

ROMANCE OF THE WONDER METAL

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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FEB.
25 CENTS



SEE
PAGE 194

“The NEXT WAR” by **HIRAM MAXIM**

FATE Led Them to a Living Tomb!

But Edward Eiskamp and Six Companions Cheated Death in Underground Maze

Edward Eiskamp who, with six companions, had this thrilling experience in the Sam's Point caves in the wilds of the Catskills.



"The light continued to burn!"

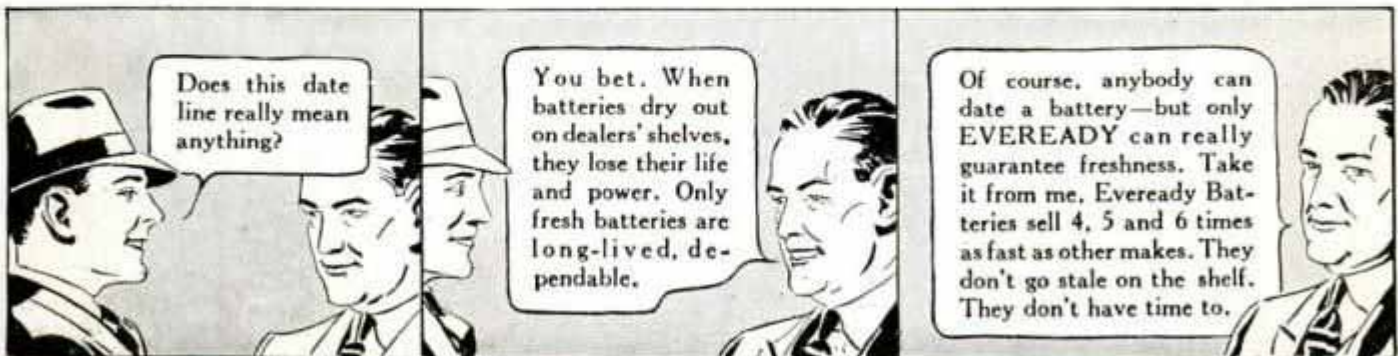
"*Splash . . .* our tiny rock-bound world went black! I had dropped our flashlight into a pool of icy water at the very bottom of that cavern-maze that burrows for miles in every direction under the Catskills. Without light, here was our living tomb. In weeks or months or years someone would find seven skeletons in this crypt.



"But the light continued to burn. Up through eight feet of water came the bright halo of hope. We fished up that flashlight, and those powerful *fresh* Eveready Batteries lighted our way back from Eternity."



EVEREADY BATTERIES
← **ARE FRESH BATTERIES**
ONE REASON WHY THEY LAST LONGER

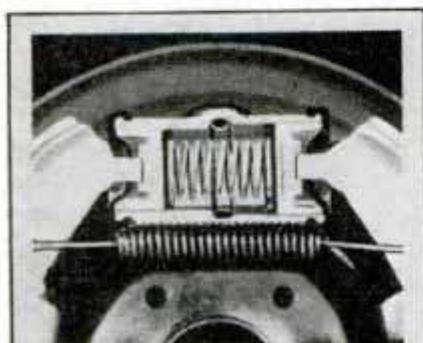
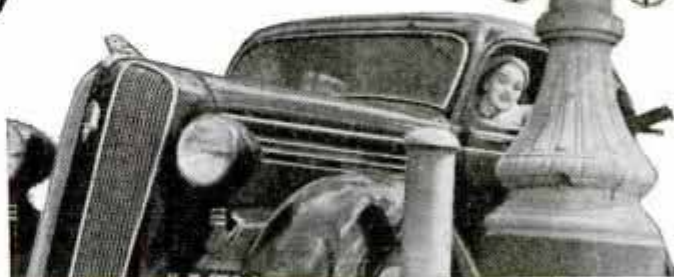


Winning *their* Fight for Safety—

FOR HUMANITY'S SAKE
DRIVE SAFELY

Every man and woman in America must be interested in the vital subject of safety.

ENGINEERS DEVELOP STILL MORE SAFEGUARDS FOR DRIVER AND PUBLIC IN WORLD'S SAFEST LOW-PRICED CAR



100% hydraulic! Plymouth's brakes have two pistons at each wheel—safer—surer.

THE SAFEST BRAKES a motor car can have, engineers say, are the 100% hydraulic kind... used in the big 1936 Plymouth.

These brakes do not rely upon the "winding action" of brake shoes. Stepped cylinders apply equalized pressure on each shoe of the individual wheel. By the hydraulic principle, they are al-

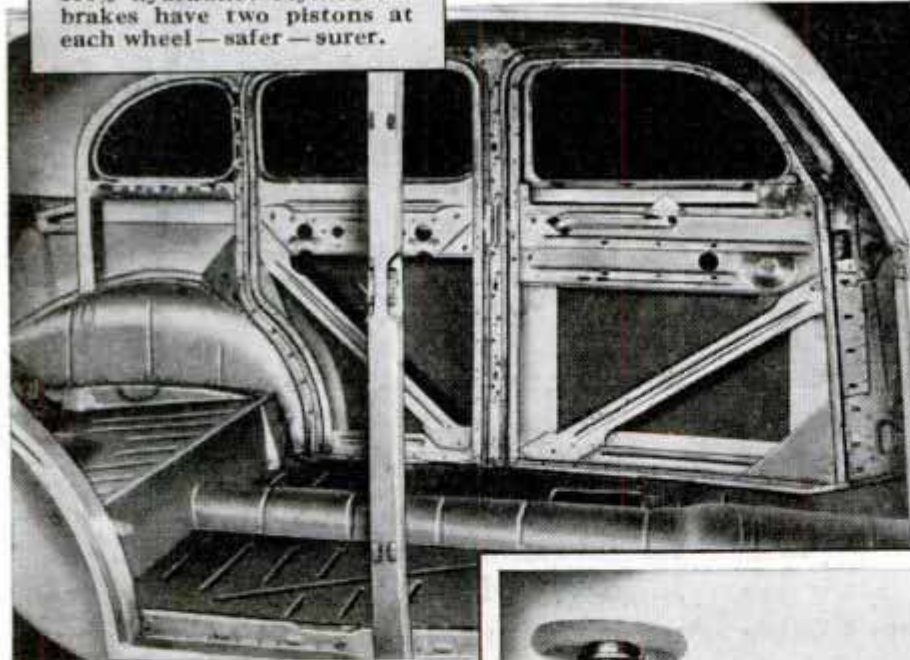
ways equalized... always stop smoothly and safely.

Another great safety factor is the Safety-Steel body (all structural members of steel) interlocking with the car's frame so that each reinforces the other.

You can see the 1936 Plymouth—at all Chrysler, Dodge and De Soto dealers. The price is \$510 (and up, list at factory, Detroit; special equipment extra). PLYMOUTH DIVISION OF CHRYSLER CORP.

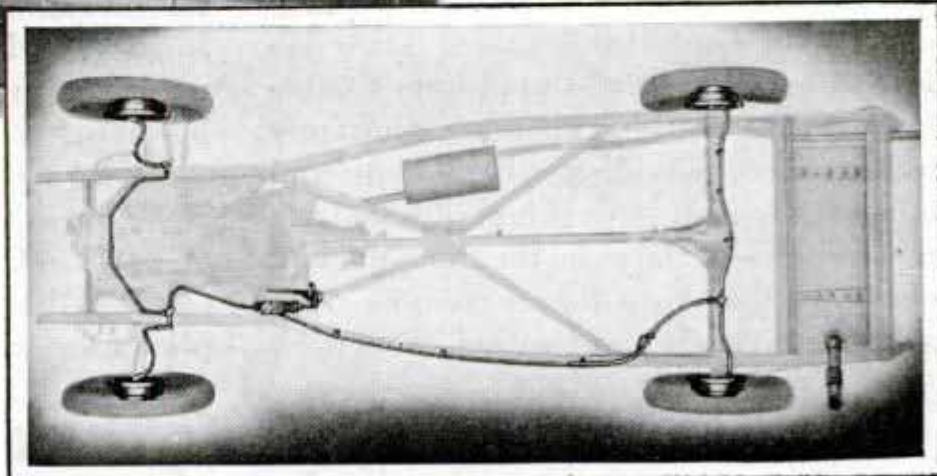


Insist upon 100% hydraulic brakes that stop you smoothly, quickly.



(Above) Famed Safety-Steel body—every structural member is steel—which is interlocking with car frame... for your greater protection in any emergency.

(Right) Simplest, safest braking system made—Plymouth's 100% hydraulic brakes... which are always equalized... always stop you smoothly, safely. No rods or cables to rattle, rust or break.



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Skilled maintenance men guard your telephone service day and night. As a result of their vigilance, both local and long distance calls go through more quickly and accurately.

It's easy to telephone, but there's nothing easy about giving you good telephone service. It takes many thousands of trained employees to do that.

A considerable part of this work is handled by the Central Office men. Their job is to safeguard service—to prevent trouble from getting a start. They are constantly testing lines, circuits, switchboards and other equipment—working with outside repair men—performing the thousand and one tasks that keep things running right and prevent their going wrong. This work

goes on twenty-four hours a day—every day in the year.

The "trouble shooters" of the Bell System work quickly, effectively because of careful training and long experience. Their loyalty, skill and resourcefulness are a priceless tradition of the telephone business.

It is no accident that your telephone goes along for so many months without trouble of any kind. The Bell System gives this country the most efficient, reliable telephone service in the world.

Bell Telephone System

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

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

February, 1936

Vol. 65, No. 2

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New Magic in Man-Made Stone

DRAB concrete, like Cinderella, has doffed its humble garb and become a thing of beauty. It has adopted all the hues of the rainbow and has also quite suddenly assumed a dozen other qualities undreamed of a few years ago. There is heat-insulating concrete, sound-absorbing concrete, high-strength concrete, lightweight concrete, quick-hardening concrete and low-heat concrete. In competent hands, lifeless concrete today can be made to express any mood, from the somber to the exotic. In the March issue appears the first of two articles describing the latest magic wrought by this man-made stone. The story is illustrated by eight pages of Coloroto pictures.

Next Month

HAVE you a \$2,500 penny? You have if you own an un-circulated specimen of the 1799 copper cent. And if you own a five-dollar gold piece issued in 1849 by the Massachusetts and California company, you have a coin worth three times that much. An article next month explains how to start a coin collection.

The Next War at Sea

IN PREVIOUS issues, Hiram Percy Maxim has described the next great war in the air and on the land, basing his statements on the supposition that recent discoveries of science may be applied to the wholesale slaughter of human beings. In March he depicts the next great war on the high seas with whole navies fighting each other instead of engagements involving fifteen or twenty vessels on each side. Like his previous articles, Mr. Maxim's coming story constitutes a powerful argument for peace.

Talking by Hand

THE use of hands and arms as a substitute for speech persists today among motorists, in the trading pit, at auction sales, in railroading and in a dozen other fields. You are "talking by hand" when you point your finger or shake your fist. Watch for the fascinating story, "Speech Without Words," next month.

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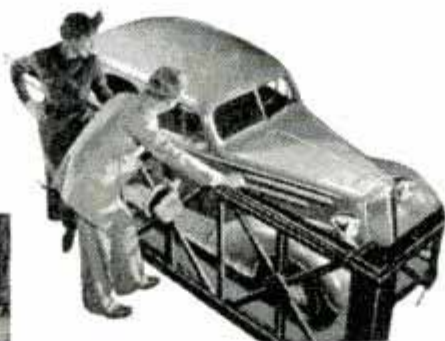
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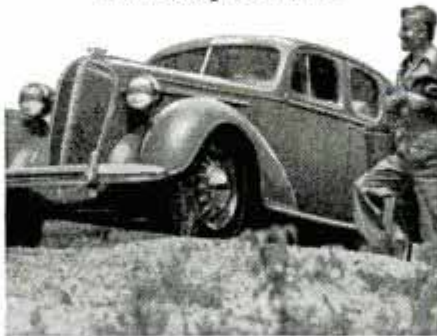
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Promoted—when others were fired!

The Story of LaSalle Student Shaw



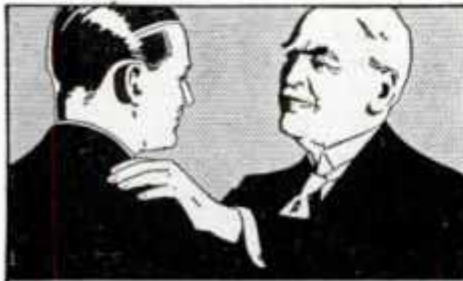
"Since the War I have been book-keeper at \$35 a week. Married, with one baby girl, I found it harder every month to make ends meet. I was desperate!



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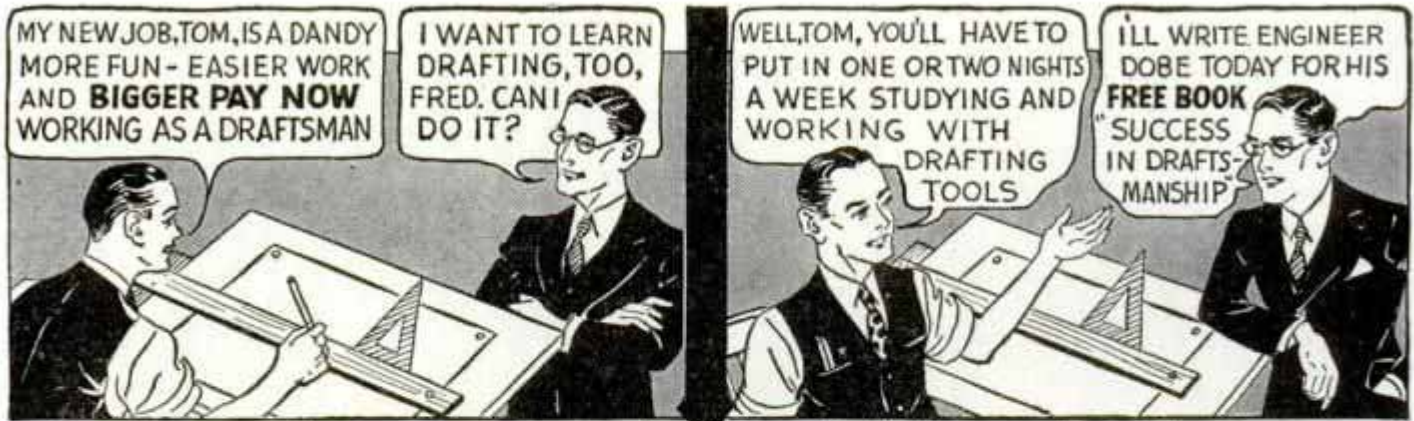
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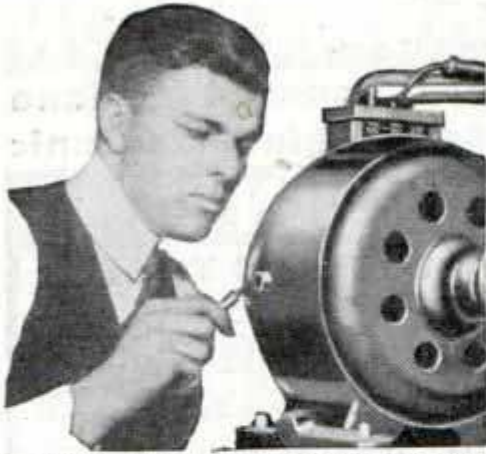
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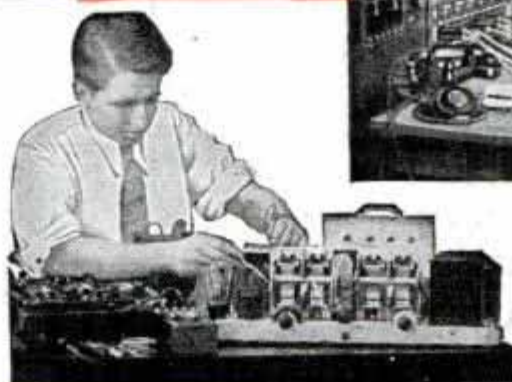
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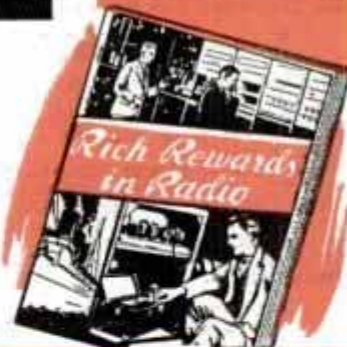
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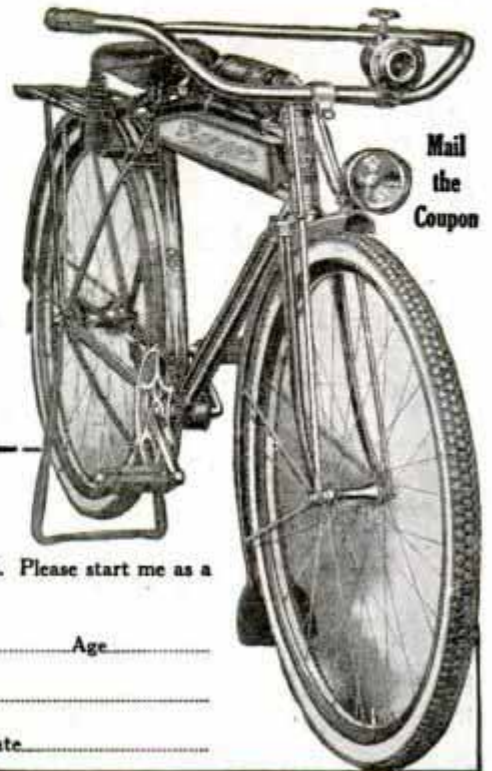
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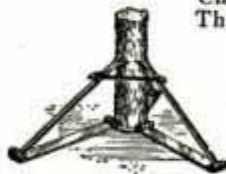
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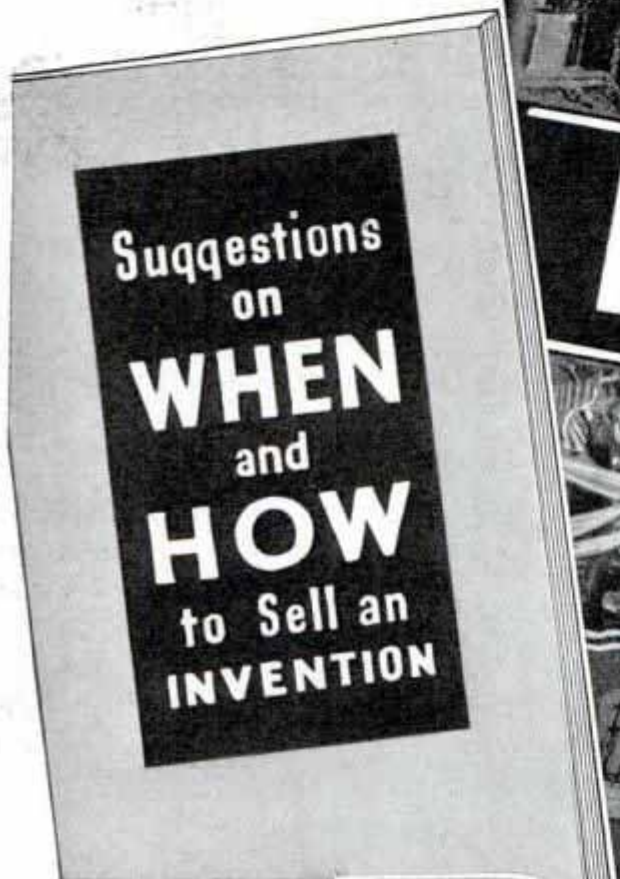
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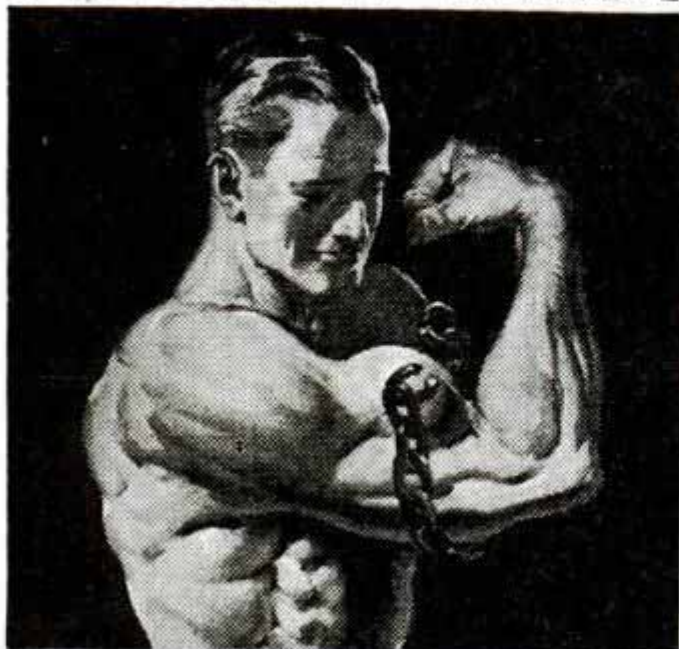
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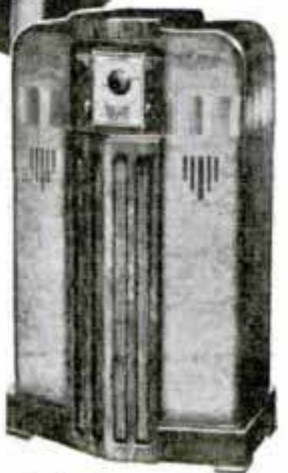
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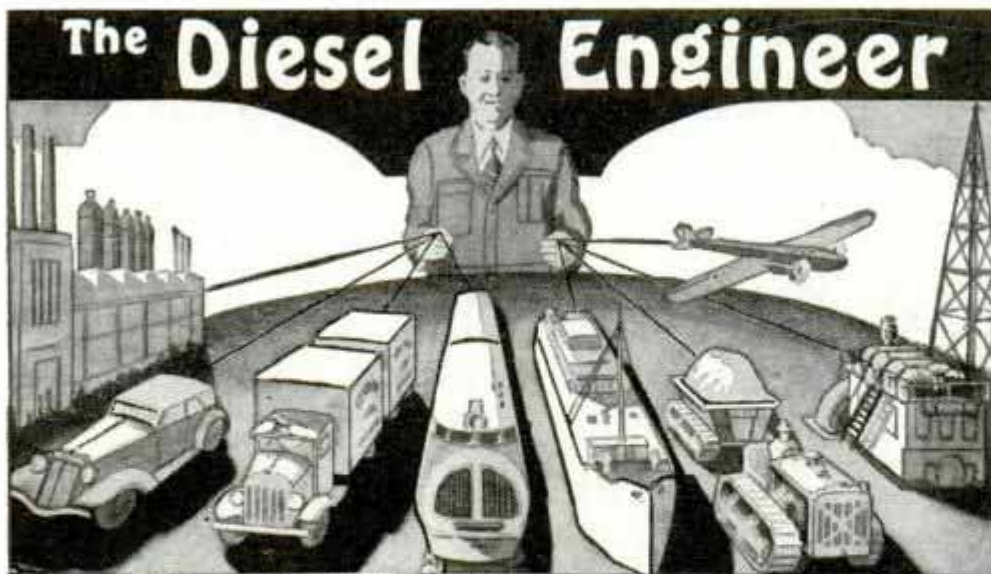
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(Continued to page 66A)



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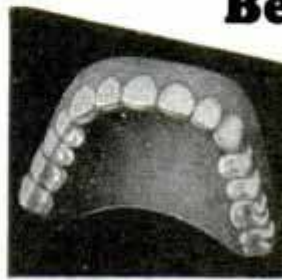
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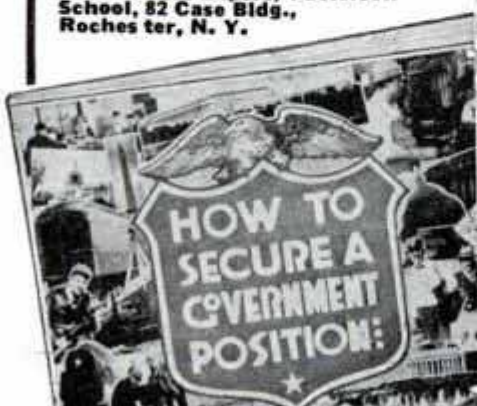
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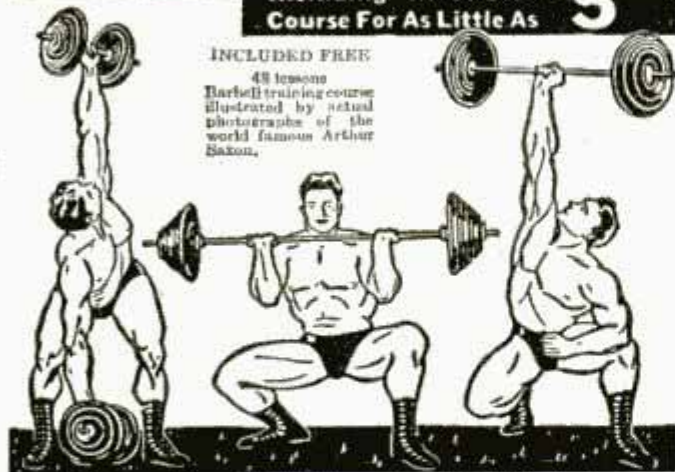
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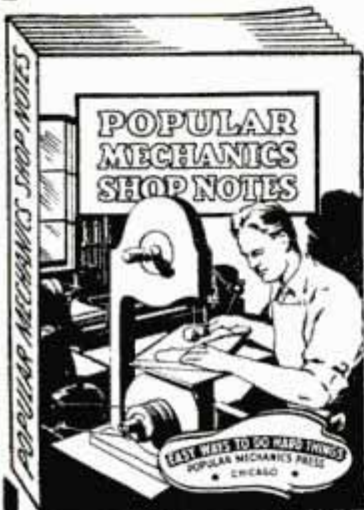
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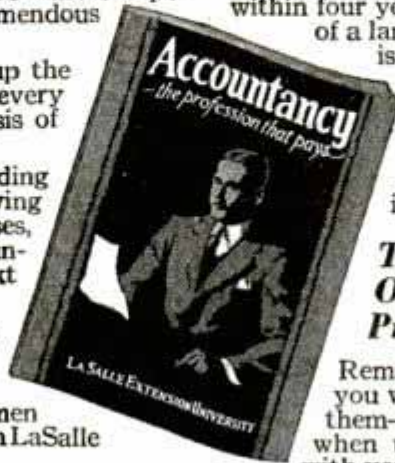
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CLASSIFIED

Advertisements



Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance
To be inserted under proper classification in March issue, copy should be in our office January 14th
Popular Mechanics Magazine, 200 East Ontario Street, Chicago, Illinois

YOU'LL PROFIT

By reading and answering the classified ads in this section. Hundreds of opportunities to make and save money.

Popular Mechanics Magazine,
200 East Ontario St., Chicago, Ill.

Dear Mr. Johnson: We have known for some little time that our classified ad in Popular Mechanics was drawing quite a few inquiries, but I was really surprised today, when I looked over our monthly report of inquiries received from our various mediums of advertising, to see that out of the seven leading sporting magazines in which we ran ads for a few consecutive months, our Popular Mechanics ad showed the best results. Considering the short time we have been an advertiser in this publication, it is needless to say that we are more than pleased. With best wishes,

Yours very truly,

JONAS BROS.

(Original letter on file in our office)

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MIDGET Car. midget motorcycle headquarters. Full line, parts, plans, motors, wheels, rims, brakes, fenders. Completely illustrated catalog—10c. Bates Midget Motors, 4877 Armitage, Chicago.

ARC Welder—Built from Dodge generator. Complete blueprints, simple instructions, \$1.00 cash, or C.O.D. Particulars, stamp. C. A. Carlson, 2212 Grand Ave., Omaha, Nebr.

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MOTOSEAL Puts new life in motor while you drive. Pays for itself in oil and gas savings. Price \$1.00, free literature. Moto-seal Laboratories, 3360 Scott, San Francisco, Calif.

REPAIR Your own car, complete instructions. Parts wholesale. Write Auto Unit Co., 1412 Great Northern Bldg., Chicago.

MIDGET Racing. Get full details on this thrilling sport; facts for fans, builders, drivers; track sizes, regulations; car specifications, pictures, working drawings. Book tells all about Indianapolis cars, Miller-Fords and world's fastest car. Brand new Automobile Racing, fourth edition, \$1 post-paid, \$1.12 C.O.D.; 3c tax if you live in Ohio. Ray F. Kuns, Dept. 17, Madisonville, Cincinnati, Ohio.

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AUTOMOBILE Heat indicators repaired \$1.50. Marine motor heat indicators repaired \$2.75. United Speedometer Repair Co., Dept. 6, 436 West 57th Street, New York City.

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PLATING Outfits for automobile parts. Connect to battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

A. C. GENERATORS

TWENTY New practical changes for automobile generators. See our advertisement at bottom of page 131A. Autopower, Inc.

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\$1 VALUE For 50c. Get facts on trailer coach design. This 50-page book can save you 100 times its cost. Order direct from author. Money back if not satisfied. 2c tax in Ohio. Ray F. Kuns, Dept. 127, Madisonville, Cincinnati, Ohio.

BUILD One wheel trailers. Send dime for particulars. Economy Trailer Co., Box 633, Sedan, Kansas.

TRAILER-ITES! See advertisement of Trailer Travel Magazine on page 151A.

MOTORCYCLES, BICYCLES AND SUPPLIES

POWER Your bike with low priced Speed-bike motor. Attach in one hour. Eighty miles to gallon. Thirty miles an hour. Free folder. Guaranteed. Outboard Motor Corp., 4034 N. 28th St., Milwaukee, Wis.

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BICYCLE Specials: United States chain tires \$1.19. Write for other bargains. Box 92, Station D, Los Angeles, Calif.

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MOTORCYCLE Bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 West Main St., Rochester, N. Y.

HENDERSON, Excelsior, Harley, Indian, used parts, alloy pistons, catalogue and wings pin 10c. Ballak, 1115 Chestnut Street, St. Louis, Mo.

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CLEVENGER'S Flight Manual saves you \$50 when you learn to fly. It gives you an unbelievable insight to the art of flying. It tells how and why students make mistakes and the methods of instruction to correct them. A world of complete and practical information on every page. Price \$1.00. Porterfield Aircraft Corporation, 25th and McGee Trafficway, Kansas City, Mo.

PROPELLERS For airplanes, iceleds, snowleds. Catalog dime. Lorenzen Propellers, Niles, Michigan.

LITERATURE—Ten folders, Heath light planes, motors, snowleds, 25c. Heath Aviation Company, Benton Harbor, Michigan.

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USED Airplanes \$85 and up. Literature 10c. Continental, Box 344, Dept. 2, Indianapolis, Ind.

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FOR Aviation training under our apprentice-plan, see page 26A.

GET into aviation. Air transport pilots get up to \$7,000 per year; mechanics, \$2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2004 Aircraft Building, Lincoln, Nebr.

BATTERIES, GENERATORS, ETC.

SLOW Speed wind charger from automobile generator. Complete plans 10c, with 20 other generator changes. LeJay Manufacturing, 3439 Hennepin, Minneapolis, Minn.

DELCO Light plants. Rebuilt. Guaranteed. M. Pliske, 2033 E. 69th, Cleveland, Ohio.

PROFIT Rebuilding batteries. Make your own plates. Information 25c coin. Blueprints for building wind-electric charger 25c. Arcwelder 50c. Coil and condenser tester 25c. All for \$1.00. General Battery Service, MC935 Fourth St. N., Minneapolis, Minn.

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WINDCHARGER Plan 10c, propellers \$1.25 postpaid. Beacon Mfg., Benedict, N. Dak.

WIND Electric charger plans \$1.00. Henry Bosch, Armour, S. D.

WESTINGHOUSE Power generator—110 volt a.c. 200 watt, \$7.90. See our advertisement on page 137A. National Electric Tool Co., 560 West Washington St., Chicago.

EDISON Storage batteries for power and lighting systems. Especially adapted for all make plants. The ideal battery for wind driven generators. Replace your old batteries with Edisons. Rugged construction. Non-acid. No sulphation. Fifteen year life. Five year unconditional notorized guarantees. Complete generating plants. Free illustrated literature. "See Jay Battery Company," 82 Sterling Avenue, Yonkers, New York.

6-32 VOLT Wind electric plants. Kits \$10.00 up. Parts catalog, plans 25c. Currier Mfg. Co., Minneapolis, Minn.

ELECTRIC Lights—Wind driven—You build them. Write Wind Motor Electric, Ridgway, Mont.

EDISON Non-acid storage batteries for all types electric light plants. None of the acid battery diseases. Long life. Fully guaranteed. Attractive bargains in light plants, generators, motors, etc. D. Hawley Smith Company, Croton Falls, N. Y.

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HUNDREDS Of new and rare items, replacement parts and supplies. Send 3c for new, 60-page, wholesale catalog. Autopower, 408-B S. Hoyne Avenue, Chicago.

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300 AMPERE Welding generator. Fine condition \$150.00. Wilmot Auto Supply, 1970 Wilmot St., Chicago.

ANY D.C. motor or generator easily converted to highest capacity arc welder. Blueprints \$2.00. Monroe, Box 3343, St. Paul, Minn.

DEMONSTRATORS, Electric arc welders. Money-saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, M-263, Troy, Ohio.

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ARC-WELDING Outfit \$1.25. Weld fenders, braze, solder. Lavrow, 4368-W. Warren, Detroit. Stamp appreciated.

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MOTORS, 1/2 H.P. enlarger, electrical supplies. Wholesale bargain pricelist free. Mailorder Electric Co., 153 North Desplaines, Chicago.

25 SLIGHTLY Used 1/2 horse alternating motors \$9.85. 1/4 horse new General Electric \$5.90. 1/2 horse Universal motors \$1.95. Wilmot Auto Supply, 1970 Wilmot St., Chicago.

GOVERNORS Control speed of any make of auto engine, regardless of load changes, when used for stationary or portable power production. Read our ad on page 130A. Candee-Smith Governor Co.

THREE To ten KVA alternating generators. Motors, converters. Queen City Electric, 1736 Grand Avenue, Chicago.

WINDING Data, 100 AC motors, various horsepower and voltage, \$1.00. Motor Data Co., 3002 Monroe, Kansas City, Mo.

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TREMENDOUS Surplus of factory tools selling out. Drills, taps, files, hacksaws, etc. Send for free lists, include six cents postage. Travers Tool Co., 264 Jackson Ave., Long Island City, N. Y.

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ELECTRIC Drills, new, \$5.95 up. Descriptions sent. Shaw, 31-A Winchester St., Boston, Mass.

50-1/2 HORSE, 110 Volt, Universal motors equipped with 14 to 1 gear reduction \$3.50. Wilmot Auto Supply, 1970 Wilmot St., Chicago.

BARGAINS, Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Ken's Equipment, Box M-264, Troy, Ohio.

WHOLESALE Prices!—Shop supplies; tools; spray guns; motors; lathes. Catalog 10c. Kostka, 2350-X South Crawford, Chicago.

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14" x 5' LODGE & Shipley lathe, quick change, good condition, price \$175.00. 14" x 5' Monarch, quick change, good condition, \$150.00. 14" Steptoe crank shaper, \$125.00. All sizes of machine tools. Terms to suit. Cincinnati Machinery & Supply Company, 27 W. Second Street, Cincinnati, Ohio.

HAND Spring winders \$2.50. H. Myers, 111 Washington Street, Burlington, Iowa.

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AIRBOATS, America's finest portable boats and kyaks. Special winter prices—\$5.00 and up. Write for free catalogue. Airboats, Dedham, Mass.

OUTBOARD Motor Mart. All makes, new and used outboard motors and parts. Bought, sold and exchanged. 315 Atlantic Ave., Boston, Mass.

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SPEED Boat. Steady, flat-bottom design. Light. Sturdy. Easy to build. Ideal outboard racer. Inexpensive. Complete plans free. Masonite, 111 W. Washington, Chicago.

BUILD Your own boat. Our fabricated materials save you 2/3. Describe requirements and let us quote. Illustrated catalog 100 boats 10c. Bay City Boats, Inc., 1552 Adams, Bay City, Mich.

12-FOOT Flat bottom rowboat—complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray Street, New York.

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GENUINE Carl Zeiss astronomical and terrestrial telescope, from 39X to 275X, complete \$1530.00 outfit at \$750. Picture and details on request. Bass Camera Co., Dept. "A," 179 W. Madison St., Chicago, Ill.

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GENUINE Navy telescopes \$12.50 each. Excellent spotting scope or astronomical finder. Many other uses, Bausch & Lomb. Object. Lens 2". Eye lens 15/16". Mag. 3 to 10x. Angular field 3° 30' to 12°. Erect image. Remittance must accompany orders. Manhattan Electrical Bargain House, 105 Fulton Street, Dept. M, New York City.

FOR Sale—6" reflecting telescope. A. Hays, 15 E. St. Joe, Rapid City, S. D.

TELESCOPES, Microscopes, binoculars. Lowest prices. Optical catalog free. Brownscope Company, 234 Fifth Avenue, New York.

BUILD Reflecting telescope. Catalog free. Optical Laboratories, Larchmont, New York.

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100 GOOD Arrowheads \$3.00. List 3c. H. Daniel, Dardanelle, Arkansas.

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STEER Horns, six feet spread, for sale. Lee Bertillon, Mineola, Texas.

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BIGGEST \$1.00 Buy! Seven clearly written, profusely illustrated books. Free diploma. Our complete \$15.00 home course on mounting birds, animals, fish; tanning, making novelties. \$1.00 pays everything. Guaranteed as fine if not finer than any, regardless of price. Send \$1.00 today. Schmidt School of Taxidermy, Dept. G-3-2, Memphis, Tenn.

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TAXIDERMY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc. Everything for the progressive taxidermist. Send for big illustrated catalogue—Free. Jonas Bros., 1049 Broadway, Denver, Colorado.

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4,000,000 DAVIS Chicks annually. Broilers and layers. 22 standard breeds. Make more money raising poultry. Demand Davis electric hatched chicks. They are guaranteed. Write for catalogue, prices and early order discounts. Davis Poultry Farm, Rt. 34, Ramsey, Indiana.

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POULTRY House. Latest improved design. Completely insulated. 20' long. 20' wide. 9' 10" high. Sturdy. Easy to build. Complete plans free. Masonite, 111 W. Washington, Chicago.

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BEAUTIFUL Pure white police dogs. Ansonia Kennels, Mose, N. Dak.

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THE Great Northern serves an agricultural empire of fertile productive farms where rents, prices and operating costs are low in Minnesota, North Dakota, Montana, Idaho, Washington and Oregon. Write for free book and full information. E. C. Leedy, Dept. 1357, Great Northern Railway, St. Paul, Minnesota.

NEW Opportunity! Farm income is up. Good land still at rock bottom prices. Washington, Montana, Minnesota, Idaho, North Dakota, Oregon. Ask about extensive northwest developments under construction. Literature, impartial advice. Specify state. J. W. Haw, 119 Northern Pacific Ry., St. Paul, Minn.

\$5 DOWN, \$5 Monthly, 20 acres in Missouri Ozarks, \$100. Fishing, hunting, trapping. Hubbard, 216 Grossman Bldg., Kansas City, Kansas.

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PERMANENTLY Cold chocolate confection; no refrigeration. Sensational! Delicious, profitable. Experience and special equipment unnecessary. Secret formula \$1.00. John Clayton, 3774 Knight Rd., Vancouver, B. C., Canada.

FROG Raising—If interested, we guarantee to save you money. Send 10c for literature now. American Frog Industries, Rayne, Louisiana.

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MACHINE Designers' Guide—Practical handbook of formulas, examples, mechanics, graphics, strength of materials, for designers, inventors, draftsmen and self-instruction. Price \$2.50. K. W. Najder, Mechanical Engineer, Lake Orion, Mich.

CASH Paid for old books, magazines, letters, any early printed matter, obsolete bonds. List for stamp. Meyart, Box 1305B, St. Louis, Mo.

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84 MYSTIFYING Card tricks, 10c. Explained in simple language, illustrated. Franklin Publishing Company, 800 North Clark Street, Dept. 2200, Chicago.

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SALES Agents wanted for Darling Oil, The Hemlock Liniment, and other Darling products. Over thirty-seven years on the market. Hemlock Oil Co., Box A32, Orange, Mass.

SPLASHLESS 25c Filters save glassware. Invaluable proposition. Introductory dozen \$1.25. Barnett, Box 63, Times Square Station, New York.

"WINDOW-RITER"—Magic pencil writes on glass. All colors. Storekeepers buy quickly. Ideal for baseball scores. Large profits. Big repeaters. Free sample. Lake Chemical, 6 E. Lake, Dept. 2-PM, Chicago.

WHOLESALE Catalog free, 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

SELL Metal key checks. Name, address on sample, 25c. Irvin Buschkowsky, 508-A Oak, Chaska, Minn.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

FREE Sample—New photo novelties, 300% profit. Novel-Ad Company, 3327 North Av., Chicago.

SELL Retailers Bermuda onion plants. Marvelous repeaters. Dyson, Cotulla, Texas.

DOLLARS In spare or full time. No canvassing. Brault, Davis, Ill.

FAST Selling products easily made at home. Literature free. Terrone, 22 Station S, Brooklyn, N. Y.

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

PROFITABLE Plans, formulas, ideas, free literature. Raythe, 744 East 126, Cleveland, Ohio.

AUTO Radio—World's cheapest. Entirely new. Write J-20th Century Co., Kansas City, Mo.

SELL Men's neckwear. 100% profit. No investment. Write for free samples. Art-style Neckwear, Elmira, N. Y.

FREE! Descriptions, 450 newest money making opportunities. Metromails, P-2, Cincinnati.

CASH Income daily silvering mirrors at home. Plating autoparts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 128, Marion, Indiana.

CASH In vending machine craze sweeping country. Huge profits. No experience needed. We start you. Exclusive territory. Write quick. Parker Supply, 2124 Clark, Chicago.

COIN Money selling colored people. Give away free pictures of Joe Louis with hair preparation. Valmor 5249-NM Cottage Grove, Chicago.

I WANT Men for local tea and coffee routes. Make up to \$42.50 a week to start. No experience needed but must give prompt service to families on your route. I send everything; no money risk. Write Albert Mills, 2634 Monmouth, Cincinnati, Ohio.

AUTO Owners drive 200 miles—46c. Fuel oil conversions \$12.00. Satisfaction guaranteed. Agents wanted. Stamps (3c) bring information. Desogay Company, 1719 Addison Street, Berkeley, California.

AGENTS—Salesmen take orders for overcoats, topcoats, raincoats, jackets, paying up to \$4.00 commission. Outfit free. Special, G-4543 Ravenswood, Chicago.

AGENTS, A whirlwind seller and coin getter. "Middy's Scissors Sharpener." Sample and particulars 10c. Edward Woehr, 808 S. 49th St., Philadelphia, Pa.

100% PROFIT In the "Self Starting Cigar Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 25c. Costs \$1.75 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-38, New Method Bldg., Bradford, Pa.

MEN—Women \$3 to \$6 daily. Selling 25c household necessity that repeats. Three to ten sold in every home. Free sample. Write Puro Company, 3107 Pine St., Dept. B-2046, St. Louis, Mo.

STOPS Thieves! Pays you big money—Quick. New burglar alarm sells for \$1. Thirty million prospects. Get demonstrator now! Pruitt, Dept. 152, Elburn, Ill.

STA-KLEAR Keeps auto windows from steaming and frosting. 200% profit. Sample and details 25c. Atkinson Chemical Co., Bay Village, Ohio.

CASH Paid for butterflies, insects. See Sincialr Display Advertisement on page 18A.

AGENTS: Smash go prices! Santos coffee 12c lb. 4 oz. vanilla 8½c, razor blades 10 for 8½c, 100 sticks chewing gum 12c. 150 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

AGENTS Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfits. The Moss Company, 64 Searle Bldg., Rochester, N. Y.

LOOK Men, women; earn \$5-\$10 daily, selling new window cleaning compound. 2 sales an hour does it. Seneca Specialties, Geneva, N. Y.

\$3.00 HOURLY! Amazing automobile ornament. Produces revolving colored light. Propell-O-Lite Company, Mt. Washington, Ohio.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

MAKE Commissions daily—Sell Goodyear raincoats, jackets; union made; lowest prices! Outfit free! Goodyear, BB1133, Milwaukee, Chicago.

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

GOLD Letters for store windows. Large sizes penny each. Free samples. Modernistic Sign, 3004 Lincoln Ave., Chicago.

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

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

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

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

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

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

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

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

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mucilages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

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

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

HIGH-GRADE SALESMEN

CLOTHING Salesman wanted. To represent the world's largest manufacturing retailers of men's clothes. New spring and summer fabrics and styles now ready. Liberal commissions. An opportunity to make a good income and establish an increasingly profitable business. Write The Richman Brothers Company, Cleveland, O.

SELL To stores—5c carded nuts, food specialties, carded merchandise. Year round moneymakers. Interstate Supply Co., 211 First Avenue N., Minneapolis, Minn.

WAKE Up mister! The fire department in your own home town and any town of 1000 and up within a few miles of you may need fire hose now. Because of the depression requirements have not been maintained and many replacements are necessary. Who will get this waiting order? You will, if you will go after it, thereby making a nice commission for yourself and opening the door to an opportunity to become one of our regular salesmen with allotted territory. In addition these towns may need a fire engine. This is big business and pays you handsomely for your efforts. Just as soon as you find where some hose is needed, write or wire immediately our expense and we will send you full particulars. Only one man in a district will be selected. First come—first served! The General Fire Truck Corp., Manufacturers of Fire Engines, Extinguishers and Allied Products, Dept. B, 4127 Forest Park Blvd., St. Louis, Mo.

SALESMEN, Insurance agents may now share the profits of "Salesman's Secret of How to Get Favorable Interviews." Copyrighted. Formerly \$12.00. Worth it! Guaranteed to double your sales. For limited time \$1.00 buys it. Send your dollar now! Wendell West, Box 145, Oakland, Calif.

PRINTING Prices wrecked. Show local users big savings. Take easy, quick orders. Experience unnecessary. Complete line. Union label. Free cut service. Big commission. Outfit free. Publix Printing, 633-F Plymouth, Chicago.

MAN—Handle regular store route. Place nationally advertised 5c-10c counter card mdse. New aspirin deal—6 tablets 5c. 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 2810, Spencer, Ind.

MAKE Big money—Commissions advanced, sell Popular Mechanics work shoes—complete line of dress shoes—outfit free. Dura-Tex Shoe Co., 80, Brockton, Mass.

SALESMEN, Distributors, agents. Something new. 4 in 1 auto product. Cleans, polishes, removes tar and road film. 100% profit. Send 25 cents for sample and details. Lyon Co., Beaver Dam, Wisconsin.

SALESMEN: New Meco beverage fizzers, re-usable bottle caps, sanitary liquor pourers and other fast sellers. Big commissions, send four dimes for samples. Meco, Inc., 2947 No. 30th St., Milwaukee, Wis.

WOVEN Labels—Tremendous field—Liberal commissions. Premier, 267 Fifth, New York.

EVERY Store, office, institution needs new \$2 letter printer. Mailmarts, PMC-1, Cincinnati.

STRANGE Chemical sponge cleans wallpaper like magic. Banishes housecleaning drudgery. Women amazed. Hustlers cleaning up. Outfit free. Kristee Mfg., Dept. 252, Akron, Ohio.

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

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" tailored-to-measure clothes, make up to \$10 in a day. Experience unnecessary. Free suit offer. Low prices. Quick sales. Free outfit. Permanent! Fairbanks Company, 2267-M Wabansia, Chicago.

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

SELL Our beautiful rubber link mats to public buildings. Cleveland Mat Corporation, 5511 Euclid Ave., Cleveland, Ohio.

SELL Business establishments. Two minimum sales daily make \$42 weekly. No mdse. investment. Paracraft, 1600 Locust, Des Moines, Iowa.

SALESMEN: Sell complete line calendars, gummed labels, restaurant checks, carbonized salesbooks, business stationery. Special features. Free deals. Big comm. daily. Free sales portfolio. Lionel, Dept. GZ, 312 So. Hamilton, Chicago.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 2-A, 4503 Ravenswood, Chicago.

SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2640 N. Third St., Milwaukee, Wisconsin.

SALESMEN—Sell complete line quality printing. All business necessities. Gummed labels, adv. cards, salesbooks, calendars, Hammerrill bond stationery, etc. New features. Large spot cash commissions. Complete sales outfit free. All-Trades Printing Service, Dept. PM-26, Rockford, Illinois.

MAKE Big money—Commissions advanced, sell Popular Mechanics work shoes—complete line of dress shoes—outfit free. Dura-Tex Shoe, 80, Brockton, Mass.

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

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

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

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

SELL Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. Outfit free. United, F-6155 South State, Chicago.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

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

WORLD'S Lowest priced oil burner, uses any oil—fits any stove. Big profits for agents. Renmor Mfg. Co., Not Inc., 4877 Armitage, Chicago.

NAP-TOL Crystals—Cleans everything! Non-explosive, odorless. 25c package makes 10 gallons—150% profit. Marvelous repeat business. Write today! Madame Chalons, A-325 W. Huron, Chicago.

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

HELP WANTED

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

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848-A-178 Lincoln Ave., Chicago.

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

FREE Suit and large cash profits for every six \$16.95 all wool tailor made to measure suits you sell. No limit to number of free suits you may earn. Three Star Clothes, 330 S. Franklin St., Chicago, Ill., Dept. 35B.

GROW Mushrooms right now—a steady income—in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! We buy. Book free. American Mushroom Industries, Dept. 513, Toronto, Ont.

USER-AGENTS, Introduce new \$1 postcard printed. Mailmarts, PMB-1, Cincinnati.

ABLE Men for distributing and route work. Automobiles given men who qualify. \$35-a-week opportunity. Details free. Albert Mills, 2632 Monmouth, Cincinnati, O.

SPARE Time money. Easy work, no selling. Nothing to buy, nothing to pay. George, Box 228C, Jackson Heights, N. Y.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 18A.

LEARN Diesel engineering. Rapidly expanding field. Good pay for Diesel-trained men for next 25 years. Home training possible. Get latest and right up-to-date Diesel Handbook. Authentic. \$5.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

IMPROVE Your penmanship. Particulars free. Enclose quarter and receive twelve cards showing name beautifully written. Expert Penman, Box 194, Pasadena, Calif.

ELECTRIC Refrigeration—Air conditioning. Rapid growth creates big demand for trained men. Earn up to \$35.00—\$50.00 weekly. Get facts. Write for free book. Address President, U. E. Inst., 404 N. Wells, Box 126-A, Chicago, Ill.

LEARN Law in twenty minutes per day. Credit extended. Franklin Institute, Box 1798, Milwaukee, Wis.

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

LEARN Auto mechanics, metal finishing, electricity, refrigeration. Stevinson's 2008A Main, Kansas City, Missouri.

GET Ahead in life. Study at home. Courses, books—every line greatly reduced. Mention interest. J. McDermott, 254 Drexel Bldg., Philadelphia.

LEARN Jiu-Jitsu from America's leading experts. Become a Jiu-Jitsu instructor in ninety days. Graduates of this institution afforded splendid social and financial benefits. Full information free from the American School of Jiu-Jitsu, Inc., 1044 South Olive Street, Los Angeles, California.

GOLD Buyer's Guide! Just published! (Copyrighted.) Contains complete instructions and buying plans. Few dollars starts this wonderful lifetime business! \$1.00 pre-paid. Agents Supply Co., Dept. "P," Belleville, N. J.

INVENTING Now taught successfully. Home study. Write for free booklet. Trofimov School of Inventive Practice, 3859 Northampton Rd., Cleveland, Ohio.

LEARN Auctioneering, earn \$200 per day. Write for illustrated catalogue. American School Auctioneering, Aurora, Missouri.

STAMMERING. Stuttering corrected. Write Lewis Institute, 12052 Woodward, Detroit, Michigan.

LEARN Account collecting. Good income, quick results. Interesting booklet free. National Collectors Association, Newark, Ohio.

"DYNAMENTAL"—Complete in 12 lessons. Gives secret of mind power and control, concentration, memory, willpower, contacting subconscious. \$1.00 postpaid. Dynamental Foundation, 9304 Amesbury Ave., Cleveland, Ohio.

CORRESPONDENCE Courses, book bargains. Free lists. R. E. Kelley, Sturgis, Michigan.

SECRET Service. Valuable information free. Write International Secret Service Institute, PM-26, Hoboken, N. J.

GOVERNMENT Jobs. Start \$105-\$175 month. Men-women. Prepare now for next held examinations. Common education. List positions free. Franklin Institute, Dept. F3, Rochester, N. Y.

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

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

GET The position you want. Practical methods in ten chapter text will show you how. \$1 prepaid. Personnel Publications, 316 Court St., Brooklyn, N. Y.

MEN Wanted willing to learn landscape designing and fill big paying positions as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 400 Plymouth Bldg., Des Moines, Iowa.

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

GET Free copy of our questionnaire—find out immediately what government jobs paying \$105-\$190 month you can qualify for. Men-women, age 18-53. No obligations. Write, Instruction Bureau, 101, St. Louis, Mo.

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

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

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

BOXING. Learn boxing, complete illustrated instructions 25c. Wrestling 25c. Jiu-Jitsu 25c. Muscle-building instructions and exercisers \$1. Prof. Dryer, Box 1850, Chicago.

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

CARTOONING—COMMERCIAL ART

MONEY—Popularity—Through illustrating, 50 lesson, professional course—60c. Graphic Service, 417 Southway, Baltimore, Maryland.

NEWEST Methods. 320 illustrations. \$1.00 postpaid. New Market Studio, Knickerbocker Building, New York City.

IF You like to draw, sketch or paint—Write for free talent test and art book. Federal Schools, Inc., Dept. P26, Minneapolis, Minn.

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

MINIATURE Cartoon course, containing 100 drawings, "How to Sell Cartoons" plan, etc., 25c. Graphic Cartoons, R. 2, Box 274-A, 16th Street and Arizona Canal, Phoenix, Arizona.

ARTIST Will cartoon your portrait, 50c. Send photo. General designing, music covers, lowest rates. Nendick, 220 North 3rd, Maywood, Illinois.

SELL Your cartoons. "Cartoonists' Guide" tells where! 25c. Ridman, 3235-G Jefferson, Cincinnati.

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

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

ADVERTISING AGENCIES

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 343-B, Chicago.

INCH Display advertisement 50 magazines, year \$24. Wood's Popular Services, Atlantic City, N. J.

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

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

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

FOR ADVERTISERS

23 WORDS, 25 Magazines, three months \$1.50. Empire, Shawano, Wis.

BUSINESS SERVICE

SALES Letters, folders, circulars, complete mail campaigns planned and written to produce "plus" profits for you. Write for descriptive folder today. Raymond W. Walter, Box 626, Ridgewood, N. J.

WHERE To buy anything—Manufacturers, wholesalers. \$1.00. King Service, 702 Lakeview, Jamestown, New York.

PRACTICAL Information business addresses, supply sources, formulas, remedies, processes. 25c each question. Dissatisfaction refund. General Information, 350 East 18, New York.

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

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

RUBBER STAMPS AND OFFICE SUPPLIES

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

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

CUSHION Mounted, one—two lines, 25c. Three 35c. Stamp Works, 814 Bradley, Peoria, Ill.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

"DUPRINT" Stencil duplicator. Prints postcards, letterheads, envelopes—anything. \$2.00 complete. Metromails, P-2, Cincinnati.

LOWEST Price! Stencil duplicator, \$3. Offset, \$1. User-agents wanted. Mailmarts, PMA-1, Cincinnati.

DUPLICATOR Ink \$1.25 pound; stencils \$2.50 quire. Midwest, 4854 Reading, Cincinnati.

STENCILS. Any duplicator, \$1.25 doz. Ink, \$1 pound. Quality! Mailmarts, PMD-1, Cincinnati.

BECO Rotary duplicator \$15.50 complete. All metal. Prints anything typewritten, handwritten, drawn. Beco, East Orange, N. J.

THE "American Flyer" typewriter—The wonder typewriter of the 20th century now only \$4.75, express prepaid. 9 special features. Illustrated folder free. American Flyer Typewriter, Box 523, Florence Branch, Los Angeles, Calif.

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

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

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

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

1,000 BUSINESS Cards \$1.00 postpaid. T. R. Dickey, Hawthorne, Calif.

QUALITY Printing, letterheads, envelopes, cards, blotters, etc. Samples free. D. J. Hemingway, 25 Oak Knoll Road, Natick, Mass.

2000 BUSINESS Cards \$1.50. Card case free. Andruzzi, 566 Seybert, Hazleton, Penna.

COMPLETE Printing service for you. Send today for price list and "Printed Word." Fay Company, 85 Columbia St., Newark, N. J.

LETTERHEADS, Envelopes, 500 \$1.10; 1000 \$2.00, (postage). Reference: Dunn-Bradstreet, Raymonds', Newport, N. Y.

200 EACH, Neatly printed letterheads, envelopes \$1.50. Stumpprint, S-Whitley, Ind.

100 ENVELOPES, 100 Letterheads \$1.00 postpaid. Progress Printers, Bedford, Ind.

500 EACH, Letterheads, envelopes \$3.50. Vernon's Stationery Co., South Bend, Ind.

BUSINESS Cards, 1000, \$1. Neatly printed, money with order. Conley Press, 420 East Ninth, Kansas City, Missouri.

HUMIDITY indicators, novel advertisements; 1000 \$1.00. Sample 5c. Nelson, Thomas Company, Greenfield, Mass.

ATTRACTIVE Gum labels, your copy. 1000—\$1.85. Jobey Press, 3932 Madison, Chicago.

HAMMERMILL Letterheads 200, \$1.00; 500, \$2.00; 1000, \$3.00. Same prices for envelopes, statements, blotters, shippingtags. Business cards, parcelpost labels 500, \$1.00; 1500, \$2.00. Dollar Printers, Ottawa, Ill.

BETTER Labels, lower cost! Samples. Labelers, 6618C Quimby, Cleveland, Ohio.

EMBOSSO—500 Letterheads and envelopes \$5.89 delivered. Solihdays, Knox, Indiana.

5000 ENVELOPES, Letterheads, postcards, 6x9 circulars—\$8.99. 1000 envelope slips, \$1.75, 5000, \$3.90—postpaid. Samples. Goodprint, Harrisonburg, Va.

1000 ENVELOPES \$1.95. Cards, tickets \$1.00. Bradshaw, 3214-P Huron, Chicago.

1000 LETTERHEADS Or envelopes, \$2.75. 5000 envelopes, \$7.50. Lawndale Press, Franklin, N. H.

ATTRACTIVE Letterheads, envelopes, statements, 250—\$1.00. Box 135-P, La Crosse, Wisconsin.

MIMEOGRAPHED Letters. Low prices. Send for sample. Ideal Service, Box 73, Sta. A, Brooklyn, N. Y.

WRITE For price list. Drachprint, 1619 Hogan St., St. Louis, Mo.

PRINTING. Prepaid prices. Mail-Order Publishers, 954-P 8th Avenue, New York.

GUMMED Labels: 1,000 printed, 1x1 1/2, 20 words or less, 50c. JBS Company, Box 93, Holyoke, Mass.

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

250 LETTERHEADS, Envelopes and business cards, neatly printed, postpaid \$3.50. Lonelm Printery, Paulding, Ohio.

PRINTING? Write us. Square Deal Printers, Box 215, Greenfield, Mass.

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

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

BOY Merchants—Famous library of 4 volumes covers the building of almost everything a boy might want to make. A great boon to parents and teachers. Actually covers 4,000 different articles. Each volume 460 pages, fully illustrated. Cloth. Price \$2.00 each or set of 4 vols.—\$7.00 postpaid. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.

PRINTING OUTFITS AND SUPPLIES

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

NEW Type 29c font. Catalogue dime. National Type Company, Jackson, Mich.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 65-A; 6 Columbia St., Newark, N. J.

BARGAINS Hand, job presses; type, supplies. Send stamp. 159 Harvard, Cambridge, Massachusetts.

ENVELOPES, Cards, blotters. Bond, gummed and ruled papers. Lowest wholesale prices. VanDorn Paper-stocks, Ottawa, Ill.

BARGAINS. Presses, type. List 3c. Exchange D11, 22 Orient, Meriden, Conn.

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

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

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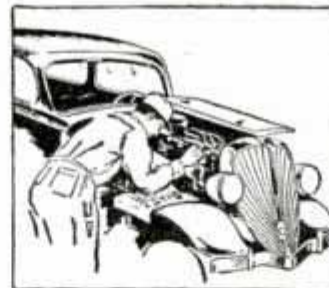
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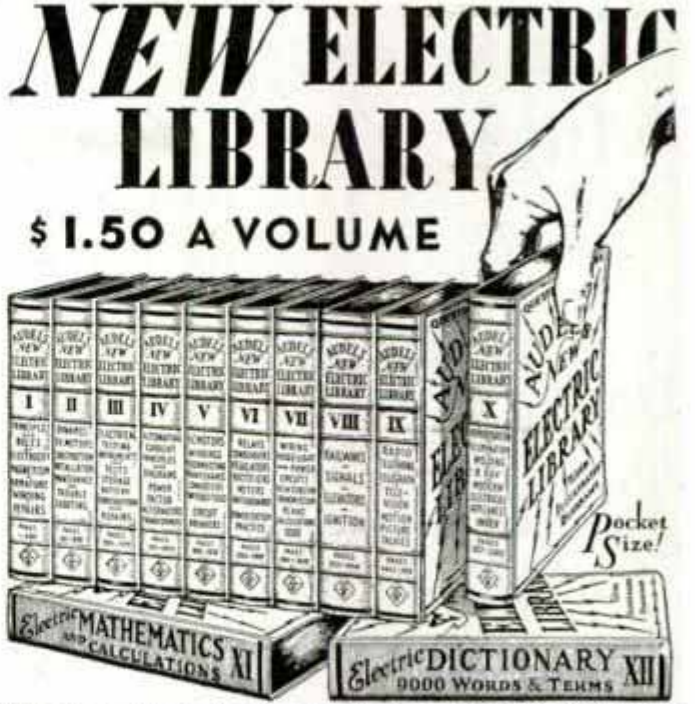
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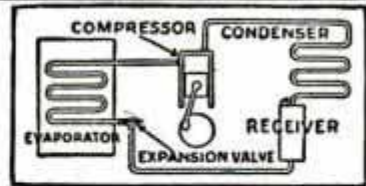
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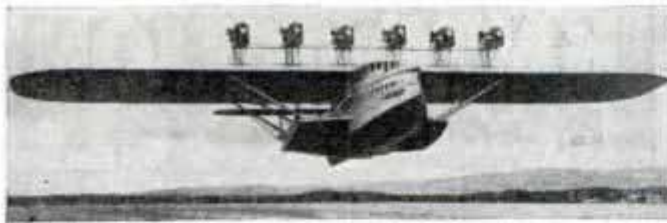
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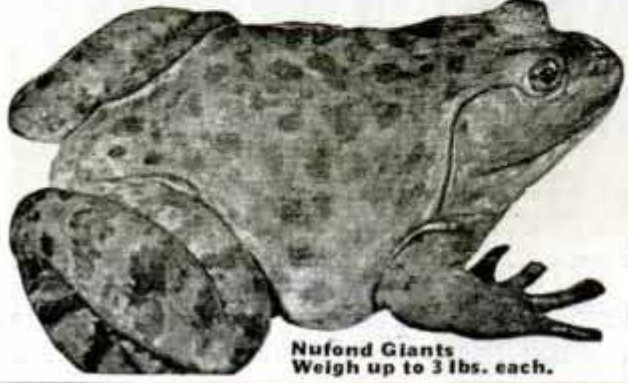
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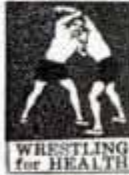


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This airplane type Doenut cord tire was invented by A. J. Musselman, who developed the original air-wheel for airplanes and motor vehicles. Doenut Tire patent No. 2015459. Requires only 12 to 15 lbs. of air to carry 200 lb. loads per tire. These Doenut tires are revolutionizing the tire industry. They take less power to propel, literally float over road bumps and are winners in coasting contests. You can build any of these vehicles in a few evenings' spare time at home. Send 25c for detail working blue prints for any vehicle shown above except Derby racer, or 50c for any three, except Derby racer blue print, which is \$1.00. Catalog of building sets, wheels and parts, FREE.

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The Editor's



MAIL BAG

(Continued from page 28A)

slight inward pressure, they adhere to each other as though magnetized. Perhaps some reader can give me the explanation of this phenomenon. Is it magnetism, electricity, atmospheric pressure, the result of a vacuum, molecular attraction, capillary power or what?—*J. O. Perry, Chicago, Ill.*

Snake Without a Reverse



"Some of your readers might like to know whether a snake is so constructed that it can go into reverse. The following clipping may throw light on the subject: 'When Mrs. John Rosecrants went to the

cellar of her home, she spied the tail of a snake protruding from the top of a soda pop bottle. She found that the reptile, a bull snake, had stuck its head into the bottle in pursuit of a mouse and was unable to back out. Its body was neatly folded several times inside the bottle. When the bottle was broken, the snake measured thirty-three inches."—*Ira J. Smith, Cordell, Okla.*

It's Snow-Car Time



"Enclosed is a picture of a snow car that I built and tried out last year. It worked fine mechanically and steered all right. However, the snow had to be quite hard to carry it. The car has a Henderson motor."—*Evald Gorsgren, McGregor, N. D.*

Set Works; Builds Four



"I am sending you a picture of myself and one of the 5-tube a.c. receivers that I built from the article in Popular Mechanics Magazine. As the set gave exceptionally good results as to quality and selectivity, I built four of them for my family and have not had a complaint on any one of them. Your radio articles and blueprints are easy to follow."—*John W. Rohrn, Canton, Ill.*

Wonderful Tone

"I have a car radio, assembled from diagrams in your magazine, in a car without suppressors, but with two antennas under the running boards. This set out-performs all sets around here. I have picked up a station on every wave length and the set has a wonderful tone. I also have used it on a battery with a four-foot antenna in the house with just as good results."—*H. A. Pond, Wichita, Kans.*

From Far Malaya

"I have been reading regularly your magazine since 1913 and I have gained a wealth of knowledge of value to me, a prospector of commercial minerals in British Malaya."—*Ong Ghim Phoe, Federated Malaya States, Malaya.*

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MATHEMATICS



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(P. M. 2-36)

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Here's the most attractive offer, we believe, that's ever been made to pipe smokers. Simply go to your dealer and get Prince Albert. Smoke 20 pipefuls. If you don't say you've had the best pipe smokin' ever, the makers of Prince Albert will return full purchase price, plus postage, just as the offer says.

What to expect—We know that in Prince Albert we've got the quality—the taste and aroma—that men are looking for. So now we ask that you, too, try Prince Albert. Test Prince Albert under our positive you-must-be-pleased guarantee. Note the special "crimp cut." It makes Prince Albert cool, mild, and long-burning.

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Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed)
R. J. Reynolds Tobacco Company,
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Vol. 65

FEBRUARY, 1936

No. 2.

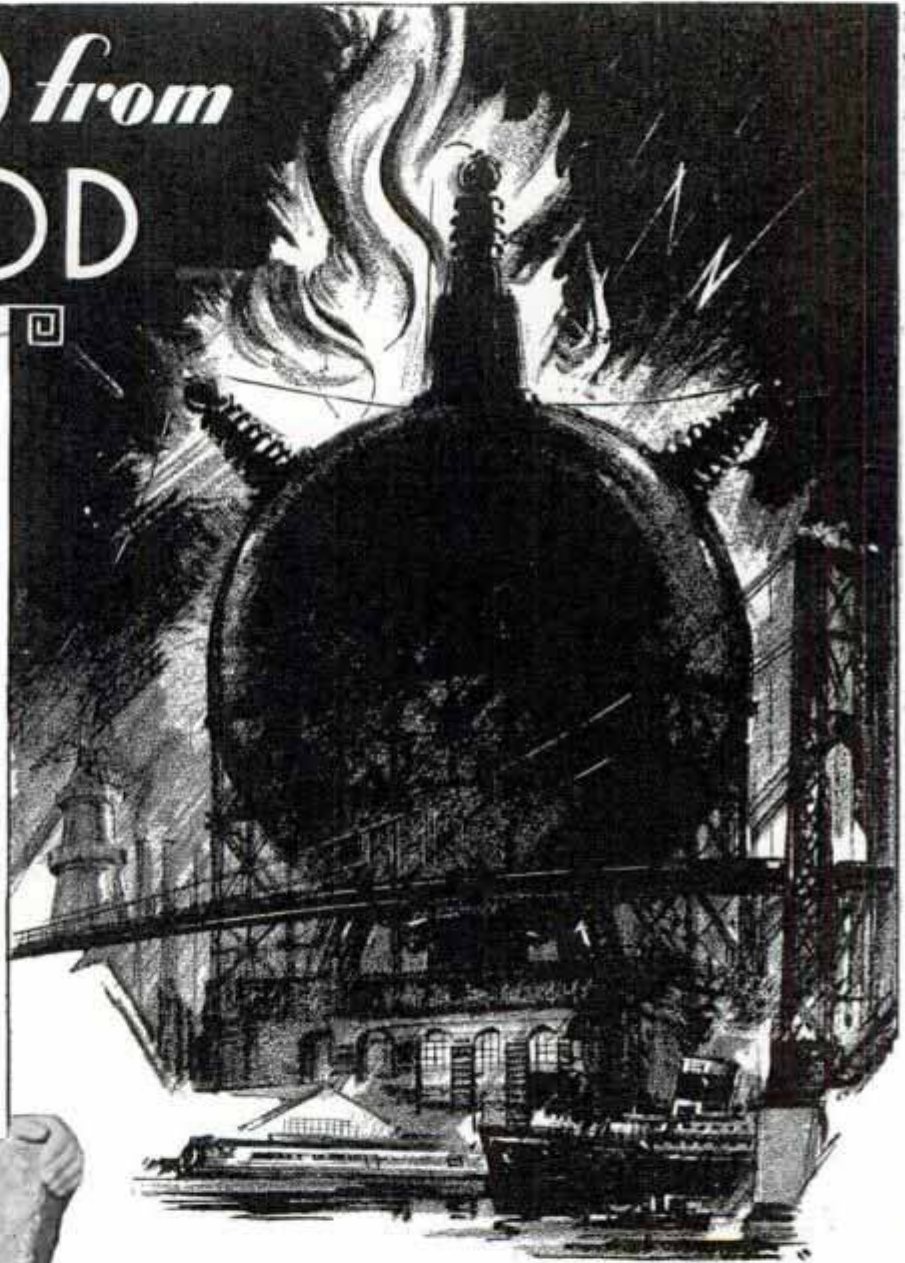
FOOD *from* WOOD

By
Chas. E. Hewitt, Jr.

GERMANY'S inventors and manufacturers have been concentrated on one grand objective—to wipe out all imports. By their skilled teamwork, several major battles of this import war—and incidentally, of the



Block of Inexpensive Building Material Made from Berlin's Waste and Rubbish and Suitable for Partitions



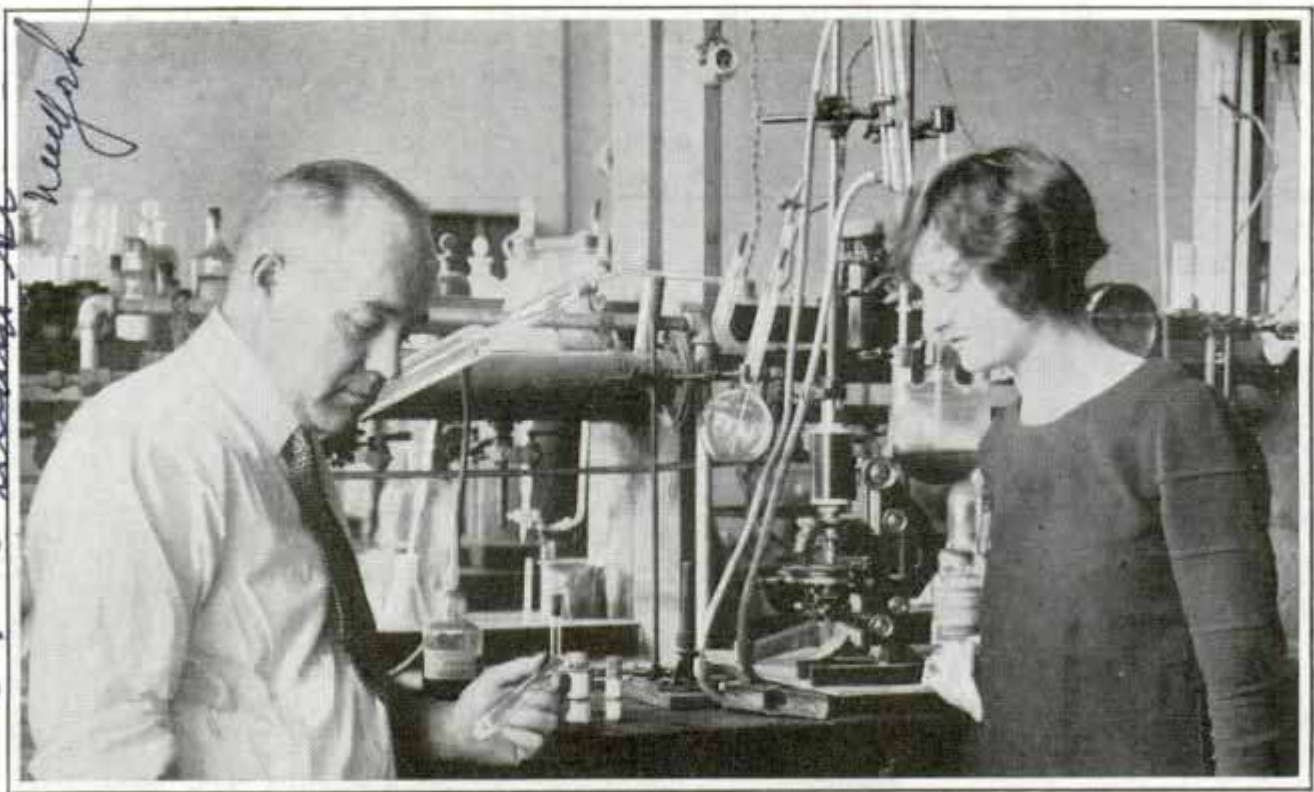
Artist's Conception of Electrical Experiments of German Scientists in Effort to Break Down Atoms

next real war—already have been fought and won. The greatest single victory to date is the completion of the Bergin factory in Mannheim-Rheinau, where the production of sugar from wood waste has been placed on a commercial basis. By the new process, the German people will henceforth be able to make cake frosting from tree bark, fatten their pigs on succulent meals of sawdust, pour resin on their salads, and fill their gas tanks with

mandelstrasse 9 Munich

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no further data



Dr. R. F. Jackson and Dr. Sylvia Goergen of U. S. Bureau of Standards Who Discovered Acid Treatment to Convert Starchlike Substances Found in Dahlias and Artichokes into Sugar

old twigs and branches. The Bergin "Wonder-Works" was built by Dr. Friedrich Bergius, Nobel prize-winner. His co-workers are Fritz Koch, Prof. Erik Haegg-lund, and E. Faerber.

The Bergin Works will produce weekly 125 tons of sugar, sixty-one tons of lignin, and eight tons of fine vinegar. Any portion of the sugar output may be withdrawn before the final process of refinement and marketed instead as super-grade fodder, in the form of dark brown blocks somewhat resembling maple sugar. Likewise, any part of the daily output of sixteen tons of sugar may be turned—by a further wave of the Bergius wand—into commercial alcohol, 100 pounds of wood-sugar yielding four gallons of 100 per cent alcohol. Production price of the new sugar is officially stated as thirty pfennigs or about seven and one-half cents per pound.

Bergius' "wood-sugar" differs in no physical characteristics, including taste and nutritive value, from the sugar now obtained throughout the world from sugar beets and sugar cane. Though "artificially" produced, the new sweet has nothing in common with the non-nutritive, highly concentrated "saccharine" developed during the world war.

As far as raw material is concerned, the

Bergius invention is nearly as great a triumph as his colleague Bosch's "fixation of nitrogen," which drew its main ingredient from the air itself. For the new alcohol, sugar, vinegar and fodder are obtained from a source which for practical purposes is quite as inexhaustible and which has hitherto been considered useless—waste wood. This literally means scraps from woodworking, branches pruned from fire wood, ordinary sawdust, plane shavings and similar waste.

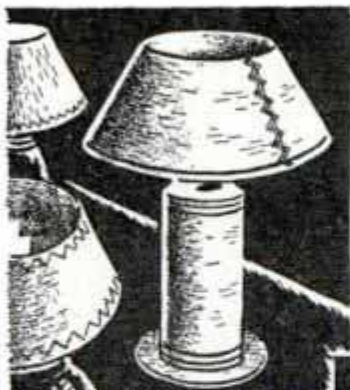
But "food from wood," spectacular victory though it is, is only one sector of Germany's all-round war against imports. In the gargantuan struggle to stamp the famous "Made in Germany" also upon every article sold at home, one other epoch-making invention has long been famous. Everyone knows how Bosch and Bergius "cracked" coal to produce gasoline and set the Fatherland free from dependence on foreign oil fields for motor fuel.

This year's development of the by-products of the Bosch-Bergius process are no less important, and for the public even more amazing. From the same cheapest variety of coal the German dye trust has placed on this year's market, cups and saucers, radio cases, magnifying glasses,

(Continued to page 144A)

W. S. n.p. | Emil Schilly
27 William St.
New York

Wanted—Uses for Tissue-Thin Birch Bark



ARTISTIC LAMP SHADES

FORGERY PROOF PAPER



BIRCH BARK CAN BE TOOLED AND STAMPED LIKE LEATHER



BELTS, PURSES AND BILLFOLDS



DISTINCTIVE CANDY BOXES



30 SHEETS OUT OF ONE LAYER OF BIRCH BARK



UNUSUAL XMAS CARDS



CIGARETTE TIPS

MOISTURE-PROOF SWEATBANDS FOR HATS



These Are a Few of the Many Commercial Uses Already Found for Birch-Bark Tissue

Birch bark is looking for a job. Time was when it found employment only in Indian canoes and tepees. Then craftsmen found a ready market for birch bark in the souvenir shops of summer resorts. Now the discovery of a process of splitting birch bark sheets into multiple layers has developed this bark into a versatile raw material that has already launched a new industry. Decorative, tooled goods, bark paper that is forgery-proof, purses, cigarette tips and artists' material are some of its uses, but this infant industry is soliciting ideas for other uses in the commercial world. It was Ray G. Houle, erstwhile aviator and Chicago lawyer, who developed in the White Mountains of New Hampshire the process of peeling birch bark into thirty or more layers of transparent thinness. By a softening process it is made

as smooth and pliable as fine leather, yet unusually tough. It is unharmed by acids, and impervious to water. Dip a sheet in water, remove it and touch a match to it—dry as ever, the bark burns like tinder. This quality makes it valuable where a lightweight, waterproof material is desired; as a lining for shoes, as a substitute for cork in cigarette tips, and as a sweatproof lining for hatbands. It can be soaked for hours in water without being affected. Birch bark, with its beautiful markings, is being made into lamp shades, wall panels and artistic boxes, laced billfolds, cigarette cases, belts and purses resembling tooled leather. The New Hampshire craftsmen, with an inexhaustible supply of material, are busy hunting new jobs for birch bark in industry. They do not injure live birches by stripping them, but depend for their supply upon bark from trees already cut for the mills.

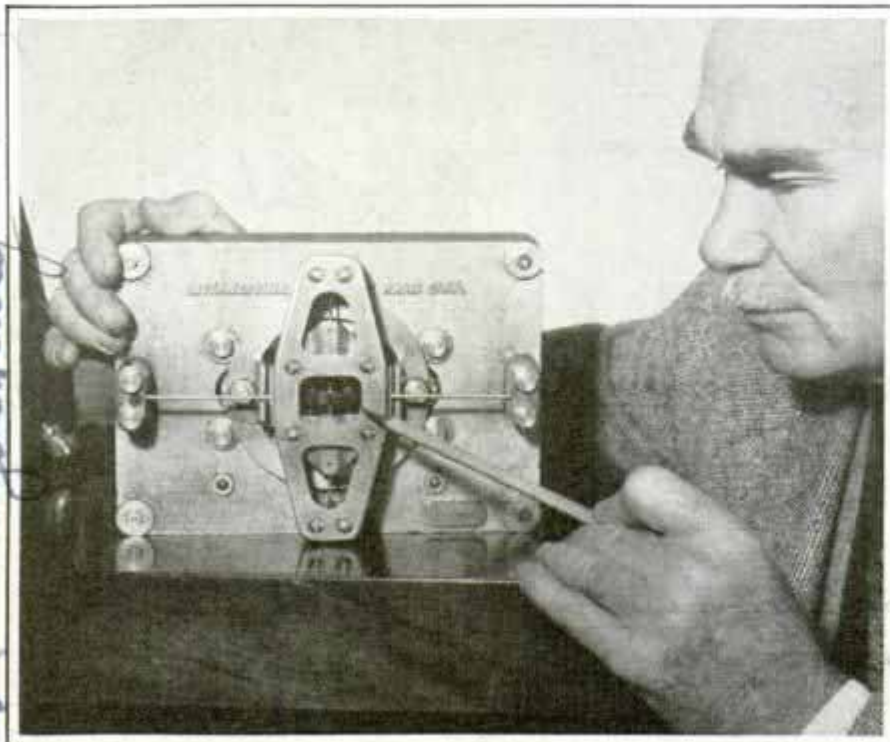
¶ Natives of Ceylon capture young parrots by pouring sand into the tree-hole nests until the hole is filled and the birds reach the surface.

Robert Smithman
Robert Sept. 1934

Conway, N.H.
Ray G. Houle
White Mountain

11/2 3/35

Magnetic Vibrating Mirror Reflects Television Picture



Mirror Hung between Poles of Magnetic Coil Vibrates 5,000 Times a Second, Reflecting Sharp Pictures on Television Screen

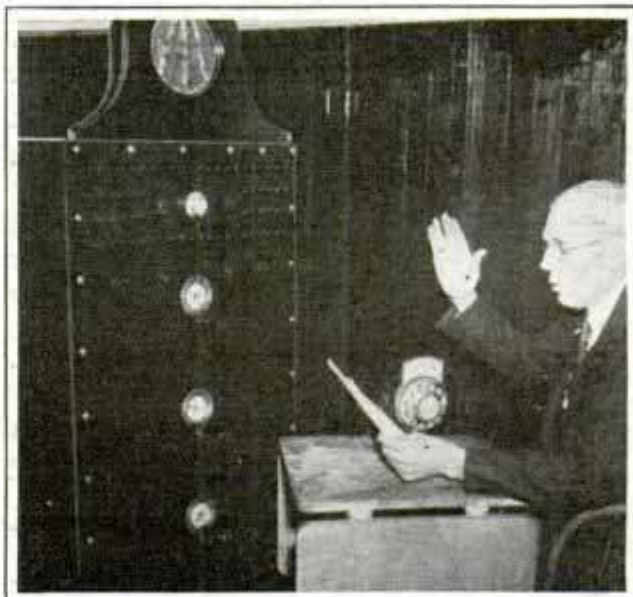
Clear, sharp television pictures without the use of a cathode-ray tube are obtained by means of a vibrating mirror which reflects the picture on a two-foot-square screen. This method of scanning was developed by Dr. Lee De Forest and William Priess. Light from a 500-watt projection lamp is polarized and passes through a Kerr cell that modulates the beam. Thence the modulated light is reflected by the mirror to the screen. The mirror, a polished steel plate with a rhodium surface, is suspended between the poles of a magnetic coil operated by rectified power from the ordinary house circuit. The mirror itself vibrates 5,000 times a second and its cradle mounting vibrates at right angles twenty-five times a second, throwing twenty-five 200-line pictures on the projection screen each second. This scanner is inexpensive and quiet.

retarding effects have been achieved by coating wood with fire-resisting chemicals mixed with blood albumin, sodium silicate, artificial resins and other binders. No wood commonly used in buildings and other structural fields is strictly "fireproof," because no known treatment protects wood from destruction under very high temperatures. What the latest method does is to make the wood fire-resistant. Such wood offers many possibilities in reducing fire losses.

"Tin Stool Pigeon" Betrays Secrets of Prisoners

All conversation of prisoners in their cells at the Columbia reformatory

at Lorton, Va., is recorded by a "tin stool pigeon" made by one of the prisoners. The communication system, which includes both a sending and receiving set, is connected to every cell in the institution. It can be used to address the prisoners as well as to listen in on their talk.



Speaking over Communication System in Reformatory Which also Listens in on Prisoners' Talk

Blood Product Fireproofs Wood

Blood products are used in fireproofing wood at the United States Forest Products Laboratory at Madison, Wis. Marked fire-

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Col. W.L. Plank, Supt.
Pick

Emb. Walter & Burton, 1032 Florida Ave
Chromy Ohio.

Tire with Flexible-Rib Tread Stops Car Fast

Quicker stopping power is claimed for a new tire constructed with a flexible-rib tread. The narrow ribs extend around the circumference and give unusual softness. As a result, the tire literally wraps itself around rocks and other road obstructions, thus



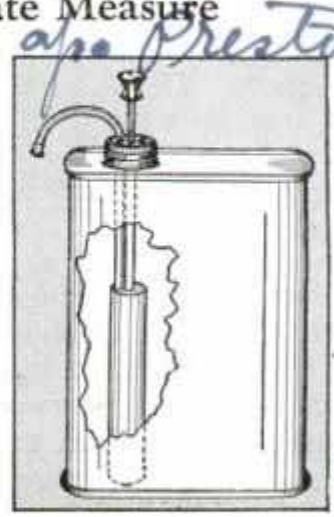
Several Views of Rib Tread Tire; Right, Center, How Ribs Act as Squeegee in Stopping



Car makers previously had set 160 feet as the distance required to stop a similar car traveling at the same speed on a dry surface. The General Tire and Rubber company, maker of the new tire, claims greater safety from blowouts, as the construction results in development of less heat.

£ 1430 Pump Delivers Fluid from Can in Accurate Measure

Convenient for measuring small quantities of oils, glycerine and other liquids and for filling small bottles, an automatic measuring pump is now available. Double-acting, it delivers either a half ounce or an ounce from the can at each stroke of the plunger. It is made of brass and is accurate and clean.



"swallowing" instead of resisting them. When the brakes are applied hard, as in an emergency, photographs through plate glass reveal that these thin rubber ribs form a serpentine pattern, each acting as a squeegee to wipe the moisture off a wet surface or to cling more closely to a dry surface. In actual road tests, the stopping distance is about half that necessary for cars equipped with tires carrying conventional treads. In a test on wet pavement, the thin-ribbed tire stopped a 3,500-pound car going sixty miles per hour in 120 feet.

Several Tire
Pump

U. R. Hall Products Co. 9304 Argyle

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The GREATEST



Cosmic-Ray Counter Carried to Stratosphere by Capt. Stevens and Capt. Anderson

Chladey

cently carried by Capt. Albert Stevens and Capt. Orvil Anderson on their record flight above the earth, was made and designed at the Bartol Research Foundation of the Franklin Institute. The results obtained by this apparatus will take considerable time to tabulate and study, but Dr. W. F. G. Swann of the Bartol Foundation has announced that it was found that the higher the apparatus was taken, the more numerous were the waves. Mysterious as are the origins of these cosmic rays, scientists can count them. The counter merely consists of a glass tube, through one end of which a platinum wire is inserted. The tube is exhausted and sealed. A slight charge of positive electricity is placed on the platinum wire, and every time a cosmic ray strikes this wire, the charge is discharged, and these dis-



TRAVELING at the speed of light, 186,000 miles per second, and shorter than any wave lengths known to man—thus being able to penetrate six feet of lead—cosmic rays come to the earth's atmosphere from the vast universe beyond. Just what are these mysterious rays? Where do they come from? Can man use them as a source of energy? These are the important questions over which scientists ponder.

It has been known that the earth's atmosphere acts as a blanket against these waves, and that they are more numerous as man rises higher and higher above the earth's surface. Thus, flights into the stratosphere are important because from them man can learn much regarding these interesting and important waves that form science's greatest mystery.

The cosmic-ray apparatus re-

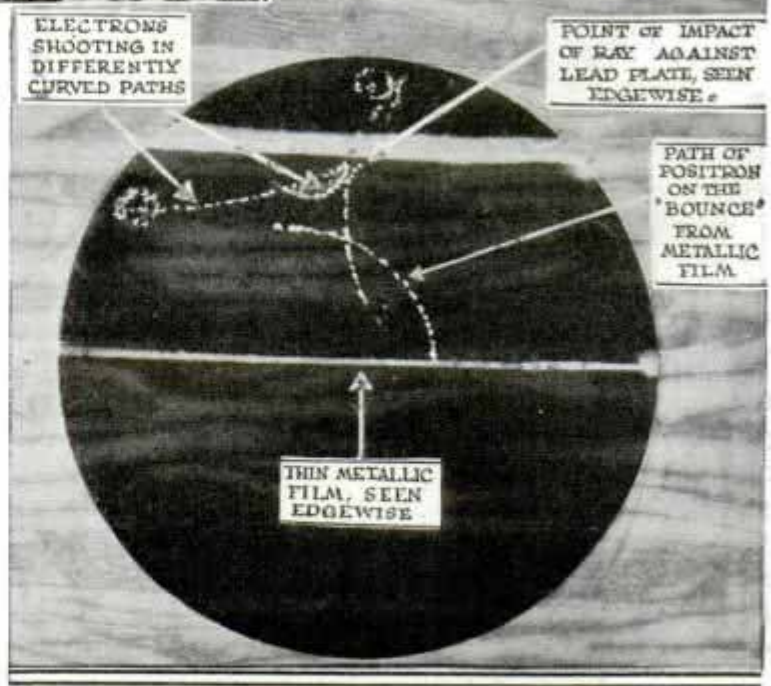


Diagram Depicting Birth of Matter from Radiant Energy and Evacuated Glass Cylinder, Heart of Cosmic-Ray Recorder

Mystery of SCIENCE

charges can be counted. The cosmic rays carry a negative charge.

But the mere counting of the cosmic rays was not sufficient and an ingenious cosmic-ray "telescope" was made for the stratosphere flight. In this three of these tubes were placed in a row on each side of a box. These tubes were so arranged that in order to make a count the ray must pass through all the tubes, discharging all three. This would, of course, give the direction of the ray, or rather the direction from which it came. There were ten of these boxes, five on each side, and they were tilted at various angles.

One battery of five telescopes was placed at an angle of ninety degrees to another battery of five. In this way rays from many angles could be counted. Each of the ten telescopes was attached to a dial, and these dials were photographed every one-half minute, together with a compass showing

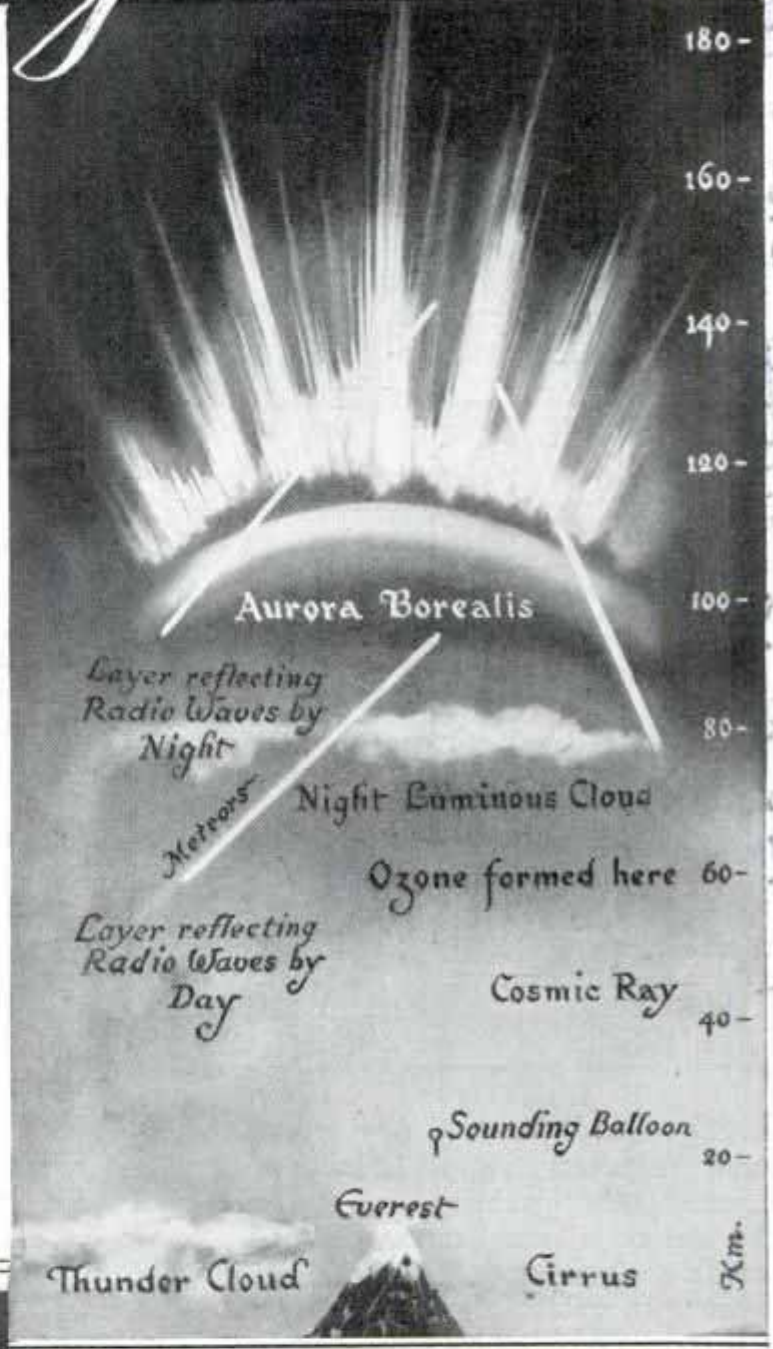


Diagram Showing Height of Various Phenomena and Instrument Which Records Intensity of Cosmic Rays

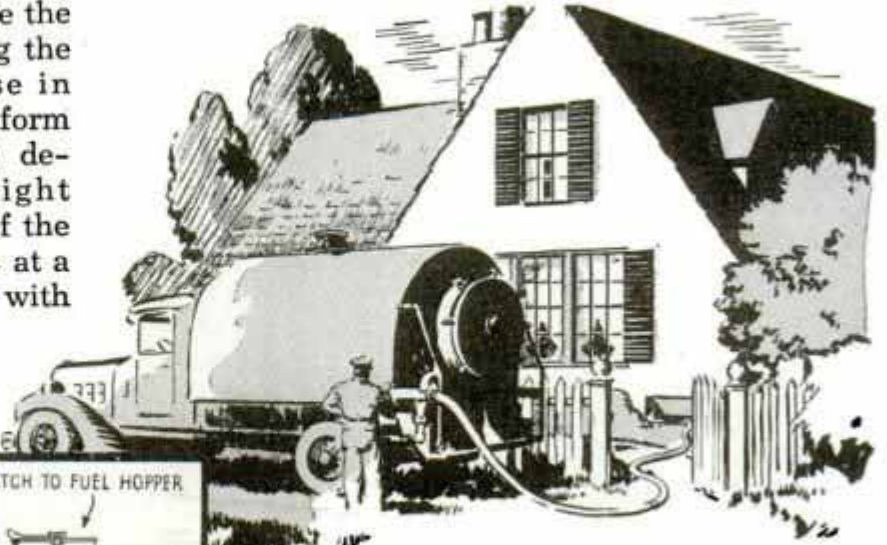
the direction in which the gondola was drifting. In addition to this, each one of the ten telescopes was attached to a device which was photographed on a continuously moving film which showed a flash every time a cosmic ray struck three tubes on one side of any telescope.

In addition to this the gondola carried the older type of cosmic-ray counter, a ball, made of a

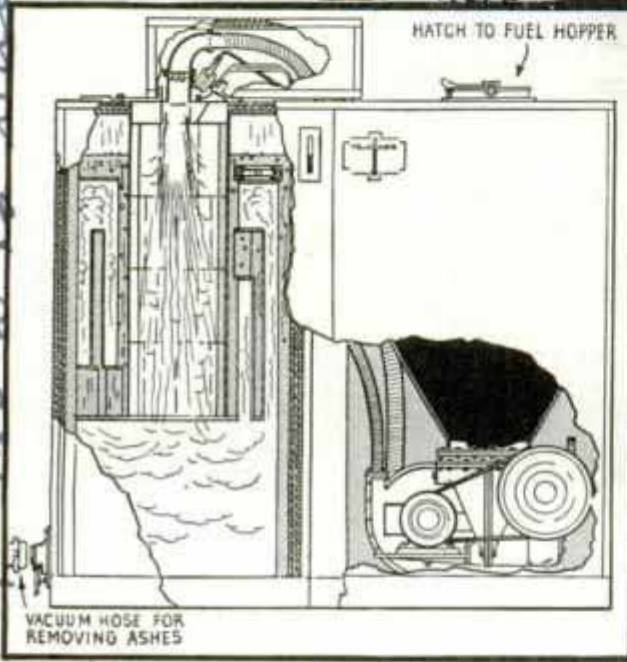
(Continued to page 152A)

Powdered Coal Plant Cuts Home Heating Bill

Pulverized coal burners are the latest development in heating the home. An eight-room house in Chicago was heated to a uniform temperature of seventy-two degrees Fahrenheit day and night through one winter by one of the new powdered-coal furnaces at a cost of only \$64, compared with \$132 with a previous heating plant. Clean, safe, and economical, pulver-



Pulverized Coal Is Delivered and Ashes Removed by Hose; Diagram Shows Furnace and Fuel Feed System



ized coal has been used for years in industrial plants but its application to the small-home heating problem has been hampered by the small combustion chamber, fuel-feeding arrangements and the expense of providing extremely fine mesh coal. The company, which has just placed a home unit on the market, undertakes to deliver pulverized coal to an airtight, combustion-proof hopper in the home once every month or two and its truck at the same time pipes away by vacuum the accumulated ashes at the base of the furnace. From the hopper, the fuel is carried by a specially designed feeder with a toothed wheel through a tube where a vacuum delivers it to the inlet of an exhaust fan. This fan drives the powdered coal up a flexible hose to the burner nozzle where it enters the combustion chamber downward. Proper aeration for thorough com-

bustion is provided in the nozzle. Automatic thermostat control with several safety provisions regulates the firing. When room temperature drops one degree below the desired warmth, a Nichrome steel wire at the top of the furnace starts to heat. Forty seconds later, gas is automatically turned on in a small nozzle adjacent to the Nichrome coil, which lights the gas. A few seconds later the pulverized coal feeder starts, and the gas ignites the coal-air mixture as it enters the combustion chamber. As this chamber heats up, the ignition system is automatically shut off. Should ignition fail, safety controls turn off gas and current. There is no dust, and only a small amount of ash.

Every Thousand Miles

THERE are enough abrasives in the average thousand-mile, six-quart crankcase drain to make friction strips for 2,300 packets of matches.

Three tons of air are used by the average motor every thousand miles.

Enough water is generated by automotive vehicles in the United States to fill a river twenty-five feet wide, six feet deep and reaching from Los Angeles to New York.

It is economy to change your oil at least every thousand miles.

Standard Oil Co.

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 Standard Oil Co.
 120 S. La Salle
 Chicago
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 R. 603

1373
 1373



NEWSSTAND in the Cincinnati Union Terminal. All the metal work is aluminum.

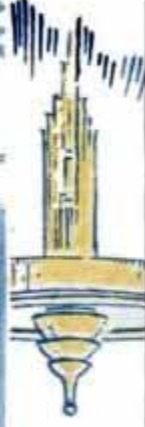
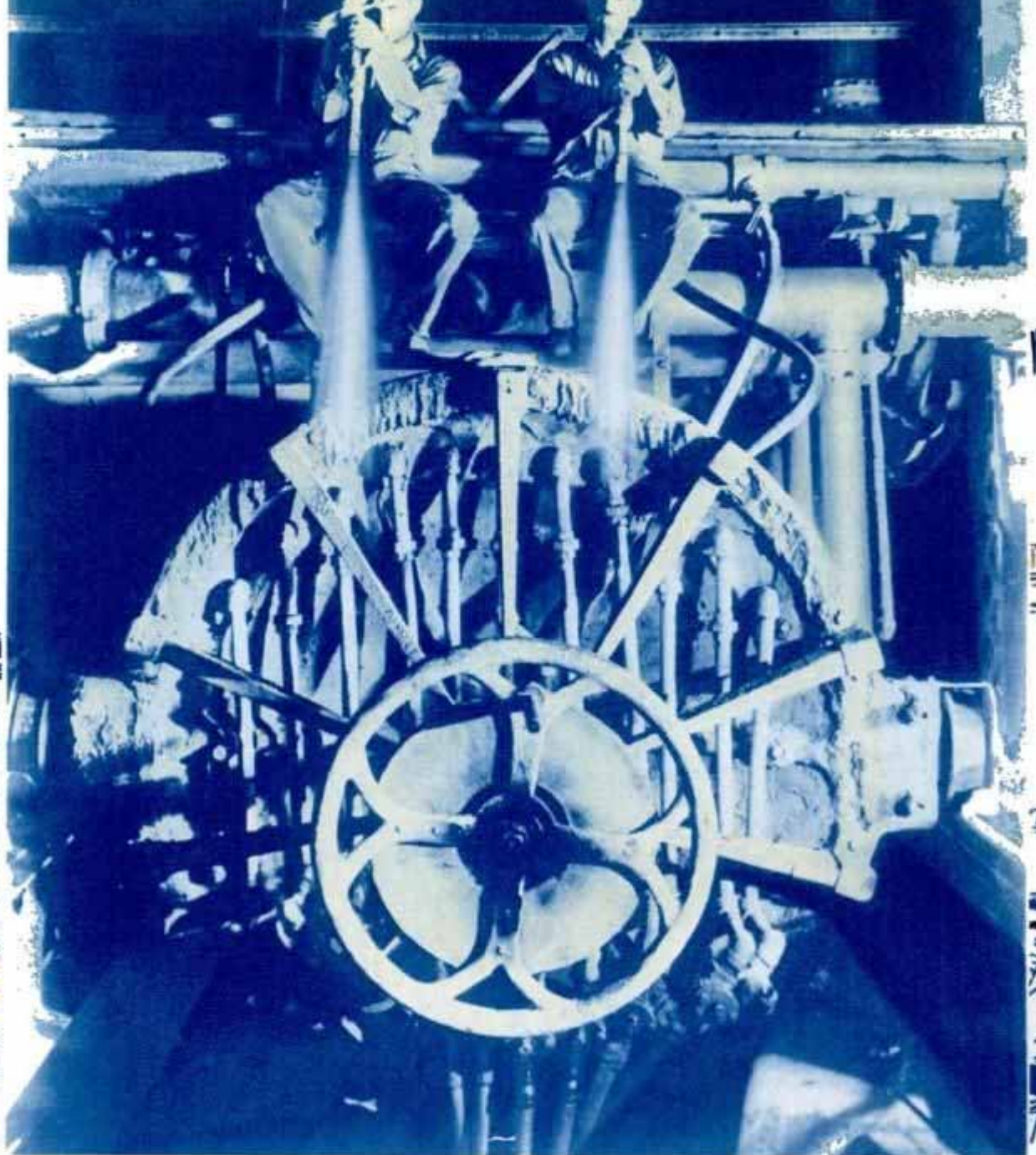
ALUMINUM
The **Wonder Metal**

169

8134

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190



FILTERING the impurities from the sodium aluminate solution, one of the steps in the purification of bauxite.

By H. W. MAGEE

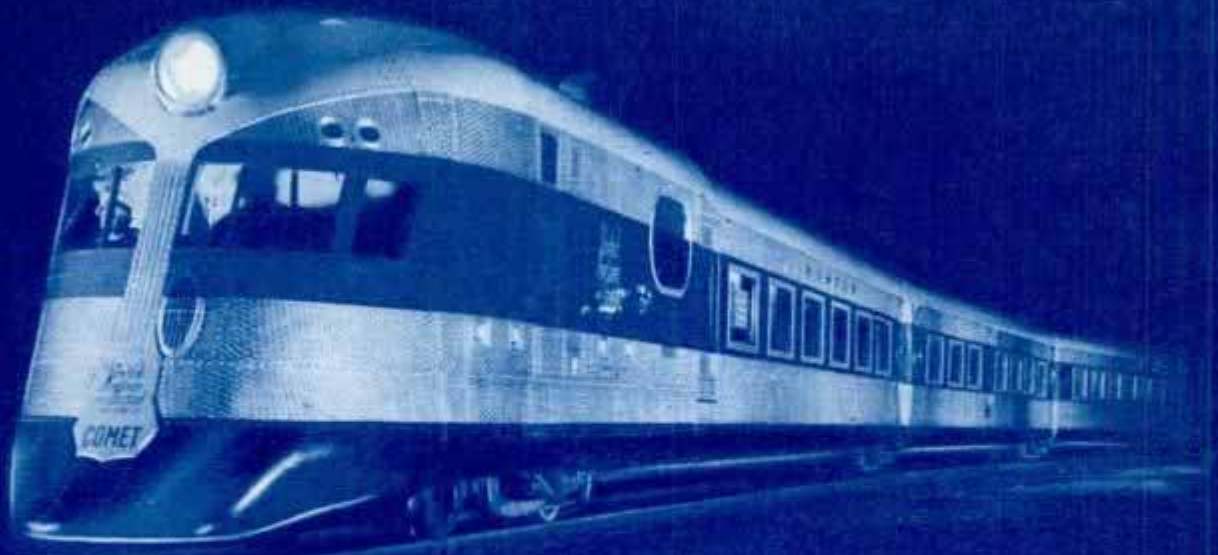
WHAT would happen today if someone discovered a process for producing gold which would make this metal as common as iron and lead?

Part of the answer may be found in the story of aluminum, a young metal whose history reads like fiction. Less than a century ago, aluminum was a rare metal, as costly as gold. In 1852 it was quoted at \$545 a pound. In 1879 an American purchased a pair of opera glasses in Paris and the jeweler offered an aluminum or platinum mounting for about the same price. The purchaser took aluminum—and lived to regret it.

Then aluminum was transformed almost overnight from a semi-precious metal into a relatively common one. The change in this youngster among metals was wrought by a youngster among scientists, Charles Martin Hall of Oberlin, Ohio, a youth of twenty-two. This boy, just out of college, solved a problem that had stumped world-famous chemists for fifty years by discovering a process to produce aluminum inexpensively. His discovery created a great industry and made the metal available for thousands of industrial purposes.

Probably no other metal today can be obtained in as many diversified forms. It

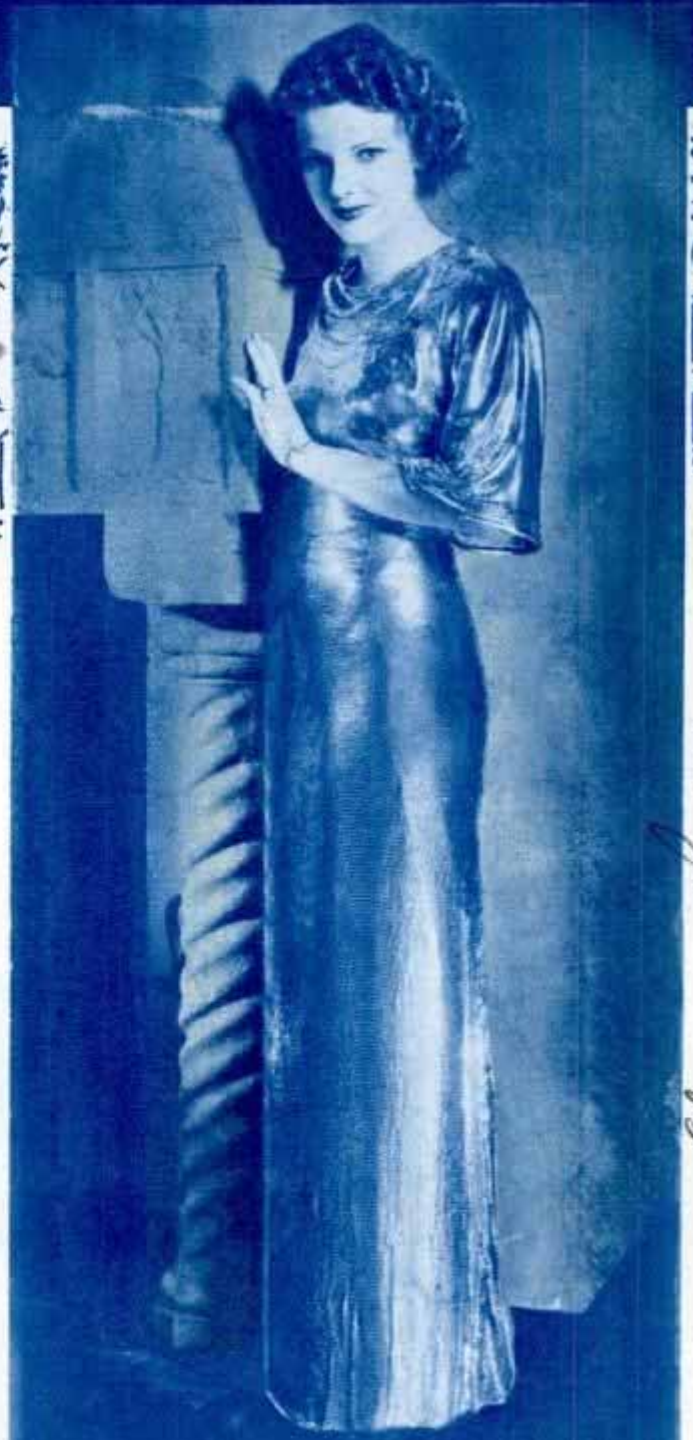
Aluminum Company of America, 1876, Alfred P. Pillsbury, Pa.



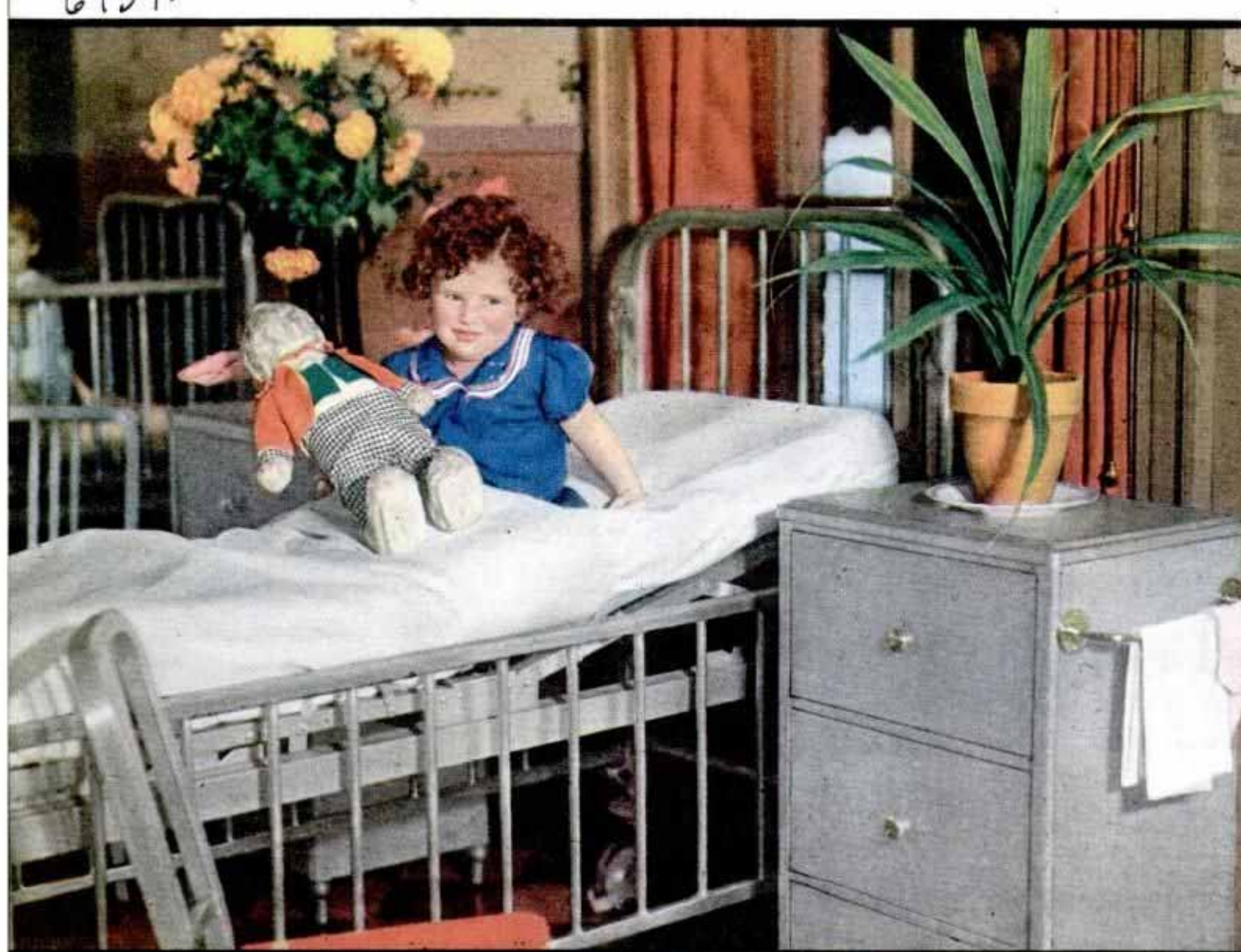
ALUMINUM "Comet" of New York, New Haven and Hartford railroad, and gown of aluminum mesh.

has been adapted to virtually every known metal-working process and its applications range from wrist watches and beads to dump trucks and overhead cranes, from bottle caps and collapsible tubes for tooth paste to railroad trains and airplanes. Aluminum now ranks fifth among metals in tonnage produced and used, and this month it celebrates its golden jubilee, the fiftieth anniversary of young Hall's momentous discovery.

Hall, a student in Oberlin college in 1883, heard his chemistry professor remark that the man who found a process



Elena Laid

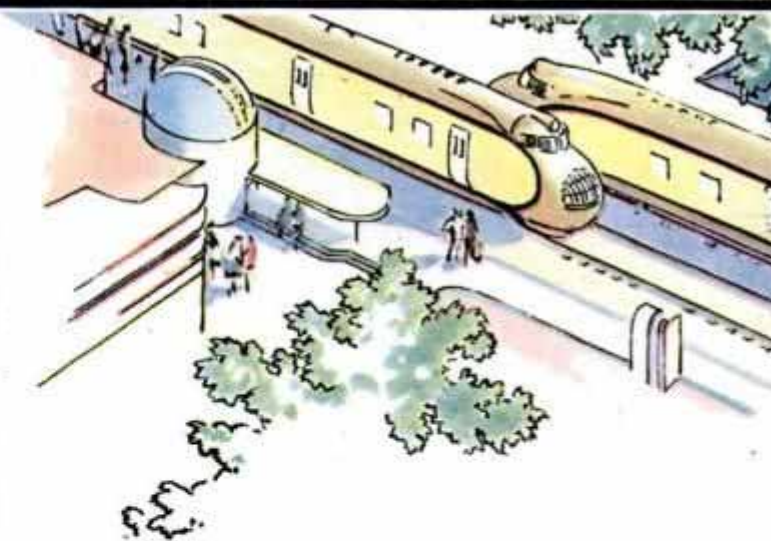


192

Walton
 THIS room in a Home for Children presents an interesting use for aluminum furniture. Chairs, bed and other furniture are aluminum in natural finish.

near Pittsburgh, Pa.
 for producing aluminum on a commercial scale would not only be a benefactor to mankind, but would also make a great fortune. The nineteen-year-old boy nudged a classmate and whispered, "I'm going after that metal."

And go after it he did, undismayed by the fact that the ablest scientists had failed to obtain aluminum except in small amounts and by costly processes. Always interested in chemistry, Hall knew all the aluminum thus far produced had been obtained by chemical means. In 1825, Oersted, a Danish chemist, heated a mixture of aluminum chloride and potassium amalgam. From the resultant aluminum amalgam he obtained a little lump that looked like tin, which he called "metal of clay." It was aluminum—the first ever produced by man. Two



years later, Friedrich Woehler, the German scientist, repeated the Dane's experiment but got no aluminum. He did "rediscover" the metal, however, when he substituted metallic potassium for amalgam.

Then a Frenchman, Henri Sainte-Claire Deville, used sodium instead of potassium and had even better luck. He produced a few bars of the metal and

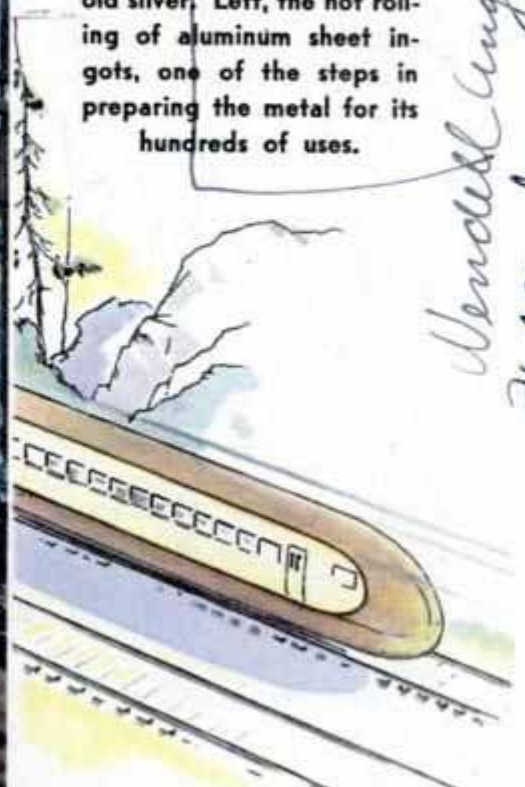
1933



Kensington does new Kensington, Pa.

TABLE service and decorative pieces made of aluminum with a sheen not unlike old silver. Left, the hot rolling of aluminum sheet ingots, one of the steps in preparing the metal for its hundreds of uses.

*Wendell August
Forge, Iron City, Pa.*





ROLLING aluminum plate and, at right, escalators finished by Alumilite process to produce a soft, lustrous sheen.

exhibited them at the Paris exposition in 1855. Napoleon III had a happy thought. Why not equip an army with this lightweight metal? He ordered Deville to turn out aluminum. Deville produced some. There was just one trouble with it. It cost a lot of money. So Napoleon contented himself with aluminum buttons for his uniform and a set of aluminum forks and spoons which he offered grandly at dinners to those in favor at

dears Richard Bldy Cheng





ALUMINUM is particularly adaptable to office furniture and fittings. Note the aluminum chair, lamp, pen set and other articles as well as the aluminum trim applied to the desk.

the moment. Less-honored guests were forced to eat with Napoleon's plain gold and silver tableware.

Hall had read all this. He knew aluminum was the most abundant of all the metals in the earth's crust. Every clay bank he saw was a potential source. He began his experiments in the college laboratory and after his graduation in 1885 he set up a laboratory in his father's woodshed. First, he tried to reduce alumina, the oxide of aluminum, with carbon and other chemicals. Failing in this, he conceived the idea that, if he could find a solvent for alumina, he might be able to separate electrolytically the aluminum from the solution without destroying the solvent.

Month after month he kept up his search. Nine months after graduation and at the age of twenty-two, he found what he sought. Cryolite, a mineral, when molten, he discovered, would dissolve aluminum oxide or alumina, and would hold a considerable amount of it in solution. Highly elated, he tried to electrolyze his solution. There was no aluminum. Changing to a carbon crucible, he tried again, on February 23, 1886. And it worked! The aluminum oxide was broken down by the electric current.

Hall might have labored even harder had he known that another young scientist across the sea was working along the same lines. A Frenchman, P. L. T. Heroult, also twenty-two, made the iden-

Ortshugh Pa. 1914

Controlled by - Aluminum & 1342
Wood Colors, Inc. 8079 Euclid Blvd.



Aluminum
and

THESE articles show some of the color effects obtained by means of the Alumilite-process.

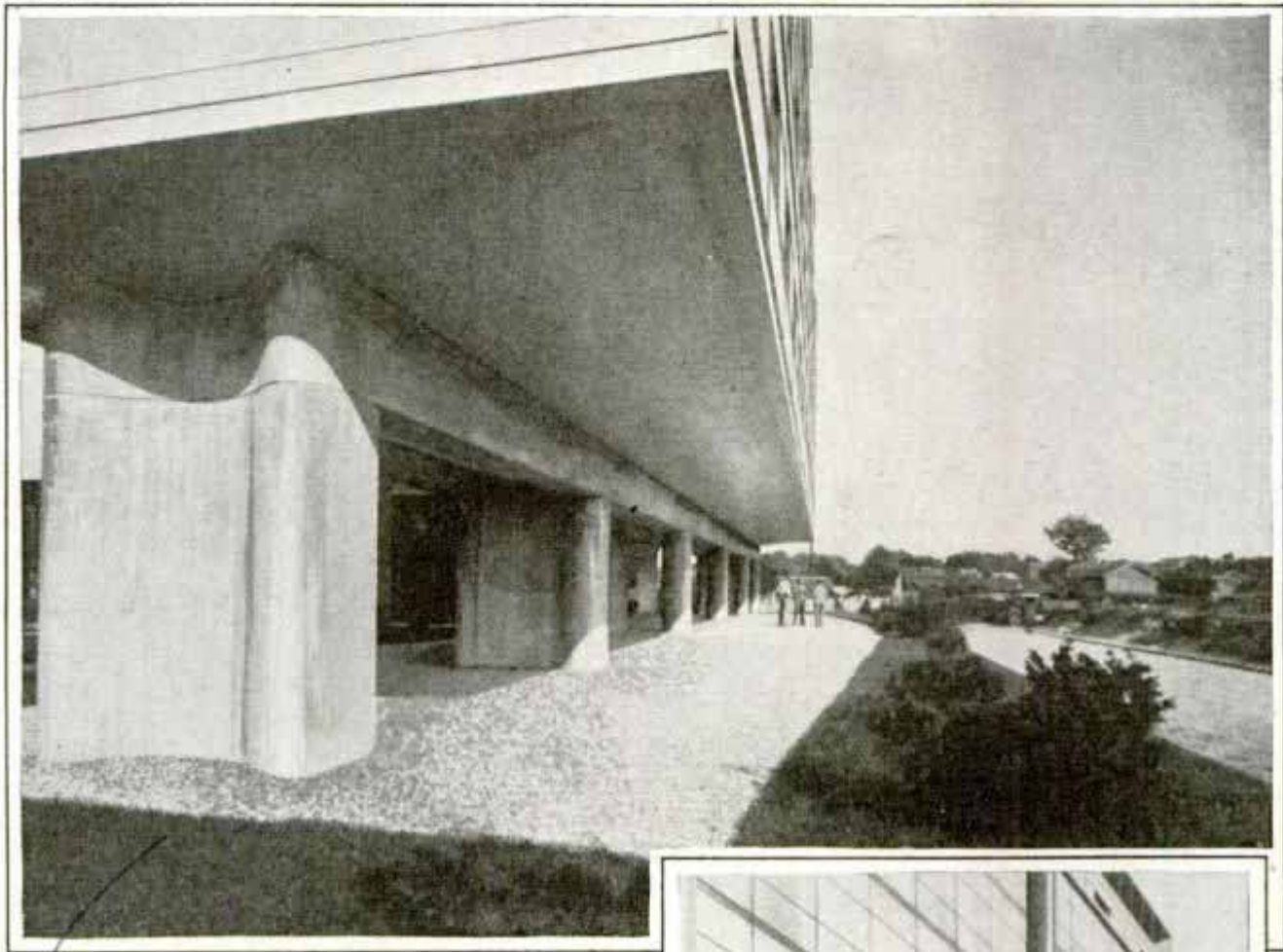
tical discovery two months later. The same year a New Yorker, H. Y. Castner, patented a process for making sodium cheaply, intending to produce aluminum chemically, but the electrolytic process was cheaper.

Hall had a process worth millions but no money. It was two years before he (Continued to page 128A)



4 W. 10 8rd. New York.

of the FUTURE



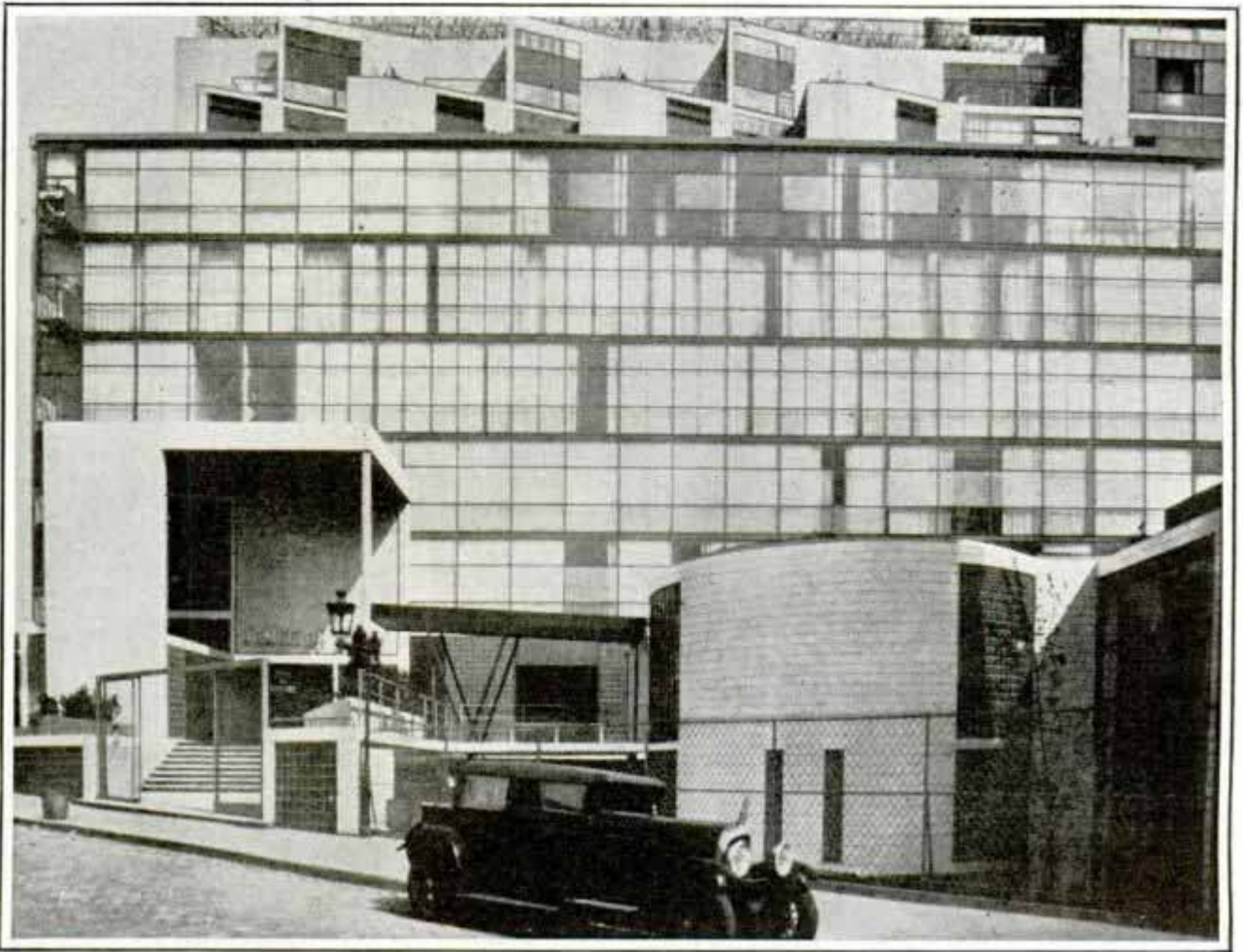
and daring experiments. We cannot hold back. The tide of modern life is sweeping over us like a flood."

Build skyscrapers in public parks, he says, and set these skyscrapers on stilts, allowing a free circulation of vehicles and people beneath them. The skyscraper on stilts is one of the basic features of Le Corbusier's Radiant City. In a number of recent European buildings he has demonstrated how the idea works out.

The first Radiant City, under construction in the French colony of Algeria, will be the proving ground for many of Le Corbusier's principles of city planning. Here the skyscrapers will be distributed in a geometric pattern, and they will be set in a landscaped park. A system of broad elevated and depressed highways will connect the buildings, which will stand on stilts. The northern exposures will be almost entirely of glass; the southern exposures will be solid walls, to ward



Raised Foundation for Paris Dormitory and Salvation Army Building in Paris



This Salvation Army Building in Paris Incorporates Some of Le Corbusier's Ideas That the Modern Building Should Be a "Machine for Living in"; Note Expanses of Glass

off the tropical sun. Each apartment will enjoy its own primary school; and for the whole group there is a university, an amusement center, and an industrial area.

"I have a profound feeling," said Le Corbusier, "that similar cities will find their natural soil in the United States. America perpetually revolves, it has infinite natural resources, and energy unknown elsewhere. Great cities and their oppressive congestion have sprung up only in the last fifty years; they have created problems which we were never prepared to handle.

"The program I propose is neither European, American, nor African. It is human and universal. It represents the urgent job of our time. The last few years have sufficed to make our cities inhuman."

Le Corbusier condemns all buildings that seek to imitate some architectural style of the past.

"The last fifty years of progress," he says, "have changed the face of the world more than the last six centuries. The time

is ripe for construction, not for foolery. We cannot live in the same sort of dwellings our forefathers built."

Here are some definitions which have brought Le Corbusier to the front rank of modern planners:

An automobile is a mass-production house.

A chair is a machine for sitting in. A chair is in no way a work of art; it has no soul.

A town is a tool. The house, the street, the town are points to which human energy is directed; they should be ordered.

A house is a shelter against cold, heat, rain, thieves, and the inquisitive, and a receptacle for light and sun.

According to Le Corbusier, the man who builds a house should plan certain provisions for himself.

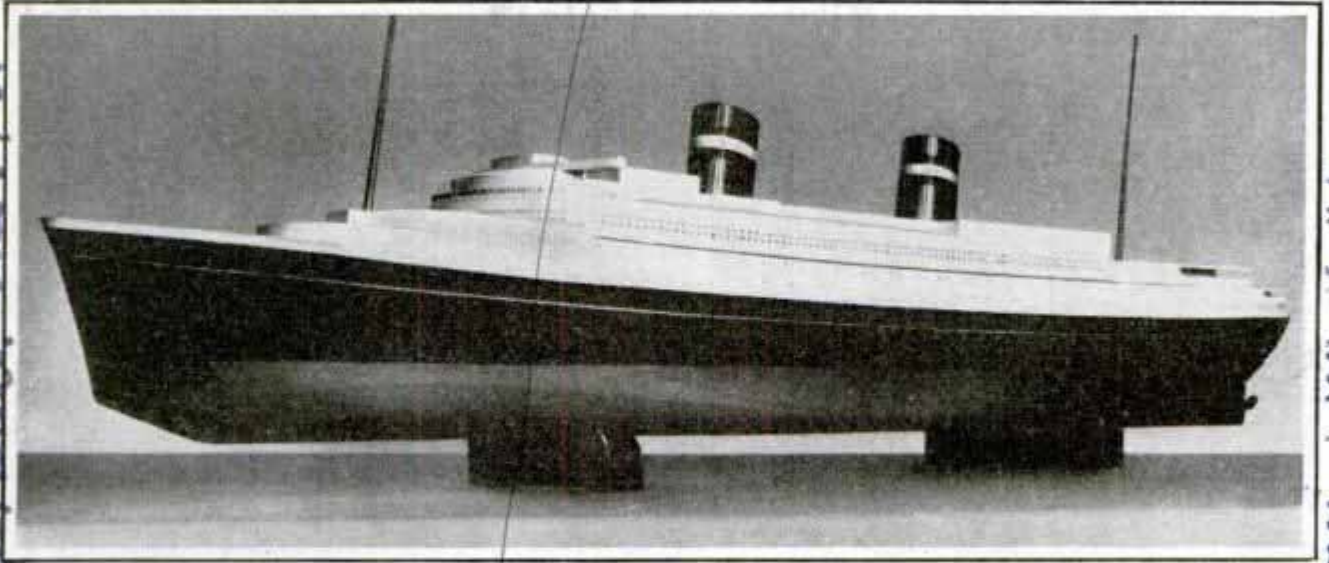
"First," he says, "plan your bathroom as one of the largest rooms in the house; one wall should open on a balcony where you can have direct access to the sun. You

(Continued to page 154A)

New York

Streamline Ship Cuts Through Water and Air

*Emb George Borok to Albert-Drach
Lau due 131 Cedar. W*



Model of a 33,000-Ton Ship Now Being Built to Incorporate Modern Streamlining; Note Streamline Hull to Reduce Water Resistance and Streamline Funnels to Cut Air Resistance

Streamlined below the water line and above it, a 33,000-ton ship now being built for the Holland-America Line is being designed to minimize both water and air resistance. Even the funnels are to be streamlined and the hull is streamlined throughout. The ship will have an overall length of 751 feet, a breadth of eighty-eight feet and a depth of more than fifty-

five feet, and will accommodate more than 1,300 passengers. Two sets of turbines will generate more than 34,000 shaft horsepower. Special precautions against fire will include a sprinkler system, the use of asbestos insulation and fireproof paint and fire screens and partitions which will make it possible to localize a blaze in the section where it originated.

81456

Japanese Lanterns of Stone Given in Memory of Edison

Two great Japanese lanterns of stone whose design symbolizes "eternal light" are the gift of Japan as a memorial to the late Thomas Alva Edison, electrical wizard. Renzo Sawada, Japanese consul general, presented the six-foot lanterns to the Edison library and laboratory at West Orange, N. J., scene of the great inventor's major work. In his early experiments which led to the invention of the incandescent lamp more than a half century ago, Edison made use of Japanese bamboo for filament. Each of the memorial lamps weighs more than 4,300 pounds.



Symbols of "Eternal Light," Twin Japanese Lanterns of Stone, Weighing More Than Two Tons Each, Were Presented in Memory of Thomas A. Edison to the Edison Laboratory at West Orange, N. J., in Behalf of Japan

Acme 100 ml

Road Surface Made of Metal Prevents Skidding of Wheels



Testing Skidproof Metal Paving in England by Attempting to Push a Rubber-Tired Wheel Across It at Right Angles

England is experimenting with a highway surface made entirely of metal, a sample of which was displayed at a recent public works exhibition in London. One of the advantages claimed for the metal road covering is that it is virtually impossible to go into a skid on it, thus making it a safer form of pavement for auto traffic. The metal paving was tested by pushing a rubber tire on it at a right angle to simulate a skid.

in flight. The ring measures about twelve inches in diameter, two inches wide, weighs two pounds and is attached to the back of the propeller at the hub. From the ring, three tubes extend along the leading edges of the blades and from these tubes the solution is fed to the bare metal by the pilot who controls the flow from the cockpit. A supply for five hours is carried, but that much may not be used on transport or mail flights, since the pilot releases the solution only for periods sufficient to break up ice as it begins to form on the blades. Tests of the ring were made in a refrigerated wind tunnel operated by the B. F. Goodrich company. Conditions similar to those

in actual flight were produced. Alcohol or other de-icing solution can be used. Formation of ice on the propeller has been one of the industry's major problems.

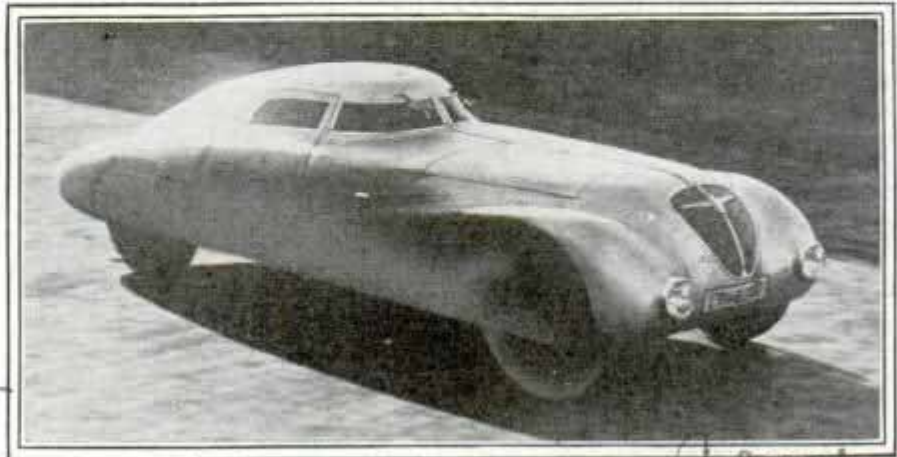
8 1440

Streamline Car Raises Record for Long-Distance Run

Germany now boasts the world's record for speed for a run of 4,000 kilometers, or about 2,500 miles. An Adler sports car, a

Anti-Ice Solution Guards Plane's Propeller

What is believed to be a major advance in the campaign against the peril of ice formations on aircraft propellers has been made by the Bureau of Air Commerce through development of a ring which feeds an anti-ice solution to the propeller blades while the plane is



Streamline German Car Which Made Run of 4,000 Kilometers at an Average Speed of More Than Seventy-Eight Miles per Hour

1 held at Royal Agricultural Hall, Dalston, England.

made by B. F. Goodrich

Made by B. F. Goodrich

streamline creation produced in that country, recently raised the world's record for speed for its particular type by covering the distance at an average of more than seventy-eight miles per hour. The previous record, set in France, was about sixty-four miles per hour. Fenders are built into the body of the Adler car and the rear end is brought to a point to lower wind resistance.

Two-Place "Flivver" Plane Is Economical to Operate



Acme
Two-Place, Low-Wing, All-Metal "Flivver" Plane Which Makes a Speed of 131 Miles per Hour with a Ninety-Horsepower Motor

Troops Talk with Headquarters by Portable Radio

Far in advance of their headquarters, Italian soldiers invading Ethiopia keep in touch with the general command by means of portable radio sets. The two-way outfit is carried by one soldier while a companion, with a head-set receiver, takes down messages broadcast from headquarters and makes reports on the advancing troops to the command in the rear.



Acme
Italian Soldier at Ethiopian Front Carries Radio While Companion Jots Down Order from Headquarters

One of the planes being tested in the bureau of air commerce private owner plane development program is a Curtiss-Wright coupe, a low-wing, all-metal, two-place monoplane featuring a type of construction which lends itself to low price production and low operating and maintenance costs. A speed of 131 miles per hour is obtained with a ninety-horsepower radial air-cooled engine. It has a wing span of thirty-five feet and an over-all length of twenty-five feet six and one-half inches. The gross weight is 1,800 pounds, the useful load is 646 pounds and the normal cruising range is 496 miles.

Fuse on Vulcanizing Patch Starts Heat Instantly

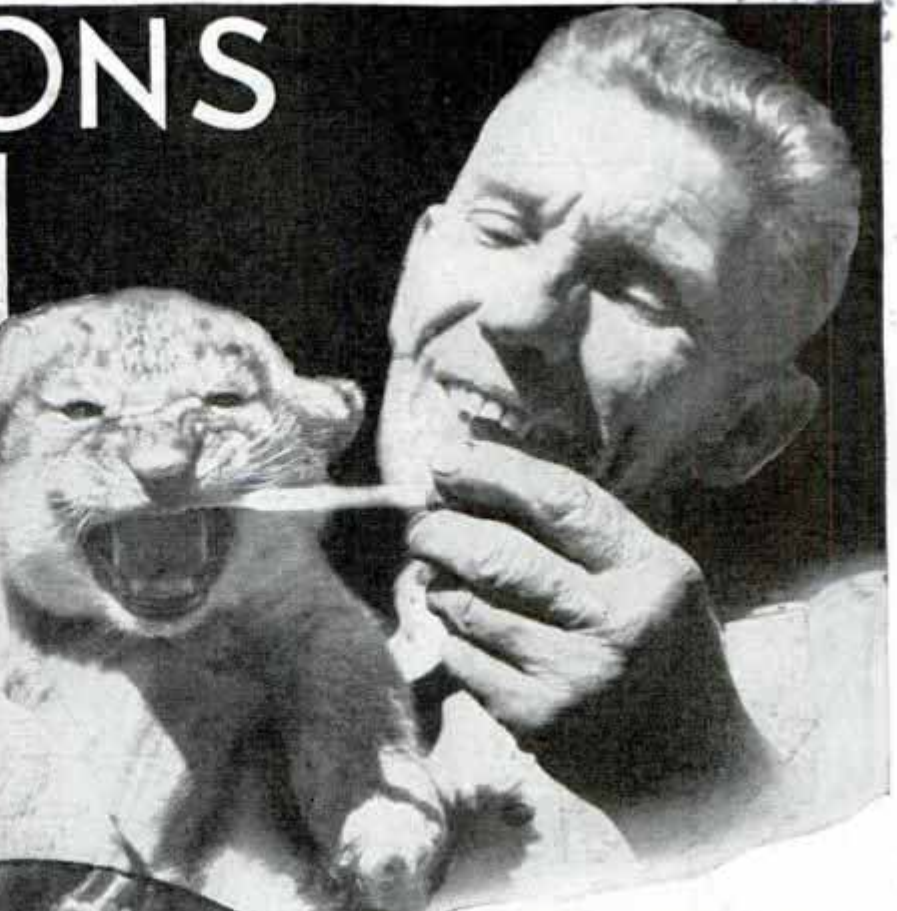
Quick heat is assured on one type of vulcanizing patch for motorists by a fuse that is easily set off by a match or cigarette. The fuse is attached at the center of the heating element, and when it is ignited, heat spreads uniformly from the center to the edges of the patch and vulcanizes the tube patch at every point.



E 1441
Curtiss-Wright Corp. New York
27 W 57 St.
White-Way Products
Memphis Tenn

White-Way Products

to LIONS



Feeding a Baby Lion with a Medicine Dropper and, at Left, Dinner Time for the Infant Camels

they are kept in darkened cages for the first week. Like other cats, also, they are full of play when young and grow lazier as they become older.

Usually, of course, mother animals have complete charge of their babies and the trainers merely keep an eye on the family and guard its health. But if a mother is sick, or if she threatens to kill her young, as sometimes happens in captivity, the cubs must be taken out of the cage and raised by hand.

"When a lion is two or three weeks old it still drinks milk from the bottle because its teeth haven't broken through yet," Roth explains. "But its claws are already well developed. The baby needs them for holding on, as it is extremely afraid of high places. You will

you might mistake the mew for a tiny snarl and compare a purr to the sound of a distant airplane engine with a couple of cylinders missing. The close baby fur is harsher than a kitten's. Like other cats, the cubs are born with eyes closed and

E1300.



Reared Together, the Young Lions and Baby Fawn Are the Best of Friends; Right, Baby Deer Looking for Dinner

find a cub is as gentle as a kitten on the ground but if you pick it up it holds on with its claws with all its might.

"You would think lion cubs would be anxious for raw meat as soon as their teeth develop but the fact is that we have to teach them to eat it. If a cub is living with its mother she does the teaching but if we are raising it on a bottle we start by rubbing our hands on the meat and then allowing the cubs to lick it off. After the cub does this long enough to learn to enjoy the taste, we start with a few ounces of finely ground hamburger a day and gradually increase the amount.

"Almost any kind of meat except pork is good for the cats. Most zoos standardize on horse meat. For the next few months the cubs get bones from which nearly all the meat has been removed. The cubs play with the bones, lick them, and chew off all the meat they can find. They don't get real rations until they are a year old. By then they receive up to eight pounds

of meat a day, including bones. A couple of years later a lion gets one meal a day consisting of fifteen pounds of meat or more."

Full-grown lions are just as curious about babies as are humans. At the Goebel farm fifty lions that are housed in a few large cages surrounding a small grass lawn pay no attention if a man sits down to eat his lunch or read a book. But if an attendant brings a baby lion out on the lawn to play, every lion in sight springs up and stares continually at the

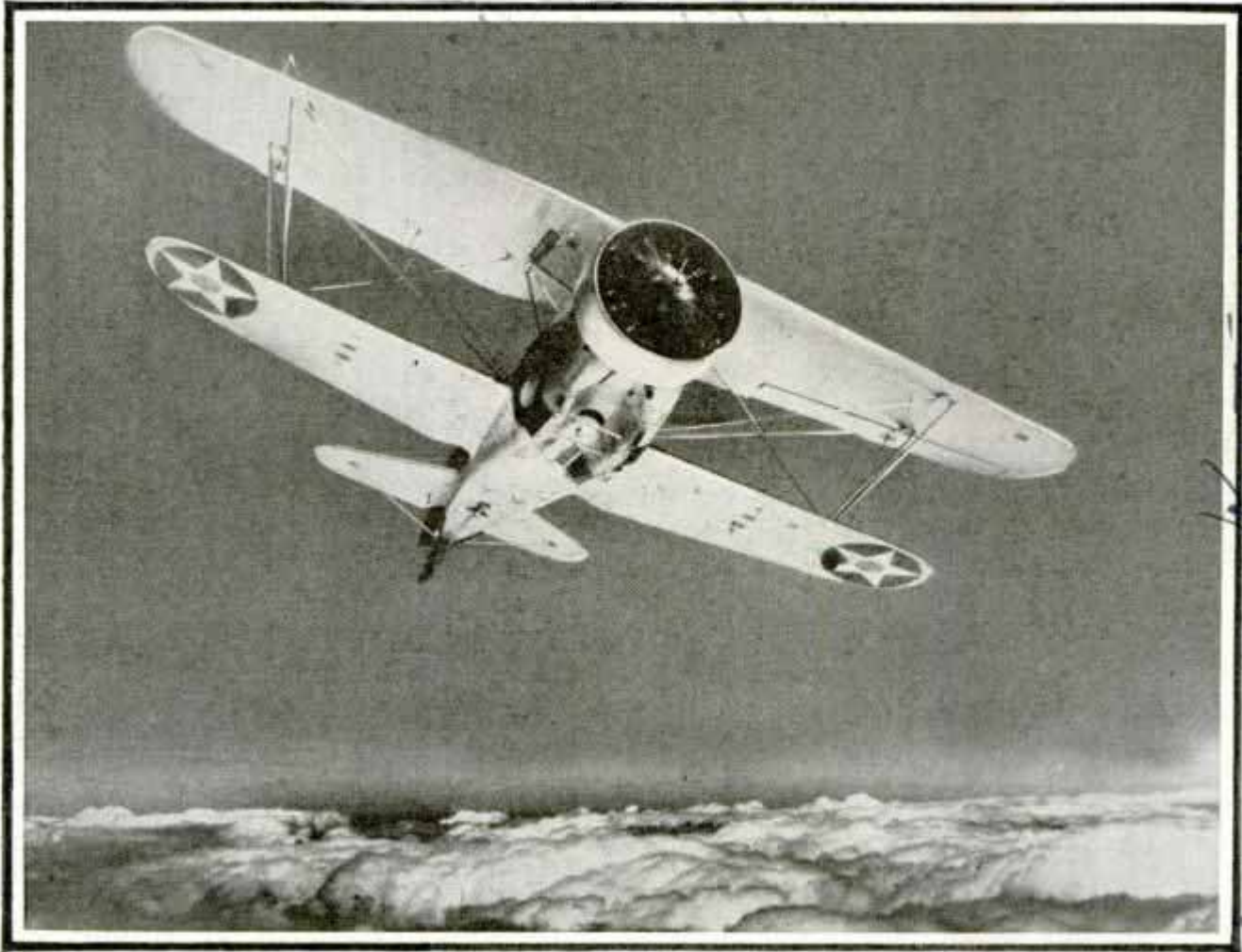


cub until it is returned to its cage. Most lions and tigers guard their babies jealously but a mother hyena never raises more than two cubs at a time. If more than a pair are born the mother keeps two and drops the others through the bars of her cage. They must be rescued at once for after an hour or two of neglect they usually die. Zebras are very good mothers and raise their colts with great care, but the docile camel is a poor mother in captivity and is apt to step on its young. The ungainly camel babies are always kept in separate pens.

Monkeys make the best mothers of all

(Continued to page 124A)

Latest Fighting Planes Are Built for the Navy



One of the New Ships in the Navy's Fighting Air Squadron Is Shown Above the Clouds as It Was Tested Recently; Note That the Landing Gear Is Retracted into the Sides of the Fuselage

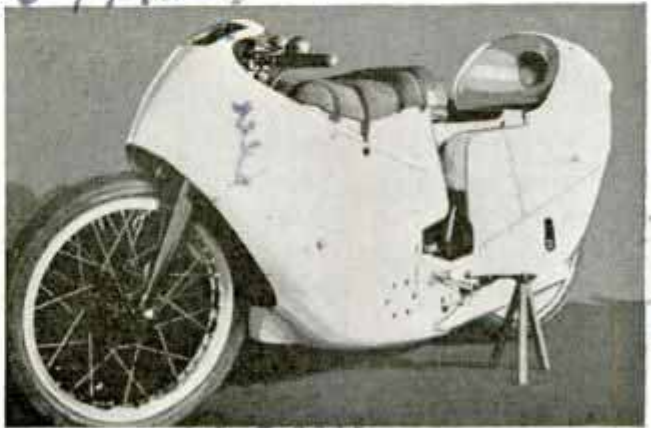
Catapulted from the mother ship, U.S.S. "Ranger," the navy's latest fighting planes are tested above the clouds, far out at sea, safe from prying eyes. A fleet of Curtiss single-seat planes recently was delivered to the "Ranger." An outstanding feature

of this type plane is the retractable landing gear which is pulled into the sides of the craft's fuselage when flying. On one of the first flights, a photographer caught the new fighter in an unusual picture as it sped just above the tops of the clouds."

Curtiss Aeroplane & Motor Co.

Speedy Streamline Motorcycle Bids for World's Record

With a streamline body resembling the "bathtub" sidecar, an Italian motorcycle already has won three speed championships and gives promise of establishing a new world's record. It has a four-cylinder, water-cooled motor and was built by the National Aeronautical company of Rome. The motorcycle is expected to reach 157 miles an hour, several miles faster than the mark set by a German rider.



Streamline Motorcycle Exceeds Two Miles a Minute

One gallon of gasoline weighing six pounds will transport the 51,000-pound "China Clipper" plane one mile.

Chi. Herald Exam. National Aeronautical Co.

Buffalo - N.Y. Vulcan and Aeromarine Co. National Aeronautical Co. Rome Italy

Arsenal Junior High School
POPULAR MECHANICS

Giant Models of Printing Type Help to Teach Large Classes



These Large Size Models of Type Help the Instructor to Teach the Fundamentals of Printing to Large Classes

Fundamentals of hand composition are taught large classes with the aid of giant models of type and materials. The models consist of a composing stick, line gauge, type, leads and slugs and spacing materials. The pupils can see the demonstrations from a distance of thirty feet. Type and spaces are made of white pine for lightness. Covered with aluminum paint, the models have a leadlike appearance. The composing stick is a working model with clamp and slide which operate in the same manner as those on a standard stick. It can be set to three measures, sufficient for instruction purposes.

sons with conflicting claims would be invited to state their case and after consideration of evidence the patentability of the idea would be decided. This would eliminate much duplication of patents and reduce litigation. Second, a special patents court should be established, with judges qualified in science and engineering as well as in law, to speed up handling of cases. Third, a corps of specially trained patent advisers should assist courts trying patent cases. The board also advises taxation of patents to prevent them from being left idle, as is often the case at present. This method of eliminating "dormant" patents has been used in some European countries. The board also recommends that some reduction be made in the present cost of securing a patent, to offset costs of the patent-taxing system.

61448

Giant Trestle Ski-Jump Offers New Thrills in Sport

More than 600 feet from top to bottom, one of the world's longest trestle ski-jumps has been completed recently at Lit-

Changes in Patent Laws Urged to Aid Business

To facilitate the handling of patent-office business and to speed up use of new ideas in industry, the President's science advisory board has proposed these changes in American patent-law procedure: First, descriptions of the article or process to be patented should be published in the official gazette before the patent is granted. Per-



This Long Ski-Jump, with Its Sixty-Foot Gap, Is Believed to Be One of the Most Dangerous in the World

Vertical text on the left margin, including 'Patent Service' and 'No. 112933'.

Vertical text on the right side of the page, including 'Changes in Patent Laws Urged to Aid Business'.

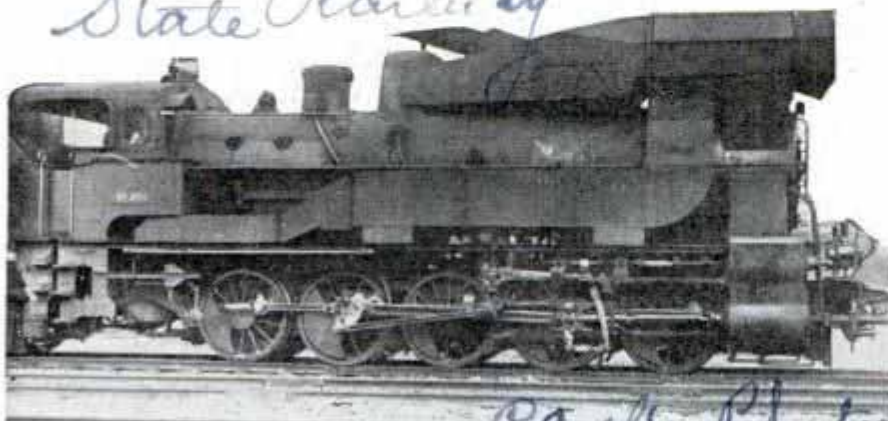
Handwritten initials 'J.H.' in the bottom right corner.

Handwritten text at the bottom of the page, including 'The Board' and other illegible words.

Assess
6/1457
leton, Mass. Its length, with a sixty-foot gap in the center, will offer plenty of thrills for spectators and ski-jumpers. The structure is made of wood. A speed of seventy-five miles per hour can be attained on the incline. After a ski-jumper leaves the platform 684 feet up the hillside, he slides 409 feet to the jumping-off place, across the sixty-foot gap to the landing trestle, which is 275 feet long, and on to the bottom of the course.

6/1453
**Locomotive Hood
Preheats Air to
Save Fuel**

Tests are being conducted in Austria with a hood for locomotives intended to reduce coal consumption. A compartment constructed at the top of the front of the engine enables the air current needed for burning the coal to be mixed with the coal fumes. Tests have indicated this method results in a saving of as much as twenty per cent in coal consumption as compared with the usual method of drawing cold air into the combustion chamber of the boiler.



Paul's Photos
Hood on Engine Mixes Air with the Coal Fumes

6/1457
**Floodlights Bathe "Empress"
During Repairs in Drydock**

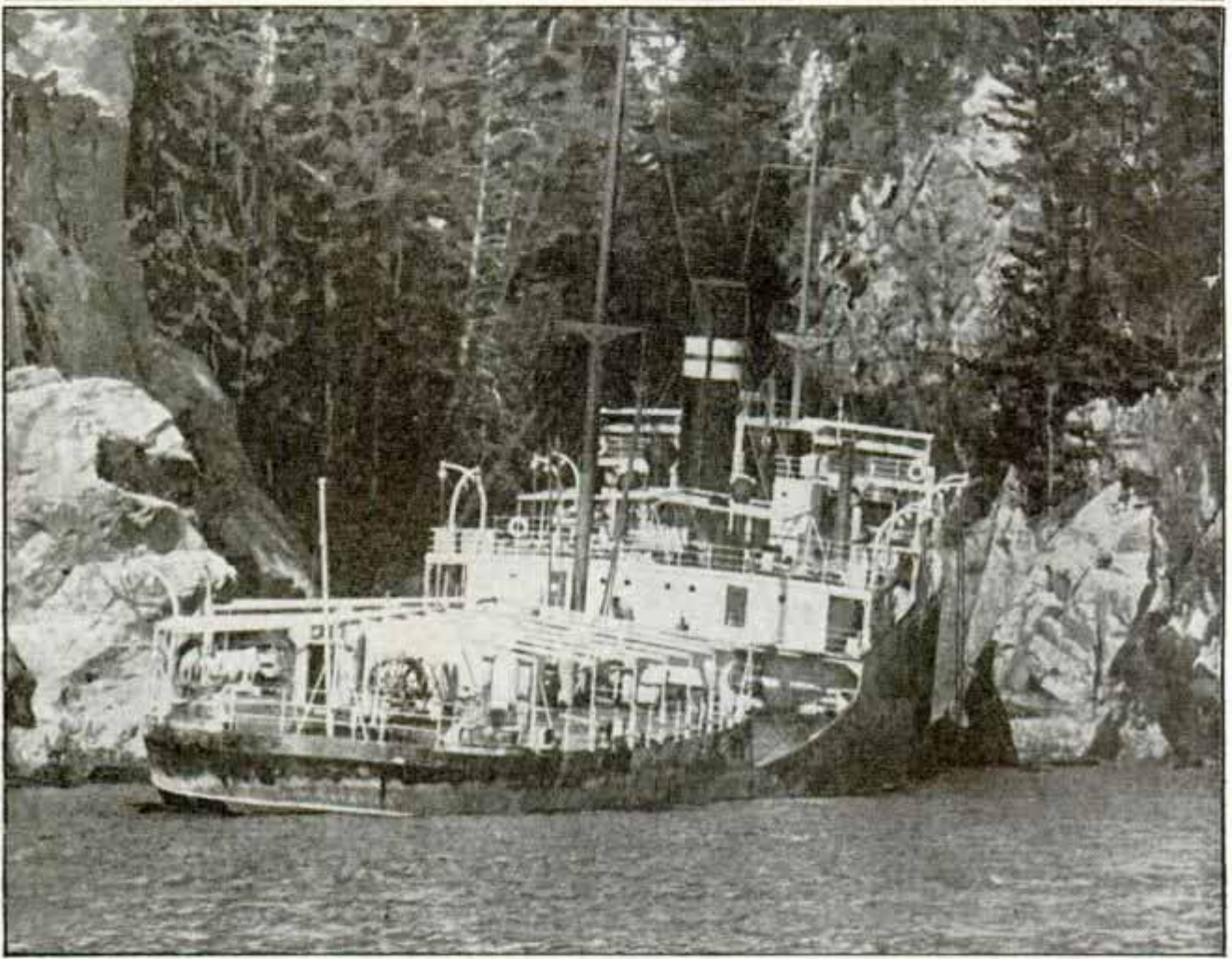


© Planet News, Ltd. Acme.
In Bed at Her Southampton Drydock, the "Empress of Britain" Is Undergoing Repairs to Bow Plates Damaged in a St. Lawrence River Collision

While the great "Empress of Britain" takes her annual rest in drydock at Southampton, England, batteries of floodlights illumine the white queen of the Canadian Pacific fleet. The "Empress" required repairs in addition to the regular annual overhaul this year, having damaged some of the plates in her bow when she collided with the steamer "Kafiristan," while cruising in the St. Lawrence river last summer.

6/2/10
Box 497, Dayton Ohio

The GRAVEYARD



The Norwegian Freighter, "Tatjana," Shortly after the Vessel Had Been Salvaged by the "Salvage King" at a Cost of Only \$70,000

THE captain frowned, muttered to himself in Norwegian. He'd weathered many a storm and brought his ship into port but never had he seen snow falling so thickly. Ice was forming on decks and superstructure! That was bad.

He glanced out into the seething sea, scarcely visible now and turned to his charts. Suddenly the freighter faltered. The crew rushed to the decks. They had hit a rock. The ship was sinking!

An overgrown tug lay idly in the harbor at Victoria, a few wisps of smoke drifting from the funnel. Suddenly the ship came to life. The crew rushed from their cabins. Great billows of smoke began to surge up. A message, brief and to the point, had arrived. "Norwegian freighter, 'Tatjana,' on rocks off west coast of Vancouver Island."

That was all. The tug was soon steaming out of the harbor, off to add another daring rescue to the annals of the sea.

The Pacific reaches up each year to claim more lost ships for its own. Until recently the sea offered a perilous, often hopeless challenge to salvagers. But now modern science, after spending millions of dollars and years of study, has produced new methods and superior ships to battle with the ravages of the deep. Foremost among the ships is the "Salvage King."

Although scarcely larger than the average tug, the "Salvage King" has rescued several hundred ships, ranging from small freighters to palatial liners, during the past twenty years.

In 1919 the "Prince Rupert" hit a rock off Swanson bay and made a dramatic but

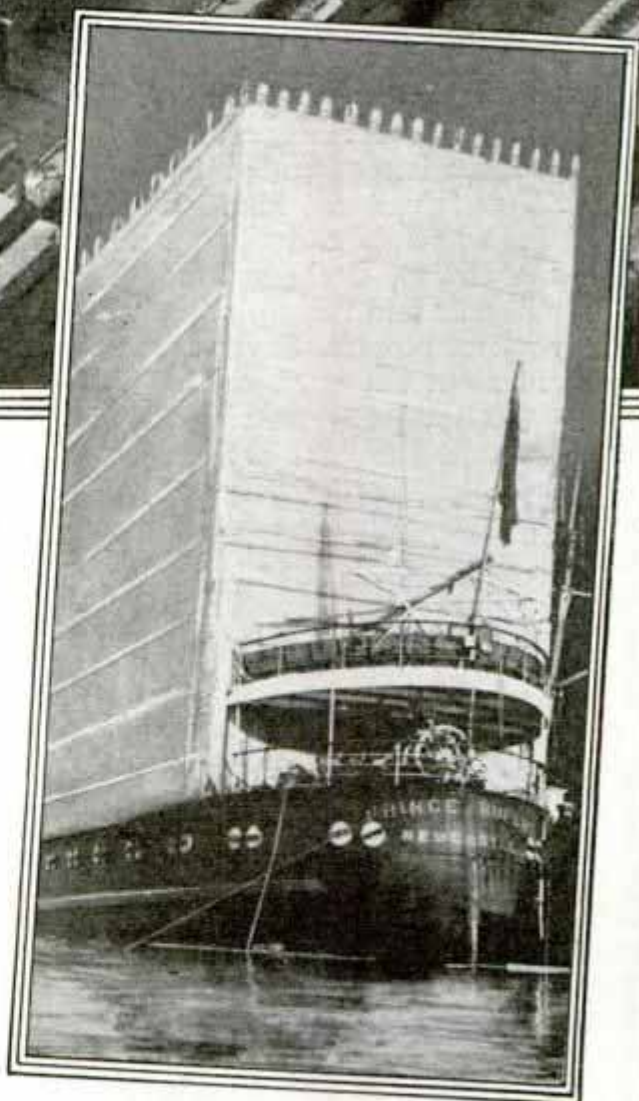
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of THE PACIFIC



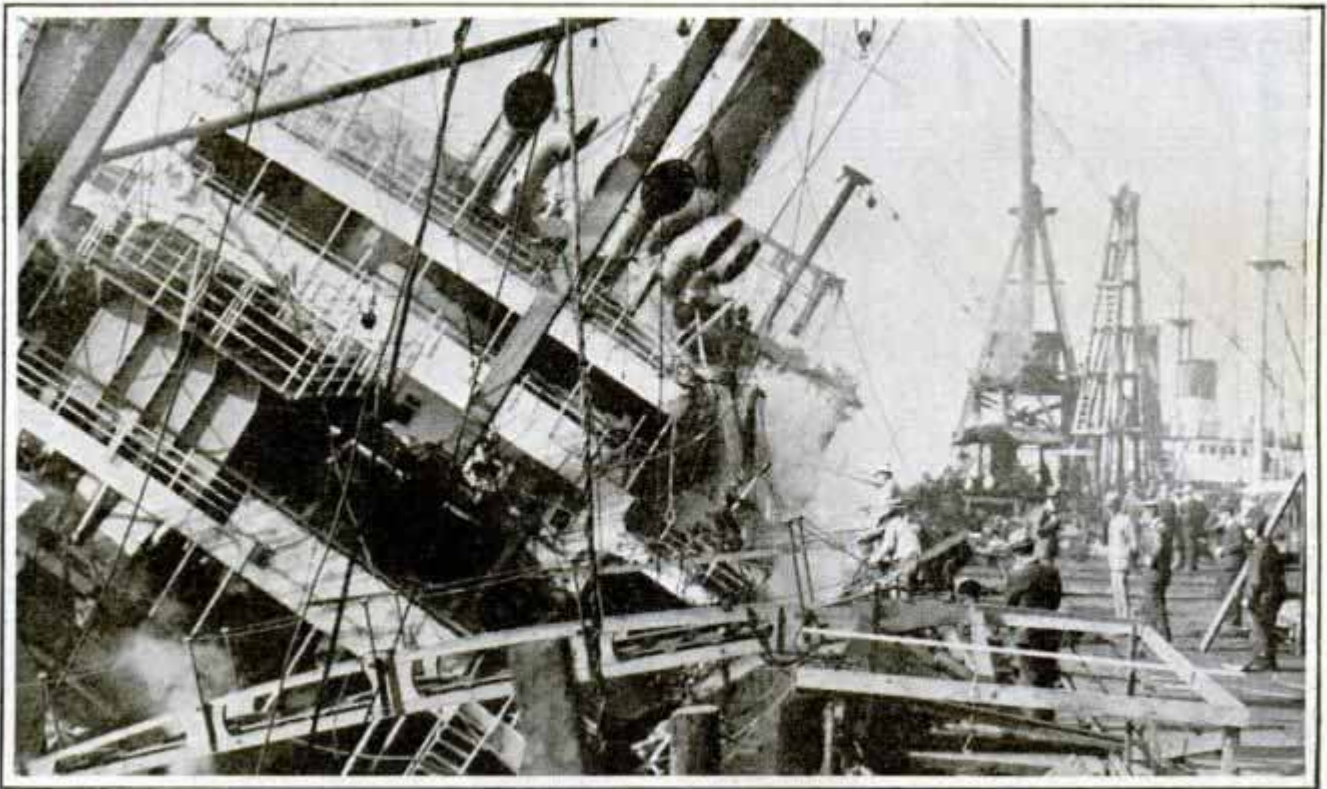
unsuccessful effort to reach shore before sinking. The \$350,000 salvager set off to her rescue. After divers had made a survey of the vessel, they constructed a cofferdam, and then heavy canvas walls around the top of the ship, extending from the upper deck to sea level. As the water was pumped from this canvas "yard," the vessel, relieved of its burden, slowly rose. The "King" steamed home with the "lost" ship at his side.

In 1925 came the wreck of the "Tatjana" off the coast of Vancouver island. Again the "Salvage King" was called and, in a few days, the freighter was brought into port in excellent condition—at an expense of about \$70,000. The Norwegian owners gave the ship as payment and the Pacific Salvage company ran her on several voyages to New York, eventually selling her back to the original owners.



Top Photo Courtesy Harry Kirwin

Top, Salvaging the "President Madison"; Below, the "Prince Rupert" with Watertight Wall around Her



Salvaging the "President Madison" after the Vessel Keeled Over During Repairs in Seattle; the Work Was Completed in Twenty-Eight Days

Probably the most unusual salvaging job was the hazardous rescue of the American Mail Line's "President Madison" in 1933. The "President Madison" had returned from the Orient, discharged her passengers in Seattle and tied up at the wharf of a dry dock for repairs. Several plates were removed from the starboard side of the \$14,000,000 liner. But instead of listing to the port side, the liner suddenly righted herself, keeled over, and sank to the starboard. Water surged in through the openings in the side, through portholes and open doors on deck. In less than fifteen minutes the exclusive stores, lounges, dining rooms, and luxurious bedrooms were a total wreck.

The "Salvage King" was ordered to the assistance of the floating palace, a rescue which was to cost around \$1,000,000. And the "Salvage King" alone could do it! With bridge and superstructure cutting deeply into the wharf, the "Madison" lay on her starboard side at an angle of fifty-one degrees—a far from safe position. Submerged to the boat deck on one side, her weight put the wharf under a strain so great it was in danger of giving away.

A diver went below to make a platform for others and soon several divers started to patch the section from which the plates

had been removed, using the top of the wharf for patch material. Riggers were sent to remove cargo derricks and lifeboats to relieve the vessel of all unnecessary top weight. Two divers cleared an under-water path to the ship. Another started plugging all ventilators and openings on the decks below water level.

Then carpenters were rushed to the scene to build gang planks, level walks, and platforms for the pumps. These platforms had to be hung by chains so the pumps could be lowered as the water decreased in the hold and yet kept upright as the ship returned to its normal position. In the mad race against time, the men worked day and night. If the wharf were to collapse under the weight of 14,100 tons, the "Madison" would "turn turtle," wreck all their work and endanger lives.

There was a further possibility that the ship might slip away from the wharf as the ground was soft. The salvagers first duty was to make this almost an impossibility. Underwriters claimed seventeen per cent of their salaries for liability insurance against an average rate of about five per cent.

The wreck occurred on March 25 and by the first of the month, nine divers were

(Continued to page 138A)

Color Piano Plays Melody on Rods of Glass

Vivid splashes of sunset-red and shafts of cool green play along a hanging curtain of glass rods bathed in a deep purple background. The color piano is translating music into tones of the spectrum. On an orthodox piano a musician plays. At the keyboard of a companion piano Prof. William H. Varnum, chairman of the art department of the University of Wisconsin, fingers keys that actuate

Madison, Wis.



Professor Varnum at Keyboard of Color Piano and Demonstrating Hanging "Screen" of Glass Rods on Which Lights Play; Floodlights above Stage Throw Color on Background While Spotlights in Wings Play "Melody"

floodlights and spotlights interpreting in color the moods of the audible music. Each key is the electric switch for a color light mounted in the wings of a small stage and focused on the row of fifty glass rods. Each octave on the piano represents one color of the spectrum. Three switches above the keyboard control major "chords" of color, floodlights above the stage that envelop the set in the fundamental hue of the musical composition. Foot pedals operate rheostats controlling the volume of each color octave. Professor Varnum, the inventor, has grouped various colors according to their/physio-

logical or psychological effect on human beings. He lists the emotional aspects of color thus: Red, very exciting, irritating, bloody, passionate; orange, hot, warm, glowing, lively, suffocating; yellow, gay, extreme opposite of sickly; green, peaceful, neutral, tranquil; blue, cool, sedate, sober; violet, stern, hard, unyielding, gloomy; purple, stately, pompous, impressive. The color pianist listens to the theme of the musician and adapts that mood to his color stage. The instrument is opening new avenues for the study of music and color coordination and the development of stage lighting.

Emb. Clarence S. Lund, 146 Langdon St. Madison, Wis.

of visible light

6 1198

The NEXT WAR

PART II

JUST as happened in Manchuria, there was no formal declaration of war when hostilities began in Ethiopia. The first notice that a war had started was when explosive bombs began to rain down from the sky, destroying villages and killing and maiming men, women and children.

If the great nations of Europe become involved in another war, someone has endeavored to predict what will happen. He says a nation will suddenly discover all radios have stopped working; all electric lights and power are off; no telephone will work; fires are breaking out in all electrical apparatus; the generators in the generating stations are melting; automobiles have stopped because of ignition failure.

In the morning there are no newspapers, no deliveries, no taxicabs, no trolleys or buses. No elevators are running. No fire or police alarms are working. All this because the enemy has liberated a "ray" or a "high frequency" of some sort, which breaks down all insulation, and melts all high-powered electrical apparatus.

Such a condition is not possible by any means known to man at this date. Instead of a war beginning in this manner, it more likely will begin in an infinitely more terrible manner. There will be no warning. Some gray morning there will be ear-splitting explosions, so frequent as to sound like a steady roar. The confused and terror-stricken inhabitants of a city will rush in panic to windows to see buildings exploding, and falling into the streets; fires by the thousands will be seen breaking out; streets will be choked with maddened men, women and



High-Speed Camera Photographs Showing the Firing of a 2,100-Pound Shell from Army's Sixteen-Inch Coast Defense Gun; Top, Powder and Smoke Belching from Gun after Shell Was on Its Way; Next the White Gases Envelop the Smoke of the Black Powder; Third Come the Belching Clouds of Black; Bottom, the Black Smoke Lazily Drifts Away

at Fort Tilden N.Y.

on the LAND

By Hiram Percy Maxim

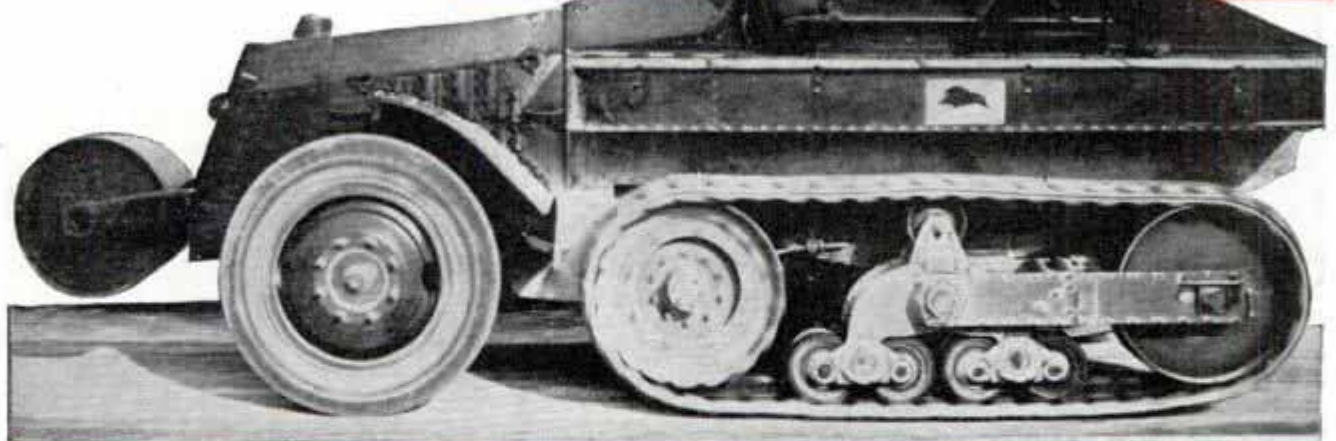
Noted Inventor, Author and Engineer

children struggling through the wreckage; bursting water mains flooding the streets; gas mains belching fire and death-dealing gas; electric service wires writhing and flashing; chaos such as civilization has never beheld will reign supreme.

With the city aflame, deadly poison gas will rain down from the skies and send to death the last remnants of the inhabitants. It is in some such manner that the next war will start.

After a few of these surprise attacks, the nations will settle down to

*did Feb 17 1936
Hartford Conn.*



French Soldiers in Gasproof Garments in Front of Bombproof Shelter for Five Persons; Below, One of the Latest French Tanks, Heavily Armed and Capable of High Speed

the business of destroying one another. There will then be disclosed wonderful mechanisms for the wholesale killing of humanity and the destruction of property which science and engineering have developed in recent years.

The device likely to do more to make warfare different from anything the world has thus far known is the endless track

wheel. It made its first appearance in the latter part of the World War on the "tanks" of the British. These tanks were not dependent upon roads. They could go anywhere and they swept everything before them. They had power enough to smash down trees and small buildings. Their speed was four or five miles per hour, a brisk walking pace.



German Soldiers Launching Inflated Boat; Below, German Family Wearing Gas Masks with Improved Visibility

Today, the tank has grown to ten times the size, weight, and power of those first ones. At the army proving grounds at Aberdeen, Md., recently, one of our latest tanks, carrying a crew of seven men, armed with machine guns, ran across a rough field at sixty miles an hour. Disdaining bombs dropping from above and a hail of machine-gun fire, and fairly radiating machine-gun fire itself, it ran down and demolished a building supposed

to be sheltering a squad of machine gunners.

The endless-chain tread has revolutionized the artillery. In the World War, field guns were three-inch caliber and were mounted on regular wheels and hauled by horses. The three-inch field guns of today are towed by tractors at fifty miles an hour. They are able to shoot ten shells before the first one bursts. The tenth shell is actually on its way before the first one has arrived at its mark.

A four and two-tenths-inch gun, able to shoot at sixty-five degrees elevation a thirty-three-pound shell seven miles, can be towed over rough ground at fifty-five miles an hour. A six and two-tenths-inch rifle, able to fire a ninety-five-pound shell fifteen miles can be moved fifty miles an hour. Anti-aircraft guns and their range-finding equipment can be picked up, shifted 100 miles, and set up again in three hours. Chemical trench mortars, for throwing shells loaded with poison gas, can be hauled over a rough field at over sixty miles an hour.

The heaviest artillery, equal in power to coast defense guns, is also now mobile. Such guns will throw a 2,100-pound shell

loaded with 700 pounds of high explosive thirty miles. The rapid moving of such guns is destined to increase profoundly the destruction that will be wrought in the next great war. Twelve-inch guns now are more mobile than the swiftest horse-drawn three-inch guns in the last war.

Tanks, the cavalry of the future, poison-gas proof and equipped with machine guns, and field artillery, promise to do the advancing and bear the brunt of battle in the next war. We shall see on the battlefield no men, but thousands of tanks, battling each other as uncouth prehistoric monsters must have done, rearing and plunging, climbing and rolling over each other, the vanquished dying in clouds of red flame and black smoke.

Poison and deadly disease germs which ap-



Washington, England
British Fireman Equipped to Disperse Gas in Event of Air Raid;
Below, Berlin Police Department Operating by Candle Light When
City Was Darkened during a Mock Air Raid

E 1198



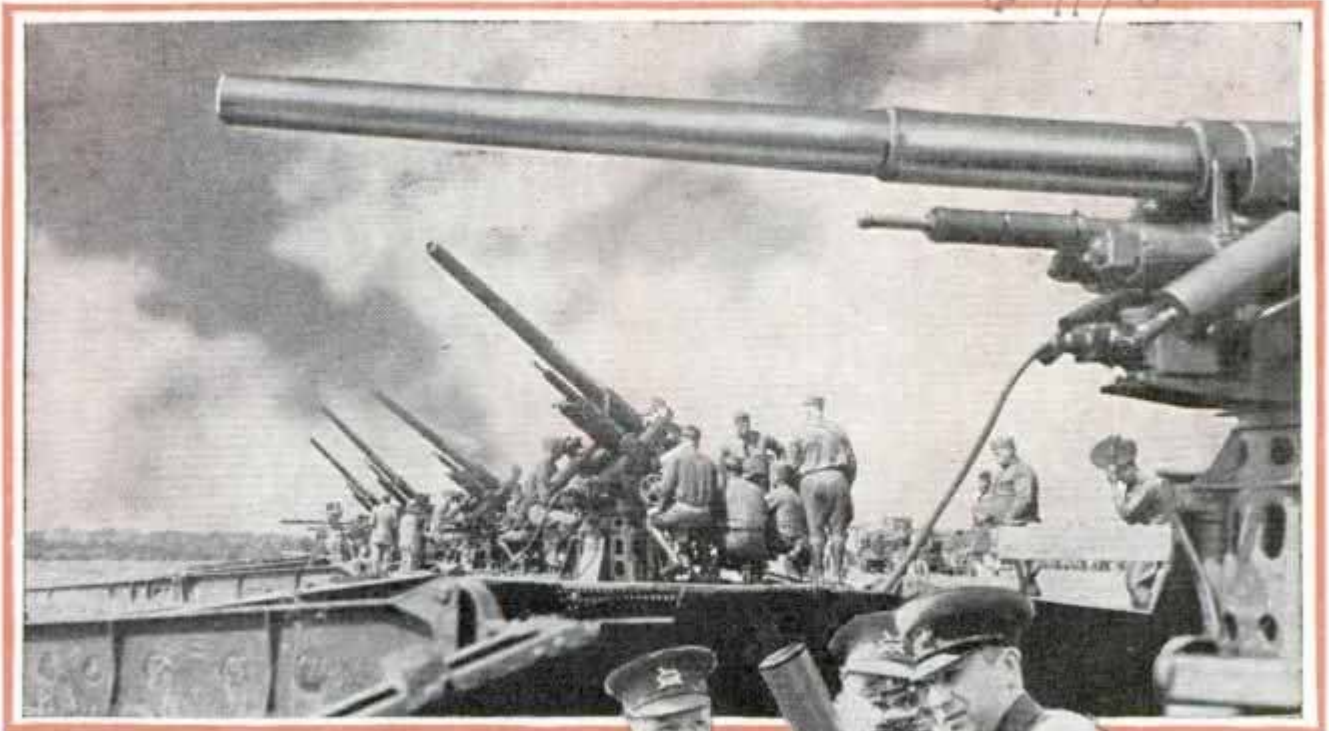
Machine Guns and Gas Masks Being Demonstrated to Japanese Women during an Inspection to Show What Army Life Is Like

peared in the World War for the first time, are destined to loom big in a next war. Both are shrouded in secrecy in all countries. But from what is known to have been accomplished in science, we are able to infer that the various war departments must have large stores of liquid material which when released turns to a gas which will kill by merely contacting

the skin. No gas mask can protect against it. In a public hearing before a congressional committee in Washington, Captain Bradner, then chief of research of chemical warfare, testified, in effect, that a single airplane carrying two tons of a certain liquid, which would generate a gas when liberated, would kill, merely by its action on the skin, every human being in an area 100 feet wide by seven miles long. Had Germany had 4,000 tons of this liquid and 300 airplanes in 1917, the entire American Expeditionary Force



British Artillerymen Operating One of the Big Guns at Fort Madelina on Island of Malta



might have been annihilated in one night.

Will Irwin, the war correspondent, in his book, "The Next War," quotes Col. J. F. C. Fuller of the British army as saying we can expect in the next great war to see hundreds of thousands of gas containers dropped from planes by parachutes and released by radio when weather conditions are favorable for the spreading of gas toward the enemy. Under favorable conditions, such an arrangement could send hundreds of thousands to death.

War departments guard their secrets but the public can, however, judge from scientific and engineering knowledge what is likely to happen. It has been suggested, and the plan is practical, that along certain frontiers for hundreds of miles and at certain localities near large fortifications, there are already planted thousands of containers of lethal liquids. They are said to have vents into the open air and a means of release which is controlled by underground wires. Were an enemy army to reach these points under favorable wind conditions they literally could be

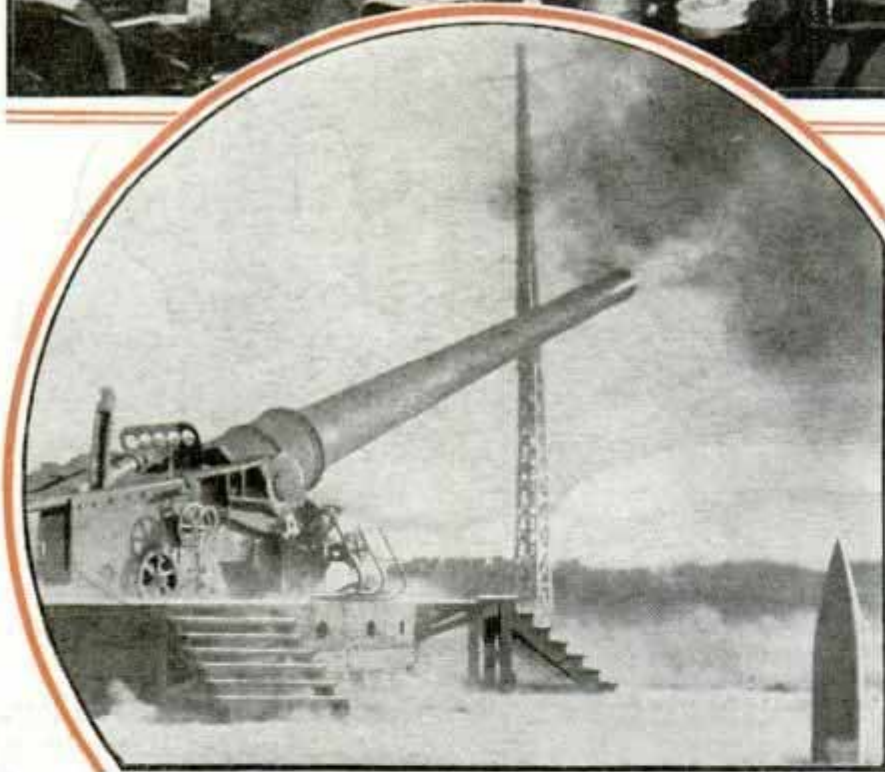


Top, Battery of Mobile Anti-Aircraft Guns Firing at Target Towed by Plane at Aberdeen, Md.; Bottom, Latest Type of British Mortar

submerged in dense clouds of poison gas.

In the case of disease germs, it has been proposed to make use of deadly diseases which Europeans and Americans have never encountered, and to which, in consequence, they are very susceptible. It is reasonable to believe there are stored away in the secret chambers of several war departments, thousands of gallons of disease cultures ready for distribution.

An entirely new form of bomb is said to use fulminate of mercury or other similar materials which detonate rather than explode in the ordinary sense. These ma-



Top, Gas-Mask Shop in Paris Where Citizens Buy Equipment for Protection in Event of War; Bottom, United States Coast Defense Gun

materials do not inflame or burn progressively, as ordinary explosives do, but the entire mass flashes into gas instantaneously. Incredible pressures result, since the time element is so short. A small bomb loaded with detonating material dropped on the roof of a building would do as much damage as a large shell. Dropped on a street,

at 2000 Monmouth Co

machine-gun fire. Since the war, phosphorus, and similar materials which burst into flame when exposed to air, have been loaded with bombs for airplane dropping. They do not need to be large or heavy. A modern bombing plane can carry thousands of them. A fleet of bombers showering a city with these incendiary bombs

it conceivably would break through and smash water and gas mains and underground electric service. A modern bomber, carrying several thousand such bombs, would be capable of indescribable destruction in large cities.

In the last war flame throwers were used to a limited extent. They played a flame from a hose, as water is squirted, but it was found they had too short a range, required too much clumsy equipment, and too many men were exposed to

would start tens of thousands of fires simultaneously. When winds were too strong for poison gas, these incendiary bombs would work at their best. General Mitchell, formerly of our air force, pleading for more airplanes before the house committee on appropriations, said a few enemy planes if allowed to reach New York City could drop phosgene gas over an area of 100 square



Top, British Tank Which Moves at High Speed and Is Intended to Pursue Retreating Army; Bottom, Light Tanks Used by Italy

miles, and inundate the entire area, killing every inhabitant.

Radio communication is different from all other forms of human communication across distance in that all engaged in the communication use the same ether or space. This brings about interference or "jamming." By emitting a strong radiation on a broad band of frequencies, all radio within this band is rendered indistinguishable. During the World War one nation stationed a ship over the submarine cables and sunk a coil of wire near one of them. This coil picked up the electrical impulses passing in the cable, which were led up to the ship, where they were amplified. Many war messages were there-

by overheard and used.

To avoid "jamming" of radio signals, a combination of different wave lengths, or frequencies, has been used so that by repetition it is usually possible to obtain the entire communication. However, it has been maintained by some that more is gained by permitting the enemy to communicate freely because it enables his traffic to be copied. A large percentage usually can be deciphered, notwithstanding it is all in code.

Jamming of radio control of unmanned airplanes would upset control of the latter; but by using a secret combination of many frequencies and other expedients, enough can be got through probably to overcome the difficulty. There has been no experience in actual warfare with unmanned airplanes operating by radio.

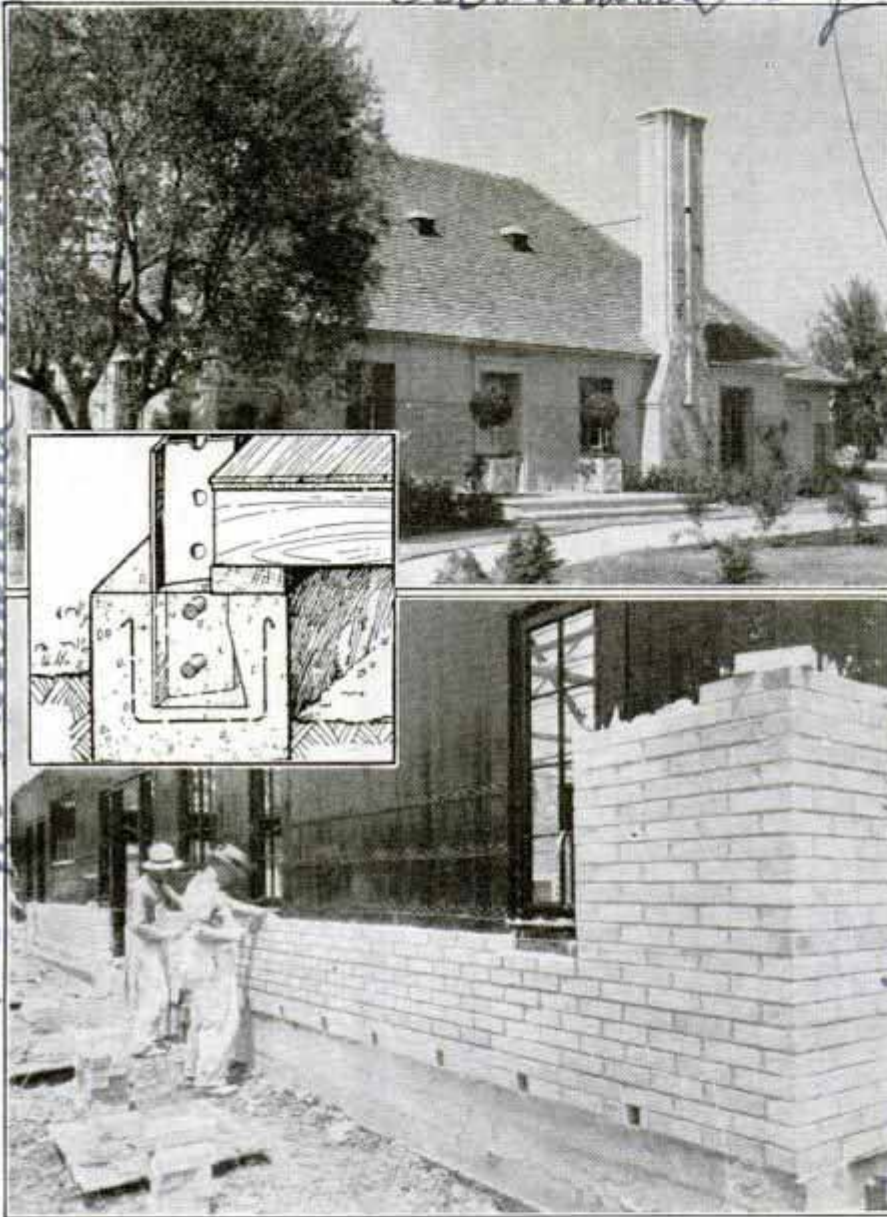
During the past year important developments have occurred in super-high frequency radio. Successful communication has been accomplished under favorable conditions on wave lengths as short as six inches. This means a frequency of approximately 1,800 million oscillations per second. Research work is being done on

(Continued to page 136A)

Steel Walls That "Breathe"

Defy Quakes and Corrosion

Alhambra Calif



Top, the Quake-Proof, Decay-Resistant House; Below, Finishing Exterior; Inset Shows Twelve-Inch Steel "Breathing Wall" Set in Concrete

Houses of steel with walls that "breathe," safe from earthquakes and resistant to the attacks of termites, fungus, dry rot and the infirmities of old age, are one of the latest developments in the building industry. All load-bearing walls are of copper-bearing steel imbedded in a foundation of concrete slab, the steel specially processed to withstand corrosion. Numerous air vents in the cellular walls allow air to circulate constantly, helping insulate against summer heat and prevent heat loss in winter. Exterior finish and roofing material may be chosen to suit the build-

er. Plaster walls on the interior are made possible by nailing wallboard or insulating material through the steel with barbed, casehardened nails and then applying plaster. Steel joists are hung on steel dowels inserted in the air ports of the walls. Hardwood floors are either laid on top of waterproof concrete slab or are nailed to strips laid in the concrete.

Cotton Runway for Planes Is Planned at Newark

Taking a tip from southern highways, the Newark airport will construct a cotton runway for planes this year. Cotton sheeting has been found to check erosion, cracking and wrinkling, and it is used on rural and secondary roads of the southern states where traffic is light. The cotton becomes a binding layer between the base and top dressing of the road. From six to eight bales of cotton are required to surface one mile of highway eighteen feet wide.

Pipe Ends Are Joined Quickly by Compression Coupling



Pipes can be coupled in a few seconds with a special coupling unit now being manufactured, and the pipe ends need neither threading, grooving nor flaring. The coupling body itself is threaded, and after placing it over the junction of the two pipes, a few turns of a wrench screws two threaded "follow-

Palmer Steel Buildings, Inc. Los Angeles
116 N. Sacramento Blvd. Calif
1399 320 S. Chapel St. Alhambra Calif
Pugh's
Cotton Textile Institute
8/407
8/400
Calvin Deane 11855
S. R. Dresser Mfg. Co.

ers" on the coupler threads and two resilient gaskets inside are compressed tightly around the pipe, sealing the joint permanently. Each gasket is protected by a special metallic armor, and it is claimed the gasket will last as long as the pipe itself unless temperatures exceed 200 degrees Fahrenheit.

81388
"Free-Wheeling" Electric Plug Keeps Cord from Twisting

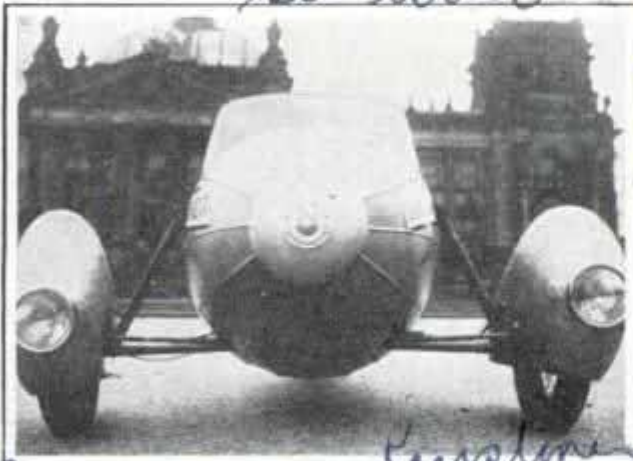


Twisted cords on electric lamps and other appliances are an unnecessary nuisance. A cord with a free-turning plug can be turned indefinitely without snarling. The Bakelite base

which holds the contact points is attached to the outer cap of the plug by a swivel, allowing the outer part to revolve.

81353
Auto Shaped Like Airplane Operated at Low Cost

Shaped like an airplane, a three-wheel streamline automobile built in Germany has an exceptionally low operating cost. It is claimed the lightweight car makes nearly sixty miles to a gallon of gasoline and has a top speed of more than seventy miles an hour. One of the features of the car is a lamp set in each airplane type of fender.



Three-Wheel Streamline Auto Built Like an Airplane; Note Lamps Set in the Fenders

81341
Brakes Equalized by Tester On One Wheel at a Time



Handy Equipment for Equalizing Brakes Is Operated Easily by One Man

Designed for one-man operation and applied to one wheel at a time, a new machine makes easy the job of equalizing the automobile brakes. The tester is placed at the rear of the wheel and a crank is turned to rotate the wheel in forward running direction. A pointer on the machine's dial registers brake resistance. A similar test on the opposite wheel shows whether the brakes are equalized and adjustments can be made if the readings vary.

81422
Faster Job of Sanding Is Done with Waterproof Sandpaper

Smoother, faster sanding of coated surfaces can be accomplished with a waterproof sandpaper recently developed. Before using, the sandpaper is dipped in water and kept moist during the work by redipping in a pan of water. This washes out wood fibers and paint, making the paper sand a fine surface in a short time. It can be used on either wood or metal to remove paint or rust.

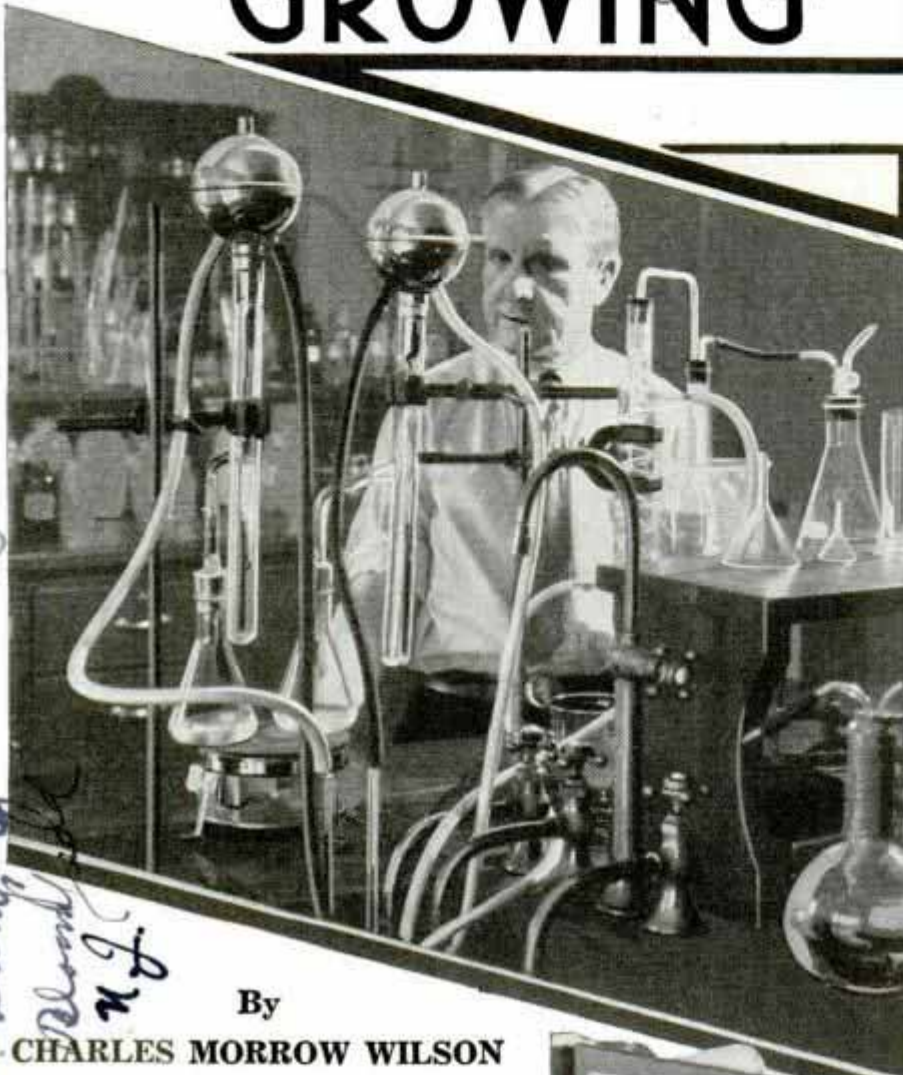
Merchandise Dept. Chicago

Los Angeles Calif. E 1341

myr
Kaiser-Fahrzeugbau
Kaiser-Fahrzeugbau
Minnesota Mining
Mfg. Co. 797

Thermond Rubber Corp

GROWING THINGS



decay bacteria in foods and kill injurious bacteria in water, and green vegetables, human food or animal feeds grown within a few hours inside metal cabinets, without soil and without sunlight.

These are some of today's and tomorrow's headlines in the march of science and mechanics into farms, fields and home gardens.

Most soil teems with enemies to plants and man, weed seed, soil hibernating insects, virulent parasites and fungi. For centuries people have striven to sterilize soils and fight these hosts of unwelcome guests. The

Left, Analyzing Soil Sterilized by Soft X-Rays; Below, Using "Filing Cabinet" Agriculture to Study Common Molds

By

CHARLES MORROW WILSON

SOIL permanently sterilized—freed of weed seed, destructive insects, bacteria, fungi and plant diseases—by automatically controlled electric cookers.

Vegetables and flowers grown out of season in soil ideally heated by electrical resistance cables and flowers blooming in mid-winter as a result of artificial lighting.

Delicate seed made healthy, surface soil riddled of harmful insects and fungi, tree borers and termites destroyed by a new "soft X-ray" and vegetables and flowers grown in winter on electric griddles.

Bothersome insects, such as mosquitoes and codling moths, destroyed by light waves too small for the eye to detect, electric lamps which destroy mold and

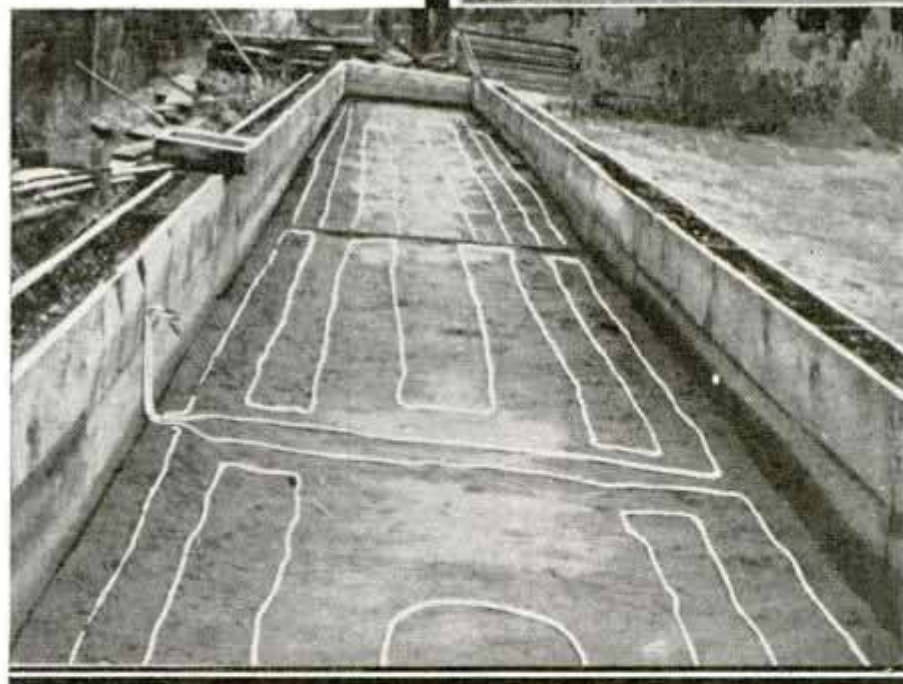
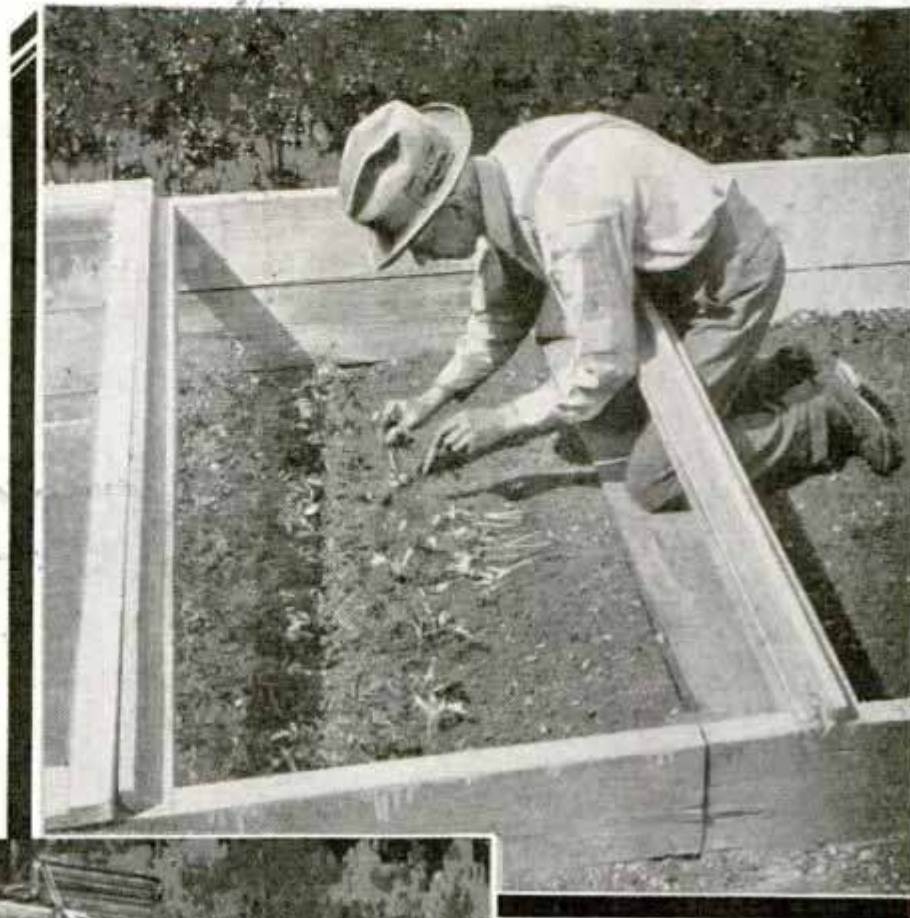


200 W. 54th St. New York
 8/32
 Route 1, Newfane, Vt.
 Westinghouse Lamp Co.
 Samuel S. Hibben, Dir.
 Applied Lighting, Westinghouse Lamp Co.
 N.Y.

BY MAGIC

primitive defense has been to wait until fall to burn off dead leaves and stalks. More recently there have been attempts to purify the soil with chemicals. But few chemicals are effective in cold soils and sometimes the residues prove harmful.

Some progressive New York farmers, gardeners and florists are trying to sterilize their soil with electrical heat. They find that heating the soil to 180 degrees for five or six hours, not only kills soil bacteria and insect life, but virtually every variety of weed seed, con-



Above, Saving Time by Starting Plants in Hotbed; Bottom, an Electric Hotbed, Showing Method of Placing Cable to Distribute Heat Evenly

verts unavailable forms of soil nitrogen into available plant foods, and develops great quantities of ammonia. This changes to nitrate, which results in more rapid plant growth.

The commercial soil sterilizer consists of a box with one cubic yard capacity, built

low sterilization of one-half cubic yard. The cost of sterilizing a cubic yard of soil for a period of six hours at three cents per kilowatt hour is approximately one dollar. A cubic yard of fertile soil will fill about 2,000 small flowerpots, and saving in weeding alone more than repays steriliz-

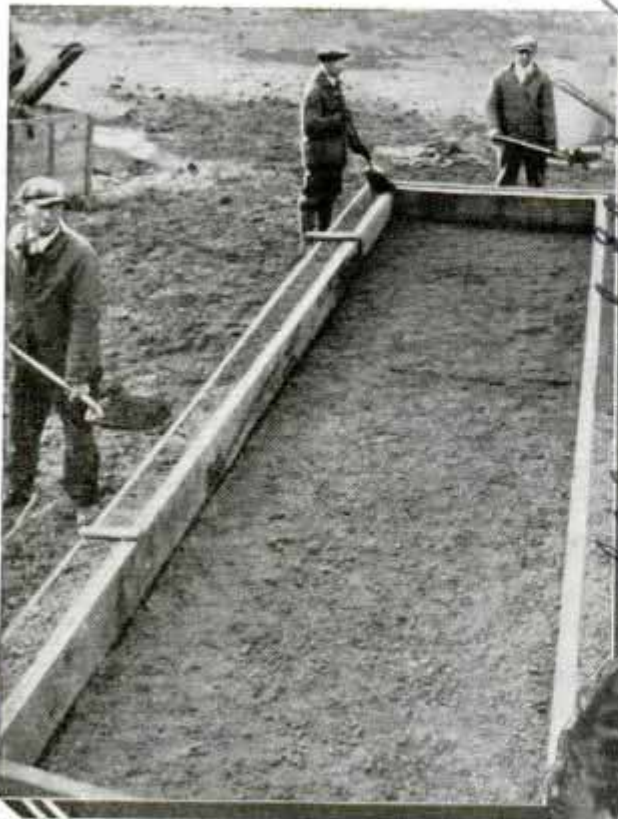
of eighth-inch boiler plate and provided with a top for loading and a bottom dump for emptying the soil after it has been "cooked." A homemade wooden box properly wired might serve as well. Heat is furnished by fifteen electric heating elements carrying a connected load of five kilowatts placed to give even heat throughout the box and allow free space for removing soil. Elements are connected in upper and lower circuits to al-

*Consolidated Car Heating
818 21st*

81821

Handwritten notes on the right margin, including "81821" at the top and "Consolidated Car Heating" at the bottom.

for quantities less than 500 ft



most successful beds are insulated on sides and bottom with about a foot of cinders. Spread burlap on top of the cinders and cover with three or four inches of clean sand. Over this the lead-covered resistance cable can be laid. This cable, about the size of a lead pencil, ranges in price from one and one-half to four cents a foot. Cable should be installed to give even distribution of heat throughout the bed. Sides of the bed radiate heat and tend to be cooler than the center.

"Therefore the first cable should be laid lengthwise four inches from the sides and carried within four inches of the ends. The next cable should be six and one-half inches from the first; the third ten and one-half inches from the second.

The center should be filled in with the remainder of the cable spaced at regular intervals, the cable remaining continuous. Heating can best be controlled by an ordinary thermostat. A voltage of 120 will normally heat a bed with an area of 250 square feet or less. Cable should be covered with two or three inches of sand, and the sand covered with five or

(Continued to page 116A)

ing costs. The best test for sterilization is to bury a medium-sized potato in the soil. As soon as the potato is well done, the soil is sterile.

Though electrical sterilizing is in its infancy, electrical heating of soil has come into widespread use. The largest electrically heated field is in Holland, and covers more than five acres. Heating of soil by electricity is being done successfully on about forty commercial farms and nurseries in New York state alone.

Lawrence B. Carney, soil-heating expert, gives these directions for making an electric hotbed for home use:

"It is best to select a south slope to avoid wind and to dig out enough earth to allow the finished bed to be slightly below the surface of the surrounding land. The



Top, Placing Cinder Insulation in Electric Hotbed; Center, a "Filing Cabinet Garden"; Bottom, an Electric Garden in Mid-Winter

Will not answer letters Rural Service Dept. Albany, N.Y. (H. De.) New York Power & Light

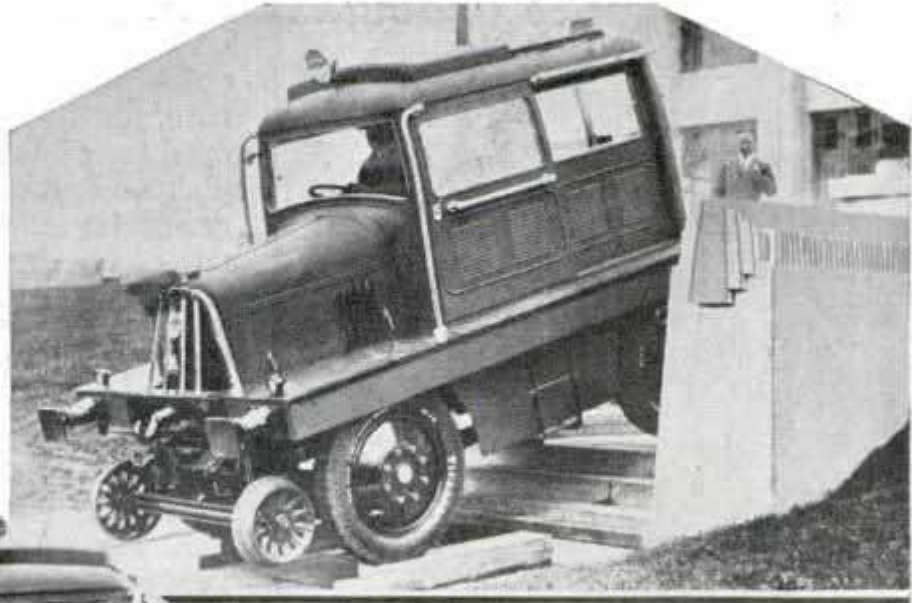
only

no longer covered 2/21/36

Handwritten notes at the bottom of the page, including "Cinder insulation" and "Electric garden in mid-winter".

Stair-Climbing Diesel Car Rides Road or Rail

Even a Flight of Stairs Is Not Too Tough an Obstacle for This Versatile Diesel-Power Car, Which Can Climb or Descend Steps and Travel Rough Roads on Pneumatic Tires, or Drop Its Steel Wheels to Ground Level and Ride a Railway Track, Pulling Ten Trucks



Local Industrial Vehicles

*Albert
Engelhardt,
London, S.E.
London, S.E., Eng.*



Equally at home on highway, railroad track or even climbing up your front steps, a versatile Diesel-power car of original design has been put to performance tests in England. The truck demonstrated its ability to travel on almost any type of surface with ease. It is equipped with four-wheel drive and four-wheel steering. In addition to the pneumatic truck tires for the road, flanged steel wheels which can be lowered into position in front and rear enable the car to ride railroad tracks. The Diesel engine provides ample power to pull ten trucks.

*Per Sept. 1937
Aug. 31st - August
maker Eastman Kodak Research Laboratories, Rochester, N.Y.*

Life-Giving Hormone Is Found to Stimulate Plant Growth

Auxin, a plant hormone that imparts a lively stimulus to the growth of vegetation, is being demonstrated in crystalline form by Dr. F. W. Went and fellow research workers at the California Institute of Technology. Lemon and willow twigs subjected to the hormone treatment soon put out strong new roots. Auxin causes plant cells to elongate and accelerates root growth. It is a white crystal substance.

Pasadena

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



Being studied by the California Institute of Technology

Tiny Motorcycle Helps Pilot After Forced Landing



Lightweight Motorcycle Carried in Plane to Provide Transportation for Pilot after Forced Landing

So lightweight that it can be carried in the plane, a midget motorcycle has been produced for the use of transport and mail pilots after forced landings. The tiny machine enables the pilot to travel some distance in search of assistance. It weighs ninety pounds and is made from airplane tubing, sheet aluminum, a bicycle motor, coaster brake clutch and a folding steering wheel. Power is transmitted to the rear wheel with bicycle sprocket and chain.

Better Farm Tools Tomorrow Seen in Recent Advances

From a glance at vast improvements in farm machinery during recent years comes the prediction for the immediate future of less costly implements, small mechanized tools easily operated, easily repaired, better adapted to special tasks and with a useful life far greater than the implements of today. One of the latest developments is a small combine designed to harvest a five-foot cut of soybeans, dwarf grain sorghums and small grains. It is easily handled in small fields, and S. H. McCrory, chief of the Bureau of Agricul-

tural Engineering of the Department of Agriculture, believes it is the precursor of a similar combine to harvest corn. It may be necessary, he says, to breed a quick-drying, easily shelled variety of corn, just as dwarf sorghums were developed for combine harvesting on the great plains. Farm machines can be run at greater speeds with less wear since the use of pneumatic tires and improvement of bearings, oiling methods and protection against dust. Tractors are only half as heavy as twenty years ago, and with better carburetion and manifolding, anti-friction bearings and modern lubrication systems they deliver a greater proportion of engine power at the drawbar. Mr. McCrory says farm implements twenty years old are as out of date as a 1915 automobile and "we can reasonably expect even greater improvements in the next twenty years than in the last twenty."

Ventilated Trunk Built on Auto to Carry Hunting Dogs

His hunting dogs ride in comfort when a Cadillac, Mich., sportsman goes afield with his shotgun. The built-in trunk of his sedan accommodates the dogs, and a special ventilator installed at the side of the trunk assures them plenty of fresh air.



Built-In Trunk with Special Ventilator Which Accommodates a Michigan Man's Hunting Dogs

Vertical handwritten notes on the left margin: "Arch. Skel", "Younger", "1421", "See letter.", "Dept of Agriculture".

Vertical handwritten notes on the right margin: "Washington D.C.", "1418", "Ventilated Trunk Built on Auto to Carry Hunting Dogs".

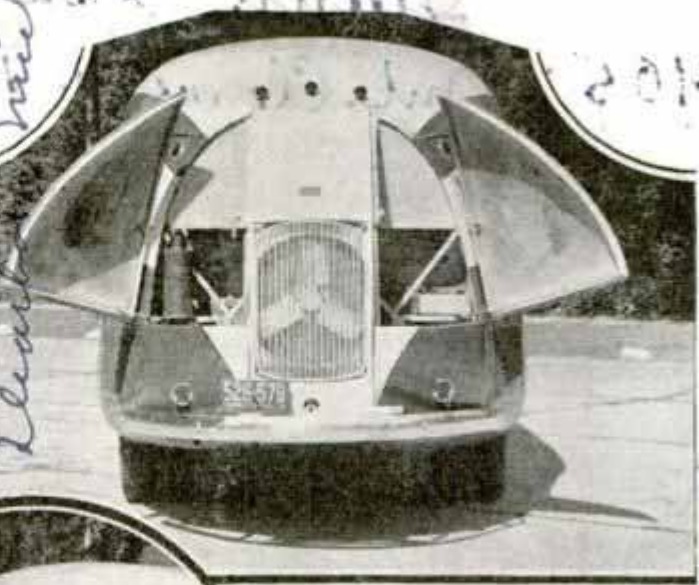
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Handwritten notes at the top right: "Washington D.C.", "1418".

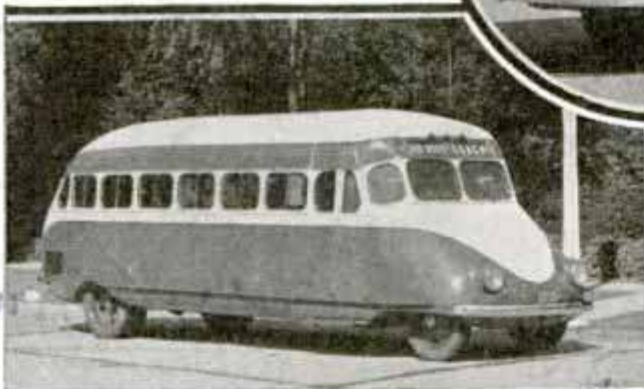
Handwritten notes at the bottom: "Dept of Agriculture", "Chevrolet Motor Co 420 W".

Rear-Engine Bus Borrows Style from Planes

Stealing its streamline styling from today's giant transport airplanes, a rear-engine motor coach of unusually light weight is delivering startling performances in experimental service. Designed by William B. Stout, president of the Society of Automotive Engineers, the bus weighs less than three tons. A standard Ford V-8 engine is mounted at the rear, placing weight on the drive wheels, rendering steering easier and, coupled with the low weight per horsepower, affording rapid acceleration. Passengers are relieved of motor noise and fumes. The exterior is of sheet steel, and the body is built as a unit on a frame of welded steel tubing



Back and Side Views of Light-weight Streamline Motor Coach Showing Engine Mounted at Rear, Easily Accessible When "Wings" Are Opened



free from any bolts, screws or rivets, so sturdy that the conventional chassis frame is eliminated. Twenty-four passengers are accommodated.

They enter a stepless front door and proceed down an aisle at the same level, stepping up to the seats which are six inches above the floor. This depressed floor arrangement permits greater head room and cuts down the over-all height of the coach.

Perfume Prepared from Fruits Rivals Flower Essence

Prepared in the laboratories of a Hollywood cosmetics company, perfume made from fruits is said to rival the flower extracts. Dr. A. T. Frascati, who created the fruit perfumes by a special process and secret formula, predicts that the most beautiful perfumes of the future will come from fruit extracts. The same laboratories prepare individual scents for motion-picture players.

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



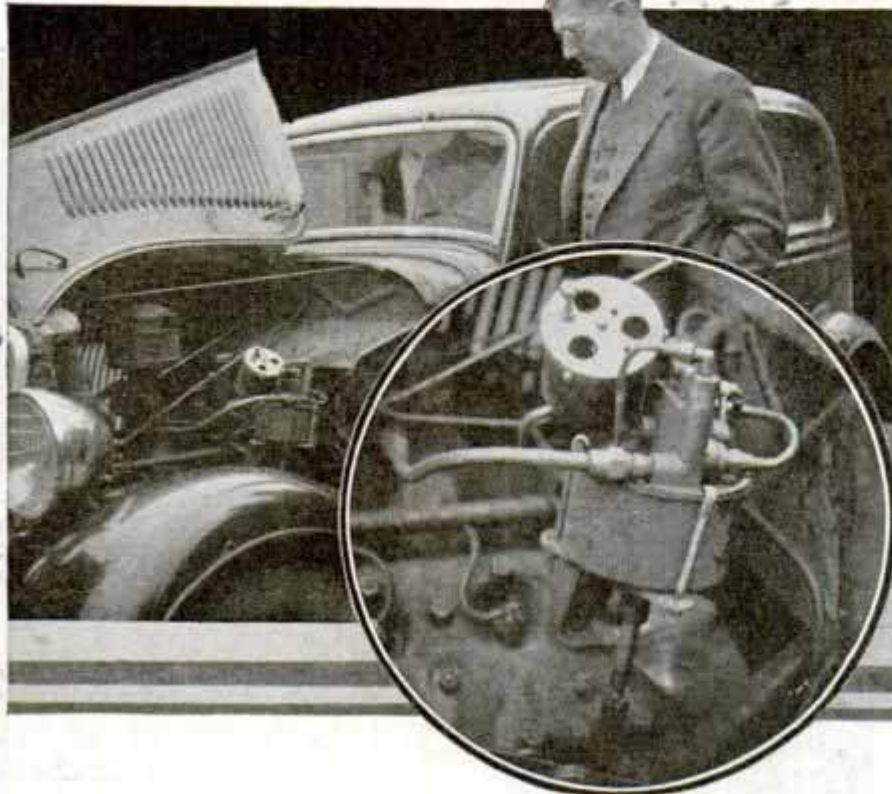
Go max Juctol
Highland

Power Clutch for Ford Car Is Controlled by Accelerator

Ms. E. Porter 1256 Meldrum Ave. Detroit, Mich

8/14/05

Con. Clutch for Underwood
B. 4. 1905 223
Int. Clemens Mich



Special Power Clutch Installed in Automobile, and Closeup of Unit; This Clutch Engages Automatically When Accelerator Is Depressed

Easily installed in two hours by a mechanic, a special power clutch unit for Ford automobiles is now on the market. When the accelerator pedal is depressed, the clutch engages automatically. When the motor idles, the clutch is disengaged. The clutch control takes hold ahead of the motor pick-up and does not stall it. The unit is automatically oiled through the use of oil and air vapor from the crankcase of the motor.

ular brand. The branding system was devised by Prof. Roy E. Jones of Connecticut State college.

any melting or burning devices known. As soon as intense heat is played on it, a slag is formed and this is unaffected by any melting. The steel is so hard and the heat-resisting qualities are so high that it is necessary to cast it in special molds for each individual job and then finish off by grinding.

8/14/20

Poultry Branded Like Cattle to Balk Thieves

Protection of poultry from theft is afforded by branding the birds like cattle. With forceps, the wing of each bird is perforated and ink rubbed into the flesh, leaving a mark that the chicken carries for life. The mark is in the form of letters and numbers to show the owner's partic-

Storrs Conn



Using Branding Tool on Chicken's Wing

Steel Resisting Hottest Flame Is Used for Bank Vault

Steel which is claimed has six times the tensile strength of armor plate and which possesses a melting point so high that it can withstand the strongest oxy-acetylene flame is incorporated in a safe in England for the Greek National bank. The vault is said to be capable of withstanding all the orthodox methods of forcible entrance. The material of which it is made, known as Tann steel, can resist

8/14/17

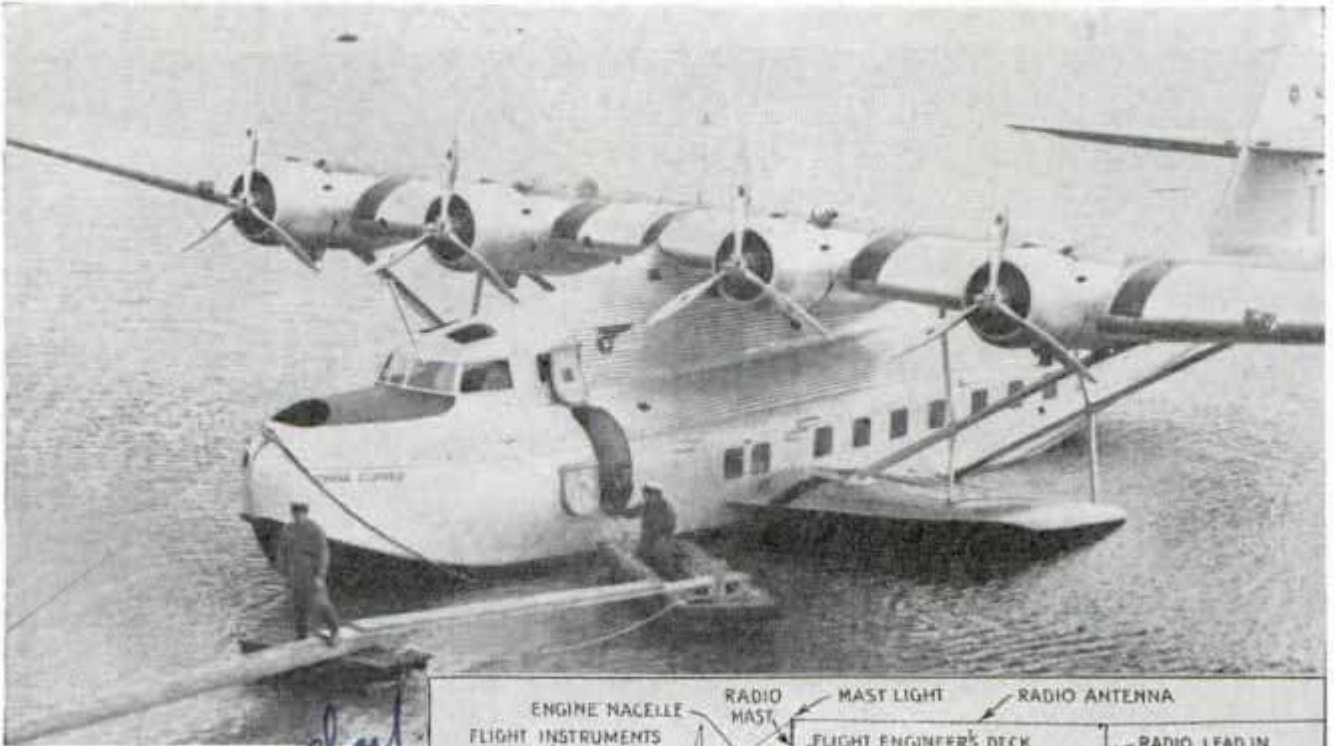
mother address

Con. Clutch for Underwood B. 4. 1905 223 Int. Clemens Mich

Developed by L. Tann and H. ...

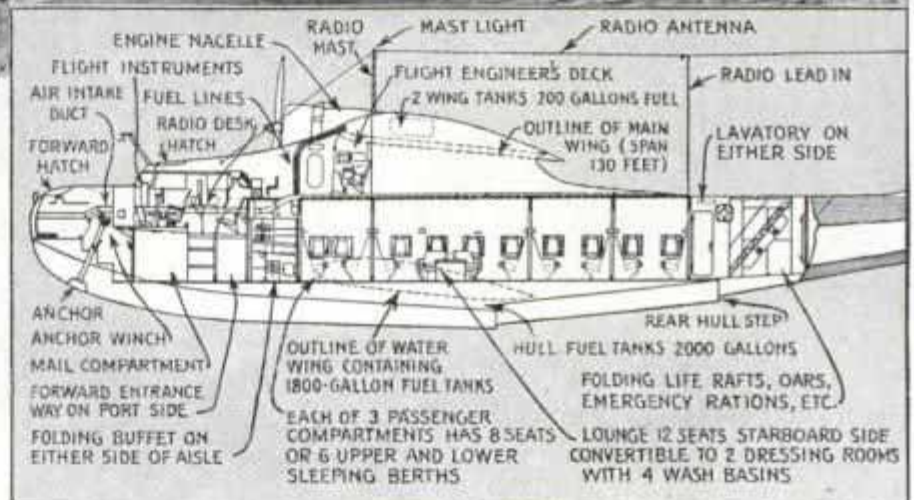
Con. Subens & Patton

Clipper Brings Manila within Six Days of U.S.



Drawing © Aero Digest

The 51,000-Pound "China Clipper," One of a Fleet of Flying Boats Which Will Carry Passengers and Mail Across the Pacific; Right, Diagram Showing Arrangement of Control Cabin, Passenger Compartment, Fuel Tanks and Other Equipment



When Pan-American Airways' "China Clipper" completed the first transpacific airmail flight from the United States to the Philippines recently, it brought Manila, 8,000 miles distant, within six days of American shores and forged the last link in an aerial chain destined eventually to transport both mail and passengers across the Pacific. Carrying about 110,000 pieces of mail, the flying boat, which made the trip in six days, clipped about sixteen days from the best time made by steamers. Stops were made at the air bases at Honolulu, Midway islands, Wake island and Guam. The "Clipper," first of a fleet of huge flying boats, is the same type of plane intended to carry passengers later. It is powered with four fourteen-cylinder engines of 830 horsepower each and has a 4,000-mile flying range. Gross weight is

51,000 pounds and cruising speed is 157 miles per hour. The main wing span is 130 feet and the propellers are of the constant-speed metal type. Each of the three passenger compartments has space for eight seats or they can be changed into six upper and lower sleeping berths.

81397— Prize Is Offered for Invention of Carnauba Wax Extractor

The president of Brazil has offered a \$4,000 prize to the inventor of a machine for extracting carnauba wax. The wax is produced only in Brazil and used in making shoe and furniture polishes and similar industrial processes. If he accepts the prize, the inventor of a mechanical extractor must waive private patent rights.

Press memo Dept. of

81177

The WORLD'S Greatest Race -



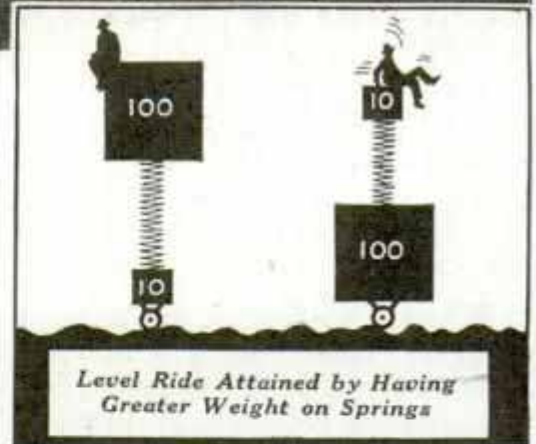
By JULIAN LEGGETT

NO OTHER race in the world attracts 50,000 entries and more than 3,000,000 spectators, so these figures for the 1935 All-American Soap Box Derby place this annual event in a class by itself. And in 1936, there will be twice as many drivers and double the attendance.

In more than fifty cities last year, crowds cheered on the winners of the preliminaries and at Akron, Ohio, more than 90,000 acclaimed a thirteen-year old boy a champion as he piloted his motorless car across the finish line a split second ahead of two other young finalists, capturing the national title.

The winner was Maurice Bale, Jr., and in 1934, the year the derby became a national event, Robert Turner, aged eleven, took first place. To each was awarded a four-year college scholarship and to second and third place winners were presented other prizes and trophies.

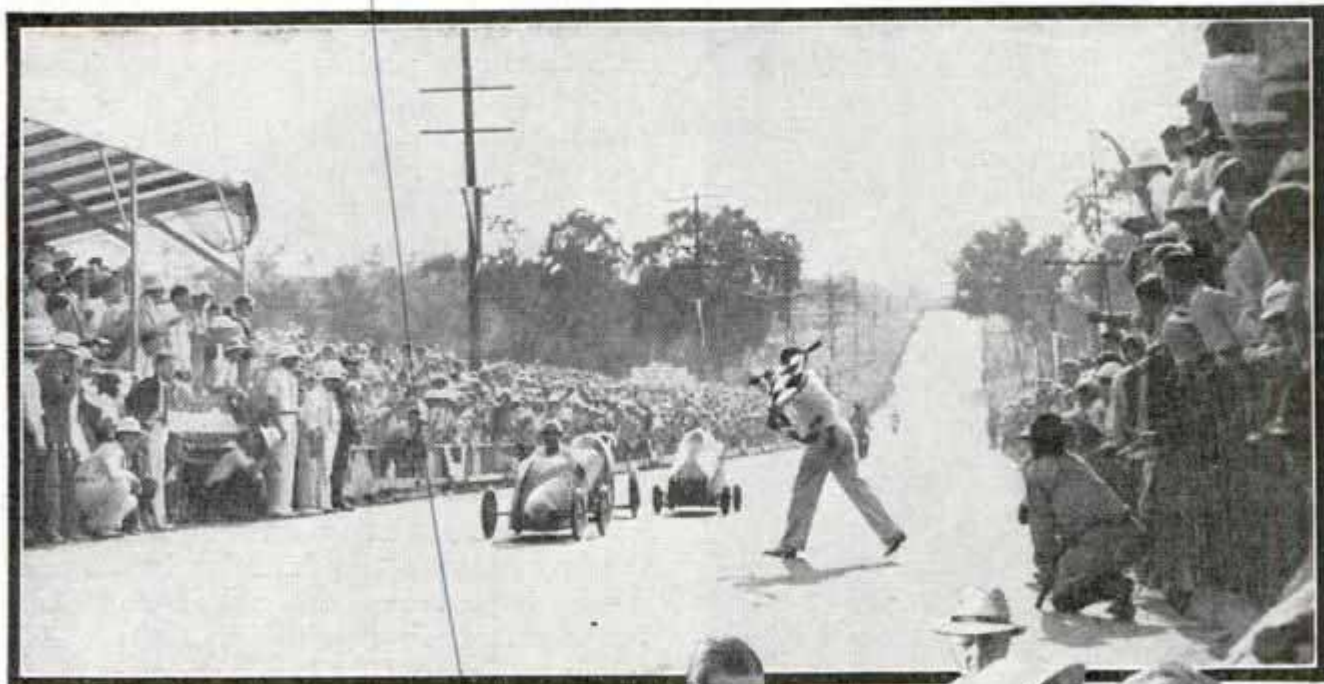
American boys have been building soap box cars, coasters and pushmobiles for as many years as they have been able to get the necessary materials, but Myron E. Scott, a newspaper photographer, was the first to conceive the idea of a



Top, Studying Plans for a Speedy Soap Box Racing Car; One Type of Wheel Is Shown

120 W. Milwaukee Ave. Detroit, Mich. 6/11/37 113

the SOAP BOX DERBY



scheduled racing event in which only soap box cars could compete. This idea developed at an amazing rate and the derby, now sponsored by the Chevrolet Motor company and newspapers scattered from one end of the United States to the other, is recognized as the world's greatest amateur racing event.

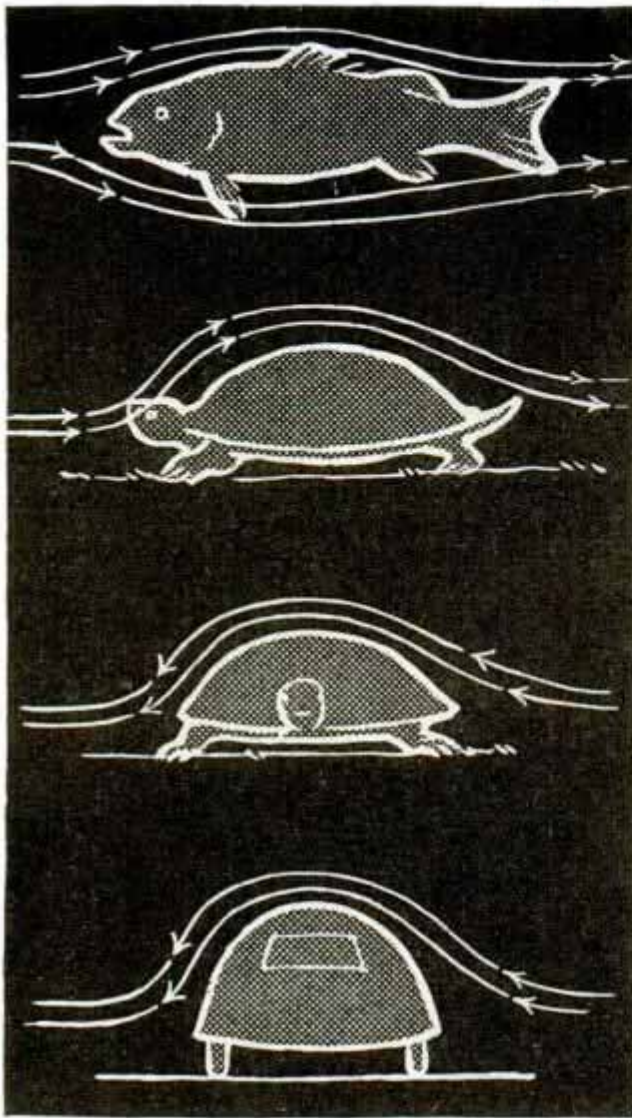
At first the derby cars were just soap boxes or crudely constructed bodies set on wheels and steered with a rope. Here and there you might find a real steering wheel, picked up



Top, Finish of 1935 Race; Center, the Winner, Maurice Bale, Jr.; Bottom, Robert Turner, 1934 Winner

at a junk yard, and occasionally an enterprising driver would have some effective means of stopping his car. It didn't take long for the drivers, and their fathers, to learn that a winning car had to be more than that. The 1934 derby brought out a number of well-constructed cars, one of which attained a speed of more than fifty miles an hour, and in 1935, some of the cars were as carefully built as an automobile.

Technical men have formulated rules



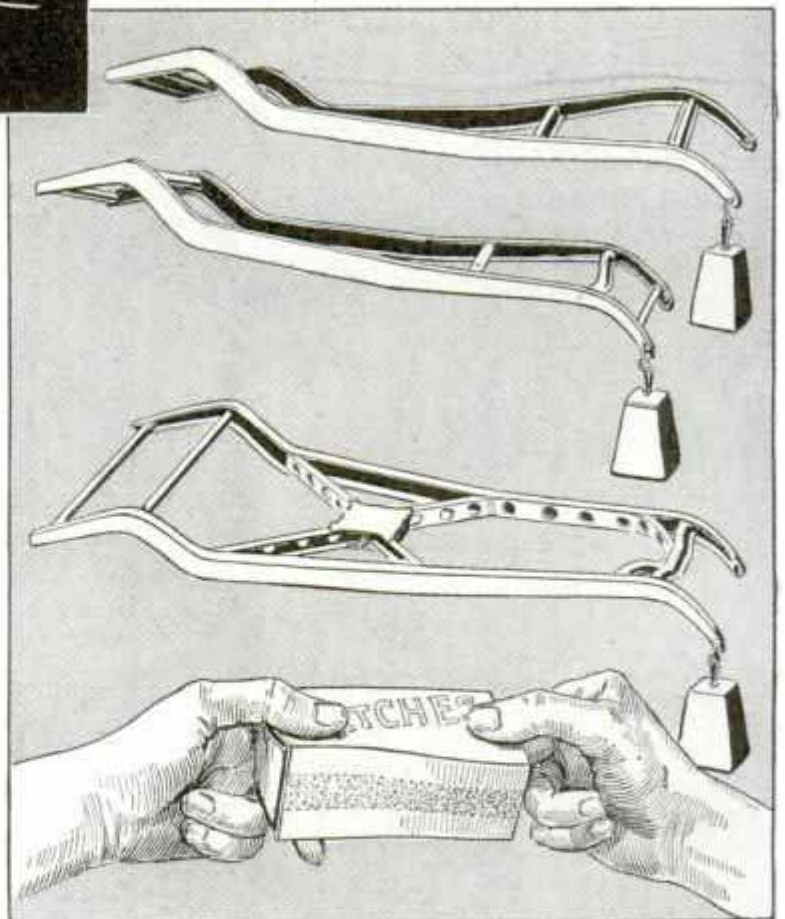
which govern the weight of the car, the degree of incline down which the young drivers race, the size of the car and various safety factors. Through these rules runs the idea of getting the most speed—with safety—out of a car which any boy between nine and fifteen might be able to construct with the aid of his father and the neighbors. To keep the derby fair to all, even the cost of materials is limited for 1936.

Building a soap box racing car brings up many problems that the engineer encountered in the automobile. These include frame design; value of streamlining; use of roller, ball or plain wheel bearings; effect of car's weight on speed; springs and the ratio between sprung and unsprung weight; value of independent suspension of wheels; proper balance

to attain roadability; large or small wheels; solid rubber or pneumatic tires, and if pneumatic, whether small cross-section, high-pressure or large cross-section low-pressure tires.

Automotive engineers say the frame should be designed to resist twist and weave when stress is placed on one corner, and this holds true for the soap box car. If the proper cross members, or their equivalents, are used, the frame remains rigid and does not impose a heavier load on one wheel than on another. Proper balance, or roadability, is one secret of speed, so construction which makes each wheel carry its proportionate share of the combined weight of car and driver is desirable.

Overcoming friction between wheel and axle by using some kind of bearing is highly important, with roller and ball bearings favored over the plain type. All three types were found on last year's cars, but the winner was equipped with the unit type of ball bearings having races and balls of hardened and ground steel. Counterweights were used for balancing the

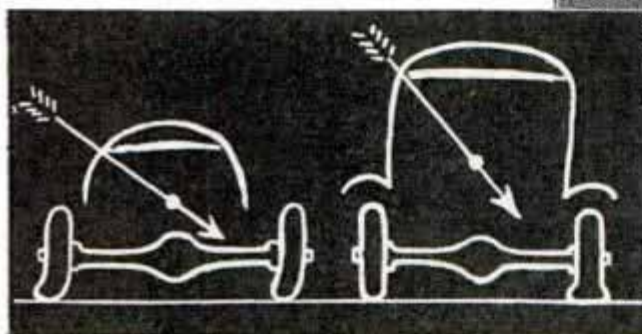
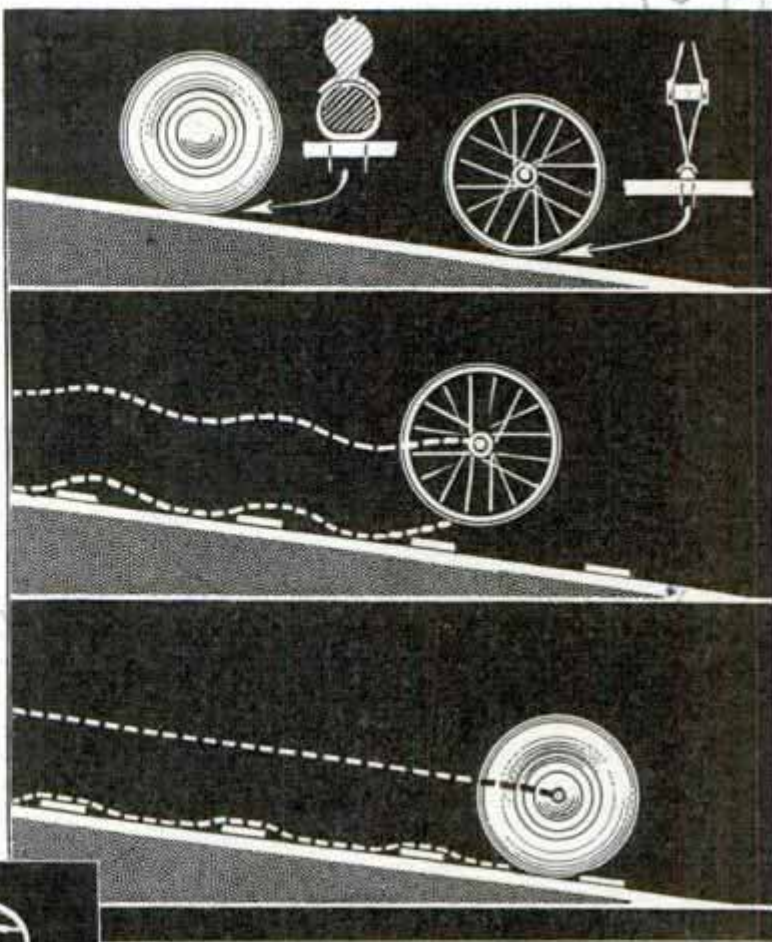


Top, Turtle's Shape Reduces Resistance to Currents from Any Direction; Bottom, Properly Supported Frame Resists Twist

wheels and care was taken to see that the bearings ran freely.

All other things being equal, except weight, the heavier car probably would win a race on a course where an incline ends on a level straightaway and where the finish line is located on the level part of the course and some little distance from the end of the incline. Weights of the 1936 derby cars are limited to 175 pounds.

Whether the car should have springs is another question that the builder must decide. Springs might have the effect of keeping the body in an almost level plane, riding straight toward the finish line instead of bobbing up and down and interfering with the forward motion. If springs are used, the problem of the ratio of sprung or unsprung weight arises.



Top, Comparing Small Cross-Section Tire with Large Cross-Section Low-Pressure Tire; Note How Low-Pressure Tire Clings to Road; Bottom, Balance, Not Lowness to Ground, Is Key to Roadability

Unsprung weight is that between the springs and the road. If only a small part of the total weight of car and driver is unsprung, then the car will ride in a more nearly straight line. This is illustrated by two weights, one of ten pounds and the other of 100 pounds, with a spring between them. If the ten-pound weight is on top and the whole assembly strikes a bump, considerable vibration will be transmitted to the ten-pound weight. In contrast, the level of the 100-pound weight would hardly be disturbed if it were on top and the small weight struck a bump. One factor, of course, is the compression of the spring by the heavier weight. The derby car builder can work out this interesting problem if he uses springs.

In the same connection, independent

wheel suspension might be considered. To keep the car on an even keel while the individual wheel "steps" over uneven spots on the course might be desirable. Some simple forms of suspension could be employed for the suspension of all four wheels, thus offsetting the lack of springs under the body, but the care with which wheel suspension must be kept adjusted to attain greatest speed should be considered carefully before a decision is made to use this construction. Several cars appeared in last year's races with front-wheel or "knee-action" suspension.

On the matter of what kind of wheels and tires should be used on this small racing car, there are almost as many opinions as there are engineers. The disk wheel is regarded as offering less resistance to wind than other types, but its advantages at the low speeds of the derby may be too small to be considered. In this connection, the 1935 winner's car had disk wheels. The large diameter wheel and the small wheel each have their backing, but the large wheel seems to give best results.

Tires are of more importance than the type of wheel. Both solid and pneumatic

(Continued to page 120A)

Absorbent Wall Silences Open Phone Booth



Walls of Perforated Metal Backed by Balsam Wool Absorb Noise and Make Doors Unnecessary

Telephone booths are being equipped with sound absorbent walls which make it possible to dispense with the door. The interior of the booth is faced with perforated metal backed with balsam wool, effectively deadening noise from outside the booth and absorbing the speaker's voice so that, even without a door, it cannot be heard outside the booth. The metal is easily washed. The base of the booth is left open for ventilation and cleaning, and there is no glass.

Spores of Plants Survive Trip into the Stratosphere

Surviving conditions where man would die, tiny spores of important plant diseases are growing in a laboratory of the depart-

ment of agriculture in Washington after journeying more than thirteen miles into the stratosphere with the balloon, "Explorer II." Discovery that spores still can live after being sent to an altitude of 72,395 feet was one of the first scientific conclusions from the recent stratosphere flight sponsored by the National Geographic Society and the army air corps. The spores carried aloft had to withstand temperatures lower than sixty-five degrees below zero, such a low atmospheric pressure that man could not live in it, ultraviolet rays from the sun which never reach the earth and which are capable of killing some forms of life, ozone and extreme dryness.

61445

Crystals "Grown" in a Furnace Will Extend Research

Artificial growth of large, optically perfect lithium fluoride crystals, which transmit light over a wider range of wave lengths than any known optical material, has been accomplished at the Massachusetts Institute of Technology. That this triumph of synthesis holds a promise of extending the horizon of atomic research is predicted by scientists. Some of the crystals are three inches in diameter. Lithium fluoride crystals transmit light from high in the infrared region through the visible band and deep into the invisible ultraviolet field. The synthetic crys-

Cambridge, Mass



Removing Three-Inch Lithium Fluoride Crystal from Thin Platinum Crucible in Which It Was "Grown"

Prof Donald C. Mackenzie

Acoustic. Div. Burgess
Battery Co., Madison Wis
\$105.00 of Madison

61443

tals are grown in an electric furnace at a temperature of more than 1,200 degrees centigrade. After cutting and polishing, the crystals are used in optical research instruments and are expected to be an important contribution to microscopy. In the atomic research field, the crystals may play an important role in spectroscopic investigations, particularly on liquids and some gases which must be confined in some form of container that will permit the transmission of light over the widest possible range of wave lengths. As a chemical, lithium fluoride is a relative of common table salt.

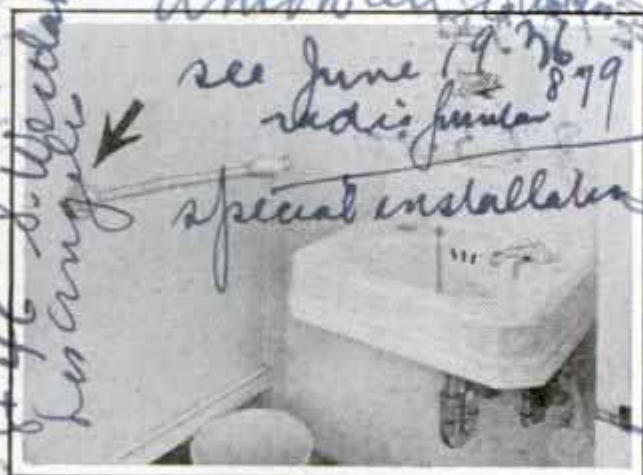
Chinese Revive Ancient Art of Hammered-Iron Silhouette



Delicate Designs Are Wrought by Chinese in Hammered Iron; Center Panel Depicts Ship Supposed to Have Reached America before Columbus

Photocell Turns on Faucet in Washroom Basin

Water begins to flow like magic when a patron steps to the washbasin in a gasoline filling station in Los Angeles. An electric eye controls the faucet. A beam of light projected from one wall is picked up in a small housing on the wall to the left of the basin. When a patron stands before the basin he interrupts the light beam and the electric mechanism beneath the basin turns on the faucet.



Interruption of Light Beam Received in Housing Indicated by Arrow Starts Water Flowing from Faucet

Craftsmen in San Francisco's Chinatown are reviving an oriental art that had its origin in ancient imperial China—that of hammering pictorial and decorative designs in iron. Two hundred years ago, or more, this art reached its zenith. The artists enhance the silhouette effect of the hammered iron by backing the panels with white rice paper.

Oil Wells Two Miles Deep Tax Strongest Steel Pipe

Terrific pressure at depths of two miles and more under the earth calls for ingenuity in engineering steel pipes strong enough for use in deep oil wells. With the growing demand for oil, wells are being drilled at increasing depths. Thicker pipe is stronger, but thickness cannot be increased indefinitely because of mounting costs. Pressures of 60,000 pounds to the square inch must be resisted at 7,880 feet deep, and steel pipes proof against 80,000-pound pressure are used at 10,000 feet. At even greater depths, pipes are strengthened to a resistance of 95,000 pounds to the inch by compressing larger sized pipes into a smaller finished circumference.

Comb. Clarence in Lindsey

*see June 1936
radio journal
special installation*

Adams and... statement made by... T. McLean Jasper

and... sum... 8/35... 7.27.62

*Blvd. Defrost
Milk*

Twenty-Ton Statue of Buddha Gives Problem to Exhibitors



Acme © Planet News, Ltd.
Raising the Ancient Figure of Buddha in a London Exhibition Hall by Means of Steel Scaffolding

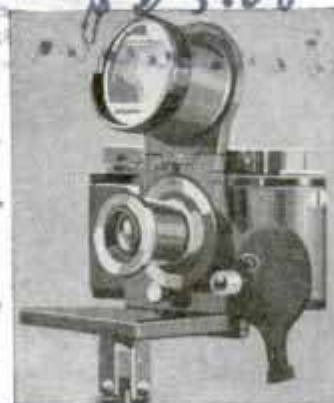
Brought to London, England, for a Chinese art exhibition, a colossal statue of Buddha presented a tough problem to the exhibitors. The enormous figure weighs twenty tons, and a special scaffolding was required to erect it. The monument dates back to the fifth century.

Peek at Automobile of Future Is Given by Engineer

What's next in automobiles? More speed, greater power? In recent years changes have been unimportant—radiator grille, stepped-up horsepower, trends toward over-drive and supercharger. More fundamental developments are just ahead, and David E. Anderson, chief engineer of

the Bohn Aluminum and Brass corporation, believes they will not be toward greater speed. "The public," he says, "is rapidly coming to realize the 100-mile-an-hour automobile is not only an extravagance but a menace. It is my opinion that economy is to get first consideration during the next design period." Tomorrow's motor car, he thinks, will be capable of twenty-five to thirty-five miles per gallon. Rear engine cars promise lightness, roominess and economy, but engines must be lighter and aluminum alloys will form major parts of motor, cylinder blocks and crankcase. "Extremely high torque will be required at low speed," says this engineer. "As a result of increases in bore and other changes in the engine superstructure, many engines are called on to deliver more power at greater speeds than they were designed to produce. The result has been a tremendous amount of bearing trouble forcing the engine manufacturer to resort for bearing linings to harder alloys than are at times good for the crankshafts. The engine should have a supercharging carburetion system at least at low speed in order to efficiently employ the higher compression necessary to produce the required low-speed torque. The supercharger or pressure-carbureting action could taper off as speeds increase."

Ground-Glass Finder Is Help in Focusing Small Camera



Miniature cameras of the popular "candid" types can be converted into ground-glass focusing cameras by attaching a unit now being manufactured. The image thrown on the ground glass is the

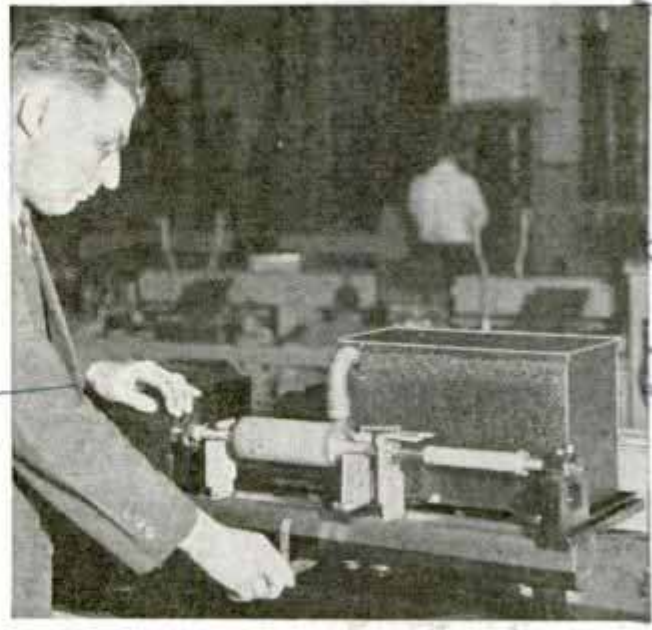
1408
D. Paul Shull

at Bourbignon 1 hour 10 min

Optical Co., 510 Allen St. New York, N.Y.

exact size of the picture. The camera, with finder locked in position, is placed on a tripod and focused with the ground-glass lens unit. Then the finder is folded back and the camera folded into position for the exposure. This method is particularly useful for copying work, close-ups, portraits, and microscopic photography.

Facsimile Message Is Sent on Telegraph Wires



Facsimile Telegram Is Placed on Revolving Cylinder for Electrical "Scanning"

It was a revolutionary step from the dot-and-dash Morse code to the telegraphic printer, and now comes the facsimile telegram. Carrying a step farther the process by which newspaper photographs are transmitted by cable and wire, the Western Union Telegraph company has begun transmission of messages by the electrical scanning method which reproduces at the receiving end of the wire an exact replica of the original message. Faster than previous devices of this type, the facsimile transmission uses dry paper and requires no processing. The telegram, written on a red blank, is mounted on a cylinder revolving on a horizontal axis and progressing sideways. It takes about six revolutions to build up a letter as wide as the typewritten "s", or about 100 revolutions while the cylinder moves forward an inch. Fourteen square inches can be "scanned" in a minute. At the receiving end a synchronized cylinder carries the blank on which the message is reproduced, ready for immediate delivery. Although handwriting can be telegraphed as readily as printing, the Western Union is transmitting only typewritten messages at first.

Leaks in Water Main Found by Radio Microphone

Hunting down leaks in water mains and pipes is the latest duty assigned to radio. A Cincinnati water department expert found that by connecting an arrangement of radio tubes and a sensitive microphone with a fire hydrant or house water pipe he could "tune in" on a break in the water system. A far-away leak emitted a sizzling sound which became a roar as the radio was brought nearer the leak. Taking readings on either side of the leak and graphing the results, the leak can be located exactly.

Oscillating Bed for Patients Helps Treat Heart Ills

Designed to improve circulation and build up the heart muscles, an oscillating bed is used by Dr. C. E. Sanders of Missouri in treatment of heart ailments. Operated by an electric motor, the bed tilts the patient's head and then his feet slowly through a twenty-six inch arc, allowing the blood to penetrate all extremities.



Patient on Tilting Bed Is Rocked Slowly to Stimulate Circulation to Extremities in Heart Disease Cases

Dr. C. E. Sanders
3418 W. 1st St. Kansas City, Mo.

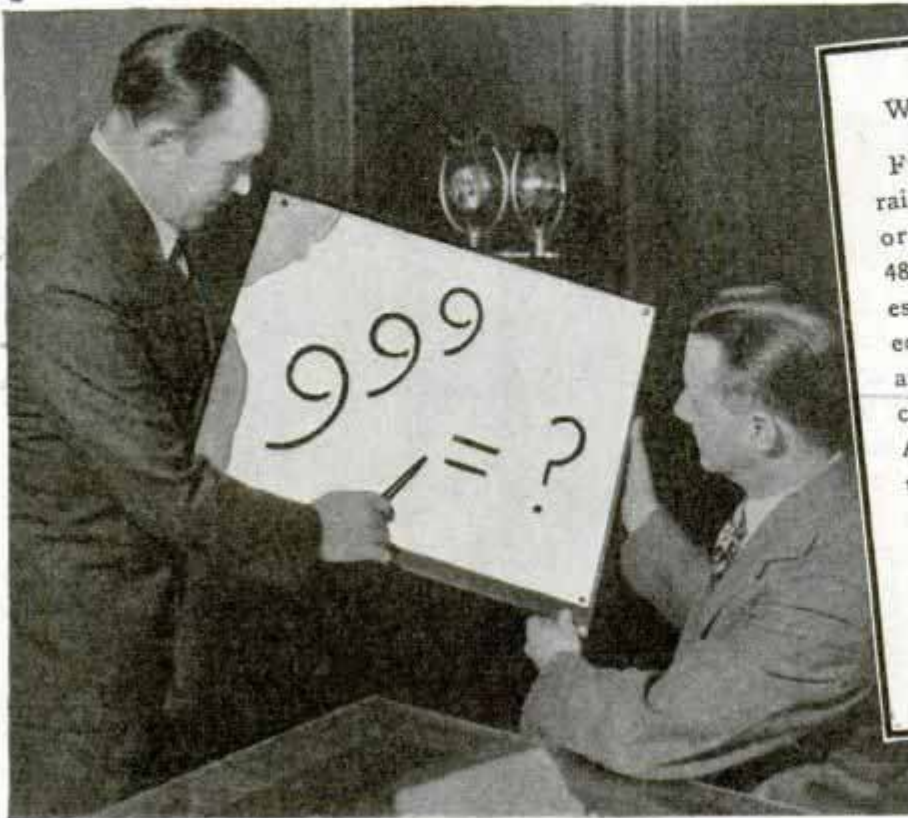
Athmar W. Pies.
Kansas City, Mo.
James G. Cannon, Chas. Chelmsford and Ave. Kansas City, Mo.

60 Hudson St. New York

81370
81424
Kansas City
Vasocillator
C7

61280
20 W. Harrison St. Kansas City, Mo.

The INCREDIBLE



WRITE THE ANSWER

Figure at left expresses 9 raised to the 9th power of 9, or 9 raised to the 387,420, 489th power. It is the largest sum that can be indicated by three figures. The final answer, Mr. Ripley says, will contain 369 millions of digits. Allowing for five digits to the inch, the length of tape required to write down the answer would be 1,164 miles, and the ordinary human span of life would be sadly insufficient to accomplish the task.

1,164 miles

By Robert L. Ripley

(As Told to James McQueeny)

2358 45 W. New York
"I DON'T believe that!"

This statement quite frequently is the signal for a fight. In my own case, however, I take it sitting down, smiling. Being called untruthful is to me a compliment and as long as I continue to receive the lion's share of this odd form of flattery I don't worry about a wolf being at my door.

The reason! Whenever I am doubted it means I have unearthed something for one of my cartoons, a broadcast or a movie short that seems incredible and, therefore, is most interesting. The reader or hearer didn't know the truth when it was told him.

Publishers estimate my cartoon is read by more than 70,000,000 persons, as it now appears in 325 American and foreign newspapers, being translated into thirteen languages in thirty-eight countries.

This widespread circulation is productive of mail and more mail. My daily mail averages between 2,500 and 3,000 letters. When I get something particularly outstanding in a cartoon the number sky-rockets. A few years back when I said



Picture Taken on Authentic Site of Garden of Eden Where Tigris and Euphrates Rivers Meet

Lindbergh was the sixty-seventh man to make a non-stop flight over the Atlantic, 10,000 persons called or took their pens in hand to tell me I was, among other things, crazy.

But Sir John Alcock and Sir A. Whitton Brown flew from Newfoundland to Ireland in 1919. The same year the English

"BELIEVE IT *or* NOT"

dirigible, "R 34," with thirty-one aboard, crossed from Scotland to America and returned. In 1924, the German "ZR3," later the "Los Angeles," flew from Friedrichshafen, Germany, to Lakehurst, N. J., with thirty-three men. Thus, Lindbergh was the sixty-seventh.

Getting material for my cartoon necessitates much traveling. The last time I looked at my travel book I counted 181 countries visited, and by the time I draw my last cartoon I hope to have been in every country in the world. There are thirty-eight in which I haven't set foot.



The Author with a Grotesque Mask Picked Up during a Visit to Bali; Below, a Chicken with a Twenty-Four-Foot Tail Found by Ripley in Japan

In my meanderings, I've hit some hot spots—places that make Hell seem like Paradise by comparison. The Hell I refer to is a delightful village in rural Norway. Cool breezes blow off the celebrated Maelstrom, and wild flowers brighten a velvety green carpet that rolls down a gentle slope

to the fjord. "Gentle slope" is the correct meaning of the word "Hell" in Norwegian.

For real heat I have yet to find any place comparable to Danakil valley, situated in Ethiopia, which holds the world's record—168 degrees, and I experienced heat of 152 degrees in Azizia, near Tripoli,



last year. When I went into Tripoli by Garian, I passed by 80,000 people and didn't see them. It wasn't the heat, either. Garian is the home of the Troglodytes, the people who live underground in the heart of the desert. In the Garden of Hesperides, I found that the famous golden apples, once much sought after by Hercules, were not apples at all, but oranges.

In one illustration you will see the authentic site of the Garden of Eden where the Tigris and Euphrates rivers meet as described in the Bible. And try as I might, I couldn't find a single apple tree. Take a look at the wall shown in another illustration. Not very impressive, is it? Yet, here the doom of Babylon was written. In the famous Palace of Belshazzar, now only a mass of bricks and dust, I inspected the walls on which the strange handwriting appeared during the feast.

Although the Sepulcher of Christ is the holiest spot on earth to Christians, its key is entrusted to my friend, Jacob Nusaibeh, a Mohammedan. The Nusaibeh family has been in charge of the door of the Holy Sep-

ulcher for the last 600 years. One of the most unique cemeteries in the world is the Paco in Manila, Philippines, started by the Spanish conquerors centuries ago. It is built in the form of two huge concentric rings, in the walls of which are niches where the dead are interred. Most of the niches are now empty and open, indicating either poverty or forgetfulness on the part of the living relatives. They are required to pay an annual rental of two pesos, and if they fail to do so, the bones are taken out and thrown away.

In Japan, I found dwarfed trees, each hundreds of years old and still thriving. From the time these trees burst forth as sprouts they are cleverly tied down and



Top, Ripley Pointing Out Some of 181 Countries He Has Visited; Center, Paco Cemetery in Manila; Bottom, Ripley with Doorkeeper of Holy Sepulcher

weighted to prevent growth, and the tops are trimmed to balance the limited root growth. Some of these specimens have been known to reach the age of 1,000 years. And while in Miyanoshta, Japan, it was my pleasure to see a hen with a tail twenty-four feet long.

The origin of my cartoon is, to me, one of the greatest "Believe It or Nots." One dreary afternoon in 1918, I was having a hard time filling the expanse of drawing paper before me with anything that faintly resembled a decent idea for a sport-page cartoon. I was bereft of ideas. In desperation I pieced together a few athletic oddities that had been kicking around my desk. I captioned the layout, "Believe It or Not," flipped it on the boss' desk and dashed out before he could collar me.

The drawing appeared in the old New York Globe the following day, and much to my surprise, there was considerable



Top, the Well of Bethlehem; Center, Dwarf Trees Grown in Japan; Bottom, Wall on Which the Doom of Babylon Was Written

comment about it. The boss suggested I do another one whenever sufficient material could be assembled. A week later the second one appeared, later on, two a week, and finally, one every day. That first drawing has expanded into a corporation. Cartoons, books, broadcasts, movie shorts, personal appearances and lectures prevent me from calling my time my own. And to add to my troubles, I am besieged with lawsuits, taxes, and imitators.

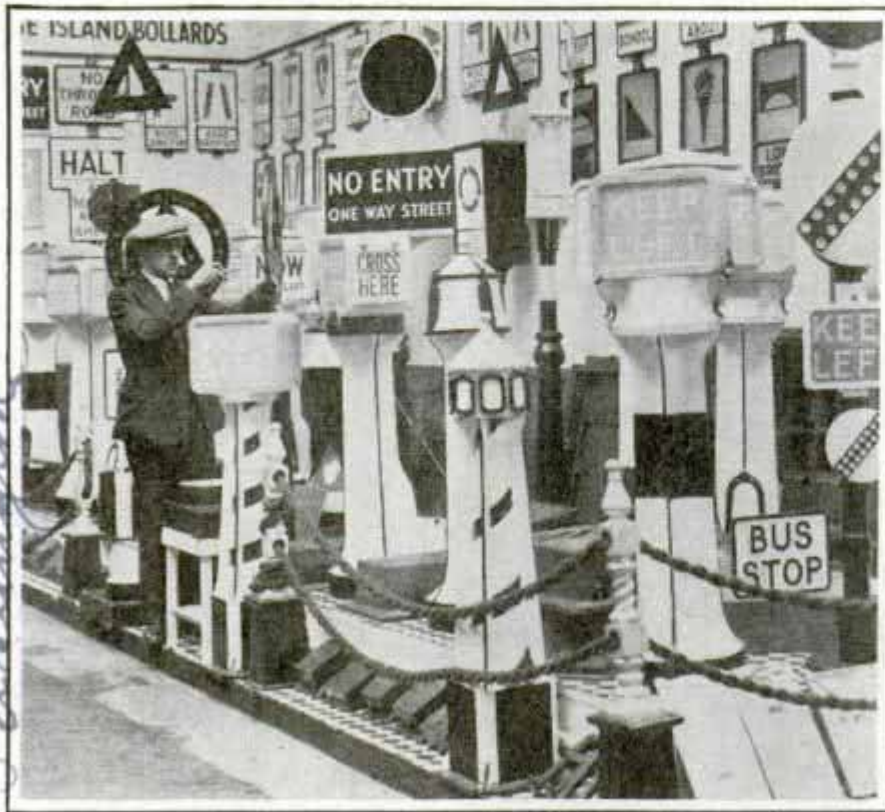
My education in drawing started when I was old enough to hold a pencil. No one taught me. Even in grammar school in my home town, Santa Rosa, Calif., my teacher, knowing my dislike for English composition, allowed me to draw my work instead of writing it. At fourteen, I was lucky enough to sell a cartoon to a magazine for eight dollars. It was captioned, "The Village Belle Was Slowly Ringing" and showed a country girl turning a wringer. From that time until I was a "cartoonist" I went through the struggles of a journeyman cartoonist's life which consisted principally of getting fired off one job onto another.

(Continued to page 140A)

Motorist's Idea of Nightmare Is Collection of Road Signs

Budgman, Inc.

paint is constantly agitated to provide a uniform mixture and a ten-gallon tank makes frequent re-filling unnecessary. It also is claimed that spray painting gives a deeper penetration of the wash into cores and molds and a better binding of the sand, that it reduces chipping and grinding costs, eliminates defective castings caused by imperfect molds and saves coating material.



© Planet News, Ltd.
Collection of Most of Highway and Street Signs Used in England Displayed at a Recent Public Works Exhibition in London

One of the displays at a public works exhibition in London recently was a collection of most of the highway and street signs set up in that country to control motor traffic. Some of the British drivers who viewed the scores of markers, some of them contradictory in character but standing side by side, looked on the display as a representation of a motorist's nightmare with dozens of traffic orders staring him in the face at once.

near the top and is pulled open to begin pouring. When the box is empty, the spout can be removed and inserted in the side of another container.

Sprayer Paints Cores and Molds Faster Than Brushing

Cores, both green and baked, are being painted in about one-tenth the time formerly required by using a special sprayer for the purpose instead of brushing the paint on. With the sprayer the paint gets in and covers surfaces inaccessible to the brush, reaching the deep pockets of molds and giving them the same protective covering as the fully exposed surfaces. During application, the blacking material or

Detachable Spout Aids in Pouring Sugar or Salt

Instantly attached to any cardboard container, a metal pouring spout makes it easy for the housewife to handle cereals, granulated sugar and salt without spilling. The device is pushed into the side of the container



Pouring Spout Which Fits Any Cardboard Box and Makes It Easy to Pour Sugar or Salt

Royal Canadian Institute

1429

*Sorden Mfg Co.
110 E 23rd St*

Stratosphere Balloonists Look Down on Sky



© National Geographic Society

Washington D.C.
 Photograph of Stratosphere Balloon Taken from Accompanying Plane One Hour after Ascent Began; Cigar-Shaped at Start, the Huge Bag Became a Sphere When Gas Expanded in Rarefied Stratosphere

White sky is beneath, deep violet sky above when you gaze through the window of a balloon riding the stratosphere lanes fourteen miles above the earth. From an altitude of 72,395 feet, the height attained by Capt. Albert W. Stevens and Orvil A. Anderson in their record-making balloon ascension, the earth is scarcely visible. Mist and dust particles in the lower atmosphere catch the light and form the white, hazy "sky" below; above, there is nothing to capture these light waves and the upper sky appears dark. With ultraviolet eyes the ceiling would have appeared brighter, with light of shorter wave lengths. Mechanical eyes—cameras equipped with red and infrared filters—can pierce the murk of the earth's atmosphere better than human eyes. Looking toward the world from outside it, the two stratosphere explorers saw a "close-up" of

the view that men on the moon or nearby planets would see. The photograph above was taken from an army plane an hour after the balloon started up.

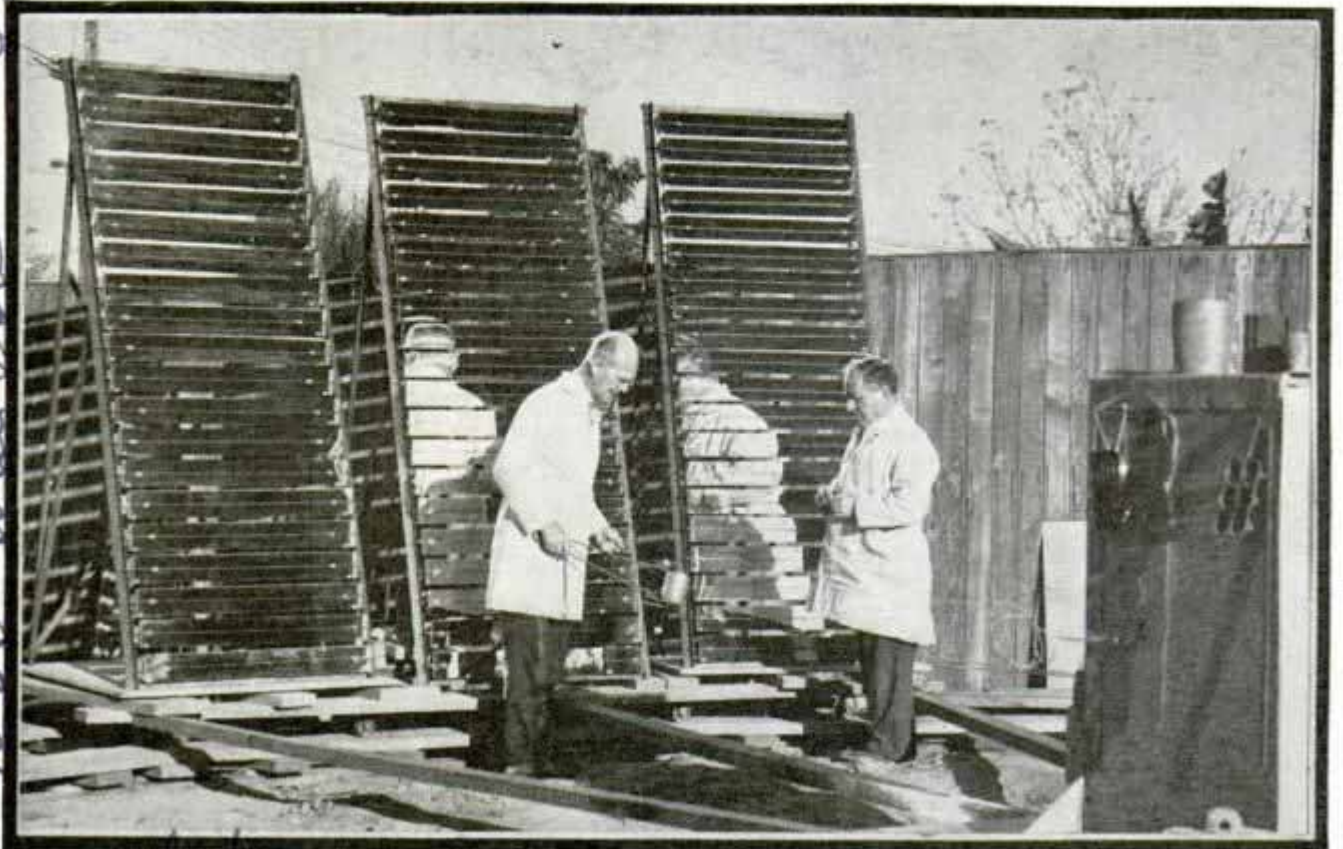
8/358

Worm Helped Columbus

IT WASN'T an Indian waving a torch that Columbus saw the night before he discovered America. It was a worm—a luminous syllid or "sea worm" whose light is sometimes seen over the ocean in October, the month Columbus landed. He described the light as "like a small wax candle which rose and fell." An English marine biologist believes it was the lighted worm that fooled Columbus.

L. R. Crawshaw
Marine Biological

Superheat from Sun Developed by Mirrors



Sets of Mirrors with Which the Sun's Rays Are Focused to Produce Extremely High Temperatures; Heat as Great as 50,000 Degrees May Be Obtained in This Manner, the Inventor Claims

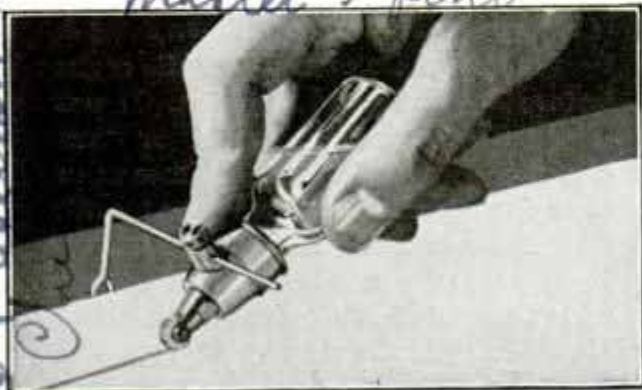
Holding a new hope for industry, a curved-mirror "furnace" concentrates the sun's rays and develops heat ranging from 1,000 to 50,000 degrees. Such high temperatures would be used to recover mercury from cinnabar, melt ore, superheat steam and to serve other purposes where

extreme heat is required. While the solar furnace is still in the experimental stage, it has been subjected to exhaustive tests by the inventor, H. E. McCoy of California. The machine consists of a number of curved mirrors which focus the sun's rays on one spot.

Paint Striper Fed by Bottle Has Adjustable Wire for Guide

Anyone can learn to do a neat job of painting stripes with a striper equipped with an adjustable wire guide. A tight-

fitting knurled wheel, available in several widths according to the size stripe desired, lays down an even stripe of paint which it draws from a small feeder bottle. Any kind of paint, lacquer or enamel can be used, and besides the guide wire, which can be bent or adjusted to any position, the striper will follow a straight edge or a compass.



Knurled Wheel Tapping Paint Bottle Lays Even Stripes as Guide Wire Follows Straight Edge

Nation Is Dependent on Chemist in Event of War Blockade

In the event of a war blockade, the United States would lack such essential products as antimony, manganese, chro-

d.w. H. E. McCoy / Los Angeles
 5030 Wall St. Cal.
 81398
 Wendell Mfg. Co. Inc.
 2804 Belmont

2804 Belmont

mium, mercury, mica, nickel, rubber, tin, tungsten and wool. In such an emergency the country would be dependent on its chemists to develop new alloys and suitable substitutes for essential raw materials, says Capt. H. A. Kuhn, executive officer of the Chicago Chemical Warfare Procurement district, in a recent report to the Chicago section of the American Chemical Society. While the United States is probably more self-sufficient than any other nation in regard to the raw materials required by industry to manufacture war materials, we would lack many essential items in the event of a blockade, including, in addition to those listed, such things as camphor, coffee, coconut shells, hides, iodine, jute, Malay fiber, shellac, silk, sisal and sugar. Such developments as synthetic camphor, rubber, benzol, naphthalene, ethyl alcohol, methanol, phenol, improved rayon, a domestic supply of iodine and new alloys all have added to national defense, says Capt. Kuhn.

Fingerprint Enlarger Aids Quick Identification



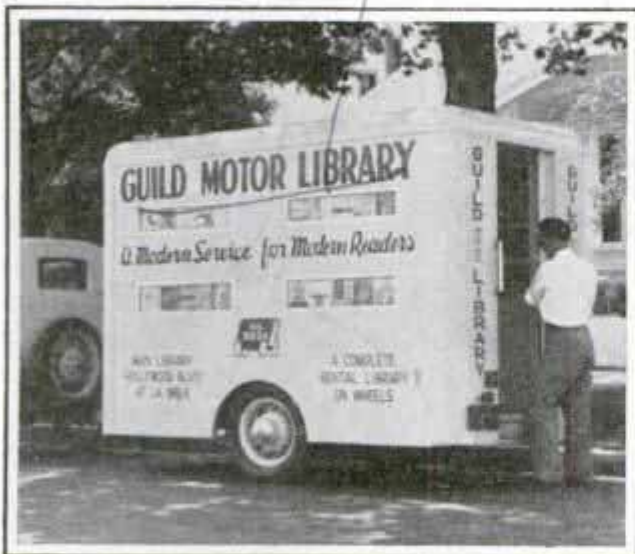
Studying Enlarged Image of Fingerprint to Speed Up Identification of Suspect

Automatically enlarging fingerprints on a glass screen seven inches in diameter, a new device is expected to speed up the work of identifying criminals. Ridges and whorls can be measured quickly and compared with original fingerprint records with increased accuracy by using the equipment. The instrument uses reflected light, but transmitted light also can be used to check handwriting specimens and counterfeit notes.

330 W. 42nd Street, New York

Rental Library in a Trailer Delivers Books to Home

Readers in Hollywood, Calif., can order today's fare of books just like today's menu of groceries. A telephone call to the rental library brings to your front door a library on wheels. Inside a large auto trailer are shelves stocked with books; the customer can order any particular book delivered, or select his reading matter from the shelves.



Customers of This Trailer Library Can Order Books Delivered or Choose from Its Shelves When It Calls

Over a Hundred Kinds of Steel Are Used in Automobiles

More than 100 different types of steel went into the manufacture of the 1935 automobile. The swift changes in automotive metals are manifest in a comparison with the year 1911, when only seven carbon steels and eleven alloy steels were listed by the Society of Automotive Engineers. Last year 109 types were counted, eighty-three of them containing alloys. There were ten nickel steels and twenty-two nickel-chromium steels.

Cont. John Johnson, 82 1/2 6 Comaine, N. (Iron)

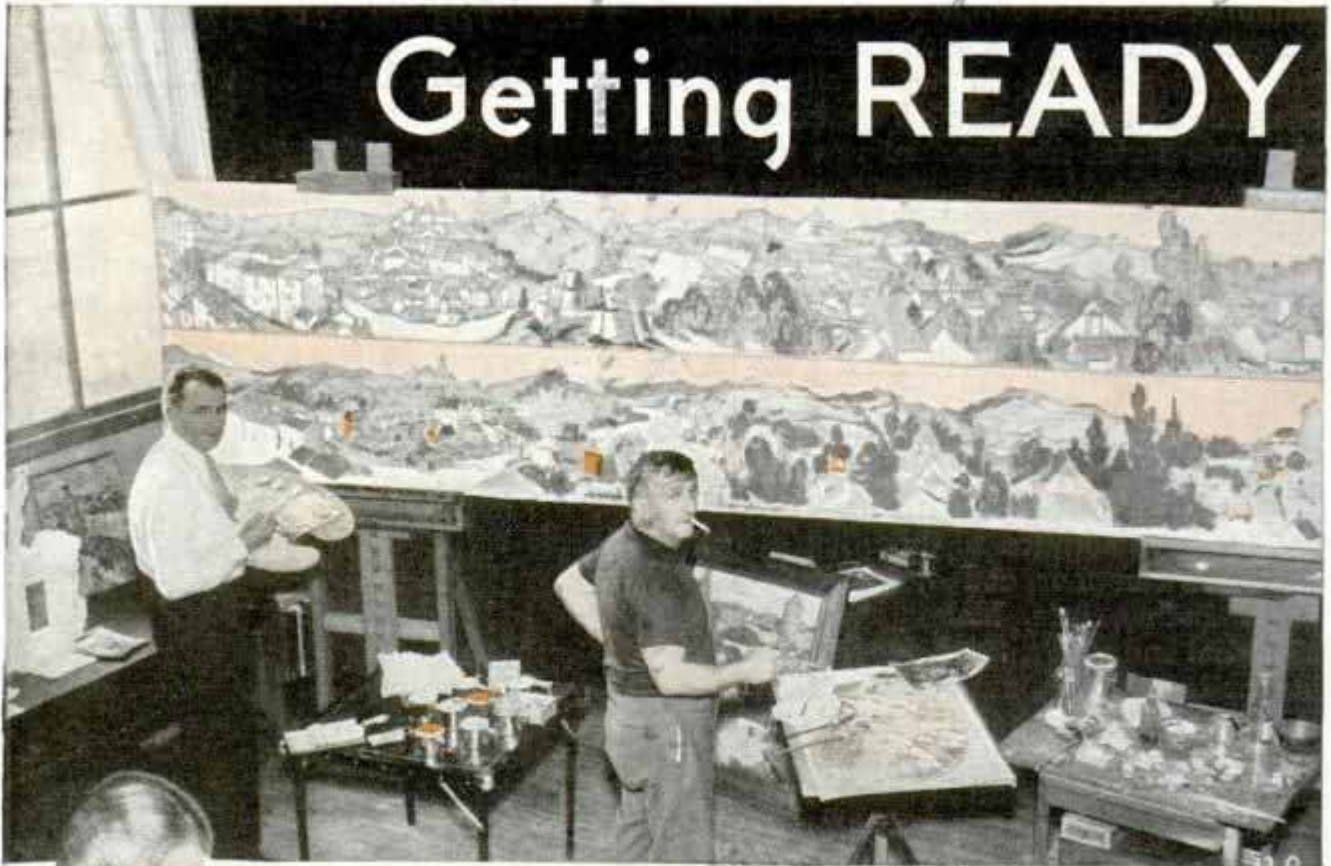
Determined by fingerprint. Criminal Police & Identification Bureau. Pasadena Calif.

G. M. Watson, Metal... Car parts. Int. El... and...

81413

6.11.11
C.W. Andrew & Co.,
1151 S. Broadway, Los Angeles

Getting READY



Artists Painting Sketches of Outdoor Scenes Which Will Be Photographed and Matched with Close-Up Scenes of Actors; Below, Miniature from Which Full-Size Set Will Be Made

MANUFACTURING movies is one of the world's biggest and most exacting jobs. The coordinated efforts of an army of men are necessary to bring life to celluloid and the sound track. The average picture costs \$600,000, exposes 100,000

feet of film before 7,500 are finally selected by the cutters, and employs 9,000 actors, extras, laborers, writers, and technical experts, not to mention the director and the production manager.

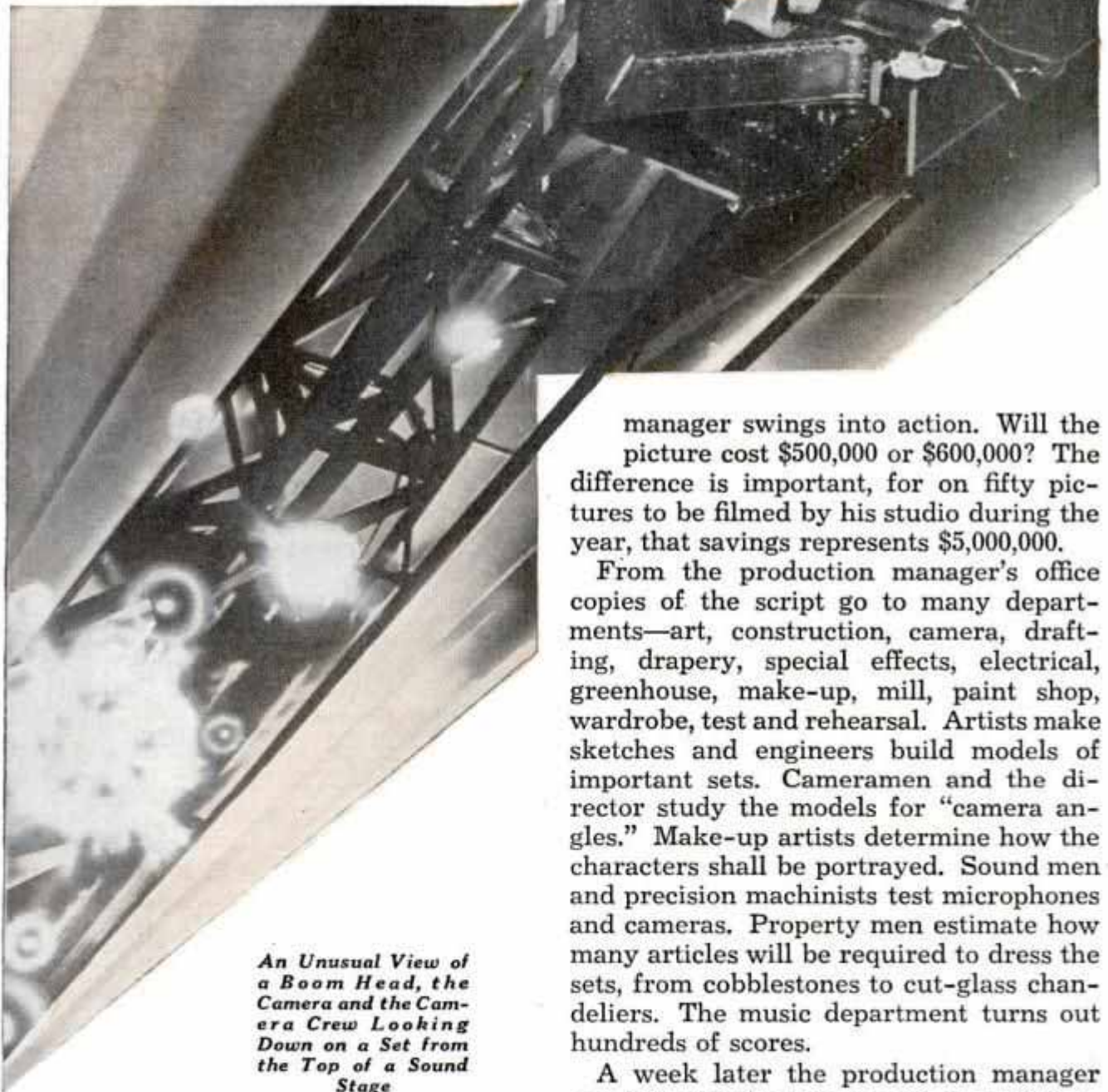
The production manager is the "jack of all trades and master of many" from whose office flow the commands which set thirty departments in motion once a story is selected. On his shoulders rests the responsibility for the smooth functioning of all equipment from cameras to microphones; the testing, selecting and rehearsing of actors, and the designing and building of sets, with stand-by settings, both indoors and out, ready for immediate use in case illness, rain or fire halts a scene. Once the cameras begin to roll, he must stay two weeks ahead of schedule with sets, costumes and properties, for each day's delay on a picture costs the producer \$10,000 in salaries, rent, insurance and general

studio overhead. There are only seven major studios in the United States, all in Hollywood or near by. Seven production managers flashed the orders that resulted in 396 feature pictures and a multitude of short subjects being completed "on sched-

to "SHOOT"

ule" last year. Each is a walking card catalogue, for he must know all about as many as fifteen pictures, in preparation or in production. Each spends \$50,000 a day.

When the final shooting script containing all the dialogue and prescribing camera positions, fade-outs, fade-ins and dissolves, as well as various technical suggestions as to mood, tempo, characterization and sound effects, is complete, the production

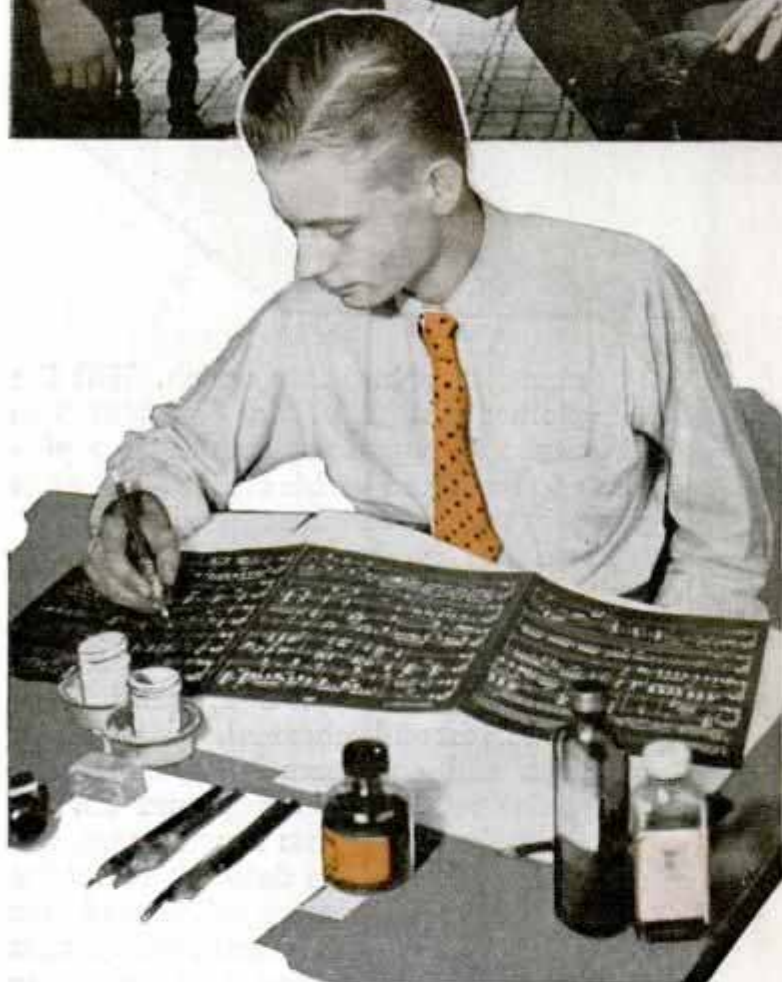


An Unusual View of a Boom Head, the Camera and the Camera Crew Looking Down on a Set from the Top of a Sound Stage

manager swings into action. Will the picture cost \$500,000 or \$600,000? The difference is important, for on fifty pictures to be filmed by his studio during the year, that savings represents \$5,000,000.

From the production manager's office copies of the script go to many departments—art, construction, camera, drafting, drapery, special effects, electrical, greenhouse, make-up, mill, paint shop, wardrobe, test and rehearsal. Artists make sketches and engineers build models of important sets. Cameramen and the director study the models for "camera angles." Make-up artists determine how the characters shall be portrayed. Sound men and precision machinists test microphones and cameras. Property men estimate how many articles will be required to dress the sets, from cobblestones to cut-glass chandeliers. The music department turns out hundreds of scores.

A week later the production manager concludes his final "cost conference." Perhaps he saves \$10,000 by omitting one



Measuring Distance from Camera to Actor for Close-Up; Below, Studio Musician Correcting Musical Score

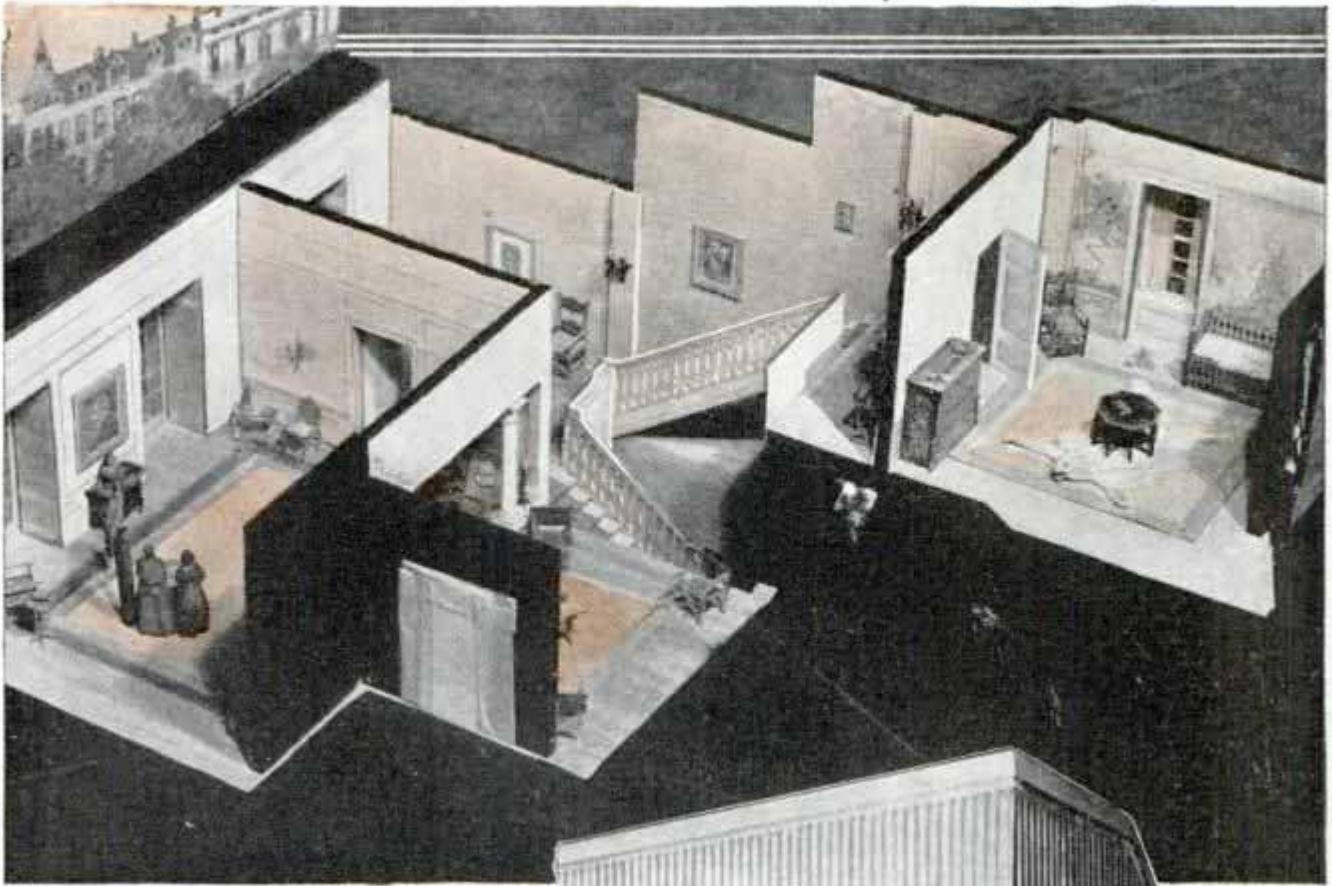
scene, \$5,000 by using fewer people in another. The final decision is \$600,000 for the picture. Cameras roll in two weeks.

The casting director selects actors and actresses. Telephones ring in many Hol-

lywood homes. The production manager calls for scores of brunette men and blonde girls to appear on the studio test stage, a bare room fitted only with a simple set, camera and lights. Those who best fit the leading parts are selected. A day later all to take part in early scenes gather at the rehearsal hall, another room devoid of furniture except chairs, tap mat for dancers and a piano.

Meanwhile construction, property, wardrobe and art departments are busy, for the picture will require shooting possibly 300 scenes in thirty-five working days. How many settings will be used? In "The Littlest Rebel," for instance, Shirley Temple romped through and around three sides of a southern mansion and through five interiors representing rooms of the same house; actors appeared in the White House

of the civil war period and in the interview room used by President Lincoln; two interiors of a Richmond, Va., home felt the glare of the brilliant lights; a federal prison rose on a sound stage, and alongside it



were exterior and interior views of a slave cabin. Forty miles from Hollywood 1,000 Union and Confederate soldiers fought in Sherwood forest, while a river was created on a sound stage for thrilling close-up action.

Ed Ebele, veteran production manager at Twentieth Century-Fox studio, provided the river for these scenes. Where a cabin stood yesterday, the river flowed next morning—right across the stage. Ebele built the river in a day. First, he placed the tanks and built the banks. From the studio greenhouse the smaller flora were brought. Workmen cut pepper trees, stripping their branches to make hauling in trucks easier. In the studio the trees were rebuilt, and the branches fixed in place again. Branches suspended from the ceiling helped give depth. Indoor rivers as wide as fifteen feet have been filmed on a sound stage.

In one picture a street in Venice was reproduced and six gondolas were poled about the stage on a 9,000-square-foot body of water one foot deep. Carpenters



Movie Set in Miniature, and Sound Mixer Booth Where Volume of Voice as Compared with Music Is Regulated

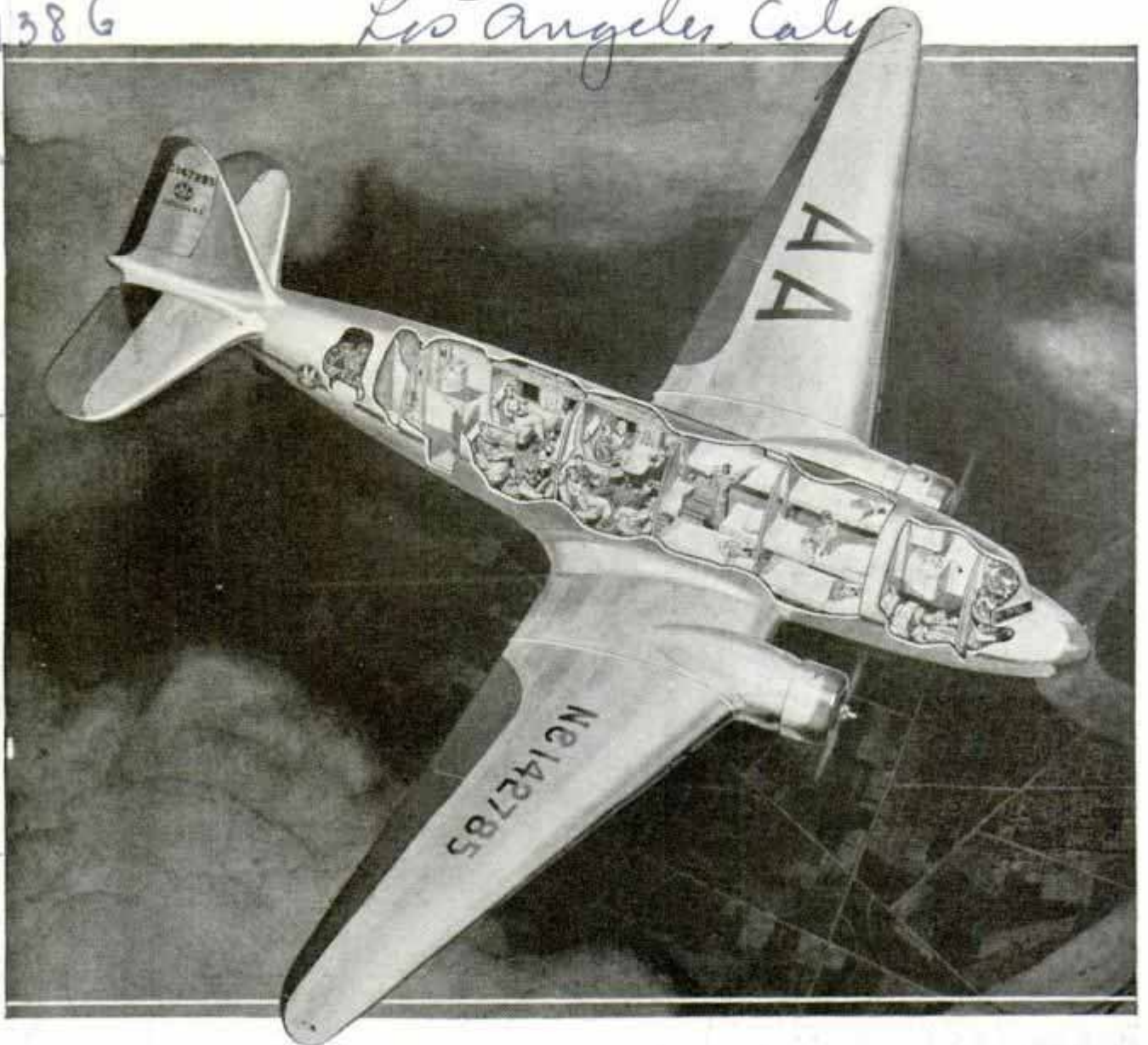
laid a canvas on the stage floor, planked the outer walls, covered the canvas with three coats of paraffin, and poured 61,000 gallons of water onto the set.

(Continued to page 132A)

This is a miniature set for a movie. The set is made of wood and is painted to look like a slave cabin. The set is placed on a sound stage. The set is used for filming scenes of a river. The set is built in a day. The set is made of wood and is painted to look like a slave cabin. The set is placed on a sound stage. The set is used for filming scenes of a river. The set is built in a day.

10555 Holman Ave
 Los Angeles, Calif

Twelve-Ton Flying Hotel Has Sixteen Berths



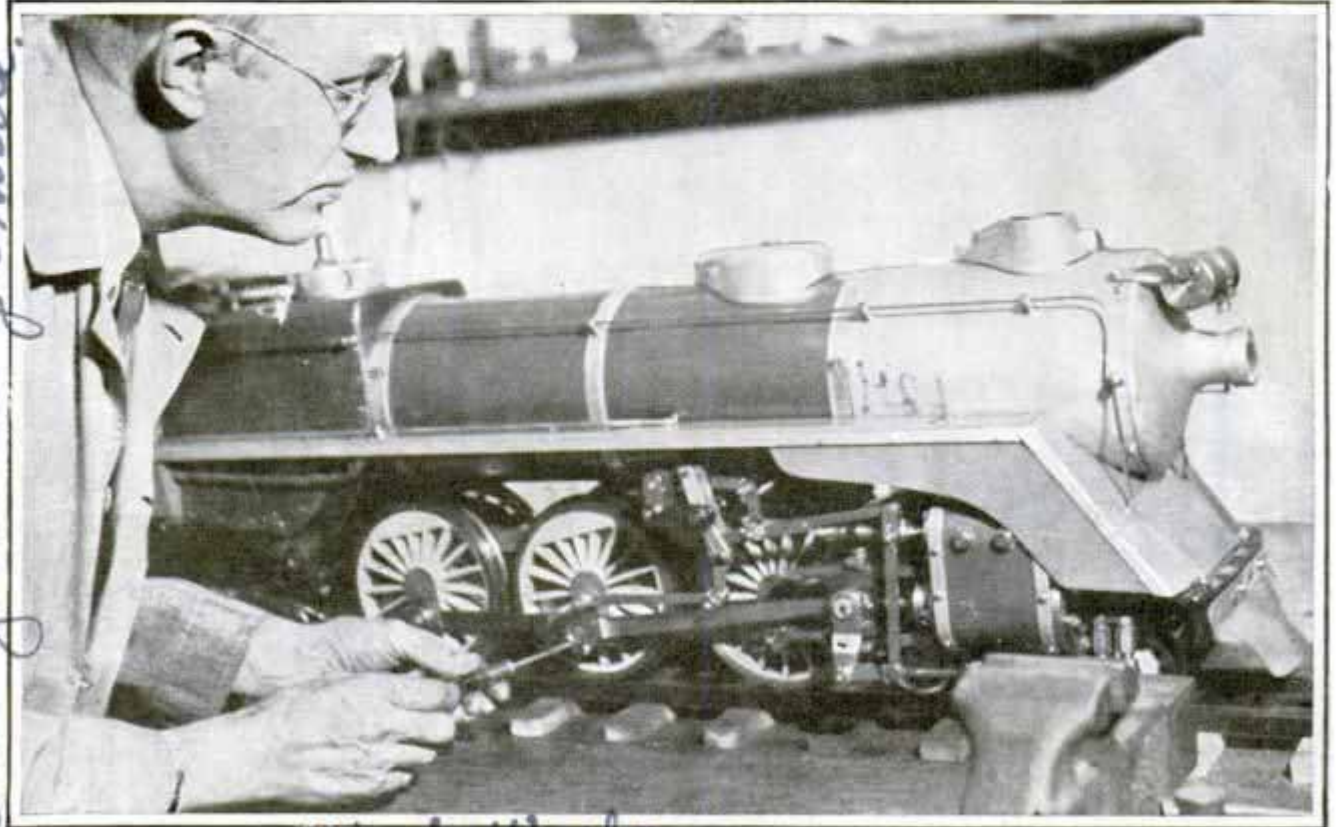
Drawing Shows, from Front to Rear, Pilots' Cabin; Mail-Express and Commissary Compartment; Two Sections with Berths Made Up; Two Sections for Day Travel; Dressing Rooms and Luggage Space

By night a great flying hotel with upper and lower berths for sixteen, by day a twenty-four-passenger luxury liner rocketing through the air at top speed of 215 miles an hour—such is the latest Douglas sleeper transport plane, a fleet of which is being built for American Airlines. The twelve-ton ship, a low-wing twin-engined monoplane built on the lines of previous Douglas transports but more roomy, has a cabin seven feet eight inches wide and six feet six inches high, accommodating four spacious passenger compartments on each side of a center aisle. For day travel each compartment has facing seats; as a sleeper, the back and bases of the seats form eight lower berths that are six feet

five inches long and thirty-five inches wide. Upper berths are twenty-nine inches wide. Dropping down from the roof of the cabin, the "uppers" are accessible by steps and are provided with air by an extra slot above the cabin window. Separate dressing rooms for men and women are located at the rear of the ship. In front of the cabin is a complete commissary equipped to serve more elaborate meals than formerly, and to keep food and beverages hot or cold indefinitely. The ship's length is sixty-five feet, its wing span ninety-five feet. Besides baggage racks in the compartments, there is luggage and mail space at the rear of the fuselage and opposite the commissary. Au-

Douglas Aircraft Co. Santa Monica, Calif

Powerful Model Engine Pulls Eight Persons



Wade Wale
 Engine and Tender Built by Chicago Man in His Home Workshop Together Weigh More Than Three Hundred Pounds; Locomotive Is of Original Design and Burns Liquid Fuel

In his spare time, a Chicago man has constructed a model locomotive that develops 140 pounds steam pressure and will run at a top speed of thirty miles an hour. The engine alone weighs 225 pounds, and its tender ninety pounds. With properly built cars, this powerful model could take eight adult persons for a ride. The boiler has a three-gallon capacity, the tender ten gallons. Liquid fuel is burned. The cylinders are one and three-quarters by two inches, and the drive wheels six inches in diameter. It took 1,700 hours to build the model, using a small lathe and drill press in addition to hand tools.

1984
Cobra Venom Relieves Pain without Forming Habit

Cobra venom has been found quite as effective as morphine in the relief of pain, but without the dangerous habit-forming qualities of the narcotic drug. Deadly in any large quantity, the venom of the serpent can be administered safely in small doses. It checks pain by acting upon the high nerve centers in the brain.

81378
Auto Sixty-Six Inches Long Is Complete to License

One of the smallest cars ever granted a state license, a sixty-six-inch auto built by a Californian, is complete in every detail. Its four-cylinder air-cooled engine



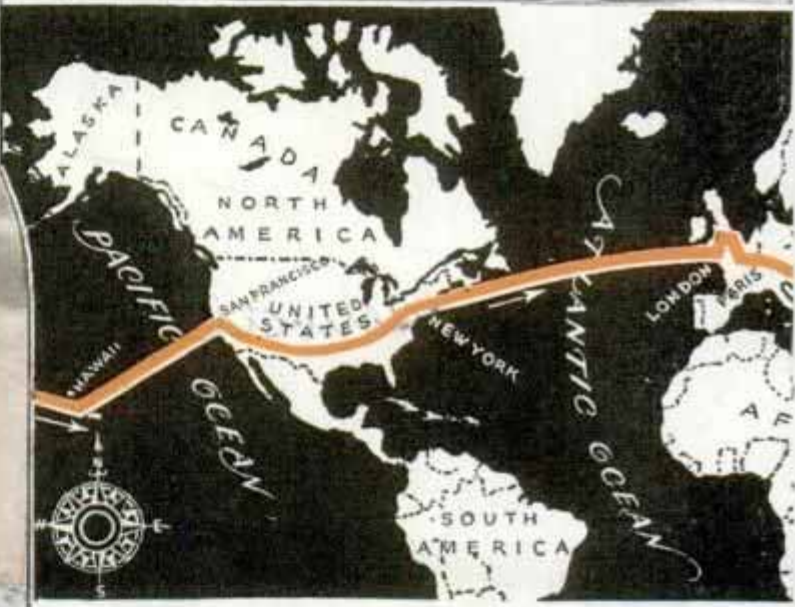
2000-1984
 This Smartly Designed Miniature Automobile Easily Carries Weight of Grown Person

*Supervisor of Exchange
 Chicago Board of Trade
 1365
 1384
 2000-1984
 All: David T. Macht*

4 W. 108th St
 E 1269

Around the WORLD

to Paris American Airways -
 Chrysler Bldg, N.Y.C.



Top, an Afghan Band; Left, Road Sign Near Damascus Telling the Traveler the Route to Bagdad

ANYBODY can do it," says Robert E. Fulton, Jr., who recently completed an eighteen-month trip around the world on a motorcycle.

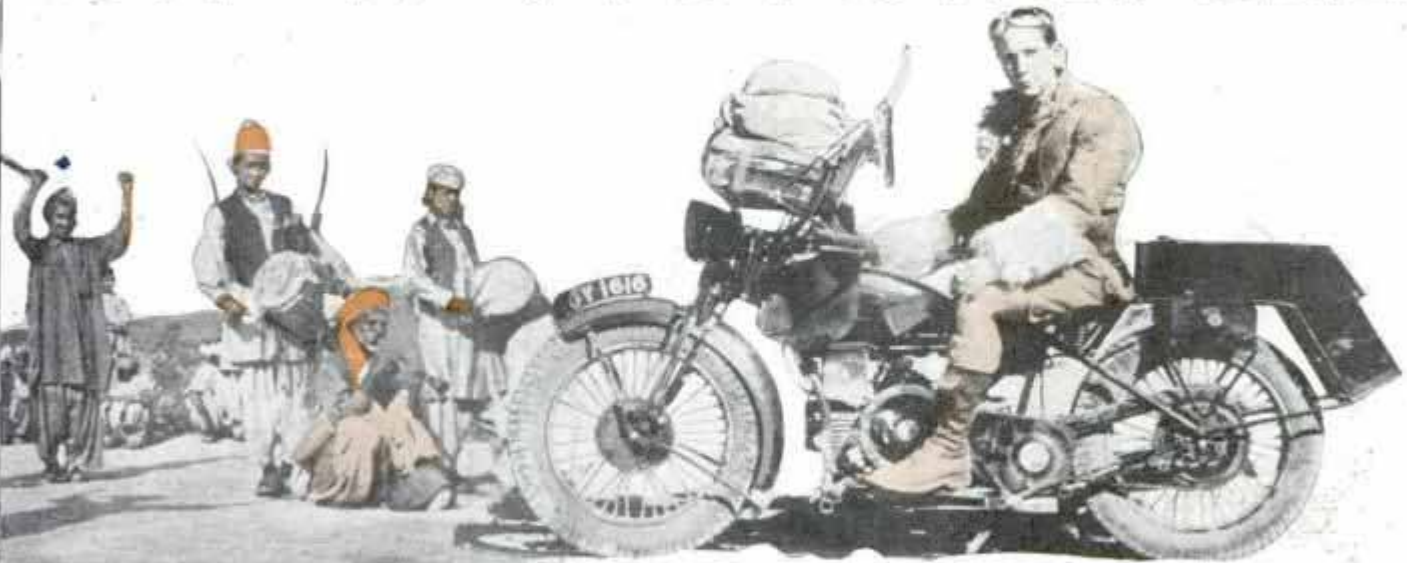
"I wanted to see the world," he explains. "Going by boat and train was too superficial and didn't offer the thrills of a motorcycle trip."

Robert E. Fulton, Jr., is a typical young American, now living in Greenwich, Conn. A few years ago he was in Europe studying architecture. While dining with

a friend in London one day, he casually mentioned he would like to take a trip around the world on a motorcycle. The friend offered him a motorcycle free if he would undertake the journey. Fulton accepted the gift and started out.

Ahead of him lay 40,000 miles of land and water. The two wheels of his motorcycle carried him 25,000 miles of that distance. The motorcycle and its equipment, without a passenger, weighed 500 pounds. It was a two-cylinder horizontally opposed engine rated at fifteen horsepower. With a special tank on the rear, Fulton carried seven gallons of gasoline, giving him a cruising radius of 350 miles. The wheels had auto-size tires which lasted

on a MOTORCYCLE



for the entire journey. In addition to the clothing he wore, he carried a few odds and ends of fresh linen, a toothbrush and a razor. For the motor he carried spare pistons, chains, spark plugs and screws. He had never ridden a motorcycle before he undertook to travel around the world on one, but he soon learned the rudiments. From London he sailed across the Channel and headed for Vienna, Budapest, Belgrade, Sofia, and Athens, before attempting to traverse the inhospitable deserts of the Near East.

In Turkey he found the country almost roadless, and for endless miles rode through clouds of dry alkali dust. Toward dusk one evening he approached a concrete bridge without noting that one of the sections had fallen into the river. Fulton was hurled from his seat. He landed fifteen feet below the bridge and was knocked unconscious. The motorcycle suffered little damage from its drop and Fulton awoke in the midst of natives who were dashing cold water in his face.

After this incident, he headed for Syria, Damascus, Bagdad, Baluchistan, Afghanistan, and Khyber Pass, the latter famed the world over as a danger spot. But Fulton found the guardian of the pass a meek, peaceful

Top, an Afghan War Dance, and Robert E. Fulton, Jr., on the Motorcycle Which Carried Him around the World; Center, the Route Followed by Fulton in Going around the World; He Started from London; Bottom, Irak Desert Patrol Near Bagdad; Here Fulton Rode Across a Roadless Desert



fellow whose greatest desire in life was to visit Hollywood and New York.

Traveling and living among strange, isolated people, Fulton often resorted to the universal sign language. Notwithstanding the grim terrors of which he had been warned, he met genuine courtesy and hospitality everywhere. All the so-called wicked and dangerous people he had heard about proved to be kind and helpful.

On his way through India he came to a gorgeous white palace in the city of Udaipur. It belonged to a maharana whose great wealth enabled him to live in the traditional Oriental luxury. Without a formal presentation or announcement, Fulton rode up to the main gate and was allowed to pass by the guards who presented arms; he rode through a second and a third gate and finally entered a great courtyard, where the maharana's private herd of elephants was tied with chains. The loud noise of the motor



Top, a Scene in Afghanistan; Center, a Signpost in India Pointing the Way to London, and a Scene in Siam; Bottom, Maharana's Palace in India Where Fulton Was Made Welcome Until His Motorcycle Stamped the Herd of Elephants

frightened the animals, and amid a stampede the guards arrived and threw Fulton out with much less ceremony than they had welcomed him in.

Traversing a road near Rajputana, India, Fulton's leg caught a thorny branch and he lost control of the motorcycle. He tumbled down an embankment and landed in the midst of a herd of wild boars. He remembered the stories about their viciousness and took to his heels. Looking back, he saw the boars also running—in the opposite direction. In his travels through India he never saw a live snake in its natural habitat. The snake charmers, he said, operate for the sole benefit of tourists.

After India, Fulton headed for the Dutch East Indies, Java, and Sumatra. He has good reason to remember one of the queer native customs. They train monkeys to throw down ripe coconuts from high branches. Riding under a row of coconut trees one

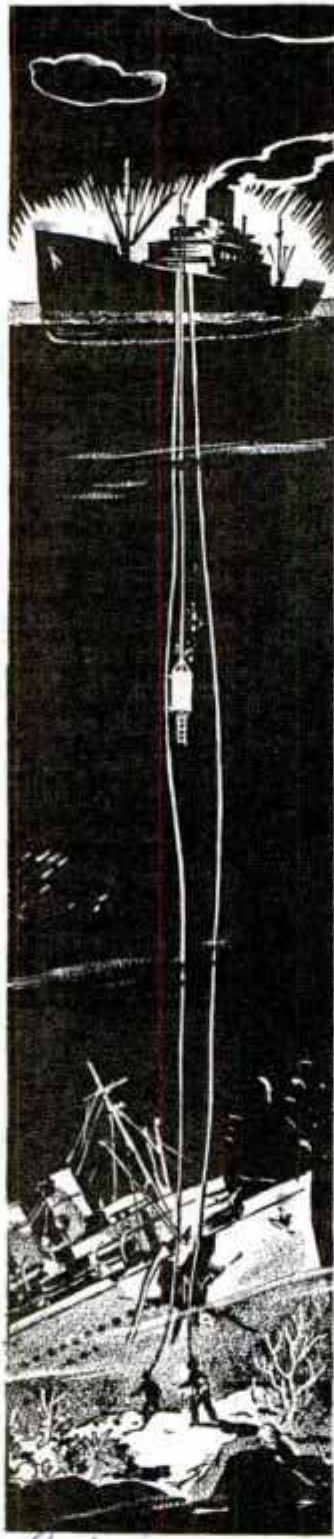
(Continued to page 142A)

61345

Undersea Air Tank Saves Diver from 'Bends'

To speed the diver's recovery from the terrific pressure of deep-sea work a submersible decompression chamber has been devised, a "half-way house" in which the diver can take refuge while ascending. Unless the ascent is gradual enough to allow the escape from the lungs of nitrogen gas, sudden release of pressure causes nitrogen "bubbling" in the body, known as caisson disease or "the bends." A diver needs as much as two hours to climb to the surface after working an hour 200 feet down, and it takes endurance to hang from a rope deep in cold, swirling water. The new decompression chamber is a steel cylinder with doors in top and bottom. The diver climbs in from below, water being kept out by compressed air; the lower door is then shut and he is hoisted aboard the tender vessel and the pressure reduced gradually in a dry, warm atmosphere. Discomfort is minimized and the waste working time is reduced by forty per cent.

Science Service 11/6/35



Drawings Show Position of Decompression Chamber and How Diver Enters It

Fluids Form Flexible Coating on Metal, Paper, Glass

Hard, firm coatings that also are flexible and pliable can be applied to paper, leather, metal, glass and other materials by mixing two liquids now on the market. The coating is a fluid that hardens when brought into contact with the hardener,

also a fluid. Until development of the hardener, the coating material was used only where heat could be applied to set it, as in ceramic work. When the two fluids are used together, they form a hard elastic film that is good for coating paper, embossing leather, weatherproofing electric wire and the like. The coating will not tarnish the precious metals.

Sqm. Ball. 354 lb. 400 lb. drum.

61359

The Sparhawk Co. Herndon Va. Parker Ill.

(Suggests)

Auto Armrests of Rubber Also Are Door Handles

E 1302



Top, Cutting Rubber into Shape of Door Handle; Bottom, Pontiac Design

Cut from rubber and fitted with metal backs, armrests in some of the 1936 cars also serve as door handles. The armrests are fashioned from sponge rubber in the shape of a "U," the metal back is applied and the upholstering sewed on. The "U" shape permits gripping the armrest so the door may be opened or closed.

Egg Yolks Colored by Feeding Hens Proper Food

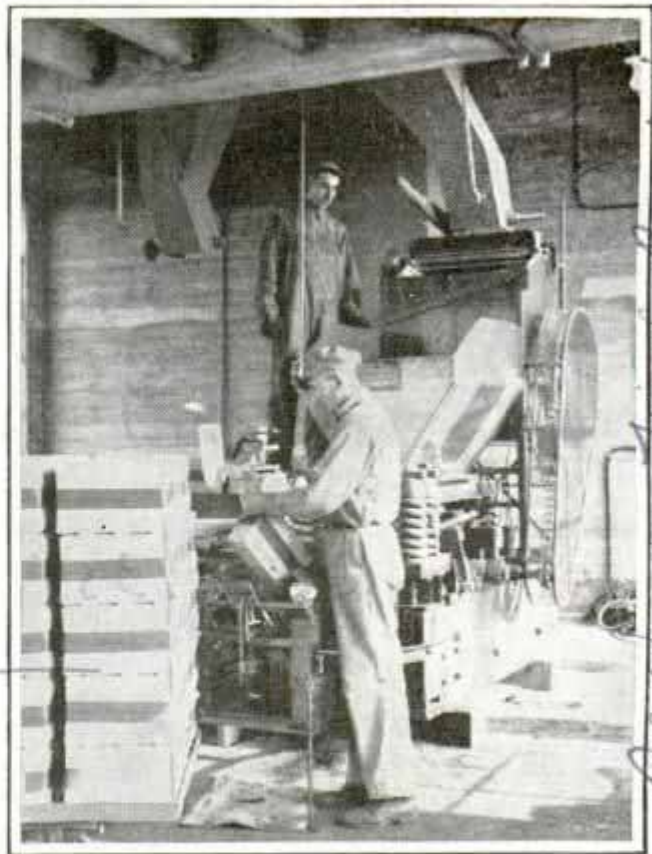
Poultrymen can get hens to lay pale or deep-color yolk eggs by feeding them accordingly, the U. S. Department of Agriculture finds. Small amounts of pimento or chili pepper in regular rations will color the yolks a deep orange-red, and white corn, instead of yellow, with limited amount of green feed will make the yolks pale. Hens on the latter diet will need cod-liver oil to supply the vitamin A they

miss by not getting yellow corn. Richer shades of yellow may be obtained by increasing yellow corn and green feed in the ration, but too much green feed will give the yolks a brown or green off-tint. Deep-colored egg yolks are in demand for cake making and also are used in the manufacture of some kinds of ice cream because they impart a golden color.

E 1377

Coal Compressed and Packaged Helps Keep Home Cleaner

Compressed into cubes and wrapped into packages twelve inches long, eight inches wide and four inches thick, coal is being marketed in a manner designed to keep the home clean. Six four-inch cubes are encased in each package, making a handy sized fuel that is as clean as a loaf of bread or similar article. A machine now in operation in Michigan converts slack coal into the packaged product at the rate of two tons per hour. A binder made from corn helps hold the coal particles together in the cubes. After being packaged, the coal is placed in a kiln and heated to a high temperature for several hours to make the bond more complete.



Coal Packaging Machine at Work; at Left Is Truck Loaded with Packaged Fuel

*2000-1936-2000
General Motors
Pontiac
376*

*Century
Packaging Fuel Co. 1-4-30*

Science Service 10/28/35

Tri-Bladed Autogiro Tested in Wingless Flight



© Aero Service Corp.

Latest Model Autogiro, Wingless and with Only Three Rotor Blades to Sustain It in Air, Is Shown in Test Flight above New Philadelphia Post Office; Notice Roof Adaptable for Aircraft Landing Port

Flight without wings in heavier-than-air craft is now a matter of fact. Built for tests by the U. S. army, the latest type of Pitcairn autogiro has no supporting wings, but is kept aloft by a three-bladed rotor instead of the four-bladed "fan" of ear-

lier models, and is balanced by horizontal and vertical controls in the tail structure. In the photograph, the autogiro is seen flying above the new Philadelphia post office, the roof of which was designed as a landing port for mail-carrying planes.

Bicycle Stand Controlled by Foot from Riding Position

Operated from a riding position, a bicycle stand folds up behind the pedal when not in use and is controlled entirely by the foot. The stand can be attached to any bicycle in a few minutes and it is claimed it is easier and quicker to use than the conventional U-shaped stand.



Handy Bicycle Stand Is Shown Erect and in Horizontal Position

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

*Berry & Cohen Co.
114 E. Broadway*

Wide World

*not in production as yet.
2/26/36*

E 1350

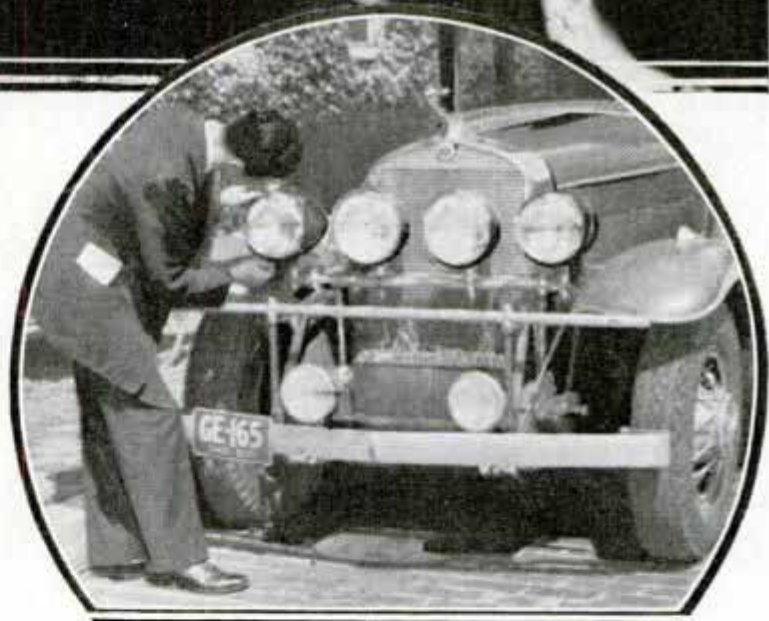
8 1116

RIDDLE Challenges Inventors



ditions, that is, when lamps are perfectly adjusted and the weather is dry and clear. At sixty miles an hour, the car travels eighty-eight feet per second. Thus, the 500-foot head lamps illuminate the road less than six seconds ahead, hardly enough for the driver to see an obstacle, make up his mind to apply the brake and then bring the car to a stop. It requires about 280 feet to stop a car going sixty, even with perfect brakes and on dry pavement. At least double that distance is necessary for the average car because few drivers keep their head lamps and brakes in perfect adjustment.

At Nela Park laboratories of the General Electric company, a special automobile tests new ideas in motor-car illumination. In front of the radiator is a panel containing numerous electrical terminals for connecting experimental head lamps that are carried on special supports. This car has been fitted with head lamps many times as powerful as the ones on your car. In one instance, 250-watt bulbs, ten times



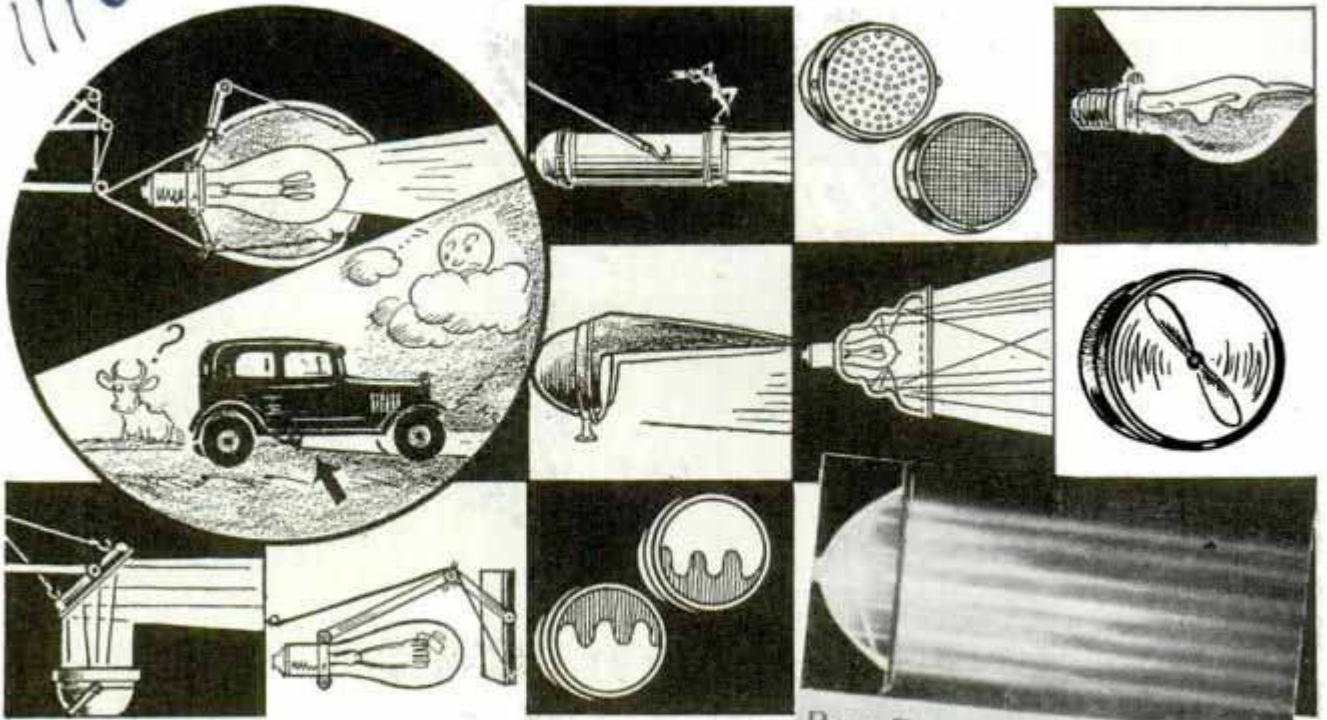
Top, Illumination by 250-Watt Bulbs, Ten Times as Powerful as Any in Use; Bottom, Car for Testing Head Lamps

as powerful as the largest now in use, were installed. The powerful beams turned the highway into day for a distance of at least a quarter of a mile. The engineers were able, in this way, to get an idea of what future road lighting may be like, provided state laws are relaxed and drivers uniformly comply with some regulation on dimming.

One reason why drivers have not dimmed is because they were virtually left in dark-

Cleveland, Ohio.

2 1116

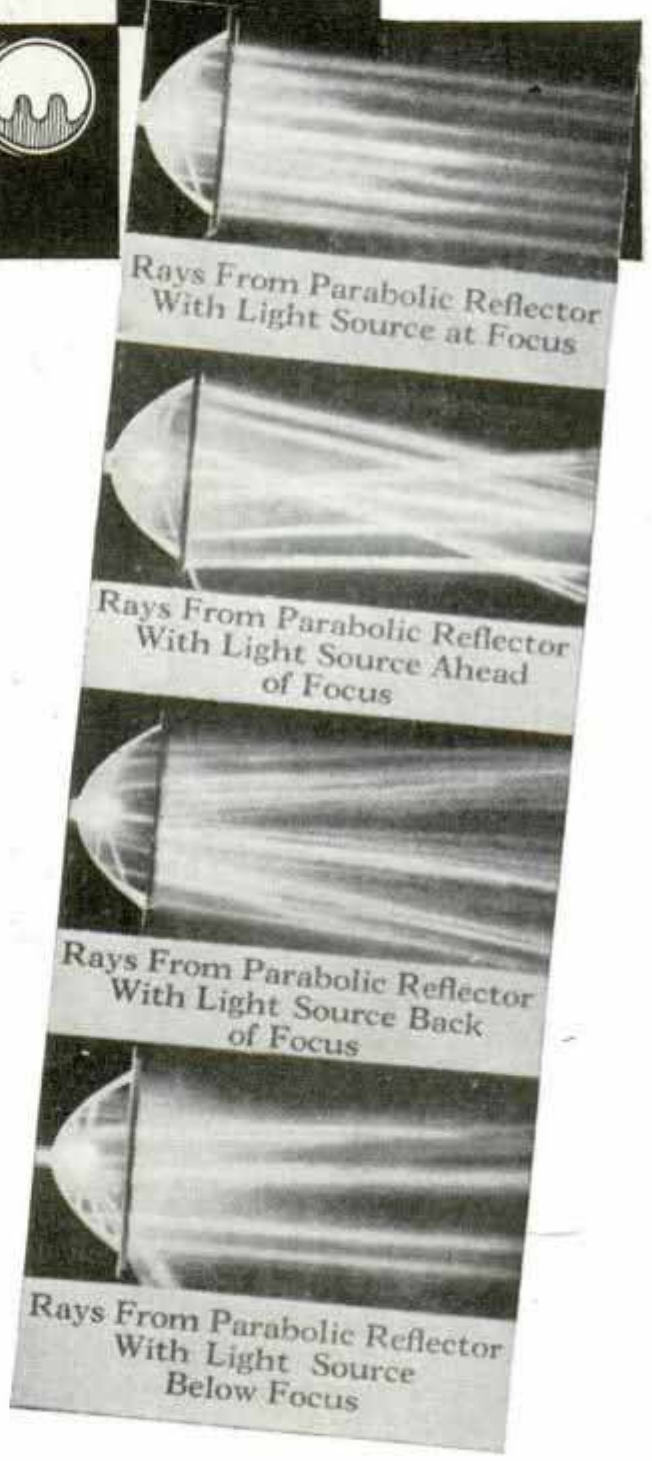


Various Ways by Which Inventors Have Tried to Improve Auto Lighting

ness when the dimmers were on. Two new auto-lighting systems recently introduced eliminate this excuse. One system is a new type of beam control, effected by using a bulb developed by General Electric engineers, and the other is the asymmetric now familiar to many motorists.

In the asymmetric system one of the head lamps, usually the left one, illuminates the right curb or roadside; and its position remains fixed for either passing or driving. The other headlight throws its beam down the center of the roadway when no other car is approaching; but in passing, the beam is depressed by operation of a switch, so that the light strikes the roadway a short distance in front of the car. Thus there is one fixed, intense beam of light and a movable one which together provide good illumination. The asymmetric system uses a bulb having two V-shaped filaments, one above the other.

The newer system uses a bulb having two straight, horizontal filament coils, almost end to end, one being slightly above the other. In normal driving, both head lamps project their beams down the center of the road for several hundred feet. The light pattern from each lamp is the same, and one coincides with the other. If one lamp burns out, the road still is illuminated, with, of course, diminished in-



Strip Showing Beam Cast by Locating Light Source in Various Positions

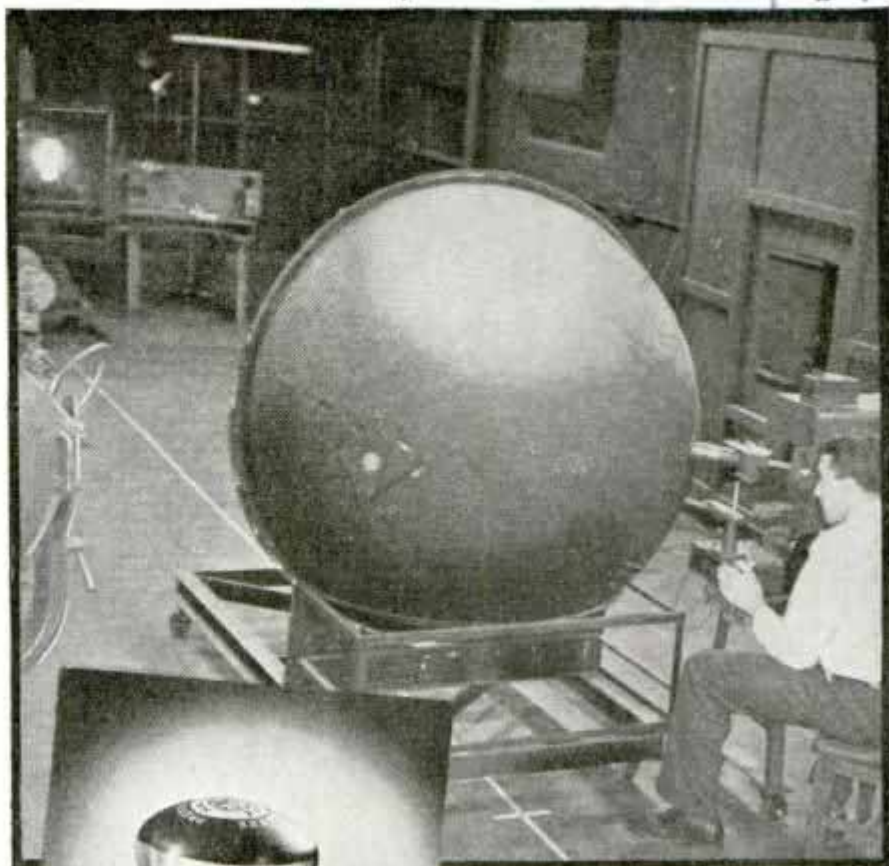
2 1116

tensity. When passing another car the driver operates a switch, usually with the foot, causing both head-lamp beams to shift to the right and drop slightly. These superimposed beams, practically of the same intensity as the driving beam, light the roadside, revealing signboards, pedestrians and other objects, without danger of blinding other drivers.

But neither system can overcome faulty adjustment of head lamps. Engineers recommend that the car be tested at least twice a year to keep headlights at their greatest efficiency.

Practically all new cars use the prefocused lamp, which was developed in the research laboratories at Nela Park. The lamp consists of the familiar glass bulb, usual bayonet base and a prefocusing ring soldered to the base. There is only one way of inserting the lamp, so that it is impossible to get the filaments out of place.

Another new automobile lighting development,



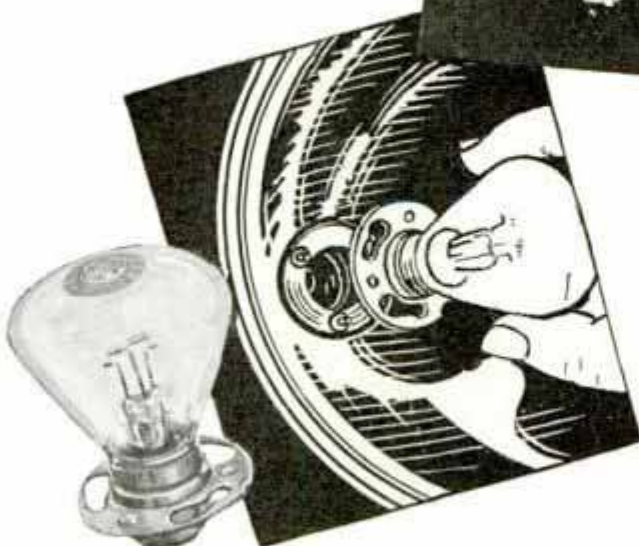
Top, Measuring Beam Intensity of Experimental Lamp; Center, Capped Head Lamp Bulb Which Reduces Scattering in Fog

but one that is not looked upon with enthusiasm by all lighting experts, is the shielded or capped headlight bulb. This consists of an ordinary lamp with the front portion of the bulb made nontransparent by coating the glass with an opaque material which masks most of the direct rays that normally do not strike the reflector. Its only

advantage seems to be that it does minimize annoyance from scattered light, thereby making headlights somewhat more comfortable to the eye when viewed at close range by approaching drivers.

The fog problem is another automobile lighting riddle that still remains to be answered. Red or yellow lights and the various other anti-fog stunts that have been tried have been found of little advantage.

The lighting engineer's advice to inventors is to concentrate on something that really is needed; to keep in mind the fact



Bottom, Prefocused Head Lamp Bulb and, Right, Method of Installation Eliminates Chance of Inserting Bulb Incorrectly

(Continued to page 135A)

Glass Is Made into Fabrics

Better than Wool or Cotton



Section of Glass Wool from Which Yarn Is Woven; Cloth Made of This Yarn Has Remarkable Wearing Qualities

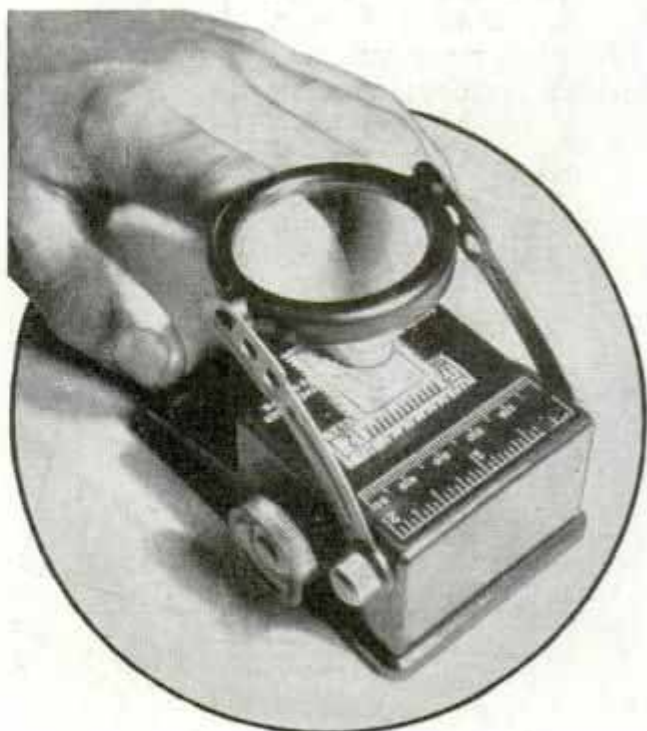
Your clothing and the bottle from which you get the morning's milk soon may come from the same glass melting pot. Already glass is being made into yarn that is many times stronger than fabric materials of the same size and it can be used like cotton or wool yarn. The same ingredients used in making the milk bottle are found in the glass yarn, but once out of the melting pot, that intended for fabric is blown into glass wool that has strands twenty times smaller than the human hair. At one point on a conveyor system, these strands are caught up and spun into yarn. Coloring added to the ingredients in the melting pot already has tinted the glass blue, pink or any other hue desired. In weight the glass wool compares favorably with the lightest or airiest of materials, eiderdown, and its insulating qualities are excellent, making it highly valuable to

manufacturers of electric wire and cable. It can be used to advantage in walls and ceilings of buildings because it is fireproof insulation. Produced by the Owens-Illinois Glass company, the glass yarn has been crocheted into berets, knitted into shawls and woven into rugs. Cost of its manufacture can be kept low because the spinning can be done by modern textile machines without readjustment and no dyeing is necessary.

8/205

Perforation Gauge for Stamps Stops Eyestrain

Intended for the stamp collector or dealer who has occasion to examine many specimens daily, a special gauge with a revolving drum relieves the collector of much of the eyestrain usually associated with such work. The perforation gauge is mounted on a revolving



Gauge for Comparing Perforations in Stamps

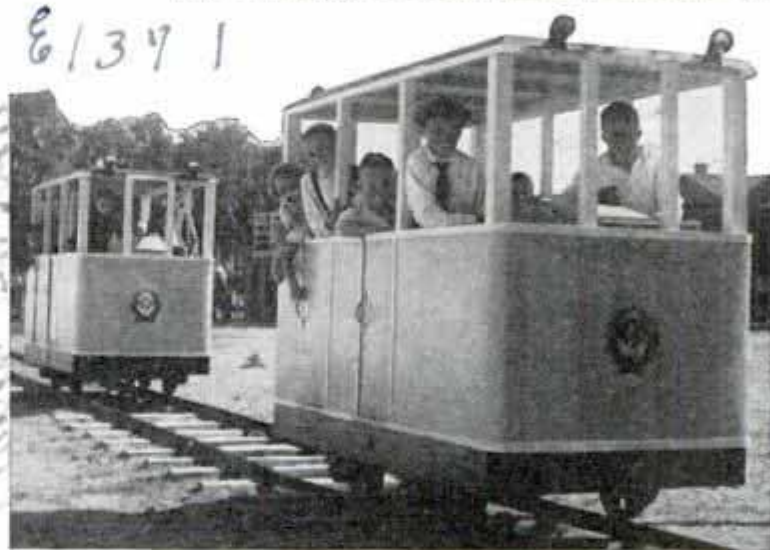
Blair Low

Owens-Illinois Glass Co. Newark, Ohio
Industrial Materials Div. Ohio
1946

C/O Toledo Blades
Toledo Ohio

537 S. Dearborn Chicago

Children Help Build Railway in Playground of Theater



Russian Children Operating Play Cars on Their Own Railroad on Grounds of Young People's Theater at Archangel

drum, placed under a slit so the specimen can be held in position, and the various perforation sizes are whisked quickly past for comparison. This speeds up classifying work by as much as 150 per cent. Also included in the equipment is an adjustable magnifying glass of large field and high power, an inch and one twenty-fifth inch scale, a watermark detector and a flat-press scale.

12/8

Lighter in Cigarette Case Works without Flame

Built into a roll-cover cigarette case, a flameless lighter ignites the cigarette when the user holds one end against the element and puffs. The cover works like that of a roll-top desk, sliding easily to expose or inclose the cigarettes. Chemical reaction causes the lighter to operate without a flame. The case is made in several colors.



Two Views of Handy Cigarette Case with Built-In Flameless Lighter

In the garden of the Theater for Young Spectators at Archangel, U.S.S.R., is a playground railway which the Russian children themselves helped build. Directed by adults, they participated in laying the narrow-gauge rails and in equipping the miniature cars.

Generator for Bicycle Light Supplies Ample Current

Steady and ample current for bicycle lights is furnished by a small generator which ends the inconvenience of battery failure and replacement. Incased in a streamline, chromium-plated shell which is attached to the bicycle frame under the seat and out of the rider's way, the generator lightly engages the rear wheel and builds up sufficient current at eight miles an hour to light head and tail lamps brightly. It is attached with a clamp, requiring no drilling of holes, and can be turned off easily when not needed.



Shallow lakes and marshes can be converted into dry land by planting "rice grass" and other water plants.

Leclerque
Leclerque
Leclerque

5-80
place 87.50
Rhodium plate 10.50

1337

Pharmaceutical
J. Thomas

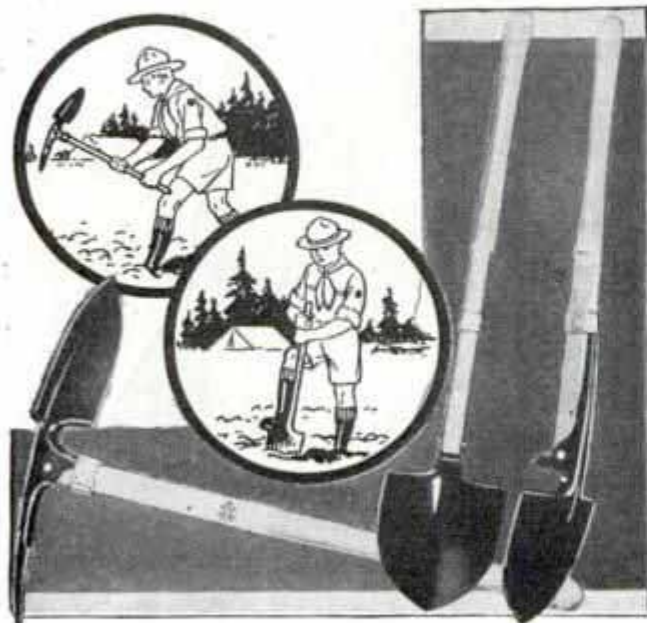
Platinum product Smetzmanet.

ury department at Wash-
 ington issues an average
 of a million dollars a year
 in new paper money to
 citizens who turn in
 burned or mutilated cur-
 rency for redemption.
 Catherine Costigan, one
 of five women who ex-
 amine the old money and
 decide claims, has been
 engaged in the work for
 thirty years and has be-
 come so expert at the job
 that she does most of her
 inspection with the un-
 aided eye.

81296

Combined Pick and Spade Is Handy for Tool Kit

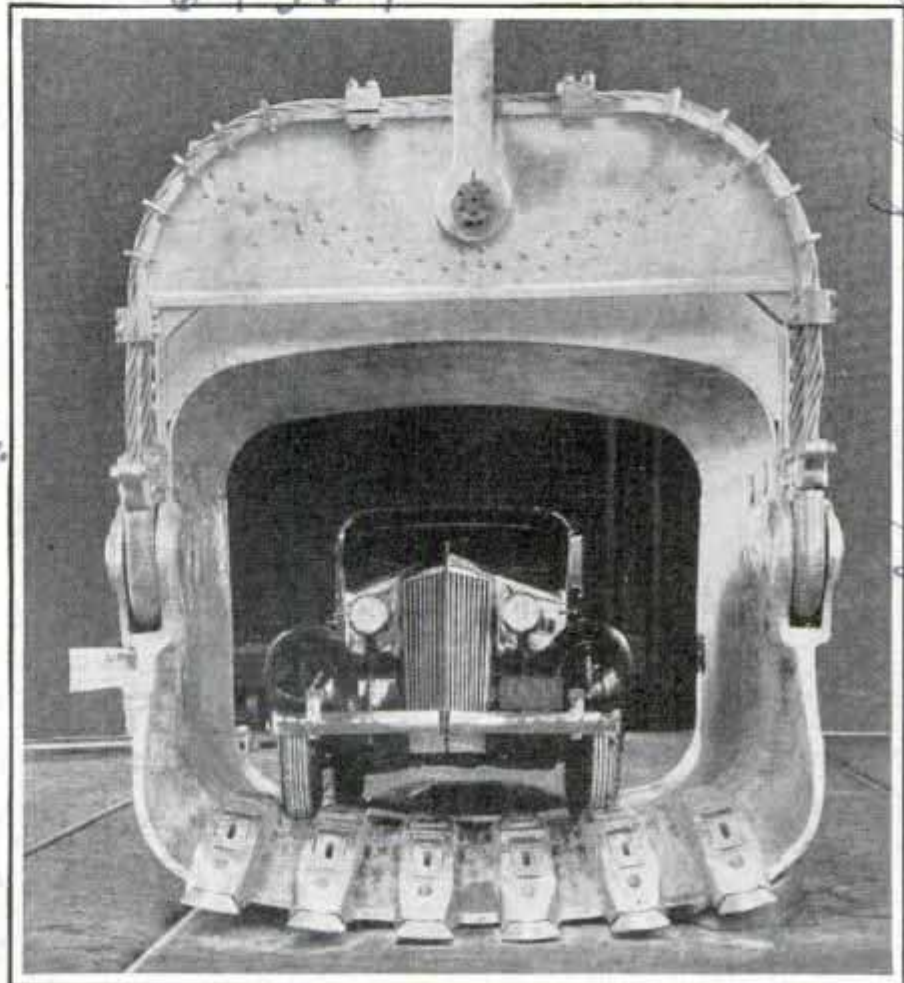
To save space in the camping kit and tool case, there is a combination pick and shovel which is perfectly balanced for either purpose. The working end is pivoted, and when used as a shovel the pick is held against the handle by a firm clamp. The same clamp slides down the shaft to hold the tool when used as a pick. It is lightweight but sturdy, and easily packed in an automobile.



Two-Purpose Tool Locked for Use as Pick or Shovel

Light Alloy Power Shovel Lifts Carload in Two Bites

81364



Automobile Driving through Jaws of This Coal Dipper with Plenty of Room to Spare Gives an Idea of Its Immensity

Two big bites by the mammoth power shovel now digging coal at Wilmington, Ill., are enough to fill the average railway coal car. It is built of lightweight metal alloy. The jaws are big enough to accommodate an automobile, with plenty of room to spare. Engineered especially for coal-stripping operations in the northern Illinois field, the dipper can lift thirty-two cubic yards at one scoop—a mouthful that would fill a nine-by-twelve foot kitchen.

81349

Rugs Made of Goat Whiskers

Goat whiskers are no longer wasted. The chin whisker crop raised by thousands of Angora billy goats has been found to make very good rugs and carpets. It has been discovered that the whiskers are strong and durable and take dyes well, so thousands are being used.

Marnon Steam Shovel Co
 Marnon Ohio
 Northern Illinois Coal Corp
 Sueno Bros
 Upholstery makers
 in Bristol, R. I.

Vaughan and
 2114

61143
10555 Alhambra Ave
Los Angeles, Calif

S.O.S.'S



ity two and one-half miles. Verdugo hills partly obscured. First range of the Hollywoods in the open. You are over the field now. Start your spiral and I'll follow you through. Now you are over the east corner."

Two miles below the operations manager is standing at the end of a runway speaking directions into a handset connected to the radio transmitter. Your pilot slants his left wing down into the clouds and the plane begins a sweeping turn, descending 400 feet a minute in wide spirals



"HELLO, Bowman in 334. This is the Burbank remote. I think I can hear you north of the field. Give me three bursts."

In the cockpit ahead of you the pilot speeds up the engines three times.

"Okay. Now give me two bursts for a check."

You are in a westbound United air liner skimming the tops of the clouds at 12,000 feet. From the clock you judge you should be nearing Los Angeles but since midnight you have seen nothing except a turbulent cloud bank below. From his seat the pilot sees no more than you but now he has a second pair of eyes on the ground giving him a picture of the field. The voice in his ear-phones continues:

"Keep coming. It's raining down here. Ceiling is 800 feet. Visibil-

Top, Pilot of Air Liner Reporting to Ground by Radio; Bottom, Radio Operator on Ground Bringing Pilot Down by Listening to Plane above the Clouds

*Operations - Joe Able, Operations manager, United Air Lines
Union Air Terminal,
Berkeley Calif*

of the AIR



around the field. For nearly half an hour the passengers see nothing but fog but the pilot "sees" every light and shadow on the field below. He flies the plane with his eyes on the instrument panel and listens to the radio directions. Part of the trick of landing an airplane by radio is to give the pilot his position slightly in advance so he is above the point at the instant he is told about it. He must know exactly where he is so there will be no confusion at the instant he breaks through the fog.

Landing an airplane "by ear" takes rigorous training and the operations manager must have keen ears not confused by echoes. For a stunt one clear afternoon one operations manager "brought in" a single-engine airplane while blindfolded, telling the pilot exactly where he was at all times although several other planes in the air tried to baffle him with their exhausts.



Ticket Staff Filing Air-Line Reservations; Bottom, Meteorological Officer Figuring Course Correction to Offset Effect of Side Wind



With recent improvements in radio that permit faster schedules, some lines are beginning to use the "low ceiling approach." Instead of flying on top of the clouds until it is over the airport, an incoming liner begins to reduce its altitude as far away as twenty miles. During the period of blind flying the pilot follows a radio range beam that is only a few hundred feet wide in the vicinity of the airport, and in the last few miles the operations manager on the ground can hear the plane's motors and correct the course by radio if necessary.

Before the radio range beams were installed, pilots sometimes depended on voice communication alone for their safety. Several years ago an air liner became lost at night when the pilot was forced to climb to a high altitude where he was blown off his course by an unusually strong wind. Having lost contact with the ground because of intervening clouds, he finally dropped closer to the ground and found himself hopelessly lost. An air-minded radio fan who had been listening

to the pilot describe his plight to the air-line radio station observed the plane passing over his town and telephoned the radio station. The radio operator then informed the pilot he had just passed a certain point and that by steering southwest he would reach the terminal.

Radio prevents worry and aimless searching when airplanes are forced down. If a pilot decides the weather is so bad he should land at an intermediate field he calls the nearest radio station and explains the cause of the delay.

Fifty miles after leaving a midwestern airport both motors of an air liner faltered and quit. The pilot made a good landing, snapped on his transmitter and phoned his position to the airport. Shortly afterward the radio operator was astonished to hear a similar report from a second

(Continued to page 122A)



Top, Inspecting Engine Before Flight; Center, Pilot Practicing Blind Flying in Hooded Cockpit; Bottom, Pilot Talking with Radio Operator

Color Pictures Sent by Television or Wire

Television pictures in full natural colors can be transmitted and received with experimental apparatus developed by Leroy J. Leishman, creator of a system for transmitting pictures by telegraph. The process requires the use of two color wheels or groups of prisms, one at the transmitting end and the other at the receiver. The pictures are sent three times faster than normal, each succeeding picture being relayed to the transmitter through a filter that selects the major color and holds back the rest of the light. Another color wheel at the receiving



Two Views of Apparatus with Which Natural-Color Pictures May Be Transmitted and Received; the System Holds Great Possibilities for Television and Telegraphic Picture Service

end reproduces the monochrome pictures in series of red, green and blue-violet images at intervals of one-forty-eighth of a second. So, at the end of one-sixteenth of a second, three separate pictures are received and combined to produce natural colors. Combinations of the three major colors create as many as 212 different shades and hues. Synchronizing the color receiver with the transmitter is accomplished by pressing a button until the right color combination is received. Patents also have been granted for using a

moving spectrum from groups of prisms instead of color wheels. The system may be used with scanning disk, cathode ray, mirror disk or vibrating mirror types of television and is suitable for direct observation of the pictures or for projected pictures. Pictures transmitted over telegraph circuits also can be sent in full colors by the method.

Although they float on salt seas, icebergs contain no salt, for they are formed of glacial ice that was originally snow.

Highland Ave
1256 S. Highland Ave
Chicago, Ill.

Gen. Leishman, E
Stinson, Jr.

Chicago Apparatus Co.
1256 S. Highland Ave
Chicago, Ill.

11/4/35

found, ranging from squirrel-sized animals regarded as distant relatives of the great family of primates to creatures called bear-dogs, although they were not ancestral to either. These latter animals apparently were carrion-feeders, with hyena-like habits. Some very primitive forms of hoofed animals are in the Smithsonian Institution's collection from this region. These creatures lived in the paleocene epoch, or just after the dinosaurs had vanished.

E 1338

Amphibion Drops Anchor from Nose of Its Pontoon

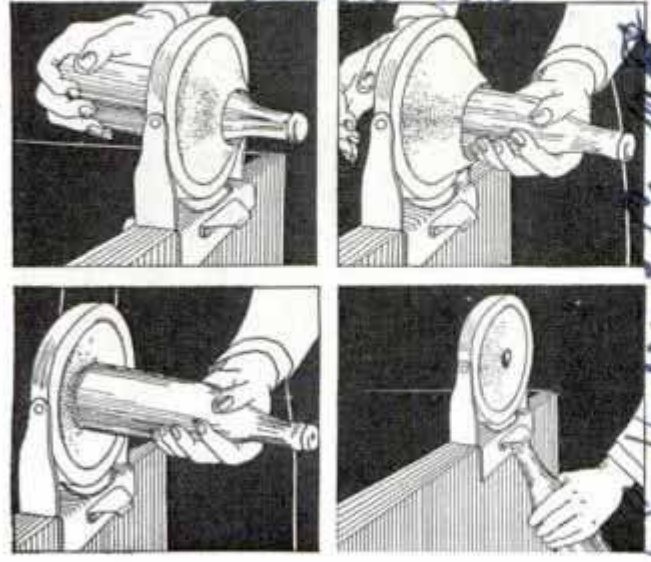


Stem of This Mushroom-Like Anchor Is Withdrawn into Nose of Pontoon When This Speed Champion of Amphibians Is Ready to Take Off

Handy Wiping Disk Dries Bottles for Serving

To dry beverage and other bottles before serving them on the table there is a handy wiping unit consisting of an absorbent disk through the center of which the bottle is drawn. This dries the "dew" or dampness from icing. After wiping the sides, a final rub on the disk cleans the bottom of the bottle. The unit also has a bottle opener.

Bottle dri



Drying a Bottle by Drawing It through Absorbent Disk; Bottle Cap Remover Is Also Provided

Peel off the nose of one pontoon on the world's fastest amphibion and you have an anchor. Weigh anchor, and a cable operated from the cockpit of the plane draws the mushroom-shaped anchor up from the harbor bottom, retracts its stem into the pontoon and the streamline nose is buttoned on for flight. Maj. Alexander P. de Seversky, owner of the amphibion, is credited with a world's record speed of 230 miles an hour in the craft.

E 1382

Safe Fluid Detects Watermarks on Postage Stamps

To help stamp collectors discern the watermarks on postage stamps, a special fluid has been developed. Unlike benzine, which is sometimes used for the purpose, it is non-inflammable and therefore safe. When the stamp is immersed in this liquid its watermark is instantly visible.

c/o. De Seversky Aircraft Corp. 108 Massachusetts Ave. Cambridge, Mass.

Easy Way to Dry Bottles

As E. Harris & Co. 108 Massachusetts Ave.

Los Angeles
Calif

Curved Cylinders on Engine Reduce the Weight



Pistons Describe a Semi-Circular Stroke in Curved Cylinders of This New Type Motor

Cylinders of a new two-cycle engine are built on a curve instead of being straight-sided. The pistons describe a semi-circle on in and out strokes. Exceptional lightness and efficiency are claimed for the engine. The tops of the piston heads are cut on a diagonal instead of square to counteract the tendency of the pistons to cause excessive wear on the outer side of the cylinders. The force of the fuel explosions against the diagonal heads tends to drive the piston toward the inner side of the cylinder. The engine is air and oil cooled and has a special timing system. The design is said to be suitable for a steam, Diesel or gasoline motor.

Auto Warm-Up Time Reduced by Quick-Start Gasoline

Tests of quick-starting gasoline developed by Standard Oil company scientists show that the warm-up period is reduced considerably, thus giving the driver control over the car in less time than ever

before. A car is not considered properly controllable until the warm-up period is over because there are times when good throttle control and acceleration are as important as good brakes. In 1926, an average car traveling twenty-five miles per hour at twenty degrees above zero would have to cover seventeen and two-tenths blocks, or about two miles before the engine would be humming properly. This year, the quick-starting gasoline reduces the warm-up period to less than four blocks. The new motor fuel is said to be achieved by strengthening the "front-end" volatility, producing a quick flash that starts the flame. The "heavy ends" of the gasoline keep the flame going to complete the operation efficiently.

8/252

Long-Handled Lawn Weeder Removes Dandelions

Particularly adapted to removing dandelions, a new weeder equipped with a long handle takes much of the work out of keeping the lawn clean. Operation of the device is simple. Removal of the dandelions and other weeds is permanent because the tool takes out the roots.



This Weeder Pierces to the Roots and Its Long Handle Obviates Tiresome Stooping in Care of Lawn

Ed. Thomas & Livingston Co.
105 5-5
Los Angeles
Calif

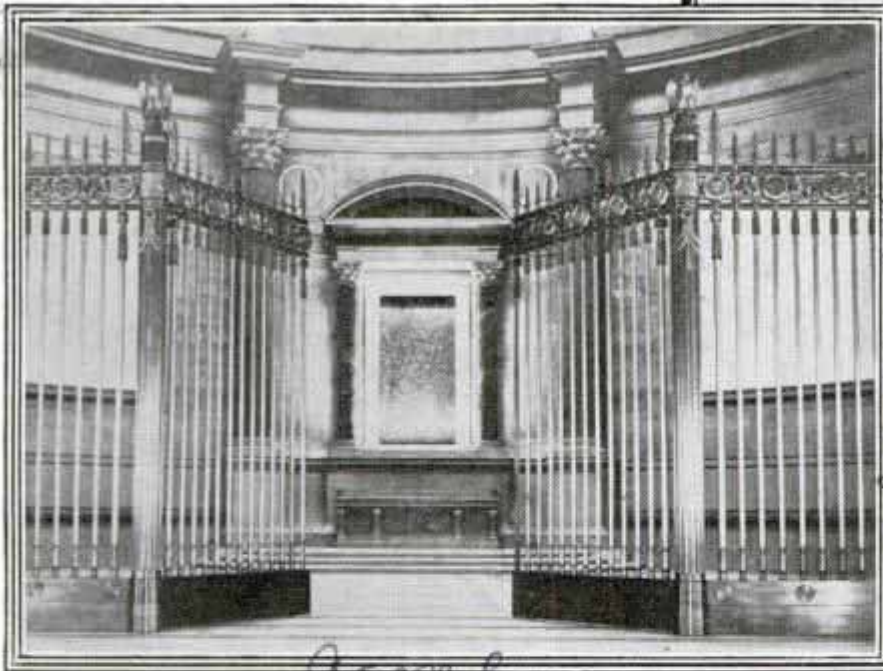
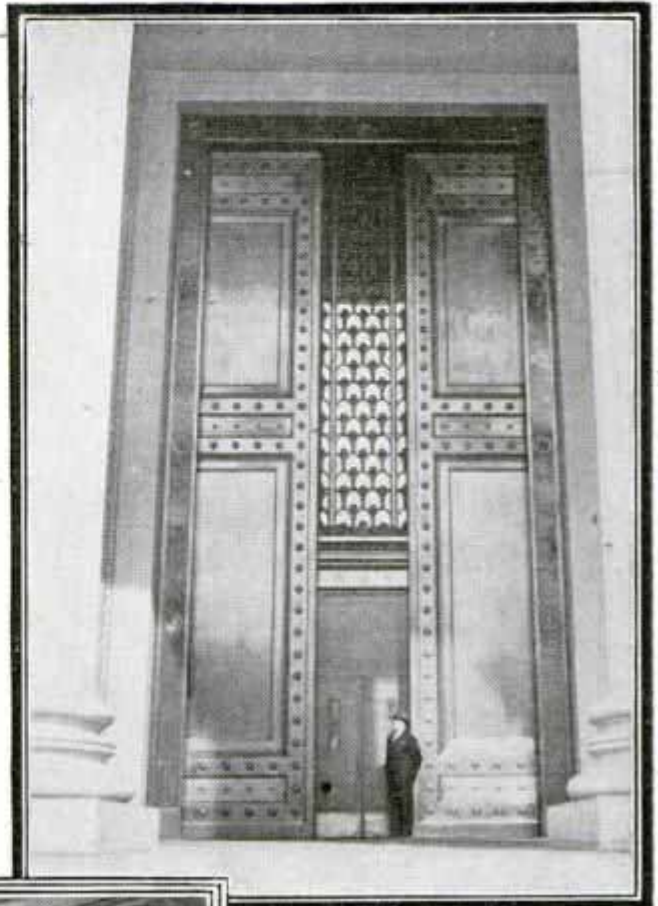
8/136

Chicago

C. S. Hashins
Elizabethtown, Pa.

Steel and Stone Protect Nation's Documents

In the recently completed Archives building in Washington, D. C., the nation's most precious documents, including the constitution and the declaration of independence, are guarded in a veritable fortress of steel and stone. One of the ornamental and protective features of the structure is a twenty-ton bronze entrance door opened or closed at the press of a button. The constitution and declaration of independence repose in the closely guarded shrine room, cut off from the rest of the building by metal bars. The building is air-conditioned and every safeguard is provided for the perpetual care of state papers and documents under conditions ideal for their preservation. It has been found that acid gases in the air hasten the destruction of paper and to prevent such contamination, the air in the Archives building will be washed in an alkaline solution. The building is five stories high and comprises 559,000 square feet of floor



Top, Twenty-Ton Bronze Doors Opened by Pressing a Button; Bottom, Constitution and Declaration of Independence Are Kept Safe Here

space, sufficient to house thousands of records which have been accumulated by the various government departments over a period of many years.

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

the ship and opened a sterile flat glass dish containing solidified material on which germs grow. The dishes or plates later were incubated in the laboratory. On only two of twelve plates were there any microorganisms and these, Dr. Walker believes, were contaminated by organisms on his hands or clothing.

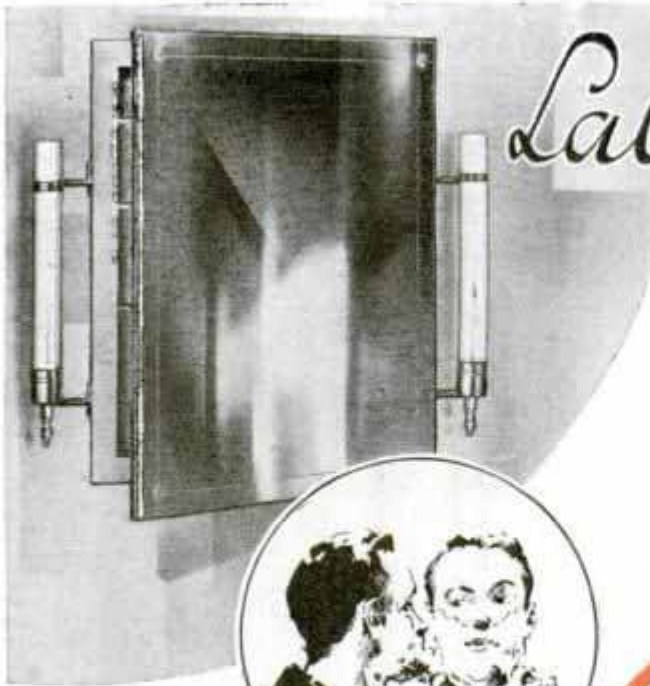
87348
Air Four Miles Up Is Found Free from Germs

From 20,000 feet to 28,000 feet, the air apparently is free of germs or what bacteriologists call sterile. This is the finding of Dr. George Walker, of Baltimore, who made a high-altitude flight in an army bombing plane to make the test. At 20,000 feet and at every 1,000 feet above to 28,000, Dr. Walker extended his hands through a slit in the front compartment of

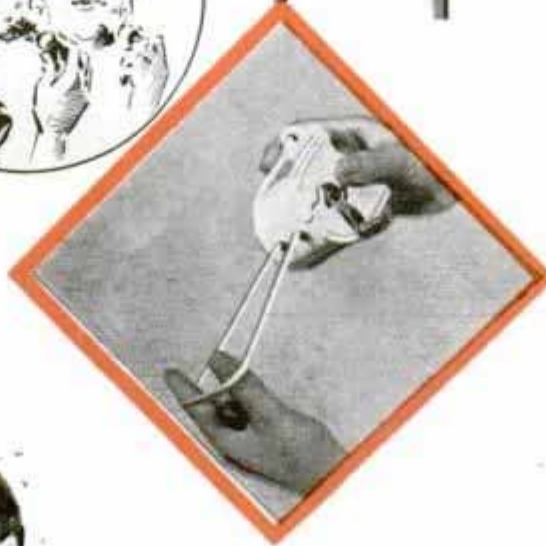
Came from 11/35

in journal.

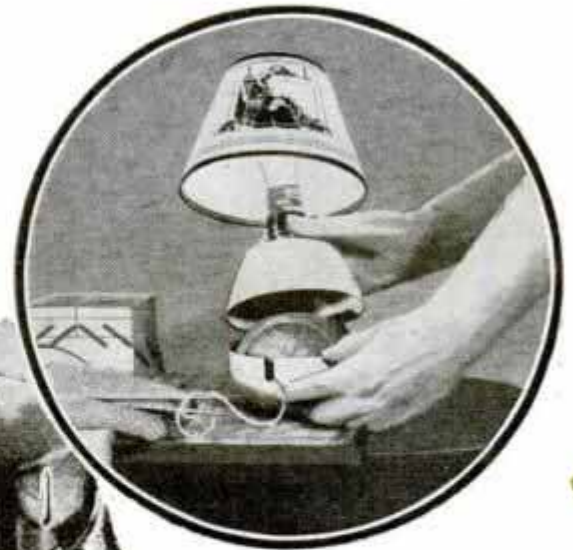
Latest HOME



Medicine Cabinet, Above, Equipped with a Mirror and Tubular Lights, Making the Glass Free from Glare and Shadows When Shaving



Dining-Room Chair, Above, Quickly Converted into High Chair for Baby, Complete with Tray, by Raising Front of Seat to Vertical Position; Everything Unfolds Automatically and the High Chair Locks Itself in Place; Left, Indoor Clothesline Reel with Locking Adjustment Which Insures a Taut Line; It Can Be Screwed to a Door Casing; Below, the Base of the Lamp Accommodates a Ball of Yarn for Knitting, Dispensed through Hole in Side

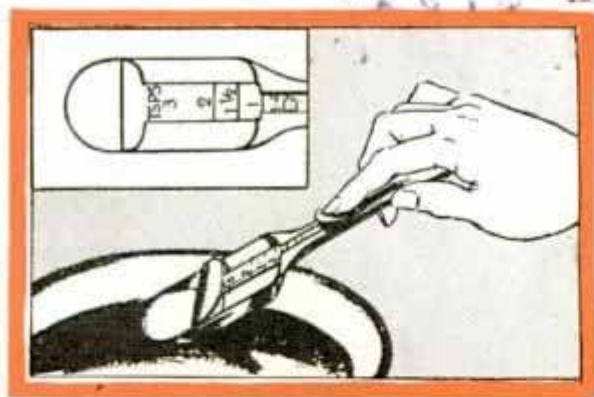


Left, Ovenette for Top of Stove Which Saves Fuel, Both in Cooking and in Reheating, and Permits Quicker Cooking Because of the Fuel Saving

ACCESSORIES



Above, Both Hands Can Be Used to Turn the Jar When This Opener, Which Holds the Cover in a Vise-Like Grip, Is Used; It Can Be Adjusted to Hold Bottle Caps, as Well as Jar Covers; Below, Accurate Measuring Spoon for Powders or Liquids; Seven Units of Measurement Are Offered by Adjusting the Sliding Section

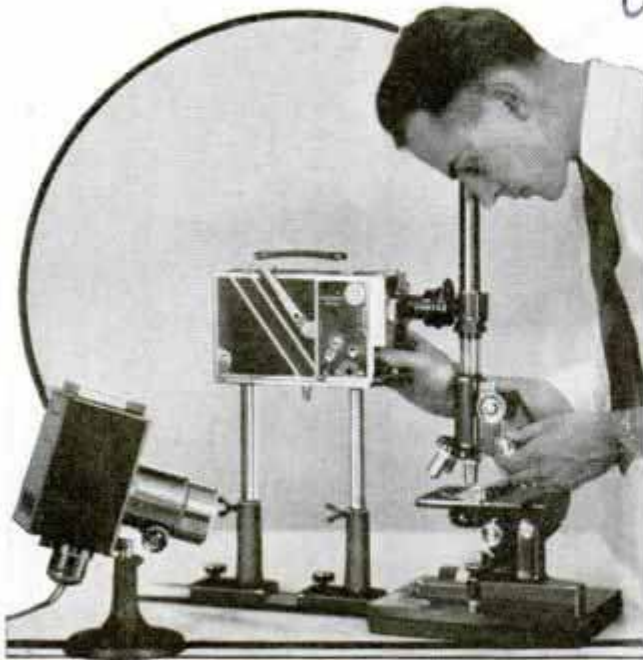


Above, This Washstand for the Bathroom Has a Built-In Bin for Soiled Linen, a Towel Rack, an Interior-Lighted Medicine Cabinet, a Convenient Shelf and an Upper Cupboard for Toilet Supplies; Left, Portable Window Shelf for Flower-pots Which Transforms the Usual Narrow Window Sill into a Wide Shelf with a Chromium Guard Rail; It Can Be Placed in Position without Using Any Tools and without Any Nails or Screws

81315.

Cheap Micro-Movies in Color Made with Beam Splitter

637 St Paul
Rochester
ny



Making Microscopic Movies with Lens Which Permits Observation of Subject While Filming It

Producing microscopic movies at low cost is made possible by a special observation eyepiece, developed by Bausch and Lomb Optical company, which acts as a beam splitter. The eyepiece is fitted to the camera in place of the regular lens. In the beam splitter is a forty-five degree prism which causes part of the light to be reflected to the film and part to be transmitted through the eyepiece so the operator can observe the action while the picture is being made. The device can be fitted to any microscope. Not only can the movies be made in black and white, but with Eastman's Kodachrome film, pictures in natural color can be obtained. Doctors, medical students and all scientific workers can make records in black and white or color, while the amateur, at modest expense, is enabled to make unusual movies of the activities of live specimens.

Radio System Free from Static 347 May Speed Television

Complete elimination of static from a radio program is accomplished by a new system devised by Maj. Edwin H. Armstrong of Columbia University. Initial demonstrations have been made on a wave length of two and one-half meters, and

Alma Bernice
11/9/35

New York City.

there are indications that the system would have applications in television broadcasting. But it also holds the possibility that some day the home radio receiver may be freed of static. In a recent test, during an electrical storm, signals from a 2,000-watt station atop the lofty Empire State building in New York were received and registered on phonograph records at a station eighty-five miles away. Uninterrupted reception, with no static, was the result. For comparison, a big 50,000-watt station, recorded at the same time, gave signals full of crashing jars and often unintelligible. The front page of a newspaper transmitted by the same method was received in clear, readable form. At the same time a musical program was transmitted, the first time in the experiments that music and the printed word had been sent and received together. The static-free system is the result of introducing into the transmitted waves a characteristic which does not exist in radio waves that nature creates in causing static. The receiver is so constructed that it picks up those radio waves having the special "man-marked" characteristics and discards the natural ones.

81329

Small Motors Are Protected from Danger of Overload

Fractional-horsepower motors can be saved from the danger of overload, just as large engines are protected, by installing a thermal overload starter which breaks



the current whenever the overload continues long enough to menace the motor. It does not trip the line on momentary or starting overloads. When the current has been broken and the operating switch returned to the "off" position, the motor

can be restarted after a short interval by merely pressing the starter button. This starter is useful on such motors as those on oil burners, washing machines, bench and portable tool machines.

Cutter. Hammer. Co.
1333 W. St. Paul

*Drummond Radio Supply Co
1528 Armitage Ave
Chicago*

Radio

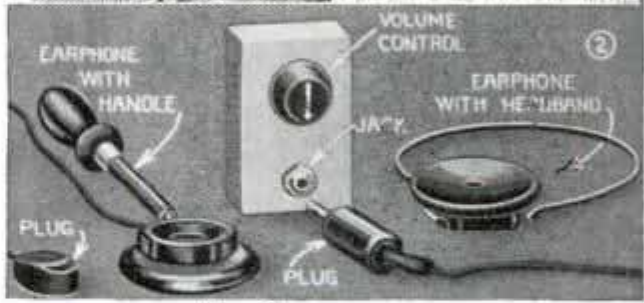
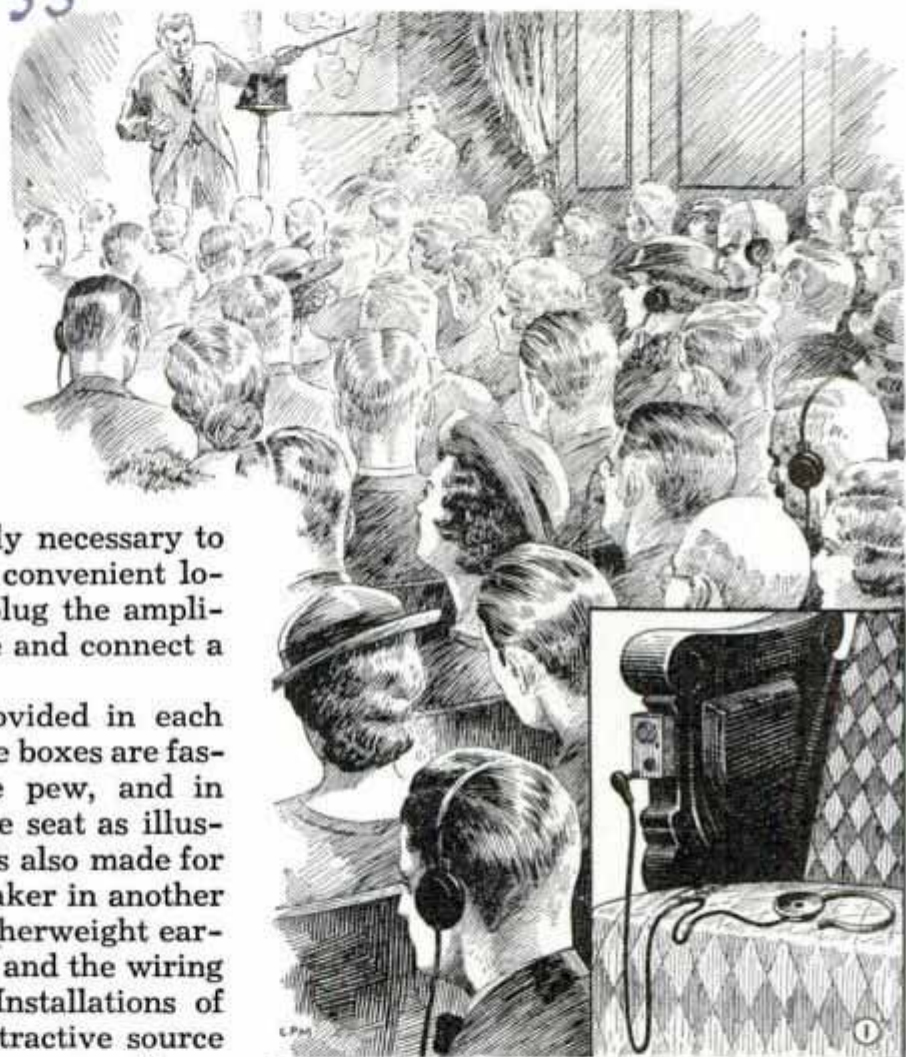


83635

Group Hearing Aid

EASILY installed in churches, theaters and other places of public assemblage, this group hearing aid is complete in every detail. It is merely necessary to place the microphone in a convenient location in the sound field, plug the amplifier into the a.c. supply line and connect a few outlet boxes.

Volume controls are provided in each outlet box. In a church these boxes are fastened to the back of the pew, and in theaters to the frame of the seat as illustrated in Fig. 1; provision is also made for operating a small loud-speaker in another room. Two varieties of featherweight earphones are shown in Fig. 2, and the wiring diagram is given below. Installations of this description offer an attractive source of revenue to radio service men and experimenters. In some cases the church will install the amplifier, microphone and outlets while the individuals served purchase their own earphones.



TUBE Set

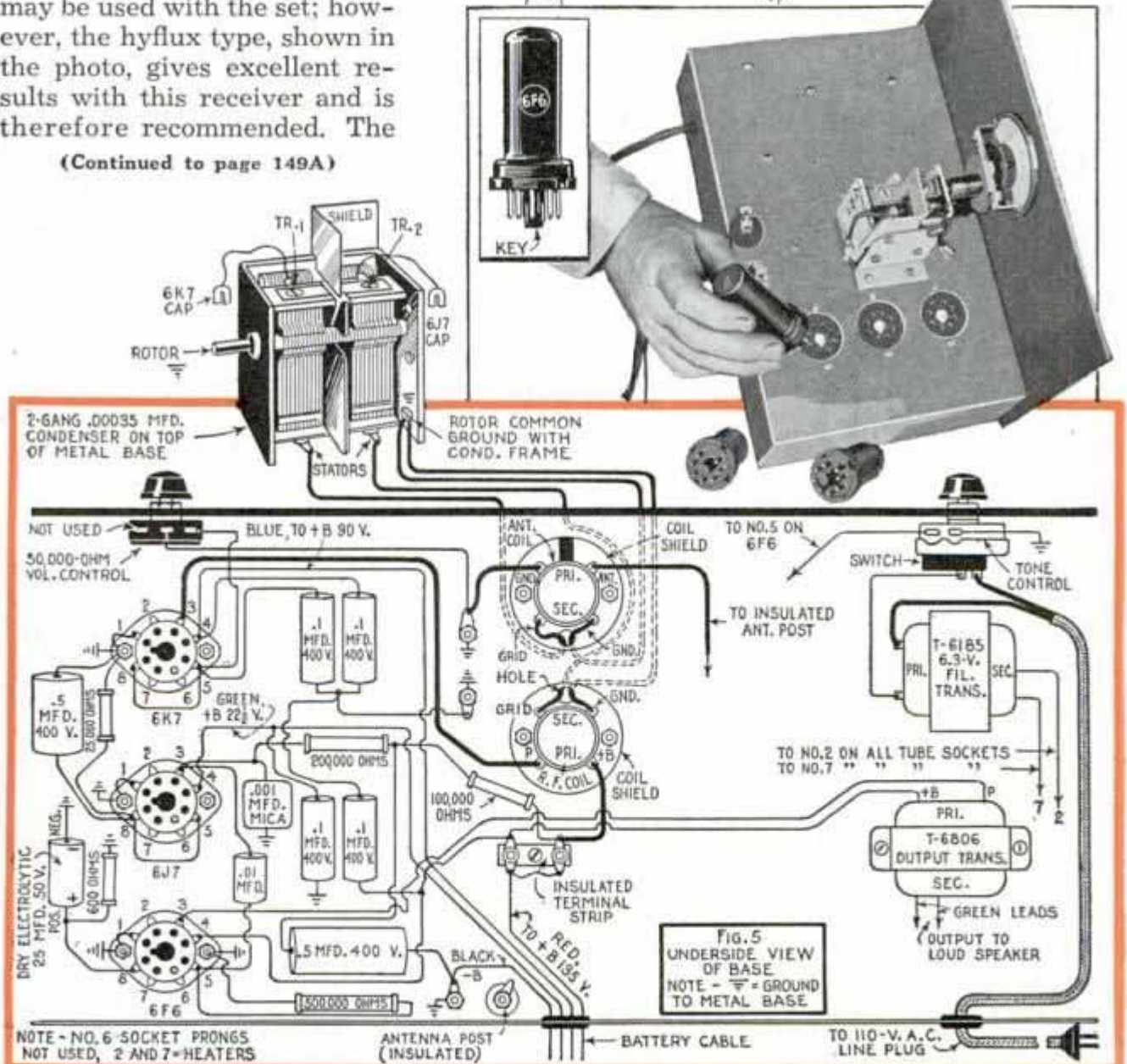
for Beginners



the tube-pin arrangement, which corresponds to the numbered tube-socket terminals, appears in Fig. 3. A wiring diagram for the B-batteries is shown in Fig. 4 and the simplified wiring diagram is given in Fig. 5.

Any good magnetic speaker may be used with the set; however, the hyflux type, shown in the photo, gives excellent results with this receiver and is therefore recommended. The

(Continued to page 149A)



How to Make Low-Loss Antenna Connections



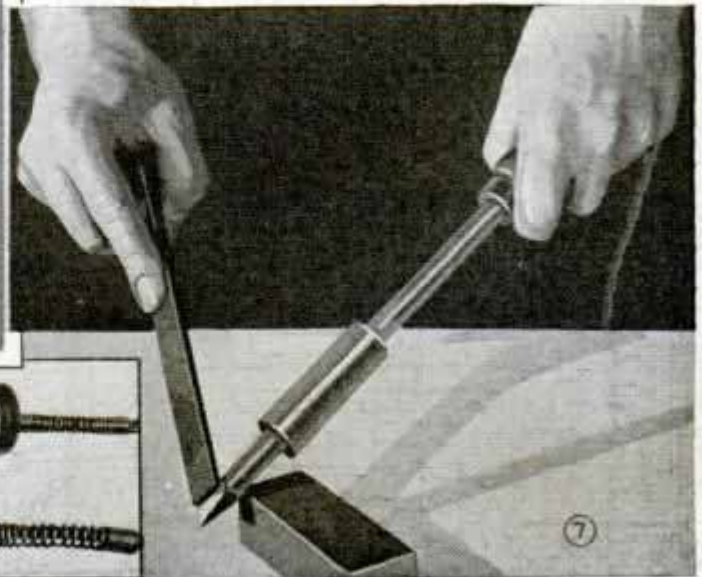
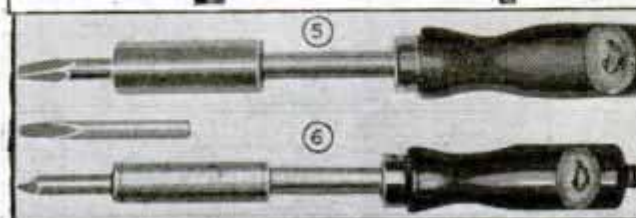
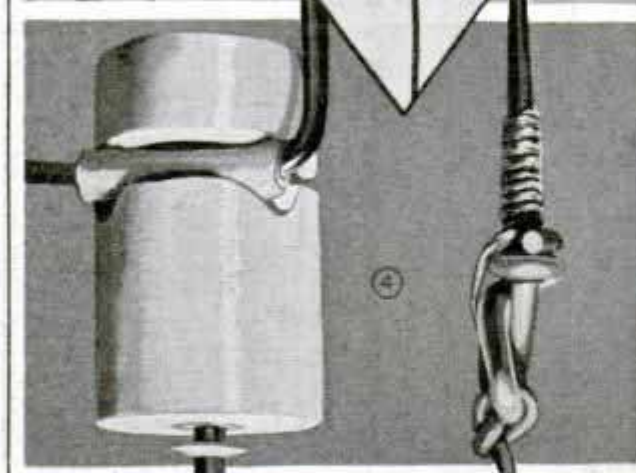
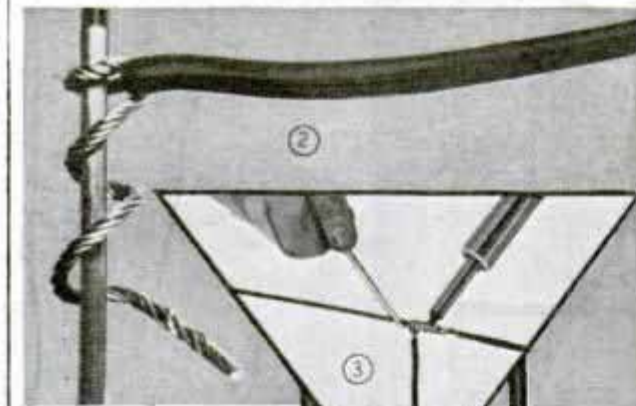
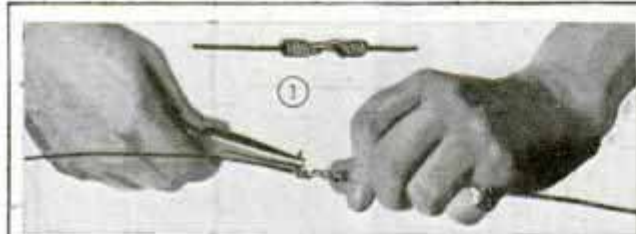
CIRCUS aerial gymnasts grasp each other's arms in perilous acrobatics, each holding the other's wrist. Grasp your wrists in the same manner and observe how your fingers twine naturally over the forearm. The strongest mechanical splice for antenna wire is made in the same general manner, as illustrated in Fig. 1.

When solder is sweated into these tight turns, the junction of the two wires is stronger than the wire itself. Not alone does this insure a permanent antenna installation but the low resistance of the joint permits maximum sig-

nal strength from distant stations to reach the receiver.

To join a flexible insulated lead-in to a stiff antenna wire of the usual No. 12 or 14 enameled-copper variety, carefully scrape the insulation from both wires; twist the strands of the flexible wire tightly and start a single winding with one turn-back loop as shown in Fig. 2. The turns are then pulled tight and the joint is well heated with the soldering iron before applying the solder as indicated in Fig. 3. The connection at the right in Fig. 4 is recommended when a flexible lead is to be joined to the end of a heavy wire. Remove the necessary amount of insulation from each wire and make a loop of the stiff wire; knot the flexible lead to the

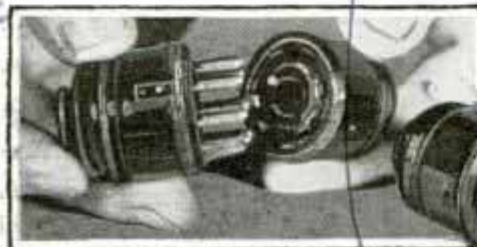
(Continued to page 150A)



PRACTICAL RADIO SUGGESTIONS

Corp. 500 S. T. Irony
Chicago

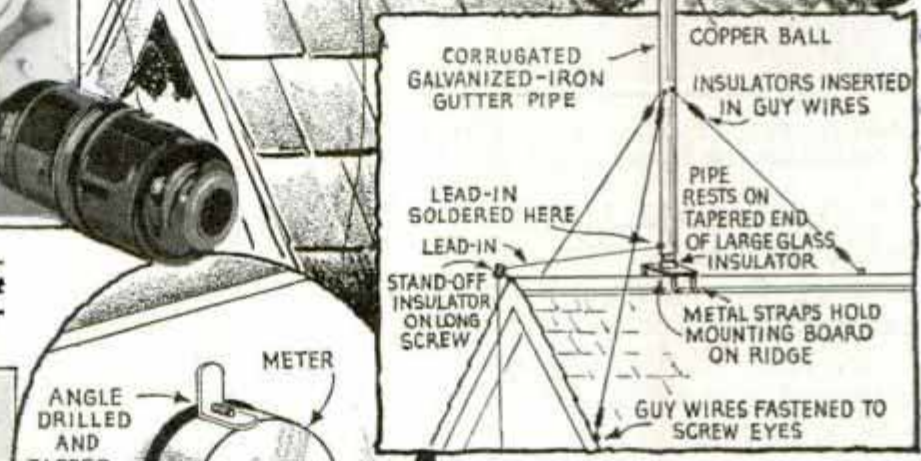
Right, Non-Directional Vertical-Capacitative Type Antenna for Congested Locations Where Power-Line Interference Is Troublesome; the 10-Ft. Pipe Is Mounted on a Glass-Pole Insulator and Topped with a Copper Flush Ball; Including the Usual Lightning Arrester in the Lead-In, the Cost Should Not Exceed Two Dollars



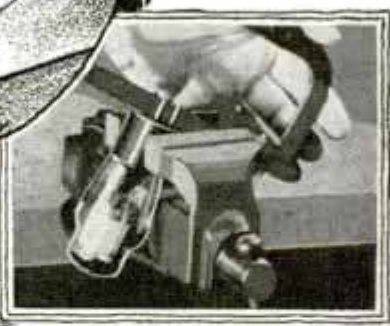
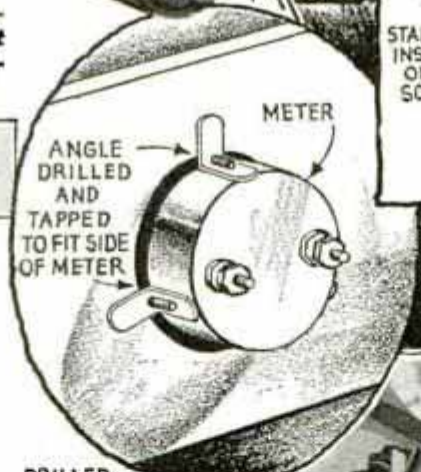
Plug and Socket Cable Connectors for Power Supplies or Test Sets; Metal Cover Shields Connections



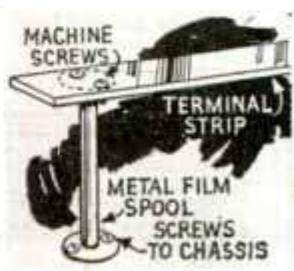
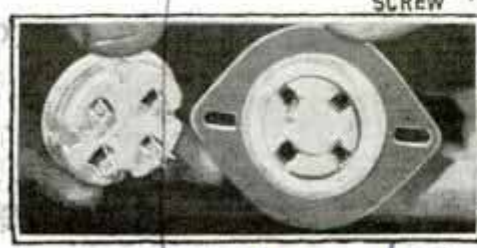
Above, Standard Wire-Wound Volume Control to Which a Switch May Be Added, Now Available to Experimenters and Service Men; Back Cover Is Removed Quickly and Replaced with the Switch Cover Plate; Right, Small Metal Angles Permit Mounting of Flush-Type Meters in Slightly Oversize Holes, Enabling the Amateur to Use Panel Material Salvaged from Discarded Equipment; Below, Ceramic-Type Tube Socket, with Adapter Plate, for High-Gain Short-Wave Supers



Below, Slots Cut through Tube Base Reduce Leakage Losses in Experimental Ultra-Short Wave Receivers



Left, Porcelain Socket Mounted on Metal Chassis without Spacing Bushings; the Slot Is Outlined and Several Small Holes Are Drilled in the Center to Start a Hack-Saw Blade; Ends of Strips Are Bent Over and Drilled to Fit Socket Mounting Holes; Right, Film Spools Make Good Supports for Insulated Terminal Strip



American Electric Corp. Chicago
 3655
 30 S. T. Irony Chicago
 3655

3655
 Clarostat Corp. Chicago

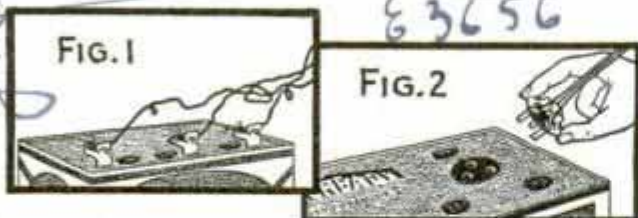
Five-Band Phone Monitor for Amateurs



Amateur Phone Monitor Showing Tuning Dial and Band-Changing Switch Mounted on Front Panel

This well-shielded monitor may be used in the same room with the transmitter or even by the operator himself, to detect carrier hum or audio distortion in any form. These faults can be heard immediately and corrected in the transmitter. It is a humless well-filtered unit with self-contained power supply, and has a continuous range from 5 to 200 meters.

Plug-and-Socket B-Battery Connections



Wrong connections, shocks and unsightly leads are eliminated by plug-and-socket B and C-batteries recently offered

NEXT MONTH—How to Build the Improved Little Giant Portable A.C.-D.C. Broadcast Receiver. The 1936 model of this popular little 4-tube set has the following features: airplane-type dial calibrated in kilocycles; 2 pilot lights; improved dynamic speaker; gets police calls; low cost; easy to build; fine tone and range.

to owners of battery-operated receivers. The old and new methods are illustrated in Figs. 1 and 2; no wiring changes are necessary in the set. The socket holes are arranged to prevent wrong connections.

Compact I.F. Transformer Has Iron Core

Extremely small iron particles, treated with an insulating material, form the core of this compact i.f. transformer shown with one of the new all-metal tubes. Performance equal to, or better than, that obtained from well-designed large air-core coils is claimed for these midget transformers which occupy about one-half as much chassis space.



Speaker Repair Kit for Service Men



A first-aid kit in loud-speaker work enables the service man to make quick repairs and solves one of the major problems in radio trouble shooting. Special tools and replacement parts are included.

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

Vertical handwritten text on the left margin: "National Carbon Co. 30 E. 42nd, New York 18-45 Broadway 3522" and "Eastern Radio Specialty Co. 635 90."

Large handwritten text at the bottom: "Multiplex Radio Service" and "National Carbon Co."



STENCILING

without "Tie Marks"

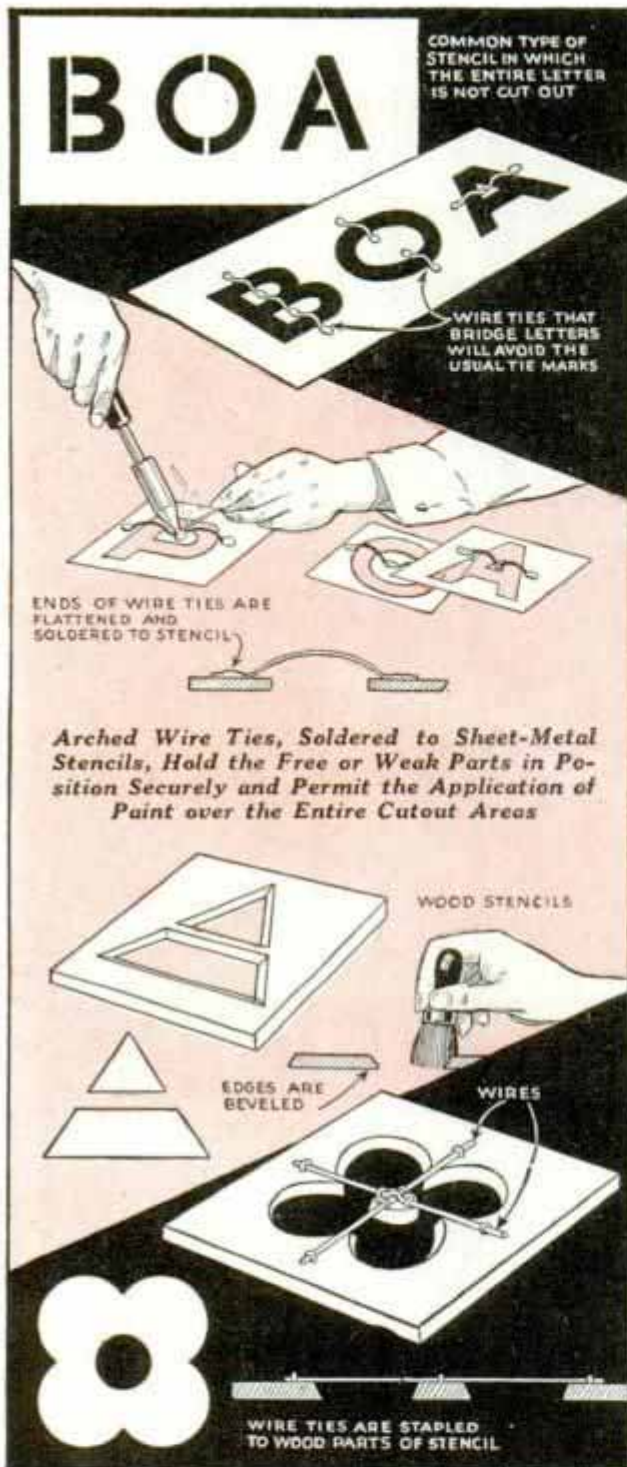
By GEOFFREY ARCHBOLD

TWO of the chief objections to the usual type of stencils for decorating are their general flimsiness and the presence of the ties that hold the parts together. There are several ways of evading or remedying these mechanical limitations. The devices suggested in this article are for the relatively simple type of stencils used in wall decoration or in the multiple production of signs, toys, furniture, textiles, etc. They are not intended to supplant composite multiple stencils, or the screen-process, but to be used in cases where either of these are inadvisable or unavailable.

Ties of the customary type make the transferred design unduly spotty and complicated, and this sort of lettering or decoration, which is otherwise a fine piece of craftsmanship, carries with it the impression of cheapness, so often associated with stenciled work. In lettering, for example, the letters A, B, D, O, P, Q and R require ties to support their centers, (unless double stencils are used) and many of the other letters require ties to strengthen the stencil. In thin sheet-metal stencils, the usual tie is necessarily of noticeable width. By substituting wire ties and cutting out all of the design, tie marks can be eliminated. The ties are bent over the open areas of the stencils, enabling the user to get paint under them readily, and the ends are soldered to the solid parts. Copper or brass wire, of a gauge sufficiently heavy to hold the parts of the



Good Stenciling Technique Enables You to Use Simple Designs to Obtain Striking Effects; Stenciling without Tie Marks Offsets the Impression of Cheapness Often Associated with Stenciled Work



Wood Stencils with Beveled Edges, When Coated with Shellac or Varnish, Are Very Durable; the Free Parts May Be Held in Position with Tie Wires Held to the Wood with Small Staples

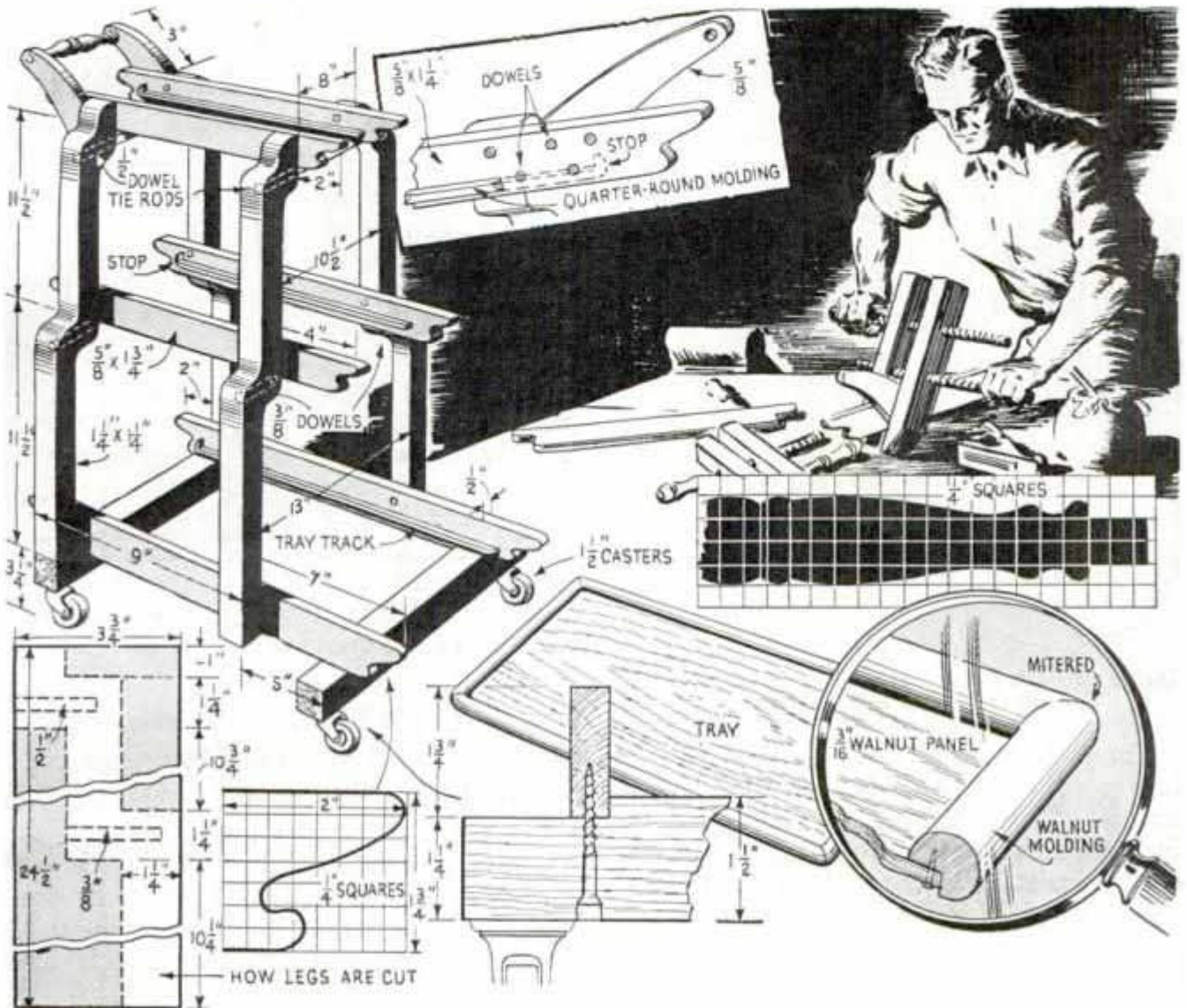
stencil rigidly, is used, and the ends should be flattened to permit a good contact for soldering. In the case of letters or designs having free portions two methods may be followed in soldering the free portions in place. One is to cut out the entire design, leaving no ties or attachments of any kind, and save the letter centers or free portions of the design. Lay the pieces on a smooth, heatproof surface, keeping them

firmly in place with weights or thumb-tacks and solder the wire ties in place as needed. The other method is to cut out the design, leaving one or, at most, two tiny shreds of metal, in places where the soldered tie will not touch, in order to retain each free portion. After soldering, all retaining shreds are carefully cut off.

Repeated beating of the brush on a sheet-metal stencil in constant use tends to hammer it out of shape. This is difficult to remedy in the more complex stencils cut in intricate designs or lettering, but in simpler designs, particularly those used for adding a second color, it is not difficult to make a thin wooden stencil that is almost indestructible. After applying the design to a square of any close-grained wood about $\frac{1}{4}$ in. or less in thickness, it is cut out with a scroll saw, or with a chisel. The edges should be beveled to an angle of 45 to 60 degrees. It is then given a few coats of shellac or thin varnish. If such a stencil is in constant use, additional coats of finish should be applied at regular intervals, as the original wears away with use. Wooden stencils having no free parts have a distinct advantage over sheet-metal stencils in that it is possible, to a far greater extent, to cut the wood into various projecting points, tongues, and similar shapes, which would either bend out of position or break off entirely in thin sheet-metal construction. The wooden stencil does not beat out of shape and, if precautions are taken against warping, it always lies much flatter and in closer contact with the surface to be painted than a sheet-metal stencil. When not in use, wooden stencils should be cleaned and dried and placed under a suitable weight between two flat, heavy boards to prevent warping. It is also advisable to keep them in a dry place at a medium temperature.

In slightly more complex designs, particularly those having free parts, a wire tie may be used to hold the loose parts in position, as previously described in the construction of sheet-metal stencils. It is unnecessary to arch the wires in this case, as the thickness of the wooden plate gives the same effect. The wires should be attached firmly to the wooden plate by means of small staples. If they penetrate the plate, the projecting ends may be filed down flush.

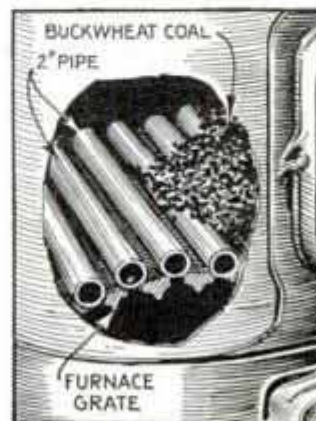
Three-Story Beverage Cart Has Sliding Trays



With its removable trays at three levels and side members that narrow toward the top, this castered beverage cart is a stable piece of furniture of either walnut or pine. The odd-shaped legs are band-sawed from a single piece, as indicated in the lower left-hand detail, and are reinforced at the "hips" with dowels to prevent splitting at these points. Horizontal tray supports, fitted with slides of quarter-round molding, are doweled to the legs, the bottom supports being fastened to heavier pieces carrying the casters. Two $\frac{1}{2}$ -in. dowel tie rods across the top of the leg assemblies serve the dual purpose of holding them together and of strengthening the upper hips. All joints and dowels are close fitting and are fastened with casein glue. A handle bracket assembly is shown in the upper center detail, and is attached with dowels and glue. Trays are a single panel of wood bounded with a molding.

Furnace Grates Bridged with Pipe to Burn Fine Coal

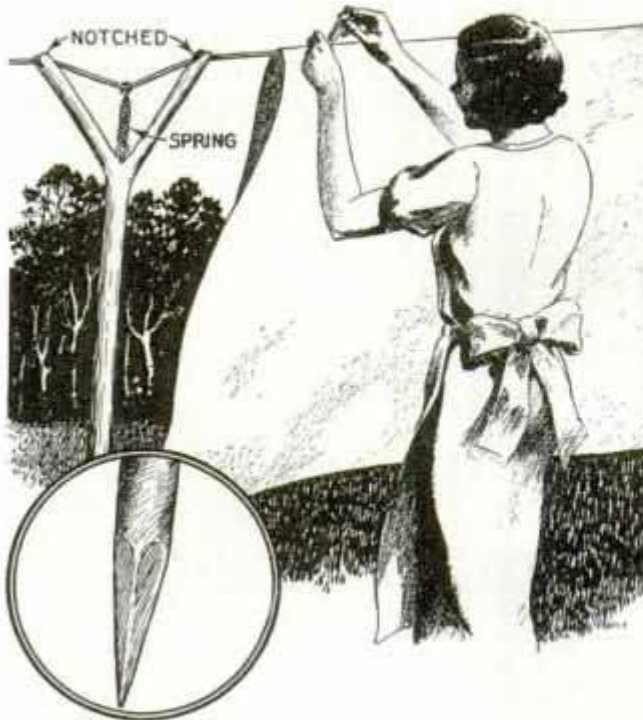
Here is a simple method I used to convert the grates in my furnace to handle buckwheat coal, which is very fine and falls through ordinary grates.



Lengths of 2-in. iron pipe were cut to fit between each pair of grates as shown in the drawing, thus bridging the wide openings between them. The pipes will not be dislodged from their positions if care is

taken when shaking the grates.—Edward Apfelbaum, Philadelphia, Pa.

Prop Has Coil Spring to Take Up Slack in Clothesline



Spring on Forked Clothesline Prop Keeps Wash Off Ground and Helps to Hold Line Taut

Consisting of a forked pole, this clothesline prop is unusually effective in that it not only keeps the wash off the ground, but tends to keep the line taut. The arms of the forked end are notched to receive the line, while a coil spring fitted with a hook at one end is fastened in the crotch with a large screw eye. When hooked over the line, the spring holds it in the notches and at the same time takes up some of the slack.

Fowl Cannot Fly Out of Pen When Wing Is Weighted

Instead of clipping a fowl's wing feathers to keep it from flying over a fence, wrap a short piece of wire solder around the three largest feathers of one wing. The solder not only prevents full spread of the wing for flying, but also weights it down so that any flight will be made in a circle. The same result may be attained by wrapping the



feathers with adhesive tape, inclosing a small pebble or other similar weight.—G. E. Hendrickson, Argyle, Wis.

feathers with adhesive tape, inclosing a small pebble or other similar weight.—G. E. Hendrickson, Argyle, Wis.

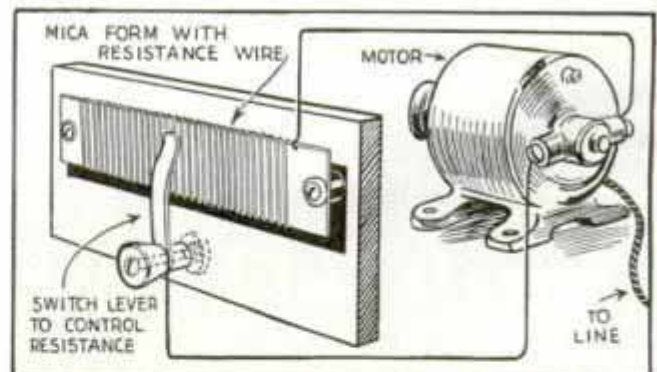
Hip Boots Reinforced at the Folds Will Last Longer

Hip boots, unless suspended from a hook when not in use, are usually folded for storage. This creases each boot in the same place until the fabric eventually cracks and causes leakage at these points. If cold patches, such as are used to repair inner tubes, are applied at the folds, the life of the boots will be prolonged.



Homemade Rheostat Controls Speed of Small Motors

Small electric motors of the series or universal type may be connected to this rheostat so that their speed can be reduced to any value desired. The rheostat is made by winding Nichrome wire on a strip of mica, the edges of which have



Nichrome Wire Wound on Strip of Mica Makes Rheostat to Control Speed of Small Motors

been nicked to keep the turns of wire spaced properly. For 6-volt motors, No. 22 Nichrome wire is suitable, while No. 30 should be used for 110-volt motors. Amount of wire needed will have to be determined by experiment, as the resistance varies with different motors. Start with plenty of wire and gradually cut it down to get the desired resistance.



The Latest in

METAL FURNITURE

PART II—OCCASIONAL TABLE IN BLACK AND ALUMINUM

By W. T. Warde

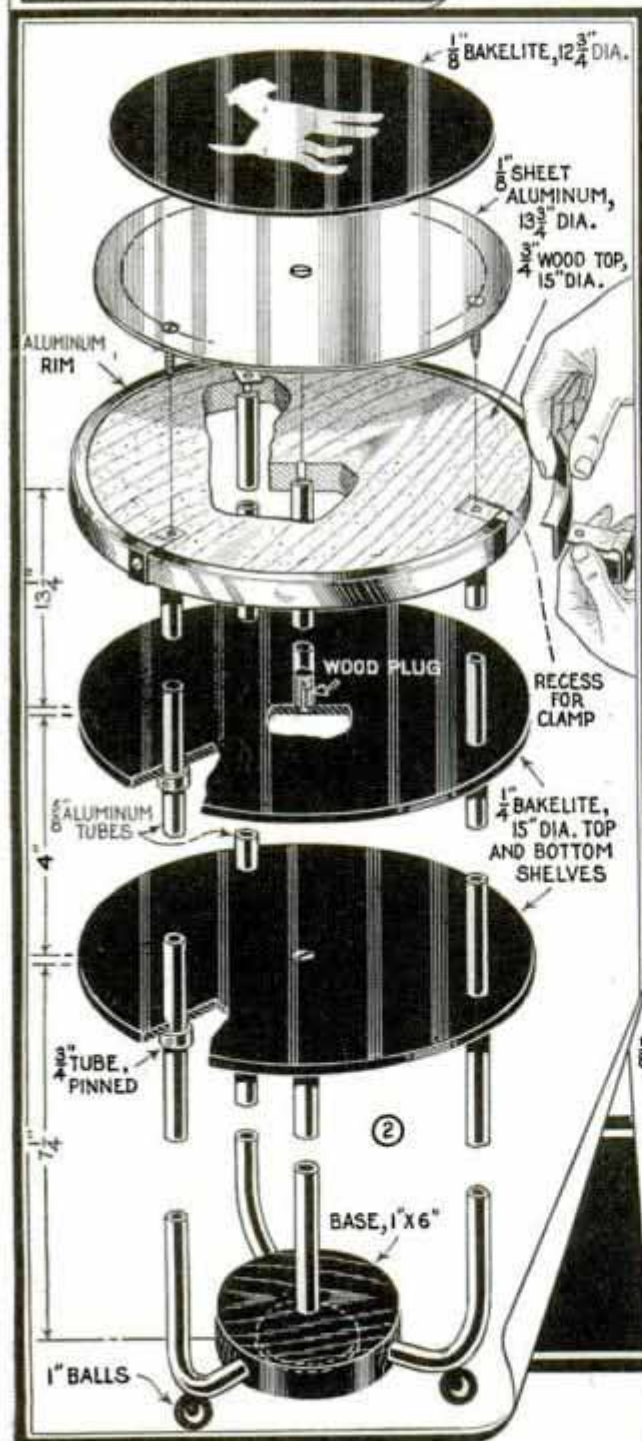
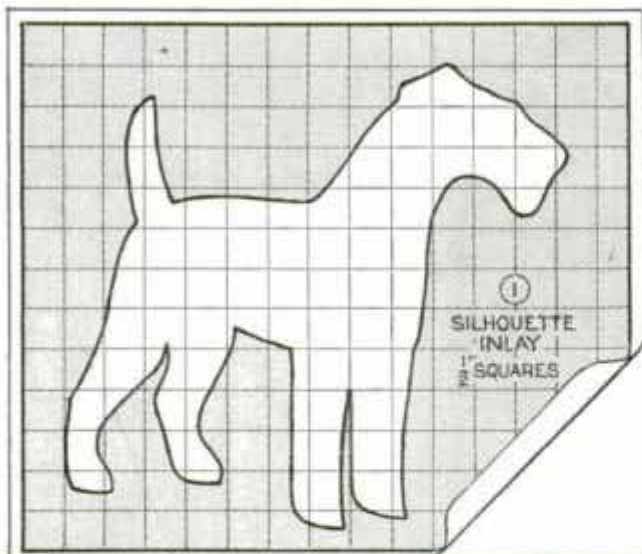
THIS occasional table reflects the recent trend of the modern to simple lines and subdued color contrasts. Your choice of materials can be aluminum, wood and Bakelite, or, for the Bakelite you can substitute Micarta, the new resin plastics, or ordinary plywood, which can be finished to resemble Bakelite closely. By this substitution you can lower the first cost considerably.

A two-tone inlaid top, two shelves of Bakelite and a hardwood base come first. Figs. 2 and 3 picture the top, shelves and base. The wooden top

disk and the base, recessed for a lead weight, are easy turning jobs. The circular Bakelite and aluminum disks can be sawed to the rough size and finished with a sanding disk. While the wooden parts are still in the lathe, lines are scribed to give the location of the holes as indicated in Figs. 2, 3 and 5. Then you finish the base and the top disk with two coats of black enamel, rubbing the last coat to a dull gloss with pumice and rottenstone. The inlay, Figs. 1 and 2, is easy. First, you cut out the silhouette from $\frac{1}{8}$ -in. flat alumi-



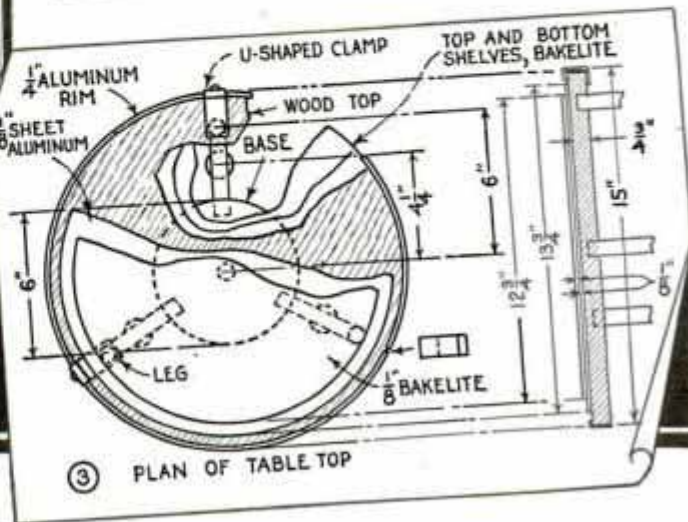
Bakelite Co



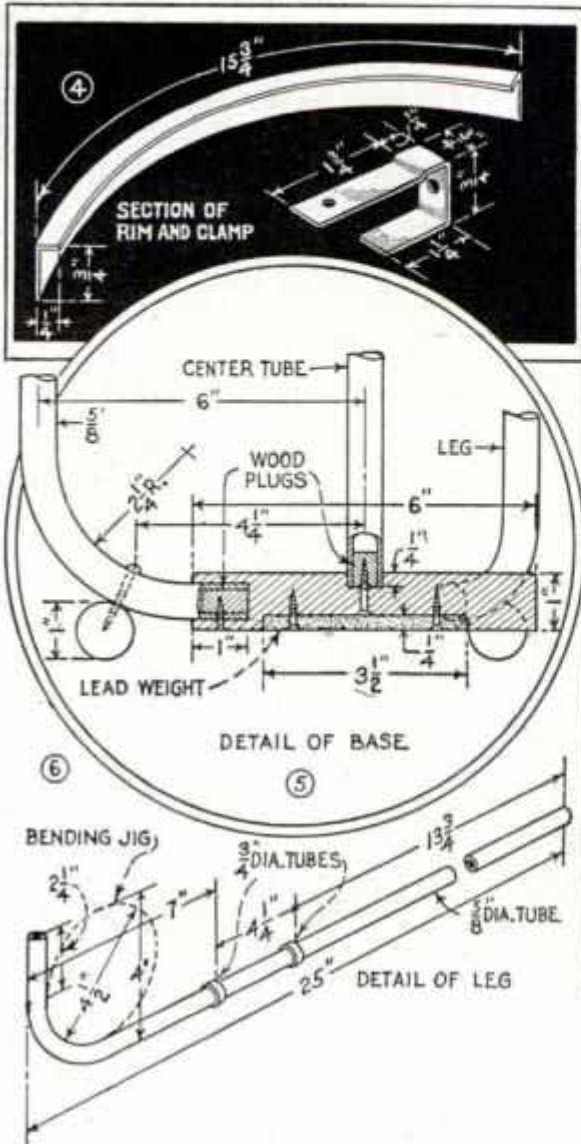
num. Lay it over the Bakelite disk, carefully scribe the outline, and saw out the waste. Then file to an exact fit.

Now the legs: For these you will need three pieces of 5/8-in. aluminum tubing with 1/16-in. wall. Each piece is 48 in. long. The bending jig to be used here is the same as that described in the previous installment of this series. The tubes are first filled with clean, damp sand, and the ends plugged with a 1/2 by 2-in. length of dowel. Next, each leg is to be fitted with two collars cut from 3/4-in. aluminum tubing. However, only the lower collar can be put on the leg at the present time. Fig. 6 shows the location of the two collars which serve as supports for the shelves as you will see from Fig. 2. The metal rim about the wooden top disk, Fig. 2, consists

- MATERIAL LIST**
- 1 piece 1 x 8 x 8-in. birch
 - 1 piece 3/4 x 18 x 18-in. birch
 - 2 pieces 3/4 x 16 x 16-in. Bakelite
 - 1 piece 1/8 x 15 x 15-in. aluminum
 - 1 piece 1/8 x 14 x 14-in. Bakelite
 - 4 1-in. diameter button molds or ball feet
 - 1 12-ft. length half-hard 5/8-in. aluminum tubing, No. 16 ga.
 - 1 6-ft. length half-hard 5/8-in. aluminum tubing, No. 16 ga.
 - 1 6-in. length half-hard 3/4-in. aluminum tubing, No. 16 ga.
 - 3 1-in. strips half-hard aluminum sheet 20 in. long, No. 20 ga.
 - 1 piece 8-in. square half-hard aluminum sheet, 1/8 in. thick
 - 1 piece hardwood dowel 24 in. long
 - 2 lbs. pig lead
 - 3 duralumin wood screws, round head, 5/8 in. long
 - 6 duralumin wood screws, flat head, 1 1/4 in. long
 - 6 duralumin wood screws, flat head, 1 1/2 in. long
 - 6 aluminum rivets 1 in. long

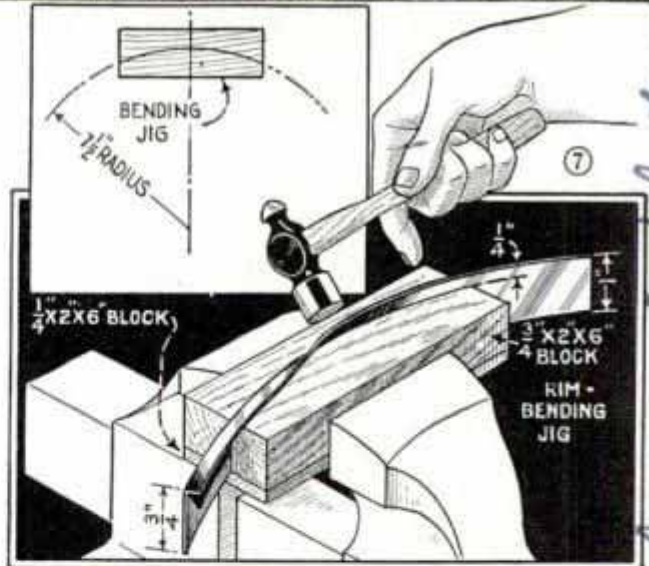


Handwritten notes:
 8. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



of three segments cut from 1-in. strips of No. 20-ga. aluminum. One edge is bent at right angles as in Figs. 4 and 7. From this same material make three clamps as in Fig. 4, and you're ready to assemble.

To begin, you press the curved ends of the legs into the base and fasten with screws as in Fig. 5. Then drill holes for screws in the curved section of the tubing as in Fig. 5, the screws holding the ball feet. Now you set up the center tube and slide the lower shelf down over the legs until it rests on the collars. Then drive a single screw through the shelf into the plugged end of the center tube. Next come the upper collars, and on top of these, the upper shelf with the second section of the center tube screwed in place. Follow with the top, the assembly of which is clearly shown in Fig. 2. Screws hold the aluminum overlay, but the top overlay must be fastened to the aluminum disk with liquid solder. Clamp the parts together until the solder sets.



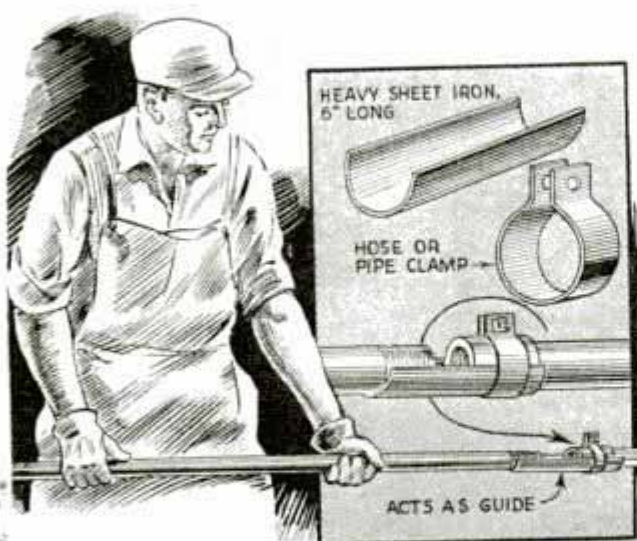
A mold for the lead base weight can be made by recessing a block of wood, the recess to be 1/4 in. deep and 4 in. in diameter. After you pour the lead, remove the casting and drill two or three holes near the outer edge, then fit into the recessed base and fasten with screws.

Now to finish, you will need to do some smoothing up with a file and fine emery cloth. After this, all that remains is polishing the metal with a good metal polish.

chromium plated can be used

*Aluminum screws
Steel Sales Corp., 129 S. Jefferson*

Lengths of Pipe Joined Single-Handed When Using This Guide

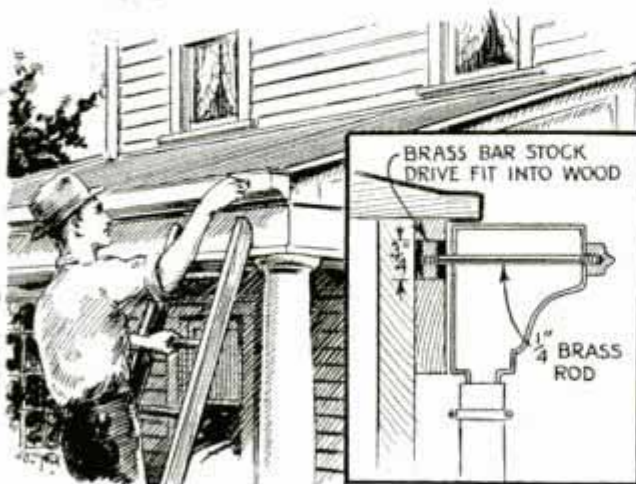


It's No Trick to Join Long Pieces of Pipe if a Guide Is Clamped to the End of One Piece

When joining two long pieces of pipe single-handed, this guide will make the job easy. Simply clamp a piece of heavy sheet metal around the coupling at the end of one pipe, allowing it to project to guide the threaded end of the other pipe.

Eave Troughs Bolted to Building Are Removable for Painting

Most eave troughs are painted only where exposed to view, and the inaccessible parts are left to rust. By installing them so that they will be removable without involving much work, their entire surfaces can be painted periodically, with the result that the life of the troughs will be prolonged for years. A good method of making eave troughs removable is to bolt



If Eave Troughs Are Bolted to Building They Can Be Removed to Paint Parts Usually Inaccessible

them in place as shown in the detail. Holes $\frac{3}{4}$ in. in diameter are drilled at regular intervals in the side of the house and then plugged tightly with short pieces of brass, which have been drilled and tapped to take brass rods. These are threaded at the ends and are inserted through the troughs. Nuts on the other ends hold the troughs firmly in place.

Pickling-Jar Compressor Is Adjustable

In pickling meats at home, it is essential to keep them submerged in a brine solution. This is usually done by placing a board over the contents of the jar and weighting it down with a stone, which is rather unhandy, especially when portions of the contents are to be removed occasionally. A better method is to attach a wire bail under the rim of the jar and use a notched stick for the compressor as shown. By placing the lower end of



the stick against the board and pressing it down, the bail is made to engage one of the notches to hold the meat submerged.

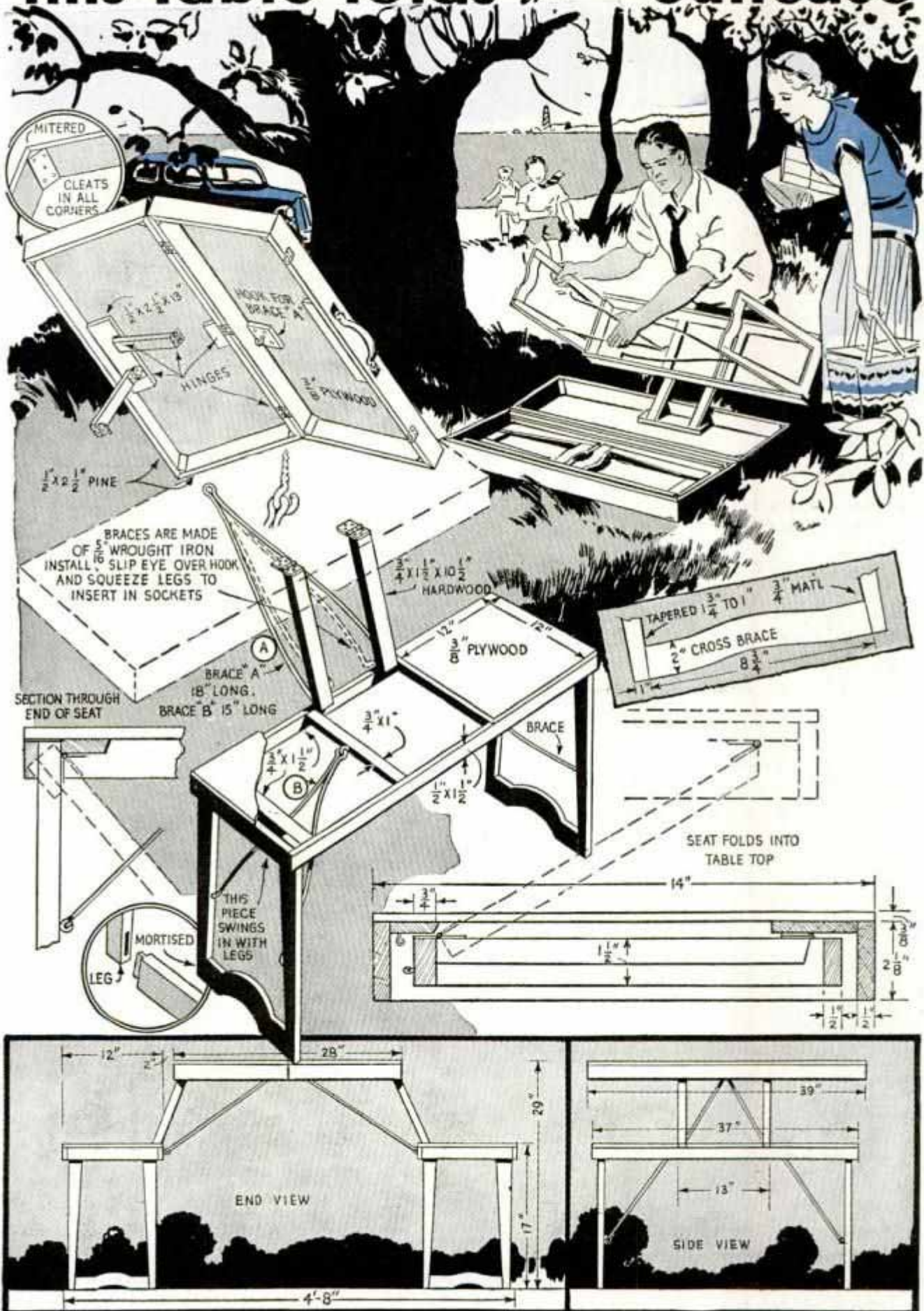
Motor Speed Reduced with Hand Grinder

For obtaining slow motion in animated window displays, for coil winding or for any other purpose where a speed-reduction unit is needed, a hand grinder will often do the trick. Of

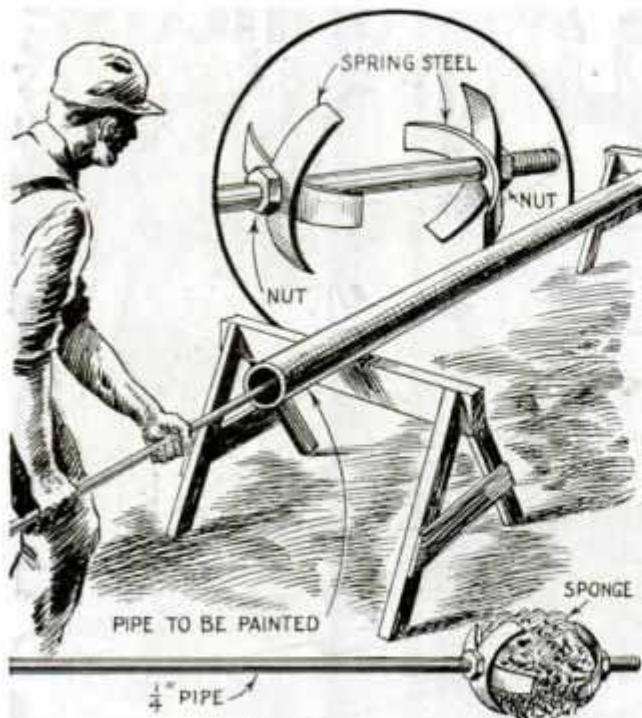


course, it must be remembered that a grinder should be used only for light work of this kind. Belt the motor to the emery stone and substitute a pulley of the desired size for the grinder handle. When winding coils the spool on which the coil is to be wound may be fastened to the handle shaft.

This Table Folds into a Suitcase



Large Pipe Is Painted on Inside Surface with Sponge Swab



Sponge, Compressed between Spring Holders on Small Pipe, Fits Snugly inside Large Pipe

On a job where the inside surfaces of a number of 2-in. pipes were to be painted, a swab of the type shown was rigged up to do the work quickly. A length of $\frac{1}{4}$ -in. pipe was threaded back several inches from one end, after which two nuts and four pieces of spring steel were assembled on it to hold a sponge as shown. In use, the sponge end of the tool is dipped in the paint and then pushed back and forth through the pipe to leave an even coat on the inside.

Correct Developing Time Is Checked Against Sample Negative



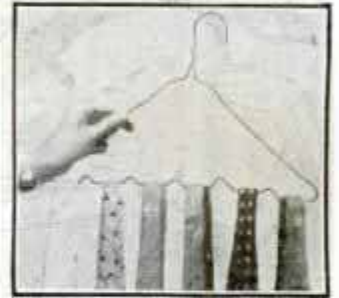
with a good grade of white enamel, which has been mixed with an equal amount of thinner. Then fasten the sample over one side of a ruby lamp with adhesive tape.

Difficulty of knowing when to remove a negative from the developer is overcome easily by using a sample negative of correct density and contrast. Coat the back of the sample evenly

By holding a negative that is being developed in front of the other half of the lamp, you can judge if it has the correct density.

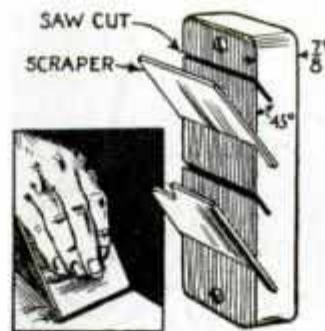
Neckties Held on Crimped Coat Hanger

By crimping a wire coat hanger, you have a holder that will keep your neckties in neat order. The wire can be crimped easily with a pair of pliers, the raised portions of the crimped wire keeping the ties separated.



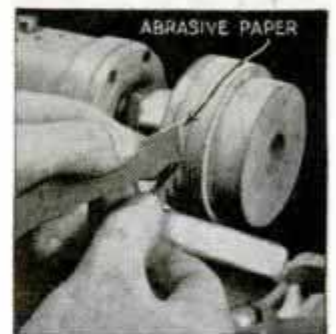
Steel Scrapers Protected against Nicking

A block of wood, having several saw cuts as shown, makes a good holder in which to keep your steel scrapers to avoid nicking them, which often happens when they are kept with other tools. The holder should be screwed to a wall within convenient reach from the workbench.—Edward J. Hartel, Jamaica Plains, Mass.



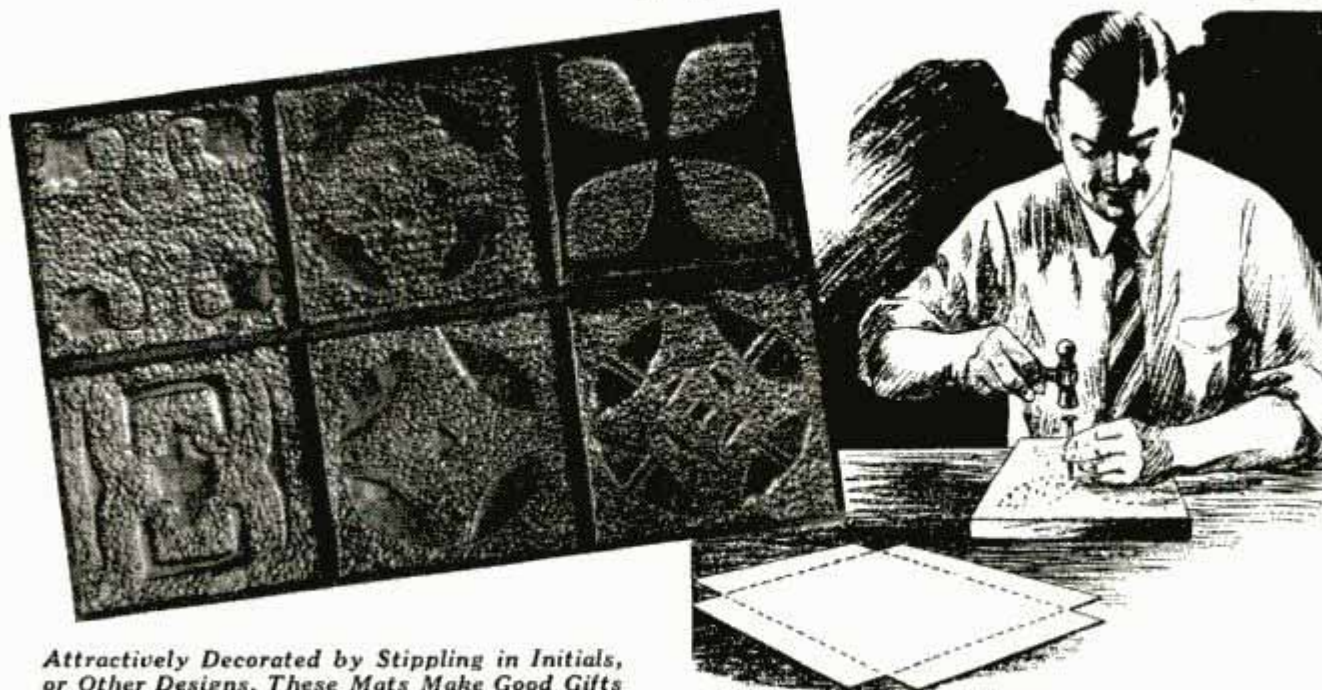
Sharpening Glass Cutter on a Lathe

Glass cutters need not be discarded because the cutting wheels have become dulled as they can be sharpened on a lathe or drill press. Turn a wood disk or short cylinder and then, holding the glass cutter against the rotating disk as shown, press a piece of emery board against the cutting wheel at the proper angle to give it a new edge.



☐ When the draft on a boiler or furnace door sticks, lubricate it with powdered graphite rather than oil, which burns off.

Hot-Dish Mats of Stippled Tin Are Lasting



Attractively Decorated by Stippling in Initials, or Other Designs, These Mats Make Good Gifts

These mats, made of tin backed with $\frac{3}{4}$ -in. wood blocks, preferably plywood, have an advantage over the usual types in that they are practically indestructible and can be made in unlimited designs. Use soft tin of medium weight and cut it to the size desired, allowing enough overlap at the edges to bend down over the sides of the block. First shape the tin over a block of the same size as the backing block to be used. Then, with a hammer

and a large nail, stipple in the design. To simplify this work, first trace the design on a piece of paper and cement the latter to the tin. Then you can stipple right through the paper, thus avoiding errors. After the stippling job is done, remove the tin to the backing block and tack it to the sides with small brads. To protect finished surfaces, cover the bottom of the mat with felt, using glue or rubber cement as an adhesive.

Roll Film Is Developed in Regular Tank with This Holder

Wrapped spirally around two film holders, roll film can be developed in a regular tank. The holders are bound together tightly with cord so that the layers of film will not touch each other. Also, take care in wrapping so that the turns do not overlap. Regular metal clips may be used to fasten the ends of the roll to the holders. —Fred G. Korth, Chicago.

Wallpaper Patches Made Unnoticeable

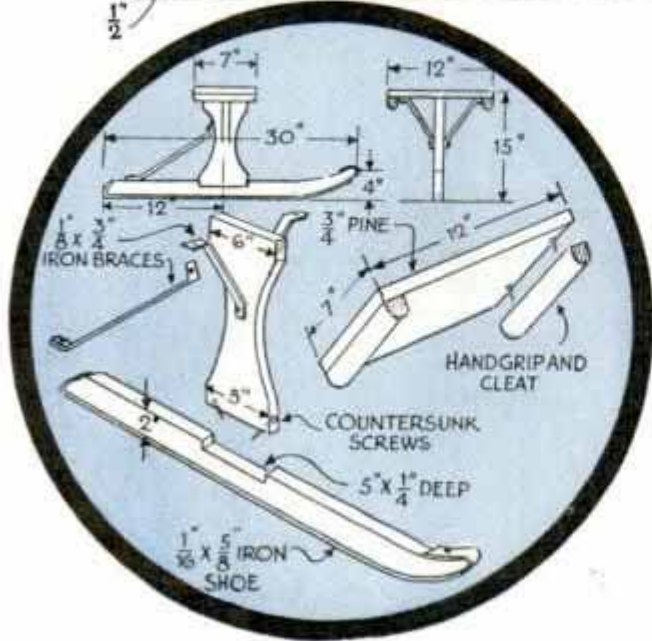
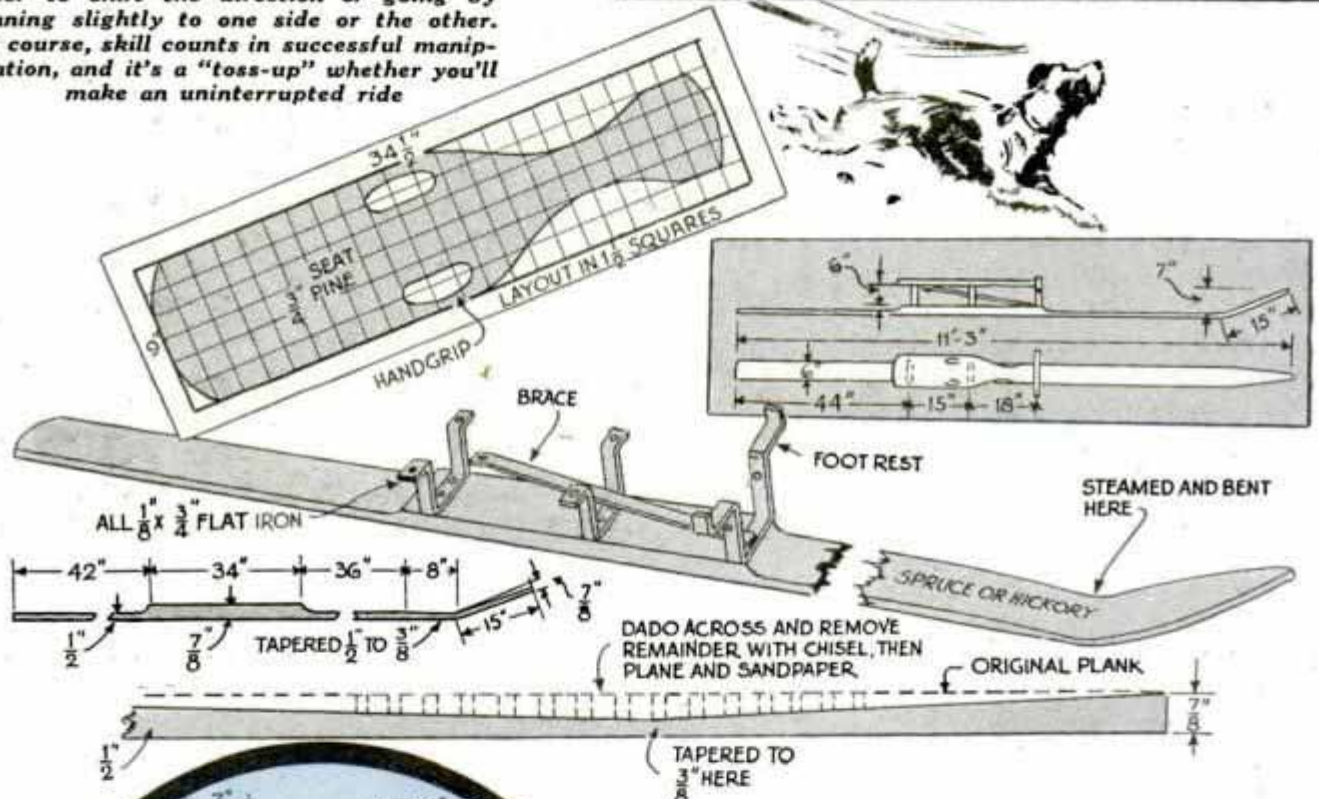
When repairing wallpaper, use a patch which has first been placed in the sun and faded to the approximate shade of the old paper. Do not use a square rectangular piece, but tear it so that the edges will be irregular. By matching the designs on the paper and using this method of applying the patch it is scarcely noticeable.





This page pictures two adaptations of the ski idea, both for "solo flights." Neither has a steering device, it being left to the rider to shift the direction of going by leaning slightly to one side or the other. Of course, skill counts in successful manipulation, and it's a "toss-up" whether you'll make an uninterrupted ride

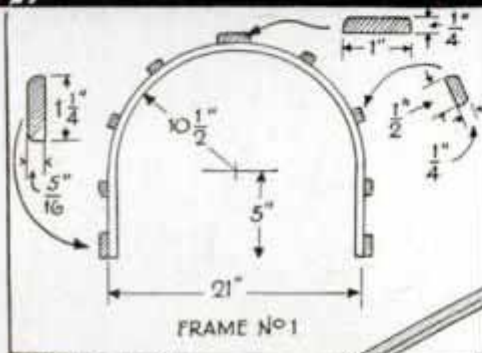
What to Build



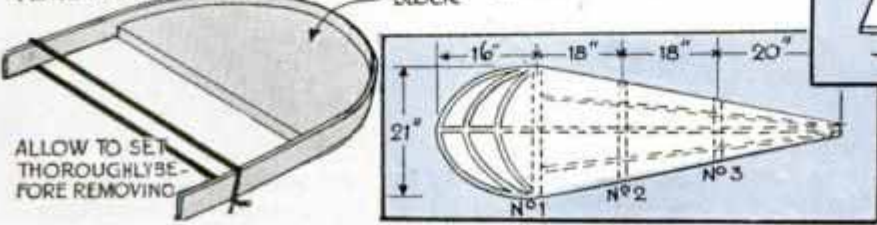
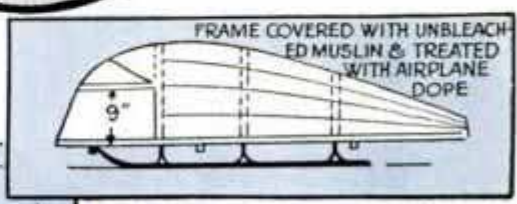
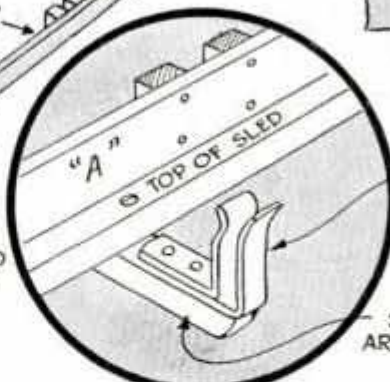
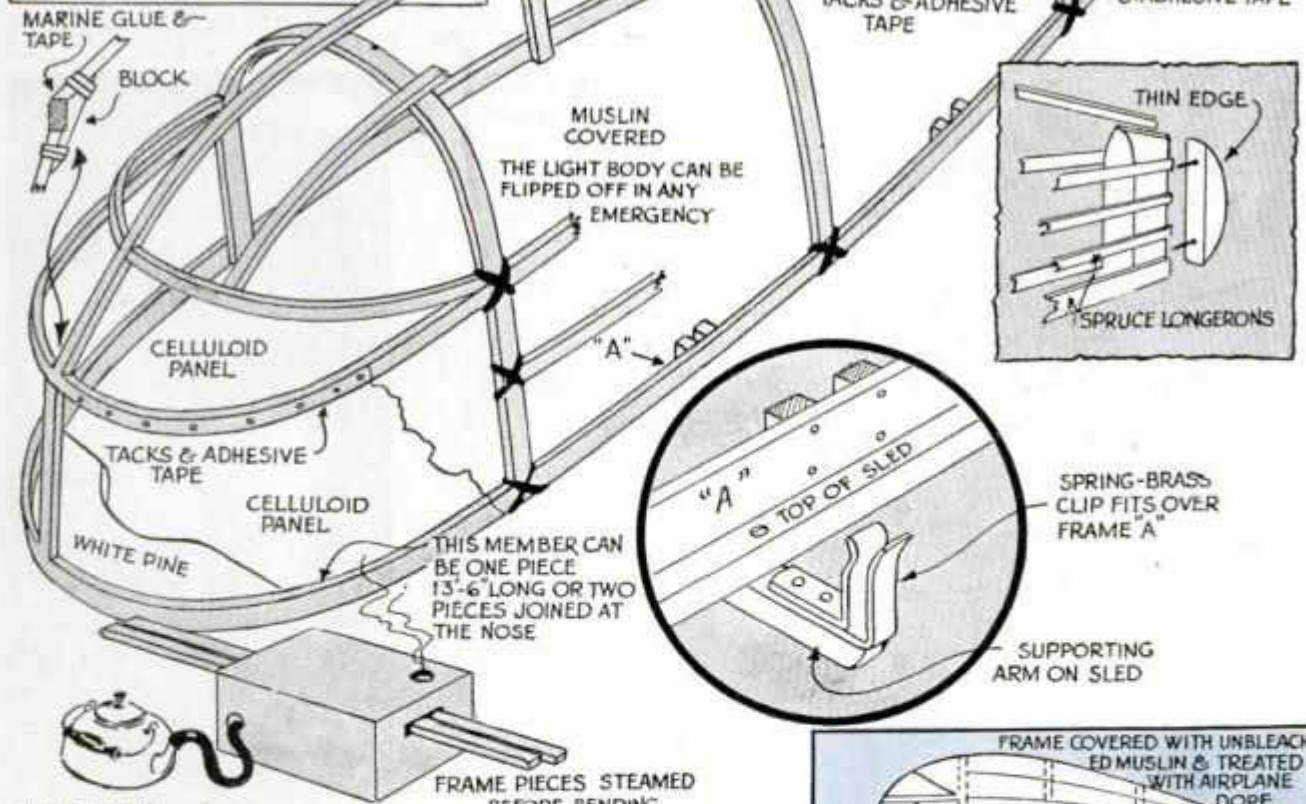
INSTEAD of a ski on each foot, which most beginners find rather hard to manage, here is a single ski upon which the rider sits comfortably. It is especially intended for use on soft snow. Handholes in the low seat, and a couple of footrests, help the rider to maintain balance. Direction of movement is influenced by leaning toward either side. A variation of this idea is the single-runner scooter, shown in the two circles. The runner is short and has an iron shoe, for use on hard-packed snow or ice. The high seat, which has handgrips underneath, requires greater dexterity in balancing this than the ski.



for WINTER SPORTS



Full Vision Ahead in This Streamline Sled! The Muslin or Canvas-Covered Top Is Shrunk "Drum Tight" with Wing Dope

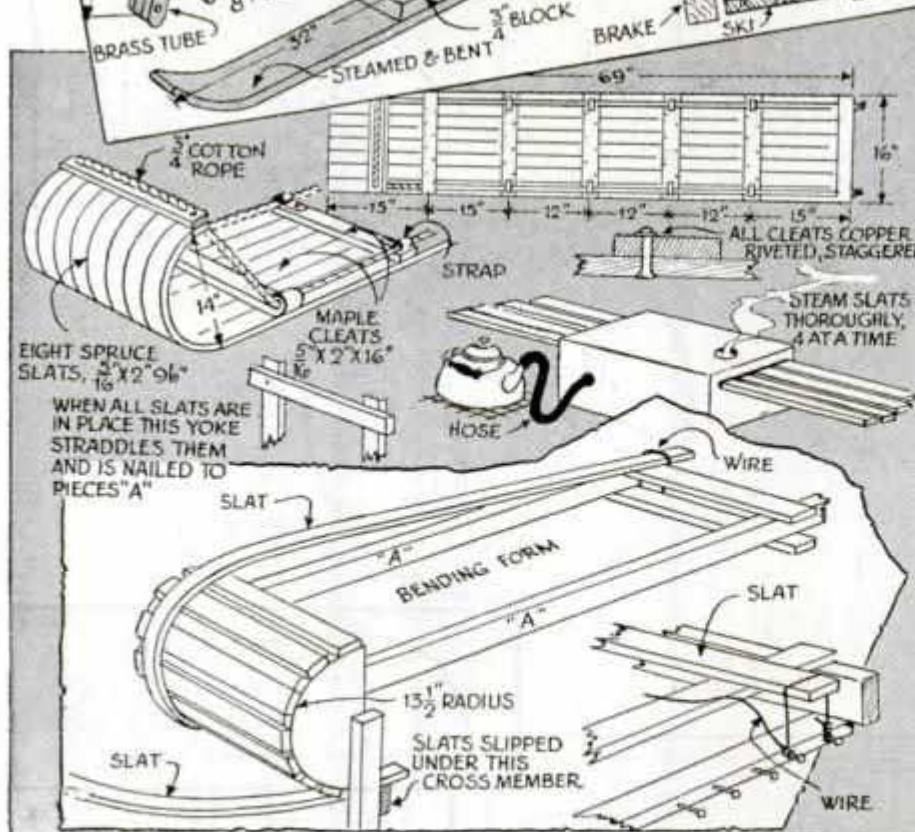
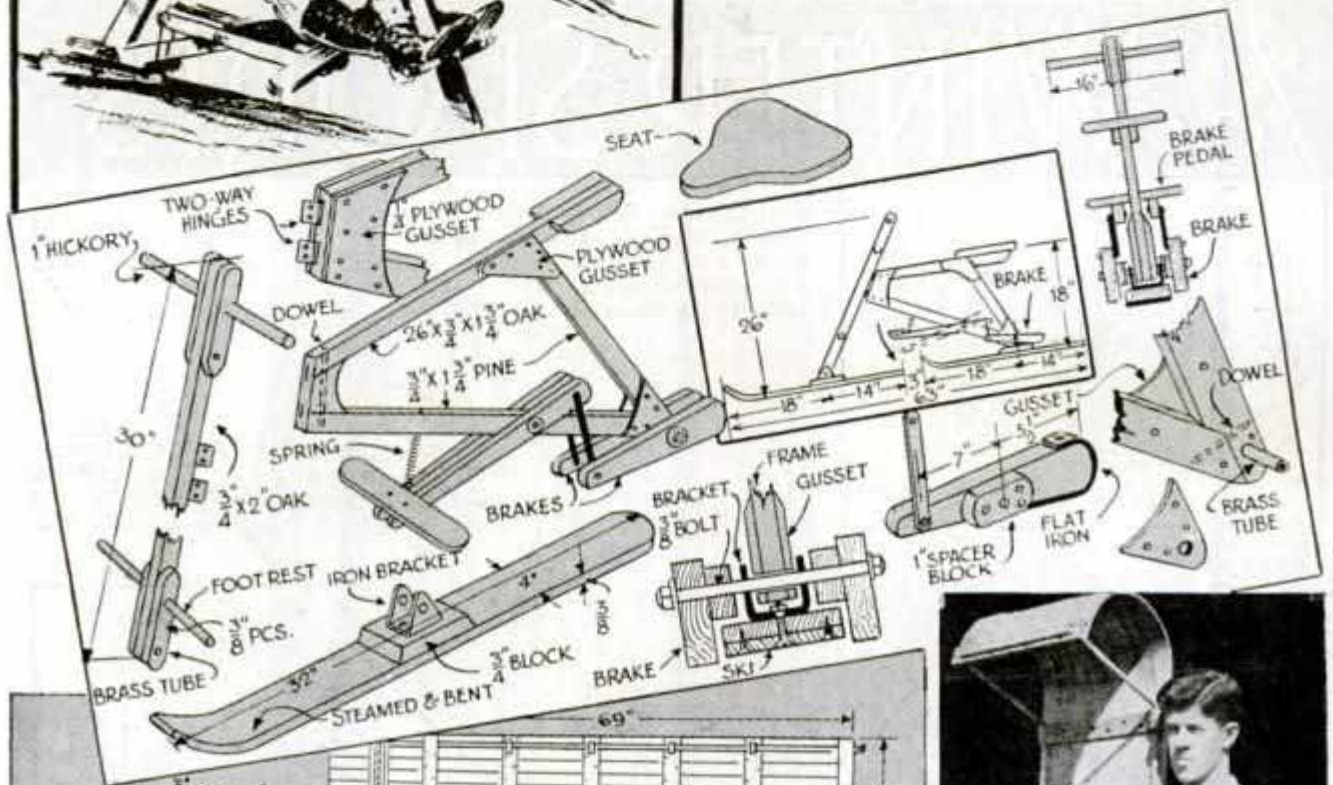


The Light Top Can Be Flipped Off Instantly from the Spring-Brass Clips That Hold It in Place or You May Find It Handy to Hinge One Side

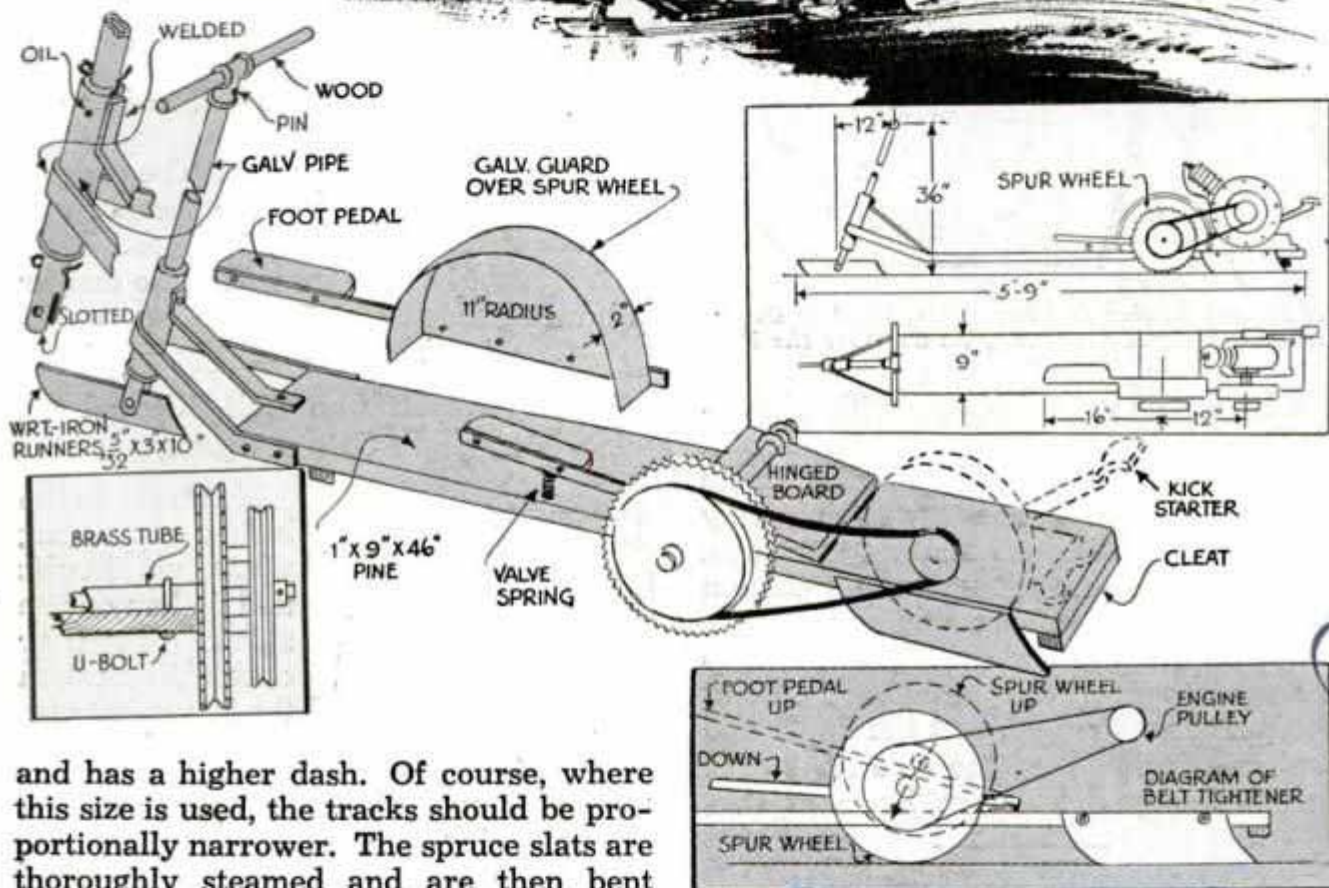


This "bi-skee" is especially designed for use as a winter coasting bicycle. It is made of white pine with the exception of bearing brackets, hinges and a few fittings. Dowels and plywood gussets reinforce all joints, waterproof casein glue being used wherever possible. The brake pedal takes the place of the usual bicycle foot crank.

The toboggan appears much like the conventional design, but it is narrower



Above, "Bi-Skee" gives you a fast "bicycle ride" down a snow-covered hill. Too much speed, however, may call for the application of brakes that are foot-controlled. Below, for most purposes of tobogganing, this 6-ft. job will be just the thing. The curved front is uniformly bent on the form shown



and has a higher dash. Of course, where this size is used, the tracks should be proportionally narrower. The spruce slats are thoroughly steamed and are then bent over the form, being held down at the other end with wire. When the slats have all been bent, they are straddled with a yoke so they will lie flat. After drying for 48 hrs. in dry weather, the slats are removed and assembled to maple cleats by copper-riveting. When the job is finished apply several coats of shellac, rubbing each with steel wool when dry. The finish coat is sanded and waxed.

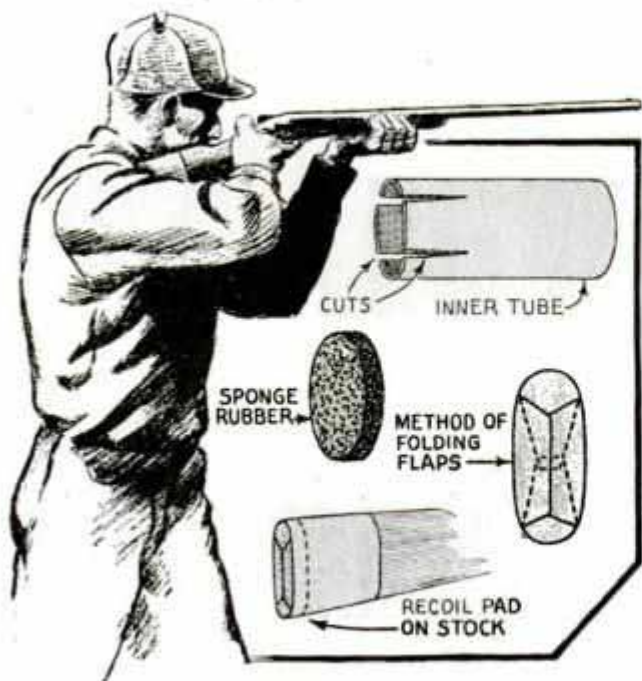
The motor-driven scooter has wrought-iron runners, a single one at the front which is used for steering, and two at the rear. The spur wheel is covered with a guard and is driven by the belt only when the foot pedal is depressed. Motor-control lines should be handy on the steering bar and a foot brake should be provided.

Motor-Driven Scooter Is the Outstanding Number in the Winter Ice Carnival; You Can Obtain Small Gas Engines for This Purpose

Johnson Motor Co. Waukegan Ill.

Jacobson Mfg. Co., Racine, Wis.

"Kick" Taken Out of Gun with Recoil Pad of Sponge Rubber



If Sponge Rubber Is Unavailable, Wool or Other Non-Wadding Material May Be Used for the Pad

Why bruise your shoulder with a heavily loaded shotgun when you can make a recoil pad for a few cents? Cut off a length of inner tube, of a size to stretch tightly over the stock, and slit one end as shown. Slip the tube over the stock and place a piece of sponge-rubber pad against the butt plate. The pad should be trimmed to the same shape as the plate. Then cement the tube over the pad, first the upper and lower flaps and then the side flaps over them.—George J. Thiessen, Fremont, O.

Marbleizing Cardboard for Sign Work

Amateur show-card writers, who have admired the vari-colored marble effects on cards displayed in store windows, will be surprised to learn that the production of such background designs is extremely simple. A deep pan is filled with water and several drops of different oil colors are added. As the oil rises to the surface, the water is stirred and the card immersed in it, edgewise. When lifted, the oil colors



As the oil rises to the surface, the water is stirred and the card immersed in it, edgewise. When lifted, the oil colors

adhere to the card in beautiful mottled or marble designs. This idea is also adaptable to bordering your stationery by simply dipping the edges of each sheet into the water in the same way.

"Hot-Bottle" Cup Held with Paper Handle

Grasping a hot cup of coffee from an insulated bottle in your bare hands isn't much fun, but you can manipulate it easily with a strip of paper, folded over several times and



then slipped around the cup. The ends of the improvised handle serve the purpose of an "ear" and, as paper is a good insulator against heat, there will be no danger of burning the fingers.

Noisy Washtub on Wall Silenced by Tight Grip of Spring



If you are in the habit of hanging your washtubs and boilers on the side of a porch or outbuilding, fasten the lower handles with coil springs as shown. This will keep the tubs from being blown down, and will also keep the wind

from swinging them against the building which is especially annoying at night.

Protecting Coils of Electric Heater

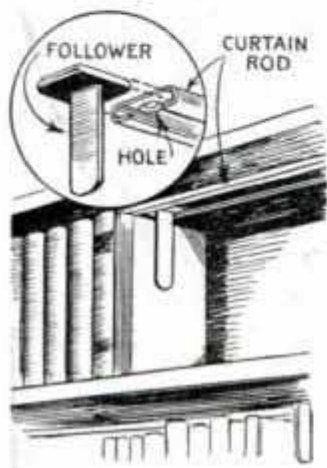
Spread over the exposed heating coils of an electric hot plate or stove, magnesium oxide powder protects the Nichrome wire against air, which soon oxidizes it and causes the coils to burn out



prematurely. Pack the powder firmly into the grooves of the coil holders and level it off with a straightedge. Heat from the coils soon fuses the powder to a solid mass.

Bookrest Slides in Curtain Rod

Nailed to the underside of a bookshelf top and fitted with a follower, the channeled part of a telescoping curtain rod will be effective in keeping books upright.

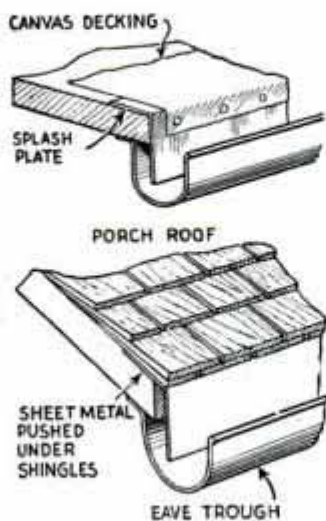


The follower is merely two strips of heavy sheet brass bent at right angles near the upper ends and soldered together to form a tee, a third strip being soldered across the top of the tee to strengthen the assembly. Or, if desired, you can use two pieces of

flat iron and weld them together. In use, pressure of the books against the follower causes the horizontal part to bind in the curtain rod and keep it from slipping. The follower is adjusted by relieving the pressure so that it can be moved.—Lester P. Young, Culver, Ind.

Eave Splash Plates Protect Your Home

Pushed under the shingles and then bent down into the eave troughs, a strip of sheet metal will keep water from being blown under the edge of the shingles where it may cause the wood to decay by keeping it damp for several days at a time. This idea also holds true on porches that are covered with a canvas decking as shown in the upper detail.—L. H. Georger, Buffalo, N. Y.



Outdoor Aviary Equipped with 'Vestibule' So Birds Won't Escape

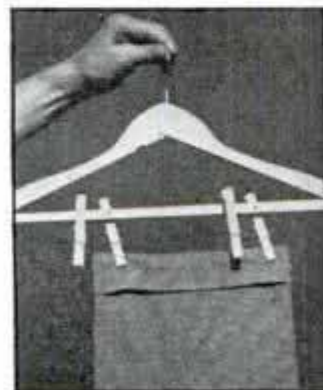


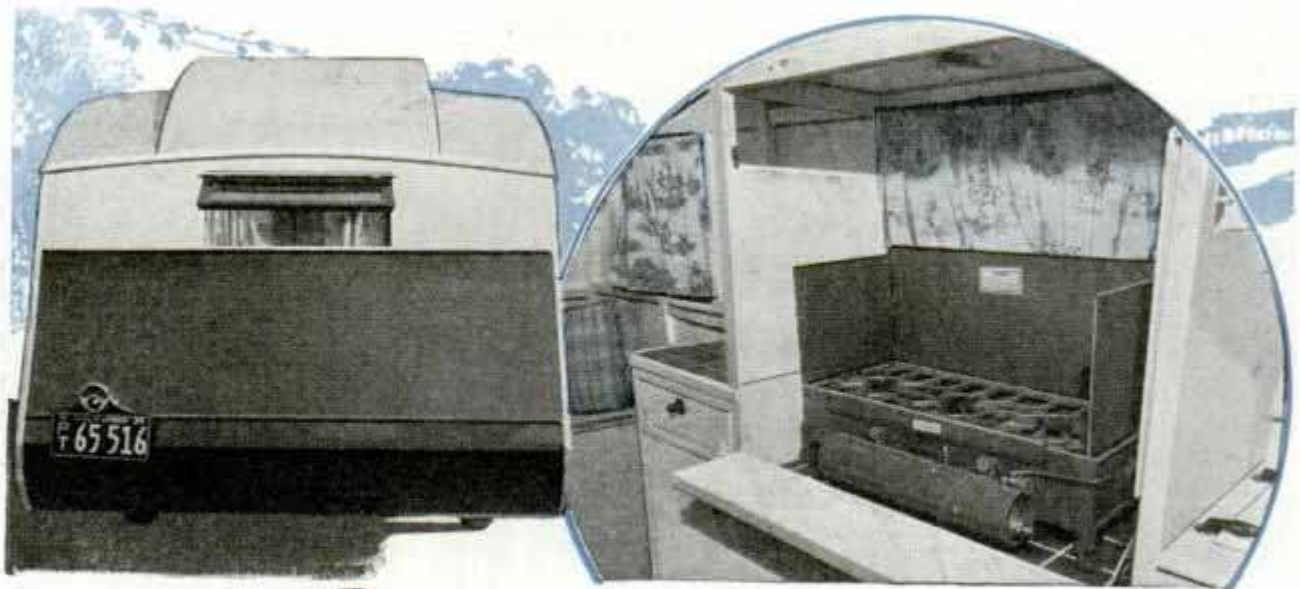
Both Doors Should Be Fitted with Coil Springs and Also with Hooks on the Inside

By building an entrance with two doors, the bird fancier can enter his aviary without any possibility of the birds getting away, because only one door is opened at a time. In case a bird does escape into the entrance, you can get it back into the aviary again before the outer door is opened.

Two Pairs of Trousers Hung on One Hanger with Spring Clothespins

Screwed to the crossarm of a wooden coat hanger, four spring-type clothespins enable you to suspend two pairs of trousers from the hanger so that either pair can be removed without disturbing the other. The clothespins are screwed in pairs to opposite sides of the crossarm, which then serves as a spacer between the trousers so they can be hung up or removed easily.—Bob Ruskauff, Long Beach, Calif.





At Home in this



Every Need for Touring Is Met in This Trailer; Cook-stove, Sink, Icebox, Clothes Closet and Other Equipment Are Conveniently Arranged and Adequate Cross Ventilation Is Provided by Numerous Screened Windows

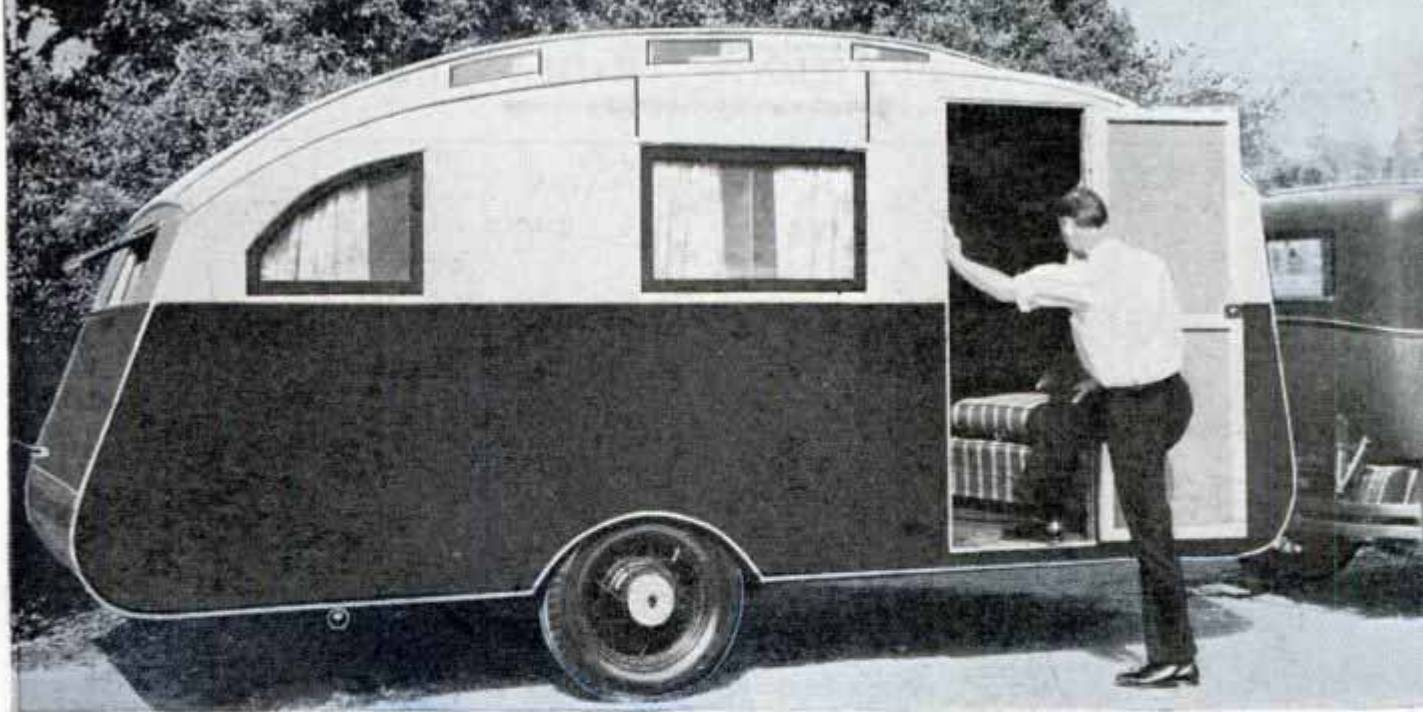
PART I—BUILDING THE CHASSIS

STYLED in the latest streamline, roomy, yet light and sturdy, this trailer affords you all the comforts of home. "Roadability" is assured by a clever arrangement of interior fittings to give an equal distribution of weight. An underslung axle of unique and original design maintains a low center of gravity and at the same time provides a spring seat as close to the wheel as possible. The tubular construction of the axle reduces the unsprung weight to the minimum.

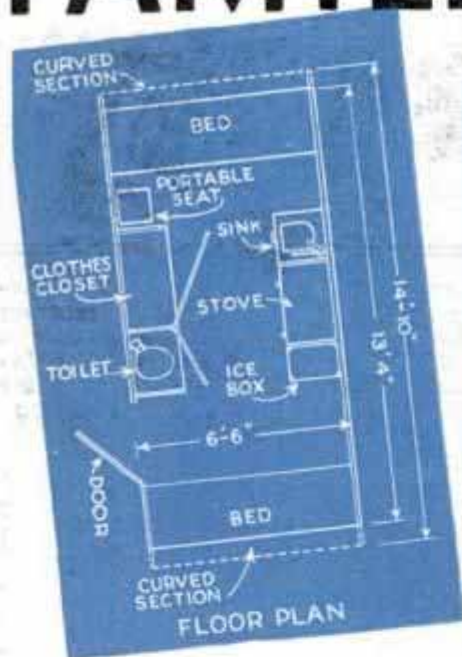
Construction begins with the sills. Fig. 1 gives you a perspective view of the under-frame assembled, and over in Figs. 4 and 5 you will find the essential dimensions.

The sills, A in Fig. 1, are of selected hard maple, $2\frac{1}{4}$ by 4 in. in cross section, and are joined by spruce cross members, B, $1\frac{1}{2}$ by $2\frac{1}{2}$ in. in section. All joints are mortised and secured with $\frac{5}{16}$ -in. carriage bolts. Before you begin work, notice from Fig. 4 that all the cross members, except the ends, are spaced on centers. A section of each sill between the third and fifth cross members is rabbeted to take the fender as shown in Fig. 1 and the detail at the left in Fig. 5. With this rabbet cut at the bench you can mortise the sills and cross members.

The care you use in mortising determines to a great extent the rigidity and



FAMILY TRAILER...

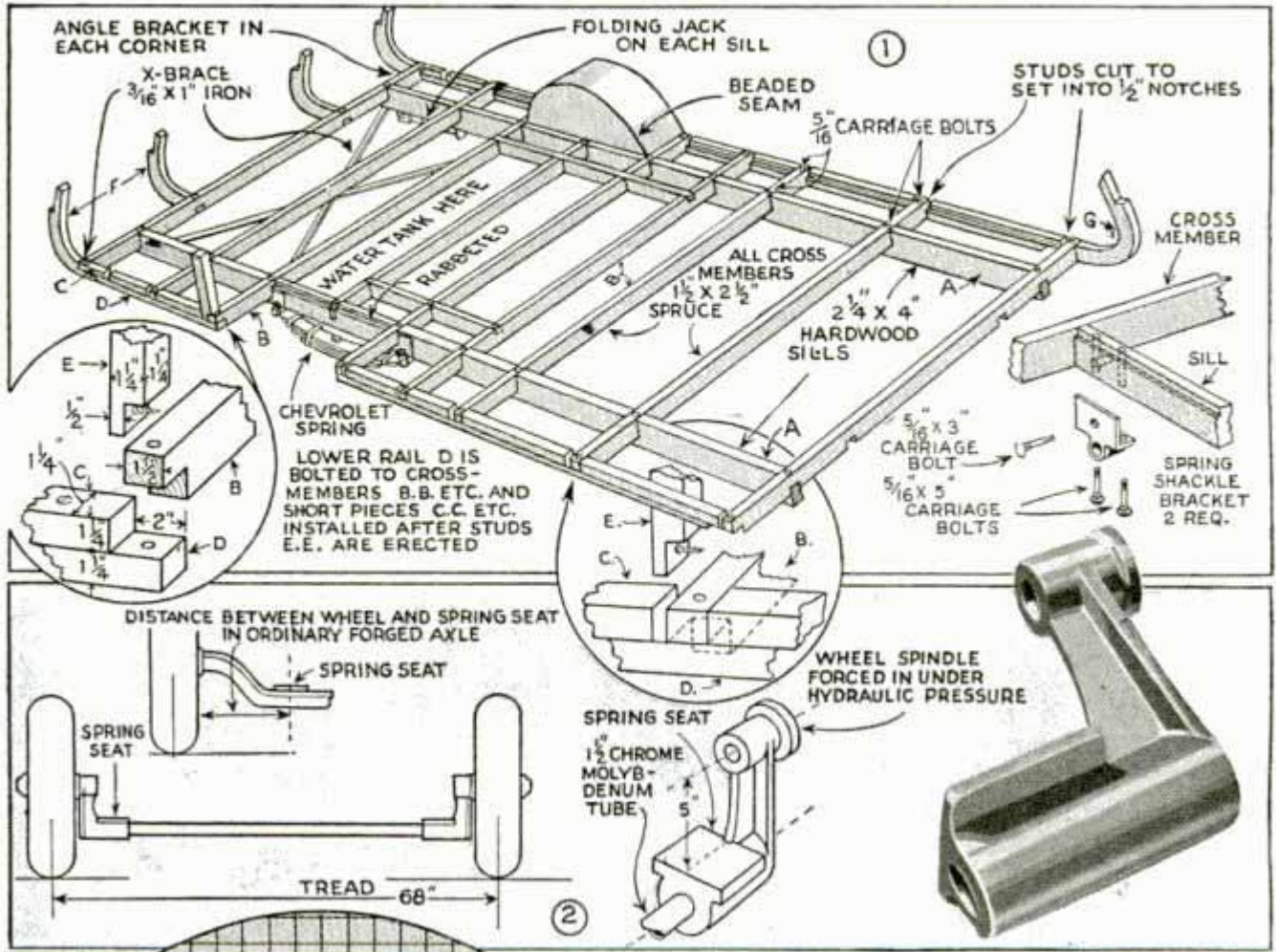


For Sleeping Quarters That Will Accommodate Four Persons, a Luxurious Studio Couch Is Placed at Each End; the Aluminum-Painted Top Reflects Heat, Keeping the Interior Cool; for Added Insulation, the Walls and Top May Be Made Double

strength of the frame. Accuracy in laying out the spacing and depth of the cuts and the use of a miter box in sawing down the shoulders of the mortises will assure a close fit. Scoring the depth of each mortise with a marking gauge will aid in chipping out the waste with a chisel, as the last few chips will break off at the scored line. Now you level two sawhorses on the floor and place the sills on these. Then with the cross members in place you can check the fit of all the joints and bore the $\frac{5}{16}$ -in. holes for the bolts. When you bore

these holes it will help to clamp the parts tightly together so that the bit goes through the two members as though they were one piece. Waterproof casein glue is used in all joints of the underframe. Now with this assembly set up and bolted together, be sure, before the glue sets, to check the frame at each corner with a square. If necessary, put clamps on the frame to hold it in the square position until the glue is dry.

Now you're ready for the lower rails, fenders, springs, and the curved end mem-

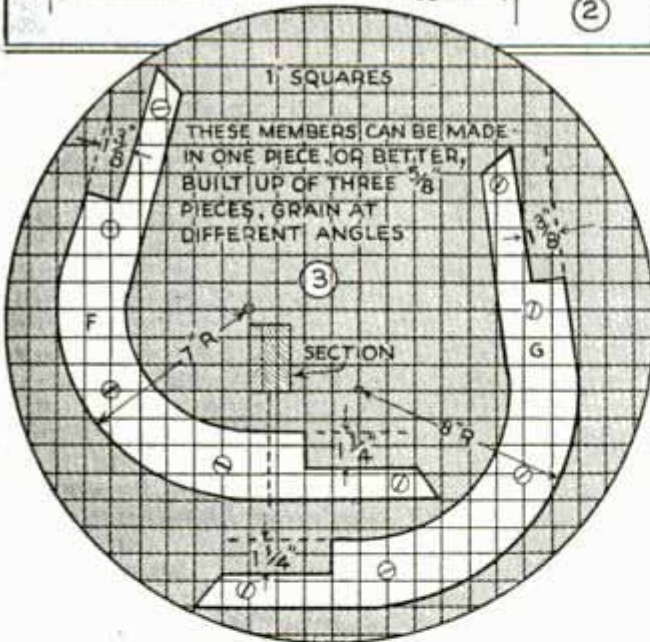


This Shows Exactly How the Underframe Is Assembled, Using Light Materials without Sacrificing Rigidity; an Underslung Tubular Axle Affords a Spring Mount Close to the Wheel and Reduces Unsprung Weight; Streamlining of the Body Begins with the Curved Frame Pieces, Detailed in Fig. 3

Those at the rear are cut on a shorter radius than those at the front. The lower detail in Fig. 5 shows how these curved pieces are bolted to the frame. You can, of course, make up the fenders yourself from heavy galvanized iron, but your tinsmith, with the equipment he will have at hand, can do a neater job in far less time and at a nominal cost. The fenders are cut on a 16-in. radius but not to a full semicircle, as they are only 14 in. deep and 10 in. wide. Chevrolet front springs are mounted on the sills as in Fig. 1, the shackle brackets being bolted to the sill as in the detail at the right. The bolts holding the shackle brackets should be a snug fit in the holes bored through the wood. It's a good idea to use lock washers on all bolts in the underframe.

Now that you've progressed to this stage you're ready to start with the axle. As shown in Fig. 2, this is a simple affair con-

bers. The cross members are halved at the ends to take the lower hardwood rails, which are 1 1/4 by 1 1/4 in. in section. These rails, part D in Fig. 1, are bolted to the cross members with 5/16-in. bolts. There are two longitudinal pieces halved into the cross members directly over the axle. These form an opening for the water tank. Fig. 3 shows what you will want to know about the curved end members, F and G.





sisting of two wheel-spindle brackets of electric steel joined with a chrome-molybdenum tube. You can buy the tube but it will probably be necessary to make the spindle brackets. The additional cost of this work will be money well spent, as this type of axle is so far superior to anything that can be improvised from standard auto parts. After you get your axle made up as suggested in Fig. 2, you make a trial fit on the springs, but do not attach the axle permanently to the frame as the latter must remain on the sawhorses until the upper structure is set up.

Two jobs remain to be done before you have the underframe complete. The first is making and installing the 14-gal. water tank, which is dimensioned in Fig. 6 and shown in position in Fig. 4. Once again, a tinsmith can save you a lot of time and

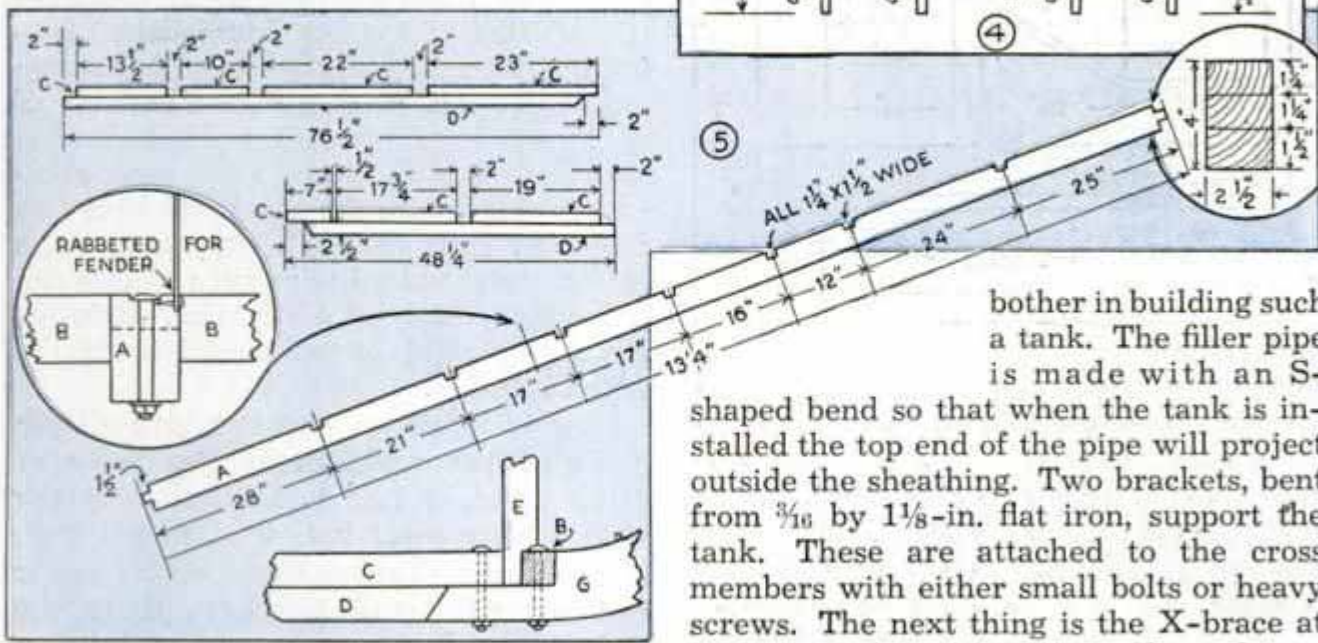
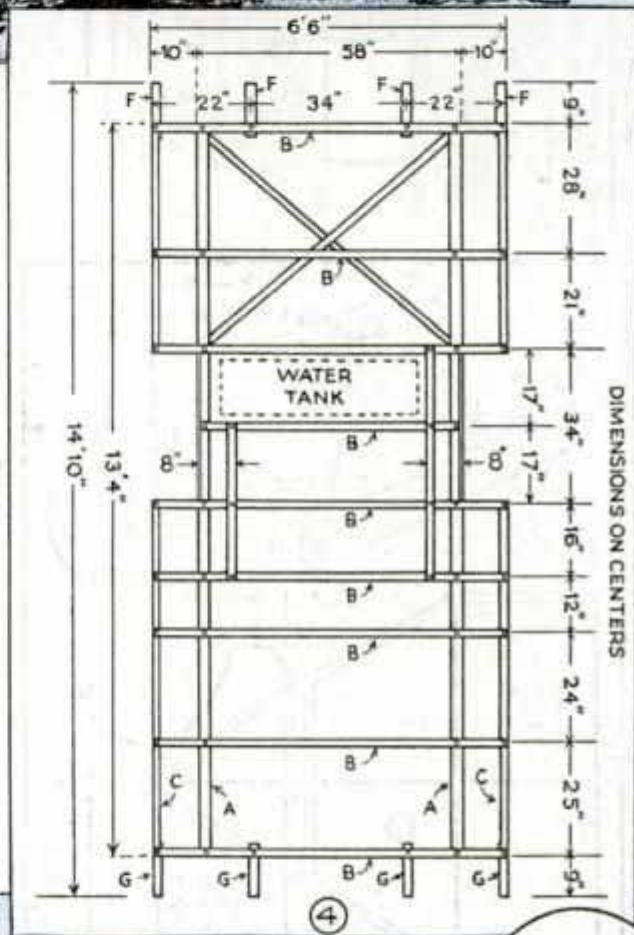
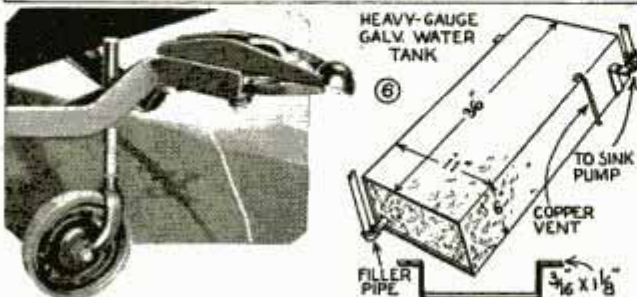
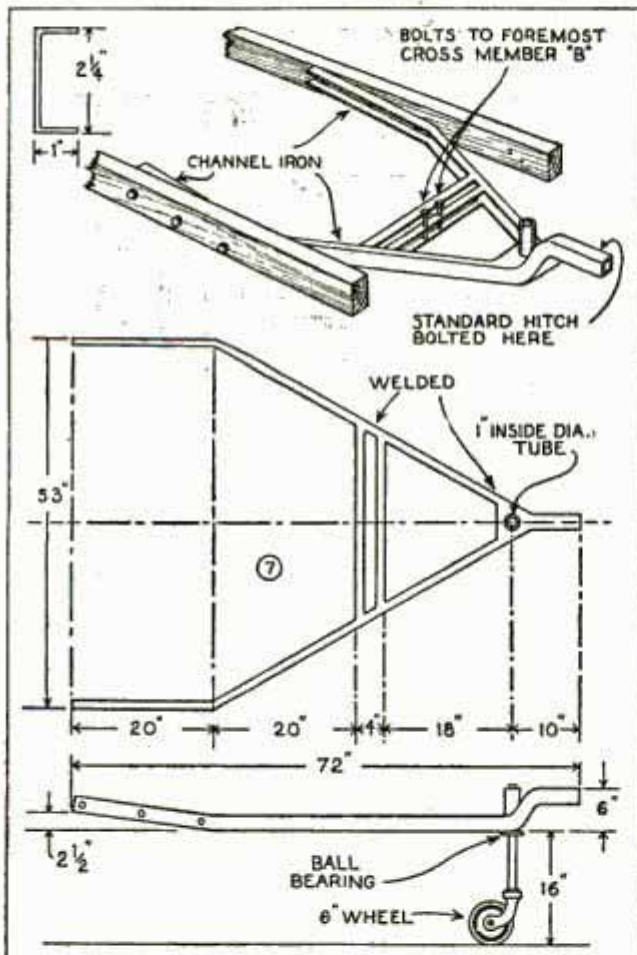
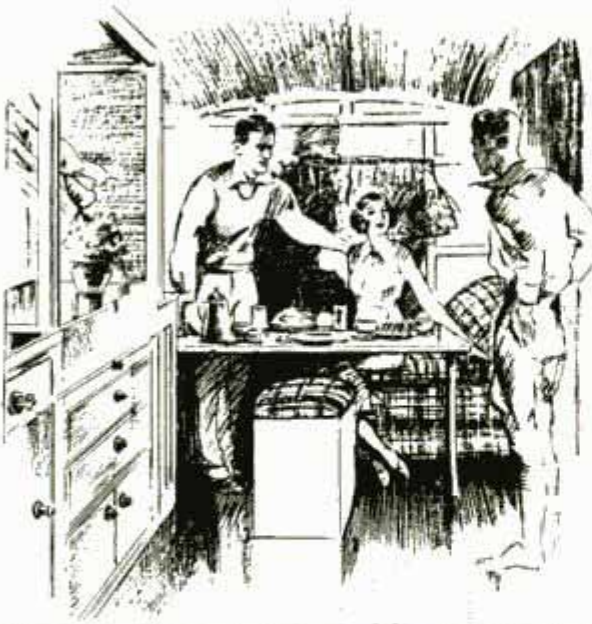


Fig. 4 Gives You a Dimensioned Plan of the Underframe Shown Assembled in Fig. 1, While Fig. 5 Details the Sills and Lower Rails

bother in building such a tank. The filler pipe is made with an S-shaped bend so that when the tank is installed the top end of the pipe will project outside the sheathing. Two brackets, bent from $\frac{3}{16}$ by $1\frac{1}{8}$ -in. flat iron, support the tank. These are attached to the cross members with either small bolts or heavy screws. The next thing is the X-brace at the rear, and the 1 by $2\frac{1}{4}$ -in. channel-iron A-frame, which carries the coupler and the caster wheel at the front. Details on



An A-Shaped Frame of Channel Iron Carries the Trailer Hitch and Caster Wheel; the Galvanized Tank Supplies Water to a Marine-Type Pump

the construction of the A-frame are given in Fig. 7, and the X-brace is shown installed in Figs. 1 and 4. The A-frame calls for a simple welding job and the fitting of a bushing to take the spindle of the caster wheel. The bushing can be made from a short length of tubing. The A-frame is not installed permanently at this time as it would interfere with the body sheathing.

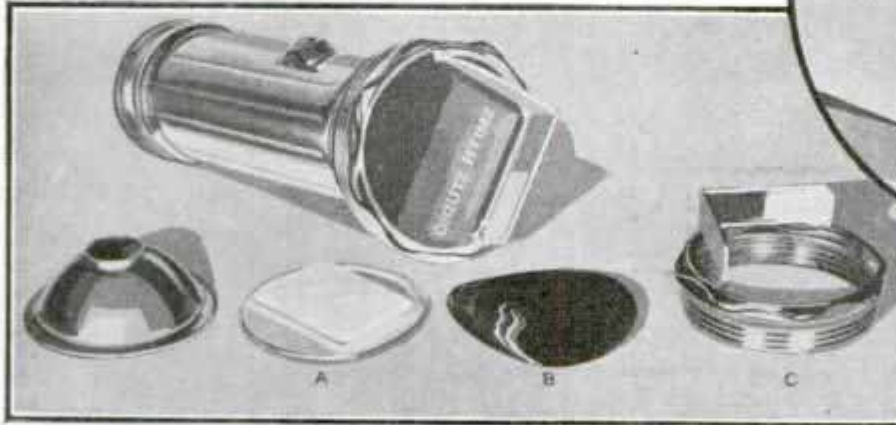
You will need two folding jacks to support the rear end of the trailer when it is parked. These are attached to the sills with a bracket as in Fig. 1; they serve to prevent tipping and ease the weight resting on the tires. Provide a reliable catch or hook so that the jacks will not drop down when you're on the road. You can also get out the filler pieces, C in Fig. 1. The position of these is shown in the enlarged detail at the left. These pieces are cut to fit but are not installed permanently until the studs, E, are erected. In connection with the fitting of these pieces, see the lower detail in Fig. 5, which shows the curved end member, G, bolted both to the cross member and the filler piece, C. This assembly is not completed until the studs are set up at the four corners, as the studs are glued and screwed to the cross members before the filler piece is put in place. When you cut these filler pieces be sure of the length. Properly cut and fitted, with the studs in place, they contribute greatly to the strength and rigidity of the whole structure. Just now is also a good time to check the frame over for slight inequalities which might cause trouble when laying the floor. A straightedge will show up any high spots on the cross members. If necessary, level up with a plane. To insure close fit of the studs, scrape away any excess glue where the cross members join the outer rails. For wheels you can use any of the standard wire auto wheels fitted with a 5:50 by 17-in. tire. Suitable bearings should be purchased to fit the wheel spindles.

Now to finish up, you can give all the parts of the underframe two coats of black paint, a primer first, then follow with a body coat. It is well, in painting, not to cover those sections of the lower rail where the studs join the rail and the end of the cross member, as glue is to be used in these joints.

(To be continued)

Name Is Printed on Photos with Flashlight

Preferable to stamping or writing, this flashlight name printer permanently marks your photos by exposing them at one corner before development, so that your name, initials or monogram will appear in black as a permanent part of the photo. Use a flashlight having a flat lens. Take it apart and solder a tin angle to the



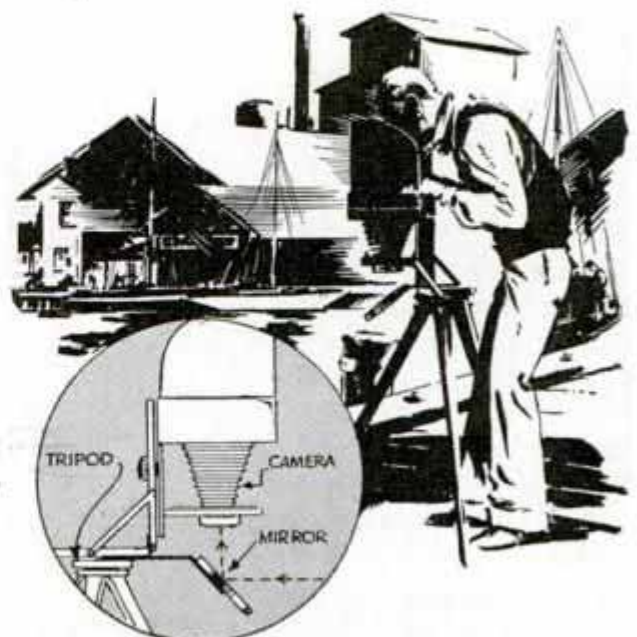
Lighted Flashlight, with Negative Carrying Name Placed over Lens, Is Held above Corner of Undeveloped Print to Expose Sensitized Paper

lens cap as shown in detail C to serve as a guide in getting the name uniformly on all photos. Then cement a small piece of frosted glass to the underside of the lens A to diffuse the light, using a little table gelatin dissolved in water or a drop of Canada balsam. Next print your name on white paper with India ink and photograph it. Develop the film in contrast developer to obtain clear lettering on an opaque background. Then cut out the portion of the film carrying the name in

the form of a disk, detail B, to fit over the lens. Assemble the flashlight with the disk between the lens and the cap. In use, place each print, after it has been printed, but not developed, on the edge of a board or table and hold the flashlight above it as shown for about 5 seconds to expose this portion of the paper. Then turn off the flashlight before lifting it from the paper to avoid blurring the name, after which the print is developed in the regular way. —Ivan C. Luckman, Erie, Pa.

Drawing by Tracing Images Reflected through Camera

By using a small plate-glass mirror and a tilting tripod top, arranged as shown in the drawing, any focusing type of camera having a ground glass, can be used to make drawings. Substitute a sheet of plain glass for the ground glass in the camera back, and if the back is not already equipped with a viewing hood, to keep out unwanted light, one can be made from cardboard. The mirror is fastened to one end of a narrow piece of heavy sheet metal, the other end being clamped between the tripod and tilting top. Adjust the mirror at an angle so that the scene will be reflected into the camera lens. With the lens wide open and a sheet of tracing paper over the glass in the camera back, drawings are easily made.



Irregular Lathe Turnings Sanded Easily with Tapered Abrasive Stick

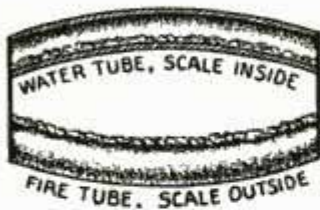


Stick Covered with Sandpaper Gets into Grooves of Turnings That Can't Be Sanded in the Regular Way

For greater ease in sanding various grooves in turned pieces, take a round, tapered stick and wrap it with abrasive paper. This permits getting into any groove or following almost any curve on a turning, and does a quick, efficient sanding job.

Why Boiler Tubes Buckle

It has been observed that when tubes in a horizontal water-tube boiler buckle, they bend upward, while those in the fire-tube type of boiler buckle downward.



When the steel, of which the tubes are made, becomes heated, it naturally weakens. Therefore, the hottest side is the weakest. In the water-tube boiler, the weakest side is on the bottom. The compressive forces acting on the tube, when in operation, are equal, and are opposite in direction, acting from the ends parallel with the tube. The hotter side compresses more readily than the cooler side. Therefore, in the case of the water-tube boiler, the buckling is upward. For the same reason, the upper side in the fire-tube boiler is the hottest and the buckling is downward. Another contributory cause of buckling is soot and

ashes, which are deposited to the greatest depth on the top or outside of the tubes in a horizontal boiler, and on the bottom or inside of the tubes of a fire-tube boiler. This deposit, of course, insulates part of the tubes against heat, with the result that buckling occurs toward this part.—W. F. Schaphorst, Newark, N. J.

ashes, which are deposited to the greatest depth on the top or outside of the tubes in a horizontal boiler, and on the bottom or inside of the tubes of a fire-tube boiler. This deposit, of course, insulates part of the tubes against heat, with the result that buckling occurs toward this part.—W. F. Schaphorst, Newark, N. J.

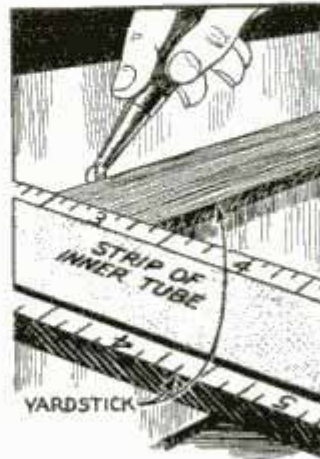
Developing Photo Prints Evenly

When certain parts of a photo print develop too dark before other parts reach sufficient depth, an excellent "short stop" is as follows: Prepare a solution consisting of 28 per cent acetic acid, 2 oz., and water, 1 qt. Before the print has developed in the darker portions to the sufficient depth, immerse the photo in the solution. This will stop development immediately. Then wash the print with water and, still under a safelight, apply developer with a cotton swab to the parts which will be too light. When they have almost reached the desired depth, immerse the print in the developer again until sufficient blackness is attained. This will eliminate all lines caused by "local" developing.



Non-Slip Straightedge for Cutting Glass

When cutting glass, a straightedge faced with rubber on one side, which is laid on the glass, will prevent slipping. A piece of inner tube is ideal for the purpose and is attached by applying two coats of rubber cement to both the rubber and straightedge, letting the first coat dry before applying the next. After the second coat has dried, the rubber strip is pressed into place.—A. J. Kaufmann, Los Angeles, Calif.



Shortcuts for the MODEL RAILWAY BUILDER

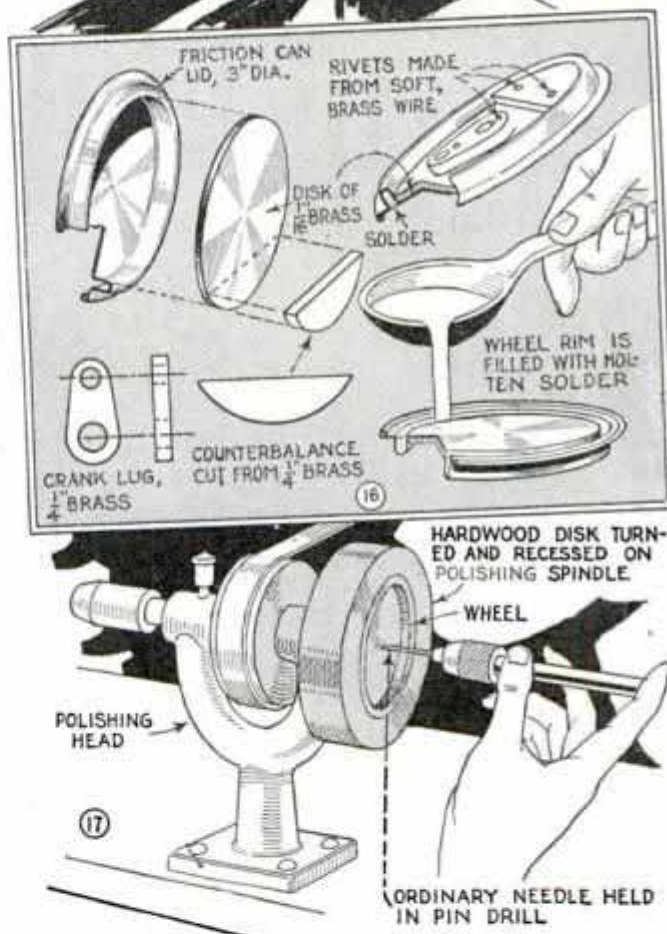


PART II

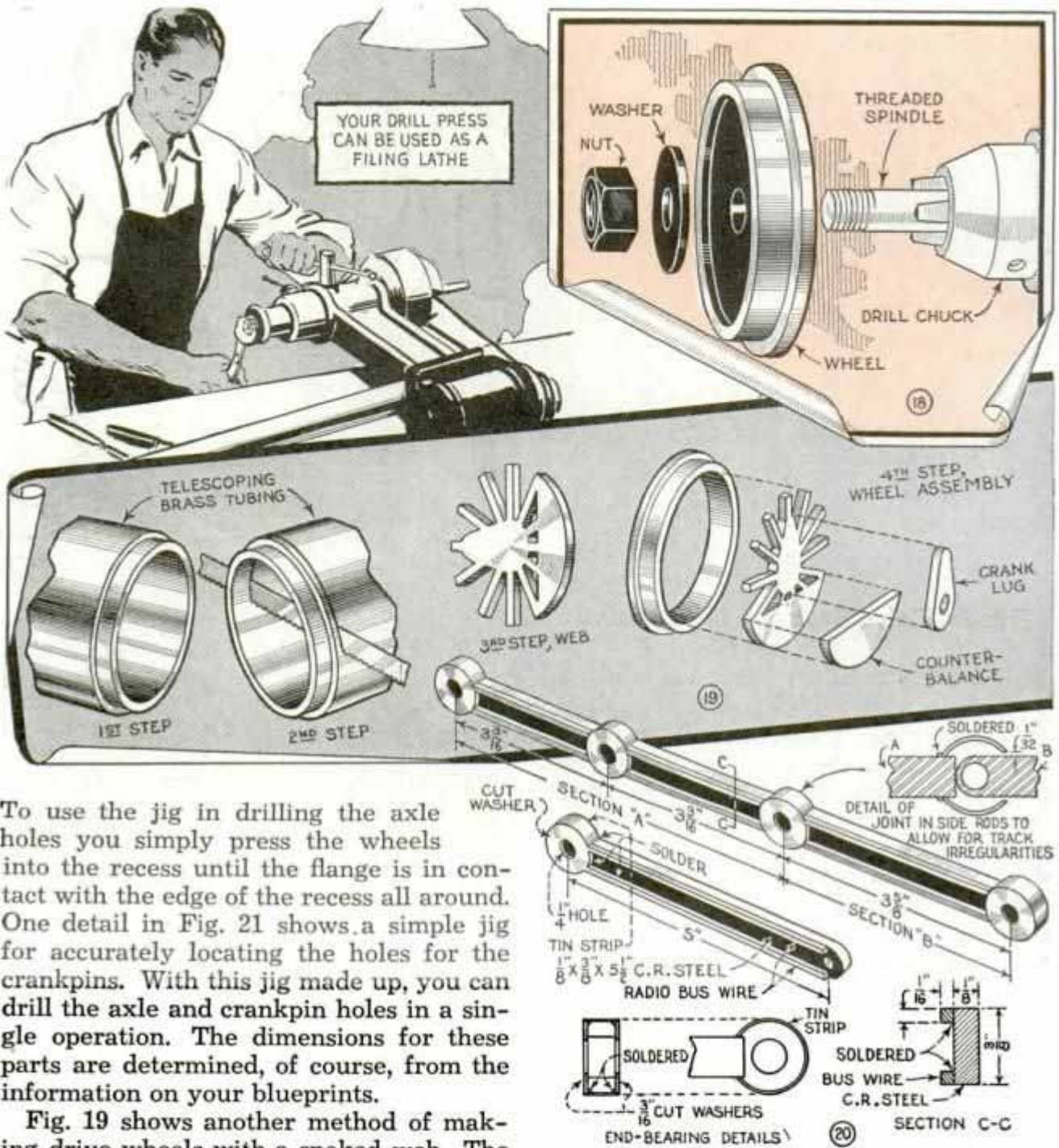
Wheels, Valve Gear and Motor Drive

BY USING ordinary friction can lids, a couple pieces of brass and molten solder you can make model locomotive drive wheels without any machine work. Before you conclude that this results in crude work, look at Fig. 27, which shows a complete chassis ready for the electric drive. In this case all the wheels were made from can lids. Fig. 16 shows you how. Of course, the can lids for any set of wheels should be of uniform size and those selected have to be free from dents, bends or other imperfections. When using the can lid, you already have the tread and flange of the wheel virtually made to order. All that is necessary, is to add to each wheel three parts; a reinforcing disk, a counterbalance and a crank lug. All these parts are sawed from solid brass to the size called for on your blueprints. Then they are finished before soldering and riveting to the wheel. The rivets can be made from soft brass wire. After you have these parts in place, turn the wheel over, flux the concave rim and fill it with molten solder. Then a bit of cleaning up with a file will make your wheel ready to mount on the axle.

Finding the exact center of the wheel as in Fig. 17 is very important. Lacking a wood lathe you can use a polishing head. The hardwood disk is screwed on the tapered end of the polishing spindle and



turned into round. Then it is recessed to take the drive wheel in a tight press fit and, with the work revolving, you can locate the center with a needle held in a pin drill. When, after trial, the needle remains steady you have the exact center of the wheel. Mark this for spotting with a prick punch. You can use the same hardwood disk as a jig when you drill the holes for the main axles on the drill press.



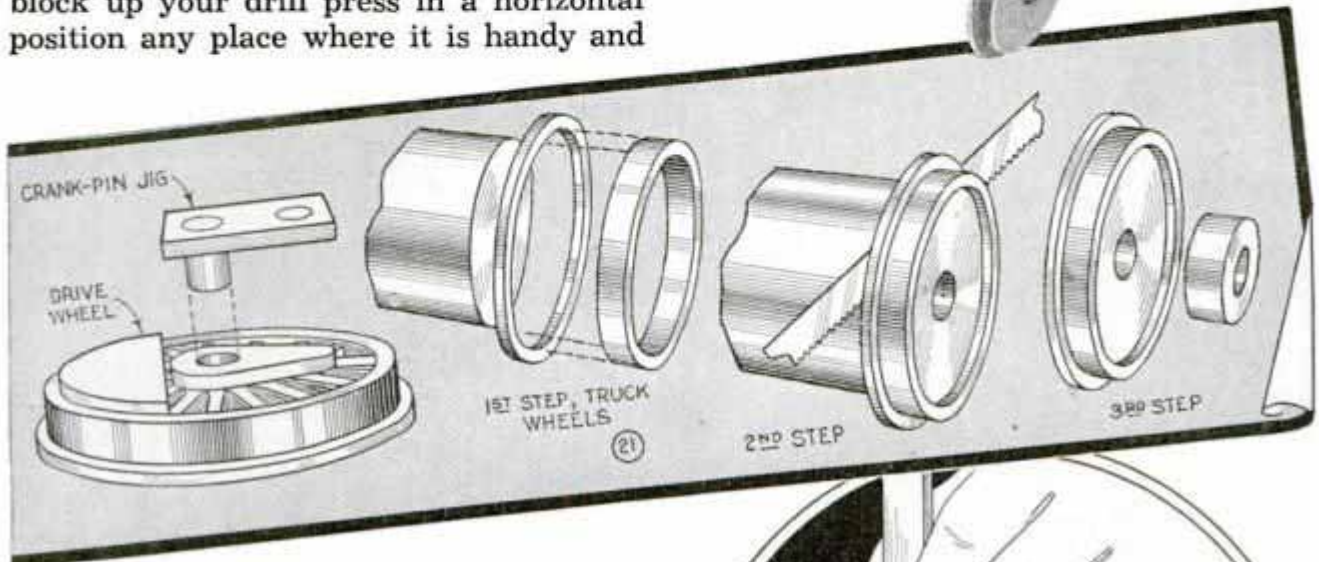
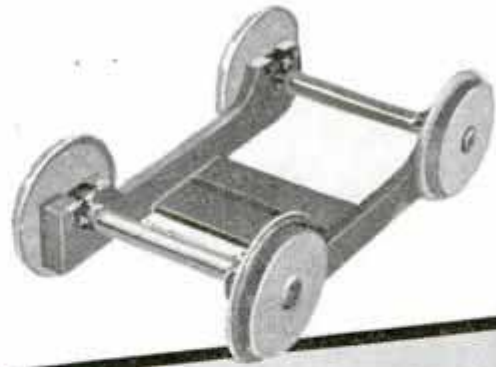
To use the jig in drilling the axle holes you simply press the wheels into the recess until the flange is in contact with the edge of the recess all around. One detail in Fig. 21 shows a simple jig for accurately locating the holes for the crankpins. With this jig made up, you can drill the axle and crankpin holes in a single operation. The dimensions for these parts are determined, of course, from the information on your blueprints.

Fig. 19 shows another method of making drive wheels with a spoked web. The four steps illustrated tell the whole story of how you form the rim and flange with telescoping brass tubing. The third step shows how a spoked web is cut from a brass disk with a base for the crank lug and counterbalance already formed, and the fourth step shows the assembly of the parts into the complete wheel with the crank lug and counterbalance built out to the required width. All the parts are soldered together to form the single unit. Looking across the page at Fig. 21 you will see that the same method is used in making up wheels for the lead and trailer trucks. Now, if you do not have telescoping tub-

ing of the right size handy, there's still another way of making a suitable flange. The tread is made from tubing in the way just described, then you set the wheel in a recessed block as in Fig. 22, the recess large enough to take a length of soft brass wire in addition to the diameter of the wheel. Force the wire into the recess about the rim as shown and then flow solder into the joint.

Once you have them center-drilled for the axles, wheels made by the latter method must be put through a finishing operation. Going back to Fig. 18 and the

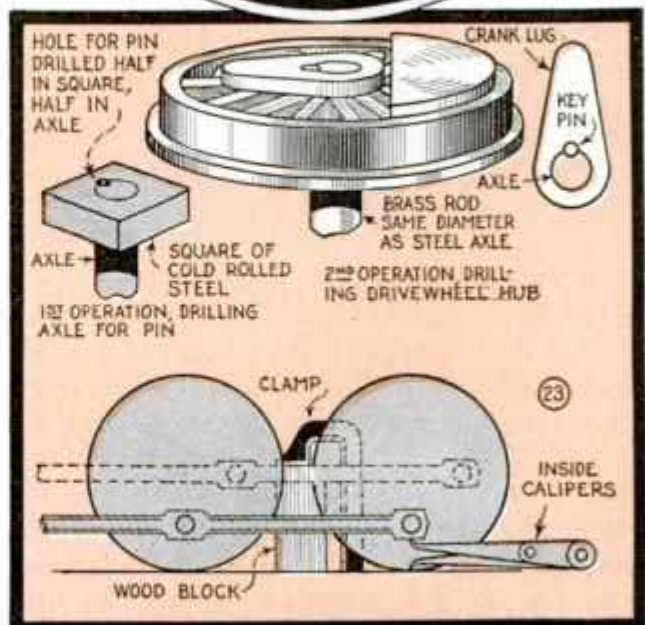
illustration at the left, you will see how your drill press can be utilized as a filing lathe. If you have been careful to center the axle holes, your wheels are already concentric. All that is necessary is to taper the tread slightly, smooth up the front and back faces, and round the flange to the blueprint dimensions. To do this, you block up your drill press in a horizontal position any place where it is handy and

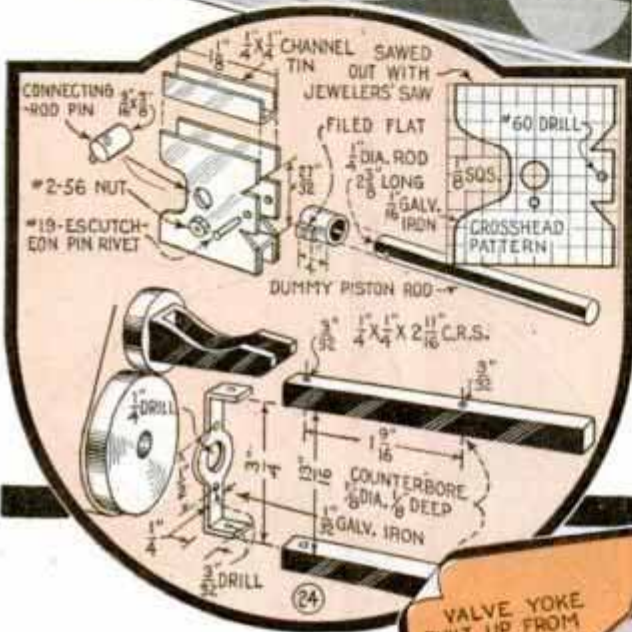
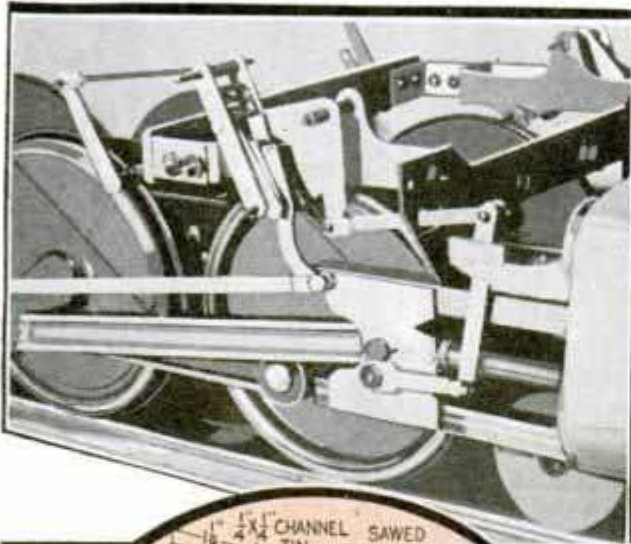


provide a threaded spindle to hold the work as in Fig. 18.

As you will see, the ends of the chuck jaws afford a shoulder against which the wheel can be tightened. For good work, the speed of the drill spindle should be fairly high, about 2,000 r.p.m. To finish all over, you will need several sizes of small round and flat files. The trick in doing clean filing of this sort, is to keep the file moving in a straight stroke over the work, and at the same time to apply a light but uniform pressure. To taper the tread of the wheel, you would use a flat file, and to file in the fillet at the point where the tread meets the flange, you should use a fine, round file. Following this procedure with such an improvised outfit, you can do a neat job of finishing your wheels.

Just at this stage in the construction you make the side rods as in Fig. 20, which shows side rod and connecting rod for a chassis with eight drive wheels. This type of side rod has to be made with a flexible joint, a detail of which is shown. If your model has only six drive wheels, three on a side, then you use a rigid side rod as the center wheel is usually made with a flat tread, there being no flange. When you are ready to drill the side rods, use the locomotive frame as a jig, for it is impor-

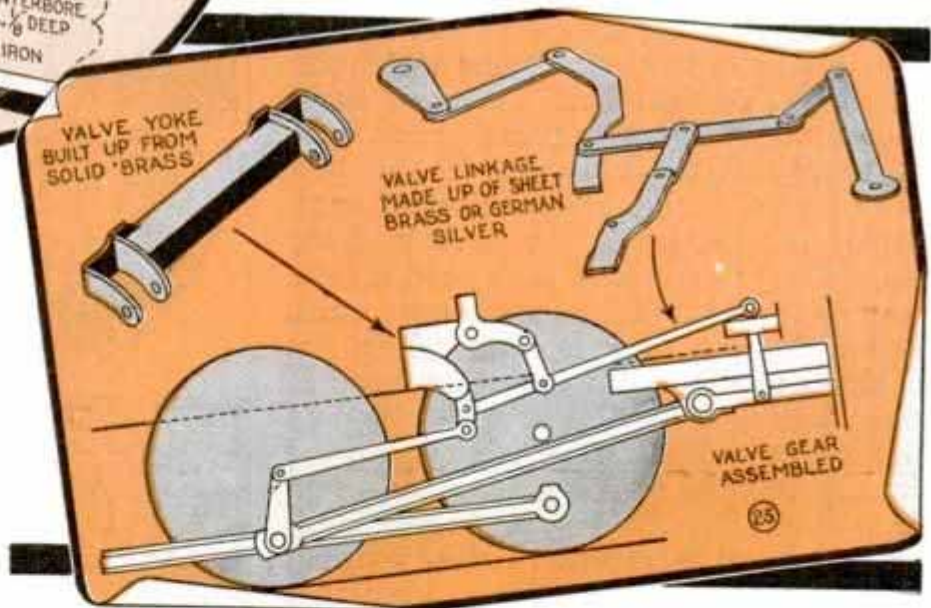




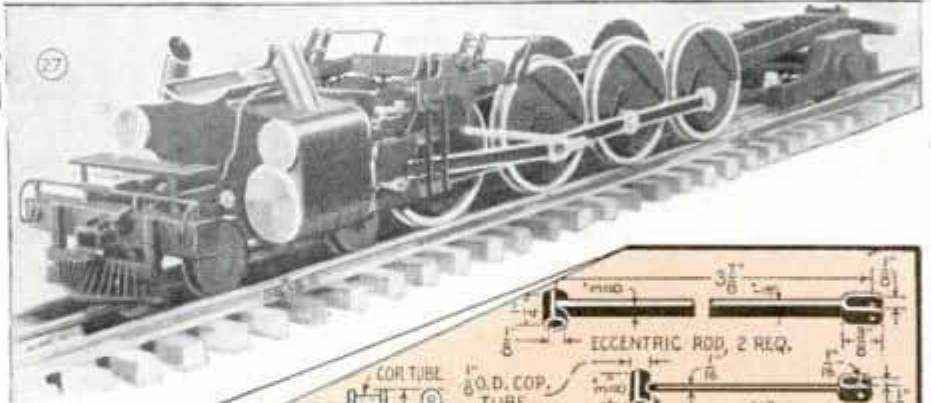
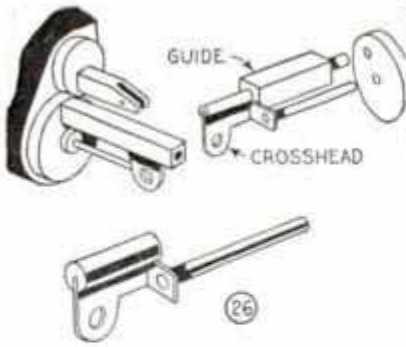
tant that the distance between the holes in the side rods and those in the frame be exactly the same. You can clamp the rods right to the frame and lay off the exact center-to-center distances between the holes for the crankpins. This done, you are ready to set the wheels on the axles and quarter the cranks. In building either a $\frac{1}{4}$ or $\frac{1}{2}$ -in. scale model you can do one of two things when fastening the wheels to the axles. You can make the axles from steel-rod stock and pin the brass wheels, or you can use brass rod for the axles and solder the joint. The latter is the easier method, and though not orthodox, is fully as good in point of utility. In pinning the wheel to the axle you cannot drill the hole for the pin half in brass and half in steel

as the drill will draw into the softer metal. So with the steel axle you drill a square of steel to a drive fit over the end and then drill for the pin. With the wheel you drive a length of brass rod into the axle hole. This method is shown in Fig. 23. Either way, you now fasten the wheels permanently to the axles on one side of the frame only, leaving the remaining drive wheels loose on the axles, but with all crankpins and side rods in place. Then with a pair of inside calipers, you set one side rod on the side opposite the loose wheels, either right or left, exactly in the horizontal position, and under the rod you place a hardwood block. Then clamp the rod to the block as in Fig. 23. Now with the calipers again adjusted, you set the opposite side rod to its lowest position, then fasten the loose drive wheels permanently to the axles. This is a quick method of quartering the cranks and is sufficiently accurate for the electrically driven model.

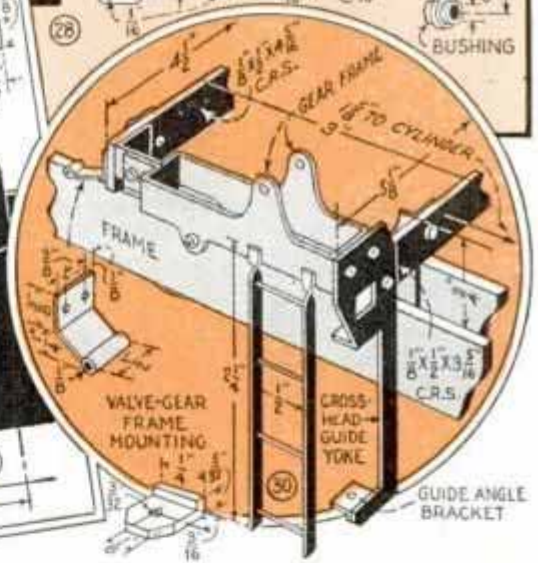
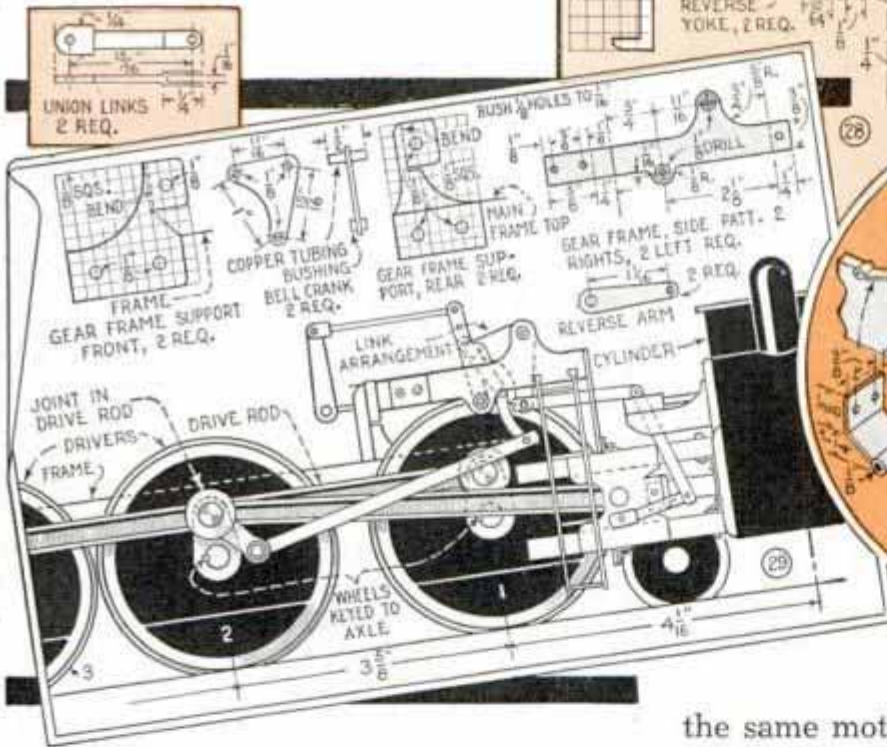
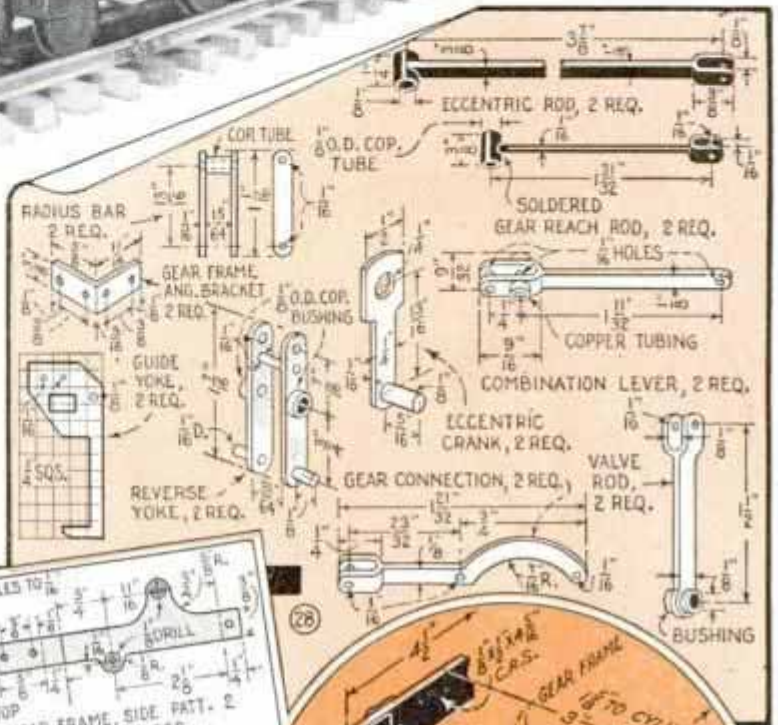
Looking over Figs. 24 to 30 inclusive, you have the story of crosshead and valve-



gear assemblies. Where given, the dimensions are, of course, only approximate and they will likely vary with the model you are building. However, in general design you will find these two assemblies much the same. Figs. 24 and 26, for example, show two types of crossheads and guides. The more simple of the two types of valve gears shown is that in Fig. 25. This is the type your blueprints will probably call for if you are building a $\frac{1}{4}$ -in. scale model



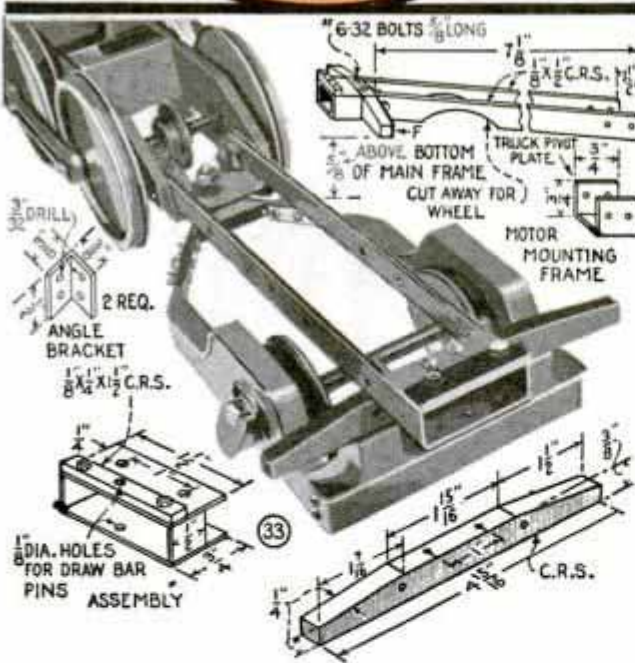
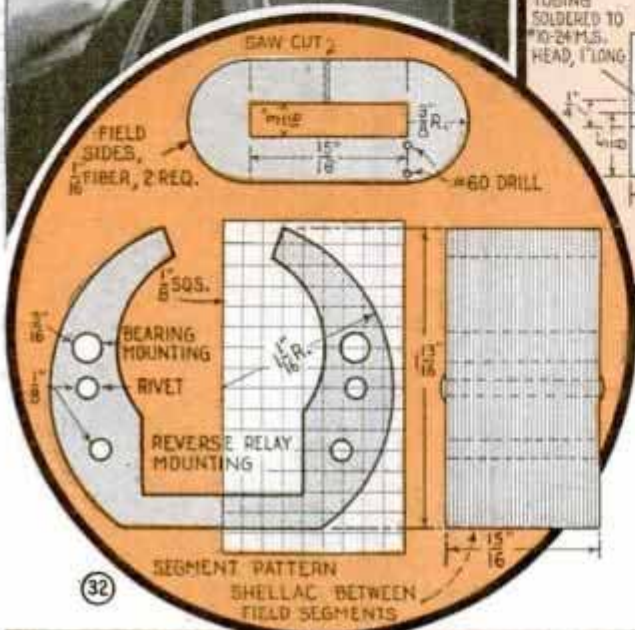
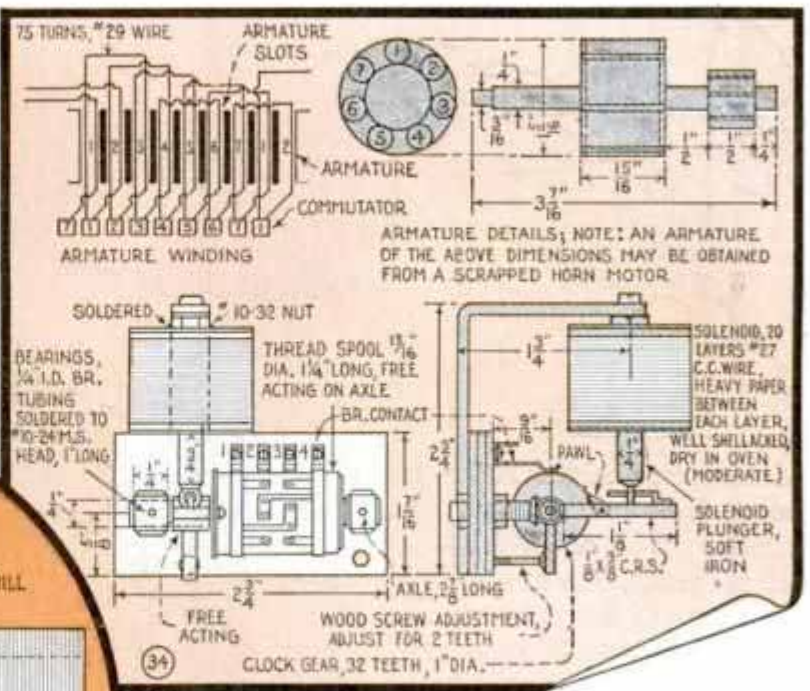
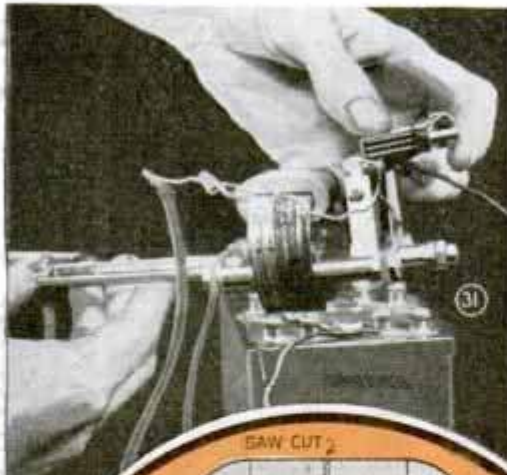
of modern design. Aside from the yoke, the whole affair generally can be made of German silver or sheet brass, riveted loosely together with brass escutcheon pins. Figs. 28, 29 and 30 detail the valve gear shown assembled on the



chassis in Fig. 27, which is built to 1/2-in. scale. Here the parts are of sufficient size to permit the use of small bolts and machine screws in assembling. Making cross-heads and valve gears for practically all models is purely a sheet-metal job, except the cross guides, and, in some models, the valve yoke. In Fig. 25, the yoke is made up of stock brass in simulation of the casting ordinarily furnished in this particular design. You can see the difference between this and the yoke detailed in Figs. 29 and 30. Also note that the link arrangement of these two differs, although

the same motion is imparted to the valve stem. Because of these variations in the design of model locomotives, it is well to make a close study of your blueprints before you cut any materials.

Now the last phase of the chassis construction—making and mounting the motor drive. Figs. 31 to 37 inclusive cover this work in detail. Begin with Fig. 33, which shows the support for the motor frame, and also how it is attached to the main frame of the chassis over the trailer truck. This support serves the twofold purpose of providing a base for the motor and later for the engine cab when the assembly is complete. It is attached to the



tion of the motor involves the rewinding of the field and a seven-pole, series-wound armature. Movement of the locomotive is controlled by an automatic reverse relay, which is operated by a solenoid. In this instance the motor is made up from parts of a discarded auto-horn motor, odds and ends of radio equipment, small steel rods and pieces of brass tubing for the few bushings necessary. Fig. 34 details the armature winding and the construction of the solenoid and relay. The relay contact drum is a thread spool of the dimensions given. To one end of the drum is attached a small clock gear. Each time the solenoid is energized by the closing of a remote-control switch, it advances the drum one-sixteenth of a revolution by means of the pawl acting on the clock gear, thus reversing the current in the armature windings. By omitting the solenoid and fitting a lever in a convenient position under the locomotive cab, the switch may be operated manually.

Figs. 35 and 36 show clearly the bearing details, the motor frame, the brush mounting, and current pick-up shoes for inside and outside third-rail operation. Fig. 37 gives the wiring diagram for operation with the relay, while the completed motor, mounted on the chassis, is shown in the illustration directly above Fig. 37. The motor, as you will note, is built for a 1/2-in. scale locomotive and in this size it will give satisfactory service, but if you are building a model in smaller

main frame as a separate unit, but in certain designs and types it is made an integral part of the main frame. See Part I in the January issue of Popular Mechanics. The motor detailed is designed as a drive for the 1/2-in. scale chassis shown in Fig. 27, and is of the universal type for operation on 18 to 25 volts. The construc-

Inside of Boiler or Drum Is Inspected with Tube and Flashlight



By Looking through a Tube with a Flashlight Fastened to One End You Can Inspect Dark Interiors

For inspecting the inside surfaces of boilers, tanks, drums, etc., fasten a flashlight, preferably one of the "pen" type, to one end of a long tube, insert the assembly through the bung and then look through the tube. In the absence of a suitable tube for the purpose, one can be made by wrapping heavy paper around a broomstick and fastening it with glue.

Percolator Handle Is Removable to Prevent Charring

To avoid charring a percolator handle, why not make it removable? The round heads of two small bolts are cut off and soldered to a strip of sheet metal, which is in turn soldered to the percolator. The handle is then slotted as shown to slip over the bolt heads. Incidentally, if your



percolator handle does not lend itself to this alteration, the handle from an old electric sadiron is usually quite easy to convert for the purpose.

Lunch Box Has Metal Initials

Thin, metal letters of the type used on ladies' purses are handy to initial your lunch box. They will last the life of the box, and can be obtained at almost any department store. The letters are provided with small prongs for attachment which are inserted through holes punched in the box and then bent over on the inside.



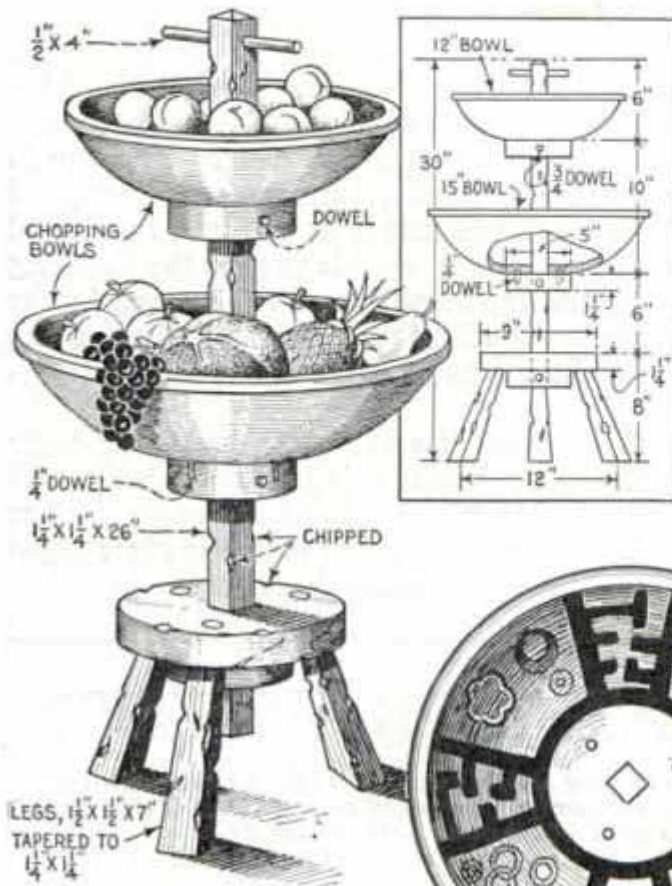
Dust-Mop Handle Has Flexible Joint for Cleaning under Furniture

You can clean under low furniture with very little stooping if your dust mop has a flexible joint in the handle. Cut the handle in two and connect the severed ends with a piece of rubber hose, which may be held in place with shellac or rubber cement. It is best to use fairly stiff hose so that the handle will be as rigid as possible for regular mopping.—T. L. Moore, Detroit, Mich.



It's Easy to Dust Floors under Furniture When You Have a Flexible Joint in the Mop Handle

Double-Deck Fruit Holder of Aztecan Design



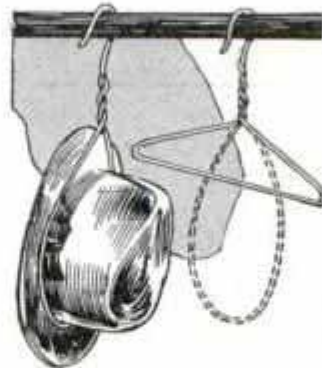
Chipping at Random with a Knife or Chisel Gives the Appearance of Ancient Aztec Workmanship

Constructed entirely of wood and having the appearance of ancient Aztec workmanship, this colorful fruit holder lends an ornamental touch to a dull corner. The job can be done with a keyhole or coping saw, brace and bit and a plane, the parts being assembled entirely with dowels and casein glue. A square standard is mounted on a three-legged stool, and supports two wood chopping bowls. These are doweled to wood disks which are pinned to the standard with larger dowels. The wood, except the bowls, is "aged" by roughening with a stiff, wire brush after burning it slightly with a blowtorch, or by chipping, gouging or adzing. A coat of stain followed by a rubbing down with rottenstone gives a pleasing antique effect. If the inside surfaces of the bowls are given one coat of clear shellac, the color design to be done in bright hues will be more brilliant. Do not be geometrical with the designs—let them be more or less irregular in keeping with the Aztec idea.



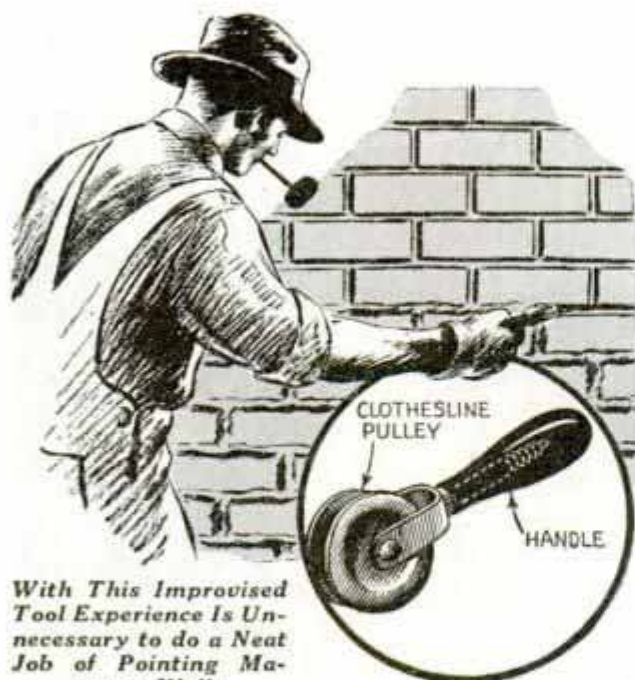
Hat Rack Made from Coat Hanger Is Carried in Suitcase

If space in a closet does not permit use of regular hat racks, or if you are staying in temporary quarters, you can improvise a holder for your hat from a wire coat hanger. Also, the holder is handy when traveling as it can be carried in the bottom of a suitcase and takes up no room. The



hanger is bent to form a loop as indicated, after which the shank of the hanger is bent to one side at the twisted part so that a hat will not fall out.

❗ Don't mix glue in a glass container as it may break the glass when it dries.



With This Improved Tool Experience Is Unnecessary to do a Neat Job of Pointing Masonry Walls

Pointing Tool for Masonry Joints from Grooved Pulley

Anyone can do a neat job of pointing masonry walls with a grooved pulley of a size to suit the work at hand. A clothesline pulley is suitable for the purpose as it has a screw shank to which a handle is easily attached. In use, mortar is applied between the bricks in the usual way and the tool is run over it to give the finishing touch. If the width of the groove in the putty equals the distance between the bricks a neat job will result.

☐ A piece of clear glass laid over your cookbook when using it on a table will keep it open and protect the pages against soiling; adhesive tape over the glass edges will prevent cutting the fingers.

BUILD YOUR BOAT THIS WINTER

so it will be ready to launch next spring when the boating season opens. The photo shows "Hi-Ho," a 14-ft. family runabout, driven by a 11 to 22-hp. outboard, or converted model-T Ford motor. Six prints giving complete constructional details will be sent postpaid for \$1.00.



"WHAT TO MAKE"

This 80-page Craftsman's Guide is just crammed full of practical information and valuable reference data for the home workshop. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get materials. Will be sent postpaid on receipt of 12c.

POPULAR MECHANICS MAGAZINE
Dept. B.P. 200 E. Ontario St., Chicago

OTHER BOATS

- "Roamer"—765 to 770: Outboard cabin cruiser; two berths. Six prints \$1.00.
- "Sea Saucer"—893: 9½-ft. sail boat. Deck, bottom and sides are 3/16-in. plywood. 25c.
- 17-Ft. Kayak—928 and 929: Light framework covered with canvas. Two prints 50c.
- 12-Ft. Utility Rowboat—707: Flat bottom. Four seats. Sturdy design. 25c.
- 16-Ft. Canoe—811 and 812: Cedar planking covered with canvas. Two prints 50c.
- 12-Ft. Sailboat—524 and 525: Flat bottom, center-board type. Two prints 50c.



Shop notes
1937

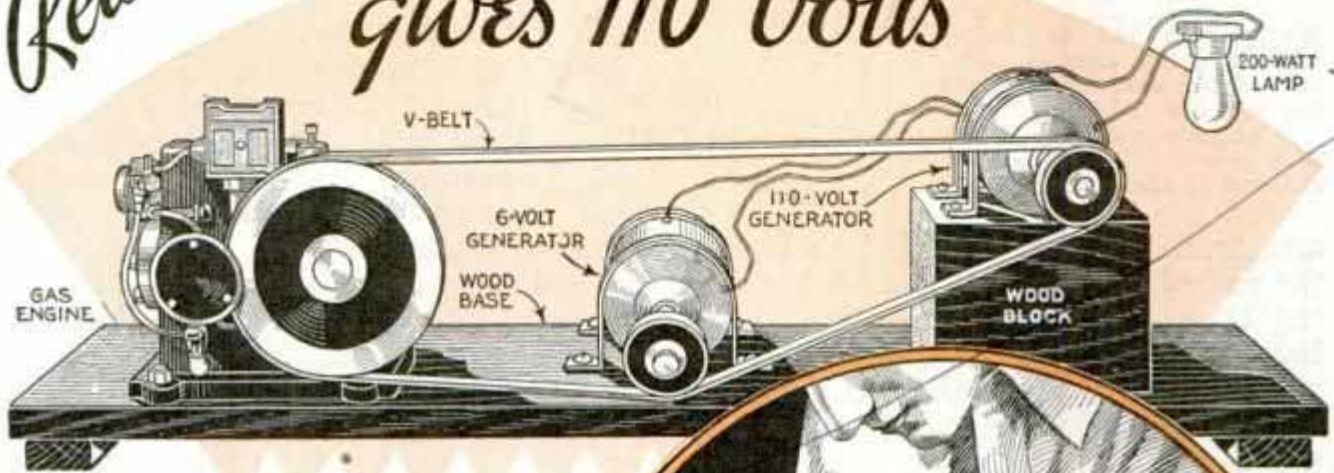


SHOP NOTES

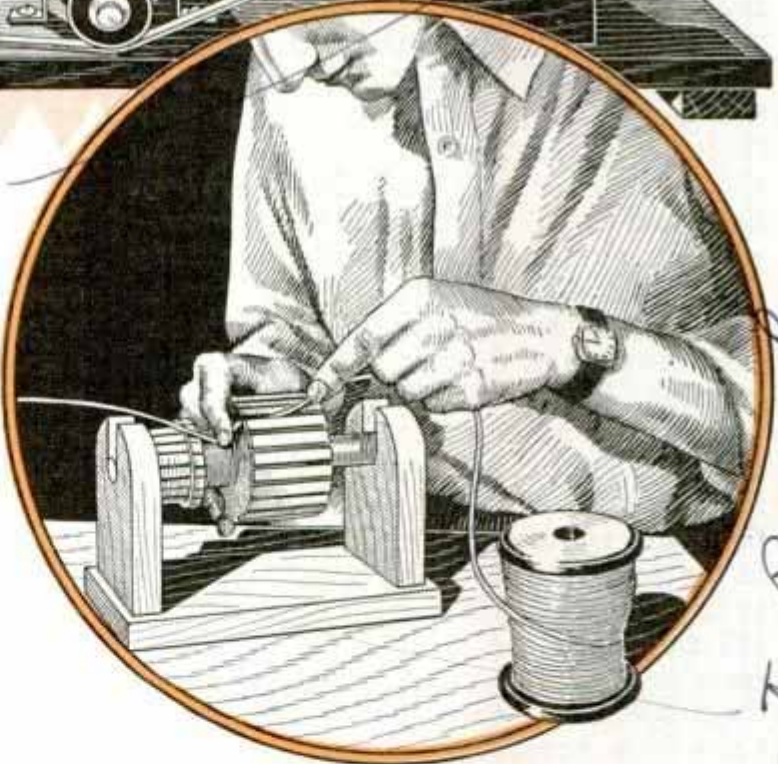
Latent
mch.
Rewound

AUTO GENERATOR

gives 110 volts



Complete 110-volt, a.c., lighting outfit, capable of providing about 200 watts under continuous duty, consists of a 1/2-h.p. gasoline engine and two model-T Ford generators, mounted on a single wooden base. The generator at the right is re-wound to produce 110 volts when driven 1,800 r.p.m., while the one in the center supplies field excitation for the first. Below, the work of rewinding is facilitated by mounting the armature shaft in this wooden holder



TWO model-T, Ford generators are required to make this complete 110-volt a.c. generator. One of them must be in good condition so that it can be used as a 6-volt generator to furnish magnetism for the field coils of the other unit. The other may have its armature windings burned out, but the field coils (those on the stationary frame) must be in good shape.

The defective generator is dismantled by taking off the gear, removing the end plate with the bearing, and pulling out the armature and commutator. The armature is stripped of all of its wire, being careful not to damage the fiber insulating

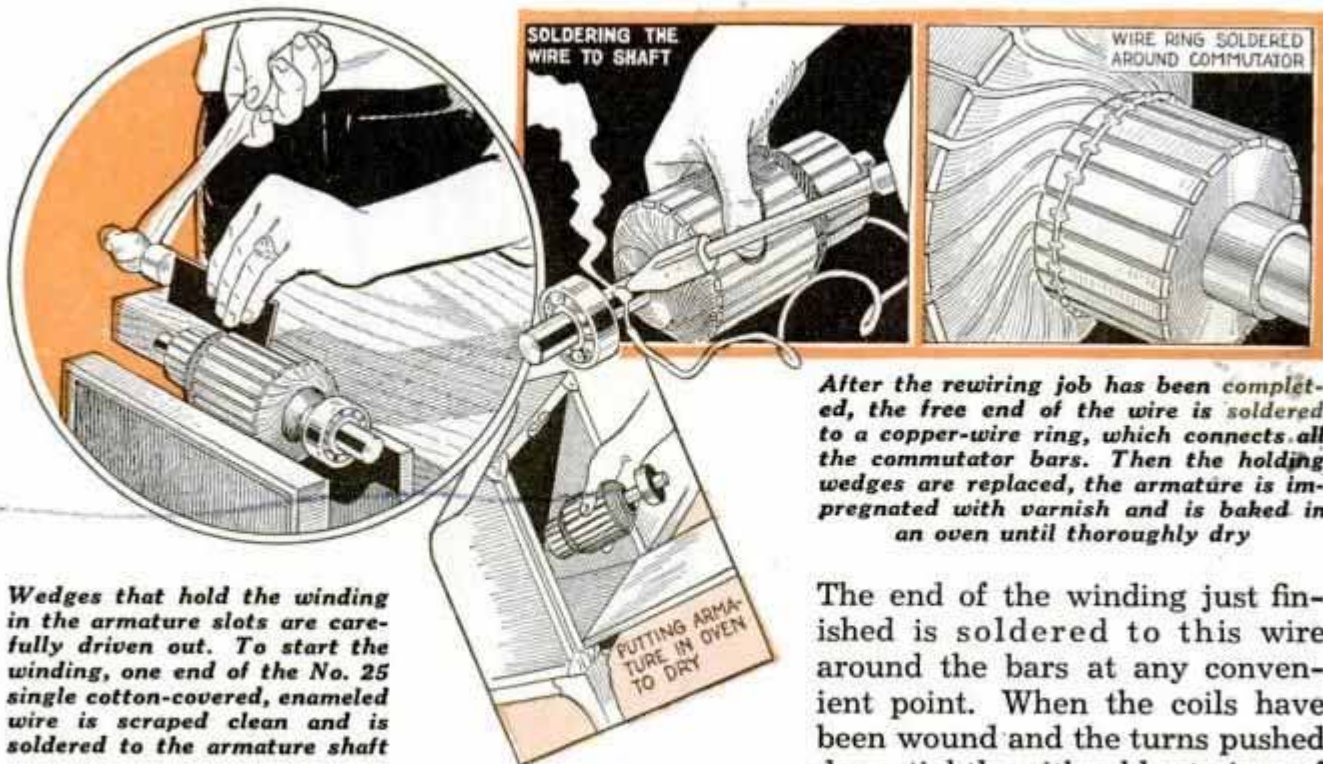
laminations on each end. If the paper insulation in the slots is not in perfect condition, it should be removed, and replaced with new insulation. New slot insulations may be cut from sheet fiber or heavy brown paper.

You will need 1 lb. of No. 25 single cotton-covered, enameled wire to rewind the

will operate 4-50 watt lamp
8-25 watt lamp
Auto Power Co
406. B
Hygiene Ave
Chicago

S.W. Linciana % circulation and wires due. 30 Travelodge B.

Johnson motor Co. Washburn, Ill 301



Wedges that hold the winding in the armature slots are carefully driven out. To start the winding, one end of the No. 25 single cotton-covered, enameled wire is scraped clean and is soldered to the armature shaft

armature. The start is made by soldering the end of the wire to the shaft between the bearing and the laminations. Next, bring the wire up to the nearest slot, lay it in the bottom of the slot, and return to the start by the adjacent slot as shown in the wiring diagram. Keep this up until these two slots are filled with wire. This should take about 90 turns if they are kept tight and even. As the coils are completed, the wire should be pushed carefully down into the slots so that the wood wedges may be pressed into place to secure the coils as they were in the original winding. Let us say that these slots are numbers 3 and 4 respectively. From slot 4 go to slots 2 and 5 as shown in the wiring diagram. Wind these two slots with the same number of turns as before, and in the same direction. From slot 5 proceed to slots 1 and 6. Wind these slots half full (45 turns) in the same direction. Then from slots 6, go to slots 9 and 8 and wind them full in the opposite direction. Continue this procedure, as shown in the winding diagram, until all the slots are filled. When correctly done, all the slots will be full except slots 1 and 21 which will be half full.

The high part of the commutator is cleaned and a wire is soldered around its circumference, making sure that each bar is rigidly soldered to this wire. This shorts all the bars of the commutator together.

After the rewiring job has been completed, the free end of the wire is soldered to a copper-wire ring, which connects all the commutator bars. Then the holding wedges are replaced, the armature is impregnated with varnish and is baked in an oven until thoroughly dry

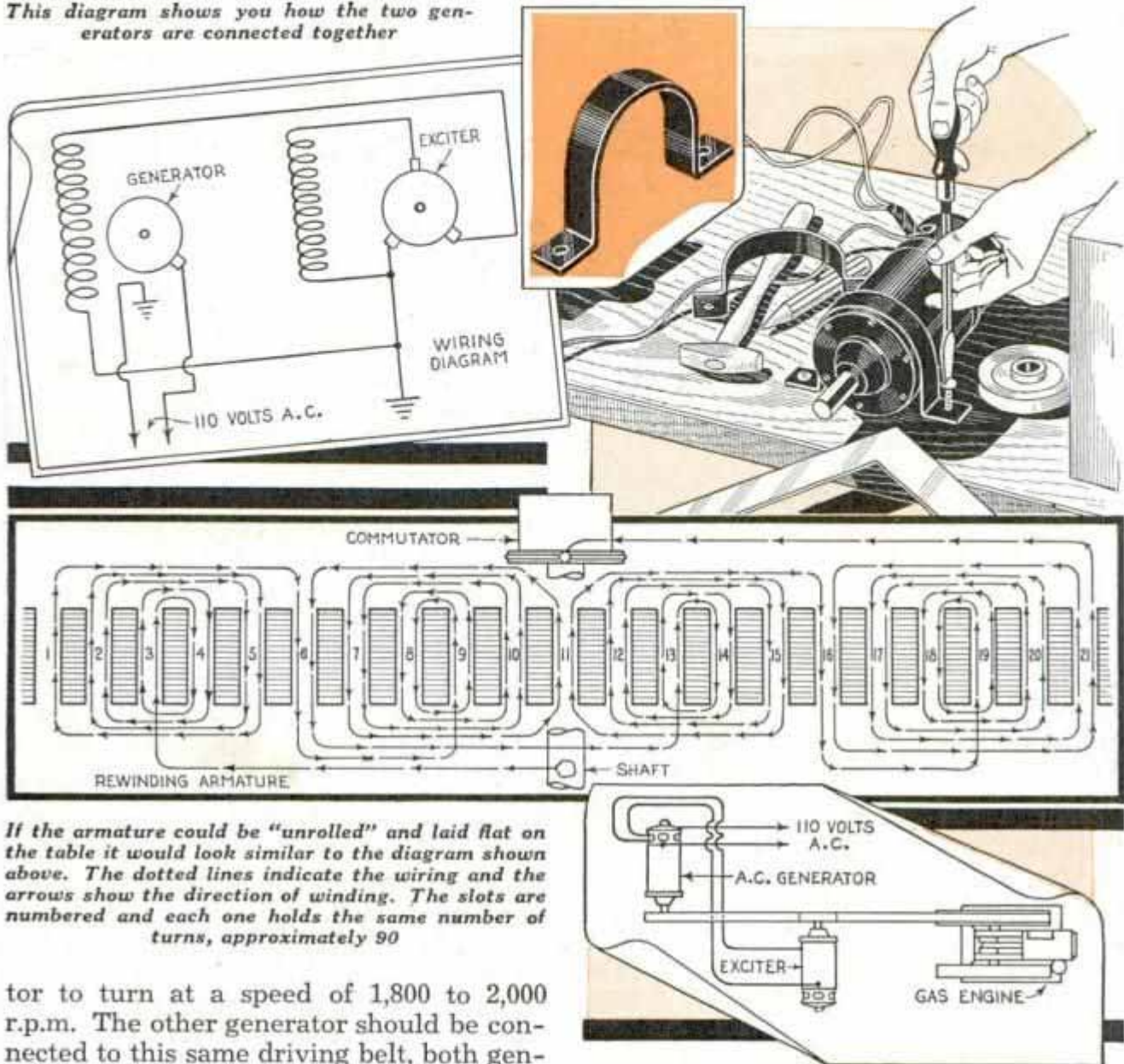
The end of the winding just finished is soldered to this wire around the bars at any convenient point. When the coils have been wound and the turns pushed down tightly with a blunt piece of

wood to make the windings solid, drive the holding wedges back in place to seal the slots. The armature is next placed in a pan of varnish until the windings have absorbed as much varnish as possible. After allowing the varnish-impregnated armature to dry in the air for a few hours, it is placed in an oven and baked dry.

The housing with the brush attachment is inspected next. The brush, which is grounded, is removed as it will not be required. The third brush, which is the thinnest of the three, is also removed permanently. This leaves the remaining brush connected to the terminal to which the cutout was formerly connected. This terminal now becomes one side of the a.c. line. The field coil wires are disconnected from the third brush holder and from the grounded brush holder. Long wires are soldered to each of these and taped. These wires are forced between the adjacent coils so that they can be run out of the casing through the holes in the end plate.

When the generator is reassembled the job is done. In order to use this generator, it is necessary to drive it at a speed of about 1,800 r.p.m. to produce 110 volts at 60 cycles. However, it may be necessary to drive the generator slightly faster to get the best performance. If the driving engine has a speed other than 1,800 r.p.m. under load, it will be necessary to adjust the pulley sizes to get the genera-

This diagram shows you how the two generators are connected together



If the armature could be "unrolled" and laid flat on the table it would look similar to the diagram shown above. The dotted lines indicate the wiring and the arrows show the direction of winding. The slots are numbered and each one holds the same number of turns, approximately 90

tor to turn at a speed of 1,800 to 2,000 r.p.m. The other generator should be connected to this same driving belt, both generators being mounted so that they will rotate in the same direction as they did when installed for generating current in a car. The speed of the second generator is not very critical because its output can be adjusted by sliding the third brush. This generator supplies the field excitation to the 110-volt generator. The two wires, which were run out from the back of the housing of the 110-volt generator, should be connected to the terminal on top, and to the frame of the 6-volt generator. The a.c. voltage is taken off from the top terminal or brush, and the frame of the revamped generator.

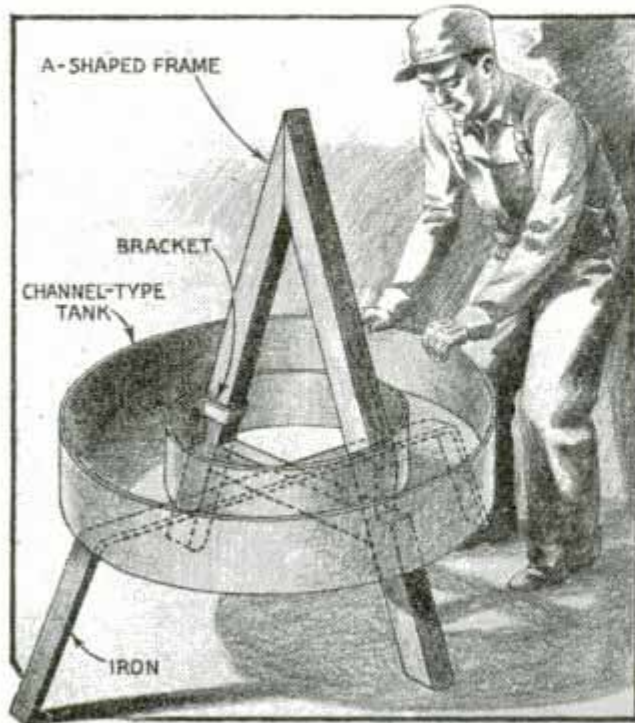
The capacity of this generator is approximately 200 watts continuous duty. A $\frac{1}{2}$ -h.p. gasoline engine or motor will be required to pull it. In operating this generator, the voltage may be increased by adjusting the third brush of the 6-volt

generator, or by increasing the speed of the 110-volt generator. If the speed of the generator is increased above 1,800 r.p.m. the cycles will become slightly over 60. However, this should not interfere with the operation of appliances if the speed is not allowed to be greater than 2,500 revolutions per minute.

Castor Oil for Lubricating Hot Parts

For lubricating sprockets or bearings on automatic ovens or other machinery having the moving parts subjected to heat, castor oil is one of the best lubricants. It does not ignite so easily as most oils, does not carbonize and cake on the moving parts, and a moderate amount will keep the parts in good condition, which makes it valuable where dripping is objectionable.

Rocking Tank Drains and Quenches Work in One Operation

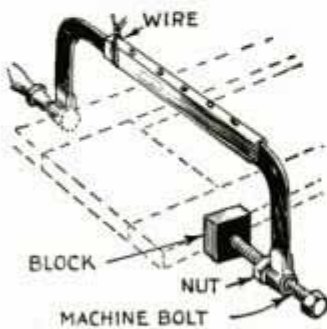


Work on One Side of This Tank Is Automatically Drained When That on the Other Side Is Quenched

This quench tank has an advantage over the usual type in that it can be rocked, causing the quenching fluid to flow from one side to the other. Thus, work on one side is drained when the tank is tipped to quench that placed on the other side. The tank is of the channel type, and is supported by an A-shaped frame. An iron bar bent to a wide U-shape and fastened to the bottom of the tank, at right angles to the frame, permits the tipping action as shown.—John Hyler, Peoria, Ill.

Clamp Made from Hack-Saw Frame

For jobs requiring a light clamp with a wide mouth, I find that a hack-saw frame serves the purpose nicely. Adjust the frame to the approximate width required, after which a couple turns of wire at the end of the telescoping part will hold it together. Then insert a long machine bolt through the outer end and drive a nut up against the frame. A hard-



wood block placed between the end of the bolt and the work prevents marring.—E. V. Michael, Pawhuska, Okla.

Ink Spreader Saves Time in Press Room

When ink in a collapsible tube is applied to the ink disk of a job-printing press, it is usually in such masses that the rollers must be operated for some time to distribute it evenly over the surface. To avoid this, one pressman made a sheet-metal spreader of the shape shown and fastened it to the tube with a rubber band. The flat end can be used to spread the ink in a jiffy.



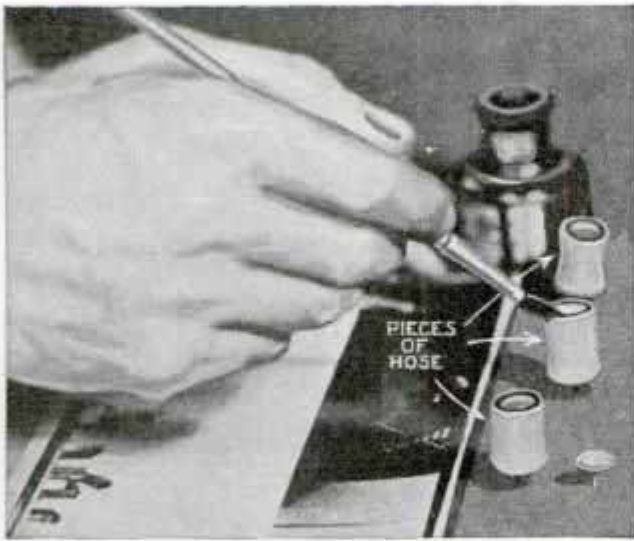
Old Broom Gripped in Pipe Handle for Roof-Tarring Jobs

To avoid the expense of using bristle brushes on roof-tarring jobs, one workman made a pipe handle in which old brooms could be held. A tee on the end of the pipe takes the broom, and the pipe is screwed against it to hold it snugly. The worn straws should be cut away to square up the end, and the broom handle should be sawed off to leave a short stub.



Interchangeable Handle Made of Pipe to Utilize Old Brooms for Spreading Tar on Roofs

Two Handy Ideas for Artists and Draftsmen



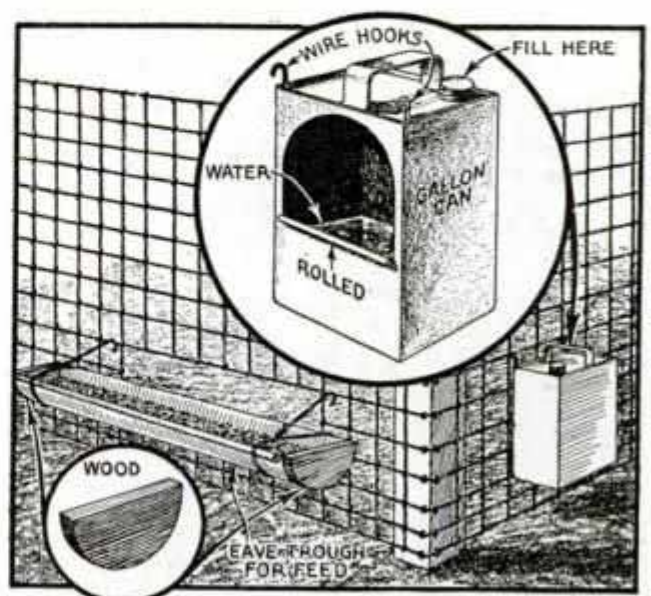
Cups made by pushing short pieces of hose over large rubber-head tacks, are unusually handy for mixing artists' paints. Being rubber, the cups are easy to clean, and they are adjustable in depth by simply moving the tack head in or out of the hose. By pushing the tack points into the drawing board, the cups may be placed close to the work, and they can be set vertically to prevent spilling regardless of the angle at which the board is tilted. The right-hand detail shows a French curve with the edges marked off in divisions and lettered to save time when inking a penciled sketch. When drawing a curve, the letters indicating the portion of the instrument used are copied on the sketch. Then,



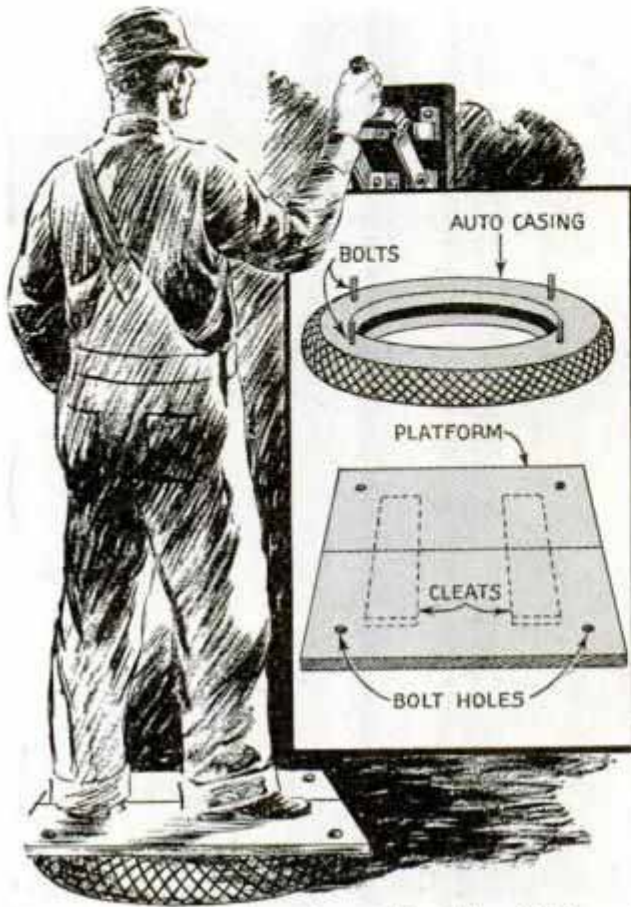
when inking the drawing, it is unnecessary to try out various parts of the curve to find the portion used. The letters may be cut or scratched into the celluloid, or they may be written with a pen dipped in acetic acid. When dry, such writing has a dull appearance in the surface of the celluloid and may be colored by adding pigment to the acid.

Poultry Feed and Water Containers on Fence Save Steps

Suspended from the exterior of a poultry-yard fence, feed and water containers made from large cans and old eave troughs not only save many steps, but prevent scattering of feed and contamination of drinking water. Old varnish cans with portions of the backs cut out serve for water containers. The water supply may be replenished through the opening in the top by removing the screw cap. The feed troughs are sections of old eave troughs having curved pieces of wood nailed to the ends. It will be necessary to cut openings in the fence level with the containers so that the poultry can get their heads through to reach the feed and water.—Glenn R. Hampton, McCamey, Tex.



Insulated Platform Protects Electrician against Severe Shocks



Tire Bolted to Platform Keeps Electrician Off Ground or Floor When Working with High-Voltage Current

When electricians must stand on the ground or a damp floor while working with electrical apparatus carrying high-voltage current, this insulated platform will lessen the possibility of severe electrical shocks. A wooden platform is bolted to an old auto tire, the bolts being inserted through the upper wall of the tire, as shown, so that they do not come in contact with the ground or floor.

Hardwood Wedge Is Metal Sheathed

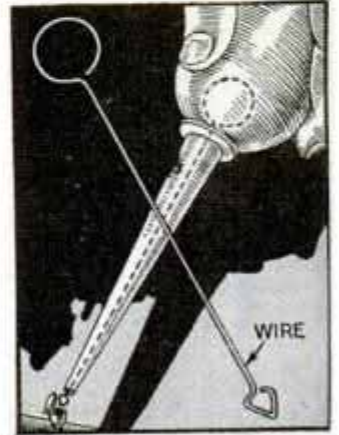


As most iron wedges are too short to split logs without driving them down below the surface of the cleft, where they are difficult to drive and almost impossible to remove, I start the split with them and finish it with

long wood wedges. These are hardwood, about 1 ft. long and are protected on the sides with strips of galvanized sheet iron tacked on. If several of these wedges are made up, you can split any log without difficulty.—A. Hinkley, Rowley, Mass.

Non-Clogging Spout for Oilcan

To prevent clogging the spout of an oilcan, when it is used around machinery, bend a length of small wire to form a loop at one end. Insert the other end through the spout and bend the projecting portion to form a small triangle. This end may be used to clean oil holes or to lift cup caps.



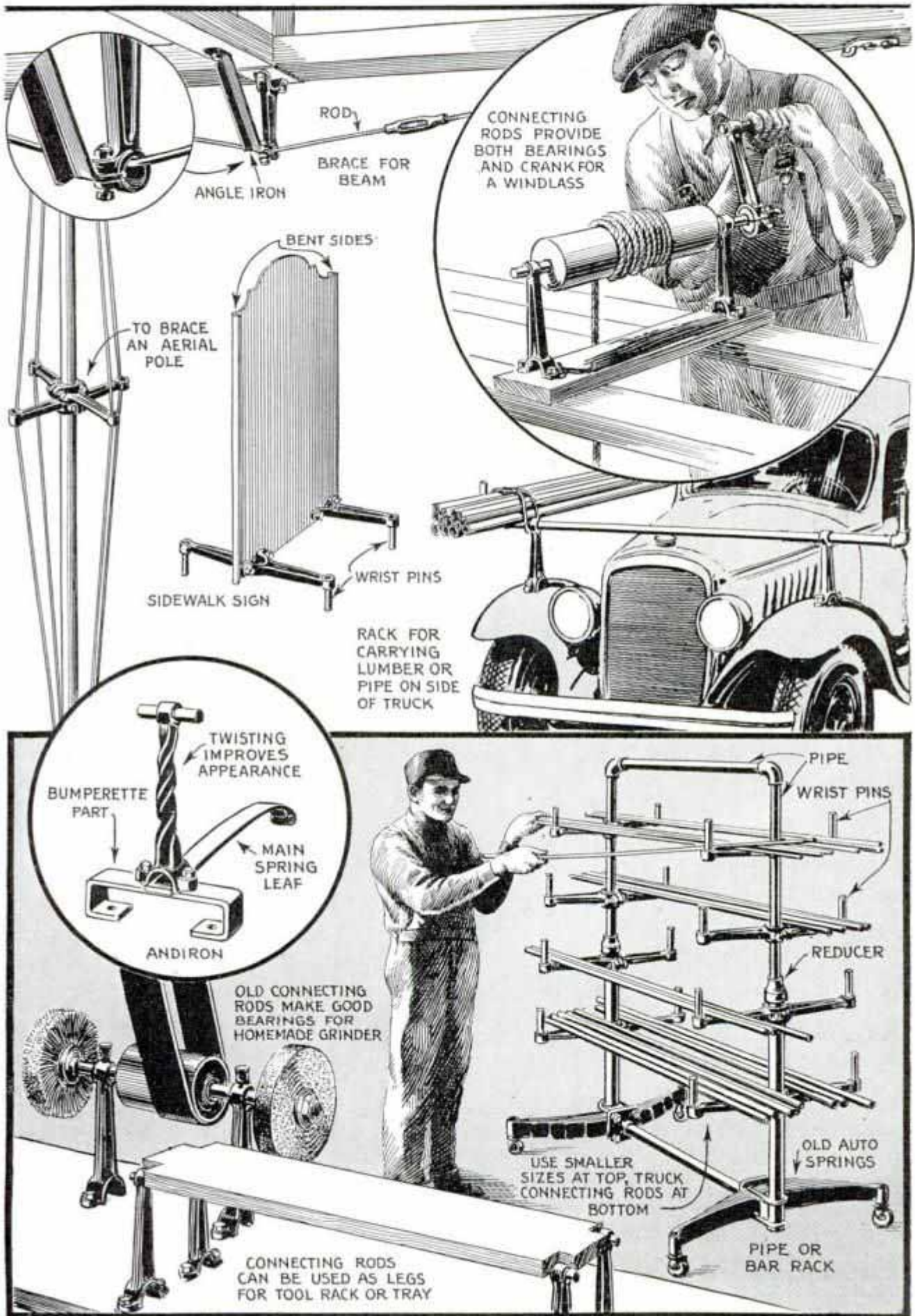
Show Cards Dried in Cardboard Trough

When making up a number of small price tickets and similar work, show-card writers will find a piece of corrugated cardboard handy for holding the cards while they are drying. Bend the cardboard at right angles and prop it against the wall, tacking the lower portion to the top of a table or drawing board.



The Cardboard Is Bent at Right Angles and Propped against a Wall, Tacking the Lower Part to a Table

Old Auto Connecting Rods Have Many Uses



Rolled Paper Is Torn Off Roll Evenly with Hack-Saw Blades

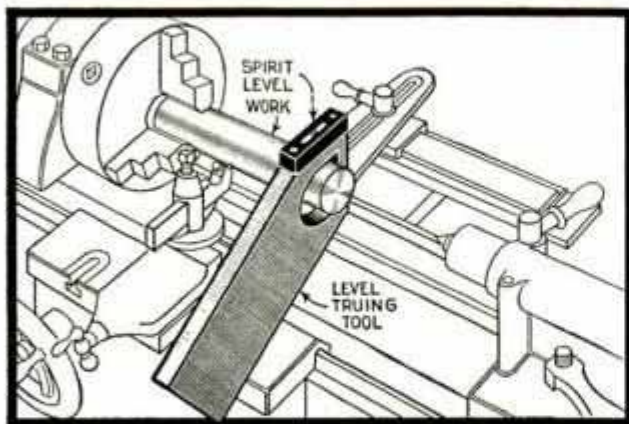


HACK-SAW BLADES

Hack-Saw Blades Tend to Perforate Heavy Wrapping Paper and Make It Tear with Straight Edges

Most wrapping-paper holders of the type shown are not effective when heavy paper is used, unless the operator presses down on the shearing blade with one hand while tearing off the paper with the other. To improve such a holder to handle heavy paper, one storekeeper riveted hack-saw blades to the shearing blade. The teeth tend to perforate the paper when it is pressed against them, thus making it tear off with straight edges.

Tool for Truing Turned Lathe Work Is Made from Level



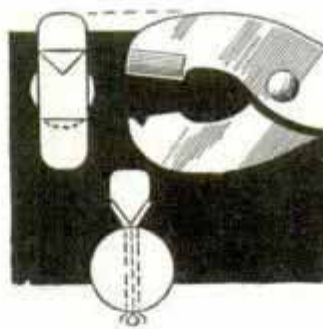
By Using This Tool, You Can True Up Turned Work without Stopping the Lathe

Instead of using chalk to aid in truing up turned work in a lathe, which requires frequent stopping and starting, try this

tool. It consists of a length of flat steel with a hole bored at one end to take the largest size of stock usually handled on the lathe. The front side of the hole is cut to a V-shape. The tool is then slipped over a perfectly true piece of work with the bar resting against the lathe bed. Next, the top of the bar is marked off and then machined level, after which a small spirit level is attached to it with screws. If the tool is laid on any size of work within its capacity, and it is true, the bubble will be central. If the work is not true, the high spot will show by the bubble moving away from the operator as the chuck is turned by hand—H. Moore, Hamilton, Ont., Can.

Cotter Keys Spread by Altered Pliers

For spreading cotter keys, alter an old pair of pliers as shown. Grind the face of the upper jaw to a V-shape and cut a V-slot across the face of the lower jaw as



shown. In use, hold the pliers so that the head of the cotter key rests in the slot of the lower jaw. Then, by bringing the edge of the upper jaw between the legs of the key, you can

bend them over quickly, after which a light tap on each leg with the pliers will finish the job.—Ralph Stewart, Charlotte, N. C.

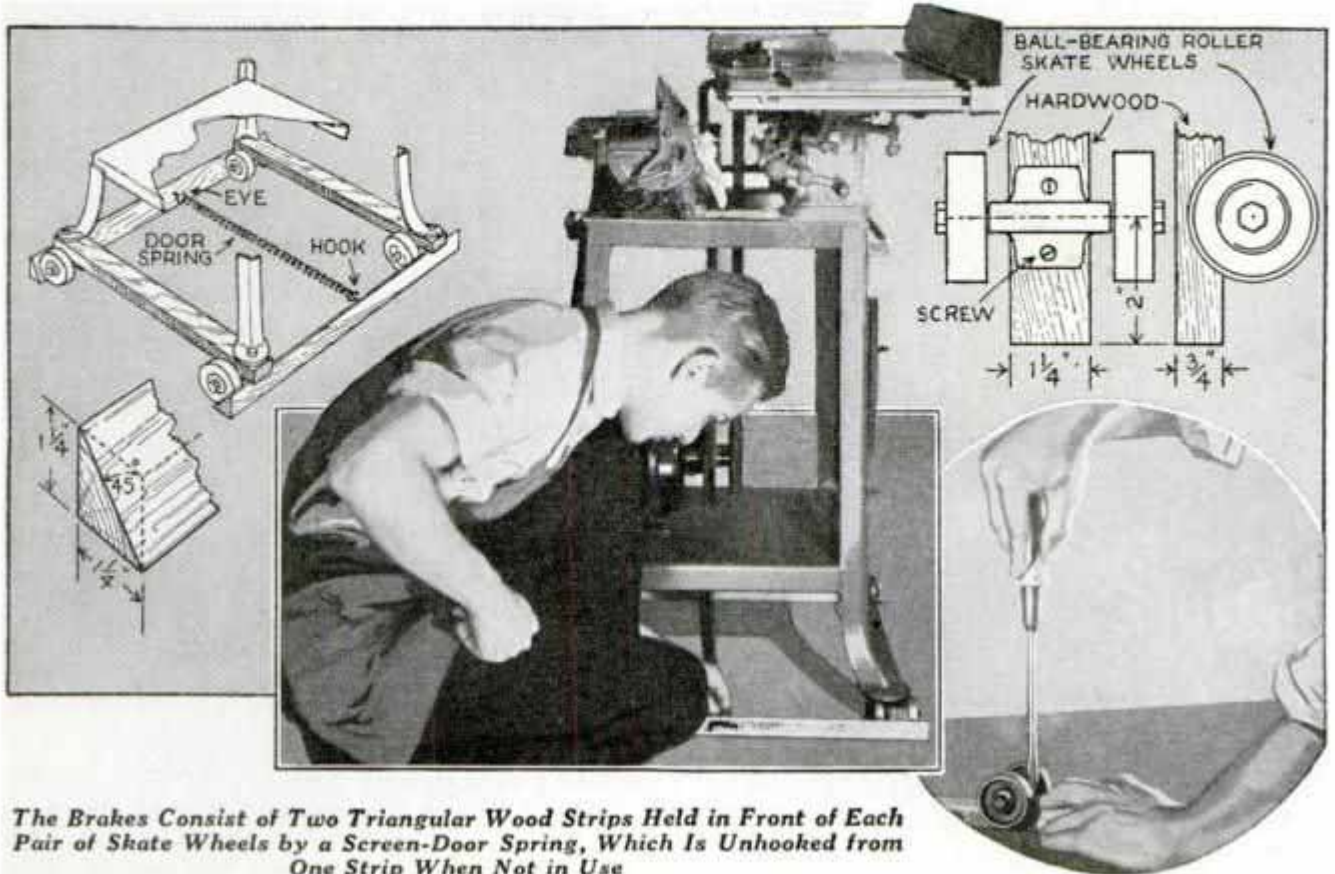
Tool-Room Checks on Curtain Ring Are Easy to Remove

Instead of carrying tool-room checks on a key ring, which is difficult to open when the hands are greasy, try using a spring curtain ring of the type shown. Opened like a safety pin, it is



easy to handle and can be clipped to your belt or clothing, or it may be carried on a short chain.

Circular Saw Has "Roller Skates" and Brakes



The Brakes Consist of Two Triangular Wood Strips Held in Front of Each Pair of Skate Wheels by a Screen-Door Spring, Which Is Unhooked from One Strip When Not in Use

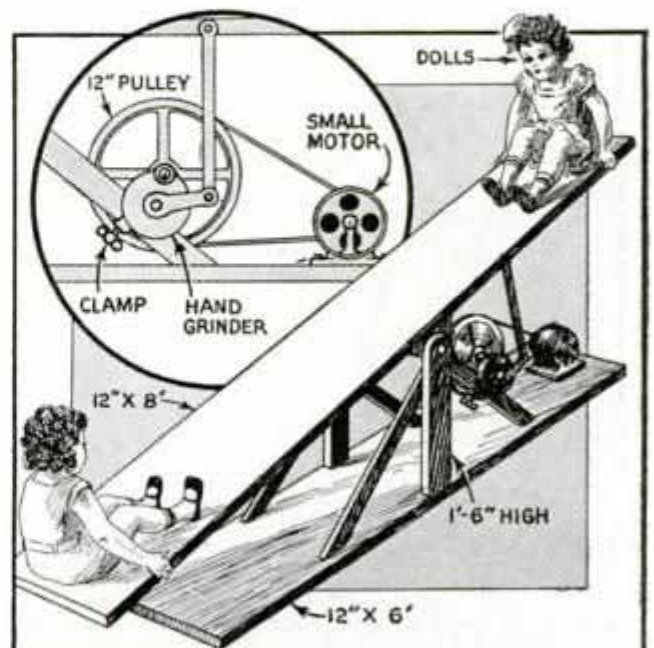
If you have a floor-type circular saw, the problem of moving it without difficulty is solved with two old roller skates, preferably of the ball-bearing type. Cut off the rivets that hold the wheel trucks in place and mount the pairs of wheels on the ends of two hardwood strips as shown,

bolting the latter to the feet of the saw stand. To keep the saw from "creeping" when in use, two triangular strips of wood are held with a coil spring against the lower part of the wheels. When moving the saw these are pulled up over the legs. —R. O. Buck, Chicago.

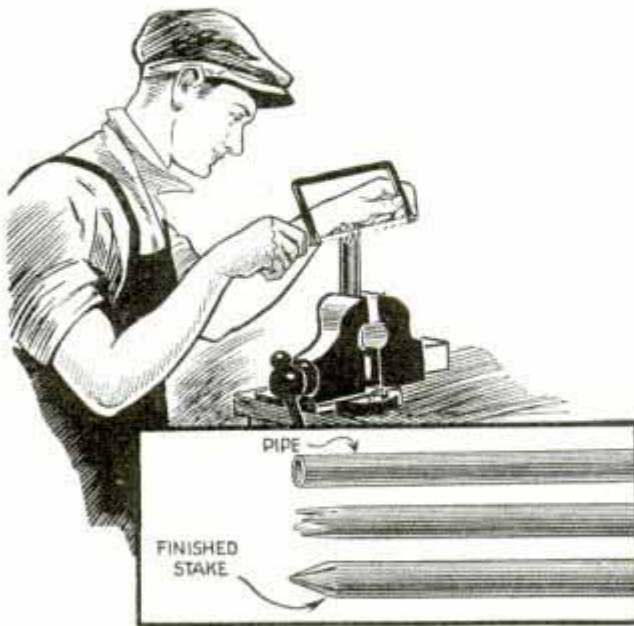
Seesawing Dolls Put Action in This Store-Window Display

Set in your show window with the operating mechanism concealed by scenery built up of painted cloth and evergreen foliage, these seesawing dolls will attract attention of many shoppers. The seesaw is driven by a small motor through the gear mechanism of a hand grinder. A 12-in. pulley is substituted for the grinding wheel and a 2-in. crank arm takes the place of the handle, the arm being connected to the seesaw with a wood pitman. The entire assembly occupies a space 8 ft. long, 1 ft. wide and 1½ ft. high.

Most of the noise made when cutting sheet metal on a scroll saw can be eliminated if the work is sandwiched between two sheets of heavy cardboard.



Stakes Made from Pieces of Scrap Pipe Are Strong and Durable



Hollow Stakes of Pipe Are Light to Handle, and Will Withstand Hard Usage

Needing a number of stakes to set concrete forms and for other purposes, a contractor made them inexpensively from scrap pieces of pipe. To point the stakes, one end of each piece of pipe was serrated to form four teeth, which were then hammered together as illustrated.

Covers of Ice-Cream Containers Removed by Pulling on Strips of Paper

Realizing the difficulty his customers often experienced in removing covers from ice-cream containers, a druggist places a strip of waxed paper across the top of the filled container before putting on the cover. The latter can be removed easily by pulling up on the projecting ends of the paper.



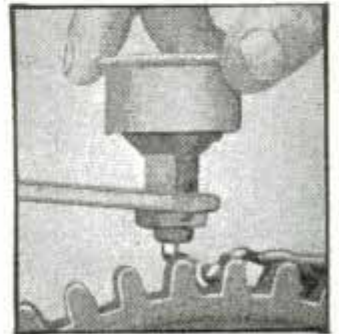
Boiler Scale Loosened with Vinegar

In cases where a thick coat of rust has been deposited on the inside walls of the pipes and boiler of a steam-heating plant, most of this can be removed as follows:

Drain all the water from the boiler, remove the steam-pressure gauge and, using a funnel, pour bulk vinegar, 5 gal., into the boiler, and then fill up with water. Allow the vinegar solution to circulate through the system for six days of firing. Then drain and flush with clean water.—H. B. Klimek, Detroit, Mich.

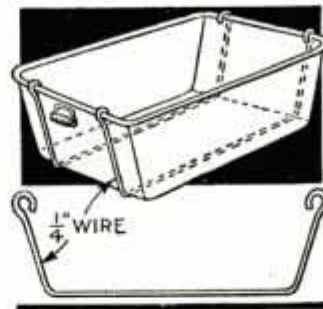
Gear Grease Is Dropped on Teeth from Cup Mounted Rigidly

For effectively lubricating gears that are not housed, mount a grease cup above them as shown. A couple of turns of the cup at intervals will keep the gear lubricated.



A flat-iron arm drilled at one end to take the cup nipple and bolted to a convenient part of the machine makes a good mounting. Or, if the gears are covered with a shield, the cup can be screwed on the latter.

Metal Shop Baskets on Wire Runners Prevent Fast Wear



In a western factory where parts are carried from table to table or to various departments in sheet-metal baskets, the workmen soon wear holes in the bottoms by pulling them along on a concrete floor or sliding them over the table tops. To prevent such wear, lengths of heavy wire or small iron rod are placed on the baskets as shown to serve as runners. When worn, the wires are replaced.

Photographic paper that is too old to make good prints may often be used with excellent results by adding potassium iodide, 1 teaspoonful, for each quart of developer in the tank; the iodide often corrects the tendency of the paper to turn gray before being fully developed.

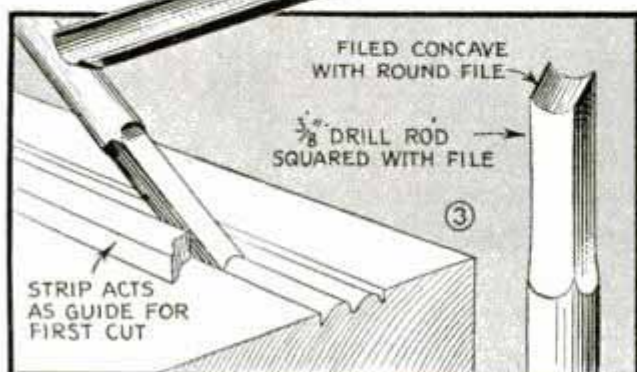
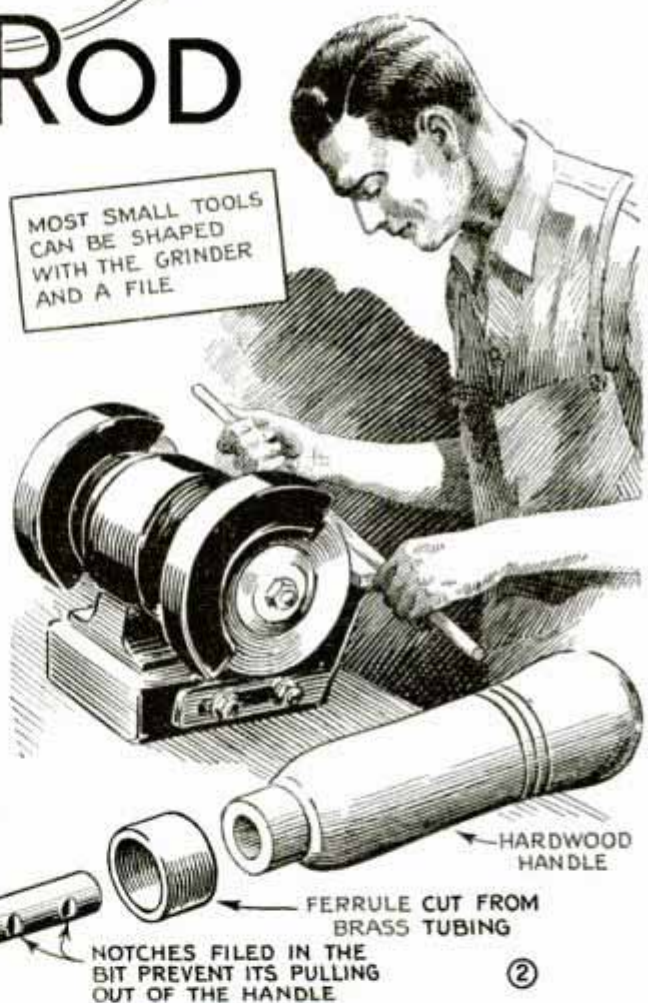


TOOLS *you can make* from DRILL ROD

By W. CLYDE LAMMEY

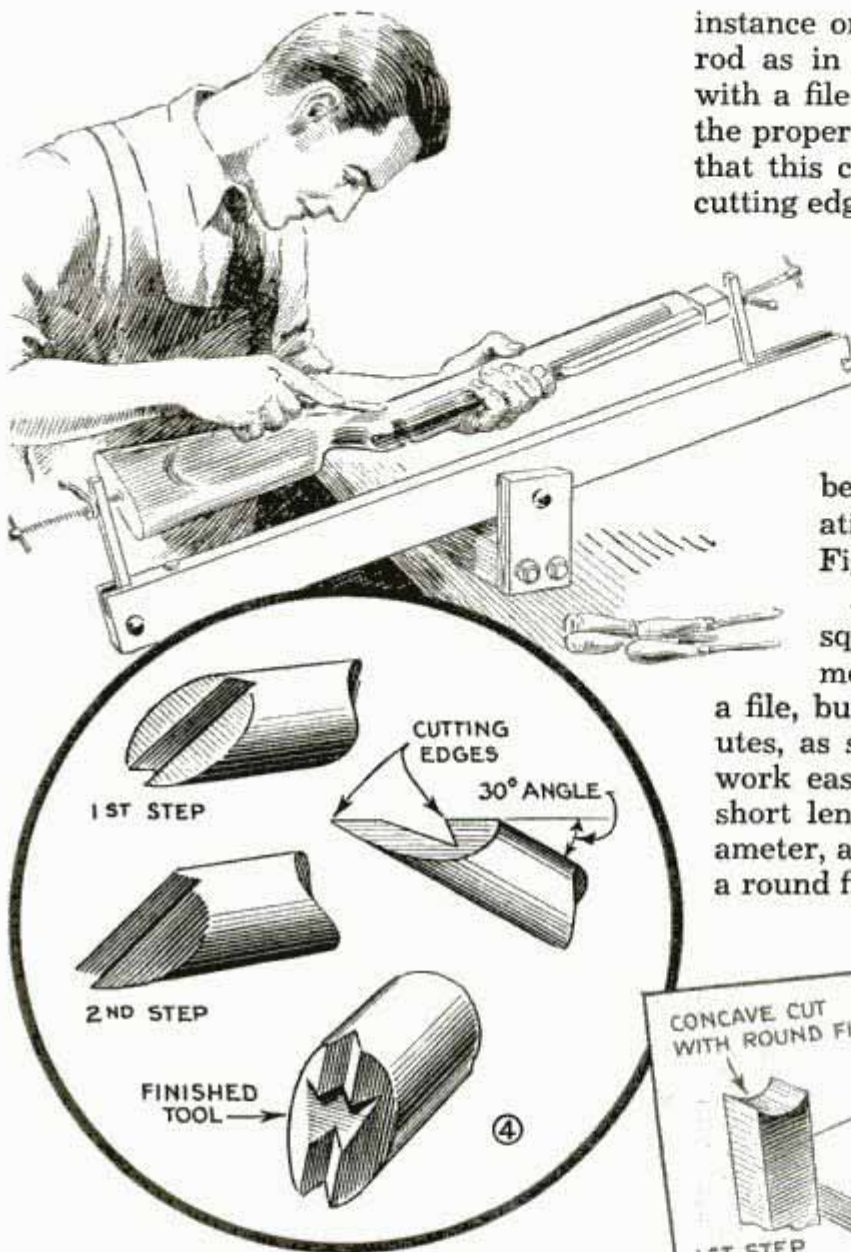
REMEMBER the times you needed a certain size or type of chisel, screwdriver or punch? Or, perhaps it was a swage, gouge, nail set, turning chisel, fluting or beading tool. These and many others can be improvised from drill rod. As an example, you need a very small cold chisel for fine chipping operations on brass or other soft metals. A piece of $\frac{1}{4}$ or $\frac{3}{8}$ -in. drill rod, a file, and a few minutes time, is all you need to make exactly what you want. Drill rod is cheap, the size is always exact, and you can grind, file, and turn it easily.

Fig. 1 shows the variety of small hand tools made of drill rod. Most of these are serviceable without tempering, especially those intended for woodworking. Tools shaped from drill rod can be ground and honed to a ra-



zor edge which will stand up in any ordinary wood. For woodworking tools, you can get ready-made hardwood handles or you can make them yourself as in Fig. 2, providing brass ferrules to prevent splitting. Handles should always be large enough to fit the hand comfortably and afford a good grip for easy control of the cutting edge.

Now some practical applications: For beading on a piece of furniture try the



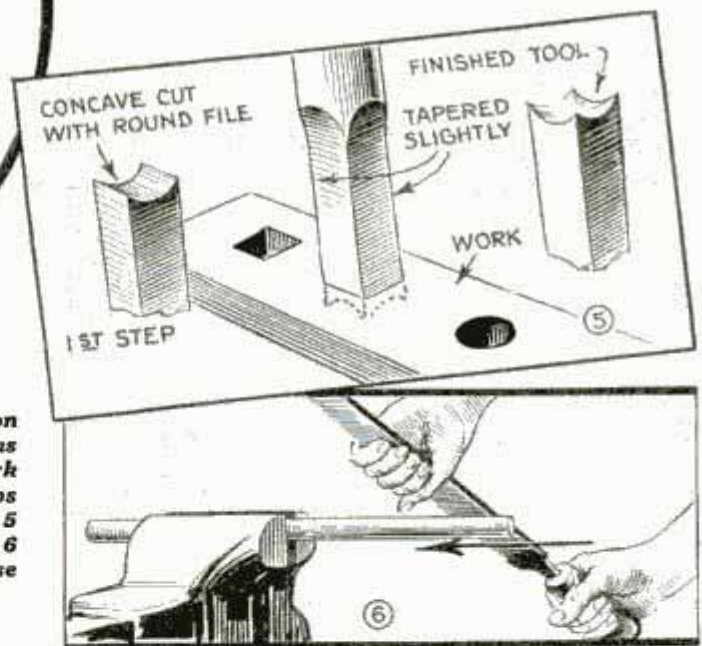
Perhaps you have admired the fine checkering on high-grade gunstocks and wondered how it was done. You can make a tool for this delicate work from drill rod as in Fig. 4, which shows the steps in shaping the cutting point with a file. Fig. 5 shows a tool for squaring a round hole, while Fig. 6 gives you a method of making rotary files for use on wood and soft metals

tool shown in Fig. 3. It works equally well on either a curved or flat surface. To make it, you simply square a short length of drill rod, fit a suitable handle and file the end to a concave form. The angle should be about 30 degrees. A strip, clamped to the work, acts as a guide when starting the first cut, which should be light until the wood is deeply scored. Then a few strokes will finish the bead.

A tool used for fine checkering, as for

instance on gunstocks, is made from drill rod as in Fig. 4. A few careful strokes with a file will bring the cutting edges to the proper form. You will see from Fig. 4 that this consists of four bevels and four cutting edges, and that the two inside bevels form a "V." All four bevels are ground at the same angle. Except in the very finest work, the checked area on a gunstock is inclosed with a border, generally a single, shallow bead. The tool for this final operation is made the same as that in Fig. 3, except that it is smaller.

Another common problem is squaring a round hole drilled in metal. This is a tedious job with a file, but a swage, made in a few minutes, as shown in Fig. 5, will make the work easy. Simply square the end of a short length of drill rod of suitable diameter, and make two concave cuts with a round file at right angles across the flat

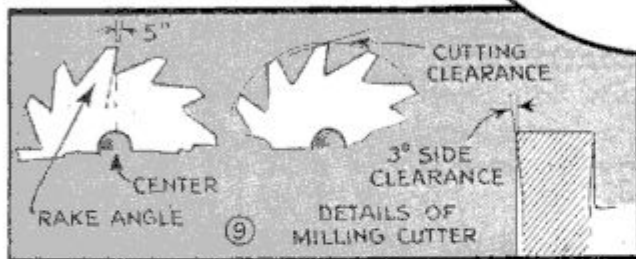
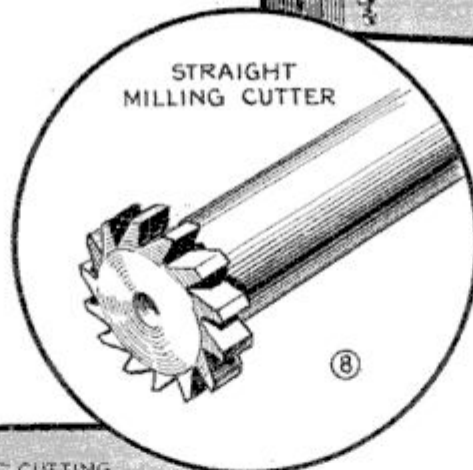
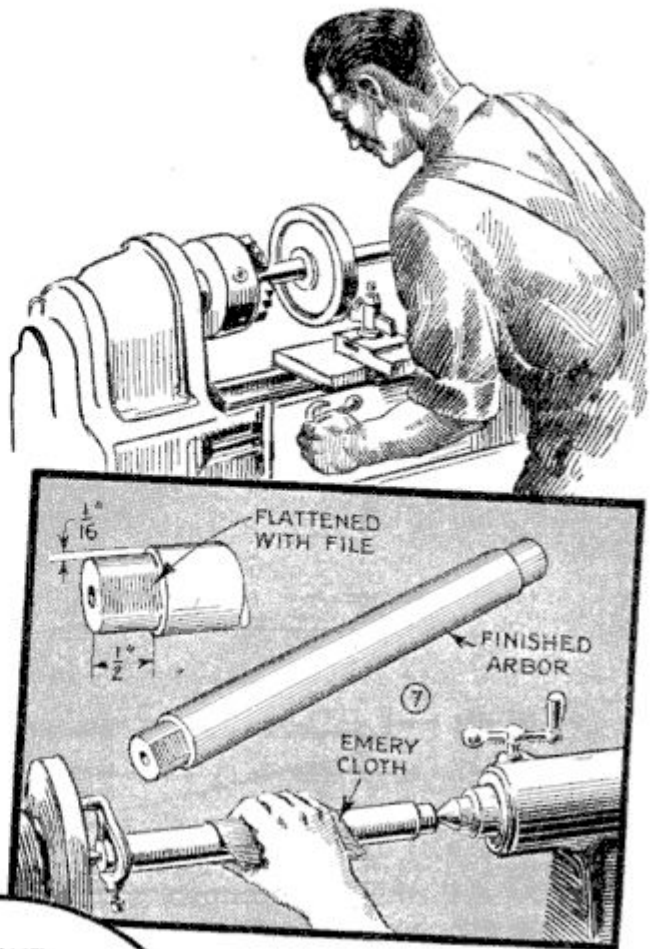


end. Set this tool over the hole to be squared and strike it a few light blows with a hammer. To square holes in any of the soft metals, the cutting point need not be hardened; in iron or steel, of course, it must be suitably tempered.

Rotary files like those shown in Fig. 6 are handy for use in the drill press or in a portable electric drill. You can turn these to shape and then groove the cutting faces with a single-cut file as shown.

They will cut in wood or soft metals without hardening.

A lathe tool for machining a small flywheel or locomotive drive wheel, is a mandrel. Fig. 7 shows the whole process of making this tool from drill rod. First you mount the work on centers and shoulder the ends back an inch or so. Then you turn down the body to a true cylinder and to a diameter slightly greater than that of the hole it is to fit. To get the necessary taper on small mandrels, loop a strip of emery cloth over the body at what is to be the small end. With the lathe running, pinch the cloth tightly between the fingers and move it slowly toward the opposite end, at the same time gradually lessening the pressure. In this way you will form a taper, the degree of which is easily checked with a micrometer caliper. Mandrels of small diameters should be as short as the work will permit. Another lathe tool, which is easily made, is the straight milling cutter shown in Figs. 8 and 9. Making this cutter is a matter of turning it to the rough form and then filing in the cutting teeth. The side clearance you can form by undercutting in the lathe. To use the cutter, you center it in the chuck and mount the work on the tool-post saddle in what-

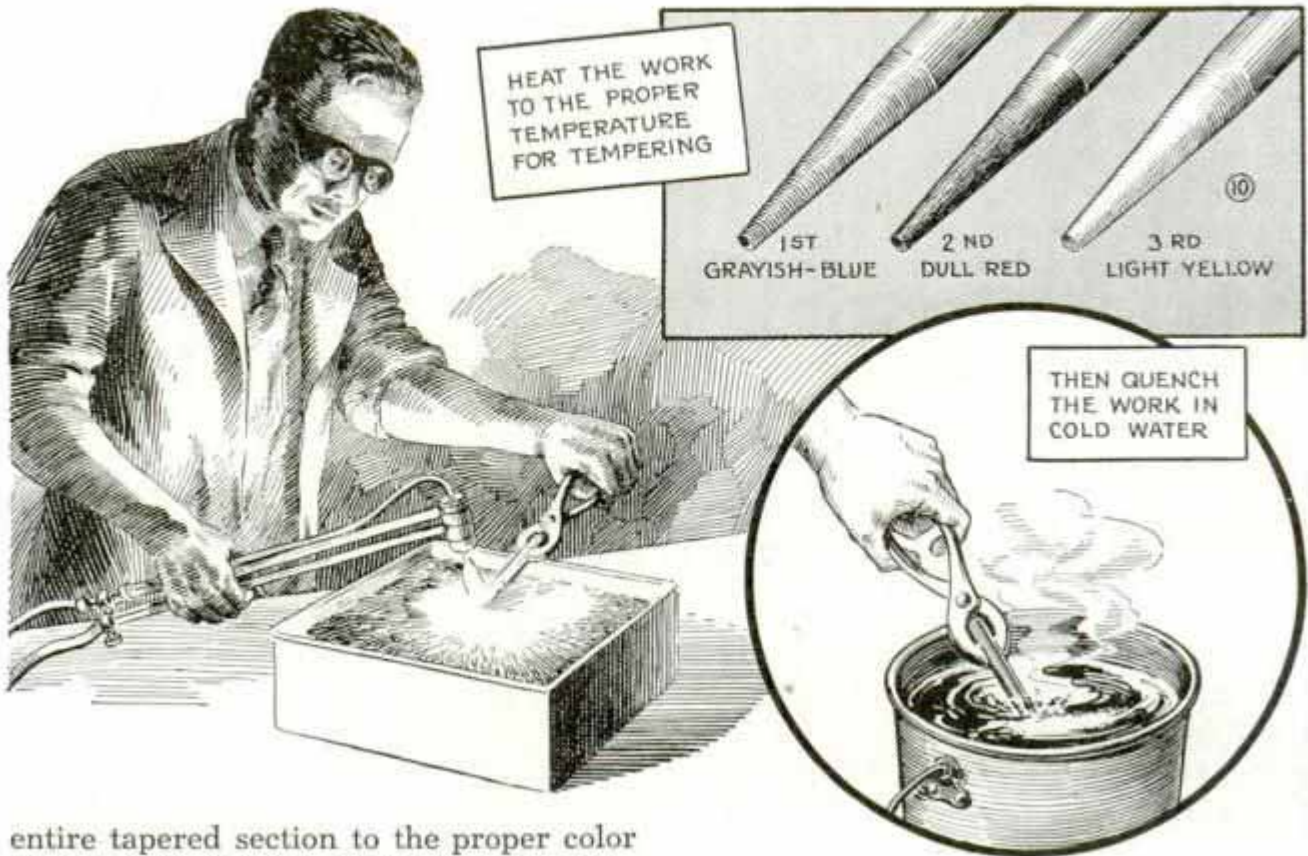


ever way is necessary to hold it securely. Then you reverse the lathe spindle at slow speed and feed the work against the cutter with the cross feed. Such a cutter will work, without hardening, in any soft metal, including brass.

A glance at Fig. 10 will tell you what to do when it is necessary to temper. As a first step, it is well to anneal the drill rod from which the tool is to be made. This is done by heating to a dull red color and

Above, a quick way of making up a lathe mandrel to hold cast pulleys and small flywheels for machining all over. For light work such a mandrel need not be hardened. Small milling cutters, as in Fig. 8, for use in your lathe, can be made by turning down a piece of drill rod to form a shank and then shaping the teeth. Left, how you shape the teeth of the milling cutter for proper clearance and cutting angle

then allowing it to cool slowly. Now you file, grind or turn the rod to the desired shape and then re-heat with a torch. A thick pad of asbestos or a shallow, tin box, filled with sand and heated, will make a good support for the work while you are heating it. In general, the oxide colors go through the three stages shown in Fig. 10, and it is important to observe these color changes closely, in order to temper successfully. The object is to bring the work uniformly to the same color on the section you want hardened. For example, in heating the tapered end of the nail set in Fig. 10, you keep the flame well back on the taper and allow the heat to travel to the point. In this way you will bring the



entire tapered section to the proper color at the same instant, whereupon you immediately quench the work in cold water. In general, this same process applies to any of the small tools requiring tempering, but you will have to use some judgment in applying the heat, of course. When you

grind tools on an emery wheel, be careful not to draw the temper, which is done by slightly overheating them. Therefore, keep a can of water handy and dip the tool every few seconds to keep it cool.

Ice Cakes Handled on Loading Platform with Iron Skid



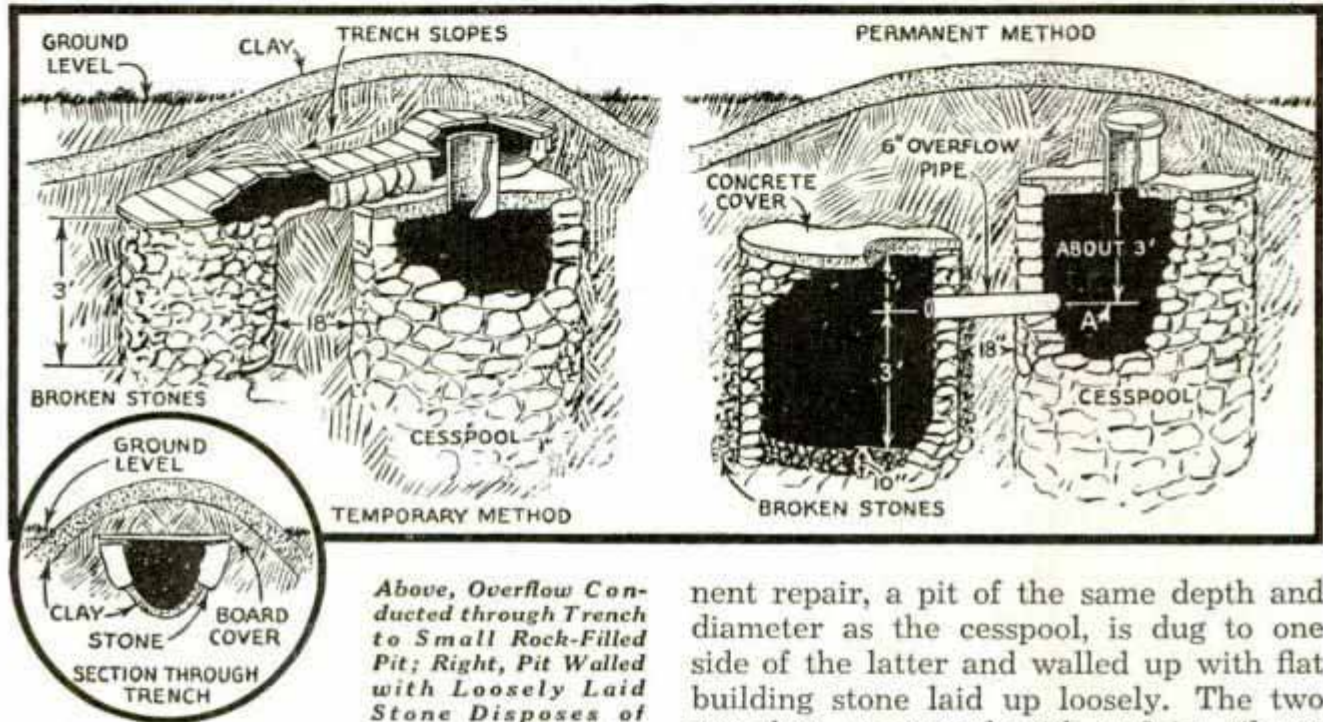
This Skid Saves Time When Ice Cakes Are Moved About on a Platform or Up a Gangplank

For handling ice on a loading platform, and for conveying the large cakes up or down a gangplank, this skid will be found much safer and more easily controlled than tongs. It is made of heavy iron rod bent double and welded to form an eye at the looped end. The free ends are then spread apart, bent at right angles and pointed to slide easily under an ice cake. A cross rod is added to strengthen the skid and to provide a foot piece by which the points may be pushed into place. When the handle is pulled down, the pointed ends dig into the ice, and the cake is also raised at that end so that it can be pulled or pushed about with ease.

☐ An economical filler for stopping cracks around windows and doors of barns and other outbuildings is made by mixing equal parts of fine sand and asphalt-roofing paint; the filler dries hard, is water and weather proof and takes paint readily.

Cesspools Repaired to Dispose of Overflow

In many of the older types of cesspools, which are walled up with stones loosely laid, cracks between the stones become clogged and cause them to overflow. Two methods offer a means of effectively disposing of the overflow. The first method, shown in the left-hand detail, provides temporary drainage, while the second effects a permanent repair at minimum ex-



Above, Overflow Conducted through Trench to Small Rock-Filled Pit; Right, Pit Walled with Loosely Laid Stone Disposes of Overflow Permanently

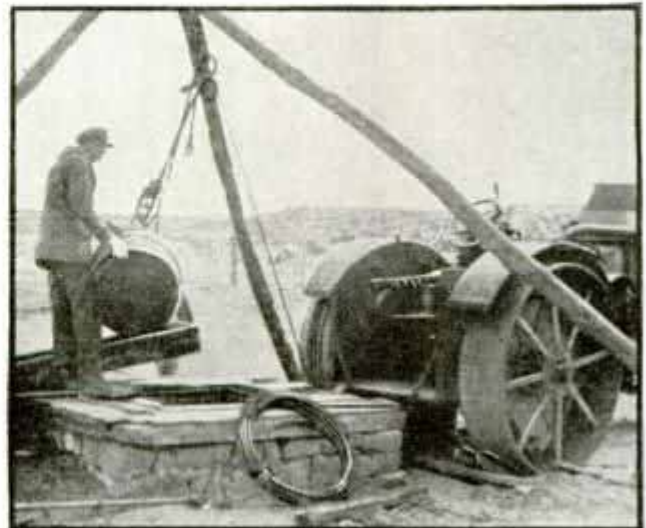
pense. For temporary relief from the trouble, the overflow is conducted through a clay-lined trench into a pit filled with loose, crushed stone. To make a perma-

nent repair, a pit of the same depth and diameter as the cesspool, is dug to one side of the latter and walled up with flat building stone laid up loosely. The two are then connected with a 6-in. tile at about the position indicated by A in the right-hand detail. The bottom of the pit is filled with sand to a depth of 10 in. and the top is covered with a concrete slab.—Lawrence N. Olsen, Philadelphia, Pa.

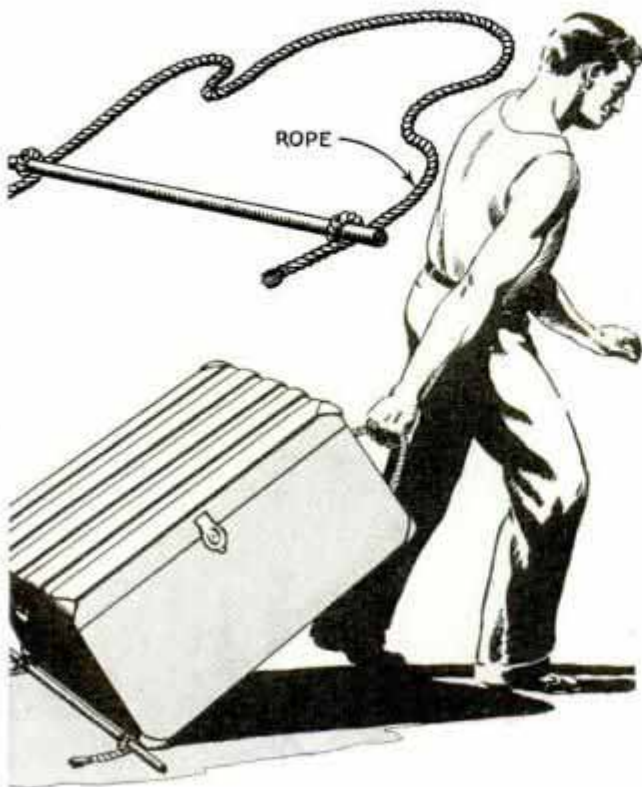
Three-Speed Winch by Using One Drive Wheel of Tractor

On farms and other places where there is occasional need of a strong winch, a tractor will do the job in an emergency. Jack up one wheel and wrap the cable or rope around the tire, chocking the other one to hold the tractor. If lugs are used on the wheel, you may have to remove them to avoid damaging the cable, especially if they run horizontally across the tire.

☐Ticking of an alarm clock in a bedroom may be muffled by inverting a crock or bowl over it; in an invalid's room an inverted fish bowl is preferable as the clock face will be visible.



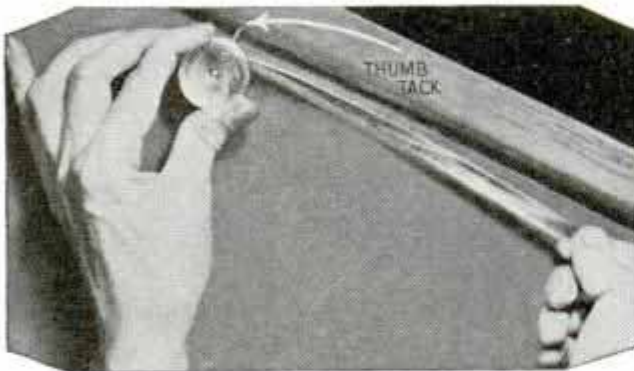
Heavy Trunks Moved on Rope Skid to Prevent Damaging Floors



Rope Skid for Expressmen to Move Heavy Trunks over Floors without Marring Them

Expressmen, who are frequently obliged to carry heavy trunks to avoid marring polished floors, will find a rope skid a time and labor saver. A trunk, when placed on the skid with one end against the wood crossbar, may be pulled over a floor without damaging the surface.

Tape Measure Fitted with Thumbtack Is Used Single-Handed



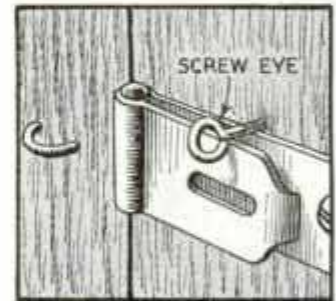
Thumbtack on Case of Steel Tape to Take Measurements Longer Than Reach of Your Arm

When measuring long timbers, buildings or other wooden material with a tape measure, a thumbtack soldered to the case of the tape will enable you to do the job

single-handed. In use, the point of the tack is pushed into the surface of the work to be measured, after which the tape is pulled out to the required length.

Free End of Padlock Hasp Is Clipped under Screw Eye

To keep the hinged end of a hasp, when not in use, from swinging around and catching in the door casing or on the clothing, drive a screw eye or hook



above the hasp as indicated. Then the eye or hook can be turned to engage the hinged end and hold it against the door.

Wooden Stakes Shielded from Splitting under Sledge Blows



Slipped over the upper end of wood stakes, a hub from a buggy or light wagon wheel makes a good shield to prevent them from splitting under the blows of a sledge.

As the hub is tapered, it will fit various sizes of either round or square stakes. A light upward blow on the lower end of the hub loosens it after the stake has been driven.

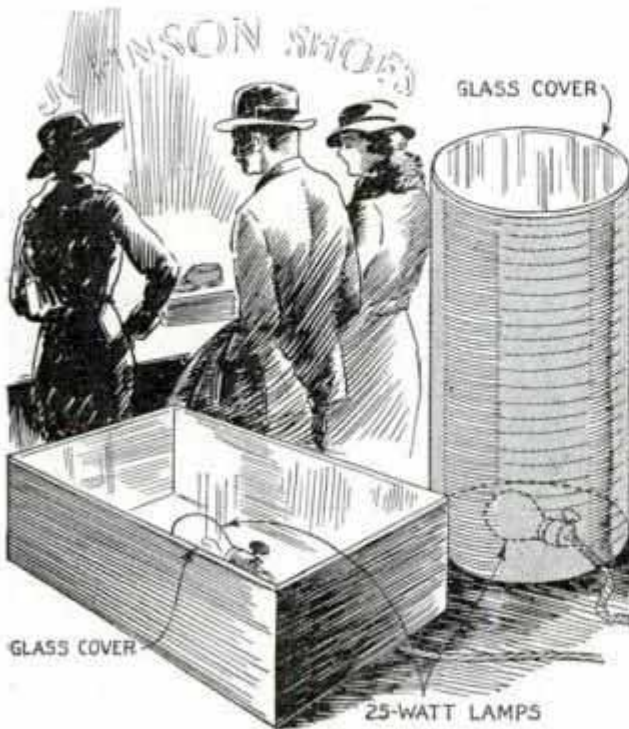
Hooks on Beehives Replace Weights

Instead of piling stones on a beehive to hold the covers and "supers," screen-door hooks and screw eyes will lock the assembly together and give a much neater appearance.

When attaching them, measure off their locations uniformly on the hives so that they will be interchangeable.



These Window Displays Are "Eye Catchers"



Above, objects in show window illuminated individually by box or cylindrical pedestals containing lamps. Right, miniature figures having light-bulb heads attract shoppers' attention to messages held in their hands

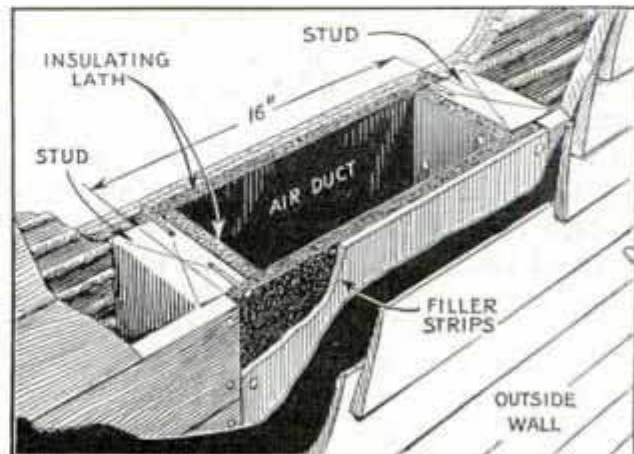


In the right-hand detail is shown an exceptional display where small cardboard figures have electric bulbs painted to resemble human heads. The figures, posed in a realistic manner, call the attention of shoppers to advertising placards held in their hands. The detail shows how the lamp sockets are held to the cardboard with U-shaped clamps.

Hot-Air Ducts Built of Insulating Board Reduce Heat Loss

In homes where hot air is to be carried to an upper floor through ducts in the walls, a great improvement over the usual sheet-metal ducts is to construct them of insulating board of the type having one side faced with aluminum foil. Besides permitting greater area between the studs for air passage, the ducts, due to their insulating qualities, minimize loss of heat by radiation, permitting them to be installed in outside walls as well as partitions.

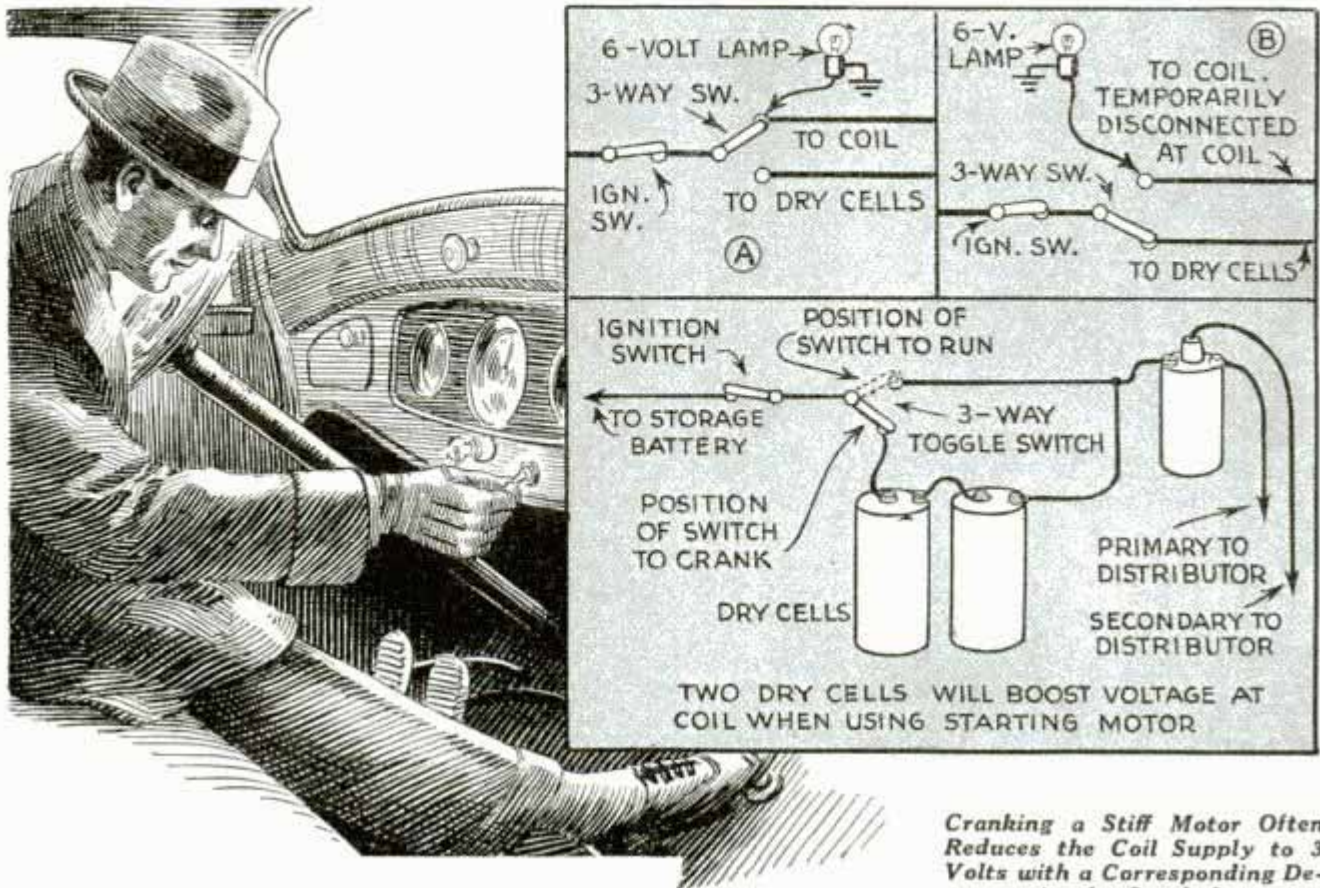
When it is necessary to fold a blueprint, back the creases with adhesive tape and the print will last longer.



With the Aluminum Face Inside, This Insulating Lath Offers Little Resistance to Passage of Air

Sold Bond Insulating Lath
national Insulating Board Co. Buffalo, N.Y.
188 Delaware Ave.

Winter Starting Aided with Ignition Booster

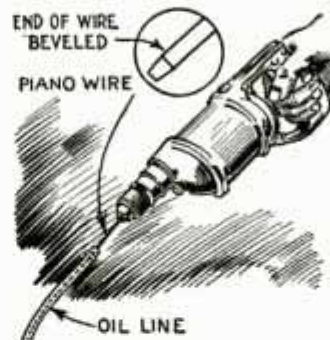


Cranking a Stiff Motor Often Reduces the Coil Supply to 3 Volts with a Corresponding Decrease in the Spark Intensity

An ignition "helper" consisting of two dry cells to boost the current so that good, hot sparks at the plugs will start the motor quickly, will save much wear and tear on the battery. The method of connecting the dry cells in the circuit with a three-way toggle switch is shown so that the dry-cell supply may be switched on conveniently. After the motor is running, the supply is cut off. In wiring, be sure that the negative and positive sides of the dry-cell supply are connected to correspond to the circuit of the car. To check this, take a 6-volt lamp with two long lead wires. Ground one of them to the car frame and then, with the three-way switch turned to the running position, as indicated in the drawing, touch the bared end of the other to the terminal that leads to the ignition switch. The lamp will burn at full brilliancy. Now, disconnect the coil wire from the coil temporarily and touch the end of the lamp wire to the terminal of the three-way switch that connects to the dry cells, the switch being turned over to cranking position. If the lamp burns with more brilliancy than normal, the connections to the dry cells are made correctly. If it burns dimly, reverse them.

Clogged Oil Line Cleaned with Wire and Electric Drill

Clogged oil or fuel lines are cleaned readily by inserting a length of piano wire into the tubing and rotating it with an electric or hand drill. The end of the wire should be beveled so that it will easily penetrate any foreign matter in the line. If you have much of this work to do, braze the end of the wire to a small



steel or brass rod so that it can be chucked into the drill quickly.

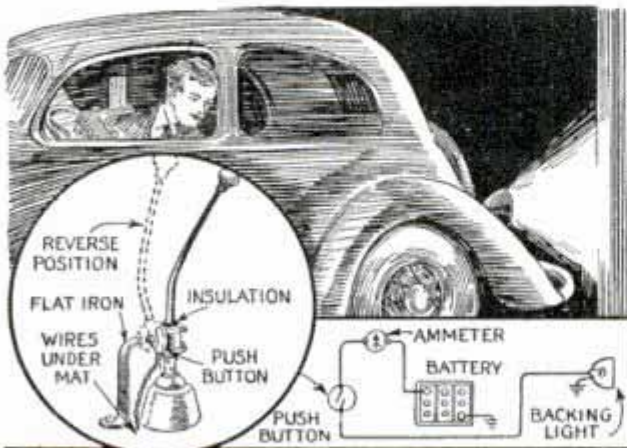
"Switching" Ignition Points Doubles Their Life

You will find that efficient service of the ignition points on a Ford V-8 can be lengthened greatly by changing their position when they begin to wear. The

screws should be removed from the breaker plate and reinstalled on opposite sides. Then the assembly of the two moving breaker points should be removed, turned over, and put back in place. The reason for changing the position of the points is the fact that the right-hand set, as viewed from the driver's seat, serves only to close the ignition circuit and does not wear as fast as the left-hand set, which breaks the circuit to fire the cylinders. Too rapid burning of points is usually caused by a faulty condenser or high voltage in the electrical system. Performance can be improved also by keeping the tension on the breaker spring between 22 and 27 oz. It is necessary also to see that the gap of each pair of points is set at the clearance specified by the manufacturer.

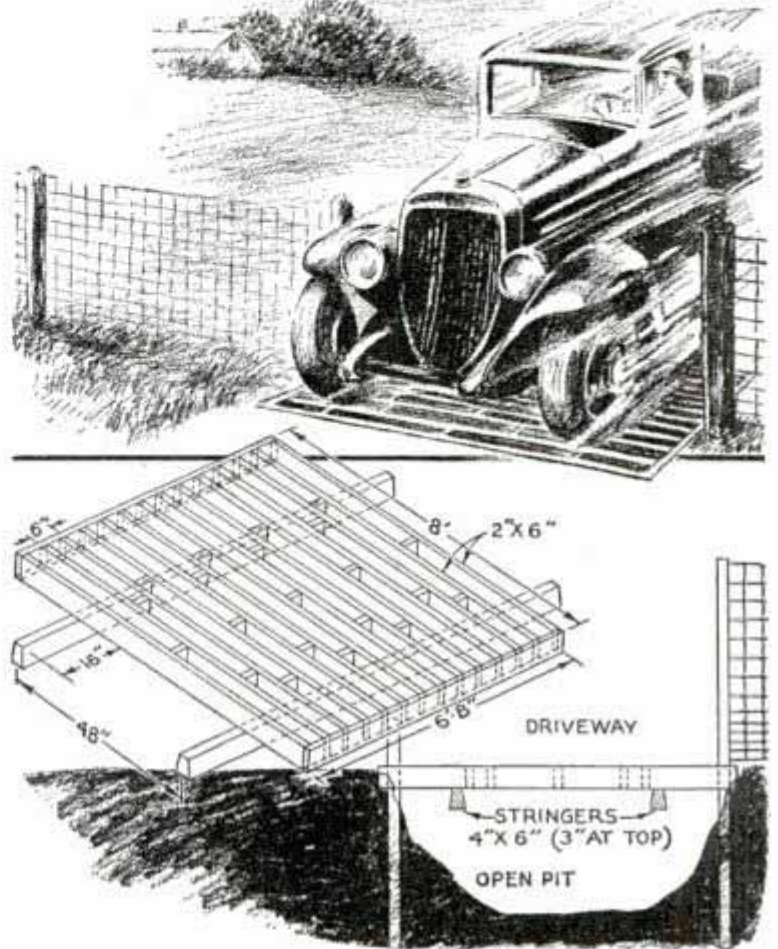
"Backing Light" on Rear of Car Turns on Automatically

Mounted on a rear-bumper bracket and wired to a push button on the gearshift lever, a small spotlight will be turned on automatically to provide illumination when backing your car. Insulate the push button thoroughly from the lever with a piece of inner tube. A flat-iron bracket screwed to the floor boards depresses the push button when the car is shifted to reverse. Place the wires so that the insulation will not be chafed and cause a short circuit.



When Car Is Reversed the Push Button Is Automatically Depressed to Turn on Light

Cattle Guard at Driveway Gate for Cars and Trucks



Heavy Grating Set over Pit between Driveway Gate Posts Keeps Out Cattle, Yet Allows Cars and Trucks to Enter

To avoid the inconvenience of opening and closing a gate each time the farm car or truck was driven to or from the highway, superintendent of the Southeast Minnesota Experiment Station installed a cattle guard at driveway entrance as shown. A pit was dug to a depth of 3 ft. between the gate posts and then bridged with a grating supported by heavy stringers. The grating was made of 6-in. planks set on edge and spaced 6 in. apart from centers, the planks being held in this position by spiking other planks across their ends and by spacing blocks staggered through the center. A regular gate was installed to one side for use when taking a team through the fence.

☞ Before putting on new license plates, polish them with wax just like you do the car body and they will remain like new.

Grain-Sack Tie Strings Cut Same Length on Gallon Jug



For Different Lengths, Various Sizes of Bottles and Other Cylinders Are Used

With one stroke of a sharp knife or razor blade, you can cut a number of tie strings of equal length for tying sacks. Wrap the

twine around a jug as many times as the number of strings desired, and then cut them off on one side. A gallon jug is about the size for grain-sack tie strings.

Keeping Shop Scrap Cans in Place

To keep workmen in a shop from moving the scrap cans to suit their individual convenience, a long bolt was soldered into a hole in the bottom of each can. At the designated locations of the cans, holes were drilled



through the floor to receive the bolts, thus making it impossible to set the cans at any other location.

☐ Stains on washbowls and bath tubs usually can be removed with kerosene.

The Next Issue

YOU, TOO, CAN TAKE FAST-ACTION PHOTOS

High-speed shutters and fast film now available to all camera fans, together with careful planning and handling, will bring split-second movements in your photos—the way to make photos “live.” Chock full of the tricks that make many “impossible” shots relatively easy to get.

SIX ARE SERVED ON COMPACT DINETTE

Ideal for apartments and small homes! Modern “fold-away” dinette with storage space for linen and silverware. Complete blueprint covering two pages.

DRESSING UP YOUR KITCHEN SINK

Have you seen the latest in kitchen cabinet sinks? Almost any sink can be improved by adding this modern touch—a simple job for the craftsman.

TRAILER IS HOME ON WHEELS

Now is the time to start building your trailer home for next summer’s vacation trip. This installment of the streamline trailer covers framing and roofing.

METAL FURNITURE

Following the trend in use of metal tubing and plastics, this story shows an attractive console table. A telephone may be housed under the sliding top.

Wings on Wheels



the
1936

HARLEY-DAVIDSON

They're here NOW — the 1936 Harley-Davidsons—and they're the last word in motorcycle speed, power, and style.

Yeah, man—an array of advancements and magnificent models—new cylinders and heads with deep cooling flanges—spring fork shield—a new 80 model—a new sidecar!

No use trying to tell you all about them—you'll have to SEE and RIDE one of these "Wings-on-wheels" motorcycles to get a good idea of the THRILLS that will be yours when you own one. See your nearest Harley-Davidson dealer NOW. Ask for a FREE RIDE on a 1936 Harley-Davidson. Ask him about his EASY PAY Plans—and send in the coupon.

Ride a
HARLEY-DAVIDSON

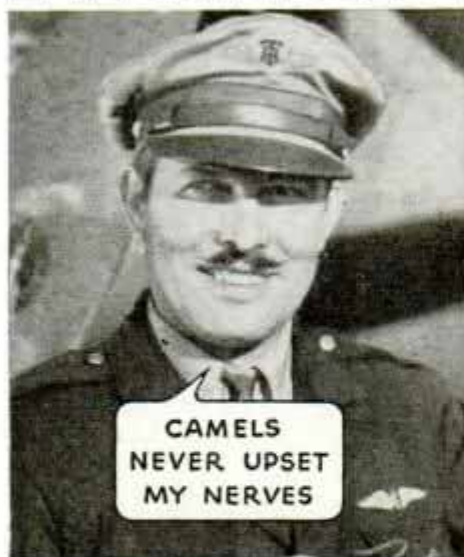
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Dept. P., Milwaukee, Wis.
Interested in Motorcycling. Send illustrated literature on new '36 Harley-Davidsons. Postage stamp enclosed, is to cover mailing cost.

Name.....

Address.....

My age is 16-19 years, 20-30 years,
 31 years and up, under 16 years.
(Check your age group)

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ROScoe TURNER—Famous Flyer



MRS. WM. LA VARRE—Explorer



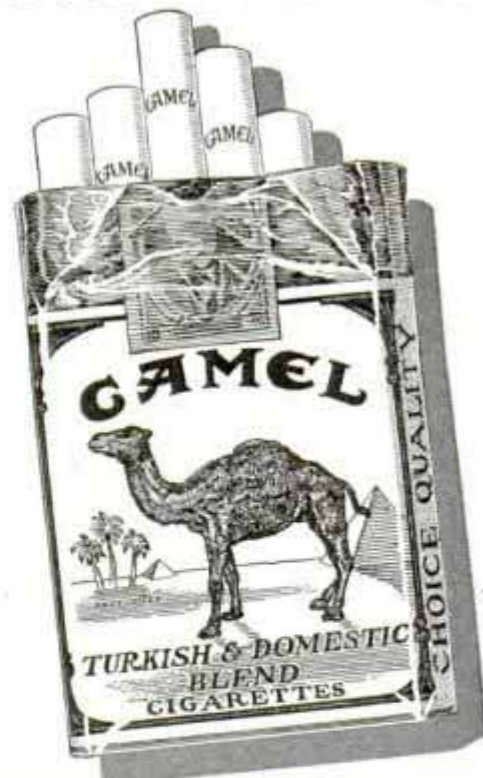
GENE SARAZEN—Golf Champion

CAMEL'S COSTLIER TOBACCOS mean so much to so many people that we invite you to try them too—confident that they'll win you.

**Camels must please you _____
or you've smoked them FREE!**

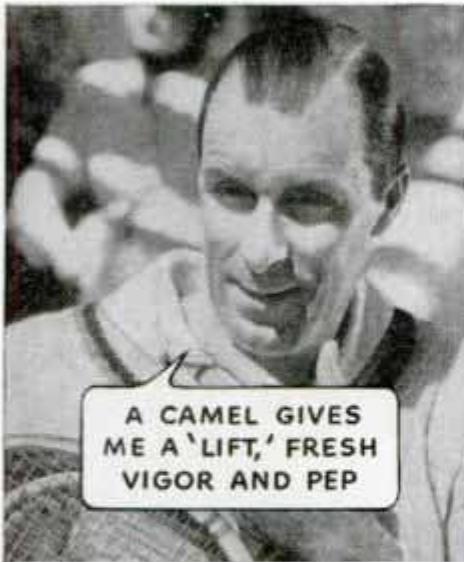
● Camels have given more pleasure to more people than any other cigarette. And so we now issue this new "try ten" invitation in order that others can find out for themselves the difference Camel's costlier tobaccos make in smoking pleasure.

Why offer can be made—We know smokers like Camels, once they try the costlier tobaccos in Camels. Literally millions of people have changed to Camels and found new enjoyment... new benefits. We want you to share their enthusiasm. Turn to Camels. Be one of the vast number who share in the enjoyment and appreciation of those finer, more expensive tobaccos.



COSTLIER TOBACCOS!

CAMEL'S COSTLIER TOBACCO!



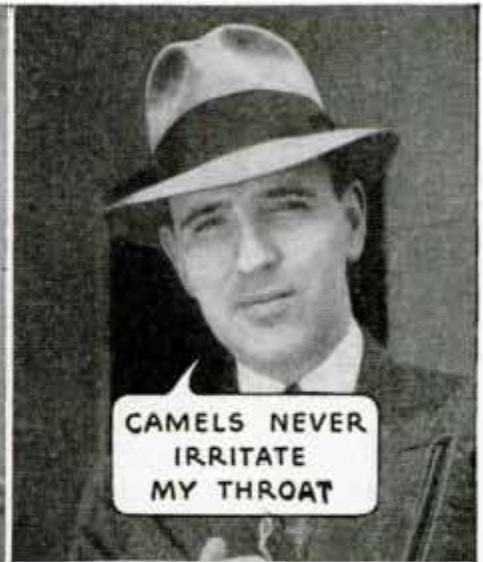
A CAMEL GIVES
ME A 'LIFT,' FRESH
VIGOR AND PEP

WM. T. TILDEN, 2nd—Tennis Star



CAMELS ARE
A MILDER
CIGARETTE !

HOMEMAKER—Mrs. J. B. Feeley



CAMELS NEVER
IRRITATE
MY THROAT

SALESMAN—A. M. Craig, Jr.

**READ OUR INVITATION
TO YOU**

Money-Back Invitation to try Camels

Smoke 10 fragrant Camels. If you don't find them the mildest, best-flavored cigarettes you ever smoked, return the package with the rest of the cigarettes in it to us at any time within a month from this date, and we will refund your full purchase price, plus postage.

(Signed)

R. J. REYNOLDS TOBACCO COMPANY
Winston-Salem, North Carolina

© 1936, R. J. Reynolds Tob. Co.

Camels are made from finer, MORE EXPENSIVE TOBACCO
—Turkish and Domestic—than any other popular brand.

When writing to advertisers please mention Popular Mechanics

81327

Growing Things by Magic

(Continued from page 206)

six inches of good, rich soil." Used only for producing early plants such as peppers, tomatoes, cabbages and common annual flowers for transplanting, an electric hotbed three by nine feet, with a capacity of 12,000 to 15,000 plants, would probably meet the needs of an amateur home gardener and the cost of producing plants for early transplanting would probably be around five cents a square foot of soil heated.

For an all-winter garden, the hotbed should be covered with glass of greenhouse quality, preferably in three-by-nine-foot sashes. For raising early plants only, glass probably will not be needed. The bed should be kept well watered, and if covered, should be ventilated during warm weather. A sunny basement or porch frequently proves a good location. When the bed is not in use, its temperature can be raised high enough to sterilize the soil. The seed beds can produce from one to a dozen crops yearly.

Winter vegetables such as beets, lettuce, turnips and celery grow well in soil temperatures of from fifty to sixty degrees. "Warm weather" vegetables require a soil temperature of about seventy degrees for best growth. Keep soil temperature at about eighty degrees until seeds have germinated. After sprouting, sixty-five to seventy degrees is a good growing temperature. Indoor garden experiments also show that many types of flowers can be made to blossom in mid-winter or very early spring by exposure to seventy-five-watt lamps three or four hours each night.

One gardener has installed a "warming griddle" for starting early peppers, tomatoes, cabbage and various garden vegetables and flowers for transplanting. He built the griddle on a bench in a corner of his greenhouse, covered the top of the bench with lead-sheathed wire cable made for resistance heating and placed two-by-four-inch boards between the cables to protect them from the weight of soil boxes. Within three weeks he produced sturdy plants for transplanting.

Electricity is taking new roles in the above-ground propagation of plants. Dr. Samuel G. Hibben, director of applied lighting for the Westinghouse company, in

cooperation with experts of the department of agriculture, is developing a means of sterilizing soils with a short-wave or soft X-ray radiation capable of penetrating the soil several inches. When the device is fully developed it is possible the soil of fields, gardens and flower beds can be freed of harmful insects, bacteria, larvae and fungi by use of a portable outfit. The soft X-ray has proved sure death to various animal organisms such as insects beneath the bark of a tree and termites in timber.

"We have done sufficient work to ascertain the practical possibilities of sterilizing food products and liquids and killing bacteria in water by means of electric lamps," says Dr. Hibben. "Practical lamps are available that produce mostly invisible light and such radiators can also prevent the growth of white mold on food, and this may retard or prevent a great deal of depreciation. This use comes to practical effect in connection with bakery products, the aging of meat, and the preparation of containers like cans and bottles. Another class of invisible radiation just at the edge of the visible spectrum is being studied in connection with practical equipment for trapping insects. This may become a valuable operation to the home gardener."

A new school of scientific agriculture is seeking to produce certain types of plants without using either soil or sunlight—a "cabinet" style of farming which would conceivably change the form of producing farms into a series of filing cabinets. The principal advantages of artificial and indoor growing of crops is saving of space, labor, transportation, and time of growth. The basic belief is that soil is not absolutely necessary for the growing of many valuable forms of plant life. The physical purpose of soil is to give anchorage to plants. The soil then proceeds by various means to feed the plant. Air does the rest, and actually the plant takes the largest part of its living from the air.

Contained in the soil, however, are the basic chemicals of plant foods, nitrogen, potassium, calcium, phosphorus, sulphates and certain minor salts and extractives. Reduced to saturate solutions, these foods

(Continued to page 118A)

no further data

Belman

Lamp Co., Bloomfield

Equipment sold by Plant Cultivator

\$2500⁰⁰ for PICTURES AT NIGHT



A picture
like one of these may
win you \$350⁰⁰

HERE'S YOUR CHANCE to discover a fascinating, new indoor sport—and try for a valuable cash award as well. No special skill is required . . . there's no expensive equipment to buy. Just make a picture at night, indoors or out. It's easy to do with Mazda Photoflood or Photoflash lamps and Kodak "SS" or Kodak Verichrome Film. And you don't need any expensive equipment . . . your present camera will do, if it can be set for "time." Read the simple rules . . . try for an award—*tonight*. Eastman Kodak Company, Rochester, N. Y.



89 CASH AWARDS every month
during January, February, March, 1936:

- 2 awards of \$100 each
- 3 awards of \$50 each
- 4 awards of \$25 each
- 10 awards of \$10 each
- 20 awards of \$5 each
- 50 awards of \$2 each

\$250 GRAND AWARD

A \$250 Grand Award will be given to one of the six winners of the \$100 award; hence the grand award winner receives \$350 for a single picture.

KODAK "SS" FILM . . . indoors or out, day or night, this film steps up any camera's picture-making range. Ultra-sensitive to the rays of artificial light, it is ideal for night pictures.

Accept nothing but the film in the familiar yellow box.



RULES

- 1 Any number of pictures made on or after January 1, 1936, may be entered. Entries must be post-marked not later than midnight of February 15, March 15, and April 15—the three closing dates. Contests are open to any amateur in the United States and Canada (except employees of Eastman Kodak Company and those engaged in the manufacture or sale of photo supplies).
- 2 Prizes will be awarded *only* for pictures made at night, either indoors or outdoors, by artificial light. Winners will be chosen solely on subject interest and appeal, not on technical excellence.
- 3 Each prize-winning picture, with negative and sole rights for advertising, publication, and exhibition in any manner, shall become the property of the Eastman Kodak Company. If winning picture is of a person or persons, their (or, if under 21, the parent's) written consent to use the picture must be furnished before prize can be awarded.
- 4 Each print must bear, on the back, your name, address, make of camera, kind of film, and lights. No prints can be returned. Be sure to keep the negatives.

The decision of the judges shall be final.

Mail prints only to Prize Contest Office,
Eastman Kodak Company, Rochester, N. Y.

FREE — a booklet, all about
Night Pictures

Write for your copy of this booklet, or get it from your dealer, today. It gives complete information about Night Pictures . . . what film to use . . . how to set your camera . . . where to place the lights . . . suggests subjects. Eastman Kodak Company, Rochester, N. Y.



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61327

Growing Things by Magic

(Continued from page 116A)

LOOSE HANDLES QUICKLY MADE TIGHT

MIX a little Smooth-On No. 1 into a putty, put this into the opening, force the parts together, and in a few minutes the metallizing of the Smooth-On produces *lasting* tightness. Such repairs cost only several cents each and save many dollars otherwise spent for renewals that are no better.

In addition to quick, effective replacement of loose handles and knobs as suggested in the sketches, Smooth-On No. 1 enables you to stop leaks at cracks and joints in steam pipes, radiators and boilers, in water pipes and tanks, in gas pipes, in automobile radiators, engine water jackets, hose connections and in gasoline and oil lines, to make loose bolts, nuts, screws, etc., permanently tight.

Smooth-On No. 1 after set and metallized holds water, steam, gasoline, oil, etc., under any pressure, and may be applied with equal success to any metal. It is also used for anchoring and taking up looseness, and holds in masonry, tiled walls, slate, wood, etc.

By doing your own household and automobile repairing with Smooth-On No. 1, all the Smooth-On repairs you make in a year will probably cost you less than any one of them made by a professional mechanic—and you will be surprised at the ease of application and the number of places where Smooth-On can save money.

Keep a can of Smooth-On No. 1 in your tool box and be ready for emergencies. Do your own repairing and at the end of the year you will find that your efforts have been handsomely rewarded.

The free Smooth-On Repair Book gives full instructions.

Get Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins at nearest hardware store or if necessary direct from us.



Write for FREE BOOK



Do it with SMOOTH-ON

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Please send the free Smooth-On Repair Book.

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2-36.....

usually come to the plant through its roots. Heat is the medium of converting crude chemicals to salts consumed by the plant and the basis of soil heat is, of course, sunlight.

"File cabinet" agriculturists argue it is possible to feed food chemicals directly to the sprouted plants under carefully controlled condition and to provide a reliable chemical energy to substitute for unreliable sunlight. This would end all hazards of drought and flood, bring scientific accuracy to agriculture, reduce growing time from one to four months and insure that most of the plant food actually would be consumed by plants. Growing fertility of open soil is probably less than one per cent efficient.

Naturally the scientist who visualizes producing farms in cabinet drawers would not attempt to raise all crops in such a way, but certain crops offer advantages. Recent stories from Germany tell of green vegetables being grown chemically in steel cabinets within a few hours. Cabinet drawers are lined with peat moss or sterile sand, plant food extractives are applied to germinated plants under regulated heat conditions, and rank, appetizing green vegetables are said to result within a few days. German dairy feed experiments are said to be featuring cabinet-grown ensilage, young plants nourished with chemical extractives in the morning, and fed to livestock the same night. Due to its rapidity of growth, within a season's time a comparatively small area of drawer space can yield as much green food as twenty-five to fifty acres planted in outdoor crops. Some American scientists also are devoting their time to the study of filing cabinet farming because the large import of the work is readily understandable.

Clearly visible on new horizons of mechanics and science is a new agriculture, a new technique of plant culture which may guarantee to ourselves and to our children a permanent abundance of all the great harvests which arise from earth.

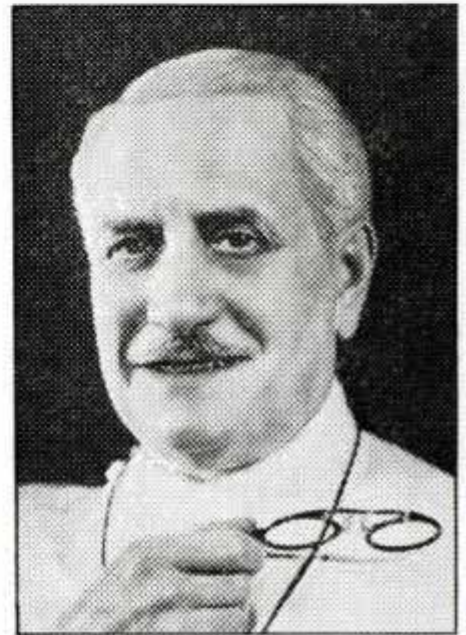
Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Science Discovers New Way to Increase Weight

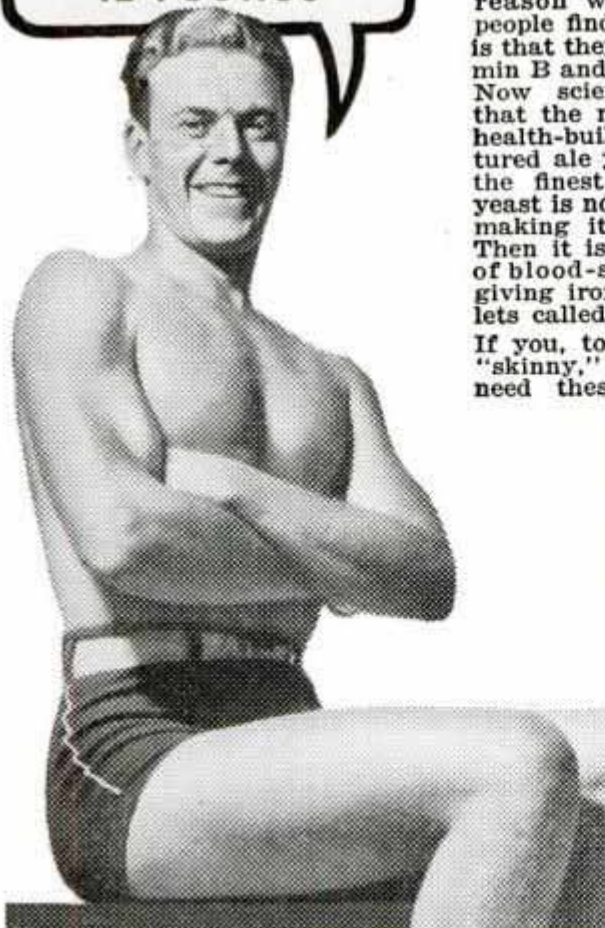
Gains of 10 to 25 pounds in a few weeks reported by users!

FIRST PACKAGE MUST INCREASE WEIGHT OR THE TRIAL IS **Free!**

Sensational new "7-power" ale yeast giving thousands attractive pounds



SKINNY? SEE HOW I LOOK SINCE I GAINED 12 POUNDS



Posed by professional models

AN AMAZING new "7-power" yeast discovery in pleasant tablets is putting pounds of solid, normally attractive flesh on thousands of "skinny," run-down people who never could gain an ounce before.

Doctors now know that the real reason why great numbers of people find it hard to gain weight is that they don't get enough Vitamin B and iron in their daily food. Now scientists have discovered that the richest known source of health-building Vitamin B is cultured ale yeast. By a new process the finest imported cultured ale yeast is now concentrated 7 times, making it 7 times more powerful. Then it is combined with 3 kinds of blood-strengthening, energy-giving iron in pleasant little tablets called Ironized Yeast tablets.

If you, too, are one of the many "skinny," run-down persons who need these vital health-building

elements to put on solid pounds, get these new "7-power" Ironized Yeast tablets from your druggist at once. Day after day, as you take them, watch flat chest develop and skinny limbs round out to normal attractiveness. Indigestion and constipation from the same source quickly vanish, skin clears to normal beauty—you're an entirely new person.

Results guaranteed

No matter how skinny and run-down you may be, try this wonderful new "7-power" Ironized Yeast for just a few short weeks. If you're not delighted with the results of the very first package, your money instantly refunded.

Only don't be deceived by the many cheaply prepared "Yeast and Iron" tablets sold in imitation of Ironized Yeast. These cheap counterfeits usually contain only the lowest grade of ordinary yeast and iron, and cannot possibly give the same results as the scientific Ironized Yeast formula. Be sure you get the genuine. Look for "IY" stamped on each tablet.

Special FREE offer!

To start you building up your health right away, we make this absolutely FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results guaranteed with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 532, Atlanta, Ga.

11 lbs. in 4 weeks

"Was in bad shape, bowels off, bad headaches, weak and tired. With Ironized Yeast I gained 11 lbs. in 4 weeks and feel strong as an ox."—Robert Thompson, Columbus, Georgia.

15 lbs. in 5 weeks

"Had lost weight and strength. Nothing helped till I took Ironized Yeast. Gained 15 lbs. in 5 weeks, feel great."—Fred Wehmann, Brooklyn, N. Y.

21 lbs., clear skin

"Was so skinny and pimply the girls never noticed me. In 12 weeks with Ironized Yeast I gained 21 lbs. and my face cleared."—Roy Rigby, De Kalb, Ill.

Man, what Bargains!

Now every workshop can afford these
NEW LOW-PRICED
Black & Decker Electric Tools



NEW 6-INCH BENCH GRINDER

Even the smallest shop can afford this power grinder. Just the thing for tool sharpening, light grinding, buffing, polishing, wire-brushing, etc. Equipped with tool rests, wheel guards, carrying handle and rubber feet which anchor it firmly without bolts. Fitted with "Compo" oil-less bearings. All moving parts carefully balanced. A great tool for only \$24.

NEW 1/4-INCH JUNIOR DRILL—a sturdy, practical tool which will handle a thousand and one jobs around the shop, home or garage. Drives twist drills up to 1/4-inch in metal; wood augers up to 1/2-inch. Also drives wheels for light grinding, buffing, wire-brushing, polishing, etc. Has big easy-grip handle; sliding thumb switch; powerful universal motor; 3-jaw keyed chuck. A sensation—for only \$19.50.

NEW 1/2-INCH JUNIOR DRILL (not shown) drills holes up to 1/2" in metal; 1 1/4" in wood; drives hole saws up to 3 1/2" in any material a hack saw will cut. A wonderful bargain—only \$35.

MAIL THE COUPON today for the name of the nearest dealer where you can see these new B. & D. Tools and for free circular giving complete descriptions.



MAIL THIS COUPON NOW

The Black & Decker Mfg. Co.,
602 Pennsylvania Ave., Towson, Md.

Please send me Free Literature describing new low-priced Black & Decker Tools and the address of my nearest B. & D. dealer.

Name

Occupation

Address

City State

The World's Greatest Race

(Continued from page 215)

tires have been used on the derby cars, with pneumatics apparently having some advantages. The rule for 1936 specifies tires of rubber construction, meaning either type. The rules also prohibit the use of wheels having steel or wood running surfaces. There is no question but that the rubber-equipped wheel holds the track better and gives the driver better control.

The biggest argument is over the small cross-section high-pressure tire and the large cross-section low-pressure tire. The winning car for 1935 was equipped with special made tires having a tread design typical of the speedway. Inflation pressure was about forty-five pounds. Advantages of this tire are disputed by engineers who claim that the low-pressure, or "doughnut" tire, will give a better grip on the road, rolling over instead of bouncing over small objects or uneven spots on the track. Inflating the small cross-section tire to a pressure determined by actual test runs, might reduce this tendency to lose traction.

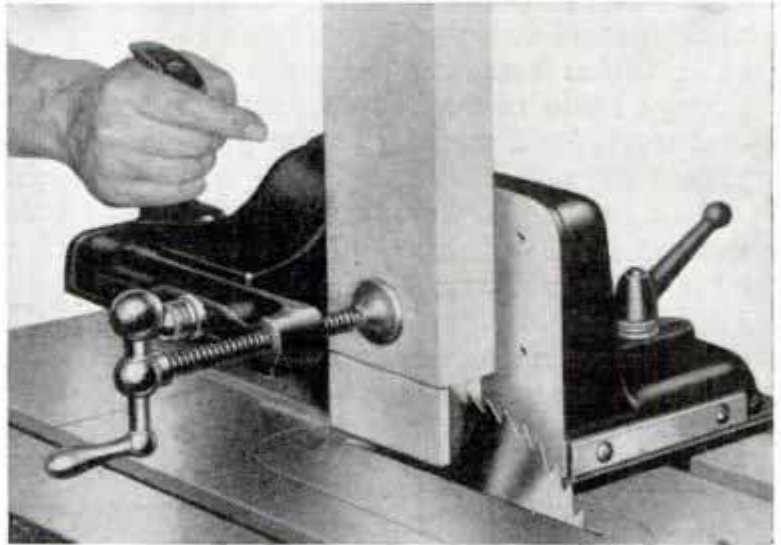
Streamlining is another question for the derby car builder. Any form of construction that tends to reduce wind resistance, both head-on and crosswise, should result in more speed, although engineers seem agreed that the effect of streamlining on the automobile does not become noticeable until a speed of thirty-five to forty miles an hour is reached. Since the derby car is much smaller, this might not hold true, and a body shaped like a turtle's back, which is a good model for all forms of streamlining, probably would have some effect in a close race. Great structural strength is another advantage offered by the turtle-back body.

One of several designs may be used for the steering arrangement, but all must incorporate a wheel. The brake must stop the car with safety, and there are several types capable of fulfilling this requirement. Last year's cars had ground friction, tire friction, internal expanding, external contracting and freak combinations of brake designs, all operated by hand lever or pedal.

In articles to come, automotive and mechanical engineers will tell what they consider essential in designing a soap box racing car that will be a winner.

NEW "DELTA" ATTACHMENT MAKES TENONING SAFE

Now, thanks to this newly developed Delta attachment for Delta circular saws—anyone can do tenoning on the circular saw, swiftly, accurately and with utmost safety. Every possibility of risk is eliminated. The work is fed to the saw with one hand far removed from the revolving blade. Facilitates fast and accurate repetition work, such as the making of tenons, dado cuts on end grain, housings on sash and cabinet work. Ideal for home workshops, schools, light manufacturing work. Costs surprisingly little. Takes stock up to $2\frac{3}{4}$ in. thick, any width within capacity of saw, and will cut tenons up to $2\frac{1}{4}$ in. long on 8 in. saw, any width desired. For full details see 1936 Delta Catalog.



Complete Line of QUALITY Motor-Driven Tools

"Quality" as applied to Delta Tools is more than an adjective. It is an actual fact recognized by tens of thousands of users of motor-driven tools all over the world. The Delta line includes Circular Saws, Jointers, Lathes, Scroll Saws, Band Saws, Routers, Shapers, Grinders and a complete assortment of attachments and accessories.

New DELTA Shaper Unit

Important basic features include: 1. Extra Large Table permitting the handling of large work with ease; 2. Interchangeable Spindles for $\frac{5}{8}$ " and $\frac{1}{2}$ " hole cutters for various types of work; 3. Improved Completely Adjustable Fence for all varieties of straight work; starting pin for curved work of all kinds; 4. Complete Guarding system; 5. High Speed of 10,000 R. P. M. which with standard 3-lip Delta cutter gives over 30,000 cuts a minute, thus insuring smooth and finished work; 6. Complete range of cabinet and sash cutters for all types of mill work.

New 10-in. Circular Saw

Another new sensational Delta hit! Many unusual new features. Write for full details.

Write for 1936 Catalog

It is crowded with photographs and information about the new line of 1936 Delta tools. Mail coupon without delay. Enclose only 10 cents at same time for Book No. 2 of Practical Delta Projects, 32 pages of new and novel things to make, with numerous blue prints, working drawings, photographs and illustrations — and complete directions.

DELTA MANUFACTURING COMPANY,
600-634 E. Vienna Ave., Dept. A236
MILWAUKEE, WISCONSIN

I enclose 10c (stamps or coin), for which please send me one copy of Book No. 2 "Practical Delta Projects". Also place me on your mailing list to receive 1936 Delta catalog of quality motor-driven wood-working tools.

Name.....
Address.....
City.....
State.....
Age.....
 Check here if you are Delta user now.



IF proof of Delta superiority were necessary for the craftsman who knows good tools, it would be afforded by the fact that the Delta Manufacturing Company is now the largest manufacturer in the world making this type of machinery exclusively.

DELTA MANUFACTURING COMPANY

600-634 E. Vienna Ave. (Dept. A236), Milwaukee, Wis.

S.O.S.'s of the Air

(Continued from page 252)

8143

air liner which had landed about five miles from the first. A heavy storm the night before had forced water into the airport's underground fuel tanks and both planes had refueled from the same tanks. But the prompt radio messages prevented worry and started aid rushing to the grounded planes without delay.

On a long flight, when the destination is unapproachable because of bad weather, an airplane is cleared by the dispatcher to the farthest intermediate field along the route where a safe landing may be made. En route, the weather at the terminal may improve and in that case fresh orders are issued by radio, clearing the plane through to its destination. Aside from these clearances few commands are given to a pilot in the air. He may be advised to fly at a certain altitude, or requested to change his course, but never commanded, as he is the final judge of conditions in the air.

One day a few years ago the fog was so thick at one airport the attendants couldn't see ten feet. They were surprised to see an air liner slowly loom up out of the fog and taxi to the landing canopy and unload its passengers. The pilot explained that although the terminal building was shrouded in a patch of fog the entire runway was in the clear and he had landed in the normal manner. Since then the department of commerce has established minimum weather conditions, usually adopted from regulations of one air line or another, under which landings may be made. If the ceiling or visibility is too limited the pilot must cruise around until the weather lifts or must land at some other field.

At busy airports such as the United Air Lines terminal at Burbank, Calif., the radio operator works at full speed every minute he is on duty. Twenty-two liners on regular schedule land or take off from the field every day and in addition other large airplanes make frequent landings. Each of the scheduled liners reports by radio a few minutes before landing or after leaving and also reports its position and weather at half-hour intervals while it is in the station's area. In addition, the ground operators handle quantities of traffic between ground stations, confirming schedules, handling seat reservations,

and relaying the quantities of mail and express carried by each plane. They phone ahead the desires of passengers, arranging for cabs to meet them at the airports, or for changes from one plane to another. Planes due to pass each other on the same airway are warned of their proximity and advised of the altitude of each other. In cases of doubt the pilots talk between themselves and arrange to fly at different altitudes.

If the air is clogged with messages and a ground operator finds it hard to advise an incoming liner of the wind and barometer at the field he shifts to another frequency where the conversation can be carried on without interference. At some time after dark the operator tells the listening airplanes he is shifting from day to night frequency, from 5,592½ kilocycles to 3,182½ kilocycles. At that signal the pilots likewise switch their receivers and transmitters to the new frequency.

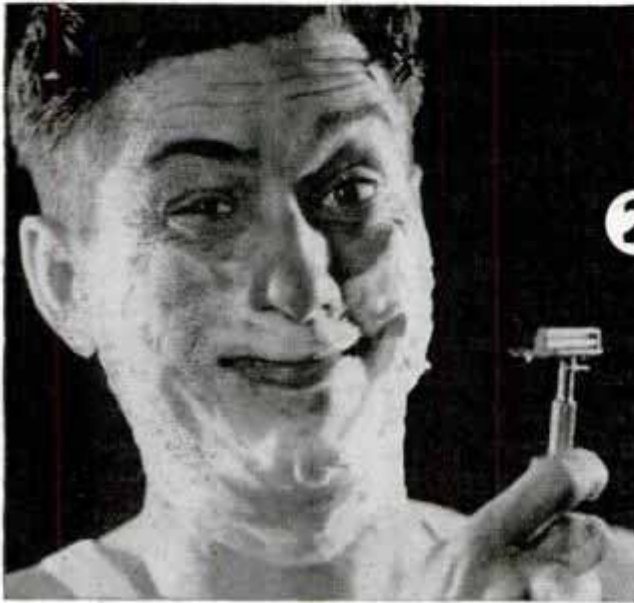
Occasionally when an operator calls a plane he receives no reply due to the mysterious "skip" type of fading that seems to be most prevalent during the hot summer months. The pilot may not hear him, or he may not be able to hear the pilot's reply. In such a case some other ground station helps out and a three-cornered conversation is carried on. The skip condition may last for a few minutes or for several hours and may affect only a small territory or cover an area hundreds of miles across. Sometimes an operator in Chicago is unable to work planes a few miles away although he may hear Pacific coast stations and airplanes.

In the air several kinds of static rarely experienced on the ground sometimes make reception so poor that only experienced pilots can "read" through it. Electrical disturbances are intensified and create roars and crackles in the earphones. Rain and snow often create steady frying or sizzling noises that nearly drown out reception, as may also be the case during a dust storm. Even ice on the rubber de-icers along the leading edge of a wing seems to build up static charges that pop in the earphones when the rubber is stretched and deflated to cause the ice to drop off.

3 reasons why Ingram's shaves are quicker, cleaner, cooler



1 WILTS WHISKERS SOFTER FOR EASIER SHAVING.



2 SMOOTHS THE SKIN SO THE RAZOR CUTS CLOSE.

3 COOLS THE SHAVE; BANISHES AFTER-STING.



FOR THE BETTER SHAVES YOU GET WITH INGRAM'S, THANK THE THREE SPECIAL INGREDIENTS WHICH THIS SHAVING CREAM CONTAINS!

Every time you shave they give this help:

1st, wilt whiskers at the skin-line, so you need not hack and hoe to get them off. 2nd, smooth the skin to prevent scuffing razor strokes. 3rd, cool your face while you shave, and keep it cool when you've finished.

Any man may get top-notch shaves once in a while. But Ingram's shavers get them every day. And at less cost. Ingram's is *concentrated*. It goes further. Three months of cool, happy shaves in every tube or jar.

And if you are a "bluebeard"—a twice-a-day shaver—Ingram's will be your special friend. It conditions your skin—so you can shave as close and often as you like, without irritation.

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INGRAM'S SHAVING CREAM

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E 1300

Playing Nursemaid to Lions

(Continued from page 186)

and for the first week or two the infant is never out of the mother's arms. Later she lets her baby play by itself but always keeps it in sight. If a baby makes a dash to run away the mother reaches out and grasps it by the tail before it can escape. Monkeys eat virtually all foods that humans do and when the baby begins to eat the mother samples everything the baby gets and slaps the baby away if it reaches for something harmful.

You can buy a baby lion for \$125 and up although if you want to save money you can get a one-year-old for a little less. The reason is that a half-grown lion has neither the appeal of a baby nor the ferocious appearance of the full-grown beast. A fully developed four-year-old has a market value of from \$250 to \$1,000. Baby "cats" treated with steady kindness rarely turn vicious in later years but as they grow older and stronger they become rough playmates because of their great size and weight. The so-called "wrestling" lions which engage in rough-and-tumble matches with their trainers are raised by hand from youth and are as affectionate as dogs.

"Two days of kindness accomplishes more with an animal than two months of cruelty," Roth tells you. "I've taken twelve tigers direct from the jungle and worked with them so that three weeks later they were trained to perform in an arena. The buggy whip that I carry is used only for pointing and snapping. If I should beat the tigers I would never be able to trust all of them in the arena with me."

Roth's favorite animal is "Bobby," a wrestling tiger which is only seventeen months old but already weighs 380 pounds. Roth raised him at home from a one-pound cub and until a few months ago "Bobby" had the run of the house and the back yard, playing with the dogs and chickens and Roth's children. Now that he has grown too large for a house pet, the tiger spends most of the day in a cage. Each morning he is turned loose for several hours to exercise in the motion-picture "jungle" that adjoins the lion farm. "Bobby" is completely tame and has worked on command on a motion-picture

stage with scores of people within reach of his spring. Wrestling a 380-pound tiger is hard work for a strong man and sometimes, to quiet the animal, several trainers take turns in holding a mock fight with him.

"The only trouble with 'Bobby' is that he never wants to stop playing and sometimes I have a hard time getting away from him," Roth says. "After you have been knocked down half a dozen times and rolled on and held by a pair of giant paws while the animal licks your clothing you are exhausted. Once I was picking apples in the back yard, before 'Bobby' was fully grown. He decided he wanted to play and leaped from the ground to the limb on which I was sitting, knocking us both down."

"Bobby's" mother, now eight years old, is one of the few tigers in captivity which will touch cooked food. The reason is that Roth raised her side by side with his two dogs. At mealtimes the trainer served raw meat to the tiger and cooked meat or prepared dog food to the dogs. After eating her own meal the tiger usually helped the dogs finish up their own food.

"When the tiger saw the dogs eating cooked carrots and potatoes she decided she could eat them also," Roth says. "Now she will eat vegetables any time and if you should happen to have a gallon of warm soup handy she would like to have that too."

You shouldn't always assume, when you see a dozen "fighting female lions" growling and spitting on their perches in a wild animal show, that the animals are tame and merely putting on an act, Roth says. The chances are that the animals are actually jungle-born. Wild animals make better performers than those born and raised in captivity. Domesticated lions or tigers, being used to the presence of men, are less apt to obey the trainers so readily. Besides, a trainer may be more careless with animals that he thinks are tame and if there should happen to be a vicious one in the bunch the trainer may be caught off guard and hurt. Most accidents in the arena today happen with animals born in captivity, it is claimed.

(Continued to page 126A)



"THE FIRST GIRL I EVER LIKED — and these Pimples had to come!"

But it wasn't too late, Ben found, to mend the trouble!



Don't let Adolescent Pimples make YOU hide away!

DURING the adolescent years—ages 13 to 25—important glands develop. This causes disturbances throughout the body. Waste poisons in the blood irritate the skin, causing pimples.

for adolescent pimples. It clears the blood of skin irritants. Then the pimples disappear. Eat Fleischmann's Yeast 3 times a day, before meals, plain, or in a little water—until skin clears.

Doctors prescribe Fleischmann's Yeast



—clears the skin
by clearing skin irritants out of the blood

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100 SHAVES

40¢ GIANT TUBE
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Playing Nursemaid to Lions

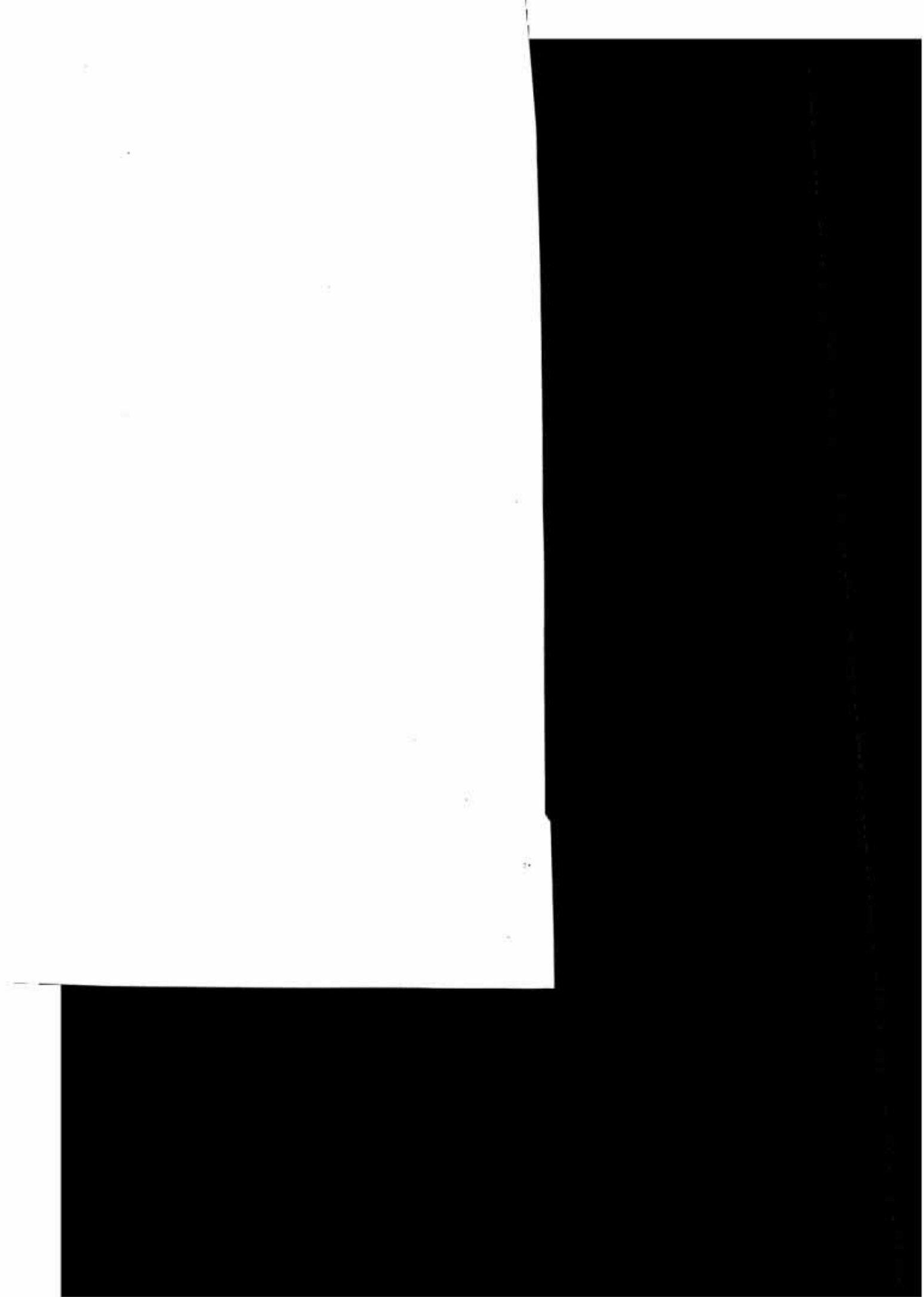
(Continued from page 124A)

When you watch a dozen or more jungle kings snarling and roaring while the trainer makes them jump over boxes or pose on pedestals you wonder how one man has the courage to enter the cage. Training a wild animal to act is mainly a matter of patience and kindness. First, the animal must be led to think that he can't hurt the trainer. When Roth receives a new lion fresh from the jungle he first studies its disposition. An animal that continually charges the bars at the sight of a man is bad and probably will be hard to train.

If the lion, or tiger, seems tractable it is sent into the arena to become accustomed to its surroundings. Finally a wide white collar is tied around its neck, from which a chain is led outside the cage. Then Roth opens the door and walks in. If the lion charges, men on the end of the chain pull it taut and Roth walks around outside the scope of the chain, talking to the animal in a soothing voice. Day by day he walks closer, finally petting the animal with the end of his whip. After a few more days a stool is placed near the lion and usually the animal immediately jumps to the top of this perch. If, by then, it seems to be docile the chain is removed and Roth completes the training alone in the cage.

Even with kindness, of course, lion training is not the safest job in the world. Roth has been clawed a number of times, usually "by accident." The most serious occasion was when a dozen full-grown tigers that had been trained recently were entering the arena single file. The line crowded up and the second tiger in line took a sharp nip at the leader's tail. The startled leader gave one great roar and leaped across the cage, landing on Roth's shoulders.

The trainer barely had time to raise his arm and elbow to ward off the claws, and dodged behind some of the stools with his face and shoulders clawed open. It happened during a circus performance, and, true to the tradition that "the show must go on," Roth bound a handkerchief around his head, finished the act, and after being treated at the hospital, returned to the arena to stage a final performance in which he appeared with a group of sixteen lions. The old belief that the instant



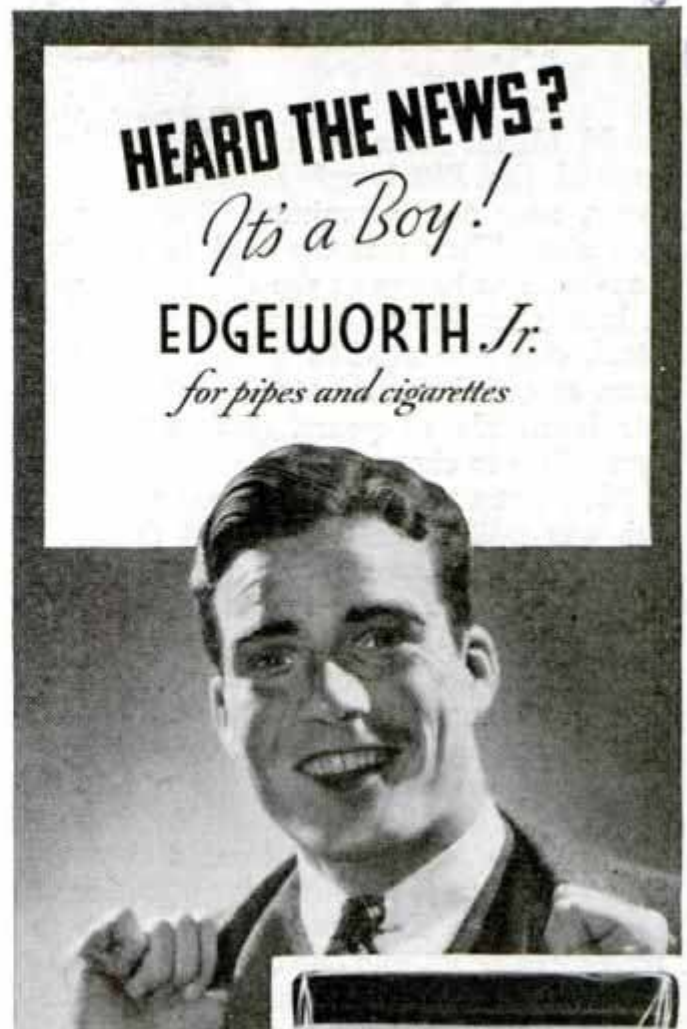
outine and measured with accuracy has been made possible primarily by the use of new materials for the containers and pistons and a new design. By the new design the steel is made to support itself, the supporting pressure on the outside of the container automatically becoming greater as the internal pressure becomes greater. This is accomplished by making the container in the form of a conical stopper, which pushes more and more tightly into an external heavy block of steel as the force on the piston increases. With this apparatus routine measurements up to 50,000 atmospheres have been made for a number of months and pressures up to 70,000 have occasionally been reached.

a wild animal draws blood he is certain to kill his victim is merely a superstition, Roth has learned.

The trainer's most difficult feat was to train four polar bears to act. The bears were five years old and the smallest of them weighed 500 pounds. At the start of the training one bear, clad in a collar with two strong ropes attached to it, was led into the arena. Four men outside the cage were holding to each rope. As soon as Roth entered the cage the bear charged straight for him and the eight men who tried to hold the animal were dragged off their feet. Roth dodged behind some properties in the cage and escaped. He started in again the next day and two months later the group of bears were performing like veterans, sitting on stools and changing places at command while Roth stood among them armed only with the buggy whip with which he gives his orders.

Ice Hotter than Boiling Water Is Made under Pressure

Ice so hot that it burns the hand has been made experimentally under tremendous pressures in the Harvard University laboratory. Prof. Percy W. Bridgman heated ice to an unbearable temperature by applying sufficient pressure to prevent its melting. This "hot ice" begins to appear under pressure equivalent to 6,000 atmospheres. Under 25,000 atmospheres, ice melts at a temperature above that of boiling water and can be made to melt at even higher temperatures by increasing the pressure. Many other magic changes are effected under million-pound pressures in the laboratory. Graphite, a soft, slippery lubricant, under pressure equal to 100,000 atmospheres or 1,500,000 pounds to the square inch, becomes hard as a diamond, embedding itself in steel, then reverting to its original soft state when the pressure is released. Rubber, paper, wood and linen under 700,000 pounds pressure and twisting are transformed into a translucent, horn-like material. Prof. Bridgman has created conditions simulating those of the earth's core, and succeeded in finding three new kinds of solid bismuth, one new form of mercury, one of gallium, two of tellurium, and several other new kinds of matter. New apparatus was designed to obtain the terrific pressure.



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Aluminum—the Wonder Metal

(Continued from Roto Section)

could obtain financial aid. His backers formed the Pittsburgh Reduction Company, now the Aluminum Company of America. They foresaw that this metal, one-third as heavy as the older ones, and a better conductor of heat than iron or steel, could be used in many ways. But iron, copper, lead and zinc had been used for hundreds of years. Metal workers were slow to change.

Aluminum made by the chemical process was selling for about eight dollars a pound. Hall's company offered some for five dollars. No one bought it. It was reduced to four, then to two dollars a pound. Still no one wanted any. This taught the backers it was necessary to do more than make aluminum in order to sell it. It was necessary to create markets, to do research and development work, to find alloys with which the metal could be combined to adapt it to particular purposes.

One of the first experiments was in making castings, and one of the early castings was a teakettle. The aluminum industry virtually was born in that teakettle. Aluminum cooking utensils began to gain favor. Their popularity has increased with the years. Today about fourteen per cent of the aluminum produced in this country is used for pots, pans and percolators. More than 350,000,000 kitchen utensils of aluminum have been made in America—a round dozen for each family.

While it is estimated that eight per cent of the earth's crust consists of aluminum, it is never found in its pure form. Bauxite, a mineral, offered the best source of commercial aluminum. Arkansas and Dutch Guiana supply most of the bauxite used in this country. Bauxite contains aluminum oxide plus many impurities which are removed by chemical processes. The remaining alumina, a fine, whitish material like table salt, is treated by the Hall process, now refined and improved. It is stirred in a bath of molten cryolite in carbon-lined cells, and an electric current is passed through the mixture to rob the alumina of its oxygen, causing pure aluminum to be deposited on the bottom of each cell. Two pounds of alumina produce about one pound of aluminum.

The metal is tapped from the cell and

poured into pigs which are remelted and cast into ingots. To improve the mechanical properties of aluminum the metal is alloyed with small percentages of other elements. The common alloying elements are copper, magnesium, manganese and silicon. Some alloys of aluminum possess the strength of structural steel.

Because of its light weight and excellent conductivity, the metal soon was recognized as suitable for electrical cables. Some 430,000 miles of aluminum power lines, reinforced with cores of steel wire to add strength, transmit electrical energy from points of generation to points of use in America. Span lengths of 2,000 and 3,000 feet are not uncommon.

Aluminum was used in architecture before Hall's discovery. In 1884 a 100-ounce aluminum casting was made as a capstone for the Washington monument. It was considered a very large piece of very precious metal. Recently a 7,500-pound casting was turned out. During the nineties aluminum was being used for elevator inclosures, stair railings and grilles. With the trend to lightweight, light-colored metals in architecture, aluminum has come into its own in the building industry. As skyscrapers pushed higher, weight became a bigger problem. So aluminum now is widely used not only for decorative purposes but for spandrels, cornices, window frames, railings, leaders and gutters. The Empire State building contains more than 5,700 aluminum spandrels and 150,000 pounds of the metal inclose and decorate the mooring mast.

The transportation industry today is the largest user of aluminum produced in this country. Thirty-eight per cent of the total production goes into automobiles, airplanes, dirigibles, trains, boats and trucks. Aluminum is used in passenger automobiles for reciprocating engine parts, but it finds an even wider application in trucks where a reduction of dead load by using aluminum results in an increased pay load.

When railroads wanted to increase speed, one of the first problems was to decrease weight. Aluminum again fitted into the picture. At first, cars were built partly of aluminum, then entire cars were

(Continued to page 130A)

FORD FACTORY-RECONDITIONED GENERATORS



Every factory-reconditioned Ford generator is carefully rebuilt and tested . . . ready to give new-generator performance.

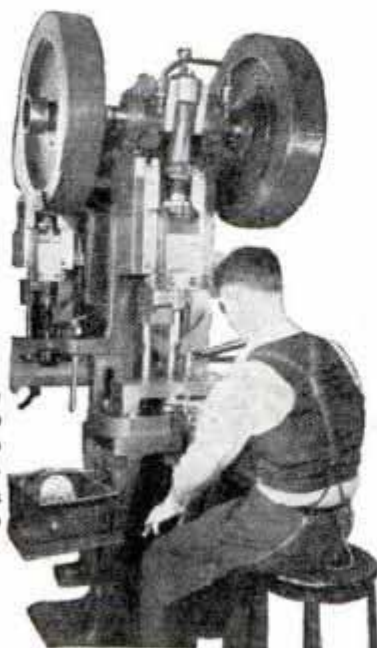
THE Ford plan of factory reconditioning the engine and other units and making them available to all Ford car and truck owners at low cost is one of the big advantages of Ford ownership.

The same Ford methods used in building the new Fords are used to recondition these exchange units. In the River Rouge factory at Dearborn, complete facilities are available—production methods are used—experienced men do the work. The units get careful inspection and production tests. That's why the work is right and exchange prices are low.

The generator is one of more than a dozen units included in the Ford exchange plan. These generators are reconditioned in the Ford generator plant—the same plant where all Ford generators are built.



The electrified conveyor supplies current to operate these generators until they are removed at the end for output test.



These large presses insert the bushings in the generator end-plates and then burnish them to accurate size.

In the reconditioning, the exchange generators are completely torn down. The parts are washed, then carefully inspected. All parts that are worn or damaged are thrown out. That's why many of the parts in the rebuilt generators are new parts. After assembly, these generators must pass the same tests as new ones. That's why they give new-generator performance.

The cost to the owner is actually less than for replacing the armature and brushes alone. And since the exchange is made quickly, the owner also saves time. This exchange service can be had from every Ford dealer.

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Aluminum—the Wonder Metal

(Continued from page 128A)

aluminized and now several all-aluminum trains are in operation.

Each metal has at least one industry in which it has won special recognition and aviation might be called aluminum's own. Without this metal and its alloys the progress of aviation would have been retarded greatly. Virtually all military and transport planes today are of aluminum and the metal has played a vital part in the development of the dirigible. The application of aluminum to the marine field has increased in recent years. Small craft utilize it for masts, spars and railings; larger ones like the "Normandie" use it for partitions and decorative purposes.

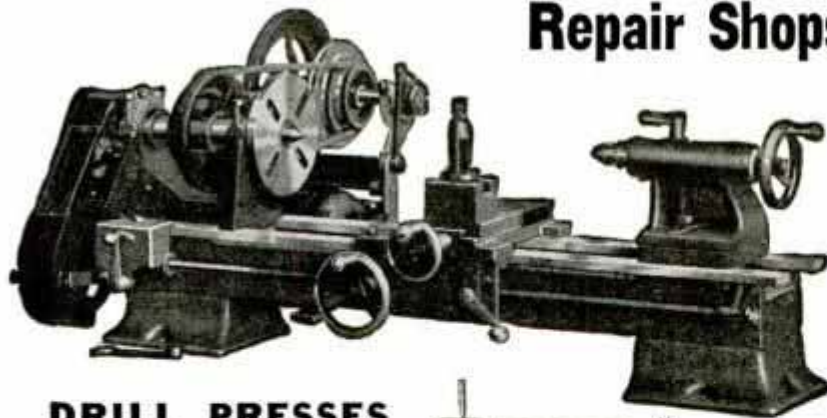
While the cooking-utensil, electrical-conductor, building and transportation industries consume about seventy per cent of the aluminum produced, the metal now is used in hundreds of other fields in one form or another. Aluminum foil, collapsible tubes, and bottle seals and caps are encountered daily. Household appliances by the hundreds are built partly or entirely of aluminum, and you probably will find the metal in your furniture, your telephone, your radio and possibly in your watch. Aluminum paint is utilized both in industrial and domestic fields and the metal is found in big dragline excavators and overhead cranes. Even the floor of a Pittsburgh bridge is constructed of it.

And the metal is no longer gray. It can be produced in the hues of the rainbow through a coloring method known as the Alumilite process. When Hall began turning out aluminum, he produced fifty pounds a day. In 1934, the world production was more than 375,000,000 pounds.

The man who gave the world aluminum as we know the metal lived to see the prophecy of his chemistry professor fulfilled. He died in 1914 a wealthy man and he already saw the world enjoying many of the fruits of his discovery.

Men of vision see the world at the threshold of a new age of transportation, architecture and communication. Aluminum has made itself indispensable in these and many other fields. It has come as far in half a century as many other metals advanced in 5,000 years. With such a beginning, who can predict the destiny of this "metal of clay"?

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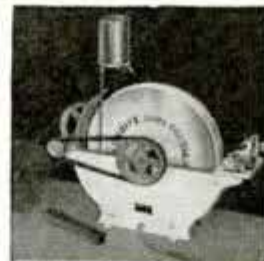
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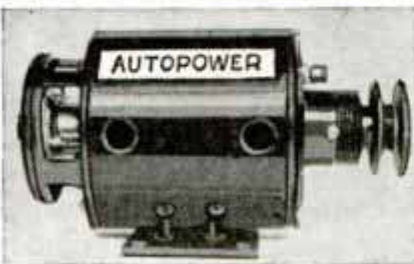


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P. O. Box 1425 Dept. 72 Providence, R. I.



Getting Ready to "Shoot"

(Continued from page 231)

The production manager not only accepts responsibility for the appearance of the completed set; he guarantees the set will be ready on schedule. These sets usually are constructed first in miniature and viewed through tiny cardboard cameras to determine what the lens will reveal.

"Constructing full-size sets for miniatures," explains Mr. Ebele, "involves not only the physical building of the set itself but includes all its dressings, decorations and even gowns for the actresses. Carefully toned colors are used to decorate sets. These include shades of gray, from cream to black; tan, brown and green. Red and shades of blue are tricky and may give an effect different from that wanted.

"Painting, lighting, music and architecture enter into the designing of the miniatures. With the fast film now in commercial use, we use scarcely a third as much light as formerly. In the past we have been unable to photograph white, for around the edges of any white object a halo spread. Now actors can wear white."

As the actors rehearse, the construction department moves with amazing speed. Four days after that department receives blueprints of a model, it will have painted and dressed the most elaborate set. Recently carpenters built a four-room bungalow, including brick foundation and chimney, in thirty-six hours. One "permanent" street 400 feet long with pavement, elevated railway and sidewalks good for five years, was completed in ten days. Movie workmen have devised a method of pouring concrete sidewalks and curbs at the same time and they can lay two-inch-thick walks on a sound stage seven times faster than an outside contractor. They pour the concrete over a wire base in the afternoon and the next morning actors are walking on it. The enormous cost is spread over several pictures. Small changes in shops and street fronts may make one setting available for several pictures.

Until the last sound stage is empty, the production manager virtually lives in his office. It is his job to see that the camera records the last scene on or very near the scheduled day, that the film is effectively edited and that, at last, hundreds of still pictures are made of the stars, for without publicity all his work would be wasted.

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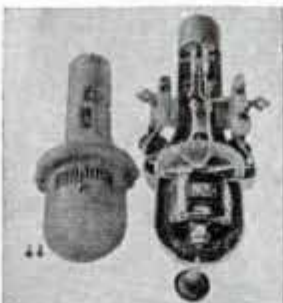
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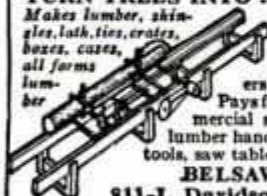
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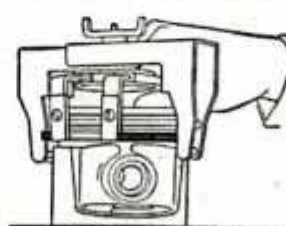
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Auto Lighting Riddle

(Continued from page 245)

that the automobile manufacturer must keep down costs to prevent his business from losing money and that the average car owner hesitates to part with more than a few cents for a gadget on which he has to spend time or money for installation, no matter how great the resulting advantages. The best way of making a new lighting idea popular is, in the light of past experience, to have some manufacturer put it on his car as standard equipment.

The inventor often works with his own headlights, which are out of adjustment; and at the same time he does not possess enough knowledge about the physics of headlighting equipment. He generally thinks that objectionable glare can be eliminated by screening off either the upper or lower part of the reflector. Perhaps his system will work perfectly with his head lamps because they are out of adjustment, but it won't work on other cars.

Another pitfall that traps inventors is their failure to realize that headlights are not always at rest when in use. Careful adjustment of the lighting equipment, coupled perhaps with the use of a trick gadget that does no particular harm, produces a beam of light that seems to be just the thing. It shoots down the road for 500 feet or so, and its uppermost limits do not cause discomfort even to the pedestrian who is walking toward it. All seems well—until the car is taken out on the road. Then the picture changes. The car bounces up and down in passing over the irregularities present in even a good pavement; and furthermore tilts upward and downward in going over hills. The result is that the carefully aimed beams almost constantly annoy approaching drivers. The only remedy is to depress the beam.

Although a vast majority of auto lighting "improvements" fail when tested under the rigid conditions of the laboratory and road, there is one cheerful note in the situation. The very pronounced activity of inventors shows that they recognize the challenge of the automobile lighting problem and that they are seeking a solution—the perfect head lamp.

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

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The Next War on the Land

(Continued from page 201)

still shorter wave lengths. As wave lengths shorten, the number of different communication lanes increases. Theoretically there are an infinite number before zero is reached. It is in these ultra-short wave lengths that we shall see many marvelous things performed in the next great war.

To learn what is going on far back of the enemy lines, the latest discoveries in photography have been used. From an airplane flying at high altitude, photographs by infrared haze penetrating light are made on a strip of film which is developed and presented to view in thirty seconds. By studying this film as it is unreel, the observer has his vision extended as much as 100 miles.

A recent discovery is the lethal quality of ultra-high frequency, high-amplitude sound waves. Transmitted into water they kill every living thing even to the smallest bacteria. Directed at persons they create violent nausea and a long list of disabilities, some of which are fatal. Directed at large structures of light weight, such as airplane wings and propellers, they create vibrations violent enough to wreck the structure. By altering the frequency to suit the natural period of vibration of a given structure, they will actually "fiddle the bridge down," so to speak. Just what has been accomplished in adopting this principle to warfare is not known.

The press has recently shown pictures and reported tests in Europe where large numbers of troops with equipment have been dropped from the air in parachutes. The troops would seem to have rather a brief existence entirely surrounded in enemy territory. This points to the possibility of dropping quantities of poison gas, incendiary and disease germ containers back of enemy lines.

The discoveries and developments which have been made in science and engineering since the World War, when adapted to the wholesale slaughtering of human beings and the wholesale destruction of their property, would result in the annihilation of whole nations. We find that 700,000 were killed in the Civil War, 10,000 in the Spanish-American War, and 9,980,000 in the World War. If there is another world war, the death and destruction that will be wrought will be beyond estimate.

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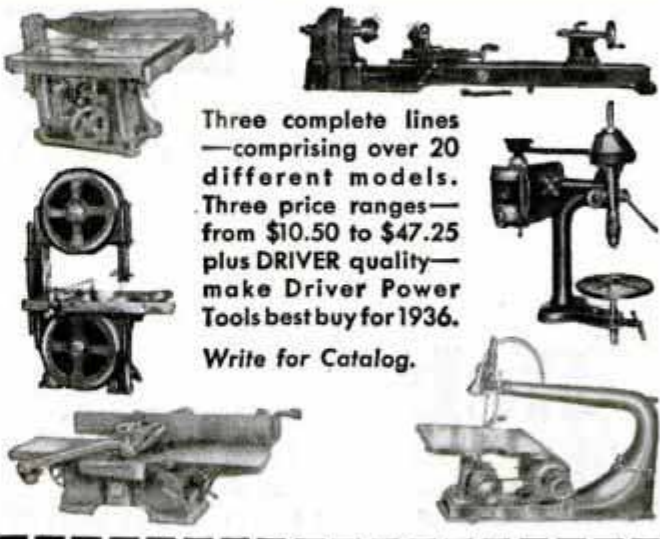
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will stop it almost instantly? Why run the risk of bad infections when it has been proven according to standard tests that Lucky Tiger Ointment destroys such germs? First aid. Costs little. At Druggists or Barbers.

The Graveyard of the Pacific

(Continued from page 192)

at work. Pumps, one already working, had been installed in six holds. Cables had been attached to purchase gear from the king posts, and were anchored across the channel. Buoys were set up and a small tug patrolled day and night to warn all ships. With the aid of a derrick barge, tug and scow, the riggers hung forty-nine tanks on the port side of the "Madison." These tanks, suspended so they would automatically submerge and relieve the vessel of their weight when it reached an angle of twenty degrees, weighed seventeen tons each.

Working day and night, the salvagers had the ship floating with a list of ten degrees by the middle of April. On the twenty-first, the liner was floating at an angle of five degrees to the port side. All water had been pumped out and the vessel was properly moored. In twenty-eight days the salvagers completed a task which "experts" had declared almost impossible. Even the owners had considered ninety days the minimum.

The two men in command averaged more than twenty hours of work each day during the job. During forty-eight hours of continuous pumping the salvagers averaged 6,000 tons of water per hour.

The guardian of the Pacific never sleeps. If, within a day or an hour, you hear of a "lost" ship off the Pacific coast, you will know that the "King" is ready—perhaps there before word reaches you of the wreck.

81361

Machine-Gun Bullets Avert Gasoline Tank Explosion

While flames leaped up around a loaded gasoline tank car and threatened a terrific explosion that might have destroyed the entire town of Willard, Kans., deputy sheriffs raced to obtain a machine gun and perforated the car with bullets, averting disaster. Several other gasoline cars had been burst and set aflame by a train wreck, and it was feared explosion of the one sealed tank car would spread destruction and death. High-powered rifles failed to puncture the steel tank, but machine guns rushed from Topeka, fifteen miles away, quickly drilled holes that drained the car and prevented a blast.

Chicago Tribune



My adventure with the invisible

by Lowell Thomas

World Traveler—Radio Commentator

MACHINES chattered around me, a bewildering complexity of mechanism endowed with superhuman faculties of precision. They had cost millions of dollars—years of research. As I stood in the Gillette factory in Boston I reflected: "Imagine this prodigious assembling of technological perfection, just to make a blade."

My guide corrected me, saying: "That isn't what we are turning out here. We are all collaborating here to produce a perfect edge. And that, actually and positively, is a thing that you cannot see." I was to learn he was right.

Within the next few hours I saw equipment and processes that amazed me. Electric furnaces in which coils of steel are hardened and tempered. Inside they are 1500 degrees hot, outside they are so cool you can rest your hands upon them. Diamonds from Kimberley or Brazil that play their part in the testing machines. Microscopes with a 3000-power magnifying capacity. Cathode ray oscillographs that far outstrip man's poor faculties of perception or accuracy.

And all for what? To turn out something too fine for the human eye to perceive—a shaving edge of incomparable keenness. And day after day, Gillette experts are testing and experimenting to produce an even sharper, smoother-shaving edge—although it is difficult for me to imagine that today's Gillette blade could be improved. I know—I've tried them all—in all parts of the world.

So in view of what I've seen and experienced, I can't imagine how any shaver could select a blade other than Gillette.



Here are the facts about razor blades. Why let anyone deprive you of shaving comfort by selling you a substitute? Ask for Gillette Blades and be sure to get them.

GILLETTE SAFETY RAZOR CO.
BOSTON, MASS.

The Incredible 'Believe It or Not'

(Continued from page 223)

My greatest thrill, I think, occurred last March when I was given the chance to be the first American to broadcast around the world. My address was carried to American listeners by long wave and to every country in the world by short-wave stations. The broadcast was given in sixteen foreign languages.

When will the supply of unusual facts be used up? The wise boys have been predicting the end for several years. The truth is that the world is filled with "Believe It or Nots." My job now is principally a matter of selecting the most timely, the most bizarre facts, and so it will remain for another ten years or so because I have that much material on hand—believe it or not.

Gold Made in the Laboratory Is Brought Nearer

Production of gold in the laboratory is foreshadowed by developments in artificial radioactivity, according to Prof. Samuel C. Lind, of the University of Minnesota. The only remaining hurdle, he points out, is the energy barrier of the nucleus. When scientists find a surer method of shooting the nuclei, or center portions, of atoms with highly charged particles, the transmutation of elements in quantity will be possible, Prof. Lind holds. In order to change the structure of the nucleus, and thereby the identity of the atom, the powerful repelling force of energy surrounding and protecting it must be penetrated by more efficient means than are known at present. Artificial radioactivity is less than two years old, but already new elements have been made. Overcoming the energy barrier of the nucleus can be done at a cost, Prof. Lind says, but what the price will be is another question. If it can be done cheaply, then the production of gold by that method would be profitable, gold could be made in quantities and eventually the price might be brought so low as to topple the metal from its place as a monetary standard. Transmutations have so far been produced in quantities too small to measure by chemical or electroscopic methods, the professor observes. Counting devices for individual particles have had to be used.

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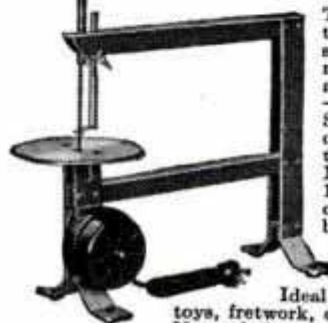
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Around the World

(Continued from page 238)

day, Fulton was struck by a falling coconut which knocked him unconscious. From the Dutch East Indies, he traveled back to the mainland and visited Siam, Indo-China, and China, covering 3,000 miles in China alone. From China he went to Japan, thence to the United States by steamer.

In the whole journey, he never removed the front tire from its rim. He had six blowouts in the rear one but finished the trip with his original tires. Fulton reports much road-building remains to be done before the traveler can ride across Eurasia in the same comfort with which he now travels across the United States. Roads in western Europe are good; in the Balkan states they are bad; Turkey is roadless for the most part; Syria enjoys a good road system, built by the French; between Damascus and Bagdad, one can travel at a forty-mile clip over hard dirt desert; Baluchistan and Afghanistan offer little besides rough caravan trails; India has good primary roads built by the British, but in a good many instances, it was necessary to cross rivers on railroad trestles, and in Malaya, the abundance of crude rubber stocks has resulted in a unique experiment with rubber-surfaced roads. The rubber is mixed with pebbles and, according to Fulton, makes a very good riding surface.

The great majority of the world's peoples are still in a very primitive age of mechanics, although the machine age is pulling backward peoples out of their isolation. The magic of mechanical transport brings them together. Many millions are still untouched by the machine age. They are doing their day's work in the most primitive fashion; they are still suffering from lack of good food and comfort, all of which the machine can overcome.

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Food from Wood

(Continued from page 162)

“amber” cigarette holders and beads, and even shatterproof windows for omnibuses. Once again Germany’s inventors have here slashed a sizable strip from the long list of the nation’s imports. The basic new product, “Kunst Harz,” or artificial resin, can be substituted in thousands of ways for wood, metal, ivory, horn, porcelain and even for glass.

The most remarkable refinement of this new by-product is what is marketed under the trade name of “Plexi-Glas.” It is “bendable glass,” and splinterproof. The material, clear as ordinary glass, and containing no reinforcing steel threads, has been adopted for use in all the modern, streamline omnibuses which the Nazi government has built to operate on the new “Hitler highways.”

This Plexi-Glas, a product of pitcoal waste, can be bent readily to and fro at a temperature of 194 degrees Fahrenheit. But it has one other remarkable advantage as construction material—it can be worked with a simple steel point, and does not require a diamond point as does ordinary glass. Its properties seem incredible to the ordinary layman; this “glass” can actually be cut in two with an ordinary wood saw.

“Kunst Harz” is produced in two varieties. By the chemical combination of phenol with pitcoal waste and a formaldehyde condensate, “Phenol Harz” is manufactured. Every new billiard ball, umbrella handle, cigarette holder, pair of goggles and shatterproof window placed on the market in the last few months in Germany has been a Phenol Harz product.

The other variety is “Amino Harz,” and is produced by a sister process which substitutes urea for phenol. All new knife handles, radio cabinets, switchboards, fancy buttons, electrical appliances, and even unbreakable cups and saucers are being fashioned from this new material.

Not only is Germany already preparing to breakfast, lunch and dine on her forests, but she has actually begun to use her coal for jewelry and windows. But “invention” is only one part of the battle. The other is “substitution.” For instance, though German soil does not contain sorely desired metals, Germany’s famous

heavy industry does. Hitler has ordered that the national railways be “mined.” His huge “replacement program,” by which the German State Railways will divest itself of all metals needed for armament has been going full blast for six months. “Precious” parts all the way from locomotives’ copper boilers to the cotton insulation on electric-light wires are being systematically salvaged for the good of the hard pressed Fatherland.

The new “precious” metals in Germany are copper, tin and zinc. With a large hurry-up armament program, Hitler needs them all in quantity and can get little. His unique reclamation program is commandeering tons of them from the repair sheds of Germany’s gargantuan State Railways, next largest to America’s.

The initial command in this salient of the war on imports outlawed the huge copper boilers, or fireboxes, of German locomotives, until recently considered the most efficient type. These are being replaced by boilers of steel. Successful experiments also have been conducted with boilers of “Kunst Harz.” All brass has also been officially doomed, and ordered systematically confiscated from the railways’ rolling stock. Among other items of equipment, this removes the capacious ash trays, whose red and gold gleam on the walls of every train compartment is familiar to every American who has spent a vacation in Germany.

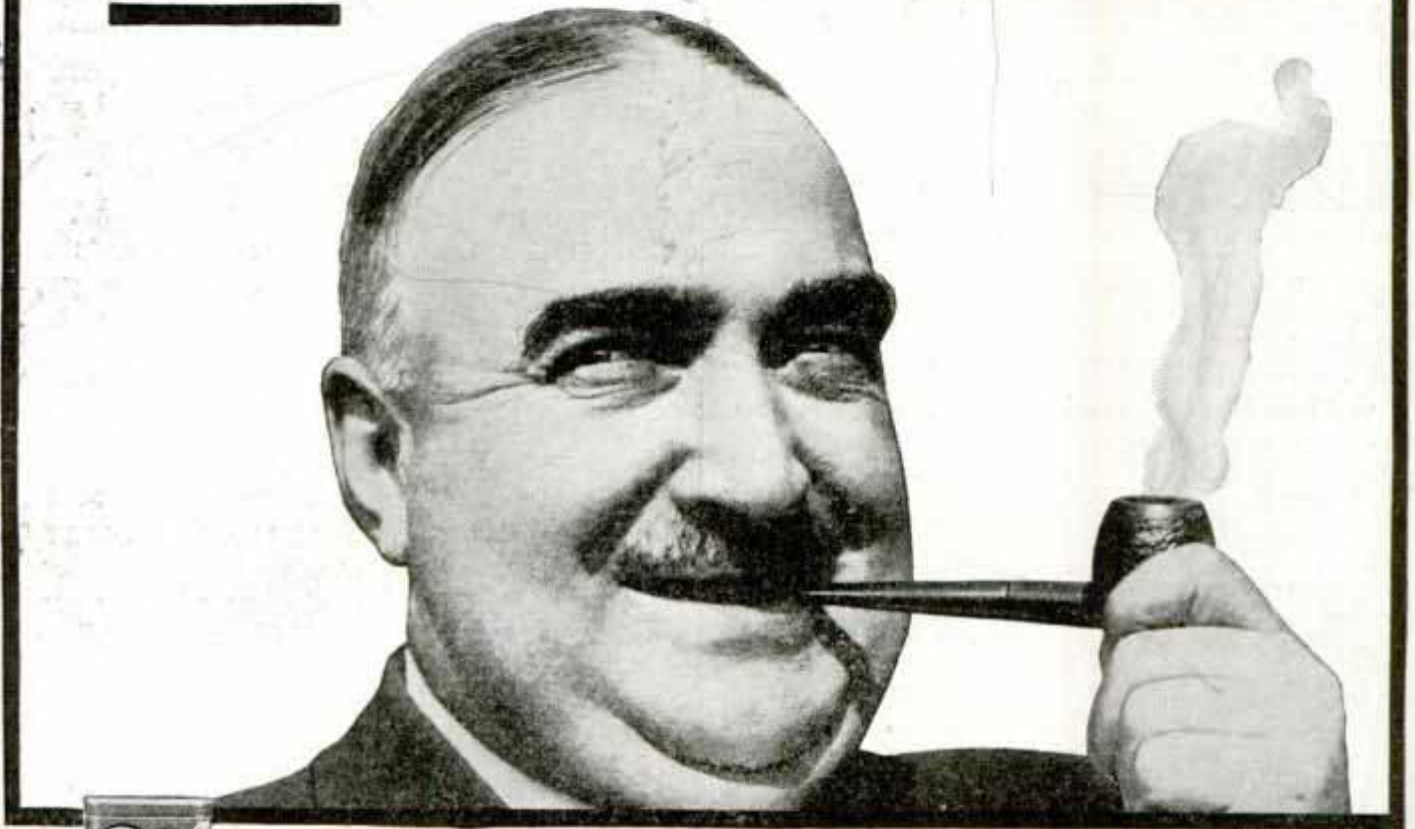
Bronze has also been proscribed, since it is an alloy of all three of the trinity of metals “for government use only”—copper, zinc and tin. This rule is even changing the tone of the engine bells, since the high sharp peal of bronze must now give way to the dull, muffled clang of cast iron. Even the bronze letters and nameplates upon the locomotive faces have been taxed for the armament treasury. They are replaced by a particularly cheap type of aluminum, called “Silumin.” All frames for clothes hangers, hatracks and baggage hammocks are also en route to the government melting-pot for they are also of brass. Even the brass steam-heat valves have been removed and valves of the new “Kunst Harz” put in their places.

(Continued to page 146A)

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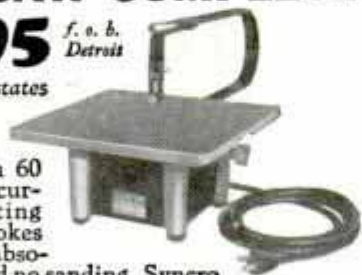
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Food from Wood

(Continued from page 144A)

Similarly proscribed are copper wires. They are replaced by specially treated duralumin—aluminum slightly alloyed with copper and manganese. Perhaps the most remarkable substitution, however, is that which calls for a new type of insulation for all electric wires. Slashing Germany's cotton imports is one of the most difficult tasks of the anti-importation campaign. All wires installed in the entire German Railway system in 1935 therefore were insulated with paper or artificial silk.

Another unpublicized victory in Germany's struggle to subsist entirely on homegrown products was fought out in Munich, with successful experiments in fueling automobiles with propane gas. Municipal trucks, equipped with propane gas drive, have over a three-month period, not only functioned satisfactorily but recorded a saving of thirty-two per cent in fuel costs. Propane is not a liquid, but literally a gas, or vapor, a by-product of the Eergius-Bosch "coal-cracking" process. The same treatment which releases petroleum from coal, also sets free a heavy gaseous hydrocarbon called "propane." A great advantage of this fuel gas over ordinary illuminating gas is that it is non-poisonous.

The most characteristic skirmish of the "war against imports," however, must remain the "Save Your Dirty Oil" campaign of south Germany. In this sector of the boycott battle, the propagandist is in the frontline trenches and the scientist admittedly far behind. Under the motto "Not One Quart of Used Oil in the Gutter," the government of Bavaria has instituted an official drive to send all exhausted lubricants to special factories for "regeneration."

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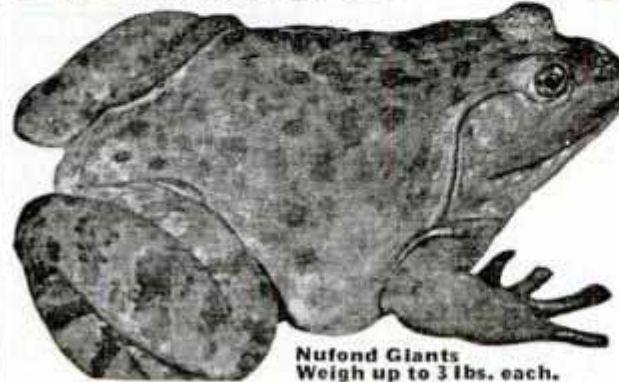
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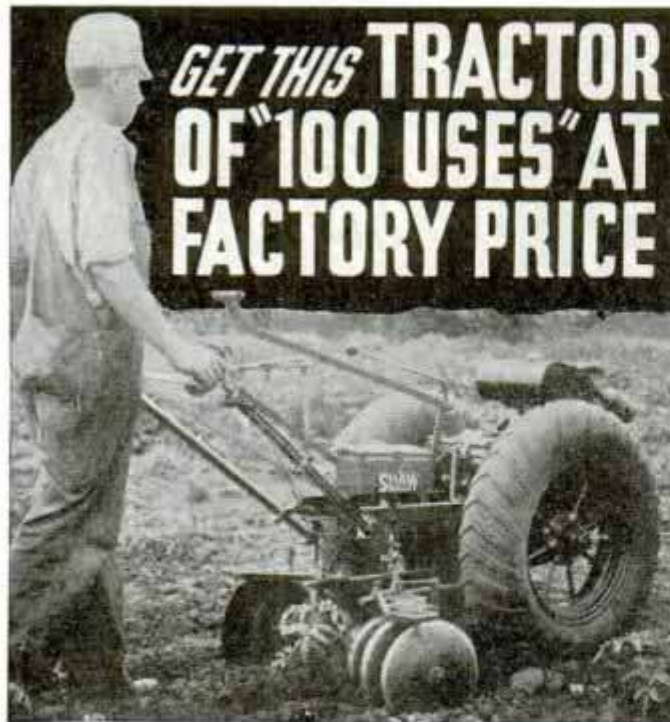
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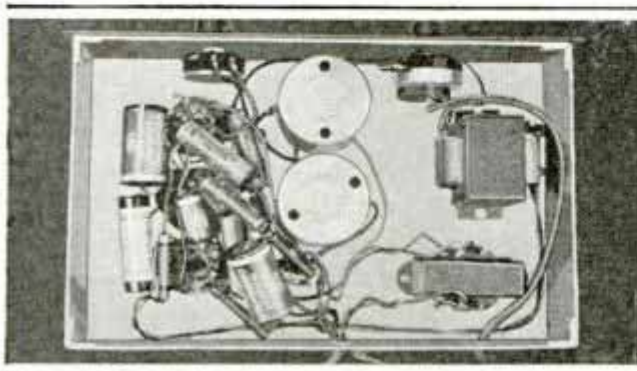
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All-Metal Tube Set for Beginners

(Continued from page 263)

two coils in the small shield cans are mounted directly under the tuning condenser and the leads to the grids which go to the stators of the condenser unit should be as short as possible to prevent feedback and insure good selectivity. Leads to the grid caps of the tubes will come from Tr. 1 and Tr. 2 on the top of the condenser.

Filament wires 2 and 7 should be twisted together and connected to prongs Nos. 2 and 7 on each socket. The No. 1 terminal of all three sockets contacts the metal cases of the tubes and should be connected to ground. Mount several soldering lugs



Underside View of Completed Receiver

on the base and connect them together with bare wire to provide a good common ground without depending entirely on the metal base. A complete list of materials can be obtained upon application without charge. Solder all connections with rosin-core solder, and a good hot iron, using ordinary hook-up wire for the circuit.

To place the receiver in operation, connect the antenna and run a lead from the adjacent ground post to a ground clamp on a cold-water pipe. Connect the speaker, plug in the 110-volt line cord and turn on the filament switch. Adjust the tuning condenser until you hear a fairly loud signal on the low end of the dial near 1,500 kc. Now adjust Tr. 1 and Tr. 2 with a small screwdriver until the signal is the loudest; then repeat this process at the high end of the dial. A position of these adjustments will be found where the signals are about equal in volume at both ends of the dial; the set is then ready for use. A large blueprint of all diagrams is available, those who wish it should specify blueprint R-219. The receiver may be installed in a table-type cabinet if desired.

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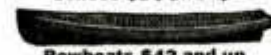
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Low-Loss Antenna Connections

(Continued from page 264)

loop and make the electrical connection above, thus removing the strain from the soldered junction.

A frequent cause of lead-in losses results from the practice of winding insulated lead-in wire around the nail used to fasten a common type of split-section porcelain stand-off insulator to the side of the house. A low-loss method of anchoring the wire in the insulator is illustrated in the photo at the left in Fig. 4. Wind a few turns of inch-wide adhesive tape around the wire to form a pad for the porcelain to grip without damage to the insulation. Shielded lead-in wire should always be treated in this manner to prevent the porcelain from pressing the woven metal shielding through the insulation.

There are a few simple rules for good soldering that every radio experimenter and set owner should follow. When choosing an electric soldering iron for a particular job, be sure that the iron is large enough to supply sufficient heat to the parts so that the solder will flow freely when applied to the work. Fig. 5 shows a fairly heavy iron suitable for making antenna and ground connections, also for general soldering around the home. It may be used with an extension cord for outdoor work. The smaller iron, Fig. 6, is an 80-watt variety with two tips, specially designed for building and repairing radio receivers. The small barrel enables the operator to reach difficult corners.

To tin the working tip of the iron, and thus retard the formation of oxide on the working faces, allow the iron to heat for about 5 minutes, apply soldering paste to the tip and then a thin coating of solder as indicated in the upper sketch. Remove the excess solder with a cloth; a badly corroded iron may be cleaned with a smoothing file as shown in the lower photo.

The work to be soldered must be cleaned thoroughly with sandpaper or a steel brush. For antenna joints and soldered connections in the r.f. circuits of radio receivers and transmitters, do not use soldering paste or acid flux. Employ rosin-core solder in these cases to avoid any trace of corrosion. Heat the work thoroughly with the iron and apply the rosin-core solder on the opposite side of the joint until the heated surfaces melt it.

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(Continued from page 167)

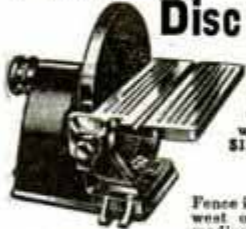
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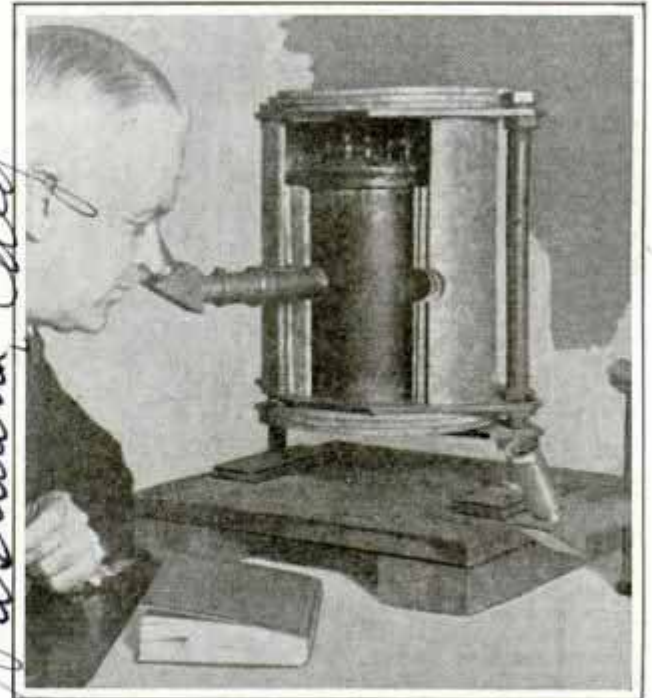
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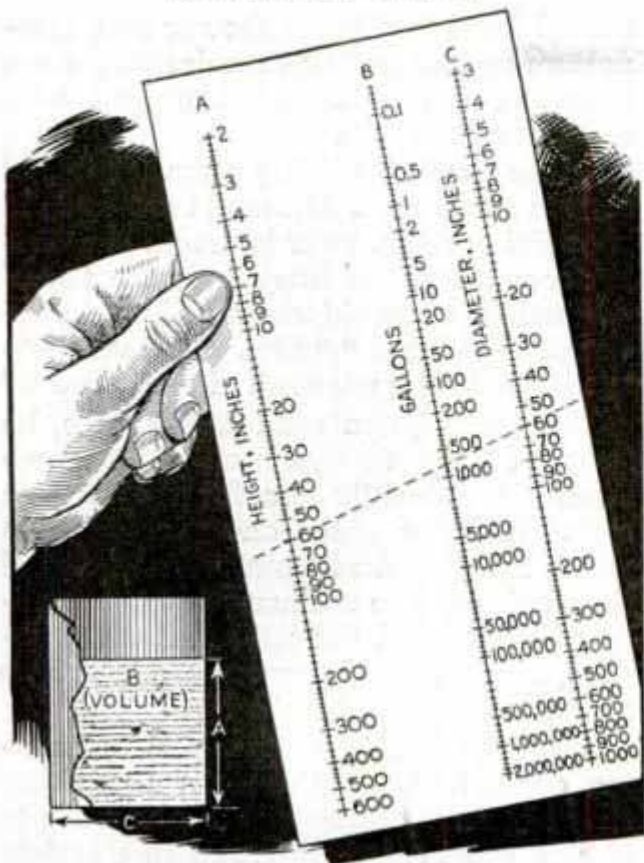
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tough alloy and lined with lead, containing nitrogen under pressure. Every time a cosmic ray struck this ball, there was an electrical disturbance in the nitrogen and this was measured. This, of course, gave only the total number of rays.

What good are cosmic rays? That question is now taking up the thought of scientists. Dr. Arthur H. Compton has estimated that if all the energy of the cosmic rays could be gathered twenty miles above the earth's surface and utilized one hundred per cent it would only amount to 20,000 horsepower. The atmosphere of the earth acts as a blanket, and the rays are only one two-hundredths as numerous at sea level as twenty miles up, so the same authority has estimated that at sea level only 100 horsepower could be found on the whole surface of the earth, about enough to drive one automobile.

Yet cosmic rays may have a great influence on weather, they may also have many other influences as yet unknown to man, for scientists even now admit that they do not yet know what cosmic rays really are. Through them scientists may be able to study the "ancient" history of the universe, and this means millions of years. Truly, cosmic rays are the great mystery of the universe. Will some use be found for them? No one can tell.

Chart to Figure the Capacity of Round Tanks



Point of Intersection Between a Line, Drawn Across the Outside Columns, and Center Column, Indicates Tank Capacity in Gallons

The problem of quickly determining the capacity in gallons of a cylindrical tank mounted in a vertical position, is easily solved with this chart. To use it, draw a straight line between column A, representing the height of the tank in inches, and column C, which represents the diameter in inches. The point where the line intersects column B will be the number of gallons in the tank. In case it is desired to know the amount of liquid in a given tank at a given time, column A represents the depth of the liquid. The chart may be used backwards for determining the height and diameter of a proposed tank of any predetermined capacity.

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Snapshot of W. G. Simmons and wife, Miami, Fla.

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The Radiant City of the Future

(Continued from page 180)

should have, besides, a shower and gymnasium apparatus. Have a dressing room adjoining the bathroom equipped with closets and mirrors.

"Have one large living room instead of several small ones. Demand bare walls in your living room, your bedroom and dining room. Put the kitchen at the top of the house to avoid smells. Have concealed or diffused lighting. Have ventilating panes to the windows of every room."

This prescription cannot, of course, be followed in every instance, but it represents a worthwhile aim for the modern man. In large cities one sees changes which have resulted from the wide use of the machine. The ordinary street, formerly a playground for neighborhood children, is now a highly specialized "machine for producing speed traffic."

People blame the automobile for causing congestion. Le Corbusier holds that the very same automobile can be made to reduce congestion if allowed to circulate in a city properly planned.

We have carried the notion that the center of a city should be the busiest place; the "heart" of a city corresponds to the district where congestion is greatest. Why not, asks Le Corbusier, carry the main highways around the edge of the city, instead of directing them into the center? Then there would be no congestion, for on the edge of the city there is more space than in the center. If roads are laid according to this plan, the heart of a city will be transferred to its borders. The center of a city is the most impractical place for traffic density. If we shift the city streets, says Le Corbusier, we can shift the traffic congestion.

Le Corbusier admires American grain elevators and suspension bridges. Their simplicity, grandeur and truthful forms are in perfect harmony, he says. In the grain elevators, he sees the first fruits of the machine age.

"American engineers overwhelm us with their calculations," he says. "Such men—intelligent, cold, and calm—are needed to build the house and lay out the town."

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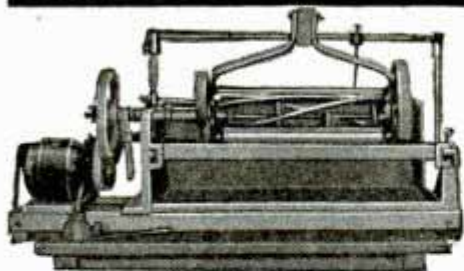
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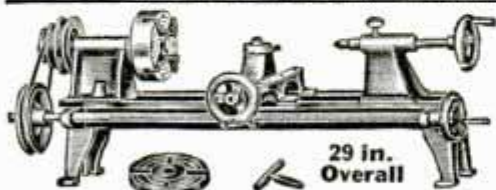
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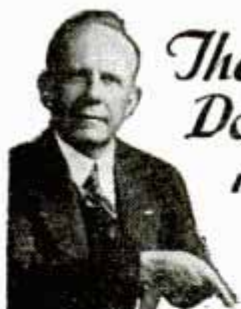
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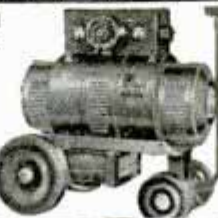
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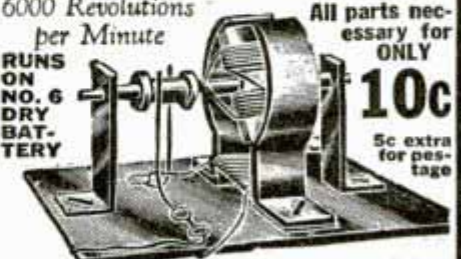
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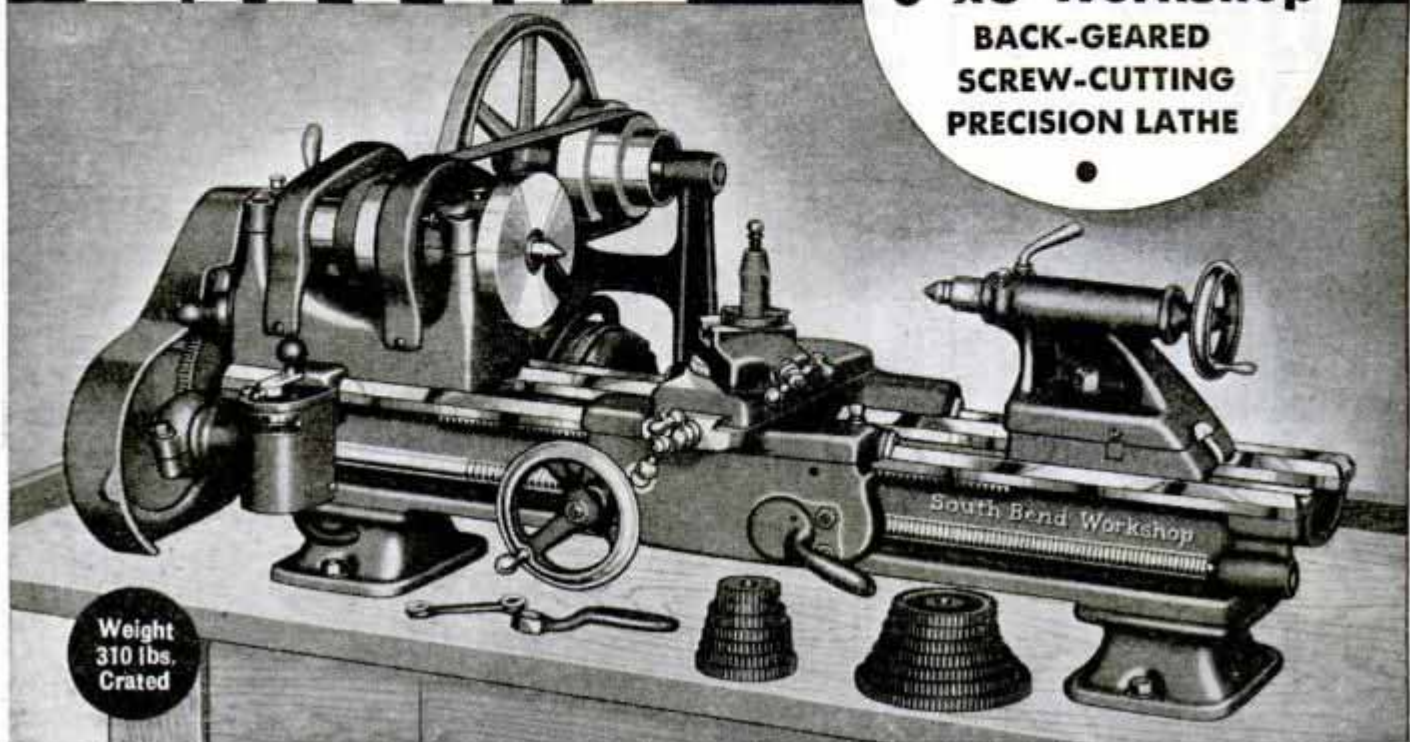
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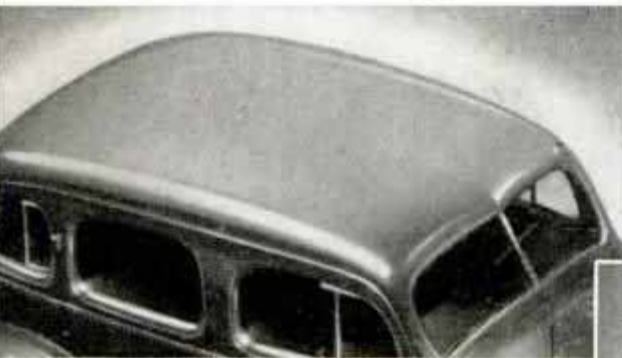
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SOUTH BEND Precision LATHES

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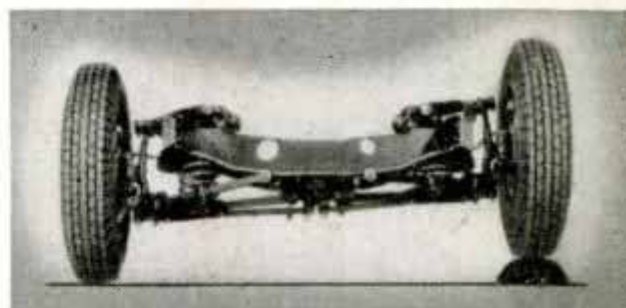
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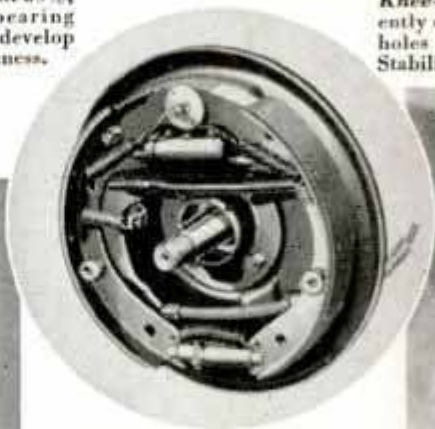
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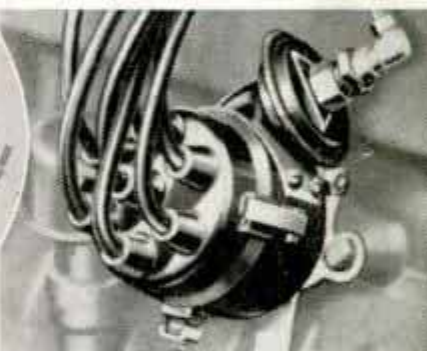
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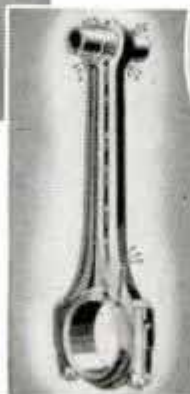


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