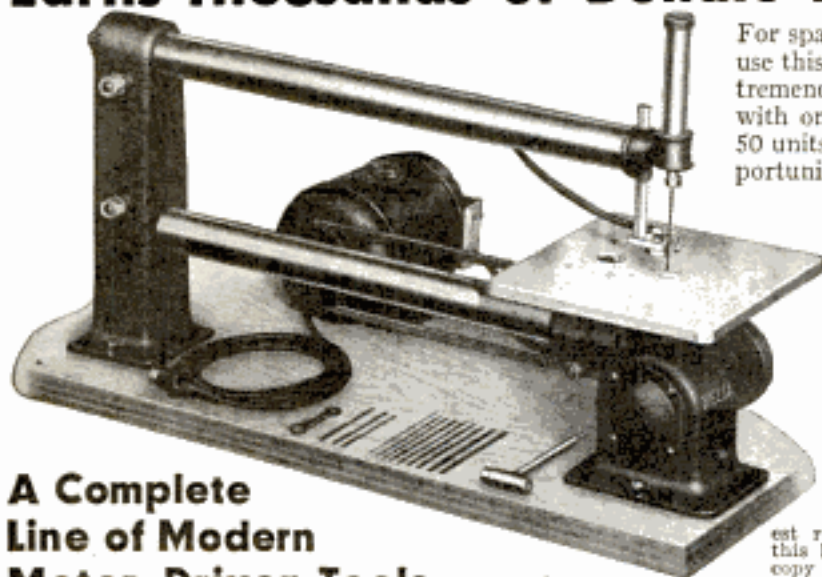


Veneer Can Be Held Firmly on Curved Surfaces While the Glue Dries by This Method

cloth, long enough to cover the section to be veneered, and tack it to two square wood blocks. The cloth should be sufficiently long to be wrapped around the blocks a couple of times so the tacks will not tear out. Care should be taken to see that the form is neither too long nor too short. The old veneer should be removed and the new piece dampened to make it more flexible. Glue is then brushed over the two contacting surfaces, after which a piece of paper is placed between the veneer and the form, and pressure is applied to the form with two clamps. The paper prevents the glue from sticking to the cloth.—H. L. Weatherby, Montgomery, Alabama.

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Heats quickly. Fits small and odd sized places. Genuine nichrome element. Hand-carrying, professional tool. Year guarantee on heating element. Money cheerfully refunded if not satisfied. Read stamps, coin or dollar bill, or C. O. D. 15c extra. Order one today. Title offer withdrawn shortly.

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\$1.85 ea.
5 or more
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ELECTRIC SPRAYER OUTFIT AT A BIG BARGAIN

Complete with GV full liquid pressure adjustable \$20 gun with fan and round spray tips, 10 inch swath, non-clogging; 1/4 H. P. 110 VT. 60 Cycle A. C. Motor; air filter tank; Kellogg air-cooled compressor size 1 3/4 x 1 3/4; Connectors and 15 ft. hose, plug and cord; 5 spray jars.

Ideal for spraying paint, varnish, lacquer, enamel, insecticides, etc. For home use or profit. Regular \$67.50 value—our price only **\$22.50**. Send \$5.00 deposit, balance C. O. D. Satisfaction guaranteed or money back.

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51

MILES ON A GALLON of GASOLINE WINS ECONOMY CONTEST

49 MILES Takes 2nd Place

Winning Cars Equipped With WHIRLWIND GAS SAVERS

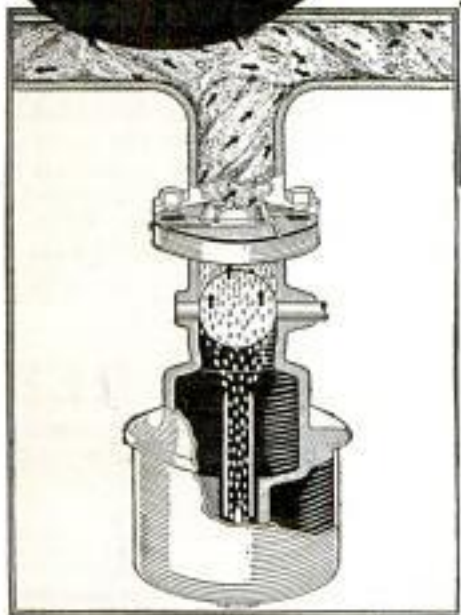
Automobile owners who have been worrying about gasoline expense will be interested in an amazing test recently conducted by a Texas Motor Car Company. Twenty-three cars were entered in a mileage economy test, the winning car running 51 miles on a gallon of gas, the second car 49 miles on a gallon. When official test records were published it was found the two winning cars were both equipped with Whirlwind gas savers.

"Peak" Contest Mileages

The amazing results obtained in this mileage contest are naturally greater than those obtained in ordinary driving. Careful throttling, most economical speeds—no traffic hold-ups—and no waste of power thru quick stops, help to bring about these "peak" mileages.

A Test On Your Car

More power, faster pick-up, less carbon, quicker starting, and increased mileage is what users say in telling of their experience with the Whirlwind. Every motorist owes it to himself to test the Whirlwind to prove the results on his own car.



How Whirlwinds Save Gasoline

The principle of the Whirlwind is to slightly compress the partly vaporized gasoline as it passes thru the raised venturi. Extra air enters from four air inlets at such a tangent as to pick up the unvaporized gasoline particles, whirling them into action.

The turbulence created breaks them into a vaporized gas, giving better, smoother power, quicker starting, cutting gasoline waste and carbon formation.

Car owners all over the world are amazed at the results of their tests. "I have more speed, power, and increased mileage," writes Henry Bomberger. "Hills I used to take in second I now make in high." Anton Wetsch: "I wouldn't take the Whirlwind off my car for any money. I am certainly convinced." W. B. Fountain: "My mileage has increased greatly. My car has plenty of pick-up and starts like a whip."

SALESMEN AND DISTRIBUTORS WANTED

To Make Up To \$100 A Week and More

Whirlwind men are making big profits taking care of local business for this fast selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MFG. COMPANY

Dept. 946-A, Station C Milwaukee, Wis.



Mrs. C. P. Blalock,
contest winner

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you save.

GUARANTEE

No matter what kind of a car you have or how big a gas eater it is the Whirlwind will save you money. While we do not claim to produce 49 to 51 miles on ordinary driving, we do guarantee that the Whirlwind will save its cost within 30 days or the trial will cost you nothing. We invite you to test it at our risk. You are to be the sole judge.

FREE OFFER COUPON

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Dept. 946-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

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\$48.40 a Day

actually possible in this

Amazing New Food Business

If you are looking for a steady weekly income of from \$50 to \$200 a week—depending only upon your own willingness to work—here are the facts about a most astonishing new business that you can start at home on a very small investment. Read.

GERHARDT WINTHER (whose picture is above) lost his job as a Baker. Couldn't find a thing. Savings dwindled. Faced with Charity—or worse. Suddenly he came up smiling in an astonishing new business, that swept him up to prosperity—overnight! Made money from the first day. Now after being in business only 90 days he writes: "When others talk about Depression I can laugh. I make more now every week than I ever made before, my self-confidence has been restored, I can stay at home and take in as high as \$125 a week from my wholesale and retail business. What a business! What a break!"

Winther's is not one isolated example—an exception—No! He is one of fifty! For while this money-making business is so new that the public hardly knows about it, already over fifty men have started it in different parts of the country. And in spite of the times, they're making money—some only \$50 or \$60 a week, but others up to as high as \$150 and even more. And this astonishing, ready-made business in which I can now start a few more men is so profitable that it is possible to make as much as \$48.40 a day, doing a wholesale business only and letting others do your selling for you.

What's the Secret?

This new business is so simple that you may be inclined to dismiss it with a wave of the hand. But thoughtful men who can analyze its possibilities will see in it a source of real money. It's the Potato Chip Business. But that isn't all. A strange discovery about potatoes has enabled us to build a machine that makes a *New Kind of Chip*—not like any other potato chip you ever saw or tasted. Even the old-fashioned kind of potato chip has made fortunes for hundreds of men. But now with this new chip, the possibilities are unlimited. It is different in appearance, different in taste, and in addition it has one astounding new

quality that sets it entirely apart from anything ever offered before—it is "MINERALIZED."

Nine Vital Minerals

Not many people know this, but Department of Agriculture figures show that raw potatoes contain **NINE VITAL HEALTH-GIVING MINERALS**. They're as good for you as Orange Juice. They also contain a rare Vitamin and an abundance of Mineral Proteins. BUT—by the old process of cooking, all of these vital minerals were removed. The old kind of potato chip was but a tasteless pulp—worthless as a mineral food! Now, with this revolutionary new invention I have found a way to **RETAIN** all nine minerals, a way to **RETAIN** the Mineral Proteins. And you'd be absolutely amazed to discover the difference these minerals make in the taste. One sample is enough for any storekeeper. The minerals give **VITA-SEALD** Chips a tang and a "Come-Back-For-More" Taste that you can't describe. You'd have to taste the chips themselves. Another thing: As an accident I also discovered how to get 35% more chips out of the same quantity of potatoes. So the margin of profit—already big—was increased by my invention. With the use of my machine you can get

\$10.85 Profit from \$1.95

Cooked the new way, \$1.95 worth of raw materials makes \$12.80 worth of finished products at retail prices netting \$10.85 profit! And the **VITA-SEALD** machine operates with such incredible speed that \$12.80 worth of chips is only one hour's maximum output! The profit on the same hour's work, if chips are sold at wholesale, is \$6.05. Working 8 hours a day and doing only a wholesale business you can actually net \$48.40 a day on a capacity business. And that requires no retail selling. Even if you did only half this well you would be making \$24 a day profit—or \$144 a week.

No Experience Needed

With the **VITA-SEALD** machine as a basis of operation you can start your business in the kitchen—basement—anywhere. For a space 52 x 20 inches is all it occupies. No cooking skill is required—no special experience of any kind. I am the originator of **VITA-SEALD**. I have over 10 years experience in the potato chip business and I can and will show you exactly what to do



NO CANVASSING
NO SELLING!

UNDER new plan others sell for you. This is the method employed by O. J. Riley, pictured above. Already Riley has more than 100 retail stores selling his product and he enjoys a big weekly income. Send for Free Book and learn how you can duplicate the success of Winther, Riley and 50 others.

to start making money—good money—the very first week—show you how to make every grocery, lunch room, cigar stand, hotel and restaurant pay you a steady, ever-growing profit. And your total investment is so small you can get it back the first few weeks you are in business.

16-Page Book FREE

The facts presented here are a bare outline. Limited space permits no more. But if you are interested in this startling business that can bring you a big income at once—in any locality—that can make you independently wealthy in a few short years, you are urged to write for my 16-page illustrated book that presents all the facts in full detail. Immediate action is imperative. This is among the first of my public announcements. Yet, already, over 30 men are on the way to big money. Hundreds of others have written for information. So it will pay you to get this information without a moment's unnecessary delay. No salesman will call on you. And a request for information doesn't place you under the slightest obligation. Send the coupon—or better still, a wire—today, to A. H. Adams, President,

Vita-Seald Potato Chip Co.
 500 N. Dearborn, Dept. S-516, Chicago, Ill.

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Please rush free book that describes your new Vita-Seald invention and that tells how earnings of \$50 to \$200 a week are easily possible.

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